

**RCRA Facility Assessment
Sampling Visit
for
Naval Weapons
Industrial Reserve Plant
Calverton, New York**

VOLUME I



**Northern Division
Naval Facilities Engineering Command**

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**RCRA FACILITY ASSESSMENT - SAMPLING VISIT
FOR
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
CALVERTON, NEW YORK**

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

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10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090**

**Submitted by:
Halliburton NUS Corporation
993 Old Eagle School Road, Suite 415
Wayne, Pennsylvania 19087-1710**

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SUBMITTED BY:



**DAVID D. BRAYACK, P.E.
PROJECT MANAGER
HALLIBURTON NUS CORPORATION
PITTSBURGH, PENNSYLVANIA**

APPROVED FOR SUBMISSION BY:



**JOHN J. TREPANOWSKI, P.E.
CLEAN PROGRAM MANAGER
HALLIBURTON NUS CORPORATION
WAYNE, PENNSYLVANIA**

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EXECUTIVE SUMMARY

The Northern Division of the Naval Facilities Engineering Command has issued Contract Task Order (CTO) 0138 to Halliburton NUS Corporation, under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62472-90-D-1298 to perform a Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) for the Naval Weapons Industrial Reserve Plant (NWIRP), located in Calverton, New York.

This work was conducted in accordance with the requirements of the New York State RCRA Hazardous Waste Permit for the facility (NYSDEC 1-4730-00013/00001-0), dated March 25, 1992. New York State Department of Environmental Conservation (NYSDEC) is the lead oversight agency. This work was also conducted in accordance with the requirements of the United States Environmental Protection Agency (EPA) facility permit (EPA ID Number NYD003995198), dated May 11, 1992. The EPA supports NYSDEC in its oversight activities. The requirements of both permits appear to be the same, although the terminology and format vary.

Purpose

The purpose of CTO 0138 is to conduct an RFA investigation at four separate sites within the NWIRP Calverton. The primary objectives of this RFA are to gather environmental information regarding each of the sites in order to :

- Eliminate from further investigation those sites that pose no definable threat to the environment or to human health under RCRA.
- Document the release or potential release of hazardous substances at each site and determine if additional action is necessary.

The sites to be investigated under this RFA are as follows:

- Site 8 - Coal Pile Storage Area
- Site 9 - Electronic Counter Measures (ECM) Area
- Site 10 - Cesspool/Leachfield Areas (Multiple Sites)
- Site 11 - Fixture Storage Area

There are other sites at the facility currently under investigation as part of a RCRA Facility Investigation (RFI).

Facility Description

The Calverton facility is approximately 6,000 acres overall in area. The developed section of the facility occupies approximately 3,000 acres and is dominated by two large runways. The balance of the facility is wooded areas, near the ends of the runways (buffer zones). The facility is roughly rectangular in shape and measures, at its greatest distances, 3.65 miles east to west and 1.6 miles north to south.

The Calverton Facility has been owned by the United States Navy since the early 1950's. At that time, the property was purchased from a number of private owners. The facility was expanded in 1958 through additional purchases of privately owned land.

The Calverton NWIRP facility was constructed in the early 1950's for use in the development, assembly, testing, refitting, and retrofitting of Naval combat aircraft. Grumman has been the sole operator of the facility, which is known as a Government-Owned-Contractor Operated (GOCO) installation. Construction was completed in 1954. The facility supports aircraft design and production at the Grumman Bethpage, New York NWIRP.

Geology/Hydrogeology

The Calverton facility is located in an area underlain by permeable glacial material and characterized by limited surface water drainage features. Normal precipitation at the facility is expected to infiltrate rapidly into the soil. The majority of the facility is located within the Peconic River drainage basin. Extensive wetland areas and glacially-formed and man-made lakes and ponds are located southwest and south of the facility. NWIRP Calverton occupies a relatively flat, intermorainal area. The topographic relief at NWIRP is 54 feet; elevations range from 30 to 84 feet above mean sea level.

NWIRP Calverton is underlain by approximately 1,300 feet of unconsolidated sediments. The unconsolidated sediments consist of four distinct geologic units. These units, in descending order, are the Upper Glacial Formation, the Magothy Formation, the Raritan Clay Member of the Raritan Formation, and the Lloyd Sand Member of the Raritan Formation.

The glacial sediments beneath the NWIRP are approximately 250 feet thick and consist of both glacial till and outwash deposits. Till is deposited directly by the ice, while outwash deposits are laid down by

meltwater-supplied glaciofluvial systems. The till in Suffolk County ranges from 0 to 150 feet in thickness and generally consists of poorly sorted to unstratified sediments. The outwash deposits consist chiefly of well-sorted and stratified sand and gravel. One important characteristic of outwash deposits is their high degree of heterogeneity. Lithologies may vary widely over relatively short vertical and horizontal distances.

Site 8 - Coal Pile Storage Area

The coal pile storage area is used for the bulk storage of coal for the on site steam plant. The coal pile storage area was investigated because of reports that solvents were placed on the coal. The concept for this action is that the coal would adsorb the solvents and then the solvents would be destroyed during the coal burning process. Because of these actions, solvents may have passed through the coal and entered the underlying soils and groundwater in the area. During an initial reconnaissance of the area in October 1992, it was observed that precipitation runoff from the coal pile enters a small marshy area north of the coal pile. This marsh is near production wells for the facility. Two of these wells (Production Wells 2 and 3) were found to be contaminated with low levels of solvents.

RFA activities in this area concentrated on investigating potential solvent (volatile organic) contamination in the remaining coal pile, in the soils and groundwater underneath the coal pile, and in the sediments and surface water in marsh. Other organics (except for those naturally found in coal) and inorganic contaminants are not be expected to be a concern for this area.

Soil, sediment, waste, and surface water samples were collected and analyzed in accordance with NEESA methodology for TCL volatiles organics and freon.

Site 8 - Analytical Summary

Several volatile organic chemicals were detected in Site 8 soil, sediment, and waste material (coal) samples. In soil, methylene chloride and acetone (suspected blank contaminants) were detected, as well as benzene, toluene, ethylbenzene, and xylenes (BTEX). The most frequent occurrence of detection of these chemicals was observed at soil boring closest to the wetland (SB10). Higher concentrations of BTEX were noted in the surface soil (0 to 2 feet) sample than in the subsurficial (4 to 6 feet) sample collected at SB10.

Based on field observations during the sampling, fuel and/or oil contamination may be present at soil boring SB10.

For the sediment samples, detectable concentrations of organic chemicals were only noted in one sediment sample collected in the southern-most portion of the wetland (nearest the coal pile). Benzene and toluene, in addition to chlorinated aliphatic chemicals (1,1-dichloroethane, chloroform, and 1,1,1-trichloroethane) were detected at concentrations which are equal to or marginally greater than respective method detection limits. These positive detections were not reported in the associated field duplicate sample. The detections of 1,1-dichloroethane and 1,1,1-trichloroethane in the sediment at one sediment location provides some evidence that the Coal Pile Storage Area is a possible source area for organic groundwater contamination observed in Production Wells 2 and 3. Also of note with the sediment sample results is that toluene was detected in two other samples at concentrations of 4 ug/kg and 63 ug/kg. These Waste (coal) materials that were sampled and analyzed contained detectable amounts of 2-butanone, 2-hexanone, toluene, and freon 113. The detection of ketones and toluene are not consistent with suspected release activities. Chlorofluorocarbons were detected in the groundwater near the site and provide another possible link between the Coal Pile Storage Area and contaminated groundwater at Production Wells 2 and 3.

Site 8 - Conclusions and Recommendations for Further Action

There is evidence that historic activities at the Coal Pile Storage Area may have impacted soils and groundwater near the coal pile. However, based on the relatively low concentrations of chemicals detected in the coal, soil, and sediment samples, the impact from TCL volatile organics is not expected to be a threat to human health or the environment.

Based on the findings at Soil Boring 10, at a depth of 4 to 6 feet below grade surface (groundwater interface), hydrocarbon (fuels/oils) contamination may be present in the soils and groundwater beneath the site. As a result, a petroleum hydrocarbon and a VOC soil and groundwater investigation should be performed in this area to define if contamination is present.

Site 9 - ECM Area

The ECM area is a test facility for Electronic Counter Measure equipment. The ECM area was investigated because volatile organics were detected in an area located northeast of the property boundary fenceline (and potentially hydraulically downgradient) of the ECM area. Beyond the fenceline is a sod farm. A portion of the sod farm (nearest the ECM Area) was selected as an experimental program for growing sod using municipal solid waste compost to amend the natural soils and provide nutrients. As part of this program, a series of monitoring wells (MW1 to MW7) were installed and are being monitored by

the Suffolk County Department of Health. 1,1,1-trichloroethane was detected in several wells, with a maximum concentration of 190 ug/l.

Based on the reconnaissance of the ECM area in October 1992, there is visual evidence that construction debris was disposed near the area in the past. Historic photographs of the facility indicate disturbances of the soils in the area during the 1960s and 1970s. Also, solvents (volatile organics) were used at the site in the past. The disposal of other materials in this area cannot be ruled out.

RFA field activities in this area focused on the debris disposal area, the former solvent storage area, and the cesspool as possible sources of the solvent contamination observed north east of this site. There is no evidence that suggests other organics or inorganic contaminants would be present at the site. Soil and groundwater samples were collected and analyzed in accordance with NEESA methodology for TCL volatiles organics and freon.

Site 9 - Analytical Summary

Soil samples collected at the ECM Area site have detectable concentrations of toluene and styrene. However, these detected chemicals were present at concentrations less than respective CRQLs and applicable TAGM values (New York State Cleanup Levels).

Results from groundwater samples collected at the ECM Area site indicated organic chemical contamination in offsite monitoring wells ECM-GW001 and ECM-GW007. Although both contain 1,1,1-trichloroethane, only GW001 contains detectable quantities of other organic chemicals (chloromethane, 2-butanone, carbon tetrachloride, and 4-methyl-2-pentanone). The maximum detected concentrations of 1,1,1-trichloroethane and iron exceed the applicable New York State groundwater quality standards for these chemicals. Federal primary and secondary MCLs were exceeded for cadmium and iron, respectively, at one onsite location.

Site 9 - Conclusions and Recommendations for Further Action

Trace levels of non-halogenated organic chemicals were detected in onsite soil samples. The concentration of the detected chemicals are below relevant criteria and these chemicals were not detected in offsite groundwater.

The 1,1,1-trichloroethane contamination in offsite monitoring wells was confirmed. However, the absence of this chemical in on site samples indicates that the ECM area is not likely to be the source and is almost

certainly not a continuing source of offsite groundwater contamination. However, to further support this conclusion, a limited temporary monitoring well program is recommended.

Site 10 - Cesspool/Leachfield Areas

The cesspools/leach fields at the facility are used for sanitary wastes. The cesspools/leach field areas were investigated because of the potential for industrial wastes to have been discharged to them. Because of the large number of cesspools/leach fields at the facility, and the consideration that some areas are used only for sanitary wastes (no industrial-type activity in that area), a preliminary screening of potentially contaminated cesspools/leach fields was conducted during the preparation of the work plan. This screening reduced the number of areas to be investigated during the RFA from 22 to 8. Field activities for these areas focused on soil and groundwater contamination for solvents and to a lesser extent, inorganic contaminants.

A concurrent two-phase field investigation was performed for the cesspools/leach field at this facility. Phase 1 was a soil gas survey and Phase 2 was a soil sampling investigation. The soil gas survey was used to identify potential areas of soil and groundwater contamination associated with selected facility cesspools/leach fields. The soil gas samples were analyzed at a subcontractors laboratory facility. Each of the samples were analyzed on a quick turn around basis (1 to 3 days). The decision to sample soils at specific sites and the location of any soil borings at cesspool/leach field areas was based on the soil gas results, with sampling conducted at locations with the highest soil gas concentrations. The second phase consisted of subsurface soil sampling and analysis at a fixed-base laboratory.

Soil gas samples were collected and analyzed for field screening purposes (VOCs) and soil samples were collected and analyzed in accordance with NEESA methodology for TCL volatiles plus freon, and TAL metals and cyanide.

Site 10 - Analytical Summary

Soil samples collected at the cesspool/leach field areas had detectable concentrations of various organic and inorganic constituents. Although most of the detected chemicals are present at concentrations which are less than respective New York State TAGM values and background levels, some of the maximum results reported for inorganic chemicals are greater than background and TAGM levels. Affected areas include cesspool/leach fields at Buildings 06-13 (sodium and cyanide), 06-17 (sodium), 06-42 (sodium), and 07-03 (iron, manganese, and sodium). Sodium, the most frequently exceeded chemical, was not considered to be an environmental contaminant, as it is a common and naturally occurring cation, an

essential human nutrient, and not used in significant amounts in processes at the facility. The exceedence noted for iron and manganese at Site 07-03 is also believed to be naturally occurring and is within published background ranges for the Eastern United States.

Detected TICs and field observations at Buildings 06-11 and 06-18 indicate the presence of non-TCL target compounds in soils at levels which may indicate the presence of fuel/oil-related constituents.

Site 10 - Conclusions and Recommendations for Further Action

The investigation of the cesspools and leach fields indicated the presence of trace to low levels of TCL volatile organic contamination.

The investigation did find the presence of minor inorganic contamination. However, based on the chemicals found and relative toxicity, these chemicals are not expected to require additional study.

Two sites, Building 06-11 - Jet Fuel Systems Lab and Building 06-18 - Engine Test House, are potentially contaminated with fuel and/or oil related products. An investigation of soils and groundwater is warranted to define the extent of this potential contamination.

Site 11 - Fixture Storage Area

The Fixture Storage Area is used for the storage of miscellaneous equipment at the facility. The Fixture Storage Area was investigated because historical aerial photographs of the site indicated that material of unknown origin was used to fill in depressions. This site was added to the investigation during the field work (May 1994). The approach used at this site was the same as the approach used for Site 10 (Cesspool/Leachfield Areas); namely a wide-spread soil gas program was conducted followed by a more select soil boring program. The soil gas survey was performed across the site to identify potential areas of contamination. Soil gas samples were analyzed by a subcontractor and soil boring locations were selected based on the results of the soil gas survey.

Soil gas samples were collected and analyzed for field screening purposes and soil samples were collected and analyzed in accordance with NEESA methodology for TCL volatiles organics plus freon, and TAL metals and cyanide.

Site 11 - Analytical Summary

Soil samples collected at the Fixture Storage Area site had detectable concentrations of 2-butanone, chloroform, 1,1,1-trichloroethane, and toluene, in addition to several positive detections of various inorganic constituents. However, the detected chemicals were present at concentrations less than respective CRQLs and applicable TAGM values.

Site 11 - Conclusions and Recommendations for Further Action

The presence of low concentrations of solvents at the site are indicative that trace quantities of industrial chemicals have entered the soils and groundwater. However, based on the concentrations detected, no additional action is recommended for this site.

1.0 INTRODUCTION

1.1 PURPOSE

The Northern Division of the Naval Facilities Engineering Command has issued Contract Task Order (CTO) 0138 to Halliburton NUS Corporation, under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62472-90-D-1298 to perform a Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) for the Naval Weapons Industrial Reserve Plant (NWIRP), located in Calverton, New York, (See Figures 1-1 and 1-2).

This work is part of the Navy's Installation Restoration (IR) Program, which is designed to identify contamination of Navy and Marine Corps lands/facilities resulting from past operations and to institute corrective measures, as needed. There are typically four distinct stages. Stage 1 is the Preliminary Assessment (formerly known as the Initial Assessment Study). Stage 2 is a RCRA Facility Assessment - Sampling Visit (RFA) (also referred to as a Site Investigation), which augments the information collected in the Preliminary Assessment. Stage 3 is the RCRA Facility Investigation/Corrective Measures Study (RFI/CMS) (also referred to as a Remedial Investigation/Feasibility Study [RI/FS]), which characterizes the contamination at a facility and develops options for remediation of the site. Stage 4 is the Remedial Action, which results in the control or cleanup of contamination at sites. This report was prepared under Stage 2 (RFA).

This work was conducted in accordance with the requirements of the New York State RCRA Hazardous Waste Permit for the facility (NYSDEC 1-4730-00013/00001-0), dated March 25, 1992. New York State Department of Environmental Conservation (NYSDEC) is the lead oversight agency. This work was also conducted in accordance with the requirements of the United States Environmental Protection Agency (EPA) facility permit (EPA ID Number NYD003995198), dated May 11, 1992. The EPA supports NYSDEC in its oversight activities. The requirements of both permits appear to be the same, although the terminology and format vary.

In 1986, an Initial Assessment Study (IAS) identified potentially contaminated sites at NWIRP Calverton (Navy, 1986). Based on the IAS, a Site Investigation (SI) was conducted for the NWIRP Calverton between July 1991 and April 1992 (Navy, 1992). This SI evaluated potential environmental contamination at seven areas. Environmental contamination was confirmed at four of these areas and is being

1-2

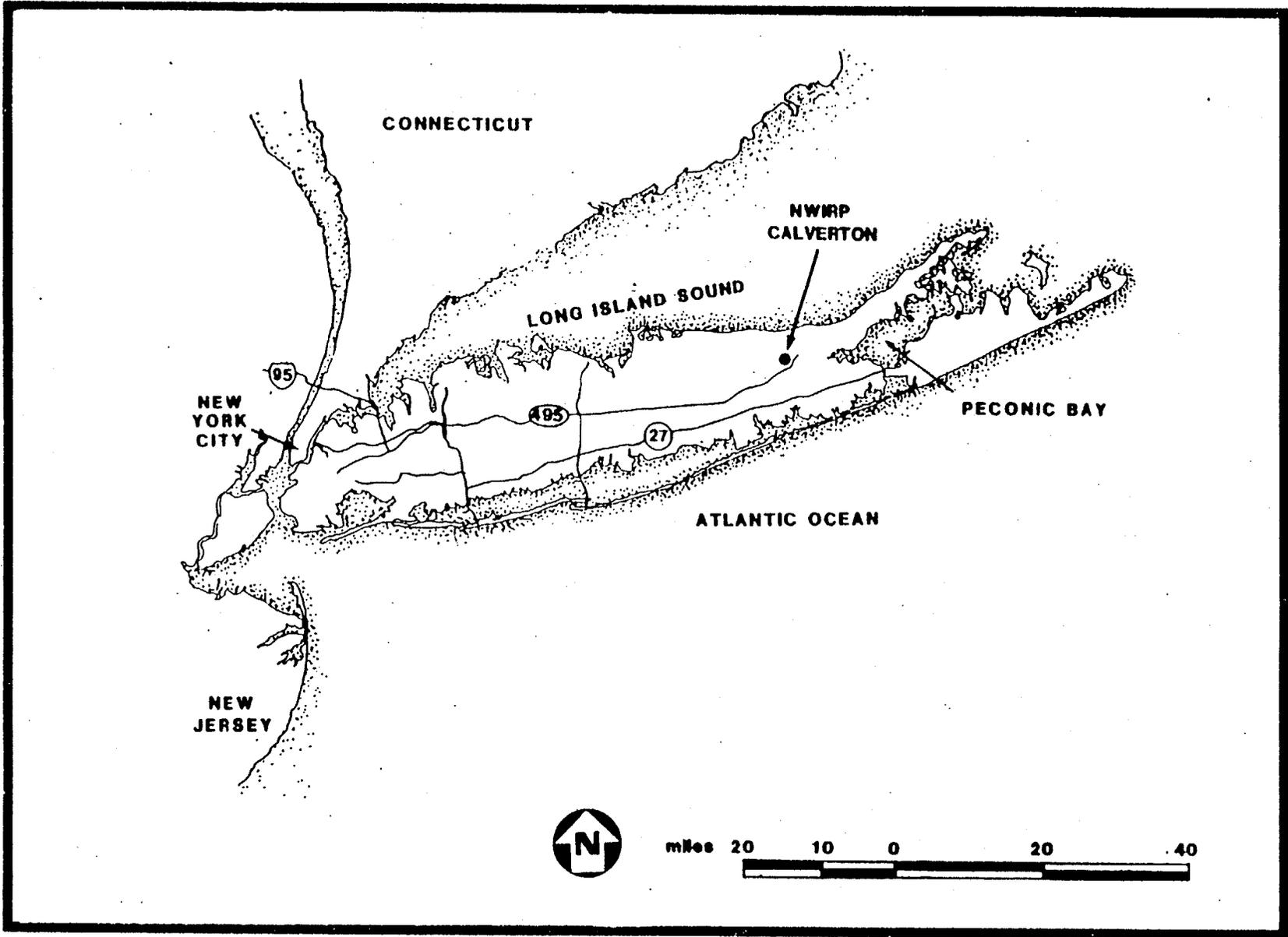
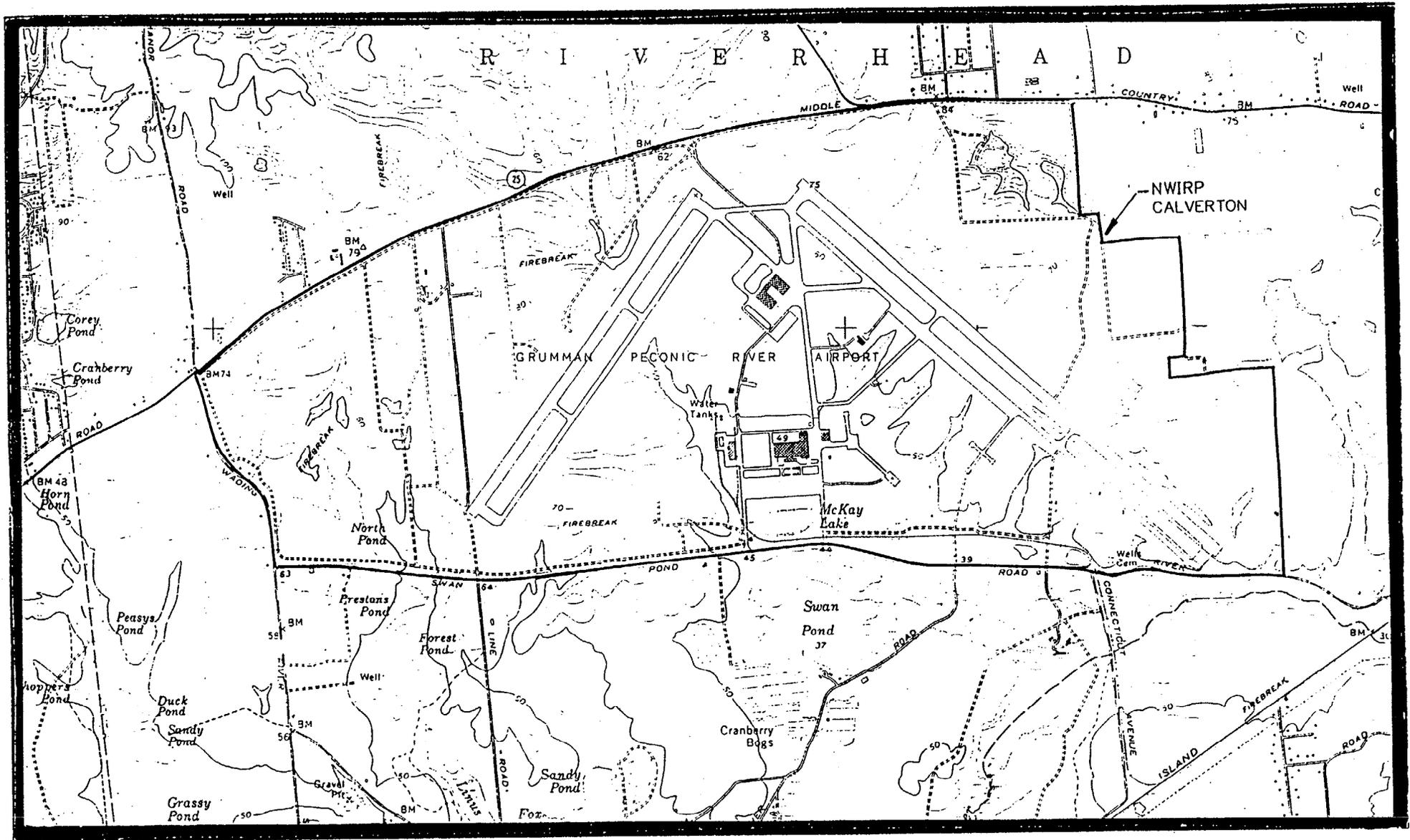


FIGURE 1-1

GENERAL LOCATION MAP
RFA - SAMPLING VISIT
NWIRP, CALVERTON, NEW YORK





1-3

USGS QUADRANGLE: WADING RIVER 1967

FIGURE 1-2

SITE LOCATION
RFA - SAMPLING VISIT
NWIRP, CALVERTON, NEW YORK



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addressed under a separate RCRA Facility Investigation (RFI). The remaining three sites were identified as not being contaminated.

Since the completion of the SI, four additional sites were identified as potentially contaminated. These four sites are addressed in this program and are as follows:

- Site 8 - Coal Pile Storage Area
- Site 9 - Electronic Counter Measures (ECM) Area
- Site 10 - Cesspool/Leachfield Areas (Multiple Sites)
- Site 11 - Fixture Storage Area

The purpose of CTO 0138 is to conduct an RFA investigation at four separate sites within the NWIRP Calverton. The primary objectives of this RFA are to gather environmental information regarding each of the sites in order to :

- Eliminate from further investigation those sites that pose no definable threat to the environment or to human health under RCRA.
- Document the release or potential release of hazardous substances at each site and determine if additional action is necessary.

A work plan detailing the work to be performed at three sites (Sites 8, 9, and 10) was prepared in January 1993 (Navy 1993a). The field activities were initiated in February 1994 and completed in August 1994. During the field activities, a fourth site (Site 11) was added to the investigation. The field work for Site 11 was performed using the same approach and rationale as that conducted for Site 10.

1.2 FACILITY DESCRIPTION/ENVIRONMENTAL SETTING

1.2.1 Facility Location

The sites involved in this study are located within the confines of the Naval Weapons Industrial Reserve Plant (NWIRP) in Calverton, Suffolk County, New York, (see Figures 1-1 and 1-2). The majority of the facility is located within the municipality of Riverhead and a small area on the western side of the facility is located within Brookhaven. Calverton is located on Long Island approximately 80 miles east of New York City.

The Calverton facility is approximately 6,000 acres overall in area. The developed section of the facility occupies approximately 3,000 acres and is dominated by two large runways (Figure 1-2). The balance of the facility is wooded areas, near the ends of the runways (buffer zones). The facility is roughly rectangular in shape and measures, at its greatest distances, 3.65 miles east to west and 1.6 miles north to south.

The facility is bordered by Middle Country Road (NY Rt. 25) to the north, agricultural land to the east, River Road to the south, and Wading River Road to the west. The primary features of the facility are two large paved runways, a 7,000-foot runway (Runway 5-23) located on the western half of the site and oriented southwest to northeast, and a 10,000 foot runway (Runway 32-14), located on the eastern half of the site and oriented southeast to northwest. The runways are connected by a 1,250-foot taxiway at the north central section of the runways.

The Calverton Facility has been owned by the United States Navy since the early 1950's. At that time, the property was purchased from a number of private owners. The facility was expanded in 1958 through additional purchases of privately owned land. Grumman Corporation has operated the facility since its construction (Navy, 1986).

The Calverton NWIRP facility was constructed in the early 1950's for use in the development, assembly, testing, refitting, and retrofitting of Naval combat aircraft. Northrup Grumman has been the sole operator of the facility, which is known as a Government-Owned-Contractor Operated (GOCO) installation. Construction was completed in 1954. The facility supports aircraft design and production at the Northrup Grumman Bethpage, New York NWIRP.

The majority of industrial activity at the facility is confined to the developed area in the center and south center of the facility, between the two runways. Industrial activities at the facility are related to the manufacture and assembly of aircraft and aircraft components. Hazardous waste generation at the facility is related to metal finishing processes, such as metal cleaning and electroplating. The painting of aircraft and components results in additional waste generation (Navy, 1986; Navy 1992).

1.2.2 Physical Characteristics

Surface Water

The Calverton facility is located in an area underlain by permeable glacial material and characterized by limited surface water drainage features. Normal precipitation at the facility is expected to infiltrate rapidly into the soil.

The majority of the facility is located within the Peconic River drainage basin. Extensive wetland areas and glacially-formed and man-made lakes and ponds are located southwest and south of the facility. The eastward-flowing Peconic River is located approximately 500 feet south of the facility at its closest point. Based on topography, groundwater is expected to flow southward and discharge to the ponds and wetland areas, and ultimately be received by the Peconic River via overland flow. The Peconic River flows 1.95 stream miles eastward from Runway 32-14 into Peconic Lake. The Peconic is tidally influenced below the dam on the Peconic Lake, located 3.2 stream miles from the site, and discharges to Peconic Bay which is 8.5 stream miles from the facility.

Major surface water features at the Calverton facility include McKay Lake, the Northeast Pond, and the North Pond. McKay Lake is a man-made basin located north of River Road, midway along the southern site border. The northeast pond is located at the northeast corner of the site, and North Pond is located at the southwest corner of the facility. Several small drainage basins exist near the fuel calibration area. All of these ponds and drainage basins are land locked, with the exception of McKay Lake, which has an intermittent discharge to Swan Pond, located 1,500 feet to the south. Swan Pond, approximately 55 acres in size, discharges to the Peconic River 1.6 stream miles south of the McKay Lake via a string of cranberry bogs (USGS, 1967; Navy, 1986).

McKay Lake receives SPDES-regulated noncontact cooling water discharge from industrial activities at the site, treated sanitary effluent and storm water runoff from paved areas in the developed center of the site. The lake is approximately 9 acres in area, and is known to support fish such as large mouth bass and bluegills. An intermittent drainage pathway leads into the northwest corner of the lake from an origin approximately 2,000 feet to the northwest. The lake is not believed to receive direct surface water runoff from any of the areas involved in the site inspection (Navy, 1986, 1976; Guthrie, 1983, 1984).

The northeast pond area actually consists of two ponds, a 2.3-acre pond directly east of the disposal area and an approximately 1-acre pond located less than 500 feet to the southeast of the disposal area. Both of these ponds lie in land-locked depressions and may be of glacial origin. Observations made during soil

boring drilling activities in the pond disposal area indicated that the main ponds elevation is similar to the local groundwater elevation, (Navy 1991). As stated earlier, no outfalls exist from the ponds; they are expected to receive limited overland surface water flow from surrounding land in the northeast corner of the site (USGS, 1967).

North Pond is approximately 1.75-acre in size. It is a landlocked pond and located approximately 1,000 feet southwest of the southwest corner of the western runway. North Pond may receive limited overland surface water runoff from areas west of the western runway. The picnic grounds disposal area is located approximately 1,500 feet north of the pond; however, because of limited topographic influence, it is not expected that overland flow will reach the pond from the disposal area. North Pond is north of a string of 6 interconnected ponds leading to the Peconic River (although it is not connected to the ponds). These include Prestons Pond, an unnamed pond, Forest Pond, Linus Pond, Fox Pond, and Sandy Pond. All are less than 16 acres in size. Prestons Pond is located approximately 750 feet south of North Pond; the drainage from Prestons Pond reaches Peconic River, approximately 2.1 stream miles to the southeast.

A long string of interconnected ponds exists approximately 3,500 feet west of the western edge of the Calverton Facility. These ponds, including Horn Pond, Peasys Pond, Duck Pond, Sandy Pond, Grassy Pond, and Jones Pond, begin immediately south of NY Rt. 25 and flow approximately 2.5 stream miles to the Peconic River. The ponds are all less than 20 acres in size. These water bodies may receive groundwater and limited surface water runoff from the far western areas of the facility.

A limited number of small wetland areas exist on the Calverton facility. North Pond is classified by the U.S. Department of the Interior, Fish and Wildlife Department as a palustrine emergent wetland. The western half of the 2 acre northeast pond is classified as palustrine, forested/scrub/shrub wetland. The drainage basin receiving runoff from the fuel calibration area is classified as palustrine scrub/shrub/emergent wetland (U.S. Department of the Interior, 1980).

Extensive areas of wetlands exist south of the facility adjacent to the Peconic River and its tributaries, including Swan Pond. The dominant wetland classifications of these areas are palustrine forested, palustrine scrub/shrub, and palustrine emergent. Areas of lacustrine open water wetland exist along the Peconic River. Approximately 7 stream miles from the site, areas of estuarine intertidal wetlands begin, which continue along the Peconic River into Great Peconic Bay. Predominant classifications in the tidal areas include emergent, flat and beach/bar wetlands.

The total wetland frontage within the 15-mile surface water drainage pathway is greater than 15 miles (U.S. Department of the Interior, 1980).

Regional Geology

NWIRP Calverton lies within the Atlantic Coastal Plain Physiographic Province. Generally, this region is characterized as an area of relatively undissected, low-lying plains. The Atlantic Coastal Plain is underlain by a thick sequence of unconsolidated deposits. The surface topography was created or modified by Pleistocene glaciation (Isbister, 1966).

Ground surface elevations on Long Island range from sea level to approximately 400 feet above mean sea level (MSL). The two most prominent topographic features in the Long Island area are the Ronkonkoma terminal moraine and the Harbor Hill end moraine. These east-west trending highlands mark the southern terminus or maximum extent of two glacial advances. The older Harbor Hill moraine lies along the northern shore of Long Island, the younger Ronkonkoma moraine basically bisects the island. NWIRP Calverton occupies a relatively flat, intermorainal area between these two features. The topographic relief at NWIRP is 54 feet; elevations range from 30 to 84 feet above mean sea level (McClymonds and Franke, 1972; Jensen and Soren, 1974).

NWIRP Calverton is underlain by approximately 1,300 feet of unconsolidated sediments. The unconsolidated sediments consist of four distinct geologic units. These units, in descending order, are the Upper Glacial Formation, the Magothy Formation, the Raritan Clay Member of the Raritan Formation, and the Lloyd Sand Member of the Raritan Formation (McClymonds and Franke, 1972).

The glacial sediments beneath the NWIRP are approximately 250 feet thick and consist of both glacial till and outwash deposits. Till is deposited directly by the ice, while outwash deposits are laid down by meltwater-supplied glaciofluvial systems. The till in Suffolk County ranges from 0 to 150 feet in thickness and generally consists of poorly sorted to unstratified sediments. The outwash deposits consist chiefly of well-sorted and stratified sand and gravel. One important characteristic of outwash deposits is their high degree of heterogeneity. Lithologies may vary widely over relatively short vertical and horizontal distances.

The Cretaceous age Magothy Formation underlies the Upper Glacial Formation and is approximately 520 feet thick. The Magothy Formation chiefly consists of stratified, fine to coarse sand and gravel.

The Cretaceous age Raritan Clay Member of the Raritan Formation underlies the Magothy Formation and is approximately 170 feet thick. The Raritan Clay consists of clay and silty clay.

The Lloyd Sand Member of the Raritan Formation underlies the Raritan Clay and is approximately 400 feet thick. The Lloyd Sand consists chiefly of fine to coarse sand and gravel.

The unconsolidated sediments beneath the site unconformably overlie crystalline bedrock. The crystalline bedrock consist of schist, gneiss, and granite. The regional dip is to the south and southeast. All of the geologic units dip in these directions, although to varying degrees (McClymonds and Frank, 1972).

Facility-Specific Geology

A soil boring and sampling program was completed as part of the Site Investigation, (Navy 1992). This program consisted of drilling testing borings using hollow-stem auger and split-spoon sampling techniques through the vadose zone sediments to the top of the water table at various locations throughout the NWIRP. Because of the shallow depth to the water table beneath the activity, the depths of the borings range from 7 to 22 feet. Consequently, the Upper Glacial Formation was the only unit encountered/sampled.

The borings reveal that the sites are predominantly underlain by coarse to very coarse sediments of probable glaciofluvial origin. Two dominant lithologies were encountered. The upper lithofacies is a brownish to orange-brown coarse sand which contained varying but always minor amounts of clay and silt. Where present, these lithofacies typically extended from near the surface to a depth of approximately 4 to 5 feet. The upper zones of these lithofacies most likely grade into the lower soil horizons, but the cut-and-fill or disturbed nature of the sites made it difficult or impossible to identify soil zones. Underlying this sand is a highly uniform, light tan to buff colored, coarse to very coarse grained sand with infrequent gravel. The thickness of this facies is unknown, as no underlying facies were penetrated.

Soils

The soils underlying the NWIRP were discussed in detail in the IAS (Navy, 1986). Each site studied as part of this investigation occurs in an area that, by the nature of the site activity, involved the disturbance of the soil. It is unlikely that the native soil exists as mapped beneath any of the sites. This is due to fill activity, soil removal activity, or the cut-and-fill or grading activity associated with construction at the other sites.

Hydrogeology

The unconsolidated sediments that underlie the NWIRP are generally coarse-grained with high porosities and permeabilities. These factors create aquifers with high yields and high transmissivities.

The Upper Glacial Formation, the Magothy Formation, and the Lloyd Sand are the major regional aquifers. The Upper Glacial and the Magothy aquifers are of principal importance in Suffolk County because of their proximity to the land surface. The Lloyd Sand aquifer is not widely exploited because of its depth (McClymonds and Franke, 1972).

The Upper Glacial aquifer is widely used as a source of potable water in Suffolk County. The water table beneath the NWIRP lies within this aquifer. Porosities in excess of 30 percent have been calculated for the Upper Glacial aquifer in the adjoining Nassau County, Long Island. The estimated value of hydraulic conductivity is 270 feet per day (ft/day).

The Magothy aquifer is also widely used as a source of potable water in Suffolk County. The most productive units are the coarser sands and gravel. The permeability of the Magothy is high; hydraulic conductivities have been calculated in excess of 70 ft/day.

