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ENVIRONMENTAL RESTORATION PROGRAM

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NO FURTHER RESPONSE ACTION PLANNED
DECISION DOCUMENT

SITE 12– SPILL SITE NORTHWEST OF BUILDING 370

106TH RESCUE WING
NEW YORK AIR NATIONAL GUARD
FRANCIS S. GABRESKI AIRPORT
WESTHAMPTON BEACH, NEW YORK

MAY 2004

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106TH RESCUE WING
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WESTHAMPTON BEACH, NEW YORK

MAY 2004

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Prepared for the

Air National Guard
Under National Guard Bureau Contract DAHA92-01-D-0004

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TABLE OF CONTENTS

Page

LIST OF FIGURES v
LIST OF TABLES v
LIST OF ACRONYMS vi
DECLARATION vii
1.0 INTRODUCTION 1-1
1.1 SITE NAME, LOCATION, AND DESCRIPTION 1-5
1.1.1 Site Description 1-5
1.1.2 Topography 1-6
1.1.3 Critical Environments 1-6
1.1.4 Adjacent Land Uses 1-9
1.1.5 Nearby Populations 1-9
1.1.6 General Surface Water and Groundwater Resources 1-10
1.1.7 Surface and Subsurface Features 1-13
1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES 1-13
1.2.1 Site History 1-13
1.2.2 Regulatory Agency Involvement 1-16
1.3 COMMUNITY PARTICIPATION 1-16
1.4 SCOPE OF RESPONSE ACTION 1-16
1.4.1 Remedial Investigation (2000-2001) 1-17
2.0 SUMMARY OF SITE CHARACTERISTICS 2-24
2.1 PHYSIOGRAPHY 2-1
2.2 GEOLOGY 2-1
2.2.1 Upper Glacial Deposits 2-1
2.3 SOIL CHARACTERISTICS 2-3
2.3.1 Soil Associations 2-3
2.3.2 Soil Descriptions 2-4
2.4 SOIL CONTAMINATION INVESTIGATION RESULTS 2-6
2.4.1 Geologic Results 2-6
2.4.2 Soil and Screening Samples 2-7
2.4.3 Confirmatory Soil Samples 2-7
2.5 SURFACE WATER HYDROLOGY 2-8
2.6 HYDROGEOLOGY 2-18
2.6.1 Upper Glacial Aquifer 2-18
2.6.2 Gardiners Clay 2-21
2.7 GROUNDWATER CONTAMINATION INVESTIGATION RESULTS 2-21
2.7.1 Groundwater Screening Samples 2-22
2.7.2 Direct-Push Confirmatory Groundwater Samples 2-22
2.7.3 Groundwater Monitoring Samples 2-23
2.8 CLIMATE 2-27
2.9 AIR 2-27
2.10 RECEPTORS 2-27
3.0 BASELINE RISK ASSESSMENT 3-1
3.1 EVALUATION OF LEAD IN SURFACE SOIL 3-1

TABLE OF CONTENTS (Continued)

3.2 BASELINE RISK ASSESSMENT FOR PAHs IN SURFACE SOIL 3-6
3.2.1 Exposure Assessment 3-6
3.2.2 Future Use Risk 3-11
3.3 ECOLOGICAL ASSESSMENT 3-11
3.3.1 Evaluation of Ecological Risks 3-12
4.0 SELECTED ACTION: NO FURTHER RESPONSE ACTION PLANNED 4-1

APPENDICES

Page

A REFERENCES A-1

LIST OF FIGURES

Page

Figure 1.1 Francis S. Gabreski Airport and ANG Base Location 1-2
Figure 1.2 Locations of ERP Sites Including Site 12 Spill Site Northwest of Building 370 1-3
Figure 1.3 Basewide Topography 1-7
Figure 1.4 Public Drinking Water Supply Well Locations 1-12
Figure 1.5 Site 12 – May 1999 Suffolk County Department of Health Services, Direct-Push Soil Sample Locations and Results 1-15
Figure 1.6 Site 12 – 2000-2001 Remedial Investigation Locations of Monitoring Wells and Direct-Push Borings 1-20
Figure 2.1 Regional Stratigraphy and Hydrogeology 2-2
Figure 2.2 Site 12 – 2000-2001 Remedial Investigation - Soil and Groundwater Sample Results 2-9
Figure 2.3 May 15-16, 2001 Basewide Potentiometric Surface Map 2-20
Figure 3.1 2000 – 2001 Remedial Investigation – Risk Assessment Adult Lead Risk Calculation Spreadsheet 3-7

LIST OF TABLES

Table 1.1 Public Drinking Water Supply Well Information 1-11
Table 1.2 May 1999 Suffolk County Department of Health Services Direct-Push Soil Sample Analytical Results 1-14
Table 1.3 2000 - 2001 Remedial Investigation Samples Collected and Analyses Performed 1-21
Table 2.1 2000 – 2001 Remedial Investigation Confirmatory Soil Analytical Results – Volatile and Semivolatile Compounds 2-10
Table 2.2 2000 – 2001 Remedial Investigation Confirmatory Soil Analytical Results - Metals 2-14
Table 2.3 Hydrologic Properties of Regional Aquifers 2-19
Table 2.4 2000 – 2001 Remedial Investigation Confirmatory Groundwater Analytical Results, Volatile and Semivolatile Organic Compounds 2-24
Table 2.5 2000 – 2001 Remedial Investigation Groundwater Monitoring Analytical Results Volatile and Semivolatile Organic Compounds 2-25
Table 2.6 2000 – 2001 Remedial Investigation Groundwater Monitoring Analytical Results Metals - Rounds 1 and 2 2-26
Table 3.1 Summary of Default Parameter Values for the Risk Estimation Algorithm 3-5
Table 3.2 Blood Lead Concentrations and Calculated Probability of Risk 3-6

LIST OF ACRONYMS

ABB-ES	ABB–Environmental Services, Inc.
ALM	Adult Lead Methodology
ANG	Air National Guard
ANG/CEVR	Air National Guard/Environmental Division/Restoration Branch
BGS	Below Ground Surface
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRP	Community Relations Plan
DD	Decision Document
DRO	Diesel Range Organics
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
GRO	Gasoline Range Organics
HAZWRAP	Hazardous Waste Removal Actions Program
HMTC	Hazardous Materials Technical Center
IRP	Installation Restoration Program
MCL	Maximum Contaminant Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NFRAP	No Further Response Action Planned
NYDOH	New York Department of Health
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
106th RQW	106th Rescue Wing
PA	Preliminary Assessment
PAH	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PCE	Perchloroethylene (tetrachloroethylene)
PEER	PEER Consultants, P.C.
PID	Photoionization Detector
RAG	Risk Assessment Guidance
RI	Remedial Investigation
SI	Site Investigation
SCDHS	Suffolk County Department of Health Services
TAL	Target Analyte List
TCE	Trichloroethylene
TCP	Tri-Ortho Cresyl Phosphate
TPH	Total Petroleum Hydrocarbons
TRW	Technical Review Workgroup
ULBC	Upper Limit of Background Concentrations

DECLARATION

Site Name and Location:

Environmental Restoration Program
Site 12 – Spill Site Northwest of Building 370
106th Rescue Wing
New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Statement of Basis and Purpose:

This Decision Document (DD) presents the selected remedial action for Site 12 – Spill Site Northwest of Building 370, at the 106th Rescue Wing, New York Air National Guard, Francis S. Gabreski Airport, Westhampton Beach, New York. This decision is based on the results of a 1994 Site Investigation (SI), and a Remedial Investigation (RI) conducted from 1999 through 2000 under the Environmental Restoration Program (ERP), with the cooperation and support of the New York Department of Environmental Conservation (NYSDEC), the New York State Department of Health, and the Suffolk County Department of Health Services (SCDHS).

Description of the Selected Remedy:

Site 12 has been selected for No Further Response Action Planned (NFRAP) based upon the findings of field investigations and evaluation of scientific data. The site was initially described in May of 1999, based on direct-push soil sampling preformed by the SCDHS, at the request of the 106th RQW. The initial SCDHS sampling tentatively identified the hydraulic fluid additive tri-ortho cresyl phosphate (TCP), and identified polynuclear aromatic hydrocarbons (PAHs) exceeding NYSDEC action levels in site soils. As a result, the site was investigated during the

2000 – 2001 Remedial Investigation (RI) by direct-push sampling of soil and groundwater, by installation of monitoring wells, and collection of groundwater monitoring samples.

During the 2000-2001 RI, no TCP or PCBs were detected. Low concentrations of PAHs and lead were confirmed in shallow soils, and trace levels of volatile organics were tentatively identified in site groundwater. Chromium was detected in soil and groundwater but was determined to be naturally occurring. Only lead and PAHs were identified as contaminants of potential concern (COPCs) at Site 12. The detection of lead in one shallow soil sample was associated with debris from recent construction activities. Risk associated with lead in shallow soil was assessed using the Environmental Protection Agency (EPA) Technical Review Workgroup (TRW) Adult Lead Methodology (ALM), which indicated that risks associated with lead were within acceptable limits. The RI risk assessment of concentrations of PAHs detected in shallow soil found that they do not pose an unacceptable risk since there are no complete exposure pathways. The RI concluded that no further action was necessary, and a decision document was recommended.

Therefore, based on the current conditions at Site 12, it has been determined that contaminant levels at the site pose no significant risk or threat to public health or the environment. No Further Response Action Planned under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), is required at this site.

Declaration Statement:

This Category III DD has been prepared in accordance with the June 1995 U.S. Air Force NFRAP Guide. According to the June 1995 U.S. Air Force NFRAP Guide, a Category III NFRAP decision is appropriate for a geographically contiguous area or parcel of real property where environmental evidence demonstrates that hazardous substances or petroleum products or their derivatives have been stored, released, or disposed of, but are present in quantities that require no response action to protect human health and the environment. This DD presents the selected action for Site 12 developed in accordance with CERCLA, as amended, and to the extent

practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). It also satisfies the requirements of the National Environmental Policy Act (NEPA) that apply to CERCLA response actions. It has been determined that the selected remedy of no further action is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate, and is cost effective. The statutory preference for further treatment is not applicable because contaminant levels at the site have been determined to present no significant threat to human health or the environment; therefore, no further action is necessary.

NYSDEC CONCURRENCE LETTER

ENVIRONMENTAL RESTORATION PROGRAM

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NO FURTHER RESPONSE ACTION PLANNED
DECISION DOCUMENT
SITE 12– SPILL SITE NORTHWEST OF BUILDING 370
106TH RESCUE WING
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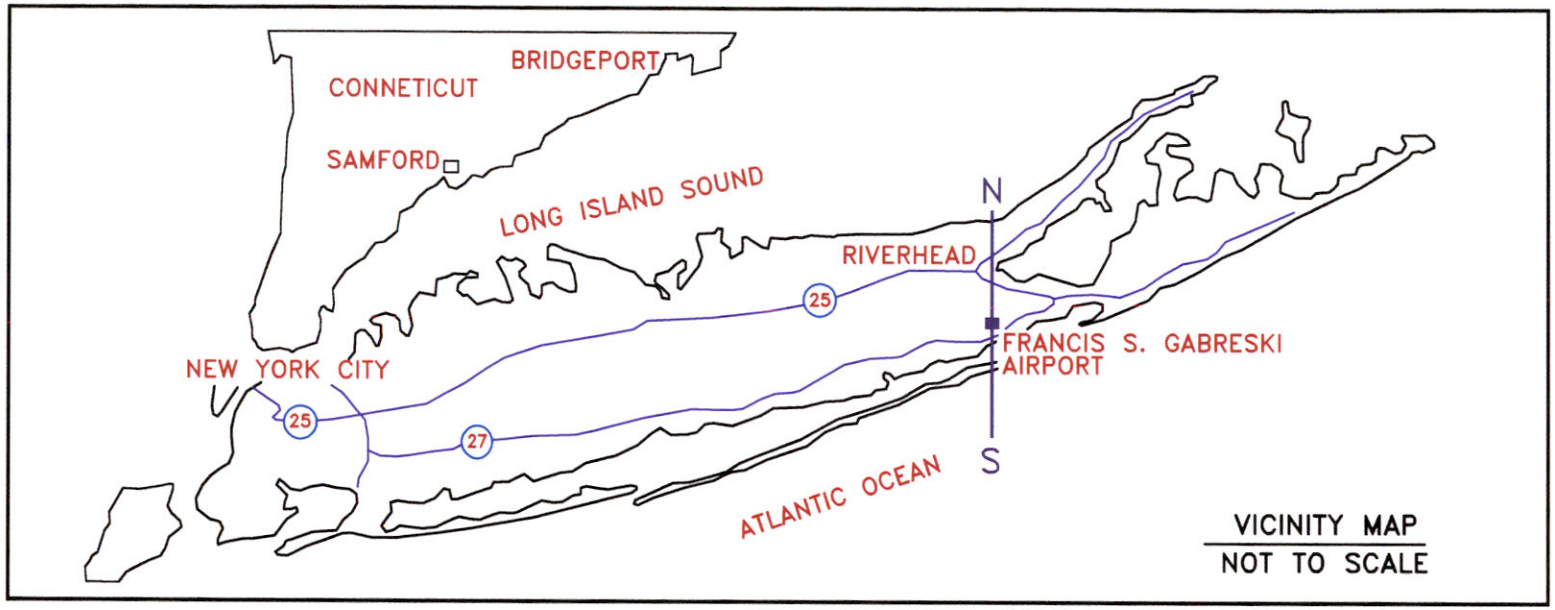
FRANCIS S. GABRESKI AIRPORT
WESTHAMPTON BEACH, NEW YORK

DECISION SUMMARY

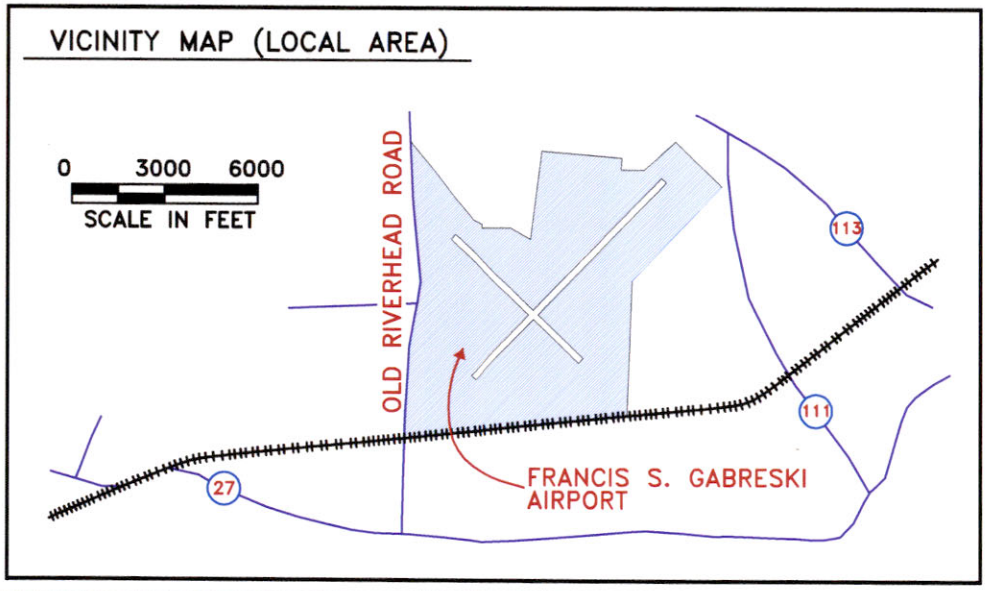
1.0 INTRODUCTION

This Decision Document (DD) supports a No Further Response Action Planned (NFRAP) decision for Site 12, the Spill Site Northwest of Building 370 at the 106th Rescue Wing, New York Air National Guard (ANG), Francis S. Gabreski Airport, in the town of Westhampton Beach, New York (the base). The base is located on the eastern end of Long Island in Suffolk County, New York. As shown on Figure 1.1, the Francis S. Gabreski Airport, formerly known as Suffolk County Airport, is on Old Riverhead Road, approximately 2 miles north of the Atlantic Ocean shoreline and the town of Westhampton Beach. As shown on Figure 1.2, Site 12 is located in the east- central portion of the base, southeast of Moen Street and Northwest of Building 370.

