

**INSTALLATION RESTORATION PROGRAM  
ACTION MEMORANDUM  
FIRE TRAINING AREA 2 (SITE FT-002)  
PLATTSBURGH AIR FORCE BASE  
PLATTSBURGH, NEW YORK**

**CONTRACT No. F41624-94-D-8106  
DELIVERY ORDER 0003  
CDRL # A029  
DOCUMENT CONTROL #D003042**

**Submitted to:**

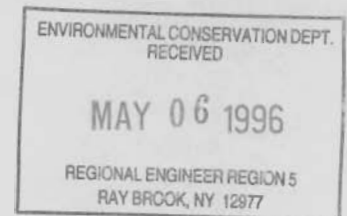
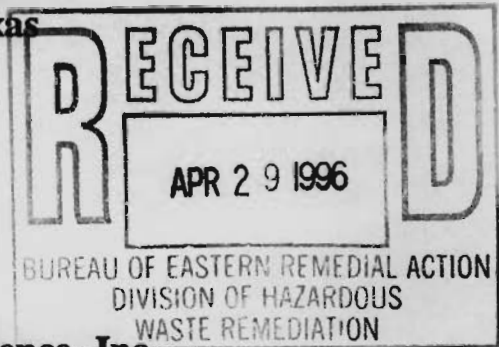
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**ACTION MEMORANDUM**  
**DECLARATION STATEMENT**

**Installation Restoration Program**

**Site FT-002 Fire Training Area**

**Plattsburgh Air Force Base, Plattsburgh, New York**

**1.0 STATEMENT OF BASIS AND PURPOSE**

This decision document presents the preferred removal action alternative for remediating vadose zone soil (i.e. soil above the groundwater table) at the Installation Restoration Program (IRP) Site FT-002 Fire Training Area at Plattsburgh Air Force Base (PAFB), New York. The removal action was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Contingency Plan (NCP).

**2.0 ASSESSMENT OF THE AREA**

Conditions presently exist at the PAFB IRP Site FT-002 which, if not addressed by implementing the response action documented in this Action Memorandum, will lead to (1) actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants, and (2) migration to the local groundwater of high levels of additional hazardous substances or pollutants or contaminants.

**3.0 DESCRIPTION OF PREFERRED REMOVAL ALTERNATIVE**

The preferred removal action alternative addresses the principle threat of FT-002 by removing benzene, toluene, ethylbenzene, xylenes (BTEX) and chlorinated solvents, from the vadose zone soils. The preferred alternative for the FT-002 site vadose zone soils is based on available site information and will follow the Presumptive Remedy Approach (EPA 540-F-93-048), which in this case involves soil vapor extraction (SVE) and bioventing for soils contaminated with volatile and semivolatile organic compounds (VOCs and SVOCs) such as BTEX and chlorinated solvents. The use of SVE and bioventing is recommended based on pilot test and site investigation data which has shown the efficacy of these technologies in removing volatile contaminants from the FT-002 soils. The recommended removal action for Site FT-002 includes the following components:

Soil vapor extraction will be implemented in the vicinity of Pit 1 at FT-002 to achieve removal of chlorinated hydrocarbons known to exist at that area. Bioventing will be implemented in areas not impacted by chlorinated hydrocarbons, namely Pits 2, 3, and 4. The full-scale SVE/bioventing system will consist of a number of vertical soil vapor extraction and/or bioventing wells manifolded to two or more centrifugal vacuum blowers. The extraction wells will be placed so that the entire area of vadose zone contamination at the Pit 1 area of FT-002 is impacted by the SVE system. Similarly,

the bioventing wells will be placed in and around the Pits 2, 3, and 4 area. Tentatively, the extracted soil gas will be treated by a catalytic or flameless thermal oxidation unit (and, if necessary, an acid scrubber), or vapor phase carbon treatment prior to emission to the atmosphere. Additionally, concurrent free product removal and depression of the groundwater will be implemented to expose additional soils to treatment.

#### 4.0 STATUTORY DETERMINATION

The preferred removal alternative protects human health and the environment, complies with applicable or relevant and appropriate federal and state requirements, and is cost-effective. The removal alternative satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume of hazardous substances as a principal element.

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Name/Title

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Date

## SECTION 1.0

### INTRODUCTION

#### 1.1 INTRODUCTION

Plattsburgh Air Force Base (PAFB) has determined that a "time critical" removal action is necessary at Site FT-002. Fire Training Area - 002 (FT-002) is located approximately 500 feet west of the runway, approximately 500 feet east of the PAFB boundary, south of landfill LF-022 and north of LF-023. The site is located on a land surface which slopes gently toward the Saranac and Salmon Rivers which are located approximately 1.9 miles east of the site (Figure 1.1). Four bermed former fire fighter training pits are located at the site and range in size from approximately 60 to 160 feet in diameter. The majority of the soil contamination on the site is beneath and adjacent to Pit 1, the smaller of the bermed pits. Figure 1.2 shows the location of the pits in relation to Perimeter Road.

#### 1.2 SITE HISTORY

Fire fighting training exercises were conducted at this site from the middle to late 1950s and continued until the site was permanently closed on May 22, 1989. Typically, the bottom of a pit was saturated with water and then filled with a layer of jet fuel and ignited. Fire fighters would practice extinguishing the flames which generally surrounded a mock metal aircraft in the pit. Unburned fuel soaked into the ground creating the contaminated soil column now found beneath the pit. In 1980, cement-stabilized soil liners were added to Pits 2 and 3 which were active at that time; Pits 1 and 4 had been deactivated. Prior to strict environmental regulations, solvents and other chemicals were sometimes mixed with fuel and placed in the pit for burning. Some fuel and noncombustible fluids seeped into the soil beneath the unlined pits or leaked through cracks in the lined pits. After years of training activities at the site, the soil column beneath each pit has become contaminated with fuel-related compounds and solvents. Another potential source is the oil/water separator near Pit 4 that received drainage from Pits 2 and 3.

The primary contaminants in the Pit 1 source area are fuel residuals which have migrated to a depth of approximately 35 to 40 feet where the maximum depth to groundwater is encountered. Free product has been observed in near Pit 1. A maximum petroleum hydrocarbon (PHC) concentration of 12,000 mg/kg has been detected in the surface soils sampled at a depth between 2 and 4 feet below ground surface (bgs). Samples collected inside the Pit 1 source area and above the groundwater table showed PHC concentrations from 1,800 to 12,000 mg/kg. The volatile organic compounds benzene, toluene, ethylbenzene, and total xylenes (BTEX) were detected in the soils above the water table along with trace amounts of chlorinated solvents such as trichloroethene and dichloroethene compounds (ABB Environmental Services, 1992).

The primary contaminants in the Pit 4 source area are also fuel residuals which have migrated to a depth of approximately 35 feet where the maximum depth to groundwater is encountered. Free product has been observed in monitoring wells downgradient of Pit 4 near the oil/water separator. A maximum PHC concentration of 4,500 mg/kg has been detected in the surface soils sampled at a depth between 2 and 4 feet bgs. Samples collected inside the pit source area and above the water table showed PHC concentrations from 450 to 7,250 mg/kg. Trace amounts of volatile organic compounds ethylbenzene and xylenes were also detected in the soils above the water table. PHC concentrations in a boring next to



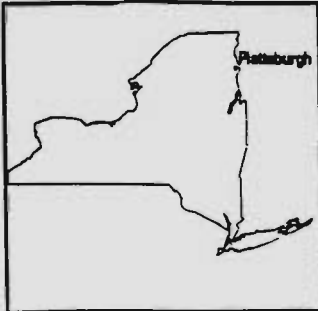
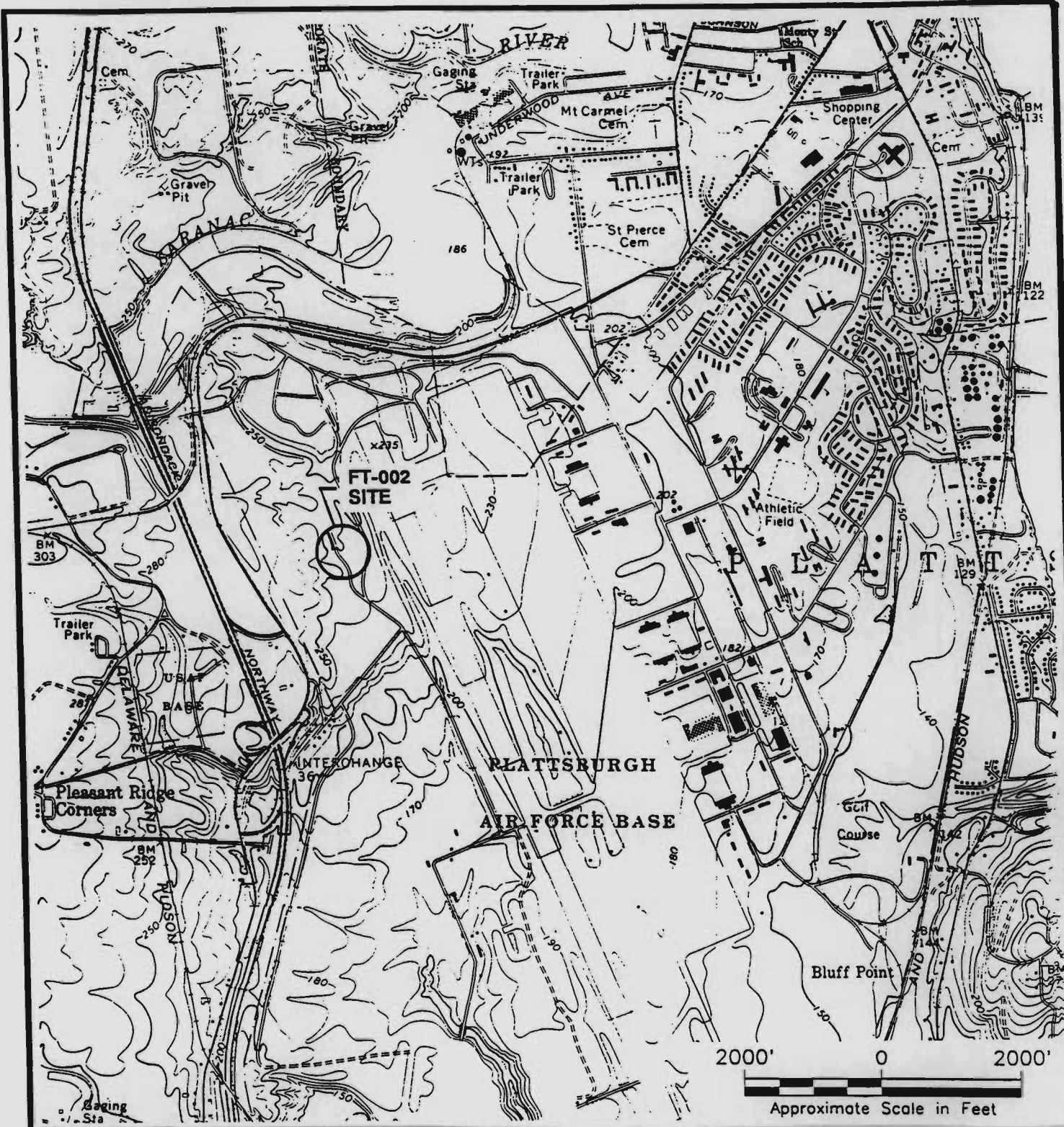
the oil/water separator were below the detection limit except at the water table where they exceeded 20,000 mg/kg. (ABB Environmental Services, 1992).

This Action Memorandum presents a proposed removal action to address immediate environmental risks associated with previous spills at the site. The proposed removal action presented includes soil vapor extraction (SVE) and bioventing of contaminated soil which are recommended in accordance with available site information and the Presumptive Remedy Approach (EPA 540-F-93-048). The SVE technology will be implemented in the Pit 1 area of FT-002 to achieve removal of chlorinated hydrocarbons. Because no chlorinated hydrocarbons have been found in the Pits 2, 3, and 4 area, bioventing will be implemented at these locations to address the hydrocarbon contamination. All site information collected to date, including previous site investigation and pilot test data, indicate that SVE and bioventing will be effective remedial technologies for remediating vadose zone soils at the FT-002 site. The site soils are primarily fine to medium grained sands with high air permeabilities. The site contaminants are primarily volatile organic compounds, which have been shown to be effectively removed by both SVE and bioventing. The combination of highly permeable soils and easily volatilized contaminants provide the optimum conditions to ensure the efficacy of the SVE and bioventing technologies. Based on these data, the Presumptive Remedy Approach is applicable at the FT-002 site.

Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and Environmental Protection Agency's (EPA's) scientific and engineering evaluation of performance data on technology implementation. The objective of the presumptive remedies initiative is to use the program's past experience to streamline site investigation and speed up selection of cleanup actions. Over time, presumptive remedies are expected to ensure consistency in remedy selection and reduce the cost and time required to clean up similar types of sites. Presumptive remedies are expected to be used at all appropriate sites except under unusual site-specific circumstances. Based on the site information available, the presumptive remedy approach is applicable at the FT-002 site.

This document is presented in the format provided in the Environmental Protection Agencies (EPA) Action Memorandum Guidance Document, dated September 1990 (OSWER Directive 9360.3-01).





NEW YORK  
QUADRANGLE LOCATION

LONGITUDE: N44° 38' 49"  
LATITUDE: W73° 27' 17"

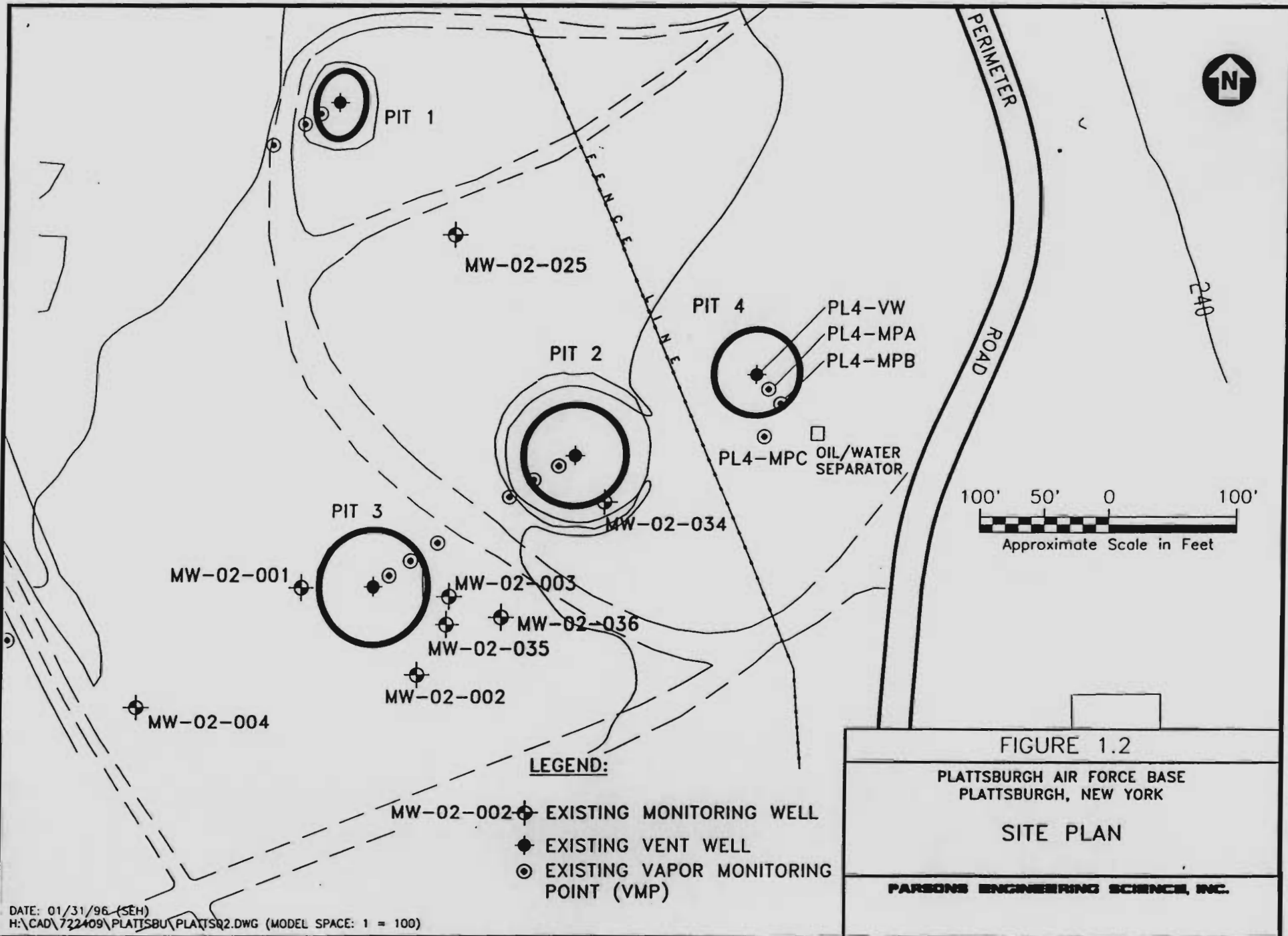


**FIGURE 1.1**

**PLATTSBURGH AIR FORCE BASE  
PLATTSBURGH, NEW YORK**

**SITE LOCATION MAP**

**PARSONS ENGINEERING SCIENCE, INC.**



**LEGEND:**

- MW-02-002 EXISTING MONITORING WELL
- EXISTING VENT WELL
- EXISTING VAPOR MONITORING POINT (VMP)

FIGURE 1.2

PLATTSBURGH AIR FORCE BASE  
PLATTSBURGH, NEW YORK

SITE PLAN

PARSONS ENGINEERING SCIENCE, INC.

## **SECTION 2.0**

### **PURPOSE**

PAFB is undertaking a "time critical" Removal Action to remediate the vadose zone soils (i.e., soil above the groundwater table) at the former Fire Training Area-002 (FT-002) located at PAFB in Plattsburgh, New York, pursuant to the Federal Facilities Agreement dated September 12, 1991. This is being undertaken as a component of the Department of Defense (DOD) Installation Restoration Program (IRP) and as a component of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1980, and amended by the 1986 Superfund Amendments and Reauthorization Action (SARA).

The purpose of this Action Memorandum is to document the proposed removal action described herein for the area designated as Site FT-002 at PAFB.

## SECTION 3.0

### SITE CONDITIONS AND BACKGROUND

#### 3.1 SITE DESCRIPTION

##### 3.1.1 Physical Location

PAFB is located in northeastern New York State, adjacent to Lake Champlain (Figure 3.1). It is approximately 26 miles south of the Canadian border and 167 miles north of Albany, New York. The base is bordered on the north by the City of Plattsburgh and on the east by Lake Champlain. The base covers 4,795 acres: 3,365 acres are federally owned and controlled by the military, and 1,430 acres are registered as easement tracts. PAFB was officially closed by the Department of Defense on 30 September 1995, and control of the property transferred to the Plattsburgh Development Committee.

Site FT-002, formerly designated FT-001, is located in the northwest corner of the base and is approximately 700 feet wide and 800 feet long. The FT-002 site is located approximately equidistant (500 feet) between the Plattsburgh AFB runway to the east and the base boundary on the west. Site FT-002 is located south of domestic waste landfill LF-022 and north of domestic waste/spent munitions landfill LF-023. Previous remedial investigation studies suggested that these sites are not contributing an appreciable mass of contamination to groundwater affected by FT-002 operations. Both source areas (LF-022 and LF-023) are to be covered under separate remedial action implementation programs to minimize exposure risks from the surface soil pathway.

Figure 3.2 is a site location map showing the position of the site relative to PAFB and the surrounding area. The site is located on a land surface that slopes gently eastward toward the confluence of the Saranac and the Salmon Rivers, which is located approximately 1.9 miles east of the site. Figure 3.3 is a site map showing the FT-002 site and the immediately adjacent area in detail. The site consists of four bermed pits that range in diameter from approximately 60 to 160 feet. The surface of the site is transected by several unpaved roads. Site FT-002 is situated in a limited-access area within the former PAFB.

##### 3.1.2 Removal Site Evaluation

Site FT-002 was used to train base and municipal fire-fighting personnel from the mid- to late-1950s until the site was permanently closed to standard fire training activities on May 22, 1989. However, limited emergency rescue training had been allowed at the site since 1989 and previous to closure of the base. During fire training exercises, fires were ignited in fire training pits located in the FT-002 area. Prior to 1980, the fire pits consisted of sand and gravel depressions. In 1980, cement-stabilized soil liners were added to active Pits 2 and 3. Pits 1 and 4 had been previously removed from service.

For the purpose of fire training exercises, the pits were typically saturated with water before adding approximately 75 to 100 gallons of fuel, which was then ignited (ABB Environmental Services, Inc., and URS Consultants, Inc., 1993). Pits 2 and 3 were supplied with fuel from a partially buried fuel storage tank. The fuel was fed to the pits via underground gravity feed lines. The fuel for the fire pits consisted mainly of off-specification waste jet fuel (JP-4) mixed with waste oil. Solvents and other chemicals were sometimes mixed with the fuel. A single training exercise usually consisted of four consecutive cycles of igniting and extinguishing fires in the training pits. Prior to the 1980s, a maximum of 2,000 gallons of fuel was burned weekly during fire training exercises (Radian, 1985). Previous site investigations have suggested training activities may also have been conducted in an area north and west of the pits (ABB Environmental Services, Inc. and URS Consultants, Inc., 1993).

### 3.1.3 Site Characteristics

#### 3.1.3.1 Physical Features

Figure 3.3 is a generalized map showing the major features at Site FT-002. The general surface features on and adjacent to the FT-002 site consist of the fire training area proper, paved and dirt roads, the runway and flightline, and the drainage area between the runway and the flightline. Three fire training pits can be identified by surface features at the site. Pits 2 and 3 are easily recognized by the presence of berms and cement-stabilized soil liners. Pit 1 has no visible lining or berm, but can be identified from distressed vegetation on its north side and from aerial photographs as a slight land surface depression. The fourth fire training pit, Pit 4, was the most difficult to discern and was not located until the Phase II Remedial Investigation (RI). Pit 4 still has a slight berm, which can be identified on a 2-foot contour interval topographic map (ABB Environmental Services, Inc., 1992).

A partially buried fuel storage tank, which was located south of Pit 1, was removed in the fall of 1990. The soil and gravel ramp built up and over this former tank are still present at the site. Underground fuel supply lines that run from the former tank area to Pits 2 and 3 and underground drainage lines that run from Pits 2 and 3 to the oil/water separator east of Pit 2 are still intact.

The FT-002 site was graded from east to west at some time during its operational history, as indicated by mounds of dirt and debris along the western edge of the site (Figure 3.3). The Phase I RI report identified the presence of a large storage tank, approximately 30 feet long and 7 feet in diameter, at the northwestern edge of the site (E.C. Jordan, Co., 1990). This tank was removed by the U.S. Air Force in either late 1993 or early 1994.

The major manmade features at the site consist of the fire training pits, paved and unpaved roads, two buildings associated with the free product recovery system currently operating at the site and a 4-foot-high, three-wire fence.

The nearest on-base housing unit is more than 6,000 feet southwest (downgradient) of the FT-002 site. The nearest off-base residential area is the cluster of mobile homes located approximately 2,000 feet south of the site. Various light industries are located about 800 feet to the west, and Interstate 87 is about 1,600 feet west of the site.

The fire training pits at the FT-002 site are essentially barren of vegetation. Surrounding environs can be described as successional old field and successional shrubland. Trees have overgrown the soil mounds created during surface grading activities on the western perimeter of the site.

#### 3.1.3.2 Geological and Hydrogeological Characteristics

The geology and subsurface conditions at FT-002 were characterized as part of the initial site investigations (E.C. Jordan, Co., 1989a), the Phase I RI (E.C. Jordan, Co., 1990), and the EE/CA (Parsons ES, 1994). The following section presents the geology and hydrogeology of the area near Site FT-002.

#### 3.1.3.3 Site Stratigraphy

Four distinct stratigraphic units underlie the FT-002 site: sand, clay, till, and carbonate bedrock. The sand unit generally extends from ground surface up to 90 feet bgs in the vicinity of the FT-002 site. A 7-foot-thick clay unit has been identified on the eastern side of the site. The thickness of the clay on the western side of the site has not been determined. A 30- to 40-foot thick clay/till unit is also present from 80 to 105 feet bgs in the vicinity of the FT-002 site. Bedrock is located approximately 120 feet bgs. Groundwater occurs in the sand unit approximately 30 to 40 feet bgs. Interpretative profiles were generated from soil borings, soil samples collected during the installation of monitoring wells, CPT explorations, laboratory grain-size analyses, and geophysical surveys (Parsons ES, 1994). The locations of the geologic profiles are shown in Figure 3.4. The northwest-



southeast profile (parallel to the direction of groundwater flow) and the north-south profile (perpendicular to the direction of groundwater flow) are shown in Figures 3.5 and 3.6, respectively.

#### Upper Sand Unit

The upper sand unit consists of well-sorted, medium-to fine-grained sand, with a trace of some silt. Gravel and cobbles are only occasionally encountered, and fine sands and silts become more predominant at the base of the sand unit. The bottom 5 to 10 feet of the sand unit consists of silty sand with silt lenses (ABB Environmental, Inc., 1992). The cone penetrometer test (CPT) data collected during the EE/CA confirm the presence of fine-grained sand and silt at the bottom of the sand unit (Parsons ES, 1994). The sand was observed to change from light brown to gray at the water table, which could be attributable to a change from a generally oxidizing environment (unsaturated soil) to a reducing environment (saturated soil).