The Upper Glacial and the Magothy aquifers are believed to be hydraulically interconnected and to function as a single unconfined aquifer. Onsite well logs, previous hydrogeological investigations, and geologic mapping indicate that although clay lenses are present in both aquifers that may create locally confining and/or perched conditions, these lenses are not widespread and do not function as regional aquitards (McClymonds and Franke, 1972; Fetter, 1976).

The Raritan Clay has a very low permeability (approximately 3×10^{-5} ft/day) and hydrologically acts as a regional confining layer. The confining nature of this unit is believed to minimize the local risk of contamination to the underlying Lloyd Sand aquifer (McClymonds and Franke, 1972).

The Lloyd Sand is also a potentially excellent aquifer that has not been extensively developed because of its depth and the abundant water available in the overlying aquifers. Estimated hydraulic conductivities for the Lloyd Sand range from 20 to 70 ft/day.

The depth to the water table beneath the activity, as determined during the Site Inspection (Navy, 1992) ranges from approximately 5 to 20 feet below grade surface. When surface elevations are taken into account, the relief of the water table over the entire activity is approximately 15 feet. The hydraulic gradient beneath the activity, then, may be characterized as low.

Groundwater flow rates beneath the activity are not known. As discussed, the aquifers beneath the activity have high porosities and permeabilities and would support high groundwater velocities. Without a sufficient

hydraulic gradient or "driving force," however, groundwater velocities will be low, regardless of the physical properties of the matrix.

The overall direction of groundwater flow beneath the NWIRP is uncertain. As discussed in the IAS, the NWIRP is situated very near a regional groundwater divide. The IAS hypothesized that the activity actually straddled this divide, with groundwater beneath the northern half of the activity flowing to the north and groundwater beneath the southern half of the activity flowing to the south. Examination of the topographic map, however, seems to indicate that the general slope of the surface and the surface drainage over the entire activity is predominantly to the south. Localized undulations or changes in topography at the individual sites may alter this flow direction, especially in the shallowest aquifer zones. The Peconic River basin is the likely discharge point for most of the groundwater in the shallow aquifer zones (Upper Glacial and upper Magothy aquifers). Although the vertical gradients beneath the NWIRP are not known, it seems likely that a portion of the groundwater beneath the activity may migrate downward and recharge the deeper zones of the Magothy, and thus enter the regional groundwater system (Navy, 1986).

The facility production wells undoubtedly affect the flow pattern of the local groundwater, but to an unknown extent. These wells are between 140 and 155 feet deep. The individual well draw down and the radius of the resultant cone of depression formed by the pumping of these wells are not known (Fetter, 1976; Seaburn, 1970a and b).

Climate and Meteorology

The facility is located in an area classified as a humid-continental climate. Its proximity to the Atlantic Ocean and Long Island Sound add maritime influences to this classification (National Oceanic and Atmospheric Administration, 1982).

The average yearly temperature at the NOAA Riverhead Research Station, located 4.5 miles northeast of the site, is 52.2 F, with a mean maximum average monthly temperature of 73.3 F in July and a minimum average monthly mean temperature of 30.9 F in January. Annual precipitation at the Riverhead station averages 45.32 inches. The highest month average precipitation is 4.46 inches, occurring in December, and the lowest 2.90 inches, occurring in July. The average yearly evapotranspiration rate is 29 inches, resulting in a net annual precipitation rate of 16.32 inches. A 2-year, 24-hour rainfall can be expected to bring 3.4 inches of precipitation (National Oceanic and Atmospheric Administration, 1982; U.S. Department of Commerce, 1961).

1.3 OVERVIEW OF RFA

The following section describes the general sampling objectives and approach to sampling for each of the described sites; Site 8 - Coal Pile Storage Area, Site 9 - ECM Area, Site 10 - Cesspool/Leach Field Areas, and Site 11 - Fixture Storage Area, (See Figure 1-3).

Site 8 - Coal Pile Storage Area

The coal pile storage area was investigated because of reports that solvents were placed on the coal and the finding of solvents in the adjacent production wells. The concept for this action is that the coal would adsorb the solvents and then the solvents would be destroyed during the coal burning process. Because of these actions, solvents may have passed through the coal and entered the underlying soils and groundwater in the area. During an initial reconnaissance of the area in October 1992, it was observed that precipitation runoff from the coal pile enters a small marshy area north of the coal pile, (See Figure 1-4). This marsh is near production wells for the facility. Two of these wells (Production Wells 2 and 3) were found to be contaminated with low levels of solvents. The solvents and concentrations detected at levels near and above drinking water standards in these Production Wells are summarized as follows.

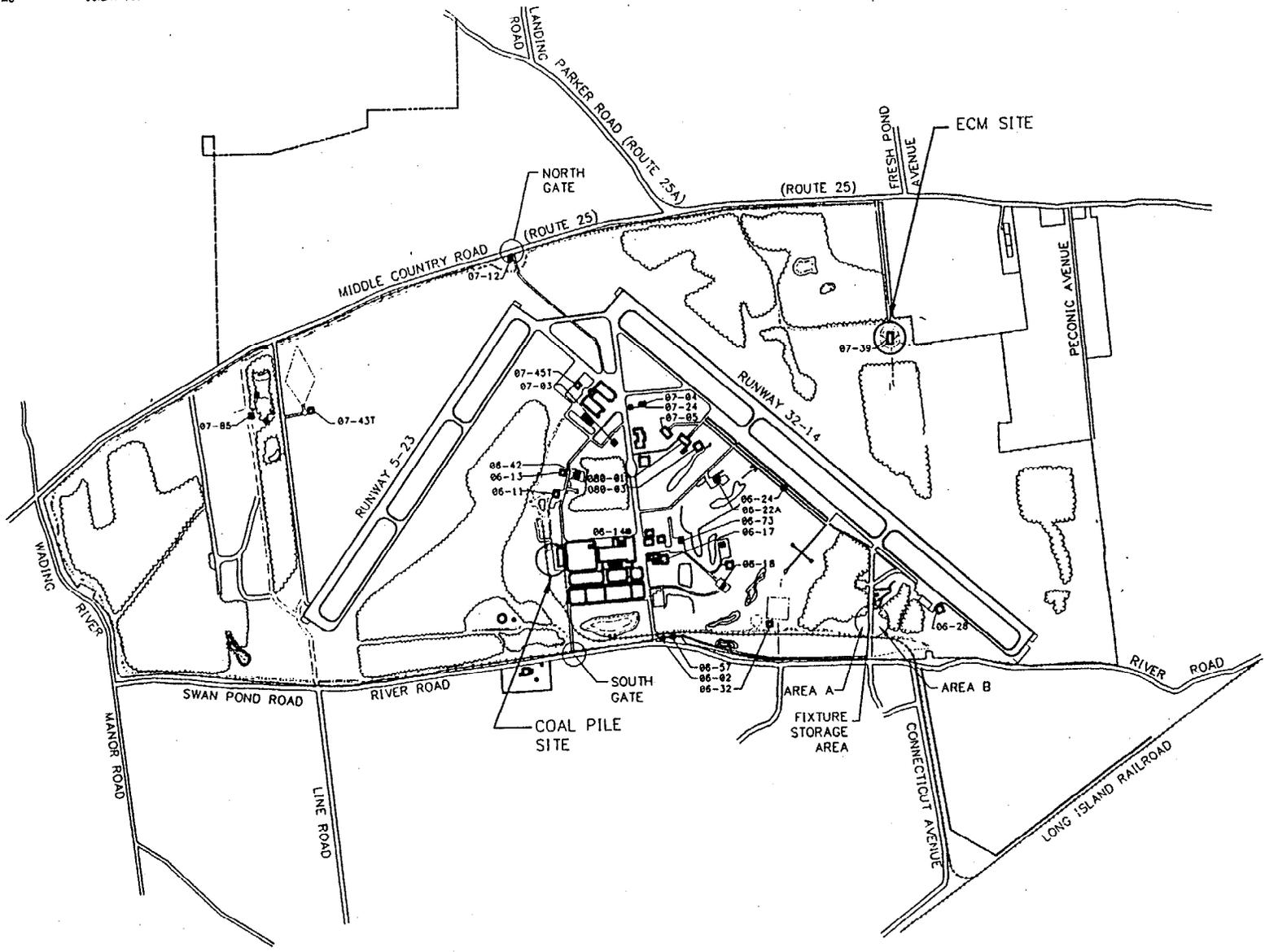
1,1,1-trichloroethane	5 ug/l
freon 113	14 ug/l
vinyl chloride	2 ug/l

RFA activities in this area concentrated on investigating potential solvent (volatile organic) contamination in the remaining coal pile, in the soils and groundwater underneath the coal pile, and in the sediments and surface water in marsh. Other organics (except for those naturally found in coal) and inorganic contaminants are not be expected to be a concern for this area. Soil, sediment, waste, and surface water samples were collected and analyzed in accordance with NEESA methodology for TCL volatile organics and freon.

Site 9 - ECM Area

The ECM area was investigated because volatile organics were detected in an area located northeast of the property boundary fenceline (and potentially hydraulically downgradient) of the ECM area (See Figure 1-5). Beyond the fenceline is a sod farm. A portion of the sod farm (nearest the ECM Area) was selected as an experimental program for growing sod using municipal solid waste compost to amend the

1-13



NOTE: NUMBERED BUILDINGS INDICATE LOCATIONS OF
CESSPOOLS/LEACHFIELDS TO BE INVESTIGATED

- TREELINE

LOCATION OF SITES
REA - SAMPLING VISIT
NWIRP, CALVERTON, NEW YORK

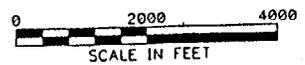
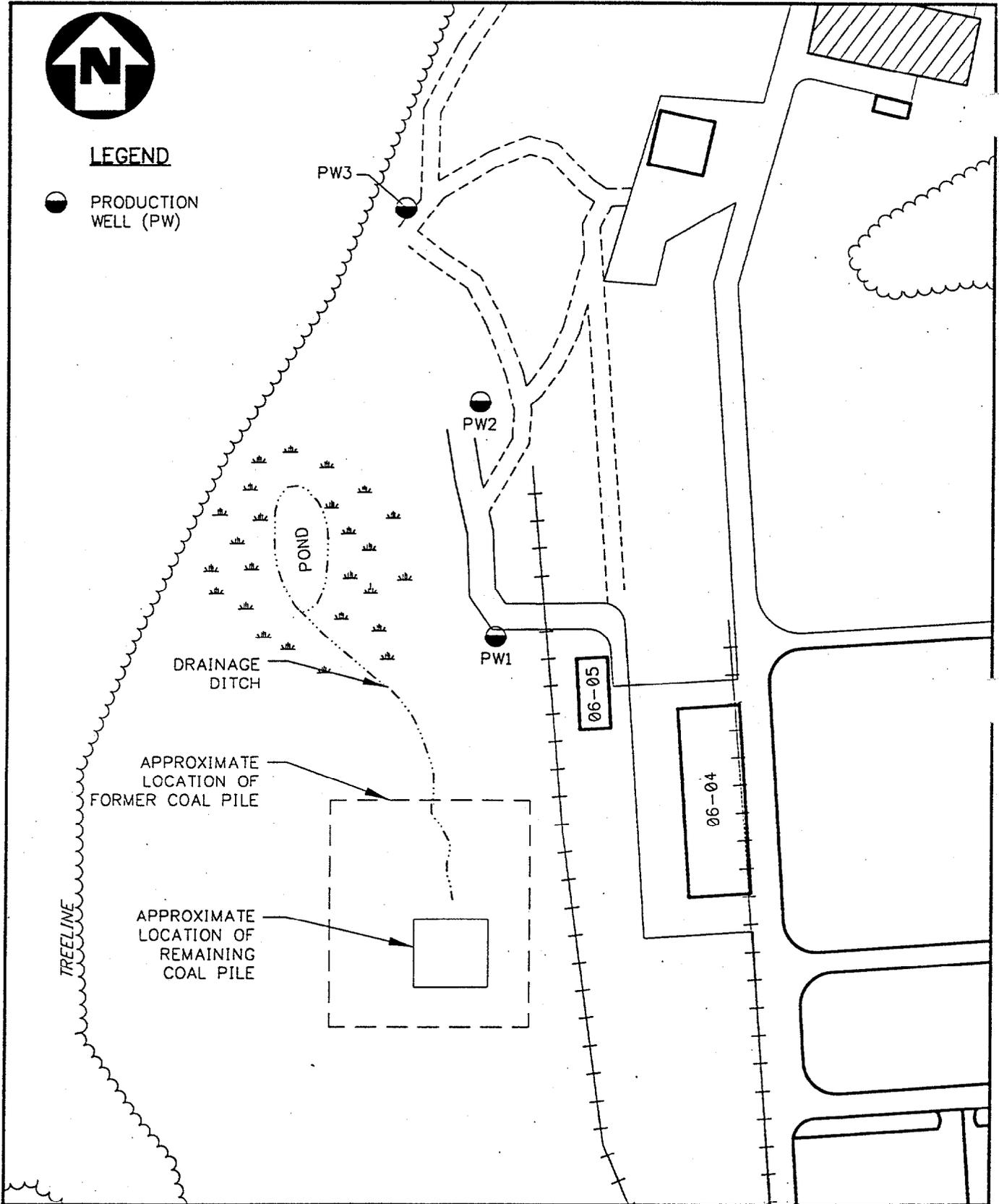


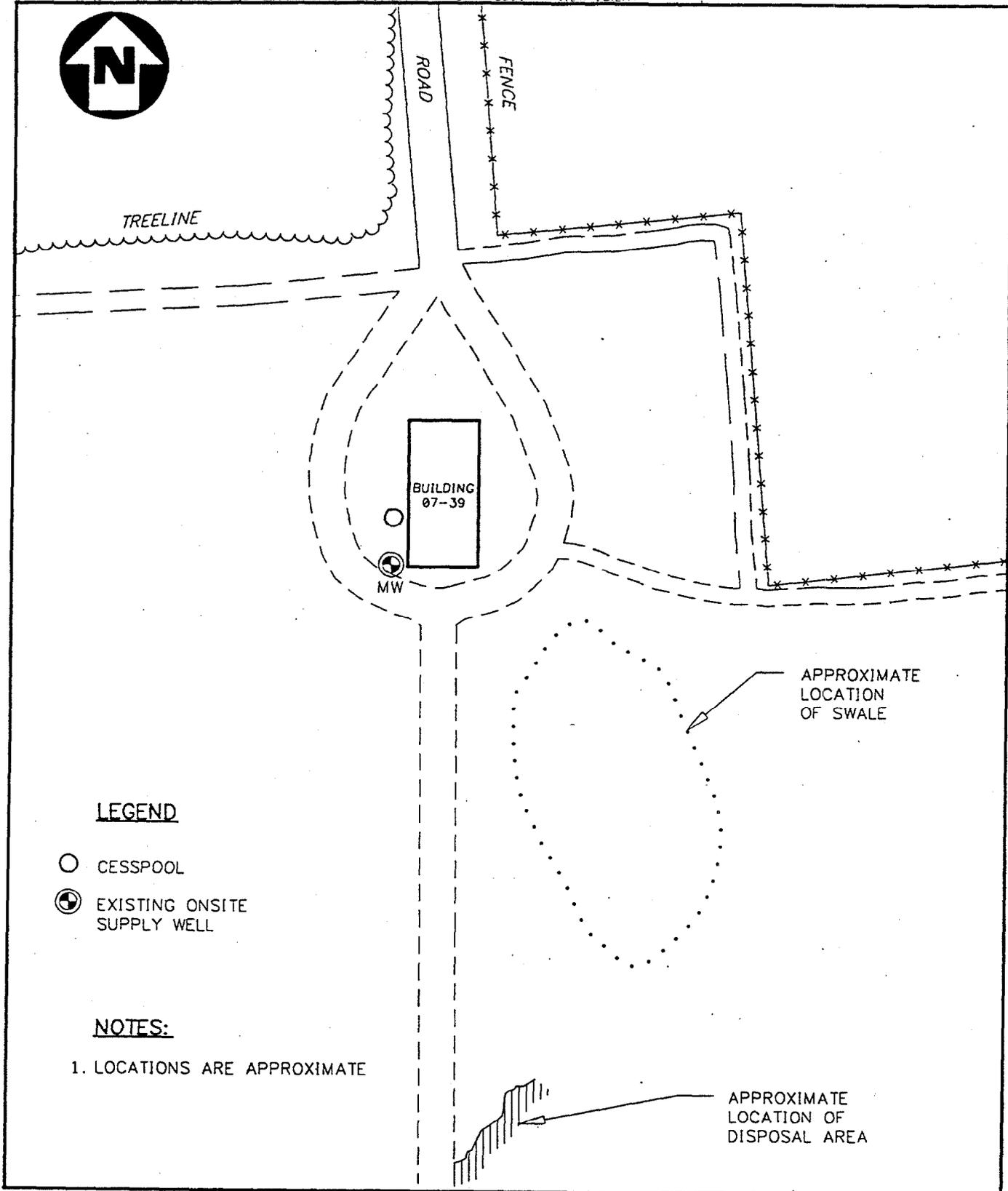
FIGURE 1-3



APPROXIMATE SCALE 1" = 250'

SITE LAYOUT MAP
SITE 8 - COAL PILE STORAGE AREA
RFA - SAMPLING VISIT
NWIRP, CALVERTON, NEW YORK

FIGURE 1-



LEGEND

- CESSPOOL
- ⊗ EXISTING ONSITE SUPPLY WELL

NOTES:

1. LOCATIONS ARE APPROXIMATE

APPROXIMATE SCALE 1" = 150'

SITE LAYOUT
SITE 9 - ECM AREA
RFA - SAMPLING VISIT
NWIRP, CALVERTON, NEW YORK

FIGURE 1-5



HALLIBURTON NUS
Environmental Corporation

natural soils and provide nutrients. As part of this program, a series of monitoring wells (MW1 to MW7) were installed and are being monitored by the Suffolk County Department of Health. 1,1,1-trichloroethane was detected in several monitoring wells, with a maximum concentration of 190 ug/l.

Based on the reconnaissance of the area in October 1992, there is visual evidence that construction debris was disposed near the area in the past. Historic photographs of the facility indicate disturbances of the soils in the area during the 1960s and 1970s. Also, solvents (volatile organics) were used at the site in the past. The disposal of other materials in this area cannot be ruled out. RFA field activities in this area focused on the debris disposal area, the former solvent storage area, and the cesspool as possible sources of the solvent contamination observed north east of this site. There is no evidence that suggests other organics or inorganic contaminants would be present at the site. Soil and groundwater samples were collected and analyzed in accordance with NEESA methodology for TCL volatile organics and freon.

Site 10 - Cesspool/Leachfield Areas

The cesspools/leach field areas were investigated because of the potential for industrial wastes to have been discharged to them in the past (see Figure 1-3). Because of the large number of cesspools/leach fields at the facility, and the consideration that some areas are used only for sanitary wastes (no industrial-type activity in that area), a preliminary screening of potentially contaminated cesspools/leach fields was conducted during the preparation of the work plan (Navy 1993a). This screening reduced the number of areas to be investigated from 22 to 8 during this RFA. Field activities for these areas focused on soil and groundwater contamination for solvents and to a lesser extent, inorganic contaminants. The basis for this concept is summarized as follows.

- Solvents (VOCs) are generally more toxic, more mobile, and relatively more stable in the aquifer than other organics. Also, these chemicals are normally used at the facility. Therefore, VOCs represent the most significant threat to groundwater.
- Some inorganics chemicals may be present in rinsewaters generated at the facility. Soluble inorganics may migrate to the surrounding soil and groundwater.
- Other organics were not widely used at the facility, or those which were, are either relatively not toxic or not mobile in water.

- Grumman maintains the cesspools. Contents are periodically removed and disposed of. Also, at the time that the facility is to be closed, the cesspool contents would be evaluated for contamination and handled appropriately.

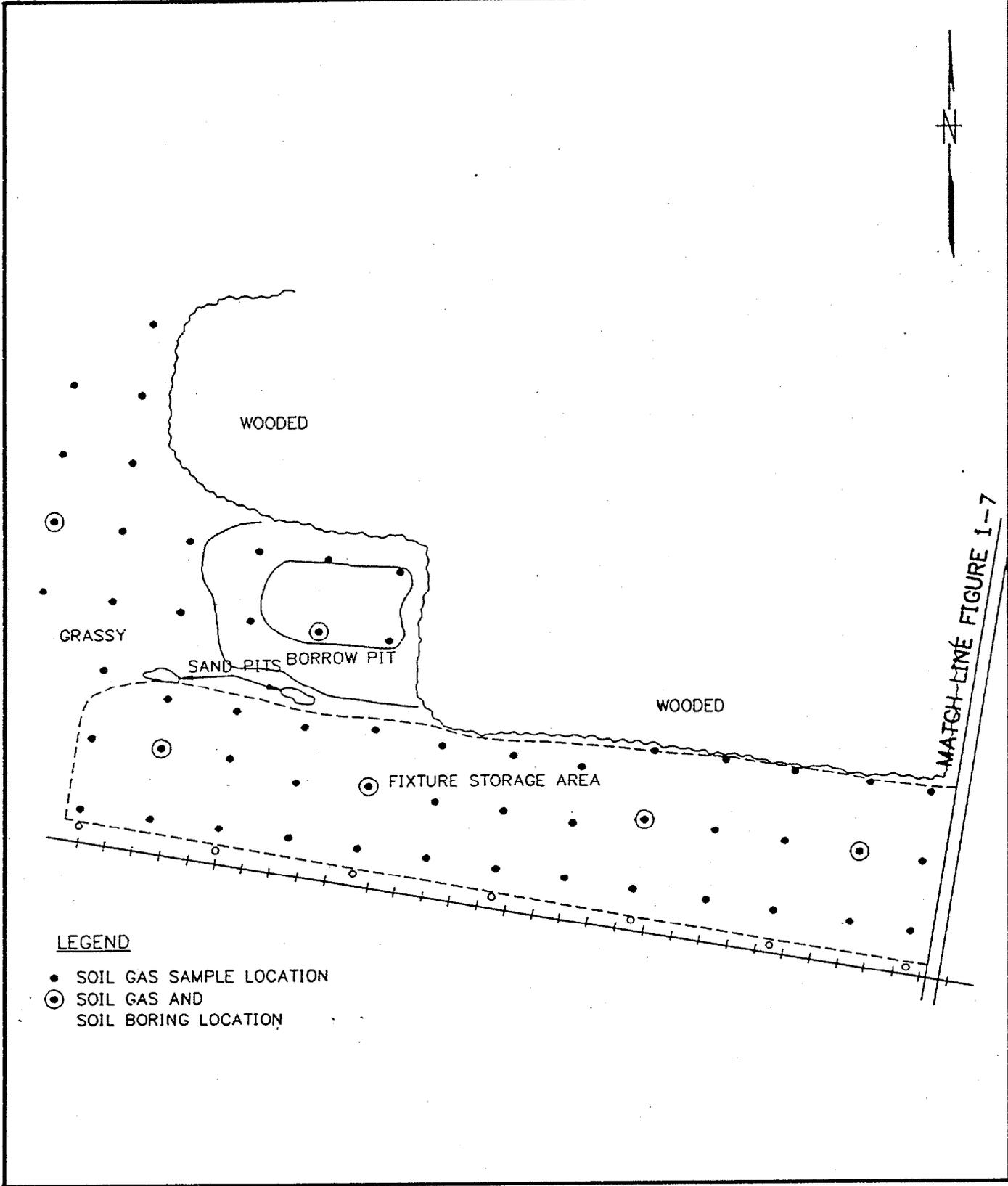
A concurrent two-phase field investigation was performed for the cesspools/leach field at this facility. Phase 1 was a soil gas survey and Phase 2 was a soil sampling investigation. The soil gas survey was used to identify potential areas of soil and groundwater contamination associated with selected facility cesspools/leach fields. The soil gas samples were analyzed at a subcontractors laboratory facility. Each of the samples were analyzed on a quick turn around basis (1 to 3 days). The decision to sample soils at specific sites and the location of any soil borings at cesspool/leach field areas was based on the soil gas results, with sampling conducted at locations with the highest soil gas concentrations. The second phase consisted of subsurface soil sampling and analysis at a fixed-base laboratory.

Soil gas samples were collected and analyzed for field screening purposes (VOCs) and soil samples were collected and analyzed in accordance with NEESA methodology for TCL volatile plus freon, and TAL metals and cyanide.

Site 11 - Fixture Storage Area

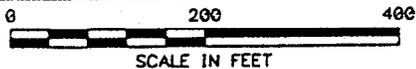
The Fixture Storage Area was investigated at the request of the Suffolk County Department of Health because historical aerial photographs of the site indicated that material of unknown origin was used to fill in depressions. General site features are presented in Figures 1-6 and 1-7. This site was added to the investigation during the field work (May 1994). The approach used at this site was the same as the approach used for Site 10 (Cesspool/Leachfield Areas); namely a wide-spread soil gas program was conducted followed by a more select soil boring program. The soil gas survey was performed across the site to identify potential areas of contamination. Soil gas samples were analyzed by a subcontractor and soil boring locations were selected based on the results of the soil gas survey.

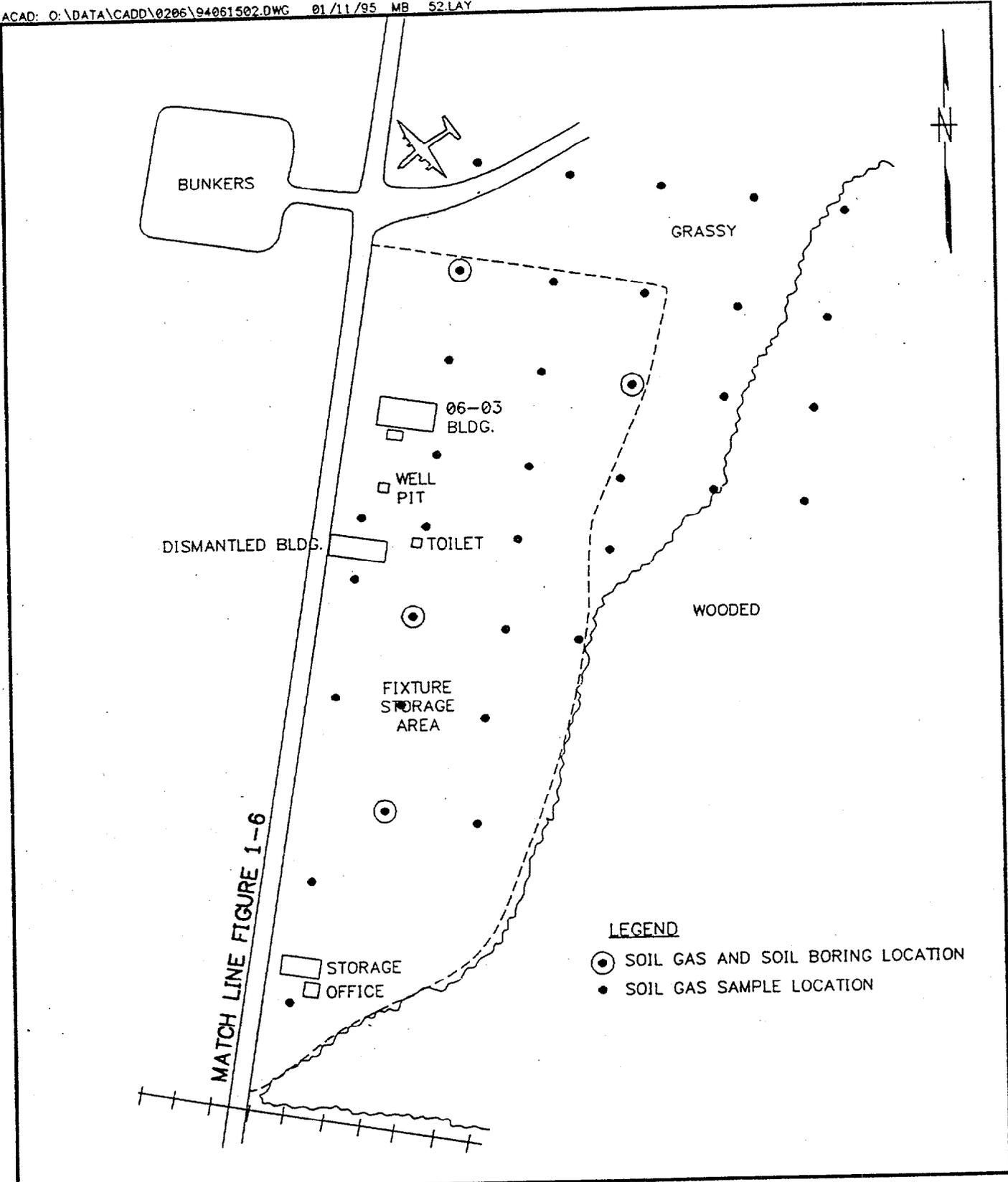
Soil gas samples were collected and analyzed for field screening purposes and soil samples were collected and analyzed in accordance with NEESA methodology for TCL volatile organics plus freon, and TAL metals and cyanide.



SITE 11A - STORAGE AREA
SOIL GAS/SOIL BORING LOCATIONS
NWIRP, CALVERTON, NEW YORK

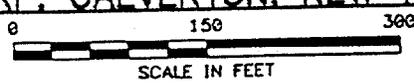
FIGURE 1-6





SITE 11B - STORAGE AREA
SOIL GAS/SOIL BORING LOCATIONS
NWIRP, CALVERTON, NEW YORK

FIGURE 1-7



1.4 BACKGROUND SAMPLES

Background soil samples were collected at 12 locations at NWIRP Calverton and analyzed for Target Analyte List (TAL) metals and cyanide. These samples were collected to determine naturally occurring concentrations of these constituents at the facility. This type of testing is normally conducted for metals only, because most metals are naturally present in most soils. TCL volatile organics and freon are not naturally found in the environment. A conclusion of metal contamination is then based on a statistical comparison of the metal results at a given site to background levels.

Background soil sampling locations are identified in Figure 1-8. These sample locations were selected in the field, with the locations representing primarily remote wooded areas.

1.4.1 Sample Collection Procedures

The background soil samples were collected at the locations identified in Figure 1-8, using a decontaminated stainless steel trowel. Sample depths were 6 to 12 inches below ground surface, except sample BG-SB19 which was collected 6 to 8 inches below ground surface depth interval. The samples were then placed in appropriate sample containers and secured in a cooler on ice prior to shipment to the analytical laboratory. Sample log sheets are presented in Appendix A. Chain-of-custody forms are provided in Appendix B.

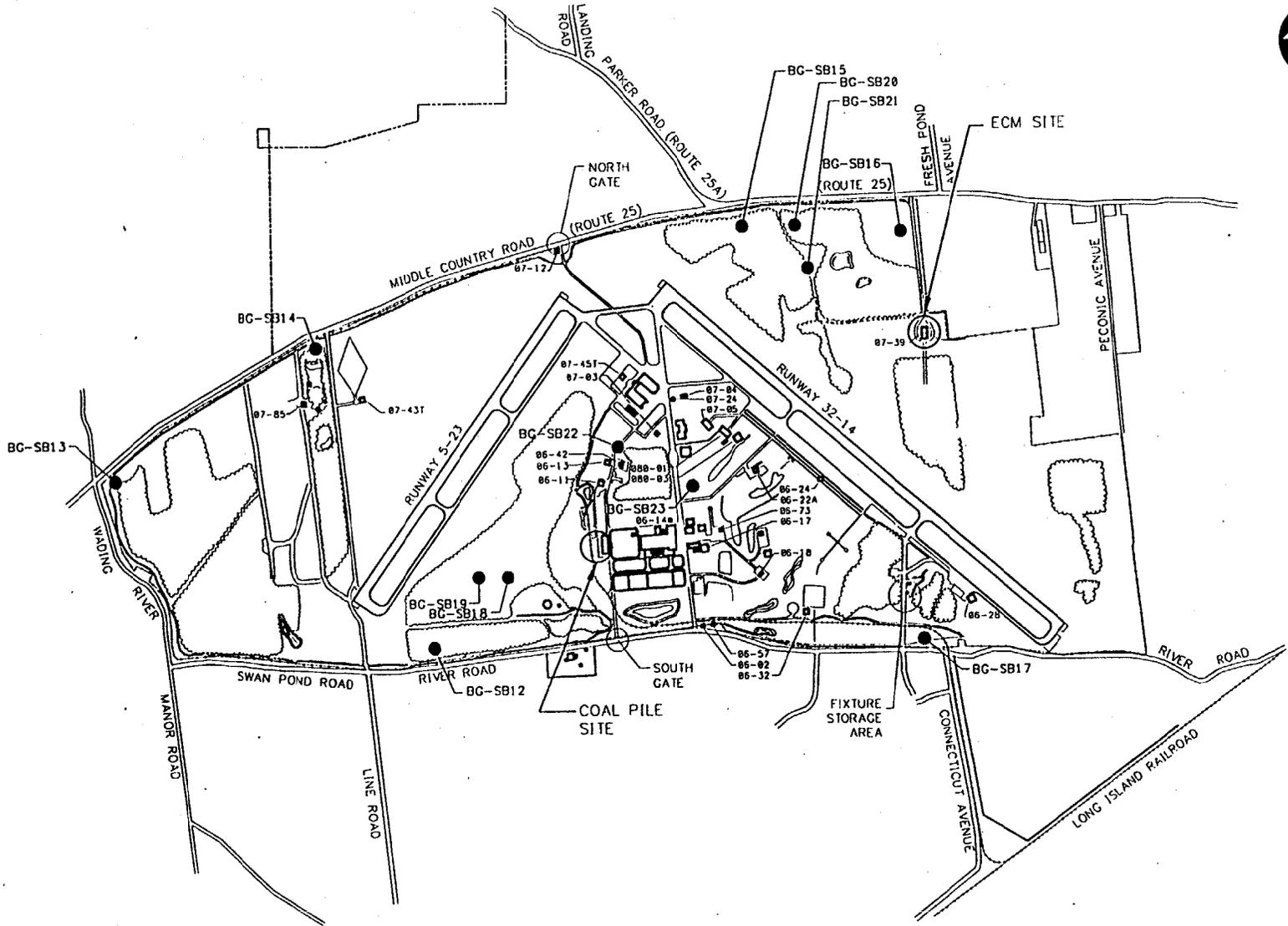
Two field duplicate sample pairs were generated during the sampling event. The duplicates (samples BG-SB16/BG-SB16-DU-02 and BG-SB18/BG-SB18-DU-01) permit evaluation of the precision due to sample collection techniques. One rinsate blank was generated during the collection of the background samples to allow assessment of the effectiveness of the decontamination procedures employed in the field.

1.4.2 Background Analytical Results

Results of the analysis of the background soil samples which were collected at NWIRP Calverton are presented in Table 1-1. Included in this table are all reported results, positive results and detection limits (for nondetects) for each target analyte in each sample. The final column in Table 1-1 presents the calculated 95th percentile (quantile) value for positively detected chemicals. The 95th percentile represents a reasonable upper bound concentration for background levels in the soils at the NWIRP Calverton. For calculation purposes, nondetected chemicals were evaluated using one-half of the reported sample-specific detection limits. Results of field duplicate samples were averaged prior to evaluation of the 95th percentile of the data set.



1-21



--- TREELINE

BACKGROUND SAMPLE LOCATIONS
RFA FIELD INVESTIGATION
NWIRP, CALVERTON, NEW YORK

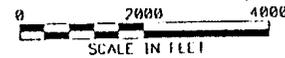


FIGURE 1-8

Positively detected background chemicals include aluminum, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, sodium, vanadium, and zinc. All data were used in the background calculation except one outlier reported for mercury (0.86 mg/kg and 0.74 mg/kg in samples BG-SB16 and BG-SB16-DU-02, respectively). The levels of lead reported in samples BG-SB16/BG-SB16-DU-02 were initially suspected to be outliers. However, after review of the sample location (near a road) and published rural background levels (TAGM 4046, revised January 24, 1994, Appendix A, Table 4) it was accepted for use as representative data points.

Data validation found that the overall quality of the results was acceptable. Specific problems with the data are summarized as follows. The matrix spike recovery for silver was very low and as a result, the silver data was rejected. However, silver was not detected in any of the background samples and silver is not a common soil constituent. Therefore, any positive detections of silver in site soils would be considered an indication of contamination.

Eleven of fourteen zinc results were rejected in accordance with EPA Region II protocol because of blank contamination. Rejection of this data results in a slightly elevated background set for zinc. Cadmium and lead were similarly rejected in 3 of 14 and 1 of 14 samples, respectively.

1.5 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The quality of the data collected during the RCRA Facility Assessment is assured through numerous measures which are designed to qualitatively and quantitatively evaluate the effectiveness of field decontamination procedures, precision of sample collection techniques, potential sample matrix interferences, and validity of the analytical data. These goals are accomplished by steps taken in the field and laboratory and measured by PARCC (precision, accuracy, representativeness, comparability, and completeness) parameters. Data validation is also performed on the analytical data to ensure the correctness and accuracy of the reported data.

1.5.1 PARCC Parameters

PARCC (precision, accuracy, representativeness, comparability, and completeness) parameters are characteristics of the data that allow quantitative and qualitative assessment of data quality. Each parameter analyzes a different element of the overall usability of the data.