The purpose of this Category III DD (as specified in the June 1995 U.S. Air Force NFRAP Guide) is to summarize the existing data for the site, to evaluate the risk to human health and the environment, and to provide the ANG's rationale for making the NFRAP decision for this site. According to the June 1995 U.S. Air Force NFRAP Guide, a Category III NFRAP decision is appropriate for a geographically contiguous area or parcel of real property where environmental evidence demonstrates that hazardous substances or petroleum products or their derivatives have been stored, released, or disposed of, but are present in quantities that require no response action to protect human health and the environment. Data used to prepare this DD is summarized from the following documents:

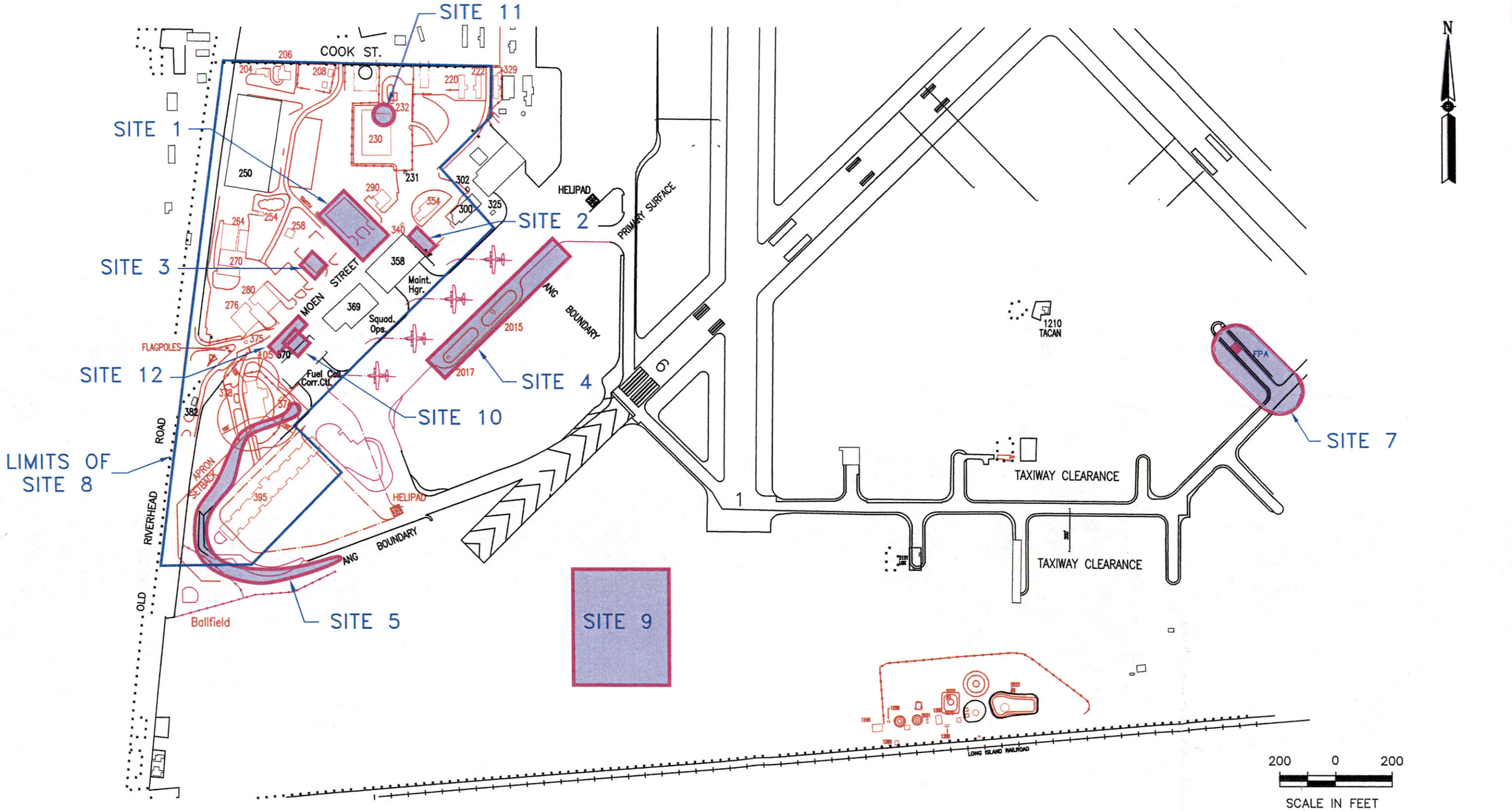






SOURCE: PEER 2003

PEER PROJ./3005-011 GAB3005/Site12 NFRAP/FIG 1.1	FRANCIS S. GABRESKI AIRPORT AND ANG BASE LOCATION 106th RESCUE WING, NEW YORK ANG WESTHAMPTON BEACH, NEW YORK	FIGURE 1.1



PEER PROJ./003005.011 GAB3005/NFRAP/SITE12/FIG 1.2	LOCATIONS OF ERP SITES INCLUDING SITE 12 – SPILL SITE NORTHWEST OF BUILDING 370 106th RESCUE WING, NEW YORK ANG FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.2

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- *Phase I Records Search, Suffolk County Air Force Base (Retired)*, by Dames & Moore, 1986;
- *Installation Restoration Program, Phase I – Records Search for 106th Aerospace Rescue and Recovery group,* Hazardous Materials Training Center (HMTC), 1987;
- *Site Investigation Report, 106th Rescue Group,* by ABB-Environmental Services (ABB-ES), May 1997; and
- *Draft-Final Remedial Investigation Report for Sites 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, and 12, 106th Rescue Wing,* by PEER Consultants, P.C. (PEER), October 2003.

A description of Site 12 and its surrounding area is provided in Section 1.1. Information on the history of Site 12, including any enforcement actions, is presented in Section 1.2. Highlights of the base's community participation efforts are presented in Section 1.3. The scope of the response action at the base is discussed in Section 1.4. A discussion of the characteristics of Site 12, including information on the physiography, geologic setting, climatology, and environmental media, the nature and extent of contamination, and receptors at the site, is presented in Section 2.0. An evaluation of the risks to human health and the environment posed by the site are presented in Section 3.0. Section 4.0 presents the selected action for Site 12 and the rationale for the selection of this action. Appendix A provides a list of the references that were used to prepare this DD.

1.1 SITE NAME, LOCATION, AND DESCRIPTION

Sections 1.1.1 through 1.1.5 present an overview of Site 12, including a description of the site; the topography of the area; and information on critical environments, adjacent land uses, and nearby populations. Sections 1.1.6 and 1.1.7 provide information on the general surface water and groundwater resources and surface and subsurface features of the area.

1.1.1 Site Description

Site 12 – Spill Site Northwest of Building 370 is located on the Francis S. Gabreski ANG Base on the northwest side of Building 370 (Hangar A), where workers noted an odor during

excavation for installation of a new forced main for the sanitary sewer system on the base. The site was initially described in May of 1999, based on direct-push soil sampling preformed by the Suffolk County Department of Health Services (SCDHS), at the request of the 106th RQW.

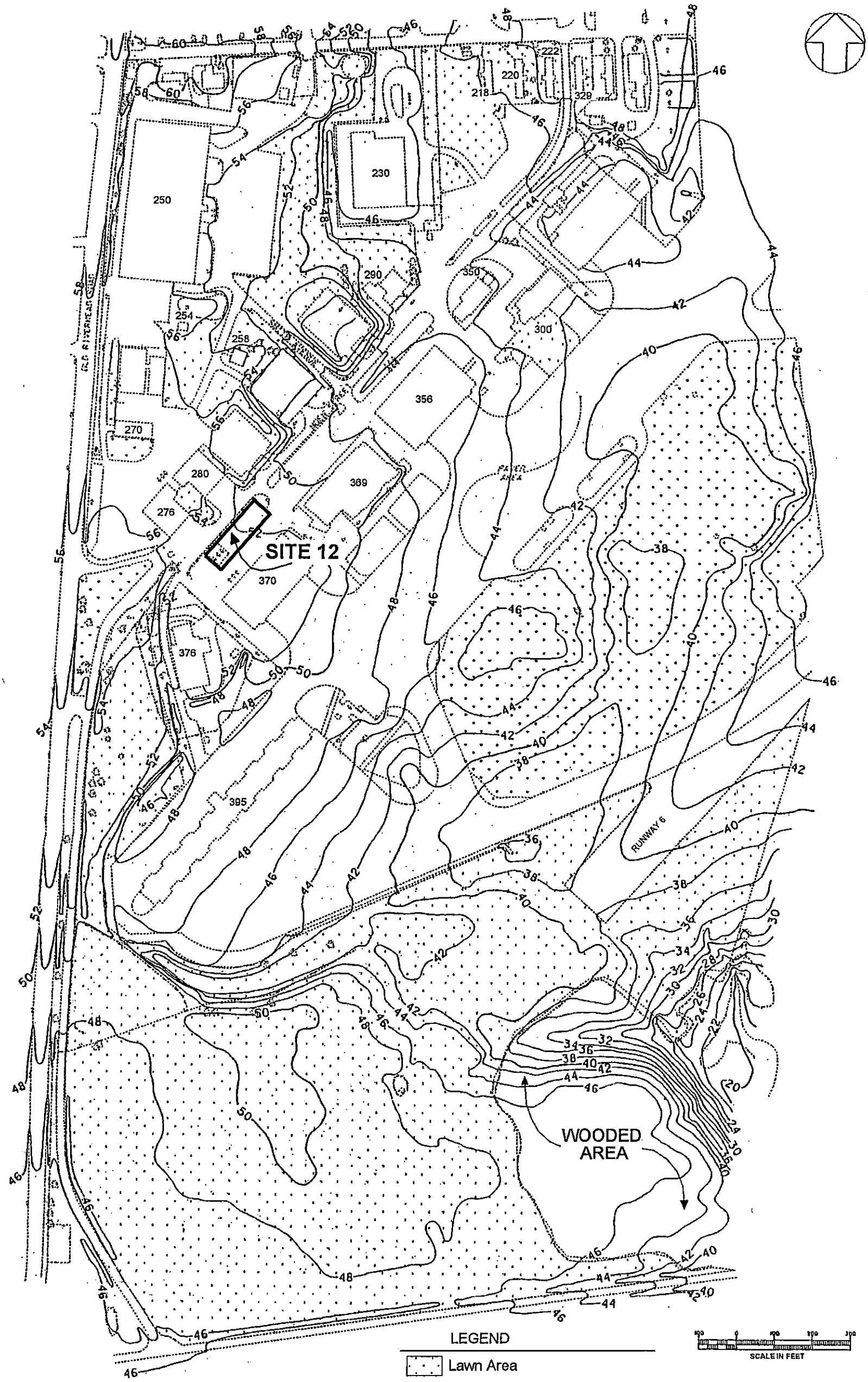
1.1.2 Topography

Francis S. Gabreski Airport is situated on a glacial outwash plain south of the Ronkonkoma terminal moraine, which formed during the Wisconsin glaciation. Relief is characteristically flat with subtle rolling terrain and steeper stream channels (ABB-ES 1997). Figure 1.3 shows the topography of the base. Site 12 is mostly flat lying, with subtle gradients towards local storm sewer inlets. The entire site is paved with asphalt and concrete.

1.1.3 Critical Environments

For the purpose of this DD, critical environments are defined to include all lands and waters that are specifically recognized or managed (by federal, state, or local government agencies or private organizations) as rare, unique, unusually sensitive, or important natural resources. These areas include permanent and seasonal habitats of federally designated endangered species, nature preserves (including federal and state parks), wilderness areas, wildlife sanctuaries, and wetlands, but they do not include parks established solely for historic preservation or recreation.

The Francis S. Gabreski Airport is located within the Long Island Pine Barrens. The Pine Barrens are characterized by open, sunlit woodlands dominated by pitch pine interspersed with white and scarlet oak. In the immediate area of the airport, the Pine Barrens are characterized by a transition from 30 to 80 ft tall pitch pines. The Quogue Wildlife Refuge, adjacent to the east side of the airport, is characterized by dwarf pitch pines ranging from 3 to 6 ft tall. The airport is surrounded by wooded areas consisting of 25 ft pitch pines and scattered scrub oak (Dames & Moore 1987).



PEER PROJ./003005-011 GAB3005/NFRAP/Site12/FIG1.3	BASEWIDE TOPOGRAPHY 106 th RESCUE WING, NEW YORK ANG FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.3

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The following are the Threatened and Endangered species potentially located within a 4-mile radius of the site (ABB-ES 1995):

- Northern Harrier (*Circus cyaneus*)
- Osprey (*Pandion haliaetus*)
- Tiger Salamander (*Ambystoma tigrinum tigrinum*)
- Eastern Mud Turtle (*Kinosteron subrabrum subrubum*)

A more detailed description of the vegetation and animal life in the area is provided in the Phase I Records Search (Dames & Moore 1986).

1.1.4 Adjacent Land Uses

The Francis S. Gabreski Airport is owned by Suffolk County. The airport is bounded to the north by undeveloped land, to the east by the Quogue Wildlife Refuge, to the south by the Long Island Railroad (LIRR), and to the west by Old Riverhead Road. As of July 8, 1958, the airport occupied approximately 2500 acres of relatively flat terrain (Anthony J. Vasell, pers. comm. 2001). The *Francis S. Gabreski Airport Master Plan* (Latino 2002) reports the current area of the airport as 1,486 acres. The 106th RQW leases approximately 70 acres of runways, hangars, and maintenance/service facilities near the southwest corner of the airport. The airport surrounds the base on all sides except the west, where the base is adjacent to Old Riverhead Road. Further to the west, across Old Riverhead Road, is a mixed area of undeveloped Pine Barrens, residential areas, and small businesses. To the south, across the LIRR, is an area of mixed industrial, business, and residential properties.

1.1.5 Nearby Populations

The base has a total population of over 900 employees (during unit training assembly weekends), which includes nearly 300 full-time staff, and over 600 traditional guardsmen. The base is located about 2 miles northwest of the center of the town of Westhampton Beach, New York. The population of the Westhampton Beach area is approximately 1,900 people (PEER 2000).

1.1.6 General Surface Water and Groundwater Resources

Surface Water Resources

Surface water is not a significant resource at the base. The nearest surface water is Aspatuck Creek, which is not used for drinking water. Aspatuck Creek flows through the Quogue Wildlife Refuge, which is adjacent to the airport on the east.

Groundwater Resources

Groundwater is the only water supply source for Suffolk County. The majority of the public water supply in Westhampton Beach area is obtained from the Upper Glacial Aquifer; while the rest is obtained from the Magothy and Lloyd aquifers. Hydrogeology is discussed further in Section 2.6.

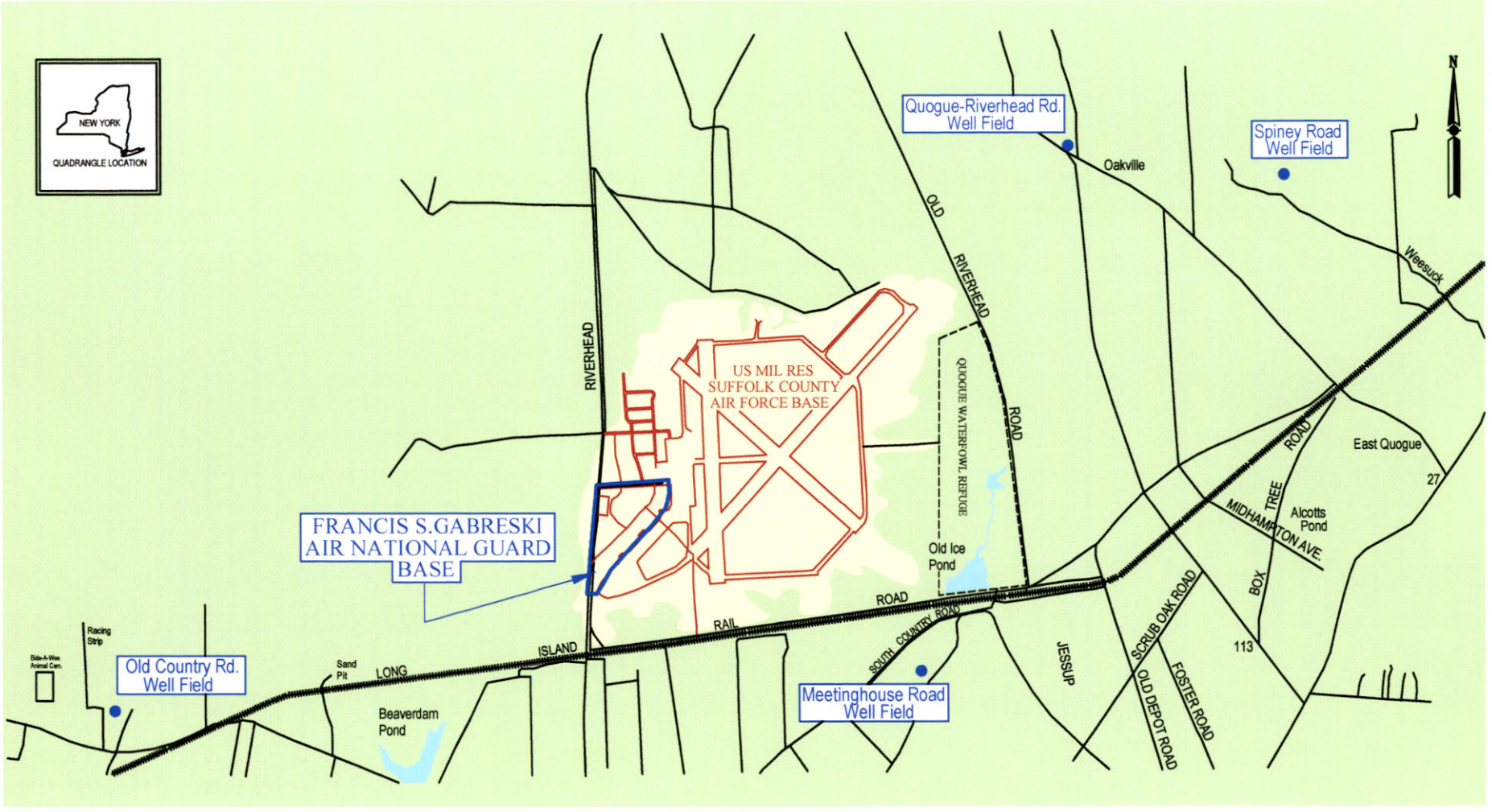
At present, Suffolk County Water Authority supplies the majority of the water in the Westhampton Beach area; the rest is supplied by several smaller companies. Suffolk County Water Authority operates 18 wells in 4 well fields within a 4-mile radius of the site, and their nearest public supply well field is located 0.61 miles southeast of Francis S. Gabreski Airport. Table 1.1 provides information pertaining to the public drinking water supply wells. Figure 1.4 shows the location of identified public drinking water supply wells.

A number of domestic water wells are located within 1 mile of the base boundary, south of the airport (ABB-ES 1997). Due to concerns about groundwater contamination from Site 6 (the Petroleum, Oils and Lubricants Facility), most or all of the residences utilizing private water wells were provided with access to the public water supply through the Suffolk County Water Authority in the early- to mid-1980s (Anthony J. Vasell, pers. comm. 2003).

Table 1.1
Public Drinking Water Supply Well Information
106th Rescue Wing - New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Well Field Identification	Distance from Site (miles)	Aquifer Tapped	Well Number	Screened Interval (ft BGS)	Total Depth (ft BGS)	Population Served (Approximate)
Meeting House Road	0.6	Upper Glacial	20	55-75	78	6,500
			22	74-104	104	
			15A	31-51	53	
Quogue-Riverhead Road	1.2	Magothy	1	386-447	449	2,200
Spinny Road	1.7	Upper Glacial	1	85-115	118	190
			2	118-158	163	
Old Country Road	2.2	Upper Glacial	1	60-75	76	1,800
			2	NA	70	
			3	128-157	161	

Source: Dames & Moore 1986.
BGS Below Ground Surface



SOURCE: USGS 7.5 minute series quadrangle maps for Eastport and Quogue, New York dated 1956

PEER PROJ./003005-011 GAB3005/NFRAP/SITE12/FIG 1.4	PUBLIC DRINKING WATER SUPPLY WELL LOCATIONS 106th RESCUE WING, NEW YORK ANG FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.4

1.1.7 Surface and Subsurface Features

Aside from underground utilities such as communications, water, electric and sanitary sewer, no unknown surface or subsurface features, or structures such as tanks or drums are believed to exist at Site 12.

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Sections 1.2.1 and 1.2.2 present a history of Site 12. Further details concerning analytical results of soil and groundwater samples are provided in Section 2.4.

1.2.1 Site History

In May 1999, Site 12 was discovered while workers were installing a forced-main sanitary sewer pipeline on the northwest side of Building 370. Suspected contamination was detected when workers noted what was described as a "strange smell" or a "musty/petroleum" odor in the excavation. The suspected contamination persisted from 8 ft BGS to the total depth of the excavation at 15 ft BGS. The nature and extent of the suspected contamination was unknown.