#### Clay Layer

The next lower unit in the profile is a deep water glacial lacustrine clay deposit. The extent and depth of the clay layer are based on data obtained during CPT explorations and during installation of deep groundwater monitoring wells. Previous data suggest that the clay layer is located approximately 90 feet bgs on the west side of the FT-002 site and 20 feet bgs on the east side of the flightline (ABB Environmental, Inc. and URS Consultants, Inc., 1993). Although few borings have completely penetrated the clay layer, seismic survey results from the eastern side of the FT-002 site suggest that the clay layer is approximately 7 feet thick. Together the clay and overlying sands represent a regressive sequence caused by retreating shorelines related to the shrinkage of the former Champlain Sea. The sea receded due to isostatic rebound of the crust after the melting of the glaciers (Fishers, 1968; ABB Environmental, Inc. and URS Consultants, Inc., 1993).

#### Till

Gray till was found on the east side of FT-002 at an estimated depth of 88 feet bgs during the installation of monitoring well MW-02-007. (ABB Environmental, Inc., 1992; ABB Environmental, Inc. and URS Consultants, Inc., 1993). This boring completely penetrated the 37-foot thick till. Till was also encountered at 58 feet bgs south of the site at the Weapons Storage Area, and at a depth of 60 feet at CP-02-007. (Parsons ES, 1994). The till is poorly sorted, with particle sizes ranging from clay and silt to gravel and cobbles. The till near the base of the unit has the characteristics of basal till, whereas the upper portions of the unit contain sediments more massive in structure.

#### Bedrock

The elevation of the fourth geologic unit, limestone bedrock, was determined by previous seismic surveys and auger refusal during the installation of MW-02-007 (ABB Environmental, Inc., 1992; ABB Environmental, Inc. and URS Consultants, Inc., 1993). The bedrock unit is located approximately 120 feet bgs at the FT-002 site, and slopes downward to a depth of 140 feet bgs on the east side of the flightline. No bedrock has been cored during the site investigation or remedial investigation, but outcrops on the eastern side of Plattsburgh AFB have been identified as Ordovician Period limestone (Fisher, 1968).

#### **3.1.3.4 Grain Size Distribution**

No samples from the sand unit were collected during the RI for physical characterization data. However, grain-size distribution, Atterburg limits, water content, and specific gravity were measured on samples of the confining clay unit during previous site characterization efforts (E.C. Jordan, Co., 1991b; ABB Environmental, Inc., 1992).

Clay samples used for these types of analyses were collected using a 3-foot, thin-wall tube to prevent significant disturbance of soil core integrity (ABB Environmental, Inc. and URS Consultants, Inc., 1993). Grain-size distribution was determined using the standard American Society for Testing Materials (ASTM) sieve analysis

methodology (ASTM D 422). Classification ranged from a gray clay with a trace of sand and silt to a gray fine sand with some silt and clay. The grain size distribution was as follows: sand-size particles ranged from 0.8 to 35.3 percent, silt-size particles ranges from 4.9 to 33.9 percent, and clay-size particles ranged from 31.6 to 89.8 percent (ABB Environmental, Inc. and URS Consultants, Inc., 1993).

Water content of the confining clay layer ranged from 40 to 56 percent using ASTM Method D 2216. Results of the Atterburg limit tests completed using ASTM Method D 4318 showed that, in general, the clay samples could be classified as a plastic clay with a Unified Soil Classification System (USCS) classification of CH. The specific gravity of the tested clay samples ranged from 2.65 to 2.85. Higher specific gravities were likely attributable to the presence of greater amounts of clay-sized particles in the particular sample (ABB Environmental, Inc. and URS Consultants, Inc., 1993).

#### **3.1.3.5 Groundwater Flow Patterns**

Three distinct hydrogeologic units have been identified beneath the FT-002 site. Data collected during previous site investigations suggest that the uppermost aquifer is unconfined and exists in the shallow sand unit described in Section 3.1.3.3. The depth to groundwater in the sand aquifer ranges from 45 feet bgs on the west side of the site to almost zero between the flightline and runway.

The second unit is a series of aquitards and aquicludes consisting of silts, clays, and glacial till (i.e., the confining layers). The third hydrogeologic unit is a confined aquifer within the limestone bedrock unit (Giese and Hobba, 1970; ABB Environmental, Inc. and URS Consultants, Inc., 1993). This bedrock aquifer is unconfined to the west of Plattsburgh AFB near the Adirondack Mountains, which act as a recharge area. Groundwater then flows to the east under Plattsburgh AFB toward Lake Champlain. Water from this confined bedrock aquifer discharges to topographic lows, the Salmon and Saranac Rivers, and eventually to Lake Champlain. Groundwater from the confined portion of this bedrock aquifer also leaks upward into the unconfined aquifer in the overlying sand unit.

Groundwater flow in the vicinity of the FT-002 site is to the southeast (generally toward Lake Champlain). The average gradient along the groundwater flow lines emanating from the FT-002 site to 8,200 feet downgradient is approximately 0.010 foot per foot (ft/ft) (Figure 3.7). Available data show that groundwater elevations in the unconfined sand aquifer typically vary by about 2 feet across the site. Some wells displayed seasonal variations of 4 to 5 feet, depending on the time of year the measurement is taken. Water level measurements are not available for each season for a full year, but these fluctuations reflect seasonal or annual trends.

#### **3.1.4 Release or Threatened Release into the Environment of a Hazardous Substance, or Pollutant or Contaminant**

As previously discussed, off-specifications waste jet fuel (JP-4), mixed with waste oil and occasionally chlorinated solvents, was routinely fed to one of four fire training pits and ignited for fire fighting exercises. Unburned fuel and noncombustible fluids seeped into the soil beneath the pits. After years of training exercises at the site the soil column beneath each pit has become contaminated with fuel-related compounds, and solvents (Pit 1 only). Other potential sources of contamination include a partially buried fuel storage tank (removed in the fall of 1990), a network of underground fuel supply and drainage lines, and an intact oil/water separator.

##### **3.1.4.1 Previous Sampling Results**

Several site investigations have been conducted since the spring of 1984 to characterize soil and groundwater contamination at FT-002. A preliminary assessment of the site was completed in 1985 (Radian, 1985); a site inspection (E.C. Jordan, Co., 1989a) and a Phase I remedial investigation (E.C. Jordan, Co., 1990) were completed in 1988; a free product recovery pilot test was conducted in 1989 (E.C. Jordan, Co., 1989b and 1991a); a drainage flow study was completed in 1990 (E.C. Jordan, Co., 1991b); a soil remedial investigation



was completed in 1991 (ABB Environmental, Inc., 1992); and a Phase II groundwater remedial investigation was completed in 1991 (ABB Environmental Services, Inc. and URS Consultants, Inc., 1993). A Phase II feasibility study report for the site also has been prepared (URS Consultants, Inc., 1993). An Intrinsic Remediation Engineering Evaluation/Cost Analysis was conducted in 1993 and 1994 (Parsons ES, 1994).

The results of these investigations suggest that the soil and groundwater associated with and downgradient of the fire training area is contaminated with JP-4-related compounds and chlorinated solvents. The unburned fuel mixture seeped beneath the pits and, over years of training exercises, contaminated the soil column and groundwater underlying the pit area. In some areas, the soil is saturated with fuel. LNAPL is present in the capillary fringe and floating on top of the groundwater in some areas (e.g. downgradient of Pit 1, Pit 4, and the oil/water separator). The former fuel storage tank and oil/water separator that served Pits 2 and 3 have also been identified as potential sources of soil and groundwater contamination. The site-specific data presented in Sections 3 and 4 are based on a review of these documents and on data collected by Parsons ES and researchers from the Robert S. Kerr Environmental Research Laboratory (RSKERL). A synopsis of site characterization activities conducted prior to implementation of field work under this program is provided in the Phase I and Phase II remedial investigation reports (ABB Environmental, Inc., 1992; ABB Environmental, Inc. and URS Consultants, Inc., 1993).

#### Soil Gas Contamination

Several soil gas surveys have been conducted at the FT-002 site under the IRP to assess the nature and extent of volatile organic hydrocarbon contamination in shallow subsurface soil. Soil gas samples were also collected at the site during the AFCEE Bioventing Test Initiative program.

Data from the IRP soil gas surveys suggested that most deeper soil contamination (i.e., several feet bgs) is associated with previously identified source areas, namely, Pits 1, 2, 3, and the area north of the pits (ABB Environmental, Inc., 1992). Volatile organic compound (VOC) contamination was typically not found in shallow soil, which can be attributed to migration, volatilization, and biodegradation. Soil gas samples taken in Pits 1, 2, 3, and 4 during the initial bioventing sample event show measurable BTEX concentrations in samples from 12 to 38 feet bgs. The concentration of the BTEX compounds appeared to increase with depth, which can also be attributed to downward migration and/or enhanced volatilization and degradation at and near the ground surface.

#### LNAPL Contamination

Mobile light non-aqueous phase liquid (LNAPL) refers to product that is present at saturation, can percolate through unsaturated soil under the influence of gravity, and can migrate into flowing groundwater. LNAPL is also possibly present in soils at residual or insular saturation, which will prohibit downward percolation. The site characterization methods employed at this site cannot directly distinguish between mobile and residual LNAPL. However, LNAPL that was present within permanent groundwater monitoring wells is, by definition, mobile LNAPL. Additionally, resistivity profiles and laser induced fluorescence (LIF) data can be coupled with soil analytical data to semi-quantitatively define the extent of LNAPL at the site. The methodology used to make this type of correlation is discussed in the EE/CA (Parsons ES, 1994).

Although previous data suggest that approximately 5,000 to 50,000 gallons of LNAPL is within the capillary fringe soils or on the groundwater table at the FT-002 site (URS Consultants, Inc., 1993), the amount of LNAPL in the subsurface at a site can be extremely difficult to quantify. Based on resistivity profiles, CPT LIF data, Site Characterization and Analysis Penetrometer System (SCAPS) data, and product thickness measurements taken in December 1993 at permanent groundwater monitoring wells MW-02-014 and MW-02-15, approximately 39,000 gallons of residual and mobile LNAPL is estimated to be present within the source area at the FT-002 site. The LIF CPT surveys completed at this site in December 1993 and May 1994, respectively, show a LNAPL plume

that is about 350,000 square feet (ft<sup>2</sup>) in areal extent with a maximum thickness of 10 feet within and immediately downgradient of the suspected source areas at the FT-002 site.

Figure 3.8 is an isopach map showing the distribution and measured thickness of LNAPL at the site as of May 1994. This map was prepared using the greatest LNAPL thickness measured at each location during the EE/CA (Parsons ES, 1994).

The LNAPL plume is comprised predominantly of co-mingled BTEX compounds and TCE. Table 3.1 summarizes the relative concentration of the major compounds measured semiquantitatively using gas chromatograph/mass spectrometer (GC/MS) in a sample of free product collected from monitoring well MW-012-015. Soil data collected during the LIF CPT and SCAPS surveys completed in December 1993 and May 1994, respectively, indicate that the concentration of TCE in soil saturated with LNAPL is significantly elevated in the portion of the LNAPL plume adjacent to and downgradient from Pit 1. Soil samples taken from within Pit 3 at several depths showed no detectable concentrations of any of the target compounds, suggesting that this pit may not be a direct source of contamination.

#### Unsaturated Soil Contamination

Previous soil sampling efforts at the FT-002 site focused on defining the nature and extent of fuel-related contamination in vadose zone (unsaturated) soils (ABB Environmental, Inc., 1992). Earlier soil core data showed that fuel-related compounds, especially the BTEX compounds, generally increased in concentration in soil with depth. The maximum concentration of these compounds were typically measured within the capillary fringe near the groundwater surface.

#### Soil BTEX Contamination

Figure 3.9 shows the extent of total BTEX soil contamination at the site as identified during confirmatory soil sampling. Details on the nature and extent of soil contamination are described in previous reports (ABB Environmental, Inc., 1992). A limited number of soil samples were collected and analyzed for BTEX contamination during the EE/CA (Parsons ES, 1994). From these data, soil BTEX contamination appears to extend downgradient to at least the Perimeter Road. The highest measured concentration of total BTEX in soil collected during this effort was 2,051 milligrams per kilogram (mg/kg). This maximum total BTEX concentration was observed in a soil core sample taken from approximately 40 feet bgs at sample location 84D, which is within or at least immediately adjacent to the suspected source area of JP-4 contamination. The JP-4 and TPH concentrations for this sample location and depth (44,300 and 120,000 mg/kg, respectively) are indicative of LNAPL source contamination.

Figure 3.10 schematically illustrates the probable vertical extent of vadose zone BTEX contamination along a line parallel to groundwater flow based on soil data collected in December 1993 and May 1994 (Parsons ES, 1994). These data suggest that most of the LNAPL traveled at saturation to the water table, and little fuel-related contamination is held at residual saturation above the capillary fringe. Measured concentration of total BTEX in soil samples generally increased with depth. However, data from the EE/CA (Parsons ES, 1994) also indicated some level of soil contamination in shallow soils at select sample locations. The presence of fuel-related contamination in shallow soils can probably be attributed to either recent surface spills or subsurface heterogeneities that have impeded downward migration.

Assuming that the former fire training pits are the only source of contamination at the site, the soil data also indicate that fuel-related contamination has spread laterally. Lateral spreading within the capillary fringe can result from seasonal water table fluctuations, the chemical and physical properties of the contaminants themselves, and the effects of capillary forces (ABB Environmental, Inc., 1992). Additionally, some degree of lateral spreading is consistent with a slow release, such as is indicated at FT-002 given the operational history of the site (Farmer, 1983).

### Soil TPH Contaminations

Figures 3.9 and 3.11 show that elevated TPH concentrations are closely associated with elevated BTEX concentrations in soil. The distribution of soil contamination at the site is consistent with the suspected sources. Measured TPH concentrations exceeded 120,000 mg/kg at 84D in saturated soil near the water table within the source area. Measured TPH concentrations at 84F, which are located at the outer fringe of the suspected area of LNAPL, reached a maximum of 2,051 mg/kg of soil. The vertical thickness of TPH contamination that equals or exceeds 100 mg/kg in soil is approximately 25 feet above the water table within the source area. The vertical thickness of TPH contamination decreases and then disappears in areas downgradient of the source area.

Elevated concentrations of TPH in soil did not extend significantly below the groundwater table. Existing data suggest that the winter water table levels may represent a seasonal low. Because soils below this minimum water table level did not appear to be affected by site-related contamination, it appears that the total depth of soil contamination is due to contact with LNAPL. Dissolved contamination in groundwater does not appear to be a significant source of soil contamination.

### Soil Solvent Contamination

Chlorinated solvents were mixed with the JP-4 fuel used in fire training exercises at the site. The Phase I RI report for soils identified TCE, DCE, 1,3-DCB, and 1,4-DCB as fuel-related contamination based on the operational history of the site. Figure 3.12 describes the probable extent of TCE contamination in soil, as measured in December 1993 and May 1994. Elevated TCE concentrations were measured in the same soil samples that exhibited elevated BTEX and TPH concentrations. TCE was not measured in soil samples determined to be uncontaminated with regard to other fuel-related compounds. This correlation of contamination distribution in soil suggests that solvent compounds were mixed with fuel before release and that these solvent compounds have not separated significantly from the source fuel during downward migration via percolation.

### Groundwater Contamination

The upper, unconfined aquifer underlying the FT-002 site is contaminated with dissolved fuel-related compounds and solvents consistent with those identified in the LNAPL and vadose zone soils. Previous groundwater investigations conducted at the site have defined a contaminant distribution pattern based on contaminant concentrations (ABB Environmental, Inc. and URS Consultants, Inc., 1993). The primary site-related contaminants that were measured at elevated concentrations in groundwater near the suspected source area as part of previous investigation efforts were the BTEX compounds, TCE, cis-DCE, trans-DCE, naphthalene, carbon disulfide, and 2-methylnaphthalene. The primary site-related contaminants measured at detectable concentrations in groundwater downgradient of the FT-002 site were identified as the BTEX compounds, TCE, cis-DCE, trans-DCE, and vinyl chloride. The vertical and horizontal extent of the fuel-related BTEX compounds and the solvents differed significantly. These differences will be discussed in detail in subsequent sections. Table 3.4 summarizes the groundwater quality data from previous site investigations for the primary site-related contaminants.

### Dissolved BTEX Contamination

Table 3.5 presents the analytical results for the BTEX compounds measured in groundwater samples collected in December 1993 and May 1994 (Parsons ES, 1994). Dissolved BTEX compounds are present within and downgradient from the suspected source area at FT-002. Groundwater analytical results indicate that the dissolved BTEX groundwater plume currently extends approximately 2,800 feet downgradient from Site FT-002, and has a maximum width of about 500 feet. These data are consistent with groundwater data on the BTEX compounds collected in 1991 as part of earlier characterization efforts (ABB Environmental, Inc., 1992).

The analytical results for several groundwater samples collected from the source area during the December 1993 sampling event showed maximum total BTEX concentrations ranging from 3.14 ppm in MW-02-021 to 6.01

ppm in MW-02-014. These data suggest equilibrium partitioning calculations may overestimate the mass of total BTEX in the groundwater at Site FT-002 (Parsons ES, 1994).

Figure 3.13a is an isopleth map that shows the areal distribution of total BTEX dissolved in groundwater as of December 1993. No groundwater samples were collected and analyzed for BTEX compounds during the May 1994 sampling event. This isopleth map was constructed using the maximum total BTEX concentrations identified at each sample location to provide a conservative estimate of the nature and extent of dissolved BTEX contamination. This figure also includes data collected during a 1991 survey conducted between the runway and flightline. These sample locations are used to confirm the lateral width of the dissolved BTEX plume at its furthest downgradient edges. These data represent the only data available for this area. As indicated on this map, dissolved BTEX contamination is migrating to the southeast in the direction of groundwater flow.

Figure 3.13b is an isopleth map that shows the vertical distribution of total BTEX dissolved in groundwater along the plume centerline as of December 1993. The maximum concentration of dissolved total BTEX was measured immediately downgradient of the area with LNAPL contamination. Concentrations of dissolved total BTEX generally were elevated at approximately 40 feet bgs and decreased with depth beneath and immediately downgradient of the suspected source area. The data suggest the presence of a preferential pathway or strong vertical hydraulic gradients as the dissolved total BTEX plume migrates downgradient beneath the runway.

#### Dissolved Chlorinated Solvent Contamination

Groundwater samples were collected in December 1993 and May 1994 to characterize the nature and extent of chlorinated solvent contamination at the FT-002. Analytical results for these samples and those collected in 1991 are presented in Table 3.6. The source of contamination at the site is known to include chlorinated and nonchlorinated solvents mixed with off-specification JP-4 fuel. Figures 3.14a and 3.14b illustrate the areal extent of the current dissolved chlorinated solvent plume. Measured concentrations of chlorinated solvents in collected groundwater samples indicate that these contaminants are present in dissolved form. Observed concentrations do not suggest the presence of chlorinated solvents as dense non-aqueous phase liquids (DNAPLs).

The measured horizontal extent of the total chlorinated solvents plume was about 4,800 feet downgradient of the suspected source area (Figure 3.14a). The maximum lateral width of the chlorinated plume is approximately 2,000 feet. There appears to be a good correlation between the horizontal extent of the chlorinated solvent plume and the direction of groundwater flow in the immediate area. Data on the horizontal extent of total chlorinated solvent contamination in groundwater collected under this program compare well with data collected in 1991, under the IRP. The maximum horizontal extent of the chlorinated solvent plume as of September 1991 was determined to be about 6,000 feet (ABB Environmental, Inc. and URS Consultants, Inc., 1993). Comparison of these two data sets suggests that the chlorinated solvent plume may have decreased by about 20 percent in areal extent from September 1991 to May 1994. However, the maximum measured concentration within the source area remained relatively constant with levels of 10,000 ppb to 10,323.7 ppb from 1991 to 1994 (Parsons ES, 1994). The slight increase in concentration may be a result of sampling methodology rather than an actual change in site conditions.

The vertical extent of the total chlorinated solvents plume measured in December 1993 and May 1994 is different than that shown by the BTEX compounds (Figures 3.13b and 3.14b). Chlorinated solvent contamination was measured at greater depth in the unconfined aquifer within the source area than BTEX contamination. Furthermore, chlorinated solvents showed greater vertical stratification at sample locations downgradient of the source area. The difference in vertical distribution patterns between the BTEX compounds and total chlorinated solvents was documented in the Phase II RI report (ABB Environmental, Inc. and URS Consultants, Inc., 1993). However, the differences between the two plumes with respect to vertical distribution appear more pronounced in data collected under this program.



### 3.1.4.2 Current Status

The principle source of contamination (use of jet fuel and waste solvents for fire training) has been permanently stopped at the site and this area will no longer be used due to the closed status of the base. The main concern at this time is the secondary source of contamination, the contaminated soil and LNAPL above the groundwater. Previous sampling rounds have confirmed the presence of organic contaminants in the soil at Site FT-002. Based on the available information (i.e., SI and RI Reports) elevated levels of organic contaminants have been detected in the groundwater. The proposed interim removal action should be implemented to protect the groundwater from further contamination.

### 3.1.5 NPL Status

PAFB is listed on the National Priority List (NPL) as of November 1989 (final). Several sites across the base are in different stages of investigation, from the Preliminary Assessment stage to the implementation of remedial actions. Several investigations have been conducted on the area adjacent to fire training site FT-002. This proposed removal action addresses immediate environmental risks associated with previous spills at the site.

## 3.2 OTHER ACTIONS TO DATE

Plattsburgh AFB has initiated several investigations at the FT-002 site to identify, evaluate, and remediate hazardous contamination as part of the Department of Defense (DOD) Installation Restoration Program (IRP). Since initiation of the IRP, Plattsburgh AFB has been placed on the National Priorities List (NPL) of facilities to be remediated through the USEPA Superfund Program. The FT-002 site has been divided into two operable units. Operable Unit 1 consists of surface and subsurface soil above the zone of water table fluctuation. Operable Unit 2 consists of groundwater and deep subsurface soil, including soil within the zone of water table fluctuation. Separate remedial investigations (RIs) and feasibility studies (FSs) have been completed for each operable unit. Site FT-002 was also selected as a test site for a pilot study of the bioventing technology as part of the AFCEE Bioventing Test Initiative.

Current remedial activities at the FT-002 site include operation of an active LNAPL recovery system at a source control/removal action and installation and testing of pilot-scale bioventing systems at each of the four pits for a treatability study. The LNAPL recovery system, which went into continuous operation in 1993, consists of a network of four wells, each equipped with a pump and an oil-sensing skimmer. Product and aqueous-phase liquids are pumped to a treatment facility located between FT-002 and LF-023. The treatment consists of metal pretreatment, air stripping, and carbon polishing. Design capacity of the system is 80 gallons per minute (gpm). The treatment system discharges from between 20 to 80 gpm of treated effluent to the Salmon River drainage basin. The LNAPL recovery system has been effective at removing separate phase hydrocarbons from the groundwater at a rate of 30 to 65 gallons per day. However, separate phase hydrocarbons still remains in several groundwater monitoring wells northeast and east of Pits 1, 2, and 4. The rate of product recovery of this system has decreased significantly, and plans for additional recovery wells are under development.