TABLE 1-1 (Continued)
SUMMARY OF ANALYTICAL RESULTS - BACKGROUND SOIL SAMPLES
TAL METALS AND CYANIDE
NWIRP CALVERTON, NEW YORK

CHEMICAL	IDL	BG-SB18*	BG-SB18-DU	BG-SB19	BG-SB20	BG-SB21	BG-SB22	BG-SB23	Mean ¹	Standard Deviation ²	95th Percentile ³
Aluminum	18.0	1010	886	2460	10400	13100	1290	4940	8,180	5,260	16,800
Antimony	6.0	6.3 U	6.2 U	6.3 U	6.6 U	6.6 U	6.1 U	6.4 U	ND	ND	ND
Arsenic	0.60	1	0.84	0.63	2.4	2.2	0.86	1.1	4.05	6.05	14.0
Barium	4.0	4.2 U	4.1 U	4.2 U	8.2	15.8	4.9	6.3	10.4	6.52	21.1
Beryllium	0.60	0.63 U	0.62 U	0.63 U	0.66 U	0.66 U	0.61 U	0.64 U	ND	ND	ND
Cadmium	1.0	0.06	0.04 U	0.04 U	1.3 R	0.04	0.04	0.04	0.35	0.97	1.9
Calcium	200	211 U	207 U	209 U	220 U	221 U	276	452	231	131	447
Chromium	2.0	2.1 U	2.1 U	3.4	8.7	10.8	2 U	32.7	9.90	8.31	23.6
Cobalt	2.0	2.1 U	2.1 U	2.1 U	2.2 U	2.2 U	2 U	2.1 U	1.71	1.21	3.7
Copper	2.0	2.1 U	2.1 U	2.1 U	2.2 U	2.2 U	2 U	2.1 U	4.49	11.4	23.2
Iron	8.0	1990	1700	3320	11300	13200	1880	4920	8,635	5,020	16,900
Lead	0.40	5.4	6.1	4.2	8.1	6.7	20.8	8.9	16.0	19.8	48.6
Magnesium	20.0	84.4 U	82.6 U	122	635	858	81.4 U	398	684	531	1,560
Manganese	1.0	2.5	3.7	6.4	29.5	43.8	6.2	35	39.8	31.0	90.8
Mercury	0.10	0.09 U	0.09 U	0.1 U	0.1 U	0.11 U	0.1 U	0.09 U	0.06	0.02	0.09
Nickel	6.0	4.2 U	4.1 U	4.2 U	4.4 U	4.4 U	4.1 U	6.8	3.48	1.96	6.7
Potassium	40.0	127 U	124 U	125 U	162	151	122 U	129 U	166	111	348
Selenium	0.60	0.63 U	0.63 U	0.63 U	0.65 U	0.67 U	0.64 U	0.64 U	ND	ND	ND
Silver	2.0	2.1 R	2.1 R	2.1 R	2.2 R	2.2 R	2 R	2.1 R	ND	ND	ND
Sodium	200	211 U	210	209	226	227	273	273	233	31.6	285
Thallium	0.80	0.63 U	0.63 U	0.63 U	0.65 U	0.67 U	0.64 U	0.64 U	ND	ND	ND
Vanadium	2.0	6.1	6.1	6.9	18.2	20.8	7	61.8	19.6	14.6	43.6
Zinc	2.0	5.3 R	7.3 R	9.9 R	21.3 R	23.5 R	15 R	17.4 R	29.9	5.15	38.4
Cyanide	0.50	1 U	1.1 U	1 U	1.1 U	1.1 U	1 U	1 U	ND	ND	ND

TABLE 1-1 (Continued)
SUMMARY OF ANALYTICAL RESULTS - BACKGROUND SOIL SAMPLES
TAL METALS AND CYANIDE
NWIRP CALVERTON, NEW YORK

CHEMICAL	IDL	BG-SB18*	BG-SB18-DU	BG-SB19	BG-SB20	BG-SB21	BG-SB22	BG-SB23	Mean ¹	Standard Deviation ²	95th Percentile ³
Cyanide	0.50	1 U	1.1 U	1 U	1.1 U	1.1 U	1 U	1 U	ND	ND	ND

1. The mean is the arithmetic average of the values. For non detected results, 1/2 the MDL was used (including consideration of the moisture content). Duplicates were averaged.
2. Background soil data is assumed to normally distributed. The standard deviation is calculated as follows.

$$S = \sqrt{\sum(x_i - x_a)^2/n}$$

where: x_i is specific result.
 x_a is the arithmetic average.
 n is the number of samples

3. The 95th percentile equals $x_a + 1.645 \cdot S$.

U - Analyte not detected at reported detection limit.

* - Field duplicate sample.

ND - Analyte not detected in background samples.

Precision is the reproducibility of a result for a given parameter for a sample analyzed repetitively under identical or similar conditions. The external precision is assessed through field duplicate sample analysis and measures the reproducibility of the sampling techniques. Internal precision is assessed through laboratory duplicate sample analyses which measure the precision of analytical results. Results are qualified for duplicate precision during data validation to provide indications of potentially imprecise values in the data.

Accuracy is the comparison of a measured result to the actual value. During laboratory analysis accuracy is assessed in several manners via calibrations and surrogate and matrix spike recoveries. Control limits are established for each criterion and are evaluated individually to determine necessary corrective actions, if required.

All data collected should be representative of actual conditions at the sampling location. Steps taken in the development of the work plan and the laboratory statement of work are designed to obtain results that are representative of the actual site conditions. Field sampling activities were performed in accordance with the work plan. The use of USEPA CLP analytical protocols and data deliverables ensure that analytical results and deliverables are representative, consistently performed, and reported.

Comparability is achieved by standardizing the sampling techniques, analytical methodology, and reporting format. By being consistent with previous activities and methods, recent data is comparable to historical data, excepting variability due to seasonal and temporal changes.

Completeness is a measure of the amount of usable data retrieved versus the amount of data originally obtained. For the ideal sample matrices, 100% completeness is expected. However, limitations attributable to the sample matrix heterogeneity and analytical instrumentation may decrease the completeness. Data validation is performed in order to identify and eliminate the unusable portions of a data set. If significant deficiency is noted for sample data completeness (i.e., approximately 95% complete), corrective actions including resampling are considered. For the NWIRP Calverton RFA, no significant problems were noted for this parameter.

1.5.2 Field QC Samples

Field Quality Control (QC) samples were collected in support of the RFA field activity to address necessary portion of the PARCC parameters. Such samples include field duplicates, field blanks, rinsate blanks, and trip blanks. Certified clean bottleware were used throughout the investigation to eliminate potential problems associated with possibly contaminated sample containers.

Field duplicate sample pairs were collected to provide assessment of field sampling method precision. The results of the analyses were used to flag potentially imprecise data. Although some analytical data were estimated for duplicate imprecision, no data were rejected for this reason and the field sampling effort is considered to be acceptable with regard to this parameter.

Field QC blanks were collected to track and identify the introduction of blank contaminants into the data from field activities. Field blanks were collected from the source of potable water used in the decontamination of sampling equipment to identify this as a possible source of chemical contamination. Rinsate blanks were performed daily for each piece of sampling equipment used to assess any residual chemical contamination on the decontaminated sampling equipment. The trip blanks are analyzed for volatile organic constituents only and originate at the laboratory or bottleware distributor to track chemical contamination which may be incident to sample containers during transport to the site and, subsequently, to the laboratory.

All information obtained from the analysis of these QC samples is used in data validation to identify potential data deficiencies.

Chemicals detected in site-specific field blanks and their maximum concentrations include chloromethane (2J ug/l), methylene chloride (6J ug/l), acetone (11 ug/l), 2-butanone (15 ug/l), chloroform (1ug/l J), calcium (6,080 ug/l), magnesium (131 ug/l), manganese (7J ug/l), lead (50 ug/l), sodium (1,030 ug/l), cyanide (581J ug/l), iron (191 ug/l), toluene (2J ug/l), and zinc (32J). This data was used to qualify and in several cases reject positive detections in field samples. Site specific QA/QC discussions are provided in Section 2.0, 3.0, 4.0, and 5.0

1.5.3 Data Validation

Data validation is the process of evaluating raw and summarized analytical data to identify potential limitations in the data quality due to field and/or laboratory analysis problems. All data were validated with reference to U.S. EPA Functional Guidance for evaluating organic and inorganic analyses, NEESA-Level D data validation protocol, and method-specific requirements. A data validation memorandum was generated for the analyses of each sample set that summarizes the findings of the data review. These memoranda, which were submitted to the Halliburton NUS project manager, provide an explanation of the applied data qualifiers, and identifies problems associated with data usability. The validation memoranda and tabulated analytical database are presented in Appendices C and D, respectively.

Organic analyses were validated in accordance with NEESA-Level D validation requirements and with reference to "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses" (U.S. EPA, February 1, 1988). The data were validated based on a review of the following parameters:

- Holding Times
- GC/MS Tuning
- Initial and Continuing Calibration
- Field QC and Laboratory Blanks
- Surrogate Recovery
- Matrix Spike/Matrix Spike Duplicate
- Field Duplicates
- Internal Standards Performance
- TCL Compound Identification
- Compound Quantitation
- Tentatively Identified Compounds (TICs)

Data that were compromised as a result of noncompliance in one or more of the review areas were qualified as outlined in the validation guidance. Data validation reports summarize all qualification actions taken. No major problems resulting in the rejection of analytical data for organics analyses were noted.

Inorganic analyses were validated in accordance with NEESA-Level D validation requirements and with reference to "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses" (U.S. EPA, July 1, 1988). The data were validated based on a review of the following parameters:

- Holding Times
- Initial and Continuing Calibration Standard Performance
- Field QC and Laboratory Blanks
- ICP Interference Check Sample
- Laboratory Check Sample
- Laboratory Duplicate Sample
- Matrix Spike Sample
- Furnace Atomic Absorption QC
- ICP Serial Dilution
- Sample Result Verification
- Field Duplicates

Data that were compromised as a result of noncompliance in one or more of the review areas were qualified as outlined in the validation guidance. Data validation reports summarize all qualification actions taken.

Only some of the inorganic data are considered to be unusable. Data which were rejected are qualified with an "R" qualifier, and are not to be considered for numerical evaluation. Several sample data points were qualified on the basis of blank contamination, in which case a positive result has been replaced with a revised quantitation or detection limit and qualified "U". Remaining qualified data are considered estimated; positive results are flagged with a "J" qualifier, and nondetects denoted with a "UJ" qualifier.

The percentage of rejected data per media, per site are as follows:

Site 8 - Coal Pile	Soils: 0%
	Sediment: 7%
Site 9 - ECM Area	Soils: 0%
	Groundwater: 2%
Site 10 - Cesspool/Leachfields	Soils: 3%
Site 11 - Fixture Storage Area	Soils: 2%

Overall, the goal of 95% completeness was achieved.

2.0 COAL PILE STORAGE AREA

2.1 SITE DESCRIPTION/ENVIRONMENTAL SETTING

The Coal Pile Storage Area is situated behind the Steam Plant in the south central portion of the NWIRP Calverton (See Figure 1-3). Historically, the coal was used to fuel the boilers. Also, some of the coal from this area was used for road base material throughout the facility. There are reports that solvents were placed on the coal pile, so that when the coal was burned, the solvents would be destroyed.

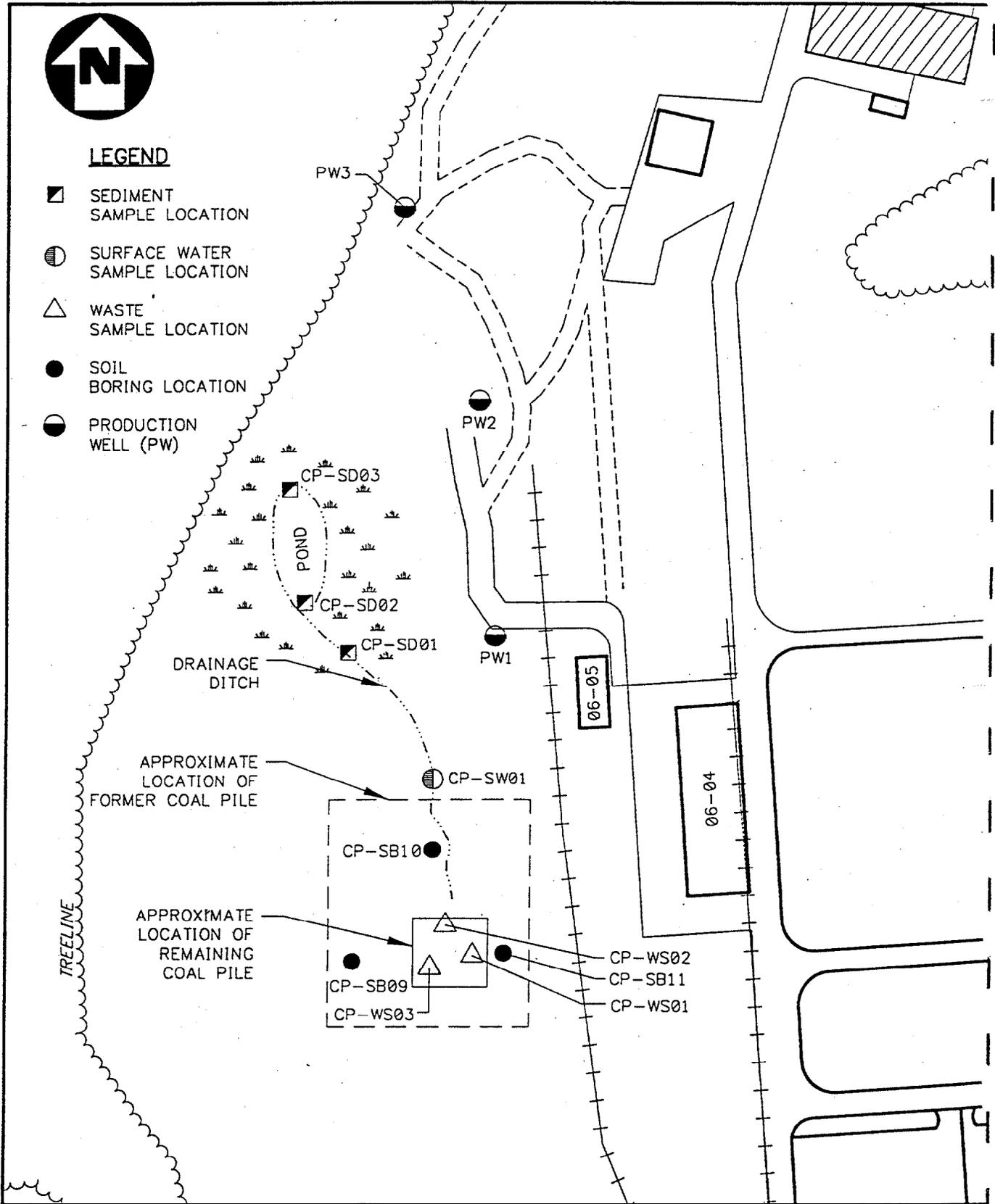
The site is generally flat with a shallow slope to a swamp located immediately north of the coal pile, (See Figure 2-1). Surface runoff, formed during rain events, typically flows toward this swamp. This swamp is classified as a wetland under the Natural Resources Management Plan for the facility, (NRMP, 1990). In addition to runoff, this swamp periodically receives excess production well water (through a pressure relief valve).

To the south of the coal pile is a drainage ditch which receives boiler blowdown. This ditch drains to the south. To the east of the coal pile is a grassy field and to the west is the steam plant. There are three production wells located approximately 500 feet to 1,500 feet to the north east. The wells are used as a potable and industrial water supply. The production wells extract groundwater from a depth of approximately 145 feet below ground surface.

Production wells, PW 2 and PW 3, have exhibited evidence of solvent contamination. The most significant contaminants detected are freon 113 and 1,1,1-trichloroethane at maximum concentrations of 14 ug/l and 5 ug/l, respectively. Activated carbon is currently used to treat the water prior to use.

2.2 SAMPLING OBJECTIVES

The primary reason for investigating the Coal Pile Storage Area is the presence of chlorinated solvents in the adjacent production wells coupled with reports that solvents were placed on the coal pile. As a result, the investigation at the Coal Pile Storage Area focused on potential contaminants which may have been placed on the coal pile and the migration pathways those contaminants may have followed.



APPROXIMATE SCALE 1" = 250'

SITE LAYOUT MAP
SITE 8 - COAL PILE STORAGE AREA
RFA - SAMPLING VISIT
NWIRP, CALVERTON, NEW YORK

FIGURE 2-

The specific objective of the investigation was to determine if the reported placement of solvents on the coal could have caused the contamination noted in the production wells. To achieve this objective, environmental samples of the coal, the underlying soils, surface water (runoff), and sediment samples were collected to evaluate potential migration to the wetland. From the wetland, the contaminants may have migrated downward to the production wells.

2.3 SAMPLING ACTIVITIES

Environmental samples were collected from various media in and around the coal pile. The investigation included three soil borings for lithologic characteristics and chemical analyses, six sediment samples from the adjacent wetland, and one surface water sample from the erosion-formed drainage swale connecting the coal pile to the wetland, (See Figure 2-1). Three samples were also collected from within the coal pile. Soil boring logs and sample logsheets are contained in Appendix A. Each of the samples was analyzed for TCL volatile organics and freon 113 using the USEPA Contract Laboratory Program (CLP) Statement of Work OLM01 (Revision 8). Additional discussion of the sampling activities is presented below.

Soil borings were advanced using hollow stem auger drilling techniques. Split-spoon samples were collected continuously to the water table to evaluate subsurface lithologies. Each of these samples was visually evaluated for evidence of contamination (staining) and the head space of the split spoon was checked with an organic vapor analyzer (OVA) meter. These findings are presented on the sample log sheets (Appendix A). Two samples from each boring were retained for chemical analyses. One sample was collected from the water table interface as an indication of deep soil contamination and/or groundwater contamination. The second sample was selected based on the zone with the highest OVA readings obtained during that boring and/or the presence of staining. For reference, the last four digits of the sample number indicates the depth at which the sample was collected in feet (e.g., 0204 indicates that the sample was collected at a depth of 2 to 4 feet below grade surface. The samples were analyzed for TCL volatile organics and freon 113.

Six sediment samples were collected from the wetland located north of the coal pile to monitor the potential contaminant migration from the coal pile to the production wells. The sediment samples were collected using a stainless steel bucket type auger and augering into the sediment. The water was then decanted and sediment placed into the required sample containers.

The sediment samples were collected from three sample locations to provide reasonable coverage of the entire wetland. One sample location was near the drainage swale from the coal pile; one sample location was in the middle; and one sample location was at the far end (nearest the Production Wells 2 and 3).

The samples were collected at two depths to indicate current and potentially historic migrations. The shallow samples were collected at a depth of 4 to 8 inches, (samples indicated with the code of .33.66 [feet below sediment surface]). The deep samples were collected at a depth of 1.5 to 2 feet (samples indicated with the code of 1.520). The samples were analyzed for TCL volatile organics and freon 113.

The surface water sample was collected from a slight drainage depression between the coal pile and the wetland. The sample was collected during a rain event when surface water would naturally flow toward the wetland. The surface water sample was analyzed for TCL volatile organics and freon 113.

Three samples of the existing coal pile were collected to determine if there is any evidence of solvents remaining on the coal. Samples were collected from approximately 10 to 20 inches below the surface of the coal pile using a stainless steel sampling trowel. Material was placed directly into the sample containers. The samples were analyzed for TCL volatile organics and freon 113.

Sampling equipment (split-spoons, auger heads and sampling trowels) was decontaminated between sample locations using the following procedures:

- potable water rinse
- alconox detergent wash
- potable water rinse
- steam distilled water rinse
- methanol rinse
- steam distilled water rinse
- air dry

All samples were kept on ice to maintain a temperature of at least 4 C from the time of sample collection until receipt by the laboratory. Samples were shipped via overnight carrier to minimize holding times. Chain of custody records can be found in Appendix B.

2.4 WASTE CHARACTERISTICS

The wastes potentially present at the Coal Pile Storage Area include coal (not classified as a waste), solvents, and potentially fuels/oils. The coal is classified as a raw material. Based on chemical constituents commonly found in coal, aromatic volatile organics (including benzene and toluene) and semivolatiles would be expected. However, because of the coal matrix, these constituents are not expected to be highly mobile.

Common solvents used at the facility, which may have been placed on the coal, include chlorinated solvents, freon, toluene, methylene chloride, methyl ethyl ketone (2-butanone), and lacquer thinners. These chemicals are all relatively mobile in the environment. Water solubilities are summarized as follows.

<u>Chemical</u>	<u>Water Solubility (mg/l)</u>
benzene	1,780
toluene	515
methylene chloride	20,000
methyl ethyl ketone	350,000
lacquer thinners	variable

Chlorinated solvents are denser than water. Benzene, toluene, fuels, and oils are lighter than water. With the exception of oils, each of the chemicals are relatively volatile.

2.5 EVIDENCE OF RELEASE/WASTE MIGRATION PATHWAYS

This section provides a description of the evidence of chemical release at the Coal Pile Storage Area (Site 8) and identifies possible migration pathways which would facilitate physical transport of the chemicals in the environment.

Evidence Of Release

Evidence of chemical release at the Coal Pile Storage Area is limited to accounts made by employees at the facility who describe the placement of solvents on the coal pile and allowing the solvents to infiltrate into the coal. The frequency, volume, and time period of solvent placement onto the coal are unknown. These accounts coupled with the finding of chlorinated solvents in nearby production wells are the primary basis for the conducting the investigation at this site.

Waste Migration Pathways

Chemical migration pathways associated with a volatile organic contaminant release onto a coal pile include volatilization to the atmosphere, migration into the groundwater, leaching to groundwater, and, to a limited extent, transport in surface water and sediment. Retention of the solvents on the coal itself is the most likely fate for solvents. Solvents are organic chemicals that have a high affinity for organic carbon; bituminous coal is comprised almost entirely of organic carbon. Subsequent volatilization is a likely fate mechanism for a volatile solvent, as a significant portion of the coal pile is air-filled (voids

between coal pieces) and liquids poured onto the coal would spread over the surface of the coal particles, providing a significant amount of surface area for volatilization to occur. Vapors would be generated and released over a long period of time to the air-filled spaces in the pile, and migrate from the pile with other vapors being emitted naturally from the fragmented coal.

Another transport mechanism for the solvents released onto the coal involves dissolution into rainwater percolating through the storage pile during storm events. Most of the water is likely to be retained on the coal, but a portion of contaminated water may have leached through the coal and contacted the groundwater. Groundwater under the coal pile is located at a depth of approximately four to eight feet below the bottom of the coal pile. The effect of this transport mechanism would be most evident by contamination in Production Well #1. However, contamination has not been observed in this production well.

Physical transport of chemicals bound to organic carbon in sediments or dissolved in runoff water through erosional processes is also a potentially significant transport mechanism. The solvents which are suspected to have been placed on the coal pile are considered to have relatively high water solubilities (greater than 10 mg/l) and would dissolve readily into rainwater if contacted. Drainage patterns at Site 8 follow a generally northern direction and discharge to a wetland area. A solvent release onto the coal pile which was not appreciably reduced by volatilization and/or leaching to groundwater would be detectable in the surface water and sediments leading to the wetland. Chlorinated chemicals have been detected in the sediments and Production Wells; and the production wells likely include recharge from the area of the sediment.

2.6 RECEPTORS/EXPOSURE PATHWAYS

This section provides a preliminary assessment of exposure pathways and receptors that may contact contaminated environmental media, whose origin is the Coal Pile Storage Area (Site 8). The identified routes of exposure and receptors are consistent with current land use at the facility and provide an evaluation of future land use. Initially, receptors are identified which are consistent with the current and potential future land uses. Exposure routes which are applicable for each receptor group are then identified which are based on land use and behavior patterns of the potential receptors.

Receptors

NWIRP Calverton is a currently operating industrial facility. Under a current land use scenario, employees of the facility are the only relevant receptor group. All individuals in this receptor group were assumed to

be adults who work a standard 40-hour work week for 250 days each year. Security at the facility was assumed to be adequate to eliminate the possibility of trespassers at the plant, thereby eliminating these individuals as potential receptors.

Future plans for the facility include possible use of the land for civilian residents. Under a residential land use scenario, adult and child residents are relevant receptors who were assumed to be living at the site under reasonable residential conditions (i.e., single-family dwellings on landscaped lots). Residential exposure were considered to be year round and include all exposures related to normal residential activity.

Ecological receptors, which inhabit the identified wetland area to the north of Site 8, may also be affected by a chemical release at the site. The wetland can provide habitat for various vertebrate and invertebrate life forms. Results of media-specific sampling in the wetland can provide a more accurate assessment of the media potentially impacted and can serve as a tool for identification of the appropriate environmental receptors.

Exposure Pathways

Exposure pathways for human and environmental receptors are a function of the media involved. The identification for the site was qualitative and based on predicted behavior patterns of individual receptors. Exposure routes for current (industrial/commercial) and potential future (residential) land use conditions were considered.

Exposure to chemicals in soil can occur via incidental ingestion, dermal contact, and inhalation of fugitive dust emissions. Industrial/commercial land use can allow exposure to soil chemicals by all specified routes.

Exposure to surface water and sediment was assumed to occur concurrently. At this site, this pathway is limited as no significant flowing surface water is present. In fact, the field sampling team conducting work at the site had to wait several months to encounter a storm event sufficient enough to generate surface water at the site. However, a wetland area is located about 300 feet to the north of Site 8. Industrial/commercial exposure to surface water and sediments is not considered relevant as exposure under normal circumstances is not likely.

Dermal contact for residents is the only exposure route for surface water and sediment which is applicable as the shallow depth of any standing water prevents full immersion.

2.7 RESULTS OF SAMPLING VISIT

The following sections describe the results and findings of the sampling activities which occurred at the Coal Pile Storage Area. Included in this discussion are the results of the soil boring investigation and environmental sampling program. The sample locations and analytical results for this site are summarized in Figure 2-2. Sample log sheets and soil boring log sheets are presented in Appendix A. Sample chain-of-custody forms are presented in Appendix B. Data validation letters are presented in Appendix C. Complete analytical data summary sheets are presented in Appendix D. Additional backup on the laboratory method, laboratory QA/QC samples, and Form I's are available in the project files.

2.7.1 Geology

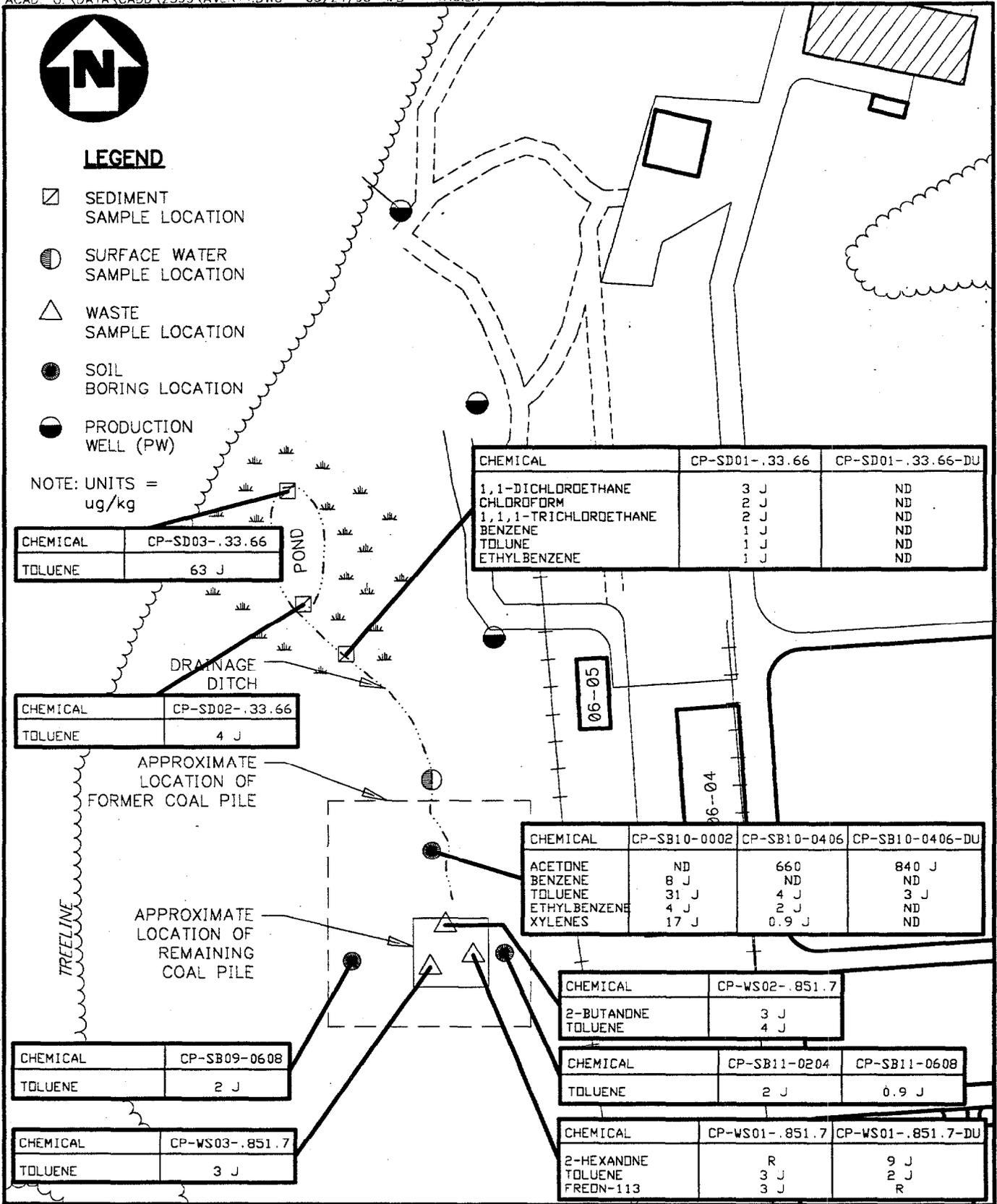
Three soil borings (CP-SB09, CP-SB10, CP-SB11) were drilled around the perimeter of the former coal pile for both lithologic characteristics and chemical analyses. Each boring was advanced to the water table using hollow-stem auger drilling techniques. As described in the boring logs found in Appendix A, materials encountered consisted of several inches of coal fragment and dust followed by fine grained sand with some silt and traces of pebbles. Sand increased in size with depth to the water table where it is described as medium grained sand with some fine sand and pebbles.

2.7.2 Hydrogeology

Split-spoon samples collected from borings CP-SB09 and CP-SB11 were saturated at a depth of approximately 8 feet below grade surface, (indicating the water table interface). The water table was encountered in boring CP-SB10 at a depth of approximately 5 feet below grade surface.

2.7.3 Analytical Results

Soil samples collected at the Coal Pile Storage Area (Site 8) were analyzed for Target Compound List (TCL) volatile organic compounds and freon 113 using the USEPA Contract Laboratory Program (CLP) Statement of Work OLM01 (revision 8). The method provides Contract Required Quantitation Limits (CRQLs) of 10 ppb (ug/l or ug/kg) for all target compounds and chemical-specific method detection limits which range from 0.5 to 9 ppb. Solid sample quantitation and detection limits are subject to revision based on individual sample moisture content.



APPROXIMATE SCALE 1" = 250'

ANAYLTICAL RESULTS
SITE 8 - COAL PILE STORAGE AREA
RFA-SAMPLING VISIT
NWIRP, CALVERTON, NEW YORK

FIGURE 2-2



Positive results were reported for methylene chloride, acetone, benzene, toluene, ethylbenzene, or xylenes in one or more soil samples from Site 8. Sediment samples were noted to have positive results reported for 1,1-dichloroethane, chloroform, 1,1,1-trichloroethane, benzene, and toluene. Waste samples contained detectable amounts of 2-butanone, 2-hexanone, toluene, and freon 113. The following text provides a discussion of the results for each of the environmental media which were sampled at the Coal Pile Storage Area. The results are presented graphically in Figure 2-2.

Soil

As summarized in Table 2-1, positively detected chemicals in soil from Site 8 included acetone, benzene, toluene, ethylbenzene, and xylenes. Acetone (detected in 2 of the 7 samples collected) is a suspected laboratory blank contaminant, as the presence of this chemical is not consistent with the presumed mode of site contamination (i.e., disposal of hydrocarbon and/or chlorinated solvents). Acetone was detected only in the field duplicate sample pair (CP-SB10-0406 and CP-SB10-0406-DU) at concentrations of 660 ug/kg and 840 ug/kg. The surficial soil sample (0-2 feet) collected at location SB10 did not contain acetone at a detectable concentration.

Benzene (detected in one of seven samples), toluene (detected in 6 of 7 samples), and ethylbenzene and xylenes (detected in 2 of seven samples) complete the list of detected chemicals in soil at Site 8. All of these chemicals are aromatic hydrocarbons and are naturally present in varying amounts in bituminous coals. Benzene (detected at 8 ug/kg), ethylbenzene (concentrations ranging from 2 ug/kg to 4 ug/kg), and xylenes (0.9 ug/kg to 17 ug/kg) were detected only at location SB10. Toluene was detected in all samples except CP-SB09-0204, with a maximum concentration of 31 ug/kg in sample CP-SB10-0002. A clear pattern of BTEX contamination is noted for sample CP-SB10-0002. Much lower concentrations (at or less than 4 ug/kg) of BTEX chemicals were reported for other samples, including the subsurface sample collected at SB10 (i.e., CP-SB10-0406). It may be concluded that any release of volatile organic solvents onto the former coal pile at Site 8 was limited: in areal extent (as frequent detections were limited to only one location); amount of chemical released (evidenced by concentrations at or below the CRQL at all but one sample location); and affected only the surficial portion of soils (specifically, only the top 2 feet of the sampled material as demonstrated by comparison of surface and subsurface soil sample data at each location).

Tentatively Identified Compounds (TICs) were detected in the soil samples and included various unknown compounds (maximum of 1,200 ug/kg), trichlorofluoromethane (freon 11, at a maximum of 160 ug/kg), and various alkylcycloalkanes (at concentrations which ranged to 8,000 ug/kg). Please note that reported TIC concentrations are highly unreliable, with actual concentrations potentially varying a factor of one or more

TABLE 2-1

**SUMMARY OF ANALYTICAL DATA - SOIL SAMPLES (ug/kg)
SITE 8 - COAL PILE STORAGE AREA
NWIRP CALVERTON, NEW YORK**

Chemical	Method Detection Limit	CP-SB09- 0204	CP-SB09-0608	CP-SB10- 0002	CP-SB10- 0406	CP-SB10-0406-DU	CP-SB11-0204	CP-SB11-0608
					Field Duplicate Pair			
Acetone	9				660	840 J		
Benzene	1			8 J				
Toluene	1		2 J	31 J	4 J	3 J	2 J	0.9 J
Ethylbenzene	1			4 J	2 J			
Xylenes	0.5			17 J	0.9 J			
TICs	NA			Unknown Freon 11	Unknown Hydrocarbons	Unknown Hydrocarbons Methylcyclohexane		

Estimated value

Blank indicates a non detection reported for this sample/compound.

NA: Not applicable

orders of magnitude. All TICs were detected only at SB10, with most (all but the freon 11) being detected at the 4-6' depth interval. The duplicate sample collected from this location contained similar TIC results. Field observations noted during the collection of this sample (SB10-0406) included an OVA split-spoon head-space reading of 52 part per million (ppm) and a noticeable solvent-type odor emanating from the sample. These findings indicate that TCL volatile contamination is not present at this location, however, fuels, oils, or other types of hydrocarbon contamination may be present at this location and in areas further hydraulically downgradient.

Table 2-2 presents a comparison of the RFA analytical results to the New York State Standards for soil, as outlined in Technical and Administrative Guidance Memorandum (TAGM) on Determination of Soil Cleanup Objectives and Cleanup Levels (Number 4046 (final), January 24, 1994). Also included in this table are chemical-specific frequency of detection, range of positive results, and average of all results. The arithmetic average of the data set was determined considering non detected values to be equal to one-half of the reported method detection limit. The TAGM values presented for each chemical are concentrations which are protective of human health (systemic or cancer effects) and groundwater quality.

Acetone was detected in a field duplicate sample pair at concentrations of 660 ug/kg and 840 ug/kg. Considering non detects reported for the other soil samples results in an average concentration of 129 ug/kg. Both the minimum positive result and the average concentration for acetone exceed the 110 ug/kg TAGM standard for protection of groundwater. The presence of acetone is suspected to be related to blank contamination, however, a comprehensive data validation was not able to dismiss the reported positive results. The concentration of acetone reported exceeded the concentration detected in the blank by a factor of greater than 10. No other positive results reported for soils at the Coal Pile Storage Area exceed respective TAGM standards.

Sediment

Results of analyses performed on sediment samples collected at the Coal Pile Storage Area are summarized in Table 2-3 and indicate the presence of low concentrations of chlorinated aliphatic and monocyclic aromatic chemicals. Positive results were reported for samples collected from the 4 to 8 inch depth interval only.

Toluene was found in the sediment sample collected at locations SD02 (4 ug/kg) and SD03 (66 ug/kg). Toluene is suspected to be associated with the natural degradation of bituminous coal which was stockpiled at the site. The areal extent of this chemical is considered to be minimal as analytical results

TABLE 2-2

**EVALUATION OF ANALYTICAL DATA - SOIL SAMPLES
SITE 8 - COAL PILE STORAGE AREA
NWIRP CALVERTON, NEW YORK**

Chemical	Frequency of Detection	Range of Positive Results (ug/kg)	Arithmetic Mean of Results (ug/kg)	New York State TAGM (ug/kg)	
				Protection of Human Health	Protection of Groundwater
Acetone	2/7	660 - 840	129	8,000,000	110
Benzene	1/7	8	1.8	24,000	60
Toluene	6/7	0.9 - 31	6.7	20,000,000	1,500
Ethylbenzene	2/7	2 - 4	1.4	8,000,000	5,500
Xylenes	2/7	0.9 - 17	3.4	200,000,000	1,200

TABLE 2-3

**SUMMARY OF ANALYTICAL DATA - SEDIMENT SAMPLES (ug/kg)
SITE 8 - COAL PILE STORAGE AREA
NWIRP CALVERTON, NEW YORK**

Chemical	Method Detection Limit	CP-SD01- .33.66	CP-SD01- .33.66-DU	CP-SD01- 1.520	CP-SD02- .33.66	CP-SD02-1.520	CP-SD03- .33.66	CP-SD03-1.520
		Field Duplicate Samples						
1,1-Dichloroethane	2	3 J						
Chloroform	1	2 J						
1,1,1-Trichloroethane	2	2 J						
Benzene	1	1 J						
Toluene	1	1 J			4 J		63 J	
Ethylbenzene	1	1 J						
TICs	NA			Unknown	Unknown	Unknown		

UJ - Estimated quantitation limit.