At the request of the 106th RQW, a preliminary direct-push soil investigation was performed by the Suffolk County Department of Health Services (SCDHS). The SCDHS investigation included collection of soil samples from three direct-push borings, identified as I-2573, I-2574, and I-2575. Sample analyses by the SCDHS tentatively identified three isomers of tri-ortho cresyl phosphate (TCP), a component of high temperature hydraulic fluid, at estimated concentrations of 100 µg/kg each. However, subsequent SCDHS sampling from additional direct-push boring I-5004 did not confirm the tentative detections of TCP. SCDHS sampling also identified polynuclear aromatic hydrocarbons (PAHs) exceeding New York State Department of Environmental Conservation (NYSDEC) Action Levels from boring I-5004. Table 1.2 presents the SCDHS data for Site 12. Figure 1.5 shows the approximate locations of

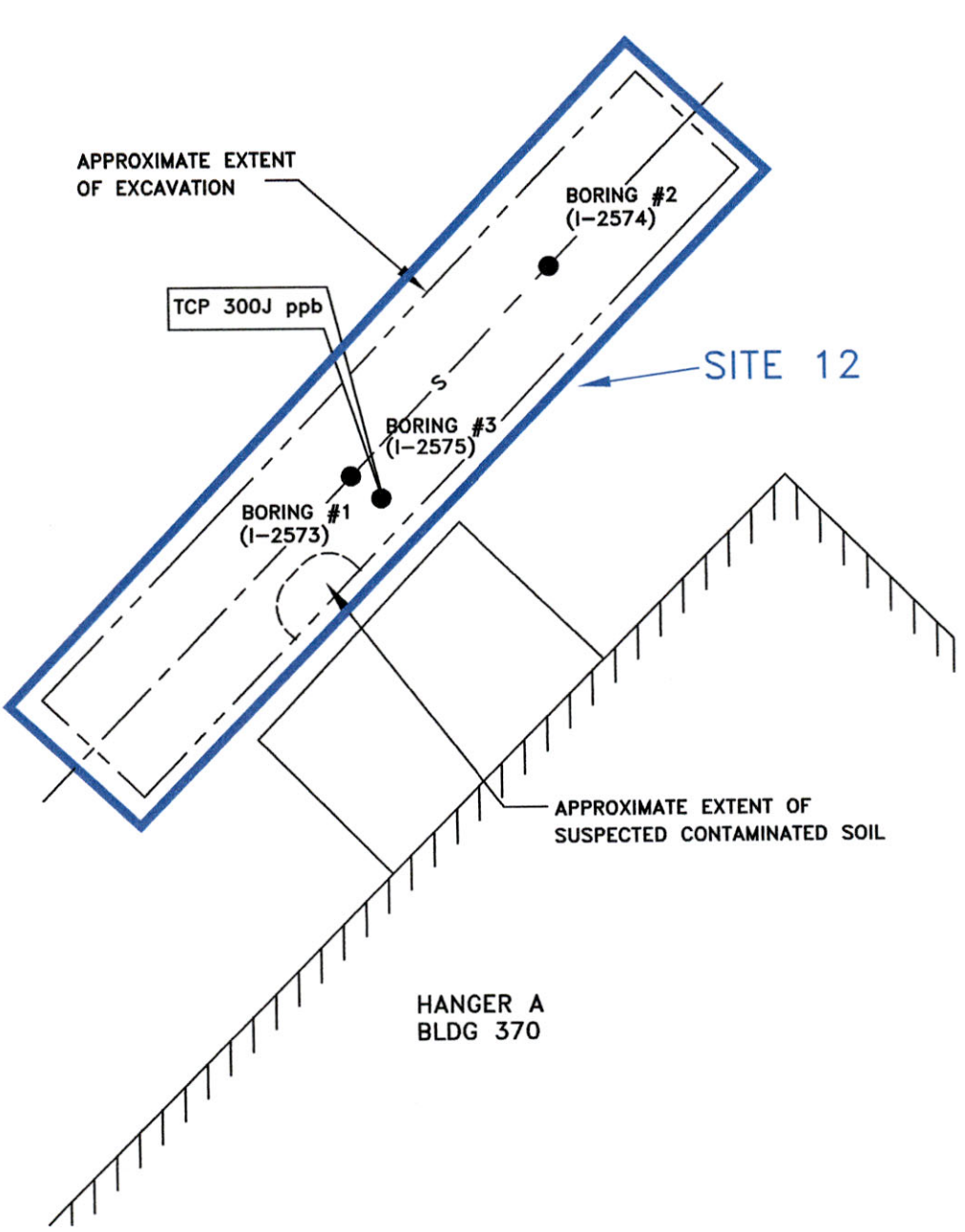
Table 1.2
May 1999 Suffolk County Department of Health Services
Direct-Push Soil Sample Analytical Results
106th Rescue Wing - New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Analyte (ppb)	Action Levels	SCDHS Sample Identification				
		Probe No. 1 (I-2573)	Probe No. 2 (I-2574)	Probe No. 3 (I-2575)	I-5004	I-5004
		-1, -2, -3, -4, -5	-1, -2	-1	-1	-2
Acenaphthylene	41,000	NR	NR	NR	112	ND
Phenanthrene	50,000	NR	NR	NR	625	ND
Anthracene	50,000	NR	NR	NR	211	ND
Fluoranthene	50,000	NR	NR	NR	1,890	56.4 J
Pyrene	50,000	NR	NR	NR	2,020	ND
Benzo(a)anthracene	300	NR	NR	NR	**1,140**	ND
Chrysene	400	NR	NR	NR	**1,020**	ND
bis(2-ethyl hexyl)phthalate	50,000	NR	NR	NR	85.2 J	ND
Benzo(b)fluoranthene	1,100	NR	NR	NR	626	ND
Benzo(k)fluoranthene	1,100	NR	NR	NR	**1,440**	ND
Benzo(a)pyrene	60.9	NR	NR	NR	**1,080**	ND
Indeno(1,2,3-cd)pyrene	3,200	NR	NR	NR	425	ND
Dibenz(a,h)anthracene	14	NR	NR	NR	**190**	ND
Benzo(g,h,i)perylene	50,000	NR	NR	NR	360	ND
Tri-ortho cresyl phosphate	NA	ND	ND	300 J [a]	ND	ND
Gasoline	NA	NR	NR	NR	ND	ND
Lubricating Oil	NA	NR	NR	NR	ND	ND
Kerosene/Jet Fuel	NA	NR	NR	NR	ND	ND
Diesel Fuel, Fuel Oil #2	NA	NR	NR	NR	ND	ND
Fuel Oil #4	NA	NR	NR	NR	ND	ND
Fuel Oil #6	NA	NR	NR	NR	ND	ND

Source: SCDHS Memorandum, 1999.

J Indicates an estimated concentration.
NA Not applicable.
ND Not detected.
NR Not reported.
Shading and bolding indicate exceedances of action levels.

Notes:
a) Three isomer peaks tentatively identified, at 100 ppb each.



LEGEND

● DIRECT PUSH BORING BY SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES (SCDHS)

TCP TRI-ORTHO CRESYL PHOSPHATE

J ESTIMATED CONCENTRATION BELOW DETECTION LIMIT

0 10 20
SCALE IN FEET

PEER PROJ./003005-011 GAB3005/DF NFRAP/SITE12/FIG1.5	SITE 12 – MAY 1999 SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES DIRECT-PUSH SOIL SAMPLE LOCATIONS AND RESULTS 106th RESCUE WING, NEW YORK AIR NATIONAL GUARD FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.5

the SCDHS preliminary direct-push soil samples I-2573, I-2574, and I-2575, and the sample results. Given the available documentation, the location of boring I-5004 could not be determined.

Since the direct-push sampling by the SCDHS tentatively identified TCP and detected PAHs, the site was subsequently added to the list of sites being remediated under the current Environmental Restoration Program (ERP) at the 106th RQW, Francis S. Gabreski Airport. There had been no other investigations of this site prior to the 2000 – 2001 Remedial Investigation (RI), which was performed by PEER in 2000 - 2001 (PEER 2003)

1.2.2 Regulatory Agency Involvement

There is no history of United States Environmental Protection Agency (US EPA) involvement at Site 12. The NYSDEC and SCDHS have been involved in the planning of RI activities, review, and revision of plans and reports, and approval of final documents. Other than the direct-push initial soil investigation by the SCDHS, there have been no enforcement activities at Site 12, and there are no permits or agreements that govern response action at the site. No NYSDEC spill number has been assigned to the site.

1.3 COMMUNITY PARTICIPATION

A Community Relations Plan (CRP) was completed for the base in April 1999. The final versions of the CRP and all other ERP documents are available for public review at the Westhampton Beach Public Library.

1.4 SCOPE OF RESPONSE ACTION

The initial soil investigation performed by the SCDHS is described above. Section 1.4.1 describes the sole response activity performed by the ANG/CEVR, the 2000 – 2001 RI.

1.4.1 Remedial Investigation (2000-2001)

The 2000 – 2001 RI activities at Site 12 were intended to:

- Determine the presence or absence of TCP and PAH contamination in subsurface soils;
- Define the extent of TCP and PAH contamination in subsurface soils, if confirmed;
- Assess site groundwater for potential contamination by TCP and PAHs;
- Evaluate the suspected presence of PCBs; and
- Assess site soil and groundwater for other potential contaminants.

To achieve these goals, 10 direct-push borings were advanced and sampled for soil and groundwater, and two new monitoring wells were installed and sampled. No previously existing monitoring wells were associated with Site 12.

Action levels used during the RI included:

- NYSDEC Recommended Soil Cleanup Objectives (RSCOs), as per the NYSDEC Technical Assistance Guidance Memorandum (TAGM # 4046, NYSDEC 1994);
- Upper Limits of Background Concentrations (ULBCs), as calculated by ABB-ES, following NYSDEC guidelines set forth in the Technical and Operational Guidance Series (TOGS, NYSDEC 1991);
- New York State (NYS) Class GA Groundwater (TAGM # 4046, NYSDEC 1994), and
- Federal Maximum Contaminant Levels (MCLs), as set forth by the EPA (EPA 1995).

The direct-push borings installed in the area of Site 12 were initially selected based on the April 1999 SCDHS sampling results. Final locations were determined with the advice of the base EM and Civil Engineer, both of whom had personal recollections of the original excavation and the occurrence of the suspected contamination.

The ten direct-push borings were installed as follows:

- S12-DP01 was installed near the southeast edge of the area of "strange smelling soils." This boring was located using the SCDHS report as a reference, approximately 35 ft northwest of Building 370.
- S12-DP02 was about 15 ft northeast of SCDHS Probe # 1 (I-2573), near the east corner of the area, as located from the SCDHS sampling report.
- S12-DP03 was about 15 ft northeast of S12-DP02, near the location where SCDHS sampling had detected PAHs in subsurface soil.
- S12-DP04 was installed at the approximate location of the outlet of a former drainpipe from Building 370, as described by the Base EM.
- S12-DP05 was located about 33 ft northwest of S12-DP04, on the northwest side of the excavation for the forced main sewer.
- S12-DP06 was located about 10 ft northwest of Building 370, between the location of S12-DP04 and Building 370.
- S12-DP07 was located near the north corner of the former soil contamination area, on the northwest side of the forced main sewer excavation.
- S12-DP08 was located on the northwest side of the forced main sewer excavation, approximately 20 ft northwest of S12-DP03, and near the approximate SCDHS sample location (I-5004) where PAHs were detected.
- S12-DP09 was installed about 50 ft southwest of S12-DP01, as close to the edge of the soil contamination area as buried utilities allowed.
- S12-DP10 was installed between S12-DP01 and S12-DP05, near the center of the former soil contamination area.

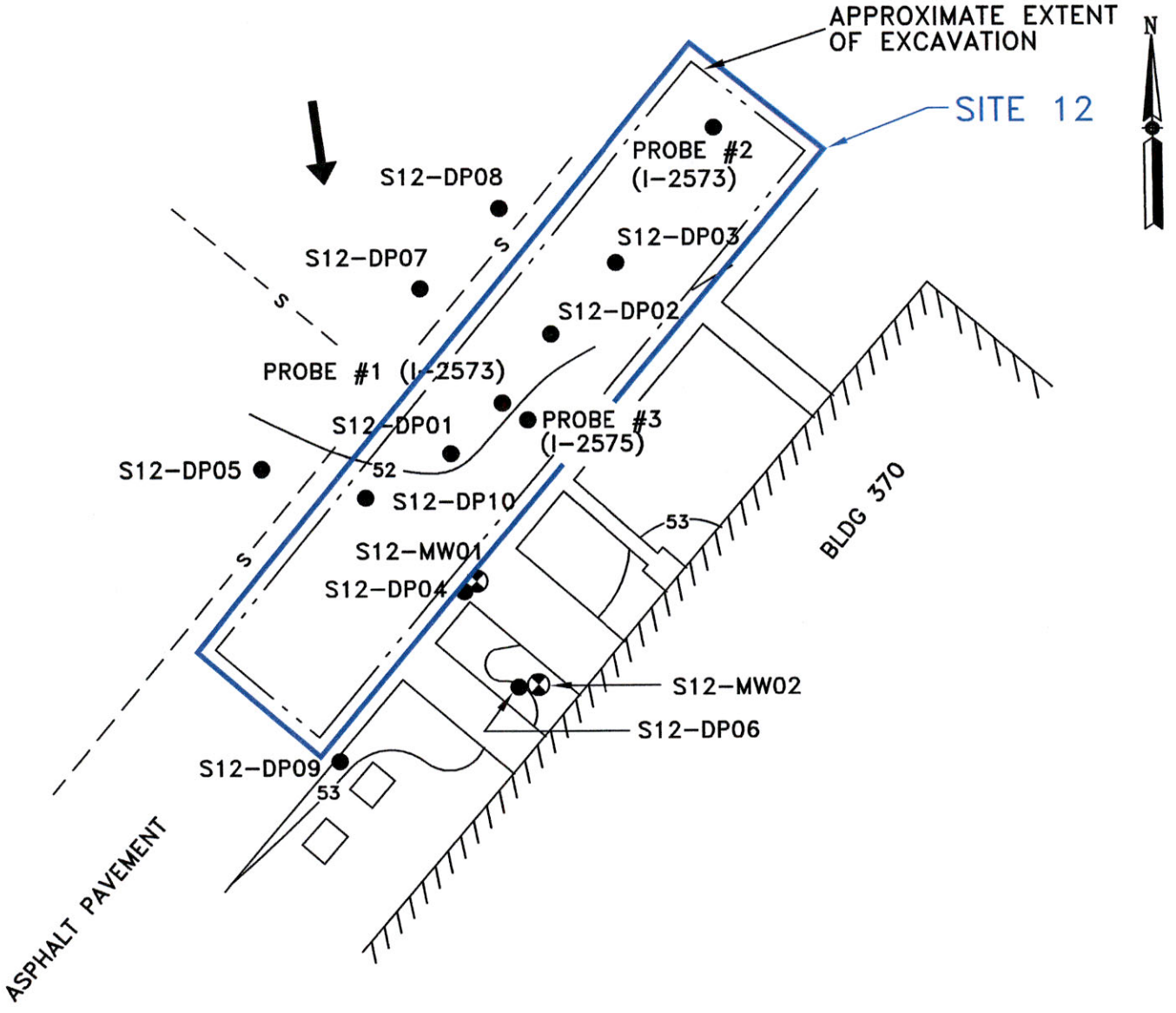
Soil samples were collected from the direct-push borings using a 4-ft Strata Probe™, direct-push sampling device. Sample collection proceeded continuously from the top of soil to the top of the water table. Soil samples were collected for lithologic description, and for field screening using a photoionization detector (PID), calibrated daily. Samples were submitted for expedited screening analysis of benzene, toluene, ethylbenzene and xylenes (BTEX) (S12-DP01 through

S12-DP08) by an on-site field laboratory, and expedited analysis of volatile organic compounds (S12-09 and S12-10) by an off-site laboratory. Samples were also submitted for confirmatory analysis of volatile and semivolatile organic compounds, Target Analyte List (TAL) metals, and TCP by an off-site, state-certified laboratory. Direct-push borings S12-DP-01, S12-DP02, and S12-DP04 were sampled for PCBs where suspect soil was encountered.

Groundwater samples were collected from each soil boring for screening and confirmatory analysis. Borings S12-DP01 through S12-DP08 were sampled and analyzed for expedited screening analysis of BTEX by an on-site field laboratory, while borings S12-09 and S12-10 were analyzed for expedited analysis of volatile organic compounds by an off-site laboratory. All ten borings were sampled for confirmatory analysis of volatile and semivolatile organic compounds.

Two hollow stem auger (HSA) borings were performed for soil sampling and monitoring well installation. Soil samples were collected from the HSA borings using standard split spoon techniques. Soil samples were submitted for analysis of volatile and semivolatile organics, TAL metals, and TCP.

Two new monitoring wells were installed and two rounds of groundwater monitoring samples were collected and analyzed for volatile and semivolatile organics, TAL metals, and TCP. One well was also sampled for parameters indicative of potential biological remediation. The RI sample locations are depicted on Figure 1.6, and are summarized on Table 1.3. The results of the RI soil investigation at Site 12 are presented in Section 2.4. The results of the RI groundwater investigation are provided in Section 2.7.



