U.S. ARMY CORPS OF ENGINEERS
HUNTSVILLE DIVISION

WORK PLAN FOR CERCLA ESI OF FIFTEEN SOLID WASTE MANAGEMENT UNITS

AT
SENECA ARMY DEPOT
ROMULUS, NEW YORK

PREPARED FOR

U.S. ARMY CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

PREPARED BY

ENGINEERING-SCIENCE, INC.

DRAFT

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SENECA ARMY DEPOT
ROMULUS, NEW YORK

Prepared For:
U.S. Army Corps of Engineers
Huntsville Division
Huntsville, Alabama

Prepared By:
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APPROVAL SHEET

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LIST OF ACRONYMS AND ABBREVIATIONS

AOC	Areas of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
BP	Before Present
$CaCO_3$	Calcium Carbonate
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CDAP	Chemical Data Acquisition Plan
CFR	Code of Federal Regulations
CRZ	Contamination Reduction Zone
2,6-DNT	2,6-Dinitrotoluene
2,4-DNT	2,4-Dinitrotoluene
DQO	Data Quality Objective
DRMO	Defense Reutilization and Marketing Office
E	East
EM	electromagnetic
EOD	Explosive Ordnance Disposal
EP	Extraction Procedure
EPA	U.S. Environmental Protection Agency
ESI	Expanded Site Inspection
eV	electron volts
FID	Flame Ionization Detector
FS	Feasibility Study
FSAP	Field Sampling and Analysis Plan
ft	feet
GPR	Ground-Penetrating Radar
HFA	Human Factors Applications Inc.
HMX	Octahydro-1,3,5,7-Tetranitro-1,3,5-7-Tetrazocine
IAG	Interagency Agreement
IP	Ionization Potential
L	Liter
m	meter

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg	milligram
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSL	Mean Sea Level
mg/L	milligrams per liter
NAPL	Non-Aqueous Phase Liquids
NPL	National Priority List
NYSDEC	New York State Department of Environmental Conservation
NYSDWS	New York State Drinking Water Standard
NTUs	Nephelometric Turbidity Units
OB	Open Burn Facility
OD	Open Detonation Facility
OVA	Organic Vapor Analyzer
OVM	Organic Vapor Monitor
PA	Preliminary Assessment
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PEP	Propellants, Explosives and Pyrotechnics
PID	Photoionization Detector
ppm	parts per million
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
RAS	Routine Analytical Services
RCRA	Resource Conservation and Recovery Act
RDX	Hexahydro-1,3,5-Trinitro-1,3,5-Triazine

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

RI/FS	Remedial Investigation/Feasibility Study
RQD	Rock Quality Designation
SAS	Special Analytical Services
SEAD	Seneca Army Depot
SIR	Subsurface Interface Radar
SOW	Statement of Work
SWMU	Solid Waste Management Unit
TAGM	Technical and Administrative Guidance Manual
Tetryl	Methyl-2,4,6-Trinitrophenylnitramine
2,4,6-TNT	2,4,6-Trinitrotoluene
TOC	Total Organic Carbon
TOX	Total Organic Halogens
ug/L	micrograms per liter
USACE	United States Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USATHAMA	United States Army Toxic and Hazardous Materials Agency
USCS	Unified Soil Classification System
UXO	Unexploded Ordnance
VOA	Volatile Organic Analyte
VOC	Volatile Organic Compound
WP	Work Plan
W	West

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1.0 INTRODUCTION

1.1 PURPOSE

Engineering-Science, Inc. (ES) has been retained by the U.S. Army Corps of Engineers to develop Work Plans to conduct preliminary site investigations at the Seneca Army Depot (SEAD). The areas to be investigated under this Work Plan include fifteen Solid Waste Management Units (SWMUs) at SEAD.

The work will be performed according to the requirements of the New York State Department of Environmental Conservation (NYSDEC), the U.S. Environmental Protection Agency, Region II (EPA), and the Interagency Agreement (IAG). The purpose of this investigation will be to determine whether hazardous constituents or wastes have been released to the environment at each of the fifteen SWMUs to be investigated and to evaluate potential threats to human health, welfare, and the environment. The format of this Work Plan is based on the requirements of EPA (EPA 1987). This EPA document provides guidance for Expanded Site Inspections (ESI).

1.2 SCOPE

This investigation is similar in format, but not as extensive as a Remedial Investigation/Feasibility Study (RI/FS) investigation. It will be more descriptive than a RCRA Facility Assessment (RFA) sampling visit, and less detailed than the full RI/FS investigation process. Since ESIs are being conducted at each of the 15 SWMUs, these SWMUs are now classified as Areas of Concern (AOC). In this document, the terms (AOC and SWMU) are used interchangably since each of the 15 SWMUs has been designated as an AOC. After completion of the final report for this investigation, if an AOC is determined to pose a threat to human health, welfare or the environment, a CERCLA Remedial Investigation (RI) will be undertaken.

The IAG sets forth an incremental agenda which begins with the initial identification of each SWMU and culminates with a Record of Decision (ROD) for each SWMU requiring a remedial action. In some instances, it may be clear that after conducting a preliminary investigation, a SWMU poses little threat to human health and the environment and enough evidence exists to eliminate this SWMU from further consideration by classifying this SWMU as a No-Action SWMU. In other cases, the SWMU will be investigated as an AOC. Following this, a RI/FS will be performed to gain additional data to prepare a ROD.

In subsection 10.6 of the IAG, AOC completion reports are described. In accordance with Section 10.6, the Army is required to prepare a completion report for AOC that pose no threat to public health or welfare or to the environment. The completion report provides certification and documentation that the AOC in question does not constitute a threat to public health, welfare or to the environment.

SEAD anticipates that the site investigation may reveal that one or more of the fifteen AOC will pose no threat to human health or welfare or to the environment. For these cases, the professional opinions and recommendations contained in the final report will constitute the completion report described in Section 10.6 of the IAG. For those AOC that are determined to pose a threat to public health or welfare or to the environment, an RI/FS will be performed in accordance with Section 10.9 of the IAG.

1.3 BACKGROUND

SEAD is a 10,587-acre facility in Seneca County, Romulus, New York, that has been owned by the United States Government and operated by the Department of the Army since 1941. Figure 1-1 identifies the location of SEAD. Since its inception in 1941, SEAD's primary mission has been the receipt, storage, maintenance, and supply of military items. This function includes disposal of military ammunition and explosives by burning and detonation.

In May 1979, the US Army Toxic and Hazardous Materials Agency (USATHAMA) began conducting an evaluation of SEAD. This evaluation was undertaken "to assess the environmental quality of SEAD with regard to the use, storage, treatment, and disposal of toxic and hazardous materials" and "to define any conditions which may adversely affect the health and welfare or result in environmental degradation" (USATHAMA 1980). The report concluded that geological conditions are such that contaminants, if present, could migrate in surface or subsurface waters.

In November 1986, SEAD applied for a Part B Resource Conservation and Recovery Act (RCRA) Permit to operate a hazardous waste storage facility, SWMU designation (SEAD-1), a polychlorinated biphenyl storage facility (SEAD-2) and a deactivation furnace (SEAD-17). The open burning (OB) facility and the open detonation (OD) facility (SEAD-23 and SEAD-45, respectively) are also currently under interim status. Under the RCRA Hazardous and Solid Waste Amendments of 1984 (HSWA), Part B Permits issued after November 8, 1984, require identification and corrective action at any SWMU located on the installation that is releasing hazardous constituents or hazardous wastes to the environment. This requirement applies to all SWMUs regardless of when the wastes were placed therein.

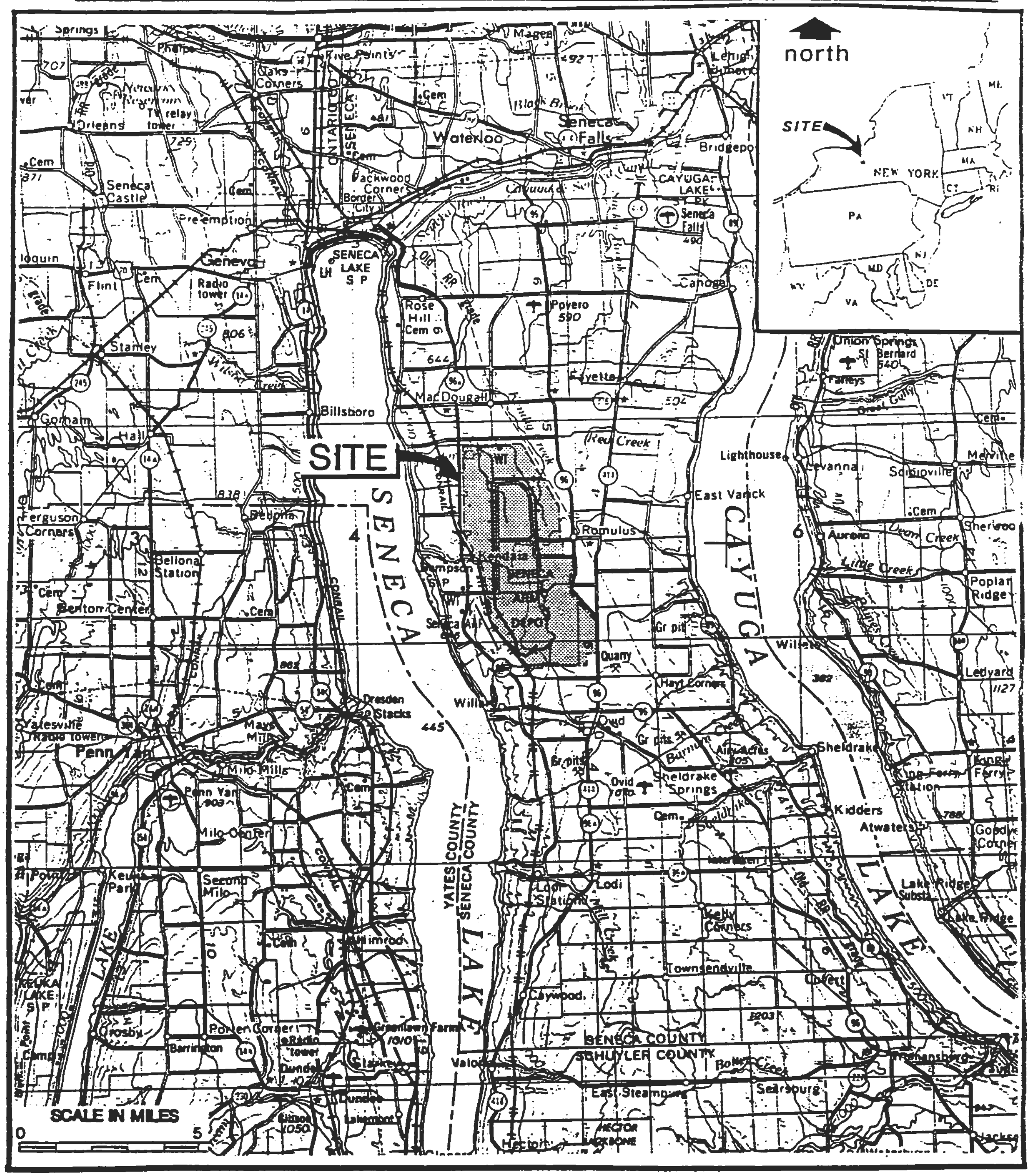

FIGURE 1-1 LOCATION MAP

SWMU Closure normally performed under RCRA guidelines has been deferred when SEAD was proposed for the National Priority List (NPL). In August 1990, SEAD was added to EPA's Superfund list and subsequent remediation of targeted problem sites became regulated under CERCLA guidelines. An agreement was made with the EPA Region II and NYSDEC to integrate the Army's RCRA corrective action obligations with CERCLA response obligations to facilitate overall coordination of investigations mandated at SEAD. Therefore, any required future investigations will be based on CERCLA guidelines and RCRA shall be considered an Applicable or Relevant and Appropriate (ARAR) Requirement pursuant to Section 121 of CERCLA.

As required by the EPA Region II and by NYSDEC, the U.S. Army Corps of Engineers commissioned a "Solid Waste Management Unit Classification Report" at SEAD (ERCE 1991). This work was performed to evaluate the effects of past solid waste management practices at identified SWMUs on the facility and to classify each as areas where "No Action is Required" or as "Areas of Concern" (AOC). Areas of Concern include both (a) SWMUs where releases of hazardous substances may have occurred and (b) locations where there has been a release or threat of a release into the environment of a hazardous substance or constituent (including radionuclides) under CERCLA. AOC may include, but need not be limited to, former spill areas, landfills, surface impoundments, waste piles, land treatment units, transfer stations, wastewater treatment units, incinerators, container storage areas, scrap yards, cesspools and tanks with associated piping that are known to have caused a release into the environment or whose integrity has not been verified.

The original 69 SWMUs were identified in the SWMU Classification Report (SCR), prepared by ERCE (1991) presented on Table 1-1. Three additional SWMUs at SEAD have been identified by SEAD (70, 71, 72) bringing ghe total to 72. The fifteen units that are the subject of this investigations are presented in Table 1-2.

In addition to the SWMU investigations to be performed under this contract, additional investigations currently being undertaken include a Remedial Investigation/Feasibility Study (RI/FS) at the Incinerator Ash Landfill (SEAD-3, 6, 8, 14, and 15) and an RI/FS at the Open Burn Facility (SEAD-23).

TABLE 1-1

LIST OF SWMUs AND AOC IDENTIFIED AT SENECA ARMY DEPOT

SWMU/AOC Designation	Title
SEAD- 1	Hazardous Waste Container Storage Facility: Bldg. 307
SEAD- 2	PCB Transformer Storage: Bldg. 301
SEAD- 3[a]	Incinerator Cooling Water Pond
SEAD- 4	Munitions Washout Facility Leach Field
SEAD- 5	Sewage Sludge Waste Pile
SEAD- 6[a]	Abandoned Ash Landfill
SEAD- 7	Shale Pit
SEAD- 8[a]	Non-Combustible Fill Area
SEAD- 9	Old Scrap Wood Site
SEAD-10	Present Scrap Wood Site
SEAD-11	Old Construction Debris Landfill
SEAD-12	Radioactive Waste Burial Sites (3)
SEAD-13	IRFNA Disposal Site
SEAD-14[a]	Refuse Burning Pits
SEAD-15[a]	Abandoned Incinerator Building
SEAD-16	Abandoned Deactivation Furnace: Bldg. S-311
SEAD-17	Existing Deactivation Furnace: Bldg. 367
SEAD-18	Classified Document Incinerator: Bldg. 709
SEAD-19	Classified Document Incinerator: Bldg. 801
SEAD-20	Sewage Treatment Plant No. 4
SEAD-21	Sewage Treatment Plant No. 715
SEAD-22	Sewage Treatment Plant No. 314
SEAD-23[a]	Open Burning Facility
SEAD-24	Abandoned Powder Burning Pit
SEAD-25	Fire Training and Demonstration Pad

TABLE 1-1 (Cont.)

LIST OF SWMUs AND AOC IDENTIFIED AT SENECA ARMY DEPOT

SWMU/AOC Designation	Title
SEAD-26	Fire Training Pit and Area
SEAD-27	Bldg. 360 Steam Cleaning Waste Tank
SEAD-28	Bldg. 360 Underground Waste Oil Tanks (2)
SEAD-29	Bldg. 732 Underground Waste Oil Tank
SEAD-30	Bldg. 118 Underground Waste Oil Tank
SEAD-31	Bldg. 117 Underground Waste Oil Tank
SEAD-32	Bldg. 718 Underground Waste Oil Tanks (2)
SEAD-33	Bldg. 121 Underground Waste Oil Tank
SEAD-34	Bldg. 319 Underground Waste Oil Tanks (2)
SEAD-35	Bldg. 718 Waste Oil-Burning Boilers (3)
SEAD-36	Bldg. 121 Waste Oil-Burning Boilers (2)
SEAD-37	Bldg. 319 Waste Oil-Burning Boiler
SEAD-38	Bldg. 2079 Boiler Blowdown Leach Pit
SEAD-39	Bldg. 121 Boiler Blowdown Leach Pit
SEAD-40	Bldg. 319 Boiler Blowdown Leach Pit
SEAD-41	Bldg. 718 Boiler Blowdown Leach Pit
SEAD-42	Preventive Medicine Lab
SEAD-43	Old Missile Propellant Test Lab (Bldg. 606)
SEAD-44	Quality Assurance Test Lab
SEAD-45	Open Detonation Facility
SEAD-46	Small Arms Range
SEAD-47	Radiation Calibration Source Storage (Bldgs. 321 and 806)
SEAD-48	Pitchblend Storage Bunkers
SEAD-49	Columbite Ore Storage (Bldg. 356)
SEAD-50	Tank Farm

TABLE 1-1 (Cont.)

LIST OF SWMUs AND AOC IDENTIFIED AT SENECA ARMY DEPOT

SWMU/AOC Designation	Title
SEAD-51	Herbicide Usage - perimeter of high security area
SEAD-52	Ammunition Breakdown Area (Bldgs. 608 and 612)
SEAD-53	Munitions Storage Igloos
SEAD-54	Asbestos Storage Igloos
SEAD-55	Tannin Storage Igloos
SEAD-56	Herbicide and Pesticide Storage
SEAD-57	Explosive Ordnance Disposal Area
SEAD-58	Booster Station (Building 2131)
SEAD-59	Fill Area (West of Building 135)
SEAD-60	Oil Discharge (Building 609)
SEAD-61	Underground Waste Oil Tank (Building 718)
SEAD-62	Nicotine Sulfate Disposal Area (south side of road, between Buildings 606 and 612)
SEAD-63	Miscellaneous Components Burial Site
SEAD-64	Garbage Disposal Areas (Derris Landfill south of storage pad)
SEAD-65	Acid Storage Pad
SEAD-66	Pesticide Storage Area (Near Buildings 5 and 6)
SEAD-67	Dump Site (East of Sewage Treatment Plant No. 4)
SEAD-68	Pest Control Shop (Building S-335)
SEAD-69	Disposal Area (Building 606)
SEAD-70	Building 2110 Fill Area
SEAD-71	Alledged Paint Disposal Area
SEAD-72	Mixed Waste Storage Facility (Bldg. 803)

NOTES: [a] These units have already been identified as AOC and RI/FS activities have been initiated at these sites.

TABLE 1-2

FIFTEEN SOLID WASTE MANAGEMENT UNITS AND AREAS OF CONCERN TO BE INVESTIGATED

Designation	Title
SEAD-5	Sewage Sludge Waste Piles
SEAD-9	Old Scrap Wood Site
SEAD-12A & B	Radioactive Waste Burial Sites
SEAD-43, 56, and 69	Building 606 - Old Missile Propellant Test Lab, Herbicide/Pesticide Storage, and Building 606 Disposal Area
SEAD-44A & B	Quality Assurance Test Laboratory
SEAD-50	Tank Farm
SEAD-58	Debris Area Near Booster Station 2131
SEAD-59	Fill Area West of Building 135
SEAD-60	Oil Discharge Adjacent to Building 609
SEAD-62	Nicotine Sulfate Disposal Area near Buildings 606 or 612
SEAD-63	Miscellaneous Components Burial Site
SEAD-64A, B, C, and D	Garbage Disposal Areas
SEAD-67	Dump Site East of STP No. 4
SEAD-71	Fill Area Adjacent to Building T-2110
SEAD-72	Rumored Paint and Solvent Burial Pit

1.4 APPROACH TO CERCLA INVESTIGATION

The Army, as a matter of policy, is commencing CERCLA investigations at SWMUs prior to reaching final resolution on the proper classification for all SWMUs by EPA and NYSDEC. The Army is proceeding with the investigation of only those units on which the Army and the regulatory agencies concur. The Army and the regulatory agencies are in agreement with respect to the classification of all fifteen SWMUs scheduled for investigation under this Work Plan.

The Army is investigating SWMUs that have been determined to be Areas of Concern as determined by the findings of the SWMU Classification Report (ERCE 1991) and the negotiations with EPA and NYSDEC. The current Work Plan proposes to investigate all of the SWMUs that have been listed in Table 1-2.

1.5 WORK PLAN ORGANIZATION

This Work Plan consists of five sections and four appendices. Section 1.0 (Introduction) provides objectives of the Work Plan, background information regarding the site, and general information regarding the procedures and requirements stated in the Work Plan. Section 2.0 (Site Conditions) describes the physical conditions of SEAD including climate, physical setting, topography, geologic setting, hydrogeology and surface waters. Section 3.0 (Data Quality Objectives) identifies the data uses and needs for the investigation. Section 4.0 (Sampling Plan) provides a description of each SWMU, identifies the former or current operating procedures, and describes the sampling locations, the rationale, logistics, and frequency for the samples, as well as the analytical program to be implemented at each SWMU. Section 5.0 (Project Management Schedule and Reports) describes the schedule to complete this Work Plan and the staff that will be used. Appendix A (Field Sampling and Analysis Plan) provides a description of the pre-sample considerations, field operations, post sample collection considerations, and sample packaging. Appendix B (Health and Safety Plan) documents the procedures and equipment necessary to allow safe working conditions on site. Appendix C (Chemical Data Acquisition Plan) provides a description of the analytical methodologies to be used and a description of the standard operating procedures and Quality Assurance/Quality Control (QA/QC) requirements for the laboratory. Appendix D (Scope of Work) contains the scope of work for this investigation.

2.0 SITE CONDITIONS

2.1 CLIMATE

The seasonal variation in temperatures at SEAD range from an average of 23°F in January to 69°F in July. The annual precipitation averages approximately 30 inches. Wind directions are primarily westerly and west-southwesterly.

2.2 PHYSICAL SETTING

SEAD is an active military installation that was constructed on a 10,587 acre site in 1941. SEAD is located in an uplands area of New York State, (generally over 600 feet in elevation), approximately 40 miles south of Lake Ontario, near Romulus, New York (refer to Figure 1-1). The upland area forms a divide separating two of the New York Finger Lakes, Cayuga Lake on the east and Seneca Lake on the west. Sparsely populated farmland covers most of the surrounding area. New York State Highways 96 and 96A adjoin SEAD on the east and west boundaries, respectively.

2.3 TOPOGRAPHY

SEAD lies on the western side of a series of north to south trending rock terraces which separate Cayuga Lake on the east and Seneca Lake on the west (refer to Figure 1-1). The rock terraces range in elevation from 490 feet above Mean Sea Level (MSL) in northern Seneca County to as much as 1600 feet above MSL at the southern end of the lakes. Elevations on the depot range from 450 feet above MSL on the western boundary to 760 feet above MSL in the southeast corner. The depot's surface generally consists of a west and north sloping surface.

2.4 GEOLOGIC SETTING

The Finger Lakes uplands area is underlain by a broad north-to-south trending series of rock terraces mantled by glacial till. As part of the Appalachian Plateau, the region is underlain by a tectonically undisturbed sequence of Paleozoic rocks consisting of shales, sandstones, conglomerates, limestones and dolostones. Figure 2-1 shows the regional geology of Seneca County. In the vicinity of SEAD, monoclinal black shale of the Devonian age (385 million years BP), Hamilton group, dip gently to the south at a rate of approximately 35 feet per mile, and show little evidence of tectonic disturbance by folding or faulting.

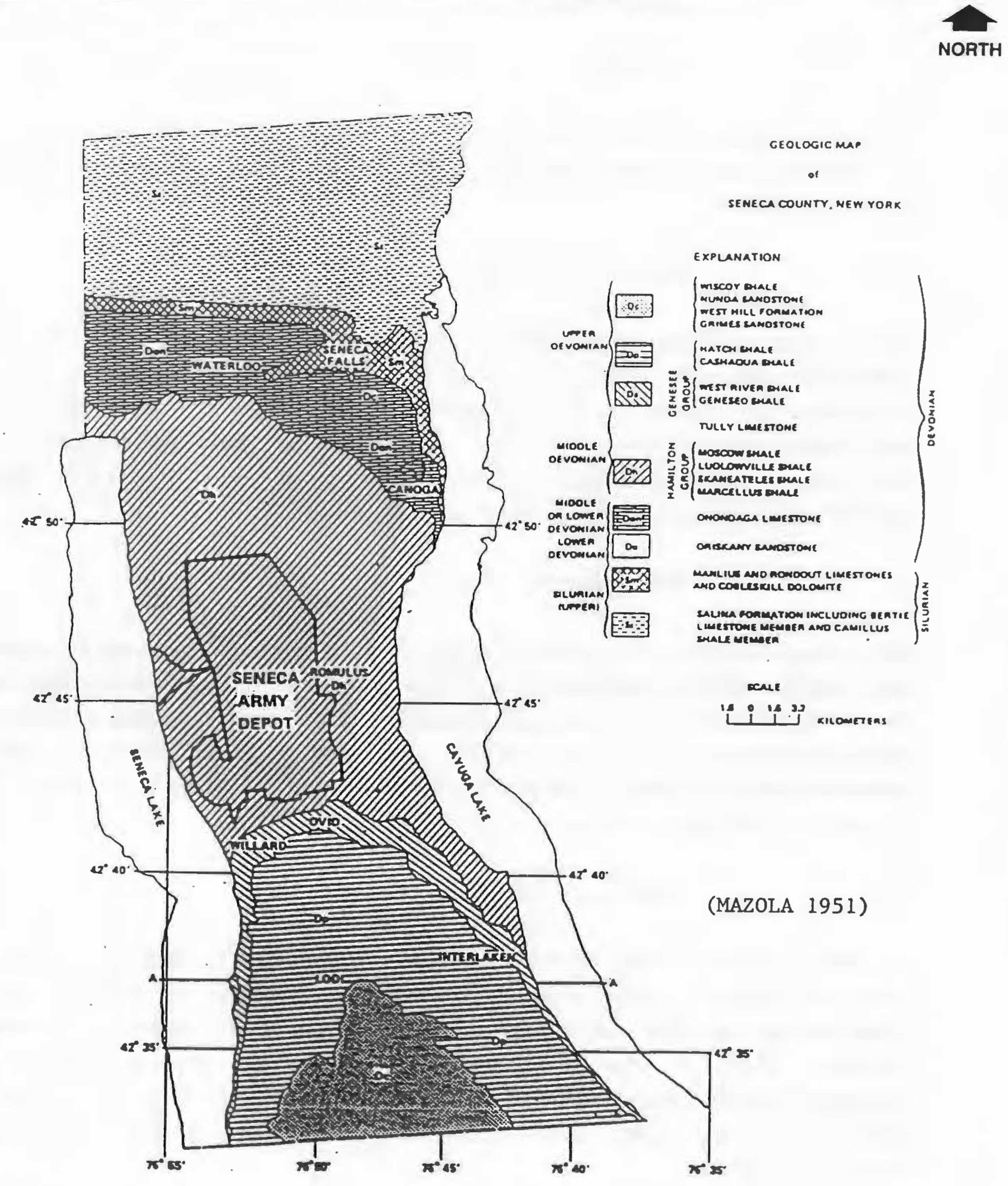

FIGURE 2-1 REGIONAL GEOLOGIC MAP

Locally, the bedrock is a soft, grey, fissile, highly jointed shale that is the upper member of the Hamilton Group. Figure 2-2 is the stratigraphic section of Paleozoic rocks of Central New York. The shale contains interbeds of calcareous shale and limestone. The shale is extensively jointed and weathered at the contact with overlying tills. Joint spacings are from 1 inch to 4 feet in surface exposures. Prominent joint directions are N 60° E, N 30° W and N 20° E, with the joints being primarily vertical. Corings performed on the upper 5 to 8 feet of the bedrock at the Open Burning Grounds (OB) revealed low Rock Quality Designations (RQDs), i.e., <5% RQD with almost 100% recovery. This information indicates that at the glacial till/shale interface, the rock is highly fractured but has not weathered to the point of being unrecoverable. Much of the fracturing in the underlying bedrock may be attributed to the glacial event coupled with regional stresses.

Pleistocene age (Wisconsinan event, 20,000 BP) glacial till deposits overlie the bedrock across the site. Figure 2-3 presents an overview of the subsurface soils in the area. The site is shown on this figure as lying on the western edge of a large glacial till plain between Seneca Lake and Cayuga Lake. The till matrix, the result of glaciation, varies locally but generally consists of horizons of unsorted silt, clay, sand and gravel. The till has a high percentage of clay, as they were derived from the underlying shales. Thicknesses of the glacial till deposits on SEAD range from 1 to 15 feet. Darien silt-loam soils, 0 to 18 inches thick, have developed over the Wisconsinan age glacial tills. In general, the topographic relief associated with these soils is from 3% to 8%.

Table 2-1 compares the average metal concentrations in soils based upon a total of 8 background sample collected during Phase I RI/FS investigations at the Ash Landfill and Open Burning Grounds at Seneca Army Depot. These data show a wide range in metal concentrations for many of the primary metals found within these clay rich soils. Additional background samples will continue to be collected to help refine the present understanding of metals concentrations in the site soils.

2.5 HYDROGEOLOGY

2.5.1 Regional

Four distinct hydrologic units have been identified within Seneca County. These include two distinct shale formations, a series of limestone units and unconsolidated Pleistocene glacial sediments. Overall, the groundwater in the county is very hard and, therefore, the quality is minimally acceptable for use as potable water.

SOURCE: RICKARD AND FISHER
GEOLOGIC MAP OF NEW YORK,
FINGER LAKES SHEET,1970

MESOZOIC

Lower Cretaceous

MESOZOIC INTRUSIVES
Kimberlite and alnoite dikes and diatremes.

PALEOZOIC

Upper Devonian

CONNEAUT GROUP
600-1000 ft. (180-300 m.)
Germania Formation—shale, sandstone; Whitesville Formation—shale, sandstone; Hinsdale Sandstone; Wellsville Formation—shale, sandstone; Cuba Sandstone.

CANADAWAY GROUP
800-1200 ft. (240-370 m.)
Machias Formation—shale, siltstone; Rushford Sandstone; Caneadea, Canisteo, and Hume Shales; Canaseraga Sandstone; South Wales and Dunkirk Shales; In Pennsylvania: Towanda Formation—shale, sandstone.

JAVA GROUP
300-700 ft. (90-210 m.)
Wiscoy Formation—sandstone, shale; Hanover and Pipe Creek Shales.

WEST FALLS GROUP
1100-1600 ft. (340-490 m.)
Nunda Formation—sandstone, shale.
West Hill and Gardeau Formations—shale, siltstone; Roricks Glen Shale; upper Beers Hill Shale; Grimes Siltstone.
lower Beers Hill Shale; Dunn Hill, Millport, and Moreland Shales.
Nunda Formation—sandstone, shale; West Hill Formation—shale, siltstone; Corning Shale.
"New Milford" Formation—sandstone, shale.
Gardeau Formation—shale,. siltstone; Roricks Glen Shale.
Slide Mountain Formation—sandstone, shale, conglomerate.
Beers Hill Shale; Grimes Siltstone; Dunn Hill, Millport, and Moreland Shales

SONYEA GROUP
200-1000 ft. (60-300 m.)
In west: Cashaqua and Middlesex Shales.
In east: Rye Point Shale; Rock Stream ("Enfield") Siltstone; Pulteney, Sawmill Creek, Johns Creek, and Montour Shales.

GENESEE GROUP AND TULLY LIMESTONE
200-1000 ft. (60-300 m.)
West River Shale; Genundewa Limestone; Penn Yan and Geneseo Shales; all except Geneseo replaced eastwardly by Ithaca Formation—shale, siltstone and Sherburne Siltstone.
Oneonta Formation—shale, sandstone.
Unadilla Formation—shale, siltstone.
Tully Limestone.

Middle Devonian

HAMILTON GROUP
600-1500 ft. (180-460 m.)
Moscow Formation—In west: Windom and Kashong Shales, Menteth Limestone Members; In east: Cooperstown Shale Member, Portland Point Limestone Member.
Ludlowville Formation—In west: Deep Run Shale, Tichenor Limestone, Wanakah and Ledyard Shale Members, Centerfield Limestone Member. In east: King Ferry Shale and other members, Stone Mill Sandstone Member.
Skaneateles Formation—In west: Levanna Shale and Stafford Limestone Members; In east: Butternut, Pompey, and Delphi Station Shale Members, Mottville Sandstone Member.
Marcellus Formation—In west: Oakta Creek Shale Member; In east: Cardiff and Chittenango Shale Members, Cherry Valley Limestone and Union Springs Shale Members.
Panther Mountain Formation—shale, siltstone, sandstone.

ONONDAGA LIMESTONE AND ORISKANY SANDSTONE
75-150 ft. (23-45 m.)
Onondaga Limestone—Seneca, Morehouse (cherty) and Nedrow Limestone Members, Edgecliff cherty Limestone Member, local bioherms.
Oriskany Sandstone.

Lower Devonian

HELDERBERG GROUP
0-200 ft. (0-60 m.)
Coeymans and Manlius Limestones; Rondout Dolostone.

AKRON DOLOSTONE, COBLESKILL LIMESTONE, AND SALINA GROUP
700-1000 ft. (210-300 m.)
Akron Dolostone; Bertie Formation—dolostone, shale.
Camillus and Syracuse Formations—shale, dolostone, gypsum, salt.
Cobleskill Limestone; Bertie and Camillus Formations—dolostone, shale.
Syracuse Formation—dolostone, shale, gypsum, salt.
Vernon Formation—shale, dolostone.

Upper Silurian

LOCKPORT GROUP
80-175 ft. (25-55 m.)
Oak Orchard and Penfield Dolostones, both replaced eastwardly by Sconondoa Formation—limestone, dolostone.

Lower Silurian

CLINTON GROUP
150-325 ft. (40-100 m.)
Decew Dolostone; Rochester Shale.
Irondequoit Limestone; Williamson Shale; Wolcott Furnace Hematite; Wolcott Limestone; Sodus Shale; Bear Creek Shale; Wallington Limestone; Furnaceville Hematite; Maplewood Shale; Kodak Sandstone.
Herkimer Sandstone; Kirkland Hematite; Willowvale Shale; Westmoreland Hematite; Sauquoit Formation—sandstone, shale; Oneida Conglomerate.

MEDINA GROUP AND QUEENSTON FORMATION
0-900 ft. (0-270 m.)
Medina Group: Grimsby Formation—sandstone, shale.
Queenston Formation—shale, siltstone.
Undifferentiated Medina Group and Queenston Formation.

Upper Ordovician

LORRAINE GROUP
700-900 ft. (210-270 m.)
Oswego Sandstone.
Pulaski and Whetstone Gulf Formations—siltstone, shale.

Middle Ordovician

TRENTON GROUP
100-300 ft. (30-90 m.)
Utica Shale.

Hamilton group	Moscow shale	43±	Lower two-thirds of section is a fossiliferous, soft gray calcareous shale; upper third highly friable but less calcareous and fossiliferous. Staining by iron oxide very common. Concretions present in greater abundance in lower beds, but irregular calcareous masses occur throughout section. Joints parallel, tightly sealed, trending N.65°E. and N.25°-30°W.
	Ludlowville shale	43±	Lower beds are thinly laminated, light-colored, fossiliferous, shaly passage beds; overlain by hard calcareous black shales 13 to 30 centimeters thick and rich in corals and brachiopods; hard layers responsible for falls and cascades. Middle beds are less fossiliferous, soft gray arenaceous shales, rich in concretions, calcareous lenses, and occasional thin sandstone layers. Upper beds (Tichenor limestone member) are thin, irregularly bedded gray shales becoming light blue gray upon exposure, calcareous, coarsely textured, and fossiliferous. Joints parallel 5 to 50 centimeters apart, well developed but tight.
	Skaneateles shale	56±	Basal beds composed of dark fissile shale. Upper shale more calcareous, grayish to bluish impure limestone layers. Joint pattern N.75°E. and N.30°W.; diagonal joints N.50°E. Joints sealed, parallel and spaced 15 centimeters to 1.2 meters apart.
	Marcellus shale	15	Black, slatelike, bituminous shale with occasional limestone layers in sequence, and containing zones rich in iron sulfides or calcareous concretions, often with septarian structures; very fissile, iron-stained and gray when weathered. Joint pattern N.25°W., N.65°E., 2.5 centimeters to 1.2 meters apart.

SENECA ARMY DEPOT , ROMULUS NY

REGIONAL BEDROCK STRATIGRAPHY

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FIGURE 2-2

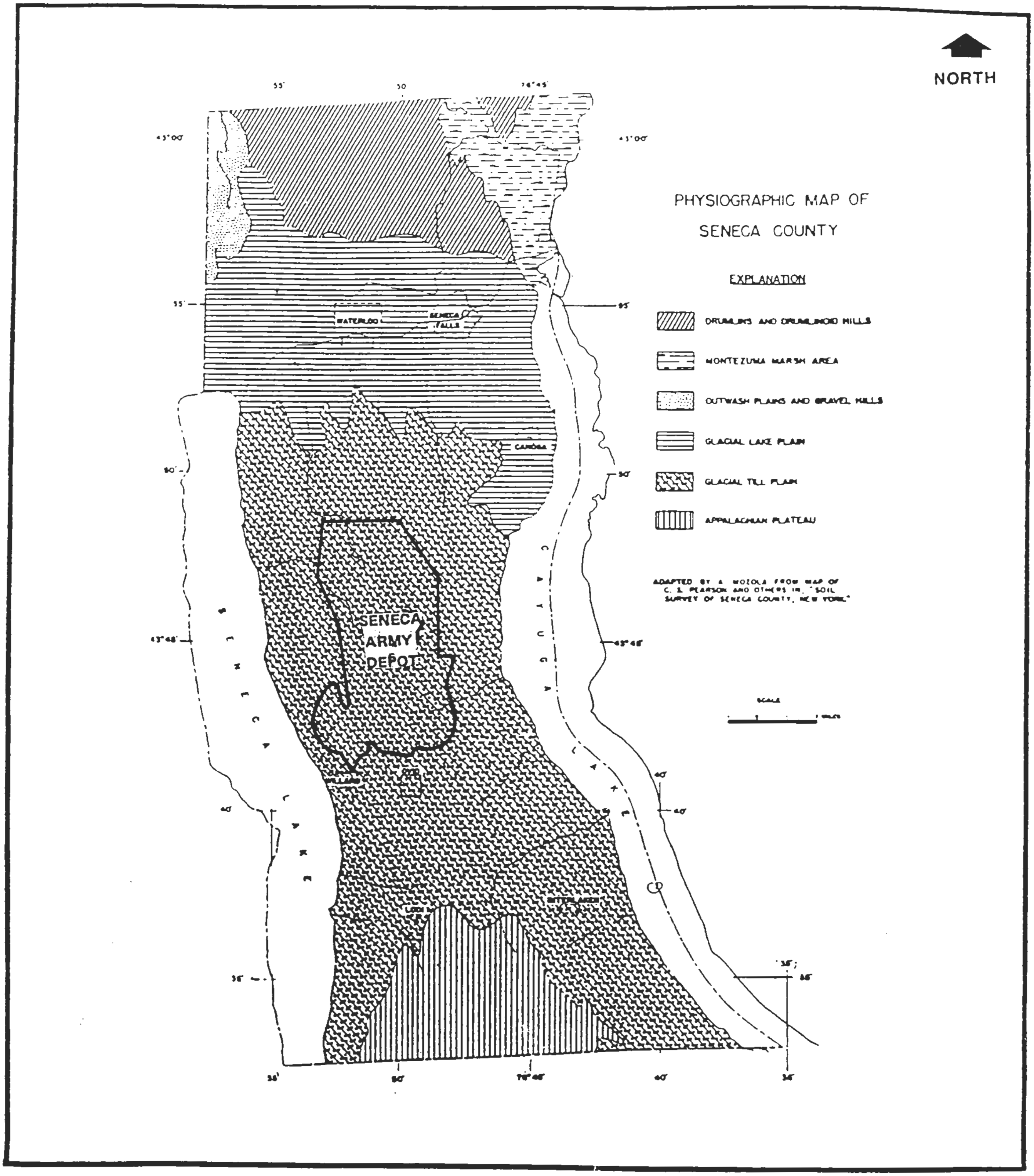


FIGURE 2-3 REGIONAL PHYSIOGRAPHY MAP

TABLE 2-1
AVERAGE BACKGROUND CONCENTRATIONS OF SELECTED HEAVY METALS IN SOILS
8 SAMPLES TOTAL (1)

PARAMETER	MINIMUM	MAXIMUM	AVERAGE	STANDARD DEVIATION	TOTAL # ABOVE ND (2)
Aluminum	7160.0	20500.0	14630.0	4465.8	8
Antimony	5.7	5.7	5.7	0.0	1
Arsenic	3.8	6.1	4.8	0.8	7
Barium	39.9	136.0	87.0	29.2	8
Beryllium	0.5	1.4	1.0	0.3	8
Cadmium	1.5	2.9	2.2	0.4	8
Calcium	2860.0	104000.0	44147.5	43238.8	8
Chromium	11.2	30.1	22.3	6.4	8
Cobalt	8.1	18.4	13.7	3.0	8
Copper	16.2	32.7	23.5	4.8	8
Iron	17300.0	37200.0	29512.5	7032.1	8
Lead	7.8	14.5	11.3	2.0	8
Magnesium	5850.0	17000.0	8958.8	3638.3	8
Manganese	514.0	1130.0	824.5	196.7	8
Mercury	0.04	0.09	0.06	0.02	7
Nickel	19.0	49.3	37.0	10.7	8
Potassium	1050.0	2110.0	1493.8	365.3	8
Selenium	ND	ND	ND	ND	0
Silver	ND	ND	ND	ND	0
Sodium	75.3	116.0	96.9	17.5	4
Thallium	ND	ND	ND	ND	0
Vanadium	12.9	32.2	21.8	5.8	8
Zinc	74.8	126.0	90.0	15.3	8
Cyanide	ND	ND	ND	ND	0

NOTES:
1) Background soil samples collected from Phase I RI/FS investigations at the Ash Landfill (7 samples) and Open Burning Grounds (1 sample) at Seneca Army Depot.
2) ND indicates Non-Detect limit.

A substantial amount of information concerning the area hydrogeology has been compiled by the state of New York (Mozola 1951 and Crain 1974). These are the most recent reports available and have been reviewed to better assess the hydrogeology of the area surrounding SEAD. Geologic cross-sections from Seneca Lake and Cayuga Lake have been constructed by the state of New York (Mozola 1951). This information suggests that a groundwater divide exists approximately halfway between these two finger lakes. SEAD is located on the western slope of this divide, and it is expected that the regional shallow groundwater flow would be westward toward Seneca Lake. Southerly flow would likely be blocked by the Valley Heads Moraine. Within a 4-mile radius of the site, a total of 32 wells exist for which information has been obtained (Mozola 1951). This information includes (1) the depth and the diameter of wells, (2) the individual well's yield and (3) the geological strata the well was drilled through. This data is useful in providing an understanding and characterization of the aquifer(s) present. A review of this information indicates that three geologic strata have been used to provide water for both domestic and agricultural purposes. These include (1) a bedrock aquifer which in this area is predominantly shale, (2) an overburden aquifer which includes Pleistocene sediments (glacial till) and (3) deep beds of limestone.

As of 1951, 25 area wells obtained water from the shale aquifer, six wells tapped the overburden aquifer and one well used the deep limestone as a source of water (Mozola 1951). For the six wells which utilized groundwater extracted from the overburden, the average yield was approximately 7.5 gpm. The average depth of these wells was 36 feet. The geologic material which comprises the aquifer is generally Pleistocene till, with the exception of one well located to the northeast of the site, which produces water from outwash sand and gravel deposits. The yields from these overburden wells ranged from 4 to 15 gpm. The well located in the outwash sand and gravel deposit, drilled to 60 feet, yielded only 5 gpm. A 20-foot hand dug well, located southeast of the outwash well, yielded 10 gpm (Mozola 1951).

The information reviewed indicates that the upper portions of the shale formation would be expected to yield small supplies of water, adequate for domestic use. For the-Devonian shales of the Hamilton group, the obtained yields (i.e., less than 15 gpm) are consistent with what would be expected for shales (LaSala 1968). The deeper portions of the shale formation (at depths greater than 235 feet) have provided yields up to 150 gpm. These high yields may be due to the presence of interbedded limestone at depth. In general, as the depth of penetration into the shale is increased beyond approximately 100 feet, the yields decrease unless limestone interbeds are intercepted. A limestone cavity was noted in one well log at approximately 610 feet. This well, drilled to a final depth of 787 feet, yielded approximately 150 gpm. It appears that the yields in the upper 100 feet of shale are almost double those measured at depths below 100 feet provided that a limestone cavity was not intercepted. This is consistent with what would be expected, i.e., as the depth of penetration is increased, the fracturing in the shale is decreased making less water available.

As mentioned previously, in the deep portions of the shale, limestone cavities are encountered which provide substantial quantities of water. This source of water is considered to comprise a separate source of groundwater for the area. Based on previous studies only a small number of wells in the region adjacent to SEAD produce water from limestone interbeds, which may be due to the drilling depths required to intercept this water (LaSala 1968 and Mozola 1951).

As of 1951, approximately 95 percent of the wells have been used for domestic or farm water supply, and the average daily pumpage of water from the wells is around 500 gallons (0.35 gpm)(Mozola 1951). Approximately 5 percent of the wells in the county are used for commercial, industrial or municipal purposes. Seneca Falls and Waterloo, the two largest communities in the county, are in the hydrogeologic region which is most favorable for the development of a groundwater supply. However, the hardness of the groundwater is objectionable to the industrial and commercial establishments within these villages; therefore, they both use surface water as their municipal supplies. The villages of Ovid and Interlaken, both of which are without substantial industrial establishments, use groundwater as their public water supplies. Ovid obtains its supply from two shallow gravel-packed wells, and Interlaken is served by a developed seepage-spring area. Regionally, the phreatic aquifer of the unconsolidated surficial glacial deposits of the region would be expected to flow in a direction consistent with the ground surface elevations.

2.5.2 Local

Data concerning local groundwater resources, aquifer yield and geology of the western Oswego River Basin (Crain 1974) revealed that eight wells were drilled within 1 mile of the SEAD boundary.

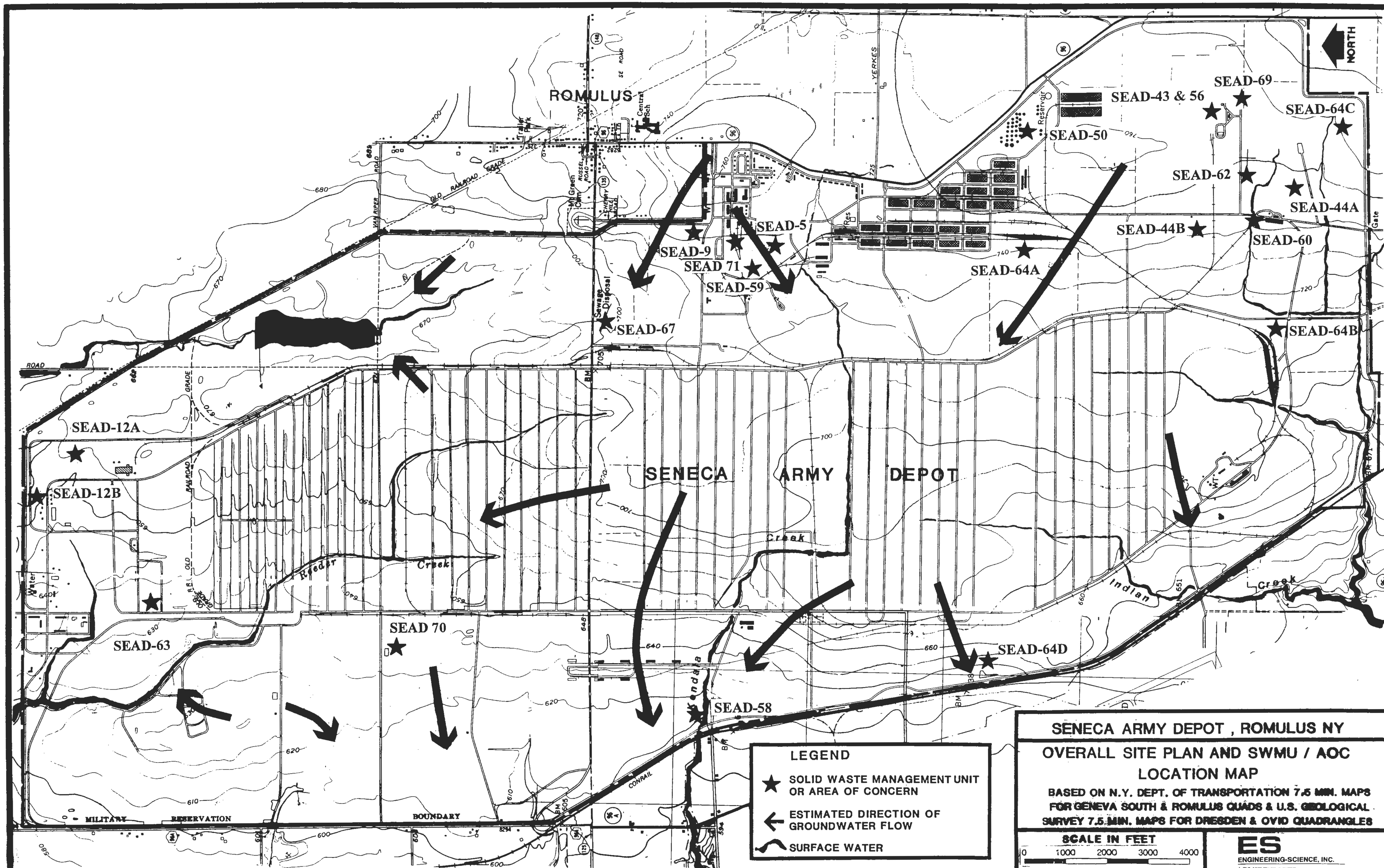
The water bearing material for six of the wells is shale. One of the wells along the western boundary of SEAD produces water from a calcarious shale. Another well, located within the southern boundary of SEAD, produces water from the glacial till. Data for six of the eight wells revealed that well yields ranged from 1 to 10 gpm with the southern most well having the highest yield (Crain 1974). There was no information regarding yields for one of the northeastern wells and the second well located within SEAD's boundary.

Although these wells have multiple uses, the principle uses are either domestic or commercial water supply (Crain 1974).

Since groundwater flow is anticipated to follow the topography, the estimated direction of groundwater flow on SEAD is shown on Figure 2-4.

2.6 SURFACE WATER SETTING

Surface drainage from SEAD flows to four creeks as shown in Figure 2-4. In the southern portion of the depot, the surface drainage flows through ditches and streams into Indian and Silver Creeks. These creeks then flow into Seneca Lake just south of the SEAD airfield. The central area of SEAD drains into Kendaia Creek. Kendaia Creek discharges into Seneca Lake near the Lake Housing Area. The majority of the northwestern and north-central portion of SEAD drain into Reeder Creek. The northeastern portion of the depot, which includes a marshy area called the Duck Ponds, drains into Kendig Creek and then flows north into the Cayuga-Seneca Canal and to Cayuga Lake.



SENECA ARMY DEPOT , ROMULUS NY

OVERALL SITE PLAN AND SWMU / AOC LOCATION MAP

BASED ON N.Y. DEPT. OF TRANSPORTATION 7.5 MIN. MAPS FOR GENEVA SOUTH & ROMULUS QUADS & U.S. GEOLOGICAL SURVEY 7.5 MIN. MAPS FOR DRESDEN & OVID QUADRANGLES

SCALE IN FEET 0 1000 2000 3000 4000

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3.0 DATA QUALITY OBJECTIVES

3.1 INTRODUCTION

Data quality objectives (DQOs) are qualitative and quantitative statements that specify the quality of the data required to support the Expanded Site Inspection (ESI) activities at the fifteen SWMUs. Through the development of DQOs, the objectives and methods to be used in the ESI are clearly defined. Data quality objectives support such activities as site characterization, risk assessment, and deciding whether an RI/FS should be performed at each SWMU.

The DQO development process results in more thorough and complete work plans that detail the selected sampling and analysis options. In addition, DQO development increases confidence levels in data to be used for decision making. The DQO process is initiated during project planning and is incorporated into the ESI Work Plan.

Data quality objectives are developed through a three-stage process which consists of identification of decision types (Stage 1), identification of data uses and needs (Stage 2), and design of data collection program (Stage 3).

3.2 DQO STAGE 1: IDENTIFICATION OF DECISION TYPES

Stage 1 of the DQO process is initiated during the ESI scoping activity. This stage is also initiated whenever new data are evaluated or when objectives or decisions must be redefined. During this stage of the DQO process, the following tasks are performed:

- Identification of major decisions,
- Identification and involvement of data users,
- Evaluation of available information, and
- Development of a conceptual model.

3.2.1 Identification of Major Decisions

The data generated by the ESI will be used to make two major decisions regarding each SWMU. These decisions are:

- Determine whether a release has occurred to groundwater, surface water, soil, sediment, or air; and,

- Evaluate the need to perform additional investigations or eliminate the SWMU as a "No Action" SWMU.

These decisions will be based on the data to be collected which will include: geophysical surveys, chemical analysis of various environmental samples, and an understanding of the environmental interactions between groundwater, soil and air at each SWMU.

3.2.2 Identification and Involvement of Data Users

Data generated during the ESI will be used by primary and secondary data users to determine whether a release occurred on site and whether each site should enter the RI/FS process.

Primary users include the project and technical managers for the USEPA, NYSDEC, U.S. Army Corps of Engineers, Huntsville Division; environmental personnel at Seneca Army Depot; the Parsons Main project manager and technical staff; and subcontractors. Parsons Main's project manager has the primary responsibility for incorporating DQOs into the planning and implementation activities.

Secondary data users include those who rely on ESI data to support programmatic activities. They provide input to the primary data users by establishing generic needs and occasionally, site-specific data needs. Secondary data users include technical personnel who comprise the Technical Review Commitee (TRC) that will review work plans and reports. These people include local residents, technical specialists from public interest groups, and New York Department of Health personnel.

3.2.3 Evaluation of Available Information

Available information for each SWMU provides the basis for designing the collection and analysis of environmental samples and other field work proposed in the ESI Work Plan.

For most of the SWMUs, there was only general information on the processes that took place. Some information on the location of releases were based on hearsay. There was little to no documentation for the activities at most of the SWMUs other than that provided in the ERCE (1991) report.

The available plans are large scale maps showing the entire SEAD facility plus specific information such as utilities. Some of them contain general topographic information for the facility. This ESI Work Plan proposes to produce site base maps showing current site conditions and detailed topography at contour intervals of 2 feet. These maps will be used to plot sampling locations and other information obtained during the field work. Production of these maps are discussed in Section 4 of the Work Plan.

3.2.4 Development of Conceptual Model

A conceptual model has been developed for each SWMU from a review of available information. The model, which is summarized in Table 3-1, provides information on the primary sources, primary release mechanisms, secondary sources, pathways, exposure routes, and receptors.

3.3 DQO STAGE 2: IDENTIFICATION OF DATA USES AND NEEDS

Stage 2 of the ESI DQO process defines specific data uses, identifies the necessary quality and quantity of data required to support the ESI, and designates appropriate sampling and analytical methods. The major elements of Stage 2 are identification of:

- Data uses,
- Data types,
- Data quality needs,
- Data quantity needs, and
- Evaluation of sampling and analysis options.

3.3.1 Data Uses

Data obtained during the ESI of each SWMU will be used for the following purposes:

- Health and safety monitoring,

- Site characterization, which includes locating the type and extent of releases and establishing background concentrations for various matrices,

- Risk assessment to evaluate whether each SWMU could be declared a "No Action" SWMU or whether a remedial investigation should be performed at the SWMU,

- Develop work plans for remedial investigations, and

- Evaluate whether the site poses an imminent threat to human health or the environment.

TABLE 3-1
CONCEPTUAL MODELS FOR SWMUS

SEAD	Primary Sources	Primary Release Mechanisms	Secondary Sources	Exposure Media	Exposure Routes	Receptor			
						Human		Biota	
						Area Residents	On-Site Workers	Terrestrial	Aquatic
5	Sewage Sludge Waste Piles	Infiltration, Erosion	Soil	Soil, Ground-water	Ingestion		●	●	
					Inhalation		●	●	
					Dermal Contact		●	●	
9	Old Scrap Wood/Fill Area, Debris	Infiltration, Erosion	Soil	Soil, Ground-water	Ingestion		●	●	
					Inhalation		●	●	
					Dermal Contact		●	●	
12A	Burial Pits, Debris	Infiltration	Soil	Soil, Ground-water, Surface Water	Ingestion		●	●	●
					Inhalation		●	●	
					Dermal Contact		●	●	●

TABLE 3-1 (CON'T)
CONCEPTUAL MODELS FOR SWMUS

SEAD	Primary Sources	Primary Release Mechanisms	Secondary Sources	Exposure Media	Exposure Routes	Receptor			
						Human		Biota	
						Area Residents	On-Site Workers	Terrestrial	Aquatic
12B	Burial Pits, Tank	Infiltration, Leaks	Soil, Groundwater	Soil, Groundwater	Ingestion		●	●	
					Inhalation		●	●	
					Dermal Contact		●	●	
43, 56, and 69	Propellant Test Lab, Herbicide/ Pesticide Facility, Tank, Drums, Debris	Munitions Infiltration, Leaks, Propellant Testing, Herbicide/ Pesticide Handling	Soil, Groundwater, Surface Water	Air, Soil, Groundwater, Surface Water	Ingestion		●	●	●
					Inhalation		●	●	
					Dermal Contact		●	●	●
44A	Berms, Munitions, Test Lab	Infiltration, Destruction of Explosives	Soil	Soil, Groundwater, Surface Water	Ingestion		●	●	●
					Inhalation		●	●	
					Dermal Contact		●	●	●

TABLE 3-1 (CON'T)
CONCEPTUAL MODELS FOR SWMUS

SEAD	Primary Sources	Primary Release Mechanisms	Secondary Sources	Exposure Media	Exposure Routes	Receptor			
						Human		Biota	
						Area Residents	On-Site Workers	Terrestrial	Aquatic
44B	Munitions, Test Lab	Infiltration, Destruction of Explosives	Soil	Soil, Surface Water, Groundwater	Ingestion		●	●	●
					Inhalation		●	●	
					Dermal Contact		●	●	●
50	Tanks	Infiltration, Spills, Leaks	Soil	Air, Soil, Groundwater, Surface Water	Ingestion		●	●	●
					Inhalation	●	●	●	
					Dermal Contact		●	●	●
58	Debris, Possible Burial Pits, Drums, Cans	Infiltration, Leaks	Soil	Soil, Groundwater, Surface Water	Ingestion		●	●	●
					Inhalation		●	●	
					Dermal Contact		●	●	●

TABLE 3-1 (CON'T)
CONCEPTUAL MODELS FOR SWMUS

SEAD	Primary Sources	Primary Release Mechanisms	Secondary Sources	Exposure Media	Exposure Routes	Receptor			
						Human		Biota	
						Area Residents	On-Site Workers	Terrestrial	Aquatic
59	Debris, Fill Area	Infiltration	Soil	Soil, Ground-water	Ingestion		●	●	
					Inhalation		●	●	
					Dermal Contact		●	●	
60	Oil Spill	Infiltration	Soil	Soil, Ground-water, Surface Water	Ingestion		●	●	●
					Inhalation		●	●	
					Dermal Contact		●	●	●
62	Drums	Infiltration, Leaks	Soil	Soil, Ground-water	Ingestion		●	●	●
					Inhalation		●	●	
					Dermal Contact		●	●	●

TABLE 3-1 (CON'T)
CONCEPTUAL MODELS FOR SWMUS

SEAD	Primary Sources	Primary Release Mechanisms	Secondary Sources	Exposure Media	Exposure Routes	Receptor			
						Human		Biota	
						Area Residents	On-Site Workers	Terrestrial	Aquatic
63	Debris, Burial Pits	Infiltration	Soil	Soil, Ground-water, Surface Water	Ingestion		●	●	●
					Inhalation		●	●	
					Dermal Contact		●	●	●
64A	Landfill	Infiltration	Soil	Soil, Ground-water	Ingestion		●	●	
					Inhalation		●	●	
					Dermal Contact		●	●	
64B	Landfill	Infiltration	Soil	Soil, Ground-water, Surface Water	Ingestion		●	●	●
					Inhalation		●	●	
					Dermal Contact		●	●	●

TABLE 3-1 (CON'T)
CONCEPTUAL MODELS FOR SWMUS

SEAD	Primary Sources	Primary Release Mechanisms	Secondary Sources	Exposure Media	Exposure Routes	Receptor			
						Human		Biota	
						Area Residents	On-Site Workers	Terrestrial	Aquatic
64C	Proposed Landfill	Infiltration	Soil	Soil, Ground-water	Ingestion		●	●	
					Inhalation		●	●	
					Dermal Contact		●	●	
64D	Landfill	Infiltration	Soil	Soil Ground-water	Ingestion		●	●	
					Inhalation		●	●	
					Dermal Contact		●	●	
67	Waste Piles	Infiltration, Erosion	Soil	Soil, Ground-water, Surface Water	Ingestion		●	●	●
					Inhalation		●	●	
					Dermal Contact		●	●	●

TABLE 3-1 (CON'T)
CONCEPTUAL MODELS FOR SWMUS

SEAD	Primary Sources	Primary Release Mechanisms	Secondary Sources	Exposure Media	Exposure Routes	Receptor			
						Human		Biota	
						Area Residents	On-Site Workers	Terrestrial	Aquatic
71	Debris, Fill Area	Infiltration	Soil	Soil, Ground-water Surface Water	Ingestion		●	●	●
					Inhalation		●	●	
					Dermal Contact		●	●	●
72	Disposal Pit, Solvent and Paint Cans	Infiltration, Leaks	Soil	Soil, Ground-water	Ingestion		●	●	
					Inhalation		●	●	
					Dermal Contact		●	●	

3.3.2 Data Types

The types of data that will be obtained during the ESI include:

- Matrices: Soil, groundwater, surface water, sediment, and air (monitoring for health and safety purposes only)
- Concentrations: Primarily environmental levels with elevated levels possibly encountered at sources or release points.
- Parameters: Geophysical surveys, field instrument readings, visual observation of soils and geophysical anomalies, chemical analyses performed in accordance with NYSDEC CLP Statements of Work and other analytical method procedures.
- Quality assurance data from equipment blanks, duplicates, splits, and trip blanks prepared in the field and laboratory-generated method blanks, duplicates, and matrix spike/matrix spike duplicates.
- Sample types: Grab samples will almost always be obtained. Composite samples will only be obtained from test pits excavated into berms.
- Geophysical instruments will be used to measure depth to groundwater, and locate subsurface anomalies. Electromagnetic, seismic refraction, and ground penetrating radar techniques will be used.

3.3.3 Data Quality Needs

Data quality varies depending on the types and uses of data that are obtained. Each task of the ESI field work will produce data of different quality. Data quality is based on three factors: appropriate analytical levels, contaminants of concern, and required detection limits.

3.3.3.1 Appropriate Analytical Levels

Appropriate analytical levels are determined by considering data uses. The analytical levels, as defined by the EPA (1987), which apply to this ESI are as follows:

- Level 1: Field screening using portable instruments, such as organic vapor monitoring, radiological measurements, and dust readings. These results are often not compound specific and not quantitative, but they are available in real time. They can be used to select samples for analysis and for field health and safety support.

- Level 2: Field analyses using more sophisticated portable analytical instruments, such as gas chromatography for the soil gas analyses. Reliable qualitative and quantitative data can be obtained depending on the types of contaminants, sample matrices, and personnel skills. QA/QC data can be obtained by analyzing duplicate and blank samples. Level 2 data cannot be used for risk assessment calculations because the QA/QC requirements are not rigorous enough.

- Level 3: Analysis by Standard Methods. The following analyses will be conducted using routine analytical methods; therefore, they will be reported as Level 3 data quality: explosives, herbicides, total petroleum hydrocarbons, nitrate, fluoride, and the VOC analysis Method 524.2. These analyses incorporate standard laboratory QA/QC practices and are described in numerous published sources such as SW-846, Standard Methods and ASTM procedures.

- Level 4: Analyses in accordance with the EPA's Contract Laboratory Program. The following chemical analysis data for this ESI will be produced at Level 4: volatile and semivolatile organic compounds, heavy metals, cyanide, and pesticides/PCBs. These analyses will be performed according to the New York State Department of Environmental Conservation's CLP protocols stated in their Statement of Work. These protocols are considered equivalent to the U.S. EPA requirements for Level 4 data. Level 4 analysis are characterized by rigorous QA/QC requirements. The data package submittal from the laboratory contains all the raw data generated in the analysis, including mass spectral identification charts, mass spectral tuning data, spike recoveries, laboratory duplicate results, method black results, instrument calibration, and holding times documentation.

3.3.3.2 Contaminants of Interest

The contaminants of interest are described for each SWMU in Sections 4.1.2 through 4.15.2 of the Work Plan. These were used to select the analyses that will be performed at each SWMU.

3.3.3.3 Required Detection Limits

The chemical analysis results will be compared to the ARARs developed as part of the CERCLA investigations at the SEAD facility. The detection limits for the analytes, as presented in Section 7.0 of the Chemical Data Acquisition Program (Appendix C) are generally below the ARARs that will be used to evaluate whether each SWMU could be classified as a "No Action" SWMU. The only exception are the detection limits for the VOC CLP analysis. These limits are higher than the Maximum Contaminant Limits in the federal drinking water regulations. Therefore, if a SWMU could be classified as a "No Action" SWMU based on the chemical analyses proposed in Sections 4.1.5 through 4.15.5 of the Work Plan, then groundwater samples would be obtained from all the monitoring wells at that SWMU and analyzed for VOCs using Method 524.2. The VOC analysis results would then be used to complete the SWMU classification.

3.3.4 Data Quantity Needs

In general, soil samples will be collected at locations suspected to be source areas, groundwater samples will be collected at locations considered to be downgradient of source areas. The number of soil samples to be collected is based upon engineering judgement and on understanding of the operations performed at the SWMU. For groundwater, one sample from each downgradient well will be considered sufficient.

The number of samples collected at each SWMU must be sufficient to meet the general site characterization objectives and satisfy the QA/QC requirements for data validation.

Background groundwater, surface water, sediment, and soil samples will be obtained when possible at each SWMU.

Each type of QA/QC sample that is prepared in the field (equipment blanks, duplicates, and matrix spike/matrix spike duplicates) will be obtained at a rate of 1 per 20 samples of each matrix. A trip blank for VOCs will be included with each cooler that contains samples to be analyzed for VOCs. Split samples, that will be sent to the Corps of Engineers QA Laboratory, will be prepared at a rate of 1 per 20 samples for each matrix.

3.3.5 Evaluation of Sampling and Analysis Options

This section describes the information used to develop each field program and the proposed order in which the field program will be accomplished.

3.3.5.1 Sampling and Analysis Components

The type of surveys, matrices to be sampled, number of samples, and analysis methods used to characterize each SWMU for the ESI were selected based on:

- previous site characterization data,
- prior activities,
- chemicals of interest, and
- existing site conditions.

3.3.5.2 Sampling and Analysis Approach

The ESI of each SWMU will be performed in two major phases. Most of the work will be performed during the first phase, with all media being sampled. Any SWMU that fails to show evidence of contamination will be subjected to a second phase of groundwater sampling and analysis using a method with lower detection limits to verify that any Phase I groundwater "Non-Detects" do actually meet groundwater criteria. Such evidence of a lack of contamination through two rounds of analysis would form the basis for recommendation of "No Action". The proposed approach to complete the ESI at each SWMU is as follows:

Phase I

- UXO clearance.
- Perform geophysical surveys.
- Excavate geophysical anomalies and perform other test pit excavations. Collect samples for chemical analysis. Ship samples to laboratory.
- Perform borings and install monitoring wells. Select soil samples for chemical analysis. Ship samples to laboratory.
- Develop monitoring wells.
- Measure water levels at each SWMU.
- Obtain surface soil, groundwater, surface water and sediment samples. Ship samples to laboratory.
- Validate chemical analysis data.
- Perform evaluation of SWMUs to identify SWMUs that could be classified as "No Action".

Phase II

- Sample groundwater from all the monitoring wells at potential "No Action" SWMUs, then send samples to laboratory for VOC analysis by Method 524.2.
- Validate VOC analysis data performed by Method 524.2.
- Complete SWMU evaluations.

Report

- Prepare ESI report.

3.4 DQO STAGE 3: DESIGN OF DATA COLLECTION PROGRAM

The details of the data collection program for each SWMU are presented in Sections 4.1 through 4.15 of the Work Plan.

4.0 SAMPLING PLAN

This section describes the field and analytical work, along with the report preparation, to be performed during investigation of the 15 SWMUs. The approach of this workplan is to investigate areas likely to have been impacted by a release of hazardous constituents. Sample locations are concentrated in source areas or in presumed upgradient locations to establish background conditions. Engineering-Science has estimated groundwater flow directions based primarily on topography and to some extent on proximity to surface water. The site plans for the 15 SWMUs are shown in Figure 2-4 and Figures 4-1 through 4-21.

Three types of geophysical techniques will be utilized at many of the SWMUs. These techniques include: (1) seismic refraction, (2) ground penetrating radar (GPR), and (3) electromagnetic (EM-31). Seismic refraction will be used to determine the depth to groundwater at SWMUs where the groundwater gradient over the length of the traverse is expected to be greater than one foot. This will be determined based on the topographic relief at each SWMU prior to the survey. GPR and EM-31 will be used to locate disturbed sediments and buried structures (i.e., buried channels, ditches, drums, UXOs, septic systems, etc.)

The investigation of the 15 SWMUs will involve geophysics and the sampling of soil, sediment, surface water, and groundwater, although not all medias will be sampled at each SWMU. Soil borings will be utilized to evaluate the site stratigraphy and to provide soil samples for chemical analysis. Test pits will be utilized during these investigations to evaluate subsurface stratigraphy and/or to provide samples for chemical analysis. Monitoring wells will be installed and sampled during these SWMU investigations to establish groundwater flow directions and to evaluate the impact upon the groundwater system. Where appropriate, surface water and surface sediment samples will be collected. Three types of geophysical surveys will be performed during the SWMU investigations, seismic refraction, ground penetrating radar (GPR), and electromagnetic methods (EM).

Chemical constituents of concern for this investigation are summarized in Table 4-1. The analytical methods utilized at each SWMU, and the rationale for selection of each analytical method are presented in Table 4-2. Table 4-3 presents a summary of samples to be collected

TABLE 4-1

SUMMARY OF CHEMICAL CONSTITUENTS OF CONCERN

Material Managed at SEAD	Chemical Group	Analytical Method
1. Propellants, Explosives and Pyrotechnics (PEP)	Heavy metals Semi-voltile organic compounds (SVOs) Explosives	TAL Metals TCL SVOs 8330
2. Solvents	Volatile organic compounds (VOCs) Semi-volatile organic compounds (SVOs)	TCL VOCs, 524.2 TCL SVOs
3. Oils	Petroleum hydrocarbons (TPH)	PCB in oil 8080, 418.1
6. Transformer Oil	Polychlorinated biphenyls (PCBs)	TCL Pest./PCB
7. Herbicides	Herbicides	8150
8. Pesticides	Pesticides	TCL Pest./PCB
9. Sludge	Heavy metals Semi-volatile organic compounds (SVOs) Nitrates Volatile Organic Compounds	TAL Metals TCL SVOs 353.2 TCL VOCs, 524.2
10. Radioactive	Radionuclides	9310

TABLE 4-2
SMWU - SPECIFIC EPA ANALYTICAL METHODS AND SELECTION RATIONALE

SMWU/ AOC	8150 Herbicides	8330 Explosives	TCL SVOs	TCL VOCs	TAL Metals and Cyanide	TCL Pestcides/PCB	353.2 NO_3	418.1 TPH	9310 Gross & Gross B Radio-activity	Selection Rationale
SEAD 5			X	X	X	X	X			Sewage sludge disposed of here (SVOs, VOCs, heavy metals, and 353.2). Heavy metals and nitrates detected in sludge.
SEAD 9			X	X	X	X		X		Fire training, landfill, and scrapwood/fire-wood site.
SEAD 12A + B			X	X	X	X			X	Radioactive wastes may be buried here.

SMWU/ AOC	8150 Herbicides	8330 Explosives	TCL SVOs	TCL VOCs	TAL Metals and Cyanide	TCL Pestcides/PCB	353.2 NO_3	418.1 TPH	9310 Gross & Gross B Radio-activity	Selection Rationale
SEAD 43, 56, 69	X	X	X	X	X	X	X	X (only at SB43-4)		Pyrotechnic, explosive, and propellant (PEP) materials tested here (8330, SVOs and heavymetals) and breakdown products (353.2) may be present herbicides/pesticides were managed here and may have been spilled.
SEAD 44 A + B		X	X	X	X	X	X			PEP materials tested here (8330, SVOs, and heavymetals) and breakdown products may be present.
SEAD 50			X	X	X	X				Minerals, ores, and asbestos stored here.
SEAD 58			X	X	X	X				DDT possible disposed of here (SVOs, VOCs, heavy metals).

SMWU/ AOC	8150 Herbicides	8330 Explosives	TCL SVOs	TCL VOCs	TAL Metals and Cyanide	TCL Pestcides/PCB	353.2 NO_3	418.1 TPH	9310 Gross & Gross B Radio-activity	Selection Rationale
SEAD 59			X	X	X	X		X		Fill area, unknown contaminants.
SEAD 60			X	X	X	X		X		Oil spill from boiler house.
SEAD 62	X		X	X	X	X				Nicotine sulfate disposal.
SEAD 63			X	X	X	X				Miscellaneous components disposed of here.
SEAD 64 A,B,C,D			X	X	X	X				Garbage, drums disposed of here (SVOs, VOCs, heavy metals).
SEAD 67			X	X	X	X				Dump site.
SEAD 70			X	X	X	X				Fill area.
SEAD 71			X	X	X	X				Paints/solvents disposed of here (SVOs, VOCs, heavy metals).

TABLE 4-3
SUMMARY OF SAMPLING AND ANALYSES

	ANALYSES						
	No. of Samples	Suite[2]	TPH 418.1	Herb-icides 8150	Nitrates 353.2	Explo-sives 8330	Radio-activity[3] 9310 901.1
SEAD 5							
Groundwater	3	3			3		
TP[1] Soils	5	5			5		
SEAD 9							
B[1] Soil	9	9	9				
Groundwater	3	3	3				
SEAD 12 A							
B,TP[1] Soils	11	11					11
Groundwater	3	3					3
Surface water	4	4					4
Sediment	4	4					4
SEAD 12 B							
B,TP[1] Soils	11	11					11
Groundwater	3	3					3
SEAD 43, 56, and 69[4]							
B[1] Soils	21	21	3	21	21	21	
Groundwater	4	4		4	4	4	
Surface water	4	4		4	4	4	
Sediment	4	4		4	4	4	
Surface soil	3	3		3	3	3	

ANALYSES							
	No. of Samples	Suite[2]	TPH 418.1	Herb-icides 8150	Nitrates 353.2	Explo-sives 8330	Radio-activity[3] 9310 901.1
SEAD 44A							
Berm Excav-ations	9	9			9	9	
Surface soil	6	6			6	6	
Surface water	4	4			4	4	
Sediment	4	4			4	4	
Groundwater	3	3			3	3	
SEAD 44B							
Surface water	2	2			2	2	
Sediment	2	2			2	2	
Surface soil	3	3			3	3	
SEAD 50							
Surface water	3	3					
Sediment	3	3					
Surface soil	7	7					
SEAD 58							
B,TP[1] Soils	15	15					
Groundwater	4	4					
Sediment	3	3					
Surface water	3	3					
Surface soil	3	3					
SEAD 59							
B, TP[1] soils	20	20	20				
Groundwater	3	3	3				
SEAD 60							
B[1] Soils	9	9	9				
Groundwater	3	3	3				
Sediment	3	3	3				
Surface water	3	3	3				

ANALYSES							
	No. of Samples	Suite[2]	TPH 418.1	Herb-icides 8150	Nitrates 353.2	Explo-sives 8330	Radio-activity[3] 9310 901.1
SEAD 62							
TP Soils	3	3		3			
SEAD 63							
B,TP[1] Soils	15	15					
Groundwater	3	3					
Surface water	2	2					
Sediment	2	2					
SEAD 64A							
B[1] Soils	12	12					
Groundwater	3	3					
SEAD 64B							
B[1] Soils	12	12					
Groundwater	3	3					
Surface water	3	3					
Sediment	3	3					
SEAD 64C							
TP[1] Soils	3	3					
Groundwater	4	4					
SEAD 64D							
B[1] Soils	9	9					
Groundwater	3	3					
Surface soil	5	5					
SEAD 67							
TP Soils	8	8					
Groundwater	3	3					
Surface water	1	1					
Sediment	1	1					
SEAD 70							
B[1] Soils	9	9					
Groundwater	4	4					
Surface water	2	2					
Sediment	2	2					

	ANALYSES						
	No. of Samples	Suite[2]	TPH 418.1	Herb-icides 8150	Nitrates 353.2	Explo-sives 8330	Radio-activity[3] 9310 901.1
SEAD 71 TP[1] Soils Groundwater	 2 3	 2 3					
Sample Subtotal	327	327	56	39	77	69	36
Duplicates (5%)		16	3	2	4	4	2
Equip. Blanks (1 per day)[5]	36						
MS/MSD/MSB (3/20 samples)[6]		49					
Total Number of Analyses	36	392	59	41	81	73	38
Estimated VOC Trip Blanks[7]	22						

NOTES TABLE 4-3:

1. B = Borings
   TP = Test Pits (test pits include pile samples).
2. Suite consists of analyzing each sample for TCL VOCs, SVOs, and Pesticide/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW.
3. Analysis for radioactivity will consist of gross alpha and gross beta analysis by Method 9310 and gamma spectral analysis by Method 901.1.
4. One liquid sample and one sludge sample will be collected from the septic system in front of Building 606 and both will analyzed for TCL VOCs, SVOs, Pesticides/PCBs, TAL Metals and Cyanide.
5. Rinseates will be collected at a rate of one per day per matrix. The estimate was based on 20 soil samples per day and 210 soil samples (210/20 = 11), 4 water samples per day and 86 water samples total (86/4 = 22), and 10 sediment samples per day and 31 sediment samples total (31/10 = 3). An total estimate of 36 equipment blanks are to be collected (11 + 22 + 3).
6. The matrix spike analysis, which is performed every 20 samples, actually consists of 3 analyses: method spike blank, matrix spike, and matrix spike duplicate.
7. Number of VOC trip blanks were estimated based on one trip blank per day, 4 water samples per day, and 86 water samples to be obtained (86/4 = 22).
8. Laboratory analysis methods are presented on Table C-2 of Appendix C, Chemical Data Acquisition Plan.

and analyses to be performed. All analyses will be performed in accordance with the methodology presented in the Chemical Data Acquisition Plan, Appendix C.

Engineering-Science feels that it is appropriate to apply rigorous analytical methods during the initial site assessment so that there is reasonable justification for developing no action SWMUs and to help in eliminating compounds from further consideration in subsequent investigations. Without these analyses there is little justification for elimination of any constituents because past operating and disposal practices at these SWMUs are not well defined. The constituents cited in the Chemicals of Interest sections (below) were obtained from the ERCE report (ERCE 1991).

All of the sample locations throughout the 15 SWMUs will be surveyed using the New York State Plan coordinate system. Accurate site base maps will be developed through the use of aerial photographic surveys. All monitoring wells within each SWMU will be surveyed relative to an established U.S.G.S. datum to allow for the preparation of a groundwater topography map indicating the direction of groundwater flow. The locations of borings and monitoring wells may be adjusted slightly based upon the results of the various geophysical surveys and upon a more complete field reconnaissance.

Due to the past use of explosives and munitions throughout SEAD, UXO site clearance will be performed at all of the SWMUs where explosives are suspected and where wastes have been disposed of. During berm sampling where explosives are a constituent of concern, UXO personnel will screen each sample site and will collect soil samples.

Upon completion of the field investigations, ES will reduce and evaluate the data in preparation of completing the ESI reports. Reduction and statistical analyses will be performed in accordance with NYSDEC and EPA procedures to document the impact of each SWMU upon the environment.

4.1 SEAD 5 - SEWAGE SLUDGE WASTE PILES

SEAD-5 is composed of a number of sewage sludge waste piles that are located west of Building 135. These piles were derived from two on-site sewage treatment plants. The location and approximate boundary of the SWMU are shown in Figure 4-1.

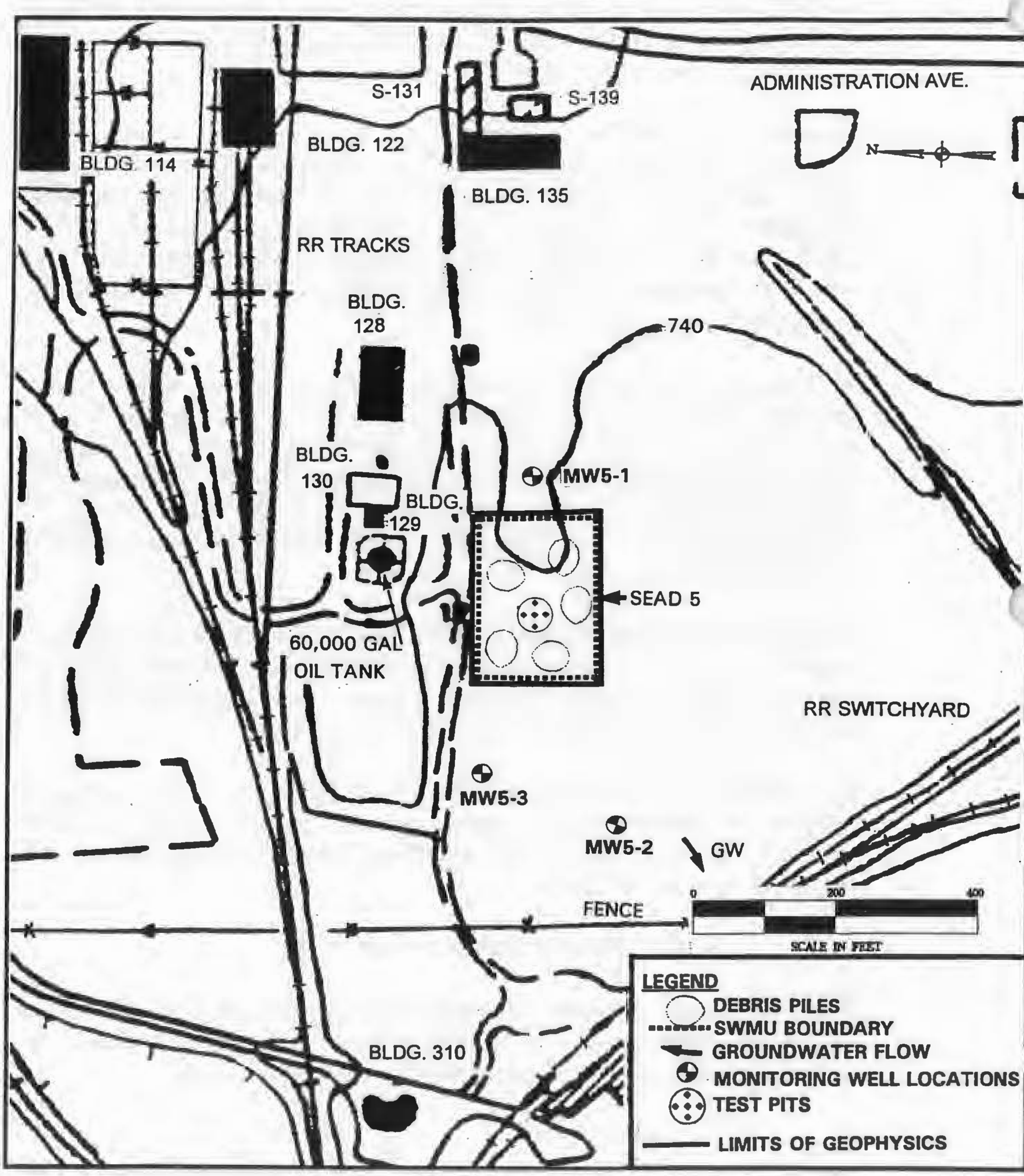

FIGURE 4-1 Sampling Plan for SEAD 5: Sewage Sludge Waste Piles

4.1.1 Site Background

4.1.1.1 Historical Use

Sewage sludge was stockpiled in this area during the 1980's and deposited west of Building 135. The sludge was removed from the drying beds of on-site Sewage Treatment Plants No's 4 and 715. The process of removing the sludge and transporting it to this area occurred at two month intervals, according to SEAD personnel. No information is available on the period of time over which materials have been placed here.

4.1.1.2 Current Conditions

Approximately five sludge piles exist covering an area that measures approximately 220 feet by 110 feet. The heights of these piles range from 5 to 10 feet, and they are discontinuous in nature. At present the piles are covered with vegetation. It did not appear that this vegetation was stressed. There is no indication that UXO related items would be present in this area. SEAD has indicated that sludge is no longer being stockpiled in this area. In June of 1992, Seneca removed approximately 560 tons of sludge from this site. The sludge was placed in an off-post secure landfill. Seneca has no further plans for off post disposal of sludge from this site.

Currently the sewage sludge that is produced from the on site treatment plants is being stored in a covered area near Building 4. SEAD intends to submit a land spreading application for the sludge located at SEAD-5 and SEAD-20 in the fall of 1993.

4.1.1.3 Existing Analytical Data

Two sludge samples were taken from the piles on January 9, 1992. The exact locations of the samples within the waste pile area are uncertain. The results of the chemical analyses are presented in Table 4-4. This analysis was performed to determine the feasibility of disposing of the sludge at the Seneca Meadows Municipal Landfill. A TCLP analysis consisting of metals, organic extractable pesticides, VOCs, organic extractable base neutrals, and acids was performed on the two samples. The only constituent found to be above detection limits was cadmium.

Parameter	East Piles	West Piles	Limits	Units	Method Number
TCLP Metals					Method No. 3510
Arsenic	<0.10	<0.10	5.0	mg/l	7060
Barium	<5.0	<5.0	100.0	mg/l	7030
Cadmium	0.06	0.05	1.0	mg/l	7130
Chromium	<0.05	<0.05	5.0	mg/l	7190
Lead	<0.20	<0.20	5.0	mg/l	7420
Mercury	<0.10	<0.10	0.20	mg/l	7471
Selenium	<0.10	<0.10	1.0	mg/l	7740
Silver	<0.05	<0.05	5.0	mg/l	7760
TCLP Org. Extractables					
Pesticides					Method No. 3510
Chlordane	<0.01	<0.01	0.03	mg/l	8080
Endrin	<0.01	<0.01	0.02	mg/l	8080
Heptachlor	<0.01	<0.01	0.008	mg/l	8080
Lindane	<0.01	<0.01	0.4	mg/l	8080

TABLE 4-4 SEAD 5 SLUDGE ANALYSIS RESULTS - EAST AND WEST PILES

Parameter	East Piles	West Piles	Limits	Units	Method Number
Methoxychlor	<0.01	<0.01	10.0	mg/l	8080
Toxaphene	<0.01	<0.01	0.5	mg/l	8080
Herbicides					
2,4–D	<0.02	<0.02	10.0	mg/l	8150
2,4,5–TP (Silvex)	<0.004	<0.004	1.0	mg/l	8150
TCLP VOCs					Method No. 3510
Vinyl chloride	<0.10	<0.10	0.20	mg/l	8010
1,1–Dichloroethene	<0.05	<0.05	0.70	mg/l	8010
Chloroform	<0.05	<0.05	6.0	mg/l	8010
1,2–Dichloroethane	<0.05	<0.05	0.50	mg/l	8010
Carbon Tetrachloride	<0.05	<0.05	0.50	mg/l	8010
Trichloroethene	<0.05	<0.05	0.50	mg/l	8010
Tetrachloroethene	<0.05	<0.05	0.70	mg/l	8010
Benzene	<0.05	<0.05	0.50	mg/l	8020
Chlorobenzene	<0.05	<0.05	100.0	mg/l	8020

TABLE 4-4 (Con't) SEAD 5 SLUDGE ANALYSIS RESULTS - EAST AND WEST PILES

Parameter	East Piles	West Piles	Limits	Units	Method Number
1,4- Dichlorobenzene	<0.05	<0.05	7.5	mg/l	8020
Methyl Ethyl Ketone	<0.10	<0.10	200	mg/l	NYSDOH 310-25
TCLP Org. Extractables					
Base Neutrals					Method No. 3510
2,4- Dinitrotoluene	<0.010	<0.010	0.13	mg/l	8270
Hexachlorobenzene	<0.010	<0.010	0.13	mg/l	8270
Hexachloro-1,3-Butadiene	<0.010	<0.010	0.50	mg/l	8270
Hexachloroethane	<0.010	<0.010	3.0	mg/l	8270
Nitrobenzene	<0.010	<0.010	2.0	mg/l	8270
Pyridine	<0.010	<0.010	5.0	mg/l	8270
Acids					
Total Cresol	<0.050	<0.050	200.0	mg/l	8040
Pentachlorophenol	<0.050	<0.050	100.0	mg/l	8040
2,4,5-Trichlorophenol	<0.050	<0.050	400.0	mg/l	8040
2,4,6-Trichlorophenol	<0.010	<0.010	2.0	mg/l	8040

Notes:
All analyses were performed by methods outlined in Federal Register Rules and Regulations Volume 55, No. 61, Part 261, Appendix II, March 29, 1990.
Analysis performed by NYS Certified Labs #11000 or #10248.
Samples taken by Lozier Laboratories, Inc. on Jan. 9, 1992.

TABLE 4-4 (Con't) SEAD 5 SLUDGE ANALYSIS RESULTS - EAST AND WEST PILES

Tables 4-5 and 4-6 contains the results of analysis performed on samples obtained from the drying beds of Sewage Treatment Plants Nos. 4 and 715 in 1985. No PCBs were detected, however some metals and nitrates were detected at elevated concentrations.

4.1.2 Contaminants of Interest

Previous sludge sampling has indicated that heavy metals (copper, zinc) and nitrates are the principal contaminants of concern.

4.1.3 Transport Pathways

The transport pathways for the chemicals of concern at the Sewage Sludge Waste Piles include soil and groundwater. Rainfall runoff flowing off these waste piles could leach heavy metals and nitrates from the sludge into the surrounding soils and groundwater.

4.1.4 Field Investigation

4.1.4.1 Geophysical Survey

Since the waste piles are above the land surface and their extent will be determined using visual observations and land surveying.

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

Parameters	Sewage Treatment Plant No. 4	Sewage Treatment Plant No. 715
PCB-1016	ND	ND
PCB-1242	ND	ND
PCB-1248	ND	ND
PCB-1254	ND	ND
PCB-1260	ND	ND
PCB-1262	ND	ND

Notes:
All results in ug/g (ppm) dry weight unless noted otherwise.
ND = Not detected at or above reporting limit.
Samples collected by NYSDEC in February 1985.

TABLE 4-5 SEAD 5 SLUDGE ANALYSIS RESULTS - (FEBRUARY, 1985)

Parameters	Sewage Treatment Plant No. 4	Sewage Treatment Plant No. 715
Total Volatile Solids %	68.4	54.1
pH	6.3	7.3
Cd	6.1	8.3
Cr	26	110
Cu	1490	1130
Hg	2.5	1.7
K	640	860
Ni	33	23
Pb	180	280
Zn	1240	1210
Ammonia as Nitrogen	4100	5300

TABLE 4-5 (Con't) SEAD 5 SLUDGE ANALYSIS RESULTS - (FEBRUARY, 1985)

Parameters	Sewage Treatment Plant No. 4	Sewage Treatment Plant No. 715
Nitrate as Nitrogen	<1.5	51.2
Nitrite as Nitrogen	38.2	<3.75
Total Kjeldahl Nitrogen	21000	38000
Total Phosphorus	9800	14000
Total Solids %	13.8	7.04
Extractable Organic Halogens	3	12
Volatile Organic Halogens	<0.1	0.5
Total Organic Halogens	3	12.5
PCB−1221	ND	ND
PCB−1232	ND	ND

TABLE 4-5 (Con't) SEAD 5 SLUDGE ANALYSIS RESULTS - (FEBRUARY, 1985)

TABLE 4-6 SEAD 5 SLUDGE ANALYSIS RESULTS - (OCTOBER - DECEMBER, 1985)

Location	Date	% Solids	Cu	TOX
STP No. 4	10/24/85	25	1840	0.42
STP No. 17	10/24/85	28	1860	1.17
STP No. 4	11/14/85	24.1	1300	0.6
STP No. 17	11/14/85	24.6	680	0.5
STP No. 4	12/19/85	12.2	968	3.6
STP No. 17	12/19/85	18.7	1898	2.2

Notes:

All results in ug/g (ppm) dry weight unless noted otherwise.
All samples collected by Seneca Army Depot.

4.1.4.2 Media To Be Investigated

Soils

One soil sample will be collected with a backhoe from each of the five sewage sludge waste piles at SEAD 5 as shown in Figure 4-1. A composite sample will be collected from each of the waste piles using the sampling procedures described in the Field Sampling and Analysis Plan. These samples will be analyzed for the parameters listed in Section 4.1.5.

Groundwater

Three groundwater monitoring wells will be installed at SEAD 5. The locations of the proposed wells are shown in Figure 4-1. These well locations are based upon a presumed groundwater flow direction towards the east. The upgradient well will be used to determine background groundwater quality at the site. The remaining two wells will be located downgradient of the sewage sludge waste piles to evaluate the potential impact of the sewage sludge waste sites on the groundwater.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. The well installation procedures are fully described within the Field Sampling and Analysis

Plan. Following installation and development, one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.1.5.

4.1.5 Analytical Program

A total of 5 soil samples and three groundwater samples will be collected from SEAD-5 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, and nitrates by Method 353.2. A summary of the analytical program for SEAD-5 is presented in Table 4-3.

4.1.6 Handling UXOs and Explosives

UXOs and explosives are not expected to be present at this SWMU.

4.2 SEAD 9 OLD SCRAP WOOD SITE

Figure 4-2 shows the location and estimated boundary of the scrap wood site and fill area defined as SEAD 9. The access road to the old scrap wood site is located approximately 400 feet north of the intersection of East Kendaia Road and East Patrol Road along East Patrol Road. The dirt road leads to a cul de sac at the end of which debris is present.

4.2.1 Site Background

4.2.1.1 Historical Use

Construction debris was deposited at this site from 1977-1984, and scrap wood from 1984 to 1986. Periodically between 1985 and 1992 the fire department used this area for training when they burned scrapwood that could not be sold. The nature of this fire training is uncertain. No historical data exists on the procedures used or materials burned.

4.2.1.2 Current Conditions

There are numerous piles of scrap wood and miscellaneous other items that exist in and around the cul de sac. Piles of scrap wood and fire wood are evident throughout the site.

Concrete and asphalt waste were reported by ECRE (1991) during the development of the SWMU Classification Report. The area is flat and of a semi circular shape as shown in Figure 4-2. The area has a steep slope on the west side possible indicating the edge of a filled area. There were no signs of stressed vegetation noted during the January 1993 site visit.

4.2.1.3 Existing Analytical Data

There is no existing analytical data for this site.

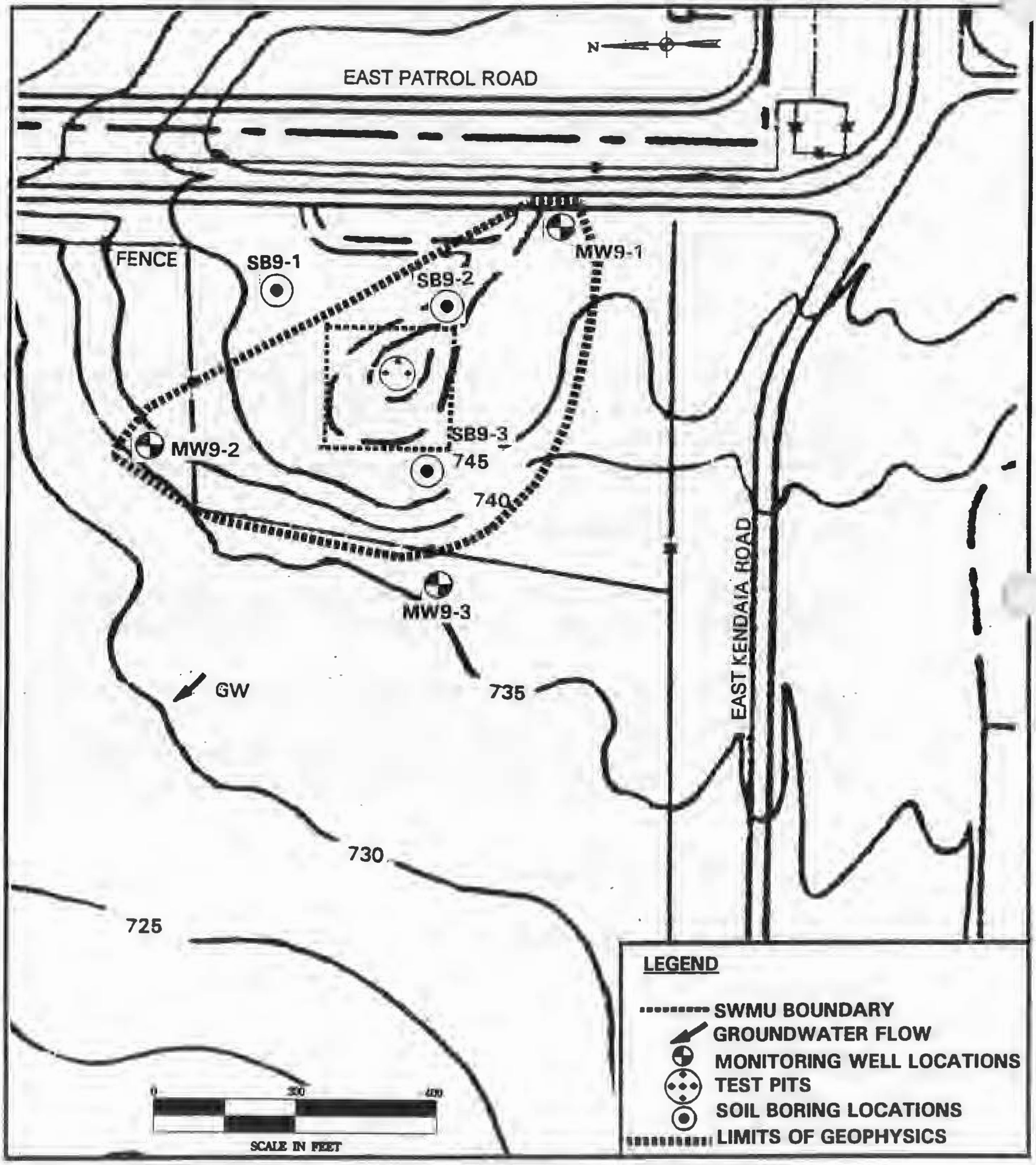

FIGURE 4-2 Sampling Plan for SEAD 9: Old Scrap Wood Site

4.2.2 Contaminants of Interest

It is unknown what may have been disposed of within the old scrap wood site. Consequently, Pesticides/PCBs, VOCs, SVOs, and heavy metals are potentially present. Petroleum products, primarily benzene, toluene, and xylene, are also potential contaminants since fire training took place in this area.

4.2.3 Transport Pathways

A variety of activities took place in this area which include fire training and landfilling. The transport pathways of the buried waste and fuels used for burning include both surface water runoff and groundwater.

4.2.4 Field Investigation

4.2.4.1 Geophysical Survey

Electromagnetic (EM-31) and Ground Penetrating Radar (GPR) surveys will be performed at SEAD 9. The initial geophysical investigation will be an EM-31 survey performed on a 20 foot by 20 foot grid throughout the survey and as shown in Figure 4-2. The objective of the EM-31 survey will be to delineate the limits of the landfill and to identify locations where metallic objects may be buried within the subsurface. Upon completion of the EM-31 survey, contour maps of the in-phase and quadrature components of the electromagnetic field will be generated to aid in identifying the waste limits and the locations of possible buried metallic objects within the landfill.

Subsequent to the EM-31 survey a GPR survey will be performed. The GPR data will be collected across the area shown in Figure 4-2 along profiles spaced at 50 foot intervals. Those data will be used to supplement the EM-31 interpretation of the waste limits and to provide additional information on the thickness of the waste. GPR data will also be collected over each distinct EM-31 anomaly in order to provide a better characterization of the suspected metallic source.

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

4.2.4.2 Media To Be Investigated

Soils

Both soil borings and test pits will be performed at SEAD 9 to evaluate the thickness, distribution, and chemical make up of the materials on site. The soil boring and test pit locations are shown in Figure 4-2.

Three test pits will be dug at SEAD 9 within the landfill area as shown in Figure 4-2. The final test pit locations will be based upon the results of the geophysical surveys. These test pits will be performed to allow a visual inspection of the fill and to evaluate locations of suspected buried metallic objects. No soil samples will be collected from these test pits.

Three soil borings will be performed at SEAD 9. The soil borings will be used to determine the thickness of the fill. Each boring will be continuously sampled to the top of the water table. A total of three soil samples from each boring will be collected and analyzed. The field screening procedures used for soil sample selection are described within Section 4.2.5 of the Field Sampling and Analysis Plan. The three samples from each boring will be submitted for the chemical analyses identified in Section 4.2.5.

Groundwater

Three monitoring wells will be installed at SEAD 9. The proposed well locations are shown in Figure 4-2. The presumed direction of groundwater flow at this SWMU is to the northwest. An upgradient well will be installed to determine the background groundwater quality at the site. The remaining two wells will be located downgradient of the old scrap wood site and fill area. These will be used to assess the impact of the fill area and activities at the scrap wood site on the groundwater system.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and development, one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.2.5.

4.2.5 Analytical Program

A total of 9 soil samples and three groundwater samples will be collected from SEAD-9 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, and total petroleum hydrocarbons by EPA Method 418.1. A summary of the analytical program for SEAD-9 is presented in Table 4-3.

4.2.6 Handling UXOs and Explosives

UXOs and explosives are not expected to be present at this SWMU.

4.3 SEAD 12-RADIOACTIVE WASTE BURIAL SITES

SEAD 12 is composed of two distinct areas. Location A is north of Building 813 while Location B in northeast of Building 804. The two areas are shown in Figures 4-3 and 4-4.

Location A covers an area of approximately 1000 ft. by 1000 ft. The area is located in the Northeast corner of the Q between past Patrol Road and Service Road No. 1. It is suspected that up to five small burial pits are located in this area northeast of Building 813. Figure 4-3 shows the location of this area.

Location B is northeast of Buildings 803, 804 and 805. A pit containing a 5000 gal. storage tank is thought to be located north of Building 803. Another dry storage pit is thought to be located north of building 804. Radioactive wastes or wastewaters were reportedly disposed of in these pits. Figure 4-4 shows the location of these areas.

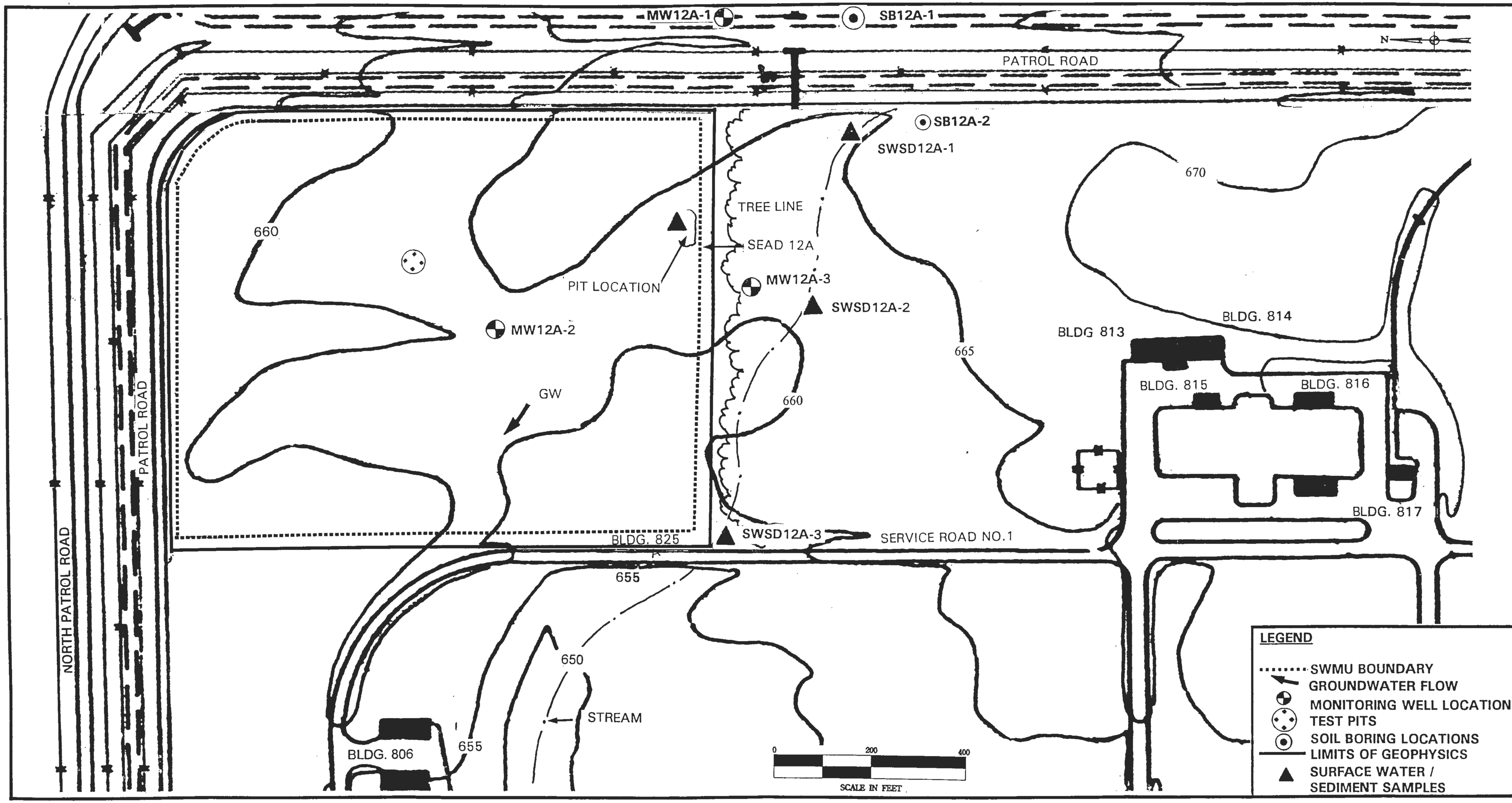

FIGURE 4-3 SAMPLING PLAN FOR SEAD 12A - RADIOACTIVEWASTEBURIAL SITE

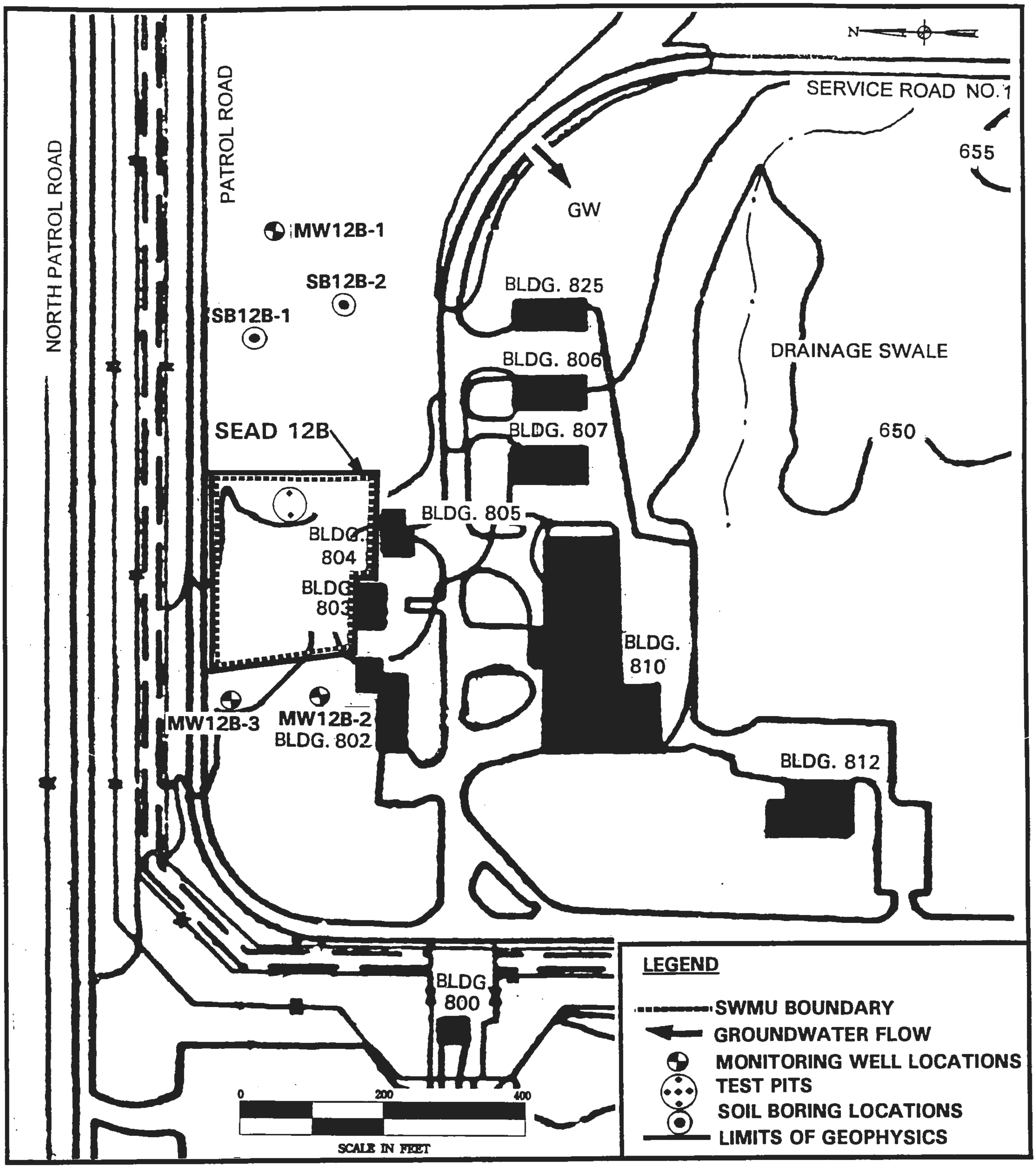

FIGURE 4-4 Sampling Plan for SEAD 12B: Radioactive Waste Burial Site

4.3.1 Site Background

4.3.1.1 Historical Use

Location A was believed to be used for the disposal of lab wastes. It is believed that these burials took place between 1940 and 1980. One of the pits was excavated in 1986 and a large amount of lab trash was removed and shipped to an authorized off-site radioactive waste landfill in December 1987. There are believed to be up to five burial pits located in this area.

The 5000 gallon storage tank at Location B was utilized for storage of wastewater. This wastewater was generated from the washing of radioactive contaminated clothing. SEAD attempted to remove the tank. The top of the tank was ripped off in the process. The tank was then backfilled in place. This cement tank was closed in place in 1986. The dry storage pit was also excavated in 1986. This dry storage pit contained pieces of plywood according to the SWMU Classification Report (ECRE, 1991).

4.3.1.2 Current Conditions

During the January 1993 site visit one of the suspected burial pits, as shown in Figure 4.3, was identified. The pit is about 200 feet west of Patrol Road along the treeline. SEAD indicates that this location is where the 1986 excavation was performed. In January 1993 the pit was approximately 15 feet in diameter and filled with water. In the center of Location A there also appears to be a slightly raised area possibly indicating the existence of a filled area.

To the south of Location A there are woods that border Patrol Road and Service Road One. There are low lying wet areas in the north part of the woods and a stream that runs East to West.

There is presently no information available on the locations of either structures in Location B. A visual inspection of the site identified drainage ditches located near Buildings 805 and 804 and a mound located behind Building 803 that has been identified as a bunker. Otherwise the area is flat. There were no signs of stressed vegetation in this area.

4.3.1.3 Existing Analytical Data

Reports documenting the closure, cleanup, and excavations are classified. Soil analysis results from the dry storage pit north of Building 804 are located in Table 4-7. The samples were collected of the 16 samples analyzed on a Nuclear Data, Model 682 Multi-Channel Analyzer all results were less than minimum detectable activities.

4.3.2 Contaminants of Interest

It is unknown what may have been disposed of within these burial pits. Consequently pesticides/PCBs, VOCs, SVOCs, heavy metals, and potential radioactive isotopes may be present.

4.3.3 Transport Pathways

Soil, groundwater, and surface water are possible transport pathways. If the wastes removed were contaminated with radioactive particles, ground water contamination may have resulted from the long term burial of these wastes.

4.3.4 Field Investigation

4.3.4.1 Geophysical Survey

Electromagnetic (EM-31) and Ground Penetrating Radar (GPR) surveys will be performed at Locations A and B of SEAD 12. The EM-31 survey will be conducted on a 20 foot by 20 foot grid across the areas shown in Figures 4-3 and 4-4. The objective of the EM-31 survey will be to delineate the locations of the suspected burial pits at both sites, and to delineate the location of the 5000 gallon buried tank.

Upon completion of the EM-31 survey a GPR survey will be performed. The GPR data will be collected across the area shown in Figures 4-3 and 4-4 along profiles spaced at 50 foot intervals. Those data will be used to supplement the EM-31 data as pertains to the suspected pit locations and to further characterize the buried 5000 gallon tank. The GPR data will also be used to evaluate the composition of the fill materials within the individual pits. GPR data will be collected over individual EM-31 anomalies to provide a further characterization of the individual anomaly sources.

Sample No.	Description	Findings
1	24" center	<MDA
2	24" north	<MDA
3	Mass 79.4 g	<MDA
4	plywood found in hole	<MDA
5	54" west	<MDA
6	22"	<MDA
7	stuck to plywood at 2 feet	<MDA
8	16" south	<MDA
9	20" center	<MDA
10	20" east	<MDA
11	54" east	<MDA
12	44" east	<MDA
13	40" north	<MDA
14	54" southeast	<MDA
15	20" east	<MDA
16	26" southwest	<MDA

Notes:

1) The samples were analyzed on a Nuclear Data, Model 682 MultiChannel Analyzer utilizing an Ortec Gamma–X intrinsic germanium detector.
2) MDA – minimum detectable activities
3) Pit was excavated on May 27, 1986. The only suspicious debris encountered was pieces of plywood.
4) Soil samples were collected from the bottom of the pit (54") and when the pit was partially backfilled (22").

TABLE 4-7 SEAD 12B - SOIL ANALYSIS RESULTS - DRY PIT NORTH OF BLDG 804

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

4.3.4.2 Media To Be Investigated

SEAD 12A - Northeast of Building 813

Soils

Both test pits and soil borings are proposed for SEAD 12A. The locations of these are shown in Figure 4.3. Five test pits are proposed at SEAD 12A. One test pit will be conducted within the existing pit that has been identified on-site. The pit was observed during a visual inspection in January 1993 to be filled with water and debris. Four additional test pits will be located based upon the results of the geophysical survey. These test pits will be situated within the remaining presumed burial pits. Soil samples will be collected from these test pits and submitted for chemical analyses identified in Section 4.3.5.

Two soil borings will be completed at SEAD 12A. The soil boring locations will be upgradient of the SWMU to determine background analytical data. A total of three samples from each boring will be collected and analyzed. The three samples to be analyzed from each boring will be submitted for chemical analyses identified in Section 4.3.5.

Groundwater

Three wells will be installed at SEAD 12A. The monitoring well locations are shown in Figure 4.3. The presumed direction of groundwater flow at this SWMU is northwest. The upgradient well will be installed to determine the background groundwater quality. The additional wells will be located downgradient of the disposal pits. The locations of these wells are subject to slight changes depending upon how many and where disposal pits are located in this area.

Monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and development, one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.3.5.

Surface Water and Sediment

Four surface water and sediment samples will be collected as shown in Figure 4.3. During the site visit of January 1993 the existing pit was seen to be filled with water. A surface water and sediment sample will be collected from this pit. Three additional surface water and sediment samples will be collected from the stream that runs east to west through the wooded area south of SEAD 12A. The samples will undergo the chemical analyses described in Section 4.3.5.

12B North of Building 804

Two test pits and two soil borings will be completed at SEAD 12B as shown in Figure 4-4. Two pits were previously excavated in 1986, one near the dry storage pit and a second near the 5000 gallon tank. Reports of these excavations were not available to ES. The location of these two pits could not be visually determined during the site visit of January 1993. Two additional test pits will be completed at SEAD 12B. The locations of these test pits will be based upon the results of the geophysical surveys. One test pit will be directly adjacent to both the 5000 gallon tank and the dry storage pit to confirm the present status of these units. Soil samples will be collected from these pits and submitted for chemical analyses identified in Section 4.3.5.

Two soil borings will be completed at SEAD 12B as shown in Figure 4-4. These soil borings will be completed upgradient of the SWMU to determine background analytical data. Each boring will be continuously sampled to the top of the water table. A total of three samples from each boring will be collected and analyzed. The three samples to be analyzed from each boring will be submitted for chemical analyses identified in Section 4.3.5. Three soil samples will also be collected from the bottom of the 5,000 gallon tank with the aid of a hand auger. These samples will also be submitted for chemical analysis identified in Section 4.3.5.

Groundwater

Three monitoring wells will be installed at SEAD 12B. The location of these wells are shown in Figure 4-4 but are subject to change depending upon refining the locations of the disposal pits. One of these wells will be installed upgradient of the pits in order to establish background groundwater quality. The additional two wells will be located downgradient of the two disposal pits. Groundwater analysis will be used to evaluate the extent to which contamination has migrated to the groundwater.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and development, one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.3.5.

4.3.5 Analytical Program

A total of 11 soil samples, 4 surface water and sediment samples, and three groundwater samples will be collected from SEAD-12A for chemical and radiologic testing. In addition, 11 soil samples and three groundwater samples will be collected from SEAD 12B. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, and radiochemical analysis for Gross α and Gross β by Method 9310 and gamma spectral analysis by Method 901.1. The radiologic samples will be collected in accordance with the procedures outlined in Section 3.3.2using the gieger mueller and alpha scintillation instruments as a screening tool for health and safety. A summary of the analytical program for SEAD-12A and SEAD-12B is presented in Table 4-3.

4.3.6 Handling UXOs and Explosives

UXOs and explosives are not expected to be present at this SWMU.

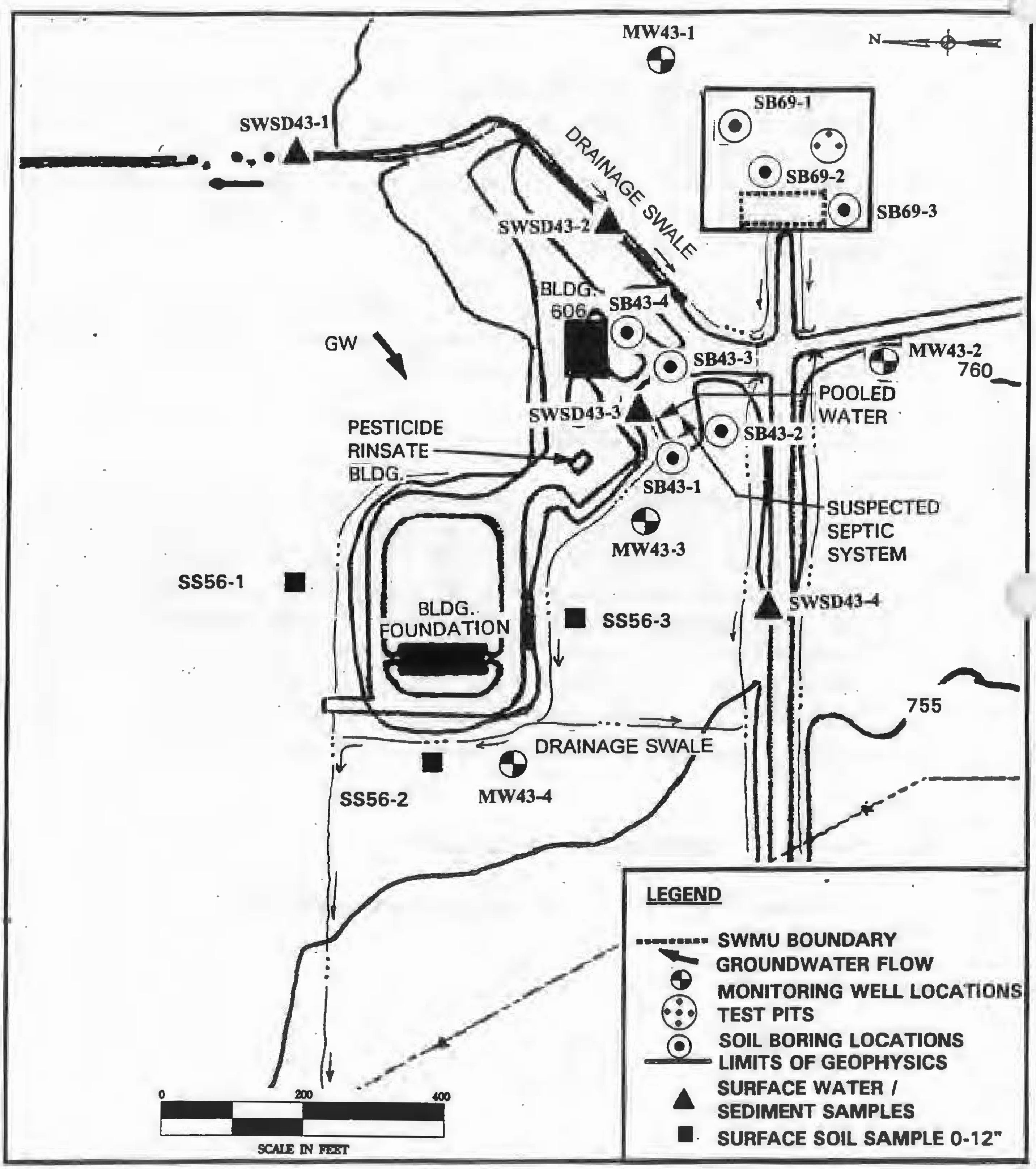

FIGURE 4-5 Sampling Plan for SEAD 43, 56, 69: Building 606/Disposal Area

4.4 SEAD 43 - OLD MISSILE PROPELLANT TEST LAB
SEAD 56 - HERBICIDE/PESTICIDE STORAGE
SEAD 69 - BUILDING 606 DISPOSAL AREA

These SWMUs will be investigated together due to their association with Building 606. SEAD's 43, 56, and 69 are located in the southeast corner of the depot. Building 606, which was once used as a missile propellant test laboratory (SEAD 43), is now the herbicide pesticide storage facility (SEAD 56). A disposal area associated with these operations is also located nearby (SEAD 69). These three areas are shown on Figure 4-5.

4.4.1 Site Background

4.4.1.1 Historical Use

Building 606 was reported to have been used as a missile propellant test laboratory in the 1960's. The Old Missile Test Facility conducted QA surveillance testing. This commonly involved operational or functional testing of explosive devices. The SWMU Classification Report indicates that liquid IRFNA that was disposed of at the IRFNA disposal site (SEAD13) was generated in the Building 606 area. During this time IRFNA and/or liquid propellants may have been disposed of in this area. Since 1976 Building 606 has been used for herbicide/pesticide storage. The building was renovated in 1979 to include the following health and safety features: ventilation fan with lowering door vents, local exhaust for the mixing area, shower, emergency spill kits, a fire protection system connected directly with the on-post fire department, and adequate shop signs and disposal procedures. The buildings drains and concrete floors have been sealed.

Northwest of Building 606 is a concrete foundation that is believed to have been associated with the old missile test facility. This may have been an acid storage building. The actual corrugated metal building has been moved to the Administrative area, and is now Building 132. This concrete pad has been used in the past, and currently, to aerate spill residues.

A concrete underground tank was used for intermittent storage of washwater from the rinsing of the portable truck mounted tank used for mobile spraying operations. The mobile tank requires rinsing between dissimilar pesticide and herbicide applications. Rinseate is always used for diluent for the next application of the pesticide or herbicide.. In 1989, the tank was removed and was replaced with a new tank located within a vault to comply with underground tank regulations. East of Building 606 a pesticide rinseate building has been constructed. The rinseate from this process is now discharged into the new tank.

In June of 1992, the building 606 water faucet was repaired by Depot employees. During the repair excavation, a floating product and a diesel fuel odor was observed. Seneca environmental personnel interviewed a Depot employee which resulted in the report of a fuel line break in a small tractor that was stored at this site several years ago, which may have resulted in the release of virgin diesel fuel. Following this report, groundwater and soil samples were taken from the excavation, and a petroleum fingerprint analysis indicate 1.09 mg/l of diesel fuel in water. The soil sample composite taken from this excavation tested negative (non-detect) using analytical method NYSDOH 310-13. The excavation site was left uncovered and roped off, and cleanup was deferred to Seneca's IAG and the CERCLA cleanup process.

Approximately 300 feet south of Building 606 a road leads east to an open field that was used as a disposal area for Building 606. The entire field was inspected during the January 1993 site visit. A debris area that measured approximately 100 feet by 100 feet was identified at the end of the road. SEAD personnel have reported that debris (fence posts, 2,4-D cans, and pesticide cans) has been dumped in this area. It is believed this could also be a potential site for the two drums of nicotine sulfate (SEAD 62).

4.4.1.2 Current Conditions

Building 606 is currently used for herbicide pesticide storage and has been since 1976. A barren area in front of Building 606 was described in the SWMU Classification Report, as possibly indicative of a previous spill of some sort. An asbestos workshop is also part of this facility. Figure 4-6 is a plan view of Building 606. A variety of herbicide and pesticide compounds and dispersal equipment are stored in Building 606. Preparation of the compounds prior to dispersal is carried out in a separate section of the building. Table 4-8 lists the material stored in the Herbicide/Pesticide Facility.

The containers used for mixing herbicides/pesticides are washed out at the end of the operation in the Pesticide Rinseate Building west of Building 606. Rinseate from the building is discharged through a new drain and double walled pipe into the new tank located in an underground vault adjacent to the rinseate facility. A drainage swale is located behind the rinseate facility.

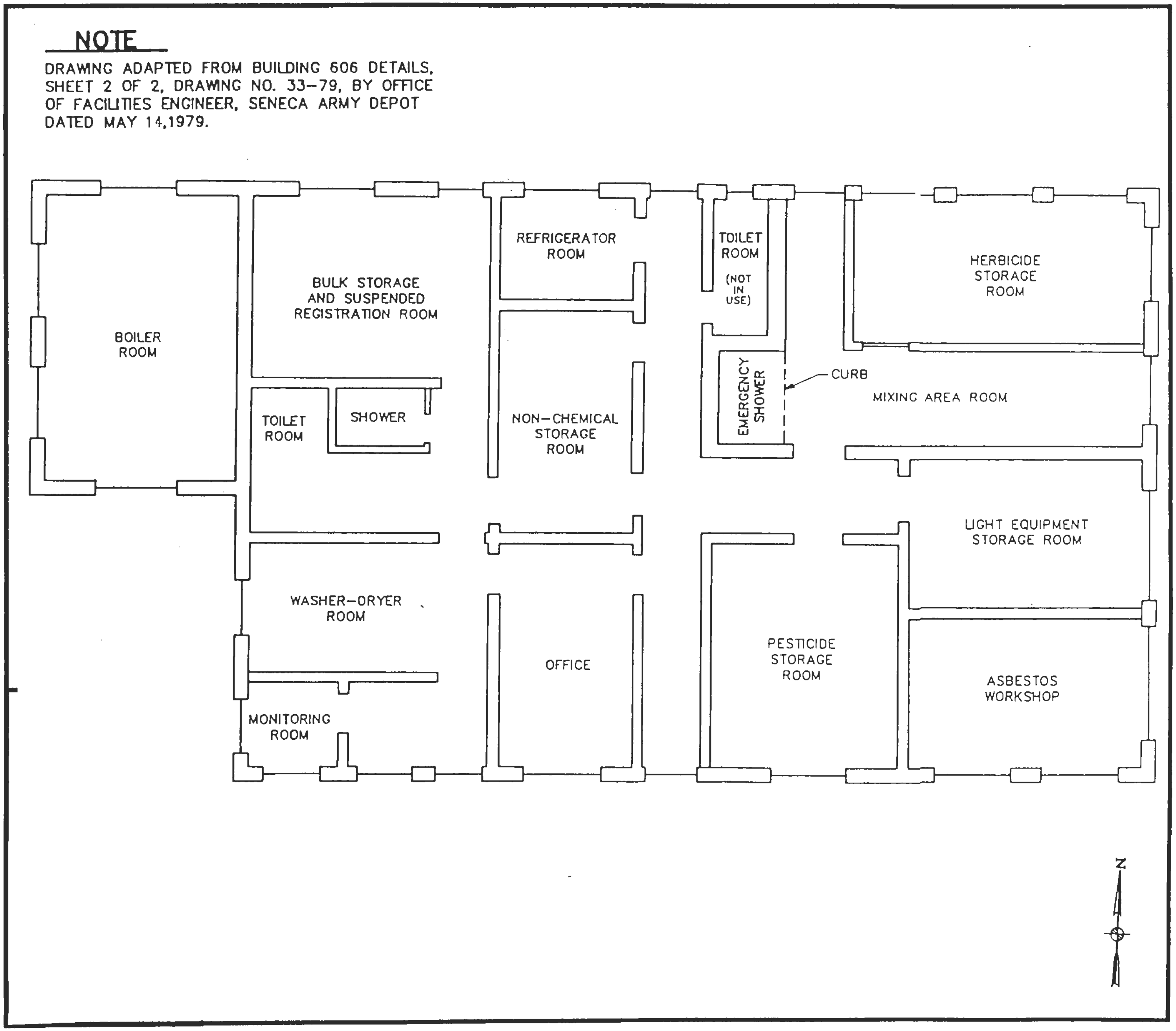

FIGURE 4-6 Sampling Plan for SEAD 43, 56, 69: Plan View of Building 606

Pesticide Storage Area
Pesticide Storage Room
Diazinon 4E Spray Ortho Hornet and Wasp Killer FICAM–W–WWP OFF Aerosol Synthrin liquid concentrate Pegeon–9–strychnine grain bait (1) Diazinon dust Phostoxin tablets, gas Mariate 2–MR emulsifiable concentrate Sythion 5E emulsifiable concentrate (2) Vaposector liquid concentrate (2) Sevin carbaryl WWP Malathion liquid concentrate Warfarin anticoagulant Diaphacin paraffin anticoagulant Cutter insect repellant aerosol Tree wound dressing aersol D–con flea fogger
Herbicide Storage Room
Round up liquid concentrate Low Vol 2,4–D liquid concentrate Princep 80W WWP UROX–B–water sol. concentrate Arsenal
Bulk and Suspended Registration Storage Room
Tordon 10K pellets Boracil IV granular Weed and feed lawn
Storage in SW Corner Room
15–15–15 garden fertilizer Tree spikes 5–10–15 Grub –Out
NOTES: (1) Not used. (2) Not in stock during visual site inspection.

TABLE 4-8 SEAD 56 HERBICIDES AND PESTICIDES STORED IN BUILDING 606

The washwater from the rinsing of pesticide containers is reused immediately as a diluent in the pesticide application. The vault for the storage tank was intended to be watertight but has not proven to be so. A sump pump and discharge pipe were installed to empty the vault of rainwater that accumulates inside of it during heavy rain events. This water is discharged into a depressed area and pools just east of the underground vault. No indication of leaking from the tank has been noted by SEAD personnel.

The concrete pad northwest of Building 606 that was once associated with the Old Missile Test Laboratory is currently used to aerate spill residues according to SEAD.

Southwest of Building 606 is a structure believed to be a septic system. Two above ground concrete vaults are located on either end of a 25 foot long mound. Atop the mound are several black vent pipes. Two working sump pumps are located at the most eastern end of the mound.

The waste disposal area near Building 606 (SEAD 69) contains various construction debris. Bricks and concrete blocks are visible on the surface. A topographic depression, indicative of a pit of some kind, was noted in the SWMU Classification Report. There were no signs of stained soil or stressed vegetation noted during the January 1993 site visit. There are no wetlands located in the immediate area.

Due to the presence of the Old Missile Propellant Test Labs, there is a possibility of UXO's in this area.

4.4.1.3 Existing Analytical Data

Groundwater and soil samples were taken outside of Building 606 to determine if diesel fuel may have leaked from a fuel line. A petroleum fingerprinting analysis indicated 1.09 mg/l of diesel fuel in the water. A composite soil sample taken from the excavation tested negative (non-detect) using Analytical Method NYSDOH 310-13.

4.4.2 Contaminants of Interest

Contaminants that might be detected in the vicinity of Building 606 due to the operations at SEAD 56 and 69 include herbicides and pesticides. Other contaminants of interest include heavy metals, VOCs and SVOs, and explosives. Petroleum products are also potential contaminants by the water faucet outside Building 606 where diesel fuel is reported to have leaked from a fuel line.

4.4.3 Transport Pathways

Transport pathways for the contaminants in this area include soil, surface water, and groundwater. Heavy metals, explosives, and herbicides and pesticides are considered to be potential contaminants in this area.

4.4.4 Field Investigation

4.4.4.1 Geophysical Survey

No geophysical investigations will be performed at either SEAD 43 or SEAD 56. Both electromagnetic (EM-31) and Ground Penetrating Radar (GPR) surveys will be performed at SEAD 69. The EM-31 survey will be conducted on a 20 foot by 20 foot grid across the area shown in Figure 4-5. The objectives at the EM-31 survey will be to delineate the limits of the waste disposal area and to identify the presence and location of buried metallic objects within the disposal area.

