U.S. ARMY CORPS OF ENGINEERS
HUNTSVILLE DIVISION

00880

WORK PLAN FOR CERCLA ESI OF TEN SOLID WASTE MANAGEMENT UNITS

AT
SENECA ARMY DEPOT
ROMULUS, NEW YORK

PREPARED FOR

U.S. ARMY CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

PREPARED BY

PARSONS MAIN, INC.

WORKPLAN FOR CERCLA INVESTIGATION OF TEN SOLID WASTE MANAGEMENT UNITS

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	Area 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
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

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
RI/FS	Remedial Investigation/Feasibility Study
RQD	Rock Quality Designation
SAS	Special Analytical Services
SEAD	Seneca Army Depot
SIR	Subsurface Interface Radar

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

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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LIST OF ADDENDUM

1	Geophysical Surveys

1.0 INTRODUCTION

1.1 PURPOSE

Parsons Main, Inc. (Parsons Main) 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 ten 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 ten 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 an RI/FS investigation. It will be more descriptive than a RCRA Facility Assessment (RFA) sampling visit, and less detailed than the RI/FS investigation process. Since ESIs are being conducted at each of the 10 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 these ten 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) may 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 Remedial Investigation/Feasibility Study (RI/FS) may be required to gain enough 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 AOCs 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.

Seneca anticipates that the site investigation may reveal that one or more of the ten AOCs 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 AOCs 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 the mandate of the IAG paragraph 10.9.

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 "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.

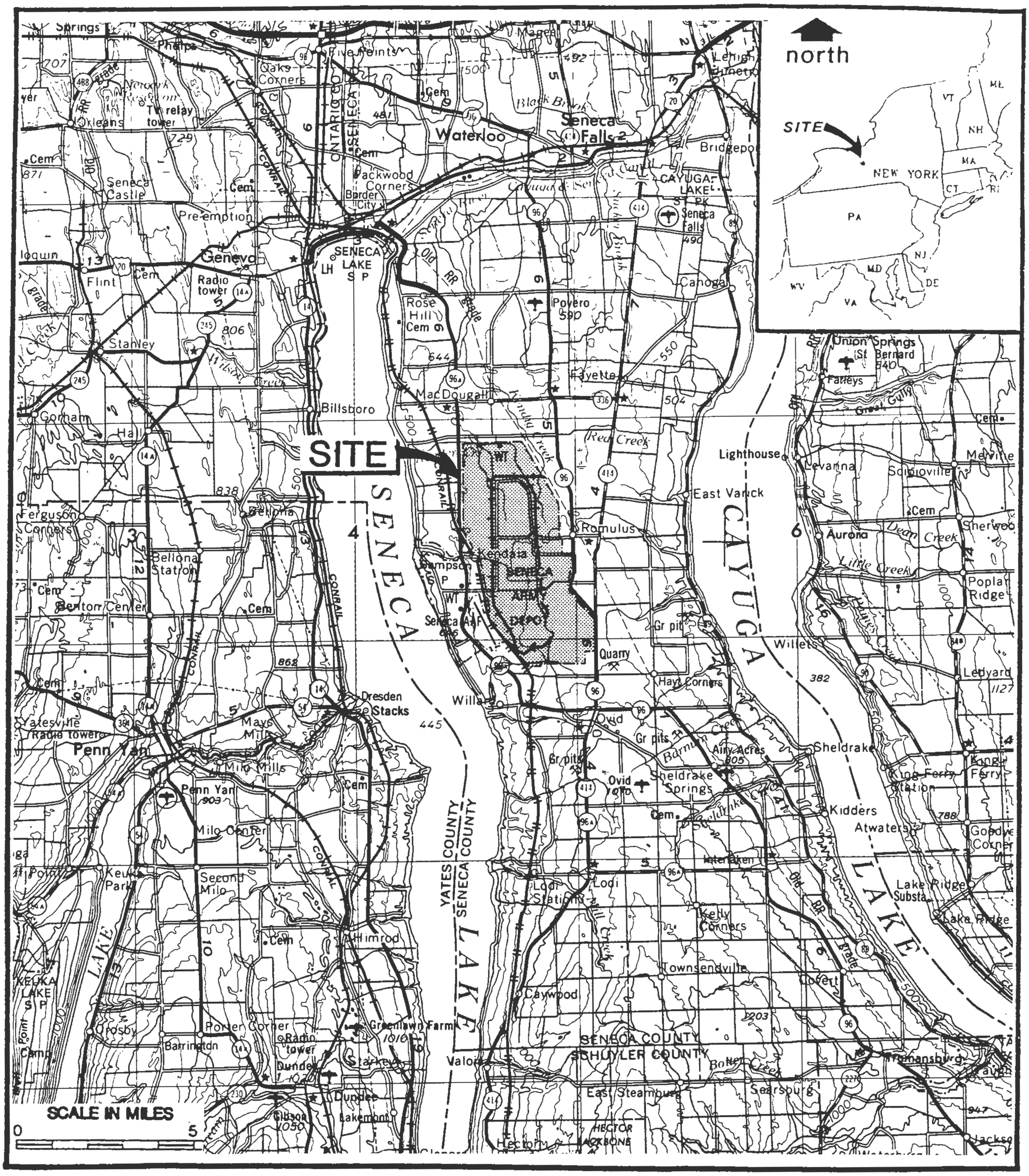


FIGURE 1-1 LOCATION MAP

Closure under RCRA guidelines was deferred when the 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 mandated by the EPA Region II and by NYSDEC, the U.S. Army Corps of Engineers commissioned the "Solid Waste Management Unit Classification Report" at 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" (AOCs). 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. AOCs 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 total number of SWMUs and AOCs identified in the ERCE study is presented on Table 1-1. Of the 69 SWMUs and AOCs identified in the ERCE study, the eight highest priority SWMUs and two moderate priority AOCs have been selected by the Army for further investigation (refer to subsection 1.4 for further discussion of selection process). These ten units, presented on Table 1-2, are the subject of this investigation. Following completion of the ERCE report, three additional SWMU's have been added by the Army, bringing the total to 72. The final number of SWMUs and AOCs to be investigated is being negotiated between the Army and NYSDEC/EPA and is contingent upon securing additional funds from the Defense Environmental Restoration Account as provided by the United States Congress.

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 SEAD-15) and an RI/FS at the Open Burn Facility (SEAD-23).

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

TABLE 1-1

LIST OF SWMUs AND AOCs 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[c]	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[b]	Old Construction Debris Landfill
SEAD-12	Radioactive Waste Burial Sites (3)
SEAD-13[b]	IRFNA Disposal Site
SEAD-14[a]	Refuse Burning Pits
SEAD-15[a]	Abandoned Incinerator Building
SEAD-16[c]	Abandoned Deactivation Furnace: Bldg. S-311
SEAD-17[c]	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[c]	Abandoned Powder Burning Pit
SEAD-25[c]	Fire Training and Demonstration Pad

TABLE 1-1 (Cont.)

LIST OF SWMUS AND AOCS IDENTIFIED AT SENECA ARMY DEPOT

SWMU/AOC Designation	Title
SEAD-26[c]	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[c]	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 AOCS 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[c]	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 AOCs and RI/FS activities have been initiated at these sites.
[b] These units are moderate priority AOCs (included in this study).
[c] These units are highest priority SWMUs (included in this study).

TABLE 1-2

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

Designation	Unit	Title
SEAD-4	SWMU	Munitions Washout Facility Leach Field
SEAD-11	AOC	Old Construction Debris Landfill
SEAD-13	AOC	Inhibited Red Fuming Nitric Acid (IRFNA) Disposal Site
SEAD-16	SWMU	Abandoned Deactivation Furnace (Bldg. S-311)
SEAD-17	SWMU	Existing Deactivation Furnace (Bldg. 367)
SEAD-24	SWMU	Abandoned Powder Burning Pit
SEAD-25	SWMU	Fire Training and Demonstration Pad
SEAD-26	SWMU	Fire Training Pit and Area
SEAD-45	SWMU	Open Detonation Facility
SEAD-57	SWMU	Explosive Ordnance Disposal Area

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 ten SWMUs scheduled for investigation under this Work Plan. However, the Army and the regulatory agencies are currently in dispute in regards to the classification of approximately 30 other SWMUs.

The Army is investigating SWMUs that have been determined to be Areas of Concern (AOCs) which pose the greatest potential risk to human health and the environment as determined by the findings of the SWMU Classification Report (ERCE 1991). The Army is proceeding on a worst first basis. The currentWork Plan proposes to investigate all of the SWMUs that have been classified as high priority units. High priority units are defined as those units for which a release of a hazardous waste has been reported or a release is likely to have occurred (ERCE 1991). This Work Plan also proposes to investigate two of the ten units classified as moderate priority AOCs (ERCE 1991).

1.5 WORK PLAN ORGANIZATION

This Work Plan consists of six sections and five 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 (Description of SWMUs to be Investigated) provides a description of each SWMU and identifies the former or current operating procedures. Section 5.0 (SWMU Investigations) identifies the sampling locations, the rationale, logistics, and frequency for the samples, as well as the analytical program to be implemented at each SWMU. Section 6.0 (Plans and Management) 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 (Existing Analytical Data for SWMUs) provides copies of existing data tables for selected SWMUs. Appendix E (Response to Comments) provides responses to EPA and NYSDEC comments on the Work Plan.

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-south westerly.

2.2 PHYSICAL SETTING

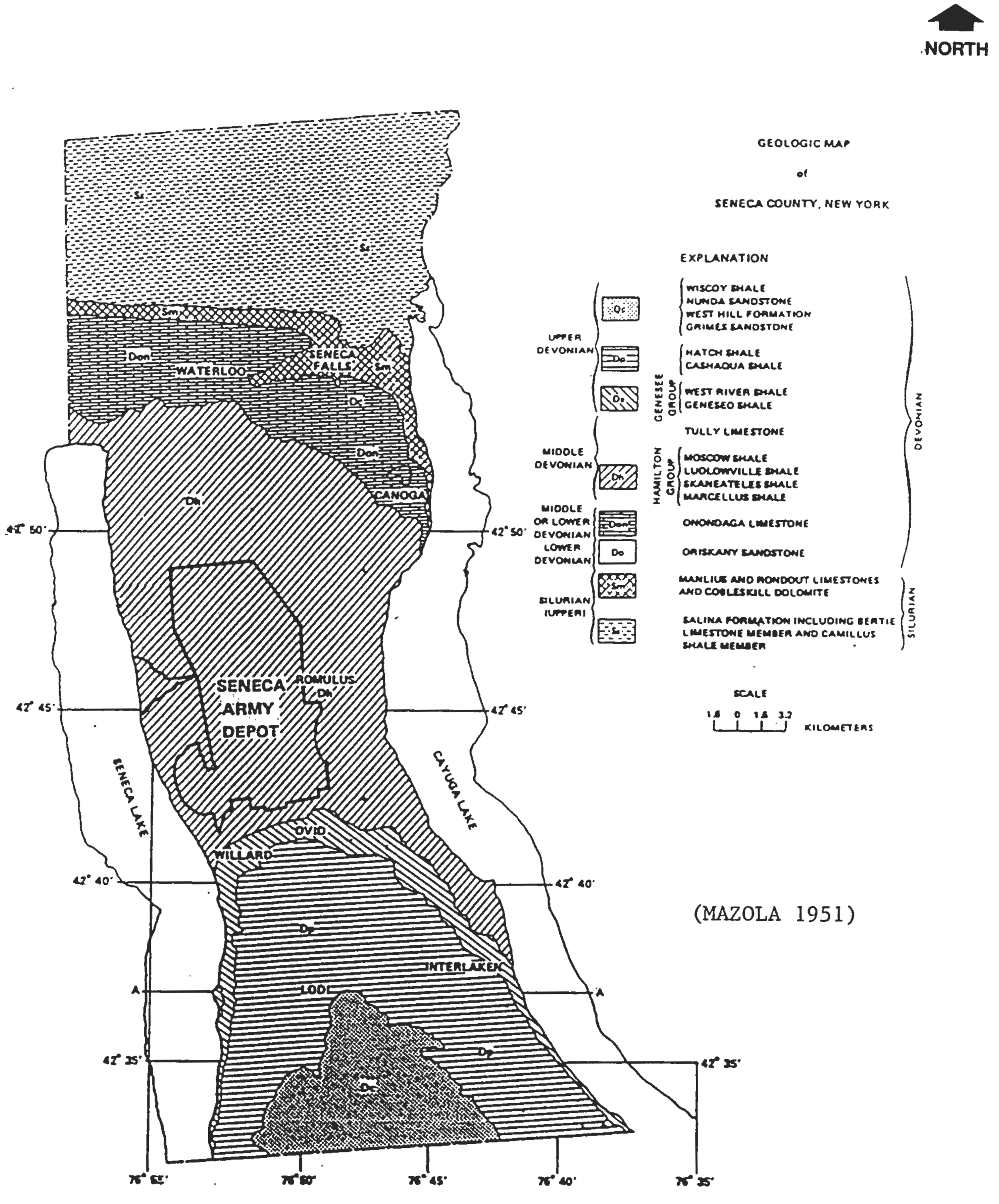
SEAD is an active military installation that was constructed on a 10,587 acre site in 1941. SEAD is located on an uplands area of New York State, (generally over 600 feet in elevation), approximately 40 miles south of Lake Ontario, near Romulus, New York (refer to Figure 1-1). The upland area forms a 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 shallowly to the south, 35 feet per mile, and show little evidence of tectonic disturbance, by folding or faulting.



(MAZOLA 1951)

FIGURE 2-1 REGIONAL GEOLOGIC MAP

Locally, the shale is a soft, grey, fissile, highly jointed upper member of the Hamilton Group. Figure 2-2 is a stratigraphic section of Paleozoic rocks of Central New York. The shale contains interbeds of calcareous shale and limestone. The shale is extensively jointed or fractured at the contact with overlying tills. Joint spacings are 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 bedrock shales. 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 would be expected to have 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 3%-8%.

Table 2-1 compares average metal content in shale, sandstone, limestone, soil and sediment of the Great Lakes for arsenic, barium, cadmium, chromium, mercury, lead and selenium. The table shows shales contain from 2 to more than 10 times the quantity of metals than other sedimentary rocks. This is due to the cation complexing capacity of the clays that make up the shales. It is probable that the soils, such as those at SEAD, which developed over the shales or over the tills derived from the shales, would contain metal values greater than those listed for average 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; Rorícks 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.

Middle Devonian

Unadilla Formation—shale, siltstone.
Tully Limestone.

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.

Lower Devonian

Oriskany Sandstone.

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

Upper Silurian

AKRON DOLOSTONE, COBLESKILL LIMESTONE, AND SALINA GROUP
700-1000 ft. (210-300 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.

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

CLINTON GROUP
150-325 ft. (40-100 m.)
Decew Dolostone; Rochester Shale.

Lower Silurian

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: Grimbsy Formation—sandstone, shale.
Queenston Formation—shale, siltstone.

Upper Ordovician

Undifferentiated Medina Group and Queenston Formation.

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.

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REGIONAL BEDROCK STRATIGRAPHY

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FIGURE 2-2

TABLE 2-1

AVERAGE BACKGROUND CONCENTRATIONS OF SELECTED HEAVY METALS IN ROCKS, SOILS AND SEDIMENTS[1,2,3]

Metal	Shale	Sandstone	Limestone	Soils	Sediment[4]
Arsenic	15	1	2.5	5	12
Barium	700	50	100	500	NA
Cadmium	0.2	<0.1	0.1	1	2.5
Chromium	100	35	10	50	75
Mercury	0.5	0.07	0.05	0.03	0.0
Lead	40	7	8	20	55
Selenium	0.6	NA	0.08	0.02	NA

NOTES:
[1] Source: Levinson 1980, unless otherwise noted.
[2] All concentrations as total metals in parts per million (ppm).
[3] Values are an average of samples from earth's crust, which can vary significantly.
[4] Upper 95% confidence limit of pre-industrial concentrations in Great Lakes sediments (NYSDEC 1989).

A substantial amount of information concerning 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. The occurrence of limestone is considered to be unusual for this area and is more commonplace to the north.

As of 1957, 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 is composed of 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 southeasterly from 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 mid-Devonian shales such as those of 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 limestone cavities at depth. The solutioning of limestone joints can cause the formation of elongated cavities. In general, as the depth of penetration into the shale is increased, beyond >100 feet, the yields decrease unless a limestone cavity is 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 the previous studies, a small number of wells in the region adjacent to SEAD utilize limestone as a source of water, 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 is composed of calcarious shale. Another well, located within the southern boundary of SEAD, is composed of till. Data for six of the eight wells revealed that well yields ranged from 1 to 10 gpm with the southern most well yielding the greatest amounts (Crain 1974). There was no information regarding yields for one of the northeastern wells and the well located within SEAD's boundary.

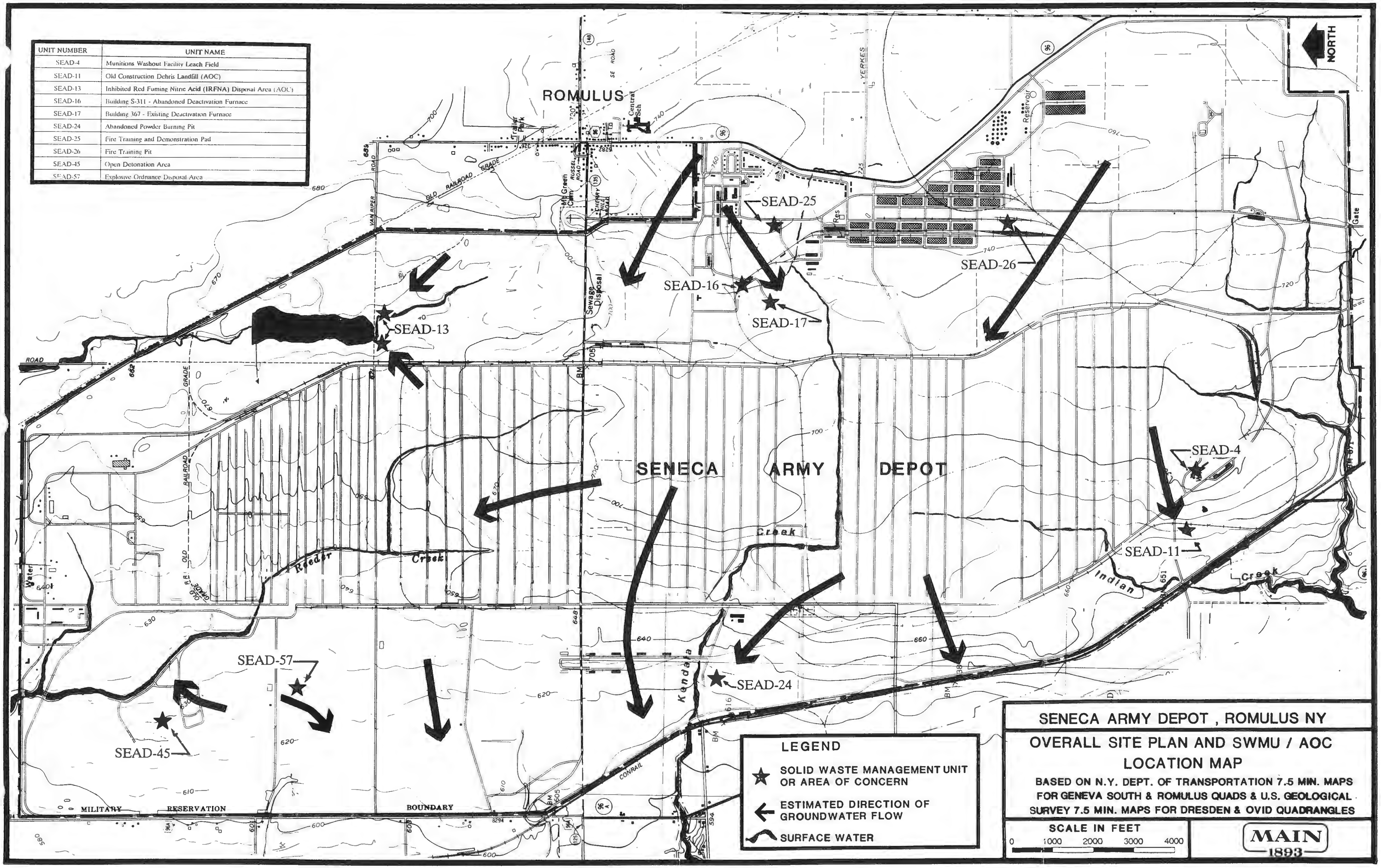
Although these wells have multiple uses, the principle uses are either domestic or commercial water supply (Crain 1974).

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 part and administration area of SEAD drain into Kendaia Creek. Kendaia Creek discharges into Seneca Lake near the Lake Housing Area. The majority of the northwestern and north-central portion of 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.

FIGURE 2-4



UNIT NUMBER	UNIT NAME
SEAD-4	Munitions Washout Facility Leach Field
SEAD-11	Old Construction Debris Landfill (AOC)
SEAD-13	Inhibited Red Fuming Nitric Acid (IRFNA) Disposal Area (AOC)
SEAD-16	Building S-311 - Abandoned Deactivation Furnace
SEAD-17	Building 367 - Existing Deactivation Furnace
SEAD-24	Abandoned Powder Burning Pit
SEAD-25	Fire Training and Demonstration Pad
SEAD-26	Fire Training Pit
SEAD-45	Open Detonation Area
SEAD-57	Explosive Ordnance Disposal Area

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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

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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 ten 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 whether 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) who 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 5.3.6 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
4	Wastewater Discharge	Infiltration, Discharge to Pond	Soil, Sediment, Surface Water	Soil, Sediment, Ground-water, Surface Water	Ingestion		●	●	●
					Inhalation	●	●	●	
					Dermal Contact		●	●	●
11	Debris, Drums, Tanks	Infiltration, Leaks	Soil, Ground-water	Soil, Ground-water	Ingestion		●	●	
					Inhalation	●	●	●	
					Dermal Contact		●	●	
13	Drums	Disposal Pits	Soil	Ground-water, Surface water, Sediment	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
25	Drums & Tanks	Spills, Burning	Soil	Air, Soil, Ground-water	Ingestion		●	●	
					Inhalation	●	●	●	
					Dermal Contact		●	●	
26	Drums & Tanks	Spills, Burning	Soil, Surface water, Oil, Sediment	Air, Soil, Ground-water, Oil, Sludge	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
16	Out of specification munitions	Munitions Incineration	Soil, Dust	Soil, Groundwater	Ingestion		●	●	
					Inhalation	●	●	●	
					Dermal Contact		●	●	
17	Out of specification munitions	Munitions Incineration	Soil, Discharge water, Dust	Air, Soil, Groundwater	Ingestion		●	●	
					Inhalation	●	●	●	
					Dermal Contact		●	●	
24	Explosive Material	Destruction of Explosives	Soil	Soil, Groundwater	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
45	Out of specification munitions	Munitions Destruction	Soil	Air, Soil, Ground-water, Surface Water, Sediment	Ingestion	●	●	●	●
					Inhalation	●	●	●	
					Dermal Contact	●	●	●	●
57	Out of specification munitions	Munitions Destruction	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, soil gas, and air (monitoring for health and safety purposes only)
- Concentrations: Primarily environmental levels with medium levels possibly encountered at sources or release points.
- Parameters: Geophysical surveys, soil gas 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, PCB in Oil, 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 Section 5.2 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 Section 5.2 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 immediately 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 (including the initial round of groundwater sampling) 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" meet groundwater criteria. Such evidence of a lack of contamination through two rounds of analysis would form the basis for a recommendation of "No Action". The proposed approach to complete the ESI at each SWMU is as follows:

Phase I

- UXO clearance.
- Perform geophysical, then soil gas surveys.
- Excavate geophysical anomalies and perform other test pit excavations. Collect samples foı 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 STAGE 3: DESIGN OF DATA COLLECTION PROGRAM

The details of the data collection program are presented in Section 5.2 of the Work Plan for each SWMU.

4.0 DESCRIPTION OF SWMUs TO BE INVESTIGATED

This section of the Work Plan presents available information for each SWMU regarding current site conditions, historical operating practices, and existing chemical analysis data. The majority of the information regarding operating procedures and existing analytical data was obtained from the ERCE SWMU Classification Report (ERCE 1991). This information represents the most current source of information available.

4.1 SEAD-4: MUNITIONS WASHOUT FACILITY LEACH FIELD

The Munitions Washout Facility Leach Field was active between 1948 and 1963. At present, the foundation of the washout plant is still visible (approximately 150 feet long by 80 feet wide), but there is no visual evidence of the leach field. Figure 4-1 shows the estimated location of the leach field with respect to the other features nearby, i.e., the former munitions washout facility foundation and the wastewater pond. Information from SEAD indicates wastewater may also have been discharged to a ditch that carried the wastewater north across the road to a leach field.

4.1.1 Operating Practices

Operations at this unit included dismantling and removing explosives from munitions by steam cleaning. This operation produced explosive solids and wastewater. Solid explosives were most likely open burned at the OB facility (SEAD-23) or the old powder burning pit (SEAD-24). Chemical constituents that are common at Department of Defense washout plants include TNT, RDX, HMX, Tetryl, trinitrobenzene and heavy metals. The actual explosives in the wastewater are unknown. It is suspected that the wastewater that was produced was processed through sawdust to remove any solid explosive residues prior to being discharged to an area where it leached into the ground or flowed into a nearby ditch. The ditch possibly discharged to a pond located west of the facility. Some wastewater discharged potentially into an area near Building 2084, which is approximately 1,000 feet, due south, of the munition washout facility, Figure 4-1 (USAEHA 1988). Wastewater may have also been discharged into an area near the Building 2079 boiler plant (Figure 4-1).

Within the past 8 years, the pond was widened and deepened using a bulldozer. Pond sediment was pushed southwestward to a 400-foot by 150-foot area southwest and adjacent to the pond. This scraped-off sediment has been sampled in an area shown on Figure 4-1. A shallow depression near the berm and Building T2105 are included in this SWMU.

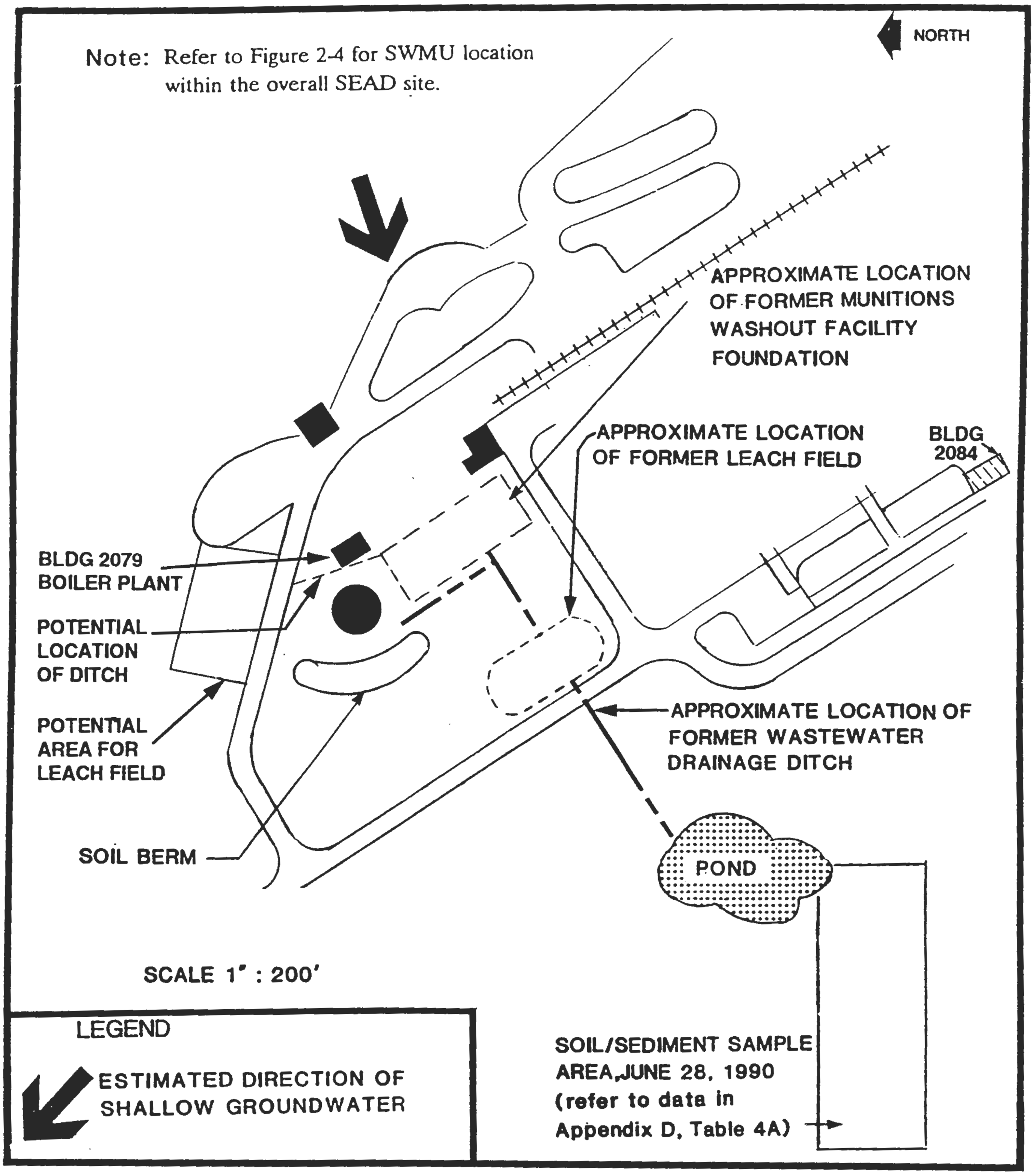


FIGURE 4-1 SITE PLAN FOR SEAD-4: MUNITIONS WASHOUT FACILITY LEACH FIELD

4.1.2 Existing Analytical Data

The data source for SEAD-4 states that soil sampling has been conducted in the pond area at SEAD-4 (ERCE 1991). The ERCE report also provided the following information: sample number, some sample depth information, the concentration units, names of three explosives which were analyzed and sampling data.

Seventy soil samples, collected on June 28, 1990 under the supervision of ERCE from the pond area on were analyzed for three explosive compounds (2,4,6-TNT, 2,4-DNT and 2,6-DNT). None of these explosives were detected (ERCE 1991). Sample locations and data are presented in Appendix D.

4.2 SEAD-11: OLD CONSTRUCTION DEBRIS LANDFILL

The Old Construction Debris Landfill was active during the period of 1946 to 1949 (refer to Figure 4-2). The landfill, covering approximately 4 acres (590 feet by 300 feet), is currently abandoned and the surface is vegetated with grasses and weeds.

4.2.1 Operating Practices

The operating practices of the landfill during the late 1940s are not known.

4.2.2 Existing Analytical Data

No existing analytical data for this SWMU were discovered.

4.3 SEAD-13: IRFNA DISPOSAL SITE

The Inhibited Red Fuming Nitric Acid (IRFNA) Disposal Site was active during the early 1960s (refer to Figure 4-3). The site consisted of six pits which were 30 feet long, 8 feet wide and 4 feet deep and were located in two separate areas. The pits were constructed by excavation with a bulldozer to a shale stratum 4 feet below ground. Following excavation, limestone was placed in the bottom of the pits to a depth of approximately 2.5 feet below ground. Limestone was used to neutralize the acid. The sides of the pits were also lined with limestone. At present, the site has been abandoned and the exact locations of the pits are unknown.

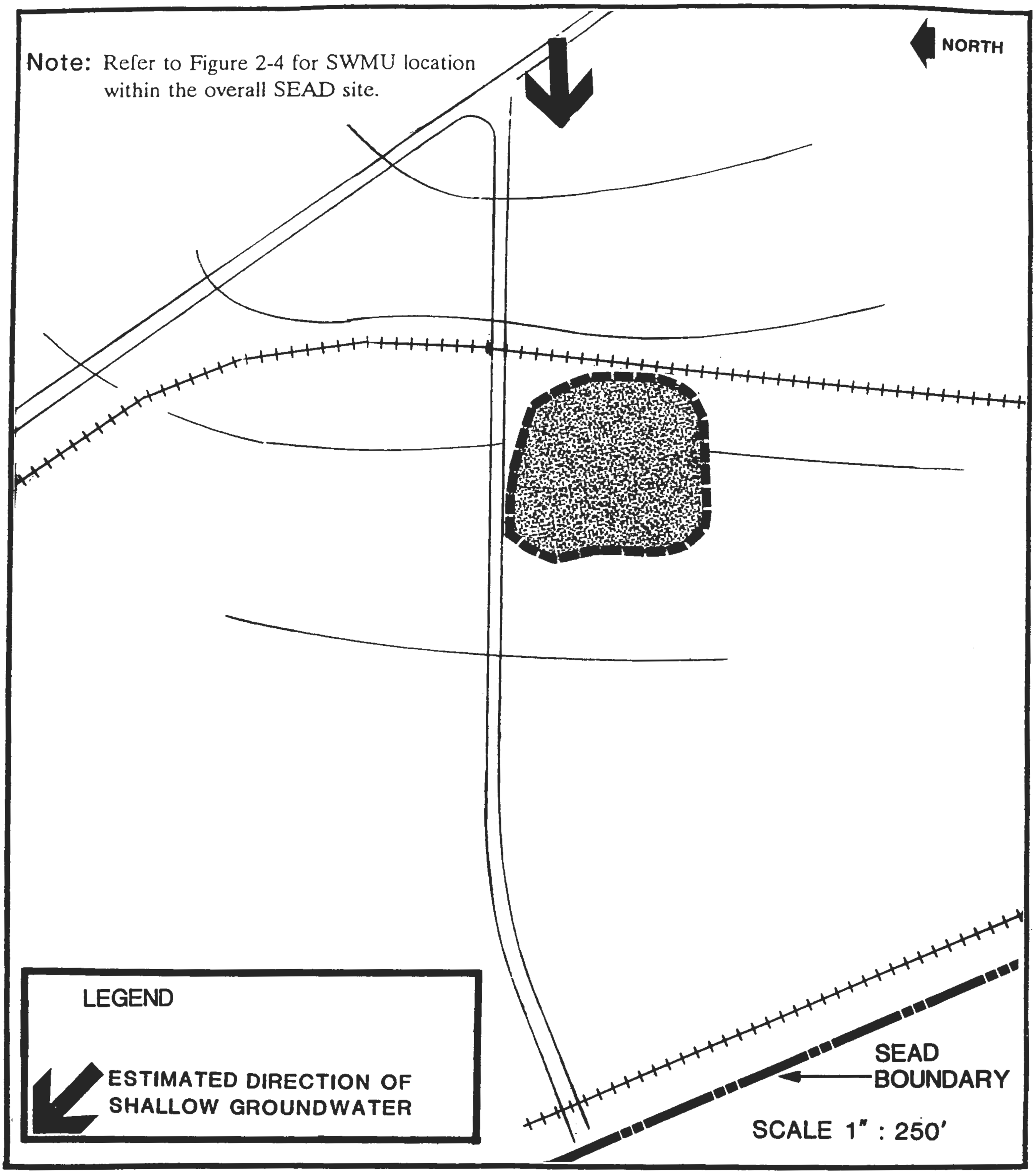


FIGURE 4-2 SITE PLAN FOR SEAD-11: OLD CONSTRUCTION DEBRIS LANDFILL

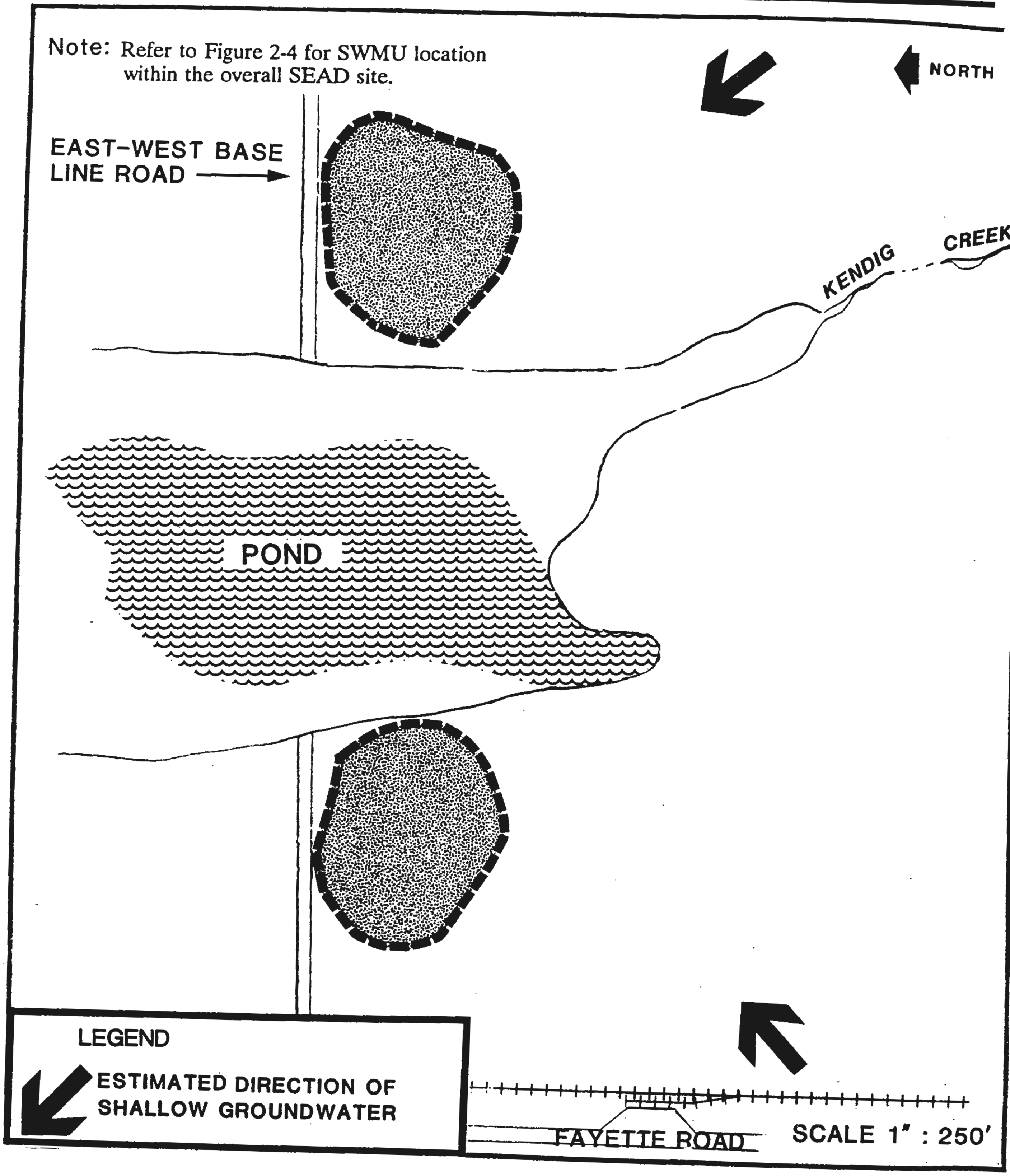


FIGURE 4-3 SITE PLAN FOR SEAD-13: IRFNA DISPOSAL SITE

4.3.1 Operating Practices

Barrels (18.8-gallon capacity) of unserviceable IRFNA were stored on pallets near the west end of the pits. A stainless steel ejector, operated by water pressure, was fitted into a barrel with water flowing through the ejector. The ejector discharged a mixture of water and IRFNA through a long polyethylene hose under the water surface in the pit being used. During this period the IRFNA was allowed to mix with the limestone in the pit to facilitate the neutralization of the acid.

Five minutes were required to empty a barrel. Ten barrels were usually discharged into a single pit during a day's operation.

4.3.2 Existing Analytical Data

The chemical analysis information for SEAD-13 consists of the following data: publication containing chemical analysis methods used, sampling dates, concentrations, concentration units and sample type. The SEAD-13 site plan provided in the ERCE report is nearly illegible and shows no discernible sample locations (refer to Appendix D). Therefore, no sample locations are shown for this SWMU on Figure 4-3.

The most recent data available from this SWMU is from August 1960. The data are for several sample locations in and near the acid disposal area. Sample locations are not shown in the ERCE report.

However, a well location map has been copied from the ERCE report, but it shows only proposed wells. The parameters tested on groundwater from the wells were pH, dissolved solids, specific conductance, calcium (as Ca), total hardness (as $CaCO_3$), nitrate-N, fluoride, chloride, and total iron. The data are provided in Appendix D.

4.4 SEAD-16: BUILDING S-311 - ABANDONED DEACTIVATION FURNACE

The Abandoned Deactivation Furnace, located in Building S-311, was used to destroy munitions from approximately 1945 to the mid-1960s (refer to Figure 4-4). The furnace area floor occasionally has some standing water, possibly from high groundwater seepage in and/or rainwater entering through the lower ramp door.

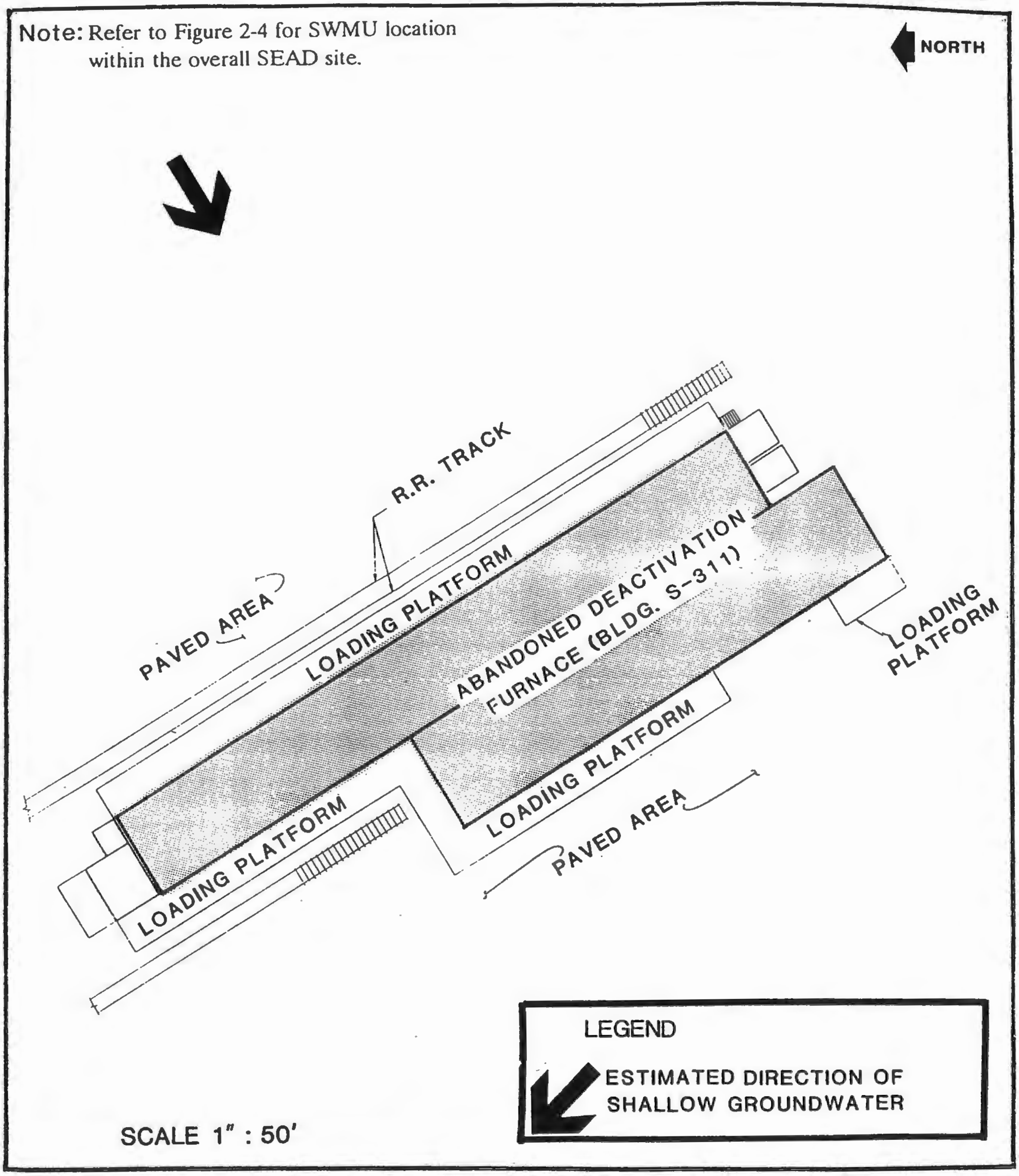


FIGURE 4-4 SITE PLAN FOR SEAD-16:
ABANDONED DEACTIVATION FURNACE (BLDG. S-311)

4.4.1 Operating Practices

Small arms munitions, both obsolete and unserviceable, were destroyed by incineration. There were no air pollution or dust control devices installed on the furnace. The pipes located above the building may have conveyed propellants, which may also have been stored in the building.

4.4.2 Existing Analytical Data

No existing analytical data were discovered for this SWMU.

4.5 SEAD-17: BUILDING 367 - EXISTING DEACTIVATION FURNACE

The Existing Deactivation Furnace, located in Building 367, has been active from 1962 to the present (refer to Figure 4-5). Air pollution control equipment was added to the unit in 1970, and it was further upgraded in 1989.

The deactivation furnace is used to incinerate obsolete and unserviceable small arms munitions (20 mm or less in size), fuses, boosters and firing devices. The furnace consists of a rotary kiln retort and feed discharge assemblies. The revolving retort is made of cast steel. The kiln has a cross-sectional area of 4.6 square feet and is 20 feet long. The kiln is fired by No. 2 fuel oil. The furnace's feed system consists of a waste feed weighing system, a primary waste feed conveyor and a secondary conveyor. The furnace is equipped with an Air Pollution Control System (APCS). The APCS consists of an afterburner, gas coolers, cyclone separator, baghouse, compressor, induced draft fan, stack and associated duct work.

The furnace has been included in the facility's Part B permit application. The unit was upgraded in 1989 to meet the operating requirements for incinerators detailed in 40 CFR Part 264 Subpart O. As part of the RCRA regulations, interim closure of the unit was conducted in 1989. The plan for conducting the trial burn has been prepared. The trial burn will be conducted after review and approval of the trial burn plan by NYSDEC and the EPA.

4.5.1 Operating Practices

Unpacked ammunition is placed on a conveyor for transfer to the deactivation furnace at prescribed intervals. The ammunition is burned and exploded by the heat in the furnace. The residue from the furnace is transferred by a conveyor to an approved hazardous waste container and allowed to cool. When cooled, the scrap metal is disposed of in barrels for transfer to the Defense, Reutilization and Marketing Office (DRMO).

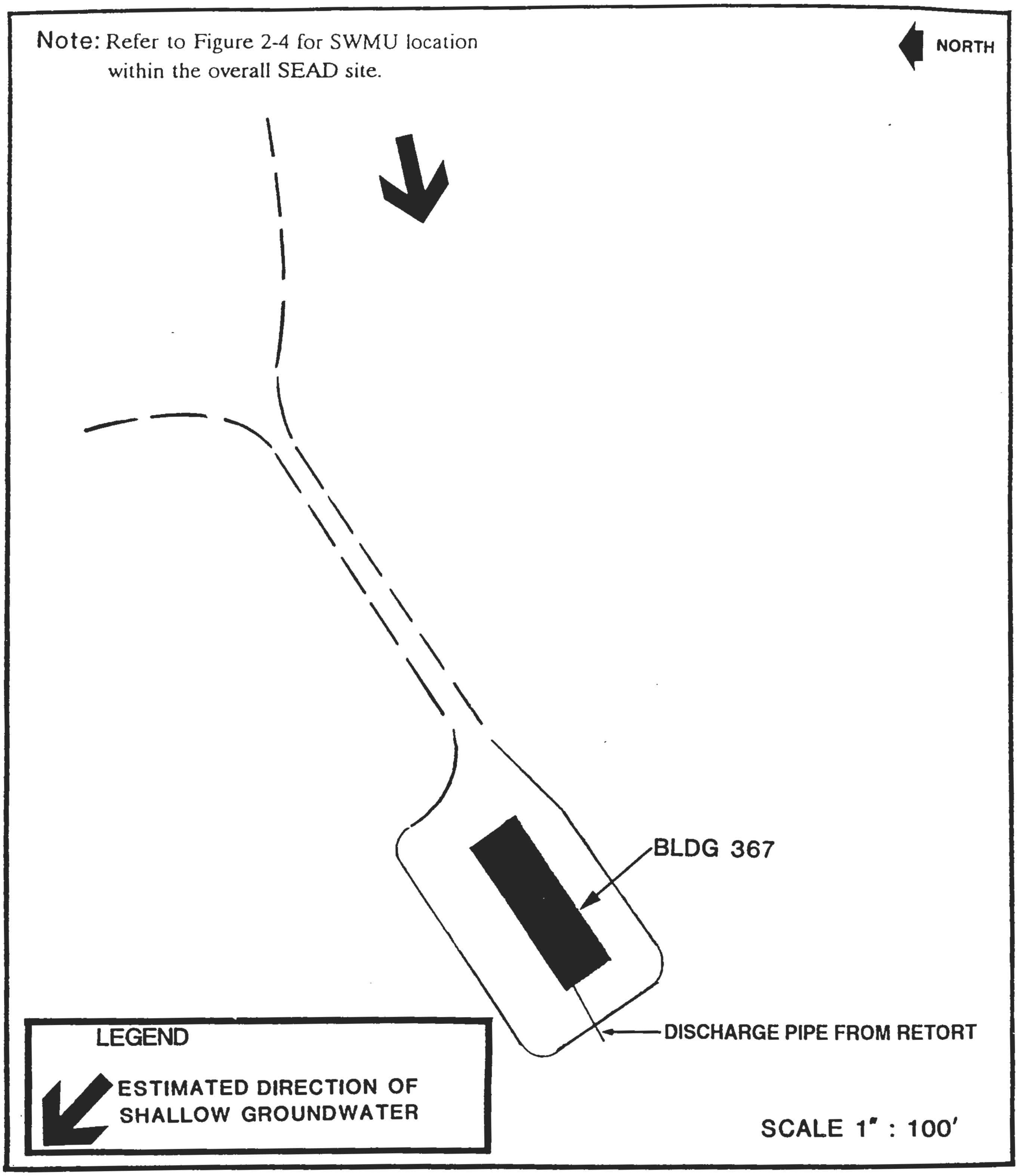


FIGURE 4-5 SITE PLAN FOR SEAD-17:
EXISTING DEACTIVATION FURNACE (BLDG. 367)

4.5.2 Existing Analytical Data

The chemical analysis information for SEAD-17 presents the following data: sample types, sampling dates, sample location in most instances, concentration units, parameters, concentrations, detection limits when the parameter was not detected, and results of field blanks.

Twenty nine surface soil samples and 29 wipe samples from inside the building were collected during the interim closure process. These samples were analyzed for barium and lead. The soil samples were below the EP Toxicity limit for barium. Eighteen of the 29 soil samples exceeded the EP Toxicity limitation for lead. Results of these analyses and a plan showing the surface soil sampling locations are provided in Appendix D.

4.6 SEAD-24: ABANDONED POWDER BURNING PIT

The Abandoned Powder Burning Pit was active during the 1940s and 1950s (refer to Figure 4-6). At present, the pit area is surrounded by a U-shaped, 4-foot-high berm which is approximately 150 feet across and 325 feet long. There is an adjacent shale-covered area which may also have been used.

4.6.1 Operating Practices

Although the operating practices of this unit are unknown, black powder, M10 and M16 solid propellants and probably explosive trash were disposed of here.

4.6.2 Existing Analytical Data

No existing analytical data were discovered for this SWMU.

4.7 SEAD-25: FIRE TRAINING AND DEMONSTRATION PAD

The Fire Training and Demonstration Pad has been in use since the late 1960s (refer to Figure 4-7). The Pad, measuring approximately 90 feet by 100 feet, is covered with gravel and sparse grass.

4.7.1 Operating Practices

In the past, the pad was used for fire control training. Currently, the pad is used once or twice a year for fire fighting demonstrations.

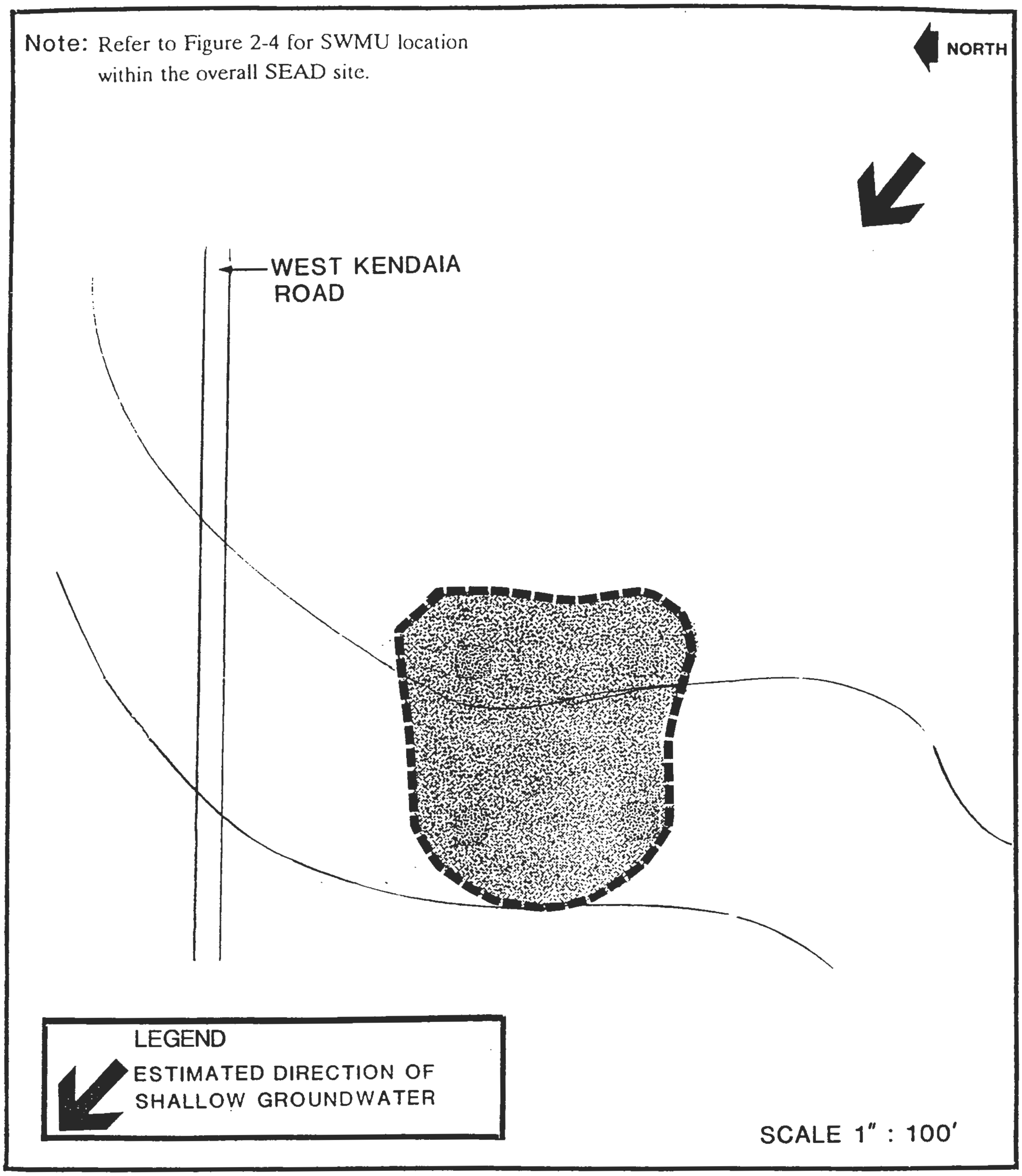


FIGURE 4-6 SITE PLAN FOR SEAD-24: ABANDONED POWDER BURNING PIT

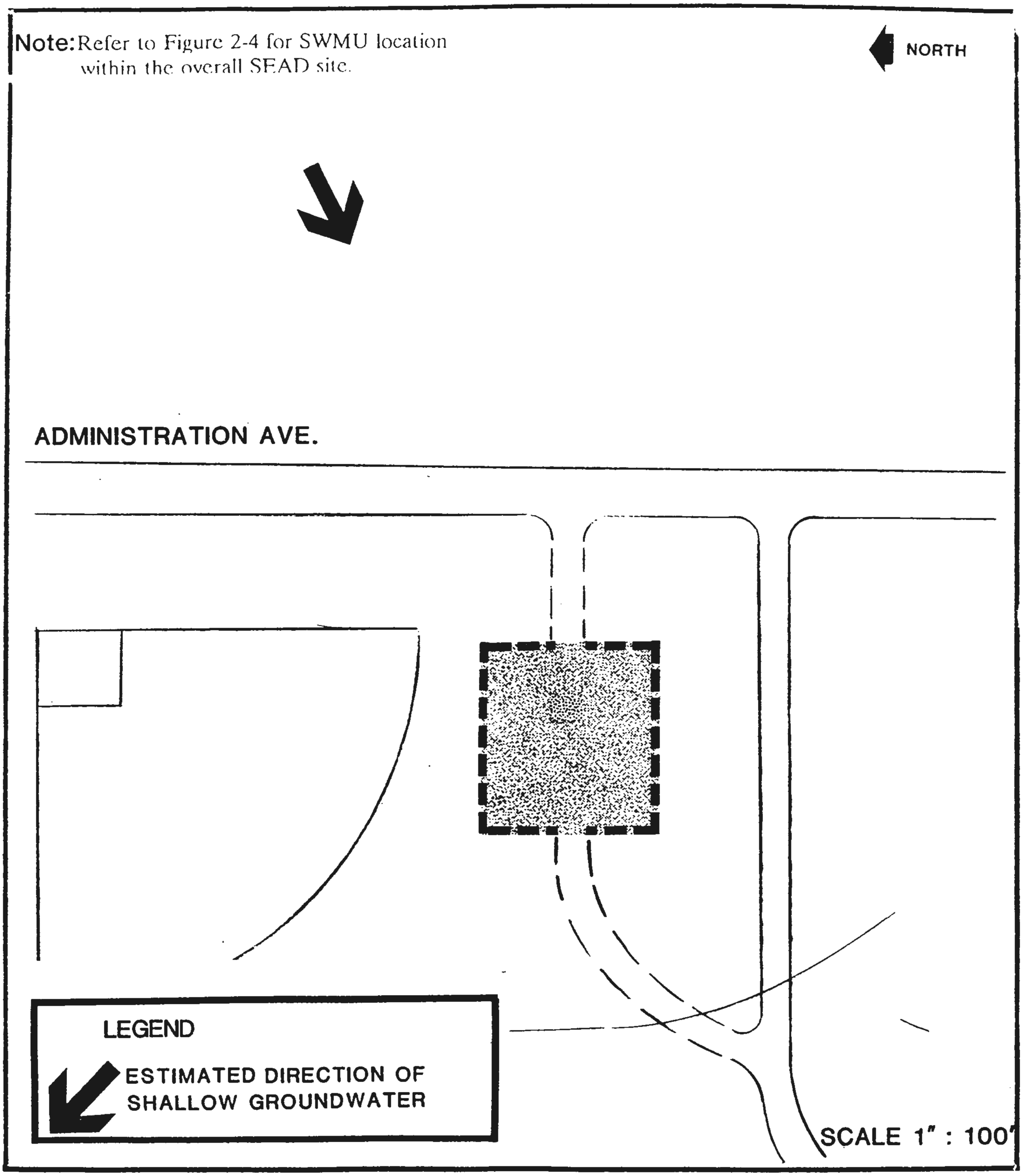


FIGURE 4-7 SITE PLAN FOR SEAD-25: FIRE TRAINING AND DEMONSTRATION PAD

4.7.2 Existing Analytical Data

No existing analytical data were found for this SWMU.

4.8 SEAD-26: FIRE TRAINING PIT AND AREA

The Fire Training Pit and Area has been in use from 1977 to the present (refer to Figure 4-8). The pit is approximately 75 feet in diameter and approximately 3 feet deep and is located in the fire training area which is 1,300 feet by 200 feet and is a grass field. A bentonite liner was installed in the pit in 1982 or 1983. At present, the Fire Training Pit and Area is active. During a site inspection in 1990, the fire pit was full of water. Additionally, metal drums, concrete rubble and other debris were observed on the south end of the fire training area.

4.8.1 Operating Practices

Various flammable materials are floated on water, ignited and extinguished. The pit is used one to four times a year for fire fighting training. Prior to 1977, the fire training area surrounding the pit may have also been used for fire demonstrations.

4.8.2 Existing Analytical Data

No existing analytical data were discovered for this SWMU.

4.9 SEAD-45: OPEN DETONATION FACILITY

The Open Detonation (OD) facility consists of a detonation mound which covers approximately 1.0 acre (refer to Figure 4-9). The hill is glacial material which is moved via bulldozer in support of OD operations. The detonation area has been in use from 1941 to the present and is under RCRA interim status. A RCRA Part B Subpart X, permit has been submitted to both EPA and NYSDEC. At this time the permit has not been issued.

The U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) originally identified this facility as a location of known or suspected waste materials (USATHAMA 1980). In 1987, the facility was deleted from the SWMU submission list by the U.S. Army Environmental Hygiene Agency (USAEHA 1988). The reason for deleting the unit was due to the fact that it was combined with the Open Burn (OB) Facility designated as SEAD-23. The OD facility was again added to the SWMU list in August 1988 by NYSDEC.

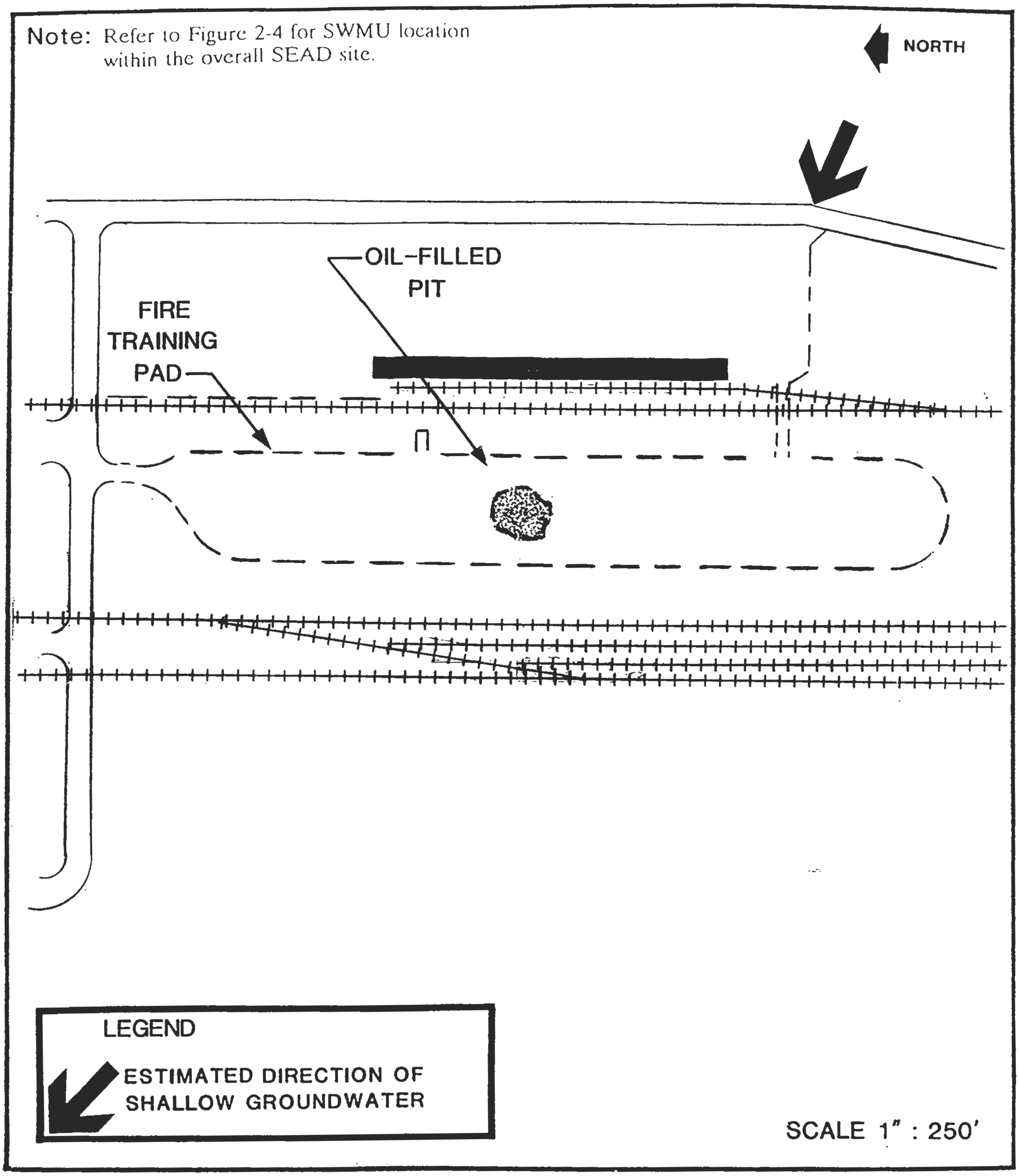
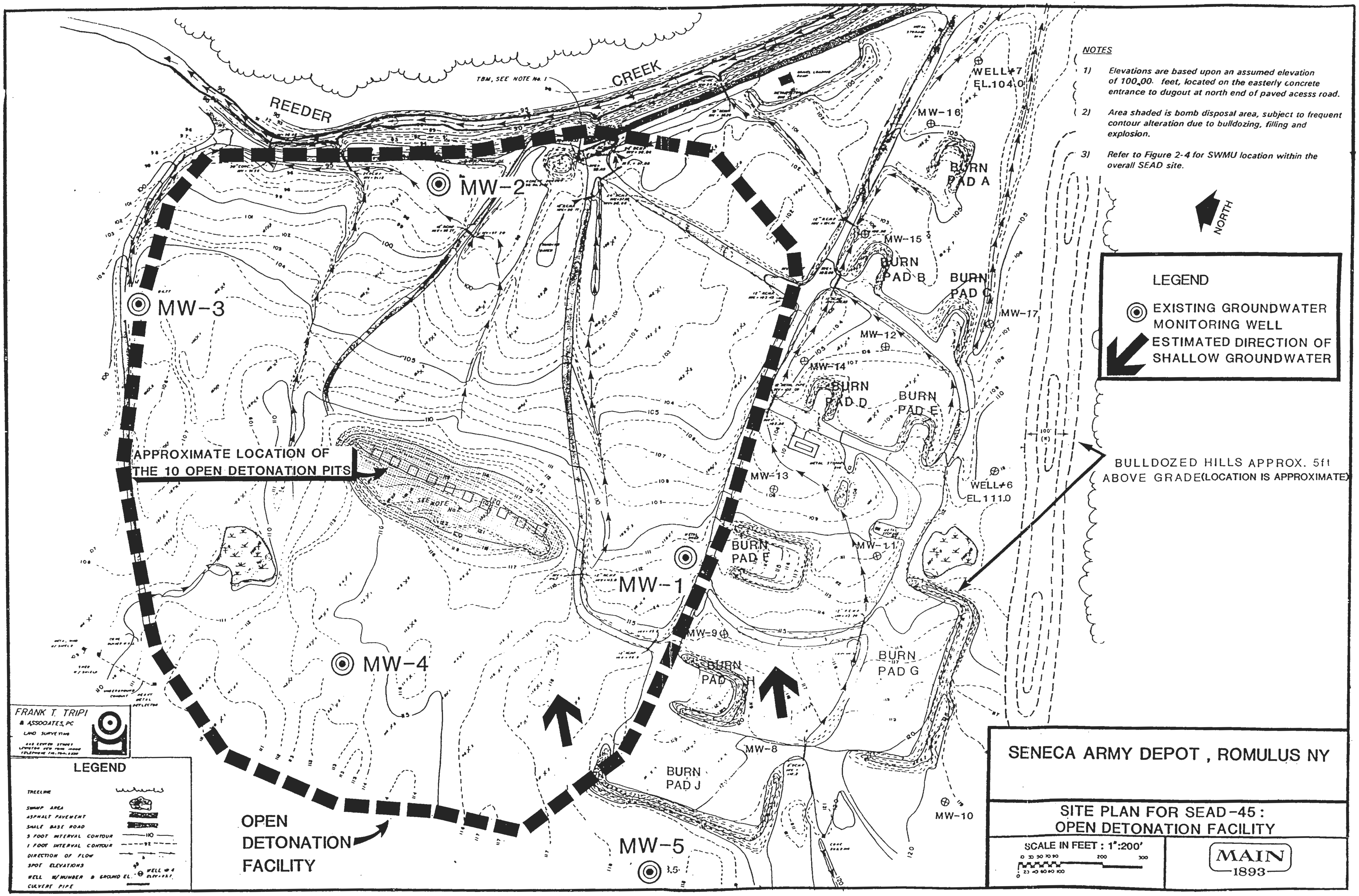


FIGURE 4-8 SITE PLAN FOR SEAD-26: FIRE TRAINING PIT AND AREA

FIGURE 4-9



NOTES

1) Elevations are based upon an assumed elevation of 100.00 feet, located on the easterly concrete entrance to dugout at north end of paved acesss road.

2) Area shaded is bomb disposal area, subject to frequent contour alteration due to bulldozing, filling and explosion.

3) Refer to Figure 2-4 for SWMU location within the overall SEAD site.

SENECA ARMY DEPOT , ROMULUS NY

SITE PLAN FOR SEAD-45 :
OPEN DETONATION FACILITY

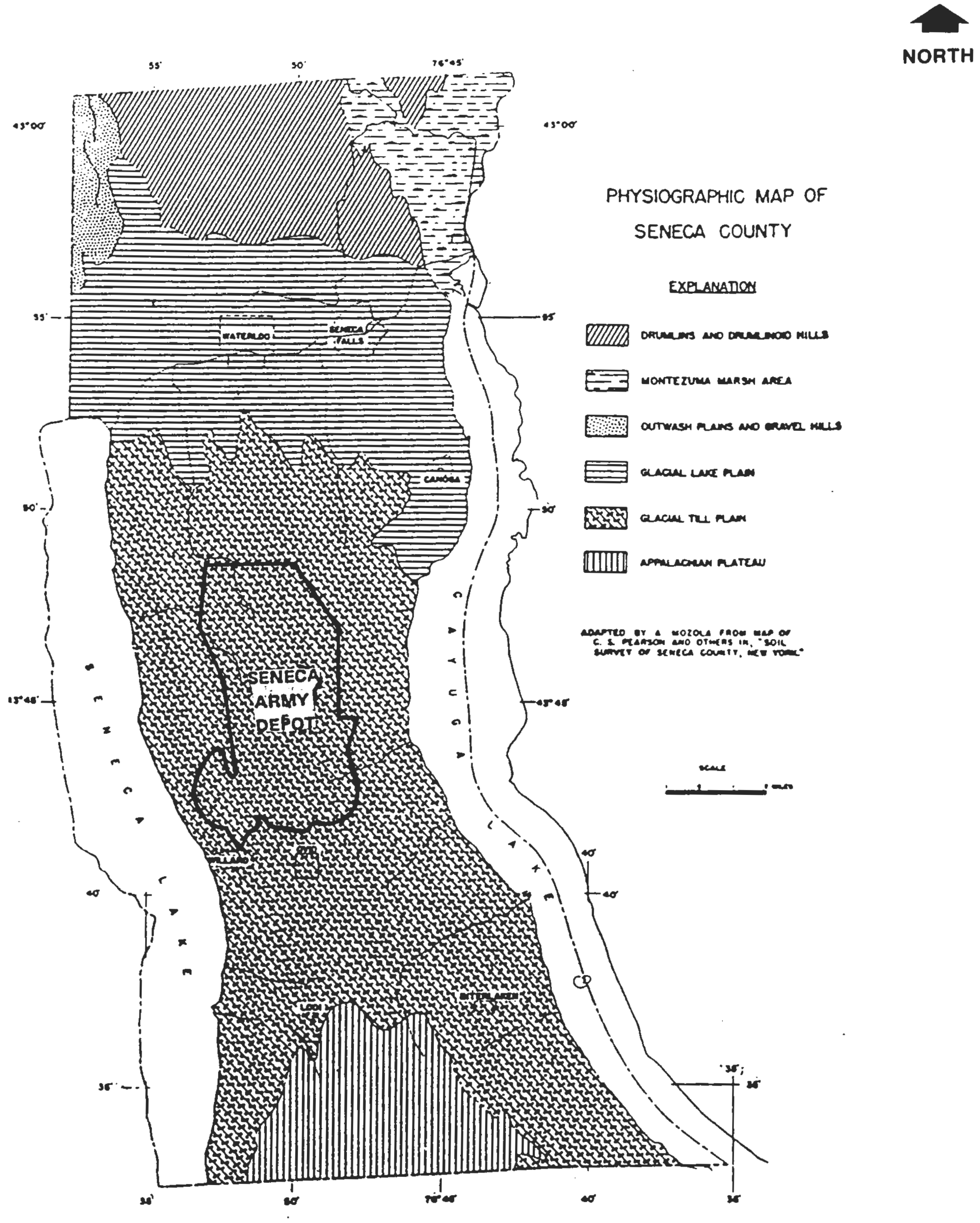


FIGURE 2-3 REGIONAL PHYSIOGRAPHY MAP

4.9.1 Operating Practices

Material to be detonated is placed in a bulldozed hole in the hill with demolition material to destroy the ammunition or components. Primer cord is attached to the demolition material, blasting caps are attached to the primer cord, and the primer cord is attached to circuit wire. The hole is backfilled and a minimum of 8 feet of soil is placed over the material to be detonated. The operator detonates the material after returning to the dugout and taking proper safety precautions.

4.9.2 Existing Analytical Data

The Open Detonation facility has five groundwater monitoring wells associated with it, MW-1 through MW-5, as shown on Figure 4-9. Monitoring well installation data was available in tabular form and is presented in Appendix D, Table 45A. Groundwater quality data for conventional pollutants and explosives obtained during 1979 are presented in Appendix D, Table 45B. One explosive compound, 4-amino-2,6-dinitrotoluene, was detected in groundwater from wells MW-1 to -4 and from Reeder Creek (both up and downstream of SEAD-45) at concentrations from 1.36 to 1.96 ppb.

Groundwater data during the period 1981 through 1987 and for 1989 are summarized on Tables 45C, 45D and 45E in Appendix D.

In 1982, the USAEHA analyzed soil samples collected from eight locations around this area (pits 2,4,6 and 8). Analyses were performed for EP Toxicity (As, Ba, Cd, Cr, Hg, Pb, Se and Ag) and explosives (HMX, RDX, Tetryl, 2,4,6-TNT, 2,4-DNT, 2,6-DNT). The analytical results indicated the presence of Cd in all samples (0.19-0.45 mg/l) which was below 1.0 mg/l criteria. Explosives were also found in each sample (RDX 1.4-1.7 ug/kg; Tetryl 1.6-16.3 ug/kg; 2,4,6-TNT 2.2-61 ug/kg; 2,4-DNT 1.1-19. ug/kg).

4.10 SEAD-57: EXPLOSIVE ORDNANCE DISPOSAL AREA

The Explosive Ordnance Disposal Area consists of a berm approximately 4 feet wide and 8 to 10 feet high with an inside diameter of approximately 70 feet (refer to Figure 4-10). The disposal area has been active from 1941 to the present and is currently used for bomb squad training. A shallow depression near the berm and Building T2105 are included in this SWMU.

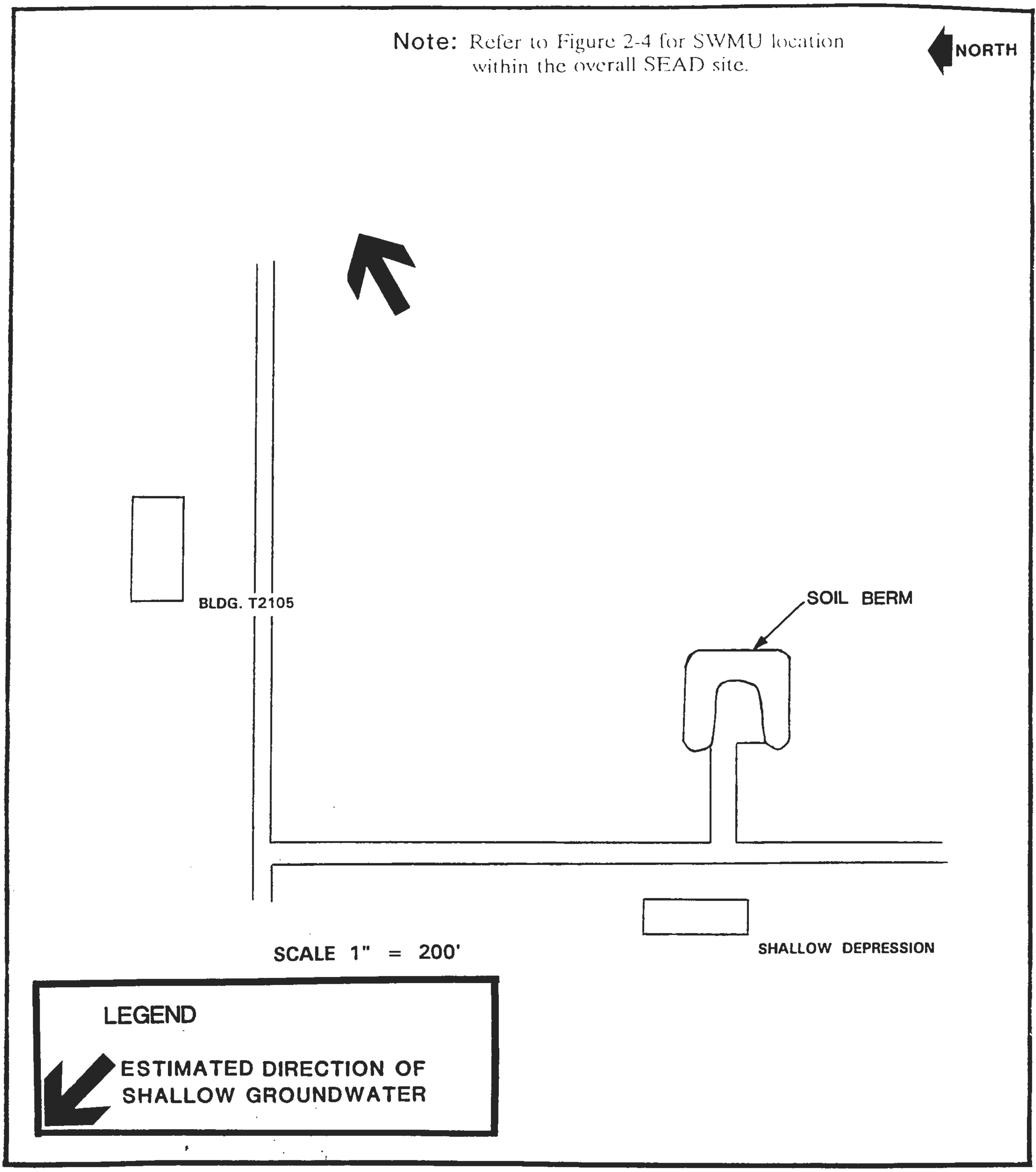


FIGURE 4-10 SITE PLAN FOR SEAD-57: EXPLOSIVE ORDNANCE DISPOSAL AREA

4.10.1 Operating Practices

In the past, the bermed area was used for open detonation. The bermed area and the depression may have been used for the disposal of explosives. Currently, the bermed area is used for bomb squad training. Building T2105 may have been used to store material before it was detonated.

4.10.2 Existing Analytical Data

No existing analytical data were discovered for this SWMU.

5.0 SWMU INVESTIGATIONS

5.1 INTRODUCTION

This section describes the work to be performed during investigation of the 10 SWMUs. The approach of this Work Plan is to investigate areas likely to have been impacted by a release of hazardous constituents. Sample locations are concentrated in source areas or in hydrologic upgradient locations to establish background conditions. Parsons Main has estimated groundwater flow directions based primarily on topography and to some extent on proximity to surface water. All references to upgradient and downgradient hydrologic locations in this section are estimated. The estimated direction of groundwater flow for each SWMU is presented on Figures 2-4 and 5-1 through 5-10.

Prior to personnel entering each SWMU to perform field work, Parsons Main and UXO personnel will evaluate the potential for UXOs to be present at the SEAD. If necessary, UXO personnel will clear areas of the site where field work will be performed.

Three types of geophysical techniques could be performed at several 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.)

Investigation of the 10 SWMUs will involve sampling of soil, soil gas, sediment, surface water and groundwater, although not all medias will be sampled at each SWMU. Chemical constituents of concern for this investigation are summarized on Table 5-1. Analytical methods utilized at each SWMU and the rationale for selection of each analytical method are presented on Table 5-2. Table 5-3 presents a summary of samples to be collected and analyses to be performed. All analyses will be performed in accordance with the methodology presented in the Chemical Data Acquisition Plan, Appendix C.

Parsons Main feels that it is appropriate to conduct these analyses during the initial assessment so that there is reasonable justification for eliminating certain compounds from further consideration in subsequent investigations. The constituents cited in the Chemicals of Interest sections for each SWMU in Section 5.2 were obtained from the ERCE report (ERCE 1991).

TABLE 5-1

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 Nitrates	TAL Metals* TCL SVOs* 8330, 353.2
2. Solvents	Volatile organic compounds (VOCs) Semi-volatile organic compounds (SVOs)	TCL VOCs*, 5242 TCL SVOs
3. Oils	Petroleum hydrocarbons (TPH)	8015 Herbicides 8150 PCB in oil 8080
4. Nitric/Hydrofluoric Acid	Nitric/Hydrofluoric Acid	353.2, 340.2
5. Transformer Oil	Polychlorinated biphenyls (PCBs)	TCL Pest./PCB*
6. Herbicides	Herbicides	8150
7. Insulation	Asbestos	Polarized Light Microscopy

TABLE 5-2
SWMU-SPECIFIC EPA ANALYTICAL METHODS AND SELECTION RATIONALE

SWMU/ AOC	pH	Asbestos	8150 Herbicides	8330 Expl.	TCL SVOs	TCL VOCs	TAL Metals	TCL PCB	353.2 NO_3	8015 TPH	340.2 F	8080 PCB	Selection Rationale
SEAD-4	-	-	X	X	X	X	X	X	X	-	-	-	Pyrotechnic, explosive and propellant (PEP) materials managed here (Expl., SVOs, and metals) and breakdown products (Nitrate) may be present.
SEAD-11	-	-	X	X	X	X	X	X	X	X	-	-	Landfills have been historically utilized for industrial waste disposal.
SEAD-13	x	-	X	-	X	X	X	X	X	-	X	-	Strong acid neutralized in pits here. Nitrate and fluoride may be indicators of residual salts originating from acid. pH will indicate neutralization effectiveness
SEAD-16	-	X	X	X	X	X	X	X	X	-	-	-	Heavy metals have been released in dust and ash from stack with no air pollution controls. PEP materials have been managed here (Expl., SVOs and metals) and breakdown products (Nitrate) may be present.
SEAD-17	-	-	X	X	X	X	X	X	X	-	-	-	Although air pollution controls have been used, heavy metals released in dust and ash from the system. (Similar to SEAD 16)
SEAD-24	-	-	X	X	X	X	X	X	X	X	-	-	PEP materials managed here (Expl., SVOs and heavy metals) and breakdown products (Nitrate) may be present. Solvents and/or petroleum products may have been utilized to initiate powder burn.
SEAD-25	-	-	X	-	X	X	X	X	X	X	-	-	Materials burned include: fuels and used oil: leaded fuel possible.
SEAD-26	-	-	X	-	X	X	X	X	X	X	-	X	Materials burned include: fuels and used oil: leaded fuel possible.

TABLE 5-2 (Cont.)

SWMU-SPECIFIC ANALYTICALMETHODS AND SELECTION RATIONALE

SWMU/ AOC	pH	Asbestos	8150 Herbicides	8330 Expl.	TCL SVOs	TCL VOCs	TAL Metals	TCL PCB	353.2 NO_3	8015 TPH	340.2 F	8080 PCB	Selection Rationale
SEAD-45	-	-	X	X	X	X	X	X	X	-	-	-	PEP materials managed here (Expl., SVOs and heavy metals) and breakdown products (Nitrate) may be present.
SEAD-57	-	-	X	X	X	X	X	X	X	-	-	-	PEP materials managed here (Expl., SVOs and heavy metals) and breakdown products (Nitrate) may be present.

Table 5-3

Summary of Laboratory Analyses

		Analyses[5]					
	No. of Samples	Suite[2]	TPH	Herbicides	PCB in Oil	Asbestos	Fluoride
SEAD-4							
B/TP[1] Soils	44	44					
Groundwater	6	6					
Surface Water	2	2					
Sediment	3	3					
Surface Soil	7	7					
SEAD-11							
B/TP Soils	15	15	15				
Groundwater	4	4	4				
SEAD-13							
B Soils	30	30					30
Groundwater	6	6					6
Surface Water	3	3					3
Sediment	3	3					3
SEAD-16							
Groundwater	3	3					
Surface Water	2	2					
Surface Soil	16	16					
Propellants	3	3					
Solid Materials	10	10				5	
Bldg. Materials	10					5	
SEAD-17							
B Soils	9	9					
Groundwater	3	3					
Surface Soil	23	23					
SEAD-24							
B Soils	15	15	15				
Groundwater	3	3	3				
Surface Soil	12	12	12				

Table 5-3
(Con't)

		Analyses[5]					
	No. of Samples	Suite[2]	TPH	Herbicides	PCB in Oil	Asbestos	Fluoride
SEAD-25							
B Soils	18	18	18				
Groundwater	3	3	3				
SEAD-26							
B/TP Soils	36	36	36				
Groundwater	4	4	4				
Surface Water	1	1	1				
Sediment	1	1	1				
Oil	1		1	1	1		
SEAD-45							
TP Soils	5	5					
Surface Soil	9	9					
Groundwater	9	9					
Surface Water	4	4					
Sediment	4	4					
SEAD-57							
TP Soils	11	11					
Surface Soils	9	9					
Groundwater	3	3					
Sample Subtotal	350	339	113	1	1	10	42
Duplicates (5%)		17	6	-	-	1	2
Equip. Blanks (5%)		17	6	-	-	-	2
MS/MSD/MSB (3/20 samples)[3]		51	18	-	-	-	6

Table 5-3
(Con't)

		Analyses[5]					
	No. of Samples	Suite[2]	TPH	Herbicides	PCB in Oil	Asbestos	Fluoride
Total Number of Analyses		424	143	1	1	11	52
Estimated VOC Trip Blanks[4]	14						

Notes:

1. B=Borings, TP=Test pits

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, explosive compounds, herbicides, and nitrates. At SEAD-13, SEAD-25, and SEAD-26, explosive compounds will not be analyzed. The TCL and TAL compounds will be analyzed at Level IV, whereas the other compounds will be analyzed at Level III.

3. A matrix spike analysis, performed every 20 samples, actually consists of 3 analyses: method spike blank, matrix spike, and matrix spike duplicate.

4. Number of VOC trip blanks were estimated based on one trip blank per day, 4 water samples per day, and 55 water samples to be obtained (55/4=14).

5. Laboratory analysis methods are presented on Table C-2 of Appendix C, Chemical Data Acquisition Plan.

All monitoring wells on 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 on the SWMU. This will also allow comparison of groundwater elevations from SWMU to SWMU.

The locations of borings and monitoring wells may be adjusted based on the results of geophysical and soil gas surveys and more complete field reconnaissance.

The above field work will represent Phase I of the ESI field work. If no contaminants are detected that would cause a remedial investigation to be performed at a SWMU, then, during Phase II, groundwater will be obtained from each well at the SWMU and analyzed for VOCs using Method 524.2. This method has detection limits for VOCs that are lower than the Maximum Contaminant Levels listed in the federal drinking water regulations.

5.2 SWMU-SPECIFIC SAMPLING PROGRAM

This section of the Work Plan describes the field work and samples that will be obtained at each of ten SWMUs to be investigated. The procedures for performing the field work and obtaining the samples are described in Appendix A, Field Sampling and Analysis Plan. Appendix A also includes a table (Table A-1) summarizing the procedures that will be used at each SWMU. The health and safety procedures that will be followed while on-site are presented in Appendix B, Health and Safety Plan. SWMU specific safety guidelines are presented in Appendix B of the Health and Safety Plan. The Chemical Data Acquisition Plan (Appendix C) presents the policies, organization, objectives, quality assurance (QA), and quality control activities to be implemented in this CERCLA site inspection.

5.2.1 SEAD-4: Munitions Washout Facility Leach Field

Based on previous operating practices, wastewater from the washout facility contained explosives and heavy metals. Based on ERCE information and discussions with SEAD personnel, this wastewater could have been discharged to a leach field west of the former building, to an unlined ditch that discharged to a pond approximately 500 ft. west of the former building, to an unlined ditch that flowed north and discharged on the north side of the road to possibly a leach field, and to areas near Buildings 2079 and 2084. These locations are shown on Figure 5-1. Because this wastewater could leach into the ground the potential migration pathways include both soil and groundwater. Additionally, because the ditch possibly discharged to the pond, surface water and sediment must also be considered as potential migration pathways.

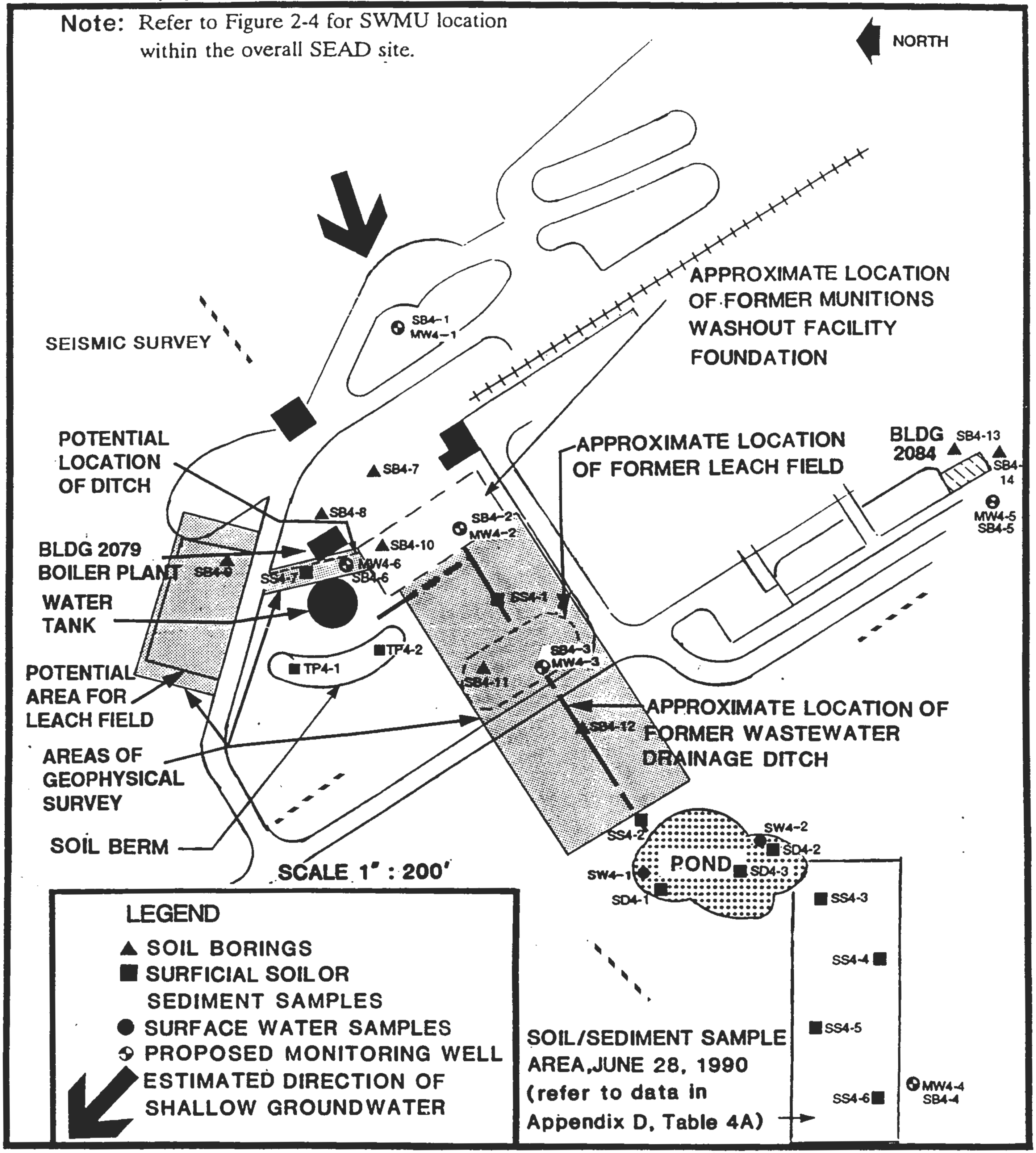


FIGURE 5-1 SAMPLING LOCATIONS FOR SEAD-4: MUNITIONS WASHOUT FACILITY LEACH FIELD

Health and Safety procedures for the investigations performed at SEAD-4 are described in the Health and Safety Plan (Appendix B) and in the SWMU-specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.1.1 Chemicals of Interest

Chemicals which presumably could be found during sample testing from SEAD-4 include 2,4,6-TNT, 2, 4-DNT, 2,6-DNT, RDX, HMX, trinitrobenzene, Tetryl and heavy metals. Soil samples were collected from the pond area in 1990 and tested for 2,4,6-TNT, 2,4-DNT and 2-6-DNT. Explosives were not detected in any of the samples tested (ERCE 1991). Sample locations and data are presented in Appendix D.

5.2.1.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU.

The exact location of the leach field west of the washout facility is unknown. To determine the leach field's location, a GPR survey will be performed. GPR will be relied upon as the primary geophysical method. To provide cost effective backup geophysical data, an electromagnetic (EM-31) survey will be performed together with the GPR survey. The objectives of these surveys will be to delineate the location of the leach field and the locations of subsurface pipes and structures that serviced the leach field (refer to Figure 5-1). Because heavy metals may be constituents of concern here, the electromagnetic data will supplement the GPR survey by providing information on the extent of soils with elevated apparent conductivities. A grid of GPR and electromagnetic data will be collected over the area where the leach field is suspected to be located. The GPR data will be collected at points spaced at 10-foot intervals. Electromagnetic measurements will be made on the same profiles with sample points spaced at 10-foot intervals. It is estimated that up to 15 profiles, each 200 feet in length, will be surveyed.

GPR and EM-31 surveys will also be performed to determine whether a buried ditch or pipe leading north from the former facility and a leach field north of the road exist. The GPR survey will be performed at points spaced at 10-foot intervals. Each survey will be approximately 40 feet long. EM-31 measurements will be made along profiles oriented approximately east-west at 10-foot intervals in the area of the potential pipe and leach field. Each survey will be approximately 250 feet long.

In addition, GPR and EM-31 profiles will be performed in the area between the pond and the former facility to identify the location of the former ditch through which wastewater was discharged. It is estimated that up to six profiles, spaced at 100-foot intervals, will be surveyed to locate the former ditch. These profiles will be approximately 200 feet in length.

Soils

Borings: Fourteen soil borings are proposed for SEAD-4 (refer to Figure 5-1) to evaluate the vertical extent of contaminants. Boring SB4-1 will provide data on the background soil quality. The other borings are at locations where releases to the environment may have occurred. Six borings are associated with installation of the six wells proposed for SEAD-4.

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. These include: (1) from 0-12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (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.

The three samples to be analyzed from each boring will be submitted for chemical analyses identified in Section 5.2.1.3. The data gathered will be used to locate soils affected by disposal of the wash water.

Test Pits: Two soil samples will be collected from the soil berm to evaluate its soil quality. The source of the soil is unknown and may have been affected by the wastewater before it was used to construct the berm. These samples are to be collected via two test pits. Four soil samples will be composited into one sample for each test pit.

Surface Soils: Up to seven surface soil samples will be obtained. Two samples (SS4-1 and SS4-2) will be collected from the original bed of the ditch which leads west to the pond. If the ditch has been buried, the surface of the ditch bed will be exposed before sampling. Samples SS4-3 to SS4-6 will be obtained from the material that was bulldozed from the pond. Sample SS4-7 will be obtained from the original bed of any ditch that is discovered leading north from the former facility. The bed of the ditch will be exposed before the sample is obtained.

Groundwater

The six monitoring wells proposed for SEAD-4 will be used to evaluate groundwater flow direction and the groundwater quality at areas of the SWMU that may have been affected by the wash water. One well (MW4-1) is proposed for monitoring background groundwater quality. The presumed direction of groundwater flow at this SWMU is to the west-southwest.

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 tested for the parameters listed in Section 5.2.1.3.

Surface Water and Sediment

Three sediment samples and two surface water samples will be collected from the pond. Both surface water samples and two sediment samples will be obtained near the edge of pond. Surface water and sediment samples will be obtained at the same locations. One sediment sample will be obtained from the deepest part of the pond, near the center.

Each sediment and surface water sample will be tested for the chemical parameters listed in Section 5.2.1.3.

5.2.1.3 Analytical Program

A total of 51 soil samples, three sediment samples, six groundwater samples, and two surface water samples will be collected from SEAD-4 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, explosive compounds by Method 8330, herbicides by Method 8150, and nitrates by Method 352.2. A summary of the analytical program for SEAD-4 is presented in Table 5-3.

5.2.1.4 Handling UXOs and Explosives

The facilities at this SWMU were used to wash explosives from munitions; therefore, there is the potential for UXOs and explosives to be present in the soil. As a result, personnel from UXB will be on-site to monitor the subsurface explorations and sampling. UXB will decide when remote drilling and site clearance will be necessary based on-site conditions. The following paragraphs present the proposed procedures to handle UXOs and explosives at SEAD 4.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

Test pit excavations and the collection of soil samples from the excavations will be performed by UXB.

UXB 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.

5.2.2 SEAD-11: Old Construction Debris Landfill

At this time, it is anticipated that the landfill primarily contains construction debris; however, the actual contents of the landfill are not known.

Health and Safety procedures for the investigations performed at SEAD-11 are described in the Health & Safety Plan (Appendix B) and in the SWMU specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.2.1 Chemicals of Interest

Presently, it is unknown what chemicals, if any, may have been disposed of in the landfill. Consequently, PCBs, VOCs, SVOCs, explosive organics and heavy metals are considered to be potentially present.

5.2.2.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU.

An electro-magnetic survey, using an EM-31, and GPR surveys will be conducted on the landfill to delineate the limits of the landfill and to determine if any buried metallic objects are present within the landfill (refer to Figure 5-2). A 10-foot by 10-foot grid will be established over the landfill for the EM-31 Survey. The initial geophysical characterization will consist of collecting EM-31 data over this grid. The EM-31 data will be interpreted to delineate the waste boundaries. Any distinct magnetic anomalies thought to be associated with buried metallic objects will also be delineated. Subsequent to the EM-31

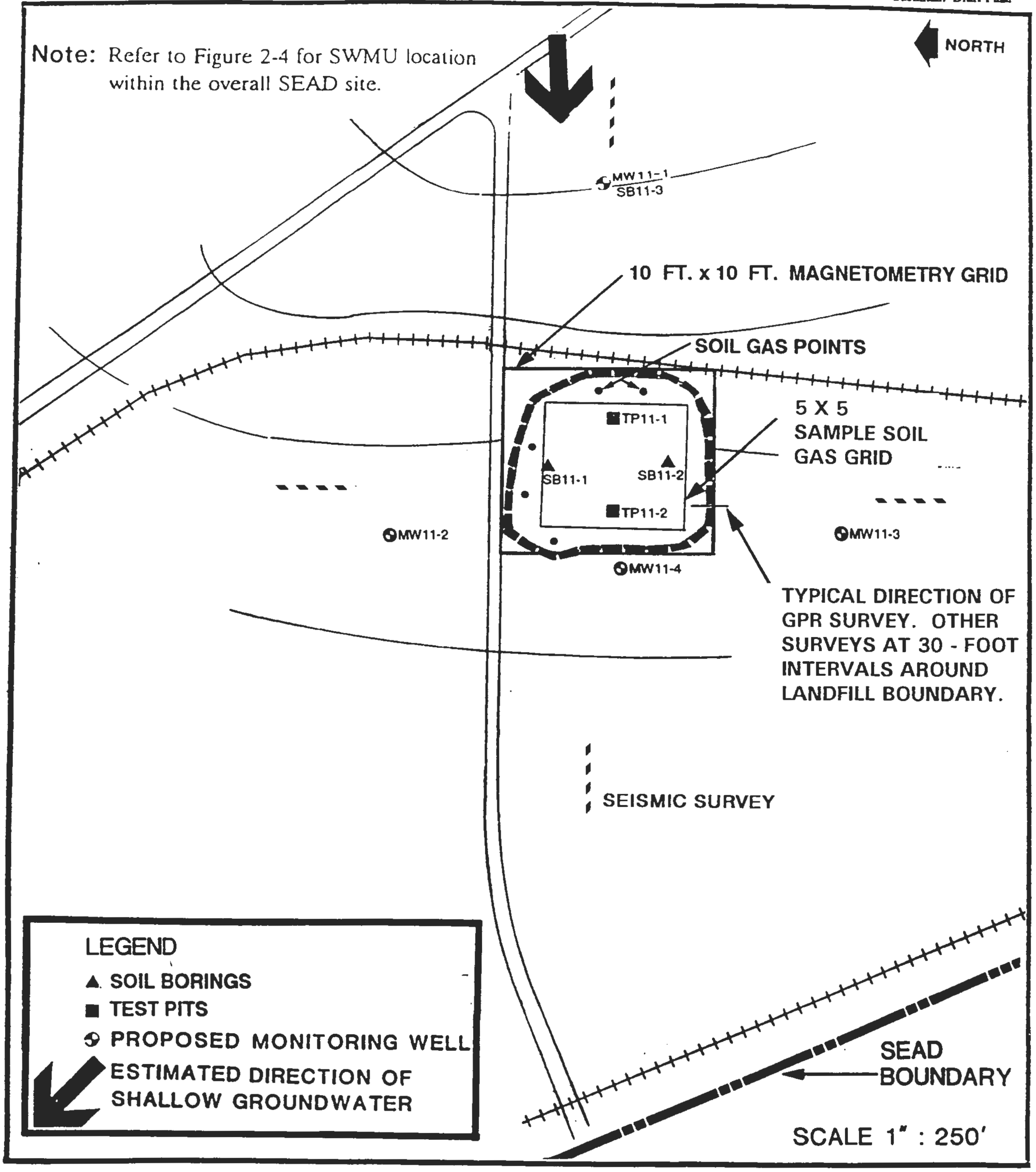


FIGURE 5-2 SAMPLING LOCATIONS FOR SEAD-11: OLD CONSTRUCTION DEBRIS LANDFILL

survey, a GPR survey will be performed. The GPR data will be collected along profiles spaced at 30-foot intervals to help delineate the landfill limits. In addition, GPR data will be collected over each identified EM-31 anomaly to provide a detailed characterization of the source of each anomaly. It is estimated that the EM-31 survey grid will be approximately 200 feet by 200 feet.

Soil Gas

A soil gas survey will be performed on the fill area to determine if concentrations of volatile organic compounds are present in the fill soil gas. This survey will potentially identify source areas of VOCs within the fill.

It is anticipated that up to 30 soil gas sampling locations will be established on the fill area within a specified grid, although the exact number will be determined in the field. Proposed soil gas sampling locations are shown in Figure 5-2. These locations can be changed while in the field after receiving concurrence from the NYSDEC.

Soils

Borings: Soil samples will be obtained from two soil borings drilled through the landfill (SB11-1 and -2) and at a background location (SB11-3). The two landfill borings will be located as shown on Figure 5-2 or at soil gas anomalies. Three samples from each boring will be obtained for chemical analysis. These include: 1) from 0 to 12 inches below grade, 2) immediately above the water table, and 3) an intermediate point. 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.

Test Pits: Two test pits will be excavated to the base of the landfill debris or water table, whichever is deeper, to observe the type of material present in the landfill and obtain soil samples. The two test pits will be located at geophysical or soil gas anomalies or as shown on Figure 5-2. Three samples from each test pit will be obtained for chemical analysis as described for the samples from the soil borings.

Soil samples from the borings and test pits will be submitted for the chemical analyses identified in Section 5.2.2.3.

Groundwater

Four monitoring wells will be installed on this SWMU as shown in Figure 5-2: one upgradient of the landfill (MW11-1) to obtain background water quality data, one north of the landfill, one south of the landfill, and one immediately downgradient of the landfill. The presumed direction of groundwater flow at this SWMU is to the west-southwest.

These wells will be used to determine the groundwater flow direction in the vicinity of the landfill, evaluate the potential for radial groundwater flow from the landfill, and, determine if hazardous constituents are migrating in the groundwater from the landfill. One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer.

Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.2.3.

5.2.2.3 Analytical Program

Four groundwater samples and 15 soil samples will be collected from SEAD-11 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 352.2, and total petroleum hydrocarbons by Method 8015. Up to 30 soil gas samples will be collected from the fill area and analyzed for volatile organic compounds using a Photovac portable gas chromatograph. A summary of the analytical program for SEAD-11 is presented in Table 5-3.

5.2.2.4 Handling UXOs and Explosives

UXOs and explosive material could have been disposed with the construction debris in this landfill. Therefore, personnel from UXB will be on-site to monitor the subsurface explorations and sampling. UXB will decide when remote drilling and site clearance will be necessary based on-site conditions. The following paragraphs present the proposed procedures to handle UXOs and explosives at SEAD-11.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

Test pit excavations and the collection of soil samples from the excavations will be performed by UXB.

UXB will clear areas for field personnel to walk on-site, to perform geophysical surveys, and to obtain groundwater samples.

5.2.3 SEAD-13: IRFNA Disposal Site

The exact location of the pits used to dispose of Inhibited Red Fuming Nitric Acid (IRFNA) is currently unknown. An earlier investigation by ERCE indicated that the pits were located near the west end of the East-West Baseline Road on the south side of the road (ERCE 1991) as shown on Figure 5-3.