J - Estimated positive result.

Blank indicates a non detection reported for this sample/compound.

NA: Not applicable

for sediment collected at the 1.5 to 2 foot depths at both locations indicate there to be no detectable volatile organics in the soils.

Other organic chemicals detected in sediment were noted in only one other sample (CP-SD01-33.66). All detected chemicals: 1,1-dichloroethane (3 ug/kg), chloroform (2 ug/kg), 1,1,1-trichloroethane (2 ug/kg), benzene (1 ug/kg), and ethylbenzene (1 ug/kg) were reported to be present at concentrations less than the 10 ug/kg CRQL. The positive detections for these chemicals were not confirmed in the field duplicate of this sample. The presence of 1,1-dichloroethane and 1,1,1-trichloroethane is consistent with available historical information regarding groundwater contamination at nearby Production Wells 2 and 3. However, other halogenated organic chemicals (dichloroethenes), which were detected in these production wells, were not detected in soil, sediment, or waste samples collected at Site 8.

TICs were observed in the Site 8 sediments. However, the mass spectra of these chemicals could not be matched to available library spectra with any confidence and are considered to be unknown. The maximum concentration of unknown TIC was noted to be 11 ug/kg in sediment, but is not considered to be accurate as no chemical-specific calibration was performed.

Table 2-4 presents a summary of the frequency of detection, range of positive results, average of all results, and relevant New York State technical guidance for sediments. The guidance presented for protection of human health are based on the principal of equilibrium partitioning of contaminants adsorbed to organic carbon in sediments to the water column and consider bio-accumulation effects in humans. Chemical-specific octanol-water partitioning coefficients (K_{ow}) and Ambient Water Quality Criteria (AWQC) were used as the basis for determining human health protective sediment standards. Sediment standards which are protective of benthic organisms were based on the minimum-lowest and median (or severe) effects levels as determined by a selected group of biological studies.

As shown in Table 2-4, no exceedences were noted for positively detected sediment chemicals, therefore, it may be inferred that chemicals present in the sediments are not at concentrations which would prove harmful to aquatic organisms or human health.

Surface Water

A surface water sample was collected as part of the RFA for Site 8. The sample was collected during a rain event in September 1994, from a drainage swale leading from the coal pile to the wetland. The tabulated data results for this sample are in Appendix D and a copy of the validation letter is in

TABLE 2-4

**EVALUATION OF ANALYTICAL DATA - SEDIMENT SAMPLES
SITE 8 - COAL PILE STORAGE AREA
NWIRP CALVERTON, NEW YORK**

Chemical	Frequency of Detection	Range of Positive Results (ug/kg)	Arithmetic Mean of Results (ug/kg)	New York State Technical Guidance (ug/kg) ⁽¹⁾		
				Human Health Bioaccumulation	Benthic Aquatic Toxicity	
					Acute	Chronic
1,1-Dichloroethane	1/7	3	1.5	N/A	N/A	N/A
Chloroform	1/7	2	0.85	N/A	N/A	N/A
1,1,1-Trichloroethane	1/7	2	1.4	N/A	N/A	N/A
Benzene	1/7	1	0.68	0.6	N/A	N/A
Toluene	3/7	1 - 63 ⁽²⁾	11.6	N/A	N/A	N/A
Ethylbenzene	1/7	1	1.4	N/A	N/A	N/A

⁽¹⁾ - Sediment criteria calculation based on assumed sediment organic carbon content of 0.1% (i.e., TOC = 1000 mg/Kg). NYSDEC Division of Fish and Wildlife (November 1993).

⁽²⁾ - A Federal and state sediment standard for toluene is not available. However, based on sediment/surface water partitioning and water-based standards for protection of aquatic life, a calculated toluene sediment criteria is 510 ug/kg.

N/A - Standard not available

Appendix C. No positive results were detected in the surface water sample, indicating that the surface water is not a current pathway for contaminant migration.

Waste Samples

Coal samples collected at the Coal Pile Storage Area were analyzed for the same parameters as soil and sediment samples. Positively detected organic chemicals in the coal include 2-butanone (one detection at 3 ug/kg), 2-hexanone (one detection at 9 ug/kg), toluene (a maximum of 4 ug/kg), and freon 113 (one detection at 3 ug/kg), (See Table 2-5). Toluene, detected in all four samples, was the most pervasive chemical detected at Site 8. Toluene is suspected to be associated with degradation of the bituminous coal, which is stockpiled at the site. 2-Butanone is considered to be a common laboratory contaminant. However a comprehensive data validation was not able to ascertain a laboratory source for this chemical and this chemical is used at the facility. The positive results reported for toluene, 2-hexanone, and freon 113 are estimated and non detects for some other chemicals were rejected because of low internal standard recovery. Discussion of the results of data validation is presented in text which follows and in Appendix C.

Several unknown TICs were reported in the waste materials (coal). However, the mass spectra of these chemicals could not be matched to available library spectra with any confidence and are considered to be unidentifiable. The maximum concentration of an unknown TIC (38 ug/kg) is not considered accurate, as no chemical-specific calibration was performed.

Coal samples collected at the Coal Pile Storage Area were not compared to any New York TAGM standards as the materials which were sampled are neither soil or sediments. The results of analysis for this material is presented to provide assessment of the occurrence of potential contaminants at the site.

Quality Assurance/Quality Control (QA/QC) and Blank Samples

Review of the analytical data for the QA/QC and field and laboratory blank samples and the results of an intensive data validation indicate there to be some deficiencies in the analytical data quality. Sample data which were affected by analytical and/or QC problems have been qualified in accordance with U. S. EPA Region II data validation protocol. Appendix C provides a complete assembly of the data validation memoranda which were prepared in support of the data evaluation.

TABLE 2-5

**SUMMARY OF ANALYTICAL DATA - WASTE SAMPLES (ug/kg)
SITE 8 - COAL PILE STORAGE AREA
NWIRP CALVERTON, NEW YORK**

Chemical	Method Detection Limit	CP-WS01- .851.7	CP-WS01-.851.7-DU	CP-WS02-.851.7	CP-WS03-.851.7
		Field Duplicate Samples			
2-Butanone	2			3 J	
2-Hexanone	1	R	9 J	R	R
Toluene	1	3 J	2 J	4 J	3 J
Freon-113	1	3 J	R	R	R

J - Estimated positive result

R - Data rejected (unusable)

Blank indicates a non detection reported for this sample/compound.

Field duplicate precision for soil, sediment, and the waste samples were considered to be within the data validation control limits. Data validation resulted in the rejection of some nondetected analytical data due to extremely low surrogate recoveries; associated positive results are reported as estimated.

All data (positive results and nondetects) unaffected by rejection are qualified as estimated because of exceedence of the technical holding time allowed for performance of analyses. The affect on the data is a possible under reporting of the magnitude of positive results as degradation and volatilization may occur in samples. All data should be considered biased low as a conservative approach.

Blank contamination was also noted for some QC samples which were grouped with the samples collected at Site 8. Field blank sample data which were generated for the sampling activities at the Coal Pile Storage Area were qualified for blank contamination which was detected in associated laboratory method blank samples. Detected blank contaminants include methylene chloride (detected at a maximum concentration of 34 ug/l), chloroform (2 ug/l), chlorobenzene (2 ug/kg), acetone (maximum of 30 ug/l), 4-methyl-2-pentanone (6 ug/kg), and 2-hexanone (10 ug/kg).

Summary

Several volatile organic chemicals were detected in Site 8 soil, sediment, and waste material (coal) samples. In soil, methylene chloride and acetone (suspected blank contaminants) were detected as well as benzene, toluene, ethylbenzene, and xylenes. The most frequent occurrence of detection of these chemicals was observed at soil boring location SB10. Higher concentrations of BTEX were noted in the surface soil (0-2') sample than in the subsurficial (4-6') sample collected at SB10. Based on field observations during the sampling, fuel and/or oil contamination may be present at soil boring SB10.

Detectable concentrations of organic chemicals were only noted in the shallow sediment sample (4-8" deep) collected in the northern most portion of the wetland. Benzene and toluene, in addition to chlorinated aliphatic chemicals (1,1-dichloroethane, chloroform, and 1,1,1-trichloroethane) were detected at concentrations which are equal to or marginally greater than respective method detection limits. These positive detections were not reported in the associated field duplicate sample. Toluene was also detected in samples CP-SD02-.33.66 (4 ug/kg) and CP-SD03-.33.66 (63 ug/kg). The detections of 1,1-dichloroethane and 1,1,1-trichloroethane in the sediment at location SD01 provides some evidence that the Coal Pile Storage Area is a possible source area for organic groundwater contamination which has been historically observed in Production Wells 2 and 3.

Waste (coal) materials that were sampled and analyzed contained detectable amounts of 2-butanone, 2-hexanone, toluene, and freon 113. The detection of ketones and toluene are not consistent with suspected release activities. Chlorofluorocarbons were detected in the groundwater near the site and provide another possible link between the Coal Pile Storage Area and contaminated groundwater at Production Wells 2 and 3.

2.8 CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER ACTIONS

The conclusions and recommendations for further action are summarized as follows.

1. There is evidence that historic activities at the Coal Pile Storage Area may have impacted soils and groundwater near the coal pile. However, based on the relative concentration of chemicals detected in the coal, soil, and sediment samples, the impact from TCL volatile organics is not expected to be a current or future risk to human health or the environment. In addition, the coal pile does not appear to be a continuing source of contamination.
2. Based on the findings at Soil Boring 10, at a depth of 4 to 6 feet below grade surface (groundwater interface), hydrocarbon (fuels/oils) contamination may be present in the soils and groundwater. As a result, a floating free product, soil, and groundwater investigation (including VOC testing) should be performed in this area to determine if contamination is present and if present to define the nature and extent.

3.0 ELECTRONIC COUNTER MEASURE (ECM) AREA

3.1 SITE DESCRIPTION/ENVIRONMENTAL SETTING

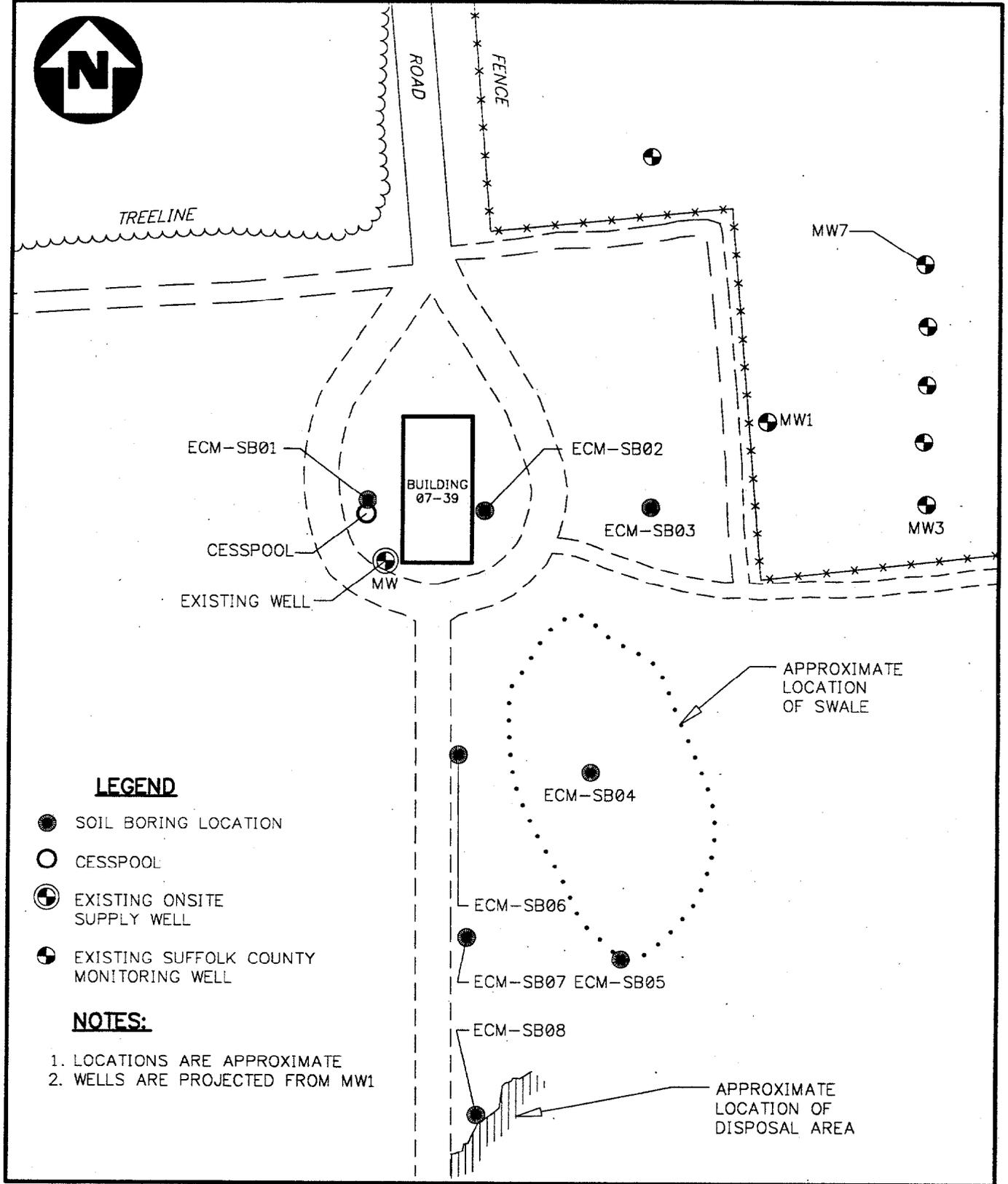
The Electronic Counter Measure (ECM) Area is located in the northeast corner of the NWIRP, Calverton, (See Figure 1-3). This area was constructed in the early 1970's and is currently used for testing and evaluating various electronic counter measure equipment. There is no manufacturing occurring at this site. However, 1,1,1-trichloroethane (TCA) is used as a cleaning agent at this site. It has been reported that approximately 10 gallons per year of TCA are used in cleaning of miscellaneous parts.

General site features include the ECM building (Building 07-39), an old debris disposal area located approximately 600 feet to the south, and a two depressions located to the east and to the southeast, (See Figure 3-1). It is likely that these depressions used to consist of a natural drainage swale leading to the south. Construction debris and miscellaneous equipment were visible in and around the disposal area and throughout the southeast depression.

Located just to the east of ECM Area is the property fence line. Beyond the fence line is a sod farm. A portion of the sod farm (nearest the ECM Area) was selected as an experimental program for growing sod using municipal solid waste compost to amend the natural soils and provide nutrients. It has been reported that municipal solid waste was used as a soil supplement. As part of this experimental program, a series of monitoring wells (MW1 to MW7) were installed and are being monitoring by the Suffolk County Department of Health. TCA at a concentration of 190 ug/l was detected in the well furthest from the ECM area (MW-7). Monitoring wells closer to the site exhibited lower concentrations of chemicals. Also noted during site visits in 1993 and 1994 was the presence of several drums and laboratory type containers (amber bottles) located just northeast of the ECM area, on the sod farm, and near the fence.

3.2 SAMPLING OBJECTIVES

The investigation at the ECM area was initiated at the request of the Suffolk County Department of Health. According to the Health Department, 1,1,1-trichloroethane was detected in samples collected from the offsite wells. Groundwater flow patterns estimated by the County indicated that the ECM area could be a potential source of the contamination. To determine this, a subsurface soil sampling investigation was



APPROXIMATE SCALE 1" = 150'

FIGURE 3-1

SITE LAYOUT
SITE 9 - ECM AREA
NWIRP, CALVERTON, NEW YORK



performed. In addition, the offsite monitoring wells and an onsite low volume potable water supply well at the ECM area were sampled and analyzed. Each of the samples was analyzed for Target Compound List (TCL) volatile organic compounds and freon 113 using the USEPA Contract Laboratory Program (CLP) Statement of Work OLM01 (Revision 8). The onsite groundwater sample (and associated field duplicate) was also analyzed for Target Analyte List (TAL) metals and cyanide according to the analytical methods described in the CLP Statement of Work ILM02 (Revision 1).

3.3 SAMPLING ACTIVITIES

Sampling activities at the ECM included the drilling and sampling of eight soil borings for lithologic characterization and chemical analyses (two samples per boring), groundwater sampling from three County wells located offsite just to the east of the ECM area, and an onsite potable water supply well located adjacent to the ECM building. Soil boring logs and sample logsheets are contained in Appendix A. The location of the sample points are presented in Figure 3-1.

Soil borings were advanced using hollow stem auger drilling techniques. Split-spoon samples were collected continuously to the water table to evaluate subsurface lithologies. Each of these samples was visually evaluated for evidence of contamination (staining) and the head space of the split spoon was checked with an organic volatile analyzer (OVA) meter. These findings are presented on the sample log sheets (Appendix A). Two samples from each boring were retained for chemical analyses. One sample was collected from the water table interface as an indication of deep soil contamination and/or groundwater contamination. The second sample was selected based on the zone with highest OVA reading obtained in that boring and/or the presence of staining. For reference, the last four digits of the sample number indicates the depth at which the sample was collected in feet (e.g. 0204 indicates that the sample was collected at a depth of 2 to 4 below grade surface. The samples were analyzed for TCL volatiles and freon 113.

Groundwater samples were obtained from three County wells (MW1, MW3, and MW7) located offsite to the northeast. The wells were sampled using dedicated bailers installed in the wells. Three casing volumes were removed from each well before sampling, and the pH and specific conductance was measured after each purge volume. Each groundwater sample was analyzed for TCL volatiles and freon 113.

A groundwater sample was also obtained from a potable water supply well west of the ECM building. The well pump was allowed to run for several minutes and then a sample was collected from a sample tap on the distribution piping. This sample was analyzed for TCL volatile organics, freon 113, and TAL metals.

Sampling equipment (split-spoons, auger heads and sampling trowels) were decontaminated between sample locations using the following procedures:

- potable water rinse
- alconox detergent wash
- potable water rinse
- steam distilled water rinse
- methanol rinse
- steam distilled water rinse
- air dry

Samples were kept on ice to maintain a temperature of at least 4 C from the time of sample collection until receipt by the laboratory. Samples were shipped via overnight carrier to minimize holding times. Chain of custody records can be found in Appendix B.

3.4 WASTE CHARACTERISTICS

Based on interviews with workers, the only potentially significant waste present at the ECM area is 1,1,1-trichloroethane (TCA). However, because of potential operations conducted at this facility, minor quantities of other solvents may also be present. TCA and other similar solvents are all relatively mobile in the environment. The water solubility of TCA is approximately 720 mg/l. In its pure form TCA is denser than water. Also, TCA has a relatively high vapor pressure in both in pure form as well as when dissolved in water.

3.5 EVIDENCE OF RELEASE/WASTE MIGRATION PATHWAYS

This section provides a description of any evidence of chemical release at the ECM Area (Site 9) and identifies possible migration pathways which would facilitate physical transport of the chemicals in the environment.

Evidence Of Release

Evidence of chemical release at the ECM is based on the finding of TCA in County monitoring wells located to the northeast of the site coupled with observations of TCA being used at the facility and reports that used TCA was placed on trays outside the building to allow the solvent to evaporate. Leaks, spills, and overflow of the tray during precipitation events could have caused TCA to enter underlying soils and

groundwater. Based in interviews with workers, approximately 10 gallons per year of TCA were used at this facility.

Based on water level data obtained from the County monitoring wells, the County indicated that in this area groundwater flows to the northeast. This flow path would provide a direct connection between the ECM area and the most contaminated County monitoring well (MW-7). Site-specific groundwater flow patterns for the ECM area are not available. Also, irrigation of the sod farm could affect the direction of groundwater flow.

Waste Migration Pathways

Chemical migration patterns associated with a volatile contaminant release include volatilization to the atmosphere, absorption to organic carbon in soil, and leaching to groundwater. Since the solvent was reportedly placed in trays, volatilization is considered to be the most probable fate of the majority of the chemical. The vapors would dissipate rapidly in air and undergo significant dilution and photo-chemical degradation in the atmosphere. Based on the volume of TCA used and its toxicity, it is not likely that the amount of solvent released into the atmosphere would result in a health risk to employees or other downwind receptors.

Although not reported by workers, it is assumed that at least a small amount of solvent could have been spilled from the drying trays. These materials would soak into soil, adsorb to organic carbon, and undergo volatilization (to the soil gas) and dissolution in water percolating through the soil. Most solvent is likely to be retained in the soil, but a portion of contaminated water may have leached through unsaturated zone soils and contacted the groundwater, located at a depth of approximately 20 to 30 feet below the ground surface. The occurrence of this process would be most evident by contamination in soils collected at the suspected spill locations in the unsaturated zone and at the groundwater capillary interface at that location and other downgradient areas.

Because of the high permeability of the soils and low topographic relief, physical transport of chemicals bound to sediments or dissolved in runoff water through erosional processes is not considered a potentially significant transport mechanism at this site. However, two low areas, located to the southeast of Building 07-39 were sampled to assess the potential occurrence of any chemicals which were transported across the site surface.

3.6 RECEPTORS/EXPOSURE PATHWAYS

This section provides a preliminary assessment of exposure pathways and receptors that may contact contaminated environmental media at the ECM Area (Site 9). The identified routes of exposure and receptors are consistent with current land use at the facility and consider possible future land use.

Initially, receptors were identified according to current and potential future land uses. Exposure routes applicable for each receptor group were then identified. These exposure routes were based on land use and behavior patterns of the potential receptors.

Receptors

NWIRP Calverton is an active industrial facility. Under a current land use scenario, employees of the facility are the only relevant receptor group. All individuals in this receptor group were assumed to be adults who work a standard 40-hour work week for 250 days each year. Security measures at the facility are assumed to eliminate the possibility of trespassers at the plant, thereby eliminating these individuals as potential receptors.

Future plans for the facility include possible use of the land for civilian residents. Under a residential land use scenario, adult and child residents are relevant receptors who are assumed to be living at the site under reasonable residential conditions (i.e., single-family dwellings on landscaped lots). Residential exposures were considered to occur throughout the year and include all exposures related to normal residential activity.

No ecological receptors have been identified at this site.

Exposure Pathways

Exposure pathways for human and environmental receptors are a function of the media involved. The identification for the site was qualitative and based on predicted behavior patterns of individual receptors. Exposure routes for current (industrial/commercial) and potential future (residential) land use conditions were considered.

Exposure to chemicals in soil can occur via incidental ingestion, dermal contact, and inhalation of fugitive dust emissions. Industrial/commercial land use can allow exposure to soil chemicals by all specified routes.

Current industrial/commercial receptors are not exposed to the site groundwater, as a water distribution system is currently in operation at the plant. However, groundwater exposure to future residents at the site and/or current residents downgradient of the site is possible. Under normal conditions, reasonable exposure to groundwater chemicals was quantified via ingestion, dermal contact, and by inhalation of volatiles emitted during showering or bathing.

3.7 RESULTS OF SAMPLING VISIT

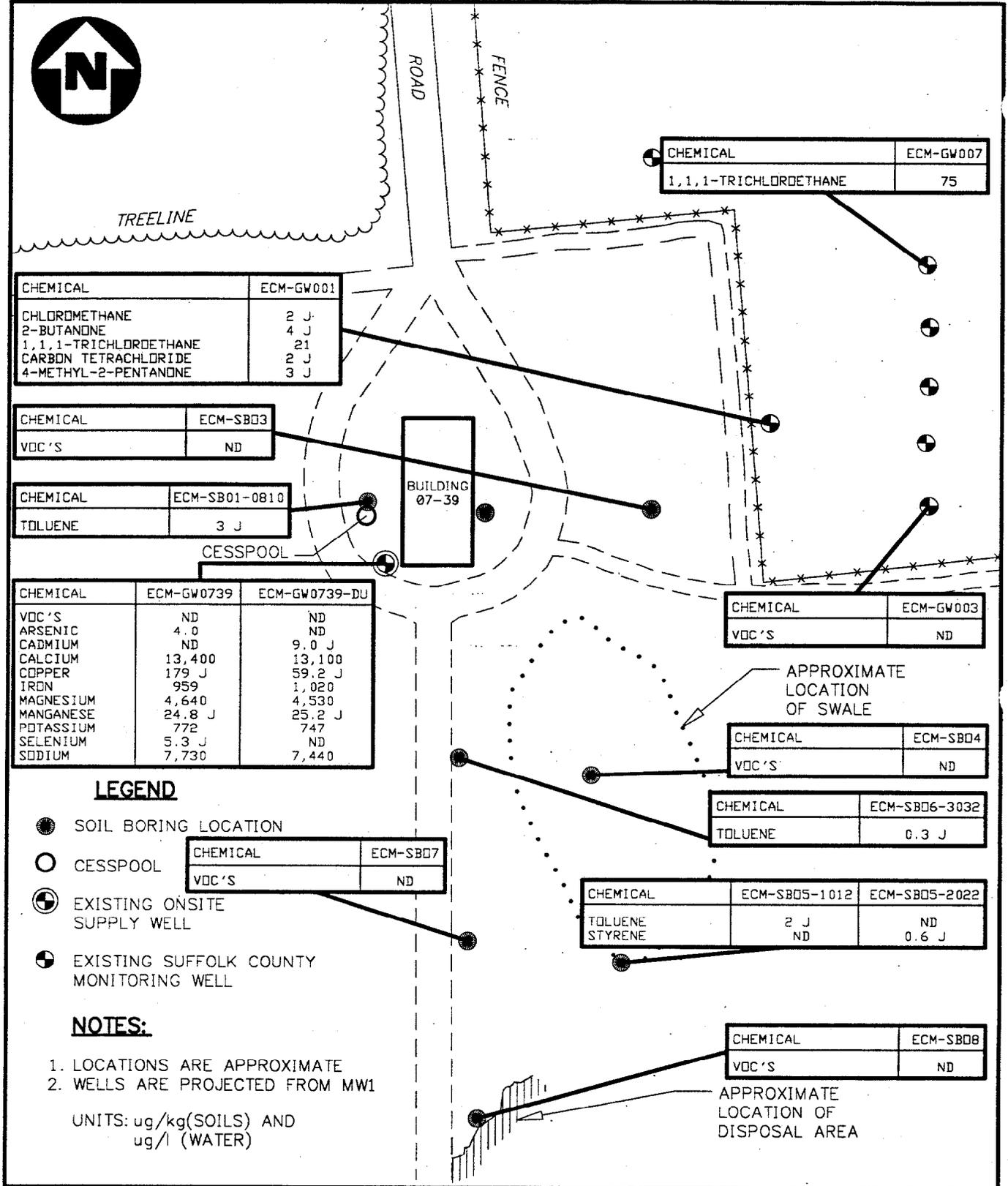
The following sections describe the results and findings of the sampling activities for the ECM Area. Included in this discussion are the results of the soil boring investigation and environmental sampling program. The sample locations and analytical results for this site are summarized in Figure 3-2. Sample log sheets and soil boring log sheets are presented in Appendix A. Chain of custody forms for the samples are presented in Appendix B. Data validation letters are presented in Appendix C. Complete analytical data summary sheets are presented in Appendix D. Additional backup on the laboratory methods, QA/QC samples, and Form I's are available in the project files.

3.7.1 Geology

Eight soil borings (ECM-SB01 - ECM-SB08) were drilled and sampled at the ECM area for both lithologic characterization and chemical analyses. The borings were advanced to the water table using hollow-stem drilling techniques. Soils throughout the area were described primarily as fine to medium grained sand with sub-round to round pebbles from the ground surface to the bottom of the boring.

3.7.2 Hydrogeology

Based on the soil borings drilled at the ECM Area, the water table was encountered at a depth of approximately 30 feet below ground surface in six borings. In soils borings ECM-SB04 and ECM-SB05, the water table was encountered at a depth of about 25 feet below ground surface. This difference results from the fact that the borings were drilled in a topographical low area.



APPROXIMATE SCALE 1" = 150'

FIGURE 3-2

3.7.3 Analytical Results

Soil and groundwater samples collected at the ECM Area (Site 9) were analyzed for Target Compound List (TCL) volatile organic compounds and freon 113 using the USEPA Contract Laboratory Program (CLP) Statement of Work OLM01 (Revision 8). One groundwater sample (and associated field duplicate) was also analyzed for Target Analyte List (TAL) metals and cyanide according to the analytical methods described in the CLP Statement of Work ILM02 (Revision 1). The organic analysis method provides Contract Required Quantitation Limits (CRQLs) of 10 ppb (ug/l or ug/kg) for all target compounds and chemical-specific method detection limits which range from 0.5 to 9 ppb. Solid sample quantitation and detection limits are subject to revision based on individual sample moisture content.

Toluene and styrene were positively detected in soils collected at Site 9, (See Figure 3-2). Offsite groundwater was noted to contain detectable amounts of chloromethane, 2-butanone, 1,1,1-trichloroethane, carbon tetrachloride, 4-methyl-2-pentanone. Volatile organic chemical were not observed in the onsite groundwater, although various inorganic constituents were detected. The following text provides a discussion of the results for each of the environmental media that was sampled at the ECM Area.

Soil

Table 3-1 presents a summary of analytical results for positively detected chemicals in soil at the ECM Area site. For each chemical, method detection limits are specified and the numerical values of the positive results are presented. Positively detected chemicals in soil from Site 9 include toluene (detected in three of 18 samples) and styrene (detected in one of 18 samples). The use of significant quantities of toluene or styrene at the facility was not identified. Toluene was detected at concentrations which range from 0.3 ug/kg to 3 ug/kg. Styrene was detected at a concentration of 0.6 ug/kg. Of significant importance with these results is that 1,1,1-trichloroethane was not detected in any of the soil borings, including samples from ECM-SB02 and ECM-SB03. Soil boring ECM-SB02 was placed at the location where employees at the facility reported that the 1,1,1-trichloroethane was both stored and used. Soil boring ECM-SB03 was intended to be placed directly between the most contaminated County monitoring well (MW7) and soil boring ECM-SB02. However, it was actually placed about 100 feet south of this hypothetical point. Therefore, ECM-SB03 would not be considered hydraulically downgradient of the ECM area at this point.

Tentatively Identified Compounds (TICs) detected in the soil samples included various unknown compounds (maximum of 12 ug/kg), a saturated hydrocarbon (at a maximum of 36 ug/kg), and a dichloromethylbenzene isomer (detected at 10 ug/kg). TICs were detected at the deep interval samples collected at locations SB01, SB02, SB05 and SB06. Please note that reported TIC concentrations are

TABLE 3-1

**SUMMARY OF ANALYTICAL DATA - SOIL SAMPLES (ug/kg)
SITE 9 - ECM AREA
NWIRP CALVERTON, NEW YORK**

Chemical	Method Detection Limit	ECM-SB01-0810	ECM-SB01-3032	ECM-SB01-3032-DU	ECM-SB02-2022	ECM-SB02-3436	ECM-SB03-2426
			Field Duplicate Samples				
Toluene	1	3 J					
Styrene	1						
TICs		Unknown	Saturated HC	Saturate HC			

Chemical	Method Detection Limit	ECM-SB03-2830	ECM-SB04-0810	ECM-SB04-2426	ECM-SB05-1012	ECM-SB05-2022	ECM-SB06-1012
Toluene	1				2 J		
Styrene	1					0.6 J	
TICs			Unknown			Sat HC, Unknowns	

Chemical	Method Detection Limit	ECM-SB06-3032	ECM-SB07-1820	ECM-SB07-3032	ECM-SB08-2022	ECM-SB08-2022-DU	ECM-SB08-2830
					Field Duplicate Samples		
Toluene	1	0.3 J					
Styrene	1						
TICs							

J - Estimated value

Blank indicates a non detect reported for this sample/compound.

Saturated HC (Hydrocarbons)

highly unreliable, with actual concentrations potentially varying a factor of one or more orders of magnitude. These TICs may be related to the operation of a sanitary cesspool, adjacent to building 07-39.

During the soil boring program, a stained soil layer was detected in SB02 at a depth of approximately 20 to 22 feet below grade surface. This soil boring corresponds to location where the 1,1,1-trichloroethane drum and evaporation tray were. In addition, the OVA reading obtained from the sample split-spoon head-space was 820 ppm. The sample was submitted for analytical testing. Field observations on samples collected below this depth to the water table (30 feet below ground surface) indicate that the staining was only present in this specific zone and the OVA readings decreased significantly with depth. It should be noted that significant TICs were not observed at this location. Based on the depth of the zone below the ground surface (20 feet), the distance above the groundwater table (10 feet), and the absence of TCL volatile organics and TICs at this zone, the elevated OVA readings may be attributable to naturally occurring methane from the nearby cesspool, as similar OVA readings (64 ppm) and similar analytical results were obtained for the 8 to 10 foot interval in soil boring SB01.

Table 3-2 presents a comparison of analytical results to New York State Standards for soil as outlined in Technical and Administrative Guidance Memorandum (TAGM) on Determination of Soil Cleanup Objectives and Cleanup Levels (Number 4046 (final), January 24, 1994). Also included in this table are chemical-specific frequency of detection, range of positive results, and average of all results. The arithmetic average of the data set is determined considering non detected values to be equal to one-half of the reported method detection limit. The TAGM values presented for each chemical are concentrations which are considered to be protective to human health (systemic or cancer effects) and groundwater quality.

The relevant TAGM standards for toluene and styrene are not exceeded by either the reported maximum or calculated average concentrations for Site 9.

Groundwater

Results of analyses performed for groundwater samples collected at the ECM Area site and the adjacent sod farm are summarized in Table 3-3. Groundwater sampling locations are shown on Figure 3-2. Positive results were reported for chloromethane, 2-butanone, 1,1,1-trichloroethane, carbon tetrachloride, and 4-methyl-2-pentanone in the offsite groundwater samples. Arsenic, cadmium, calcium, copper, iron, magnesium, manganese, potassium, selenium, and sodium were detected in the onsite water supply well sample. Although volatile organic analyses were conducted at all ECM Area water sampling locations, TAL metals and cyanide were only analyzed for water from ECM-GW0739, an abandoned supply well located next to the southwest corner of Building 07-39.

TABLE 3-2

**EVALUATION OF ANALYTICAL DATA - SOIL SAMPLES
SITE 9 - ECM AREA
NWIRP CALVERTON, NEW YORK**

Chemical	Frequency of Detection	Range of Positive Results (ug/kg)	Arithmetic Mean of Results (ug/kg)	New York State TAGM (ug/kg)	
				Protection of Human Health	Protection of Groundwater
Toluene	3/18	0.3 - 3	0.8	20,000,000	1,500
Styrene	1/18	0.6	0.5	N/A	N/A

N/A - Standard not available for this chemical.

TABLE 3-3

**SUMMARY OF ANALYTICAL DATA - GROUNDWATER SAMPLES (ug/l)
SITE 9 - ECM AREA
NWIRP CALVERTON, NEW YORK**

Chemical	Method Detection Limit	ECM-GW0739	ECM-GW0739-DU	ECM-GW001	ECM-GW003	ECM-GW007
		Field Duplicate Samples				
Chloromethane	1			2 J		
2-Butanone	5			4 J		
1,1,1-Trichloroethane	2			21		75
Carbon tetrachloride	3			2 J		
4-Methyl-2-pentanone	6			3 J		
TICs	NA	Unknown	Unknown		Unknown	
Arsenic	3.0	4.0		NA	NA	NA
Cadmium	5.0		9.0 J	NA	NA	NA
Calcium	1,000	13,400	13,100	NA	NA	NA
Copper	10.0	179 J	59.2 J	NA	NA	NA
Iron	40.0	959	1,020	NA	NA	NA
Magnesium	100	4,640	4,530	NA	NA	NA
Manganese	5.0	24.8 J	25.2 J	NA	NA	NA
Potassium	200	772	747	NA	NA	NA
Selenium	3.0	5.3 J		NA	NA	NA
Sodium	1,000	7,730	7,440	NA	NA	NA

NA - Analysis not performed for this parameter or not applicable. J - Estimated positive result
Blank indicates a non detect reported for this sample/compound.

The highest frequency of detection and all but one maximum concentration of volatile organic chemicals were observed in offsite groundwater sample ECM-GW001 (MW-1). Chemicals detected in this well include chloromethane (2 ug/l), 2-butanone (4 ug/l), carbon tetrachloride (2 ug/l), and 4-methyl-2-pentanone (9 ug/l). The maximum concentration reported for 1,1,1-trichloroethane (75 ug/l) was found in offsite monitoring well ECM-GW007 (MW-7). No other positive detections for volatile organic chemicals were noted for groundwater samples collected as part of the ECM area investigation.

Unknown and unidentifiable TICs were detected in the groundwater samples at concentrations which range from 5 ug/l to 32 ug/l. Several unknown TICs were also identified in the associated field quality control blanks which were generated for the groundwater samples.

Inorganic analyses of the groundwater collected from ECM-GW0739 (and field duplicate sample ECM-GW0739-DU) yielded maximum results for arsenic (4.0 ug/l), cadmium (9.0 ug/l), calcium (13,400 ug/l), copper (179 ug/l), iron (1,020 ug/l), magnesium (4,640 ug/l), manganese (25.2 ug/l), potassium (772 ug/l), selenium (5.3 ug/l), and sodium (7,730 ug/l).