Upon completion of the EM-31 survey, a GPR survey will be performed. The GPR data will be collected across the area shown in Figure 4-5 along profiles spaced at 50 foot intervals. These data will be used to supplement the EM-31 data as pertains to the definition of the waste limits. The GPR data will also be used to provide information on the thickness and composition of the waste. Additional GPR data will also be collected over individual EM-31 anomalies thought to be associated with buried metallic objects. These data will be used to provide further characterization of the EM-31 anomaly sources.

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

4.4.4.2 Media To Be Investigated

Soils

Test pits, surface soil samples, and soil borings will all be completed in this area. Figure 4.5 shows the locations of all sample points.

Three soil borings will be performed around the suspected septic system southwest of Building 606. At present this area has not been positively identified as a septic system by SEAD personnel. Borings are proposed to identify contamination that may have occurred due to the presence of this system. One additional soil boring is proposed in the area containing the stressed vegetation outside Building 606. This will be located in front of the Building 606 water faucet in order to further characterize the presence of diesel fuel due to the fuel line break of a small tractor. Three soil borings will also be performed at SEAD 69, the waste disposal area. Each boring will be continuously sampled to the top of the water table. A total of three samples from each boring will be collected and analyzed. The three samples to be analyzed from each boring will be submitted to chemical analyses identified in Section 4.4.5.

Three surface soil samples will be collected from the area surrounding the storage pad northwest of Building 606. This area, once a building for acid storage and now used to aerate spill residues, is a potential location for soil contamination.

Three test pits will be performed within SEAD 69. The locations of the test pits will be based upon the results of the geophysical surveys. No soil samples will be collected from these pits. The purpose of the test pits is to visually examine the composition of the fill and to evaluate potential metallic objects buried within the waste.

Surface Water and Sediments

A total of four surface water and sediment samples will be collected at the site. The sampling locations are shown on Figure 4-5. One surface water and sediment sample will be collected from the area where water has pooled near the discharge pipe from the vault. Three additional surface water and sediment samples will be collected from the drainage ditch located nearby. One of these samples will be upgradient of the site and the remaining two downgradient of it.

Groundwater

Four monitoring wells will be installed at SEAD 43, 56, and 69. The presumed direction of groundwater flow at this SWMU is west-southwest. The monitoring well locations are shown in Figure 4-5. The upgradient well will be installed to determine background groundwater quality. The remaining three wells are located downgradient of Building 606, the disposal area, and the foundation northwest of Building 606.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and development, one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.4.5.

Sludge/Liquid (from buried tank outside Building 606)

Two samples, will be collected from within this buried tank believed to be a septic system. It is believed that there will probably be an upper aqueous layer and a bottom sediment layer. One sample will be taken of each. The liquid material will be collected with a teflon bottom filling sludge sampler. The sediment layer will be sampled within Eckman dredge, a clamshell type sampler. These samples will be analyzed for TCL VOCs, SVOs, Pesticides/PCBs, TAL Metals and Cyanide according to NYSDEC CLP SOW, and also herbicides by Method 8150.

4.4.5 Analytical Program

A total of 24 soil samples, four surface water and sediment samples, and four groundwater samples will be collected from SEAD-43/56/69 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, explosive compounds by Method 8330, herbicides by Method 8150, nitrates by Method 353.2. At SB43-4 the soil will be analyzed for total petroleum hydrocarbons by EPA Method 418.1. A summary of the analytical program for SEAD-43/56/69 is presented in Table 4-3.

4.4.6 Handling UXOs and Explosives

The facilities (Building 606) at this SWMU were used as the Old Missile Propellant Test Laboratory. As a result, various on site investigative work tasks may require UXO clearance. UXO personnel will decide, based upon site conditions, when remote drilling and site clearance will be necessary. The following presents the proposed procedures to handle UXOs and explosives.

During drilling operation, a UXO Safety Officer will monitor the work and screen samples. Drilling may be performed remotely. Test pit excavations and the collection of soil samples will be performed by UXO personnel. UXO personnel will clear areas for field personnel to walk on-site, to perform geophysical surveys, and to obtain surface soil, surface water, sediment, and groundwater samples.

4.5 SEAD 44 QA TEST LABS

SEAD 44 is comprised of two separate locations. Figures 4-7 and 4-8 shows Locations A and B that make up SEAD 44.

Location A is approximately 1000 ft. East of Brady Road and 1500 ft. North of South Patrol Road along an unnamed dirt road. The dirt road is parallel to South Patrol Road as shown in Figure 4-7. Location B is located along the East side of Brady Road as shown in Figure 4-8.

4.5.1 Site Background

4.5.1.1 Historical Use

Both locations A and B were used for quality assurance testing of CS grenades, fire devices and pyrotechnics. Mines were detonated aboveground at the bermed area associated with SEAD 44A. At SEAD 44B, the QA laboratory tested timed fuzes. It has not been determined if the fuzes were actually detonated at SEAD 44B.

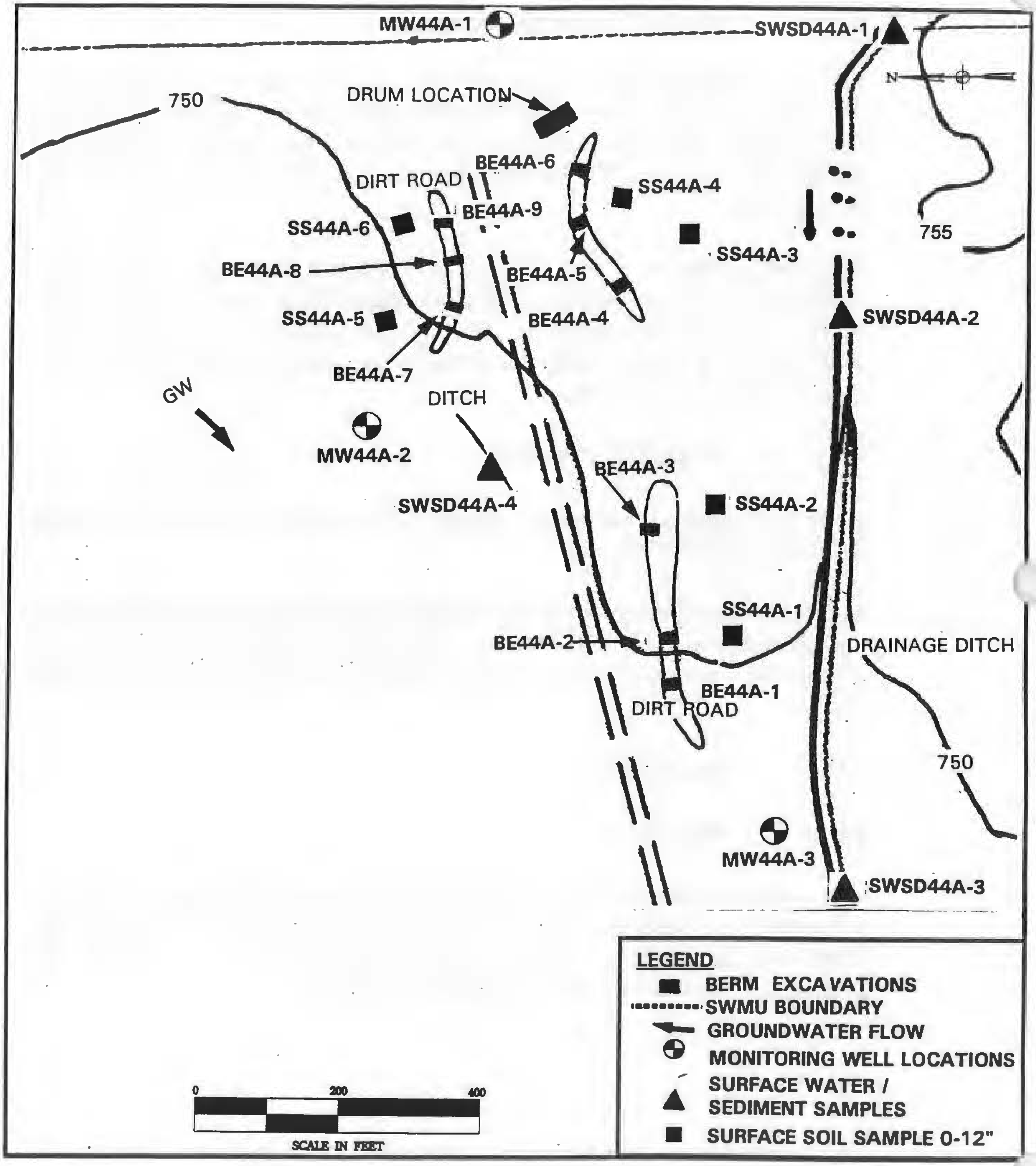

FIGURE 4-7 Sampling Plan for SEAD 44A: QA Test Laboratory

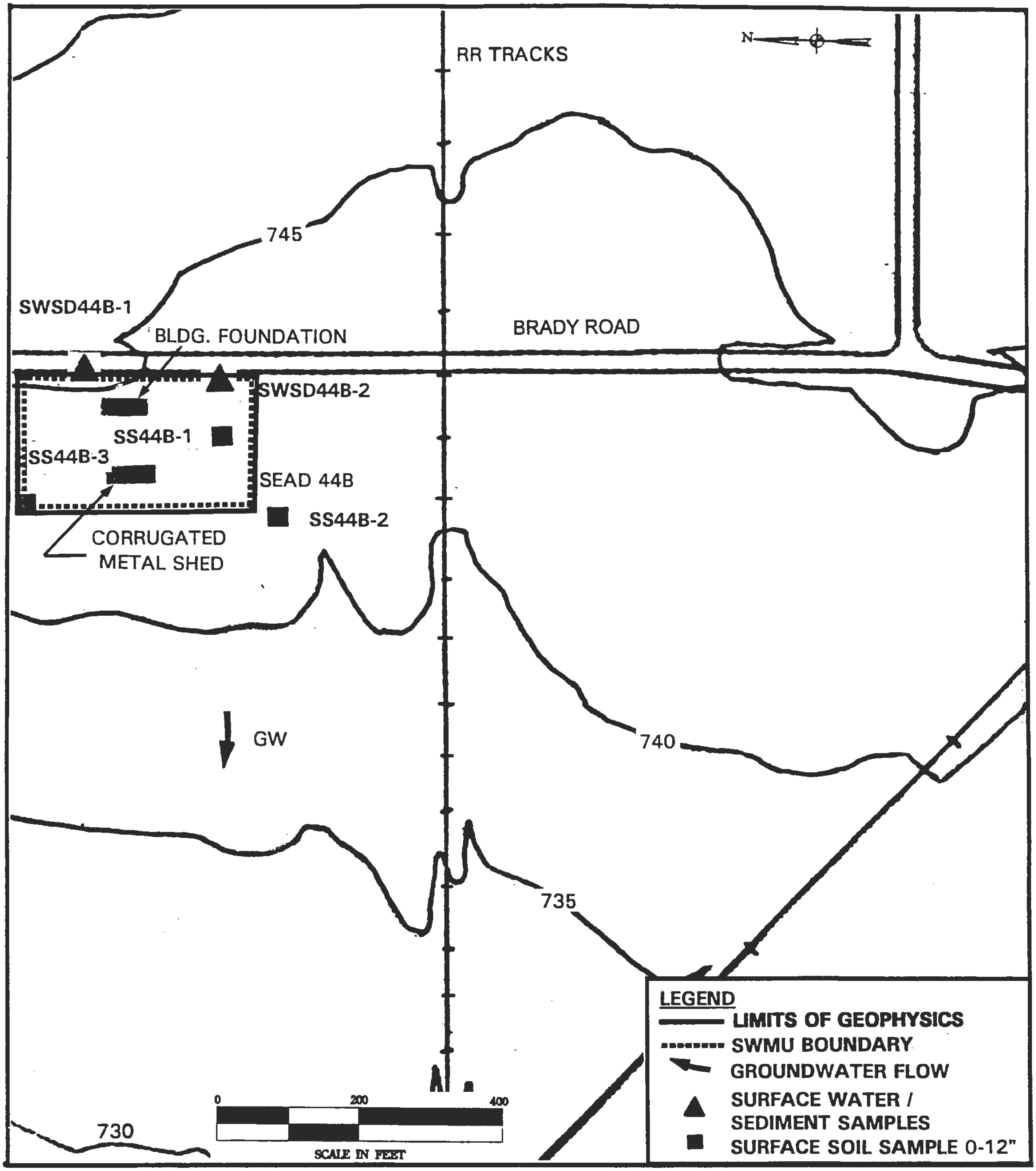

FIGURE 4-8 Sampling Plan for SEAD 44B: QA Test Laboratory

4.5.1.2 Current Conditions

Along both sides of the dirt road at Location A there are berms. These bermed areas potentially contain unexploded ordinances since they were used for QA testing. There were no visible signs of any building foundations. Along the north side of the dirt road there were three metal poles that may have been used for holding screens in place while detonating munitions. There was also a small ditch on the north side of the dirt road. There were no apparent wetlands or stressed vegetation in the area. At the end of the dirt road, on the south side, is an empty drum labelled steam waste.

At Location B there was an abandoned concrete foundation that was approximately 20 feet by 50 feet. Directly behind it to the east is a metal pole believed to have been used to display a red flag that was used to signal when testing was being performed. There is also a dilapidated corrugated metal shack behind the concrete foundation. There is a drainage ditch on this side of the road that runs parallel to Brady Road and a culvert that runs underneath Brady Road.

4.5.2 Contaminants of Interest

Contaminants that might be detected during sample analysis at SEAD 44 include VOCs, SVOCs, explosives, nitrates, and heavy metals because the areas were used for the quality assurance testing of munitions and pyrotechnics.

4.5.3 Transport Pathways

Leaching of metals from the soil into the groundwater is a potential pathway for the heavy metals in locations A and B. Surface water is also a potential pathway at locations A and B.

4.5.4 Field Investigation

4.5.4.1 Geophysical Investigation

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

4.5.4.2 Media To Be Investigated

SEAD 44A - West of Building 612

Soils

Both berm excavations and surface soil samples will be collected from the area in and around SEAD 44A. The locations of the sample points are shown in Figure 4-7. Three soil samples from each of the berms will be collected. There are three berms in this area that are visible from the road. The area was not walked during the site visit due to the danger of UXOs. It is possible that there are additional bermed areas. If additional berms are identified these will be sampled also in a fashion similar to what is described here. The soil samples will be taken from the mid-depth point of each berm with the aid of a backhoe.

Two surface soil samples, collected from a depth of 0-12" will be taken from the area surrounding each of the three berms. All soil samples will be analyzed from the parameters listed in Section 4.5.5.

Surface Water and Sediment

A total of four surface water and sediment samples will be collected at this site. The locations are shown in Figure 4-7. This drainage ditch runs parallel to the dirt road. South of the bermed areas three surface water and sediment samples will be collected from the drainage ditch. An additional surface water and sediment sample will be taken from a small ditch that contained pooled water on the north side of the dirt road. These samples will be analyzed for the parameters listed in Section 4.5.5.

Groundwater

Three groundwater monitoring wells will be installed at SEAD 44A as shown in Figure 4-7. These well locations are based upon a presumed groundwater flow direction of west-southwest as shown. The upgradient well will be installed to monitor background groundwater quality. The remaining two monitoring wells will be installed downgradient of the bermed areas. These locations are subject to slight change based upon UXO clearance and further visual site investigation of the area.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and development, one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.5.5.

SEAD 44B - Brady Road, North of Building 612.

Soils

The QA Testing Lab is believed to have been located where the concrete slab at SEAD 44B is located. Three surface soil samples are proposed at SEAD 44B in the area surrounding the concrete slab, flagpole, and metal shack. The surface soil samples will be collected from a depth of 0-12". The sample locations are shown on Figure 4-8. These soil samples will be analyzed for the parameters listed in Section 4.5.5.

Surface Water and Sediment

Two surface water and sediment samples will be collected from the drainage ditch that runs parallel to Brady Road. The sample locations are shown on Figure 4-8. This drainage ditch is adjacent to the SWMU on the east side of Brady Road. These surface water and sediment samples will be analyzed for the parameters listed in Section 4.5.5.

4.5.5 Analytical Program

A total of 18 soil samples, 6 surface water and sediment samples, and three groundwater samples will be collected from SEAD-44A/44B for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and

Cyanide according to the NYSDEC CLP SOW, explosive compounds by Method 8330, nitrates by Method 353.2. A summary of the analytical program for SEAD-44A/44B is presented in Table 4-3.

4.5.6 Handling UXOs and Explosives

The facilities at these SWMUs were used as Quality Assurance Test Laboratories. As a result, UXO personnel will be on-site to monitor the subsurface explorations and sampling. UXO personnel will decide when remote drilling and site clearance will be necessary based on site conditions. The following presents the proposed procedures for handling UXOs and explosives at SEAD 44.

During drilling operation, a UXO Safety Officer will monitor the work. All drilling is expected to be performed remotely. Test pit excavations and the collection of soil samples will be performed by UXO personnel.

UXO personnel will also clear areas for field personnel to walk on-site, to perform geophysical surveys, and to obtain surface soil, surface soil, surface water, sediment, and groundwater samples.

4.6 SEAD 50 TANK FARM

A tank farm is located in the area west of East Patrol Road between Building 350 and Buildings 356 and 357 as shown in see Figure 4-9. This is designated as SEAD 50.

4.6.1 Site Background

4.6.1.1 Historical Use

It is not known at what time the tank farm originated. At one time there were approximately 160 aboveground storage tanks in this area. The tanks were only used to store dry materials, according to SEAD personnel. These materials included minerals, ores, and asbestos. Tanks have been removed from the farm over an extended period. In 1988 ten tanks were removed and sold to area farmers. Figure 4-9 shows the location of the remaining tanks and shows the locations of former tanks based upon review of historic aerial photographs.

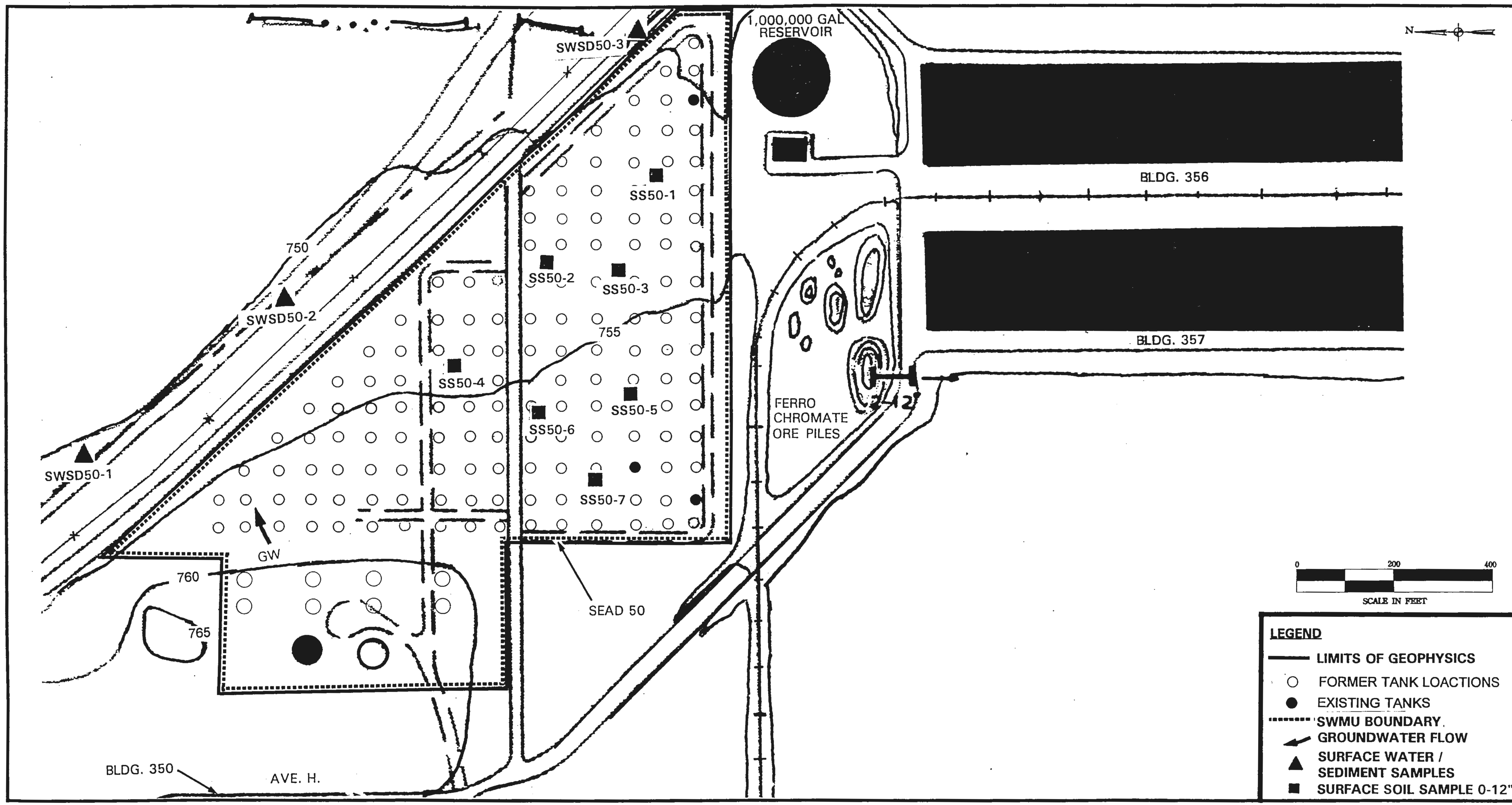

FIGURE 4-9 Sampling Plan for SEAD 50: Tank Farm

There are only four remaining aboveground storage tanks and they are scattered around the area as shown in Figure 4-9. Two of the tanks are used for the storage of antimony, one for asbestos and the remaining tank stores rutile ore. The rest of the site is covered with vegetation except in the areas where tanks were previously located. These areas are circular in shape and gravel covered. There are no existing records of leaks or spills from any of the tanks. There are no wetlands in the area.

4.6.1.3 Existing Analytical Data

There is no existing analytical data from this site.

4.6.2 Contaminants of Interest

Since it is uncertain what may have been stored here, Pesticides/PCBs, VOCs, SVOs, and heavy metals are the contaminants of interest.

4.6.3 Transport Pathways

Materials stored in this area include minerals, ores, and asbestos. Therefore possible transport pathways include not only soil and groundwater, but because many of these materials are so dusty, air must also be considered.

4.6.4 Field Investigation

4.6.4.1 Geophysical Investigation

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

4.6.4.2 Media To Be Investigated

Soils

It is proposed that seven surface soil samples taken from a depth of 0-12" be collected from several previous tank locations as shown on Figure 4-9. It is believed that only dry materials were stored in this aboveground tank farm. Surface soil samples will indicate whether any spills or leaks occurred in these areas and what exactly may have been stored there. These seven surface soil samples will be located randomly over the entire area of the tank farm. These surface soil samples will be analyzed for the parameters listed in Section 4.6.5.

Surface Water and Sediment

Three surface water and sediment samples will be taken from the drainage ditch that runs east of the tank farm along East Patrol Road. The surface water and sediment sample locations are displayed in Figure 4-9. These samples will be analyzed for the parameters listed in Section 4.6.5.

4.6.5 Analytical Program

A total of 7 soil samples and 3 surface water and sediment samples will be collected from SEAD-50 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW. A summary of the analytical program for SEAD-50 is presented in Table 4-3.

4.6.6 Handling UXOs and Explosives

UXOs and explosives are not expected to be present at this SWMU.

4.7 SEAD 58 - DEBRIS AREA NEAR BOOSTER STATION 2131

A debris area is located Northeast of Booster Station 2131 as shown in Figure 4-10.

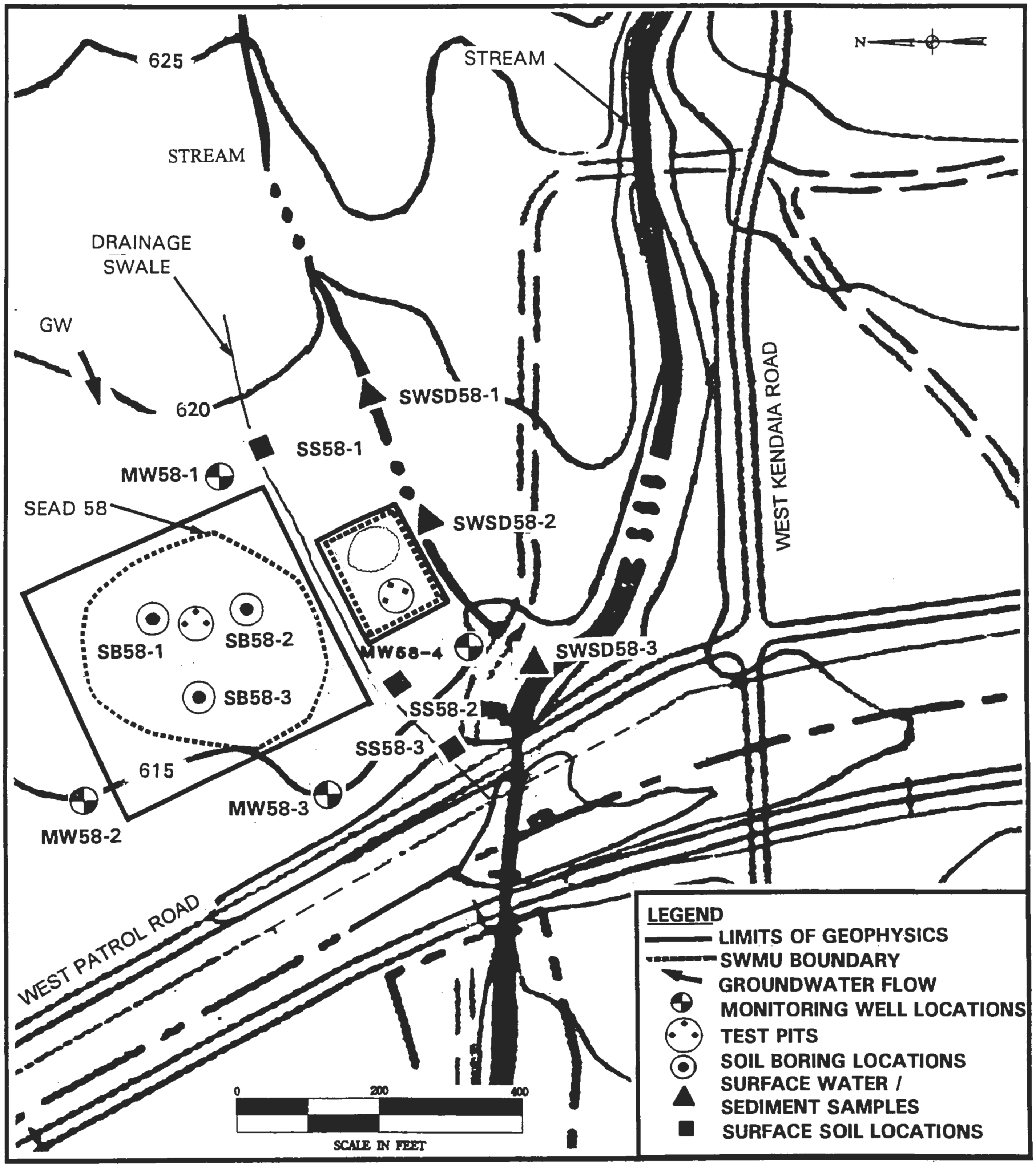

FIGURE 4-10 Sampling Plan for SEAD 58: Debris Area/Booster 2131

4.7.1 Site Background

4.7.1.1 Historical Background

The booster station is a pumphouse used to pump drinking water from the lake to the on-site reservoir. Interviews with SEAD personnel has indicated that debris has been dumped in this area. It is not known what types of waste were disposed of in this area. It is rumored that DDT, a contact insecticide, may have been disposed of in this area. There are no DDT usage records available for SEAD.

4.7.1.2 Current Conditions

During the site inspection of January 1993, there were two areas of concern identified. The first area contained a pile of surface debris located 150' North and 300' East of the Booster Station as shown in Figure 4-10. This pile measured approximately 10 feet by 10 feet and contained rusted drums of various sizes. There was one 55 gallon drum and the remaining drums were all smaller in size. The smaller drums are believed to have once held propellants. The waste pile was also noted to contain various broken glass bottles. An additional waste pile was located just north of the first area. This area measured approximately 10 feet by 10 feet. This second waste pile contained partially buried drums. There is a stream due south of this area which runs east to west.

In the second area, fifty feet north of the above mentioned area, there is a drainage swale which also runs east to west. Fifty feet north of the drainage swale is a large circular area that measures approximately 300' in diameter where stressed vegetation was identified during the January 1993 site inspection. These locations are as shown in Figure 4-10.

4.7.2 Contaminants of Interest

Since it is unknown what may have been disposed of in these areas, Pesticides/PCBs, VOCs, SVOCs, and heavy metals are potentially present.

4.7.3 Transport Pathways

DDT is a contact insecticide which could be absorbed by soil particles and migrate to the soil and groundwater. A drainage ditch and small stream run on either side of this disposal area making surface water an additional potential pathway.

4.7.4 Field Investigation

4.7.4.1 Geophysical Survey

Electromagnetic (EM-31) and Ground Penetrating Radar (GPR) surveys will be performed at SEAD 58. The initial geophysical investigation will be an EM-31 survey performed on a 20 foot by 20 foot grid throughout the survey and as shown on Figure 4-10. The objective of the EM-31 survey will be to delineate the limits of the waste and to identify locations where metallic objects may be buried within the subsurface. Upon completion of the EM-31 survey, contour maps of the in-phase and quadrature components of the electromagnetic field will be generated to aid in identifying the waste limits and the locations of possible buried metallic objects within the landfill.

Subsequent to the EM-31 survey a GPR survey will be performed. The GPR data will be collected across the areas shown in Figure 4-10 along profiles spaced at 50 foot intervals. Those data will be used to supplement the EM-31 interpretation of the waste limits and to provide additional information on the thickness of the waste. GPR data will also be collected over each distinct EM-31 anomaly in order to provide a better characterization of the suspected metallic source.

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

4.7.4.2 Media To Be Investigated

Soils

Both soil borings and test pits will be completed at SEAD 58. The locations of the sample points are shown in Figure 4-10.

A total of six test pits will be completed altogether. Three test pits will be completed within the debris areas. The locations of these test pits will be based upon the results of the geophysical surveys. Soil samples will be collected from each test pits within this area and analyzed for the parameters listed in Section 4.7.5. Three additional test pits will also be performed within the barren field area. The locations of these test pits will also be determined by the geophysical survey results. Soil samples will be collected from these test pits and analyzed for the parameters listed in Section 4.7.5.

Three soil borings will be performed in the barren area to evaluate the subsurface conditions. The soil borings will be located based upon the results of the geophysical surveys. If a disposal area is identified here then two borings will be completed within the waste. Each boring will be continuously sampled to the top of the water table. A total of three samples from each boring will be collected and analyzed. The soil samples will be analyzed for the parameters listed in Section 4.7.5.

Surface Water and Sediment

Both a stream and an intermittent drainage ditch run from east to west adjacent to the debris areas and barren area. Three surface water and sediment samples will be obtained from the stream. One sample location will be upgradient of the debris areas and while the remaining two sample locations will be downgradient of the debris areas. The drainage swale did not contain water at the time of the visual site inspection (January, 1993).

Three surface soil samples will also be collected from this drainage swale. One sample location will be upgradient of the debris barren areas while the remaining two will be located downgradient. The locations for these samples are displayed on Figure 4-10. The samples will be analyzed for the parameters listed in Section 4.7.5.

Groundwater

Four monitoring wells will be installed at SEAD 58. The monitoring well locations are shown in Figure 4-10 and are based upon a presumed groundwater flow direction towards the southwest. The upgradient monitoring well will be installed to establish the background groundwater quality. The remaining three wells will be installed downgradient of the debris areas and barren area as shown in Figure 4-10.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and development, one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.7.5.

4.7.5 Analytical Program

A total of 18 soil samples, 3 surface water and sediment samples, and four groundwater samples will be collected from SEAD-58 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW. A summary of the analytical program for SEAD-58 is presented in Table 4-3.

4.7.6 Handling UXOs and Explosives

UXOs and explosives are not expected to be present at this SWMU.

4.8 SEAD 59 - FILL AREA WEST OF BUILDING 135

A fill area is located west of Building 135 and west of the sewage sludge piles (SEAD 5) along both sides of a dirt road that runs perpendicular to Administration Ave. as shown in Figure 4-11. This fill area has been designed SEAD 59.

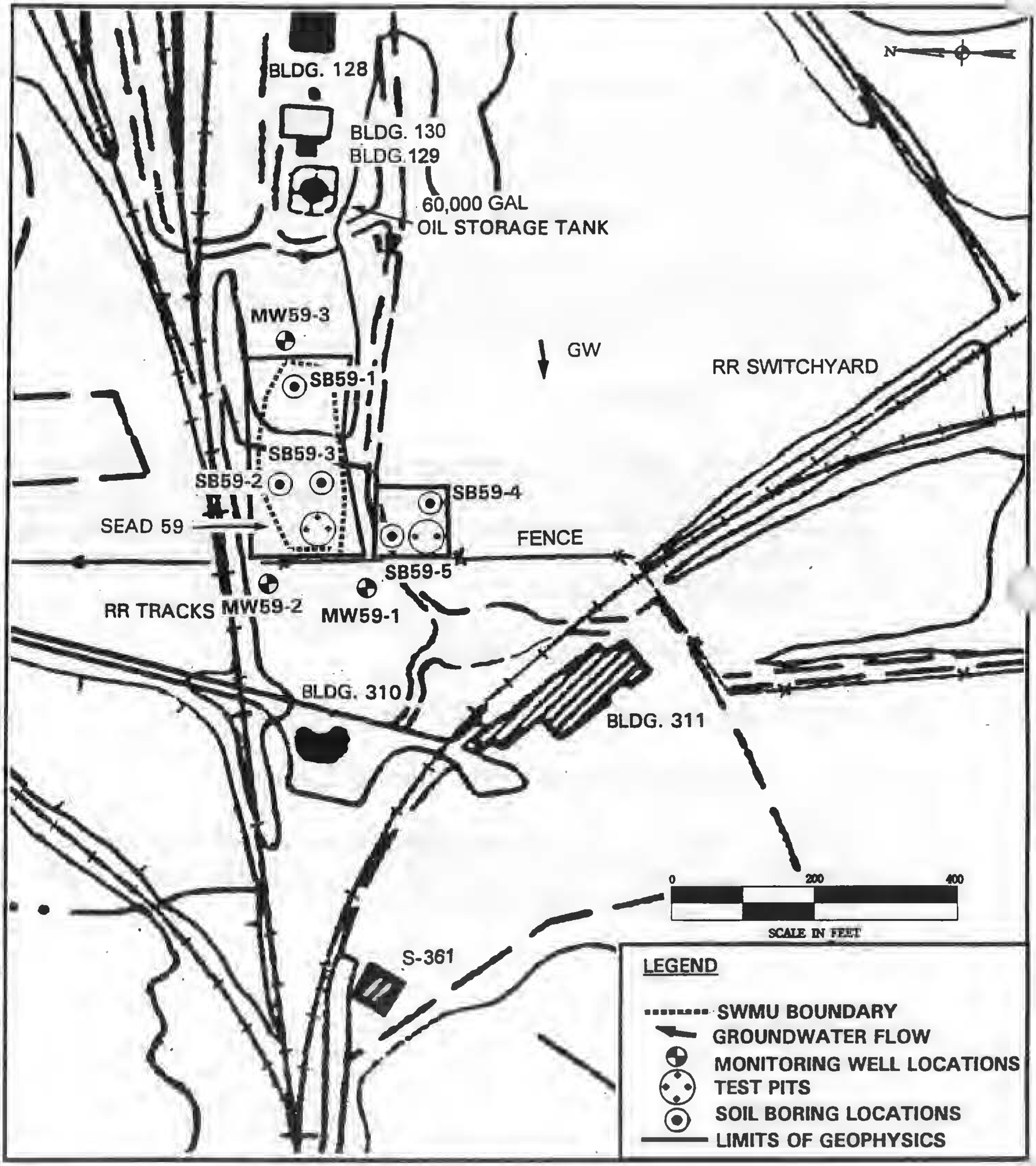

FIGURE 4-11 Sampling Plan for SEAD 59: Fill Area West of Building 135

4.8.1 Site Background

4.8.1.1 Historical Use

This area may have been used for the disposal of construction debris and oily sludges. It is not known when the disposals actually took place.

4.8.1.2 Current Conditions

There are several waste piles located along both sides of the dirt road as shown in Figure 4-11. The piles are up to five feet high. The area that contains waste piles on the north side of the road is approximately 300 feet by 150 feet in area. The smaller area on the south side of the road is approximately 100 feet by 100 feet. The piles are covered with vegetation. There are no wetlands in the area.

4.8.1.3 Existing Analytical Data

There is no existing analytical data for this site.

4.8.2 Contaminants of Interest

Since it is unknown what may have been disposed of here, Pesticides/PCBs, VOCs, SVOCs, and heavy metals are potentially considered to be present. Oily sludges are suspected to have been buried here so petroleum hydrocarbons are also considered a contaminant of interest.

4.8.3 Transport Pathways

Due to the uncertainty of the identity of contents of this fill area and debris piles, potential transport pathways include air, soil, and groundwater.

4.8.4 Field Investigations

4.8.4.1 Geophysical Survey

Electromagnetic (EM-31) and Ground Penetrating Radar (GPR) surveys will be performed at SEAD 59. The initial geophysical investigation will be an EM-31 survey performed on a 20 foot by 20 foot grid throughout the survey and as shown on Figure 4-11. The objective of the EM-31 survey will be to delineate the limits of the landfill and to identify locations where metallic objects may be buried within the subsurface. Upon completion of the EM-31 survey contour maps of the in-phase and quadrature components of the electromagnetic field will be generated to aid in identifying the waste limits and the locations of possible buried metallic objects within the landfill.

Subsequent to the EM-31 survey a GPR survey will be performed. The GPR data will be collected across the area shown in Figure 4-11 along profiles spaced at 50 foot intervals. Those data will be used to supplement the EM-31 interpretation of the waste limits and to provide additional information on the thickness of the waste. GPR data will also be collected over each distinct EM-31 anomaly in order to provide a better characterization of the suspected metallic source.

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

4.8.4.2 Media To Be Investigated

Soils

Both soil borings and test pits will be performed at SEAD 59. The locations of the sample points are shown in Figure 4-11.

A total of five test pit samples will be collected from the waste piles and filled area. One composite soil sample will be taken from each pile with the aid of a backhoe. The sample will be collected from a discrete location using a stainless steel trowel and bowl. The soil sample will be collected from the mid-depth point and will be analyzed for the parameters described in Section 4.5.5.

A total of five soil borings will be performed in the two fill areas. These borings will determine the depth of the filled area. Each boring will be continuously sampled to the top of the water table. A total of three samples from each boring will be collected and analyzed. The boring locations are shown in Figure 4-11. These sample locations are subject to change based upon the results of the geophysical surveys. The samples will be analyzed for parameters listed in Section 4.8.5.

Groundwater

Three monitoring wells will be installed at SEAD 59. The monitoring well locations are shown in Figure 4-11 and are based upon a presumed direction of groundwater flow towards the east. The upgradient well will be installed to monitor background groundwater quality at the site. The other two wells will be installed downgradient of the fill area to evaluate the impact of this unit upon the groundwater system.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and development, one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.8.5.

4.8.5 Analytical Program

A total of 20 soil samples and three groundwater samples will be collected from SEAD-59 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, and total petroleum hydrocarbons by EPA Method 418.1. A summary of the analytical program for SEAD-59 is presented in Table 4-3.

4.8.6 Handling UXOs and Explosives

UXOs and explosives are not expected to be present at this SWMU.

4.9 SEAD 60 - OIL DISCHARGE ADJACENT TO BUILDING 609

SEAD 60 represents an area of oil stained soil adjacent to Building 609. Oil believed to have been discharged from a pipe in the wall of Building 609 resulted in a spill adjacent to the building. No information is available on the date of the spill, the volume of materials released nor on the composition of the spilled materials. Figure 4-12 shows the location and site of the spill area with respect to other features nearby.

4.9.1 Site Background

4.9.1.1 Historical Use

Building 609 is a boiler house for Building 612. The spill was first noticed in 1989 by SEAD personnel. The existence of a spill report is not known.

4.9.1.2 Current Conditions

The spill area, which measures approximately 30 feet by 6 feet is located outside the southwest corner of the building. The quantity of oil spilled is unknown. The spill area extends past the railroad track, where the soils are visibly stained. No vegetation is present in the spill area. The boilers currently use #2 oil but it is not known if this type of oil was being used at the time of the spill.

4.9.1.3 Existing Analytical Data

There is no existing analytical data for this site.

4.9.2 Contaminants of Interest

The only known incident to occur in this area resulting in contamination was the oil spill. Potential contamination includes petroleum hydrocarbons and also PCBs since it has not been proven exactly what the oil source was.

4.9.3 Transport Pathways

The potential transport pathways for this site include soil, surface water, and groundwater.

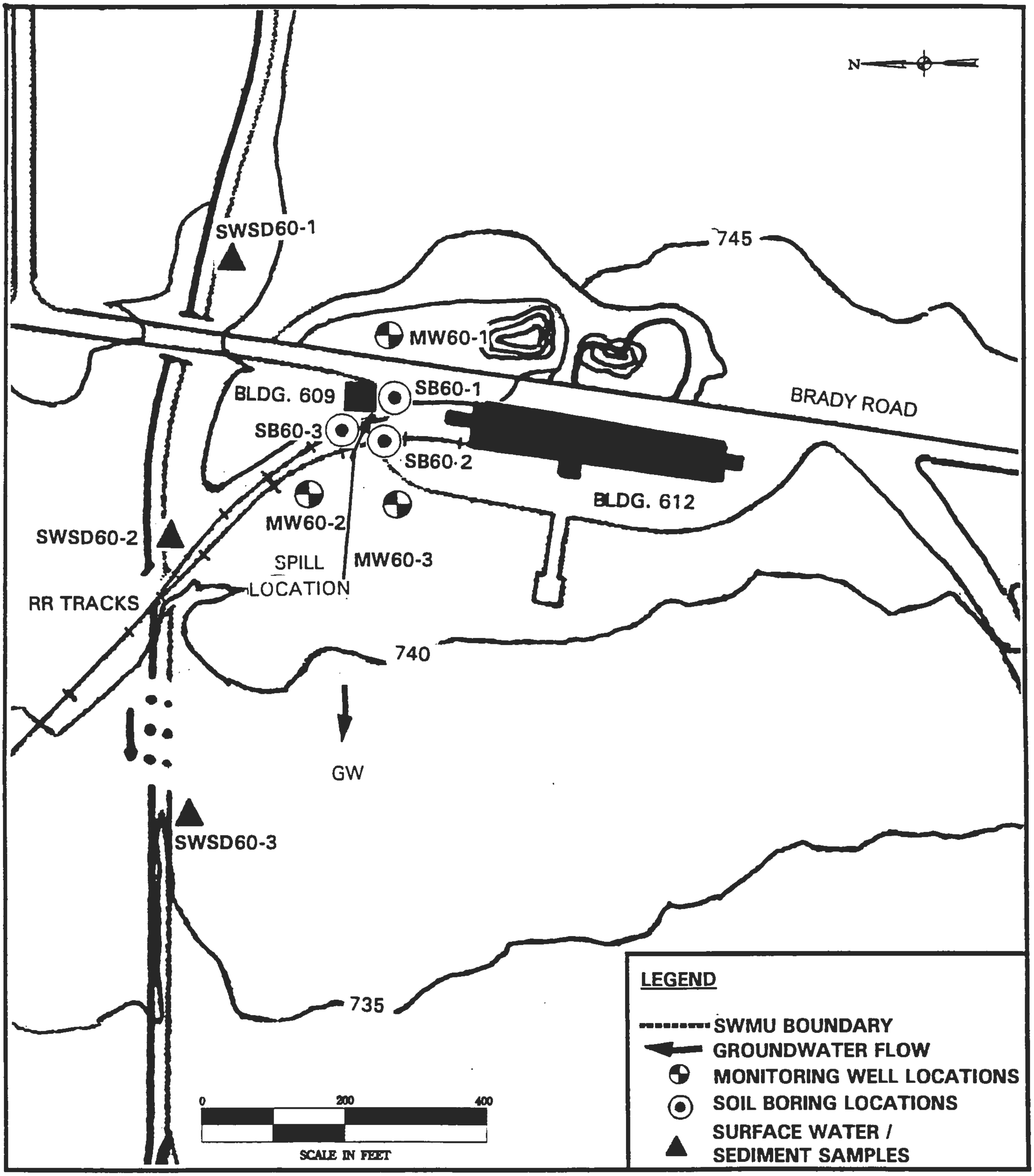

FIGURE 4-12 Sampling Plan for SEAD 60: Oil Discharge Adjacent to Building 609

4.9.4 Field Investigation

4.9.4.1 Geophysical Investigation

There will be no geophysical investigation at SEAD 60. The oil spill is visible on the soil surface. The extent to which the oil has permeated the soil will be determined by visually observing the soil on the surface and by obtaining soil samples from borings.

4.9.4.2 Media To Be Investigated

Soils

Three soil borings are proposed in the area of and adjacent to the oil spill outside of Building 609. Each boring will be continuously sampled to the top of the water table. A total of three samples from each boring will be collected and analyzed. The borings will also help to determine the thickness of contaminated soil. Figure 4-12 shows the sampling locations. The three samples to be analyzed from each boring will be submitted for chemical analyses as identified in Section 4.9.5.

Groundwater

Three monitoring wells will be installed at SEAD 60 to determine if the oil has migrated to the groundwater. Figure 4-12 shows the sampling locations. The presumed direction of groundwater flow at this SWMU is west. The upgradient well will be installed to establish the background groundwater quality. Two monitoring wells will be installed downgradient of the spill area to determine the effects of the spill on the groundwater system.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and development, one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.9.5.

Surface Water and Sediment

Three surface water and sediment samples will be collected from the site. See Figure 4-12 for sampling locations. A drainage ditch runs east to west approximately 300 feet north of

Building 609. In order to determine if the oil contamination has migrated to this ditch, three surface water and sediment samples will be collected here. These samples will be analyzed for the parameters listed in Section 4.9.5.

4.9.5 Analytical Program

A total of 9 soil samples, 3 surface water and sediment samples, and three groundwater samples will be collected from SEAD-60 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, and total petroleum hydrocarbons by EPA Method 418.1. A summary of the analytical program for SEAD-60 is presented in Table 4-3.

4.9.6 Handling UXOs and Explosives

UXOs and explosives are not expected to be present at this SWMU.

4.10 SEAD 62 - NICOTINE SULFATE DISPOSAL AREA

It is believed two drums containing nicotine sulfate were disposed of in the area between or surrounding Buildings 606 and 612. This area is quite large and measures approximately one-half mile by one quarter mile. There is no indication of where exactly or when the disposal may have occurred. Figure 4-13 shows the locations of Buildings 606 and 612 and the surrounding area.

4.10.1 Site Background

4.10.1.1 Historical Use

Building 606 is currently used as the pesticide/herbicides storage facility. Building 612 is an munitions disassembly facility. Both buildings have been used for these operations for quite some time.

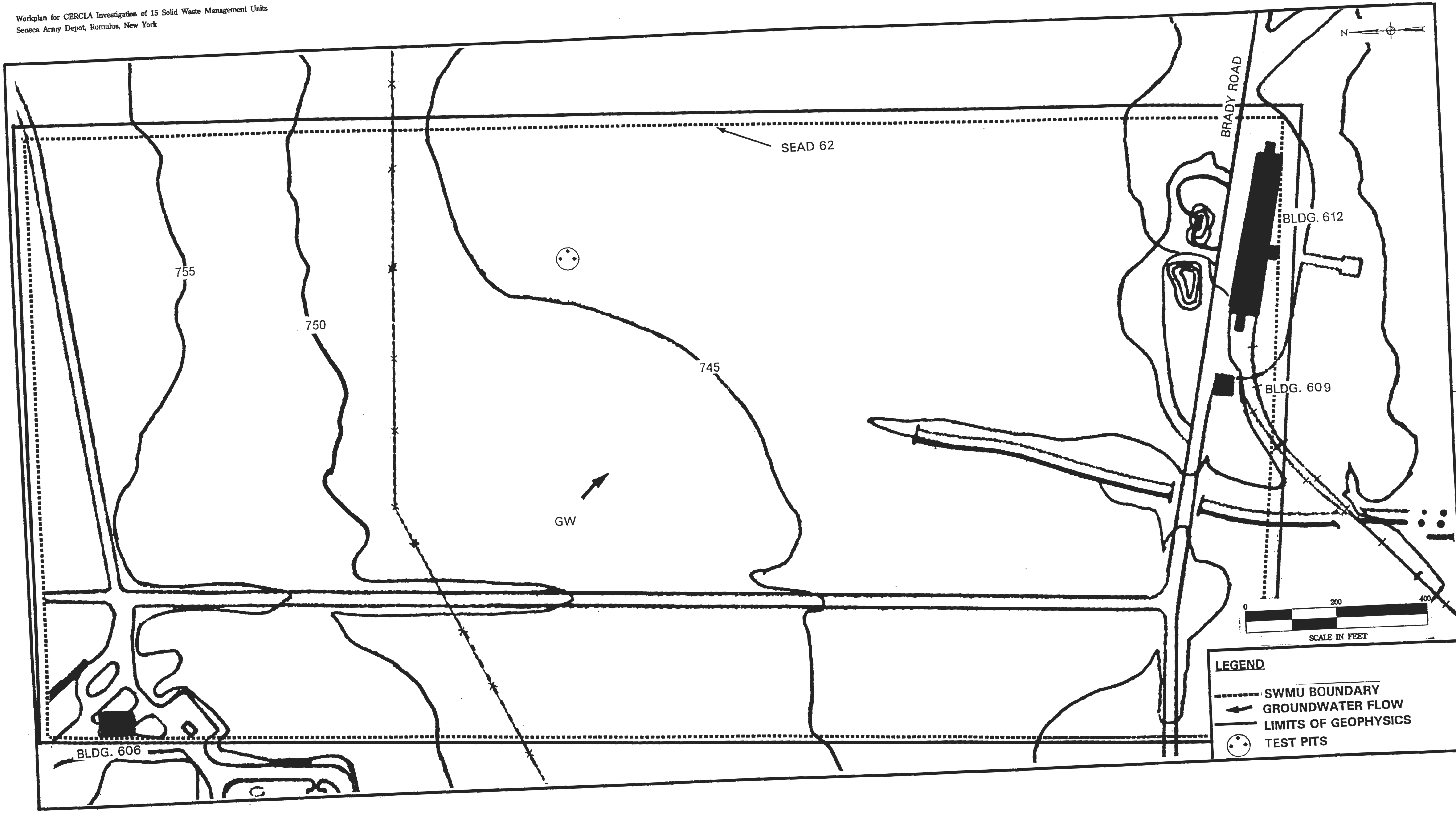

FIGURE 4-13 Sampling Plan for SEAD 62: Nicotine Sulfate Disposal Area

4.10.1.2 Contaminants of Interest

SEAD 62 is a potential site for the nicotine sulfate disposal. Herbicides and pesticides are the primary contaminants of concern.

4.10.1.3 Existing Analytical Data

There is no existing analytical data for this site.

4.10.3 Transport Pathways

The potential transport pathways for the nicotine sulfate include soil and groundwater.

4.10.4 Field Investigation

4.10.4.1 Geophysical Survey

Electromagnetic (EM-31) and Ground Penetrating Radar (GPR) surveys will be performed at SEAD 62. The initial geophysical investigation will be an EM-31 survey performed on a 50 foot grid throughout the survey area as shown on Figure 4-13. The objective of the EM-31 survey will be to identify locations where the drums containing nicotine sulfate may be buried within the subsurface. Upon completion of the EM-31 survey contour maps of the in-phase and quadrature components of the electromagnetic field will be generated to aid in identifying the locations of possible buried metallic objects within the subsurface.

Subsequent to the EM-31 survey a GPR survey will be performed. The GPR data will be collected over each distinct EM-31 anomaly in order to provide a better characterization of the suspected metallic source.

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

4.10.4.2 Media To Be Investigated

Soils

Three test pits will be dug in areas that the geophysical survey results identify anomalies or potential sites thought to be associated with the nicotine sulfate drums. One soil sample will be collected from each of these test pits and analyzed as described in Section 4.10.5. The area being investigated is quite large and no other medias are proposed to be sampled until the location of the drums is pinpointed. Figure 4-13 shows the suspected area between Building 606 and 612.

4.10.5 Analytical Program

A total of 3 soil samples will be collected from SEAD-62 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, and herbicides by Method 8150. A summary of the analytical program for SEAD-62 is presented in Table 4-3.

4.10.6 Handling UXOs and Explosives

UXOs and explosives are not expected to be present at this SWMU.

4.11 SEAD 63 - MISCELLANEOUS COMPONENTS BURIAL SITE

Figure 4-14 shows the location of SEAD 63, the Miscellaneous Components Burial Site. The miscellaneous component burial site is located, on the east side of North South Baseline Road. The area measures approximately 200 feet by 100 feet. It is believed that this area was used for the burial of classified parts. The types and/or composition of these parts is not known. The SWMU Classification Report defined the burial site as being 80 feet by 65 feet but no distinct area associated with the burial site was detected during the January 1993 site investigation.

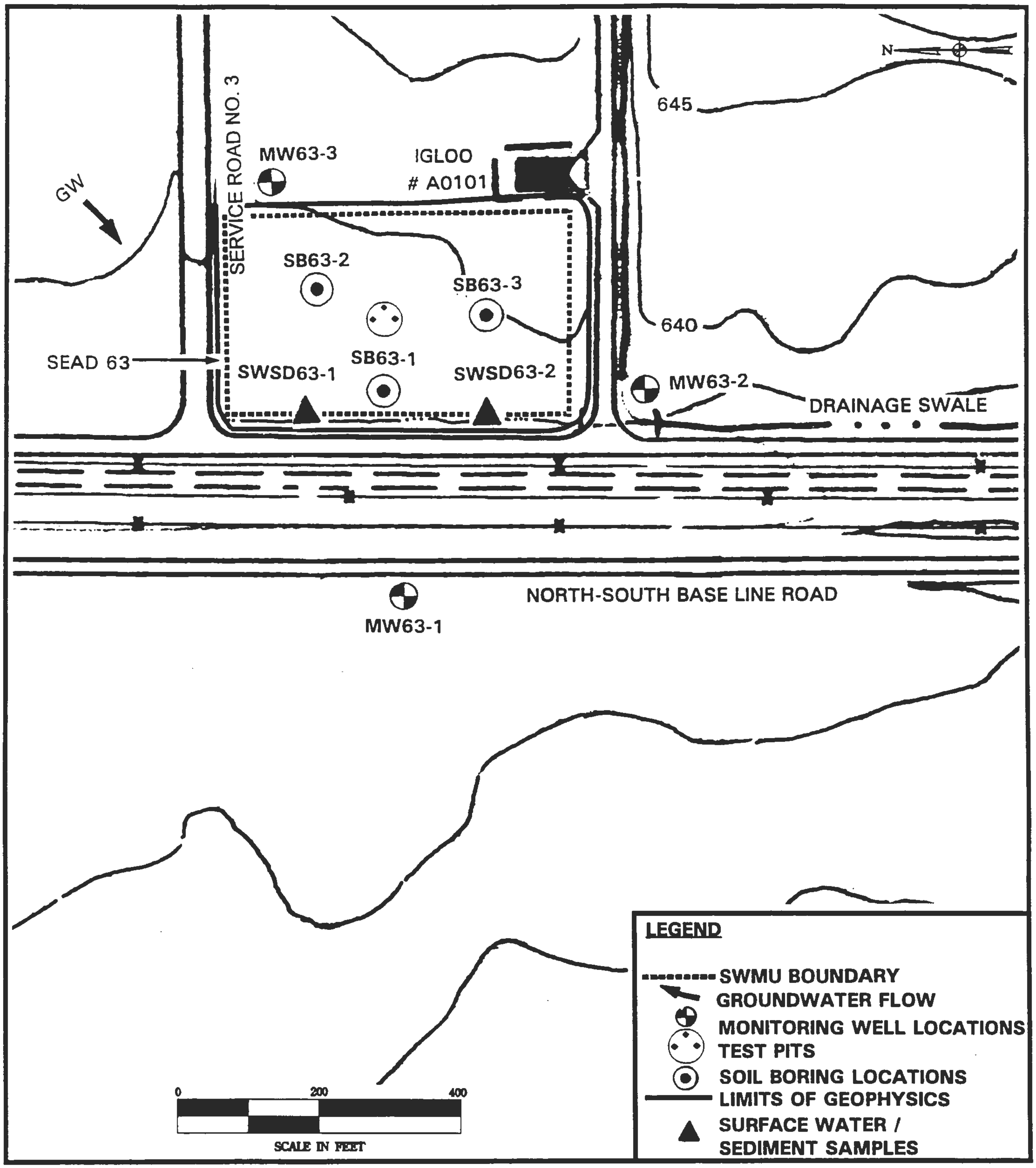

FIGURE 4-14 Sampling Plan for SEAD 63: Miscellaneous Components Burial Site

4.11.1 Site Background

4.11.1.1 Historical Use

This site was used during the 1950's and 1960's to bury classified parts. The types of materials that were disposed of have been identified by SEAD as metal parts. At the time of there disposal they were classified so records do exist to the exact nature of these items although they are not currently available. The SWMU Classification Report states that "inert materials" were buried within the pit.

4.11.1.2 Current Conditions

The site is generally flat and moderately vegetated. A drainage ditch runs along North South Baseline Road. There are no wetlands in the area. There is no visible debris on the surface. Some of the vegetation appeared to be stressed adjacent to the road. No signs of visibly disturbed soils could be associated with the burial pit.

4.11.1.3 Existing Analytical Data

There is no existing analytical data for this site.

4.11.2 Contaminants of Interest

It is unknown what may have been disposed of within these burial pits. Consequently, Pesticides/PCBs, VOCs, SVOCs, and heavy metals may be present.

4.11.3 Transport Pathways

Soil and surface water are considered to be potential transport pathways. If the wastes here are contaminated with radioactive particles, groundwater contamination may have resulted from long term burial of the wastes.

4.11.4 Field Investigation

4.11.4.1 Geophysics

Electromagnetic (EM-31) and Ground Penetrating Radar (GPR) surveys will be performed at SEAD 63. The initial geophysical investigation will be an EM-31 survey performed on a 20 foot by 20 foot grid throughout the survey area as shown on Figure 4-14. The objective of the EM-31 survey will be to delineate the limits of the burial pit and to identify locations where metallic objects may be buried within the subsurface. Upon completion of the EM-31 survey contour maps of the in-phase and quadrature components of the electromagnetic field will be generated to aid in identifying the burial pit locations and the locations of possible buried metallic objects within the pit.

Subsequent to the EM-31 survey a GPR survey will be performed. The GPR data will be collected across the area shown in Figure 4-14 along profiles spaced at 50 foot intervals. Those data will be used to supplement the EM-31 interpretation of the burial pit location. GPR data will also be collected over each distinct EM-31 anomaly in order to provide a better characterization of the suspected metallic source.

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

4.11.4.2. Media To Be Investigated

Soils

Both test pits and soil borings will be completed at SEAD 63. The locations of the various sample points are shown in Figure 4-14.

Three test pits will be dug at SEAD 63. The exact test pit locations will be based upon the results of the geophysical surveys. These test pits will provide for a visual examination of any buried waste, and to determine the extent and location of the burial area identified with the geophysics. Soil samples will be collected from each test pit and submitted for chemical analysis identified in Section 4.11.5.

Three soil borings will be completed at SEAD 63. The estimated locations of these borings are shown on Figure 4-14. The soil borings will be focused within and downgradient of the burial pit as identified with the geophysical data. Each boring will be continuously sampled to the top of the water table. A total of three samples from each boring will be collected and analyzed. An additional three soil samples will be collected from the background monitoring well boring to establish background soil chemistry. The three samples to be analyzed from each boring will be submitted for chemical analyses identified in Section 4.11.5.

Surface Water and Sediment

Two surface water and sediment samples will be collected at SEAD 63. The surface and sediment samples will be obtained at the locations that are shown on Figure 4-14. The drainage ditch that runs north to south along the east side of North-South Baseline Road and is immediately downgradient of the burial site will be sampled.

Groundwater

Three monitoring wells will be installed at SEAD 63. The monitoring well locations are shown in Figure 4-14. The presumed direction of groundwater flow at this site is west-southwest. One monitoring well will be installed upgradient of the area and will be used to establish the background groundwater quality. Two additional wells will be installed downgradient of the burial site. These wells will be used to determine the impact of the Miscellaneous Components Burial Site on the groundwater.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and development, one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.11.5.

4.11.5 Analytical Program

A total of 15 soil samples, 2 surface water and sediment samples, and three groundwater samples will be collected from SEAD-63 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and

Cyanide according to the NYSDEC CLP SOW. A summary of the analytical program for SEAD-63 is presented in Table 4-3.

4.11.6 Handling UXOs and Explosives

UXOs and explosives are not expected to be present at this SWMU.

4.12 SEAD 64A, 64B, 64C, 64D - GARBAGE DISPOSAL AREAS

There are four garbage disposal areas associated with this SWMU, three of which were active in the past, and one of which is the site of a proposed landfill. None of these four units are contiguous. Figures 4-15, 4-16, 4-17, and 4-18 show the locations of SEAD 64A, B, C, and D respectively with respect to other features nearby.

4.12.1 Site Background

4.12.1.1 Historical Use

SEAD 64A, 64B and 64D were all used during the time period from 1974 to 1979 when the on site solid waste incinerator was not in operation. The types of wastes landfilled in these areas are suspected to be primarily household items, although metal drums and other industrial wastes were reported for locations A, B and D in the SWMU Classification Report. SEAD 64C is the location of a proposed on-site landfill. Information presented within the SWMU Classification report suggests that limited dumping may also have occurred at SEAD 64C. This was not confirmed during the January 1993 site visit.

4.12.1.2 Current Conditions

SEAD 64A is located south of the storage pad at 7th Street. The disposal area measures approximately 350 feet by 200 feet. This area was used for garbage disposal from 1974 to 1979 when the solid waste incinerator (SEAD 15) was not operating. The area appears to have been disturbed, however no debris or garbage was visible on the surface. The site is relatively flat and covered with dense vegetation. A "no dumping" sign has been placed in the area. There are no existing wells located in this area.

SEAD 64B is located south of the classified yards and north of Ovid Road. The disposal area measures approximately 200 ft. by 400 ft. Piles of fill material are located in the area and a dirt road leads into the disposal grounds. The location is slightly elevated above the surrounding area and is densely vegetated. A drainage ditch runs alongside of the railroad tracks. This area was also used for garbage disposal from 1974 to 1979 when the solid waste incinerator (SEAD 15) was not operating. There are no existing wells located in this area.

SEAD 64C is located in the southeast corner of the base near the area where East Patrol Road becomes South Patrol Road. The area is densely vegetated and no debris was located during the visual site inspection of January 1993. This area was never used for landfilling but information within the SWMU Classification report suggests that limited dumping may have occurred in this area. There is a 20 foot by 15 foot concrete pad located in this area but it is not known what this concrete pad was used for. There are four wells located at SEAD 64C, one upgradient and three downgradient of the proposed landfill site as shown in Figure 4-17.

SEAD 64D is a large garbage disposal area that runs along the east side of West Patrol Road for about one-half mile. This area was also used for garbage disposal from 1974 to 1979 when the solid waste incinerator was not operating. From the road no debris was visible on the surface during the January 1993 site visit. Firebreaks are mowed into the area running east to west and north to south. Stressed vegetation was visible along West Patrol Road. The remaining area was densely vegetated with brush and tall grass.

4.12.1.3 Existing Analytical Data

Four wells were installed at SEAD 64C to obtain necessary hydrological and geological data to prepare an application for a state permit to operate a sanitary landfill on site. Nine soil borings were performed and four monitoring wells were installed. Temperature, pH, chlorides, chemical oxygen demand (from dichromate), conductivity, iron and water levels were measured monthly during 1980-1981. Typical results from that time period are shown in Table 4-9.

There is no additional existing data for any of the remaining three garbage disposal sites.

Parameters	Well No. 6	Well No. 7	Well No. 8	Well No. 9
Temperature (deg.C)	8	7	7	6
pH	7.2	7.4	7.2	7.2
Chlorides	0.2	1.3	3.5	1.5
C.O.D.(from dichromate)	0	2	0	0
Conductivity (umhos at 25 deg.C)	612	577	702	937
Iron	0.2	0.4	0.2	0.4
Water Level (below grade)	13.75"	23.75"	112.5"	22.5"

Notes:
1) Analysis date 1/15–26/81
2) Water was sampled monthly 1980–1981. Theses are typical parameters and results.
3) Results in mg/l unless indicated otherwise.

TABLE 4-9 SEAD 64C PROPOSED GARBAGE DISPOSAL AREA - TYPICAL WELL DATA

4.12.2 Contaminants of Interest

It is unknown at this time what was disposed of at the landfill sites. Therefore, Pesticides/PCBs, VOCs, SVOCs, and heavy metals are considered to be contaminants of interest.

4.12.3 Transport Pathways

Since it is not known the extent of what materials might be buried here soil, air, groundwater, and where applicable, surface water are potential transport pathways at all four locations.

4.12.4 Field Investigation

4.12.4.1 Geophysical Survey

Electromagnetic (EM-31) and Ground Penetrating Radar (GPR) will be performed at SEAD 64A, B, C, and D. Seismic Refraction surveys will be performed at SEAD 64A, B, and D. The initial geophysical investigations will be an EM-31 survey performed on a 20 foot by 20 foot grid throughout the survey area as shown in Figures 4-15 through 4-18. The objective of the EM-31 survey will be to delineate the limits of the landfill and to identify locations where metallic objects may be buried within the subsurface. Upon completion of the EM-31 survey contour maps of the in-phase and quadrature components of the electromagnetic field will be generated to aid in identifying the waste limits and the locations of possible buried metallic objects within the landfill.

Subsequent to the EM-31 survey a GPR survey will be performed. The GPR data will be collected across the areas shown in Figures 4-15 through 4-18 along profiles spaced at 50 foot intervals. Those data will be used to supplement the EM-31 interpretation of the waste limits and to provide additional information on the thickness of the waste. GPR data will also be collected over each distinct EM-31 anomaly in order to provide a better characterization of the suspected metallic source.

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

4.12.4.2 Media To Be Investigated

SEAD 64A

Soils

Both test pits and soil borings will be completed at SEAD 64A. The locations of the various sample points are shown in Figure 4-15.

Three test pits will be performed at SEAD 64A. The location of the three test pits will be based upon the results of the geophysical surveys. The test pits are to be performed where distinct geophysical anomalies are found that are thought to be associated with buried metallic objects. The purpose of these test pits is to visually identify the contents of this disposal area. No soil samples will be taken from the test pit locations.

Three soil borings will be performed in SEAD 64A. The tentative locations of soil borings and test pits are shown on Figure 4-15. The final locations will be determined after the geophysical surveys are performed. The objective of these borings is to determine the waste thickness and to provide subsurface samples for chemical analysis. Each boring will be continuously sampled to the top of the water table. A total of three samples from each boring will be collected and analyzed. The three samples to be analyzed from each boring will be submitted for chemical analyses identified in Section 4.12.5.

Three soil samples will also be collected and analyzed from the upgradient monitoring well boring to provide information relative to background soil chemistry.

Groundwater

Three monitoring wells will be installed at SEAD 64A. The monitoring well locations are shown in Figure 4-15 and are based upon a presumed direction of groundwater flow direction towards the west. One well will be installed upgradient of this garbage disposal area in order to monitor background groundwater quality. Two additional monitoring wells will be installed downgradient of the area to assess the impact the garbage disposal has had on the groundwater.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and development, one groundwater sample will be collected from each well and analyzed for parameters listed in Section 4.12.5.

<u>SEAD 64B</u>

<u>Soils</u>

Both test pits and soil borings will be completed at SEAD 64B. The locations of the various sample points are shown in Figure 4-16.

Three test pits will be completed at SEAD 64B. The exact locations of the test pits will be based upon the results of the geophysical surveys. The test pits are to be performed where geophysical anomalies are found that are thought to be associated with buried metallic objects. The purpose is to visually identify the contents of the fill within the disposal area. No soil samples will be collected from these test pits.

Three soil borings will be performed at SEAD 64B. The soil boring locations are shown in Figure 4-16. The objectives of these soil borings are to determine the thickness of waste at the site and to provide subsurface samples for chemical analysis. The soil samples will be collected from each soil boring. The three samples to be analyzed from each boring will be submitted for chemical analyses identified in Section 4.12.5. The final soil boring locations will be determined based upon the results of the geophysical surveys. Three soil samples will also be collected and analyzed from the upgradient monitoring well boring to assess background soil quality.

<u>Groundwater</u>

Three monitoring wells will be installed at SEAD 64B. The monitoring well locations are shown in Figure 4-16 and are based upon a presumed groundwater flow direction towards the southwest. One well will be located upgradient of the garbage disposal area in order to monitor background groundwater chemistry. Two additional monitoring wells will be installed downgradient of the area to assess the impact the garbage disposal has had on the groundwater system.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and development, one groundwater sample will be collected from each well and analyzed for parameters listed in Section 4.12.5.

Surface Water and Sediment

Three surface water and sediment samples will be collected from the drainage ditch that runs along the railroad tracks on the north side of the garbage disposal area. The sample locations are shown in Figure 4-16. The samples will be analyzed for the parameters listed in Section 4.12.5 and will be used to determine the effect the garbage disposal area and surface water runoff have had on surface water quality.

Sead 64C

Soil

Three test pits will be performed at SEAD 64C. The final test pit locations will be determined based upon the results of the geophysical surveys. The objective of these test pits is to determine what kinds of waste may be present in the disposal area and to confirm the source of distinct geophysical anomalies. Soil samples will be taken from the bottom of each test pit and analyzed as described in Section 4.12.5.

Groundwater

There are four existing monitoring wells at SEAD 64C. One is located upgradient and three are located downgradient of the SWMU. The presumed direction of groundwater flow at this SWMU is southwest. One groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.12.5.

Sead 64D

Soils

Test pits, soil borings, and surface soil samples will be collected at SEAD 64D. The locations of the various sample points are shown in Figure 4-17.

The boundaries of this landfill will be determined based upon the results of the geophysical surveys. Tentative sampling locations and the geophysical survey boundary are shown on Figure 4-17. Five surface soil samples will be collected from the area adjacent to West Patrol Road where stressed vegetation was observed during the January 1993 site visit. These samples will be collected from a depth of 0-12". The samples will be analyzed according to the procedures described in Section 4.12.5.

Three test pits will be performed at SEAD 64D. The locations of the test pits will be based upon the results of the geophysical surveys. The objectives of these test pits will be to visually evaluate the waste characteristics and to confirm the source of distinct geophysical anomalies. No samples will be collected from these test pits.

Three soil borings will be completed at SEAD 64D. The locations of the proposed borings will be based upon the results of the geophysical surveys. All three borings will be completed within the suspected landfill area. The objectives of the soils borings are to determine the thickness of the waste and to provide subsurface samples for chemical analysis. Each boring will be continuously sampled to the top of the water table. A total of three samples from each boring will be collected and analyzed. The soil samples will be analyzed for parameters listed in Section 4.12.5.

Groundwater

Three monitoring wells will be installed at SEAD 64D. The locations of the proposed wells are shown in Figure 4-18 and are based upon a presumed direction of groundwater flow at this SWMU toward the west. One background monitoring well will be located upgradient of the garbage disposal area in order to monitor background groundwater chemistry. The other two monitoring wells will be located downgradient of the landfill to determine the impact of

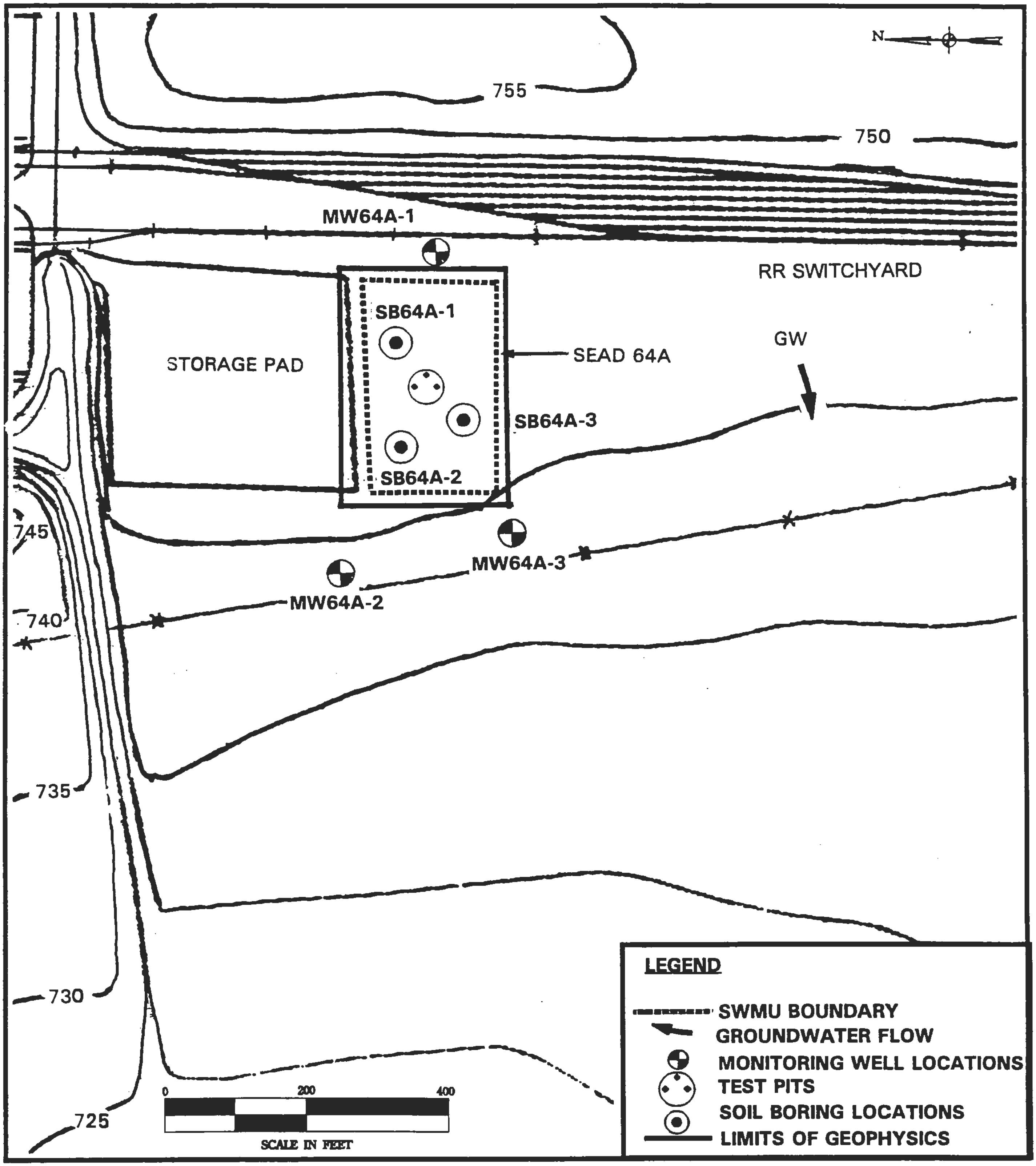

FIGURE 4-15 Sampling Plan for SEAD 64A: Garbage Disposal Area

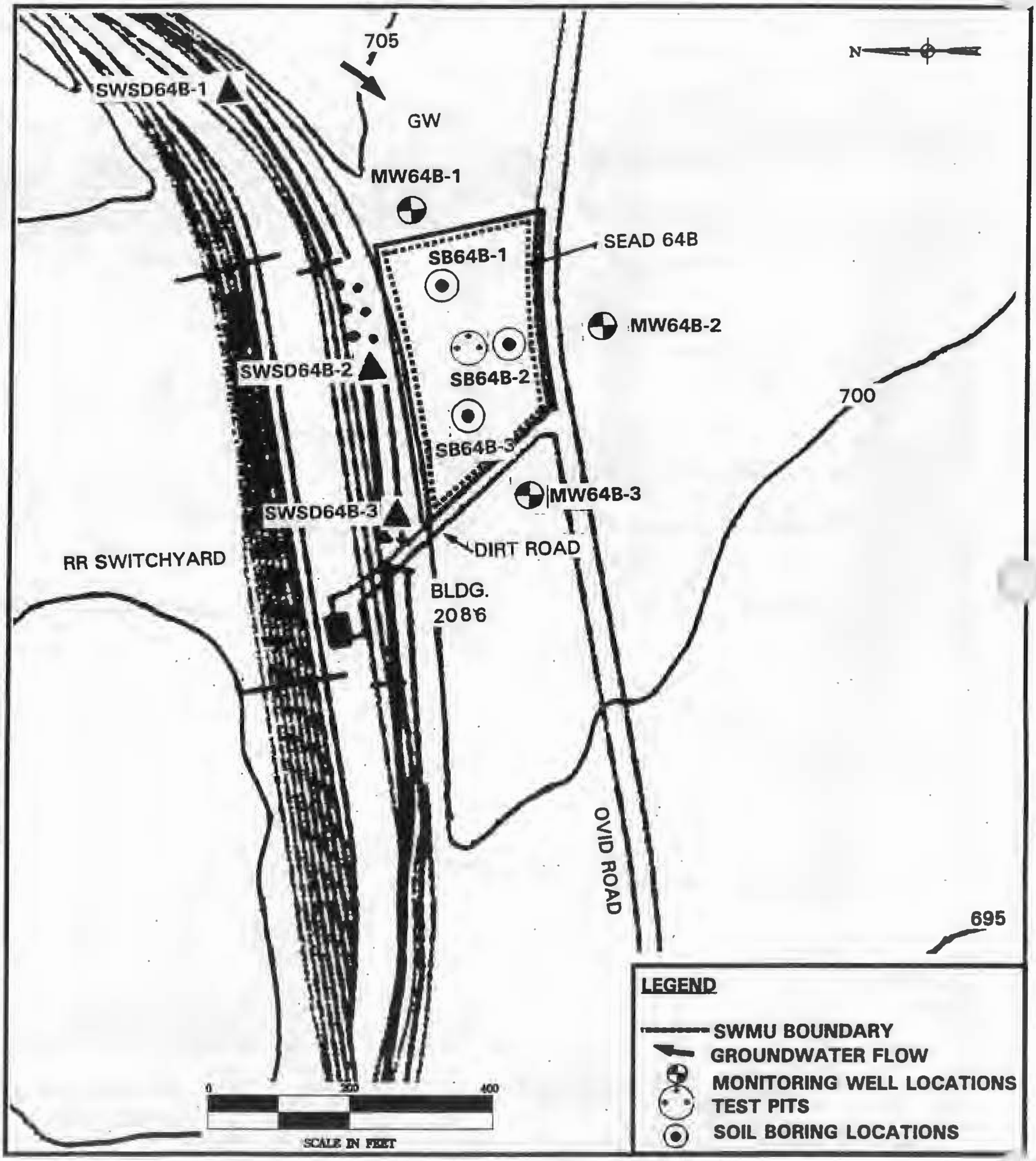

FIGURE 4-16 Sampling Plan for SEAD 64B: Garbage Disposal Area

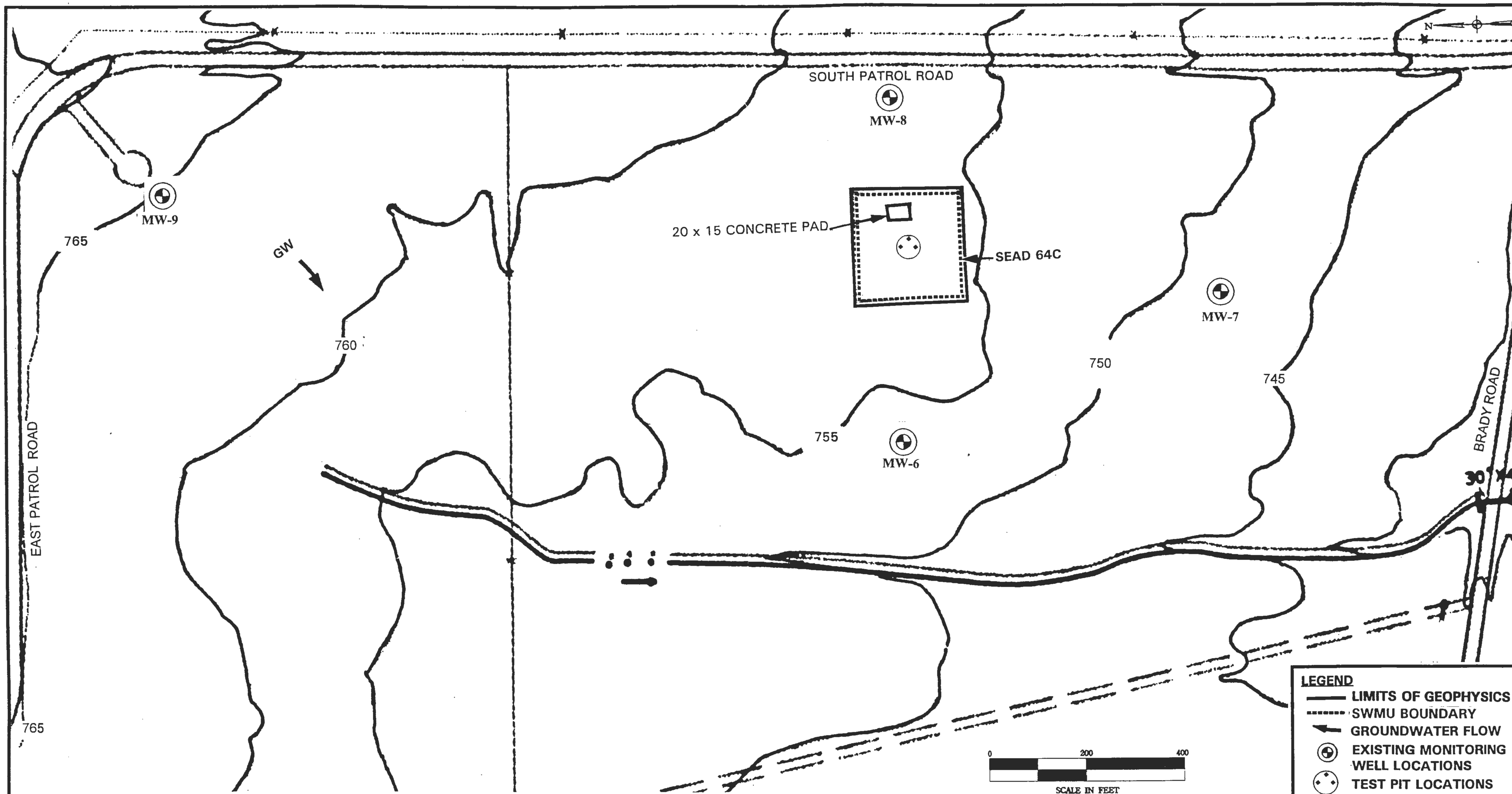

FIGURE 4-17 Sampling Plan for SEAD 64C: Garbage Disposal Area

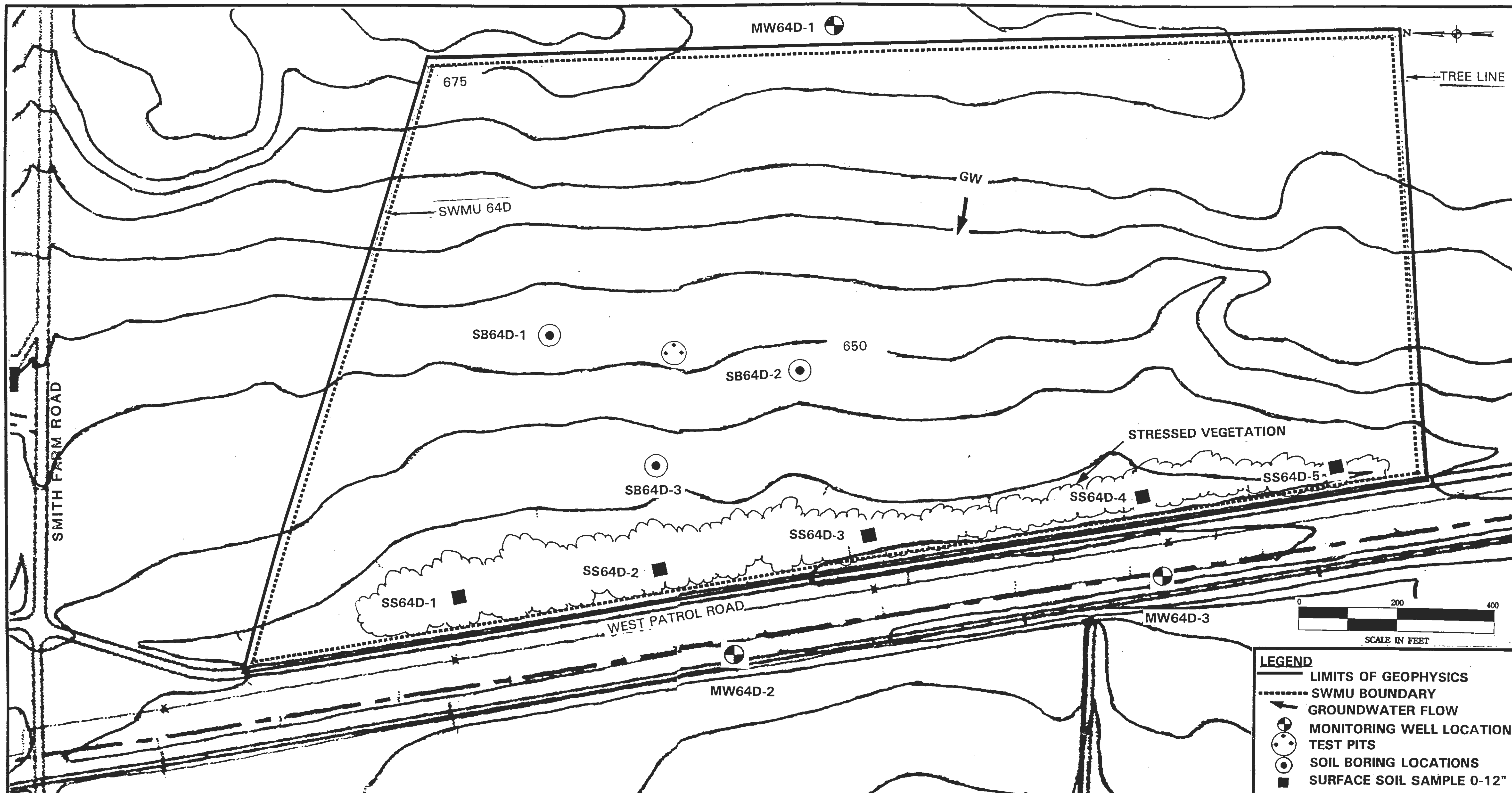

FIGURE 4-18 Sampling Plan for SEAD 64D: Garbage Disposal Area

the disposal area on the groundwater system. These locations may be subject to change when the extent of the landfill is determined from the geophysical survey.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and development, one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.12.5.

4.12.5 Analytical Program

A total of 41 soil samples, 3 surface water and sediment samples, and thirteen groundwater samples will be collected from SEAD-64A, 64B, 64C, and 64D for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW. A summary of the analytical program for SEAD-64A, 64B, 64C, and 64D is presented in Table 4-3.

4.12.6 Handling UXOs and Explosives

UXOs and explosives are not expected to be present at this SWMU.

4.13 SEAD 67 - DUMP SITE EAST OF SEWAGE TREATMENT PLANT NO. 4

SEAD 67 is composed of several waste piles east of sewage treatment plant No. 4. The site is located off of West Romulus Road east of the sewage treatment plant. Figure 4-19 shows the location of the dump site with respect to other features nearby.

4.13.1 Site Background

4.13.1.1 Historical Use

It is not known what wastes were disposed of in this area and when these disposals may have taken place.

4.13.1.2 Current Conditions

One pile that is approximately 10 feet in diameter and brush covered is located 10 feet south of West Romulus Road and east of the Sewage Treatment Plant. Approximately 100 feet further into the woods several more brush covered piles exist. These piles are approximately five feet high. No other refuse or debris was located in the area. No stressed vegetation, wetlands or stained soil were detected during the January 1993 site visit.

4.13.1.3 Existing Analytical Data

There is no existing analytical data from this area.

4.13.2 Contaminants Of Interest

It is unknown at this time what materials were disposed of at the dump site east of STP No. 4. Therefore, Pesticides/PCBs, VOCs, SVOCs, and heavy metals are considered to be contaminants of interest.

4.13.3 Transport Pathways

Since it is not known what was disposed of at this dump site, soil, groundwater and air are considered to be potential transport pathways.

4.13.4 Field Investigation

4.13.4.1 Geophysical Survey

Electromagnetic (EM-31) and Ground Penetrating Radar (GPR) surveys will be performed at SEAD 67. The initial geophysical investigation will be an EM-31 survey performed on a 20 foot by 20 foot grid throughout the survey and as shown on Figure 4-19. The objective of the EM-31 survey will be to delineate the limits of the landfill and to identify locations where metallic objects may be buried within the subsurface. Upon completion of the EM-31 survey contour maps of the in-phase and quadrature components of the electromagnetic field will be generated to aid in identifying the waste limits and the locations of possible buried metallic objects within the landfill.

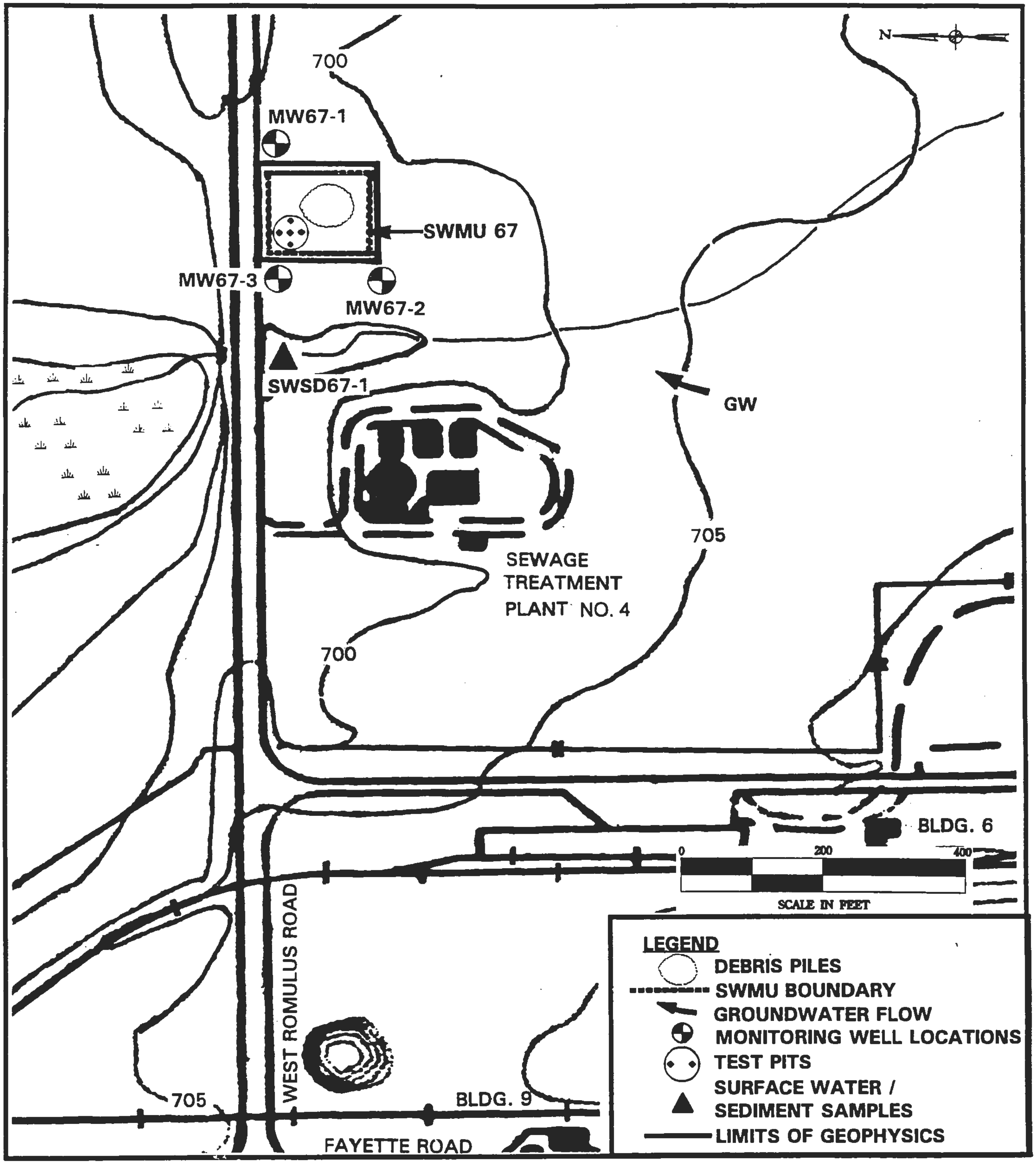

FIGURE 4-19 Sampling Plan for SEAD 67: Dump Site East of STP No. 4

Subsequent to the EM-31 survey a GPR survey will be performed. The GPR data will be collected across the areas shown in Figure 4-19 along profiles spaced at 50 foot intervals. Those data will be used to supplement the EM-31 interpretation of the waste limits and to provide additional information on the thickness of the waste. GPR data will also be collected over each distinct EM-31 anomaly in order to provide a better characterization of the suspected metallic source.

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

4.13.4.2 Media To Be Investigated

Test pits and soil borings will be completed at SEAD 67. The locations of the various sample points are shown in Figure 4-19.

One soil sample will be collected using a backhoe from each of the five waste piles in the area east of the Sewage Treatment Plant. These samples will be analyzed as described in Section 4.13.5 to determine the chemical composition of the piles.

Soil samples will be collected and submitted for chemical analysis from the proposed upgradient monitoring well boring location. This boring will be continuously sampled to the top of the water table. A total of three samples from this boring will be collected and submitted for chemical analyses as identified in Section 4.13.5.

<u>Surface Water and Sediment</u>

One surface water and sediment sample will be taken from the drainage ditch due west of the debris piles. This sample will be collected and analyzed to determine if surface water runoff is a transport pathway of contamination at this SWMU. The sample location is shown in Figure 4-19.

Groundwater

Three monitoring wells will be installed at SEAD 67. The locations of the monitoring wells are shown in Figure 4-19 and are based upon a presumed direction of groundwater flow at this SWMU towards the northeast. One will be located upgradient of the debris piles and will be installed for monitoring the background groundwater quality. The remaining two wells will be installed downgradient of the site to determine if the contaminants from the debris piles have leached into the groundwater.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and sediment, one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.14.5.

4.13.5 Analytical Program

A total of 8 soil samples, 1 surface water and sediment sample, and three groundwater samples will be collected from SEAD-67 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW. A summary of the analytical program for SEAD-67 is presented in Table 4-3.

4.13.6 Handling UXOs and Explosives

UXOs and explosives are not expected to be present at this SWMU.

4.14 SEAD 70 - FILL AREA ADJACENT TO BUILDING T-2110

Directly east of Building T-2110 is a fill area that measures approximately 200 feet by 200 feet that has been designated as SEAD 70. Building T-2110 is located along the section of Igloo Road No. 5 that is on the west side of North-South Baseline Road. Figure 4-20 shows the location of SEAD 70.

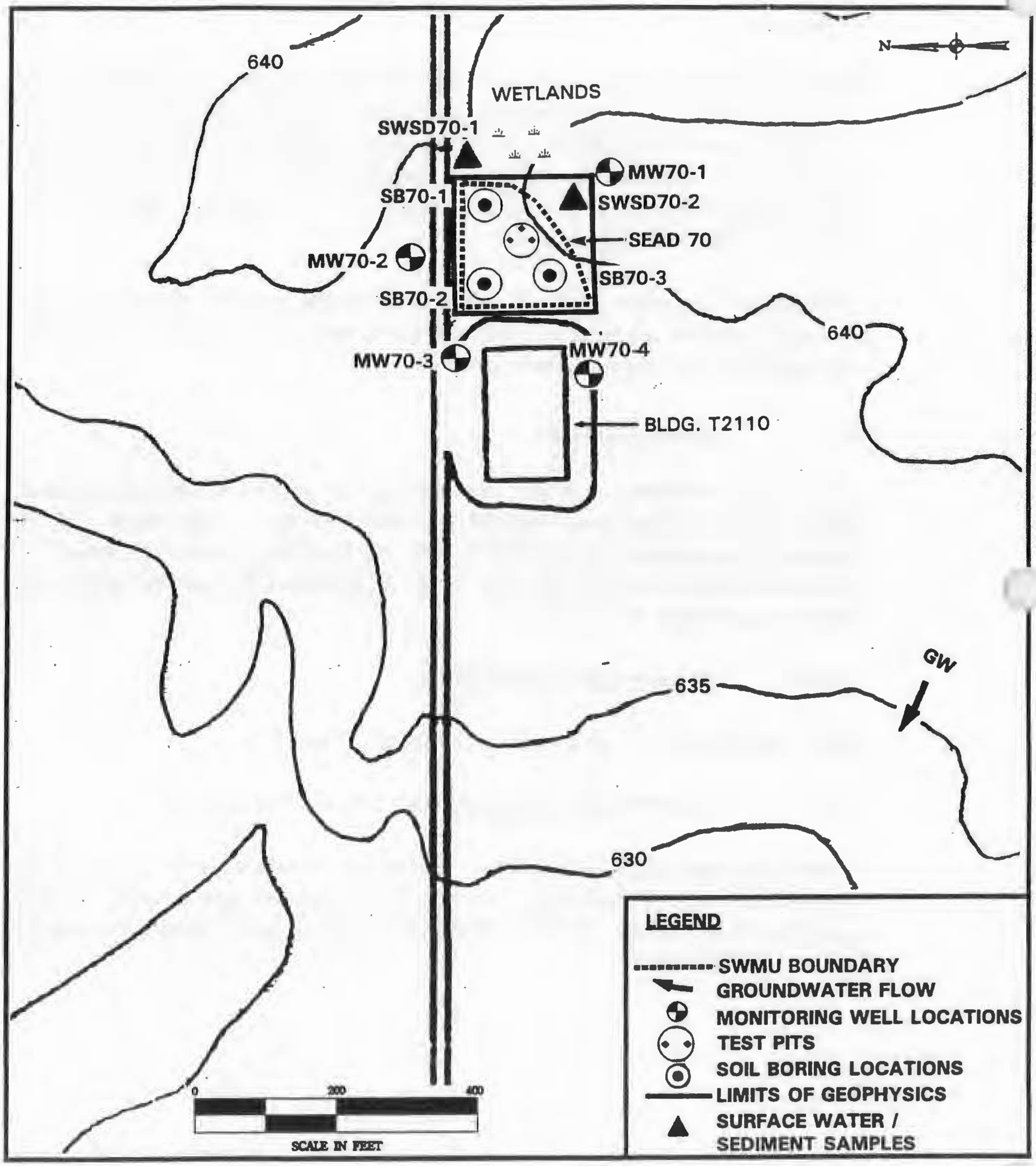

FIGURE 4-20 Sampling Plan for SEAD 70 Fill Area Adjacent to Building T-2110

4.14.1 Site Background

4.14.1.1 Historical Use

Building T-2110 may have at one time been used to house horses according to SEAD personnel. The fill area east of T-2110 has previously been used to dispose of construction debris. It is not know what else may have been buried at this site. Up to two years ago soldiers at SEAD used this location as a staging area.

4.14.1.2 Current Conditions

The eastern section of this fill area contains railroad ties, rolls of barbed wire, wooden pallets, and other miscellaneous items. The area is sparsely vegetated, being covered with low lying grass and moss. The eastern sections of this site drops off several feet to a wooded area characterized by wetlands. Building T-2110 is old and dilapidated with piles of hay and sawdust located inside. The walls are broken and the contents are visible from the outside.

4.14.1.3 Existing Analytical Data

There is no existing analytical data from this site.

4.14.2 Contaminants of Interest

It is unknown what may have been disposed of in this fill area besides construction debris. Therefore, Pesticides/PCBs, VOCs, SVOCs, and heavy metals are considered to be contaminants of interest.

4.14.3 Transport Pathways

It is unknown what wastes were buried in the fill area adjacent to Building T-2110. Therefore, soil, groundwater, air, and surface water are potential transport pathways.

4.14.4 Field Investigation

4.14.4.1 Geophysical Survey

Electromagnetic (EM-31) and Ground Penetrating Radar (GPR) surveys will be performed at SEAD 70. The initial geophysical investigation will be an EM-31 survey performed on a 20 foot by 20 foot grid throughout the survey and as shown on Figure 4-20. The objective of the EM-31 survey will be to delineate the limits of the landfill and to identify locations where metallic objects may be buried within the subsurface. Upon completion of the EM-31 survey contour maps of the in-phase and quadrature components of the electromagnetic field will be generated to aid in identifying the waste limits and the locations of possible buried metallic objects within the landfill.

Subsequent to the EM-31 survey a GPR survey will be performed. The GPR data will be collected across the areas shown in Figure 4-20 along profiles spaced at 50 foot intervals. Those data will be used to supplement the EM-31 interpretation of the waste limits and to provide additional information on the thickness of the waste. GPR data will also be collected over each distinct EM-31 anomaly in order to provide a better characterization of the suspected metallic source.

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

4.14.4.2 Media To Be Investigated

Soils

Three test pits will be performed at SEAD 70. The test pit locations will be based upon the results of the geophysical surveys. The test pits locations will be in areas where geophysical anomalies are detected that are though to be associated with buried metallic objects. No soil samples will be collected from these test pits. Their purpose is for visual identification of the fill materials and confirmation of suspected geophysical anomaly sources.

Three soil borings will also be installed at SEAD 70. The soil borings will be used to determine the depth of the fill area and to provide subsurface samples for chemical analysis. Each boring will be continuously sampled to the top of the water table. A total of three samples from each boring will be collected and analyzed. The three samples to be analyzed from each boring will be submitted for chemical analyses identified in Section 4.14.5.

Surface Water Sediment

Two surface water and sediment samples will be taken from the wetlands area downgradient of the fill area as shown in Figure 4-20. These samples will be analyzed for the parameters identified in Section 4.14.5. The analysis of these samples will be used to determine if surface water and sediment have been impacted by constituents at the site.

Groundwater

Four monitoring wells will be installed at SEAD 70. The monitoring well locations are shown in Figure 4-20 and are based upon a presumed direction of groundwater flow at this SWMU towards the northwest. One monitoring well will be installed upgradient for monitoring background groundwater chemistry. The other three monitoring wells will be installed downgradient and used for assessing groundwater contamination due to the presence of the landfill.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and developments one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.14.5.

4.14.5 Analytical Program

A total of 9 soil samples, 2 surface water and sediment samples, and four groundwater samples will be collected from SEAD-70 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and

Cyanide according to the NYSDEC CLP SOW. A summary of the analytical program for SEAD-70 is presented in Table 4-3.

4.14.6 Handling UXOs and Explosives

UXOs and explosives are not expected to be present at this SWMU.

4.15 SEAD 71 - RUMORED PAINT AND SOLVENT BURIAL PIT

SEAD 71 is a rumored paint and/or solvent disposal area. SEAD 71 is located west of Building 127 between a chain link fence and a dirt road that run near the railroad tracks. The site covers approximately 450 square feet. The suspected location for the rumored paint and solvent burial pit is shown on Figure 4-21.

4.15.1 Site Background

4.15.1.1 Historical Use

SEAD 71 is a small area where paints and/or solvents may have been disposed of in burial pits. It is not known what other activities may have occurred here. No dates of activities are available.

4.15.1.2 Current Conditions

The suspected location is approximately 450 square feet and triangular shaped. The area is grassy and shows no signs of having been disturbed. A fence borders the east side of the suspected location. Adjacent to the fence are scrap fence materials, concrete parking signs and a utility pole. Railroad tracks run east to west alongside this location.

4.15.1.3 Existing Analytical Data

There is no existing analytical data for this site.

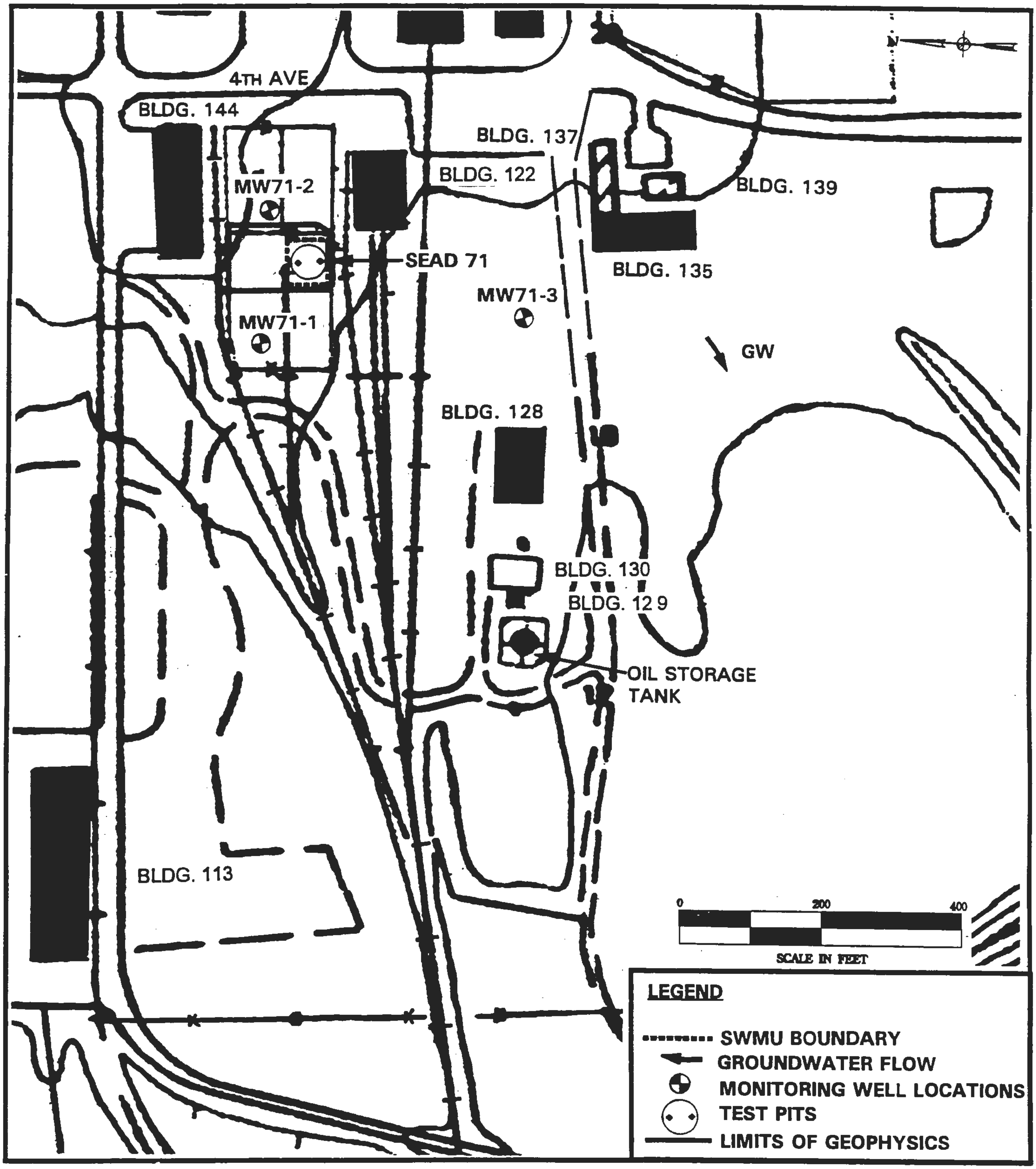

FIGURE 4-21 Sampling Plan for SEAD 71: Rumored Paint/Solvent Burial Pit

4.15.2 Contaminants of Interest

The primary constituents of concern are VOCs, SVOCs and heavy metals in the rumored paint and solvent burial pit.

4.15.3 Transport Pathways

The transport pathways for the chemicals of concern at the rumored paint and solvent burial pit include soil and groundwater.

4.15.4 Field Investigation

4.15.4.1 Geophysical Survey

A Ground Penetrating Radar (GPR) survey will be performed at SEAD 71. The GPR data will be collected across the areas shown in Figure 4-21 along profiles spaced at 10 foot intervals. Since the rumored paint and solvent burial area is relatively small and surrounded by metallic objects an EM-31 survey would not produce reliable data due to interference effects. GPR data will be collected throughout the site in order to delineate the location of the rumored burial pit.

In order to determine the direction of groundwater flow at the site up to four seismic refraction spreads will be surveyed. These spreads will be located at each boundary of the SWMU and surveyed using a weight drop energy source and 5 foot geophone spacings. The depth to the water table will be determined for each spread. Since the individual spreads will be situated at the SWMU boundaries, this horizontal spacing and the water table depth information will be used to determine the direction of groundwater flow. This information will be used in turn to locate monitoring wells both up and downgradient of the SWMU.

4.15.4.2 Media To Be Investigated

Soils

Two test pits will be performed at SEAD 71. The area in which burials are believed to have taken place is relatively small and these test pits will be used to identify the location and types of debris present. The exact location of the test pits will be determined based upon the results of the GPR survey. Soil samples will be collected from the bottom of each pit and analyzed for the parameters listed in Section 4.15.5 to determine what contaminants have migrated to the soil.

Groundwater

Three monitoring wells will be installed at SEAD 71. The monitoring well locations are shown in Figure 4-21 and are based upon a presumed groundwater flow direction towards the east. One monitoring well will be installed upgradient of the rumored paint and solvent burial pit for monitoring background groundwater quality. The remaining two monitoring wells will be installed downgradient of the area for monitoring the impact of the rumored paint and solvent burial pit upon the groundwater system.

All monitoring wells will be constructed so that the entire thickness of the aquifer is screened. Following installation and development, one groundwater sample will be collected from each well and analyzed for the parameters listed in Section 4.15.5.

4.15.5 Analytical Program

A total of 2 soil samples and three groundwater samples will be collected from SEAD-71 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW. A summary of the analytical program for SEAD-71 is presented in Table 4-3.

4.15.6 Handling UXOs and Explosives

UXOs and explosives are not expected to be present at this SWMU.

4.16 DATA REDUCTION, ASSESSMENT AND INTERPRETATION

Upon completion of all field investigations identified in Sections 4.1 through 4.15 the data will be reviewed, processed, evaluated and interpreted. Conclusions will be described for each of the following subcategories. The need for additional data will be identified through the assessment and interpretation process.

4.16.1 Geophysical

The geophysical surveys will produce a variety of subsurface data which will be reduced and analyzed. Objectives of this assessment will include identification of the location and extent of the distribution of any buried objects and former trenches and determination of the groundwater flow.

The following figures will be prepared to support the interpretation of the geophysical data:

Electromagnetic Survey (EM-31)

- The EM survey grid will be shown on a base map of the SWMU.
- Contours of the quadrature and in-phase component readings will be prepared and shown on a base map of the SWMU. The individual EM readings will be provided on tables.

Ground Penetrating Radar (GPR) Survey

- The GPR survey lines will be shown on a base map of the SWMU.
- The subsurface image radar profiles from the graphic strip recorder, annotated by the geophysicists, will be provided as an appendix.

EM and GPR Surveys

- Anomalous areas defined by the EM and GPR survey will be shown as shaded areas on a base map of each SWMU.

Seismic Refraction

- Seismic lines will be shown on a base map of the SWMU.
- First Break Analysis.
- Time distance plots.
- Velocity Analysis/Layer Assignment
- Computer Processing.

4.16.2 Soils

The soil data will be evaluated to meet the following objectives:

- Identify the type and extent of chemical constituents detected in the soil samples.
- Portray source areas using plan and cross-sectional views.
- Validate the Level III and IV data.

4.16.3 Surface Water and Sediment

Surface water and sediment data will be evaluated to meet the following objectives:

- Validate the Level III and IV data.
- Identify and quantify chemical constituents found in surface water and sediment samples.

4.16.4 Groundwater

Groundwater data will be evaluated to meet the following objectives:

- Validate the Level III and IV data.
- Estimate horizontal hydraulic gradients and identify groundwater flow directions. This information will be displayed in plan view.
- Identify the chemical constituents and their concentrations in the groundwater being released from each SWMU.
- Identify spatially the extent of dispersion of chemical concentrations. The resulting plume will be displayed graphically.

4.16.5 Comparison to Background

4.16.5.1 Objective

Organic, inorganic and heavy metal constituent concentrations will be measured in this investigation for the environmental media of soil (surficial, test pits and borings), sediment, surface water and groundwater. The objective of the investigation is to determine if a chemical release has occurred at each unit and the nature of that release. To make this determination, constituent concentrations must be established for media unaffected by chemicals from each particular SWMU; that is, SWMU-specific background constituent concentrations must be defined. Once background concentrations are defined, a comparison will be made between background media samples and SWMU-affected media samples. The comparison will indicate whether the unit has affected the surrounding media.

4.16.6 Survey

Surveying will be performed at the fifteen SWMUs under investigation to provide accurate site base maps which will be used for the following purposes:

1. Map the direction and compute the velocity of groundwater movement
2. Locate all the environmental sampling points
3. Serve as the basis for volume estimates of impacted soils and sediments which may require a remedial action
4. Map the extent of any impacted groundwater above established ARAR limits
5. Provide accurate and current information regarding the topography and site conditions, such as building locations.

The survey will involve photogrammetric mapping, followed by a field survey. By having an aerial photographic survey performed for the site, the site topographic data can be electronically input to Engineering-Science's Engineering Site Package (ESP) software on our Intergraph CAD System. This approach will produce more accurate site maps and since the software stores the data as a three-dimensional file, it will facilitate a great deal more flexibility in its future use. Typical examples of what this software can produce automatically are stormwater run-off calculations, cut and fill calculations, and graphical cross-section through any part of the site. The field control will establish horizontal and vertical control and will serve as the basis for relating the photogrammetric information to actual land elevations and the New York State Plane Coordinate System.

During the field survey, plastic or wooden hubs shall be used for all basic control points. A minimum of one concrete monument with 3.25-inch domed brass or aluminum alloy survey markers (caps) and witness posts will be established at each SWMU investigated. The concrete monuments will be located within the project limits and will be set 50 feet from the edge of any existing roads in the interior of the project limits and will be a minimum of 500 feet apart. The placement of all monuments, hubs, etc., shall be coordinated with SEAD. Witness posts, etc., shall be durable and brightly colored to preclude damage due to normal landscaping activities. Concrete monuments shall be constructed so as to preclude damage due to frost action. Horizontal control (1:10,000) and vertical control (1:5,000) 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-1-1993	SEAD-2-1993	SEAD-3-1993
USAED-HUNTSVILLE	USAED-HUNTSVILLE	USAED-HUNTSVILLE

The dies for stamping the numbers and letters into these caps shall be of 1/8 inch. All coordinates will be to the closest 0.01 foot and will be referenced to the State Plane Coordinate System, and all elevations are to be referenced to the 1929 National Geodetic Vertical Datum. Elevations to the closest 0.10 foot shall be provided for the ground surface at each soil boring. Elevations to the closest 0.01 foot shall also be established for the survey marker and the top of casing (measuring point) at each monitoring well.

The location, identification, coordinates and elevations of all the control points recovered and/or established at the site and all of the geophysical survey areas, soil borings, monitoring wells (new and existing) and all surface water and sediment sampling points will be plotted on a topographic map (at a scale of 1 inch = 50 feet) to show their location with respect to surface features within the project area. U.S.G.S control points exist at the Seneca Base. This information will be provided to the surveyor prior to the survey. A tabulated list of the monuments, the soil borings and the surface water and sediment sample points including their coordinates and elevations, a "Description Card" for each monument established or used for this project, the 1 inch = 50 feet map and all field books and computations will be prepared by the surveyor. The Description Card will show a sketch of each monument; its location relative to reference marks, buildings, roads, towers, etc.; written description telling how to locate the monument from a known point; the monument name or number and its coordinates and elevation.

During the field survey, level circuits will close on a benchmark whose elevation is known (other than the starting benchmark if possible). The following criteria will be met in conducting the survey:

- Instruments will be pegged regularly.
- Rod levels will be used.
- Foresight and backsight distances will be reasonably balanced.
- Elevation readings will be recorded to 0.01 foot.

Temporary monuments will be set and referenced for future recovery. All monuments will be described in the field notes. Sufficient description will be provided to facilitate their recovery.

Traverses will be closed and adjusted in the following manner:

- Bearing closures will be computed and adjusted, if within limits.
- Coordinate closures will be computed using adjusted bearings and unadjusted field distances.
- Coordinate positions will be adjusted if the traverse closes within the specified limits. The method of adjustment will be determined by the surveyor.
- Final adjusted coordinates will be labeled as "adjusted coordinates." Field coordinates will be specifically identified as such.
- The direction and length of the unadjusted error of closure, the ratio of error over traverse length, and the method of adjustment will be printed with the final adjusted coordinates.

Level circuits will be closed and adjusted in the following manner:

- For a single circuit, elevations will be adjusted proportionately, provided the raw closure is within the prescribed limits for that circuit.
- In a level net, where the elevation of a point is established by more than one circuit, the method of adjustment will consider the length of each circuit, the closure of each circuit, and the combined effect of all the separate circuit closures on the total net adjustment.

For this project, all surveys shall be third-order plane surveys as defined by the following standards and specifications:

<u>Traverse</u>

Standard error of the mean for length measurements	1 in 10,000
Position closure per loop in feet after azimuth adjustment	1:5,000 checkpoint or 3.34 M** (whichever is smaller)

<u>Leveling</u>

Levels error of closure per loop in feet	0.05 M**

M** is the square root of distance in miles.

Third-order plane surveys and horizontal angular measurements will be made with a 20-second or better transit. Angles will be doubled, with the mean of the doubled angle within 10 seconds of the first angle. Distance measurements will be made with a calibrated tape corrected for temperature and tension or with a calibrated electronic distance meter instrument (EDMI). When using EDMI, the manufacturer's parts per million (ppm) error is applied, as well as corrections for curvature and refraction.

Site surveys will be performed in accordance with good land surveying practices and will conform to all pertinent state laws and regulations governing land surveying. The surveyor shall be licensed and registered in New York. Upon completion of the project, all original field notebooks, computations, and pertinent reference materials will be available at the surveyor's office. Photostatic copies of these materials will be kept in the project files.

All field note reduction will be checked and marked in such a way that a visual inspection of the field notes will confirm that checks have been made. All office entries in field notebooks will be made in colored pencil. The office worker who reduces or checks field notes will initial each page worked on in the color used on that page.

Monitoring well locations will be surveyed only after the installation of the tamperproof locking cap guard pipe or road box, which will be set in concrete. The following elevations will be measured:

- Top of the outer protective casing at the point opposite the lock or bolt on the guard pipe or road box
- At the notch cut into the lip (not the cap) of the PVC riser pipe.
- Finished concrete pad adjacent to the outer well casing.

The aerial photographic survey will be performed with an aerial camera equal to or better than a Ziess RMKA 15/23 with a focal length of 6 inches. The scale of the photography will be suitable for determination of 2-foot ground contours, but will not be greater than 1" = 600. Black and white aerial photographs will be sufficient. The photographs to be taken will be sufficient enough to cover the SWMUs to be investigated. A U.S.G.S topographic map will be used to determine the limits of the photographic survey. A copy of the survey boundary will be a deliverable to the surveyor. Since the site is within the confines of the Seneca Army Depot, an active military installation, written permission will be necessary to conduct the aerial flyover. The deliverables from the surveyor will include:

1. A list indicating the location, identification, coordinates and elevations of each monument, soil boring, monitoring well and surface water sample point.
2. Two sets of black and white contacts.
3. An Intergraph IDGS file, on tape, of the topographic map.
4. Photostatic copies of the surveyor's field notes.

10 seconds of the first angle. Distance measurements will be made with a calibrated tape corrected for temperature and tension or with a calibrated electronic distance meter instrument (EDMI). When using EDMI, the manufacturer's parts per million (ppm) error is applied, as well as corrections for curvature and refraction.

Site surveys will be performed in accordance with good land surveying practices and will conform to all pertinent state laws and regulations governing land surveying. The surveyor shall be licensed and registered in New York. Upon completion of the project, all original field notebooks, computations, and pertinent reference materials will be available at the surveyor's office. Photostatic copies of these materials will be kept in the project files.

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2. Two sets of black and white contacts.

3. An Intergraph IDGS file, on tape, of the topographic map.
4. Photostatic copies of the surveyor's field notes.

5.0 PROJECT MANAGEMENT, SCHEDULE, AND REPORTS

The purpose of this Work Plan is to present and describe the activities that will be required for development of the site inspection. The Field Sampling and Analysis Plan (Appendix A) details procedures which will be used during the field activities. Included in this plan are procedures for sampling soil, soil gas, sediments, surface water and groundwater. Additionally included in this plan are procedures for developing and installing monitoring wells, measuring water levels, and packaging and shipping of samples.

The Health and Safety Plan (Appendix B) details procedures to be followed during field activities to protect personnel involved in the field program.

The Chemical Data Acquisition Plan (Appendix C) describes the procedures to be implemented to assure the collection of valid data. It also describes the laboratory and field analytical procedures and QA/QC requirements which will be used during the site investigation.

5.1 SCHEDULING

Figure 5-1 presents the proposed schedule which relates defined work tasks with time to complete each task.

5.2 STAFFING

This section contains a listing of project staff and describes the functional relationships of the organizational structure and responsibilities of the support functions. The project organization is presented in Figure 5-2. Each of the Engineering-Science personnel listed serves in a supervisory role. These personnel will provide overview and guidance to the project team and will assist the Project Manager in the resolution of technical difficulties.

The USACE Project Manager will oversee the entire project. A USACE Technical Manager will support the Project Manager.

The Engineering-Science Project Manager, Mr. Michael Duchesneau, P.E., is responsible for the effective day-to-day management of the project staff; direct communication and liaison with the USACE and SEAD; technical approach and review of deliverables, management of resources, schedules and budgets; and communication among the general and technical support functions.

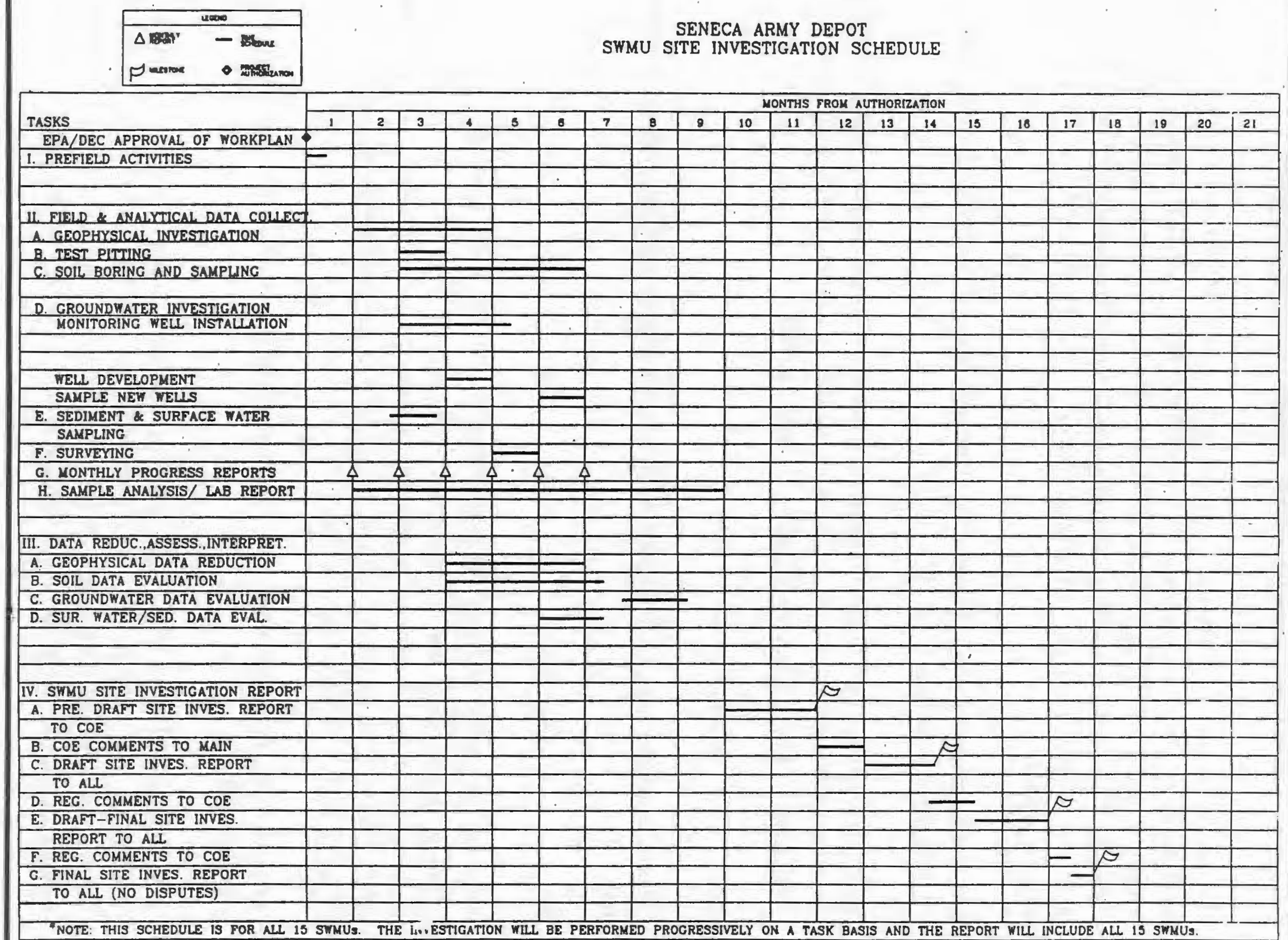

FIGURE 5-1 SWMU INVESTIGATION SCHEDULE

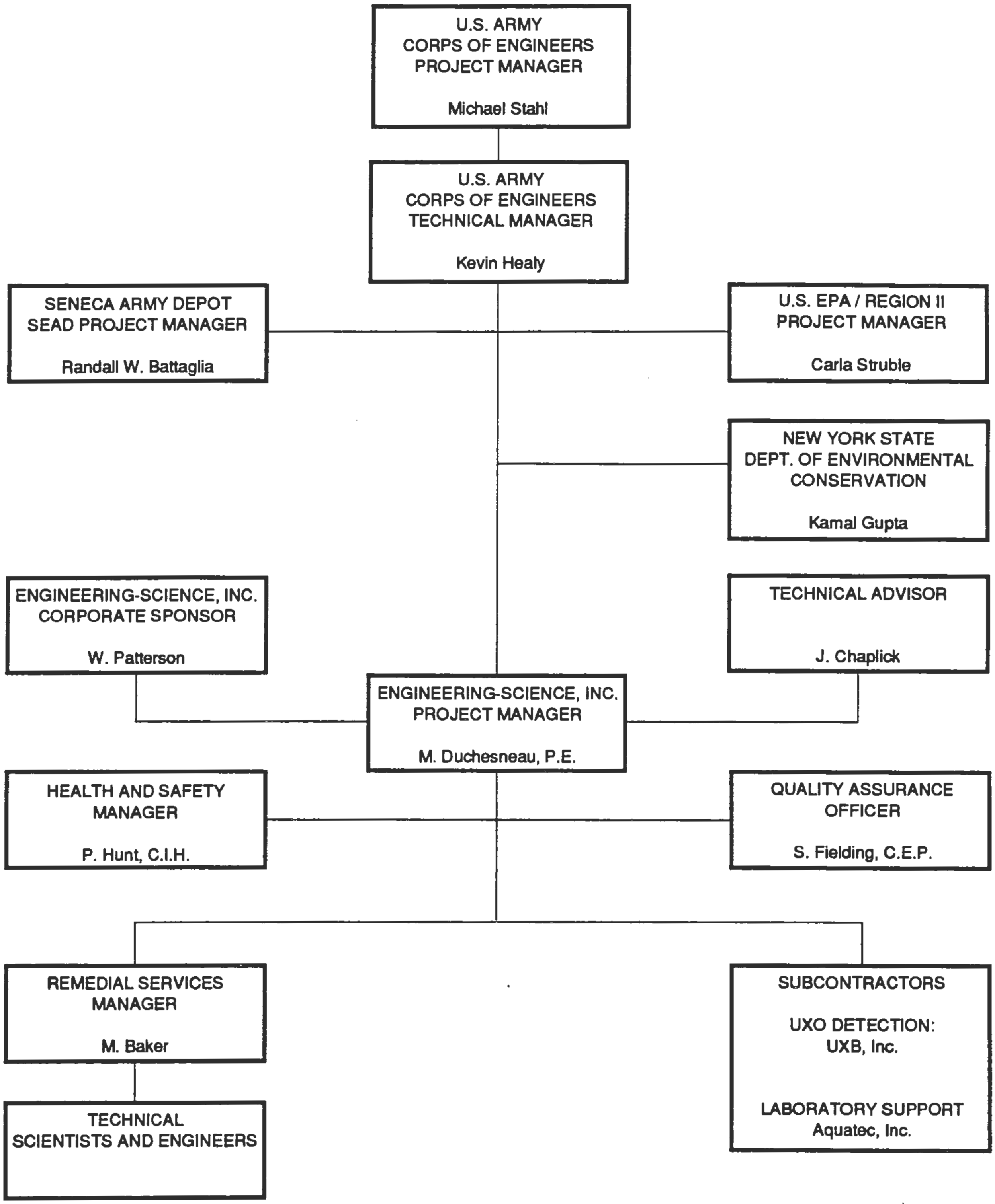

FIGURE 5-2 PROJECT ORGANIZATION

The general support personnel include a Health and Safety Manager and Quality Assurance Officer. The Health and Safety Manager is responsible for preparing the health and safety plan for site activities and training project personnel in safety practices. The Quality Assurance Officer is responsible for monitoring and periodically auditing to assure QC procedures outlined in the Chemical Data Acquisition Plan are followed by the field team and the laboratory.

The support personnel in hydrogeology and regulatory compliance will provide technical support and assist in the resolution of difficulties related to their individual fields.

Outside support has been retained by Engineering-Science to provide laboratory assistance (Aquatec, Inc.) and to aid in UXO detection and handling (UXB, Inc.).

5.3 DATA REPORTING

The program described in this Work Plan is intended to provide a data base which will yield an understanding of on-site conditions. Engineering Science recognizes that during the ESI process there may be a need to expand a particular task. Consequently, the expeditious completion of the program requires good communication between Engineering-Science, SEAD, USCOE, NYSDEC and EPA. This section describes the mechanisms which will ensure that communications between all concerned are maintained.

5.3.1 Work Plan Deviations

During the field work, deviations from the work proposed in the Work Plan may be necessary. When deviations are required, they will be approved by the EPA and NYSDEC before being performed.

5.3.2 Laboratory Data Reports

Reports from the analytical laboratory will include a tabulation of sample results, dates of analysis, method references, completed chain-of-custody forms, blank analysis data, precision and accuracy information for each method, and narrative discussion of any difficulties experienced during analysis. A copy of each data package will be sent by the laboratory to the Project Manager. The Project Manager will immediately arrange for making additional copies of the data packages including copies for the Document Controller and Project Quality Assurance Officer. The sample analysis data will be tabulated by the laboratory and presented to the Project Manager on computer diskettes. These tables will be used to prepare a working database for assessment of the site contamination condition.

5.3.3 Monthly Field Activity Reports

While field work associated with the response activities is being conducted at the site, a monthly Field Activity Report to the EPA and NYSDEC will be submitted no later than the 10th day of the month addressing the following:

1. A summary of work completed in the field, including any deviations from the Work Plan,
2. Anticipated or actual delays,
3. Discovery of significant additional contaminants other than expected,
4. Quantum increase in concentration of hazardous substances of any media beyond that expected,
5. Determination of any specific or potential increase of danger to the public, the environment, or to individuals working at the site, and
6. Copies of all Quality Assured Data and sampling test results and other laboratory deliverables received during the month.
7. A copy of the laboratory's chemical analysis reports received during the month will be sent to the Corps of Engineers' QA Laboratory.

5.3.4 Sampling Letter Reports

At the completion of the first round of field work sampling, a letter report characterizing the site will be furnished by the Project Manager. This report will at a minimum list the locations and quantities of contaminants at the site. Should additional sampling rounds be required to confirm initial sampling, additional letter reports will also be required.

5.3.5 Quarterly Reports

Quarterly Reports will be submitted to EPA and NYSDEC no later than the 10th day of January, April, July, and October. Relevant feeder input for these reports will be provided by ES at least two weeks in advance of Seneca's deadline. The quarterly reports shall address the following:

1. Minutes of all formal Project Manager, Technical Review Committee, and other formal meetings held during the preceding period,
2. Status report on all milestones on schedule, report and explanation for milestones not met, and assessment of milestones to be met during the next period,
3. Outside inspection reports, audits and other administrative information developed,
4. Permit status, as applicable,
5. Personnel staffing status or update,

6. Copies of all Quality Assured Data and sampling test results and all other laboratory deliverables received during that quarter, and
7. A community relations activity update.

5.3.6 Final Report

At the conclusion of the ESI, a report will be generated that documents the field work, and data interpretation performed during the ESI. A section on data quality will be included that discusses the results of data validation, describes how well the data quality objectives were met, and summarizes the results of any audits performed during the ESI. The ESI report will conclude whether a release has occurred at each SWMU and will recommend whether a RI/FS should be performed at each SWMU or whether the SWMU should be declared a "No Action" SWMU.

