ENVIRONMENTAL RESTORATION PROGRAM

FINAL
NO FURTHER RESPONSE ACTION PLANNED
DECISION DOCUMENT

SITE 3 – FORMER WASTE STORAGE AREA

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

JANUARY 2004

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JANUARY 2004

Prepared by

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Prepared for the

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

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LIST OF ACRONYMS

ABB-ES	ABB–Environmental Services, Inc.
ALM	Adult Lead Methodology
ANG	Air National Guard
ANG/CEV	Air National Guard/Environmental Division
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
COPC	Contaminant of potential concern
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
MSL	Mean sea 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
PCB	Polychlorinated biphenyl
PEER	PEER Consultants, P.C.
POL	Petroleum, oils, and lubricants
RBC	Risk-Based Concentration
RI	Remedial Investigation
RSCO	Recommended Soil Cleanup Objective
SI	Site Investigation
SCDHS	Suffolk County Department of Health Services
TAL	Toxic Analytes List
TCE	Trichloroethylene
TPH	Total petroleum hydrocarbons
TRW	Technical Review Workgroup
ULBC	Upper Limit of Background Concentrations

DECLARATION

Site Name and Location:

Environmental Restoration Program
Site 3 – Former Waste Storage Area
106th Rescue Group
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 3 (Former Waste Storage Area) at the 106th Rescue Group, 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).

Description of the Selected Remedy:

Site 3 has been selected for No Further Response Action Planned (NFRAP) based upon the findings of field investigations and evaluation of scientific data. The SI identified arsenic, chromium, lead, and silver as contaminants of potential concern (COPCs) in groundwater at Site 3. The RI found no detections of arsenic and silver and they were eliminated as contaminants of concern. Cadmium, chromium, and lead were detected in one RI surface soil sample at concentrations exceeding the NYSDEC Recommended Soil Cleanup Objectives (RSCOs). The RI determined that chromium was naturally occurring and it was eliminated as a COPC. Risks associated with lead in soil were assessed using the Environmental Protection Agency (EPA)

Technical Review Workgroup (TRW) Adult Lead Methodology (ALM), which indicated that lead risks were acceptable at Site 3. A Baseline Risk Assessment was conducted for Site 3. During the risk assessment, cadmium was eliminated as a COPC since complete exposure pathways were not identified for on-site or off-site receptors.

Therefore, based on the current conditions at Site 3, 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 3 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 NFRAP 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 treatment is necessary.

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Eastern Remedial Action, 11th Floor
625 Broadway, Albany, New York 12233-7015
Phone: (518) 402-9625 • **FAX:** (518) 402-9022
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

January 13, 2004

Mr. Alan Klavans
Environmental Remediation Branch
ANG/CEVR
3500 Fetchet Avenue
Andrews AFB, MD 20762-5157

RE: Suffolk County Air National Guard, ID No. 152148
Draft - Final No Further Action Planned Decision Document
Site 3

Dear Mr. Klavans:

The New York State Department of Health and the New York State Department of Environmental Conservation have reviewed the above referenced Draft - Final No Further Action Planned Decision Document Site 3. Based upon these reviews, we have no comments at this time.

If you have any questions, or need more information, please call me at (518) 402-9692 or email me at hlbishop@gw.dec.state.ny.us.

Sincerely,

Heather Bishop
Division of Environmental Remediation

ec: I. Ushe, NYSDOH
S. Robbins, SCDHS
W. Parish, Region 1
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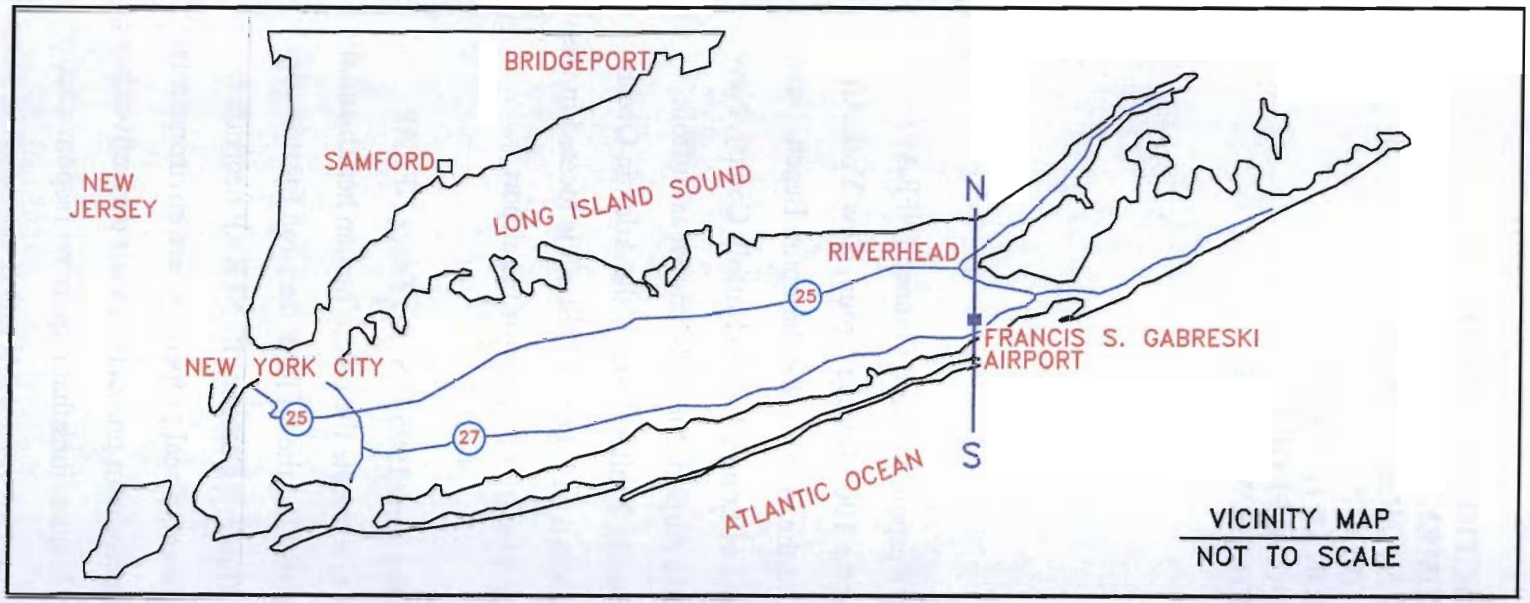
WESTHAMPTON BEACH, NEW YORK