Table 3-4 presents a summary of the frequency of detection, range of positive results, average of all results, and relevant New York State groundwater quality standards and federal Maximum Contaminant Levels (MCLs) for groundwater. State groundwater standards are established in the New York Codes, Rules, and Regulations, (NYCRR) Title 6 - Part 703 as amended in October 1993. All groundwater at the site was assumed to be Class GA as described in the NYCRR water quality classification scheme. Federal MCLs are established through the Safe Drinking Water Act. Although MCLs are enforceable only for water supplies and systems which serve 25 or more people, these criteria are frequently used as remediation goals and are presented for comparison as a federal standard.

As noted in the table, detected concentrations for 1,1,1-trichloroethane and iron exceeded respective New York State Class GA groundwater quality standards. The primary federal MCL for cadmium (5 ug/l) and the secondary MCL for iron (300 ug/l) were also exceeded. The 1,1,1-trichloroethane is an indication of groundwater contamination. Iron, at similar concentrations were detected in groundwater wells throughout the facility, indicating that the iron may be of natural origin. All other detected chemicals were reported at concentrations which are less than respective criteria. The exceedences for the organic chemical were noted to be limited to ECM-GW001 and ECM-GW007, two wells which are located outside of the facility boundary in an area reported to have been used for sewage sludge application. Inorganic chemical exceedences were associated with water collected from ECM-GW0739, the only water sample which was analyzed for TAL metals and cyanide.

TABLE 3-4
EVALUATION OF ANALYTICAL DATA - GROUNDWATER SAMPLES
SITE 9 - ECM AREA
NWIRP CALVERTON, NEW YORK

Chemical	Frequency of Detection	Range of Positive Results (ug/l)	Arithmetic Mean of Results (ug/l)	New York State Groundwater Quality Standard (ug/l)	Federal Maximum Contaminant Level (ug/l)
Chloromethane	1/5	2	0.88	50	N/A
2-Butanone	1/5	4	1.7	50	N/A
1,1,1-Trichloroethane	2/5	21 - 75	25	5	200
Carbon Tetrachloride	1/5	2	0.88	5	5
4-Methyl-2-pentanone	1/5	3	1.1	50	N/A
Arsenic	1/2	4.0	4.0	25	50
Cadmium	1/2	9.0	9.0	10	5
Calcium	2/2	13,100 - 13,400	13,250	N/A	N/A
Copper	2/2	59.2 - 179	119	200	1,300 ⁽²⁾
Iron	2/2	959 - 1020	990	300 ⁽¹⁾	300 ⁽³⁾
Magnesium	2/2	4,530 - 4,640	4,590	35,000	N/A
Manganese	2/2	24.8 - 25.2	25.0	300 ⁽¹⁾	50 ⁽³⁾
Potassium	2/2	747 - 772	760	N/A	N/A
Selenium	1/2	5.3	5.3	10	50
Sodium	2/2	7,440 - 7,730	7,590	20,000	N/A

(1) - Total iron and manganese not to exceed 500 g/l.

(2) - SDWA Action Level for copper.

(3) - Secondary MCL

N/A - Standard not available

Cesspool Wastes

The cesspool wastes at the ECM area were not sampled as part of this investigation. However, Soil boring ECM-SB01 was installed beside this cesspool to determine potential environmental effects from its use. Also, samples of the cesspool wastewater and sludge were collected and analyzed by the County in September 1992. Although this media is not comparable to New York State TAGM values (because they are acknowledged wastes), the data do provide an indication of the identities and relative concentrations of chemicals which are present in the cesspool at the ECM Building.

Results of analyses found the wastewater to contain 1,1-dichloroethane (10 ug/l), naphthalene (7 ug/l), and toluene (37 ug/l), along with detectable concentrations of beryllium (0.002 mg/l), cadmium (0.39 mg/l), chromium (0.32 mg/l), copper (22 mg/l), lead (1.3 mg/l), mercury (0.37 mg/l), nickel (0.64 mg/l), selenium (0.041 mg/l), silver (0.14 mg/l), and zinc (170 mg/l).

The cesspool sludge contains a wider variety of organic chemicals which partition preferentially to organic carbon in the sludge. Detected organics include the monocyclic aromatics n-butylbenzene (11 ug/kg), sec-butylbenzene (20 ug/kg), p-isopropyltoluene (260 ug/kg), naphthalene (36 ug/kg), and toluene (67 ug/kg), and the chlorinated solvent 1,1-dichloroethane (42 ug/kg). The detected monocyclic aromatics are consistent with fuel-related constituents. The dichloroethane isomer is a possible site-related chemical.

Metals detected in the cesspool sludge from the ECM Building include all of the ones detected in the supernatant liquid: arsenic (0.43 mg/kg), beryllium (0.015 mg/kg), cadmium (1.6 mg/kg), copper (110 mg/kg), lead (49 mg/kg), mercury (0.23 mg/kg), nickel (5.6 mg/kg), selenium (0.23 mg/kg), silver (1.0 mg/kg), and zinc (550 mg/kg).

Quality Assurance/Quality Control (QA/QC) and Blank Samples

Review of the analytical data for the QA/QC and field and laboratory blank samples and the results of an intensive data validation indicate some deficiencies in the analytical data quality. Sample data affected by analytical and/or QC problems were qualified in accordance with U. S. EPA Region II data validation protocol. Appendix C provides a complete assembly of the data validation memoranda which document the data evaluation.

Field duplicate precision was considered to be within the data validation control limits. Data validation resulted in the estimation of some positive sample results and quantitation limits for organic compounds based on holding time exceedences, calibration noncompliances, and reported positive results which were

less than respective CRQLs. Some groundwater sample data for organic analyses were qualified on the basis of out of control limit calibrations. Some inorganic analysis data are qualified on the basis of CRDL recoveries outside of control limits, field duplicate imprecision, and low correlation coefficient.

Blank contamination was also noted for some QC samples which were grouped with the samples collected at Site 9. Some field blank sample data generated for the sampling activities at the ECM Area were qualified for blank contamination, which was detected in associated laboratory method blank samples. Laboratory blanks contained detectable concentrations of methylene chloride (detected at a maximum concentration of 34 ug/l), acetone (maximum of 30 ug/l), chloroform (1 ug/l), and xylenes (maximum of 2 ug/l).

Summary

Soil samples collected at the ECM Area site have detectable concentrations of toluene and styrene. However, these detected chemicals were present at concentrations less than respective CRQLs and applicable TAGM values.

Results from groundwater samples collected at the ECM Area site indicated organic chemical contamination in offsite monitoring wells ECM-GW001 and ECM-GW007. Although both contain 1,1,1-trichloroethane, only GW001 contains detectable quantities of other organic chemicals (chloromethane, 2-butanone, carbon tetrachloride, and 4-methyl-2-pentanone). The maximum detected concentrations of 1,1,1-trichloroethane and iron exceed the applicable New York State groundwater quality standards for these chemicals. Federal primary and secondary MCLs were exceeded for cadmium and iron, respectively, at one onsite location.

3.8 CONCLUSIONS AND RECOMMENDATION FOR FURTHER ACTION

This sections presents the conclusions and recommendation for this site.

1. Trace levels of non-halogenated organic chemicals were detected in onsite soil samples. The concentration of the detected chemicals are below relevant criteria and these chemicals were not detected in offsite groundwater.
2. The 1,1,1-trichloroethane contamination in offsite monitoring wells was confirmed. However, the absence of this chemical in on site samples indicates that the ECM area is not a likely source and is certainly not a continuing source of the contamination.

3. Three temporary monitoring wells will be installed inside the NWIRP fence, northeast of the ECM area to confirm the above conclusions. These wells will be sampled for VOCs.
4. During cesspool closure, surrounding soils would need to be evaluated for inorganic contamination.

4.0 CESSPOOLS/LEACH FIELD AREAS

4.1 SITE DESCRIPTION/ENVIRONMENTAL SETTING

There are approximately twenty-two cesspool/leach fields located throughout the NWIRP Calverton Facility, (See Figure 1-3). The cesspools/leach fields were intended only for the discharge of sanitary wastes. All industrial wastes were allegedly contained and transported offsite for treatment/disposal. However, at least on one reported occasion, industrial wastewater overflowed into the one of the leach fields (06-17). Other unreported discharges (prior to the early 1980s), and miscellaneous small quantity discharges to the cesspools/leach fields are possible. Of those twenty-two areas it was determined that industrial chemicals, including solvents were used in only eight areas and therefore required investigation. The cesspool/leach field areas, respective building numbers, time period constructed, operations conducted, and potential chemicals present are presented in Table 4-1.

The location of each of the cesspool/leach fields is presented in Figure 1-3. The cesspools/leach fields are generally located adjacent to buildings which they service. Two larger leach field were abandoned and replaced by an on site sewage treatment plant in the 1970s. The exact location of most of the cesspools are readily observed in the field by the characteristic large diameter manhole cover. However, several cesspools are currently covered by asphalt, and the location was determined by reports from employees.

4.2 SAMPLING OBJECTIVES

The objective of the cesspool/leach field investigation was to determine if the operation of the cesspools/leach fields resulted in significant environmental contamination of the underlying soils and/or groundwater. As a result, the investigation focused on the most mobile chemicals, (solvents). Other contamination, which may be present in the cesspool sludges, would be addressed at the closure of the facility. To conduct this investigation, an extensive soil-gas investigation was conducted at each area, followed by a more focused soil boring investigation.

4.3 SAMPLING ACTIVITIES

This section provides a discussion of the activities performed at each of the cesspool/leachfield areas investigated.

TABLE 4-1

**CESSPOOL/LEACH FIELD DESCRIPTIONS
SITE 10 - CESSPOOL/LEACH FIELD AREAS
NWIRP CALVERTON, NEW YORK**

Cesspool Area	Building No.	Time Period Constructed	Operations Conducted	Potential Chemicals Present
Fuel Systems Test Lab	06-11	1950s	Testing of fuels and fuel systems.	Fuels, solvents, and oils.
Facilities Maintenance Building	06-13	1970s	Maintenance of facility equipment.	Fuels, solvents, and oils.
Sewage Pump Station	06-17	1950s	Aircraft component assembly, paint stripping, and painting.	Solvents, paint strippers, paint residues, and alodine
Engine Test House	06-18	1950s	Testing of aircraft engines.	Fuels, solvents, and oils.
Vehicle Transportation Building	06-42	1960s	Vehicle maintenance.	Fuels, solvents, oils, antifreeze, and batteries.
New Fuel Calibration Building	06-73	1980s	Pressure testing of fuel systems.	Fuels, solvents, and oils.
Sewage Pump Station	07-03	1950s	Aircraft assembly.	Fuels, solvents, and oils.
Avionics Noise Check	08-01	1950s	Testing of aircraft.	Fuels, solvents, and oils.

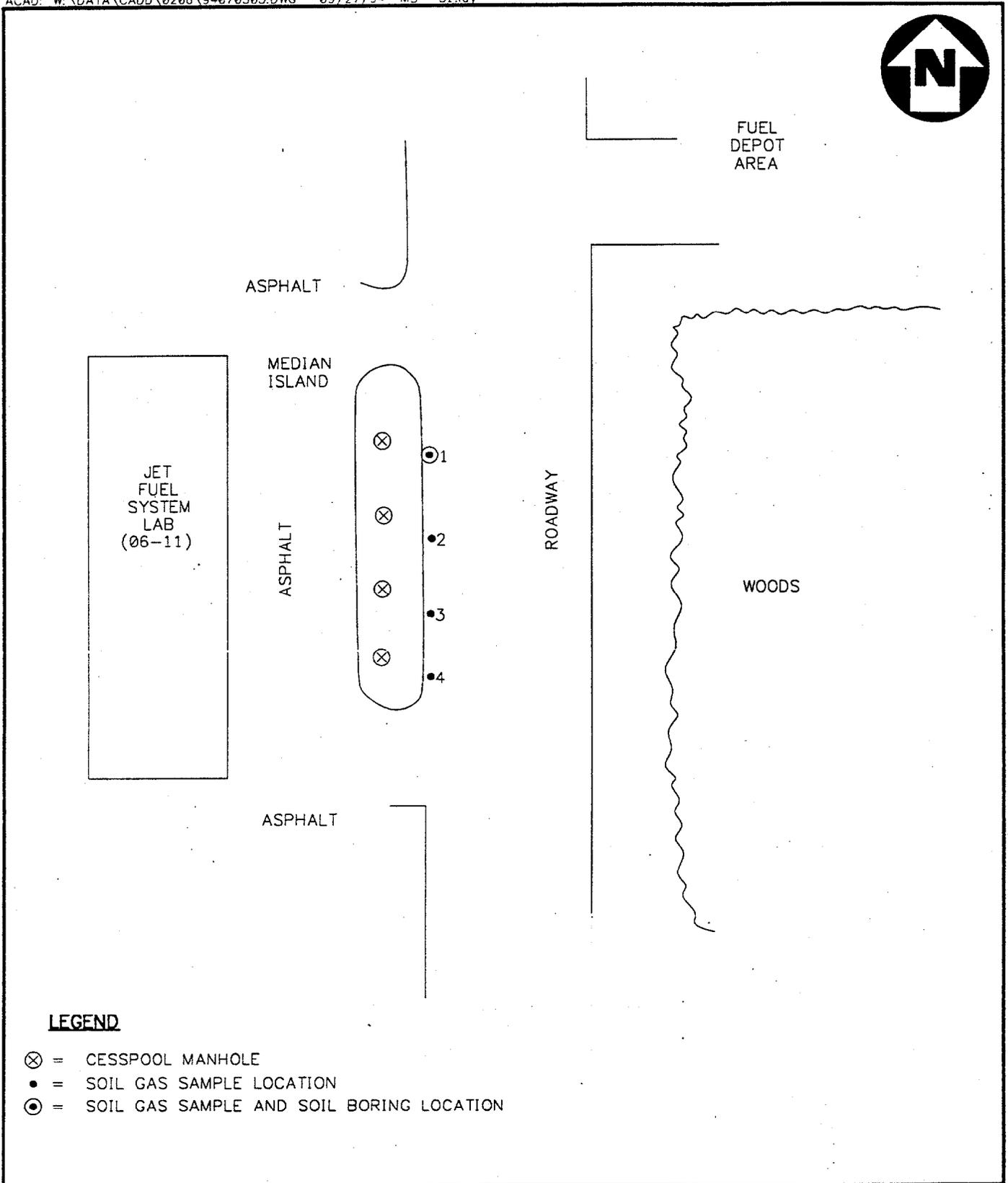
The sampling rationale used at these site was to establish a relatively comprehensive soil gas grid near and around the cesspool areas. Based on the results of the soil gas survey, a more focused soil boring program was then conducted.

Soil gas sampling grids and discrete sampling locations were used to provide suitable coverage of the area of potential contamination at each area. In areas containing several cesspools, a rectangular sampling grid was set up over the entire area. Grid spacing varied according to the overall size of each site and the number of cesspools at each site. Grid spacing was adjusted in the field to place approximately one to two soil gas sampling points adjacent to each cesspool. At areas containing a single, or a small number of cesspools (less than four), two soil gas sampling points per cesspool were installed, with a minimum of three soil gas sampling locations per site where sampled. Soil gas sampling points were located within 5 to 10 feet of known cesspool edges. Figures 4-1 through 4-8 show soil gas sample locations at each of the cesspool/leach field area.

Each sampling location was marked with a surveyor's pin flag. Groundwater was estimated to be approximately 5 to 20 feet below ground surface (bgs) at the NWIRP, Calverton. Soil gas samples were collected by driving a steel sampling probe approximately 3 to 6 feet into the ground. The drive point on the probe was slotted to allow soil gas to flow through the sampling probe. The sampling probe was evacuated prior to collection of the soil gas sample. The soil gas sample was collected into an air sample bag from a dedicated inert sampling tube that connected the steel probe to a pump. The samples were analyzed at the subcontractors (Target) fixed-base laboratory with quick turnaround on analytical reporting. Detailed soil-gas results are presented in Appendix E.

A gas chromatograph compound library was established using certified gas standards for the following target compounds:

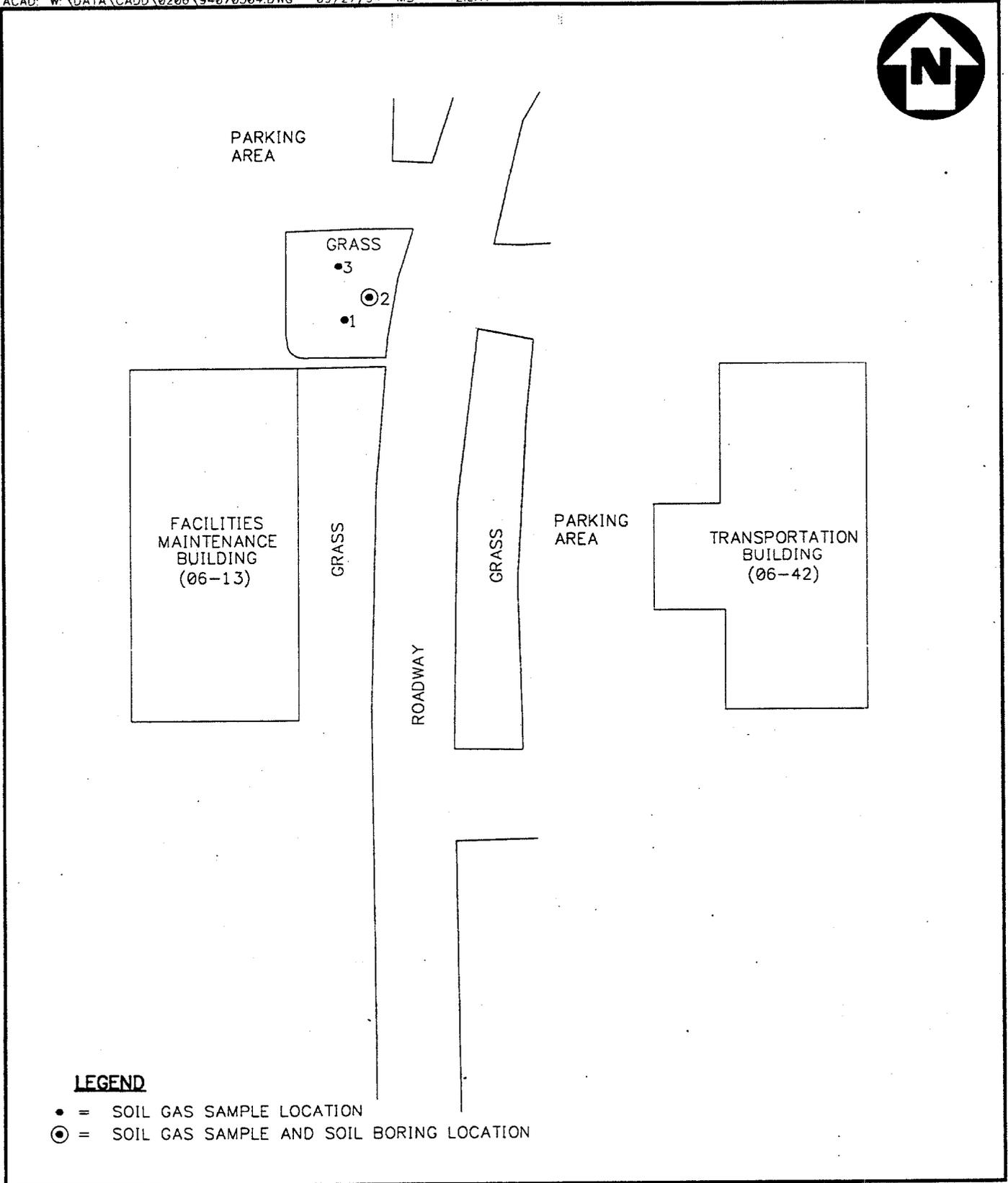
Benzene	Ethylbenzene
1,1-dichloroethene (DCE)	c-1,2-DCE
t-1,2-DCE	1,1-dichloroethane (DCA)
Trichloroethene (TCE)	Tetrachloroethene (PCE)
1,1,1 trichloroethane (TCA)	1,1,2-TCA
Chloroform	Carbon tetrachloride
Toluene	Total (m-, p-, and o-,) xylenes
Methylene chloride	Freon 113



JET FUEL SYSTEM LAB (06-11)
SOIL GAS/SOIL BORING LOCATIONS
NWIRP, CALVERTON, NEW YORK

FIGURE 4-1

NOT TO SCALE

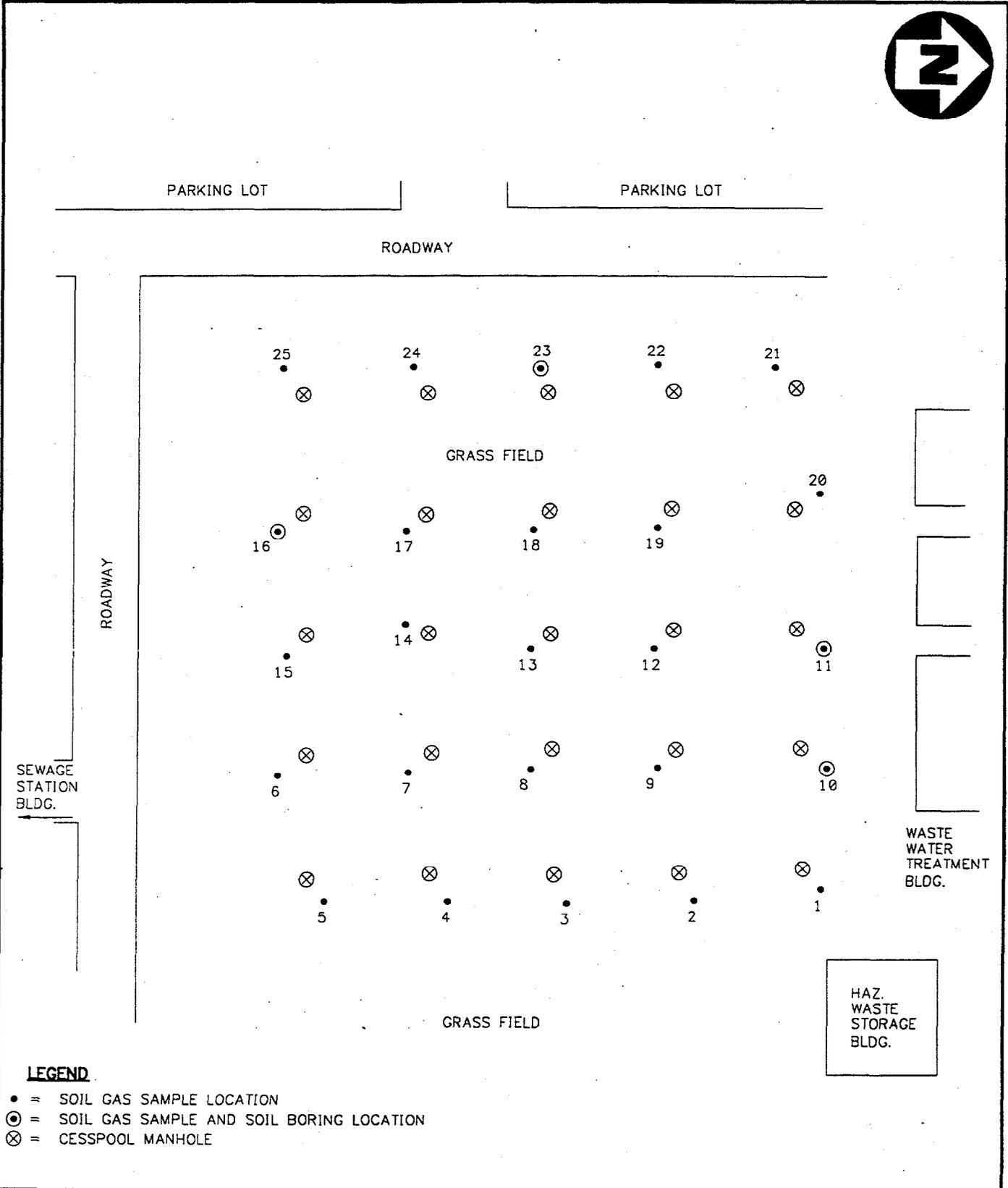


FACILITIES MAINTENANCE BLDG. (06-13)
SOIL GAS/SOIL BORING LOCATIONS
NWIRP, CALVERTON, NEW YORK

FIGURE 4-2

NOT TO SCALE

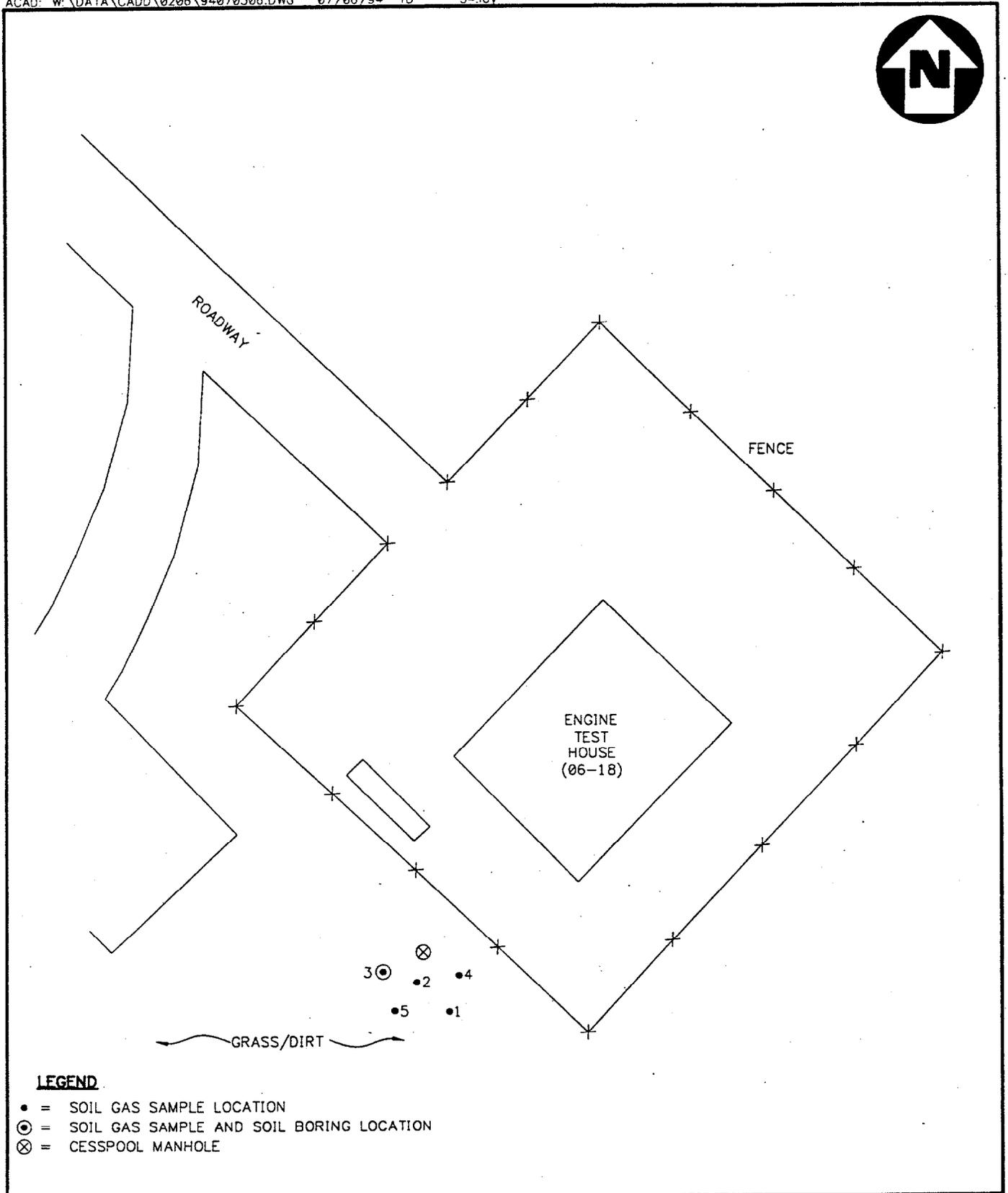




SEWAGE PUMP STATION #2 (06-17)
SOIL GAS/SOIL BORING LOCATIONS
NWIRP, CALVERTON, NEW YORK

FIGURE 4-3

NOT TO SCALE

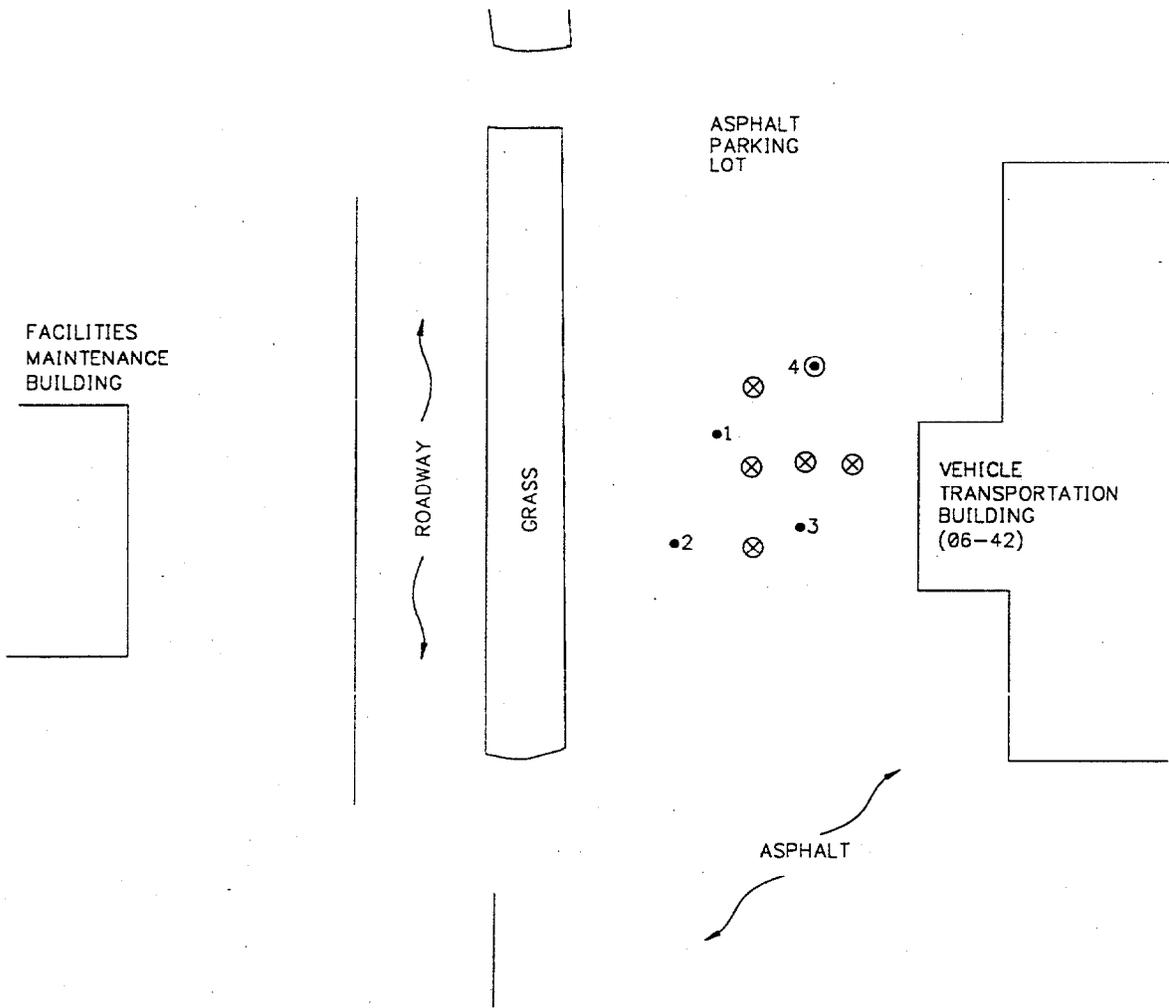


ENGINE TEST HOUSE (06-18)
SOIL GAS/SOIL BORING LOCATIONS
NWIRP, CALVERTON, NEW YORK

FIGURE 4-4

NOT TO SCALE





LEGEND

- = SOIL GAS SAMPLE LOCATION
- ⊙ = SOIL GAS SAMPLE AND SOIL BORING LOCATION
- ⊗ = CESSPOOL MANHOLE

VEHICLE TRANSPORTATION BLDG. (06-42)

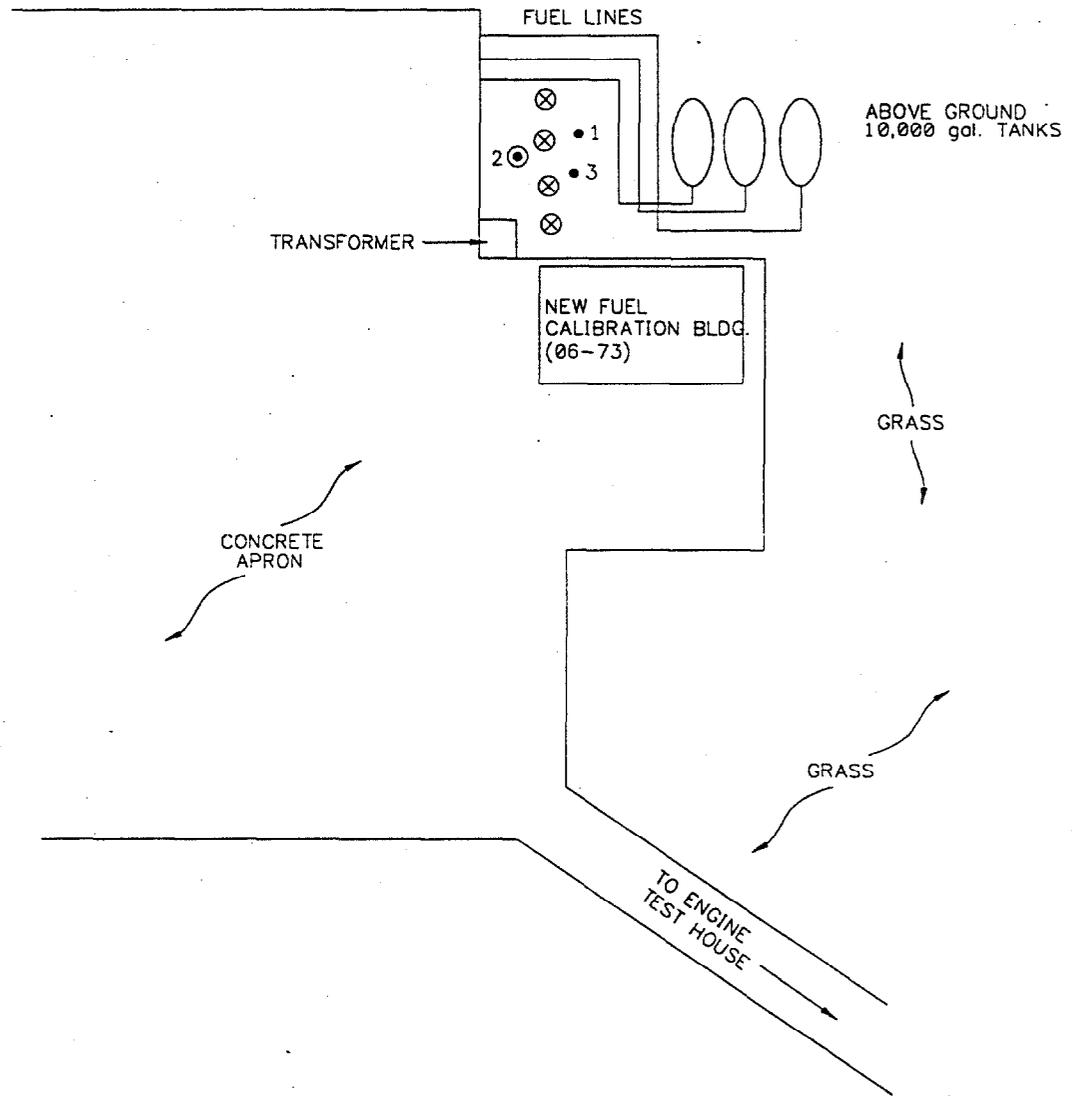
SOIL GAS/SOIL BORING LOCATIONS

NWIRP, CALVERTON, NEW YORK

NOT TO SCALE

FIGURE 4-5





LEGEND

- = SOIL GAS SAMPLE LOCATION
- ⊙ = SOIL GAS SAMPLE AND SOIL BORING LOCATION
- ⊗ = CESSPOOL MANHOLE

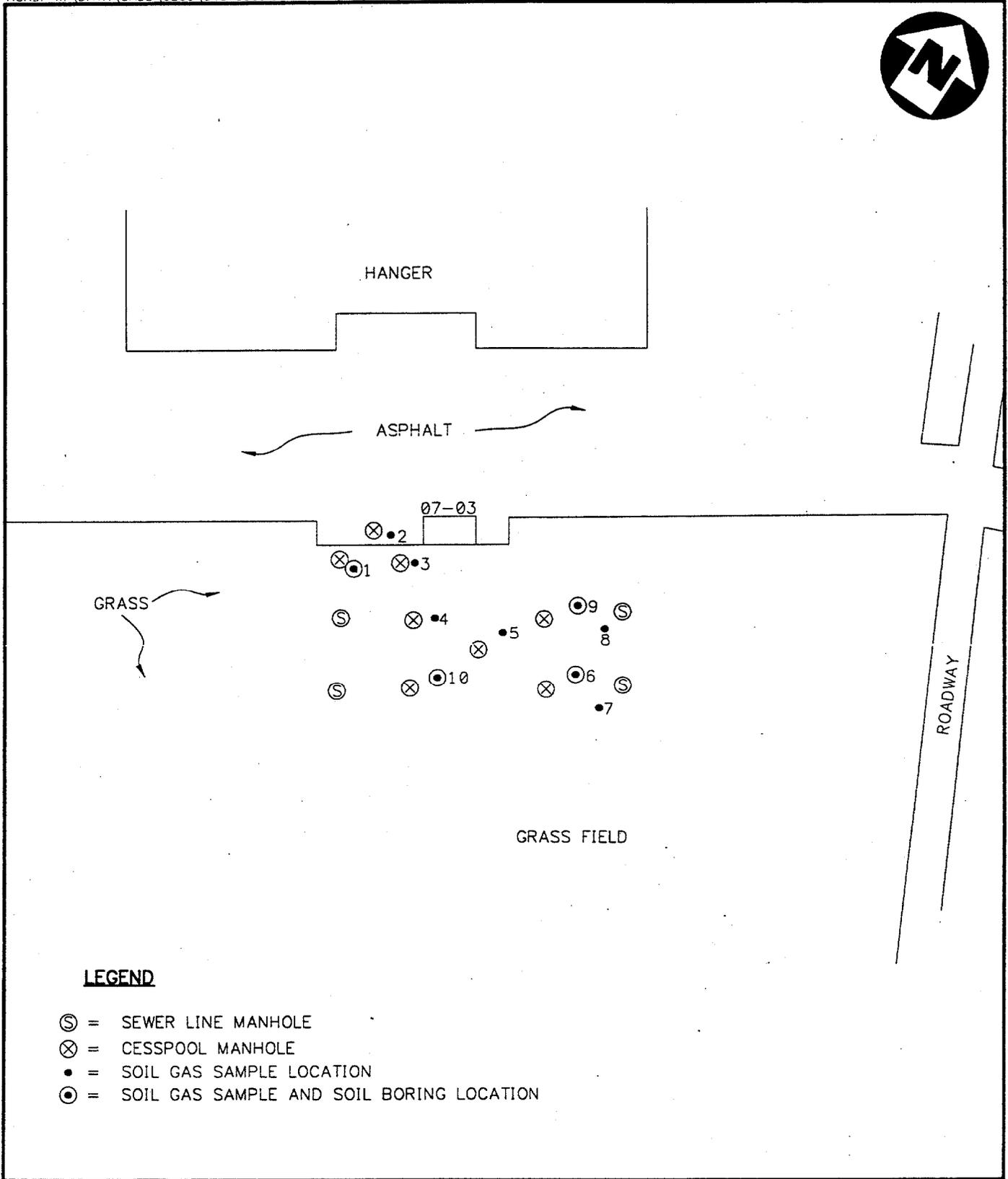
NEW FUEL CALIBRATION BLDG. (06-73)