APPENDIX A

FIELD SAMPLING AND ANALYSIS PLAN

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1.0 INTRODUCTION

Environmental measurements are subject to a wide variety of instrument, spatial, and temporal variables. A representative sample of the material from which it is collected must accurately depict the spatial, temporal, physical, and chemical qualities of the material. Standard operating procedures help to minimize those errors which result in the collection of invalid data or nonrepresentative samples. This is important as field data collection provides the primary basis upon which site investigations, assessments, and remedial actions are based.

There are four basic factors which affect the quality of sampling data. These are: 1) Selection of the sample collection site; 2) Method of sample collection; 3) Sample preparation, preservation and storage methods; and 4) Sample analysis. Samples must be representative of the media from which they are extracted, and maintain their integrity and/or constituents between the time of sampling and the time of analysis. Field measurement devices and procedures also must follow set procedures to obtain precise and accurate readings at representative locations.

This document presents the Engineering-Science, Inc. Field Sampling and Analysis Plan (FSAP) for the collection of precise, accurate, and representative field data. If a non-standard situation is encountered in the field, the ES project manager or Remedial Services Manager will be contacted immediately and advised of the situation. If it is deemed necessary the appropriate contacts at SEAD and the Army Corps of Engineers-Huntsville will be contacted. Lastly, if approval from NYSDEC or EPA is necessary these agencies will be contacted. If the provided FSAP does not cover a situation encountered in the field, procedures recommended by the EPA or other suitable authority will be followed.

This FSAP describes the field sampling methods and data collection procedures for the Expanded Site Inspection of 15 Solid Waste Management Units at Seneca Army Depot in Romulus, New York.

The field techniques and number of samples that will be collected at each SWMU are described in Section 4.0 of the Work Plan. Table A-1 in the FSAP summarizes the types of field work that will be performed at each SWMU and references the section in the FSAP that describes the field procedures which will be used.

TABLE A–1
SUMMARY OF FIELD WORK FOR CERCLA SITE INSPECTIONS OF FIFTEEN SOLID WASTE MANAGEMENT UNITS

	GEOPHYSICAL SURVEYS					SOIL SAMPLING												
SEAD NO.	UXO CLEAR. (3.1) 1	SEISMIC REFRACT. (3.2.1)	GPR (3.2.3)	EM–31 (3.2.2)	SAMPL. ANOM'S (3.2.4)	BORINGS (3.3.2)	TEST PITS (3.3.3) 2	SURF. SOIL (3.3.4)	MONITOR WELL (3.4 & 3.5)	SURF. WATER (3.6.2)	SEDI–MENT (3.6.3)	BERM EXCAV–ATIONS (3.3.3)	PROPL'NT & OTHER MAT'LS (3.8)	WASTE MGMT. (3.8)	COMP–OSITE (4.1)	SAMPLE PRESERV. (4.2)	SAMPLE STORGE (4.3)	DECON. (4.4)
5		X					X		X					X		X	X	X
9		X	X	X	X	X	X		X					X		X	X	X
12A		X	X	X	X	X	X		X	X	X			X		X	X	X
12B		X	X	X	X	X	X		X					X		X	X	X
43, 56, & 69	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X	X
44A	X	X						X	X	X	X	X	X	X	X	X	X	X
44B	X	X						X		X	X		X	X		X	X	X
50		X						X		X	X			X		X	X	X
58		X	X	X	X	X	X	X	X	X	X			X		X	X	X
59		X	X	X	X	X	X		X					X		X	X	X
60		X				X			X	X	X			X		X	X	X
62		X	X	X	X		X							X		X	X	X

TABLE A-1

SUMMARY OF FIELD WORK FOR CERCLA SITE INSPECTIONS

OF FIFTEEN SOLID WASTE MANAGEMENT UNITS

	GEOPHYSICAL SURVEYS					SOIL SAMPLING												
SEAD NO.	UXO CLEAR. (3.1) 1	SEISMIC REFRACT. (3.2.1)	GPR (3.2.3)	EM-31 (3.2.2)	SAMPL. ANOM'S (3.2.4)	BORINGS (3.3.2)	TEST PITS (3.3.3) 2	SURF. SOIL (3.3.4)	MONITOR WELL (3.4 & 3.5)	SURF. WATER (3.6.2)	SEDI-MENT (3.6.3)	BERM EXCAV-ATIONS (3.3.3)	PROPL'NT & OTHER MAT'LS (3.8)	WASTE MGMT. (3.8)	COMP-OSITE (4.1)	SAMPLE PRESERV. (4.2)	SAMPLE STORGE (4.3)	DECON. (4.4)
63		X	X	X	X	X	X		X	X	X			X		X	X	X
64A		X	X	X	X	X	X		X					X		X	X	X
64B		X	X	X	X	X	X		X	X	X			X		X	X	X
64C					X		X		X 3					X	X	X	X	X
64D		X	X	X	X	X	X	X	X					X		X	X	X
67		X	X	X	X		X		X	X	X			X		X	X	X
71		X	X	X	X	X	X		X	X	X			X		X	X	X
72		X	X		X		X		X					X	X	X	X	X

NOTES:
1. Section of the Field Sampling and Analysis Plan that pertains to this subject.
2. Test pits include waste pile samples and test pits.
3. No well installations at this SWMU, only sampling of existing wells.

Performance of the tasks described herein require adherence to health and safety procedures defined in the Health and Safety Plan provided in Appendix B. Addenda to the Site Health and Safety Plan will be developed, as may be necessary, for specific field data collection tasks.

The pre-field activities include the following:

1. A site inspection to familiarize key project personnel with site conditions and finalize direction and scope of field activities,
2. A comprehensive review of the Health & Safety Plan with field team members to insure that the hazards that might occur and preventive and protective measures for those hazards are completely understood,
3. An inspection of all equipment necessary for field activities to insure proper functioning and usage, and
4. A comprehensive review of sampling and work procedures with field team members.

2.0 PRESAMPLING CONSIDERATIONS

2.1 COMMUNICATIONS

Personnel responsible for the design and/or implementation of field sampling activities are encouraged to establish and maintain close communications with personnel responsible for the performance of chemical, physical, or biological characterization activities. Development of open communication between these two parties can provide an important conduit via which information relevant to the representativeness, integrity, and quality of the sample can be transferred. For example, laboratory personnel can be an important source of information and materials that are essential to ensure that samples are properly preserved at the time of their collection. Laboratory personnel can also assist sampling personnel with the definition of sample volume and number of sample aliquots that are required to complete the analyses of interest. Furthermore, laboratory personnel should also assist program management and field personnel with the definition of analytical procedures used to quantify the pollutants of concern to ensure that suitable procedures with appropriate detection limits are specified. Field personnel should provide laboratory personnel with advance notification of sample shipment to minimize the period of time between sample collection and analysis. Furthermore, this mechanism can be used to advise laboratory personnel of unusual properties exhibited by samples as they were being collected. Finally, the establishment of open communications between field and laboratory personnel can facilitate implementation of managerial decisions to refocus the emphasis or extent of certain investigations.

Specifically, field personnel are responsible for the following:

1) daily communication with the project manager to advise of the project status;
2) communication with the laboratory prior to and during sampling of sediment, soil, and water; and
3) communication with subcontractors, the frequency of which is to be determined by the project manager.

2.2 SAMPLE INTEGRITY ISSUES

The selection and use of suitable sample containers is an important facet of any field sampling and analysis project. Storage of samples in unsuitable containers can lead to sample loss, sample contamination, and/or sample degradation, each of which has direct implications on the representativeness, and therefore the utility of the data that is ultimately reported.

Prior to the initiation of field work, project personnel will familiarize themselves with sample bottle, storage, and packaging requirements and recommendations. Specific issues that will be reviewed include analytical sample size requirements, sample bottle type, sample preservation requirements, and holding times between collection and analysis. Sources of this information include conversations with laboratory personnel and review of analytical methodology descriptions provided in any of numerous reference sources, such as those listed in SW-846.

Once familiar with sample packaging and preservation requirements, project personnel will obtain the necessary sample bottles and transport containers as well as essential preservative chemicals and supplies. Frequently, sample bottles and transport containers can be obtained directly from the laboratory where the subsequent analyses will be completed; although outside vendors of these materials should also be considered. In either case, it is important to insure that all containers are suitably precleaned, dried, capped, and stored prior to their use for holding samples. Whenever the integrity of any sample container is suspect, due to presence of foreign liquids or debris or due to conditions of suspected or known incomplete container closure, the sample container will not be used and recleaned prior to use.

Sample preservation will be completed immediately after the collection of the required sample volume. Frequently, sample preservation includes the performance of some field determination (e.g., pH measurement), the addition of a small quantity of a chemical preservative to the sample, the closure of the sample container and its placement in a container (e.g., ice chest) where a controlled environment (4° C or room temperature) has been established. Alternatively, some subset of the listed steps may be required. Regardless of the level of sample preservation required, it is imperative that required procedures be implemented immediately at the time of sample collection.
More complete discussions of sample bottle preparation, sample preservation, sample storage, and packaging and shipping are presented in Sections 4 and 5 of this appendix.

2.3 QUALITY CONTROL SAMPLES

Four types of quality control samples will be produced and submitted to the laboratory as a result of each field study: Trip Blanks, Field or Equipment Blanks, Field Duplicates, and Matrix Spike/Matrix Spike Duplicates. All water used for trip blanks, field equipment rinse blanks and the final rinse in the decontamination procedure will be demonstrated as analyte-free. Distilled water from a local water distributor will be chemically analyzed before field work begins to demonstrate it is analyte-free. Then this water will be used throughout the fieldwork. Descriptions of these samples are presented below.

<u>Trip Blank:</u> This sample is used to determine whether contaminants are being introduced to field samples due to improper laboratory procedures, poor container precleaning operations or due to conditions encountered during transport. Trip blanks will be prepared only for volatile organic compound analyses of only groundwater and surface water samples.

A volatile organic analysis trip blank is prepared by filling a precleaned screw cap septum vial with demonstrated analyte-free water, preserving it as described in the Chemical Data Acquisition Plan, sealing the vial, and placing it into the transport chest with other empty bottles. This sample is transported to the field, where it remains stored with the empty sample bottles until those bottles are used. Trip blanks will accompany shipments of aqueous samples for volatile organic analysis. Then the trip blank is stored with the samples until they are analyzed at the analytical laboratory. Typically one trip blank is provided for each day of anticipated field sample collection.

<u>Field (Equipment) Blank</u>: This sample is used to determine whether field sampling (decontamination and sample collection) procedures or the environment of the job site are possible sources of contaminant introduction. Generally, one field blank sample is prepared each day for each matrix obtained that day and submitted for the same analyses requested that day. In the field, demonstrated, analyte-free water is poured into the sampling device, and then transferred to the sample container using the same procedures as used to collect the sample.

<u>Field Duplicate</u>: Field duplicates are used to provide an estimate of the precision of field sampling and analytical procedures. A field duplicate sample is defined as two samples that are collected simultaneously from one location. Duplicate samples will each have unique sample numbers, and they will be analyzed separately as two unknowns within the laboratory. Information denoting the true identify of each duplicate will be recorded in the field notebook. One field duplicate for every increment of 20 field samples or less will be collected.

Matrix Spike/Matrix Spike Duplicate:

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to evaluate the precision and accuracy of the analytical methods used by the laboratory. MS/MSD samples are collected using the same procedures as a field duplicate. The extra bottles that will be used for MS and MSD analyses will be labeled the same as the sample. A note will be added to the Chain-of-Custody form that this sample will be used for MS and MSD analyses. One set of MS/MSD samples will be obtained for every 20 samples of each matrix obtained.

2.4 SAMPLE NUMBERING SCHEME

A uniform sample numbering scheme will be used to be certain that each sample has a unique number. The Site Manager will ensure that the sample numbering scheme is followed in the field so that site workers do not duplicate numbers. The general components of the numbering scheme are 1) matrix, 2) SWMU #, 3) location # and 4) sample #.

The general numbering scheme will be as follows:

Matrix - SWMU # - Location #. Sample #

Where: Matrix is either SB = Soil Boring
MW = Monitoring Well
SW = Surface Water
SD = Sediment;
SS = Surface Soil
TP = Test Pit
BE = Berm Excavation

SWMU # is identified according to the assigned SEAD number (e.g., SEAD-4);

Location # is identified consecutively beginning with 1 for each matrix type; and

Sample # is identified consecutively beginning with .1 for each location.

For borings, the depth interval for soil samples will be recorded in a field logbook along with the corresponding sample number. The distance from shore, water depth, sample depth range, and sample number will be recorded for surface water and sediment samples.

3.0 FIELD OPERATIONS

The proposed field operations for the SWMUs area will consist of the following major tasks:

1. Unexploded Ordnance (UXO) Survey
2. Geophysical Survey
3. Surface and Subsurface Soil Sampling
4. Monitoring Well Installation, Development and Sampling
5. Surface Water and Sediment Sampling

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

3.1 UNEXPLODED ORDNANCE CLEARANCE

3.1.1 Objectives

An unexploded ordnance (UXO) survey will be conducted in areas suspected of containing UXOs that will be accessed by field personnel during the conduct of this Work Plan. The UXO survey will consist of:

- Hand-held magnetometry surveys of access routes and areas of SWMUs where field personnel and equipment will be performing field work.
- Flagging suspected UXOs and limits of cleared access routes and sampling routes.
- Down-hole magnetometry surveys during drilling in areas suspected to contain UXOs.

3.1.2 UXO Clearance Procedures

An electromagnetic (active all-metals) induction detector and a passive ferrous metals detector will be used to search the access routes and sampling areas. The hand held magnetometers and a description of their operation are listed below:

1. Electromagnetic (Active All-Metals) Induction Detectors

Active locators, as a class, generate a magnetic field. Their detection ranges are determined by the strength of their magnetic field, the attenuation of the field in the soil, the size and makeup of the items being sought, and the amount of conductive clutter in the search area. These factors tend to limit active detection ranges to three (3) feet or less, depending on the search instrument. A major advantage to this type of detector is its all metals capabilities. These instruments are capable of detecting ordnance constructed of both ferrous and nonferrous metals. Active locators can affect UXO fuses; therefore it is necessary to have some knowledge of the types of ordnance and their fuzing systems that may be encountered within the search area. The U.S. military currently utilizes locators that employ the multiple-coil, balanced bridge, and phase-imbalance types of active locators.

The active all-metals magnetometer that will be used is the White's Eagle II SL 90. The White's Eagle II SL 90 is able to detect a 75 to 81 mm projectile at a depth of 1.5 to 2 feet. There are many environmental considerations that can affect the depth of detection (magnetic signatures), i.e., soil characteristics (minerals and salts present), type of metal being detected, size of the metal object, orientation of the object (vertical or horizontal to the linear axis of the object), metallic contamination of the site (wide spread fragmentation), and the capabilities of the detector. Activities such as earth removal and tree grubbing can also change the magnetic signatures in the earth. With all factors taken into consideration, there are no iron clad measurements regarding the sizes of UXOs or depths at which they can be detected.

2. Passive Ferrous Metals Detector

Passive ferrous metal detectors detect anomalies in the earth's magnetic field which are produced by ferromagnetic (ferrous metal) targets. Generally passive locators respond to either: 1) the magnitude of the magnetic field strength (Proton-Precession) or 2) the gradient or rate of change of the field (Fluxgate). The detection ranges of passive locators are dependent on the resolution of the device, the magnetic features of the search area, magnetic features of the item being located, and the search technique being used (i.e., continuous sweep or grid mapping). The standard passive magnetometers in use today to detect ordnances are of the Fluxgate and the Proton-Precession types.

The passive ferrous metal magnetometers that will be used are the Mk 26 Mod 0 Ordnance Locator (Forster Ferex 4.021) and the Schonstedt Model GA-52B.

Extreme care for the personnel and equipment entering the site's sampling areas is required at certain SWMUs where ordnances and UXOs are likely to be present. Some of these items have been exposed to fire or explosions and because of this, any of these items which are still explosively loaded are extremely hazardous. The active all-metals and passive detectors will be used to search the access routes and sampling sites for hazardous items.

Depending upon the object size, physical properties (ferrous or nonferrous) and depth of burial, large non-ordnance metal objects may also be located and marked on the SWMU areas. Excavation to determine the identification of these items will be performed as needed to complete the study of the ten SWMUs (See Section 3.3).

UXOs will not be moved unless absolutely necessary. A qualified SEAD UXO removal team will be required to move and properly dispose of any UXOs.

All UXOs that can be safely moved and must be moved, will be moved remotely. Under no circumstances will any of the following items be moved (remotely or otherwise) by EOD personnel:

1. UXO with a point initiating base detonating-lucky (PIBDL) fuse
2. UXO with a Mechanical Time fuse
3. UXO with an All-Ways-Acting fuse
4. UXO with a Cocked Strike fuse
5. UXO with a Graze Back Up fuse
6. Any UXO with a fuse system that cannot be identified.

3.1.3 Downhole Magnetometry Survey

Specialized techniques such as down hole magnetometry can also be performed. If manual operation of the soil boring equipment is performed, rechecks of the bore hole at two (2) foot intervals until virgin soil is encountered will be performed. If remote drilling procedures are employed, no additional checks of the site are required after the initial active all-metals and passive ferrous metals inspection of the sampling site have been performed.

3.1.4 Flagging Suspected UXOs and Cleared Areas

All UXOs discovered during the survey will be marked with yellow flags. Cleared access routes and work areas will be outlined with orange flags. Field personnel will not go outside the delineated cleared areas.

3.1.5 Data Verification

Data verification for UXO clearance will be an ongoing process during the clearance of the access routes and sampling areas with the main emphasis being the location of hazardous UXOs and components.

3.2 GEOPHYSICAL SURVEYS

3.2.1 Seismic Refraction

3.2.1.1 Objectives

Seismic refraction surveys will be performed at all the SWMUs to determine the direction of groundwater flow by measuring the depth to the water table. These data, along with land topographic information, will be used to more accurately locate the up and downgradient monitoring wells.

3.2.1.2 Field Procedures

3.2.1.2.1 Survey Line Layout

Two perpendicular seismic refraction transects will be laid out at each site. The shot point locations along each profile will be located using a metal tape and marked with spray paint or flagging. These shot point locations will be used to define each individual seismic spread. The seismic data will be collected using an industry standard 12 or 24 channel signal enhancement seismograph.

The geophone cable will be laid out along each profile using the shot point locations described above. In grassy areas, the geophones will be coupled to the ground using 3 inch metal spikes that are attached to the base of the geophone. When the geophones are to be placed on asphalt or concrete, small metal base plates will replace the metal spike on each geophone. The geophones placed on asphalt or concrete will be weighted down using small 2 to 3 pound sand bags to improve overall coupling with the ground and to help minimize background noise levels. Geophone spacings will be held at 5 foot intervals throughout the survey.

Once the seismograph setup is complete and data collection is ready to commence, the background noise level at each geophone location will be monitored. The background noise is displayed on the seismograph CRT as a series of moving bars, the amplitude of which is proportional to the background noise level. This review provides information on ambient noise levels, while also highlighting geophones that may be malfunctioning. Geophones that display a high level of noise will be moved or have their placement adjusted.

3.2.1.2.2 Seismic Energy Source

An impact or dropped weight will be used as the seismic energy source. Due to the shallow nature of the water table (i.e., generally less than 10 feet in depth) a low energy source will be sufficient to accurately image the water table surface.

3.2.1.2.3 Data Collection

Three shots will be fired for each geophysical spread located at the spread ends and spread center. A paper copy of each seismic record will be made in the field. Each record will be reviewed for quality to insure that adequate signal to noise levels were present for the shot. Upon initial acceptance, a preliminary velocity analysis will be performed in the field to define the subsurface structure along each spread. This preliminary review will focus on determining if the water table surface has been properly resolved. Upon final acceptance of each shot, the seismic record will be annotated to identify the transect number, the spread number, the shot point number, and the shot point location.

After each record is reviewed, accepted, and annotated, the data collection procedure is repeated for the remainder of the shot points for each spread.

3.2.1.2.4 Surveying

Subsequent to the seismic data collection, a survey will be performed to provide X,Y,Z station information for the seismic shot point locations to $\pm$ 1.0 feet horizontally and $\pm$ 0.1 feet vertically. These data will be used during seismic data reduction and seismic modeling.

3.2.1.3 Data Reduction

3.2.1.3.1 First Break Analysis

The seismic refraction method relies upon the analysis of the arrival times of the first seismic energy at each geophone location to provide details about the subsurface geology. The time when the seismic energy arrives at each geophone location is referred to as the first break. Each seismic record will be reviewed, both using the seismograph CRT and the paper records, to determine the first breaks at each geophone. This analysis will be preliminarily performed in the field with the data checked after the completion of the field program. These first break data values will be tabulated and used to create time-distance plots as described below.

3.2.1.3.2 Time-Distance Plots

For each seismic spread, a graph will be made of the first break determinations for all of the spread shot points. These graphs will display, in an X-Y plot, the first breaks (time) versus the geophone locations (distance). These time-distance plots form the basis of the geophysical interpretation.

3.2.1.3.3 Velocity Analysis/Layer Assignment

The time-distance plots will be individually analyzed to assign each first break arrival to an assumed layer within the subsurface. It is estimated that up to four distinct seismic layers may exist at the site. These include the unsaturated and saturated surficial deposits, the weathered bedrock, and the competent bedrock. In general, these various layers can be grouped into broad ranges of seismic velocities. As an example, unsaturated deposits will generally have a seismic velocity of less than 2,500 feet per second. By comparison, the saturated deposits should have seismic velocities in the range of 4,500 to 5,500 feet per second.

The time-distance plots will be interpreted to yield the velocity distribution within the subsurface. Each first break arrival will be assigned to one of the above mentioned layers. This velocity analysis and layer assignment will form the basis for the data files to be used during the seismic modeling.

3.2.1.4 Data Interpretation

3.2.1.4.1 Computer Processing

Once the first break analysis and layer assignments are complete, input seismic data files will be created for use in the seismic modeling software. The input files include all of the information pertaining to the spread geometry, shot point locations and depths, first break arrivals, and layer assignments. The elevation data will also be input into the computer files. The computer program, SIPT (Scott, 1977)[1] will be used to model the seismic data. This is discussed further in the following sections.

3.2.1.4.2 Computer Modeling

The computer program SIPT will be used to model the seismic refraction data. SIPT is an interactive computer program developed by the United States Geological Survey for the inverse modeling of seismic refraction data. This program uses input seismic refraction data to create two-dimensional cross-sectional models of velocity layering within the subsurface. The program uses the delay time method to produce a first approximation of the subsurface velocity layering. This approximation is then refined through the use of iterative ray tracing and model adjustment to minimize the differences between field measured first arrival times and the forward modeled raypath times. The program also provides various levels of velocity analyses that will be reviewed to provide diagnostic information on the model solutions.

3.2.1.4.3 Interpretation

The results of the computer modeling will be reviewed with the known geology of the site. The subsurface velocity layering will be attributed to known or expected geologic units. A detailed analysis will be made of the velocity distribution of the upper, unsaturated materials to ensure that,

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1 J.H. Scott. SIPT - A Seismic Refraction Inverse Modeling Program for Time Share Terminal Computer Systems. U.S. Geological Survey, Open File Report 77-366, 1977.

near surface low velocity materials are not adversely affecting the data quality and interpretation. The velocity distribution within the bedrock will also be reviewed to provide information on the presence and degree of weathering and to identify any lithologic or fracture related changes within the bedrock.

3.2.1.4.4 Seismic Cross-Sections

Based upon the seismic refraction data and the logs from the various monitoring wells, two seismic cross-sections will be generated for each SWMU. These cross-sections will show the land surface elevation and the elevation of the water table and bedrock surfaces. If the presence of other geologic units is determined from the seismic data, these will also be shown. The locations of bedrock piezometers, along with the stratigraphic information derived from them, will be shown on these cross-sections.

3.2.2 Electromagnetic (EM-31) Survey

3.2.2.1 Objectives

Electromagnetic (EM-31) surveys will be performed at the SWMUs listed in Table A-1 during this ESI. The objectives of the EM-31 surveys will be to delineate waste boundaries, identify the location of buried metallic objects, and identify the locations of old disposal pits. The specific objectives for each SWMU are presented in Section 4.0 of the Work Plan. The EM-31 method will always be employed in conjunction with Ground Penetrating Radar (GPR) surveys so as to provide significant redundancy during the geophysical investigations.

3.2.2.2 EM-31 Survey Procedures

The electromagnetic data at each SWMU will be collected using both grid and profile based surveys. In general, the grid based surveys will use either a 10 foot by 10 foot or 20 foot by 20 foot grid spacing. Refer to the individual SWMU descriptions in Sections 5 for the grid spacing details. The corners of the geophysical survey grids will be established using a registered NY State land surveyor. The individual EM-31 survey lines and station locations will be established using both hip chains and hand held compasses.

At all of the SWMUs where EM-31 data will be collected, a data logger will be used to record the individual electromagnetic readings. Both the in-phase and quadrature components of the electromagnetic field will be measured and recorded. These data will in turn be stored on a computer and printed out at the end of each field day. For each SWMU where EM-31 data is to be collected, a calibration area, free of cultural interference, will be established. The EM-31 response will be measured at this area at the start of each day. This check will be made to insure that no significant meter drift is occurring during each survey.

3.2.2.3 Data Interpretation

Upon completion of each electromagnetic survey, the data will be presented in both profile and contour form. Both the in-phase and quadrature components will be plotted. This multiple presentation format will aid in the interpretation of the data. All of these presentation aids will be interpreted to identify the locations of buried metallic objects, disposal pits, waste boundaries, and areas of elevated subsurface soil apparent conductivities. These data will be compared to the results of the GPR surveys to provide as complete and accurate interpretation of the subsurface conditions at each SWMU as possible.

3.2.2.4 Data Verification

The EM-31 instrument is calibrated by the manufacturer. This calibration can be rechecked in the field but this requires that access to highly resistive rock outcrops are available. A secondary field calibration is performed on a daily basis to insure repeatability of measurements and to check against daily meter drift. This field calibration is the only performance evaluation that is performed on these instruments. The EM-31 data will be collected at each SWMU to evaluate only relative variations in subsurface conductivities. The absolute terrain conductivity is not required since the individual SWMU objectives are to identify relative variations in subsurface conditions associated with waste boundaries, buried metallic objects, etc. During the individual SWMU surveys, up to five station repeats will be performed on a daily basis so as to qualitatively evaluate the overall data repeatability.

3.2.3 <u>Ground Penetrating Radar (GPR) Survey</u>

3.2.3.1 Objectives

A GPR survey of selected areas within a SWMU will be conducted to locate buried structures (i.e., buried or filled-in pits, trenches, disposal areas) and obtain more information on anomalies detected during the EM-31 surveys. GPR can also identify the original ground surface beneath berms.

3.2.3.2 GPR Survey Procedures

The GPR instrument will be hand operated on the areas at each SWMU identified in Section 4 of the Work Plan. As the equipment is pulled across the site, the reflected radar pulses are transmitted to the receiver unit where they are converted to analog signals. The analog signal is transmitted to the control unit where the signal is electronically processed and sent to the graphic recorder. The graphic recorder produces a continuous chart display on electro-sensitive paper. This real-time display enables the operator to interpret the data on site.

3.2.3.3 Data Verification

Data from the GPR survey will be verified when subsurface explorations are performed to identify anomalies and penetrate through disposal pits.

3.2.4 Exploration of Subsurface Geophysical Anomalies

3.2.4.1 Objectives

Exploration of subsurface geophysical anomalies will be performed to verify the data obtained during the GPR and EM-31 surveys.

3.2.4.2 Excavation Procedures

Several of the fifteen SWMUs that are the subject of this Work Plan (SEAD 43, 56, 69 and SEAD 44A and B) are areas suspected of containing UXOs. Only those SWMUs that potentially contain UXOs will be investigated by a UXO technician with the aid of UXO Safety Officer and UXO Project Leader. All SMWUs not suspected of containing UXOs will have excavations performed without the aid of UXO personnel.

The excavations will be performed using a backhoe with a smooth-edged bucket operated by a UXO technician. At no time will non-UXO personnel be permitted on the excavation site until they are cleared to enter by the UXO Safety Officer. The excavation will extend to a distance of two feet on either side of the subsurface anomaly. The width, length, and depth will be based on the size of the geophysical anomaly with applicable considerations for prevailing conditions such as flooding or stability of the excavation. Based on consultation with the Engineering-Science Project Leader, UXO Project Leader, and UXO Safety Officer, the final depth of excavation will be decided. The boom and bucket of the backhoe will be operated in such a manner as to not exert impact or shock to the soil or its contents. The depth of the excavation increment (not to exceed two feet) will be at the discretion of the UXO Safety Officer. The contents of each bucket of material removed from the excavation will be gently placed on the ground and spread out to expose the contents as much as possible for a visual inspection. If at any time during the excavation, the UXO Safety Officer determines the risks and hazards are too great to proceed with the excavation, the excavation will be halted. The UXO Safety Officer has absolute and final authority in determining the procedures and safety issues associated with the excavation. All SWMUs not suspected of containing UXOs will be investigated without the aid of UXO personnel.

The excavation will be continuously monitored with a PID or OVM. At no time will any personnel be permitted to enter the excavation. If the pit is not closed immediately after any samples have been obtained, the excavation will be barricaded to prevent accidental entry by personnel working on the site. Each excavation will be marked after closure as needed for identification of the site.

A log containing the location of each excavation will be maintained by the UXO team. The log will include the excavation number, location, items observed (such as UXOs or drums), and other significant data. Records pertaining to sampling, geological data and associated requirements will be maintained by Engineering-Science as described in Section 3.3.3 of this appendix.

Due to the potential hazards associated with the excavations, when necessary, the UXO contractor will obtain samples for Engineering-Science in accordance with the sample collection procedures described in Section 3.3.3 of this appendix. The excavation equipment will be cleaned between excavation sampling operations in accordance with decontamination procedures outlined in Section 4.4 of this appendix.

3.3 SOIL SAMPLING

3.3.1 Objectives

Surface and subsurface soil samples will be obtained to determine the nature and extent of contamination within and around each SWMU; and establish background levels in similar soils.

3.3.2 Boring Techniques

Hollow stem augers will be used to drill each boring. Generally, the borings will be to refusal which will represent the depth the competent bedrock.

Remote drilling operations may be required at some of the SWMUs due to the potential presence of unexploded ordnance. Drilling procedures could involve the manual set up of the augers and split spoons, remote augering, remote driving of the split spoon and manual retrieval of the split spoon sample.

Soil samples will be collected continuously during the boring using a standard two-inch diameter, two-foot long carbon steel split spoon barrel. Soil samples will be screened for volatile organic compounds using a PID or OVM and for radioactivity with a radiation meter. Three of the samples from each boring will be selected for chemical analysis: 1) 0 to 12 inches below grade; 2) immediately above the water table; and 3) midway between samples (1) and (2). The intermediate sample will be collected at a depth where one of the following site specific items occurs: (1) a stratigraphic change such as the base of the fill, (2) evidence of perched water table, (3) elevated photoionization detection (PID) readings, or (4) visibly affected soil (e.g., oil stains). If none of these occur, then the intermediate sample will be collected at the halfway point between the samples collected at the surface and at the water table. If intermediate split spoon samples exhibit elevated PID readings, the one with the highest concentration will be the one intermediate sample to be analyzed. Each of these samples will be submitted for chemical testing for parameters identified in the Chemical Data Acquisition Plan. Samples to be analyzed for volatile organic compounds will be collected first in two 40 ml vials with septum seals. The remaining soil from the spoon will be mixed in a decontaminated stainless steel bowl with a decontaminated stainless steel utensil and placed in appropriate sample containers.

All borings will be logged using a standardized boring log form (Figure A-1). 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,

OVERBURDEN BORING REPORT

ENGINEERING-SCIENCE, INC.	CLIENT:	BORING NO.:

PROJECT:

LOCATION:

JOB NO.	
EST. GROUND ELEV.:	
START DATE:	
FINISH DATE:	
CONTRACTOR:	
DRILLER:	
INSPECTOR:	
CHECKED BY:	
CHECK DATE:	

DRILLING SUMMARY:

DRILLING METHOD	HOLE DIA	DEPTH INT	SAMPLER SIZE	SAMPLER TYPE	HAMMER TYPE	HAMMER WT/FALL

DRILLING ACRONYMS:

HSA	HOLLOW-STEM AUGERS	HMR	HAMMER	SS	SPLIT SPOON
DW	DRIVE-AND-WASH	SHR	SAFETY HAMMER	CS	CONTINUOUS SAMPLING
MRSLC	MUD-ROTARY SOIL-CORING	HHR	HYDRAULIC HAMMER	5I	5 FT INTERVAL SAMPLING
CA	CASING ADVANCER	DHR	DOWN-HOLE HAMMER	NS	NO SAMPLING
SPC	SPIN CASING	WL	WIRE-LINE	ST	SHELBY TUBE
				3S	3 INCH SPLIT SPOON

MONITORING EQUIPMENT SUMMARY

INSTRUMENT TYPE	DETECTOR TYPE/ENERGY	RANGE	BACKGROUND READING	BACKGROUND TIME	BACKGROUND DATE	CALIBRATION TIME	CALIBRATION DATE	WEATHER

MONITORING ACRONYMS

PID	PHOTO - IONIZATION DETECTOR	BGD	BACKGROUND	DGRT	DRAEGER TUBES
FID	FLAME - IONIZATION DETECTOR	CPM	COUNTS PER MINUTE	PPB	PARTS PER BILLION
GMD	GEIGER MUELLER DETECTOR	PPM	PARTS PER MILLION	MDL	METHOD DETECTION LIMIT
SCT	SCINTILLATION DETECTOR	RAD	RADIATION		

COMMENTS:

OTHER REPORTS	DATE/PENDING	N/A
WELL DEVELOPMENT		
SURVEYOR		
CORE LOG		
WELL INSTALLATION DETAILS		
HYDRAULIC TESTING		
GEOPHYSICAL LOGGING		

 SEE MASTER ACRONYM LIST FOR COMPLETE LISTING OF ABBREVIATIONS

OVERBURDEN BORING REPORT

ENGINEERING-SCIENCE, INC.	CLIENT:	BORING #:

MONITORING				COMMENTS:	
INSTRUMENT	INTERVAL	BGD	TIME		DRILLER:
					INSPECTOR:
					DATE:

DEPTH (FT)	SAMPLING: BLOWS PER 6 INCHES	SAMPLING: PENETRATION RANGE (FEET)	SAMPLING: RECOVERY RANGE (FEET)	SAMPLE: DEPTH INT (FEET)	SAMPLE: NO.	SAMPLE: VOC	SAMPLE: RAD SCRN	SAMPLE DESCRIPTION (As per Burmeister: color, grain size, MAJOR COMPONENT, Minor Components with amount modifiers and grain-size, density, stratification, wetness, etc.)	USCS CLASS	STRATUM CLASS
5										
10										
15										
20										

 SEE MASTER ACRONYM LIST FOR COMPLETE LISTING OF ABBREVIATIONS BORING #:

ver. 08-Oct-92 OBBORP2.WK1

6. Length of each recovered sample,
7. Depth of all stratigraphic changes,
8. Lithologic description according to standard USCS 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,
15. Surface elevation, and
16. VOC readings of split spoon samples

After the boring is completed, it will be filled to ground surface with lean grout containing at least 3% bentonite powder by volume. If groundwater is present in the borehole, the grout will be pumped through a tremie pipe to the bottom of the boring. Grout will be pumped in until undiluted grout discharges from the boring at ground surface.

Split spoon barrels will be decontaminated as described in Section 4.4 of this appendix. Drilling augers will be steam cleaned along with other drilling equipment between boring locations.

3.3.3 Test Pitting Techniques

The primary objective of the test pitting is to provide a means for visual evaluation of subsurface soils and collection of soil samples. Test pitting will also be used to investigate anomalies discovered during the geophysical surveys.

Test pit locations will be marked in the field prior to performing the excavation. The excavations will be performed with a backhoe using a smooth edged bucket when possible. The top 6 to 12 inches of soil will be segregated so that it can be used to cover the other backfilled soils when the test pit is closed. The length and width of the excavation will be kept as small as practical to minimize the potential of exposing field personnel to hazardous conditions. If UXOs or explosives are anticipated to be present, UXO personnel will perform the excavation and obtain the soil samples. Procedures to excavate soils that may contain UXOs are described in Section 3.2.4 of this appendix. A staging area, which includes run-off containment features, will be set up for visual inspection of the soils so that soils partially contaminated with hazardous constituents are not spread out over the site. If UXOs or explosives are observed in excavated soils where they were not anticipated, the excavation will be stopped until the UXO personnel can examine the situation and recommend a course of action to the Engineering-Science Safety Officer.

The excavation will be continuously monitored by Engineering-Science with a PID. At no time will any personnel be permitted to enter the excavation. Any containers excavated from a pit containing liquid or solid substances will be overpacked and, later, tested for hazardous constituents. The test pit will be closed by backfilling the pit with the soil that was removed from it. As discussed above, the surface soils will be backfilled last. If the pit is not to be closed immediately after the required samples have been obtained, the excavation will be barricaded to prevent accidental entry by personnel working on the site. Each excavation will be marked after closure as needed for identification of the location.

A log for each test pit will be prepared to record the subsurface soil conditions, monitoring data, location of samples obtained, and other information as shown in Figure A-2. Where appropriate, photographs of the test pits will be taken.

Samples will not be collected from every test pit location. However, where applicable test pit samples will be collected using the bucket of the backhoe. The bucket will be scraped along the side of the test pit at the desired depth to allow sediment to fall into the bucket or scooped from the bottom of the test pit. The sample will be collected from the backhoe bucket with a stainless steel shovel or scoop, mixed in a stainless steel bowl, then transferred to the appropriate sample containers.

Some composite samples will be collected from test pits. To prepare soil composite samples, equal sized subsamples are placed into a decontaminated stainless steel container (e.g., bowl, pan) and thoroughly mixed. The required volume is then recovered and placed into the sample container, while the excess is discarded. Whenever possible compositing of soils should be limited to situations where dry or loosely bound (non-agglomerated) materials are present, as wet or agglomerated materials are difficult to homogenize without mechanical devices.

The excavation equipment will be cleaned between test pit excavations as described in Section 4.4 of this appendix.

Berm excavations will be performed in the same manner as test pits.

TEST PIT REPORT

ENGINEERING-SCIENCE, INC.	CLIENT:	TEST PIT #:
PROJECT: LOCATION:		JOB NUMBER: EST. GROUND ELEV. INSPECTOR: CONTRACTOR: START DATE: COMPLETION DATE: CHECKED BY: DATE CHECKED:

TEST PIT DATA

LENGTH	WIDTH	DEPTH	EXCAVATION/SHORING METHOD

MONITORING DATA

INSTRUMENT	DETECTOR	BACKGROUND	TIME/DATE

COMMENTS:

TOTAL SAMPLES:

SCALE (FT)	VOC./RAD.	SAMPLE NUMBER	SAMPLE DEPTH RANGE	STRATA SCHEMATIC	DESCRIPTION OF MATERIALS (BURMEISTER METHODOLOGY)	REMARKS
1						
2						
3						
4						
5						

SEE MASTER ACRONYM LIST FOR COMPLETE LISTING OF ABBREVIATIONS

TEST PIT #:

3.3.4 Surface Soils

Grab samples of surface soils will be obtained by removing a representation section of soil from 0 to 6 inches below ground surface. The section will have a similar cross-section over the entire depth range of the sample. Data regarding the soil sample will be recorded on the sampling record form for soils (Figure A-3). Surface soil samples will be collected with a stainless steel trowel or scoop, then placed in a stainless steel bowl. Any VOC samples will be placed in VOA vials before mixing the soil. The soil will then be mixed and placed in the remaining sample containers.

3.3.5 Health and Safety Procedures

All soil sampling will be performed in accordance with the health and safety procedures described in Appendix B of this Work Plan. At SWMUs where there is a potential for UXOs and explosives, access routes and sampling work areas will be searched by UXO personnel prior to soil sampling operations. The boundaries of the access routes will be marked with orange survey flags. All UXOs located during the search operation will be flagged with yellow survey markers.

Remote drilling and test pitting by UXO personnel will be performed at locations deemed advisable by Engineering-Science and UXO personnel.

All samples collected during the soil sampling operations at these SWMUs will be inspected by UXO personnel for small UXO components prior to on-site testing or shipment for off-site laboratory testing. In areas heavily contaminated by UXOs or UXO components, samples will be collected by UXO personnel.

3.4 MONITORING WELL INSTALLATION

This section outlines the installation of overburden monitoring wells. A hollow-stem auger will be used to drill the borings and install the overburden wells. If necessary, air rotary methods will be employed for drilling and installing the monitoring wells in bedrock.

All activities described in this procedure will be overseen by a qualified Engineering-Science geologist.

FIGURE A-3

SAMPLING RECORD – SOIL

NGINEERING – SCIENCE, INC.	CLIENT:	DATE:
PROJECT:		INSPECTOR:
LOCATION:		LABORATORY:
		SAMPLING STAFF:
		CHAIN OF CUSTODY #:

WEATHER / FIELD CONDITIONS CHECKLIST (RECORD MAJOR CHANGES)

TIME (24 HR)	TEMP (APPRX)	WEATHER (APPRX)	REL. HUMIDITY (GEN)	WIND VELOCITY (APPRX)	WIND DIRECTION (0 – 360)	GROUND / SITE SURFACE CONDITIONS

MONITORING

INSTRUMENT	DECTECTOR

SAMPLE #	DEPTH RANGE	TIME	TYPE (GRAB / COMP.)	COLOR	GRAIN SIZE	USCS CLASS	FOREIGN MAT. (Y/N)	SAMPLE DEVICE	CLEANING PROCEDURE	CONTAINER SIZE/TYPE	MON. VOC/RAD	QC SPL (Y/N)

3.4.1 Objectives

The objectives of this task are to install monitoring wells which will provide representative samples of groundwater quality in the overburden aquifer and also provide accurate determinations of piezometric head. The wells will be screened across the water table. Typical monitoring wells are shown as Figures A-4 and A-5. Based on depth to water measurements and boring logs from previous reports on the Seneca Army Depot Facility, the water table occurs within the glacial till. If the water table occurs in competent bedrock, bedrock wells will be installed.

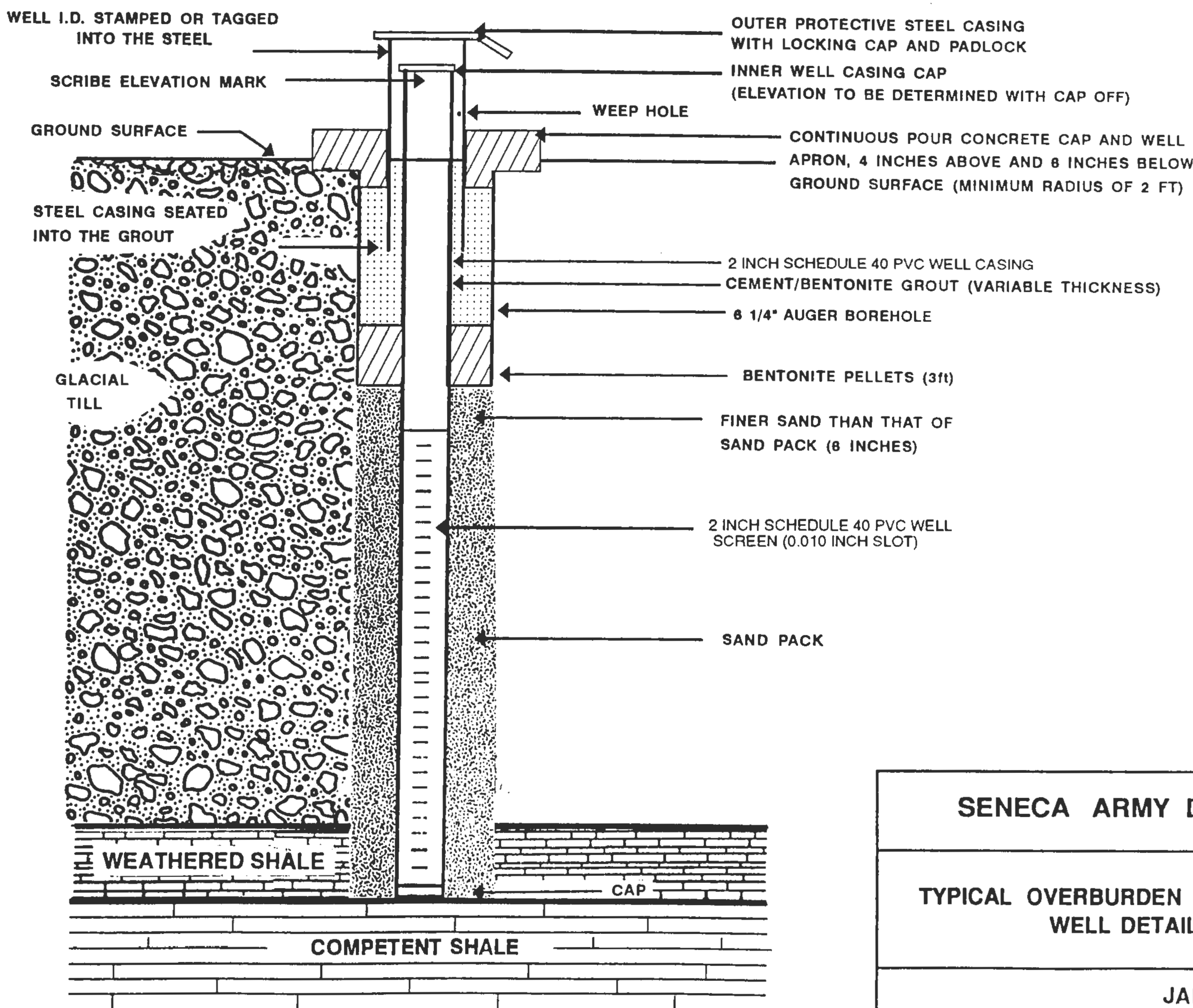
3.4.2 Decontamination of Equipment

Every appropriate precaution must be taken during drilling and construction of monitoring wells to avoid introducing contamination into the borehole. All equipment to be placed into the boring will be decontaminated before use at the site and between boreholes. Equipment must be steam-cleaned between holes and only non-chlorinated potable water may be used during drilling operations, unless otherwise approved by the NYSDEC. The manufacturers of PVC pipe immediately wrap the pipe in plastic bags after it comes off the extrusion line to protect the pipe from any contamination during storage and transport. The company who prepares the pipe for use in well construction typically slot the pipe, dust it, wash it with a mild Alconox solution, and also wrap it in plastic to protect if from contamination during storage and transport.

3.4.3 Well Installation

Proper design, construction, and installation of the proposed wells are essential for accurate interpretation of the groundwater data. The program to be implemented is consistent with the USEPA Region II CERCLA QA Manual and the NYSDEC Technical and Administrative Guidance Manuals (TAGMS) regarding design, installation, development and collection of groundwater samples. Further, the program is in compliance with all requirements described in the NYSDEC, 6 NYCRR Part 360, Solid Waste Management Facilities Regulations, Section 360-2.11, which details groundwater monitoring well requirements.

The installation of each monitoring well will begin after the boring has been completed. Only one well will be installed in each boring. Installation will begin within 48 hours for fully cased boreholes. Once installation has begun, no breaks in the installation process will be made until the well has been grouted and the drill casing removed.

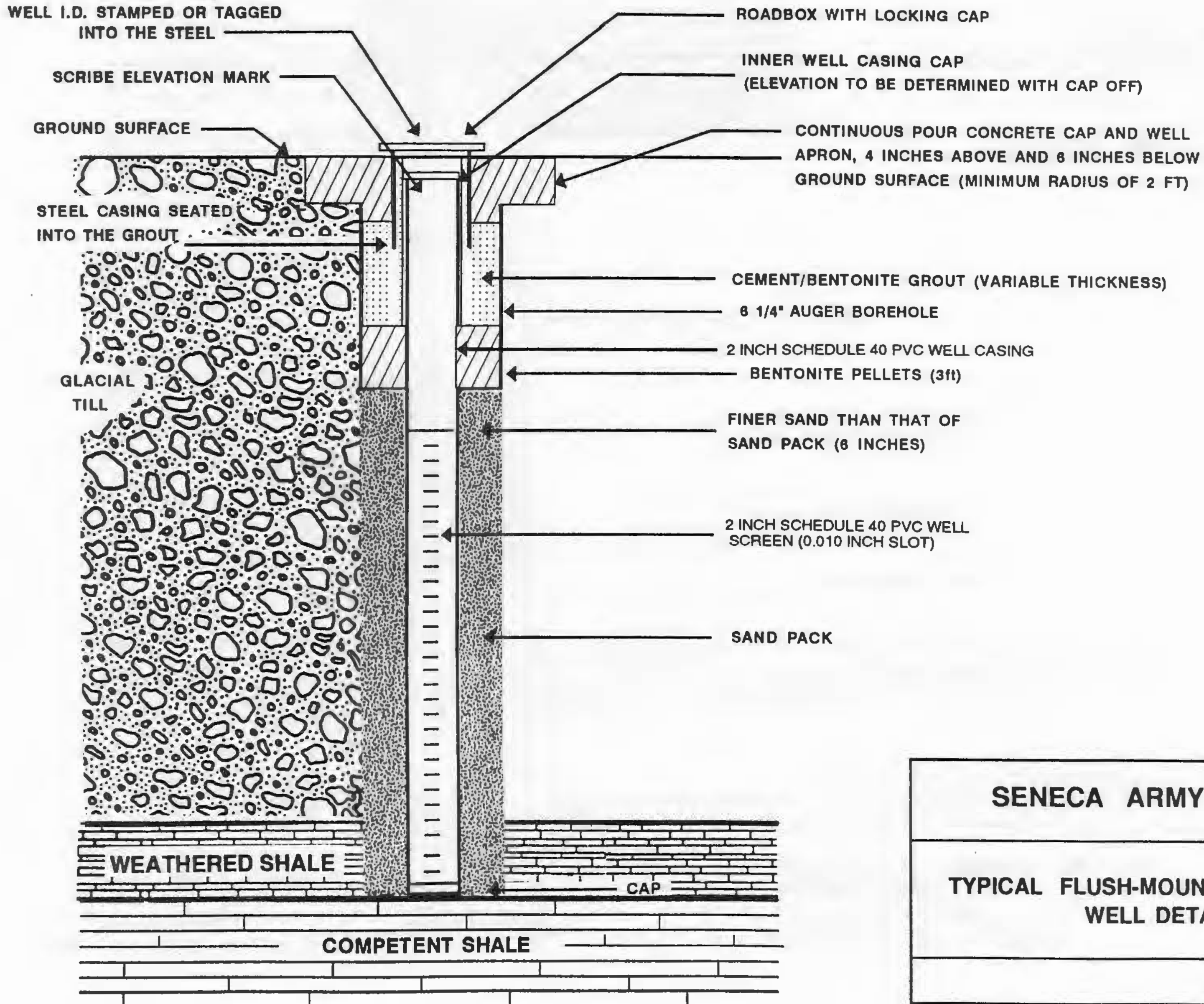


SENECA ARMY DEPOT

TYPICAL OVERBURDEN MONITORING WELL DETAIL

JANUARY 1993

FIGURE A-4



SENECA ARMY DEPOT

TYPICAL FLUSH-MOUNT MONITORING WELL DETAIL

JANUARY 1993

FIGURE A-5

Overburden wells will be installed using hollow-stem augers. These wells will be screened from 3 feet above the water table to the top of competent bedrock. Figures A-4 and A-5 illustrate typical overburden monitoring well details. Previous well logs and current fieldwork suggest these wells will not be more than 20 feet deep with well screen lengths of 15 feet or less. Soil split spoon samples will be collected continuously as the auger penetrates the formation. Soil samples will be collected as described in the soil boring program. The monitoring wells will be constructed of new 2-inch schedule 40 PVC with a screen slot size of 0.010" and threaded, flush joints.

A sand pack will be placed by a tremie pipe in the annular space between the well screen and the hollow stem auger. The sand pack will not extend more than 2 feet above the top, or 6 inches below the bottom of the screen. A finer grained sand pack material, 6 inches thick, will be placed at the top of the sand pack, between the sand pack and the bentonite seal to prevent infiltration of the bentonite into the sand pack around the well screen. A layer of bentonite pellets, up to 3 feet thick, will be used to seal the well and will be poured within the annular space. Potable water will be poured on the pellets, then the remaining annular space will be completely filled with a lean cement grout containment at least 3% bentonite an hour later after the pellets have hydrated. The grout mixture will be placed in the annular space using a tremie pipe. Augers will be removed as the grouting progresses to prevent caving.

In all instances, wells will be protected with a steel casing, at least 4 inches in diameter in untrafficed areas. This protective steel casing will extend 4 feet below the ground surface to prevent heaving by frost. The protective casing will have a locking cap and a weather resistant padlock. Duplicate keys will be obtained. A cement collar will surround the well. A weep hole will be drilled at the base of the protective steel casing above the cement collar to allow drainage of water. An expanding cap will also be placed in the top of the 304 stainless steel well casing. This cap will provide protection from inappropriate filling of the well, should the protective casing lock be broken. A permanent well identification marker will be attached to the steel protective casing.

In trafficed areas where the steel casing may be hit, a roadway box will be installed.

Where flush-mount wells are required, the surface completed protective casing will be a roadway box. The roadway box will be installed so that any surface water that collects in the box will drain out the base and not go down the well. The grout will fill the annulus to a depth equal to at least the length of the roadway box plus 6 inches. About 8 inches of silica sand will be placed on the grout. The roadway box will then be placed in the hole so that the rim of the box is at, or at most 1 inch above, ground surface. The space between the riser pipe and the borehole will be filled with silica sand to 1 foot below ground surface then filled with cement to ground surface. A locking 304 stainless steel cap will be placed on the end of the riser pipe. If the box needs to be installed underground due to earth moving operations at the SWMU, a large magnet will be placed on the roadway box cover so that it can be easily found.

The protective casings will be marked with the well number using metal stamps or paint on the pipe, not the cover. The well number will be painted on the roadway box cover and engraved on the locking 304 stainless steel cap inside the roadway box. The details of well installation will be recorded.

The well casings will be marked with the well number using metal stamps or a metal plate pop riveted to the steel casing, not to the cover.

A bedrock monitoring well may be necessary if the water table is below the surface of the competent bedrock although this is unlikely based on the conditions observed to date. The boring will be drilled using the air rotary technique to a depth that is approximately 12 feet below the groundwater table. A 15 foot screen with a slot size of 0.010 inches will be installed. The same procedures will be used to install the bedrock well as described for the overburden well.

The details of the borings will be recorded on the Test Boring Report Form shown previously as Figure A-1. Details of the well installation will be recorded on the appropriate form shown as Figures A-6 to A-9.

3.5 MONITORING WELL DEVELOPMENT AND SAMPLING

3.5.1 Objectives

The purpose of this task is to remove sediment and fines from the well and surrounding soil so that a representative sample of the groundwater can be obtained.

3.5.2 Monitoring Well Development

The development of monitoring wells will be performed 2 to 7 days after well installation and at least 7 days before well sampling and monitoring activities.

OVERBURDEN MONITORING WELL
COMPLETION REPORT & INSTALLATION DETAIL
PROTECTIVE RISER COMPLETION

ENGINEERING-SCIENCE, INC. | CLIENT: | WELL #:

PROJECT: ______ PROJECT NO: ______
LOCATION: ______ INSPECTOR: ______
CHECKED BY: ______

DRILLING CONTRACTOR: ______ POW DEPTH: ______
DRILLER: ______ INSTALLATION STARTED: ______
DRILLING COMPLETED: ______ INSTALLATION COMPLETED: ______
BORING DEPTH: ______ SURFACE COMPLETION DATE: ______
DRILLING METHOD(S): ______ COMPLETION CONTRACTOR/CREW: ______
BORING DIAMETER(S): ______ BEDROCK CONFIRMED (Y/N?) ______
ASSOCIATED SWMU/AOC: ______ ESTIMATED GROUND ELEVATION: ______

PROTECTIVE SURFACE CASING:
DIAMETER: ______ LENGTH: ______

RISER:
TR: ______ TYPE: ______ DIAMETER: ______ LENGTH: ______

SCREEN:
TSC: ______ TYPE: ______ DIAMETER: ______ LENGTH: ______ SLOT SIZE: ______

POINT OF WELL: (SILT SUMP)
TYPE: ______ BSC: ______ POW: ______

GROUT:
TG: ______ TYPE: ______ LENGTH: ______

SEAL: TBS: ______ TYPE: ______ LENGTH: ______

SAND PACK: TSP: ______ TYPE: ______ LENGTH: ______

SURFACE COLLAR:
TYPE: ______ RADIUS: ______ THICKNESS CENTER: ______ THICKNESS EDGE: ______

CENTRALIZER DEPTHS
DEPTH 1: ______ DEPTH 2: ______ DEPTH 3: ______ DEPTH 4: ______

COMMENTS:

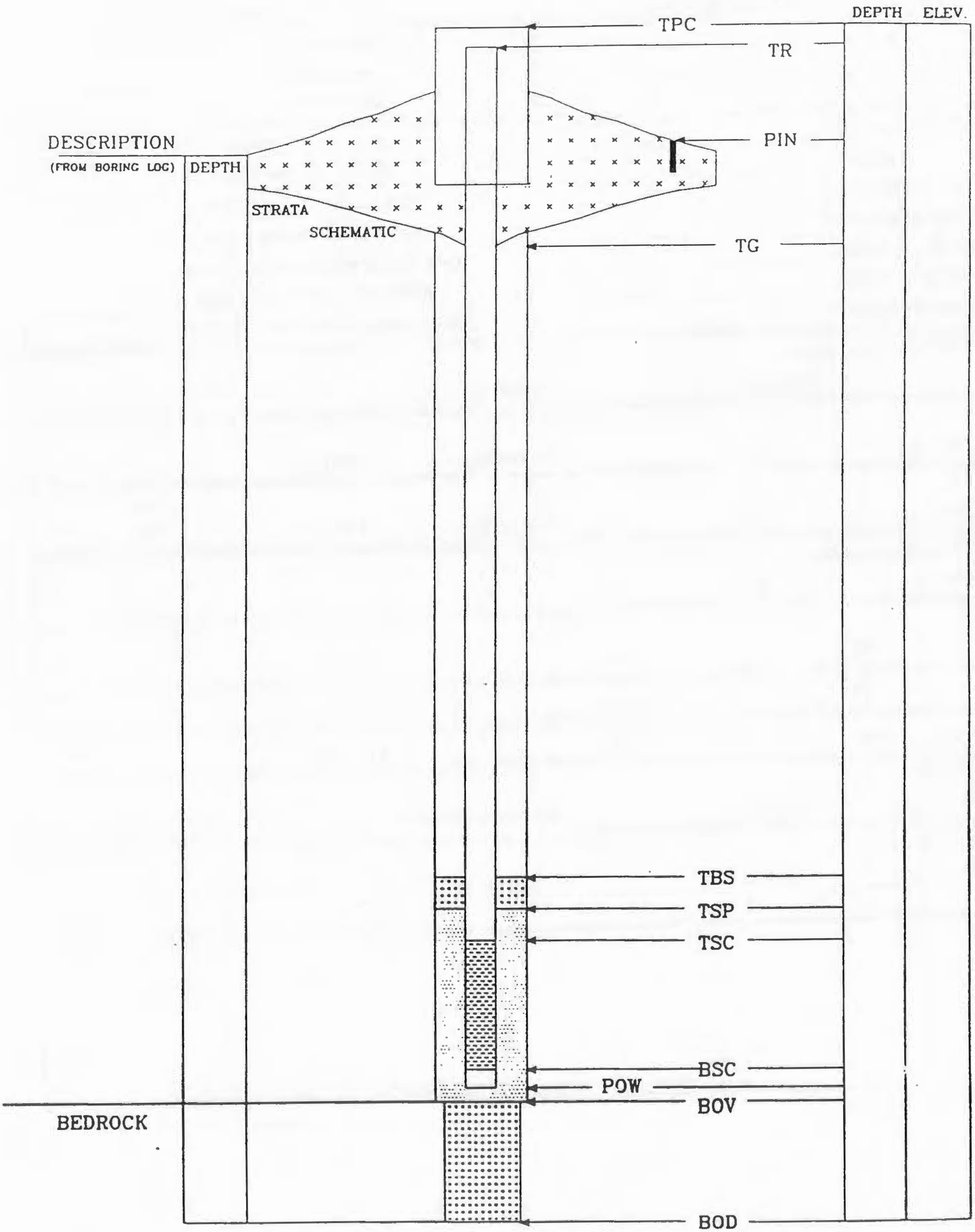
* ALL DEPTH MEASUREMENTS REFERENCED TO GROUND SURFACE

SEE PAGE 2 FOR SCHEMATIC

OVERBURDEN MONITORING WELL
PROTECTIVE RISER INSTALLATION DETAIL

ENGINEERING-SCIENCE, INC.	CLIENT:	WELL #:

DATE: ____________



* NOT TO SCALE

OVERBURDEN MONITORING WELL
COMPLETION REPORT & INSTALLATION DETAIL
ROADWAY BOX - SURFACE COMPLETION

ENGINEERING-SCIENCE, INC. | CLIENT: | WELL #:

PROJECT: ____________ PROJECT NO: ____________
LOCATION: ____________ INSPECTOR: ____________
CHECKED BY: ____________

DRILLING CONTRACTOR: ____________ POW DEPTH: ____________
DRILLER: ____________ INSTALLATION STARTED: ____________
DRILLING COMPLETED: ____________ INSTALLATION COMPLETED: ____________
BORING DEPTH: ____________ SURFACE COMPLETION DATE: ____________
DRILLING METHOD(S): ____________ COMPLETION CONTRACTOR/CREW: ____________
BORING DIAMETER(S): ____________ BEDROCK CONFIRMED (Y/N?) ____________
ASSOCIATED SWMU/AOC: ____________ ESTIMATED GROUND ELEVATION: ____________

PROTECTIVE SURFACE CASING:
DIAMETER: ____________ LENGTH: ____________

RISER:
TR: ________ TYPE: ________ DIAMETER: ________ LENGTH: ________

SCREEN:
TSC: ________ TYPE: ________ DIAMETER: ________ LENGTH: ________ SLOT SIZE: ________

POINT OF WELL: (SILT SUMP)
TYPE: ________ BSC: ________ POW: ________

GROUT:
TG: ________ TYPE: ________ LENGTH: ________

SEAL: TBS: ________ TYPE: ________ LENGTH: ________

SAND PACK: TSP: ________ TYPE: ________ LENGTH: ________

SURFACE COLLAR:
TYPE: ________ RADIUS: ________ THICKNESS CENTER: ________ THICKNESS EDGE: ________

CENTRALIZER DEPTHS
DEPTH 1: ________ DEPTH 2: ________ DEPTH 3: ________ DEPTH 4: ________

COMMENTS:

* ALL DEPTH MEASUREMENTS REFERENCED TO GROUND SURFACE

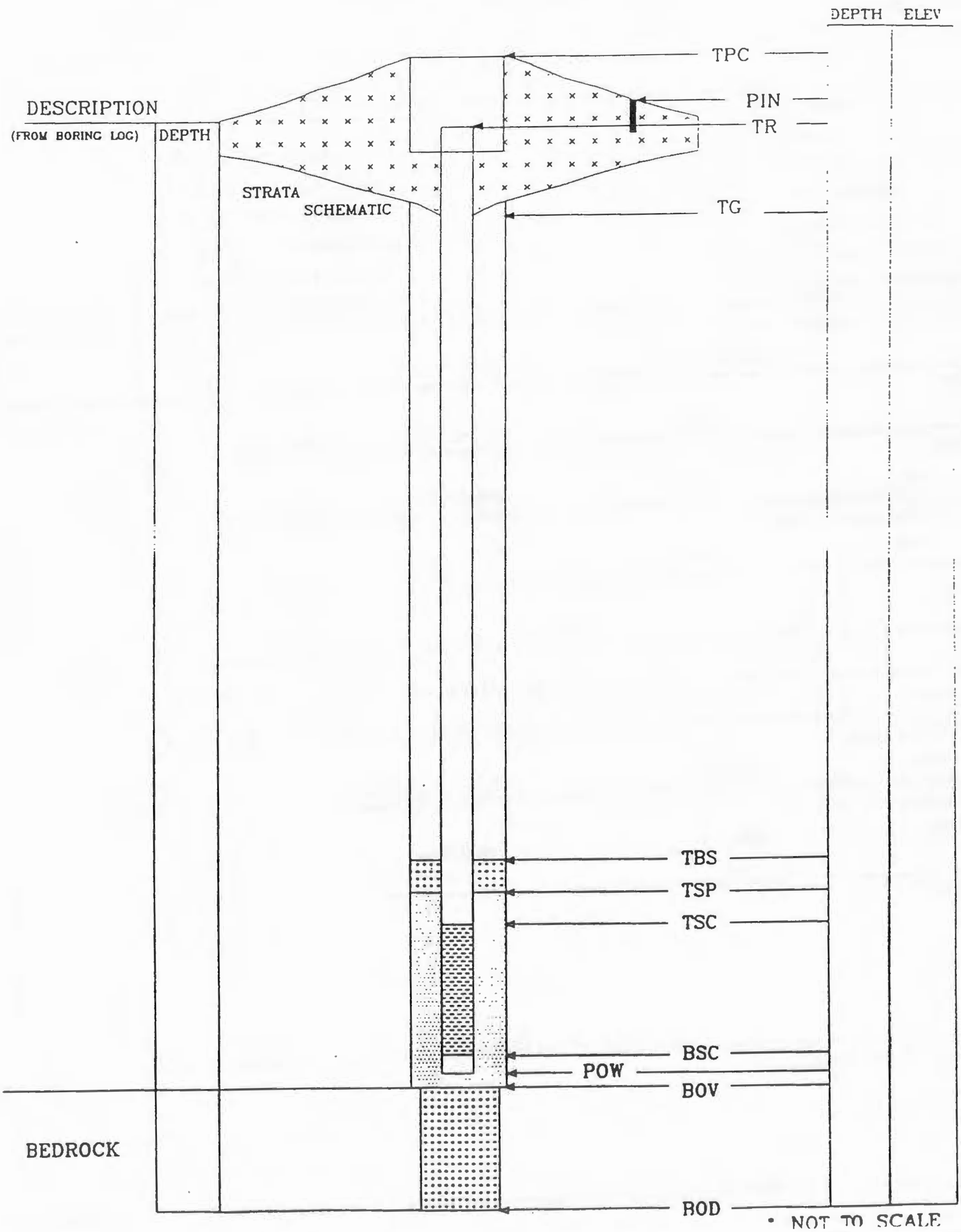
SEE PAGE 2 FOR SCHEMATIC

OVERBURDEN MONITORING WELL

ROADWAY BOX INSTALLATION DETAIL

ENGINEERING-SCIENCE, INC.	CLIENT:	WELL #

DATE ____________



BEDROCK MONITORING WELL
COMPLETION REPORT & INSTALLATION DETAIL
PROTECTIVE RISER COMPLETION

ENGINEERING-SCIENCE, INC. | CLIENT: | WELL #:

PROJECT: ____________ PROJECT NO: ____________
LOCATION: ____________ INSPECTOR: ____________
CHECKED BY: ____________

DRILLING CONTRACTOR: ____________ POW DEPTH: ____________
DRILLER: ____________ OUTER CASING INSTALLATION: ____________
DRILLING COMPLETED: ____________ INNER CASING INSTALLATION: ____________
DEPTH TO BEDROCK: ____________ SURFACE COMPLETION DATE: ____________
BORING DEPTH: ____________ COMPLETION CONTRACTOR/CREW: ____________
DRILLING METHOD(S): ____________ CORE TYPE/SIZE: ____________
BORING DIAMETER(S): ____________ FOOTAGE CORED: ____________
ASSOCIATED SWMU/AOC: ____________ ESTIMATED GROUND ELEVATION: ____________

PROTECTIVE CASING:
DIAMETER: ____________ LENGTH: ____________

OUTER CASING:
TC: ______ TYPE: ______ DIAMETER: ______ LENGTH: ______ POC: ______

RISER:
TR: ______ TYPE: ______ DIAMETER: ______ LENGTH: ______

SCREEN:
TSC: ______ TYPE: ______ DIAMETER: ______ LENGTH: ______ SLOT SIZE: ______

POINT OF WELL: (SILT SUMP)
TYPE: ______ BSC: ______ POW: ______

GROUT:
OUTER TG: ______ TYPE: ______ LENGTH: ______
INNER TG: ______ TYPE: ______ LENGTH: ______

SEAL: TBS: ______ TYPE: ______ LENGTH: ______

SAND PACK: TSP: ______ TYPE: ______ LENGTH: ______

SURFACE COLLAR:
TYPE: ______ RADIUS: ______ THICKNESS CENTER: ______ THICKNESS EDGE: ______

CENTRALIZER DEPTHS
DEPTH 1: ______ DEPTH 2: ______ DEPTH 3: ______ DEPTH 4: ______

COMMENTS:

* ALL MEASUREMENTS REFERENCED TO GROUND SURFACE

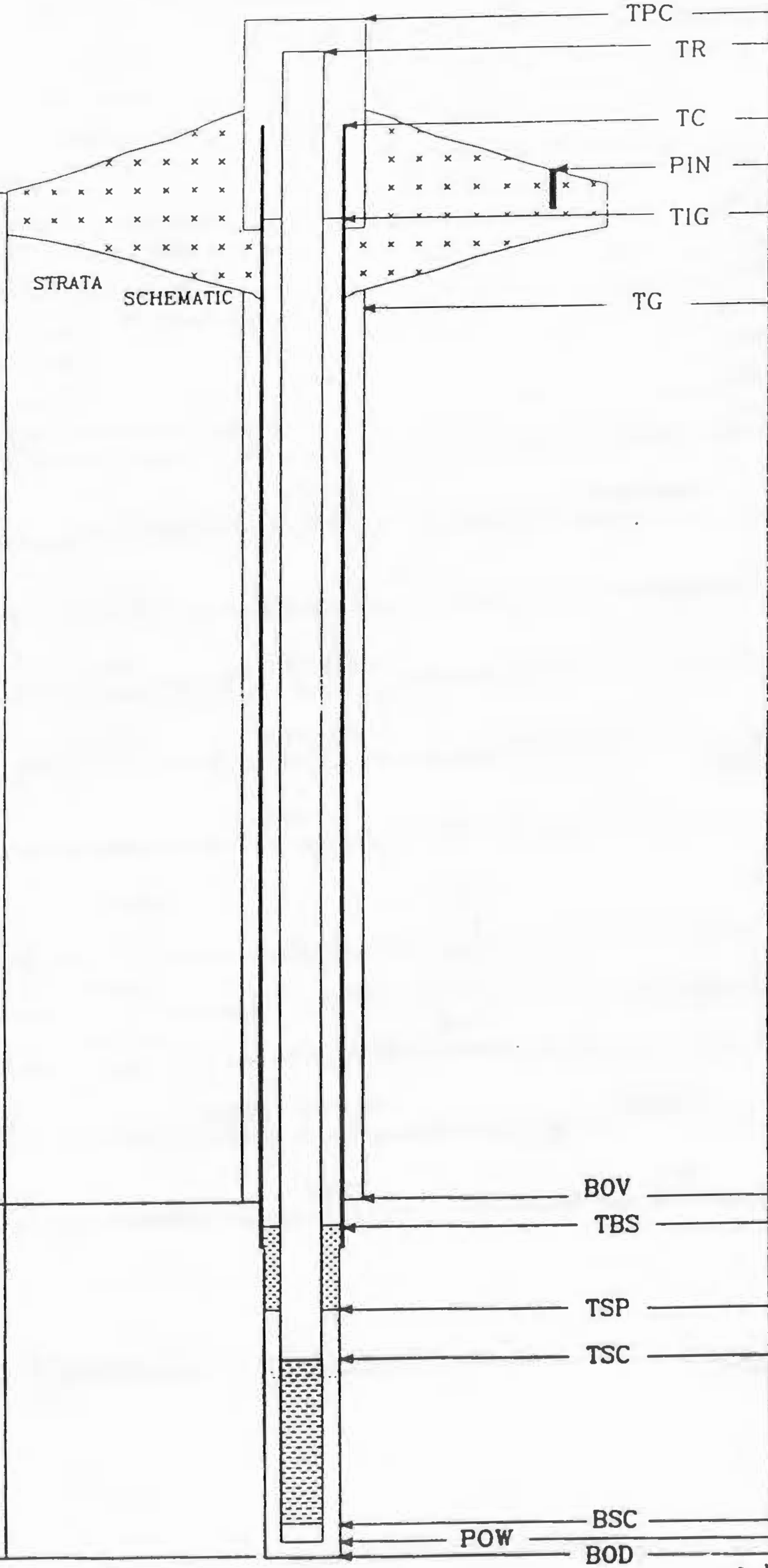
SEE PAGE 2 FOR SCHEMATIC

BEDROCK MONITORING WELL
PROTECTIVE RISER – INSTALLATION DETAIL

ENGINEERING–SCIENCE, INC.	CLIENT:	WELL #:

DATE: ____________

DESCRIPTION (FROM BORING LOG) | DEPTH | DEPTH | ELEV.



BEDROCK | RQD

* NOT TO SCALE

BEDROCK MONITORING WELL
COMPLETION REPORT & INSTALLATION DETAIL
ROADWAY BOX – SURFACE COMPLETION

ENGINEERING-SCIENCE, INC. | CLIENT: | WELL #:

PROJECT: ______ PROJECT NO: ______
LOCATION: ______ INSPECTOR: ______
CHECKED BY: ______

DRILLING CONTRACTOR: ______ POW DEPTH: ______
DRILLER: ______ OUTER CASING INSTALLATION: ______
DRILLING COMPLETED: ______ INNER CASING INSTALLATION: ______
DEPTH TO BEDROCK: ______ SURFACE COMPLETION DATE: ______
BORING DEPTH: ______ COMPLETION CONTRACTOR/CREW: ______
DRILLING METHOD(S): ______ CORE TYPE/SIZE: ______
BORING DIAMETER(S): ______ FOOTAGE CORED: ______
ASSOCIATED SWMU/AOC: ______ ESTIMATED GROUND ELEVATION: ______

PROTECTIVE CASING:
DIAMETER: ______ LENGTH: ______

OUTER CASING:
TC: ______ TYPE: ______ DIAMETER: ______ LENGTH: ______ POC: ______

RISER:
TR: ______ TYPE: ______ DIAMETER: ______ LENGTH: ______

SCREEN:
TSC: ______ TYPE: ______ DIAMETER: ______ LENGTH: ______ SLOT SIZE: ______

POINT OF WELL: (SILT SUMP)
TYPE: ______ BSC: ______ POW: ______

GROUT:
OUTER TG: ______ TYPE: ______ LENGTH: ______
INNER TG: ______ TYPE: ______ LENGTH: ______

SEAL: TBS: ______ TYPE: ______ LENGTH: ______

SAND PACK: TSP: ______ TYPE: ______ LENGTH: ______

SURFACE COLLAR:
TYPE: ______ RADIUS: ______ THICKNESS CENTER: ______ THICKNESS EDGE: ______

CENTRALIZER DEPTHS
DEPTH 1: ______ DEPTH 2: ______ DEPTH 3: ______ DEPTH 4: ______

COMMENTS:

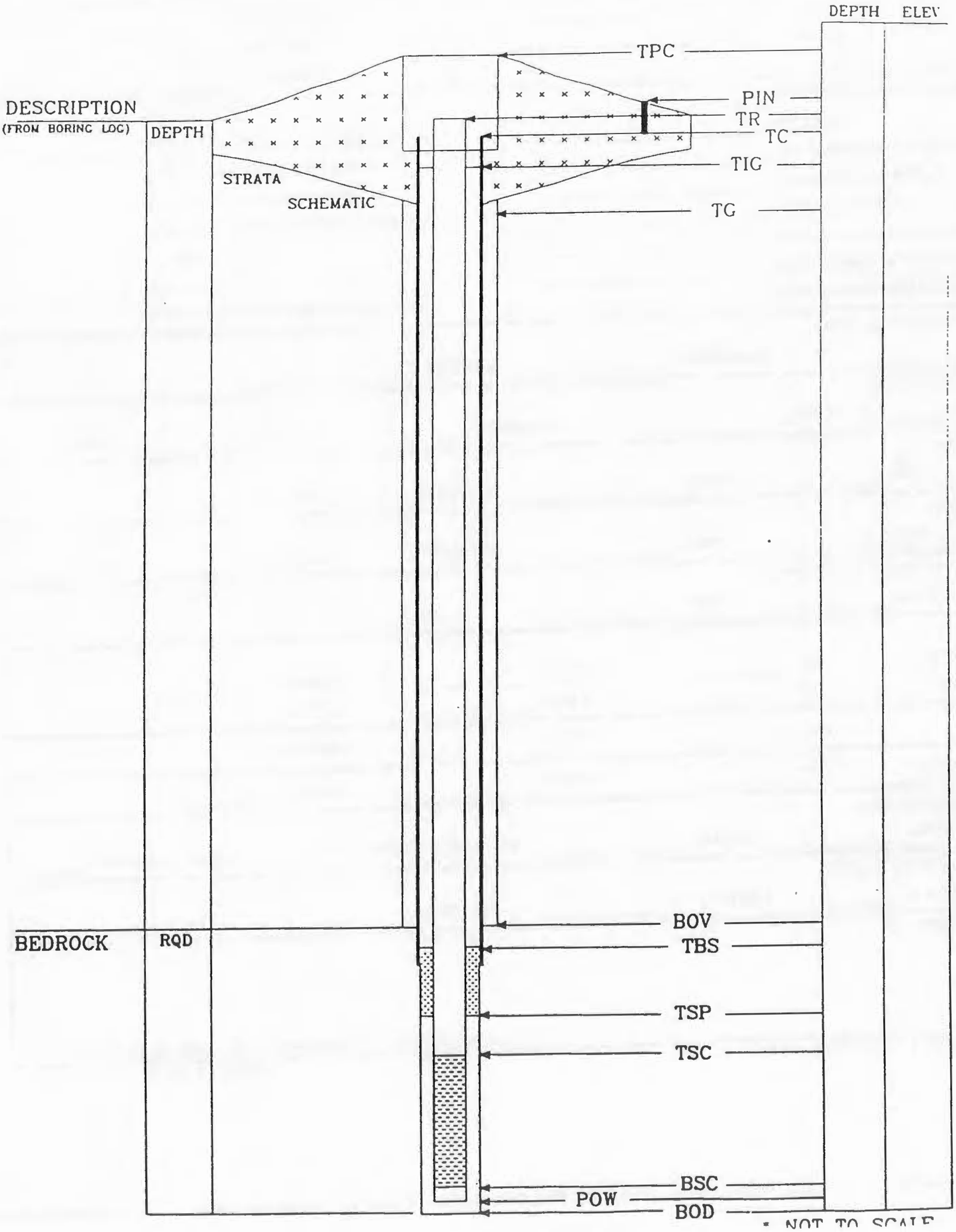
* ALL MEASUREMENTS REFERENCED TO GROUND SURFACE

SEE PAGE 2 FOR SCHEMATIC

BEDROCK MONITORING WELL
ROADWAY BOX COMPLETION DETAIL

ENGINEERING-SCIENCE, INC.	CLIENT.	WELL #

DATE: ______________



* NOT TO SCALE

If necessary, access routes and sampling work areas where UXOs are potentially present will be searched by UXO personnel prior to monitoring well development and sampling operations (boundaries of the access routes will have been previously marked with orange survey flags). All UXOs located during the search operation will be flagged with yellow survey markers. In areas heavily contaminated by UXOs or UXO components, well development and groundwater sampling could be performed by UXO personnel.

Development of wells will be accomplished by pumping with an electric-powered submersible pump or a gasoline-powered centrifugal pump. If well yields cannot sustain the flow rate of the submersible or centrifugal pump, a bailer will be used. Water will not be added to the well to aid in development. All development equipment will be decontaminated prior to use in each well. The decontamination procedures for downhole development equipment and the bailer are provided in Section 4.4 of this appendix.

As 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 can result in elevated metal concentrations detected in the groundwater. A well development report will be completed, as shown on Figure A-10, Well Development Report.

3.5.3 Development Criteria

The criteria for determining if the well has been properly developed is based upon the guidance provided by the NYSDEC, TAGM #HWR-88-4015. This guidance document specifies an upper level of allowable levels of turbidity in groundwater from monitoring wells which is considered acceptable for determining the water quality of metals in the aquifer. This policy does not apply to surface waters.

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

1. Water samples will have the lowest possible NTUs
2. The temperature, specific conductivity and pH of the well water vary by no more than 10 percent.

WELL DEVELOPMENT REPORT

ENGINEERING-SCIENCE, INC.	CLIENT:	WELL #:

PROJECT : ______________________ DATE: __________

LOCATION: ______________________ PROJECT NO. : __________

DRILLING METHOD (s): __________

PUMP METHOD (s): __________

SURGE METHOD (s): __________

INSTALLATION DATE: __________

INSPECTOR: __________

CONTRACTOR: __________

CREW: __________

START DEVELOPMENT DATE: __________

END DEVELOPMENT DATE: __________

WATER DEPTH (TOC): __________ ft

WELL DIA. (ID CASING): __________ ft

BORING DIAMETER: __________ ft

INSTALLED POW DEPTH(TOC): __________ ft

MEASURED POW DEPTH(TOC): __________ ft

SILT THICKNESS: __________ ft

POW AFTER DEVELOPMENT: __________ ft

DIAMETER FACTORS (GAL/FT):

DIAMETER (IN):	2	3	4	5	6	7	8	9	10	11	12
GALLONS/FT:	0.163	0.367	0.654	1.02	1.47	2.00	2.61	3.30	4.08	4.93	5.87

STANDING VOLUME INSIDE WELL = WATER COLUMN X WELL DIAMETER FACTOR = ______ GAL. = A

STANDING WATER IN ANNULAR SPACE =
WATER COL. BELOW SEAL(ft) X (BORING DIAM. FACTOR – WELL DIAM. FACTOR) X 0.3 = ______ GAL. = B

SINGLE STANDING WATER VOLUME = A + B = ... ______ GAL. = C

MINIMUM VOLUME TO BE REMOVED = 5 X C .... ______ GALS.

ACTIVITY	START TIME	END TIME	ELAPSED TIME	GALLONS REMOVED	pH	CONDUCTIVITY	TEMP	COLOR	OTHER
TOTALS/FINAL									

COMMENTS:

SEE MASTER ACRONYM LIST FOR COMPLETE LISTING OF ABBREVIATIONS WELL #: __________

Temperature and specific conductivity will be measured in the field using a YSI model 33 SCT meter; pH will be measured in the field using an Orion model 230A pH meter. A nephelometer will be used to measure turbidity. The instruction manuals for these instruments will be kept with the instrument in the field.

3.5.4 Well Survey

The locations and elevations of all existing and newly installed monitoring wells must be surveyed to obtain their location which is then plotted on a map in the hydrogeologic report. The location of each well will be tied to the New York State coordinate system. The ground surface elevation and the top of the monitoring well riser pipe must be accurately measured to the nearest one-hundredth of a foot. The elevation of the riser pipe will be made at a notch cut into the lip of the pipe. The plug or cap covering the well will be removed for this measurement. Well survey procedures are described in Section 4.16 of the Work Plan.

3.5.5 Groundwater Sampling Procedures and Analyses

Prior to groundwater sample collection, water levels in all monitor wells will be measured as described in Section 6.1 of this appendix. Down hole equipment will be decontaminated according to the procedures outlined in Section 4.4, of this appendix.

Groundwater sampling will be performed in three steps: (1) remove the silt, (2) purge the water standing in the well, and (3) sample the water. Each of these steps is described in this section.

Silt Removal

One to two days prior to sampling, measure and record the depth to groundwater. Install a previously unused piece of 3/8" OD Teflon tubing in the well. Determine the thickness of silt in the bottom of the well by measuring the depth to the top of the silt. If the thickness of silt is greater then 1-inch silt removal as described below will be performed. If the thickness is less than 1-inch then no silt removal is necessary prior to the purging process.

Connect the Teflon tubing to 1/4" Tygon tubing installed in the head of a peristaltic pump. Begin purging with the bottom opening of the Teflon tube immediately above the silt layer and begin to slowly agitate the silt with the tube so that the silt is disturbed, becomes suspeded and is collected by the tube (the purge water should become silt-laden and have a dark brown-tray color indicating that the silt is being removed). Use an appropriate flow rate for the silt removal. If more force is required to adequately disturb the silt at the bottom of the well, slowly lower a decontaminated one-inch stainless steel or Teflon bailer to the bottom of the well and very slowly agitate the silt while pumping. Avoid over-agitating the silt and suspending it in too much of the water column. Stop purging when the water is no longer silt-laden and dark brown-gray in color. Afte removing the silt, leave the teflon tube in the well.

Purging

The wells will be purged prior to sampling using a peristaltic pump with a dedicated Teflon tube. Before purging, measure the depth to water with a decontaminated electronic water level meter. Leave the water level probe in the well so that the water level can be monitored continuously during purging. Prior to beginning the purging process remove any silt that has settled on the bottom of the well using the procedure described above. The purging process will begin with the open-end of the tube at the bottom of the well screen (or at least 6 inches from the bottom of the well). The purging flow rate will be between 1.5 and 2 L/min. Determine the exact flow rate using a plastic graduated beaker and record this on the sampling data sheet. The water will be purged into a graduated 5-gallon bucket. After approximately one well volume has been removed, record the time, flow rate, depth to the bottom of the opening of the Teflon tube and the total volume of water removed on the sampling data sheet. Fill a 1-gallon plastic container from the outlet side of the peristaltic pump and immediately measure the temperature, specific conductance, and pH (make sure to agitate the bath prior to making these measurements). For wells which are not purged to near dryness after one well volume has been removed, the Teflon tube will be slowly raised to a point between the top of the well screen and the water surface. When two well volumes have been removed, record the required data (noted above) on the data sheet. Purging of the well will continue until three well volumes have been removed. After purging the third well volume, record the required data (noted above). If necessary make additional temperature, specific conductance, and pH measurements on additional well volumes until they stabilize (two successive measurements vary be less than 10%). Moving the location of the tube from the screened interval to a point near the top of the water surface during purging will ensure the removal of any stagnant water from the well prior to sampling. After removal of the necessary well volumes the well will be allowed to sit for two and one half hours prior to sampling at which time the water level will be measured in the well. If the well has recovered to 95% of the original static level, then sampling of the well will be performed. If the 95% recovery has not been achieved after 3 hours, then the recovery requirement for the well will be reduced to 85% prior to sampling.

For wells which are very slow to recharge, purging of groundwater, at the 1.5 to 2 L/min flow rate, will continue until the well has been drained to near dryness (i.e., when the water level is at 1 foot above the bottom of the wll). Again the purging process will begin with the open end of the Teflon tube at the bottom of the well screen or at least 6 inches from the bottom of the well. Make sure to record the time, flow rate, depth to the bottom of the open tube, and total volume of water removed after purging the well to near dryness (make sure to note the flow rate during purging). Also record the temperature, specific conductance and pH immediately after purging to near dryness (make sure to collect enough water for these measurements before purging to near dryness; monitor the water level with an electronic water level meter during purging). At this time the well will be considered to have been purged enough to ensure that the subsequent water samples collected from the well will be representative of water from the aquifer. Once pumped to near dryness the well will be allowed to recover to 85% of the original static level prior to sampling. If, however, the well has not recharged to 85% after six hours, sampling of the well will begin.

<u>Sampling</u>

Measure and record the depth to water. Verify that the water level meets the 85% or 95% requirement for the well, or that the six hour recharge time has elapsed. Wells which do not meet the 95% recovery after 3 hours will be considered to be slow recharging wells and the recovery goal will be reduced to 85% of the original static water level prior to sampling. If the well has not recharged to within 85% of the original static level after 6 hours, then the well will be sampled the next day as water is available for each parameter.

Prior to collecting the sample, the Teflon purging tube must be removed from the well. Use a pair of new outer gloves to remove the tubing and place it into a clean plastic bag during sampling. To sample, lower a decontaminated bailer into the well at a rate of 1/2-inch/sec to minimize the disturbance of water and silt in the well. When the bailer has filled with water, remove it at a rate of 1/2-inch/sec and fill the appropriate sample containers. If during the sampling process the well is bailed to near dryness (i.e., the bailer reaches the bottom of the well) sampling will be stopped until the well recharges to 85% of the original static level. If it has not recharged to 85% after 6 hours, sampling will continue the next day as water is available for each parameter (return the Teflon tubing to the well while waiting long periods for the well to recharge for sampling). When sampling is complete, return the dedicated Teflon tubing to the well.

Groundwater samples collected for volatile analyses will be collected first, before any of the other parameters of interest and will be obtained in a manner that will minimize the loss of volatile compounds. The sampling sequence for the other parameters will be semivolatiles, metals, cyanide, explosives, pesticides/PCB, total petroleum, hydrocarbons, nitrates and radionuclides. Groundwater samples will be collected with the required quality assurance/quality control (QA/QC) samples, then transmitted to the laboratory for chemical analysis in accordance with the Chemical Data Acquisition Plan (CDAP).

Samples will be preserved and packed in ice for shipment to the laboratory as described in Sections 4.3.4.4 and 5.0 of this appendix. Data regarding groundwater sample collection will be recorded on the Sampling Record form for groundwater (Figure A-11). Chain-of-Custody records will be maintained as described in Section 5.3.2 of this appendix.

3.6 SURFACE WATER AND SEDIMENT SAMPLING

3.6.1 Objectives

The objective of this task is to obtain representative samples of surface water and sediment. Generally, surface water and sediment samples will be obtained at the same location and time.

3.6.2 Surface Water Sampling Procedures

If necessary, access routes and sampling work areas where UXOs are potentially present will be searched by UXO personnel prior to sampling surface water and sediment. Boundaries of cleared access routes will be marked with orange survey flags. All UXOs located during the search operation will be flagged with yellow survey markers.

In areas heavily contaminated by UXOs or UXO components, surface water and sediment samples could be collected by UXO personnel.

Surface water sampling equipment will be decontaminated prior to use in accordance with the procedures outlined in Section 4.4 of this appendix. Surface water samples will be obtained from the designated locations shown in Section 4 of the Work Plan. The sampling will be accomplished by using the following procedure:

SAMPLING RECORD – GROUNDWATER

ENGINEERING – SCIENCE, INC.	CLIENT:	DATE:

PROJECT:	INSPECTOR:
LOCATION:	LABORATORY:
	LAB. STAFF:
	CHAIN OF CUSTODY #:

WEATHER / FIELD CONDITIONS CHECKLIST (RECORD MAJOR CHANGES)

TIME (24 HR)	TEMP (APPRX)	WEATHER (APPRX)	REL. HUMIDITY (GEN)	WIND (FROM) VELOCITY (APPRX)	WIND (FROM) DIRECTION (0 – 360)	GROUND / SITE SURFACE CONDITIONS

MONITORING

INSTRUMENT	DECTECTOR

WELL DIAMETER FACTORS

DIAMETER (INCHES):	1	1.5	2	3	4	5	6	7	8	9	10
GALLONS / FOOT:	0.041	0.092	0.163	0.367	0.654	1.02	1.47	2.00	2.61	3.30	5.87

STANDING WATER VOLUME = WELL DIAMETER FACTOR * WATER COLUMN

WELL #						
STATIC WATER DEPTH (FT)						
WELL DEPTH (POW) FT						
STANDING WATER VOL. (GAL)						
PURGING DEVICE						
VOL. OF BAILER PUMP FLOW RATE (GAL)						
PURGE START TIME/ PURGE STOP TIME						
GALLONS REMOVED						
WELL VOLUMES REMOVED						
SAMPLING DEVICE						
SAMPLING DEVICE CLEANING PRODEDURE						
TIME / CONTAINER	VOA					
	SVO					
	METALS					
FOR SAMPLES						
TAKEN						
ODOR (VOC)						
COLOR						
TEMPERATURE (C)						
SPEC. COND. (umhos)						
pH						
TURBIDITY (NTU)						
FIELD FILTERED (Y/N)						

SAMPLING RECORD – GROUNDWATER

ENGINEERING–SCIENCE, INC.	CLIENT:	DATE:

LOCATION: WELL#:	WELL POINT (TOC): SCREENED INTERVAL (TOC):

PURGING WITH A PERISTALTIC PUMP

STATIC DEPTH TO WATER PRIOR TO PURGING (TOC):

TIME BEGIN PURGING: TIME END PURGING:

TIME:						
DEPTH TO WATER (ft)						
DEPTH TO BOTTOM OPENING OF TEFLON TUBE (TOC)						
FLOW RATE (ml/min)						
VOLUME OF WATER REMOVED (gals)						
TEMPERATURE (deg. C)						
SPEC. COND (umhos)						
PH						

DEPTH TO WATER MEASUREMENTS AFTER PURGING

DATE						
TIME						
DEPTH TO WATER (ft)						
"AFTER PURGE" WATER COLUMN (ft)						
"STATIC" WATER COLUMN (ft)						
% RECOVERY						

Notes:

(1) Determine water column in the well (for both "after purge" and "static" conditions) by subtracting the measured water level from the well point.

(2) Divide the "after purge" water column by the "static" water column and multiply by 100 to determine the percent of recovery for the well.

COMMENTS:

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-foot 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 a PID or OVM. If the concentration at breathing level is steadily elevated above background levels, use appropriate health and safety equipment as described in the Health and Safety Plan (Appendix B).

3. Collect the sample from the surface water body by immersing a clean beaker or the sample bottle without preservatives. The sampling beaker 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 bottles are used for sample collection, a 45-degree angle should be used. Sampling will proceed from downstream locations to minimize impacts associated with disturbance of sediments. If the sample is collected by sampling personnel wading into the body of water, the sampler should approach the sampling location from downstream and all parts of the sampler's body should remain downstream of the sample container during sample collection (wading will be avoided if possible). Water samples will be analyzed as described in Section 4 of the Work Plan and the Chemical Data Acquisition Plan (Appendix C).

4. Fill all appropriate sample containers (listed in Appendix C, Chemical Data Acquisition Plan) directly or from the intermediate sample collection container, if necessary. Collect any QA/QC samples that are required for this location.

5. Measure the following parameters by direct immersion of instrument probes into the water body, if possible:

    1. Temperature,
    2. pH, and
    3. 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. The instruction manuals for these instruments will be kept with the instrument in the field.

6. Record all the field data on the Sampling Record form for surface water (Figure A-12). Chain-of-Custody records will be maintained as described in Section 5.3.2 of this appendix. Samples will be preserved and packed for shipment to the laboratory as described in Sections 4.3, 4.4, and 5.0 of this appendix. Pertinent information includes distance from shore and water depth.

3.6.3 Sediment Sampling Procedures

Obtaining sediment samples is normally not a difficult task unless sampling is being conducted at great depth, in which case a boat and appropriate sampling device would be necessary. There are no set procedures for the collection of representative samples of stream sediments where the stream materials may be quite variable, i.e., coarse gravels to fine clays. Therefore, care must be taken to obtain samples that will be representative of the sediment materials present. Sampling will start at downstream locations and go upstream to minimize disturbance of sediments. The sampler will approach the sample location from downstream.

Usually, very simple techniques are used to collect sediment samples. Most samples are grab samples, which can be kept as individual samples or combined to form composite samples. The following are some suggested techniques for sediment sampling:

1. In small, low flowing streams or near the shore of a pond or lake, a Ponar sampler or beaker can be used to grab sediments.

2. To obtain sediments from larger streams or further from the shore of a pond or lake, a beaker made from the appropriate material can be clamped to a telescoping aluminum pole. A Ponar sampler could also be used.

3. To obtain sediments from rivers or in deeper lakes and ponds, a spring loaded sediment dredge or benthic sampler can be used.

When sampling from large rivers, ponds, or lakes, it may be necessary to lay out a visual or surveyed grid, if possible, then collect individual or composite samples from locations within the grid. All surface water and sediment locations are specifically described in the Work Plan.

All sediment samples collected, except those destined for volatile organic analysis, will be homogenized prior to being placed into sample containers.

FIGURE A-12

PAGE OF

SAMPLING RECORD – SURFACE WATER

ENGINEERING – SCIENCE, INC. | CLIENT: | DATE:

PROJECT:

LOCATION:

INSPECTOR:

LABORATORY

LAB. STAFF:

CHAIN OF CUSTODY #:

WEATHER / FIELD CONDITIONS CHECKLIST (RECORD MAJOR CHANGES)

TIME (24 HR)	TEMP (APPRX)	WEATHER (APPRX)	REL. HUMIDITY (GEN)	WIND (FROM) VELOCITY (APPRX)	WIND (FROM) DIRECTION (0 – 360)	GROUND / SITE SURFACE CONDITIONS

MONITORING

INSTRUMENT	DECTECTOR

SAMPLE #	DEPTH	TIME	TEMP	MON. (VOC)	COLOR	TURBIDITY (NTU)	pH	SPEC COND	D.O.	SAMPLING DEVICE	CLEANING PROCEDURE	CONTAINER TYPE / SIZE	QC SPL (Y/N)

PAGE OF

Sediment samples will be analyzed as described in Section 4 of the Work Plan and in Appendix C, Chemical Data Acquisition Plan.

All the field data will be recorded on the Sampling Record form for soil (Figure A-3). Pertinent data includes distance from shore, water depth, and depth range over which the sample was collected. Chain-of-Custody records will be maintained as described in Section 5.3.2 of this appendix. Samples will be preserved and packed for shipment to the laboratory as described in Sections 4.3, 4.4, and 5.0 of this appendix.

3.7 SAMPLING PROCEDURES FOR PROPELLANTS AND OTHER MATERIALS

3.7.1 Propellants

At certain SWMUs propellants may be present in pipes associated with former manufacturing or treatment processes. To determine whether the propellants can be safely sampled and analyzed, residue in the pipes will be sampled and tested by UXO personnel. If the material is determined to be safe to handle, it will be sampled and analyzed as part of the ESI.

Propellants will be sampled using a decontaminated stainless steel implement that will scrape residue from the inner wall of the pipe. The propellants will be transferred to a decontaminated stainless steel bowl, then placed into the appropriate sample bottles. If field conditions require changing this sampling procedure, then the changes will be documented along with other sampling data on the Sampling Record form for soils (Figure A-3).

3.7.2 Oil

Oil or other light non-aqueous phase layers may be present on the surface of water. It is proposed that this oil or light non-aqueous phase layer (LNAPL) be sampled at certain SWMUs. A decontaminated stainless steel or glass container will be lowered into the oil and water so that the mouth of the container is upright, but tipped at approximately at 45 degree angle. The container will be lowered into the liquid just enough so that mostly oil will enter the container. The oil will be poured into the appropriate sample bottles for liquid samples while minimizing the amount of water added to the bottles.

3.7.3 Dust

Dust and dirt on the floor of some of the buildings will be sampled for various parameters. This material will be sampled using the same procedures as for surface soils (Section 3.3.4 of this appendix) except that the dust and dirt may have to be collected over a broad area of the floor rather than digging into the soil. The size of the area will be recorded on the Sampling Record form.

3.7.4 General Sampling Information

The locations and number of samples of each of these materials are described in Section 4 of the Work Plan. Health and Safety procedures of a SWMU-specific basis are described in the Health and Safety Plan.

3.8 INVESTIGATION-GENERATED WASTE MANAGEMENT

All soil and water generated during drilling and well development and purging will be collected on-site. All drill cuttings, well development water, and decontamination liquids will be contained in approved 55-gallon drums. 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 which will recommend the disposition for each drum. For each drum considered to contain contaminated material, a specific optimum method of disposal will be recommended, along with a price for disposal. The material will be disposed under manifest, using the SEAD RCRA disposal permit. SEAD is the generator and ultimate signatory of transport and disposal manifests.

In the case of soil excavated from test pits, the Army has been granted a written exemption from USEPA allowing test pit soil to be backfitted in lieu of testing and possible management as a waste. Please refer to the exemption letter from EPA to the U.S. Army, dated September 16, 1991, attached at the end of this appendix.

4.0 POST SAMPLE COLLECTION PROCEDURES

Once a solid or liquid sample has been collected, it needs to be handled in an appropriate manner so that it will continue to have concentrations of contaminants that are representative of those in the sample at the time of collection. Sampling equipment used for sample collection or field determinations must also be decontaminated prior to reuse to prevent cross-contamination.

4.1 COMPOSITING

Occasionally, samples will be composited prior to chemical or physical characterization. Equivalent sized (weight, volume) aliquots will be collected from each selected location and combined in a receptacle. The material will be mixed, then distributed into the appropriate sample containers (Section 4.3). Necessary preservatives will be added (Section 4.2), then samples will be packed appropriately (Section 5.0).

Samples collected for volatile organic analysis will either be analyzed separately or composited by the laboratory.

4.2 SAMPLE PRESERVATION

Sample preservation will be performed in the field, immediately after sample collection and field preparative steps are completed. Soils and other forms of solid materials are preserved by completely filling the sample container with sample, tightly securing the container top, followed by placement of the sample on ice or in a freezer and out of sunlight. Preservatives are added to some of the aqueous samples depending on the analysis to be performed. Table 4.1 of the Chemical Data Acquisition Plan (Appendix C) outlines the required preservatives and holding times for soil and water samples. In many cases where pH control or additions of reagents are required, separate bottles and chemical preservatives may be supplied by the laboratory. In other cases the reagents or preservatives may be placed in the sample bottle prior to delivery to the site.

Many concentrated acids, bases, and many other chemicals required for sample preservation can not be shipped by air. This limitation should be anticipated and these materials will be shipped to the job site before sampling begins.

4.3 SAMPLE STORAGE

Samples should be stored in a nonreactive and noncontaminating containers. Appropriate containers include those made of polyethylene, glass, or teflon. In general, samples collected for metals and general water quality parameters are stored in plastic bottles. Samples collected for organic analysis are routinely placed in glass, preferably amber glass bottles. Soil samples are generally placed in glass jars with teflon lids or cap liners.

In most cases, bottles will be supplied by the laboratory conducting the analyses. It is the responsibility of the project staff to inform the laboratory of the exact analyses that will be conducted so the lab can supply the appropriate bottles. Table 4.1 of the Chemical Data Acquisition Plan (Appendix C) presents the types of containers that will be used for various analyses.

4.4 EQUIPMENT AND MATERIAL DECONTAMINATION

All equipment used during the collection, preparation, preservation, and storage of environmental samples must be cleaned prior to their use and after each subsequent use. Frequently, sampling equipment must be cleaned between successive uses in the field to prevent cross contamination. When field cleaning is needed, it is essential that it be conducted diligently, to ensure that all parts of the field equipment that come in contact with the sample are properly decontaminated.

Supplies needed for cleaning or decontamination is dependent upon the materials and equipment to be cleaned. When small items require cleaning in the field, several small buckets and small containers of reagents or wash liquids are adequate. However, when major items, such as large pumps, require decontamination, it may be necessary to transport large wash basins and larger volumes of washing solutions. The following is a general equipment list for field decontamination operations.

1. Detergent, such as Alconox.
2. Potable water.
3. Demonstrated analyte free water.
4. Methanol
5. Hexane and/or other suitable solvents to remove petroleum products.
6. Storage vessels to transport large volumes of water to the site.
7. Buckets for washing and rinsing equipment.

8. Paper towels, clean rags or chemwipes to remove excessive soil or petroleum products before the equipment is decontaminated.
9. Ultrapure HNO_3.
10. Plastic squeeze bottles for rinsing equipment.

The following procedure will be used to decontaminate the sampling equipment (e.g., split spoons, syringes, bowls, scoops, bailers, soil gas sampling rods and points):

1. Wipe with rag, towel or chemwipes, or steam clean to remove excess soils or debris.
2. Wash and scrub with low phosphate detergent.
3. Tap water rinse.
4. Rinse with 1% HNO_3, ultrapure.
5. Rinse with high-purity methanol followed by hexane rinse.
6. Rinse well with demonstrated analyte free water.
7. Air dry, and
8. Use equipment immediately or wrap in clean aluminum foil or teflon film for temporary storage.

Rinse water level tapes and slugs (slug testing) with tap water, followed by demonstrated analyte-free water. Place in a polyethylene bag to prevent contamination during storage or transit.

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 demonstrated analyte-free water. Clean the exterior of the submersible pumps and hoses that contact formation water by washing with detergent/water solution, followed by a tap water rinse, and a final rinse with demonstrated analyte-free water. Dedicate all tubing to individual wells or dispose of it, 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.

Drilling equipment, such as augers, mud tubs, downhole hammers and drill rods, and backhoe buckets will be steam cleaned before use at each location and at the end of the job before going off-site.

5.0 SAMPLE PACKAGING, SHIPPING, AND CHAIN-OF-CUSTODY PROCEDURES

Once the samples have been collected, prepared, preserved, and appropriately stored, they must be packaged and shipped. In addition, from the time of sample collection until analyses have been completed, chain-of-custody procedures must be implemented and manufactured to document control and handling of the samples. This section outlines procedures for the packing and shipping environmental samples and general chain-of-custody procedures.

5.1 PACKAGING AND SHIPPING PROCEDURES FOR ENVIRONMENTAL SAMPLES

All sample containers must be placed in a sturdy, insulated shipping container for transport to the laboratory. A metal or plastic picnic cooler is recommended. The following is an outline of the procedures to be followed.

1. Using fiberglass tape, secure the drain plug at the bottom of the cooler to ensure that liquid from sample container breakage or melting ice does not leak from the cooler.

2. Line the bottom of the cooler with a layer of absorbent material such as vermiculite.

3. Use pieces of carved-out plastic foam or individually wrapped glass containers to help prevent breakage.

4. Pack sample bottles in the cooler. Hand tighten all screw caps and mark sample volume level on the outside of large containers.

5. Pack small containers, such as 40 milliliter vials, in small plastic sandwich bags. When shipping these with larger containers, cushion smaller vials to minimize breakage.

6. Pack additional cushioning material, such as vermiculite or bubble pack, between the sample containers.

7. Pack ice, sealed in plastic bags, on top of the samples in the cooler when samples must be kept cold.

8. Seal the chain-of-custody form in a plastic bag and attach it to the inside or top of the cooler lid.

9. Close the lid of the cooler; be sure it is tightly fastened.

10. Seal the container with strong tape (fiberglass reinforced). Wrap the tape vertically around the cooler: two wraps each on the long and short dimensions.

11. Attach a shipping label with a return address to the outside of the cooler, along with, arrows indicating "This End Up" on all four sides, and "This End Up" label on the top of the lid.

12. Apply additional labels such as "Fragile" or "Liquid In Glass" as necessary.

13. If the cooler is not equipped with a padlock, apply a signed custody seal between the lid and body of the cooler.

Samples packaged in this way can be shipped by commercial carrier. Staff should be prepared to open and reseal the cooler for inspection when offering them for shipment. Be aware that some commercial carriers have limits for the number of pounds per item that can be shipped. Notify the laboratory of the name of the carrier, the containers' Bill of Lading numbers, and it's expected delivery date.

5.2 PACKING AND SHIPPING HAZARDOUS SAMPLES EXCLUDING THOSE FROM CLOSED CONTAINERS

1. Place one, decontaminated, labeled sample container in a 2-mil-thick self-sealing plastic bag. Care should be taken to position the sample label so that it may be read through the bag.

2. Place some vermiculite in the bottom of a half-gallon or gallon metal paint can to absorb shock and leaking material in the event of sample breakage. The sealed sample bag is then placed in the can. Additional vermiculite is added to fill the remaining space in the can. Close the can lid and seal in place with clips.

3. Attach address and return mailing labels to each can. Attach additional Department of Transportation Labels as are required by provisions of 49 CFR 171, 172, 173, or 178. Such labels may include "Flammable Liquid", "Flammable Solid", "Corrosive", etc.

4. Place the can in a cooler that has been partially filled with vermiculite. Additional vermiculite should then be placed where needed to secure the metal can. If more than one can is being shipped, this should be specified in the carrier's bill of lading. Seal a copy of the chain-of-custody record in a plastic bag, place it in the cooler, and shut and fasten the cooler lid.

5. Mark the top of the cooler with a "This End Up" label. The outside must display the same labels as are present on the metal can inside; In addition, arrows pointing to the top must appear on all four sides. Attach a label marked "Laboratory Samples" to the lid.

6. Secure the drain plug and lid of the cooler with fiberglass tape and custody seals as described in Section 5.1.

7. Check to be sure that the carrier's bill of lading is completed and signed. The sampler's certification for restricted articles must also be completed and signed. Personnel should be prepared to open and reseal the cooler if requested by the carrier. If transported by air, samples should be shipped by cargo aircraft only.

5.3 RECORD KEEPING AND CHAIN-OF-CUSTODY PROCEDURES

5.3.1 Record Keeping

Most of the sampling data and well installation information will be written on the forms presented in this appendix. Log books will be used to record the daily activities of each sampling team.

Photographs of all sampling locations and operations are desirable, although they frequently will not be allowed. If photographs are taken, the photographer should record time, date, site location, and brief description of the subject on the back of the photo, (polaroid) or in a log book and then sign it. Photographic documentation that may be used as evidence should be handled in a way to ensure that chain-of-custody can be established.

5.3.2 Custody Procedures

Chain-of-custody documentation must be implemented and followed whenever samples are collected, transferred, stored, analyzed, or destroyed. The primary objective of these procedures is to create an accurate written record that traces the possession and handling of the sample from the moment of its collection through analysis, to disposal.

A sample is defined as being in someone's "custody" if:

1. It is in one's actual possession, or
2. It is in one's view, after being in one's physical possession, or
3. It is in one's physical possession and then locked up so that no one can tamper with it, or
4. It is kept in a secured area, restricted to authorized personnel only.

The number of persons involved in collecting and handling samples should be kept to a minimum.

Labels or tags must be firmly affixed to the sample containers. Be sure that the container is dry enough for a gummed label to be securely attached. Each sample must be labeled using waterproof ink and sealed immediately after it is collected. Labels should be filled out before collection to minimize handling of sample container. Clear tape will be placed over the label. Tags attached by string are acceptable when gummed labels are not applicable. Figure A-13 is an example of a sample label.

A Chain-of-Custody form (Figure A-14) will be filled out for and accompany the samples placed in each cooler for shipment to the laboratory. This form records the type of sample, sample number, sampling time, analyses to be performed, and the bottles and preservatives used.

One member of the sampling team will be designated Field Sample Custodian. The samples and forms are transferred to the Field Sample Custodian by the team members who collect the samples at the end of each day. The Field Sample Custodian is responsible for packaging and dispatching samples to the appropriate laboratory. This responsibility includes filling out, dating, and signing the appropriate portion of the chain-custody record.

When transferring the samples, the receiver and sender must sign and record the date and time of transfer on the chain-of-custody record. Custody transfers made to the Field Sample Custodian should account for each sample, although samples may be transferred as a group. Every person who takes custody must fill in the appropriate section of the chain-of-custody record.

LOCATION ______________________ DATE ______________________

B/TP NO. ______________________ SAMPLE NO. ______________________

DEPTH ______________________ TIME ______________________

TYPE ______________________ SAMPLED BY ______________________

ANALYSES: VOA ABN METALS PEST/PCB

O&G PET. ID OTHER ______________________

PRESERVATIVE ______________________

INSTRUCTIONS/CAUTIONS ______________________

____

LABORATORY ______________________

CHAIN OF CUSTODY RECORD

PAGE ____ OF ____

JOB NO. ____	LABORATORY ____	DELIVERY DATE ____
PROJECT ____	ADDRESS ____	DATE FINAL REPORT DUE ____
CONTACT ____	CONTACT ____	PROJECT MANAGER'S INITIALS ____

SAMPLE NO.	LABORATORY SAMPLE NO.	SAMPLING		SAMPLE DEPTH	SAMPLE TYPE	ANALYSES										NO. OF CONTAINERS	COMMENTS (Special instructions, cautions, etc.)
		DATE	TIME			VOA	ABN	METALS	PEST/PCB	PET. ID	O & G						

Sampled and Relinquished by Sign Print Firm Date Time	Received by Sign Print Firm Date Time
Relinquished by Sign Print Firm Date Time	Received by Sign Print Firm Date Time
Relinquished by Sign Print Firm Date Time	Received by Sign Print Firm Date Time

Evidence Samples tampered with? ☐ No ☐ Yes

If Yes, explain in remarks.

VOA Vial											LIQUID
Glass Bottle											
PlasticBottle											
Preser-vative											
Container Volume											
VOA Vial											SOLID
Glass Jar											
Plastic Jar											
Preser-vative											
Container Volume											

Note: Sample bottles supplied by lab, unless indicated.

PRESERVATION KEY: A - Sample chilled, B - Filtered, C - Acidified with ____ D - NaOH, E - NaThiosulfate, F - Other

REMARKS: (Sample storage, nonstandard sample bottles)

FIGURE A-14

All packages sent to the laboratory will be accompanied by the chain-of-custody form and other pertinent forms. A copy of these forms will be retained by the Field Sample Custodian and stored in the central file for the project in the office. Mailed packages can be registered with return receipt requested. For packages sent by common carrier, receipts should be retained as part of the permanent chain-of-custody documentation. The laboratory custodian should sign field chain-of-custody forms to acknowledge receipt of the samples in the labs and either initiate separate laboratory custody procedures or maintain the field chain-of-custody until the sample is disposed. All chain-of-custody documentation will be returned to the central file.

6.0 HYDROGEOLOGIC DATA COLLECTION PROCEDURES

6.1 GROUNDWATER ELEVATION MEASUREMENTS

The depth to groundwater will be measured in the wells located on site. This information could be collected from a group of wells (such as each SWMU) during a short period of time (1 to 3 hours) to evaluate groundwater flow direction or from a few wells over a long period of time (for example, 12 or 24 hours) to evaluate groundwater elevation variations over time.

When no Light Non-Aqueous Phase Layer (LNAPL) is suspected to be present, a battery-operated water level indicator will be used to measure the depth to groundwater. At wells where LNAPLs may be present, an oil-water interface probe will be used to measure the LNAPL thickness and water level. If necessary, a bottom filling bailer specially designed to obtain samples of petroleum products floating on water will be used. This bailer is especially useful when thin layers (less than 0.05 feet) of LNAPLs are present. The indicator or probe will be calibrated against a tape measure to provide an accurate depth measurement. The calibration will occur at the beginning of each field program and once per month thereafter.

All groundwater depth measurements will be referenced to the notch on the top of the well casing, not the top of the protective casing.

Groundwater elevation information will be recorded in the field on the Sampling Record form for groundwater as shown in Figure A-11 or in a notebook.

6.2 SURFACE WATER ELEVATION MEASUREMENTS

When required, staff gauges will be installed in surface water bodies (streams or ponds) at locations where surface water is anticipated to be present year round. The gauge will be driven into the sediment so that the scale can be seen from shore and the gauge will not move. The elevation and location of each gauge will be measured by a land surveyor.

Attachment to Appendix A

Exemption Letter From EPA Dated September 16, 1991

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
JACOB K. JAVITS FEDERAL BULDING
NEW YORK, NEW YORK 10278

SEP 2 0 1991

Mr. Gary Kittell
Director of Engineering and Housing
Department of the Army
Seneca Army Depot
Romulus, New York 14541-5001

Re: Seneca Army Depot Superfund Site

Dear Mr. Kittell:

I am writing you this long overdue letter to confirm that I agreed at the meeting we had this past February that, in general, soils excavated from test pits dug during remedial investigation could be redeposited without regulatory restriction. This of course would not apply if obviously contaminated materials were unearthed (e.g., drums, visibly contaminated soil etc.). Subsequent evaluation might also require remediation of the redeposited soil. In such cases the material/soil would require proper disposal.

If you have any questions on this please call me at (212) 264-8670.

Sincerely yours,

Robert J. Wing, Chief
Federal Facilities Section

cc: K. Gupta, NYSDEC
R. Battaglia, SEAD
K. Healy, USACE

APPENDIX B
HEALTH AND SAFETY PLAN

SENECA ARMY DEPOT
CERCLA EXPANDED SITE INSPECTION
AT THE FIFTEEN
SOLID WASTE MANAGEMENT UNITS
ROMULUS, NEW YORK

PREPARED BY: Jason W. Cupp
Health and Safety Officer

APPROVED BY: Michael Duchesneau
Project Manager

APRIL, 1993

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this Health and Safety Plan (HASP) is to establish personnel protection standards and mandatory safety practices and procedures for field investigation efforts. This plan assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise during field investigations at fifteen solid waste management units (SWMUs) at Seneca Army Depot, Romulus, New York.

The following SWMUs are the subject of this investigation:

SEAD - 5, The Sewage Sludge Waste Piles
SEAD - 9, The Old Scrap Wood Site
SEAD - 12, The Radioactive Waste Burial Sites
SEAD - 43, The Old Missle Propellent Test Lab
SEAD - 56, The Herbicide/Pesticide Storage Area
SEAD - 69, The Building 606 - Disposal Area
SEAD - 44, The QA Test Labs
SEAD - 50, The Tank Farm
SEAD - 58, The Debris Near Booster Station 2131
SEAD - 59, The Fill Area West of Building 135
SEAD - 60, The Oil Discharge Adjacent to Building 609
SEAD - 62, The Nicotine Sulfate Disposal Area
SEAD - 64A, 64B, 64C, 64D, The Garbage Disposal Areas
SEAD - 67, The Dump Site East of Sewage Treatment Plant No. 4
SEAD - 70, The Fill Area Adjacent to Building T-2110
SEAD - 71, The Rumored Paint and Solvent

This plan may be modified by Addenda to accommodate changes in specific work plans and task specific and location specific hazards for the various SWMU investigation activities. Addenda to this plan will incorporate data obtained during subsequent sampling.

The provisions of the plan are mandatory for all Engineering-Science, Inc. personnel engaged in on-site hazardous waste operations. Subcontractors working for Engineering-Science, Inc. must conform to this Health and Safety Plan unless they prepare and administer a plan with equivalent requirements. All Engineering-Science, Inc. and Engineering-Science, Inc. contract personnel who engage in project activities must be familiar with this plan and comply with its requirements; these personnel must sign-off on the Plan Acceptance Form (to be attached), which will be submitted to the Engineering-Science, Inc. Project Manager for retention in the project file. All personnel performing work under this plan must be trained and have a current medical examination in accordance with 29 CFR 1910.120.

1.2 PERSONNEL

All Engineering-Science, Inc. site personnel and Engineering-Science, Inc. subcontractors performing duties or working in areas where there is the potential for exposure to hazardous material will meet the training requirements of OSHA 29 CFR 1910.120 before working on-site. Site personnel and their duties are outlined below:

1. Engineering-Science, Inc.'s Site Manager, responsible for all Engineering-Science, Inc. personnel and Engineering-Science, Inc.'s subcontractors on-site and designates duties to the on-site personnel. The name of the Site Manager or, if the Site Manager is absent, the name of the acting Site Manager, shall be posted in the command post.

2. The Site Safety Officer is responsible for carrying out the provisions of this HASP with regard to site work, and will ensure that all personnel entering the site understand and adhere to the provisions of this plan and that personnel meet the training and medical monitoring requirements of 29 CFR 1910.120. Any changes in the provisions of this HASP shall be made in writing by the Site Safety Officer and shall be approved by the Project Safety Officer or Corporate Health and Safety Officer. Any personal protective equipment upgrades or downgrades shall be documented in writing by the Site Safety Officer. The Site Safety Officer shall have the authority to stop an operation or site work if, in the opinion of the Site Safety Officer, the site conditions or the manner in which the work is being conducted, presents a hazard to site personnel, surrounding populations, or the environment. The name of the Site Safety Officer or, if the Site Safety Officer is absent, the name of the Acting Site Safety Officer, shall be posted in the Command Post.

3. UXO personnel will be responsible for locating and identifying unexploded ordnance on the site and for clearing access pathways to sampling and work locations. UXO personnel shall not move or dispose of any UXO found. Disposal and demolition of UXOs will be performed by SEAD EOD personnel. UXB, Inc. has been contracted to supply UXO personnel for the SWMU Investigation Field Work.

4. SEAD EOD personnel will be responsible for disposal and demolition of any UXOs found at the site.

5. The Site Safety Monitors are responsible for all air monitoring. Air monitoring requirements for the Seneca Site are set forth in Section 6.0 of HASP.

6. Field personnel will be involved in sampling, inspections, field monitoring, and decontamination, as specified in this HASP the Work Plan, and the Field Sampling and Analysis Plan (Appendix A to the Work Plan). These activities will be carried out in accordance with the QA/QC protocols in the Chemical Data Acquisition Plan (CDAP). Site personnel will only perform tasks for which they have received appropriate training.

Site visitors who are not affiliated with ES, ES's subcontractors, USEPA, NYSDEC, or Seneca Army Depot will not be allowed into active work areas without making arrangements with Seneca and ES well in advance of the planned visit. Site visitors must present evidence of appropriate training and participation in a medical surveillance program in accordance with 29 CFR 1910.120, and evidence of ability to use a respirator in accordance with 29 CFR 1910.134.

Seneca Army Depot, USEPA and NYSDEC personnel will be permitted into active work areas after presenting a letter addressed to Engineering-Science, Inc.'s Site Safety Officer certifying they have passed a physical examination and are certified to wear the appropriate respiratory protective equipment.

All visitors will follow the advice and instructions of Engineering-Science, Inc.'s Site Manager and Site Safety Officer. Failure to follow these instructions may endanger the health and safety of visitors and other on-site personnel.

2.0 SITE CHARACTERIZATION

2.1 SITE HISTORY AND DESCRIPTION

The Seneca Army Depot, a 10,587 acre facility in Seneca County, Romulus, New York, has been owned by the United States Government and operated by the Department of the Army since 1941. Since its inception in 1941, SEAD's primary mission has been the receipt, storage, maintenance, and supply of military items. This function includes disposal of military ammunition and explosives by burning and detonation. Several investigations have been conducted at the solid waste management units (Figure B-1) including:

1. U.S. Army Environmental Hygiene Agency's (AEHA) Groundwater Contamination Survey No. 38-26-0868-88 (July, 1987).

2. U.S. Army Environmental Hygiene Agency's (AEHA) Evaluation of Solid Waste Management Units, Seneca Army Depot.

3. RCRA Facility Assessment at SEAD in July 1988, Additional SWMUs.

4. Solid Waste Management Unit Classification Report, Seneca Army Depot, Romulus New York by ERCE Environmental and Energy Services Co., Inc. April 12, 1991.

The most recent SWMU classification report by ERCE in April 1991, described and evaluated the SWMUs and also delineated those units that would require further sampling investigation or corrective action. Each unit has been classified as an area where "No Action is Required" or as an "Area of Concern" (AOC). AOCs include locations where releases of hazardous substances may have occurred and locations where there has been a release or threat of release into the environment of a hazardous substance, pollutant or contaminant (including radionuclides) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

The individual SWMUs which are the subject of this investigation are described in Attachment A.

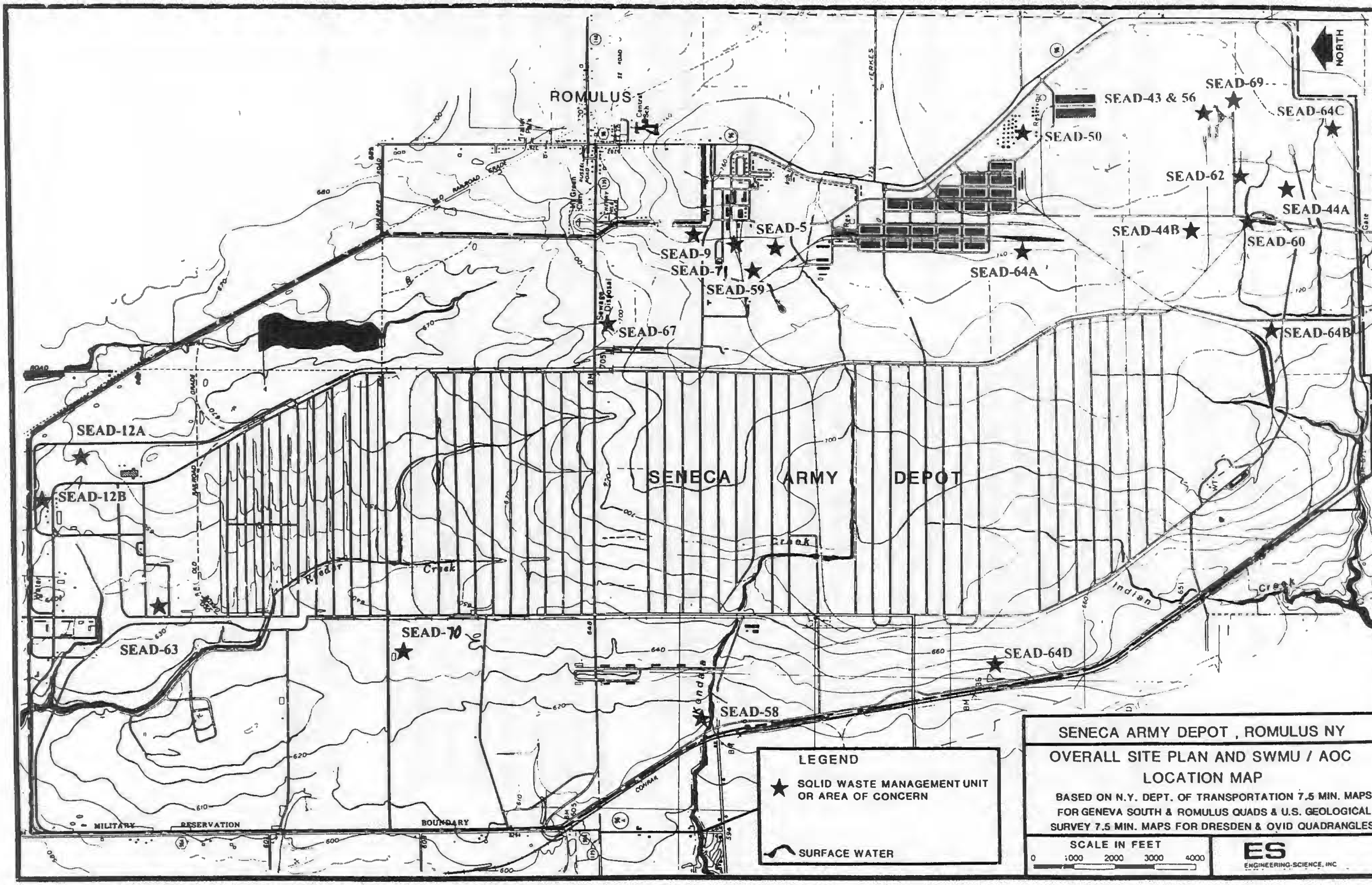

FIGURE B-1 OVERALL SITE PLAN AND SWMU LOCATION MAP

2.2 PLANNED SITE ACTIVITIES

The field activities at the SWMUs include the following tasks: UXO detection and clearance by UXB, Inc.; geophysical surveying; test pit excavations; soil sampling; monitoring well installation, development, and sampling; surface water sampling and sediment sampling.

2.3 HAZARD EVALUATION

The general chemical and physical hazards which may be encountered at the SWMUs are described below. Hazards specific to each of the SWMUs are described in Attachment A to this HASP.

2.3.1 Exposure Potential

The primary sources of exposure at the fifteen SWMUs will be the surface and subsurface soils and groundwater. These media may be contaminated with heavy metals, explosive compounds or low level radioactive waste. The exposure potential for each of the planned site activities is described below. SWMU specific hazards are described in Attachment A to this HASP.

Geophysical Monitoring and UXO Detection and Removal - The geophysical monitoring is non-intrusive and generally has a low exposure potential. There is some potential for exposure to metal and explosive contaminated surface soils. Several types of geophysical techniques will be used to detect the presence of UXOs and buried trenches which may contain UXOs. Once detected, these areas will be flagged and the high anomalies will be removed by qualified UXO trained demolition experts. There are high risks associated with these operation due to premature detonation. UXO handling procedures are described in Section 9.

Soil Sampling - The primary route of exposure during the soil sampling will be through contact with metal and explosive contaminated soil. There is also potential inhalation exposure of radioactive alpha particulates during drilling. There is a potential for explosion due to unexploded ordnance. This risk will be minimized by a prior clearing of boring locations and by implementing a remote drilling program. The overall exposure potential for soil sampling is moderate due to remote drilling procedures. There is a high potential for direct contact with contaminated soils.

Monitoring Well Installation, Development, and Sampling - The exposure potential for the monitoring well development and sampling is similar to that of soil sampling. There will be additional monitoring wells installed so remote drilling and UXO hazards are possible. There is potential contact exposure to contaminated groundwater, particularly during well development.

Test Pit Excavations - Test pits will be dug in some areas to assess potential contaminant sources and to collect soil samples. There is a medium potential for UXO detonation during the excavation. The area to be excavated will be cleared by UXO personnel prior to and during the excavation and prior to the collection of the samples. During the sampling there is a moderate potential for contact exposure to metals and explosive compound contaminated soils.

Surface Water Sampling - The exposure potential for the surface water sampling to be conducted at the SWMUs is low. The waters to be sampled are not expected to contain high levels of contaminants. Surface water at some sites include drainage swales and pooled water that may contain higher levels. There is some potential for contact exposure to dissolved metals and explosives in surface water.

Sediment Sampling - The primary route of potential exposure during sediment sampling is through contact with contaminated sediments and surface waters. There is some potential for exposure to volatile contaminants which may be contained in the sediments. The exposure potential for fugitive dusts is low, since the handled sediments will be wet and will not produce dusts.

2.3.2 Chemical Hazards

A large number of compounds have been detected in previous soil and groundwater investigations at the Seneca site. Most of these compounds are heavy metals and explosives.

The following is a summary of the toxic effects of these compounds. Exposure limits and physical properties are given in Table B-1 and in the Chemical Hazard Evaluation Sheets contained in Attachment B. Chemicals occurring at individual SWMUs are listed in Attachment A.

TABLE B-1

PERMISSIBLE EXPOSURE LIMITS FOR SUSPECTED COMPOUNDS DETECTED FOR THE FIFTEEN SWMUs AT SEAD

		Permissible Exposure Limits[1] (mg/m3)	Short-Term Exposure Limits (mg/m3)[2]	Ceiling Limits (mg/m3)[3]	Other Exposure Limits (mg/m3)[4]	Carcinogenic Rating[5]
Metals	Arsenic	0.01	–	–	0.002[6]	A
	Barium	0.5	–	–	--	--
	Cadmium dust	0.2	–	0.6	–	B1
	Chromium (VI)	0.05	–	0.1	0.001[7]	A
	Copper, Dust and Mist	1.0	–	–	–	D
	Mercury	0.01	0.03	0.1	–	D
	Nickel	0.1	–	–	0.015[7]	A
	Selenium	0.2	–	–	–	(8)
	Zinc Total Dust	10.0	–	–	–	--
Volatiles		(PPM)	(PPM)			
	Benzene	1.0	5	–	0.33(0.1)[7]	A
	Toluene	100	150	–	–	D
	Xylene	100	150	–	--	D
	Petroleum Products					
Semi-volatiles	PCB's	0.5 (skin)	–	–	0.001[7]	B2
	DDT	1.0 (skin)	–	–	0.5[7]	B2
	Nicotine	0.5	–	–	–	–
Explosives						
	HMX	–	–	–	1.5[9]	--
	RDX	–	–	–	1.5[9]	C
	2,4,6-TNT	0.5 (skin)	–	–	–	(8)
	2,6-DNT	1.5 (skin)	–	–	–	B2
	2,4-DNT	1.5 (skin)	–	–	–	B2
	Tetryl	1.5 (skin)	–	–	0.5 (skin)[10]	–
Ionizing Radiation	Beta/Gamma	–	–	–	2 mRem/hr	(6)
	Alpha	–	–	–	2 mRem/hr	(6)

Notes:

(1) OSHA 8-hour time-weighted average Permissible Exposure Limits (PEL). For metals, PEL shown is lowest of compounds likely to be encountered on-site.
(2) OSHA Short-Term Exposure Limit. 15 minute time-weighted average concentration
(3) OSHA Ceiling Limit. Concentration not to be exceeded during any part of the work day.
(4) Occupational Exposure Limits from other sources.
(5) EPA weight of evidence ratings for each compounds.
- A Confirmed human carcinogen
- B1 Probable confirmed human carcinogen. Limited human evidence.
- B2 Probable confirmed human carcinogen. Sufficient animal evidence.
- C Possible Human Carcinogen, Limited Animal Evidence
- D Not classifiable
- – No data or carcinogenic rating not determined.

(6) NIOSH REL Ceiling
(7) NIOSH REL TWA
(8) Substance identified as suspected or confirmed human carcinogen by agency other than USEPA.
(9) Sitting, 1991.
(10) PEL derived by analogy to 2,4,6-TNT and dinitrobenzene

Arsenic - Arsenic becomes a skin irritant with prolonged exposure: moist areas of the skin; respiratory mucosa; angles of eyes, ears, nose, and mouth; and the wrists being common sites of irritation. Acute exposure symptoms include abdominal pain, vomiting, and watery diarrhea followed by shock due to fluid loss. Acute inhalation exposure can cause chest pain, coughing, giddiness, and general weakness which precede gastrointestinal symptoms. Symptoms of chronic inhalation exposure proceed in three phases. Initial symptoms are weakness, loss of appetite, occasional nausea and vomiting, and some diarrhea. The second phase consists primarily of irritant effects of the eyes, nose, and respiratory passages, with perforation of the nasal septum common, and allergic reactions of the skin. The third phase consists of peripheral neural effects, usually numbness. Arsenic has been causally associated with skin cancer and implicated in increases in the incidence of lung cancer.

Barium - Barium and its compounds are highly toxic. Acute symptoms are excessive salivation; vomiting; colic; diarrhea; convulsive tremors; slow, hard pulse; and elevated blood pressure. Bleeding in the stomach, intestines, and kidneys may occur. Chronic exposure results in enlargement of the liver and spleen, and increases in white blood cell counts. Barium has been found to produce lung cancer in rats.