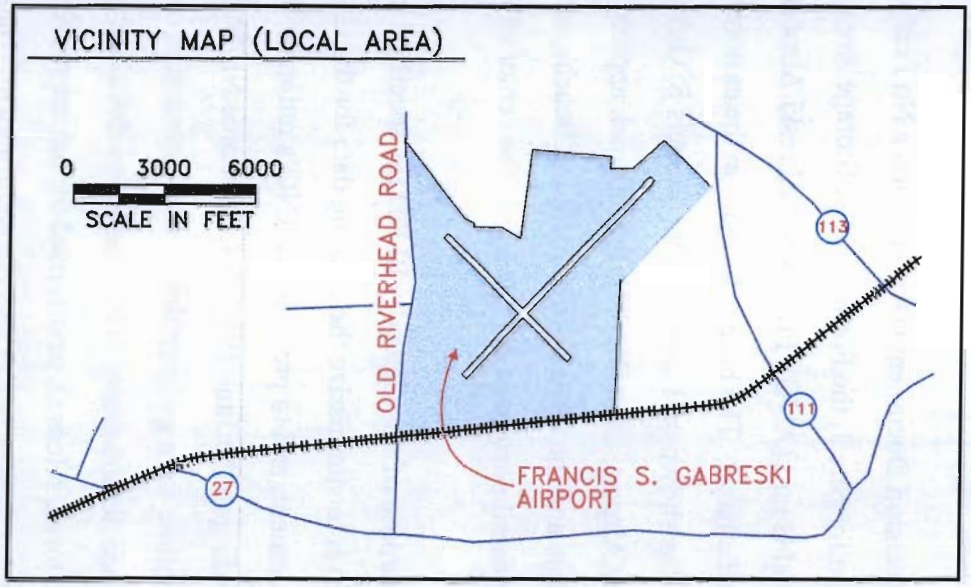
DECISION SUMMARY

1.0 INTRODUCTION

This Decision Document (DD) supports a No Further Response Action Planned (NFRAP) decision for Site 3, the Former Waste Storage Area at the 106th Rescue Group, 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 3 is located in the west-central portion of the base, near the center of the western boundary of the airport.