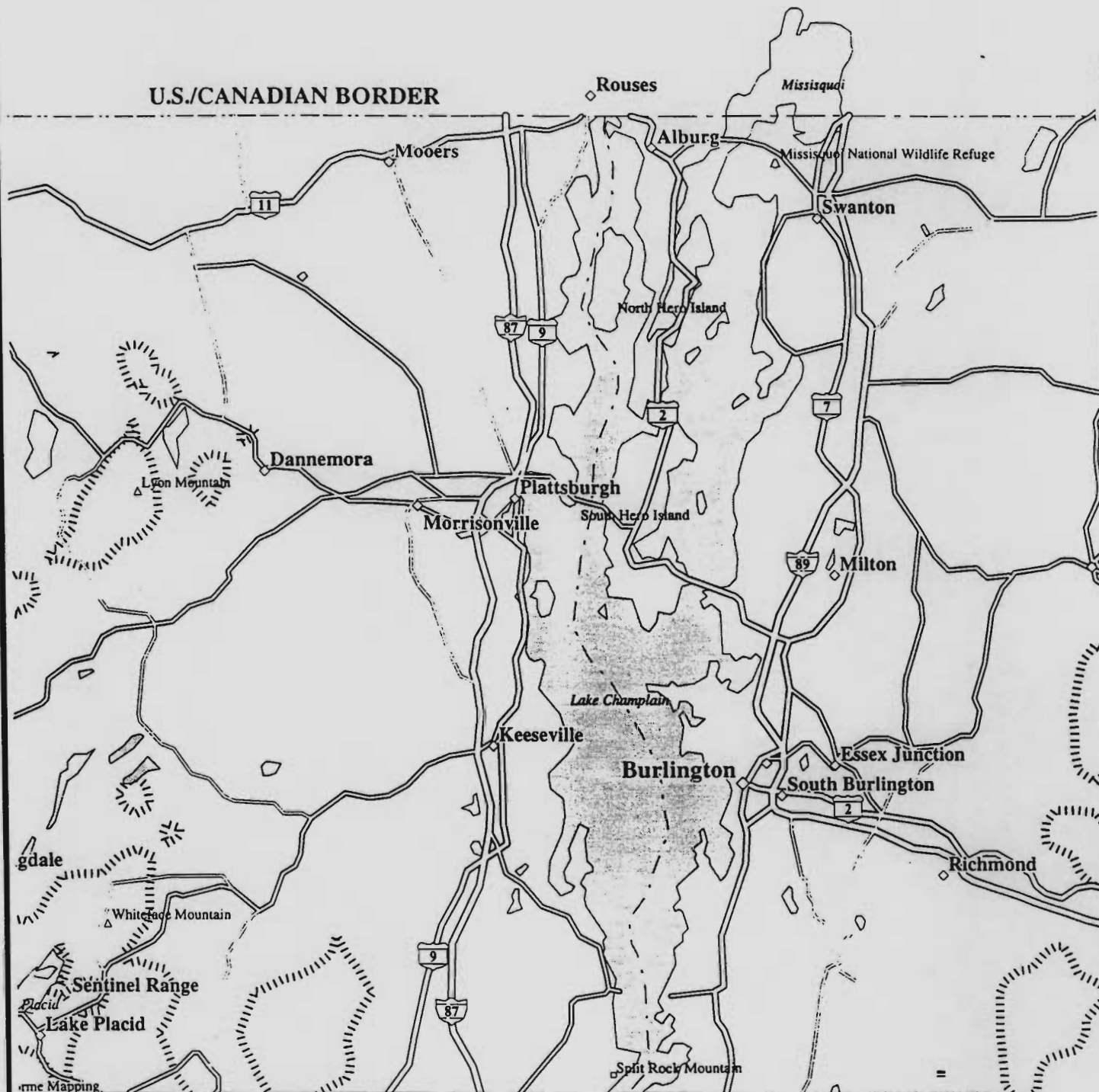
A bioventing treatability study has also been conducted at the FT-002 site. Pilot-scale demonstration systems have been installed at each of the four fire training pits. The objectives of this demonstration were 1) to assess the treatability of fuel-contaminated unsaturated soils by supplying oxygen throughout the contaminated soil depth, 2) to determine the rate at which indigenous microorganisms degrade fuel when stimulated by oxygen-rich soil gas, and 3) to evaluate the potential for sustaining these rates of biodegradation until fuel contamination is remediated to concentrations below regulatory standards. A single bioventing well was constructed near the center of each of the four bermed fire training pits in 1993 and 1994 (Parsons ES, 1993). Three multiple-depth vapor monitoring points also were installed within a 60-foot radius of each of these central bioventing wells at the time of their construction. Initial pilot test results involving soil gas chemistry, air permeability, radius of oxygen influence, and *in situ* respiration rates at all pits suggest that naturally occurring oxygen had been depleted in the

contaminated soils, and that the addition of oxygen through air injection or soil vapor extraction will likely be an effective method of stimulating aerobic fuel biodegradation. A 1-year extended test period has been completed for the bioventing system constructed at Pit 3 (Parsons ES, 1993a). A work plan for an extended one year bioventing test at test Pits 1 and 4 has been prepared and initial respiration tests have been completed (Parsons ES, 1994a).

### **3.3 FEDERAL, STATE, AND LOCAL ACTION TO DATE**

The New York State Department of Environmental Conservation (NYSDEC) first recognized that contamination was present at Site FT-002 in April 1985. There has been an exchange of correspondence between PAFB and the NYSDEC since the discovery of the problem.

The Air Force informed the United States Environmental Protection Agency (USEPA) and NYSDEC in May of 1995 of their intention to perform a source control removal action. Receipt of this action memorandum starts the clock for this time critical removal action.



NEW YORK  
QUADRANGLE LOCATION

LONGITUDE: N44° 38' 49"  
LATITUDE: W73° 27' 17"



Scale 1:500,000 (at center)

10 Miles

10 KM

**FIGURE 3.1**

**PLATTSBURGH AIR FORCE BASE  
PLATTSBURGH, NEW YORK**

**REGIONAL LOCATION MAP**

**PARSONS ENGINEERING SCIENCE, INC.**





NEW YORK  
QUADRANGLE LOCATION

LONGITUDE: N44° 38' 49"  
LATITUDE: W73° 27' 17"

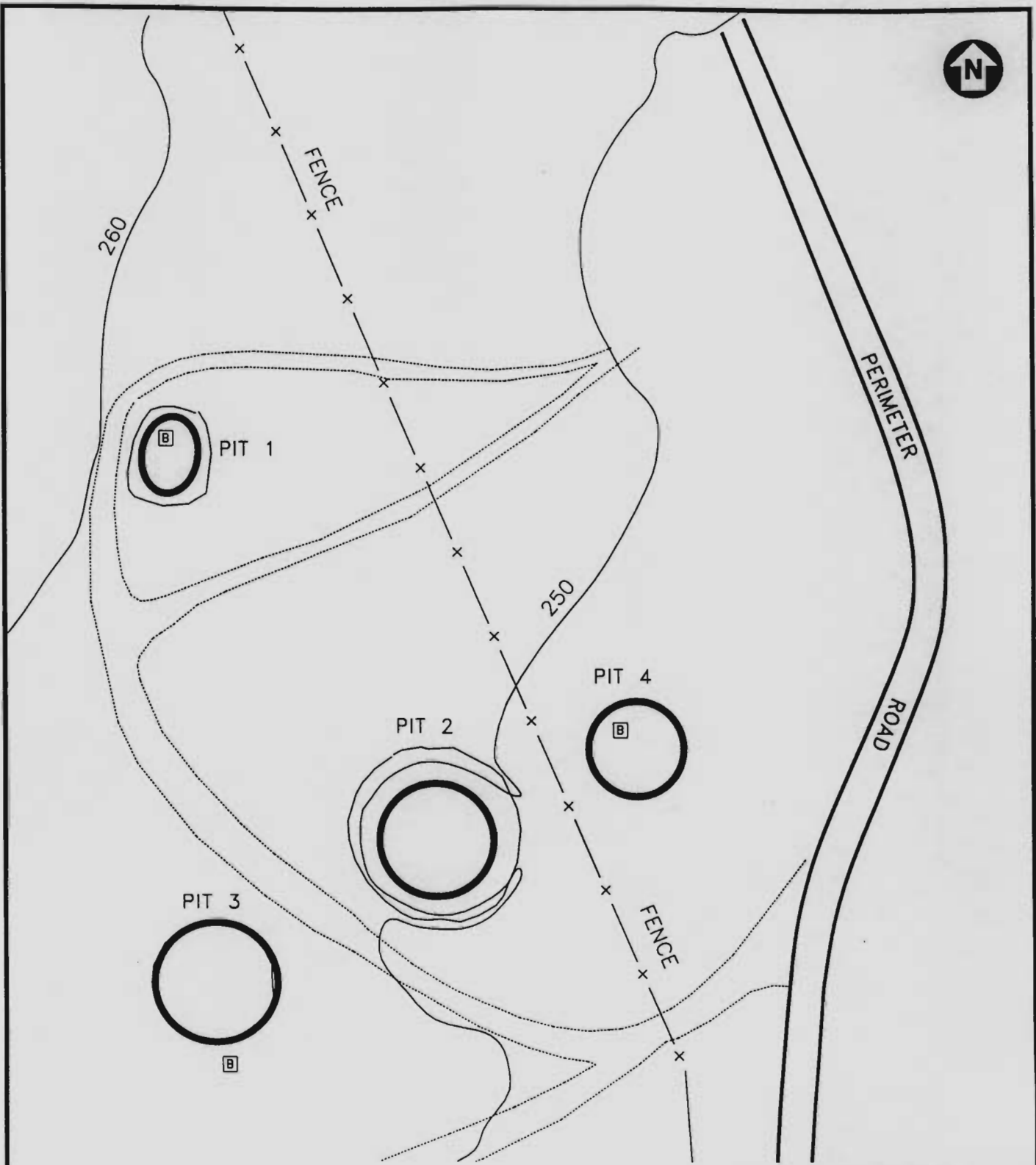


FIGURE 3.2

PLATTSBURGH AIR FORCE BASE  
PLATTSBURGH, NEW YORK

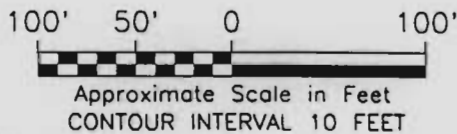
**SITE LOCATION MAP**

**PARSONS ENGINEERING SCIENCE, INC.**



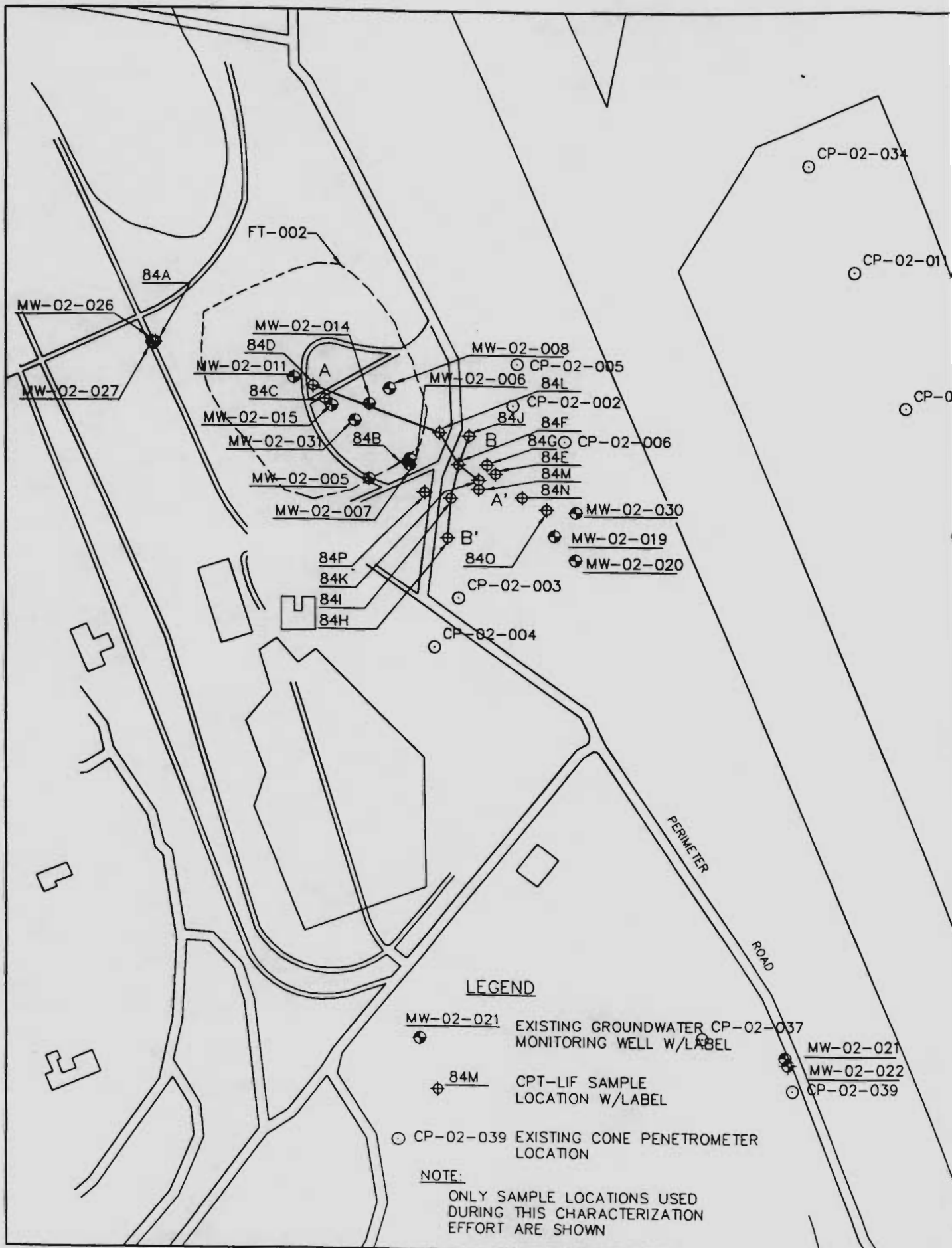
**LEGEND:**

**[B]** BLOWER UNIT






DATE: 01/31/96 (SEH)  
H:\CAD\727307\27307G37.DWG (MODEL SPACE)

FIGURE 3.3
PLATTSBURGH AIR FORCE BASE PLATTSBURGH, NEW YORK
FT-002 SURFACE FEATURES MAP
<b>PARSONS ENGINEERING SCIENCE, INC.</b>



**LEGEND**

- 
 MW-02-021 EXISTING GROUNDWATER MONITORING WELL W/LABEL
- 
 84M CPT-LIF SAMPLE LOCATION W/LABEL
- 
 CP-02-039 EXISTING CONE PENETROMETER LOCATION

**NOTE:**  
 ONLY SAMPLE LOCATIONS USED DURING THIS CHARACTERIZATION EFFORT ARE SHOWN

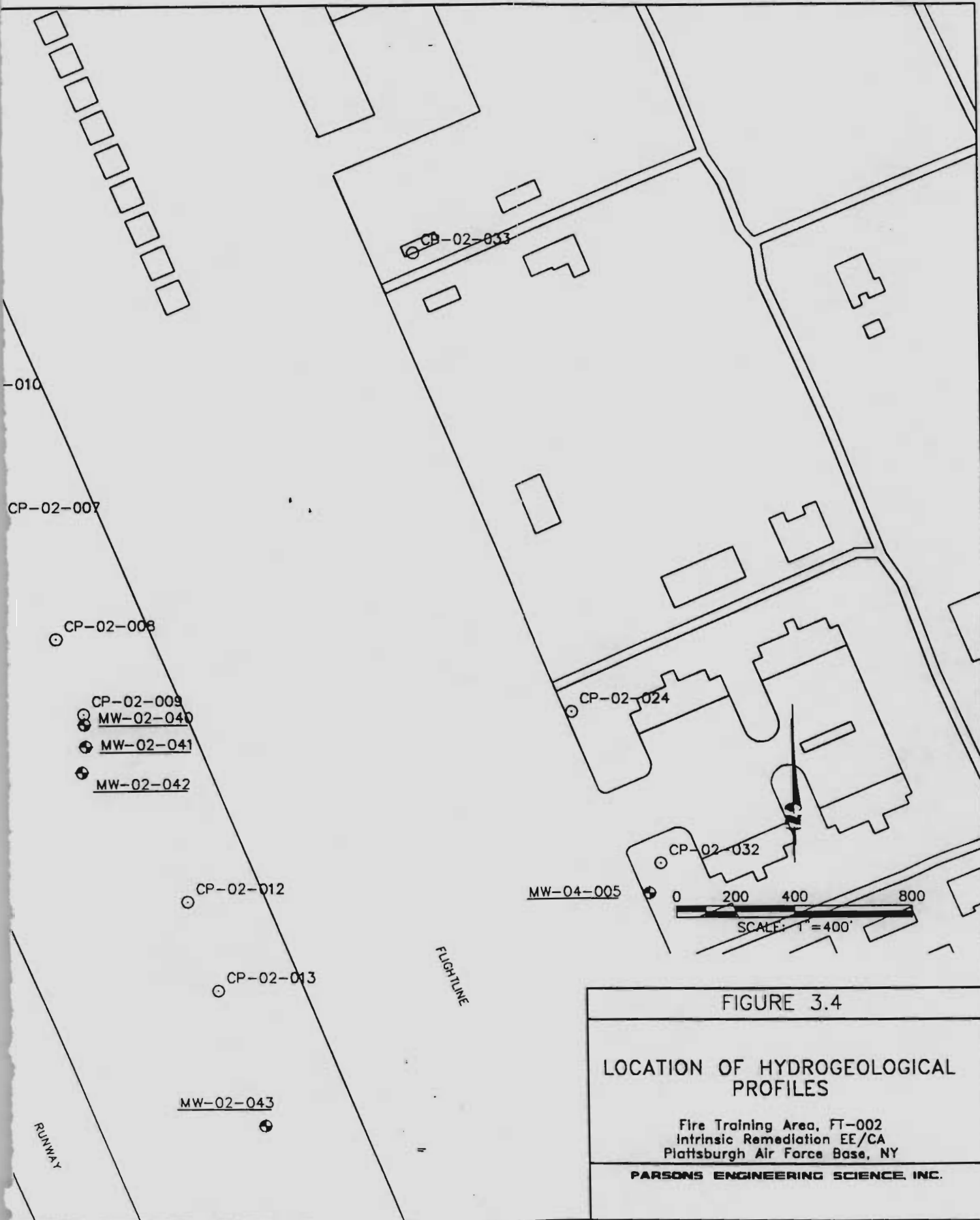
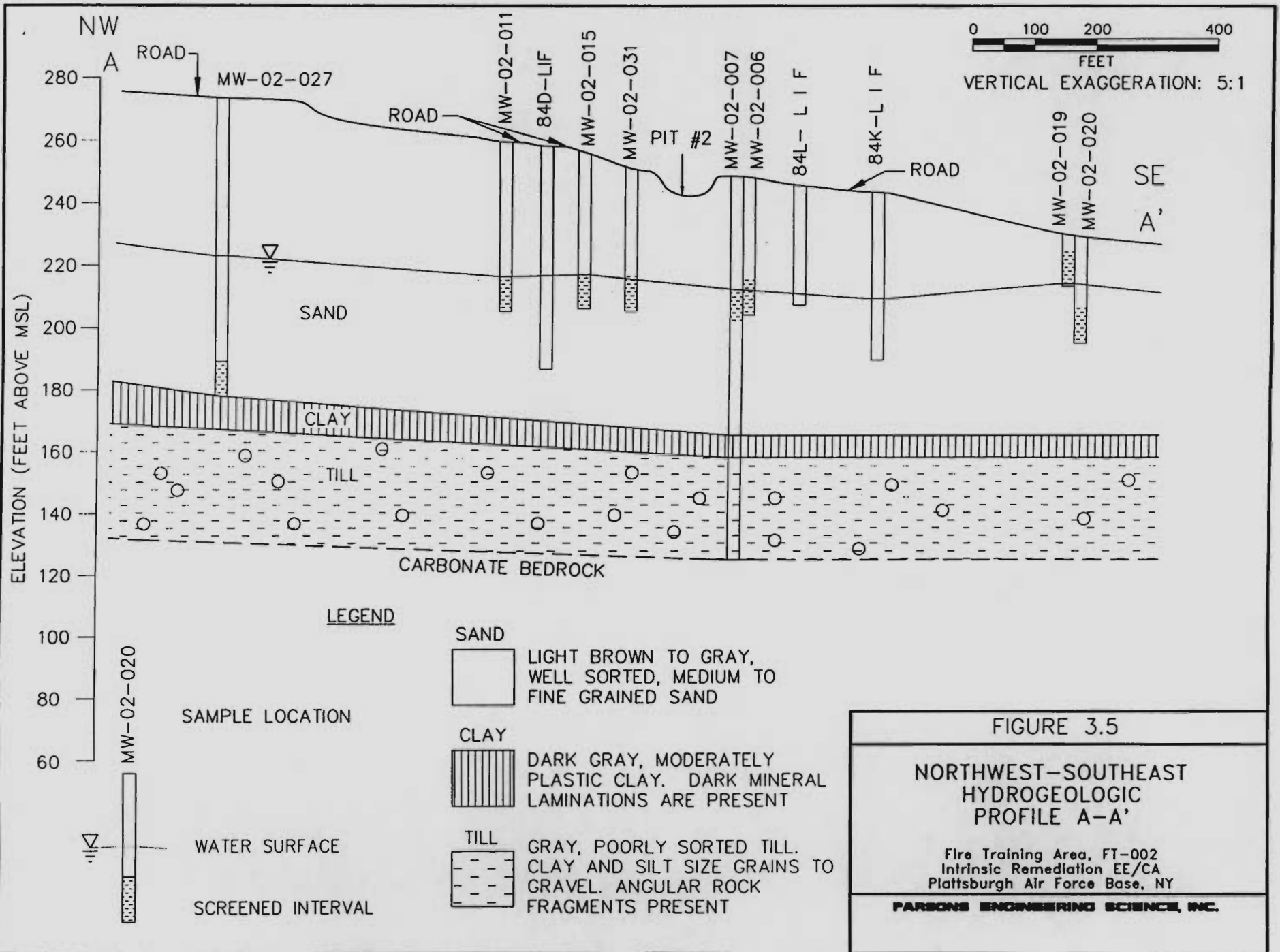


FIGURE 3.4

LOCATION OF HYDROGEOLOGICAL PROFILES

Fire Training Area, FT-002  
 Intrinsic Remediation EE/CA  
 Plattsburgh Air Force Base, NY

PARSONS ENGINEERING SCIENCE, INC.



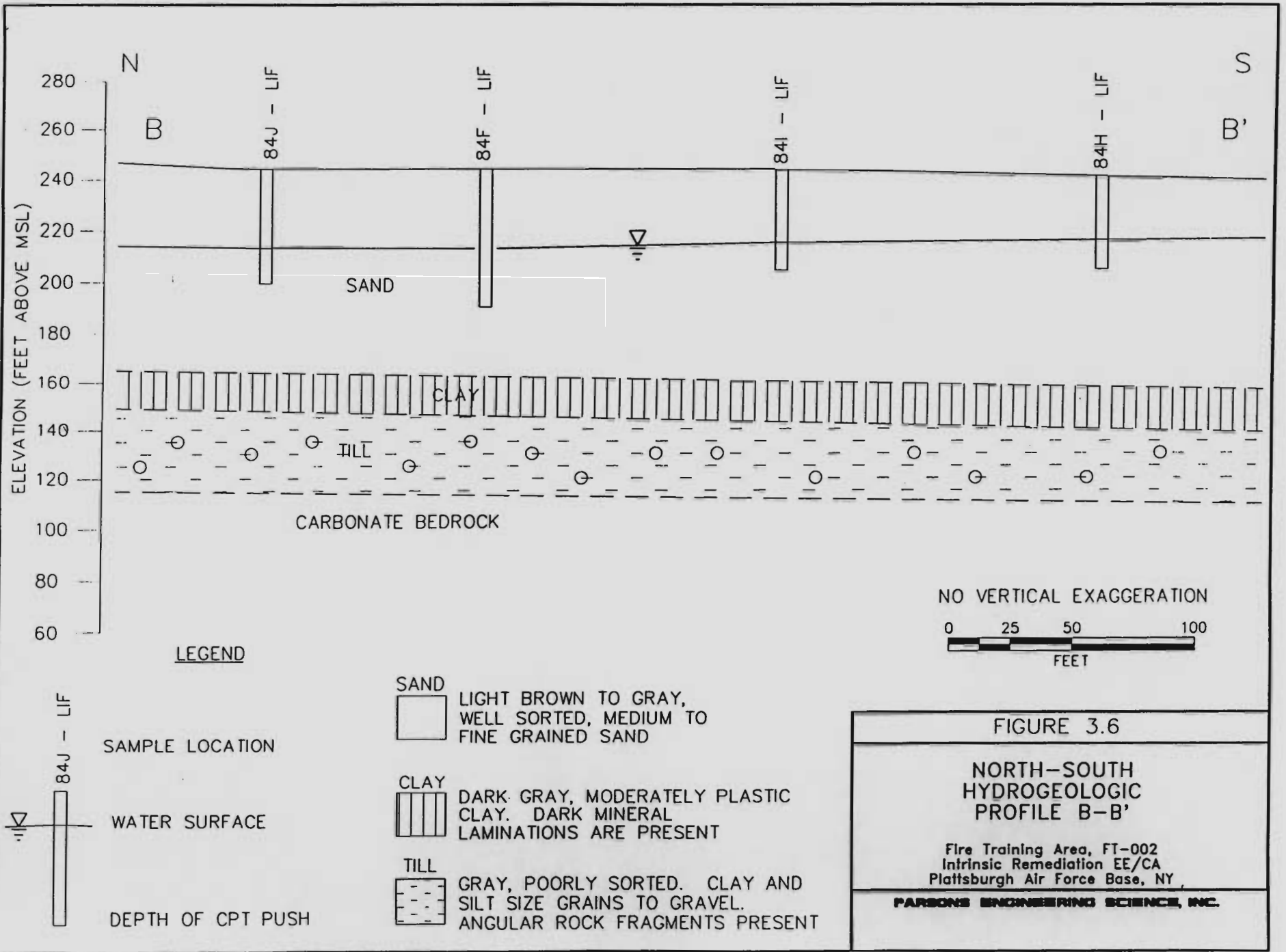
**FIGURE 3.5**

**NORTHWEST-SOUTHEAST  
HYDROGEOLOGIC  
PROFILE A-A'**

Fire Training Area, FT-002  
Intrinsic Remediation EE/CA  
Plattsburgh Air Force Base, NY

**PARSONS ENGINEERING SCIENCE, INC.**

91-8



**FIGURE 3.6**

**NORTH-SOUTH HYDROGEOLOGIC PROFILE B-B'**

Fire Training Area, FT-002  
 Intrinsic Remediation EE/CA  
 Plattsburgh Air Force Base, NY