Abandoned aboveground piping was observed in the areas southeast and southwest of the Duck Ponds. Some of this piping could have been used during the IRFNA disposal project as an emergency shower. An IRFNA disposal study stated that a deluge shower was used for personnel decontamination (USAEHL 1960). Additionally, an abandoned water hydrant was observed southwest of the Duck Ponds. Possibly, this water hydrant was used to supply water pressure to the stainless steel ejector.

The pits were lined with limestone which neutralized some or all of the IRFNA. The neutralized wastewater may have migrated to the water table. In addition to groundwater, another potential migration pathway could be surface water via the Duck Pond.

Health & Safety procedures for the investigations performed at SEAD-13 are described in the Health & Safety Plan (Appendix B) and in the SWMU-specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.3.1 Chemicals of Interest

The primary constituents of concern are heavy metals, nitrates, and fluoride.

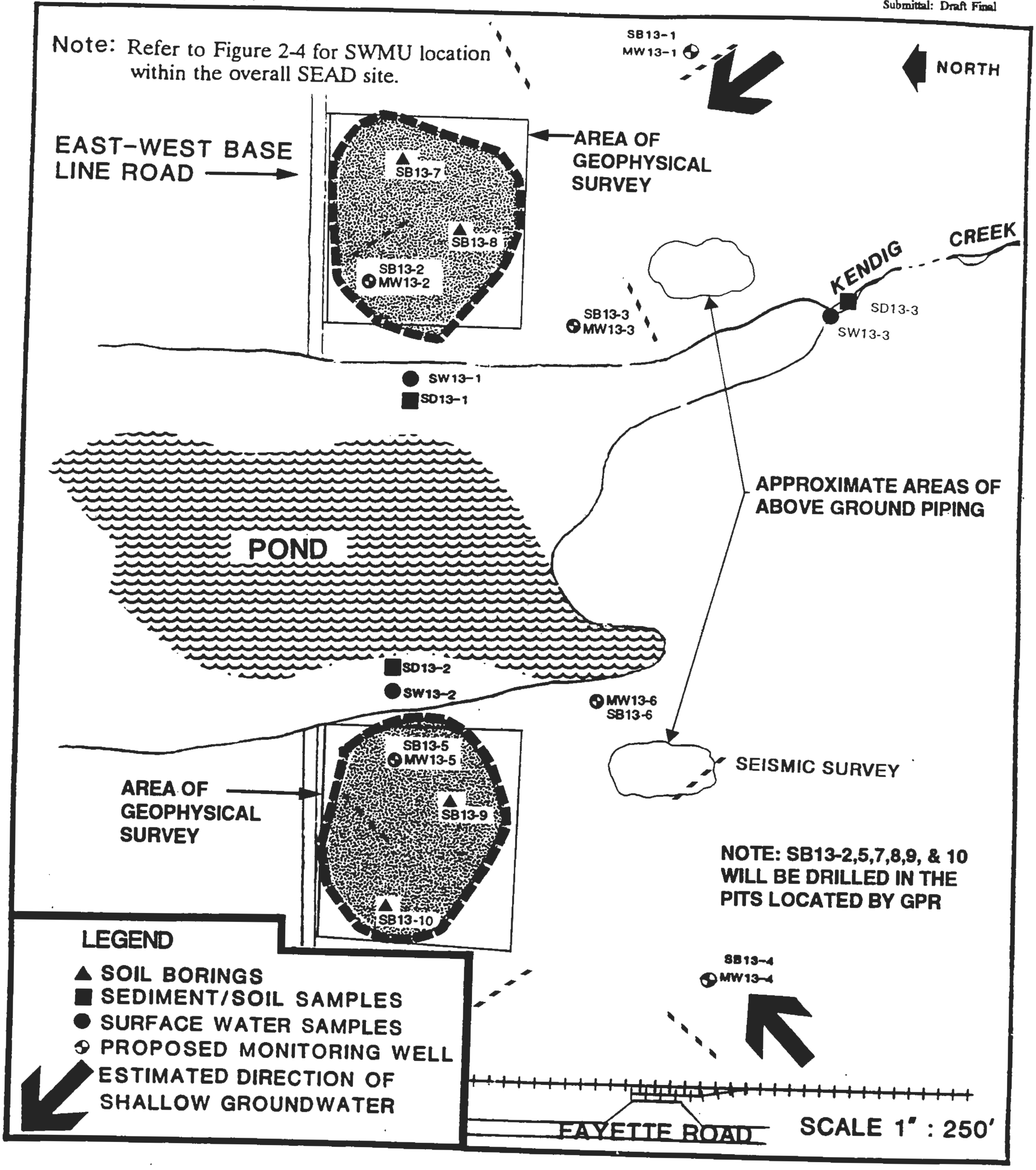


FIGURE 5-3 SAMPLING LOCATIONS FOR SEAD-13: IRFNA DISPOSAL SITE

5.2.3.2 Media To Be Investigated

Geophysics

To locate the six abandoned disposal pits and to evaluate the potential presence of IRFNA barrels in the subsurface, both GPR and EM-31 surveys (non-invasive) will be conducted. The GPR method will be used to identify areas of disturbed soils that could be associated with the IRFNA pits. The EM-31 data will be collected on profiles spaced at 20-foot intervals throughout the two areas where the pits are presumed to be (refer to Figure 5-3). EM-31 measurements will be made at 10-foot spacings along each profile. It is estimated that up to 30 profiles, varying in length from 300 feet to 400 feet, will be surveyed. The GPR data will be collected along the same profiles as the EM-31 data. When the pit locations are identified with the GPR method, additional data will be collected in order to delineate the extent of the pits. If the initial GPR and EM-31 surveys indicate that some of SEAD-13 has been covered by water, it is possible to conduct an additional GPR survey on the water surface. The survey is not likely to yield clear data if pond sediment has covered the originally disturbed soil areas of SEAD-13.

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other over the pits on each side of the Duck Pond after they are located by GPR and EM-31 surveys. Data from the surveys will be used to determine the direction of groundwater flow, adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU, and evaluate whether the disposal of the nitric acid has created a hole or trough in the bedrock surface. Additional surveys may be necessary to further delineate any holes or troughs observed during the initial seismic refraction surveys.

Soils

Borings: Three soil borings will be advanced within each of the two disposal areas (refer to Figure 5-3) at locations tentatively identified as IRFNA disposal pits. Two borings will also be drilled on each side of the pond to obtain soil quality data at a background location (SB13-1 and -4) and near the pond (SB13-3 and -6). Three samples will be collected from each boring: (1) from 0 to 12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detector (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.

If the water table is less than 5 feet below the surface, the boring will be advanced to a maximum depth of 10 feet. Samples of soil for chemical analysis will be collected in these borings 1) from 0 to 12 inches below ground surface, 2) immediately above the water table, and 3) below the water table using one of the four criteria described in the previous paragraph to collect an intermediate sample.

Groundwater

After the geophysical surveys locate the disposal pits, a monitoring well will be installed upgradient of each disposal area, near the downgradient edge of each disposal area, and south of each disposal area near the pond. These wells will be used to determine the groundwater flow direction, background groundwater quality, and to determine if hazardous constituents are migrating with the groundwater from the pits.

The presumed direction of groundwater flow on this SWMU is to the northwest for the pits east of the pond and northeast for the pits west of the pond as shown in Figure 5-3. Monitoring wells MW13-1 and MW13-4 will be used to obtain background water quality data.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.3.4.

Surface Water and Sediment

To assess the potential impact of the IRFNA disposal pits on adjacent surface water bodies, three sediment samples and three surface water samples will be collected from within the Duck Pond (refer to Figure 5-3). One surface water and one sediment sample (SW13-3 and SD13-3) will be used to obtain background surface water and sediment quality data. The exact locations of the other two samples will be determined based on an inspection of the site. Criteria to select these locations include stressed vegetation, proximity to the pits, and surface water discharge points that originate from the area of the pits. Sediment and surface water samples will be collected at the same location and will be tested for the parameters listed in Section 5.2.3.4.

5.2.3.3 Additional Information

The aboveground piping and hydrant will be located on the topographic map that will be created for the site. They will be examined to evaluate their probable use.

5.2.3.4 Analytical Program

A total of 30 soil samples, three sediment samples, six groundwater samples, and three surface water samples will be collected from SEAD-13 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, herbicides by Method 8150, nitrates by Method 352.2, and fluoride by Method 340.2. A summary of the analytical program for SEAD-13 is presented in Table 5-3.

5.2.3.5 Handling UXOs and Explosives

Available information indicates UXOs and explosives were not placed near the disposal pits; therefore, UXB will not be on site to monitor for these materials.

However, UXB personnel will be on site to monitor the drilling and sampling due to their experience at other IRFNA sites and the conditions that may be encountered.

5.2.4 SEAD-16: Building S-311 Abandoned Deactivation Furnace

Although explosives are most likely to have been completely destroyed in the furnace, heavy metals from the munitions probably exited the furnace in both ash and dust. Because soil samples near the existing deactivation furnace (SEAD-17 described below) have exhibited lead EP Toxicity concentrations in the range of 0 to 384 mg/l (refer to Appendix D), it is assumed that the soils surrounding the abandoned deactivation furnace may also show elevated lead concentrations, especially since the unit had no air pollution control devices. In addition to soils, migration pathways from the furnace could be air and groundwater.

Health & Safety procedures for the investigations performed at SEAD-16 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.4.1 Chemicals of Interest

Explosive compounds of interest include HMX, RDX, TNT and 2,4-DNT. In addition to explosive compounds, heavy metals, primarily lead and barium, are of concern. There is also pipe insulation inside the building that may contain asbestos.

5.2.4.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and the other two wells downgradient of the SWMU.

Soils

Sixteen surficial soil samples will be collected (0 to 6 inches in depth) in the vicinity of Bldg. S-311, as shown on Figure 5-4 and tested for the parameters listed in Section 5.2.4.3. Sample SS16-16 will be used to obtain background surface soil quality data.

Groundwater

Three monitoring wells will be installed at the abandoned deactivated furnace area (refer to Figure 5-4). One will be installed in an upgradient location (MW16-1) for background water quality and two will be installed in downgradient locations to determine if hazardous constituents have migrated from this SWMU and determine the direction of groundwater flow. The presumed direction of groundwater flow at this SWMU is to the southwest.

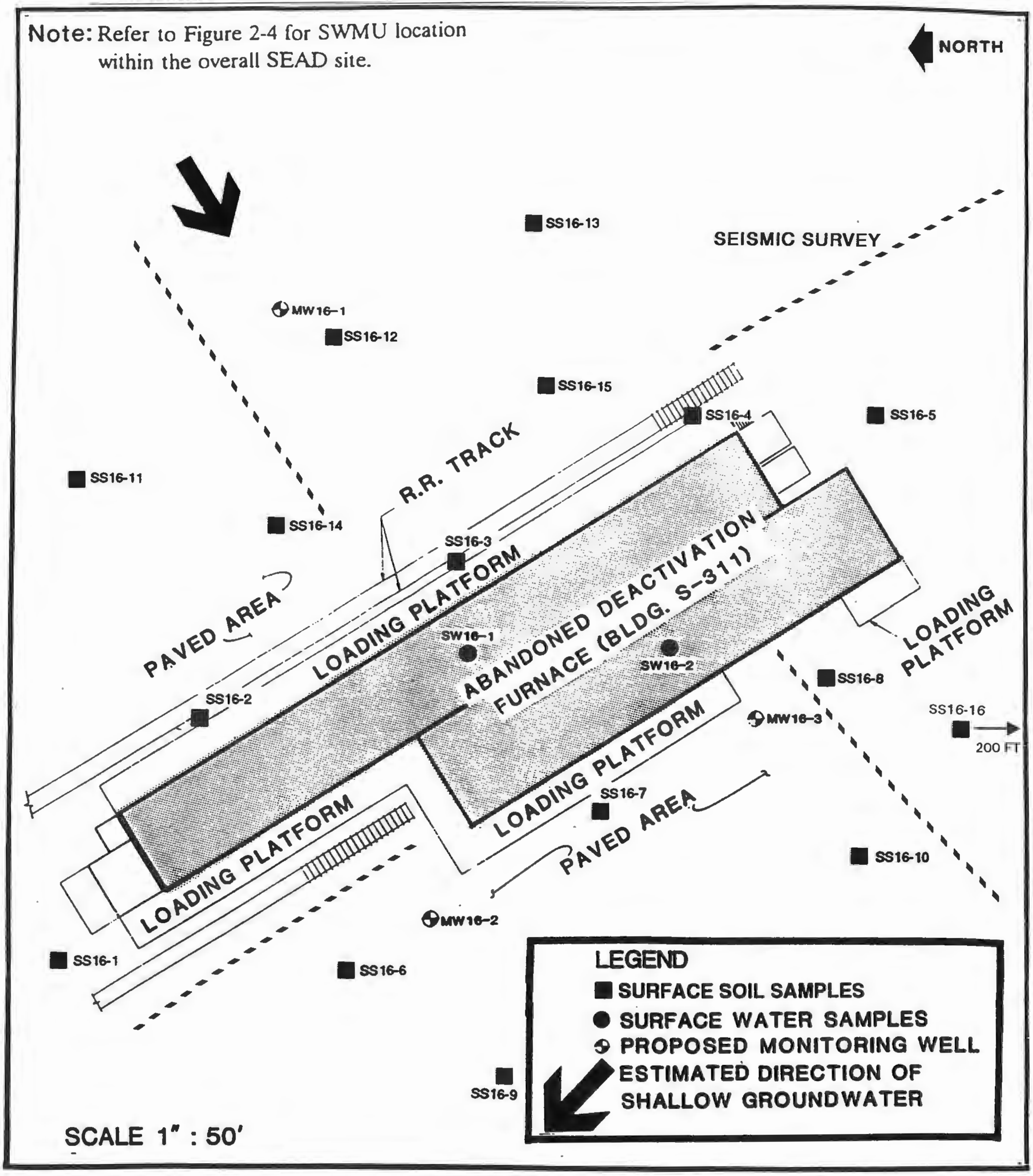
One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.4.3.

Surface Water

Previous inspections of SEAD-16 have revealed standing water within the furnace. Two samples of this standing water will be collected and tested for the parameters listed in Section 5.2.4.3.

Propellants

If propellant residues are present in the pipes that can be safely handled by field sampling and laboratory personnel, the residues will be sampled from a maximum of 3 locations and tested for the parameters listed in Section 5.2.4.3.



<u>FIGURE 5-4 SAMPLING LOCATIONS FOR SEAD-16: ABANDONED DEACTIVATION FURNACE (BLDG. S-311)</u>

Solid Materials from the Building

One to two samples of the scale inside the furnace and eight to nine samples of dirt from various locations on the floor of the building will be obtained. Five samples of building materials (pipe insulation, transite panels, etc.) will also be obtained from within the building. These samples will be tested for the parameters listed in Section 5.2.4.3.

5.2.4.3 Analytical Program

A total of sixteen soil samples, three groundwater samples, 10 samples of furnace scale and residues on the floor of the building, two surface water samples, and a maximum of three propellant residue samples will be collected from SEAD-16 for chemical testing. All these 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, and nitrates by Method 352.2. Five samples of building materials and 5 samples of dirt inside the building will be analyzed for asbestos. A summary of the analytical program for SEAD-16 is presented in Table 5-3.

5.2.4.4 Handling UXOs and Explosives

The facility at this SWMU was used to burn explosives in munitions; therefore, there is the potential for UXOs and explosives to be present in the soil. As a result, personnel from UXB will be on-site to monitor the subsurface explorations and sampling. UXB will decide when remote drilling and site clearance will be necessary based on site conditions.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

UXB will clear areas for field personnel to walk onsite, to perform geophysical surveys, and to obtain surface soil, surface water, and groundwater samples.

5.2.5 SEAD-17: Building 367 Existing Deactivation Furnace

The explosives from the munitions burned in the furnace are most likely to have been destroyed in the furnace. Heavy metals probably exited the furnace in the ash and dust. During previous investigations, surface soil samples and wipe samples were collected during an interim closure process and tested for barium and lead. Some of the soil samples collected exceeded EP Toxicity limits established for lead. The primary migration pathways are expected to be soil and groundwater.

Health & Safety procedures for the investigations performed at SEAD-17 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.5.1 Chemicals of Interest

Heavy metals, primarily lead and barium, and explosives are of concern.

5.2.5.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and if necessary adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU.

Groundwater

Three monitoring wells will be installed to assess the potential impact of this SWMU on the groundwater quality. One monitoring well (MW17-1) will be installed hydraulically upgradient of the furnace for background water quality, while the remaining two monitoring wells will be installed downgradient of this SWMU (refer to Figure 5-5). The presumed direction of groundwater flow on this SWMU is to the west-southwest.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.5.3.

Soil

Borings: Three soil borings will be drilled at the locations where the monitoring wells will be installed. 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. These include (1) from 0-12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detection (PID) reading, or (4) visibly affected soil (e.g., oil stains). If none of these occur, then the intermediate sample will be collected at

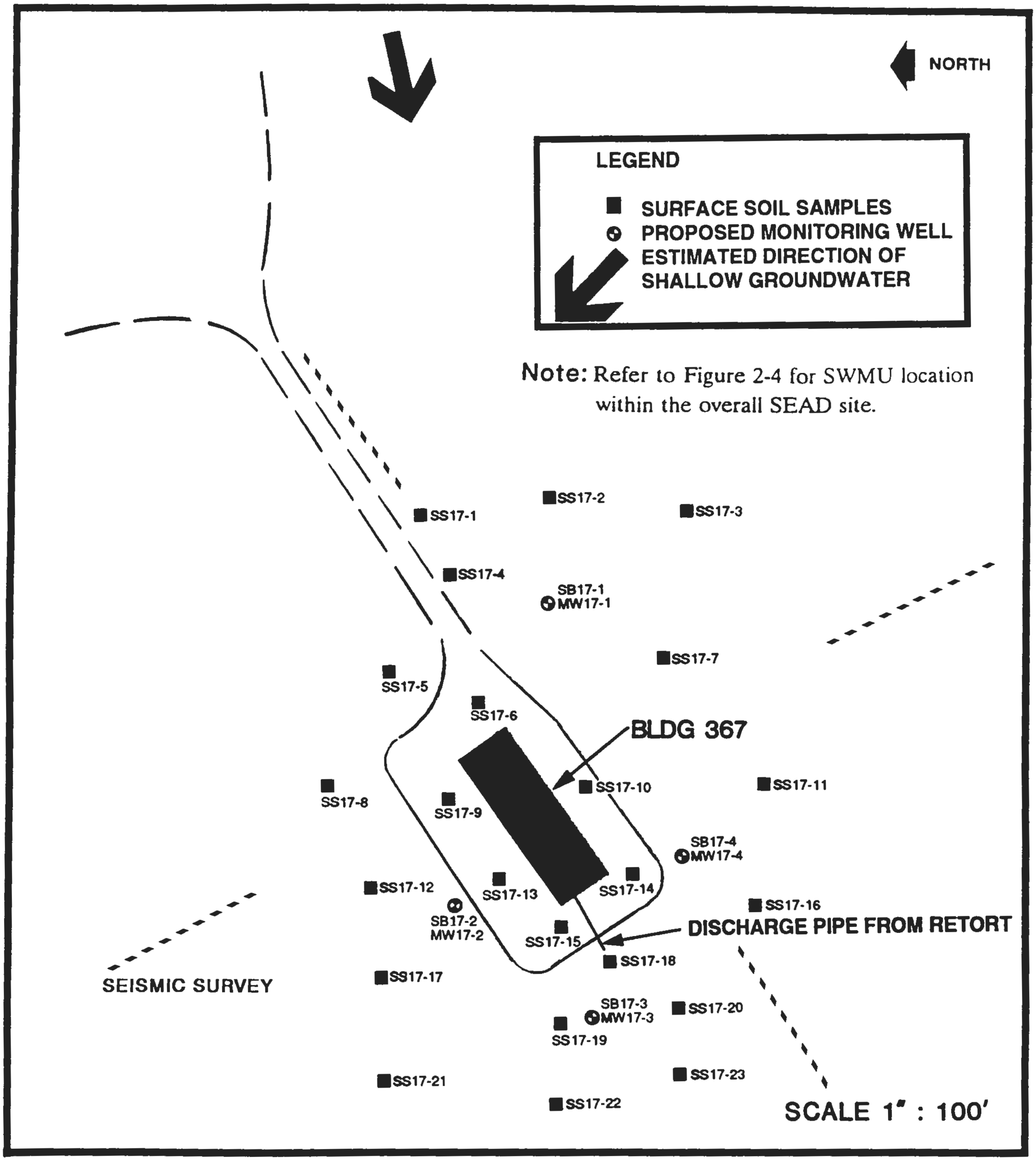


FIGURE 5-5 SAMPLING LOCATIONS FOR SEAD-17: EXISTING DEACTIVATION FURNACE (BLDG. 367)

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. The three samples from each boring will be submitted for chemical analyses identified in Section 5.2.5.3. Soil samples from SB17-1 will be used for background soil quality.

Surface Soils: Surficial soil samples from 0 to 6 inches below grade will be obtained from 23 locations around Building 367. One of the samples, SS17-18, will be obtained from the discharge point of the pipe that drains water from the retort inside the building. These samples will be submitted for the chemical analysis identified in Section 5.2.5.3. Soil samples from SB17-1 will be used for background soil quality.

5.2.5.3 Analytical Program

A total of three groundwater samples, nine subsurface soil samples, and 23 surficial soils samples will be collected from SEAD-17 for chemical analysis. 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, and nitrates by Method 352.2. A summary of the analytical program for SEAD-17 is presented in Table 5-3.

5.2.5.4 Handling UXOs and Explosives

No UXOs or explosive compounds at concentrations high enough to detonate are expected to be present in the soils surrounding SEAD-17; therefore, no remote drilling or UXO clearance will be performed during field work at this SWMU.

5.2.6 SEAD-24: Abandoned Powder Burning Pit

Although the operating practices of the pit are unknown, explosive compounds are the primary constituents of concern. Because these explosive compounds could leach into the groundwater, the primary migration pathways are expected to be groundwater and soil.

Health & Safety procedures for the investigations performed at SEAD-24 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.6.1 Chemicals of Interest

The primary chemicals of interest are explosive compounds, including HMX, RDX, TNT, 2,4-DNT, heavy metals, VOCs (solvent initiator), and TPH (fuel oil initiator).

5.2.6.2 Media To Be Investigated

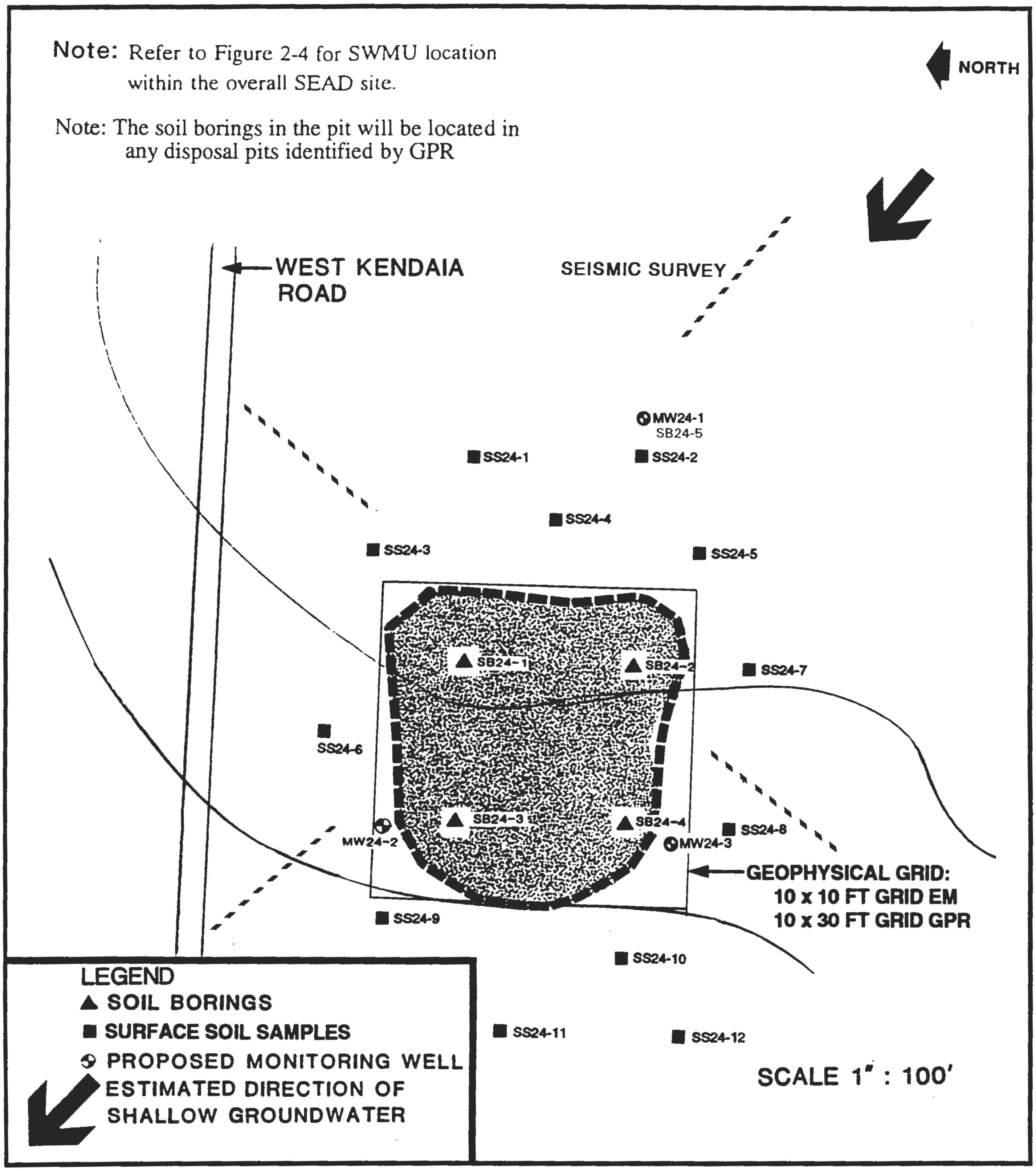
Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU.

To evaluate the subsurface conditions at SEAD-24, EM-31 and GPR surveys will be performed to locate potential pits and buried ordnance at the site. A grid of electromagnetic data will be collected across the site. The profiles will be spaced at 10-foot intervals with electromagnetic measurements made at 10-foot intervals along each profile. If the electromagnetic data indicate substantial anomalies associated with buried metallic objects, a subsequent radar survey will be performed to characterize each anomaly source. In addition, GPR data will be collected along all profiles spaced at 30-foot intervals to characterize the extent of disturbed soils at the site.

Soils

Borings: A total of four borings will be performed within the berm area at this SWMU (refer to Figure 5-6). The borings will be performed in any pits tentatively identified by GPR. If no pits are identified, the borings will be drilled at the approximate location shown. A fifth boring (SB24-5) will be drilled to obtain background soil quality 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: (1) from 0 to 12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detector (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 intermediate sample to be analyzed.



Note: Refer to Figure 2-4 for SWMU location within the overall SEAD site.

Note: The soil borings in the pit will be located in any disposal pits identified by GPR

FIGURE 5-6 SAMPLING LOCATIONS FOR SEAD-24: ABANDONED POWDER BURNING PIT

Surface Soils: Surficial soil samples 0 to 6 inches below grade will be obtained from 12 locations surrounding the abandoned pit. These samples will be submitted for the chemical analyses identified in Section 5.2.6.3.

Groundwater

One monitoring well (MW24-1) will be installed upgradient of SEAD-24 to obtain background water quality data, while two monitoring wells will be installed adjacent to and downgradient of this unit to evaluate whether hazardous constituents have migrated from the SWMU and to determine the groundwater flow direction. The presumed direction of groundwater flow at this SWMU is to the northwest.

One monitoring well will be installed at each location that is screened over the entire thickness of the aquifer. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.6.3.

5.2.6.3 Analytical Program

A total of 27 soil samples and three groundwater samples will be collected from SEAD-24 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 352.2, and total petroleum hydrocarbons by Method 8015. A summary of the analytical program for SEAD-24 is presented in Table 5-3.

5.2.6.4 Handling UXOs and Explosives

The facilities at this SWMU were used to burn explosives; therefore, there is the potential for UXOs and explosives to be present in the soil in the pit. As a result, personnel from UXB will be on-site to monitor the subsurface explorations and sampling performed in the pit. UXB will decide when remote drilling and site clearance will be necessary based on site conditions. The following paragraphs present the proposed procedures to handle UXOs and explosives at SEAD-24.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

UXB will clear areas for field personnel to walk in the pit and to perform geophysical surveys.

5.2.7 SEAD-25: Fire Training and Demonstration Pad

Based on past site activities, spent solvents (prior to RCRA), water-contaminated fuels and oils have been used at this SWMU. The primary migration pathways are expected to be groundwater, although soil and air are also potential pathways.

Health & safety procedures for the investigations performed at SEAD-25 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.7.1 Chemicals of Interest

Petroleum products, primarily benzene, toluene and xylene, and solvents are of concern. Additionally, lead may also be of concern if leaded fuels were used for fire fighting demonstrations. Where waste oil is managed, there is potential for PCB transformer oil to be mixed in with it.

5.2.7.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradients of the SWMU.

Soils

A total of six soil borings will be advanced at this SWMU, five within the area of the pad (refer to Figure 5-7), and one east of the pad to obtain background soil quality 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: (1) from 0 to 12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detector (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 intermediate sample analyzed.

Note: Refer to Figure 2-4 for SWMU location within the overall SEAD site.

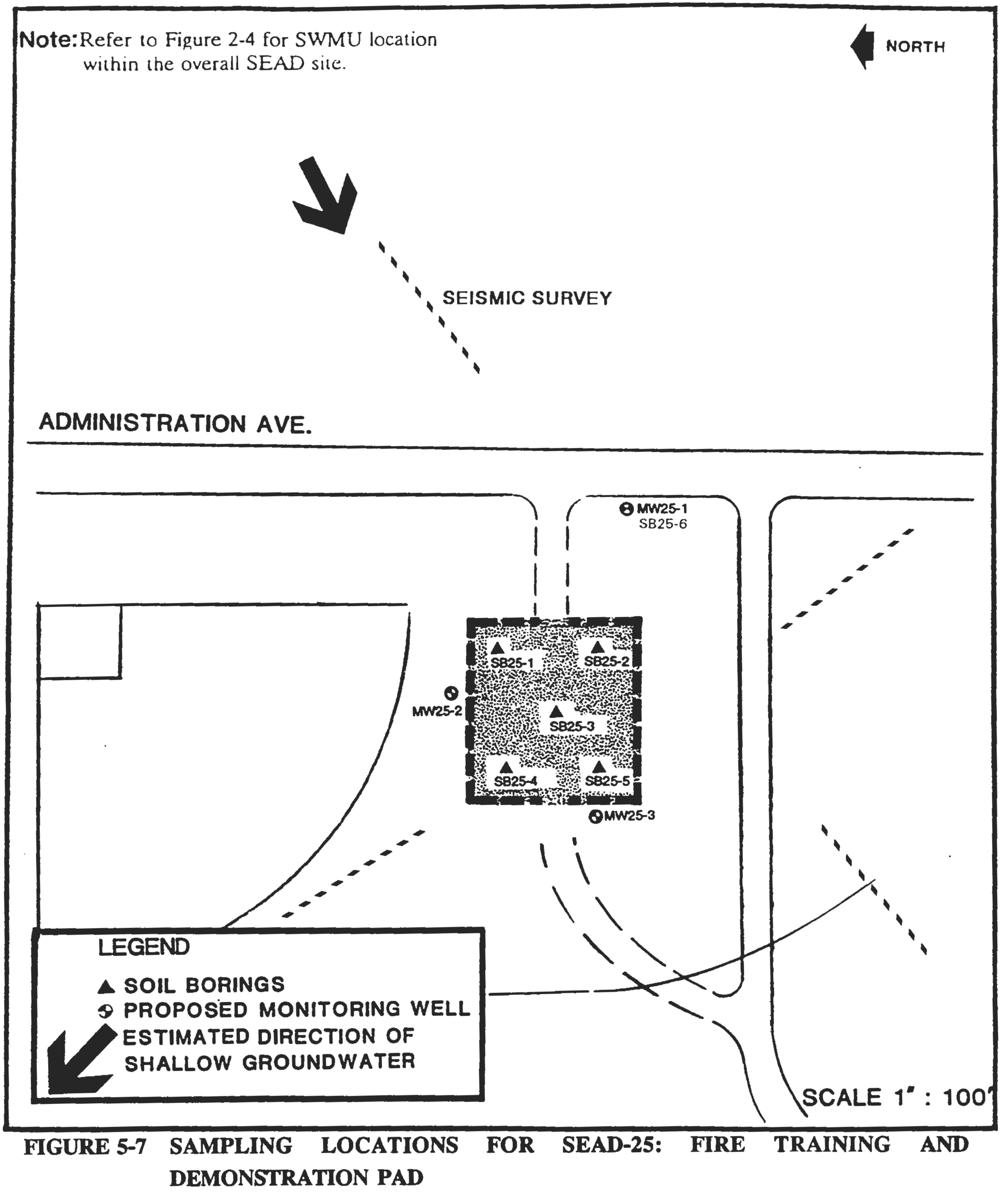


FIGURE 5-7 SAMPLING LOCATIONS FOR SEAD-25: FIRE TRAINING AND DEMONSTRATION PAD

Groundwater

A total of three monitoring wells will be installed at this SWMU. One monitoring well will be installed upgradient of the pad to obtain background water quality data, while the remaining two wells will be installed adjacent and downgradient of the pad to determine if hazardous constituents have migrated from the SWMU and to determine the direction of groundwater flow. The presumed direction of groundwater flow at this SWMU is to the southwest.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.7.3.

5.2.7.3 Analytical Program

A total of 18 soil samples and three groundwater samples will be collected from SEAD-25 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs [including methyl tertiary butyl ether (MTBE)], SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, herbicides by Method 8150, nitrates by Method 352.2, and total petroleum hydrocarbons by Method 8015. A summary of the analytical program for SEAD-25 is presented in Table 5-3.

5.2.7.4 Handling UXOs and Explosives

UXOs nor explosives were handled at SEAD-25; therefore, no remote drilling or UXO clearance will take place during the field work.

5.2.8 SEAD-26: Fire Training Pit and Area

Fuels, oils and solvents were stored in the fire training area and burned in the pit (refer to Figure 5-8). Approved fuels are currently burned in the pit.

Flammable materials were floated on water within the fire pit prior to extinguishing; therefore, fuels containing water, used oils and herbicides and spent solvents (prior to RCRA) may have leached into the subsurface and migrated down to the water table. The primary migration pathways are expected to be soil, groundwater, and surface water.

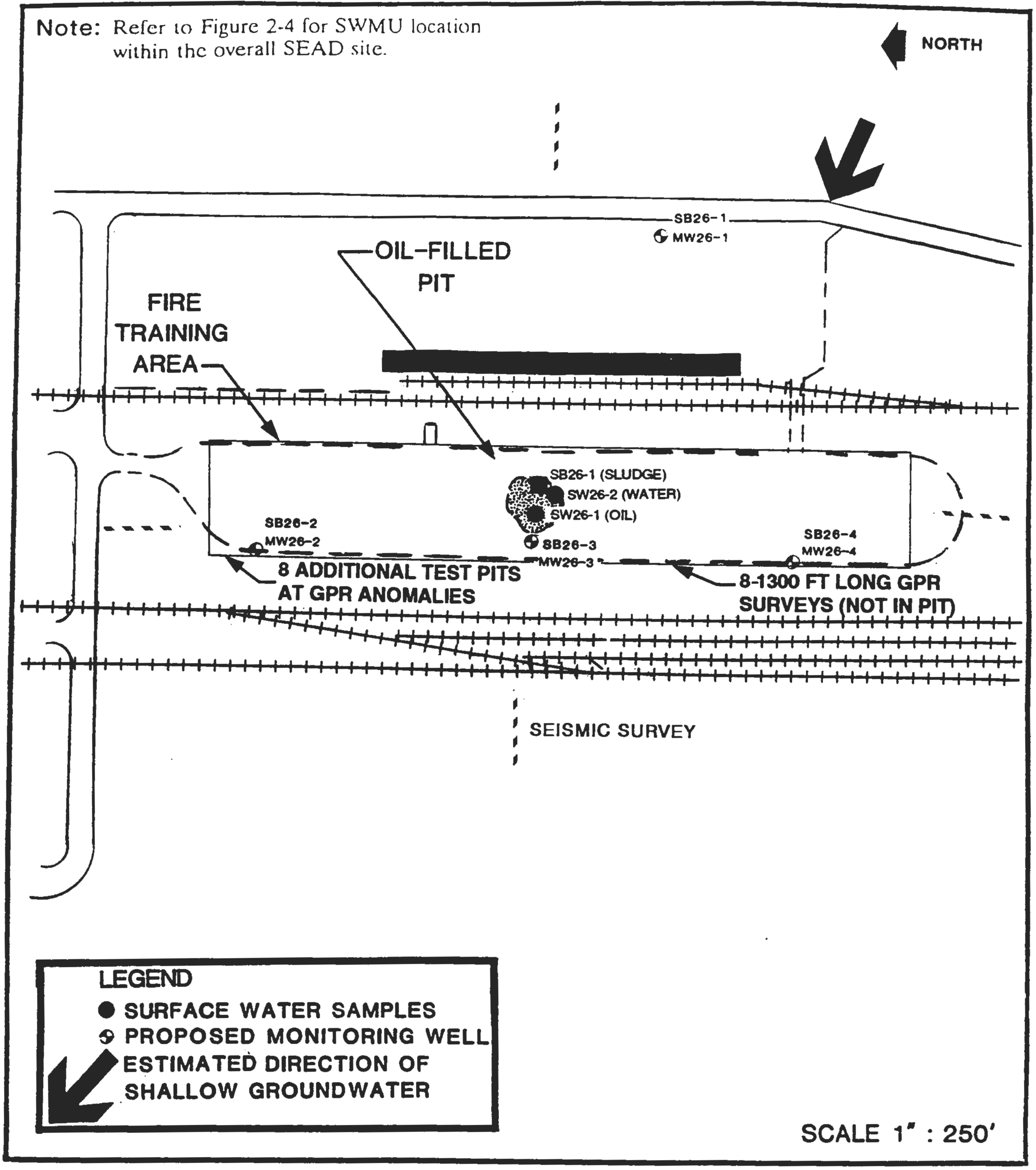


FIGURE 5-8 SAMPLING LOCATIONS FOR SEAD-26: FIRE TRAINING PIT AND AREA

Health & Safety procedures for the investigations performed at SEAD-26 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.8.1 Chemicals of Interest

The primary chemicals of interest are solvents and petroleum products, including benzene, toluene and xylenes. Lead may also be a constituent of concern because leaded fuels were likely to have been used. Where waste oil is managed, there is potential for PCB transformer oil and herbicides to be mixed in with it.

5.2.8.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU.

A GPR survey will be performed within the fire training area, but not within the fire training pit. The data will be collected along eight 1300 foot long profiles in the area outlined in Figure 5-8. The GPR data will be used to detect anomalies and characterize the extent of disturbed soils at the site.

Soils

Borings: A total of four borings are proposed for this SWMU; one boring will be drilled upgradient of the pit and three borings will be drilled downgradient of the fire training area (refer to Figure 5-8). One of the downgradient borings proposed is adjacent to the pit. These four borings are associated with the four proposed wells. Each boring will be continuously sampled to the top of the water table. Samples from SB26-1 will be used to obtain background soil quality data.

Test Pits: Eight test pits will be excavated at anomalies detected during the GPR survey. If less than eight anomalies are detected, a total of eight test pits will still be excavated: one at each anomaly and the others at locations in the fire training area where no anomalies were detected.

A total of three samples from each boring and test pit will be collected: (1) from 0 to 12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detector (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 intermediate sample analyzed.

Groundwater

Four wells are proposed for SEAD-26, one upgradient for background water quality data and three adjacent and downgradient (refer to Figure 5-8) to determine the groundwater flow direction and determine if hazardous constituents have migrated from the SWMU. The presumed direction of groundwater flow at this SWMU is to the southwest.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.8.3.

Oil, Surface Water, and Sediment

Three samples will be obtained from the fire training pit: one of any oil floating on the water, one of the surface water, and one of the sediment at the bottom of the pit. These samples will be analyzed for the parameters listed in Section 5.2.8.3.

5.2.8.3 Analytical Program

A total of 36 soil samples, four groundwater samples, one sediment sample, and one surface water sample will be collected from SEAD-26 for chemical testing. All these samples will be analyzed for the following: the TCL VOCs [including methyl tertiary butyl ether (MTBE)], SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, herbicides by Method 8150, nitrates by Method 352.2, and total petroleum hydrocarbons by Method 8015. One oil sample will be collected, then analyzed for TPH by Method 8015, PCBs by Method 8080, and herbicides by Method 8150. A summary of the analytical program for SEAD-26 is presented in Table 5-3.

5.2.8.4 Handling UXOs and Explosives

No UXOs or explosives are known to have been used at the fire training area: therefore, no remote drilling or UXO clearance will be performed during field activities at this SWMU.

5.2.9 SEAD-45: Open Detonation Facility

Based on the operating practices at SEAD-45, metals, nitrates and explosive compounds have the potential to be adsorbed into the soil or to migrate to the water table.

Health & Safety procedures for the investigations performed at SEAD-45 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.9.1 Chemicals of Interest

The primary chemicals of interest are heavy metals, explosive compounds and nitrates.

5.2.9.2 Media To Be Investigated

Geophysics

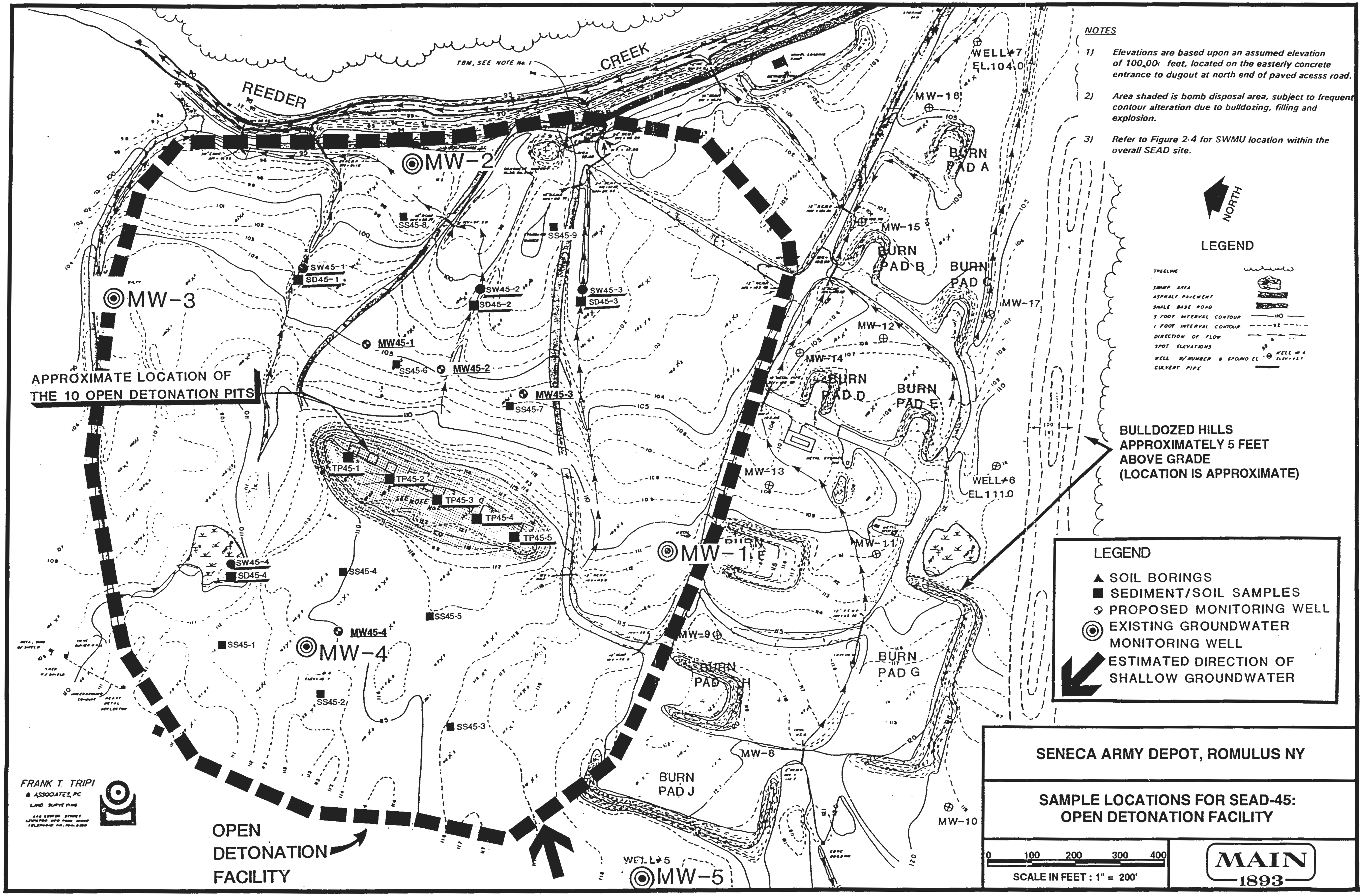
To evaluate the potential for buried unexploded ordinance at the OD ground, GPR and EM-31 surveys will be performed in the area surrounding the elongate detonation hill. The electromagnetic data will be collected along profiles spaced at 10-foot intervals with readings spaced at 10 feet along each profile. Where the electromagnetic data indicate anomalies possibly associated with buried metallic objects, a subsequent ground-penetrating survey will be performed to characterize the anomaly source. A maximum of 10 test pits will be excavated to observe the types of buried metallic objects present at this SWMU.

Soils

Test Pits: Soil samples will be collected from five test pits in the detonation mound (refer to Figure 5-9). Four soil samples will be collected from each test pit and composited into one sample/test pit.

Surface Soils: Nine surficial soil samples will be obtained from locations east and west of the ten open detonation pits. Chemical analysis of these samples will be used to evaluate the effect of wind-blown material from the pits on the environment in the two prominent wind directions, east and west.

Soil quality data will be compared to background soil quality data obtained during the RI investigation at the adjacent open burning grounds.



NOTES

1) Elevations are based upon an assumed elevation of 100.00 feet, located on the easterly concrete entrance to dugout at north end of paved acesss road.

2) Area shaded is bomb disposal area, subject to frequent contour alteration due to bulldozing, filling and explosion.

3) Refer to Figure 2-4 for SWMU location within the overall SEAD site.

LEGEND

- TREELINE
- SWAMP AREA
- ASPHALT PAVEMENT
- SHALE BASE ROAD
- 5 FOOT INTERVAL CONTOUR
- 1 FOOT INTERVAL CONTOUR
- DIRECTION OF FLOW
- SPOT ELEVATIONS
- WELL W/ NUMBER & GROUND EL
- CULVERT PIPE

LEGEND

- ▲ SOIL BORINGS
- ■ SEDIMENT/SOIL SAMPLES
- PROPOSED MONITORING WELL
- ◎ EXISTING GROUNDWATER MONITORING WELL
- ESTIMATED DIRECTION OF SHALLOW GROUNDWATER

SENECA ARMY DEPOT, ROMULUS NY

SAMPLE LOCATIONS FOR SEAD-45: OPEN DETONATION FACILITY

SCALE IN FEET : 1" = 200'

MAIN 1893

FRANK T. TRIPI & ASSOCIATES, PC LAND SURVEYING

11
x
17

Groundwater

Four wells are proposed for SEAD-45. One well will be upgradient of the mound to obtain background water quality data and three wells will be located downgradient of the detonation mound as shown on Figure 5-9. These wells will be completed 3 to 5 feet below grade then covered with soil to avoid damage by OD facility operations. Each well cap will have a large magnet fixed to the inside of the casing cap to facilitate locating the well for groundwater sample collection. The direction of groundwater flow at this SWMU is northeast to east toward Reeder Creek based on data from the existing wells.

Existing wells MW-1 through MW-5 will be sampled with the four proposed wells. Well MW45-4 will be used as an upgradient well.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample will be collected from each well.

Surface Water and Sediment

A surface water sample and a sediment sample will be collected at the same sampling point from each of four locations at SEAD-45: three drainage channels east of the detonation mound and the marsh area northwest of the detonation mound as shown in Figure 5-9. Surface water and sediment quality data will be compared to background surface water and sediment data obtained during the RI investigation at the adjacent open burning grounds.

5.2.9.3 Analytical Program

Fourteen soil samples, nine groundwater samples, four surface water samples and four sediment samples will be collected from SEAD-45 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, and nitrates by Method 352.2. A summary of the analytical program for SEAD-45 is presented in Table 5-3.

5.2.9.4 Handling UXOs and Explosives

The facilities at this SWMU were used to destroy munitions; therefore, there is the potential for UXOs and explosives to be present in the soil. As a result, personnel from UXB will be on-site to monitor the subsurface explorations and sampling. UXB will decide when remote drilling and site clearance will be necessary based on site conditions. The following paragraphs present the proposed procedures to handle UXOs and explosive at SEAD-45.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

Test pit excavations and the collection of soil samples from the excavations will be performed by UXB.

UXB 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.

5.2.10 SEAD-57: Explosive Ordnance Disposal Area

Based on past operating practices, metals, nitrates and explosives from the detonation of explosives could become adsorbed onto soil particles or migrate to groundwater. The estimated direction of groundwater flow is southwest.

Health & Safety procedures for the investigations performed at SEAD-57 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.10.1 Chemicals of Interest

The primary chemicals of interest are heavy metals, nitrates, and explosive compounds.

5.2.10.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the detonation area and shallow depression.

To evaluate the potential of buried unexploded ordinance at the site, GPR and EM-31 surveys will be performed within the inner area of the circular 70-foot diameter bermed detonation area and shallow depression (refer to Figure 5-10). The EM-31 data will be collected on a 10-foot by 10-foot grid. Where the EM-31 data indicate anomalies possibly associated with buried metallic objects, a subsequent GPR survey will be performed to characterize the anomaly source.

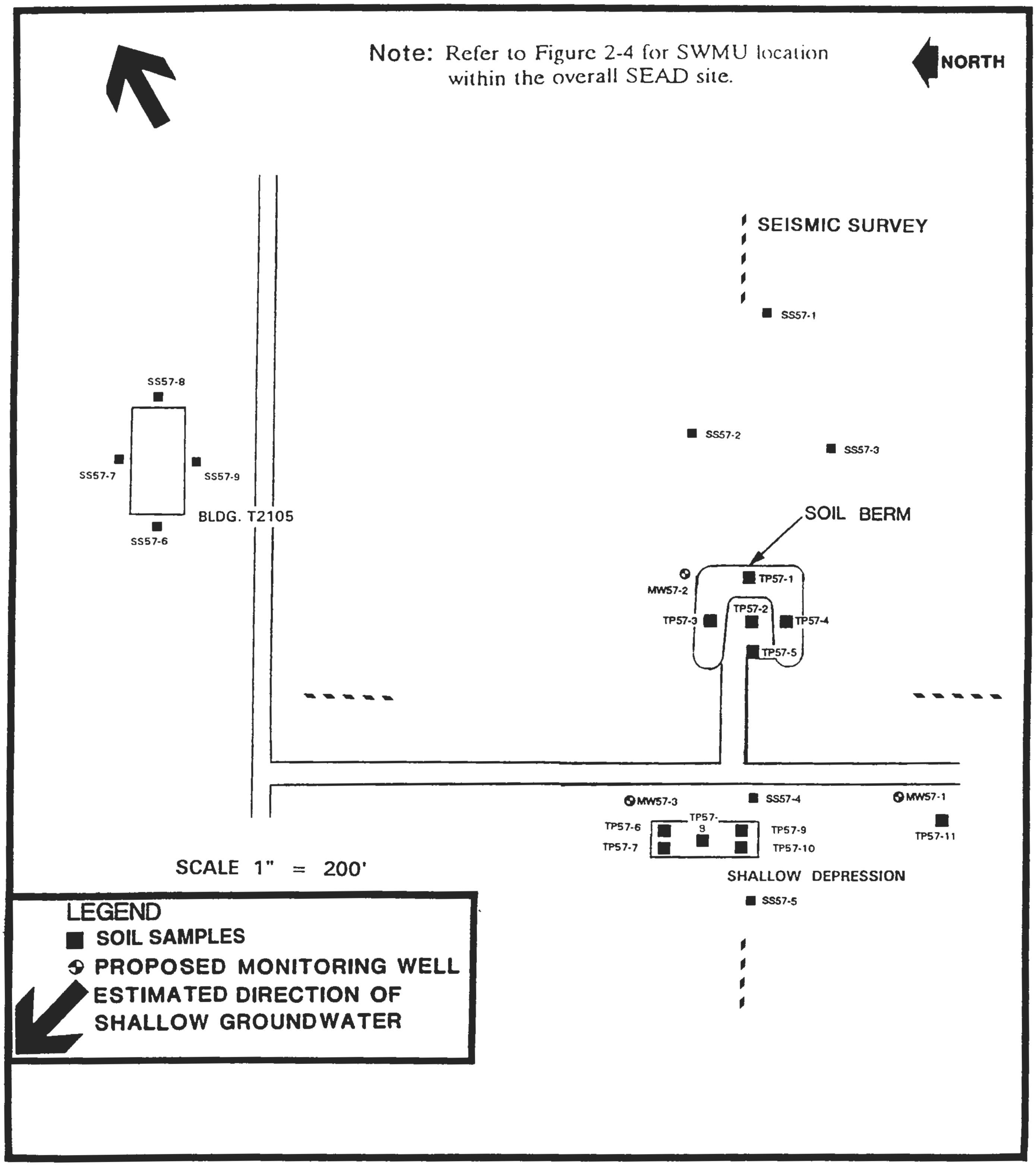


FIGURE 5-10 SAMPLING LOCATIONS FOR SEAD-57: EXPLOSIVE ORDNANCE DISPOSAL

Soil

Test Pits: Eleven test pits will be excavated at SEAD-57: three on the berm (TP57-1, -3, and -4), two within the detonation area (TP57-2 and -5), five in the depressed area (TP57-6 to -10), and at a background location (TP51-11) (Figure 5-10). The test pits will be located at anomalies detected during the geophysical surveys in these three areas. If no anomalies are detected within an area, the test pits will be located as shown in Figure 5-10. Four soil samples will be collected from each test pit and composited into one sample per test pit.

Surface Soils: Five surficial soil samples from 0 to 6 inches below grade will be obtained from locations east and west of the disposal area which are the dominant wind directions. Four other surficial soil samples will be obtained from around Building T2105. These locations are shown on Figure 5-10.

Groundwater

Three wells are proposed for SEAD-57, one upgradient and two adjacent and downgradient. The estimated direction of groundwater flow is to the northeast. One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample will be obtained from each well.

5.2.10.3 Analytical Program

A total of twenty soil samples and three groundwater samples will be collected from SEAD-57 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 352.2. A summary of the analytical program for SEAD-57 is presented in Table 5-3.

5.2.10.4 Handling UXOs and Explosives

The facilities at this SWMU were used to destroy munitions; therefore, there is the potential for UXOs and explosives to be present in the soil. As a result, personnel from UXB will be on-site to monitor the subsurface explorations and sampling. UXB will decide when remote drilling and site clearance will be necessary based on-site conditions. The following paragraphs present the proposed procedures to handle UXOs and explosives at SEAD-57.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

Test pit excavations and the collection of soil samples from the excavations will be performed by UXB.

UXB will clear areas for field personnel to walk on-site, to perform geophysical surveys, and to obtain surface and groundwater samples.

5.3 DATA REDUCTION, ASSESSMENT AND INTERPRETATION

Upon completion of all field investigations identified in Section 5.2, 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.

5.3.1 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.

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.

5.3.2 **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.

5.3.3 **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.

5.3.4 **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.

5.3.5 Comparison to Background

5.3.5.1 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.

5.3.5.2 Statistical Comparisons

The EPA recommends several statistical methods for comparing data, depending upon the situation (EPA 1989). The various methods and circumstances under which they are utilized are presented in Table 5-4. Once data are produced from the investigation, a statistical method will be selected and implemented for the ten SWMUs under investigation. Groundwater data can be statistically compared using any of these methods. Only some of these methods can be used to statistically compare other media, such as soil.

5.3.6 Survey

Surveying will be performed at the ten 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 photogrametric 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 MAIN's Engineering Site Package (ESP) software on our Intergraph CAD System. This approach will

TABLE 5-4

EPA-RECOMMENDED STATISTICAL METHODS[1]

Constituent	Type of Comparison	Recommended Method	Section of Guidance Document[1]
Any Constituent in Background	Background vs. Compliance Well	ANOVA Tolerance Limits Prediction Intervals	5.2 5.3 5.4
	Intra-well	Control Charts	7
ACL/MCL Specific	Fixed Standard	Confidence Intervals Tolerance Limits	6.2.1 6.2.2
Synthetic	Many Nondetects in Data Set	Refer to Section 8.1	8.1

NOTE: [1] U.S.EPA, "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, April 1989 (EPA/530-SW-89-026).

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 photogrametric 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-7-1990 USAED-HUNTSVILLE	SEAD-8-1990 USAED-HUNTSVILLE	SEAD-9-1990 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:

Traverse

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)

Leveling

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 Zeiss 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.

6.0 PLANS, MANAGEMENT AND REPORTING

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.

6.1 SCHEDULING

Figure 6-1 presents the proposed schedule which relates defined work tasks with time to complete each task.

6.2 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 6-2. Each of the Parsons Main 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 Parsons Main 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.

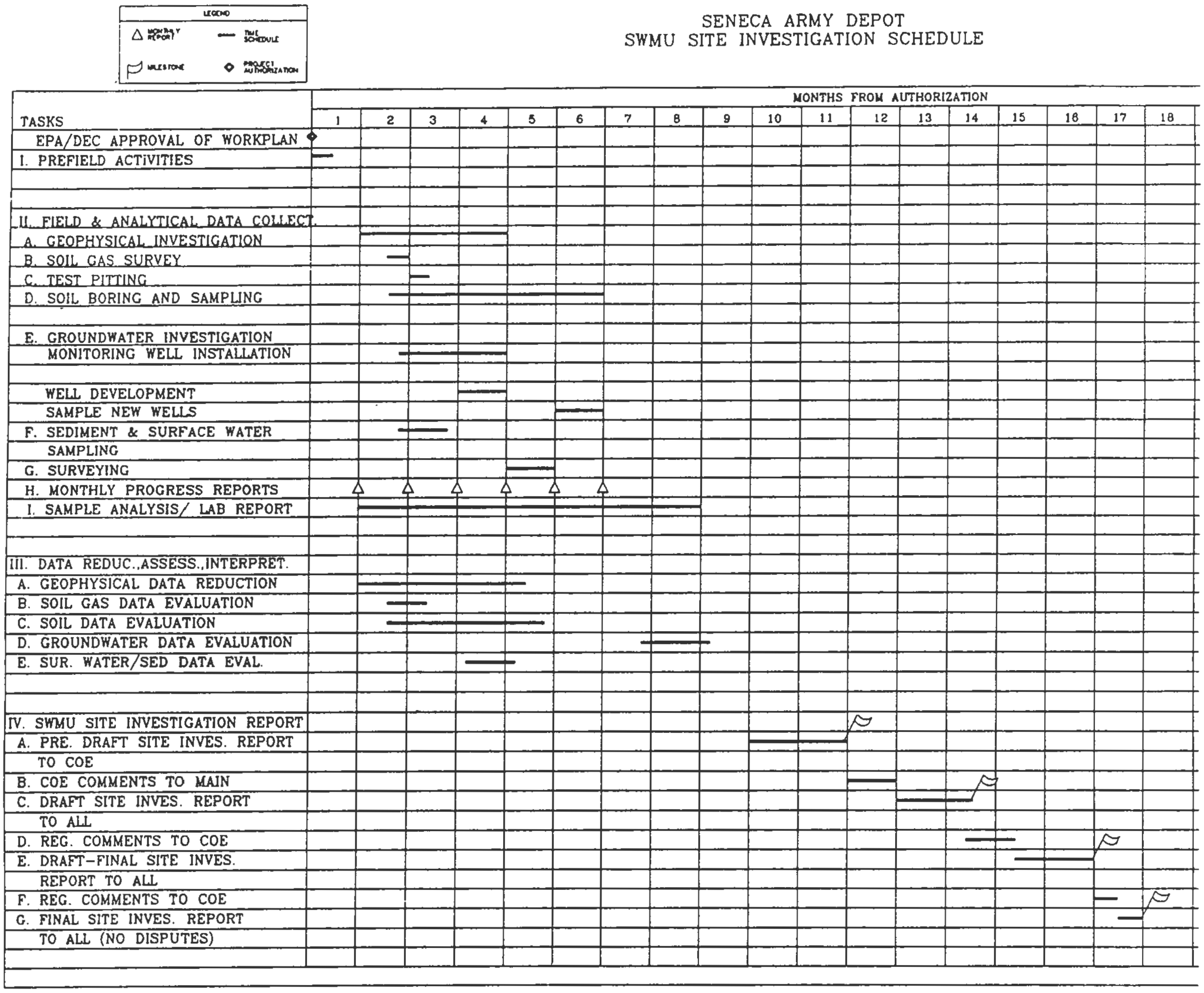


FIGURE 6-1 SWMU INVESTIGATION SCHEDULE

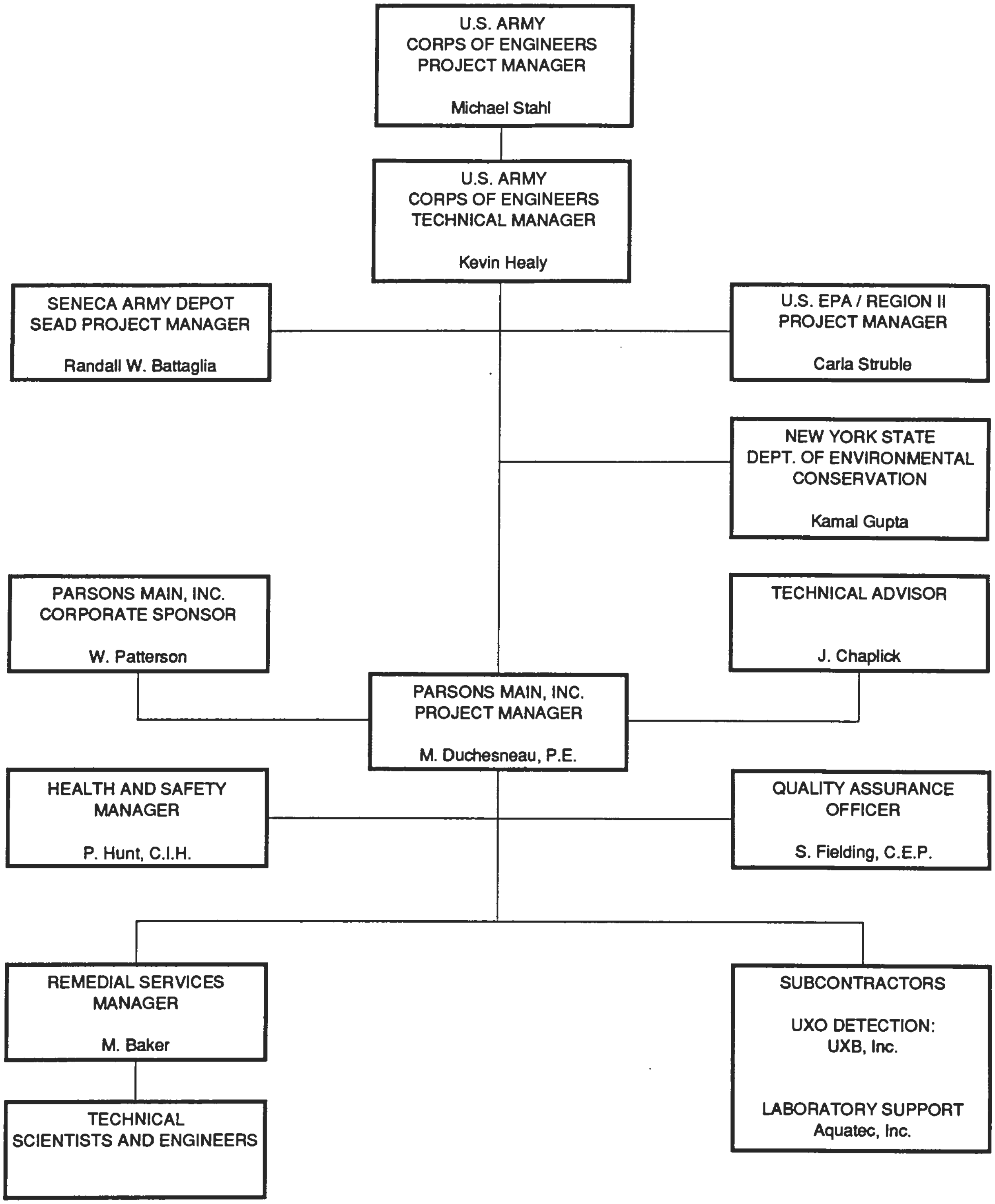


FIGURE 6-2 PROJECT ORGANIZATION

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 Parsons Main to provide laboratory assistance (Aquatec, Inc.) and to aid in UXO detection and handling (UXB, Inc.).

6.3 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. Parsons Main 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 Parsons Main, SEAD, USCOE, NYSDEC and EPA. This section describes the mechanisms which will ensure that communications between all concerned are maintained.

6.3.1 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.

6.3.2 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.

6.3.3 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.

6.3.4 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.

6.3.5 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, 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.

6.3.6 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 the SWMU should be declared a "No Action" SWMU.

APPENDIX A

FIELD SAMPLING AND ANALYSIS PLAN

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ATTACHMENT: Exemption letter from U.S. EPA Region II to the U.S. Army dated September 16, 1991.

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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 Parsons Main, Inc. Field Sampling and Analysis Plan (FSAP) for the collection of precise, accurate, and representative field data. 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 10 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 5.2 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.

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.

TABLE A-1
SUMMARY OF FIELD WORK FOR CERCLA SITE INSPECTIONS AT TEN SOLID WASTE MANAGEMENT UNITS

	GEOPHYSICAL SURVEYS					SOIL SAMPLING												
SEAD NO.	UXO CLEARANCE (3.1)1	SEISMIC REFRAC (3.2.1)	GPR (3.2.3)	EM-31 (3.2.2)	SAMPLING ANOM'S (3.2.4)	BORINGS (3.3.2)	TEST PITS (3.3.3)	SURFACE SOIL (3.3.4)	MONITOR WELLS (3.4&3.5)	SURFACE WATER (3.6.2)	SEDIMENT (3.6.3)	SOIL GAS (3.7)	PROPEL'NT & OTHER MATER'LS (3.8)	WASTE MGMT (3.9)	COM-POSIT (4.1)	SAMPLE PRESERV. (4.2)	SAMPLE STORAGE (4.3)	DECON. (4.4)
4	X	X	X	X		X	X	X	X	X	X			X	X	X	X	X
11	X	X	X	X	X	X	X		X			X		X	X	X	X	X
13		X	X	X		X			X	X	X			X		X	X	X
16	X	X						X	X	X			X	X		X	X	X
17		X				X		X	X					X		X	X	X
24	X	X	X	X	X	X		X	X					X		X	X	X
25		X				X			X					X		X	X	X
26		X	X		X	X	X		X	X	X		X	X		X	X	X
45	X		X	X	X		X	X	X	X	X			X		X	X	X
57	X	X	X	X	X		X	X	X					X		X	X	X

NOTES: 1. REFERS TO SECTION OF THE FIELD SAMPLING AND ANALYSIS PLAN THAT PERTAINS TO THIS SUBJECT

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.

Trip Blank: 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.

Field (Equipment) Blank: 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.

Field Duplicate: 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;
SG = Soil Gas
SS = Surface Soil

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. Unexplained 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
6. Soil Gas Survey

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, except SEAD-45, 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

Four 120-foot seismic refraction transects will be laid out at each site. They will be approximately equidistant from the center of the SWMU and each other with each transect pointing toward the center of the SWMU. 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 ± 1.0 feet horizontally and ± 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 __ 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 5.2 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 Ground Penetrating Radar (GPR) Survey

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 5.2 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

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 Parsons Main 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.

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 Parsons Main 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 Parsons Main 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 (3) 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,
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,

FIGURE A-1

PAGE 1 OF

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		

PAGE 1 OF   SEE MASTER ACRONYM LIST FOR COMPLETE LISTING OF ABBREVIATIONS   BORING NO.:

ver. 08-Oct-92   OBBORP1.WK1

FIGURE A-1 (CONT'D)

PAGE 2 OF

OVERBURDEN BORING REPORT

ENGINEERING-SCIENCE, INC.	CLIENT:	BORING #:

MONITORING			
INSTRUMENT	INTERVAL	BGD	TIME

COMMENTS

DRILLER:

INSPECTOR

DATE

DEPTH (FT)	SAMPLING			SAMPLE				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
	BLOWS PER 6 INCHES	PENE-TRATION RANGE (FEET)	RECOV-ERY RANGE (FEET)	DEPTH INT (FEET)	NO.	VOC	RAD SCRN			
5										
10										
15										
20										

PAGE 2 OF SEE MASTER ACRONYM LIST FOR COMPLETE LISTING OF ABBREVIATIONS BORING #:

ver. 08-Oct-92 OBBORP2.WK1

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 Parsons Main Safety Officer.

The excavation will be continuously monitored by Parsons Main 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.

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.

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.

FIGURE A-2

PAGE OF

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		STRATA SCHEMATIC	DESCRIPTION OF MATERIALS (BURMEISTER METHODOLOGY)	REMARKS
		NUMBER	DEPTH RANGE			
1						
2						
3						
4						
5						

SEE MASTER ACRONYM LIST FOR COMPLETE LISTING OF ABBREVIATIONS

TEST PIT #:

ver. 1/ 08-Oct-92

TSTPIT.WK1

FIGURE A-3

PAGE OF

SAMPLING RECORD – SOIL

ENGINEERING – SCIENCE, INC.

CLIENT:

DATE:

PROJECT:

LOCATION:

INSPECTOR:

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)

PAGE OF

ver 09-Oct-92

SEE MASTER ACRONYM LIST FOR COMPLETE LISTING OF ABBREVIATIONS

SLRCD.WK1

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 Parsons Main 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.

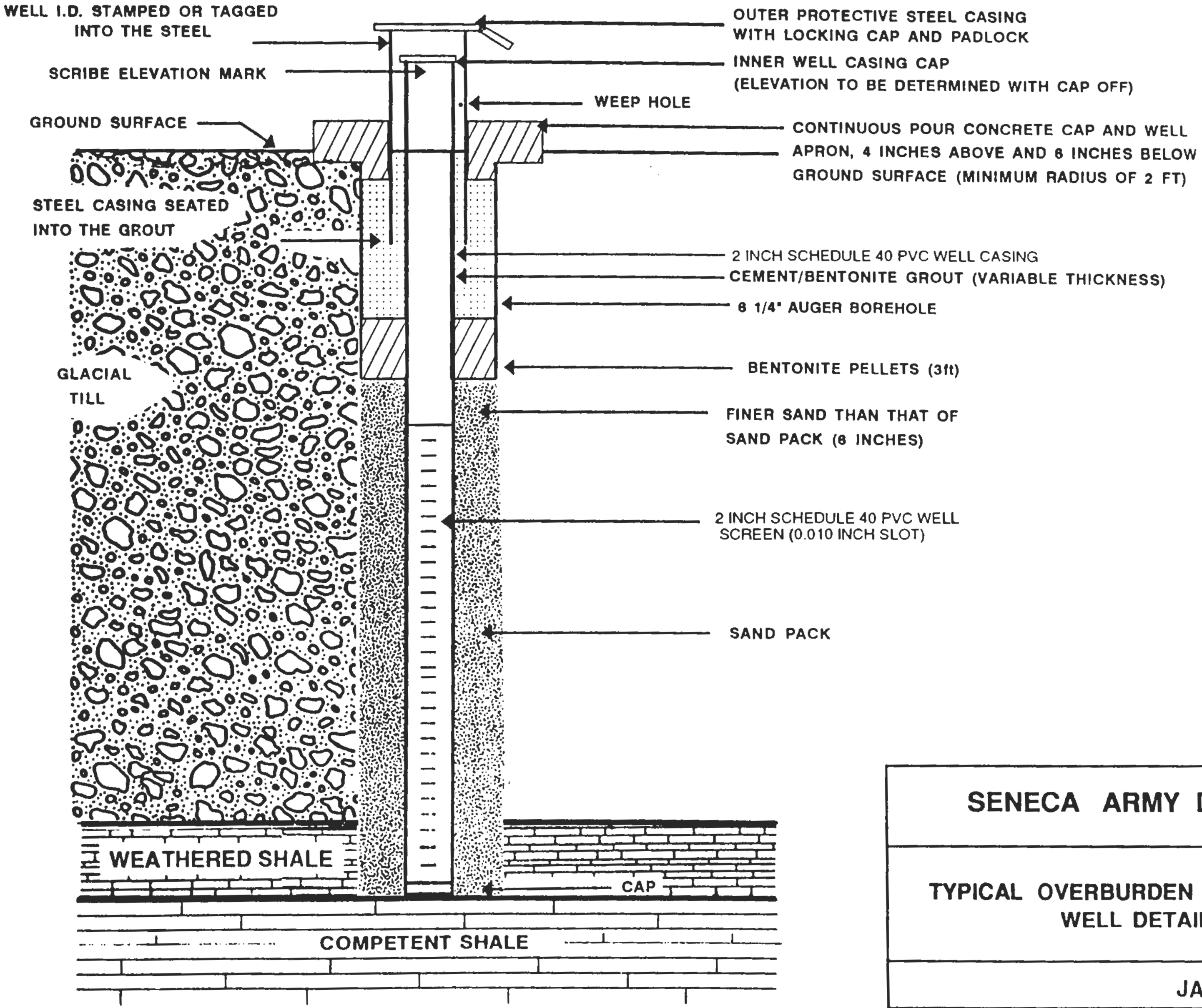
3.4 MONITORING WELL INSTALLATION

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 Parsons Main geologist.

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.



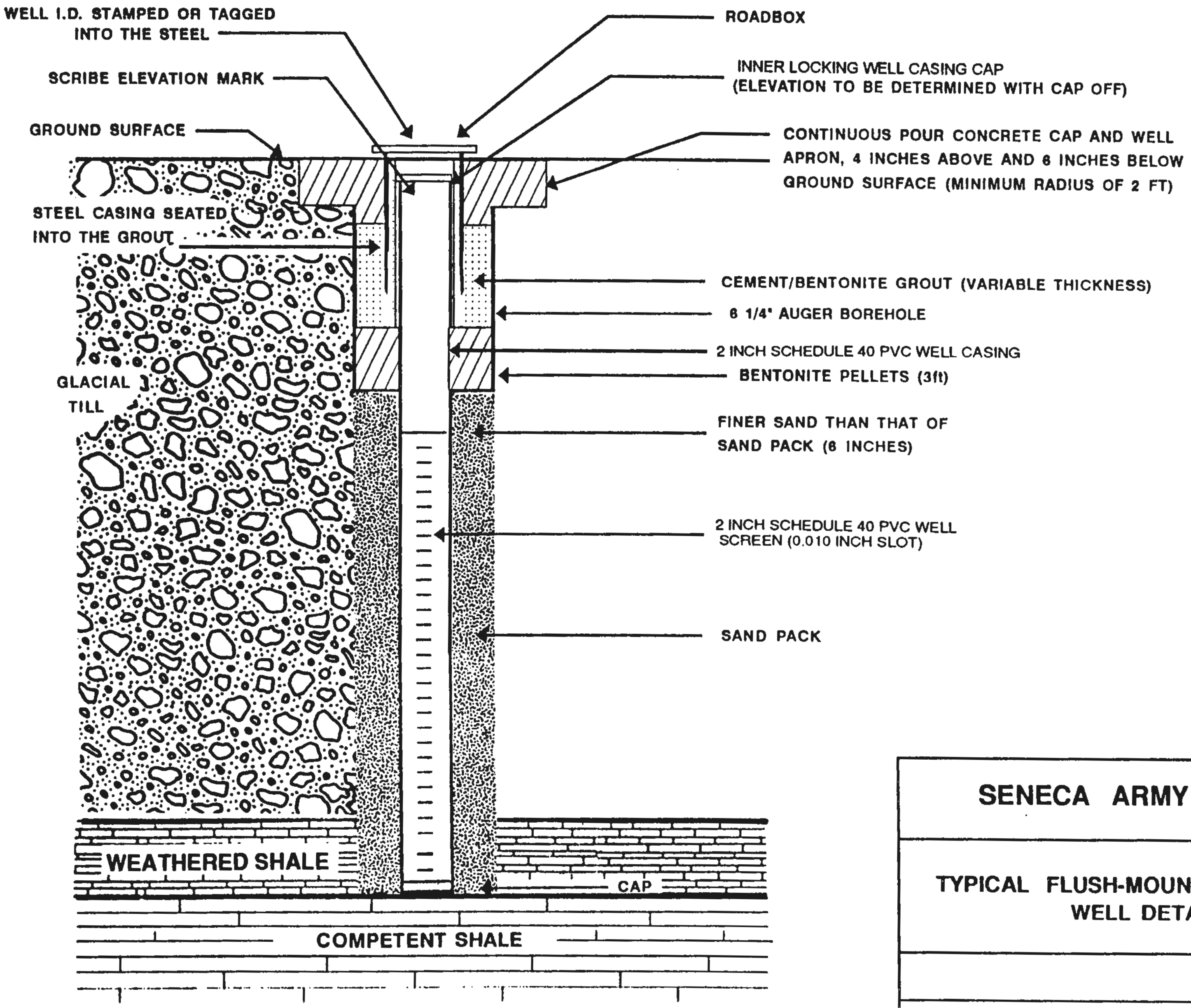
SENECA ARMY DEPOT

TYPICAL OVERBURDEN MONITORING WELL DETAIL

JANUARY 1993

MAIN
1893

FIGURE A-4



SENECA ARMY DEPOT

TYPICAL FLUSH-MOUNT MONITORING WELL DETAIL

JANUARY 1993

MAIN 1893

FIGURE A-5

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 PVC well material will be cleaned in the factory before shipping it.

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.

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.

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.

FIGURE A-6

PAGE 1 OF 2

OVERBURDEN MONITORING WELL
COMPLETION REPORT & INSTALLATION DETAIL
PROTECTIVE RISER COMPLETION

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

PROJECT: ______
LOCATION: ______

PROJECT NO: ______
INSPECTOR: ______
CHECKED BY: ______

DRILLING CONTRACTOR: ______
DRILLER: ______
DRILLING COMPLETED: ______
BORING DEPTH: ______
DRILLING METHOD(S): ______
BORING DIAMETER(S): ______
ASSOCIATED SWMU/AOC: ______

POW DEPTH: ______
INSTALLATION STARTED: ______
INSTALLATION COMPLETED: ______
SURFACE COMPLETION DATE: ______
COMPLETION CONTRACTOR/CREW: ______
BEDROCK CONFIRMED (Y/N?) ______
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:

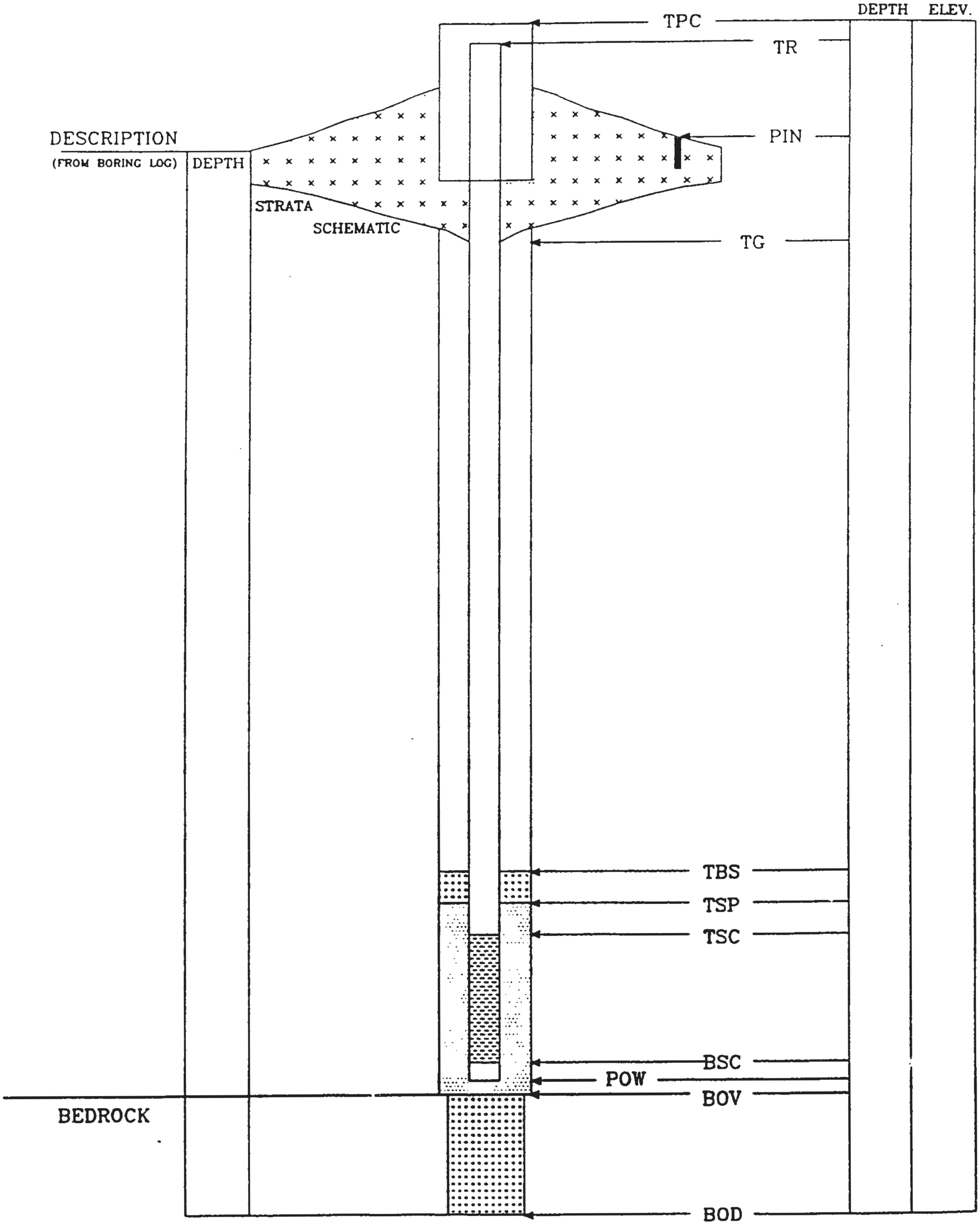
• ALL DEPTH MEASUREMENTS REFERENCED TO GROUND SURFACE

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:
LOCATION:

PROJECT NO:
INSPECTOR:
CHECKED BY:

DRILLING CONTRACTOR:
DRILLER:
DRILLING COMPLETED:
BORING DEPTH:
DRILLING METHOD(S):
BORING DIAMETER(S):
ASSOCIATED SWMU/AOC:

POW DEPTH:
INSTALLATION STARTED:
INSTALLATION COMPLETED:
SURFACE COMPLETION DATE:
COMPLETION CONTRACTOR/CREW:
BEDROCK CONFIRMED (Y/N?)
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

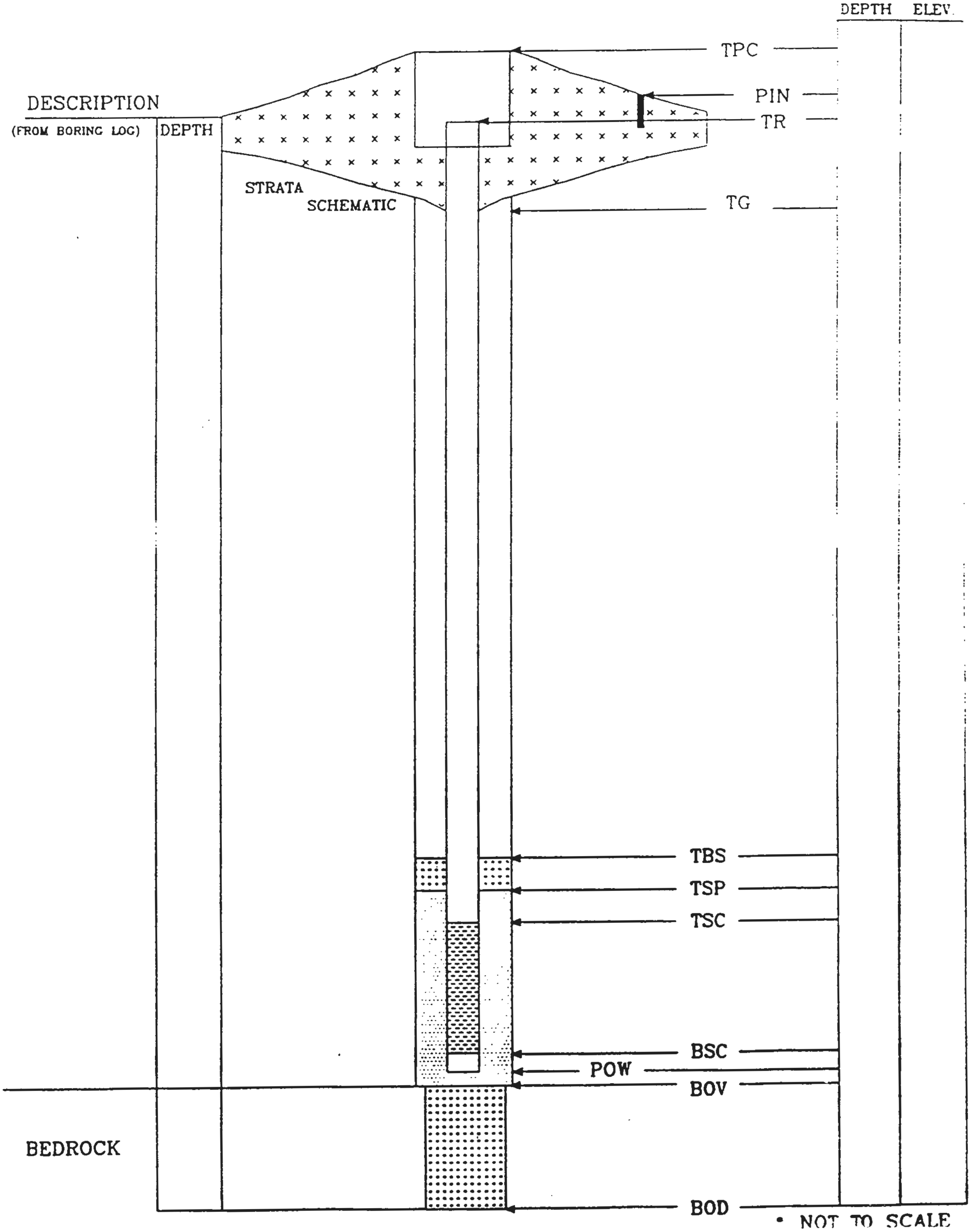
OVERBURDEN MONITORING WELL
ROADWAY BOX INSTALLATION DETAIL

ENGINEERING-SCIENCE, INC.

CLIENT:

WELL #

DATE



• NOT TO SCALE

FIGURE A-8

PAGE: 1 OF 2

BEDROCK MONITORING WELL
COMPLETION REPORT & INSTALLATION DETAIL
PROTECTIVE RISER COMPLETION

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

PROJECT: ______
LOCATION: ______

PROJECT NO: ______
INSPECTOR: ______
CHECKED BY: ______

DRILLING CONTRACTOR: ______
DRILLER: ______
DRILLING COMPLETED: ______
DEPTH TO BEDROCK: ______
BORING DEPTH: ______
DRILLING METHOD(S): ______
BORING DIAMETER(S): ______
ASSOCIATED SWMU/AOC: ______

POW DEPTH: ______
OUTER CASING INSTALLATION: ______
INNER CASING INSTALLATION: ______
SURFACE COMPLETION DATE: ______
COMPLETION CONTRACTOR/CREW: ______
CORE TYPE/SIZE: ______
FOOTAGE CORED: ______
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:

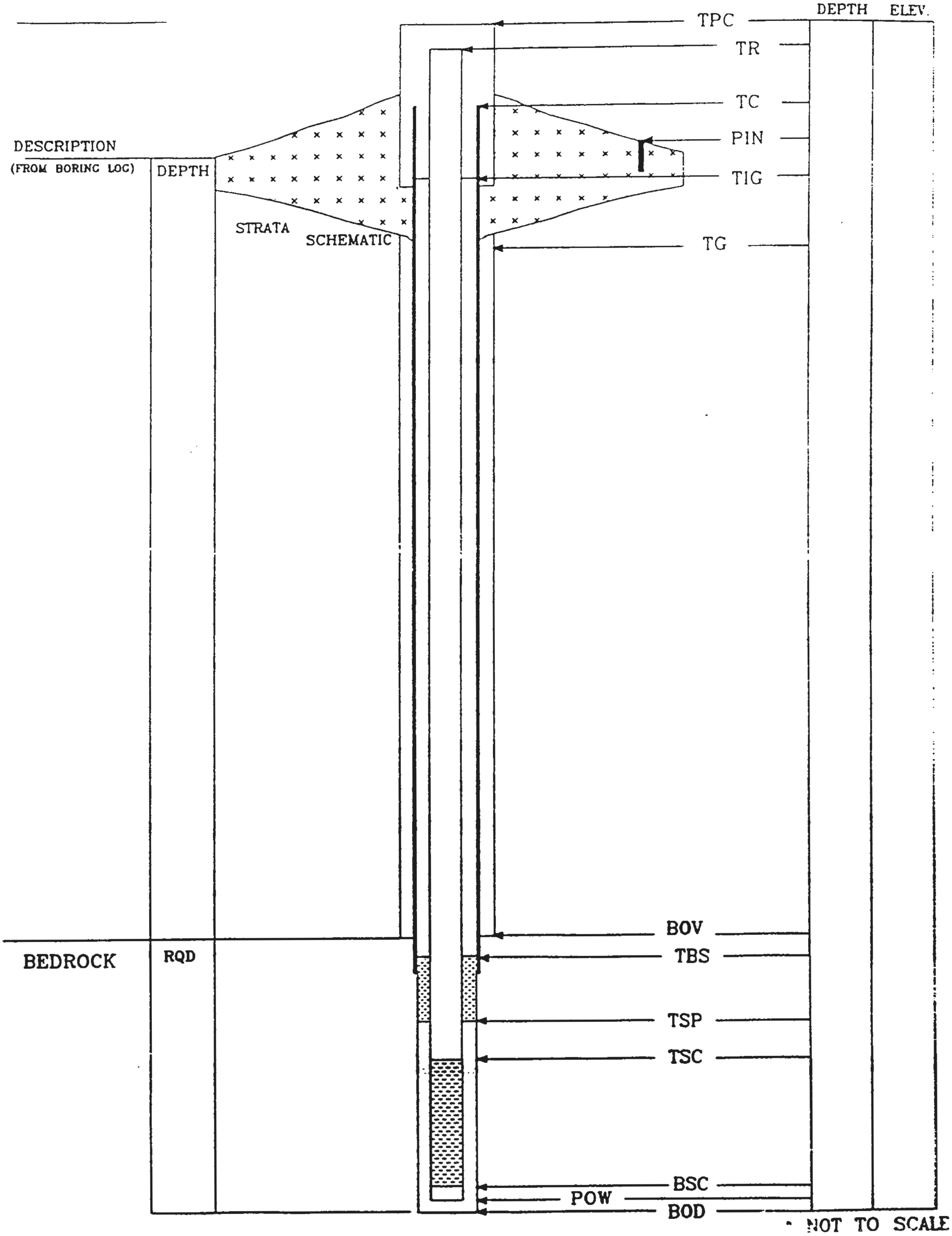
• ALL MEASUREMENTS REFERENCED TO GROUND SURFACE

SEE PAGE 2 FOR SCHEMATIC

BEDROCK MONITORING WELL
PROTECTIVE RISER - INSTALLATION DETAIL

ENGINEERING-SCIENCE, INC.	CLIENT:	WELL #:

DATE: ______________



NOT TO SCALE

FIGURE A-9

PAGE: 1 OF 2

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

ENGINEERING–SCIENCE, INC.
CLIENT:
WELL #:

PROJECT:
LOCATION:

PROJECT NO:
INSPECTOR:
CHECKED BY:

DRILLING CONTRACTOR:
DRILLER:
DRILLING COMPLETED:
DEPTH TO BEDROCK:
BORING DEPTH:
DRILLING METHOD(S):
BORING DIAMETER(S):
ASSOCIATED SWMU/AOC:

POW DEPTH:
OUTER CASING INSTALLATION:
INNER CASING INSTALLATION:
SURFACE COMPLETION DATE:
COMPLETION CONTRACTOR/CREW:
CORE TYPE/SIZE:
FOOTAGE CORED:
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

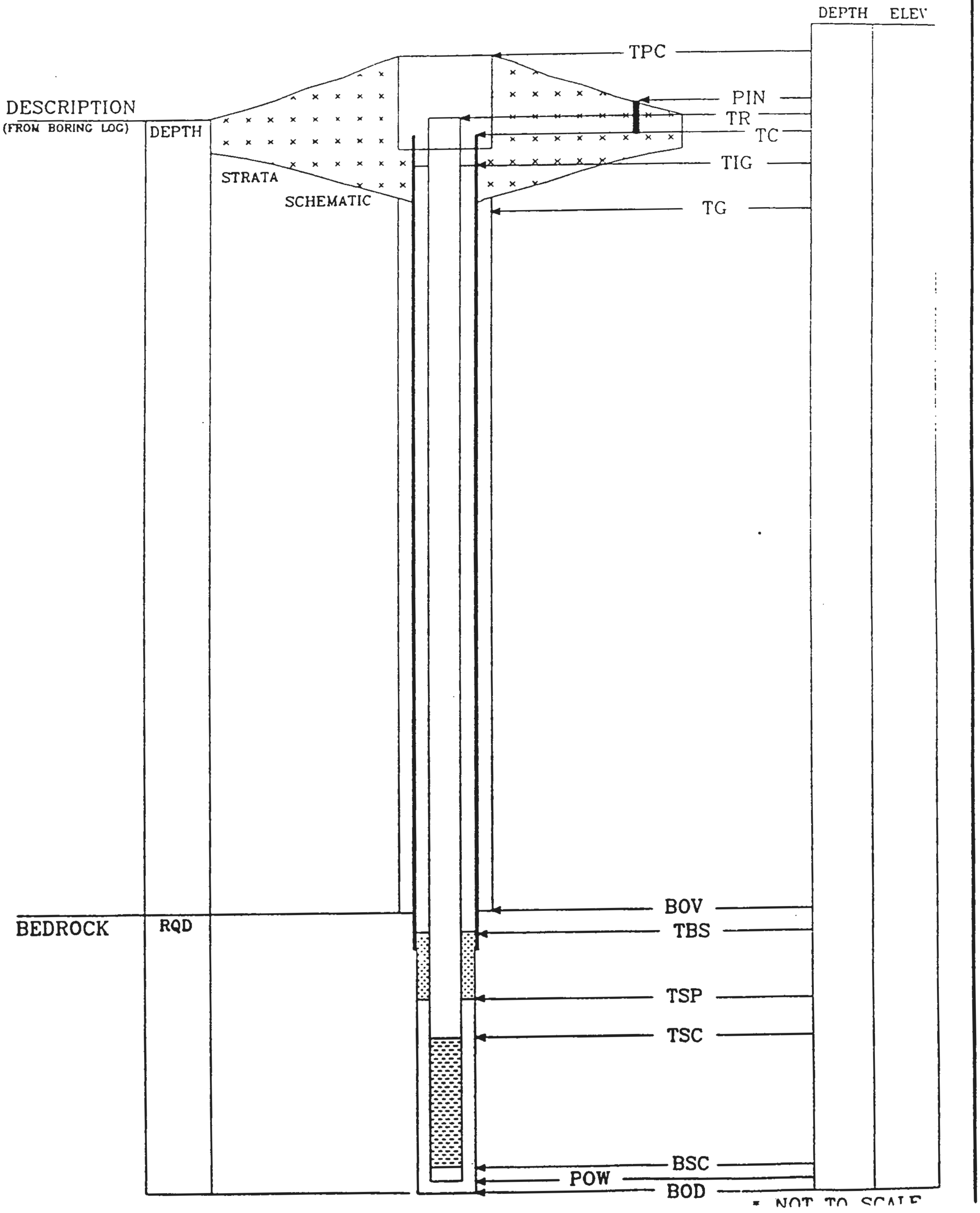
SEE PAGE 2 FOR SCHEMATIC

PAGE: 1 OF 2

BEDROCK MONITORING WELL
ROADWAY BOX COMPLETION DETAIL

ENGINEERING-SCIENCE, INC.	CLIENT:	WELL #:

DATE: ____________



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. The water is less than 50 NTUs
2. The temperature, specific conductivity and pH of the well water vary by no more than 10 percent.

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.

If the turbidity requirement of less than 50 NTUs cannot be met, Parsons Main will consult with the NYSDEC Project Manager decide on a further course of action.

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

FIGURE A-10

WELL DEVELOPMENT REPORT

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

PROJECT : ______________________
LOCATION: ______________________

DATE: ____________
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 #: ____________

ver. 08-Oct-92

WELLDEV.WK1

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 5.3.6 of Section 5; "SWMU Investigations".

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 of these steps are 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 than 1 inch then 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 the 1/4" Tygon tubing installed in the head of the 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 suspended and is collected by the tube (the purge water should become silt-laden and have a dark brown-gray 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. After 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 by 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 well). 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.

Sampling

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, herbicides, total petroleum hydrocarbons, nitrate, and fluoride. 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 5 of the Work Plan. The sampling will be accomplished by using the following procedure:

1. Establish the exact location of each sampling station in the field. The sample site will be noted on a site plan and marked in the field with flagging and a 4-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).

FIGURE A-11

PAGE OF

SAMPLING RECORD – GROUNDWATER

ENGINEERING – SCIENCE, INC. CLIENT: DATE:

OJECT:

OCATION:

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

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 FOR SAMPLES TAKEN	VOA					
	SVO					
	METALS					
ODOR (VOC)						
COLOR						
TEMPERATURE (C)						
SPEC. COND. (umbos)						
pH						
TURBIDITY (NTU)						
FIELD FILTERED (Y/N)						

PAGE OF

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 5.0 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.

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

ver. 1 / 09–Oct–92 SEE MASTER ACRONYM LIST FOR COMPLETE LISTING OF ABBREVIATIONS WTRRCD.WK1

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.

Sediment samples will be analyzed as described in Section 5.0, SWMU Investigations 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 SOIL GAS SURVEY

3.7.1 Objectives

A soil gas survey will be performed at selected SWMUs to evaluate the potential volatile organic compounds in the soil or on or in the groundwater. The soil gas survey will allow a delineation of the source areas, which may be contributing to groundwater contamination. The exact number of sampling locations are described in Section 5 of this Work Plan for each SWMU. Soil gas surveys could extend beyond the proposed program when necessary to define a source area.

3.7.2 Explanation Of Method

The method involves extracting a small representative sample of soil gas through a hollow steel probe driven a few feet into the ground and analyzing the gas for the presence of volatile contaminants. The presence of contaminants in the soil gas provides a strong indication that there is a source of volatile organics either in the soil near the probe or in the groundwater below the probe. The soil gas analysis is performed in the field with a portable gas chromatograph so that sample loss does not occur due to shipment off-site. The analytical results are available immediately and can be used to help direct the investigation.

Soil gas analysis is used as a screening tool for rapidly identifying contaminant sources in soils and, in some cases, delineating groundwater contamination plumes. In soils above groundwater contamination plumes, the expected soil gas concentrations will be much less than those concentrations which would be expected for source soils. The soil gas program described in this workplan will identify areas where volatile organics range in concentration between 0.5 to 100 ppm. These concentrations will indicate the presence of source materials (i.e., soils saturated with solvents). These soils constitute a continual sink for groundwater impacts.

The soil gas evaluation program involves three essential elements. These are:

1. Soil Gas Sampling
2. Analytical Support
3. Data Interpretation

3.7.3 Soil Gas Sampling

1. A 1.75-inch, outer diameter, steam-cleaned, hollow hardened carbon steel drilling rod (AW) is driven approximately 5 feet below the ground surface using a drilling rig equipped with standard drilling equipment. The steel drilling rod is fitted with a penetrometer point on the tip (Figure A-13).

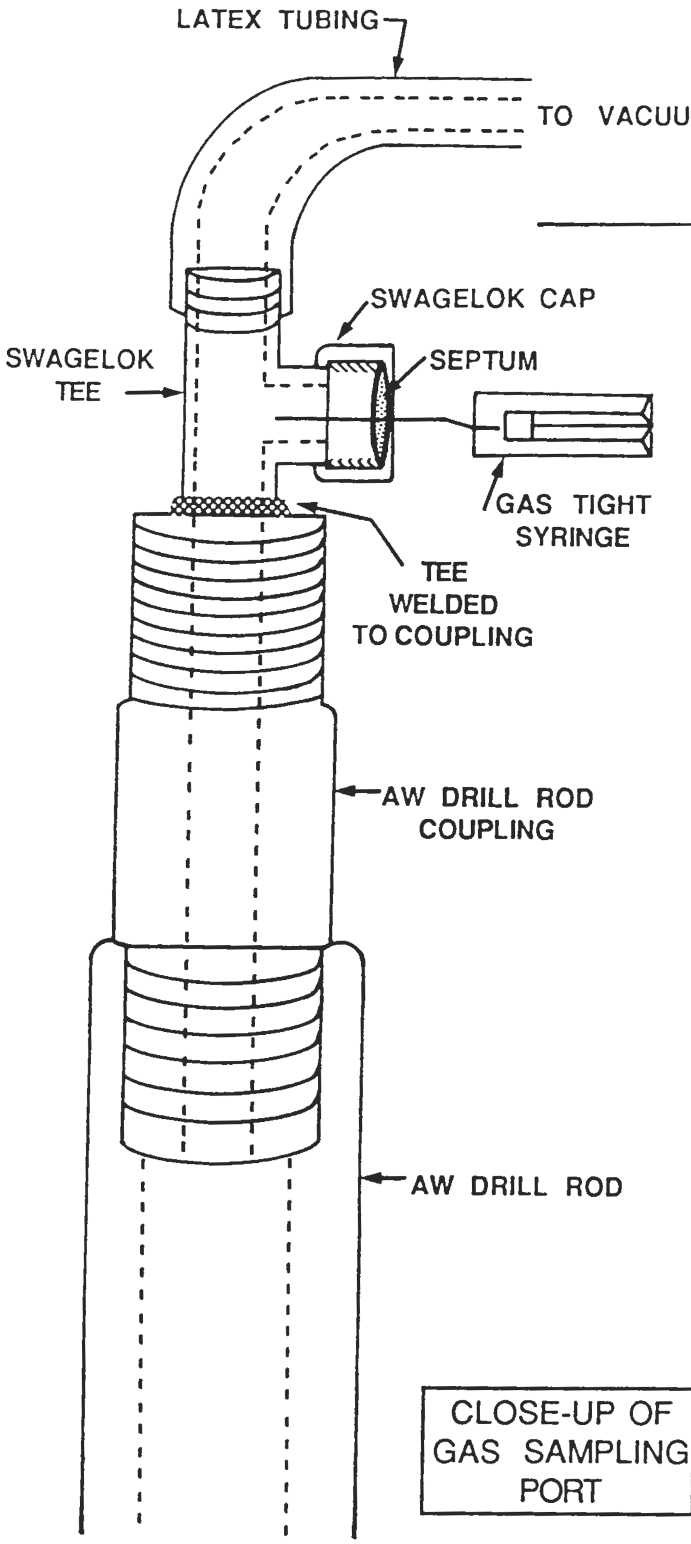
2. Once the desired depth of penetration is reached, the drilling rod is withdrawn approximately 6 inches which allows the penetrometer point to dislodge from the rod and creates a void space through which soil gas can be extracted. A metal rod is inserted into the hollow drilling rod to ensure that the penetrometer point has been dislodged. If necessary, the point is knocked out with the metal rod.

3. Bentonite is packed at the ground surface around the probe to prevent influx of atmospheric air into the sample probe.

4. The hollow drilling rod exposed above the land surface is fitted with a coupling containing both evacuation and sampling ports. Teflon tape will be used on the threads connecting the coupling to the hollow drilling rod to prevent infiltration of surface gases into the sampling port.

5. The probe is purged by creating a slight negative pressure with an air sampling pump through a latex evacuation line to ensure that the gases flowing through the hollow drilling rod are representative of soil gases. Samples of soil gas are collected prior to contact with any tubing or pumps.