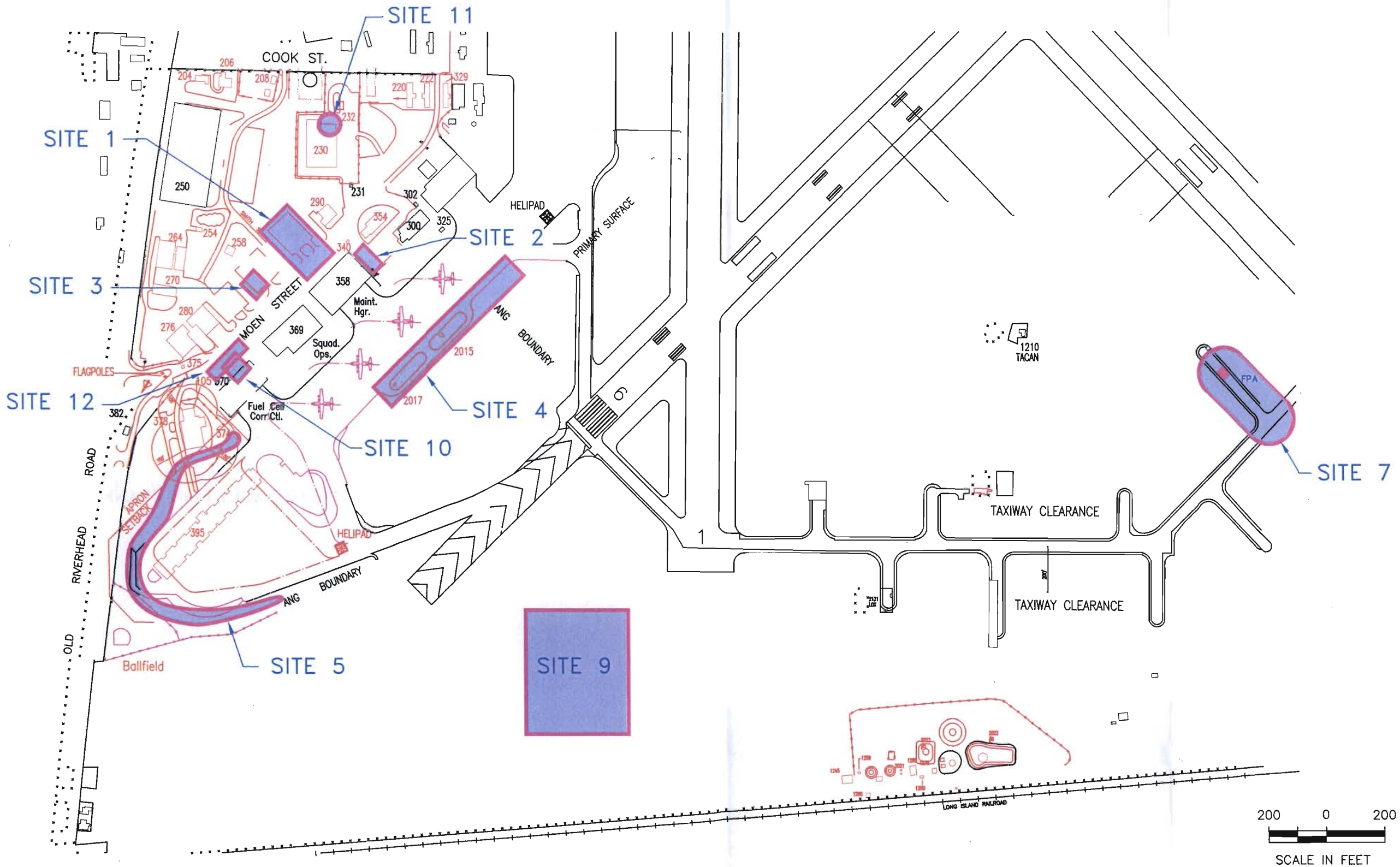
The purpose of this Category III DD (as specified in the June 1995 U.S. Air Force NFRAP Guide) is to summarize the existing data for the site, to evaluate the risk to human health and the environment, and to provide the ANG's rationale for making the NFRAP decision for this site. According to the June 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 sources:





SOURCE: PEER 2003

PEER PROJ./003005-009 GAB/Final 3 NFRAP DD/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./003005.009 GABRESKI/FINALSITE3NFRAPDD/FIG 1.2	LOCATIONS OF ERP SITES INCLUDING SITE 3 106th RESCUE WING, NEW YORK ANG FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.2

- *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
- *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 3 and its surrounding area is provided in Section 1.1. Information on the history of Site 3, including 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 3, including information on the physiography, geologic setting, climatology, 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 3 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 3, 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 3 – Former Waste Storage Area is located on the Francis S. Gabreski ANG Base in the southeast corner of an asphalt-paved parking lot at the western corner of the intersection of Moen

Street and Smith Avenue (Figure 1.2). The site was formerly the gravel floor of Building 282 (ABB-ES 1997). The building was removed in 1989. Currently the site is used for temporary storage of miscellaneous equipment and parking for mobile aerospace ground support equipment. The site is enclosed by a chain link fence with a vehicle access gate on the southeast side facing Moen Street. The paved area of the lot is surrounded by a grassy lawn on all sides, except at the vehicle entrance gate, where asphalt paving is continuous with the paved roads. Currently, there is little visible evidence to suggest that the site was ever used for waste storage; there are no signs of spills or stains associated with the site. The only remaining evidence of former Building 282 is several concrete footers for the roof supports.