Benzene - Benzene will cause local irritation to the skin, eyes and respiratory tract and may cause redness, dryness and scaling of the skin due to defatting. Acute systemic effects include headache, dizziness, convulsions, coma and death may occur due to effects on the heart. Chronic exposures effects the blood-forming tissues primarily, resulting initially in increases in blood cell counts followed by aplastic anemia with an overactive or under active bone marrow. Epidemiological studies have linked benzene with leukemias and it is classified as a suspected human carcinogen.

Cadmium - Cadmium compounds induce vomiting at low oral doses and systemic oral poisoning is rare. Acute exposure can occur by inhalation, producing irritation in the respiratory tract followed hours later by coughing, chest pain, sweating and chills and, later, general weakness, severe respiratory irritation, and fluid build up in the lungs. These symptoms can lead to emphysema or death. Chronic exposure can lead to emphysema, kidney damage, and possible heart and blood pressure effects. Animal studies have shown cadmium to produce cancer, birth defects, testicular atrophy, and liver and nerve damage. Some studies in man have shown an association of cadmium exposure with cancers of the prostate and kidney.

Chromium - Chromium compounds can act as allergens, resulting in local irritation of the skin and respiratory tract. Systemic effects are generally a result of the irritating properties of chromium compounds on the eyes, nose, and respiratory tracts. Chromium compounds has been shown to be carcinogenic in rats and has been associated with increases in lung cancer in humans. The irritant and carcinogenic effects differ widely for various compounds of chromium.

Copper - Copper is a soft, heavy metal which occurs naturally as a variety of salts, as well as in the pure metallic form. Copper is an essential trace element in humans and animals. Copper salts are irritating to the skin and cause itching, erythema, and dermatitis. They may cause conjunctivitis, ulceration and clouding of the cornea. Metallic copper can cause keratinization of the hands and soles of the feet. Inhalation of copper fumes can cause congestion of the nasal mucous membranes and perforation of the septum. Ingestion causes irritation of the gastrointestinal tract, producing nausea, vomiting, gastritis, and diarrhea. If vomiting fails to occur, gradual absorption from the bowel may cause systemic poisoning. The systemic effects of copper include capillary damage, kidney and liver damage, and excitation followed by depression. Jaundice and hemolytic anemia can also occur following acute poisoning.

Mercury - Mercury is a local irritant of skin and mucous membranes any may be a skin sensitizer in some people. Acute poisoning symptoms are generally irritant: acute inhalation exposure results in inflammation of the lung and bronchioles. Chronic exposure symptoms are non-specific: weight loss, appetite loss, memory loss, insomnia, indigestion, weakness, metallic taste in mouth, tremors in eyelids, fingers, lips, or tongue, and loosening of teeth. Symptoms may vary among individuals. Long-term or high dose exposures can produce irritability, delirium, anxiety, or manic depressive psychosis.

Nickel - Dermal exposure to nickel and nickel compounds results in contact dermatitis and chronic eczema. Nickel and its compounds are also irritants to the conjunctiva of the eye and mucous membranes of the upper respiratory tract. Chronic exposure to elemental nickel and its salts may result in lung and nasal passage cancer. Effects are also seen on the heart, muscles, brain, and kidney.

Selenium - Selenium and various selenium compounds can effect the body if inhaled, if they come into contact with the eyes or skin, or if swallowed. Selenium compounds if inhaled in large quantities can cause severe breathing difficulties. Skin contact can cause burns or rashes. Long-term exposure can cause paleness, stomach disorders, coated tongue, and nervousness. Fluid in the abdominal cavity, damage to the liver and spleen have been reported in animals.

Petroleum Products -

Fuel Oils -- Fuel oils are mixtures of straight-chain, branched, double-bonded, cyclic, and aromatic hydrocarbons containing 10 to 16 carbons. Fuel oils come in six grades, numbered 1 to 6, with the lower numbered fuel oils being composed of lighter mixtures of hydrocarbons. The toxicity of these fuel oils varies widely, though all produce skin irritation with prolonged contact. Inhalation exposure is generally not a problem due to the low volatility of these mixtures, though cases of inhalation intoxication from Fuel oil No. 1 (jet fuel) have been reported to cause dizziness, headache, nausea, palpitations, and pressure in the chest. Lighter fuel oils are rapidly absorbed from the stomach and cause gastrointestinal irritation,vomiting, diarrhea, and may cause drowsiness and central nervous depression. Ingestion may lead to aspiration into the lungs which may cause pulmonary edema, hemorrhage, irritation, and cardiac and kidney effects. Pulmonary exposure may also occur through exposure to mists. Chronic exposure may lead to kidney damage. Fuel oils are not classified as carcinogens and teratogenic data are negative.

Gasoline - Gasoline is a mixture of five-carbon to eleven-carbon straight-chain, branched, double-bonded, cyclic,and aromatic hydrocarbons. Acute inhalation exposure effects are primarily on the central nervous system, including staggered gait, slurred speech and confusion. High levels may cause coma or death from respiratory failure. Contact exposure results in irritation, defatting, and some individuals may develop an allergic reaction to gasoline. Chronic exposures may result is kidney damage and in lead toxicity with leaded gasolines. Gasoline is not classified as a carcinogen. Teratogenic and mutagenic data are negative.

Polychlorinated Biphenyls (PCBs) - Polychlorinated biphenyls primarily effect the skin and the liver. Skin areas exposed to PCBs develop chloracne, which consists of small pimples and dark pigmentation. Later, comedones and pustules develop. Some PCBs are suspected carcinogens, producing liver tumors. Acute and chronic exposures can result in edema, jaundice, vomiting, anorexia, nausea, abdominal pains, and fatigue.

Toluene - Toluene will cause local irritation to the skin, eyes, and respiratory tract. and may cause defatting, drying and scaling of the skin. Acute systemic effects include headache, dizziness,nausea, loss of appetite, lassitude and eventual coma if exposure is prolonged. Toluene does not display the effects on the blood forming tissues seen with benzene and is not classified as a carcinogen in humans or animals. Chronic exposures can result in effects on the liver, kidneys and central nervous system.

Xylenes -- Acute effects are of xylene exposure include skin and mucous membrane irritation, central nervous system effects, and respiratory irritation leading to pulmonary congestion, edema, and hemorrhage. Inhalation exposure can also lead to liver and cardiac damage. Chronic exposure can result in effects on the liver, kidneys and central nervous system and may have an effect on the blood forming tissues, No carcinogenic effects have been documented; possible teratogenic effects have been observed.

HMX - The chemical name of HMX is octahydro-1,3,5,7-tetranitro -1,3,5,7-tetrayocine. Considered a poison by ingestion or intravenous injection, HMX remains an explosive of concern to many industries who handle this compound. At high temperatures, HMX decomposes violently and emits toxic fumes of NOX.

RDX - The chemical name of RDX is hexahydro-1,3,5-trimethyl -1,3,5-triazine. The solubility of RDX in water at 18° was found to be 44.7 ppm and hydrolysis is slow. RDX is a corrosive irritant to the skin, eyes and mucous membranes. Experimental reproductive abnormalities and epileptiform convulsions from exposure have been reported. It is one of the most powerful high explosives in use today. RDX has more shattering power than TNT and is often mixed with TNT as a bursting charge for aerial bombs, mines and torpedoes. When heated to decomposition it emits toxic fumes of NO_x.

2,4,6-TNT - The chemical name of 2,4,6-TNT is 2,4,6-trinitrotoluene. It is not been known to undergo hydrolysis in the environment. Symptoms of exposure to TNT are sneezing, coughing, sore throat, and muscle pain. TNT effects the blood, liver kidneys, skin, central nervous system, and cardiovascular system. Human systemic effects when ingested include: hallucinations, cyanosis, and gastrointestinal changes. Experimental reproductive abnormalities and mutagenic data have been reported. This chemical has been classified as a skin irritant and has been implicated in aplastic anemia. TNT can cause headaches, weakness, anemia, liver injury and may be absorbed through the skin. TNT is flammable or explosive when exposed to heat or flame. Moderate explosion hazard; will detonate under strong shock. It is a comparatively insensitive explosive, however, sudden heating of any quantity will cause detonation.

2,6-DNT - The chemical name of 2,6-DNT is 2,6-dinitrotoluene. It is not expected to hydrolyze under normal environmental conditions. NIOSH recommends to reduce exposure to DNT to the lowest levels possible. Experimental testing of 2,6-DNT has shown it to be more active as a liver carcinogen than 2,4-DNT isomer. The major target organs are the blood, liver, and central nervous system. Symptoms of exposure include anoxia, cyanos, anemia, and jaundice.

2,4-DNT - The chemical name of 2,4-DNT is 2,4-dinitrotoluene. It is not expected to hydrolyze under normal environmental conditions. 2,4-DNT is poisonous if swallowed or injected subcutaneously. It has been shown to be carcinogenic, teratogenic, and mutagenic in experimental tests. 2,4-DNT can cause anemia, methemoglobinemia, cyanosis, and liver damage. The chemical will combust when exposed to heat or flame; can react with oxidizing materials. There have been cases of explosion during manufacture and storage and mixture with nitric acid is a high explosive. Other mixtures such as alkalies can cause a significant increase in pressure. When heated to decomposition it emits toxic fumes of NO_x.

2.3.3 Physical Hazards

Due to the operations at some of the SWMUs, there is very likely to be unexploded ordnance or explosives dispersed in the SWMUs. Large portions of the SWMUs have not been surveyed for UXOs and no catalog of locations of UXOs is available. The presence of UXOs on the site presents a **EXTREMELY HAZARDOUS CONDITION.**

UXB personnel trained in the discovery and handling of UXOs shall perform all UXO clearance at the SWMUs to be investigated. Cleared pathways and work areas shall be outlined with red "DANGER" tape. Employees shall not cross the tape into uncleared areas.

When working in cleared areas, the work crews and equipment shall be positioned such that the chance for accidental movement into uncleared areas is minimized. Equipment shall be placed so as not to impede emergency escape and evacuation along the cleared pathways.

Cleared roads and pathways shall be marked. **ON-SITE WORKERS SHALL NOT STRAY FROM THE CLEARED PATHWAYS AND ROAD!** UXOs found on the site may have been subjected to stresses which render them very unstable and the UXOs may detonate with even very slight disturbance. **ON-SITE WORKERS SHALL NOT TOUCH, KICK, OR OTHERWISE DISTURB ANY MATERIALS ON-SITE WHICH MAY BE UXOs.**

Other than the presence of UXOs, the principle physical hazards at the Seneca site involve working around heavy equipment, site terrain, and site debris.

Terrain hazards include marshy areas, areas of rough terrain, and areas of protruding debris. In areas where access is difficult or hazardous, access paths shall be cleared and maintained, and movement through these areas shall be along the access paths.

Activities on-site will include:

1. Site visits;
2. Geophysical surveys;
3. Unexploded ordnance detection and clearance;
4. Soil boring and sampling;
5. Surface water and sediment sampling;
6. Test pit excavation; and
7. Monitoring well installation, development and sampling.

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

2.3.4 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-site 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 (i.e. test pits), 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 give 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 kilo volts (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 in an elevated position will be returned to traveling position and condition before being moved. Movement through the depot facility will be along established roads. All site equipment will be inspected before each use to ensure that it is in proper working order. Any equipment found to be unsafe shall be repaired or taken out of service.

2.3.5 Heat Stress

Site work at the SWMUs may be conducted during the summer and early fall months and heat stress is a serious concern. Heat stress monitoring for employees wearing protective clothing will be conducted whenever the temperature is above 60°F. For employees not wearing protective clothing, heat stress monitoring will be conducted when the temperature is above 80°F. Pulse rate and oral temperature measured at the end of each work period will be used to monitor heat stress in on-site employees. Heat stress monitoring procedures are described in Attachment C of this HASP, Standard Operating Procedures for Emergencies Due to Heat and Heat Stress Monitoring.

2.3.6 Cold Stress

Site work at the SWMUs may be conducted during cold weather. Cold stress monitoring for employees working outdoors will be conducted. Two factors influence the development of a cold injury: ambient temperature and wind velocity. Cold stress monitoring will be conducted when temperatures are below 4°C (40°F). Cold stress monitoring procedures are described in Attachment C of this HASP, Standard Operating Procedures for Emergencies Due to Cold and Cold Stress Monitoring.

2.3.7 Biological Hazards

Biological hazards can result from encounters with mammals, insects, snakes, spiders, ticks, plants, parasites, and pathogens. Mammals can bite or scratch when cornered or surprised.

The bite or scratch can result in local infection or infection with systemic pathogens or parasites. Insect and spider bites can result in severe allergic reactions in sensitive individuals. Exposure to poison ivy, poison oak or poison sumac results in skin rash. Ticks are a vector for a number of serious diseases. Dead animals, organic wastes, and contaminated soil and water can harbor parasites and pathogens.

2.3.7.1 Poison Ivy

Poison ivy is common throughout the SEAD site. Know how to recognize the poison ivy plant and avoid walking through areas of heavy growth. If you must walk through areas of poison ivy, keep extremities covered and avoid contact of bare skin with poison ivy leaves and stems. When digging in areas of poison ivy growth, avoid contact with the roots; these too can produce a reaction.

Wash skin areas exposed to the poison ivy as soon as possible. Oils from the poison ivy plant can adhere to clothes. Wash clothes exposed to poison ivy before wearing again.

2.3.7.2 Ticks and Lyme Disease

Ticks may be common during the spring and summer at the SEAD site. Two types of ticks may be encountered.

The dog tick is the larger, more common tick. After biting, the dog tick will remain attached to the victim until engorged with blood. Usually, dog ticks can be found by careful inspection of the body at the end of the work day. If the tick is already imbedded in the skin, remove it with tweezers or fingers by grasping the tick as close to the skin as possible and pulling downward. Check to make sure all tick parts have been removed from the skin. Wash the area of the bite with soap and water. Seek medical attention if any tick parts remain in the skin. Dog ticks may transmit rocky mountain spotted fever and other diseases.

The deer tick is much smaller, ranging from poppy seed to grape seed size, and does not remain attached to the skin for very long after biting. You may be bitten by a deer tick and never see the tick. Deer ticks can transmit Lyme disease, which can have serious, long-term health effects if left untreated. If you discover a small tick imbedded in the skin, remove it as above. Check the area of the bite periodically. If you develop a rash or develop flu-like symptoms, seek medical attention. Lyme disease is characterized by a bulls-eye type rash; light in the center with an outer red area. Flu-like symptoms may also occur. These signs may occur at different times and the rash may not appear.

If you discover any bites on the skin, wash the affected area and seek medical attention if a rash or flu-like symptoms appear.

Take the following steps to limit the likelihood of getting tick bites:

- Tuck pants legs into socks.
- Wear long sleeves, hat and closed shoes.
- Use tick repellant, such as DEET, on clothes.
- Check body for ticks daily.
- Shower immediately after work and wash work clothes daily.

2.3.7.3 Snakes

Poison snakes are not common to the area of the SEAD site, though central New York is within the range of rattlesnakes and copperheads. To minimize the chance of snake bites:

- Do not put hands and feet where you have not looked.
- Avoid stepping into clumps of weeds and brush.
- Step heavily. Snakes can feel footfalls through the ground and will avoid you if they can.
- Wear heavy leather boots and loose fitting pants.

Caution should be used if any snake is encountered.

2.3.8 Radiation Hazards

Radioactive materials were stored at Seneca Army Depot in the form of pitch blend, a tarry, uranium oxide ore derived from coal. The pitch blend has been removed from the depot, however, the possibility exists that small amounts of this radioactive material were disposed on-site. With the exception of the Radioactive Waste Burial Site (SEAD-12) which stored radioactive wastewater generated from the washing of radioactive contaminated clothing, and disposal of low-level radioactive debris, radioactive materials are not known to be in the fifteen SWMUs being investigated under this plan, but monitoring for radioactivity will be conducted to further minimize the small chance of exposure.

The hazards associated with radioactive materials result from the particles emitted from the material. Potential chemical toxicity of radioactive elements are usually of secondary importance relative to the potential for health effects from the radioactivity. Three types of radioactive particles are of concern with regard to environmental radioactivity: alpha particles, beta particles, and gamma or x- rays. The hazards associated with each of these types of radiation are discussed below.

Alpha Radiation

Alpha particles are large radioactive particles consisting of two neutrons and two protons. Alpha particles can only travel a few inches in air and can be shielded by a piece of paper or clothing. The outer layers of the skin are also an effective shield to alpha particles and thus, alpha particles do not represent an external radiation hazard. However, if alpha particles are ingested or inhaled they can represent a significant internal radiation hazard. Ingestion or inhalation of alpha emitting radionuclides, such as radium, radon, and thorium have been associated with cancers of the lungs and leukemia.

Beta Radiation

Beta particles are fast moving particles which are equal in mass to electrons. Beta particles are moderately penetrating and can be shield by thin layers of plastic or plexiglass. Beta particles from strong sources have a maximum range in air of about 30 feet. Beta particle from other sources have a range in air of 1 to 20 feet. Beta particles can penetrate the outer layers of skin and are an external radiation hazard to the skin and the eyes, as well as an internal radiation hazard. The dose received from an ingested beta emitting radionuclide is less than the dose that would be received from an equivalent amount of an alpha emitting material. Internal exposure to beta emitters has been associated with cancer in various organs.

Gamma radiation

Gamma radiation or x-rays are highly penetrating photons and have ranges measured in kilometers. Gamma radiation is considered primarily an external exposure hazard because of the long range and highly penetrating nature of the radiation. Dense materials, such as lead and concrete are effective as shielding for gamma radiation. Exposure to gamma rays has been associated with increased incidence of cancers in various organs.

3.0 HEALTH AND SAFETY TRAINING

All site workers involved in hazardous work have met the training requirements set forth in 29 CFR 1910.120(e). All employees engaged in hazardous waste site work have received 40 hours of training in hazardous waste site operations and safety procedures. Written certification of this training will be provided as an attachment to the HASP. This training has been followed by 3 days of supervised on-site experience. Employees performing hazardous waste work prior to March 1987, who received initial training that was standard at that time, are assumed to satisfy 29 CFR 1910.120 as a result of training and experience.

Supervisors and site managers have received an additional 8 hours of specialized training on the safe management of site operations. All employees have received annual updated training. Additional training has been provided to those employees designated to respond to site emergencies. Additional training will be provided to those employees who may be exposed to unique or special hazards at the site.

On-site safety training will consist of a detailed safety meeting and training session prior to the beginning of any field work. This meeting will cover all site activities and will also review the site emergency response plan. All site workers and managers are required to attend this meeting. Other topics to be discussed will include donning and doffing of personnel protective equipment as well as a brief toxicological review of site-specific known and suspected contaminants.

Daily safety meetings will also be conducted prior to each day's activities. These meetings will cover the safety measures to be employed during that day's activities and the emergency response and evacuation procedures for each work site and work crew.

On-site training will be documented using the form contained in Attachment D, On-Site Documentation Forms.

3.1 INITIAL SITE TRAINING

Initial site training shall consist of a review of this site specific HASP and shall cover the following topics.

- Site Personnel and Duties
- Site Description

- Site Characterization
- Chemical and Physical Hazard Evaluation
- Toxicological Information
- Heat Stress and Cold Stress
- Site Layout, Site Control Measures, and Work Zones
- Personnel Protective Equipment
- Air Monitoring
- Safe Work Practices and Engineering Controls
- Spill Containment Program
- Decontamination Procedures
- Emergency Response Plan
- On-site Emergency Plan
- Off-site Emergency Plan
- Evacuation Procedures
- Safe Distances and Places of Refuge
- Emergency Decontamination
- Emergency and Personnel Protective Equipment
- Emergency Telephone Numbers
- Directions to Hospital
- Medical Surveillance Requirements
- Health and Safety Training

UXB will provide site specific basic UXO Recognition and Avoidance Training. The following areas will be included:

1. Basic UXO and UXO component recognition training
2. UXO avoidance and reporting procedures
3. Specific hazards related to UXOs
4. UXO emergency procedures
5. Emergency medical care related to UXOs

3.2 SAFETY BRIEFINGS

Safety briefings shall be conducted at least weekly and at the beginning of new operations, changes in site conditions, and changes in operating procedures due to weather, new equipment, or additional site information.

The topics covered in the safety briefings will include, as appropriate:

- Evacuation routes and emergency procedures
- Use of additional protective equipment
- Terrain hazards
- Weather hazards
- New chemical or toxicological information
- Periodic review of portions of the site specific HASP
- Review of site incidents, follow-up, and corrective measures.

4.0 MEDICAL SURVEILLANCE

All personnel conducting work in the exclusion and contamination reduction zones will be participating in a medical surveillance program which meets the criteria set forth in OSHA 29 CFR Part 1910.120. This rule requires that employees engaged in hazardous waste site work receive a medical examination at least annually, and they be certified by the examining physician to wear a respirator without restrictions. All subcontractors involved in hazardous work must certify to Engineering-Science, Inc. that all site workers meet the above criteria. Written certification of completion of medical exams for designated project employees will be provided as a separate attachment of this HASP.

Employees of Seneca Army Depot (SEAD) who will be performing activities in active work areas at the fifteen SWMUs will be required to participate in SEAD's medical surveillance program for respirator use.

4.1 PHYSICAL EXAMINATIONS

Employees receive physical exams annually and at the time of termination from Engineering-Science, Inc. or reassignment from the hazardous work assignments.

Personnel who are significantly exposed to hazardous materials may require special exams. The need for these tests will be determined by the attending physician after consulting with supervisors and health and safety personnel. Provisions will be made to repeat tests when necessary.

Physical exams will be conducted by or under the direct supervision of a licensed physician or a medical consultant who is Board Certified or Board Eligible in Occupation or Aerospace Medicine by the American Board of Preventive Medicine, Inc. with at least three years of experience in occupational medicine.

The examining physician will furnish Engineering-Science, Inc.'s Health and Safety Officer with an oral report and indicate any adverse effects. A written report will follow. The physician is instructed, however, to reveal any specific findings or diagnoses unrelated to occupational exposure to the employee or the employee's designee only.

Medical records for Engineering-Science, Inc. personnel are kept on file by Engineering-Science, Inc. for at least 30 years plus the length of employment. Medical monitoring for Engineering-Science, Inc. employees is the responsibility of Engineering-Science, Inc., and Engineering-Science, Inc. will bear the entire cost.

5.0 SITE LAYOUT AND CONTROL MEASURES

5.1 UNEXPLODED ORDNANCE CLEARANCE

Certain SWMUs are known to contain various types of unexploded ordnance (UXO) or explosives. All movement on these sites shall be along cleared roads and pathways. Cleared roads and pathways shall be marked. **ON-SITE WORKERS SHALL NOT STRAY FROM THE CLEARED PATHWAYSAND ROAD!** UXOs found on the site may have been subjected to stresses which render them very unstable and the UXOs may detonate with even very slight disturbance. **ON-SITE WORKERS SHALL NOT TOUCH, KICK, OR OTHERWISE DISTURB ANY MATERIALS ON-SITE WHICH MAY BE UXOs.**

UXB personnel trained in the discovery and handling of UXOs shall perform all UXO clearance for the fifteen SWMUs. Cleared pathways and work areas shall be marked with red "DANGER" tape.

When working in cleared areas, the work crews and equipment shall be positioned such that the chance for accidental movement into uncleared areas is minimized. Equipment shall be placed so as not to impede emergency escape and evacuation along the cleared pathways.

Drilling will be performed by remote operations at the SWMUs where unexploded ordnance are suspected. The SWMUs where UXOs are suspected are identified in Attachment A to this HASP.

5.2 WORK ZONES

The support zone and command post for the field work at the SWMU areas will consist of an office trailer and storage areas at one central location for all SWMUs. The location of the support zone will be determined prior to the commencement of the field work.

The main decontamination facilities for equipment and personnel will be located adjacent to the support zone. These facilities will be used for vehicle and heavy equipment decontamination and for personnel decontamination and personal hygiene facilities. Temporary decontamination facilities will be set up at the individual SWMUs as necessary.

Two types of exclusion zones will be established onsite. UXO exclusion zones will include all on-site areas beyond the areas flagged by UXB personnel as cleared of UXOs. Chemical contaminant exclusion zones will be set up for conducting drilling and other fixed location tasks. These exclusion zones will be set up at individual work locations when necessary.

The chemical contaminant exclusion zone will consist of a 50-foot buffer around all sides of the drill rig, marked by barrier tape or fencing. If surface contamination is not suspected in the area and none is created as a result of the operations, the exclusion zone barriers will be removed when the work at each location is completed.

If surface contamination is created or suspected as a result of the operations, an exclusion zone will be defined around the suspected surface contamination until the problem has been mitigated.

Mobile operations, such as sediment sampling and geophysical surveying, will not have defined exclusion zones.

5.3 UTILITIES CLEARANCE

Facility maps will be obtained and consulted prior to commencing any intrusive work. Borehole sites will be positioned accordingly, marked with wooden stakes, and then cleared with SEAD. Drilling is to be done at the marked, cleared locations only.

5.4 SITE CONTROL

Seneca is responsible for overall site security. All Engineering-Science, Inc. personnel and subcontractors and all equipment to be used in the field investigation shall be logged in each day at the command post prior to proceeding to other areas of the site. All persons other than work crews wishing to enter the active work areas shall first sign in at the command post.

5.5 SITE COMMUNICATIONS

Routine site communications will be maintained between all work crews and the support zone with two-way radios. On-site emergency communications will be maintained by the use of air horns. Details of the emergency communications are contained in the Emergency Response Plan in Section 11.0 of this HASP.

6.0 MONITORING

6.1 GENERAL

Standard Operating Procedures for the calibration and operation of all monitoring instruments and copies of the operating manuals for these instruments will be kept in the command post. Instruments will be field calibrated daily (each day the instrument is used). Instruments will be calibration checked a minimum of twice daily, before and after use. Calibration log sheets will be kept for each instrument and will become part of the permanent file. A copy of a calibration log sheet is contained in Attachment D, On-Site Documentation Forms.

Instruments will be kept on charge whenever not in use. All monitoring and instrument calibration will be done by persons who have been trained in the use of the equipment.

6.2 ON-SITE MONITORING

All site work which breaks the ground surface will be monitored, at a minimum, with an O_2 meter/explosimeter and an organic vapor meter. Thermoelectron Organic Vapor Meter (OVM-580B/580S) equipped with a 10.6e V lamp, or OVA 128 flame ionization detector (FID) and a Gieger-Mueller type radiation meter with count rate meter. Instrument settings on all direct reading air monitoring instruments will be set on the most sensitive scale (i.e., OVA 128: x1) unless a reading is detected. The action levels for changes in personnel protective equipment and personnel actions are given in Table B-2, Action Levels for Changes in Respiratory Protection. The action levels specified for the organic vapors may be increased or decreased if air sample analysis (GC or GC/MS) results indicate a greater or lesser degree of hazard for the given organic vapors readings. Any changes in the action levels will be documented in writing by the Site Safety Officer and approved by the Project Safety Officer or the Corporate Health and Safety Officer.

At work locations where there is the potential for chemicals to exceed Permissible Exposure Limit (PELs) action levels in the breathing zone, chemical specific indicator tubes (Draeger or equivalent) will be used to monitor the work area. Action levels are generally one half of the PEL.

Monitoring of airborne particulates will be conducted with the MIE Miniram (PDM-3) during excavation of test pits, soil boring and in areas where surface contamination and fugitive dust is expected to be high. Measurements will be data logged and a TWA for the work period will

TABLE B-2
ACTION LEVELS FOR CHANGES IN RESPIRATORY PROTECTION
AND SITE EVACUATION

LEVEL OF PROTECTION/ACTION TAKEN

INSTRUMENT	LEVEL D	LEVEL C	LEVEL B	PROCEED WITH CAUTION	EVACUATE SITE
HNU (ppm)	BKGD	<5	<500		>500
OVA (ppm)	BKGD	<5	<500		>500
OXYGEN (%)	19.5-23	19.5-23	<19.5		>23
LOWER EXPLOSIVE LIMIT (%)	<10	<10	<10	10<LEL<25	>25
RADIATION METER (mR/HR)	<0.5	<0.5	<0.5	0.5<mR<5	>5
AEROSOL MONITOR (mg/m3)	<1.0	<10	<50		>50

be calculated. Two Miniram will be used; one at the worksite, and one downwind of the work area.

6.3 ACTION LEVELS AND RESPIRATORY PROTECTION

Action levels for all instruments are given in Table B-2, Action Levels for Changes in Respiratory Protection. When an action level is equalled or exceeded, immediately shut down the operation and evacuate the work area. Allow the levels to stabilize and reenter the work area to make a measurement. Restart work if levels are below the action levels. If the action level remains exceeded, re-assess the situation. Upgrade personnel protective equipment (PPE) prior to reentry of the area.

Periodic measurements will be made for total VOCs at the work face (e.g., top of well, drill cuttings, excavation spoils). If the total VOC levels at the work face are higher than action level but ambient levels are below action levels, proceed carefully and monitor more frequently. If total VOCs at the work face exceed 10 times the ambient air action level, upgrade personnel protective equipment.

6.4 WIND DIRECTION INDICATOR

A wind direction indicator will be erected at every active work site. This will enable the site safety monitor and on-site personnel to determine upwind locations necessary for proper health and safety procedure implementation and, if necessary, evacuation procedures.

7.0 PERSONAL PROTECTIVE EQUIPMENT

The selection and use of personnel protective equipment at the Seneca site will be in accordance with Engineering-Science, Inc.'sPersonal Protective Equipment Program, contained in Attachment E, Engineering-Science, Inc.'s Personal Protective Equipment Program. The unknown nature of hazardous waste site work and the possibility of changing conditions during the conduct of the work may require changes in the personal protective equipment. When changes in personal protective equipment become necessary, these changes shall be made in accordance with the action levels and criteria set forth in this plan and according to the established procedures contained in Engineering-Science, Inc.'sPersonal Protective Equipment Program.

Routine site work at the Seneca site will be performed in Level D protection, augmented with overboots, inner surgical gloves, and chemical-resistant outer gloves. Level C respiratory protection with organic vapor/acid gas cartridges will be carried by all work crews to be donned when air monitoring indicates the need for respiratory protection. Required equipment for Levels B, C, and D are detailed in Table B-3, Description of Personal Protective Equipment and Levels of Protection.

The organic vapor monitor will be the primary instrument for determining contaminant concentrations which may trigger a change in respiratory protection. Level C protection will be worn in situations where inhalation of fugitive dust containing metals or explosives is determined to be present in high levels. Action levels for changes in personnel protection equipment are shown in Table B-2.

In the event that personal protective equipment (PPE) is ripped or torn, work shall stop and PPE shall be removed and replaced as soon as possible. The minimum levels of protection to be worn and the equipment which shall be available for general site tasks are shown in Table B-4, Minimum Levels of Protection and Available Upgrade Protection for Site Tasks. The minimum levels of protection required for specific site tasks and locations will be specified in the SWMU specific addenda and accompanying Task Specific Safe Operating Guidelines (TSSOG's). The TSSOG's and SWMU specific addenda should be consulted prior to commencing any site activities. (Attachment A to this HASP).

TABLE B-3
DESCRIPTION OF PERSONAL PROTECTIVE EQUIPMENT
AND LEVELS OF PROTECTION

LEVEL D

HARD HAT
EYE PROTECTION - SAFETY GOGGLES, GLASSES, OR FACE SHIELD
SAFETY SHOES - STEEL TOE, LEATHER
(or)
SAFETY BOOTS - STEEL TOE, NEOPRENE

LEVEL C

LEVEL D PROTECTIVE EQUIPMENT PLUS:
RESPIRATORY PROTECTION - FULL FACEPIECE AIR PURIFYING RESPIRATOR (APR), CARTRIDGE OR CANISTER

SKIN PROTECTION - POLY-COATED TYVEK OR SARANEX COVERALL*
INNER LATEX GLOVES*
OUTER NITRILE GLOVES*
NEOPRENE BOOT COVERS*

LEVEL B

LEVEL C PROTECTIVE EQUIPMENT EXCEPT FOR:
RESPIRATORY PROTECTION - FULL FACEPIECE SELF-CONTAINED BREATHING APPARATUS (SCBA) INSTEAD OF APR

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*OTHER MATERIALS MAY BE SPECIFIED TO PROVIDE BETTER PROTECTION WHEN WORKING WITH CERTAIN TYPES OF CHEMICALS.

TABLE B-4

MINIMUM LEVELS OF PROTECTION AND AVAILABLE UPGRADE PROTECTION FOR SITE TASKS

Activity	PPE Worn	PPE With Crew	Emergency PPE at Command Post
Geophysical Survey	D	C	
Soil Boring and Sampling	D	C	B
Monitoring Well Development and Sampling	D	C	B
Surface Water and Sediment Sampling	D	C	B
Decontamination	C	-	B
Test Pits	C	B	
Soil Gas Survey	D	C	B

8.0 SAFE WORK PRACTICES AND ENGINEERING CONTROLS

Safe work practices and engineering controls shall be implemented to comply with OSHA 29 CFR 1910.120 to limit employee exposure to hazardous substances or conditions. The use of personnel protective equipment has limitations and presents hazards of its own, such as physical stress and interference with peripheral vision, calling for the consideration and implementation of work practices and engineering controls prior to beginning site tasks and before the use of personnel protective equipment is instituted.

The safe work practices and engineering controls discussed below apply to general site procedures.

8.1 SAFE WORK PRACTICES

The following work practices are intended for use when site activities involve potential exposure to hazardous substances or conditions.

1. Certain SWMUs are known to contain various types of unexploded ordnance (UXO) or explosives.
   All movement on the site shall be along cleared roads and pathways.
   ON-SITE WORKERS SHALL NOT STRAY FROM THE CLEARED PATHWAYS AND ROAD!
   ON-SITE WORKERS SHALL NOT TOUCH, KICK, OR OTHERWISE DISTURB ANY MATERIALS ON-SITE WHICH MAY BE UXOs.
2. The buddy system will be utilized at all times within the exclusion zone.
3. Entry into and exit from zones within the site must be made via the established access control points.
4. Prescribed personnel protective equipment must be worn as directed by the Site Health and Safety Office and Project Manager.
5. Assumptions will not be made concerning the nature of materials found on the site. Should any unusual situations occur (not covered by the Site Standard Operating Procedures), operations will cease and the Site Health and Safety Officer and the Project Manager will be contacted for further guidance.
6. Communication hand signals must be understood and reviewed daily.
7. Consultation with the Project Manager shall be made to avoid any uncertainties.

8. Ground fault circuit interrupters shall be used on all field electrical equipment. Improperly grounded/guarded tools shall be tagged out-of- service and the Project Manager shall be notified immediately.
9. If a piece of equipment fails or is found to be in need of repair, it will be immediately tagged out-of-service and the Project Manager shall be notified. This equipment will not be returned to service until repairs have been completed and the equipment tested by a competent individual.
10. Unsafe conditions shall be reported immediately.
11. Unusual odors, emissions, or signs of chemical reaction shall be reported immediately.
12. Workers will minimize contact with hazardous materials by:
    a. Avoiding areas of obvious contamination
    b. Using poly sheeting to help contain contaminants
    c. Avoiding contact with toxic materials
13. Only essential personnel will be permitted in the work zones.
14. Whenever possible, personnel will be located upwind during material handling.
15. At the first sign of odors detected inside the facepiece of a respirator, or if the employee begins experiencing any signs or symptoms of exposure to site toxic material (this information will be discussed during the daily meeting and can be found on the appropriate Chemical Hazard Evaluation Sheets, Attachment B), the employee will leave the area immediately and report the incident to the Health and Safety Officer and Project Manager.
16. Smoking will be allowed only in designated areas of the support zone.

8.2 PERSONAL HYGIENE PRACTICES

The following personal hygiene practices will apply to field work conducted at the fifteen SEAD SWMU areas:

1. No smoking or chewing of tobacco or gum shall be allowed within the exclusion or decontamination zones.
2. No eating or drinking shall be allowed in the exclusion or decontamination zones.
3. On-site personnel shall remove protective clothing and wash face and hands prior to leaving the decontamination zones.
4. Disposable outerwear will be placed in drums located in the personnel decontamination area. Drums will be staged on-site at a central location for later disposal.

8.3 UXO CONTAMINATED SAMPLING OPERATIONS

For safety purposes in areas where UXOs are suspected, soil and well boreholes are checked with a Forster Ferex/4.021 (Mk 26 Mod) Ordnance Locator. It is a USACE requirement that all boreholes in areas possibly contaminated with UXOs must be rechecked at 2 foot to 4 foot intervals during drilling operations. This can be eliminated if remote drilling equipment is used.

In areas of heavy UXO equipment contamination, UXB EOD technicians can collect samples with hand augers or similar equipment. The physical hazards and measures used to deal with those are outlined in Section 2.3, Hazard Evaluation.

8.3.1 Inspection of Laboratory Samples Prior to Off Site Shipment

Many of the UXO components intended for disposal at the site are quite small and could easily be included in laboratory samples for off site testing. These items, although quite small, will produce small fragments moving at a high velocity if initiated during laboratory testing. These fragments could cause severe injuries to laboratory personnel processing these samples. All samples should be inspected by qualified UXB EOD personnel to ensure that they do not contain any small UXO components.

8.4 FIRE CONTROL

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.

8.5 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.

8.6 EXPLOSIVE FIRES

Under no circumstances will an attempt be made to fight an explosive fire. If a fire involving explosive materials should occur on the site, all personnel will immediately evacuate the site. Fire department personnel responding to the incident must be informed of the fact that the fire involves explosive materials.

8.7 CONFINED SPACE ENTRY

No confined space entry is planned for the investigations of the 15 SWMUs. If confined space entry becomes necessary during the implementation of the work, the ES confined space entry procedures will be appended to the site safety plan and will be instituted prior to allowing any confined space entry.

8.8 SITE INSPECTIONS

Site inspections will be conducted daily by the site safety officer to ensure that site work is accomplished in accordance with the approved safety plan, contract requirements and federal regulations. Daily inspections will be documented.

8.9 ACCIDENT REPORTING AND RECORDKEEPING

Accidents and near miss incidents will be recorded on the accident report form contained in Attachment D - Site Documentation Forms. Accidents reports are to be completed by involved parties if possible. Accidents and near misses will be investigated by the site safety officer and the site manager. The investigation team shall make recommendations for preventing a recurrence of the accident or incident and submit the accident report to the project health and safety officer and the office health and safety representative. The accident report shall be retained on file at the site, in the project files and in office health and safety files. All accidents or incidents which are recordable will be entered on the OSHA 200 log maintained in the Engineering-Science, Inc., Boston Office.

The office health and safety officer and the project health and safety officer shall review the accident report and approve or make additional recommendations for prevention of the future occurence of the incident. The project health and safety officer shall ensure that remedial recommendations are carried out by the filed staff.

9.0 UNEXPLODED ORDNANCE

Some SEAD SWMU areas may be contaminated with UXO components and UXOs. All UXB EOD operations will be performed in accordance with the following procedures:

1. **UXB Explosive Ordnance Disposal Services** - The specific services to be performed in support of this project are listed below. It should be noted that the services are orientated to site safety during evaluation of the applicable SWMUs.

   a. **Unexploded Ordnance Safety Training** - In accordance with 29 CFR Part 1910.120 paragraph (e), UXB has developed an Unexploded Ordnance (UXO) Safety Training class that is provided to the prime contractor for the training of all personnel who will be working on the site. This class includes an instructional guide and handouts for workers on the site.

   b. **UXO Inspection of the Sampling Sites** - UXB will provide the personnel and equipment required to inspect the access routes and sampling sites for UXOs. The magnetometry equipment utilized by UXB is capable of detecting both ferrous and nonferrous objects however, heavy metallic contamination will greatly hinder operations on the site.

      (1) **Marking Access Routes and Sampling Site Boundaries** - Dependant upon the equipment size and quantity being brought into a sampling site, a 10' to 20' wide access route will be searched for UXOs. The boundaries of the access route will be marked at 25' intervals with orange survey flags. As with the equipment considerations for the access route, the size of the sampling area may range from an area 50' x 50' in size.

      (2) **Marking and Handling of UXOs** - In addition to the ordnance items disposed at some SWMUs, it can be expected that "ordnance kick-outs" from demolition can be expected to be found on site. All explosive loaded UXOs will be marked with yellow survey flags.

   c. **UXB EOD Site Procedures** - The following practices are standard UXB EOD procedures used on DOD installations throughout the United States. The UXB EOD search team (consisting of two EOD technicians of which one holds a Master EOD rating) will conduct a visual surface and electronic subsurface UXO search of the access route and sampling site. In conjunction with the UXO search, UXB EOD will perform the following steps:

(1) Identify and mark the boundaries of the access route and sampling site areas that will require UXO search operations.

NOTE: Hand excavation is the preferred method of excavation for buried UXOs; however, if a UXO is buried at great depth or the soil conditions are such that hand excavation is not possible, a backhoe will be used if necessary. All excavations performed by UXB will be in compliance with 29 CFR Part 1926 and EM 385-1-1.

(2) Using visual surface locations techniques, electronic subsurface techniques and excavation as required, locate and identify UXOs within the boundaries of the access route and sampling site.

(3) When an explosive, chemical, propellant, or pyrotechnic loaded UXO is located the following steps will be followed:

(a) Mark the UXOs location with a yellow marker flag.
(b) Determine the type of UXO, i.e. projectile, rocket, bomb, etc.
(c) Determine the condition of the UXO (Armed or Unarmed).
(d) Determine which of the following explosive/hazard categories is applicable:
1 High Explosive (HE)
2 High Explosive Anti-Tank (HEAT)
3 Armor Piercing High Explosive (APHE)
4 Improved Conventional Munition (ICM)
5 Anti-Personnel Ejection Round Special (APERS)
6 White/Red Phosphorous
7 Other

(e) Determine which of the following fuzing categories is applicable:

1 Point Detonating (PD)

2 Base Detonating (BD)
3 Point Initiating Base Detonating - Lucky (PIBD-Lucky)
4 Mechanical Time (MT)
5 Electronic Time (ET)
6 Proximity (VT)
7 Powder Train Time Fuze (PTTF)
8 All-Ways Acting (as in the 40 mm grenade system)

NOTE: **If the site contains numerous UXOs, report the initial UXO located and continue search operations. Perform all of the steps outlined in paragraphs 1.c(3). through 1.c(3)(e)8. and then report the total number located at the end of the day.**

(f) Report the UXO to the Contractor Representative and Government Representative with project oversight responsibility.

(g) Request demolition of the UXOs by the SEAD EOD Detachment.

NOTE: **Due to scheduling and other mission requirements of the SEAD EOD Detachment, they may not be able to respond on the day called or for several days afterwards.**

(4) If the delayed Government EOD support for destruction of the UXOs will hinder or halt project operations and the Contractor or Government Representative requests movement of the UXO(s), the following is applicable for UXB operations on SEAD:

(a) If the Contractor Representative request that the UXO(s) be moved, refer this individual to the Government Representative having oversight of the project. The Contractor Representative does not have authority to direct the movement of UXOs on the project site.

(b) Upon request of the Government Representative, the UXB EOD Team Leader will reevaluate the UXO(s) to determine which if any can be moved.

<u>NOTE:</u> <u>**Very careful evaluation of the UXO will be required. As a rule, ordnance items with attached fuzing systems which have been exposed to fire or a detonation are not to be moved and must be destroyed in place. The UXB EOD Team Leader is the only person with the authority to make the decision of whether or not the UXB EOD personnel will move an UXO.**</u>

(c) Unarmed/Unfired UXOs - Any UXO which has not been fired/launched or experienced any other actions (exposed to fire or detonations) required to put the UXO in an armed condition.

1 If the UXO in the unarmed/unfired condition includes any positive safety devices (safety pin/clip, electrical shunts, etc.), and these items are missing, the UXO shall be considered to be armed.

2 If the unarmed/unfired UXO has been damaged by fire or has other physical damage, it shall be considered to be armed.

(d) Armed UXO - Any UXO which has experienced the required actions to place it in an armed condition.

<u>NOTE:</u> <u>**Only unarmed and armed UXOs that are determined to be safe to move will be moved. Under no circumstances will any of the following UXOs be moved:**</u>

- <u>**HEAT with a PIBD -Lucky fuzing system**</u>

- **Any munition with a Mechanical Time (MT) Fuze**
- **Any munition with a fuze containing an Impact back-up (graze feature)**
- **Any munition containing an All-Ways Acting fuze (as in the 40 mm grenade system)**
- **Any munition that you can not determine the type of fuze or if it is safe to move.**

(e) Based on the field evaluation of the UXO(s) by the UXB EOD Team Leader a final decision will be made if the UXO is safe to move. If the UXB EOD Team leader determines that the UXO(s) can safely be moved, the following procedures will be followed:

1 Establish an UXO explosive holding area. This area must be separate from the nonexplosive loaded ordnance component holding area.
2 This holding area will be a minimum of 100 meters from any structures, power lines, and equipment.
3 The holding area will be clearly marked with yellow flags on its four (4) corners.
4 The location of the UXO holding area will be identified to both the contractor and Government site representatives.
5 The UXO(s) will be moved one (1) at a time and in the proper attitude.
6 Except as indicated below, the UXO(s) should be moved to the holding area by hand. If required, both EOD technicians will carry the UXO(s) to the holding area.
7 Large UXOs (155 mm and above) may be transported by vehicle (backhoe, front end loader, etc.) to the holding area.
8 A record of all UXOs placed in the explosive holding area will be maintained by the UXB EOD Team Leader.

(5) Nonexplosive loaded ordnance components will be collected and stored in a designated location for pick up by SEAD Range Operations

personnel at their convenience. Items in this category would include but not be limited to the following types of ordnance/residue:

NOTE: **The location of items too large to be moved by hand will be reported to the SEAD Range Operations Personnel for collection at a later date.**

(a) Armor Piercing (AP) projectiles
(b) Empty ejection munitions
(c) Spent rocket motors (when found separated from warheads)
(d) Nonexplosive loaded training munitions

(6) A record of all UXOs will be maintained in a log book.

(7) Upon completion of UXO search operations, a UXO Density Report will be provided to the Contractor and Government Representatives.

2. **Sampling Operations** - During sampling operations, UXB will provide EOD services as needed. Some of the required additional EOD services normally provided on projects of this nature are listed below:

a. **Borehole Magnetometry** - For safety purposes, soil and well boreholes are normally checked with UXB's Förster Ferex® 4.021 (Mk 26 Mod 0) Ordnance Locator. This is a USACOE requirement that all boreholes in areas that are possibly contaminated with UXOs must be rechecked at 2' or 4' intervals during drilling operations.

NOTE: **The requirement for rechecking the boreholes at 2' and 4' foot intervals can be eliminated if remote drilling equipment is used.**

b. **Collection of Samples** - In areas of heavy UXO contamination, UXB EOD technicians can collect samples with hand augers or similar equipment. This eliminates the requirement to expose other contractor personnel in high hazard areas.

c. **Excavation Services** - In some cases excavation of trenches for a cross section study of the soil or to obtain samples may be required. Normally the trenching is accomplished with a backhoe. Because of the high level of hazards from the UXOs in the area, UXB will provide EOD operators for the backhoe. UXB's technicians are experienced in this area and are familiar with all aspects from sample collection to equipment decontamination between sampling sites.

10.0 DECONTAMINATION

Decontamination is the physical removal of contaminants from clothing and equipment or the chemical change of such contaminants to innocuous substances. Decontamination procedures will take place in the contamination reduction zone. Disposal is an available option in lieu of decontamination when decontamination is impractical.

The following decontamination procedures are intended to meet the requirements of 29 CFR 1910.120(k). No personnel or equipment shall enter the contaminated zone of the site until workers have acknowledged the decontamination procedures and operating procedures intended to minimize contamination. These procedures shall be monitored by the Site Health and Safety Officer to determine their effectiveness. Ineffective procedures will be corrected.

10.1 DECONTAMINATION FACILITIES

The main decontamination facilities at the SEAD SWMU areas will be located adjacent to the support zone. These decontamination facilities will be used for vehicle and heavy equipment decontamination and for personnel decontamination. Personnel decontamination must take place prior to leaving the decontamination area and prior to entering any personnel hygiene facilities or before eating, drinking, or smoking.

10.2 PERSONNEL DECONTAMINATION

Personnel decontamination will consist primarily of a segregated equipment drop, removal and disposal of any non-reusable protective equipment, and washing of hands and face. No heavy contamination of clothing is expected and disposable protective clothing will be disposed of as non-hazardous waste. However, if contamination is detected (i.e., elevated PID readings, visual evidence, or known contact with potentially contaminated liquids) personal protective equipment and cartridges from respirators will be bagged separately from daily garbage. Facilities for personnel and sampling equipment decontamination will be set up between the equipment decontamination pad and the site trailer. Personnel will not enter the office trailer without first going through decontamination, and hands and face must be thoroughly washed before eating, drinking, etc.

Level C Decontamination - The activities to be carried out at each station are described on Table B-5, Measures for Level C Decontamination.

TABLE B-5
MEASURES FOR LEVEL C DECONTAMINATION

Station 1:	Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down station may be set up within this area.
Station 2:	Outer Garment, Boots and Gloves Wash and Rinse	Scrub outer boots, outer gloves and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3:	Outer Boots and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Canister or Mask	If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	Outer Garment Removal	Remove outer garment. Place on plastic for further cleaning or in barrel for disposal.
Station 6:	Face Piece Removal	Facepiece is removed. Avoid touching face with fingers, Facepiece deposited on plastic sheets.
Station 7:	Inner Boot and Glove Removal	Boots and inner gloves removed an deposited in separate containers lined with plastic.
Station 8:	Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Level B Decontamination - The activities to be carried out at each station are described on Table B-6, Measures for Level B Decontamination.

10.3 EQUIPMENT DECONTAMINATION

Equipment and vehicle decontamination will consist of pressure washing followed by steam cleaning. Solvent and soap and water washes will be performed when required for sampling or for heavy contamination. Gross contamination, such as caked mud and dirt on augers and split spoons, will be removed at the work site and placed back in the borehole or drummed with other drilling spoils if contaminant indicators (e.g., PID readings) warrant drumming of the soils.

10.4 PREVENTION OF CONTAMINATION

In an effort to minimize contact with waste and decrease the potential for contamination, the points outlined below will be adhered to during all phases of field investigation and sampling.

1. Personnel will make every effort not to walk through puddles, mud, any discolored surface, and/or any area of obvious contamination.
2. Personnel will not kneel or sit on the ground in the exclusion zone and/or in the Contamination Reduction Zone (CRZ).
3. Personnel will not place equipment on drums, containers, vehicles, or on the unprotected ground.
4. Where appropriate, personnel will wear disposable outer garments and use disposable equipment.

TABLE B-6
MEASURES FOR LEVEL B DECONTAMINATION

Station 1:	Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down station may be set up within this area.
Station 2:	Outer Garment, Boots	Scrub outer boots, outer gloves and splash suit and Gloves Wash and Rinse decon solution or detergent water. Rinse off using copious amounts of water.
Station 3:	Outer Boots and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Tank Change	If worker leaves exclusive zone to change air tank, this is the last step in the decontamination procedure. Worker's canister air tank is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	SCBA Removal	SCBA backpack and facepiece is removed. Avoid touching face with finger. SCBA deposited on plastic sheets.
Station 6:	Outer Garment Removal	Remove outer garments. Place on plastic for further cleaning or in barrel for disposal.
Station 7:	Inner Boot and Glove Removal	Boots and inner gloves removed and deposited in separate containers lined with plastic.
Station 8:	Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

11.0 EMERGENCY RESPONSE PLAN

This Emergency Response Plan applies to site work at the fifteen SWMU areas listed in Section 1.0 and shown on Figure B-2. Copies of this plan are to be kept at the site command post and support areas. The list of emergency telephone numbers and directions to the nearest exit gate and nearest hospital will be prominently posted in the command post. Copies of the directions to the nearest hospital will be kept in all site vehicles.

This emergency response plan shall be coordinated with SEAD emergency response procedures prior to the beginning of site work.

11.1 ON-SITE EMERGENCIES

On site emergencies can range from minor cuts and scrapes to explosions, fires, and the release of toxic gases. Apparently minor incidents at hazardous waste sites can have serious consequences or may indicate the presence of a previously unknown health and safety hazard. Explosions, fires, and the release of toxic gases will not only involve site workers, but may affect the neighboring populations and the environment.

All incidents will be reported as soon as possible to the Site Manager and the Site Safety Officer who will determine the appropriate steps to be taken.

When the incident is minor, the work may continue. When an incident is considered serious, work will be discontinued until the emergency situation has been brought under control, the incident has been evaluated, and any conditions which may have contributed to the emergency have been mitigated.

All site incidents, including near misses, will be investigated and documented, using the Incident Report Form and Incident Follow-Up Report Form in Attachment D, On-Site Documentation Forms.

11.2 OFF-SITE EMERGENCIES

In the unlikely event of a vapor release off-site, the contamination source will be secured, if possible.

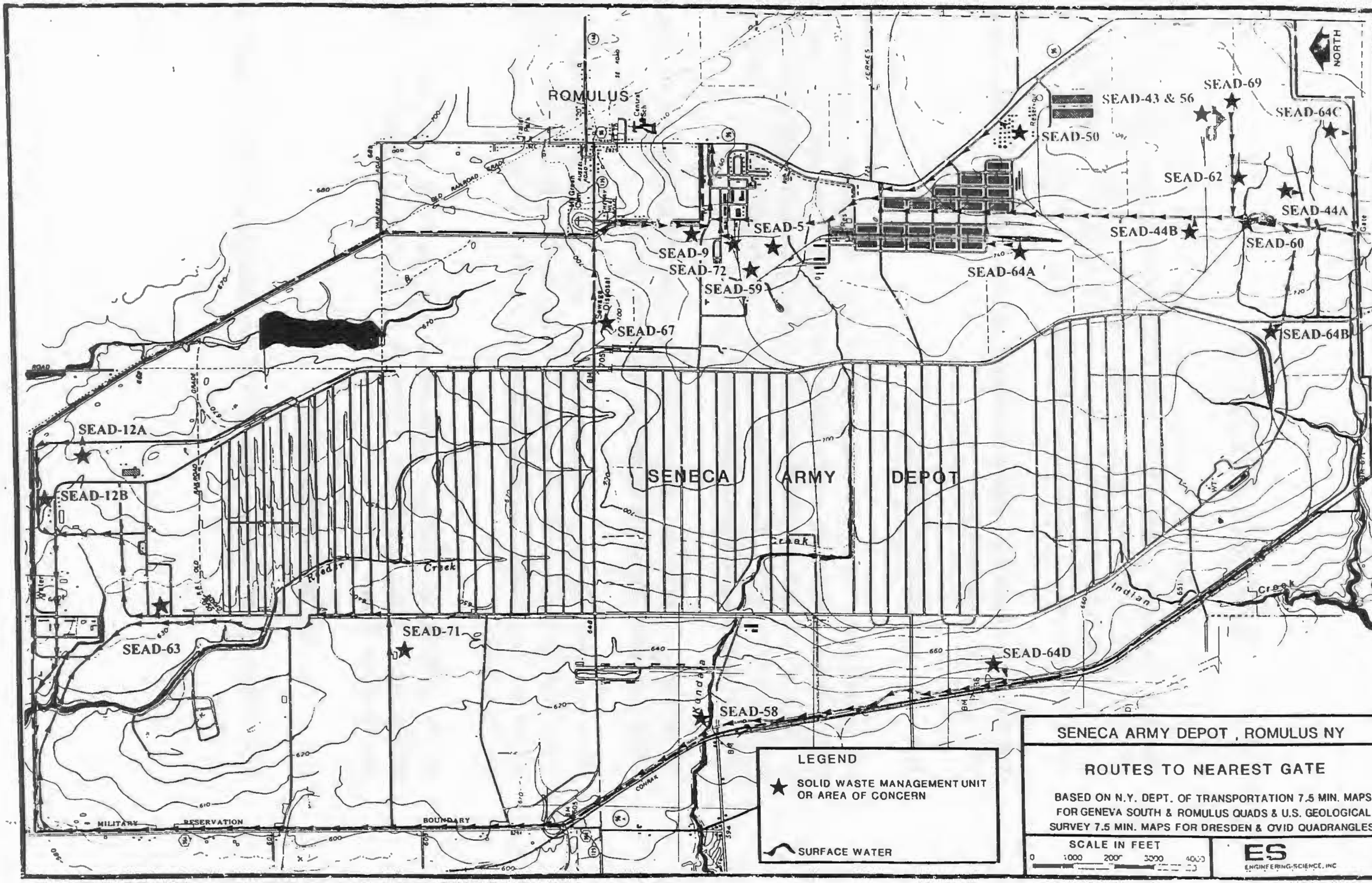


FIGURE B-2 ROUTES TO NEAREST GATE (POSTS 1 & 3)

Emergency response contacts will be notified in the following order:

1. SEAD Security and Environmental Office
2. Safety Officer
3. Project Manager

The phone numbers of these contacts are provided in Section 11.9 and will be posted in the site trailer.

SEAD Emergency Response personnel will be utilized in all emergencies which may involve exposure to people away from the work sites. The SEAD Emergency Response Plan for the depot will be implemented when SEAD Emergency Response personnel determine it is necessary.

11.3 SITE PERSONNEL AND LINES OF AUTHORITY

A clear chain-of-command in emergency situations ensures clear and consistent communication between site personnel and, therefore, results in more effective response to the emergency situation. The duties of site personnel in emergency situations are outlined below:

The **Site Manager** will direct all emergency response operations, designate duties to other site personnel, and serve as liaison with government officials and emergency response teams.

The **Site Safety Officer** will make initial contact with off-site emergency response teams (first aid, fire, police, etc.), make recommendations on work stoppage, and provide for on-site first aid and rescue.

The **Command Post Supervisor** will be designated when no one is performing this function during normal site work. This person will maintain contact with off-site response teams and notify additional agencies or offices that need to be contacted.

Decontamination personnel will stand by to perform emergency decontamination. Decontamination personnel will also assist the safety officer in rescue operations when necessary.

Field personnel will assist in rescue operations or take over for decontamination personnel when they are required for other duties.

11.4 EMERGENCY SITE COMMUNICATIONS

Emergency communications will be maintained by use of air horns kept in the support areas and with each work crew. The emergency communications codes are given in Table B-7, On-Site Emergency Communications.

11.5 EVACUATIONPROCEDURES

Some areas to be investigated may contain various types of unexploded ordnance (UXO). All movement on the site, **EVEN UNDER EMERGENCY CONDITIONS**, shall be along cleared roads and pathways. Cleared roads and pathways shall be marked. **ON-SITE WORKERS SHALL NOT STRAY FROM THE CLEARED PATHWAYSAND ROAD!**

Evacuation from work sites shall be along the access paths cleared to the various worksites. Equipment shall be placed so as not to impede emergency escape and evacuation along the cleared pathways. Evacuation routes from work areas shall be discussed daily for each work crew as a part of the daily safety meeting.

11.6 EMERGENCY DECONTAMINATION AND FIRST AID

Decontamination procedures used in emergency situations will vary greatly with the severity and particulars of the situation. The Engineering-Science, Inc. Site Safety Officer is first aid/CPR certified and will provide advice on the medical and decontamination procedures to be used in each emergency situation. General guidelines for first aid and decontamination procedures are given below.

11.6.1 Inhalation Exposure

Remove the victim from the exposure area to an area with fresh air. Attempt rescue only if proper protective gear (Level B or C) is available for the rescue team. Remove protective clothing and respiratory protective gear as soon as possible to determine if the administration of CPR is necessary. If so, complete decontamination while CPR is being administered. Continue CPR until emergency medical unit arrives. If CPR is not required, complete decontamination and transport to hospital; administer other first-aid as indicated.

TABLE B-7
ON-SITE EMERGENCY COMMUNICATIONS

AIR HORN SIGNAL	ACTION
THREE SHORT BLASTS	SHUT DOWN EQUIPMENT, STAND BY RADIO
ONE LONG BLAST	RETURN TO NEAREST SUPPORT ZONE
CONTINUOUS LONG BLASTS	EVACUATE SITE BY BEST, FASTEST ROUTE

HAND SIGNALS	MEANING
HAND GRIPPING THROAT	OUT OF AIR, CAN'T BREATHE
GRIP PARTNER'S WRIST	LEAVE AREA IMMEDIATELY; NO DEBATE
HANDS ON TOP OF HEAD	NEED ASSISTANCE
THUMBS UP	OK; I'M ALL RIGHT; I UNDERSTAND
THUMBS DOWN	NO; NEGATIVE

11.6.2 Contact Exposure

Remove victim from area and flush affected area with water only. Be careful not to spread the contamination to other parts of the body. Remove protective clothing and flush area with water only. Consult references to determine if soap and water wash is indicated. Do not remove respirator until removal of contaminant from body is reasonably assured and the victim is well into a clean zone.

11.6.3 Physical Injury

If a physical injury occurs or worker collapses in a clean zone. First aid will be administered as indicated.

If a physical injury occurs in a contaminated zone, care must be taken to prevent contact of any contaminant with open wounds. The wound can provide easy access to the body for toxic chemicals which are not normally a skin absorption problem. Protective clothing will be removed carefully to avoid additional injury and avoid any exposure of the wound to contaminants on the clothing.

If a worker collapses or loses consciousness in a contaminated zone, remove protective clothing and respiratory protective gear as soon as possible to determine if the administration of CPR is necessary. If so, complete decontamination while CPR is being administered. Continue CPR until emergency medical units arrive. If CPR is not required, complete decontamination and transport to hospital; administer other first-aid as indicated.

11.7 EMERGENCY MEDICAL TREATMENT AND FIRST AID

A first aid kit large enough to accommodate anticipated emergencies will be kept in the support zone. In addition, each work crew will carry a smaller first aid kit for minor injuries. If any injury should require advanced medical assistance, the victim will be transported to the hospital.

Each work site will have a vehicle for transportation to the hospital. Keys will be left in or near the ignition.

11.8 EMERGENCY AND PERSONAL PROTECTIVE EQUIPMENT

The support zone will have the following emergency equipment:

Self-Contained Breathing Apparatus (SCBA)
First Aid Kit
Fire Extinguisher (A, B, C Type)
15-Minute Emergency Eyewash Station
Air Horn

Each work crew will have at the work site the following emergency equipment:

First Aid Kit
Fire Extinguisher (A, B, C Type)
Hand-Held Eyewash
Air Horn

11.9 EMERGENCY TELEPHONE NUMBERS

Emergency telephone numbers for medical and chemical emergencies are given in Table B-8, Emergency Telephone Numbers. These numbers will be displayed prominently near each site phone.

11.10 DIRECTIONS TO HOSPITAL

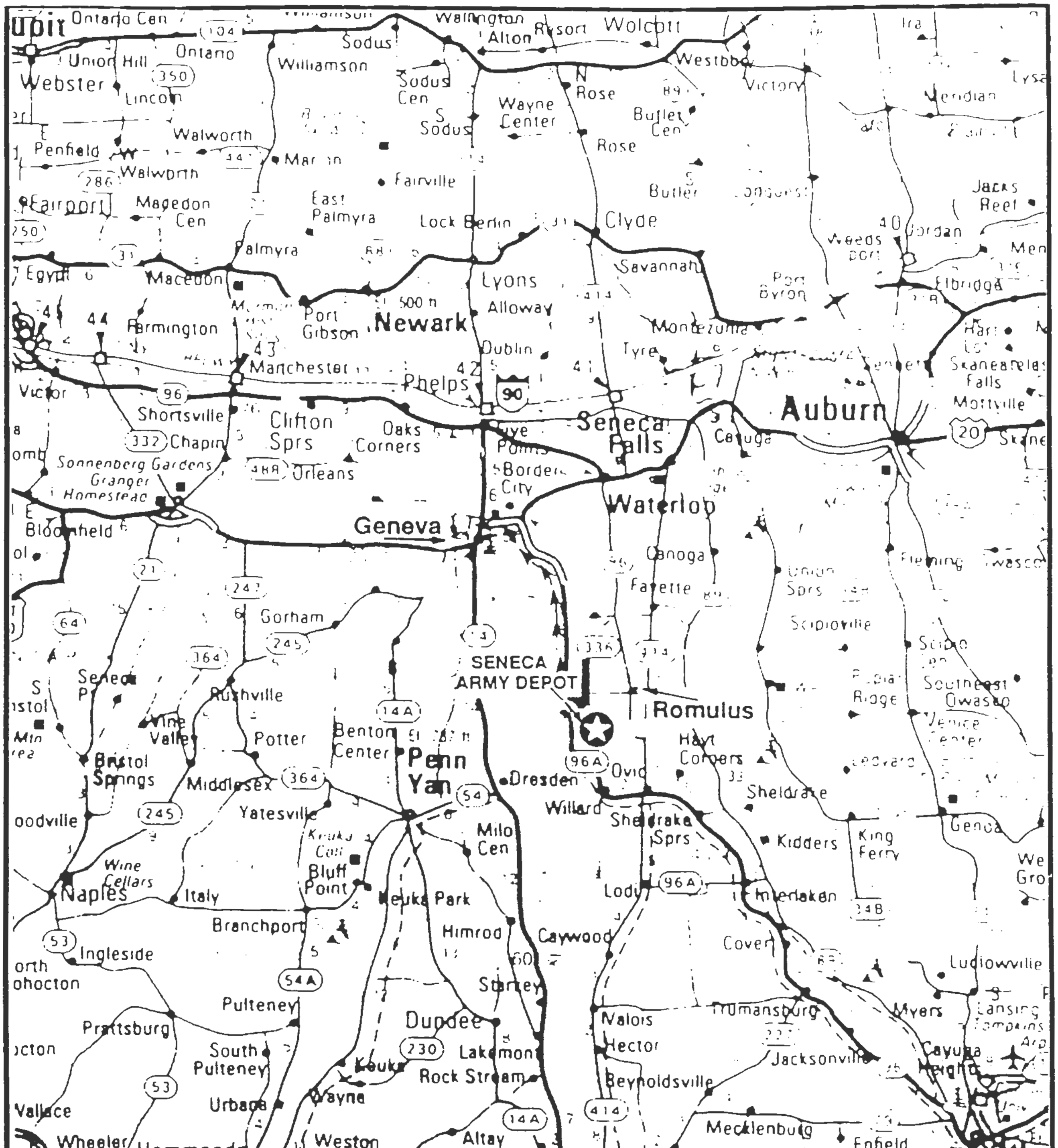
Directions to the nearest hospital are shown and described in Figure B-3, Route to Geneva General Hospital. The map will be displayed in the command post and kept in every site vehicle.

TABLE B-8

EMERGENCY TELEPHONE NUMBERS

SENECA ARMY DEPOT
ROMULUS, NEW YORK

Ambulance SEAD	(607) 869-1436
Fire SEAD	(607) 869-1316
Police SEAD	(607) 869-0448
Geneva General Hospital 186-198 North Street Geneva, New York	(315) 798-4222
SEAD Staff Duty Officer	(607) 869-0251
Seneca Army Depot Security	(607) 869-1243
On Post Calls	3-0-xxx or 4-1-xxx
Chemtrec	(800) 424-9300
National Response Center - Environmental Emergencies	(800) 424-8802
Randy Battaglia - Seneca Army Depot Environmental Contact	(607) 869-1450
Samuel Hopper, Sr. - HFA Senior EOD Field Supervisor	(301) 743-2377
Michael Duchesneau - ES Project Manager	(617) 859-2492



From Post #3, take right on route 96A. Follow north to route 20. Take route 20 heading west into downtown Geneva and follow signs for Geneva General Hospital.

From Post #1, take left on route 96. Follow north to route 20 intersection. Take left on route 20 heading west into downtown Geneva and follow signs for Geneva General Hospital.

N

0 5 10 Miles

0 5 10 15 Kilometers

SENECA ARMY DEPOT

ROUTE TO GENEVA GENERAL HOSPITAL

FIGURE B-3

ATTACHMENT A

INDIVIDUAL SWMU INVESTIGATION DESCRIPTIONS

1-1 Physical Description & Activities Performed on SEAD-5:

Sewage Sludge Waste Piles

The sewage sludge waste piles are located west of building 135 and directly south of the 60,000 gallon Oil Tank along a dirt road running perpendicular to Administration Ave. (see Figure BA-1).

Sewage sludge was stockpiled in this area during the 1980's. The sludge was removed from the drying beds of Sewage Treatment Plants No 4 and No. 715. The process of removing the sludge and transporting it here occurred approximately every two months.

There are five piles covering an area approximately 220 feet by 110 feet. The depths of the piles range from 5 to 10 feet and are discontinuous. The piles are covered with vegetation. It does not appear that this vegetation is stressed. There is no indication that UXO related items would be present in this area. At the present time sludge is not being stockpiled here. The sludge stored in the waste pile area is slowly being removed to Seneca Meadows Municipal Landfill.

Currently the sewage sludge that is produced is being stored in a covered area near Building 4. SEAD is awaiting approval of a land spreading permit for this sludge.

1-2 Potential Chemical Contaminants

- Copper
- Zinc
- Nitrates

1-3 Physical Hazards

- Rough Terrain
- Pathogenic Organisms

1-4 Field Work

- Install, develop and sample groundwater monitoring wells
- Sludge pile sampling

1-5 Monitoring To Be Performed

A PID or OVM meter will be used to screen for volatiles. A miniram particulate meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

1-6 **Task Specific Safe Operating Guidelines**

No. 1 Drilling and Soil Boring - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Well Development - Level D
No. 22 Soil Sampling - Level D

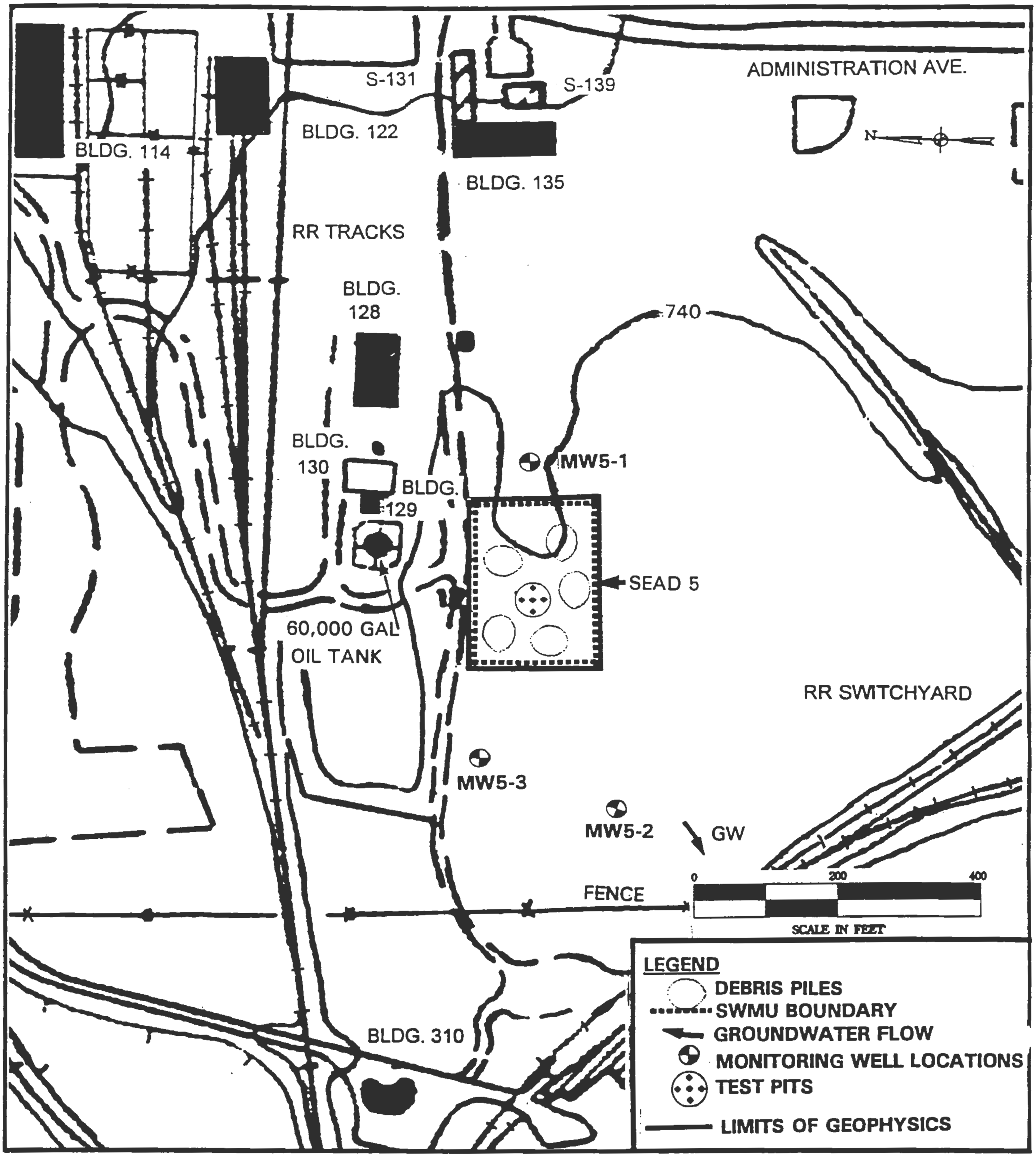


FIGURE BA-1 SITE PLAN FOR SEAD SWMU 5: SEWAGE SLUDGE WASTE PILES

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #5 Sewage Sludge Waste Piles

3. Hazards
   - Inhalation : Heavy metals in soil and dust
   - Contact : Heavy metal in soil
   - Explosion : No known hazard exists
   - Physical : Rough terrain (fall/trip hazard).

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges. Poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout drilling. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SWMU #5 Sewage Sludge Piles

3. Hazards
   - Inhalation : Bentonite and cement, heavy metals in soil and dust
   - Contact : Heavy metals in soil
   - Explosion : No known hazard exists
   - Physical : Avoid rough terrain (fall/trip hazard).

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout removal of augers. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored before and during installation of casing, sand pack, and grout. Spoils should be monitored periodically.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Exploslmeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m³)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

   : Remove caked mud and dirt from augers as they are pulled.

   : Minimize dust during preparation of bentonite and cement slurries.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boot and gloves.
Step 3 Removal of boot covers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SWMU #5 Sewage Sludge Piles

3. Hazards
   - Inhalation : Not applicable
   - Contact : Heavy metals in water
   - Explosion : No known hazard exists
   - Physical : Avoid rough terrain (fall/trip hazard).

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses or splash shield, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout well development. Periodically monitor well and headspace of development water receiving container.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of monitoring well as much as possible during well development.

   : All wastewater and silty sediment from well development operations should be contained in a waste drum and disposed of properly.

   : Wastewater drum should be placed in a stable flat position which can be accessed later for removal and disposal.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from teflon bailers and pumps before leaving each well locality.

Steam clean equipment before using in another well.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 4 Removal of coverall (if worn).
Step 5 Removal of respirator (if worn).
Step 6 Removal of inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #5 Sewage Sludge Waste Piles

3. Hazards
   - Inhalation : Heavy metals in soil and dust
   - Contact : Heavy metals in soil
   - Explosion : No known hazard exists
   - Physical : Avoid rough terrain (fall/trip hazard).

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.
   - Upgrade to Level C : Full-face piece air-purifying respirator with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Check surface soils for possible contamination before sampling.

   : Do not kneel or sit on ground in areas of potential contamination.

7. Decontamination :

Equipment : Equipment should be cleaned for sampling.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of tyvek coveralls (if worn).
Step 6 Removal of inner gloves.
Step 8 Wash hands and face.

2-1 Physical Description & Activities Performed on SEAD-9

Old Scrap Wood Site

The access road to the Old Scrap Wood site is located approximately 400 feet north of the intersection of East Kendaia Road and East Patrol Road along East Patrol Road. The dirt road leads to a cul de sac where the debris is stored.

There are numerous piles of scrap wood and miscellaneous other items that exist in and around the cul de sac. The area is flat and of a semi circular shape (see Figure BA-2). The area has a very steep slope on the west side indicating a filled area. There were no signs of stressed vegetation.

This site was used to store construction debris from 1977-1984 and scrap wood from 1984 to 1986. Periodically the fire department used this area for training. Prior to this areas use as a scrap wood site the area received landfill. The origin and nature of this landfill is unknown, although it may have been used to dispose of construction debris.

The site is currently used to store scrapwood and firewood. The firewood is available to depot employees for purchase. Concrete and asphalt wastes are also present.

2-2 Potential Chemical Contaminants

- PCB's
- VOC's
- SVOC's
- Heavy Metals
- Benzene
- Toluene
- Xylene
- Petroleum Products

2-3 Physical Hazards

- Scrap debris
- Rough Terrain

2-4 Field Work

- Industrial, develop and sample groundwater monitoring wells
- Test borings
- Test pits
- Geophysics (EM31 & GPR)

2-5 **Monitoring to be Performed**

A PID of OVM meter will be used to screen for volatile organic compounds. A miniram particulates meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

2-6 **Task Specific Safe Operating Guidelines**

No. 1 Drilling and Test Boring - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Well Development - Level D
No. 12 Test Pit Excavation - Level B
No. 28 Geophysical Monitoring - Level D

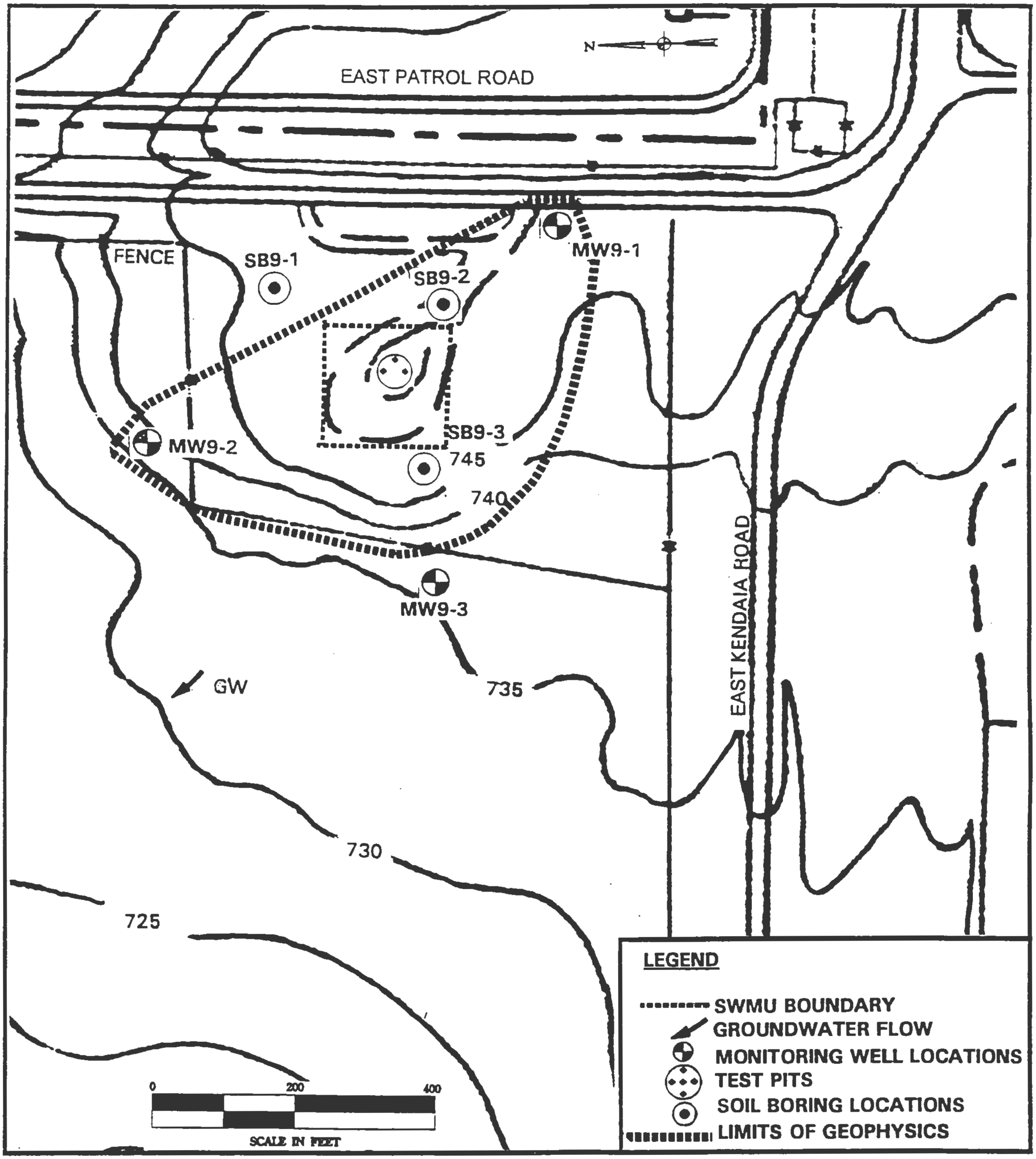


FIGURE BA-2 SITE PLAN FOR SEAD SWMU 9: OLD SCRAP WOOD SITE

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SMWU #9 Old Scrap Wood Site

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated water, soil & dust
   - Contact : Heavy metals, PCB's, petroleum products in soil and water
   - Explosion : No known hazard exists
   - Physical : Scrap debris piles.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges. Poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout drilling. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 25	19.5 to 25	<19.5	--	>25
Explosimeter (% LEL)	<10	<10	<10	>10	>25
HNU/OVA/OVM (PPM)	BKGD	<5	<500	--	>500
Aerosol Meter (mg/m³)	<1	<5	<25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 to 5	>5
Hydrogen Sulfide (PPM)	<5	<10	<300	--	>300
Hydrogen Cyanide (PPM)	<2	<10	<50	--	>50

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SWMU #9 Old Scrap Wood Site

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated water, soil and dust
   - Contact : Heavy metals, PCB's, petroleum products in soil and water
   - Explosion : No known hazard exists
   - Physical : Scrap debris piles.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout removal of augers. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored before and during installation of casing, sa... pack, and grout. Spoils should be monitored periodically.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 25	19.5 to 25	<19.5	--	>25
Explosimeter (% LEL)	<10	<10	<10	>10	>25
HNU/OVA/OVM (PPM)	BKGD	<5	<500	--	>500
Aerosol Meter (mg/m^3)	<1	<5	<25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 to 5	>5
Hydrogen Sulfide (PPM)	<5	<10	<300	--	>300
Hydrogen Cyanide (PPM)	<2	<10	<50	--	>50

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

   : Remove caked mud and dirt from augers as they are pulled.

   : Minimize dust during preparation of bentonite and cement slurries.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boot and gloves.
Step 3 Removal of boot covers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SWMU #9 Old Scrap Wood Site

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated water, soil and dust
   - Contact : Heavy metals, PCB's, petroleum products in soil and water
   - Explosion : No known hazard exists
   - Physical : Scrap debris piles.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses or splash shield, safety shoes or boots.
   - Upgrade to Level C : Full-face piece air-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout well development. Periodically monitor well and headspace of development water receiving container.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 25	19.5 to 25	< 19.5	--	> 25
Explosimeter (% LEL)	< 10	< 10	< 10	> 10	> 25
HNU/OVA/OVM (PPM)	BKGD	< 5	< 500	--	> 500
Aerosol Meter (mg/m³)	< 1	< 5	< 25	--	--
Radiation Meter (mR/hr)	< 0.1	< 0.1	< 0.1	0.1 to 5	> 5
Hydrogen Sulfide (PPM)	< 5	< 10	< 300	--	> 300
Hydrogen Cyanide (PPM)	< 2	< 10	< 50	--	> 50

6. Work Practices : Crews should stand upwind of monitoring well as much as possible during well development.

   All wastewater and silty sediment from well development operations should be contained in a waste drum and disposed of properly.

   Wastewater drum should be placed in a stable flat position which can be accessed later for removal and disposal.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from teflon bailers and pumps before leaving each well locality.

Steam clean equipment before using in another well.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 4 Removal of coverall (if worn).
Step 5 Removal of respirator (if worn).
Step 6 Removal of inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #9, Old Scrap Wood Site

3. Hazards
   - Inhalation : Volatile organics, Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals in soil and water
   - Explosion :
   - Physical : Construction debris, barbed wire, railroad ties, slip, trip, fall hazards.

4. Personal Protective Equipment :
   - Level B : Self-contained breathing apparatus (SCBA) or air-line respirater. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

5. Monitoring : Ambient air should be monitored continuously throughout excavation. Excavation materials should be monitored periodically and with any change of appearance.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1-500	--	>500

6. Work Practices : Personnel shall enter the test pit for rescue only.

   : Crews should stand upwind of testpit as much as possible during operations.

   : Excavation should proceed slowly with constant visual monitoring to watch for possible buried drums or heavily stained soils. Excavation should be terminated with discovery of drums.

   : Back-up safety monitor should be posted away from and upwind of work area maintaining line of sight and prepared to perform rescue in Level B.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from bucket, backhoe, and other equipment before leaving excavation area. Equipment should be steamed cleaned before leaving site. If no samples are being taken , backhoe need not be steam cleaned between test pits.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove SCBA backpack.
Step 5 Remove coveralls.
Step 6 Remove respirator face-piece.
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SWMU #9 Old Scrap Wood Site

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated water, soil and dust
   - Contact : Heavy metals, PCB's, petroleum products in soil and water
   - Explosion : No known hazard exists
   - Physical : Scrap debris piles.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout survey within the exclusion zone.

   Before each survey line is run, safety monitor and survey team should c[illegible] proposed path and monitor ambient air along line. Adjust survey line or [illegible] appropiate precautions in areas where hazards are found.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 25	19.5 to 25	<19.5	--	>25
Explosimeter (% LEL)	<10	<10	<10	>10	>25
HNU/OVA/OVM (PPM)	BKGD	<5	<500	--	>500
Aerosol Meter (mg/m³)	<1	<5	<25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 to 5	>5
Hydrogen Sulfide (PPM)	<5	<10	<300	--	>300
Hydrogen Cyanide (PPM)	<2	<10	<50	--	>50

6. Work Practices : Geophysical survey team should keep clear of other active work sites unless comparable protective equipment is available.

   Geophysical survey team should inform other work crews of their presence so that the work crews can give appropriate warnings.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from all field equipment that has come into contact with the soil , water , or potentially contaminated surfaces and should be decontaminated prior to leaving the site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of coveralls (if worn).
Step 6 Removal of respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

3-1 Physical Description & Activities Performed on SEAD 12

Radioactive Waste Burial Sites

Location A: Northeast of Building 813
Location B: North of Building 804

Location A covers an area approximately 1000 ft. by 1000 ft. The area is located in the Northeast corner of the Q area between Patrol Road and Service Road No. 1. There is believed to be five small burial pits located in this area northeast of Building 813. Figure BA-3A shows the location of Area 12A.

Location A was believed to be used for the disposal of lab wastes. It is believed that these burials took place between 1940 and 1980. One of the pits was excavated in 1986 and a large amount of lab trash was removed and shipped to an authorized off-site radioactive waste landfill in December 1987. There are believed to be five additional burial pits located in this area.

Location B is north of Buildings 803, 804 and 805. A pit containing a 5000 gal. storage tank is thought to be located north of Building 803. A dry storage pit, is thought to be located north of building 804. Radioactive wastes were reportedly buried in these pits. The 5000 gal. storage tank at Location B was utilized for storage of wastewater. This wastewater was generated from the washing of radioactive contaminated clothing. This cement tank was closed in place in 1986. The dry storage pit was also excavated in 1986. This dry storage pit contained pieces of plywood. Figure BA-3B shows the location of Area 12B.

3-2 Potential Chemical Contaminants

- Heavy metals
- Pesticides/PCB's
- VOC's
- Radon
- Radioactive materials
- Alpha, beta and gamma radiation

3-3 Physical Hazards

- Rough Terrain

3-4 Field Work

- Install, develop and sample groundwater monitoring wells
- Surface water sampling
- Sediment sampling
- Drilling and test borings
- Test pits
- Geophysics (EM31 & GPR)

3-5 Monitoring to be Performed

A PID or OVM meter will be used to screen for volatile organic compounds. A miniram particulates meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

3-6 Task Specific Safe Operating Guidelines

No. 1 Drilling and Test Boring - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Well Development - Level D
No. 12 Test Pit Excavation - Level B
No. 16 Sediment Sampling - Level D
No. 22 Surface Soil Sampling - Level D
No. 28 Geophysical Monitoring - Level D

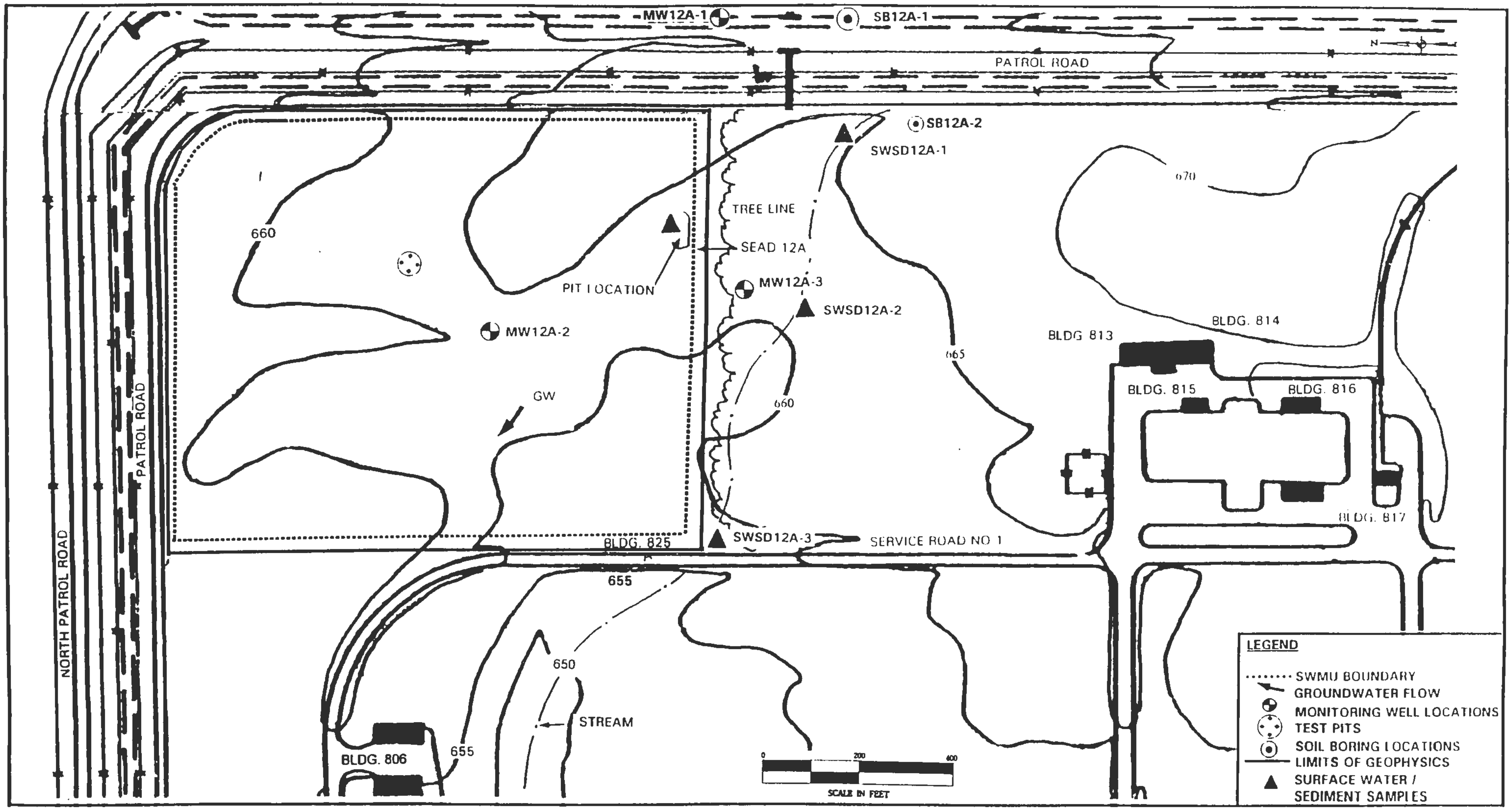


FIGURE BA-3A SITE PLAN FOR SEAD SWMU 12A: RADIOACTIVE WASTE BURIAL PILES

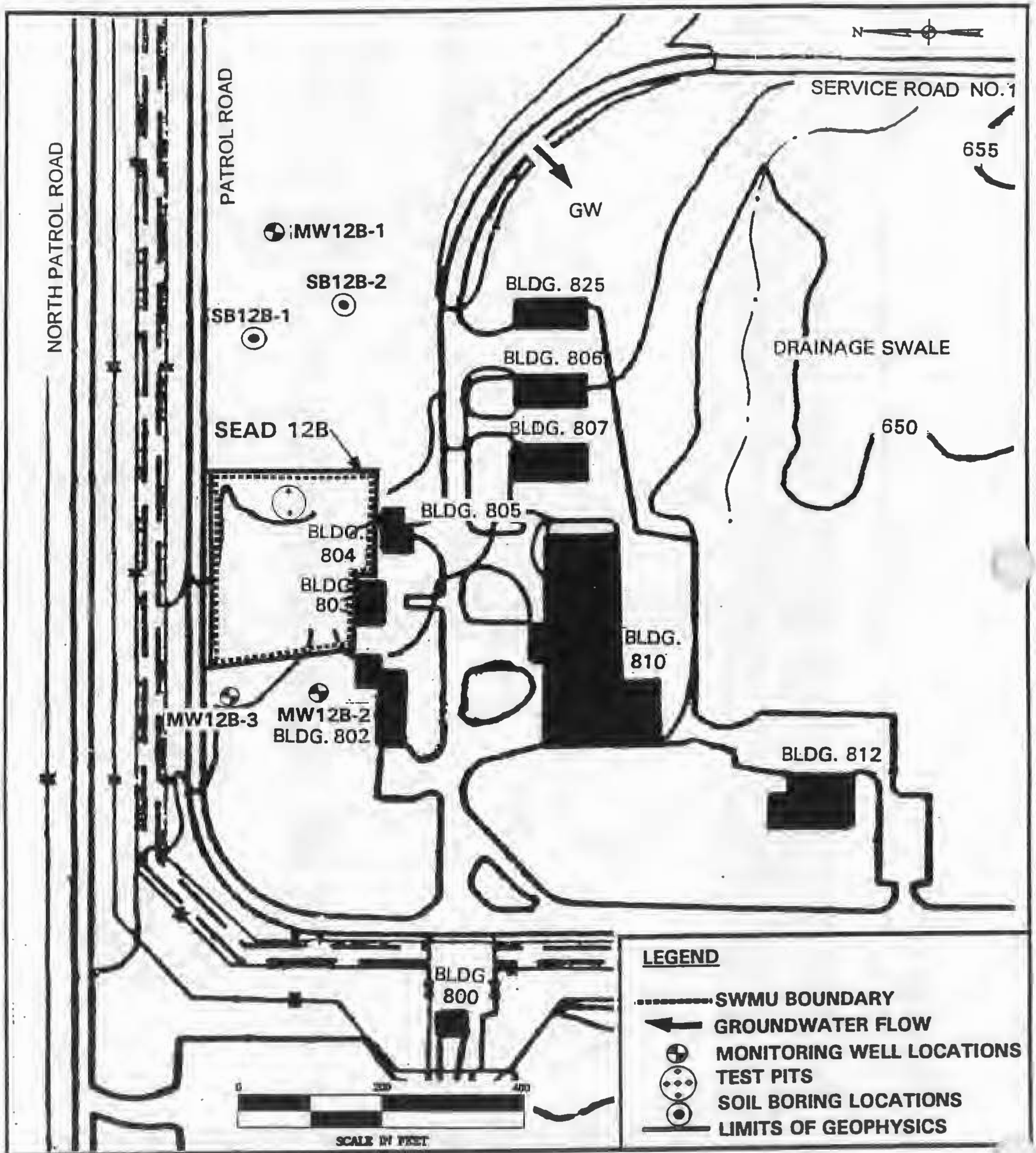


FIGURE BA-3B SITE PLAN FOR SEAD SWMU 12B: RADIOACTIVE WASTE BURIAL PILES

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #12 (Location A&B) Radioactive Waste Burial Site

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated water, soil and dust containing alpha emitters
   - Contact : Heavy metals, PCB's, pesticides in soil and water
   - Explosion : No known hazard exists
   - Physical : Radioactive materials

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges. Poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout drilling. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should be monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Radiologic Frisking
Step 3 Tape removal from boots and gloves.
Step 4 Removal of bootcovers.
Step 5 Removal of outer gloves.
Step 6 Remove tyvek coveralls (if worn).
Step 7 Remove respirator (if worn).
Step 8 Remove inner gloves.
Step 9 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #12 (Location A&B) Radioactive Waste Burial Site

3. Hazards
   - Inhalation : Semivolatile compounds, contaminated water, soil and dust containing alpha emitters
   - Contact : Heavy metals, PCB's, pesticides in soil and water
   - Explosion : No known hazard exists
   - Physical : Radioactive materials

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout removal of augers. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored before and during installation of casing, sand pack, and grout. Spoils should be monitored periodically.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

   : Remove caked mud and dirt from augers as they are pulled.

   : Minimize dust during preparation of bentonite and cement slurries.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Radiologic Frisking
Step 3 Tape removal from boot and gloves.
Step 4 Removal of boot covers.
Step 5 Removal of outer gloves.
Step 6 Remove tyvek coveralls (if worn).
Step 7 Remove respirator (if worn).
Step 8 Remove inner gloves.
Step 9 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #12 (Location A&B) Radioactive Waste Burial Site

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated water, soil and dust containing alpha emitters
   - Contact : Hevy metals, PCB's, pesticides in soil and water
   - Explosion : No known hazard exists
   - Physical : Radioactive materials

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses or splash shield, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout well development. Periodically monitor well and headspace of development water receiving container.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m³)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Crews should stand upwind of monitoring well as much as possible during well development.

   All wastewater and silty sediment from well development operations should be contained in a waste drum and disposed of properly.

   Wastewater drum should be placed in a stable flat position which can be accessed later for removal and disposal.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from teflon bailers and pumps before leaving each well locality.

Steam clean equipment before using in another well.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Radiologic Frisking
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of coverall (if worn).
Step 6 Removal of respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #12 Location (A&B) Radioactive Waste Burial Site

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated water, soil and dust containing alpha emitters
   - Contact : Heavy metals, PCB's, pesticides in soil and water
   - Explosion : No known hazard exists
   - Physical : Radioactive materials.

4. Personal Protective Equipment :
   - Level B : Self-contained breathing apparatus (SCBA) or air-line respirater. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

5. Monitoring : Ambient air should be monitored continuously throughout excavation. Excavation materials should be monitored for radioactivity continuously and with any change of appearance.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1-500	--	>500

6. Work Practices : Personnel shall enter the test pit for rescue only.

   : Crews should stand upwind of testpit as much as possible during operations.

   : Excavation should proceed slowly with constant visual monitoring to watch for possible buried anomalies or heavily stained soils. Excavation should be terminated with discovery of anomaly.

   : Back-up safety monitor should be posted away from and upwind of work area maintaining line of sight and prepared to perform rescue in Level B.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from bucket, backhoe, and other equipment before leaving excavation area. Equipment should be steamed cleaned before leaving site. If no samples are being taken , backhoe need not be steam cleaned between test pits.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Radiologic Frisking
Step 3 Remove and discard overboots.
Step 4 Remove and discard outergloves.
Step 5 Remove SCBA backpack.
Step 6 Remove coveralls.
Step 7 Remove respirator face-piece.
Step 8 Remove inner gloves.
Step 9 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #12 (Location A&B) Radioactive Waste Burial Site

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated water, soil and dust containing alpha emitters
   - Contact : Heavy metals, PCB's, pesticides in soil and water
   - Explosion : No known hazard exists
   - Physical : Radioactive materials

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

   Upgrade to level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling. Downwind monitoring should be conducted periodically or when elevated workzone readings are recorded.

   Split spoons should be monitored when opened. Sample material should be monitored immediately after collection of sample.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Crews should stand upwind of sample location as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from sampling equipmemt before leaving work area. Equipment should be steamed cleaned before leaving site. Sampling equipment should be decontaminated according to the sampling plan requirements.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Radiologic Frisking
Step 3 Wash overboots.
Step 4 Rinse, remove and discard overboots.
Step 5 Wash outer gloves.
Step 6 Rinse, remove and discard outergloves.
Step 7 Remove coveralls (if worn).
Step 8 Remove inner gloves.
Step 9 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #12 (Location A&B) Radioactive Waste Burial Site

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated water, soil and dust containing alpha emitters
   - Contact : Heavy metals, PCB's, pesticides in soil and water
   - Explosion : No known hazard exists
   - Physical : Radioactive materials

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Check surface soils for possible contamination before sampling.

   : Do not kneel or sit on ground in areas of potential contamination.

7. Decontamination :

Equipment	:	Equipment should be cleaned for sampling.
Personal	:	Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Radiologic Frisking
Step 3 Tape removal from boots and gloves.
Step 4 Removal of bootcovers.
Step 5 Removal of outer gloves.
Step 6 Removal of tyvek coveralls (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #12 (Location A&B) Radioactive Waste Burial Site

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated water, soil and dust containing alpha emitters
   - Contact : Heavy metals, PCB's, pesticides in soil and water
   - Explosion : No known hazard exists
   - Physical : Radioactive materials

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout survey within the exclusion zone.

   Before each survey line is run, safety monitor and survey team should check proposed path and monitor ambient air along line. Adjust survey line or take appropiate precautions in areas where hazards are found.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Geophysical survey team should keep clear of other active work sites unless comparable protective equipment is available.

   Geophysical survey team should inform other work crews of their presence so that the work crews can give appropriate warnings.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from all field equipment that has come into contact with the soil , water , or potentially contaminated surfaces and should be decontaminated prior to leaving the site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Radiologic Frisking
Step 3 Tape removal from boots and gloves.
Step 4 Removal of bootcovers.
Step 5 Removal of outer gloves.
Step 6 Removal of coveralls (if worn).
Step 7 Removal of respirator (if worn).
Step 8 Removal of inner gloves.
Step 9 Wash hands and face.

RADIOLOGIC SUPPLEMENT
TO SEAD 12

SUPPLEMENT TO HEALTH AND SAFETY PLAN
PROCEDURES FOR FIELD INVESTIGATIONS OF POTENTIAL RADIOLOGICAL SITES

SENECA ARMY DEPOT, ROMULUS, NEW YORK
SWMU SEAD 12A AND 12B

1.0 INTRODUCTION AND PURPOSE

The purpose of this addendum is to define personnel protective standards and mandatory safety practices and procedures to address the potenial for encountering radionuclides excess of background concentrations at locations witin SWMUs SEAD 12A and 12B at Seneca Army Depot, Romulus, New York.

The procedures and standards for radionuclides set out in this addendum supplement health and safety standards and procedures contained in the document "Safety and Health Plan, Seneca Army Depot, CERCLA Expanded Site Inspection at the Fifteen Solid Waste Management Units," Engineering-Science, Inc.

2.0 SITE CHARACTERIZATION

SEAD SWMU 12A is located in the northeast corner of the Q area between Patrol Road and Service No. 1. Five small burial pits are thought to be located in an area approximately 1,000 square feet. Suitcase size devices containing trash and low level radioactive materials are believed to have been deposited in this area between 1940 and 1980. These materials may include: Cathode ray tubes treated with a fluorescent coating containing cobalt-60 (^{60}Co); laboratory cleaning swipes; equipment cleaning swipes with uranium oxide; diodes and transistors containing trace amounts of radium-226 (^{226}Ra); general low-level radioactive trash and personnel training devices.

SEAD SWMU 12B is located west of Area 12A and north of buildings 803, 804, and 805. Area 12B contains a 5,000 gallon storage tank which once held wash waters from the cleaning of radioactive contaminated clothing. There is also a dry storage pit, north of building 804, in which pieces of plywood and items similar to those expected in area 12A may be buried.

2.1 RADIATION HAZARDS

The hazards associated with radioactive materials result from the particles emitted from the material. Potential chemical toxicity of radioactive elements are usually of secondary importance relative to the potential for health effects from the radioactivity. Three types of radioactive particles are of concern with regard to environmental radioactivity: alpha particles, beta particles, and gamma or x-rays. The hazards associated with each of these types of radiation are discussed below.

Alpha Radiation

Alpha particles are large radioactive particles consisting of two neutrons and two protons. Alpha particles can only travel a few inches in air and can be shielded by a piece of paper or clothing. The outer layers of the skin are also an effective shield to alpha particles and thus, alpha particles do not represent and external radiation hazard. However, if alpha particles are ingested or inhaled they can represent a significant internal radiation hazard. Ingestion or inhalation of alpha emitting radionuclides, such as radium, radon, and have been associated with cancers of the lungs and leukemia.

Beta Radiation

Beta particles are fast moving particles which are equal in mass to electrons. Beta particles are moderately penetrating and can be shield by thin layers of plastic or plexiglass. Beta particles from strong sources have a maximum range in air of about 30 feet. Beta particle from other sources have a range in air of 1 to 20 feet. Beta particles can penetrate the outer layers of skin and are an external radiation hazard to the skin and the eyes, as well as an internal radiation hazard. The dose received from an ingested beta emitting radionuclide is less than the dose that would be received from an equivalent amount of an alpha emitting material. Internal exposure to beta emitters has been associated with cancer in various organs.

Gamma radiation

Gamma radiation or x-rays are highly penetrating photons and have ranges measured in kilometers. Gamma radiation is considered primarily an external exposure hazard because of the long range and highly penetrating nature of the radiation. Dense materials, such as lead and concrete are effective as shielding for gamma radiation. Exposure to gamma rays has been associated with increased incidence of cancers in various organs.

3.0 TRAINING

All Engineering-Science employees working in the areas of potential radioactive contamination will receive training in the potential for exposure to radiation during site work, the possible health effects of radiation exposure, the use of radiation monitoring equipment and the interpretation of the monitor readings, and the standard operating procedures for site work in the areas where there is a potential for radiation exposure.

4.0 MEDICAL SURVEILLANCE

No additional medical surveillance measurements are necessary.

5.0 SITE LAYOUT AND CONTROL MEASURES

Under normal operating conditions, no additional site control measures will be required when working in the areas of potential radioactive contamination.

In the event that a large radiation source is encountered resulting in elevated radiation readings, the work area will be evacuated and the area where elevated radiation readings are present will be marked off with hazard warning tape (See section 6.0 for action levels). If the radiation readings are greater than 5 millirem per hour (mrem/hr), the area will be cordoned off with tape and/or signs displaying the radiation logo and the words "Radiation Area." Re-entry to areas of high radiation readings shall be under the supervision of the Supervising Health Physicist.

6.0 MONITORING

6.1 GENERAL MONITORING

Radiation monitoring shall be conducted during all intrusive work performed in areas of potential radioactive contamination with a thin window Geiger-Mueller pancake-type detector with a count rate instrument for gamma and beta radiation (ex. Victoreen Model-190 Survey and count rate meter with Model 489-* Probe for alpha particulate and Model 489-11C Probe for Beta & Gamma detection).

Monitoring for gross beta and gamma radiation will be conducted in the work zone and on all samples obtained from the borings. Monitoring for gross alpha radiation will be conducted on all samples obtained from the borings.

Background for gross beta and gamma shall be established at each work zone prior to beginning of work each day. The background reading shall be the level recorded about three feet above the ground surface in the vicinity of the work area. If gross beta and gamma readings in work zone exceed 1000 counts per minute (cpm), stop work, back off from the work area, and consult with Supervising Health Physicist and notify Project Manager.

Background for gross alpha readings shall be established at each work zone prior to beginning of work each day. The background readings shall be the level recorded at the ground surface in the vicinity of the work area, but away from areas of potential contamination. If gross alpha readings from the samples exceed 1000 cpm, cover the sample with the split spoon, back off from the work area, and consult Supervising Health Physicist and notify the Project Manager.

If work zone readings or soil sample survey readings exceed 1000 cpm at any time during drilling any person directly involved with the drilling or handling soils or soiled drilling equipment shall perform a self-frisk prior to leaving the work area and prior to eating, smoking or drinking, using the following procedure:

a) Verify frisker is on the x1 scale.
b) Survey hands before picking up probe.
c) Hold probe approximately 1/2 inch from the surface being surveyed and move the probe slowly over the surface (2 inches per second maximum). Take care not to touch the surface being monitored with the probe.
d) Monitor face (pause at mouth and nose).
e) Monitor neck and shoulders.
f) Monitor arms (pause at each elbow).
g) Monitor chest and abdomen.
h) Monitor back, hips and seat of pants.
i) Monitor legs (pause at each knee).
j) Monitor shoe tops and bottoms (pause at soles and heels).

If count rate increases to greater than 200 cpm and remains there consistently, stay in area and notify Supervising Health Physicist for appropriate actions and decontamination procedures.

6.2 PERSONAL MONITORING

Personnel working within the exclusion and decontaminations areas of SWMU SEAD 12 shall wear a thermoluminescent dosimeter (TLD) personal radiation monitoring device. The TLD shall be worn on the front area of the chest at all times while working within the exclusion and decontamination zones. These badges will be used to determine each individual's exposure to radiation as a result of their involvement in field investigations at Seneca Army Depot (specifically SEAD SWMU 12).

7.0 PERSONAL PROTECTIVE EQUIPMENT

Minimum levels of protection specified in the main body of the health and safety plan shall also apply to tasks performed in the areas of potential radioactive contamination. Descriptions of the equipment comprising each of the levels of protection is contained in the body of the HASP.

Safety glasses and hardhats shall be worn at all times during drilling. Latex inner gloves and outer nitrile gloves shall be worn for handling of samples and all equipment which comes in contact with subsurface soils.

8.0 SAFE WORK PRACTICES AND ENGINEERING CONTROLS

Drill cuttings shall be cleared frequently from around the auger and stockpiled for later disposal. Do not allow stockpiled cuttings or cuttings around auger to dry out. Dry soils can become fugitive dusts, increasing the chance of inhalation exposure. Keep the stockpiled cuttings covered or spray with water to limit fugitive dusts. If work area spoils are found to be contaminated with radiological constituents that will be segregated from other spoils. Reusable equipment (i.e. drill rig, tables, monitoring instruments, etc.) will be protected from potential contamination by potentially radioactive spoils or sampled materials using plastic sheeting. These covering materials will be recovered and containerized at the end of each day.

All Safe Work Practices in the main body of the HASP apply to work in the potential areas of radioactive contamination.

9.0 DECONTAMINATION

If readings greater than 200 cpm are obtained during a self frisk (See section 6.0 above) contact the Supervising Health physicist for appropriate decontamination procedures. Otherwise, decontamination procedures shall be as described in the main body of the HASP.

10.0 EMERGENCY RESPONSE PLAN

No additions to the emergency response plan are required.

4-1 Physical Description & Activities Performed on SEAD SWMUs 43, 56, & 69

Old Missile Propellant Test Lab
Herbicide/Pesticide Storage
Building 606 Disposal Area

These SWMUs will be investigated together due to their proximity to Building 606 and each other. SEAD 43, 56 and 69 are located in the southeast corner of the depot. Building 606, once used as a missile propellant test laboratory, is now the herbicide/pesticide storage facility. A disposal area associated with these operations is located nearby. These three areas are shown on Figure BA-4.

The Old Missile Test Facility conducted QA surveillance testing, which commonly means operational or functional testing. During this time IRFNA and/or liquid propellants may have been disposed of in this area. Since 1976 it has been used for herbicide/pesticide storage. This concrete block building is approximately 80 feet by 40 feet. The building was renovated in 1979 to include the following health and safety features: ventilation fan with lowering door vents, local exhaust for the mixing area, shower, emergency spill kits, a fire protection system connected directly with the on-post fire department, and adequate shop signs and disposal procedures. The buildings drains and concrete floors have been sealed.

Northwest of Building 606 is a concrete foundation that is believed to have been associated with the old missile test facility. It was an acid storage building. The corrugated metal building once located on this foundation has been moved to the Administrative area, and is now Building 132. This concrete pad is currently used to aerate spill residues.

IRFNA that was disposed of at the IRFNA site (SEAD 13) was generated in the Building 606 area. At SEAD 13 it was neutralized in trenches and mixed with fuel oil and burned in small furnaces.

The washwater from the rinsing of containers used for the mixing of pesticides used to be stored in a concrete underground storage tank. In 1984, the Pest Management Review recommended that the tank be removed. Use of this tank ceased and it was removed. It has been replaced by a new tank located in a vault. East of Building 606 pesticide rinseate from this building discharges into the new tank.

Approximately 300 feet south of Building 606 a road leads west to a small area that was used as a disposal area for Building 606. The entire open field was walked and the only area appearing to contain debris was approximately 100 feet by 100 feet and located directly at the end of the road. SEAD personnel have reported that debris (fence posts, 2,4-D cans, and pesticide cans) has been dumped in this area. It is believed this could also be a potential site for the two drums of nicotine sulfate (SEAD 62).

Building 606 has been used for herbicide/pesticide storage since 1976. A barren area in front (south) of Building 606 (described in the SWMU Classification Report), is possibly indicative of a previous spill. An asbestos workshop is also part of this facility. A variety of herbicide and pesticide compounds and dispersal equipment are stored in Building 606. Preparation of the compounds prior to dispersal is carried out in a separate section of the building.

The containers used for mixing herbicides/pesticides are washed out at the end of the operation in the Pesticide Rinseate Building east of Building 606. Rinseate from the building is discharged through a double walled pipe into the new tank located in an underground vault adjacent to the rinseate facility. A drainage swale is located behind the rinseate facility.

The washwater in the tank is reused for new batches of pesticides/herbicides. The vault for the storage was intended to be watertight but has not proven to be so. The sump pump and discharge pipe were installed to empty the vault of rainwater that accumulated inside of it. This water is discharged into a depressed area and pools just east of the underground vault.

The concrete pad northwest of Building 606 that was once associated with the Old Missile Test Laboratory is currently used to aerate spill residues.

Southwest of Building 606 is a structure believed to be a septic system. Two above ground concrete vaults are located on either end of a 25 foot long mound. Atop the mound are several black vent pipes. Two working sump pumps are located at the most eastern end of the mound.

The waste disposal area near (SEAD 69) Building 60 contains various construction debris. Bricks and concrete blocks are visible on the surface. A topographic depression, indicative of a pit of some kind, was noted in the SWMU Classification Report. There are no signs of stained soil or stressed vegetation. There are no wetlands located in the immediate area.

Due to the presence of the Old Missile Propellant Test Labs, there is a possibility of UXO's in this area.

4-2 Potential Chemical Contaminants

- 2,4-D
- Herbicides
- Pesticides
- Heavy metals
- 2,4,6-TNT
- 2,4-DNT
- 2,6-DNT
- RDX
- HMX
- Trinitrobenzene
- Tetryl
- Nicotine

4-3 Physical Hazards

Construction debris
Brick & concrete blocks

4-4 Field Work

- Install, develop and sample groundwater monitoring wells
- Drilling & test borings
- Soil sampling
- Test Pits
- Geophysics (EM31 & GPR)

4-5 Monitoring to be Performed

A PID or OVM meter will be used to screen for volatile organic compounds. A miniram particulate meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

4-6 Task Specific Safe Operating Guidelines

No. 1 Drilling & Test Boring - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Well Development - Level D
No. 12 Test Pits - Level B
No. 19 Surface Water Sampling - Level D
No. 22 Soil Sampling - Level D
No. 28 Geophysical Monitoring - Level D

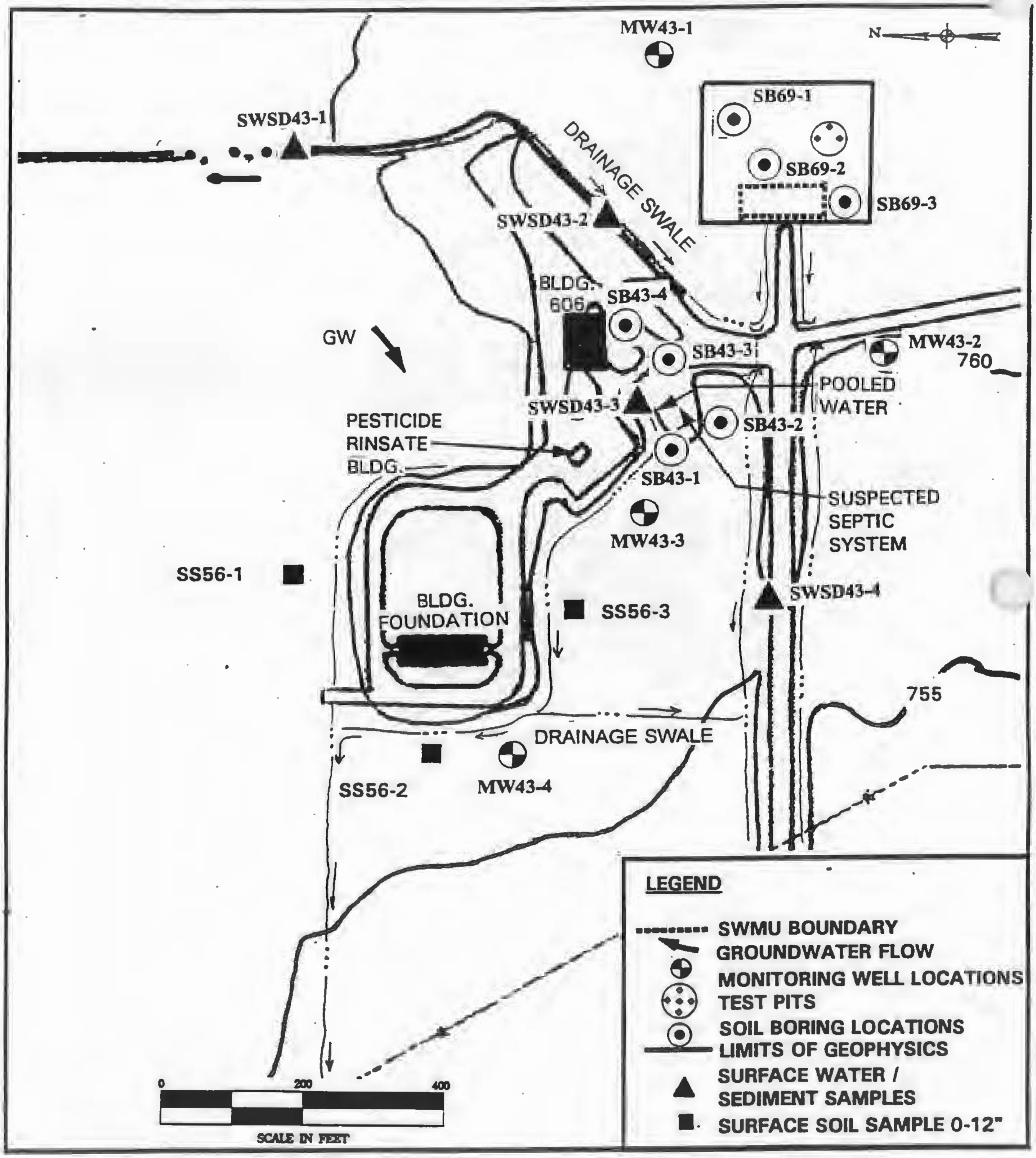


FIGURE BA-4 SITE PLAN FOR SEAD SWMU 43, 56, 69: OLD MISSILE PROPELLANT TEST I
HERBICIDE/PESTICIDE STORAGE
BUILDING 606 DISPOSAL AREA

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMUs 43, 56, 69

3. Hazards
   - Inhalation : Herbicides, pesticides, contaminated soil and dust
   - Contact : Heavy metals, RDX, HMX herbicides, pesticides in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges. Poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout drilling. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should be monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMUs 43, 56, 69

3. Hazards
   - Inhalation : Bentonite and cement dust
   - Contact : Heavy metals, RDX, HMX herbicides, pesticides, in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout removal of augers. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored before and during installation of casing, sand pack, and grout. Spoils should be monitored periodically.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

   : Remove caked mud and dirt from augers as they are pulled.

   : Minimize dust during preparation of bentonite and cement slurries.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boot and gloves.
Step 3 Removal of boot covers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMUs 43, 56, 69

3. Hazards
   - Inhalation : Herbicides, pesticides, contaminated soil and dust
   - Contact : Heavy metals, RDX, HMX herbicides, pesticides in water
   - Explosion : Explosive compounds
   - Physical : Construction debris.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses or splash shield, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout well development. Periodically monitor well and headspace of development water receiving container.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of monitoring well as much as possible during well development.

   : All wastewater and silty sediment from well development operations should be contained in a waste drum and disposed of properly.

   : Wastewater drum should be placed in a stable flat position which can be accessed later for removal and disposal.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from teflon bailers and pumps before leaving each well locality.

Steam clean equipment before using in another well.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 4 Removal of coverall (if worn).
Step 5 Removal of respirator (if worn).
Step 6 Removal of inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMUs 43, 56, 69, Old Missle Propellant Test Labs, Herbicide/Pesticide Storage, and Bldg. 606 Disposal

3. Hazards
   - Inhalation : Volatile organics, Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals in soil and water
   - Explosion :
   - Physical : Construction debris, barbed wire, railroad ties, slip, trip, fall hazards.

4. Personal Protective Equipment :
   - Level B : Self-contained breathing apparatus (SCBA) or air-line respirater. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

5. Monitoring : Ambient air should be monitored continuously throughout excavation. Excavation materials should be monitored periodically and with any change of appearance.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1-500	--	>500

6. Work Practices : Personnel shall enter the test pit for rescue only.

   : Crews should stand upwind of testpit as much as possible during operations.

   : Excavation should proceed slowly with constant visual monitoring to watch for possible buried drums or heavily stained soils. Excavation should be terminated with discovery of drums.

   : Back-up safety monitor should be posted away from and upwind of work area maintaining line of sight and prepared to perform rescue in Level B.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from bucket, backhoe, and other equipment before leaving excavation area. Equipment should be steamed cleaned before leaving site. If no samples are being taken , backhoe need not be steam cleaned between test pits.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove SCBA backpack.
Step 5 Remove coveralls.
Step 6 Remove respirator face-piece.
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMUs 43, 56, 69

3. Hazards
   - Inhalation : Herbicides, pesticides, contaminated soil and dust
   - Contact : Heavy metals, RDX, HMX in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.
   - Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor/HEPA filter cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of as much as possible during sampling.

   : Always perform surface water sampling in groups minimum of 2 people.

7. Decontamination :

Equipment : Sampling equipment should be cleaned before leaving site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove coveralls (if worn).
Step 5 Remove respirator (if worn).
Step 6 Remove inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMUs 43, 56 69

3. Hazards
   - Inhalation : Herbicides, pesticides, contaminated soil and dust
   - Contact : Heavy metals, RDX, HMX in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Check surface soils for possible contamination before sampling.

   : Do not kneel or sit on ground in areas of potential contamination.

7. Decontamination :

Equipment : Equipment should be cleaned for sampling.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of tyvek coveralls (if worn).
Step 6 Removal of inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMUs 43, 56, 69

3. Hazards
   - Inhalation : Herbicides, pesticides, contaminated soil and dust
   - Contact : Heavy metals, RDX, HMX in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout survey within the exclusion zone.

   Before each survey line is run, safety monitor and survey team should check proposed path and monitor ambient air along line. Adjust survey line or take appropiate precautions in areas where hazards are found.

Instrument Actions Levels	D	C	B	Exercise Caution	Evecuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Geophysical survey team should keep clear of other active work sites unless comparable protective equipment is available.

   : Geophysical survey team should inform other work crews of their presence so that the work crews can give appropriate warnings.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from all field equipment that has come into contact with the soil , water , or potentially contaminated surfaces and should be decontaminated prior to leaving the site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of coveralls (if worn).
Step 6 Removal of respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

5-1 Physical Description & Activities Performed on SEAD SWMU 44

QA Test Labs

Location A: Southeast of Building 612
Location B: Brady Road, North of Building 612

Location A is approximately 1000 ft. East of Brady Road and 1500 ft. North of South Patrol Road along an unnamed dirt road as shown in Figure BA-5A. The dirt road is parallel to South Patrol Road. Location B is located along the East side of Brady Road as shown in Figure BA-5B.

Both Areas A and B were used for quality assurance testing of CS grenades, fire devices and pyrotechnics. At SEAD 44B, QA tested timed fuzes. It has not been determined if the fuzes were actually detonated at SEAD 44B. However, mines were detonated aboveground at the bermed area associated with SEAD 44A.

Along both sides of the dirt road at Location A there are berms. These bermed areas potentially contain unexploded ordnance since they were used for QA testing. There were no visible signs of any building foundations. Along the north side of the dirt road there were three metal poles that could have been used for holding screens in place while detonating munitions. There was also a small ditch on the north side of the dirt road. There were no apparent wetlands or stressed vegetation in the area. At the end of the dirt road, on the south side is an empty drum labelled steam waste.

At Location B there was an abandoned concrete foundation that was approximately 20 feet by 50 feet. Directly behind it (east) there is a flag pole believed to have been used to display a red flag. The red flag was used to signal when testing was being performed. There is also a dilapidated corrugated metal shack behind the concrete foundation. There is a drainage ditch on this side of the road that runs parallel to Brady Road and a culvert that runs underneath Brady Road.

5-2 Potential Chemical Contaminants

- 2,4,6-TNT
- 2,4-DNT
- 2,6-DNT
- RDX
- HMX
- Trinitrobenzene
- Tetryl
- Heavy metals

5-3 **Physical Hazards**

- Unexploded ordnance
- Rough terrain
- Metal fragments

5-4 **Field Work**

UXO clearance will be performed prior to beginning each task.

- Install, develop and sample groundwater monitoring wells
- Surface water sampling
- Soil sampling
- Sediment sampling

5-5 **Monitoring to be Performed**

A PID or OVM meter will be used to screen for volatile organic compounds. A miniram particulate meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

5-6 **Task Specific Safe Operating Guidelines**

No. 1 Drilling and Test Boring - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Well Development - Level D
No. 16 Sediment Sampling - Level D
No. 19 Surface Water Sampling - Level D
No. 22 Surface Soil Sampling - Level D

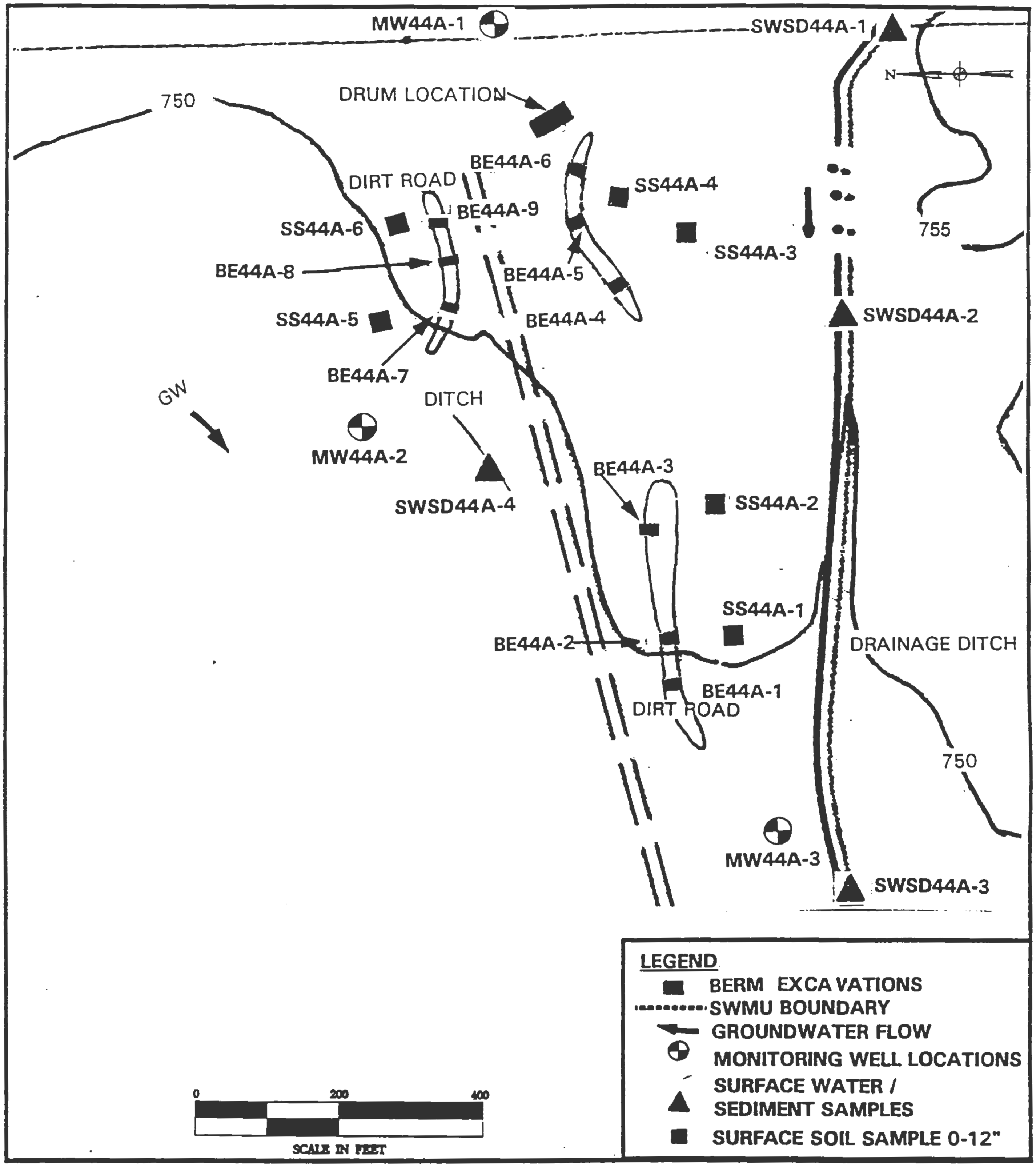


FIGURE BA-5A SITE PLAN FOR SEAD SWMU 44A: QA TEST LABS

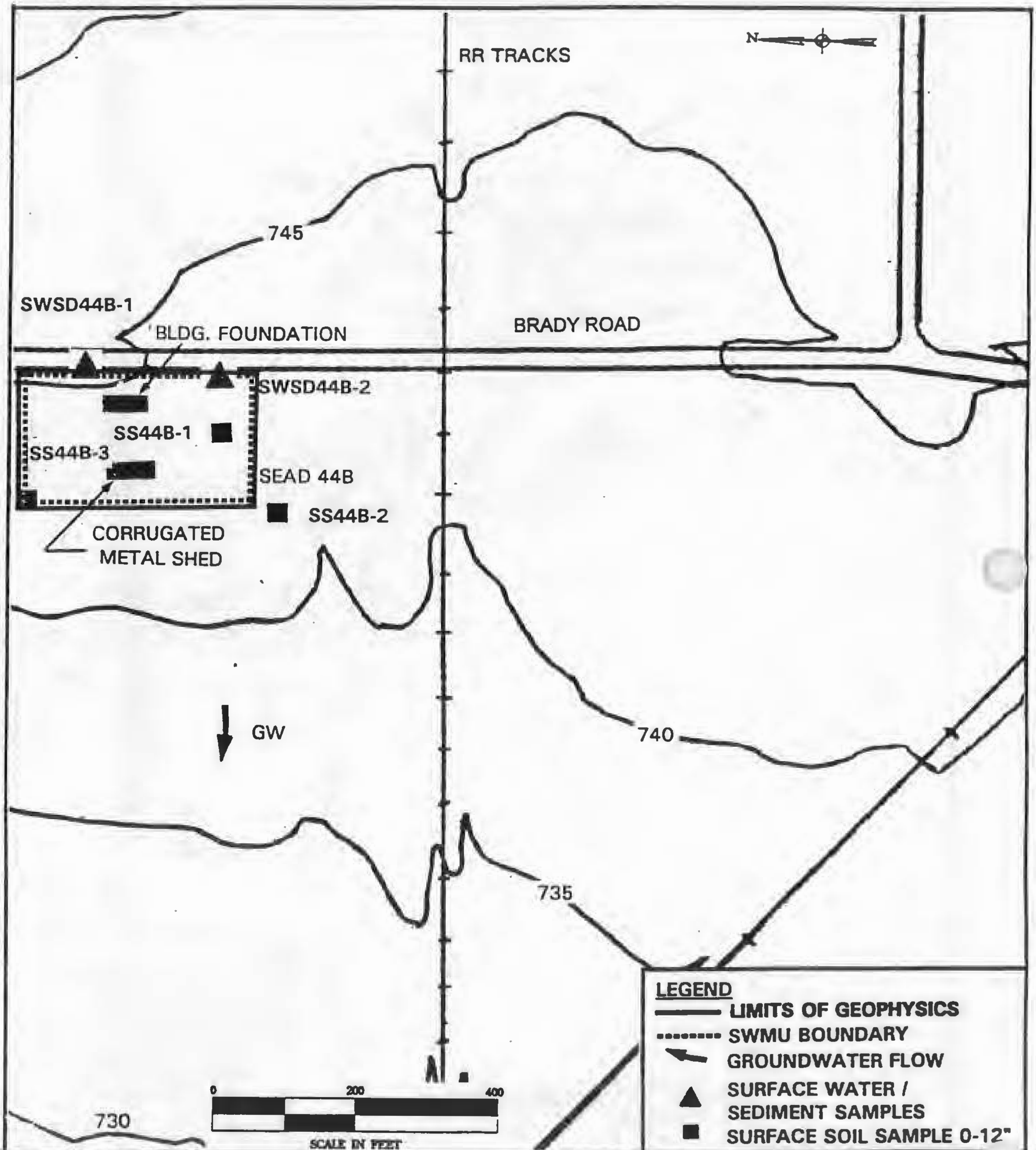


FIGURE BA-5B SITE PLAN FOR SEAD SWMU 44B: QA TEST LABS

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #44 (A&B) QA Test Labs

3. Hazards
   - Inhalation : Contaminated soil and dust
   - Contact : Heavy metals, RDX, HMX, in soil and water
   - Explosion : Unexploded ordnance
   - Physical : Metal objects, fragments protruding from the ground.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges. Poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout drilling. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should be monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #44

3. Hazards
   - Inhalation : Contaminated soil and dust
   - Contact : Heavy metals, RDX, HMX, in soil and water
   - Explosion : Unexploded ordnance
   - Physical : Metal objects, fragments protruding from the ground.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout removal of augers. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored before and during installation of casing, sand pack, and grout. Spoils should be monitored periodically.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

   : Remove caked mud and dirt from augers as they are pulled.