LEGEND

- DIRECT PUSH PROBE
- NEW MONITORING WELL
- 47 — GROUND SURFACE CONTOUR ELEVATIONS (FT ABOVE MEAN SEA LEVEL)
- S — SEWER
- APPROXIMATE GROUNDWATER FLOW DIRECTION (12/94)

NOTE:

1. PROBES #1, #2, & #3 INSTALLED IN 1999 BY SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES.

0 10 20
SCALE IN FEET

SOURCE: EWELL W. FINLEY P.C. SURVEYORS, 2001, AND ABB-ES, 1997

PEER PROJ./003005-011 GAB3005/DF NFRAP/SITE 12/FIG1.6	SITE 12 - 2000-2001 REMEDIAL INVESTIGATION LOCATIONS OF MONITORING WELLS AND DIRECT-PUSH BORINGS 106th RESCUE WING, NEW YORK AIR NATIONAL GUARD FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.6

Table 1.3
2000 - 2001 Remedial Investigation
Samples Collected and Analyses Performed
106th Rescue Wing – New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Date	Sample ID	Ft BGS	Type	BTEX[a]	VOCs[b]	SVOCs	Metals	PCBs	TCP
11/27/00	GAB-12-DP01-01	0 to 2	Soil Probe	X	X	X	X		X
11/27/00	GAB-12-DP01-02	24 to 28	Soil Probe	X	X	X	X	X	X
11/27/00	GAB-12-DP01-03	36 to 38	Soil Probe	X	X	X	X	X	X
11/27/00	GAB-12-DP01-22	24 to 28	Soil Probe	X	X	X	X	X	X
11/27/00	GAB-12-DP02-01	0 to 2	Soil Probe	X	X	X	X		X
11/27/00	GAB-12-DP02-02	20 to 24	Soil Probe	X	X	X	X	X	X
11/27/00	GAB-12-PW01-01	38 to 42	GW Screening	X	X	X			
11/28/00	GAB-12-DP02-03	36 to 40	Soil Probe	X	X	X	X		X
11/28/00	GAB-12-DP03-01	0 to 2	Soil Probe	X	X	X	X		X
11/28/00	GAB-12-DP03-02	16 to 20	Soil Probe	X	X	X	X		X
11/28/00	GAB-12-DP03-03	36 to 40	Soil Probe	X	X	X	X		X
11/28/00	GAB-12-PW02-01	38 to 42	GW Screening	X	X	X			
11/29/00	GAB-12-DP04-01	0 to 2	Soil Probe	X	X	X	X		X
11/29/00	GAB-12-DP04-02	10 to 13	Soil Probe	X	X	X	X	X	X
11/29/00	GAB-12-DP04-03	39 to 40	Soil Probe	X	X	X	X		X
11/29/00	GAB-12-DP05-01	0 to 2	Soil Probe	X	X	X	X		X
11/29/00	GAB-12-PW03-01	38 to 42	GW Screening	X	X	X			

Notes:
a) BTEX analyses performed at on-site field laboratory.
b) VOC analyses performed at off-site state-certified laboratory.
BGS Below Ground Surface
BTEX Benzene, Toluene, Ethylbenzene and Xylenes
VOCs Volatile Organic Compounds
SVOCs Semi-volatile Organic Compounds
TCP Tri-ortho Crysel Phosphate
PCBs Polychlorinated Biphenyls
X Analysis Performed

Table 1.3 (Continued)
2000 - 2001 Remedial Investigation
Samples Collected and Analyses Performed
106th Rescue Wing – New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Date	Sample ID	Ft BGS	Type	BTEX[a]	VOCs[b]	VOCs[v]	SVOCs	Metals	PCBs	TCP
11/29/00	GAB-12-PW04-01	38 to 40	GW Screening	X		X	X			
11/30/00	GAB-12-DP05-02	36 to 40	Soil Probe	X		X	X	X		X
11/30/00	GAB-12-DP06-01	0 to 2	Soil Probe	X		X	X	X		X
11/30/00	GAB-12-DP06-02	12 to 13.5	Soil Probe	X		X	X	X		X
11/30/00	GAB-12-DP06-03	13.5 to 16	Soil Probe	X		X	X	X		X
11/30/00	GAB-12-DP06-04	36 to 40	Soil Probe	X		X	X	X		X
11/30/00	GAB-12-DP07-01	0 to 2	Soil Probe	X		X	X	X		X
11/30/00	GAB-12-DP07-02	36 to 40	Soil Probe	X		X	X	X		X
11/30/00	GAB-12-PW05-01	38 to 42	GW Screening	X		X	X			
11/30/00	GAB-12-PW06-01	38 to 42	GW Screening	X		X	X			
12/1/00	GAB-12-DP08-01	0 to 2	Soil Probe	X		X	X	X		X
12/1/00	GAB-12-DP08-02	12 to 14.5	Soil Probe	X		X	X	X		X
12/1/00	GAB-12-DP08-03	16 to 18	Soil Probe	X		X	X	X		X
12/1/00	GAB-12-DP08-04	36 to 40	Soil Probe	X		X	X	X		X
12/1/00	GAB-12-PW07-01	38 to 42	GW Screening	X		X	X			
12/1/00	GAB-12-PW08-01	38 to 42	GW Screening	X		X	X			
1/11/01	GAB-12-DP09-01	0 to 4	Soil Probe		X	X	X	X		X
1/11/01	GAB-12-DP09-02	36 to 40	Soil Probe		X	X	X	X		X

Notes:
a) BTEX Analyses performed at on-site field laboratory.
b) Expedited VOC analyses performed at a off-site laboratory.
c) VOC analyses performed at off-site state-certified laboratory.
BGS Below Ground Surface
BTEX Benzene, Toluene, Ethylbenzene and Xylenes
VOCs Volatile Organic Compounds
CH_4 Methane
SVOCs Semi-volatile Organic Compounds
TCP Tri-Ortho Crysel Phosphate
PCBs Polychlorinated Biphenyls

X Analysis Performed

Table 1.3 (Continued)
2000 - 2001 Remedial Investigation
Samples Collected and Analyses Performed
106th Rescue Wing – New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Date	Sample ID	Ft BGS	Type	BTEX[a]	VOCs[b]	VOCs[c]	SVOCs	Metals	TCP	DRO	GRO	CH4	Alkalinity	Chloride	SO4
1/12/01	GAB-12-DP09-03	40 to 44	Soil Probe		X	X	X	X	X						
1/12/01	GAB-12-DP10-01	0 to 4	Soil Probe		X	X	X	X	X						
1/12/01	GAB-12-DP10-02	9 to 12	Soil Probe		X	X	X	X	X						
1/12/01	GAB-12-DP10-03	36 to 38	Soil Probe		X	X	X	X	X						
1/12/01	GAB-12-PW09-01	40 to 44	GW Screening		X	X	X								
1/12/01	GAB-12-PW10-01	38 to 42	GW Screening		X	X	X								
1/31/01	GAB-12-SB01-01	0 to 2	Soil Split Spoon			X	X	X	X						
1/31/01	GAB-12-SB01-02	40 to 44	Soil Split Spoon			X	X	X	X						
1/31/01	GAB-12-SB02-01	0 to 2	Soil Split Spoon			X	X	X	X						
1/31/01	GAB-12-SB02-02	12 to 14	Soil Split Spoon			X	X	X	X						
1/31/01	GAB-12-SB02-03	38 to 40	Soil Split Spoon			X	X	X	X						
2/15/01	GAB-12-S12MW01-01	39.8 to 47.3	GW Monitoring	X		X	X	X	X	X	X	X	X	X	X
2/15/01	GAB-12-S12MW01-21	39.8 to 47.3	GW Monitoring	X		X	X	X	X	X	X	X	X	X	X
2/16/01	GAB-12-S12MW02-01	38.9 to 47.3	GW Monitoring			X	X	X	X						
5/29/01	GAB-12-S12MW01-02	32.1 to 47.1	GW Monitoring	X		X	X	X	X	X	X	X	X	X	X
5/29/01	GAB-12-S12MWO2-02	32.0 to 47.0	GW Monitoring			X	X	X	X						
5/29/01	GAB-12-S12MWO2-22	32.0 to 47.0	GW Monitoring			X	X	X	X						

Notes:
a) BTEX analyses performed at off-site state-certified laboratory.
b) Expedited VOC analyses performed at a off-site laboratory.
c) VOC analyses performed at off-site state-certified laboratory.
BGS Below Ground Surface
BTEX Benzene, Toluene, Ethylbenzene and Xylenes
VOCs Volatile Organic Compounds
SVOCs Semi-volatile Organic Compounds
X Analysis Performed

DRO Diesel Range Organics
GRO Gasoline Range Organics
CH_4 Methane
SO_4 Sulfate
TCP Tri-ortho Crysel Phosphate

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2.0 SUMMARY OF SITE CHARACTERISTICS

Section 2.0 provides a summary of the characteristics of Site 12, including information on the physiography, geology, hydrogeology, surface water hydrology, soil, climatology, environmental media, the nature and extent of contamination, and receptors at the site.

2.1 PHYSIOGRAPHY

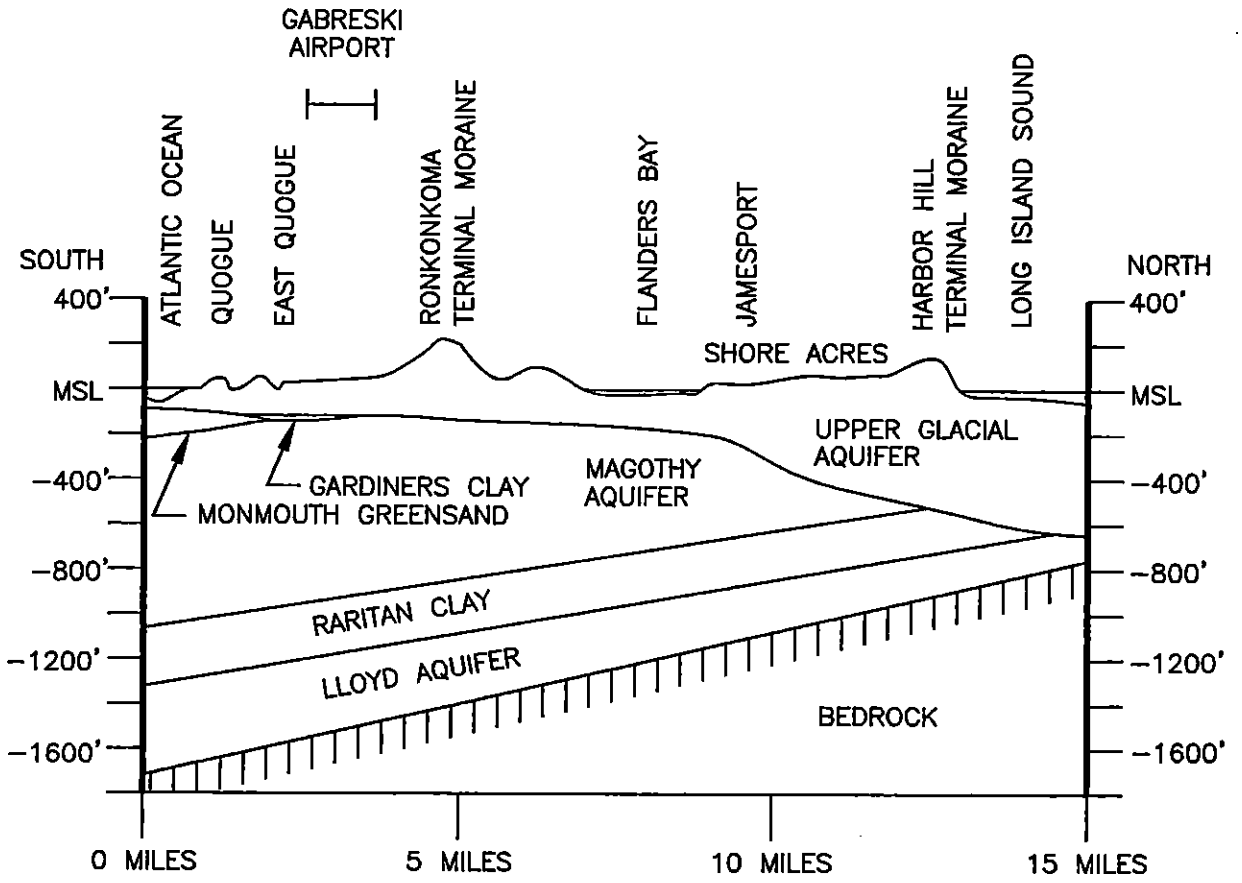
The base is located on the eastern end of Long Island. Long Island is included in the Atlantic Coastal Plain physiographic province. The island is characterized by glacial landforms related to the Wisconsin Glaciation. The island is located at the southern limit of glaciation, and exhibits a series of terminal moraines, which form low hills running from the west-southwest to the east-northeast, along the spine of the island. The base is located on the gently sloping outwash plain formed south of the terminal moraines when the glacier retreated northwards, and melt water flowed southward towards the Atlantic Ocean. The melt water carried sand and gravel sediment southwards, and deposited it as a stratified outwash plain. The outwash plain slopes southward from the terminal moraine to the bays and barrier islands along the Atlantic Ocean shoreline.

2.2 GEOLOGY

Five unconsolidated formations occur at Francis S. Gabreski Airport. These units dip generally to the south, with the thicker units very widespread and underlying most of Suffolk County. Figure 2.1 depicts the regional stratigraphy using a north-south-trending cross-section of the geologic formations present. The cross-section location is shown on Figure 1.1.

2.2.1 Upper Glacial Deposits

The upper Pleistocene glacial deposits are of greatest importance in regards to Site 12. These deposits form the soil surface across the base, makeup all of the subsurface soils of interest regarding Site 12, and form the matrix for the Upper Glacial Aquifer, described below in Section



SOURCE: ABB-ES 1997

SCALE: 1 IN = APPROXIMATELY 3 MILES

PEER PROJ./003005-011 GAB3005/NFRAP/SITE12/FIG2.1	REGIONAL STRATIGRAPHY AND HYDROGEOLOGY 106th RESCUE WING, NEW YORK ANG FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 2.1

2.6.1. These unconsolidated sediments are composed of glacial outwash deposits; lacustrine and marine deposits; and terminal, ground, and ablation-moraine till deposits. The sediments below the airport are mostly outwash deposits consisting of stratified fine to coarse sand and gravel of light- to dark-brown, tan, and yellowish-brown color. The sand consists primarily of sub- to well-rounded quartz, with trace amounts of feldspar and rare lithic fragments. The gravel is also primarily quartz, with slightly higher proportions of feldspar and lithic fragments. The sediments are framework supported, loose to dense, with little or no cement or interstitial material. Approximately 100 to 120 ft of these sediments are found below the airport and above the underlying Gardiners clay. Till deposits known as the Ronkonkoma Terminal Moraine are expressed as hills approximately 2 miles north of the base.

2.3 SOIL CHARACTERISTICS

Descriptions of the soil associations and characteristics at Site 12 are presented in Sections 2.3.1 and 2.3.2, respectively.

2.3.1 Soil Associations

Surface soils in the vicinity of the airport belong to either the Riverhead-Plymouth-Carver Association or the Plymouth-Carver Association. These soil associations are characteristically similar, with only subtle variations between them. The former occurs over 95% of the installation, and is characterized by deep, nearly level to gently sloping, well-drained to excessively drained, moderately coarse textured and coarse-textured soils. The latter is generally rolling and hilly, with deep excessively well drained, coarse-textured soils on moraines. These glacially derived soils have characteristically low soil moisture content, unsuitable for most agricultural purposes, and support only limited types of native vegetation (Dames & Moore 1986).

2.3.2 Soil Descriptions

The soils encountered during the RI direct-push and HSA borings conformed to the description of Riverhead-Plymouth-Carver Association glacial outwash sands and to descriptions reported in previous investigations. Sieve analyses of four Shelby tube samples collected during the RI found sand from 76.8% to 95.4%, gravel from 1.3% to 14.6%, and fines (silt/clay) from 2.3% to 8.6%. Permeability (k) for the tested soils ranged from 1.27×10^{-1} centimeters per second (cm/sec) from 4 to 6 ft BGS at Site 12, to 1.76×10^{-2} cm/sec from 20 to 21.5 ft BGS at Site 2. Natural soil density ranged from 90.3 to 96.1 pounds per cubic ft (lbs/ft^3) dry, and from 94.8 to 103.6 lbs/ft^3 wet. Overall, the soils are well-sorted medium sands, with some gravel and traces of fines. The geology of the soils encountered during the RI is described below.

The primary stratigraphic unit of interest at the base is the Pleistocene-age Upper Glacial Sand and Gravel. This unit consists of unconsolidated sands and gravels deposited as glacial outwash during the Wisconsin glaciation. This is the only unit that outcrops locally, and makes up the entire native surface soils found at the site. The surface soils are well drained to excessively drained and moderately coarse to coarse, with low soil moisture content. The Upper Glacial sediments are well sorted, very porous, and highly permeable. These soils and sediments cause a high proportion of precipitation to infiltrate without significant runoff. The Upper Glacial unit is from 100 to 120 ft thick at the site.

The Gardiners Clay underlies the upper glacial unit in the vicinity of the Francis S. Gabreski Airport and the base. This unit is approximately 40 ft thick, and consists of clay, silt, and clayey and silty sand. Consequently, the Gardiners Clay has lower permeability than the Upper Glacial unit and the underlying Magothy formation, and forms an aquitard between these units. The Gardiners Clay was not encountered in RI soil borings.

Sand

The sands encountered were commonly medium, with some coarse and fine, and rarely very fine sands. The sands were commonly well sorted, with some poorly sorted and often contained trace to common amounts of fine to coarse gravel. Sand densities were commonly loose to very loose from the surface to about 20 to 25 ft BGS; with some medium dense sands from 25 ft to 40 ft. BGS. Moisture content was low in the vadose zone, with surface soils being dry, followed by slightly moist soils from approximately 1 to 2 ft BGS, extending downward to about 2 ft above saturation. Moist soils were rarely encountered more then 2 ft above the top of saturation. The capillary zone was usually less than 2 ft in thickness. Saturation was encountered at 32 ft BGS to 33 ft BGS at Site 12. Bedding was sub-horizontal to horizontal, consistent with glacial outwash sands. Well-sorted coarse sand with traces of fine gravel was found occasionally, while fine to very fine sands were rare, and were often more moist and compact than adjacent medium sand layers.

Gravel

Gravel occurred at trace to common frequency in medium to coarse, poorly to well sorted sands. Soils containing gravel were mostly gravely sands, with rare sandy gravels. Gravel was commonly fine to large in size, with rare cobbles. Gravel was usually poorly sorted, well rounded to sub-spherical, and rarely sub-angular to angular.

Silt and Clay

Silts were very rare, usually occurring in the subsurface as isolated, thin layers of silty sand and clayey silty sand mixtures. Pure silts and sandy silts were extremely rare. Top soil usually contained some silt, which was limited to the upper 0.5 ft BGS. Clay was extremely rare in native soils, and only occurred as isolated, thin layers of clayey silty sand.

2.4 SOIL CONTAMINATION INVESTIGATION RESULTS

The soil investigation activities conducted during the 2000 - 2001 RI at Site 12 are listed in Section 1.4. Figure 1.5 depicts the sampling locations. The findings of the soil investigation at Site 12 are discussed in the following subsections.

2.4.1 Geologic Results

During the 2000 – 2001 RI, geologic information was obtained at Site 12 from 10 direct-push borings and 2 HSA well borings. During soil boring activities, native soils were observed to be typical pale yellow to light gray medium sands, with some gravel and traces of fines. Fill material was noted to depths of 14.5 ft BGS, 17 ft BGS, and 8.6 ft BGS at borings S12-DP03, S12-DP05, and S12-DP10, respectively. Boring S12-DP01 also had possible fill to about 12 ft BGS. No signs of contamination were noted at either of the HSA well borings. Indications of possible contamination that were observed from the direct-push borings included:

- Faint metallic, pungent or musty odors were observed from borings S12-DP01, S12-DP02, and S12-DP03 at depths between 16 to 24 ft BGS, but were not associated with stain or elevated PID readings.
- Purple to pinkish gray staining/discoloration was observed from 8 to 16 ft BGS at S12-DP04, but with no associated odor or elevated PID readings. This stain appeared to be a vertical vein or stringer, approximately 1 cm thick, of stronger purple color, surrounded by a halo of pale pinkish gray that faded away within 1 or 2 cm around the vein. Traces of similar pink to pinkish red stains were noted at 12 ft BGS in S12-DP08 and 8 to 10 ft BGS at S12-DP09.
- Dark brown, oily appearing stain in thin (< 1 cm) horizontal bands was noted at 38 ft BGS at S12-DP09, and at depths of 17, 25, and 30 ft BGS at S12-DP08. This stain also had no associated odor or elevated PID readings.
- An unspecified stain was noted below the top of saturation at 40 to 41 ft BGS at S12-DP02, associated with a very faint odor, but no elevated PID readings or sheen.

- A solvent-like or metallic odor was noted in S12-DP10 from 1 to 5 ft BGS in fill material. There was no associated stain, but PID readings were noted from 4 to 40 ppmv.