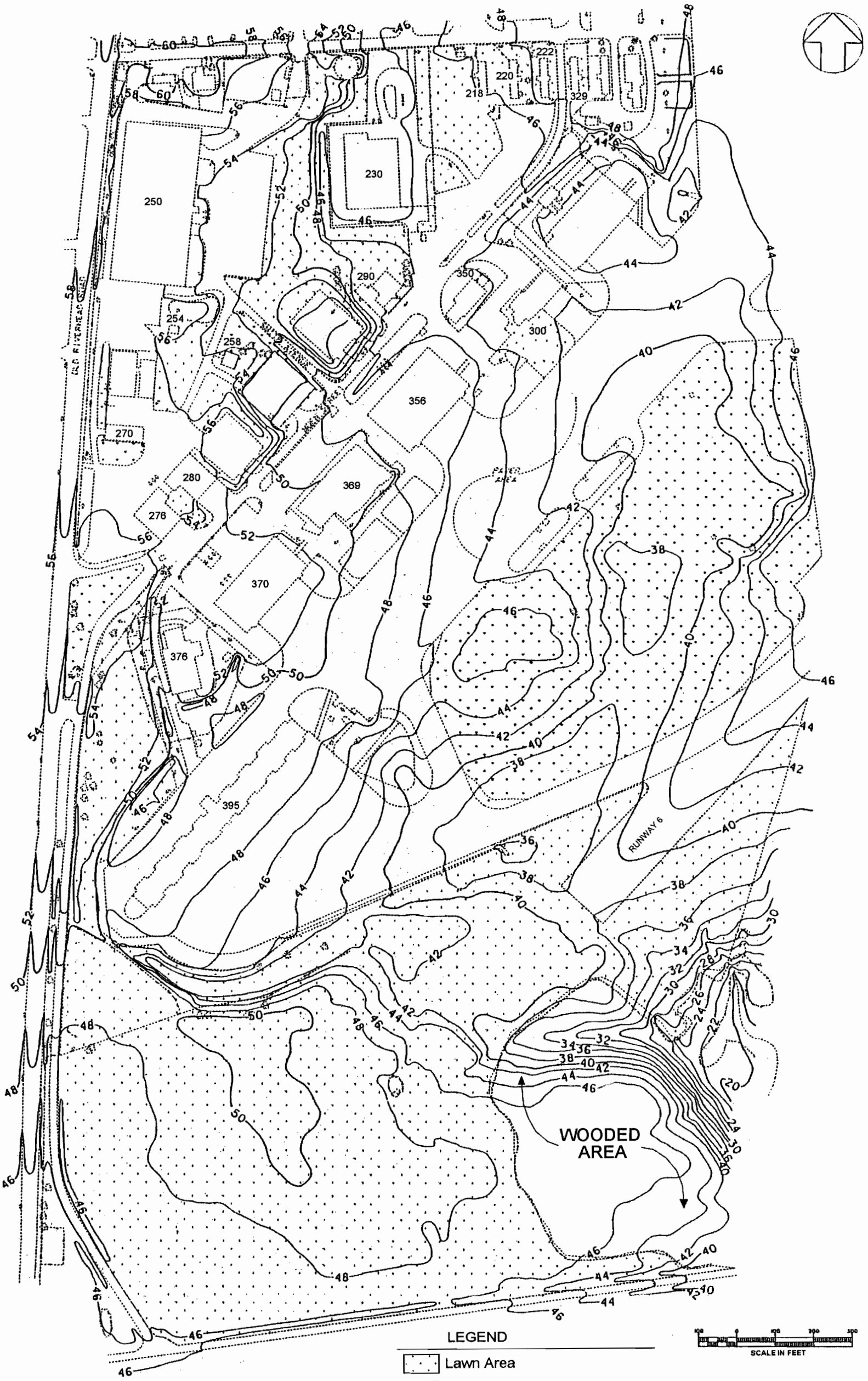
1.1.2 Topography

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.

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



Vertical Datum: NGVD 1929

Elevations in ft. Above Mean Sea Level

Source: S&W, 1999

2-Ft. Contour Intervals

PEER	BASEWIDE TOPOGRAPHY 106 th RESCUE WING, NEW YORK ANG FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.3
PROJ./003005-009		
GAB/3NFRAP/FIG1.3.PDD		

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).

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. The airport occupies approximately 2500 acres of relatively flat terrain (Anthony J. Vasell, pers. comm. 2001). The *Francis S. Gabreski Airport Master Plan* reports the current area of the airport as 1,486 acres (Latino 2002). 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 business. 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.

Table 1.1
Public Drinking Water Supply Well Information [a]
106th Rescue Wing
New York Air National Guard
Westhampton Beach, New York

Well Field I.D.	Distance from Site (miles)	Aquifer Tapped	Screened Interval (ft BGS)	Total Depth (ft BGS)	Population Served (Approximate)
Meeting House Road	0.61	Upper Glacial	Well #20 55-75 Well #22 74-104 Well #15A 31-51	Well #20 78 Well #22 104 Well #15A 53	6,538
Quogue-Riverhead Road	1.16	Magothy	Well #1 386-447	Well #1 449	1,189
Spinny Road	1.7	Upper Glacial	Well #1 85-115 Well #2 118-158	Well #1 118 Well #2 163	189
Old Country Road	2.18	Upper Glacial	Well #1 60-75 Well #2 NA Well #3 128-157	Well #1 76 Well #2 70 Well #3 161	1,783