   : Minimize dust during preparation of bentonite and cement slurries.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boot and gloves.
Step 3 Removal of boot covers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #44 (A&B) QA Test Labs

3. Hazards
   - Inhalation : Contaminated soil and dust
   - Contact : Heavy metals, RDX, HMX, in soil and water
   - Explosion : Unexploded ordnance
   - Physical : Metal objects, fragments protruding from the ground.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses or splash shield, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout well development. Periodically monitor well and headspace of development water receiving container.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of monitoring well as much as possible during well development.

   : All wastewater and silty sediment from well development operations should be contained in a waste drum and disposed of properly.

   : Wastewater drum should be placed in a stable flat position which can be accessed later for removal and disposal.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from teflon bailers and pumps before leaving each well locality.

Steam clean equipment before using in another well.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 4 Removal of coverall (if worn).
Step 5 Removal of respirator (if worn).
Step 6 Removal of inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #44 (A&B) QA Test Labs

3. Hazards
   - Inhalation : Contaminated soil and dust
   - Contact : Heavy metals, RDX, HMX, in soil and water
   - Explosion : Unexploded ordnance
   - Physical : Metal objects, fragments protruding from the ground.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

   Upgrade to level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling. Downwind monitoring should be conducted periodically or when elevated workzone readings are recorded.

   Split spoons should be monitored when opened. Sample material should be monitored immediately after collection of sample.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of sample location as much as possible during operations.

   : Exercise care on wet, muddy or steep terrain.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from sampling equipmemt before leaving work area. Equipment should be steamed cleaned before leaving site. Sampling equipment should be decontaminated according to the sampling plan requirements.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Wash overboots.
Step 3 Rinse, remove and discard overboots.
Step 4 Wash outer gloves.
Step 5 Rinse, remove and discard outergloves.
Step 6 Remove coveralls (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #44 (A&B) QA Test Labs

3. Hazards
   - Inhalation : Contaminated soil and dust
   - Contact : Heavy metals, RDX, HMX, in soil and water
   - Explosion : Unexploded ordnance
   - Physical : Metal objects, fragments protruding from the ground.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor/HEPA filter cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	< 19.5	--	> 23.5
Explosimeter (% LEL)	< 10	< 10	< 10	10 - 25	> 25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	> 2

6. Work Practices : Crews should stand upwind of as much as possible during sampling.

   : Always perform surface water sampling in groups minimum of 2 people.

7. Decontamination :

Equipment : Sampling equipment should be cleaned before leaving site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove coveralls (if worn).
Step 5 Remove respirator (if worn).
Step 6 Remove inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #44 (A&B) QA Test Labs

3. Hazards
   - Inhalation : Contaminated soil and dust
   - Contact : Heavy metals, RDX, HMX, in soil and water
   - Explosion : Unexploded ordnance
   - Physical : Metal objects, fragments protruding from the ground

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.
   - Upgrade to Level C : Full-face piece air-purifying respirator with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Check surface soils for possible contamination before sampling.

   : Do not kneel or sit on ground in areas of potential contamination.

7. Decontamination :

Equipment : Equipment should be cleaned for sampling.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of tyvek coveralls (if worn).
Step 6 Removal of inner gloves.
Step 8 Wash hands and face.

6-1 Physical Description & Activities Performed on SEAD SWMU 50

Tank Farm

The tank farm is located in the area west of East Patrol Road between building 350 and Buildings 356 and 357. It is not known at what time the tank farm originated. However, at one time there were approximately 160 aboveground storage tanks when the tank farm was originally constructed. The tanks were used to store dry materials. These materials included minerals, ores and asbestos. In 1988 ten tanks were tested, removed and sold to area farmers. Figure BA-6 shows the location of existing tanks and also former tank locations. The former tank locations were obtained from a 1959 aerial photograph.

Currently, there are only four remaining aboveground storage tanks and they are scattered around the area. Two of the tanks are used for the storage of antimony, one for asbestos and the remaining stores rutile ore. The rest of the site is covered with vegetation except in the areas where tanks were previously located. These areas are circular and gravel covered. There are no existing records of leaks or spills from any of the tanks. There are no wetlands in the area.

6-2 Potential Chemical Contaminants

- Heavy metals
- Asbestos

6-3 Physical Hazards

- Aboveground tanks (metal debris)
- Wetlands

6-4 Field Work

- Surface soil sampling
- Surface water sampling
- Sediment sampling

6-5 Monitoring to be Performed

A PID or OVM meter will be used to screen for volatile organic compounds. A miniram particulate meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

6-6 Task Specific Safe Operating Guidelines

No. 16 Sediment Sampling - Level D
No. 19 Surface Water Sampling - Level D
No. 22 Surface Soil Sampling - Level D

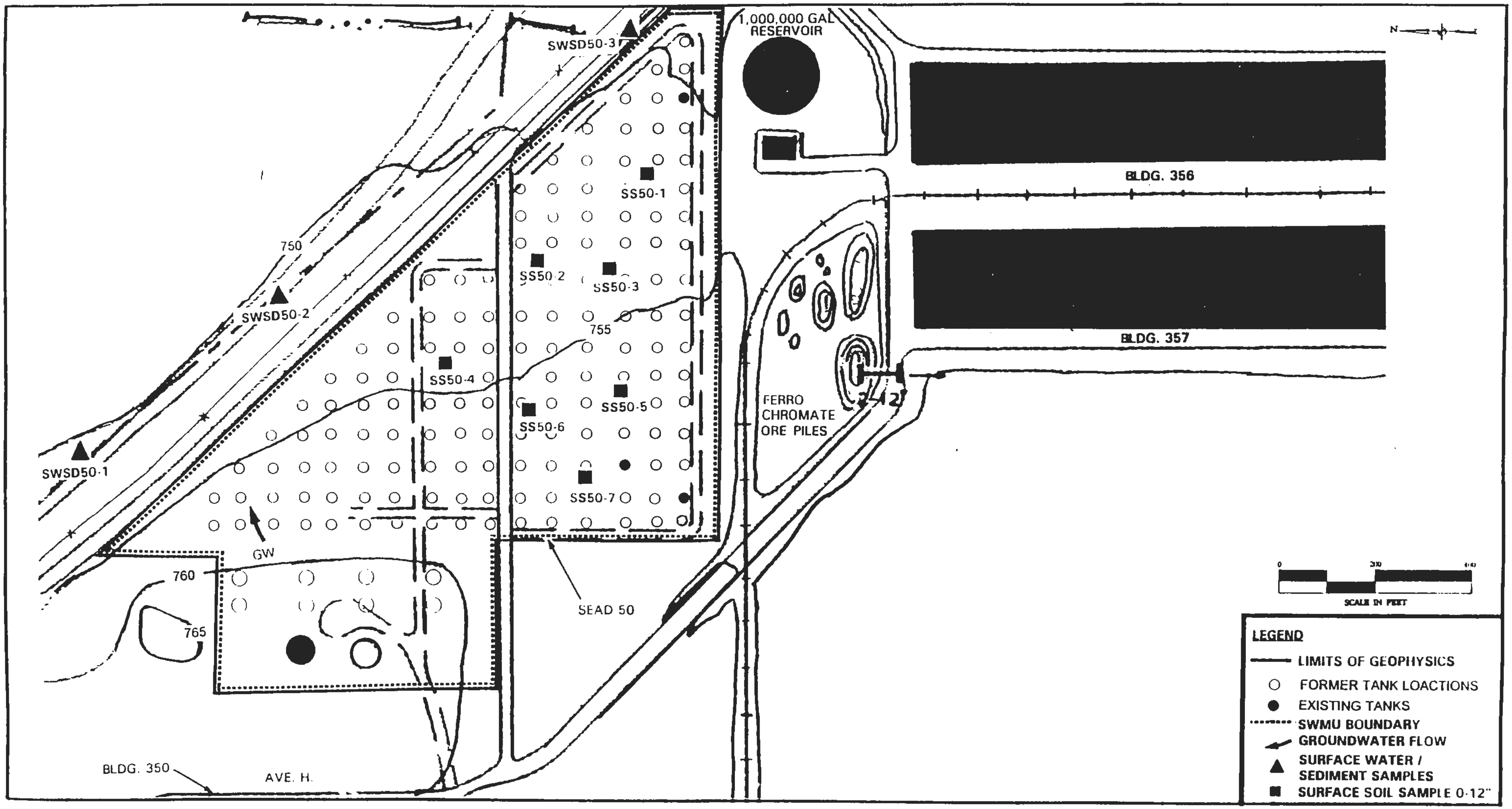


FIGURE BA-6 SITE PLAN FOR SEAD SWMU 50: TANK FARM

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #50 Tank Farm

3. Hazards
   - Inhalation : Heavy metals in dust, asbestos
   - Contact : Heavy metals in soils and water
   - Explosion : None
   - Physical : Aboveground tanks.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

   Upgrade to level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling. Downwind monitoring should be conducted periodically or when elevated workzone readings are recorded.

   Split spoons should be monitored when opened. Sample material should be monitored immediately after collection of sample.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of sample location as much as possible during operations.

   : Watch for asbestos-like materials. If observed, retreat and avoid area. If necessary, upgrade to Level C for working near asbestos-like materials.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from sampling equipmemt before leaving work area. Equipment should be steamed cleaned before leaving site. Sampling equipment should be decontaminated according to the sampling plan requirements.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Wash overboots.
Step 3 Rinse, remove and discard overboots.
Step 4 Wash outer gloves.
Step 5 Rinse, remove and discard outergloves.
Step 6 Remove coveralls (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #50 Tank Farm

3. Hazards
   - Inhalation : Heavy metals in dust, asbestos
   - Contact : Heavy metals in soils and water
   - Explosion : None
   - Physical : Aboveground tanks.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor/HEPA filter cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of as much as possible during sampling.

   : Always perform surface water sampling in groups minimum of 2 people.

   : Watch for asbestos like materials. If observed, retreat and avoid area. If necessary, upgrade to Level C for working near asbestos like materials.

7. Decontamination :

Equipment : Sampling equipment should be cleaned before leaving site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove coveralls (if worn).
Step 5 Remove respirator (if worn).
Step 6 Remove inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #50 Tank Farm

3. Hazards
   - Inhalation : Heavy metals in dust, asbestos
   - Contact : Heavy metals in soils and water
   - Explosion : None
   - Physical : Aboveground tanks.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.
   - Upgrade to Level C : Full-face piece air-purifying respirator with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m³)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Check surface soils for possible contamination before sampling.

   : Do not kneel or sit on ground in areas of potential contamination.

   : Watch for asbestos - like materials. If observed retreat and avoid area. If necessary, upgrade to Level C for working near asbestos-like materials.

7. Decontamination :

Equipment	:	Equipment should be cleaned for sampling.
Personal	:	Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of tyvek coveralls (if worn).
Step 6 Removal of inner gloves.
Step 8 Wash hands and face.

7-1 Physical Description & Activities Performed on SEAD SWMU 58

Debris Area Near Booster Station 2131

The booster station (2131) is a pumphouse used to pump drinking water from the lake to the reservoir. It is not known what waste may have been disposed of in this area. It is rumored that DDT, may have been disposed of here. There are no DDT usage records availabe.

During our site inspections there were two areas of concern discovered: a number of debris areas located adjacent to each other, and a large barren area.

The first area contains a pile of debris on the surface located 150' North and 300' east of the Booster Station and north of the stream (figure BA-7). This pile is approximately 10' x 10' and contains rusted drums of various sizes. There is one 55 gallon drum and the remaining are smaller. The smaller drums are believed to have once held propellants. The pile also contains various broken glass bottles. The area to the north contains partially buried drums. This area is approximately 10' x 10'. There is a stream due south of this area which runs east to west.

In the second area, fifty feet north of the debris piles area, there is a drainage swale which also runs east to west. Fifty feet north of the drainage swale is a large circular area with stressed vegetation (approximately 300' diameter).

7-2 Potential Chemical Contaminants

- PCB's
- VOC's
- SVOC's
- Explosive Compounds
- Heavy Metals
- DDT

7-3 Physical Hazards

- Debris piles
- Broken glass
- Rusted drums

7-4 Field Work

- Test pits
- Drilling and test borings
- Install, develop and sample groundwater monitoring wells
- Surface water sampling
- Sediment sampling
- Surface soil sampling
- Geophysics (EM31 & GPR)

7-5 **Monitoring to be Performed**

A PID or OVM meter will be used to screen for volatile organic compounds. A miniram particulate meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

7-6 **Task Specific Safe Operating Guidelines**

No. 1 Drilling and Test Boring - Level D
No. 4 Well Installation - Level D
No. 7 Well Development - Level D
No. 10 Test Pit Excavation - Level D
No. 16 Sediment Sampling - Level D
No. 19 Surface Water Sampling - Level D
No. 22 Surface Soil Sampling - Level D
No. 28 Geophysical Monitoring - Level D

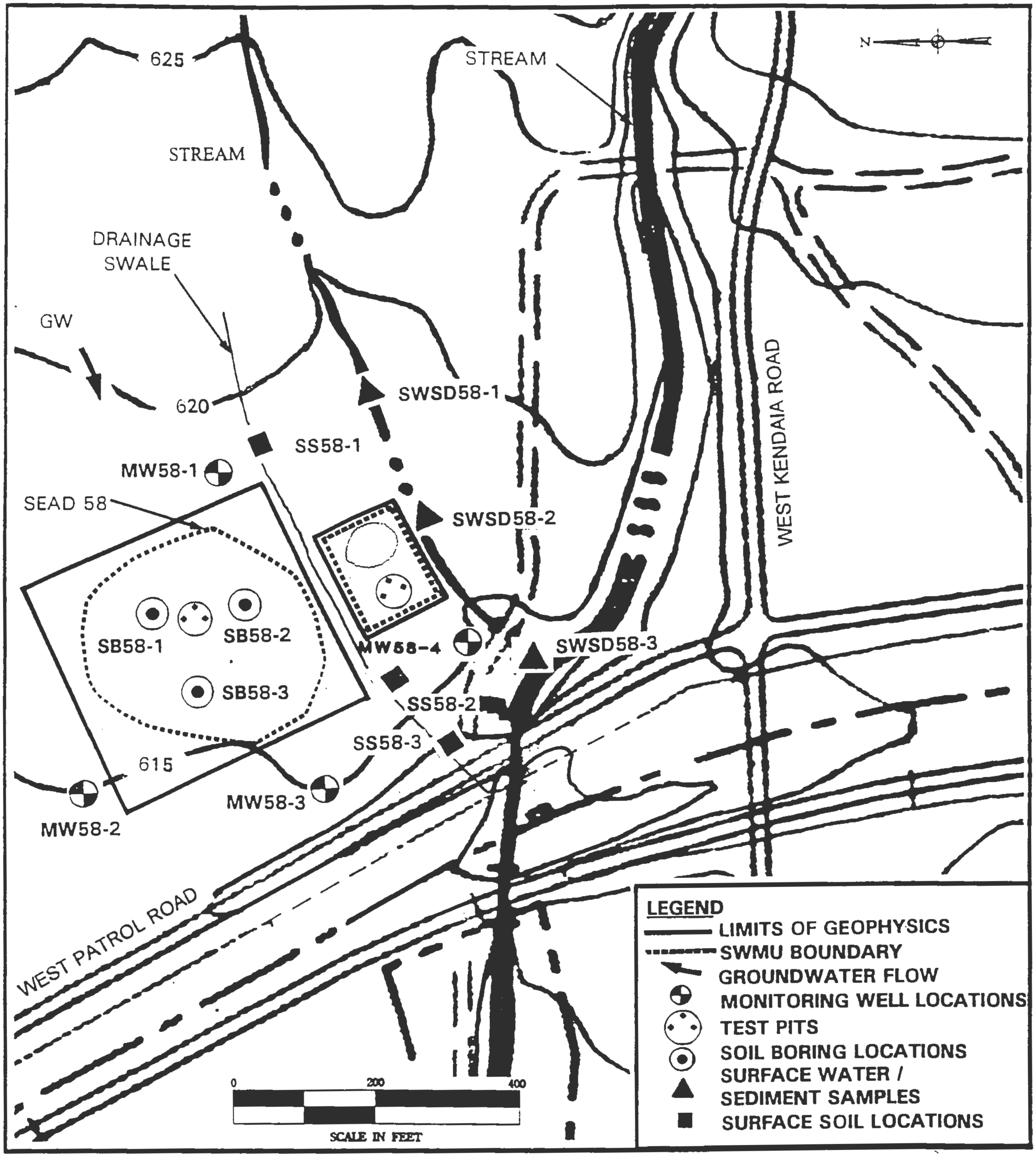


FIGURE BA-7 SITE PLAN FOR SEAD SWMU 58: DEBRIS AREA NEAR BOOSTER STATION 2131

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #58 Debris Area Near Booster Station 2131

3. Hazards
   - Inhalation : Semi-volatile compounds, DDT, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosives, DDT in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Debris piles, broken glass & rusted drums.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges. Poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout drilling. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should be monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	< 19.5	--	> 23.5
Explosimeter (% LEL)	< 10	< 10	< 10	10 - 25	> 25
HNU/OVA/OVM (PPM)	BKGD.	Bkgd - 5	5 - 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #58

3. Hazards
   - Inhalation : Semi-volatile compounds, DDT, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosives, DDT in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Debris piles, broken glass & rusted drums.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.
   - Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout removal of augers. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored before and during installation of casing, sand pack, and grout. Spoils should be monitored periodically.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	< 19.5	--	> 23.5
Explosimeter (% LEL)	< 10	< 10	< 10	10 - 25	> 25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	> 2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

   : Remove caked mud and dirt from augers as they are pulled.

   : Minimize dust during preparation of bentonite and cement slurries.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boot and gloves.
Step 3 Removal of boot covers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #58 Debris Area Near Booster Station 2131

3. Hazards
   - Inhalation : Semi-volatile compounds, DDT, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosives, DDT in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Debris piles, broken glass & rusted drums.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses or splash shield, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout well development. Periodically monitor well and headspace of development water receiving container.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of monitoring well as much as possible during well development.

   All wastewater and silty sediment from well development operations should be contained in a waste drum and disposed of properly.

   Wastewater drum should be placed in a stable flat position which can be accessed later for removal and disposal.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from teflon bailers and pumps before leaving each well locality.

Steam clean equipment before using in another well.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 4 Removal of coverall (if worn).
Step 5 Removal of respirator (if worn).
Step 6 Removal of inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #58 Debris Area Near Booster Station 2131

3. Hazards
   - Inhalation : Volatile organics, Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals in soil and water
   - Explosion :
   - Physical : Construction debris, barbed wire, railroad ties, slip, trip, fall hazards.

4. Personal Protective Equipment :
   - Level B : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

5. Monitoring : Ambient air should be monitored continuously throughout excavation. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should be monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	< 19.5	--	> 23.5
Explosimeter (% LEL)	< 10	< 10	< 10	10 - 25	> 25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	< 0.1	< 0.1	< 0.1	0.1 - 2	> 2
Benzene (Draeger Tube - PPM)	< 1	< 1	1-500	--	> 500

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipment before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another boreholes.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 5 Remove tyvek coveralls.
Step 7 Remove respirator (if worn).
Step 8 Remove inner gloves.
Step 9 Wash hands and face.

Change of APR canistrer can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #58 Debris Area Near Booster Station 2131

3. Hazards
   - Inhalation : Semi-volatile compounds, DDT, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosives, DDT in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Debris piles, broken galss & rusted drums.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.
   - Upgrade to level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling. Downwind monitoring should be conducted periodically or when elevated workzone readings are recorded.

   Split spoons should be monitored when opened. Sample material should be monitored immediately after collection of sample.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of sample location as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from sampling equipmemt before leaving work area. Equipment should be steamed cleaned before leaving site. Sampling equipment should be decontaminated according to the sampling plan requirements.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Wash overboots.
Step 3 Rinse, remove and discard overboots.
Step 4 Wash outer gloves.
Step 5 Rinse, remove and discard outergloves.
Step 6 Remove coveralls (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #58 Debris Area Near Booster Station 2131

3. Hazards
   - Inhalation : Semi-volatile compounds, DDT, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosives, DDT in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Debris piles, broken glass & rusted drums.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.
   - Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor/HEPA filter cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m³)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of as much as possible during sampling.

   : Always perform surface water sampling in groups minimum of 2 people.

7. Decontamination :

Equipment : Sampling equipment should be cleaned before leaving site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove coveralls (if worn).
Step 5 Remove respirator (if worn).
Step 6 Remove inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #58 Debris Area Near Booster Station 2131

3. Hazards
   - Inhalation : Semi-volatile compounds, DDT, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosives, DDT in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Debris piles, broken glass & rusted drums.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Check surface soils for possible contamination before sampling.

   : Do not kneel or sit on ground in areas of potential contamination.

7. Decontamination :

Equipment : Equipment should be cleaned for sampling.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of tyvek coveralls (if worn).
Step 6 Removal of inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #58 Debris Area Near Booster Station 2131

3. Hazards
   - Inhalation : Semi-volatile compounds, DDT, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosives, DDT in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Debris piles, broken glass & rusted drums.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout survey within the exclusion zone.

   Before each survey line is run, safety monitor and survey team should cl[illegible] proposed path and monitor ambient air along line. Adjust survey line or take appropiate precautions in areas where hazards are found.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Geophysical survey team should keep clear of other active work sites unless comparable protective equipment is available.

   Geophysical survey team should inform other work crews of their presence so that the work crews can give appropriate warnings.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from all field equipment that has come into contact with the soil , water , or potentially contaminated surfaces and should be decontaminated prior to leaving the site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of coveralls (if worn).
Step 6 Removal of respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

8-1 Physical Description & Activities Performed on SEAD SWMU #59

Fill Area West Of Building 135

The fill area is located west of Building 135 and also west of the sewage sludge piles (SEAD 5) as shown in Figure BA-8.

There are several piles along both sides of the dirt road that runs perpendicular to Administration Avenue. The piles are up to five feet deep. The area on the north side of the road is approxmately 300 feet by 150 feet in area. The smaller area on the south side of the road is approximately 100 feet by 100 feet. The piles are covered with vegetation. There are no wetlands in the area.

This area was potentially used for the disposal of construction debris and oily sludges. It is not known when the disposals actually took place.

8-2 Potential Chemical Contaminants

- PCB's
- VOC's
- SVOC's
- Explosive compounds
- Petroleum hydrocarbons

8-3 Physical Hazards

- Rough terrain
- Construction debris

8-4 Field Work

- Soil borings
- Install, develop and sample groundwater monitoring wells
- Surface soil sampling
- Geophysics (EM31 & GPR)

8-5 Monitoring to be Performed

A PID or OVM meter will be used to screen for volatile organic compounds. A miniram particulate meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

8-6 Task Specific Safe Operating Guideline

No. 1 Drilling and Test Borings - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Well Development - Level D
No. 12 Test Pits - Level B
No. 22 Surface Soil Sampling - Level D
No. 28 Geophysical Monitoring - Level D

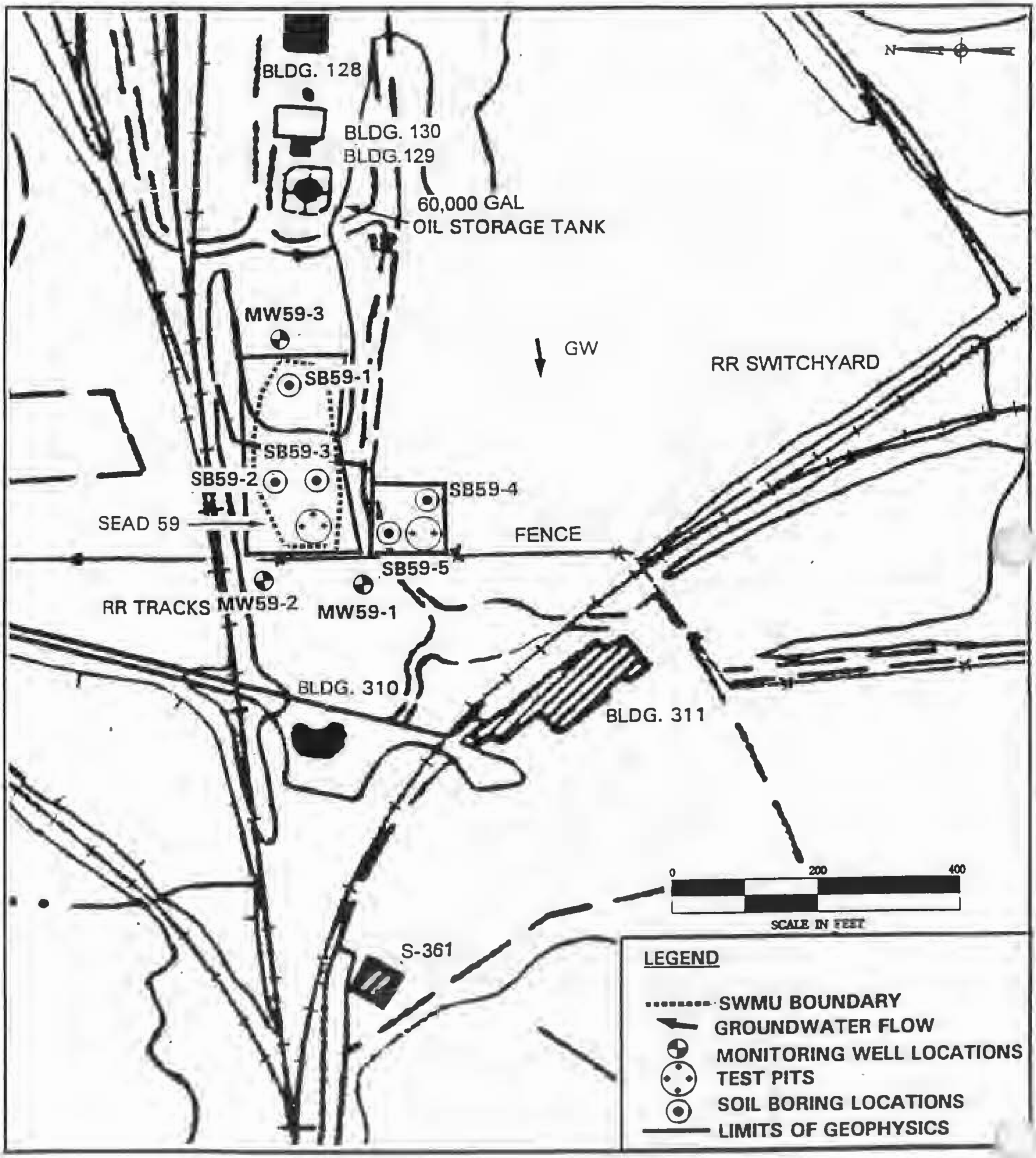


FIGURE BA-8 SITE PLAN FOR SEAD SWMU 59: FILL AREA WEST OF BUILDING 135

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #59 Fill Area West of Building 135

3. Hazards
   - Inhalation : Semi-volatile compounds, petroleum hydrocarbons, contaminated soils and dust
   - Contact : PCB's, explosive compounds in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges. Poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout drilling. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should be monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #59 Fill Area West of Building 135

3. Hazards
   - Inhalation : Semi-volatile compounds, petroleum hydrocarbons, contaminated soil and dust
   - Contact : PCB's, explosive compounds in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout removal of augers. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored before and during installation of casing, sand pack, and grout. Spoils should be monitored periodically.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

   : Remove caked mud and dirt from augers as they are pulled.

   : Minimize dust during preparation of bentonite and cement slurries.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boot and gloves.
Step 3 Removal of boot covers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #59 Fill Area West of Building 135

3. Hazards
   - Inhalation : Semi-volatile compounds, petroleum hydrocarbons, contaminated soil and dust
   - Contact : PCB's, explosive compounds in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses or splash shield, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout well development. Periodically monitor well and headspace of development water receiving container.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	< 19.5	--	> 23.5
Explosimeter (% LEL)	< 10	< 10	< 10	10 - 25	> 25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	< 0.1	< 0.1	< 0.1	0.1 - 2	> 2
Benzene (Draeger Tube - PPM)	< 1	< 1	1 - 500	--	> 500

6. Work Practices : Crews should stand upwind of monitoring well as much as possible during well development.

   : All wastewater and silty sediment from well development operations should be contained in a waste drum and disposed of properly.

   : Wastewater drum should be placed in a stable flat position which can be accessed later for removal and disposal.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from teflon bailers and pumps before leaving each well locality.

Steam clean equipment before using in another well.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 4 Removal of coverall (if worn).
Step 5 Removal of respirator (if worn).
Step 6 Removal of inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #59, Fill Area West of Building 135

3. Hazards
   - Inhalation : Semi-volatile compounds, petroleum hydrocarbons, contaminated soil and dust
   - Contact : PCB's, explosive compounds in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris, slip, trip, fall hazards.

4. Personal Protective Equipment :
   - Level B : Self-contained breathing apparatus (SCBA) or air-line respirater. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

5. Monitoring : Ambient air should be monitored continuously throughout excavation. Excavation materials should be monitored periodically and with any change of appearance.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Personnel shall enter the test pit for rescue only.

   : Crews should stand upwind of testpit as much as possible during operations.

   : Excavation should proceed slowly with constant visual monitoring to watch for possible buried drums or heavily stained soils. Excavation should be terminated with discovery of drums.

   : Back-up safety monitor should be posted away from and upwind of work area maintaining line of sight and prepared to perform rescue in Level B.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from bucket, backhoe, and other equipment before leaving excavation area. Equipment should be steamed cleaned before leaving site. If no samples are being taken , backhoe need not be steam cleaned between test pits.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove SCBA backpack.
Step 5 Remove coveralls.
Step 6 Remove respirator face-piece.
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #59 Fill Area West of Building 135

3. Hazards
   - Inhalation : Semi-volatile compounds, petroleum hydrocarbons, contaminated soil and dust
   - Contact : PCB's, explosive compounds in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Check surface soils for possible contamination before sampling.

   : Do not kneel or sit on ground in areas of potential contamination.

7. Decontamination :

Equipment : Equipment should be cleaned for sampling.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of tyvek coveralls (if worn).
Step 6 Removal of inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #59 Fill Area West of Building 135

3. Hazards
   - Inhalation : Semi-volatile compounds, petroleum hydrocarbons, contaminated soil and dust
   - Contact : PCB's explosive compounds in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout survey within the exclusion zone.

   Before each survey line is run, safety monitor and survey team should check proposed path and monitor ambient air along line. Adjust survey line or take appropiate precautions in areas where hazards are found.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Geophysical survey team should keep clear of other active work sites unless comparable protective equipment is available.

   : Geophysical survey team should inform other work crews of their presence so that the work crews can give appropriate warnings.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from all field equipment that has come into contact with the soil , water , or potentially contaminated surfaces and should be decontaminated prior to leaving the site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of coveralls (if worn).
Step 6 Removal of respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

9-1 Physical Description & Activities Performed on SEAD 60

Oil Discharge Adjacent to Building 609

Oil believed to have been discharged from a pipe in the wall of Building 609 resulted in a spill.

Building 609 is a boiler house for Building 612 where ammunition handling and disassembly take place. The spill was first noticed in 1989 but the existence of spill report is not know. The oil is believed to have been discharged from the boiler. It is not known what volume of oil has been spilled.

Both buildings 609 and 612 are currently used (Figure BA-9). The spill area, approximately 30' by 60' is located outside the southwest corner of the building. However the quantity of the oil spilled is unknown. The spill area crosses the railroad track, is oil stained and contains no vegetation. The boilers currently use #2 but it is not known if this type oil was used at the time of the spill.

9-2 Potential Chemical Contaminants

- Petroleum hydrocarbons
- PCB's

9-3 Physical Hazards

- Railroad tracks

9-4 Field Work

- Soil borings
- Install, develop and sample groundwater monitoring wells
- Surface water sampling
- Sediment sampling

9-5 Monitoring to be Performed

A PID or OVM meter will be used to screen for volatile organic compounds. A miniram particulates meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

Monitoring with indicator tubes and personal sampling for benzone will be conducted for all intrusive activities.

9-6 Task Specific Safe Operating Guidelines

No. 1 Drilling and Test Borings - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Well Development - Level D
No. 16 Sediment Sampling - Level D
No. 19 Surface Water Sampling - Level D

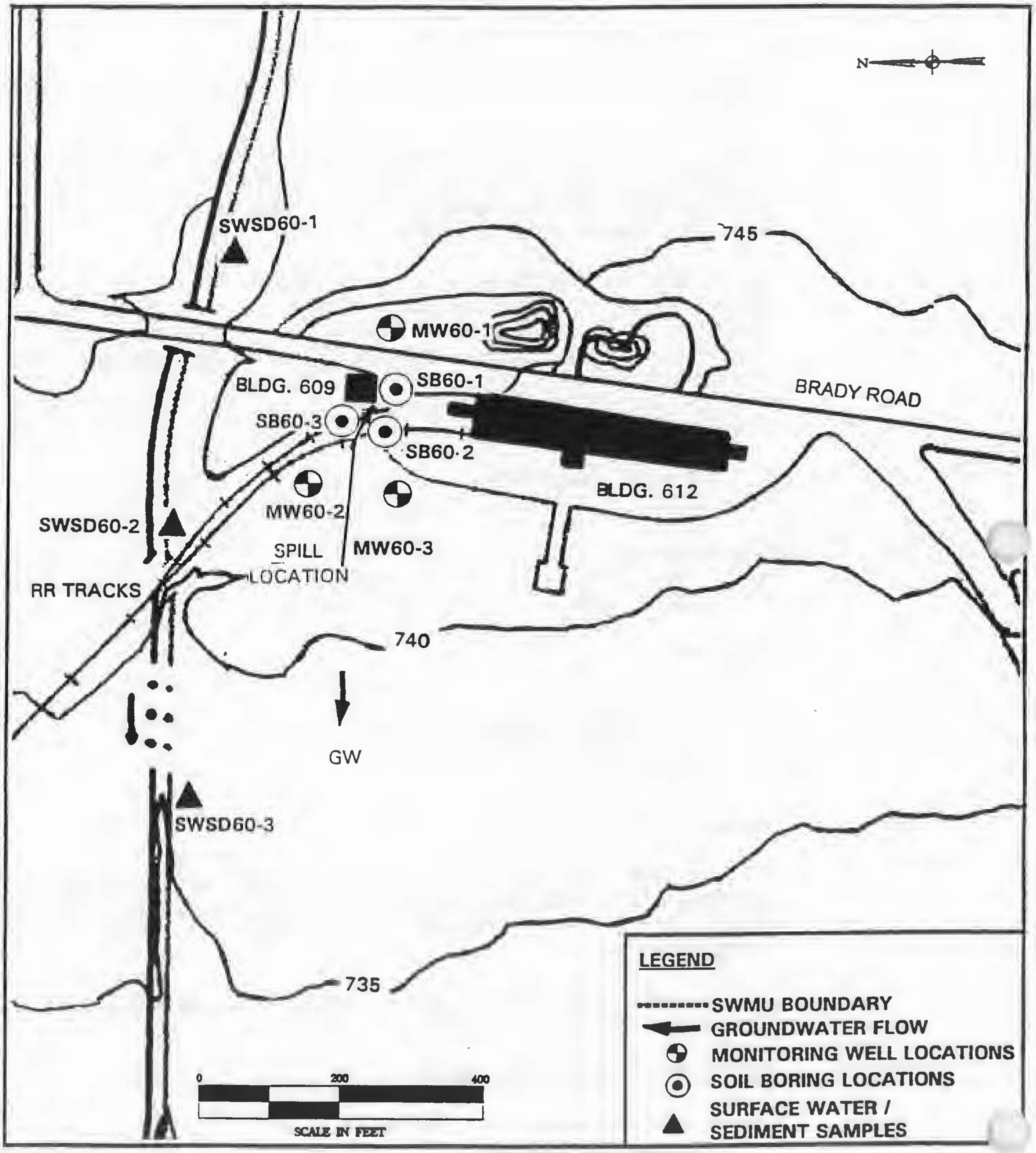


FIGURE BA-9 SITE PLAN FOR SEAD SWMU 60: OIL DISCHARGE ADJ. TO BLDG 609

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #60 Oil Discharge Adjacent To Building 609

3. Hazards
   - Inhalation : Petroleum hydrocarbons, contaminated soil and dust
   - Contact : PCB's, petroleum hydrocarbons in soil and water
   - Explosion : No known hazard exists
   - Physical : Railroad tracks.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges. Poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout drilling. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should be monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #60 Oil Discharge Adjacent To Building 609

3. Hazards
   - Inhalation : Petroleum hydrocarbons, contaminated soil and dust, bentonite & cement dust
   - Contact : PCB's, petroleum hydrocarbons in soil and water
   - Explosion : No known hazard exists
   - Physical : Railroad tracks.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout removal of augers. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored before and during installation of casing, sand pack, and grout. Spoils should be monitored periodically.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 25	19.5 to 25	< 19.5	--	> 25
Explosimeter (% LEL)	< 10	< 10	< 10	> 10	> 25
HNU/OVA/OVM (PPM)	BKGD	< 5	< 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	< 5	< 25	--	--
Radiation Meter (mR/hr)	< 0.1	< 0.1	< 0.1	0.1 to 5	> 5
Hydrogen Sulfide (PPM)	< 5	< 10	< 300	--	> 300
Hydrogen Cyanide (PPM)	< 2	< 10	< 50	--	> 50

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

   : Remove caked mud and dirt from augers as they are pulled.

   : Minimize dust during preparation of bentonite and cement slurries.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boot and gloves.
Step 3 Removal of boot covers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #60 Oil Discharge Adjacent To Building 609

3. Hazards
   - Inhalation : Petroleum hydrocarbons, contaminated soil and dust
   - Contact : PCB's, petroluem hydrocarbons in soil and water
   - Explosion : No known hazard exists
   - Physical : Railroad tracks.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses or splash shield, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout well development. Periodically monitor well and headspace of development water receiving container.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Crews should stand upwind of monitoring well as much as possible during well development.

   : All wastewater and silty sediment from well development operations should be contained in a waste drum and disposed of properly.

   : Wastewater drum should be placed in a stable flat position which can be accessed later for removal and disposal.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from teflon bailers and pumps before leaving each well locality.

Steam clean equipment before using in another well.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 4 Removal of coverall (if worn).
Step 5 Removal of respirator (if worn).
Step 6 Removal of inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #60 Oil Discharge Adjacent to Building 609

3. Hazards
   - Inhalation : Petroleum hydrocarbons, contaminated soil and dust
   - Contact : PCB's, petroleum hydrocarbons in soil and water
   - Explosion : No known hazard exists
   - Physical : Railroad tracks.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

   Upgrade to level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling. Downwind monitoring should be conducted periodically or when elevated workzone readings are recorded.

   Split spoons should be monitored when opened. Sample material should be monitored immediately after collection of sample.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Crews should stand upwind of sample location as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from sampling equipmemt before leaving work area. Equipment should be steamed cleaned before leaving site. Sampling equipment should be decontaminated according to the sampling plan requirements.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Wash overboots.
Step 3 Rinse, remove and discard overboots.
Step 4 Wash outer gloves.
Step 5 Rinse, remove and discard outergloves.
Step 6 Remove coveralls (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #60 Oil Discharge Adjacent to Building 609

3. Hazards
   - Inhalation : Petroleum hydrocarbons, contaminated soil and dust
   - Contact : PCB's, petroleum hydrocarbons in soil and water
   - Explosion : No known hazard exists
   - Physical : Railroad tracks.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor/HEPA filter cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Crews should stand upwind of as much as possible during sampling.

   : Always perform surface water sampling in groups minimum of 2 people.

7. Decontamination :

Equipment : Sampling equipment should be cleaned before leaving site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove coveralls (if worn).
Step 5 Remove respirator (if worn).
Step 6 Remove inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

10-1 Physical Description & Activities Performed on SEAD 62

Nicotine Sulfate Disposal Area

It is believed two drums containing nicotine sulfate were disposed of in the area between or surrounding Buildings 606 and 612, which are approximately one-half mile apart. There is no indication of where exactly or when the disposal may have occurred. Figure BA-10 shows the locations of Buildings 606 and 612 and the surrounding area.

It is also possible the drums were disposed of at the Building 606 Disposal Area (SEAD 69).

Building 606 is currently used as the pesticide/herbicides storage facility. Building 612 is an munitions disassembly facility. Both buildings have been used for these operations for quite some time.

10-2 Potential Chemical Contaminants

- Nicotine sulfate
- Herbicides
- Pesticides

10-3 Physical Hazards

- Sharp rusted metal debris

10-4 Field Work

- Test pits
- Geophysics (EM31 & GPR)

10-5 Monitoring to be Performed

A PID or OVM meter will be used to screen for volatile organic compounds. A miniram particulates meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

10-6 Task Specific Safe Operating Guidelines

No. 12 Test Pit Excavation - Level B
No. 28 Geophysical Monitoring - Level D

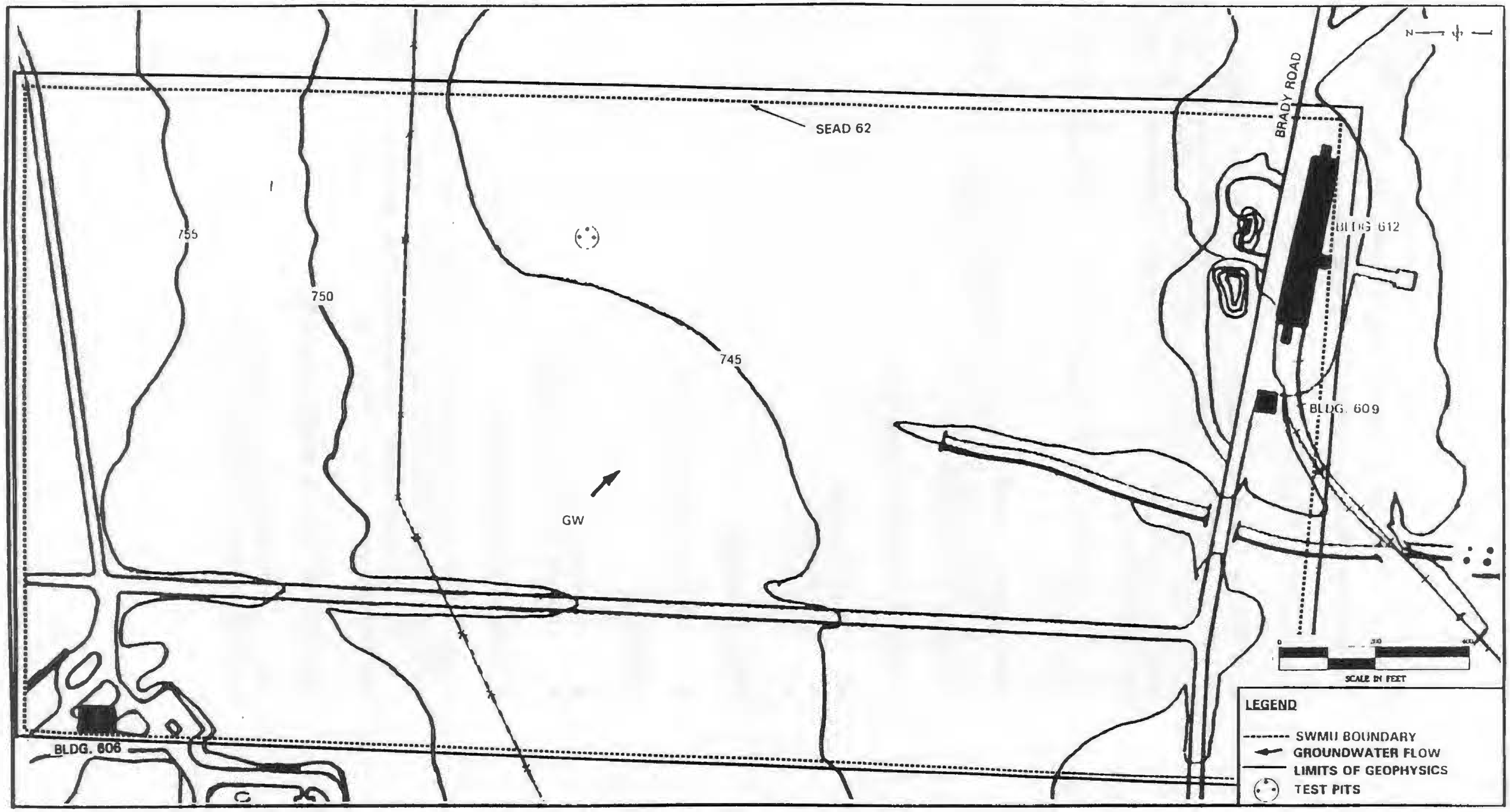


FIGURE BA-10 SITE PLAN FOR SEAD SWMU 62: NICOTINE SULFATE DISPOSAL AREA

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #62 Nicotine Sulfate Disposal Area

3. Hazards
   - Inhalation : Nicotine sulfate, pesticide, herbicides, contaminated soil and dust
   - Contact : Pesticide, herbicides, contaminated soil and water
   - Explosion : No known hazard exists
   - Physical : Exercise caution when work activity involves excavating possible drums or other potentially sharp metal debris.

4. Personal Protective Equipment :
   - Level B : Self-contained breathing apparatus (SCBA) or air-line respirater. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

5. Monitoring : Ambient air should be monitored continuously throughout excavation. Excavation materials should be monitored periodically and with any change of appearance.

Instrument Actions Levels	D	Exercise C	B	Caution	Evacuate
Oxygen (%)	19.5 to 25	19.5 to 25	< 19.5	--	> 25
Explosimeter (% LEL)	< 10	< 10	< 10	> 10	> 25
HNU/OVA/OVM (PPM)	BKGD	<5	< 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	<5	< 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 to 5	>5
Hydrogen Sulfide (PPM)	<5	< 10	< 300	--	> 300
Hydrogen Cyanide (PPM)	< 2	< 10	< 50	--	> 50

6. Work Practices : Personnel shall enter the test pit for rescue only.

   : Crews should stand upwind of testpit as much as possible during operations.

   : Excavation should proceed slowly with constant visual monitoring to watch for possible buried drums or heavily stained soils. Excavation should be terminated with discovery of drums.

   : Back-up safety monitor should be posted away from and upwind of work area maintaining line of sight and prepared to perform rescue in Level B.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from bucket, backhoe, and other equipment before leaving excavation area. Equipment should be steamed cleaned before leaving site. If no samples are being taken , backhoe need not be steam cleaned between test pits.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove SCBA backpack.
Step 5 Remove coveralls.
Step 6 Remove respirator face-piece.
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #62 Nicotine Sulfate Disposal Area

3. Hazards
   - Inhalation : Nicotine sulfate, pesticide, herbicides, contaminated soil and dust
   - Contact : Pesticide, herbicides, contaminated soil and water
   - Explosion : No known hazard exists
   - Physical : Exercise caution when work activity involves excavating possible drums or other potentially sharp metal debris.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout survey within the exclusion zone.

   Before each survey line is run, safety monitor and survey team should check proposed path and monitor ambient air along line. Adjust survey line or take appropiate precautions in areas where hazards are found.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 25	19.5 to 25	<19.5	--	>25
Explosimeter (% LEL)	<10	<10	<10	>10	>25
HNU/OVA/OVM (PPM)	BKGD	<5	<500	--	>500
Aerosol Meter (mg/m^3)	<1	<5	<25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 to 5	>5
Hydrogen Sulfide (PPM)	<5	<10	<300	--	>300
Hydrogen Cyanide (PPM)	<2	<10	<50	--	>50

6. Work Practices : Geophysical survey team should keep clear of other active work sites unless comparable protective equipment is available.

   Geophysical survey team should inform other work crews of their presence so that the work crews can give appropriate warnings.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from all field equipment that has come into contact with the soil , water , or potentially contaminated surfaces and should be decontaminated prior to leaving the site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of coveralls (if worn).
Step 6 Removal of respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

11-1 Physical Description & Activities Performed on SEAD 63

Miscellaneous Components Burial Site

This site was used during the 1950's and 1960's to bury classified parts which cannot be identified. The burial site has not been excavated so the contents are unknown and UXOs are a possibility. The SWMU Classification Report states that "inert materials" were buried in the pit. The site is basically flat and moderately vegetated. A drainage ditch runs along the west side of the SWMU along North-South Baseline Road. There are no wetlands in the area. There is no visible debris on the surface. Some of the vegetation appears to be stressed (See Figure BA-11).

11-2 Potential Chemical Contaminants

No information currently available.

11-3 Physical Hazards

- Drainage ditch
- Unexploded ordinance

11-4 Field Work

UXO clearance shall be performed prior to beginning each task.

- Test Pits
- Soil Borings
- Install, develop and sample groundwater monitoring wells
- Surface water sampling
- Sediment sampling

11-5 Monitoring to be Performed

A PID or OVM meter will be used to screen for volatile organic compounds. A miniram particulate meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

11-6 Task Specific Safe Operating Guidelines

No. 1 Drilling and Test Borings - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Well Development - Level D
No. 12 Test Pit Excavation - Level B
No. 16 Sediment Sampling - Level D
No. 19 Surface Water Sampling - Level D
No. 28 Geophysical Monitoring - Level D

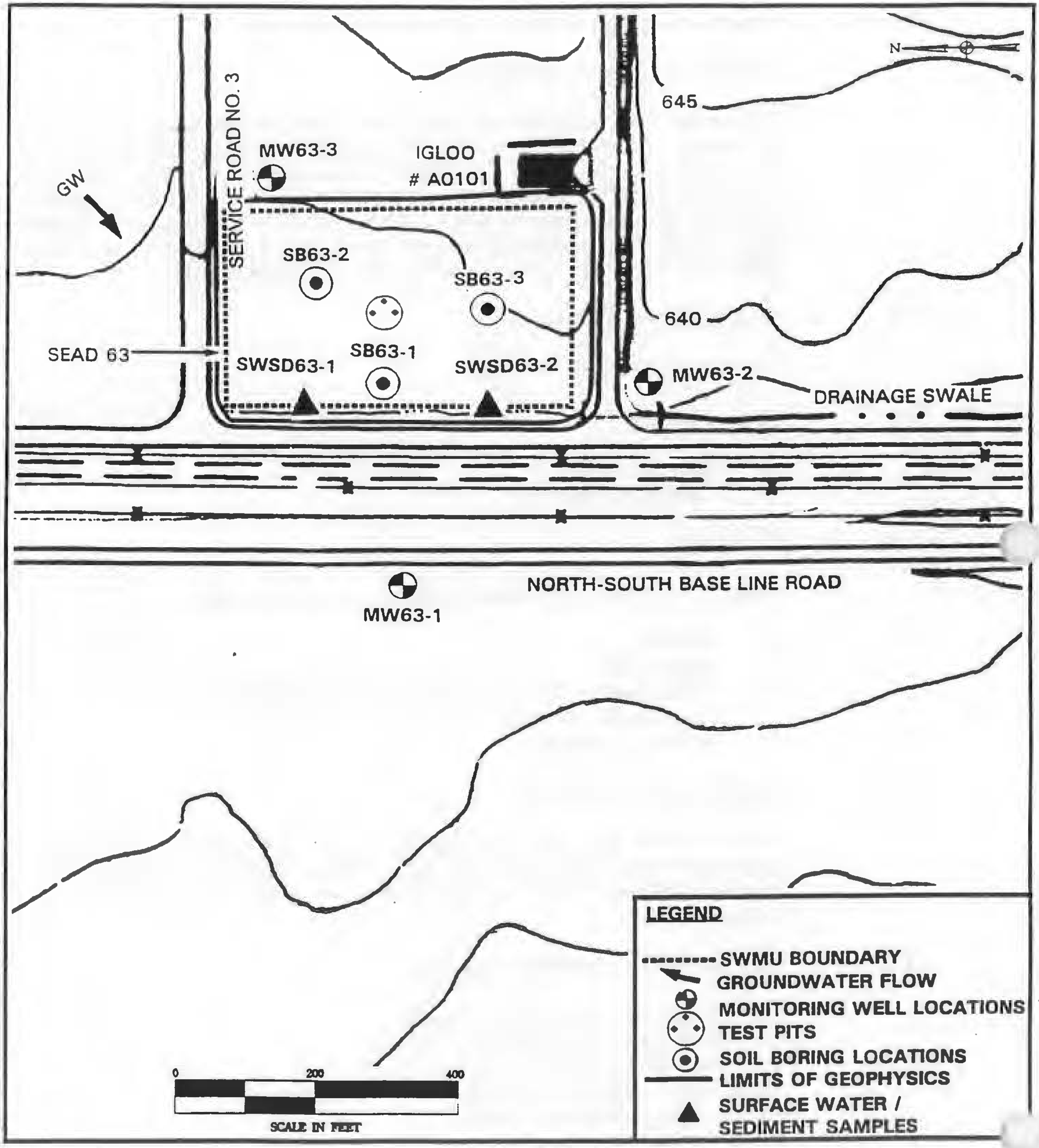


FIGURE BA-10 SITE PLAN FOR SEAD SWMU 63: MISCELLANEOUS COMPONENTS BURIAL SITE

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #63 Miscellanesou Compounds Burial Site

3. Hazards
   - Inhalation : Contaminated dusts
   - Contact : Contaminated soils and liquids
   - Explosion : Unexploded ordnance
   - Physical :

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges. Poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout drilling. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should be monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	< 19.5	--	> 23.5
Explosimeter (% LEL)	< 10	< 10	< 10	10 - 25	> 25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	> 2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #63 Miscellaneous Compounds Burial Site

3. Hazards
   - Inhalation : Contaminated dusts
   - Contact : Contaminated soils and liquids
   - Explosion : Unexploded ordnance
   - Physical :

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout removal of augers. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored before and during installation of casing, sand pack, and grout. Spoils should be monitored periodically.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

   : Remove caked mud and dirt from augers as they are pulled.

   : Minimize dust during preparation of bentonite and cement slurries.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boot and gloves.
Step 3 Removal of boot covers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #63 Miscellaneous Compounds Burial Site

3. Hazards
   - Inhalation : Contaminated dusts
   - Contact : Contaminated soils and liquids
   - Explosion : Unexploded ordnance
   - Physical :

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses or splash shield, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout well development. Periodically monitor well and headspace of development water receiving container.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	< 19.5	--	> 23.5
Explosimeter (% LEL)	< 10	< 10	< 10	10 - 25	> 25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	< 0.1	< 0.1	< 0.1	0.1 - 2	> 2

6. Work Practices : Crews should stand upwind of monitoring well as much as possible during well development.

   : All wastewater and silty sediment from well development operations should be contained in a waste drum and disposed of properly.

   : Wastewater drum should be placed in a stable flat position which can be accessed later for removal and disposal.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from teflon bailers and pumps before leaving each well locality.

Steam clean equipment before using in another well.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 4 Removal of coverall (if worn).
Step 5 Removal of respirator (if worn).
Step 6 Removal of inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #63, ~~Rumored Paint and Solvent~~ Burial Ground

3. Hazards
   - Inhalation : Volatile organics, Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals in soil and water
   - Explosion :
   - Physical : Construction debris, barbed wire, railroad ties, slip, trip, fall hazards.

4. Personal Protective Equipment :
   - Level B : Self-contained breathing apparatus (SCBA) or air-line respirater. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

5. Monitoring : Ambient air should be monitored continuously throughout excavation. Excavation materials should be monitored periodically and with any change of appearance.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1-500	--	>500

6. Work Practices : Personnel shall enter the test pit for rescue only.

   : Crews should stand upwind of testpit as much as possible during operations.

   : Excavation should proceed slowly with constant visual monitoring to watch for possible buried drums or heavily stained soils. Excavation should be terminated with discovery of drums.

   : Back-up safety monitor should be posted away from and upwind of work area maintaining line of sight and prepared to perform rescue in Level B.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from bucket, backhoe, and other equipment before leaving excavation area. Equipment should be steamed cleaned before leaving site. If no samples are being taken , backhoe need not be steam cleaned between test pits.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove SCBA backpack.
Step 5 Remove coveralls.
Step 6 Remove respirator face-piece.
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #63 Miscellaneous Compounds Burial Site

3. Hazards
   - Inhalation : Contaminated dusts
   - Contact : Contaminated soils and liquids
   - Explosion : Unexploded ordnance
   - Physical :

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

   Upgrade to level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling. Downwind monitoring should be conducted periodically or when elevated workzone readings are recorded.

   Split spoons should be monitored when opened. Sample material should be monitored immediately after collection of sample.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of sample location as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from sampling equipmemt before leaving work area. Equipment should be steamed cleaned before leaving site. Sampling equipment should be decontaminated according to the sampling plan requirements.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Wash overboots.
Step 3 Rinse, remove and discard overboots.
Step 4 Wash outer gloves.
Step 5 Rinse, remove and discard outergloves.
Step 6 Remove coveralls (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #63 Miscellaneous Compounds Burial Site

3. Hazards
   - Inhalation : Contaminated dusts
   - Contact : Contaminated soils and liquids
   - Explosion : Unexploded ordnance
   - Physical :

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.
   - Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor/HEPA filter cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	< 19.5	--	> 23.5
Explosimeter (% LEL)	< 10	< 10	< 10	10 - 25	> 25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	< 0.1	< 0.1	< 0.1	0.1 - 2	> 2

6. Work Practices : Crews should stand upwind of as much as possible during sampling.

   : Always perform surface water sampling in groups minimum of 2 people.

7. Decontamination :

Equipment : Sampling equipment should be cleaned before leaving site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove coveralls (if worn).
Step 5 Remove respirator (if worn).
Step 6 Remove inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #63, Miscellaneous Components Burial Site

3. Hazards
   - Inhalation : Volatile organics, Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals in soil and water
   - Explosion :
   - Physical : Construction debris, barbed wire, railroad ties, slip, trip, fall hazards.

4. Personal Protective Equipment :
   - Level B : Self-contained breathing apparatus (SCBA) or air-line respirater. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

5. Monitoring : Ambient air should be monitored continuously throughout excavation. Excavation materials should be monitored periodically and with any change of appearance.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1-500	--	>500

6. Work Practices : Personnel shall enter the test pit for rescue only.

   : Crews should stand upwind of testpit as much as possible during operations.

   : Excavation should proceed slowly with constant visual monitoring to watch for possible buried drums or heavily stained soils. Excavation should be terminated with discovery of drums.

   : Back-up safety monitor should be posted away from and upwind of work area maintaining line of sight and prepared to perform rescue in Level B.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from bucket, backhoe, and other equipment before leaving excavation area. Equipment should be steamed cleaned before leaving site. If no samples are being taken , backhoe need not be steam cleaned between test pits.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove SCBA backpack.
Step 5 Remove coveralls.
Step 6 Remove respirator face-piece.
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #63 Miscellaneous Compounds Burial Site

3. Hazards
   - Inhalation : Contaminated dusts
   - Contact : Contaminated soils and liquids
   - Explosion : Unexploded ordnance
   - Physical :

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout survey within the exclusion zone.

   Before each survey line is run, safety monitor and survey team should check proposed path and monitor ambient air along line. Adjust survey line or take appropiate precautions in areas where hazards are found.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Geophysical survey team should keep clear of other active work sites unless comparable protective equipment is available.

   : Geophysical survey team should inform other work crews of their presence so that the work crews can give appropriate warnings.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from all field equipment that has come into contact with the soil , water , or potentially contaminated surfaces and should be decontaminated prior to leaving the site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of coveralls (if worn).
Step 6 Removal of respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

12-1 Physical Description & Activities Performed on SEAD 64A, 64B, 64C, 64D

Garbage Disposal Areas

There are four garbage disposal areas associated with this SWMU, three of which were active in the past, and one of which was the site of a proposed landfill. None of these four units are contiguous. Figures BA-12A, BA-12B, BA-12C and BA-12D show the locations of SEAD 64A, B, C, and D respectively with respect to other features nearby.

SEAD 64A, 64B and 64D were all used during the time period when the solid waste incinerator was not operating from 1974 to 1979. The types of wastes are suspected to be primarily household items, although metal drums and other industrial wastes were reported for locations A, B and D. SEAD 64C is the location of a proposed landfill and was never actually used for landfilling.

SEAD 64A is located south of the storage pad at 7th Street. The area is approximately 350 feet by 200 feet. The area appears to have been disturbed, however no debris or garbage was visible on the surface. The site is relatively flat and covered with dense vegetation. A "no dumping" sign has been placed in the area. There are no existing wells located in this area.

SEAD 64B is located south of the classified yards and north of Ovid Road. Piles of fill material were located in the area and a dirt road leads into the disposal grounds. The entire location is an elevated area between Ovid Road and the railroad tracks that is densely vegetated and approximately 200 ft. by 400 ft. A drainage ditch runs alongside of the railroad tracks that are located along the north side of this disposal area. There are no existing wells located in this area.

SEAD 64C is located in the southeast corner of the base near the area where East Patrol Road becomes South Patrol Road. The area is densely vegetated and no debris was located during the visual site inspection. This area was never actually used for landfilling only proposed to be used as a landfill. There is a 20 foot by 15 foot concrete pad located in this area. It is not known what this concrete pad was used for. There are four wells located at SEAD 64C, one upgradient and three downgradient of the proposed landfill site.

SEAD 64D is a large garbage disposal area that runs along the east side of West Patrol Road for about one-half mile. From the road no debris was visible on the surface. Firebreaks are mowed into the area running east to west and north to south. Stressed vegetation was visible along West Patrol road. The remaining area was densely vegetated with brush and tall grass. There are several wells in the vicinity that were installed as part of the Ash Landfill CERCLA Investigation.

12-2 **Potential Chemical Contaminants**

- PCB's
- VOC's
- SVOC's
- Explosive compounds
- Heavy metals

12-3 **Physical Hazards**

- Railroad tracks
- Dense vegetation
- Drainage ditch

12-4 **Field Work**

- Test Pits
- Soil Borings
- Install, develop and sample groundwater monitoring wells
- Surface water sampling
- Sediment sampling
- Geophysics (EM31 & GPR)

12-5 **Monitoring to be Performed**

A PID or OVM meter will be used to screen for volatile organic compounds. A miniram particulates meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

12-6 **Task Specific Safe Operating Guidelines**

No. 1 Drilling and Soil Boring - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Well Development - Level D
No. 10 Test Pit Excavation 64C - Level D
No. 12 Test Pit Excavations 64A, 64B, 64D - Level B
No. 16 Sediment Sampling - Level D
No. 19 Surface Water Sampling - Level D
No. 28 Geophysical Monitoring - Level D

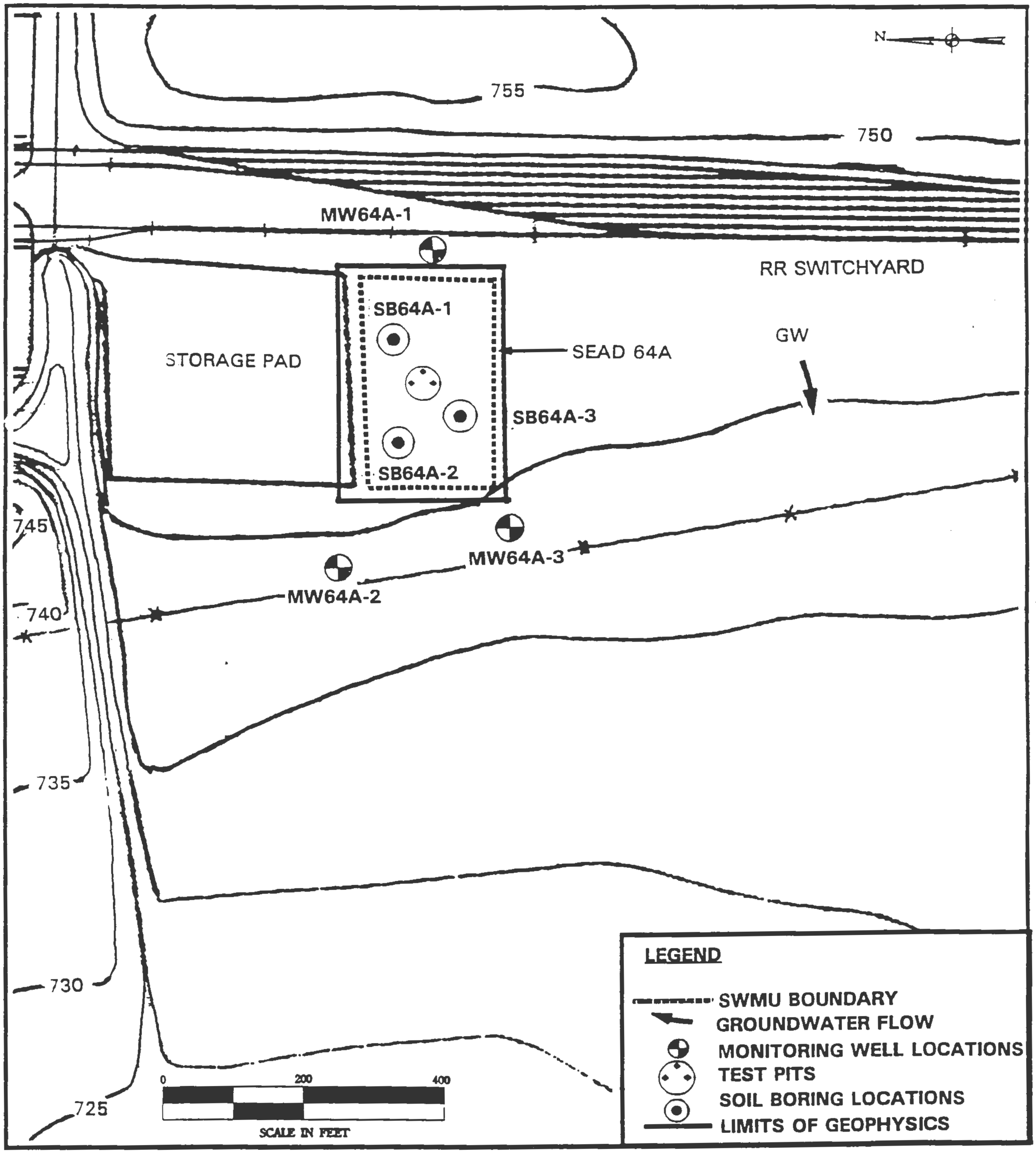


FIGURE BA-12A SITE PLAN FOR SEAD SWMU 64A: GARBAGE DISPOSAL AREA

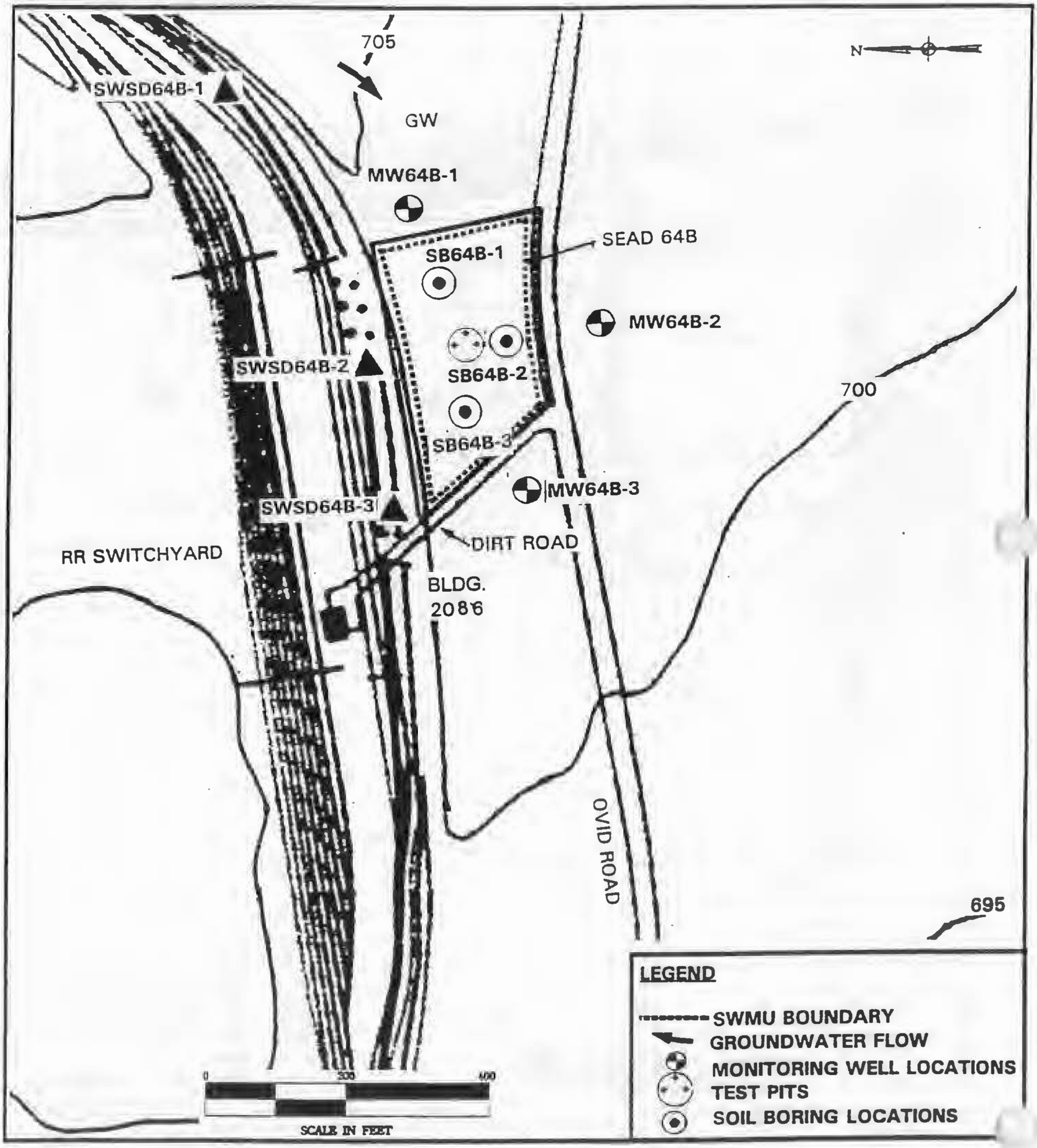


FIGURE BA-12B SITE PLAN FOR SEAD SWMU 64B: GARBAGE DISPOSAL AREA

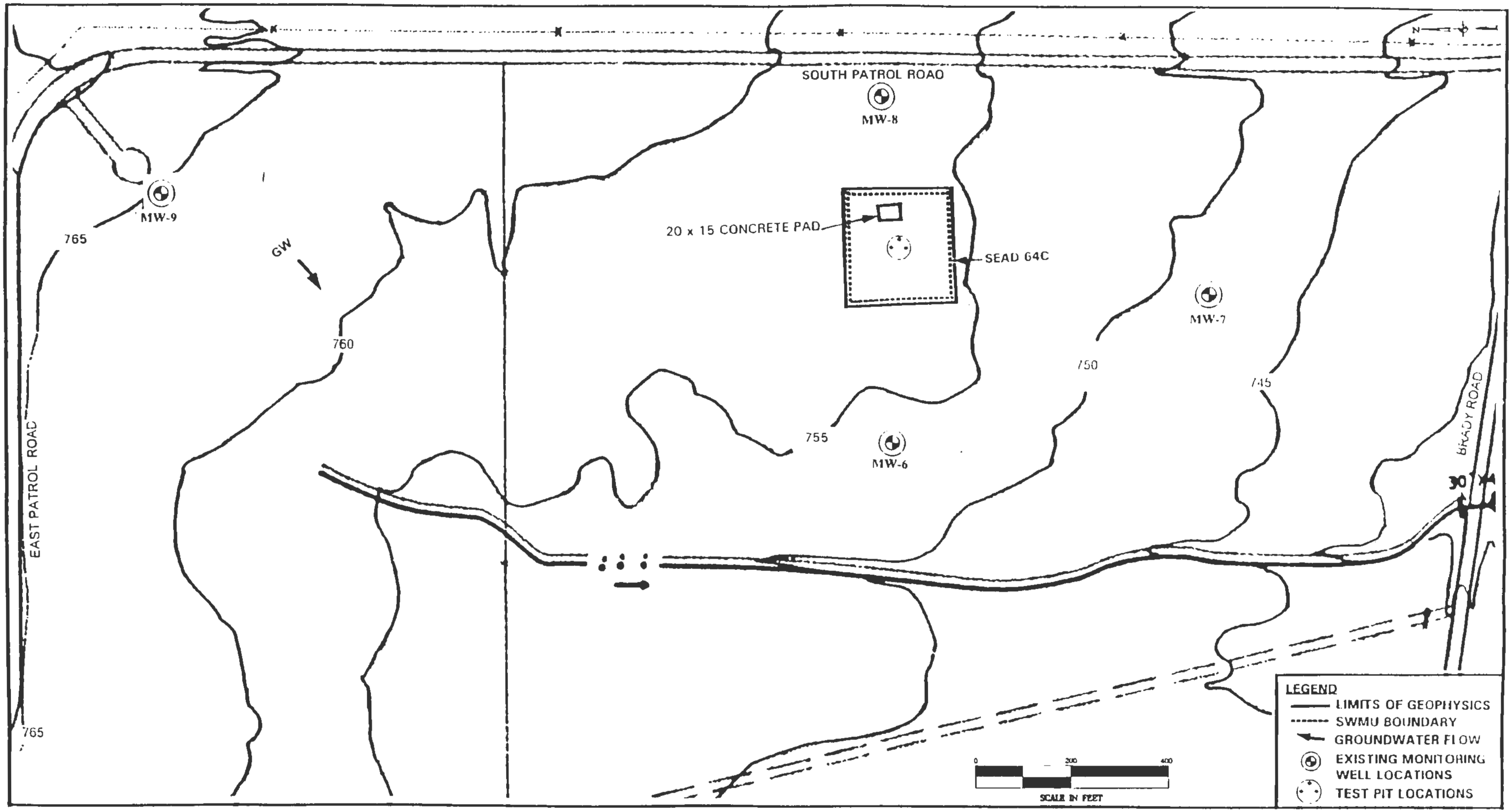


FIGURE BA-12C SITE PLAN FOR SEAD SWMU 64C: GARBAGE DISPOSAL AREA

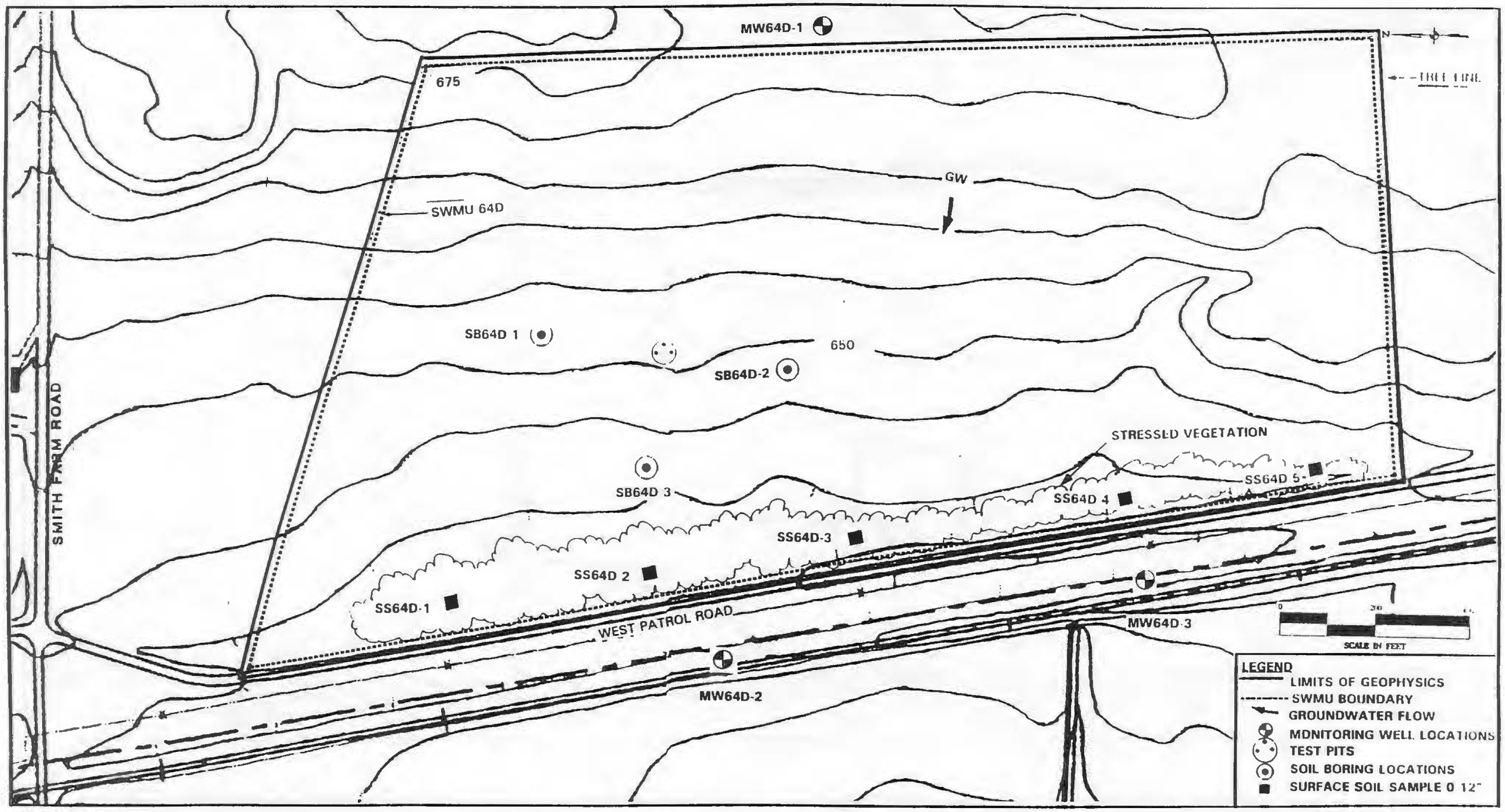


FIGURE BA-12D SITE PLAN FOR SEAD SWMU 64D: GARBAGE DISPOSAL AREA

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #64A, 64B, 64C, 64D Garbage Disposal Areas

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, PCB's explosive organics in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Exercise caution when work activity is close to railroad tracks, dense vegetation, or drain ditches.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges. Poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout drilling. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should be monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	< 19.5	--	> 23.5
Explosimeter (% LEL)	< 10	< 10	< 10	10 - 25	> 25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	> 2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1.	Site	:	Seneca Army Depot, Romulus, New York
2.	Location	:	SEAD SWMU #64A, 64B, 64C, 64D Garbage Disposal Areas
3.	Hazards		
	Inhalation	:	Semi-volatile compounds, contaminated soil and dust
	Contact	:	Heavy metals, PCB's, explosive organics in soil and water
	Explosion	:	Explosive compounds in soil
	Physical	:	Exercise caution when work activity is close to railroad tracks, dense vegetation, or drain ditches.
4.	Personal Protective Equipment	:	
	Level D	:	Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.
	Upgrade to Level C	:	Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.
5.	Monitoring	:	Ambient air should be monitored continuously throughout removal of augers. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded. Borehole should be monitored before and during installation of casing, sand pack, and grout. Spoils should be monitored periodically.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	< 19.5	--	> 23.5
Explosimeter (% LEL)	< 10	< 10	< 10	10 - 25	> 25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	< 0.1	< 0.1	< 0.1	0.1 - 2	> 2

6.	Work Practices	:	Crews should stand upwind of borehole as much as possible during operations.
		:	Remove caked mud and dirt from augers as they are pulled.
		:	Minimize dust during preparation of bentonite and cement slurries.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boot and gloves.
Step 3 Removal of boot covers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #64A, 64B, 64C, 64D Garbage Disposal Areas

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosive organics in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Exercise caution when work activity is close to railroad tracks, dense vegetation, or drain ditches.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses or splash shield, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout well development. Periodically monitor well and headspace of development water receiving container.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of monitoring well as much as possible during well development.

   : All wastewater and silty sediment from well development operations should be contained in a waste drum and disposed of properly.

   : Wastewater drum should be placed in a stable flat position which can be accessed later for removal and disposal.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from teflon bailers and pumps before leaving each well locality.

Steam clean equipment before using in another well.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 4 Removal of coverall (if worn).
Step 5 Removal of respirator (if worn).
Step 6 Removal of inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #64A, 64B, 64C, 64D, Garbage Disposal Areas

3. Hazards
   - Inhalation : Volatile organics, Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals in soil and water
   - Explosion :
   - Physical : Construction debris, barbed wire, railroad ties, slip, trip, fall hazards.

4. Personal Protective Equipment :
   - Level B : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

5. Monitoring : Ambient air should be monitored continuously throughout excavation. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should be monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m³)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1-500	--	>500

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipment before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another boreholes.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 5 Remove tyvek coveralls.
Step 7 Remove respirator (if worn).
Step 8 Remove inner gloves.
Step 9 Wash hands and face.

Change of APR canistrer can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site Name	:	Seneca Army Depot, Romulus, NY
2. Location	:	SEAD SWMU #64A, 64B, 64C, 64D Rumored Paint and Solvent Burial Ground
3. Hazards		
Inhalation	:	Volatile organics, Semi-volatile compounds, contaminated soil and dust
Contact	:	Heavy metals in soil and water
Explosion	:	
Physical	:	Construction debris, barbed wire, railroad ties, slip, trip, fall hazards.
4. Personal Protective Equipment	:	
Level B	:	Self-contained breathing apparatus (SCBA) or air-line respirater. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.
5. Monitoring	:	Ambient air should be monitored continuously throughout excavation. Excavation materials should be monitored periodically and with any change of appearance.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	< 19.5	--	> 23.5
Explosimeter (% LEL)	< 10	< 10	< 10	10 - 25	> 25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	< 1	< 1	1-500	--	> 500

6. Work Practices

: Personnel shall enter the test pit for rescue only.

: Crews should stand upwind of testpit as much as possible during operations.

: Excavation should proceed slowly with constant visual monitoring to watch for possible buried drums or heavily stained soils. Excavation should be terminated with discovery of drums.

: Back-up safety monitor should be posted away from and upwind of work area maintaining line of sight and prepared to perform rescue in Level B.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from bucket, backhoe, and other equipment before leaving excavation area. Equipment should be steamed cleaned before leaving site. If no samples are being taken , backhoe need not be steam cleaned between test pits.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove SCBA backpack.
Step 5 Remove coveralls.
Step 6 Remove respirator face-piece.
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMu #64A, 64B, 64C, 64D Garbage Disposal Area

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosive organics in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Exercise caution when work activity is close to railroad tracks, dense vegetation, or drain ditches.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

   Upgrade to
   level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling. Downwind monitoring should be conducted periodically or when elevated workzone readings are recorded.

   Split spoons should be monitored when opened. Sample material should be monitored immediately after collection of sample.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	< 19.5	--	> 23.5
Explosimeter (% LEL)	< 10	< 10	< 10	10 - 25	> 25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	< 0.1	< 0.1	< 0.1	0.1 - 2	> 2

6. Work Practices : Crews should stand upwind of sample location as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from sampling equipmemt before leaving work area. Equipment should be steamed cleaned before leaving site. Sampling equipment should be decontaminated according to the sampling plan requirements.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Wash overboots.
Step 3 Rinse, remove and discard overboots.
Step 4 Wash outer gloves.
Step 5 Rinse, remove and discard outergloves.
Step 6 Remove coveralls (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #64A, 64B, 64C, 64D Garbage Disposal Areas

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosive organics in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Exercise caution when work activity is close to railroad tracks, dense vegetation, or drain ditches

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.
   - Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor/HEPA filter cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of as much as possible during sampling.

   : Always perform surface water sampling in groups minimum of 2 people.

7. Decontamination :

Equipment : Sampling equipment should be cleaned before leaving site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove coveralls (if worn).
Step 5 Remove respirator (if worn).
Step 6 Remove inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #64A, 64B, 64C, 64D Garbage Disposal Areas

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosive organics in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Exercise caution when work activity is close to railroad tracks, dense vegetation, or drain ditches.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout survey within the exclusion zone.

   Before each survey line is run, safety monitor and survey team should check proposed path and monitor ambient air along line. Adjust survey line or take appropiate precautions in areas where hazards are found.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Geophysical survey team should keep clear of other active work sites unless comparable protective equipment is available.

   Geophysical survey team should inform other work crews of their presence so that the work crews can give appropriate warnings.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from all field equipment that has come into contact with the soil , water , or potentially contaminated surfaces and should be decontaminated prior to leaving the site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of coveralls (if worn).
Step 6 Removal of respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

13-1 Physical Description & Activities Performed on SEAD SWMU 67

Dump Site East of Sewage Treatment Plant No. 4

SEAD 67 is located off of West Romulus Road east of Sewage Treatment Plant No. 4. Figure BA-13 shows the location of the dump site with respect to nearby features.

It is not known what wastes were disposed of in this area and when these disposals took place.

The first pile is about 10 feet south of West Romulus Road, east of the Sewage Treatment Plant. This pile is approximately 10 feet in diameter and brush covered. About 100 feet further into the woods there are several more brush covered piles. These piles are approximately five feet high. No refuse or debris are located in the area. No stressed vegetation, wetlands or stained soil were observed.

13-2 Potential Chemical Contaminants

- PCB's
- VOC's
- SVOC's
- Explosive compounds
- Heavy metals

13-3 Physical Hazards

- Miscellaneous debris piles

13-4 Field Work

- Soil sampling
- Install, develop and sample groundwater monitoring wells
- Surface water sampling
- Sediment sampling
- Geophysics (EM31 & GPR)
- Test Pits

13-5 Monitoring to be Performed

A PID or OVM meter will be used to screen for volatile organic compounds. A miniram particulate meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

13-6 **Task Specific Safe Operating Guideline**

No. 1 Geophysical Monitoring - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Well Development - Level D
No. 12 Test Pits - Level B
No. 16 Sediment Sampling - Level D
No. 19 Surface Water Sampling - Level D
No. 22 Surface Soil Sampling - Level D

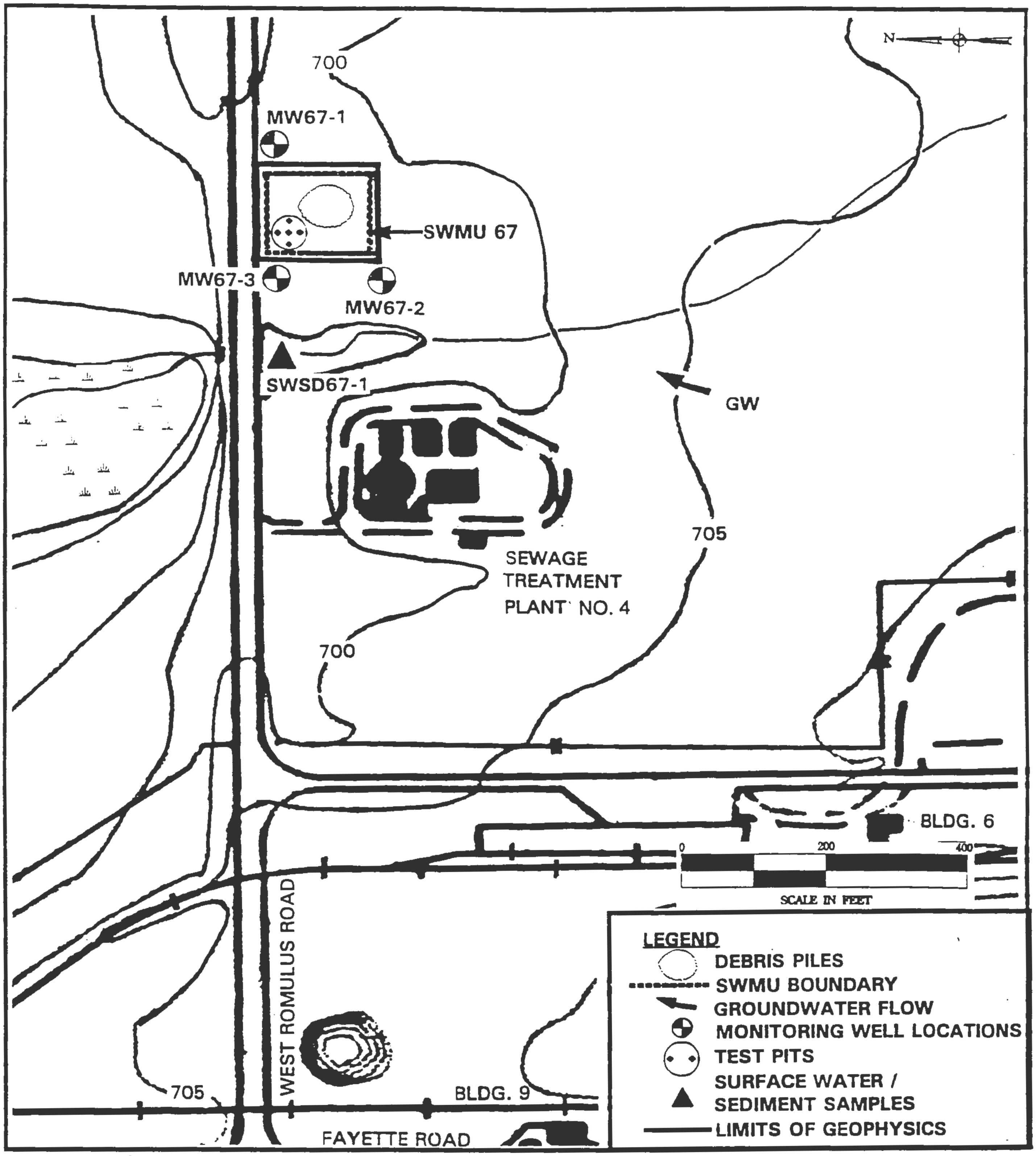


FIGURE BA-13 SITE PLAN FOR SEAD SWMU 67: DUMP SITE EAST OF SEWAGE TREATMENT PLANT NO. 4

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #67 Dump Site East of Sewage Treatment Plant No. 4

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, explosive organics, PCB's in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Large debris piles.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges. Poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout drilling. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should be monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #67 Dump Site East of Sewage Treatment Plant No. 4

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, explosive organics, PCB's in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Large debris piles.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.
   - Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout removal of augers. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored before and during installation of casing, sand pack, and grout. Spoils should be monitored periodically.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

   : Remove caked mud and dirt from augers as they are pulled.

   : Minimize dust during preparation of bentonite and cement slurries.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boot and gloves.
Step 3 Removal of boot covers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #67 Dump Site East of Sewage Treatment Plant No. 4

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, explosive organics, PCB's in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Large debris piles.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses or splash shield, safety shoes or boots.
   - Upgrade to Level C : Full-face piece air-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout well development. Periodically monitor well and headspace of development water receiving container.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of monitoring well as much as possible during well development.

   : All wastewater and silty sediment from well development operations should be contained in a waste drum and disposed of properly.

   : Wastewater drum should be placed in a stable flat position which can be accessed later for removal and disposal.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from teflon bailers and pumps before leaving each well locality.

Steam clean equipment before using in another well.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 4 Removal of coverall (if worn).
Step 5 Removal of respirator (if worn).
Step 6 Removal of inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #67, Dump Site East of STP No. 4

3. Hazards
   - Inhalation : Volatile organics, Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals in soil and water
   - Explosion :
   - Physical : Construction debris, barbed wire, railroad ties, slip, trip, fall hazards.

4. Personal Protective Equipment :
   - Level B : Self-contained breathing apparatus (SCBA) or air-line respirater. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

5. Monitoring : Ambient air should be monitored continuously throughout excavation. Excavation materials should be monitored periodically and with any change of appearance.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1-500	--	>500

6. Work Practices : Personnel shall enter the test pit for rescue only.

   : Crews should stand upwind of testpit as much as possible during operations.

   : Excavation should proceed slowly with constant visual monitoring to watch for possible buried drums or heavily stained soils. Excavation should be terminated with discovery of drums.

   : Back-up safety monitor should be posted away from and upwind of work area maintaining line of sight and prepared to perform rescue in Level B.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from bucket, backhoe, and other equipment before leaving excavation area. Equipment should be steamed cleaned before leaving site. If no samples are being taken , backhoe need not be steam cleaned between test pits.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove SCBA backpack.
Step 5 Remove coveralls.
Step 6 Remove respirator face-piece.
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #67 Dump Site East of Sewage Treatment Plant No. 4

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, explosive organics, PCB's in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Large debris piles.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.
   - Upgrade to level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling. Downwind monitoring should be conducted periodically or when elevated workzone readings are recorded.

   Split spoons should be monitored when opened. Sample material should be monitored immediately after collection of sample.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	< 19.5	--	> 23.5
Explosimeter (% LEL)	< 10	< 10	< 10	10 - 25	> 25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	> 500
Aerosol Meter (mg/m^3)	< 1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	> 2

6. Work Practices : Crews should stand upwind of sample location as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from sampling equipmemt before leaving work area. Equipment should be steamed cleaned before leaving site. Sampling equipment should be decontaminated according to the sampling plan requirements.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Wash overboots.
Step 3 Rinse, remove and discard overboots.
Step 4 Wash outer gloves.
Step 5 Rinse, remove and discard outergloves.
Step 6 Remove coveralls (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #67 Dump Site East of Sewage Treatment Plant No. 4

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, explosive organics, PCB's in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Large debris piles.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor/HEPA filter cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of as much as possible during sampling.

   : Always perform surface water sampling in groups minimum of 2 people.

7. Decontamination :

Equipment : Sampling equipment should be cleaned before leaving site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove coveralls (if worn).
Step 5 Remove respirator (if worn).
Step 6 Remove inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMu #67 Dump Site East of Sewage Treatment Plant No. 4

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, explosive organics, PCB's in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Large debris piles.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Check surface soils for possible contamination before sampling.

   : Do not kneel or sit on ground in areas of potential contamination.

7. Decontamination :

Equipment : Equipment should be cleaned for sampling.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of tyvek coveralls (if worn).
Step 6 Removal of inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #67 Dump Site East of Sewage Treatment Plant No. 4

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, explosive organics, PCB's in soil and dust
   - Explosion : Explosive compounds in soil
   - Physical : Large debris piles.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout survey within the exclusion zone.

   Before each survey line is run, safety monitor and survey team should ch[illegible] proposed path and monitor ambient air along line. Adjust survey line or take appropiate precautions in areas where hazards are found.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Geophysical survey team should keep clear of other active work sites unless comparable protective equipment is available.

   : Geophysical survey team should inform other work crews of their presence so that the work crews can give appropriate warnings.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from all field equipment that has come into contact with the soil , water , or potentially contaminated surfaces and should be decontaminated prior to leaving the site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of coveralls (if worn).
Step 6 Removal of respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

14-1 Physical Description & Activities Performed on SEAD SWMU 70

Fill Area Adjacent to Building T-2110

Building T-2110 is located along Igloo Road No. 5 west of North-South Baseline Road. Directly east of Building T-2110 is a fill area approximately 200 feet by 200 feet. Figure BA-14 shows the location of SEAD-71.

Building T-2110, may have at one time been used to house horses. The fill area east of T-2110 has previously been used to dispose of construction debris. It is not known what else may have been buried there. Prior to two years ago, soldiers at SEAD used this location as a staging area. The eastern section of this fill area contains railroad ties, rolls of barbed wire, wooden pallets, and other miscellaneous items. The area is sparsely vegetated with low lying grass and moss. The eastern sections of this site drop off several feet to a wooded area characterized by wetlands. Building T-2110 is old and dilapidated with piles of hay and sawdust located inside. The walls are broken and the contents are visible from the outside.

14-2 Potential Chemical Contaminants

Heavy metals
PCB's
VOC's
SVOC's
Explosive compounds

14-3 Physical Hazards

- Barbed wire
- Railroad ties
- Construction debris

14-4 Field Work

- Test pits
- Soil borings
- Install, develop and sample groundwater monitoring wells
- Surface water sampling
- Sediment sampling
- Geophysics (EM31 & GPR)

14-5 Monitoring to be Performed

A PID or OVM meter will be used to screen for volatile organic compounds. A miniram particulate meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

14-6 Task Specific Safe Operating Guidelines

No. 1 Drilling and Soil Borings - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Well Development - Level D
No. 12 Test Pit Excavation - Level B
No. 16 Sediment Sampling - Level D
No. 19 Surface Water Sampling - Level D
No. 28 Geophysical Monitoring - Level D

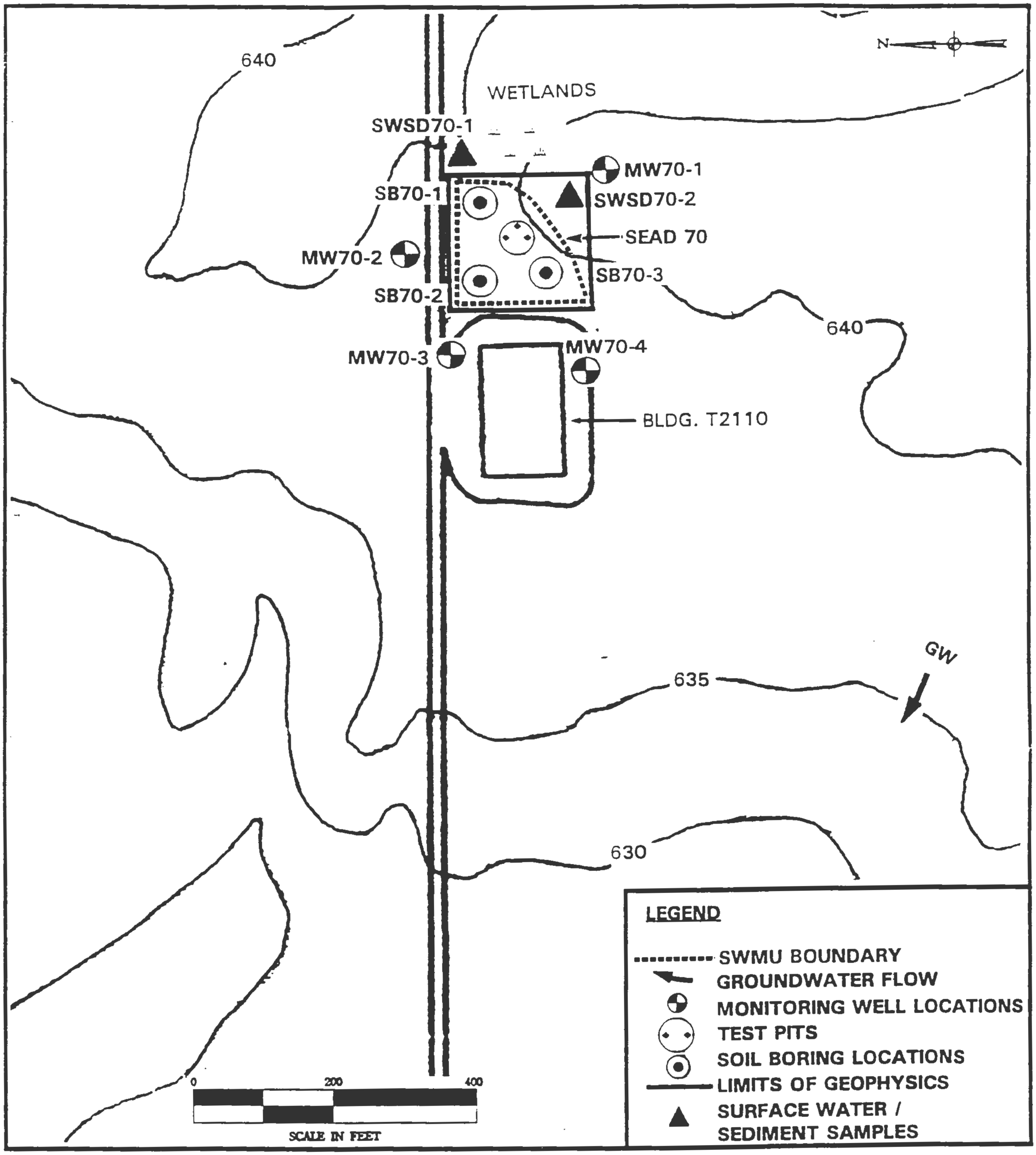


FIGURE BA-14 SITE PLAN FOR SEAD SWMU 70: FILL AREA ADJACENT TO BUILDING T-2110

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #70 Fill Area Adjacent to Building T-2110

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosive organics in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris, barbed wire, railroad ties.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges. Poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout drilling. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should be monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD -	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m³)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #70 Fill Area Adjacent to Building T-2110

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosive organics in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris, barbed wire, railroad ties.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout removal of augers. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored before and during installation of casing, sand pack, and grout. Spoils should be monitored periodically.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

   : Remove caked mud and dirt from augers as they are pulled.

   : Minimize dust during preparation of bentonite and cement slurries.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boot and gloves.
Step 3 Removal of boot covers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1.	Site	:	Seneca Army Depot, Romulus, New York
2.	Location	:	SEAD SWMU #70 Fill Area Adjacent to Building T-2110
3.	Hazards		
	Inhalation	:	Semi-volatile compounds, contaminated soil and dust
	Contact	:	Heavy metals, PCB's, explosive organics in soil and water
	Explosion	:	Explosive compounds in soil
	Physical	:	Construction debris, barbed wire, railroad ties.
4.	Personal Protective Equipment	:	
	Level D	:	Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses or splash shield, safety shoes or boots.
	Upgrade to Level C	:	Full-face piece air-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.
5.	Monitoring	:	Ambient air should be monitored continuously throughout well development. Periodically monitor well and headspace of development water receiving container.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6.	Work Practices	:	Crews should stand upwind of monitoring well as much as possible during well development.
		:	All wastewater and silty sediment from well development operations should be contained in a waste drum and disposed of properly.
		:	Wastewater drum should be placed in a stable flat position which can be accessed later for removal and disposal.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from teflon bailers and pumps before leaving each well locality.

Steam clean equipment before using in another well.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 4 Removal of coverall (if worn).
Step 5 Removal of respirator (if worn).
Step 6 Removal of inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #70, Fill Area Adjacent to Building T-2110

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosive compounds in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris, barbed wire, railroad ties, slip, trip, fall hazards.

4. Personal Protective Equipment :
   - Level B : Self-contained breathing apparatus (SCBA) or air-line respirater. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

5. Monitoring : Ambient air should be monitored continuously throughout excavation. Excavation materials should be monitored periodically and with any change of appearance.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Personnel shall enter the test pit for rescue only.

   : Crews should stand upwind of testpit as much as possible during operations.

   : Excavation should proceed slowlywith constant visual monitoring to watch for possible buried drums or heavily stained soils. Excavation should be terminated with discovery of drums.

   : Back-up safety monitor should be posted away from and upwind of work area maintaining line of sight and prepared to perform rescue in Level B.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from bucket, backhoe, and other equipment before leaving excavation area. Equipment should be steamed cleaned before leaving site. If no samples are being taken , backhoe need not be steam cleaned between test pits.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove SCBA backpack.
Step 5 Remove coveralls.
Step 6 Remove respirator face-piece.
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #70 Fill Area Adjacent to Building T-2110

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosive organics in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris, barbed wire, railroad ties.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor/HEPA filter cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m³)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of as much as possible during sampling.

   : Always perform surface water sampling in groups minimum of 2 people.

7. Decontamination :

Equipment : Sampling equipment should be cleaned before leaving site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove coveralls (if worn).
Step 5 Remove respirator (if worn).
Step 6 Remove inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #70 Fill Area Adjacent to Building T-2110

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosive organics in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris, barbed wire, railroad ties.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

   Upgrade to level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling. Downwind monitoring should be conducted periodically or when elevated workzone readings are recorded.

   Split spoons should be monitored when opened. Sample material should be monitored immediately after collection of sample.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Crews should stand upwind of sample location as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from sampling equipmemt before leaving work area. Equipment should be steamed cleaned before leaving site. Sampling equipment should be decontaminated according to the sampling plan requirements.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Wash overboots.
Step 3 Rinse, remove and discard overboots.
Step 4 Wash outer gloves.
Step 5 Rinse, remove and discard outergloves.
Step 6 Remove coveralls (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #70

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals, PCB's, explosive organics in soil and water
   - Explosion : Explosive compounds in soil
   - Physical : Construction debris, barbed wire, and railroad ties.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout survey within the exclusion zone.

   Before each survey line is run, safety monitor and survey team should che proposed path and monitor ambient air along line. Adjust survey line or take appropiate precautions in areas where hazards are found.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 to 23.5	19.5 to 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2

6. Work Practices : Geophysical survey team should keep clear of other active work sites unless comparable protective equipment is available.

   : Geophysical survey team should inform other work crews of their presence so that the work crews can give appropriate warnings.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from all field equipment that has come into contact with the soil , water , or potentially contaminated surfaces and should be decontaminated prior to leaving the site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of coveralls (if worn).
Step 6 Removal of respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

15-1 Physical Description & Activities Performed on SEAD SWMU 71

Rumored Paint and Solvent Burial Pit

SEAD 71 is located west of Building 127 between a chain link fence and dirt road that run near the railroad tracks. The suspected location for the rumored paint and solvent burial pit is shown on Figure BA-15.

The size of this area is relatively small and it is not known what other activities may have occurred there. It is not even verifiable that paints and solvents were buried here.

The suspected location is approximately 450 square feet. The area is grassy and shows no signs of having been disturbed. A fence borders the east side of the suspected location. Along the fence are scrap fence material, concrete parking stops and a utilitiy pole. Railroad tracks run east to west alongside this location.

15-2 Potential Chemical Contaminants

- VOC's
- SVOC's
- Heavy metals

15-3 Physical Hazards

- Railroad tracks
- Scrap fence material
- Concrete parking stops

15-4 Field Work

- Test Pits
- Install, develop and sample groundwater monitoring wells
- Geophysics (GPR)

15-5 Monitoring to be Performed

A PID or OVM meter will be used to screen for volatile organic compounds. A miniram particulates meter will be used to monitor dust generation during all intrusive activities. Radiation meters will be used to screen samples for radioactivity above background levels.

Personal sampling for benzene will be performed for all intrusive activities.

15-6 Task Specific Safe Operating Guidelines

No. 1 Drilling and Soil Borings - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Well Development - Level D
No. 12 Test Pit Excavation - Level B
No. 28 Geophysical Monitoring - Level D

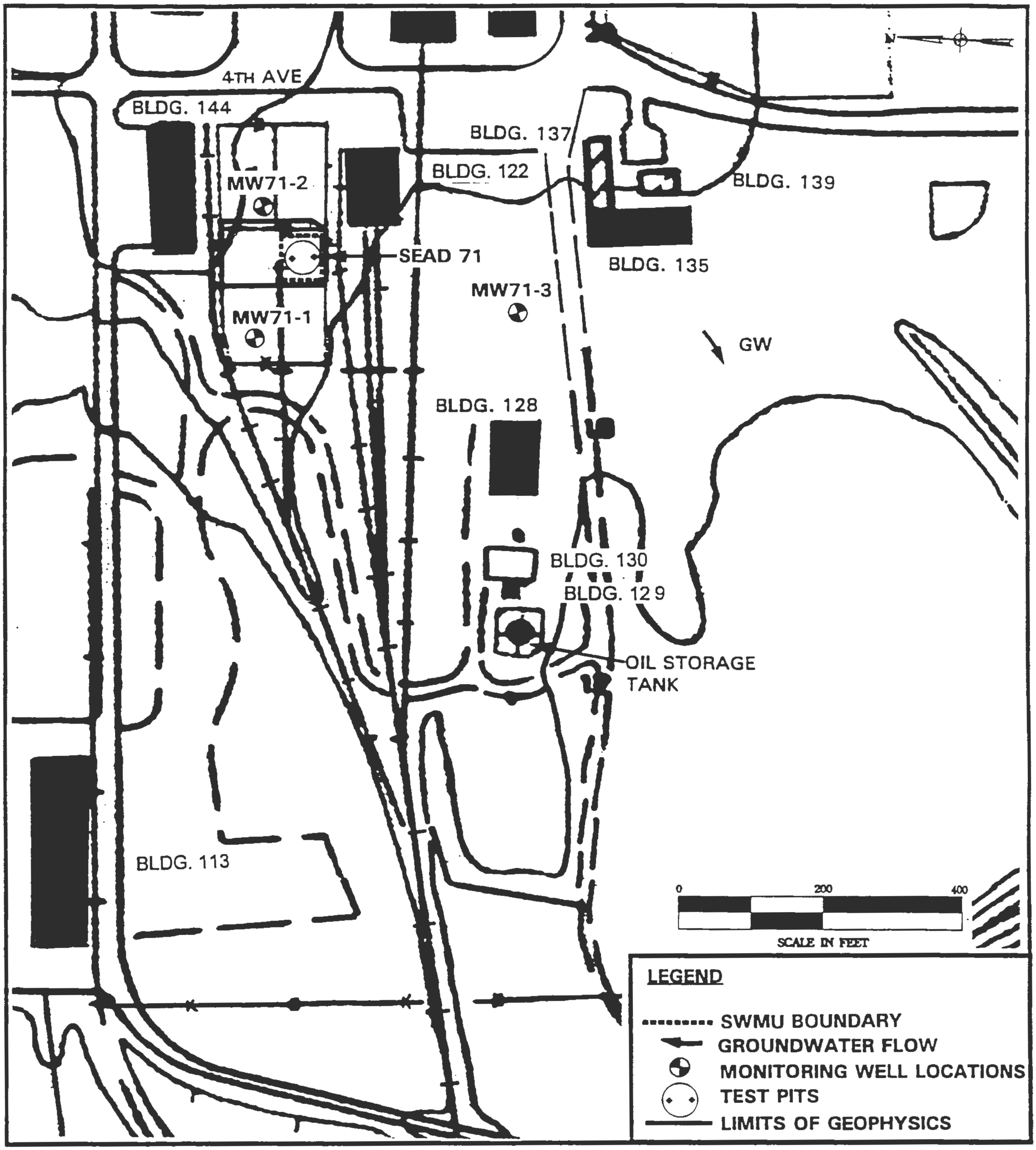


FIGURE BA-15 SITE PLAN FOR SEAD SWMU 71: RUMORED PAINT AND SOLVENT BURIAL PIT

1. Site Name : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #71 Rumored Paint and Solvent Burial Pit

3. Hazards
   - Inhalation : Volatile organics, semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals in soil and water
   - Explosion : No known hazard exists
   - Physical : Railroad tracks, scrap fence material, concrete parking stops

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges. Poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout drilling. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored at change of auger flights. Spoils should be monitored periodically. Split spoons should be monitored when opened.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m³)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #71 Rumored Paint and Solvent Burial Pit

3. Hazards
   - Inhalation : Volatile organics, semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals in soil and water
   - Explosion : No known hazard exists
   - Physical : Railroad tracks, scrap fence material, concrete parking stops.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety glasses, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout removal of augers. Downwind monitoring should be conducted periodically or when elevated borehole or workzone readings are recorded.

   Borehole should be monitored before and during installation of casing, sand pack, and grout. Spoils should be monitored periodically.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Crews should stand upwind of borehole as much as possible during operations.

   : Remove caked mud and dirt from augers as they are pulled.

   : Minimize dust during preparation of bentonite and cement slurries.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from augers, drill, rig and other equipmemt before leaving drilling area. Equipment should be steamed cleaned before leaving site. Augers should be steam cleaned prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boot and gloves.
Step 3 Removal of boot covers.
Step 4 Removal of outer gloves.
Step 5 Remove tyvek coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #71 Rumored Paint and Solvent Burial Pit

3. Hazards
   - Inhalation : Volatile organics semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals in soil and water
   - Explosion : No known hazard exists
   - Physical : Railroad tracks, scrap fence material, concrete parking stops.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses or splash shield, safety shoes or boots.

   Upgrade to Level C : Full-face piece air-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout well development. Periodically monitor well and headspace of development water receiving container.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m³)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	≥2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Crews should stand upwind of monitoring well as much as possible during well development.

   : All wastewater and silty sediment from well development operations should be contained in a waste drum and disposed of properly.

   : Wastewater drum should be placed in a stable flat position which can be accessed later for removal and disposal.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from teflon bailers and pumps before leaving each well locality.

Steam clean equipment before using in another well.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 4 Removal of coverall (if worn).
Step 5 Removal of respirator (if worn).
Step 6 Removal of inner gloves.
Step 7 Wash hands and face.

Change of APR canister can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #71, Rumored Paint and Solvent Burial Ground

3. Hazards
   - Inhalation : Volatile organics, Semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals in soil and water
   - Explosion :
   - Physical : Construction debris, barbed wire, railroad ties, slip, trip, fall hazards.

4. Personal Protective Equipment :
   - Level B : Self-contained breathing apparatus (SCBA) or air-line respirater. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

5. Monitoring : Ambient air should be monitored continuously throughout excavation. Excavation materials should be monitored periodically and with any change of appearance.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1-500	--	>500

6. Work Practices : Personnel shall enter the test pit for rescue only.

   : Crews should stand upwind of testpit as much as possible during operations.

   : Excavation should proceed slowly with constant visual monitoring to watch for possible buried drums or heavily stained soils. Excavation should be terminated with discovery of drums.

   : Back-up safety monitor should be posted away from and upwind of work area maintaining line of sight and prepared to perform rescue in Level B.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from bucket, backhoe, and other equipment before leaving excavation area. Equipment should be steamed cleaned before leaving site. If no samples are being taken , backhoe need not be steam cleaned between test pits.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove SCBA backpack.
Step 5 Remove coveralls.
Step 6 Remove respirator face-piece.
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

1. Site : Seneca Army Depot, Romulus, New York

2. Location : SEAD SWMU #71 Rumored Paint and Solvent Burial Pit

3. Hazards
   - Inhalation : Volatile organics, semi-volatile compounds, contaminated soil and dust
   - Contact : Heavy metals in soil and water
   - Explosion : No known hazard exists
   - Physical : Railroad tracks, scrap fence material, concrete parking stops.

4. Personal Protective Equipment :
   - Level D : Neoprene boot covers, nitrile outer gloves and latex inner gloves, safety glasses, safety shoes or boots.

   Upgrade to
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout survey within the exclusion zone.

   Before each survey line is run, safety monitor and survey team should ch[illegible] proposed path and monitor ambient air along line. Adjust survey line or take appropiate precautions in areas where hazards are found.

Instrument Actions Levels	D	C	B	Exercise Caution	Evacuate
Oxygen (%)	19.5 - 23.5	19.5 - 23.5	<19.5	--	>23.5
Explosimeter (% LEL)	<10	<10	<10	10 - 25	>25
HNU/OVA/OVM (PPM)	BKGD	Bkgd - 5	5 - 500	--	>500
Aerosol Meter (mg/m^3)	<1	1 - 5	5 - 25	--	--
Radiation Meter (mR/hr)	<0.1	<0.1	<0.1	0.1 - 2	>2
Benzene (Draeger Tube - PPM)	<1	<1	1 - 500	--	>500

6. Work Practices : Geophysical survey team should keep clear of other active work sites unless comparable protective equipment is available.

   : Geophysical survey team should inform other work crews of their presence so that the work crews can give appropriate warnings.

7. Decontamination :

Equipment : Gross contamination (caked mud, dirt and debris) should be removed from all field equipment that has come into contact with the soil , water , or potentially contaminated surfaces and should be decontaminated prior to leaving the site.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Tape removal from boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of coveralls (if worn).
Step 6 Removal of respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

ATTACHMENT B

CHEMICAL HAZARD EVALUATION SHEETS

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Arsenic **CAS NUMBER:** 7440-38-2
SYNONYMS:
REFERENCES CONSULTED: Merck Index, NIOSH pocket Guide

CHEMICAL PROPERTIES:

CHEMICAL FORMULA	: As	**VAPOR PRESSURE**	: 1 mmHg @ 372°C
MOLECULAR WEIGHT	: 74.92	**VAPOR DENSITY**	:
PHYSICAL STATE	: Brittel metal	**SPECIFIC GRAVITY**	: 5.73
SOLUBILITY IN H_2O	: Insoluble	**FLASH POINT**	:
BOILING POINT	: sublimes	**FLAMMABLE LIMITS**	:
MELTING POINT	: 1135°F	**INCOMPATIBILITIES**	: hot acids, strong oxidizers, bromine azide

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL	: 0.01 mg/m3	**TOXICITY CLASS**	: iritant, systemic
OSHA STEL	:		
NIOSH REL	: 0.002 mg/m3 C. 15 min		
NIOSH STEL	:	**CARCINOGENIC CLASS**	: Confirmed inhalation carcinogen.
ACGIH TLV	: 0.2 mg/m3		
ACGIH STEL	:	**ROUTES OF EXPOSURE:**	inhalation, ingestion, direct contact, skin absorption.
IDLH	: 100mg/m3		
ODOR THRESH.	:		
ODOR	: garlic-like		

HANDLING RECOMMENDATIONS AND PERSONAL PROTECTIVE MEASURES
Air purifying respirators with particulate cartridges at 0.01 mg/m3. SCBA at 0.5 mg/m3. Gloves, eye protection.

EMERGENCY MEASURES AND FIRST AID
Wash skin with soap and water; irrigate eyes immediately. immediate medical attention if swallowed.

SYMPTOMS OF EXPOSURE
Acute: Stomach irritation, nausea, vomiting, diarrhea, can progress to shock and death.
Chronic: Exfoliation and pigmentation of skin, herpes, polyneuritis, altered hematopoiesis, degeneration of liver and kidneys, lung cancer.

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Barium **CAS NUMBER:** 7440-39-3
SYNONYMS:
REFERENCES CONSULTED: NIOSH Pocket Guide,

CHEMICAL PROPERTIES:

CHEMICAL FORMULA	: Ba	**VAPOR PRESSURE**	: 10 mmHg @ 1049°C
MOLECULAR WEIGHT	: 137.34	**VAPOR DENSITY**	:
PHYSICAL STATE	: Lumps or powder	**SPECIFIC GRAVITY**	: 3.6
SOLUBILITY IN H_2O	: varies	**FLASH POINT**	:
BOILING POINT	: 1640°C	**FLAMMABLE LIMITS**	:
MELTING POINT	: approx. 725°C	**INCOMPATIBILITIES**	:

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL	: 0.5 mg/m3	**TOXICITY CLASS**	3 Local, Systemic
OSHA STEL	:	**CARCINOGENIC CLASS**	:
NIOSH REL	: 0.5 mg/m3	**ROUTES OF EXPOSURE**	: inhaltion, ingestion, direct contact
NIOSH STEL	:		
ACGIH TLV	: 0.5 mg/m3		
ACGIH STEL	:		
IDLH	: 1100 mg/m3		
ODOR THRESH.	:		
ODOR	:		

HANDLING RECOMMENDATIONS AND PERSONAL PROTECTIVE MEASURES
Respirators with particulate cartridges at 0.5 mg/m3. SCBA at 25 mg/m3. Gloves, eye protection.

EMERGENCY MEASURES AND FIRST AID

SYMPTOMS OF EXPOSURE
Eye irritant, benign pneumoconiosis, skin irritation, gastroenteritis, muscular paralysis, slow pulse.

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Benzene **CAS NUMBER:** 71-43-2
SYNONYMS: Benzol, cyclohexatriene, phenyl hydride
REFERENCES CONSULTED: NIOSH Pocket Guide, Sax, Dangerous Properties of Hazardous Materials

CHEMICAL PROPERTIES:

CHEMICAL FORMULA	: C6H6	**VAPOR PRESSURE**	: 75 mmHg
MOLECULAR WEIGHT	: 78.1	**VAPOR DENSITY**	: 2.8
PHYSICAL STATE	: Liquid	**SPECIFIC GRAVITY**	: 0.877
SOLUBILITY IN H_2O	: 1800 ppm	**FLASH POINT**	: 12°F
BOILING POINT	: 176°F	**FLAMMABLE LIMITS**	: 1.4% - 8.0%
MELTING POINT	: 42°F	**INCOMPATIBILITIES**	: Strong oxidizers, zinc in presence of steam, sulfuric acid, potassium, chromic anhydride, diborane.

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL	: 1 ppm, 3.2 mg/m3	**TOXICITY CLASS**	
OSHA STEL	: 5 ppm, 15.6 mg/m3		
NIOSH REL	: 0.1 ppm, 0.32 mg/m3	**CARCINOGENIC CLASS**	: Probable human carcinogen
NIOSH STEL	: 1 ppm, 3.2 mg/m3		
ACGIH TLV	: 10 ppm, 32 mg/m3	**ROUTES OF EXPOSURE**	: Inhalation, ingestion direct contact skin absorption
ACGIH STEL	:		
IDLH	: 2000 ppm		
ODOR THRESH.	: 1.5 - 5 ppm		
ODOR	: Aromatic		

HANDLING RECOMMENDATIONS AND PERSONAL PROTECTIVE MEASURES
Air purifying respirator at 1 ppm; SCBA at 10 ppm. Impermeable protective clothing, gloves, boots; eye protection.

EMERGENCY MEASURES AND FIRST AID
Wash skin with soap and water; flush eyes immediate with large amounts of water; remove from inhahltion exposure, CPR if necessary; If ingested, do not induce vomiting, remove by gastric lavage and catharsis, get immediate medical attention.

SYMPTOMS OF EXPOSURE
Acute: Excitation, euphoria, headache, drowsiness, dizziness, vomiting, delirium, inconsciousness, blurred vision, tremors, shallow respiration.
Chronic: Headache, anorexia, drowsiness, nervousness, pallor, anemia, bleeding under skin and eyes, reduced clotting ability, liver and kidney damage, leukemia.

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Cadmium **CAS NUMBER:** 7440-43-9
SYNONYMS:
REFERENCES CONSULTED: NIOSH Pocket Guide, Patty's Industrial Hygiene

CHEMICAL PROPERTIES:

CHEMICAL FORMULA	: Cd	**VAPOR PRESSURE**	:
MOLECULAR WEIGHT	: 112.40	**VAPOR DENSITY**	:
PHYSICAL STATE	: Soild	**SPECIFIC GRAVITY**	: 8.6
SOLUBILITY IN H_2O	: Insoluble	**FLASH POINT**	:
BOILING POINT	: 767°C	**FLAMMABLE LIMITS**	:
MELTING POINT	: 321°C	**INCOMPATIBILITIES**	: Strong oxidizers, elemental sulfur, selenium, tellurium

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL	: 0.2 mg/m3 0.6 Ceil.	**TOXICITY CLASS**	:
OSHA STEL	:		
NIOSH REL	: Ca	**CARCINOGENIC CLASS:**	Probable human carcinogen
NIOSH STEL	:		
ACGIH TLV	: 0.05 mg/m3 Ceil.	**ROUTES OF EXPOSURE:**	inhalation, ingestion, direct contact
ACGIH STEL	:		
IDLH	: 4.0 mg/m3		
ODOR THRESH.	:		
ODOR	:		

HANDLING RECOMMENDATIONS AND PERSONAL PROTECTIVE MEASURES
Air purifying respirator with HEPA filters at 0.05 mg/m3. SCBAs required at 2.5 mg/m3. Wear protective clothing, gloves and boots; eye protection.

EMERGENCY MEASURES AND FIRST AID
Irrigate eye immediately. Wash skin with soap and water. If swallowed give water and induce vomiting. Get immediate medical attention. Remove from inhalation exposure and give artificial respiration, if necessary.

SYMPTOMS OF EXPOSURE
Acute: Salivation, choking, vomiting, diarrhea, abdominal pain, difficulty breathing, chest tightness, cough, pulmonary edema.
Chronic: Proteinuria, emphysema, anemia, hypertension.

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Chromium VI **CAS NUMBER:** 7440-47-3
SYNONYMS: Chrome. hexavalent chromium
REFERENCES CONSULTED: NIOSH Pocket Guide

CHEMICAL PROPERTIES:

CHEMICAL FORMULA	: Cr (VI)	**VAPOR PRESSURE**	: 1mmHg @ 1610°C
MOLECULAR WEIGHT	: 52	**VAPOR DENSITY**	:
PHYSICAL STATE	: violet, green, or orange salts	**SPECIFIC GRAVITY**	: 7.14
		FLASH POINT	:
SOLUBILITY IN H_2O	: varies	**FLAMMABLE LIMITS**	:
BOILING POINT	: 4784°F	**INCOMPATIBILITIES**	: Strong oxidizers, acids, strong alkalies
MELTING POINT	: 3452°F		

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL	: 0.1 mg/m3 Ceil.	**TOXICITY CLASS**	
OSHA STEL	:		
NIOSH REL	: 0.001 mg/m3	**CARCINOGENIC CLASS**	: Confirmed human carcinogen
NIOSH STEL	:		
ACGIH TLV	: 0.05 mg/m3	**ROUTES OF EXPOSURE**	: inhalation, ingestion, direct contact
ACGIH STEL	:		
IDLH	: 500 mg/m3		
ODOR THRESH.	:		
ODOR	:		

HANDLING RECOMMENDATIONS AND PERSONAL PROTECTIVE MEASURES
Air purifying respirator with HEPA cartridges at 0.05 mg/m3; SCBA at 2.5 mg/m3. Impermeable gloves, boots and overalls. Eye protection.

EMERGENCY MEASURES AND FIRST AID
Flush eyes with large amounts of water. Wash skin with soap and water. If ingested give large amounts of water and induce vomiting. Get immediate medical attention.

SYMPTOMS OF EXPOSURE
Acute: Respiratory irritation, dizziness, vomiting, skin irritation and ulceration.
Chronic: Proteinuria, hematuria, oliguria, anuria, uremia, shock, cancer.

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Copper **CAS NUMBER:** 7440-50-8
SYNONYMS:
REFERENCES CONSULTED: NIOSH Pocket Guide

CHEMICAL PROPERTIES:

CHEMICAL FORMULA	: Cu	**VAPOR PRESSURE**	:
MOLECULAR WEIGHT	: 63.5	**VAPOR DENSITY**	:
PHYSICAL STATE	: metal	**SPECIFIC GRAVITY**	: 8.92
SOLUBILITY IN H_2O	: insoluble	**FLASH POINT**	:
BOILING POINT	: 2567°C	**FLAMMABLE LIMITS**	:
MELTING POINT	: 1083.4°C	**INCOMPATIBILITIES**	: Acetylene gas, magnesium metal, strong acids, organic acids

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL	: 1 mg/m3	**TOXICITY CLASS**	:
OSHA STEL	:		
NIOSH REL	: 1 mg/m3	**CARCINOGENIC CLASS:**	
NIOSH STEL	:	**ROUTES OF EXPOSURE:**	inhalation, ingestion, direct contact.
ACGIH TLV	: 1 mg/m3		
ACGIH STEL	:		
IDLH	:		
ODOR THRESH.	:		
ODOR	:		

HANDLING RECOMMENDATIONS AND PERSONAL PROTECTIVE MEASURES

Air purifying respirator with HEPA cartridge at 1 mg/m3. SCBA at 50 mg/m3. Gloves, boots, and eye protection.

EMERGENCY MEASURES AND FIRST AID

Flush eyes with water. Wash skin with soap and water.

SYMPTOMS OF EXPOSURE

Acute: Irritation of upper respiratory tract, ulceration and perforation of nasal septum, cough, fever, digestive disorders, headache, corneal ulcerations.
Chronic: Dermatitis.

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Fuel Oils **CAS NUMBER:**
SYNONYMS: Fuel Oil No. 1, No. 2, No. 3, No. 4, No.5, No. 6, Kerosene, Jet fuel
REFERENCES CONSULTED: IRP Tox Guide, Patty's Industrial Hygiene

CHEMICAL PROPERTIES: Fuel oil mixtures vary. Chemical properties given are extremes of ranges.

CHEMICAL FORMULA	: C10-C15 hydrocarbons	**VAPOR PRESSURE**	: 2.1mmHg-26mmHg
		VAPOR DENSITY	:
MOLECULAR WEIGHT	: Approx. 180	**SPECIFIC GRAVITY**	: 0.81 - 0.95
PHYSICAL STATE	: Liquid	**FLASH POINT**	: 38°C-169°C
SOLUBILITY IN H_2O	: 5 ppm	**FLAMMABLE LIMITS**	: 0.6% - 7.5%
BOILING POINT	: 151°C-588°C	**INCOMPATIBILITIES**	: Strong oxidizers
MELTING POINT	: -48°C-18°C		

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL	: 100 ppm 400 mg/m3(a)	**TOXICITY CLASS**	:
OSHA STEL	:		
NIOSH REL	: 100 ppm 400 mg/m3(a)	**CARCINOGENIC CLASS:**	
NIOSH STEL	:	**ROUTES OF EXPOSURE:**	inhalation, ingestion, direct contact
ACGIH TLV	:		
ACGIH STEL	:		
IDLH	: 10,000 ppm	(a) Exposure limits for naptha(coal tar).	
ODOR THRESH.	:		
ODOR	: Kerosene		

HANDLING RECOMMENDATIONS AND PERSONAL PROTECTIVE MEASURES
Air purifying respirator with organic vapor cartridges at 100 ppm. SCBAs at 1000 ppm. Impermeable clothing, gloves, and boots. Eye protection.

EMERGENCY MEASURES AND FIRST AID
Wash skin with soap and water. Irrigate eyes immediately with large quantities of water. Remove from inhalation exposure and perform rescue breathing, if necessary. If ingested, do not induce vomiting, get immediate medical attention.

SYMPTOMS OF EXPOSURE
Acute: Headache, nausea, confusion, drowsiness, convulsions, coma. Irritating to skin. If ingested nausea and vomiting may result in aspiration and lung damage (chemical pneumonitis).
Chronic: Kidney damage.

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Lead **CAS NUMBER:** 7439-92-1
SYNONYMS: White lead, lead flake, plumbum
REFERENCES CONSULTED: NIOSH Pocket Guide, Merck Index

CHEMICAL PROPERTIES:

CHEMICAL FORMULA	: Pb	**VAPOR PRESSURE**	: 1 mmHg @ 970°C
MOLECULAR WEIGHT	: 207.19	**VAPOR DENSITY**	:
PHYSICAL STATE	: Soft metal	**SPECIFIC GRAVITY**	: 11.35
SOLUBILITY IN H_2O	: Insoluble	**FLASH POINT**	:
BOILING POINT	: 1783°F	**FLAMMABLE LIMITS**	:
MELTING POINT	: 473°F	**INCOMPATIBILITIES**	: Strong oxidizers, hydrogen peroxide, active metals: sodium, potassium

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL	: 0.05 mg/m3
OSHA STEL	:
NIOSH REL	: 0.10 mg/m3
NIOSH STEL	:
ACGIH TLV	: 0.15 mg/m3
ACGIH STEL	:
IDLH	: 700 mg/m3
ODOR THRESH.	:
ODOR	:

TOXICITY CLASS :

CARCINOGENIC CLASS: Possible human carcinogen
ROUTES OF EXPOSURE: inhalation, ingestion, direct contact

HANDLING RECOMMENDATIONS AND PERSONAL PROTECTIVE MEASURES
Air purifying respirator with HEPA cartridge at 0.05 mg/m3. SCBA at 2.5 mg/m3. Impermeable clothing, gloves, and boots. Eye protection.

EMERGENCY MEASURES AND FIRST AID
Wash skin with soap and water. Irrigate eyes immediately with large quantities of water. Remove from inhalation exposure and perform rescue breathing, if necessary. If ingested, remove by gastric lavage with magnesium sulfate or sodium sulfate.

SYMPTOMS OF EXPOSURE
Acute:
Chronic: Lassitude, insomnia, cyanosis, eye grounds, lead line on gums, anorexia, weight loss, malnutrition, constipation, abdominal pain, hypotension, anemia, tremors, wrist drop, reproductive effects, encephalopathy, nephropathy.

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Mercury **CAS NUMBER:** 7439-97-6
SYNONYMS: Quicksilver
REFERENCES CONSULTED: NIOSH Pocket Guide, Merck Index, NIOSH/OSHA Occupational Health Guidelines

CHEMICAL PROPERTIES:

CHEMICAL FORMULA	: Hg	**VAPOR PRESSURE**	: 0.0012 mmHg
MOLECULAR WEIGHT	: 201	**VAPOR DENSITY**	: 7.0
PHYSICAL STATE	: Silver Liquid	**SPECIFIC GRAVITY**	: 13.59
SOLUBILITY IN H_2O	: 20 ppm	**FLASH POINT**	:
BOILING POINT	: 674°F	**FLAMMABLE LIMITS**	:
MELTING POINT	: -38°F	**INCOMPATIBILITIES**	: Acetylene, ammonia gases

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL	: 0.05 mg/m3 Skin	**TOXICITY CLASS**	:
OSHA STEL	:		
NIOSH REL	: 0.05 mg/m3 Skin	**CARCINOGENIC CLASS:**	
NIOSH STEL	:	**ROUTES OF EXPOSURE:**	inhalation, ingestion, direct contact, skin absorption
ACGIH TLV	: 0.1 mg/m3 Skin		
ACGIH STEL	:		
IDLH	: 10 mg/m3		
ODOR THRESH.	:		
ODOR	: odorless		

HANDLING RECOMMENDATIONS AND PERSONAL PROTECTIVE MEASURES
SCBA at 0.05 mg/m3. Impermeable clothing, gloves, and boots. Eye protection. Clothing should provide complete coverage at 0.05 mg/m3.

EMERGENCY MEASURES AND FIRST AID
Wash skin with soap and water. Irrigate eyes immediately with large quantities of water. Remove from inhalation exposure and perform rescue breathing, if necessary. If ingested, induce vomiting and get immediate medical attention.