6. The effluent gas from the air sampling pump will be monitored with a hand held vapor monitor, such as the HNU PI101. The gas sample will be collected immediately if the effluent monitoring indicates an increase in the concentration of volatiles. Gas samples will be collected to coincide, as much as possible, with the highest concentration of gas



CLOSE-UP OF GAS SAMPLING PORT

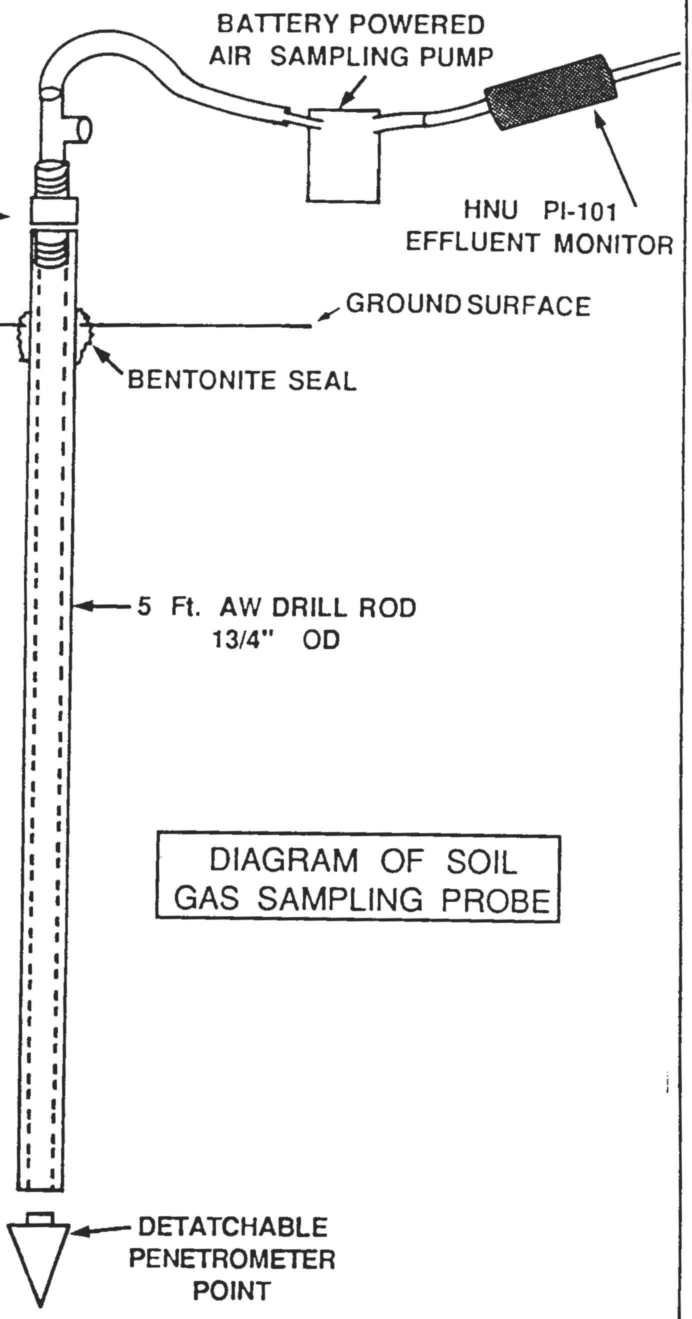


DIAGRAM OF SOIL GAS SAMPLING PROBE

SENECA ARMY DEPOT

SWMU CLASSIFICATION REPORT

SOIL GAS
SAMPLING PROBE

SEPTEMBER 1991

MAIN
1893
CHAS. T. MAIN, INC., Engineers
BOSTON . CHARLOTTE . PASADENA

found to be present. If no increase in the concentration of soil gas is determined by the effluent monitoring then purging will be performed for a minimum of 5 minutes. After 5 minutes of purging, a soil gas sample is collected through a septum port using a gas-tight gas sampling syringe.

7. The sample is then injected into the portable gas chromatograph for analysis.

8. The drilling rod is removed from the ground using the drill rig and the probe hole is backfilled with bentonite to prevent infiltration of surface water. Drilling rods will be steam cleaned after each use. Other sampling equipment (e.g., drill couplings, sampling syringes, tubing, etc.). will be decontaminated after each use according to the decontamination procedures outlined in Section 4.5 of this appendix. All syringes will be decontaminated prior to field use and checked for cleanliness by running blanks.

9. The sampling locations will be marked in the field so that a land surveyor can produce coordinates and elevations for them.

3.7.4 Analytical Support

Soil samples are analyzed in the field using a portable gas chromatograph to facilitate real time data acquisition. A simplified explanation of the analytical procedure is provided in the following paragraphs.

The gas chromatograph instrument separates compounds in a chromatographic column (selected on a site-specific basis) and detects and quantifies the compounds using a detector. After a sample is introduced to the chromatograph, it is carried by a carrier gas through the column. Different compounds pass through the column at different rates, resulting in a characteristic "retention time" for each compound. By comparison with standards, this retention time can be used to identify compounds. The detector responds to the presence of compounds by producing an electric current. The magnitude of this current can be used, when compared to standards, to determine concentrations of compounds present in the sample.

The analytical system to be utilized for this program is the portable Photovac 10S50 gas chromatograph. This instrument is equipped with a heated capillary column and an on-board peak integrator. The detector for this instrument is the Photoionization Detector (PID). The PID is ideal for detecting volatile organic compounds which contain aromatic rings and unsaturated double bonds.

Quantitative analysis of soil gas requires quantitative gas standards. Gas standards will be prepared by a gas standard vendor such as Scott Specialty Gas or Canaan Scientific Products, Inc. The gas standard mixture will include trichloroethene, 1,2-dichloroethene, benzene, toluene, and xylene, each at concentrations of approximately 100 ppmv. This standard mixture will be certified by the standard manufacturer and a certificate of analysis will accompany the gas standard. All field calibration standards will be prepared from this certified gas standard. Dilutions will be made from this standard by injecting a known volume of calibration gas into a clean glass sampling bulb of known volume.

Since the intent of the soil gas program is to indicate the presence of elevated concentrations of volatile organic compounds, soil gas results will be expressed as total volatile organic compounds as trichloroethene. If retention time matches between the soil gas sample and the calibrated gas standard are within ± 1 sec. then individual compounds detected in the soil gas will be reported. However, since the soil gas program is a screening program determination of individual organic compounds is not critical to the detection and delineation of likely source areas.

A detailed description of the analytical procedures is as follows:

Calibration Procedures and Frequency

The analytical instrument will be calibrated each day prior to the analysis of a sample.

Gas Standards

Gas standards will be prepared from certified pre-calibrated compressed gas cylinders. Compressed gas standards offer advantages in time savings and ease of use. However, they are limited to only those compounds within the cylinder. The VOC concentrations will be traceable to National Bureau of Standards (NBS) standards.

The calibration procedure is as follows:

1. A two stage pressure regulator is attached to the cylinder for gas removal.

2. A clean, labeled, glass gas sampling bulb (approx. 125 ml), with a teflon connection is placed over the second stage effluent port. The teflon stopcocks at both ends are opened.

3. The diaphragm of the regulator is turned counterclockwise until the pressure in the diaphragm is unnoticeable by the hand.

4. The cylinder valve is opened. The first stage pressure will indicate the current cylinder pressure.

5. The second stage pressure is increased to 2 psig by turning the regulator valve clockwise.

6. Gas should be heard passing through the bulb as the second stage pressure is increased. The bulb is allowed to purge for approximately 10 seconds. The teflon stopcock furthest from the regulator is closed, then, the stopcock closest to the regulator is closed. The gas is now captured within the glass bulb at the delivery pressure of the regulator.

7. Using a gas-tight, designated syringe, an appropriate volume of captured gas will be removed from the bulb through the silicone septum and injected into the clean sampling bulb.

8. The Response Factor (RF) for each analyte is obtained as the ratio of the gas concentration injected and the area under the peak produced by that injection. This integration is performed electronically by the on-board electronic integrator.

9. Response factors will be obtained for each analyte listed in the gas standard.

10. For constant volume injections, the RF represents the concentration of analyte per unit area of instrument response. It is obtained by injecting a known concentration of analyte into the instrument and dividing the concentration by the area of the peak observed on the chromatogram. The analyte concentration in an unknown soil gas sample is determined by injecting an equal volume of gas into the gas chromatograph. The peak area obtained from the unknown sample is multiplied by the RF to determine the actual concentration of the analyte injected.

    The RF allows conversion of peak areas into concentrations for the contaminants of interest. The RF used is changed if the standard response varies 50%. If the standard injections vary by more than 50% the standard injections are repeated. If the mean of the two standard injections represents greater then 50% difference than a third standard is injected and a new RF is calculated from the three standard injections. A new data sheet is started with the new RFs and calibration data.

$$\%\ Difference = \frac{A\ area - B\ area}{A\ area}$$

Where: A = mean peak area of standard injection from first calibration
B = peak area of subsequent standard injection

The low peak standards will be made fresh daily.

A two point calibration curve will be performed daily, one point will be approximately 0.5 ppmv and the second point will be at approximately 5 ppmv. Dilutions of the calibrated gas standard will be performed using gas-tight syringes and injecting appropriate volumes into clean gas-tight gas sampling bulbs of known volume.

11. Syringe blanks will be performed for each syringe to be used prior to analysis. Syringes will be cleaned with Alconox or equivalent detergent and brush daily. They will be baked out in an oven at a minimum temperature of 60°C. for a minimum of 1 hour prior to use.

12. System blanks are ambient air drawn through a probe not installed in the ground and through the complete sampling apparatus. This air is analyzed by the same procedure as a soil gas sample. One system blank will be run at the start of each day from the batch of probes to be used.

13. A duplicate field sample will be taken after every 20 sample locations or at a minimum of one per day.

14. Field notebooks will be kept detailing the sample identification and amount of sample injected.

The following system parameters will also be noted:

a) Gas flows for the ultra pure air
b) Tank pressures for the ultra pure air
c) Integrator parameters
    1) Gain and baseline offset
d) Column
    1) type
    2) length and diameter
    3) packing material
    4) temperature
e) Operator
f) Date and time

If any system parameters change, the chromatograms are labelled with the changes noted.

15. Sample Documentation - The field notebooks will allow for full traceability of results. The response factors used and how they were calculated will be noted. The sample number, time, amount injected and the peak are noted.

    The actual chromatogram can be traced from this information. The sample concentration is calculated using the RF, amount injected and peak area for the component of interest.

3.7.5 Data Interpretation

Data interpretation is an important element of the soil gas analysis. The acquired vapor phase concentrations are evaluated to determine the relationship between soil gas and source soils.

When examining chromatographs and comparing peak heights, several factors must be considered. Retention times (used to identify compounds) will vary with operating temperature and carrier gas flow rate. The detector responds to mass, not necessarily the concentration of the gas. Consequently, the sample volume injected into the chromatograph is important when interpreting output. "Gain", the degree of electronic amplification of the signal from the detector, must also be considered. If concentrations and volumes of two samples are equal, peak height will be higher in the one analyzed using a higher gain. Typically, large sample volumes and, if necessary, high gains are used to detect very low concentrations.

Typically, the soil gas survey is used to provide screening data, identifying areas where compounds are present and the total volatile organic concentration. This is primarily accomplished by expressing the concentrations of compounds as the trichloroethene equivalents. Various volumes and concentrations of trichloroethene gas reference standards are injected under similar operating conditions as those for the unknown samples. Quantification of VOCs in the samples is accomplished by comparing the area of the compound peaks on the sample chromatogram with the area of the trichloroethene reference standard peak. This is most often accomplished by the instrument integrator, however, it can be accomplished manually.

The soil gas data will be tabulated by relating each location to a specific concentration of total volatile organic compound, expressed as trichloroethene equivalents. Additionally, individual volatile organic peaks will be quantified, such as trichloroethene, providing a reasonable retention time match can be obtained, ± 1 sec. This data will also be presented on a site map with each sampling location assigned a specific soil gas concentration. Soil gas isocontours will then be interpreted from the obtained data, thereby identifying approximate boundaries for likely source areas.

3.8 SAMPLING PROCEDURES FOR PROPELLANTS AND OTHER MATERIALS

3.8.1 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).

3.8.2 Asbestos

Pipes within some of the buildings may have been wrapped with an insulating material containing asbestos. Samples of this insulation material will be collected using appropriate health and safety procedures by picking it up by hand and placing it into a glass or plastic, wide-mouth bottle. Sampling data will be recorded on the Sampling Record for soils (Figure A-3).

3.8.3 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.

3.8.4 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.

3.8.5 General Sampling Information

The locations and number of samples of each of these materials are described in Section 5.2 of the Work Plan. Health and Safety procedures of a SWMU-specific basis are described in the Health and Safety Plan.

3.9 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-14 is an example of a sample label.

A Chain-of-Custody form (Figure A-15) 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.

FIGURE A-14

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. ____
PROJECT ____
CONTACT ____

LABORATORY ____
ADDRESS ____
CONTACT ____

DELIVERY DATE ____
DATE FINAL REPORT DUE ____
PROJECT MANAGER'S INITIALS ____

		SAMPLING				ANALYSES											
SAMPLE NO.	LABORATORY SAMPLE NO.	DATE	TIME	SAMPLE DEPTH	SAMPLE TYPE	VOA	ABN	METALS	PEST/PCB	PET. ID	O & C					NO. OF CONTAINERS	COMMENTS (Special instructions, cautions, etc.)

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											
Preservative											
Container Volume											
VOA Vial											SOLID
Glass Jar											
Plastic Jar											
Preservative											
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-15

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 BUILDING
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 TEN
SOLID WASTE MANAGEMENT UNITS
ROMULUS, NEW YORK

PREPARED BY: Jason W. Cupp

APPROVED BY: for Phil Hunt
Health and Safety Officer

APPROVED BY:
Project Manager

JANUARY, 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 ten solid waste management units (SWMUs) at Seneca Army Depot, Romulus, New York.

The following SWMUs are the subject of this investigation:

SEAD-4, The Munitions Washout Facility Leach Field,
SEAD-11, The Old Construction Debris Landfill,
SEAD-13, The IRFNA Disposal Site,
SEAD-16, The Building S-311 - Abandoned Deactivation Furnace,
SEAD-17, The Building 367 - Existing Deactivation Furnace,
SEAD-24, The Abandoned Powder Burning Pit,
SEAD-25, The Fire Training and Demonstration Pad,
SEAD-26, The Fire Training Pit,
SEAD-45, The Demolition Area, and
SEAD-57, The Explosive Ordnance Disposal Area.

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 Parsons Main personnel engaged in on-site hazardous waste operations. Subcontractors working for Parsons Main must conform to this Health and Safety Plan unless they prepare and administer a plan with equivalent requirements. All Parsons Main and Parsons Main 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 Parsons Main 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 Parsons Main site personnel and Parsons Main 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. Parsons Main's Site Manager, responsible for all Parsons Main personnel and Parsons Main'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 ordinance 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 Main, Main's subcontractors, USEPA, NYSDEC, or Seneca Army Depot will not be allowed into active work areas without making arrangements with Seneca and Main 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 Parsons Main'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 Parsons Main'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.

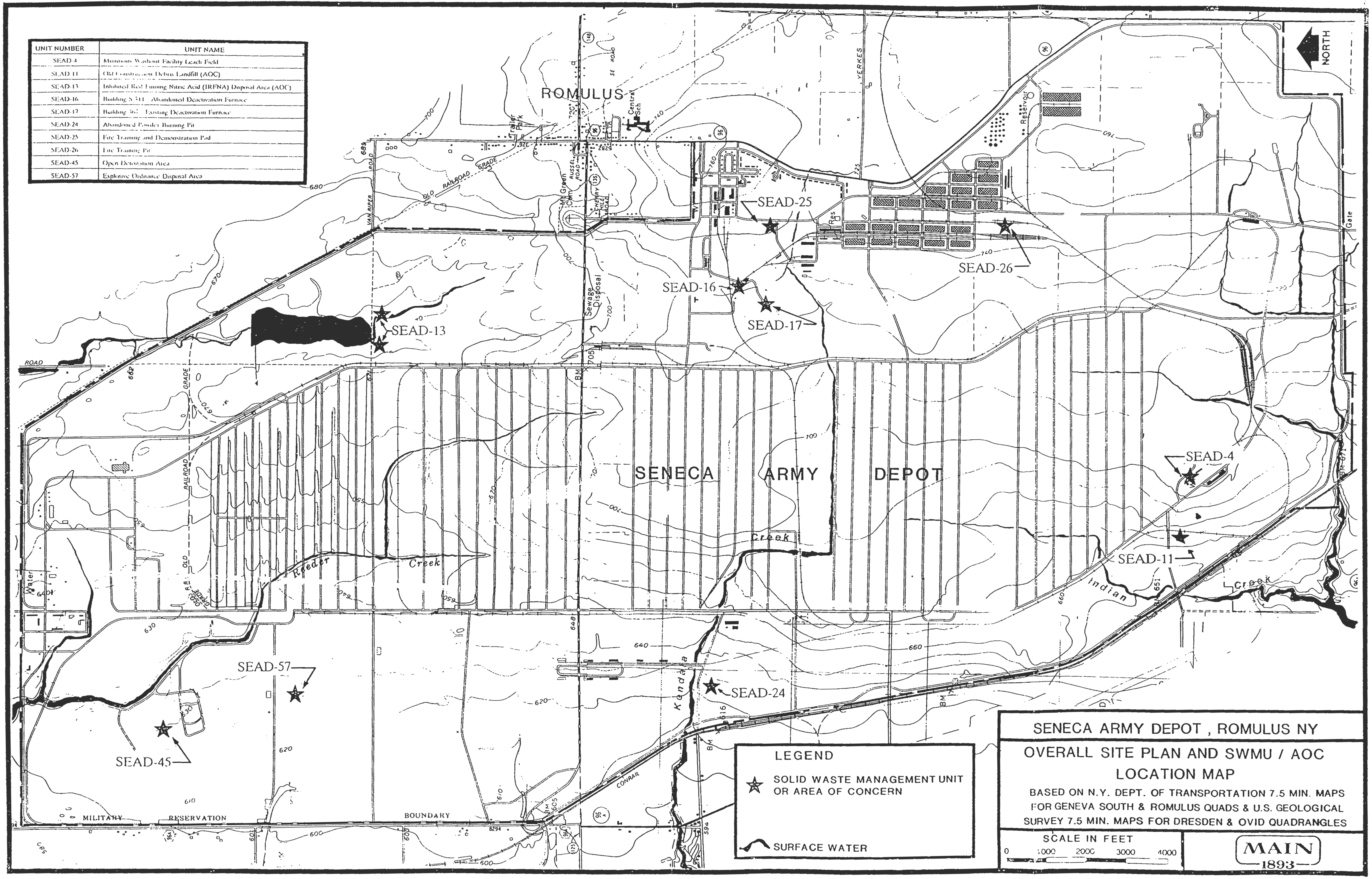
3. RCRA Facility Assessment at SEAD in July 1988, Additional SWMUs.

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 radio nuclides) 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



UNIT NUMBER	UNIT NAME
SEAD-4	Munitions Washout Facility Leach Field
SEAD-11	Old Construction Debris Landfill (AOC)
SEAD-13	Inhibited Red Fuming Nitric Acid (IRFNA) Disposal Area (AOC)
SEAD-16	Building S-311 - Abandoned Deactivation Furnace
SEAD-17	Building 367 - Existing Deactivation Furnace
SEAD-24	Abandoned Powder Burning Pit
SEAD-25	Fire Training and Demonstration Pad
SEAD-26	Fire Training Pit
SEAD-45	Open Detonation Area
SEAD-57	Explosive Ordnance Disposal Area

LEGEND

☆ SOLID WASTE MANAGEMENT UNIT OR AREA OF CONCERN

SURFACE WATER

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

2.2 PLANNED SITE ACTIVITIES

The field activities at the SWMUs include the following tasks: UXO detection and clearance by UXB, Inc.; geophysical surveying; soil gas surveys; 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 ten SWMUs will be the surface and subsurface soils and groundwater. These media may be contaminated with heavy metals and explosive compounds. 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 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.

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.

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.

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. There may water sources at some sites, such as 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.

Test Pitting - 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.

Soil Gas Survey - The primary exposure pathway during the soil gas survey will be contact with contaminated surface soils. There is a small chance of exposure to soils or contaminants adhering to the soil gas probe. Inhalation exposure to soil gas components may occur during the sampling and analysis.

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 COMPOUNDS DETECTED AT ELEVEN SWMUs AT SENECA

		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	–	–	–	A
	Barium	0.5	–	–	–	–
	Cadmium dust	0.2	–	0.6	–	B1
	Chromium (VI)	0.05	–	0.1	–	A
	Copper	1.0	–	–	–	D
	Lead	0.05	–	–	–	B2
	Mercury	0.01	0.03	0.1	–	D
	Nickel	0.1	–	–	–	A
	Selenium	0.2	–	–	–	(6)
Volatiles						
	Benzene	3.2	16	–	–	A
	Toluene	375	560	1125	–	D
	Xylene	435	655	–	–	D
Acids	IRFNA(8)					
	(Nitric Acid)	5.0	10	–	–	–
	Nitrogen Dioxide	-	1.8	–	–	–
	Hydrogen Fluoride	2.5	5.0	–	–	–
Explosives						
	HMX	–	–	–	1.5(7)	–
	RDX	–	–	–	1.5(7)	C
	2,4,6-TNT	0.5 (skin)	–	–	–	(6)
	2,6-DNT	1.5 (skin)	–	–	–	B2
	2,4-DNT	1.5 (skin)	–	–	–	B2

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) Substance identified as suspected or confirmed human carcinogen by agency other than USEPA.
(7) Sitting, 1991
(8) Inhibited red fuming nitric acid (IRFNA).

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.

Asbestos - Asbestos is a confirmed human carcinogen, causing cancers of the lungs, gastrointestinal tract, and the lining of the chest and abdominal cavity. Asbestos also causes asbestosis, a permanent, progressive, scarring disease of the lungs which causes labored breathing and usually leads to premature death due to infection, associated heart disease, or 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.

Hydrofluoric acid - Hydrofluoric acid and hydrogen fluoride are extremely corrosive to body tissues and cause severe burns. The acid can penetrate the skin, destroying tissues and even bone beneath. Burns may only be perceptible hours after the exposure and may be slow to heal. Inhalation exposure can result in irritation of nose and eyes and may produce fluorosis and pulmonary edema.

Lead - Lead has no local toxic effects. Systemic poisoning symptoms are non-specific: fatigue, headache, poor sleeping, aching bones and muscles, constipation, abdominal pains, and decreased appetite. All these symptoms are reversible with time away from exposure. Continued exposure results in anemia, pallor, "lead line" on the gums, and decreased hand grip strength. Lead also has central nervous systems effects and has been implicated in producing learning deficiencies in exposed children. Compounds of lead display a variety of toxic effects that are more specific to the compound than to lead. Some of these compounds have been found to be carcinogenic in experimental animals.

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.

Nitric Acid - Nitric acid is strongly corrosive, producing yellow burns on the skin. Inhalation of nitric acid mist can cause bronchitis and chemical pneumonitis and the vapor and mist may corrode teeth.

Nitrogen Dioxide - Nitrogen dioxide is a highly toxic gas, causing irritation to eyes, nose, throat and respiratory system. Symptoms include cough, frothy sputum, chest pain, dyspnea, congestion, inflammation of the lungs, and cyanosis. Even short exposures can result in severe symptoms. One or two minutes exposure at 200 ppm can be fatal to humans.

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.

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.

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 ordinance 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 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.

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 ordinance detection and clearance;

4. Soil boring and sampling;
5. Surface water and sediment sampling;
6. Test pit excavation;
7. Soil gas surveys, and
8. 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 ordinance contact; abrasions, contusions, lacerations, etc. resulting from use of power tools; and elevated noise levels. The potential for such hazards necessitates that all onsite personnel wear 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-sites and en route to and from sites in accordance with state and local motor vehicle regulations for speed, lights and warnings, passenger carrying, and operation. If any equipment is left unattended at night adjacent to a highway in use, it will be provided with suitable barricading, lighting, reflectors, or other suitable visual warnings to identify its location.

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

Hand and audible (horn) signals to equipment operators will be the commonly accepted industry standard signals for the type of equipment being used. All signals will be reviewed by the operator and signaller before work begins. Only one person will signal the equipment operator at any 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 skins 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. No radioactive materials are known to be in the ten 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 Working Practices and Engineering Controls
- 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 involved in hazardous work on the site 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 Parsons Main 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 ten 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 Parsons Main 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 Parsons Main'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 Parsons Main personnel are kept on file by Parsons Main for at least 30 years plus the length of employment. Medical monitoring for Parsons Main employees is the responsibility of Parsons Main, and Parsons Main 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 ten 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 ordinance 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 Parsons Main 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 monitor (HNu photoionization detector (PID) equipped with a 10.2 V lamp, Thermoelectron Organic Vapor Monitor (OVM), or OVA flame ionization detector (FID)). Instrument settings on all direct reading air monitoring instruments will be set on the most sensitive scale (i.e., OVA: X1; HNu: 0-20 ppm) 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 (stranger 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 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 Parsons Main's Personal Protective Equipment Program, contained in Attachment E, Parsons Main'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 Parsons Main's Personal 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 RESPIRATOR, CARTRIDGE OR CANISTER SKIN PROTECTION - HOODED POLY-COATED TYVEK OR SARANEX COVERALL* INNER LATEX GLOVES* OUTER NEOPRENE GLOVES* NEOPRENE BOOT COVERS*
LEVEL B	LEVEL C PROTECTIVE EQUIPMENT EXCEPT FOR: RESPIRATORY PROTECTION - FULL FACEPIECE SELF-CONTAINED BREATHING APPARATUS (SCBA) INSTEAD OF RESPIRATOR

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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
Confined Space Entry	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 ordinance (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.

8.2 PERSONAL HYGIENE PRACTICES

The following personal hygiene practices will apply to field work conducted at the SEAD SWMUs 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 UXO's 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

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

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

Confined space entry may be required during the investigations of the Abandoned Deactivation Furnace (SWMU 16). For details of this procedure consult Attachment F of this plan.

9.0 UNEXPLODED ORDNANCE

Some areas of the site 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)

<u>2</u> Base Detonating (BD)
<u>3</u> Point Initiating Base Detonating - Lucky (PIBD-Lucky)
<u>4</u> Mechanical Time (MT)
<u>5</u> Electronic Time (ET)
<u>6</u> Proximity (VT)
<u>7</u> Powder Train Time Fuze (PTTF)
<u>8</u> All-Ways Acting (as in the 40 mm grenade system)

<u>NOTE:</u> **<u>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.</u>**

(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.

<u>NOTE:</u> **<u>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.</u>**

(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.

NOTE: **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.**

(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.

NOTE: **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:**

- **HEAT with a PIBD -Lucky fuzing system**

- **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 disposable of 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, 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 and 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 with 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 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 ten 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.

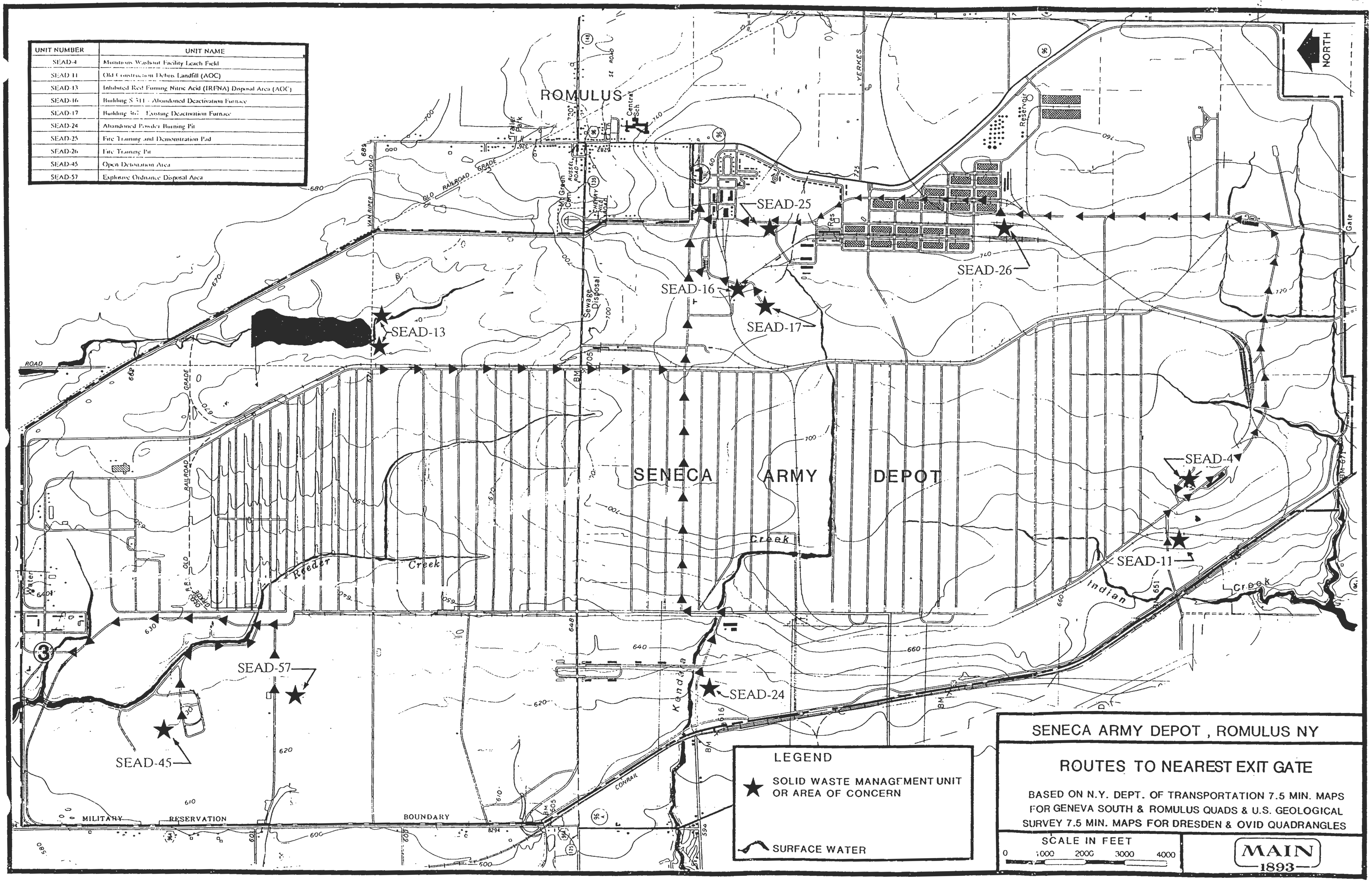
When the incident is minor, the work may continue. When an incident is considered serious, work will be discontinued until the emergency situation has been brought under control, the incident has been evaluated, and any conditions which may have contributed to the emergency have been mitigated.

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



UNIT NUMBER	UNIT NAME
SEAD-4	Munitions Washout Facility Leach Field
SEAD-11	Old Construction Debris Landfill (AOC)
SEAD-13	Inhibited Red Fuming Nitric Acid (IRFNA) Disposal Area (AOC)
SEAD-16	Building S-311 - Abandoned Deactivation Furnace
SEAD-17	Building 367 - Existing Deactivation Furnace
SEAD-24	Abandoned Powder Burning Pit
SEAD-25	Fire Training and Demonstration Pad
SEAD-26	Fire Training Pit
SEAD-45	Open Detonation Area
SEAD-57	Explosive Ordnance Disposal Area

LEGEND

★ SOLID WASTE MANAGEMENT UNIT OR AREA OF CONCERN

SURFACE WATER

SENECA ARMY DEPOT , ROMULUS NY

ROUTES TO NEAREST EXIT GATE

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

MAIN 1893

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 ordinance (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 Parsons Main Site Safety Officer will provide advice on the 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

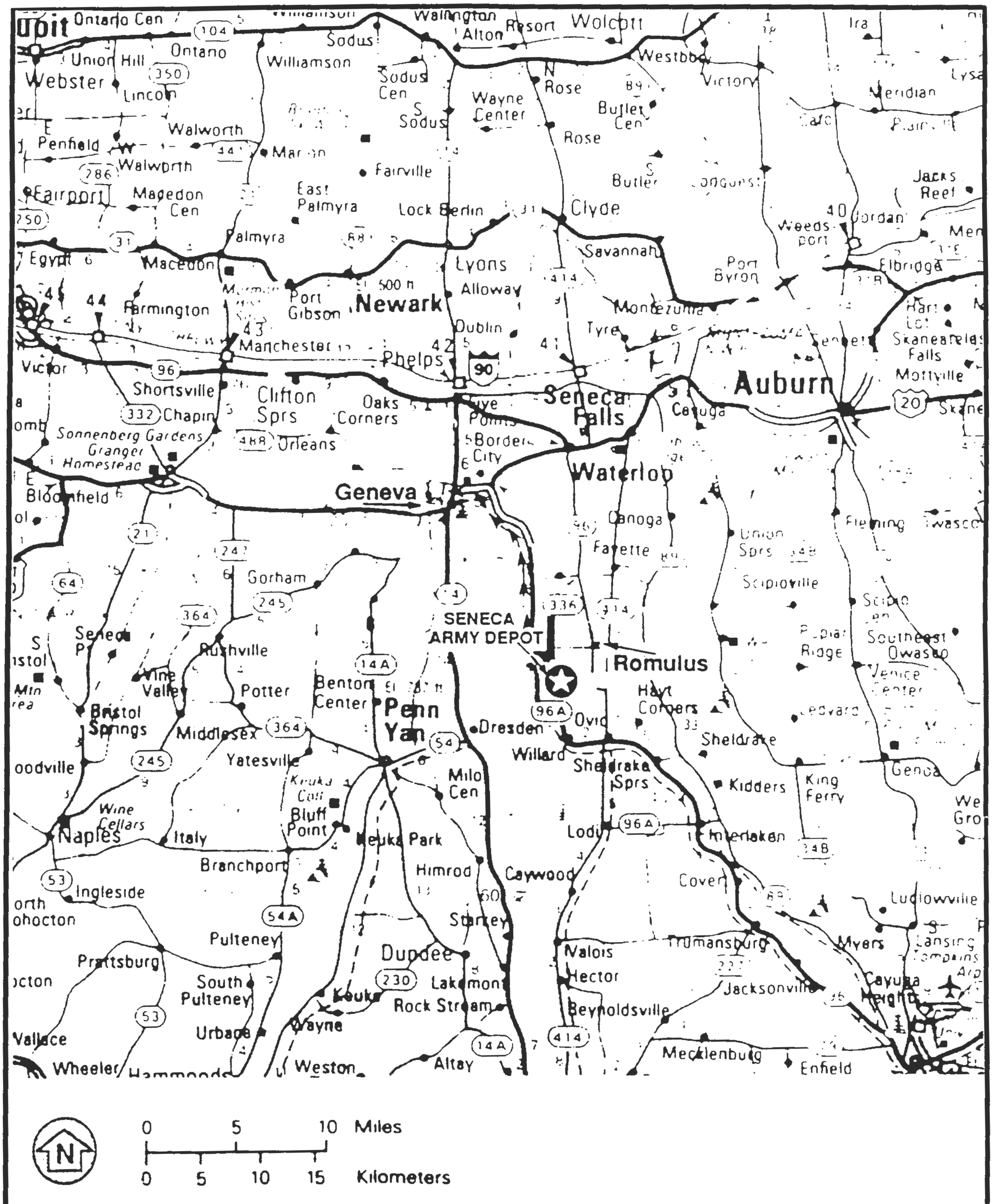
Directions to the nearest hospital are shown and described in Figure B-3, Route to Seneca Hospital. The map will be displayed in the command post and kept in every site vehicle.

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) 869-0274
Seneca Army Depot Clinic		(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 Hooper, Sr. -	HFA Senior EOD Field Supervisor	(301) 743-2377
Michael Duchesneau -	MAIN Project Manager	(617) 859-2492
Phillip Hunt -	MAIN Health and Safety Officer	(617) 859-2590



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-4: MUNITIONS WASHOUT FACILITY LEACH FIELD

SEAD SWMU#4 includes the Munition Washout Facility, a leach field, a drainage ditch from the leach field to a pond, the pond, and a number of possible disposal areas near the washout facility and the pond.

The Munitions Washout Facility Leach Field is approximately 150 feet long by 80 feet wide. At present, the foundation of the washout plant is still visible, but no visual evidence of the leach field is observable (Figure BA-1).

Operations at this unit included dismantling and removing explosives (e.g., TNT, RDX, HMX) from munitions by steam cleaning. This operation produced explosive solids and wastewater. The solid explosives were transported to the burning grounds for thermal destruction. The wastewater contained dissolved explosives such as TNT, RDX, HMX and tetryl and other chemical impurities such as trinitrobenzene and heavy metals. It should be noted that TNT, RDX, HMX and Tetryl are the most probable explosive contaminants. The actual explosives in the wastewater are unknown. It was reported that the wastewater was processed through sawdust to remove any solid explosive residues prior to being discharged to an area where it leached into the ground or flowed into a nearby ditch. The ditch possibly discharged to a pond located west of the facility. The U.S. Army Environmental Hygiene's Ground Water Contamination Survey No. 38-26-0868-88 stated that the remaining wastewater discharged into an area near Building 2084. Recently, it was reported from an employee that the remaining wastewater discharged into an area near Building 2079.

1-2 POTENTIAL CHEMICAL CONTAMINANTS

2,4,6-TNT
2,4-DNT
2,6-DNT
RDX
HMX
Trinitrobenzene
Tetryl
Heavy metals

1-3 PHYSICAL HAZARDS

- Pond
- Moderate Explosive Potential

1.4 FIELD WORK

UXO clearance will be completed prior to beginning each task.

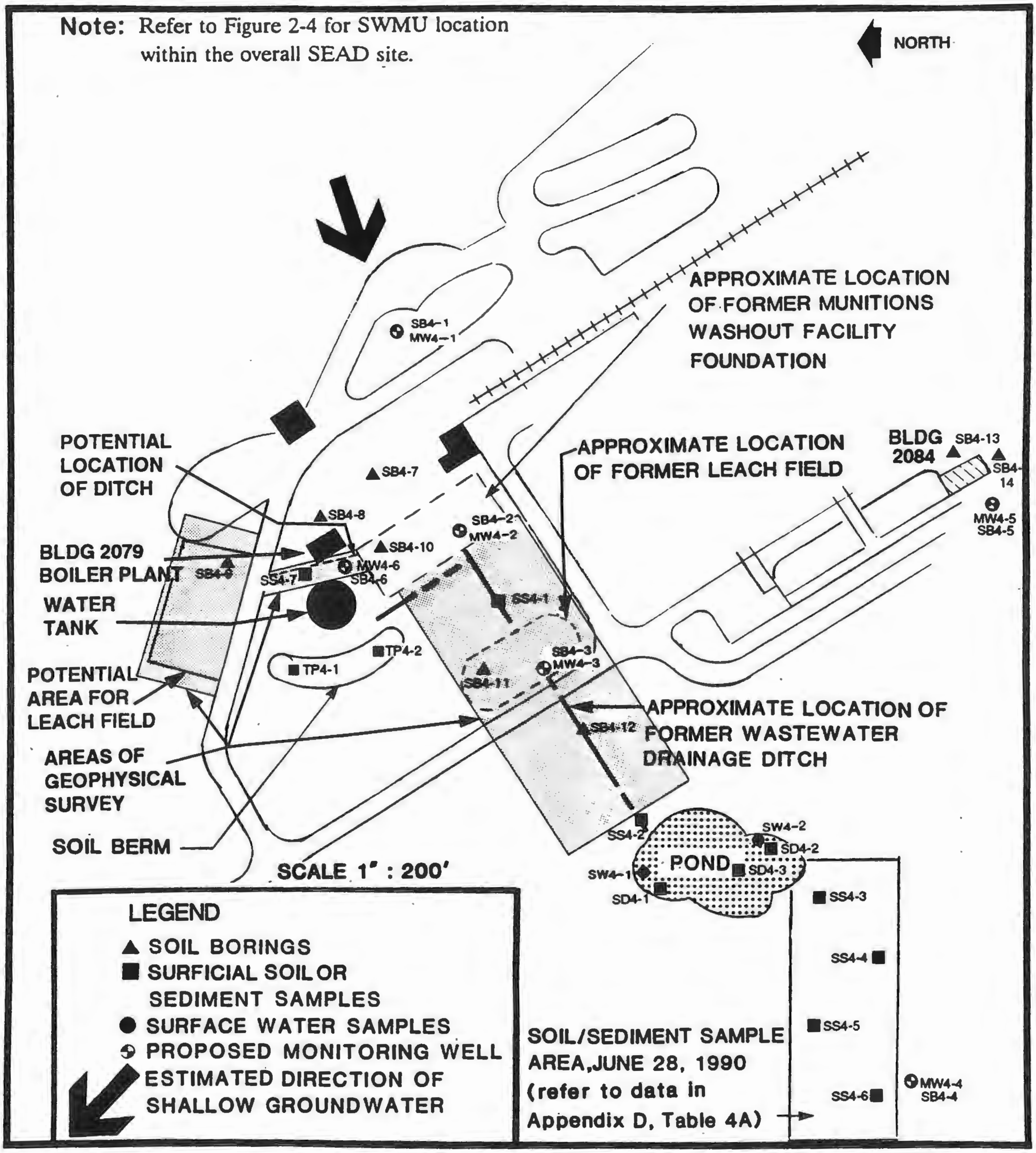
- Surface Soil Sampling
- Soil Borings
- Install, Develop and Sample Groundwater Monitoring Wells
- Sediment Sampling
- Surface Water Sampling
- Geophysical Surveys
- Test Pits

1-5 MONITORING TO BE PERFORMED

Geophysical Survey will be utilized to determine the presence of buried objects or structures. A PID or OVM meter will be used to screen for volatiles. Particulate monitoring will be performed during excavation of test pits.

1-6 TASK SPECIFIC SAFE OPERATING GUIDELINES

No. 1 Soil Boring - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Well Development and Sampling - Level D
No. 12 Test Pit Excavation - Level B
No. 16 Sediment Sampling - Level D
No. 19 Surface Water Sampling - Level D
No. 22 Surface Soil Sampling - Level D
No. 28 Geophysical Survey - Level D



Note: Refer to Figure 2-4 for SWMU location within the overall SEAD site.

FIGURE BA-1 SITE PLAN FOR SEAD-4: MUNITIONS WASHOUT FACILITY LEACH FIELD

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1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #4 Munitions Washout Facility Leach Field

3. Hazards
    - Inhalation : Semi-volatile compounds, contaminated soil and dust
    - Contact : Heavy metals and explosive compound in soil and water
    - Explosion : Explosive compounds in soil
    - Physical : Exercise caution when work activity is close to the pond.

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 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 for VOCs and radiation.

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.

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, NY

2. Location : SEAD SWMU #4 Munitions Washout Facility Leach Field

3. Hazards
   Inhalation : Bentonite and cement dust
   Contact : Heavy metals and explosive compounds in soil and groundwater
   Explosion : Explosive compounds in soil
   Physical : Exercise caution when work activity is close to the pond.

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.

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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.

WELL DEVELOPMENT AND SAMPLING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 7
page 1 of 2

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #4 Munitions Washout Facility Leach Field

3. Hazards
   - Inhalation :
   - Contact : Heavy metals and explosive compounds in groundwater
   - Explosion : TNT, RDX, HMX are explosives compounds
   - Physical : Exercise caution when work activity is close to the pond.

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-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Monitor well headspace upon opening. If readings are elevated, let well air out and monitor again. If readings are still elevated, upgrade PPE.

   : 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/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 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.

   : Place wastewater receiving drum on stable, flat surface with access for later 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 coveralls (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.

TEST PIT EXCAVATION
LEVEL B

TASK SPECIFIC
SAFE OPERATING GUIDELINE 12

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1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #4, Munitions Washout Facility

3. Hazards
   - Inhalation : Semi-volatile compounds, contaminated soils and dust
   - Contact : Heavy metals and explosive compounds in soil
   - Explosion : Explosive compounds in soil
   - Physical : Heavy machinery, excavation, slippery soils near pond.

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 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 test pit 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 perfom rescue in Level B.

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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, NY

2. Location : SEAD SWMU #4 Munitions Washout Facility Leach Field

3. Hazards
    - Inhalation :
    - Contact : Heavy metals and explosive compounds in sediments
    - Explosion :
    - Physical : Poor footing, slippery soils.

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 sampling. Downwind monitoring should be conducted 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 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 : Use only safe access routes to edge of water.

    : Get stable footing and secure work area prior to taking samples.

---

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 Remove and discard overboots.
Step 3 Remove and discard outergloves.
Step 4 Remove and discard coveralls (if worn).
Step 5 Remove respirator (if worn).
Step 6 Remove inner gloves.
Step 7 Wash hands and face.

Change of APR cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #4 Munitions Washout Facililty Leach Field

3. Hazards
   - Inhalation :
   - Contact : Heavy metals and explosive compounds in water
   - Explosion :
   - Physical : Exercise caution when working close to the water source.

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),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.

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 : Use only safe access routes to edge of water.

   : Get stable footing and secure work area prior to taking samples.

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.

SURFACE SOIL SAMPLING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 22

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #4 Munitions Washout Facility Leach Field

3. Hazards
    - Inhalation : Fugitive dusts contaminated with heavy metals and explosive compounds
    - Contact : Heavy metals in soil
    - Explosion : Explosive compounds in soil
    - 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 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 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 : Check surface soils for possible contamination before sampling.

: Do not kneel or sit on ground in areas of potential contamination.

: Always assume the presence of suspected compound when conducting sampling.

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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 respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

Change of APR cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

GEOPHYSICAL MONITORING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDLINE 28

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #4 Munitions Washout Facility Leach Field

3. Hazards
   - Inhalation :
   - Contact : Heavy metals and explosive compounds in soil
   - Explosion :
   - Physical : Avoid any objects along the survey lines which may cause injury. Exercise caution when work activity is close to the pond.

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 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 cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

3-1 PHYSICAL DESCRIPTION AND ACTIVITIES PERFORMED ON SEAD-11: OLD CONSTRUCTION DEBRIS LANDFILL

The Old Construction Debris Landfill covers approximately 4 acres (590 feet by 300 feet) is currently abandoned and the surface is vegetated with grasses and weeds. Operating practices of the landfill are not known (Figure BA-3).

3-2 POTENTIAL CHEMICAL CONTAMINANTS

Contents mostly unknown.

- PCBs
- VOC
- SVOs
- explosive compounds
- heavy metals.

3-3 PHYSICAL HAZARDS

- Unexploded Ordnance
- Metal Debris
- Rough Terrain
- Protruding Debris

3-4 FIELD WORK

UXO clearance will be completed prior to beginning each task.

- Geophysical Survey
- Test Pits
- Soil Boring
- Install, Develop and Sample Groundwater Monitoring Wells
- Soil Gas Surveys

3-5 MONITORING TO BE PERFORMED

Geophysical survey will be utilized to determine the presence of buried objects. A PID will be used to screen for volatiles. Particulate monitoring will be performed during excavation of test pits. A gas chromatograph will be used to analyze soil gas samples.

3-6 TASK SPECIFIC SAFE OPERATING GUIDELINES

No. 1 Soil Boring - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Monitoring Well Development & Sampling - Level D
No. 12 Test Pits - Level B
No. 28 Geophysical Survey - Level D
No. 31 Soil Gas Survey - Level D

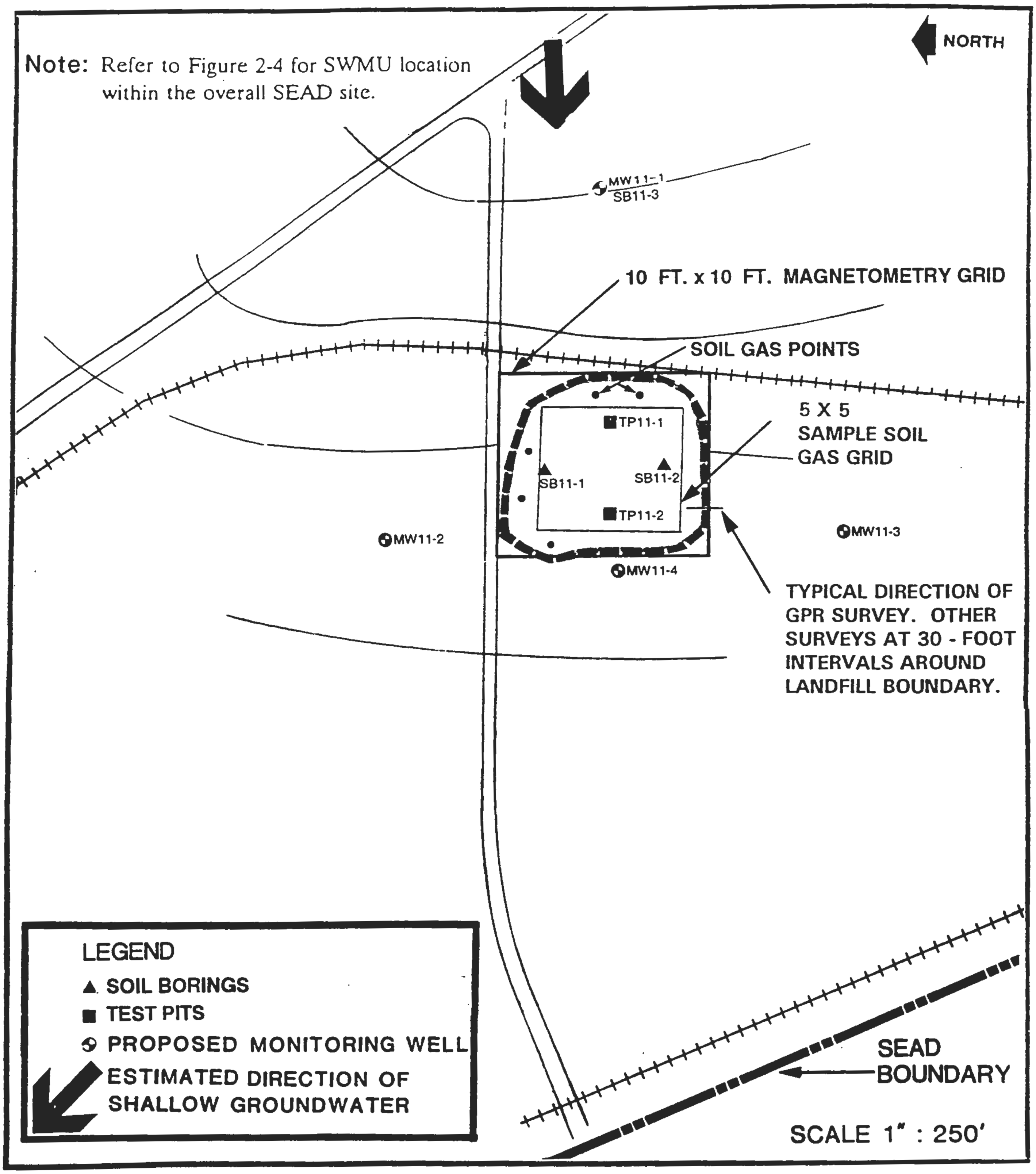

FIGURE BA-3 SITE PLAN FOR SEAD-11: OLD CONSTRUCTION DEBRIS LANDFILL

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1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #11 Old Construction Debris Landfill

3. Hazards
   - Inhalation : VOC's and SVOC's in soil
   - Contact : PCB's, heavy metals in soils
   - Explosion : Possible explosive compounds in soil
   - Physical : Metal debris or protruding objects; (Slip, trip, fall 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 be 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/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.

---

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, NY

2. Location : SEAD SWMU #11 Old Construction Debris Landfill

3. Hazards
    Inhalation : VOC's and SVOC's, bentonite and cement dust
    Contact : PCB's or heavy metals in soils
    Explosion : Possible explosive compounds in soil
    Physical : Metal debris or protruding objects; (Slip, trip, fall hazards).

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.

WELL DEVELOPMENT
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 7

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #11 Old Construction Debris Landfill

3. Hazards
   - Inhalation : VOC's and SVOC's contained in groundwater
   - Contact : PCB's, heavy metals in groundwater
   - Explosion :
   - Physical : Metal debris or protruding objects; slip trip, fall 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-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/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 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.

TEST PIT EXCAVATION
LEVEL B

TASK SPECIFIC
SAFE OPERATING GUIDELINE 12

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #11 Old Construction Debris Landfill

3. Hazards
   Inhalation : VOC's and SVOC's in soil
   Contact : PCB's, heavy metals in soils
   Explosion : Possible explosive compounds in soil
   Physical : Metal debris, protruding objects, slip, trip, fall hazard.

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.

	Exercise				
Instrument Actions Levels	**D**	**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.

Change of SCBA air tank can be performed after removal of outer gloves if coveralls are not grossly contaminated.

GEOPHYSICAL MONITORING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDLINE 28

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #11 Old Construction Debris Landfill

3. Hazards

   Inhalation : VOC's and SVOC's soil
   Contact : PCBs, heavy metals in soil
   Explosion : Explosive compounds possible
   Physical : Metal debris or protruding objects; slip, trip, fall hazards.

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.

Change of APR cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

SOIL GAS SAMPLING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 31

---

1. Site : Seneca Army Depot

2. Location : SEAD SWMU #11 Old Construction Debris Landfill

3. Hazards
    - Inhalation : VOC's and SVOC's contained in soil
    - Contact : PCB's, heavy metals in soils
    - Explosion : Possible explosive compounds in soil
    - Physical : Metal debris or protruding objects; slip, trip, fall 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) dust-mist/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 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 : Check surface soils for possible contamination before sampling.

    : Do not kneel or sit on ground in areas of potential contamination.

    : Do not vent soil gas pump effluent to enclosed space.

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 coveralls (if worn).
Step 6 Remove respirator (if worn).
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

Change of APR cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

4-1 PHYSICAL DESCRIPTION AND ACTIVITIES PERFORMED ON SEAD-13: IRFNA DISPOSAL SITE

The Inhibited Red Fuming Nitric Acid (IRFNA) Disposal Site consisted of six (6) pits which were 30 feet long, 8 feet wide and 4 feet deep. The pits were constructed by excavation with a bulldozer to a shale stratum 4 feet below ground. Following excavation, limestone was place in the bottom of the pits to a depth of approximately 2.5 feet and the sides of the pits were lined with limestone.

Barrels (18.8 gallon capacity) of unserviceable IRFNA were stored on pallets near the west end of the pits. A stainless steel ejector, operated by water pressure, was fitted into a barrel with water flowing through the ejector. The ejector discharged a mixture of water and IRFNA through a long hose under the standing water in the pit being used. Five minutes were required to empty a barrel. Ten barrels were usually discharged into a single pit during a day's operation. At present, the site has been abandoned and the exact location of the pits unknown (Figure BA-4).

4-2 CHEMICAL SUSPECTS

- Oxidizer Inhibited Red Fuming Nitric Acid (IRFNA)
- Nitric Acid ($HNO_{3)}$
- Nitrogen Dioxide (NO_2)
- Hydrogen Fluoride (HF)
- Nitrates
- Fluoride

4-3 PHYSICAL HAZARDS

- Metal Debris
- Rough Terrain

4-4 FIELD WORK

- Geophysical Survey
- Soil Boring
- Install, Develop and Sample Groundwater Monitoring Wells
- Sediment Sampling
- Surface Water Sampling

4-5 MONITORING TO BE PERFORMED

A geophysical survey will be performed to determine the presence and location of pits and IRFNA barrels. A PID will be used to screen for volatiles.

Direct reading indictor tubes for Hydrogen Fluoride (HF), Nitric Acid (HNO_3), acid gases and Nitrogen Dioxide (NO_2) will be used during intrusive activities.

4-6 TASK SPECIFIC SAFE OPERATING GUIDELINES

No. 3 Soil Boring Level B
No. 6 Installation Monitoring Wells Level B
No. 9 Development and Sampling of Monitoring Wells Level B
No. 16 Sediment Sampling Level D
No. 19 Surface Water Sampling Level D
No. 28 Geophysical Survey Level D

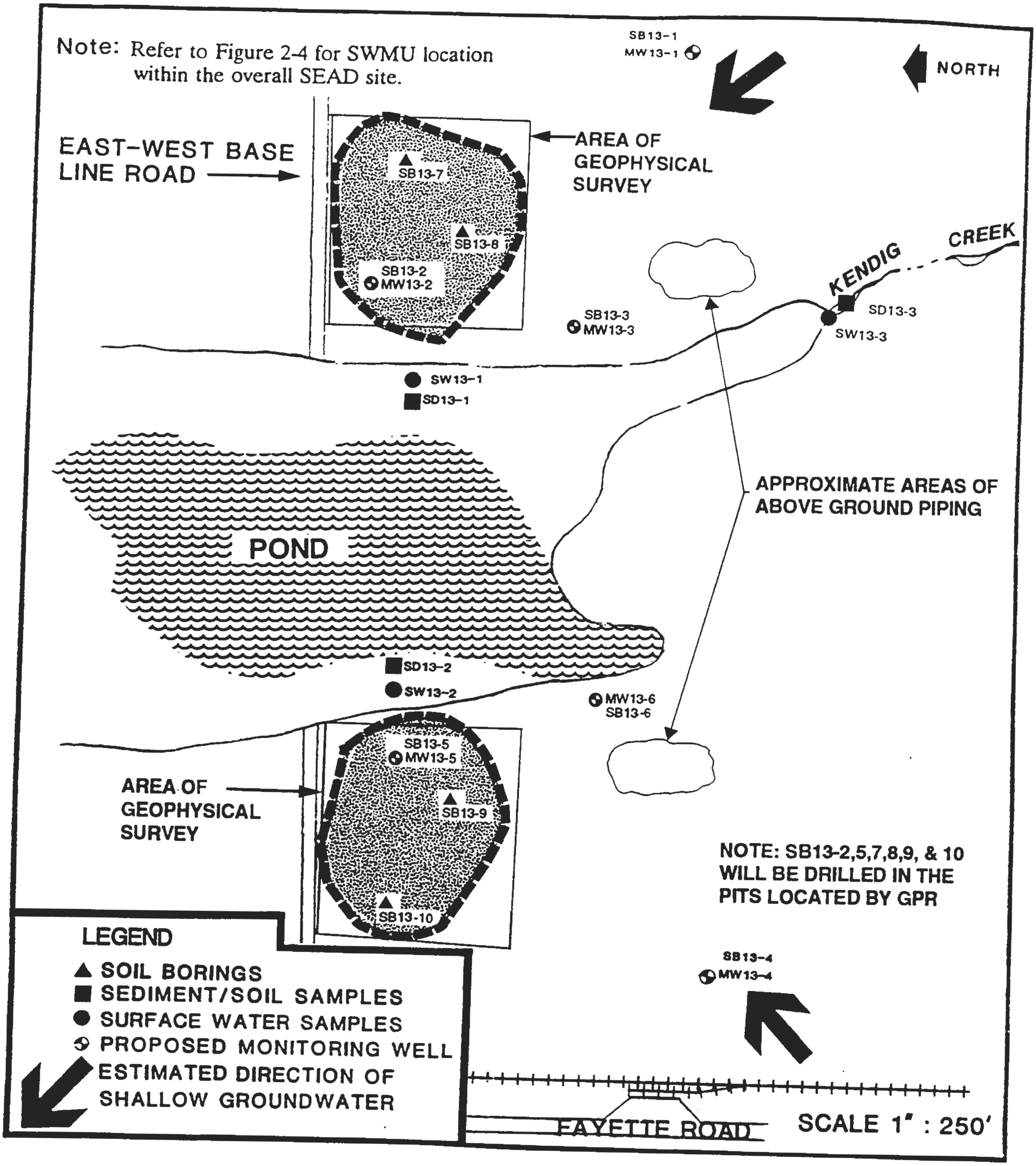

FIGURE BA-4 SITE PLAN FOR SEAD-13: IRFNA DISPOSAL SITE

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #13 - IRFNA Disposed Site

3. Hazards
   - Inhalation : Nitrogen Dioxide, hydrogen fluoride, acid gases
   - Contact : Nitric Acid
   - Explosion : None
   - Physical : Low pH soils and groundwater

4. Personal Protective Equipment :
   - Level B : Full-face self-contained breathing apparatus (SCBA) or air-line respirator, poly-coated tyvek coveralls, 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 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 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. For airlines, air supply should be upwind of work area. Arrange airlines to minimize possibility of equipment falling on airlines and to minimize trip hazards.

---

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 Remove and discard overboots.
Step 3 Remove and discard outer gloves.
Step 4 Remove SCBA backpack.
Step 5 Remove tyvek coveralls.
Step 6 Remove respirator.
Step 7 Remove inner gloves.
Step 8 Wash hands and face.

: Back up safety monitor should be posted away from and upwind of work area maintaining line of sight and prepared to perfom rescue in Level B.

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #13 IRFNA Disposal Site

3. Hazards
   - Inhalation : Nitrogen Dioxide, Hydrogen Fluoride, acid gases
   - Contact : Nitric Acid, Hydrogen Fluoride, caustics
   - Explosion : None
   - Physical : Low pH soils and groundwtaer

4. Personal Protective Equipment :
   - Level B : Self-contained breathing apparatus (SCBA), Poly-coated tyvek suit, neoprene boot covers, nitrole outer gloves and latex inner gloves, hard hat, safety shoes or boots.

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 Removal of SCBA backpack
Step 6 Removal of coveralls.
Step 7 Removal of respirator
Step 8 Remove of inner gloves.
Step 9 Wash hands and face.

Change of SCBA air tank can be performed after removal of outer gloves if coveralls are not grossly contaminated.

WELL DEVELOPMENT AND SAMPLING
LEVEL B

TASK SPECIFIC
SAFE OPERATING GUIDELINE 9

---

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #13 IRFNA Disposal Site

3. Hazards
   - Inhalation : Nitrogen Dioxide, Hydrogen Fluoride, Acid gases
   - Contact : Nitric Acid, Hydrogen Fluoride, Cavities
   - Explosion : None
   - Physical : Low pH groundwater

4. Personal Protective Equipment :
   - Level B : Full-face piece self-contained breathing apparatus (SCBA) or air-line respirator. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

5. Monitoring : Monitor well headspace upon opening. If readings are elevated, let well air out and monitor again. If readings are still elevated, upgrade PPE.

   : Borehole headspace should be monitored continuously throughout well development and headspace of development water receiving container 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 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.

   : Place wastewater receiving drum on stable, flat surface with access for later 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 Tape removal of boots and gloves.
Step 3 Removal of bootcovers.
Step 4 Removal of outer gloves.
Step 5 Removal of SCBA backpack.
Step 6 Removal of tyvek coveralls.
Step 7 Removal of respirator.
Step 8 Removal of inner gloves.
Step 9 Wash hands and face.

Change of SCBA air tank can be performed after removal of outer gloves if coveralls ar not grossly contaminated.

SEDIMENT SAMPLING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 16
page 1 of 2

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #13, IRFNA Disposal Site

3. Hazards
   - Inhalation : Nitrogen Dioxide, Hydrogen Fluoride
   - Contact : Low pH soil and surface water, causties
   - Explosion :
   - Physical : Soft, slippery soils, poor footing

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 acid gas 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 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 sample location as much as possible during operations.

   : Use only safe access routes to edge of water.

   : Get stable footing and secure work area prior to taking samples.

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 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 cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

---

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #13 Building S-311 Abandoned Deactivation Furnace

3. Hazards
   Inhalation :
   Contact : Low pH soils and surface water
   Explosion :
   Physical : Soft, slippery soils; poor footing

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 acid gas 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.

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 as much as possible during sampling.

   : Always perform surface water sampling in groups minimum of 2 people.

   : Use only safe access routes to edge of water.

   : Get stable footing and secure work area prior to taking samples.

---

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.

GEOPHYSICAL MONITORING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDLINE 28

---

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #13 - IRFNA Disposal Site

3. Hazards
   Inhalation : Nitrogen Dioxide, Hydrogen Fluoride, Acid gases
   Contact : Nitric Acid, Hydrogen Fluoride, Caustics
   Explosion : None
   Physical : Low pH soils and groundwater

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 acid gas 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 :

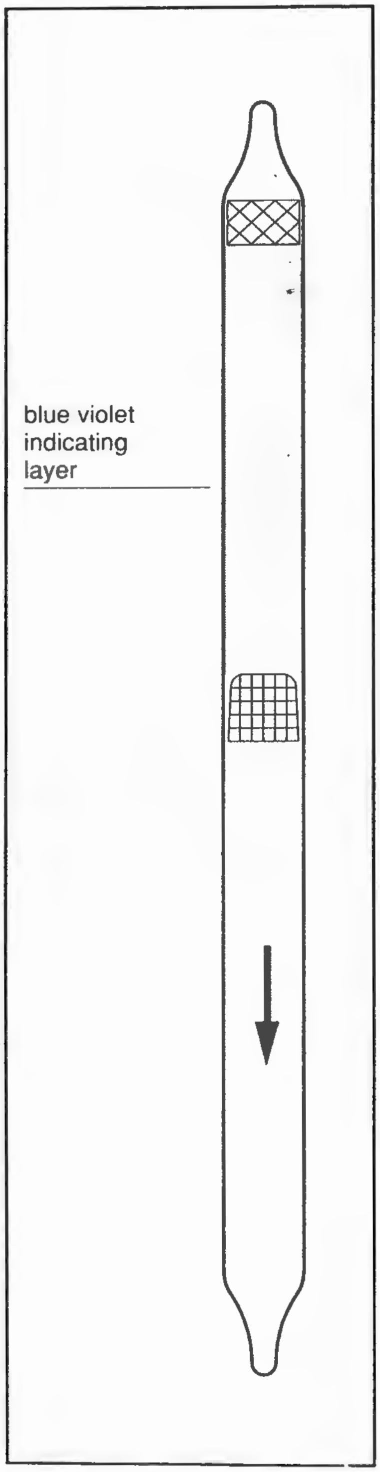
Equipment	:	Gross contamination (caked mud, dirt and debris) should be removed from all field equipment that has come into contact with the soil , water , or potentially contaminated surfaces and should be decontaminated prior to leaving the site.
Personal	:	Personal decontamination will consist of:

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.

Change of APR cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

Acid Test

Dräger-Tube
8101121



Standard Measuring Range : Qualitative identification of acid gases.
Number of Strokes (n) : 1
Time for Measurement : ca. 3 s
Standard Deviation : ± 30 %
Color Change : blue violet —> yellow or pink yellow

Ambient Operating Conditions

Temperature : 0 to 40 °C
Absolute Humidity : 3 to 15 mg H_2O / L

Reaction Principle

e.g . HCl + pH Indicator —> pink yellow reaction product

Cross Sensitivity

This tube indicates various acid gases with differing sensitivities and colors ranging from yellow to pink. It is impossible to differentiate them.

Dräger-Tube
6728591

Standard Measu
Number of Stro
Time for Measu
Standard Devia
Color Change

Ambient Operati

Temperature
Absolute Humid

Reaction Princip

CH_2=CH-CN +
HCN +
HCl + Meth

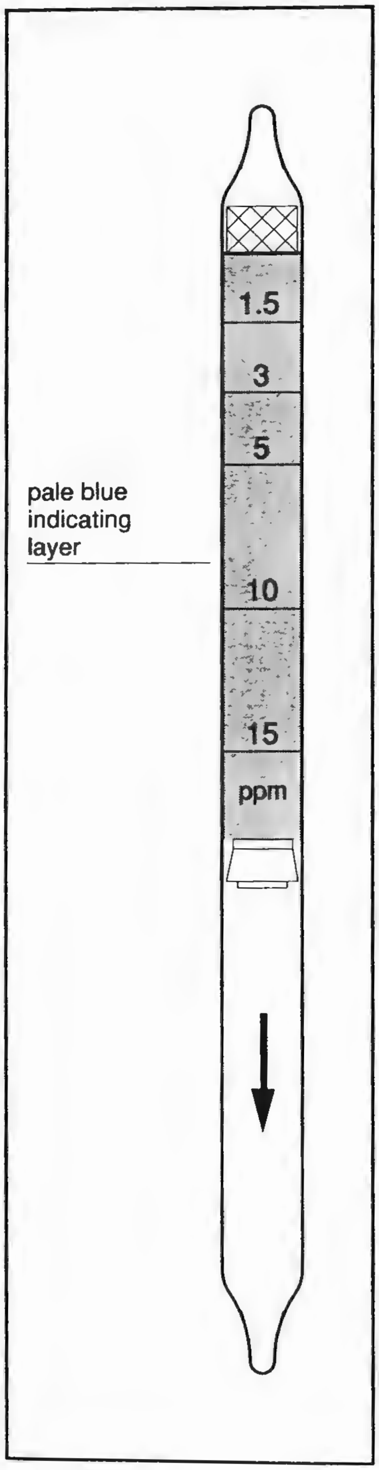
Cross Sensitivity

influence on th
one, 20 ppm b
ethanol, 10 p
styrene or 10

adiene reacts w
adiene, the acr
with 400 ppr

Hydrogen Fluoride 1.5/b

Dräger-Tube
CH 30301



Standard Measuring Range : 1.5 to 15 ppm
Number of Strokes (n) : 20
Time for Measurement : ca. 120 s
Standard Deviation : ± 15 to 20 %
Color Change : pale blue —> pale pink

Ambient Operating Conditions

Temperature : 15 to 30 °C
Absolute Humidity : max. 9 mg H_2O / L

Reaction Principle

HF + $Zr(OH)_4$/Quinalizarin —> $[ZrF_6]^{2-}$ + Quinalizarin

Cross Sensitivity

In the presence of higher humidity (> 9 mg H_2O / L), hydrogen fluoride mist is generated, which cannot be quantitatively indicated by the detector tube (i.e. the indication is too low).

Other halogenated hydrocarbons in the TLV range do not interfere.

Dräger-Tube
CH 19501

:	0.1 to 1 ppm Discoloration compared to color standard.
:	20
:	ca. 300 s
:	± 50 %
:	pale brown —>pin

:	0 to 30 °C
:	< 30 mg H_2O / L

il_2 + 4 CO
nk colored complex

a brown discoloration a
etracarbonyl.

react with the iodine
ickel tetracarbonyl indica
tube describe how the
d.

mp strokes the reagent
uid carefully drawn onto

Dräger-Tube
6728311

Nitric Acid 1/a

Standard Measuring Range	:	5 to 50 ppm / 1 to 15 ppm
Number of Strokes (n)	:	10 / 20
Time for Measurement	:	ca. 120 s /ca. 240 s
Standard Deviation	:	± 10 to 15 %
Color Change	:	blue —> yellow

Ambient Operating Conditions

Temperature	:	5 to 40 °C
Absolute Humidity	:	3 to 15 mg H_2O / L

Reaction Principle

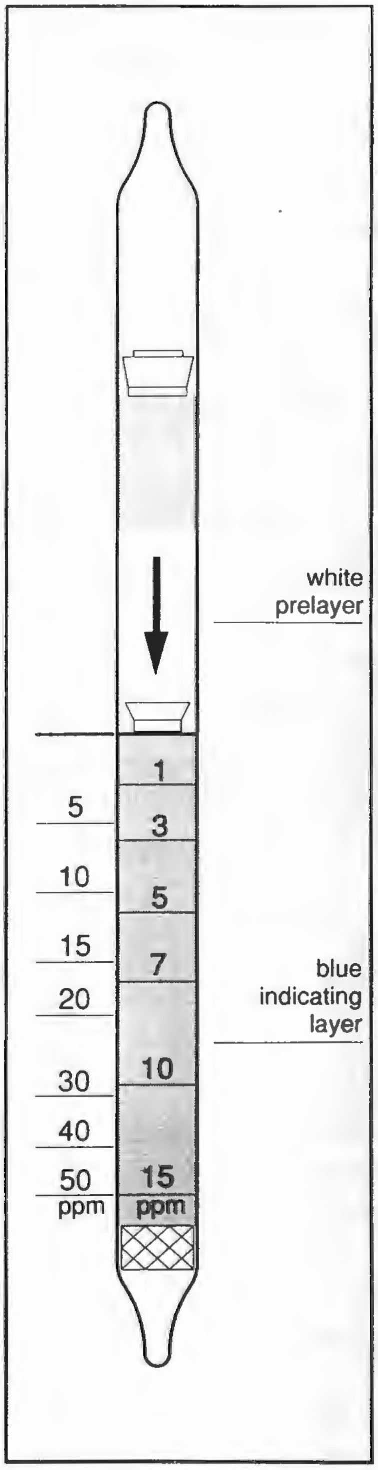
HNO_3 + Bromophenol blue —> yellow reaction product

Cross Sensitivity

Hydrogen sulfide and nitrogen dioxide in the TLV range do not interfere, however, 50 ppm nitrogen dioxide gives an indication similar to 3 ppm nitric acid.

It is impossible to measure nitric acid in the presence of other mineral acids.

Chlorine discolors the indication layer gray, and this makes it difficult to evaluate the nitric acid indication. If chlorine is present in the TLV range, this leads to slightly higher nitric acid indications.



Dräger-Tube

6719101

Nitrogen Dioxide 2/c

Standard Measuring Range	:	5 to 100 ppm / 2 to 50 ppm
Number of Strokes (n)	:	5 / 10
Time for Measurement	:	ca. 60 s / ca. 120 s
Standard Deviation	:	± 10 to 15 %
Color Change	:	yellow —> blue gray

Ambient Operating Conditions

Temperature	:	10 to 40 °C
Absolute Humidity	:	< 30 mg H_2O / L

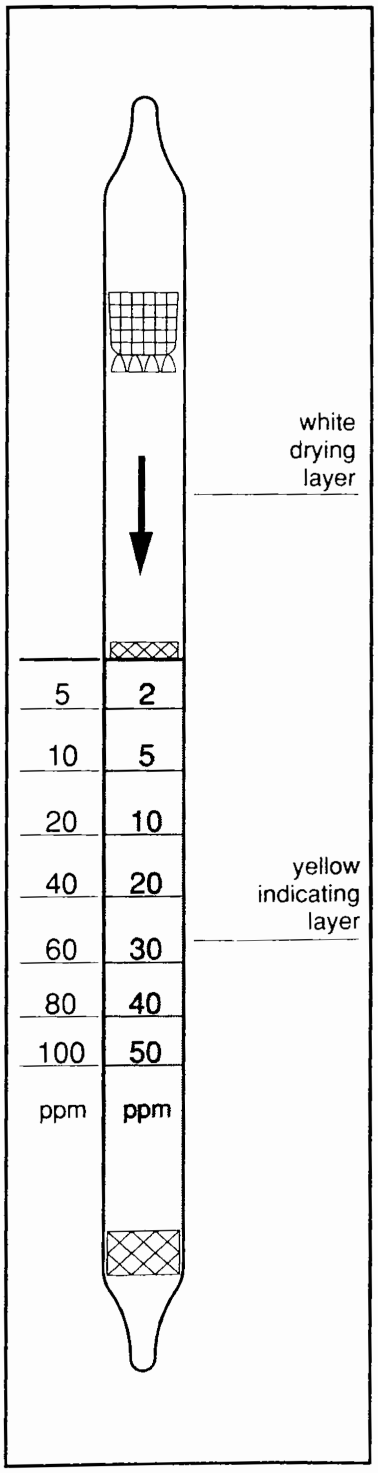
ction Principle

Diphenylbenzidine —> blue gray reaction product

Sensitivity

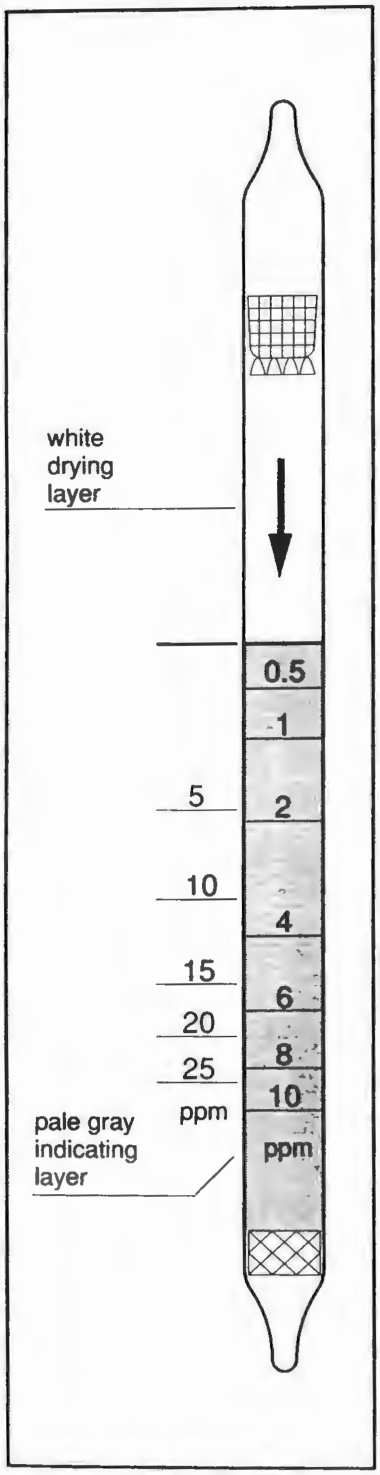
Impossible to measure nitrogen dioxide when ozone or chlorine are present in levels above their TLVs.

oxide is not indicated.



Nitrogen Dioxide 0.5/c

Dräger-Tube
CH 30001



Standard Measuring Range : 5 to 25 ppm / 0.5 to 10 ppm
Number of Strokes (n) : 2 / 5
Time for Measurement : ca. 15 s /ca. 38 s
Standard Deviation : ± 10 to 15 %
Color Change : pale gray —> blue gray

Ambient Operating Conditions

Temperature : 0 to 40 °C
Absolute Humidity : max. 30 mg H_2O / L

Reaction Principle

NO_2 + Diphenylbenzidine —> blue gray reaction product

Cross Sensitivity

It is impossible to measure nitrogen dioxide when ozone and/or chlorine are present in levels above their TLVs.

Nitric oxide is not indicated.

Dräger-Tube
6719101

Standard Measu
Number of Strok
Time for Measur
Standard Deviati
Color Change

Ambient Operati

Temperature
Absolute Humidit

Reaction Principl

NO_2 + Diphenylben

ss Sensitivity

impossible to m
/or chlorine are

oxide is not inc

5-1 PHYSICAL DESCRIPTION AND ACTIVITIES PERFORMED ON SEAD 16: BUILDING S-311 - ABANDONED DEACTIVATION FURNACE

The Abandoned Deactivation Furnace, located in Building S-311, was used to destroy munitions. The furnace area has been flooded with rain water entering through the lower ramp door (Figure BA-5).

Small arms munitions, both obsolete and unserviceable, were destroyed by incineration. There were no air pollution or dust control devices installed on the furnace. The pipes located above the building may have conveyed propellants, which may also have been stored in the building.

5-2 CHEMICAL SUSPECTS

HMX
RDX
TNT
2,4-DNT
Lead
Heavy Metals
Asbestos

5-3 PHYSICAL HAZARDS

- Unexploded Ordnance
- Metal Scraps
- Debris
- Confined Space Entry

5-4 FIELD WORK

UXO clearance will be completed prior to beginning each task.

- Surface Soil Sampling
- Surface Water Sampling
- Asbestos Sampling
- Soil Boring
- Install, Develop and Sample Groundwater Monitoring Wells
- Ash Sampling in Incinerator - Confined Space Entry
- Geophysical Survey

5-5 MONITORING TO BE PERFORMED

A PID meter will be used to screen for volatiles. A Geophysical survey will be perfomed to determine the presence of buried objects.

O_2/LEL monitoring, Radiation Monitoring and PID Monitoring will be conducted during initial entry.

Personal sampling for asbestos will be conducted for all work inside the building using NIOSH Method 7402.

5-6 TASK SPECIFIC SAFE OPERATING GUIDELINES

No. 1 Soil Boring - Level D
No. 4 Installation of Monitoring Wells - Level D
No. 7 Development & Sampling of Monitoring Wells - Level D
No. 19 Surface Water Sampling - Level D
No. 22 Surface Soil Sampling - Level D
No. 28 Geophysical Survey - Level D
No. 41 Asbestos Sampling - Level C

Confined Space Entry - Attachment F
Ash Sampling - Level B

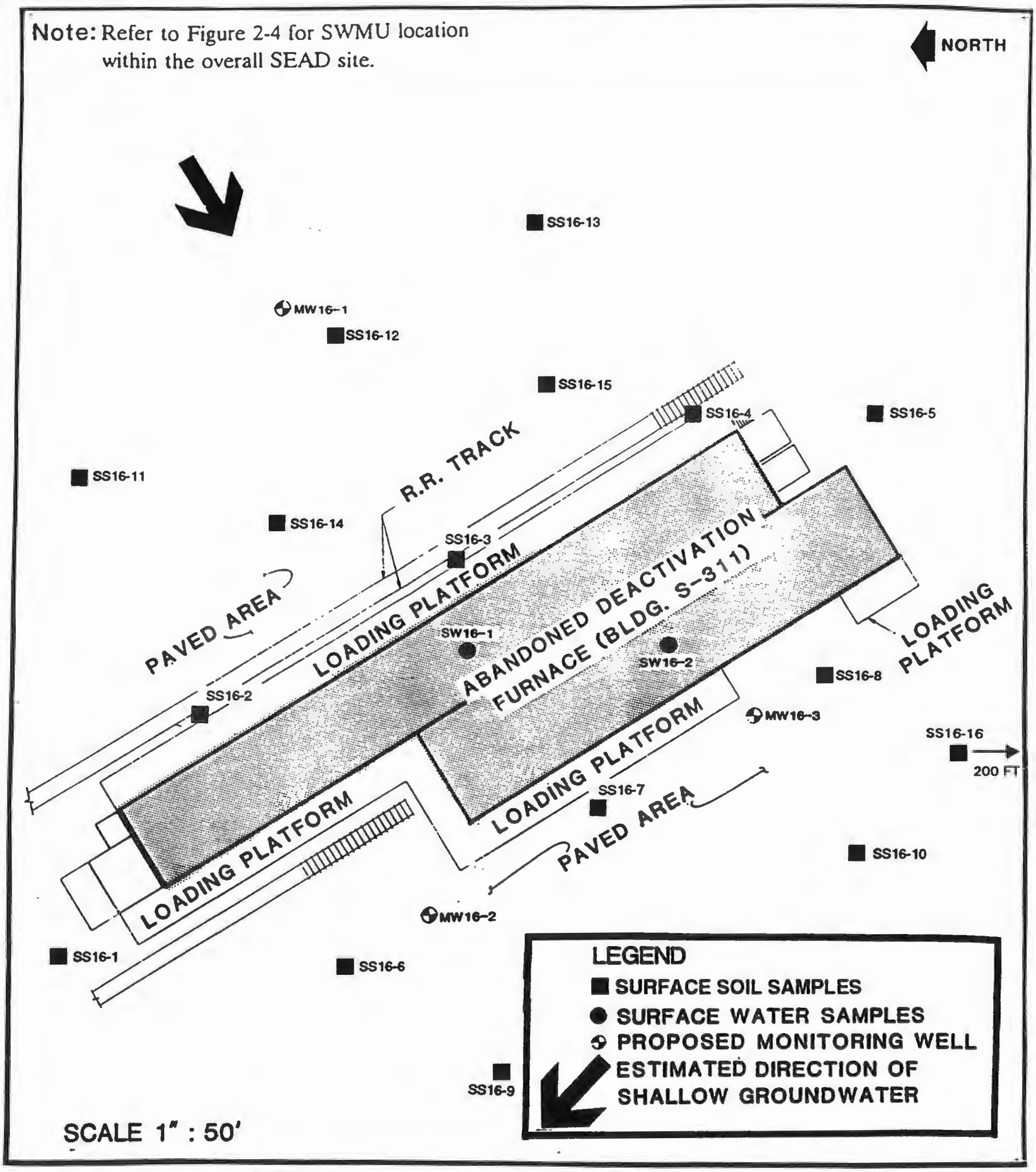


FIGURE BA-5 SITE PLAN FOR SEAD-16: BUILDING S-311 - ABANDONED DEACTIVTION FURNACE

WELL INSTALLATION
LEVEL D

TASK SPECIFIC
SAFE OPERATION GUIDELINE 4

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #16 Abandoned Deactivation Furnace

3. Hazards
   - Inhalation : Contaminated dusts. Bentonite and cement dust
   - Contact : Soils possibly containing heavy metals and explosive compounds
   - Explosion : Possibly explosive compounds present
   - Physical : Metal debris, or protruding objects slip, trip, fall 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/dust-mist 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, NY

2. Location : SEAD SWMU #16 Abandoned Deactivation Furnace

3. Hazards
   - Inhalation : None suspected
   - Contact : Groundwater possibly contains heavy metals and explosive compounds
   - Explosion : None suspected
   - Physical : Metal debris, protruding objects - slip, trip, fall 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-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Monitor well headspace upon opening. If readings are elevated, let well air out and monitor again. If readings are still elevated, upgrade PPE.

   : 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/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 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.

   : Place wastewater receiving drum on stable, flat surface with access for later 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 respirator (if worn).
Step 5 Removal of coveralls (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 #16 Building S-311 Abandoned Deactivation Furnace

3. Hazards
   - Inhalation : Contaminated dusts
   - Contact : Soils possibly contain heavy metals and explosive compounds
   - Explosion : Possibly explosive compounds present
   - Physical : Metal debris, protruding objects: slip, trip, fall 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 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 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.

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.

SURFACE WATER SAMPLING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 19

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #16 Building S-311 Abandoned Deactivation Furnace

3. Hazards
   - Inhalation : Friable asbestos possible
   - Contact : Surface water may contain heavy metals
   - Explosion : Unexploded ordnance
   - Physical : Metal debris or protruding objects machinery, confined space.

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.
   : Personal sampling for asbestos.

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 as much as possible during sampling.

   : Use only safe access routes to edge of water.

   : Get stable footing and secure work area prior to taking samples.

   : Watch for asbestos like materials. If observed retreat and upgrade to Level C.

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.

SURFACE SOIL SAMPLING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 22

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1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #16 Building S-311 Abandoned Deactivation Furnace

3. Hazards
    - Inhalation : Contaminated dusts
    - Contact : Soils possibly contain heavy metals and explosive compounds
    - Explosion : Possibly explosive compounds present
    - Physical : Metal debris, protruding objects: slip, trip, fall 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 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 : 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.

GEOPHYSICAL MONITORING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDLINE 28

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1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #16 Building S-311 Abandoned Deactivation Furnace

3. Hazards
   Inhalation : Contaminated dusts
   Contact : Soils possibly contain heavy metals and explosive compounds
   Explosion : Possibly explosive compounds present
   Physical : Metal debris, protruding objects: slip, trip, fall 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 acid gas 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.

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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.

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #16 - Abandoned Deactivation Furnace

3. Hazards
    Inhalation : Asbestos, heavy metals, petroleum hydrocarbons
    Contact :
    Explosion : Explosive compounds, Unexploded ordnance
    Physical : Machinery, confined spaces, debris.

4. Personal Protective Equipment :
    Level C : Full-face piece air-purifying respirator (APR) with organic vapor HEPA filter cartrigdes. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

    Upgrade to Level B : SCBA or Air-line respirator instead of APR.

5. Monitoring : Personal sampling for asbestos. Ambient air should be monitored continuously throughout sampling.

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 : Spray material to be sampled with water/surfactant mixture to limit release of asbestos fibers.

    : Personnel sampling the asbestos will be trained in accordance with 29 CFR 1910.1001 (Occupational Exposure to Asbestos).

7. Decontamination :

Equipment : Wet wipe all sampling equipment and sample containers. Dispose of wet wipes with protective clothing.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Wipe overboots.
Step 3 Remove and discard overboots.
Step 4 Wipe outer gloves.
Step 5 Remove and discard outer gloves.
Step 6 Remove coveralls.
Step 7 Remove and wipe respirator.
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.

Dispose of used protective clothing in asbestos disposal bag or double bagged heavy duty trash bags. Keep separate from other used potective gear until proper disposal is determined.

6-1 PHYSICAL DESCRIPTION AND ACTIVITIES PERFORMED ON SEAD-17: BUILDING 367 - EXISTING DEACTIVATION FURNACE

The Existing Deactivation Furnace, located in Building 367, has been active from 1962 to the present. A dust collection system was added to the unit in 1978 and further upgraded in 1989.

The activation furnace is used to incinerate obsolete and unserviceable small arms munitions (20 mm or less in size), fuses, boosters and firing devices. The furnace consists of a rotary kiln retort and feed discharge assemblies. The revolving retort is made of case steel. The kiln has a cross-sectional area of 4.6 square feet and is 20 feet long. The kiln is fired with a No. 2 fuel oil. The furnace's feed system consists of a waste feed weighing system, a primary waste feed conveyor, and a secondary conveyor. The furnace is equipped with an Air Pollution Control System consisting of an afterburner, gas coolers, cyclone separator, baghouse, compressor, induced draft fan, stack, and associated duct work (Figure BA-6).

Unpacked ammunition is placed on a conveyor for transfer to the deactivation furnace at prescribed intervals. The ammunition is burned and exploded by the heat in the furnace. The solid residue from the furnace is transferred by a conveyor to an approved hazardous waste container and allowed to cool. When cooled, the scrap metal is disposed of in barrels for transfer to the Defense Re-utilization and Marketing Office (DRMO).

The furnace has been included in the facility's Part B permit application. The unit was upgraded in 1989 to meet the operating requirements for incinerators detailed in 40 CFR Part 264 Subpart O. As part of the RCRA regulations, interim closure of the unit was conducted in 1989. The plan for conducting the trial burn has been prepared. The trial burn will be conducted after review and approval of the trial burn plan by the NYSDEC and the USEPA

6-2 POTENTIAL CHEMICAL CONTAMINANTS

- Lead
- Barium
- Heavy Metals
- HMX
- RDX
- TNT
- 2,4-DNT

6-3 PHYSICAL HAZARDS

- Unexploded Ordnance
- Metal Debris

6-4 FIELD WORK

Unexploded ordnance clearance should be cleared prior to beginning each task.

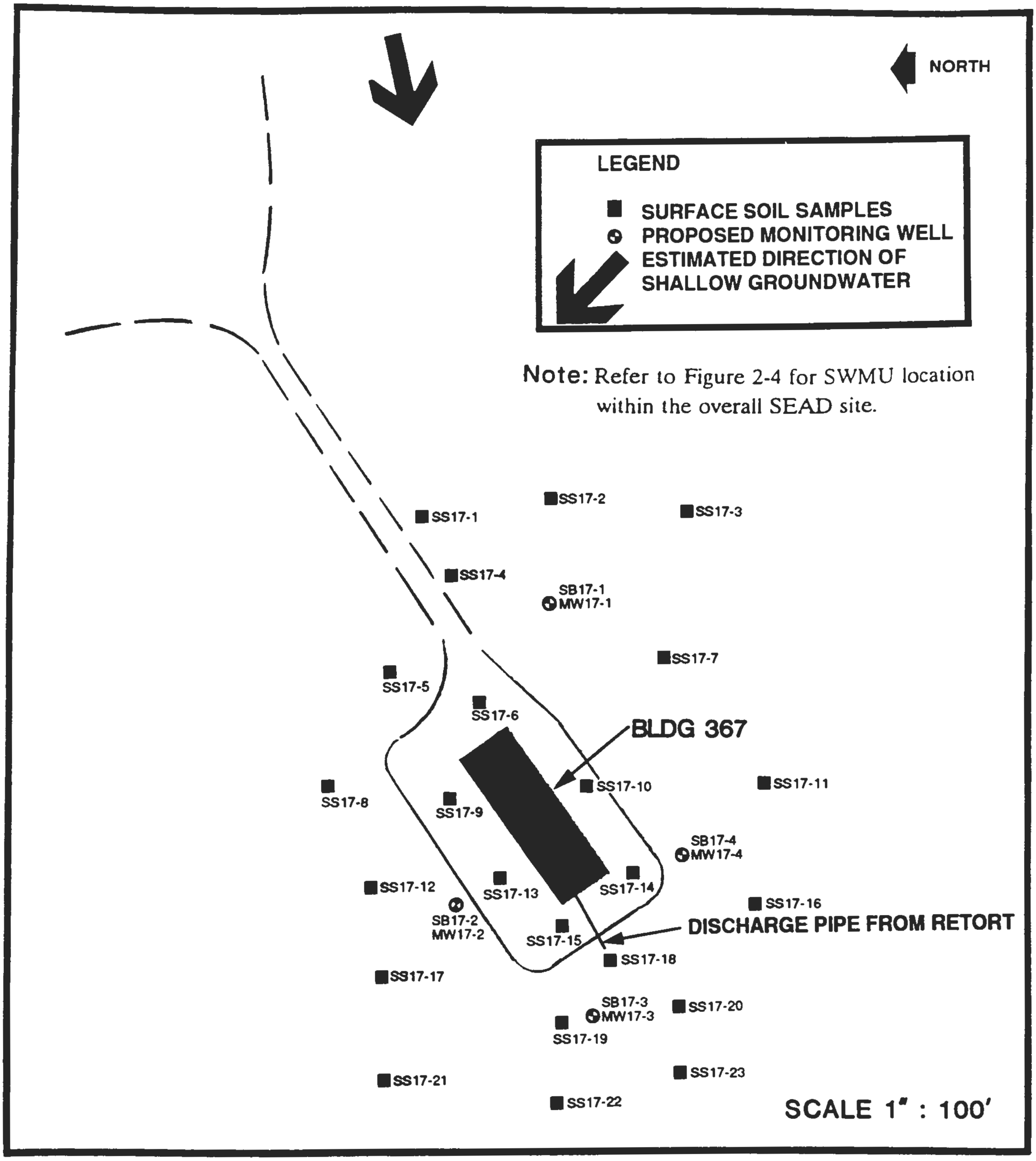
- Surface Soil Sampling
- Soil Boring
- Install, Develop and Sample Groundwater Monitoring Wells
- Geophysical Survey

6-5 MONITORING TO BE PERFORMED

A PID meter will be used to screen for volatiles. A Geophysical survey will be perfomed to determine the presence of buried objects.

6-6 TASK SPECIFIC SAFE OPERATING GUIDELINES

No. 1 Soil Boring - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Monitoring Well Development and Sampling - Level D
No. 22 Surface Soil Sampling - Level D
No. 28 Geophysical Survey - Level D



Note: Refer to Figure 2-4 for SWMU location within the overall SEAD site.

FIGURE BA-6 SITE PLAN FOR SEAD-17: BUILDING 367 - EXISTING DEACTIVTION FURNACE

DRILLING AND TEST BORING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 1

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1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #17 Building 367 - Existing Deactivation Furnace

3. Hazards
   - Inhalation : Dust may contain heavy metals and explosive compounds
   - Contact : Soil possibly contains heavy metals and explosive compounds
   - Explosion : Unexploded ordnance
   - Physical : Avoid any shell fragments which may be live. Watch for slip, trip and fall 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 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 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.

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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.

WELL INSTALLATION
LEVEL D

TASK SPECIFIC
SAFE OPERATION GUIDELINE 4

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #17 Building 367 - Existing Deactivation Furnace

3. Hazards
   - Inhalation : Bentonite and cement dust
   - Contact : Soil possibly contains heavy metals and explosive compounds
   - Explosion : Unexploded ordnance
   - Physical : Avoid any shell fragments which may be live. Watch for slip, trip, fall 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 removed 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, NY

2. Location : SEAD SWMU #17 Building 367-Existing Deactivation Furnace

3. Hazards
   Inhalation :
   Contact : Groundwater possibly contains heavy metals and explosive compounds
   Explosion :
   Physical : Avoid any shell fragments which may be live.

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-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Monitor well headspace upon opening. If readings are elevated, let well air out and monitor again. If readings are still elevated, upgrade PPE.

   : 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/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 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.

   : Place wastewater receiving drum on stable, flat surface with access for later 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 coveralls (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.

SURFACE SOIL SAMPLING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 22

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #17 - Building 367 - Existing Deactivation Furnace

3. Hazards
   Inhalation : Heavy metals, explosive compounds in soil
   Contact : Heavy metals, explosive compounds in soil
   Explosion : Unexploded ordnance
   Physical : Unexploded ordnance, machinery, slip, trip, fall hazards.

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 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 : Check surface soils for possible contamination before sampling.
   : Do not kneel or sit on ground in areas of potential contamination.

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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 Respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

Change of APR cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

GEOPHYSICAL MONITORING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDLINE 28
page 1 of 2

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #17 Building 367 - Existing Deactivation Furnace

3. Hazards

   Inhalation :

   Contact : Soil possibly contains heavy metals

   Explosion : Unexploded ordnance

   Physical : Avoid any shell fragments which may be live. Watch for slip, trip, fall 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 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.

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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.

Change of APR cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

7-1 PHYSICAL DESCRIPTION AND ACTIVITIES PERFORMED ON SEAD-24: ABANDONED POWDER BURNING PIT

The Abandoned Powder Burning Pit is a U-shaped 4-foot high berm which is approximately 150 feet across and 325 feet long. There is an adjacent shale-covered area which may also have been used (Figure BA-7).

Although the operating practices of this unit are unknown, black powder, M10 and M16 solid propellants, and probably explosive trash were disposed of here.

7-2 CHEMICAL SUSPECTS

- Explosive Compounds
- Heavy Metals
- Solvents
- Petroleum Hydrocarbons

7-3 PHYSICAL HAZARDS

- Debris
- Metal
- Explosive compounds

7-4 FIELD WORK

UXO clearance will be completed prior to beginning each task.

- Geophysical survey
- Surface Soil Sampling
- Install, Develop and Sample Groundwater Monitoring Wells

7-5 MONITORING TO BE PERFORMED

A geophysical survey will be utilized to determine the presence of buried objects. A PID will be used to screen for volatiles.

7-6 TASK SPECIFIC SAFE OPERATING GUIDELINES

No. 1 Soil Boring - Level D
No. 4 Installation of Monitoring Wells - Level D
No. 7 Development and Sampling of Monitoring Wells - Level D
No. 22 Surface Soil Sampling - Level D
No. 28 Geophysical Survey - Level D

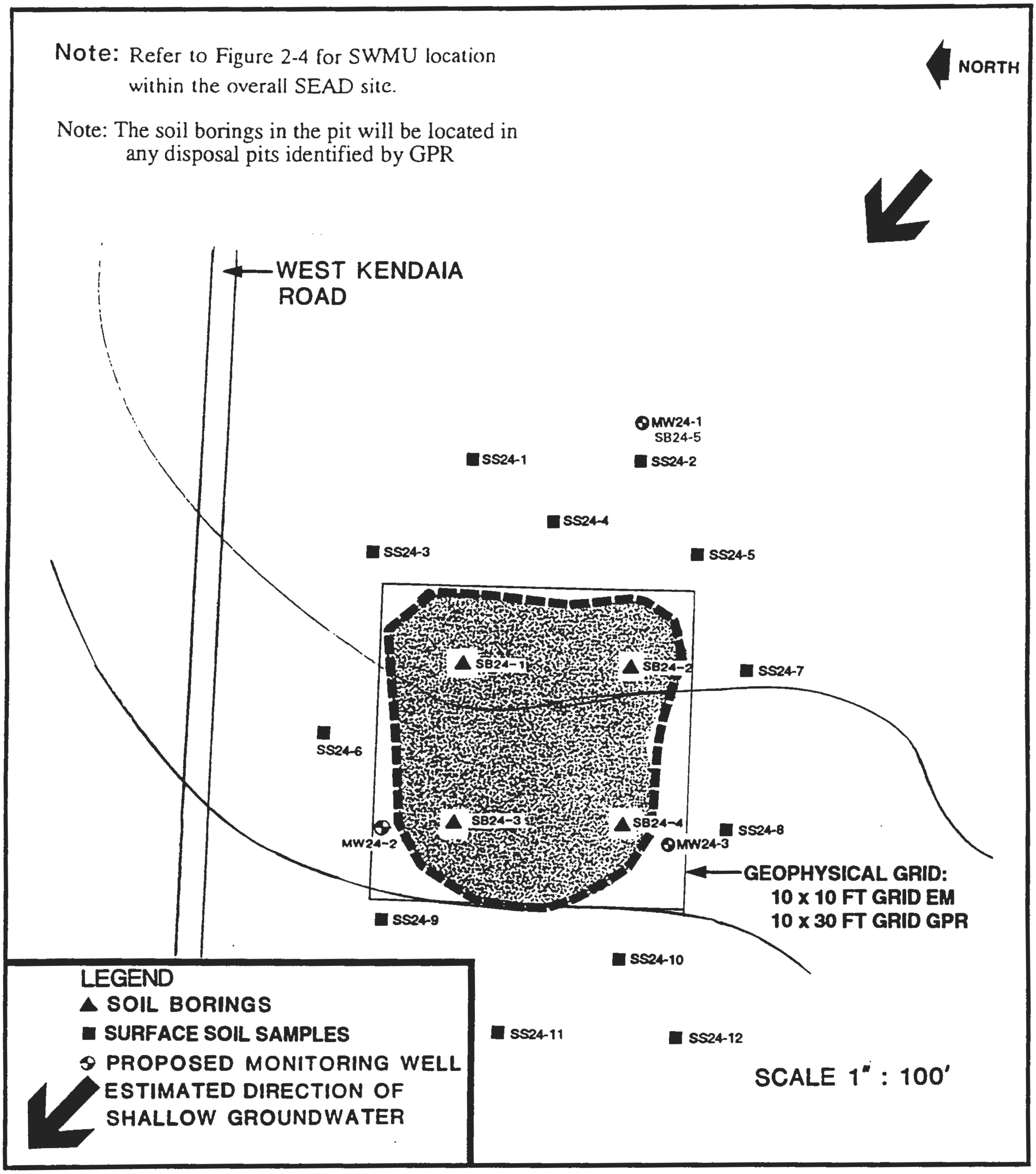

FIGURE BA-7 SITE PLAN FOR SEAD-24: ABANDONED POWDER BURNING PIT

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1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #24 - Abandoned Powder Burning Pit

3. Hazards
   - Inhalation : Volatile organics, petroleum hydrocarbons
   - Contact : Heavy metals, volatile organics, petroleum hydrocarbons in soil
   - Explosion : Explosive compounds
   - Physical : Metal objects, protruding 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 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 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.

WELL INSTALLATION
LEVEL D

TASK SPECIFIC
SAFE OPERATION GUIDELINE 4
page 1 of 2

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #24 Abandoned Powder Burning Pit

3. Hazards
   - Inhalation : Volatile organics and petroleum hydrocarbons, bentonite and cement dust
   - Contact : Soils contain heavy metals, volatile organics
   - Explosion : Possible explosive compounds present
   - Physical : Metal objects and protruding metal 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 cartridge, 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 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 slurry.

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.

WELL DEVELOPMENT AND SAMPLING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 7
page 1 of 2

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #24 Abandoned Powder Burning Pit

3. Hazards
   - Inhalation : VOC's and petroleum hydrocarbons
   - Contact : Heavy metals and VOCs in groundwater
   - Explosion : None suspected
   - Physical : Metal objects and protruding metal 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-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Monitor well headspace upon opening. If readings are elevated, let well air out and monitor again. If readings are still elevated, upgrade PPE.

   : 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/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 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.

   : Place wastewater receiving drum on stable, flat surface with access for later 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 coveralls (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, NY

2. Location : SEAD SWMU #24 - Abandoned Powder Burning Pile

3. Hazards
   - Inhalation : Volatile organics, petroleum hydrocarbons
   - Contact : Volatile organics, petroleum hydrocarbons and heavy metals in soil
   - Explosion : Explosive compounds in soil
   - Physical : Metal objects and protruding 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 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 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 : 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 Respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

Change of APR cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

GEOPHYSICAL MONITORING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDLINE 28

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #24 Abandoned Powder Burning Pit

3. Hazards
    - Inhalation : Volatile organics and petroleum hydrocarbons
    - Contact : Soils containing heavy metals, volatile organics, petroleum hydrocarbons
    - Explosion : Possible explosive compounds present
    - Physical : Metal objects and protruding 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.

Change of APR cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

8-1 PHYSICAL DESCRIPTION AND ACTIVITIES PERFORMED ON SEAD-25: FIRE TRAINING AND DEMONSTRATION PAD

The Fire Training and Demonstration Pad is approximately 90 feet by 100 feet and is covered with gravel and sparse grass (Figure BA-8).

In the past, the pad was used for fire control training. Currently, the pad is used once or twice a year for fire fighting demonstrations.

8-2 CHEMICAL SUSPECTS

- Explosives
- Benzene
- Xylene
- Toluene
- Heavy Metals
- Petroleum Hydrocarbons
- Diesel Fuel
- PCBs

8-3 PHYSICAL HAZARDS

- Metal Debris

8-4 FIELD WORK

- Soil Boring
- Install, Develop and Sample Groundwater Monitoring Wells
- Geophysical Survey

8-5 MONITORING TO BE PERFORMED

A PID will be used to screen for volatiles. A Geophysical survey will be perfomed to determine the presence of buried objects.

8-6 TASK SPECIFIC SAFE OPERATING GUIDELINES

No. 1 Soil Boring - Level D
No. 4 Monitoring Well Installation - Level D
No. 7 Monitoring Well Development and Sampling - Level D
No. 28 Geophysical Survey - Level D

Benzene 0.5/a

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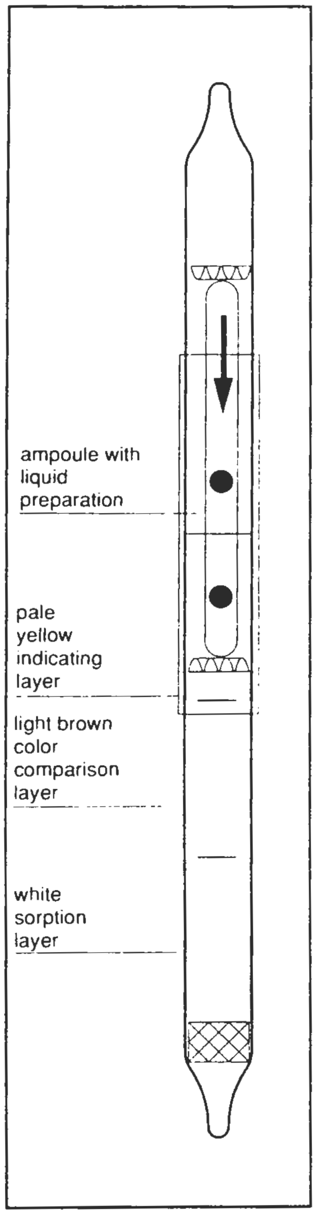
6728561



Standard Measuring Range	:	0.5 to 10 ppm
Number of Strokes (n)	:	40 to 2
Time for Measurement	:	ca. 900 to 45 s
Standard Deviation	:	± 30 %
Color Change	:	white —> pale brown

Ambient Operating Conditions

Temperature	:	10 to 40 °C
Absolute Humidity	:	3 to 15 mg H_2O / L

Reaction Principle

$$2\,C_6H_6 + HCHO \longrightarrow C_6H_5\text{-}CH_2\text{-}C_6H_5 + H_2O$$
$$C_6H_5\text{-}CH_2\text{-}C_6H_5 + H_2SO_4 \longrightarrow \text{p-quinoid compound}$$

Cross Sensitivity

Other aromatics (e.g. toluene, xylene, ethyl benzene) are indicated. It is impossible to measure benzene in the presence of these aromatics.

Petroleum hydrocarbons, alcohols and esters do not affect the indication.