**PARSONS ENGINEERING SCIENCE, INC.**



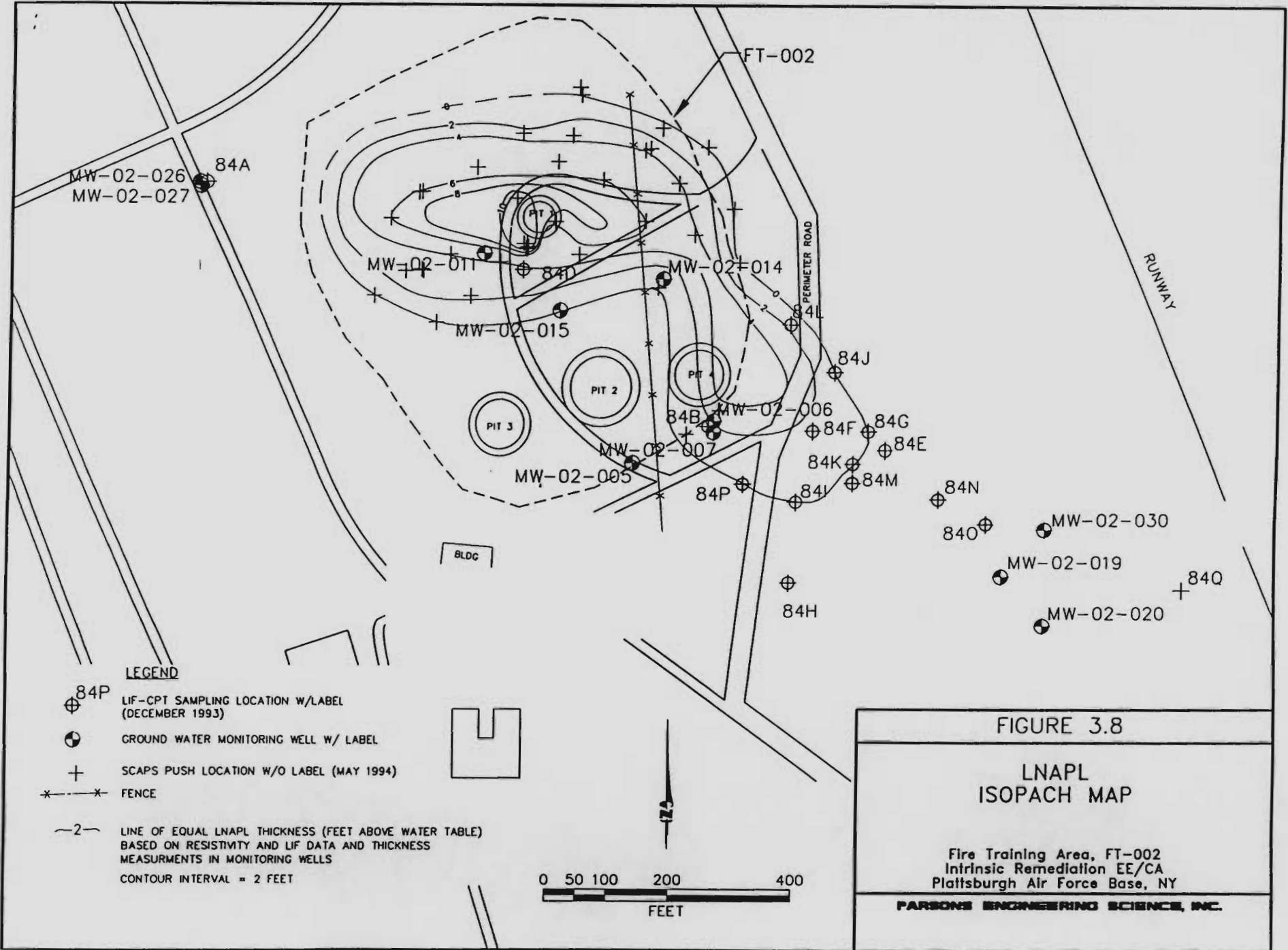
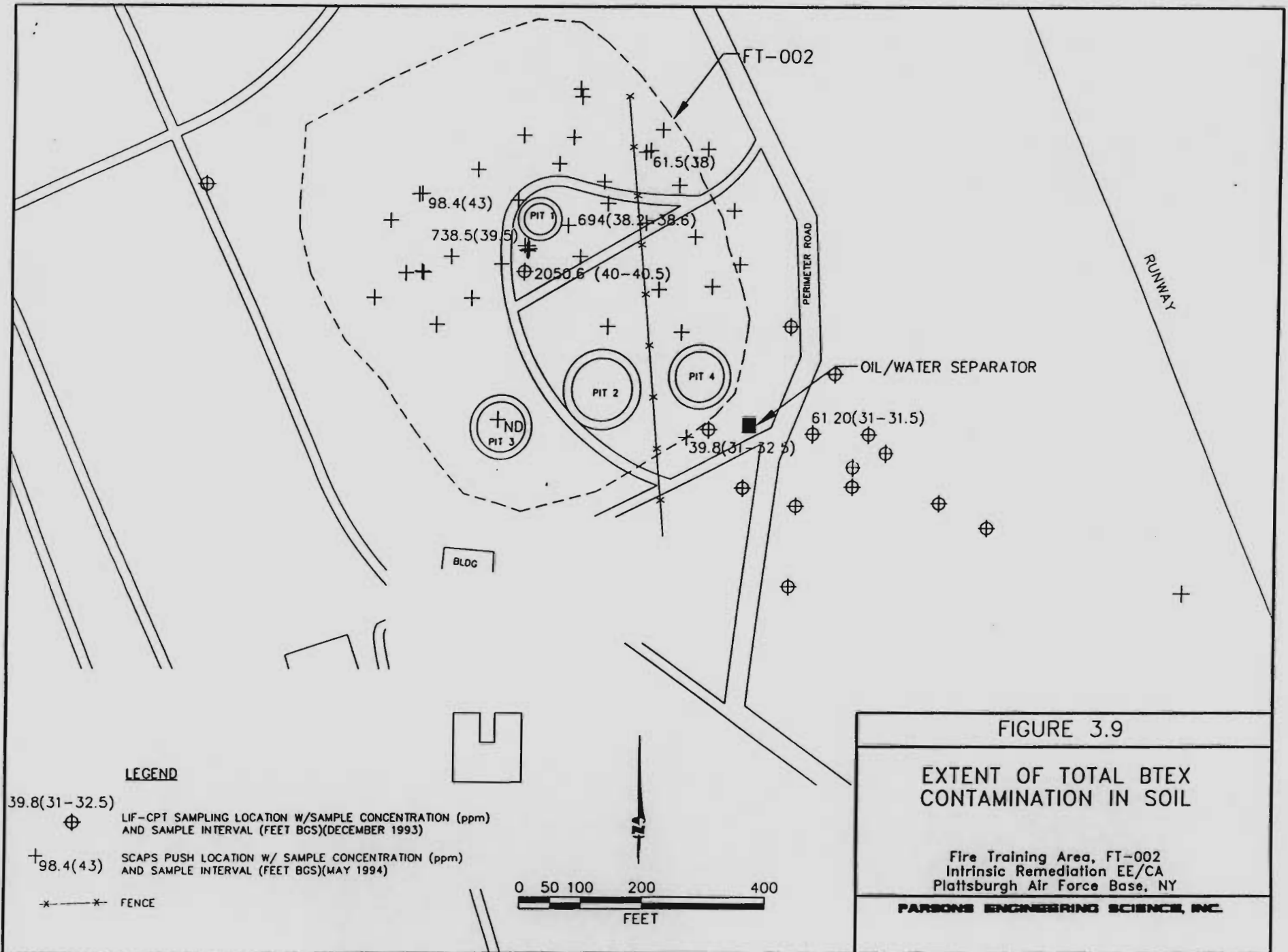
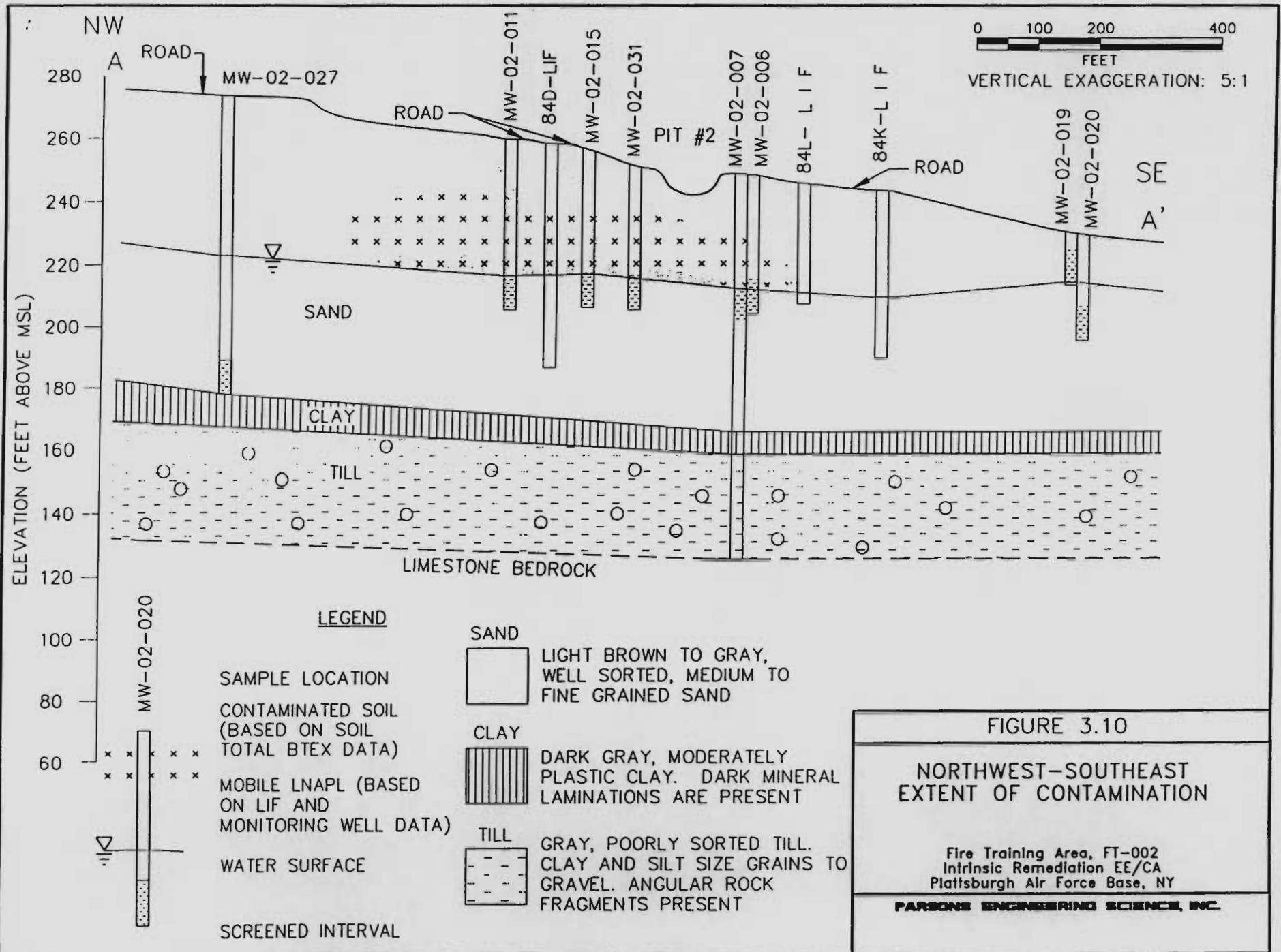


FIGURE 3.8  
 LNAPL ISOPACH MAP  
 Fire Training Area, FT-002  
 Intrinsic Remediation EE/CA  
 Plattsburgh Air Force Base, NY  
 PARSONS ENGINEERING SCIENCE, INC.





3-20

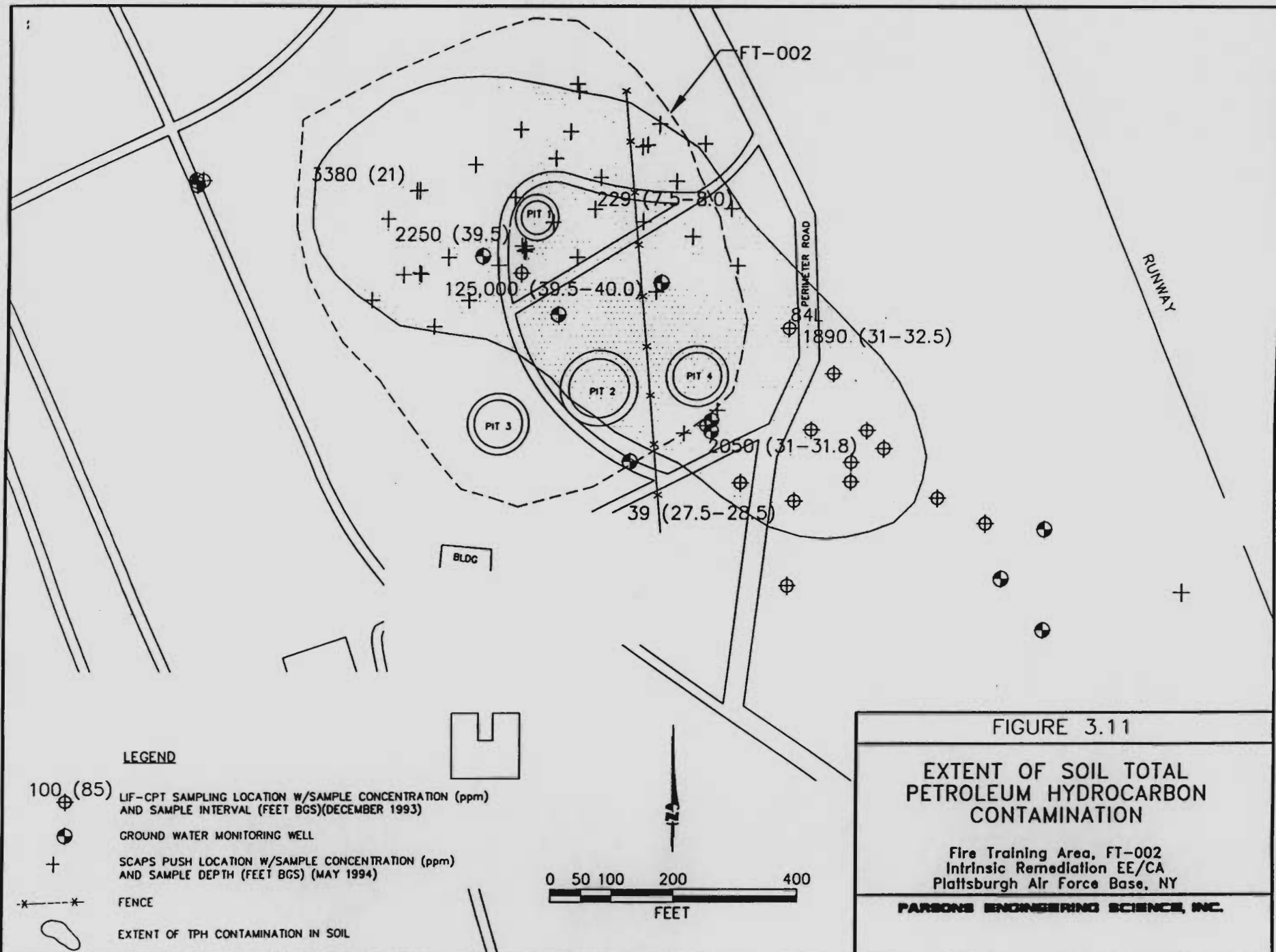


**FIGURE 3.10**

**NORTHWEST-SOUTHEAST  
EXTENT OF CONTAMINATION**

Fire Training Area, FT-002  
Intrinsic Remediation EE/CA  
Plattsburgh Air Force Base, NY

**PARSONS ENGINEERING SCIENCE, INC.**



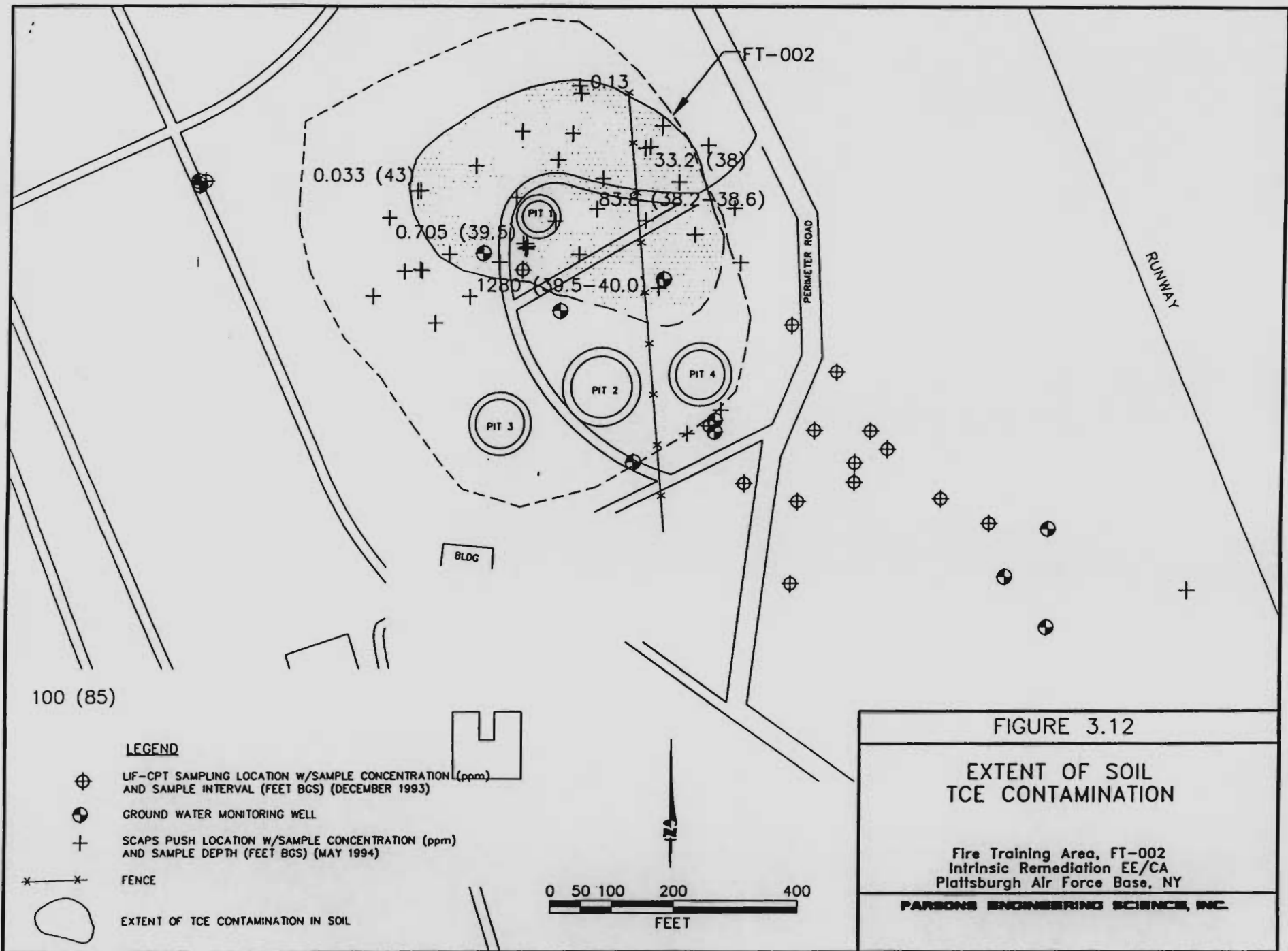


FIGURE 3.12

EXTENT OF SOIL TCE CONTAMINATION

Fire Training Area, FT-002  
Intrinsic Remediation EE/CA  
Plattsburgh Air Force Base, NY

PARSONS ENGINEERING SCIENCE, INC.

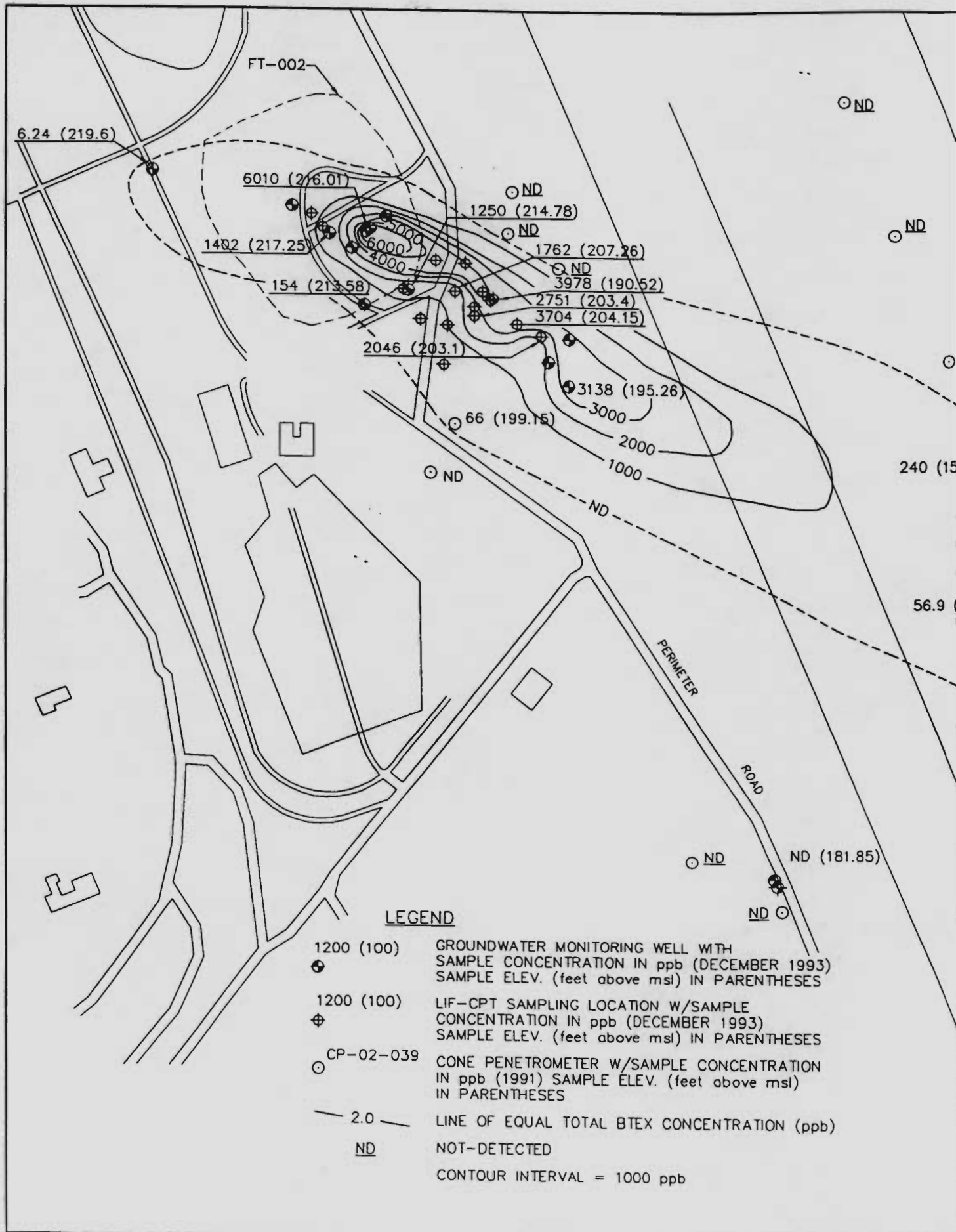


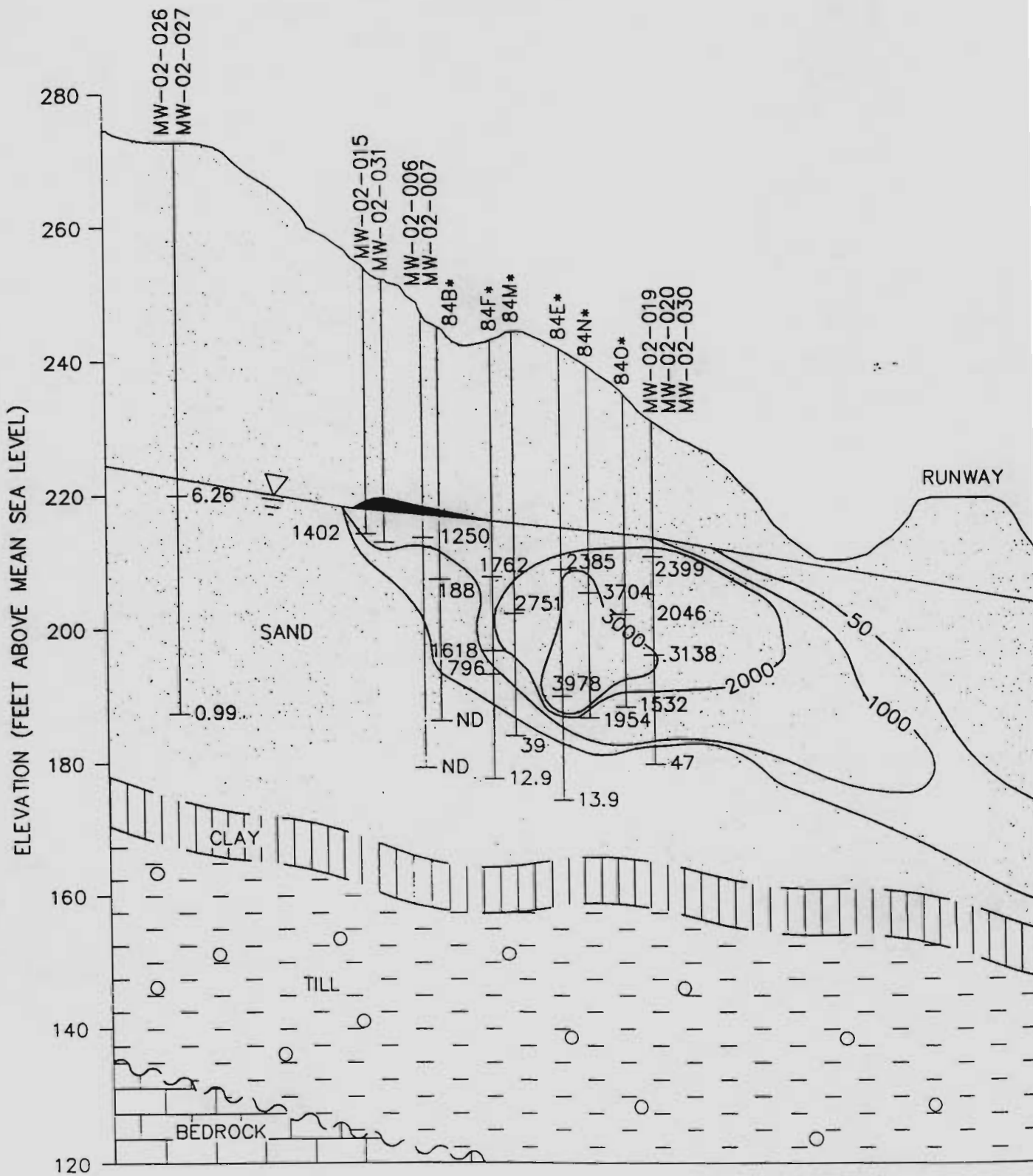


FIGURE 3.13a

**AREAL EXTENT OF DISSOLVED  
BTEX AT DEPTH OF  
MAXIMUM CONCENTRATION**



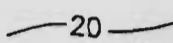







Fire Training Area, FT-002  
Intrinsic Remediation EE/CA  
Plattsburgh Air Force Base, NY