(a) Source: Dames & Moore 1987.
BGS Below Ground Surface

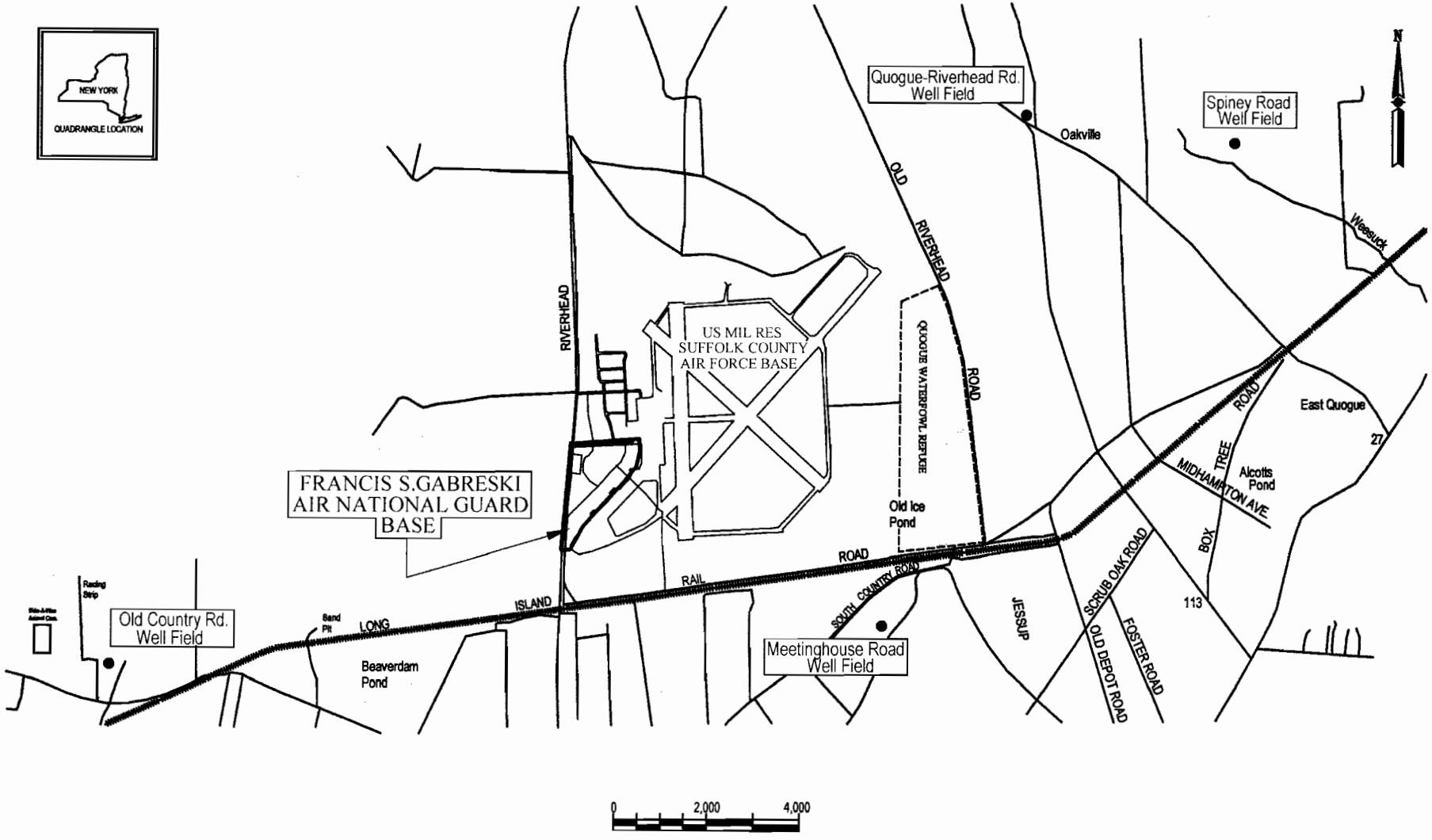
A number of domestic water wells are located within 1 mile of the base boundary, south of the airport (ABB-ES 1997). Due to concerns about groundwater contamination from Site 6 (the POL Facility), most or all of the residences utilizing private water wells were provided with access to the public water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

1.1.7 Surface and Subsurface Features

Aside from underground utilities such as water, electric and sanitary sewer, no unknown surface or subsurface features, or structures such as tanks or drums are believed to exist at Site 3.

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Sections 1.2.1 and 1.2.2 present a history of Site 3. Further details concerning analytical results of soil and groundwater samples are provided in Section 2.4.



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

PEER PROJ./003005-009 GAB/Final 3 NFRAP DD/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

1.2.1 Site History

The site is former location of Building 282 (ABB-ES 1997), which was removed in 1989 (A. Vasell, pers. comm.). Past practices at this site included the storage of shop wastes, recovered oils, and waste fuels stored in drums from 1984 to 1989. The drums containing wastes were stored on the building's gravel floor and beneath a leaky roof (ABB-ES 1997). No spills were reported in association with this site. However, stained gravels and soils were observed during the second records search. The cumulative volume of any potential releases was estimated to have been less than 1000 gal (HMTC 1987). The site was not assigned a RCRA permit since the 106th RQW determined their status was a small quantity generator (A. Vasell, pers. comm.).

Site 3 was initially identified during the Phase I Records Searches by Dames & Moore (1986) and HMTC (1987). A Site Investigation was conducted at Site 3 in 1994 by ABB-ES (ABB-ES 1997), and an RI was completed by PEER in 2001 (PEER 2003).

1.2.2 Regulatory Agency Involvement

There is no history of United States Environmental Protection Agency (US EPA) involvement at Site 3. The New York State Department of Environmental Conservation (NYSDEC) has been involved in the planning of RI activities, review, and revision of plans and reports, and approval of final documents. There have been no enforcement activities at Site 3, and there are no permits or agreements that govern response action at 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 Environmental Restoration Program (ERP) documents are available for public review at the Westhampton Beach Public Library.