Additional Information

Before carrying out the measurement the reagent ampoule must be broken and the liquid of the ampoule must be transferred to the indication layer so that it is completely saturated.

Benzene 0.05

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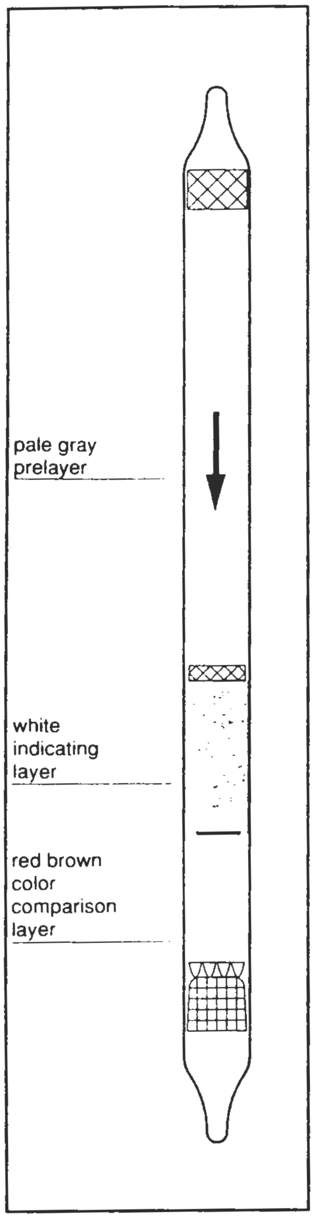
CH 24801



Standard Measuring Range : 0.05 to 1.4 mg/L Equiv. to 15 to 420 ppm.
Number of Strokes (n) : 20 to 2
Time for Measurement : ca. 180 to 18 s
Standard Deviation : ± 30 %
Color Change : white —> red brown

Ambient Operating Conditions

Temperature : 0 to 30 °C
Absolute Humidity : 5 to 12 mg H_2O / L

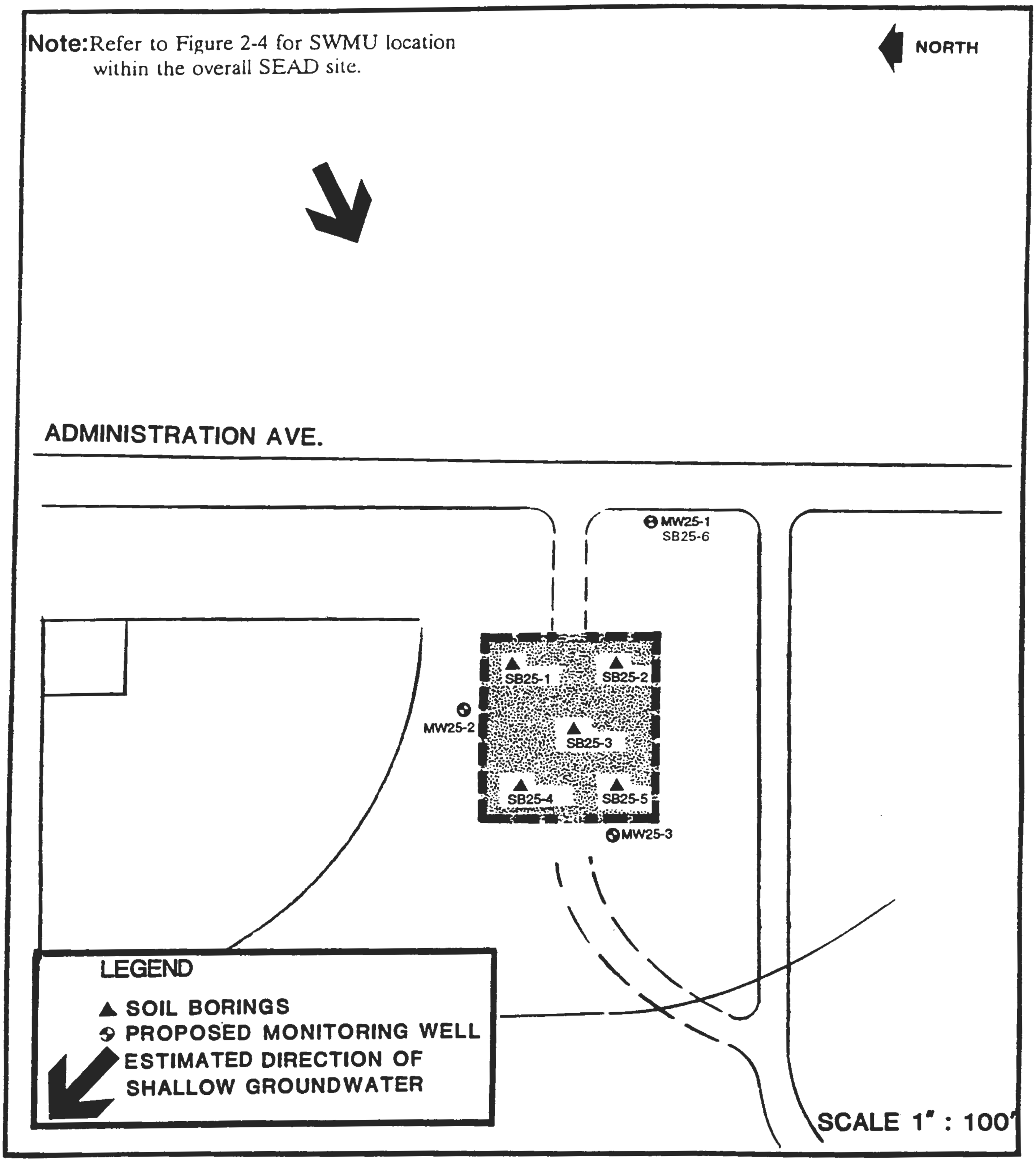
Reaction Principle

a) $2\ C_6H_6 + HCHO \longrightarrow C_6H_5\text{-}CH_2\text{-}C_6H_5 + H_2O$
b) $C_6H_5\text{-}CH_2\text{-}C_6H_5 + H_2SO_4 \longrightarrow$ p-quinoid compound

Cross Sensitivity

Other aromatics (e.g. toluene, xylene) are trapped in the prelayer, causing a reddish brown discoloration. If the toluene or xylene concentration is too high and the entire prelayer is discolored, a benzene measurement is not possible.

Petroleum hydrocarbons, alcohols and esters do not affect the indication.



Note: Refer to Figure 2-4 for SWMU location within the overall SEAD site.

FIGURE BA-8 SITE PLAN FOR SEAD-25: FIRE TRAINING AND DEMONSTRATION PAD

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1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #25 Fire Training and Demonstration Pad

3. Hazards
   - Inhalation : VOC's (Xylene, Benzene, Toluene), petroleum hydrocarbons
   - Contact : Heavy metals, benzene, xylene, toluene, PCBs in soil
   - Explosion : Possibly explosive compounds present
   - Physical : Metal debris or protruding objects slip, trip, fall hazards

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 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 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.

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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 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.

WELL DEVELOPMENT
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 7

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #25 Fire Training and Demonstration Pad

3. Hazards
   - Inhalation : VOC's (Xylene, Benzene, Toluene), petroleum hydrocarbons
   - Contact : Heavy metals, PCBs, Benzene, Xylene and Toluene in groundwater
   - Explosion : None suspected
   - Physical : Metal debris or protruding objects; slip, strip, fall 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-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Monitor well headspace upon opening. If readings are elevated, let well air out and monitor again. If readings are still elevated, upgrade PPE.

   : 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/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 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.

   : Place wastewater receiving drum on stable, flat surface with access for later 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 coveralls (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.

GEOPHYSICAL MONITORING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDLINE 28
page 1 of 2

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #25 Fire Training and Demonstration Pad

3. Hazards
   - Inhalation : VOC's (Xylene, Benzene, Toluene) petroleum hydrocarbons
   - Contact : Heavy metals, xylene, PCBs, benzene, toluene in soil
   - Explosion : Possibly explosive compounds present
   - Physical : Metal debris or protruding objects; slip, trip, full hazards.

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

Change of APR cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

WELL INSTALLATION
LEVEL D

TASK SPECIFIC
SAFE OPERATION GUIDELINE 4

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #25 Fire Training and Demonstration Pad

3. Hazards
   Inhalation : VOC's (Xylene, Benzene, Toluene), petroleum hydrocarbons
   Contact : Heavy metals, benzene, PCBs, xylene, or toluene in soil
   Explosion : Possibly explosive compounds present
   Physical : Metal debris or protruding objects slip, trip, fall hazards

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.

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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.

9-1 PHYSICAL DESCRIPTION AND ACTIVITIES PERFORMED ON SEAD-26: FIRE TRAINING PIT AND AREA

The Fire Training Pit is approximately 75 feet in diameter and approximately 3 feet deep and is located in the fire training area which is a grassy field 1300 feet by 200 feet. A bentonite liner was installed in 1982 or 1983. At present, the Fire Training Pit is active. During a site inspection in 1990, the fire pit was full of water. Additionally, metal drums, concrete rubble and other debris was observed on the south end of the fire training area (Figure BA-9).

For fire training exercises various flammable materials are floated on water, ignited and extinguished. The pit is used one to four times a year for fire fighting training. Prior to 1977, the fire training area surrounding the pit may have also been used for fire demonstrations.

9-2 CHEMICAL SUSPECTS

- Explosives
- Petroleum Hydrocarbons
- Solvents
- Heavy Metals
- PCB's
- Benzene
- Toluene

9-3 PHYSICAL HAZARD

- Debris
- Metal

9-4 FIELD WORK

- Soil Boring
- Install, Develop and Sample Groundwater Monitoring Wells
- Surface Water Samples
- Geophysical Survey
- Sediment Sampling
- Test Pits

9-5 MONITORING TO BE PERFORMED

A PID meter will be used to screen for volatiles. A Geophysical survey will be perfomed to determine the presence of buried objects. Particulate monitoring will be performed during excavation of test pits.

9-6 TASK SPECIFIC SAFE OPERATING GUIDELINES

No. 1 Soil Borings - Level D
No. 4 Installation Monitoring Wells - Level D
No. 7 Development & Sampling of Monitoring Wells - 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 Survey - Level D

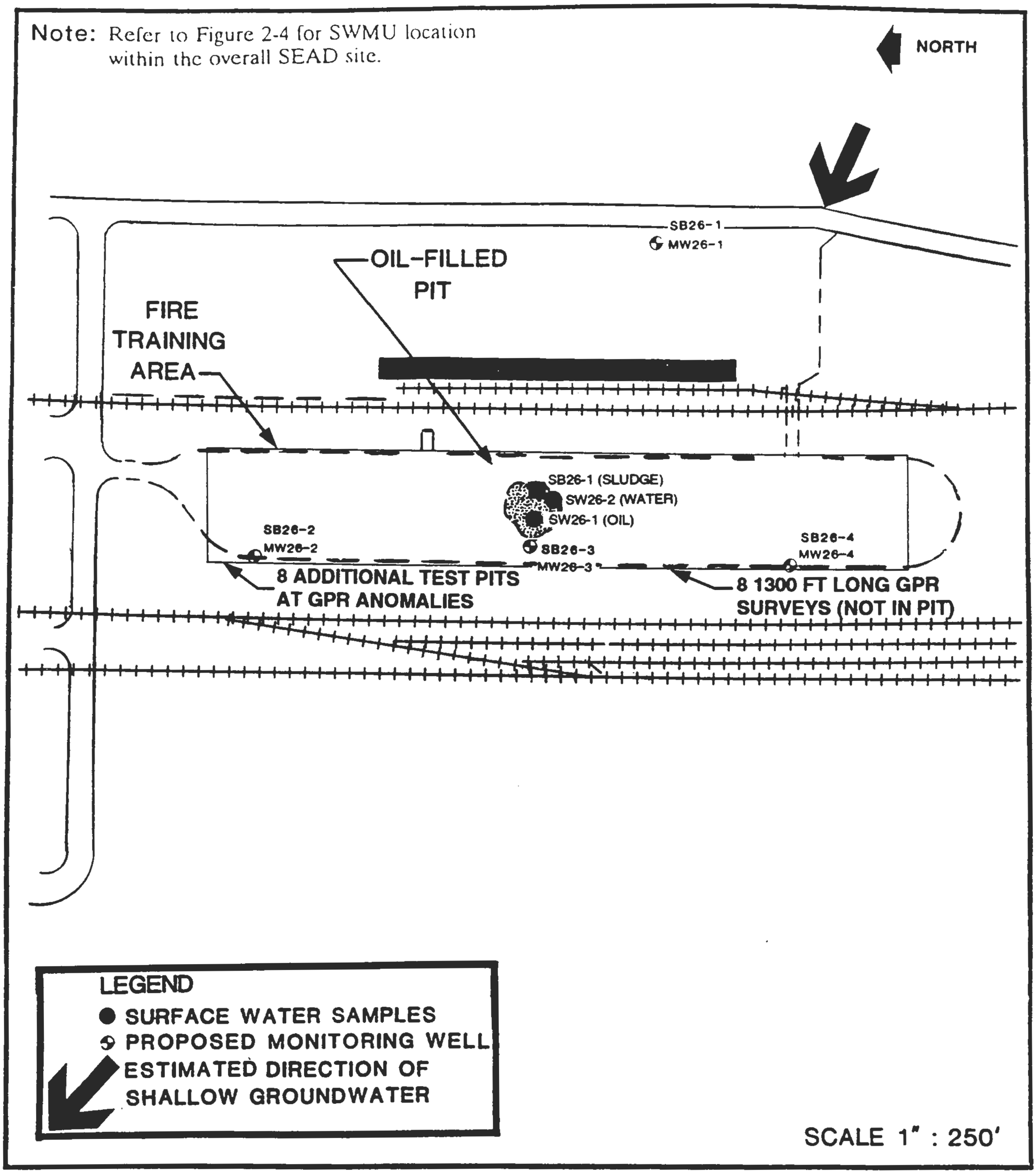

FIGURE BA-9 SITE PLAN FOR SEAD-26: FIRE TRAINING PIT

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1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #26 Fire Training Pit

3. Hazards
   - Inhalation : VOC's (Benzene, Toluene), Petroleum Hydrocarbons
   - Contact : Heavy metals, benzene, toluene, PCB's in soil
   - Explosion : Possibly explosive compounds present
   - Physical : Metal debris or protruding objects, slip, trip, fall 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 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 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.

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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.

WELL INSTALLATION
LEVEL D

TASK SPECIFIC
SAFE OPERATION GUIDELINE 4

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #26 Fire Training Pit

3. Hazards
   - Inhalation : VOC's (Benzene, Toluene), petroleum hydrocarbons
   - Contact : Heavy metals, benzene, toluene, PCB's in soil
   - Explosion : Possibly explosive compounds present
   - Physical : Avoid metal debris or protruding objects, slip, trip, fall 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 cartridge, 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, NY

2. Location : SEAD SWMU #26 Fire Training Pit

3. Hazards
    Inhalation : VOC's (Benzene, Toluene), petroleum hydrocarbons
    Contact : Heavy metals, benzene, toluene, or PCB's in groundwater
    Explosion : None suspected
    Physical : Metal debris or protruding objects around well locations.

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-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Monitor well headspace upon opening. If readings are elevated, let well air out and monitor again. If readings are still elevated, upgrade PPE.

    : 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/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 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.

    : Place wastewater receiving drum on stable, flat surface with access for later 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 coveralls (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.

TEST PIT EXCAVATION
LEVEL B

TASK SPECIFIC
SAFE OPERATING GUIDELINE 12

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #26 Old Construction Debris Landfill

3. Hazards
   - Inhalation : VOC's (Benzene, Toluene), petroleum hydracarbons
   - Contact : Hevy metals, benzene, toluene, PCB's in surface water.
   - Explosion : None suspected.
   - Physical : Poor footing, slippery surfaces.

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.

		Exercise			
Instrument Actions Levels	**D**	**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.

Change of SCBA air tank can be performed after removal of outer gloves if coveralls are not grossly contaminated.

SEDIMENT SAMPLING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 16

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #26 Fire Training Pits
3. Hazards
   - Inhalation : VOC's (Benzene, toluene), petroleum hydrocarbons
   - Contact : Heavy metals, benzene, toluene, PCB's
   - Explosion : More suspected
   - Physical : Poor footing, slippery surfaces.

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 sampling. Downwind monitoring should be conducted 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 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 sample location as much as possible during operations.

   : Use only safe access routes to edge of water.

   : Get stable footing and secure work area prior to taking samples.

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 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 cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

SURFACE WATER SAMPLING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 19
page 1 of 2

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #26 Fire Training Pit

3. Hazards
    - Inhalation : VOC's (Benzene, Toluene), petroleum hydrocarbons
    - Contact : Heavy metals, benzene, toluene, or PCBs in surface water.
    - Explosion : None suspected
    - Physical : Poor footing, slippery surfaces.

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 cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling. Downwind monitoring should be conducted when elevated workzone readings are recorded.

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 as much as possible during sampling.

    : Use only safe access routes to edge of water.

    : Get stable footing and secure work area prior to taking samples.

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.

GEOPHYSICAL MONITORING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDLINE 28

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #26 Fire Training Pit

3. Hazards
    - Inhalation : VOC's (Benzene, Toluene), petroleum hydrocarbons
    - Contact : Heavy metals, benzene, toluene, or PCBs in soil
    - Explosion : Possibly explosive compounds present
    - Physical : Metal debris, protruding objects, slip, trip, fall 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 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

Change of APR cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

10-1 PHYSICAL DESCRIPTION AND ACTIVITIES PERFORMED ON SEAD-45: DEMOLITION AREA

The Open Detonation (OD) ground consists of a detonation hill which covers approximately 1.0 acre. The hill is loose soil which is moved around for the detonation activities.

The U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) originally identified this facility as a location of known or suspected waste materials. In 1987, the facility was deleted from the SWMU submission list by the U.S. Army Environmental Hygiene Agency. The reason for deleting the unit was due to the fact that it was combined with the unit designated as SEAD-23. The facility was again added to the SWMU list in August 1988, by the New York State Department of Environmental Conservation (Figure BA-10).

The ammunition or components to be destroyed are placed in a bulldozed hole with demolition material. Primer cord is attached to the demolition material, blasting caps are attached to the primer cord, and the primer cord is attached to circuit wire. The hole is backfilled with a minimum of 8 feet of soil over the material to be detonated. The operator detonates the material after returning to the dugout and taking proper safety precautions.

10-2 CHEMICAL SUSPECTS

- Explosive Compounds
- Heavy Metals
- Nitrates

10-3 PHYSICAL HAZARDS

- Debris
- UXOs
- Loose Soils - Unstable Footing
- Steep Slopes

10-4 FIELD WORK

UXO clearance will be completed prior to beginning each task.

- Geophysical Survey
- Surface Soil Sampling
- Install, Develop and Sample Groundwater Monitoring Wells
- Surface Water Samples
- Soil Boring
- Test Pits
- Sediment Sampling

10-5 MONITORING TO BE PERFORMED

A Geophysical survey will be perfomed to determine the presence of buried objects. Particulate monitoring will be performed during excavation of test pits. A PID meter will be used to screen for volatiles.

10.6 TASK SPECIFIC SITE OPERATING GUIDELINE

No. 1 Soil Boring - Level D
No. 4 Installation of Monitoring Wells - Level D
No. 7 Development and Sampling of Monitoring Wells - Level D
No. 10 Test Pit Excavation - Level D
No. 16 Sediment Soil Sampling - Level D
No. 19 Surface Water Sampling - Level D
No. 22 Surface Soil Sampling - Level D
No. 28 Geophysical Survey - Level D

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #45 Demolition Area

3. Hazards
   - Inhalation : Contaminated soils and dust
   - Contact : Heavy metals in soil
   - Explosion : Possible unexploded ordinance (UXOs)
   - Physical : Debris, steep slopes, loose soils, unexploded ordnance

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 workzone readings are recorded.

   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 sample location 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.

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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 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, NY

2. Location : SEAD SWMU #45 Demolition Area

3. Hazards
   - Inhalation : None suspected
   - Contact : Heavy metals in groundwater
   - Explosion : None suspected
   - Physical : Loose soils, debris, steep slopes, unexploded ordnance.

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 cartridge, poly-coated tyvek coveralls.

5. Monitoring : Monitor well headspace upon opening. If readings are elevated, let well air out and monitor again. If readings are still elevated, upgrade PPE.

   : 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/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 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.

   : Place wastewater receiving drum on stable, flat surface with access for later 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 coveralls (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.

TEST PIT EXCAVATION
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 10
page 1 of 2

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1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #45 - Open Detonation Grounds

3. Hazards

Inhalation : Heavy metals, explosive compounds in soil and dust.
Contact : Heavy metals, explosive compounds in soil.
Explosion : Unexplosded ordnance
Physical : Explosive compounds, debris.

4. Personal Protective Equipment :

Level B : Neoprene boot covers, nitrile outer gloves and latex inner gloves, hard had, safety glasses, safety shoes or boots.

Upgrade to Level C : Full-face piece air-purifying respirator (APR) with organic vapor cartridges.

5. Monitoring : Ambient air should be monitored continuously throughout excavation. Downwind monitoring should be conducted periodically or when elevated excavation or workzone readings are recorded.

: Spoils should be monitored periodically and with and change in appearance.

: Upgrade PPE if consistant elevated readings in spoils are observed.

		Exercise			
Instrument Actions Levels	**D**	**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 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 and other equipment before leaving excavation area. Equipment should be steamed cleaned before leaving site. Bucket should be steam cleaneded prior to use in another borehole.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Removal of bootcovers.
Step 3 Removal of outer gloves.
Step 4 Remove tyvek coveralls.
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.

SEDIMENT SAMPLING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 16

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #45 Demolition Area

3. Hazards
    Inhalation : Contaminated soil and dust
    Contact : Heavy metals in soil
    Explosion : Unexploded ordinance (UXOs)
    Physical : Debris, loose soils, sheep slope, unexploded ordnance

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 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 sample location as much as possible during operations.

    : Use only safe access routes to edge of water.

    : Get stable footing and secure work area prior to taking samples.

---

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 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 cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #45 Demolition Area

3. Hazards
   - Inhalation : None suspected
   - Contact : Avoid skin contact with surface water possibly containing heavy metals
   - Explosion : Possible unexploded ordinance (UXOs)
   - Physical : Use caution while sampling a surface water locality (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 cartridge, poly-coated tyvek coveralls.

5. Monitoring : Ambient air should be monitored continuously throughout sampling. Downwind monitoring should be conducted or when elevated workzone readings are recorded.

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 as much as possible during sampling.

   : Use only safe access routes to edge of water.

   : Get stable footing and secure work area prior to taking samples.

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, NY

2. Location : SEAD SWMU #45 - Open Detonation Grounds

3. Hazards
   - Inhalation : Heavy metals, explosive compounds in soil and dust
   - Contact : Heavy metals, explosive compounds in soil
   - Explosion : Unexploded ordnance
   - Physical : Debris, poor footing, loose soils

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 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 : 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 respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

Change of APR cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

GEOPHYSICAL MONITORING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDLINE 28

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #45 Demolition Area

3. Hazards
   - Inhalation : Contaminated soil and dust
   - Contact : Heavy metals in soil
   - Explosion : Possible unexploded ordinance (UXOs)
   - Physical : Debris , loose soils, steep slopes, unexploded ordnance

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

Change of APR cartridge 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 #45 Demolition Area

3. Hazards
   - Inhalation : Contaminated soil and dust
   - Contact : Heavy metals in soils
   - Explosion : Possible unexploded ordinance (UXOs)
   - Physical : Debris, loose soils, steep slopes, unexploded ordinance.

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 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 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.

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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.

11-1 PHYSICAL DESCRIPTION AND ACTIVITIESPERFORMED ON SEAD-57: EXPLOSIVE ORDNANCE DISPOSAL AREA

The Explosive Ordnance Disposal Area consists of a circular berm approximately 4 feet wide and 8 to 10 feet high with an inside diameter of approximately 70 feet (Figure BA-11).

In the past, the area was used for open detonation. The area may also have been used for the disposal of explosives. Currently, the site is used for bomb squad training.

11-2 CHEMICAL SUSPECTS

- Explosive Compounds
- Heavy Metals
- Nitrates

11-3 PHYSICAL HAZARDS

- UXOs
- Rough Terrain
- Metal Debris

11-4 FIELD WORK

UXO clearance will be completed prior to beginning each task.

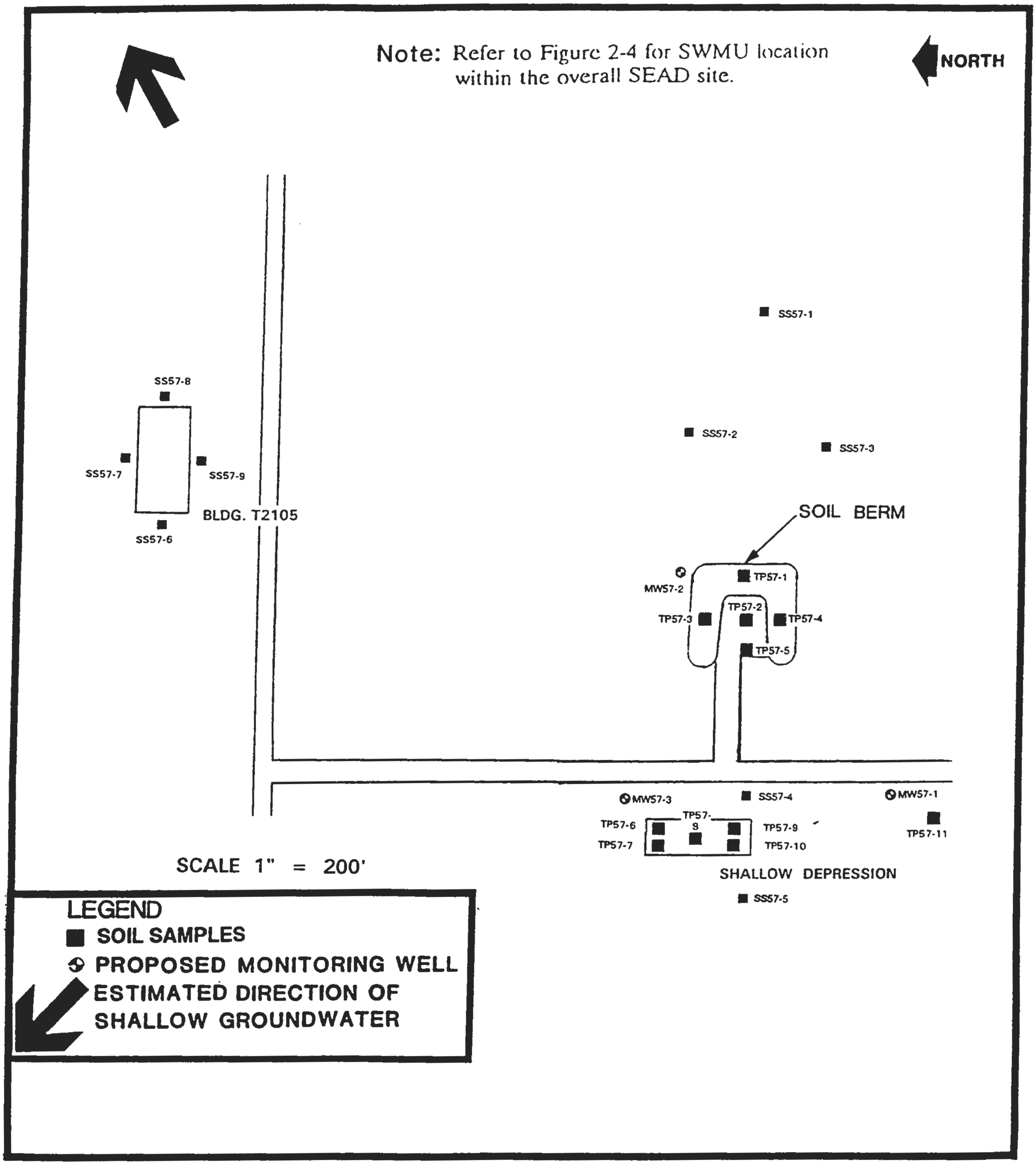
- Surface Soil Sampling
- Install, Develop and Sample Groundwater Monitoring Wells
- Geophysical Survey
- Test Pits

11-5 MONITORING TO BE PERFORMED

A Geophysical survey will be perfomed to determine the presence of buried objects. Particulate monitoring will be performed during excavation of test pits. A PID meter will be used to screen for volatiles.

11-6 TASK SPECIFIC SAFE OPERATING GUIDELINES

No. 1 Soil Boring - Level D
No. 4 Installation of Monitoring Wells - Level D
No. 7 Development Sampling of Monitoring Wells - Level D
No. 12 Test Pit Excavation - Level
No. 16 Soil Sampling - Level D
No. 28 Geophysical Survey - Level D



Note: Refer to Figure 2-4 for SWMU location within the overall SEAD site.

FIGURE BA-11 SITE PLAN FOR SEAD-57: EXPLOSIVE ORDNANCE DISPOSAL AREA

WELL INSTALLATION
LEVEL D

TASK SPECIFIC
SAFE OPERATION GUIDELINE 4
page 1 of 2

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #57 Explosive Ordinance Disposal Area

3. Hazards
   - Inhalation : Contaminated soil and dust
   - Contact : Heavy metals in soil
   - Explosion : Possible unexploded ordinance (UXOs)
   - Physical : Metal debris, unexploded ordnance.

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.

WELL DEVELOPMENT
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 7
page 1 of 2

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1. Site : Seneca Army Depot

2. Location : SEAD SWMU #57 Explosive Ordinance Disposal Area

3. Hazards
   - Inhalation :
   - Contact : Heavy metals in groundwater
   - Explosion : Unexploded ordnance
   - Physical : Metal debris, unexploded ordnance.

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-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Monitor well headspace upon opening. If readings are elevated, let well air out and monitor again. If readings are still elevated, upgrade PPE.

   : 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/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 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.

   : Place wastewater receiving drum on stable, flat surface with access for later 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.

TEST PIT EXCAVATION
LEVEL B

TASK SPECIFIC
SAFE OPERATING GUIDELINE 12

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1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #57 - Explosive Ordnance Disposal Area

3. Hazards
   - Inhalation : Contaminated soil and dust
   - Contact : Heavy metals in soil
   - Explosion : Unexplosded ordnance
   - Physical : Unexploded ordnance, debris, machinery, excavation.

4. Personal Protective Equipment :
   - Level B : Self-contained breathing apparatus (SCBA) or air-line respirator. 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.

		Exercise			
Instrument Actions Levels	**D**	**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 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 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 and other equipment before leaving excavation area. Equipment should be steamed cleaned before leaving site. Bucket should be steam cleaneded prior to use in another borehole.

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.

Change of SCBA air tank can be performed after removal of outer gloves if coveralls are not grossly contaminated.

---

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #57 - Explosive Ordnance Disposal Area

3. Hazards
   - Inhalation : Contaminated soil and dust
   - Contact : Heavy metals in soil
   - Explosion : Unexploded ordnance
   - Physical : Unexploded ordnance, 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 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 25	19.5 to 25	<19.5	--	>25
Exploeimeter (% 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 : 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 respirator (if worn).
Step 7 Removal of inner gloves.
Step 8 Wash hands and face.

Change of APR cartridge can be performed after removal of outer gloves if coveralls are not grossly contaminated.

GEOPHYSICAL MONITORING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDLINE 28

1. Site : Seneca Army Depot

2. Location : SEAD SWMU #57 Explosive Ordinance Disposal Area

3. Hazards
   Inhalation : Contaminated soil and dust
   Contact : Heavy metals in soil
   Explosion : Possible unexploded ordinance (UXO)
   Physical : Metal debris and unexploded ordnance.

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

Change of APR cartridge 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 #57 Explosive Ordinance Disposal Area

3. Hazards
   Inhalation : Contaminated soil and dust
   Contact : Heavy metals in soil
   Explosion : Possible unexploded ordinance (UXO)
   Physical : Metal debris, unexploded ordnance.

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 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 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.

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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.

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
MOLECULAR WEIGHT : 74.92
PHYSICAL STATE : Brittel metal
SOLUBILITY IN H_2O : Insoluble
BOILING POINT : sublimes
MELTING POINT : 1135°F

VAPOR PRESSURE : 1 mmHg @ 372°C
VAPOR DENSITY :
SPECIFIC GRAVITY : 5.73
FLASH POINT :
FLAMMABLE LIMITS :
INCOMPATIBILITIES : hot acids, strong oxidizers, bromine azide

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL : 0.01 mg/m3
OSHA STEL :
NIOSH REL : 0.002 mg/m3 C. 15 min
NIOSH STEL :
ACGIH TLV : 0.2 mg/m3
ACGIH STEL :
IDLH : 100mg/m3
ODOR THRESH. :
ODOR : garlic-like

TOXICITY CLASS : iritant, systemic

CARCINOGENIC CLASS : Confirmed inhalation carcinogen.

ROUTES OF EXPOSURE: inhalation, ingestion, direct contact, skin absorption.

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.

0892

CHEMICAL HAZARD EVALUATION SHEET

CHEMICAL NAME: Barium

CAS NUMBER:7440-39-3

SYNONYMS:

REFERENCES CONSULTED: NIOSH Pocket Guide,

CHEMICAL PROPERTIES:

CHEMICAL FORMULA : Ba

MOLECULAR WEIGHT : 137.34

PHYSICAL STATE : Lumps or powder

SOLUBILITY IN H_2O : varies

BOILING POINT : 1640°C

MELTING POINT : approx. 725°C

VAPOR PRESSURE : 10 mmHg @ 1049°C

VAPOR DENSITY :

SPECIFIC GRAVITY : 3.6

FLASH POINT :

FLAMMABLE LIMITS :

INCOMPATIBILITIES :

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL : 0.5 mg/m3

OSHA STEL :

NIOSH REL : 0.5 mg/m3

NIOSH STEL :

ACGIH TLV : 0.5 mg/m3

ACGIH STEL :

IDLH : 1100 mg/m3

ODOR THRESH. :

ODOR :

TOXICITY CLASS : Irritant, systemic

CARCINOGENIC CLASS :

ROUTES OF EXPOSURE : inhaltion, ingestion, direct contact

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
MOLECULAR WEIGHT : 78.1
PHYSICAL STATE : Liquid
SOLUBILITY IN H_2O : 1800 ppm
BOILING POINT : 176°F
MELTING POINT : 42°F

VAPOR PRESSURE : 75 mmHg
VAPOR DENSITY : 2.8
SPECIFIC GRAVITY : 0.877
FLASH POINT : 12°F
FLAMMABLE LIMITS : 1.4% - 8.0%
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
OSHA STEL : 5 ppm, 15.6 mg/m3
NIOSH REL : 0.1 ppm, 0.32 mg/m3
NIOSH STEL : 1 ppm, 3.2 mg/m3
ACGIH TLV : 10 ppm, 32 mg/m3
ACGIH STEL :
IDLH : 2000 ppm
ODOR THRESH. : 1.5 - 5 ppm
ODOR : Aromatic

TOXICITY CLASS

CARCINOGENIC CLASS : Probable human carcinogen
ROUTES OF EXPOSURE : Inhalation, ingestion direct contact skin absorption

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
MOLECULAR WEIGHT : 112.40
PHYSICAL STATE : Soild
SOLUBILITY IN H_2O : Insoluble
BOILING POINT : 767°C
MELTING POINT : 321°C

VAPOR PRESSURE :
VAPOR DENSITY :
SPECIFIC GRAVITY : 8.6
FLASH POINT :
FLAMMABLE LIMITS :
INCOMPATIBILITIES : Strong oxidizers, elemental sulfur, selenium, tellurium

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL : 0.2 mg/m3 0.6 Ceil.
OSHA STEL :
NIOSH REL : Ca
NIOSH STEL :
ACGIH TLV : 0.05 mg/m3 Ceil.
ACGIH STEL :
IDLH : 4.0 mg/m3
ODOR THRESH. :
ODOR :

TOXICITY CLASS :

CARCINOGENIC CLASS: Probable human carcinogen

ROUTES OF EXPOSURE: inhalation, ingestion, direct contact

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.

0892

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)
MOLECULAR WEIGHT : 52
PHYSICAL STATE : violet, green, or orange salts
SOLUBILITY IN H_2O : varies
BOILING POINT : 4784°F
MELTING POINT : 3452°F

VAPOR PRESSURE : 1mmHg @ 1610°C
VAPOR DENSITY :
SPECIFIC GRAVITY : 7.14
FLASH POINT :
FLAMMABLE LIMITS :
INCOMPATIBILITIES : Strong oxidizers, acids, strong alkalies

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL : 0.1 mg/m3 Ceil.
OSHA STEL :
NIOSH REL : 0.001 mg/m3
NIOSH STEL :
ACGIH TLV : 0.05 mg/m3
ACGIH STEL :
IDLH : 500 mg/m3
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 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
MOLECULAR WEIGHT : 63.5
PHYSICAL STATE : metal
SOLUBILITY IN H_2O : insoluble
BOILING POINT : 2567°C
MELTING POINT : 1083.4°C

VAPOR PRESSURE :
VAPOR DENSITY :
SPECIFIC GRAVITY : 8.92
FLASH POINT :
FLAMMABLE LIMITS :
INCOMPATIBILITIES : Acetylene gas, magnesium metal, strong acids, organic acids

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL : 1 mg/m3
OSHA STEL :
NIOSH REL : 1 mg/m3
NIOSH STEL :
ACGIH TLV : 1 mg/m3
ACGIH STEL :
IDLH :
ODOR THRESH. :
ODOR :

TOXICITY CLASS :

CARCINOGENIC CLASS:
ROUTES OF EXPOSURE: inhalation, ingestion, direct contact.

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
MOLECULAR WEIGHT : Approx. 180
PHYSICAL STATE : Liquid
SOLUBILITY IN H_2O : 5 ppm
BOILING POINT : 151°C-588°C
MELTING POINT : -48°C-18°C
VAPOR PRESSURE : 2.1mmHg-26mmHg
VAPOR DENSITY :
SPECIFIC GRAVITY : 0.81 - 0.95
FLASH POINT : 38°C-169°C
FLAMMABLE LIMITS : 0.6% - 7.5%
INCOMPATIBILITIES : Strong oxidizers

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL : 100 ppm 400 mg/m3(a)
OSHA STEL :
NIOSH REL : 100 ppm 400 mg/m3(a)
NIOSH STEL :
ACGIH TLV :
ACGIH STEL :
IDLH : 10,000 ppm
ODOR THRESH. :
ODOR : Kerosene
TOXICITY CLASS :
CARCINOGENIC CLASS:
ROUTES OF EXPOSURE: inhalation, ingestion, direct contact

(a) Exposure limits for naptha(coal tar).

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
MOLECULAR WEIGHT : 207.19
PHYSICAL STATE : Soft metal
SOLUBILITY IN H_2O : Insoluble
BOILING POINT : 1783°F
MELTING POINT : 473°F

VAPOR PRESSURE : 1 mmHg @ 970°C
VAPOR DENSITY :
SPECIFIC GRAVITY : 11.35
FLASH POINT :
FLAMMABLE LIMITS :
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
MOLECULAR WEIGHT : 201
PHYSICAL STATE : Silver Liquid
SOLUBILITY IN H_2O : 20 ppm
BOILING POINT : 674°F
MELTING POINT : -38°F

VAPOR PRESSURE : 0.0012 mmHg
VAPOR DENSITY : 7.0
SPECIFIC GRAVITY : 13.59
FLASH POINT :
FLAMMABLE LIMITS :
INCOMPATIBILITIES : Acetylene, ammonia gases

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL : 0.05 mg/m3 Skin
OSHA STEL :
NIOSH REL : 0.05 mg/m3 Skin
NIOSH STEL :
ACGIH TLV : 0.1 mg/m3 Skin
ACGIH STEL :
IDLH : 10 mg/m3
ODOR THRESH. :
ODOR : odorless

TOXICITY CLASS :

CARCINOGENIC CLASS:
ROUTES OF EXPOSURE: inhalation, ingestion, direct contact, skin absorption

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
MOLECULAR WEIGHT : 58.7
PHYSICAL STATE : Solid
SOLUBILITY IN H_2O : 180 ppm
BOILING POINT : 4946°C
MELTING POINT : 2648°C

VAPOR PRESSURE : 1 mmHg @ 1800°C
VAPOR DENSITY :
SPECIFIC GRAVITY : 8.908
FLASH POINT :
FLAMMABLE LIMITS :
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
MOLECULAR WEIGHT : 78.96
PHYSICAL STATE : Powders, crystals
SOLUBILITY IN H_2O : Insoluble
BOILING POINT : 689.9°C
MELTING POINT : 217°C

VAPOR PRESSURE : 1 mmHg @ 356°C
VAPOR DENSITY :
SPECIFIC GRAVITY : 4.26
FLASH POINT :
FLAMMABLE LIMITS :
INCOMPATIBILITIES : Acids, strong oxidizers

EXPOSURE LIMITS AND TOXICITY INFORMATION

OSHA PEL : 0.2 mg/m3
OSHA STEL :
NIOSH REL : 0.2 mg/m3
NIOSH STEL :
ACGIH TLV : 0.2 mg/m3
ACGIH STEL :
IDLH : 100 mg/m3
ODOR THRESH. :
ODOR :

TOXICITY CLASS :

CARCINOGENIC CLASS:
ROUTES OF EXPOSURE: inhalation, ingestion, direct contact

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
MOLECULAR WEIGHT : 92.1
PHYSICAL STATE : Liquid
SOLUBILITY IN H_2O : 520 ppm
BOILING POINT : 111°C
MELTING POINT : -95°C

VAPOR PRESSURE : 22 mmHg
VAPOR DENSITY : 3.14
SPECIFIC GRAVITY : 0.867
FLASH POINT : 40°F 4°C
FLAMMABLE LIMITS : 1.3% - 7.0%
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

DRAFT

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).

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- 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 / W -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.

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*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.

<u>Heat Cramp Symptoms</u>. The symptoms of heat cramp are:

- Muscle cramps in legs and abdomen,
- Pain accompanying the cramps,
- Faintness, and
- Profuse perspiration.

<u>Heat Cramp Emergency Care</u>. 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

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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 .

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HEAT STRESS MONITORING

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.

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INCIDENT REPORT

Page 1 of 6

Inc. rpt. no.:________-____

DATE OF REPORT ______________

SITE: ____

SITE LOCATON: ____

REPORT PREPARED BY: ____
NAME PRINTED TITLE

INCIDENT CATEGORY
(check all that apply)

___ Injury
___ Near Miss
___ Motor Vehicle
___ Mechanical
___ Illness
___ Fire
___On site equipment
___ Other
___ Property Damage
___ Chemical Exposure
___ Electrical

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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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
____ Dislocations
____ Heat Burns
____ Chemical Burns
____ Cold Exposure
____ Frostbite

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INCIDENT REPORT
Page 3 of 6

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: ______________________
____

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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: $______________________________

DRAFT

INCIDENT REPORT
Page 5 of 6

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?)

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

Page ___ of ___

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

PARSONS-MAIN, INC.
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.

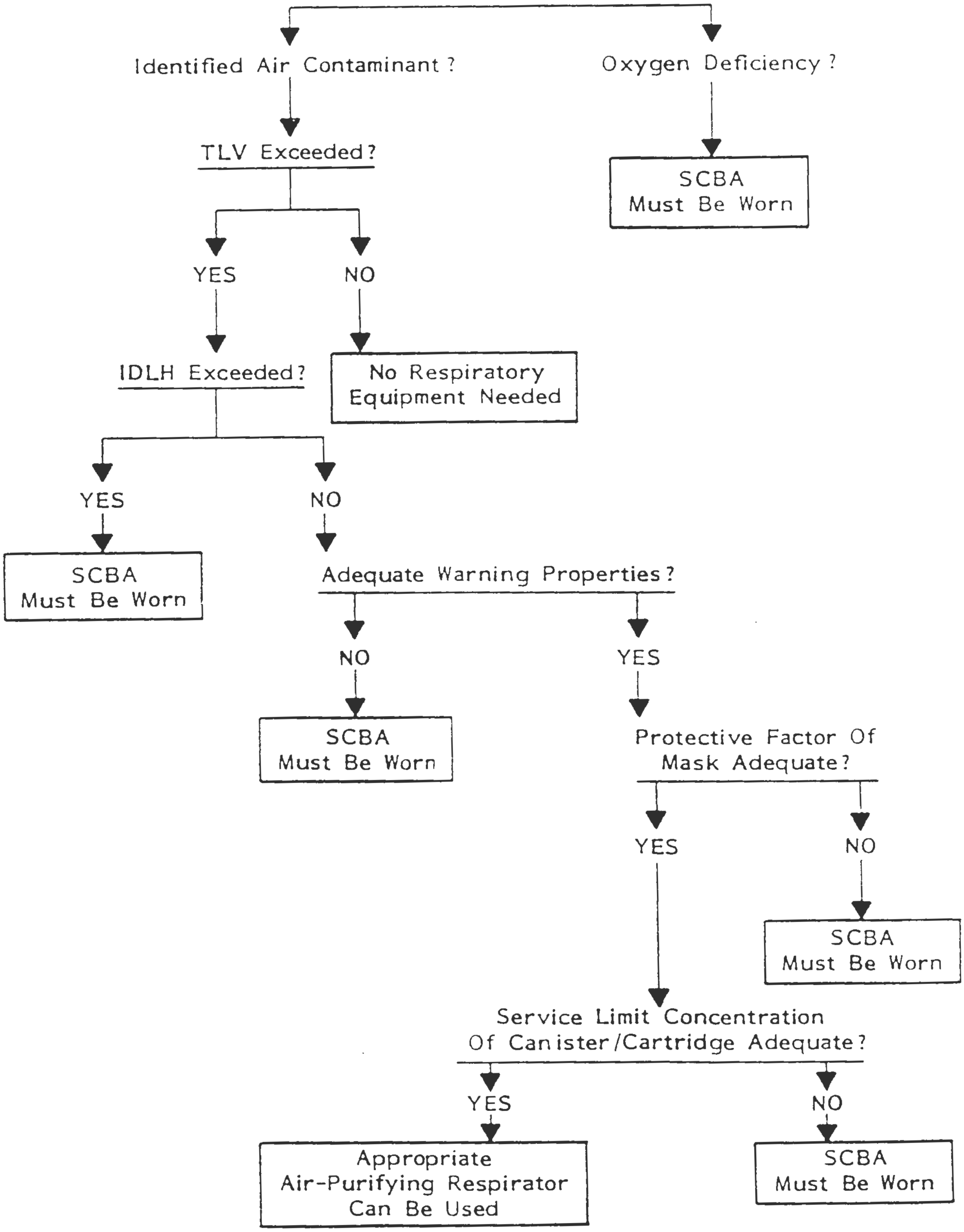
5.0 RESPIRATOR SELECTION

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 Protection Factors

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 Respirator Types

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 pressure-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:

Rubber head harness:

Rubber hose:

Exhalation valve:

Inhalation valves (APR):

Speaking diaphram:

Remarks:

O-rings (APR)

Cartridge (APR)

Type:

Exp. date:

Washing
Sanitization:

Antifogging Agent Application
on lenses:

Table 7

Self-Contained Breathing Apparatus Monthly Inspection Sheet

Device:

Serial #: _

Date inspected:

Inspected by:

Checklist

Rubber facepiece:

Rubber head harness:

Rubber hose:

O-rings

Exhalation valve:

Facepiece Lens:

Harness:

Backpack:

Washing/Sanitizing:

Operating Instructions:

Hydrostatic test date:

No visible damage:

Remarks:

Antifogging Agent Application on lenses:

Air Cylinder Pressure:

Bypass Valve (MSA):

Mainline Valve (MSA):

Alarm:

Regulatory Diaphragm (MSA):

Regulatory Function:

Demand Valve O.K. (North):

Pressure Demand:

Storage Box:

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 [illegible] include [illegible]

(i) [illegible]

(ii) Cleaning and [illegible]

(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.

[[illegible] amended by 49 FR 5322 [illegible] 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 [illegible]

(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.

§ 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. Indentification 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

ATTACHMENT F

PARSONS-MAIN, INC.
CONFINED SPACE ENTRY PROCEDURES

CONFINED SPACE ENTRY PROGRAM

FOR

HAZARDOUS WASTE SITE INVESTIGATIONS

January, 1993

Confined Space Entry Program
for
Hazardous Waste Site Investigations

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1.0 PURPOSE AND SCOPE

This confined space entry program is intended to provide guidelines and methods for work which must be carried out in confined spaces during hazardous waste site investigations or remedial measures. The procedures of this program are parallel to the requirements of the Engineering-Science Confined Space Entry Program for wastewater treatment plants. This plan is intended to address the hazards and required procedures of confined space entry as it may be required at hazardous waste sites and as they differ from the hazards and requirements at wastewater treatment plants.

The Occupational Safety and Health Administration (OSHA) regulations governing hazardous waste site operations require that confined space entry procedures be addressed in the health and safety plan for site work (29 CFR part 1910.120(b)(4)(ii)(I)). If no confined space entry is required for a particular site, this should be explicitly stated in the health and safety plan. If entry into confined spaces is required the procedures for developing an entry plan and conducting the work should be drawn from the guidance in this program.

It is important to plan carefully for any confined space entry procedure. Work in confined spaces accounts for a disproportionate share of accident fatalities and often fatalities occur to would-be rescuers as well as to confined space workers. Hazardous conditions can arise quickly in a confined space due to residual contamination, poor ventilation, uncontrolled energy release, or other factors. Escape from a confined space can be difficult and slow, possibly turning an otherwise minor hazard into a catastrophe.

Entry into any area designated as a confined space will be by permit only (See Section 5.3). The permit is an authorization and approval in writing that specifies the location and type of work to be done, and certifies that all existing hazards have been evaluated and the necessary protective measures have been taken to ensure the safety of each worker.

2.0 DEFINITION OF A CONFINED SPACE

A "confined space" is defined as any enclosed or semi-enclosed space that has limited openings for entry and exit, that is not intended for continuous employee occupancy, and that does not have sufficient natural or mechanical ventilation to prevent build-up of a hazardous atmosphere.

Confined spaces which may be encountered at hazardous waste sites include storage tanks, sewers, waste pits, degreasers, ventilation and exhaust ducts, tunnels, utility vaults, and pipelines. Excavations deeper than four feet should also be considered confined spaces. Note that excavations should be sloped or shored according to the requirements of 29 CFR 1926.651 prior to entry by any personnel.

Abandoned buildings should also be treated as confined spaces, at least during initial entry, until actual conditions inside the building can be determined. For entry into buildings, use of standard procedures for initial entry into unknown environments will satisfy many of the requirements for entry into a confined space.

2.1 POTENTIAL HAZARDS OF CONFINED SPACES

There are a number of hazards associated with confined spaces. These include:

- explosive and toxic gases
- noise
- oxygen deficiency (asphyxiation)
- falling objects
- bumping into obstructions
- vehicular traffic
- temperature extremes

All of the above hazards can lead to accidents. All employees must be made aware of these hazards. All of the above hazards can be eliminated resulting in no loss of time or loss of life. The prevention of accidents requires a common sense approach to work in confined spaces and strict adherence to all safety rules associated with confined spaces.

2.2 CLASSIFICATION OF CONFINED SPACES

Confined spaces are classified based upon existing or potential hazards relative to the confined space. The classification is based on the characteristics of the confined space, oxygen level, flammability (class A, B, or C), and toxicity. Table 1 shows the classification of confined spaces. All employees are to be made aware of these classifications and office and site management are responsible for insuring that all employees or contractors working in confined spaces understand this system of classification.

3.0 REQUIRED EQUIPMENT FOR CONFINED SPACE ENTRY

The following is a list of equipment which must be considered as the minimum required for entering and working in confined spaces:

- fresh air blower and large diameter flexible hose for ventilation.

- atmosphere-testing equipment to monitor oxygen deficiency, combustible gases, and suspected toxic gases (e.g., hydrogen sulfide and carbon monoxide)

- harness and individual life lines for each person going into the confined space and for the standby crew outside

- a positive pressure, self-contained breathing apparatus or a positive pressure supplied air respirator with a five-minute escape tank for each entry person and for the standby rescue crew

- protective clothing, including rubber boots, gloves, rain gear, hard hats with chin straps, and face shields or goggles

- explosion-proof lights

- communications equipment, if the scope of the work makes it necessary
- first aid kit
- tripod-type lifting equipment with parachute-type harness readily available in case ladders are corroded or fail during entry or exit. A harness rope can also be used to lower and raise employees where there are no ladders

All personnel must have a clear understanding of the use of the equipment, and periodic inspections (every 30 days) should be made of the equipment and user ability to operate it effectively. A checklist of considerations for use in working with confined spaces can be found in Table 2. Equipment necessary for each particular confined space should be determined by using this table and by the Office Health and Safety Representative.

4.0 ATMOSPHERIC TESTING OF CONFINED SPACES

All confined spaces must be considered dangerous before entry until proven safe. Tests should be taken of the atmosphere in the space before opening, if this is practical. Some confined spaces may have ports or holes through which a probe may be inserted prior to opening. A test of the atmosphere shall be performed before any employee enters a confined space.

The principal atmospheric tests will be for oxygen deficiency, explosive, and toxic gases. Combination meters are available that will give an indication of the percentage of oxygen and the percentage of the lower explosive limit of the tested atmosphere. The atmosphere shall be tested for the presence of hydrogen sulfide, carbon monoxide, methane, carbon dioxide, or any other gas suspected of being present in the particular space.

It is important to understand that some gases or vapors are heavier than air and will settle to the bottom of a confined space. Also, some gases are lighter than air and will be found around the top of the confined space area (see Figure 1). Therefore, it is necessary to test all areas (top, middle, bottom) of a confined space.

If the atmosphere is found to contain toxic or explosive gases or has an oxygen concentration less than 19.5 percent or greater than 23 percent the area must be ventilated. If possible, openings upstream and downstream from the work area should be opened. An air supply blower for positive displacement of the atmosphere should be used. When using a gasoline/diesel powered ventilation blower, ensure exhaust from engine is not being drawn into the confined space by the blower. If a hazardous atmosphere persists in spite of ventilation, it will be necessary for the employee to utilize proper respiratory protection equipment while in the confined space. Entrance into an atmosphere containing any type of hazardous gas will require the use of a positive pressure self-contained breathing apparatus or positive pressure supplied air respirator with a five-minute escape tank.

Personnel working in a confined space must be equipped with a continuous atmospheric monitoring device. This is true even if the atmosphere was found to be safe before entry to the confined space. Monitoring of the atmosphere shall be performed in accordance with the Confined Space Entry permit. Equipment use for continuous monitoring of the atmosphere shall be explosion-proof and equipped with an audible alarm that will alert employees when a hazardous condition develops.

4.1 INSTRUMENT MAINTENANCE AND CALIBRATION

An employee's well being depends on the proper functioning of safety equipment; careful, regular maintenance of the monitoring equipment is essential. Maintenance documentation for the air monitoring equipment must be maintained by the Site Health and Safety Representative.

All monitoring instruments must be calibrated prior to use. Records of calibration are to be maintained by the Site Health and Safety Representative. The limitations and possible sources of error for each instrument must be understood by the operator. It is extremely important to ensure that an instrument responds to the substance(s) it was designed to monitor.

4.2 OXYGEN-DEFICIENT ATMOSPHERES

An oxygen-deficient atmosphere will have less than 19.5 percent available oxygen (O_2), which is the minimum level for safe entry into a confined space without a breathing apparatus. An atmosphere with less than 19.5 percent available oxygen places the employee in imminent danger.

The oxygen level in a confined space can decrease because of work being done, such as welding, cutting, brazing, stirring up sludge, chemical reaction of residual contents, chemical reaction of material sorbed on walls, etc. The oxygen level can also be decreased if displaced by another gas, such as carbon dioxide or nitrogen. Total displacement of oxygen by another gas can result in unconsciousness and death.

4.3 FLAMMABLE AND EXPLOSIVE ATMOSPHERES

For a confined space to have an explosive or flammable atmosphere, three components are necessary; oxygen, a flammable or explosive gas, vapor or dust in the proper mixture, and a source of ignition (fire, hot work, sparks). Explosive and flammable gases encountered in waste site confined spaces may include methane, hydrogen sulfide, gasoline, solvent vapors, and carbon monoxide. Entry into a confined space for any type of hot work will be prohibited when air monitoring indicates the presence of flammable vapors greater than 10 percent of the lower flammability limit.

An oxygen-enriched atmosphere is an environment with available oxygen above 23 percent. This type of atmosphere will cause flammable materials, such as clothing and hair, to burn violently when ignited. Never use oxygen to ventilate a confined space since this will produce an oxygen-enriched atmosphere.

4.4 TOXIC ATMOSPHERES

All substances (liquids, vapors, solid materials, and dusts) should be considered hazardous in a confined space. Toxic substances can come from the following:

- The product stored or conveyed in the space: Toxic substance can be absorbed into walls and can give off toxic gas when sampling, cleanup, or removal activities are performed. This is especially true in confined spaces in waste disposal areas due to the possible presence of sludges and decomposing material. Toxic gases which may be encountered in waste site confined spaces include carbon monoxide, hydrogen sulfide, hydrogen cyanide, and solvent vapors. Know what was stored in the confined space before entering and take appropriate protective measures.

- The work being performed in the space: Examples of work which can cause the creation of toxic substances are welding, cutting, brazing, cleaning, painting, scraping and sanding. Monitor around the operation continuously.

- Prior or existing process lines, waste lines or drain lines leading into a confined space. Toxic atmospheres can be generated in various processes. For example, cleaning solvents are used in many industries. The vapors from these solvents are very toxic in a confined space.

5.0 PRE-ENTRY WORK PRACTICES

5.1 ISOLATION/LOCKOUT/TAGGING

Whenever entry into a confined space is necessary, the space must be isolated from all other systems and sources of hazardous energy must be controlled. This is to insure that injury does not occur from inadvertent actions while an employee is in the confined space.

Sources of hazardous energy include any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

The potential sources of hazardous energy for different types of confined spaces will vary. Prior to any entry into a confined space, the potential sources of hazardous energy should be identified through a thorough investigation of previous uses of the space. Inspect any pipes, hydraulic lines, pneumatic lines, and electrical lines in the vicinity of the confined space to determine their origin and destination. All lines leading to the confined space should be disconnected or blanked (physically blocked) before entry to the confined space is attempted. All overhead or overhanging structures or materials should be inspected for materials which could fall onto workers during the confined space work. Any mechanical parts or moving parts in the confined space and mechanisms which control the movement of the confined space should be blocked to prevent inadvertent movement.

Blanks must be used to physically isolate all lines connected to the confined space. Shut-off valves serving lines to the confined space must also be locked in the closed position and tagged for identification. In addition to blanking, pumps and compressors serving these lines entering the confined space must be locked out and tagged to prevent accidental activation. If a drain line is located within the confined space, provision should be made when necessary to tag it. In continuous systems, where complete isolation is not possible, such as sewers, specific written safety procedures should be used.

There must be an electrical isolation of the confined space to prevent accidental activation of moving parts that would be hazardous to the worker. Lock-out of circuit breakers or disconnects in the open (off) position with a key-type padlock is required. The only key is to remain with the person working inside the confined space (who locked out the breaker). If more than one person is inside the confined space, each person must place his own lock on the circuit breaker. In addition to lockout systems, there must be an accompanying tag that identifies the operation and prohibits use.

Mechanical isolation of moving parts can be achieved by disconnecting linkages, or removing drive belts or chains. Equipment with moving mechanical parts must also be blocked in such a manner that there can be no accidental rotation. Remember, lives are at stake. All of these steps are equally important. All lockout and tagout procedures must conform to OSHA Standards (see 29 CFR Part 1910.147).

At abandoned facilities, do not assume that electricity and other sources of energy have been turned off. Careful inspections should be conducted to determine possible sources of energy leading to buildings, tanks, etc., and these sources of energy should be disconnected as far upstream of the confined space as is possible.

5.2 MEDICAL, FIRST AID AND RESCUE PROVISIONS

First aid training must be provided for personnel directly involved with work in confined spaces. A list of hospitals, clinics, doctors, police, and fire and ambulance services must be maintained, together with a first aid kit. First aid kits must be checked on a scheduled basis and before any work for which they may be needed. Workers shall have a contingency plan available in the event of an emergency. For Class A and B (see Table 1 for definition) entry there must always be someone readily available in the area of the confined space who is currently trained in cardio-pulmonary resuscitation (CPR) and standard first-aid procedures.

Standby rescue personnel shall be fully equipped and ready to effect a rescue entry immediately. The harness and line will also provide security when a man is in a hazardous location. Should rescue of an employee be required, the exact procedure will be determined by the location, crew size, and particular confined work space. If a tripod and full body harness have been utilized, the extraction can usually be made by one top-side attendant.

The initial reaction of a standby person under a situation where an employee is in trouble is to go after a victim. This is not a correct first move and could lead to more casualties. First, call for help either by radio or phone. Next, the rescuer must put on respiratory protection and other necessary equipment before entering the confined space. After reaching the victim, assess the injury and the nature of the accident for the correct removal procedure. Administer first aid or breathable air to keep the victim alive until further medical assistance arrives.

5.3 CONFINED SPACE ENTRY PERMIT

A permit is an authorization and approval in writing that specifies the location and type of work to be done. It certifies that all existing hazards have been evaluated by a qualified person and necessary protective measures have been taken to insure the safety of each employee. The Plant Health and Safety Representative or Plant Manager must be responsible for securing the permit and shall sign off when the work and hazards have been located and described.

A work safety permit/confined space entry permit must include the following:

- Hazards that may be encountered
- Complete isolation checklist, including blanking or disconnecting; electrical lockout; and mechanical lockout

- Special clothing and equipment, including personal protective equipment and clothing; safety harness or lines; tools approved for use in accordance with the Hazardous Location Classification (NEC-1981); and approved electrical equipment

- Atmospheric testing readings, including oxygen level; flammability or explosive levels; and toxic substance levels

- Atmospheric monitoring while work is being performed (Class A on a continuous basis and Class B as determined by the qualified person)

- Personnel training and complete understanding of the hazards

- Standby person(s) as named on the permit

- Emergency procedures

- Confined space classifications A, B, and C. The permit must be updated for each shift or crew change with the same requirements. The permit for a Class A or B confined space should be posted in a conspicuous place, close to the entrance, and a copy filed with the employer and Plant Health and Safety file

An example of a safety work permit/confined space entry permit is shown in Table 3.

5.4 LABELING AND POSTING

All entrances to any confined space must posted. Signs shall include, but are not limited to the following information:

DANGER

CONFINED SPACE

ENTRY BY PERMIT ONLY

When a specific work practice is performed or specific safety equipment is needed, the following statement shall be added, in large letters, to the warning sign:

RESPIRATOR REQUIRED FOR ENTRY

LIFELINE REQUIRED FOR ENTRY

6.0 WORKING IN A CONFINED SPACE

6.1 ENTERING A CONFINED SPACE

Regardless of vehicular or pedestrian traffic, all open manholes, pits, or other ground surface openings should always be marked with barricades and warning devices such as traffic cones. This protection should not be removed until the work is completed and the covers replaced. A manhole cage over the manhole shaft is very desirable as well, both for protection it provides and as a handhold while descending into, and ascending from, the manhole.

When entering a manhole or other confined space which has a manhole for entry always use a specially designed tool or pick to remove the cover, never use a finger or hand for this purpose. Leave the cover two to three feet from the manhole and flat on the ground. Never leave the cover leaning against a object where it could fall.

Be alert for loose or corroded steps or poor footing when entering a confined space. Always test or kick each step individually before using it. If required, portable ladders should be used for entrance. If ladders are used, they should be adequately secured for safety. If an aluminum ladder is to be used in a confined space where chemicals were stored, the previous contents should be checked for compatibility with aluminum. Deaths have occurred due to reactions of aluminum ladders with incompatible materials.

A first aid kit should always be at the work site when entry into a confined space is made. The kit should include amyl-nitrite capsules for hydrogen sulfide exposure.

6.3 WORKING IN A CONFINED SPACE

When work is being done in a confined space, stand-by personnel, preferably at least two, must be present in case of accident or should rescue become necessary. Each stand-by person must have a fully charged, positive pressure, self-contained breathing apparatus readily available.

All personnel working in the confined space must be wearing a safety harness with an individual life line. Each stand-by person shall also have a safety harness and life line. An emergency hoist must be available to lift personnel out of the confined space should the need arise.

Personnel who are in the confined space must be equipped with a continuous atmospheric monitoring device. Generally, the indicator can be worn on the belt of the employee. The indicator must have an audible alarm that sounds in an unsafe environment. This continuous monitor is extremely important as there have been instances where the confined atmosphere has changed quickly into a hazardous environment, even with continuous ventilation.

While working in the confined space the employee must be aware of several factors. High temperatures and humidity can lead to heat stress or suffocation. If the worker begins to feel dizzy or light-headed he must leave the confined space immediately.

Slick and wet surfaces will probably be encountered in the confined space. Slips and falls can cause injury. Falling objects are also a hazard, particularly in spaces which have topside opening for entry. Hard hats must always be worn in confined spaces.

Noise within a confined space may be amplified because of the design and acoustic properties of the space. Excessive noise can damage hearing as well as affect communication, such as a shouted warning or the alarm on belt worn gas monitors. Hearing protection may be warranted.

Explosion-proof lights shall always be used in confined spaces. All electrical tools used must be equipped with ground fault interrupters. Workers must be aware that wet surfaces increase the potential for, and effect of, electric shock.

Initial work inside the confined space should proceed slowly. The work crew should look for any signs that the work is producing a hazardous condition such as increased air monitoring readings at breathing level or at the work face, signs of chemical reaction, vapor generation, or mechanical or physical instability.

If the sampling or other work shows no sign of producing a hazardous condition, the work can proceed at a more normal pace. However, the work crew should remain aware of possible changing conditions in different areas of the confined space. All activities should be performed with extreme care and with the constant awareness of the limitations and hazards of working in a confined space.

7.0 TRAINING FOR CONFINED SPACE WORK

Personnel are made aware of the hazards and procedures associated with confined space entry during the initial safety training. Personnel who have been assigned to work in a confined space, or in support of those working in a confined space, must receive the following additional training prior to assignment:

- emergency entry and exit procedures
- use of applicable respirators
- first aid and cardio-pulmonary resuscitation
- lockout procedures
- safety equipment including rescue equipment used
- fire protection
- traffic control procedures
- permit systems
- work practices
- communications

Rescue and training drills designed to maintain proficiency are to be conducted with new employees, and thereafter, at least annually or at lesser intervals. Training in all aspects of confined space safety must be an ongoing process.

8.0 MEDICAL MONITORING

The medical monitoring requirements of 29 CFR 1910.120 for general hazardous waste site work are adequate for monitoring employees performing confined space entry. Potential chemical exposures in the confined space should be reviewed to determine if any special pre-work medical monitoring tests are indicated.

TABLE 1
CONFINED SPACE CLASSIFICATION TABLE

PARAMETERS	CLASS A	CLASS B	CLASS C
Characteristics	Immediately dangerous to life; rescue procedures require the entry of more than one individual fully equipped with life support equipment; communication requires an additional standby person stationed at the confined space.	Dangerous, but not immediately life threatening; rescue procedures require the entry of no more than one individual fully equipped with life support equipment; indirect visual or auditory communication with workers. A standby person must be available.	Potential hazard; requires no modification of work procedures; standard procedures; direct communication with workers from outside the confined space.
Oxygen	16% or less, 16.3 kPa (122mm Hg) or greater than 25%[a], 25.3 kPa (190 mm Hg)	16.1% to 19.4%, 16.3-19.6 kPa (122-147 mm Hg) or 21.5% to 25% 21.7-25.3 kPa (163-190 mm Hg)[a]	19.5% to 21.4%, 19.7-21.7 kPa (148-163 mm Hg)
Flammability Characteristics	20% or greater of LEL	10%-19% LEL	10% LEL or less
Toxicity	IDLH[b]	Greater than Permissible Exposure Limit (PEL) referenced in 29 CFR Part 1910 subpart Z (OSHA); less than IDLH[b]	Less than Permissible Exposure Limit (PEL) referenced in 29 CFR Part 1910 subpart Z (OSHA)

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[a] Based upon a total atmospheric pressure of 100 kPa (769 mm Hg)(sea level).

[b] Immediately Dangerous to Life or Health (IDLH); as referenced in NIOSH Registry of Toxic and Chemical Substances, Manufacturing Chemists data sheets, industrial hygiene guides or other recognized authorities.

Source: U.S. Department of Health Education and Welfare, 1979. Criteria for a recommended standard

TABLE 2
CHECK LIST OF CONSIDERATIONS FOR ENTRY, WORKING IN, AND EXITING CONFINED SPACES

Item	Class A	Class B	Class C
Permit	x	x	x
Atmospheric testing	x	x	x
Monitoring	x	x	x
Medical surveillance	x	x	x
Training of personnel	x	x	x
Labeling and posting	x	x	x
Preparation			
Isolation/lockout/tagout	x	x	o
Purge and ventilate	x	x	o
Cleaning processes	o	o	o
Requirements for special equipment/tools	x	x	o
Procedures	x	x	x
Initial plan	x	x	x
Standby person	x	x	x
Communications/observation	x	x	x
Rescue	x	x	x
Work			
Safety equipment and clothing	x	x	x
Head protection	o	o	o
Hearing protection	o	o	o
Hand protection	o	o	o
Foot protection	o	o	o
Body protection	o	o	o
Respiratory protection	x	x	x
Safety belts	x	x	x
Life lines, harness	x	x	x
Rescue equipment	x	x	x
Recordkeeping/exposure			

x - indicates requirement
o - indicates determination by the qualified person

Class A - Atmosphere immediately dangerous to life -- oxygen deficiency, explosive, toxic, flammable.
Class B - Could cause injury or illness that can be protected against -- not immediately dangerous to life or health.
Class C - Confined space hazard requiring no work procedure modification.
Source: U.S. Department of Health Education and Welfare, 1979, Criteria for Recommended Standards ...working in confined spaces, DHEW (NIOSH) Publications No. 80-106, Page 5.

TABLE 3
CONFINED SPACE ENTRY PERMIT

Class[a] ______________

Location of work: ____
Description of work: ____
Employees Assigned: ____
Entry Date/Time: ____
Outside Contractors: ____

Isolation Checklist:
- Blanking and/or Disconnecting
- Electrical
- Mechanical
- Other

Hazardous Work:
- Burning
- Welding
- Brazing
- Open flame
- Other

Hazards Expected:
- Corrosive Materials
- Hot Equipment
- Flammable Materials
- Toxic Materials
- Drains Open
- Cleaning (i.e., chemical or water lance)
- Spark-producing Operations
- Spilled Liquids
- Pressure Systems
- Other

Vessel Cleaned:
- Deposits: ____
- Method: ____
- Inspection: ____
- Neutralized with: _____________________________________

Fire Safety Precautions: ____

Personal Safety:
- Ventilation Requirements
- Respirators
- Clothing
- Head, Hand, and Foot Protection
- Shields
- Life Lines and Harness
- Lighting
- Communication
- Employee Qualified
- Buddy System
- Standby Person
- Emergency Egress Procedures
- Training Sign Off
- (Supervisor and Qualified Person) ______________________________
- Remarks: ____

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[a] Class A until tests prove hazards to be of lower classification

TABLE 3 (CONTINUED)
CONFINED SPACE ENTRY PERMIT

Atmospheric Gas Tests

	Tests Performed	Location	Reading
Example:	(oxygen)		(19.5%)
Example:	(flammability)		(Less than 10% LEL)
	Hydrogen Sulfide	____	____
	____	____	____
	____	____	____

Remarks: ____________________

Calibration: ____________________

(signature)

Tests performed by: ____________________

(signature)

Time: ____________________

Authorizations:

Field Team Ladder: ____________________

Project Health and Safety Officer: ____________________

Etc: ____________________

Entry and Emergency Procedures Understood:

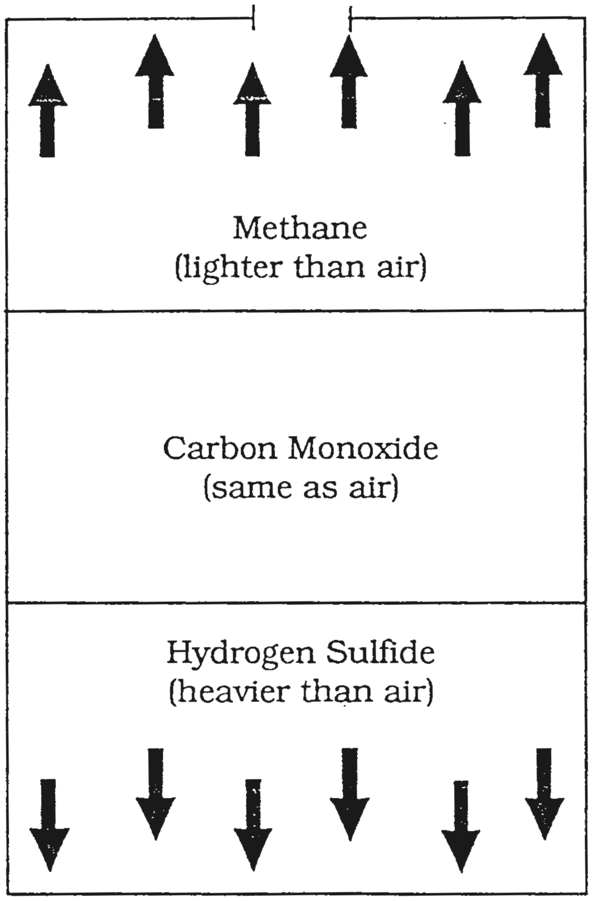
Standby Person: ____________________

Rescue: ____________________

Telephone: ____________________

Permit expires: ____________________

Classification: ____________________



Atmospheric Testing: From the Outside, Top to Bottom

APPENDIX C

CHEMICAL DATA ACQUISITION PLAN

CERCLA SITE INSPECTIONS

AT

TEN SOLID WASTE MANAGEMENT UNITS

SENECA ARMY DEPOT
ROMULUS, NEW YORK

JANUARY 1993

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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 ten 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).

Parsons Main, 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 ten SWMUs.

Matrices to be sampled and analyzed during the ESI include soil, soil gas, 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 ten SWMUs and
- Determine background levels of constituents of concern

The investigation of the ten SWMUs will involve sampling of soil, soil gas, 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 Parsons Main and Parsons Main's subcontractors during the course of the ESI of ten SWMUs 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 ten SWMUs at SEAD requires the combined effort of three firms. Parsons Main 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. Parsons Main 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. Parsons Main is also responsible for the preparation of all final evaluation reports.

Mr. Michael Duchesneau, P.E., the Parsons Main 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 Parsons Main. 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 6-2 of Section 6 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 Parsons Main'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 Parsons Main concerning sample handling, applicability of EPA methodologies, and interpreting analysis results and for communicating requests and information from Parsons Main 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 5.2 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 samples are being contaminated during transit or sample collection. Trip blanks pertain only to 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 if the volatile samples are shipped in the same cooler.

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 sampling glassware and containers will be used whenever possible. 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 and carry equipment (ice and coolers) to keep the sample below 4°C during the day. The only type of preservation used for soil samples is storage at or below 4°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.

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).

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]	HNO3 TO pH<2	28 days
2.	Metals, except Mercury	P[2]	HNO3 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
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

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[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

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 program for this ESI on 10 SWMUs includes the collection of field replicate, equipment blank, 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 day of sampling. 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.

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 steel implements (spoons, spades, etc.), placed into the appropriate sample containers, and 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.

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.

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 ten SWMUs. 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 10 SWMUs 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 10 SWMUs 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; and Method 8080 for PCBs in oil using the latest revision.
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. EPA 600/M4-82-020 for Asbestos analysis.
5. "Methods for the Determination of Organic Compounds in Drinking Water," EPA 600\4-88-039: Method 524.2 for Volatile Organic Compounds

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	

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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)

		Quantitation Limits**	
	VOCs	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

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[a] Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for volatile TCL Compounds are 125 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight 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.

[**] 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-5

CONTRACT REQUIRED QUANTITATION LIMITS* FOR PESTICIDES AND POLYCHLORINATED BIPHENYLS (PCBs)

Pesticides/PCBs	Quantitation Limits** Water (ug/L)	Quantitation Limits** 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.

** 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	Water (ug/L) 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
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 chekc 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
TCL-VOC		Water	Soil	Water	Soil	
	NYSDEC CLP					
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	
VOCs	Method 524.2	20	-	80-120	-	90%
TCL-SVO		Water	Soil	Water	Soil	
	NYSDEC CLP					
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	
TCL-PESTICIDES/PCB		Water	Soil	Water	Soil	
	NYSDEC CLP					
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	
TAL METALS		Water	Soil	Water	Soil	
23 Metals and Cyanide	NYSDEC CLP					
	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

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 Fluorescence 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

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 Parsons Main. 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 and qualified environmental geologists, engineers, environmental analysts, 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, Parsons Main 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 by SEAD 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.

Parsons Main will provide input for these reports to SEAD at least two weeks prior to the submittal deadline.

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)
SA = 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)

AQUATEC
QUALITY ASSURANCE
PROGRAM PLAN

Prepared by

Aquatec, Inc.
75 Green Mountain Drive
South Burlington, Vermont

Revision 5

Approval

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George W. Starbuck
President

Joseph Comeau
Joseph K. Comeau, Ph. D.
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Neal E. Van Wyck
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Chemistry Laboratory Director

Philip C. Downey
Philip C. Downey, Ph. D.
Biology Laboratory Director

Karen R. Chirgwin
Karen R. Chirgwin
Quality Assurance Officer

I hereby authorize and approve the following Quality Assurance Program Plan for use in Aquatec's Analytical Laboratory.

1/11/91

George W. Starbuck
President

Date

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.

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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

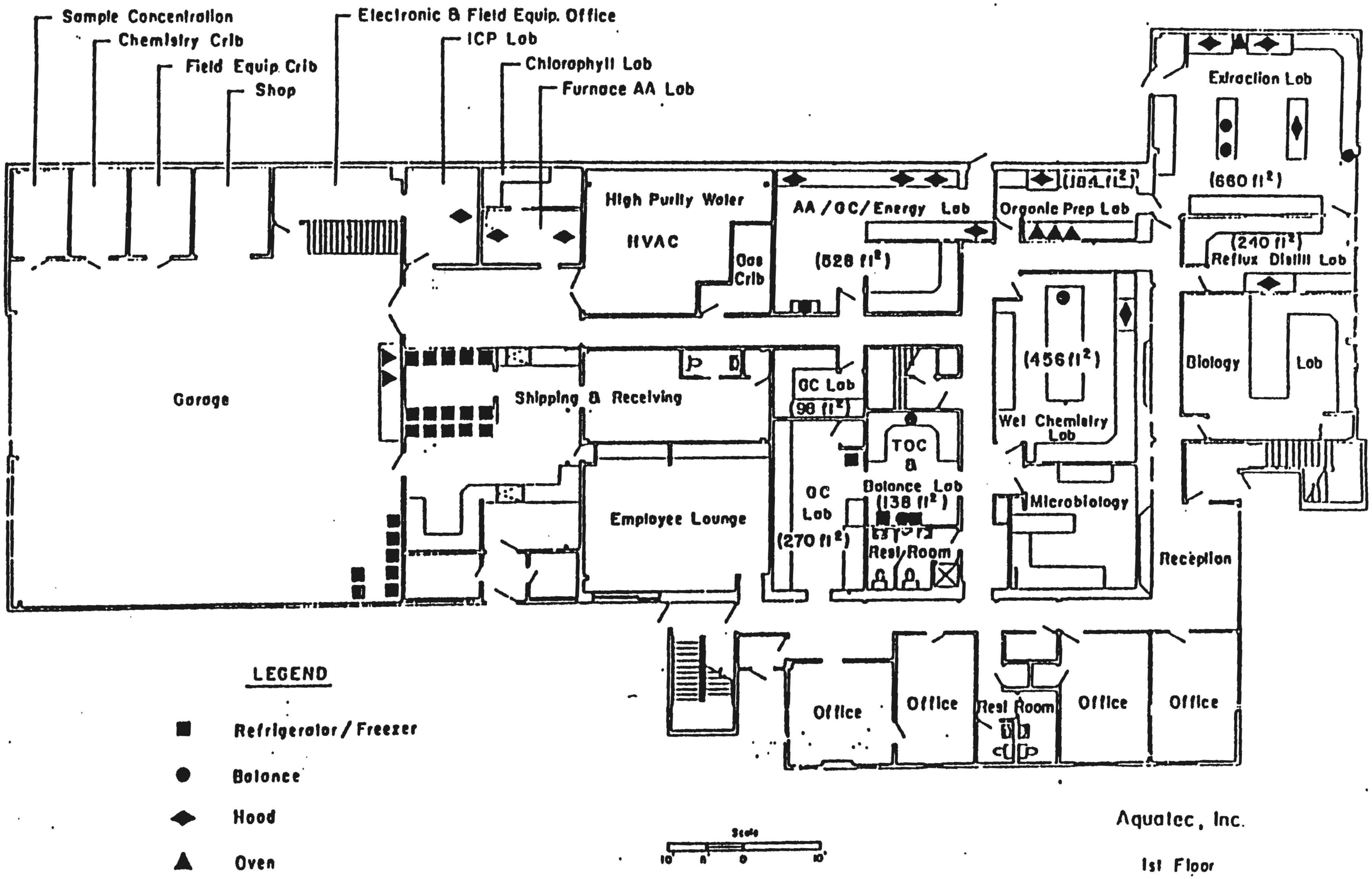
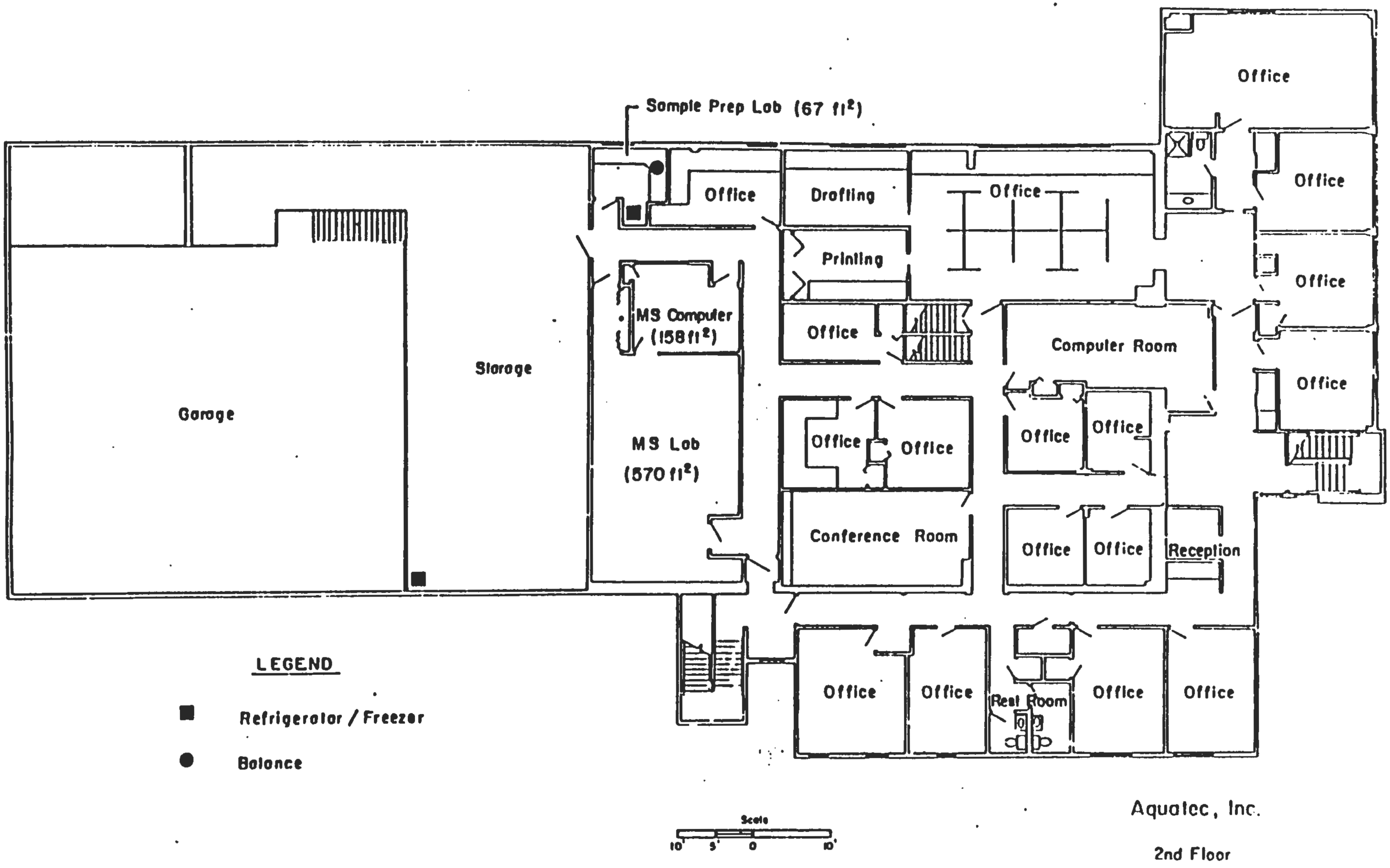


Figure : Facilities



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

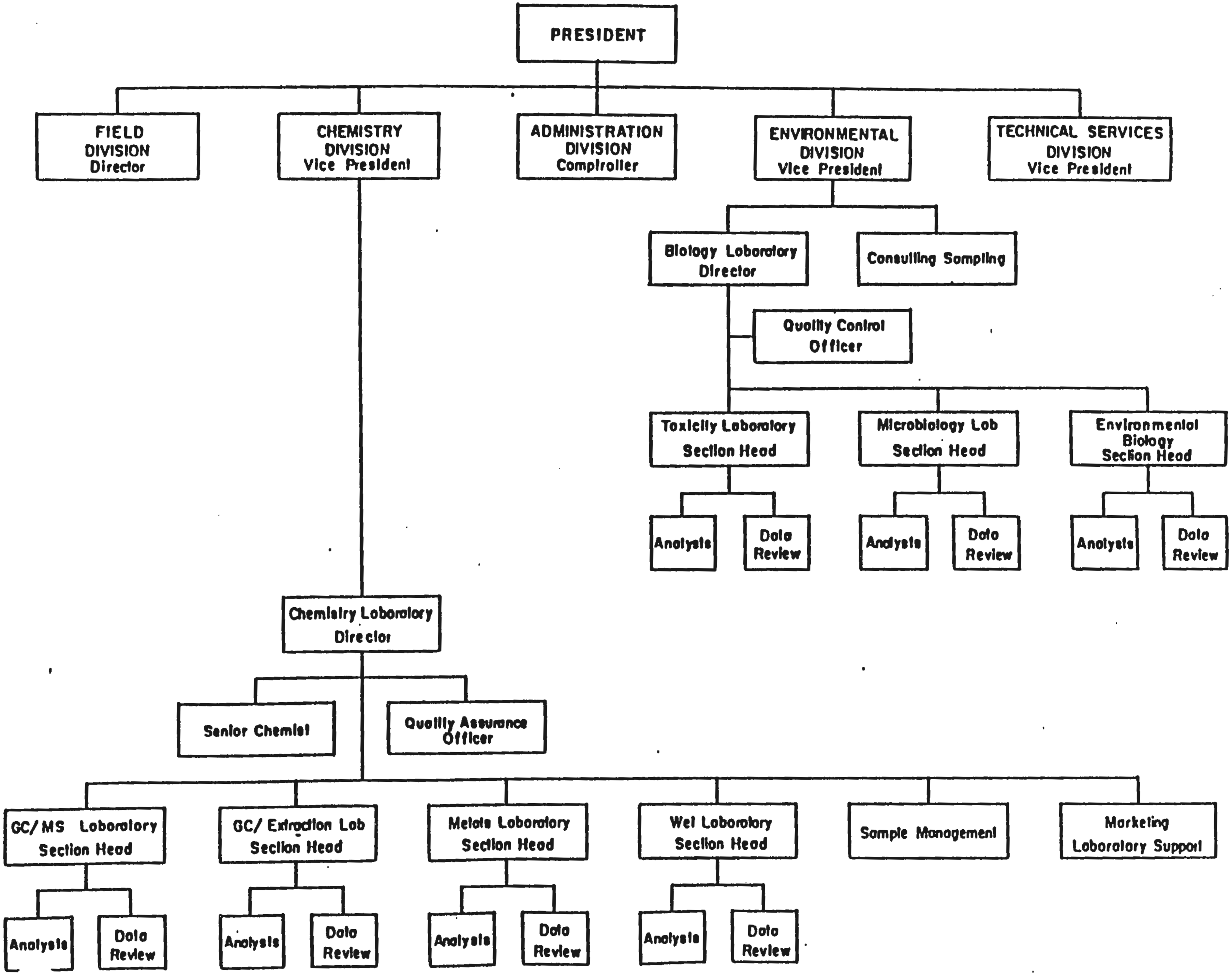


Figure B.1 Organization boratory Personnel acceptance of data, which falls outside of QC criteria or is questionable in nature, must be approved by the Laboratory Section Head.

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 SHZ1 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.

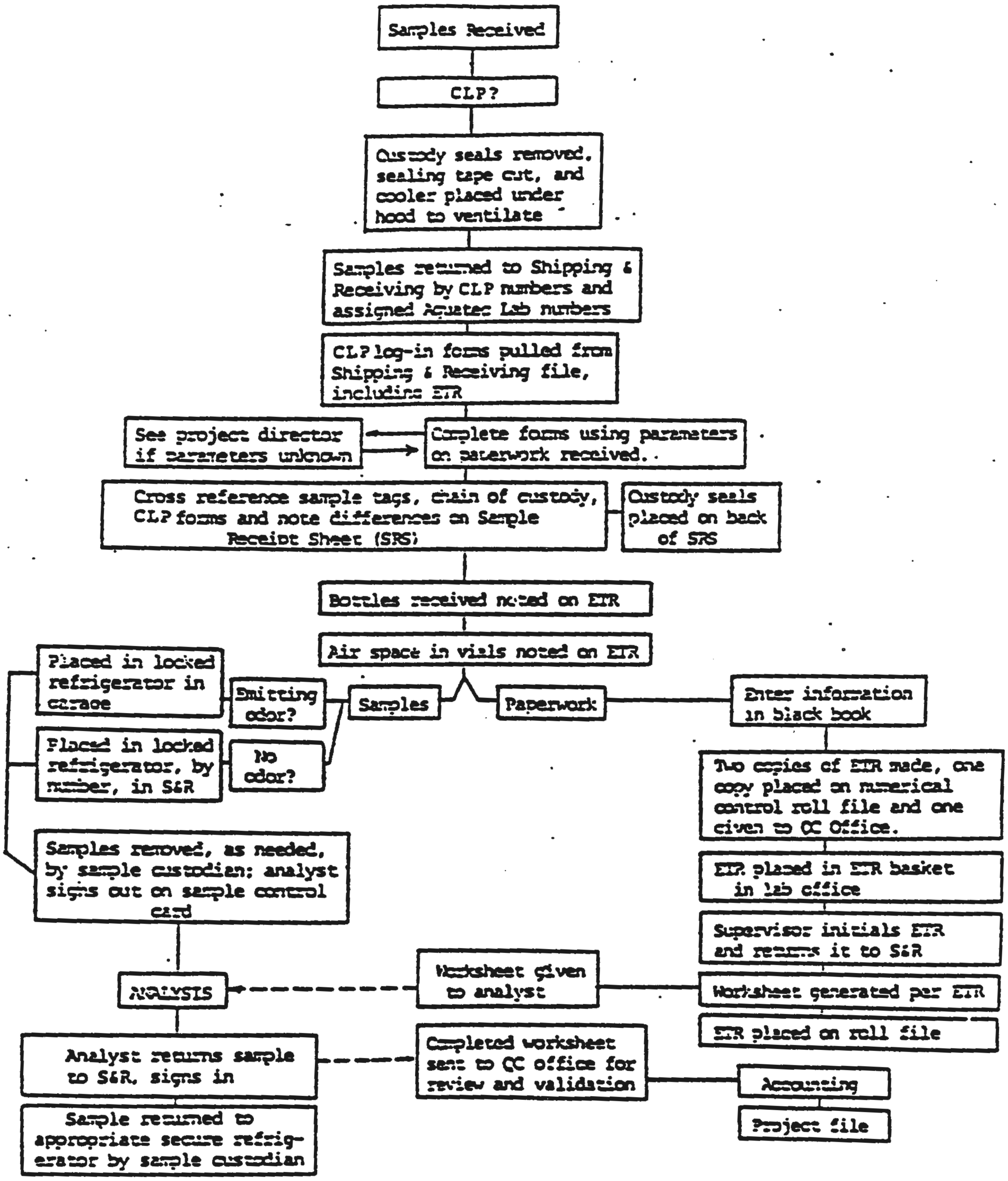
Samples are physical evidence and should be handled according to certain procedural safeguards. For some legal proceedings, proof that the laboratory is a secure repository for the sample is sufficient to insure that the analytical data will be admitted as evidence. However, in some cases a court may 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

Figure D.2

CHAIN OF CUSTODY RECORD

F - 0058

Page ______ of ______

Aquatec, Inc. 75 Green Mountain Drive South Burlington, VT 05403 (802) 658-1074 / FAX: (802) 658-3189

Client's Reference: ____________________

Client: ____________________

Address: ____________________

Comments: ____________________

Project Name: ____________________

Project No.: ____________________

Quote No.: ____________________

Collection Date: ____________________

Sampler(s): ____________________

Container Type / No. of

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 [illegible] RECORD

AQU[illegible]C, INC.

Figure D.3

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 ± 2 standard deviations from the mean value; the control limits are set at ± 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.

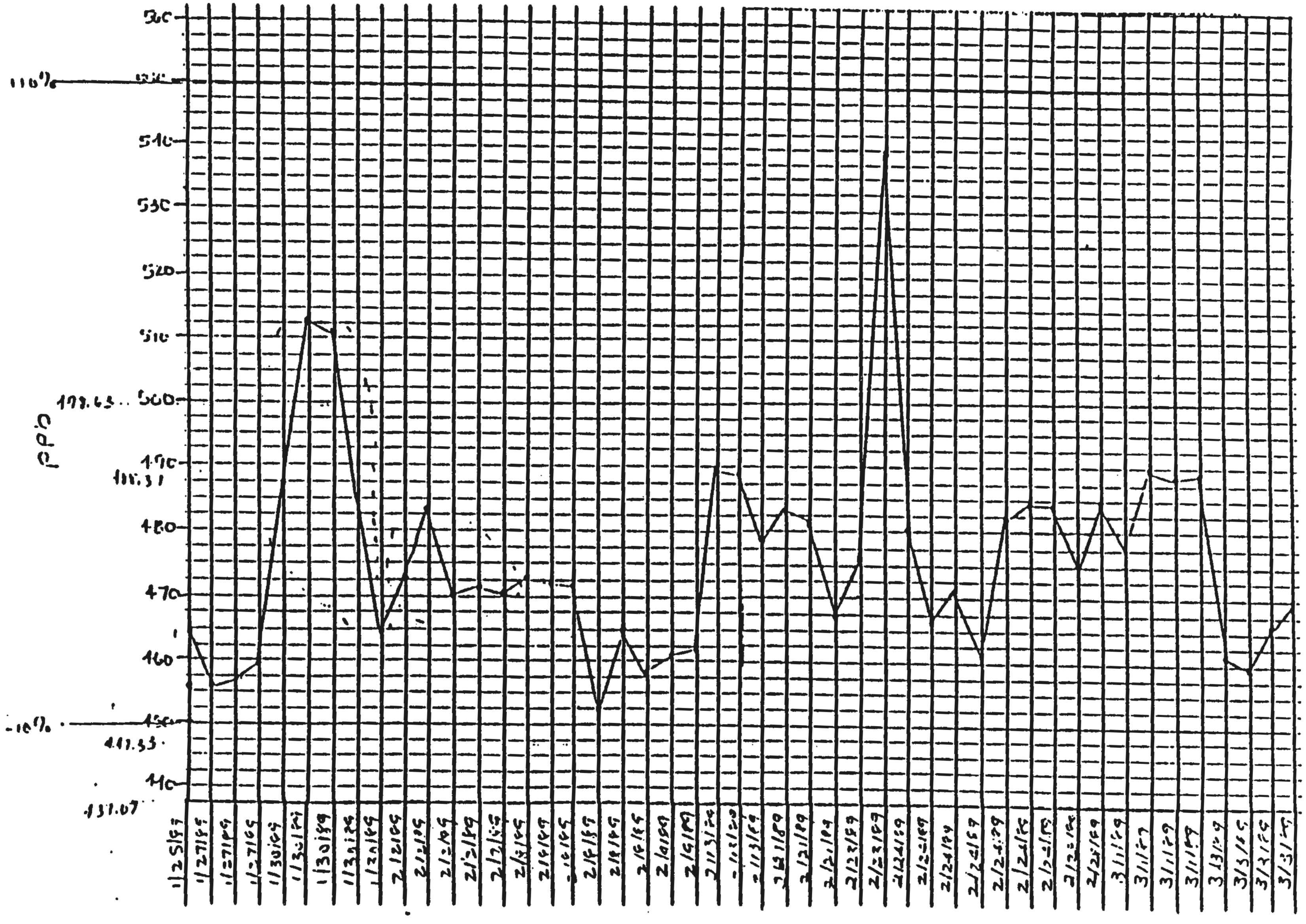
F.3.2 Surrogate Spikes

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(1)

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

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															
10															
3															
44															
60															
68															

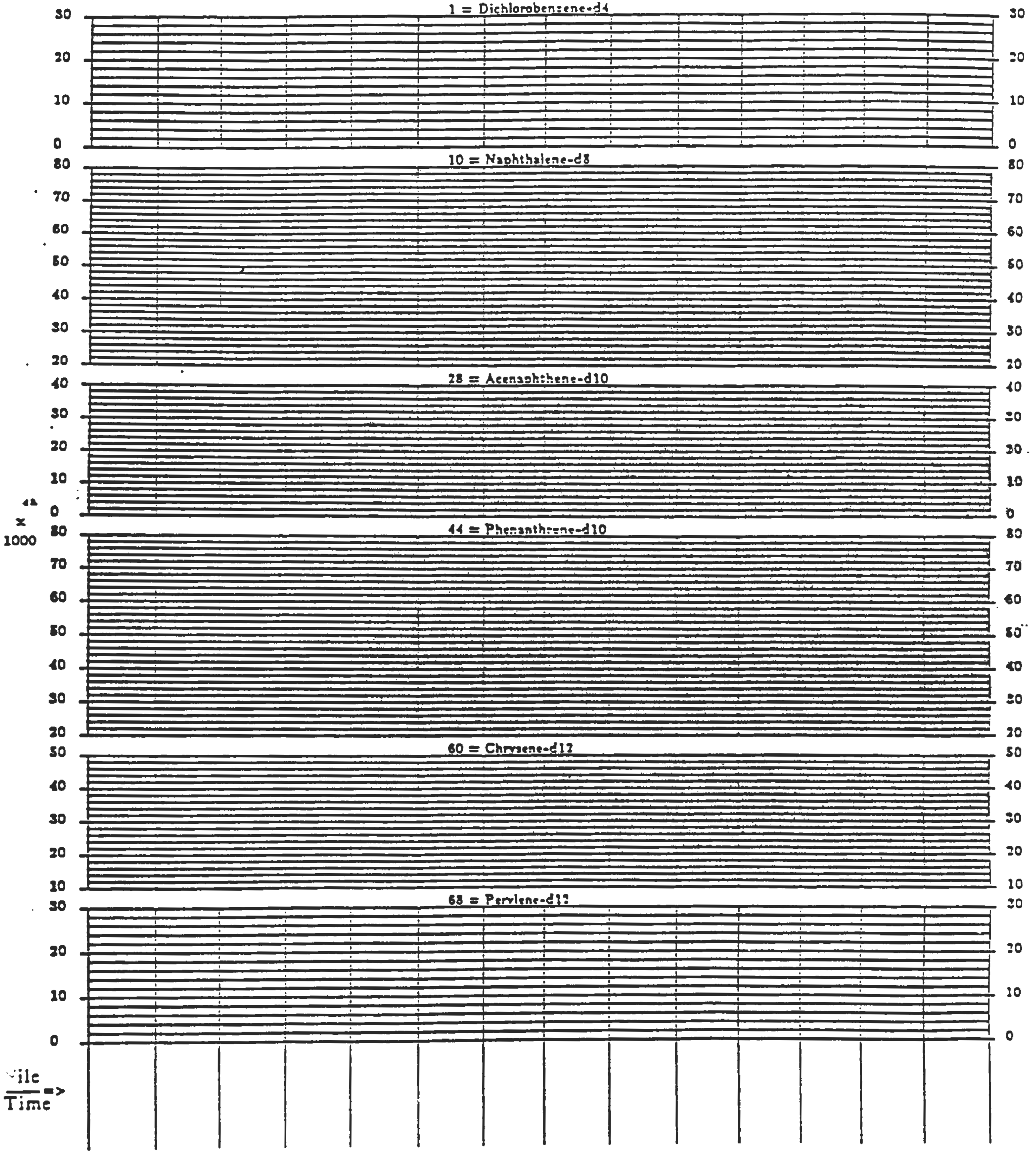


Figure F.2

ETR or Case No: __________ [illegible]

Client: ______________________________ Acquisition Date(s): ______________

IS	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT
1															
13															
36															
30															

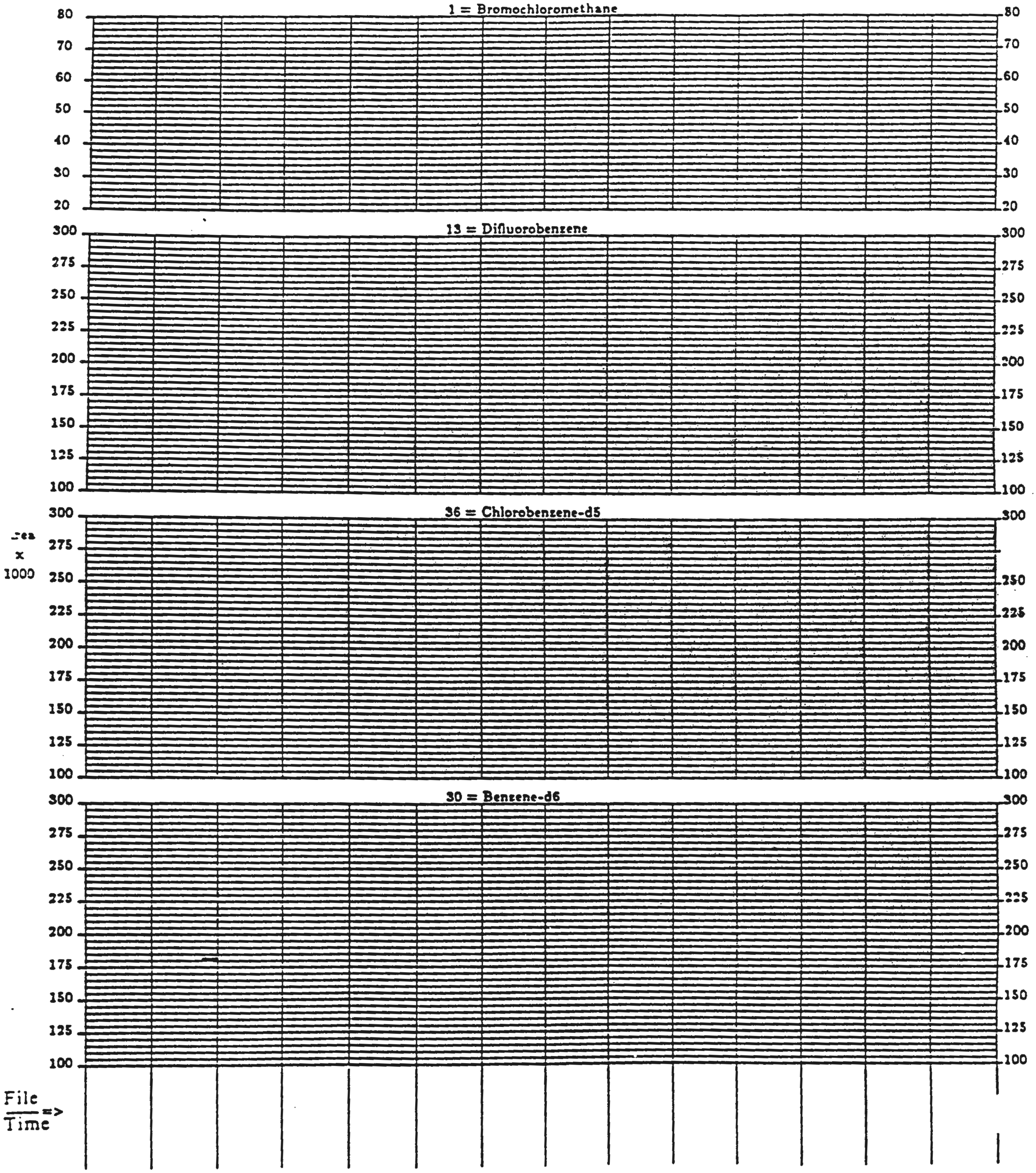


Figure F.2 (continued)

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 <u>in situ</u> 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.