**PARSONS ENGINEERING SCIENCE INC.**





**LEGEND**

-  SAMPLE ELEVATION (ft above msl)
- 16.4  MEASURED CONCENTRATION OF TOTAL BTEX (ppb)
- 20  ESTIMATED CONCENTRATION OF TOTAL BTEX (ppb)
-  ESTIMATED OILY PHASE PLUME
-  SURFACE OF GROUNDWATER TABLE
-  UNCONFORMITY
-  LIGHT BROWN TO GRAY, WELL SORTED, MEDIUM TO FINE GRAINED SAND
-  DARK GRAY, MODERATELY PLASTIC CLAY. DARK MINERAL LAMINATIONS ARE PRESENT
-  GRAY, POORLY SORTED TILL. CLAY AND SILT SIZE GRAINS TO GRAVEL. ANGULAR ROCK FRAGMENTS PRESENT
-  LIMESTONE BEDROCK

\* WATER ELEVATION DATA FROM CPT POINTS ARE ESTIMATED VALUES

VERTICAL EXAGGERATION = 20X

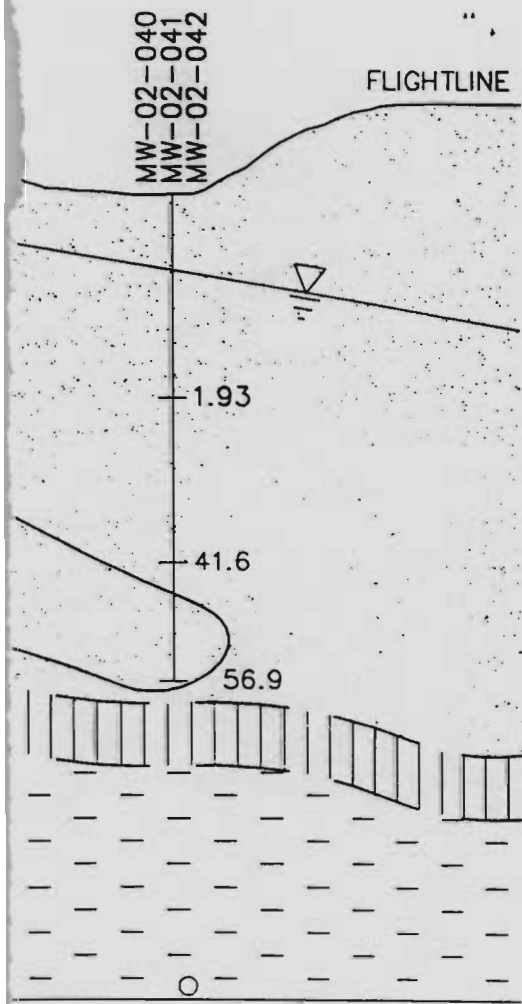
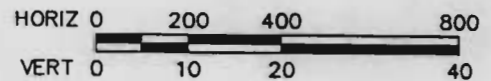
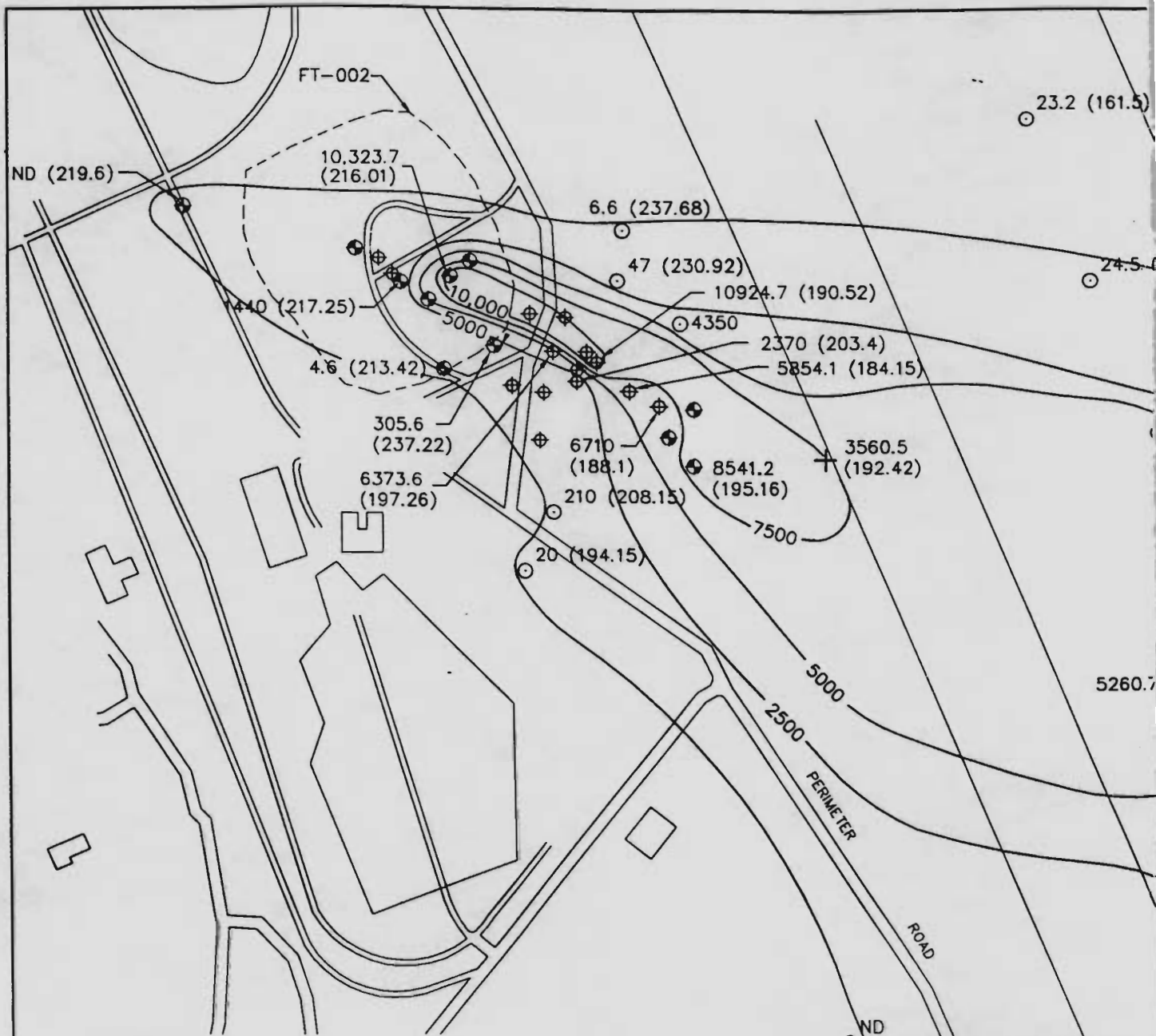


FIGURE 3.13b




VERTICAL EXTENT OF DISSOLVED  
TOTAL BTEX (ppb)  
ALONG PLUME CENTERLINE

Fire Training Area, FT-002  
Intrinsic Remediation EE/CA  
Plattsburgh Air Force Base, NY

PARSONS ENGINEERING SCIENCE INC.



**LEGEND**

- 1200 (100)  GROUNDWATER MONITORING WELL WITH SAMPLE CONCENTRATION IN ppb (DECEMBER 1993) SAMPLE ELEV. (feet above msl) IN PARENTHESES
- 1200 (100)  LIF-CPT SAMPLING LOCATION W/SAMPLE CONCENTRATION IN ppb (DECEMBER 1993) SAMPLE ELEV. (feet above msl) IN PARENTHESES
- CP-02-039  CONE PENETROMETER W/SAMPLE CONCENTRATION IN ppb (1991) SAMPLE ELEV. (feet above msl) IN PARENTHESES
- 2.0 — LINE OF EQUAL TOTAL BTEX CONCENTRATION (ppb)
- ND NOT-DETECTED
- CONTOUR INTERVAL = 1000 ppb
- + SCAPS PUSH LOCATION WITH SAMPLE CONCENTRATION IN ppb (MAY 1994).

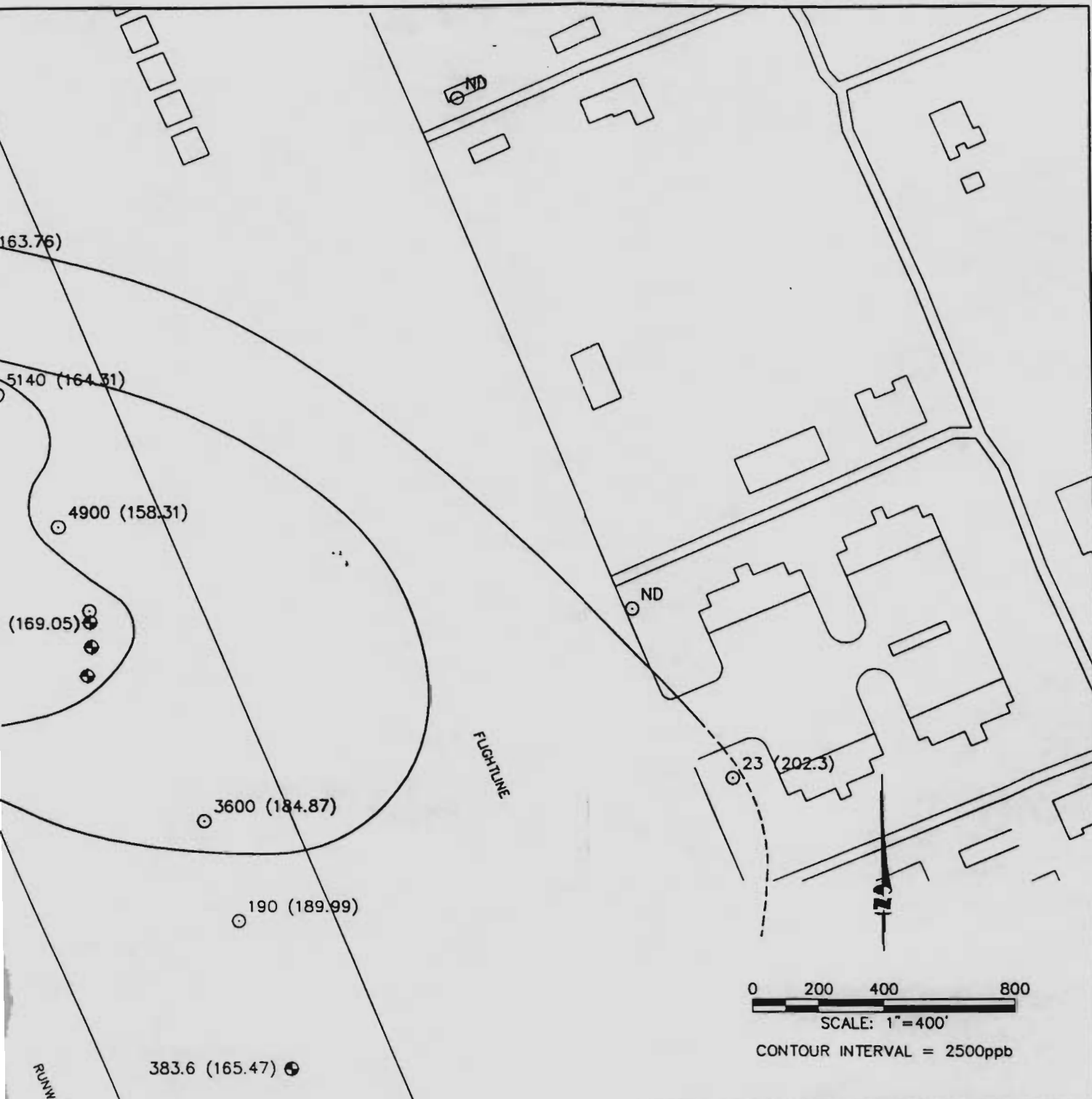
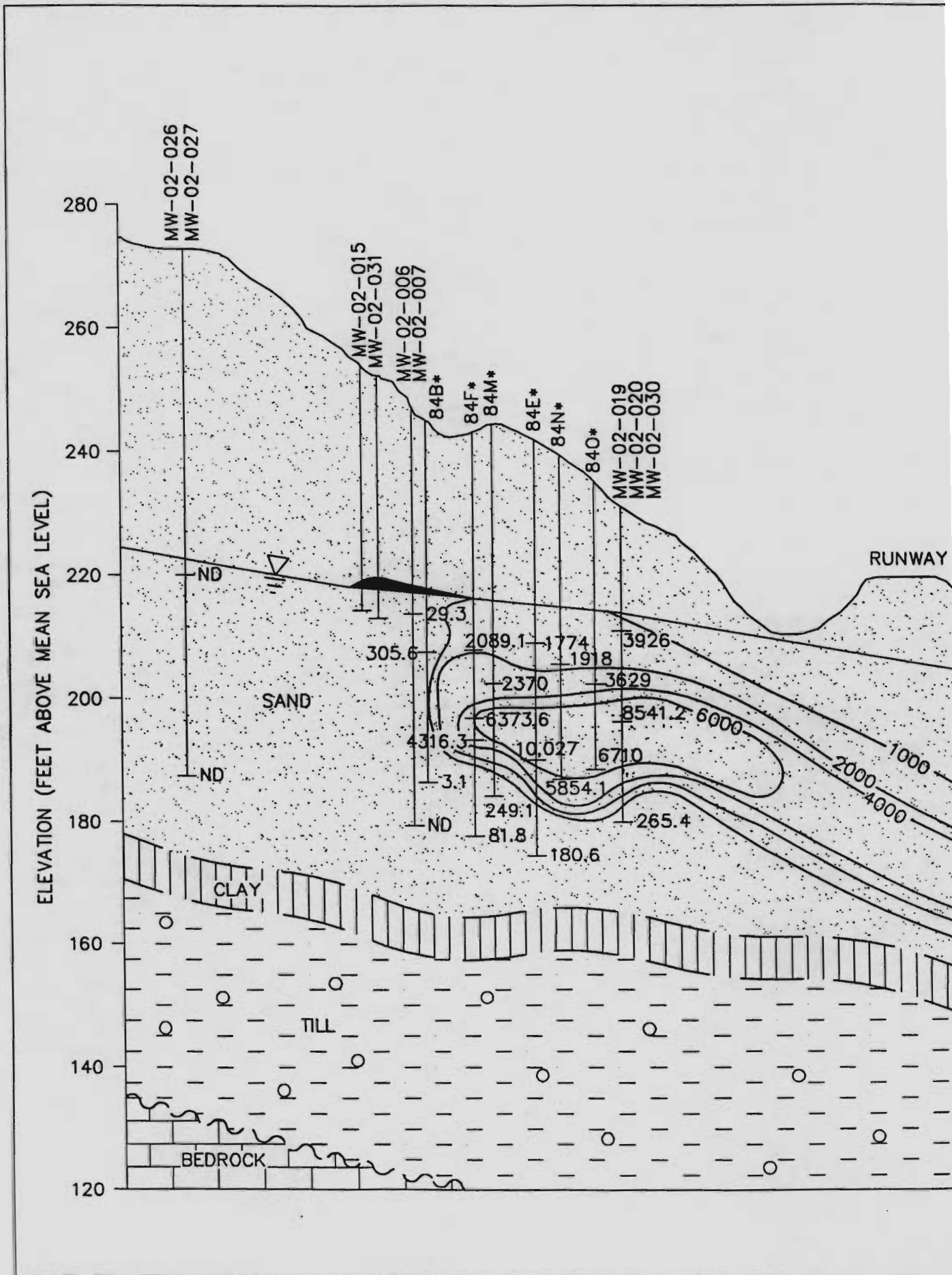


FIGURE 3.14a



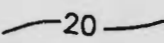
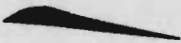

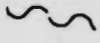
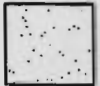


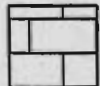
AREAL EXTENT OF DISSOLVED  
CHLORINATED SOLVENTS AT DEPTH  
OF MAXIMUM CONCENTRATION

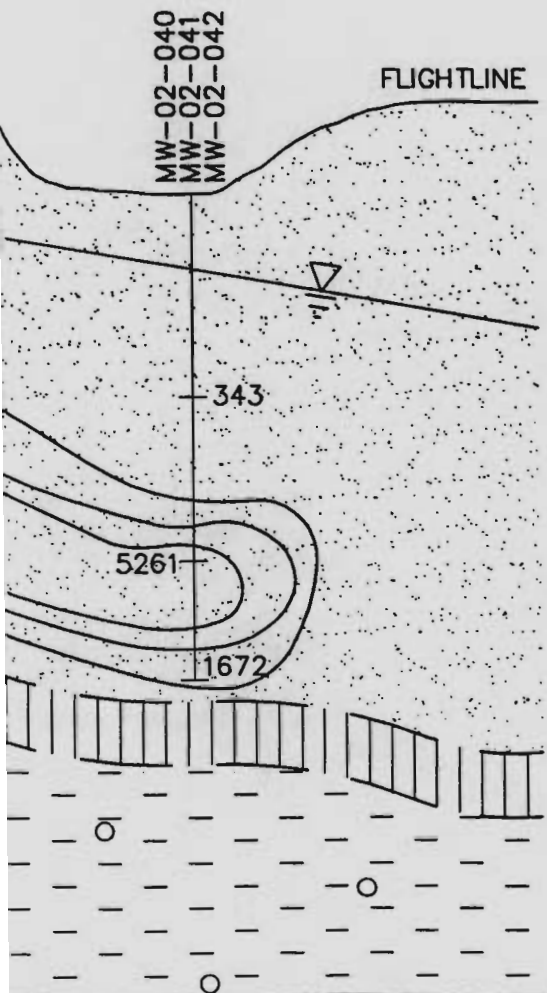
Fire Training Area, FT-002  
Intrinsic Remediation EE/CA  
Plattsburgh Air Force Base, NY

PARSONS ENGINEERING SCIENCE INC.



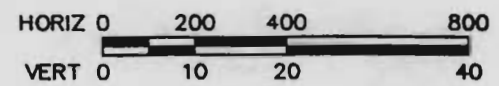
**LEGEND**

-  SAMPLE ELEVATION (ft above msl)
-  16.4 MEASURED CONCENTRATION OF TOTAL CHLORINATED SOLVENTS (ppb)
-  20 ESTIMATED CONCENTRATION OF TOTAL CHLORINATED SOLVENTS (ppb)
-  ESTIMATED OILY PHASE PLUME
-  SURFACE OF GROUNDWATER TABLE
-  UNCONFORMITY
-  LIGHT BROWN TO GRAY, WELL SORTED, MEDIUM TO FINE GRAINED SAND
-  DARK GRAY, MODERATELY PLASTIC CLAY. DARK MINERAL LAMINATIONS ARE PRESENT
-  GRAY, POORLY SORTED TILL. CLAY AND SILT SIZE GRAINS TO GRAVEL. ANGULAR ROCK FRAGMENTS PRESENT
-  LIMESTONE BEDROCK



\* WATER ELEVATION DATA FROM CPT POINTS ARE ESTIMATED VALUES

VERTICAL EXAGGERATION = 20X



**FIGURE 3.14b**

**VERTICAL EXTENT OF DISSOLVED TOTAL CHLORINATED SOLVENTS ALONG PLUME CENTERLINE**

Fire Training Area, FT-002  
Intrinsic Remediation EE/CA  
Plattsburgh Air Force Base, NY

**PARSONS ENGINEERING SCIENCE, INC.**

TABLE 3.1  
 CHEMICAL ANALYSIS OF LNAPL SAMPLE  
 COLLECTED FROM MW-02-015 IN DECEMBER 1993  
 Fire Training Area, FT-002  
 Intrinsic Remediation EE/CA  
 Plattsburgh Air Force Base, NY

Compound	Measured Concentration a/ (ppm) b/	Mass Fraction (%)
Benzene	1,400	0.83
Toluene	8,970	5.32
Ethylbenzene	5,400	3.23
m-Xylene	13,700	8.13
o-Xylene	4,570	2.71
p-Xylene	4,920	2.92
1,2,3-trimethylbenzene	3,560	2.11
1,2,4-trimethylbenzene	3,960	4.13
1,3,5-trimethylbenzene	4,100	2.44
1-methylapthalene	1,400	0.83
2-methylapthalene	1,990	1.18
Decane	17,600	10.45
Dodecane	11,100	6.59
Heptane	1,170	0.7
Hexane	4,090	2.43
Napthalene	1,370	0.81
Nonane	15,300	9.1
Octane	14,600	8.67
Pentadecane	2,980	1.77
Tetradecane	5,490	3.26
Trichloroethene (TCE)	16,400	9.74
Tridecane	9,320	5.53
Undecane	12,000	7.12

a/ GC/MS Semiquantitative Estimate, USEPA RSKERL, 2/11/94  
 b/ ppm = parts per million



TABLE 3.2

SOIL DATA FOR THE BTEX COMPOUNDS AND TOTAL PETROLEUM HYDROCARBONS  
 Fire Training Area, FT-002  
 Intrinsic Remediation EE/CA  
 Plattsburgh Air Force Base, NY

Sample Location	Sample Date	Sample Interval(' bgs) <sup>u</sup>	JP-4 (mg/kg)	TPH <sup>v</sup> (mg/kg)	OVM <sup>w</sup>	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	m-xylene (mg/kg)	o-xylene (mg/kg)	p-xylene (mg/kg)	Total BTEX (mg/kg)
84B	Dec. '93	31-32.5	1550	1890	NR <sup>u</sup>	BLQ <sup>v</sup>	1.73	5.01	18.2	7.91	6.91	39.76
84D	Dec. '93	3-3.5	NR	BLQ	NR	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	3.5-4	NR	BLQ	NR	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	4-4.5	NR	BLQ	NR	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	4.5-5	NR	BLQ	NR	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	5-5.5	NR	BLQ	NR	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	5.5-6	NR	BLQ	NR	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	6-6.5	NR	176	NR	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	7-7.5	NR	BLQ	NR	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	7.5-8	NR	BLQ	0	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	8-8.5	NR	BLQ	3	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	8.5-9	NR	BLQ	2	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	9-9.5	NR	BLQ	1	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	9.5-10	NR	BLQ	NR	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	10-10.5	NR	BLQ	NR	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	10.5-11	NR	BLQ	2	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	11-11.5	NR	BLQ	3	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	11.5-12	NR	BLQ	1	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	12-12.5	NR	BLQ	3	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	12.5-13	NR	BLQ	2	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	13-13.5	NR	BLQ	1	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	13.5-14	NR	BLQ	1	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	14-14.5	2.09	BLQ	0	ND <sup>v</sup>	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84D	Dec. '93	14.5-15	NR	BLQ	1	NR	NR	NR	NR	NR	NR	NR
84D	Dec. '93	15-15.5	19.4	94	45	ND	0.0585	BLQ	0.0369	BLQ	BLQ	0.095
84D	Dec. '93	15.5-16	4370	4120	297	0.262	5.35	3.89	13.6	8.81	6.01	37.92
84D	Dec. '93	16-16.5	1330	2080	655	0.0738	2.58	2.65	8.98	5.22	3.76	23.26
84D	Dec. '93	16.5-17	3140	5180	584	0.351	9.31	7.98	26.6	14.8	11	70.04
84D	Dec. '93	17-17.5	2880	5400	663	0.263	8.41	7.6	26.1	14.3	10.5	67.17