2.4.2 Soil and Screening Samples

During direct-push sampling, soil screening samples were collected from S12-DP01 through S12-DP08, and submitted to the field laboratory for screening analysis of BTEX. No BTEX compounds were detected in the soil-screening samples. The soil samples were also screened for organic vapors during sample collection using the PID. The PID screening results were negative for detectable organic vapors.

Soil screening samples from direct-push borings S12-DP09 and S12-DP10 were submitted for expedited turnaround at the off-site laboratory for screening analysis of volatile organic compounds. No volatile organic compounds were detected above NYSDEC Action Levels in the soil screening samples. The volatile organic compound tetrachloroethylene [perchloroethylene (PCE)] was tentatively detected in shallow soil at S12-DP01, at an estimated concentration of 2 J µg/kg.

2.4.3 Confirmatory Soil Samples

Confirmatory soil samples were collected from ten direct-push boring locations, S12-DP01 through S12-DP10, and two well boring locations, S12-SB01 and S12-SB02. The confirmatory soil samples were analyzed for:

- volatile organic compounds;
- semivolatile organic compounds;
- TCP;
- PCBs (from three locations only); and
- TAL metals.

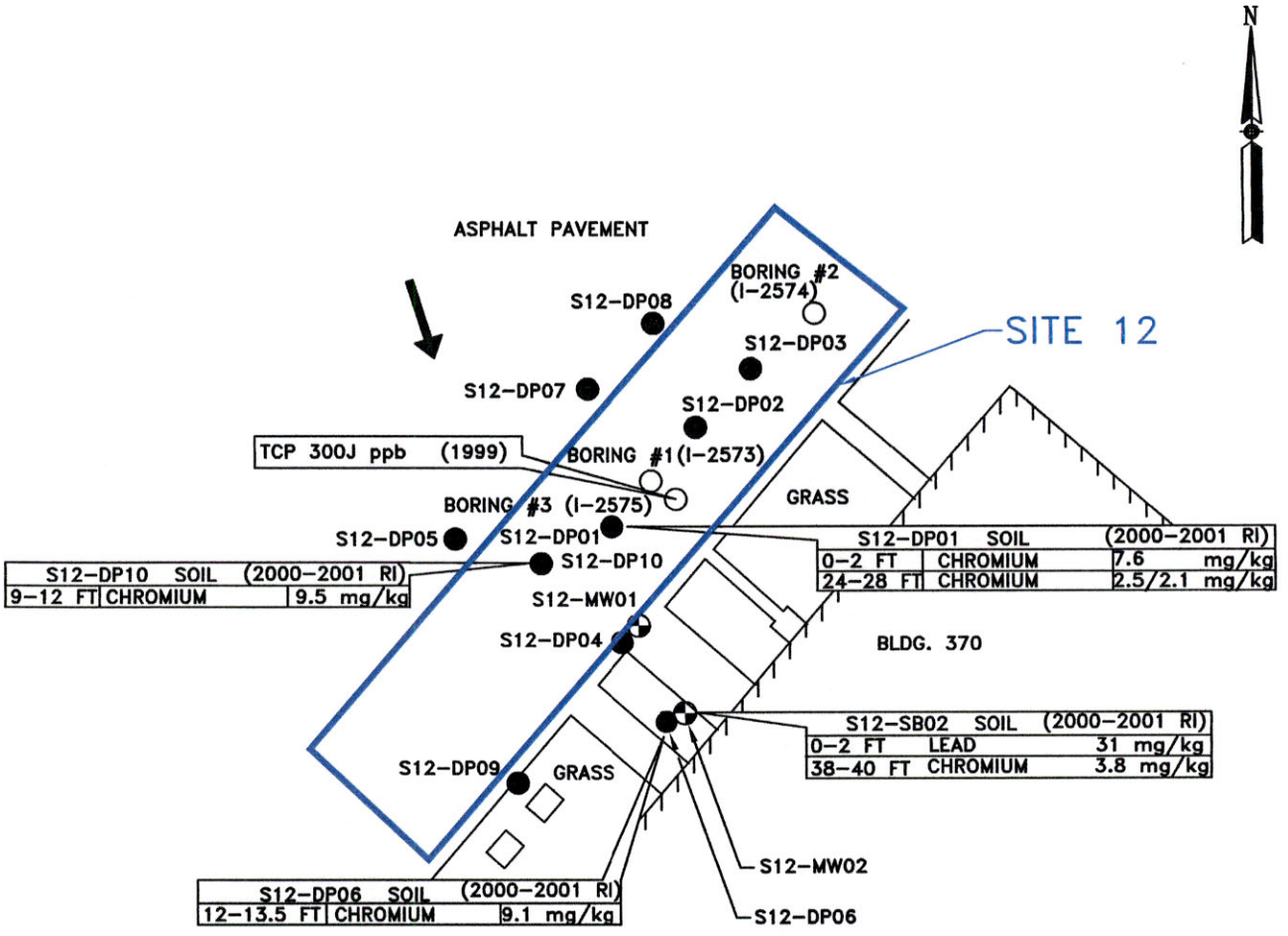
Sample locations form the 2000 – 2001 RI where analytes exceeded of action levels at Site 12 are shown on Figure 2.2. The results of the volatile and semivolatile organic compound confirmatory soil analyses are summarized on Table 2.1. No TCP or PCBs were detected in any of the samples. No volatile or semivolatile organic compounds were detected at concentrations above the NYSDEC Action Levels. The tentative detection of PCE in one shallow soil-screening sample was unconfirmed. Methylene chloride was detected, but is considered a laboratory contaminant, as discussed in the *Draft Final RI Report*, Appendix J (PEER 2002).

Table 2.2 summarizes the results of the TAL metals analysis for confirmatory soil samples at Site 12. TAL metals analyses showed that:

- Chromium was detected above the ULBC, but below NYSDEC RSCOs, in samples from S12-DP01, S12-DP06, S12-DP10, and S12-SB02. The 2000 – 2001 RI determined that chromium is naturally occurring, and it is not considered as a COPC.
- Lead was detected above the ULBC in the shallow soil interval of 0 to 2 ft BGS from S12-SB02. During sample collection, construction debris was noted in the immediate location of S12-SB02, including metal shavings and galvanized steel, which can be considered potential sources of lead cross-contamination. For the purposes of this NFRAP DD, lead in surface soil is considered a COPC. This represents a conservative approach, since the lead detected at S12-SB02 may be due to cross-contamination by construction debris.

2.5 SURFACE WATER HYDROLOGY

The topography of the Francis S. Gabreski Airport area is such that surface water runoff flows in a southerly and southeasterly direction. The majority of precipitation at the airport percolates into the extremely well drained soil and moves in the subsurface aquifers although some may move short distances as runoff. The limited surface water run off from the base drains to Aspatuck Creek located near the southeast corner of the airport. Aspatuck Creek flows into Quantuck Bay, a tidal estuary which is separated from the Atlantic Ocean by a narrow barrier island (ABB-ES 1997).



ACTION LEVELS		
ANALYTE	SURFACE (1) SOIL (mg/kg)	SUBSURFACE (1) SOIL (mg/kg)
CHROMIUM	6.1	0.84
LEAD	4.4	0.27

(1) NYDEC TAGM #4046

LEGEND

- ○ DIRECT PUSH BORING (SCDHS 1999)
- ● DIRECT PUSH BORING (RI 2000-2001)
- ⊕ MONITORING WELL

SCDHS SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES

→ APPROXIMATE GROUNDWATER FLOW DIRECTION (05/01)

TCP TRI-ORTHO CRESYL PHOSPHATE

J ESTIMATED CONCENTRATION BELOW DETECTION LIMIT

NOTE:

PROBES #1 THROUGH #3 WERE PREVIOUSLY INSTALLED BY SCDHS.

0 10 20
SCALE IN FEET

SOURCE: EWELL W. FINLEY P.C. SURVEYORS, 2001, AND ABB-ES, 1997

PEER

003005-011

GAB/DF NFRAP/SITE12/FIG2.2

SITE 12 - 2000-2001 REMEDIAL INVESTIGATION-SOIL AND GROUNDWATER SAMPLE RESULTS (1999 SCDHS & 2000-2001 RI)
106th RESCUE WING, NEW YORK AIR NATIONAL GUARD
FRANCIS S. GABRESKI AIRPORT
WESTHAMPTON BEACH, NEW YORK

FIGURE 2.2

Table 2.1
2000 – 2001 Remedial Investigation
Confirmatory Soil Analytical Results – Volatile and Semivolatile Compounds
106th Rescue Wing – New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Parameter	Action Level [b]		Sample Location, Depth, Type, and Concentration [a]									
	Saturated [c]	Unsaturated [d]	DP01-01 (0-2 ft) -U	DP01-02 (24-28 ft) -U	DP01-22 (24-28 ft) -U	DP01-03 (36-38 ft) -S	DP02-01 (0-2 ft) -U	DP02-02 (20-24 ft) -U	DP02-03 (36-40 ft) -S	DP03-01 (0-2 ft) -U	DP03-02 (16-20 ft) -U	DP03-03 (36-40 ft) -S
Volatile Organic Compounds (µg/kg)												
Chloroform	3.0	300	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	14	1400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	15	1500	2 BJ	2 J	2 BJ	5	3 J	3 J	3 J	4J	2 J	2 J
Semivolatile Organic Compounds (µg/kg)												
Benzo(a)anthracene	330	330	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	330	1100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	330	400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	19,000	50,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	6650	50,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCBs (µg/kg) [e]	1000 (Surface)	10,000 (Subsurface)	NA	ND	ND	ND	NA	ND	NA	NA	NA	NA
TCP (mg/kg)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

B	Analyte is also found in associated blank.
J	Estimated value.
NA	Not analyzed.
ND	Not detected.
PCBs	Polychlorinated biphenyls.
TCP	Tri-o-cresyl)phosphate.
--	No applicable action level.

(a) Location "DP0X-SS0X" refers to surface soil sample at direct-push location 0X, at depth specified in feet below ground surface (BGS): DP01-SS01 is direct-push surface soil sample (first sample) at location DP01 at depth of 0-0.3 ft BGS. Location "DP0X-0X" refers to sample number collected at location DP0X, at depth specified in ft BGS; DP02-03 is the third direct-push sample collected from location DP02 at a depth of 8-12 ft BGS. Type of soil sample: S - Saturated; U - Unsaturated.

(b) Recommended Soil Cleanup Objectives, NYSDEC, TAGM 4046.

(c) Soil in direct contact with groundwater.

(d) Greater than 5 ft above the water table.

(e) Recommended Cleanup Objectives for PCBs in Surface and Subsurface Soils, NYSDEC, TAGM 4046.

Table 2.1 (Continued)
2000 – 2001 Remedial Investigation
Confirmatory Soil Analytical Results – Volatile and Semivolatile Compounds
106th Rescue Wing – New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Parameter	Action Level [b]		Sample Location, Depth, Type, and Concentration [a]								
	Saturated [c]	Unsaturated [d]	DP04-01 (0-2 ft) -U	DP04-02 (10-13 ft) -U	DP04-03 (36-40 ft) -S	DP05-01 (0-2 ft) -U	DP05-02 (36-40 ft) -S	DP06-01 (0-2 ft) -U	DP06-02 (12-13.5 ft) -U	DP06-03 (13.5-16 ft) -U	DP06-04 (36-40 ft) -S
Volatile Organic Compounds (µg/kg)											
Chloroform	3.0	300	ND	ND	ND	1 J	ND	ND	ND	ND	ND
Tetrachloroethene	14	1400	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	15	1500	6	ND	2 J	6	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)											
Benzo(a)anthracene	330	330	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	330	1100	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	330	400	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	19,000	50,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	6650	50,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCBs (µg/kg) [e]	1000 (Surface)	10,000 (Subsurface)	NA	ND	NA	NA	NA	NA	NA	NA	NA
TCP (mg/kg)	–	–	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

B Analyte is also found in associated blank.
J Estimated value.
NA Not analyzed.
ND Not detected.
PCBs Polychlorinated biphenyls.
TCP Tri-o-cresyl)phosphate.
– No applicable action level.

(a) Location "DP0X-SS0X" refers to surface soil sample at direct-push location 0X, at depth specified in feet below ground surface (BGS): DP01-SS01 is direct-push surface soil sample (first sample) at location DP01 at depth of 0-0.3 ft BGS. Location "DP0X-0X" refers to sample number collected at location DP0X, at depth specified in ft BGS; DP02-03 is the third direct-push sample collected from location DP02 at a depth of 8-12 ft BGS. Type of soil sample: S - Saturated; U - Unsaturated.
(b) Recommended Soil Cleanup Objectives, NYSDEC, TAGM 4046.
(c) Soil in direct contact with groundwater.
(d) Greater than 5 ft above the water table.
(e) Recommended Cleanup Objectives for PCBs in Surface and Subsurface Soils, NYSDEC, TAGM 4046.

Table 2.1 (Continued)
2000 – 2001 Remedial Investigation
Confirmatory Soil Analytical Results – Volatile and Semivolatile Compounds
106th Rescue Wing – New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Parameter	Action Level [b]		Sample Location, Depth, Type, and Concentration [a]								
	Saturated [c]	Unsaturated [d]	DP07-01 (0-2 ft) U	DP07-02 (36-40 ft) S	DP08-01 (0-2 ft) U	DP08-02 (12-14.5 ft) U	DP08-03 (16-18 ft) U	DP08-04 (36-40 ft) S	DP09-01 (0-4 ft) U	DP09-02 (36-40 ft) S	DP09-03 (40-44 ft) S
Volatile Organic Compounds (µg/kg)											
Chloroform	3.0	300	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	14	1400	1 BJ	1 BJ	ND	ND	ND	ND	ND	ND	ND
Toluene	15	1500	ND	ND	ND	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)											
Benzo(a)anthracene	330	330	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	330	1100	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	330	400	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	19,000	50,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	6650	50,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCBs (µg/kg) [e]	1000 (Surface)	10,000 (Subsurface)	NA	NA	NA	NA	NA	NA	NA	NA	NA
TCP (mg/kg)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

B	Analyte is also found in associated blank.
J	Estimated value.
NA	Not analyzed.
ND	Not detected.
PCBs	Polychlorinated biphenyls.
TCP	Tri-o-cresyl)phosphate.
--	No applicable action level.

(a) Location "DP0X-SS0X" refers to surface soil sample at direct-push location 0X, at depth specified in feet below ground surface (BGS): DP01-SS01 is direct-push surface soil sample (first sample) at location DP01 at depth of 0-0.3 ft BGS. Location "DP0X-0X" refers to sample number collected at location DP0X, at depth specified in ft BGS; DP02-03 is the third direct-push sample collected from location DP02 at a depth of 8-12 ft BGS. Type of soil sample: S - Saturated; U - Unsaturated.

(b) Recommended Soil Cleanup Objectives, NYSDEC, TAGM 4046.

(c) Soil in direct contact with groundwater.

(d) Greater than 5 ft above the water table.

(e) Recommended Cleanup Objectives for PCBs in Surface and Subsurface Soils, NYSDEC, TAGM 4046.

Table 2.1 (Continued)
2000 – 2001 Remedial Investigation
Confirmatory Soil Analytical Results – Volatile and Semivolatile Compounds
106th Rescue Wing - New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Parameter	Action Level [b]		Sample Location, Depth, Type, and Concentration [a]							
	Saturated [c]	Unsaturated [d]	DP10-01 (0-4 ft) U	DP10-02 (9-12 ft) U	DP10-03 (36-38 ft) S	SB01-01 (0-2 ft) U	SB01-02 (40-42 ft) S	SB02-01 (0-2 ft) U	SB02-02 (12-14 ft) U	SB02-03 (38-40 ft) S
Volatile Organic Compounds (µg/kg)										
Chloroform	3.0	300	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	14	1400	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	15	1500	ND	ND	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)										
Benzo(a)anthracene	330	330	ND	ND	ND	ND	ND	20 J	ND	ND
Benzo(b)fluoranthene	330	1100	ND	ND	ND	ND	ND	26 J	ND	ND
Chrysene	330	400	ND	ND	ND	ND	ND	20 J	ND	ND
Fluoranthene	19,000	50,000	ND	ND	ND	ND	ND	48 J	ND	ND
Pyrene	6650	50,000	ND	ND	ND	ND	ND	38 J	ND	ND
PCBs (µg/kg) [e]	1000 (Surface)	10,000 (Subsurface)	NA	NA	NA	NA	NA	NA	NA	NA
TCP (mg/kg)			ND	ND	ND	ND	ND	ND	ND	ND

Notes:

B	Analyte is also found in associated blank.
J	Estimated value.
NA	Not analyzed.
ND	Not detected.
PCBs	Polychlorinated biphenyls.
TCP	Tri-o-cresyl)phosphate.
--	No applicable action level.

(a) Location "DP0X-SS0X" refers to surface soil sample at direct-push location 0X, at depth specified in feet below ground surface (BGS): DP01-SS01 is direct-push surface soil sample (first sample) at location DP01 at depth of 0-0.3 ft BGS. Location "DP0X-0X" refers to sample number collected at location DP0X, at depth specified in ft BGS; DP02-03 is the third direct-push sample collected from location DP02 at a depth of 8-12 ft BGS. Type of soil sample: S - Saturated; U - Unsaturated.
(b) Recommended Soil Cleanup Objectives, NYSDEC, TAGM 4046.
(c) Soil in direct contact with groundwater.
(d) Greater than 5 ft above the water table.
(e) Recommended Cleanup Objectives for PCBs in Surface and Subsurface Soils, NYSDEC, TAGM 4046.

Table 2.2
2000 – 2001 Remedial Investigation
Confirmatory Soil Analytical Results - Metals
106th Rescue Wing - New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Parameter	Action Levels		Sample Location, Depth, Type, and Concentration [a]									
	NYSDEC [b] RSCO	BKG [c] or ULBC [d]	DP01-01 (0-2 ft)	DP01-02 (24-28 ft)	DP01-22 (24-28 ft)	DP01-03 (36-38 ft)	DP02-01 (0-2 ft)	DP02-02 (20-24 ft)	DP02-03 (36-40 ft)	DP03-01 (0-2 ft)	DP03-02 (16-20 ft)	DP03-03 (36-40 ft)
Metals (mg/kg)												
Aluminum	SB	33,000	1600 N	400 N	360 N	320 N	460 N	300 N	260	1600	180	240
Arsenic	7.5 or SB	7.5/5.5 [d]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	300 or SB	15 – 600	3.4	1.5	1.3	1.1	1.0	ND	ND	2.5	1.0	1.6
Calcium	SB	130 - 35,000	110	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	10 or SB	6.1/0.84 [d]	7.6	2.5	2.1	ND	ND	ND	ND	ND	ND	ND
Cobalt	30 or SB	2.5 – 60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	25 or SB	1 – 50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	2000 or SB	2000 - 550,000	2400 E	1300 E	1100 E	530 E	450 E	470 E	580	1600	240	360
Lead	SB [e]	4.4/2.7 [d] [e]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium	SB	100 – 5000	180	45	50	59	39	36	55	120	28	47
Manganese	SB	50 – 5000	21 N*E	23 N*E	17 N*E	13 N*E	12 N*E	24 N*E	9.1	12	2.1	9.5
Mercury	0.1	0.001 - 0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	13 or SB	0.5 – 25	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5
Potassium	SB	8500 - 43,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	150 or SB	1 – 300	4.4	2.0	1.9	1.2	1.1	1.1	1.2	2.7	ND	ND
Zinc	20 or SB	9 – 50	3.8	3.2	3.0	2.9	1.9	2.4	1.4	4.1	4.6	12

Notes:

* Analysis is not within laboratory quality control limits.
B Analyte is also found in associated blank.
E Estimated value or not reported due to the presence of interferences.
ND Not detected.
SB Site background.
-- No applicable action level.
Shading and bolding indicate exceedance of action levels.