SYMPTOMS OF EXPOSURE
Acute: Coughing, dyspnea, dermatitis, salivation, lacrimation, thirst, metallic taste, nausea, vomiting, gastrointestinal pain.
Chronic: Pneumonia, bronchitis, acidosis, leukopenia, hematuria, proteinuria, diarrhea, bloody stools, lead line on gums, central nervous depression, anorexia, anemia, paresthesia, hallucinations, mental depression, nervousness, incoordination, insomnia, headache, weight loss, tremors, convulsions, cardiac depression, kidney damage, numbness in extremities, fatigue.

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Nickel **CAS NUMBER:** 7440-02-0

SYNONYMS: Nickel catalyst, Raney nickel

REFERENCES CONSULTED: NIOSH Pocket Guide, NIOSH/OSHA Occupational Health Guidelines

CHEMICAL PROPERTIES:

CHEMICAL FORMULA	: Ni	**VAPOR PRESSURE**	: 1 mmHg @ 1800°C
MOLECULAR WEIGHT	: 58.7	**VAPOR DENSITY**	:
PHYSICAL STATE	: Solid	**SPECIFIC GRAVITY**	: 8.908
SOLUBILITY IN H_2O	: 180 ppm	**FLASH POINT**	:
BOILING POINT	: 4946°C	**FLAMMABLE LIMITS**	:
MELTING POINT	: 2648°C	**INCOMPATIBILITIES**	: Nitric acid, chlorine, oxidizers, combustible vapors, wood, sulfur

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL(a)	: 1 mg/m3
OSHA PEL(b)	: 0.1 mg/m3
NIOSH REL	: 0.015 mg/m3
NIOSH STEL	:
ACGIH TLV	: 0.05 mg/m3
ACGIH STEL	:
IDLH	:
ODOR THRESH.	:
ODOR	:

TOXICITY CLASS :

CARCINOGENIC CLASS: Confirmed human carcinogen

ROUTES OF EXPOSURE: inhalation, ingestion, direct contact

HANDLING RECOMMENDATIONS AND PERSONAL PROTECTIVE MEASURES

Air purifying respirator at with HEPA cartridges at 0.1 mg/m3. SCBA at 5 mg/m3. Impermeable clothing, gloves, and boots. Eye protection.

EMERGENCY MEASURES AND FIRST AID

Wash skin with soap and water. Irrigate eyes immediately with large quantities of water. Remove from inhalation exposure and perform rescue breathing, if necessary. If ingested, give large quantity of water and induce vomiting. Get immediate medical attention.

SYMPTOMS OF EXPOSURE

Acute: Nausea, vomiting, diarrhea.

Chronic: Dermatitis, asthma, skin sensitization, pulmonary inflammation, edema, sinus cancer, respiratory cancer, asthma.

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Selenium **CAS NUMBER:** 7782-49-2
SYNONYMS:
REFERENCES CONSULTED: NIOSH Pocket Guide

CHEMICAL PROPERTIES:

CHEMICAL FORMULA	: Se	**VAPOR PRESSURE**	: 1 mmHg @ 356°C
MOLECULAR WEIGHT	: 78.96	**VAPOR DENSITY**	:
PHYSICAL STATE	: Powders, crystals	**SPECIFIC GRAVITY**	: 4.26
SOLUBILITY IN H_2O	: Insoluble	**FLASH POINT**	:
BOILING POINT	: 689.9°C	**FLAMMABLE LIMITS**	:
MELTING POINT	: 217°C	**INCOMPATIBILITIES**	: Acids, strong oxidizers

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL	: 0.2 mg/m3	**TOXICITY CLASS**	:
OSHA STEL	:		
NIOSH REL	: 0.2 mg/m3	**CARCINOGENIC CLASS:**	
NIOSH STEL	:	**ROUTES OF EXPOSURE:**	inhalation, ingestion, direct contact
ACGIH TLV	: 0.2 mg/m3		
ACGIH STEL	:		
IDLH	: 100 mg/m3		
ODOR THRESH.	:		
ODOR	:		

HANDLING RECOMMENDATIONS AND PERSONAL PROTECTIVE MEASURES
Air purifying respirator with HEPA cartridge at 0.2 mg/m3. SCBA at 10 mg/m3. Impermeable clothing, gloves, and boots. Eye protection.

EMERGENCY MEASURES AND FIRST AID
Wash skin with soap and water. Irrigate eyes immediately with large quantities of water. Remove from inhalation exposure and perform rescue breathing, if necessary. If ingested, induce vomiting and get immediate medical attention.

SYMPTOMS OF EXPOSURE
Acute: Irritation to eyes, skin, and mucous membranes; headache, pulmonary edema, transient dyspnea, bronchitis, pneumonitis, skin blisters.
Chronic: Liver and kidney danage, anemia.

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Toluene **CAS NUMBER :** 108-88-3
SYNONYMS: Methyl benzene, toluol, phenylmethane
REFERENCES CONSULTED: NIOSH Pocket Guide, Sax, Patty's Industrial Hygiene

CHEMICAL PROPERTIES:

CHEMICAL FORMULA	: C6H5CH3	**VAPOR PRESSURE**	: 22 mmHg
MOLECULAR WEIGHT	: 92.1	**VAPOR DENSITY**	: 3.14
PHYSICAL STATE	: Liquid	**SPECIFIC GRAVITY**	: 0.867
SOLUBILITY IN H_2O	: 520 ppm	**FLASH POINT**	: 40°F 4°C
BOILING POINT	: 111°C	**FLAMMABLE LIMITS**	: 1.3% - 7.0%
MELTING POINT	: -95°C	**INCOMPATIBILITIES**	: Strong oxidizers

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL	: 100 ppm	375 mg/m3
OSHA STEL	: 150 ppm	560 mg/m3
NIOSH REL	: 100 ppm	375 mg/m3
NIOSH STEL	: 150 ppm	560 mg/m3
ACGIH TLV	: 100 ppm	377 mg/m3
ACGIH STEL	: 150 ppm	560 mg/m3
IDLH	: 2000 ppm	
ODOR THRESH.	: 2.5 ppm	
ODOR	: Sweet, pungent	

TOXICITY CLASS :

CARCINOGENIC CLASS:
ROUTES OF EXPOSURE: inhalation, ingestion, direct contact

HANDLING RECOMMENDATIONS AND PERSONAL PROTECTIVE MEASURES
Air purifying respirator with organic vapor cartridge at 100 ppm. SCBA at 1000 ppm. Impermeable clothing, gloves, and boots. Eye protection.

EMERGENCY MEASURES AND FIRST AID
Wash skin with soap and water. Irrigate eyes immediately with large quantities of water. Remove from inhalation exposure and perform rescue breathing, if necessary. If ingested, do not induce vomiting. Remove by gastric lavage and catharsis. Get immediate medical attention.

SYMPTOMS OF EXPOSURE
Acute: Central nervous system depression, headache, drowsiness, dizziness, fatigue,weakness, delirium, unconsciousness.
Chronic: Possible skin, liver, and kidney damage.

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Xylenes **CAS NUMBER :** 1330-20-7
SYNONYMS: dimethylbenzenes, xylol, o-, m-, p-xylene
REFERENCES CONSULTED: NIOSH Pocket Guide, Patty's Industrial Hygiene, Sax

CHEMICAL PROPERTIES: Range of values for o, m, and p isomers shown.

CHEMICAL FORMULA	: C6H4(CH3)2	**VAPOR PRESSURE**	: 7 - 9 mmHg
MOLECULAR WEIGHT	: 106.17	**VAPOR DENSITY**	:
PHYSICAL STATE	: Liquid	**SPECIFIC GRAVITY**	: 0.86 - 0.88
SOLUBILITY IN H_2O	: 146 - 170.5 ppm	**FLASH POINT**	: 62.6°F - 84°F
BOILING POINT	: 138.3°C - 144.4°C	**FLAMMABLE LIMITS**	: 1.0% - 7.0%
MELTING POINT	: -48.9°C - -25°C	**INCOMPATIBILITIES**	: Strong oxidizers

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL	: 100 ppm 435 mg/m3
OSHA STEL	: 150 ppm 655 mg/m3
NIOSH REL	: 100 ppm 435 mg/m3
NIOSH STEL	: 150 ppm 655 mg/m3
ACGIH TLV	: 100 ppm 434 mg/m3
ACGIH STEL	:
IDLH	: 1000 ppm 4340 mg/m3
ODOR THRESH.	: 1 ppm 4.35 mg/m3
ODOR	: Aromatic

TOXICITY CLASS :

CARCINOGENIC CLASS:
ROUTES OF EXPOSURE: inhalation, ingestion, direct contact

HANDLING RECOMMENDATIONS AND PERSONAL PROTECTIVE MEASURES
Air purifying respirator with organic vapor cartridges at 100 ppm. SCBA at 1000 ppm. Impermeable clothing, gloves, and boots. Eye protection.

EMERGENCY MEASURES AND FIRST AID
Wash skin with soap and water. Irrigate eyes immediately with large quantities of water. Remove from inhalation exposure and perform rescue breathing, if necessary. If ingested, do not induce vomiting and get immediate medical attention.

SYMPTOMS OF EXPOSURE
Acute: Eye, nose, throat, and skin irritation, drying and defatting of skin, respiratory tract irritation, dizziness, excitement, drowsiness, incoherence, staggering gait, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain, dermatitis.
Chronic: Central nervous system impairment, kidney damage, decreased pulmonary function.

ATTACHMENT C

STANDARD OPERATING PROCEDURES FOR EMERGENCIES DUE TO COLD AND COLD STRESS

STANDARD OPERATING PROCEDURES FOR EMERGENCIES DUE TO HEAT AND HEAT STRESS

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COLD STRESS

Field operations during winter months can create a variety of hazards for the employee. Frostbite, frostnip, and hypothermia can be experienced and, if not remedied, cause severe health effects and even death. Therefore, it is important that all employees are able to recognize the symptoms of these conditions and correct the problem as quickly as possible.

A. THE EFFECTS OF COLD

Persons working outdoors in temperatures at or below freezing may experience frostbite. Extreme cold for a short time may cause severe injury to the body surface or result in profound generalized cooling, causing death. Extremities such as fingers, toes, and ears are most susceptible.

Prolonged exposure to extreme cold produces the following symptoms: shivering, numbness, low body temperature, drowsiness, and marked muscular weakness.

Two factors influence the development of a cold injury: ambient temperature and wind velocity. Windchill is used to describe the chilling effect of moving air in combination with low temperatures. Table 1 shows a windchill chart. As a general rule, the greatest incremental gain in windchill occurs when a wind velocity increases from 5 mph to 10 mph. Additionally, water conducts heat 240 times faster than air. Therefore, the body cools dramatically when personal protective equipment is removed and clothing underneath is perspiration-soaked.

There are three categories of cold-injury: frostnip, frostbite, and hypothermia.

1. Frostnip

Frostnip is the initial symptom of frostbite and is characterized by a whitened area of the skin accompanied by a burning or painful feeling.

Emergency Care

Warm the affected area either by body heat or warm (not hot) water.

2. Frostbite

Frostbite is local tissue damage caused by exposure to low temperatures. Ice crystals form, either superficially or deeply, in the fluids and underlying soft tissue of the skin. The nose, cheeks, ears, fingers, and toes are most commonly affected.

Frostbite Symptoms

- Skin is cold, hard, white, and numb.
- Skin may be blistering.

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- Victim may not be in pain.
- In advanced cases victim experiences mental confusion.
- Judgment impairment.
- Victim will stagger.
- Eyesight failure.
- Unconsciousness.
- Shock symptoms, followed by death.

Frostbite Emergency Care

Cover the frozen area and warm the victim with extra clothing and blankets. Bring the victim indoors (if possible) and allow victim to drink warm liquids.

Rewarm the frozen area quickly by immersion in warm (not hot) water. The best temperature is between 102 and 105°F. This procedure may take up to thirty minutes. The victim will experience greater and greater pain as tissues thaw.

If warm water is not available or not practical to use, wrap the affected area in a sheet and warm blankets.

Severe swelling will develop rapidly after thawing. Discontinue warming the victim as soon as the affected area becomes flush.

When the affected area has been warmed, have the victim exercise it. If the fingers or toes are involved, place dry, sterile gauze between the digits to separate them.

If travel is necessary, cover the affected parts with sterile or clean clothes and keep the injured areas elevated. Obtain medical assistance as soon as possible.

It is important during treatment that you do not:

- Rub the affected area as rubbing may cause gangrene (tissue death).
- Allow the victim to put the affected part near a hot stove or fire.
- Break blisters.
- Allow the victim to walk if the affected area is the feet. (However, walking on a frozen foot is better than staying in the cold.)
- Apply other dressings unless the victim is to be transported for medical aid.
- Allow the victim to smoke or drink alcohol.

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It is important to protect the frozen area from further injury, to warm the affected area rapidly, and to maintain respiration. Never allow the affected area to refreeze. This may lead to further damage and result in eventual amputation.

It is also important to remember that areas that have had frostbite are more susceptible to recurrent frostbite.

3. Hypothermia

Hypothermia results from prolonged exposure to the cold thereby lowering the body's core temperature. Cold does not necessarily mean temperatures below freezing, as hypothermia can be caused by temperatures above 32°F when the person is hungry, wet, tired, and over-exerted. The target organ of hypothermia is the brain.

Hypothermia Symptoms

- Severe shivering.
- Abnormal behavior characterized by decreased efficiency, decreased level of communication, forgetfulness, repetitive behavior, poor motor skills, poor judgment, and general apathy.
- Listlessness and sleepiness.
- Weakness, inability to walk, and repeated falling.
- Later stages include collapse, stupor, unconsciousness, and eventual death.

During hypothermia, the body's thermoregulatory mechanisms may shut down. Shivering is the body's way of warming itself. At 95°F, the body will produce maximum shivering. At 87.8°F, the body loses its capacity to shiver. Table 2 lists the signs of hypothermia. The worker's exposure to cold should be immediately terminated when severe shivering becomes evident.

It is important to note that if a victim is found in a remote area, despite the death-like appearance, the person may be saved. All attempts should be made to revive the victim.

Hypothermia Emergency Care

All stages of hypothermia are treated by either passive or active rewarming. Passive rewarming is accomplished by better conservation of the patient's body heat. However, the victim's thermoregulatory mechanisms must be intact.

Active rewarming means heat is applied to the victim by an external source, either surficially and/or through the core. Treatment includes:

- Preventing further heat loss. Remove the victim to warm, dry place (out of the wind, cold, and rain/snow).

- Remove wet clothing piece-by-piece and dry the underlying skin.
- Dress in several layers of warm, dry clothing, giving preference to the central body core rather than the extremities.
- Cover the victim's head, then wrap victim in blankets.
- If the victim is conscious, allow him/her to drink hot fluids.
- Monitor oral body temperature every 15 minutes. If body temperature falls below 96.8°F, the team member should not be allowed outside until body temperature returns to normal.

In more severe cases of hypothermia, implement the above treatment but also institute some type of active rewarming, including:

— Electric pads or blankets

— Hot-air blowers or heaters

— Heated blankets or clothes

— Use of human body heat

It is important to watch for signs of return of the normal thermoregulatory mechanisms (shivering, teeth chattering, "goose flesh"), and to monitor mental status.

Victim should be transferred to a medical facility after the emergency care steps have been initiated and should not be allowed to return to work for at least 48 hours.

If there has been severe hypothermia, the victim should not be considered dead despite his/her appearance. Treat the victim as stated above and prepare for transfer to a medical facility. If the victim is pulseless and not breathing, perform CPR.

Table 3 lists Threshold Limit Values for working in the cold.

Work-Warming Regimen

If work is performed continuously in the cold at an equivalent chill temperature (ECT) or below -7°C (20°F) heated warming shelters (tents, cabins, rest rooms, etc.) shall be made available nearby and the workers encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria, are indications for immediate return to the shelter. When entering the heated shelter the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation or a change of dry work clothing provided. A change of dry work clothing shall be provided as necessary to prevent workers from returning to their work with wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood

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flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of diuretic and circulatory effect.

For work practices at or below -12°F (10°F) ECT, the following shall apply:

1. The worker shall be under constant protective observation (buddy system or supervision).

2. The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, rest periods must be taken in heated shelters and opportunity for changing into dry clothing shall be provided.

3. New employee shall not be required to work full-time in cold in the first days until they become accustomed to the working conditions and required protective clothing.

4. The weight and bulkiness of clothing shall be included in estimating the required work performance and weights to be lifted by the worker.

5. The work shall be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats shall not be used. The worker should be protected from drafts to the greatest extent possible.

6. The workers shall be instructed in safety and health procedures. The training program shall include as a minimum instruction in:

   a. Proper rewarming procedures and appropriate first aid treatment.

   b. Proper clothing practices.

   c. Proper eating and drinking habits.

   d. Recognition of impending frostbite.

   e. Recognition signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.

   f. Safe work practices.

Special caution shall be exercised when working with toxic substances. Cold exposure may require reduced exposure limits.

Eye protection for workers employed out-of-doors in a snow and/or ice-covered terrain shall be supplied. Special safety goggles to protect against ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) and blowing ice crystals are required where there is an expanse of snow coverage causing a potential eye exposure hazard.

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Workplace monitoring is required as follows:

a. Suitable thermometry should be arranged at any workplace where the environmental temperature is below 16°C (60°F) to enable overall compliance with the requirements of the TLV to be maintained.

b. Whenever the air temperature at a workplace falls below -1°C (30°F), the dry bulb temperature should be measured and recorded at least every four hours.

c. In indoor workplaces, the wind speed should also be recorded at least every four hours whenever the rate of air movement exceeds 2 meters per second (5 mph).

d. In outdoor work situations, the wind speed should be measured and recorded together with the air temperature whenever the air temperature is below -1°C (30°F).

e. The equivalent chill temperature shall be obtained from Table 1 in all cases where air movement measurements are required, and shall be recorded with the other data whenever the equivalent chill temperature is below -7°C (20°F).

Employees shall be excluded from work in cold at -1°C (30°F) or below if they are suffering from diseases or taking medication which interferes with normal body temperature regulation or reduces tolerance to work in cold environments. Workers who are routinely exposed to temperatures below -24°C (-10°F) with wind speeds less than 5 mph, or air temperatures below -18°C (0°F) with wind speeds above 5 mph should be medically certified as suitable for such exposures.

Trauma sustained in freezing or subzero conditions requires special attention, because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues, in addition to providing for first aid treatment.

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TABLE 1

TABLE 1

COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS AN EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER: In < hr with dry skin. Maximum danger of false sense of security				INCREASING DANGER: Danger from freezing of exposed flesh within one minute				GREAT DANGER: Flesh may freeze within 30 seconds.			
Trenchfoot and immersion foot may occur at any point on this chart.												

*Developed by U. S. Army Research Institute of Environmental Medicine, Natick, MA.

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TABLE 2

SIGNS OF HYPOTHERMIA

Core Temperature °C	°F	Clinical Signs
37.6	99.6	"Normal" rectal temperature.
37	98.6	"Normal" oral temperature.
36	96.8	Metabolic rate increases in an attempt to compensate for heat loss.
35	95.0	Maximum shivering.
34	91.4	Severe hypothermia below this temperature.
32 31	89.4 87.8	Consciousness clouded, blood pressure becomes difficult to obtain but react to light; shivering ceases.
30 29	86.0 84.2	Progressive loss of consciousness; muscular rigidity increases; pulse and blood pressure difficult to obtain; respiratory rate decreases.
28	82.4	Ventricular fibrillation possible with myocardial irritability.
27	80.6	Voluntary motion ceases; pupils nonreactive to light; deep tendon and superficial reflexes absent.
26	78.8	Victim seldom conscious.
25	77.0	Ventricular fibrillation may occur spontaneously.
24	75.2	Pulmonary edema.
22 21	71.6 69.8	Maximum risk of ventricular fibrillation.
20	68.0	Cardiac standstill.
18	64.4	Lowest accidental hypothermia victim to recover.
17	62.6	Isoelectric electroencephalogram.
9	48.2	Lowest artificially cooled hypothermia patient to recover.

THRESHOLD LIMIT VALUES WORK / WARM-UP SCHEDULE FOR FOUR-HOUR SHIFT*

	AIR TEMPERATURE — SUNNY SKY		NO NOTICEABLE WIND		5 MPH WIND		10 MPH WIND		15 MPH WIND		20 MPH WIND	
	°C (APPROX)	°F	MAXIMUM WORK PERIOD	NUMBER OF BREAKS	MAXIMUM WORK PERIOD	NUMBER OF BREAKS	MAXIMUM WORK PERIOD	NUMBER OF BREAKS	MAXIMUM WORK PERIOD	NUMBER OF BREAKS	MAXIMUM WORK PERIOD	NUMBER OF BREAKS
1.	-26° TO -28°	-15° TO -19°	(NORMAL BREAKS)	1	(NORMAL BREAKS)	1	75 MINUTES	2	55 MINUTES	3	40 MINUTES	4
2.	-29° TO -31°	-20° TO -24°	(NORMAL BREAKS)	1	75 MINUTES	2	55 MINUTES	3	40 MINUTES	4	30 MINUTES	5
3.	-32° TO -34°	-25° to -29°	75 MINUTES	2	55 MINUTES	3	40 MINUTES	4	30 MINUTES	5	NON-EMERGENCY WORK SHOULD CEASE	
4.	-35° TO -37°	-30° TO -34°	55 MINUTES	3	40 MINUTES	4	30 MINUTES	5	NON-EMERGENCY WORK SHOULD CEASE			
5.	-38° TO -39°	-35° to -39°	40 MINUTES	4	30 MINUTES	5	NON-EMERGENCY WORK SHOULD CEASE					
6.	-40° TO -42°	-40° TO -44°	30 MINUTES	5	NON-EMERGENCY WORK SHOULD CEASE							
7.	-43° & BELOW	-45° & BELOW	NON-EMERGENCY WORK SHOULD CEASE									

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Notes: (a) Schedule applies to moderate to heavy work activity with warm-up beaks of ten (10) minutes in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example, at -30°F with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with four breaks in a 4-hour period (Step 5).

(b) The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.

(c) If only the windchill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: (1) special warm-up breaks should be initiated at a windchill of about 1750 W/m^2; (20 all non-emergency work should have cased at or below a windchill of 2250 W/m^2. In general the warm-up schedule provided above slightly under compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.

*Adapted from Occupational Health & Safety Division, Saskatchewan Department of Labour.

Field operations during the summer months can create a variety of hazards to the employee. Heat cramps, heat exhaustion, and heat stroke can be experienced; and if not remedied, can threaten life or health. Therefore, it is important that all employees be able to recognize symptoms of these conditions and be capable of arresting the problem as quickly as possible.

A. THE EFFECTS OF HEAT

As the result of normal oxidation processes within the body, a predictable amount of heat is generated. If the heat is liberated as it is formed, there is no change in body temperature. If the heat is liberated more rapidly, the body cools to a point at which the production of heat is accelerated and the excess is available to bring the body temperature back to normal.

Interference with the elimination of heat leads to its accumulation and thus to the elevation of body temperature. As a result, the person is said to have a fever. When such a condition exists, it produces a vicious cycle in which certain body processes speed up and generate additional heat. Then the body must eliminate not only the normal but also the additional quantities of heat.

Heat produced within the body is brought to the surface largely by the bloodstream and escapes to the cooler surroundings by conduction and radiation. If air movement or a breeze strikes the body, additional heat is lost be convection. However, when the temperature of the surrounding air becomes equal to or rises above that of the body, all of the heat must be lost by vaporization of the moisture or sweat from the skin surface. As the air becomes more humid (contains more moisture), vaporization from the skin slows down. Thus, on a day when the temperature is 95 to 100°F, with high humidity and little or no breeze,, conditions are ideal for the retention of heat within the body. It is on such a day, or more commonly a succession of such days (a heat wave), that medical emergencies due to heat are likely to occur. Such emergencies are classified in three categories: heat cramps, heat exhaustion, and heat stroke.

1. HEAT CRAMPS

Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps of the leg and abdominal muscles. Heat cramps also may result from drinking iced water or other drinks either too quickly or in too large a quantity.

Heat Cramp Symptoms. The symptoms of heat cramp are:

- Muscle cramps in legs and abdomen,
- Pain accompanying the cramps,
- Faintness, and
- Profuse perspiration.

Heat Cramp Emergency Care. Remove the patient to a cool place. Give him sips of liquids such as "Gatorade" or its equivalent. Apply manual pressure to the cramped muscle. Remove the patient to a hospital if there is any indication of a more serious problem.

2. HEAT EXHAUSTION DRAFT

Heat exhaustion occurs in individuals working in hot environments, and may be associated with heat cramps. Heat exhaustion is caused by the pooling of blood in the vessels of the skin. The heat is transported from the interior of the body to the surface by the blood. The blood vessels in the skin become dilated and a large amount of blood is pooled in the skin. This condition, plus the blood pooled in the lower extremities when an individual is in an upright position, may lead to an inadequate return of blood to the heart and eventually to physical collapse.

Heat Exhaustion Symptoms. The symptoms of heat exhaustion are:

- Weak pulse;
- Rapid and usually shallow breathing;
- Generalized weakness;
- Pale, clammy skin;
- Profuse perspiration;
- Dizziness;
- Unconsciousness; and
- Appearance of having fainted (the patient responds to the same treatment administered in cases of fainting).

Heat Exhaustion Emergency Care. Remove the patient to a cool place and remove as much clothing as possible. Administer cool water, "Gatorade," or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allow chilling or overcooling. Treat the patient for shock, and remove him to a medical facility if there is any indication of a more serious problem.

3. HEAT STROKE

Heat stroke is a profound disturbance of the heat-regulating mechanism, associated with high fever and collapse. Sometimes this condition results in convulsions, unconsciousness, and even death. Direct exposure to sun, poor air circulation, poor physical condition, and advanced age (over 40) bear directly on the tendency to heat stroke. It is a serious threat to life and carries a 20 percent mortality rate. Alcoholics are extremely susceptible.

Heat Stroke Symptoms. The symptoms of heat stroke are:

- Sudden onset;
- Dry, hot, and flushed skin;
- Dilated pupils;
- Early loss of consciousness;
- Full and fast pulse;
- Breathing deep at first, later shallow and almost absent;
- Muscle twitching, growing into convulsions; and
- Body temperature reaching 105 to 106°F or higher.

Heat Stroke Emergency Care. Remember that this is a true emergency. Transportation to a medical facility should not be delayed. Remove the patient to a cool environment if possible, and remove as much clothing as possible. Assure an open airway. Reduce body temperature promptly, preferably by wrapping in a wet sheet or else by dousing the body with water.

If cold packs are available, place them under the arms, around the neck, at the ankles, or at any place where blood vessels that lie close to the skin can be cooled. Protect the patient from injury during convulsions, especially from tongue biting.

B. AVOIDANCE OF HEAT-RELATED EMERGENCIES

Please note that in the case of heat cramps or heat exhaustion, "Gatorade" or its equivalent is suggested as part of the treatment regime. The reason for this type of liquid refreshment is that such beverages will return much-needed electrolytes to the system. Without these electrolytes, body systems cannot function properly, thereby increasing the represented health hazard. Therefore, when personnel are working in situations where the ambient temperatures and humidity are high, and especially in situations where protection Levels A, B, and C are require, the site safety officer must:

- Assure that all employees drink plenty of fluids ("Gatorade" or its equivalent);
- Assure that frequent breaks are scheduled so overheating does not occur; and
- Revise work schedules, when necessary, to take advantage of the cooler parts of the day (e.g., 5:00 a.m. to 1:00 p.m. and 6:00 p.m. to nightfall).
- Assure that workers are acclimated before allowing them to work for extended periods. Heat induces a series of physiological and psychological stresses that the individual worker must adjust to during the first week of heat exposure. Workers should slowly work into their peak work performance over a two-week period. Workers absent from the site several days must be allowed to become reacclimated.

If protective clothing must be worn, especially Levels A and B, the suggested guidelines for ambient temperature and maximum wearing time per excursion are given in the following Table:

Suggested guidelines for continuous use of Level A or Level B protection:

Ambient Temperature (°F)	Maximum Wearing Time per Excusion (minutes)
Above 90	15
85 to 90	30
80 to 85	60
70 to 80	90
60 to 70	120
50 to 60	180

C. REST-RECOVERY REGIME **DRAFT**

One method of measuring the effectiveness of employees' rest-recovery regime is by monitoring the heart rate. The "Brouha Guideline" is one such method:

- During a three-minute period, count the pulse rate for the last 30 seconds of the first minute, the last 30 seconds of the second minute, and the last 30 seconds of the third minute.

- Double the count.

If the recovery pulse rate during the last 30 seconds of the first minute is at 110 beats/minute or less, and the deceleration between the first, second, and third minutes is at least 10 beats/minute, the work-recovery regime is acceptable. If the employee's rate is above that specified, a longer rest period is required, accompanied by an increase intake of fluids .

HEAT STRESS MONITORING

DRAFT

NAME: ______________________ DATE/TIME: ______________

SITE: ______________

COMPANY: ______________________ LOCATION: ______________

Pulse Rate Monitoring (30 second rest prior to first measurement):

Starting Time: __________ Pulse Rate: __________ beats/minute;

rest 30 sec.: __________; rest 30: __________ b/m;

rest 30 sec.: __________; rest 60: __________ b/m;

rest 60 sec.: __________; rest 60: __________ b/m;

Starting Time: __________ Pulse Rate: __________ beats/minute;

rest 30 sec.: __________; rest 30: __________ b/m;

rest 30 sec.: __________; rest 60: __________ b/m;

rest 60 sec.: __________; rest 60: __________ b/m;

Starting Time: __________ Pulse Rate: __________ beats/minute;

rest 30 sec.: __________; rest 30: __________ b/m;

rest 30 sec.: __________; rest 60: __________ b/m;

rest 60 sec.: __________; rest 60: __________ b/m;

Starting Time: __________ Pulse Rate: __________ beats/minute;

rest 30 sec.: __________; rest 30: __________ b/m;

rest 30 sec.: __________; rest 60: __________ b/m;

rest 60 sec.: __________; rest 60: __________ b/m;

Method of Measurement:

Carotid Artery: __________; Instrument (specify type): ______________

Self-Determined & Reported: ________

Site Safety Officer: __________(Contractor); ________(Contract Monitor)

____
Site Safety Officer

ATTACHMENT D

ON-SITE DOCUMENTATION FORMS

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

I have read and agree to abide by the contents of the Health and Safety Plan for the following project:

____

____
Signed

____
Date

Return to Office Health and Safety Representative before starting to work on subject project work site.

DRAFT

INCIDENT REPORT

Inc. rpt. no.:________-____

DATE OF REPORT ______________

SITE: ____

SITE LOCATON: ____________________________________

REPORT PREPARED BY: ______________________________
NAME PRINTED TITLE

INCIDENT CATEGORY
(check all that apply)

___ Injury ___ Illness ___ Property Damage

___ Near Miss ___ Fire ___ Chemical Exposure

___ Motor Vehicle ___ On site equipment ___ Electrical

___ Mechanical ___ Other

DATE AND TIME OF INCIDENT ______________________________

Narrative Report of Incident:
(Provide sufficient detail so that the reader may fully understand the actions leading to or contributing to the incident, the incident occurrence, and actions following the incident. Append additional sheets of paper if necessary.)

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DRAFT

Inc. rpt. no.:_______-____

WITNESSES TO INCIDENT

1. NAME ______________________ COMPANY ______________
   ADDRESS ______________________
   TELEPHONE NO. ______________________

2. NAME ______________________ COMPANY ______________
   ADDRESS ______________________
   TELEPHONE NO. ______________________

INJURIES

FIRST INJURED PERSON

Name and Address of Injured: ______________________

____

SSN: ____________ Age:______ Sex:______

Years of Service: ________ Time on Present Job: _____

Title/Classification: ______________________

Severity of Injury or Illness: ____ Non-disabling
____ Disabling ____ Medical Treatment
____ Fatality

Estimated Number of Days Away From Job: ______________

Nature of Injury or Illness: ______________________

____

Classification of Injury:

____ Fractures ____ Heat Burns ____ Cold Exposure
____ Dislocations ____ Chemical Burns ____ Frostbite

DRAFT

Inc. rpt. no.:_______-___

____ Sprains
____ Abrasions
____ Lacerations
____ Punctures
____ Faint/Dizziness
____ Respiratory Allergy
____ Dermal Allergy
____ Radiation Burns
____ Bruises
____ Blisters
____ Toxic Respiratory Exposure
____ Heat Stroke
____ Heat Exhaustion
____ Concussion
____ Bites
____ Toxic Ingestion

Part of Body Affected: ______________________________
Degree of Disability: ______________________________

Date Medical Care was Received: ____________________
Where Medical Care was Received: ____________________
Address (if off-site):

____

If Hospitalized
Name, Address and Telephone No. of Hospital:

____

Name, Address and Telephone No. of Physician

____

SECOND INJURED PERSON

Name and Address of Injured: __________________________

____

SSN: _______________ Age:______ Sex:______

Years of Service: _________ Time on Present Job: ______

Title/Classification: ______________________________

Severity of Injury or Illness: ____ Non-disabling
____ Disabling
____ Medical Treatment
____ Fatality

Estimated Number of Days Away From Job: ________________

Nature of Injury or Illness: ____________________________

____

DRAFT

INCIDENT REPORT

Inc. rpt. no.:________-____

Classification of Injury:

____ Fractures
____ Dislocations
____ Sprains
____ Abrasions
____ Lacerations
____ Punctures
____ Faint/Dizziness
____ Respiratory Allergy
____ Dermal Allergy
____ Heat Burns
____ Chemical Burns
____ Radiation Burns
____ Bruises
____ Blisters
____ Toxic Respiratory Exposure
____ Cold Exposure
____ Frostbite
____ Heat Stroke
____ Heat Exhaustion
____ Concussion
____ Bites
____ Toxic Ingestion

Part of Body Affected: ______________________________
Degree of Disability: ______________________________
Date Medical Care was Received: ____________________
Where Medical Care was Received: ___________________
Address (if off-site):

____

If Hospitalized
Name, Address and Telephone No. of Hospital:

____

Name, Address and Telephone No. of Physician

____

(If more than two injuries, provide information on separate sheet).

PROPERTY DAMAGE

Brief Description of Property Damaged

____
____
____

Estimate of damage: $______________________________

Inc. rpt. no.:_______-____

INCIDENT LOCATION

____
____
____

INCIDENT ANALYSIS

Causative agent most directly related to accident (Object, substance, material, machinery, equipment, conditions):

____
____

Was weather a factor?: ______________________________

Unsafe mechanical/physical/environmental condition at time of incident (Be specific):

____
____

Unsafe act by injured and/or others contributing to the incident (Be specific, must be answered):

____
____

Personal factors (Improper attitude, lack of knowledge or skill, slow reaction, fatigue):

____
____

On Site Incidents

Level of personal protection equipment required in Site Safety Plan:______________ . ______________
____
____

Modifications:______________________________
____
____

Was injured using required equipment?:______________
____
____

DRAFT

Inc. rpt. no.:________-____

If not, how did actual equipment use differ from plan:

____
____
____

ACTION TAKEN TO PREVENT RECURRENCE
(Be very specific. What has or will be done? When will it be done? Who is the responsible party to insure that the correction is made?)

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INCIDENT REPORT COMPLETED BY

______________________ ______________________
HSO Name Printed HSO Signature

OTHERS PARTICIPATING IN INVESTIGATION

____
Name Printed Signature Title

____
Name Printed Signature Title

____
Name Printed Signature Title

INCIDENT FOLLOW-UP REPORT

DRAFT

Incident No.: ______________________ Date of Incident: __________

Site Name: ____________________________ Project No.: __________

Follow-up Prepared By: ________________________ Date: __________

Outcome of Incident: ____

____

Physicians Recommendations:
First Injured Person: ____

Second Injured Person: ____

Other Injured Persons: ____

____

Date Returned to Work:
First Injuried Person: ______________________

Second Injured Person: ______________________

Other Injured Persons: ______________________

____

Have corrective actions recommended by investigation been implemented ? If not, explain why not. What alternative actions have been taken?

____

____

____

____

Investigation Team:

Name Printed	Signature	Title

ATTACH ANY ADDITIONAL INFORMATION

DRAFT

SCBA

RESPIRATORY LOG

SITE: ______________________________

LOCATION: ______________________________

DATES OF INVESTIGATION: ____________________

User	Date of Use	SCBA#	Satisfactory Check-Out (Yes/No - Initials)	Date Cleaned

SCBA Performance Comments:

____

Site Health and Safety Officer   Date

or ES Project Manager

Return to Office Health and Safety Representative at the completion of field activities.

DRAFT

AIR PURIFYING

RESPIRATOR LOG

SITE: ______________________

LOCATION: ______________________

DATES OF INVESTIGATION: ______________________

User	Date of Use	Cleaned and Inspected Prior To Use (Initials)	Cartridges Changed Prior to Use (Yes, NO, N/A)	Total Hours on Cartridge

Site Health and Safety Officer or ES Project Manager   Date

Return to Office Health and Safety Representative at the completion of field activities.

DRAFT

Site Entry Log:

SITE: ____

LOCATION: ____

DATES OF INVESTIGATION: ___________________________

Date	Name	Company	Activity	Time in / Time out

FIELD AIR MONITORING LOG

DRAFT

DATE ____________

SITE: ______________________________ PAGE ____ OF ____

SITE SAFETY OFFICER: ____________ SAFETY MONITORS: ____________

____

WEATHER CONDITIONS: ______________________________

INSTRUMENTATION CONDITIONS: ______________________________

ACTIVITY/REASON FOR MONITORING	LOCATION	TIME	READING	INITIALS

DRAFT

AIR MONITORING INSTRUMENT

CALIBRATION LOG

Project Name : ______________________ Project Location: ______________________

Job Number: ______________________

Instrument Type: ______________________ Instrument Number: ______________________

Date	Cal Gas Conc.	Instrument Reading	Adjusted (Y/N)	New Setting	New Reading	Maintenance Notes	Initials

ATTACHMENT E

PERSONAL PROTECTIVE EQUIPMENT PROGRAM

RESPIRATORY PROTECTION PROGRAM

Prepared for

THE ENGINEERING-SCIENCE NORTHEAST OPERATIONS OFFICE

June 1990

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1.0 OBJECTIVE

The objective of the Respiratory Protection Program is to provide Engineering-Science, Inc. (ES) Northeast Operations field personnel with sufficient information and guidance to adequately protect themselves from potential inhalation hazards during hazardous waste or industrial field operations. The use of respirators to protect personnel from inhalation hazards is permitted by OSHA under 29 CFR Part 1910.134 when other more positive methods of protection, such as engineering controls (e.g., ventilation) or work practices (e.g., substitution) are not feasible.

2.0 NEED FOR RESPIRATORY PROTECTION

OSHA has established safe exposure levels for various airborne contaminants that may be encountered at sites during field operations. If worker exposure to these substances exceeds the OSHA permissible exposure limits, OSHA requires that feasible engineering controls and administrative measures be instituted to reduce worker exposure to within acceptable levels. If controls are not feasible, employers are required to provide the appropriate, approved respirators for employee protection. Because of the nature of site work in general, traditional industrial hygiene engineering controls are not usually feasible. Hence, respirators must be relied upon as a means for protecting workers at hazardous waste sites. All respiratory protection practices for ES Denver personnel, including selection and use, shall be in accordance with this program.

3.0 MINIMUM REQUIREMENTS OF AN ACCEPTABLE RESPIRATOR PROGRAM

OSHA has established the requirements for a minimally acceptable program under 29 CFR Part 1910.134. A copy of this standard is included as Appendix A in this manual. Elements that must be incorporated into an OSHA-acceptable program include the following:

- Approved respiratory devices must be properly selected.
- A determination must be made regarding the need for respiratory protective devices.
- An employee training program must be established in which the employee becomes familiar with the respiratory protective devices and is trained in the proper selection and use of respirators and their limitations.
- There must be provisions for:
  The proper maintenance, storage, inspection and repair of respirators.
  Testing for the proper fit of the respiratory protective equipment.
  Medical screening of employees to determine if they are physically able to perform their assigned work while using of respiratory protective equipment.
- Written standard operating procedures for the selection and use of respiratory protective equipment.

4.0 ESTABLISHMENT OF THE RESPIRATOR PROGRAM

Personnel with specific responsibilities for the implementation of the program include the following:

4.1 OFFICE HEALTH AND SAFETY REPRESENTATIVE (PHILLIP HUNT, C.I.H.)

The Office Health and Safety Representative is responsible for:

- Administering the respiratory protection program.
- Setting up and conducting training program.
- Selecting and working with a medical contractor.
- Ensuring the office has the necessary respiratory protective equipment.
- Scheduling and conducting fit testing.
- Development of written standard operating procedures guiding the selection respiratory equipment.
- Maintaining fit test and medical records.

4.2 HEALTH AND SAFETY EQUIPMENT MANAGER

The health and safety equipment manager reports to the Office Health and Safety Representative and is responsible for the following:

- The inspection, maintenance and cleaning of respirators.
- The proper storage of respirators.
- Maintenance of records for the repair of respirators.
- Maintaining an adequate stock of cartridges for air purifying respirators. This person must ensure self-contained breathing apparatuses are filled with Grade D or better breathing air.
- Distributing respirators to field team members.

4.3 PROJECT HEALTH AND SAFETY OFFICER (PHSO)

All hazardous waste and industrial field investigations shall have a Project Health and Safety Officer. This individual reports to the Office Health and Safety Representative and is responsible for the following:

- Ensuring that any team member conducting a field investigation has received training in the selection and use of respirators and has the equipment necessary to conduct the investigation safely.
- Determining the degree of respiratory protection required for each field task or operation.
- Ensuring site-specific training is performed prior to onsite activities.
- Maintaining records of respirator use.

4.4 PROJECT STAFF

All project team members must read and conform to the Project Health and Safety Plan. Employees must present a copy of their fit test log to the equipment manager in order to receive a respirator. Employees are to perform daily inspections and cleaning of their assigned respirator. In the field respirators shall be stored in a convenient, clean and sanitary location when not in use. Workers must report any perceived problems or difficulties with respiratory protecive equipment to their Project Health and Safety Officer. These malfunctions may include, but are not limited to, the following:

- Perception of odor while wearing a respirator.
- Resistance in breathing during respirator use.
- Fatigue due to respirator use.

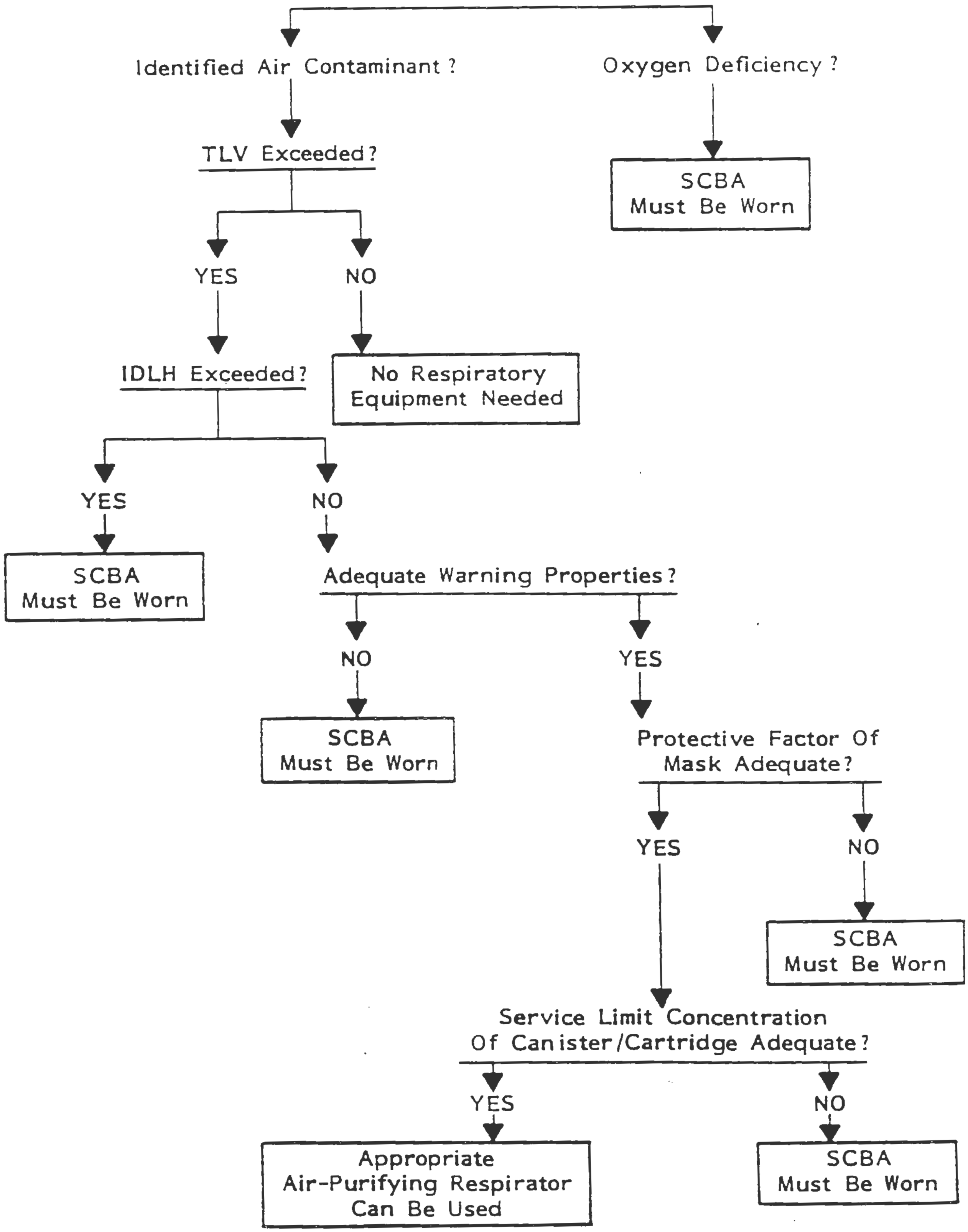
5.0 RESPIRATOR SELECTION

The investigation of hazardous waste sites presents workers with a number of environmental conditions, some of which are better defined than others. It is not the purpose of this document to provide precise decision logic criteria encompassing every potential environmental situation. Each situation is unique. This document recognizes that many decisions concerning respiratory protection selection involve aspects of risk assessment. This procedure ensures that all relevant data are considered in the process of conducting respiratory proectection risk assessments, resulting in the selection of specific respiratory protective equipment items appropriate for protection against hazardous chemical exposure. Steps to take include:

1. Assimilate all available information pertaining to the hazard including: past activities, suspected materials, historical information, land use, analytical data, nature of current activities, etc.
2. Evaluate the relevance and timeliness of the data to determine the appropriate protective level needed for the task.
   a) Is the analytical data relevant?
   b) Was the past sampling or monitoring conducted during the same season as is anticipated for the activities planned? If not, what implication might this hold?
   c) Was past sampling or monitoring conducted from a medium which is pertinent to the evaluation of hazards associated with the activities specified in the task work plan?
3. Identify substances present at the work area.
4. Utilizing the subject areas listed below, evaluate all of the known or suspected chemicals on site. Topics requiring elaboration are detailed in the decision logic criteria section (see Figure 1).
   a) Permissible Exposure Limits (PEL), Threshold Limit Values (TLV).
   b) Eye irritation potential for substance (see below, decision logic criteria section).
   c) Warning properties of substance (see below, decision logic criteria section).
   d) Immediately Dangerous to Life and Health (IDLH) cocnentrations (see below, decision logic criteria section).
   e) Any possibility of poor sorbent efficiency at IDLH concentrations and below.
   f) Is there a possibility of severe skin irritation resulting from skin contact with corrosive gases (see below, decision logic criteria).
   g) The vapor pressure of the substance.
   h) Any possibility of high heat of reaction with sorbent material in cartridge or canister (see below, decision logic criteria).
   i) Is there a possibility of shock sensitivity of chemical being sorbed onto the cartridge or canister (see below, decision logic criteria).

FIGURE 1

DECISION LOGIC FLOW CHART ON CHOOSING APPROPRIATE RESPIRATOR



5. Determine the physical state(s) of the substance as it is likely to be encountered at the hazardous waste site. It will be either:
   a) a gas or vapor;
   b) particulate (dust, fume, or mist), or
   c) a combination of (a) and (b).
6. Oxygen deficient atmospheres (ANSI Z88.2-1980) —- air-purifying respirators shall not be worn in environments deficient in oxygen (< 19.5% by volume or partial pressure less than 100 mm of mercury).

5.1 DECISION LOGIC CRITERIA

5.1.1 Skin Adsorption and Irritation

A supplied-air suit may provide skin protection from extremely toxic substances which may be absorbed through the skin or cause severe skin irritation. Most information concerning skin irritation is not quantitative but rather is presented in commonly used descriptive terms, such as "a strong skin irritant, highly irritating to the skin" and "corrosive to the skin." Decisions made concerning skin irritation are judgmental and are often based on this non-quantitative information. As a guideline for the use of the supplied-air suit for substances that are sorbed through the skin, a single skin penetration LD50 of 2 g/kg for any animal species is used.

5.1.2 Poor Warning Properties

Air-purifying devices cannot be used to protect against organic vapors with poor warning properties. Warning properties include odor, eye irritation, taste imparting characteristics, and respiratory irritation. Warning properties provide an indication to the wearer of possible cartridge exhaustion or of poor face piece fit. Adequate warning properties can be assumed when the substances odor, taste, or irritation effects are detectable and persistent at concentrations at or below the permissible exposure limit.

If the odor or irritation threshold of a substance is more than two times greater than the PEL, this substance should be considered to have poor warning properties. Some substances have extremely low thresholds of odor and irritation in relation to the permissible exposure limit. These substances can be detected by a worker within the face piece of the respirator even when the respirator is functioning properly. These substances are considered to have poor warning properties (see Table 1).

Although 30 CFR Part 11*[1] does not specifically eliminate the use of air-purifying respirators for pesticides with poor warning properties, prudent practices dictate that a respirator should not be used to protect against any substance with poor warning properties.

---

* The primary technical criteria for what constitutes a permissible respirator is determined by the technical requirements of 30 CFR Part 11 (Department of Interior, Bureau of Mines, Respiratory Protective Devices and Test for Permissibility).

5.1.3 Sorbents

There are certain limitations to the use of sorbent cartridge/canister respirators. When the following conditions exist, a sorbent cartridge is not recommended:

- A cartridge/canister air-purifying respirator can never be used when evidence exists of immediate (less than 3 minutes) breakthrough time at or below the IDLH concentration.
- An air-purifying canister/cartridge respirator shall not be used when there is reason to suspect that the sorbent does not provide adequate efficiency against the removal of a specific contaminant(s) that may be encountered at the site.
- Where there is reason to suspect that a sorbent has a high heat of reaction with a substance, use of that sorbent is not allowed.
- Where there is reason to suspect that a substance sorbed onto the surface of a cartridge or canister is shock sensitive, use of air-purifying respirators is prohibited.
- For concentrations of organic vapors which exceed 1,000 ppm (10 times the PEL for quarter masks or 50 times the PEL for full facepiece masks). Note: this respirator will not be selected if the contaminant or its concentration are unknown.

5.1.4 Eye Irritation

The decision of whether to use a full-face respirator or a half or quarter-face respirator is often made by considering the chemical's potential for producing eye irritation or damage. The following guidelines deal with eye protection.

Any eye irritation is considered unacceptable for routine work activities. Therefore, only full-face respirators are permissible in contaminant concentrations that produce eye irritation. For escape, some eye irritation is permissible if it is determined that such irritation would not inhibit escape and such irritation is reversible.

In instances where quantitative eye irritation data cannot be found in literature references, and theoretical considerations indicate that the substance should not be an eye irritant, half-face piece respirators are allowed.

In cases where a review of the literature indicates a substance causes eye irritation but no eye irritation threshold is specified, the full-face piece respirators can be used.
Immediately dangerous to life or health (IDLH)

The definition of IDLH provided in 30 CFR 11.3(t) is as follows:

> "Immediately dangerous to life or health" means conditions that pose an immediate threat to life or health or conditions that pose an immediate threat of severe exposure to contaminants, such as radioactive materials, which are likely to have adverse cumulative or delayed effects on health."

The purpose of establishing an IDLH exposure concentration is to insure that the worker can escape without injury or irreversible health effects in the event of failure of the respiratory protective equipment. The IDLH is considered the maximum concentration above which only

Table 1

Comparison of Selected Odor Thresholds and TlVs for Chemical Compounds

Compounds	Odor Threshold (ppm)	TLV (ppm)
Group 1 - Odor Threshold and TLV Approximately the Same		
Cyclohexane	300	300
Cyclohexanol	100	50
Epichlorhydrin	10	5
Ethylene diamine	11	10
Hydrogen chloride	10	5
Methyl acetate	200	200
Methylamine	10	10
Methyl chloroform	500	350
Nitrogen dioxide	5	3
Propyl alcohol	200	200
Turpentine	200	100
Group 2 - Odor Threshold from 2 to 10 Times the TLV		
Acrolein	0.2	0.1
Acrylonitrile	21.0	2.0
Allyl alcohol	7.0	2.0
Arsine	0.21	0.05
1,2-Dichloroethylene	500.0	200.0
Dichloroethyl ether	35.0	5.0
Dimethyl acetamide	46.0	10.0
Ethyl benzene	200.0	100.0
Hydrogen selenide	0.3	0.05
Isopropyl glycidyl ether (IGE)	300.0	50.0
Group 3 - Odor Threshold Equal to or Greater than 10 Times TLV		
Bromoform	530.0	0.5
Camphor (synthetic)	1.6-200	2.0
Carbon tetrachloride	75.0	5.0
Chloroacetophenone	1.0	0.05
Chloroform	200.0	10.0
Chloropicrin	1.0	0.1
Diglycidyl ether (DGE)	5.0	0.1
Dimethylformamide	100.0	10.0
Ethylene oxide	500.0	1.0
Methyl formate	2000.0	100.0
Methanol	2000.0	200.0
Methyl cyclohexanol	500.0	50.0
Phosgene	1.0	0.1
Toluene 2,4-diisocyanate (TDI)	2.0	0.005

a highly reliable positive-pressure self contained breathing apparatus is permitted. Since IDLH values are conservatively set, any approved respirator may be used up to its maximum use concentration below the IDLH.
In establishing the IDLH concentration the following factors are considered:

1. Escape without loss of life or irreversible health effects. Thirty minutes is considered the maximum permissible exposure time for escape.
2. Severe eye or respiratory irritation or other reactions which would prevent escape without injury.

IDLH should be determined from the following sources:

1. Specific IDLH concentration provided in the literature such as the AIHA

Hygienic Guides and the NIOSH Pocket Guide to Chemical Hazards

2. Human exposure data
3. Acute animal exposure data
4. Acute toxicological data from analogous substances.

The following guidelines should be used to interpret toxicological data reported in the literature for animal species:

1. Where acute inhalation exposure data (30 minutes to 4 hours) are available for various animal species the lowest exposure concentration causing death or irreversible health effects in any species is determined to be the IDLH concentration.
2. Chronic exposure data may have little relevance to the acute effects and should not be used in determining the IDLH.

5.1.6 <u>Protection Factors</u>

The protection factors of respiratory protection devices are a useful numerical tool to aid in the selection of appropriate respiratory protection. Protection factors measure the overall effectiveness of a respirator.

The protection factor of a given respirator for a specific user multiplied by the PEL for a given substance is the maximum allowable concentration of that substance for which the respirator may be used. For example, if the protection factor for a full-face mask respirator is 50 and substance X has a PEL (or TLV) of 10 ppm, the full-face mask respirator will provide protection up to 500 ppm (see Table 2).

5.1.2 <u>Respirator Types</u>

5.1.2.1 Air-Purifying Respirators

As mentioned earlier, an air-purifying respirator can be used only if the atmosphere contains greater than 19.5 percent oxygen and the contaminant is present at a concentration below the IDLH level. Another important consideration is that the contaminant in question has properties which will alert the user that the filter or sorbent is about to be exhausted. The various types of air-purifying respirators utilized by Atlanta are listed below.

5.1.2.2 **Half-Mask Respirators**

A half-mask respirator fits from under the chin to above the nose. One or two cartridges are used to filter the air and discarded once the use limits are reached. Whereas the quarter-mask is approved for only dusts, the half-mask has approved cartridges for pesticides, organic vapors, dusts, mists, fumes, acid gases, ammonia, and several combinations.

5.1.2.3 **Full Face Mask Respirators**

The whole face, including the eyes, is protected by the full face mask. It gives 5 times the protection of a half-mask (full face mask PF = 50, half-mask PF = 10). Full Face masks are more expensive, but the added protection is certainly advantageous, no matter how small the risk in a given situation.

5.1.2.4 **Atmosphere Supplying Respirators**

Atmosphere supplying respirators provide from 5 minutes to several hours of breathing air. The amount of protection provided is based upon the type of face piece and its mode of operation. The full face mask provides the best protection.

Of the three modes of operation, continuous, demand, and pressure-demand, the prêssure-demand mode provides the best protection.

There are two types of atmosphere supplying respirators that the Atlanta office uses: airline and self-contained breathing apparatus (SCBA). A description of each is presented below.

5.2.4.1 **Airline Respirator**

This respirator uses an airline to transport clean compressed air to the wearer. The mode of operation may be either continuous, demand, or pressure-demand. This respirator may be worn in an IDLH environment if: (1) it is pressure-demand type, and (2) it incorporates an escape SCBA into the system, however, no more than 300 feet of airline is allowed.

5.2.4.2 **Self-Contained Breathing Apparatus**

The self-contained breathing apparatus (SCBA) allows the wearer to carry a cylinder of compressed air or oxygen without the confinement of a hose or airline.
The North 801 and MSA Ultralite are the two types of SCBAs used by Engineering-Science. Both are open-circuit SCBAs. The North respirator is approved for demand and pressure demand modes. Greater protection is afforded, however, when these respirators are operated in the pressure demand mode.

5.2.4.3 **Escape**

Engineering-Science will provide and ensure that all employees will carry an escape respirator where exposure to extremely toxic substances may occur. (An extremely toxic substance is defined as a gas or vapor having an LC50 equal to or less than 10 ppm). An

Table 2

Selected Respirator Protection Factors

Type of Respirator	Protection Factor (Qualitative Test)
Air-purifying	
quarter-mask	10
half-mask	10
Air-line	
quarter-mask	10
half-mask	10
Hose mask	
full facepiece	10
SCBA, demand	
quarter-mask	10
half-mask	10
Air-purifying	
full facepiece	50
Air-line, demand	
full facepiece	50
SCBA, demand	
full facepiece	50
Air-line, pressure-demand, with escape provision	
full facepiece (no test required)	10,000+
SCBA, pressure-demand or positive pressure	
full facepiece (no test required)	10,000+

For additional information consult ANSI Z88.2 - 1980.

escape SCBA must have at least 5 minutes of breathing air stored in a small cylinder or coiled stainless-steel tube. Escape devices should never be used for entry into hazardous atmospheres.

4.3 SELECTION OF RESPIRATORS USING ACTIVITY MEASUREMENTS

Identification and evaluation of the contaminants that exist at a particular time provide the basis for selection of a respirator. However, real-time monitoring of activities at sites will be conducted using direct reading air monitoring instruments as the index of hazard. Therefore, respirators must be selected prior to initiating an activity, based on characterizations of groundwater and soils, knowledge of the area and associated waste, and previous measurements of worker exposure levels for the same or very similar tasks under similar conditions. Once a level of protection has been chosen, it can be modified based on real-time activity measurements, supplemented with background information and professional judgment.

Below are the allowed modifications. Please note carefully the qualifiers.

- Level B to Level D

This modification may be made in the sustained absence of volatiles or particulates as measured on real-time equipment and at the direction of the PHSO.

- Level C to Level D
  Same as Level B to Level D
- Level D to Level B

May be made at the direction of the PHSO based on the magnitude of the measurements and on professional judgment.

- Level C to Level B

Permissible at the direction of the PHSO in cases where total volatiles or particulate measurements exceed the preset action level based on characterization on the expected contaminants.

- Level D to Level C

Permissible at the direction of the PHSO when total volatiles or particulates exceed the preset action level based on characterization of the expected contaminants and when PEL-TWA measurements are being taken concurrently.

- Level B to Level C

May be made at the direction of the PHSO only when the contaminants and their concentrations are known. This modification should not be used without substantial knowledge of all the chemicals involved and their expected behavior in relation to change in concentration and effect on absorbent cartridges.

6.0 TRAINING AND FITTING

6.1 TRAINING

Selecting the respirator appropriate for a given hazard is important, but equally important is using the selected device properly. Proper use can be ensured by careful training of users and by maintenance of respiratory protective devices.

Engineering-Science requires respirator training as part of the initial training course conducted for workers who are to perform hazardous waste or industrial field operations. Additionally, the ES Denver office requires respirator training to be incorporated into the annual refresher training provided to employees performing hazardous waste activities. Both trainings will address the subjects in Table 3. Project-specific respirator training should be offered by the Project Health and Safety Officer as part of the initial site-specific training.

6.2 RESPIRATOR FITTING

The proper fitting of respiratory protective devices requires the use of a fit test. The fit test is needed to determine a proper match between the facepiece of the respirator and the face of the user.

The test subject shall be given the opportunity to choose the most comfortable respirator from various sizes and manufacturers. The test subject shall hold each facepiece up to the face and eliminate those which do not provide a comfortable fit.

The most comfortable mask is donned and worn for at least 5 minutes to assess comfort. The test subject should evaluate the following points:

- The position of the mask on the nose.
- The room available for eye protection or prescription inserts.
- The room available to talk.
- The position of the mask on the face and cheeks.

After the subject has determined the respirator of greatest comfort, that person shall conduct a negative and positive pressure fit check. Another facepiece shall be selected and retested if the test subject fails the fit checks. After the successful completion of the fit checks, the respirator fit shall be evaluated using a test atmosphere.

6.2.1 Test Atmospheres

The users of respirators are required to test the facepiece-to-face seal of the respirator and to wear the respirator in a test atmosphere. The test atmosphere is simulated in an enclosure that permits the user to enter with the equipment on while an atmosphere of a low-toxicity compound is generated. The isoamyl acetate and irritant smoke test described in the text that follows will be performed by the Office Health and Safety Representative every 6 months for personnel engaged in hazardous waste and industrial field operations. The Office Health and Safety Representative will follow the OSHA protocols for fit testing (29 CFR Part 1910.1028). A summary of this protocol is presented below. After

Table 3

Respirator Training

Lecture and Discussion

- Discussion of classification of respirators (e.g., air purifying and atmosphere-supplying respirators)
- Discussion of respirator capabilities and limitations.
- Instruction on setting "action levels".
- Instruction on OSHA Standard for respiratory protection.
- Proper fitting.
- Classroom and field training in recognizing and copy with emergencies.

Workshop and Field Exercise

- Field exercise in Levels A, B, and C protective ensembles.
- Disassembly and reassembly of respirators emphasizing components, their function, and their relation to the overall function of the respirator.
- Inspection of respirators.
- Proper donning and field fit testing.
- Fit testing with a test atmosphere.
- Cleaning, maintenance, and storage.

the fit test has been successfully completed, a fit test log (see Table 4) will be issued to the test subject.

6.2.1.1 Isoamyl Acetate Test

Isoamyl acetate, a low-toxicity substance with a banana-like odor, is used widely in testing the facepiece fit of organic vapor cartridge/canister respirators. The substance is applied to the cotton wad inside the enclosure. The user should put on the respiratory protective device in an area away from the test enclosure so there is no prior contamination of the cartridge or "pre-exposure" to the isoamyl acetate. The user should perform the following:

- Normal breathing.
- Deep breathing, as during heavy exertion.
- Side-to-side and up-and-down head movements. These movements should not be exaggerated, but should approximate those that take place on the job.
- Talking. This is most easily accomplished by reading a prepared text (e.g., Rainbow Passage) loudly enough to be understood by someone standing nearby.
- Other exercises may be added depending upon the need.

The major drawback of isoamyl acetate test is that odor thresholds vary widely among individuals. Also, the sense of smell is easily dulled and may deteriorate during the test so the user can detect only high vapor concentrations.

Another disadvantage is isoamyl acetate smells pleasant, even in high concentrations. Therefore, unless the worker is highly motivated toward wearing respirators, the results of this test are sometimes suspect.

6.2.1.2 Irritant Smoke Test

The irritant smoke test, similar to the isoamyl acetate test, is used widely in testing the facepiece fit of particulate and particulate/organic vapor filter respirators. This test can be used for both air-purifying and supplied-air respirators. The challenge agent is an irritant (stannic oxychloride) that is available commercially in sealed glass tubes. When the tube ends are broken and air passed through them, a dense, irritating smoke is emitted. In this test, the user steps into the test enclosure and the irritant smoke is sprayed into the enclosure. If the user detects any of the irritant smoke, a defective fit is indicated and adjustment or replacement of the respirator is required. The irritant smoke test must be performed with caution because the aerosol is highly irritating to the eyes, skin, and mucous membranes. As a qualitative means of determining respirator fit, this test has a distinct advantage in that the wearer usually reacts involuntarily to leakage by coughing or sneezing. The likelihood of giving a false indication of proper fit is reduced.

6.2.2 Daily Qualitative Fit Check at the Site

In the field each employee is responsible for performing daily qualitative fit checks of their assigned respirator prior to entry into a hazardous atmosphere. The daily determination of fit will consist of a negative and positive pressure fit checked as described below.

TABLE 4
ENGINEERING SCIENCE, INC.
BOSTON OFFICE
FIT–TEST RECORD LOG

NAME OF
EMPLOYEE: ______________________

LOCATION: ES BOSTON OFFICE (101 HUNTINGTON AVE., BOSTON, MA.)

SIGNATURE: ______________________ DATE: __________

NAME OF
FIT–TESTER: ______________________

SIGNATURE: ______________________ DATE: __________

TYPE OF RESPIRATOR:	FULL FACE
MANUFACTURER:	NORTH
MODEL:	7600–8A
CORRECTIVE LENSES:	YES

TYPE OF TEST	PASS/FAIL
ISOAMYL ACETATE	P F
IRRITANT SMOKE	P F

6.2.2.1 The Negative Pressure Test

In this test, the user closes off the inlet of the canister, cartridge(s), or filter(s) by covering it with the palm of their hand; inhales gently so that the facepiece collapses slightly; and holds their breath for about 10 seconds. If the facepiece remains slightly collapsed and no inward leakage is detected, the respirator is probably functioning correctly.

6.2.2.2 The Positive Pressure Test

This test is conducted by closing off the exhalation valve and exhaling gently into the facepiece. The fit is considered satisfactory if slight positive pressure can be built up inside the facepiece without any evidence of outward leakage.

7.0 RESPIRATOR INSPECTION, CLEANING, MAINTENANCE, AND STORAGE

7.1 INSPECTION

Respirator inspection to verify operating conditions and maintenance must be made an integral part of the overall respirator program. Wearing a poorly maintained or malfunctioning respirator is, in one sense, more dangerous than not wearing a respirator at all. The employee wearing a defective device thinks they are protected when, in reality, they are not. Emergency escape devices are particularly vulnerable to poor maintenance, since they generally are used infrequently, and then in the most hazardous and demanding circumstances.

7.1.1 Air Purifying Respirators (MSA UltraTwin)

Each individual must inspect their air purifying respirator. The warehouse health and safety equipment manager is responsible for inspecting respirators prior to assignment and upon receipt from the field. Table 5 lists the elements to be observed during the inspection process.

7.1.2 Self-contained Breathing Apparatus (MSA Ultralite and North 801)

Self-contained breathing apparatuses (SCBAs) must be inspected by the warehouse manager on a monthly basis and by the Project Health and Safety Officer prior to beginning work. Each worker must inspect their individual facepiece assembly according to the rubber facepiece and head harness inspection procedures in Table 6. An inspection checklist for SCBAs is presented in Table 7.

7.1.3 Emergency Escape Packs

These 5-minute escape packs will be thoroughly inspected monthly and placed back into service by the health and safety equipment manager. Inspections must include the following:

- Air supply.
- Hood integrity.
- Overall cleanliness.

- Air delivery hose.
- Harness integrity.

7.2 CLEANING AND STORAGE

The health and safety equipment manager is responsible for inspecting and cleaning (if necessary) all respirators returning from the field. Cleaning is accomplished either by using the manufacturers cleaner-sanitizer or by hand washing with a mild soap solution followed by a thorough rinse and air drying. After cleaning, sanitizing and inspecting the respirator, the equipment manager will repackage and store the respirator in an area protected against dust, sunlight, heat, extreme cold, excessive moisture or damaging chemicals. The respirators must be packed and stored so the exhalation valve will rest in a normal position. When respirators are used routinely in the field, they must be cleaned daily by the assigned person.

7.3 MAINTENANCE

Continued usage of respirators will require periodic repair or replacement of component parts of the equipment. Replacement of parts and repair of air purifying respirators, in most cases, present few problems. The manufacturer will provide replacement parts. Replacement parts for respiratory protective devices must be those of the manufacturer of the equipment. Substitution of parts from a different brand or type of respirator will invalidate the approval of the respirator. Maintenance of SCBA equipment is more difficult, primarily because of the valve and regulator assembly. Because of this, regulations require that SCBA equipment be returned to the manufacturer for adjustment or repair.

All maintenance required on a respirator must be recorded in the respirator's log book.

8.0 MEDICAL ASPECTS OF RESPIRATOR USE

Engineering-Science policy provides that no personnel will be permitted to wear a respirator without clearance from a physician to do so. The diagnostic protocol for a fit-to-work classification includes as assessment of the worker's ability to use air purifying respirators and SCBAs. The examining physician will have clinical data, including spirometry, x-ray, and cardiac-function data as well as physical observations on which to base a conclusion. Some individuals, especially those with marginal respiratory and cardiac functions, may experience a sense of choking (angina) when using respirators. If this is distinct and persistent, the worker should not be allowed to wear respiratory protective equipment. A specific conclusion addressing this requirement must accompany the worker's fit-to-work statement from the examining physician.

9.0 EVALUATION OF THE RESPIRATOR PROGRAM

The respirator program will be periodically evaluated by the Office Health and Safety Representative and modified as appropriate.

The auditing of respirator practices will determine whether the appropriate respirators are being selected and worn properly. Examination of respirators in use and in storage will indicate how well the equipment is being maintained. The results of periodic audits of

Table 5

Daily Inspection of Air Purifying Respirators

- **Rubber facepiece - check for:**
  - -- Excessive dirt (clean all dirt from facepiece).
  - -- Cracks, tears, or holes (obtain new facepiece).
  - -- Distortion (allow facepiece to "sit"free from any constraints and see if distortion disappears; if not, obtain new facepiece).
  - -- Cracked, scratched, or loose-fitting lenses.

- **Head harness - check for:**
  - -- Breaks or tears (replace head straps)
  - -- Loss of elasticity (replace head straps)
  - -- Broken or malfunctioning buckles or retaining clips (obtain new buckles).

- **Inhalation valve, exhalation valve - check for:**
  - -- Detergent residue, dust particles, or dirt on valve or valve seat (clean residue with soap and water).
  - -- Cracks, tears, or distortion in the valve material or valve seat (contact warehouse manager).
  - -- Missing or defective valve cover (obtain valve cover from equipment manager).

- **Cartridges and canisters - check for:**
  - -- Proper filter for the hazard (verify with Project Health and Safety Officer).
  - -- Missing or worn gaskets (contact warehouse manager for replacement).
  - -- Worn filter and facepiece threads (replace filter or facepiece).
  - -- Cracks or dents in filter housing (replace filter).

Table 6

Facepiece Inspection Sheet

Device:	ID#:
Date inspected:	Inspected by:

Checklist

Rubber facepiece:	O-rings (APR)
Rubber head harness:	Cartridge (APR)
	Type:
Rubber hose:	Exp. date:
Exhalation valve:	Washing Sanitization:
Inhalation valves (APR):	Antifogging Agent Application on lenses:
Speaking diaphram:	
Remarks:	

Table 7

Self-Contained Breathing Apparatus Monthly
Inspection Sheet

Device:	Serial #: _
Date inspected:	Inspected by:

Checklist

Rubber facepiece:	Antifogging Agent Application on lenses:
Rubber head harness:	Air Cylinder Pressure:
Rubber hose:	
O-rings	Bypass Valve (MSA):
Exhalation valve:	Mainline Valve (MSA):
Facepiece Lens:	Alarm:
Harness:	Regulatory Diaphragm (MSA):
Backpack:	Regulatory Function:
Washing/Sanitizing:	Demand Valve O.K. (North):
Operating Instructions:	Pressure Demand:
Hydrostatic test date:	Storage Box:
No visible damage:	
Remarks:	

respirator storage and use, consultations with wearers, measurements of hazard levels in work areas, and medical surveillance of wearers will be reviewed and analyzed to determine the effectiveness of the respirator program. Evidence of excessive exposure to hazards will be followed up to determine why inadequate protection was provided, and action will be taken to prevent a repeat of this problem.

APPENDIX A

OSHA RESPIRATORY PROTECTION STANDARD

(29 CFR Part 1910.134)

OCCUPATIONAL SAFETY AND HEALTH STANDARDS
SUBPART I — PERSONAL PROTECTIVE EQUIPMENT

(Code of Federal Regulations, Title 29, Chapter XVII, Part 1910, Subpart I; 36 FR 10466, May 29, 1971; amended at 36 FR 15105, August 13, 1971; 37 FR 22231, October 18, 1972; republished at 39 FR 23502, June 27, 1974; standard provision revoked at 43 FR 49726, October 24, 1978; amended at 49 FR 5322, February 10, 1984)

Subpart I—Personal Protective Equipment

§ 1910.132 General requirements.

(a) *Application*. Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

(b) *Employee-owned equipment*. Where employees provide their own protective equipment, the employer shall be responsible to assure its adequacy, including proper maintenance, and sanitation of such equipment.

(c) *Design*. All personal protective equipment shall be of safe design and construction for the work to be performed.

§ 1910.133 Eye and face protection.

(a) *General*. (1) Protective eye and face equipment shall be required where there is a reasonable probability of injury that can be prevented by such equipment. In such cases, employers shall make conveniently available a type of protector suitable for the work to be performed, and employees shall use such protectors. No unprotected person shall knowingly be subjected to a hazardous environmental condition. Suitable eye protectors shall be provided where machines or operations present the hazard of flying objects, glare, liquids, injurious radiation, or a combination of these hazards.

(2) Protectors shall meet the following minimum requirements:

(i) They shall provide adequate protection against the particular hazards for which they are designed.

(ii) They shall be reasonably comfortable when worn under the designated conditions.

(iii) They shall fit snugly and shall not unduly interfere with the movements of the wearer.

(iv) They shall be durable.

(v) They shall be capable of being disinfected.

(vi) They shall be easily cleanable.

(vii) Protectors should be kept clean and in good repair.

(3) Persons whose vision requires the use of corrective lenses in spectacles, and who are required by this standard to wear eye protection, shall wear goggles or spectacles of one of the following types:

(i) Spectacles whose protective lenses provide optical correction.

(ii) Goggles that can be worn over corrective spectacles without disturbing the adjustment of the spectacles.

(iii) Goggles that incorporate corrective lenses mounted behind the protective lenses.

(4) Every protector shall be distinctly marked to facilitate identification only of the manufacturer.

(5) When limitations or precautions are indicated by the manufacturer, they shall be transmitted to the user and care taken to see that such limitations and precautions are strictly observed.

(6) Design, construction, testing, and use of devices for eye and face protection shall be in accordance with American National Standard for Occupational and Educational Eye and Face Protection, Z87.1–1968.

§ 1910.134 Respiratory protection.

(a) *Permissible practice*. (1) In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to the following requirements.

(2) Respirators shall be provided by the employer when such equipment is necessary to protect the health of the employee. The employer shall provide the respirators which are applicable and suitable for the purpose intended. The employer shall be responsible for the establishment and maintenance of a respiratory protective program which shall include the requirements outlined in paragraph (b) of this section.

(3) The employee shall use the provided respiratory protection in accordance with instructions and training received.

(b) *Requirements for a minimal acceptable program*. (1) Written standard operating procedures governing the selection and use of respirators shall be established.

(2) Respirators shall be selected on the basis of hazards to which the worker is exposed.

(3) The user shall be instructed and trained in the proper use of respirators and their limitations.

(4) [Removed]
[1910.134(b)(4) deleted by 49 FR 5322, February 10, 1984]

(5) Respirators shall be regularly cleaned and disinfected. Those used by more than

one worker shall be thoroughly cleaned and disinfected after each use.
[1910.134(b)(5) amended by 49 FR 5322, February 10, 1984]

(6) Respirators shall be stored in a convenient, clean, and sanitary location.

(7) Respirators used routinely shall be inspected during cleaning. Worn or deteriorated parts shall be replaced. Respirators for emergency use such as self-contained devices shall be thoroughly inspected at least once a month and after each use.

(8) Appropriate surveillance of work area conditions and degree of employee exposure or stress shall be maintained.

(9) There shall be regular inspection and evaluation to determine the continued effectiveness of the program.

(10) Persons should not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. The local physician shall determine what health and physical conditions are pertinent. The respirator user's medical status should be reviewed periodically (for instance, annually).

(11) Approved or accepted respirators shall be used when they are available. The respirator furnished shall provide adequate respiratory protection against the particular hazard for which it is designed in accordance with standards established by competent authorities. The U.S. Department of Interior, Bureau of Mines, and the U.S. Department of Agriculture are recognized as such authorities. Although respirators listed by the U.S. Department of Agriculture continue to be acceptable for protection against specified pesticides, the U.S. Department of the Interior, Bureau of Mines, is the agency now responsible for testing and approving pesticide respirators.

(c) *Selection of respirators.* Proper selection of respirators shall be made according to the guidance of American National Standard Practices for Respiratory Protection Z88.2–1969.

(d) *Air quality.* (1) Compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity. Oxygen shall meet the requirements of the United States Pharmacopoeia for medical or breathing oxygen. Breathing air shall meet at least the requirements of the specification for Grade D breathing air as described in Compressed Gas Association Commodity Specification G–7.1–1966. Compressed oxygen shall not be used in supplied-air respirators or in open circuit self-contained breathing apparatus that have previously used compressed air. Oxygen must never be used with air line respirators.

(2) Breathing air may be supplied to respirators from cylinders or air compressors.

(i) Cylinders shall be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR Part 178).

(ii) The compressor for supplying air shall be equipped with necessary safety and standby devices. A breathing air-type compressor shall be used. Compressors shall be constructed and situated so as to avoid entry of contaminated air into the system and suitable in-line air purifying sorbent beds and filters installed to further assure breathing air quality. A receiver of sufficient capacity to enable the respirator wearer to escape from a contaminated atmosphere in event of compressor failure and alarms to indicate compressor failure and overheating shall be installed in the system. If an oil-lubricated compressor is used, it shall have a high-temperature or carbon monoxide alarm, or both. If only a high-temperature alarm is used, the air from the compressor shall be frequently tested for carbon monoxide to insure that it meets the specifications in subparagraph (1) of this paragraph.

(3) Air line couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of air line respirators with nonrespirable gases or oxygen.

(4) Breathing gas containers shall be marked in accordance with American National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained, Z48.1–1954; Federal Specification BB–A–1034a, June 21, 1968, Air, Compressed for Breathing Purposes; or Interim Federal Specification GG–B–00675b, April 27, 1965, Breathing Apparatus, Self-Contained.

(e) *Use of respirators.* (1) Standard procedures shall be developed for respirator use. These should include all information and guidance necessary for their proper selection, use, and care. Possible emergency and routine uses of respirators should be anticipated and planned for.

(2) The correct respirator shall be specified for each job. The respirator type is usually specified in the work procedures by a qualified individual supervising the respiratory protective program. The individual issuing them shall be adequately instructed to insure that the correct respirator is issued.
[1910.134(e)(2) amended by 49 FR 5322, February 10, 1984]

(3) Written procedures shall be prepared covering safe use of respirators in dangerous atmospheres that might be encountered in normal operations or in emergencies. Personnel shall be familiar with these procedures and the available respirators.

(i) In areas where the wearer, with failure of the respirator, could be overcome by a toxic or oxygen-deficient atmosphere, at least one additional man shall be present. Communications (visual, voice, or signal line) shall be maintained between both or all individuals present. Planning shall be such that one individual will be unaffected by any likely incident and have the proper rescue equipment to be able to assist the other(s) in case of emergency.

(ii) When self-contained breathing apparatus or hose masks with blowers are used in atmospheres immediately dangerous to life or health, standby men must be present with suitable rescue equipment.

(iii) Persons using air line respirators in atmospheres immediately hazardous to life or health shall be equipped with safety harnesses and safety lines for lifting or removing persons from hazardous atmospheres or other and equivalent provisions for the rescue of persons from hazardous atmospheres shall be used. A standby man or men with suitable self-contained breathing apparatus shall be at the nearest fresh air base for emergency rescue.

(4) Respiratory protection is no better than the respirator in use, even though it is worn conscientiously. Frequent random inspections shall be conducted by a qualified individual to assure that respirators are properly selected, used, cleaned, and maintained.

(5) For safe use of any respirator, it is essential that the user be properly instructed in its selection, use, and maintenance. Both supervisors and workers shall be so instructed by competent persons. Training shall provide the men an opportunity to handle the respirator, have it fitted properly, test its face-piece-to-face seal, wear it in normal air for a long familiarity period, and, finally, to wear it in a test atmosphere.

(i) Every respirator wearer shall receive fitting instructions including demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly. Respirators shall not be worn when conditions prevent a good face seal. Such conditions may be a growth of beard, sideburns, a skull cap that projects under the facepiece, or temple pieces on glasses. Also, the absence of one or both dentures can seriously affect the fit of a facepiece. The worker's diligence in observing these factors shall be evaluated by periodic check. To assure proper protection, the facepiece fit shall be checked by the wearer each time he puts on the respirator. This may be done by following the manufacturer's facepiece fitting instructions.

(ii) Providing respiratory protection for individuals wearing corrective glasses is a serious problem. A proper seal cannot be established if the temple bars of eye glasses extend through the sealing edge of the full facepiece. As a temporary measure, glasses with short temple bars or without temple bars may be taped to the wearer's head. Wearing of contact lenses in contaminated atmospheres with a respirator shall not be allowed. Systems have been developed for mounting corrective lenses inside full facepieces. When a workman must wear corrective lenses as part of the facepiece, the facepiece and lenses shall be fitted by qualified individuals to provide good vision, comfort, and a gas-tight seal.

(iii) If corrective spectacles or goggles are required, they shall be worn so as not to affect the fit of the facepiece. Proper selection of equipment will minimize or avoid this problem.

(f) *Maintenance and care of respirators.* (1) A program for maintenance and care of respirators shall be adjusted to the type of plant, working conditions, and hazards involved, and shall include the following basic services:

(i) Inspection for defects (including a leak check).

(ii) Cleaning and disinfecting.

(iii) Repair.

(iv) Storage

Equipment shall be properly maintained to retain its original effectiveness.

(2) (i) All respirators shall be inspected routinely before and after each use. A respirator that is not routinely used but is kept ready for emergency use shall be inspected after each use and at least monthly to assure that it is in satisfactory working condition.

(ii) Self-contained breathing apparatus shall be inspected monthly. Air and oxygen cylinders shall be fully charged according to the manufacturer's instructions. It shall be determined that the regulator and warning devices function properly.

(iii) Respirator inspection shall include a check of the tightness of connections and the condition of the facepiece, headbands, valves, connecting tube, and canisters. Rubber or elastomer parts shall be inspected for pliability and signs of deterioration. Stretching and manipulating rubber or elastomer parts with a massaging action will keep them pliable and flexible and prevent them from taking a set during storage.

(iv) A record shall be kept of inspection dates and findings for respirators maintained for emergency use.

(3) Routinely used respirators shall be collected, cleaned, and disinfected as frequently as necessary to insure that proper protection is provided for the wearer. Respirators maintained for emergency use shall be cleaned and disinfected after each use.

[1910.134(f)(3) amended by 49 FR 5322, February 10, 1984]

(4) Replacement or repairs shall be done only by experienced persons with parts designed for the respirator. No attempt shall be made to replace components or to make adjustment or repairs beyond the manufacturer's recommendations. Reducing or admission valves or regulators shall be returned to the manufacturer or to a trained technician for adjustment or repair.

(5) (i) After inspection, cleaning, and necessary repair, respirators shall be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators placed at stations and work areas for emergency use should be quickly accessible at all times and should be stored in compartments built for the purpose. The compartments should be clearly marked. Routinely used respirators, such as dust respirators, may be placed in plastic bags. Respirators should not be stored in such places as lockers or tool boxes unless they are in carrying cases or cartons.

(ii) Respirators should be packed or stored so that the facepiece and exhalation valve will rest in a normal position and function will not be impaired by the elastomer setting in an abnormal position.

(iii) Instructions for proper storage of emergency respirators, such as gas masks and self-contained breathing apparatus, are found in "use and care" instructions usually mounted inside the carrying case lid.

(g) *Identification of gas mask canisters.* (1) The primary means of identifying a gas mask canister shall be by means of properly worded labels. The secondary means of identifying a gas mask canister shall be by a color code.

(2) All who issue or use gas masks falling within the scope of this section shall see that all gas mask canisters purchased or used by them are properly labeled and colored in accordance with these requirements before they are placed in service and that the labels and colors are properly maintained at all times thereafter until the canisters have completely served their purpose.

(3) On each canister shall appear in bold letters the following:

(i)—

Canister for ....

(Name for atmospheric contaminant)

or

Type N Gas Mask Canister

(ii) In addition, essentially the following wording shall appear beneath the appropriate phrase on the canister label: "For respiratory protection in atmospheres containing not more than ...... percent by volume of ...."

(Name of atmospheric contaminant)

(iii) [Revoked]

(4) Canisters having a special high-efficiency filter for protection against radionuclides and other highly toxic particulates shall be labeled with a statement of the type and degree of protection afforded by the filter. The label shall be affixed to the neck end of, or to the gray stripe which is around and near the top of, the canister. The degree of protection shall be marked as the percent of penetration of the canister by a 0.3-micron-diameter dioctyl phthalate (DOP) smoke at a flow rate of 85 liters per minute.

(5) Each canister shall have a label warning that gas masks should be used only in atmospheres containing sufficient oxygen to support life (at least 16 percent by volume), since gas mask canisters are only designed to neutralize or remove contaminants from the air.

(6) Each gas mask canister shall be painted a distinctive color or combination of colors indicated in Table I-1. All colors used shall be such that they are clearly identifiable by the user and clearly distinguishable from one another. The color coating used shall offer a high degree of resistance to chipping, scaling, peeling, blistering, fading, and the effects of the ordinary atmospheres to which they may be exposed under normal conditions of storage and use. Appropriately colored pressure sensitive tape may be used for the stripes.

[Section 1910.134(g)(3)(iii) revoked at 43 FR 49726, October 24, 1978, 1978, effective November 24, 1978]

TABLE I-1

Atmospheric contaminants to be protected against	*Colors assigned**
Acid gases	White.
Hydrocyanic acid gas	White with ½-inch green stripe completely around the canister near the bottom.
Chlorine gas	White with ½-inch yellow stripe completely around the canister near the bottom
Organic vapors	Black.
Ammonia gas	Green.
Acid gases and ammonia gas	Green with ½-inch white stripe completely around the canister near the bottom.
Carbon monoxide	Blue.
Acid gases and organic vapors	Yellow.
Hydrocyanic acid gas and chloropicrin vapor	Yellow with ½-inch blue stripe completely around the canister near the bottom.
Acid gases, organic vapors, and ammonia gases.	Brown.
Radioactive materials, excepting tritium and noble gases.	Purple (Magenta).
Particulates (dusts, fumes, mists, fogs, or smokes) in combination with any of the above gases or vapors.	Canister color for contaminant, as designated above, with ½-inch gray stripe completely around the canister near the top.
All of the above atmospheric contaminants	Red with ½-inch gray stripe completely around the canister near the top.

*Gray shall not be assigned as the main color for a canister designed to remove acids or vapors.

NOTE: Orange shall be used as a complete body, or stripe color to represent gases not included in this table. The user will need to refer to the canister label to determine the degree of protection the canister will afford.

[Sec. 1910.134(g)(6)]

§ 1910.135 Occupational head protection.

Helmets for the protection of heads of occupational workers from impact and penetration from falling and flying objects and from limited electric shock and burn shall meet the requirements and specifications established in American National Standard Safety Requirements for Industrial Head Protection, Z89.1-1969.

§ 1910.136 Occupational foot protection.

Safety-toe footwear for employees shall meet the requirements and specifications in American National Standard for Men's Safety-Toe Footwear, Z41.1-1967.

§ 1910.137 Electrical protective devices.

Rubber protective equipment for electrical workers shall conform to the requirements established in the American National Standards Institute Standards as specified in the following list:

Item	*Standard*
Rubber insulating gloves	J6.6-1967.
Rubber matting for use around electric apparatus	J6.7-1935 (R1962).
Rubber insulating blankets.	J6.4-1970.
Rubber insulating hoods	J6.2-1950 (R1962).
Rubber insulating line hose	J6.1-1950 (R1962)
Rubber insulating sleeves	J6.5-1962.

§ 1910.138 Effective dates.

(a) The provisions of this Subpart I shall become effective on August 27, 1971, except that:

(1) Any provision in any other section of this subpart which contains in itself a specific effective date or time limitation shall become effective on such date or shall apply in accordance with such limitation; and

(2) If any standard in 41 CFR Part 50-204, other than a national consensus standard incorporated by reference in § 50-204.2(a)(1), is or becomes applicable at any time to any employment and place of employment, by virtue of the Walsh-Healey Public Contracts Act, or the Service Contract Act of 1965, or the National Foundation on Arts and Humanities Act of 1965, any corresponding established Federal standard in this Subpart I which is derived from 41 CFR Part 50-204 shall also become effective, and shall be applicable to such employment and place of employment, on the same date

§ 1910.139 Sources of standards.

Sec	*Source*
1910.132	41 CFR 50-204.7.
1910.133(a)	ANSI Z87.1-1968. Eye and Face Protection.
1910.134	ANSI Z88.2-1969. Standard Practice for Respiratory Protection.
1910.134 Table I-I.	ANSI K13.1-1967. Identification of Gas Mask Canister.
1910.135	ASNI Z89.1-1969. Safety Requirements for Industrial Head Protection.
1910.136	ANSI Z41.1-1967. Men's Safety-Toe Footwear.
1910.137	ANSI Z9.4-1968. Ventilation and Safe Practices of Abrasive Blasting Operations.

§ 1910.140 Standards organizations.

Specific standards of the following organization have been referenced in this part. Copies of the referenced materials may be obtained from the issuing organization.

American National Standards Institute, 1430 Broadway, New York, NY 10018

ATTACHMENT F

PARSONS-MAIN, INC.
CONFINED SPACE ENTRY PROCEDURES

APPENDIX C

CHEMICAL DATA ACQUISITION PLAN

CERCLA SITE INSPECTIONS

AT

FIFTEEN SOLID WASTE MANAGEMENT UNITS

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2.0 PROJECT DESCRIPTION

This Chemical Data Acquisition Plan (CDAP) has been prepared for the CERCLA Expanded Site Investigations (ESI) at fifteen solid waste management units (SWMUs) at the Seneca Army Depot (SEAD) and will serve as the Quality Assurance Project Plan (QAPP) for this site. This CDAP presents the policies, organization, objectives, quality assurance (QA), and quality control (QC) activities to be implemented in this CERCLA ESI. This document has been prepared in accordance with the U.S. Army Corps of Engineers Regulation "Chemical Data Quality Management for Hazardous Waste Remedial Activities" (ER 1110-1-263; March 1990) and NYS Department of Environmental Conservation Division of Hazardous Substances Regulation "RCRA Quality Assurance Project Plan Guidance" (July 1989).

Engineering Science, Inc. has been retained by the U.S. Army Corps of Engineers to conduct a CERCLA ESI to determine the nature of environmental impacts at each of the fifteen SMWUs.

Matrices to be sampled and analyzed during the ESI include soil, groundwater, surface water, and sediment. In performing these analyses, the contracted laboratory will follow all procedures specified in the latest NYSDEC Contract Laboratory Program (CLP) Statement of Work (SOW) for CLP analyses. Non-CLP analyses will be performed in accordance with the methods specified in Section 7 of this CDAP.

The Work Plan (WP), including the Field Sampling and Analysis Plan (FSAP) and the Health and Safety Plan (HASP), prepared for this ESI contains complete discussions of specific task objectives, their relationships to previous investigations, detailed project design, sampling protocols, and Quality Assurance/Quality Control requirements for sampling. The number and type of samples collected and submitted to the laboratory for analysis are outlined in these plans.

3.0 CHEMICAL DATA QUALITY OBJECTIVES

3.1 PROJECT OBJECTIVES AND SCOPE

Specific project objectives include:

- Determine if there has been a release of hazardous constituents from each of the fifteen SMWUs and
- Determine background levels of constituents of concern
- Determine sources of contamination to the best degree possible based on the data proposed in the Workplan.

The investigation of the fifteen SMWUs will involve sampling of soil, sediment, surface water and groundwater. The basic approach of the Work Plan is to investigate areas likely to have been impacted by a release of hazardous materials. In general, the majority of the sample locations will be located in areas which have the highest potential for being impacted. Some sampling locations on each SWMU will be located in upgradient positions to establish background conditions.

The general parameters of concern are volatile and semi-volatile organic compounds, explosive compounds, PCBs and heavy metals although not all parameters will be tested for at each SWMU.

At this writing, there are no air monitoring programs planned other than that required for health and safety monitoring due to field work. If results are obtained during the course of this CERCLA site investigation indicating that an air monitoring program would aid in the investigation of the site, then air samples will be proposed for the contaminants of concern during the RI/FS.

3.2 QUALITY ASSURANCE OBJECTIVES FOR CHEMICAL MEASUREMENTS

The data quality objectives discussed below ensure that all data generated or developed will be in accordance with procedures appropriate for its intended use, and that the data will be of known and documented quality and be able to withstand scientific and legal scrutiny. The quality of the measurement data can be defined in terms of completeness, representativeness, accuracy, precision, comparability, and traceability. Each of these terms is defined as follows:

- Completeness is defined as the percentage of measurements that are judged to be valid measurements. Factors that negatively affect completeness include the following: missing scheduled sampling events, submitting improper quantity of sample, sample leakage or breakage in transit or during handling, missing prescribed holding times, losing sample during laboratory analysis through accident or improper handling, improper documentation such that traceability is compromised, or rejection of sample results due to failure to conform to QC criteria specifications. A completeness objective of at least 90% of the data specified by the statement of work is the goal established for this project.

- Representativeness expresses the degree to which the sample data accurately and precisely represent the population from which the sample was collected. Representativeness is a qualitative parameter that will be controlled by the proper design and management of the sampling program. The QA goal will be to have all samples and measurements be representative of the media sampled and aliquots taken for analysis should be representative of the sample received.

- Accuracy is the measure of agreement between an analytical result and its "true" or accepted value. Large deviations from a known value represent a change in the measurement system. Potential sources of deviation include (but are not limited to) the sampling process, sample preservation, sample handling, matrix effects, sample analysis, and data reduction. Sampling accuracy is typically assessed by collecting and analyzing field and trip blanks for the parameters of interest. Analytical laboratory accuracy is determined by comparing results from the analysis of matrix spikes, surrogates, or check standards to their known values. Accuracy results are generally expressed as Percent Recovery (%R). Accuracy goals for the parameters to be analyzed are presented in Section 7 of this document.

- Precision is the determination of the reproducibility of measurements under a given set of conditions, or a quantitative measure of the variability of a group of measurements compared to their average value. Precision is typically measured by analyzing field duplicates and laboratory duplicates (sample duplicate, matrix spike duplicate, check standard duplicate, and/or laboratory blank duplicate). Precision is most frequently expressed as standard deviation (SD), percent relative standard deviation (%RSD), coefficient of variation (CV), or relative percent difference (%RPD). Precision goals for the parameters to be analyzed are presented in Section 7 of this document.

- Comparability is a qualitative parameter expressing the confidence with which one dataset can be compared with another. Sample data should be comparable with other measurement data for similar samples collected under similar sampling conditions. The utilization of standard sampling techniques, analytical methodologies, and reporting units will aid in ensuring the comparability of data. All results will be reported in a standard format using appropriate, defined units of measure. All laboratory data will be reported according to New York State Department of Environmental Conservation Contract Laboratory Protocols for Level IV and Level III data deliverables.

- Traceability is the extent to which reported analytical results can be substantiated by supporting documentation. Traceability documentation exists in two essential forms; those which link the quantitation process to authoritative standards, and those which explicitly describe the history of each sample from collection to analysis and disposal. The traceability goal for this project is 100%.

The fundamental mechanisms that will be employed to achieve these quality goals are: (1) prevention of defects in quality through planning and design, documented instructions and procedures, and careful selection and training of skilled, qualified personnel, (2) quality assessment through a program of regular audits and inspections, and (3) corrective action in response to audit findings. This CDAP has been prepared in response to these goals and describes the Quality Assurance Program to be implemented and the QC procedures to be followed by Engineering Science and Engineering Science's subcontractors during the course of the ESI of fifteen SMWUs at the Seneca Army Depot.

4.0 AE CONTRACTOR PROJECT ORGANIZATION AND FUNCTIONAL AREA RESPONSIBILITIES

4.1 PROJECT ORGANIZATION

This section describes the organizational structure, lines of authority, and responsibilities of individuals who will be responsible for the successful execution of the CDAP. Subcontractor personnel providing services in support of this project will perform work in strict compliance with the appropriate contract specifications for this activity.

The CERCLA ESI of fifteen SMWUs at SEAD requires the combined effort of three firms. Engineering Science is responsible for overall project activities including coordination of the two firms subcontracted for sampling, analytical services, and consultation. UXB, Inc. will provide expertise in the area of explosive ordinance disposal. They will be the first consultants on-site to assess whether UXOs and explosive material are at each SWMU. ES and Aquatec, Inc. will provide all necessary field sampling services. Aquatec, Inc. will also provide equipment, materials, and personnel for all field and laboratory analyses for samples associated with this investigation. ES is also responsible for the preparation of all final evaluation reports.
Mr. Michael Duchesneau, P.E., the Engineering Science Project Manager, is responsible for managing the implementation and performance of the project on a day-to-day basis. He will have the overall responsibility of managing and administrating project tasks, schedules, budgets, and completion. He will also be responsible for coordinating the efforts of the assigned project staff and for establishing the performance standards and data quality objectives for all work initiated.

Mr. Duchesneau will be supported during the performance of this program by numerous individuals at Engineering Science. Principal assistance will be provided by Chief Discipline Scientists, who are responsible for assuring the quality of work conducted by individuals that fall under their line management responsibility. Figure 5-2 of Section 5 in the Work Plan illustrates the organizational structure as it applies to this project.

Mr. James Chaplick is the Technical Advisor for this project and the Boston office's Chief Discipline Engineer responsible for establishing work performance objectives and standards for all operations related to remedial investigations or studies. Assisting, and reporting directly to, Mr. Chaplick are two lead scientists who focus and specialize on specific disciplines that are required during implementation of the ESI. These include Mr. Mark Baker, the Remedial Services Manager, and Mr. Philip Hunt, the Safety and Health Officer.

Independent oversight of quality related issues pertinent to this project will be maintained by Mr. Stanley Fielding, who is the Project Quality Assurance Officer (PQAO). Mr. Fielding will oversee and monitor all day-to-day and project-specific data collection and generation activities. The PQAO will function as an independent reviewer of the project's adherence to the QA/QC procedures identified in this document. Specifically, he will be responsible for initiating and documenting the findings of required Performance and Systems Audits; for overseeing Preventive Maintenance activities; for defining measures as they may be necessary to correct conditions that are out of control; and for reporting all findings to designated project management. The PQAO will report findings directly to Mr. Duchesneau and Engineering Science's management. The PQAO will also prepare monthly reports showing findings of his review activities (see Reports to Management described below) which will be provided to the EPA in Monthly Progress Reports.

4.2 FIELD SAMPLING RESPONSIBILITIES

All field sampling activities will be coordinated through the Project Manager. He is responsible for the development, review, and implementation of sampling work plans for the ESI. The implementation of these work plans includes performance and system audits of the sampling activities by the PQAO with reports submitted to the Project Manager for initiation of corrective action.

The customer service representative at Aquatec, Inc. will be Pauline T. Malik. Ms. Malik is responsible for communicating information to Engineering Science concerning sample handling, applicability of EPA methodologies, and interpreting analysis results and for communicating requests and information from Engineering Science to laboratory personnel.

Sampling personnel will be experienced in U.S. EPA and NYSDEC procedures for surface and subsurface soils and water sampling. In addition, all on-site personnel will have completed the 40-hour health and safety training course in accordance with Occupational Safety and Health Administration (OSHA) requirements. The project Health and Safety Plan, will be made available for all personnel on-site. Sign-off sheets verifying that personnel have read the plan will be maintained on file.

Sampling personnel have the responsibility for field calibration of measurement and test equipment on their respective project tasks. All equipment used in the field, such as pH meter, thermometer, and specific conductance meter will have a calibration check on a daily basis to use. They will maintain field notebooks documenting project activities and will complete other documentation including boring and sampling logs. They will also be responsible for proper labeling, handling, storage, shipping, and chain-of-custody procedures for samples collected during their project tasks.

4.3 CONTRACT LABORATORY RESPONSIBILITIES

A discussion of Aquatec, Inc. including location, personnel, facilities, instrumentation, and capabilities is contained in Aquatec's Quality Assurance Program Plan (QAPP) attached as Appendix A to this appendix.

Samples will be analyzed in the Aquatec's laboratory in South Burlington, Vermont under the direction of Neal Van Wyck, Laboratory Director, assisted by Karen R. Chirgwin, Aquatec's Quality Assurance Officer; Joseph J. Orsini, Ph.D., Inorganic Laboratory Supervisor; and Gary B. Stidsen, Organic Laboratory Supervisor. Analysts and technicians in each laboratory section are responsible for analyzing the samples and performing QC analyses and specified procedures to ensure reliability of the data. They are responsible for proper documentation of all analyses and QC procedures, including the primary data review of results.

5.0 FIELD ACTIVITIES

A detailed description of field procedures are included in the Field Sampling and Analysis Plan (FSAP) which is included as Appendix A of the Work Plan. The FSAP will address the following topics:

- UXO clearance procedures
- Geophysical survey procedures
- Sample collection procedures for each matrix.
- Description of sampling devices and equipment
- Decontamination procedures
- Waste handling procedures

5.1 LIST OF EQUIPMENT, CONTAINERS, AND SUPPLIES TO BE TAKEN TO THE FIELD

The field equipment needed to perform the field activities at each SWMU are described in the FSAP. In general, this equipment consists of sampling equipment, bottles to store samples, preservatives, sample storage and shipping supplies, decontamination supplies, personal protection equipment, instruments for field screening and health and safety, and forms and notebooks to record data.

5.2 SAMPLING LOCATIONS

The sampling locations for each SWMU are described in Section 4 of the Work Plan. These samples will be used to obtain information on the extent of contaminants of concern, locate releases, and measure background concentrations.

5.3 GENERAL INFORMATION AND DEFINITIONS

a. Contractor Laboratory. The laboratory performing analysis of the field samples. This may be an AE laboratory, a Remedial Action contractor laboratory or a laboratory subcontracted by either. Aquatec, Inc. in South Burlington, Vermont has been chosen to analyze the samples.

b. QA and QC Samples. Samples analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. QA and QC samples include splits or replicates of field samples, rinsate blanks, trip blanks, and matrix spike/matrix spike duplicates.

QC Samples. Quality Control samples are collected by the sampling team in duplicate for use by the contractor'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 contractor's analytical lab are of suitable quality. QC samples represent approximately 5% of the field samples.

QA Samples. Split samples sent to a USACE QA laboratory by overnight delivery and analyzed to evaluate the AE and the contractor laboratory performance. QA samples represent approximately 5% of the field samples. The contractor shall coordinate with the designated QA laboratory not less than 48 hours before sampling to assure that the QA laboratory is alerted to receive the QA samples and process then within the time limits specified by applicable EPA regulations and guidelines.

c. Split Samples. Samples that are collected as a single sample, homogenized, divided into two or more equal parts, and placed into separate containers. The sample shall be split in the field prior to delivery to a laboratory. Ordinarily, split samples are analyzed by two different laboratories.

d. Replicate (duplicate, triplicate, etc) Samples. Multiple grab samples, collected separately, that equally represent a medium at a given time and location. This is the required type of collocated sample for volatile organic analyses and most groundwater and surface water samples.

e. Rinsate Blank (Field Equipment Blank). Samples consisting of demonstrated analyte free water collected from a final rinse of sampling equipment after the decontamination procedure has been performed. The purpose of rinsate blanks is to determine whether the sampling equipment is causing cross contamination of samples.

f. Trip Blank. Containers of demonstrated analyte-free water that are kept with the field sample containers from the time they leave the laboratory until the time they are returned to the laboratory. The purpose of trip blanks is to determine whether aqueous samples are being contaminated during transit or sample collection. Trip blanks pertain only to aqueous volatile organic analyses; therefore, the containers must contain no headspace. Only one trip blank is needed for one day's sampling and shall satisfy trip blank requirements for all matrices for that day.

5.4 SAMPLING AND PRESERVATION PROCEDURES

5.4.1 Sample Containers and Preservation

It is essential to the validity of analytical results that samples be collected and stored in properly prepared containers to minimize sources of contamination. New precleaned sampling glassware and containers will always be used. Containers from ESS or another supplier that meets the conditions in "Specifications and Guidance for Obtaining Contaminant-Free Sample Containers" published by EPA's Office of Emergency and Remedial Response in April 1990 will be used for this ESI. The type and size of sample containers required are indicated in Table C-1.

Proper sample preservation techniques are important to maintain the integrity of the sample and validity of the analytical results. Methods of preservation are intended to (1) retard biological activity, (2) retard hydrolysis of chemical compounds and complexes, (3) reduce volatility of constituents, and (4) reduce absorption effects. Preservation methods are generally limited to pH control, chemical additives, and refrigeration. The USACE Sample Handling Protocols (Appendix E to ER 1110-1-263) for the contaminants of concern at SEAD are listed in Table C-1.

Field personnel will add preservatives to the bottles that will be used that day (or prepreserved bottles will be used) and carry equipment (ice and coolers) to keep the sample below 4°C (+/- 2°C) during the day. The only type of preservation used for soil samples is storage at or below 4°C (+/- 2°C), so field personnel will ensure that the necessary supplies such as ice and ice chests are readily available at the collection site. Sample preservation will be initiated by field personnel immediately upon sample collection.

TABLE C-1

REQUIRED CONTAINERS, PRESERVATION AND HOLDING TIMES

		Containers[1]	Preservation	Maximum Holding Time
I.	Groundwater, Surface Water, Oil, and Other Liquids			
1.	Mercury	P[2]	HNO_3 TO pH<2	28 days
2.	Metals, except Mercury	P[2]	HNO_3 to pH<2	180 days
3.	Explosives	G[3]	Cool, 4°C	7/40 days[4]
4.	Volatiles	G[7]	HCL to pH<2,4°C	14 days
5.	Semi-Volatiles	G[6]	Cool, 4°C	7/40 days[4]
6.	Pesticides/PCBs	G[6]	Cool, 4°C	7/40 days[4]
7.	Fluoride	P	None Required	28 days
8.	Nitrate	P,G	Cool, 4°C	2 days
9.	Total Petroleum Hydrocarbons	G[6]	HCL to pH<2,4°C	28 days
10.	Radioactivity	P[8]	HNO_3 to pH<2	6 months
II.	Soil, Asbestos, and Other Solids			
1.	Mercury	G[5]	Cool, 4°C	28 days
2.	Metals, except Mercury	G[5]	Cool, 4°C	180 days
3.	Explosives	G[6]	Cool, 4°C	7/40 days[4]
4.	Volatiles	G[7]	Cool, 4°C	14 days
5.	Semi-Volatiles	G[3]	Cool, 4°C	7/40 days[4]
6.	Pesticides/PCBs	G[3]	Cool, 4°C	7/40 days[4]
7.	Fluoride	P	None Required	28 days
8.	Nitrate	P,G	Cool, 4°C	2 days
9.	Asbestos	G[6]	None Required	None
10.	Radioactivity	P[8]	None Required	6 months

1 Polyethylene (P) or Glass (G)
2 500 ml plastic containers with appropriate preservation
3 2.3 liter amber glass container with Teflon line cap
4 7 days from sample receipt to extraction/40 days from extraction to analysis
5 500 ml glass container with polyethylene liner
6 250 ml amber glass container with Teflon lined cap
7 40 ml amber glass with Teflon lined cap
8 8 oz. high density polyethylene bottle for solid samples, 2L HDPE bottle for liquid samples.

5.4.2 Holding Times

Maximum holding times for all analytes of interest are presented in Table C-1. These holding times satisfy the requirements of the EPA's SW-846 Protocols and the USACE Sample Handling Protocols (Appendix E to ER 1110-1-263).

5.4.3 Details of Sampling and Preservation Procedures

The Work Plan and FSAP discuss the details of sampling with respect to equipment, location, and frequency. This document will discuss those elements of field sampling and preservation that directly impact the quality assurance aspects of the ESI.

An integral part of any field sampling program is the implementation of a Quality Control program. The QC lab will be COE/MRD approved analytical laboratory. The QC program for this ESI on 15 SMWUs includes the collection of field replicate and matrix spike/matrix spike duplicate samples for all matrices. Each type of QC sample will be collected at a minimum frequency of one per twenty samples (5%). One VOA trip blank will be incorporated for each cooler shipped daily containing water samples to be analyzed for volatiles. Equipment blanks will be collected at a rate of 1 per day. In addition, each type of QC samples will be handled, preserved, and documented in exactly the same manner as required for the matrix and analyte of interest. Field duplicate samples will be submitted to the laboratory blind.

The QA laboratory will be the Missouri River Division. The QA program for this ESI on 15 SWMUs includes the collection of duplicates, a background soil sample, rinseates for water samples, and trip blanks. QA samples to be collected include duplicates at a minimum frequency of one per twenty samples (5%), a background soil sample split from a background location, rinseates at the rate of one per day for water samples, and trip blanks at a rate of one per shipping cooler containing water samples to be analyzed for volatiles.

5.4.3.1 Soil, Sediment and Other Solid Materials Sampling Procedure

Using stainless steel sampling equipment, enough solid material is removed from a specified depth to fill the required containers and placed in a decontaminated stainless steel bowl. Samples for VOA will be placed in vials, then the remaining material will be mixed thoroughly with stainless properly preserved. QC and/or QA sample containers shall be filled from the same mixture as one of the samples.

Insulation material for asbestos analysis will be picked up by hand and placed into the appropriate sample container.

5.4.3.2 Surface Water, Groundwater, and Other Liquid Sampling Procedure

Groundwater samples will be obtained after the monitoring well is purged of water standing in the well. At least three submerged well volumes will be removed from the well. Additional volumes will be removed until the pH, temperature, and specific conductivity are observed to vary less than 10% and the turbidity is less than 50 NTUs. The number of submerged well volumes that will be removed from low recharge wells will vary depending on the recharge rate. These procedures are discussed in Section 3.4.5 of Appendix A of this Work Plan. Groundwater will be sampled with a Teflon bailer or peristaltic pump with Teflon tubing.

Surface water will be collected as grab samples by submerging containers in the water.

Oil on surface water will be collected by partially submerging a container in the water so that primarily oil entered the container.

5.4.3.3 Replicate Samples

One replicate sample will be collected for each batch of 20 or fewer samples per matrix sampled. This requirement applies to all matrices. Replicate water quality samples will be collected by alternately filling the appropriate containers until the required volume has been obtained. Replicate soil samples will be mixed until a representative homogeneous sample can be obtained. Homogenization will be accomplished by filling a properly decontaminated intermediate bowl (stainless steel) and mixing. The extent of mixing required will depend on the nature of the material and will be considered complete when a consistent physical appearance is achieved. In every situation possible QC duplicates for the COE/MRD approved analytical laboratory and QA replicates for MRD will be collected at the same site.

5.4.3.4 Rinsate Blanks (Field Equipment Blanks)

A rinsate field equipment blank will be collected to detect possible sources of contamination introduced from field sampling equipment that may influence analytical results. The field equipment blank will consist of one set of sample containers for all analytes of interest. Demonstrated analyte-free water will be poured over or through the sampling equipment after the decontamination process. In the event that dedicated sampling equipment is used, field equipment blanks will not be collected. One field equipment blank will be collected at a frequency of one in twenty (5%) samples for each matrix sampled. The field equipment blanks will be handled, transported, and analyzed in the same manner as all other samples collected during the sampling event.

5.4.3.5 Matrix Spike Samples

The use of matrix spikes gives insight into the analytical proficiency and efficiency of the analytical methods. During the field sampling activities, sufficient sample volume must be collected (triple the normal sample volume) so that a Matrix Spike/Matrix Spike Duplicate pair and a Method Blank (MS/MSD/MSB) for TCL constituents, VOCs by Method 524.2, herbicides, explosives, and petroleum hydrocarbons and a matrix spike/replicate pair for TAL constituents, nitrate, and fluoride can be prepared. Samples for matrix spikes will be collected for each batch of 20 or fewer field samples of the same matrix. A description of the laboratory procedures are outlined in section 7.0 of this document.

5.5 FIELD DOCUMENTATION

The purpose of documenting site activities is to provide a complete record of all sampling procedures, site conditions, and sample chain of custody. A strict field documentation program consistent with the following documents will be implemented.

- RCRA Ground Water Monitoring Technical Enforcement Guidance Document. U.S. EPA (OSWER-9950.1) September 1986.
- Protocol for Ground Water Evaluations. U.S. EPA (OSWER Dir. 9080.0-1) September 1986.

5.5.1 Field Logbook

Field logbooks will be used to record all site activities during field operations. Logbooks will be provided to each field sampling team and dedicated to the ESI of the fifteen SMWUs. Durable hard cover bound logbooks with water proof pages such as those manufactured by TeleDyne will be used. All pages will be numbered consecutively and will not be removed under any circumstances. Entries will be recorded using black indelible ink. Each entry will be dated, legibly written, and contain an accurate and complete description of site activities. Each page will be signed by all personnel making an entry on that particular page. Any changes or corrections will be initialed by the person making the alterations. At the completion of each field sampling event, the field logbook entries will be photocopied and placed on file.

Logbook entries will include the following types of information (this is not intended to be an exhaustive list).

- project name, job number, and location
- date and time of arrival and departure from the site
- purpose of site visit such as quarterly sampling, surveying, surface water sampling, etc.
- name of person keeping the log
- name and affiliation of all persons on-site
- weather and field conditions at time of sampling and any changes occurring throughout the sampling event
- photographic information including description of what was photographed, date and time, and number of the negative on the roll.
- significant site observations, such as condition of monitoring wells, color of leachate seeps, etc.
- summary of the day's activities

5.5.2 Forms

Single-page forms will be used for recording the field information that will be obtained during collection of samples, drilling borings, and installing monitoring wells. These forms will be used to record the following types of information:

- reference to FSAP, if applicable

- sample identification number
- location of sampling point including sample collection depth for surface water and sediment samples.
- description of sampling method including procedures followed, equipment used, well volume removed, calibration of field equipment, sampling sequence, etc.
- sample description (i.e., groundwater, sediment, surface water), appearance, condition, and volume of the samples collected.
- results of field measurements such as pH, conductivity, temperature, etc.
- type of preservation used for each sample
- description of sample containers; type, quantity, volume, lot numbers and analysis required.
- date and time of sample collection
- name of collector(s)
- Chain-of-custody information such as analysis requested and bottles and preservatives used.

6.0 SAMPLE CHAIN OF CUSTODY AND TRANSPORTATION

6.1 SAMPLE LABELS

Sample labels will be affixed to all sample containers during collection. Sample labels will be filled out in indelible ink and include:

- Date and time of collection
- Sample location
- Matrix
- Sample number
- Analysis to be performed
- Sampler's name and affiliation
- Preservative added

After the labels have been completed and affixed to the sample container, they will be covered with clean Mylar tape to guard against obliteration of the sample label.

6.2 CHAIN OF CUSTODY PROCEDURES

The goal of implementing chain of custody procedures is to ensure that the sample is traceable from the time of collection through analysis, reporting, and disposal. The chain of custody procedures, sample seals and forms, are initiated in the field at the time of sample collection. Each sample container is sealed with chain of custody tape after sampling is complete. Chain of custody forms including the signatures of the relinquishers and the receiver, the date and time, and any pertinent remarks are filled out and sent along with the samples to the laboratory. The samples and their chain of custody form are placed in coolers and the coolers additionally sealed with chain of custody tape. The coolers are then transported to Aquatec's laboratory for analysis. Upon arrival at the laboratory, the chain of custody form will be signed and a copy retained with the field data sheets for that round of sampling.

Once the samples are logged into the laboratory system, an internal chain of custody record is maintained. An analyst requesting a sample must sign this chain of custody form before the sample is released to their possession. When the analysis is complete, samples are returned to Sample Management and the chain of custody form updated. For a complete discussion of laboratory chain of custody procedures, and copies of chain of custody forms, refer to Aquatec's QAPP attached as Appendix A of this document.

6.3 SAMPLE PACKING AND SHIPPING PROCEDURES

In order to minimize the possibility of sample leakage, breakage, or spillage and to comply with USACE Sample Handling Protocol (Appendix E of ER 1110-1-263) and U.S. Department of Transportation shipping regulations, samples will be packaged and shipped according to the procedures summarized below:

- Package all samples so they do not spill, leak or vaporize
- Uniquely identify and properly label each sample
- Enter all sample information on a chain of custody form
- Individually wrap all containers and carefully pack them, upright, in an appropriate cooler. Use cooling packs and packing material to fill the excess space in the cooler.
- Enter the custody tape number on the chain of custody form, sign and date the "Relinquished By" space, seal the chain of custody form in plastic, and attach it to the inside lid of the container.
- Seal the cooler with (signed and dated) custody tape such that the cooler cannot be opened without breaking the tape. Secure the cooler with strapping (fiber) tape.
- Put "This Side Up" labels on all four sides and "Fragile" labels on at least two sides.
- Record the packaging and shipping details (sample numbers, custody form numbers, custody seal numbers, airbill number, etc.) in the Field Activities Notebooks.
- Ship the cooler for overnight delivery to the analytical laboratory.

7.0 LABORATORY ANALYTICAL PROCEDURES

All analytical testing, documentation, and reporting will be performed by Aquatec's personnel. Specific laboratory operations are governed by Aquatec's QAPP which discusses laboratory activities from the arrival of samples to the reporting of validated analytical data. Supplemental QC criteria are provided in the individual methods and in Aquatec's Standard Operating Procedures, as appropriate.

This section of the CDAP outlines the particular provisions of the laboratory QAPP applicable to the testing of samples collected during the ESI at 15 SMWUs located at SEAD

7.1 GENERAL LABORATORY PROCEDURES

Aquatec's QAPP, attached as Attachment A to this document, contains detailed discussions of the laboratory facilities, storage areas, analytical instrumentation, equipment and system performance checks, preventative maintenance, glassware cleaning, sample preservation and storage, chemical inventory, and personnel training program. These items will not be discussed in this document.

7.2 ANALYTICAL METHODS

Environmental samples from the 15 SMWUs at SEAD will be analyzed by qualified laboratory personnel according to the methods listed in Table C-2 to C-8 from the following references:

1. NYSDEC CLP Analytical Services Protocol, December 1991 with updates, Statement of Work for Organics and Inorganics Analyses.
2. SW-846, "Test Methods for Evaluating Solid Waste:" Method 8330 for Nitroaromatics and Nitroamines; Method 8150 for Herbicides; Method 8015 for Total Petroleum Hydrocarbons; Method 8080 for PCBs in oil using the latest revision; and Method 9310 for Gross Alpha and Gross Beta.
3. "Methods for Analysis of Water and Wastes, EPA-600\4\79-020: Method 353.2 for Nitrate and Method 340.2 for Fluoride.
4. "Methods for the Determination of Organic Compounds in Drinking Water," EPA 600\4-88-039: Method 524.2 for Volatile Organic Compounds
5. EPA Method 901.1, Gamma Spectrometry, from EPA 600/4-80-032.

TABLE C-2
PARAMETER LIST FOR INORGANIC AND ORGANIC ANALYSES

I. Soil and Sediment Analyses	Preparation Method	Analytical Method	Reporting Limits (ug/Kg)
A. Inorganics (TAL)			
i. Aluminum	NYSDEC CLP	NYSDEC CLP	20,000
ii. Antimony	NYSDEC CLP	NYSDEC CLP	6,000
iii. Arsenic	NYSDEC CLP	NYSDEC CLP	1,000
iv. Barium	NYSDEC CLP	NYSDEC CLP	20,000
v. Beryllium	NYSDEC CLP	NYSDEC CLP	500
vi. Cadmium	NYSDEC CLP	NYSDEC CLP	500
vii. Calcium	NYSDEC CLP	NYSDEC CLP	500,000
viii. Chromium	NYSDEC CLP	NYSDEC CLP	1,000
ix. Cobalt	NYSDEC CLP	NYSDEC CLP	5,000
x. Copper	NYSDEC CLP	NYSDEC CLP	2,500
xi. Iron	NYSDEC CLP	NYSDEC CLP	10,000
xii. Lead	NYSDEC CLP	NYSDEC CLP	300
xiii. Magnesium	NYSDEC CLP	NYSDEC CLP	500,000
xiv. Manganese	NYSDEC CLP	NYSDEC CLP	1,500
xv. Mercury	NYSDEC CLP	NYSDEC CLP	20
xvi. Nickel	NYSDEC CLP	NYSDEC CLP	4,000
xvii. Potassium	NYSDEC CLP	NYSDEC CLP	500,000
xviii. Selenium	NYSDEC CLP	NYSDEC CLP	500
xix. Silver	NYSDEC CLP	NYSDEC CLP	1,000
xx. Sodium	NYSDEC CLP	NYSDEC CLP	500,000
xxi. Thallium	NYSDEC CLP	NYSDEC CLP	1,000
xxii. Vanadium	NYSDEC CLP	NYSDEC CLP	5,000
xxiii. Zinc	NYSDEC CLP	NYSDEC CLP	2,000
xxiv. Cyanide, total	NYSDEC CLP	NYSDEC CLP	1,000
B. Organics			
i. TCL Volatile Organics	NYSDEC CLP	NYSDEC CLP	Table C-3
ii. TCL Semivolatile Organics	NYSDEC CLP	NYSDEC CLP	Table C-4
iii. TCL Pesticide/PCBs	NYSDEC CLP	NYSDEC CLP	Table C-5
iv. Explosives	8330 CLP	8330	Table C-6
v. Herbicides	8150	8150	Table C-7
vi. Volatile Organics	-	524.2	Table C-8
C. Other Analytes			
i. Fluoride		340.2	5 mg/kg
ii. Nitrate		353.2	1 mg/kg
iii. Total Petroleum Hydrocarbons	8015	8015	3.3 mg/kg

TABLE C-2 (Continued)
PARAMETER LIST FOR INORGANIC AND ORGANIC ANALYSES

	Preparation Method	Analytical Method	Reporting Limits
II. Groundwater and Surface Water Analyses			(ug/L)
A. Inorganics (TAL)			
1. Aluminum NYSDEC CLP	NYSDEC CLP	200	
2. Antimony NYSDEC CLP	NYSDEC CLP	60	
3. Arsenic	NYSDEC CLP	NYSDEC CLP	10
4. Barium	NYSDEC CLP	NYSDEC CLP	200
5. Beryllium	NYSDEC CLP	NYSDEC CLP	5
6. Cadmium NYSDEC CLP	NYSDEC CLP	5	
7. Calcium	NYSDEC CLP	NYSDEC CLP	5,000
8. Chromium NYSDEC CLP	NYSDEC CLP	10	
9. Cobalt	NYSDEC CLP	NYSDEC CLP	50
10 Copper	NYSDEC CLP	NYSDEC CLP	25
11. Iron	NYSDEC CLP	NYSDEC CLP	100
12. Lead	NYSDEC CLP	NYSDEC CLP	3
13. Magnesium	NYSDEC CLP	NYSDEC CLP	5,000
14. Manganese	NYSDEC CLP	NYSDEC CLP	15
15. Mercury	NYSDEC CLP	NYSDEC CLP	0.2
16. Nickel	NYSDEC CLP	NYSDEC CLP	40
17. Potassium NYSDEC CLP	NYSDEC CLP	5,000	
18. Selenium	NYSDEC CLP	NYSDEC CLP	5
19. Silver	NYSDEC CLP	NYSDEC CLP	10
20. Sodium	NYSDEC CLP	NYSDEC CLP	5,000
21. Thallium NYSDEC CLP	NYSDEC CLP	10	
22. Vanadium	NYSDEC CLP	NYSDEC CLP	50
23. Zinc	NYSDEC CLP	NYSDEC CLP	20
24. Cyanide, total	NYSDEC CLP	NYSDEC CLP	10
B. Organics			
1. TCL Volatile Organics	NYSDEC CLP	NYSDEC CLP	Table C-3
2. TCL Semivolatile Organics	NYSDEC CLP	NYSDEC CLP	Table C-4
3. TCL Pesticide/PCBs	NYSDEC CLP	NYSDEC CLP	Table C-5
4. Explosives	8330	8330	Table C-6
5. Herbicides	8150	8150	Table C-7
6. Volatile Organics	-	524.2	Table C-8
C. Other Analytes			
1. Nitrate	Extract[1]	353.2	10
2. Fluoride	Extract[1]	340.2	100
3. Total Petroleum Hydrocarbons	8015	8015	100
III. Oil Analyses			
1. Total Petroleum Hydrocarbon	8015	8015	-
2. PCBs	8080	8080	1 ug/kg[3]
3. Herbicides	8150	8150	Table C-7
IV. Asbestos		PLM_2	

1. Mix a known quantity of soil in known volume of water, stir, then filter to form aqueous extract.
2. Polarized light microscopy in EPA 600/M4-82-020.
3. Detection limit is 1 ug PCB per Kg oil for each of the following Aroclors: 1016, 1221, 1232, 1242, 1248, 1254, and 1260.

TABLE C-3
CONTRACT REQUIRED QUANTITATION LIMITS* FOR VOLATILE ORGANIC COMPOUNDS (VOCs)

VOCs		Quantitation Limits** Water (ug/L)	Low Soil/Sediment[a] (ug/Kg)
1.	Chloromethane	10	10
2.	Bromomethane	10	10
3.	Vinyl Chloride	10	10
4.	Chloroethane	10	10
5.	Methylene Chloride	5	5
6.	Acetone	10	10
7.	Carbon Disulfide	5	5
8.	1,1-Dichloroethene	5	5
9.	1,1-Dichloroethane	5	5
10.	1,2-Dichloroethene (total)	5	5
11.	Chloroform	5	5
12.	1,2-Dichloroethene	5	5
13.	2-Butanone	10	10
14.	1,1,1-Trichloroethane	5	5
15.	Carbon Tetrachloride	5	5
16.	Vinyl Acetate	10	10
17.	Bromodichloromethane	5	5
18.	1,2-Dichloropropane	5	5
19.	cis-1,3-Dichloropropene	5	5
20.	Trichloroethene	5	5
21.	Dibromochloromethane	5	5
22.	1,1,2-Trichloroethane	5	5
23.	Benzene	5	5
24.	trans-1,3-Dichloropropene	5	5
25.	Bromoform	5	5
26.	4-Methyl-2-pentanone	10	10
27.	2-Hexanone	10	10
28.	Tetrachloroethene	5	5
29.	Toluene	5	5
30.	1,1,2,2-Tetrachloroethane	5	5
31.	Chlorobenzene	5	5
32.	Ethyl Benzene	5	5
33.	Styrene	5	5
34.	Xylenes (Total)	5	5
	Methyl Tert Butyl Ether	10	10

[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, however the detection limits achieved will be the best possible.

** 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 based as required by the contract, will be higher.

TABLE C-4

CONTRACT REQUIRED QUANTITATION LIMITS* FOR SEMIVOLATILE COMPOUNDS (SVOs)

	Quantitation Limits**	
SVOs	Water (ug/L)	Low Soil/Sediment [a] (ug/Kg)
35. Phenol	10	330
36. bis (2-Chloroethyl) ether	10	330
37. 2-Chlorophenol	10	330
38. 1,3-Dichlorobenzene	10	330
39. 1,4-Dichlorobenzene	10	330
40. Benzyl alcohol	10	330
41. 1,2-Dichlorobenzene	10	330
42. 2-Methylphenol	10	330
43. bis (2-Chloroisopropyl) ether	10	330
44. 4-Methylphenol	10	330
45. N-Nitroso-di-n-dipropylamine	10	330
46. Hexachloroethane	10	330
47. Nitrobenzene	10	330
48. Isophorone	10	330
49. 2-Nitrophenol	10	330
50. 2,4-Dimethylphenol	10	330
51. Benzoic acid	50	1600
52. bis (2-Chloroethoxy) methane	10	330
53. 2,4-Dichlorophenol	10	330
54. 1,2,4-Trichlorobenzene	10	330
55. Naphthalene	10	330
56. 4-Chloroaniline	10	330
57. Hexachlorobutadiene	10	330
58. 4-Chloro-3-methylphenol (para-chloro-meta-cresol)	10	330
59. 2-Methylnaphthalene	10	330
60. Hexachlorocyclopentadiene	10	330
61. 2,4,6-Trichlorophenol	10	330
62. 2,4,5-Trichlorophenol	50	1600
63. 2-Chloronaphthalene	10	330
64. 2-Nitroaniline	50	1600

TABLE C-4 (cont.)

CONTRACT REQUIRED QUANTITATION LIMITS*
FOR SEMIVOLATILE COMPOUNDS (SVOs)

	Quantitation Limits**	
SVOs	Water (ug/L)	Low Soil/Sediment (ug/Kg)
65. Dimethylphthalate	10	330
66. Acenaphthylene	10	330
67. 2,6-Dinitrotoluene	10	330
68. 3-Nitroaniline	50	1660
69. Acenaphthene	10	330
70. 2,4-Dinitrophenol	50	1600
71. 4-Nitrophenol	50	1600
72. Dibenzofuran	10	330
73. 2,4-Dinitrotoluene	10	330
74. Diethylphthalate	10	330
75. 4-Chlorophenyl-phenyl ether	10	330
76. Fluorene	10	330
77. 4-Nitroaniline	50	1600
78. 4,6-Dinitro-2-methylphenol	50	1600
79. N-nitrosodiphenylamine	10	330
80. 4-Bromophenyl-phenylether	10	330
81 Hexachlorobenzene	10	330
82. Pentachlorophenol	50	1600
83. Phenanthrene	10	330
84. Anthracene	10	330
85. Di-n-butylphthalate	10	330
86. Fluoranthene	10	330
87. Pyrene	10	330
88. Butylbenzylphthalate	10	330
89. 3,3-Dichlorobenzidine	20	660
90. Benzo(a)fluoranthene	10	330
91. Chrysene	10	330
92. bis(2-Ethylhexyl)phthalate	10	330
93. Di-n-octylphthalate	10	330
94. Benzo(b)fluoranthene	10	330
95. Benzo(k)fluoranthene	10	330
96. Benzo(a)pyrene	10	330

TABLE C-4 (cont.)

CONTRACT REQUIRED QUANTITATION LIMITS*
FOR SEMIVOLATILE COMPOUNDS (SVOs)

	Quantitation Limits**	
	Water	Low Soil/Sediment [a]
SVOs	(ug/L)	(ug/Kg)
97. Indeno(1,2,3-cd)pyrene	10	330
98. Dibenz(a,h)anthracene	10	330
99. Benzo(g,h,i)perylene	10	330

[a] 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, however the detection limits achieved will be the best possible.

** 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 based as required by the contract, will be higher.

TABLE C-5

CONTRACT REQUIRED QUANTITATION LIMITS* FOR PESTICIDES AND POLYCHLORINATED BIPHENYLS (PCBs)

Pesticides/PCBs	Quantitation Limits** Water (ug/L)	Low Soil/Sediment [a] (ug/Kg)
100. alpha-BHC	0.05	8.0
101. beta-BHC	0.05	8.0
102. delta-BHC	0.05	8.0
103. gamma-BHC (Lindane)	0.05	8.0
104. Heptachlor	0.05	8.0
105. Aldrin	0.05	8.0
106. Heptachlor epoxide	0.05	8.0
107. Endosulfan I	0.05	8.0
108. Dieldrin	0.10	16.0
109. 4,4-DDE	0.10	16.0
110. Endrin	0.10	16.0
111. Endosulfan II	0.10	16.0
112. 4,4-DDD	0.10	16.0
113. Endosulfan sulfate	0.10	16.0
114. 4,4-DDT	0.10	16.0
115. Methoxychlor	0.5	80.0
116. Endrin Ketone	0.10	16.0
117. alpha-Chlordane	0.5	80.0
118. gamma-Chlordane	0.5	80.0
119. Toxaphene	1.0	160.0
120. Aroclor-1016	0.5	80.0
121. Aroclor-1221	0.5	80.0
122. Aroclor-1232	0.5	80.0
123. Aroclor-1242	0.5	80.0
124. Aroclor-1248	0.5	80.0
125. Aroclor-1254	1.0	160.0
126. Aroclor-1260	1.0	160.0

[a] 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, however the detection limits achieved will be the best possible.