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**TABLE 3.2 (CONTINUED)**  
**SOIL DATA FOR THE BTEX COMPOUNDS AND TOTAL PETROLEUM HYDROCARBONS**  
**Fire Training Area, FT-002**  
**Intrinsic Remediation EE/CA**  
**Plattsburgh Air Force Base, NY**

Sample Location	Sample Date	Sample Interval(' bgs) <sup>c</sup>	JP-4 (mg/kg)	TPH <sup>a</sup> (mg/kg)	OVM <sup>b</sup>	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	m-xylene (mg/kg)	o-xylene (mg/kg)	p-xylene (mg/kg)	Total BTEX (mg/kg)
84D	Dec. '93	17.5-18	3000	4480	591	0.162	6.53	6.9	24.4	13.4	9.77	61.16
84D	Dec. '93	18-18.5	3290	4230	709	0.388	11	9.49	32.9	17.6	13.2	84.58
84D	Dec. '93	18.5-1	2340	3450	616	0.21	6.52	5.91	20.9	11.2	8.29	53.03
84D	Dec. '93	19-19.5	2200	3030	610	0.163	6.39	6.12	21.8	11.5	8.58	54.55
84D	Dec. '93	19.5-20	1810	2880	673	0.131	4.78	4.5	1.61	8.52	6.37	25.91
84D	Dec. '93	20-20.5	1740	2360	481	0.177	5.93	5	17.7	9.26	6.93	45.00
84D	Dec. '93	20.5-21	795	1150	631	0.035	1.89	2.03	7.37	4.04	2.88	18.25
84D	Dec. '93	21-21.5	1310	1790	558	0.13	3.99	3.49	12.4	6.59	4.9	31.5
84D	Dec. '93	21.5-22	2410	2340	448	0.275	8.55	7.31	26	13.9	10.2	66.24
84D	Dec. '93	22-22.5	1940	2220	584	0.158	6.11	5.55	19.7	10.5	7.76	49.78
84D	Dec. '93	22.5-23	2240	3240	562	0.24	8.14	6.98	24.7	13.2	9.8	63.08
84D	Dec. '93	23-23.5	1860	3710	713	0.31	7.9	5.95	20.6	11	8.19	53.95
84D	Dec. '93	23.5-24	79.6	194	501	BLQ	0.131	0.125	0.457	0.271	0.179	1.16
84D	Dec. '93	28-28.5	ND		NR	ND	ND	BLQ	ND	ND	ND	ND
84D	Dec. '93	35-35.5	19.1	112	42	BLQ	0.132	0.0369	0.131	0.0633	0.0509	0.414
84D	Dec. '93	35.5-36	10.9	99	38	BLQ	0.145	0.0275	0.0951	0.0469	0.0408	0.355
84D	Dec. '93	36-36.5	1750	3380	219	0.812	13.5	6.55	22.4	9.87	8.25	61.38
84D	Dec. '93	36.5-37	3440	4780	471	1.47	25.8	12.5	45.8	19	16.6	121.17
84D	Dec. '93	37-37.5	7840	7570	408	4.9	64.2	31.4	94	39.4	38.3	272.2
84D	Dec. '93	37.5-38	12600	10100	490	9.63	109	51.4	161	62.4	68.1	461.53
84D	Dec. '93	38-38.5	8000	18800	521	6.01	80.1	40.5	139	49.7	47.7	363.01
84D	Dec. '93	38.5-39	22500	39400	414	20.5	236	128	390	137	135	1046.5
84D	Dec. '93	39-39.5	39000	75300	454	32.9	412	239	697	245	244	1869.9
84D	Dec. '93	39.5-40	52700	125000	340	48	547	313	899	318	320	2445
84D	Dec. '93	40-40.5	44300	120000	490	42.6	470	260	751	262	265	2050.6
84D	Dec. '93	40.5-41	28800	78700	348	27.4	303	168	499	173	171	1341.4
84D	Dec. '93	41-41.5	7900	19400	521	7.38	77.2	44.8	134	46	45.7	355.08
84D	Dec. '93	44-44.3	2.73	BLQ	5	ND	BLQ	0.04	0.0978	0.0438	0.0356	0.217
84F	Dec. '93	25.5-26	NR	BLQ	2	NR	NR	NR	NR	NR	NR	NR

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TABLE 3.2 (CONTINUED)

**SOIL DATA FOR THE BTEX COMPOUNDS AND TOTAL PETROLEUM HYDROCARBONS**  
**Fire Training Area, FT-002**  
**Intrinsic Remediation EE/CA**  
**Plattsburgh Air Force Base, NY**

Sample Location	Sample Date	Sample Interval(' bgs) <sup>u</sup>	JP-4 (mg/kg)	TPH <sup>v</sup> (mg/kg)	OVMT <sup>w</sup>	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	m-xylene (mg/kg)	o-xylene (mg/kg)	p-xylene (mg/kg)	Total BTEX (mg/kg)
84F	Dec. '93	26-26.5	NR	BLQ	1	NR	NR	NR	NR	NR	NR	NR
84F	Dec. '93	26.5-27	NR	BLQ	3	NR	NR	NR	NR	NR	NR	NR
84F	Dec. '93	27-27.5	NR	BLQ	1	NR	NR	NR	NR	NR	NR	NR
84F	Dec. '93	27.5-28	NR	BLQ	1	NR	NR	NR	NR	NR	NR	NR
84F	Dec. '93	28-28.5	NR	BLQ	1	NR	NR	NR	NR	NR	NR	NR
84F	Dec. '93	28.5-29	NR	BLQ	1	NR	NR	NR	NR	NR	NR	NR
84F	Dec. '93	29-29.5	NR	64	6	NR	NR	NR	NR	NR	NR	NR
84F	Dec. '93	29.5-30	NR	106	44	NR	NR	NR	NR	NR	NR	NR
84F	Dec. '93	30-30.5	591	762	208	0.119	0.917	1.52	4.69	2.06	1.83	11.14
84F	Dec. '93	30.5-31	618	812	408	0.122	2.89	2.07	6.77	3.23	2.51	17.59
84F	Dec. '93	31-31.5	1770	2050	236	0.315	9.2	7.38	24	11.6	8.7	61.20
84L	Dec. '93	31-32.5	NR	1890	NR	NR	NR	NR	NR	NR	NR	NR
84L	Dec. '93	31.5-32.5	NR	34	NR	NR	NR	NR	NR	NR	NR	NR
84P	Dec. '93	26-26.5	NR	BLQ	1	NR	NR	NR	NR	NR	NR	NR
84P	Dec. '93	26.5-27	NR	BLQ	1	NR	NR	NR	NR	NR	NR	NR
84P	Dec. '93	27-27.5	NR	BLQ	1	NR	NR	NR	NR	NR	NR	NR
84P	Dec. '93	27.5-28	NR	39	1	NR	NR	NR	NR	NR	NR	NR
84P	Dec. '93	28-28.5	NR	BLQ	33	NR	NR	NR	NR	NR	NR	NR
84P	Dec. '93	28.5-29	NR	BLQ	14	NR	NR	NR	NR	NR	NR	NR
84P	Dec. '93	29-29.5	NR	35	11	NR	NR	NR	NR	NR	NR	NR
36PTR3NS	May'94	35.5	1.6	NR	NR	ND	BLQ	BLQ	0.0117	BLQ	BLQ	0.01
66PTR1SS	May'94	11	3440	6950	NR	0.0323	0.548	1.52	16.9	9.23	7.38	35.61
67PTR1SS	May'94	20	0.95	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
68PTR1SS	May'94	39.5	14500	22500	NR	4.75	84.7	12	433	90	114	738.45
70PTR3SS	May'94	10	5.84	151	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
71PTR3SS	May'94	21	3430	3380	NR	BLQ	2.64	7.06	34.4	18.2	11.7	74.00
72PTR3SS	May'94	43	3900	8020	NR	0.085	11.5	11.3	43.7	15.3	16.5	98.39
74PTR2NS	May'94	13	0.65	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
75PTR2NS	May'94	33.8	0.75	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ



**TABLE 3.2 (CONTINUED)**

**SOIL DATA FOR THE BTEX COMPOUNDS AND TOTAL PETROLEUM HYDROCARBONS  
Fire Training Area, FT-002  
Intrinsic Remediation EE/CA  
Plattsburgh Air Force Base, NY**

Sample Location	Sample Date	Sample Interval(' bgs) <sup>d</sup>	JP-4 (mg/kg)	TPH <sup>e</sup> (mg/kg)	OVM <sup>e</sup>	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	m-xylene (mg/kg)	o-xylene (mg/kg)	p-xylene (mg/kg)	Total BTEX (mg/kg)
76PTR2NS	May'94	38	2120	NR	NR	BLQ	5.23	11.1	26	11.2	8.04	61.57
84BA	May'94	10.1-10.5	NR	<70	NR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	10.5-10.9	NR	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	10.9-11.3	NR	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	11.3-11.7	NR	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	11.7-12.1	NR	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	12.1-12.5	NR	<70	NR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	31.5-31.6	NR	<70	NR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	31.6-32	NR	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	32-32.4	NR	<70	NR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	32.4-32.4	NR	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	32.8-33.2	NR	<70	NR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	33.2-33.6	NR	<70	NR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	33.6-34	NR	<70	NR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	34-34.1	NR	<70	NR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	34.1-34.5	NR	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	34.5-34.9	NR	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	34.9-35.3	NR	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	35.3-35.7	NR	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	35.7-36.1	NR	<70	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84BA	May'94	36.1-36.5	NR	<70	NR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84CA	May'94	38.1-38.5	NR	NR	NR	0.0162	64.3	70.2	228	46.1	62.7	471.32
84S	May'94	7.5-8.0	12.7	229	NR	ND	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84S	May'94	7.0-7.5	17.5	<70	NR	BLQ	0.083	0.0115	0.0514	0.0226	0.0187	0.19
84S	May'94	17.0-17.5	0.76	<70	NR	BLQ	BLQ	BLQ	0.0086	BLQ	BLQ	0.01
84S	May'94	16.5-17.0	0.78	<70	NR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84S	May'94	24.7-25.0	76.8	<70	NR	0.0256	0.193	0.1	0.458	0.258	0.17	1.20
84S	May'94	35.2-35.5	9750	9150	NR	2.84	53.7	40	124	37.5	41.7	299.74
84S	May'94	34.4-34.8	4690	3090	NR	1.16	26.6	19.5	65.6	20.4	21.7	154.96

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**TABLE 3.2 (CONTINUED)**  
**SOIL DATA FOR THE BTEX COMPOUNDS AND TOTAL PETROLEUM HYDROCARBONS**  
**Fire Training Area, FT-002**  
**Intrinsic Remediation EE/CA**  
**Plattsburgh Air Force Base, NY**

Sample Location	Sample Date	Sample Interval(' bgs) <sup>d</sup>	JP-4 (mg/kg)	TPH <sup>a</sup> (mg/kg)	OVM <sup>b</sup>	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	m-xylene (mg/kg)	o-xylene (mg/kg)	p-xylene (mg/kg)	Total BTEX (mg/kg)
84S	May'94	33.6-34.0	4390	3810	NR	1.32	25.7	18.8	62	19.7	20.5	148.02
84S	May'94	33.2-33.0	611	<70	NR	0.0475	2.1	2.1	7.43	2.67	2.37	16.72
84S	May'94	38.2-38.6	20600	19900	NR	9.95	108	79	357	73.1	67.1	694.15
84S	May'94	37.4-37.8	8780	15900	NR	4.25	59.3	41.6	204	40.8	42.7	392.65
84S	May'94	37.2-37.4	7960	NR	NR	2.26	29.8	28.4	85.4	24.6	28.1	198.56
84S	May'94	41.1-41.5	2410	3400	NR	2.04	21.6	15.4	44.5	14	14.8	112.34
84S	May'94	40.7-41.1	4090	NR	NR	3.47	37.3	26.3	73.3	23.2	25	188.57
84S	May'94	40.3-40.7	32.2	<70	NR	0.481	1.29	0.349	1.06	0.378	0.327	3.89
84S	May'94	39.7-39.9	15400	13800	NR	7.05	67.4	53	229	46.6	53.3	456.35
84S	May'94	42.7-43.1	16.4	<70	NR	0.031	1.71	0.245	0.725	0.2665	0.229	3.21
84S	May'94	42.3-42.7	39	NR	NR	0.0431	2.05	0.416	1.19	0.458	0.385	4.54
84S	May'94	41.9-42.3	9990	3850	NR	4.73	126	75.3	227	73.8	71.2	578.03
06PTR1SF	May'94		NR	NR	NR	BLQ	BLQ	0.0787	0.014	0.059	0.074	0.23
B8133384	May'94		NR	NR	NR	BLQ	BLQ	7.38	24.5	0.04	8.9	40.82

a/ TPH = total petroleum hydrocarbons

b/ OVM =organic vapor meter

c/ ' bgs = feet below ground surface

d/ NR = not reported

e/ BLQ = below practical limit of quantitation

f/ ND = not detected

**TABLE 3.3**

**SOIL DATA FOR CHLORINATED SOLVENTS AND OTHER FUEL-RELATED COMPOUNDS**

**Fire Training Area, FT-002  
Intrinsic Remediation EE/CA  
Plattsburgh Air Force Base, NY**

Sample Location	Sample Date	Sample Interval(' bgs) <sup>a</sup>	TCE <sup>a</sup> (mg/kg)	1,2,3-TMB <sup>b1</sup> (mg/kg)	1,2,4-TMB <sup>a</sup> (mg/kg)	1,3,5-TMB <sup>a</sup> (mg/kg)	1,3-DCB <sup>a</sup> (mg/kg)	1,4-DCB <sup>a</sup> (mg/kg)	1,2-DCB <sup>a</sup> (mg/kg)	Naphthalene (mg/kg)	2-methylnaph <sup>a</sup> (mg/kg)	1-methylnaph <sup>a</sup> (mg/kg)
84B	Dec. '93	31-32.5' bgs	BLQ <sup>a</sup>	6.37	16.3	6.26	BLQ	0.0398	BLQ	2.79	4.03	2.69
84D	Dec. '93	14-14.5' bgs	ND <sup>a</sup>	BLQ	BLQ	0.034	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
84D	Dec. '93	15-15.5' bgs	ND	0.0347	BLQ	BLQ	ND	ND	ND	BLQ	BLQ	BLQ
84D	Dec. '93	15.5-16' bgs	ND	11.3	15.5	10.3	0.05	0.127	ND	1.71	3.93	4.02
84D	Dec. '93	16-16.5' bgs	BLQ	4.83	11.3	4.61	BLQ	0.0672	0.142	1.24	1.38	1.33
84D	Dec. '93	16.5-17' bgs	BLQ	12	28.3	11.7	0.053	0.123	NR <sup>a</sup>	6.33	8.3	6.33
84D	Dec. '93	17-17.5' bgs	BLQ	11.6	28.2	11.1	0.047	0.113	0.451	8.03	9.56	6.92
84D	Dec. '93	17.5-18' bgs	ND	12.1	29.2	11.1	0.0048	0.116	0.497	8.97	10.7	7.75
84D	Dec. '93	18-18.5' bgs	BLQ	13.6	33.3	13	0.053	0.127	0.567	9.49	11.1	7.99
84D	Dec. '93	18.5-19' bgs	BLQ	9.09	22.8	8.39	0.036	0.0871	0.36	6.68	7.94	5.63
84D	Dec. '93	19-19.5' bgs	BLQ	9.05	22.6	8.39	0.036	0.0858	0.413	6.59	7.89	5.59
84D	Dec. '93	19.5-20' bgs	BLQ	6.92	17.5	6.32	0.029	0.0673	0.304	5.2	6.48	4.59
84D	Dec. '93	20-20.5' bgs	BLQ	6.94	17.7	6.31	BLQ	0.0665	0.308	4.95	5.99	4.23
84D	Dec. '93	20.5-21' bgs	ND	3.44	8.84	3.02	BLQ	0.0361	0.146	2.58	3.14	2.16
84D	Dec. '93	21-21.5' bgs	BLQ	5.37	13.6	4.7	BLQ	0.0511	0.241	3.95	4.98	3.54
84D	Dec. '93	21.5-22' bgs	BLQ	11.1	27.3	9.7	0.043	0.103	0.496	8.13	10.1	7.27
84D	Dec. '93	22-22.5' bgs	BLQ	8.75	21.8	7.61	BLQ	0.08	0.38	6.45	8.17	5.77
84D	Dec. '93	22.5-23' bgs	BLQ	10.5	26	9.28	0.041	0.0965	0.451	7.54	9.74	6.99
84D	Dec. '93	23-23.5' bgs	BLQ	8.33	20.4	7.26	0.033	0.077	0.407	5.82	7.43	5.28
84D	Dec. '93	23.5-24' bgs	ND	0.311	0.759	0.25	BLQ	BLQ	BLQ	0.275	BLQ	BLQ
84D	Dec. '93	35-35.5' bgs	BLQ	0.0392	0.0941	0.0317	ND	ND	BLQ	BLQ	BLQ	BLQ
84D	Dec. '93	35.5-36' bgs	ND	BLQ	0.0347	BLQ	BLQ	ND	BLQ	BLQ	BLQ	BLQ
84D	Dec. '93	36-36.5' bgs	5.06	7.62	19.2	6.8	0.078	0.307	1.48	5.15	6.81	4.79
84D	Dec. '93	36.5-37' bgs	17.4	14.8	35.4	13.9	0.121	0.367	2.34	9.73	11.7	8.36
84D	Dec. '93	37-37.5' bgs	57.2	29.3	62.6	30.5	0.295	0.879	5.09	18.6	22.3	16.4
84D	Dec. '93	37.5-38' bgs	169	38.2	82.5	44.5	0.923	2.68	11.7	23.9	30.3	22.2
84D	Dec. '93	38-38.5' bgs	210	28.6	76.2	26.9	0.876	2.57	11.7	15.5	20.1	12.5
84D	Dec. '93	38.5-39' bgs	615	73.5	193	71.4	2.76	8.01	36.1	39.7	52.9	35.3



TABLE 3.3 (CONTINUED)

SOIL DATA FOR CHLORINATED SOLVENTS AND OTHER FUEL-RELATED COMPOUNDS

Fire Training Area, FT-002

Intrinsic Remediation EE/CA

Plattsburgh Air Force Base, NY

Sample Location	Sample Date	Sample Interval(' bgs)'	TCE <sup>a</sup> (mg/kg)	1,2,3-TMB <sup>b1</sup> (mg/kg)	1,2,4-TMB <sup>a</sup> (mg/kg)	1,3,5-TMB <sup>a</sup> (mg/kg)	1,3-DCB <sup>a</sup> (mg/kg)	1,4-DCB <sup>a</sup> (mg/kg)	1,2-DCB <sup>a</sup> (mg/kg)	Napthalene (mg/kg)	2-methylnaph <sup>a</sup> (mg/kg)	1-methylnaph <sup>a</sup> (mg/kg)
84D	Dec. '93	39-39.5' bgs	931	127	328	127	5.25	14.9	66.6	67.4	90.3	61.5
84D	Dec. '93	39.5-40' bgs	1280	164	425	165	692	19.8	88.2	86.3	116	78.7
84D	Dec. '93	40-40.5' bgs	1130	133	343	134	5.82	16.7	73.4	69.8	92.7	62.6
84D	Dec. '93	40.5-41' bgs	876	89.9	239	89.5	3.97	11.4	51.4	47.9	62.3	40.1
84D	Dec. '93	41-41.5' bgs	314	26.4	67.1	24.6	1.36	3.91	18.3	13.7	18.4	11.9
84D	Dec. '93	44-44.3' bgs	ND	BLQ	BLQ	BLQ	ND	ND	ND	BLQ	BLQ	BLQ
84F	Dec. '93	28-28.5' bgs	BLQ	ND	ND	ND	ND	ND	ND	BLQ	BLQ	BLQ
84F	Dec. '93	30-30.5' bgs	ND	2.37	5.28	1.9	ND	ND	ND	0.615	1.45	0.82
84F	Dec. '93	30.5-31' bgs	ND	2.29	5.91	2.31	ND	ND	ND	0.821	1.6	0.96
84F	Dec. '93	31-31.5' bgs	ND	7.16	19.4	8.21	ND	ND	ND	2.45	6.24	3.88
36PTR3N	May'94	35.5' bgs	0.13	BLQ	0.00849	BLQ	NR	NR	NR	NR	NR	NR
66PTR1S	May'94	11' bgs	0.00979	7.28	15.9	7.1	NR	NR	NR	NR	NR	NR
67PTR1S	May'94	20' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
68PTR1S	May'94	39.5' bgs	0.705	40	106	48.2	NR	NR	NR	NR	NR	NR
70PTR3S	May'94	10' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
71PTR3S	May'94	21' bgs	BLQ	13.1	33.9	17.5	NR	NR	NR	NR	NR	NR
72PTR3S	May'94	43' bgs	0.0334	8.12	24.9	11.6	NR	NR	NR	NR	NR	NR
74PTR2N	May'94	13' bgs	0.0198	ND	BLQ	ND	NR	NR	NR	NR	NR	NR
75PTR2N	May'94	33.8' bgs	0.0766	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
76PTR2N	May'94	38' bgs	33.2	7.97	18.8	7.88	NR	NR	NR	NR	NR	NR
84BA	May'94	10.1-10.5' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	10.5-10.9' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	10.9-11.3' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	11.3-11.7' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	11.7-12.1' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	12.1-12.5' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	31.5-31.6' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	31.6-32' bgs	BLQ	BLQ	ND	BLQ	NR	NR	NR	NR	NR	NR

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**TABLE 3.3 (CONTINUED)**

**SOIL DATA FOR CHLORINATED SOLVENTS AND OTHER FUEL-RELATED COMPOUNDS**

**Fire Training Area, FT-002**

**Intrinsic Remediation EE/CA**

**Plattsburgh Air Force Base, NY**

Sample Location	Sample Date	Sample Interval(' bgs)'	TCE <sup>v</sup> (mg/kg)	1,2,3-TMB <sup>b/</sup> (mg/kg)	1,2,4-TMB <sup>v</sup> (mg/kg)	1,3,5-TMB <sup>d/</sup> (mg/kg)	1,3-DCB <sup>v</sup> (mg/kg)	1,4-DCB <sup>v</sup> (mg/kg)	1,2-DCB <sup>v</sup> (mg/kg)	Naphthalene (mg/kg)	2-methylnaph <sup>v</sup> (mg/kg)	1-methylnaph <sup>v</sup> (mg/kg)
84BA	May'94	32-32.4' bgs	BLQ	ND	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	32.4-32.4' bgs	BLQ	ND	BLQ	ND	NR	NR	NR	NR	NR	NR
84BA	May'94	32.8-33.2' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	33.2-33.6' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	33.6-34' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	34-34.1' bgs	BLQ	ND	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	34.1-34.5' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	34.5-34.9' bgs	BLQ	ND	ND	ND	NR	NR	NR	NR	NR	NR
84BA	May'94	34.9-35.3' bgs	BLQ	ND	BLQ	ND	NR	NR	NR	NR	NR	NR
84BA	May'94	35.3-35.7' bgs	BLQ	ND	ND	ND	NR	NR	NR	NR	NR	NR
84BA	May'94	35.7-36.1' bgs	BLQ	ND	ND	BLQ	NR	NR	NR	NR	NR	NR
84BA	May'94	36.1-36.5' bgs	BLQ	ND	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84CA	May'94	38.1-38.5' bgs	144	19.5	42.3	22.6	NR	NR	NR	NR	NR	NR
84S	May'94	7.5-8.0' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84S	May'94	7.0-7.5' bgs	BLQ	0.0236	0.0671	0.0271	NR	NR	NR	NR	NR	NR
84S	May'94	17.0-17.5' bgs	0.00756	BLQ	0.00833	BLQ	NR	NR	NR	NR	NR	NR
84S	May'94	16.5-17.0' bgs	BLQ	BLQ	BLQ	BLQ	NR	NR	NR	NR	NR	NR
84S	May'94	24.7-25.0' bgs	0.00778	0.285	0.796	0.245	NR	NR	NR	NR	NR	NR
84S	May'94	35.2-35.5' bgs	19.1	24.4	53.7	25.3	NR	NR	NR	NR	NR	NR
84S	May'94	34.4-34.8' bgs	8.03	13.4	31	14.2	NR	NR	NR	NR	NR	NR
84S	May'94	33.6-34.0' bgs	7.78	12.7	30.9	13.6	NR	NR	NR	NR	NR	NR
84S	May'94	33.2-33.0' bgs	0.408	2.02	5.39	2.07	NR	NR	NR	NR	NR	NR
84S	May'94	38.2-38.6' bgs	83.8	42.4	102	39.8	NR	NR	NR	NR	NR	NR
84S	May'94	37.4-37.8' bgs	29.1	0.26	58.8	22.8	NR	NR	NR	NR	NR	NR
84S	May'94	37.2-37.4' bgs	20.7	15.7	35.5	16.7	NR	NR	NR	NR	NR	NR
84S	May'94	41.1-41.5' bgs	15.4	6.62	16.7	7.72	NR	NR	NR	NR	NR	NR
84S	May'94	40.7-41.1' bgs	30.2	10.4	26.8	12.2	NR	NR	NR	NR	NR	NR
84S	May'94	40.3-40.7' bgs	1.25	0.116	0.243	0.108	NR	NR	NR	NR	NR	NR