1.4 SCOPE OF RESPONSE ACTION

Section 1.4.1 describes the initial SI, completed in 1994. Section 1.4.2 describes the most recent response activity, the RI completed in 2001.

1.4.1 Site Investigation (1994)

The initial SI at Site 3 was preformed by ABB-ES in 1994 (ABB-ES 1997). Two direct-push soil borings were performed, and were sampled to investigate the suspected release of solvents, oils, and waste petroleum products. Direct-push borings DP-016 and DP-017 were completed at depths of 38 and 17 ft below ground surface (BGS), respectively. Soil samples were collected and analyzed from both borings for volatile and semivolatile organics and for Toxic Analytes List (TAL) metals. One direct-push groundwater-screening sample was collected from DP-016, which reached 38 ft BGS.

Chromium and lead were detected in surface and subsurface direct-push soil samples at Site 3. However, their concentrations did not exceed the NYSDEC Action Levels then in effect for soils. Silver was detected in one sample at a concentration of 0.20 mg/kg, equal to the NYSDEC Action Level then in effect for soils. The detection of silver occurred at 17 ft BGS, and appeared to be an isolated occurrence. The concentration detected does not exceed the current revised NYSDEC Action Level for silver, which is 0.76 mg/kg (PEER 2000).

Chromium was detected in the groundwater-screening sample from DP-016 at a concentration of 67 micrograms per liter (µg/L). This concentration did not exceed the federal Maximum Contaminant Level (MCL) of 100 µg/L. Chromium was the only analyte detected above NYSDEC Action Levels or reporting limits in groundwater. The groundwater-screening samples were collected from direct-push borings during the SI, and were typically observed to be more turbid than those collected from monitoring wells. The presence of elevated concentrations of chromium in the groundwater-screening samples was attributed to dissolution of suspended

solids during sample preservation. Therefore, the exceedance by chromium at Site 3 was not considered representative of actual groundwater quality (ABB-ES 1997).

The SI results are graphically shown on Figure 1.5. Tables 1.2 and 1.3 summarize the analytes detected at or above action limits at Site 3 during the SI (ABB-ES 1997).

Table 1.2
Subsurface Soil Results Above Action Levels [a]
Site 3 – Former Hazardous Waste Storage Facility (1984 to 1989) - 1994 SI
106th Rescue Wing
New York Air National Guard
Westhampton Beach, New York

Analyte	Previous Action Level (mg/kg)	Revised Action Level (mg/kg)	Depth (ft BGS)	Sample Location	Concentration (mg/kg)
Silver	0.20	0.76	15 – 17	DP-017	0.20

(a) Source: ABB-ES 1997.

Table 1.3
Groundwater Results Above Action Levels [a]
Site 3 – Former Hazardous Waste Storage Facility (1984 to 1989) - 1994 SI
106th Rescue Wing
New York Air National Guard
Westhampton Beach, New York

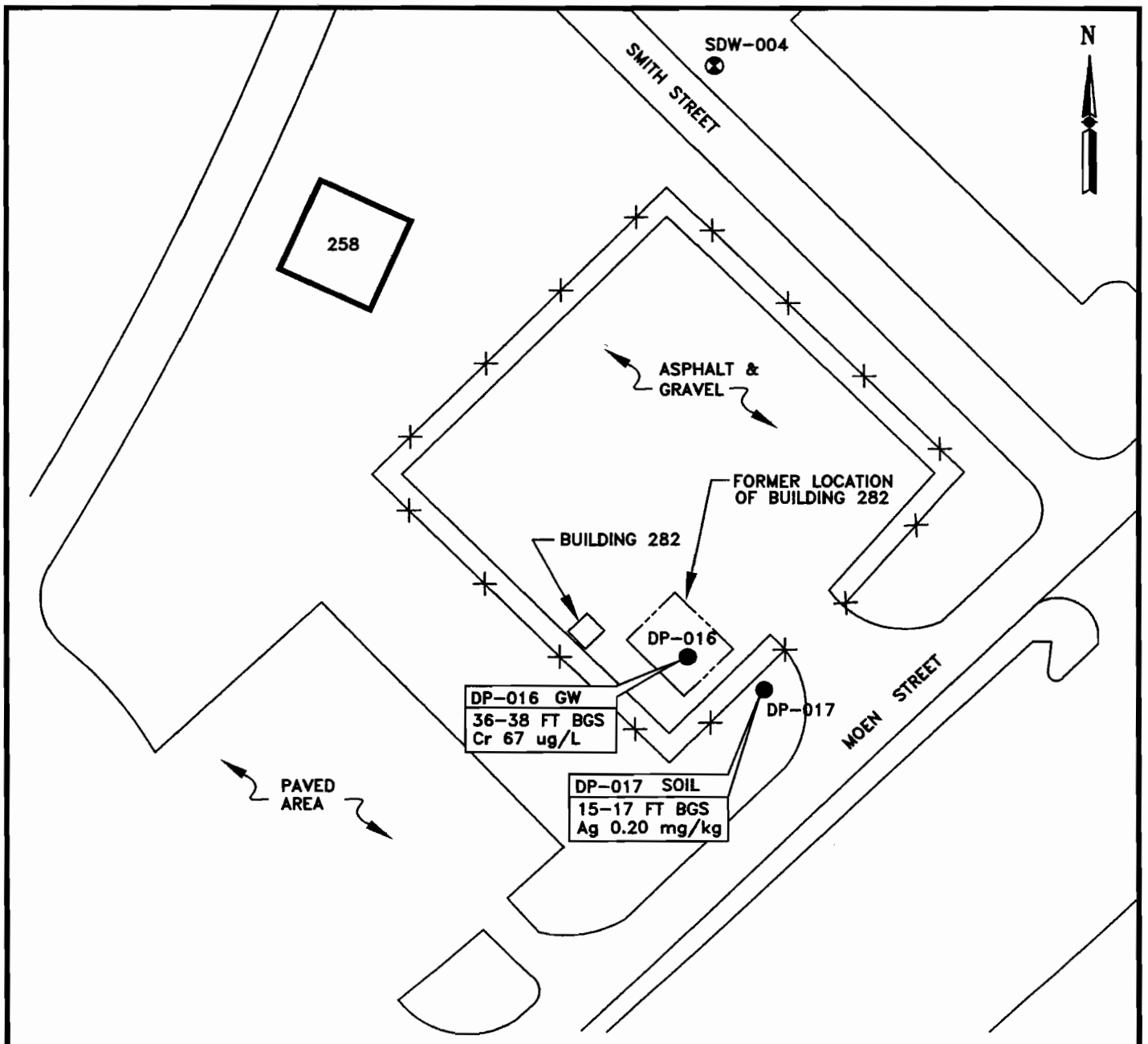
Analyte	Action Level (µg/L)	Depth (ft BGS)	Sample Location	Concentration (µg/L)
Chromium	50	36 – 38	DP-016	67