** 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 based as required by the contract, willbe higher.

TABLE C-6
METHOD 8330 QUANTITATION LIMITS FOR EXPLOSIVES

Compound	Quantitation Limits** Water (ug/L) Low Level	High Level	Soil/Sediment[a] (ug/g)
HMX	--	13.0	2.2
RDX	0.836	14.0	1.0
1,3,5-TNB	0.258	7.3	0.25
1,3-DNB	0.108	4.0	0.25
Tetryl	--	4.0	0.65
2,4,6-TNT	0.113	6.9	0.25
4-AM-DNT*	0.0598	--	--
2-AM-DNT*	0.0349	--	--
2,6-DNT	0.314	9.4	0.26
2,4-DNT	0.0205	5.7	0.25

[a] See Table C-3 for a discussion of Quantitition Limits
** See Table C-3 for a discussion of Soil Quantitation Limits
* Breakdown Degradation Products

TABLE C-7
METHOD 8150 QUANTITATION LIMITS FOR HERBICIDES

Parameter	Quantitation Limits Water (ug/L)	 Soil/Sediment (ug/g)
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

TABLE C-8
METHOD 524.2 QUANTITATION LIMITS
FOR VOLATILE ORGANIC COMPOUNDS (VOCs) IN GROUNDWATER

VOCs	Quantitation Limits ug/l
Benzene	0.5
Bromobenzene	0.5
Bromochloromethane	0.5
Bromodichloromethane	0.5
Bromoform	0.5
Bromomethane	0.5
n-Butylbenzene	0.5
sec-Butylbenzene	0.5
tert-Butylbenzene	0.5
Carbon tetrachloride	0.5
Chlorobenzene	0.5
Chloroethane	0.5
Chloroform	0.5
Chloromethane	0.5
2-Chlorotoluene	0.5
4-Chlorotoluene	0.5
Dibromochloromethane	0.5
1,2-Dibromo-3-chloropropane	0.5
1,2-Dibromoethane	0.5
Dibromomethane	0.5
1,2-Dichlorobenzene	0.5
1,3-Dichlorobenzene	0.5
1,4-Dichlorobenzene	0.5
Dichlorodifluoromethane	0.5
1,1-Dichloroethane	0.5
1,2-Dichloroethane	0.5
1,1-Dichloroethene	0.5
cis-1,2 Dichloroethene	0.5
trans-1,2-Dichloroethene	0.5
1,2-Dichloropropane	0.5
1,3-Dichloropropane	0.5
2,2-Dichloropropane	0.5
1,1-Dichloropropene	0.5
cis-1,2-Dichloropropene	0.5

TABLE C-8 (cont.)

VOCs	Quantitation Limits ug/l
trans-1,2-Dichloropropene	0.5
Ethylbenzene	0.5
Hexachlorobutadiene	0.5
Isopropylbenzene	0.5
4-Isopropyltoluene	0.5
Methylene chloride	0.5
Naphthalene	0.5
n-Propylbenzene	0.5
Styrene	0.5
1,1,1,2-Tetrachloroethane	0.5
1,1,2,2-Tetrachloroethane	0.5
Tetrachloroethene	0.5
Toluene	0.5
1,2,3-Trichlorobenzene	0.5
1,2,4-Trichlorobenzene	0.5
1,1,1-Trichloroethane	0.5
1,1,2-trichloroethane	0.5
Trichloroethene	0.5
Trichlorofluoromethane	0.5
1,2,3-Trichloropropane	0.5
1,2,4-Trimethylbenzene	0.5
1,3,5-Trimethylbenzene	0.5
Vinyl chloride	0.5
o-Xylene	0.5
m-Xylene	0.5
p-Xylene	0.5

NYSDEC CLP methods will be used for the analysis of inorganic and organic constituents in soil, sediment, groundwater, and surface water. SW-846 Method 8330 will be used for the analysis of explosives. SW-846 Method 8150 will be used to analyze for herbicides. SW-846 Method 8015 is a gas chromatographic method to analyze for the type and quantity of petroleum hydrocarbons. Nitrate will be analyzed using Method 353.2, an automated cadmium reduction method. SW-846 Method 8080 will be used to analyze for PCBs in oil. Fluoride will be analyzed using Method 340.2. Asbestos will be analyzed using polarized light microscopy as discussed in EPA 600/M4-82-020 to determine the type of asbestos materials, their quantity, and fiber length.

Volatile and semivolatile organic constituents will be analyzed on GC/MS Systems. Pesticides/PBCs will be analyzed by GC/ECD. Inorganic metallic elements will be analyzed on the Inductively Coupled Plasma Spectrophotometer (ICP), the Graphite Furnace Atomic Absorption Spectrophotometer (GFAA), and the Cold Vapor Atomic Absorption Spectrophotometer (CVAA) according to the NYSDEC CLP Statement of Work. Explosives will be analyzed on a High Pressure Liquid Chromatography (HPLC) system by Method 8330.

If necessary, groundwater from the wells at potential "No Action" SWMUs will be resampled and analyzed by Method 524.2 for volatile organic compounds.

7.3 QUALITY CONTROL REQUIREMENTS

The precision, accuracy, and completeness goals for each compound analyzed by the laboratory are presented in Table C-9.

7.3.1 TAL and Conventional Inorganic Analyses

At a minimum, the following general QC measures will be employed by the laboratory, as appropriate for the methods for TAL constituents, fluoride, and nitrate:

Calibration - Prior to each round of analyses, the analytical instrument will be calibrated to define the linear range of the instrument. Calibration will be performed each day prior to sample analysis as specified for each method in Table C-10.

Check Standards - Check standards, at concentrations near the mid-point of the calibration curve, will be analyzed at a frequency of once every 10 samples or as specified in the method. Results will be used to verify the standard calibration curve being used as specified for each methods in Table C-10.

Matrix Spike - An aliquot of at least one out of every 20 samples per matrix will be spiked with a known quantity of standard. This fortified sample will be prepared and analyzed to assess the accuracy of the analytical method for that matrix. Recovery of the matrix spike will be in conformance with these specified on Table C-9.

Duplicate - One duplicate analysis will be performed at a minimum frequency of one for every 20 samples per matrix. Relative percent difference of duplicate samples will be in conformance with these specified on Table C-9.

Method Blank - At least one blank for every 20 samples will be prepared and analyzed to detect possible interferences introduced in the laboratory. Results of the method blank should be less than the reporting limit for all inorganics of interest, or the blank and all associated samples must be re-prepared and re-analyzed.

7.3.2 TCL and Other Organic Analyses

At a minimum, the following general QC measures will be employed by the laboratory for TCL constituents, VOCs by Method 524.2, explosives, herbicides, and petroleum hydrocarbons.

Initial Calibration - The instrument performances must be evaluated before samples are analyzed. A successful initial calibration will conform to method specifications for resolution, retention time, and %RSD as specified for each method in Table C-10.

Continuing Calibration Checks - A calibration check will be performed at the beginning and end of each day. The response of the continuing calbiration check standard must be within those specified for eacfh method in Table C-10, or the system is out-of-control and must be re-calibrated. Additional samples cannot be analyzed until another satisfactory initial calibration is achieved.

TABLE C-9

Precision, Accuracy, and Completeness Goals for Laboratory Data

Measurement Parameter	Method Reference	Precision RPD		Accuracy % Rec.		Completeness
<u>TCL-VOC</u>		<u>Water</u>	<u>Soil</u>	<u>Water</u>	<u>Soil</u>	
	<u>NYSDEC CLP</u>					
1,1-Dichloroethene	Statement of Work	14	22	61-145	59-172	90%
Trichloroethene		14	24	71-120	62-137	
Benzene		11	21	76-127	66-142	
Toluene		13	21	76-125	59-139	
Chlorobenzene		13	21	75-130	60-133	
<u>VOCs</u>	Method 524.2	20	-	80-120	-	90%
<u>TCL-SVO</u>		<u>Water</u>	<u>Soil</u>	<u>Water</u>	<u>Soil</u>	
	<u>NYSDEC CLP</u>					
Phenol	Statement of Work	42	35	12-110	26-90	90%
2-Chlorophenol		40	50	27-123	25-102	
1,4-Dichlorobenzene		28	27	36-97	28-104	
N-Nitroso-di-n-Propylamine		38	38	41-116	41-126	
1,2,4 Trichlorobenzene			28	23	39-98	38-107
4-Chloro-3-Methylphenol			42	33	23-97	26-103
Acenaphthene		31	19	46-118	31-137	
4-Nitrophenol		50	50	10-80	11-114	
2,4-Dinitrotoluene		38	47	24-96	28-89	
Pentachlorophenol		50	47	9-103	17-109	
Pyrene		31	36	26-127	35-142	
<u>TCL-PESTICIDES/PCB</u>			<u>Water</u>	<u>Soil</u>	<u>Water</u>	<u>Soil</u>
	<u>NYSDEC CLP</u>					
Gamma-BHC	Statement of Work	15	50	56-123	46-127	90%
Heptachlor		20	31	40-131	35-130	
Aldrin		22	43	40-120	34-132	
Dieldrin		18	38	52-126	31-134	
Endrin		21	45	56-121	42-139	
4,4'-DDT		27	50	38-127	23-134	
<u>TAL METALS</u>		<u>Water</u>	<u>Soil</u>	<u>Water</u>	<u>Soil</u>	
23 Metals and Cyanide		<u>NYSDEC CLP</u>				
	Statement of Work	25	50	50-150	20-180	90%

TABLE C-9

Precision, Accuracy, and Completeness Goals for Laboratory Data

Measurement Parameter	Method Reference	Precision RPD		Accuracy % Rec.		Completeness
		Water	Soil	Water	Soil	
Explosives	Method 8330	25	50	70-130	50-150	90%
Herbicides	Method 8150					
2,4-D		30	50	63-87	63-87	90%
2,4,5-TP		30	50	73-103	73-103	
Total Petroluem Hydrocarbons	Method 8015	25	50	60-140	60-140	90%
Nitrate	Method 353.2	10	10	75-125	75-125	90%
Fluoride	Method 340.2	10	10	75-125	75-125	90%
PCBs in Oil	Method 8080	40 (in oil)	-	35-159 (in oil)	-	90%

Note:

Precision and accuracy goals for nitrate, fluoride, and PCBs in Oil were based on Aquatec's laboratory experience. Precision and accuracy goals for the other parameters were obtained from the procedures for each method.

Method Blank - A method blank is carried through the entire analytical procedure as a sample. One method blank will be generated for every extraction batch of 20 samples or less per matrix. Results of the method blank should be less than the reporting limit for all elements of interest, or the blank and all associated samples must be re-extracted and re-analyzed.

Matrix Spike/Matrix Spike Duplicate/Matrix Spike Blank (MS/MSD/MSB) - An MS/MSD/MSB set of samples will be analyzed at least once for every 20 field samples per matrix. Known concentrations of explosives will be added to identical aliquots from a field sample. The percent recovery of the spiked compounds must be in conformance with those specified on Table C-9.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

8.1 INTRODUCTION

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducability of results are consistent with the appropriate manufacturer's specifications or project-specific requirements.

8.2 LABORATORY EQUIPMENT

The procedures for instrument calibration, calibration verification, and the frequency of calibrations are described in the NYSDEC CLP Statements of Work. Calibration of other instruments required for measurements associated with these analyses will be in accordance with the manufacturer's recommendations and the standard operating procedures of the laboratory. Calibration methods for tests not included in the CLP Statements of Work will be in accordance with the procedures of the analytical method, and laboratory standard operating practices (Table C-10).

8.3 FIELD EQUIPMENT

Calibration of field instruments will be performed at intervals recommended by the manufacturer or more frequently as conditions dictate. Field instruments include pH meters, thermometers, specific conductivity meters, a field gas chromatograph, water level probes, turbidity meters geophysics instruments, and health and safety equipment (organic vapor detectors, Draeger tube pumps, and geiger counters).

Calibration of health and safety equipment is discussed in the Health and Safety Plan (Appendix B of this Work Plan). Calibration of geophysics instruments will be provided by the subcontractor(s) selected to conducted these determinations. These procedures will be provided once this contractor is designated and included in the SOP for Field Data Collection (Volume III, Appendix A). Geophysics equipment is not calibrated because the data is compared to itself.

The pH meter will be calibrated with standard buffer solutions prior to each day or partial day of field use. A full calibration sequence for field pH meters will involve use of three standardized buffer solutions (e.g., pH 4, pH 7, and pH 10) which bracket the full range of measurements expected to be made during the day of use. Additional calibration sequences will be commissioned if field measurements fall outside the range of calibration conducted at the start of each day, or when intermediate calibration checks that the response of the field meter is changing.

During the day, the meter will be periodically checked against one of the selected pH buffers. Typically, meters will be checked once or twice daily to assure that the meter is continuing to operate according to specifications. Fresh, traceable buffer solution will be used for each determination. Calibration results will be recorded in a field log book, along with the information describing the lot numbers of the buffers.

The calibration of the pH meter will also be verified at the completion of each day of use. The meter will be used to measure the pH of three fresh, standard buffer solutions and all readings will be documented in the field notes. Any indication that the response of the pH meter has decayed during use will be used to adjust, or reject, data that has been collected with the meter in question.

Thermometers used for field determinations will be calibrated daily against ice water, tepid water, and other temperature measuring devices not used for field determinations. Each thermometer or temperature measuring device will also be calibrated in the office prior to its use in the field. Office calibrations will include measurements against ice water, tepid water and boiling water, as well as other temperature measuring devices not taken to the field.

TABLE C-10
CALIBRATION CRITERIA

METHOD	INSTRUMENT	CALIBRATION FREQUENCY	CALIBRATION POINTS	CRITERIA FOR PASSING
NYSDEC CLP Statement of Work Metals by ICP	Jarrell-Ash Enviro II	Calibration at the beginning of each analytical series Calibration check every 10 samples	3-t initial calibration standards	correlation > 0.995 calibration check within 10% of true value
NYSDEC CLP Statement of Work Mercury by Cold Vapor	Leeman Labs PS2000	Calibration at the beginning of each analytical series Calibration check every 10 samples	4 initial calibration standards + 1 blank	correlation >0.995 calibration check within 20% of true value
NYSDEC CLP Statement of Work Metals by Graphite Furnace AA	Perkin Elmer 5100 Graphite Furnace AA	Calibration at the beginning of each analytical series Calibration check every 10 samples	3 initial calibration standards + 1 blank	correlation >0.995 calibration check within 10% of true value
Explosive by Method 8330	Waters High Pressure Liquid chromatograph with UV and Fluore-scence detectors	Calibration at the beginning of each analytical series calibration check daily	4 initial calibration standards + 1 blank	Correlation >0.995 calibration check within 2 sd of initial standard

TABLE C-10
CALIBRATION CRITERIA

METHOD	INSTRUMENT	CALIBRATION FREQUENCY	CALIBRATION POINTS	CRITERIA FOR PASSING
Herbicides by Method 8150	Hewlett Packard 5890	Calibration at the beginning of each analytical series calibration check	Initial calibration linearity characterization over 100 fold range	Refer to NYSDEC SOW
PCBs only by Method 8080	Hewlitt Packard 5840 GC/ECD	Calibration check Std.	Initial calibration linearity characterization over 100 fold range	Refer to NYSDEC SOW
NYSDEC CLP TCL Volatile Organics Statement of Work	Hewlett Packard HP5971A MSD GC/MS	Tune Verification and check calibration every 12 hours	5 initial calibration standards 10,50,100, 150, 200 ppb On-going calibration 50 ppb standard	Refer to NYSDEC Statement of Work
NYSDEC CLP TCL Semivolatile Organics Statement of Work	Hewlett Packard HP5971A MSD GC/MS	Tune Verification and check calibration every 12 hours	5 initial calibration standards 20,50,80, 120, 160 ng On-going calibration 50 ng standard	Refer to NYSDEC Statement of Work

TABLE C-10
CALIBRATION CRITERIA

METHOD	INSTRUMENT	CALIBRATION FREQUENCY	CALIBRATION POINTS	CRITERIA FOR PASSING
NYSDEC CLP Cyanide	Bausch and Lomb UV/VIS Spec. 2000	Calibration at the beginning of each analytical series Calibration check every 10 samples	4 initial calibration standards	check standard within 15% of true value
NYSDEC CLP TCL Statement of Work Pesticides/PCBs	Hewlett Packard 5890 GC/ECD	Calibration at the beginning of each analytical series Calibration check every 10 samples	Initial calibration linearity characterization over 100 fold range	Refer to NYSDEC SOW
Nitrate	Alpkem RFA 300	Calibration check every 10 samples	5 initiated + blank	Correlation >0.995 check std. 10% of true value
Fluoride	Ion specific electrode	Calibration check every 10 samples	5 initiated + blank	Correlation >0.995 check std. 10% of true value

TABLE C-10
CALIBRATION CRITERIA

METHOD	INSTRUMENT	CALIBRATION FREQUENCY	CALIBRATION POINTS	CRITERIA FOR PASSING
SID, S3 Total Organic Carbon	Carlo Erba EA1108 elemental analyzer	Calibration at the beginning of each analytical series Calibration check every 10 samples	1 calibration std + 1 blank	Within 10% of true value
Hardness, EDTA Titrimetric Method, EPA Method 130.2	Titration Burette	Calibrate Titrant at the Beginning of each analytical Areas	Not Applicable	None
Nitrate, Cadmium Reduction Method, EPA Method 353.3	Spec. 20	Calibration at the beginning of each analytical series Calibration check every 10 samples	5 Calibration stds. and 1 blank	Within 10% of true value
Level II Analysis for Volatile Organics	Hewlett Packard 5890 GC FID and PID in series	Calibration daily every 24 hours	1 calibration standard + 1 blank	None
Level II Analysis for Lead	Perkin Elmer Plasma II ICP	Calibration daily every 24 hours	1 calibration standard + 1 blank	None

TABLE C-10
CALIBRATION CRITERIA

METHOD	INSTRUMENT	CALIBRATION FREQUENCY	CALIBRATION POINTS	CRITERIA FOR PASSING
Level II Analysis for Explosives	Spec. 20	Calibration daily every 24 hours	1 calibration standard + 1 blank	None

The specific conductivity meter will be cleaned prior to use in the field. This cleaning will occur in the home office. Each conductivity meter will also be electronically calibrated in the office if manufacturer specifications indicate that such checks should be periodically completed.

In the field, the accuracy of conductivity meters will be assessed by calibrating the meter against a minimum of two standardized solutions before each day of use. These solutions will be selected to bracket the range of all measurements anticipated to occur. In the field, the instrument will be periodically checked against standard solutions of known concentrations. Any indication that the conductivity meter is drifting will necessitate the performance and documentation of a complete calibration cycle in the field. The accuracy of the conductivity meter will also be checked at the end of each day. These measurements will be used to confirm the accuracy of all measurements made with the device during the day and to validate or discredit measurements recorded in the field notes.

The portable GC utilized for the soil vapor survey will be calibrated daily using methods recommended by the manufacturer.

Depth marks on the water level probes and oil/water interface probes will be compared to a steel tape on a monthly basis.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

9.1 DATA REDUCTION

Data reduction, validation, and reporting of this project will primarily involve the analytical laboratory and any contracted data validation services. General data reduction and validation procedures used by Aquatec's personnel are contained in their QAPP. Sample calculations are contained in their Standard Operating Procedures, and the method specifications.

All concentration data shall be expressed in units of micrograms per liter (ug/L) or micrograms per kilogram (ug/Kg) dry weight, as appropriate for the matrix. The field measurements of pH, conductivity, turbidity, and temperature shall be reported in standard logarithmic, umho/cm, NTUs, and degrees Celsius, respectively.

All analytical results are carefully reviewed and formatted into final submittal form by experienced quality control personnel. Each result reported by the laboratory undergoes four levels of data review. The analysts and technicians provide primary data review at the bench level, secondary and tertiary review is performed by independent experienced quality control personnel, and the final data packages are reviewed by Ms. Malik before submission to Engineering Science. Data submittals will be in the format specified in NYSDEC CLP Protocols Level IV for CLP analyses and Level III for other analyses.

9.2 DATA VALIDATION

9.2.1 Data Quality Review

Data validation shall be conducted by trained, qualified and experienced chemists, and the Project QA officer.

Consistent data quality for this project will be obtained by the application of a standard data analysis and validation process. Critical review of data is designed to isolate spurious values. Data will be reviewed at a minimum by the analyst, laboratory QC personnel, laboratory Project Manager, and the Project QA Officer

9.2.2 Field Data

Screening data will be validated using one of three procedures:

1. Routine checks will be made during the processing of data. For example, the field work will be observed and documentation will be checked for completeness and accuracy.

2. Checks for consistency of the data set over time will be performed. This can be accomplished by visually comparing data sets against gross upper limits obtained from historical data sets, or by testing for historical consistency. Anomalous data will be identified and evaluated.

3. Checks may be made for consistency with parallel data sets, that is, data sets obtained presumably from the same population (for example, for the same region of the aquifer or volume of soil.

The purpose of these validation checks and tests is to identify outliers; that is, an observation that does not conform to the pattern established by other observations. Outliers may be the result of transcription errors or instrument malfunctions. Outliers may also be manifestations of a greater degree of spatial or temporal variability than expected.

After an outlier has been identified, a decision concerning its fate will be rendered. Obvious mistakes in data (e.g., transcription errors) will be corrected when possible, and the correct value will be inserted. If the correct value cannot be obtained, the data may be excluded.

An attempt will be made to explain the existence of the outlier. If no plausible explanation can be found for the outlier, it will be included in the data set, but a note highlighting its presence and associated concerns will be included in the report. Also, an attempt will be made to determine the effect of the outlier when both included and excluded from the data set. A determination will be made whether it is appropriate to resample.

9.2.3 In-House Laboratory Review

Aquatec will follow data evaluation procedures recommended and approved by the U.S. EPA and NYSDEC. The EPA Region II Standard Operating Procedures (SOPs) for Evaluating Organic and

Inorganic Data will be used to evaluate the data produced. Chemical analysis data will be reviewed based on the analysis results of the duplicate, spiked, and blank samples obtained by the laboratory. The laboratory will issue the chemical analysis data and associated QA/QC data in reports and the chemical analysis data summarized in computer spreadsheets.

9.2.4 Data Review and Validation

When the chemical analysis reports are received from the laboratory, Engineering Science will examine the reports and computerized tables for errors and problems with the analysis. Typical errors include incorrect sample numbers as compared to the sampling records and Chain of Custody; holding time exceedances; recoveries outside acceptable ranges; number of laboratory blanks, duplicates, and spikes do not meet criteria; and typographic errors in analysis results.

The tabulated chemical analysis data will be sorted by site, then type of medium. When an analyte is not detected in a sample, the detection limit will be included in the table. Also the type of detection limit will be noted in the table.

The chemical analysis data will be validated according to the EPA Region II Functional Guidelines for Evaluating Organic Analyses, SOP No. HW-6, Revision 8 and the EPA Region II Functional Guidelines for Evaluating Inorganic Analyses, SOP No. HW-2, Revision XI. Chemical analysis data of the field-generated QA/QC samples will be included when validating the data.

The Project Manager will be kept informed of all non-conformance issues and ensure that corrective action is taken prior to data manipulation and assessment routines. Once the QA/QC review has been completed, the Project Manager may direct the team leaders or others to initiate and finalize the analytical data assessment.

9.3 REPORTING

9.3.1 Field Data

Field data and other information will be documented on forms designated in the FSAP (Appendix A) and in field notebooks assigned to the project. The forms, shown in Appendix A, will be used for routine procedures such as sampling, borings, well installation, water level measurements, and test pitting. The field notebook shall be used to describe the overall work for the day and any deviations from the standard operating procedures.

9.3.2 Laboratory Data Reports

Reports from the analytical laboratory will include a tabulation of sample results, dates of analysis, method references, completed chain-of-custody forms, blank analysis data, precision and accuracy information for each method, and narrative discussion of any difficulties experienced during analysis. A copy of each data package will be sent by the laboratory to the Project Manager. The Project Manager will immediately arrange for making additional copies of the data packages including copies for the Document Controller and Project Quality Assurance Officer. The sample analysis data will be tabulated by the laboratory and presented to the Project Manager on computer diskettes. These tables will be used to prepare a working database for assessment of the site contamination condition.

9.3.3 Monthly Field Activity Reports

While field work associated with the response activities is being conducted at the site, a monthly Field Activity Report to the EPA and NYSDEC will be submitted no later than the 10th addressing the following:

1. A summary of work completed in the field,
2. Anticipated or actual delays,
3. Discovery of significant additional contaminants other than expected,
4. Quantum increase in concentration of hazardous substances of any media beyond that expected,
5. Determination of any specific or potential increase of danger to the public, the environment, or to individuals working at the site, and
6. Copies of all Quality Assured Data and sampling test results and other laboratory deliverables received during the month.
7. A copy of the laboratory's chemical analysis reports received during the month will be sent to the Corps of Engineers' QA Laboratory.

9.3.4 Sampling Letter Reports

At the completion of the first round of field work sampling, a letter report characterizing the site will be furnished by the Project Manager. This report will at a minimum list the locations and quantities of contaminants at the site. Should additional sampling rounds be required to confirm initial sampling, additional letter reports will also be required.

9.3.5 Quarterly Reports

Quarterly Reports will be submitted to EPA and NYSDEC no later than the 10th day of January, April, July, and October. The quarterly reports shall address the following:

1. Minutes of all formal Project Manager, Technical Review Committee (TRC) and other formal meetings held during the preceding period,
2. Status report on all milestones on schedule, report and explanation for milestones not met, and assessment of milestones to be met during the next period,
3. Outside inspection reports, audits and other administrative information developed,
4. Permit status, as applicable,
5. Personnel staffing status or update,
6. Copies of all Quality Assured Data and sampling test results and all other laboratory deliverables received during that quarter, and
7. A community relations activity update.

9.3.6 Final Report

At the conclusion of the ESI, a report will be generated that documents the field work, and data interpretation performed during the ESI. A section on data quality will be included that discusses the results of data validation, describes how well the data quality objectives were met, and summarizes the results of any audits performed during the ESI. The ESI report will conclude whether a release has occurred at each SWMU and will recommend whether an RI/FS should be performed at each SWMU.

10.0 PERFORMANCE AND SYSTEM AUDITS

QA system performance shall be performed under the direction and approval of the PQAO. Functioning as an independent body and reporting directly to project and company management, the PQAO will select personnel to conduct the audit as well as plan and schedule system and performance audits based upon company and project-specific procedures and requirements. These audits may be implemented to evaluate the capability and performance of project and subcontractor staff and their compliance with the QA/QC Plan, in addition to the effectiveness of or impact to the existing project QA/QC Plan and its associated governing documents. Each performance and system audit shall be conducted by a trained and qualified head auditor and designated trained and qualified auditors.

At times, the PQAO may request additional staff with specific expertise from the company and/or project groups to assist in conducting performance audits. In these instances, however, the responsibility for the performance audit will remain with the head auditor and auditors, with the additional staff expertise responsible for clarifying and delineating technical requirements.

The PQAO and auditors shall maintain accurate records of the scope of the audit, identification of items subject to the audits, and results. Quality assurance audits may be initiated by the Project Manager, the PQAO, or the Site Manager, if, in their opinion, a situation exists that warrants an audit. The EPA states "such audits should be performed at sufficiently required intervals during the field investigation."

10.1 PERFORMANCE AUDITS

A field audit may be performed by the PQAO or designated auditor during collection of the field samples to verify that field samplers are following established sampling procedures. A laboratory audit may be performed by the PQAO or designated auditor during analysis of the field samples to verify that the laboratory is following established procedures.

Performance audits shall be scheduled twice per each year of the field investigation.

10.2 SYSTEM AUDITS

System audits, performed by the PQAO or designated auditors, will evaluate the effectiveness of the procedures used to collect data. In addition, field and laboratory quality control procedures and associated documentation may be system audited. System audits shall be scheduled twice per each year of the field investigation. The Project Manager or Site Manager may request the PQAO to perform unscheduled audits if conditions adversely affecting data quality are detected.

10.3 FORMALIZED AUDITS

Formalized audits refer to any system or performance audit that is documented and implemented by the PQAO. The auditors will use a written procedure or checklist to objectively verify that quality assurance requirements have been developed, documented, and instituted in accordance with the Work Plan. Formalized audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by the PQAO or his designee after gathering and evaluating all resultant data. Items, activities, and documents determined by lead auditors to be in non-conformance shall be identified at exit interviews conducted by the involved management. Non-conformances will be logged and documented using audit findings listed in the audit report. These audit findings will be directed to the Project Manager to institute corrective actions in a specified and timely manner. All audit findings and acceptable resolutions will be approved by the PQAO prior to issue. Implementation of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the PQAO will close out the audit report and findings. Section 13, Corrective Action, outlines in detail methods for corrective action.

11.0 PREVENTIVE MAINTENANCE

11.1 PREVENTIVE MAINTENANCE PROCEDURES

Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations or written procedures developed by the operators. Documentation should be generated in support of these activities.

11.2 SCHEDULES

Project-specific written procedures will identify, where applicable, the schedule for servicing critical items in order to minimize the downtime of the measurement system. It will be the responsibility of the operator to adhere to this maintenance schedule and to arrange any necessary and prompt service as required. Service to the equipment, instruments, tools, and gauges shall be performed by qualified personnel. These procedures shall be reviewed and approved by the Project Manager and PQAO and shall be subject to audit.

In the absence of any manufacturer's recommended maintenance criteria, a maintenance procedure will be developed by the operator based upon experience and previous use of the equipment.

11.3 RECORDS

Logs will be established to record and control maintenance and service procedures and schedules. All maintenance records will be documented and traceable to the specific equipment, instruments, tools, and gauges. Records produced shall be reviewed, maintained, and filed by the operators at the laboratories and by the data and sample control personnel when, and if, equipment, instruments, tools, and gauges are used at the sites. The PQAO shall audit these records to verify complete adherence to these procedures.

11.4 SPARE PARTS

A list of critical spare parts will be identified by the operator. These spare parts will be stored for availability and use in order to reduce the downtime. In lieu of maintaining an inventory of spare parts, a service contract for rapid instrument repair or back-up instruments will be available.

Aquatec's laboratory maintains a large inventory of spare parts, and employs qualified in-house technicians for instrument repair and maintenance.

12.0 DATA ASSESSMENT PROCEDURES

12.1 CALCULATION OF MEAN VALUES AND ESTIMATES OF PRECISION

The mean, C of a series of replicate measurements of concentration C_i, for a given surrogate compound or analyte will be calculated as:

$$C = \frac{1}{n} \sum_{i=1}^{n} C_i$$

Where: n = number of replicate measurements; C, C_i are both in mg/L or mg/kg.

The estimate of precision of a series of replicate measurements will usually be expressed as the relative standard deviation, RSD:

$$RSD = \frac{SD \times 100\%}{C}$$

Where: SD = Standard Deviation

$$SD = \frac{\sum_{i=1}^{n} (C_i - C)^2}{(n-1)}$$

Alternatively, for data sets with a small number of points the estimate of precision may be expressed as a range percent, R:

$$R = \frac{(C_1 - C_2) \times 100\%}{C}$$

Where: C_1 = highest concentration value measured in data set
C_2 = lowest concentration value measured in data set

Precision is also measured by calculating the relative percent difference (RPD) between duplicate analyses. The following equation is used:

$$\%RPD = \frac{D_1 - D_2}{(D_1 + D^2)/2} \times 100$$

where:
RPD = Relative Percent Difference
D_1 = First Sample Value
D_2 = Second Sample Value (duplicate)

12.2 ASSESSMENT OF ACCURACY

Accuracy will be evaluated by comparing the recovery of surrogate and matrix spike compounds the goals identified in Section 7. The recovery of a surrogate compound will be defined as:

$$\text{Recovery, \%} = \frac{Cs \times Vs \text{ (or } Ws)}{Q} \times 100$$

Where: C_s = measured concentration of surrogate compound in sample, mg/L (or mg/kg)
$V_s(W_s)$ = Total volume (or weight) of sample to which surrogate was added, L (or kg)
Q = Quantity of surrogate compound added to sample, mg

The individual component recoveries for the matrix spike sample are defined as:

$$\text{Matrix Spike Percent Recovery} = \frac{SSR - SR}{SA} \times 100$$

where:
SSR = Spike Sample Results
SR = Sample Results
SA = Spike Added (concentration)

13.0 CORRECTIVE ACTION

Corrective action may be initiated at any time by any person performing work in support of the field investigation.

All project personnel have the responsibility, as part of the normal work duties, to promptly report these situations and implement the corrective action as required. The following procedures have been established to assure that situations such as malfunctions, deficiencies, deviations, and errors are promptly investigated, documented, evaluated, and corrected. When a situation is identified, the cause will be evaluated and a corrective action will be proposed to preclude repetition. The corrective action will be approved by the PQAO and the Project Manager. The situation, cause, and resulting corrective action will be documented and reported to the Field Supervisor, Chief Discipline Engineers and Scientists, the Corporate QA Manager, and involved subcontractor management, as appropriate. Corrective actions may be initiated as a result of any of the following:

1. When predetermined acceptance standards are not attained
2. When procedure or data compiled are determined deficient
3. When equipment or instrumentation is found faulty
4. When samples and test results are questionably traceable
5. When quality assurance requirements have been violated
6. When designated approvals have been circumvented
7. As a result of a management assessment
8. As a result of laboratory comparison studies

Corrective action required as a result of performance, system, and formalized audits shall require formal documented corrective action procedures.

14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

As discussed in Section 9.3.3 of this appendix, a monthly Field Activity Report will be prepared while field work associated with this ESI is occurring. A copy of the laboratory's chemical analysis reports received during the month will be sent to the Corp of Engineer's QA Laboratory when the monthly report is distributed. Information regarding the true identify of field-generated samples, such as trip blanks, duplicates, splits, and equipment blanks, will also be sent to the QA Laboratory.

A section on data quality will be included in the final report that discusses the results of the data validation and that describes how well the data quality objectives were met. The precision, accuracy, and completeness of the data will be calculated based on a review of laboratory and field QC samples and summarized in the report. The results of any audits will also be summarized in this section. Information will include: purpose of the audit, items audited, audit results, recommended solutions, and actions resulting from audit recommendations.

APPENDIX A

Aquatec's Quality Assurance Program Plan (QAPP)

APPENDIX B

EPA Method 8330

APPENDIX A

Aquatec's Quality Assurance Program Plan (QAPP)

AQUATEC
QUALITY ASSURANCE
PROGRAM PLAN

Prepared by

Aquatec, Inc.
75 Green Mountain Drive
South Burlington, Vermont

Revision 5

Approval

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President

Joseph K. Comeau, Ph. D.
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Biology Laboratory Director

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ADDENDUM
QUALITY ASSURANCE
PROGRAM PLAN

Prepared by

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Revision 3

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PREFACE

Aquatec believes that the commitment of all within its organization to a comprehensive Quality Assurance Program Plan is a necessity to meet the objectives of this analytical laboratory and of the Contract Laboratory Programs. The following Laboratory Quality Management Plan is an embodiment of the current practices of quality assurance/quality control at Aquatec. The in-house quality assurance program is aimed at the production of data of known quality and integrity, while sustaining a minimum loss of data due to out-of-control conditions.

Each laboratory section is responsible for keeping an updated version of Standard Operating Procedures (SOP) applicable to that section. To ensure continuity of analysis throughout the laboratory, specifics in the areas such as sample handling, instrument calibration, quality control measures, injection technique, data acquisition, data processing, and autosampler procedures are thoroughly explained in each SOP. Following the guidelines stated in SOPs, contractual obligations and method specifications can be met.

The constituents that make up Aquatec's quality assurance/quality control program have been greatly influenced by the contractual obligations. Currently, Aquatec is a participant in the United States Environmental Protection Agency's Contract Laboratory Program, REM Contract Laboratory Program, and the New York State Contract Laboratory Program. As a result, many of the routine quality assurance/quality control measures and restrictions utilized by the laboratory are designed to meet the obligations as set forth in these contracts. When "contractual obligation" is mentioned in the following text, it is in reference to these contracts.

The practices of quality assurance/quality control presented in the following text are set forth as minimums, and any additional measures that the client requires can be incorporated into the quality assurance/quality control project plan. The minimums set forth should be considered, as such, a minimum. Any tailoring or customizing the client may require, based on individual needs, can usually be implemented within the laboratory structure.

Table of Contents

A. PHYSICAL FACILITIES

The physical facilities available for analytical work at Aquatec are housed in one building with a total of 22,300 square feet of floor space. This comprises the corporate headquarters with an additional off-site bioassay laboratory and storage facility. The floor plan in Figure A.1 shows the location, size, and utilities available on an individual laboratory basis. Over 12,000 square feet are utilized by the chemistry division; approximately 3,500 square feet are devoted to analytical activities. The laboratories occupy 3,000 square feet; sample management, 260 square feet; and incubators, the analytical balance, and desks for computations and transcription are located in an 190 square foot room. Linear bench space in the laboratories are made of synthetic stone and occupy a total of 317 feet. The entire facility is air conditioned, has overhead fluorescent lighting, and the flooring is comprised of epoxy, tile, or raised computer flooring depending on the needs of the work space. The gas chromatography/mass spectrometry laboratory has a positive pressure air system with make-up air drawn through activated carbon filters. All other laboratories utilize a negative pressure air system. The laboratory also has many facilities to support the analytical effort in the form of a reverse osmosis system, deionization system, and computer networking.

Because of the nature of our work at Aquatec, adequate security of the facilities, methodologies, and project files is necessary. Access to the main building is controlled through a system of combination-locked doors and, during business hours, reception log-in procedures for visitors. In addition, anti-intrusion devices and key-control are employed to secure access to the facilities and its contents. Visitors register upon entering the building and are accompanied by an employee while visiting the facility. Aquatec

Figure A.1.1 Facilities

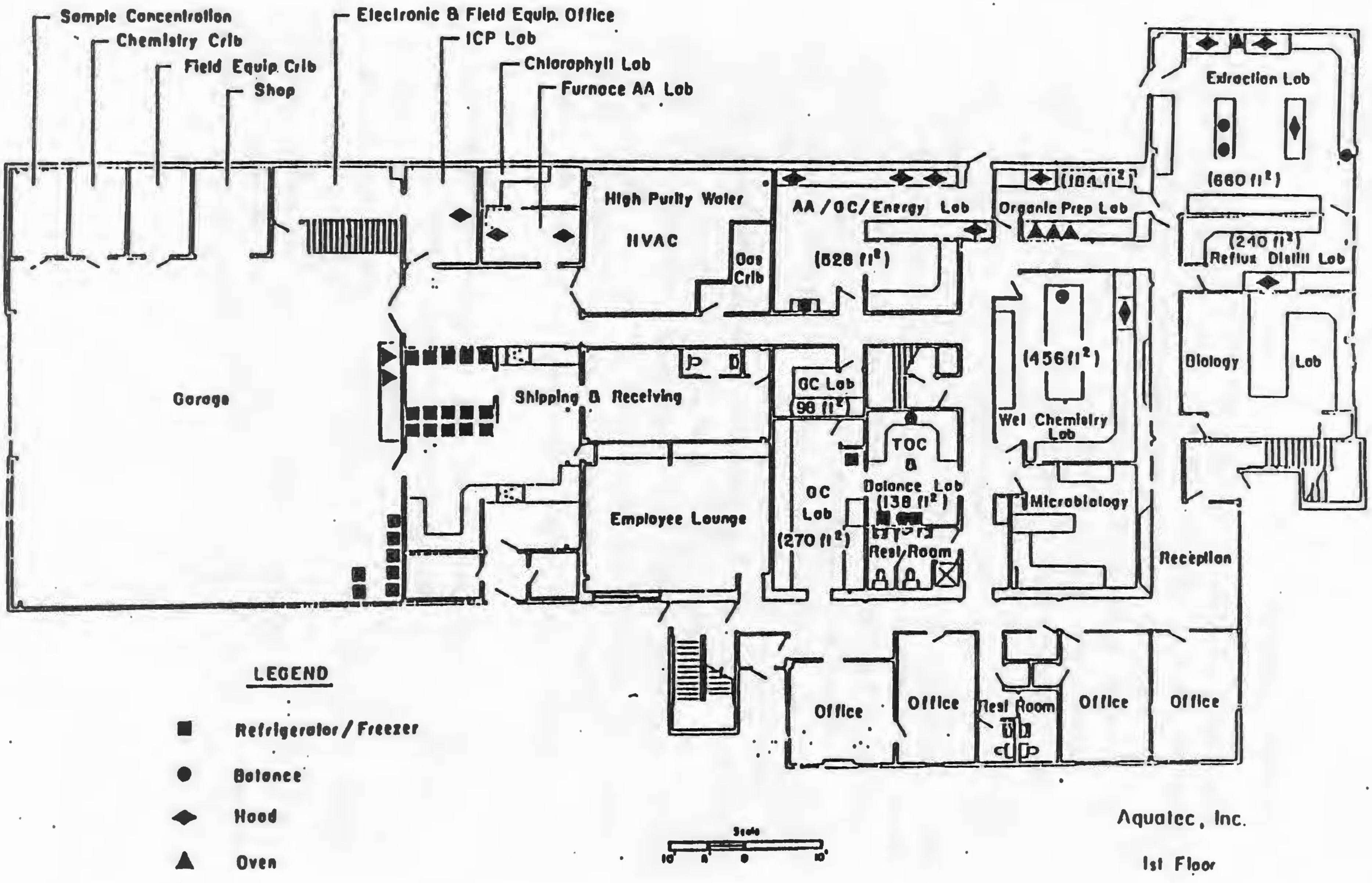
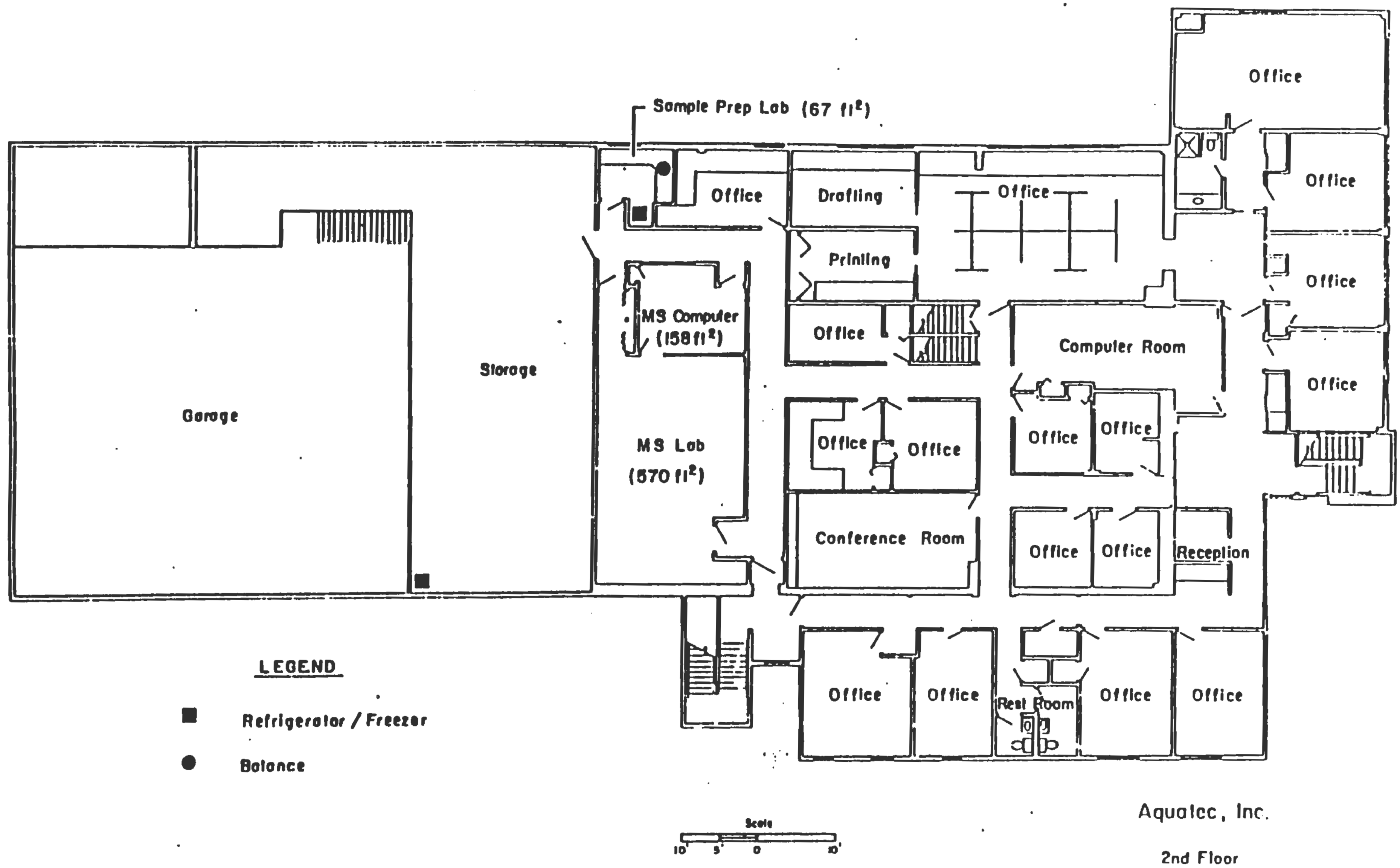


Figure : Facilities



employees are expected to be familiar with and adhere to standards of confidentiality mandated by individual contracts and common sense business practices. Laboratory Section Heads will insure that their personnel are familiar with Aquatec's security policies.

B. PERSONNEL

The organization of laboratory personnel within the Aquatec Analytical Laboratories is presented in Figure B.1. The laboratory structure provides a means for communication from the bench level up to the Laboratory Director. This organization facilitates the generation of data, several levels of data review, and the monitoring of the overall quality of the data produced in the laboratory before it is reported to the client. The Quality Assurance Program within the laboratory is operated independently of the laboratory sections generating data and reports directly to upper management levels. If discrepancies are found in the performance of any section of the laboratory, it is reported to the Laboratory Director who is responsible for initiating the proper corrective action within the section. In this way, objectivity in the evaluation of laboratory operations can be obtained.

B.1 Roles and Responsibilities

Each section within the laboratory has specific roles and responsibilities in terms of producing a product of known quality. All laboratory personnel are expected to have a working knowledge of the Aquatec Quality Assurance Program Plan (QAPP). It is expected that employees at every level will ensure that data is generated in compliance with the Aquatec QAPP.

At the bench level, analysts are responsible for the generation of data by analyzing samples according to written SOP's. They are also responsible for ensuring that all documentation related to the sample is complete and accurate. The analyst should provide management with immediate notification of quality problems within the laboratory. The analysts have the authority to accept or reject data based on compliance with well-defined QC acceptance criteria. The

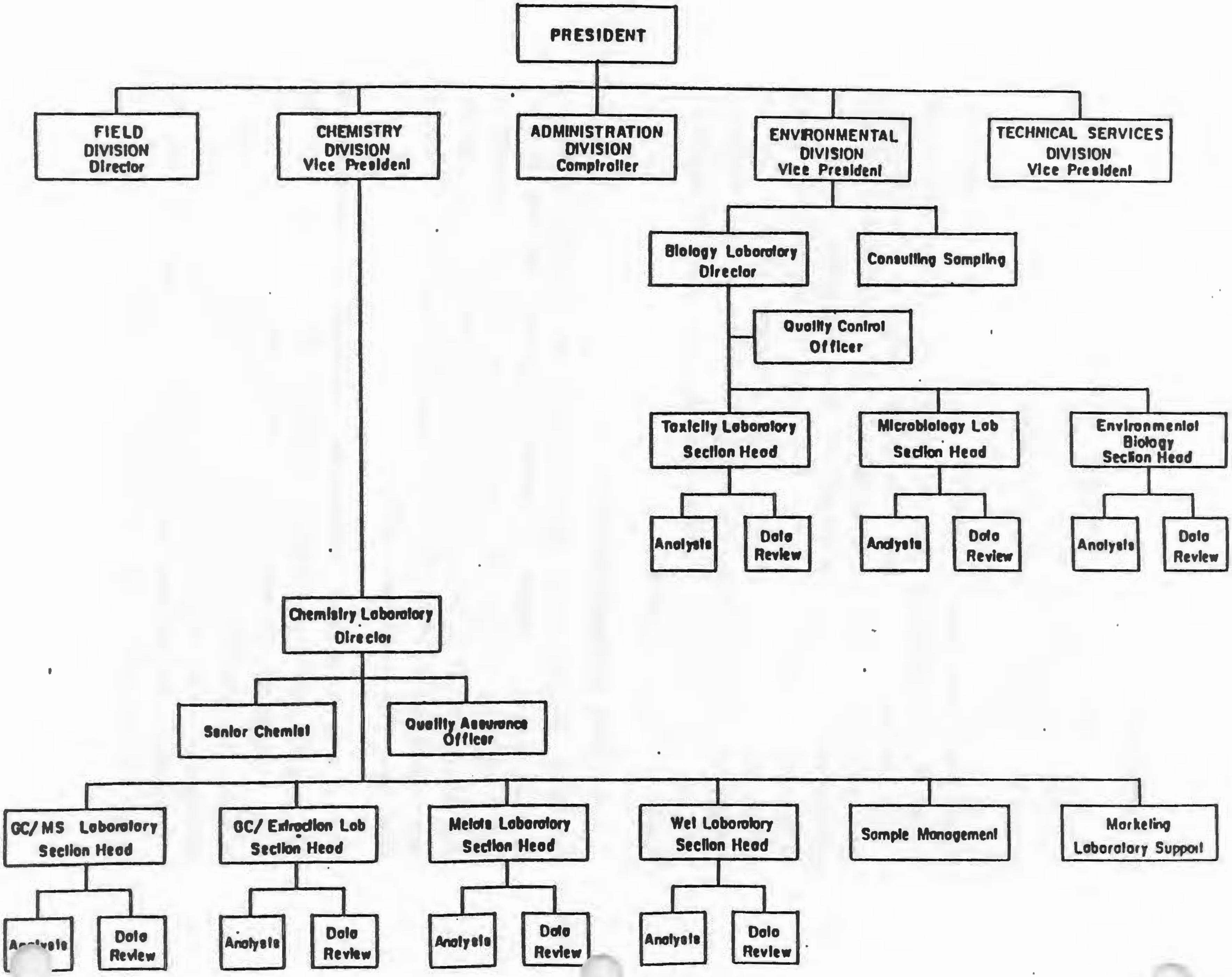


Figure B.1 Organization c boratory Personnel acceptance of data, which falls outside of QC criteria or is questionable in nature, must be approved by the Laboratory Section Head.

The data review groups are responsible for providing a secondary review of the raw data presented by the analysts. All calculations, calibrations, and QC criteria are evaluated against the objectives of the contract to ensure nothing has been overlooked in the generation of the data. Any discrepancies found in the data should be reported to the appropriate Laboratory Section Head for corrective action. The data review group is also responsible for publishing the final product submitted to the project directors for final review. In the data presentation, the proper forms and formats must be observed.

Laboratory Section Heads are responsible for the overall flow of work and data in and out of the laboratory. They are responsible for the maintainence of accurate SOPs and the enforcement of the QAPP and SOPs in their laboratory. The data produced by the analysts must be of known quality and legally defensible. Any discrepancies in QC criteria will be brought to their attention, and a decision reached as to whether or not the data is acceptable. If, in their judgment, there are technical reasons which warrant the acceptance of what appears to be out-of-control data, these reasons should be well documented and discussed with the Laboratory Director before the sample and corresponding data are considered acceptable.

Project Directors are responsible for dealing directly with the clients. They are technically oriented and well versed in analytical methodologies enabling them to effectively communicate the clients' needs to the laboratory. Project Directors are selected for specific projects based upon their past experiences and qualifications in relation to the proposed scope of work. Roles of the Project

Directors include shipping the proper sampling containers to the job site, inspection of samples and shipping containers upon arrival at the laboratory, overseeing the log-in procedures, monitoring the progress of the analytical work, and review the final data packages before submittal to the client. Project Directors are instrumental in interfacing and assisting both the laboratory and the client in resolving any difficulties that may arise during the course of a project.

The Quality Assurance Officer is responsible for the implementation of the QAPP and monitoring the activities of the laboratory for compliance. The Quality Assurance Officer will periodically conduct internal audits to identify potential problems within the laboratory. The results of these audits are reported to the Laboratory Director for corrective action. The Quality Assurance Officer is also responsible for establishing databases which record performance attributes of the laboratory. The Quality Assurance Officer will also assist the chemists in the writing of the SOP's and distribution of revisions in a timely fashion. In an effort to evaluate the laboratory's performance against other laboratories, the Quality Assurance Officer will maintain records of Performance Evaluation results, audit comments, and training status of personnel.

The Laboratory Director is ultimately responsible for the data that is produced and reported by the laboratory. Any discrepancies in methodology, procedures, QC criteria, or reporting will be channeled through the Laboratory Director. When the Quality Assurance division detects discrepancies or problems, they are reported to the Laboratory Director who is responsible for initiating corrective action within the laboratory. A follow-up audit is performed to assure that the problem has been corrected.

B.2 Training

The level of training necessary to perform analytical tasks is derived from academic background and past experience, technical courses, and informal on-the-job training with specific methods or instrumentation. The responsibilities for formal academic training lies foremost with the individual. The responsibility for the additional specialized skills obtained through in-house training or external workshops is a shared obligation of the individual, their supervisor, and the Company. An individual's academic and professional experience are kept on file including an initial statement of qualifications or resume and any additional documentation concerning subsequent training. Copies of certificates of completion, transcripts, diplomas, or other documentation will be included in the files as appropriate.

Trainees are under the supervision of experienced analysts who are responsible for their work during the training period. This ensures the quality of data reported to clients. The training records consist of an Aquatec form F-0341 (Figure B.2) and is included in the individual's file. Training record summaries are available for inspection from the Document Control Officer.

Included in Appendix A are the resumes of key personnel and a summary of laboratory personnel experience.

aquatec RECORD OF INDIVIDUAL TRAINING

WEEK ENDING

LAST NAME - FIRST NAME - MIDDLE INITIAL	POSITION	DIVISION

TRAINING PROJECT NO.____________ CODE__________

Individual employees are to submit this form with their weekly time cards to substantiate all hours charged to 903 series projects. Copies of all certificates, diplomas, transcripts, or other documentation should be attached.

THE ABOVE NAMED PERFORMED TRAINING OR INSTRUCTION ON THE DATES AND FOR THE HOURS INDICATED			
DATE			NATURE OF DUTIES, TRAINING OR INSTRUCTION
DAY	MONTH	YEAR	

Employee's Signature

Supervisor's Signature

SEP 86

C. ANALYTICAL INSTRUMENTATION

C.1 Summary of Major Analytical Instrumentation

The following is a listing of all major analytical instrumentation and date of purchase available for analysis at Aquatec. Analytical instruments are maintained by a qualified in-house technician.

Gas Chromatography/Mass Spectrometry

Two Finnigan 5100 Series GC/MS systems with subambient temperature control, chemical ionization, negative ion and high resolution capillary column chromatography capabilities. Data system includes Nova 4X computer, 70 Mb Winchester disk drive and Micro VAX file server networking.[(3/85),(3/85)]

Two Finnigan OWA 1050 Series GC/MS systems, each configured with Tekmar LSC-2 purge and trap and Tekmar automatic sampler units. Data system includes Nova 4X Computer, 70 Mb Winchester disk drive and Micro VAX file server networking.[(7/80),(10/82)]

Finnigan OWA 1050 Series GC/MS interfaced with a Tekmar LSC-2000 purge and trap, Dynatherm analytical thermal desorber and a Tekmar cryofocusing trap. [(7/88)]

Three Finnigan mass spectral data processors supporting Super Incos software and VAX networking. [(9/86),(7/88),(11/89)]

Varian 3400 GC equipped with Finnigan 700 ion trap detector. Subambient temperature controller, and Tekmar LSC-2000 purge and trap add versatility.(6/87)

Dedicated screening Hewlett Packard 5840 GC with Flame Ionization and Electron Capture Detectors and Hewlett Packard 3393A integrator.(6/78)

Gas/Liquid Chromatography

Eight Hewlett Packard 5890 gas chromatographs with autosamplers and subambient temperature controllers.

Detectors include FID, ECD, PID, HWD and NPD. An Envirochem 850 thermal desorber and Tekmar LSC-2 provide specialized sample introduction. Data is handled by four Maxima 820 computer data stations and Hewlett Packard 3392A integrators.[(5/84),(5/84),(3/85),(3/85),(4/85),(6/87),(7/88),(7/88)]

Hewlett Packard 5840 GC with autosampler and ECD and FID detectors.(6/78)

Two Tracor 540 GCs with Hall and photoionization detectors. Two Tekmar purge and trap sample concentrators and two Maxima 820 computer data stations.[(3/85),(12/87)]

Waters 600 multi-solvent delivery system liquid chromatograph. Lambda-Max LC UV-VIS spectrometer and Kratos 980 programmable fluorescence detection system. 742 WISP autosampler.(1/88)

Organic Sample Preparation

Analytical bio-chemistry 1002A autoprep gel permeation chromatograph with UV detector.(12/84)

Analytical bio-chemistry 1002B autoprep gel permeation chromatograph with UV detector.(8/90)

Ten Millipore Zero Headspace Extractors (ZHE) for TCLP VOA Extraction.[(1/87),(2/88),(2/88),(2/88),(2/88),(2/88),(8/90),(8/90),(8/90),(8/90)]

Atomic Spectroscopy/Metals Analysis

Two Perkin Elmer Plasma II inductively coupled plasma emission spectrometer with series 7500 computer and AS-51 autosampler. System has UV capabilities and versatile sequential scanning monochromator. [(12/85),(2/90)]

Two Jarrell-Ash SH21 atomic absorption spectrometers with Smith-Hieftje correction. System includes dedicated graphite furnace, atomizer, data station, and autosampler. [(8/90),(8/90)]

Perkin-Elmer 5000 atomic absorption spectrometer with Model 500 graphite furnace and AS-51 autosampler.(10/83)

Perkin-Elmer Z3030 graphite furnace atomic absorption spectromete with Zeeman background corrector. System includes AS60 autosampler and video data station.(10/83)

Perkin-Elmer 3030B flame atomic absorption spectrometer. Capabilities include operation in both absorption and emission.(6/86)

Perkin-Elmer 306 atomic absorption spectrometer dedicated for cold vapor mercury analysis.(8/72)

CEM Corporation MDF 80 microwave digestion system includes Teflon vessels and constant torque lapping station.(4/87)

Wet Chemistry/Inorganic Analysis

Dionex 2000i/SP ion chromatograph.(10/85)

Bausch and Lomb 2000 scanning UV-visible spectrometer used for colorimetric analysis.(4/81)

LECO CHN-600 direct reading carbon hydrogen nitrogen determinator.(6/84)

LECO AC-300 automatic calorimeter.(6/84)

LECO direct reading moisture, ash, fixed carbon and volatile carbon determinator.(6/84)

LECO SC132 sulfur determinator.(2/88)

Oceanography International Model 700 total organic carbon analyzer.(12/78)

Dohrman DX-20 total organic halogen analyzer.(6/81)

Perkin-Elmer 1330 infrared spectrometer with data station.(8/81)

Biological Analysis

Turner Designs Model 10 Fluorometer.

Eberbach Model 2700 microprojection instrument. Adapted for computer digitizing.(3/73)

Zeiss DRC Dissecting Microscope (11/87)

Two Zeiss Lab 16 Compound Microscopes with high pressure mercury lamp for epifluorescent capabilities.[(11/85), (12/86)]

Olympus I MT-100 Trinocular Inverted Tissue Culture Microscope(1/82)

Four American Optical Binocular Microscopes [(4/70), (4/70),(6/73),(4/81)]

C.2 Instrument Calibration

The calibration and standardization procedures for analytical instrumentation is defined in the respective sectional SOP's. The procedures can be modified and revised as required by contractual obligations and special projects. Analytical balances and thermometers are calibrated against NBS, or NBS traceable, materials.

The sectional SOPS discuss in detail how each instrument is calibrated, including frequency for calibration and re-calibration, and the source or grade of the calibration materials. The range of analyses performed and instrumentation utilized by Aquatec is very large and the calibration procedures are instrument specific and vary from analysis to analysis. The calibration procedures usually include an initial system performance check and some type of initial calibration with each analytical series. On-going and closing calibration checks are also included in most analytical series. For each type of calibration standard or performance check there are specific criteria to meet before sample analyses begin. These criteria are established in the methodologies as they are written in the referenced texts or by contract specifications.

C.3 Preventative Maintenance

Analytical instrumentation are maintained and serviced according to the manufacturers specifications. Each analytical instrument has a specific maintenance logbook. All routine maintenance and repair work is recorded with the date and the initials of the individual performing the maintenance task. Reports from outside service work are incorporated into the instrument logbooks. For GC/MS instrumentation, all performance checks (decafluorotriphenylphosphine and p-bromofluorobenzene) associated with instrument tune for a particular instrument are to be maintained in a separate loose-leaf notebook for that instrument.

On a daily basis, the operation of balances, incubators, refrigerators, the high purity water system, furnaces, ovens, air conditioning, and builing facilities are documented on Aquatec Monitoring Worksheets. Any discrepancies are immediately reported to the appropriate laboratory or technical services personnel for resolution. All analytical balances are checked with Class "S" weights and a thermometer is resident in each refrigerator/freezer.

A computer based system to continuously monitor the temperatures inside the refrigerator/freezer units is used in addition to the manual daily thermometer reading. Each refrigeration unit contains a temperature probe packed in sand and is connected to the microVAX system to record the temperature of the unit. Acceptable temperature excursion limits have been established and set within the VAX program. Each temperature reading is immediately compared to the limits, and for values falling outside of the established limits, a buzzer will sound and corrective action will be initiated immediately. Provisions have been made to contact technical services personnel at home during off hours to insure that the refrigeration systems are not out of control for more than 20 minutes.

C.3.1 Maintenance Control Charts

In addition to routine and preventative maintenance, control charts are maintained for several instruments as an indicator of when maintenance may be necessary. In the GC/MS laboratory, instrument sensitivity is monitored using internal standards. The internal standard solution is injected into every standard, blank, and sample acquired on the GC/MS. The area of the internal standard compounds in an acquisition are plotted on control charts that can serve as an indicator of the overall condition of the instrument. Instrumentation problems can be diagnosed and remedied by tracking the response patterns on the control charts. The control charts are updated following each analysis.

D. SAMPLE HANDLING AND STORAGE PROCEDURES

The procedures used to receive, track, and maintain the integrity and quality of both samples and data are presented below. Routine samples are processed with a variable degree of chain-of-custody documentation depending on client requirements. Samples requiring strict chain-of-custody have associated forms and procedures which establish written proof of possession. Sample receipt and subsequent handling are included as text and flow charts in the Sample Management SOP. Figure D.1 is an example of the flow of Contract Laboratory Program samples and documentation through the laboratory.

D.1 Chain-of-Custody Procedures

The critical nature of chain-of-custody procedures cannot be overemphasized. These procedures record the history of the samples' custody from acquisition to final disposal.

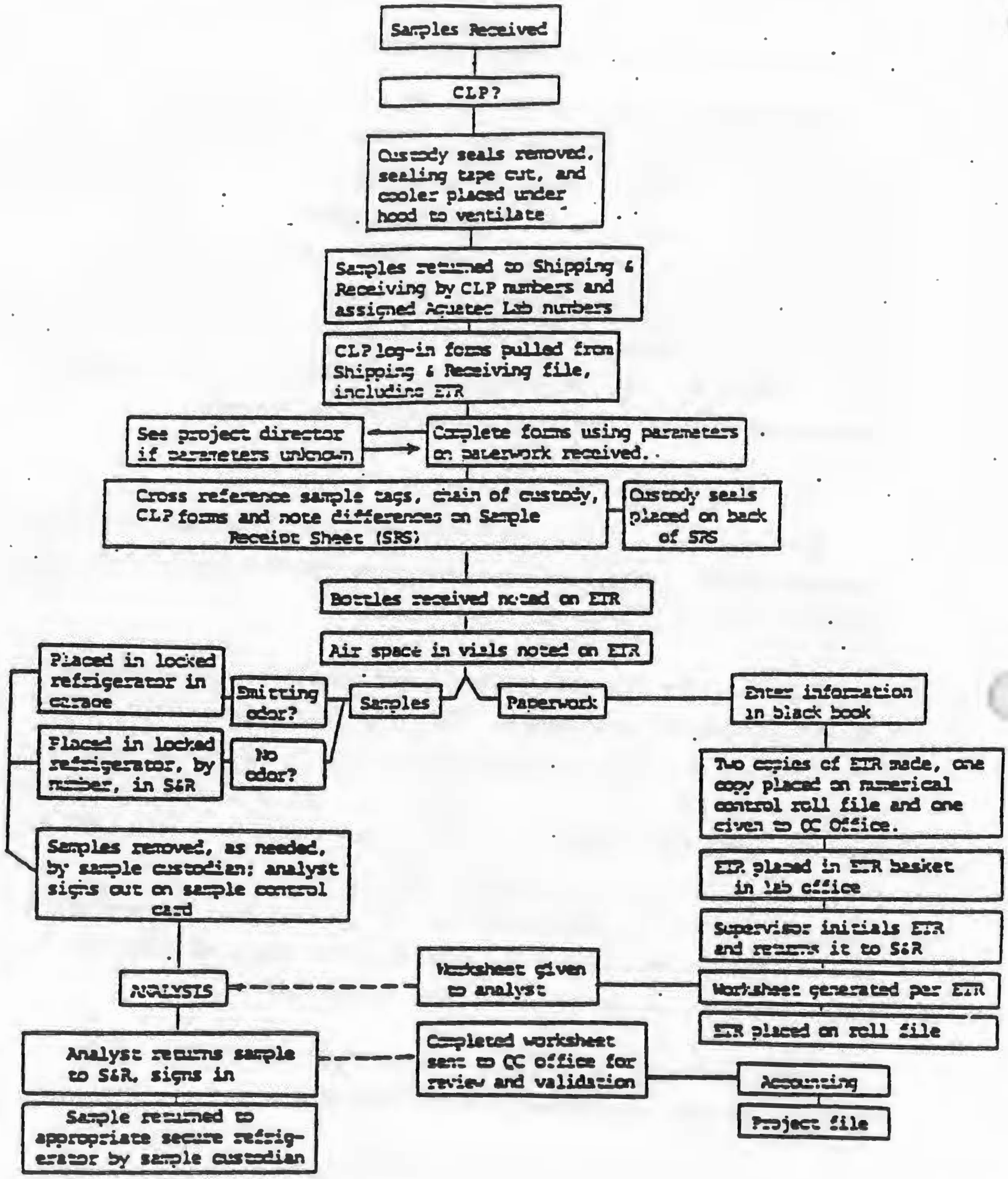
Samples are physical evidence and should be handled according to certain procedural safeguards. For some legal proceedings, proof that the laboratory is a secure repository for the sample is sufficient to insure that the analytical data will be admitted as evidence. However, in some cases a court may require a showing of the hand-to-hand custody of samples while at the laboratory. In such instances, the laboratory must be able to produce documentation that traces the in-house custody record of the samples from the time of sample receipt to the completion of sample analysis.

The National Enforcement Investigations Center (NEIC) of EPA defines custody of evidence in the following ways:

1. It is in your actual possession, or
2. It is in your view, after being in your physical possession, or
3. It was in your possession and then you locked or sealed it up to prevent tampering, or
4. It is in a secure area.

Figure D.1.

In-Lab Sample Handling



The chain-of-custody procedures employed at Aquatec are implemented through the Sample Management Office. An example chain-of-custody form is presented in Figure D.2. The following procedures have been established to satisfy contractual obligations.

1. To guarantee that samples are in a secure area, access to the laboratory is through a monitored reception area with all other access doors locked. Visitors sign-in with the receptionist and are escorted by an Aquatec employee during their stay in the laboratory. Refrigerators, freezers, and other sample storage areas are kept locked, and only sample custodians and supervisory personnel have keys to the sample storage area(s).

2. Samples will remain in locked sample storage until removal for sample preparation or analysis.

3. All transfers of samples into and out of the storage area(s) are documented on an internal chain-of-custody record (form F-0169) shown in Figure D.3.

4. After a sample has been removed from storage by the analyst, the analyst is responsible for returning the sample to the storage area before the end of their working day.

D.2 Sample Receipt

The receipt of samples should be scheduled with the Sample Custodian or designee before samples are shipped. This is important because unstable parameters require prompt analysis and the sample custodians must coordinate the arrival of the samples with Laboratory Section Heads to insure that staff and facilities are available to perform the required analysis. The quality of analytical data is reflected directly by the quality of sample handling.

Samples are received in an area specifically established for sample receipt and storage. Upon receipt, a sample is assigned a laboratory identification number. This number, along with basic

CHAIN OF CUSTODY RECORD

F - 0058

Page ______ of ______

Figure D.2

Aquatec, Inc. 75 Green Mountain Drive South Burlington, VT 05403 (802) 658-1074 / FAX: (802) 658-3189

Client's Reference:	Project Name:	Container Type / No. of
Client:	Project No.:	
Address:	Quote No.:	
Comments:	Collection Date:	
	Sampler(s):	

Sample Identification	Collection Time	Comp.	Grab	Matrix	Analysis / Remarks						

Signature	Company	Date/Time Relinquished	Signature	Company	Date/Time Received
1			1		
2			2		
3			3		

(September '90)

SAMPLE . RECORD

Figure D.3

AQU. .C, INC.

Results Transmitted: ____________

Disposal Date: ____________

ETR Number: ____________

Project No.: ____________

Case Number: ____________

Document Control No.: ____________

LABORATORY SAMPLE NUMBER	REMOVED BY	DATE AND TIME REMOVED	REASON	DATE AND TIME RETURNED

information (including date received and general sample description), is recorded in the laboratory's master log and the computer based Laboratory Management System (LMS). Aquatec uses the LMS to track samples from quote through login, analysis, reporting, and finally invoicing. The laboratory's master log is maintained as a parallel paper system backup.

An Environmental Test Request (ETR) is generated in the Laboratory Management System for each sample or series of samples. The ETR contains all of the specific information relative to a particular sample (all field information associated with sample collection, the sample identification number, the parameters to be analyzed for, the results of any field work). The ETR number is recorded in the laboratory's master log as a reference to the laboratory identification numbers. The ETR's are then maintained in a file of work in progress.

The individual samples are checked to insure that they are in proper containers and have been properly preserved for the requested analysis. The laboratory identification number is then physically affixed to the sample container(s), the proper Chain-of-Custody forms are generated, and the sample is properly stored in either refrigerators or freezers, depending on the requested analysis.

When the laboratory is ready to analyze the sample, an analyst requests the sample from the Sample Custodian and signs the proper Chain-of-Custody forms before removing it from the sample storage area. When analysis is complete, the analyst returns the sample to the custodian and signs the proper Chain-of-Custody form relinquishing custody of the sample. Once the samples have been completely analyzed, they are stored until their disposal date or a date specified by contractual obligations.

D.3 Laboratory Documentation

Workbooks, bench sheets, instrument logbooks, and instrument printouts, are used to trace the history of samples through the analytical process and to document and relate important aspects of the work, including the associated quality controls. All logbooks, bench sheets, instrument logs, and instrument printouts are part of the permanent record of the laboratory. Completed workbooks and instrument logbooks are submitted to the Data Review Groups for review and storage.

Each page or, as required, each entry is to be dated and initialed by the analyst at the time the record is made. Entries in the GC/MS standards logbooks and runlogs are made in duplicate using carbon sheets. Errors in entry are to be crossed out in indelible ink with a single stroke and corrected without the use of white-out or by obliterating or writing directly over the erroneous entry. All corrections are to be initialed and dated by the individual making the correction. Pages inserted into logbooks are to be stapled to a clean, bound page. The analyst's initials are to be recorded in such a manner that the initials overlap the inserted page and the bound page. A piece of non-removable transparent tape is then to be placed over the initials as a seal. Pages of logbooks that are not completed as part of normal record keeping should be completed by lining out unused portions. Specific information on the types of logbooks, format of entry, and other pertinent information are contained in the appropriate sectional SOPs.

Laboratory notebooks are periodically reviewed by the Laboratory Section Heads for accuracy, completeness, and compliance to this QAPP. All entries and calculations are verified by the Laboratory Section Head. If all entries on the pages are correct, then the

Laboratory Section Head initials and dates the pages. Corrective action is taken for incorrect entries before the Laboratory Section Head signs.

D.4 Storage of Records

D.4.1 Commercial Clients

Worksheets containing the supportive documentation are stored by method number in the file cabinets for one year. After this time period, the worksheets are placed in cardboard boxes. These boxes are labeled and stored for a minimum of seven (7) years.

D.4.2 Level IV Data

The completed data package including supportive documentation is placed in a box and retained at Aquatec for a minimum of seven (7) years.

D.4.3 Storage of Tapes

Magnetic computer tapes are stored in the computer room, and corresponding tape streamer logbooks are maintained for a minimum of seven (7) years.

E. ANALYTICAL METHODOLOGIES

Detailed descriptions of accepted procedures for the analysis of organic, inorganic, and biological parameters are maintained in the individual laboratory sectional SOPs. Appendix B of this QAPP presents a summary of the methods employed by Aquatec's chemistry and biology laboratories.

Detection limits for the individual parameters are dependent upon the methodologies employed. Aquatec achieves detection limits established by the methods which can also be modified to accommodate difficult sample matrices or client specifications.

It is important to the validity of the analytical results that samples be collected and stored in properly prepared containers to eliminate sources of contamination arising from sample containers. All aqueous samples are preserved, chemically or by refrigeration, as specified in EPA methodologies. Soil and sediment samples are unable to be uniformly chemically preserved, therefore the preservation for these samples will be limited to storage at 4°C.

E.1 Subcontracted Analyses

Aquatec does not routinely subcontract analytical services with the exception of dioxin, asbestos, and radiologicals analyses. Prospective subcontracting firms are thoroughly reviewed with an emphasis on their overall quality control practices and the quality of their data. Aquatec will ensure that the subcontracting firm has all the information necessary to perform the analyses to satisfy the objectives of the client. Samples are shipped to subcontracting firms from Aquatec's sample management department and the results of the analyses are transmitted back to Aquatec for review. These results will be synthesized into Aquatec's reporting format and presented to the client.

F. QUALITY CONTROL

Controls analyzed in conjunction with samples are essential in the evaluation of the quality of the generated data. The following quality control procedures are employed by the laboratory. Although, in many cases, this satisfies only the minimum requirements, the laboratory is continually working within quality control programs initiated by its clients. These programs may include any of the following quality controls in addition to other contractual obligations.

The quality control program implemented in the laboratory includes the analysis of method blanks, reference standards, analytical spikes, and surrogate spikes. Every analytical series includes some of these controls, depending upon the analysis. The combination of controls used in an analysis must be completely representative of the analytical task. This includes all aspects of sample preparation and sample analysis.

F.1 Method Blanks

Sources of contamination in the analytical process, whether a contribution of specific analytes or a source of interferences need to be identified, isolated, and corrected. The intent of the method blank is to identify possible sources of contamination within the analytical process. For this reason, it is necessary that the method blank is initiated at the beginning of the analytical process and encompasses all aspects of the analytical work. This will include glassware, reagents, instrumentation, or other sources of contamination that could affect sample analysis. Laboratory section SOP's as well as contractual obligations define the frequency of method blank analysis. In the absence of a specified frequency, a method blank is analyzed with each analytical series at a frequency of one method blank associated with no more than twenty samples.

This same concept applies to sample containers either used or supplied by Aquatec for the collection of samples. A method, or bottle blank, should be analyzed for each type of sample container as it would be used for sample collection. The frequency of analysis would preferably extend to each lot of processed sample containers. At a minimum the analysis of a container blank should be performed whenever the preparation process, preservation reagent, or type of container changes.

The use of holding blanks associated with volatile organics analyses, whether by GC or GC/MS, is also to be considered in the concept of a method blank. Cross contamination of samples held in closed storage is a distinct possibility. A holding blank specific to each group of samples received for analysis will be generated and analyzed with the samples. Holding blanks indicate contaminants which may have affected the sample during storage at the laboratory.

The analysis of field blanks, trip blanks and equipment blanks, add more insight into interpreting the results of sample analysis. Equipment blanks are generated as part of the sampling process in the field. Field and trip blanks indicate what contaminants may have affected the samples during sampling or in transit to the laboratory. Analysis of these type of blanks are not routine, but they can be performed at a client's request or as specified in a contract.

F.2 Reference Standards

Reference standards are standards of known concentration and independent in origin from the calibration standards. These reference standards are generally available through the U.S. Environmental Protection Agency, the National Bureau of Standards, or are specified by analytical methodologies. Reference standards are included in the analytical process, although in some aspects of sample handling and preparation, they may not reflect the analytical process. The intent of reference standard analysis is to provide insight into the analytical proficiency within an analytical series. This includes the preparation of calibration standards, the validity of calibration, sample preparation, instrument set-up, and the premises inherent in quantitation. Reference standards are utilized in every analytical series with the exception of GC/MS and certain GC analyses for which reference standards do not exist. The results of a reference standard analysis exceeding specified tolerances have major implications with respect to the associated sample result, thus requiring the reanalysis of samples. It is important to consider how representative the standard analysis is with respect to the sample analysis in evaluating the results.

F.2.1 Control Limits

Control Charts are maintained for the inorganic analysis of water and wastewater using EPA's 200 series methods. The warning and control limits on these charts are calculated based on 20 determinations and are set by contractual obligations. In the absence of set limits, the warning limits are set at $\pm$ 2 standard deviations from the mean value; the control limits are set at $\pm$ 3 standard deviations from the mean value. If the 95% confidence interval published by EPA for the true value is within these determined limits, the EPA limits are used for that analyte. When a reference standard value exceeds the established warning limits, careful scrutiny is given to the operating system, standards preparation, and procedures that were used in obtaining the result. If the value of the reference standard exceeds the established control limits, then sample analysis is stopped and corrective action is taken. All samples analyzed since the last passing reference standard will be reanalyzed following recalibration of the instrument. The control limits are updated by the Quality Assurance Officer annually or semi-annually based on the previous 20 determinations. Permanent records of all reference standard determinations are kept in a database. An example of a control chart is given in Figure F.1.

F.3 Analytical Spikes

F.3.1 Analyte Spikes

The intent of the analytical spike is to provide insight into the efficiency and proficiency of an analytical series. This includes quantitation standards, sample preparation, instrument set-up, and the premises inherent in quantitation. This control reflects the efficacy of sample analysis within an analytical series while it is less sensitive in reflecting the conditions which are within the control of the analyst. When analytes are spiked directly into the original sample, they are called matrix spikes. Within an analytical series, a representative sample portion is designated as a separate sample and spiked with known concentration(s) of the analyte(s) under consideration. The advantages to this approach lies in the fact that the spiked sample portion is handled and prepared in exactly the same manner as the samples. Sample related interferences affecting an analysis will be reflected in the results from the spiked sample portion. Results of analytical spikes exceeding the specified tolerances need to be evaluated thoroughly in conjunction with other measures of control. In the absence of other control measures, the integrity of the analytical work cannot be verified. Reanalysis with additional controls or different analytical methodologies is necessary.

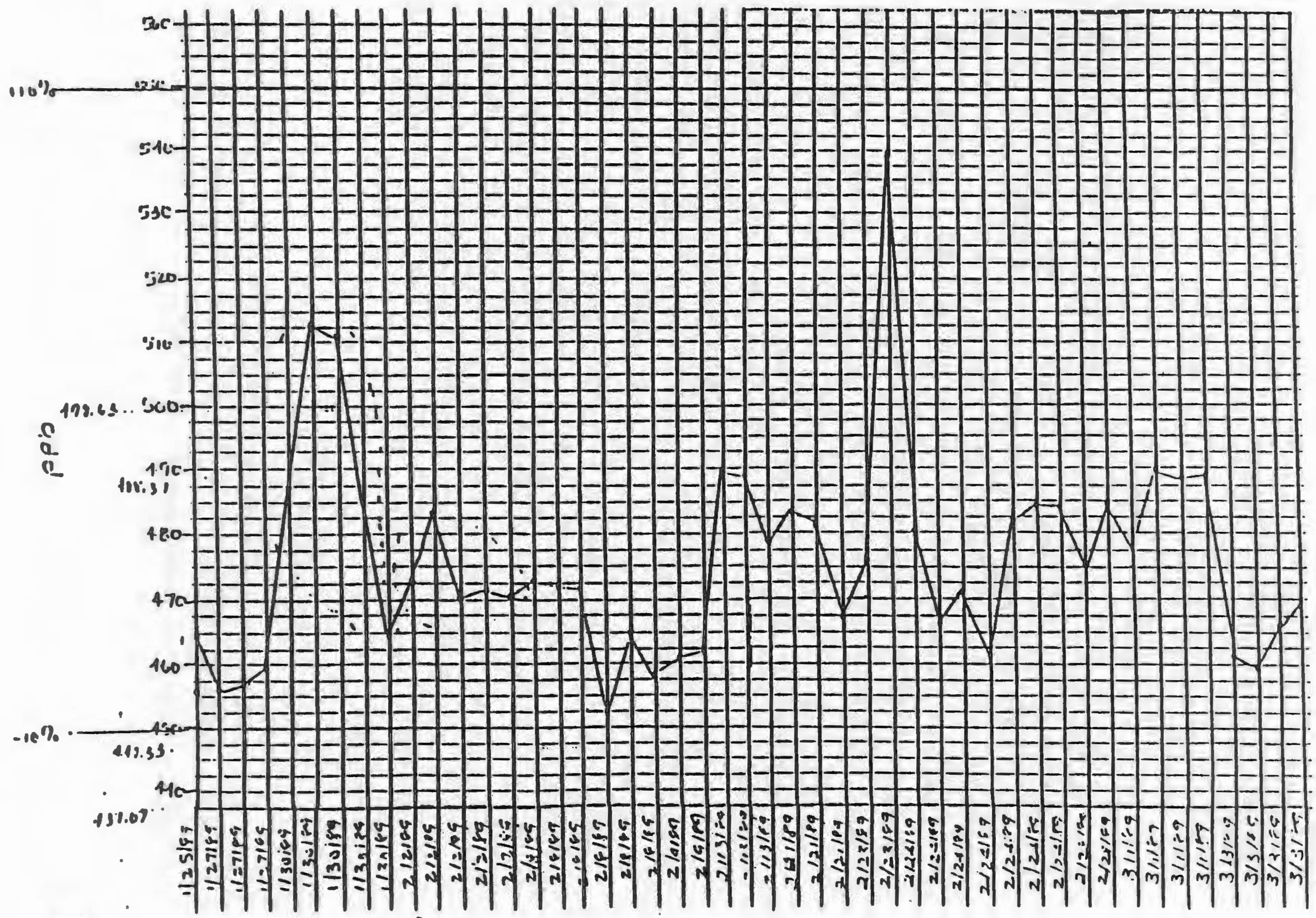
F.3.2 Surrogate Spikes

Another type of analyte spike is a surrogate spike. Surrogates are compounds unlikely to be found in nature that have properties similar to the analytes of interest. This type of control is

Figure F.1 Example of Reference Standard Control Chart

Cadmium

REFERENCE STANDARD IVQCS



n = 20

$\bar{x}$ = 467.85

s.d. = 10.26

T.V. = 500 ppb

(calculated from IvQCS(i))

primarily used in the GC/MS and GC laboratories. The intent of a surrogate spike is to provide broader insight into the proficiency and efficiency of an analytical method on a sample specific basis. This control reflects analytical conditions which may not be attributable to sample matrix. If results of surrogate spike analysis exceed specified tolerances, then the analytical results need to be evaluated thoroughly in conjunction with other control measures. In the absence of other control measures, the integrity of the data cannot be verified. Reanalysis of the sample with additional controls or different analytical methodologies is necessary.

F.4 Replicate Analysis

Replicate analysis is a measure of analytical precision and can be limited in its scope. If used in conjunction with reference standards or analytical spikes, it can give a measure of the reliability of the analytical systems. Replicate analyses can be significant in the interpretation of analytical results for samples which have complex matrices. The results of a replicate analysis may influence final reports.

F.5 Calibration Check Standards

Calibration check standards analyzed within a particular analytical series will give insight into the instruments' stability. A calibration check standard should be analyzed at the beginning and end of an analytical series or periodically throughout a series containing a large number of samples. Frequency of analysis is defined in the methodologies and contractual obligations. In the absence of a specified frequency, calibration check standards should be analyzed after every ten samples. In analyses where internal standards are used, a calibration check standard need only be run in the beginning of an analytical series. If results of the calibration check standard exceed specified tolerances, then all samples analyzed since the last acceptable calibration check standard are reanalyzed.

F.6 Internal Standards

Internal standard areas are monitored in the GC/MS laboratory. The internal standard is present in all acquisitions with the exception of performance standards (decafluorotriphenylphosphine and p-bromofluorobenzene). The response of each compound within the internal standard is plotted on a control chart (Figure F.2). The tolerance ranges of these charts are contractually set. In the absence of any other criteria, the following working rule applies: the area of any compound cannot fall below 50% of its value in the preceding check standard nor can it rise above 100% of its value. If internal standard areas in one or more samples exceeds the specified tolerances, then the instrument will be recalibrated and all affected samples reanalyzed.

F.7 Biological Standards

F.7.1 Microbiological Standards

All equipment and supplies used in the microbiological analyses are routinely checked for sterility. Laboratory dionized water is monitored monthly for bacterial densities and required water quality characteristics. If any of the parameters are out of the specified tolerances, the personnel responsible for the dionized water system are notified and corrective action is taken. The laboratory water is tested annually for suitability for culturing bacteria. Glassware is tested annually using the inhibitory test to insure that the glassware cleaning procedures do not inhibit bacterial growth. Bacteria sample containers are prepared in lots and each lot is checked for sterility. If the tested container is not sterile, then all the associated containers will be re-sterilized and re-tested.

A positive and negative control sample is run with each daily set of bacteriological samples. The negative control is conducted using the dilution water appropriate for the test. This dilution water is

EPR or Case No.: ______

Client: ______________________ Acquisition Date(s): ______________________

IS	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT
1															
10															
28															
44															
60															
68															

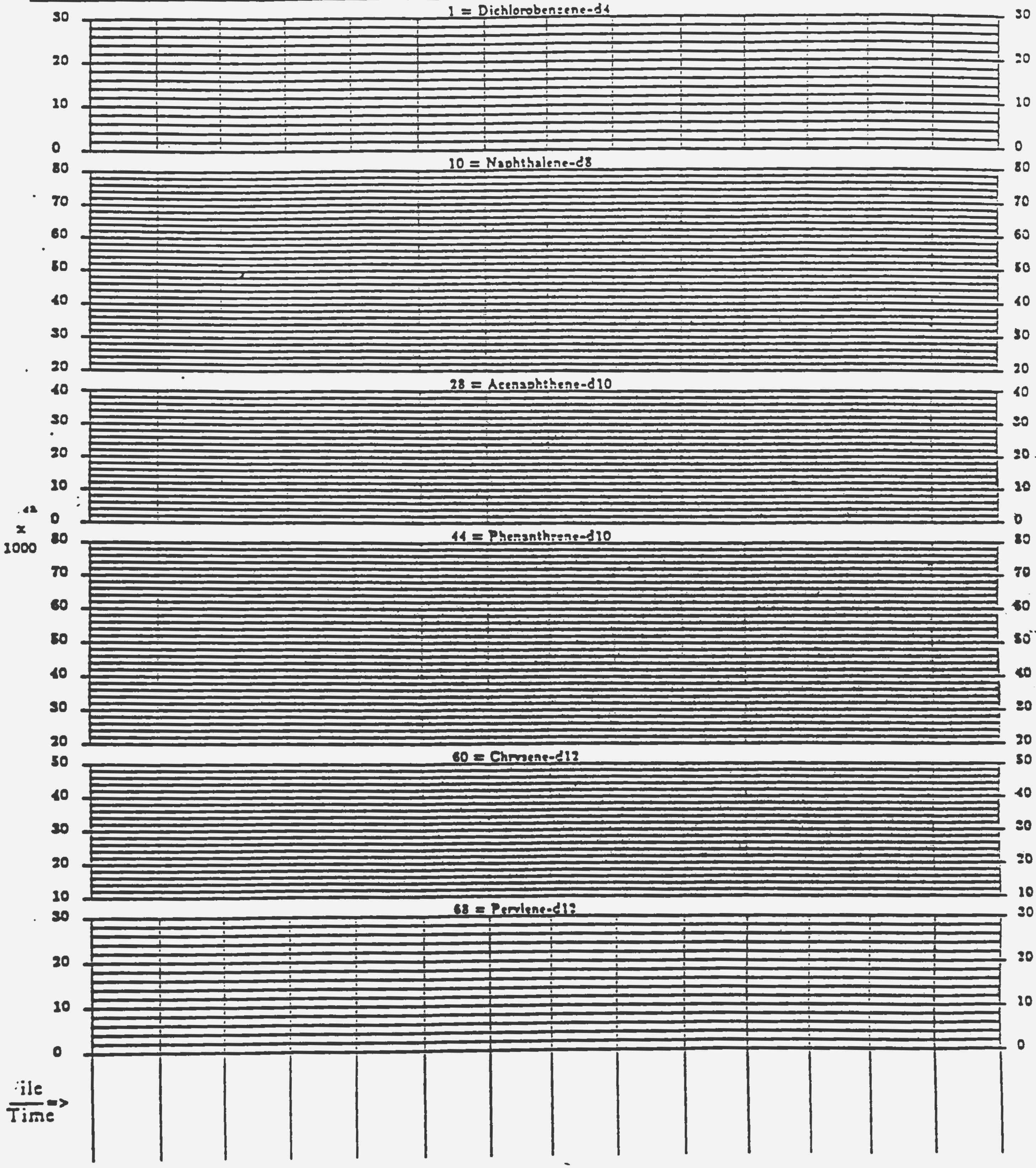


Figure F.2

ETR or Case No: ________

Client: ______________________ Acquisition Date(s): ______________

IS	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT
1															
13															
36															
30															

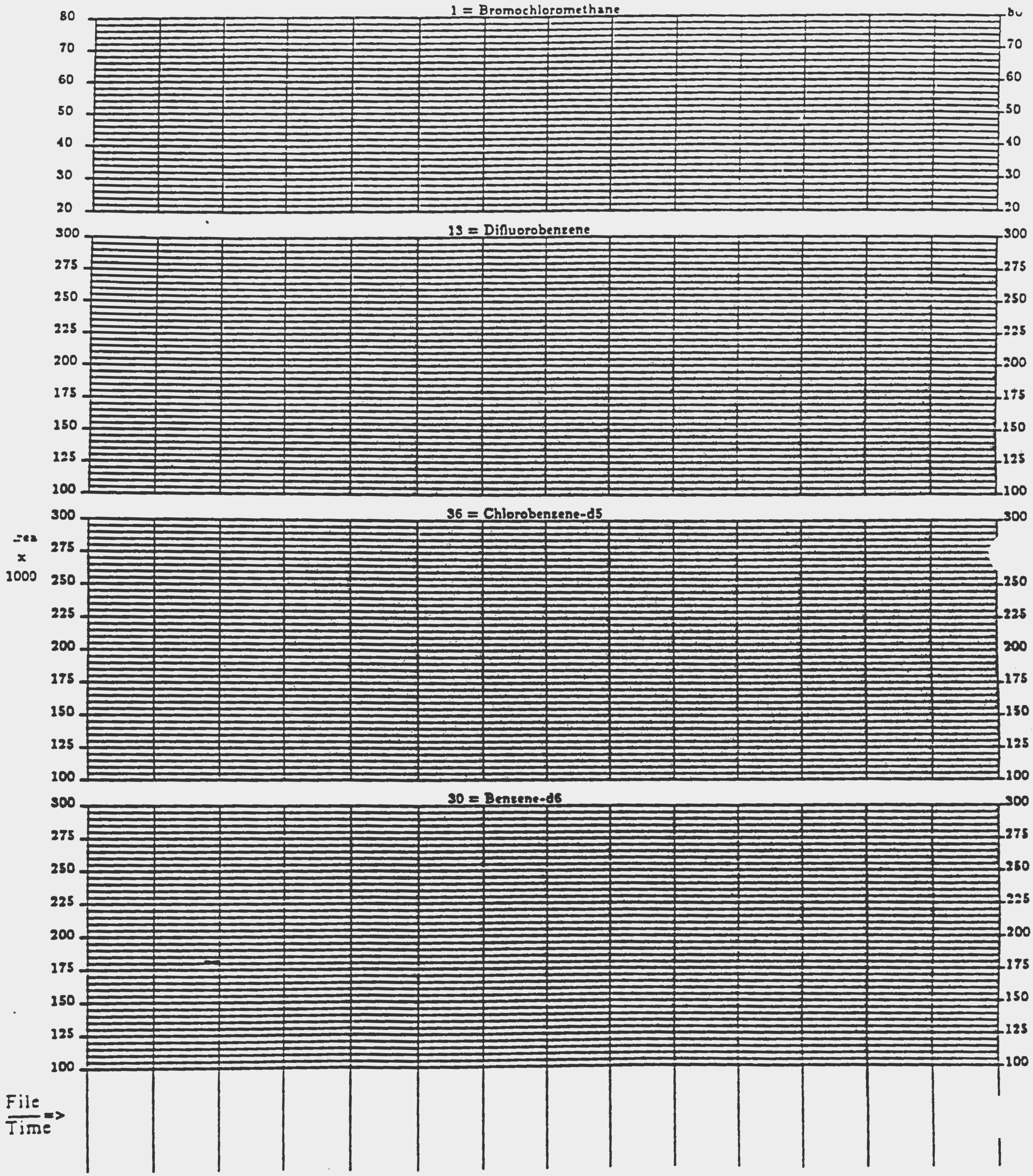


Figure F.2 (continued)

typically sterile phosphate rinse buffer. The positive control consists of the use of a target bacteria for the specified test, such as Esterichia coli, Salmonella spp., or Enterobacter sp., which are routinely maintained in the laboratory. Positive contols are diluted to an appropriate concentration and are carried through the entire analysis to insure that cultural conditions are maintained. If the results of the negative or positive control samples indicate contamination or cultural problems, then all affected samples will be resampled and reanalyzed.

F.7.2 Bioassay Standards

The sensitivity of the lineages of all test organisms used in the bioassay studies are routinely evaluated using reference toxicants obtained from USEPA Quality Assurance Program and/or internal toxicant standards. Test organism sensitivites are compared to specified tolerances. Control limits are calculated as outlined in Section F.2.1 of this QAPP. Fresh and saltwater test organisms cultured in our laboratory are maintained under the recommended environmental conditions and monitored daily by laboratory personnel.

In accordance with bioassay method protocols, each test concentration and control samples are analyzed in replicate. A control sample consisting of the dilution water used in the bioassay are analyzed with every test series. If the response of the control test organisms are outside control limits, the test conditions are scrutinized for out-of-control situations. The response of the control test organisms and the test conditions are reported with each bioassay. The interpretation of the response and test conditions may influence the final report. If the test is judged by the Biological Laboratory Director as unacceptable due to organism response and/or laboratory conditions, the test results will be rejected and a new sample analyzed.

F.8 Software Quality Control

Aquatec's Technical Support Division develops software for data reduction and reporting for the Analytical Laboratory Division. These programs are requested and specified by the laboratory in terms of valid assumptions, calculations, and presentation of data. All software requests are presented to the Laboratory Director who will evaluate the request in terms of applicability and pass it on to Technical Support personnel. After the programs are developed but before they are put into general use by the laboratory, they are checked and approved by a laboratory representative. Once the programs have been approved, they are introduced to the laboratory personnel and the appropriate SOPs are updated to reflect changes in procedures for an analytical method. Record of all software requests, developments, improvements, and approvals are filed in the project files.

F.9 Audits

F.9.1 Audits from Regulatory Agencies

As a participant in state and federal certification programs, the laboratory sections at Aquatec are audited by representatives of the regulatory agency issuing certification. Audits are usually conducted on an annual basis and focus on laboratory conformance to the specific program protocols for which the lab is seeking certification. The auditor reviews sample handling and tracking documentation, analytical methodologies, analytical supportive documentation, and final reports. The audit findings are formally documented and submitted to the laboratory for corrective action.

F.9.2 Internal Audits

All laboratory sections of the Chemistry Division at Aquatec are required to participate in semi-annual internal audits which are administered by the Quality Assurance Officer. The findings of these audits are formally documented and submitted to the Laboratory Director and to corporate management. The Laboratory Director will have the responsibility for resolving points at issue or for effecting necessary changes to the laboratory's practices.

The audit program will focus on the following areas:

1. Maintenance of acceptable and complete SOP's in company format.
2. Maintenance of training records.
3. Maintenance of notebooks.
4. Maintenance of instrument records.
5. Evaluation of standards control records.
6. Evaluation of sample handling procedures.
7. Evaluation of data handling and storage procedures.

F.10 Corrective Action

When deficiencies or out-of-control situations exist, the Quality Assurance Program provides a means of detecting and correcting these situations. Samples analyzed during out-of-control situations are reanalyzed prior to reporting of results. There are several levels of out-of-control situations that may occur in the laboratory during analysis.

F.10.1 Bench Level

Corrective action procedures are often handled at the bench level. If an analyst finds a nonlinear response during calibration of an instrument, then the instrument is recalibrated before sample analysis commences. The problem is often corrected by a careful examination of the preparation or extraction procedure, spike and calibration mixes, or instrument sensitivity. If the problem persists, it is brought to the management level.

F.10.2 Management Level

If resolution at the bench level was not achieved or a deficiency is detected after the data has left the bench level, then corrective action becomes the responsibility of the Laboratory Section Head or Laboratory Director. Unacceptable matrix or surrogate spike recoveries detected by data review are reported to the Laboratory

Section Head. A decision to reanalyze the sample or report the results is made depending on the circumstances. Documentation procedures for sample reanalysis are initiated at this point if necessary.

F.10.3 Receiving Level

If discrepancies exist in either the documentation of a sample or its container, a decision must be made after consulting with the appropriate management personnel. All decisions will be fully documented. Some examples of container discrepancies are broken samples, inappropriate containers, or improper preservation. In these cases, corrective action involves the Project Director contacting the client to resolve the problems.

F.10.4 Statistical Events

This type of corrective action can only be monitored if control charts are kept for an analyte. An out-of-control situation is defined as data exceeding control limits, unacceptable trends detected in the charts, or unusual changes in the instrument detection limits. When these situations arise, it is brought to the attention of the Laboratory Director who will initiate corrective action.

F.10.5 Audit Response

The laboratory is required to respond with corrective action to the audit findings and recommendations of the regulatory agencies before certification for a particular program can be granted. If a recommendation is related to document format (for example, laboratory name is absent from a preprinted benchsheet), then the laboratory personnel will revise the document format and a copy of the revised document format will be submitted to the appropriate representatives of the regulatory agency. If a recommendation is related to an actual procedure (for example, error correction), then the recommendation will be communicated to the laboratory personnel informing them of the correct procedure and a record of this communication will be submitted to the appropriate representatives of the regulatory agency. If a recommendation is related to the written procedures (for example, written SOPs), then the laboratory personnel will revise the written SOPs and a copy of the new SOPs will be submitted to the appropriate representatives of the regulatory agency. The Laboratory Quality Assurance Officer will conduct a follow-up audit to verify that corrective action has been implemented within one to two weeks of the audit report. Observations made during this follow-up audit will be submitted to the appropriate representatives of the regulatory agency.

F.11 Interlaboratory Testing

The analytical laboratory participates in the EPA inter-laboratory performance evaluation program for water (WS) and wastewater (WP) in addition to evaluations conducted by the states of Vermont and New York. The analytical laboratory also participates in the inorganic and organic quarterly performance evaluations conducted by the EPA. Employee performances are annually evaluated. In some cases, extenuating circumstances will require more frequent evaluations.

F.12 Inventory Procedures

Purchasing guidelines for all equipment and reagents effecting data quality are well defined and documented in the sectional SOPs. Similarly, performance specifications are documented for all items of equipment having an effect on data quality. Any item critical to the analysis, an *in situ* instrument or reagent, received and accepted by the organization is documented. This includes type, age, and acceptance status of the item. Reagents are dated upon receipt to establish their order of use and to minimize the possibility of exceeding their shelf life.

Requests for equipment affecting the quality of analytical data will be submitted in writing to the Laboratory Director for technical approval. After approval, the requisition will be submitted to the company president for purchase approval.

G. DATA VALIDATION AND REPORTING

Each laboratory section provides extensive data validation prior to reporting results to the client. In general, there are three levels of review as outlined below. For a complete description of validation steps and processes, refer to the sectional SOPs or to the Analytical Laboratories SOP.

The analyst is responsible for primary review of data generated from sample analysis. If recoveries of all quality control samples are within specified tolerances, then the data are presented to data review groups for secondary review. If recoveries of any quality control samples exceed specified tolerances, then affected samples are reanalyzed.

Secondary review is conducted by data review groups to determine if analytical results are acceptable. If recoveries of all quality control samples are within specified tolerances, then the data are presented to Project Directors for final review. If recoveries of any quality control samples exceed specified tolerances, then affected samples are submitted for reanalysis.

Project Directors determine if all analytical results of a sample(s) are consistent. If so, then the data are presented in a final report to the client. If discrepancies or deficiencies exist in the analytical results, then corrective action is taken. Audits of final reports by the Quality Assurance Officer will be conducted to determine the precision, accuracy, completeness, and representativeness of sample analyses.

After all analytical data has been reviewed, the final report can be assembled for submission to the client. Aquatec offers five levels for reporting analytical results based on Data Quality Objectives (D.Q.O.). Level I data consists of measurements taken during field analysis.

Level II data requires a specified degree of confidence in the compound identification and quantitation. Compound identification specificity can range from group identification to single compound identification. Level II reporting consists of an analytical report with internal quality control results retained at Aquatec.

Level III data requires a high degree of confidence in the compound identification and quantification, but not necessarily to the standards of level IV. This degree of confidence is achieved by examination of the raw laboratory data and the use of applicable laboratory QA/QC requirements. The frequency of QA/QC checks and standardizations are less than for level IV analysis. Level III reporting consists of an analytical report with some internal quality control results reported; these include reference standards and method blanks.

Level IV data requires the highest degree of confidence in the compound identification and quantitation. Level IV is defined by the QA/QC supporting material which is provided by a CLP Regular Analytical Services Request. The high degree of confidence in the data are achieved by a thorough examination of the raw laboratory data and strict laboratory QA/QC controls. These controls include frequent standardization, spikes, duplicates, blanks, and strict compound identification criteria.

Level V data has unique requirements in either compound identification, quantitation, detection limits, cleanup or QA/QC requirements. Level V analytical procedures are defined through the use of Special Analytical Services (SAS) requests for CLP. The procedures and QA/QC are specified through these requests. The QA/QC for Level V data usually requires frequent standardization, spikes, duplicates, blanks, and strict compound identification criteria.

There are five (5) general sections to any CLP data package. Sections may be added or deleted depending on the scope of work.

Section 1 - Narrative

The information contained in the narrative consists of (a) client name and address; (b) cross reference to Aquatec's ETR #; (c) date of receipt of samples; (d) cross reference of Aquatec's lab number to clients sample ID; (e) a discussion of the analytical work.

Section 2 - Analytical Results

The results of all analyses will be contained in this section including any external quality control as specified by contractual obligations.

Section 3 - Supportive Documentation

This section contains any printouts, chromatograms, and raw data generated from the analyses.

Section 4 - Sample Preparation

Extraction sheets, digestion sheets, % solids, logbook pages, and runlog pages are found in this section.

Section 5 - Sample Handling

All documentation accompanying samples such as sample receipt sheets, internal Chain-of-Custody forms, correspondence,and telephone logs.

Once the document is assembled, the sections are distinguished with blue paper with their respective titles. The pages are paginated in numerical order and photocopied. Copy(s) of the documentation are sent to the client, and the original document is retained at Aquatec in storage for a minimum of seven (7) years.

H. SAFETY CONSIDERATIONS

Aquatec has a fundamental responsibility to provide facilities, equipment, maintenance, and an organized program to make necessary improvements to ensure a safe working environment. Unless employees fulfill their responsibilities for laboratory safety, the safety-related features of the facility and established safety programs will be ineffective.

The Aquatec building is equipped with many structural safety features. These include:

* Fire Alarm System
* Sprinkler System
* Exit Signs
* Emergency Lighting System
* Fire Extinguishers
* Laboratory Showers
* Fire Doors
* Fire Blankets
* Fume Hoods

Each employee will be familiar with the location, use, and capabilities of general and specialized safety features associated with their workplace. To protect employees from potential workplace hazards, Aquatec provides and requires the use of certain items of protective equipment. These include safety goggles, protective clothing, gloves, respirators, etc. If employee owned safety equipment is used, these items will be inspected to assure adequacy and conformity to applicable regulations. For a complete description of the types of personal safety equipment available, refer to the Laboratory SOP Section H.6.

Precautions to be taken in the transportation, storage, and use of chemical substances are outlined on Material Safety Data Sheets provided by chemical supply companies. Employees using chemical substances are to become familiar with the Material Safety Data Sheets, especially those pertaining to routinely handled chemicals. These are maintained in a file, available to all employees.

APPENDIX A

Resumes of Key Personnel
Qualifications of Personnel

Resume

JANINE L. BANKS

Sample Management

EDUCATION

Rensselear Polytechnic Institute, Troy, NY, 1980-1982
Studied Computer Science and Management

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1984-Present

PROJECT RELATED EXPERIENCE

1984-Present

Responsible for the logging in of samples, ensuring contractual requirements (for government or private industry contracts) are met through scrutiny of both samples and corresponding documentation.

Responsible for following chain-of-custody procedures and enforcing the in-house custody system.

Responsible for managing a team of sample custodians.

Other responsibilities include the examination of samples for proper preservation and bottles as they arrive for log-in, preserving the integrity of samples while in the laboratory, keeping bottle stocks for the field department, shipping of bottles to clients, proper disposal of remaining samples, and career development of sample custodians.

Resume

KAREN R. CHIRGWIN

Quality Assurance Officer

EDUCATION

- M.S. University of Vermont, Burlington, VT, 1988 (Biostatistics)
- B.A. University of Vermont, Burlington, VT, 1985 (Biology)
- B.A. University of Vermont, Burlington, VT, 1985 (Mathematics)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1987-Present
University of Vermont Department of Mathematics and Statistics, Burlington, VT, 1986-1988
Environmental Science, Inc., Middletown, CT, 1986

REPRESENTATIVE EXPERIENCE

1989-Present, Aquatec, Inc.
As Quality Assurance Officer, Ms. Chirgwin is responsible for the continued development and implementation of a Quality Assurance Program for inorganic and organic analyses of environmental samples. Her responsibilities include the preparation and maintenance of the Laboratory Quality Assurance Program Plan (QAPP), conducting audits, participating in and responding to audits from government and regulatory agencies, and monitoring the use of quality controls within the laboratory sections. In addition, Ms. Chirgwin oversees the development, revision, and implementation of standard operating procedures within the laboratory sections. She is also involved with the preparation and review of Quality Assurance Project Plans (QAPjP) and work plans for large environmental projects.

1987-1989, Aquatec, Inc.
As an analytical chemist, Ms. Chirgwin was responsible for the analysis of volatile and semivolatile organic contaminants in environmental samples by GC/MS. Analyses required the use of GC/MS methodologies including EPA 500, 600, SW846, and EPA and New York State Contract Laboratory Protocols (CLP).

1986-1988, University of Vermont
Ms. Chirgwin was a Graduate Teaching Fellow responsible for lecturing, preparing exams, and grading students in introductory level statistics courses.

<u>REPRESENTATIVE EXPERIENCE</u> (continued)
1986, Environmental Science Corp.
Ms. Chirgwin was an analytical chemist responsible for the preparation and analysis of environmental samples for inorganic contaminants using atomic spectroscopy and conventional wet chemistry methods. She developed and implemented a program for total halogen analysis in contaminated oil samples, using the Parr Bomb, for 45-50 samples daily.

Supported the organic chemists by preparing BNA extracts for analysis by GC/MS and setting up autosampler runs for the analysis of PCBs and VOAs in contaminated oil samples by GC.

Resume

JOSEPH K. COMEAU, Ph.D.

Vice President, Chemistry

EDUCATION

B.S., Manhattan College, NY, 1968
(Chemistry)
Ph.D., State University of New York, Buffalo, NY, 1975
(Analytical Chemistry)

PROFESSIONAL ASSOCIATIONS

American Chemical Society

SPECIALIZED TRAINING

Incos Applications Programming, Finnigan Institute, 1985
Infrared Spectroscopy, Perkin Elmer Corporation, 1981
Capillary Chromatography for GC/MS, Finnigan Institute, 1980
Analysis of Priority Pollutants, Finnigan Institute, 1980
Infrared Data Station Operation, Perkin Elmer Corporation, 1981
Miniranger Operation and Electronic Maintenance, Motorola Government Electronics Division, 1975

Other

General Radiotelephone Operator License, 1987

EMPLOYMENT HISTORY

Aquatec, Inc., South Burlington

Vice President	1985 - Present
Laboratory Director	1976 - 1990
Chemist	1973 - 1976

Vermont Water Resources Laboratory, Montpelier, VT

Chemist	1972 (summer)

Ayerst Laboratories, Rouses Point, NY

Chemist	1965 - 1971 (summers)

RECENT RESPONSIBILITIES AT AQUATEC, INC.

Managerial - Responsible for overall work flow and project direction for a group of fifty scientists and technicians. Duties include goal setting, resource planning, staffing and client contact.

Technical - active in method design and implementation. Responsible for all technical aspects leading to Aquatec's entry into the EPA organic Contract Laboratory Program (CLP) in 1983. Currently involved in consultation on industrial waste treatment, high purity water production, process control and technical insurance matters.

REPRESENTATIVE PUBLICATIONS AND REPORTS

A Study of Organic Levels and General Water Quality in Champlain Water District Water. Prepared for IBM Corporation, 1978.

A Study of the Anodic Behavior of Propane Using Techniques of Electrochemical Mass Spectrometry, Ph.D. Thesis, SUNY at Buffalo, 1975.

Binkerd, R., H.G. Johnston, and J.K. Comeau. Physical Impact Evaluation of the Discharge of Heated Water from the C.P. Crane Generating Station. Prepared for State of Maryland Department of Natural Resources, 1978.

Bruckenstein, S., and J. Comeau. "Electrochemical Mass Spectrometry," Intermediates in Electrochemical Reactions, The chemical Society, Faraday Division 56, 1973.

Chemical Characterization and Treatability Study of Industrial Waste Effluent. Prepared for RCA Corporation, Mountaintop, PA, 1975.

Identification and Quantification of PCB's As Isomer Groups by Gas Chromatography/Electron Capture Detection on Low Level Extracts. Prepared for EPA Region 1, 1986.

James A. Fitzpatrick Nuclear Power Plant Cooling Water System Fl Study. Prepared for the Power Authority of the State of New York, 1975.

Krol, G., G. Boyden, R. Moody, B. Kho, and J. Comeau. "Thin Layer Separation and Detection of Free Estrogens," J. Chromatogr, 61, 1971.

Physical Impact Evaluation of Chalk Point Generating Station's Cooling Water System of the Patuxent River. Prepared for the State of Maryland Department of Natural Resources, 1979.

Proposed Methods for Treatment of Plating Waste Discharge. Prepared for Fairbanks-Morse Weighing Systems, Division of the Colt Industries Operating Corporation, 1974.

The Analysis of Fish for Trace Organic Contaminants Using Liquid Chromatography and Capillary GC/MS. Prepared for the State of Vermont Department of Health, 1981.

The Analysis of Polynuclear Aromatic Hydrocarbons in the Burlington Barge Canal Using Liquid Chromatography and Capillary GC/MS. Prepared for the State of Vermont Department of Health, 1981.

Resume

PHILIP C. DOWNEY, Ph.D.

Biology Laboratory Director

EDUCATION

B.S. Marietta College, 1975
(Biology)
B.S. University of Michigan, 1975
(Natural Resources; Field of Specialization - Fisheries)
M.S. Louisiana State University, 1978
(Fisheries)
Ph.D. University of Idaho, 1982
(Forestry Wildlife and Range Sciences; Field of Specialization - Fisheries Resources)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1981-Present
Lecturer, Unity College, Unity, ME, August 1982
Instructor, Washington State University/University of Idaho Summer Institute, June 1981
Consultant, Sterling H. Nelson and Sons, Inc., 1979

PROFESSIONAL ASSOCIATIONS AND CERTIFICATIONS

Certified Fisheries Scientist (Certification No. 1970)
Phi Sigma Biology Honor Society
American Fisheries Society (AFS)
Bioengineering Section of AFS
Fish Culture Section of AFS
Fish Health Section of AFS
American Society of Limnology and Oceanography
Vermont Subcommittee on Endangered Fishes

SPECIALIZED TRAINING

Hydroacoustic Assessment Techniques, Biosonics, Inc., 1986
Habitat Evaluation Procedures (HEP), Certified, 1984
Hazardous Materials Incident Response Operations (165.5)
SCUBA, NAUI Certified, 1976

REPRESENTATIVE EXPERIENCE

1985-Present

As the director of the biological division, Dr. Downey supervises the environmental, microbiology and toxicity laboratories. Recent fisheries projects have included environmental studies on lake Champlain and investigations of the habitat preferences of the American shad. Dr. Downey was the project director for a fish enhancement study conducted at a number of hydroelectric facilities. Behavioral studies conducted have included Atlantic salmon smolt outmigration with radiotelemetry. Dr. Downey was a fisheries consultant on the State of Vermont's project for locating a new State fish hatchery. His responsibilities

<u>REPRESENTATIVE EXPERIENCE</u> (continued)
included conducting studies on lake water quality for bioengineering design criteria and making projections of hatchery effluent, based upon design and operating criteria, for the discharge permit.

1981-1984
Upon joining Aquatec, Inc. in 1981, Dr. Downey developed a comprehensive fisheries and aquatic biology investigative program to assess potential impacts of thermal effluent discharged during the summer to the Connecticut River. These studies concentrated on fish health, growth, survival and species composition of representative resident fishes. Other projects included feasibility studies for hydroelectric sites and fish health inspections for bait dealers in the State of New Hampshire.

1978-1981
During these years, Dr. Downey was involved in several projects in addition to his research responsibilities for his doctoral work. He was a co-author of a manual for trout and salmon production, published by Sterling H. Nelson and Sons, Inc., a major fish food producer. He also represented the United States as a delegate to the North Pacific Aquaculture Symposium, an international technical and scientific exchange program. Selected delegates from the United States, Canada, Japan and Union of Soviet Socialist Republics attended this biannual meeting.

Resume

CONSTANCE C. DUMAS

Microbiologist

EDUCATION
B.S. University of Vermont, 1967

PROFESSIONAL HISTORY
Aquatec, Inc., South Burlington, VT, 1984-Present
Medical Center Hospital of Vermont, Burlington, VT, 1964-1974

PROFESSIONAL CERTIFICATION
MT (ASCP) #60505
Medical Technologist (American Society of Clinical Pathology), 1967

SPECIALIZED TRAINING
DNA Probe Hybridization-Assay, 1987

REPRESENTATIVE EXPERIENCE

1984-Present
Mrs. Dumas' responsibilities include microbiological analyses of food products, especially in the dairy industry, according to the Bacteriological Analytical Manual (BAM) and drinking water analysis in our State Certified laboratory. Other microbiological analyses include monitoring sewage treatment discharges for permit requirements, developing techniques for identifying autotrophic bacteria and investigation of biodegradation of petroleum products by bacteria. Mrs. Dumas also assisted in developing techniques for the use of epifluorescent microscopy for monitoring ultra-pure water systems. Since 1987, she has been responsible for the maintenance, development and quality control within microbiology.

1970-1974
During this time as a staff technologist in hematology and bacteriology, Mrs. Dumas was involved with daily analytical work, quality control, special coagulation studies and laboratory instruction of new medical technology students.

1967-1969
As a rotating staff technologist, responsibilities included analysis in bacteriology, hematology, chemistry, blood bank, serology and urinalysis in the clinical laboratory of a teaching hospital.

Resume

RICHARD T. GOMEZ

Chemist

EDUCATION

B.S. University of Vermont, 1975
(Biochemistry)
M.S. University of Vermont, 1982
(Cell Biology)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, Vermont, 1982 to Present
Parke-Davis Co., Holland, Michigan. Analytical Chemist, 1980-82
University of Vermont, Department of Pathology, College of Medicine, Burlington, Vermont. Research Technician (1975-1979), Technician in the Electron Microscope Facility (1979-1980)
International Business Machines, Corporation, Essex Junction, Vermont. Analytical Chemist, Summer 1974

PROFESSIONAL ASSOCIATIONS

American Chemical Society, past member

SPECIALIZED TRAINING

Waters Associates Liquid Chromatography School, 1982
Hewlett Packard High Resolution Capillary Chromatography School, 1984

REPRESENTATIVE EXPERIENCE

1987-Present

Mr. Gomez continues to serve as the director of several large analytical support projects on behalf of premier engineering firms and corporate clients. He also serves as Aquatec's primary customer service representative for the Chemistry Division, successfully providing assistance and guidance to existing and potential clients through the integration of his laboratory experience with a sound working knowledge of current EPA methodologies and environmental regulations.

1985-1987

Work centered around conducting special chemistry projects for corporate clients, as field studies involving high purity water pilot testing and trouble shooting, and cooling tower monitoring programs. Mr. Gomez conducted a laboratory pilot study to determine the potential for biodegradation of fuel oil in contaminated soil following application of nutrients to stimulate endogenous and exogenously applied bacteria. He was also the project director for the New York State DEC contract lab program at this time.

REPRESENTATIVE EXPERIENCE (Continued)

1982-1985
Mr. Gomez has been employed at Aquatec since 1982. For the first three years, he worked as an analytical chemist analyzing water, soil/sediments, and hazardous waste samples. Analytical techniques performed during this time included gas chromatography (GC), gas chromatography/mass spectrometry (GC/MS), infrared, ion chromatography, inductively coupled plasma and flame atomic absorption techniques for metals determination, bomb calorimetry, flashpoints, and a multitude of wet chemistry and bacteriological testing.

1980-1982
Worked as an analytical chemist at Parke-Davis Co. in Holland, Michigan. Duties included the analysis of all raw materials used in chemical manufacturing, as well as intermediary reaction products formed during the synthesis of specialty chemicals and pharmaceutical products. Analytical techniques routinely performed included gas chromatography, high pressure liquid chromatography, infrared, UV-Visible spectrophotometry, and nuclear magnetic resonance, as well as other tests listed in the U.S. Pharmacopoeia.

1979-1980
Worked as an electron microscopist for the University of Vermont Department of Pathology. Duties included tissues preparation and thin sectioning of the plasticized tissue, electron microscopy (EM) of th[illegible] sections, photographic plate developing of the EM pictures taken, a[illegible] printing the pictures by standard darkroom techniques.

1975-1979
Worked as a research assistant at the University of Vermont on a National Childhood Development grant. Project goals centered on establishing a link between fetal kidney damage and pulmonary hypoplasia. Experimental methods performed included the use of radioisotopic techniques and electrolytic radiorespirometry to biochemically evaluate chick embryo metabolism after administering nephrotoxic polyamines to damage the kidneys. Electron microscopy of fetal tissues was performed to provide morphological support of this theory.

Resume

David H. Hardwick

Chemist

EDUCATION

B.S. University of Vermont, 1977
(Biochemistry)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, Vermont, 1987 to Present
University of Vermont, Department of Pathology and Psychiatry, Burlington, Vermont, 1984 to 1987
St. Francis Hospital, Colorado Springs, Colorado, 1981 to 1984
University of Vermont, Department of Pathology and Biochemistry, Burlington, Vermont 1977 to 1981

PROFESSIONAL ASSOCIATIONS

Member, Alpha Zeta Honorary Society

REPRESENTATIVE EXPERIENCE

1987-Present
Primarily concerned with aqueous, soil, and sludge samples. Responsible for ion chromatography, organic/inorganic carbon analysis, organic halide analysis and a wide variety of spectrophotometric and titrimetric procedures. Safety Officer for section. Acting Manager in absence of Supervisor.

1984-1987
Department of Pathology - Upper Level Technician studying asbestos toxicity. Extensive experience with tissue/organ culture, radioimmunoassays, and enzymatic measurement. Routine use of carcinogens and radioisotopes. Graphics and photographics production.

Department of Psychiatry - Laboratory Administrator and Technologist in lab studying blood platelet activation and differentiation of neuroblastoma hybrid cells. Research responsibilities included tissue culture, drawing human blood donors, monoclonal antibody production, column chromatography and radioimmune procedures. Administration duties related to 4-6 lab personnel and their associated projects, equipment, set-up and maintenance; equipment and supply ordering. Laboratory Photographer.

1981-1984
Processing of all routine and STAT blood chemistry tests, and the drawing of venous and arterial blood specimens. During employment, assumed increased responsibilities for quality control and instrument maintenance. The nature of the work stressed individual precision, accuracy, and organization, while demanding the ability to function as part of a team.

REPRESENTATIVE EXPERIENCE (continued)

1977-1981

Department of Pathology - Laboratory Technician. Investigated secretory mechanisms of tracheal organ cultures as pertaining to cystic fibrosis. Work involved tissue and organ culture techniques, bacterial toxins, carcinogenic and radioactive compounds. Preparation of samples of scanning and transmission electron microscopy. Use of JEOL 35 SEM. Extensive photographic responsibilities.

Department of Biochemistry - Laboratory Technician. Beryllium toxicity in murine fibroblast monolayers in culture. Laboratory Photographer.

Resume

H. GREGORY JOHNSTON

Vice President, Technical Services Division

EDUCATION

B.S. University of Vermont, 1974
(Mathematics)
M.S. University of Vermont, 1976
(Mathematics)

PROFESSIONAL ASSOCIATIONS

American Association of Computing Machinery

SPECIALIZED TRAINING

Incos Application Programming, Finnigan Institute, 1985
Miniranger Operation and Electronic Maintenance, Motorold Government Electronics Division, 1978

EMPLOYMENT EXPERIENCE

1975-Present
Aquatec, Inc., South Burlington, VT

1970-1972
U.S. Air Force

RECENT PROJECT RESPONSIBILITIES

Overall responsibility for the design, implementation, operation, and maintenance of computer network, support systems, and laboratory instrumentation. Currently involved in development of computer systems for laboratory automation and electronic delivery and management of data.

Development of software, automation techniques, and mathematical models for project applications.

REPRESENTATIVE PUBLICATIONS AND REPORTS

Binkerd, R., H.G. Johnston, and J.K. Comeau. Physical Impact Evaluation of the Discharge of Heated Water from the C.P. Crane Generating Station. Prepared for State of Maryland Department of Natural Resources, 1978.

Determination of Optimal Setting of Condenser Cooling System Facilities. Prepared for Vermont Yankee Nuclear Power Corporation, 1983.

REPRESENTATIVE PUBLICATIONS AND REPORTS (continued)

Diffuser Performance Investigation at Indian Point Nuclear Generating Station. Prepared for Consolidated Edison Company of New York, 1978.

Hydrographic Study of Hawk Inlet using Fluorescence Tracer Techniques. Prepared for Martin Marietta Corporation, 1980.

Operational and Biological Studies. Prepared for Vermont Yankee Nuclear Power Corporation, 1983.

Physical Impact Evaluation of Chalk Point Generating Station's Cooling Water System of the Patuxent River. Prepared for the State of Maryland Department of Natural Resources, 1979.

Turbine Discharge Determination, Sawmill Station. Prepared for James River Corporation, 1981.

Turbine Discharge Determination, Shawmut Station. Prepared for Central Maine Power Company, 1982.

Resume

PAULINE T. MALIK

Chemist

EDUCATION

B.A. State University of New York at Buffalo, Buffalo, NY, 1982 (Chemistry)

Ph.D. University of Vermont, Burlington, VT, expected 1991 (Inorganic Chemistry)

PROFESSIONAL ASSOCIATIONS

American Chemical Society
Women in Science

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1988-Present
University of Vermont, Burlington, VT, 1982-1987
State University of New York at Buffalo, Buffalo, NY, 1981-1982

PROJECT RELATED EXPERIENCE

1989-Present, Aquatec, Inc.

Ms. Malik is a customer service representative which includes communicating information to clients concerning sample handling, applicability of EPA methodologies, relaying their needs to the laboratory personnel, and interpreting results when requested. At the same time Ms. Malik also manages and supervises small environmental projects. As needed, Ms. Malik is responsible for soliciting Aquatec's services to environmental consulting and engineering firms. She is also responsible for responding to RFP/RFQ's requiring technical expertise.

From September 1989 to April 1990, Ms. Malik became a full time project director for Stone & Webster Engineering Corporation who was conducting a multi-site investigation for New York City Department of Environmental Conservation. The scope of work consisted of receiving approximately 500 samples over a six week period for the full Target Compound List plus a number of additional conventional parameters. Duties included supervising large shipments of lab packs, daily inspection of samples arriving at Aquatec, communication with the client and final publication of data packages. Due to the large scope of work, Ms. Malik provided support in primary data review for both the volatile organics and metals laboratories. She additionally supported the metals instrumental laboratory by operating one of Aquatec's Inductively Coupled Plasma Spectrophotometer (ICP).

PROJECT RELATED EXPERIENCE (continued)

1982-1987, University of Vermont
Ms. Malik was a Graduate Teaching Assistant responsible for instructing the advanced freshman inorganic chemistry laboratory.

1981-1982, State University of New York at Buffalo
Ms. Malik was an Undergraduate Research Assistant synthesizing organometallic compounds with subsequent kinetic studies.

Resume

R. MASON McNEER, Ph.D.

Senior Chemist

EDUCATION

B.S. University of Chicago, 1948
Ph.D. University of Chicago, 1952

PROFESSIONAL ASSOCIATIONS

American Chemical Society
Phi Beta Kappa
The Society of the Sigma Xi

PROFESSIONAL HISTORY

Summers, 1970-1973; Full time, 1974-Present
Aquatec, Inc., South Burlington, VT, Chemist

Summers, 1968-1970
Biological Division, Webster-Martin, Inc., South Burlington, VT, Chemist

Summers, 1952-1967
Department of Water Resources, State of Vermont, Chemist

1951-1974, Professor, 1965-1974
Department of Chemistry, Norwich University, Northfield, VT,

REPRESENTATIVE EXPERIENCE

1974-Present

Evaluation of analytical work performed for clients in private industry. Including the detailed review of analytical data produced by the organic and inorganic laboratories.

Technical resource for the laboratory in the fields of organic and inorganic analytical chemistry.

Provides consultation to clients in private industry in applying various methods of chemical analysis and in interpreting analytical results.

1974-1983

Project Director, Ecological Studies, Vermont Yankee Nuclear Power Station, Vernon, Vermont.

Resume

JOSEPH J. ORSINI JR., Ph.D.

Metals Laboratory Section Head

EDUCATION

Ph.D. University of Vermont, 1989
(Analytical Chemistry)

B.A. Plattsburgh College of Arts and Science, State University of New York, 1982
(Chemistry)

PROFESSIONAL ORGANIZATIONS

American Chemical Society, Division of Inorganic Chemistry
Analytical Chemistry, and Industrial and Engineering Chemistry
Green Mountain Section of American Chemical Society

EDUCATIONAL TRAINING

9/82 to 9/88 - University of Vermont, Burlington, Vermont. Candidate for Dr. of Philosophy under Professor William E. Geiger. Specializing in the electrochemistry of organometallic rhodium, palladium and manganese compounds. Included speciation studies of rhodium hydrogenation catalysts via high speed cyclic voltammetry.

9/79 to 5/80, summers 1980, 1981 and 1982. Plattsburgh College of Arts and Science, Plattsburgh, New York. Studied mixed-valence benzotriazolato copper clusters using electron paramagnetic resonance spectroscopy.

REPRESENTATIVE EXPERIENCE

1988-Present

Trace Metals Analysis Laboratory Section Head responsiblities include personnel management, ICP analysis and development for ICP, furnace and cold vapor analyses. Recently developed ICP hydride methodologies for the analysis of arsenic and selenium in difficult matrices.

1982-1988 - Ph.D. Candidate at the University of Vermont
Expertise in modern electroanalytical techniques including voltammetric and coulometric methods.

Synthesis of organometallic, inorganic and organic compounds.

Experienced with nuclear magnetic resonance spectroscopy including use of fourier transform instruments to study various nuclei in static and dynamic environments.

Use and interpretation of mass spectral data.

Strong background in manipulations of air sensitive materials by schlenk and vacuum line techniques.

REPRESENTATIVE EXPERIENCE (Continued)
Spectroscopic techniques including electron paramagnetic resonance, ultraviolet, visible and infrared spectroscopy.

Utilized gas chromatography in the analysis of organics from organometallic decomposition reactions.

Working knowledge of computerized data analysis and simulations of cyclic voltammograms and nuclear magnetic resonance spectra.

PUBLICATIONS

"Two-Dimensional Dynamic Jahn-Teller Effects in a Mixed-Valence Benzotriazolato Copper Cluster, $Cu_5 (BTA)_6 (RNC)_4$," Kokoszka, G.F.; Baranowski, J.; Goldstein, C.; Orsini, J.; Mighell, A.D.; Himes, V.L.; and Siedle, A.R. J. Am. Chem. Soc. 1983, 105, 5627.

"ESR Spectra of New Dicopper (II) Complexes of Novel Binucleating Ligands, Karlin, K.D.; Cruse, R.M.; Kokoszka, G.F.; and Orsini, J.J. Inorg. Chim. Acta 1982, 66, L57.

RELATED EMPLOYMENT

9/82 to 9/88: Teaching Assistantship at University of Vermont.
9/81 to 5/82: Teaching Assistantship at Plattsburgh State College, Plattsburgh, New York.
Summers of 1980, 1981 and 1982: Undergraduate Research Assistant with professor Gerald F. Kokoszka, Plattsburgh, New York.

Resume

MARTHA E. ROY

Project Director

EDUCATION

B.A. St. Michael's College, Winooski, Vermont, 1983 (Biology)

M.S. University of Vermont, Burlington, Vermont, 1985 (Limnology)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1985-Present

University of Vermont, Burlington, Vermont, 1983-1985

St. Michael's College, Winooski, Vermont, 1981-1982

REPRESENTATIVE EXPERIENCE

1988-Present

Project Director of four EPA and Superfund affiliated projects. Responsibilities include client contact, initiation of required analysis, and coordination of results and supportive documentation into a data package for the client. Also responsible for maintaining Aquatec's laboratory certifications.

1985-1988

As a QA/QC Assistant, primarily responsible for the review of inorganic data generated at Aquatec. Other duties included some review of GC and GC/MS data, communicating with clients, organizing final client reports, and supervising two large government contracts.

1983-1985

During this time period worked at the University of Vermont as a laboratory instructor and research technician. Duties included teaching laboratory sessions, supervising work study students, collecting water and benthic samples as part of an acid rain study, and doing extensive data analysis on the information gathered.

Resume

ANGELA d. SHAMBAUGH

Biologist

EDUCATION

B.A. University of Montana, 1982
(Botany/German)
M.A. University of Montana, 1989
(Botany with emphasis on Phycology)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1986-Present
University of Montana Biological Station, Flathead Lake, MT. 1985-1986
University of Montana Botany Department, Missoula, MT 1983-1985

PROFESSIONAL ASSOCIATIONS AND CERTIFICATIONS

Fulbright Scholarship Recipient, August 1982 to September 1983, Universitaet Regensburg, Federal Republic of Germany
Phycological Society of America

REPRESENTATIVE EXPERIENCE

1986-Present
The biology section conducts evaluations of a variety of water bodies and biological communities ranging from bacteria to fish. Ms. Shambaugh's responsibilities reflect this varied format, with primary responsibilities being analysis of algae investigation, and serving as Biology Laboratory Coordinator. She evaluates daily laboratory data for precision and completeness. Other responsibilities include designing/conducting experiments utilizing electron microscopy, preparation of otoliths for age analysis for light microscopy, microbiological water testing, biotoxicity testing, field sample collection, and report generation.

1983-1989
Ms. Shambaugh's master thesis focused on the relationships among individual benthic algae in a nutrient-limited environment. The spatial aspects of this community were evaluated using scanning electron microscopy and light microscopy. Development and growth of the benthic community were followed from bare substrate to maturity, identifying individual species and their role in community architecture.

1985-1986
As a research assistant at the University of Montana Biological Station, Ms. Shambaugh identified and enumerated phytoplankton samples from Flathead Lake. Other responsibilities included collection of monthly field samples (including zooplankton, water quality,

REPRESENTATIVE EXPERIENCE (continued)
chlorophyll and carbon-14 photosynthesis samples); preparation of chlorophyll and C_{14} samples for analysis, preparation of P_{32} samples for scintillation analysis, and production of report summaries for publication purposes.

1983-1985
Botanical teaching assistant responsibilities during this period included development of laboratory classes for undergraduate students in plant physiology, general biology, and phycology.

1982-1983
As a Fulbright Scholarship recipient in the Federal Republic of Germany, Ms. Shambaugh was employed in the electron microscopy laboratory, Universitaet Regensburg Biology Department. Her responsibilities included specimen preparation and operation of transmission and scanning electron microscopes.

Resume

GEORGE W. STARBUCK

President

EDUCATION

B.A. University of Vermont, 1962
(Biology and Chemistry)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1970-Present
President and Chairman of Board of Directors
Webster-Martin, Inc., South Burlington, VT
Aquatic Biologist and Director of Water Quality Division, 1965-1968; Chief Executive Officer, 1968-1970; Vice President and Corporate Director, 1970-1975
Vermont Department of Water Resources, Montpelier, VT, 1962-1965
Aquatic Biologist

SPECIALIZED TRAINING

Thermal Pollution and Thermal Addition to the Marine Environment
M.I.T. summer session on Engineering of Heat Disposal from Power Generation, 1972
Biological Aspects of Thermal Pollution - U.S. Public Health Service, 1966
Graduate studies in Biology, University of Vermont, 1965-1966
Bio-assay and Pollution Ecology - U.S. Public Health Service, 1965

PUBLIC SERVICE EXPERIENCE

Corporator and Advisory Council, Bank of Vermont, 1982-1986
Chairman, American Diabetes Association, Vermont Affiliate, 1986-1987; Vice Chairman, 1984-1986
Member, Water Resources Research Council, University of Vermont, 1980-1984
Committee Member, Vermont D.U., 1977-1978
Trustee, Village of Essex Junction, VT, 1974-1977
Member, New England Regional Commission, Committee on Aquaculture, 1967-1969

REPRESENTATIVE EXPERIENCE

1970-Present

Mr. Starbuck organized Aquatec, Inc. in 1970 as a company designed to provide industry and government with a wide range of environmental services. In addition to his administrative responsibilities as President of Aquatec, he is directly involved with project reports and publications of the company. Since Aquatec's inception, Mr. Starbuck

REPRESENTATIVE EXPERIENCE (continued)
has directed the company to keep pace with National Environmental issues. He has supervised and provided consulting services for industry, local, state and federal governmental agencies and private developers. He is active in the environmental permit process and current issues such as EPA Superfund and priority pollutant surveys and analysis.