SOIL GAS/SOIL BORING LOCATIONS

NWIRP, CALVERTON, NEW YORK

NOT TO SCALE

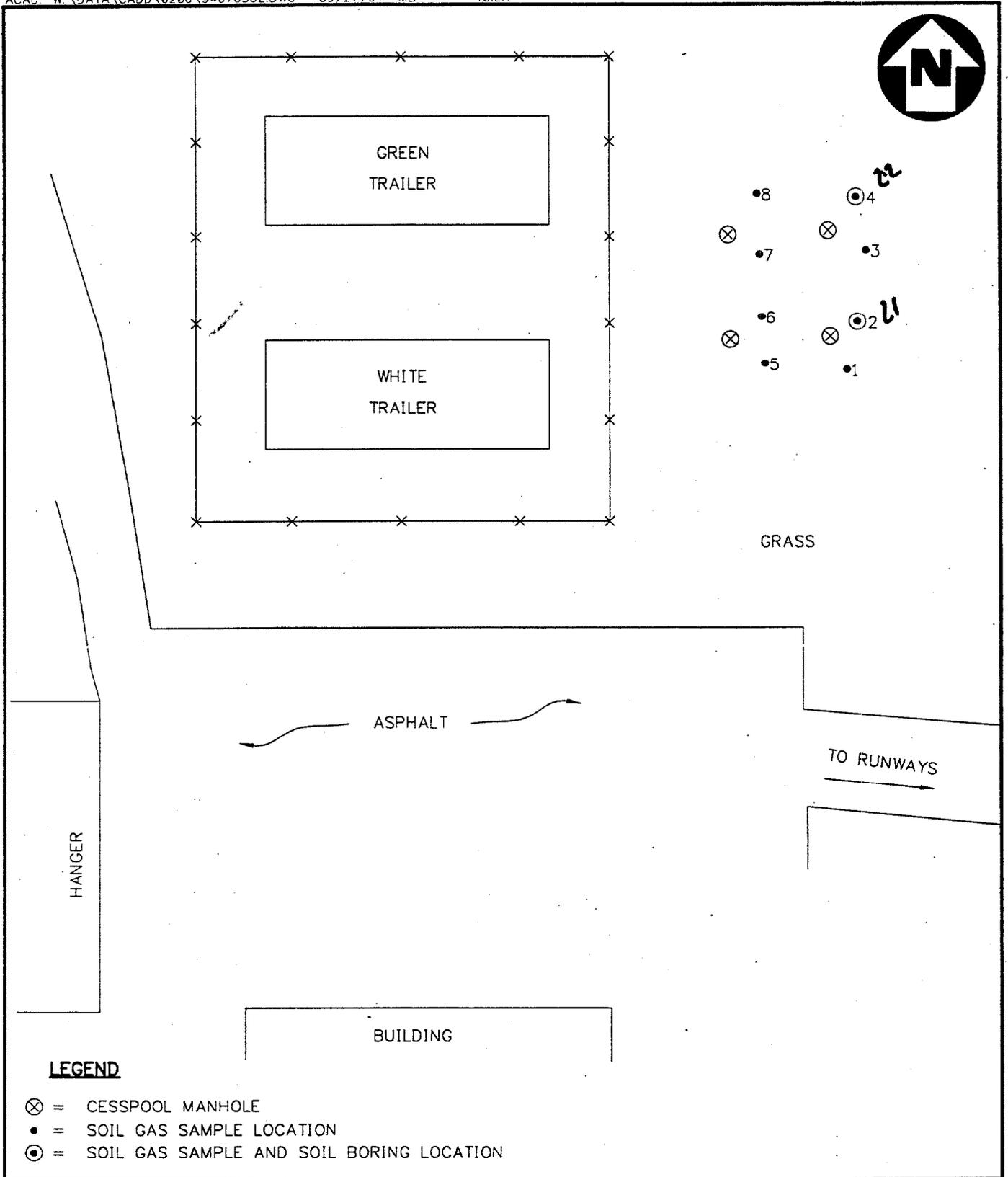
FIGURE 4-6



SEWAGE PUMP STATION (07-03)
SOIL GAS/SOIL BORING LOCATIONS
NWIRP, CALVERTON, NEW YORK

FIGURE 4-7

NOT TO SCALE



AVIONICS NOISE CHECK (080-01)
SOIL GAS/SOIL BORING LOCATIONS
NWIRP, CALVERTON, NEW YORK

FIGURE 4-8

NOT TO SCALE

Based on elevated volatile organic soil gas concentrations, specific locations at each site were further investigated by collecting and analyzing subsurface soil samples. A total of 15 soil borings were drilled at the cesspool/leachfield areas as shown on Figures 4-1 to 4-8. Each soil boring was advanced using hollow-stem auger drilling techniques. Split spoon samples were collected continuously to the water table to characterize subsurface lithologies. Each of these samples was visually evaluated for evidence of contamination (staining) and the head space of the split spoon was checked with an organic vapor analyzer (OVA) meter. These findings are presented on the sample log sheets (Appendix A). Two samples from each boring were retained for chemical analyses. One sample was collected from the water table interface as an indication of deep soil contamination and/or groundwater contamination. The second sample was selected based on the zone with the highest OVA readings obtained during that boring and/or the presence of staining. The selection of sampling locations using this approach would be biased on the conservative side, since the most volatile organic-contaminated soils at the site would be analyzed. Other locations at the site would be expected to be less contaminated.

For reference, the last four digits of the sample number indicates the depth at which the sample was collected in feet (e.g. 0204 indicates that the sample was collected at a depth of 2 to 4 feet below grade surface). The samples were analyzed for TCL volatile organics and freon 113 using the USEPA Contract Laboratory Program (CLP) Statement of Work OLM01 (Revision 8) and TAL Metals and cyanide according to the analytical methods described in the CLP Statement of Work ILM02 (Revision 1).

Sampling equipment (split-spoons and sampling trowels) were decontaminated between sample locations using the following procedures:

- potable water rinse
- alconox detergent wash
- potable water rinse
- nitric acid rinse
- steam distilled water rinse
- methanol rinse
- steam distilled water rinse
- air dry

Samples were kept on ice to maintain a temperature of at least 4 C from the time of sample collection until receipt by the laboratory. Samples were shipped via overnight carrier to minimize holding times. Chain of custody records can be found in Appendix B.

4.4 WASTE CHARACTERISTICS

The type of chemical potentially present at each cesspool/leach field area is summarized in Table 4-1 and includes solvents, fuels, oils, and alodine (chromic acid). With the exception of oils, these chemicals are relatively mobile in the environment. Water solubilities are summarized as follows.

<u>Chemical</u>	<u>Water Solubility (mg/l)</u>
benzene	1,780
toluene	515
methylene chloride	20,000
methyl ethyl ketone	350,000
lacquer thinners	unknown
oils	variable
fuels	variable
alodine	100%

The chlorinated solvents are denser than water. Toluene, fuels, and oils are less dense than water. With the exception of oils and alodine, each of the chemicals are relatively volatile. Alodine is a chromic acid solution and is miscible with water.

4.5 EVIDENCE OF RELEASE/WASTE MIGRATION PATHWAYS

This section provides a description of any evidence of chemical release at the individual areas which comprise the Cesspool/Leach field areas (Site 10) and identifies possible migration pathways which would facilitate physical transport of the chemicals in the environment.

Evidence Of Release

With the exception of one reported overflow of industrial rinse waters into the 06-17 leach field, there is no direct evidence of chemical release at any of the cesspools or leach field areas. Therefore, actual releases at any area are questionable. However, the most conservative approach was employed to consider all possible modes of release and chemicals that might be involved.

Waste Migration Pathways

Chemical migration patterns associated with a volatile contaminant release over ground include volatilization to the atmosphere, absorption to organic carbon in soil, and leaching to groundwater. Because the solvents were permitted to evaporate from racked parts, volatilization is considered to be the most probable fate of the chemical. The vapors would dissipate rapidly in the air and undergo significant dilution and photo-chemical degradation in the atmosphere. It is not likely that the amount of solvent released into the atmosphere would result in a health risk to employees or other downwind receptors.

At least a small amount of solvent could have dripped from the drying racks directly onto a floor. Once on the floor, the solvents could evaporate, be collected for other disposal, and/or enter drains leading to the cesspools/leach fields. Once in the cesspools/leach fields, the chemicals could soak into soil, adsorb to organic carbon, and could undergo volatilization (to the soil gas) and dissolution in water percolating through the soil. During storm events, most water is likely to run off the site or be retained in the soil, but a portion of contaminated water may leach through unsaturated zone soils and contacted the groundwater, located at an estimated depth of approximately 8 to 20 feet below the ground surface. The occurrence of this process would be most evident by contamination in soils collected at the suspected spill locations in the unsaturated zone and at the groundwater capillary interface. Chemicals that reach the groundwater are subject to transport via diffusive and convective transport mechanisms.

Physical transport of chemicals bound to sediments or dissolved in runoff water through erosional processes is not considered a potentially significant transport mechanism. In general, the site have little vertical relief and no drainage patterns are evident.

4.6 RECEPTORS/EXPOSURE PATHWAYS

This section provides a preliminary assessment of exposure pathways and receptors that may contact contaminated environmental media from a cesspool or leach field. The identified routes of exposure and receptors are consistent with current land use at the facility and consider possible future land use.

Initially, receptors were identified to be consistent with the current and potential future land uses. Exposure routes applicable for each receptor group were then identified. These exposure routes were based on land use and behavior patterns of the potential receptors.

Receptors

NWIRP Calverton is an active industrial facility. Under a current land use scenario, employees of the facility are the only relevant receptor group. All individuals in this receptor group can be reasonably assumed to be adults who work a standard 40-hour work week for 250 days each year. Industrial/commercial land use at the facility is assumed to be adequately secure so as to eliminate the possibility of trespassers at the plant, thereby eliminating these individuals as potential receptors.

Future plans for the facility include possible use of the land for civilian residents. Under a residential land use scenario, adult and child residents are relevant receptors assumed to be living at the site under reasonable residential conditions (i.e., single-family dwellings on landscaped lots). Residential exposures are considered to occur throughout the year and include all exposures related to normal residential activity.

No ecological receptors have been identified at this site.

Exposure Pathways

Exposure pathways for human and environmental receptors are a function of the media involved. The identification for the site was qualitative and based on predicted behavior patterns of individual receptors. Exposure routes for current (industrial/commercial) and potential future (residential) land use conditions were considered.

Exposure to chemicals in soil can occur via incidental ingestion, dermal contact, and inhalation of fugitive dust emissions. Industrial/commercial land use can allow exposure to soil chemicals by all specified routes.

Current industrial/commercial receptors are not exposed to the site groundwater as a water distribution system is currently in operation at the plant. However, groundwater exposure to future residents at the site is possible. Under normal conditions, reasonable exposure to groundwater chemicals may be quantified via ingestion, dermal contact, and by inhalation of volatiles emitted during showering or bathing.

4.7 RESULTS OF SAMPLING VISIT

The following sections describe the results and findings of the sampling activities at the cesspool/leachfield areas. Included in this discussion are the results of the soil-gas survey and soil boring investigation. The sample locations and analytical results for this site are summarized in figures presented in this section.

Sample log sheets and soil boring log sheets are presented in Appendix A. Chain of custody forms for the samples are presented in Appendix B. Data validation letters are presented in Appendix C. Complete analytical data summary sheets are presented in Appendix D. Additional backup on the laboratory method, QA/QC samples, and Form I's are available in the project files.

4.7.1 Geology

Fifteen soil borings were drilled at the cesspool/leachfield areas. Boring locations are shown in Figures 4-1 to 4-8. Each soil boring was advanced to the water table using hollow-stem auger drilling techniques. As described in the boring logs found in Appendix A, subsurface materials encountered consisted of fine grained sand to a depth of about 6-feet throughout most of the facility. Fine to medium grained sand and pea gravel was encountered from a depth of approximately 6 feet below ground surface to the water table. Borings drilled in the larger areas (both sewage pump areas) encountered medium grained sand, broken cobbles and pea gravel at a depth of about 5 to 6 feet.

4.7.2 Hydrogeology

Split-spoon samples collected from the soil boring indicated a wide ranging water table across the facility. Saturated soils were encountered at depths of 7 to 16 feet below ground surface. The following table shows the approximate depth of the water table in soil borings drilled at the cesspool/leachfield areas.

<u>Building Name</u>	<u>Soil Boring No.</u>	<u>Approximate Groundwater Interface</u>
Engine Test House	CLO618-SB18	7'
Jet Fuel System Lab	CLO611-SB19	12'
Facilities Maintenance Bldg.	CLO613-SB20	15'
Avionics Noise Check	CLO8001-SB21	13'
Avionics Noise Check -	CLO8001-SB22	11'
New Fuel Calibration Bldg.	CLO673-SB23	8'
Vehicle Transportation Bldg.	CLO642-SB24	16'
Sewage Pump Station	CLO703-SB25	15'
Sewage Pump Station	CLO703-SB26	15'
Sewage Pump Station	CLO703-SB27	15'
Sewage Pump Station	CLO703-SB28	15'
Sewage Pump Station #2	CLO617-SB29	9'
Sewage Pump Station #2	CLO617-SB30	11'

TABLE 4-2

**SUMMARY OF ANALYTICAL DATA - SOIL SAMPLES (mg/kg)
SITE 10 - CESSPOOL/LEACH FIELD AREAS
NWIRP CALVERTON, NEW YORK**

Chemical	Method Detection Limit	Building 06-11		Building 06-13		
		CL0611-SB19-1012	CL0611-SB19-1214	CL0613-SB20-1214	CL0613-SB20-1214-DU	CL0613-SB20-1416
TCL Volatile Organics/Freon 113	Varied		*			
Aluminum	18.0	325 J	367 J	299 J	376 J	372 J
Chromium	2.0					2.6
Iron	8.0	450	322	839	762	679
Lead	0.40	0.65	0.69	1.0	0.83	0.76
Magnesium	20.0	45.7	46.6	40.4	78.9	65.3
Manganese	1.0	2.3	2.0	16.5	17.8	17.7
Potassium	40.0		47.6	43.6	71.4	72.2
Sodium	200	252	271	243	248	286
Vanadium	2.0	7.8	12.8			
Zinc	2.0	2.4			2.2	2.9
Cyanide	0.50				1.2	
Tentatively Identified Compounds	NA		Hydrocarbons			

TABLE 4-2 (Continued)
 SUMMARY OF ANALYTICAL DATA - SOIL SAMPLES (mg/kg)
 SITE 10 - CESSPOOL/LEACH FIELD AREAS
 NWIRP CALVERTON, NEW YORK

Chemical	Method Detection Limit	Building 06-17				
		CL0617-SB29-0406	CL0617-SB29-0406- DU	CL0617-SB29-0810	CL0617-SB30-0406	CL0617-SB30-1012
Toluene	0.001					
Xylenes	0.0005	0.002 J				
Aluminum	18.0	3680 J	824 J	972 J	661 J	552 J
Arsenic	0.60	1.2	0.81		0.62	
Barium	4.0	6.1				
Calcium	200	362		246		
Chromium	2.0	3.1 J		6.3 J		
Copper	2.0			5.1 J		
Iron	8.0	3630 J	1110 J	1400 J	1100 J	450 J
Magnesium	20.0	433	218	150	112	76.6
Manganese	1.0	26.6 J	9.9 J	7.0 J	5.4 J	4.0 J
Potassium	40.0	135	176	73.8	73.1	53.7
Sodium	200	245	240	278	235	291
Vanadium	2.0	5.9		3.2		
Zinc	2.0					
Tentatively Identified Compounds	NA		Freon 12			

TABLE 4-2 (Continued)
 SUMMARY OF ANALYTICAL DATA - SOIL SAMPLES (mg/kg)
 SITE 10 - CESSPOOL/LEACH FIELD AREAS
 NWIRP CALVERTON, NEW YORK

Chemical	Method Detection Limit	Building 06-17 (continued)				
		CL0617-SB31-0204	CL0617-SB31-1012	CL0617-SB31-1012-DU	CL0617-SB32-0406	CL0617-SB32-1012
Toluene	0.001		0.0007 J			
Xylenes	0.0005					
Aluminum	18.0	317 J	939 J	545 J	208 J	383 J
Arsenic	0.60					
Barium	4.0					
Calcium	200					
Chromium	2.0	10.9 J	2.6 J	2.7 J	4.0 J	5.8 J
Copper	2.0					4.5
Iron	8.0	648 J	1130 J	707 J	616 J	947 J
Magnesium	20.0	43.9	87.3	57.8	41.7	52.9
Manganese	1.0	6.7	6.8	5.3	1.4	3.0
Potassium	40.0		54.1			51.0
Sodium	200					
Vanadium	2.0		3.1	2.7		
Zinc	2.0	2.2	4.0			7.5
Tentatively Identified Compounds	NA					

TABLE 4-2 (Continued)
 SUMMARY OF ANALYTICAL DATA - SOIL SAMPLES (mg/kg)
 SITE 10 - CESSPOOL/LEACH FIELD AREAS
 NWIRP CALVERTON, NEW YORK

Chemical	Method Detection Limit	Building 06-18		Building 06-42	
		CL0618-SB18-0406	CL0618-SB18-0608	CL0642-SB24-1012	CL0642-SB24-1618
2-Butanone	0.005				0.003 J
Freon 113	0.003	0.023 J			
Aluminum	18.0	258 J	306 J	300 J	372 J
Chromium	2.0		2.5		
Iron	8.0	483	768	643 J	1140 J
Lead	0.40	1.1	1.5 J		
Magnesium	20.0	32.1	53.6	44.8	85.2
Manganese	1.0	4.4	5.6	19.1 J	17.6 J
Potassium	40.0				
Sodium	200	229	267	229	292
Vanadium	2.0		3.2	2.4	3.8
Zinc	2.0	2.3	3.1		
Tentatively Identified Compounds	NA		Hydrocarbons 1,1,3-Trimethylcyclohexane		

TABLE 4-2 (Continued)
 SUMMARY OF ANALYTICAL DATA - SOIL SAMPLES (mg/kg)
 SITE 10 - CESSPOOL/LEACH FIELD AREAS
 NWIRP CALVERTON, NEW YORK

Chemical	Method Detection Limit	Building 06-73		Building 07-03		
		CL0673-SB23-0507	CL0673-SB23-0709	CL0703-SB25-1214	CL0703-SB25-1416	CL0703-SB26-0608
2-Butanone	0.005			0.005 J		
Ethylbenzene	0.001					
Xylenes	0.0005	0.001 J				
Aluminum	18.0	1860 J	4070 J	1440 J	476 J	6540 J
Arsenic	0.60	1.2	0.69	1.3		1.6
Barium	4.0		7.0			13.5
Calcium	200	254	343	418		
Chromium	2.0	2.5 J	6.3 J	9.8 J	2.5 J	5.4 J
Copper	2.0	15.6 J				
Iron	8.0	1710 J	3480 J	24100 J	689 J	5580 J
Magnesium	20.0	185	836	399	65.7 J	558
Manganese	1.0	11.4 J	25.4 J	143 J	3.7 J	20.0 J
Mercury	0.10			0.10		
Potassium	40.0	86.5	213	288	52.5	148
Sodium	200	281	267	276	279	273
Vanadium	2.0	3.1	6.7	3.4		10.1
Tentatively Identified Compounds	NA			Hexane Unknown	Freon 12	Freon 12

TABLE 4-2 (Continued)
 SUMMARY OF ANALYTICAL DATA - SOIL SAMPLES (mg/kg)
 SITE 10 - CESSPOOL/LEACH FIELD AREAS
 NWIRP CALVERTON, NEW YORK

Chemical	Method Detection Limit	Building 07-03 (continued)				
		CL0703-SB26-1416	CL0703-SB27-0608	CL0703-SB27-1416	CL0703-SB28-0204	CL0703-SB28-1416
2-Butanone	0.005					
Ethylbenzene	0.001				0.001 J	
Xylenes	0.0005		0.001 J			
Aluminum	18.0	317 J	6170 J	273 J	1950 J	232 J
Arsenic	0.60		2.0			
Barium	4.0		12.3		4.5	
Calcium	200				226	
Chromium	2.0					
Copper	2.0					
Iron	8.0	528 J	5590 J	486 J	2080 J	333 J
Magnesium	20.0	74.6	602	59.1	253	41.8
Manganese	1.0	3.2 J	29.2 J	3.0 J	17.5 J	3.9 J
Mercury	0.10					
Potassium	40.0	65.1	167	58.4	91.1	
Sodium	200	293	268	274	252	294
Vanadium	2.0		10.1		3.2	
Tentatively Identified Compounds	NA		Freon 12	Freon 12		

TABLE 4-2 (Continued)
 SUMMARY OF ANALYTICAL DATA - SOIL SAMPLES (mg/kg)
 SITE 10 - CESSPOOL/LEACH FIELD AREAS
 NWIRP CALVERTON, NEW YORK

Chemical	Method Detection Limit	Building 080-01			
		CL08001-SB21-0406	CL08001-SB21-1214	CL08001-SB22-0406	CL08001-SB22-1012
TCL Volatile Organics	Varied				
Aluminum	18.0	341 J	237 J	361 J	266 J
Chromium	2.0	2.0			
Iron	8.0	789	455	635	535
Lead	0.40	0.82	0.47	0.41	0.88
Magnesium	20.0	46.7	39.5	55.0	45.5
Manganese	1.0	13.2	3.0	9.2	4.5
Potassium	40.0	41.1			62.0
Sodium	200	225	276	251	271
Zinc	2.0	2.7	2.4	2.2	2.5
Tentatively Identified Compounds	NA				Unknown

<u>Building Name</u>	<u>Soil Boring No.</u>	<u>Approximate Groundwater Interface</u>
Sewage Pump Station #2	CLO617-SB31	11'
Sewage Pump Station #2	CLO617-SB32	11'

4.7.3 Analytical Results

Soil and groundwater samples collected at the eight cesspool/leach field areas were analyzed for Target Compound List (TCL) volatile organic compounds and freon 113 using the USEPA Contract Laboratory Program (CLP) Statement of Work OLM01 (Revision 8) and TAL Metals and cyanide according to the analytical methods described in the CLP Statement of Work ILM02 (Revision 1). The organic analysis method provides Contract Required Quantitation Limits (CRQLs) of 10 ppb (ug/l or ug/kg) for all target compounds and chemical-specific method detection limits which range from 0.5 to 9 ppb. Method detection limits for metals vary according to the identity of the subject chemical. Solid sample quantitation and detection limits are subject to revision based on individual sample moisture content.

Positively detected chemicals in the Site 10 soils are presented in Table 4-2. Chemicals detected include 2-butanone, toluene, ethylbenzene, xylenes, freon 113, and various inorganics. Of note is that all positive results reported for organics (except freon 113 in one sample) are less than respective CRQLs. Additional detail on the results of the Site 10 investigation is summarized as follows.

As presented in Table 4-2, positively detected organic chemicals in soils at the Site 10 cesspools/leach fields included 2-butanone (detected in one sample each collected at Buildings 06-42 and 07-03), toluene (detected in one sample at Building 06-17), ethylbenzene (detected in one sample each collected at Buildings 06-73 and 07-03), xylenes (detected in one sample each at locations near Buildings 06-17, 06-73 and 07-03), and freon 113 (detected only at one location by Building 06-18). Inorganics detected in the soil at Site 10 sampling locations included aluminum, arsenic, barium, calcium, chromium, copper, iron, lead, magnesium, manganese, mercury, potassium, silver, sodium, vanadium, zinc, and cyanide.

Tables presented later in this section include an evaluation of analytical results, background levels, and New York State Standards for soil as outlined in Technical and Administrative Guidance Memorandum (TAGM) on Determination of Soil Cleanup Objectives and Cleanup Levels (Number 4046 (final), January 24, 1994). Included in the data evaluation portion of these tables are chemical-specific frequency of detection, range of positive results, and average of all results. The arithmetic average of the data sets were determined considering nondetected values to be equal to one-half of the reported method detection limit, which was revised to reflect sample moisture content and dilution factors. The 95th percentile

background soil concentrations were used as a benchmark value for determining if maximum metal concentrations in soils are statistically significant.

The TAGM values presented for organic chemical are concentrations that are considered protective of human health (systemic or cancer effects) and groundwater quality. TAGM-specified cleanup goals for inorganic chemicals were based on site-specific background concentrations (calculated as the 95th percentile value), (See Section 1.5).

The relevant TAGM standards for organic chemicals at Site 10 were not exceeded by either the reported maximum or calculated average concentrations. Some maximum chemical concentrations for sodium, iron, and manganese are greater than the respective 95th percentile values of background concentrations. However, these metals are not considered toxic. No other metals were noted to exceed New York State TAGM values.

Building 06-11 - Fuel Systems Test Lab

The investigation at this cesspool area consisted of a soil gas survey followed by the installation of soil borings. Four soil gas sampling points, shown in Figure 4-9, were investigated during the field investigation to identify soil sampling locations and possible release points. Positive soil gas results were reported for 1,1-dichloroethene in two of the locations, JFSL-1 (4.3 ug/l) and JFSL-2 (2.0 ug/l), however as indicated below, no positive results were reported in the soil sample collected in association with JFSL-1 (i.e., CL0611-SB19). No other chemicals were detected in the soil gas samples collected at Building 06-11.

Table 4-3 summarizes the analytical results for soil samples collected at the Fuel Systems Test Lab (Building 06-11). Although no TCL volatile organic chemicals were detected at the area, aluminum, iron, lead, magnesium, manganese, potassium, sodium, vanadium, and zinc were detected in at least one of the two samples collected. However, the concentrations of metals detected in the soils are all below background and NYS TAGM levels.

Despite the potential conclusion that this cesspool area is relatively clean based on the soil gas and soil boring data, two additional issues were addressed. The first issue involves the significantly elevated detection limit reported for sample CL0611-SB19-1214. This sample was analyzed as a medium-level sample because of suspected hydrocarbons in the sample. The actual laboratory reported detection limit for volatile organics in this sample was 1,400 ug/kg.



FUEL
DEPOT
AREA

CHEMICAL	SG-JFSL-1	CLO611-SB19-1012
TOTAL VOCs	ND	ND
1,1-DICHLOROETHENE	4.3	ND

ASPHALT

MEDIAN
ISLAND

JET
FUEL
SYSTEM
LAB
(06-11)

ASPHALT

ROADWAY

WOODS

- ⊗ 1
- ⊗ 2
- ⊗ 3
- ⊗ 4

CHEMICAL	SG-JFSL-2
TOTAL VOCs	ND
1,1-DICHLOROETHENE	2.0

ASPHALT

LEGEND

- ⊗ = CESSPOOL MANHOLE
- = SOIL GAS SAMPLE LOCATION
- ⊙ = SOIL GAS SAMPLE AND SOIL BORING LOCATION
- SG = SOIL GAS (µg/l)
- SB = SOIL BORING (mg/Kg)

POSITIVELY DETECTED ANALYTICAL RESULTS

JET FUEL SYSTEM LAB (06-11)
NWIRP, CALVERTON, NEW YORK

FIGURE 4-9

NOT TO SCALE

TABLE 4-3

**EVALUATION OF ANALYTICAL DATA - SOIL SAMPLES
SITE 10 - CESSPOOL/LEACH FIELD AREAS - BUILDING 06-11
NWIRP CALVERTON, NEW YORK**

Chemical	Frequency of Detection	Range of Positive Results (mg/kg)	Arithmetic Mean of Results (mg/kg)	95% Percentile of Background Concentrations (mg/kg)	New York State TAGM (mg/kg)
Aluminum	2/2	325 - 367	346	16,800	Site-specific Background
Iron	2/2	322 - 450	386	16,900	2,000 or Site-specific Background
Lead	2/2	0.65 - 0.69	0.67	47.9	Site-specific Background
Magnesium	2/2	45.7 - 46.6	46.1	1,560	Site-specific Background
Manganese	2/2	2.0 - 2.3	2.2	90.8	Site-specific Background
Potassium	1/2	47.6	34.6	348	Site-specific Background
Sodium	2/2	252 - 271	262	285	Site-specific Background
Vanadium	2/2	7.8 - 12.8	10.3	43.6	150 or Site-specific Background
Zinc	1/2	2.4	1.8	27.2	20 or Site-specific Background

The cause of the elevated detection limits is suspected to be chemicals identified as TICs. Coeluting constituents prevented positive identification of many of the individual chemicals, consequently, they are identified as unknowns and unknown hydrocarbons. Reported TIC concentrations ranged from 2,900 ug/kg to 7,500 ug/kg. However, the accuracy of these values is questionable as these chemicals were quantified on the basis of a normalized response (i.e., a one-to-one response relative to the internal standard used for quantitation) and actual concentrations in the sample are different than those reported. Nonetheless, the TIC results indicate the presence of significant concentrations of hydrocarbons, probably related to fuel/oil at the groundwater interface.

The second issue was based on the observations made by the field personnel during sampling. These observations included an elevated OVA reading (20 ppm) and the presence of a noticeable solvent-type odor.

Overall, there is evidence that a fuel/oil problem may be present in this area. This area is near the fuel depot, and it is possible that the hydrocarbons are related to the Fuel Depot (RFI - Site 7).

Building 06-13 - Facility Maintenance Building

The investigation at this cesspool area consisted of a soil gas survey followed by the installation of soil borings, (See Figure 4-2). Three soil gas survey locations were sampled in a grassy area adjacent to Building 06-13. No positive soil gas results were noted. In accordance with the work plan, one soil sample was collected at the site.

Table 4-4 presents a summary of the positively detected chemicals for the Facilities Maintenance Building (Building 06-13) cesspool. A total of three soil samples, including one field duplicate sample, were collected at the site. Although no volatile organic chemicals were detected at the site, aluminum, chromium, iron, lead, magnesium, manganese, potassium, sodium, zinc, and cyanide were detected in at least one of the samples. Maximum detected concentrations of all analytes except sodium and cyanide were less than respective New York TAGM values and background concentrations.

One sodium result (286 mg/kg detected in sample SB20 at a depth of 20-22 feet) marginally exceeded the calculated background level of 285 mg/kg. The presence of this chemical is not indicative of environmental contamination, as this chemical is a common cation, essential human nutrient, and is not used for any known operation at the maintenance facility, save snow removal.

TABLE 4-4

**EVALUATION OF ANALYTICAL DATA - SOIL SAMPLES
SITE 10 - CESSPOOL/LEACH FIELD AREAS - BUILDING 06-13
NWIRP CALVERTON, NEW YORK**

Chemical	Frequency of Detection	Range of Positive Results (mg/kg)	Arithmetic Mean of Results (mg/kg)	95% Percentile of Background Concentrations (mg/kg)	New York State TAGM (mg/kg)
Aluminum	3/3	299 - 376	355	16,800	Site-specific Background
Chromium	1/3	2.6	1.8	23.6	10 or Site-specific Background
Iron	3/3	679 - 839	740	16,900	2,000 or Site-specific Background
Lead	3/3	0.76 - 1.0	0.84	47.9	Site-specific Background
Magnesium	3/3	40.4 - 78.9	62.5	1,560	Site-specific Background
Manganese	3/3	16.5 - 17.8	17.4	90.8	Site-specific Background
Potassium	3/3	43.6 - 72.2	64.9	348	Site-specific Background
Sodium	3/3	243 - 286	266	285	Site-specific Background
Zinc	2/3	2.2 - 2.9	2.3	27.2	20 or Site-specific Background
Cyanide	1/3	1.2	0.73	ND	(1)

ND - Chemical not detected in background samples.

(1) - Cleanup goal for cyanide dependent on form of cyanide complex and leaching potential.

Cyanide was detected in only one of the samples (SB20 at a depth of 12 to 14 feet) at a concentrations of 1.2 mg/kg. Cyanide was not detected in the associated field duplicate sample. No numerical standard is provided by the New York State TAGM as the available concentration of cyanide is controlled to a great extent by the form which is present. Cyanide is a chelating agent and binds strongly to polyvalent cations which inhibits its toxic characteristics in most cases.

There were no TICs in the soil samples collected at Building 06-13. Field observations during testing did not indicate any other environmental concerns.

Building 06-17 - Sewage Pump Station #2

The investigation at this leach field area consisted of a soil gas survey followed by the installation of soil borings, (See Figure 4-10). An extensive soil gas survey grid was investigated near Building 06-17. The sample area consisted of 25 points arrayed in a square grid with five transects. The results of the soil gas survey indicated volatile organics at only three locations along the northeastern edge of the grid (SPS2-1, SPS2-10, and SPS2-11). 1,1,1-Trichloroethane was the only chemical detected in the soil gas samples, at concentrations ranging from 1.2 ug/l to 1.6 ug/l. The presence of this chemical was not confirmed in the associated soil samples.

Table 4-5 provides a summary of analytical results for soil samples collected at the Sewage Pump Station (Building 06-17). Toluene and xylenes were detected once each in the ten soil samples collected at the site. Included in the ten soil samples were two pairs of field duplicate samples. Metals detected include aluminum, arsenic, barium, calcium, chromium, copper, iron, magnesium, manganese, potassium; sodium, vanadium, and zinc. As demonstrated in Table 4-5, only the maximum result for sodium exceeds respective New York State TAGM values (equal to site-specific background).

The sodium result (291 mg/kg detected in sample SB30 at a depth of 10-12 feet) marginally exceeded the calculated background level of 285 mg/kg. The presence of this chemical is not indicative of environmental contamination, as this chemical is a common cation, essential human nutrient, and does not appear at a concentration which is significantly above background levels.

One TIC, identified as freon 12, was reported in the sample collected from boring SB29 at a depth of 4 to 6 feet, but it was not reported in the associated field duplicate sample. No other positive results were reported for TICs in the samples collected at Building 06-17. Field observations during testing did not indicate any other environmental concerns.



CHEMICAL	SG-SPS2-16	CLD617-SB31-0204	CLD617-SB31-1012	CLD617-SB31-1012-DU
TOTAL VOCs	ND	ND	ND	ND
TOLUENE	ND	0.0007 J	ND	ND

PARKING LOT

PARKING LOT

ROADWAY

CHEMICAL	SG-SPS2-10	CLD617-SB29-0406	CLD617-SB29-0406-DU	CLD617-SB29-0810
TOTAL VOCs	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	1.6	ND	ND	ND
XYLENES	ND	0.002 J	ND	ND

GRASS FIELD

CHEMICAL	SG-SPS2-23	CLD617-SB32
TOTAL VOCs	ND	ND

CHEMICAL	SG-SPS2-1
TOTAL VOCs	ND
1,1,1-TRICHLOROETHANE	1.2

GRASS FIELD

SEWAGE STATION BLDG.

WASTE WATER TREATMENT BLDG.

HAZ. WASTE STORAGE BLDG.