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**TABLE 3.3 (CONTINUED)**

**SOIL DATA FOR CHLORINATED SOLVENTS AND OTHER FUEL-RELATED COMPOUNDS**

**Fire Training Area, FT-002  
Intrinsic Remediation EE/CA  
Plattsburgh Air Force Base, NY**

Sample Location	Sample Date	Sample Interval(' bgs) <sup>y</sup>	TCE <sup>a</sup> (mg/kg)	1,2,3-TMB <sup>b/</sup> (mg/kg)	1,2,4-TMB <sup>c/</sup> (mg/kg)	1,3,5-TMB <sup>d/</sup> (mg/kg)	1,3-DCB <sup>e/</sup> (mg/kg)	1,4-DCB <sup>f/</sup> (mg/kg)	1,2-DCB <sup>g/</sup> (mg/kg)	Napthalene (mg/kg)	2-methylnaph <sup>h/</sup> (mg/kg)	1-methylnaph <sup>i/</sup> (mg/kg)
84S	May'94	39.7-39.9' bgs	60.4	25.8	66	28	NR	NR	NR	NR	NR	NR
84S	May'94	42.7-43.1' bgs	0.117	0.0639	0.141	0.0498	NR	NR	NR	NR	NR	NR
84S	May'94	42.3-42.7' bgs	0.251	0.124	0.288	0.118	NR	NR	NR	NR	NR	NR
84S	May'94	41.9-42.3' bgs	70.1	32.8	90.9	38.1	NR	NR	NR	NR	NR	NR
06PTR1SF	May'94		BLQ	BLQ	0.00542	BLQ	NR	NR	NR	NR	NR	NR
B8133384	May'94		BLQ	7.74	19.9	8.47	NR	NR	NR	NR	NR	NR

a/ TCE = trichloroethene

b/ 1,2,3-TMB = 1,2,3-trimethylbenzene

c/ 1,2,4-TMB = 1,2,4-trimethylbenzene

d/ 1,3,5-TMB = 1,3,5-trimethylbenzene

e/ 1,3-DCB = 1,3-dichlorobenzene

f/ 1,4-DCB = 1,4-dichlorobenzene

g/ 1,2-DCB = 1,2-dichlorobenzene

h/ 2-methylnaph = 2-methylnapthalene

i/ 1-methylnaph = 1-methylnapthalene

j/ ' bgs = feet below ground surface

k/ BLQ = below limit of practical quantitation

l/ ND = not detected

m/ NR = not reported

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**TABLE 3.4**  
**SUMMARY OF PREVIOUS GROUND WATER QUALITY DATA**  
**Fire Training Area, FT-002**  
**Intrinsic Remediation EE/CA**  
**Plattsburgh Air Force Base, NY\***

Sample Compound	Range of Concentration(ppb) <sup>a/</sup>	Frequency of Detection	Maximum Concentration(ppb)	Sample Location of Maximum Concentration
Benzene	ND <sup>b/</sup> to 720	20/31	720	MW-02-031
Toluene	ND to 2100 D <sup>c/</sup>	25/31	2100 D	MW-02-031
Ethylbenzene	ND to 1400	26/31	1400	MW-02-006
Xylenes	ND to 9300	26/31	9300	MW-02-006
Vinyl Chloride	ND to 1000 U <sup>d/</sup>	17/31	1000 U	MW-02-031
DCE Total	ND to 9800	27/31	9800	MW-02-031
TCE	ND to 390 D	21/31	390 D	MW-02-011

\* Source: Ground water data from Phase I and II RI sampling events

a/ ppb = parts per billion

b/ ND = not detected

c/ D = concentration was established by dilution of original sample

d/ U = nondetect at the associated detection limit

**TABLE 3.5**

**GROUND WATER QUALITY DATA FOR BTEX AND TMB COMPOUNDS**

Fire Training Area, FT-002  
 Intrinsic Remediation EE/CA  
 Plattsburgh Air Force Base, NY

Sample Location	Sample Date	Sample Elevation (feet msl) <sup>u</sup>	Benzene (ppb) <sup>u</sup>	Toluene (ppb)	Ethylbenzene (ppb)	p-xylene (ppb)	m-xylene (ppb)	o-xylene (ppb)	Total Xylenes (ppb)	Total BTEX (ppb)	1,3,5-TMB <sup>u</sup> (ppb)	1,2,4-TMB <sup>u</sup> (ppb)	1,2,3-TMB <sup>u</sup> (ppb)
84B	Dec. 1993	207.22	71	52.9	16.2	8.53	24.7	14.9	48.13	188.23	BLQ <sup>u</sup>	2.24	2.46
84B	Dec. 1993	186.02	ND <sup>u</sup>	BLQ	BLQ	ND	BLQ	BLQ	BLQ	BLQ	ND	ND	ND
84E	Dec. 1993	210.52	264	525	354	303	671	268	1242	2385	54	149	60.6
84E	Dec. 1993	190.52	448	944	606	553	979	448	1980	3978	78.6	227	120
84E	Dec. 1993	174.52	6.65	BLQ	7.26	ND	BLQ	BLQ	BLQ	13.91	ND	ND	ND
84F	Dec. 1993	207.26	178	443	263	255	374	249	878	1762	57.4	159	80.7
84F	Dec. 1993	197.26	161	363	250	219	461	164	844	1618	29.7	97.1	49.6
84F	Dec. 1993	192.26	83.4	107	166	136	226	78.2	440.2	796.6	17.3	65.6	33.2
84F	Dec. 1993	177.26	1.59	BLQ	11.3	BLQ	BLQ	BLQ	BLQ	12.89	ND	ND	ND
84M	Dec. 1993	203.4	183	277	449	480	1010	352	1842	2751	88.6	242	130
84M	Dec. 1993	183.4	16.3	1.03	15.7	6.25	BLQ	BLQ	BLQ	39.28	ND	BLQ	ND
84N	Dec. 1993	204.15	416	1090	488	429	902	379	1710	3704	70.8	198	99.6
84N	Dec. 1993	184.15	287	241	318	278	607	223	1108	1954	37.8	102	56.8
84O	Dec. 1993	203.1	296	309	329	294	574	244	1112	2046	56.9	149	71.9
84O	Dec. 1993	188.1	242	78.7	273	233	512	193	938	1531.7	32.6	89.9	50
MW-02-005	Dec. 1993	213.42	1.27	ND	107	37.1	7.69	1.27	46.06	154.33	2.57	5.48	7.65
MW-02-006	Dec. 1993	214.78	7.32	101	144	200	515	283	998	1250.32	180	588	306
MW-02-006 (dup)	Dec. 1993	214.78	7.96	263	139	147	367	187	701	1110.96	43.5	122	66.3
MW-02-007	Dec. 1993	179.69	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	BLQ
MW-02-014	Dec. 1993	216.01	342	1560	808	795	1790	715	3300	6010	111	352	189
MW-02-015	Dec. 1993	217.25	30.2	303	161	183	512	213	908	1402.2	93	255	145
MW-02-019	Dec. 1993	211.43	321	327	433	352	703	263	1318	2399	65.9	179	93.2
MW-02-020	Dec. 1993	195.16	286	148	563	534	1190	419	2143	3138	116	322	157
MW-02-021	Dec. 1993	181.85	ND	ND	ND	ND	BLQ	ND	ND	ND	ND	ND	ND
MW-02-026	Dec. 1993	219.6	ND	BLQ	BLQ	BLQ	3.69	2.55	6.24	6.24	1.19	1.96	1.66
MW-02-027	Dec. 1993	186.72	ND	BLQ	ND	ND	0.997	BLQ	0.997	0.997	BLQ	BLQ	BLQ
MW-02-030	Dec. 1993	179.55	16.5	1.06	19.9	3	4.72	1.48	9.2	46.66	ND	1.1	BLQ
MW-02-030 (dup)	Dec. 1993	179.55	19.6	1.05	21.6	2.37	3.04	0.969	6.379	48.639	BLQ	BLQ	BLQ

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**TABLE 3.5 (CONTINUED)**  
**GROUND WATER QUALITY DATA FOR BTEX AND TMB COMPOUNDS**  
**Fire Training Area, FT-002**  
**Intrinsic Remediation EE/CA**  
**Plattsburgh Air Force Base, NY**

Sample Location	Sample Date	Sample Elevation (feet msl) <sup>a/</sup>	Benzene (ppb) <sup>b/</sup>	Toluene (ppb)	Ethylbenzene (ppb)	p-xylene (ppb)	m-xylene (ppb)	o-xylene (ppb)	Total Xylenes (ppb)	Total BTEX (ppb)	1,3,5-TMB <sup>c/</sup> (ppb)	1,2,4-TMB <sup>d/</sup> (ppb)	1,2,3-TMB <sup>e/</sup> (ppb)
MW-02-040	Dec. 1993	184.02	1.93	ND	ND	ND	ND	ND	ND	1.93	ND	ND	ND
MW-02-041	Dec. 1993	169.05	40.7	BLQ	ND	BLQ	ND	0.914	0.914	41.614	ND	ND	ND
MW-02-042	Dec. 1993	153.26	56.9	ND	ND	ND	ND	ND	ND	56.9	ND	ND	ND
MW-02-043	Dec. 1993	165.47	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02-043 (dup)	Dec. 1993	165.47	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02-044	Dec. 1993	166.24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Field Blank	Dec. 1993		2.42	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND
CP-02-003	1991	217.15	2	NR <sup>h/</sup>	NR	NR	NR	NR	NR	2	NR	NR	NR
CP-02-003	1991	208.15	15	NR	15	NR	NR	NR	NR	30	NR	NR	NR
CP-02-003	1991	199.15	NR	NR	66	NR	NR	NR	NR	66	NR	NR	NR
CP-02-003	1991	185.15	NR	NR	16	NR	NR	NR	NR	16	NR	NR	NR
CP-02-008	1991	153.31	240	NR	NR	NR	NR	NR	NR	240	NR	NR	NR
CP-02-009	1991	174.31	2.8	NR	NR	NR	NR	NR	NR	2.8	NR	NR	NR

- a/ feet msl = feet above mean sea level
- b/ ppb = parts per billion
- c/ 1,3,5 TMB = 1,3,5 trimethylbenzene
- d/ 1,2,4 TMB = 1,2,4 trimethylbenzene
- e/ 1,2,3 TMB = 1,2,3 trimethylbenzene
- f/ BLQ = below practical limit of quantitation
- g/ ND = not detected
- h/ NR = not reported



TABLE 3.6

## GROUND WATER QUALITY DATA FOR CHLORINATED SOLVENTS AND OTHER FUEL-RELATED COMPOUNDS

Fire Training Area, FT-002  
 Intrinsic Remediation EE/CA  
 Plattsburgh Air Force Base, NY

Sample Location	Sample Date	Sample Elevation (feet msl) <sup>v</sup>	Vinyl Chloride (ppb) <sup>v</sup>	trans-DCE <sup>v</sup> (ppb)	cis-DCE <sup>v</sup> (ppb)	Lab Qual. Flag	TCE <sup>v</sup> (ppb)	Total Chlorinated Solvents (ppb)	Fuel Carbon (ppb)
84B	Dec. 1993	207.22	BLQ <sup>v</sup>	BLQ	300		5.6	305.6	296
84B	Dec. 1993	186.02	BLQ	BLQ	3.1		BLQ	3.1	BLQ
84E	Dec. 1993	210.52	1020	1.2	752		BLQ	1773.7	3060
84E (dup)	Dec. 1993	210.52	1010	1.1	710		BLQ	1721.1	NR
84E	Dec. 1993	190.52	25.7	1.3	10000	>	0.7	10027.7	7560
84E (dup)	Dec. 1993	190.52	22.4	1.3	10900	1/2 dil <sup>v</sup>	1	10924.7	NR
84E	Dec. 1993	174.52	BLQ	BLQ	160		20.6	180.6	74.3
84F	Dec. 1993	207.26	2080	BLQ	9.1		BLQ	2089.1	2570
84F (dup)	Dec. 1993	207.26	1610	BLQ	8.3		BLQ	1618.3	NR
84F	Dec. 1993	197.26	3.6	BLQ	6370		BLQ	6373.6	3360
84F	Dec. 1993	192.26	5.7	BLQ	4310		0.6	4316.3	1930
84F	Dec. 1993	177.26	BLQ	BLQ	69		12.8	81.8	53.1
84M	Dec. 1993	203.4	1050	BLQ	1320		BLQ	2370	4300
84M (lab dup)	Dec. 1993	203.4	995	BLQ	1250		BLQ	2245	NR
84M	Dec. 1993	183.4	BLQ	BLQ	240		9.1	249.1	124
84N	Dec. 1993	204.15	1710	BLQ	208		BLQ	1918	4620
84N (dup)	Dec. 1993	204.15	1550	BLQ	209		BLQ	1759	NR
84N	Dec. 1993	184.15	3.1	1	5850		BLQ	5854.1	4200
84O	Dec. 1993	203.1	486	BLQ	3140		2.8	3628.8	3370
84O	Dec. 1993	188.1	BLQ	BLQ	6710		BLQ	6710	3280
84O (lab dup)	Dec. 1993	188.1	BLQ	BLQ	6650		BLQ	6650	NR
84-Field Blank	Dec. 1993	N/A <sup>v</sup>	BLQ	BLQ	BLQ		BLQ	BLQ	4.77
MW-02-005	Dec. 1993	213.42	BLQ	BLQ	4		0.6	4.6	844
MW-02-006	Dec. 1993	214.78	BLQ	BLQ	28.7		0.6	29.3	3620
MW-02-007	Dec. 1993	179.69	BLQ	BLQ	BLQ		BLQ	BLQ	BLQ
MW-02-007 (dup)	Dec. 1993	179.69	BLQ	BLQ	BLQ		BLQ	BLQ	NR

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**TABLE 3.6 (CONTINUED)**

**GROUND WATER QUALITY DATA FOR CHLORINATED SOLVENTS AND OTHER FUEL-RELATED COMPOUNDS**

**Fire Training Area, FT-002  
Intrinsic Remediation EE/CA  
Plattsburgh Air Force Base, NY**

Sample Location	Sample Date	Sample Elevation (feet msl) <sup>v</sup>	Vinyl Chloride (ppb) <sup>v</sup>	trans-DCE <sup>v</sup> (ppb)	cis-DCE <sup>v</sup> (ppb)	Lab Qual. Flag	TCE <sup>v</sup> (ppb)	Total Chlorinated Solvents (ppb)	Fuel Carbon (ppb)
MW-02-014	Dec. 1993	216.01	4.5	BLQ	9050		1030	10084.5	9940
MW-02-014 (dup)	Dec. 1993	216.01	3.7	BLQ	9760		560	10323.7	NR
MW-02-015	Dec. 1993	217.25	BLQ	BLQ	110		1330	1440	2800
MW-02-019	Dec. 1993	211.43	384	BLQ	3540		1.9	3925.9	4410
MW-02-020	Dec. 1993	195.16	9.8	BLQ	8530		1.4	8541.2	7580
MW-02-021	Dec. 1993	181.85	BLQ	BLQ	2		4.6	6.6	BLQ
MW-02-021 (lab dup)	Dec. 1993	181.85	BLQ	BLQ	2.1		4.5	6.6	NR
MW-02-026	Dec. 1993	219.6	BLQ	BLQ	BLQ		BLQ	BLQ	25.7
MW-02-027	Dec. 1993	186.72	BLQ	BLQ	BLQ		BLQ	BLQ	BLQ
MW-02-030	Dec. 1993	179.55	BLQ	0.7	185		79.7	265.4	145
MW-02-040	Dec. 1993	184.02	0.8	BLQ	339		3.1	342.9	92
MW-02-041	Dec. 1993	169.05	BLQ	BLQ	5230		30.7	5260.7	18500
MW-02-042	Dec. 1993	153.26	2.2	1.1	1570		98.5	1671.8	469
MW-02-042 (lab dup)	Dec. 1993	153.26	2.3	1	1570		91	1664.3	NR
MW-02-043	Dec. 1993	165.47	BLQ	BLQ	10.6		373	383.6	BLQ
MW-02-044	Dec. 1993	166.24	BLQ	BLQ	2.9		135	137.9	BLQ
MW-02-043	May 1994	165.47	1.65	2.49	11.4		303	318.5	NR
MW-02-043 (dup)	May 1994	165.47	2.14	3.32	13.9		321	340.4	NR
84Q-2	May 1994	211.92	1.18	1.08	156		2.79	161.1	NR
84Q-2 (dup)	May 1994	211.92	BLQ	1.79	155		3.07	159.9	NR
84Q-3	May 1994	199.42	488	25.6	601		6.94	1121.5	NR
84Q-4	May 1994	192.42	161	228	3150		21.5	3560.5	NR
84Q-5	May 1994	182.92	32.3	33.8	908		129	1103.1	NR
84Q-6	May 1994	175.42	28.5	11.9	1120		104	1264.4	NR
Sparge Pt 1 (1)	May 1994	14' bgs*	233	34.9	840		4.44	1112.3	NR
Sparge Pt 1 (1) (dup)	May 1994	14' bgs*	232	37.4	837		5.12	1111.5	NR

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**TABLE 3.6 (CONTINUED)**  
**GROUND WATER QUALITY DATA FOR CHLORINATED SOLVENTS AND OTHER FUEL-RELATED COMPOUNDS**  
**Fire Training Area, FT-002**  
**Intrinsic Remediation EE/CA**  
**Plattsburgh Air Force Base, NY**

Sample Location	Sample Date	Sample Elevation (feet msl) <sup>u</sup>	Vinyl Chloride (ppb) <sup>v</sup>	trans-DCE <sup>w</sup> (ppb)	cis-DCE <sup>w</sup> (ppb)	Lab Qual. Flag	TCE <sup>w</sup> (ppb)	Total Chlorinated Solvents (ppb)	Fuel Carbon (ppb)
Sparge Pt 1 (2)	May 1994	24' bgs <sup>a</sup>	167	228	1870		23.1	2288.1	NR
Sparge Pt 2	May 1994	14' bgs <sup>a</sup>	29.9	137	731		162	1059.9	NR
Sparge Pt 3	May 1994	14' bgs <sup>a</sup>	537	52.5	578		10.4	1177.9	NR
Sparge Pt 4 (1)	May 1994	14' bgs <sup>a</sup>	459	67.1	848		9.87	1383.9	NR
Sparge Pt 4 (2)	May 1994	24' bgs <sup>a</sup>	195	233	3460		14.8	3902.8	NR
Sparge Pt 5	May 1994	14' bgs <sup>a</sup>	717	55.8	324		4.73	1101.5	NR
CP-02-002	1991	230.92	NR <sup>w</sup>	NR	NR		47	47	NR
CP-02-002	1991	198.92	NR	NR	1.1		21	22.1	NR
CP-02-002	1991	192.92	NR	NR	ND <sup>w</sup>		ND	ND	NR
CP-02-003	1991	217.15	NR	NR	120		NR	120	NR
CP-02-003	1991	208.15	NR	NR	210		NR	210	NR
CP-02-003	1991	199.15	NR	NR	160		NR	160	NR
CP-02-003	1991	185.15	NR	NR	84		NR	84	NR
CP-02-003	1991	173.15	NR	NR	1.2		NR	1.2	NR
CP-02-004	1991	210.15	NR	NR	NR		1	1	NR
CP-02-004	1991	194.15	NR	NR	NR		20	20	NR
CP-02-004	1991	184.15	NR	NR	NR		ND	ND	NR
CP-02-004	1991	176.15	NR	NR	NR		ND	ND	NR
CP-02-005	1991	237.68	NR	NR	NR		6.6	6.6	NR
CP-02-005	1991	226.68	NR	NR	NR		ND	ND	NR
CP-02-005	1991	210.68	NR	NR	NR		ND	ND	NR
CP-02-005	1991	206.68	NR	NR	NR		ND	ND	NR
CP-02-005	1991	202.68	NR	NR	NR		ND	ND	NR
CP-02-006	1991	247.37	NR	NR	NR		630	630	NR
CP-02-006	1991	238.37	NR	NR	180		3400	3580	NR
CP-02-006	1991	229.37	NR	NR	850		3500	4350	NR

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**TABLE 3.6 (CONTINUED)**  
**GROUND WATER QUALITY DATA FOR CHLORINATED SOLVENTS AND OTHER FUEL-RELATED COMPOUNDS**  
**Fire Training Area, FT-002**  
**Intrinsic Remediation EE/CA**  
**Plattsburgh Air Force Base, NY**

Sample Location	Sample Date	Sample Elevation (feet msl) <sup>v</sup>	Vinyl Chloride (ppb) <sup>v</sup>	trans-DCE <sup>v</sup> (ppb)	cis-DCE <sup>v</sup> (ppb)	Lab Qual. Flag	TCE <sup>v</sup> (ppb)	Total Chlorinated Solvents (ppb)	Fuel Carbon (ppb)
CP-02-006	1991	218.37	NR	NR	NR		430	430	NR
CP-02-006	1991	207.37	NR	NR	NR		330	330	NR
CP-02-007	1991	187.81	NR	NR	NR		12	12	NR
CP-02-007	1991	178.81	NR	NR	NR		54	54	NR
CP-02-007	1991	164.81	NR	NR	240		4900	4900	NR
CP-02-007	1991	153.81	NR	NR	NR		26	26	NR
CP-02-008	1991	182.31	NR	NR	670		52	722	NR
CP-02-008	1991	167.31	NR	NR	2000		1500	3500	NR
CP-02-008	1991	158.31	NR	NR	1700		3200	4900	NR
CP-02-008	1991	153.31	NR	NR	510		3300	3810	NR
CP-02-009	1991	193.31	NR	NR	14		NR	14	NR
CP-02-009	1991	181.31	NR	NR	19		NR	19	NR
CP-02-009	1991	174.31	NR	NR	700	1/20 dil	NR	700	NR
CP-02-009	1991	165.31	NR	NR	10000	1/1000 dil	NR	10000	NR
CP-02-009	1991	155.31	NR	NR	790	1/100 dil	NR	790	NR
CP-02-009	1991	149.31	NR	NR	20	1/10 dil	NR	20	NR
CP-02-010	1991	179.76	NR	NR	NR		5.3	5.3	NR
CP-02-010	1991	163.76	NR	NR	19		5.5	24.5	NR
CP-02-011	1991	174.51	NR	NR	NR		1.4	1.4	NR
CP-02-011	1991	161.5	NR	NR	17		6.2	23.2	NR
CP-02-012	1991	194.87	NR	NR	42		19	61	NR
CP-02-012	1991	184.87	NR	NR	2100		1500	3600	NR
CP-02-012	1991	175.87	NR	NR	8.7		6.4	15.1	NR
CP-02-013	1991	189.99	NR	NR	NR		190	190	NR
CP-02-013	1991	181.99	NR	NR	3.7		8.4	12.1	NR
CP-02-024	1991	N/A	NR	NR	ND		ND	ND	NR

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**TABLE 3.6 (CONTINUED)**  
**GROUND WATER QUALITY DATA FOR CHLORINATED SOLVENTS AND OTHER FUEL-RELATED COMPOUNDS**  
**Fire Training Area, FT-002**  
**Intrinsic Remediation EE/CA**  
**Plattsburgh Air Force Base, NY**

Sample Location	Sample Date	Sample Elevation (feet msl) <sup>a/</sup>	Vinyl Chloride (ppb) <sup>b/</sup>	trans-DCE <sup>c/</sup> (ppb)	cis-DCE <sup>d/</sup> (ppb)	Lab Qual. Flag	TCE <sup>e/</sup> (ppb)	Total Chlorinated Solvents (ppb)	Fuel Carbon (ppb)
CP-02-025	1991	212.9	NR	NR	ND		ND	ND	NR
CP-02-025	1991	202.9	NR	NR	ND		50	50	NR
CP-02-025	1991	195.9	NR	NR	ND		ND	ND	NR
CP-02-032	1991	212.3	NR	NR	ND		ND	ND	NR
CP-02-032	1991	202.3	NR	NR	ND		23	23	NR
CP-02-032	1991	195.3	NR	NR	ND		ND	ND	NR
CP-02-033	1991	N/A	ND	ND	ND		ND	ND	NR
CP-02-037	1991	183.85	ND	ND	ND		ND	ND	NR
CP-02-037	1991	173.85	ND	ND	ND		ND	ND	NR
CP-02-037	1991	161.85	ND	ND	ND		ND	ND	NR
CP-02-039	1991	173.55	ND	ND	500		30	530	NR

- a/ feet msl = feet above mean sea level
- b/ ppb = parts per billion
- c/ trans-DCE = trans-dichloroethylene
- d/ cis-DCE = cis-dichloroethylene
- e/ TCE = trichloroethylene
- f/ BLQ = below practical limit of quantitation
- g/ NR = not reported
- h/ ND = not detected
- i/ dil = dilution factor
- j/ N/A = not applicable
- \* estimated feet below ground surface

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## SECTION 4.0

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

#### 4.1 THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT

##### 4.1.1 Hazard Identification

As reported previously in this document, environmental sampling has shown elevated levels BTEX compounds and chlorinated solvents. These chemical contaminants have been identified in soil and groundwater samples collected from borings taken at, and downgradient of site FT-002. Direct human contact with these contaminants is unlikely if the site is not disturbed. For the purposes of this Action Memorandum, chemical contamination is discussed in the context of the potential for additional degradation of groundwater which may be used for public consumption.