REPRESENTATIVE EXPERIENCE (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

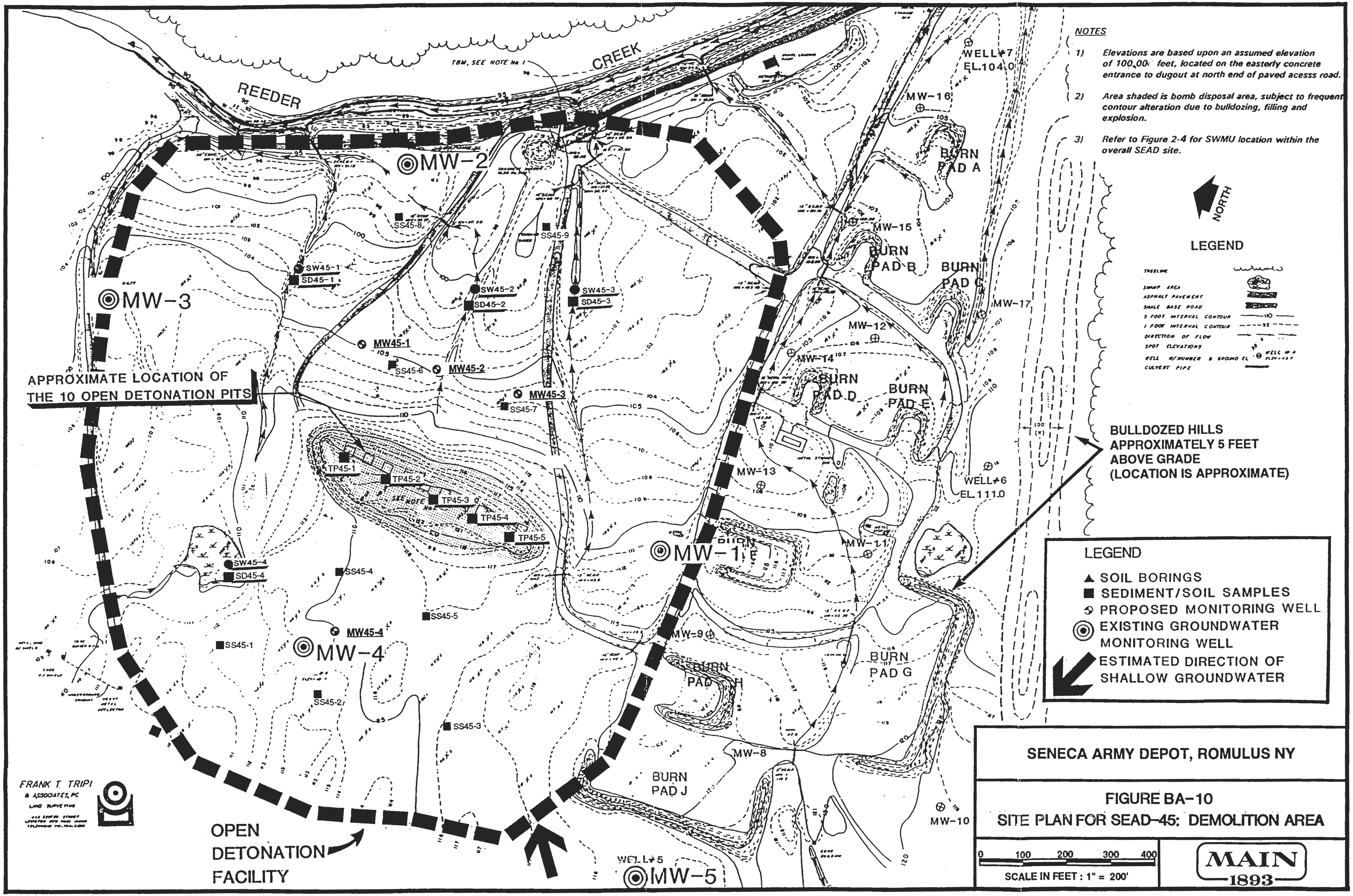
1985-Present

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

REPRESENTATIVE EXPERIENCE (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.



NOTES

1) Elevations are based upon an assumed elevation of 100.00 feet, located on the easterly concrete entrance to dugout at north end of paved acesss road.

2) Area shaded is bomb disposal area, subject to frequent contour alteration due to bulldozing, filling and explosion.

3) Refer to Figure 2-4 for SWMU location within the overall SEAD site.

LEGEND

TREELINE	
SWAMP AREA	
ASPHALT PAVEMENT	
SHALE BASE ROAD	
5 FOOT INTERVAL CONTOUR	—110—
1 FOOT INTERVAL CONTOUR	---92---
DIRECTION OF FLOW	
SPOT ELEVATIONS	
WELL W/NUMBER & GROUND EL	⊕ WELL # 4 ELEV.
CULVERT PIPE	

LEGEND

- ▲ SOIL BORINGS
- ■ SEDIMENT/SOIL SAMPLES
- ⊕ PROPOSED MONITORING WELL
- ◎ EXISTING GROUNDWATER MONITORING WELL
- ESTIMATED DIRECTION OF SHALLOW GROUNDWATER

SENECA ARMY DEPOT, ROMULUS NY

FIGURE BA-10
SITE PLAN FOR SEAD-45: DEMOLITION AREA

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 sections, photographic plate developing of the EM pictures taken, an 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

REPRESENTATIVE EXPERIENCE (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					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
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					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
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. Sup
B. Data ls
C. Anal
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. Pri

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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
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)

F - 0005

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
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
B. Data .sis
D. Lab. Assistant
E. Project Manager

** = WORK AREA

1. Inorganics
2. Microbiology
3. Organics
4. Biology

*** = TYPE EXPERIENCE

U. University/Government Lab.
H. Hospital
I. Indus
P. Priv

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APPENDIX B

Analytical Methodologies

Aquatec, Inc.
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)

E - Hazardous Waste

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

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

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

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

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

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. [illegible]
Certifying Officer

PROPERTY 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. Dicke

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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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/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. Dicke

Herbert W. Dickerman, M.D., Ph.D.
Director
Wadsworth Center for Laboratories and Research

PROPERTY OF

NEW YORK STATE DEPARTMENT OF HEALTH

DAVID AXELROD, M.D. *COMMISSIONER*

Expires 12:01 AM April 1, 1991
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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

POTABLE WATER NON-POTABLE WATER

All approved subcategories and analytes are listed on the attached addendum

Herbert W. Dicke

Herbert W. Dickerman, M.D., Ph.D.
Director
Wadsworth Center for Laboratories and Research

FORM LR 23.F

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 Analy

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 DEFENSE
UNITED STATES OF AMERICA

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 TWS

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 $4^{o}C$ 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

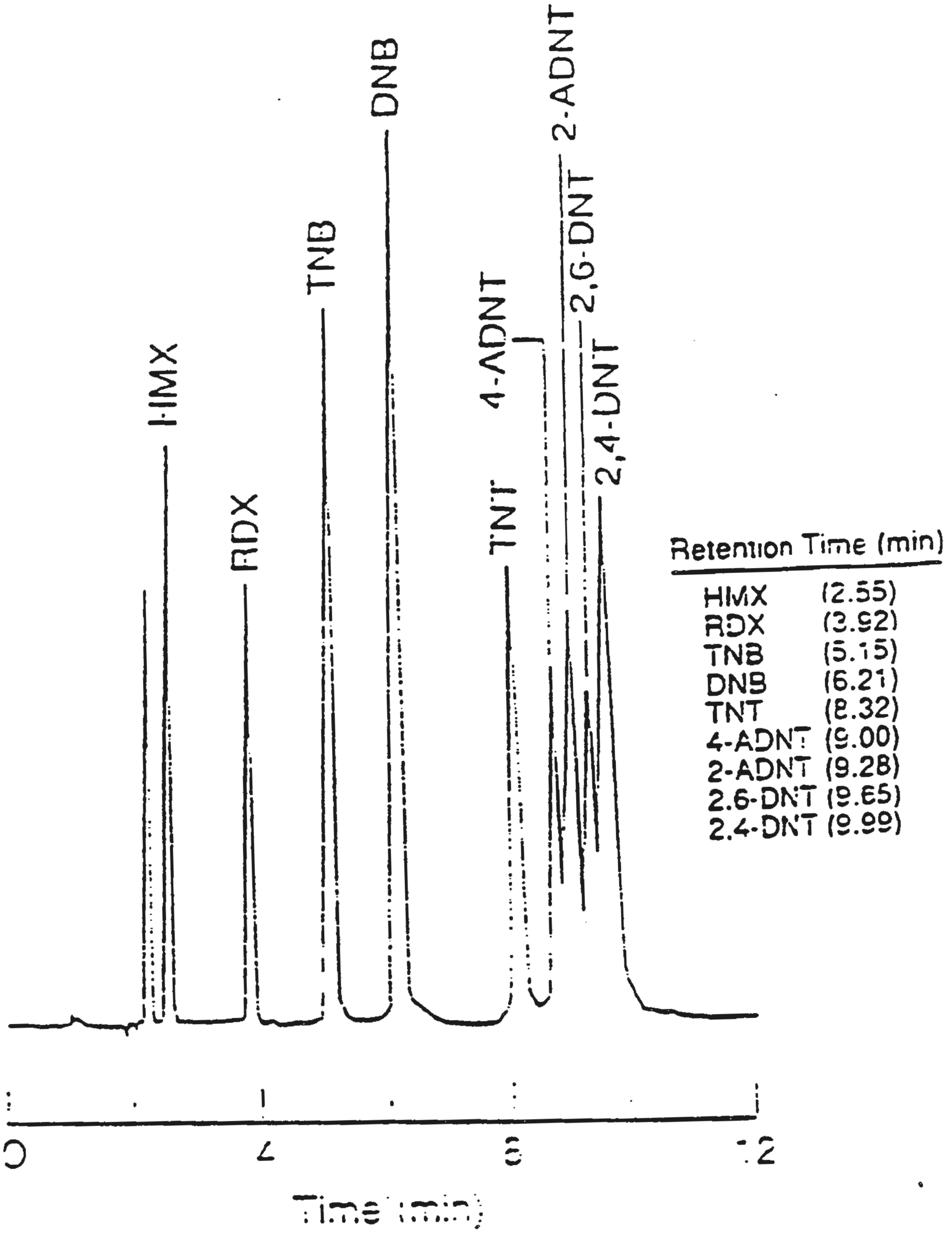
polar organic solutes from water. Analytical Chemistry, 62: 1355-1356.

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



Retention Time (min)	
HMX	(2.55)
RDX	(3.92)
TNB	(5.15)
DNB	(6.21)
TNT	(8.32)
4-ADNT	(9.00)
2-ADNT	(9.28)
2.6-DNT	(9.65)
2.4-DNT	(9.99)

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

EXISTING ANALYTICAL DATA FOR SWMUs

TABLE A-4

SOIL ANALYSIS RESULTS FROM POND AREA

JUNE 28, 1990

TABLE A-4
SOIL ANALYSIS RESULTS FROM POND AREA

Sample Number	Units	Explosives		
		2,4,6-TNT	2,4-DNT	2,6-DNT
1	ug/g	U	U	U
2	ug/g	U	U	U
3	ug/g	U	U	U
4	ug/g	U	U	U
5	ug/g	U	U	U
6	ug/g	U	U	U
7	ug/g	U	U	U
8	ug/g	U	U	U
9	ug/g	U	U	U
10	ug/g	U	U	U
11	ug/g	U	U	U
12	ug/g	U	U	U
13	ug/g	U	U	U
14	ug/g	U	U	U
15	ug/g	U	U	U
16	ug/g	U	U	U
17	ug/g	U	U	U
18	ug/g	U	U	U
19	ug/g	U	U	U
20	ug/g	U	U	U
21	ug/g	U	U	U
22	ug/g	U	U	U
23	ug/g	U	U	U
24	ug/g	U	U	U
25	ug/g	U	U	U
26	ug/g	U	U	U
27	ug/g	U	U	U
28	ug/g	U	U	U
29	ug/g	U	U	U
30	ug/g	U	U	U
31	ug/g	U	U	U

TABLE A-4 (CONTINUED)
SOIL ANALYSIS RESULTS FROM POND AREA

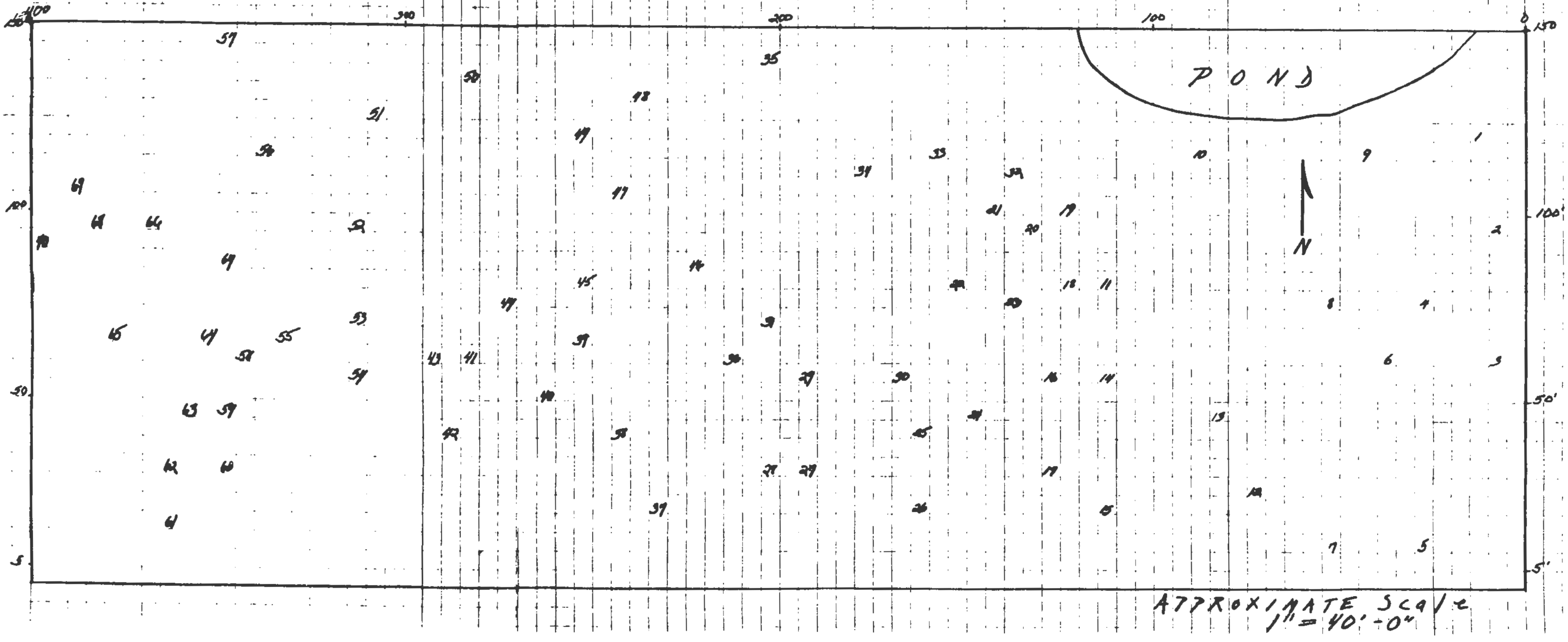
Sample Number	Units	Explosives		
		2,4,6-TNT	2,4-DNT	2,6-DNT
32	ug/g	U	U	U
36 (surface)	ug/g	U	U	U
34	ug/g	U	U	U
35	ug/g	U	U	U
36 (surface to 6")	ug/g	U	U	U
37	ug/g	U	U	U
38	ug/g	U	U	U
39	ug/g	U	U	U
40	ug/g	U	U	U
41	ug/g	U	U	U
42	ug/g	U	U	U
43	ug/g	U	U	U
44	ug/g	U	U	U
45	ug/g	U	U	U
46	ug/g	U	U	U
47	ug/g	U	U	U
48	ug/g	U	U	U
49	ug/g	U	U	U
50	ug/g	U	U	U
51	ug/g	U	U	U
52	ug/g	U	U	U
53	ug/g	U	U	U
54	ug/g	U	U	U
55	ug/g	U	U	U
56	ug/g	U	U	U
57	ug/g	U	U	U
58 (surface to 10")	ug/g	U	U	U
58 (surface)	ug/g	U	U	U

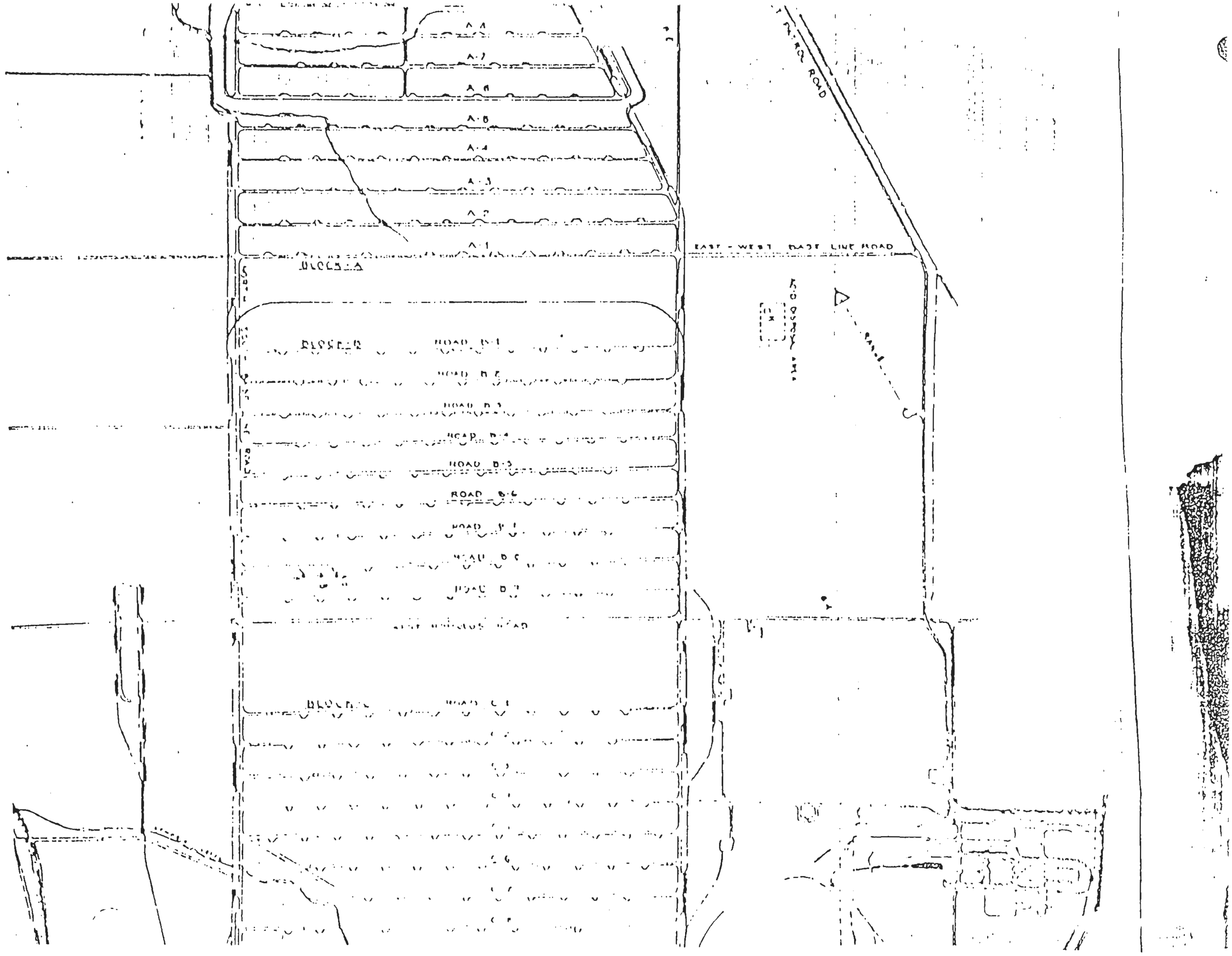
TABLE A-4 (CONTINUED)
SOIL ANALYSIS RESULTS FROM POND AREA

Sample Number	Units	Explosives		
		2,4,6-TNT	2,4-DNT	2,6-DNT
60	ug/g	U	U	U
61	ug/g	U	U	U
62	ug/g	U	U	U
63	ug/g	U	U	U
64	ug/g	U	U	U
65	ug/g	U	U	U
66	ug/g	U	U	U
67	ug/g	U	U	U
68	ug/g	U	U	U
69	ug/g	U	U	U
70	ug/g	U	U	U

NOTES:
1. U = analyzed, not detected
2. Samples collected June 28, 1990.

FIGURE 4A
LOCATION MAP FOR
SEAD-4 SEDIMENT/SOIL SAMPLES
COLLECTED FROM POND AREA JUNE 28, 1990





A-8
A-7
A-6
A-5
A-4
A-3
A-2
A-1
BLOCK A
BLOCK B
ROAD B-1
ROAD B-2
ROAD B-3
ROAD B-4
ROAD B-5
ROAD B-6
ROAD B-7
ROAD B-8
ROAD B-9
BLOCK C
ROAD C-1
EAST - WEST BASE LINE ROAD
RICO ROAD
K-0 DISPOSAL AREA

HEDEL-

TABLE 2
RESULTS OF ANALYSES OF WATER SAMPLES
SENECA ORDNANCE DEPOT

LOCATION	STRATUM	DATE	PH	DISSOLVED SOLIDS (mg/1)	SPECIFIC CONDUCTANCE (micromhos per cm at 25°C)	TOTAL ALKALINITY (as $CaCO_3$) (mg/1)	CALCIUM (as Ca) (mg/1)	TOTAL HARDNESS (as $CaCO_3$) (mg/1)	NITRATE-N (mg/1)	FLUORIDE (mg/1)	CHLORIDE (mg/1)	TOT IRO (mg
A	Glacial till	6 May 60	7.0	---	1,264	527	72.6	610	0.05	---	32.8	
		9 Jun 60	7.3	906	1,204	563	176	634	0.1	1.0	36.0	
B	Glacial till	6 May 60	6.9	---	503	240	62.2	277	0.8	---	4.0	
		9 Jun 60	7.4	364	478	257	91.4	290	0.7	0.47	5.5	
C	Hamilton Group	6 May 60	7.1	---	1,419	303	154	759	2.7	---	128	
D	Glacial till	6 May 60	7.4	---	775	310	37.7	240	0.2	---	9.0	
E	Glacial till	6 May 60	7.2	374	524	265	45.2	270	0.05	---	6.1	
F ("Lampost Restaurant")	Unknown	9 Jun 60	6.8	594	790	327	105	446	1.2	0.95	31.6	4.
G (Melamore Residence)	Unknown	9 Jun 60	7.4	623	766	294	109	407	0.1	3.30	42.3	6.
H (Disposal Area)	Surface water adjacent to disposal pits	9 Jun 60	5.4	57,400	40,400	(acid)	10,300	33,700	8,820	23.7	87.5	100
Reeder Creek	Surface water	6 May 60	7.4	---	548	211	48.1	280	0.08	---	13.6	--

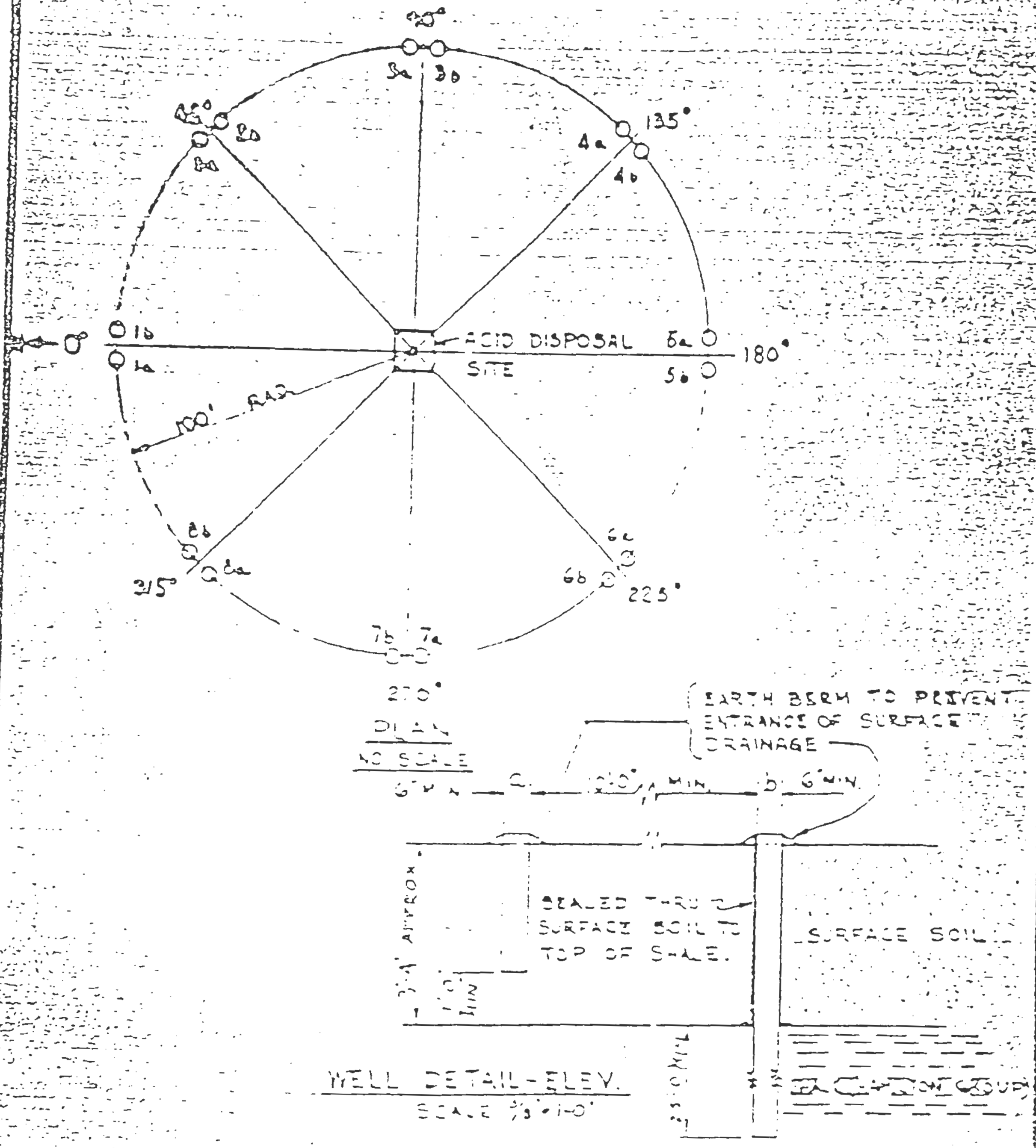
San Eng Proj No. [illegible]

MEDEI-E

TABLE 3
RESULTS OF ANALYSES OF WASTE SAMPLES
SENECA ORDNANCE DEPOT

SAMPLE NUMBER	LOCATION	PH	TOTAL SOLIDS (mg/1)	DISSOLVED SOLIDS (mg/1)	SPECIFIC CONDUCTANCE (micromhos per cm at 25°C)	CALCIUM (as Ca) (mg/1)	TOTAL HARDNESS (as $CaCO_3$) (mg/1)	NITRATE-N (mg/1)	FLUORIDE (mg/1)	CHLORIDE (mg/1)
1	Pit Number 1 after dumping 10 bbls IRFNA	1.5	94,000	72,600	69,000	15,500	46,700	13,000	23.5	101
2	Pit Number 4 four days after dumping 30 bbls IRFNA	3.4	118,000	100,000	62,800	17,700	55,600	16,100	392	110

San Eng Proj No. 3642EL-60



PLAN
NO SCALE

WELL DETAIL-ELEV.
SCALE ⅜"=1'-0"

PROPOSED SURVEILLANCE WELLS, SENECA ORDNANCE DEPOT, N.Y.
SANITARY ENGINEERING STUDY No. 3642 E4-60

UNITED STATES
ARMY ENVIRONMENTAL HEALTH LABORATORY
ARMY CHEMICAL CENTER, MARYLAND

DATE 5-27-60
DRAWN W. S
APPROVED
SCALE AS SHOWN
PLATE E-12

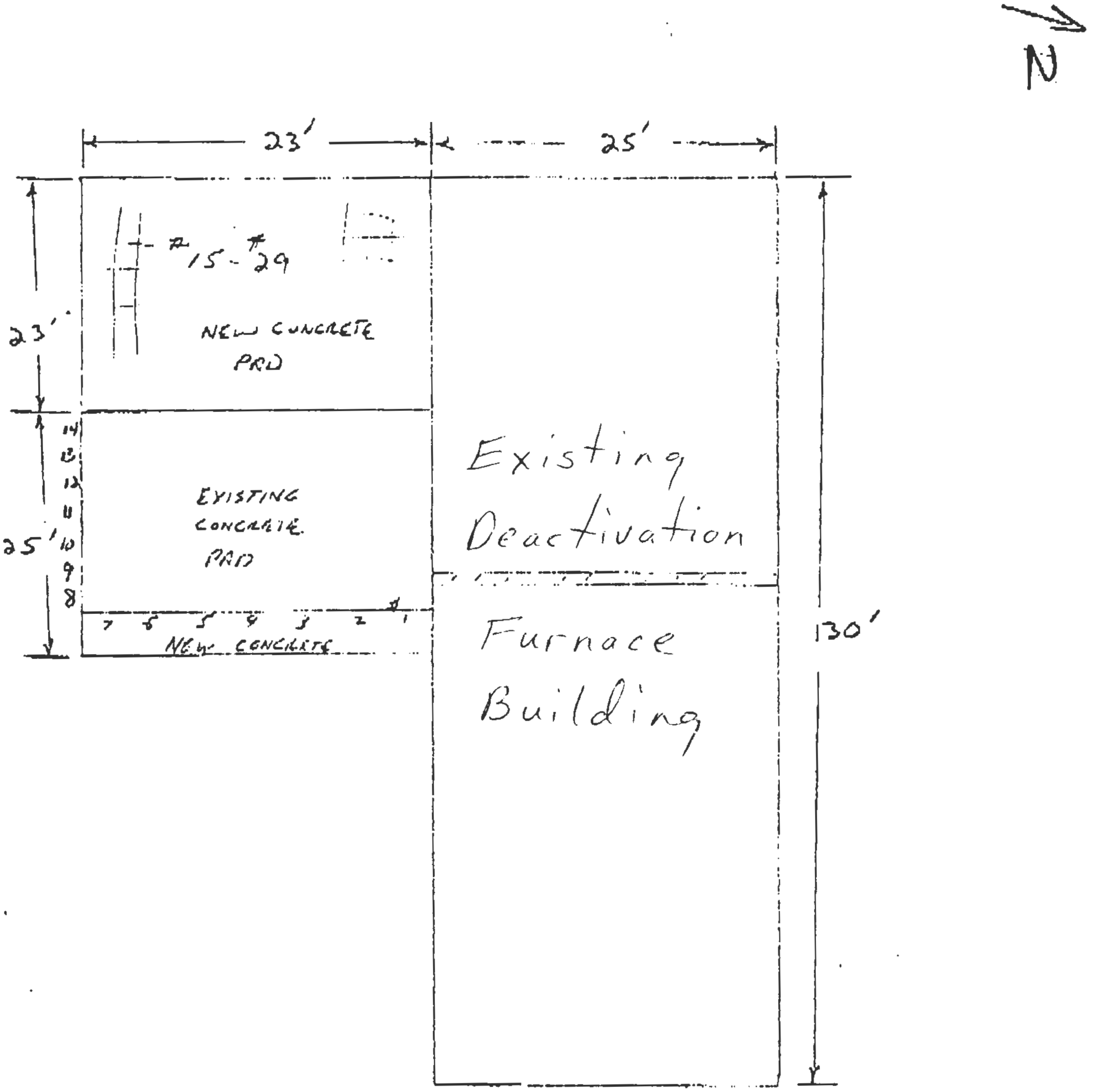
TABLE A-17

ANALYSIS RESULTS FROM SURFACE SOIL AND WIPE SAMPLES EXISTING DEACTIVATION FURNACE

SURFACE SOIL SAMPLING DATE: NOVEMBER 1, 1989

WIPE SAMPLING DATES: FEBRUARY 23, MAY 2, AND JUNE 20 1990

FIGURE 17A



Soil Sampling
Existing Deactivation Furnace Building
November 1, 1989

Samples No. 1 to 14 obtained at locations
3 ft. apart along existing concrete pad.
Samples No. 15 to 29 obtained at random locations
on a 3 ft. by 3 ft. grid

Not to Scale

TABLE A-17

I. ANALYSIS RESULTS FROM SURFACE SOIL SAMPLES COLLECTED NEAR THE DEACTIVATION FURNACE. SAMPLING DATE: NOVEMBER 1, 1989

Sample No.	Units	Parameters EP Toxicity	
		Barium	Lead
1	mg/l	< 10.0	19
2	mg/l	< 10.0	32.7
3	mg/l	< 10.0	< 1.00
4	mg/l	< 10.0	< 1.00
5	mg/l	< 10.0	270.0
6	mg/l	< 10.0	44.5
7	mg/l	< 10.0	31.0
8	mg/l	< 10.0	2.7
9	mg/l	< 10.0	4.3
10	mg/l	< 10.0	< 1.0
11	mg/l	< 10.0	< 1.0
12	mg/l	< 10.0	< 1.0
13	mg/l	< 10.0	114.0
14	mg/l	< 10.0	34.7
15	mg/l	< 10.0	26.9
16	mg/l	< 10.0	65.0
17	mg/l	< 10.0	< 1.0
18	mg/l	< 10.0	279.0
19	mg/l	< 10.0	117.0
20	mg/l	< 10.0	43.7
21	mg/l	< 10.0	326.0
22	mg/l	< 10.0	384.0
23	mg/l	< 10.0	44.1
24	mg/l	< 10.0	29.8
25	mg/l	< 10.0	197
26	mg/l	< 10.0	< 1.0
27	mg/l	< 10.0	< 1.0
28	mg/l	< 10.0	< 1.0
29	mg/l	< 10.0	19.6

NOTE:
The EP Toxicity Limitation is 100.0 mg/l for barium, and 5.0 mg/l for lead.

TABLE A-17 (CONTINUED)

II. ANALYSIS RESULTS OF WIPE SAMPLES COLLECTED IN BUILDING 367 (DEACTIVATION FURNACE). SAMPLING DATE: FEBRUARY 23, 1990

Sample No.	Area	Units	Parameters	
			Lead	Barium
1	Retort R1	ug/100 cm^2	3970	< 100
2	Retort R2	ug/100 cm^2	17,700	1040
3	Floor F3	ug/100 cm^2	1480	< 100
4	Floor F4	ug/100 cm^2	1250	< 100
5	Floor F5	ug/100 cm^2	2510	143
6	Floor F6	ug/100 cm^2	4160	250
7	Floor F7	ug/100 cm^2	12,000	260
8	Floor F8	ug/100 cm^2	4030	153
9	Floor F9	ug/100 cm^2	8510	340
10	Floor F10	ug/100 cm^2	2770	< 100
11	Baghouse BN	ug/100 cm^2	8060	293
12	Baghouse BS	ug/100 cm^2	19,200	525
13	Baghouse BE	ug/100 cm^2	20,400	850
14	Baghouse BW	ug/100 cm^2	17,200	700
15	Cyclone Flange 11	ug/100 cm^2	290	1800
16	Cyclone Flange 12	ug/100 cm^2	597	< 100
17	Air Make-up Damper	ug/100 cm^2	56	< 100
18	AMD Flange 14	ug/100 cm^2	18	< 100
19	Induction Flange 15	ug/100 cm^2	36	< 100
20	I.F. Flange 16	ug/100 cm^2	195	< 100
21	I.F. Flange 17	ug/100 cm^2	75	< 100
22	I.F. Flange 18	ug/100 cm^2	185	< 100
23	Stack Flange 19	ug/100 cm^2	117	< 100
24	Hopper Flange 20	ug/100 cm^2	685	< 100
25	Cyclone Bottom ID 21	ug/100 cm^2	232,000	11,100
26	Stack ID 22	ug/100 cm^2	7890	543
27	Hopper OD Baghouse 23	ug/100 cm^2	4950	238
28	Curved Duct to Cyclone ID 24	ug/100 cm^2	103,000	6210
29	Cyclone Flex Sect. ID 25	ug/100 cm^2	224,000	7320

TABLE A-17 (CONTINUED)

II. ANALYSIS RESULTS OF WIPE SAMPLES COLLECTED IN BUILDING 367 (DEACTIVATION FURNACE). SAMPLING DATE: FEBRUARY 23, 1990

Sample No.	Area	Units	Parameters	
			Lead	Barium
30	Fan #26	ug/100 cm^2	17,500	970
31	Fan #27	ug/100 cm^2	4870	210
32	Air Make-up ID 28	ug/100 cm^2	133,000	4860
33	Air Make-up ID 29	ug/100 cm^2	203,000	4320
34	Filter Bag Screen 30	ug/100 cm^2	241	< 100
35	Field Blank	ug/100 cm^2	< 10	< 100
36	Field Blank Duplicate	ug/100 cm^2	60.9	< 100

TABLE A-17 (CONTINUED)

III. ANALYSIS RESULTS OF WIPE SAMPLES COLLECTED IN BUILDING 367 (DEACTIVATION FURNACE). SAMPLING DATE: MAY 2, 1990

Sample No.	Area	Units	Parameters	
			Lead	Barium
1	RR1 Retort Exit	ug/100 cm^2	124,100	170
2	RR2 Retort Entrance	ug/100 cm^2	14,000	434
3	FR3 Floor Furnace Room	ug/100 cm^2	2,840	88
4	FR4 Floor Furnace Room	ug/100 cm^2	3,700	264
5	FR5 Floor Furnace Room	ug/100 cm^2	1,040	68
6	FR6 Floor Furnace Room	ug/100 cm^2	1,040	100
7	FR7 Floor Baghouse Slab	ug/100 cm^2	2,860	142
8	FR8 Floor Baghouse Slab	ug/100 cm^2	9,800	344
9	FR9 Floor Baghouse Slab	ug/100 cm^2	4,300	142
10	FR10 Floor Baghouse Slab	ug/100 cm^2	870	<40
11	FR 12 Cyclone Flange	ug/100 cm^2	1,050	46
12	FR13 Air Make-Up Damper	ug/100 cm^2	2,700	420
13	FR15 Ind. Fan Flange	ug/100 cm^2	600	<40
14	FR 16 Ind. Fan Flange	ug/100 cm^2	176	<40
15	FR17 Ind. Fan Flange	ug/100 cm^2	140	<40
16	FR19 Stack Flange	ug/100 cm^2	1,200	188
17	FR20 Baghouse Hooper Flange	ug/100 cm^2	790	<40
18	#31 East Wall Baghouse	ug/100 cm^2	590	<40
19	#32 West Wall Baghouse	ug/100 cm^2	560	<40
20	#33 North Wall Baghouse	ug/100 cm^2	380	<40
21	#34 South Wall Flange	ug/100 cm^2	540	<40
22	FR 26 Ind. Fan Flange	ug/100 cm^2	370	<40
23	FR27 Ind. Fan Flange	ug/100 cm^2	770	<40
24	#30 Filter Screen	ug/100 cm^2	920	90
25	#35 Inside Air Make-up	ug/100 cm^2	4,100	232
26	#36 Inside Fan Duct	ug/100 cm^2	1,960	104
27	#37 Inside Cyclone Flange	ug/100 cm^2	3,100	308
28	#38 Inside Stack	ug/100 cm^2	3,400	184
29	#39 Inside Stack	ug/100 cm^2	3,360	250

TABLE A-17 (CONTINUED)

III. ANALYSIS RESULTS OF WIPE SAMPLES COLLECTED IN BUILDING 367 (DEACTIVATION FURNACE). SAMPLING DATE: MAY 2, 1990

Sample No.	Area	Units	Parameters	
			Lead	Barium
30	#40 Inside Stack	ug/100 cm^2	7,400	444
31	#41 Inside Stack	ug/100 cm^2	3,100	112
32	#42 Inside Stack	ug/100 cm^2	5,700	234
33	#23 Baghouse Hopper Flange	ug/100 cm^2	8,900	362
34	#18 Ind. Fan Flange	ug/100 cm^2	690	<40
35	Field Blank	ug/100 cm^2	62	<40

TABLE A-17 (CONTINUED)

IV. ANALYSIS RESULTS OF WIPE SAMPLES COLLECTED IN BUILDING 367 (DEACTIVATION FURNACE). SAMPLING DATE: JUNE 20, 1990

Sample No.	Area	Units	Parameters	
			Lead	Barium
1	Retort Entrance	ug/wipe	82.3	<40
2	Floor	ug/wipe	1516	201
3	Floor	ug/wipe	472	142
4	Retort Exit	ug/wipe	122	<40
5	Floor	ug/wipe	2950	390
6	Floor	ug/wipe	354	148
7	N. Wall Baghouse Hopper	ug/wipe	<40.0	14.3
8	S. Wall Baghouse	ug/wipe	<40.0	24.8
9	W. Wall Baghouse	ug/wipe	<40.0	17.6
10	E. Wall Baghouse	ug/wipe	<40.0	82.1
11	Floor Under Baghouse	ug/wipe	<40.0	21.8
12	Floor Immediately after acid wash	ug/wipe	<40.0	1,350
13	Floor under Baghouse immediately after acid wash	ug/wipe	<40.0	0.44
14	Field Blank	ug/wipe	<40.0	1.53

TABLE 45A

MONITORING WELL INSTALLATION DATA (1)

Well No.	Depth Drilled	Depth to Rock	Soil Type	Ground Elevation	Casing Height	Screen Setting(2)	Elevation of Water		
							9/7	9/13	10/5
MW-1	13	12	Till	100.0	4.3	7-12	95.9	94.8	95.0
MW-2	7	6.5	Till	85.1	3.7	1-6	82.2	81.4	81.4
MW-3	11	9.5	Till	95.1	5.5	4.5-9.5	93.0	91.3	90.8
MW-4	10	9.5	Till	98.7	3.0	4.5-9.5	92.1	92.4	92.6
MW-5	15	13.5	Till	97.0	-	-	-	-	-

(1) All values reported in feet.

(2) Feet below the ground surface

Note: Data obtained from "Report, Munitions Destruct Study, Seneca Army Depot, APAP Study No. D 1031-W" for Department of the Army, New York District, Corps of Engineers by O'Brien & Gere dated November 1979. Year water elevations measured assumed to be 1979.

TABLE 45B
WATER QUALITY MONITORING DATA
CONVENTIONAL POLLUTANTS

Well No.	Date	pH	TOC	COND	TDS	TIP	TKN	NO_2	NO_3	CN	FE	PB	HG	Al	Cl
MW-1	9/7	8.3	48	770	630	0.06	1.6	<0.001	0.70	<0.1	2.4	<0.01	0.79	3.0	9.7
	10/5	8.1	3	700	880	-	-	-	-	-	18	-	-	-	
	10/5*		10		-	-	-	-	-	-	<0.01	-	-	-	
MW-2	9/7	8.0	68	790	570	0.06	1.6	0.039	<0.01	<0.1	2.6	<0.01	0.79	22.	7.5
	10/5	8.2	160	820	970	-	-	-	-	-	310.	-	-	-	
	10/5*		8		-	-	-	-	-	-	<0.01	-	-	-	
MW-3	9/7	7.9	83	790	630	0.21	0.30	0.002	<0.01	<0.1	2.1	<0.01	1.20	16.	1.8
	10/5	8.6	<1	650	750	-	-	-	-	-	15.	-	-	-	
	10/5*		13	-	-	-	-	-	-	-	0.01	-	-	-	
MW-4	9/7		260	4	470	<0.01	0.30	0.035	<0.01	<0.1	0.09	<0.01	0.79	0.5	7.0
	10/5	8.7	21	1000	1100	-	-	-	-	-	38.	-	-	-	
	10/5*		23		-	-	-	-	-	-	0.05	-	-	-	
Reeder Creek (UP)	8/31		56		660	0.52	0.30	<0.001	<0.01	-	0.49	<0.01	1.6	3.7	
	10/5				-	-	-	-	-	-	0.12	-	-	-	
Reeder Creek (DN)	8/31		49		630	0.10	0.30	<0.001	<0.01	-	0.009	<0.01	0.79	0.50	
	10/5				-	-	-	-	-	-	0.22	-	-	-	

* Filtered Samples

Note: 1. All results except pH and COND are reported as mg/l. HG reported as ug/l. COND reported as umhos/cm.

2. Data obtained from "Report, Munitions Destruct Study, Seneca Army Depot, APAP Study No. D 1031-W" for Department of the Army, New York District, Corps of Engineers by O'Brien & Gere dated November 1979. Year samples collected assumed to be 1979.

TABLE 45B (Con't)

WATER QUALITY MONITORING DATA
EXPLOSIVES

	SITE					
Parameter(1)	Well No.				Reeder Creek	
	MW-1	MW-2	MW-3	MW-4	Upstream	Downstream
2,4,6 Trinitrotoluene	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
4-amino-2,6-dinitrotoluene(2)	1.36	1.66	1.78	1.96	1.87	1.66
2-amino-4,6-dinitrotoluene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
3,5-dinitroaniline	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

(1) Values reported in ug/l (ppb)

(2) Cochromatographed, cochromatography is not proof of structure.

Note: Data obtained from "Report, Munitions Destruct Study, Seneca Army Depot, APAP Study No. D 1031-W" for Department of the Army, New York District, Corps of Engineers by O'Brien & Gere dated November 1979. Date sampled not available on original table.

TABLE 45C

SENECA ARMY DEPOT
GROUNDWATER ELEVATION FOR THE OPEN DETONATION FACILITY (SEAD 45)

Sampling Date	GROUNDWATER ELEVATIONS (ft) Well MW-1	Well MW-2	Well MW-3	Well MW-4	Well MW-5
JAN 82	111.3	95.4	105.3	109.7	118.5
APR 82	111.6	94.7	105.4	109.4	118.2
JUN 82	108.2	93.4	102.6	108.2	116.3
SEP 82	108.6	92.6	99.7	107.2	112.9
FEB 83	110.9	94.6	105.2	109.8	118.2
AUG 83	No Data	92.3	99.9	106.1	112.9
FEB 84	109.3	94.9	105.5	108.9	118.3
JUN 84	109.3	94.8	104.6	109.0	109.4
SEP 84	109.3	93.7	103.6	107.9	115.8
MAR 85	110.5	93.7	105.3	110.2	No Data
SEP 85	106.3	92.3	99.4	No Data	113.1
MAR 86	112.9	95.7	105.5	110.8	118.5
SEP 86	107.5	93.1	102.5	108.3	115.7
MAR 87	110.5	94.1	104.9	109.8	118.5
SEP 87	109.5	95.1	105.2	108.8	118.5

TABLE 45D

SUMMARY OF GROUNDWATERANALYSES
WELLS MW-1 THROUGH MW-7
(1981 THROUGH 1987)

Chemical	EPA Maximum Contaminant Level (ug/l)	New York State Groundwater Standard (ug/l)	Method Detection Limit (ug/l)	Concentration Range Detected (ug/l)	Total Number of Samples	Number of Samples Exceeding Detection Limit	Number of Samples Exceeding NYSGWS	Number of Wells Exceeding NYSGWS
Inorganics								
Arsenic	50	25	10	ND	26	0	0	
Barium	1,000	1,000	100	ND	26	0	0	
Cadmium	10	10	5	ND	26	0	0	
Chromium	50	50	10	ND	26	0	0	
Mercury	2	2	0.2	ND	26	0	0	
Lead	50	25	10	ND	26	0	0	
Selenium	10	20	5	ND	26	0	0	
Silver	50	50	10	ND	26	0	0	
Iron	NA	300	2-100	ND-1,020	65	40	3	1,7
Manganese	NA	300	1-30	ND-320	65	02	17	2,5,6,7
Fluoride	4,000	1,500	100	100-300	27	27	0	5
Nitrate	10,000[a]	10,000[a]	50	ND-10,000	27	23	1	5
Explosives								
HDX	NA	(35)[b]	100	ND	46	0	0	
RDX	NA	(35)[b]	30	ND	46	0	0	
Tetryl	NA	(1)[b]	10	ND	46	0	0	
2,4,6-TNT	NA	(1)[b]	1	ND	46	0	0	

TABLE 45D
(Cont.)

Chemical	EPA Maximum Contaminant Level (ug/l)	New York State Groundwater Standard (ug/l)	Method Detection Limit (ug/l)	Concentration Range Detected (ug/l)	Total Number of Samples	Number of Samples Exceeding Detection Limit	Number of Samples Exceeding NYSGWS	Number of Wells Exceeding NYSGWS
2,6-DNT	NA	(1.1)[c]	1	ND	46	0	0	
2,4-DNT	NA	(1)2[b]	1	ND	46	0	0	
pH	NA	(6.5-8.5)[d]		6.7-8.1[d]	300	300	0	
TOC	NA	NA	100	1,000-54,000	340	340	NA	
TOX	NA	NA	10	ND-130	335	133	NA	

NOTES:

[a] Groundwater standard is for nitrate only.
[b] Guidelines proposed from "Criteria Development Report for the Closure of Nine Burning Pads" (M&E, October 1989).
[c] EPA Water Quality Criteria for 10^{-5} risk
[d] Units are pH.

NA Not Available
ND Not Detected

Data summarized from the 1987 USAEHA Groundwater Contamination Survey

TABLE 45E

GROUNDWATER ANALYSIS DATA
(M&E, 1989)

Chemical	EPA Maximum Contaminant Level (ug/l)	New York State Groundwater Standard (ug/l)	Method Detection Limit (ug/l)	Detection Range Wells 1-6 (ug/l)	No. of Times Greater Than Detected Wells 1-6	Times Detected Greater Than Standards Wells 1-6
Inorganics						
Arsenic	50	25	10	ND - 19.3	1	0
Barium	1000	1000	200	ND - 859	5	0
Cadmium	10	10	5	ND - 18.8	1	1(4)
Chromium	50	50	10	21.5-152	6	4(1,4,5,6)
Mercury	2	2	0.2	ND - 0.58	2	0
Lead	50	25	5	38.9-206	6	6(1,2,3,4,5,6)
Selenium	10	50	5	ND - 14.3	2	1(5)
Explosives						
PETN	NA	NA	4.5	ND - 45	2	NA
HMX	NA(35) [a]	NA	1.3	ND	0	NA
RDX	NA(35) [a]	NA	0.63	ND - 1.84	2	NA
Tetryl	NA(1) [a]	NA	0.66	ND - 0.96	1	NA
2,4,6-TNT	NA(1) [a]	NA	0.78	ND	0	NA
2,6-DNT	NA(1.1)	NA	0.55	ND	0	NA
2,4-DNT	NA	NA	0.6	ND	0	NA

NOTE: [a] Proposed Guidelines from Criteria Development Report for the Closure of the Nine Burning Pads (M&E, October 1988)

APPENDIX E

RESPONSES TO EPA AND NYSDEC COMMENTS

2.0 TECHNICAL EVALUATION

2.1 General overview

Comment #1: The WP for CERCLA Investigation of Eleven SWMU is, in general, a concise, technically sound document, presenting available historical information, and then developing a sampling and analysis plan for each SWMU. As stated in Subsection 1.1 of the WP "The purpose of this investigation will be to determine whether hazardous constituents or wastes have been released to the environment at each of the eleven SWMUs to be investigated." The sampling and analysis program, proposed in this WP, generally appears adequate to accomplish this objective, with the revisions outlined in this review document.

Response #1: Acknowledged. The SWMU at SEAD-8 was dropped from this Work Plan resulting in 10 SWMUs to be investigated.

Comment #2: On a SWMU-specific basis, the WP needs to develop conceptual models which clearly identify suspected source areas, release mechanisms, migration pathways, and potential receptors. It is recommended that these models be presented in formats similar to those presented in Figures 2-2 and 3-4 of the RI/FS Guidance (EPA, 1988).

This would clearly illustrate that the proposed sampling and analysis program will provide adequate coverage of each potential migration pathway.

Response #2: Agreed. A table summarizing the conceptual model for each SWMU is presented in Section 3, Data Quality Objectives as Table 3-1.

Comment #3: Although useful, the FSAP and HASP, which have been presented with the WP, may need to be revised to include dedicated, SWMU-specific sections. This revision would improve the usefulness of these documents to field personnel. In addition, the WP should be revised to include references to these dedicated sections, where appropriate, with respect to each task to be performed at each SWMU.

Response #3: The FSAP conforms with the suggested format for the portion of an ESI that describes the field investigation procedures (EPA, 1987). Since the same procedures will be used to investigate each of the ten SWMUs, a table has been added to the FSAP that summarizes which field investigation techniques will be used at each SWMU. The HASP has been expanded to include SWMU-specific safety guidelines. An introduction has been added to Section 5.2 of the Work Plan that refers to the FSAP, HASP, and CDAP for specific information on various aspects of the field work.

Comment #4: A number of deficiencies were found in the proposed sampling and analysis program. Two areas which need revisions include the proposed ground water monitoring program, and the proposed handling of explosives related to some of the SWMUs. Discussions regarding these concerns are presented below and in the page-specific comments in Subsection 2.2.

Response #4: Acknowledged.

2.1.1 Proposed Ground Water Investigations

Comment #5: Very limited information regarding subsurface site conditions (i.e., ground water flow direction, interaction between aquifers, etc.) is available. Therefore, it is difficult to accurately evaluate locations and depths of proposed monitoring wells for their adequacy in providing the necessary information regarding each SWMU. For each SWMU which lacks adequate available information, it is recommended that an initial set of three water table wells be installed, to encompass the SWMU.

After installation of these wells, ground water elevation measurements should be taken, and the approximate direction of ground water flow be determined in the field through triangulation of the three data points. Upon determination of the direction of ground water flow, at least one monitoring well cluster, adequate to provide coverage of the entire thickness of the upper aquifer, should be installed downgradient of the SWMU.

Using the presumed ground water flow directions given in the WP, it may be possible to locate one of the original three wells approximately downgradient from the SWMU. If this is done, it may only be necessary to install a single deep well after determination of the direction of ground water flow to complete a cluster. Following this procedure for the installation of wells will optimize the location of the proposed wells to collect adequate data in a cost-effective manner. This procedure should especially be adhered to at SWMUs which may be contaminated with compounds with high specific gravities (i.e., several of the explosives) to investigate the potential for downward migration of these contaminants.

Response #5: The monitoring wells at each SWMU in the Work Plan are at proposed locations that are in accordance with this comment. Seismic refraction will be performed along two perpendicular transects to determine the groundwater flow direction at all the SWMUs except SEAD-45. There are sufficient wells at SEAD-45 to determine the groundwater flow direction. Based on the seismic data, the well locations will be adjusted so that one is upgradient, one is immediately downgradient of the SWMU, and the third is located to form a triangle. The downgradient well will be placed adjacent to the source to maximize the potential for encountering any contaminants released by the SWMU. Data from current field work on site indicate the overburden (till and weathered bedrock) is generally less than 12 feet thick on site. The aquifer characteristics of the till and weathered bedrock are very similar. The EPA and the NYSDEC have agreed with the Corps that groundwater in the till and weathered bedrock are to be treated as one aquifer. Therefore, one overburden well will be installed at each monitoring well location screened from three feet above the water table to the top of competent bedrock. Bedrock wells will not be installed during this ESI. If the soil samples and groundwater samples indicate contaminants are present that could migrate (or are migrating) down into the bedrock, bedrock wells will probably be installed during the RI/FS.

2.1.2 Considerations for Handling Explosives

Comment #6: Due to the potential presence of unexploded ordnance (UXO) at SWMUs SEAD-45 and SEAD-57, Main should evaluate the need to perform remote drilling. Subsection 2.3.1 of the HASP does make mention of a remote drilling program. However, there is no mention of which SWMUs are being considered for this program or how this program will be carried out.

It is recommended that any drilling which is proposed to occur within or near potential source areas of explosives be performed from a remote location. Due to the lack of detailed information with respect to historical operations, spills, and disposal at these SWMUs, this may be necessary to reduce potential hazards posed to onsite workers.

The body of the WP in its present state does not propose any remote drilling. Appendix B the HASP does mention that UXO clearance will be performed only at the OB/OD grounds.

The WP proposes to perform grid-based electromagnetic (EM-31) and magnetic surveys followed by ground penetrating radar (GPR) to delineate any areas which may contain UXOs at SEAD-45 and SEAD-57. Each of these surveys will involve personnel walking over the SWMU and taking readings at certain grid locations. It is recommended that all areas suspected to contain UXOs be cleared by qualified personnel prior to execution of any of the activities being proposed in this WP.

Response #6: Agreed. These comments have been incorporated into the Work Plan by adding a SWMU-specific section in Section 5 titled "Handling UXOs and Explosives." The Work Plan now states that a subcontractor will clear UXOs, then geophysical surveys (seismic refraction, EM-31, and GPR) will be performed.

2.1.3 Appendix A Field Sampling and Analysis Plan

Comment #7: As stated in Subsection 2.3.2.1 of the RI/FS Guidance (EPA, 1988), "The FSAP should be written so that a field sampling team unfamiliar with the site would be able to gather the samples and field information required." In its present form, the FSAP has not been written in such a form. None of the discussion in the FSAP is SWMU-specific, and therefore, could not be used by field personnel unfamiliar with the site to collect samples. The FSAP needs to be revised to address this issue.

Response #7: Agreed. The guidance manual to perform ESIs recommends a section that only describes field investigation procedures, which is what was prepared. A table has been added to the FSAP that shows which sampling procedures will be used at each SWMU.

Comment #8: Each sampling method should make reference to the applicable section of the HASP which describes the monitoring devices and level of personal protection that are to be utilized.

Response #8: Acknowledged. Health and safety procedures for sampling methods are location-specific as well as task-specific. Task-specific health and safety procedures for each SWMU are contained in Appendix B of the HASP.

Comment #9: The geophysical sampling plan should indicate, for each site, where the geophysical surveys will be conducted, the method in which the measurements will be taken (i.e. continuous, 10-foot nodal spacings, etc), and the types of information which must be recorded during the surveys.

Response #9: Agreed. The SWMU-specific information is presented in Section 5.2 of the Work Plan.

Comment #10: Manufacturer supplied, instrument specific operating instructions should be provided as SOPs in the appendices for each different type of monitoring or measurement device used on the sites.

Response #10: Disagree. Instructions to use each instrument will be kept with the instrument while in the field. This will be mentioned in the Work Plan.

Comment #11: For each type of sample collected the preservation methodology and container requirements should be discussed or referenced.

Response #11: Agreed. Section 4.3 of the FSAP references Table C-1 of Appendix C.

2.1.4 Appendix B Health and Safety Plan

Comment #12: OSHA requires that all site HASPs contain the following elements, as a minimum:

(1) A hazard analysis for each site task;
(2) training requirements;
(3) personal protective equipment (PPE) to be used;
(4) medical surveillance requirements;
(5) frequency and types of air monitoring;
(6) site control measures;
(7) decontamination procedures;
(8) emergency response plan;
(9) confined space entry procedures, if any; and
(10) a spill containment program.

Main addresses each of the OSHA required elements in the HASP, except for confined space entry. Overall the plan is well-organized and comprehensive.

Response #12: Acknowledged. A section on confined space entry has been added to the HASP.

2.1.5 Appendix C Chemical Data Acquisition Plan

Comment #13: The CDAP does not specify the analytes of interest for this program. The CDAP uses general terms such as volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals, and explosives. The CDAP must specify each analyte of interest, its detection limit, and the precision and accuracy goals.

Response #14: Agreed. The items in this comment has been incorporated into the Work Plan.

Comment #15: The CDAP does not give any precision and accuracy goals for any of the organic parameters with the exception of explosives.

Response #15: Agreed. Precision and accuracy goals have been included.

Comment #16: The CDAP does not describe the calculations which will be used to calculate precision and accuracy, these calculations are required to be included in a QAPJP.

Response #16: Agreed. These calculations have been included.

Comment #17: The CDAP does not include any discussions on Preventive Maintenance, Performance and System Audits, and Corrective Actions. These subjects are requirements of a QAPJP.

Response #17: Agreed. These discussions have been included.

2.1.6 Appendix F Air Monitoring Program

Comment #18:
The proposed air monitoring procedures for the remedial investigation of the SEAD reviewed for this effort were provided in Appendix B (HASP) and Appendix F (Air Monitoring Program). The procedures documented in the HASP pertain to "disturbed" conditions, i.e., those in which the work performed breaks the ground surface. The air monitoring program presented in Appendix F describes the baseline monitoring program for estimating baseline air emissions.

The proposed baseline monitoring program is an indirect screening approach. In general, the monitoring plan presented (both in Appendix B and Appendix F) is very brief, lacks sufficient detail, does not provide justification for the approach selected, and does not demonstrate that it satisfies the needs and objectives specific to the SEAD. Indirect screening technologies are considered acceptable approaches for air pathway analyses at some Superfund sites; however, the basis and rationale for selection of the method should be presented in the Air Monitoring Plan.

Response #18: Acknowledged. The air monitoring program as described in Appendix F was included in response to a comment presented during an in-house Army review of the draft Work Plan. On further review, the air monitoring program was determined to be not necessary. It is also inconsistent with the current RI/FS investigations at the OB Grounds and Ash Landfill. The need for an air monitoring program at each of these ten SWMUs will be evaluated based on the chemical analysis data obtained as a result of the ten SWMU site inspection proposed in this Work Plan. Air monitoring for VOCs and particulates has been incorporated into the HASP of this ESI Work Plan. It will use the same procedures that are being used for the RI/FS investigations currently underway.

2.2 Page-Specific Comments

2.2.1 WP Section 1.0 - Introduction

Comment #19: p. 1-1, paragraph 2: The citation "(EPA 1988)" should read "(EPA 1987)", as the document being referenced was published in 1987. Also, the letter documented in the reference list, the final entry, is incomplete.

Response #19: Agreed. These items have been corrected and completed.

Comment #20: The OSWER Directive number provided for the document, "Expanded Site Inspection - Transitional Guidance for Fiscal Year 1988" is incorrect and should be 9345.1-02.

Response #20: Agreed. This item has been corrected.

Comment #21: p. 1-1, paragraph 3: The final sentence of this paragraph states that if an AOC is determined to pose a threat to human health, welfare, or the environment, a complete CERCLA site investigation may be undertaken. The second paragraph of this page states the purpose of this investigation is to determine whether hazardous constituents or wastes have been released to the environment. Therefore, it does not appear as though a full evaluation of the potential threats to human health, welfare, and the environment will be possible upon completion of the investigation about to be proposed.

Response #21: Agreed. The second paragraph has been changed to conform with this comment.

Comment #22: The word "compete" is misspelled and should read "complete".

Response #22: Agreed. This item has been corrected.

2.2.2 WP Section 3.0 - Data Quality Objectives

Comment #23: p. 3-4, paragraph 1: The WP identifies three decisions which the data, obtained from the proposed investigation, will be used to support. This list of decisions needs to be expanded to include decisions as to whether or not any actions are required, as stated in the first sentence of Section 3.0 of the WP. Since the obtained data will be used to determine whether or not further action is required at these sites, a higher quality of data will be required.

Figure 2-1 of the ESI Guidance illustrates a three-stage process for the development of DQOs which involve (1) identifying decision types; (2) identifying data uses/needs; and (3) design data collection program. The WP is deficient in this first stage of the development of DQOs with respect to this guidance in several aspects. The WP fails to identify data users, evaluate available information from the reconnaissance performed as part of the PA, and develop a conceptual model which illustrates probable contaminant(s), migration pathway(s), and potential route(s) of exposure. The failure to present conceptual models for these sites may result in potentially impacted media not being subject to appropriate sampling and analysis.

Response #23: Agreed. See Response #24.

Comment #24: p. 3-4, paragraph 2: The WP identifies the data quality objectives without employing the three-stage process outlined in the ESI guidance document. DQOs in the WP have been developed based only on a list of three general decision types identified in Subsection 3.2 of the WP.

Response #24: Agreed. Section 3, titled "Data Quality Objectives," was revised to conform with the ESI Guidance Manual and Comments #23 and #24.

Comment #25: The WP seems to imply that EPA has already accepted Level 3 data quality for this investigation. If this is the case, a reference needs to be added to the report as to where this decision has been documented. Since the investigation being proposed in this WP may provide information leading to potentially no further action decisions, data quality may need to be set at Level 4. This would provide a greater degree of certainty in data used to support determinations as to whether or not a site poses a risk.

Response #25: Acknowledged. Level 4 data quality will be produced for the TCL and TAL analytes using NYSDEC CLP methods. Level 3 data quality will be produced for the other analytes using standard methods of analysis.

2.2.3 WP Section 4.0 - Description of SWMUs to be Investigated

SEAD-4 Munitions Washout Facility Leach Field

Comment #26: p. 4-1, paragraph 3: The WP states that waste water was discharged to an area where it was allowed to leach into the ground or flowed into a nearby ditch. The WP then states the remaining waste water discharged to an area near building 2084; and an employee stated that remaining waste water discharged to an area near building 2079, which is not shown on Figure 4-1.

From this discussion it is not clear if waste water was allowed to discharge to two or four areas. This discussion should also provide some information as to the quantities of waste water which were discharged at these different areas.

Also, all locations of suspected wastewater discharge should be presented in the figures in the SI WP. This concern was previously presented by the EPA in comments provided in June of 1991, on the Draft SWMU Classification Report (ERCE, 1991).

Response #26: Agreed. The potential wastewater discharge locations have been revised and clarified. Figure 4-1 has been revised accordingly. No information is available regarding discharge volumes.

Comment #27: p. 4-4, paragraph 1: The WP states that none of the three explosives for which sampling and analysis was performed were detected. A brief review of Appendix D, Existing Analytical Data For SWMUs, has shown that none of the analytical detection limits have been provided for the analyses which were performed. Therefore, it is not possible to evaluate the significance of a "non-detect". Also, the EPA has previously noted in comments provided on the Draft SWMU Classification Report (ERCE, 1991) that analysis for only three explosive constituents, when the types of explosives in the waste water are unknown, is not acceptable to determine that, in fact, explosives are not present in these sediments.

Response #27: Agreed. ERCE did not state the detection limit for these analyses. Samples from this area will be analyzed for explosives and other parameters.

SEAD-17 Existing Deactivation Furnace

Comment #28: p. 4-11, paragraph 2: This paragraph needs to define what is meant by an 'endless conveyor".

Response #28: Agreed. ERCE used the term in their report. It has been changed to the more general term "conveyor" in the Work Plan.

Comment #29: p. 4-11, paragraph 4: This paragraph states that the results of analyses performed on surface soils and wipe samples collected from this SWMU are provided in Appendix D. Upon reviewing Appendix D, the map provided which illustrates sample locations does not provide enough information to clearly identify the sample locations. Without the sample locations which correspond to the analytical results, it is not possible to accurately define data gaps for this SWMU, and in turn, design an appropriate sampling and analysis program for this investigation.

Response #29: Agreed. SEAD provided the map shown on Figure 17A in Appendix D that shows where the samples were obtained. Soil from this area was removed to install a concrete pad.

2.2.4 WP Section 5.0 SWMU Investigations

SEAD-4 Munitions Washout Facility Leach Field

Comment #30: p. 5-17, paragraph 3: In addition to surface water, the sediments within the pond should also be considered a potential migration pathway for contaminants. See comment for p. 4-4, paragraph 1.

Response #30: Agreed. Sediment has been included as a potential migration pathway in the Work Plan.

Comment #31: p. 5-18: Figure 5-1 illustrates the proposed locations of the four monitoring wells for this SWMU. The proposed locations of these wells do not appear to be the most appropriate for this stage of the investigation of this SWMU. As the direction of ground water flow is not known for the area near this SWMU, well locations should be proposed to accurately define the direction of ground water flow.

It is recommended that three water table wells be installed to encompass the SWMU. These wells should be approximately evenly spaced and situated such that at least one is located downgradient of the SWMU, based on the presumed direction of ground water flow presented in the WP. Upon completion of the original three wells, ground water table elevations should be measured. Then, the direction of ground water flow can be estimated in the field through triangulation of the three data points.

Response #31: Agreed. Monitoring wells have been located in accordance with this comment. Seismic refraction will also be performed to estimate the groundwater flow direction.

Comment #32: After estimation of the direction of ground water flow, a well cluster should be installed downgradient of the SWMU. This well cluster is needed to provide information regarding ground water quality throughout the thickness of the aquifer. As suspected contaminants at this SWMU include explosives which have a high relative density and low solubility, the potential for downward migration of contaminants may exist. If it is found that the aquifer is not particularly deep, and one of the original wells is located downgradient of the SWMU, it may be feasible to provide adequate coverage of the aquifer by installing only one additional deep well.

Response #32: Disagree. Only one well will be installed at each location because the overburden (till) thickness is anticipated to be less than 12 feet.

Comment #33: Figure 5-1 shows two surface soil or sediment samples to be collected from the former waste water drainage ditch (SD4-3 and SD4-4). Subsection 5.2.1.2 states that GPR is to be used to locate the former drainage ditch. This implies that the ditch is an underground feature. Therefore, it is not understood why surface soil samples are being proposed.

Response #33: Acknowledged. The ditch was apparently an unlined swale on the ground surface. If the ditch was filled in with soil, the soil will be removed to uncover the original bed of the ditch before sampling.

Comment #34: p. 5-19, paragraph 4: The WP proposes two soil samples to be collected from the soil berm. It is not clear from the information provided in the WP why these samples are being proposed. Figure 5-1 does not identify the feature shown as a dark circle to the west of BLDG 2084. If the potential of a release from this feature is suspected, this should be documented in the WP. Also, it should be stated whether this release may have potentially affected ground water. Greater detail regarding this area needs to be incorporated into this WP.

Response #34: Agreed. The source of the soil for the berm is unknown and may have been affected by the wastewater before it was used to construct the berm. The dark circle is identified as a water tank.

SEAD-11 Old Construction Debris Landfill

Comment #35: p. 5-24, paragraph 1: "GRP" should read "GPR."

Response #35: Agreed. This error was corrected.

Comment #36: p. 5-25: Figure 5-3 illustrates the proposed locations for three monitoring wells to be installed at this SWMU. These locations do not appear to be optimally placed to accurately define the direction of ground water flow in the area of this landfill. Wells MW11-2 and MW11-3 appear as though they will be located too close to the landfill. This may cause inaccurate ground water table elevation readings due to the potential for radial flow of ground water from the landfill. If ground water elevations readings too close to the landfill are taken, ground water flow direction may not be accurately defined. It is recommended that the selection of well locations follow the procedure outlined in the comment for p. 5-18.

Response #36: Agreed. These wells have been located in accordance with the comment for p. 5-18. A fourth well (MW11-4) will be located immediately downgradient of the landfill to evaluate the groundwater quality emanating from under the landfill and determine the potential for radial flow of groundwater from the landfill.

Comment #37: Contaminants at this SWMU may or may not include explosives. However, it has been assumed in the WP that explosives may be present at the site; therefore, the proposed sampling and analysis program must reflect this assumption.

Response #37: Agreed. A section on handling UXOs and explosives has been added (Section 5.2.2.4) to the sampling plan for this SWMU. All samples will be analyzed for explosives.

Comment #38: Presently it appears the only factor which has been considered in determining the presumed direction of ground water flow is Indian Creek, located to the west of the SWMU. Other factors, such as the river located to the south of the SWMU, should be considered, as this may also affect the direction of ground water flow. The actual flow direction may have more of a southerly component than shown in the figure.

Response #38: Agreed. The approximate groundwater flow direction will be determined by a seismic refraction survey.

SEAD-13 IRFNA Disposal Site

Comment #39: p. 5-27: Figure 5-4 shows proposed well locations for this SWMU. One additional well may need to be installed on either side of the pond. As the assumed ground water flow direction changes from one side of the pond to the other, these additional wells may be required to define the direction of ground water flow on each side of the pond. The proposed locations for wells MW13-2 and MW13-3 should be located closer to the downgradient boundary of the pit disposal areas. The locations being proposed in the WP do not appear to provide adequate coverage of the areas as they are not downgradient from the bulk of the areas suspected to have been used for disposal.

Response #39: Agreed. Items in this comment have been incorporated into the Work Plan.

Comment #40: As noted in the comment for p. 5-18, the wells to be installed at this SWMU should encompass the SWMU. The direction of ground water flow should be determined in the field, and, based on the thickness of the aquifer, additional wells may need to be installed to provide adequate coverage of the aquifer. This becomes necessary due to the lack of information regarding subsurface conditions at the SWMU.

Response #40: Agreed. This comment has been incorporated into the Work Plan.

Comment #41: p. 5-28, paragraph 2: The WP proposes one soil boring within and one soil boring upgradient of each of the two disposal areas. The WP needs to clearly state that these borings will be advanced through areas identified to be disposal pits. The WP states these pits will be identified through the use of GPR. Therefore, the optimum placement of these borings would seem to be directly through these pits. Figure 5-4 should also include a foot note stating these borings will be advanced through these pits.

Response #41: Agreed. Items in this comment have been incorporated into the Work Plan.

Comment #42: p. 5-29, paragraph 2: The WP needs to expand the discussion regarding surface water and sediment sampling. This discussion should include the criteria which will be evaluated in the field when selecting these sample locations.

Response #42: Agreed. Criteria to select these locations have been incorporated into the Work Plan.

SEAD-16 Building S-311 Abandoned Deactivation Furnace

Comment #43: The report does not indicate whether or not the furnace and associated equipment (e.g., stack and combustion chamber) are still in the building, has been dismantled, or decontaminated. If the furnace is still in place, the furnace and associated equipment may be contaminated with lead and barium. Support for this assumption is that the unit had no air pollution control devices and test results of wipe samples collected at the existing deactivation furnace and associated equipment have shown detectable concentrations of lead and barium.

Response #43: Agreed. The furnace and associated equipment are still in the building.

Comment #44: An inspection and evaluation should be conducted at the inactive furnace to determine if concentrations of lead and barium are a concern.

Response #44: Agreed. Bulk samples of residue on the floor and scale inside the furnace will be obtained for metals analysis. Samples of pipe insulation in the building will be analyzed for asbestos.

Comment #45: p. 5-31: Figure 5-5 presents the proposed well locations for this SWMU. See comment for p. 5-18. There is no symbol in the legend for proposed surface soil samples.

Response #45: Agreed. This comment has been incorporated into the Work Plan.

SEAD-17 Building 367 Existing Deactivation Furnace

Comment #46: Previous investigations conducted at Bldg 367/ Existing Deactivation Furnace (SEAD-17) confirmed soil contamination in the vicinity of this SWMU. Soil samples collected were analyzed for the EP Toxicity test for metals. Some of the highest concentrations of lead detected in the EP Toxicity test leachate are 384 ppm, 326 ppm, 279 ppm, and 270 ppm, which exceed the EP Toxicity limit of 5 ppm and the drinking water standard of 50 ppb established for lead. The report proposes to install three groundwater monitoring wells (one upgradient and two down gradient) to determine any potential impact from this SWMU to the groundwater.

We recommend that additional monitoring wells be installed. The additional wells should be installed in the areas where the highest lead concentrations were detected in the soils. Attached is a map depicting the locations of the soil samples collected previously, which is not included in the report.

Response #46: Disagree. The soil samples with elevated EP Toxicity lead were from an area near the building as shown on Figure 17A in Appendix D. This soil was removed before constructing a concrete pad at that location. Therefore, no additional wells will be installed near this area of the SWMU.

Comment #47: p. 5-32, paragraph 4: Subsection 5.2.6.2, Media To Be Investigated, does not propose any sampling and analysis of subsurface soils. Previously, surface soil samples collected from this SWMU have been found to contain lead concentrations which have exceeded the extraction procedures (EP) toxicity limits. However, subsurface soils have not been previously analyzed. Elevated levels of lead may be present in the subsurface soils and have not yet reached the ground water. This may result in future impacts to ground water, which will not be detected by the proposed HASP.

Response #47: Agreed. This comment has been incorporated into the Work Plan. Subsurface samples will be analyzed.

Comment #48: p. 5-33: Figure 5-6 shows the proposed locations for the monitoring wells for this SWMU. Based on the location of Kendaia Creek to the south of the SWMU, ground water may be expected to flow more in a southerly direction than presented in Figure 5-6. If this is found to be the case, then the proposed wells will not adequately define whether or not the SWMU is impacting ground water quality. Placement of the proposed wells may need to be re-evaluated with respect to the potential direction of ground water flow.

After these wells are installed, the direction of ground water flow needs to be determined. Upon determination of the actual ground water flow direction, the wells present at the SWMU may need to be reevaluated for their adequacy in providing coverage of any contamination which may be migrating from the SWMU.

Response #48: Agreed. Two perpendicular seismic refraction transects will be performed to determine the groundwater flow direction. Well locations will be adjusted based on these data so that there is an upgradient and downgradient well.

SEAD-24 Abandoned Powder Burning Pit

Comment #49: p. 5-34, paragraph 3: The WP fails to state that soil borings to be advanced within the soil bermed area will be located within any identified disposal pits. If these borings are not advanced through suspected pits, the potential exists that contaminants may be present which may not be detected.

Response #49: Agreed. This comment has been incorporated into the Work Plan.

Comment #50: p. 5-35: Figure 5-7 shows the proposed locations for three monitoring wells at this SWMU. Solvents as well as explosives are suspected to have been used at this SWMU. Both of these compounds have the potential to migrate downward within the aquifer. See comment for p. 5-18.

Response #50: Agreed. One well will be installed at each location (in accordance with p. 5-18 comment) because the overburden thickness is anticipated to be less than 12 feet.

SEAD-25 Fire Training and Demonstration Pad

Comment #51: p. 5-37: Figure 5-8 illustrates the proposed locations of the wells to be installed at this SWMU. Solvents are suspected to have been used at this SWMU. These compounds may have the potential to migrate downward within the aquifer. See comment for p. 5-18.

Response #51: Agreed. One well will be installed at each location (in accordance with p. 5-18 comment) because the overburden thickness is anticipated to be less than 12 feet.

SEAD-26 Fire Training Pit and Area

Comment #52: p. 5-39: Figure 5-9 illustrates the proposed well locations for SEAD-26. Again, it is recommended that the well location selection for this SWMU follow the procedure outlined in the comment for p. 5-18. However, due to the length of this SWMU, it will be necessary to initially install four water table wells, as shown in the figure. Then, based on the estimated ground water flow direction it may be necessary to install additional wells at more than one downgradient location to provide adequate coverage of the aquifer.

Response #52: Agreed. A seismic refraction survey along two perpendicular transects will be conducted to determine the groundwater flow direction. Well locations will be adjusted so that there is an up- and downgradient well. One well will be installed at each location (in accordance with p.5-18 comment) because the overburden thickness is anticipated to be less than 12 feet.

SEAD-45 Open Detonation Facility

Comment #53: p. 5-41, paragraph 3: This paragraph discusses soil samples collected from eight locations around this SWMU. This information should have been presented in Section 4 of this report, as part of the existing analytical data. Also, analytical results and corresponding figures should be presented as part of this WP. The inclusion of this information into this report would provide a better understanding of the scoping of the investigation of this SWMU.

Response #53: Agreed. The paragraph was moved to Section 4.

Comment #54: p. 5-41, paragraph 4: This sentence states the presumed direction of ground water flow is to the northeast. Since five monitoring wells are present at the SWMU, the direction of ground water flow should be known, not presumed.

Response #54: Agreed. This comment has been incorporated into the Work Plan.

Comment #55: p. 5-41, paragraph 6: The WP proposes magnetic and EM surveys, followed by GPR and test pitting as the procedure to identify and remove any UXO from this SWMU. This procedure seems inappropriate to remove UXOs from the SWMU.

It is recommended that first the SWMU be cleared by an explosives team (either Explosive ordnance Disposal (EOD) or a subcontractor). After the area is cleared, geophysical investigations can be safely performed.

The WP needs to explain why both magnetic and EM surveys, in addition to GPR, are being proposed for this SWMU. It would seem that these separate EM and magnetic surveys will yield similar information. Also, the FSAP discusses only hand-held magnetometry and GPR.

Response #55: Agreed. UXO personnel will first locate UXOs that could be dangerous to personnel performing field work in this SWMU. The EM-31 and GPR surveys will locate subsurface anomalies. Test pits will be used to characterize the type of buried metallic objects present in this SWMU, not remove all the UXOs. A maximum of 10 test pits will be excavated to characterize the objects. The EM-31 procedure was added to the FSAP.

Comment #56: p. 5-42, paragraph 4: This paragraph seems to propose that the wells to be installed should be shallow. Explosive compounds have already been detected in the soils at this SWMU. Therefore, the WP needs to propose deeper, downgradient wells to provide coverage of the entire thickness of the aquifer. Also, information needs to be provided in the WP regarding the existing wells at the SWMU. This information should include well construction logs, which identify the screened interval of the wells. This information is needed in evaluating the depth of the screened intervals of the wells being proposed.

Response #56: Acknowledge. Bedrock was encountered 6.5 to 13.5 feet below grade at wells MW- 1 to -5. Therefore, one well will be installed at each location screened from above the water table to the top of competent bedrock. Available information regarding these 5 wells is in tabular form. These tables have been included in Appendix D of the Work Plan.

SEAD-57 Explosive Ordnance Disposal Area

Comment #57: p. 5-44, paragraph 3: See comment for p. 5-41, paragraph 6.

Response #57: See Response #55.

Comment #58: p. 5-44, paragraph 6: See comment for p. 5-42, paragraph 4.

Response #58: The bedrock is expected to be less than 12 feet deep generally at this SWMU. The soil is expected to be till. Therefore, one well will be installed at each location screened from above the water table to the top of competent bedrock.

2.2.5 Appendix A Field Sampling and Analysis Plan

Comment #59: p. 1-1, paragraph 3: In order for "the collection of precise, accurate and representative field data" to occur, the FSAP needs to be expanded to clearly outline, on a SWMU-specific basis, all activities to be performed at each SWMU. In its current form, the FSAP does not provide the detail needed in an FSAP to ensure the collection of quality data.

Response #59: Disagree. The ESI guidance manual (EPA, 1987) suggests a Field Investigation Procedures section that only describes the techniques that will be used to collect data for an ESI. A table has been added to the FSAP that summarizes which field techniques will be used at each SWMU.

Comment #60: p. 2-3, paragraph 1: Additional quality control samples that must be collected are matrix spike and matrix spike duplicate samples.

Response #60: Agreed. This comment has been incorporated into the Work Plan.

Comment #61: p. 2-3, paragraph 2: The sampling plan must specify what analyses will require trip blanks. The preservation method of the trip blank must be specified or referenced.

Response #61: Agreed. This comment has been incorporated into the Work Plan.

Comment #62: p. 2-3, paragraph 3: The source of the blank water must be specified. A rinse blank must be collected at least once per day for each matrix, type of sampling equipment, and analysis type.

Response #62: Agreed. This comment has been incorporated into the Work Plan.

Comment #63: p. 2-4, paragraph 4: In addition to soil sample depth information, similar information should be recorded for sediment and surface water samples. This would include sample depth, water depth, and distance from shore.

Response #63: Agreed. This comment has been incorporated into the Work Plan.

Comment #64: p. 3-4, paragraph 4: The GSSI survey procedures should specify how the survey will be carried out at each of the sites; information required to carry out the study includes the grid spacing for the survey lines, the limits of the survey at each area, and the instrument settings if applicable.

Response #64: Agreed. This information has been provided in Section 5 on a SWMU-specific basis.

Comment #65: p. 3-5, paragraph 4: In order to avoid puncturing buried containers and to reduce the chance of disturbing buried UXO, a smooth-edge backhoe bucket without cutting teeth should be used.

Response #65: Agreed. This comment has been incorporated into the Work Plan.

Comment #66: p. 3-6, paragraph 5: The criteria to be used to collect a soil sample stated on p. 3-10 should be referenced. The plan should state that a soil sample from the anticipated screened interval of the monitoring well should be collected for grain size analysis.

Response #66: Disagree. Soil samples from the screened interval will not be analyzed for grain size during this ESI. This is consistent with the procedures used for the current RI/FS investigations at the Ash Landfill and OB Grounds.

Comment #67: p. 3-7, paragraph 1: The sampling plan should describe the decision process in which it will be determined that certain borings will be remotely advanced.

Response #67: Agreed. This information has been provided in Section 5 on a SWMU-specific basis.

Comment #68: p. 3-9, paragraph 1: The use of the word sediment in this paragraph implies that subsurface samples will be collected from a water body using the test pitting technique. If it is intended that subsurface soil samples will be collected then "soil"should be substituted for "sediment".

Response #68: Agreed. This comment has been incorporated into the Work Plan.

Comment #69: p. 3-10, paragraph 1: The method of closing the test pits should be described. If excavated soils are to be returned to the pit, a layer of bentonite or polyethylene sheeting should be placed at the bottom of the hole to prevent the pit from becoming a preferred pathway of contaminant migration. Containers excavated from the pits containing solid or liquid substances should be overpacked and tested for hazardous constituents.

Response #69: Acknowledged. Test pit closure procedures and procedures to handle excavated containers have been incorporated. Placing bentonite or plastic sheeting in the bottom of the test pit was not incorporated because it would be difficult to place a polyethylene sheet or bentonite pellets evenly across the bottom of the pit to obtain an impermeable layer without entering the test pit. Health and safety procedures prevent personnel from entering test pits.

Comment #70: p. 3-10, paragraph 6: Samples should be homogenized in a decontaminated stainless steel bowl with stainless steel utensils.

Response #70: Agreed. This comment has ben incorporated into the Work Plan.

Comment #71: Also, this paragraph mentions the use of an OVA or PID for screening of soil samples. P. 3-6, paragraph 16 states an OVM will be used for sample screening. The instrument to be used should be consistent unless conditions warrant otherwise. If this is the case the WP needs to include a discussion as to what conditions are governing the change in the instrument selection.

Response #71: Agreed. A PID will be used to screen soil samples.

Comment #72: p. 3-12, paragraph 1: The suspected depth to ground water should be stated.

Response #72: Acknowledged. See Response #73.

Comment #73: p. 3-15: Figure A-4 shows a bentonite seal in place at the contact between the overburden and bedrock. If this technique is being proposed to avoid the migration of contaminants in the overburden into the weathered bedrock, it may be more appropriate to propose the use of telescoped casing.

Response #73: Disagree. Current investigations indicate the weathered bedrock is usually less than 5 feet thick. The overburden and weathered bedrock are predominantly composed of clay and have similar aquifer characteristics. The saturated thickness above competent bedrock is usually less than 12 feet thick. Therefore, groundwater in the overburden and weathered bedrock is being treated as one aquifer, as agreed to by EPA and NYSDEC, with one well screened over both of these units.

Comment #74: p. 3-16, paragraph 1: The locations at which there will be a well cluster should be stated. The screen depth of the deeper well should also be provided. As noted in comments for Section 5.0 of the WP, no well clusters have been proposed. However, clusters may in fact be necessary at some of the SWMUs.

Response #74: Disagree. No well clusters will be installed during the ESI. Wells screened only in the overburden will be used to detect contaminants of concern emanating from each SWMU. The wells will be screened above the water table to detect LNAPLs. If compounds are detected that could form DNAPLs, then wells screened in the bedrock would likely be installed during the RI/FS of that SWMU.

Comment #75: p. 3-25, paragraph 4: The plan should include the operating instructions of the meters in an appendix.

Response #75: Disagree. An appendix to the Work Plan for instruction manuals will not be created. The operating instructions will be kept with the meters in the field.

Comment #76: p. 3-27, paragraph 4: If a pump is utilized to purge a well then the tubing which comes into contact with the water must be dedicated to the well.

Response #76: Agree. The tubing will be dedicated to the well or disposed.

Comment # 77: p. 3-27, paragraph 5: The use of "stainless steel gloves" should be clarified or corrected.

Response #77: Agreed. The words "stainless steel" were replaced with "outer."

Comment #78: p. 3-35, paragraph 3: For surface water samples analyzed for volatile organic compounds, a trip blank should be collected. In addition, rinsate blanks and matrix spike/matrix spike duplicates should also be collected.

Response #78: Agreed. Information regarding QA/QC samples is located in Section 2.3 of the FSAP.

Comment #79: p. 3-39, paragraph 2: Tubing used for soil gas sampling should be dedicated to each sample location.

Response #79: Disagree. Soil gas is sampled before it comes in contact with the latex tubing; therefore, there is no need to dedicate the latex tubing to each sample location.

Comment #80: p. 3-40, paragraph 4: Due to instrument calibration drift, the use of a one second window for the identification of high retention time compounds may cause the detection of many of these compounds to be identified as unknowns. It may be more appropriate to use an identification standard as a percent of the known retention time such as 2 or 3 percent.

Response #80: Disagree. A one second window was selected because the chromatograph can be set to identify peaks within this retention time window. If a peak emerges outside this window, the peak will be evaluated individually by the chemist to identify the compound.

Comment #81: p. 4-3, paragraph 6: The procedures for the decontamination of soil gas survey apparatus should be outlined.

Response #81: Agreed. The procedures are referenced in Section 3.7.3, Item 8 of the FSAP.

Comment #82: p. 6-1, paragraph 2: The procedure to be followed when there is a non-aqueous phase liquid (NAPL) suspected to be present should be outlined.

Response #82: Agreed. The procedure is discussed in Section 6.1 of the FSAP.

2.2.6 Appendix B Health and Safety Plan

Comment #83: Main states that the HASP will be modified to incorporate task/site specific hazards with addenda. At a minimum, if a discussion of these hazards cannot be included in the HASP without waiting for addenda, the nature of the anticipated hazards should be discussed.

Response #83: Agreed. Discussion of site specific hazards for all SWMUs have been included in Attachment A of the HASP.

Comment #84: The Plan Acceptance Form that must be signed by site personnel should be included.

Response #84: Agreed. The form is included in Attachment D of the HASP.

Comment #85: Site visitors are excluded from active work areas on p. 1-3 unless they are affiliated with MAIN, MAIN subcontractors, or Seneca Army Depot. EPA and EPA representatives should not be excluded from active work areas.

Response #85: Agreed. The language has been changed to not exclude EPA and NYSDEC personnel from active work areas.

Comment #86: Although radiological hazards are mentioned in the site description and monitoring of radiation levels is included in the monitoring program, a discussion of radiological hazards is not included in the HASP. In addition, a discussion of biological hazards (i.e. insects, poisonous plants) is not included.

Response #86: Agreed. A discussion of radiological and biological hazards has been included in Section 2 of the HASP.

Comment #87: The Permissible Exposure Limits (PELs) for the contaminants listed in Table B-1 are not necessarily the most stringent available exposure limits. Exposure limits for metals vary according to the chemical state of the metal and, in some cases, the PEL provided could be more stringent if all the PELs for the given metal were evaluated. In addition, some of the PELs provided are incorrect or missing. The following PELs should be corrected or included:

Chromium (VI)	0.05 mg/m3	(NIOSH, 1990)
Benzene	3.25 mg/m3	(NIOSH, 1990)
Toluene	383 mg/m3	(NIOSH, 1990)
Xylene	441 mg/m3	(NIOSH, 1990)
Nitric acid	5.24 mg/m3	(NIOSH, 1990)
HMX	1.5 mg/m3	(Sittig, 1991)
RDX	1.5 mg/m3	(Sittig, 1991)

Also, several contaminants listed as lacking carcinogenic ratings are, in fact. classified as Class D carcinogens on EPA's Integrated Risk Information System (IRIS).

Response #87: Agreed. Permissible exposure limits and carcinogenic ratings have been corrected.

Comment #88: Attachments B through E are not included.

Response #88: Agreed. These attachments have been included.

Comment #89: There is no discussion of confined space activities at the sites. If confined space activities are not anticipated this should be mentioned.

Response #89: Agreed. Confined space entry is now discussed in Section 8, titled "Safe Work Practices," and a confined space entry program has been added as Attachment F to the HASP.

Comment #90: Section 5.2 discusses two types of exclusion zones as though they were one. The exclusion zone created by HFA clearing of UXOs (exclusion zone=areas not cleared) is off limits to all personnel while the exclusion zone to be established around drill rigs is accessible by required personnel. A distinction should be made, therefore, between these areas. In addition, the exclusion zone should remain around the drill rigs regardless of the presence or lack of presence of surface contamination since the exclusion zone is established to protect personnel from more than just chemical hazards.

Response #90: Agreed. The two types of exclusion zones have been clarified.

Comment #91: Given the potential presence of benzene (PEL = 1ppm), it is suggested that a Draeger pump with tubes capable of detecting benzene be included in the monitoring program and action levels.

Response #91: Agreed. Monitoring with benzene indicator tubes will be included for those SWMUs where benzene is a potential problem.

Comment #92: The action levels listed in Table B-2 are unclear. For example, does the action level of <5 on the HNu for Level C protection mean that Level C PPE is required at any level less than 5 ppm or does it mean that Level C PPE is required at any reading greater than background but less than 5 ppm?

Response #92: Agreed. The action levels are read as the maximum level at which the stated level of protection is usable.

Comment #93: Also, the HASP states that particulate monitoring will be conducted in areas where surface contamination is expected to be high and that dust monitoring will be performed in the work area and work area perimeter during drilling, test pit excavation, and other activities which might produce high concentrations of dust.

The plan does not specify what components of dust will be monitored (e.g., heavy metals), at what time intervals data will be reported, the number of monitors, their location, or how any of these factors will be determined.

Response #93: Agreed. Dust monitoring procedures have been clarified. No specific dust borne contaminants will be monitored, only total dust.

Comment #94: Task/site specific air monitoring and PPE is put off to the Task-Specific Safe Operating Guidelines. At a minimum, if a discussion of these issues cannot be included in this HASP, the nature of the anticipated monitoring/PPE should be discussed.

Response #94: Agreed. Task Specific Safe Operating Guidelines have been included in Attachment A to the HASP.

Comment #95: The removal of PPE and the washing of hands and face should never occur in the exclusion zone as suggested by personal hygiene practice #3 (Section 8.2), except in emergency situations.

Response #95: Agreed. Personal hygiene practice #3 has been modified to require removal of PPE and washing prior to leaving the decontamination zone.

Comment #96: Section 10.1 mentions that personal hygiene facilities will be located in the decontamination zone. It should be stressed that personnel must go through proper decontamination prior to entering the personal hygiene facilities. In addition, it should also be stressed that personnel must go through decontamination before eating, drinking, smoking, etc.

Response #96: Agreed. This comment has been incorporated into the Work Plan.

2.2.7 Appendix C Chemical Data Acquisition Plan

Comment #97: p. 9, Item e: Rinsate Blanks are to consist of "demonstrated analyte free" water which is used as the final rinse of sampling equipment after decontamination has been performed. Demonstrated analyte free water is water which has been analyzed prior to use and certified free of all of the analytes of interest at the detection limits specified for the project. Change "reagent" with "demonstrated analyte free" in item e.

Response #97: Agreed. This comment has been incorporated into the Work Plan.

Comment #98: p. 10, paragraph 1: Clarify "EES or equivalent Containers". According to EPA Region II, sample containers must meet cleaning and quality control requirements of OSWER Directive # 9240.0-05 Specifications and Guidance for Obtaining Contaminant-Free Sample Containers. MAIN must compare the cleaning and Quality Control procedures for their bottles with the OSWER Directive to ensure that their bottles meets or exceeds the Directive.

Response #98: Agreed. The CDAP states that the bottles must meet the requirements of the OSWER Directive.

Comment #99: p. 11: Table 5.1 incorrectly indicates that soil VOCs will be preserved with HCl and that aqueous samples are not preserved with acid. MAIN must correct this error.

Response #99: Agreed. The error was corrected.

Comment #100: p. 15, paragraph 2: Main must include preservation added to the sample label.

Response #100: Agreed. This comment has been incorporated into the CDAP.

Comment #101: p. 18: The parameter description in Table 7-1 is inadequate. MAIN must present each specific analyte, its corresponding preparation and analytical methodology, project specific detection limit, and precision and accuracy goal.

Response #101: Agreed. This information has been incorporated into the CDAP.

Comment #102: p. 22, paragraph 6: The data validation procedure that is proposed in the CDAP is not sufficient to meet Region II requirements. The validation procedure that is performed by Aquatec is a review of the analytical data to ensure that the data has met Aquatec requirements before the data is released. This validation process does not take into account all project related considerations such as; matrix problems, rinsate and trip blank contamination, etc. MAIN must present the validation procedure to be utilized to incorporate such project related parameters.

EPA Region II policy is that analytical data be validated according to the Region II Functional Guidelines for Evaluating Organic Analyses, SOP No. HW-6, Revision 8 and the Region II Functional Guidelines for Evaluating Organic Analyses, SOP No. HW-2, Revision XI.

Response #102: Agreed. The data will be validated according to the EPA Region II policy. This has been incorporated into the CDAP.

Comment #103: p. 23, paragraph 1: The statement "Data submittals will be in the format specified in SW-846 Protocols, Level III for standard analyses and Level V for non-standard analyses." contradicts the statement in Section 3.2 (p. 5) which states "All laboratory data will be reported according to New York State Department of Environmental Conservation Contract Laboratory Protocols for Level IV and Level V data deliverables." MAIN must clarify laboratory data deliverables.

Response #103: Agreed. The laboratory data deliverables have been clarified in the CDAP.

2.2.8 Appendix F Air Monitoring Program

Comment #104:

- Three monitors are proposed for each SWMU: one upwind, one downwind, and one over each SWMU. The distances of the upwind and downwind monitors and the basis on which this will be determined were not provided.

- The monitoring plan does not state how many days monitoring will be performed to assure that peak concentrations are not missed due to variable wind conditions, since only one upwind and one downwind monitor will be used at each SWMU. What other meteorological conditions (other than wind direction and speed) will be used to determine the appropriate days for monitoring of VOCS, since VOC concentrations are also affected by temperature and sunlight?

- Baseline monitors will sample for 8-hour periods, but the plan does not specify at what time intervals, concentrations, and emissions will be reported (e.g., 8-hour time waited average (TWA), 1-hour or 15 minute concentrations).

- The baseline monitoring plan states that if releases are "significant," a more sophisticated approach will be used. The plan does not specify what is meant by "significant".

- The proposed baseline monitoring program does not include measurement of particulate emissions. Particulate emissions are important at sites which contain contaminated soils, especially during high wind conditions. Particulate matter (PM) is a very important constituent because it is very likely to include hazardous pollutants such as heavy metals, which have been noted at the site, as well as hazardous organic materials which may be adsorbed or absorbed onto PM. It should be noted that at SEAD 17, 18 of 29 soil samples were found to have lead concentrations in excess of EP toxicity levels. Particulates should be monitored during high wind conditions for baseline PM and PM components for potential wind erosion emissions.

Response #104: See Response #18.

3.0 RECOMMENDATIONS

Comment #105: The WP and all appendices need to be revised to address all comments presented in this report. Specifically, due to the potential presence of UXOs and explosive compounds, a more specialized method of investigation into the presence or absence of UXOs and explosives needs to be proposed. This may include activities such as remote drilling or UXO clearance by specialized teams. Appendix A does mention, briefly, UXO clearance, however, this should also be discussed within the body of the WP, and proposed for all SWMUs which may potentially contain UXOS.

Response #105: Agreed. The Work Plan and Appendices have been revised in accordance with EPA comments. UXO location and clearance has been clarified.

Comment #106: Also, as very limited information is available regarding subsurface conditions at this site, a more extensive investigation into ground water quality needs to be proposed. It is recommended that a well installation sequencing procedure, similar to the one described in this report, be implemented.

Response #106: Agreed. See Response #31.

Comment #107: The FSAP and the HASP need to be revised and presented in a site specific format to improve their usefulness during field operations.

Response #107: Acknowledged. See Response #3.

Comment #108: The CDAP needs to be revised to clearly state that all appropriate guidance documents will be adhered to and that the level of analytical data validation will be sufficient to support potential "no further action" decisions.

Response #108: Agreed. The CDAP has been revised in accordance with the comments.

Comment #109: The Air Monitoring Program, also needs to be revised to provide greater detail in the areas particulate monitoring and monitoring durations as noted in the comments provided for Appendix F.

Response #109: Acknowledged. See Response #18.

General Comments:

Comment #1: The site specific information in Sections 4 and 5 should be consolidated into one section. We have noticed that information got lost between these sections and was not addressed in the detailed plan for the site. Summation of testing and sampling should be given at the end of such a section or given its own section. Also, presentation of data generated and report format should be done in separate sections as well.

Response #1: Disagree. Sections 4 and 5 will not be consolidated in this Work Plan. This comment will be incorporated into the next SWMU Work Plan.

Comment #2: Most site sketches do not show all the relevant information like ditches, contours, buildings, paved areas, wetlands, visual observations, etc. The text lacks descriptions of the site features, main features of the nearby buildings, their past and current activities, visual observations and topography. This information is needed to adequately devise a work plan.

Response #2: Acknowledged. Available maps and plans do not show this detailed information; therefore, the Work Plan proposes a topographic survey of the 10 SWMUs.

Comment #3: Designation of samples is confusing for soil samples. We recommend referring to soil from soil borings as SB#1.1, surface soils as SS#-1 and sediments as SD#-1.

Response #3: Agreed. This comment has been incorporated into the Work Plan.

Comment #4: The past disposal practices at most of these SWMUs is sketchy, and therefore, disposal of other unknown wastes cannot be ruled out. We recommend sampling for the full Target Compound List in the first round, after which subsequent rounds of sampling could be reduced to compounds found in the first round. We also recommend characteristic testing for ignitability for soils suspected to contain explosive waste.

Response #4: Agreed. The TCL and TAL constituents, plus other parameters, will be analyzed. Ignitability tests on explosive wastes will not be performed because the wastes could explode and injure laboratory personnel.

Comment #5. Appendix A; Field Sampling and Analysis Plan: Appendix A needs editing and a better review, since improper language and terminology are used. In addition, this plan is not accurately corresponding to the proposed plan for each site included in the main body of the work plan.

Response #5: Agreed. Appendix A was revised and edited to correspond to the format suggested by the ESI Guidance Manual. Table A-1 was added to the appendix to summarize the types of sampling that will occur at each SWMU.

Comment #6: Appendix D: Existing Analytical Data: The Existing Analytical Data is shown in Appendix D of the work plan. It is recommended that these results be incorporated within the text. The sample location plan and sample results should appear on the page immediately following the first reference to the sampling event. This comment should be incorporated throughout the report.

Response #6: Disagree. The existing analytical data will remain in Appendix D for this Work Plan. The existing analytical data for the next SWMU Work Plan will be incorporated into the text.

Sections 4 & 5 General Comments:

Comment #7: Soil Sample:

i) Sample 1 of the boring should be deeper, 0 to 12 inches seems more reliable. Also if more than one intermediate location qualifies for sampling (such as an oil stain at one depth and at another depth, an elevated PID reading) then samples from all such points should be collected.

ii) Soil section should be broken down into three subsections (1) subsurface soil which includes all borings, (ii) surface soil, which includes grab samples and (iii) test pit sampling. This is necessary to avoid any confusion.

Response #7: Agreed. The first sample will be obtained from 0 to 12 inches. Only one intermediate sample will be obtained during this ESI. The soil section was subdivided in accordance with the comment.

Comment #8: Section 5.2.X.2. Media To Be Investigated: The details of the well construction and development, EM and GPR surveys, soil, sediment, surface water and groundwater and soil gas sampling procedures are given in Appendix A but are not referenced in this section. Referencing the appropriate section of Appendix A in this section should be done so that the field investigation team knows exactly what to follow in the field. It is our experience, that because of the poor cross referencing, many times field crew fail to locate appropriate field procedures in the work plan and do not follow them.

Response #8: Acknowledged. Field procedures in Appendix A were referenced in the introduction to Section 5.2 of the Work Plan. The field procedures will be reviewed with the field personnel prior to the field work so they are familiar with the procedures.

Sections 4 & 5 Specific Comments:

SEAD 4:

Comment #9: Section 4.1.1: The area described as 1000 feet south of building 2084 needs to be shown on a map. It also needs to be included in the work plan and investigated.

Response #9: Agreed. This comment has been incorporated into the Work Plan.

Comment #10: Building 2079 - Boiler plant is described as being on figure 4-1 when it is not shown at all. This area also needs to be included in the investigation and addressed in the work plan.

Response #10: Agreed. The items in this comment have been incorporated into the Work Plan.

Comment #11: The scraped off area is described as being shown on figure 4-2 which it is not. Figure 4-2 is of SEAD 8.

Response #11: Agreed. "Figure 4-2" has been changed to "Figure 4A in Appendix D."

Comment #12: Section 5.2.1.2: The scraped off sediment area has not been fully tested for all constituents of concern. Additional soil samples need to be taken in this area and tested for TCL and explosives and breakdown compounds.

Response #12: Agreed. Soil samples from this area will be analyzed for TCL and TAL constituents, explosives, herbicides, and nitrates.

Comment #13: The last sentence on page 5-19 states that data gathered from sample analysis of soil borings will not be used for risk assessment because it is biased towards maximum concentrations. If this investigation is to be conducted under CERCLA guidance then all data collected can and will be used to characterize the nature and extent of contamination and the resulting risk to public health and the environment. This statement must be removed from the work plan.

Response #13: Agreed. The statement was removed.

Comment #14: (SOILS) - After developing a detailed site plan (comment No. 2) which should include details of the Munitions Washout Facility Foundation and Leachfield, it is suggested that the number of soil borings in these areas (SB4-2 and SB4-3) be re-evaluated. Two soil borings in these areas are insufficient.

Response #14: Agreed. The number of borings in this area was increased.

Comment #15: (GROUNDWATER) - It is going to take more than four wells to evaluate this area considering the number of areas of concern at this site, those addressed and those not addressed. In addition, what is the logic of placing SB4-5 and MW4-4 on the southwest side of the pond?

Response #15: Agreed. Six wells are now proposed. One is located upgradient to obtain background water quality data. Another is located in the washout facility foundation. The other 4 are each downgradient of an area potentially affected by the munitions washwater. MW4-4 was moved downgradient of the area where the pond sediment was deposited.

Comment #16: (SURFACE WATER/SEDIMENTS): (i) It is said that the ditch may be buried and it may be found using GPR/EM. This means the ditch may be deeper than 0 to 6 inches. This statement must be altered to say samples are to be taken 0-6 inches into the bed of the ditch; (ii) In the pond area, we would recommend taking one more sediment sample in the center of the pond at its deepest point.

Response #16: Agreed. Both comments have been incorporated into the Work Plan.

Comment #17: (GEOPHYSICS) - It is stated that electromagnetic (EM) and GPR survey will be performed to determine the leachfield location and location of subsurface and structures that serviced the leachfield. Appendix A, Field Sampling and Analysis Plan, includes hand held magnetometry procedures and GPR survey procedures. The purpose of hand held magnetometry is to detect unexploded Ordinances (UXOS) up to a maximum depth of 3 feet. We do not think the EM survey proposed for this SEAD refers to hand held magnetometry survey. If so, then details of EM survey should be included in Appendix A and referred in appropriate section of SEAD 4. Also show planned grid layout on a map.

Response #17: Agreed. UXO detection will be performed by a subcontractor using magnetometry prior to the geophysical surveys. The survey grids are shown on the map.

SEAD 8

It is our understanding that SEAD 8 shall be addressed as part of the ongoing RI/FS at the Ash Landfill site and therefore no comments are offered on this SEAD. Please remove this SEAD from the work plan.