LEGEND

- = SOIL GAS SAMPLE LOCATION
- ⊙ = SOIL GAS SAMPLE AND SOIL BORING LOCATION
- ⊗ = CESSPOOL MANHOLE
- SG = SOIL GAS (µg/l)
- SB = SOIL BORING (mg/Kg)

CHEMICAL	SG-SPS2-11	CLD617-SB30
TOTAL VOCs	ND	ND
1,1,1-TRICHLOROETHANE	1.4	ND

POSITIVELY DETECTED ANALYTICAL RESULTS

SEWAGE PUMP STATION #2 (06-17)

NWIRP, CALVERTON, NEW YORK

NOT TO SCALE

FIGURE 4-10



TABLE 4-5

**EVALUATION OF ANALYTICAL DATA - SOIL SAMPLES
SITE 10 - CESSPOOL/LEACH FIELD AREAS - BUILDING 06-17
NWIRP CALVERTON, NEW YORK**

Chemical	Frequency of Detection	Range of Positive Results (mg/kg)	Arithmetic Mean of Results (mg/kg)	95% Percentile of Background Concentrations (mg/kg)	New York State TAGM (mg/kg)	
					Protection of Human Health	Protection of Groundwater
Toluene	1/10	0.0007	0.0005	ND	20,000	1.5
Xylenes	1/10	0.002	0.0004	ND	200,000	1.2
Aluminum	10/10	208 - 3,680	761	16,800	Site-specific Background	
Arsenic	3/10	0.62 - 1.2	0.47	14.0	7.5 or Site-specific Background	
Barium	1/10	6.1	2.1	21.1	300 or Site-specific Background	
Calcium	2/10	246 - 362	144	447	Site-specific Background	
Chromium	7/10	3.1 - 10.9	1.9	23.6	10 or Site-specific Background	
Copper	2/10	4.5 - 5.1	2.0	23.2	25 or Site-specific Background	
Iron	10/10	450 - 3,630	1,060	16,900	2,000 or Site-specific Background	
Magnesium	10/10	41.7 - 433	120	1,560	Site-specific Background	
Manganese	10/10	1.4 - 26.6	6.5	90.8	Site-specific Background	
Potassium	7/10	51.0 - 176	60.9	348	Site-specific Background	
Sodium	2/10	235 - 291	187	285	Site-specific Background	
Vanadium	4/10	2.7 - 5.9	1.9	43.6	150 or Site-specific Background	
Zinc	3/5	2.2 - 7.5	3.3	27.2	20 or Site-specific Background	

ND - Chemical not detected in background samples.

Building 06-18 - Engine Test House

The investigation at this cesspool area consisted of a soil gas survey followed by the installation of soil borings, (See Figure 4-11). The soil gas survey was conducted consisting of five locations on the south side of a cesspool near Building 06-18. Positive results were reported for toluene, xylenes, 1,1,1-trichloroethane, and/or total VOCs in the soil gas at four of the five locations (ETH-2, ETH-3, ETH-4, and ETH-5). 1,1,1-Trichloroethane was the most pervasive soil gas chemical, and was detected in four samples at concentrations ranging from 1.3 ug/l to 2.6 ug/l. Toluene (1.3 ug/l) and xylenes (5.6 ug/l) were detected only at location ETH-3, along with a total VOC concentration of 502 ug/l. One other positive result was reported for total VOCs (95 ug/l) at location ETH-4. None of the soil gas results were confirmed by the presence of detected chemicals in the soil samples.

Table 4-6 summarizes the analytical data for the Engine Test House (Building 06-18). Positive results were reported for freon 113, aluminum, chromium, iron, lead, magnesium, manganese, sodium, vanadium, and zinc in at least one of the two samples collected. As noted in Table 4-6, maximum results reported for these chemicals are all less than respective New York State TAGM values.

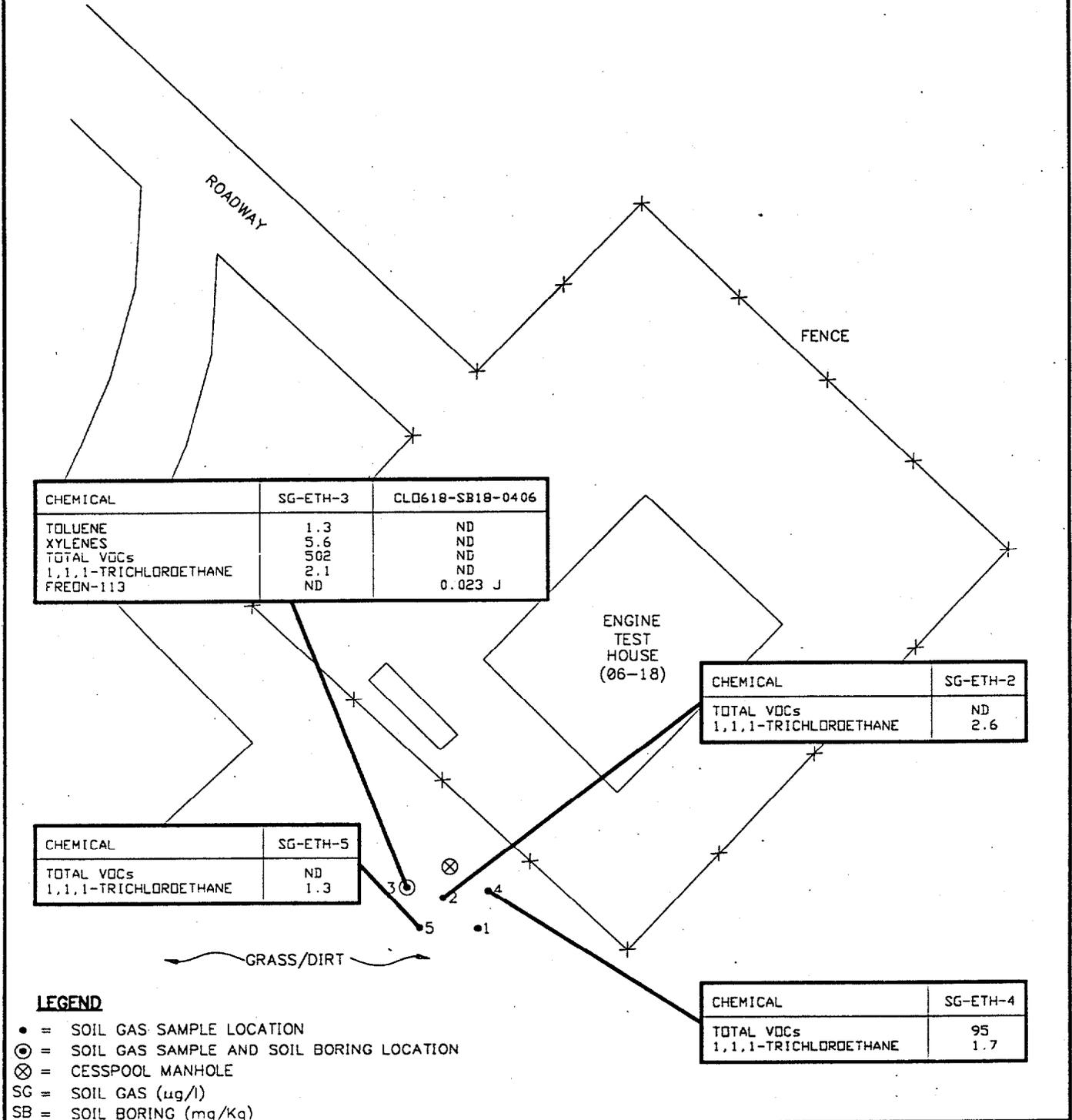
Several unknown hydrocarbons and one confirmed hydrocarbon (1,1,3-trimethylcyclohexane) were detected in the soil sample collected from the 6 to 8 foot depth at boring location SB18. The reported concentrations of the individual compounds range from 130 ug/kg to 1800 ug/kg, but are not accurate, since a calibration for these compounds was not performed. Detection of these volatile TICs is consistent with the results of the soil gas survey, which indicated 502 ug/l of VOCs in the soil gas.

In support of the TIC findings, field observations made during sampling, support the concept that contamination is present at this site. These observations include an elevated OVA reading (32 ppm) and the presence of a noticeable solvent-type odor.

Overall, there is evidence that fuel/oil is present in this area.

Building 06-42 - Vehicle Transportation Building

The investigation at this cesspool area consisted of a soil gas survey followed by the installation of soil borings, (See Figure 4-12). The soil gas survey consisted of testing four locations in the vicinity of four cesspools near the Vehicle Transportation Building. No positive results were reported for any target compounds during the analysis of soil gas samples at the site.



POSITIVELY DETECTED ANALYTICAL RESULTS

ENGINE TEST HOUSE (06-18)
NWIRP, CALVERTON, NEW YORK

NOT TO SCALE

FIGURE 4-11



Halliburton NUS
CORPORATION

TABLE 4-6

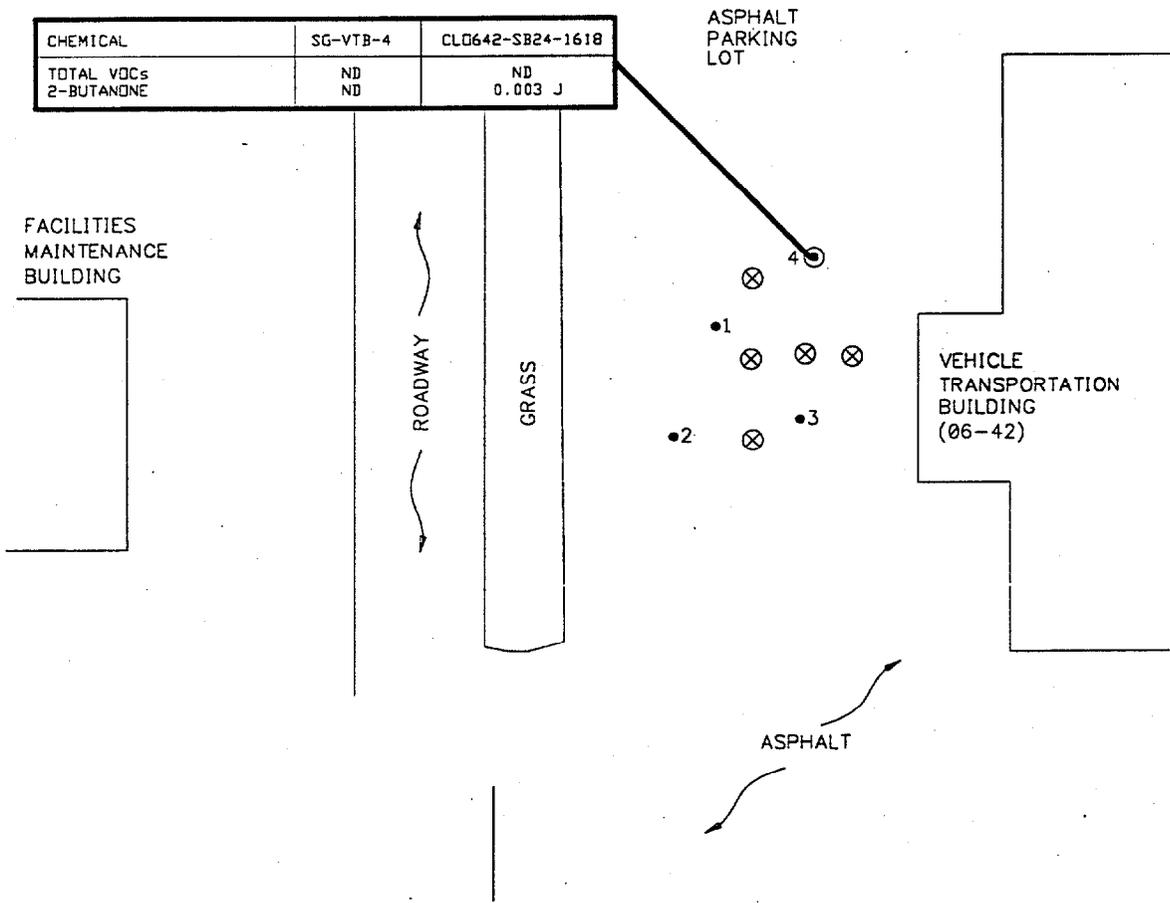
**EVALUATION OF ANALYTICAL DATA - SOIL SAMPLES
SITE 10 - CESSPOOL/LEACH FIELD AREAS - BUILDING 06-18
NWIRP CALVERTON, NEW YORK**

Chemical	Frequency of Detection	Range of Positive Results (mg/kg)	Arithmetic Mean of Results (mg/kg)	95% Percentile of Background Concentrations (mg/kg)	New York State TAGM (mg/kg)	
					Protection of Human Health	Protection of Groundwater
Freon 113	1/2	0.023	0.012	ND	200,000	6.0
Aluminum	2/2	258 - 306	282	16,800	Site-specific Background	
Chromium	1/2	2.5	1.8	23.6	10 or Site-specific Background	
Iron	2/2	483 - 768	626	16,900	2,000 or Site-specific Background	
Lead	2/2	1.1 - 1.5	1.3	47.9	Site-specific Background	
Magnesium	2/2	32.1 - 53.6	42.9	1,560	Site-specific Background	
Manganese	2/2	4.4 - 5.6	5.0	90.8	Site-specific Background	
Sodium	2/2	229 - 267	248	285	Site-specific Background	
Vanadium	1/2	3.2	2.1	43.6	150 or Site-specific Background	
Zinc	2/2	2.3 - 3.1	2.7	27.2	20 or Site-specific Background	

ND - Chemical not detected in background samples.



CHEMICAL	SG-VTB-4	CL0642-SB24-1618
TOTAL VOCs	ND	ND
2-BUTANONE	ND	0.003 J



LEGEND

- = SOIL GAS SAMPLE LOCATION
- ⊙ = SOIL GAS SAMPLE AND SOIL BORING LOCATION
- ⊗ = CESSPOOL MANHOLE
- SG = SOIL GAS (ug/l)
- SB = SOIL BORING (mg/Kg)

POSITIVELY DETECTED ANALYTICAL RESULTS
VEHICLE TRANSPORTATION BLDG. (06-42)
NWIRP, CALVERTON, NEW YORK

FIGURE 4-12

NOT TO SCALE



A summary of the analytical results for positively detected chemicals soils collected at the Vehicle Transportation Building (Building 06-42) is presented in Table 4-7. Chemicals which were detected include 2-butanone, aluminum, iron, magnesium, manganese sodium, and vanadium. Maximum results for all chemicals except for sodium less than respective New York TAGM values. The one sodium result (292 mg/kg) which exceeds the 95th percentile background level is located at SB24 at a depth interval of 16 to 18 feet below ground surface. The presence of this chemical is not indicative of environmental contamination, as this chemical is a common cation, essential human nutrient, and does not appear at a concentration significantly above background levels.

No positively detected TICs were detected for soil samples collected at Building 06-42. A split-spoon head-space OVA reading of 30 ppm was noted for the soil sample at a depth of 16 to 18 feet below ground surface, but odors as described for other sites were not noted.

Building 06-73 - New Fuel Calibration Building

The investigation at this cesspool area consisted of a soil gas survey followed by the installation of soil borings, (See Figure 4-13). Soil gas samples were collected from three locations around Figure 4-12 the four cesspools near Building 06-73. 1,1-Dichloroethene was the only positively detected soil gas chemical, found in samples NFCB-2 (6.5 ug/l) and NFCB-3 (1.0 ug/l). No other positive results were reported for the soil gas samples.

An evaluation of the analytical results for soil samples from the New Fuel Calibration Building (Building 06-73) is provided in Table 4-8. Positively detected chemicals in the soil at the site included xylenes, aluminum, arsenic, barium, calcium, chromium, copper, iron, magnesium, manganese, potassium, sodium, and vanadium. Maximum concentrations reported for all detected chemicals were less than respective New York State TAGM values and calculated background levels.

No positively detected TICs were reported for soil samples collected at Building 06-42. Field observations during testing did not indicate any other environmental concerns.

Building 07-03 - Sewage Pump Station

The investigation at this leach consisted of a soil gas survey followed by the installation of soil borings, (See Figure 4-14). The soil gas survey, consisting of samples collected from nine locations interspersed

TABLE 4-7

**EVALUATION OF ANALYTICAL DATA - SOIL SAMPLES
SITE 10 - CESSPOOL/LEACH FIELD AREAS - BUILDING 06-42
NWIRP CALVERTON, NEW YORK**

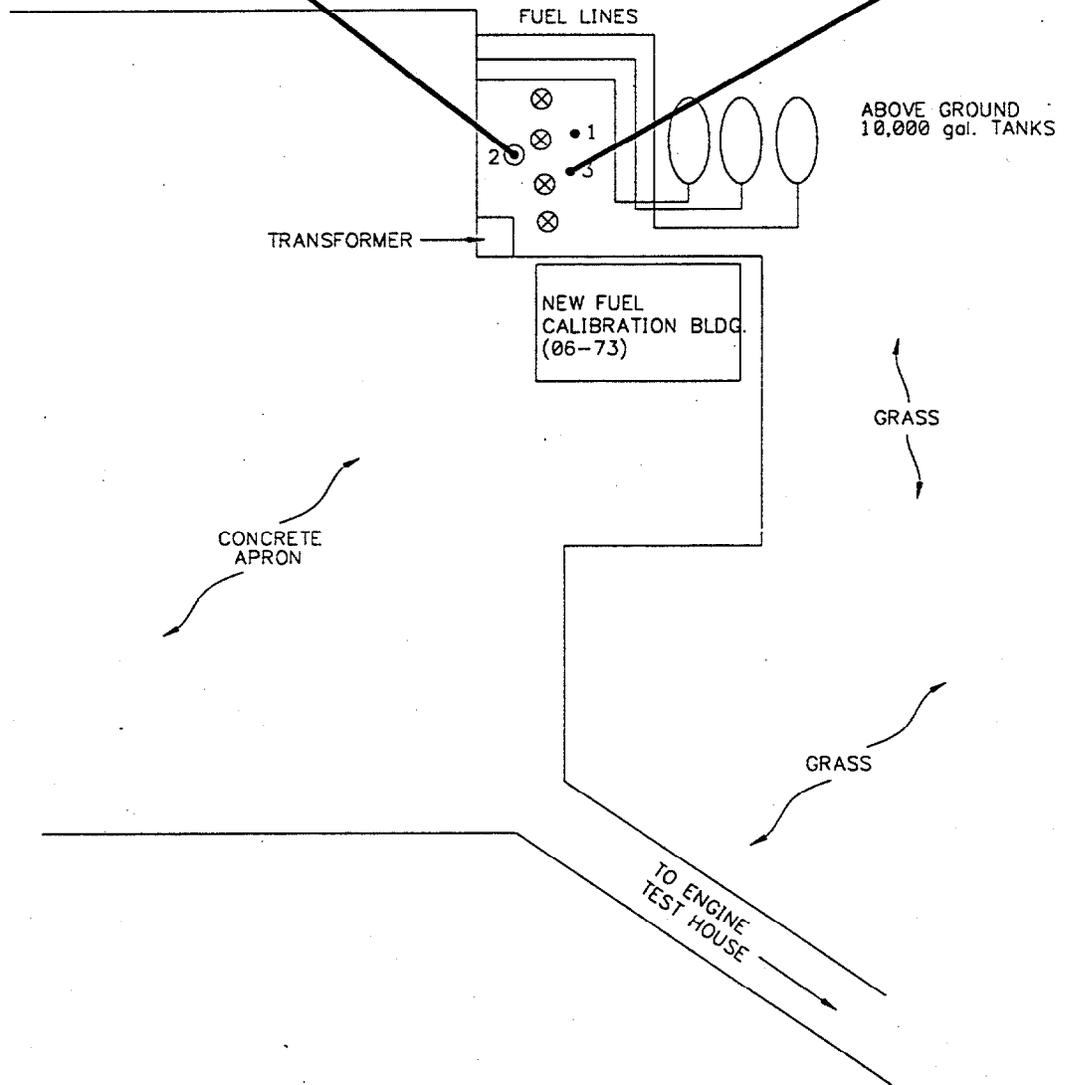
Chemical	Frequency of Detection	Range of Positive Results (mg/kg)	Arithmetic Mean of Results (mg/kg)	95% Percentile of Background Concentrations (mg/kg)	New York State TAGM (mg/kg)	
					Protection of Human Health	Protection of Groundwater
2-Butanone	1/2	0.003	0.003	ND	4,000	0.3
Aluminum	2/2	300 - 372	336	16,800	Site-specific Background	
Iron	2/2	643 - 1,140	892	16,900	2,000 or Site-specific Background	
Magnesium	2/2	44.8 - 85.2	65.0	1,560	Site-specific Background	
Manganese	2/2	17.6 - 19.1	18.4	90.8	Site-specific Background	
Sodium	2/2	229 - 292	261	285	Site-specific Background	
Vanadium	2/2	2.4 - 3.8	3.1	43.6	150 or Site-specific Background	

ND - Chemical not detected in background samples.



CHEMICAL	SG-NFCB-2	CLD673-SB23-0507
TOTAL VOCs	ND	ND
1,1-DICHLOROETHENE	6.5	ND
XYLENES	ND	0.001 J

CHEMICAL	SG-NFCB-3
TOTAL VOCs	ND
1,1-DICHLOROETHENE	1.0



LEGEND

- = SOIL GAS SAMPLE LOCATION
- ⊙ = SOIL GAS SAMPLE AND SOIL BORING LOCATION
- ⊗ = CESSPOOL MANHOLE
- SG = SOIL GAS (µg/l)
- SB = SOIL BORING (mg/kg)

POSITIVELY DETECTED ANALYTICAL RESULTS

NEW FUEL CALIBRATION BLDG. (06-73)

NWIRP, CALVERTON, NEW YORK

NOT TO SCALE

FIGURE 4-13

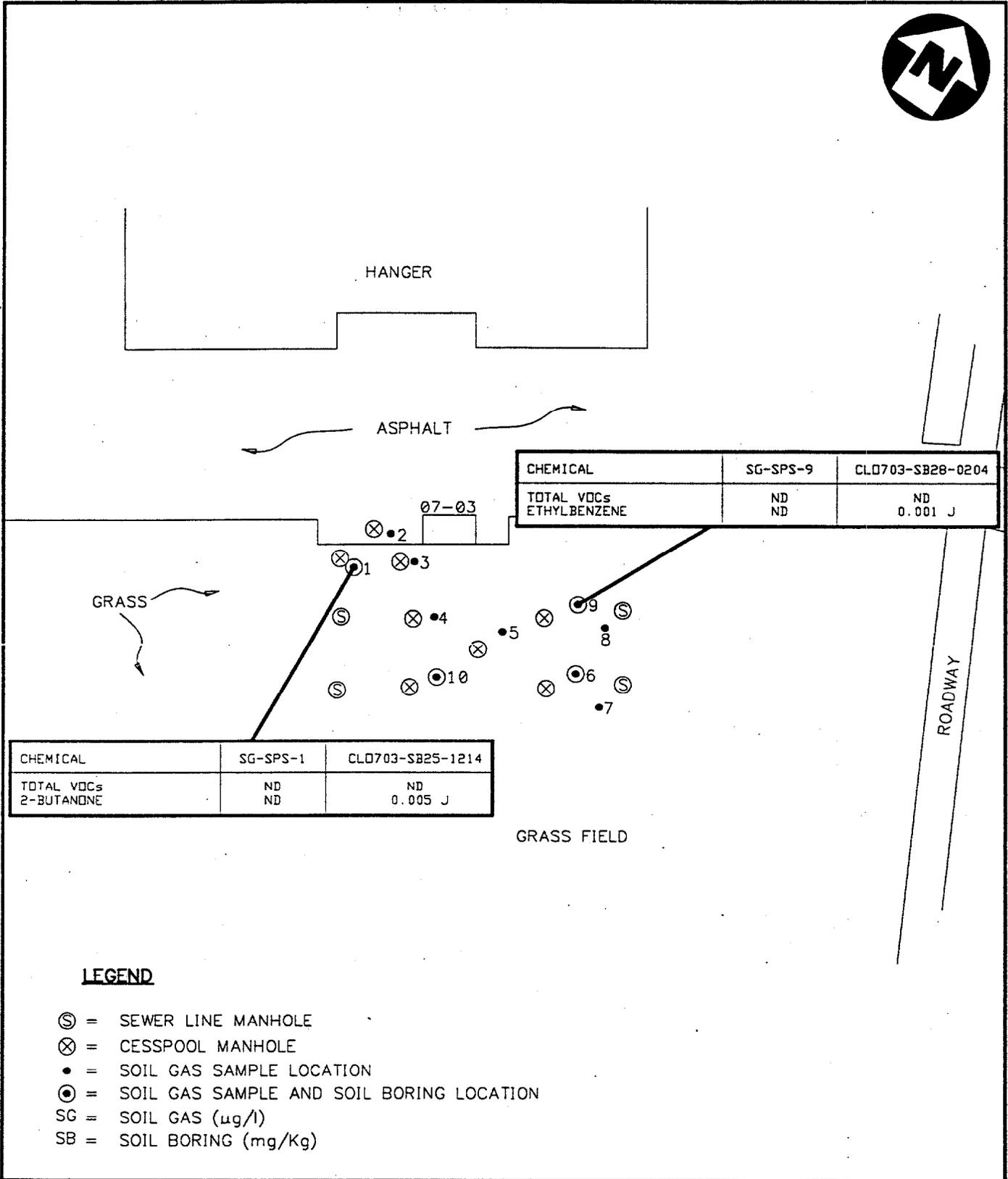


TABLE 4-8

**EVALUATION OF ANALYTICAL DATA - SOIL SAMPLES
SITE 10 - CESSPOOL/LEACH FIELD AREAS - BUILDING 06-73
NWIRP CALVERTON, NEW YORK**

Chemical	Frequency of Detection	Range of Positive Results (mg/kg)	Arithmetic Mean of Results (mg/kg)	95% Percentile of Background Concentrations (mg/kg)	New York State TAGM (mg/kg)	
					Protection of Human Health	Protection of Groundwater
Xylenes	1/2	0.001	0.0008	ND	200,000	1.2
Aluminum	2/2	1,860 - 4,070	2,970	16,800	Site-specific Background	
Arsenic	2/2	0.69 - 1.2	0.95	14.0	7.5 or Site-specific Background	
Barium	1/2	7.0	4.7	21.1	300 or Site-specific Background	
Calcium	2/2	254 - 343	299	447	Site-specific Background	
Chromium	2/2	2.5 - 6.3	4.4	23.6	10 or Site-specific Background	
Copper	1/2	15.6	8.4	23.2	25 or Site-specific Background	
Iron	2/2	1,710 - 3,480	2,600	16,900	2,000 or Site-specific Background	
Magnesium	2/2	185 - 836	511	1,560	Site-specific Background	
Manganese	2/2	11.4 - 25.4	18.4	90.8	Site-specific Background	
Potassium	2/2	86.5 - 213	150	348	Site-specific Background	
Sodium	2/2	267 - 281	274	285	Site-specific Background	
Vanadium	2/2	3.1 - 6.7	4.9	43.6	150 or Site-specific Background	

ND - Chemical not detected in background samples.



POSITIVELY DETECTED ANALYTICAL RESULTS

**SEWAGE PUMP STATION (07-03)
NWIRP, CALVERTON, NEW YORK**

NOT TO SCALE

FIGURE 4-14

between cesspools, was conducted at Building 07-03. No positive results were reported for the targeted volatile organics in the soil gas samples.

Table 4-9 summarizes the data evaluation for soil samples collected at the Old Sewage Pump Station (Building 07-03). A total of eight soil samples were collected at the site. Analysis indicated detectable concentrations of 2-butanone, ethylbenzene, xylenes, aluminum, arsenic, barium, calcium, chromium, iron, magnesium, manganese, mercury, potassium, sodium, and vanadium in at least one of the soil samples collected. All maximum concentrations reported for the detected organic chemicals were less than respective New York State TAGM values for protection of human health and the environment. However, maximum concentrations for iron, manganese, and sodium were noted to be greater than background levels. One positive result reported for mercury (0.10 mg/kg) was also greater than the calculated background concentration (0.09 mg/kg). However the result is equivalent to the New York State TAGM standard value.

Iron and manganese detected at only one location (SB25 at a depth of 12 to 14 feet) were noted to exceed the New York State TAGM values. The maximum concentrations for iron (24,100 mg/kg) and manganese (143 mg/kg) were approximately 50% greater than the respective background levels of 16,900 mg/kg and 90.8 mg/kg. The soils immediately below this point were not observed to have elevated metal concentrations. In addition, not only were the metal concentrations below background levels in the deeper sample, but they were approximately one-half (1/2) to one-thirtieth (1/30th) of those levels observed in the 12 to 14 foot depth interval. The disparity indicates that the high levels of metals observed in the 12 to 14 foot depth interval is a localized phenomenon, as extensive metal contamination would also be evident in the underlying depth interval.

Several TICs were detected in the soil samples collected at Building 07-03 leach field. The most pervasive of the TICs is freon 12, which was detected in four of the eight samples collected at concentrations. The detected concentrations ranged from 11 ug/kg to 12 ug/kg. One other sample (CL0703-SB25-1214) was reported to have contained detectable concentrations of hexane and an unknown compound. No other TICs were positively detected in the soil samples collected from Building 07-03. Field observations during testing did not indicate any other environmental concerns.

Building 080-01

The investigation at this cesspool consisted of a soil gas survey followed by the installation of soil borings, (See Figure 4-8). Eight locations near Building 080-01 were sampled during the soil gas survey. Although

TABLE 4-9

**EVALUATION OF ANALYTICAL DATA - SOIL SAMPLES
SITE 10 - CESSPOOL/LEACH FIELD AREAS - BUILDING 07-03
NWIRP CALVERTON, NEW YORK**

Chemical	Frequency of Detection	Range of Positive Results (mg/kg)	Arithmetic Mean of Results (mg/kg)	95% Percentile of Background Concentrations (mg/kg)	New York State TAGM (mg/kg)	
					Protection of Human Health	Protection of Groundwater
2-Butanone	1/8	0.005	0.003	ND	4,000	0.3
Ethylbenzene	1/8	0.001	0.0006	ND	8,000	5.5
Xylenes	1/8	0.001	0.0004	ND	200,000	1.2
Aluminum	8/8	232 - 6,170	2,170	16,800	Site-specific Background	
Arsenic	3/8	1.3 - 2.0	0.84	14.0	7.5 or Site-specific Background	
Barium	3/8	4.5 - 13.5	5.3	21.1	300 or Site-specific Background	
Calcium	2/8	226 - 418	171	447	Site-specific Background	
Chromium	3/8	2.5 - 9.8	3.5	23.6	10 or Site-specific Background	
Iron	8/8	333 - 24,100	4,920	16,900	2,000 or Site-specific Background	
Magnesium	8/8	41.8 - 602	257	1,560	Site-specific Background	
Manganese	8/8	3.0 - 143	27.9	90.8	Site-specific Background	
Mercury	1/8	0.10	0.06	0.09	0.1	
Potassium	7/8	52.5 - 288	112	348	Site-specific Background	
Sodium	8/8	252 - 294	276	288	Site-specific Background	
Vanadium	4/8	3.2 - 10.1	4.0	43.6	150 or Site-specific Background	

ND - Chemical not detected in background samples.

analyses for fuel related constituents and chlorinated organic chemicals were conducted for the soil gas samples, no positive results were reported.

Table 4-10 presents a summary of the analytical data for soils collected at the Avionics Noise Check Building (Building 080-01) and an evaluation of the data for comparison to New York State TAGMs and background levels. Although no organic chemicals were detected in the soils, some metals, including aluminum, chromium, iron, magnesium, manganese, potassium, sodium, and vanadium were detected in at least one of the four soil samples collected at the site. The reported maximum concentrations for these detected chemicals did not exceed the respective New York State TAGM values (site-specific background levels).

Although no positive results were reported for TCL volatile organic chemicals, one unknown aromatic TIC was reported for sample CL08001-SB22-1012. No other positive results were reported for TICs in samples collected at Building 080-01. Field observations during testing did not indicate any other environmental concerns.

Groundwater

As a part of the field investigation for the cesspool/leachfield sites, one groundwater sample was collected near Building 07-85. This well is located in the northwest section of the facility, (See Figure 1-3). The well is used for recreational activity at a picnic grounds area and was sampled to identify any possible contamination which may be present. The groundwater was analyzed for TCL volatile organic compounds and TAL metal and cyanide.

Although no positive results were reported for TCL volatile compounds, several TAL metals were detected. Positively detected inorganics include barium (42.4 ug/l), calcium (5970 ug/l), copper (97.9 ug/l), iron (495 ug/l), magnesium (966 ug/l), manganese (48.8 ug/l), potassium (2380 ug/l), and sodium (4410 ug/l). Only iron exceeds a respective federal standard (i.e., secondary MCL value of 300 ug/l). The individual iron concentration and the combined concentrations of iron and manganese exceed respective New York State MCLs of 300 ug/l and 500 ug/l. As discussed for the ECM area, iron and manganese appear to be wide spread contaminants at the NWIRP, and may result from natural sources.

TICs detected in the groundwater sample included two unknown compounds, at estimated concentrations ranging from 4 ug/l to 12 ug/l.

TABLE 4-10

**EVALUATION OF ANALYTICAL DATA - SOIL SAMPLES
SITE 10 - CESSPOOL/LEACH FIELD AREAS - BUILDING 080-01
NWIRP CALVERTON, NEW YORK**

Chemical	Frequency of Detection	Range of Positive Results (mg/kg)	Arithmetic Mean of Results (mg/kg)	95% Percentile of Background Concentrations (mg/kg)	New York State TAGM (mg/kg)
Aluminum	4/4	237 - 361	301	16,800	Site-specific Background
Chromium	1/4	2.0	1.4	23.6	10 or Site-specific Background
Iron	4/4	455 - 789	604	16,900	2,000 or Site-specific Background
Lead	4/4	0.41 - 0.88	0.65	47.9	Site-specific Background
Magnesium	4/4	39.5 - 55.0	46.7	1,560	Site-specific Background
Manganese	4/4	3.0 - 13.2	7.5	90.8	Site-specific Background
Potassium	2/4	41.1 - 62.0	37.0	348	Site-specific Background
Sodium	4/4	225 - 276	256	285	Site-specific Background
Zinc	4/4	2.2 - 2.7	2.5	27.2	20 or Site-specific Background

Quality Assurance/Quality Control (QA/QC) and Blank Samples

Review of the analytical data available for the QA/QC and field and laboratory blank samples and the results of data validation indicate some deficiencies in the analytical data quality. Sample data affected by analytical and/or QC problems were qualified in accordance with U. S. EPA Region II data validation protocol. Appendix C provides a complete assembly of the data validation memoranda prepared in support of the data evaluation.

Field duplicate precision for soil samples were within the data validation control limits. Data validation resulted in the estimation of some positive sample results and quantitation limits for organic compounds based on holding time exceedences, calibration noncompliances, surrogate recoveries outside of control limits, and reported positive results which were less than respective CRQLs. Maximum concentrations reported for methylene chloride (34 ug/l and 750 ug/kg in a medium level analysis), acetone (30 ug/l), chloroform (2 ug/l), chlorobenzene (2 ug/l), and toluene (1 ug/l) in field QC or laboratory method blanks were used to qualify affected analytical data. Although the data were estimated in some cases, the numerical values for affected samples are acceptable for use as reported.

Some inorganic analysis data are rejected because of holding time exceedence and extremely low CRDL and matrix spike recoveries. Other inorganic data are qualified on the basis of CRDL recoveries outside of control limits, duplicate imprecision, graphite furnace and inductively coupled plasma quantitation error, and blank contamination. Cadmium, although detected in blank analyses, is not used to qualify data as the result is qualified due to other considerations.

Summary

Soil samples collected at the cesspool/leach field areas had detectable concentrations of various organic and inorganic constituents. Although most of the detected chemicals are present at concentrations which are less than respective New York State TAGM values and background levels, some of the maximum results reported for inorganic chemicals are greater than background and TAGM levels. Affected areas include cesspool/leach fields at Buildings 06-13 (sodium and cyanide), 06-17 (sodium), 06-42 (sodium), and 07-03 (iron, manganese, and sodium). Sodium, the most frequently exceeded chemical, is not considered to be an environmental contaminant, as it is a common and naturally occurring cation, an essential human nutrient, and not used in significant amounts in processes at the facility. The exceedence noted for iron and manganese at one site is also believed to be naturally occurring and is within published background ranges for the Eastern United States.

Detected TICs and field observations at Buildings 06-11 and 06-18 indicate the presence of non-TCL target compounds in soils at levels which may indicate the presence of fuel/oil-related constituents.

4.8 CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER ACTION

1. The investigation of the cesspools and leach fields did not detect the presence of TCL volatile organics at concentrations which would be a risk to human health or the environment.
2. The investigation did find the presence of minor inorganic contamination. However, based on the chemicals found and relative toxicity, these chemicals are not expected to require additional study.
3. Two sites, 06-11 - Jet Fuel Systems Lab and 06-18 - Engine Test House, are potentially contaminated with fuel and/or oil related products. An investigation of soils and groundwater is warranted to determine if contamination is present, and if present define the extent of the contamination.

5.0 FIXTURE STORAGE AREA

5.1 SITE DESCRIPTION/ENVIRONMENTAL SETTING

The Fixture Storage Areas consists of two adjacent fields used for the storage miscellaneous equipment and parts (fixtures). The western field is being referred to a Site 11A and the eastern field is being referred to as Site 11B. The site is located in the south central portion of the site, (See Figure 1-3). The area is generally flat with only a couple of small sheds present. This site was investigated at the request of the Suffolk County Department of Health because a review of historic photographs indicated that a large shallow depression was present in this area. At some point in time, likely in the 1960s or 1970s, the depression was filled in. In addition to the storage of fixtures, the area was used to test the lunar lander. There is no evidence that manufacturing or maintenance activities occurred at this site or that disposal of wastes occurred.