1965-1970
An environmental division at Webster-Martin was established by Mr. Starbuck and he was responsible for conducting biological surveys, water quality analyses, weed and algae control projects and related studies. He established and supervised long-term physical, chemical and biological monitoring programs and prepared environmental statements and reports for submission to regulatory agencies. In 1968 Mr. Starbuck established a Hydrographic Studies Division which conducted dye diffusion surveys and bathymetric surveys as well as temperature, salinity and current measurement studies throughout much of the United States.

1962-1965
As an aquatic biologist, Mr. Starbuck conducted baseline environmental studies for classification of Vermont State water and was responsible for collection and identification of aquatic biota, chemical analysis of surface water and wastewater from primary and secondary sewage treatment plants. During this period he studied and designed systems to alleviate aquatic nuisances and conducted baseline biological surveys of Lake Champlain.

Resume

GARY B. STIDSEN

Section Head, Organic Extraction and Gas Chromatography Laboratories

EDUCATION

B.S. Norwich University, Northfield, VT, 1981
(Environmental Engineering Technology)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1982-Present

SPECIALIZED TRAINING

Finnigan Mat Institute "ITD Data System Operation" Training Course, 1988
Hewlett Packard High Resolution Capillary Chromatography School, 1984

REPRESENTATIVE EXPERIENCE

1986-Present
Section Head of the Organic Laboratory including the Extraction Laboratory and the Gas Chromatography Laboratory. Areas of analysis include pesticides/PCBs, base/neutral/acids, herbicides, volatile organic compounds in water, soil, air, and biota samples. Methods of analysis followed are the EPA 500, 600, 800 and NIOSH methods and methods according to protocols set by New York State, EPA Superfund, etc. Responsible for training of personnel, flow of samples through the laboratory and instrument maintenance. Provide technical input for collection of air, soil and water samples designed for organic analysis.

1987-1988
Project: Responsible for the sample preparation of soils for the Love Canal Habitability Study performed by New York State. The object of the project was to compare the concentration of targeted organic compounds from the Emergency Declaration Area around Love Canal to other areas in Niagara Falls and Buffalo, New York.

1985-1986
Project: Responsible for the sample preparation and gas chromatograph analysis for PCBs as Congeners of 1700 water, soil and biota samples from the New Bedford Harbor, Massachusetts area under the EPA Superfund. Work in the Extraction Laboratory included extraction and extensive clean up of the sample extracts. In the Gas Chromatography Laboratory the sample extracts were analyzed for PCBs as Congeners using electron capture detection with low parts per trillion detection limit in the sample extracts.

REPRESENTATIVE EXPERIENCE (continued)

1983-1986
Worked as a chemist in the Extraction Laboratory and the Gas Chromatography Laboratory. In the Extraction Laboratory samples were prepared for organic analysis, including pesticide/PCBs, base/neutral/acids, and herbicides. Analysis performed in the Gas Chromatography Laboratory included pesticide/PCBs, herbicides, base/neutral/acids by GC, and volatile organic compounds.

1982-1983
Worked as a chemist in the Inorganic Laboratory. Analysis performed included COD, BOD, nitrate, nitrite, phosphate, sulfur, pH, turbidity, oil and grease, solids, metals by flame atomic adsorption, formaldehyde, hardness, alkalinity, fluoride, and TOC. Also during this time period collected air samples using the techniques in EPA Method 5, and organic compounds in air using techniques in EPA Method 25.

1982
Worked with the Aquatec Survey Division. Survey experience consisted of building layouts and horizontal control for power lines. Instrumentation used included a one second Theodolite, Kern DM502, and a KNE Range IV for determining distances.

Resume

NEAL E. VAN WYCK

Laboratory Director

EDUCATION
B.A. University of Vermont, 1982
(Chemistry)
M.S. University of Arizona, 1985
(Physical Chemistry)

PROFESSIONAL HISTORY
Aquatec, Inc., South Burlington, VT, 1985-Present
University of Arizona, Tucson, AZ, 1982 - 1985

SPECIALIZED TRAINING
Waste Testing and Quality Assurance Symposium, EPA, 1988

REPRESENTATIVE EXPERIENCE

1990-Present
Responsible for coordinating the overall activities of the analytical laboratories on a daily basis and providing long-term direction as Aquatec's Laboratory Director. Responsibilities include scheduling analytical work and personnel, developing new methods and technologies, and working with Technical Support to develop procedures to automate the review and reporting of analytical data.

1985-1990
Chemist and Project Director for Environmental Chemical Analysis. Involvement with extensive chemical analysis programs for hazardous waste site characterization, discharge monitoring and delisting petitions. Specific laboratory analysis responsibilities have included the supervision of the Analytical Atomic Spectroscopy Group and the development of Inductively Coupled Plasma Emission Spectrometry for trace metals determination.

1982-1985
Research and Teaching Assistant in the University of Arizona Department of Chemistry. Teaching responsibilities included preparation of lectures and supervision over general and advanced physical chemistry laboratory sections. Research activities centered about nonlinear optical investigations of thin films and surfaces. Various multiphoton techniques were explored and developed. They are surface coherent Anti-Stokes Raman Spectroscopy, Surface Second Harmonic Generation Spectroscopy and Two Photon Spectroscopy in Film Organic Optical Waveguides.

Resume

KIM BRYANT WATSON

Project Director

EDUCATION

B.S. cum laude, Norwich University, 1981
(Environmental Engineering Technology)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, Vermont, 1982-present
Project Director, Environmental Engineering Technologist, Quality Control Specialist
Vermont Agency of Environmental Conservation, 1981-1982
Air and Solid Waste Technician

PROFESSIONAL ASSOCIATIONS AND CERTIFICATIONS

Norwich University Engineering Society
President and co-founder of Chi Beta Chapter of Tau Alpha Phi

REPRESENTATIVE EXPERIENCE

1988-Present
Project Director of Superfund and government contracts, final review and publication of USEPA Superfund data package submittals. USEPA Special Analytical Service Solicitations Contact.

1987-1988
LCIC Habitability Study; responsible for daily electronic upload of GC/MS analytical data to project bulletin board. Responsible for review and final-publication of analytical data.

1986-1987
PCB study, New Bedford, MA. Performed review and quality control of GC/MS analysis for the development of analytical procedures published in "Application of a Mixed-Method Analytical Scheme for Analysis of PCB in Water and Sediment Samples from a Polluted Estuary," Richard A. McGrath, William Steinhauer and Siegfried Stockinger (1987).

1983-1988
Close association with quality control/quality assurance associated with USEPA Superfund projects. Co-author of Analytical Laboratory Standard Operating Procedures Sections on QA/QC.

1982-1983
Extraction Lab Technician

<u>REPRESENTATIVE EXPERIENCE</u> (continued)

1981-1982

Environmental Engineering design of solid waste disposal facilities for the State of Vermont Solid Waste Program. Assistant author of State Certifications of Solid Waste facilities. Performed water quality monitoring at the majority of the solid waste facilities in the State of Vermont.

Resume

JOHN W. WILLIAMS

Toxicity Laboratory Section Head

EDUCATION

B.S. University of Massachusetts, 1968
(Marine Fisheries Biology)

Graduate-level courses completed:
Harvard University, 1984-1985
(Biochemistry, Molecular Biology)
Boston University, 1983
(Statistics for the Biological Sciences)
Southeastern Massachusetts University, 1976
(Estuarine Ecology)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1990-Present
Cosper Environmental Services, Northport, NY, 1989-1990
Battelle Ocean Sciences, Duxbury, MA, 1975-1989

PROFESSIONAL ASSOCIATIONS

Society of Environmental Toxicologist and Chemists (co-author on several research papers)
National Association of Underwater Instructors

SPECIALIZED TRAINING

Solid-phase Sediment Tests (USCOE), Sludge Tests (EPA), Drilling Fluid Tests.
Supervised and conducted GLP (Good Laboratory Practices) and non-GLP toxicity studies using dosing and flow-through systems.
Supervised organism culture facility (species: Mysidopsis bahnia, Cyprinodon variegatus, Menidia beryllina, Arbacia punctulate, Champia parvula.
Operated research vessels to 42'.
Supervised SCUBA operations, NAUI certified instructor.

REPRESENTATIVE EXPERIENCE

1990-Present
Mr. Williams supervises the toxicity testing laboratory personnel. Responsibilities include scheduling testing, QA/QC procedures and analysis of samples with marine and fresh water organisms.

REPRESENTATIVE EXPERIENCE (continued)

1989-1990

Managed operation of an aquatic toxicity testing and consulting laboratory located on Long Island in Northport, New York. Work focused on NPDES biomonitoring, both marine and freshwater.

Resume

KIRK F. YOUNG

QC Supervisor

EDUCATION

Virginia Military Institute, Lexington, VA, 1969 to 1970
B.S. Lehigh University, Bethlehem, PA, 1970 to 1973
(Civil Engineering)

PROFESSIONAL CERTIFICATION

Currently certified as a Professional Engineer in the Commonwealth of Virginia and the State of Vermont.

REPRESENTATIVE EXPERIENCE

1981-Present
Aquatec, Inc., South Burlington, VT
Performance of industrial wastewater treatability studies and design of hazardous waste treatment and disposal processes.

Daily administration of the laboratory's work within U.S. Environmental Protection Agency's Contract Laboratory Program from 1983 to 1988. The position was one of coordinating related laboratory activities as well as directing the effort of detailed review, validation and publication of the analytical data. During this period, the laboratory participated extensively in special analytical services work in support of EPA regional needs and national program development.

Current participation in the operational aspects of the laboratory, with a focus on detailed project planning and the implementation of specialized project work. In addition to this, is the responsibility for directing the effort of detailed review, validation and publication of analytical data from the GC/MS laboratory and directing activities associated with data validation services.

1978-1981
Donald L. Hamlin, Consulting Engineers, Inc., Essex Junction, VT, Professional Engineer
Project Engineer for the design and construction of municipal wastewater treatment facilities, with experience in the design of secondary and advanced treatment processes, site planning, and construction supervision.

1974-1978
Commonwealth of Virginia/Northern Regional Office of the State Water Control Board, Engineer
Shared responsibility for conducting engineering inspections and reviewing plans and specifications of municipal and industrial wastewater treatment facilities throughout the time of employment.

REPRESENTATIVE EXPERIENCE (continued)
Coordination for the industrial wastewater program within the region which, in addition to regulatory duties, included the responsibility for engineering review of industrial waste treatment proposals.

Administration of the Construction Grants Program established under Public Law 92-500, involving Virginia municipalities within the Washington, D.C. metropolitan area. This work included new facilities planning, review of treatment designs, and the allocation of grant funds.

Aquatec, Inc. - LABORATORY PERSONNEL

Date: November 1990

FULL NAME	TITLE	HIGHEST DEGREE HS	AA	BS	MS	PhD	AREA OF STUDY Major	Minor	Primary * DUTIES A	B	C	D	E	F	Primary ** WORK AREA 1	2	3	4	YRS. EXP.	TYPE *** EXP. U	H	I	P
Joseph K. Comeau	VP-Chemistry					X	Analytical Chemistry		X						X		X		24				X
R. Mason McNeer	Sr. Chemist					X	Organic Chemistry	Math		X			X		X		X		38	X			X
Neal E. Van Wyck	Chemistry Lab Director				X		Physical Chemistry		X						X		X		4				X
Kirk F. Young	QC Supervisor			X			Civil Eng.		X	X					X		X		15				X
Joseph Edwin	Chemist					X	Chemistry			X							X		14	X			X
Richard T. Gomez	Chemist				X		Bio-chemistry	Cell Biology					X		X		X		15		X	X	X
Karen R. Chirgwin	QA Officer				X		Bio-statistics		X	X					X	X	X		4				X
Gary B. Stidsen	GC Section Head			X			Env. Eng. Technology		X		X						X		8				X
Nicholas C. Santo	Chemist			X			Chemistry				X				X				15				X
Joseph J. Orsini	Metals Section Head					X	Chemistry		X		X				X				2				X
Pauline T. Malik	Chemist					X	Chemistry			X			X	X	X		X		2				X
Martha E. Roy	Chemist				X		Limnology			X			X		X		X		4				X
Philip C. Downey	Bio. Lab Director					X	Fisheries		X				X			X		X	11				X
Angela d. Shambaugh	Biologist				X		Botany	German			X					X		X	3				X
Richard A Evans	Biologist				X		Aquatic Science	Statistics			X							X	2	X			X
Kim B. Watson	Chemist			X			Env. Eng Technology			X					X		X		7	X			X
Bennye A. Ames	Chemist			X			Env. Eng. Technology				X				X				10	X			X

* = DUTIES
A. Supervisor
B. Data Analysis
C. Analyst
D. Lab. Assistant
E. Project Manager
F. Other

** = WORK AREA
1. Inorganics
2. Microbiology
3. Organics
4. Biology

*** = TYPE EXPERIENCE
U. University/Government Lab.
H. Hospital
I. Industry
P. Private Lab.

Aquatec, Inc. - LABORATORY PERSONNEL

Date: November 1990

FULL NAME	TITLE	HIGHEST DEGREE HS	AA	BS	MS	PhD	AREA OF STUDY Major	Minor	Primary * DUTIES A	B	C	D	E	F	Primary ** WORK AREA 1	2	3	4	YRS. EXP.	TYPE *** EXP. U	H	I	P
Jeffery J. Rusik	Chemist			X			Agriculture				X				X				10	X			X
Kathleen R. O'Hara	Chemist			X			Env. Science				X				X				9				X
David H. Hardwick	Wet Chem. Section Head			X			Bio-chemistry		X		X				X				12	X			X
Kristine L. Aubin	Chemist			X			Bio-chemistry			X					X				3				X
Kelly A. Thompson	Chemist			X			Chemistry				X						X		5				X
Janet A. Morton	Chemist			X			Biology	Chemistry		X							X		4	X			X
Bryce E. Stearns	Chemist			X			Env. Science				X						X		6	X			X
James C. Vose	Chemist			X			Chemistry				X						X		13			X	X
David L. Banks	Programmer			X			Computer Science			X							X		6				X
William R. DesJardins	Chemist			X			Biology				X						X		10				X
Jon P. Wilkinson	Chemist			X			Env. Engineering				X						X		4				X
Bradley W. Chirgwin	Chemist			X			Biochemistry				X						X		2				X
Michael R. Veilleux	Chemist			X			Ecology				X						X		2				X
Caroline I. Camara	Chemist			X			Biochemistry			X	X						X		2				X
Cindy M. Petersen	Chemist			X			Biology				X						X		4				X
James W. Madison	Chemist			X			Geology	Env. Sci			X						X		4				X
Jeff S. Tanguay	Chemist			X			Env. Studies				X						X		3				X

* = DUTIES
A. Super...
B. Data ...ls
D. Lab. Assistant
E. Project Manager

** = W... AREA
1. Inorganics
2. Microbiology
3. Organics
4. Biology

*** = TYPE EXPERIENCE
U. University/Government Lab.
H. Hospital
I. Indu...
P. Priv...

Aquatec, Inc. - LABORATORY PERSONNEL

Date: November 1990

FULL NAME	TITLE	HIGHEST DEGREE					AREA OF STUDY		Primary * DUTIES						Primary ** WORK AREA				YRS. EXP.	TYPE *** EXP.			
		HS	AA	BS	MS	PhD	Major	Minor	A	B	C	D	E	F	1	2	3	4		U	H	I	P
Mark P. Biercevicz	Technician			X			Natural Res. Conservation				X							X	3				X
Constance C. Dumas	Biologist			X			Med. Tech.				X					X			15		X		X
Nicholas R. Staats	Biologist			X			Biology				X							X	4	X			X
Puy N. Tam	Technician	X					General				X	X			X				4				X
Carol M. Sullivan	Chemist			X			Chemistry				X						X		2				X
Stanley G. Brinkman	Technician	X					General				X						X		4				X
Vanaja A. Sayala	Technician			X			Chemistry				X				X				3				X
Maureen R. Henry	Technician	X					General							X	X	X	X		2				X
Janine L. Banks	Sample Custodian	X					Management		X						X	X	X		5				X
Frederick P. Cota	Technician	X					General				X				X				2				X
Richard W. St. Pierre	Technician	X					General				X				X				2				X
William A. Schmidt	Technician		X				Engineering				X						X		2				X
David J. Peterson	Chemist			X			Env. Engineering				X						X		2				X
Denise M. Gregory	Chemist			X			Env. Science				X				X				1				X
Karol A. Wilson	Chemist			X			Biology			X							X		1				X
Lisa A. Usher	Chemist			X			Env. Science				X				X				1				X
Scot P. Swanborn	Chemist			X			Env. Science				X						X		4				X

* = DUTIES

A. Supervisor
B. Data Analysis
C. Analyst
D. Lab. Assistant
E. Project Manager
F. Other

** = WORK AREA

1. Inorganics
2. Microbiology
3. Organics
4. Biology

*** = TYPE EXPERIENCE

U. University/Government Lab.
H. Hospital
I. Industry
P. Private Lab.

(September '89)

Aquatec, Inc. - LABORATORY PERSONNEL

Date: November 1990

FULL NAME	TITLE	HIGHEST DEGREE HS	AA	BS	MS	PhD	AREA OF STUDY Major	Minor	Primary * DUTIES A	B	C	D	E	F	Primary ** WORK AREA 1	2	3	4	YRS. EXP.	TYPE *** EXP. U	H	I	P
Richard W. Barton	Technician		X				Science					X				X		X	1				X
John W. Williams	Biologist			X			Marine Biology				X					X		X	16				X
Steven J. Fluck	Chemist			X			Biology					X					X		8	X			X
Jocelyn A. Mills	Technician			X			Anthropology							X	X	X	X		1				X

* = DUTIES

A. Supe
D. Lab. Assistant
F. Project Manager

** = WO REA

1. Inorganics
2. Microbiology
3. Organics
4. Biology

*** = TYPE EXPERIENCE

U. University/Government Lab.
H. Hospital
I. Indu
P. Priva

APPENDIX B

Analytical Methodologies

A - Water and Wastewater Analysis

Method	Description
110.2	Color (std. units)
120.1	Conductivity (umhos/cm)
130.2	Total Hardness as CaCO3
150.1	pH (std. units)
160.1	Total Dissolved Solids
160.2	Total Suspended Solids
160.3	Total Solids
160.4	Volatile Total Solids
160.5	Settleable Solids (ml/L)
180.1	Turbidity (NTU)
200	Digestion, ICP, fu Sb
200	Digestion, fu, fl/ICP Ag
200	Digestion, fl
200.7	Silver, Total
200.7	Aluminum, Total
200.7	Arsenic, Total
200.7	Boron, Total
200.7	Barium, Total
200.7	Beryllium, Total
200.7	Calcium, Total
200.7	Cadmium, Total
200.7	Cobalt, Total
200.7	Chromium, Total
200.7	Copper, Total
200.7	Iron, Total
200.7	Potassium, Total
200.7	Lithium, Total
200.7	Magnesium, Total
200.7	Manganese, Total
200.7	Molybdenum, Total
200.7	Sodium, Total
200.7	Nickel, Total
200.7	Lead, Total
200.7	Antimony, Total
200.7	Selenium, Total
200.7	Silicon, Total
200.7	Tin, Total
200.7	Strontium, Total
200.7	Titanium, Total
200.7	Thallium, Total
200.7	Vanadium, Total
200.7	Zinc, Total
202.1	Aluminum, Total
202.2	Aluminum, Total
204.1	Antimony, Total
204.2	Antimony, Total
206.2	Arsenic, Total
208.1	Barium, Total
208.2	Barium, Total
210.1	Beryllium, Total
210.2	Beryllium, Total
213.1	Cadmium, Total
213.2	Cadmium, Total
215.1	Calcium, Total

Aquatec, Inc.
A - Water and Wastewater Analysis

Method	Description
218.1	Chromium, Total
218.2	Chromium, Total
218.4	Chromium, Hexavalent
220.1	Copper, Total
220.2	Copper, Total
231.1	Gold, Total
231.2	Gold, Total
236.1	Iron, Total
236.2	Iron, Total
239.1	Lead, Total
239.2	Lead, Total
242.1	Magnesium, Total
243.1	Manganese, Total
243.2	Manganese, Total
245.1	Mercury, Total
246.1	Molybdenum, Total
246.2	Molybdenum, Total
249.1	Nickel, Total
249.2	Nickel, Total
258.1	Potassium, Total
270.2	Selenium, Total
272.1	Silver, Total
272.2	Silver, Total
273.1	Sodium, Total
273.2	Sodium, Total
279.1	Thallium, Total
279.2	Thallium, Total
282.1	Tin, Total
282.2	Tin, Total
286.1	Vanadium, Total
286.2	Vanadium, Total
289.1	Zinc, Total
289.2	Zinc, Total
300.0	Ion Chromatography
305.1	Acidity (as CaCO3)
310.1	Alkalinity (as CaCO3)
320.1	Bromide
325.3	Chloride
330.1	Total Residual Chlorine
330.4	Total Residual Chlorine
335.1	Cyanide,Total & Amenable
335.1	Cyanide, Amenable to Cl2
335.2	Cyanide, Total
340.2	Fluoride
350.1	Ammonia-Nitrogen
350.2	Ammonia-Nitrogen
351.3	Total Kjeldahl Nitrogen
353.3	Nitrate/Nitrite Nitrogen
354.1	Nitrite Nitrogen
360.2	Oxygen, Dissolved
365.2	Orthophosphate as P
365.2	Phosphate, Total as P
370.1	Silica, Dissolved
375.4	Sulfate

A - Water and Wastewater Analysis

Method	Description
376.2	Sulfide
377.1	Sulfite
405.1	BOD5
410.1	Chemical Oxygen Demand
413.1	Oil & Grease
415.1	Organic Carbon, Total
418.1	Petroleum Hydrocarbons
420.1	Phenols, Total
420.1	Phenols, Total
425.1	MBAS (mg LAS/L)
450.1	Organic Halides, Total

B - Organic Compounds in Drinking Water

Method	Description
501.1	Trihalomethanes
501.2	Trihalomethanes
502.2	Volatile Organics
503.1	Volatile Aromatics
504	EDB and DBCP
505	Pesticides/PCB's
505	Drinking Water Pesticide
510.1	Trihalomethanes
515	Herbicides
515	Drinking Water Herbicide
524.2	Volatile Organics

C - Organics in Municipal Industrial Wastewater

Method	Description
601	Purgeable Halocarbons
601-602	Purgeable Organics
602	Purgeable Aromatics
603	Acrolein & Acrylonitrile
604	Phenols
606	Phthalate Esters
607	Nitrosamines
608	Pesticides/PCB's
609	Nitroaromatics/Isophoron
610	Polynuclear Aromatics
611	Haloethers
612	Chlorinated Hydrocarbons
613	Dioxin, Screen
614	Organophosphorus Pest.
615	Chlorinated Herbicides
619	Triazine Pesticides
622	Organophosphorus Pest.
624	Volatile Organics
625	Semivolatile Organics
625	Acid Extractables
625	Base/Neutral Extractable
680	Pesticides/PCB's

D - Biological Analysis

Method	Description
100262	Chlorophyll a,(ug/l)
1002CIF	Phytoplankton (units/l)
907A	Bacteria, Total (CFU/ml)
907C	Bacteria, Total (CFU/ml)
908A	Coliform,Total(col/100ml
908C	Coliform,Fecal(col/100ml
909A	Coliform,Total(col/100ml
909C	Coliform,Fecal(col/100ml
910B	Strep.,Fecal (col/100ml)
918A	Bact., Iron (qualitative
918C2	Bact,Iron Prof(col/100ml
918C2A	Bact,Spha/Lept(col/100ml
918C2D	Bact, Het.Iron(col/100ml
9213D	E. Coli (CFU/100ml)
AQBAC1	Coliform,Total (P/A)
AQBAC2	Coliform,Total(CFU/100ml
BA1	Bioassay F.M. Embryo
BA2	Bioassay F.M. Larval
BA3	Bioassay C-Daphnia Repr.
BA4	Bioassay Daphnia AC. 48
BA5	Bioassay F.M. AC. 48
BAM1	Coliform,Total (CFU/g)
BAM2	Coliform,E. Coli (CFU/g)
BAM3	Bacteria, Total (CFU/g)
BAM4	Salmonella Spp (P/A)
BAM5	Salmonella Spp (P/A)
ISOGRID1	Yeast & Mold,Total(Col/g
ISOGRID2	Bact.,Gram Neg. (CFU/g)
ISOGRID3	Staph. aureus (Col/g)

Method	Description
1010	Ignitability (F)
1110	Corrosivity
1310	EP Tox Extraction(metals
1310	EP Tox Ext.(Pest/Herb)
3005	Digestion, fl/ICP W, D/R
3010	Digestion, fl/ICP W, T
3020	Digestion, fu W,fl/ICP A
3020	Digestion, fu W, As/Se
3040	Dissolution
3050	Digestion, fl/ICP O
3050	Digestion, fu O,fl/ICP A
3510	Sep. Funnel Liq-Liq Ext.
3520	Continuous Liq-Liq-Ext.
3530	Acid-Base Cleanup Ext.
3540	Soxhlet Extraction
3540	Soxhlet Extraction
3550	Sonication Extraction
3820	Hexadecane Ext. & Screen
6010	Silver, Total
6010	Aluminum, Total
6010	Arsenic, Total
6010	Boron, Total
6010	Barium, Total
6010	Beryllium, Total
6010	Calcium, Total
6010	Cadmium, Total
6010	Cobalt, Total
6010	Chromium, Total
6010	Copper, Total
6010	Iron, Total
6010	Potassium, Total
6010	Lithium, Total
6010	Magnesium, Total
6010	Manganese, Total
6010	Molybdenum, Total
6010	Sodium, Total
6010	Nickel, Total
6010	Lead, Total
6010	Antimony, Total
6010	Selenium, Total
6010	Silicon, Total
6010	Strontium, Total
6010	Titanium, Total
6010	Thallium, Total
6010	Vanadium, Total
6010	Zinc, Total
7040	Antimony, Total
7041	Antimony, Total
7060	Arsenic, Total
7080	Barium, Total
7090	Beryllium, Total
7091	Beryllium, Total
7130	Cadmium, Total

Aquatec, Inc.
E - Hazardous Waste

Method	Description
7131	Cadmium, Total
7190	Chromium, Total
7191	Chromium, Total
7196	Chromium, Hexavalent
7196	Chromium, Hexavalent
7210	Copper, Total
7211	Copper, Total
7420	Lead, Total
7421	Lead, Total
7470	Mercury, Total
7471	Mercury, Total
7520	Nickel, Total
7521	Nickel, Total
7740	Selenium, Total
7760	Silver, Total
7761	Silver, Total
7840	Thallium, Total
7841	Thallium, Total
7910	Vanadium, Total
7911	Vanadium, Total
7950	Zinc, Total
7951	Zinc, Total
8010	Halogenated Volatiles
8015	Nonhalogenated Volatiles
8020	Aromatic Volatiles
8030	Acrolein/Acrylon./Aceton
8040	Phenols
8060	Phthalate Esters
8080	Organochlorine Pest/PCB'
8080	PCB's on Wipes
8080	EP Tox Pesticides
8090	Nitroaromatics/Cyc.Keton
8100	Polynuclear Aromatics
8120	Chlorinated Hydrocarbons
8140	Organophosphorus Pest.
8150	Chlorinated Herbicides
8150	EP Tox Herbicides
8240	Volatile Organics
8270	Semivolatile Organics
8270	Acid Extractables
8270	Base Neutral Extractable
8280	Dioxin (Subcon)
8310	Polynuclear Aromatics
9010	Cyanide,Total & Amenable
9010	Cyanide, Total
9010	Cyanide, Amenable to Cl2
9010A	Cyanide, Total
9020	Total Organic Halides
9030	Sulfides
9040	pH (std. units)
9041	pH Paper Method
9045	Soil pH (std. units)
9045	Soil pH (std. units)
9050	Conductivity (umhos/cm)

E - Hazardous Waste

Method	Description
9060	Total Organic Carbon
9070	Oil/Grease,Total Recover
9071	Oil/Grease
9080	Cation-Exch. (Am.Acetate
9081	Cation-Exch.(Sod.Acetate
9095	Paint Filter Liquids
TCLP	TCLP Metals Extraction
TCLP	TCLP Organic Extraction
TCLP	TCLP Volatile Extraction

F - CLP Methods

Method	Description
CLP.HCA	Aroclors/Toxaphene GC/EC
CLP.HCAT	HC Aroclors/Toxaphene &P
CLP.HCEA	Extract.Analysis by GC/M
CLP.HCEE	Extractable Ex.&Screenin
CLP.HCPP	HC Pesticides/PCB's
CLP.HCPS	Phase Separation
CLP.HCV	VOA Analysis by GC/MS
CLP.HCVE	VOA Extraction&Screening
CLP.INORG	CLP Cyanide
CLP.MET	Selenium, Total
CLP.METALS	CLP Metals
CLP.METALS	CLP Metals
CLP.PESTAN	CLP Pest./PCB Analysis
CLP.PESTEX	CLP Pest./PCB Extraction
CLP.SEMIAN	CLP Semivolatile Analysi
CLP.SEMIEX	CLP Semivolatile Extract
CLP.VOL	CLP Volatile Analysis

Aquatec, Inc.
G - Aquatec Inorganic Analysis

Method	Description
ICPHYD	Arsenic, Total
ICPHYD	Selenium, Total
IN101	Air Particulate Mass
IN154	ALA
IN162	Alkalinity (as CaCO3)
IN166	Ammonia-Nitrogen
IN171	Ash %
IN241	BOD (__Add.Rd. @$5 ea.)
IN266	Heating Value (BTU/lb.)
IN291	Bulk Density/Sieve
IN316	Chloride, Total Inorgani
IN368	Chlorine, Total
IN375	CHN (% w/w)
IN380	Cyanide, Total
IN421	Density (g/ml)
IN423	Density (g/ml)
IN425	Density (g/g)
IN526	Formaldehyde (ppm at 25C
IN528	Formaldehyde (ppm at 25C
IN530	Formaldehyde (mg/Kg)
IN532	Formaldehyde(Qualitative
IN558	ICP Semi-Quantitat. Scan
IN584	Inorganic Carbon in Soil
IN585	Inorganic Carbon in Wate
IN610	IR Scan
IN623	% Solids
IN625	Moisture/Ash
IN630	Moisture/Ash Woodchips
IN633	Nitrate-Nitrite Nitrogen
IN634	Nitrite-Nitrogen
IN636	Odor (Qualitative)
IN661	Oil/Grease
IN662	Oil/Grease (mg/Kg)
IN670	Petroleum Hydrocarbons
IN688	pH (std. units)
IN701	Phosphorus, Total
IN703	Reactivity
IN703	Reactive Cyanide
IN703	Reactivity Description
IN703	Reactive Sulfide
IN708	Phosphate, Total as P
IN714	Strontium
IN780	Total Kjeldahl Nitrogen
IN847	Total Organic Carbon
IN849	Total Organic Carbon
IN899	Total Organic Halide
IN951	Water (%) by Karl Fische

G - Aquatec Organic Analysis

Method	Description
OR101	Acetic Acid
OR127	Low Molec. Wgt. Alcohols
OR128	Low Molec. Wgt. Alcohols
OR154	Low Molec. Wgt. Amines
OR155	Low Molec. Wgt. Amines
OR180	Aromatics in Gasoline
OR207	B.T.E.X. (ug/l)
OR208	B.T.E.X. (ug/Kg)
OR209	B.T.E.X. &Hydrocar.(ug/l
OR210	B.T.E.X. & Hydrocarbons
OR211	Halogenated Org.Air Tube
OR212	B.T.E.X. in Air Tubes
OR260	Chlorinated Hydrocarbons
OR313	Ethylene Glycol
OR366	Fuel Oil Fingerprint
OR370	Volatile Hydrocarbons
OR372	Volatile Hydrocarbons
OR445	IPA/Acetone
OR472	NMP/Butyl Acetate-Water
OR499	Naphthalene (ug/l)
OR524	PCB's in Sludge
OR526	PCB's in Oil (ppm)
OR530	PCB Congeners in Water
OR531	PCB Congeners in Soil
OR532	PCB Congeners in Tissue
OR533	PCB Congeners in Waste
OR554	Perchloroethylene (ug/l)
OR580	Polynuclear Aromatics
OR606	Pyridine Compounds
OR607	Pyridine Compounds
OR620	GC Solvent Scan 2 (%v/v)
OR633	BNA Screen in Water
OR634	BNA Screen in Other
OR635	Pesticide Screen in Water
OR636	Pesticide Screen in Other
OR638	VOA Screen in Water
OR639	VOA Screen in Other
OR739	VOC(7-Hall/PID) in Water
OR741	VOC (6-Hall/PID) in Water
OR745	GC Solvent Scan 1 (%v/v)
OR792	Air Monitoring Groups
OR938	624 Modified Soil
OR951	Added Compound GC/MS

APPENDIX C

Certifications

VERMONT DEPARTMENT OF HEALTH
LABORATORY CERTIFICATION
DRINKING WATER

Laboratory: Aquatec, Inc.

Address: 75 Green Mt. Dr.

So. Burlington, Vt. 05403 Site Visit Date: 6/7/90

Site Visit Team: Harold Stowe

Joseph Ceresa

Enclosed is the report of our inspection of your laboratory. Based upon this report and on proficiency tests, your lab is certified for the chemical analysis of drinking water for:

X Inorganics: Residual Chlorine, Nitrate, Fluoride, Turbidity, Nitrite

X Metals: Arsenic, Copper, Mercury, Barium, Chromium, Selenium, Cadmium, Lead, Silver

Volatile Organic Compounds

X THM: Chloroform Bromoform BromodiChloroMethane diBromoChloroMethane

X Regulated VOC's: Vinyl Chloride CarbontetraChloride Benzene 12-diChloroEthane triCHloroEthylene 111-triChloroEthane 11-diChloroEthylene p-diChloroBenzene

X EPA List 1 VOC's: ChloroBenzene EthylBenzene

Toluene	cis/trns-12-diChloroEthylene	12-diChloropropane
Styrene	cis/trns-13-diChloroPropylene	*22-diChloropropane
o-diChloroBenzene	tetraChloroEthylene	*112-triChloroEthane
m-diChloroBenzene	*13-diChloroPropane	*11-diChloroPropylene
11-diChloroEthane	*1122-tetraChloroEthane	*diBromoMethane
o-Xylene	*1112-tetraChloroEthane	*BromoMethane
m-Xylene	*o-ChloroToluene	*diChloroMethane
p-Xylene	*p-ChloroToluene	*BromoBenzene
*Chlorothane	*ChloroMethane	*123-triChloroPropane

X *Compounds certified for identification only.

X Pesticides: Endrin Methoxychlor Chlordane Toxaphene

X Herbicides 24-D 245-TP

X Full Certification

---- Provisional, pending completion of recommended changes in procedure.

---- Interim, pending on site confirmation of completed changes.

This Certification Expires: 7/31/91

[signature]

Harold Stowe, Certification Officer

6/25/90

Date

AquaCertC90 6/25/90 WP XI

John R. McKernan, Jr.
Governor

Rollin Ives
Commissioner

STATE OF MAINE
DEPARTMENT OF HUMAN SERVICES
AUGUSTA, MAINE 04333

PUBLIC HEALTH LABORATORY
221 State Street
Augusta, Maine 04333
Telephone (207) 289-2727

CERTIFICATION BY RECIPROCITY

AQUATEC, INC.
75 GREEN MOUNTAIN DRIVE
SOUTH BURLINGTON, VT. 05403

Is certified by reciprocity for all regulated organic and inorganic Chemical Primary Drinking Water Standards listed on the drinking water certificate issued by the State of VERMONT for drinking water samples originating in the State of Maine.

Certification by reciprocity does not apply to microbiological contaminants.

This certificate is valid for one year from date of issue provided it is attached to a copy of a current valid VERMONT drinking water certificate issued under the provisions of the Safe Drinking Water Act.

Date of Issue October 25, 1989

Michael C. Sodano
Laboratory Certification Officer
Laboratory Improvement Program
Public Health Laboratory

MCS/rpk

The State of New Hampshire
Department of Environmental Services

CERTIFICATE OF APPROVAL
Drinking Water Analysis

Under the provisions of the Regulations in WS 306, as adopted under RSA 148 - B, the Department of Environmental Services hereby issues a certificate to Aquatec, Inc.

Located at 75 Green Mountain Drive *in* S. Burlington, VT

for the following analyses of:

FULL CERTIFICATION: Antimony, Arsenic, Barium, Beryllium, Cadmium, Cheomium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Nitrate-N, Nitrite-N, Fluoride, Insecticides, 2,4-D, Silvex, Trihalomethanes, Volatile Organics, Total Filterable Residue, pH, Turbidity, Alkalinity, Corrosivity, Sodium, Calcium, Total Cyanide, Total Coliform by Membrane Filtration, Total Coliform by MPN

PROVISIONAL CERTIFICATION: Thallium

The names of the laboratory personnel to whom this Certificate is issued are: Neal VanWyck, J. Comeau, G. Stidsen, D. Hardwick, J. Orsini, P. Downey, C. Dumas, K. Young, R.M. McNeer, J. Edwin, M. Roy and K. Watson

CERTIFICATE NUMBER 200690-B

DATE OF ISSUE December 19, 1990

EXPIRATION DATE December 18, 1991

Charles N. [illegible]
Certifying Officer

The State of New Hampshire
Department of Environmental Services

CERTIFICATE OF APPROVAL
Wastewater Analysis

Under the provisions of the Regulations in WS 306, as adopted under RSA 148 - B, the Department of Environmental Services hereby issues a certificate to Aquatec Inc.

Located at 75 Green Mountain Drive *in* So. Burlington, VT

for the following analyses of:

FULL CERTIFICATION: Aluminum, Arsenic, Beryllium, Cadmium, Cobalt, Chromium, Copper, Iron, Mercury, Manganese, Nickel, Lead, Selenium, Vanadium, Zinc, Antimony, Silver, Thallium, Titanium, Molybdenum, Strontium, pH, TDS, Total Hardness, Calcium, Magnesium, Sodium, Potassium, Total Alkalinity, Chloride, Fluoride, Sulfate, Ammonia-N, Nitrate-N, Orthophosphate, TKN, Total Phosphorus, COD, BOD, TOC, Total Cyanide, Oil & Grease, Non-Filterable Residue, Total Phenolics Total Residual Chlorine, Specific Conductance, PCBs in Water, PCBs in Oil, Pesticides and Volatile Organics

PROVISIONAL CERTIFICATION: NONE

The names of the laboratory personnel to whom this Certificate is issued are: Neal VanWyck, J. Comeau, G. Stidsen, D. Hardwick, J. Orsini, P. Downey, C. Dumas, K. Young, R.M. McNeer, J. Edwin, M. Roy and K. Watson

CERTIFICATE NUMBER 200690-B

DATE OF ISSUE December 19, 1990

EXPIRATION DATE December 18, 1991

Charles N. Hoyer [signature]
Certifying Officer

PROP[illegible] OF

NEW YORK STATE DEPARTMENT OF HEALTH

DAVID AXELROD, M.D. *COMMISSIONER*

Expires 12:01 AM April 1, 1991
ISSUED April 1, 1990
REVISED August 11, 1990

INTERIM CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

(Issued in accordance with the Laws of New York State)
pursuant to Section 502 of the Public Health Law

Laboratory ID. Number 10391

Director: Dr. Joseph Comeau

Laboratory Name: Aquatec Inc.
Number & Street: 75 Green Mountain Drive
City,State,Zip : S. Burlington VT 05403
VALID AT THIS ADDRESS ONLY

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/SOLID AND HAZARDOUS WASTE

All approved subcategories and/or analytes are listed below:

Characteristic Testing :
- Corrosivity
- Ignitability
- Reactivity
- Toxicity

Metals II (ALL)
Polynuclear Aromatic Hydrocarbons (ALL)
Phthalate Esters (ALL)
Purgeable Aromatics (ALL)
Volatile Chlorinate Organics (ALL)

Miscellaneous :
- Cyanide, Total
- Hydrogen Ion (pH)
- Sulfide (as S)

Haloethers (ALL)
Nitroaromatics Isophorone (ALL)
Polychlorinated Biphenyls (ALL)
Priority Pollutant Phenols (ALL)
Purgeable Halocarbons (ALL)

Acrolein and Acrylonitrile (ALL)
Chlorophenoxy Acid Pesticides (ALL)
Chlorinated Hydrocarbon Pesticides (ALL
Chlorinated Hydrocarbons (ALL)
Metals I (ALL)
Organophosphate Pesticides (ALL)

Herbert W. Dickerman

Herbert W. Dickerman, M.D., Ph.D.
Director
Wadsworth Center for Laboratories and Research

FORM LR 23.F

PROPERTY OF

NEW YORK STATE DEPARTMENT OF HEALTH

DAVID AXELROD, M.D. *COMMISSIONER*

Expires 12:01 AM April 1, 1991
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VALID AT THIS ADDRESS ONLY

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/AIR AND EMISSIONS

All approved subcategories and/or analytes are listed below:

Chlorinated Hydrocarbon Pesticides (ALL)
Polynuclear Aromatics (ALL)
Purgeable Halocarbons (ALL)
Fuels (ALL)
Polychlorinated Biphenyls (ALL)
Metals I (ALL)
Purgeable Aromatics (ALL)

Herbert W. Dickerman

Herbert W. Dickerman, M.D., Ph.D.
Director
Wadsworth Center for Laboratories and Research

PROPE[illegible]Y OF

NEW YORK STATE DEPARTMENT OF HEALTH

DAVID AXELROD, M.D. *COMMISSIONER*

Expires 12:01 AM April 1, 1991
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Laboratory Name: Aquatec Inc.
Number & Street: 75 Green Mountain Drive
City,State,Zip : S. Burlington VT 05403

VALID AT THIS ADDRESS ONLY

is hereby APPROVED as an Environmental Laboratory for the category

POTABLE WATER NON-POTABLE WATER

All approved subcategories and analytes are listed on the attached addendum

Herbert W. Dickerman, M.D., Ph.D.
Director
Wadsworth Center for Laboratories and Research

FORM LR 23.F

6968

Potable Water

Drinking Water Bacteriology

Coliform, Total
Standard Plate Count

Drinking Water Pesticide/Herbicides

2,4-D
Endrin
Lindane
Methoxychlor
2,4,5-TP (Silvex)
Toxaphene

Drinking Water Volatile Aromatics

Benzene
Bromobenzene
n-Butylbenzene
sec-Butylbenzene
tert-Butylbenzene
Chlorobenzene
2-Chlorotoluene
4-Chlorotoluene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Ethyl benzene
Hexachlorobutadiene
Isopropylbenzene
p-Isopropyltoluene (P-Cymene)
n-Propylbenzene
Styrene
Toluene
1,2,3-Trichlorobenzene
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
m-Xylene
o-Xylene
p-Xylene

Drinking Water Metals

Arsenic, Total
Barium, Total
Cadmium, Total
Chromium, Total
Copper, Total
Iron, Total
Lead, Total
Mercury, Total
Manganese, Total
Selenium, Total
Silver, Total
Sodium, Total
Zinc, Total

Drinking Water Trihalomethanes

Bromodichloromethane
Bromoform
Dibromochloromethane
Chloroform

Drinking Water Microextractables

1,2-Dibromoethane
1,2-Dibromo-3-chloropropane

Drinking Water Non-Metals

Alkalinity
Chloride
Color
Corrosivity
Fluoride, Total
Calcium Hardness
Hydrogen Ion (pH)
Nitrate (as N)
Solids, Total Dissolved
Sulfate (as SO4)

Drinking Water Volatile Halocarbons

Bromochloromethane
Bromomethane
Carbon tetrachloride
Chloroethane
Chloromethane
Dibromomethane
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
1,3-Dichloropropane
2,2-Dichloropropane
1,1-Dichloropropene
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
methylene chloride
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane
1,2,3-Trichloropropane
Vinyl chloride

Non - Potable Water

Demand

Biochemical Oxygen Demand
Chemical Oxygen Demand

Mineral

Acidity
Alkalinity
Chloride
Fluoride, Total
Calcium Hardness
Hardness, Total
Sulfate (as SO4)

Wastewater Metals II

Aluminum, Total
Antimony, Total
Arsenic, Total
Beryllium, Total
Chromium VI
Mercury, Total
Selenium, Total
Vanadium, Total
Zinc, Total

Benzidines

Benzidine
3,3-Dichlorobenzidine

Haloethers

Bis(2-chloroethyl)ether
Bis (2-chloroisopropyl) ether
Bis(2-chloroethoxy)methane
4 Chlorophenylphenyl ether
4-Bromophenylphenyl ether

Phthalate Esters

Benzyl butyl phthalate
Bis(2-ethylhexyl) phthalate
Diethyl phthalate
Dimethyl phthalate
Di-n-butyl phthalate
Di-n-octyl phthalate

Residue

Solids, Total Dissolved
Solids, Total Suspended
Solids, Total

Nutrient

Ammonia (as N)
Kjeldahl Nitrogen, Total
Nitrate (as N)
Nitrite (as N)
Orthophosphate (as P)
Phosphorus, Total

Wastewater Metals III

Cobalt, Total
Gold, Total
Molybdenum, Total
Palladium, Total
Platinum, Total
Tin, Total
Thallium, Total
Titanium, Total

Chlorinated Hydrocarbons

2-Chloronaphthalene
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
Hexachlorocyclopentadiene
1,2,4-Trichlorobenzene

Nitroaromatics and Isophorone

2,4-Dinitrotoluene
2,6-Dinitrotoluene
Isophorone
Nitrobenzene

Wastewater Bacteriology

Coliform, fecal
Standard Plate Count
Coliform, Total

Wastewater Metals I

Barium, Total
Cadmium, Total
Calcium, Total
Chromium, Total
Copper, Total
Iron, Total
Lead, Total
Magnesium, Total
Manganese, Total
Nickel, Total
Potassium, Total
Silver, Total
Sodium, Total

Acrolein and Acrylonitrile

Acrolein
Acrylonitrile

Dioxins

2,3,7,8-Tetrachlorodibenzo-p-dioxin

Nitrosoamines

N-Nitrosodimethylamine
N-Nitrosodiphenylamine
N-Nitrosodi-n-propylamine

Polychlorinated Biphenyls

PCB-1016
PCB-1221
PCB-1232
PCB-1242
PCB-1248
PCB-1254
PCB-1260

Non - Potable Water

Polynuclear Aromatics

Acenaphthene
Anthracene
Acenaphthylene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(ghi)perylene
Benzo(k)fluoranthene
Chrysene
Dibenzo(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
Naphthalene
Phenanthrene
Pyrene

Purgeable Halocarbons

Bromodichloromethane
Bromoform
Bromomethane
Carbon tetrachloride
Chloroethane
2-Chloroethylvinyl ether
Chloroform
Chloromethane
Dibromochloromethane
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
trans-1,3-Dichloropropene
cis-1,3-Dichloropropene
Methylene chloride
1,1,2,2-Tetrachloroethane
Tetrachloroethene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane
Vinyl chloride

Priority Pollutant Phenols

4-Chloro-3-methylphenol
2-Chlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2-Methyl-4,6-dinitrophenol
2-Nitrophenol
4-Nitrophenol
Pentachlorophenol
Phenol
2,4,6-Trichlorophenol

Chlorinated Hydrocarbon Pesticides

Aldrin
alpha-BHC
beta-BHC
delta-BHC
Lindane
Chlordane Total
4,4'-DDD
4,4'-DDE
4,4'-DDT
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Heptachlor
Heptachlor epoxide
Methoxychlor
Toxaphene

Organophosphate Pesticides

Azinphos methyl
Diazinon
Disulfoton
Demeton-O
Demeton-S
Malathion
Parathion ethyl
Parathion methyl

Purgeable Aromatics

Benzene
Chlorobenzene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Ethyl benzene
Toluene
Total Xylenes

Chlorophenoxy Acid Pesticides

Dicamba
2,4-D
2,4,5-T
2,4,5-TP (Silvex)

Volatile Chlorinated Organics

Benzyl chloride
Epichlorohydrin

Wastewater Miscellaneous Analytes

Boron, Total
Cyanide, Total
Phenols
Oil & Grease Total Recoverable
Specific Conductance
Surfactant (MBAS)
Silica, Dissolved
Color
Corrosivity
Bromide
Organic Carbon, Total
Sulfide (as S)
Hydrogen Ion (pH)
Temperature

The Commonwealth of Massachusetts
Department Of Environmental Quality Engineering
Lawrence Experiment Station
37 Shattuck Street, Lawrence, Massachusetts 01843

CERTIFICATION FOR ENVIRONMENTAL ANALYSIS

LABORATORY: VT008
Aquatec
75 Green Mountain Drive
South Burlington, VT 05403

DATE: 01/01/91

EXPIRATION DATE: 12/31/91

DIRECTOR: Dr. Joseph Comeau
802-658-1074

PRIMARY CATEGORIES (DRINKING WATERS)

FULL CERTIFICATION: Trace Metals, Nitrate, Fluoride, Pesticides, Herbicides, Trihalomethanes, Corrosivity Series, Sodium, Cyanide

PROVISIONAL CERTIFICATION: Volatile Organics

SECONDARY CATEGORIES (OTHER MATRICES)

FULL CERTIFICATION: Metals, Minerals, Nutrients, Demand, PCBs, Pesticides, Volatile Halocarbons, Volatile Aromatics, Cyanide, Oil & Grease, Phenolics

PROVISIONAL CERTIFICATION: None at Present

This certificate supercedes all previous certificates issued to this laboratory. Reporting of analyses other than those authorized above shall be cause for revocation of certification.

Original Certificate, not copies, must be displayed in a prominent place at all times. Certification subject to approval by OGC.

DEQE
NOW IS
THE DEPARTMENT OF
ENVIRONMENTAL PROTECTION

John E. Delaney

John E. Delaney, Ph.D., Director,
Division of Environmental Analysis

DEPARTMENT OF THE ARMY
MISSOURI RIVER DIVISION, CORPS OF ENGINEERS
P.O. BOX 103, DOWNTOWN STATION
OMAHA, NEBRASKA 68101-0103

REPLY TO ATTENTION OF

July 25, 1989

Geotechnical, Chemistry &
Materials Branch

Aquatec, Inc.
75 Green Mountain Drive
South Burlington, VT 05403

Gentlemen:

Your laboratory has been evaluated by the U. S. Army Corps of Engineers for multiple-media sample analysis of Volatile and Semivolatile Organics, Organochlorine Pesticides, PCBs, Chlorinated Herbicides, Polynuclear Aromatic Hydrocarbons, RCRA Metals, Phenols, Total Organic Carbon, Cyanide and Total Recoverable Petroleum Hydrocarbons. Enclosed for your information is a copy of the Laboratory Inspection Report.

The period of validation is eighteen (18) months from the date of this letter. During the eighteen month period, the Corps of Engineers reserves the right to conduct additional laboratory auditing and/or to suspend validation status if deemed necessary. This lab validation does not guarantee the award of any contracts from a Corps of Engineers Contracting Officer. If you have any questions or comments, please contact Mr. C. R. Mao at (402) 221-7494.

Sincerely,

William P. Todsen, P.E.
Chief, Engineering Division

Enclosure

CEMRD-ED-GC (200) 17 July 1989

MEMORANDUM THRU

CEMRD-ED-GC

CEMRD-ED-G

CEMRD-ED

FOR FILES (CEMRD-ED-GC)

SUBJECT: Laboratory Inspection and Evaluation - Aquatec Inc., Burlington, VT - 28 June 1989

1. General:

a. Date of inspection: 28 June 1989.

b. Contract for which laboratory will be used:

North Pacific Division Laboratory General QA

c. Description of contract: Chemical analysis of metals, volatile organics, semi-volatile organics, pesticides, PCB's and TRPH in water, sediment and soil samples; cyanide, TOC, phenols, PAH and herbicides in water.

d. General information on laboratory inspected:

Business Name: Aquatec, Inc.

Street Address: 75 Green Mountain Drive.

City and State: South Burlington, VT 05403

Phone: (802) 658-1074

Number employed: 60; about two thirds classified as chemists.

Additional information: Aquatec corporate offices and laboratory are at the one location, which also provides boats, sampling crews and full sampling capabilities. They were among the first eighteen EPA CLP laboratories and have remained a CLP lab ever since. Aquatec holds certifications from New Hampshire, Maine, New York and Massachusetts. The average sample turnaround time in the lab is two weeks. The building contains 22,300 square feet, 3,500 of which are devoted to analytical activities.

2. Summary of Inspection Results:

a. The audit sample results from Aquatec were outstanding. They were the most responsive of labs recently worked with, and submitted one of the best data packages we have received. They analyzed the samples with a high degree of accuracy, experiencing minor problems with only one parameter, TRPH.

b. The laboratory has a large number of qualified personnel, has adequate instrumentation, and an average sample turnaround time of two weeks. This should allow them to support most, if not all, USACE contracts.

c. Aquatec was inspected by Marcia Davies of CEMRD-ED-GC. The detailed results are addressed below and an inspection check list is available upon request.

3. Interviews:

a. George W. Starbuck, President, Joseph Comeau, Chemistry Laboratory Director, Martha Roy, Contract Project Manager, and Karen Chirgwin, Quality Assurance Office were present during the Entrance Interview. Topics discussed were Aquatec's corporate policies and experience in the HTW fields, the USACE QA Program and audit sample results.

b. At the conclusion of the inspection an exit interview was held with Joseph Comeau, Martha Roy and Karen Chirgwin. The latter two persons accompanied the inspector to lead the lab tour and answer questions. The TRPH problem was discussed at this time, but no conclusions could be drawn. The lab was asked to communicate further with C.R. Mao and/or Prem Arora of CEMRD.

4. Conclusions:

a. A full set of performance audit samples was successfully analyzed by the laboratory on the first attempt and a very complete data set sent for evaluation.

b. The laboratory's Quality Assurance Program Plan was reviewed and found to contain the information required and a sample SOP notebook was quickly surveyed by the inspector. Each analytical department maintains its own set of SOP's.

c. Aquatec has a corporate emphasis on quality control/quality assurance and has build up a well trained group to do data analysis and assessment. Internal quality control practices are ratable as excellent.

d. A corporate maintenance department is staffed with technicians who have been factory trained in the repair and upkeep of all the major instruments in the lab as well as the water purification/delivery systems, air handling, and refrigerators. The temperature in the refrigerators is computer monitored with an alarm system for unacceptable excursions.

e. No major or minor deficiencies which would adversely affect the ability of the lab to conduct the required analyses were noted.

5. Summary:

This is an outstanding laboratory with very complete capabilities. They do not subcontract samples to other labs. They have excellent facilities and staff and a very good sample turnaround. There are responsive and eager to work in a problem solving mode as well as on routine samples, and have good capabilities for doing so.

Marcia C. Davies
MARCIA C. DAVIES
Chief, HTW Chemistry Review Section

APPENDIX B

EPA Method 8330

METHOD 8330

NITROAROMATICS AND NITRAMINES BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY (HPLC)

This method is intended for the analysis of explosives residues. This Method is limited to use by analysts experienced in handling and analyzing explosive residues.

1.0 SCOPE AND APPLICATION

1.1 Method 8330 is used to determine the concentration of the following compounds in a water, soil or sediment matrix:

Compounds	Abbrev.	CAS No.[a]
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4
1,3,5-Trinitrobenzene	1,3,5-TNB	99-35-4
1,3-Dinitrobenzene	1,3-DNB	99-65-0
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	479-45-8
Nitrobenzene	NB	98-95-3
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7
4-Amino-2,6-dinitrotoluene	4-Am-DNT	1946-51-0
2-Amino-4,6-dinitrotoluene	2-Am-DNT	355-72-78-2
2,6-Dinitrotoluene	2,6-DNT	606-20-2
2,4-Dinitrotoluene	2,4-DNT	121-14-2
2-Nitrotoluene	2-NT	88-72-2
4-Nitrotoluene	4-NT	99-99-0
3-Nitrotoluene	3-NT	99-08-1

a Chemical Abstracts Service Registry number

1.2 Method 8330 provides a salting-out extraction procedure for low concentration (parts per trillion or nanograms per liter) of explosives residues in surface or ground water. Direct injection of diluted and filtered water samples can be used for water samples of higher concentration (See Table 1).

1.3 All of these compounds are either used in the manufacture of explosives or are the degradation products of compounds used for that purpose. When making stock solutions for calibration, treat each compound as if it were extremely explosive.

1.4 The practical quantitation limits (PQLs) of target analytes determined by Method 8330 in water and soil are presented in Table 1.

1.5 This method is restricted to use by or under the supervision of analysts experienced in the use of HPLC, skilled in the interpretation of chromatograms, and experienced in handling explosive materials. Each analyst must demonstrate the ability to generate acceptable results with this method.

2.0 SUMMARY OF METHOD

2.1 Method 8330 provides high performance liquid chromatographic (HPLC) conditions for the detection of ppb levels of certain explosives residues in water, soil and sediment matrix. Prior to use of this method, appropriate sample preparation techniques must be used.

2.2 Low-Level Salting-out Method: Aqueous samples of low concentration are concentrated by a salting-out extraction procedure with acetonitrile and sodium chloride. The acetonitrile extract is further concentrated to less than 1.0 mL using a Kuderna-Danish evaporator and brought to 1.0 mL using acetonitrile. The concentrated extract is diluted with 3.0 mL of reagent grade water, filtered, separated on a C-18 reverse phase column, determined at 254 nm, and confirmed on a CN reverse phase column.

2.3 High-Level Direct Injection Method: Aqueous samples of higher concentration can be diluted 1/1 (v/v) with methanol or acetonitrile, filtered, separated on a C-18 reverse phase column, determined at 254 nm, and confirmed on a CN reverse phase column. If HMX is an important target analyte, methanol is preferred.

2.4 Soil and sediment samples are extracted using acetonitrile in an ultrasonic bath, filtered and chromatographed as in Section 2.3.

3.0 INTERFERENCES

3.1 Solvents, reagents, glassware and other sample processing hardware may yield discrete artifacts and/or elevated baselines, causing misinterpretation of the chromatograms. All of these materials must be demonstrated to be free from

4.2.4 Water bath - Heated, with concentric ring cover, capable of temperature control (±5 °C). The bath should be used in a hood.

4.2.5 Balance - ± 0.1 mg.

4.3 Materials

4.3.1 High pressure injection syringe - 500 µL, (Hamilton liquid syringe or equivalent).

4.3.2 Disposable cartridge filters - 0.45 µm Teflon filter.

4.3.3 Pipettes - 50 mL, 10 mL, 5 mL, 4 mL, 2 mL, 1 mL, volumetric, Class A, glass.

4.3.4 Pasteur pipettes.

4.3.5 Scintillation Vials - 20 mL, glass.

4.3.6 Vials - 15 mL, glass, Teflon-lined cap.

4.3.7 Vials - 40 mL, glass, Teflon-lined cap.

4.3.8 Disposable syringes - Plastipak, 3 mL and 10 mL or equivalent.

4.3.9 Separatory funnel - 500 mL.

4.3.10 Volumetric flasks - 10 mL, 20 mL, 50 mL, 100 mL, 200 mL and 250 mL.

4.3.11 Vacuum desiccator - Glass.

4.3.12 Mortar and pestle - Steel.

4.3.13 Boiling chips - Solvent extracted, approximately 10/40 mesh (Teflon or equivalent).

4.3.14 Sieve - 30 mesh.

4.3.15 Oven - Forced air, without heating.

4.4 Preparation

4.4.1 Prepare all materials to be used as described in Chapter 4 for semivolatile organics.

interferences, under the conditions of the analysis, by running method blanks. Specific selection of reagents and purification of solvents by distillation in all-glass systems may be required.

3.1 2,4-DNT and 2,6-DNT elute at similar retention times (retention time difference of 0.2 minutes). A large concentration of one isomer may mask the response of the other isomer. If it is not apparent that both isomers are present (or are not detected), an isomeric mixture should be reported.

3.2 Tetryl decomposes rapidly in methanol/water solutions, as well as with heat. All aqueous samples expected to contain tetryl should be diluted with acetonitrile prior to filtration. All samples expected to contain tetryl should not be exposed to temperatures above room temperature.

3.3 Degradation products of tetryl appear as a shoulder on the 2,4,6-TNT peak. Peak heights rather than peak areas should be used when tetryl is present in concentrations that are significant relative to the concentration of 2,4,6-TNT.

4.0 APPARATUS AND MATERIALS

4.1 HPLC system

4.1.1 HPLC - equipped with a pump capable of achieving 4000 psi, a 100-µL loop injector and a 254-nm UV detector (Perkin Elmer Series 3 or equivalent).

4.1.2 C-18 Reverse phase HPLC column, 25-cm x 4.6-mm (5 µm), (Supelco LC-18 or equivalent).

4.1.3 CN Reverse phase HPLC column, 25-cm x 4.6-mm (5 µm), (Supelco LC-CN or equivalent).

4.1.4 Strip chart recorder.

4.1.5 Digital integrator (optional).

4.1.6 Autosampler (optional).

4.2 Other Equipment

4.2.1 Temperature controlled ultrasonic bath.

4.2.2 Vortex mixer.

4.2.3 Kuderna-Danish evaporator - 40 mL, micro Kuderna-Danish evaporator (Supelco #64718 or equivalent).

5.0 REAGENTS

5.1 HPLC grade chemicals shall be used in all tests. It is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lowering the accuracy of the determination.

5.2 General

5.2.1 HMX - Standard Analytical Reference Material.

5.2.2 RDX - Standard Analytical Reference Material.

5.3.2 1,3-DNB - Standard Analytical Reference Material.

5.2.4 Tetryl - Standard Analytical Reference Material.

5.2.5 2,4,6-TNT - Standard Analytical Reference Material.

5.2.6 2-Am-DNT -

5.2.7 4-Am-DNT - Reagent grade (Aldrich Chemical or equivalent).

5.2.8 2,4-DNT - Standard Analytical Reference Material.

5.2.9 2,6-DNT - Standard Analytical Reference Material.

5.2.10 1,3,5-TNB - Standard Analytical Reference Material.

5.2.11 NB - Standard Analytical Reference Material.

5.2.12 2-NT - Reagent grade.

5.2.13 3-NT - Reagent grade.

5.2.14 4-NT - Reagent grade.

5.2.15 Reagent water - All references to water in this method refer to water in which an interference is not observed at the method detection limit of the compounds of interest. Reagent water can be generated by passing tap water through a carbon filter bed containing about 1 pound of activated carbon. A water purification system may be used to generate organic-free deionized water.

5.2.16 Acetonitrile - HPLC grade.

5.2.17 Methanol - HPLC grade, distilled in glass.

5.2.18 Sodium Chloride, NaCl - Reagent grade. If possible use NaCl from glass bottles. High background levels have been observed from NaCl shipped in plastic containers.

5.2.19 Calcium Chloride, $CaCl_2$ - Reagent grade. Prepare an aqueous solution of 5 g/L.

5.3 Stock Standard Solutions

5.3.1 Dry each analyte standard to constant weight in a vacuum desiccator in the dark. Place about 100 mg (weighed to the nearest 0.1 mg) of a single analyte into a 100-mL volumetric flask and dilute to volume with acetonitrile. Invert flask several times until dissolved. Store in refrigerator at 4 °C in the dark. Calculate the concentration of the stock solution from the actual weight used (nominal concentration = 1,000 mg/L). Stock solutions may be used for up to one year.

5.4 Intermediate Standards Solutions

5.4.1 If both 2,4-DNT and 2,6-DNT are to be determined, prepare two separate intermediate stock solutions containing (1) HMX, RDX, 1,3,5-TNB, 1,3-DNB, NB, 2,4,6-TNT, 2,4-DNT and 2-Am-DNT and (2) tetryl, 2,6-DNT, 4-Am-DNT, 2-NT, 3-NT and 4-NT. Dilute the intermediate stock standard solutions to prepare two solutions at 1,000 µg/L in acetonitrile.

5.4.2 Dilute the two intermediate stock concentrate solutions with acetonitrile to prepare intermediate standard solutions that cover the range of 2.5 - 1,000 µg/L. These solutions should be refrigerated on preparation and stored in the dark, and may be used for 30 days.

5.4.3 For the low-level method, the analyst must conduct a detection limit study and devise dilution series appropriate to the desired range. Standards for the low level method must be prepared immediately prior to use.

5.5 Working Standards

5.5.1 Calibration standards at a minimum of five concentration levels should be prepared through dilution of the intermediate standards solutions by 50% (v/v) with 5 g/L calcium chloride solution (Section 5.2.19). These solutions must be refrigerated and stored in the dark, and prepared fresh on the day of calibration.

5.6 Surrogate Standards

5.6.1 The analyst should monitor the performance of the extraction and analytical system and the effectiveness of the method in dealing with each sample matrix by spiking each sample, standard and reagent water blank with one or two surrogates (e.g., analytes not expected to be present in the sample).

5.7 Eluent

5.7.1 To prepare 1 liter of eluent, add 500 mL of methanol to 500 mL of reagent water.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 Grab samples must be collected and stored in glass containers. Follow conventional sampling procedures.

6.2 Samples must be kept below 4°C and in the dark from the time of collection through analysis, except during drying.

6.3 Soil and sediment samples should be air dried to constant weight at room temperature or colder after collection.

6.4 All water samples must be extracted within 7 days of collection and analyzed within 40 days after extraction. All soil and sediment samples must be extracted within 14 days of collection and analyzed within 40 days after extraction.

7.0 PROCEDURE

7.1 Sample Preparation

7.1.1 Aqueous Samples: It is highly recommended that all samples of this type be screened with the high-level method (>50 µg/L) to determine if the low-level method (1-50 µg/L) is required.

7.1.1.1 Low-Level Method (salting-out extraction)

7.1.1.1.1 Place a 400 mL aliquot of water sample in a 500 mL separatory funnel and add 130 g of NaCl. Vigorously shake the sample until all of the NaCl is completely dissolved. Be sure to dissolve all salt before adding acetonitrile, or the dissolution process takes much longer.

7.1.1.1.2 Add a 100 mL volume of acetonitrile using a glass volumetric pipette. Shake the separatory funnel vigorously for 5 minutes. Allow the funnel to stand undisturbed for 30 minutes while the two phases separate. Discard the water (lower) layer and collect the acetonitrile (upper) layer (approximately 23 mL) in a 40 mL Teflon-capped vial. Rinse the separatory funnel with 5 mL of acetonitrile and add the rinsate to the extract.

7.1.1.1.3 If the collected sample was turbid, centrifuge the 40 mL vial at 4000 rpm's for 5 minutes. Remove the acetonitrile (upper) layer with a Pasteur pipette and transfer it to a clean vial.

7.1.1.1.4 Reduce the acetonitrile extract to less than 1.0 mL using a Kuderna-Danish evaporator and bring the total volume to 1.0 mL using acetonitrile. Dilute this concentrated extract with 3.0 mL of reagent water.

7.1.1.1.5 Filter the diluted extract through a 0.45-μm Teflon filter. Discard the first 0.5 mL of filtrate, and retain the remainder in a Teflon-capped vial for RP-HPLC analysis as in Section 7.4.

7.1.1.2 High-Level Method

7.1.1.2.1 Sample filtration: Place a 5 mL aliquot of each water sample in a scintillation vial, add 5 mL of acetonitrile, shake thoroughly, and filter through a 0.45-μm Teflon filter. Discard the first 3 mL of filtrate, and retain the remainder in a Teflon-capped vial for RP-HPLC analysis as in Section 7.4. HMX quantitation can be improved with the use of methanol rather than acetonitrile for dilution before filtration.

7.1.2 Soil and Sediment Samples

7.1.2.1 Sample homogenization: Dry soil samples in air at room temperature or colder, being careful not to expose the samples to direct sunlight. Grind and homogenize the dried sample thoroughly in an acetonitrile rinsed mortar to pass a 30 mesh sieve.

7.1.2.2 Sample extraction

7.1.2.2.1 Place a 2.0 g subsample of each soil sample in a 15 mL glass vial. Add 10.0 mL of acetonitrile, cap with Teflon-lined cap, vortex swirl for one minute, and place in an cooled ultrasonic bath for 18 hours.

7.1.2.2.2 After sonication, allow sample to settle for 30 minutes. Remove 5.0 mL of supernatant, and combine with 5.0 mL of calcium chloride solution (Section 5.2.19) in a 20 mL vial. Shake, and let stand for 15 minutes.

7.1.2.2.3 Place supernatant in a disposable syringe and filter through a 0.45-µm Teflon filter. Discard first 3 mL and retain remainder in a Teflon-capped vial for RP-HPLC analysis as in Section 7.4.

7.2 Chromatographic Conditions

Primary Column:	C-18 reverse phase HPLC column, 25-cm x 4.6-mm, 5 µm, (Supelco LC-18 or equivalent).
Secondary Column:	CN reverse phase HPLC column, 25-cm x 4.6-mm, 5 µm, (Supelco LC-CN or equivalent).
Mobile Phase:	50/50 (v/v) methanol/organic-free reagent water.
Flow Rate:	1.5 mL/min
Injection volume:	100-µL
UV Detector:	254 nm

7.3 Calibration of HPLC

7.3.1 All electronic equipment is allowed to warm up for 30 minutes. During this period, at least 15 void volumes of mobile phase are passed through the column (approximately 20 min at 1.5 mL/min) and continued until the baseline is level at the UV detector's greatest sensitivity.

7.3.2 Analyze working standards in triplicate, using the chromatographic conditions given in Section 7.2. Prepare calibration curve using peak heights or peak areas, as appropriate. The calibration curve should be linear with zero intercept.

7.3.3 Initial Calibration. Triplicate injections of each calibration standard over the concentration range of interest are sequentially injected into the HPLC in random order. Peak heights or peak areas are obtained for each analyte. Experience indicates that a linear calibration curve with zero intercept is appropriate for each analyte. Therefore, a response factor for each analyte can be taken as the slope of the best-fit regression line.

7.3.4 Daily Calibration. Analyze midpoint calibration standards, at a minimum, in triplicate at the beginning of the day, singly at the midpoint of the run and singly after the last sample of the day. Obtain the response factor for each analyte from the mean peak heights or peak areas and compare it with the response factor obtained for the initial calibration. The mean response factor for the daily calibration must agree within ±25% of the response factor of the initial calibration for the first seven daily calibrations and within two standard deviations of the initial calibration for subsequent calibrations. If this criterion is not met, a new initial calibration must be obtained.

7.4 HPLC Analysis

7.4.1 Analyze the samples using the chromatographic conditions given in Section 7.2. All positive measurements observed on the C-18 column must be confirmed by injection onto the CN column.

7.4.2 In limited applications (e.g., aqueous process wastes) direct injection of filtered and diluted sample into the HPLC system with a 100-µL loop may be appropriate. The quantitation limits are high, therefore, it is only permitted where concentrations in excess of 50 µg/L are expected.

7.4.3 Follow Section 7.6 in Method 8000 for instructions on the analysis sequence, appropriate dilutions, establishing daily retention time windows, and identification criteria. Include a mid-level standard after each group of 10 samples in the analysis sequence. If column temperature control is not employed, special care must be taken to ensure that temperature shifts do not cause peak misidentification.

7.4.4 Table 2 summarizes the estimated retention times on both C-18 and CN columns for a number of analytes analyzable using this method. An example of the separation achieved by Column 1 is shown in Figure 1.

7.4.5 Record the resulting peak sizes in peak heights or area units. The use of peak heights is recommended to improve reproducibility of low level samples.

7.4.6 Calculation of concentration is covered in Section 7.8 of Method 8000.

7.4.7 If analytical interferences are suspected, or for the purpose of confirmation, analysis using the second HPLC column is required.

8.0 QUALITY CONTROL

8.1 Prior to preparation of stock solutions, acetonitrile, methanol, and water blanks should be run to determine possible interferences with analyte peaks. If the acetonitrile, methanol, or water blanks show contamination, a different batch should be used.

8.2 Refer to Chapter One for specific quality control procedures. Quality control to validate sample extraction is covered in Method 3500.

8.3 Mandatory quality control to validate the HPLC system operation is found in Method 8000, Section 8.6.

8.4 The laboratory must, on an ongoing basis, analyze a method blank, a matrix spike, and a matrix spike duplicate/duplicate for each analytical batch (up to a maximum of 20 samples/batch) to assess accuracy. For laboratories analyzing one to ten samples per month, at least one spiked sample per month is required.

8.5 A minimum of one duplicate sample shall be run with each analytical batch. If the samples are generally non-detect samples, a matrix spike duplicate must be run with the analytical batch.

8.6 Method Blanks

8.6.1 Method blanks for the analysis of aqueous samples should be reagent water carried through all sample storage, preparation and handling procedures.

8.6.2 Method blanks for the analysis of soil samples should be uncontaminated soil carried through all sample storage, extraction, and handling procedures.

9.0 METHOD PERFORMANCE

9.1 Method 8330 was tested by six laboratories. The results of this testing indicate that the results presented in Tables 3 through 5 are to be expected.

10.0 REFERENCES

1. Bauer, C.F., T.F. Jenkins, S.M. Koza, P.W. Schumacher, P.H. Miyares and M.E. Walsh (1989). Development of an analytical method for the determination of explosive residues in soil. Part 3. Collaborative test results and final performance evaluation. USA Cold Regions Research and Engineering Laboratory, CRREL Report 89-9.

2. Grant, C.L., A.D. Hewitt and T.F. Jenkins (1989) Comparison of low concentration measurement capability estimates in trace analysis: Method Detection Limits and Certified Reporting Limits. USA Cold Regions Research and Engineering Laboratory, Special Report 89-20

3. Jenkins, T.F., C.F. Bauer, D.C. Leggett and C.L. Grant (1984) Reversed-phase HPLC method for analysis of TNT, RDX, HMX and 2,4-DNT in munitions wastewater. USA Cold Regions Research and Engineering Laboratory, CRREL Report 84-29.

4. Jenkins, T.F. and M.E. Walsh (1987) Development of an analytical method for explosive residues in soil. USA Cold Regions Research and Engineering Laboratory, CRREL Report 87-7.

5. Jenkins, T.F., P.H. Miyares and M.E. Walsh (1988a) An improved RP-HPLC method for determining nitroaromatics and nitramines in water. USA Cold Regions Research and Engineering Laboratory, Special Report 88-23.

6. Jenkins, T.F., P.W. Schumacher, M.E. Walsh and C.F. Bauer (1988b) Development of an analytical method for the determination of explosive residues in soil. Part II: Further development and ruggedness testing. USA Cold Regions Research and Engineering Laboratory, CRREL Report 88-8.

7. Leggett, D.C., T.F. Jenkins and P.H. Miyares (1990) Salting-out solvent extraction for preconcentration of neutral

polar organic solutes from water. Analytical Chemistry, 62: 1355-1356.

8. Miyares, P.H. and T.F. Jenkins (1990) Salting-out solvent extraction for determining low levels of nitroaromatics and nitramines in water. USA Cold Regions Research and Engineering Laboratory, Special Report 90-30.

11.0 SAFETY

11.1 Standard precautionary measures used for handling other organic compounds should be sufficient for safe handling of the analytes targeted by Method 8330.

Column: C-18 (25 cm x 4.6 mm, 5 μm)
Mobile Phase: 1/1 (v/v) Methanol/Water, 1.5 mL/min
Detector: UV

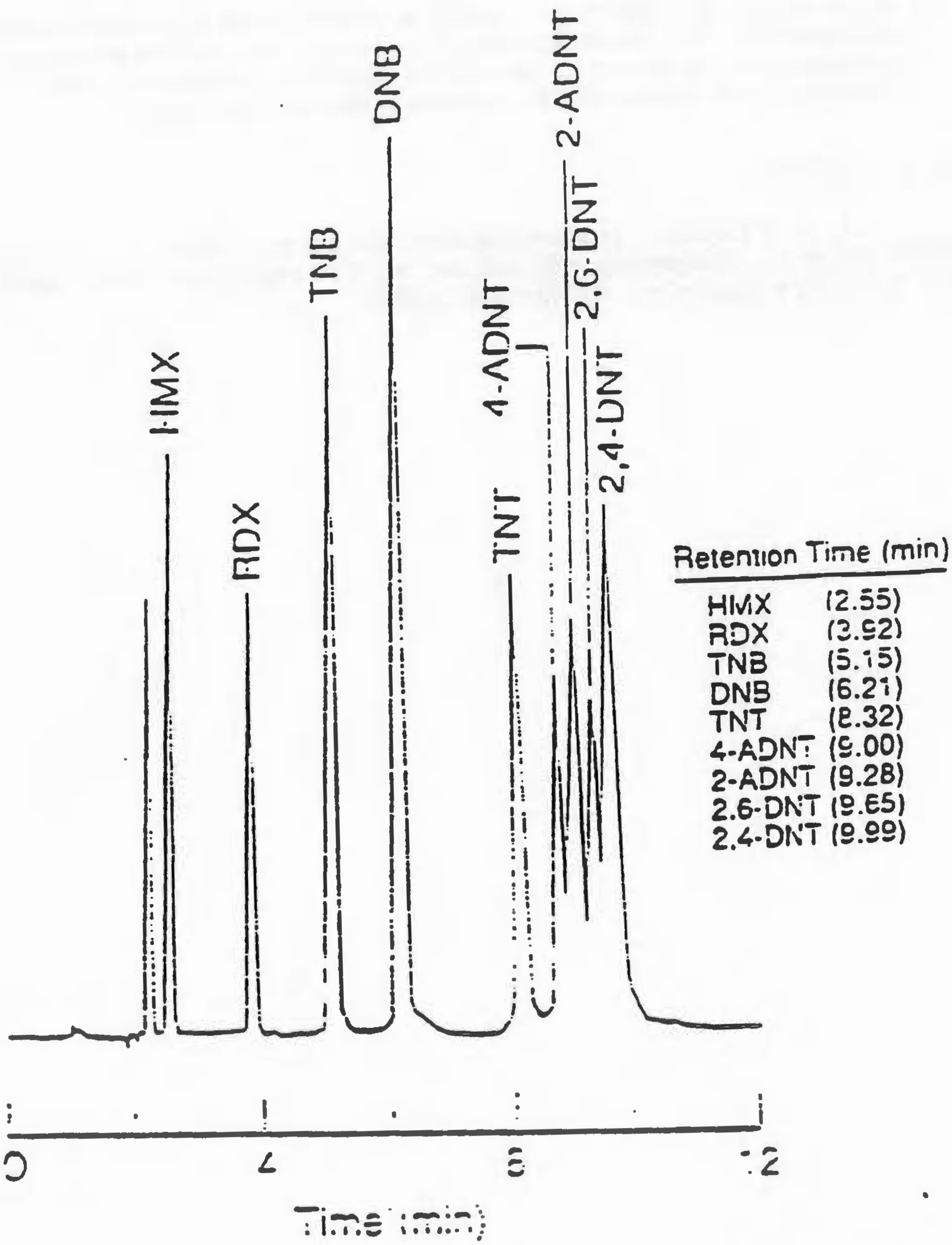

Figure 1. Liquid Chromatogram of Explosives Residues.

TABLE 1
PRACTICAL QUANTITATION LIMITS

Compounds	Water (µg/L) Low-Level	Water (µg/L) High-Level	Soil (µg/g)
HMX	-	13.0	2.2
RDX	0.836	14.0	1.0
1,3,5-TNB	0.258	7.3	0.25
1,3-DNB	0.108	4.0	0.25
Tetryl	-	4.0	0.65
NB	-	6.4	0.26
2,4,6-TNT	0.113	6.9	0.25
4-Am-DNT	0.0598	-	-
2-Am-DNT	0.0349	-	-
2,6-DNT	0.314	9.4	0.26
2,4-DNT	0.0205	5.7	0.25
2-NT	-	12.0	0.25
4-NT	-	8.5	0.25
3-NT	-	7.9	0.25

TABLE 2
RENTION TIMES FOR ANALYTES ON C-18 AND CN COLUMNS

C-18 Compounds	C-18 Retention Time (min)	CN Compounds	CN Retention Time (min)
HMX	2.4	NB	3.8
RDX	3.7	1,3,5-TNB	4.1
1,3,5-TNB	5.1	1,3-DNB	4.2
1,3-DNB	6.2	2-NT	4.4
Tetryl	6.9	4-NT	4.4
NB	7.2	3-NT	4.5
2,4,6-TNT	8.4	2,6-DNT	4.6
2,6-DNT	9.8	2,4-DNT	4.9
2,4-DNT	10.1	2,4,6-TNT	5.0
2-NT	12.3	RDX	6.2
4-NT	13.3	Tetryl	7.4
3-NT	14.2	HMX	8.4

TABLE 3
INTRALABORATORY PRECISION OF METHOD FOR SOIL SAMPLES

	Spiked Soils			Field-Contaminated Soils		
	Mean Conc. (µg/g)	SD	%rsd	Mean Conc. (µg/g)	SD	%rsd
HMX	46	1.7	3.7	14	1.8	12.8
				153	21.6	14.1
RDX	60	1.4	2.3	104	12	11.5
				877	29.6	3.4
1,3,5-TNB	8.6	0.4	4.6	2.8	0.2	7.1
	46	1.9	4.1	72	6.0	8.3
1,3-DNB	3.5	0.14	4.0	1.1	0.11	9.8
Tetryl	17	3.1	17.9	2.3	0.41	18.0
TNT	40	1.4	3.5	7.0	0.61	9.0
				669	55	8.2
2,4-DNT	5.0	0.17	3.4	1.0	0.44	42.3

TABLE 4
INTRALABORATORY ERROR OF METHOD FOR SOIL SAMPLES

	Spiked Soils			Field-Contaminated Soils		
	Mean Conc. (µg/g)	SD	%rsd	Mean Conc. (µg/g)	SD	%rsd
HMX	46	2.6	5.7	14	3.7	26.0
				153	37.3	24.0
RDX	60	2.6	4.4	104	17.4	17.0
				877	67.3	7.7
1,3,5-TNB	8.6	0.61	7.1	2.8	0.23	8.2
	46	2.97	6.5	72	8.8	12.2
1,3-DNB	3.5	0.24	6.9	1.1	0.16	14.5
Tetryl	17	5.22	30.7	2.3	0.49	21.3
TNT	40	1.88	4.7	7.0	1.27	18.0
				669	63.4	9.5
2,4-DNT	5.0	0.22	4.4	1.0	0.74	74.0

TABLE 5
INTERLABORATORY VARIANCE OF METHOD FOR WATER SAMPLES[a]

Compounds	Mean Conc. (µg/L)	SD	%rsd
HMX	203	14.8	7.3
RDX	274	20.8	7.6
2,4-DNT	107	7.7	7.2
2,4,6-TNT	107	11.1	10.4

a Nine laboratories.

APPENDIX D

SCOPE OF WORK

ORDER FOR SUPPLIES OR SERVICES

(Contractor must submit four copies of invoice.)

Form Approved OMB No. 0704-0187 Expires Aug 31, 1992

1. CONTRACT/PURCH ORDER NO.	2. DELIVERY ORDER NO.	3. DATE OF ORDER	4. REQUISITION/PURCH REQUEST NO.	5. CERTIFIED FOR NATIONAL DEFENSE UNDER DMS REG 1
DACA87-92-D-0022	0008	20NOV92	R0293A110	DO

6. ISSUED BY CODE
Division Engineer
ATTN: CEHND-PM-AE/Barnes/205-955-5333
PO Box 1600
Huntsville, AL 35807-4301

7. ADMINISTERED BY (If other than 6) CODE

RECEIVED JAN 12 1993

8. DELIVERY FOB
☐ DEST
☐ OTHER
(See Schedule if other)

9. CONTRACTOR CODE FACILITY CODE

NAME AND ADDRESS
Engineering Science, Inc.
1000 Jorie Blvd., Suite 330
Oak Brook, IL 60521

10. DELIVER TO FOB POINT BY (Date)
SEE ANNEX I

11. MARK IF BUSINESS IS
☐ SMALL
☐ SMALL DISADVANTAGED
☐ WOMEN-OWNED

12. DISCOUNT TERMS
N/A

13. MAIL INVOICES TO
SEE BLOCK 9 OF SF 252

14. SHIP TO CODE
SEE APPENDIX A, ANNEX I

15. PAYMENT WILL BE MADE BY CODE

MARK ALL PACKAGES AND PAPERS WITH CONTRACT OR ORDER NUMBER

16. TYPE OF ORDER
DELIVERY ☐ This delivery order is issued on another Government agency or in accordance with and subject to terms and conditions of above numbered contract.
PURCHASE ☐ Reference your ... furnish the following on terms specified herein.

ACCEPTANCE. THE CONTRACTOR HEREBY ACCEPTS THE OFFER REPRESENTED BY THE NUMBERED PURCHASE ORDER AS IT MAY PREVIOUSLY HAVE BEEN OR IS NOW MODIFIED, SUBJECT TO ALL OF THE TERMS AND CONDITIONS SET FORTH, AND AGREES TO PERFORM THE SAME.

Engineering-Science, Inc.	[signature]	Thomas N. Sargent, Senior VP	Jan 5, 1993
NAME OF CONTRACTOR	SIGNATURE	TYPED NAME AND TITLE	DATE SIGNED

☒ If this box is marked, supplier must sign Acceptance and return the following number of copies: Original

17. ACCOUNTING AND APPROPRIATION DATA/LOCAL USE
QX2104JA0180004
212/32020.DERA 08-8130 P788008.11 2572 S01110

18. ITEM NO.	19. SCHEDULE OF SUPPLIES/SERVICE	20. QUANTITY ORDERED/ACCEPTED*	21. UNIT	22. UNIT PRICE	23. AMOUNT
	This delivery order finalizes Contracting Officer's letter dated 20 November 1992.	Total Estimated Reimbursable Cost			$166,658
		Total Fixed Fee			10,833
	APPENDIX A, ANNEX I, Pages AI-1 thru AI-21 are enclosed, attached hereto, and made a part			Funded Cost	166,658
				Funded Fee	10,833
	Delivery order completion date is 1 Sept 1993.				
0001	LUMP SUM				177,491

* If quantity accepted by the Government is same as quantity ordered, indicate by X. If different, enter actual quantity accepted below quantity ordered and encircle.

24. UNITED STATES OF AMERICA
BY: [signature] BARRY W. FETERMAN, LTC, US ARMY
CONTRACTING/ORDERING OFFICER

25. TOTAL 177,491
29. DIFFERENCES

26. QUANTITY IN COLUMN 20 HAS BEEN
☐ INSPECTED ☐ RECEIVED ☐ ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS NOTED

DATE — SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE

27. SHIP. NO.
☐ PARTIAL
☐ FINAL

28. D.O. VOUCHER NO.

30. INITIALS

31. PAYMENT
☐ COMPLETE
☐ PARTIAL
☐ FINAL

32. PAID BY

33. AMOUNT VERIFIED CORRECT FOR

34. CHECK NUMBER

35. BILL OF LADING NO.

36. I certify this account is correct and proper for payment

DATE — SIGNATURE AND TITLE OF CERTIFYING OFFICER

37. RECEIVED AT	38. RECEIVED BY	39. DATE RECEIVED	40. TOTAL CONTAINERS	41. S/R ACCOUNT NUMBER	42. S/R VOUCHER NO.

DD Form 1155, MAY 90 — *Previous editions are obsolete.* 459/1

APPENDIX

ANNEX I

PREPARATION OF WORK PLANS FOR
CERCLA SITE INVESTIGATIONS
AT
SOLID WASTE MANAGEMENT UNITS
AT
SENECA ARMY DEPOT
ROMULUS, NEW YORK

1.0 GENERAL STATEMENT OF SERVICES.

1.1 Background. As mandated by the EPA, Region II, and by the New York State Department of Environmental Conservation (NYSDEC), the Army has performed a Solid Waste Management Unit Classification Study at Seneca Army Depot (SEAD). This work was performed to evaluate the effects of past solid waste management practices at identified solid waste management units (SWMU's) on the facility and to classify each as areas where "No Action is Required" or as "Areas of Concern" (AOC's). Areas of Concern include both (a) SWMU's where releases of hazardous substances may have occurred and (b) locations where there has been a release or threat of a release into the environment of a hazardous substance, pollutant or contaminant (including radionuclides) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). AOC's may include but need not be limited to former spill areas, landfills, surface impoundments, waste piles, land treatment units, transfer stations, wastewater treatment units, incinerators, container storage areas, scrapyards, cesspools and tanks with associated piping which are known to have caused a release into the environment or whose integrity has not been verified. The universe of SWMU's classified as part of the SWMU Classification Study is presented in Table 1.

TABLE 1

Universe of SWMUs at SEAD

ITEM	DESIGNATION		TITLE
1	SEAD-1		Bldg 307 - Hazardous Waste Container Storage Facility
2	SEAD-2		Bldg 301 - PCB Transformer Storage
3	SEAD-3	*	Incinerator Cooling Water Pond
4	SEAD-4	+	Munitions Washout Facility Leach Field
5	SEAD-5		Sewage Sludge Waste Pile
6	SEAD-6	*	Abandoned Ash Landfill
7	SEAD-7		Shale Pit
8	SEAD-8	*	Non-Combustible Fill Area
9	SEAD-9		Old Scrap Wood Site
10	SEAD-10		Present Scrap Wood Site
11	SEAD-11	+	Old Construction Debris Landfill
12	SEAD-12		Radioactive Waste Burial Sites (3)
13	SEAD-13	+	IRFNA Disposal Site
14	SEAD-14	*	Refuse Burning Pits
15	SEAD-15	*	Abandoned Incinerator Building
16	SEAD-16	+	Bld. S-311 - Abandoned Deactivation Furnace
17	SEAD-17	+	Bld. 367 - Existing Deactivation Furnace
18	SEAD-18		Bld. 709 - Classified Document Incinerator
19	SEAD-19		Bld. 801 - Classified Document Incinerator
20	SEAD-20		Sewage Treatment Plant No. 4
21	SEAD-21		Sewage Treatment Plant No. 715
22	SEAD-22		Sewage Treatment Plant No. 314
23	SEAD-23	*	Open Burning Ground
24	SEAD-24	+	Abandoned Powder Burning Pit
25	SEAD-25	+	Fire Training and Demonstration Pad
26	SEAD-26	+	Fire Training Pit
27	SEAD-27		Bld. 360 - Steam Cleaning Waste Tank
28	SEAD-28		Bld. 360 - Underground Waste Oil Tanks (2)
29	SEAD-29		Bld. 732 - Underground Waste Oil Tank
30	SEAD-30		Bld. 118 - Underground Waste Oil Tank
31	SEAD-31		Bld. 117 - Underground Waste Oil Tank
32	SEAD-32		Bld. 718 - Underground Waste Oil Tanks (2)
33	SEAD-33		Bld. 121 - Underground Waste Oil Tank
34	SEAD-34		Bld. 319 - Underground Waste Oil Tanks (2)
35	SEAD-35		Bld. 718 - Waste Oil-Burning Boilers (3)
36	SEAD-36		Bld. 121 - Waste Oil-Burning Boilers (2)
37	SEAD-37		Bld. 319 - Waste Oil-Burning Boilers (s)
38	SEAD-38		Bld. 2079 - Boiler Blowdown Leach Pit

TABLE 1 (Continued)

39	SEAD-39		Bld. 121 - Boiler Blowdown Leach Pit
40	SEAD-40		Bld. 319 - Boiler Blowdown Leach Pit
41	SEAD-41		Bld. 718 - Boiler Blowdown Leach Pit
42	SEAD-42		Preventive Medicine Lab
43	SEAD-43		Old Missile Propellant Test Lab (Building 606)
44	SEAD-44		Quality Assurance Test Lab
45	SEAD-45	+	Demolition Area (Refer to SEAD-23)
46	SEAD-46		Small Arms Range
47	SEAD-47		Radiation Calibration Source Storage (Buildings 321 and 806)
48	SEAD-48		Pitchblend Storage Bunkers
49	SEAD-49		Columbite Ore Storage (Bld. 356)
50	SEAD-50		Tank Farm
51	SEAD-51		Herbicide Usage - perimeter of high security area
52	SEAD-52		Ammunition Breakdown Area (Blds. 608 and 612)
53	SEAD-53		Munitions Storage Igloos
54	SEAD-54		Asbestos Storage Igloos
55	SEAD-55		Tannin Storage Igloos
56	SEAD-56		Herbicide and Pesticide Storage
57	SEAD-57	+	Explosive Ordnance Disposal Area
58	SEAD-58		Booster Station (Building 2131)
59	SEAD-59		Fill Area (West of Building 135)
60	SEAD-60		Oil Discharge (Building 609)
61	SEAD-61		Underground Waste Oil Tank (Building 718)
62	SEAD-62		Nicotine Sulfate Disposal Area (South side of Road, between Buildings 606 and 612)
63	SEAD-63		Miscellaneous Components Burial Site
64	SEAD-64		Garbage Disposal Areas (Debris Landfill South of Storage Pad)
65	SEAD-65		Acid Storage Pad
66	SEAD-66		Pesticide Storage Area (Near Buildings 5 and 6)
67	SEAD-67		Dump Site (East of Sewage Treatment Plant No. 4)
68	SEAD-68		Pest Control Shop (Building S-335)
69	SEAD-69		Disposal Area (Building 606)
70	SEAD-70		Building 803
71	SEAD-71		Fill Area Adjacent to building T-2110
72	SEAD-72		Rumored Paint and Solvent Burial Area

Note: The items marked by an asterisk have already been identified as AOC's and RI/FS activities have been initiated at these sites. Those marked with a + have been identified as AOC's and SI activities are being initiated under a separate contract.

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. Seneca Army Depot has applied for a Part B Permit to operate a hazardous waste storage facility (SWMU designation, SEAD-1), a polychlorinated biphenyl storage facility (SEAD-2) and a deactivation furnace (SEAD-17). The OB/OD grounds (SEAD-23) are currently under interim status. Under the Resource Conservation and Recovery Act (RCRA), Hazardous and Solid Waste Amendments of 1984 (HSWA), Part B Permits issued after 8 November 1984 shall require identification and corrective action at any SWMU located on the installation which is releasing hazardous constituents or hazardous wastes to the environment. This requirement applies to all SWMU's regardless of when the wastes were placed therein. However, the format of any required future investigations is being based on CERCLA guidelines, as agreed to by the USEPA Region II and NYSDEC, in an effort to facilitate overall coordination of investigations mandated at SEAD in response to SEAD's inclusion on the Federal Facilities National Priorities List. In addition to SWMU Site Investigations to be performed under this contract, additional investigations which are currently being undertaken include: a RI/FS at the Incinerator Ash Landfill (SEAD-3, 6, 8, 14 and SEAD-15) and a RI/FS at the OB grounds (SEAD-23).

1.4 <u>Sites To be Investigated under this Contract.</u> The sites to be investigated under this contract are listed in Table 2. A limited number of AOC's will be studied under this contract in order to provide better focus and to remain within the limits of available resources. Additional contracts will be pursued to assure investigation of all AOC's.

TABLE 2

ITEM	DESIGNATION		TITLE
1	SEAD-5		Sewage Sludge Waste Piles
2	SEAD-9		Old Scrap Wood Site
3	SEAD-12		Radioactive Waste Burial Sites - Location A: Northeast of Building 813 - Location B: North of Building 804
4	SEAD-43	*	Building 606 - Old Missile Propellant Test Lab
5	SEAD-44	+	Quality Assurance Test Laboratory
6	SEAD-50		Tank Farm
7	SEAD-56	*	Building 606 - Herbicide and Pesticide Storage
8	SEAD-58		Debris Area near Booster Station 2131
9	SEAD-59		Fill Area west of Building 135
10	SEAD-60		Oil Discharge adjacent to Building 609
11	SEAD-62		Nicotine Sulfate Disposal Area near Buildings 606 or 612
12	SEAD-63		Miscellaneous Components Burial Site
13	SEAD-64		Garbage Disposal Areas
14	SEAD-67		Dump Site East of Sewage Treatment Plant No. 4
15	SEAD-69	*	Building 606 - Disposal Area
16	SEAD-71		Fill Area Adjacent to Building T-2110
17	SEAD-72		Rumored Paint and Solvent Burial Pit

Notes: * Those items marked with an asterisk should be investigated together due to their proximity to Building 606 and each other.

+ The exact location of this unit has not been established.

2.0 OBJECTIVE

The purpose of this contract is to have the AE prepare Work Plans for the conduct of CERCLA Site Investigations at designated areas of concern at SEAD. The work shall be performed according to the requirements of the State of New York and the USEPA and according to the Federal Facilities Agreement in effect for Seneca Army Depot. In addition, all comments provided for the initial SWMU investigation Work Plan (Reference 8.4) shall be taken into account in the preparation of this plan. The format of work shall be based on the requirements presented in the EPA Guidance. No submittal shall be considered "Final" until it adequately satisfies all EPA and NYSDEC review comments and is approved by the Regulatory authorities.

3.0 DETAILED DESCRIPTION OF SERVICES

The AE shall be responsible for performance of the work described in the Tasks below as defined in this Statement of Work.

3.1 (Task A-1) Visual Inspection and Records Review. The general purpose of this task is to evaluate available information about each site and its surrounding environment. The AE shall perform a visual inspection of each site, and shall review records and reports provided by the Government or made available to the AE as published data from other sources. Most of the information will come from existing reports. In addition, the AE shall interview, where appropriate, past and present employees with knowledge of site practices. The following categorical guidelines shall be used in the review of information:

3.1.1 Operational and disposal history including past and present practices.

3.1.2 Design and/or construction details, if applicable

3.1.3 Waste profiles, including types and amounts of wastes.

3.1.4 Appropriate monitoring information, including contaminants, with sampling dates and locations (including depths) found near the unit.

3.1.5 Environmental concerns, targets and pathways

3.1.6 Corrective measures instituted

3.1.7 Detailed maps, where available; target populations and environments.

3.1.8 Releases to the environment.

3.2 <u>(Task A-2) Preparation of Work Plan</u>. The AE shall prepare a Work Plan describing specific details of the Site Investigations to be performed. Procedures, equipment and organizational structure, as well as investigation objectives and rationale, shall be discussed at appropriate locations within the plan. No field work may be performed until the plan is reviewed and approved and all work shall be performed according to the approved plan. The Work Plan shall include, as a minimum, the following Sub-plans.

3.2.1 <u>Health and Safety Sub-Plan</u>. Requirements shall, in general, follow those presented in the Health and Safety Sub-Plans of References 8.2, 8.3 and 8.4.

3.2.2 <u>Sampling and Analysis Sub-Plan.</u>

3.2.2.1 <u>Field Sampling Sub-Plan</u>. General requirements shall follow those presented in the corresponding sub-plans of References 8.2, 8.3 and 8.4. The AE shall provide required site-specific sampling objectives and rationale.

3.2.2.2 <u>Quality Assurance Project Sub-Plan</u>. General requirements shall follow those presented in the corresponding sub-plans of References 8.2, 8.3 and 8.4. Site-specific information shall be added, as required.

3.3 <u>(Task A-3) Monthly Progress Report</u>. The AE shall prepare and submit a monthly progress letter report describing the work performed since the previous report, work currently underway and work anticipated. The report shall state whether current work is on schedule, and, if not, what actions are anticipated in order to get back on schedule. The report shall be submitted not later than the 10th day of each calendar month and shall discuss the previous calendar month's activities.

3.4 (Task A-4) Presentations and Meetings. The AE shall attend meetings/presentations of work performed according to the schedule in paragraph 4.5. The meetings/presentations will consist of a summary of the work accomplished and anticipated followed by open discussion among those present. For the purposes of negotiation, the AE shall assume that meetings/presentations shall last no more than one day each, shall be made at EPA Region II offices in New York City and shall be attended by two representatives of the AE firm.

3.5 (Task A-5) Project Management. The A-E shall, during the life of the Delivery Order (DO), manage the DO in accordance with Appendix A of the basic contract SOW. The A-E shall perform all project management associated with this DO as part of this task including, but not limited to, preparing and submitting a master network schedule, cost and manpower plan, monthly progress reports, technical progress reports, monthly individual performance reports, and cost/schedule variance reports, work task proposals and a program control plan in accordance with Section 4.5 of Appendix A to the basic contract SOW.

4.0 SUBMITTALS AND PRESENTATIONS

4.1 Work Plan Format and Content. The Work Plan shall present all procedures and investigation objectives. All site drawings shall be of engineering quality 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. The report covers shall consist of durable three-ring binders which shall hold pages firmly while allowing easy removal, addition, or deletion 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. This Statement of Work shall be incorporated in the draft report only. Submittals shall include incorporation of all previous review comments as well as the disposition of each comment. Disposition of comments submitted with the final report shall be separate from the report document.

4.2 Minutes of Meeting. Following the meeting attended by the AE, the AE shall prepare and submit minutes of the meeting within 5 days to the Contracting Officer.

4.3 Correspondence. The AE shall keep a record of each phone conversation and written correspondence where information related to the performance of this contract is made. A summary of the phone conversations and written correspondence shall be submitted to the Contracting Officer monthly.

4.4 Submittals.

4.4.1 General Submittal Requirements.

4.4.1.1 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 4.4.3 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 4.5.

4.4.1.2 Partial Submittals. Partial submittals will not be accepted unless prior approval is given by the Contracting Officer.

4.4.1.3 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-ED-PM prior to the submittal date. The cover letter shall not be bound into the document.

4.4.1.4 Supporting Data and Calculations. The tabulation of criteria, data, calculations, 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. A copy of the final scope of services shall be included in the draft Work Plan only.

4.4.1.5 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 to the Contracting Officer and SEAD on IBM-PC compatible floppy disks in ASCII format.

4.4.2 Specific Submittal Requirements.

a. Work Plan (Preliminary Draft, Draft, Draft-Final, and Final)

b. Monthly Progress Reports (Final).

4.4.3 Addresses.

Commander
U.S. Army Corps of Engineers
Huntsville Division
ATTN: CEHND-PM-EP (Mr. Stahl)
106 Wynn Drive
Huntsville, AL 35805

Commander
U.S. Army Depot
Systems Command (DESCOM)
ATTN: AMSDS-EN-FD
(Mr. Biernacki)
Chambersburg, PA 17201

Commander
U.S. Army Environmental
Hygiene Agency (USAEHA)
ATTN:HSHB-ME-SR (Mr. Hoddinott)
Aberdeen Proving Ground, Md
21010-5422

Commander
US Army Corps of
Engineers,
Missouri River Division
ATTN: CEMRD-ED-EA
(Mr. Doug Plack)
PO Box 103
Downtown Station,
Omaha, NE
68101-0103

Commander
U.S. Army Material Command (USAMC)
ATTN: AMCEN-A
5001 Eisenhower Ave.
Alexandria, Virginia 22333-0001

Commander
Seneca Army Depot
ATTN: SDSSE-HE
(Mr. Randy
Battaglia)
Romulus, New York 14541

Commander
U.S. Army Corps of Engineers
Toxic and Hazardous Materials Agency
ATTN: CETHA-IR-S (Ms. Karen Wilson)
Aberdeen Proving Ground, MD 21010-5401

4.4.4 Document and Submittal List.

	Work Plan				
	Preliminary Draft	Draft	Draft-Final	Final	Monthly Reports
CEHND	2	2	2	2	2
USAMC	1	1	1	1	1
DESCOM	1	1	1	1	1
CETHA	1	1	1	1	1
CEMRD	8	8	3	3	3
SDSSE	5	23	5	5	5
USAEHA	7	7	7	7	7
TOTAL	25	43	20	20	20

4.5 <u>Completion Dates</u>.

Contract award is anticipated to be on TBD.

	Date Due (days after Award)
Submit Preliminary Draft Work Plan (to DoD only)	10 February 1993
Comments Provided	10 March 1993
Submit Draft Work Plan (to All)	10 April 1993
Regulatory Comments Due	10 May 1993
Submit Draft-Final Work Plan (to All)	1 June 1993
Final Work Plan (No Disputes)	1 July 1993
Meetings/Presentations (3)	TBD

The overall completion date for this delivery order shall be 1 September 1993.

5.0 HEALTH AND SAFETY REQUIREMENTS

Health and Safety requirements are contained in Reference 8.2, 8.3 and 8.4.

6.0 SECURITY REQUIREMENTS

6.1 The following requirements must be followed by the AE at Seneca Army Depot to facilitate of AE employees and to maintain security.

6.1.1 Personnel Registration:

6.1.1.1 A list of all AE employees, sub-contractors and suppliers indicating firm name and furnished through POC/COR to the Counterintelligence Division, Building 7 prior to commencement of work.

6.1.1.2 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 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.

6.1.1.3 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.

6.1.1.4 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.

6.1.1.5 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.

6.1.2 Traffic Regulations:

6.1.2.1 Traffic Laws, State of New York, apply with emphasis on the following regulations.

6.1.2.2 Speed Limit:

Controlled Area	- as posted
Ammo Area	- 5 mph
Limited/Exclusion Area	- 25 mph

6.1.2.3 All of the above are subject to change with road conditions or as otherwise posted.

6.1.3 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.

6.1.4 Gates:

6.1.4.1 Post 1, Main Gate - NY Highway 96, Romulus, New York is open for personnel entrance and exit 24 hours daily, 7 days a week.

6.1.4.2 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.

6.1.5 Security Regulations:

6.1.5.1 Prohibited Property:

6.1.5.1.1 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.

6.1.5.1.2 Matches or other spark producing devices will not be introduced into the Limited/Exclusion or Ammo Area's except when the possessor of such items is covered by a properly validated match or flame producing device permit.

6.1.5.1.3 All vehicles and personal parcels, lunch pails, etc. are subject to routine security inspections at any time while on depot property.

6.1.5.1.4 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.

6.1.6 AE Employee Circulation:

6.1.6.1 AE employees are cleared for entrance to the location of contract work only. Sight-seeing tours or wandering from work site is NOT AUTHORIZED.

6.1.6.2 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.

6.1.6.3 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.

6.1.7 Unions: Representatives will be referred to the Depot Industrial Labor Relations Officer (Ext. 41317).

6.1.8 Offenses: (Violations of law or regulations)

6.1.8.1 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.

6.1.8.2 Major: Serious offenses committed while on the installation will be reported to the FBI. Violators may be subject to trial in Federal Court.

6.1.9 Explosive Laden Vehicles:

6.1.9.1 Vehicles such as vans, cargo trucks, etc. carrying explosives will display placards or signs stating "EXPLOSIVES".

6.1.9.2 Explosive ladened vehicles will not be passed.

6.1.9.3 When an explosive laden vehicle is approaching, pull over to the side and stop.

6.1.9.4 When catching up with an explosive laden vehicle, slow down and allow that vehicle to remain at least 100 feet ahead.

6.1.9.5 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.

6.1.9.6 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.

6.1.10 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.

6.1.11 Security (Access) Requirements.

6.1.11.1 In general, the AE shall note that special access/administration requirements, in addition to those listed here, apply to those wishing to enter the Exclusion Area at SEAD. The AE shall coordinate with the SEAD Security Office to ascertain what special requirements exist prior to <u>considering</u> the performance of any work within this area.

6.1.11.2 Any vehicle wishing to enter either the limited/Exclusion Area must have a fire extinguisher within.

7.0 PUBLIC AFFAIRS

The AE shall not make available to the news media or publicly disclose, in general, any data generated or reviewed under this contract. The AE shall refer all requests for site information to Seneca Army Depot for comment. All requests for contract information shall be directed to the Contracting Officer, Huntsville Division. 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. The AE shall notify the Contracting Officer and Installation Public Affairs Office prior to any contacts with regulatory agencies.

8.0 MANAGEMENT OF FUNDS

The matrix in Table 3 establishes the funding allocation structure by task for this delivery order. Funds fir this delivery order will be managed at the level specified in this matrix. No transfer of funds by the A-E between tasks will be allowed without the prior approval of the Contracting Officer or the Contracting Officer's Representative.

TABLE 3
ALLOCATED FUNDING STRUCTURE BY TASK

1 Description	2 Negot. Est. Reimb. Costs	3 Negot. Fixed Fee	4 Total Negot. Costs	5 Funded Est. Reimb. Costs	6 Funded Fixed Fee	7 Total Funded Costs
Task 1	26156	1700	27856	26156	1700	27856
Task 2	94092	6116	100208	94092	6116	100208
Task 3	13121	853	13974	13121	853	13974
Task 4	10367	674	11041	10367	674	11041
Task 5	22922	1490	24412	22922	1490	24412
TOTAL	166658	10833	177491	166658	10833	177491

9.0 REFERENCE DOCUMENTS

9.1 "Solid Waste Management Unit Classification Study at Seneca Army Depot, Romulus, New York," ERC Environmental and Energy Services Co., Inc., January 1991 (Draft)

9.2 "Work Plan Remedial Investigation/Feasibility Study at the Ash Landfill, Seneca Army Depot, Romulus, New York," Environmental Science and Engineering, Inc., 1990 (Draft-Final).

9.3 "Work Plan of Architect-Engineer Services for Performing a Remedial Investigation/Feasibility Study (RI/FS) at the Open Burning (OB) Grounds, Seneca Army Depot, Romulus, New York," C.T. Main, Inc., February 1991 (Draft).

9.4 "Work Plan For CERCLA Investigation of Eleven Solid Waste Management Units at Seneca Army Depot, Romulus, New York."; 27 January 1992, C.T. Main, Inc.

APPENDIX E

MINUTES FOR THE MEETING TO DETERMINE APPROPRIATE SWMU CLASSIFICATIONS

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT
ROMULUS, NEW YORK 14541-5001

REPLY TO
ATTENTION OF

SDSSE-HE (200-1a) 30 OCT 92

MEMORANDUM FOR RECORD

SUBJECT: Minutes for the Meeting to Determine Appropriate Solid Waste Management Unit (SWMU) Classifications

1. Negotiations between the NYSDEC, USEPA and Army were held on 21-22 Sept 92 at Seneca Army Depot (SEAD), Building 123.

2. Attendance for:

a. Meeting starting 1000 hrs 21 Sept 92 and concluding 1130 hrs 21 Sept 92:

For the Army: Mr. Randall Battaglia, Project Manager, SEAD

For the USEPA: Ms. Carla Struble, Project Manager, USEPA
Mr. Jeff Healy, Alliance Technologies, Inc.

b. Meeting starting 1300 hrs 21 Sept 92 and concluding 1800 hrs 21 Sept 92 and reconvening at 0900 hrs 22 Sept 92 and concluding 1130 hrs 22 Sept 92:

For the Army: Mr. Randall Battaglia, Project Manager, SEAD
Mr. Jim Miller, SEAD
Dr. Kathleen Bucchi, Project Manager, USATHAMA
Mr. James Chaplick, P.E. Engineering Science
Mr. Mike Duchesneau, P.E. Engineering Science
Mr. Keith Hoddinott, AEHA (22 Sept 92 only)

For the USEPA: Ms. Carla Struble, Project Manager, USEPA
Mr. Jeff Healy, Alliance Technologies, Inc.

For the NYSDEC: Mr. Marsden Chen, Federal Facilities Section, NYSDEC
Mr. Kamal Gupta, Project Manager, NYSDEC
Mr. Kerdeef Gupta, RCRA Section, NYSDEC
Ms. Linda Vera, NYSDEC Region 8 (22 Sept 92 only)

For the NYSDOH: Mr. Kim Manne, NYSDOH

3. Meeting starting 1000 hrs 21 Sept 92 and concluding 1130 hrs 21 Sept 92.

Summary of USEPA and Army Meeting:

USEPA concurred with the Army's position for all SWMU's after discussion. Differences in concurrences and additional specific information desired will be specified in a letter by USEPA. (This is expected by 30 Oct 92).

USEPA recommended to investigate SEAD-46, Small Arms Range, and the Army concurred due to the possibility of unexploded ordnance. USEPA performed visual site inspections at SEAD-52, Bldg 612; SEAD-55, Tannin Storage; SEAD-65, Acid Storage Pads; SEAD-66, Pesticide Storage, Bldgs 5 & 6.

4. Meetings starting at 1300 hrs 21 Sept 92 and concluding at 1800 hrs 21 Sept 92 and reconvening at 0900 hrs 22 Sept 92 and concluding at 1130 hrs 22 Sept 92:

a. During the meetings, representatives of the Army, NYSDEC, USEPA and NYSDOH discussed, in detail, the universe of currently identified and classified SWMU's described in the Draft Final SWMU Classification Report (SCR) prepared by ERCE (1991). In addition, three SWMU's not addressed in the Draft Final SCR were discussed; units 70, 71,and 72. The objective of the meetings was to reach resolution on the proper classification of all SWMU's. The goal was to classify all SWMU's as either requiring no further action or as an Area of Concern (AOC).

b. In the meetings attended by USEPA and Army occurring earlier in the day, in which the NYSDEC and NYSDOH were not in attendance, the Army and USEPA reached consensus regarding the proper classification of all SWMU's.

c. In order to assist in the proper classification of individual SWMU's, site visits of various sites were undertaken. Sites visited were SEAD-52 (including Bldg. 608, 610, 611, & 612), SEAD-65, SEAD-68, SEAD-60, SEAD-46 and SEAD-55.

d. At the conclusion of the meeting, all SWMU's fell into one of three categories. These categories are:

- o No Action SWMU's.
- o Areas of Concern (AOC's).
- o Additional information required.

e. The category of additional information was assigned to those units in which the NYSDEC reserved its authority to classify a SWMU as either an AOC or no action unit. For this category, agreement was reached between the Army and NYSDEC regarding the level of further information that will be required in order for the NYSDEC to decide the units correct classification. The level of further information required by the NYSDEC fell into the following categories:

o NYSDEC's Federal Projects Section will consult with another NYSDEC regulatory authority (i.e RCRA or FIFRA authorities).

o SEAD will provide NYSDEC with additional studies, documentation, data or analytical test results.

o The Army will conduct limited sampling in order to further categorize the site.

f. All parties agreed that, prior to initiating fieldwork at those units requiring limited sampling, phone conferences would be held in order to discuss the Army's proposed sampling. It was agreed that, for those units where limited sampling is needed, workplans would not be required. The additional sampling and analysis will be used to determine the SWMU's proper classification.

g. The Army briefly discussed its means of contractually performing the limited additional sampling. SEAD stated that the sampling and analysis could be performed independent of the contractor who will be revising the SCR or the sampling could become a tasking for the contractor performing the SCR update. If the former were the case, SEAD could use in-house manpower or contracting mechanisms to accomplish the work. SEAD stated that it is most likely that the contractor updating the SCR will perform all sampling and revise the report accordingly.

h. The NYSDEC expressed concerns that the limited sampling may delay finalization of the SCR. SEAD agreed to inform the NYSDEC if the requirement to conduct sampling would effect the SCR finalization schedule.

i. SEAD will be consulting with the Army's executing agency regarding the SCR revision project. SEAD will keep the regulatory agencies advised of major developments concerning this project.

j. The NYSDEC recommended that the Army rename the investigations planned at eleven SWMU's. Currently, the workplan for this project is entitled "CERCLA Investigation of Eleven Solid Waste Management Units" (MAIN 1992). The NYSDEC prefers that these investigations be referred to as Phase I Remedial Investigations. The basis for the name change is that CERCLA Site Investigations are typically used for National Priorities List (NPL) scoring. The NYSDEC asserted that SEAD has already been placed on the NPL and further reference to continued CERCLA Site Investigations should be discontinued.

k. Minutes Table 1.0 summarizes the agreements reached in the meeting for each individual SWMU.

l. At the meetings conclusion, Mr. James Miller, SEAD, agreed to prepare minutes summarizing the agreements reached during the meeting. The meeting concluded at 1130 hrs. Because consensus was reached regarding the status of each individual SWMU, it was decided there was no need to reconvene during the afternoon of 22 Sept 92.

James Miller
JAMES MILLER
Environmental Protection Specialist
SEAD

MINUTES TABLE 1

UNIT NUMBER	UNIT NAME	AGREEMENTS
SEAD-1	Building 307 - Hazardous Waste Container Storage Facility	Summary of Discussions: Historical use, regulation, compliance information, and building designs and specifications for this facility were scrutinized. Consensus: NYSDEC Federal Facilities will consult with applicable NYSDEC RCRA compliance authorities. The Army is not required to supply any additional information at this time. Upon consulting RCRA authorities, NYSDEC Federal Facilities will inform SEAD of its recommended classification for SEAD-1. This task will be performed expeditiously, so that the SCR can be updated accordingly. Classification: NYSDEC-Reserved, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-2	Building 301 - PCB Transformer Storage Facility	Summary of Discussions: Historical use, regulation, compliance information, and building designs and specifications for this facility were examined. Consensus: NYSDEC Federal Facilities will consult with applicable NYSDEC RCRA compliance authorities. The Army is not required to supply any additional information at this time. Upon consulting RCRA authorities, NYSDEC Federal Facilities will inform SEAD of its recommended classification for SEAD-2. This task will be performed expeditiously, so that the SCR can be updated accordingly. Classification: NYSDEC-Reserved, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-3	Incinerator Cooling Water Pond	Summary of Discussions: Limited. This SWMU is part of the Ash Landfill Operable Unit currently being addressed in a Remedial Investigation/Feasibility Study (RI/FS). Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. Classification: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-4	Munitions Washout Facility Leach Field	Summary of Discussions: Limited. This SWMU is being addressed under the Workplan for CERCLA Investigation of eleven Solid Waste Management Units (MAIN/January 1992). This workplan is under review by USEPA. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. Classifications: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-5	Sewage Sludge Waste Piles	Summary of Discussions: Limited. The Army is currently making plans to conduct a CERCLA Site Investigation at this site. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. Classifications: NYSDEC-AOC, Army-Concur, USEPA-Concur

UNIT NUMBER	UNIT NAME	AGREEMENTS
SEAD-6	Abandoned Ash Landfill	Summary of Discussions: Limited. This unit is part of the Ash Landfill Operable Unit currently being addressed in a RI/FS. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. Classification: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-7	Shale Pit	Summary of Discussion: Past clean fill disposal practices were discussed. 6NYCRR Subpart 360-7, Construction and Demolition Landfill, regulations were reviewed. SEAD-7 receives only recognizable uncontaminated concrete, asphalt pavement, brick, soil and stone. Consensus: The shale pit does not pose a reasonable threat of release. Classification: NYSDEC-No Action, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-8	Non-Combustible Fill Area	Summary of Discussions: Limited. This SWMU is part of the Ash Landfill Operable Unit currently being addressed in a RI/FS. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. Classification: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-9	Old Scrap Wood Site	Summary of Discussions: The Army agreed that this site may pose a reasonable threat of release due to past waste disposal uncertainties. Prior to this areas use as a scrap wood site, the area received landfill. The origin and nature of this landfill is unknown. Consensus: All parties agreed that, due to uncertainty regarding the site, further investigation is needed. Classification: NYSDEC-AOC, ARMY-Concur, USEPA-Deferred to earlier meeting.
SEAD-10	Present Scrap Wood Site	Summary of Discussions: Historical management of SEAD's current scrap woodpile was reviewed; past practices were discussed at length. Consensus: NYSDEC asked that limited sampling and analysis be performed at this site. SEAD agreed. Classification: NYSDEC-Reserved, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-11	Old Construction Debris Landfill	Summary of Discussions: Limited. This unit is currently being addressed under the Workplan for CERCLA Investigation of eleven Solid Waste Management Units (MAIN/January 1992). This workplan is currently under USEPA review. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. Classifications: NYSDEC-AOC, Army-Concur, USEPA-Concur

UNIT NUMBER	UNIT NAME	AGREEMENTS
SEAD-12	Radioactive Waste Burial Sites - Location A: Northeast of Building 813 Location B: North of Building 804	Summary of Discussions: Limited. The Army is currently making plans to conduct a CERCLA Site Investigation at this site. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meeting. Classifications: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-13	IRFNA Disposal Site	Summary of Discussions: Limited. This unit is currently being addressed under the Workplan for CERCLA Investigation of eleven Solid Waste Management Units (MAIN/January 1992). Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. This workplan is under USEPA review. Classifications: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-14	Refuse Burning Pits (2 units)	Summary of Discussions: This SWMU is part of the Ash Landfill Operable Unit currently being addressed in a RI/FS. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. Classification: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-15	Building 2207 - Abandoned Solid Waste Incinerator	Summary of Discussions: Limited. This unit is a part of the Ash Landfill Operable Unit currently being addressed in a RI/FS. Consensus: All parties were in agreement prior to the 21-22 Sept meetings. Classification: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-16	Building S-311 - Abandoned Deactivation Furnace	Summary of Discussions: Limited. This SWMU is currently being addressed under the Workplan for CERCLA Investigation of eleven Solid Waste Management Units (MAIN/January 1992). This workplan is under review by USEPA. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. Classifications: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-17	Building 367 - Existing Deactivation Furnace	Summary of Discussions: Limited. This SWMU is currently being addressed under the Workplan for CERCLA Investigation of eleven Solid Waste Management Units (MAIN/January 1992). This workplan is currently under USEPA review. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. Classifications: NYSDEC-AOC, Army-Concur, USEPA-Concur

UNIT NUMBER	UNIT NAME	AGREEMENTS
SEAD-16	Building 709 - Classified Document Incinerator	Summary of Discussions: The nature of past document burning in this incinerator, including types of paper burned, volumes, and incinerator specifications were discussed. Consensus: The Army is not required to provide any additional information in support of this unit's classification. Classification: NYSDEC-No Action, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-19	Building 801 - Classified Document Incinerator	Summary of Discussions: The nature of past document burning in this incinerator, including types of paper burned, volumes, and incinerator specifications were discussed. Consensus: The Army is not required to provide any additional information in support of this unit's classification. Classification: NYSDEC-No Action, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-20	Sewage Treatment Plant No. 4	Summary of Discussions: The Army asserted that the sewage treatment plants that are regulated and in compliance with the NYSDEC SPDES program is unwarranted. The NYSDEC acknowledged and reviewed the SPDES permit effluent limitations provided in the SCR. Consensus: The Army is not required to provide any additional information in support of this unit's classification. Classification: NYSDEC-No Action, ARMY-Concur, USEPA-Deferred to earlier meeting.
SEAD-21	Sewage Treatment Plant No. 715	Summary of Discussions: The Army asserted that the sewage treatment plants that are regulated and in compliance with the NYSDEC SPDES program is unwarranted. The NYSDEC acknowledged and reviewed the SPDES permit effluent limitations provided in the SCR. Consensus: The Army is not required to provide any additional information in support of this unit's classification. Classification: NYSDEC-No Action, ARMY-Concur, USEPA-Deferred to earlier meeting.
SEAD-22	Sewage Treatment Plant No. 314	Summary of discussions: The Army asserted that the sewage treatment plants that are regulated and in compliance with the NYSDEC SPDES program is unwarranted. The NYSDEC acknowledged and reviewed the SPDES permit effluent limitations provided in the SCR. Consensus: The Army is not required to provide any additional information in support of this unit's classification. Classification: NYSDEC-No Action, ARMY-Concern, USEPA-Deferred to earlier meeting.

UNIT NUMBER	UNIT NAME	AGREEMENTS
SEAD-23	Open Burning Grounds	Summary of Discussions: Limited. This SWMU has graduated to the operable unit stage and is currently being addressed in an a RI/FS. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. Classification: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-24	Abandoned Powder Burning Pit	Summary of Discussions: Limited. This SWMU is currently being addressed under the Workplan for CERCLA Investigation of eleven Solid Waste Management Units (MAIN/January 1992). This workplan is under USEPA review. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. Classifications: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-25	Fire Training and Demonstration Pad	Summary of Discussions: Limited. This unit is currently being addressed under the Workplan for CERCLA Investigation of eleven Solid Waste Management Units (MAIN January 1992). This workplan is currently under USEPA review. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meeting. Classifications: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-26	Fire Training Pit	Summary of Discussions: Limited. This SWMU is currently being addressed under the Workplan for CERCLA Investigation of eleven Solid Waste Management Units (MAIN/ 1992). This workplan is currently under USEPA review. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meeting. Classifications: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-27	Building 360 - Steam Cleaning Waste Tank	Summary of Discussions: SEAD provided a status update on the RCRA Hazardous Waste Tank Closure Plan that is being reviewed by NYSDEC RCRA Compliance Authorities. SEAD agreed to provide the NYSDEC with sampling and analysis results when generated. If significant soil or groundwater contamination is encountered, cleanup of this site will be deferred to the CERCLA/IAG cleanup process. Consensus: The Army will forward to NYSDEC the closure plan sampling and analysis results when available. SEAD-27 will continue to be addressed under supervision of NYSDEC RCRA authorities. The proper classification of this unit will be determined based on closure test results. SEAD will strive to complete the closure process in time to avoid SCR finalization delays. Classification: NYSDEC-Reserved, ARMY-Concur, USEPA-Deferred to earlier meeting.

UNIT NUMBER	UNIT NAME	AGREEMENTS
SEAD-28	Building 360 - Underground Waste Oil Tanks (2 Units)	Summary of Discussions: The type of fuel stored, tank type (fiberglass or steel), and fuel capacity of these tanks were reviewed. Consensus: Seneca will submit to the NYSDEC tank tightness results dated 1988. The tightness results indicated that the tanks did not leak. Classification: NYSDEC-Reserved, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-29	Building 732 - Underground Waste Oil Tank	Summary of Discussion: The type of fuel stored, tank type (fiberglass or steel), and fuel capacity of this tank were reviewed. Consensus: Seneca will schedule this 1982 fiberglass tank for tightness testing in the near future. The results of this test will be included in the revised SCR and will subsequently determine SEAD-29's classification. Classification: NYSDEC-Reserved, ARMY-Concur, USEPA-Deferred to earlier meeting.
SEAD-30	Building 118 - Underground Waste Oil Tank	Summary of Discussions: The type of fuel stored, tank type (fiberglass or steel), and fuel capacity of this tank were reviewed. This tank is scheduled for removal in the near future by the SEAD in-house tank removal team. This tank is known to have taken on water and leakage is expected to have occurred. SEAD explained that the removal will be undertaken in unison with NYSDEC Region 8 regulatory authorities. If contamination is discovered when this tank is removed, soil excavation will be performed and soil sampling will be undertaken. Soil samples will be tested for the parameters mandated by the NYSDEC Region 8 Division of Water. These tests will be accomplished using the analytical methods and protocols required by Region 8, including laboratory requirements to meet established practical quantitation limits. Sample results will be forwarded to Region 8, who will make the determination whether or not the site remains contaminated after the cleanup has been completed; provided removal of contaminated soils is necessary. The test results will be incorporated into the SCR. Consensus: Analytical results from samples taken during the in-house removal project will be used to determine this unit's classification. The results will be forwarded to NYSDEC Federal Facilities Section. Classification:NYSDEC-Reserved, ARMY- Concur, USEPA-Deferred to earlier meeting

UNIT NUMBER	UNIT NAME	AGREEMENTS
SEAD-31	Building 117 - Underground Waste Oil Tank	Summary of Discussions: The type of fuel stored, tank type (fiberglass or steel), and fuel capacity of this tank were reviewed. Consensus: Seneca will submit to the NYSDEC tank tightness results dated 1988. If the tightness results indicate that the tank has not leaked, NYSDEC will consider SEAD-31 a no action SWMU. Classification: NYSDEC-Reserved, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-32	Building 718 - Underground Waste Oil Tanks (2 Units)	Summary of Discussions: The type of fuel stored, tank type (fiberglass or steel), and fuel capacity of these tanks were reviewed. These tanks held virgin number 6 fuel oil; waste oil from all the waste oil tanks was blended for use as a used oil fuel. The oil is burned in boilers which generate steam used for heating buildings. The Army stated that tightness testing of tanks containing number 6 fuel oil is technologically infeasible and not required under 6 NYCRR Part 613.5 and 40 CFR Part 266. Sampling groundwater by installing 1.5 inch groundwater monitoring wells was discussed. Consensus: Limited sampling of building 718 waste oil tank is warranted. Classification: NYSDEC-Reserved, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-33	Building 121 - Underground Waste Oil Tank	Summary of Discussions: The type of fuel stored, tank type (fiberglass or steel), and fuel capacity of this tank were reviewed. This tank held virgin number 6 fuel oil; waste oil from all the waste oil tanks was blended for use as a used oil fuel. The oil is burned in boilers to generate steam used for heating buildings. The Army stated that tightness testing of tanks containing number 6 fuel oil is technologically infeasible and not required under 6 NYCRR Part 613.5 and 40 CFR Part 266. Sampling groundwater by installing 1.5 inch groundwater monitoring wells was discussed. Consensus: Limited sampling of building 121 waste oil tank is warranted. Classification:NYSDEC-Reserved, Army-Concur, USEPA-Deferred to earlier meeting

UNIT NUMBER	UNIT NAME	AGREEMENTS
SEAD-34	Building 319 - Underground Waste Oil Tank (2 Units)	Summary of Discussions: The type of fuel stored, tank type (fiberglass or steel), and fuel capacity of this tank were reviewed. This tank held virgin number 6 fuel oil; waste oil from all the waste oil tanks was blended for use as a used oil fuel. The oil is burned in boilers to generate steam used for heating buildings. The Army stated that tightness testing of tanks containing number 6 fuel oil is technologically infeasible and not required under 6 NYCRR Part 613.5 and 40 CFR Part 266. Sampling groundwater by installing 1.5 inch groundwater monitoring wells was discussed. Consensus: Limited sampling of building 319 waste oil tank is warranted. Classification: NYSDEC-Reserved, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-35	Building 718 - Waste Oil Burning Boilers (3 Units)	Summary of Discussions: SCR photographs of building 718 waste oil burning boilers were inspected. Design features, including capacity ratings and boiler combustion rates, were reviewed. Consensus: No additional information, sampling or documentation is required. Classification: NYSDEC-No Action, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-36	Building 121 - Waste Oil Burning Boilers (2 Units)	Summary of Discussions: SCR photographs of building 121 Waste oil burning boilers were inspected. Design features, including capacity ratings and boiler combustion rates, were reviewed. Consensus: No additional information, sampling or documentation is required. Classification: NYSDEC-No Action, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-37	Building 319 - Waste Oil Burning Boilers (2 Units)	Summary of Discussions: SCR photographs of building 319 Waste oil burning boilers were inspected. Design features, including capacity ratings and boiler combustion rates, were reviewed. Consensus: No additional information, sampling or documentation is required. Classification: NYSDEC-No Action, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-38	Building 2079 - Boiler Plant Blowdown Leach Pit	Summary of Discussions: Current and historical operating practices were reviewed. Consensus: A limited sampling effort is warranted. This SWMU will be classified based on these sampling results. Classification: NYSDEC-Reserved, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-39	Building 121 - Boiler Plant Blowdown Leach Pit	Summary of Discussions: Current and historical operating practices were reviewed. Consensus: A limited sampling effort is warranted. This SWMU will be classified based on these sampling results. Classification: NYSDEC-Reserved, Army-Concur, USEPA-Deferred to earlier meeting.

UNIT NUMBER	UNIT NAME	AGREEMENTS
SEAD-40	Building 319 - Boiler Plant Blowdown Leach Pit	Summary of Discussions: Current and historical operating practices were reviewed. Consensus: A limited sampling effort is warranted. This SWMU will be classified based on these sampling results. Classification: NYSDEC-Reserved, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-41	Building 718 - Boiler Plant Blowdown Leach Pit	Summary of Discussions: Current and historical operating practices were reviewed. Consensus: A limited sampling effort is warranted. This SWMU will be classified based on these sampling results. Classification: NYSDEC-Reserved, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-42	Building 106 - Preventive Medicine Laboratory	Summary of Discussions: Operating practices at the SEAD Preventative Medicine Laboratory were reviewed. The volume and nature of infectious waste generated was discussed, as well as disposal practices consistent with applicable regulations. SEAD restated that no materials containing radioactive isotope are utilized, generated, or disposed of at the clinical laboratory. Consensus: The Army is not required to provide any additional information, conduct any sampling, or provide further documentation. Classification: NYSDEC-No Action, Army-Concur, USEPA-Deferred to earlier meeting.
SEAD-43	Building 606 - Old Missile Propellant Test Laboratory (refer to SEAD-56)	Summary of Discussions: Limited. This SWMU is scheduled to be addressed in a CERCLA Site Investigation. The fact that SEAD-43, SEAD-56 and SEAD-69 are located in the same geographical area was discussed. Consensus: Uncertainties associated with former operations at this site warrants investigation. SEAD-43, 56, and 69 should remain classified as individual units for purposes of the SCR. The area will be addressed cumulatively as an AOC for purposes of the Army's planned CERCLA Site Investigation Workplan. Classification: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-44	Quality Assurance Test Laboratory - Location A: West of Building 606 Location B: Brady Road	Summary of Discussions: Limited. The Army is currently making plans to conduct CERCLA Site Investigations at this site. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. Classifications: NYSDEC-AOC, Army-Concur, USEPA-Concur
SEAD-45	Demolition Area	Summary of Discussions: Limited. This unit is being addressed under the Workplan for CERCLA Investigation of eleven Solid Waste Management Units (MAIN/January 1992). The workplan is being reviewed by USEPA. Consensus: All parties were in agreement prior to the 21-22 Sept 92 meetings. Classifications: NYSDEC-AOC, Army-Concur, USEPA-Concur