Response: Agreed. This SEAD has been removed from the Work Plan.

SEAD 11

Comment #18: (SOILS) - No soil sampling is being proposed for this area. In order to characterize the types of waste material placed in this landfill, soil borings should be completed and soil samples should be collected. These samples are to be analyzed for full TCL, explosive compounds, by EPA method 8330 and total petroleum hydrocarbons (TPH). In addition, test pit soil samples should also be considered.

Response #18: Agreed. Borings and test pits will be performed in the landfill. A background boring will also be performed. Proposed analyses for these samples include TCL and TAL constituents, explosives, herbicides, nitrate, and TPH.

Comment #19: (GROUNDWATER) - Since we are dealing with unknowns, we recommend that well couplets be placed at each location. One well for groundwater table as described and the other for fractured bedrock. If bottom of fractured bedrock and water table are close, i.e., within 12 feet, then couplet could be replaced by a single well, screened from 3 feet above water table to top of competent bedrock (15 foot screen).

Response #19: Agreed. A single well will be installed at each location screened as described in the comment because bedrock is anticipated to be less than 12 feet deep.

Comment #20: (GEOPHYSICS) - See comment No. 17. If magnetometry survey is not referring to hand held magnetometry as detailed in Appendix A, then details of this magnetometry survey should be given. In addition, why is the GPR spacing different from magnetometry and please show planned grid layout on a map.

Response #20: Agreed. See Response #17. GPR surveys do not need to be performed on as small a grid as the EM-31 survey.

Comment #21: (SOIL GAS) - Please show planned grid on map with 30 locations and have option of geologist to change grid layout if required in the field. Changes may be effected after notifying NYSDEC of the change and reasons for the change, and receiving its concurrence.

Response #21: Agreed. This comment has been incorporated into the Work Plan.

<u>SEAD 13</u>

Comment #22: Section 5.2.4: When was the duck pond installed, where are the locations of the shower and hydrant. All details should be given on site sketches.

Response #22: Acknowledged. During the ESI, detailed topographic maps will be prepared showing the hydrant location and the above ground piping. The site conditions will be examined to establish the probable location of the showers and hydrant. Available information does not state when the duck pond was formed, this will be evaluated during the ESI.

Comment #23: (GEOPHYSICS) - Need to explain which EM is being used and what array. (See comment No. 17 also). Also, since we are investigating pits whose bottoms consisted of shale bedrock, it is very likely that the acid has dissolved the bedrock at the pit locations and even gouged out flow channels. Perhaps seismic should be considered. Also, need to show planned grid layout on map.

Response #23: Agreed. See Response #17. Seismic refraction will be used to evaluate the groundwater flow direction and whether the disposal of IRFNA created a hole or trough in the bedrock surface after the pits are located by EM-31 and GPR.

Comment #24: (SOILS) - Based on the area to be investigated (approximately 2 nos. x 300' x 400') one soil boring in each area is insufficient. More soil borings should be considered.

Response #24: Agreed. Two borings in both areas have been added to the Work Plan.

Comment #25: (GROUNDWATER) - The locations of the monitoring wells MW13-2 and MW13-3 should be re-evaluated. If the assumed groundwater flow direction is correct, then these wells should be moved closer to the pond but within the IRFNA disposal area.

Response #25: Agreed. These two wells have been located as recommended.

SEAD 16

Comment #26: What would be the constituents of the propellants mentioned in 4.5.1? Does the analytical program address these?

Response #26: Acknowledged. Propellants consist of compounds such as dinitrotoluene. SEAD will evaluate whether propellant residues are still present in the pipes and whether they can be safely handled before Parsons Main performs field work on site. If so, the residues will be sampled and analyzed.

Comment #27: The Abandoned Deactivation Furnace - Building S-311 should be surveyed and main features of this building should be shown on a plan. Wipe samples from appropriate locations, insulation samples for asbestos and tanks/sumps/condensate/pipe residue samples for appropriate parameters should be taken.

Response #27: Agreed. A detailed topographic map of the site will be prepared as proposed in the Work plan. Bulk samples of furnace scale, dirt on the floor, and pipe insulation in the building will be collected and analyzed.

Comment #28: (SOIL) - More surface soil samples need to be taken east and west of site (prevailing winds). Perhaps at 50 to 100 intervals away from site.

Response #28: Agreed. This comment has been incorporated into the Work Plan.

Comment #29: (GROUNDWATER) - Again, we recommend couplets for each well location currently marked on the sketch. If bottom of fractured bedrock and water table are close, i.e., within 12 feet, then couplets could be replaced by a single well, screened from 3 feet above water table to top of competent bedrock (15 foot screen).

Response #29: Agreed. See Response #19.

Comment #30: (GEOPHYSICS) - May want to do geophysics of well locations before well placement to avoid underground pipe lines.

Response #30: Agreed. Utility clearance will be performed if necessary.

SEAD 17: Building 367 Existing Deactivation Furnace

Comment #31: Section 5.2.6 indicates that explosives are most likely to have been completely destroyed in the furnace. There is a measure of uncertainty as to the completeness of the combustion process in this facility when it was operating. Therefore, all samples should be analyzed for full TCL.

Response #31: Agreed. All samples will be analyzed for TCL and TAL constituents, explosives, herbicides, and nitrates.

Comment #32: Preliminary studies at this facility included soil and wipe samples, and these media should be sampled as part of this investigation. This is especially of concern since previous soil samples have failed EP Toxicity for lead.

Response #32: Acknowledged. Soil samples will be obtained from around the building. No samples will be obtained from within the building because this is an active furnace.

Comment #33: Section 4.6.2 mentions 29 soil samples. Please show on a plan where these samples where taken, and at what depth.

Response #33: Agreed. This information has been incorporated into the Work Plan. See Figure 17A in Appendix D.

SEAD 24

Comment #34: (GEOPHYSICS) - Please specify what type of EM survey will be conducted. (See also comment No. 17.) Also show planned grid layout on a map.

Response #34: Agreed. See Response #17. Layout is shown on map.

Comment #35: (SOIL) - Surficial soil samples need to be taken around site location with emphasis on the easterly and westerly directions.

Response #35: Agreed. This comment has been incorporated into the Work Plan.

Comment #36: (GROUNDWATER) - Couplets should be installed at each well location so both groundwater table and fractured bedrock are monitored. If bottom of fractured bedrock and water table are close, i.e., within 12 feet, then couplets could be replaced by a single well, screened from 3 feet above water table to top of competent bedrock (15 foot screen).

Response #36: Agreed. See Response #19.

SEAD 25

Comment #37: (SOIL) - One soil boring within the pad may not adequately characterize the contaminants, and several more soil borings should be considered.

Response #37: Agreed. Four additional borings will be drilled on the pad.

Comment #38: (GROUNDWATER) - Since spent solvents have been used at this site, couplets are re-commended to intersect the "floaters and sinkers."

Response #38: Disagree. See Response #19.

Comment #39: Section 5.2.8.3, Analytical Program, should also include analysis for ketones for groundwater samples. In particular, methyl tertiary butyl ether (MTBE), which is an additive in unleaded gasoline and easily analyzed, must be included.

Response #39: Agreed. Four ketones are included in the TCL VOCs. MTBE analysis will be included as an extra compound.

SEAD 26

Comment #40: (SOIL) - More surficial and subsurface soil samples need to be taken on the site and around the site.

Response #40: Agreed. This comment has been incorporated into the Work Plan.

Comment #41: (GROUNDWATER) - Couplets should be installed at each well location so both groundwater table and fractured bedrock are monitored.

Response #41: Disagree. See Response #19.

Comment #42: Section 5.2.9.3, Analytical Program, should also include analysis for ketones for groundwater samples. In particular, methyl tertiary butyl ether (MTBE), which is an additive in unleaded gasoline, must be included.

Response #42: Agreed. See Response #39.

SEAD 45

Comment #43: Figure 5-10 shows 4 proposed wells not 3. Also, legend is inadequate in that surface water is not shown; test pit soil samples are misrepresented in designation and symbol.

Recommend that surface water and sediment samples from source locations have same numeric designation.

Response #43: Agreed. This comment has been incorporated into the Work Plan.

Comment #44: (GROUNDWATER) - Couplets should be installed at each well location so both groundwater table and fractured bedrock are monitored.

Response #44: Disagree. See Response #19.

Comment #45: Page 5-41 mentions soil samples in 1982. While page 4-17 mentions groundwater and references it in appendix, both sets of data should be given in Section 4 and map of locations given. Also, both sets should be mentioned on page 4-17 under Existing Analytical Data.

Response #45: Agreed. This comment has been incorporated into the Work Plan. A map showing the location of the soil samples collected in 1982 was not available.

Comment #46: We recommend taking surface soil samples east and west of site (prevailing wind).

Response #46: Agreed. This comment has been incorporated into the Work Plan.

SEAD 57

Comment #47: (GROUNDWATER) - Couplets should be installed at each well location so both groundwater table and fractured bedrock are monitored. If bottom of fractured bedrock and water table are close, i.e., within 12 feet, then couplets could be replaced by a single well, screened from 3 feet above water table to top of competent bedrock (15 foot screen).

Response #47: Agreed. See Response #19.

Comment #48: (SOIL) - We recommend taking surface soil samples east and west of site (prevailing wind).

Response #48: Agreed. This comment has been incorporated into the Work Plan.

Comment #49: Section 5.3.4. This refers to section 5. 2.4 which is SEAD 13's description What does this have to do with groundwater requirements.

Response #49: Agreed. Nothing; therefore, the sentence was deleted.

Appendix A. Field Sampling and Analysis Plan

Comment #50: Section 2.2: Take out the word "should" from all statements and replace it with "will." As stated, it implies that they don't have to do this, which is wrong.

Response #50: Agreed. This comment has been incorporated into the Work Plan.

Comment #51: Section 2-4: Does not address soil gas and standard surficial soil samples.

Response #51: Agreed. A numbering scheme for these samples was added.

Comment #52: Section 3.0: Does not address soil gas and standard surficial soil samples.

Response #52: Agreed. Section 3.0 now addresses these samples.

Comment #53: Section 3.2.2: List of what boring log will contain. Also, must contain location where samples are taken for analysis and any instrument readings such as an HNu.

Response #53: Acknowledged. A list of information recorded on a boring log,including instrument readings, is provided. Samples selected for analysis will be listed on the Chain-of-Custody form.

Comment #54: Section 3.2.3, first sentence: The term subsurface "Sediment" and "Sediment" samples is incorrect. You get "Soil" samples from test pits. Also at various other places incorrect designation is given, i.e., page 3-10, 7th paragraph, last sentence "remaining sediment". It should be "remaining soil".

Response #54: Agreed. These changes were made in the FSAP.

Comment #55: Section 3.2.4: No composite samples? Text mentions composite samples in several locations.

Response #55: Agreed. The text was changed to include composite samples.

Comment #56: 3.3.2, first sentence: Change "decontamination" to read "contamination".

Response #56: Agreed. This change was made.

Comment #57: Page 3-16, second paragraph, Line 5: Proper term is "overburden" not "Formation".

Response #57: Agreed. The term was changed.

Comment #58: Page 3-16, second paragraph, line 9: NYSDEC requires either stainless steel or PVC for Phase II investigations. For long-term monitoring, stainless steel is recommended.

Response #58: Agreed. The ESI Work Plan proposes wells made of PVC.

Comment #59: Section 3.3.3.4, page 3-16 and 3-20, paragraph 3: Should have a waiting period after placement of bentonite pellets to allow them to hydrate sufficiently per manufacturer's specifications. This will help prevent infiltration into sand pack when grout is placed.

Response #59: Agreed. This comment, with a waiting time of an hour, was included in the FSAP.

Comment #60: Section 3.4.5. Groundwater Sampling Procedures and Analysis, third paragraph, first sentence: It reads "After purging the well, the sampling team will change to new 304 stainless steel gloves for sample collection". We prefer 416 stainless steel gloves, but would settle for latex gloves.

Response #60: That's good! The only people we could find to make them specialize in reproducing medieval armor.

Comment #61: 3.4.3. Development Criteria, 3.4.5. Groundwater Sampling Procedures and Analysis and 4.2. Field Filtration: These sections of the Sampling Plan give an impression that the NYSDEC TAGM #HWR-88-4015 will be followed, but is not presented correctly. Portions of the TAGM which includes the reasons for issuance of the TAGM and intermediate steps in follow-up are missed in the presented Sampling Plan. Please refer to Section General Guidance for Alteration of Sample of the TAGM. It states "Non-alteration of groundwater samples collected for metals analysis shall be the standard operating procedure for the Division. It is never to be assumed or written into Phase II (Site Investigation) or Remedial Investigation Work Plans that alteration of samples is or will be allowed or expected." (emphasis added). It is clear that this work plan should have no reference to filtration. Only unfiltered groundwater samples should be collected. If, after redevelopment and repurging, the NTU measurement does not drop below 50 NTU, then C.T. Main should contact the NYSDEC Project Manager for review of the situation and for determining further course of action in accordance with NYSDEC TAGM 4015 on a case by case basis. It should not be assumed that filtration of sample will be allowed automatically if NTU measurements are above 50 NTUs.

The following changes must be made in the text of the Sampling Plan:

(i) Page 3-28, delete from "The groundwater samples will be prepared for metals to ... be filtered in this manner. " and add " If, after repurging and redevelopment of a well, the turbidity measurements remain above 50 NTU, then C.T. Main will immediately contact the Project Manager, NYSDEC, for review and determining further course of action.

(ii) Delete entire 4.2. Field Filtration section including figure A-11.

Response #61: Agreed. This comment was incorporated into the Work Plan.

Comment #62: Section 3.6.3. Soil Gas Sampling, items 6 and 7, page 3-39: What is the basis for purging the probes for 5 minutes? A more appropriate purge would be 3 to 5 probe volumes followed by sample collection. Samples are to be collected from all probes after a uniform purge volume, not immediately if the PID indicates an increase or after 5 minutes if the PID does not detect an increase. What is proposed in the Sampling Plan would in effect show low levels of soil vapor contamination and therefore is not acceptable.

Response #62: Acknowledged. The procedure states that a sample of soil gas will be collected at the time the highest OVM reading is observed. If there is no VOC concentration increase, then a sample will be obtained after 5 minutes of pumping. This procedure is based on information obtained at an EPA-sponsored course on soil gas sampling.

Comment #63: Health and Safety Plan: The NYSDEC acknowledges the receipt of this Health and Safety Plan. However, it should be understood that our review of this document is limited to ensuring the health and safety of our employees and does not extend beyond that.

The NYSDOH has the following concern and should be addressed appropriately.

- Section 11.2. Off-Site Emergencies: This section is to include a detailed community health and safety plan which encompasses contingencies for major vapor emissions from the site. What is contained within this plan is unacceptable.

Response #63: Agreed. Parsons Main will respond to on-site and off-site emergencies through SEAD emergency response personnel. This has been noted in Section 11.2 of the HASP.

LIST OF APPENDICES

Appendix A:	Aquatec's Quality Assurance Program Plan (QAPP)
Appendix B:	EPA Method 8330
Appendix C:	NYSDEC CLP Data Reporting Forms

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 10 SWMUs 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 10 SWMUs 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 418.1 for Total Recoverable Petroleum Hydrocarbons; NYSDOH Method 310-14 for Oil Fingerprint Indentification; and Method 8080 for PCBs in oil using the latest revision.

Nitrate and Method 340.2 for Fluoride.

4. EPA 600/M4-82-020 for Asbestos analysis.
5. "Methods for the Determination of Organic Compounds in Drinking Water," EPA 600\4-88-039: Method 524.2 for Volatile Organic Compounds
6. EPA Method 9040 for pH

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	8330	Table C-6
v. Herbicides	8150	8150	Table C-7
vi. Volatile Organics	524.2	524.2	Table C-8
C. Other Analytes			
i. Fluoride	340.2	340.2	5 mg/kg
ii. Nitrate	353.2	353.2	1 mg/kg
iii. Total Recoverable Petroleum Hydrocarbons	418.1	418.1	25 mg/kg

TABLE C-2 (Continued)
PARAMETER LIST FOR INORGANIC AND ORGANIC ANALYSES

			Preparation Method	Analytical Method	Reporting Limits (ug/L)
II.	Groundwater and Surface Water Analyses				
	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 Recoverable Petroleum Hydrocarbons	418.1	418.1	500
[illegible]	[illegible]				
	1.	Oil Fingerprint Identification	NYSDOH Method 310-14	NYSDOH Method 310-14	Not Applicable
	2.	PCBs	8080	8080	1 ug/kg[3]
	3.	Herbicides	8150	8150	Table C-7
IV.	Asbestos			PLM_2	

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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-7
METHOD 8150 QUANTITATION LIMITS FOR HERBICIDES

	Quantitation Limits	
Parameter	Water (ug/L)	Soil/Sediment (ug/g)
2,4-D	12.0	804.0
2,4-DB	9.1	609.7
2,4,5-T	2.0	134.0
2,4,5-TP/Silvex+der.	1.7	113.9
Dicamba (banvel)	2.7	180.9
Dalapon	58.0	3886.0
Dichlorprop	6.5	435.5
Dinoseb	0.7	46.9
MCPA	2490.0	166830.0
MCPP	1920.0	128640.0

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
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-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 Recoverable Petroluem Hydrocarbons	Method 418.1	20	20	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

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, Parsons Main 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. The analytical laboratory report submitted by the laboratory will be in the format specified in NYSDEC CLP analytical services protocol for Level IV analyses. Appendix C of the Chemical Data Aquisition contains the blank data reporting forms that specify the format of the analytical laboratory report. 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. Level III data requires a high degree of confidence in the compound identification and quantification. The frequency of QA/QC checks and standardization are often less stringent than for Level IV analysis. Level III reporting typically consists of some internal quality control results reported; these include reference standards, surrogate spike recoveries, and method blank results.

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.

APPENDIX C

NYSDEC CLP Data Reporting Forms

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: ____________________ Contract: __________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix: (soil/water) ______ Lab Sample ID: __________

Sample wt/vol: ______ (g/mL) ____ Lab File ID: __________

Level: (low/med) ______ Date Received: __________

% Moisture: not dec. ______ Date Analyzed: __________

GC Column: ________ ID: ______ (mm) Dilution Factor: __________

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ______	Q
74-87-3	Chloromethane		
74-83-9	Bromomethane		
75-01-4	Vinyl Chloride		
75-00-3	Chloroethane		
75-09-2	Methylene Chloride		
67-64-1	Acetone		
75-15-0	Carbon Disulfide		
75-35-4	1,1-Dichloroethene		
75-34-3	1,1-Dichloroethane		
540-59-0	1,2-Dichloroethene (total)		
67-66-3	Chloroform		
107-06-2	1,2-Dichloroethane		
78-93-3	2-Butanone		
71-55-6	1,1,1-Trichloroethane		
56-23-5	Carbon Tetrachloride		
75-27-4	Bromodichloromethane		
78-87-5	1,2-Dichloropropane		
10061-01-5	cis-1,3-Dichloropropene		
79-01-6	Trichloroethene		
124-48-1	Dibromochloromethane		
79-00-5	1,1,2-Trichloroethane		
71-43-2	Benzene		
10061-02-6	trans-1,3-Dichloropropene		
75-25-2	Bromoform		
108-10-1	4-Methyl-2-Pentanone		
591-78-6	2-Hexanone		
127-18-4	Tetrachloroethene		
79-34-5	1,1,2,2-Tetrachloroethane		
108-88-3	Toluene		
108-90-7	Chlorobenzene		
100-41-4	Ethylbenzene		
100-42-5	Styrene		
1330-20-7	Xylene (total)		

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

me: ____________ Contract: ____________

b Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

trix: (soil/water) ______ Lab Sample ID: ____________

mple wt/vol: ______ (g/mL) ______ Lab File ID: ____________

vel: (low/med) ______ Date Received: ____________

Moisture: ______ decanted: (Y/N) ___ Date Extracted: ____________

ncentrated Extract Volume: ______ (uL) Date Analyzed: ____________

jection Volume: ______ (uL) Dilution Factor: ____________

C Cleanup: (Y/N) ___ pH: ______

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ______	Q
108-95-2	Phenol		
111-44-4	bis(2-Chloroethyl)ether		
95-57-8	2-Chlorophenol		
541-73-1	1,3-Dichlorobenzene		
106-46-7	1,4-Dichlorobenzene		
95-50-1	1,2-Dichlorobenzene		
95-48-7	2-Methylphenol		
108-60-1	2,2'-oxybis(1-Chloropropane)		
106-44-5	4-Methylphenol		
621-64-7	N-Nitroso-di-n-propylamine		
67-72-1	Hexachloroethane		
98-95-3	Nitrobenzene		
78-59-1	Isophorone		
88-75-5	2-Nitrophenol		
105-67-9	2,4-Dimethylphenol		
111-91-1	bis(2-Chloroethoxy)methane		
120-83-2	2,4-Dichlorophenol		
120-82-1	1,2,4-Trichlorobenzene		
91-20-3	Naphthalene		
106-47-8	4-Chloroaniline		
87-68-3	Hexachlorobutadiene		
59-50-7	4-Chloro-3-methylphenol		
91-57-6	2-Methylnaphthalene		
77-47-4	Hexachlorocyclopentadiene		
88-06-2	2,4,6-Trichlorophenol		
95-95-4	2,4,5-Trichlorophenol		
91-58-7	2-Chloronaphthalene		
88-74-4	2-Nitroaniline		
131-11-3	Dimethylphthalate		
208-96-8	Acenaphthylene		
606-20-2	2,6-Dinitrotoluene		
99-09-2	3-Nitroaniline		
83-32-9	Acenaphthene		

1C

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Name: ____________ Contract: ____________

ab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

atrix: (soil/water)______ Lab Sample ID: ____________

ample wt/vol: ______(g/mL)____ Lab File ID: ____________

evel: (low/med) _____ Date Received: ____________

Moisture: ______ decanted: (Y/N)___ Date Extracted: ____________

oncentrated Extract Volume: ______(uL) Date Analyzed: ____________

njection Volume: _____(uL) Dilution Factor: ____________

PC Cleanup: (Y/N)___ pH:____

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)_______	Q
51-28-5	2,4-Dinitrophenol		
100-02-7	4-Nitrophenol		
132-64-9	Dibenzofuran		
121-14-2	2,4-Dinitrotoluene		
84-66-2	Diethylphthalate		
7005-72-3	4-Chlorophenyl-phenylether		
86-73-7	Fluorene		
100-01-6	4-Nitroaniline		
534-52-1	4,6-Dinitro-2-methylphenol		
86-30-6	N-Nitrosodiphenylamine (1)		
101-55-3	4-Bromophenyl-phenylether		
118-74-1	Hexachlorobenzene		
87-86-5	Pentachlorophenol		
85-01-8	Phenanthrene		
120-12-7	Anthracene		
86-74-8	Carbazole		
84-74-2	Di-n-butylphthalate		
206-44-0	Fluoranthene		
129-00-0	Pyrene		
85-68-7	Butylbenzylphthalate		
91-94-1	3,3'-Dichlorobenzidine		
56-55-3	Benzo(a)anthracene		
218-01-9	Chrysene		
117-81-7	bis(2-Ethylhexyl)phthalate		
117-84-0	Di-n-octylphthalate		
205-99-2	Benzo(b)fluoranthene		
207-08-9	Benzo(k)fluoranthene		
50-32-8	Benzo(a)pyrene		
193-39-5	Indeno(1,2,3-cd)pyrene		
53-70-3	Dibenz(a,h)anthracene		
191-24-2	Benzo(g,h,i)perylene		

(1) - Cannot be separated from Diphenylamine

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAM

ame: ____________________ Contract: __________

ode: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

x: (soil/water) ______ Lab Sample ID: ____________

e wt/vol: ______ (g/mL) ____ Lab File ID: ____________

isture: ______ decanted: (Y/N) ___ Date Received: __________

action: (SepF/Cont/Sonc) ______ Date Extracted: __________

entrated Extract Volume: ______ (uL) Date Analyzed: __________

ction Volume: ______ (uL) Dilution Factor: ________

Cleanup: (Y/N) ___ pH: ____ Sulfur Cleanup: (Y/N) ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ________	Q
319-84-6	alpha-BHC		
319-85-7	beta-BHC		
319-86-8	delta-BHC		
58-89-9	gamma-BHC (Lindane)		
76-44-8	Heptachlor		
309-00-2	Aldrin		
1024-57-3	Heptachlor epoxide		
959-98-8	Endosulfan I		
60-57-1	Dieldrin		
72-55-9	4,4'-DDE		
72-20-8	Endrin		
33213-65-9	Endosulfan II		
72-54-8	4,4'-DDD		
1031-07-8	Endosulfan sulfate		
50-29-3	4,4'-DDT		
72-43-5	Methoxychlor		
53494-70-5	Endrin ketone		
7421-36-3	Endrin aldehyde		
5103-71-9	alpha-Chlordane		
5103-74-2	gamma-Chlordane		
8001-35-2	Toxaphene		
12674-11-2	Aroclor-1016		
11104-28-2	Aroclor-1221		
1141-16-5	Aroclor-1232		
3469-21-9	Aroclor-1242		
2672-29-6	Aroclor-1248		
097-69-1	Aroclor-1254		
096-82-5	Aroclor-1260		

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Name:
Contract:

Lab Code:
Case No.:
SAS No.:
SDG No.:

Matrix: (soil/water)
Lab Sample ID:

Sample wt/vol: (g/mL)
Lab File ID:

Level: (low/med)
Date Received:

% Moisture: not dec.
Date Analyzed:

GC Column:
ID: (mm)
Dilution Factor:

Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

Number TICs found:

CONCENTRATION UNITS:
(ug/L or ug/Kg)

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

ab Name: ____________ Contract: ____________

ab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

atrix: (soil/water) ______ Lab Sample ID: ____________

ample wt/vol: ______ (g/mL) ______ Lab File ID: ____________

evel: (low/med) ______ Date Received: ____________

Moisture: ______ decanted: (Y/N) ______ Date Extracted: ____________

oncentrated Extract Volume: ______ (uL) Date Analyzed: ____________

njection Volume: ______ (uL) Dilution Factor: ____________

C Cleanup: (Y/N) ______ pH: ______

CONCENTRATION UNITS:

umber TICs found: ______ (ug/L or ug/Kg) ______

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

2A

WATER VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: ______________________ Contract: __________

Code: ______ Case No.: ______ SAS No.: _______ SDG No.: ________

	EPA SAMPLE NO.	SMC1 (TOL) #	SMC2 (BFB) #	SMC3 (DCE) #	OTHER	TOT OUT
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

		QC LIMITS
SMC1 (TOL)	= Toluene-d8	(88-110)
SMC2 (BFB)	= Bromofluorobenzene	(86-115)
SMC3 (DCE)	= 1,2-Dichloroethane-d4	(76-114)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D System Monitoring Compound diluted out

page __ of __

2B

SOIL VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

ab Name: ______________________ Contract: __________

ab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ________

evel:(low/med) _____

	EPA SAMPLE NO.	SMC1 (TOL) #	SMC2 (BFB) #	SMC3 (DCE) #	OTHER	TOT OUT
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

		QC LIMITS
SMC1 (TOL)	= Toluene-d8	(84-138)
SMC2 (BFB)	= Bromofluorobenzene	(59-113)
SMC3 (DCE)	= 1,2-Dichloroethane-d4	(70-121)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D System Monitoring Compound diluted out

2C

WATER SEMIVOLATILE SURROGATE RECOVERY

e: ____________________ Contract: ____________

ode: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	S7 (2CP) #	S8 (DCB) #	TOT OUT
01										
02										
03										
04										
05										
06										
07										
08										
09										
10										
11										
12										
13										
14										
15										
16										
17										
9										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										

		QC LIMITS	
S1 (NBZ)	= Nitrobenzene-d5	(35-114)	
S2 (FBP)	= 2-Fluorobiphenyl	(43-116)	
S3 (TPH)	= Terphenyl-d14	(33-141)	
S4 (PHL)	= Phenol-d5	(10-110)	
S5 (2FP)	= 2-Fluorophenol	(21-110)	
S6 (TBP)	= 2,4,6-Tribromophenol	(10-123)	
S7 (2CP)	= 2-Chlorophenol-d4	(33-110)	(advisory)
S8 (DCB)	= 1,2-Dichlorobenzene-d4	(16-110)	(advisory)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogate diluted out

page __ of __

2D
SOIL SEMIVOLATILE SURROGATE RECOVERY

Lab Name: ______________________________ Contract: _____________

b Code: _________ Case No.: ______ SAS No.: ________ SDG No.: ________

Level:(low/med) ______

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	S7 (2CP) #	S8 (DCB) #	TOT OUT
01										
02										
03										
04										
05										
06										
07										
08										
09										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										

	QC LIMITS	
S1 (NBZ) = Nitrobenzene-d5	(23-120)	
S2 (FBP) = 2-Fluorobiphenyl	(30-115)	
S3 (TPH) = Terphenyl-d14	(18-137)	
S4 (PHL) = Phenol-d5	(24-113)	
S5 (2FP) = 2-Fluorophenol	(25-121)	
S6 (TBP) = 2,4,6-Tribromophenol	(19-122)	
S7 (2CP) = 2-Chlorophenol-d4	(20-130)	(advisory)
S8 (DCB) = 1,2-Dichlorobenzene-d4	(20-130)	(advisory)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogate diluted out

page __ of __

2E
WATER PESTICIDE SURROGATE RECOVERY

Name: ______________________ Contract: __________

Lab Code: _____ Case No.: _____ SAS No.: ______ SDG No.: ______

GC Column(1): _________ ID: _____(mm) GC Column(2): _________ ID: _____(mm)

	EPA SAMPLE NO.	TCX 1 %REC #	TCX 2 %REC #	DCB 1 %REC #	DCB 2 %REC #	OTHER (1)	OTHER (2)	TOT OUT
01								
02								
03								
04								
05								
06								
07								
08								
09								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

		ADVISORY QC LIMITS
TCX	= Tetrachloro-m-xylene	(60-150)
DCB	= Decachlorobiphenyl	(60-150)

Column to be used to flag recovery values
* Values outside of QC limits
D Surrogate diluted out

page __ of __

2F
SOIL PESTICIDE SURROGATE RECOVERY

Name: ______________________ Contract: __________

Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Column(1): __________ ID: _____(mm) GC Column(2): __________ ID: _____(mm)

	EPA SAMPLE NO.	TCX 1 %REC #	TCX 2 %REC #	DCB 1 %REC #	DCB 2 %REC #	OTHER (1)	OTHER (2)	TOT OUT
01								
02								
03								
04								
05								
06								
07								
08								
09								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

		ADVISORY QC LIMITS
TCX	= Tetrachloro-m-xylene	(60-150)
DCB	= Decachlorobiphenyl	(60-150)

\# Column to be used to flag recovery values
* Values outside of QC limits
D Surrogate diluted out

age __ of __

3A

WATER VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Name: ____________________ Contract: __________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix Spike - EPA Sample No.: __________

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC. LIMITS REC.
1,1-Dichloroethene					61-145
Trichloroethene					71-120
Benzene					76-127
Toluene					76-125
Chlorobenzene					75-130

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene					14	61-145
Trichloroethene					14	71-120
Benzene					11	76-127
Toluene					13	76-125
Chlorobenzene					13	75-130

\# Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: ______ out of ______ outside limits

Spike Recovery: ______ out of ______ outside limits

COMMENTS: ______________________________

3B

SOIL VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Name: ______________________ Contract: __________

Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

rix Spike - EPA Sample No.: __________ Level:(low/med) _____

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC. LIMITS REC.
1,1-Dichloroethene					59-172
Trichloroethene					62-137
Benzene					66-142
Toluene					59-139
Chlorobenzene					60-133

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS	
					RPD	REC.
1,1-Dichloroethene					22	59-172
Trichloroethene					24	62-137
Benzene					21	66-142
Toluene					21	59-139
Chlorobenzene					21	60-133

Column to be used to flag recovery and RPD values with an asterisk

Values outside of QC limits

PD: ______ out of ______ outside limits
pike Recovery: ______ out of ______ outside limits

OMMENTS: ____
____

3C

WATER SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Name: ______________________ Contract: __________

Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

Matrix Spike - EPA Sample No.: __________

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC. LIMITS REC.
Phenol					12-110
2-Chlorophenol					27-123
1,4-Dichlorobenzene					36- 97
N-Nitroso-di-n-prop.(1)					41-116
1,2,4-Trichlorobenzene					39- 98
4-Chloro-3-methylphenol					23- 97
Acenaphthene					46-118
4-Nitrophenol					10- 80
2,4-Dinitrotoluene					24- 96
Pentachlorophenol					9-103
Pyrene					26-127

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
Phenol					42	12-110
2-Chlorophenol					40	27-123
1,4-Dichlorobenzene					28	36- 97
N-Nitroso-di-n-prop.(1)					38	41-116
1,2,4-Trichlorobenzene					28	39- 98
4-Chloro-3-methylphenol					42	23- 97
Acenaphthene					31	46-118
4-Nitrophenol					50	10- 80
2,4-Dinitrotoluene					38	24- 96
Pentachlorophenol					50	9-103
Pyrene					31	26-127

(1) N-Nitroso-di-n-propylamine

\# Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: _____ out of _____ outside limits

Spike Recovery: _____ out of _____ outside limits

MMENTS: ____

3D

SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

ab Name: ______________________ Contract: __________

ab Code: _____ Case No.: _____ SAS No.: ______ SDG No.: ______

atrix Spike - EPA Sample No.: __________ Level:(low/med) _____

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC. LIMITS REC.
Phenol					26- 90
2-Chlorophenol					25-102
1,4-Dichlorobenzene					28-104
N-Nitroso-di-n-prop.(1)					41-126
1,2,4-Trichlorobenzene					38-107
4-Chloro-3-methylphenol					26-103
Acenaphthene					31-137
4-Nitrophenol					11-114
2,4-Dinitrotoluene					28- 89
Pentachlorophenol					17-109
Pyrene					35-142

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Phenol					35	26- 90
2-Chlorophenol					50	25-102
1,4-Dichlorobenzene					27	28-104
N-Nitroso-di-n-prop.(1)					38	41-126
1,2,4-Trichlorobenzene					23	38-107
4-Chloro-3-methylphenol					33	26-103
Acenaphthene					19	31-137
4-Nitrophenol					50	11-114
2,4-Dinitrotoluene					47	28- 89
Pentachlorophenol					47	17-109
Pyrene					36	35-142

(1) N-Nitroso-di-n-propylamine

\# Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: ______ out of ______ outside limits

Spike Recovery: ______ out of ______ outside limits

COMMENTS: ____

3E
WATER PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

ab Name: ______________________ Contract: __________

ab Code: _______ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix Spike - EPA Sample No.: __________

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC. LIMITS REC.
gamma-BHC (Lindane)					56-123
Heptachlor					40-131
Aldrin					40-120
Dieldrin					52-126
Endrin					56-121
4,4'-DDT					38-127

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
gamma-BHC (Lindane)					15	56-123
Heptachlor					20	40-131
Aldrin					22	40-120
Dieldrin					18	52-126
Endrin					21	56-121
4,4'-DDT					27	38-127

\# Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: ______ out of ______ outside limits
Spike Recovery: ______ out of ______ outside limits

COMMENTS: ____
____

3F

SOIL PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

ab Name:____________________ Contract:__________

ab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

atrix Spike - EPA Sample No.: __________

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC. LIMITS REC.
gamma-BHC (Lindane)					46-127
Heptachlor					35-130
Aldrin					34-132
Dieldrin					31-134
Endrin					42-139
4,4'-DDT					23-134

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
gamma-BHC (Lindane)					50	46-127
Heptachlor					31	35-130
Aldrin					43	34-132
Dieldrin					38	31-134
Endrin					45	42-139
4,4'-DDT					50	23-134

\# Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD:______ out of ______ outside limits
Spike Recovery:______ out of ______ outside limits

COMMENTS: ____

4A
VOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

Lab Name: ______________________ Contract: ____________

Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Lab File ID: ____________ Lab Sample ID: ____________

Date Analyzed: __________ Time Analyzed: __________

GC Column: ________ ID: _____(mm) Heated Purge: (Y/N) ___

Instrument ID: __________

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

COMMENTS:

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4B

SEMIVOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO. ____________

Lab Name: ____________ Contract: ____________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Lab File ID: ____________ Lab Sample ID: ____________

Instrument ID: ____________ Date Extracted: ____________

Matrix: (soil/water) ______ Date Analyzed: ____________

Level:(low/med) ______ Time Analyzed: ____________

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

COMMENTS:

____

____

ge __ of __

FORM IV SV 3/90

4C

PESTICIDE METHOD BLANK SUMMARY

b Name: ____________ Contract: ____________

b Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

b Sample ID: ____________ Lab File ID: ____________

trix:(soil/water) ______ Extraction:(SepF/Cont/Sonc) ______

lfur Cleanup: (Y/N) __ Date Extracted: ____________

te Analyzed (1): ____________ Date Analyzed (2): ____________

me Analyzed (1): ____________ Time Analyzed (2): ____________

strument ID (1): ____________ Instrument ID (2): ____________

C Column (1): ____________ ID: ______(mm) GC Column (2): ____________ ID: ______(mm)

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED 1	DATE ANALYZED 2
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

COMMENTS: ________________________________

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5A

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: ______________________ Contract: ____________

b Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

Lab File ID: ______________ BFB Injection Date: ___________

Instrument ID: ____________ BFB Injection Time: ___________

GC Column: _________ ID: ______(mm) Heated Purge: (Y/N) ___

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	8.0 - 40.0% of mass 95	
75	30.0 - 66.0% of mass 95	
95	Base peak, 100% relative abundance	
96	5.0 - 9.0% of mass 95	
173	Less than 2.0% of mass 174	( )1
174	50.0 - 120.0% of mass 95	
175	4.0 - 9.0 % of mass 174	( )1
176	93.0 - 101.0% of mass 174	( )1
177	5.0 - 9.0% of mass 176	( )2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

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5B

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Name: ______________________ Contract: __________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Lab File ID: ____________ DFTPP Injection Date: __________

Instrument ID: __________ DFTPP Injection Time: __________

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 80.0% of mass 198	
68	Less than 2.0% of mass 69	( )1
69	Mass 69 relative abundance	
70	Less than 2.0% of mass 69	( )1
127	25.0 - 75.0% of mass 198	
197	Less than 1.0% of mass 198	
198	Base Peak, 100% relative abundance	
199	5.0 to 9.0% of mass 198	
275	10.0 - 30.0% of mass 198	
365	Greater than 0.75% of mass 198	
441	Present, but less than mass 443	
442	40.0 - 110.0% of mass 198	
443	15.0 - 24.0% of mass 442	( )2

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

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VOLATILE ORGANICS INITIAL CALIBRATION DATA

ab Name: ____________ Contract: ________

ab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

nstrument ID: ________ Calibration Date(s): ________ ________

eated Purge: (Y/N) ___ Calibration Times: ________ ________

C Column: ________ ID: ______(mm)

LAB FILE ID: RRF10 = ________ RRF20 = ________

RRF50 = ________ RRF100= ________ RRF200= ________

COMPOUND	RRF10	RRF20	RRF50	RRF100	RRF200	$\overline{RRF}$	% RSD
Chloromethane							
Bromomethane *							
Vinyl Chloride *							
Chloroethane							
Methylene Chloride							
Acetone							
Carbon Disulfide							
1,1-Dichloroethene *							
1,1-Dichloroethane *							
1,2-Dichloroethene (total)							
Chloroform *							
1,2-Dichloroethane *							
2-Butanone							
1,1,1-Trichloroethane *							
Carbon Tetrachloride *							
Bromodichloromethane *							
1,2-Dichloropropane							
cis-1,3-Dichloropropene *							
Trichloroethene *							
Dibromochloromethane *							
1,1,2-Trichloroethane *							
Benzene *							
trans-1,3-Dichloropropene *							
Bromoform *							
4-Methyl-2-Pentanone							
2-Hexanone							
Tetrachloroethene *							
1,1,2,2-Tetrachloroethane *							
Toluene *							
Chlorobenzene *							
Ethylbenzene *							
Styrene *							
Xylene (total) *							
Toluene-d8							
Bromofluorobenzene *							
1,2-Dichloroethane-d4							

* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: ______________ Contract: ______________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Instrument ID: ______ Calibration Date(s): ______ ______

Calibration Times: ______ ______

LAB FILE ID: RRF20 = ______ RRF50 = ______

RRF80 = ______ RRF120= ______ RRF160= ______

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD	
Phenol *								*
bis(2-Chloroethyl)ether *								*
2-Chlorophenol *								*
1,3-Dichlorobenzene *								*
1,4-Dichlorobenzene *								*
1,2-Dichlorobenzene *								*
2-Methylphenol *								*
2,2'-oxybis(1-Chloropropane)								
4-Methylphenol *								*
N-Nitroso-di-n-propylamine *								*
Hexachloroethane *								*
Nitrobenzene *								*
ophorone *								*
Nitrophenol *								*
2,4-Dimethylphenol *								*
bis(2-Chloroethoxy)methane *								*
2,4-Dichlorophenol *								*
1,2,4-Trichlorobenzene *								*
Naphthalene *								*
4-Chloroaniline								
Hexachlorobutadiene								
4-Chloro-3-methylphenol *								*
2-Methylnaphthalene *								*
Hexachlorocyclopentadiene								
2,4,6-Trichlorophenol *								*
2,4,5-Trichlorophenol *								*
2-Chloronaphthalene *								*
2-Nitroaniline								
Dimethylphthalate								
Acenaphthylene *								*
2,6-Dinitrotoluene *								*
3-Nitroaniline								
Acenaphthene *								*
2,4-Dinitrophenol								
4-Nitrophenol								
Dibenzofuran *								*
2.4-Dinitrotoluene *								*

* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

ab Name: ______________________ Contract: __________

ab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

nstrument ID: __________ Calibration Date(s): __________ __________

Calibration Times: __________ __________

LAB FILE ID: RRF20 = ______________ RRF50 = ______________

RRF80 = ______________ RRF120= ______________ RRF160= ______________

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD	
Diethylphthalate								
4-Chlorophenyl-phenylether *								*
Fluorene *								*
4-Nitroaniline								
4,6-Dinitro-2-methylphenol								
N-Nitrosodiphenylamine (1)								
4-Bromophenyl-phenylether *								*
Hexachlorobenzene *								*
Pentachlorophenol *								*
Phenanthrene *								*
Anthracene *								*
Carbazole								
Di-n-butylphthalate								
Fluoranthene *								
Pyrene *								
Butylbenzylphthalate								
3,3'-Dichlorobenzidine								
Benzo(a)anthracene *								*
Chrysene *								*
bis(2-Ethylhexyl)phthalate								
Di-n-octylphthalate								
Benzo(b)fluoranthene *								*
Benzo(k)fluoranthene *								*
Benzo(a)pyrene *								*
Indeno(1,2,3-cd)pyrene *								*
Dibenz(a,h)anthracene *								*
Benzo(g,h,i)perylene *								*
Nitrobenzene-d5								*
2-Fluorobiphenyl *								*
Terphenyl-d14 *								*
Phenol-d5 *								*
2-Fluorophenol *								*
2,4,6-Tribromophenol								
2-Chlorophenol-d4 *								*
1,2-Dichlorobenzene-d4 *								*

(1) Cannot be separated from Diphenylamine

* Compounds with required minimum RRF and maximum %RSD values. All other compounds must meet a minimum RRF of 0.010.

6D

PESTICIDE INITIAL CALIBRATION OF SINGLE COMPONENT ANALYTES

Name: ______________ Contract: __________

ode: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

strument ID: __________ Level (x low): low ____ mid ____ high ____

Column: __________ ID: ______(mm) Date(s) Analyzed: ________ ________

COMPOUND	RT OF STANDARDS LOW	MID	HIGH	MEAN RT	RT WINDOW FROM	TO
alpha-BHC						
beta-BHC						
delta-BHC						
gamma-BHC (Lindane)						
Heptachlor						
Aldrin						
Heptachlor epoxide						
Endosulfan I						
Dieldrin						
4,4'-DDE						
Endrin						
Endosulfan II						
4,4'-DDD						
Endosulfan sulfate						
4,4'-DDT						
Methoxychlor						
Endrin ketone						
Endrin aldehyde						
alpha-Chlordane						
gamma-Chlordane						
Tetrachloro-m-xylene						
Decachlorobiphenyl						

* Surrogate retention times are measured from Standard Mix A analyses.

Retention time windows are ± 0.05 minutes for all compounds that elute before Heptachlor epoxide, ±0.07 minutes for all other compounds, except ±0.10 minutes for Decachlorobiphenyl.

PESTICIDE INITIAL CALIBRATION OF SINGLE COMPONENT ANALYTES

Name: ______________________ Contract: __________

Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

strument ID: ________ Level (x low): low _____ mid _____ high _____

Column: ________ ID: _____(mm) Date(s) Analyzed: ________ ________

COMPOUND	CALIBRATION FACTORS				%RSD
	LOW	MID	HIGH	MEAN	
alpha-BHC					
beta-BHC					
delta-BHC					
gamma-BHC (Lindane)					
Heptachlor					
Aldrin					
Heptachlor epoxide					
Endosulfan I					
Dieldrin					
4,4'-DDE					
Endrin					
Endosulfan II					
4,4'-DDD					
Endosulfan sulfate					
4,4'-DDT					
Methoxychlor					
Endrin ketone					
Endrin aldehyde					
alpha-Chlordane					
gamma-Chlordane					
Tetrachloro-m-xylene					
Decachlorobiphenyl					

Surrogate calibration factors are measured from Standard Mix A analyses.

SD must be less than or equal 20.0 % for all compounds except the
rrogates, where %RSD must be less than or equal to 30.0%. Up to
o target compounds, but not surrogates, may have %RSD greater than
.0% but less than or equal to 30.0%.

PESTICIDE INITIAL CALIBRATION OF MULTICOMPONENT ANALYTES

Name: ______________________ Contract: __________

e: _____ Case No.: _____ SAS No.: ______ SDG No.: ______

rument ID: _________ Date(s) Analyzed: _______ _______

lumn: _________ ID: _____(mm)

COMPOUND	AMOUNT (ng)	PEAK	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR
Toxaphene		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1016		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1221		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1232		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1242		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1248		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1254		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1260		*1				
		*2				
		*3				
		4				
		5				

* Denotes required peaks

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

GC Column (1): __________ ID: _____ (mm) Instrument ID (1): ________

EPA Sample No. (Standard 1): __________ Lab Sample ID (1): ___________

Date Analyzed (1): ___________ Time Analyzed (1): ________

	ANALYTE	RT	RESOLUTION (%)
01			
02			
03			
04			
05			
06			
07			
08			
09			

GC Column (2): __________ ID: _____ (mm) Instrument ID (2): ________

EPA Sample No. (Standard 2): __________ Lab Sample ID (2): ___________

Date Analyzed (2): ___________ Time Analyzed (2): ________

	ANALYTE	RT	RESOLUTION (%)
01			
02			
03			
04			
05			
06			
07			
08			
09			

Resolution of two adjacent peaks must be calculated as a percentage of the height of the smaller peak, and must be greater than or equal to 60.0%.

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: ______________________ Contract: __________

b Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Instrument ID: __________ Calibration Date: __________ Time: __________

Lab File ID: __________ Init. Calib. Date(s): __________ __________

Heated Purge: (Y/N) ___ Init. Calib. Times: __________ __________

GC Column: __________ ID: ______(mm)

COMPOUND	$\overline{RRF}$	RRF50	MIN RRF	%D	MAX %D
Chloromethane					
Bromomethane			0.100		25.0
Vinyl Chloride			0.100		25.0
Chloroethane					
Methylene Chloride					
Acetone					
Carbon Disulfide					
1,1-Dichloroethene			0.100		25.0
1,1-Dichloroethane			0.200		25.0
1,2-Dichloroethene (total)					
Chloroform			0.200		25.0
1,2-Dichloroethane			0.100		25.0
2-Butanone					
1,1,1-Trichloroethane			0.100		25.0
Carbon Tetrachloride			0.100		25.0
Bromodichloromethane			0.200		25.0
1,2-Dichloropropane					
cis-1,3-Dichloropropene			0.200		25.0
Trichloroethene			0.300		25.0
Dibromochloromethane			0.100		25.0
1,1,2-Trichloroethane			0.100		25.0
Benzene			0.500		25.0
trans-1,3-Dichloropropene			0.100		25.0
Bromoform			0.100		25.0
4-Methyl-2-Pentanone					
2-Hexanone					
Tetrachloroethene			0.200		25.0
1,1,2,2-Tetrachloroethane			0.500		25.0
Toluene			0.400		25.0
Chlorobenzene			0.500		25.0
Ethylbenzene			0.100		25.0
Styrene			0.300		25.0
Xylene (total)			0.300		25.0
Toluene-d8					
Bromofluorobenzene			0.200		25.0
1,2-Dichloroethane-d4					

All other compounds must meet a minimum RRF of 0.010.

SEMIVOLATILE CONTINUING CALIBRATION CHECK

ame: ______________________ Contract: __________

ode: ________ Case No.: ______ SAS No.: ________ SDG No.: ________

ument ID: __________ Calibration Date: __________ Time: __________

File ID: ____________ Init. Calib. Date(s): __________ __________

Init. Calib. Times: __________ __________

COMPOUND	$\overline{RRF}$	RRF50	MIN RRF	%D	MAX %D
Phenol			0.800		25.0
bis(2-Chloroethyl)ether			0.700		25.0
2-Chlorophenol			0.800		25.0
1,3-Dichlorobenzene			0.600		25.0
1,4-Dichlorobenzene			0.500		25.0
1,2-Dichlorobenzene			0.400		25.0
2-Methylphenol			0.700		25.0
2,2'-oxybis(1-Chloropropane)					
4-Methylphenol			0.600		25.0
N-Nitroso-di-n-propylamine			0.500		25.0
Hexachloroethane			0.300		25.0
Nitrobenzene			0.200		25.0
Isophorone			0.400		25.0
2-Nitrophenol			0.100		25.0
2,4-Dimethylphenol			0.200		25.0
bis(2-Chloroethoxy)methane			0.300		25.0
2,4-Dichlorophenol			0.200		25.0
1,2,4-Trichlorobenzene			0.200		25.0
Naphthalene			0.700		25.0
4-Chloroaniline					
Hexachlorobutadiene					
4-Chloro-3-methylphenol			0.200		25.0
2-Methylnaphthalene			0.400		25.0
Hexachlorocyclopentadiene					
2,4,6-Trichlorophenol			0.200		25.0
2,4,5-Trichlorophenol			0.200		25.0
2-Chloronaphthalene			0.800		25.0
2-Nitroaniline					
Dimethylphthalate					
Acenaphthylene			1.300		25.0
2,6-Dinitrotoluene			0.200		25.0
3-Nitroaniline					
Acenaphthene			0.800		25.0
2,4-Dinitrophenol					
4-Nitrophenol					
Dibenzofuran			0.800		25.0
2,4-Dinitrotoluene			0.200		25.0

All other compounds must meet a minimum RRF of 0.010.

7C

SEMIVOLATILE CONTINUING CALIBRATION CHECK

b Name: ______________ Contract: __________

de: ________ Case No.: ______ SAS No.: ________ SDG No.: ________

strument ID: __________ Calibration Date: __________ Time: __________

b File ID: __________ Init. Calib. Date(s): __________ __________

Init. Calib. Times: __________ __________

COMPOUND	$\overline{RRF}$	RRF50	MIN RRF	%D	MAX %D
Diethylphthalate					
4-Chlorophenyl-phenylether			0.400		25.0
Fluorene			0.900		25.0
4-Nitroaniline					
4,6-Dinitro-2-methylphenol					
N-Nitrosodiphenylamine (1)					
4-Bromophenyl-phenylether			0.100		25.0
Hexachlorobenzene			0.100		25.0
Pentachlorophenol			0.050		25.0
Phenanthrene			0.700		25.0
Anthracene			0.700		25.0
Carbazole					
Di-n-butylphthalate					
Fluoranthene			0.600		25.0
Pyrene			0.600		25.0
Butylbenzylphthalate					
3,3'-Dichlorobenzidine					
Benzo(a)anthracene			0.800		25.0
Chrysene			0.700		25.0
bis(2-Ethylhexyl)phthalate					
Di-n-octylphthalate					
Benzo(b)fluoranthene			0.700		25.0
Benzo(k)fluoranthene			0.700		25.0
Benzo(a)pyrene			0.700		25.0
Indeno(1,2,3-cd)pyrene			0.500		25.0
Dibenz(a,h)anthracene			0.400		25.0
Benzo(g,h,i)perylene			0.500		25.0
Nitrobenzene-d5			0.200		25.0
2-Fluorobiphenyl			0.700		25.0
Terphenyl-d14			0.500		25.0
Phenol-d5			0.800		25.0
2-Fluorophenol			0.600		25.0
2,4,6-Tribromophenol					
2-Chlorophenol-d4			0.800		25.0
1,2-Dichlorobenzene-d4			0.400		25.0

(1) Cannot be separated from Diphenylamine
All other compounds must meet a minimum RRF of 0.010.

PESTICIDE CALIBRATION VERIFICATION SUMMARY

Lab Name: ______________________ Contract: __________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

GC Column: ________ ID: _____ (mm) Init. Calib. Date(s): ________ ________

EPA Sample No.(PIBLK): __________ Date Analyzed : __________

Lab Sample ID (PIBLK): __________ Time Analyzed : __________

EPA Sample No.(PEM): __________ Date Analyzed : __________

Lab Sample ID (PEM): __________ Time Analyzed : __________

PEM COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	RPD
alpha-BHC						
beta-BHC						
gamma-BHC (Lindane)						
Endrin						
4,4'-DDT						
Methoxychlor						

4,4'-DDT % breakdown (1): ________ Endrin % breakdown (1): ________

Combined % breakdown (1): ________

QC LIMITS:

RPD of amounts in PEM must be less than or equal to 25.0%

4,4'-DDT breakdown must be less than or equal to 20.0%

Endrin breakdown must be less than or equal to 20.0%

Combined breakdown must be less than or equal to 30.0%

PESTICIDE CALIBRATION VERIFICATION SUMMARY

ab Name: ______________ Contract: ______________

Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

C Column: ______ ID: ______ (mm) Init. Calib. Date(s): ______ ______

PA Sample No. (PIBLK): ______ Date Analyzed : ______

ab Sample ID (PIBLK): ______ Time Analyzed : ______

EPA Sample No. (INDA): ______ Date Analyzed : ______

Lab Sample ID (INDA): ______ Time Analyzed : ______

INDIVIDUAL MIX A COMPOUND	RT	RT WINDOW FROM	TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	RPD
alpha-BHC						
gamma-BHC (Lindane)						
Heptachlor						
Endosulfan I						
Dieldrin						
Endrin						
4,4'-DDD						
4,4'-DDT						
ethoxychlor						
etrachloro-m-xylene						
Decachlorobiphenyl						

EPA Sample No. (INDB): ______ Date Analyzed : ______

Lab Sample ID (INDB): ______ Time Analyzed : ______

INDIVIDUAL MIX B COMPOUND	RT	RT WINDOW FROM	TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	RPD
beta-BHC						
delta-BHC						
Aldrin						
Heptachlor epoxide						
4,4'-DDE						
Endosulfan II						
Endosulfan sulfate						
Endrin ketone						
Endrin aldehyde						
alpha-Chlordane						
gamma-Chlordane						
Tetrachloro-m-xylene						
Decachlorobiphenyl						

QC LIMITS: RPD of amounts in the Individual Mixes must be less than or equal to 25.0%.

8A
VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: ______________ Contract: ______

b Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID (Standard): __________ Date Analyzed: __________

Instrument ID: ______ Time Analyzed: __________

GC Column: _____ ID: _____(mm) Heated Purge: (Y/N) ___

		IS1(BCM) AREA #	RT #	IS2(DFB) AREA #	RT #	IS3(CBZ) AREA #	RT #
	12 HOUR STD						
	UPPER LIMIT						
	LOWER LIMIT						
	EPA SAMPLE NO.						
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS1 (BCM) = Bromochloromethane
IS2 (DFB) = 1,4-Difluorobenzene
IS3 (CBZ) = Chlorobenzene-d5

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag values outside QC limits with an asterisk.
* Values outside of QC limits.

page __ of __

SEMIVOLATILE INTERNAL

Lab Name: ______________________ Contract: __________

Code: _______ Case No.: _____ SAS No.: ______ SDG No.: ______

Lab File ID (Standard): _____________ Date Analyzed: __________

Instrument ID: __________ Time Analyzed: __________

		IS1(DCB) AREA #	RT #	IS2(NPT) AREA #	RT #	IS3(ANT) AREA #	RT #
	12 HOUR STD						
	UPPER LIMIT						
	LOWER LIMIT						
	EPA SAMPLE NO.						
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d10

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag internal standard area values with an asterisk.
* Values outside of QC limits.

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SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: ______________________ Contract: __________

Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Lab File ID (Standard): ______________ Date Analyzed: __________

Instrument ID: __________ Time Analyzed: __________

		IS4(PHN) AREA #	RT #	IS5(CRY) AREA #	RT #	IS6(PRY) AREA #	RT #
	12 HOUR STD						
	UPPER LIMIT						
	LOWER LIMIT						
	EPA SAMPLE NO.						
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag internal standard area values with an asterisk.
* Values outside of QC limits.

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PESTICIDE ANALYTICAL SEQUENCE

Name: ______________________ Contract: __________

Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

umn: __________ ID: _____(mm) Init. Calib. Date(s): ________ ________

trument ID: __________

HE ANALYTICAL SEQUENCE OF PERFORMANCE EVALUATION MIXTURES, BLANKS, SAMPLES, AND STANDARDS IS GIVEN BELOW:

MEAN SURROGATE RT FROM INITIAL CALIBRATION
TCX: ______ DCB: ______

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	TCX RT #	DCB RT #
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						

QC LIMITS

TCX = Tetrachloro-m-xylene (± 0.05 MINUTES)
DCB = Decachlorobiphenyl (± 0.10 MINUTES)

Column used to flag retention time values with an asterisk.
* Values outside of QC limits.

9A

PESTICIDE FLORISIL CARTRIDGE CHECK

b Name: ____________________ Contract: ____________

b Code: ________ Case No.: ______ SAS No.: ________ SDG No.: ________

orisil Cartridge Lot Number: __________ Date of Analysis: ______________

Column(1): ____________ ID: _____(mm) GC Column(2): ____________ ID: _____(mm)

COMPOUND	SPIKE ADDED (ng)	SPIKE RECOVERED (ng)	% REC #	QC LIMITS
alpha-BHC				80-120
gamma-BHC (Lindane)				80-120
Heptachlor				80-120
Endosulfan I				80-120
Dieldrin				80-120
Endrin				80-120
4,4'-DDD				80-120
4,4'-DDT				80-120
Methoxychlor				80-120
Tetrachloro-m-xylene				80-120
Decachlorobiphenyl				80-120

\# Column to be used to flag recovery with an asterisk.
* Values outside of QC limits.

IS CARTRIDGE LOT APPLIES TO THE FOLLOWING SAMPLES, BLANKS, MS, AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED 1	DATE ANALYZED 2
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				

age _ of __

PESTICIDE GPC CALIBRATION

ab Name: ______________________ Contract: __________

Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

PC Column: __________ Calibration Date: ________

C Column(1): __________ ID: _____(mm) GC Column(2): __________ ID: _____(mm)

COMPOUND	SPIKE ADDED (ng)	SPIKE RECOVERED (ng)	% REC #	QC. LIMITS REC.
gamma-BHC (Lindane)				80-110
Heptachlor				80-110
Aldrin				80-110
Dieldrin				80-110
Endrin				80-110
4,4'-DDT				80-110

\# Column to be used to flag recovery values with an asterisk

* Values outside of QC limits

THIS GPC CALIBRATION APPLIES TO THE FOLLOWING SAMPLES, BLANKS, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED 1	DATE ANALYZED 2
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

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10A

PESTICIDE IDENTIFICATION SUMMARY
FOR SINGLE COMPONENT ANALYTES

ab Name: ______________ Contract: ______________

Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

ab Sample ID : ______________ Date(s) Analyzed: ______ ______

nstrument ID (1): ______________ Instrument ID (2): ______________

C Column(1): ______ ID: ______(mm) GC Column(2): ______ ID: ______(mm)

ANALYTE	COL	RT	RT WINDOW FROM	TO	CONCENTRATION	%D
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					

page __ of __

PESTICIDE IDENTI
FOR MULTICOMPONENT ANALYTES

ab Name: ____________ Contract: ____________ ____________

ab Code: ________ Case No.: ________ SAS No.: ________ SDG No.: ________

ab Sample ID : ____________ Date(s) Analyzed: ________ ________

nstrument ID (1): ____________ Instrument ID (2): ____________

C Column(1): ____________ ID: ______(mm) GC Column(2): ____________ ID: ______(mm)

ANALYTE	PEAK	RT	RT WINDOW FROM	TO	CONCENTRATION	MEAN CONCENTRATION	%D
____________ COLUMN 1	1						
	2						
	3						
	4						
	5						
COLUMN 2	1						
	2						
	3						
	4						
	5						
____________ COLUMN 1	1						
	2						
	3						
	4						
	5						
COLUMN 2	1						
	2						
	3						
	4						
	5						
____________ COLUMN 1	1						
	2						
	3						
	4						
	5						
COLUMN 2	1						
	2						
	3						
	4						
	5						

At least 3 peaks are required for identification of multicomponent analytes

p. ,e __ of __

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COVER PAGE - INORGANIC ANALYSES DATA PACKAGE

Name: ____________________ Contract: __________

ab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

W No.: _____

EPA Sample No.	Lab Sample ID.

re ICP interelement corrections applied? Yes/No ___

re ICP background corrections applied? Yes/No ___
If yes-were raw data generated before application of background corrections? Yes/No ___

mments:

certify that this data package is in compliance with the terms and nditions of the contract, both technically and for completeness, for other n the conditions detailed above. Release of the data contained in this rdcopy data package and in the computer-readable data submitted on skette has been authorized by the Laboratory Manager or the Manager's signee, as verified by the following signature.

gnature: ____________________ Name: ____________________

____________________ Title: ____________________

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

ab Name: ____________ Contract: ________

ab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

atrix (soil/water): ______ Lab Sample ID: ________

evel (low/med): ______ Date Received: ________

Solids: ______

Concentration Units (ug/L or mg/kg dry weight): ______

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: ________ Clarity Before: ______ Texture: ______

Color After: ________ Clarity After: ______ Artifacts: ______

Comments:

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2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

ab Name: ______________________ Contract: __________

b Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

nitial Calibration Source: ___________

ntinuing Calibration Source: ___________

Concentration Units: ug/L

	Initial Calibration			Continuing Calibration					
nalyte	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	M
luminum									
ntimony									
rsenic									
arium									
eryllium									
admium									
ium									
omium									
obalt									
opper									
ron									
ead									
agnesium									
anganese									
ercury									
ickel									
otassium									
elenium									
ilver									
odium									
hallium									
anadium									
inc									
yanide									

) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

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2B
CRDL STANDARD FOR AA AND ICP

Lab Name: ______________ Contract: ________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

AA CRDL Standard Source: ____________

ICP CRDL Standard Source: ____________

Concentration Units: ug/L

	CRDL Standard for AA			CRDL Standard for ICP				
Analyte	True	Found	%R	True	Initial Found	%R	Final Found	%R
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								

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3
BLANKS

Lab Name: ______________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

Preparation Blank Matrix (soil/water): ______

Preparation Blank Concentration Units (ug/L or mg/kg): _____

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M
			1	C	2	C	3	C			
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron											
Lead											
Magnesium											
Manganese											
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											

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4

ICP INTERFERENCE CHECK SAMPLE

Lab Name: ______________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

ICP ID Number: ____________ ICS Source: ____________

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								

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5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

Name: ______________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

Matrix (soil/water): ______ Level (low/med): ______

% Solids for Sample: ______

Concentration Units (ug/L or mg/kg dry weight): _____

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
pper									
on									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

Comments:

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5B

POST DIGEST SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

Lab Name: ____________ Contract: ____________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix (soil/water): ______ Level (low/med): ______

Concentration Units: ug/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

Comments:

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6
DUPLICATES

EPA SAMPLE NO.

Name: ____________ Contract: ______

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix (soil/water): ______ Level (low/med): ______

% Solids for Sample: ______ % Solids for Duplicate: ______

Concentration Units (ug/L or mg/kg dry weight): ______

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								
Cyanide								

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7

LABORATORY CONTROL SAMPLE

Lab Name: ____________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

Solid LCS Source: ____________

Aqueous LCS Source: ____________

	Aqueous (ug/L)			Solid (mg/kg)					
Analyte	True	Found	%R	True	Found	C	Limits		%R
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

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8

STANDARD ADDITION RESULTS

Lab Name: ______________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

Concentration Units: ug/L

EPA Sample No.	An	0 ADD ABS	1 ADD		2 ADD		3 ADD		Final Conc.	r	Q
			CON	ABS	CON	ABS	CON	ABS			

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9
ICP SERIAL DILUTIONS

EPA SAMPLE NO.

Lab Name: ______________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

Matrix (soil/water): ______ Level (low/med): ______

Concentration Units: ug/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Aluminum							
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Mercury							
Nickel							
Potassium							
Selenium							
Silver							
Sodium							
Thallium							
Vanadium							
Zinc							

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INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: ______________ Contract: ______

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

ICP ID Number: __________ Date: ________

Flame AA ID Number: __________

Furnace AA ID Number: __________

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum			200		
Antimony			60		
Arsenic			10		
Barium			200		
Beryllium			5		
Cadmium			5		
Calcium			5000		
Chromium			10		
Cobalt			50		
Copper			25		
Iron			100		
Lead			3		
Magnesium			5000		
Manganese			15		
Mercury			0.2		
Nickel			40		
Potassium			5000		
Selenium			5		
Silver			10		
Sodium			5000		
Thallium			10		
Vanadium			50		
Zinc			20		

Comments:

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11A
ICP INTERELEMENT CORRECTION FACTORS (ANNUALLY)

Lab Name: ______________________________ Contract: ____________

Lab Code: _______ Case No.: ______ SAS No.: _______ SDG No.: _______

ICP ID Number: ______________ Date: _________

Analyte	Wave-length (nm)	Interelement Correction Factors for: Al	Ca	Fe	Mg	__
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Mercury						
Nickel						
Potassium						
Selenium						
Silver						
Sodium						
Thallium						
Vanadium						
Zinc						

Comments:

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11B
ICP INTERELEMENT CORRECTION FACTORS (ANNUALLY)

Lab Name: ____________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

ICP ID Number: ____________ Date: ________

Analyte	Wave- length (nm)	Interelement Correction Factors for:				
		__	__	__	__	__
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
opper						
ron						
Lead						
Magnesium						
Manganese						
Mercury						
Nickel						
Potassium						
Selenium						
Silver						
Sodium						
Thallium						
Vanadium						
Zinc						

Comments:

____

____

____

____

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12
ICP LINEAR RANGES (QUARTERLY)

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: _____ SAS No.: ______ SDG No.: ______

ICP ID Number: ____________ Date: ________

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	M
Aluminum			
Antimony			
Arsenic			
Barium			
Beryllium			
Cadmium			
Calcium			
Chromium			
Cobalt			
Copper			
Iron			
Lead			
Magnesium			
Manganese			
Mercury			
Nickel			
Potassium			
Selenium			
Silver			
Sodium			
Thallium			
Vanadium			
Zinc			

Comments:

____

____

____

____

13

PREPARATION LOG

Lab Name: ____________________ Contract: __________

Code: ________ Case No.: ______ SAS No.: ______ SDG No.: _______

Method: __

EPA Sample No.	Preparation Date	Weight (gram)	Volume (mL)

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ANALYSIS RUN LOG

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ________ SAS No.: ________ SDG No.: ________

Instrument ID Number: ______________ Method: __

Start Date: __________ End Date: __________

EPA Sample No.	D/F	Time	% R	Analytes																							
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	N

1

CHLORINATED HERBICIDES ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: Aquatec, Inc. Contract:

Lab Code: AQUAI Case No.: SAS No.: SDG No.:

Matrix: (soil/water) Water

Lab Sample ID:

Sample wt/vol: (g/mL) mL

Lab File ID:

Level: (low/med) Low

Date Received:

% Moisture: not dec. dec.

Date Extracted:

Dilution Factor: 1.0

Date Analyzed:

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
94-75-7	--------2,4-D	1.0	U
94-82-6	--------2,4-DB	1.0	U
93-76-5	--------2,4,5-T	0.10	U
93-72-1	--------2,4,5-TP(Silvex)	0.10	U
75-99-0	--------Dalapon	2.3	U
1918-00-9	------Dicamba	0.10	U
120-36-5	-------Dichloroprop	1.0	U
88-85-7	--------Dinoseb	0.50	U
94-74-6	--------MCPA	100	U
93-65-2	--------MCPP	100	U

FORM I

1

CHLORINATED HERBICIDES ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: Aquatec, Inc. Contract:

Lab Code: AQUAI Case No.: SAS No.: SDG No.:

Matrix: (soil/water) Soil Lab Sample ID:

Sample wt/vol: ____(g/mL) g Lab File ID:

Level: (low/med) Low Date Received:

% Moisture: not dec. ____ dec. ____ Date Extracted:

Dilution Factor: 1.0 Date Analyzed:

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

CAS NO.	COMPOUND	CONCENTRATION (ug/Kg)	Q
94-75-7	2,4-D	50	U
94-82-6	2,4-DB	50	U
93-76-5	2,4,5-T	5.0	U
93-72-1	2,4,5-TP(Silvex)	5.0	U
75-99-0	Dalapon	120	U
1918-00-9	Dicamba	5.0	U
120-36-5	Dichloroprop	50	U
88-85-7	Dinoseb	25	U
94-74-6	MCPA	5000	U
93-65-2	MCPP	5000	U

FORM I

2

CHLORINATED HERBICIDES SURROGATE RECOVERY

Lab Name: Aquatec, Inc.
Lab Code: AQUAI
SAS No.: ____________

Contract: ____________
Case No.: ____________
SDG No.: ____________

	EPA SAMPLE NO.	% REC 2,4-DA	#
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

	QC LIMITS
2,4-DA	(40-150)

\# Column to be used to flag recovery values
* Values outside of QC limits
D Surrogates diluted out

page _____ of _____

WATER CHLORINATED HERBICIDES
MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: Aquatec,Inc. Contract: ____________

Lab Code: AQUAI Case No.: _____ SAS No.: __________ SDG No.: ____________

Matrix Spike - Sample No.: _______________ Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
2,4-D					25-135
Silvex					25-135

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
2,4-D					30	25-135
Silvex					30	25-135

#Column used to flag recovery and RPD values with an asterisk
*Values outside of QC limits

RPD: ______________ out of 2 outside limits
Spike Recovery: _________ out of 4 outside limits

3

SOIL CHLORINATED HERBICIDES
MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: Aquatec,Inc. Contract: ____________

Lab Code: AQUAI Case No.: _____ SAS No.: __________ SDG No.: ____________

Matrix Spike - Sample No.: _______________ Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
2,4-D					25-135
Silvex					25-135

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
2,4-D					30	25-135
Silvex					30	25-135

#Column used to flag recovery and RPD values with an asterisk
*Values outside of QC limits

RPD: ____________ out of 2 outside limits
Spike Recovery: __________ out of 4 outside limits

FORM III

4

CHLORINATED HERBICIDES
METHOD BLANK SUMMARY

Lab Name: Aquatec,Inc. Contract: ______

Lab Code: AQUAI Case No.: ______ SAS No.: ______ SDG No.: ______

Lab Sample ID: ______ Lab File ID: ______

Matrix: (soil/water) ______ Level: (low/med) LOW

Date Extracted: ______

Date Analyzed (1): ______ Date Analyzed (2): ______

Time Analyzed (1): ______ Time Analyzed (2): ______

Instrument ID (1): ______ Instrument ID (2): ______

GC Column ID (1): ______ GC Column ID (2): ______

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED 1	DATE ANALYZED 2
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

Page 1 of 1

FORM IV

8

CHLORINATED HERBICIDES EVALUATION STANDARDS SUMMARY
Evaluation of Retention Time Shift for 2,4-DB

b Name: Aquatec,Inc. Contract: ____________

Lab Code: AQUAI Case No.: _____ SAS No.: _________ SDG No.: ______________

Instrument ID: ________________ GC Column ID: __________________

Dates of Analyses: ____________ to __________________

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	% D	*
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						

* Values outside of QC limits (2.0% for packed columns, 0.3% for capillary columns)

Page __ of __

FORM VIII

CHLORINATED HERBICIDES
CONTINUING CALIBRATION CHECK

Lab Name: Aquatec,Inc. Contract: ____________

Lab Code: AQUAI Case No.: _____ SAS No.: _________ SDG No.: ______________

Instrument ID: ________________ Column ID: ________________

Init. Calib. Date(s): _____________ _________________

COMPOUND	INITIAL RESPONSE File: Date: Time:	CONTINUING RESPONSE File: Date: Time:	%D
Dalapon			
Dicamba			
MCPP			
MCPA			
Dichlorprop			
2,4-D			
2,4,5-TP(Silvex)			
2,4,5-T			
2,4-DB			
Dinoseb			
2,4-DA			

4.0 DESCRIPTION OF SWMUs TO BE INVESTIGATED

This section of the Work Plan presents available information for each SWMU regarding current site conditions, historical operating practices, and existing chemical analysis data. The majority of the information regarding operating procedures and existing analytical data was obtained from the ERCE SWMU Classification Report (ERCE 1991). This information represents the most current source of information available.

4.1 SEAD-4: MUNITIONS WASHOUT FACILITY LEACH FIELD

The Munitions Washout Facility Leach Field was active between 1948 and 1963. At present, the foundation of the washout plant is still visible (approximately 150 feet long by 80 feet wide), but there is no visual evidence of the leach field. Figure 4-1 shows the estimated location of the leach field with respect to the other features nearby, i.e., the former munitions washout facility foundation and the wastewater pond. Information from SEAD indicates wastewater may also have been discharged to a ditch that carried the wastewater north across the road to a leach field.

4.1.1 Operating Practices

Operations at this unit included dismantling and removing explosives from munitions by steam cleaning. This operation produced explosive solids and wastewater. Solid explosives were most likely open burned at the OB facility (SEAD-23) or the old powder burning pit (SEAD-24). Chemical constituents that are common at Department of Defense washout plants include TNT, RDX, HMX, Tetryl, trinitrobenzene and heavy metals. The actual explosives in the wastewater are unknown. It is suspected that the wastewater that was produced was processed through sawdust to remove any solid explosive residues prior to being discharged to an area where it leached into the ground or flowed into a nearby ditch. The ditch possibly discharged to a pond located west of the facility. Some wastewater discharged potentially into an area near Building 2084, which is approximately 1,000 feet, due south, of the munition washout facility, Figure 4-1 (USAEHA 1988). Wastewater may have also been discharged into an area near the Building 2079 boiler plant (Figure 4-1).

Within the past 8 years, the pond was widened and deepened using a bulldozer. Pond sediment was pushed southwestward to a 400-foot by 150-foot area southwest and adjacent to the pond. This scraped-off sediment has been sampled in an area shown on Figure 4-1. A shallow depression near the berm and Building T2105 are included in this SWMU.

4.4.1 Operating Practices

Small arms munitions, both obsolete and unserviceable, were destroyed by incineration. There were no air pollution or dust control devices installed on the furnace. The pipes located above the building may have conveyed propellants, which may also have been stored in the building.

4.4.2 Existing Analytical Data

No existing analytical data were discovered for this SWMU.

4.5 SEAD-17: BUILDING 367 - EXISTING DEACTIVATION FURNACE

The Existing Deactivation Furnace, located in Building 367, has been active from 1962 to the present (refer to Figure 4-5). Air pollution control equipment was added to the unit in 1970, and it was further upgraded in 1989.

The deactivation furnace is used to incinerate obsolete and unserviceable small arms munitions (20 mm or less in size), fuses, boosters and firing devices. The furnace consists of a rotary kiln retort and feed discharge assemblies. The revolving retort is made of cast steel. The kiln has a cross-sectional area of 4.6 square feet and is 20 feet long. The kiln is fired by No. 2 fuel oil. The furnace's feed system consists of a waste feed weighing system, a primary waste feed conveyor and a secondary conveyor. The furnace is equipped with an Air Pollution Control System (APCS). The APCS consists of an afterburner, gas coolers, cyclone separator, baghouse, compressor, induced draft fan, stack and associated duct work.

The furnace has been included in the facility's Part B permit application. The unit was upgraded in 1989 to meet the operating requirements for incinerators detailed in 40 CFR Part 264 Subpart O. As part of the RCRA regulations, interim closure of the unit was conducted in 1989. The plan for conducting the trial burn has been prepared. The trial burn will be conducted after review and approval of the trial burn plan by NYSDEC and the EPA.

4.5.1 Operating Practices

Unpacked ammunition is placed on a conveyor for transfer to the deactivation furnace at prescribed intervals. The ammunition is burned and exploded by the heat in the furnace. The residue from the furnace is transferred by a conveyor to an approved hazardous waste container and allowed to cool. When cooled, the scrap metal is disposed of in barrels for transfer to the Defense, Reutilization and Marketing Office (DRMO).

4.9.1 Operating Practices

Material to be detonated is placed in a bulldozed hole in the hill with demolition material to destroy the ammunition or components. Primer cord is attached to the demolition material, blasting caps are attached to the primer cord, and the primer cord is attached to circuit wire. The hole is backfilled and a minimum of 8 feet of soil is placed over the material to be detonated. The operator detonates the material after returning to the dugout and taking proper safety precautions.

4.9.2 Existing Analytical Data

The Open Detonation facility has five groundwater monitoring wells associated with it, MW-1 through MW-5, as shown on Figure 4-9. Monitoring well installation data was available in tabular form and is presented in Appendix D, Table 45A. Groundwater quality data for conventional pollutants and explosives obtained during 1979 are presented in Appendix D, Table 45B. One explosive compound, 4-amino-2,6-dinitrotoluene, was detected in groundwater from wells MW-1 to -4 and from Reeder Creek (both up and downstream of SEAD-45) at concentrations from 1.36 to 1.96 ppb.

Groundwater data during the period 1981 through 1987 and for 1989 are summarized on Tables 45C, 45D and 45E in Appendix D.

In 1982, the USAEHA analyzed soil samples collected from eight locations around this area (pits 2,4,6 and 8). Analyses were performed for EP Toxicity (As, Ba, Cd, Cr, Hg, Pb, Se and Ag) and explosives (HMX, RDX, Tetryl, 2,4,6-TNT, 2,4-DNT, 2,6-DNT). The analytical results indicated the presence of Cd in all samples (0.19-0.45 mg/l) which was below 1.0 mg/l criteria. Explosives were also found in each sample (RDX 1.4-1.7 ug/kg; Tetryl 1.6-16.3 ug/kg; 2,4,6-TNT 2.2-61 ug/kg; 2,4-DNT 1.1-19. ug/kg).

4.10 SEAD-57: EXPLOSIVE ORDNANCE DISPOSAL AREA

The Explosive Ordnance Disposal Area consists of a berm approximately 4 feet wide and 8 to 10 feet high with an inside diameter of approximately 70 feet (refer to Figure 4-10). The disposal area has been active from 1941 to the present and is currently used for bomb squad training. A shallow depression near the berm and Building T2105 are included in this SWMU.

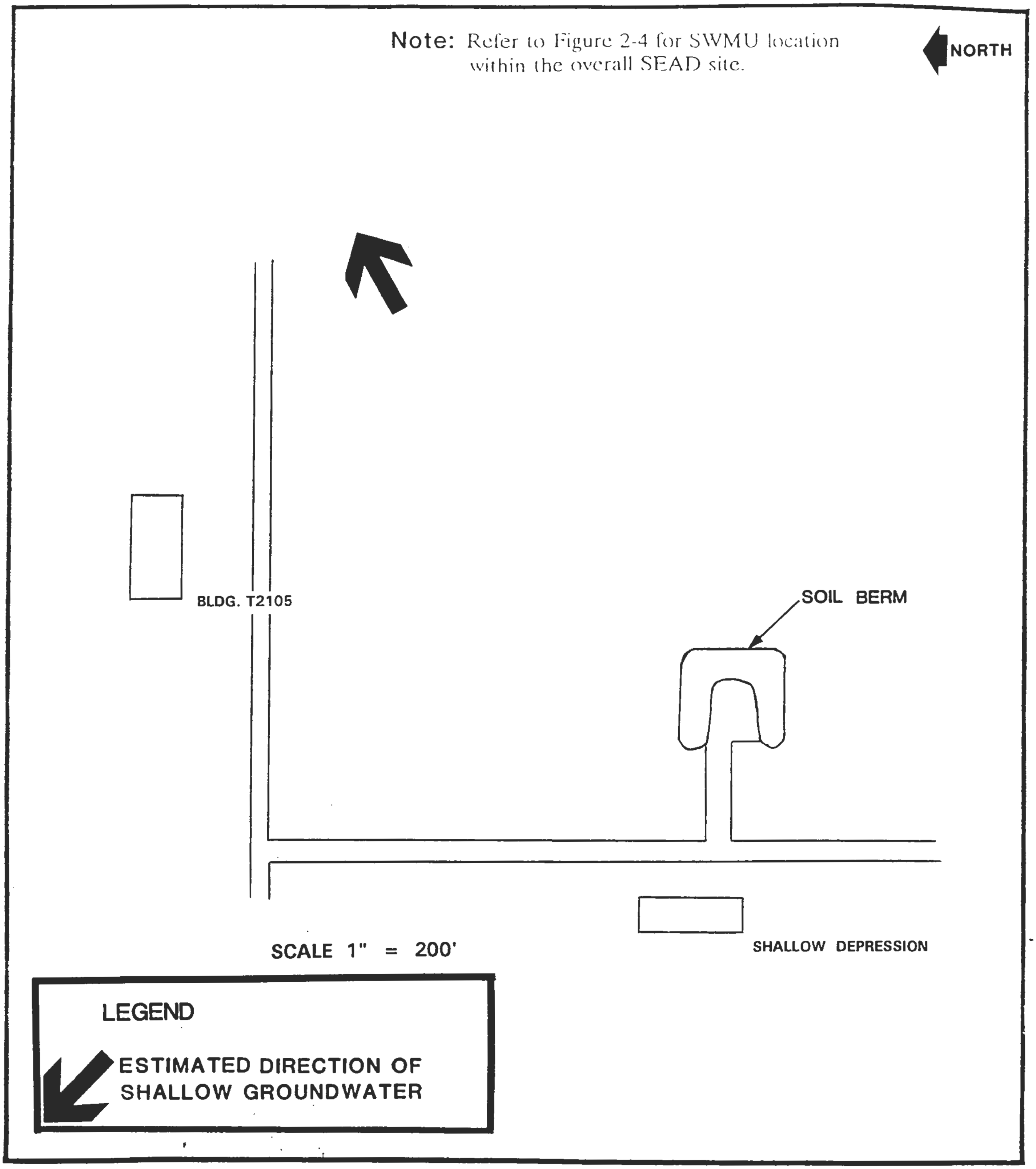


FIGURE 4-10 SITE PLAN FOR SEAD-57: EXPLOSIVE ORDNANCE DISPOSAL AREA

4.10.1 Operating Practices

In the past, the bermed area was used for open detonation. The bermed area and the depression may have been used for the disposal of explosives. Currently, the bermed area is used for bomb squad training. Building T2105 may have been used to store material before it was detonated.

4.10.2 Existing Analytical Data

No existing analytical data were discovered for this SWMU.

5.0 SWMU INVESTIGATIONS

5.1 INTRODUCTION

This section describes the work to be performed during investigation of the 10 SWMUs. The approach of this Work Plan is to investigate areas likely to have been impacted by a release of hazardous constituents. Sample locations are concentrated in source areas or in hydrologic upgradient locations to establish background conditions. Parsons Main has estimated groundwater flow directions based primarily on topography and to some extent on proximity to surface water. All references to upgradient and downgradient hydrologic locations in this section are estimated. The estimated direction of groundwater flow for each SWMU is presented on Figures 2-4 and 5-1 through 5-10.

Prior to personnel entering each SWMU to perform field work, Parsons Main and UXO personnel will evaluate the potential for UXOs to be present at the SEAD. If necessary, UXO personnel will clear areas of the site where field work will be performed.

Three types of geophysical techniques could be performed at several 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.)

Investigation of the 10 SWMUs will involve sampling of soil, soil gas, sediment, surface water and groundwater, although not all medias will be sampled at each SWMU. Chemical constituents of concern for this investigation are summarized on Table 5-1. Analytical methods utilized at each SWMU and the rationale for selection of each analytical method are presented on Table 5-2. Table 5-3 presents a summary of samples to be collected and analyses to be performed. All analyses will be performed in accordance with the methodology presented in the Chemical Data Acquisition Plan, Appendix C.

Parsons Main feels that it is appropriate to conduct these analyses during the initial assessment so that there is reasonable justification for eliminating certain compounds from further consideration in subsequent investigations. The constituents cited in the Chemicals of Interest sections for each SWMU in Section 5.2 were obtained from the ERCE report (ERCE 1991).

TABLE 5-1

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 Nitrates	TAL Metals* TCL SVOs* 8330, 353.2
2. Solvents	Volatile organic compounds (VOCs) Semi-volatile organic compounds (SVOs)	TCL VOCs*, 5242 TCL SVOs
3. Oils	Petroleum hydrocarbons (TPH)	8015 Herbicides 8150 PCB in oil 8080
4. Nitric/Hydrofluoric Acid	Nitric/Hydrofluoric Acid	353.2, 340.2
5. Transformer Oil	Polychlorinated biphenyls (PCBs)	TCL Pest./PCB*
6. Herbicides	Herbicides	8150
7. Insulation	Asbestos	Polarized Light Microscopy

TABLE 5-2
SWMU-SPECIFIC EPA ANALYTICAL METHODS AND SELECTION RATIONALE

SWMU/ AOC	pH	Asbestos	8150 Herbicides	8330 Expl.	TCL SVOs	TCL VOCs	TAL Metals	TCL PCB	353.2 NO_3	8015 TPH	340.2 F	8080 PCB	Selection Rationale
SEAD-4	-	-	X	X	X	X	X	X	X	-	-	-	Pyrotechnic, explosive and propellant (PEP) materials managed here (Expl., SVOs, and metals) and breakdown products (Nitrate) may be present.
SEAD-11	-	-	X	X	X	X	X	X	X	X	-	-	Landfills have been historically utilized for industrial waste disposal.
SEAD-13	x	-	X	-	X	X	X	X	X	-	X	-	Strong acid neutralized in pits here. Nitrate and fluoride may be indicators of residual salts originating from acid. pH will indicate neutralization effectiveness
SEAD-16	-	X	X	X	X	X	X	X	X	-	-	-	Heavy metals have been released in dust and ash from stack with no air pollution controls. PEP materials have been managed here (Expl., SVOs and metals) and breakdown products (Nitrate) may be present.
SEAD-17	-	-	X	X	X	X	X	X	X	-	-	-	Although air pollution controls have been used, heavy metals released in dust and ash from the system. (Similar to SEAD 16)
SEAD-24	-	-	X	X	X	X	X	X	X	X	-	-	PEP materials managed here (Expl., SVOs and heavy metals) and breakdown products (Nitrate) may be present. Solvents and/or petroleum products may have been utilized to initiate powder burn.
SEAD-25	-	-	X	-	X	X	X	X	X	X	-	-	Materials burned include: fuels and used oil: leaded fuel possible.
SEAD-26	-	-	X	-	X	X	X	X	X	X	-	X	Materials burned include: fuels and used oil: leaded fuel possible.

TABLE 5-2 (Cont.)

SWMU-SPECIFIC ANALYTICAL METHODS AND SELECTION RATIONALE

SWMU/ AOC	pH	Asbestos	8150 Herbicides	8330 Expl.	TCL SVOs	TCL VOCs	TAL Metals	TCL PCB	353.2 NO$_3$	8015 TPH	340.2 F	8080 PCB	Selection Rationale
SEAD-45	-	-	X	X	X	X	X	X	X	-	-	-	PEP materials managed here (Expl., SVOs and heavy metals) and breakdown products (Nitrate) may be present.
SEAD-57	-	-	X	X	X	X	X	X	X	-	-	-	PEP materials managed here (Expl., SVOs and heavy metals) and breakdown products (Nitrate) may be present.

Table 5-3

Summary of Laboratory Analyses

		Analyses[5]					
	No. of Samples	Suite[2]	TPH	Herbicides	PCB in Oil	Asbestos	Fluoride
SEAD-4							
B/TP[1] Soils	44	44					
Groundwater	6	6					
Surface Water	2	2					
Sediment	3	3					
Surface Soil	7	7					
SEAD-11							
B/TP Soils	15	15	15				
Groundwater	4	4	4				
SEAD-13							
B Soils	30	30					30
Groundwater	6	6					6
Surface Water	3	3					3
Sediment	3	3					3
SEAD-16							
Groundwater	3	3					
Surface Water	2	2					
Surface Soil	16	16					
Propellants	3	3					
Solid Materials	10	10				5	
Bldg. Materials	10					5	
SEAD-17							
B Soils	9	9					
Groundwater	3	3					
Surface Soil	23	23					
SEAD-24							
B Soils	15	15	15				
Groundwater	3	3	3				
Surface Soil	12	12	12				

Table 5-3
(Con't)

		Analyses[5]					
	No. of Samples	Suite[2]	TPH	Herbicides	PCB in Oil	Asbestos	Fluoride
SEAD-25							
B Soils	18	18	18				
Groundwater	3	3	3				
SEAD-26							
B/TP Soils	36	36	36				
Groundwater	4	4	4				
Surface Water	1	1	1				
Sediment	1	1	1				
Oil	1		1	1	1		
SEAD-45							
TP Soils	5	5					
Surface Soil	9	9					
Groundwater	9	9					
Surface Water	4	4					
Sediment	4	4					
SEAD-57							
TP Soils	11	11					
Surface Soils	9	9					
Groundwater	3	3					
Sample Subtotal	350	339	113	1	1	10	42
Duplicates (5%)		17	6	-	-	1	2
Equip. Blanks (5%)		17	6	-	-	-	2
MS/MSD/MSB (3/20 samples)[3]		51	18	-	-	-	6

Table 5-3
(Con't)

		Analyses[5]					
	No. of Samples	Suite[2]	TPH	Herbicides	PCB in Oil	Asbestos	Fluoride
Total Number of Analyses		424	143	1	1	11	52
Estimated VOC Trip Blanks[4]	14						

Notes:

1. B=Borings, TP=Test pits

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, explosive compounds, herbicides, and nitrates. At SEAD-13, SEAD-25, and SEAD-26, explosive compounds will not be analyzed. The TCL and TAL compounds will be analyzed at Level IV, whereas the other compounds will be analyzed at Level III.

3. A matrix spike analysis, performed every 20 samples, actually consists of 3 analyses: method spike blank, matrix spike, and matrix spike duplicate.

4. Number of VOC trip blanks were estimated based on one trip blank per day, 4 water samples per day, and 55 water samples to be obtained (55/4=14).

5. Laboratory analysis methods are presented on Table C-2 of Appendix C, Chemical Data Acquisition Plan.

All monitoring wells on 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 on the SWMU. This will also allow comparison of groundwater elevations from SWMU to SWMU.

The locations of borings and monitoring wells may be adjusted based on the results of geophysical and soil gas surveys and more complete field reconnaissance.

The above field work will represent Phase I of the ESI field work. If no contaminants are detected that would cause a remedial investigation to be performed at a SWMU, then, during Phase II, groundwater will be obtained from each well at the SWMU and analyzed for VOCs using Method 524.2. This method has detection limits for VOCs that are lower than the Maximum Contaminant Levels listed in the federal drinking water regulations.

5.2 SWMU-SPECIFIC SAMPLING PROGRAM

This section of the Work Plan describes the field work and samples that will be obtained at each of ten SWMUs to be investigated. The procedures for performing the field work and obtaining the samples are described in Appendix A, Field Sampling and Analysis Plan. Appendix A also includes a table (Table A-1) summarizing the procedures that will be used at each SWMU. The health and safety procedures that will be followed while on-site are presented in Appendix B, Health and Safety Plan. SWMU specific safety guidelines are presented in Appendix B of the Health and Safety Plan. The Chemical Data Acquisition Plan (Appendix C) presents the policies, organization, objectives, quality assurance (QA), and quality control activities to be implemented in this CERCLA site inspection.

5.2.1 SEAD-4: Munitions Washout Facility Leach Field

Based on previous operating practices, wastewater from the washout facility contained explosives and heavy metals. Based on ERCE information and discussions with SEAD personnel, this wastewater could have been discharged to a leach field west of the former building, to an unlined ditch that discharged to a pond approximately 500 ft. west of the former building, to an unlined ditch that flowed north and discharged on the north side of the road to possibly a leach field, and to areas near Buildings 2079 and 2084. These locations are shown on Figure 5-1. Because this wastewater could leach into the ground the potential migration pathways include both soil and groundwater. Additionally, because the ditch possibly discharged to the pond, surface water and sediment must also be considered as potential migration pathways.

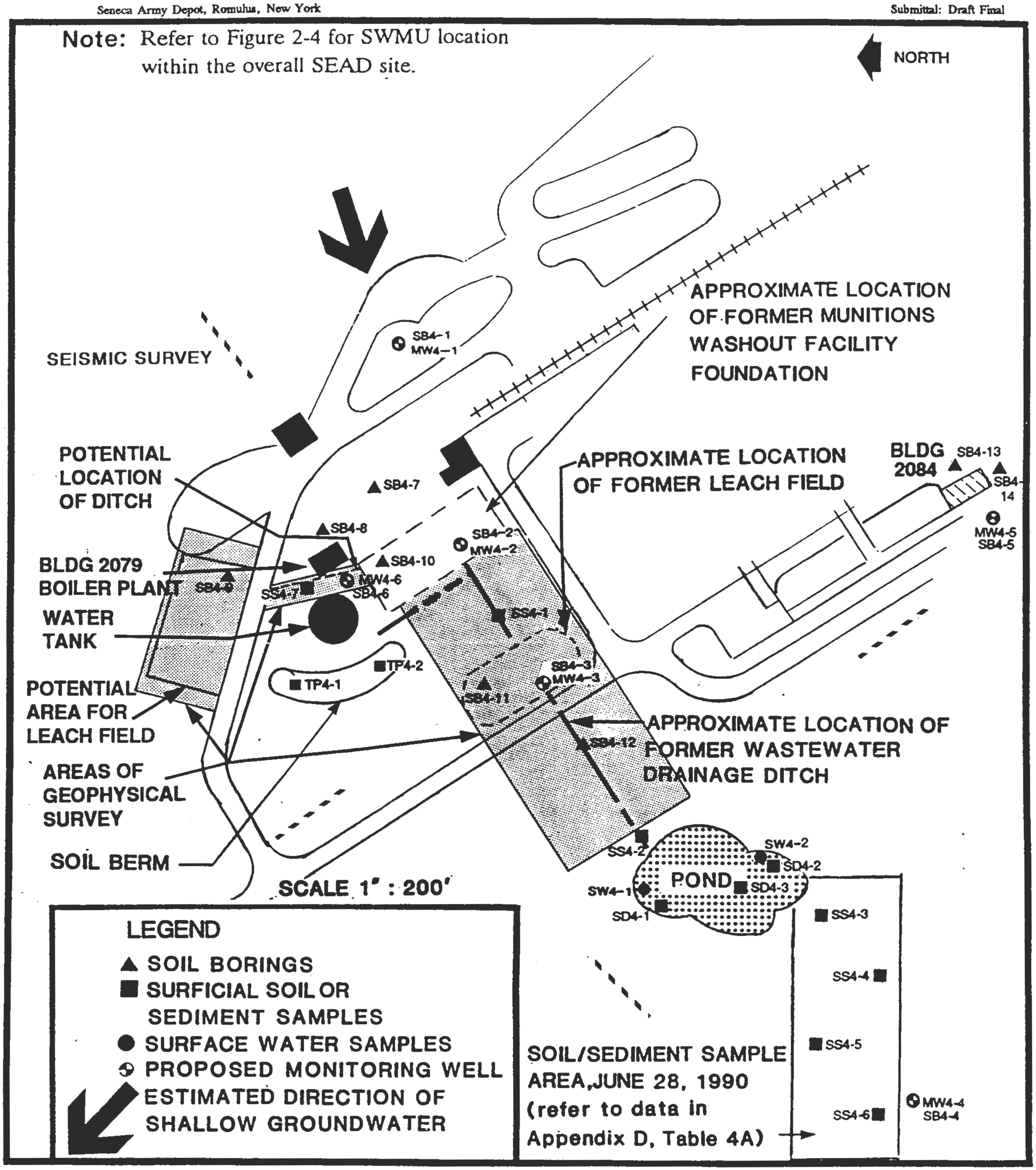


FIGURE 5-1 SAMPLING LOCATIONS FOR SEAD-4: MUNITIONS WASHOUT FACILITY LEACH FIELD

Health and Safety procedures for the investigations performed at SEAD-4 are described in the Health and Safety Plan (Appendix B) and in the SWMU-specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.1.1 Chemicals of Interest

Chemicals which presumably could be found during sample testing from SEAD-4 include 2,4,6-TNT, 2, 4-DNT, 2,6-DNT, RDX, HMX, trinitrobenzene, Tetryl and heavy metals. Soil samples were collected from the pond area in 1990 and tested for 2,4,6-TNT, 2,4-DNT and 2-6-DNT. Explosives were not detected in any of the samples tested (ERCE 1991). Sample locations and data are presented in Appendix D.

5.2.1.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU.

The exact location of the leach field west of the washout facility is unknown. To determine the leach field's location, a GPR survey will be performed. GPR will be relied upon as the primary geophysical method. To provide cost effective backup geophysical data, an electromagnetic (EM-31) survey will be performed together with the GPR survey. The objectives of these surveys will be to delineate the location of the leach field and the locations of subsurface pipes and structures that serviced the leach field (refer to Figure 5-1). Because heavy metals may be constituents of concern here, the electromagnetic data will supplement the GPR survey by providing information on the extent of soils with elevated apparent conductivities. A grid of GPR and electromagnetic data will be collected over the area where the leach field is suspected to be located. The GPR data will be collected at points spaced at 10-foot intervals. Electromagnetic measurements will be made on the same profiles with sample points spaced at 10-foot intervals. It is estimated that up to 15 profiles, each 200 feet in length, will be surveyed.

GPR and EM-31 surveys will also be performed to determine whether a buried ditch or pipe leading north from the former facility and a leach field north of the road exist. The GPR survey will be performed at points spaced at 10-foot intervals. Each survey will be approximately 40 feet long. EM-31 measurements will be made along profiles oriented approximately east-west at 10-foot intervals in the area of the potential pipe and leach field. Each survey will be approximately 250 feet long.

In addition, GPR and EM-31 profiles will be performed in the area between the pond and the former facility to identify the location of the former ditch through which wastewater was discharged. It is estimated that up to six profiles, spaced at 100-foot intervals, will be surveyed to locate the former ditch. These profiles will be approximately 200 feet in length.

Soils

Borings: Fourteen soil borings are proposed for SEAD-4 (refer to Figure 5-1) to evaluate the vertical extent of contaminants. Boring SB4-1 will provide data on the background soil quality. The other borings are at locations where releases to the environment may have occurred. Six borings are associated with installation of the six wells proposed for SEAD-4.

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. These include: (1) from 0-12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (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.

The three samples to be analyzed from each boring will be submitted for chemical analyses identified in Section 5.2.1.3. The data gathered will be used to locate soils affected by disposal of the wash water.

Test Pits: Two soil samples will be collected from the soil berm to evaluate its soil quality. The source of the soil is unknown and may have been affected by the wastewater before it was used to construct the berm. These samples are to be collected via two test pits. Four soil samples will be composited into one sample for each test pit.

Surface Soils: Up to seven surface soil samples will be obtained. Two samples (SS4-1 and SS4-2) will be collected from the original bed of the ditch which leads west to the pond. If the ditch has been buried, the surface of the ditch bed will be exposed before sampling. Samples SS4-3 to SS4-6 will be obtained from the material that was bulldozed from the pond. Sample SS4-7 will be obtained from the original bed of any ditch that is discovered leading north from the former facility. The bed of the ditch will be exposed before the sample is obtained.

Groundwater

The six monitoring wells proposed for SEAD-4 will be used to evaluate groundwater flow direction and the groundwater quality at areas of the SWMU that may have been affected by the wash water. One well (MW4-1) is proposed for monitoring background groundwater quality. The presumed direction of groundwater flow at this SWMU is to the west-southwest.

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 tested for the parameters listed in Section 5.2.1.3.

Surface Water and Sediment

Three sediment samples and two surface water samples will be collected from the pond. Both surface water samples and two sediment samples will be obtained near the edge of pond. Surface water and sediment samples will be obtained at the same locations. One sediment sample will be obtained from the deepest part of the pond, near the center.

Each sediment and surface water sample will be tested for the chemical parameters listed in Section 5.2.1.3.

5.2.1.3 Analytical Program

A total of 51 soil samples, three sediment samples, six groundwater samples, and two surface water samples will be collected from SEAD-4 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs, SVOs, Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, explosive compounds by Method 8330, herbicides by Method 8150, and nitrates by Method 352.2. A summary of the analytical program for SEAD-4 is presented in Table 5-3.

5.2.1.4 Handling UXOs and Explosives

The facilities at this SWMU were used to wash explosives from munitions; therefore, there is the potential for UXOs and explosives to be present in the soil. As a result, personnel from UXB will be on-site to monitor the subsurface explorations and sampling. UXB will decide when remote drilling and site clearance will be necessary based on-site conditions. The following paragraphs present the proposed procedures to handle UXOs and explosives at SEAD 4.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

Test pit excavations and the collection of soil samples from the excavations will be performed by UXB.

UXB 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.

5.2.2 SEAD-11: Old Construction Debris Landfill

At this time, it is anticipated that the landfill primarily contains construction debris; however, the actual contents of the landfill are not known.

Health and Safety procedures for the investigations performed at SEAD-11 are described in the Health & Safety Plan (Appendix B) and in the SWMU specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.2.1 Chemicals of Interest

Presently, it is unknown what chemicals, if any, may have been disposed of in the landfill. Consequently, PCBs, VOCs, SVOCs, explosive organics and heavy metals are considered to be potentially present.

5.2.2.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU.

An electro-magnetic survey, using an EM-31, and GPR surveys will be conducted on the landfill to delineate the limits of the landfill and to determine if any buried metallic objects are present within the landfill (refer to Figure 5-2). A 10-foot by 10-foot grid will be established over the landfill for the EM-31 Survey. The initial geophysical characterization will consist of collecting EM-31 data over this grid. The EM-31 data will be interpreted to delineate the waste boundaries. Any distinct magnetic anomalies thought to be associated with buried metallic objects will also be delineated. Subsequent to the EM-31

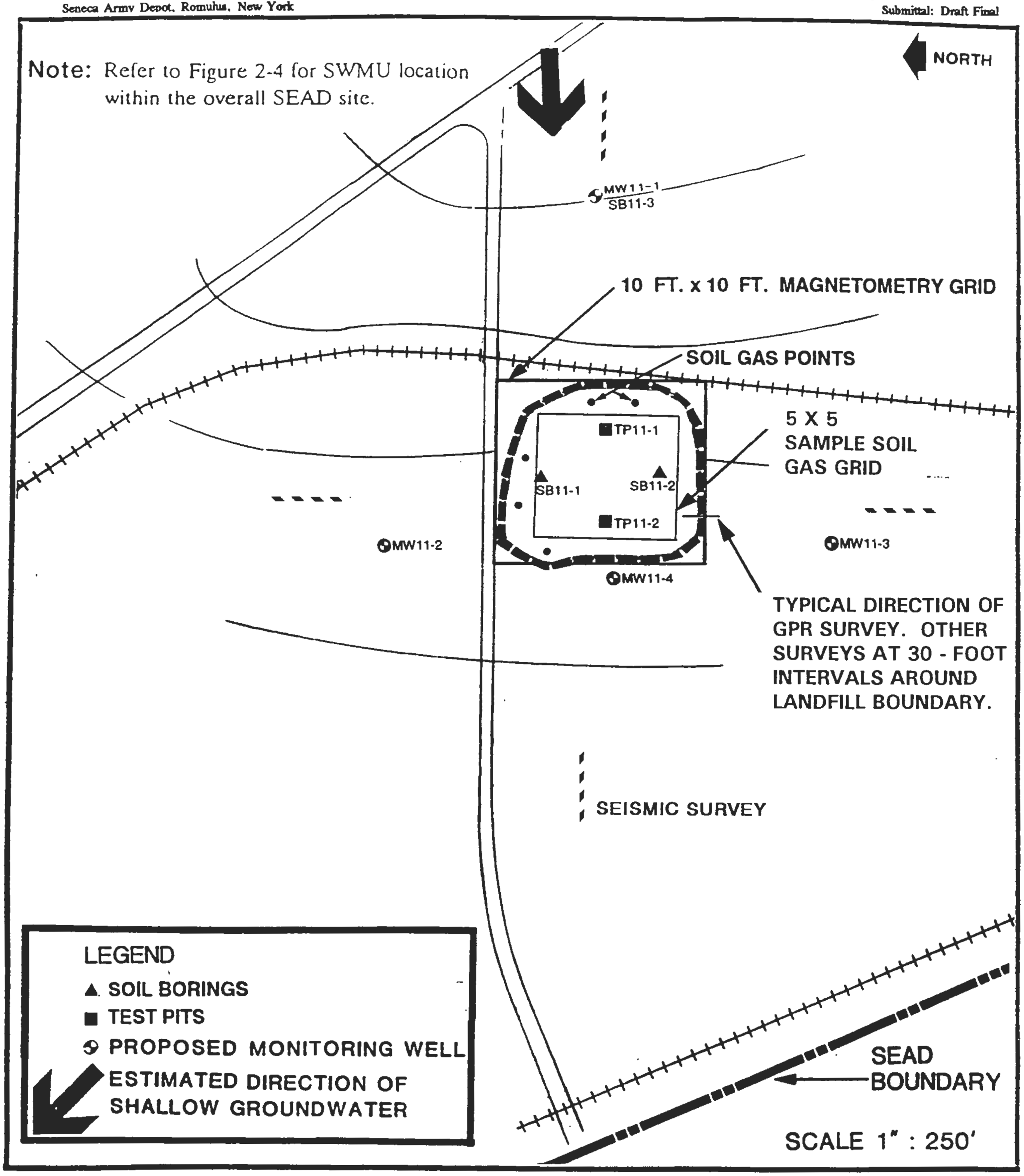


FIGURE 5-2 SAMPLING LOCATIONS FOR SEAD-11: OLD CONSTRUCTION DEBRIS LANDFILL

survey, a GPR survey will be performed. The GPR data will be collected along profiles spaced at 30-foot intervals to help delineate the landfill limits. In addition, GPR data will be collected over each identified EM-31 anomaly to provide a detailed characterization of the source of each anomaly. It is estimated that the EM-31 survey grid will be approximately 200 feet by 200 feet.