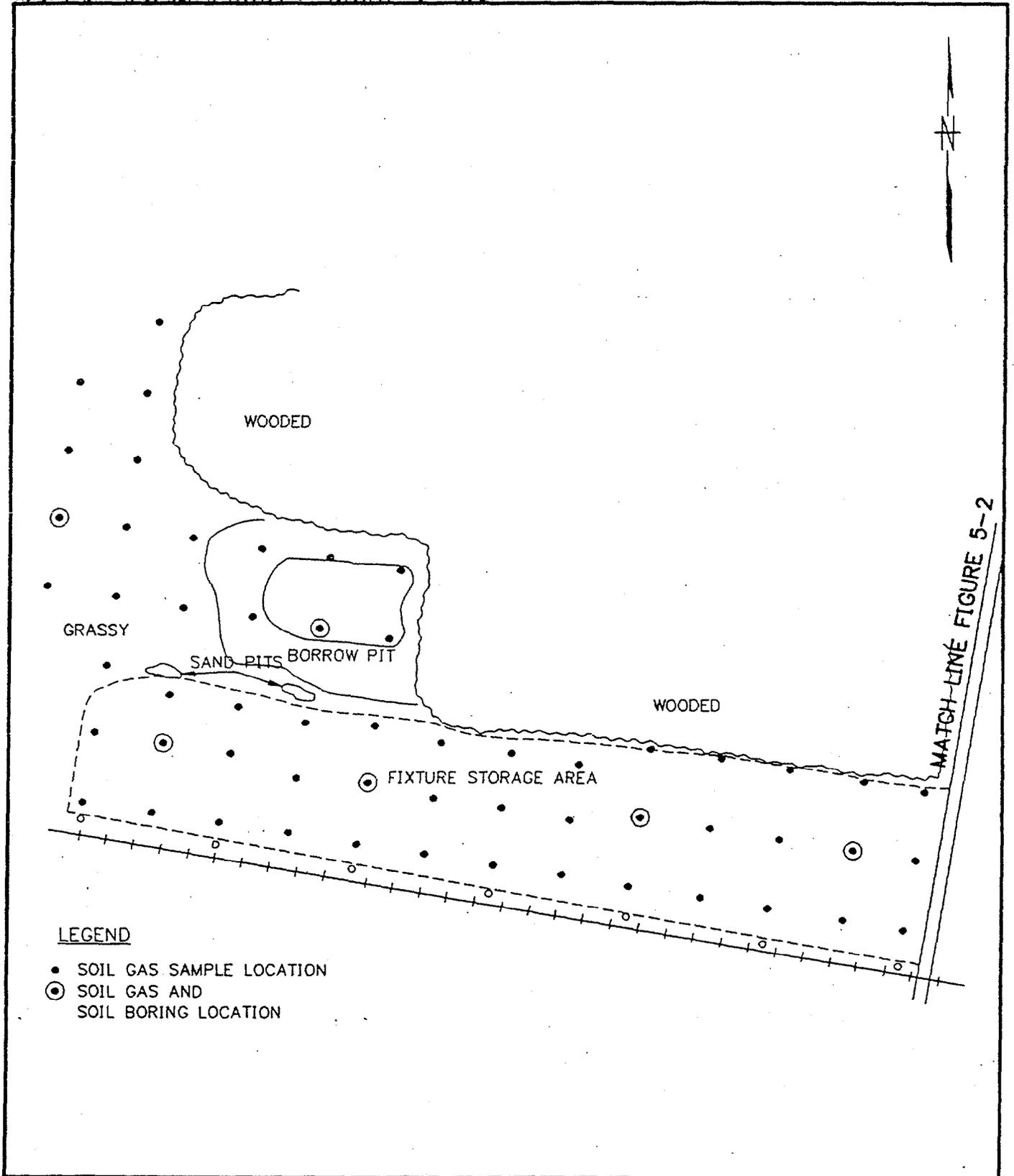
5.2 SAMPLING OBJECTIVES

The objective of the investigation at the Fixture Storage Area was to determine the environmental effects of past and present activities on soils and groundwater. This was accomplished by performing a soil-gas sampling investigation followed by a soil boring investigation. Soil boring locations were determined based on the highest positive results obtained during the soil-gas sampling program.

5.3 SAMPLING ACTIVITIES

A total of 96 soil-gas points were sampled during the investigation. Two separate sampling grids were used to provide suitable coverage of the areas of potential contamination, (one for each area). Grid spacings were set at approximately 100-foot intervals. Figures 5-1 and 5-2 show the soil gas sampling locations at the Fixture Storage Area.

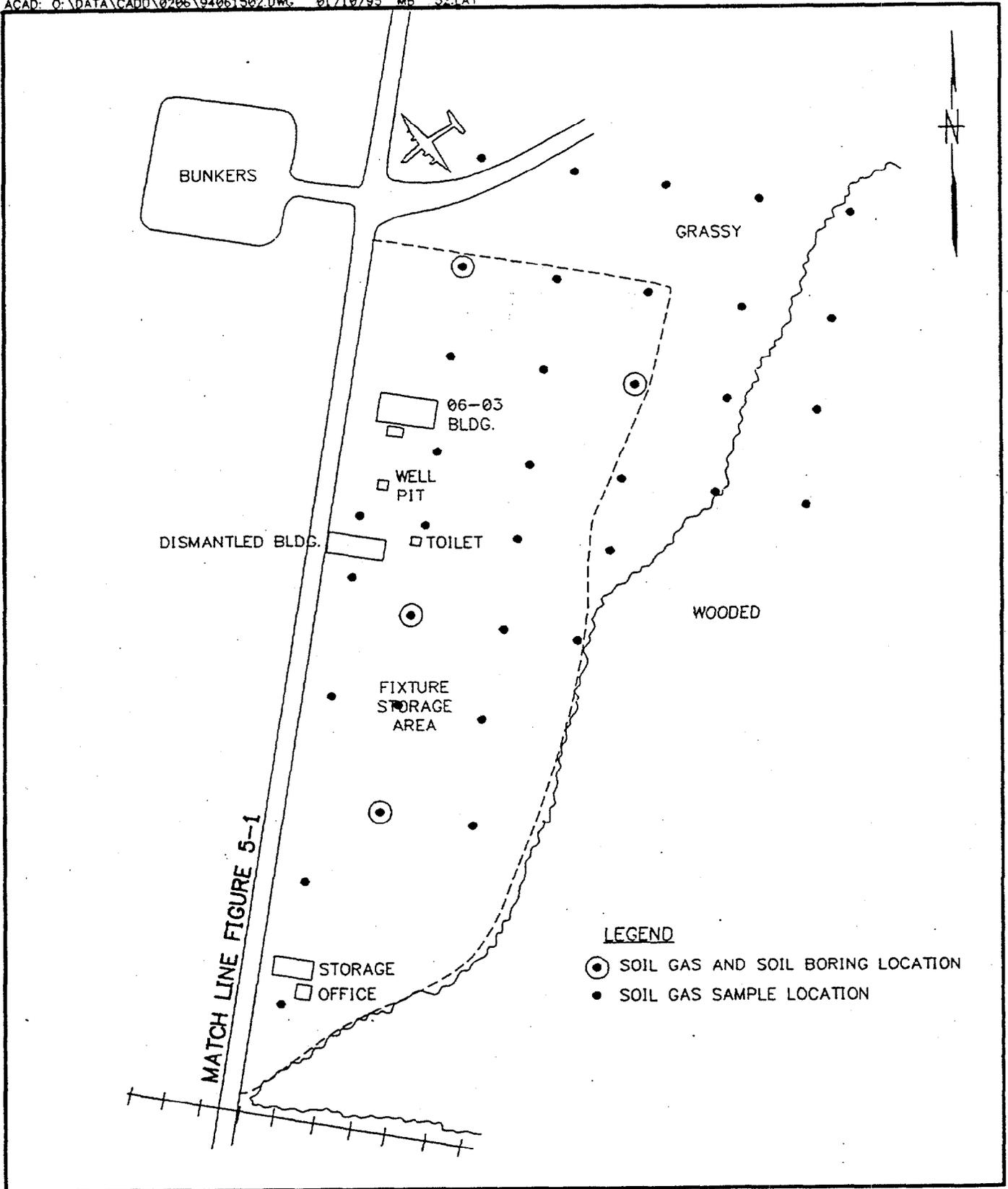
Each sampling location was marked with a surveyor's pin flag. Soil gas samples were collected by driving a steel sampling probe approximately 3 to 6 feet into the ground. The drive point on the probe was slotted to allow soil gas to flow through the sampling probe. The sampling probe was evacuated prior to collection of the soil gas sample. The soil gas sample was collected into an air sample bag from a dedicated inert sampling tube that connected the steel probe to a pump. The samples were analyzed at the subcontractors (Target) fixed-base laboratory.



SITE 11A - STORAGE AREA
SOIL GAS/SOIL BORING LOCATIONS
NWIRP, CALVERTON, NEW YORK

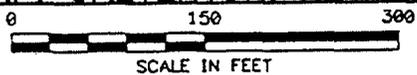
FIGURE 5-1





SITE 11B - STORAGE AREA
SOIL GAS/SOIL BORING LOCATIONS
NWIRP, CALVERTON, NEW YORK

FIGURE 5-2



A gas chromatograph compound library was established using certified gas standards for the following target compounds:

Benzene	Ethylbenzene
1,1-dichloroethene (DCE)	c-1,2-DCE
t-1,2-DCE	1,1-dichloroethane (DCA)
Trichloroethene (TCE)	Tetrachloroethene (PCE)
1,1,1 trichloroethane (TCA)	1,1,2-TCA
Chloroform	Carbon tetrachloride
Toluene	Total (m-, p-, and o-,) xylenes
Methylene chloride	Freon 113

Soil-gas samples with elevated concentrations of volatile organics were further investigated by collecting and analyzing subsurface soil samples. When soil-gas samples did not indicate contamination soil borings were drilled at perimeter locations around the grid.

A total of 10 soil borings were drilled at the Fixture Storage Area as shown in Figures 5-1 and 5-2. Each soil boring was advanced using hollow-stem auger drilling techniques. Split spoon samples were collected continuously to the water table to characterize subsurface lithologies. Each of these samples was visually evaluated for evidence of contamination (staining) and the head space of the split spoon was checked with an organic vapor analyzer (OVA) meter. These findings are presented on the sample log sheets (Appendix A). Two samples from each boring were retained for chemical analyses. One sample was collected from the water table interface as an indication of deep soil contamination and/or groundwater contamination. The second sample was selected based on the zone with the highest OVA readings obtained during that boring and/or the presence of staining. The selection of sampling locations using this approach would be biased on the conservative side, since the most volatile organic-contaminated soils at the site would be analyzed. Other locations at the site would be expected to be less contaminated.

For reference, the last four digits of the sample number indicates the depth at which the sample was collected in feet (e.g. 0204 indicates that the sample was collected at a depth of 2 to 4 feet below grade surface). The samples were analyzed for TCL volatile organics and freon 113 using the USEPA Contract Laboratory Program (CLP) Statement of Work OLM01 (revision 8). Soils were also analyzed for TAL Metals and cyanide according to the analytical methods described in the CLP Statement of Work ILM02 (Revision 1).

Sampling equipment (split-spoons, auger heads and sampling trowels) was decontaminated between sample locations using the following procedures:

- potable water rinse
- alconox detergent wash
- potable water rinse
- steam distilled water rinse
- methanol rinse
- steam distilled water rinse
- air dry

All samples were kept on ice to maintain a temperature of at least 4 C from the time of sample collection until receipt by the laboratory. Samples were shipped via overnight carrier to minimize holding times. Chain of custody records can be found in Appendix B.

5.4 WASTE CHARACTERISTICS

There is no evidence of wastes being placed at this site. Chemicals which may be present include those chemicals used throughout the facility. These chemicals include solvents, fuels, and oils. With the exception of oils, these chemicals are relatively mobile in the environment. Water solubilities are summarized as follows.

<u>Chemical</u>	<u>Water Solubility (mg/l)</u>
benzene	1,780
toluene	515
methylene chloride	20,000
methyl ethyl ketone	350,000
lacquer thinners	variable
oils	variable
fuels	variable

The chlorinated solvents are denser than water. Toluene, fuels, and oils are lighter than water. With the exception of oils, each of the chemicals are relatively volatile.

5.5 EVIDENCE OF RELEASE/WASTE MIGRATION PATHWAYS

This section provides a description of any evidence of chemical release at the Fixture Storage Area (Site 11) and identifies possible migration pathways which would facilitate physical transport of the chemicals in the environment.

Evidence Of Release

This is no historical record of chemical releases at Site 11 and there are not any reports of solvents, fuels, or chemicals being used at this site. However, during a site visit, at least one 55-gallon drum was observed locked inside one of the site sheds. The contents of this drum were not determined.

Waste Migration Pathways

Chemical migration patterns associated with a volatile contaminant release over ground include volatilization to the atmosphere, absorption to organic carbon in soil, and leaching to groundwater. Volatilization is considered to be the most probable fate of the volatile organics. The vapors would dissipate rapidly in the air and undergo significant dilution and photo-chemical degradation in the atmosphere. It is not likely that the amount of solvent released into the atmosphere would result in a health risk to employees or other downwind receptors.

Chemical which might be released would soak into soil, adsorb to organic carbon, and would undergo volatilization (to the soil gas) and dissolution in water percolating through the soil. During storm events, most water is likely to run off the site or be retained in the soil, but a portion of contaminated water may leach through unsaturated zone soils and contacted the groundwater, located at an estimated depth of approximately 4 to 23 feet below the ground surface. The occurrence of this migration pathway would be most evident by contamination in soils collected at the suspected spill locations in the unsaturated zone and at the groundwater capillary interface.

Chemicals which have contacted the groundwater are subject to transport via diffusive and convective transport mechanisms in the saturated zone. Although migration potential for the chemicals considered for this site was considered to be high, analytical information indicated that organic chemicals were not present in detectable quantities in the soils at the groundwater interface.

Physical transport of chemicals bound to sediments or dissolved in runoff water through erosional processes was not considered a potentially significant transport mechanism. The site was observed to have little vertical relief and no major drainage patterns are evident.

5.6 RECEPTORS/EXPOSURE PATHWAYS

This section provides a preliminary assessment of exposure pathways and receptors that may contact contaminated environmental media at the Fixture Storage Area (Site 11). The identified routes of exposure and receptors are consistent with current land use at the facility and consider possible future land use.

Initially, receptors were identified according to current and potential future land uses. Exposure routes applicable for each receptor group were then identified based on land use and behavior patterns of the potential receptors.

Receptors

NWIRP Calverton is an active industrial facility. Under a current land use scenario, employees of the facility are the only relevant receptor group. All individuals in this receptor group were assumed to be adults who work a standard 40-hour work week for 250 days each year. Security at the facility was assumed to be adequate to eliminate the possibility of trespassers at the plant, thereby eliminating these individuals as potential receptors.

Future plans for the facility include possible use of the land for civilian residents. Under a residential land use scenario, adult and child residents are relevant receptors and were assumed to be living at the site under reasonable residential conditions (i.e., single-family dwellings on landscaped lots). Residential exposures were considered to occur throughout the year and include all exposures related to normal residential activity.

No ecological receptors have been identified at this site.

Exposure Pathways

Exposure pathways for human and environmental receptors are determined to be consistent with the media which have been determined to be contaminated. The identification is qualitative and based on predicted behavior patterns of individual receptors. Exposure routes for current (industrial/commercial) and potential future (residential) land use conditions were considered for the site.

Exposure to chemicals in soil can occur via incidental ingestion, dermal contact, and inhalation of fugitive dust emissions. Industrial/commercial land use can allow exposure to soil chemicals by all specified routes.

Current industrial/commercial receptors are not exposed to the site groundwater as a water distribution system is currently in operation at the plant. However, groundwater exposure to future residents at the site is possible. Under normal conditions, reasonable exposure to groundwater chemicals may be quantified via ingestion, dermal contact, and by inhalation of volatiles emitted during showering or bathing.

5.7 RESULTS OF SAMPLING VISIT

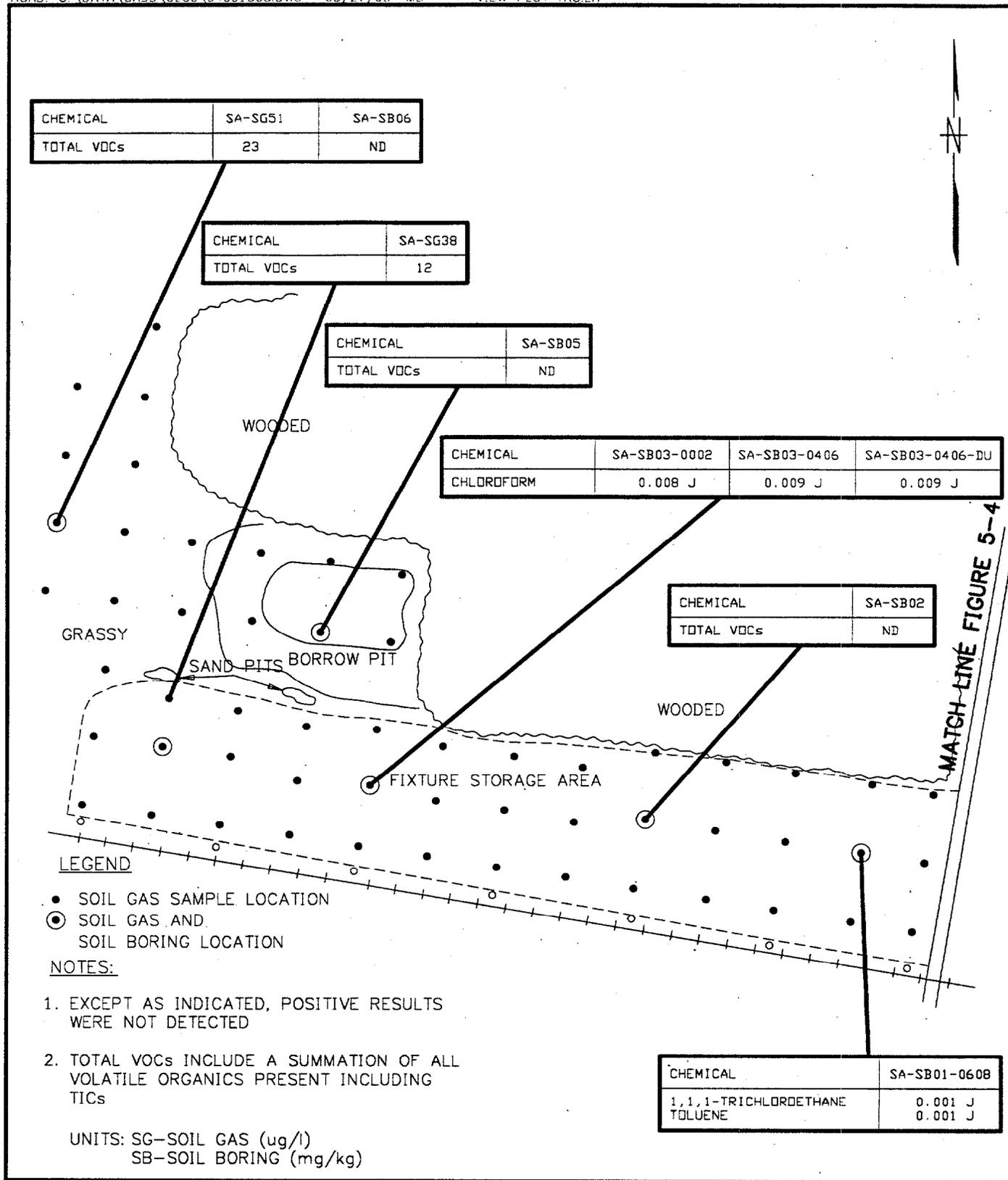
The following sections describe the results and findings of the sampling activities at the Fixture Storage Area. Included in this discussion are the results of the soil-gas survey and soil boring investigation. The sample locations and analytical results for this site are summarized in Figures 5-3 and 5-4. Sample log sheets and soil boring log sheets are presented in Appendix A. Chain of custody forms for the samples are presented in Appendix B. Data validation letters are presented in Appendix C. Complete analytical data summary sheets are presented in Appendix D. Additional backup on the laboratory method, QA/QC samples, and Form I's are available in the project files. The soil-gas results are presented in Appendix E.

5.7.1 Geology

Ten soil borings were drilled at Site 11 as shown on Figures 5-3 and 5-4. Each soil boring was advanced to the water table using hollow-stem auger drilling techniques. As described in the boring logs found in Appendix A, subsurface materials encountered throughout the Fixture Storage Area consisted of silty fine grained sands extending from the ground surface to the bottom of the boring. Several of the borings also indicated coal fragments near the surface and sub-rounded pebbles at around 5 feet extending to the bottom of the bore hole.

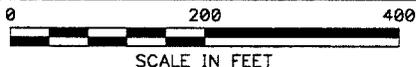
5.7.2 Hydrogeology

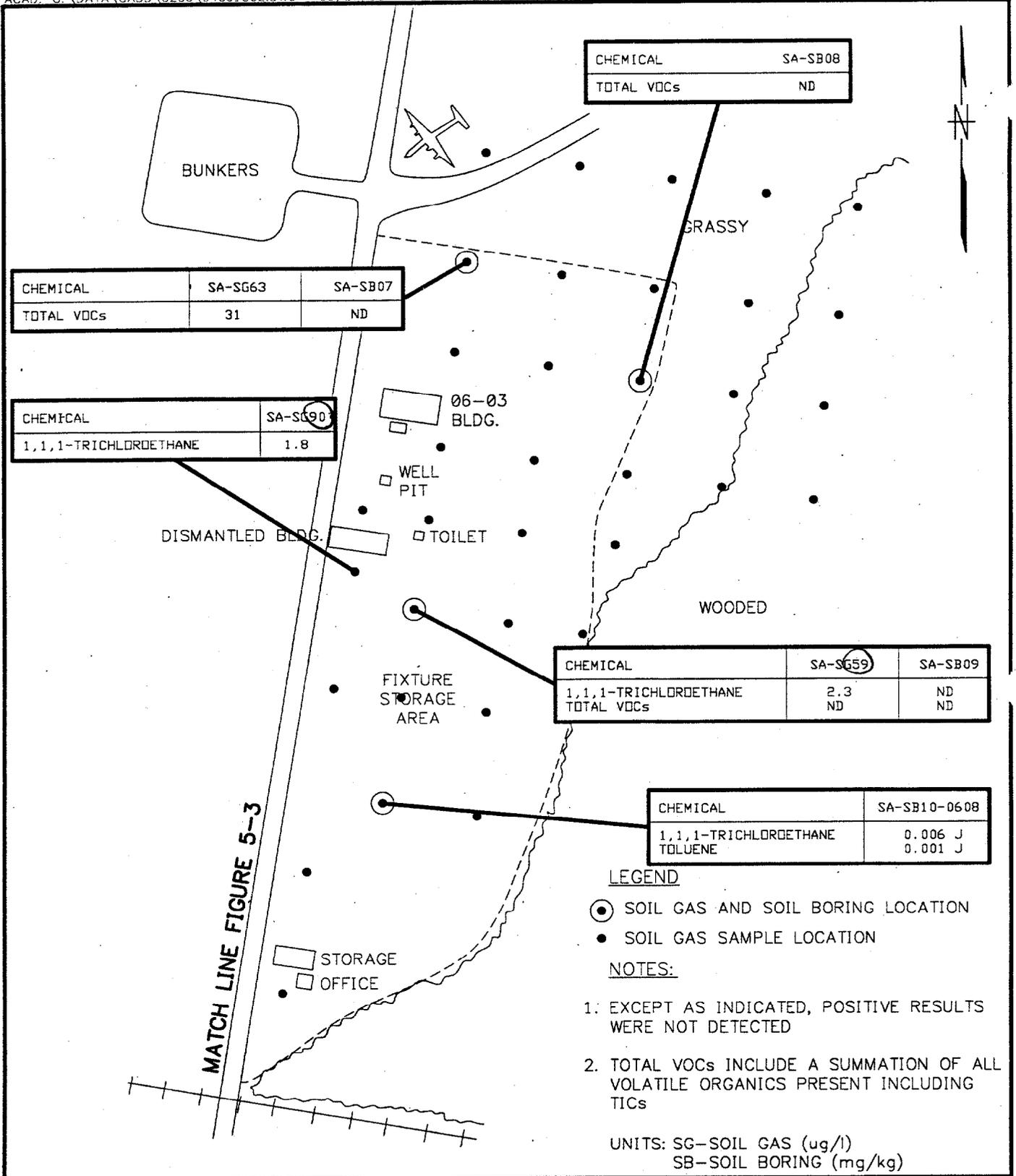
Split-spoon samples collected during the soil boring drilling indicate saturated soils encountered at varying intervals ranging from 4 to 23 feet below grade surface. The following tables shows the approximate depth of saturation based on soil boring logs at the Fixture Storage Area:



**SITE 11A - STORAGE AREA
VOLATILE ORGANIC RESULTS
NWIRP, CALVERTON, NEW YORK**

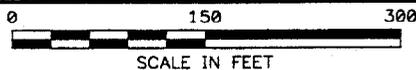
FIGURE 5-3





**SITE 11B - STORAGE AREA
VOLATILE ORGANICS RESULTS
NWIRP, CALVERTON, NEW YORK**

FIGURE 5-4



<u>Soil Boring No.</u>	<u>Approximate Groundwater Interface (bgs)</u>
SA-SB01	14'
SA-SB02	13'
SA-SB03	5'
SA-SB04	8'
SA-SB05	4'
SA-SB06	12'
SA-SB07	23'
SA-SB08	23'
SA-SB09	15'
SA-SB10	13'

5.7.3 Analytical Results

The field program conducted at this site consisted of a soil gas program followed by a soil boring program.

Soil Gas Program

Analysis of soil gas samples at Site 11 was conducted during the field investigation to characterize potential source areas and to assist in placement of soil borings near suspected source areas. The soil gas was collected in evacuated glass vials from depths of 3 to 6 feet below ground surface. The gas samples were then analyzed by gas chromatography using a flame ionization detector (FID) for identification of monocyclic aromatic hydrocarbons (BTEX) and an electron capture detector (ECD) for identification of chlorinated solvents.

As shown in Figure 5-3, Site 11A contains only two soil gas sampling locations for which positive results were reported. Although no targeted chemicals were detected at the locations, total VOCs were found at locations SA-SG51 (23 ug/L) and SA-SG38 (12 ug/L). A soil sample was collected at the location of SA-SG51, but no positive results were reported for volatile organic compounds this soil sample.

Figure 5-4 shows sampling locations and positive results of the soil gas program for Site 11B. One positive result was reported for total VOCs at location SA-SB63 (31 ug/L), but analysis of the soil sampled at this location (SA-SB07) yielded no positive results for target compound list volatiles. 1,1,1-Trichloroethene was detected in the soil gas sampled at locations SA-SG90 (1.8 ug/L) and SA-SG59 (2.3 ug/L), but the soil sample collected at the latter location (SA-SB09) also failed to produce positive

results for volatile organic chemicals. Alternatively, non detects reported for soil gas at SA-SB10 were contradicted by positive results reported (for 1,1,1-trichloroethane and toluene) in associated soil.

Soil Borings

Soil samples collected at the Fixture Storage Area (Site 11) were analyzed for Target Compound List (TCL) volatile organic compounds and freon 113 using the USEPA Contract Laboratory Program (CLP) Statement of Work OLM01 (Revision 8). The soils were also analyzed for TAL metals and cyanide according to the analytical methods described in the CLP Statement of Work ILM02 (Revision 1). The organic analysis method provides Contract Required Quantitation Limits (CRQLs) of 10 ppb (ug/l or ug/kg) for all target compounds and chemical-specific method detection limits which range from 0.5 to 9 ppb. Method detection limits for metals varied according to the identity of the subject chemical. Solid sample quantitation and detection limits are subject to revision based on individual sample moisture content.

Positively detected chemicals in Site 11 soils included 2-butanone, chloroform, 1,1,1-trichloroethane, and toluene and various inorganics. All positive results for organics were found to be less than respective CRQLs. The following text provides a discussion of the results for the soil results for the Fixture Storage Area.

As summarized in Table 5-1, positively detected organic chemicals in soil from Site 11 included 2-butanone (detected in one of 22 samples), chloroform (detected in three of 22 samples), 1,1,1-trichloroethane (detected in two of 22 samples), and toluene (detected in two of 22 samples). All reported concentrations were less than respective quantitation limits and range from 0.001 to 0.009 mg/kg. Inorganics detected in the soil samples from Site 11 included aluminum, arsenic, barium, calcium, cobalt, copper, iron, magnesium, manganese, nickel, vanadium, zinc, and cyanide.

Tentatively Identified Compounds (TICs) detected in the soil samples collected at Site 11 include a number of unidentifiable organic chemicals which were recorded as unknowns on the Form I TIC reports for each affected sample. Also detected was Freon-12 (chlorodifluoromethane) in sample SA-SB02-1214 and an unknown hydrocarbon in sample SA-SB03-0406.

Table 5-2 presents a comparison of analytical results to New York State Standards for soil as outlined in Technical and Administrative Guidance Memorandum (TAGM) on Determination of Soil Cleanup Objectives and Cleanup Levels (Number 4046 (final), January 24, 1994). Also included in this table are chemical-specific frequency of detection, range of positive results, and average of all results. The arithmetic average of the data set was determined considering non detected values to be equal to one-half of the

TABLE 5-1

**SUMMARY OF ANALYTICAL DATA - SOIL SAMPLES (mg/kg)
SITE 11 - FIXTURE STORAGE AREA
NWIRP CALVERTON, NEW YORK**

Chemical	Method Detection Limit	SA-SB01- 0608	SA-SB01- 1214	SA-SB02- 0810	SA-SB02- 1214	SA-SB03-0002	SA-SB03- 0406	SA-SB03-0406-DU
							Field Duplicate Samples	
2-Butanone	0.005							
Chloroform	0.001					0.008 J	0.009 J	0.009 J
1,1,1-Trichloroethane	0.002	0.001 J						
Toluene	0.001	0.001 J						
Aluminum	18.0	356 J	280 J	348 J	291 J	3,190 J	736 J	1,070 J
Arsenic	0.60				0.71 J	0.85 J		
Barium	4.0					10.9 J		
Calcium	200					777		
Cobalt	2.0							
Copper	2.0							
Iron	8.0	656 J	923 J	458 J	484 J	4,410 J	555 J	675 J
Magnesium	20.0					450		
Manganese	1.0	18.3 J	11.7 J	10.5 J	16.9 J	46.7 J	3.2 J	2.8 J
Nickel	6.0					9.8 J		
Vanadium	2.0					38.8 J		2.3 J
Zinc	2.0	2.3 J		4.0 J	5.0 J	20.0 J	5.5 J	6.2 J
Cyanide	0.50							
Tentatively Identified Compounds (TICs)	NA				Freon-12		Unknown Hydrocarbon	

TABLE 5-1 (Continued)
SUMMARY OF ANALYTICAL DATA - SOIL SAMPLES (mg/kg)
SITE 11 - FIXTURE STORAGE AREA
NWIRP CALVERTON, NEW YORK

Chemical	Method Detection Limit	SA-SB04- 0002	SA-SB04- 0608	SA-SB05- 0002	SA-SB05- 0204	SA-SB06-0406	SA-SB06- 1012	SA-SB07-0204
2-Butanone	0.005	0.005 J						
Chloroform	0.001							
1,1,1-Trichloroethane	0.002							
Toluene	0.001							
Aluminum	18.0	5,080 J	362 J	400 J	542 J	521 J	351 J	468 J
Arsenic	0.60	0.84 J						
Barium	4.0	9.5 J						
Calcium	200				681	1,130 J	1,020 J	
Cobalt	2.0	2.1 J			2.6 J			
Copper	2.0			2.2 J				
Iron	8.0	5,200 J	357 J	907 J	1,130 J	852 J	1,070 J	743 J
Magnesium	20.0	559		90.6	141	93.7		
Manganese	1.0	40.4 J	8.7 J	46.9 J	38.9 J	15.3 J	26.9 J	9.4 J
Nickel	6.0							
Vanadium	2.0	8.9 J			3.0 J		3.4 J	
Zinc	2.0	13.7 J	4.3 J	8.5 J	35.4 J	28.9 J	32.0 J	14.5 J
Cyanide	0.50							
Tentatively Identified Compounds (TICs)	NA						Freon 12	Freon 12

TABLE 5-1 (Continued)
SUMMARY OF ANALYTICAL DATA - SOIL SAMPLES (mg/kg)
SITE 11 - FIXTURE STORAGE AREA
NWIRP CALVERTON, NEW YORK

Chemical	Method Detection Limit	SA-SB07- 1618	SA-SB07-1618- DU	SA-SB08- 1012	SA-SB08- 2022	SA-SB09- 1214	SA-SB09- 1416	SA-SB10- 0608	SA-SB10- 1214
		Field Duplicate Samples							
2-Butanone	0.005								
Chloroform	0.001								
1,1,1-Trichloroethane	0.002							0.006 J	
Toluene	0.001							0.001 J	
Aluminum	18.0	204 J	242 J	362 J	420 J	396 J	319 J	291 J	307 J
Arsenic	0.60								
Barium	4.0								
Calcium	200				273	1,760 J			
Cobalt	2.0								
Copper	2.0								
Iron	8.0	415 J	504 J	500 J	1,380 J	707 J	830 J	556 J	555 J
Magnesium	20.0					82.9			
Manganese	1.0	23.2 J	16.4 J	5.0 J	33.9 J	11.9 J	8.4 J	9.9 J	8.8 J
Nickel	6.0								
Vanadium	2.0				3.7 J				
Zinc	2.0	3.2 J	2.6 J	2.1 J	8.4 J	48.4 J	3.7 J	2.0 J	4.2 J
Cyanide	0.50	1.5 J							
Tentatively Identified Compounds (TICs)	NA			Freon 12		Unknown			

TABLE 5-2

**EVALUATION OF ANALYTICAL DATA - SOIL SAMPLES
SITE 11 - FIXTURE STORAGE AREA
NWIRP CALVERTON, NEW YORK**

Chemical	Frequency of Detection	Range of Positive Results (mg/kg)	Arithmetic Mean of Results (mg/kg)	95% Percentile of Background Concentrations (mg/kg)	New York State TAGM (mg/kg)	
					Protection of Human Health	Protection of Groundwater
2-Butanone	1/22	0.005	0.004	N/A	4,000	0.3
Chloroform	3/22	0.008 - 0.009	0.002	N/A	114	0.30
1,1,1-Trichloroethane	2/22	0.001 - 0.006	0.002	N/A	7,000	0.76
Toluene	2/22	0.001	0.0008	N/A	20,000	1.5
Aluminum	22/22	204 - 5,080	752	16,800	Background	
Arsenic	3/22	0.71 - 0.85	0.40	14.0	7.5 or Background	
Barium	2/22	9.5 - 10.9	3.0	21.1	300 or Background	
Calcium	6/22	273 - 1,760	337	447	Background	
Cobalt	2/22	2.1 - 2.6	1.2	3.7	10 or Background	
Copper	1/22	2.2	1.2	23.2	25 or Background	
Iron	22/22	357 - 5,200	1,080	16,900	2,000 or Background	
Magnesium	6/22	82.9 - 559	97.4	1,560	Background	
Manganese	22/22	2.8 - 46.9	18.8	90.8	Background	
Nickel	1/22	9.8	3.6	6.7	13 or Background	
Vanadium	5/22	2.3 - 38.8	3.5	43.6	150 or Background	
Zinc	21/22	2.0 - 48.4	11.6	27.2	20 or Background	
Cyanide	1/22	1.5	0.56	ND	(1)	

(1) - Cleanup goal for cyanide dependent on form of cyanide complex and leaching potential.

ND - Chemical not detected in background soil sample analysis.

reported method detection limit. The TAGM values presented for organic chemical are concentrations which are protective of human health (systemic or cancer effects) and groundwater quality. TAGM-specified cleanup goals for inorganic chemicals are based on site-specific background concentrations or a numerical standard equivalent to average background levels as determined by representatives of the New York Department of Environmental Conservation.

The relevant TAGM standards for organic chemicals were not exceeded by either the reported maximum or calculated average concentrations for Site 11. Maximum and average inorganic chemical concentrations are less than respective 95th percentile values of background concentrations. Background samples were collected from uncontaminated areas at NWIRP Calverton and analyzed for TAL metals in order to establish natural concentrations of inorganics at the site, (See Section 1.4).

Quality Assurance/Quality Control (QA/QC) and Blank Samples

Review of the analytical data available for the QA/QC and field and laboratory blank samples and the results of an intensive data validation indicate there to be some deficiencies in the analytical data quality. Sample data which were affected by analytical and/or QC problems have been qualified in accordance with U. S. EPA Region II data validation protocol. Appendix C provides a complete assembly of the data validation memoranda which were prepared in support of the data evaluation.

Field duplicate precision for soil samples was considered to be within the data validation control limits. Data validation resulted in the estimation of some positive sample results and quantitation limits for organic compounds based on holding time exceedences, calibration noncompliances, and reported positive results which were less than respective CRQLs. Maximum concentrations reported for methylene chloride (28 ug/kg), acetone (40 ug/l), 2-butanone (15 ug/l), and 2-hexanone (5 ug/kg) in field QC or laboratory method blanks were used to qualify affected analytical data.

Some inorganic analysis data are qualified on the basis of CRDL recoveries outside of control limits, baseline drift, laboratory duplicate and matrix spike analysis deficiencies, low correlation coefficient for serial dilutions, and low post digestion spike recoveries. Chromium and iron were detected in blank analyses at maximum concentrations of 17.0 ug/l and 103 ug/l, respectively.

Summary

Soil samples collected at the Fixture Storage Area site had detectable concentrations of 2-butanone, chloroform, 1,1,1-trichloroethane, and toluene, in addition to several positive detections of various inorganic

constituents. However, the detected chemicals were present at concentrations less than respective CRQLs and applicable TAGMs values.

5.8 CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER ACTION

1. The presence of low concentrations of solvents at the site are indicative that trace quantities of industrial chemicals have entered the soils and groundwater. However, based on the concentrations detected, there is no risk to human health and the environment. As a result, no additional action is recommended for this site.

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