(a) Source: ABB-ES 1997.

1.4.2 Remedial Investigation (2000-2001)

The most recent response action was the performance of an RI which was conducted by PEER in 2000 and 2001. The RI activities at Site 3 were intended to:

- Evaluate the suspected presence of PCBs in soil;
- Assess surface soils for the presence of metals and toluene;
- Determine the presence or absence of silver contamination in subsurface soils;
- Define the extent of soil contamination by silver, or other metals, if confirmed;
- Confirm or deny the presence of chromium contamination in groundwater;



LEGEND

- DIRECT PUSH BORING
- MONITORING WELL
- FENCE
- BGS BELOW GROUND SURFACE
- GW GROUNDWATER

NOTES:

1. INORGANIC COMPOUND RESULTS IN SURFACE SOIL COMPARED TO BACKGROUND CONCENTRATIONS (ABB-ES 1997).
2. GROUNDWATER RESULTS COMPARED TO FEDERAL AND NEW YORK STATE DRINKING WATER STANDARDS.

60 0 60
SCALE IN FEET

SOURCE: ABB-ES, 1997

PEER PROJ./003005-009 GAB/3NFRAP/FIG1.5	SITE 3 - 1994 DIRECT PUSH SOIL AND GROUNDWATER SAMPLING RESULTS 106th RESCUE WING, NEW YORK AIR NATIONAL GUARD FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.5

- Define the nature and extent of groundwater contamination by chromium, if confirmed; and
- Screen surface soil, subsurface soils, and groundwater for any additional contaminants of concern.

Following completion of the RI fieldwork, the Draft and Draft-Final RI Reports were completed, documenting the results of the RI, and recommending that Site 3 be closed, by issuing a NFRAP DD.

During the RI Field investigation of Site 3, direct-push borings were advanced and sampled for soil and groundwater, surface soil was sampled, one new monitoring well was installed and sampled, and one existing monitoring well was sampled. The RI samples collected at Site 3 are summarized on Table 1.4. The sample locations are depicted on Figure 1.6. Direct-push soil borings, hollow-stem auger (HSA) soil borings, and monitoring wells were installed as follows:

- Direct-push soil boring S3-DP01 was advanced to the top of groundwater, and was located on the northwest side of the former waste storage area, slightly upgradient of former soil boring DP-016. S3-DP01 was sampled for soil and groundwater screening, and soil confirmatory analysis.
- Direct-push boring S3-DP02 was advanced to the top of the groundwater, on the southwest side of the former waste storage area, and slightly downgradient of S3-DP01. S3-DP02 was sampled for soil and groundwater screening, and soil confirmatory analysis.
- Soil boring SB3-01 was installed using hollow-stem auger, and sampled for soil screening and confirmatory analysis.
- Monitoring well MW3-01 was installed into the Upper Glacial Aquifer, through soil boring SB3-01. MW3-01 was sampled for 2 Rounds of groundwater analyses.