Soil Gas

A soil gas survey will be performed on the fill area to determine if concentrations of volatile organic compounds are present in the fill soil gas. This survey will potentially identify source areas of VOCs within the fill.

It is anticipated that up to 30 soil gas sampling locations will be established on the fill area within a specified grid, although the exact number will be determined in the field. Proposed soil gas sampling locations are shown in Figure 5-2. These locations can be changed while in the field after receiving concurrence from the NYSDEC.

Soils

Borings: Soil samples will be obtained from two soil borings drilled through the landfill (SB11-1 and -2) and at a background location (SB11-3). The two landfill borings will be located as shown on Figure 5-2 or at soil gas anomalies. Three samples from each boring will be obtained for chemical analysis. These include: 1) from 0 to 12 inches below grade, 2) immediately above the water table, and 3) an intermediate point. 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.

Test Pits: Two test pits will be excavated to the base of the landfill debris or water table, whichever is deeper, to observe the type of material present in the landfill and obtain soil samples. The two test pits will be located at geophysical or soil gas anomalies or as shown on Figure 5-2. Three samples from each test pit will be obtained for chemical analysis as described for the samples from the soil borings.

Soil samples from the borings and test pits will be submitted for the chemical analyses identified in Section 5.2.2.3.

Groundwater

Four monitoring wells will be installed on this SWMU as shown in Figure 5-2: one upgradient of the landfill (MW11-1) to obtain background water quality data, one north of the landfill, one south of the landfill, and one immediately downgradient of the landfill. The presumed direction of groundwater flow at this SWMU is to the west-southwest.

These wells will be used to determine the groundwater flow direction in the vicinity of the landfill, evaluate the potential for radial groundwater flow from the landfill, and, determine if hazardous constituents are migrating in the groundwater from the landfill. One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer.

Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.2.3.

5.2.2.3 Analytical Program

Four groundwater samples and 15 soil samples will be collected from SEAD-11 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 352.2, and total petroleum hydrocarbons by Method 8015. Up to 30 soil gas samples will be collected from the fill area and analyzed for volatile organic compounds using a Photovac portable gas chromatograph. A summary of the analytical program for SEAD-11 is presented in Table 5-3.

5.2.2.4 Handling UXOs and Explosives

UXOs and explosive material could have been disposed with the construction debris in this landfill. Therefore, personnel from UXB will be on-site to monitor the subsurface explorations and sampling. UXB will decide when remote drilling and site clearance will be necessary based on-site conditions. The following paragraphs present the proposed procedures to handle UXOs and explosives at SEAD-11.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

Test pit excavations and the collection of soil samples from the excavations will be performed by UXB.

UXB will clear areas for field personnel to walk on-site, to perform geophysical surveys, and to obtain groundwater samples.

5.2.3 SEAD-13: IRFNA Disposal Site

The exact location of the pits used to dispose of Inhibited Red Fuming Nitric Acid (IRFNA) is currently unknown. An earlier investigation by ERCE indicated that the pits were located near the west end of the East-West Baseline Road on the south side of the road (ERCE 1991) as shown on Figure 5-3.

Abandoned aboveground piping was observed in the areas southeast and southwest of the Duck Ponds. Some of this piping could have been used during the IRFNA disposal project as an emergency shower. An IRFNA disposal study stated that a deluge shower was used for personnel decontamination (USAEHL 1960). Additionally, an abandoned water hydrant was observed southwest of the Duck Ponds. Possibly, this water hydrant was used to supply water pressure to the stainless steel ejector.

The pits were lined with limestone which neutralized some or all of the IRFNA. The neutralized wastewater may have migrated to the water table. In addition to groundwater, another potential migration pathway could be surface water via the Duck Pond.

Health & Safety procedures for the investigations performed at SEAD-13 are described in the Health & Safety Plan (Appendix B) and in the SWMU-specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.3.1 Chemicals of Interest

The primary constituents of concern are heavy metals, nitrates, and fluoride.

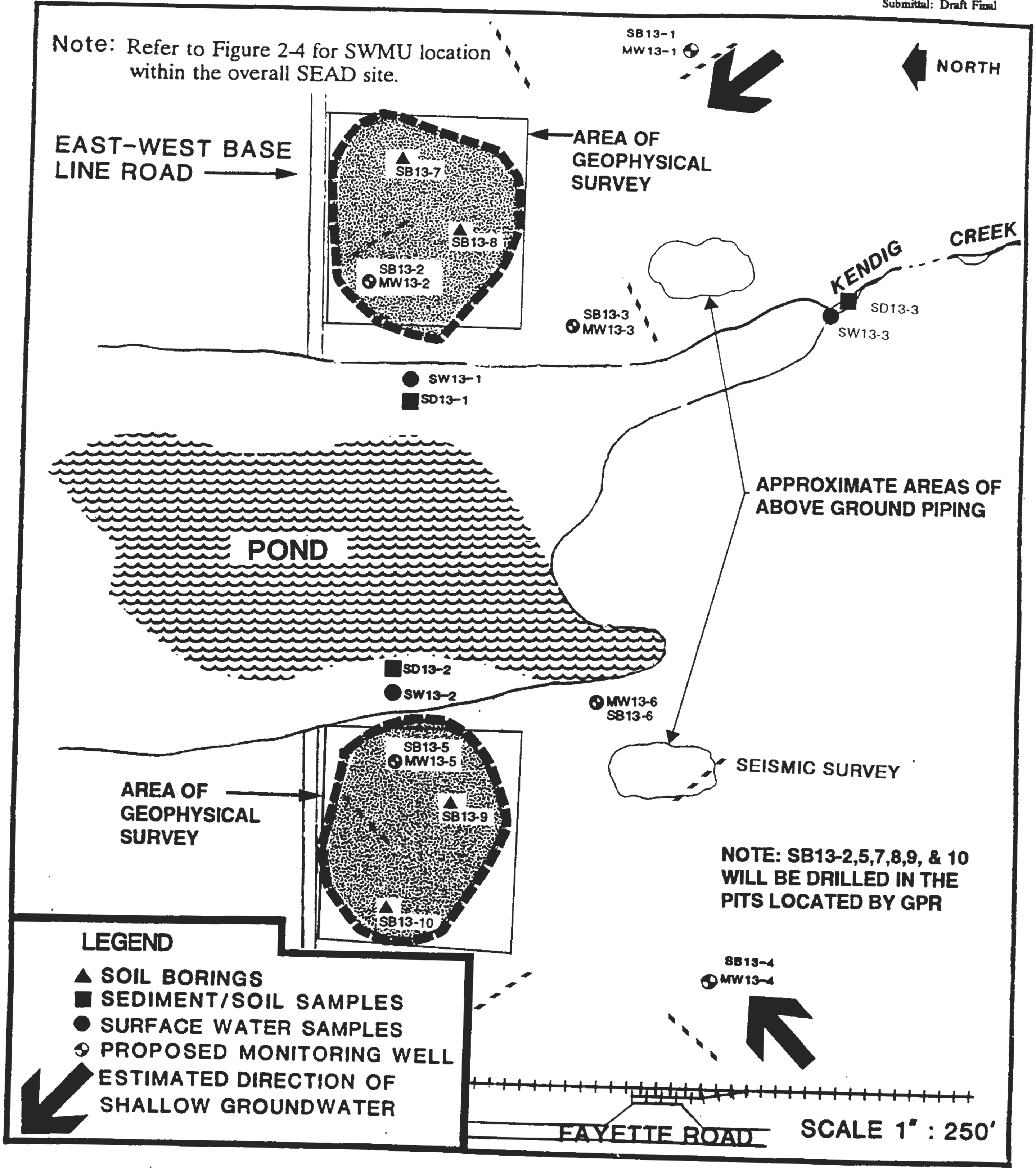


FIGURE 5-3 SAMPLING LOCATIONS FOR SEAD-13: IRFNA DISPOSAL SITE

5.2.3.2 Media To Be Investigated

Geophysics

To locate the six abandoned disposal pits and to evaluate the potential presence of IRFNA barrels in the subsurface, both GPR and EM-31 surveys (non-invasive) will be conducted. The GPR method will be used to identify areas of disturbed soils that could be associated with the IRFNA pits. The EM-31 data will be collected on profiles spaced at 20-foot intervals throughout the two areas where the pits are presumed to be (refer to Figure 5-3). EM-31 measurements will be made at 10-foot spacings along each profile. It is estimated that up to 30 profiles, varying in length from 300 feet to 400 feet, will be surveyed. The GPR data will be collected along the same profiles as the EM-31 data. When the pit locations are identified with the GPR method, additional data will be collected in order to delineate the extent of the pits. If the initial GPR and EM-31 surveys indicate that some of SEAD-13 has been covered by water, it is possible to conduct an additional GPR survey on the water surface. The survey is not likely to yield clear data if pond sediment has covered the originally disturbed soil areas of SEAD-13.

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other over the pits on each side of the Duck Pond after they are located by GPR and EM-31 surveys. Data from the surveys will be used to determine the direction of groundwater flow, adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU, and evaluate whether the disposal of the nitric acid has created a hole or trough in the bedrock surface. Additional surveys may be necessary to further delineate any holes or troughs observed during the initial seismic refraction surveys.

Soils

Borings: Three soil borings will be advanced within each of the two disposal areas (refer to Figure 5-3) at locations tentatively identified as IRFNA disposal pits. Two borings will also be drilled on each side of the pond to obtain soil quality data at a background location (SB13-1 and -4) and near the pond (SB13-3 and -6). Three samples will be collected from each boring: (1) from 0 to 12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detector (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.

If the water table is less than 5 feet below the surface, the boring will be advanced to a maximum depth of 10 feet. Samples of soil for chemical analysis will be collected in these borings 1) from 0 to 12 inches below ground surface, 2) immediately above the water table, and 3) below the water table using one of the four criteria described in the previous paragraph to collect an intermediate sample.

Groundwater

After the geophysical surveys locate the disposal pits, a monitoring well will be installed upgradient of each disposal area, near the downgradient edge of each disposal area, and south of each disposal area near the pond. These wells will be used to determine the groundwater flow direction, background groundwater quality, and to determine if hazardous constituents are migrating with the groundwater from the pits.

The presumed direction of groundwater flow on this SWMU is to the northwest for the pits east of the pond and northeast for the pits west of the pond as shown in Figure 5-3. Monitoring wells MW13-1 and MW13-4 will be used to obtain background water quality data.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.3.4.

Surface Water and Sediment

To assess the potential impact of the IRFNA disposal pits on adjacent surface water bodies, three sediment samples and three surface water samples will be collected from within the Duck Pond (refer to Figure 5-3). One surface water and one sediment sample (SW13-3 and SD13-3) will be used to obtain background surface water and sediment quality data. The exact locations of the other two samples will be determined based on an inspection of the site. Criteria to select these locations include stressed vegetation, proximity to the pits, and surface water discharge points that originate from the area of the pits. Sediment and surface water samples will be collected at the same location and will be tested for the parameters listed in Section 5.2.3.4.

5.2.3.3 Additional Information

The aboveground piping and hydrant will be located on the topographic map that will be created for the site. They will be examined to evaluate their probable use.

5.2.3.4 Analytical Program

A total of 30 soil samples, three sediment samples, six groundwater samples, and three surface water samples will be collected from SEAD-13 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, herbicides by Method 8150, nitrates by Method 352.2, and fluoride by Method 340.2. A summary of the analytical program for SEAD-13 is presented in Table 5-3.

5.2.3.5 Handling UXOs and Explosives

Available information indicates UXOs and explosives were not placed near the disposal pits; therefore, UXB will not be on site to monitor for these materials.

However, UXB personnel will be on site to monitor the drilling and sampling due to their experience at other IRFNA sites and the conditions that may be encountered.

5.2.4 SEAD-16: Building S-311 Abandoned Deactivation Furnace

Although explosives are most likely to have been completely destroyed in the furnace, heavy metals from the munitions probably exited the furnace in both ash and dust. Because soil samples near the existing deactivation furnace (SEAD-17 described below) have exhibited lead EP Toxicity concentrations in the range of 0 to 384 mg/l (refer to Appendix D), it is assumed that the soils surrounding the abandoned deactivation furnace may also show elevated lead concentrations, especially since the unit had no air pollution control devices. In addition to soils, migration pathways from the furnace could be air and groundwater.

Health & Safety procedures for the investigations performed at SEAD-16 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.4.1 Chemicals of Interest

Explosive compounds of interest include HMX, RDX, TNT and 2,4-DNT. In addition to explosive compounds, heavy metals, primarily lead and barium, are of concern. There is also pipe insulation inside the building that may contain asbestos.

5.2.4.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and the other two wells downgradient of the SWMU.

Soils

Sixteen surficial soil samples will be collected (0 to 6 inches in depth) in the vicinity of Bldg. S-311, as shown on Figure 5-4 and tested for the parameters listed in Section 5.2.4.3. Sample SS16-16 will be used to obtain background surface soil quality data.

Groundwater

Three monitoring wells will be installed at the abandoned deactivated furnace area (refer to Figure 5-4). One will be installed in an upgradient location (MW16-1) for background water quality and two will be installed in downgradient locations to determine if hazardous constituents have migrated from this SWMU and determine the direction of groundwater flow. The presumed direction of groundwater flow at this SWMU is to the southwest.

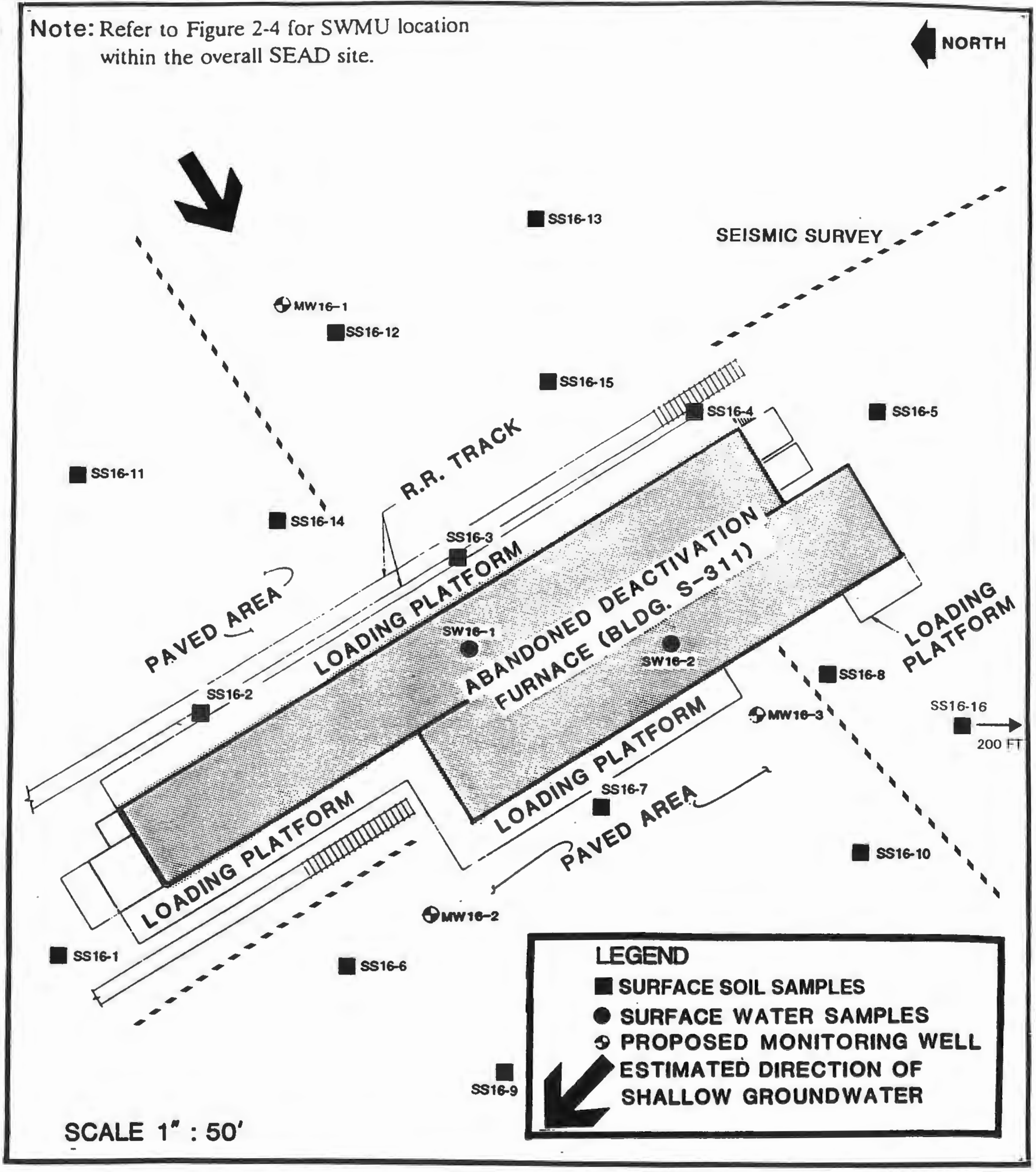
One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.4.3.

Surface Water

Previous inspections of SEAD-16 have revealed standing water within the furnace. Two samples of this standing water will be collected and tested for the parameters listed in Section 5.2.4.3.

Propellants

If propellant residues are present in the pipes that can be safely handled by field sampling and laboratory personnel, the residues will be sampled from a maximum of 3 locations and tested for the parameters listed in Section 5.2.4.3.



Note: Refer to Figure 2-4 for SWMU location within the overall SEAD site.

FIGURE 5-4 SAMPLING LOCATIONS FOR SEAD-16: ABANDONED DEACTIVATION FURNACE (BLDG. S-311)

Solid Materials from the Building

One to two samples of the scale inside the furnace and eight to nine samples of dirt from various locations on the floor of the building will be obtained. Five samples of building materials (pipe insulation, transite panels, etc.) will also be obtained from within the building. These samples will be tested for the parameters listed in Section 5.2.4.3.

5.2.4.3 Analytical Program

A total of sixteen soil samples, three groundwater samples, 10 samples of furnace scale and residues on the floor of the building, two surface water samples, and a maximum of three propellant residue samples will be collected from SEAD-16 for chemical testing. All these 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, and nitrates by Method 352.2. Five samples of building materials and 5 samples of dirt inside the building will be analyzed for asbestos. A summary of the analytical program for SEAD-16 is presented in Table 5-3.

5.2.4.4 Handling UXOs and Explosives

The facility at this SWMU was used to burn explosives in munitions; therefore, there is the potential for UXOs and explosives to be present in the soil. As a result, personnel from UXB will be on-site to monitor the subsurface explorations and sampling. UXB will decide when remote drilling and site clearance will be necessary based on site conditions.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

UXB will clear areas for field personnel to walk onsite, to perform geophysical surveys, and to obtain surface soil, surface water, and groundwater samples.

5.2.5 SEAD-17: Building 367 Existing Deactivation Furnace

The explosives from the munitions burned in the furnace are most likely to have been destroyed in the furnace. Heavy metals probably exited the furnace in the ash and dust. During previous investigations, surface soil samples and wipe samples were collected during an interim closure process and tested for barium and lead. Some of the soil samples collected exceeded EP Toxicity limits established for lead. The primary migration pathways are expected to be soil and groundwater.

Health & Safety procedures for the investigations performed at SEAD-17 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.5.1 Chemicals of Interest

Heavy metals, primarily lead and barium, and explosives are of concern.

5.2.5.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and if necessary adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU.

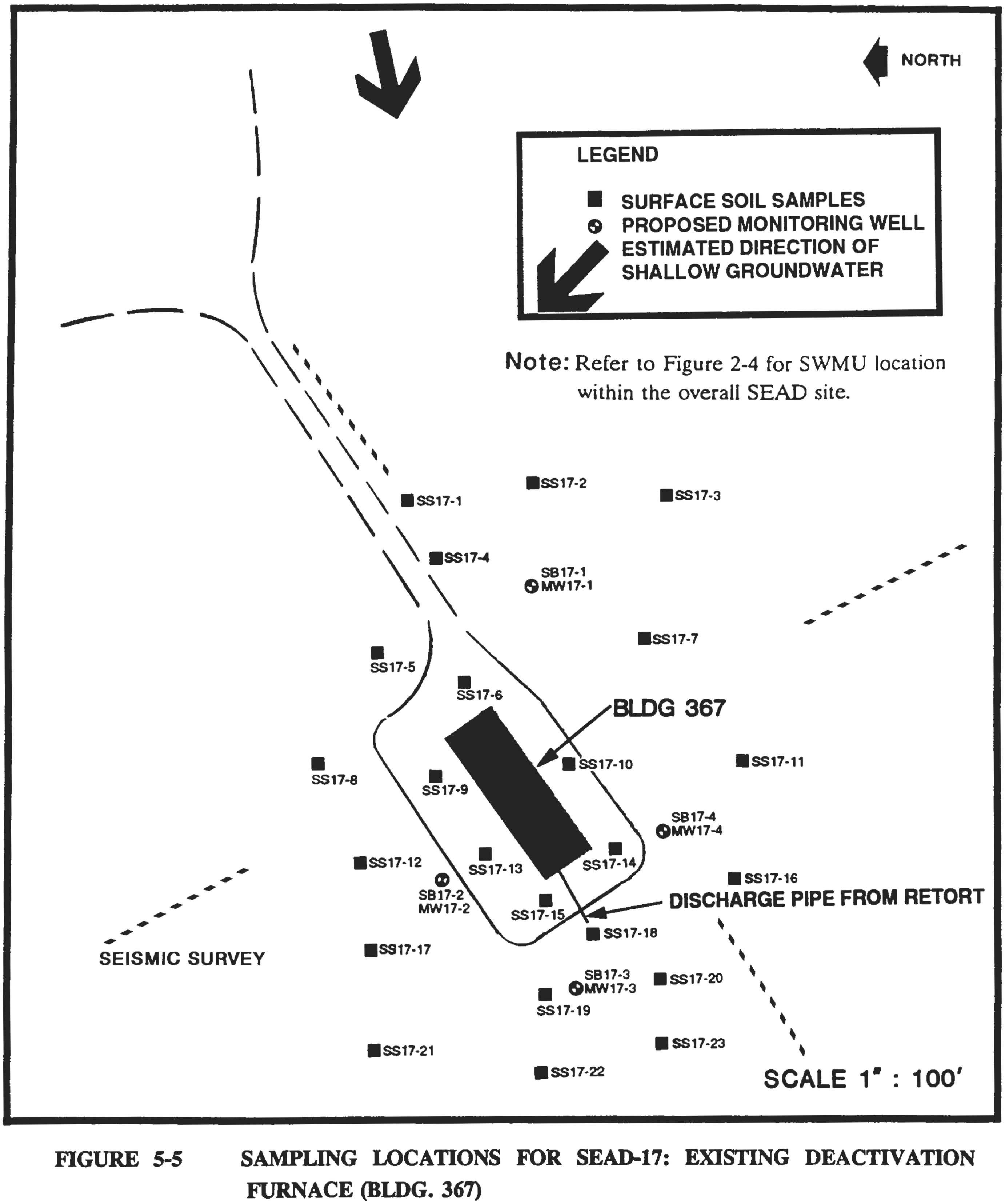
Groundwater

Three monitoring wells will be installed to assess the potential impact of this SWMU on the groundwater quality. One monitoring well (MW17-1) will be installed hydraulically upgradient of the furnace for background water quality, while the remaining two monitoring wells will be installed downgradient of this SWMU (refer to Figure 5-5). The presumed direction of groundwater flow on this SWMU is to the west-southwest.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.5.3.

Soil

Borings: Three soil borings will be drilled at the locations where the monitoring wells will be installed. 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. These include (1) from 0-12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detection (PID) reading, or (4) visibly affected soil (e.g., oil stains). If none of these occur, then the intermediate sample will be collected at



Note: Refer to Figure 2-4 for SWMU location within the overall SEAD site.

FIGURE 5-5 SAMPLING LOCATIONS FOR SEAD-17: EXISTING DEACTIVATION FURNACE (BLDG. 367)

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. The three samples from each boring will be submitted for chemical analyses identified in Section 5.2.5.3. Soil samples from SB17-1 will be used for background soil quality.

Surface Soils: Surficial soil samples from 0 to 6 inches below grade will be obtained from 23 locations around Building 367. One of the samples, SS17-18, will be obtained from the discharge point of the pipe that drains water from the retort inside the building. These samples will be submitted for the chemical analysis identified in Section 5.2.5.3. Soil samples from SB17-1 will be used for background soil quality.

5.2.5.3 Analytical Program

A total of three groundwater samples, nine subsurface soil samples, and 23 surficial soils samples will be collected from SEAD-17 for chemical analysis. 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, and nitrates by Method 352.2. A summary of the analytical program for SEAD-17 is presented in Table 5-3.

5.2.5.4 Handling UXOs and Explosives

No UXOs or explosive compounds at concentrations high enough to detonate are expected to be present in the soils surrounding SEAD-17; therefore, no remote drilling or UXO clearance will be performed during field work at this SWMU.

5.2.6 SEAD-24: Abandoned Powder Burning Pit

Although the operating practices of the pit are unknown, explosive compounds are the primary constituents of concern. Because these explosive compounds could leach into the groundwater, the primary migration pathways are expected to be groundwater and soil.

Health & Safety procedures for the investigations performed at SEAD-24 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.6.1 Chemicals of Interest

The primary chemicals of interest are explosive compounds, including HMX, RDX, TNT, 2,4-DNT, heavy metals, VOCs (solvent initiator), and TPH (fuel oil initiator).

5.2.6.2 Media To Be Investigated

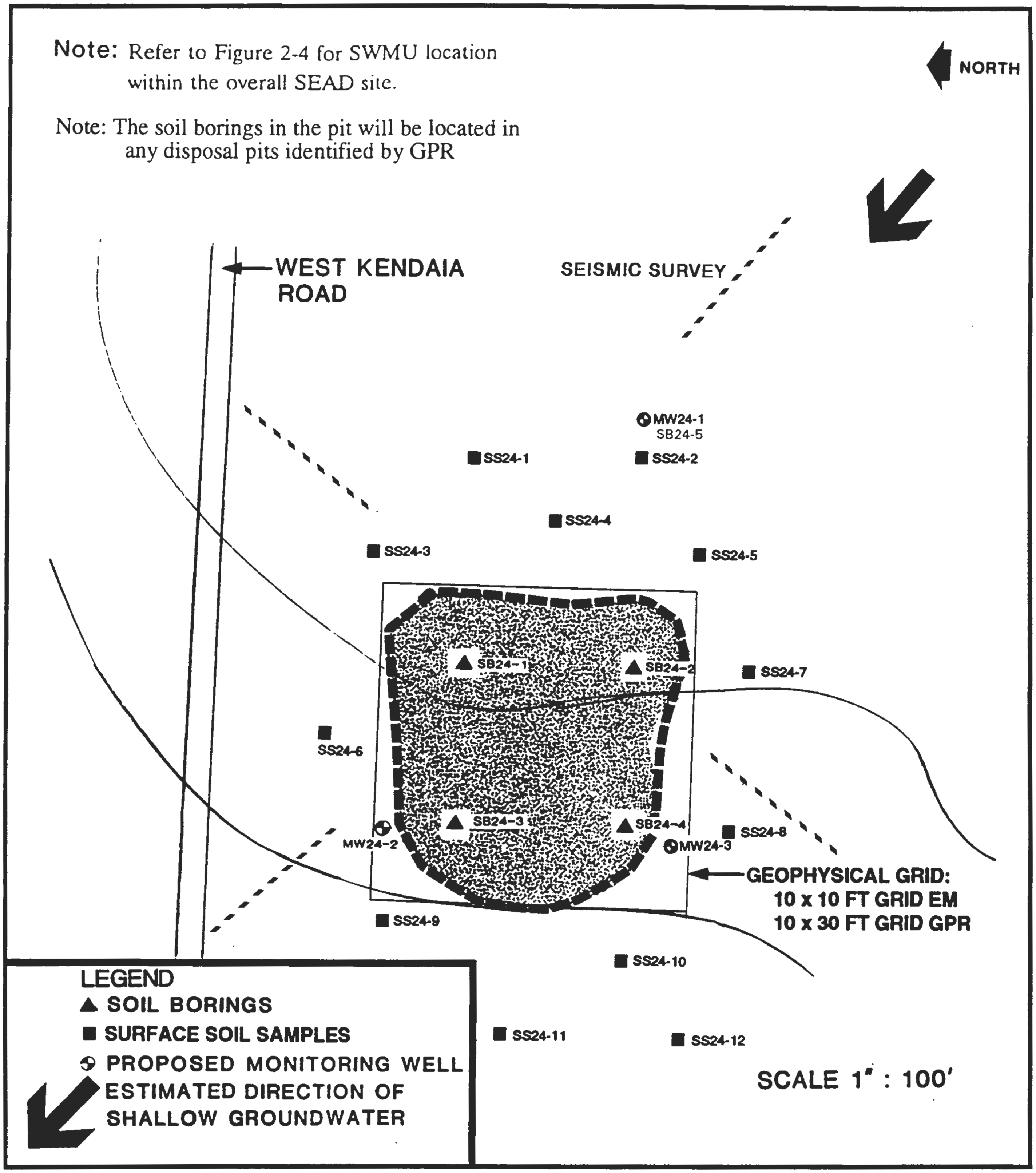
Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU.

To evaluate the subsurface conditions at SEAD-24, EM-31 and GPR surveys will be performed to locate potential pits and buried ordnance at the site. A grid of electromagnetic data will be collected across the site. The profiles will be spaced at 10-foot intervals with electromagnetic measurements made at 10-foot intervals along each profile. If the electromagnetic data indicate substantial anomalies associated with buried metallic objects, a subsequent radar survey will be performed to characterize each anomaly source. In addition, GPR data will be collected along all profiles spaced at 30-foot intervals to characterize the extent of disturbed soils at the site.

Soils

Borings: A total of four borings will be performed within the berm area at this SWMU (refer to Figure 5-6). The borings will be performed in any pits tentatively identified by GPR. If no pits are identified, the borings will be drilled at the approximate location shown. A fifth boring (SB24-5) will be drilled to obtain background soil quality 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: (1) from 0 to 12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detector (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 intermediate sample to be analyzed.



Note: Refer to Figure 2-4 for SWMU location within the overall SEAD site.

Note: The soil borings in the pit will be located in any disposal pits identified by GPR

FIGURE 5-6 SAMPLING LOCATIONS FOR SEAD-24: ABANDONED POWDER BURNING PIT

Surface Soils: Surficial soil samples 0 to 6 inches below grade will be obtained from 12 locations surrounding the abandoned pit. These samples will be submitted for the chemical analyses identified in Section 5.2.6.3.

Groundwater

One monitoring well (MW24-1) will be installed upgradient of SEAD-24 to obtain background water quality data, while two monitoring wells will be installed adjacent to and downgradient of this unit to evaluate whether hazardous constituents have migrated from the SWMU and to determine the groundwater flow direction. The presumed direction of groundwater flow at this SWMU is to the northwest.

One monitoring well will be installed at each location that is screened over the entire thickness of the aquifer. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.6.3.

5.2.6.3 Analytical Program

A total of 27 soil samples and three groundwater samples will be collected from SEAD-24 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 352.2, and total petroleum hydrocarbons by Method 8015. A summary of the analytical program for SEAD-24 is presented in Table 5-3.

5.2.6.4 Handling UXOs and Explosives

The facilities at this SWMU were used to burn explosives; therefore, there is the potential for UXOs and explosives to be present in the soil in the pit. As a result, personnel from UXB will be on-site to monitor the subsurface explorations and sampling performed in the pit. UXB will decide when remote drilling and site clearance will be necessary based on site conditions. The following paragraphs present the proposed procedures to handle UXOs and explosives at SEAD-24.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

UXB will clear areas for field personnel to walk in the pit and to perform geophysical surveys.

5.2.7 SEAD-25: Fire Training and Demonstration Pad

Based on past site activities, spent solvents (prior to RCRA), water-contaminated fuels and oils have been used at this SWMU. The primary migration pathways are expected to be groundwater, although soil and air are also potential pathways.

Health & safety procedures for the investigations performed at SEAD-25 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.7.1 Chemicals of Interest

Petroleum products, primarily benzene, toluene and xylene, and solvents are of concern. Additionally, lead may also be of concern if leaded fuels were used for fire fighting demonstrations. Where waste oil is managed, there is potential for PCB transformer oil to be mixed in with it.

5.2.7.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradients of the SWMU.

Soils

A total of six soil borings will be advanced at this SWMU, five within the area of the pad (refer to Figure 5-7), and one east of the pad to obtain background soil quality 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: (1) from 0 to 12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detector (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 intermediate sample analyzed.

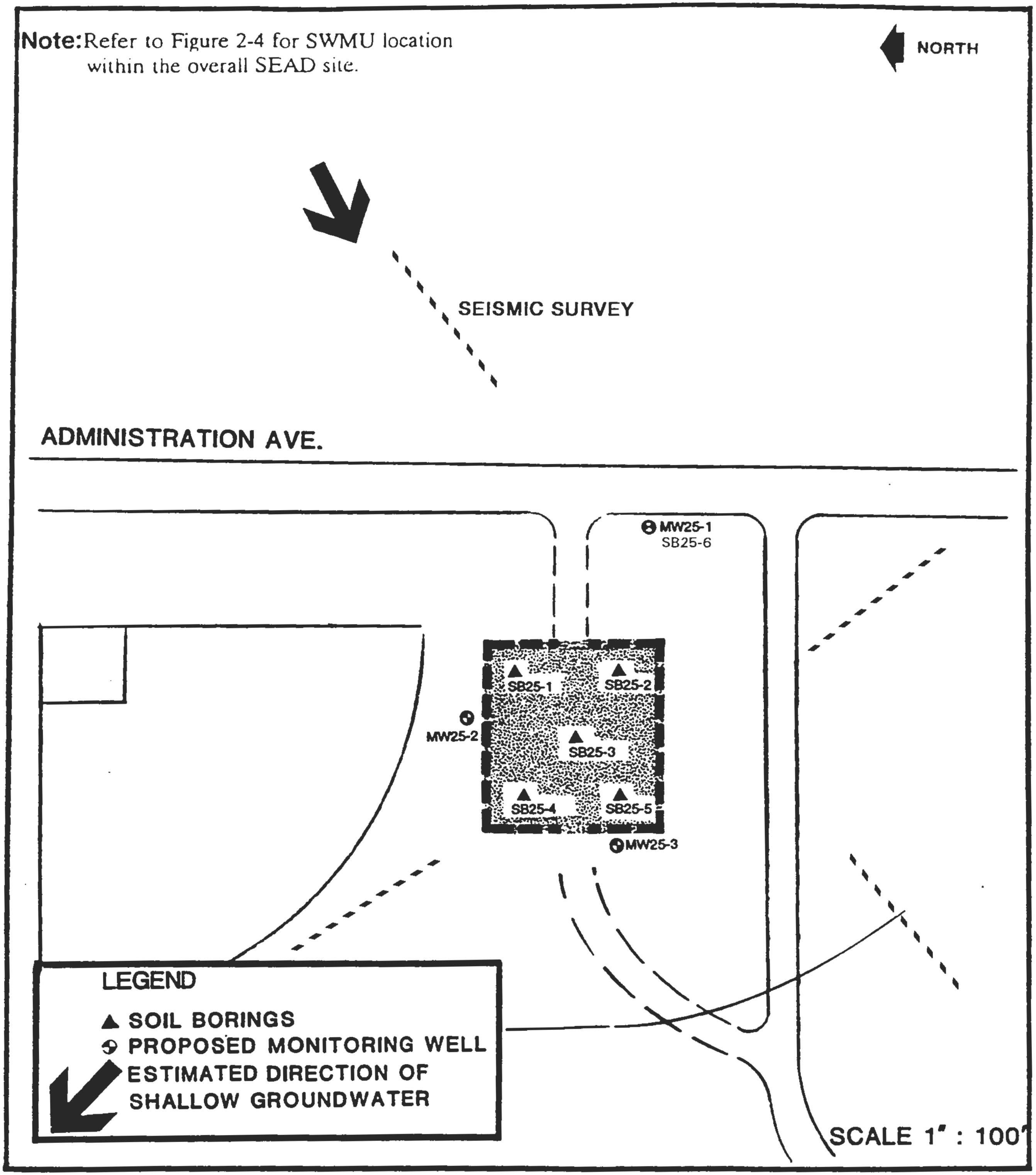


FIGURE 5-7 SAMPLING LOCATIONS FOR SEAD-25: FIRE TRAINING AND DEMONSTRATION PAD

Groundwater

A total of three monitoring wells will be installed at this SWMU. One monitoring well will be installed upgradient of the pad to obtain background water quality data, while the remaining two wells will be installed adjacent and downgradient of the pad to determine if hazardous constituents have migrated from the SWMU and to determine the direction of groundwater flow. The presumed direction of groundwater flow at this SWMU is to the southwest.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.7.3.

5.2.7.3 Analytical Program

A total of 18 soil samples and three groundwater samples will be collected from SEAD-25 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs [including methyl tertiary butyl ether (MTBE)], SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, herbicides by Method 8150, nitrates by Method 352.2, and total petroleum hydrocarbons by Method 8015. A summary of the analytical program for SEAD-25 is presented in Table 5-3.

5.2.7.4 Handling UXOs and Explosives

UXOs nor explosives were handled at SEAD-25; therefore, no remote drilling or UXO clearance will take place during the field work.

5.2.8 SEAD-26: Fire Training Pit and Area

Fuels, oils and solvents were stored in the fire training area and burned in the pit (refer to Figure 5-8). Approved fuels are currently burned in the pit.

Flammable materials were floated on water within the fire pit prior to extinguishing; therefore, fuels containing water, used oils and herbicides and spent solvents (prior to RCRA) may have leached into the subsurface and migrated down to the water table. The primary migration pathways are expected to be soil, groundwater, and surface water.

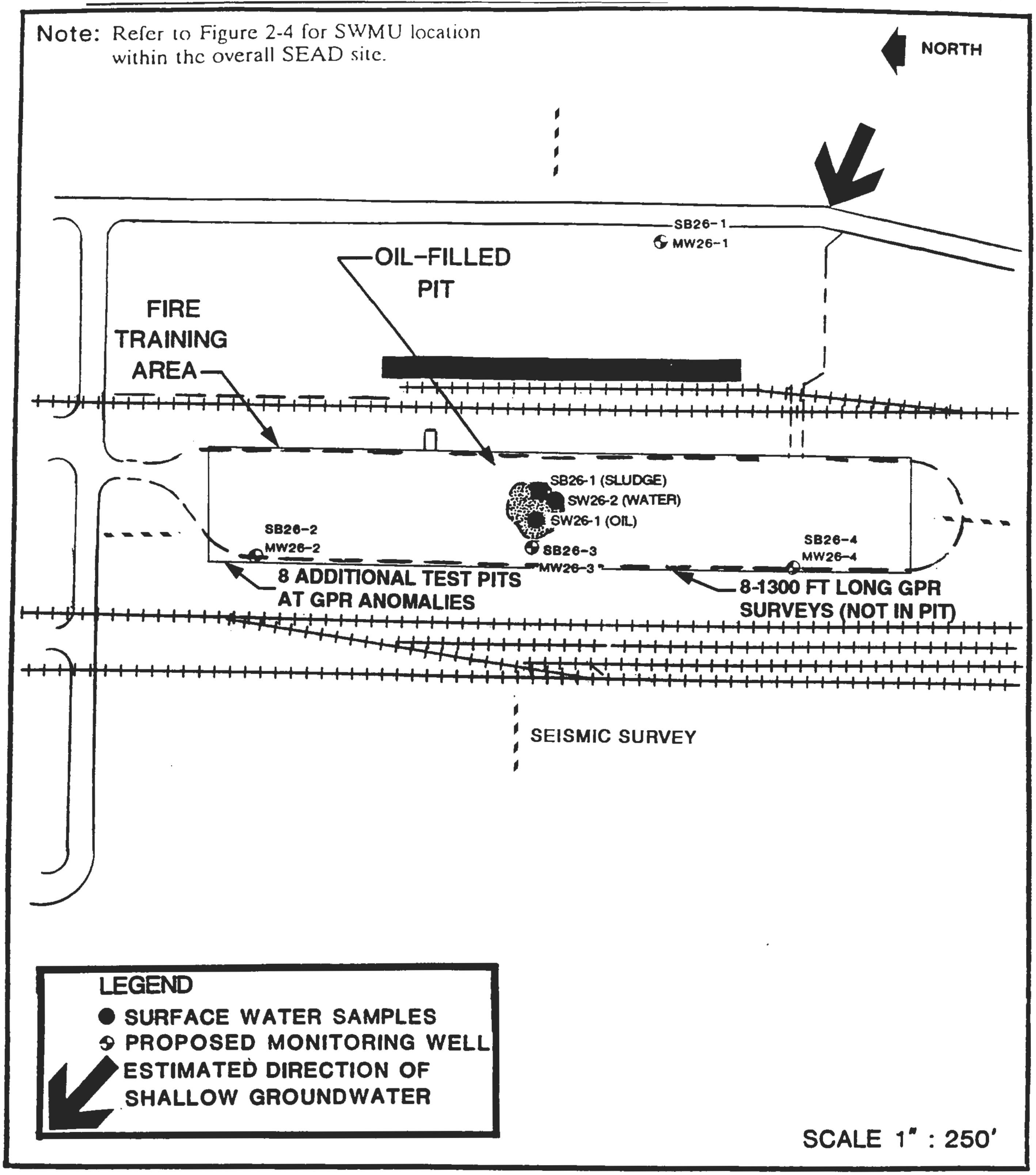


FIGURE 5-8 SAMPLING LOCATIONS FOR SEAD-26: FIRE TRAINING PIT AND AREA

Health & Safety procedures for the investigations performed at SEAD-26 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.8.1 Chemicals of Interest

The primary chemicals of interest are solvents and petroleum products, including benzene, toluene and xylenes. Lead may also be a constituent of concern because leaded fuels were likely to have been used. Where waste oil is managed, there is potential for PCB transformer oil and herbicides to be mixed in with it.

5.2.8.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU.

A GPR survey will be performed within the fire training area, but not within the fire training pit. The data will be collected along eight 1300 foot long profiles in the area outlined in Figure 5-8. The GPR data will be used to detect anomalies and characterize the extent of disturbed soils at the site.

Soils

Borings: A total of four borings are proposed for this SWMU; one boring will be drilled upgradient of the pit and three borings will be drilled downgradient of the fire training area (refer to Figure 5-8). One of the downgradient borings proposed is adjacent to the pit. These four borings are associated with the four proposed wells. Each boring will be continuously sampled to the top of the water table. Samples from SB26-1 will be used to obtain background soil quality data.

Test Pits: Eight test pits will be excavated at anomalies detected during the GPR survey. If less than eight anomalies are detected, a total of eight test pits will still be excavated: one at each anomaly and the others at locations in the fire training area where no anomalies were detected.

A total of three samples from each boring and test pit will be collected: (1) from 0 to 12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detector (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 intermediate sample analyzed.

Groundwater

Four wells are proposed for SEAD-26, one upgradient for background water quality data and three adjacent and downgradient (refer to Figure 5-8) to determine the groundwater flow direction and determine if hazardous constituents have migrated from the SWMU. The presumed direction of groundwater flow at this SWMU is to the southwest.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.8.3.

Oil, Surface Water, and Sediment

Three samples will be obtained from the fire training pit: one of any oil floating on the water, one of the surface water, and one of the sediment at the bottom of the pit. These samples will be analyzed for the parameters listed in Section 5.2.8.3.

5.2.8.3 Analytical Program

A total of 36 soil samples, four groundwater samples, one sediment sample, and one surface water sample will be collected from SEAD-26 for chemical testing. All these samples will be analyzed for the following: the TCL VOCs [including methyl tertiary butyl ether (MTBE)], SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, herbicides by Method 8150, nitrates by Method 352.2, and total petroleum hydrocarbons by Method 8015. One oil sample will be collected, then analyzed for TPH by Method 8015, PCBs by Method 8080, and herbicides by Method 8150. A summary of the analytical program for SEAD-26 is presented in Table 5-3.

5.2.8.4 Handling UXOs and Explosives

No UXOs or explosives are known to have been used at the fire training area: therefore, no remote drilling or UXO clearance will be performed during field activities at this SWMU.

5.2.9 SEAD-45: Open Detonation Facility

Based on the operating practices at SEAD-45, metals, nitrates and explosive compounds have the potential to be adsorbed into the soil or to migrate to the water table.

Health & Safety procedures for the investigations performed at SEAD-45 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.9.1 Chemicals of Interest

The primary chemicals of interest are heavy metals, explosive compounds and nitrates.

5.2.9.2 Media To Be Investigated

Geophysics

To evaluate the potential for buried unexploded ordinance at the OD ground, GPR and EM-31 surveys will be performed in the area surrounding the elongate detonation hill. The electromagnetic data will be collected along profiles spaced at 10-foot intervals with readings spaced at 10 feet along each profile. Where the electromagnetic data indicate anomalies possibly associated with buried metallic objects, a subsequent ground-penetrating survey will be performed to characterize the anomaly source. A maximum of 10 test pits will be excavated to observe the types of buried metallic objects present at this SWMU.

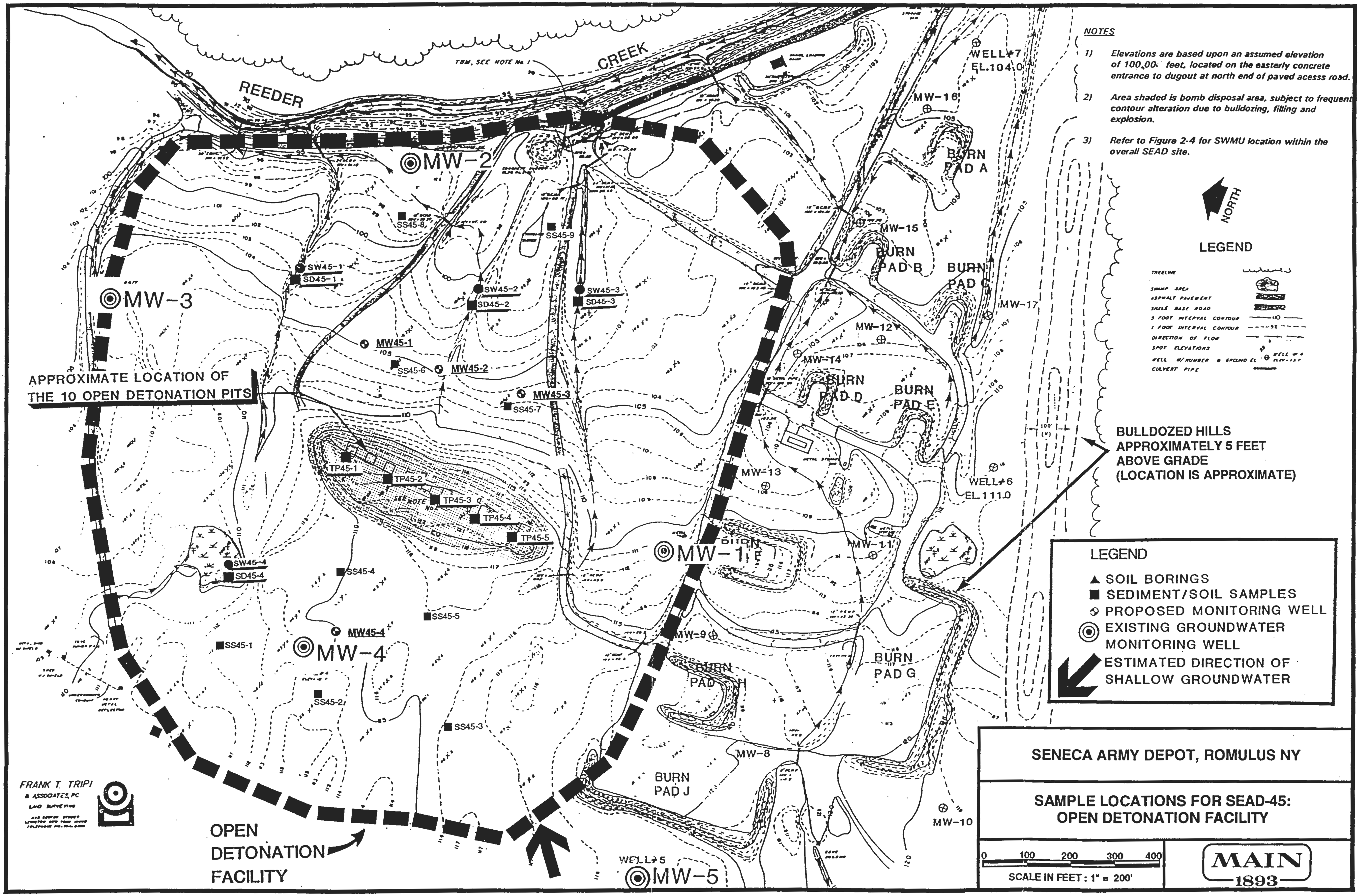
Soils

Test Pits: Soil samples will be collected from five test pits in the detonation mound (refer to Figure 5-9). Four soil samples will be collected from each test pit and composited into one sample/test pit.

Surface Soils: Nine surficial soil samples will be obtained from locations east and west of the ten open detonation pits. Chemical analysis of these samples will be used to evaluate the effect of wind-blown material from the pits on the environment in the two prominent wind directions, east and west.

Soil quality data will be compared to background soil quality data obtained during the RI investigation at the adjacent open burning grounds.

FIGURE 5-9



NOTES

1) Elevations are based upon an assumed elevation of 100.00 feet, located on the easterly concrete entrance to dugout at north end of paved acess road.

2) Area shaded is bomb disposal area, subject to frequent contour alteration due to bulldozing, filling and explosion.

3) Refer to Figure 2-4 for SWMU location within the overall SEAD site.

SENECA ARMY DEPOT, ROMULUS NY

SAMPLE LOCATIONS FOR SEAD-45: OPEN DETONATION FACILITY

Groundwater

Four wells are proposed for SEAD-45. One well will be upgradient of the mound to obtain background water quality data and three wells will be located downgradient of the detonation mound as shown on Figure 5-9. These wells will be completed 3 to 5 feet below grade then covered with soil to avoid damage by OD facility operations. Each well cap will have a large magnet fixed to the inside of the casing cap to facilitate locating the well for groundwater sample collection. The direction of groundwater flow at this SWMU is northeast to east toward Reeder Creek based on data from the existing wells.

Existing wells MW-1 through MW-5 will be sampled with the four proposed wells. Well MW45-4 will be used as an upgradient well.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample will be collected from each well.

Surface Water and Sediment

A surface water sample and a sediment sample will be collected at the same sampling point from each of four locations at SEAD-45: three drainage channels east of the detonation mound and the marsh area northwest of the detonation mound as shown in Figure 5-9. Surface water and sediment quality data will be compared to background surface water and sediment data obtained during the RI investigation at the adjacent open burning grounds.

5.2.9.3 Analytical Program

Fourteen soil samples, nine groundwater samples, four surface water samples and four sediment samples will be collected from SEAD-45 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, and nitrates by Method 352.2. A summary of the analytical program for SEAD-45 is presented in Table 5-3.

5.2.9.4 Handling UXOs and Explosives

The facilities at this SWMU were used to destroy munitions; therefore, there is the potential for UXOs and explosives to be present in the soil. As a result, personnel from UXB will be on-site to monitor the subsurface explorations and sampling. UXB will decide when remote drilling and site clearance will be necessary based on site conditions. The following paragraphs present the proposed procedures to handle UXOs and explosive at SEAD-45.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

Test pit excavations and the collection of soil samples from the excavations will be performed by UXB.

UXB 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.

5.2.10 SEAD-57: Explosive Ordnance Disposal Area

Based on past operating practices, metals, nitrates and explosives from the detonation of explosives could become adsorbed onto soil particles or migrate to groundwater. The estimated direction of groundwater flow is southwest.

Health & Safety procedures for the investigations performed at SEAD-57 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.10.1 Chemicals of Interest

The primary chemicals of interest are heavy metals, nitrates, and explosive compounds.

5.2.10.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the detonation area and shallow depression.

To evaluate the potential of buried unexploded ordinance at the site, GPR and EM-31 surveys will be performed within the inner area of the circular 70-foot diameter bermed detonation area and shallow depression (refer to Figure 5-10). The EM-31 data will be collected on a 10-foot by 10-foot grid. Where the EM-31 data indicate anomalies possibly associated with buried metallic objects, a subsequent GPR survey will be performed to characterize the anomaly source.

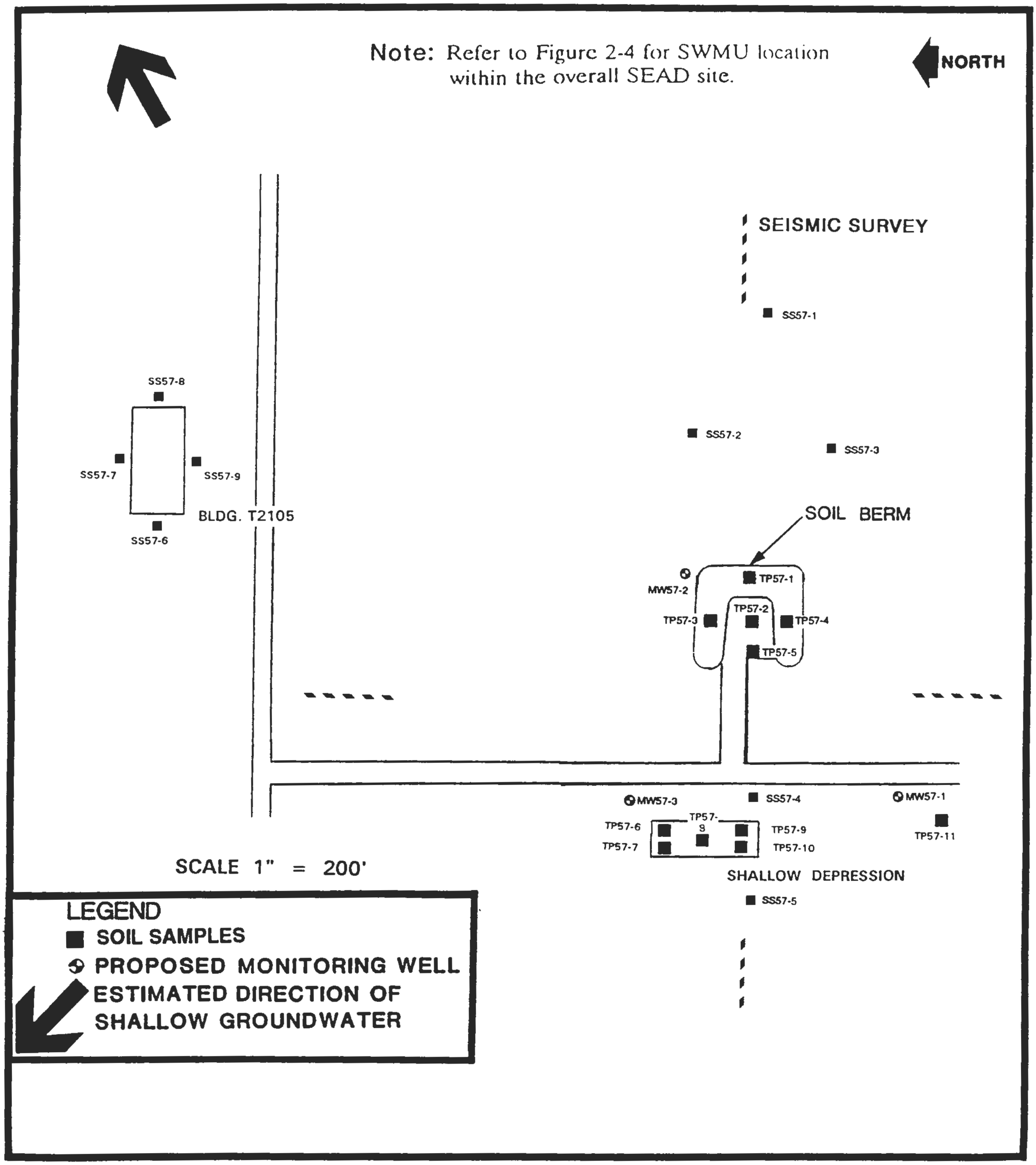


FIGURE 5-10 SAMPLING LOCATIONS FOR SEAD-57: EXPLOSIVE ORDNANCE DISPOSAL

Soil

Test Pits: Eleven test pits will be excavated at SEAD-57: three on the berm (TP57-1, -3, and -4), two within the detonation area (TP57-2 and -5), five in the depressed area (TP57-6 to -10), and at a background location (TP51-11) (Figure 5-10). The test pits will be located at anomalies detected during the geophysical surveys in these three areas. If no anomalies are detected within an area, the test pits will be located as shown in Figure 5-10. Four soil samples will be collected from each test pit and composited into one sample per test pit.

Surface Soils: Five surficial soil samples from 0 to 6 inches below grade will be obtained from locations east and west of the disposal area which are the dominant wind directions. Four other surficial soil samples will be obtained from around Building T2105. These locations are shown on Figure 5-10.

Groundwater

Three wells are proposed for SEAD-57, one upgradient and two adjacent and downgradient. The estimated direction of groundwater flow is to the northeast. One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample will be obtained from each well.

5.2.10.3 Analytical Program

A total of twenty soil samples and three groundwater samples will be collected from SEAD-57 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 352.2. A summary of the analytical program for SEAD-57 is presented in Table 5-3.

5.2.10.4 Handling UXOs and Explosives

The facilities at this SWMU were used to destroy munitions; therefore, there is the potential for UXOs and explosives to be present in the soil. As a result, personnel from UXB will be on-site to monitor the subsurface explorations and sampling. UXB will decide when remote drilling and site clearance will be necessary based on-site conditions. The following paragraphs present the proposed procedures to handle UXOs and explosives at SEAD-57.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

Test pit excavations and the collection of soil samples from the excavations will be performed by UXB.

UXB will clear areas for field personnel to walk on-site, to perform geophysical surveys, and to obtain surface and groundwater samples.

5.3 DATA REDUCTION, ASSESSMENT AND INTERPRETATION

Upon completion of all field investigations identified in Section 5.2, 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.

5.3.1 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.

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.

5.3.2 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.

5.3.3 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.

5.3.4 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.

5.3.5 Comparison to Background

5.3.5.1 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.

5.3.5.2 Statistical Comparisons

The EPA recommends several statistical methods for comparing data, depending upon the situation (EPA 1989). The various methods and circumstances under which they are utilized are presented in Table 5-4. Once data are produced from the investigation, a statistical method will be selected and implemented for the ten SWMUs under investigation. Groundwater data can be statistically compared using any of these methods. Only some of these methods can be used to statistically compare other media, such as soil.

5.3.6 Survey

Surveying will be performed at the ten 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 photogrametric 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 MAIN's Engineering Site Package (ESP) software on our Intergraph CAD System. This approach will

TABLE 5-4

EPA-RECOMMENDED STATISTICAL METHODS[1]

Constituent	Type of Comparison	Recommended Method	Section of Guidance Document[1]
Any Constituent in Background	Background vs. Compliance Well	ANOVA Tolerance Limits Prediction Intervals	5.2 5.3 5.4
	Intra-well	Control Charts	7
ACL/MCL Specific	Fixed Standard	Confidence Intervals Tolerance Limits	6.2.1 6.2.2
Synthetic	Many Nondetects in Data Set	Refer to Section 8.1	8.1

NOTE: [1] U.S.EPA, "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, April 1989 (EPA/530-SW-89-026).

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 photogrametric 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-7-1990 USAED-HUNTSVILLE	SEAD-8-1990 USAED-HUNTSVILLE	SEAD-9-1990 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:

Traverse

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)

Leveling

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.

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ATTACHMENT: Exemption letter from U.S. EPA Region II to the U.S. Army dated September 16, 1991.

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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, except SEAD-45, 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

Four 120-foot seismic refraction transects will be laid out at each site. They will be approximately equidistant from the center of the SWMU and each other with each transect pointing toward the center of the SWMU. 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 ± 1.0 feet horizontally and ± 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.

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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 5.3.6 of Section 5; "SWMU Investigations".

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 of these steps are 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 than 1 inch then 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 the 1/4" Tygon tubing installed in the head of the 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 suspended and is collected by the tube (the purge water should become silt-laden and have a dark brown-gray 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. After 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 by 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 well). 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.

Sampling

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, herbicides, total petroleum hydrocarbons, nitrate, and fluoride. 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 5 of the Work Plan. The sampling will be accomplished by using the following procedure:

1. Establish the exact location of each sampling station in the field. The sample site will be noted on a site plan and marked in the field with flagging and a 4-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).

FIGURE A-11

PAGE OF

SAMPLING RECORD – GROUNDWATER

ENGINEERING – SCIENCE, INC.

CLIENT:

DATE:

OJECT:

CATION:

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)		GROUND / SITE SURFACE CONDITIONS
				VELOCITY (APPRX)	DIRECTION (0 – 360)	

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 FOR SAMPLES TAKEN	VOA					
	SVO					
	METALS					
ODOR (VOC)						
COLOR						
TEMPERATURE (C)						
SPEC. COND. (umhos)						
pH						
TURBIDITY (NTU)						
FIELD FILTERED (Y/N)						

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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 5.0 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.

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)		GROUND / SITE SURFACE CONDITIONS
				VELOCITY (APPRX)	DIRECTION (0 – 360)	

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)

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ver. 1 / 09–Oct–92 SEE MASTER ACRONYM LIST FOR COMPLETE LISTING OF ABBREVIATIONS WTRRCD.WK1

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.

Sediment samples will be analyzed as described in Section 5.0, SWMU Investigations 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 SOIL GAS SURVEY

3.7.1 Objectives

A soil gas survey will be performed at selected SWMUs to evaluate the potential volatile organic compounds in the soil or on or in the groundwater. The soil gas survey will allow a delineation of the source areas, which may be contributing to groundwater contamination. The exact number of sampling locations are described in Section 5 of this Work Plan for each SWMU. Soil gas surveys could extend beyond the proposed program when necessary to define a source area.

3.7.2 Explanation Of Method

The method involves extracting a small representative sample of soil gas through a hollow steel probe driven a few feet into the ground and analyzing the gas for the presence of volatile contaminants. The presence of contaminants in the soil gas provides a strong indication that there is a source of volatile organics either in the soil near the probe or in the groundwater below the probe. The soil gas analysis is performed in the field with a portable gas chromatograph so that sample loss does not occur due to shipment off-site. The analytical results are available immediately and can be used to help direct the investigation.

Soil gas analysis is used as a screening tool for rapidly identifying contaminant sources in soils and, in some cases, delineating groundwater contamination plumes. In soils above groundwater contamination plumes, the expected soil gas concentrations will be much less than those concentrations which would be expected for source soils. The soil gas program described in this workplan will identify areas where volatile organics range in concentration between 0.5 to 100 ppm. These concentrations will indicate the presence of source materials (i.e., soils saturated with solvents). These soils constitute a continual sink for groundwater impacts.

The soil gas evaluation program involves three essential elements. These are:

1. Soil Gas Sampling
2. Analytical Support
3. Data Interpretation

3.7.3 Soil Gas Sampling

1. A 1.75-inch, outer diameter, steam-cleaned, hollow hardened carbon steel drilling rod (AW) is driven approximately 5 feet below the ground surface using a drilling rig equipped with standard drilling equipment. The steel drilling rod is fitted with a penetrometer point on the tip (Figure A-13).

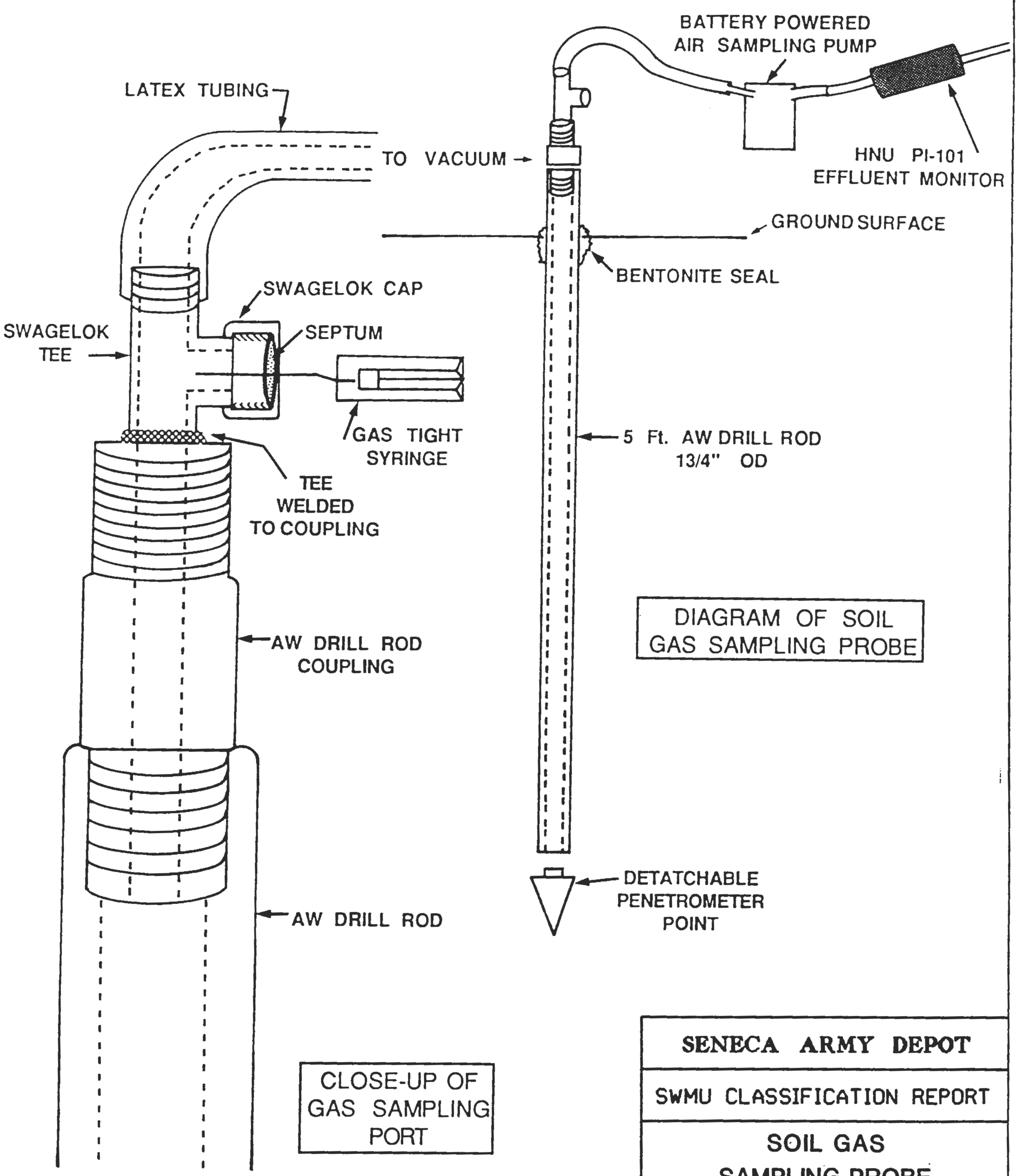
2. Once the desired depth of penetration is reached, the drilling rod is withdrawn approximately 6 inches which allows the penetrometer point to dislodge from the rod and creates a void space through which soil gas can be extracted. A metal rod is inserted into the hollow drilling rod to ensure that the penetrometer point has been dislodged. If necessary, the point is knocked out with the metal rod.

3. Bentonite is packed at the ground surface around the probe to prevent influx of atmospheric air into the sample probe.

4. The hollow drilling rod exposed above the land surface is fitted with a coupling containing both evacuation and sampling ports. Teflon tape will be used on the threads connecting the coupling to the hollow drilling rod to prevent infiltration of surface gases into the sampling port.

5. The probe is purged by creating a slight negative pressure with an air sampling pump through a latex evacuation line to ensure that the gases flowing through the hollow drilling rod are representative of soil gases. Samples of soil gas are collected prior to contact with any tubing or pumps.

6. The effluent gas from the air sampling pump will be monitored with a hand held vapor monitor, such as the HNU PI101. The gas sample will be collected immediately if the effluent monitoring indicates an increase in the concentration of volatiles. Gas samples will be collected to coincide, as much as possible, with the highest concentration of gas



SENECA ARMY DEPOT

SWMU CLASSIFICATION REPORT

SOIL GAS
SAMPLING PROBE

SEPTEMBER 1991

MAIN
1893
CHAS. T. MAIN, INC., Engineers
BOSTON . CHARLOTTE . PASADENA

found to be present. If no increase in the concentration of soil gas is determined by the effluent monitoring then purging will be performed for a minimum of 5 minutes. After 5 minutes of purging, a soil gas sample is collected through a septum port using a gas-tight gas sampling syringe.

7. The sample is then injected into the portable gas chromatograph for analysis.

8. The drilling rod is removed from the ground using the drill rig and the probe hole is backfilled with bentonite to prevent infiltration of surface water. Drilling rods will be steam cleaned after each use. Other sampling equipment (e.g., drill couplings, sampling syringes, tubing, etc.). will be decontaminated after each use according to the decontamination procedures outlined in Section 4.5 of this appendix. All syringes will be decontaminated prior to field use and checked for cleanliness by running blanks.

9. The sampling locations will be marked in the field so that a land surveyor can produce coordinates and elevations for them.

3.7.4 Analytical Support

Soil samples are analyzed in the field using a portable gas chromatograph to facilitate real time data acquisition. A simplified explanation of the analytical procedure is provided in the following paragraphs.

The gas chromatograph instrument separates compounds in a chromatographic column (selected on a site-specific basis) and detects and quantifies the compounds using a detector. After a sample is introduced to the chromatograph, it is carried by a carrier gas through the column. Different compounds pass through the column at different rates, resulting in a characteristic "retention time" for each compound. By comparison with standards, this retention time can be used to identify compounds. The detector responds to the presence of compounds by producing an electric current. The magnitude of this current can be used, when compared to standards, to determine concentrations of compounds present in the sample.

The analytical system to be utilized for this program is the portable Photovac 10S50 gas chromatograph. This instrument is equipped with a heated capillary column and an on-board peak integrator. The detector for this instrument is the Photoionization Detector (PID). The PID is ideal for detecting volatile organic compounds which contain aromatic rings and unsaturated double bonds.

Quantitative analysis of soil gas requires quantitative gas standards. Gas standards will be prepared by a gas standard vendor such as Scott Specialty Gas or Canaan Scientific Products, Inc. The gas standard mixture will include trichloroethene, 1,2-dichloroethene, benzene, toluene, and xylene, each at concentrations of approximately 100 ppmv. This standard mixture will be certified by the standard manufacturer and a certificate of analysis will accompany the gas standard. All field calibration standards will be prepared from this certified gas standard. Dilutions will be made from this standard by injecting a known volume of calibration gas into a clean glass sampling bulb of known volume.

Since the intent of the soil gas program is to indicate the presence of elevated concentrations of volatile organic compounds, soil gas results will be expressed as total volatile organic compounds as trichloroethene. If retention time matches between the soil gas sample and the calibrated gas standard are within ± 1 sec. then individual compounds detected in the soil gas will be reported. However, since the soil gas program is a screening program determination of individual organic compounds is not critical to the detection and delineation of likely source areas.

A detailed description of the analytical procedures is as follows:

Calibration Procedures and Frequency

The analytical instrument will be calibrated each day prior to the analysis of a sample.

Gas Standards

Gas standards will be prepared from certified pre-calibrated compressed gas cylinders. Compressed gas standards offer advantages in time savings and ease of use. However, they are limited to only those compounds within the cylinder. The VOC concentrations will be traceable to National Bureau of Standards (NBS) standards.

The calibration procedure is as follows:

1. A two stage pressure regulator is attached to the cylinder for gas removal.

2. A clean, labeled, glass gas sampling bulb (approx. 125 ml), with a teflon connection is placed over the second stage effluent port. The teflon stopcocks at both ends are opened.

3. The diaphragm of the regulator is turned counterclockwise until the pressure in the diaphragm is unnoticeable by the hand.

4. The cylinder valve is opened. The first stage pressure will indicate the current cylinder pressure.

5. The second stage pressure is increased to 2 psig by turning the regulator valve clockwise.

6. Gas should be heard passing through the bulb as the second stage pressure is increased. The bulb is allowed to purge for approximately 10 seconds. The teflon stopcock furthest from the regulator is closed, then, the stopcock closest to the regulator is closed. The gas is now captured within the glass bulb at the delivery pressure of the regulator.

7. Using a gas-tight, designated syringe, an appropriate volume of captured gas will be removed from the bulb through the silicone septum and injected into the clean sampling bulb.

8. The Response Factor (RF) for each analyte is obtained as the ratio of the gas concentration injected and the area under the peak produced by that injection. This integration is performed electronically by the on-board electronic integrator.

9. Response factors will be obtained for each analyte listed in the gas standard.

10. For constant volume injections, the RF represents the concentration of analyte per unit area of instrument response. It is obtained by injecting a known concentration of analyte into the instrument and dividing the concentration by the area of the peak observed on the chromatogram. The analyte concentration in an unknown soil gas sample is determined by injecting an equal volume of gas into the gas chromatograph. The peak area obtained from the unknown sample is multiplied by the RF to determine the actual concentration of the analyte injected.

    The RF allows conversion of peak areas into concentrations for the contaminants of interest. The RF used is changed if the standard response varies 50%. If the standard injections vary by more than 50% the standard injections are repeated. If the mean of the two standard injections represents greater then 50% difference than a third standard is injected and a new RF is calculated from the three standard injections. A new data sheet is started with the new RFs and calibration data.

$$\%\ Difference = \frac{A\ area - B\ area}{A\ area}$$

Where: A = mean peak area of standard injection from first calibration
B = peak area of subsequent standard injection

The low peak standards will be made fresh daily.

A two point calibration curve will be performed daily, one point will be approximately 0.5 ppmv and the second point will be at approximately 5 ppmv. Dilutions of the calibrated gas standard will be performed using gas-tight syringes and injecting appropriate volumes into clean gas-tight gas sampling bulbs of known volume.

11. Syringe blanks will be performed for each syringe to be used prior to analysis. Syringes will be cleaned with Alconox or equivalent detergent and brush daily. They will be baked out in an oven at a minimum temperature of 60°C. for a minimum of 1 hour prior to use.

12. System blanks are ambient air drawn through a probe not installed in the ground and through the complete sampling apparatus. This air is analyzed by the same procedure as a soil gas sample. One system blank will be run at the start of each day from the batch of probes to be used.

13. A duplicate field sample will be taken after every 20 sample locations or at a minimum of one per day.

14. Field notebooks will be kept detailing the sample identification and amount of sample injected.

The following system parameters will also be noted:

a) Gas flows for the ultra pure air
b) Tank pressures for the ultra pure air
c) Integrator parameters
    1) Gain and baseline offset
d) Column
    1) type
    2) length and diameter
    3) packing material
    4) temperature
e) Operator
f) Date and time

If any system parameters change, the chromatograms are labelled with the changes noted.

15. Sample Documentation - The field notebooks will allow for full traceability of results. The response factors used and how they were calculated will be noted. The sample number, time, amount injected and the peak are noted.

    The actual chromatogram can be traced from this information. The sample concentration is calculated using the RF, amount injected and peak area for the component of interest.

3.7.5 Data Interpretation

Data interpretation is an important element of the soil gas analysis. The acquired vapor phase concentrations are evaluated to determine the relationship between soil gas and source soils.

When examining chromatographs and comparing peak heights, several factors must be considered. Retention times (used to identify compounds) will vary with operating temperature and carrier gas flow rate. The detector responds to mass, not necessarily the concentration of the gas. Consequently, the sample volume injected into the chromatograph is important when interpreting output. "Gain", the degree of electronic amplification of the signal from the detector, must also be considered. If concentrations and volumes of two samples are equal, peak height will be higher in the one analyzed using a higher gain. Typically, large sample volumes and, if necessary, high gains are used to detect very low concentrations.

Typically, the soil gas survey is used to provide screening data, identifying areas where compounds are present and the total volatile organic concentration. This is primarily accomplished by expressing the concentrations of compounds as the trichloroethene equivalents. Various volumes and concentrations of trichloroethene gas reference standards are injected under similar operating conditions as those for the unknown samples. Quantification of VOCs in the samples is accomplished by comparing the area of the compound peaks on the sample chromatogram with the area of the trichloroethene reference standard peak. This is most often accomplished by the instrument integrator, however, it can be accomplished manually.

The soil gas data will be tabulated by relating each location to a specific concentration of total volatile organic compound, expressed as trichloroethene equivalents. Additionally, individual volatile organic peaks will be quantified, such as trichloroethene, providing a reasonable retention time match can be obtained, ± 1 sec. This data will also be presented on a site map with each sampling location assigned a specific soil gas concentration. Soil gas isocontours will then be interpreted from the obtained data, thereby identifying approximate boundaries for likely source areas.

3.8 SAMPLING PROCEDURES FOR PROPELLANTS AND OTHER MATERIALS

3.8.1 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).

3.8.2 Asbestos

Pipes within some of the buildings may have been wrapped with an insulating material containing asbestos. Samples of this insulation material will be collected using appropriate health and safety procedures by picking it up by hand and placing it into a glass or plastic, wide-mouth bottle. Sampling data will be recorded on the Sampling Record for soils (Figure A-3).

3.8.3 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.

3.8.4 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.

3.8.5 General Sampling Information

The locations and number of samples of each of these materials are described in Section 5.2 of the Work Plan. Health and Safety procedures of a SWMU-specific basis are described in the Health and Safety Plan.

3.9 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-14 is an example of a sample label.

A Chain-of-Custody form (Figure A-15) 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.

FIGURE A-14

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. ____
PROJECT ____
CONTACT ____

LABORATORY ____
ADDRESS ____
CONTACT ____

DELIVERY DATE ____
DATE FINAL REPORT DUE ____
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	Received by
Sign Print Firm Date Time	Sign Print Firm Date Time
Relinquished by	**Received by**
Sign Print Firm Date Time	Sign Print Firm Date Time
Relinquished by	**Received by**
Sign Print Firm Date Time	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-15

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.

APPENDIX B
HEALTH AND SAFETY PLAN

SENECA ARMY DEPOT
CERCLA EXPANDED SITE INSPECTION
AT THE TEN
SOLID WASTE MANAGEMENT UNITS
ROMULUS, NEW YORK

PREPARED BY: Jason W. Cupp

pr Phil Hunt

APPROVED BY:
Health and Safety Officer

APPROVED BY: Michael [illegible]
Project Manager

JANUARY, 1993

TABLE B-1

PERMISSIBLE EXPOSURE LIMITS FOR COMPOUNDS DETECTED AT ELEVEN SWMUs AT SENECA

		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	–	–	–	A
	Barium	0.5	–	–	–	–
	Cadmium dust	0.2	–	0.6	–	B1
	Chromium (VI)	0.05	–	0.1	–	A
	Copper	1.0	–	–	–	D
	Lead	0.05	–	–	–	B2
	Mercury	0.01	0.03	0.1	–	D
	Nickel	0.1	–	–	–	A
	Selenium	0.2	–	–	–	(6)
Volatiles						
	Benzene	3.2	16	–	–	A
	Toluene	375	560	1125	–	D
	Xylene	435	655	–	–	D
Acids	IRFNA(8)					
	(Nitric Acid)	5.0	10	–	–	–
	Nitrogen Dioxide	-	1.8	–	–	–
	Hydrogen Fluoride	2.5	5.0	–	–	–
Explosives						
	HMX	–	–	–	1.5(7)	–
	RDX	–	–	–	1.5(7)	C
	2,4,6-TNT	0.5 (skin)	–	–	–	(6)
	2,6-DNT	1.5 (skin)	–	–	–	B2
	2,4-DNT	1.5 (skin)	–	–	–	B2

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) Substance identified as suspected or confirmed human carcinogen by agency other than USEPA.
(7) Sitting, 1991
(8) Inhibited red fuming nitric acid (IRFNA).

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.

Asbestos - Asbestos is a confirmed human carcinogen, causing cancers of the lungs, gastrointestinal tract, and the lining of the chest and abdominal cavity. Asbestos also causes asbestosis, a permanent, progressive, scarring disease of the lungs which causes labored breathing and usually leads to premature death due to infection, associated heart disease, or 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.

Hydrofluoric acid - Hydrofluoric acid and hydrogen fluoride are extremely corrosive to body tissues and cause severe burns. The acid can penetrate the skin, destroying tissues and even bone beneath. Burns may only be perceptible hours after the exposure and may be slow to heal. Inhalation exposure can result in irritation of nose and eyes and may produce fluorosis and pulmonary edema.

Lead - Lead has no local toxic effects. Systemic poisoning symptoms are non-specific: fatigue, headache, poor sleeping, aching bones and muscles, constipation, abdominal pains, and decreased appetite. All these symptoms are reversible with time away from exposure. Continued exposure results in anemia, pallor, "lead line" on the gums, and decreased hand grip strength. Lead also has central nervous systems effects and has been implicated in producing learning deficiencies in exposed children. Compounds of lead display a variety of toxic effects that are more specific to the compound than to lead. Some of these compounds have been found to be carcinogenic in experimental animals.

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.

Nitric Acid - Nitric acid is strongly corrosive, producing yellow burns on the skin. Inhalation of nitric acid mist can cause bronchitis and chemical pneumonitis and the vapor and mist may corrode teeth.

Nitrogen Dioxide - Nitrogen dioxide is a highly toxic gas, causing irritation to eyes, nose, throat and respiratory system. Symptoms include cough, frothy sputum, chest pain, dyspnea, congestion, inflammation of the lungs, and cyanosis. Even short exposures can result in severe symptoms. One or two minutes exposure at 200 ppm can be fatal to humans.

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.

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.

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 ordinance 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 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.

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 ordinance detection and clearance;

4. Soil boring and sampling;
5. Surface water and sediment sampling;
6. Test pit excavation;
7. Soil gas surveys, and
8. 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 ordinance contact; abrasions, contusions, lacerations, etc. resulting from use of power tools; and elevated noise levels. The potential for such hazards necessitates that all onsite personnel wear 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-sites and en route to and from sites in accordance with state and local motor vehicle regulations for speed, lights and warnings, passenger carrying, and operation. If any equipment is left unattended at night adjacent to a highway in use, it will be provided with suitable barricading, lighting, reflectors, or other suitable visual warnings to identify its location.

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

Hand and audible (horn) signals to equipment operators will be the commonly accepted industry standard signals for the type of equipment being used. All signals will be reviewed by the operator and signaller before work begins. Only one person will signal the equipment operator at any 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 skins 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. No radioactive materials are known to be in the ten 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.

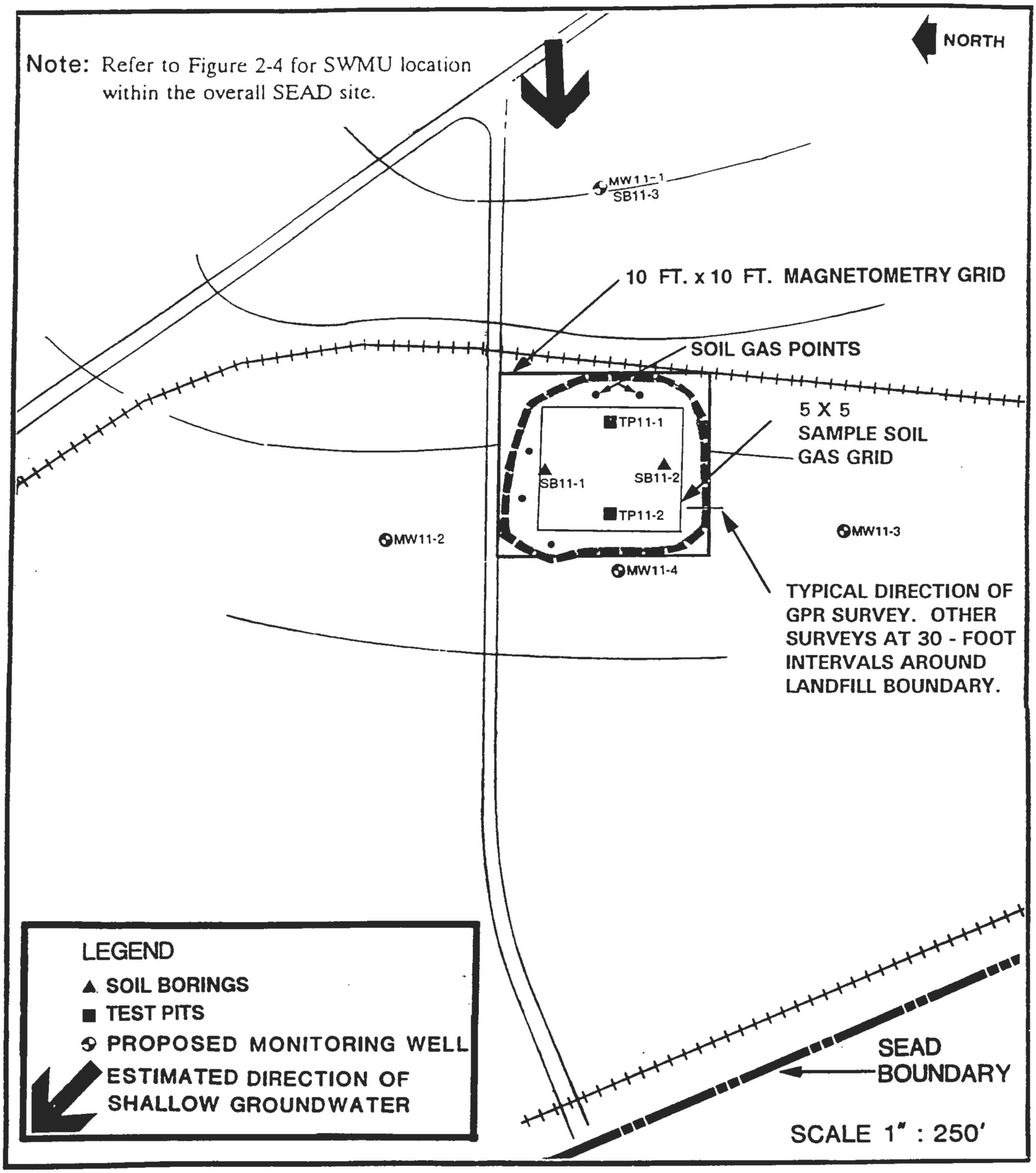


FIGURE BA-3 SITE PLAN FOR SEAD-11: OLD CONSTRUCTION DEBRIS LANDFILL

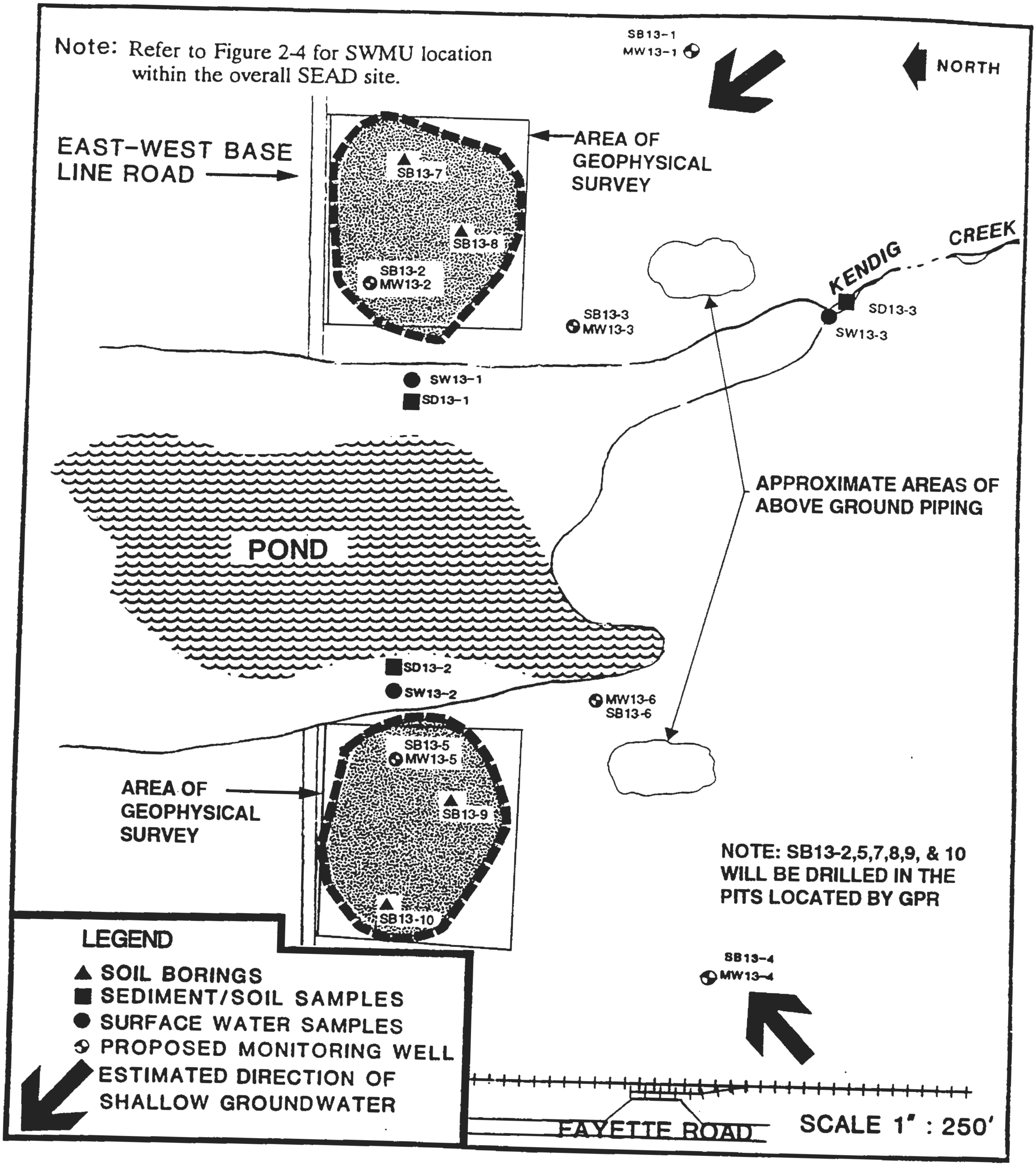


FIGURE BA-4 SITE PLAN FOR SEAD-13: IRFNA DISPOSAL SITE

5-1 PHYSICAL DESCRIPTION AND ACTIVITIES PERFORMED ON SEAD 16: BUILDING S-311 - ABANDONED DEACTIVATION FURNACE

The Abandoned Deactivation Furnace, located in Building S-311, was used to destroy munitions. The furnace area has been flooded with rain water entering through the lower ramp door (Figure BA-5).

Small arms munitions, both obsolete and unserviceable, were destroyed by incineration. There were no air pollution or dust control devices installed on the furnace. The pipes located above the building may have conveyed propellants, which may also have been stored in the building.

5-2 CHEMICAL SUSPECTS

HMX
RDX
TNT
2,4-DNT
Lead
Heavy Metals
Asbestos

5-3 PHYSICAL HAZARDS

- Unexploded Ordnance
- Metal Scraps
- Debris
- Confined Space Entry

5-4 FIELD WORK

UXO clearance will be completed prior to beginning each task.

- Surface Soil Sampling
- Surface Water Sampling
- Asbestos Sampling
- Soil Boring
- Install, Develop and Sample Groundwater Monitoring Wells
- Ash Sampling in Incinerator - Confined Space Entry
- Geophysical Survey

5-5 MONITORING TO BE PERFORMED

A PID meter will be used to screen for volatiles. A Geophysical survey will be perfomed to determine the presence of buried objects.

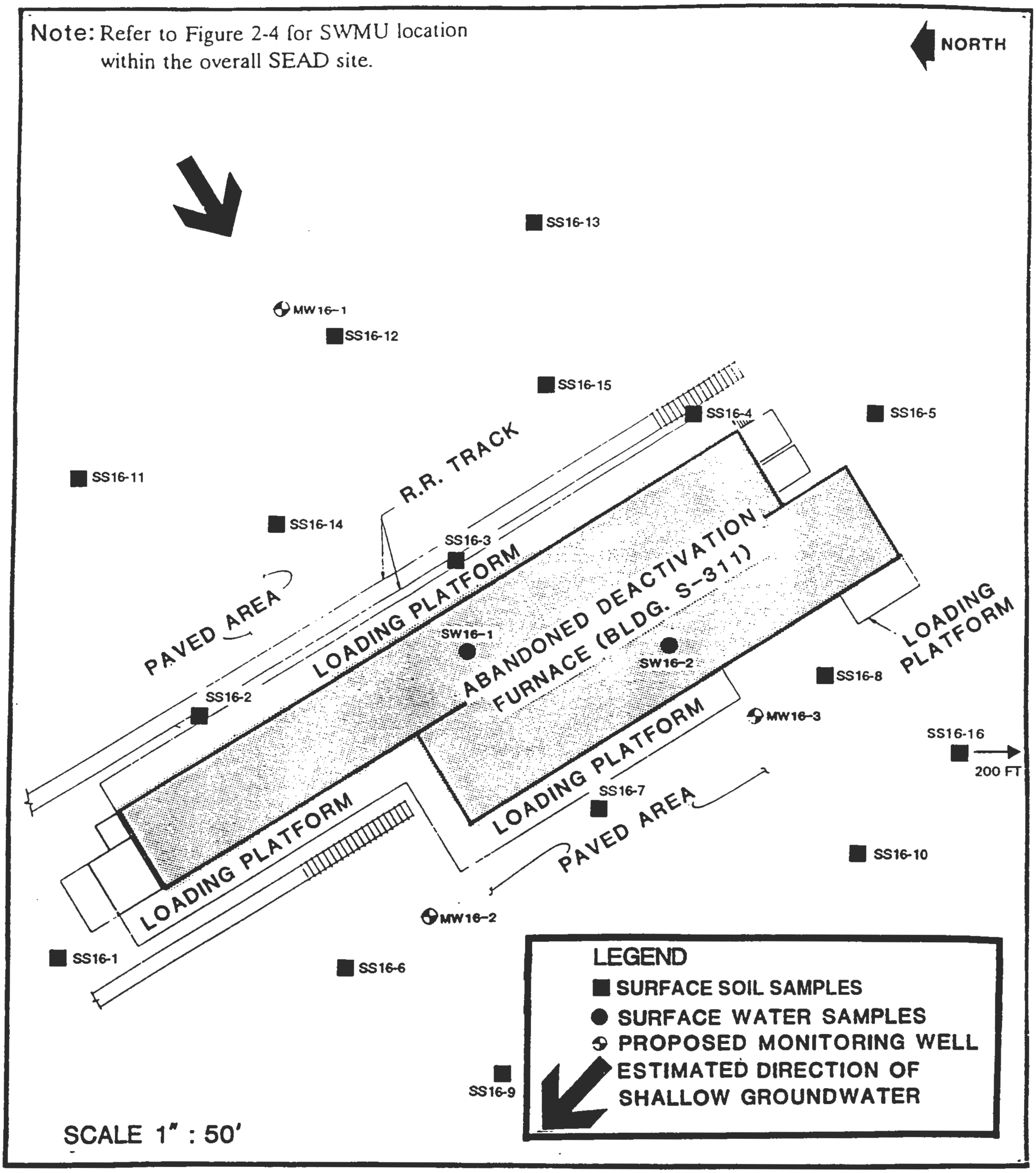
O_2/LEL monitoring, Radiation Monitoring and PID Monitoring will be conducted during initial entry.

Personal sampling for asbestos will be conducted for all work inside the building using NIOSH Method 7402.

5-6 TASK SPECIFIC SAFE OPERATING GUIDELINES

No. 1 Soil Boring - Level D
No. 4 Installation of Monitoring Wells - Level D
No. 7 Development & Sampling of Monitoring Wells - Level D
No. 19 Surface Water Sampling - Level D
No. 22 Surface Soil Sampling - Level D
No. 28 Geophysical Survey - Level D
No. 41 Asbestos Sampling - Level C

Confined Space Entry - Attachment F
Ash Sampling - Level B



Note: Refer to Figure 2-4 for SWMU location within the overall SEAD site.

FIGURE BA-5 SITE PLAN FOR SEAD-16: BUILDING S-311 - ABANDONED DEACTIVTION FURNACE

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #16 Building S-311 Abandoned Deactivation Furnace

3. Hazards

Inhalation : Contaminated dusts
Contact : Soils possibly contain heavy metals and explosive compounds
Explosion : Possibly explosive compounds present
Physical : Metal debris, protruding objects: slip, trip, fall 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 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 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.

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, NY
2.	Location	:	SEAD SWMU #16 Abandoned Deactivation Furnace
3.	Hazards		
	Inhalation	:	Contaminated dusts. Bentonite and cement dust
	Contact	:	Soils possibly containing heavy metals and explosive compounds
	Explosion	:	Possibly explosive compounds present
	Physical	:	Metal debris, or protruding objects slip, trip, fall 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/dust-mist 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, NY

2. Location : SEAD SWMU #16 Abandoned Deactivation Furnace

3. Hazards
   - Inhalation : None suspected
   - Contact : Groundwater possibly contains heavy metals and explosive compounds
   - Explosion : None suspected
   - Physical : Metal debris, protruding objects - slip, trip, fall 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-purifing respirator (APR) with organic vapor cartridge, poly-coated tyvek coveralls.

5. Monitoring : Monitor well headspace upon opening. If readings are elevated, let well air out and monitor again. If readings are still elevated, upgrade PPE.

   : 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/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 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.

   : Place wastewater receiving drum on stable, flat surface with access for later 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 respirator (if worn).
Step 5 Removal of coveralls (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.

SURFACE WATER SAMPLING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDELINE 19

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1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #16 Building S-311 Abandoned Deactivation Furnace

3. Hazards
   - Inhalation : Friable asbestos possible
   - Contact : Surface water may contain heavy metals
   - Explosion : Unexploded ordnance
   - Physical : Metal debris or protruding objects machinery, confined space.

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.
   : Personal sampling for asbestos.

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 as much as possible during sampling.

   : Use only safe access routes to edge of water.

   : Get stable footing and secure work area prior to taking samples.

   : Watch for asbestos like materials. If observed retreat and upgrade to Level C.

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 #16 Building S-311 Abandoned Deactivation Furnace

3. Hazards
   - Inhalation : Contaminated dusts
   - Contact : Soils possibly contain heavy metals and explosive compounds
   - Explosion : Possibly explosive compounds present
   - Physical : Metal debris, protruding objects: slip, trip, fall 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 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 : 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.

GEOPHYSICAL MONITORING
LEVEL D

TASK SPECIFIC
SAFE OPERATING GUIDLINE 28

1. Site Name : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #16 Building S-311 Abandoned Deactivation Furnace

3. Hazards
   Inhalation : Contaminated dusts
   Contact : Soils possibly contain heavy metals and explosive compounds
   Explosion : Possibly explosive compounds present
   Physical : Metal debris, protruding objects: slip, trip, fall 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 acid gas 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.

ASBESTOS SAMPLING
LEVEL C

TASK SPECIFIC
SAFE OPERATING GUIDELINE 41

1. Site : Seneca Army Depot, Romulus, NY

2. Location : SEAD SWMU #16 - Abandoned Deactivation Furnace

3. Hazards
   - Inhalation : Asbestos, heavy metals, petroleum hydrocarbons
   - Contact :
   - Explosion : Explosive compounds, Unexploded ordnance
   - Physical : Machinery, confined spaces, debris.

4. Personal Protective Equipment :
   - Level C : Full-face piece air-purifying respirator (APR) with organic vapor HEPA filter cartrigdes. Poly-coated tyvek suit, neoprene boot covers, nitrile outer gloves and latex inner gloves, hard hat, safety shoes or boots.

   Upgrade to Level B : SCBA or Air-line respirator instead of APR.

5. Monitoring : Personal sampling for asbestos. Ambient air should be monitored continuously throughout sampling.

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 : Spray material to be sampled with water/surfactant mixture to limit release of asbestos fibers.

   : Personnel sampling the asbestos will be trained in accordance with 29 CFR 1910.1001 (Occupational Exposure to Asbestos).

7. Decontamination :

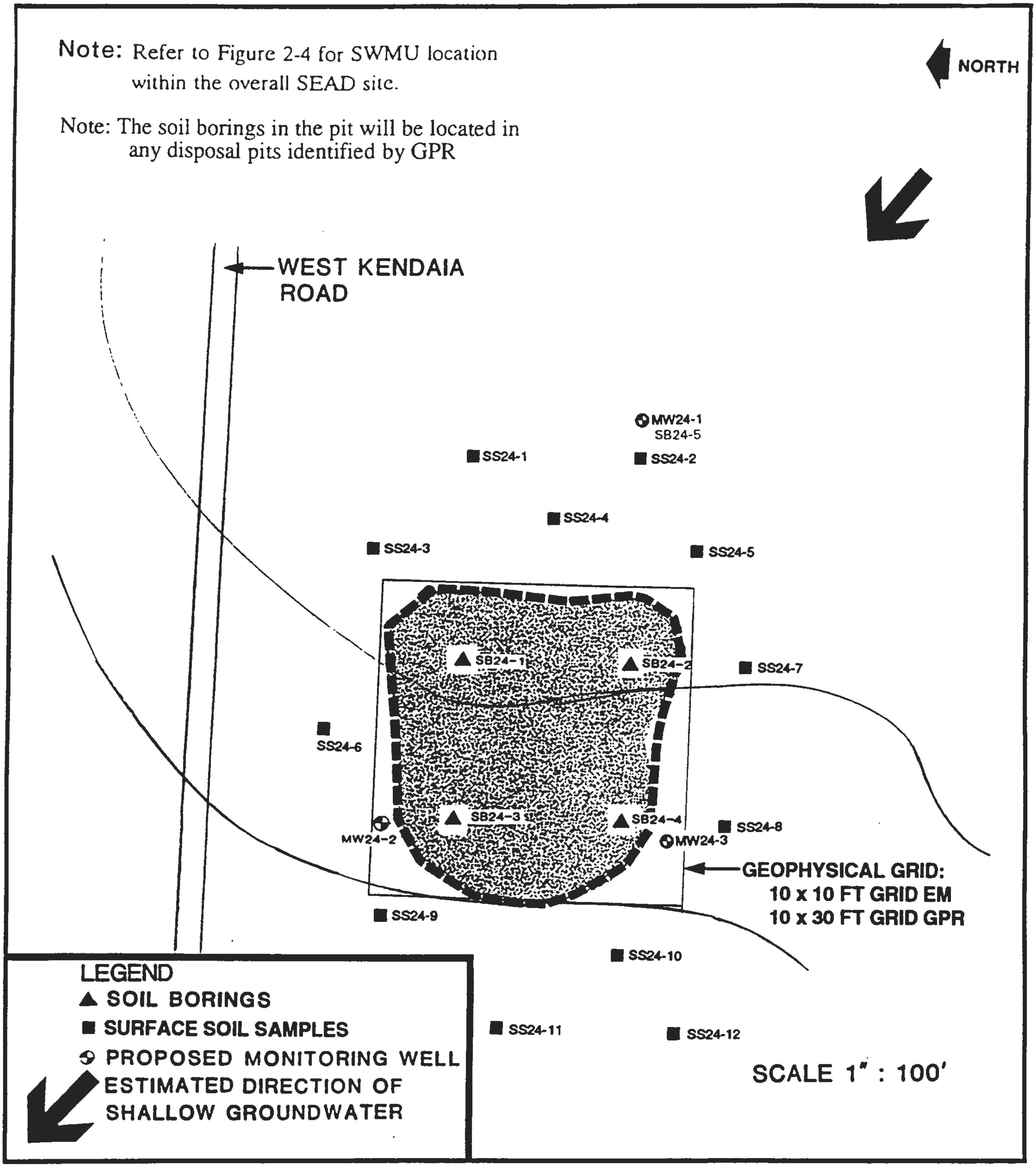
Equipment : Wet wipe all sampling equipment and sample containers. Dispose of wet wipes with protective clothing.

Personal : Personal decontamination will consist of:

Step 1 Segregated equipment drop.
Step 2 Wipe overboots.
Step 3 Remove and discard overboots.
Step 4 Wipe outer gloves.
Step 5 Remove and discard outer gloves.
Step 6 Remove coveralls.
Step 7 Remove and wipe respirator.
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.

Dispose of used protective clothing in asbestos disposal bag or double bagge heavy duty trash bags. Keep separate from other used potective gear until proper disposal is determined.



Note: Refer to Figure 2-4 for SWMU location within the overall SEAD site.