(a) Location "DP0X-SS0X" refers to surface soil sample at direct-push location 0X, at depth specified in feet below ground surface (BGS): DP01-SS01 is direct-push surface soil sample (first sample) at location DP01 at depth of 0-0.3 ft BGS. Location "DP0X-0X" refers to sample number collected at location DP0X, at depth specified in ft BGS; DP02-03 is the third direct-push sample collected from location DP02 at a depth of 8-12 ft BGS.
(b) New York State (NYS) Recommended Soil Cleanup Objectives, NYSDEC, TAGM, #4046.
(c) Eastern USA Background, NYSDEC, TAGM #4046.
(d) Upper limits of background concentrations for surface/subsurface metals in soils; see Section 6.0.
(e) Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4 to 61 ppm (mg/kg). Average background levels in metropolitan or suburban areas or near highways are much higher and typically range from 200 to 500 ppm (mg/kg) (TAGM 4046.)

Table 2.2 (Continued)
2000 – 2001 Remedial Investigation
Confirmatory Soil Analytical Results - Metals
106th Rescue Wing - New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Parameter	Action Levels		Sample Location, Depth, Type, and Concentration [a]								
	NYSDEC [b] RSCO	BKG [c] or ULBC [d]	DP04-01 (0-2 ft)	DP04-02 (10-13 ft)	DP04-03 (36-40 ft)	DP05-01 (0-2 ft)	DP05-02 (36-40 ft)	DP06-01 (0-2 ft)	DP06-02 (12-13.5 ft)	DP06-03 (13.5-16 ft)	DP06-04 (36-40 ft)
Metals (mg/kg)											
Aluminum	SB	33,000	1500	290 E*	230	860	220	680	330	200	270
Arsenic	7.5 or SB	7.5/5.5 [d]	ND	0.39 B*	ND	ND	ND	ND	ND	ND	ND
Barium	300 or SB	15 – 600	2.7	1.1*	1.7	2.1	ND	1.5	1.2	ND	1.3
Calcium	SB	130 - 35,000	69	28 B	ND	380	ND	ND	ND	ND	ND
Chromium	10 or SB	6.1/0.84 [d]	1.8	1.3 B*	0.58	0.61	ND	ND	9.1	ND	ND
Cobalt	30 or SB	2.5 – 60	0.87	0.34 B*	ND	ND	ND	ND	ND	ND	ND
Copper	25 or SB	1 – 50	2.3	1.6 B	1.5	2.2	ND	ND	ND	ND	ND
Iron	2000 or SB	2000 - 550,000	1900 E	600 E*	490 E	1100 E	770	740	1300	360	620
Lead	SB [e]	4.4/2.7 [d] [e]	1.7	1.4 B	ND	1.8	ND	ND	ND	ND	ND
Magnesium	SB	100 – 5000	270	47 *	44	220	29	64	44	25	54
Manganese	SB	50 – 5000	18	46 NE*	13	14	20	20	15	8.2	8.8
Mercury	0.1	0.001 - 0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	13 or SB	0.5 – 25	1.4	0.20 B	ND	ND	ND	ND	ND	ND	ND
Potassium	SB	8500 - 43,000	ND	28 B*	ND	ND	ND	ND	ND	ND	ND
Vanadium	150 or SB	1 – 300	3.2	1.4 *	1.0	2.2	ND	1.5	1.7	1.0	1.6
Zinc	20 or SB	9 – 50	7.0	3.2	ND	3.4	ND	1.0	1.3	ND	1.9

Notes:

* Analysis is not within laboratory quality control limits.
B Analyte is also found in associated blank.
E Estimated value or not reported due to the presence of interferences.
ND Not detected.
SB Site background.
-- No applicable action level.
Shading and bolding indicate exceedance of action levels.

(a) Location "DP0X-SS0X" refers to surface soil sample at direct-push location 0X, at depth specified in feet below ground surface (BGS): DP01-SS01 is direct-push surface soil sample (first sample) at location DP01 at depth of 0-0.3 ft BGS. Location "DP0X-0X" refers to sample number collected at location DP0X, at depth specified in ft BGS; DP02-03 is the third direct-push sample collected from location DP02 at a depth of 8-12 ft BGS.
(b) New York State (NYS) Recommended Soil Cleanup Objectives, NYSDEC, TAGM, #4046.
(c) Eastern USA Background, NYSDEC, TAGM #4046.
(d) Upper limits of background concentrations for surface/subsurface metals in soils; see Section 6.0.
(e) Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4 to 61 ppm (mg/kg). Average background levels in metropolitan or suburban areas or near highways are much higher and typically range from 200 to 500 ppm (mg/kg) (TAGM 4046.)

Table 2.2 (Continued)
2000 – 2001 Remedial Investigation
Confirmatory Soil Analytical Results - Metals
106th Rescue Wing - New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Parameter	Action Level		Sample Location, Depth, Type, and Concentration [a]								
	NYSDEC [b] RSCO	BKG [c] or ULBC [d]	DP07-01 (0-2 ft)	DP07-02 (36-40 ft)	DP08-01 (0-2 ft)	DP08-02 (12-14.5 ft)	DP08-03 (16-18 ft)	DP08-04 (36-40 ft)	DP09-01 (0-4 ft)	DP09-02 (36-40 ft)	DP09-03 (40-44 ft)
Metals (mg/kg)											
Aluminum	SB	33,000	680	326	1100	370	310	150	2400 N	350 N	210
Arsenic	7.5 or SB	7.5/5.5 [d]	ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	300 or SB	15 - 600	1.3	1.5	1.7	ND	3.4	ND	3.1	1.3	ND
Calcium	SB	130 - 35,000	ND	ND	ND	ND	ND	ND	120*	ND*	ND
Chromium	10 or SB	6.1/0.84 [d]	ND	ND	ND	ND	ND	ND	2.6*	ND*	ND
Cobalt	30 or SB	2.5 - 60	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	25 or SB	1 - 50	ND	18	ND	ND	ND	ND	ND*	3.1*	2.4
Iron	2000 or SB	2000 - 550,000	95	560	1200	530	1000	300	2300 E	670 E	590 E
Lead	SB [e]	4.4/2.7 [d] [e]	ND	ND	ND	ND	ND	ND	ND*	ND*	ND
Magnesium	SB	100 - 5000	70	57	76	73	41	ND	160*	77*	39
Manganese	SB	50 - 5000	15	9.9	5.5	16	25	7.7	20 N	12 N	14
Mercury	0.1	0.001 - 0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	13 or SB	0.5 - 25	ND	ND	ND	ND	ND	ND	ND	ND	ND
Potassium	SB	8500 - 43,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	150 or SB	1 - 300	2.3	1.4	2.4	1.4	1.7	ND	4.1	1.6	1.6
Zinc	20 or SB	9 - 50	2.0	11	2.1	2.8	2.0	ND	2.7*	3.2*	1.9

Notes:

* Analysis is not within laboratory quality control limits.
B Analyte is also found in associated blank.
E Estimated value or not reported due to the presence of interferences.
ND Not detected.
SB Site background.
– No applicable action level.
Shading and bolding indicate exceedance of action levels.

(a) Location "DP0X-SS0X" refers to surface soil sample at direct-push location 0X, at depth specified in feet below ground surface (BGS): DP01-SS01 is direct-push surface soil sample (first sample) at location DP01 at depth of 0-0.3 ft BGS. Location "DP0X-0X" refers to sample number collected at location DP0X, at depth specified in ft BGS; DP02-03 is the third direct-push sample collected from location DP02 at a depth of 8-12 ft BGS.
(b) New York State (NYS) Recommended Soil Cleanup Objectives, NYSDEC, TAGM, #4046.
(c) Eastern USA Background, NYSDEC, TAGM #4046.
(d) Upper limits of background concentrations for surface/subsurface metals in soils; see Section 6.0.
(e) Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4 to 61 ppm (mg/kg). Average background levels in metropolitan or suburban areas or near highways are much higher and typically range from 200 to 500 ppm (mg/kg) (TAGM 4046.)

Table 2.2 (Continued)
2000 – 2001 Remedial Investigation
Confirmatory Soil Analytical Results - Metals
106th Rescue Wing - New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Parameter	Action Level		Sample Location, Depth, Type, and Concentration [a]							
	NYSDEC [b] RSCO	BKG [c] or ULBC [d]	DP10-01 (0-4 ft)	DP10-02 (9-12 ft)	DP10-03 (36-38 ft)	SB01-01 (0-2 ft)	SB01-02 (40-42 ft)	SB02-01 (0-2 ft)	SB02-02 (12-14 ft)	SB02-03 (38-40 ft)
Metals (mg/kg)										
Aluminum	SB	33,000	800	300	450	1400	120	2400	250	260
Arsenic	7.5 or SB	7.5/5.5 [d]	ND	ND	ND	ND	ND	ND	ND	ND
Barium	300 or SB	15 - 600	2.2	ND	2.3	3.1	ND	15	ND	1.8
Calcium	SB	130 - 35,000	360	ND	ND	150	ND	2500	ND	ND
Chromium	10 or SB	6.1/0.84 [d]	ND	9.5	ND	3.0	ND	4.2	ND	3.8
Cobalt	30 or SB	2.5 - 60	ND	ND	ND	ND	ND	ND	ND	ND
Copper	25 or SB	1 - 50	2.5	ND	2.3	8.3	ND	5.3	2.4	2.2
Iron	2000 or SB	2000 - 550,000	1200 E	2600 E	900 E	1700 E	270 E	2500 E	510 E	950 E
Lead	SB [e]	4.4/2.7 [d] [e]	ND	ND	ND	ND	ND	31	ND	ND
Magnesium	SB	100 - 5000	150	29	110	150	ND	460	46	60
Manganese	SB	50 - 5000	16	17	16	29	7.3	23	9.1	13
Mercury	0.1	0.001 - 0.2	ND	ND	ND	ND	ND	1.9	ND	ND
Nickel	13 or SB	0.5 - 25	ND	ND	ND	ND	ND	ND	ND	ND
Potassium	SB	8500 - 43,000	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	150 or SB	1 - 300	2.5	2.8	2.4	2.7	ND	4.7	ND	1.3
Zinc	20 or SB	9 - 50	3.2	1.4	3.0	8.8	2.6	62	2.0	2.9

Notes:

* Analysis is not within laboratory quality control limits.
B Analyte is also found in associated blank.
E Estimated value or not reported due to the presence of interferences.
ND Not detected.
SB Site background.
– No applicable action level.
Shading and bolding indicate exceedance of action levels.

(a) Location "DP0X-SS0X" refers to surface soil sample at direct-push location 0X, at depth specified in feet below ground surface (BGS): DP01-SS01 is direct-push surface soil sample (first sample) at location DP01 at depth of 0-0.3 ft BGS. Location "DP0X-0X" refers to sample number collected at location DP0X, at depth specified in ft BGS; DP02-03 is the third direct-push sample collected from location DP02 at a depth of 8-12 ft BGS.
(b) New York State (NYS) Recommended Soil Cleanup Objectives, NYSDEC, TAGM, #4046.
(c) Eastern USA Background, NYSDEC, TAGM #4046.
(d) Upper limits of background concentrations for surface/subsurface metals in soils; see Section 6.0.
(e) Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4 to 61 ppm (mg/kg). Average background levels in metropolitan or suburban areas or near highways are much higher and typically range from 200 to 500 ppm (mg/kg) (TAGM 4046.)

In the vicinity of Site 12, some run off occurs during precipitation events due to the presence of the asphalt paving. However, the surrounding lawn areas allow the majority of run off to infiltrate rapidly, while the remainder is carried off by the storm sewer system. Consequently, there is no surface water or sediment in the vicinity of Site 12. Therefore, no surface water or sediment sampling was performed in association with Site 12.

2.6 HYDROGEOLOGY

Three aquifers and two aquitards are present in the region around the Francis S. Gabreski Airport. Overlying the bedrock is the Lloyd Aquifer. The Lloyd Aquifer correlates to the Lloyd sand member of the Raritan formation. Overlying the Lloyd is the Raritan clay member, an aquitard which is the upper member of the Raritan formation. Overlying the Raritan clay is the Magothy aquifer, a water-bearing unit which correlates to the Magothy formation. Overlying the Magothy is the Gardiners clay, an aquitard present beneath and south of the airport.

Overlying the Gardiners clay at the airport and overlying the Magothy north of the airport is the upper glacial aquifer, a predominantly sand and gravel unit deposited during the Wisconsin glaciation (Dames & Moore 1986).

The upper glacial aquifer and Gardiners Clay are of the greatest hydrogeologic interest with respect to Site 12. General characteristics of the hydrogeologic units present are summarized on Table 2.3. Since they are of the most interest, the hydrologic properties of the upper glacial aquifer and the Gardiners clay aquitard are further discussed below.

2.6.1 Upper Glacial Aquifer

This aquifer correlates to the saturated interval of the glacial outwash deposits of the Wisconsin glaciation. This water-bearing unit is an unconfined (water table) aquifer present in the upper glacial sediments beneath the base and airport. Groundwater elevations are approximately 15 to

Table 2.3
Hydrologic Properties of Regional Aquifers
106th Rescue Wing - New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

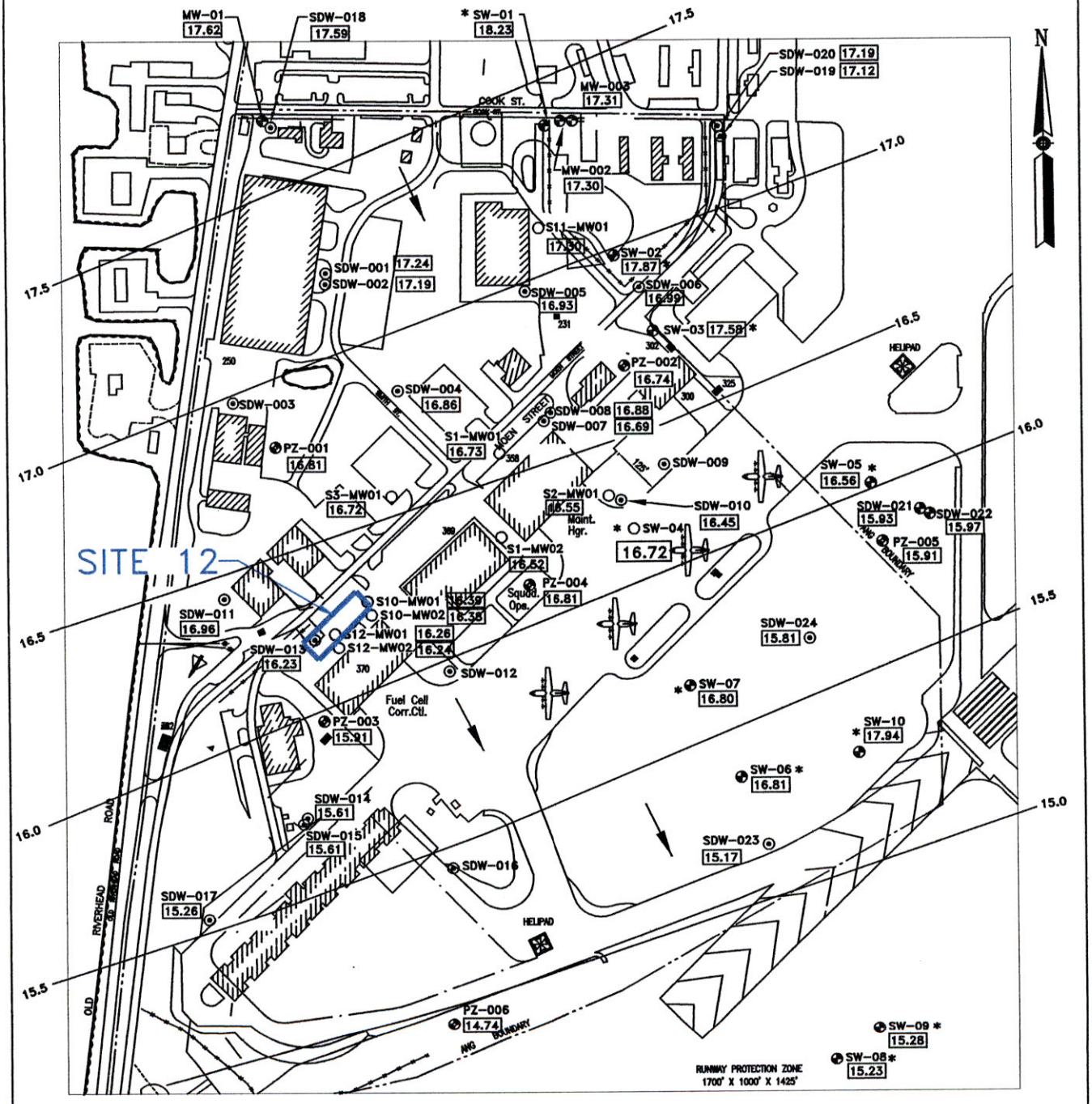
Unit	Texture	Thickness (ft)	Hydraulic Conductivity (gpd/ft^2) (cm/s)	Estimated Transmissivity (gpd/ft) (cm^2/s)
Upper Glacial	Sand and gravel	120	2,000 (9.4 x 10^{-2})	200 (2.9 x 10^{-1})
Gardiners Clay	Clay and silt	40	Aquitard	Aquitard
Magothy Formations	Sand, clayey sand	930	380 (1.8 x 10^{-2})	300 (4.5 x 10^{-1})
Raritan Clay	Clay and silt	200	Aquitard	Aquitard
Lloyd Sand	Sand and gravel	400	300 (1.4 x 10^{-2})	75 (1.1 x 10^{-1})
Bedrock	Granitic gneiss	--	Aquiclude	Aquiclude

Source: Dames & Moore 1986.

19 ft above the National Geodetic Vertical Datum, but may be less or more due to seasonal variations. The clean, coarse sand and gravel of this unit is very porous and highly permeable.