##### 4.1.2 Description of Contaminants

###### 4.1.2.1 Toxicity

**Benzene:** Benzene is absorbed into the body following ingestion, inhalation, and dermal contact, and must undergo metabolic transformation to exert its toxic effects. Metabolism occurs primarily in the liver, and to a lesser extent in the bone marrow. The primary targets of benzene toxicity are the central nervous system and the blood. Benzene is genotoxic to humans and the USEPA has placed it in weight-of-evidence cancer Group A, indicating that it is a human carcinogen.

**Toluene:** Toluene acts primarily on the central nervous system. The USEPA has placed toluene in weight-of-evidence Group D; that is, it is not classifiable as to human carcinogenicity.

**Ethylbenzene:** Humans exposed to ethylbenzene may experience eye and throat irritation, decreased movement, and dizziness. Studies in animals have shown liver and kidney damage, nervous system changes, and blood changes. The USEPA has placed ethylbenzene in weight-of-evidence Group D, indicating that it is not classifiable as to human carcinogenicity.

**Xylenes:** The primary target of xylenes toxicity is the central nervous system. Xylenes are considered to be nongenotoxic. The USEPA has placed xylenes in weight-of-evidence cancer Group D, indicating that they are not classifiable as to human carcinogenicity.

**Trichloroethene:** TCE has anesthetic properties, and inhalation of high concentrations causes unconsciousness in humans. Links to cancer and birth defects in humans are uncertain. Neither IRIS nor HEAST currently provide toxicity values for TCE. The USEPA has not resolved the weight-of-evidence classification of TCE, and currently places it in either Group C (possible human carcinogen) or Group B2 (probable human carcinogen). It has also been described as being on a Group "C-B2 continuum".

**Dichloroethene:** The available toxicity information is very limited, and sometimes does not distinguish between the two forms of 1,2-dichloroethene, that is, cis and trans. Humans exposed to high vapor levels of 1,2-dichloroethene, depending on the form and duration, may experience nausea, drowsiness, and death. In animals, adverse effects to the lung, liver, heart, and blood have been noted. The USEPA has placed 1,2-cis dichloroethene in weight-of-evidence Group D; that is, it is not



classifiable as to human carcinogenicity. 1,2-trans-dichloroethene has not been placed in weight-of-evidence group by the USEPA.

**Vinyl Chloride:** The primary health concern associated with exposure to vinyl chloride is its carcinogenic potential. The target organs for cancer include the liver, brain, and lungs, and probably the lymph- and blood-forming systems. Cases of liver cancer in humans have been associated with exposure. Other types of cancer have been demonstrated in animal studies. The USEPA has placed vinyl chloride in weight-of-evidence Group A, indicating that it is a human carcinogen.

#### 4.1.2.2 Fate and Transport

**Benzene:** Benzene will rapidly volatilize from surface soil and water. That which does not volatilize from permeable surface and subsurface soils will be highly to very highly mobile, and can be expected to leach to nearby groundwater which is not protected by a confining layer. It is fairly soluble, and will be carried with the groundwater to discharge points. It is subject to biodegradation in soils, shallow groundwater, and surface water. Benzene will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms, or hydrolyze. Photodegradation may be a significant removal mechanism in surface waters which are not conducive to microbial degradation. Benzene will undergo significant photodegradation in air, but may be washed out with rain.

**Toluene:** Much of the toluene released to surface soil will be lost to volatilization. It is mobile in soils and will leach to groundwater. Biodegradation occurs in soil and groundwater, but is inhibited by high concentrations. Under ideal conditions of low concentration and acclimated microbial populations, rapid biodegradation may occur. Losses from surface water occur due to volatilization and biodegradation. It will not significantly adsorb to sediment or bioconcentrate in aquatic organisms. In the atmosphere it will degrade or be washed out with rain.

**Ethylbenzene:** Ethylbenzene released to surface soils will probably undergo partial volatilization and, given its limited ability to sorb to soils ( $K_{OC} = 871$ ), leaching to groundwater. Evidence suggests that this material undergoes biodegradation in groundwaters, and may do so in soils if the initial loading doesn't prove toxic to soil-based microorganisms. If released to surface waters, ethylbenzene is expected to volatilize fairly readily. As with groundwaters, rapid biodegradation can be predicted after an initial acclimation period. Ethylbenzene shows only a slight to moderate tendency to adsorb to soils and sediments in waters. Bioconcentration in aquatic organisms is not expected to be significant (bioconcentration factor for ethylbenzene = 145). Ethylbenzene is expected to exist in the atmosphere primarily as a vapor, based upon its vapor pressure value (9.53 mm Hg). Principally, ethylbenzene will be removed from the atmosphere via reaction with hydroxyl radicals; some washout via rainfall may be expected.

**Xylenes:** Xylenes are moderately mobile in soil and may leach to groundwater where they are known to persist for several years despite evidence of biodegradation in both soil and groundwater. The dominant removal process in surface water is volatilization, but this is not a rapid process. Some adsorption to sediment will occur. Once released to the atmosphere, xylenes will undergo photochemical degradation at a moderate rate.

**Trichloroethene:** TCE released to soil will partially evaporate and partially leach to groundwater, where it may remain for a long time. It is highly mobile in soils, where there is some degradation to other chlorinated alkenes. Since it is only somewhat soluble in water and substantially denser, when it occurs as a separate phase it tends to sink to the bottom of the aquifer. Significant biodegradation can take place when TCE is cometabolized in the presence of BTEX compounds. Evaporation is the primary

removal mechanism in surface water. Biodegradation, hydrolysis, and photooxidation are extremely slow by comparison. Adsorption to sediment and bioconcentration in aquatic organisms are insignificant. TCE in the atmosphere is present in the vapor phase and is rapidly degraded.

**Dichloroethene:** Both isomers of 1,2-dichloroethene (cis and trans) released on soil should partially evaporate, with the balance leaching into groundwater where very slow biodegradation should occur. Biodegradation rates will increase when DCE is cometabolized in the presence of BTEX compounds. If released to surface water they will be lost mainly through volatilization. Adsorption to soil and sediment, as well as biodegradation and bioconcentration in aquatic organisms should not be significant. They will be abiotically degraded in air and scavenged by rainfall. Once in the atmosphere, considerable dispersal from source areas should occur.

**Vinyl Chloride:** Vinyl chloride rapidly volatilizes from surface soil. It is highly mobile and will likely leach to groundwater. It may be subject to limited biodegradation under aerobic conditions in soil and groundwater. It will rapidly volatilize from surface water. It is not expected to hydrolyze, bioconcentrate in aquatic organisms, or adsorb to sediment. Photodegradation may occur rapidly in surface waters high in humic acid. In the atmosphere it exists mainly in the vapor phase, and degrades rapidly.

#### 4.1.3 Contaminant Action Levels

Because there are no Federal or State standards for soil cleanup, other criteria must be used to evaluate the impact of the contamination at the site. The NYSDEC Division of Hazardous Waste Remediation has issued Technical and Administrative Guidance Memorandum HWR-94-4046, titled "Determination of Soil Cleanup Objectives and Cleanup Levels", (TAGM 4046), January 24, 1994. This guidance provides recommended soil cleanup objectives (RCOs) for the contaminants of concern at Site FT-002.

The maximum allowable soil concentrations for the major organic contaminants found at Site FT-002, calculated by the Water-Soil Partition Model, are as follows:

##### 4.1.3.1 Benzene (RCO = 60 mg/kg)

Benzene was detected during confirmation sampling in 1993 at a concentration of 48,000 mg/kg at location 84D at a depth 40 feet below grade. This value exceeds the 60 mg/kg by allowable contaminant concentration in soil provided in TAGM 4046.

##### 4.1.3.2 Toluene (RCO = 1,500 mg/kg)

Toluene was detected during confirmatory sampling in 1993 at a concentration of 547,000 mg/kg at location 84D at a depth of 40 feet below grade. This value exceeds the 1,500 mg/kg allowable contaminant concentration in soil provided in TAGM 4046.

##### 4.1.3.3 Ethylbenzene (RCO = 5,500 mg/kg)

Ethylbenzene was detected during confirmatory sampling in 1993 at a concentration of 313,000 mg/kg at location 84D at a depth of 40 feet below grade. This value exceeds the 5,500 mg/kg allowable contaminant concentration in soil provided in TAGM 4046.

##### 4.1.3.4 Xylenes (RCO = 1,200 mg/kg)

Total xylenes were detected during confirmatory sampling in 1993 at a concentration of 1,537,000 mg/kg at location 84D at a depth of 40 feet below grade. This value exceeds the 1,200 mg/kg allowable contaminant concentration provided in TAGM 4046.

#### 4.1.3.5 TCE (RCO = 700 mg/kg)

TCE was detected during confirmatory sampling in 1993 at a concentration of 1,128,000 mg/kg at location 84D at a depth of 40 feet below grade. This value exceeds the 700 mg/kg by allowable contaminant concentration provided in TAGM 4046.

#### 4.1.4 Conclusions

Previous field investigations at Site FT-002 indicate elevated levels of BTEX and certain chlorinated solvents. The soil cleanup objectives in TAGM 4046 are based on protection of groundwater. Comparing the contaminant concentrations detected in site soil samples to these objectives indicates there is a very high potential for these analytes to continue to leach into the groundwater at concentrations that would exceed the NYSDEC groundwater and NYSDOH drinking water standards even in the absence of LNAPLs. Groundwater data collected at the site confirm that BTEX compounds and chlorinated solvents have migrated from the source areas. Therefore, removal action is warranted for this site.

Almost all of the samples collected at Site FT-002 to date have been analyzed for BTEX and TCE. Therefore, the cleanup levels for Site FT-002 have been based on BTEX and TCE. It is anticipated that remediating for these compounds will effectively remove/attenuate any other VOCs present at the site.

## SECTION 5.0

### ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment. If this removal action is not implemented there is potential for additional contaminants to reach the groundwater and migrate downward and in the direction of groundwater flow. This would increase the migration of contaminants and thus, the realm of endangerment. Contamination of the groundwater, if used as a potable water source, would endanger public health and welfare.

## SECTION 6.0

### PROPOSED ACTIONS AND ESTIMATED COSTS

#### 6.1 PROPOSED ACTION

##### 6.1.1 Overview

The proposed action includes installation of a full-scale soil vapor extraction/bioventing system consisting of a number of extraction and/or bioventing wells manifolded to a two or more centrifugal vacuum blowers. SVE will be implemented at the Pit 1 area of FT-002, and bioventing in and around the Pits 2, 3, and 4 area. Tentatively, the vacuum blower will be followed by a catalytic or flameless thermal oxidation unit (and, if necessary, an acid scrubber) or a vapor phase carbon treatment system, to treat the extracted soil gas prior to emission to the atmosphere. The remedial alternative was selected based on available site information and the USEPA's Presumptive Remedy Approach for soils contaminated with VOCs and SVOCs (EPA-540-93-048).

SVE and bioventing are recommended to treat the vadose zone soils at site FT-002 based on the following:

- High permeability fine to medium grained sandy soils.
- Volatile chlorinated hydrocarbons generally are effectively removed by SVE.
- Volatile non-chlorinated hydrocarbons generally are effectively biodegraded by bioventing.
- Adequate vadose zone (30 to 40 feet thick) for performing SVE and/or bioventing.
- Previous pilot study data (i.e. bioventing test) indicating a venting radius of influence of greater than 60 feet.
- Concurrent free product removal and groundwater depression, which will enhance the overall remediation of vadose zone soils.

##### 6.1.2 Treatment Area

SVE remediation effectiveness will be determined by BTEX and TCE. According to TAGM 4046, remediating to 60 mg/kg benzene, 1,500 mg/kg toluene, 5,500 mg/kg ethylbenzene, 1,200 mg/kg xylene, and 700 mg/kg TCE will adequately protect the groundwater. The data obtained from previous field investigations indicate that measured concentrations of BTEX and TCE in the vadose zone are limited to an area approximately 1,000 feet by 1,200 feet; outside of that area there were low detectable levels of BTEX and TCE. It has been assumed that remediating all soil with detectable levels of xylene and TCE (based on the existing data) will effectively remediate all soil containing other detected organic compounds and chlorinated solvents.

##### 6.1.3 Detailed Description of Full-Scale System

Installation of a full-scale SVE system will consist of installation of a number of new extraction wells combined with four existing bioventing wells manifolded to a single or several centrifugal blower(s) followed by a catalytic or flameless thermal oxidation unit (and if necessary an acid scrubber) or a vapor phase carbon treatment system to treat the extracted soil gas prior to emission to the atmosphere. The system layout is presented on Figure 6.1.

SVE system samples will be collected from the vacuum blower inlet and thermal oxidizer exhaust stack and analyzed for VOCs of concern (BTEX, TCE, Cis-DCE, 1,3,4- and 1,2,4-Trimethylbenzene, hexane, cyclohexane, 4-Ethyltoluene, and heptane) via modified Method TO-14 using laboratory evacuated Summa® canisters. The exhaust stack will also be sampled for hydrochloric acid.

Sampling will be conducted twice daily for the first five days of the system start-up and prove-out period. Following this period, the system will be sampled once every two days for two weeks. Monthly sampling will then be initiated until VOCs (particularly the chlorinated compounds) concentrations reach an asymptotic level. Pulsed operation of the system is recommended when asymptotic levels are reached with daily sampling for a period of one week following each system restart. Monthly sampling will resume after the first week of each restart.

#### **6.1.4 Disposal of Waste**

The selection of SVE as a remedial technology in lieu of excavation and thermal treatment, i.e. incineration or thermal desorption, is based on the USEPA's Presumptive Remedy Approach and site information available. The use of SVE as a warranted remedial technology will not generate any waste necessitating disposal.

#### **6.1.5 Contribution to Remedial Performance**

The proposed action is being implemented to remediate contaminated soils so that additional contaminants do not reach the groundwater. The main objective of the remedial action is to remediate the soils containing BTEX and chlorinated solvents. Concurrent free product removal and groundwater depression will expose additional soils to treatment via SVE or bioventing.

#### **6.1.6 Description of Alternative Technologies**

The proposed removal action is "time critical" and does not require the preparation of an Engineering Evaluation/Cost Analysis (EE/CA) or a review of alternative technologies. This remedial technology was selected using the USEPA's Presumptive Remedy Approach for soils contaminated with VOCs and SVOCs (EPA-540-F-93-048).

#### **6.1.7 Engineering Evaluation/Cost Analysis (EE/CA)**

"Time critical" removal actions do not require preparation of an EE/CA.

#### **6.1.8 Applicable or Relevant and Appropriate Requirements (ARARs)**

##### **6.1.8.1 General**

All ARARs will be strictly adhered to during the removal action. The following ARARs have been identified for this removal action:

- Standards Applicable to Generators of Hazardous Waste (Title 40, Section 262, Code of Federal Regulations).
- Contingency Plan and Emergency Procedures (Title 40, Section 264, Subpart D, Code of Federal Regulations).
- General Facility Standards and Operations (Title 40, Section 264, Code of Federal Regulations).
- Hazardous Materials Regulations (Title 29, Section 1910, Code of Federal Regulations).
- Health and Safety Program (Title 29, Section 1910, Code of Federal Regulations).



- NYSDEC Hazardous Waste Management Regulations (Title 6, NYCRR, Part 373).
- (Title 49, Parts 171 through 179, Code of Federal Regulations).
- TAGM HWR-94-4046 Determination of Soil Cleanup Objectives and Cleanup Levels (Revised) January 24, 1994.
- NYSDEC Air Regulations (Title 6, NYCRR Part 200).
- NYSDEC Air Regulations (Title 6, NYCRR Part 201).
- NYSDEC Air Regulations (Title 6, NYCRR Part 211).
- NYSDEC Air Regulations (Title 6, NYCRR Part 212).
- NYSDEC Air Regulations (Title 6, NYCRR Part 257).
- Air Guide 1 - Guidelines for the Control of Toxic Ambient Air Contaminants.

#### **6.1.8.2 Removal Action**

The National Oil and Hazardous Substance Pollution Contingency Plan (NCP) Section 300.415 lists eight factors which shall be considered in determining the appropriateness of a removal action. The following factors apply to Site FT-002:

- Actual or potential exposure to nearby human populations, animal, or the food chain from hazardous substances or pollutants or contaminants;
- High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate; and
- Other situations or factors that may pose threats to the public health or welfare or the environment (i.e., the possibility for groundwater contamination).

The following factors do not apply to Site FT-002:

- Actual or potential contamination of drinking water supplies or sensitive ecosystems; groundwater is not currently used as a potable water source, and sensitive ecosystems are not in danger;
- Hazardous substances or pollutants in drums, barrels, tanks, or other bulk storage containers that pose a threat of release; all bulk storage containers have been removed;
- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released do not exist at the site;
- Threat of fire or explosion does not exist at the site; and
- The availability of other appropriate federal or state response mechanisms to respond to the release do not exist at this site.

#### **6.1.9 Project Schedule**

"Time critical" removal actions require that a planning period of less than six months exists before onsite activities are initiated. The six month period begins upon receipt of the action. To meet time objectives, the following schedule is proposed:

- April 1996 - Submit Conceptual Full-Scale SVE/Bioventing System Design to NYSDEC.

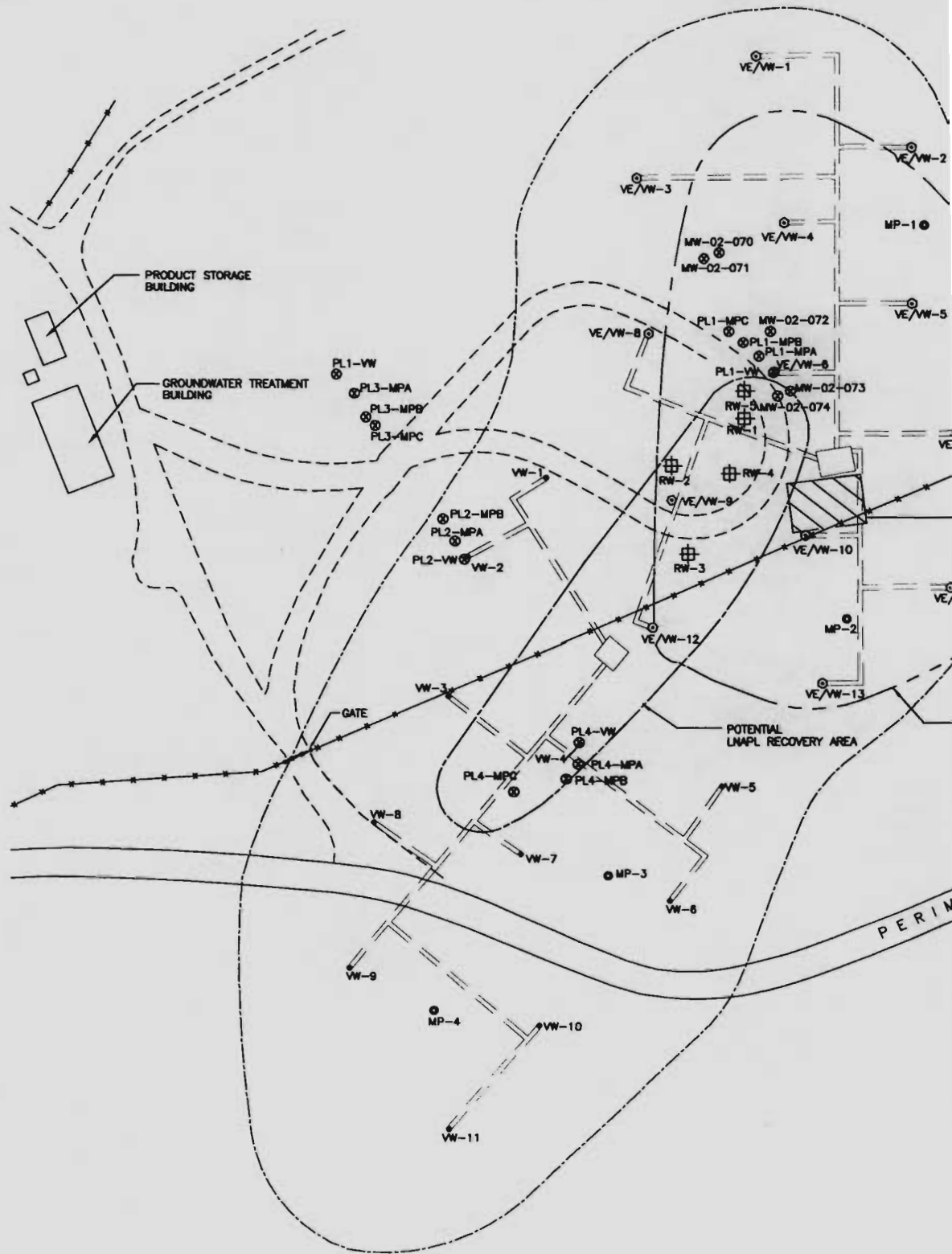
- July 1996 - Submit Final Full-Scale SVE/Bioventing System Design to NYSDEC.
- August 1996 - Install, test, and begin operation of Full-Scale SVE/Bioventing System.

## 6.2 ESTIMATED COSTS

A preliminary cost estimate has been prepared based on the following assumptions:

- Installation of a full-scale SVE system including the components detailed in Section 6.1.3 to remediate an area 1,000 feet by 1,200 feet at Site FT-002.
- The work will be done by one prime contractor who may subcontract some work items.

The total estimated cost for the removal action is between \$500,000 and \$1,000,000. (The cost of the system will be defined by OHM, Inc.).



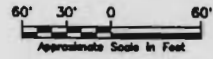
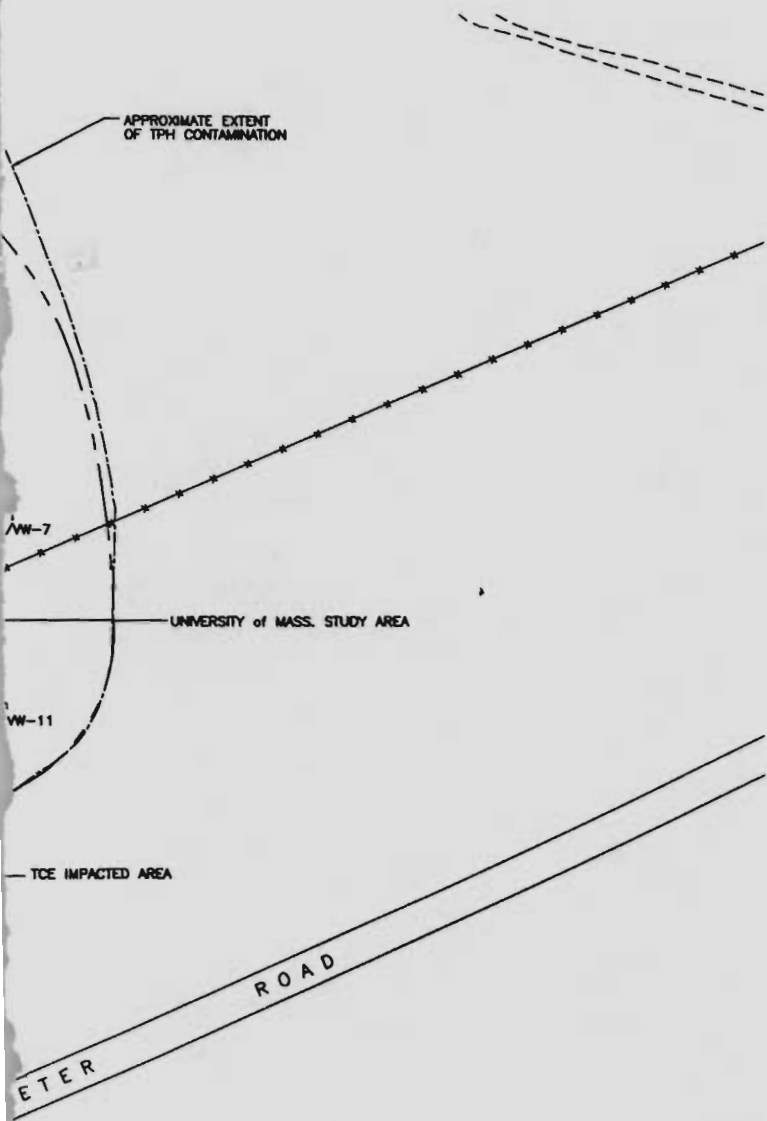


FIGURE 6.1

SITE FT-002  
 PLATTSBURGH AIR FORCE BASE  
 PLATTSBURGH, NEW YORK  
 REMEDIATION SYSTEM  
 LAYOUT

**PARSONS ENGINEERING SCIENCE, INC.**  
 DESIGN • RESEARCH • PLANNING  
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 OFFICES IN PRINCIPAL CITIES

## **SECTION 7.0**

### **EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN**

As previously discussed, there is an immediate danger of further contamination of the groundwater and subsequent migration of contamination. If this removal action is not implemented, the threat exists that additional contaminants will reach the groundwater and migrate in the direction of groundwater flow. Should this occur, the potential for exposure to human populations, animals, or the food chain will be increased.



## SECTION 8.0

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*Note: Engineering-Science, Inc. became Parsons Engineering Science, Inc. on 1 October 1994.*