Note: The soil borings in the pit will be located in any disposal pits identified by GPR

FIGURE BA-7 SITE PLAN FOR SEAD-24: ABANDONED POWDER BURNING PIT

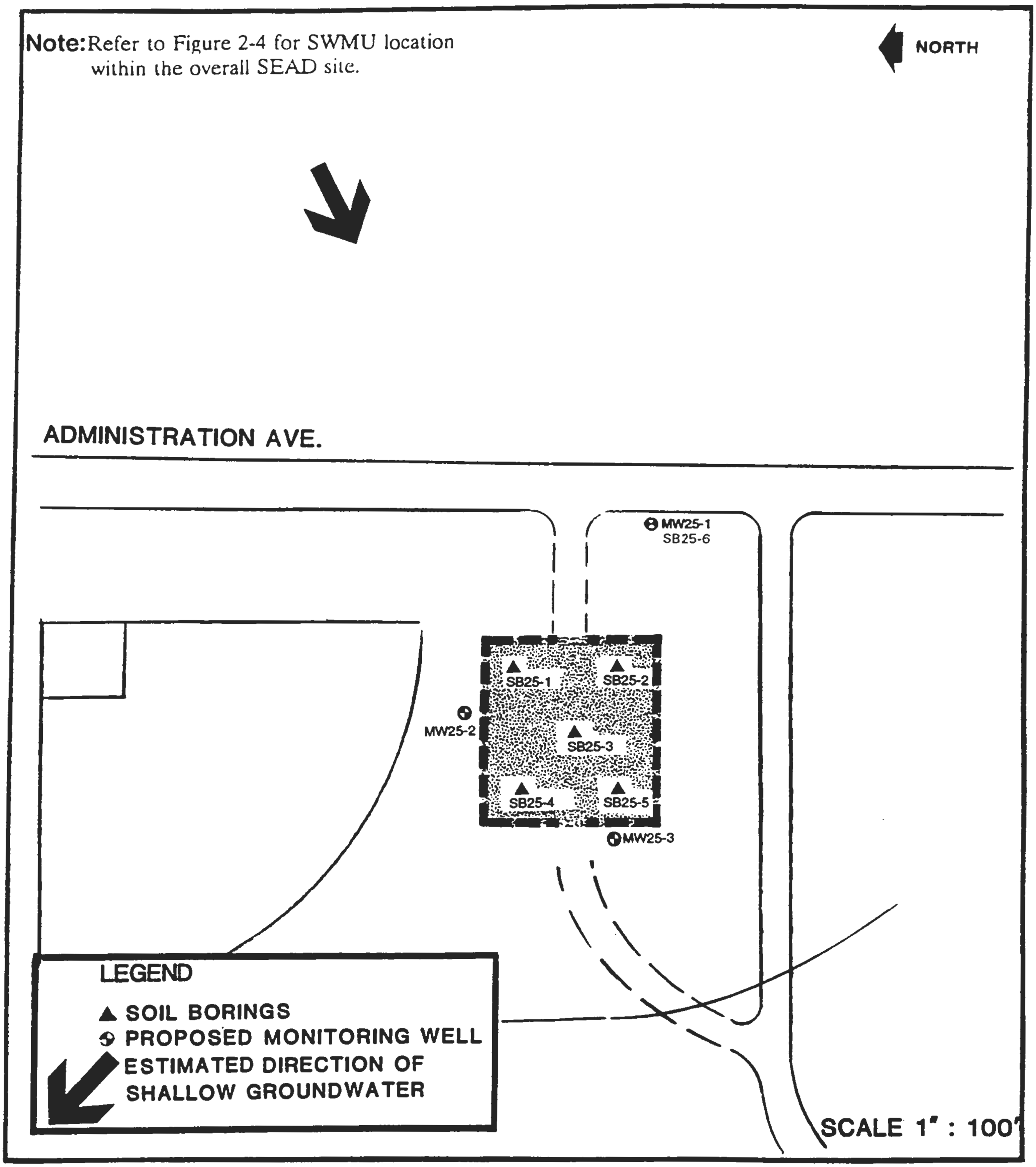
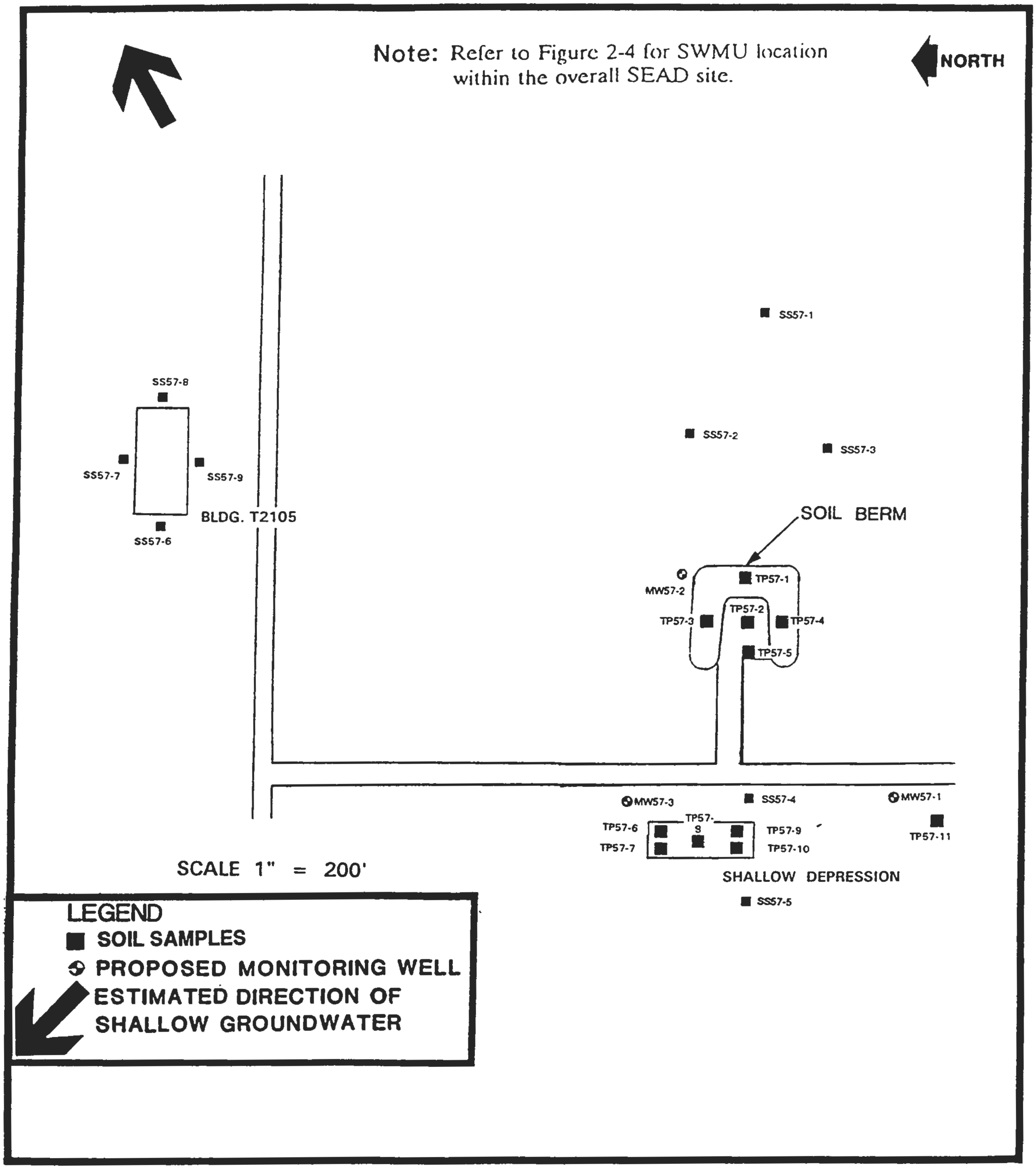


FIGURE BA-8 SITE PLAN FOR SEAD-25: FIRE TRAINING AND DEMONSTRATION PAD



Note: Refer to Figure 2-4 for SWMU location within the overall SEAD site.

FIGURE BA-11 SITE PLAN FOR SEAD-57: EXPLOSIVE ORDNANCE DISPOSAL AREA

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]	HNO3 TO pH<2	28 days
2.	Metals, except Mercury	P[2]	HNO3 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
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

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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

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 program for this ESI on 10 SWMUs includes the collection of field replicate, equipment blank, 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 day of sampling. 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.

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 steel implements (spoons, spades, etc.), placed into the appropriate sample containers, and 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.

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

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 by SEAD 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.

Parsons Main will provide input for these reports to SEAD at least two weeks prior to the submittal deadline.

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.

ES ENGINEERING-SCIENCE, INC.

TELEX 4430035
PRUDENTIAL CENTER, BOSTON, MASSACHUSETTS 02199 - TELEPHONE 617-859-2000 - FAX 617-859-2575

TRANSMITTAL FORM

DATE July 9, 1993

JOB & FILE NO. 720229-07000

TO:
Commander
Seneca Army Depot
Attn: SDSSE-HE
(Randy Battaglia)
Romulus, New York
14541

SUBJECT
Seneca Army Depot
CERCLA ESI Work Plan

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- HAVE EXCEPTION
- [✓ ARE FINAL]
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- REVISE & RESUBMIT

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	12 sets of inserts	Replacement pages for "Work Plan for CERCLA ESI of Ten Solid Waste Management Units at Seneca Army Depot, Romulus, New York"	Please use the inserts to update the three bound copies you have.

*( ) Kindly revise as noted and return ____________ (QUANTITY) signed certified copies and ____________ (QUANTITY) reproducibles of each print.

FOR:

BY:

ENGINEERING-SCIENCE, INC.

Prudential Center • Boston, Massachusetts 02199 • (617) 859-2000 • Fax: (617) 859-2043

July 9, 1993
720229-07000

Commander
U.S. Army Corps of Engineers, Huntsville Div.
Attention: CEHND-PM-EP (Mr. Gary East)
106 Wynn Drive
Huntsville, AL 35805

SUBJECT: Response To Comments
Draft Final Work Plan titled "WorkPlan for CERCLA ESI of Ten Solid Waste Management Units, Seneca Army Depot, Romulus, New York"

Dear Mr. East:

Enclosed with this cover letter are the revised pages for the Ten Solid Wastes Management Units (SWMU) Workplan. These revisions are a result of the comments from USEPA Region II and NYSDEC on the Ten SWMU Work Plan. A response letter for these comments is enclosed.

The attached set of pages should be inserted into the Draft-Final Workplan making the Draft-Final Workplan the Final Workplan and completing the Delivery Order. All copies of these inserts have been sent to the appropriate organizations including EPA and NYSDEC. Table 1 describes what pages are to be removed from the existing work plan and which are to be inserted. Please feel free to call me at 617-859-2492 if you have any questions.

Sincerely yours,

ENGINEERING-SCIENCE, INC.

Michael Duchesneau

Michael Duchesneau
Project Manager

MD/cmf/D#10

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RANDY

cc: Mr. Hoddinott, USAEHA
Commander, USAMC
Ms. Wilson, Toxic and Hazardous Materials Agency
Mr. Biernacki, DESCOM
Mr. Battaglia, SEAD
Mr. Plack, MRD
Mr. Gupta, NYSDEC
Ms. Struble, USEPA Region 2

PARSONS

TABLE 1
DIRECTIONS FOR REPLACEMENT PAGES

REMOVE:	REPLACE WITH:
Section 3	
Page 3–8, 3–9	Page 3–8, 3–9, 3–9A
Section 4	
Page 4–1	Page 4–1
Figure 4–9 (page 4–15)	Figure 4–9 (page 4–15)
Page 4–16	Page 4–16
Section 5	
Table 5–1 (pages 5–1,5–2)	Table 5–1 (pages 5–1,5–2)
Table 5–3 (pages 5–5 thru 5–8)	Table 5–3 (pages 5–5 thru 5–8)
Figure 5–1 (page 5–9, 5–10)	Figure 5–1 (page 5–9, 5–10)
Figure 5–2 (page 5–14)	Figure 5–2 (page 5–14)
Pages 5–15 thru 5–17	Pages 5–15 thru 5–17
Figure 5–3 (page 5–18)	Figure 5–3 (page 5–18)
Pages 5–19, 5–20	Pages 5–19, 5–20
Pages 5–24, 5–25	Pages 5–24, 5–25
Figure 5–8 (page 5–34)	Figure 5–8 (page 5–34)
Pages 5–35, 5–36	Pages 5–35, 5–36
Figure 5–9 (page 5–38)	Figure 5–9 (page 5–38)
Other Changes:	
Page 5–30, 5–31	Page 5–30, 5–31
Page 5–33	Page 5–33
Table 5–2 (page 5–3,5–4)	Table 5–2 (page 5–3,5–4)
Appendix A–Field Sampling & Analyses Plan	
Page A–22,23	Page A–22,23
Page A–40,41	Page A–40,41
Appendix B–Health and Safety Plan	
Pages 5–1, 5–2	Pages 5–1, 5–2
Pages 6–1, 6–2, 6–3	Pages 6–1, 6–2, 6–3
Appendix C–Chemical Data Acquisition Plan	
List of Appendices (third page of Table of Contents)	List of Appendices (third page of Table of Contents)
Page C–43, C–44	Pages C–43, C–44, C–44A
Table C–7 (page C–27, C–28)	Table C–7 (page C–27, C–28)
	Add Appendix C (CLP Data Reporting Forms) to the back of the Chemical Data Acquisition Plan
Other Changes:	
Page C–17, C–18	Page C–17, C–18
Page C–19, C–20	Page C–19, C–20
Page C–33, C–34	Page C–33, C–34
Appendix D–Existing Analytical Data for SWMUs	Add Table 45F to the end of Appendix D
Appendix E–Responses to EPA & NYSDEC Comments	Add this Response to Comments to the end of Appendix E

EPA REGION II COMMENTS

Comment #1 The WP needs to be revised to propose data quality Level IV for all analyses. As data collection achieved during this investigation may be used to support "No Further Action" decisions for some SWMUs, Level IV data quality may be required. This issue was discussed during our January 12, 1993 conference call with Amelia Jackson (EPA), Jeff Healey (TRC), Kamal Gupta (NYSDEC), Kevin Healy (CEHD), and Mike Duchesneau (C.T. MAIN).

Response #1 Agreed. All analytical deliverables that can be Level IV will be Level IV, with the exception of Method 353.2 (NO_3), Method 8080 (PCB in oil), Method 340.2 (fluoride), NYSDOH 310-14 (TPH), Method 418.1 (TRPH), Method 9040 (pH) and EPA 600/M4-82-020 (Asbestos). The VOC analysis method 524.2 has detection limits that are lower than the Maximum Contaminant Levels listed in the federal drinking water regulations. If no contaminants are detected in Phase I that would cause a remedial investigation to be performed at a SWMU, then, during Phase II, groundwater will be obtained at the SWMU and analyzed for VOCs using Method 524.2. Method 524.2, will be performed using Level IV data quality protocols. This will allow the data package to be validated. Section 3.3.3.1,Table 5-1, and Table 5-3 have been revised accordingly.

Comment #2 The WP has been revised to propose an increased number of monitoring wells be installed. However, one of these wells should be located downgradient of the northern leach field and bermed area (SEAD 4). Based on the proposed well locations presented in Figure 5-1 of the WP, no data regarding ground water quality downgradient of these areas will be obtained.

It is recommended that the location of MW4-6 be selected after the installation of three initial monitoring wells have been installed and the direction of ground water flow has been determined. At that point this well should be located downgradient of the northern leach field and bermed area. Based on Figure 5-1 of the WP it appears that a single well downgradient of this area may not provide adequate information to evaluate this entire area. Therefore, the installation of an additional well or the relocation of another proposed well must be evaluated.

Response #2 Agreed. As agreed during our phone conference call on June 10, the location of MW4-6 has been changed so that it is located downgradient of the bermed area shown in Figure 5-1.

After at least 3 monitoring wells have been installed to determine the direction of groundwater flow and GPR has been performed to confirm the location of the northern leach field, the location of MW4-2 will be fixed so that there will then be two wells located downgradient of this entire area (northern leach field and bermed area) in order to provide adequate coverage. Figure 5-1 has been revised accordingly.

Comment #3 The discussion regarding soil samples collected in the area of SEAD-45 has been moved to Section 4.0 of the WP. However, the presentation of the full results of these data and corresponding sample locations have not been included in the WP. If this information is available, it should be presented in the WP.

Response #3	Agreed. Table 45F has been added to Appendix D. It contains the full analysis of the soil samples obtained from the demolition grounds (1982, AEHA). The sampling locations have been added to Figure 4-9.
Comment #4	Exclusions zones should remain around the drill rig regardless of whether surface contamination is present. Exclusion zones are set up to protect personnel from physical as well as chemical hazards.
Response #4	Agreed. Page 5-2 of Appendix B (Health and Safety Plan) has been revised to indicate that exclusion zones around drill rigs are to protect personnel from both physical and chemical hazards.
Comment #5	The reviewer is not familiar with "stranger" chemical specific indicator tubes. It is recommended that Drager, Sensidyne or equivalent tubes be included in the monitoring program.
Response #5	Agreed. This is a typo. Page 6-1 of Appendix B (Health and Safety Plan) has been revised to state that Drager or equivalent indicator tubes will be used.
Comment #6	The action levels presented in Table B-2 of the Health and Safety Plan (HASP) remain unclear; neither the table, nor the text have been revised. It is not clear if personnel are to upgrade to Level C if any concentration of contaminants is detected below 5 parts per million (ppm) or if this upgrade is to occur when the concentration of 5 ppm is exceeded.
Response #6	Agreed. Table B-2 and the text have been revised to clarify the action levels.
Comment #7	Table C-7 presents the quantitation limits for SW-846 Method 8150 Herbicides. The quantitation limits seem very low. Table 1 of SW-846 Method 8150 presents the Method Detection Limits (MDL) for herbicides, Table 2 of the method presents factors that when multiplied by the MDL will present the practical quantitation limit for that compound. The quantitation limits presented in Table C-7 are at least a factor of 10 below the MDLs of Table 1. Main should verify that the quantitation limits presented in Table C-7 are achievable.
Response #7	Agreed. Table C-7 has been revised.
Comment #8	Based on the description of the contents of an analytical report presented in Section 9.3.2 (pg. C-44), the report will not provide sufficient information to perform the required data validation stated in Section 9.2.4 (pg. C-43) or to meet the data submittal requirements stated in Section 9.1 (pg. C-41). Main should state, in this section, that the analytical laboratory report submitted by the laboratory will be in the format specified in NYSDEC CLP Analytical Services Protocol, most recent revision, for Level IV analyses and also describe what the Level III data packages will contain.
Response #8	Agreed. The NYSDEC CLP Analytical Services Protocol most recent revision is the 3/90 version with 12/91 revisions. Blank Data Reporting forms are included in Appendix C of the Chemical Data Acquisition Plan which specifies the format of the analytical laboratory report.

Typical Level III data packages consist of internal quality control results such as reference standards, surrogate spike recoveries, and method blank results. The amount and type of information provided as part of the Level III package varies depending upon the analyses being performed. For example, surrogate spike recoveries are not possible for analyses such as pH, TPH a NO_3. The laboratory deliverables will follow the requirements of the NYS Analytical Services Protocol (ASP) Category B. For wet chemistry data the sample data will be submitted with the Conventional Analysis Data Reporting Forms for all samples in the SDG, followed by the QC analyses data, Quarterly Verification of Instrument Parameters forms, raw data and copies of the digestion and distillation logs.

NYSDEC COMMENTS

Comment Response #1&6	This is not an acceptable response. The next SWMU work plan will be reviewed independently of this one. No reason is given for not incorporating the comment in this work plan.
Response 1&6	It was decided during the telephone conference of June 18, 1993 that for the sake of time and to expedite the investigation that Sections 4 and 5 will remain separate in this workplan. Future workplans will combine the two.
Comment Response #2	If a topographic survey is needed to adequately devise a work plan perhaps one should be done prior to work finalization.
Response #2	Agreed. It was decided during the phone conference call on June 18, 1993, that a topographic survey is not needed to adequately devise this workplan. The site walk through performed before the work plan was written provided sufficient information concerning topography and identified any abnormal site characteristics. The Workplan proposes a topographic survey of the 10 SWMUs.
Comment Response #7	If only one intermediate sample will be taken, and more than one location meets the criteria stated in the final draft, how will the sampling location be chosen?
Response #7	The sampling will be performed as stated in the workplan. However, if more than one indicator (i.e., stained soil, elevated headspace, or change in strata) is identified then the Army Corps and NYSDEC will be consulted to determine if additional soil samples will be collected. No change to the text of the Workplan been made concerning this agreement.
Comment Response #19, 29, 36 and 38	If Bedrock is greater than the anticipated 12 feet and distinct two upper aquifers are noted at a particular SEAD location say upper glacial till and weathered shale, then well couplets must be installed. The work plan must provide for this possibility.
Response #19, 29, 36, and 38	Agreed. In accordance with the telephone conference of June 18, 1993, if the situation arises where bedrock is greater than the anticipated 12 feet and two distinct upper aquifers are noted at a particular SWMU the Corps and NYSDEC will be consulted to determine if a well cluster should be installed. In all instances, each well will be screened at least 2 feet above the water table. NYSDEC may require that another well be installed at a later date. No change to the text of the Workplan has been made concerning this agreement.
Comment Response #21	All 30 points are not shown. The points which are shown are obviously not positioned on a grid. The planned grid must be shown on a map.

Response #21 Agreed. Figure 5-2 has been revised to show the 30 grid points.

Comment Response #40 Subsurface soil samples were added, but not surficial samples. Surficial soil samples must be taken on and around the site.

Response #40 Agreed. Section 5.2.8.2 has been revised. Two soil samples will be taken from each test pit and eight surface samples will be taken from the area around the site. Surface samples will be collected from the upper 2 inches of soil.

Comment Response #43 Test pit soil samples are still misrepresented in symbol, and the legend still does not show surface water.

Response #43 Agreed. Figure 5-9 has been corrected.

Comment Response #60 The work plan now only states "outer gloves." The type of gloves to be used must be specified.

Response #60 Agreed. Latex or nitrile gloves will be used depending on the SWMU specific contaminants.

The following are the NYSDEC comments on the draft work plan:

Comment #1 Section 4-1, last sentence: "A shallow depression near the berm and building T2105 are included in the SWMU." This sentence refers to SEAD-57 and must be deleted. Also does the pond have an outlet or is it stagnant?

Response #1 Agreed. The sentence referring to SEAD 57 has been removed. The pond is stagnant.

Comment #2 SEAD 11, page 5-15, Test Pits: The work plan states that excavation will extend "..to the base of the landfill debris or water table, whichever is deeper." We would advise against this. If the water table is deeper, then excavation through waste to the water table may increase the contaminant migration to the groundwater.

Response #2 Agreed. The excavation will extend to the base of the landfill debris.

Comment #3 SEAD-13: Section 5.2.3 refers both to "the Duck Ponds" plural and "the Duck Pond" singular. Figure 5-3 shows only one pond. Please clarify.

Response #3 Agreed. There is only one Duck Pond. The change has been made.

Comment #4 Page 5-20 (Groundwater): It appears the positioning of monitoring wells MW13-3 and MW13-6 is solely for the purpose of determining flow direction. The wells should be repositioned downgradient of the disposal areas to provide additional contaminant migration data while still being use to determine direction of groundwater flow.

Response #4 Agreed. Figure 5-3 has been revised. MW13-3 and MW13-6 have been moved downgradient of the disposal areas accordance to the estimated direction of groundwater flow. If the seismic refraction indicates the groundwater flow is different, then NYSDEC will be notified and the location of the wells will be changed provided that approval is granted.

Comment #5 Page 5-20 (Surface Water/Sediment): This paragraph is confusing. "The exact locations of the other two samples will be based on an inspection of the site." Does this refer to the other two surface water samples or the other two sediment samples? If it refers to surface water/sediment sample 'sets' and the phrase 'sample set' should be used consistently throughout the paragraph.

Response #5 Agreed. The statement refers to the sample set and the paragraph has been revised.

Comment #6 SEAD-17, Page 5-25, Section 5.2.5.2.Groundwater: Figure 5-5 indicates 4 monitoring wells but the text and Table 5-3 indicate 3 monitoring wells. This discrepancy should be eliminated.

Response #6 Agreed. The text and table have been revised to indicate 4 monitoring wells.

Comment #7 SEAD-45, Page 4-16 and Figure 5-9: One explosive compound, 4-amino-2, 6-dinitrotoluene, was found in Reeder Creek yet, the sampling plan (Fig. 5-9) does not include water or sediment sampling from the creek. Water and sediment sampling from the creek is needed since explosive compounds have been identified in it. If however, sampling of Reeder Creek is being done under another investigation (e.g., Open Burning Ground) the results should be incorporated in the SEAD-45 investigation if they can be associated with the SEAD-45 site.

Response #7 Agreed. Reeder Creek is being sampled under the Open Burning Grounds Remedial Investigation. The results will be included in the SEAD 45 SI Report.

Appendix A Field Sampling and Analysis Plan:

Comment #1 Section 3.3.3 Testing Pitting Techniques: The excavation must also be continuously monitored for radioactivity with a radiation meter.

Response #1 Agreed. The excavation will be continuously monitored for radioactivity.

Sec. 3

3.3.2 Data Types

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

- Matrices: Soil, groundwater, surface water, sediment, soil gas, and air (monitoring for health and safety purposes only)

- Concentrations: Primarily environmental levels with medium levels possibly encountered at sources or release points.

- Parameters: Geophysical surveys, soil gas 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: total petroleum hydrocarbons, pH, asbestos, nitrate, fluoride and, PCB in Oil. These analyses incorporate standard laboratory QA/QC practices and are described in numerous published sources such as SW-846, Standard Methods and ASTM procedures. The VOC analysis Method 524.2 will be required to have Level IV data quality since this data may be used to support no further action decisions for some SWMUs.

- 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, herbicides, explosives 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. The VOC analysis by Method 524.2 will also be required to have Level IV data quality.

3.3.3.2 Contaminants of Interest

The contaminants of interest are described for each SWMU in Section 5.2 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

Sec.

4

4.0 DESCRIPTION OF SWMUs TO BE INVESTIGATED

This section of the Work Plan presents available information for each SWMU regarding current site conditions, historical operating practices, and existing chemical analysis data. The majority of the information regarding operating procedures and existing analytical data was obtained from the ERCE SWMU Classification Report (ERCE 1991). This information represents the most current source of information available.

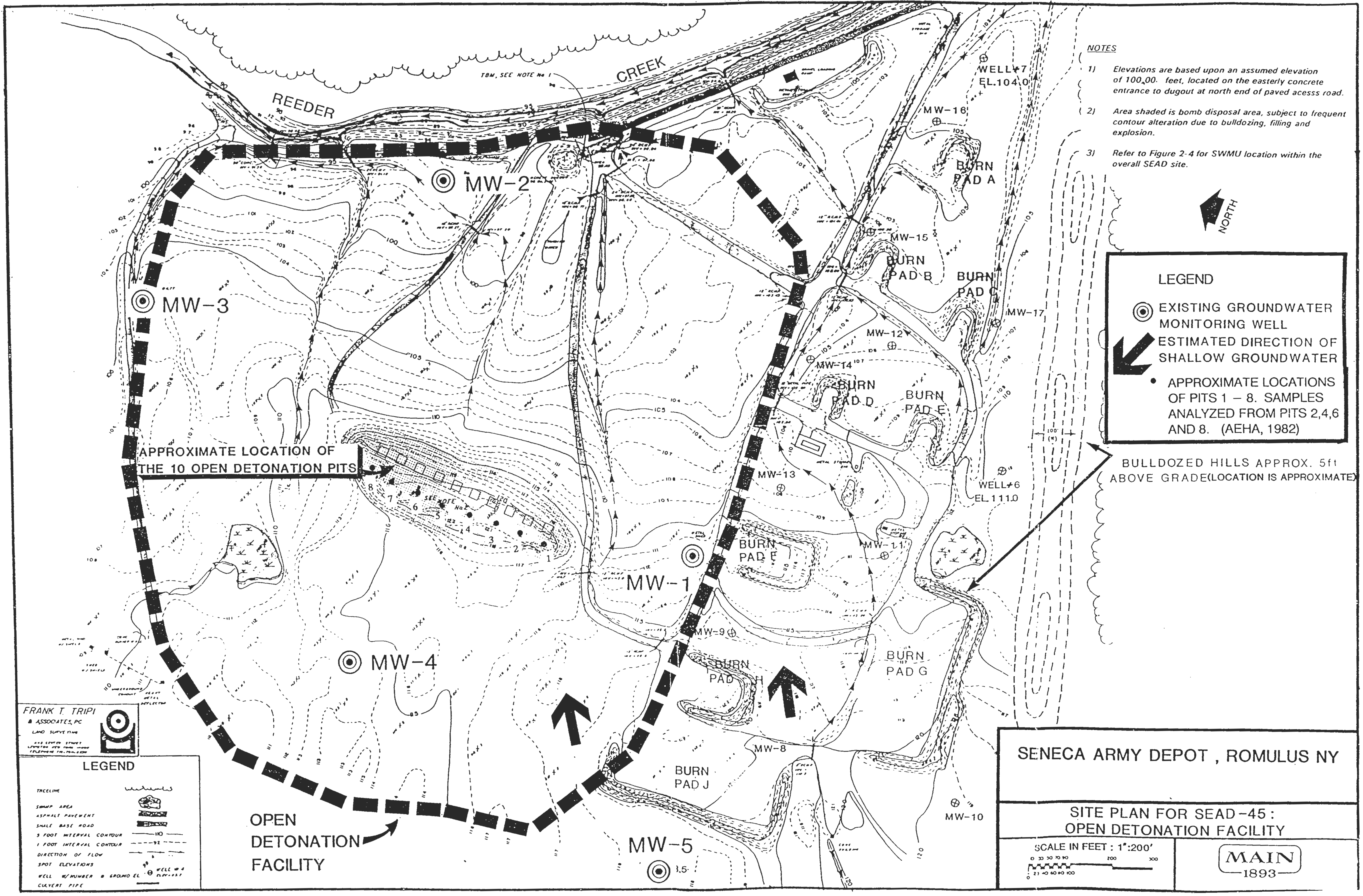
4.1 SEAD-4: MUNITIONS WASHOUT FACILITY LEACH FIELD

The Munitions Washout Facility Leach Field was active between 1948 and 1963. At present, the foundation of the washout plant is still visible (approximately 150 feet long by 80 feet wide), but there is no visual evidence of the leach field. Figure 4-1 shows the estimated location of the leach field with respect to the other features nearby, i.e., the former munitions washout facility foundation and the wastewater pond. Information from SEAD indicates wastewater may also have been discharged to a ditch that carried the wastewater north across the road to a leach field.

4.1.1 Operating Practices

Operations at this unit included dismantling and removing explosives from munitions by steam cleaning. This operation produced explosive solids and wastewater. Solid explosives were most likely open burned at the OB facility (SEAD-23) or the old powder burning pit (SEAD-24). Chemical constituents that are common at Department of Defense washout plants include TNT, RDX, HMX, Tetryl, trinitrobenzene and heavy metals. The actual explosives in the wastewater are unknown. It is suspected that the wastewater that was produced was processed through sawdust to remove any solid explosive residues prior to being discharged to an area where it leached into the ground or flowed into a nearby ditch. The ditch possibly discharged to a pond located west of the facility. Some wastewater discharged potentially into an area near Building 2084, which is approximately 1,000 feet, due south, of the munition washout facility, Figure 4-1 (USAEHA 1988). Wastewater may have also been discharged into an area near the Building 2079 boiler plant (Figure 4-1).

Within the past 8 years, the pond was widened and deepened using a bulldozer. The pond is stagnant. Pond sediment was pushed southwestward to a 400-foot by 150-foot area southwest and adjacent to the pond. This scraped-off sediment has been sampled in an area shown on Figure 4-1.



NOTES

1) *Elevations are based upon an assumed elevation of 100.00. feet, located on the easterly concrete entrance to dugout at north end of paved acesss road.*

2) *Area shaded is bomb disposal area, subject to frequent contour alteration due to bulldozing, filling and explosion.*

3) *Refer to Figure 2-4 for SWMU location within the overall SEAD site.*

LEGEND

◎	EXISTING GROUNDWATER MONITORING WELL
↙	ESTIMATED DIRECTION OF SHALLOW GROUNDWATER
•	APPROXIMATE LOCATIONS OF PITS 1 – 8. SAMPLES ANALYZED FROM PITS 2,4,6 AND 8. (AEHA, 1982)

LEGEND

TREELINE
SWAMP AREA
ASPHALT PAVEMENT
SHALE BASE ROAD
5 FOOT INTERVAL CONTOUR
1 FOOT INTERVAL CONTOUR
DIRECTION OF FLOW
SPOT ELEVATIONS
WELL W/NUMBER & GROUND EL
CULVERT PIPE

SENECA ARMY DEPOT , ROMULUS NY

SITE PLAN FOR SEAD-45 :
OPEN DETONATION FACILITY

4.9.1 Operating Practices

Material to be detonated is placed in a bulldozed hole in the hill with demolition material to destroy the ammunition or components. Primer cord is attached to the demolition material, blasting caps are attached to the primer cord, and the primer cord is attached to circuit wire. The hole is backfilled and a minimum of 8 feet of soil is placed over the material to be detonated. The operator detonates the material after returning to the dugout and taking proper safety precautions.

4.9.2 Existing Analytical Data

The Open Detonation facility has five groundwater monitoring wells associated with it, MW-1 through MW-5, as shown on Figure 4-9. Monitoring well installation data was available in tabular form and is presented in Appendix D, Table 45A. Groundwater quality data for conventional pollutants and explosives obtained during 1979 are presented in Appendix D, Table 45B. One explosive compound, 4-amino-2,6-dinitrotoluene, was detected in groundwater from wells MW-1 to -4 and from Reeder Creek (both up and downstream of SEAD-45) at concentrations from 1.36 to 1.96 ppb. Reeder Creek is being sampled as part of the Open Burning Grounds Remedial Investigation. The results will be included in the SEAD 45 SI Report.

Groundwater data during the period 1981 through 1987 and for 1989 are summarized on Tables 45C, 45D and 45E in Appendix D.

In 1982, the USAEHA analyzed soil samples collected from eight locations around this area (pits 2,4,6 and 8). Analyses were performed for EP Toxicity (As, Ba, Cd, Cr, Hg, Pb, Se and Ag) and explosives (HMX, RDX, Tetryl, 2,4,6-TNT, 2,4-DNT, 2,6-DNT). The analytical results indicated the presence of Cd in all samples (0.19-0.45 mg/l) which was below 1.0 mg/l criteria. Explosives were also found in each sample (RDX 1.4-1.7 ug/kg; Tetryl 1.6-16.3 ug/kg; 2,4,6-TNT 2.2-61 ug/kg; 2,4-DNT 1.1-19. ug/kg). Table 45F in Appendix D contains the complete results of these analyses and Figure 4-9 shows the approximate locations of the pits.

4.10 SEAD-57: EXPLOSIVE ORDNANCE DISPOSAL AREA

The Explosive Ordnance Disposal Area consists of a berm approximately 4 feet wide and 8 to 10 feet high with an inside diameter of approximately 70 feet (refer to Figure 4-10). The disposal area has been active from 1941 to the present and is currently used for bomb squad training. A shallow depression near the berm and Building T2105 are included in this SWMU.

Section

5

5.0 SWMU INVESTIGATIONS

5.1 INTRODUCTION

This section describes the work to be performed during investigation of the 10 SWMUs. The approach of this Work Plan is to investigate areas likely to have been impacted by a release of hazardous constituents. Sample locations are concentrated in source areas or in hydrologic upgradient locations to establish background conditions. Parsons Main has estimated groundwater flow directions based primarily on topography and to some extent on proximity to surface water. All references to upgradient and downgradient hydrologic locations in this section are estimated. The estimated direction of groundwater flow for each SWMU is presented on Figures 2-4 and 5-1 through 5-10.

Prior to personnel entering each SWMU to perform field work, Parsons Main and UXO personnel will evaluate the potential for UXOs to be present at the SEAD. If necessary, UXO personnel will clear areas of the site where field work will be performed.

Three types of geophysical techniques could be performed at several 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.)

Investigation of the 10 SWMUs will involve sampling of soil, soil gas, sediment, surface water and groundwater, although not all medias will be sampled at each SWMU. Chemical constituents of concern for this investigation are summarized on Table 5-1. Analytical methods utilized at each SWMU and the rationale for selection of each analytical method are presented on Table 5-2. Table 5-3 presents a summary of samples to be collected and analyses to be performed. All analyses will be performed in accordance with the methodology presented in the Chemical Data Acquisition Plan, Appendix C.

Parsons Main feels that it is appropriate to conduct these analyses during the initial assessment so that there is reasonable justification for eliminating certain compounds from further consideration in subsequent investigations. The constituents cited in the Chemicals of Interest sections for each SWMU in Section 5.2 were obtained from the ERCE report (ERCE 1991).

TABLE 5-1

SUMMARY OF CHEMICAL CONSTITUENTS OF CONCERN

Material Managed at SEAD	Chemical Group	Analytical Method[1]
1. Propellants, Explosives and Pyrotechnics (PEP)	Heavy metals Semi-voltile organic compounds (SVOs) Explosives Nitrates	TAL Metals TCL SVOs 8330, 353.2
2. Solvents	Volatile organic compounds (VOCs) Semi-volatile organic compounds (SVOs)	TCL VOCs, 524.2 TCL SVOs
3. Oils	Petroleum hydrocarbons (TPH)	418.1, NYSDOH 310-14 Herbicides 8150 PCB in oil 8080
4. Nitric/Hydrofluoric Acid	Nitric/Hydrofluoric Acid	353.2, 340.2, 9040
5. Transformer Oil	Polychlorinated biphenyls (PCBs)	TCL Pest./PCB
6. Herbicides	Herbicides	8150
7. Insulation	Asbestos	EPA 600/M4-82-020

[1] All analytical deliverables will be Level IV with exception of Method 353.2 (NO_3), Method 8080 (PCB in Oil), Method 418.1 (TRPH), NYSDOH 310-14 (TPH), Method 9040 (pH), Method 340.2 (Fluoride), EPA 600/M4-82-020 (Asbestos).

TABLE 5-2
SWMU-SPECIFIC EPA ANALYTICAL METHODS AND SELECTION RATIONALE

SWMU/ AOC	pH 9040	Asbestos EPA 600/ M4-82-020	8150 Herbicides	8330 Expl.	TCL SVOs	TCL VOCs	TAL Metals	TCL PCB	353.2 NO_3	418.1 TRPH	340.2 F	8080 PCB	NYSDOH 310-14 TPH	Selection Rationale
SEAD-4	-	-	X	X	X	X	X	X	X	-	-	-	-	Pyrotechnic, explosive and propellant (PEP) materials managed here (Expl., SVOs, and metals) and breakdown products (Nitrate) may be present.
SEAD-11	-	-	X	X	X	X	X	X	X	X	-	-	-	Landfills have been historically utilized for industrial waste disposal.
SEAD-13	x	-	X	-	X	X	X	X	X	-	X	-	-	Strong acid neutralized in pits here. Nitrate and fluoride may be indicators of residual salts originating from acid. pH will indicate neutralization effectiveness
SEAD-16	-	X	X	X	X	X	X	X	X	-	-	-	-	Heavy metals have been released in dust and ash from stack with no air pollution controls. PEP materials have been managed here (Expl., SVOs and metals) and breakdown products (Nitrate) may be present.
SEAD-17	-	-	X	X	X	X	X	X	X	-	-	-	-	Although air pollution controls have been used, heavy metals released in dust and ash from the system. (Similar to SEAD 16)

TABLE 5-2 (Cont.)

SWMU-SPECIFIC ANALYTICAL METHODS AND SELECTION RATIONALE

SWMU/ AOC	pH 9040	Asbestos EPA 600/ M4-82-020	8150 Herbicides	8330 Expl.	TCL SVOs	TCL VOCs	TAL Metals	TCL PCB	353.2 NO_3	418.1 TRPH	340.2 F	8080 PCB	NYSDOH 310-14 TPH	Selection Rationale
SEAD-24	-	-	X	X	X	X	X	X	X	X	-	-	-	PEP materials managed here (Expl., SVOs and heavy metals) and breakdown products (Nitrate) may be present. Solvents and/or petroleum products may have been utilized to initiate powder burn.
SEAD-25	-	-	X	-	X	X	X	X	X	X	-	-	-	Materials burned include: fuels and used oil: leaded fuel possible.
SEAD-26	-	-	X	-	X	X	X	X	X	X	-	X	X	Materials burned include: fuels and used oil: leaded fuel possible.
SEAD-45	-	-	X	X	X	X	X	X	X	-	-	-	-	PEP materials managed here (Expl., SVOs and heavy metals) and breakdown products (Nitrate) may be present.
SEAD-57	-	-	X	X	X	X	X	X	X	-	-	-	-	PEP materials managed here (Expl., SVOs and heavy metals) and breakdown products (Nitrate) may be present.

Table 5-3

Summary of Laboratory Analyses

		Analyses[5]					
	No. of Samples	Suite[2]	TPH	Herbicides	PCB in Oil	Asbestos	Fluoride
SEAD-4							
B/TP[1] Soils	44	44					
Groundwater	6	6					
Surface Water	2	2					
Sediment	3	3					
Surface Soil	7	7					
SEAD-11							
B/TP Soils	15	15	15				
Groundwater	4	4	4				
SEAD-13							
B Soils	30	30					30
Groundwater	6	6					6
Surface Water	3	3					3
Sediment	3	3					3
SEAD-16							
Groundwater	3	3					
Surface Water	2	2					
Surface Soil	16	16					
Propellants	3	3					
Solid Materials	10	10				5	
Bldg. Materials	10					5	
SEAD-17							
B Soils	12	12					
Groundwater	4	4					
Surface Soil	23	23					
SEAD-24							
B Soils	15	15	15				
Groundwater	3	3	3				
Surface Soil	12	12	12				

Table 5-3
(Con't)

		Analyses[5]					
	No. of Samples	Suite[2]	TPH	Herbicides	PCB in Oil	Asbestos	Fluoride
SEAD-25							
B Soils	18	18	18				
Groundwater	3	3	3				
SEAD-26							
B/TP Soils	28	28	28				
Groundwater	4	4	4				
Surface Water	1	1	1				
Sediment	1	1	1				
Oil	1		1	1	1		
Surface Soil	8	8	8				
SEAD-45							
TP Soils	5	5					
Surface Soil	9	9					
Groundwater	9	9					
Surface Water	4	4					
Sediment	4	4					
SEAD-57							
TP Soils	11	11					
Surface Soils	9	9					
Groundwater	3	3					
Sample Subtotal	354	343	113	1	1	10	42
Duplicates (5%)		17	6	-	-	1	2
Equip. Blanks (5%)		17	6	-	-	-	2
MS/MSD/MSB (3/20 samples)[3]		51	18	-	-	-	6

Table 5-3
(Con't)

		Analyses[5]					
	No. of Samples	Suite[2]	TPH	Herbicides	PCB in Oil	Asbestos	Fluoride
Total Number of Analyses		424	143	1	1	11	52
Estimated VOC Trip Blanks[4]	14						

Notes:

1. B=Borings, TP=Test pits
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, explosive compounds, herbicides, and nitrates. At SEAD-13, SEAD-25, and SEAD-26, explosive compounds will not be analyzed. The TCL and TAL compounds, explosives, and herbicides will be analyzed at Level IV, whereas the other compounds will be analyzed at Level III with the exception of Method 524.2, which will also be analyzed at Level IV.
3. A matrix spike analysis, performed every 20 samples, actually consists of 3 analyses: method spike blank, matrix spike, and matrix spike duplicate.
4. Number of VOC trip blanks were estimated based on one trip blank per day, 4 water samples per day, and 55 water samples to be obtained (55/4=14).
5. Laboratory analysis methods are presented on Table C-2 of Appendix C, Chemical Data Acquisition Plan.

All monitoring wells on 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 on the SWMU. This will also allow comparison of groundwater elevations from SWMU to SWMU.

The locations of borings and monitoring wells may be adjusted based on the results of geophysical and soil gas surveys and more complete field reconnaissance.

The above field work will represent Phase I of the ESI field work. If no contaminants are detected that would cause a remedial investigation to be performed at a SWMU, then, during Phase II, groundwater will be obtained from each well at the SWMU and analyzed for VOCs using Method 524.2. This method has detection limits for VOCs that are lower than the Maximum Contaminant Levels listed in the federal drinking water regulations. Method 524.2, a Level III analysis by Standard Methods will be conducted, however Level IV data quality will be required due to the fact that data collected during this investigation may be used to support no further action decisions for some SWMUs.

5.2 SWMU-SPECIFIC SAMPLING PROGRAM

This section of the Work Plan describes the field work and samples that will be obtained at each of ten SWMUs to be investigated. The procedures for performing the field work and obtaining the samples are described in Appendix A, Field Sampling and Analysis Plan. Appendix A also includes a table (Table A-1) summarizing the procedures that will be used at each SWMU. The health and safety procedures that will be followed while on-site are presented in Appendix B, Health and Safety Plan. SWMU specific safety guidelines are presented in Appendix B of the Health and Safety Plan. The Chemical Data Acquisition Plan (Appendix C) presents the policies, organization, objectives, quality assurance (QA), and quality control activities to be implemented in this CERCLA site inspection.

5.2.1 SEAD-4: Munitions Washout Facility Leach Field

Based on previous operating practices, wastewater from the washout facility contained explosives and heavy metals. Based on ERCE information and discussions with SEAD personnel, this wastewater could have been discharged to a leach field west of the former building, to an unlined ditch that discharged to a pond approximately 500 ft. west of the former building, to an unlined ditch that flowed north and discharged on the north side of the road to possibly a leach field, and to areas near Buildings 2079 and 2084. These locations are shown on Figure 5-1. Because this wastewater could leach into the ground the potential migration pathways include both soil and groundwater. Additionally, because the ditch possibly discharged to the pond, surface water and sediment must also be considered as potential migration pathways.

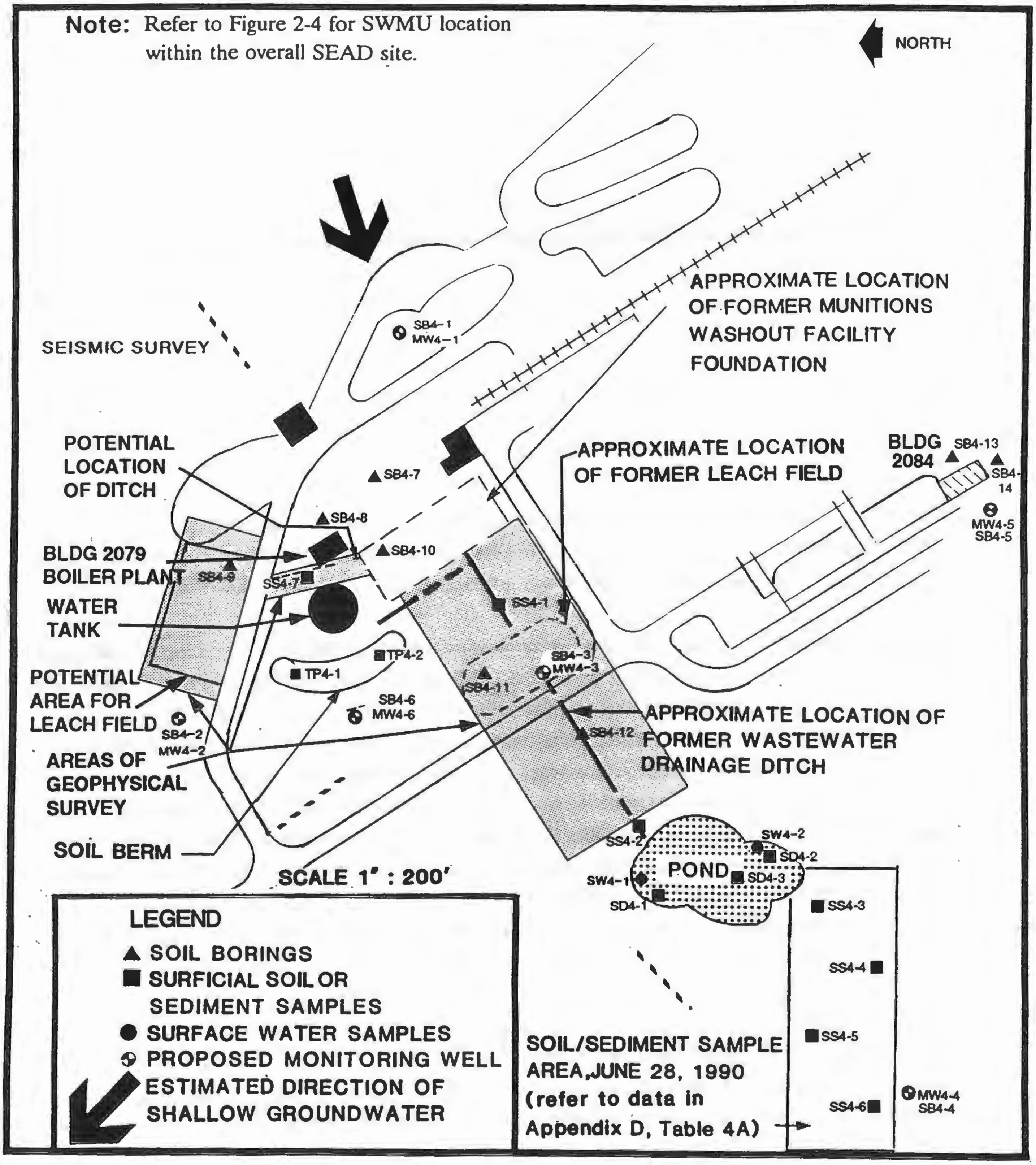


FIGURE 5-1 SAMPLING LOCATIONS FOR SEAD-4: MUNITIONS WASHOUT FACILITY LEACH FIELD

Health and Safety procedures for the investigations performed at SEAD-4 are described in the Health and Safety Plan (Appendix B) and in the SWMU-specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.1.1 Chemicals of Interest

Chemicals which presumably could be found during sample testing from SEAD-4 include 2,4,6-TNT, 2, 4-DNT, 2,6-DNT, RDX, HMX, trinitrobenzene, Tetryl and heavy metals. Soil samples were collected from the pond area in 1990 and tested for 2,4,6-TNT, 2,4-DNT and 2-6-DNT. Explosives were not detected in any of the samples tested (ERCE 1991). Sample locations and data are presented in Appendix D.

5.2.1.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU.

The exact location of the leach field west of the washout facility is unknown. To determine the leach field's location, a GPR survey will be performed. GPR will be relied upon as the primary geophysical method. To provide cost effective backup geophysical data, an electromagnetic (EM-31) survey will be performed together with the GPR survey. The objectives of these surveys will be to delineate the location of the leach field and the locations of subsurface pipes and structures that serviced the leach field (refer to Figure 5-1). Because heavy metals may be constituents of concern here, the electromagnetic data will supplement the GPR survey by providing information on the extent of soils with elevated apparent conductivities. A grid of GPR and electromagnetic data will be collected over the area where the leach field is suspected to be located. The GPR data will be collected at points spaced at 10-foot intervals. Electromagnetic measurements will be made on the same profiles with sample points spaced at 10-foot intervals. It is estimated that up to 15 profiles, each 200 feet in length, will be surveyed.

GPR and EM-31 surveys will also be performed to determine whether a buried ditch or pipe leading north from the former facility and a leach field north of the road exist. The GPR survey will be performed at points spaced at 10-foot intervals. Each survey will be approximately 40 feet long. EM-31 measurements will be made along profiles oriented approximately east-west at 10-foot intervals in the area of the potential pipe and leach field. Each survey will be approximately 250 feet long.

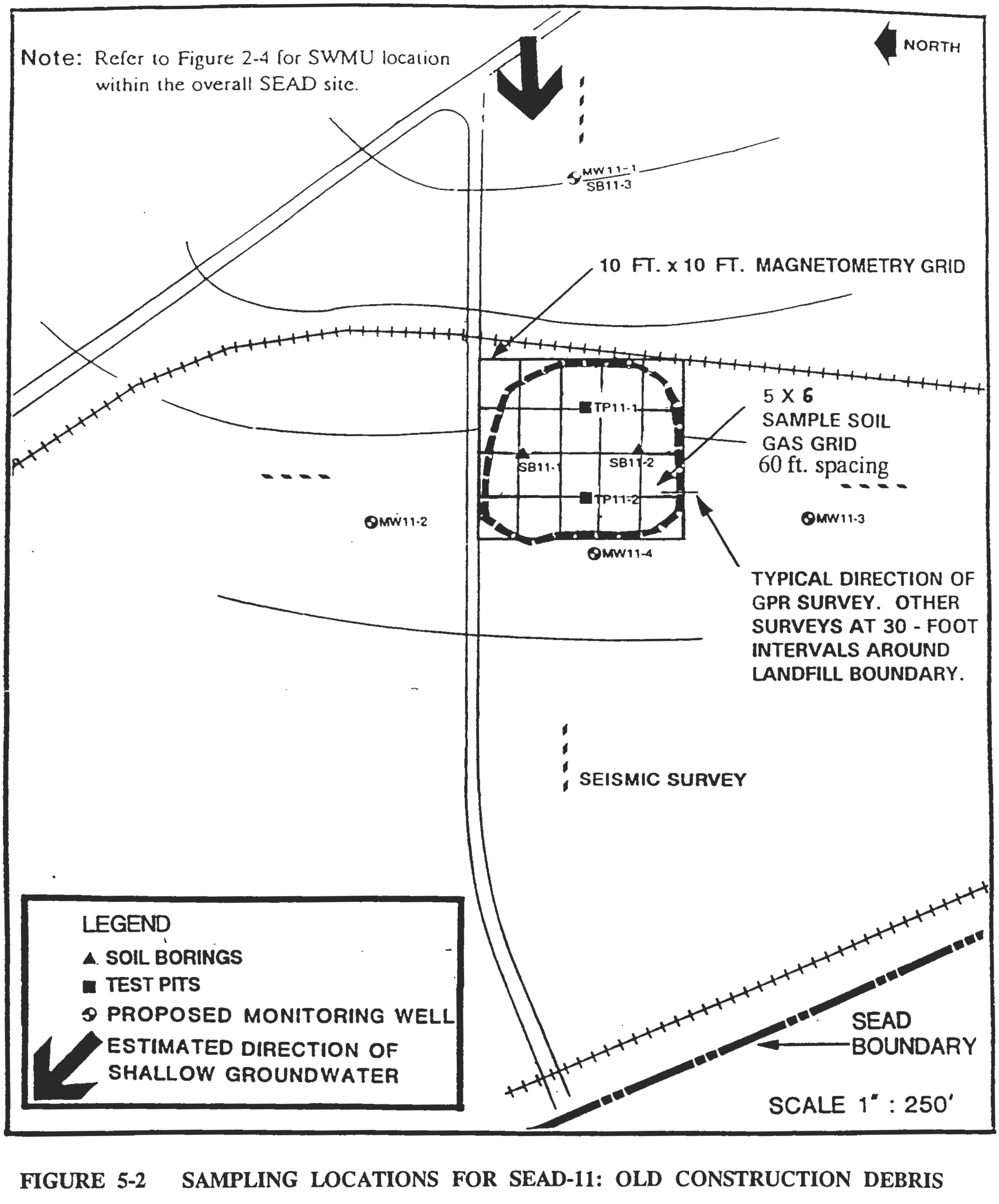


FIGURE 5-2 SAMPLING LOCATIONS FOR SEAD-11: OLD CONSTRUCTION DEBRIS LANDFILL

survey, a GPR survey will be performed. The GPR data will be collected along profiles spaced at 30-foot intervals to help delineate the landfill limits. In addition, GPR data will be collected over each identified EM-31 anomaly to provide a detailed characterization of the source of each anomaly. It is estimated that the EM-31 survey grid will be approximately 200 feet by 200 feet.

Soil Gas

A soil gas survey will be performed on the fill area to determine if concentrations of volatile organic compounds are present in the fill soil gas. This survey will potentially identify source areas of VOCs within the fill.

It is anticipated that up to 30 soil gas sampling locations will be established on the fill area within a specified grid, although the exact number will be determined in the field. Proposed soil gas sampling locations are shown in Figure 5-2. These locations can be changed while in the field after receiving concurrence from the NYSDEC.

Soils

Borings: Soil samples will be obtained from two soil borings drilled through the landfill (SB11-1 and -2) and at a background location (SB11-3). The two landfill borings will be located as shown on Figure 5-2 or at soil gas anomalies. Three samples from each boring will be obtained for chemical analysis. These include: 1) from 0 to 12 inches below grade, 2) immediately above the water table, and 3) an intermediate point. 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.

Test Pits: Two test pits will be excavated to the base of the landfill debris, to observe the type of material present in the landfill and obtain soil samples. The two test pits will be located at geophysical or soil gas anomalies or as shown on Figure 5-2. Three samples from each test pit will be obtained for chemical analysis as described for the samples from the soil borings.

Soil samples from the borings and test pits will be submitted for the chemical analyses identified in Section 5.2.2.3.

Groundwater

Four monitoring wells will be installed on this SWMU as shown in Figure 5-2: one upgradient of the landfill (MW11-1) to obtain background water quality data, one north of the landfill, one south of the landfill, and one immediately downgradient of the landfill. The presumed direction of groundwater flow at this SWMU is to the west-southwest.

These wells will be used to determine the groundwater flow direction in the vicinity of the landfill, evaluate the potential for radial groundwater flow from the landfill, and, determine if hazardous constituents are migrating in the groundwater from the landfill. One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer.

Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.2.3.

5.2.2.3 Analytical Program

Four groundwater samples and 15 soil samples will be collected from SEAD-11 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 352.2, and total recoverable petroleum hydrocarbons by Method 418.1. Up to 30 soil gas samples will be collected from the fill area and analyzed for volatile organic compounds using a Photovac portable gas chromatograph. A summary of the analytical program for SEAD-11 is presented in Table 5-3.

5.2.2.4 Handling UXOs and Explosives

UXOs and explosive material could have been disposed with the construction debris in this landfill. Therefore, personnel from UXB will be on-site to monitor the subsurface explorations and sampling. UXB will decide when remote drilling and site clearance will be necessary based on-site conditions. The following paragraphs present the proposed procedures to handle UXOs and explosives at SEAD-11.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

Test pit excavations and the collection of soil samples from the excavations will be performed by UXB.

UXB will clear areas for field personnel to walk on-site, to perform geophysical surveys, and to obtain groundwater samples.

5.2.3 SEAD-13: IRFNA Disposal Site

The exact location of the pits used to dispose of Inhibited Red Fuming Nitric Acid (IRFNA) is currently unknown. An earlier investigation by ERCE indicated that the pits were located near the west end of the East-West Baseline Road on the south side of the road (ERCE 1991) as shown on Figure 5-3.

Abandoned aboveground piping was observed in the areas southeast and southwest of the Duck Pond. Some of this piping could have been used during the IRFNA disposal project as an emergency shower. An IRFNA disposal study stated that a deluge shower was used for personnel decontamination (USAEHL 1960). Additionally, an abandoned water hydrant was observed southwest of the Duck Pond. Possibly, this water hydrant was used to supply water pressure to the stainless steel ejector.

The pits were lined with limestone which neutralized some or all of the IRFNA. The neutralized wastewater may have migrated to the water table. In addition to groundwater, another potential migration pathway could be surface water via the Duck Pond.

Health & Safety procedures for the investigations performed at SEAD-13 are described in the Health & Safety Plan (Appendix B) and in the SWMU-specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.3.1 Chemicals of Interest

The primary constituents of concern are heavy metals, nitrates, and fluoride.

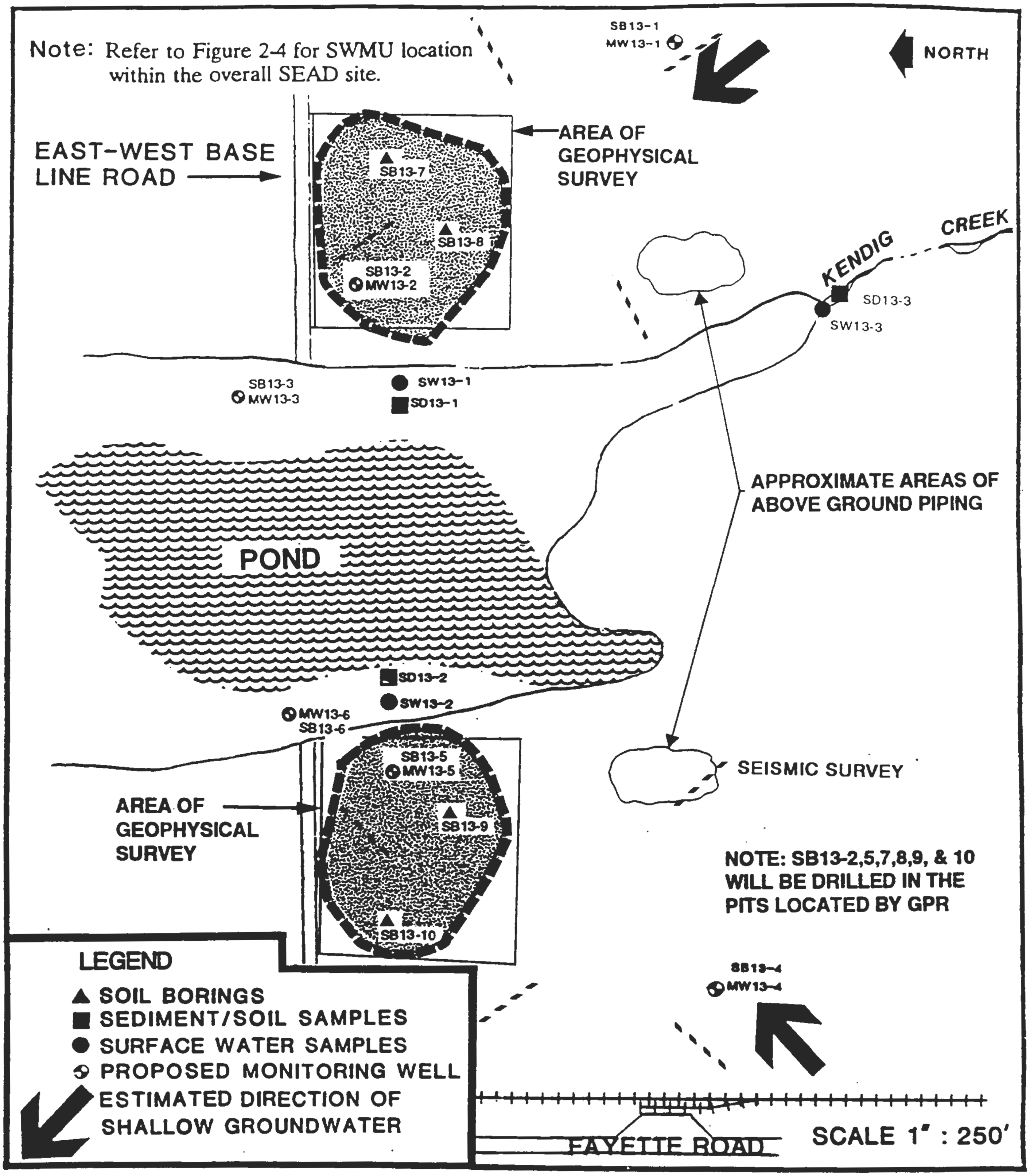


FIGURE 5-3 SAMPLING LOCATIONS FOR SEAD-13: IRFNA DISPOSAL SITE

5.2.3.2 Media To Be Investigated

Geophysics

To locate the six abandoned disposal pits and to evaluate the potential presence of IRFNA barrels in the subsurface, both GPR and EM-31 surveys (non-invasive) will be conducted. The GPR method will be used to identify areas of disturbed soils that could be associated with the IRFNA pits. The EM-31 data will be collected on profiles spaced at 20-foot intervals throughout the two areas where the pits are presumed to be (refer to Figure 5-3). EM-31 measurements will be made at 10-foot spacings along each profile. It is estimated that up to 30 profiles, varying in length from 300 feet to 400 feet, will be surveyed. The GPR data will be collected along the same profiles as the EM-31 data. When the pit locations are identified with the GPR method, additional data will be collected in order to delineate the extent of the pits. If the initial GPR and EM-31 surveys indicate that some of SEAD-13 has been covered by water, it is possible to conduct an additional GPR survey on the water surface. The survey is not likely to yield clear data if pond sediment has covered the originally disturbed soil areas of SEAD-13.

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other over the pits on each side of the Duck Pond after they are located by GPR and EM-31 surveys. Data from the surveys will be used to determine the direction of groundwater flow, adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU, and evaluate whether the disposal of the nitric acid has created a hole or trough in the bedrock surface. Additional surveys may be necessary to further delineate any holes or troughs observed during the initial seismic refraction surveys.

Soils

Borings: Three soil borings will be advanced within each of the two disposal areas (refer to Figure 5-3) at locations tentatively identified as IRFNA disposal pits. Two borings will also be drilled on each side of the pond to obtain soil quality data at a background location (SB13-1 and -4) and near the pond (SB13-3 and -6). Three samples will be collected from each boring: (1) from 0 to 12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detector (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.

If the water table is less than 5 feet below the surface, the boring will be advanced to a maximum depth of 10 feet. Samples of soil for chemical analysis will be collected in these borings 1) from 0 to 12 inches below ground surface, 2) immediately above the water table, and 3) below the water table using one of the four criteria described in the previous paragraph to collect an intermediate sample.

Groundwater

After the geophysical surveys locate the disposal pits, a monitoring well will be installed upgradient of each disposal area, near the downgradient edge of each disposal area, and south of each disposal area near the pond. These wells will be used to determine the groundwater flow direction, background groundwater quality, and to determine if hazardous constituents are migrating with the groundwater from the pits.

The presumed direction of groundwater flow on this SWMU is to the northwest for the pits east of the pond and northeast for the pits west of the pond as shown in Figure 5-3. Monitoring wells MW13-1 and MW13-4 will be used to obtain background water quality data.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.3.4.

Surface Water and Sediment

To assess the potential impact of the IRFNA disposal pits on adjacent surface water bodies, three sediment and surface water sample sets will be collected from within the Duck Pond (refer to Figure 5-3). One surface water and sediment sample set (SW13-3 and SD13-3) will be used to obtain background surface water and sediment quality data. The exact locations of the other two sample sets will be determined based on an inspection of the site. Criteria to select these locations include stressed vegetation, proximity to the pits, and surface water discharge points that originate from the area of the pits. Sediment and surface water sample sets will be collected at the same location and will be tested for the parameters listed in Section 5.2.3.4.

5.2.3.3 Additional Information

The aboveground piping and hydrant will be located on the topographic map that will be created for the site. They will be examined to evaluate their probable use.

Solid Materials from the Building

One to two samples of the scale inside the furnace and eight to nine samples of dirt from various locations on the floor of the building will be obtained. Five samples of building materials (pipe insulation, transite panels, etc.) will also be obtained from within the building. These samples will be tested for the parameters listed in Section 5.2.4.3.

5.2.4.3 Analytical Program

A total of sixteen soil samples, three groundwater samples, 10 samples of furnace scale and residues on the floor of the building, two surface water samples, and a maximum of three propellant residue samples will be collected from SEAD-16 for chemical testing. All these 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, and nitrates by Method 352.2. Five samples of building materials and 5 samples of dirt inside the building will be analyzed for asbestos. A summary of the analytical program for SEAD-16 is presented in Table 5-3.

5.2.4.4 Handling UXOs and Explosives

The facility at this SWMU was used to burn explosives in munitions; therefore, there is the potential for UXOs and explosives to be present in the soil. As a result, personnel from UXB will be on-site to monitor the subsurface explorations and sampling. UXB will decide when remote drilling and site clearance will be necessary based on site conditions.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

UXB will clear areas for field personnel to walk onsite, to perform geophysical surveys, and to obtain surface soil, surface water, and groundwater samples.

5.2.5 SEAD-17: Building 367 Existing Deactivation Furnace

The explosives from the munitions burned in the furnace are most likely to have been destroyed in the furnace. Heavy metals probably exited the furnace in the ash and dust. During previous investigations, surface soil samples and wipe samples were collected during an interim closure process and tested for barium and lead. Some of the soil samples collected exceeded EP Toxicity limits established for lead. The primary migration pathways are expected to be soil and groundwater.

Health & Safety procedures for the investigations performed at SEAD-17 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.5.1 Chemicals of Interest

Heavy metals, primarily lead and barium, and explosives are of concern.

5.2.5.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and if necessary adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU.

Groundwater

Four monitoring wells will be installed to assess the potential impact of this SWMU on the groundwater quality. One monitoring well (MW17-1) will be installed hydraulically upgradient of the furnace for background water quality, while the remaining three monitoring wells will be installed downgradient of this SWMU (refer to Figure 5-5). The presumed direction of groundwater flow on this SWMU is to the west-southwest.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.5.3.

Soil

Borings: Four soil borings will be drilled at the locations where the monitoring wells will be installed. 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. These include (1) from 0-12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detection (PID) reading, or (4) visibly affected soil (e.g., oil stains). If none of these occur, then the intermediate sample will be collected at

Surface Soils: Surficial soil samples 0 to 6 inches below grade will be obtained from 12 locations surrounding the abandoned pit. These samples will be submitted for the chemical analyses identified in Section 5.2.6.3.

Groundwater

One monitoring well (MW24-1) will be installed upgradient of SEAD-24 to obtain background water quality data, while two monitoring wells will be installed adjacent to and downgradient of this unit to evaluate whether hazardous constituents have migrated from the SWMU and to determine the groundwater flow direction. The presumed direction of groundwater flow at this SWMU is to the northwest.

One monitoring well will be installed at each location that is screened over the entire thickness of the aquifer. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.6.3.

5.2.6.3 Analytical Program

A total of 27 soil samples and three groundwater samples will be collected from SEAD-24 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 352.2, and total recoverable petroleum hydrocarbons by Method 418.1. A summary of the analytical program for SEAD-24 is presented in Table 5-3.

5.2.6.4 Handling UXOs and Explosives

The facilities at this SWMU were used to burn explosives; therefore, there is the potential for UXOs and explosives to be present in the soil in the pit. As a result, personnel from UXB will be on-site to monitor the subsurface explorations and sampling performed in the pit. UXB will decide when remote drilling and site clearance will be necessary based on site conditions. The following paragraphs present the proposed procedures to handle UXOs and explosives at SEAD-24.

During drilling operations, a Safety Officer from UXB will monitor the work. All drilling is expected to be performed remotely.

UXB will clear areas for field personnel to walk in the pit and to perform geophysical surveys.

5.2.7 SEAD-25: Fire Training and Demonstration Pad

Based on past site activities, spent solvents (prior to RCRA), water-contaminated fuels and oils have been used at this SWMU. The primary migration pathways are expected to be groundwater, although soil and air are also potential pathways.

Health & safety procedures for the investigations performed at SEAD-25 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.7.1 Chemicals of Interest

Petroleum products, primarily benzene, toluene and xylene, and solvents are of concern. Additionally, lead may also be of concern if leaded fuels were used for fire fighting demonstrations. Where waste oil is managed, there is potential for PCB transformer oil to be mixed in with it.

5.2.7.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradients of the SWMU.

Soils

A total of six soil borings will be advanced at this SWMU, five within the area of the pad (refer to Figure 5-7), and one east of the pad to obtain background soil quality 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: (1) from 0 to 12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detector (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 intermediate sample analyzed.

Groundwater

A total of three monitoring wells will be installed at this SWMU. One monitoring well will be installed upgradient of the pad to obtain background water quality data, while the remaining two wells will be installed adjacent and downgradient of the pad to determine if hazardous constituents have migrated from the SWMU and to determine the direction of groundwater flow. The presumed direction of groundwater flow at this SWMU is to the southwest.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.7.3.

5.2.7.3 Analytical Program

A total of 18 soil samples and three groundwater samples will be collected from SEAD-25 for chemical testing. All the samples will be analyzed for the following: the TCL VOCs [including methyl tertiary butyl ether (MTBE)], SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, herbicides by Method 8150, nitrates by Method 352.2, and total recoverable petroleum hydrocarbons by Method 418.1. A summary of the analytical program for SEAD-25 is presented in Table 5-3.

5.2.7.4 Handling UXOs and Explosives

UXOs nor explosives were handled at SEAD-25; therefore, no remote drilling or UXO clearance will take place during the field work.

5.2.8 SEAD-26: Fire Training Pit and Area

Fuels, oils and solvents were stored in the fire training area and burned in the pit (refer to Figure 5-8). Approved fuels are currently burned in the pit.

Flammable materials were floated on water within the fire pit prior to extinguishing; therefore, fuels containing water, used oils and herbicides and spent solvents (prior to RCRA) may have leached into the subsurface and migrated down to the water table. The primary migration pathways are expected to be soil, groundwater, and surface water.

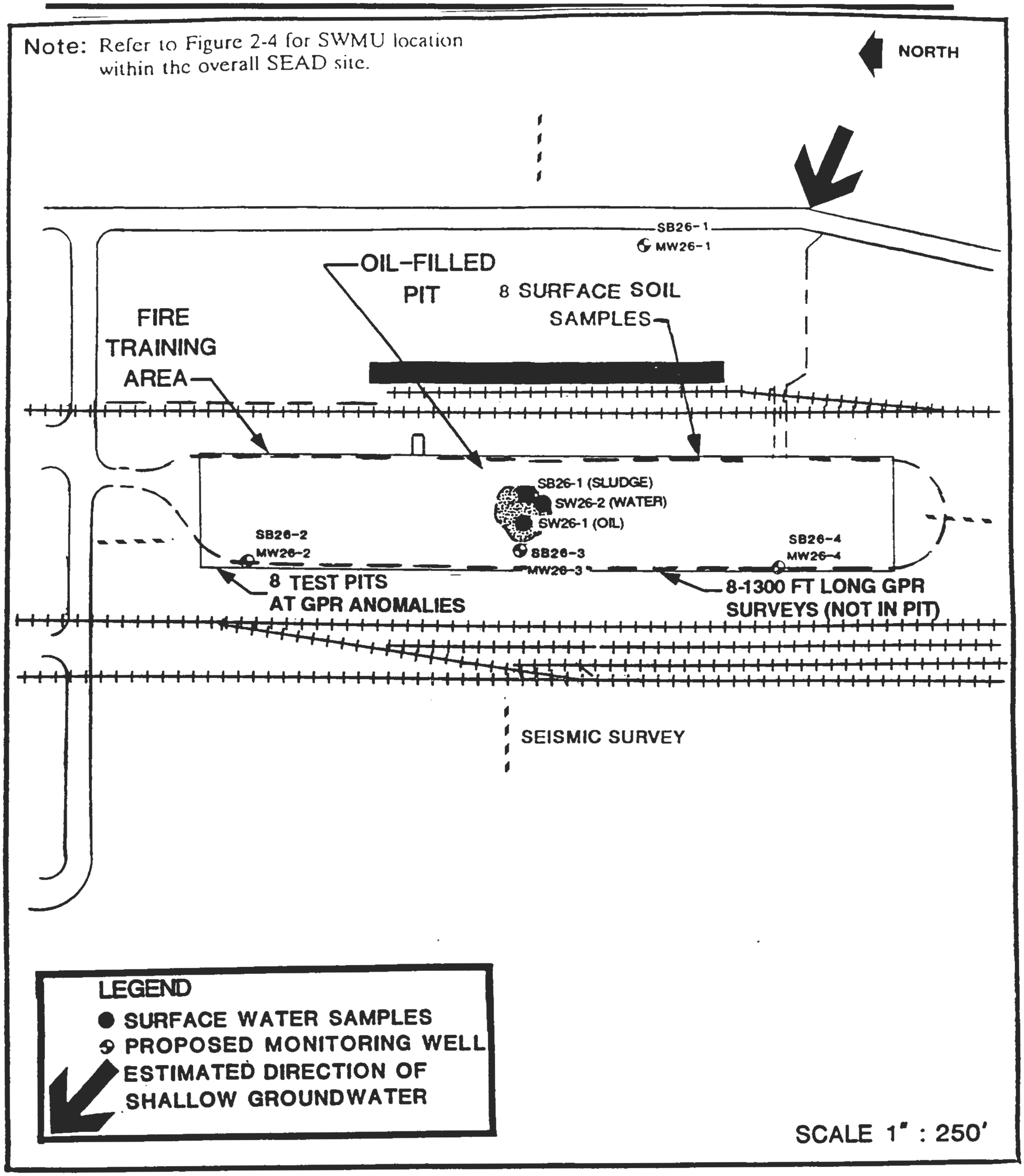


FIGURE 5-8 SAMPLING LOCATIONS FOR SEAD-26: FIRE TRAINING PIT AND AREA

Health & Safety procedures for the investigations performed at SEAD-26 are described in the Health & Safety Plan (Appendix B) and in the SWMU - specific safety guidelines (Appendix B of the Health & Safety Plan).

5.2.8.1 Chemicals of Interest

The primary chemicals of interest are solvents and petroleum products, including benzene, toluene and xylenes. Lead may also be a constituent of concern because leaded fuels were likely to have been used. Where waste oil is managed, there is potential for PCB transformer oil and herbicides to be mixed in with it.

5.2.8.2 Media To Be Investigated

Geophysics

Four 120-foot seismic refraction surveys will be performed along two lines laid out perpendicular to each other. Data from the surveys will be used to determine the direction of groundwater flow and adjust the location of the monitoring wells to locate a well upgradient and a well downgradient of the SWMU.

A GPR survey will be performed within the fire training area, but not within the fire training pit. The data will be collected along eight 1300 foot long profiles in the area outlined in Figure 5-8. The GPR data will be used to detect anomalies and characterize the extent of disturbed soils at the site.

Soils

Borings: A total of four borings are proposed for this SWMU; one boring will be drilled upgradient of the pit and three borings will be drilled downgradient of the fire training area (refer to Figure 5-8). One of the downgradient borings proposed is adjacent to the pit. These four borings are associated with the four proposed wells. Each boring will be continuously sampled to the top of the water table. Samples from SB26-1 will be used to obtain background soil quality data. A total of three samples from each boring will be collected: (1) from 0 to 12 inches below grade, (2) immediately above the water table and (3) an intermediate point. The intermediate sample will be collected at a depth where one of the following site-specific items occurs: (1) a stratigraphic change, (2) evidence of perched water table, (3) elevated photoionization detector (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 intermediate sample analyzed.

Test Pits: Eight test pits will be excavated at anomalies detected during the GPR survey. If less than eight anomalies are detected, a total of eight test pits will still be excavated: one at each anomaly and the others at locations in the fire training area where no anomalies were detected. A total of two soil samples will be collected from each test pit.

Surface Soils: Eight surficial soil samples will be collected from the area around the site. The surface soil samples will be collected from the 0-2" depth.

Groundwater

Four wells are proposed for SEAD-26, one upgradient for background water quality data and three adjacent and downgradient (refer to Figure 5-8) to determine the groundwater flow direction and determine if hazardous constituents have migrated from the SWMU. The presumed direction of groundwater flow at this SWMU is to the southwest.

One monitoring well will be constructed at each location that is screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample will be collected from each well and tested for the parameters listed in Section 5.2.8.3.

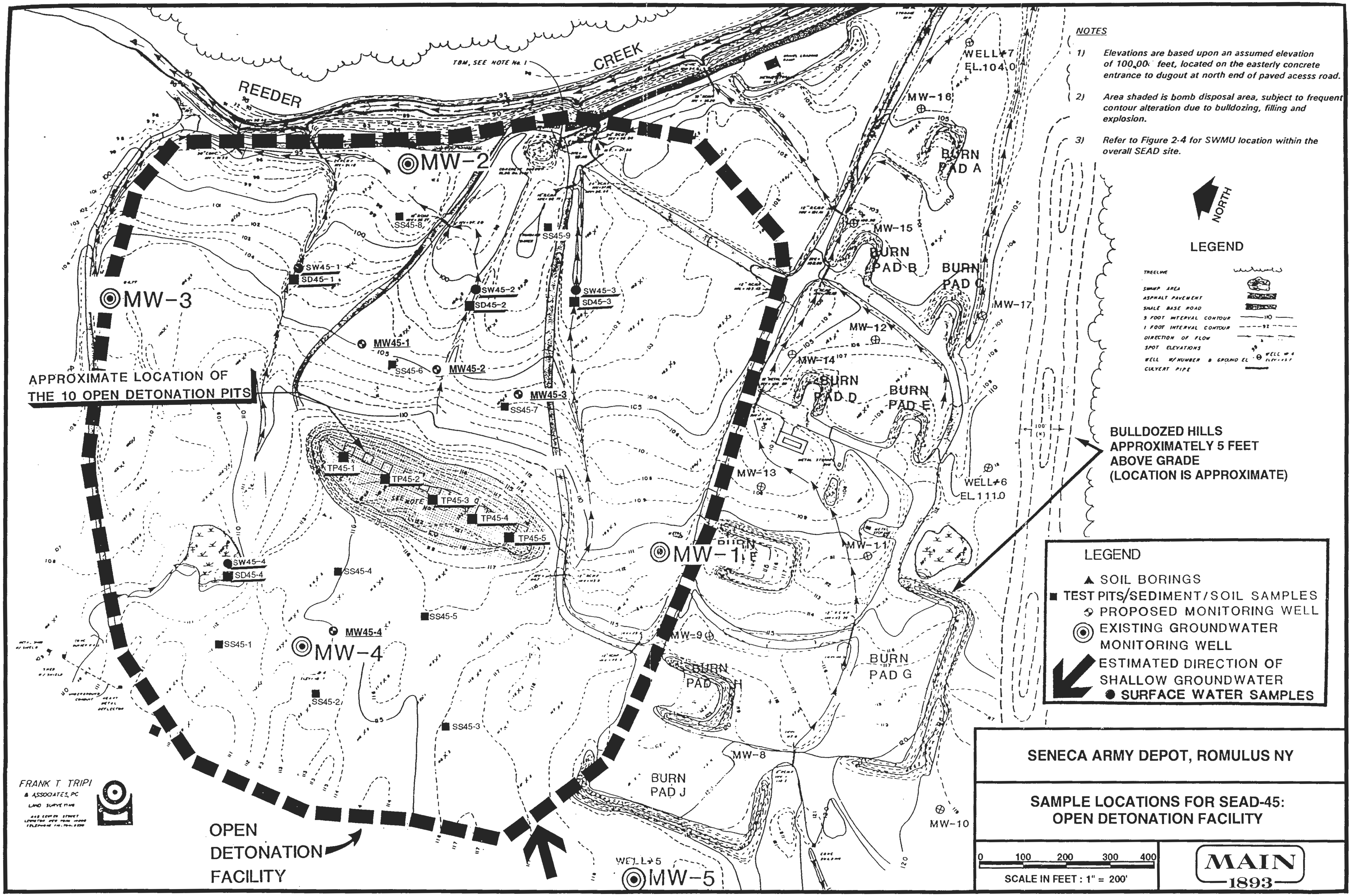
Oil, Surface Water, and Sediment

Three samples will be obtained from the fire training pit: one of any oil floating on the water, one of the surface water, and one of the sediment at the bottom of the pit. These samples will be analyzed for the parameters listed in Section 5.2.8.3.

5.2.8.3 Analytical Program

A total of 36 soil samples, four groundwater samples, one sediment sample, and one surface water sample will be collected from SEAD-26 for chemical testing. All these samples will be analyzed for the following: the TCL VOCs [including methyl tertiary butyl ether (MTBE)], SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, herbicides by Method 8150, nitrates by Method 352.2, and total recoverable petroleum hydrocarbons by Method 418.1. One oil sample will be collected, then analyzed for TPH by NYSDOH Method 310-14, PCBs by Method 8080, and herbicides by Method 8150. A summary of the analytical program for SEAD-26 is presented in Table 5-3.

FIGURE 5-9



NOTES

1) *Elevations are based upon an assumed elevation of 100.00 feet, located on the easterly concrete entrance to dugout at north end of paved acesss road.*

2) *Area shaded is bomb disposal area, subject to frequent contour alteration due to bulldozing, filling and explosion.*

3) *Refer to Figure 2-4 for SWMU location within the overall SEAD site.*

SENECA ARMY DEPOT, ROMULUS NY

SAMPLE LOCATIONS FOR SEAD-45: OPEN DETONATION FACILITY

APP. A

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 Parsons Main Safety Officer.

The excavation will be continuously monitored by Parsons Main for VOCs with a PID and for radiation with a radiation meter. 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.

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.

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.

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.

Sampling

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 nitrile or latex (depending on SWMU specific contaminants) 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, herbicides, total petroleum hydrocarbons, nitrate, and fluoride. 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 5 of the Work Plan. The sampling will be accomplished by using the following procedure:

1. Establish the exact location of each sampling station in the field. The sample site will be noted on a site plan and marked in the field with flagging and a 4-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).

APP. B

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 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.**

UXB personnel trained in the discovery and handling of UXOs shall perform all UXO clearance for the ten 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 ordinance 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 and physical contaminant exclusion zone will consist of a 50-foot buffer around all sides of the drill rig, marked by barrier tape or fencing. Exclusion zones are set up to protect personnel from physical as well as chemical hazards. Exclusion zone barriers will not be removed until the drilling operation has ceased even if surface contaminations is not found to exist in the area around the rig.

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 Parsons Main 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 monitor (HNu photoionization detector (PID) equipped with a 10.2 V lamp, Thermoelectron Organic Vapor Monitor (OVM), or OVA flame ionization detector (FID)). Instrument settings on all direct reading air monitoring instruments will be set on the most sensitive scale (i.e., OVA: X1; HNu: 0-20 ppm) 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 (Drager 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 is expected to be high. Measurements will be data logged and a TWA for the work period will be calculated. Two Miniram will be used; one at the worksite, and one downwind of the work area.

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
OVM (PID) (ppm)	<2*	2-50**	50-1,000		>1,000
OVA (FID) (ppm)	<2*	2-50**	50-1,000		>1,000
OXYGEN (%)	19.5-23	19.5-23	<19.5		>23 (explosive environment)
LOWER EXPLOSIVE LIMIT (%)	<10	<10	<10	10<LEL<25	>25 (explosive environment)
RADIATION METER (mR/HR)	<0.5	<0.5	<0.5	0.5<mR<5	>5

* including background

** If Vinyl Chloride is the known source of contamination, Level C respirator use is not recommended. In this case, workers should upgrade to Level B in the event that the action level is exceeded.

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. In the event that an action level is equalled or exceeded for a period of time greater than what would be considered to be a brief spiked reading, immediately stop work and back away from the work area. Allow the levels to stabilize and reenter the work area to take ambient measurements. If the readings are below the action level for an upgrade in personnel protective equipment, restart work under careful consideration of the possibility for another event. If the action level remains exceeded for the current level of protection, upgrade all personnel with the proper personnel protective equipment (PPE) prior to re-entry 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.

App C

1

NITROAROMATICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: Aquatec, Inc. Contract: ____________

Lab Code: AQUAI Case No.: ________ SAS No.: ________ SDG No.: ____________

Matrix: (soil/water) Soil

Lab Sample ID: ____________

Sample wt/vol: ______ (g/mL) g

Lab File ID: ____________

Level: (low/med) LOW

Date Received: ____________

% Moisture: not dec. ______ dec. ______

Date Extracted: ____________

Extraction: (SepF/Sonc) Sonc

Date Analyzed: ____________

Dilution Factor: ____________

CAS NO.	COMPOUND	CONCENTRATION UNITS: ug/Kg	Q
2691-41-0	HMX	130	U
121-82-4	RDX	130	U
99-35-4	1,3,5-Trinitrobenzene	130	U
99-65-0	1,3-Dinitrobenzene	130	U
479-45-8	Tetryl	130	U
118-96-7	2,4,6-Trinitrotoluene	130	U
1946-51-0	4-amino-2,6-Dinitrotoluene	130	U
355-72-78-2	2-amino-4,6-Dinitrotoluene	130	U
606-20-2	2,6-Dinitrotoluene	130	U
121-14-2	2,4-Dinitrotoluene	130	U

1

NITROAROMATICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: Aquatec, Inc. Contract: ________

Lab Code: AQUAI Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix: (soil/water) Water

Lab Sample ID: ______

Sample wt/vol: ______(g/mL) mL

Lab File ID: ______

Level: (low/med) LOW

Date Received: ______

% Moisture: not dec. ______ dec. ______

Date Extracted: ______

Extraction: (SepF/Sonc) SepF

Date Analyzed: ______

Dilution Factor: ______

CAS NO.	COMPOUND	CONCENTRATION UNITS: ug/L	Q
2691-41-0	HMX	0.13	U
121-82-4	RDX	0.13	U
99-35-4	1,3,5-Trinitrobenzene	0.13	U
99-65-0	1,3-Dinitrobenzene	0.13	U
479-45-8	Tetryl	0.13	U
118-96-7	2,4,6-Trinitrotoluene	0.13	U
1946-51-0	4-amino-2,6-Dinitrotoluene	0.13	U
355-72-78-2	2-amino-4,6-Dinitrotoluene	0.13	U
606-20-2	2,6-Dinitrotoluene	0.13	U
121-14-2	2,4-Dinitrotoluene	0.13	U

FORM 2
NITROAROMATICS SURROGATE RECOVERY

Lab Name: Aquatec, Inc.
Lab Code: AQUAI
Matrix: ____

Contract: ____
Case: ____
SDG No: ____

	LAB ID	CLIENT ID	NB %REC
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

	ADVISORY QC LIMITS (%)
NB = Nitrobenzene	(35-114) water (23-120) soil

3
WATER NITROAROMATICS
MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: Aquatec, Inc.
Lab Code: AQUAI
SAS No.: ____________

Contract: ____________
Case No.: ____________
SDG No.: ____________

Matrix Spike - Sample No.: ____________

Level: (low/med) ________

Compound	SPIKE ADDED (UG/L)	SAMPLE CONCENTRATION (UG/L)	MS CONCENTRATION (UG/L)	MS % REC #	QC LIMITS REC.
HMX					50-150
RDX					50-150
1,3,5-Trinitrobenzene					50-150
1,3-Dinitrobenzene					50-150
2,4,6-Trinitrotoluene					50-150
2-amino-4,6-Dinitrotoluene					50-150
2,4-Dinitrotoluene					50-150

Compound	SPIKE ADDED (UG/L)	MSD CONCENTRATION (UG/L)	MSD % REC #	% RPD #	QC RPD	LIMITS REC.
HMX					25	50-150
RDX					25	50-150
1,3,5-Trinitrobenzene					25	50-150
1,3-Dinitrobenzene					25	50-150
2,4,6-Trinitrotoluene					25	50-150
2-amino-4,6-Dinitrotoluene					25	50-150
2,4-Dinitrotoluene					25	50-150

Column used to flag recovery and RPD values with an asterisk
* Values outside ofQC limits

RPD: ____________ out of 7 outside limits
Spike Recovery: ____________ out of 14 outside limits

SOIL NITROAROMATICS
MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: Aquatec, Inc.
Lab Code: AQUAI
SAS No.: ____________

Contract: ____________
Case No.: ____________
SDG No.: ____________

Matrix Spike - Sample No.: ____________

Level: (low/med) ________

Compound	SPIKE ADDED (UG/KG)	SAMPLE CONCENTRATION (UG/KG)	MS CONCENTRATION (UG/KG)	MS % REC #	QC LIMITS REC.
					50-150
HMX					50-150
RDX					50-150
1,3,5-Trinitrobenzene					50-150
1,3-Dinitrobenzene					50-150
2,4,6-Trinitrotoluene					50-150
2-amino-4,6-Dinitrotoluene					50-150
2,4-Dinitrotoluene					50-150

Compound	SPIKE ADDED (UG/KG)	MSD CONCENTRATION (UG/KG)	MSD % REC #	% RPD #	QC RPD	LIMITS REC.
HMX					50	50-150
RDX					50	50-150
1,3,5-Trinitrobenzene					50	50-150
1,3-Dinitrobenzene					50	50-150
2,4,6-Trinitrotoluene					50	50-150
2-amino-4,6-Dinitrotoluene					50	50-150
2,4-Dinitrotoluene					50	50-150

Column used to flag recovery and RPD values with an asterisk
* Values outside ofQC limits

RPD: ____________ out of 7 outside limits
Spike Recovery: ____________ out of 14 outside limits

3QC
NITROAROMATICS
QUALITY CONTROL CHECK SAMPLE RECOVERY

Lab Name: Aquatec, Inc. Contract: ________
Lab Code: AQUAI Case No.: ________
SAS No.: ________ SDG No.: ________

QC Sample Filename: ________ Level: (low/med) ________

Compound	SPIKE ADDED (UG/L)	QC SAMPLE CONCENTRATION (UG/L)	% REC #	QC LIMITS (%)
HMX				50-150
RDX				50-150
1,3,5-Trinitrobenzene				50-150
1,3-Dinitrobenzene				50-150
2,4,6-Trinitrotoluene				50-150
2-amino-4,6-Dinitrotoluene				50-150
2,4-Dinitrotoluene				50-150

\# Column used to flag recovery and RPD values with an asterisk
* Values outside ofQC limits

Spike Recovery: ________ out of 7 outside limits

3QC
NITROAROMATICS
QUALITY CONTROL CHECK SAMPLE RECOVERY

Lab Name: Aquatec, Inc.
Lab Code: AQUAI
SAS No.: ____________
Contract: ____________
Case No.: ____________
SDG No.: ____________

QC Sample Filename: ____________ Level: (low/med) ____________

Compound	SPIKE ADDED (UG/KG)	QC SAMPLE CONCENTRATION (UG/KG)	% REC	#	QC LIMITS (%)
HMX					50-150
RDX					50-150
1,3,5-Trinitrobenzene					50-150
1,3-Dinitrobenzene					50-150
2,4,6-Trinitrotoluene					50-150
2-amino-4,6-Dinitrotoluene					50-150
2,4-Dinitrotoluene					50-150

Column used to flag recovery and RPD values with an asterisk
* Values outside ofQC limits

Spike Recovery: ____________ out of 7 outside limits

FORM4
NITROAROMATICS METHOD BLANK SUMMARY

Lab Name: Aquatec, Inc.
Lab Code: AQUAI
Lab Sample ID: ______
Matrix: ______
Date Analyzed(1): ______
Time Analyzed(1): ______
LC ID(1): ______
LC Column(1): ______

Contract: ______
Case: ______
SDG No: ______
Date Extracted: ______
Date Analyzed(2): ______
Time Analyzed(2): ______
LC ID(2): ______
LC Column(2): ______

	LAB ID	CLIENT ID	DATE ANALYZED 1	DATE ANALYZED 2
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

FORM 8
NITROAROMATICS ANALYTICAL SEQUENCE

Lab Name: Aquatec, Inc.
Lab Code: AQUAI
LC ID: ____________
LC Column: ____________

Contract: ____________
Case: ____________
SDG No: ____________
Initial Date Analyzed: ____________

	LAB ID	CLIENT ID	DATE ANALYZED	TIME ANALYZED	RT NB1	RT NB2
1	EXPL A 12.5ppb					
2	EXPL A 25ppb					
3	EXPL A 62.5ppb					
4	EXPL A 166.7ppb					
5	EXPL A 500ppb					
6	EXPL B 12.5ppb					
7	EXPL B 25ppb					
8	EXPL B 62.5ppb					
9	EXPL B 166.7ppb					
10	EXPL B 500ppb					
11	EXPL A 12.5ppb					
12	EXPL A 25ppb					
13	EXPL A 62.5ppb					
14	EXPL A 166.7ppb					
15	EXPL A 500ppb					
16	EXPL B 12.5ppb					
17	EXPL B 25ppb					
18	EXPL B 62.5ppb					
19	EXPL B 166.7ppb					
20	EXPL B 500ppb					
21	EXPL A 12.5ppb					
22	EXPL A 25ppb					
23	EXPL A 62.5ppb					
24	EXPL A 166.7ppb					
25	EXPL A 500ppb					
26	EXPL B 12.5ppb					
27	EXPL B 25ppb					
28	EXPL B 62.5ppb					
29	EXPL B 166.7ppb					
30	EXPL B 500ppb					
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						

SURROGATE RT FROM INITIAL CALIBRATION
NB1: ________ NB1 = Nitrobenzene (LC-18)
NB2: ________ NB2 = Nitrobenzene (LC-CN)

QC LIMITS
(+/- 0.08 minutes)
(+/- 0.08 minutes)

PAGE of

9A
NITROAROMATICS
CONTINUING CALIBRATION CHECK

Lab Name: Aquatec, Inc.
Lab Code: AQUAI
SAS No.: ______
Instrument ID: LC1488
Init. Calib. Date(s): ______ to ______

Contract: 91118
Case No.: ______
SDG No.: ______
Column: ______
Detector: UV @ 254nm
Standard Mix: A

COMPOUND	INITIAL CAL. MIDPOINT STANDARD #1 File: Date: Time:	INITIAL CAL. MIDPOINT STANDARD #2 File: Date: Time:	INITIAL CAL. MIDPOINT STANDARD #3 File: Date: Time:	INITIAL CAL. MEAN RESPONSE
HMX				
RDX				
1,3-Dinitrobenzene				
2,4,6-Trinitrotoluene				
2-amino-4,6-Dinitrotoluene				
2,4-Dinitrotoluene				
Nitrobenzene				

9B
NITROAROMATICS
CONTINUING CALIBRATION CHECK

Lab Name: Aquatec, Inc.
Lab Code: AQUAI
SAS No.: ____
Instrument ID: LC1488
Init. Calib. Date(s): ____ to ____

Contract: 91118
Case No.: ____
SDG No.: ____
Column: ____
Detector: UV @ 254nm
Standard Mix: 8

COMPOUND	INITIAL CAL. MIDPOINT STANDARD #1 File: Date: Time:	INITIAL CAL. MIDPOINT STANDARD #2 File: Date: Time:	INITIAL CAL. MIDPOINT STANDARD #3 File: Date: Time:	INITIAL CAL. MEAN RESPONSE
1,3,5-Trinitrobenzene				
Tetryl				
4-amino-2,6-Dinitrotoluene				
2,6-Dinitrotoluene				
Nitrobenzene				

9C
NITROAROMATICS
CONTINUING CALIBRATION CHECK

Lab Name: Aquatec, Inc.
Lab Code: AQUAI
SAS No.:
Instrument ID: LC1488
Init. Calib. Date(s): to

Contract: 91118
Case No.:
SDG No.:
Column:
Detector: UV @ 254nm
Standard Mix: A

COMPOUND	INITIAL CAL. MEAN RESPONSE	CHECK STANDARD RESPONSE File: Date: Time:	%D
HMX			
RDX			
1,3-Dinitrobenzene			
2,4,6-Trinitrotoluene			
2-amino-4,6-Dinitrotoluene			
2,4-Dinitrotoluene			
Nitrobenzene			

9D

NITROAROMATICS
CONTINUING CALIBRATION CHECK

Lab Name: Aquatec, Inc.

Lab Code: AQUAI

SAS No.: ____

Instrument ID: LC1488

Init. Calib. Date(s): ____ to ____

Contract: 91118

Case No.: ____

SDG No.: ____

Column: ____

Detector: UV @ 254nm

Standard Mix: B

COMPOUND	INITIAL CAL. MEAN RESPONSE	CHECK STANDARD RESPONSE File: Date: Time:	%D
1,3,5-Trinitrobenzene			
Tetryl			
4-amino-2,6-Dinitrotoluene			
2,6-Dinitrotoluene			
Nitrobenzene			

9E

NITROAROMATICS
DAILY CONTINUING CALIBRATION CHECK

Lab Name: Aquatec, Inc.
Lab Code: AQUAI
SAS No.:
Instrument ID: LC1488
Init. Calib. Date(s): to

Contract: 91118
Case No.:
SDG No.:
Column:
Detector: UV @ 254nm
Standard Mix: A

COMPOUND	DAILY MIDPOINT STANDARD #1 File: Date: Time:	DAILY MIDPOINT STANDARD #2 File: Date: Time:	DAILY MIDPOINT STANDARD #3 File: Date: Time:	DAILY MEAN RESPONSE
HMX				
RDX				
1,3-Dinitrobenzene				
2,4,6-Trinitrotoluene				
2-amino-4,6-Dinitrotoluene				
2,4-Dinitrotoluene				
Nitrobenzene				

9F

NITROAROMATICS
DAILY CONTINUING CALIBRATION CHECK

Lab Name: Aquatec, Inc.

Lab Code: AQUAI

SAS No.: ______

Contract: 91118

Case No.: ______

SDG No.: ______

Column: ______

Instrument ID: LC1488

Detector: UV @ 254nm

Init. Calib. Date(s): ______ to ______

Standard Mix: B

COMPOUND	DAILY MIDPOINT STANDARD #1 File: Date: Time:	DAILY MIDPOINT STANDARD #2 File: Date: Time:	DAILY MIDPOINT STANDARD #3 File: Date: Time:	DAILY MEAN RESPONSE
,3,5-Trinitrobenzene				
Tetryl				
4-amino-2,6-Dinitrotoluene				
2,6-Dinitrotoluene				
Nitrobenzene				

9G
NITROAROMATICS
DAILY CONTINUING CALIBRATION CHECK

Lab Name: Aquatec, Inc.
Contract: 91118
Lab Code: AQUAI
Case No.: ______
SAS No.: ______
SDG No.: ______
Column: ______
Instrument ID: LC1488
Detector: UV @ 254nm
Init. Calib. Date(s): ______ to ______
Standard Mix: A

COMPOUND	INITIAL CAL. MEAN RESPONSE	DAILY MEAN RESPONSE Date:	%D
HMX			
RDX			
1,3-Dinitrobenzene			
2,4,6-Trinitrotoluene			
2-amino-4,6-Dinitrotoluene			
2,4-Dinitrotoluene			
Nitrobenzene			

9H

NITROAROMATICS
DAILY CONTINUING CALIBRATION CHECK

Lab Name: Aquatec, Inc.
Lab Code: AQUAI
SAS No.: ______
Instrument ID: LC1488
Init. Calib. Date(s): ______ to ______

Contract: 91118
Case No.: ______
SDG No.: ______
Column: ______
Detector: UV @ 254nm
Standard Mix: B

COMPOUND	INITIAL CAL. MEAN RESPONSE	DAILY MEAN RESPONSE File: Date: Time:	%D
1,3,5-Trinitrobenzene			
Tetryl			
4-amino-2,6-Dinitrotoluene			
2,6-Dinitrotoluene			
Nitrobenzene			

APP. D

App D

TABLE 45F
DEMOLITION AREA SOIL DATA

	EP Toxicity[a]								Explosives[bc]					
Sample No. and Description	As	Ba	Cd	Cr	Hg	Pb	Se	Ag	HMX	RDX	Tetryl	2,4,6 -TNT	2,6- DNT	2,4- DNT
4727-001 Demolition Crater No. 2	ND	ND	0.19	ND	ND	ND	ND	ND	ND	1.4	ND	ND	ND	1.6
-002 Demolition Crater No. 2	ND	ND	0.20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.9
-003 Demolition Crater No. 4	ND	ND	0.16	ND	ND	ND	ND	ND	ND	1.4	1.6	ND	ND	1.9
-004 Demolition Crater No. 4	ND	ND	0.16	ND	ND	ND	ND	ND	ND	ND	32.0	ND	ND	ND
-005 Demolition Crater No. 6	ND	ND	0.17	ND	ND	ND	ND	ND	ND	1.3	16.3	2.2	ND	ND
-006 Demolition Crater No. 6	ND	ND	0.18	ND	ND	ND	ND	ND	ND	1.2	ND	ND	ND	1.7
-007 Demolition Crater No. 8	ND	ND	0.17	ND	ND	ND	ND	ND	ND	1.7	ND	1.4	ND	1.1
-008 Demolition Crater No. 8	ND	ND	0.45	ND	ND	ND	ND	ND	ND	ND	ND	61	ND	ND

NOTES:

ND - Not Detected
a - all units in mg/l
b - all units in ug/g
c - detection limits for all explosives was 1.0 ug/g

Source: Appendix E, Table E-1, Phase 2, Hazardous Waste Management Special Study No. 39-26-0147-83 DARCOM Open Burning/Open Detonation Grounds Evaluation, Seneca Army Depot, Seneca, New York, 2-13 May 1982.

1.0 INTRODUCTION

1.1 PURPOSE

Parsons Main, Inc. (Parsons Main) 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 ten 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 ten 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 an RI/FS investigation. It will be more descriptive than a RCRA Facility Assessment (RFA) sampling visit, and less detailed than the RI/FS investigation process. Since ESIs are being conducted at each of the 10 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 these ten 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) may 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 Remedial Investigation/Feasibility Study (RI/FS) may be required to gain enough 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 AOCs 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.

Seneca anticipates that the site investigation may reveal that one or more of the ten AOCs 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 AOCs 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 the mandate of the IAG paragraph 10.9.

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 "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.

Closure under RCRA guidelines was deferred when the 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 mandated by the EPA Region II and by NYSDEC, the U.S. Army Corps of Engineers commissioned the "Solid Waste Management Unit Classification Report" at 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" (AOCs). 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. AOCs 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 total number of SWMUs and AOCs identified in the ERCE study is presented on Table 1-1. Of the 69 SWMUs and AOCs identified in the ERCE study, the eight highest priority SWMUs and two moderate priority AOCs have been selected by the Army for further investigation (refer to subsection 1.4 for further discussion of selection process). These ten units, presented on Table 1-2, are the subject of this investigation. Following completion of the ERCE report, three additional SWMU's have been added by the Army, bringing the total to 72. The final number of SWMUs and AOCs to be investigated is being negotiated between the Army and NYSDEC/EPA and is contingent upon securing additional funds from the Defense Environmental Restoration Account as provided by the United States Congress.

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 SEAD-15) and an RI/FS at the Open Burn Facility (SEAD-23).

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

TABLE 1-1

LIST OF SWMUs AND AOCs 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[c]	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[b]	Old Construction Debris Landfill
SEAD-12	Radioactive Waste Burial Sites (3)
SEAD-13[b]	IRFNA Disposal Site
SEAD-14[a]	Refuse Burning Pits
SEAD-15[a]	Abandoned Incinerator Building
SEAD-16[c]	Abandoned Deactivation Furnace: Bldg. S-311
SEAD-17[c]	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[c]	Abandoned Powder Burning Pit
SEAD-25[c]	Fire Training and Demonstration Pad

3.3.2 Data Types

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

- Matrices: Soil, groundwater, surface water, sediment, soil gas, and air (monitoring for health and safety purposes only)

- Concentrations: Primarily environmental levels with medium levels possibly encountered at sources or release points.

- Parameters: Geophysical surveys, soil gas 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, PCB in Oil, 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 Section 5.2 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 Section 5.2 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 immediately 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 (including the initial round of groundwater sampling) 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" meet groundwater criteria. Such evidence of a lack of contamination through two rounds of analysis would form the basis for a recommendation of "No Action". The proposed approach to complete the ESI at each SWMU is as follows:

Phase I

- UXO clearance.
- Perform geophysical, then soil gas 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 STAGE 3: DESIGN OF DATA COLLECTION PROGRAM

The details of the data collection program are presented in Section 5.2 of the Work Plan for each SWMU.