It makes a porous soil, so that a high proportion of rainfall infiltrates where it falls, and there is virtually no surface runoff. The unit stores large quantities of water and, due to high porosity and permeability, yields large quantities of water to wells. The Upper Glacial Aquifer is the source of nearly all the groundwater pumped in central Suffolk County. There are no effective barriers to the movement of water anywhere in the unit, but there may be substantial variation in permeability over short distances. Hydraulic conductivity of the glacial deposits was estimated to be about 2000 gpd/ft^2 (9.4 x 10^{-2} cm/s) (ABB-ES 1997), and transmissivity is approximately 200 gpd/ft (2.9 x 10^{-1} cm^2/s) (Dames & Moore 1987).

The direction of groundwater movement within the Upper Glacial Aquifer at the Francis S. Gabreski Airport is toward the south-southeast. Depth to groundwater averages 35 to 40 ft BGS. Slug tests performed on base monitoring wells and piezometers, screened in the upper glacial aquifer, indicated hydraulic conductivities ranging from 1.6 x 10^{-2} to 5.2 x 10^{-2} cm/sec (Dames & Moore 1986). A potentiometric surface map for the area of the base, based on measurements recorded on May 15-16, 2001, is shown on Figure 2.3. The upward gradient of groundwater from the underlying Magothy Aquifer would cause the Upper Glacial Aquifer groundwater to



LEGEND

- PRE-EXISTING SMALL DIAMETER WELL
- PRE-EXISTING WELL
- PRE-EXISTING PIEZOMETER
- NEW MONITORING WELL (RI, 2000–2001)
- 15.5 POTENTIOMETRIC SURFACE CONTOUR
- GROUNDWATER FLOW DIRECTION
- 12.51 GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL
- * INDICATES GROUNDWATER ELEVATION IS CONSIDERED ANOMALOUS AND THE WELL WAS EXCLUDED IN CONSTRUCTING CONTOURS

0 200 400
SCALE IN FEET

SOURCE: BASE MAP AND ABB-ES, 1997

NOTE: WELL LOCATIONS APPROXIMATE

PEER

PROJ./003005-011

GAB3005/NFRAP/SITE12/FIG 2.3

MAY 15–16, 2001 BASEWIDE POTENTIOMETRIC SURFACE MAP
106th RESCUE WING, NEW YORK AIR NATIONAL GUARD
FRANCIS S. GABRESKI AIRPORT
WESTHAMPTON BEACH, NEW YORK

FIGURE 2.3

flow horizontally toward surface water discharge points. Migration of contaminants downward into lower aquifers is very unlikely (Dames & Moore 1986).

2.6.2 Gardiners Clay

This clay is poorly permeable and acts as an aquitard between the Upper Glacial Aquifer and the underlying Magothy Aquifer. The Gardiners Clay also constitutes a confining layer for the Magothy aquifer, which has a potentiometric surface above that of the Upper Glacial Aquifer.

At the base, the beds of clay and sand within the Gardiners clay are an effective barrier to the movement of groundwater to and from the lower aquifers. The combination of low permeability, with the generally upward movement of water within the Magothy aquifer tends to prevent downward migration of contamination from the Upper Glacial Aquifer into the lower aquifers (Dames & Moore 1986).

2.7 GROUNDWATER CONTAMINATION INVESTIGATION RESULTS

During the SI completed in 1994, chromium was detected at a concentration below the MCL in one groundwater-screening sample collected from Site 12. The SI results were summarized above in Section 1.4.1. Chromium was subsequently determined to be naturally occurring during the 2000 – 2001 RI, and is not considered a COPC.

During the 2000 -2001 RI, hydrogeologic information was obtained at Site 12 from 10 direct-push borings and by installing and monitoring two new monitoring wells. The RI groundwater investigation included collection of both screening and confirmatory direct-push ground water samples, as well as groundwater monitoring samples, as discussed below in Sections 2.7.1, 2.7.2, and 2.7.3. Screening samples for expedited BTEX analysis were collected from direct-push borings S12-DP01 through S12-DP08, and screening samples for expedited volatile organics analysis were collected from direct-push borings S12-DP09 and S12-DP10. Confirmatory groundwater samples were collected for volatile and semivolatile organics analysis from all ten direct-push borings. Two rounds of groundwater monitoring samples were collected from the

two newly installed monitoring wells. S12-MW01 and S12-MW02 were installed as a shallow and deep pair, with screened intervals of 32.1 to 47.1 ft BGS and 38.9 to 47.3, respectively. Groundwater monitoring samples were analyzed for volatile and semivolatile organics, TAL metals, and TCP.

No indication of groundwater contamination, such as sheen or odor, was noted during collection of groundwater screening and monitoring samples at Site 12. The top of saturation was observed from 37 to 38 ft BGS at the 10 direct-push borings and 2 well borings, and averaged 37 ft BGS. Groundwater elevations measured at the newly installed monitoring wells were consistent with basewide groundwater elevations. No significant vertical gradient observed between the shallow and deep wells.

2.7.1 Groundwater Screening Samples

During direct-push sampling, groundwater screening samples from S12-DP01 through S12-DP08 were submitted to the field laboratory for expedited screening analysis of BTEX. No BTEX compounds were detected in the groundwater screening samples. Groundwater screening samples from direct-push borings S12-DP09 and S12-DP10 were submitted for expedited screening analysis of volatile organic compounds at an off-site laboratory for volatile organics analyses. The volatile organic compound trichloroethylene (TCE) was detected at estimated concentrations below MCLs and NYSDEC action levels in the groundwater screening samples from S12-DP09 and S12-DP10.

2.7.2 Direct-Push Confirmatory Groundwater Samples

Direct-push groundwater confirmatory samples were collected from all ten direct-push borings and analyzed at the state-certified laboratory for volatile and semivolatile organic compounds. Table 2.3 summarizes the results of the confirmatory groundwater analyses. The volatile organic compounds that were detected did not exceed MCLs or NYSDEC Action Levels. Detected volatile organics included:

- TCE was detected at 1 ug/L at S12-DP04, and at similar estimated concentrations at 5 other locations.
- PCE was tentatively detected at two locations, two of which were likely laboratory-introduced contamination, as indicated by the "B" flag.
- 1,1,1-Trichloroethane was tentatively detected at one location, and
- Toluene was tentatively detected at three locations.

2.7.3 Groundwater Monitoring Samples

Groundwater monitoring samples were collected from monitoring wells S12-MW01 and S12-MW02 during sampling Rounds 1 and 2 and analyzed for:

- volatile and semivolatile organic compounds;
- TCP;
- bioremediation parameters, including BTEX, TPH-GRO and DRO, methane, chloride, sulfate, and alkalinity (from monitoring well S12-MW01 during each sampling round); and
- TAL metals.

In groundwater samples from Site 12, no TCP or semivolatile organics were detected. No volatile organic compounds or TAL metals were detected above MCLs or NYSDEC Action Levels, as summarized on Tables 2.4, 2.5 and 2.6. Several volatile organics were detected, including ethylbenzene, TCE, PCE, toluene, and total xylenes. Many of these detections were qualified with the "B" flag, signifying potential laboratory contamination.

No COPCs were identified in groundwater at Site 12.

No BTEX compounds or TPH-GRO were detected in the bioremediation samples from S12-MW01 during either round. TPH-DRO was detected during Round 1 at 1.9 mg/L and 2.1 mg/L

Table 2.4
2000 – 2001 Remedial Investigation
Confirmatory Groundwater Analytical Results
Volatile and Semivolatile Organic Compounds
106th Rescue Wing
New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Parameter	Action Levels		Sample Locations, Depths and Concentrations [a]									
	NYS [b]	MCL [c]	PW01-01 (38-42 ft)	PW02-01 (38-42 ft)	PW03-01 (38-42 ft)	PW04-01 (38-42 ft)	PW05-01 (38-42 ft)	PW06-01 (38-42 ft)	PW07-01 (38-42 ft)	PW08-01 (38-42 ft)	PW9-01 (40-44 ft)	PW10-01 (38-42 ft)
Volatile Organic Compounds (µg/L)												
Tetrachloroethene	5	5	ND	ND	ND	ND	0.4 BJ	0.8 BJ	0.2 J	ND	ND	ND
Toluene	5	1000	ND	ND	ND	0.3 J	0.2 J	0.2 J	ND	ND	ND	ND
1,1,1-Trichloroethane	5	200	ND	ND	ND	ND	ND	ND	ND	ND	0.2 J	ND
Trichloroethene	5	5	ND	ND	ND	1	0.4 J	0.8 J	0.6 J	ND	0.8 J	0.9 J
Remaining Analytes	5	10,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/L)												
Benzyl Alcohol	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.8 J
Remaining Analytes	50 [d]	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

B	Analyte is also found in associated blank.
Dup	Duplicate sample.
J	Estimated value.
NA	Not analyzed.
ND	Not detected.
TPH-DRO	Total petroleum hydrocarbons - diesel range organics.
TPH-GRO	Total petroleum hydrocarbons - gasoline range organics.
--	No applicable Action Level.

Shading and bolding indicate exceedance of Action Levels.

(a) Location "PW0X-0X" refers to sample number collected at location PW0X, at depth specified in ft BGS; PW01-01 is the first direct-push sample collected from location PW01 at a depth of 34-38 ft BGS.
(b) New York State (NYS), Class GA Groundwater; NYSDEC TAGM #4046.
(c) Maximum Contaminant Level (MCL), United States Environmental Protection Agency.
(d) Guidance values.

Table 2.5
2000 – 2001 Remedial Investigation
Groundwater Monitoring Analytical Results
Volatile and Semivolatile Organic Compounds
Rounds 1 and 2
106th Rescue Wing
New York Air National Guard
Westhampton Beach, New York

Parameter	Action Levels		Sample Locations and Concentrations [a]					
	NYS [b]	MCL [c]	S12MW01 -01	S12MW01 -21 (Dup)	S12MW01 -02	S12MW02 -01	S12MW02 -02	S12MW02 -22 (Dup)
BTEX (µg/L)								
All Analytes	--	--	ND	ND	ND	NA	NA	NA
Volatile Organic Compounds (µg/L)								
Carbon Disulfide	50	--	ND	0.3 J	ND	0.3 J	ND	ND
Chlorobenzene	5	--	ND	0.2 BJ	ND	ND	ND	ND
Chloroform	7	80	0.3 J	0.2 BJ	0.5 J	ND	0.6 J	0.6 J
Ethylbenzene	5	70	ND	0.2 J	ND	ND	ND	ND
Methylene Chloride	--	--	ND	ND	ND	0.3 BJ	ND	ND
Tetrachloroethene	5	5	ND	ND	ND	0.6 J	ND	ND
Toluene	5	1000	ND	ND	ND	0.6 BJ	ND	ND
Trichloroethene	5	5	0.3 J	0.4 BJ	ND	0.5 J	ND	ND
Total Xylenes	5	10,000	ND	0.2 BJ	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/L)								
All Analytes	--	--	ND	ND	ND	ND	ND	ND
TPH-GRO (µg/L)	--	--	ND	ND	ND	NA	NA	NA
TPH-DRO (mg/L)	--	--	1.9	2.1	0.21 J	NA	NA	NA
TCP (mg/L)	--	--	ND	ND	ND	ND	ND	ND

Notes:

BTEX	Benzene, toluene, ethylbenzene, and xylenes.
J	Estimated value.
NA	Not analyzed.
ND	Not detected.
Dup	Duplicate.
TPH-DRO	Total petroleum hydrocarbons - diesel range organics.
TPH-GRO	Total petroleum hydrocarbons - gasoline range organics.
TCP	Tri(o-cresyl)phosphate.

-- No applicable action level.
(a) MW" refers to monitoring well; "-01" refers to Round 1 sampling, February - March 2001; "-02" refers to Round 2 sampling, May - June 2001.
(b) New York State (NYS), Class GA Groundwater; NYSDEC TAGM #4046.
(c) Maximum Contaminant Level (MCL), United States Environmental Protection Agency.

Table 2.6
2000 – 2001 Remedial Investigation
Groundwater Monitoring Analytical Results
Metals - Rounds 1 and 2
106th Rescue Wing
New York Air National Guard
Westhampton Beach, New York

Parameter	Action Levels		Sample Location and Concentrations[a]					
	NYS [b]	MCL [c]	S12MW01-01	S12MW01-21 (Dup)	S12MW01-02	S12MW02-01	S12MW02-02	S12MW02-22 (Dup)
Metals (µg/L)								
Aluminum	--	--	350	430	410	210	1100	1000
Arsenic	25	50 [d]	ND	ND	9.0	ND	ND	7.9
Barium	--	--	21	22	22 E	56	25 E	24 E
Cadmium	10	5.0	ND	ND	ND	ND	ND	ND
Calcium	--	--	6600	6500	6500	9100	6500	6400
Chromium	50	100	5.8	6.2	3.4	8.0	5.8	6.0
Cobalt	--	--	ND	ND	ND	ND	ND	ND
Copper	--	1300 [e]	ND	ND	ND	ND	ND	ND
Iron	--	--	520	710	830 E	230	2200 E	2200 E
Lead	25	15 [e]	ND	ND	ND	ND	ND	ND
Magnesium	--	--	1800	1800	1800	2600	1700	1500
Manganese	--	--	34	41	33	56	95	84
Nickel	--	--	ND	ND	ND	ND	ND	ND
Potassium	--	--	1500	1500	1800	990	1600	1800
Sodium	--	--	24,000	23,000	22,000	58,000	22,000	22,000
Thallium	--	--	ND	ND	ND	ND	ND	ND
Vanadium	--	--	ND	ND	ND	ND	ND	ND
Zinc	--	--	ND	ND	ND	ND	ND	ND

Notes:

ND Not detected.

-- No applicable action level.

(a) "SDW" refers to small-diameter well; "MW" refers to monitoring well; "SW" refers to Stone & Webster well; "R" refers to replicate sample collected at the top of the well screen; "-01" Refers to Round 1 sampling, February - March 2001; "-02" Refers to Round 2 sampling, May - June 2001.
(b) New York State (NYS), Class GA Groundwater; NYSDEC TAGM #4046.
(c) Maximum Contaminant Level (MCL), United States Environmental Protection Agency.
(d) Federal MCL is under review.
(e) Treatment Technique Action Level. Federal MCL is concentration in water collected from tap.

in a duplicate sample, and at 0.21 J (estimated value) in Round 2. There are no NYSDEC Action Levels for TPH-GRO/DRO.

2.8 CLIMATE

The average annual rainfall in the Westhampton Beach area is about 45 in. The highest average rainfall is in March, and the lowest is in October.

2.9 AIR

Air sampling was not conducted at Site 12. The contaminants detected at Site 12 are non-volatile and would not be of concern since the majority of this site is covered in lawn and asphalt.

2.10 RECEPTORS

Site 12 is located within the boundaries of the 106th RQW, a secured government installation. The base is located within the boundaries of the Francis S. Gabreski Airport, itself a secure facility. The site surface is 90% covered with asphalt. The shallow groundwater in the immediate vicinity of the site is not used for water supply. Groundwater occurs at approximately 32 to 33 ft BGS; there is no potential exposure route for groundwater at Site 12. Exposure to off-site receptors via surface water runoff is considered highly unlikely due to the soil characteristics at the base. The soils at the base are highly porous and permeable, and precipitation rapidly infiltrates to the subsurface. Little to no runoff occurs, and has no potential to reach off-site receptors.

Consequently, the only exposure likely to occur in connection with Site 12 would be to construction workers or base personnel who could become exposed to impacted soil during excavation activities at the site. During excavation activities, a potential exposure pathway would be through dermal absorption of contaminants. However, routine safety procedures and good work practices as required in the Base Master Plan will provide adequate protection from

exposure for construction workers; this potential exposure route is therefore considered incomplete for on-site receptors. Human receptors and exposure pathways are discussed in greater detail in Section 3.2.

Potential endpoint ecological receptors that were considered for the ecological assessment included endangered species that could potentially be found within a 4-mile radius of the base. These included the Northern Harrier, the Osprey, the Tiger Salamander, and the Eastern Mud Turtle. There are no endangered plant species within a 4-mile radius of the base. Accordingly, plant species were not considered potential end point receptors for the ecological assessment. The base does not provide habitat to any known federally protected, threatened, or endangered animal species (Dames & Moore 1986).

All of the endangered species feed and reside almost exclusively in the vicinity of surface water bodies (Macwhirter, et al., 1996 and NYSDEC 2002). Therefore, the most likely of the exposure pathway would be exposure of endangered species through impacted surface water. Surface water bodies in the vicinity of the site include Aspatuck Creek, Old Ice Pond, and North Pond. Additionally, the Quogue Waterfowl Refuge is located approximately 7,000 ft east of Site 12 and 2,000 ft east of the airport. Potential mechanisms for transport of contaminants from the site include surface water run off. Surface water may be potentially impacted by contaminated surface water runoff from Site 12.

Contamination of nearby surface water bodies due to impacted surface water runoff from the base is not likely. The only surface water body downgradient of Site 12 is Aspatuck Creek. Aspatuck Creek receives surface water runoff from the base, but infiltration rates at the base are relatively high and little surface water leaves the base as runoff. Aspatuck Creek is located several hundred feet (approximately 1,500 ft) southeast of Site 12. Additionally, Site 12 is covered with 90% asphalt and concrete with the remainder being grassy lawn. This effectively eliminates, or significantly limits erosion of impacted soils by surface runoff during high rainfall events. On this basis, it is not likely that surface water bodies in the vicinity of the base will be

impacted by contaminants from the base. Therefore, since surface water bodies in the vicinity of the base are not likely to be impacted by contaminated surface runoff from the Site 12, exposure of endangered species to contaminants from the site is not expected.

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3.0 BASELINE RISK ASSESSMENT

A baseline risk assessment was conducted for Site 12 in accordance with guidelines in the EPA Risk Assessment Guidance (RAGs) document (EPA 1989), except for lead detected in site surface soils. The COPCs evaluated included lead and PAHs. Risks associated with lead in surface soil were evaluated using the EPA Technical Review Workgroup (TRW) Adult Lead Methodology (ALM) (EPA 1999), as presented below in Section 3.1. PAHs were evaluated according to standard risk assessment procedures (EPA 1989), as presented below in Section 3.2.

Quantitative evaluation of risks associated with lead are not technically feasible using the standard risk assessment equations (EPA 1989). Even though the health effects of exposure to lead are well known, no toxicity factors (i.e., reference doses or cancer slope factors) are available. Therefore, the TRW ALM was employed since it provides a scientifically defensible approach for assessing risks associated with lead in soil. This methodology is currently only applicable to lead.

Lead, which was identified as a COPC at Site 12, is classified as an inorganic metal. Metals naturally occur in soil and groundwater, and tend to persist in the environment. Metals may slowly undergo speciation to a more insoluble sulfate, sulfide, or oxide compound, but do not degrade beyond the elemental state. They tend to adsorb to soils and do not readily dissolve in water. Metals may leach from soils to groundwater, but may also be retained in surface soils especially those containing large quantities of organic materials (EPA 2001). Consequently, metals have a low potential for mobility in soils. In groundwater, metals migrate primarily by way of advection. Metals in surface soils may be transported in surface water runoff during rainfall events due to erosion and transportation of sediments.

3.1 EVALUATION OF LEAD IN SURFACE SOIL

The TRW ALM was used to evaluate potential risks to human health posed by lead in surface soils at Site 12. The decision to use the TRW ALM was based on the following factors:

- The methodology is the most current available and is recognized by the EPA.
- The approach provides a scientifically defensible approach for assessing adult lead risks associated with site-specific, non-residential exposure scenarios.
- The TRW ALM uses a simplified representation of lead biokinetics to predict blood lead concentrations in fetuses carried by women who have relatively steady patterns of site exposure to lead-contaminated soil, since they would be the highest risk population.
- The approach utilizes conservative assumptions that are applicable to circumstances in effect (non-residential use), and expected to remain in effect per the Base Master Plan (GRW Engineers, Inc., 1995), at the base and airport.
- There are no current residential facilities on the base and, according to the Base Master Plan (GRW Engineers, Inc., 1995), there are no plans for any part of the base to ever be used for residential purposes (Lt Col Jerry Webb, Base EM, personal communication, January 30, 2002).
- Future plans call for the airport to remain active indefinitely, and preclude residential use scenarios.
- Access to the sites on the base are restricted to base personnel and authorized civilians only, limiting exposure.

Equations allow calculation of fetal risks from adult exposures to specified levels of soil lead contamination, to support the EPA's goal of limiting exposure risk, which can also be applied in a "forward" manner to predict baseline risks resulting from measured concentrations. The EPA has set the blood level of concern based on the current Office of Solid Waste and Emergency Response guidance, which calls for the establishment of cleanup goals to limit childhood risk of exceeding 10 μg/dL blood lead level to 5%, also known as the 95th percentile (US EPA 1994).

The risk assessment methodology in the ALM is based on a lognormal probability model for blood levels in adult women exposed to lead-contaminated soils, coupled with an estimated

constant of proportionality between fetal and maternal blood levels. These relationships specify that the distribution of fetal blood lead levels also follows a lognormal distribution:

$$PbB_{fetal} = Lognormal(GM, GSD)$$

Where:

GM = Geometric Mean (or central blood lead concentration)
GSD = Geometric Standard Deviation [an estimated (dimensionless) value]

Estimation of the probability that fetal lead levels will exceed the EPA blood level of concern is a two-step process:

(1) Calculate the geometric mean (central) fetal blood lead concentration. The equation used for this purpose has the following form:

$$PbB_{fetal,GM} = R_{fetal/maternal} \times \left[PbB_{adult,0} + \frac{Pb_S \times BKSF \times IR_S \times AF_S \times EF_S}{AT} \right] \quad \text{(Equation 1)}$$

Where:

$PbB_{fetal,GM}$ = Central estimate of blood lead concentrations (µg/dL) for fetuses carried by women who have site exposures to soil lead at concentration, PbS.

$R_{fetal/maternal}$ = Constant of proportionality between fetal and maternal blood lead concentrations.

$PbB_{adult,0}$ = Typical blood lead concentration (µg/dL) in adults (i.e., women of child-bearing age) in the absence of exposures to the site that is being assessed.

PbS = Soil lead concentration (µg/g) (appropriate average concentration for individual).

BKSF = Biokinetic slope factor relating the (quasi-steady state) increase in typical adult blood lead concentration to average daily lead uptake (µg/dL blood lead increase per µg/day lead uptake).

IR_S = Intake rate of soil, including both outdoor soil and the soil-derived component of indoor dust (g/day).

AF_S = Absolute gastrointestinal absorption fraction for ingested lead in soil and lead in dust derived from soil (dimensionless).

EF_S = Exposure frequency for contact with assessed soils and/or dust derived in part from these soils (days of exposure during the averaging period); may be taken as days per year for continuing, long-term exposures.

AT = Averaging time; the total period during which soil contact may occur, 365 days/year for continuing long-term exposures.

(2) Determine the probability that the blood lead level for a fetus carried by a woman exposed to lead at a site exceeds 10 µg/dL. This calculation uses the fetal geometric mean (GM) blood lead from Equation 1 and the geometric standard deviation (GSD) value appropriate for the risk assessment. Note that because of the assumption of proportionality between fetal and maternal blood levels, the adult GSD and the fetal GSD are equal.

The following formula allows the calculation of probability. The logarithm of a lognormal variable follows a normal probability distribution. Exceedance probabilities for the lognormal model can be determined from standard normal model statistical tables after the GM, GSD, and exceedance criterion are converted to log scale values and a "standard normal deviate" or "z-value" is calculated:

$$z = \left[\frac{\ln(10) - \ln(GM)}{\ln(GSD)}\right] \quad \text{(Equation 2)}$$

A statistical program or a normal probability table can then be used to determine the exceedance probability, p, that a standard normal variable has a value less than z. The probability that the fetal blood lead level exceeds 10 µg/dL is obtained from the expression 1-p.

To calculate the probability, p, that fetal blood lead will exceed the blood lead target of concern, the EPA TRW has provided a spreadsheet (EPA 2001) that calculates p using the equations and assumptions presented in the ALM. Table 3.1 summarizes the default parameters used.

Using the EPA TRW spreadsheet, site-specific probabilities have been calculated using the highest detected lead concentration for Site 12 (31 mg/kg). The results of the calculation are presented in Table 3.2. Figure 3.1 presents the EPA TRW ALM spread sheet used in the calculation for lead in surface soil at Site 12. In order to obtain a reasonably conservative risk estimate, the value assigned to the parameter of $GSD_{i,adult}$ was 2.1, representing a heterogeneous population, and the value assigned to $PbB_{adult,0}$ was 2.0 µg/dL, representing the middle portion of the range. The calculated probability that $PbB_{fetal,0.95}$ will exceed the PbB_t at Site 12 is 1.1%. Probabilities of 5% or less are considered acceptable levels of risk.

Table 3.1
Summary of Default Parameter Values for the Risk Estimation Algorithm (Equations 1 through 4)

Parameter	Unit	Value	Comment
$PbB_{fetal, 0.95,goal}$	µg/dL	10	For estimating RBRGs based on risk to the developing fetus.
$GSD_{i,adult}$	--	1.8 2.1	Value of 1.8 is recommended for a homogeneous population while 2.1 is recommended for a more heterogeneous population.
$R_{fetal/maternal}$	--	0.9	Based on Goyer (1990) and Graziano et al. (1990).
$PbB_{adult,0}$	µg/dL	1.7-2.2	Plausible range based on NHANES III phase 1 for Mexican American and non-Hispanic black, and white women of child-bearing age (Brody et al., 1994). Point estimate should be selected based on site-specific demographics.
BKSF	µg/dL per µg/day	0.4	Based on analysis of Pocock et al. (1983), and Sherlock et al. (1984) data.
IR_S	g/day	0.05	Predominantly occupational exposures to indoor soil-derived dust rather than outdoor soil; (0.05 g/day = 50 mg/day).
EF_S	day/yr	219	Based on US EPA (1993) guidance for average time spent at work by both full-time and part-time workers.
AF_S	--	0.12	Based on an absorption factor for soluble lead of 0.20 and a relative bioavailability of 0.6 (soil/soluble).

Source: US EPA 1996.

RBRGs Risk-based remediation goals.

Table 3.2
Blood Lead Concentrations and
Calculated Probability of Risk
106th Rescue Wing
New York Air National Guard
Westhampton Beach, New York

PbS	$PbB_{adult, central}$	$PbB_{fetal, 0.95}$	PbB_t	P
31	2.0	6.2	10 µg/L	1.1%

Notes:

PbS	Highest detected lead concentration in surface or shallow soils in µg/g, which is equivalent to mg/kg.
$PbB_{adult, central}$	Central estimate of blood lead concentrations (µg/dL) in adults (i.e., women of child-bearing age) that have site exposure to soil lead at concentrations, PbS.
$PbB_{fetal, 0.95}$	Central estimate of blood lead concentrations (µg/dL) for fetuses carried by women who have site exposures to soil lead at concentrations, PbS. Assumes GSDi is 2.1 (heterogeneous population).
PbB_t	Target blood level of concern.
P	Probability that $PbB_{fetal, 0.95}$ will exceed PbB_t; if P < 5% then the risk is acceptable.

3.2 BASELINE RISK ASSESSMENT FOR PAHs IN SURFACE SOIL

A baseline risk assessment is generally conducted in three steps. These three steps include conducting an exposure assessment, conducting a toxicity assessment, and characterizing risks. Together, the results of these three phases are used to reach conclusions about the likelihood of adverse effects. If at any stage of the process, the assessment indicates that risks are not present, then the process is considered complete.

3.2.1 Exposure Assessment

Exposure is defined as contact of an organism with a chemical agent (EPA 1989). In order for exposure to contamination to occur, four factors must exist: (1) a source(s) of contaminants; (2) a migration pathway(s); (3) an exposure mechanism(s); and (4) receptors. Without all these

Figure 3.1
2000 - 2001 Remedial Investigation - Risk Assessment
Adult Lead Risk Calculation Spread Sheet
U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 8/14/01

Exposure Variable	PbB Equation[1] 1*	2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario: Using Equation 1 GSDi = 1.8	Using Equation 1 GSDi = 2.1	Using Equation 2 GSDi = 1.8	Using Equation 2 GSDi = 2.1
PbS	X	X	Site 12 soil lead concentration	ug/g or ppm	31	31	31	31
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	1.8	2.1	1.8	2.1
PbB_0	X	X	Baseline PbB	ug/dL	2.0	2.0	2.0	2.0
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.050	0.050
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S,D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S,D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}			**PbB of adult worker, geometric mean**	**ug/dL**	**2.0**	**2.0**	**2.0**	**2.0**
$PbB_{fetal,0.95}$			**95th percentile PbB among fetuses of adult workers**	**ug/dL**	**4.8**	**6.2**	**4.8**	**6.2**
PbB_t			**Target PbB level of concern (e.g., 10 ug/dL)**	**ug/dL**	**10.0**	**10.0**	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$			**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.2%**	**1.1%**	**0.2%**	**1.1%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

PbB_{adult} =	$PbS*BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])/365+PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

factors, the exposure pathway is not complete. Exposure assessments are conducted to estimate the magnitude of actual and/or potential exposures, the frequency and duration of these exposures, and the pathways by which organisms are potentially exposed.

3.2.1.1 Exposure Settings

This section describes the physical characteristics of Site 12. Additional information concerning the physical characteristics of the base and Site 12 is provided in Sections 2.0 and 3.0 of the RI Report (PEER 2003). Access to the base is restricted to base personnel and authorized guests only. The base is fenced and Site 12 is located within the base perimeter fence. The site itself is also enclosed within a gated chain link fence, and can be secured against unauthorized entry. Future plans call for the base and airport to remain active indefinitely, with no future plans for any residential usage of the property.

Exposure Setting

Site 12, a former hazardous waste storage area, is located at the intersection of Moen Street and Smith Avenue in the central portion of the base. Approximately 80 % of the site is covered with asphalt pavement, which is bordered with grass. Groundwater at the site is present at approximately 32 to 33 ft BGS and flows toward the southeast.

The COPCs at the site include the lead and PAHs which were identified in surface soils. No COPCs were detected in subsurface soils or site groundwater. Risks associated with lead in soil were previously assessed using the TRW ALM in Section 3.1, which concluded that lead risks were acceptable at Site 12. Therefore, only risks associated with PAHs are discussed herein. Potential receptors to the contaminated surface soils at Site 12 include base personnel, construction personnel, and site visitors. During rainfall events, surface water bodies (e.g., Aspatuck Creek) in the vicinity may be impacted by surface runoff from the site. Surface water runoff from the site may potentially contain soil particles that have been impacted due to sorption of metals. Runoff from the base discharges into Aspatuck Creek, which may be potentially

impacted by contaminated runoff from the site. Aspatuck Creek is approximately 1,500 ft southeast of the site. Potential receptors to impacted water in Aspatuck Creek are area residents.

3.2.1.2 Identification of Exposure Pathways

When identified for a potential receptor, an exposure pathway describes the mechanism(s) by which a potential receptor may be exposed to contaminants at the site, and/or the mechanism(s) by which a potential receptor may be exposed to contaminants that have been transported from the site. In this section, the pathways by which the previously discussed potential receptors may be exposed are evaluated and identified. Depending on the results of the evaluations, some of the previously identified potential receptors may be excluded from further consideration at the site.

Exposure pathways are identified based on consideration of the sources, types, and locations of contaminants at Site 12, in this case, PAHs in surface soil. The likely environmental fate of the contaminants, including persistence, partitioning, and transport, and the locations of the potential receptors are evaluated. Exposure points (points of potential contact with the contaminants) and routes of exposure (e.g., ingestion, inhalation) are identified for each exposure pathway.

Exposure Pathway Evaluation

Impacted media at Site 12 is limited to surface soil which contains elevated concentrations of lead and PAHs. Potential on-site receptors were previously identified as base personnel, construction personnel, and site visitors that might be exposed to impacted surface soil. Potential off-site receptors were previously identified as area residents that might be exposed to surface water impacted by contaminated runoff from the site.

Potential exposure routes for on-site receptors include ingestion of impacted soil, dermal contact with impacted soil, and inhalation of impacted fugitive dust. Currently, the site is 50% covered with asphalt which effectively eliminates the potential for ingestion or direct contact with impacted surface soils, or inhalation of fugitive dust from the site unless construction activities

that involve excavation occur at the site. Limited underground utilities are located in the area, and there are no plans for future construction activities at the site. Should construction activities that involve excavation become necessary at the site, adequate protection for construction workers would be provided by following routine safety procedures and good work practices as required for any on-base construction activity by the Base Master Plan (GRW Engineers, Inc., 1995). Since routine safety procedures and required good work practices will provide adequate protection from exposure for construction workers, this potential exposure rout is incomplete for on-site receptors.

Potential exposure routes for off-site receptors include ingestion of impacted surface water, or dermal contact with impacted surface water due to runoff from the base. Surface water runoff from the site may potentially contain soil particles that have been impacted due to sorption of metals. Infiltration rates at the base are relatively high and little surface water leaves the base as runoff. Currently, the site is mostly covered with asphalt which effectively caps the majority of surface soil at the site, and the remainder is covered with grass. However, due to its location at the intersection of two streets excavation activities are likely to occur at the site. If excavation activities occur at the site in the future, then exposed surface soils may have a higher potential for reaching downgradient surface water (Aspatuck Creek) than otherwise during rainfall events. However, it is not likely that the creek would be impacted by sediments from the site due to the distances involved (approximately 1,500 ft) and the concentrations of contaminants. Therefore, there are no complete exposure pathways identified for off-site receptors.

Elevated concentrations of lead were detected in surface soil at Site 12. Risks associated with lead in soils were evaluated using the TRW ALM in Section 3.1. The results of the evaluation indicate that potential risks associated with lead in surface soils at the base are acceptable. PAHs were identified as COPCs in surface soil at Site 12. However, they were present at a low levels and exposure would only be likely during excavation activities at the site. Potential exposure to site contaminants can be minimized or eliminated by following good work practices and required safety procedures during the excavation activities. Therefore, no exposures are expected to contaminants in surface soils at the site.

3.2.2 Future Use Risk

Information on future plans indicate that it is highly unlikely that base or airport property will ever be developed for any other use. Consequently, future scenarios that include developing base property for residential or other uses were not considered.

3.3 ECOLOGICAL ASSESSMENT

The ecological assessment characterized the risks to the environment posed by the COPCs that were identified at Site 12. Contaminants were detected in surface soil at the site, but not in saturated subsurface soil. Potential ecological receptors to the COPCs were evaluated on the basis of the transport mechanisms identified for the site. Contaminated media considered consisted of surface soils. Accordingly, potential receptors and potential exposure pathways may include:

- plant species existing at the site that may be exposed to contamination in surfaces soils;
- animal species that may pass through the site and be exposed to contamination in surface soils through direct contact with surface soils;
- animal species that may pass through the site and be exposed to contamination through ingestion of plant or animal species residing in site surface soils;
- animal species that reside or feed in the vicinity of surface water bodies impacted by surface run off from the site.

Potential endpoint receptors that were considered for the ecological assessment included endangered species that have been identified within a 4 mile radius of the base. These include the Northern Harrier, the Osprey, the Tiger Salamander, and the Eastern Mud Turtle. There are no endangered plant species within a 4-mile radius of the base. Accordingly, plant species were not be considered as potential end point receptors for the ecological assessment. The base does

not provide habitat to any known federally protected, threatened or endangered animal species (Dames & Moore 1986).

3.3.1 Evaluation of Ecological Risks

All of the endangered species feed and reside almost exclusively in the vicinity of surface water bodies (Macwhirter, et al., 1996 and NYSDEC 2002). Therefore, the most likely exposure pathway would be exposure of endangered species through impacted surface water. Surface water bodies in the vicinity of the site include Aspatuck Creek, Old Ice pond, and North Pond. Additionally, the Quogue Waterfowl Refuge is located approximately 7,000 ft east of Site 12. Potential mechanisms for transport of contaminants from the site include surface water run off.

Surface water may be potentially impacted by contaminated surface water runoff from the site with COPCs in surface soils. Groundwater beneath the base and airport generally flows toward the southeast. Contamination of surface water via the groundwater pathway is not likely since none of the surface water bodies (including the waterfowl refuge) are located hydraulically downgradient of Site 12. Contamination of nearby surface water bodies due to impacted surface water runoff from the base is not likely either. The only surface water body downgradient of the site is Aspatuck Creek. Aspatuck Creek receives surface water runoff from the base, but infiltration rates at the base are relatively high and little surface water leaves the base as runoff. Aspatuck Creek is located several hundred feet (approximately 1,500 ft) southeast of the site. Additionally, the majority of the site is covered with asphalt and grass which effectively eliminates, or significantly limits erosion of impacted soils by surface runoff during high rainfall events. On the basis of the above discussion, it is not likely that surface water bodies in the vicinity of the base will be impacted by contaminants from the base. Therefore, since surface water bodies in the vicinity of the base are not likely to be impacted by Site 12 groundwater, or by contaminated surface runoff, exposure of endangered species to contaminants from the site is not expected.

4.0 SELECTED ACTION: NO FURTHER RESPONSE ACTION PLANNED

A NFRAP decision is proposed for Site 12 on the basis that the site poses no significant risks to human health and the environment. This decision was developed in accordance with the June 1995 U.S. Air Force NFRAP Guide; CERCLA, as amended by the Superfund Amendments and Reauthorization Act; and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan.

According to the June 1995 U.S. Air Force NFRAP Guide, a Category III NFRAP decision is appropriate for a geographically contiguous area or parcel of real property where environmental evidence demonstrates that hazardous substances or petroleum products or their derivatives have been stored, released, or disposed of, but are present in quantities that require no response action to protect human health and the environment. Based on the results of the RI conducted at Site 12, these criteria have been met.

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APPENDIX A

REFERENCES

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