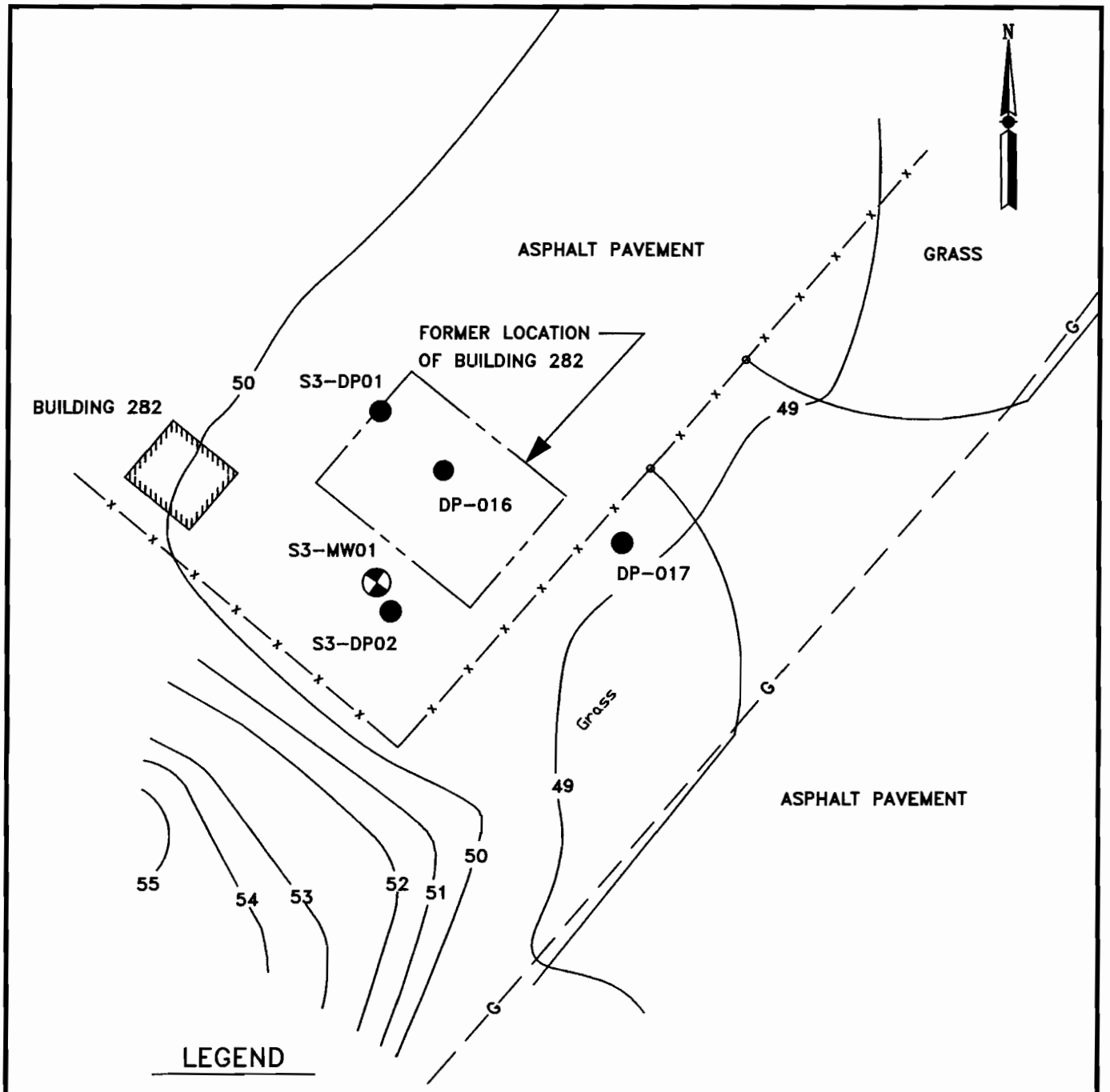
The results of the RI soil investigation at Site 3 are presented in Section 2.4, and the results of the RI groundwater investigation are provided in Section 2.7.

Table 1.4
Summary of Remedial Investigation
Samples Collected and Analyses Performed at Site 3
Francis S. Gabreski ANG Base
Westhampton Beach, New York

Date	Sample ID	Ft BGS	Type	BTEX	VOCs	SVOC	Metals	PCBs	DRO	GRO	CH_4	Alkalinity	Chloride	SO_4
11/17/00	GAB-03-DP01-01	0 to 2	Soil Probe	X	X	X	X	X						
11/17/00	GAB-03-DP01-21	0 to 2	Soil Probe	X	X	X	X	X						
11/18/00	GAB-03-DP02-SS01	0 to 0.25	Soil Surface	X	X	X	X	X						
11/18/00	GAB-03-PW01-01	36 to 40	GW Screening	X	X	X								
11/18/00	GAB-03-PW02-01	36 to 40	GW Screening	X										
11/18/00	GAB-03-DP02-01	0 to 2	Soil Probe	X	X	X	X	X						
11/18/00	GAB-03-DP01-02	24 to 28	Soil Probe	X	X	X	X	X						
11/18/00	GAB-03-DP02-02	32 to 36	Soil Probe	X	X	X	X	X						
11/18/00	GAB-03-DP01-03	36 to 40	Soil Probe	X	X	X	X	X						
11/18/00	GAB-03-DP02-03	36 to 40	Soil Probe	X	X	X	X	X						
11/19/00	GAB-03-PW02-01	36 to 40	GW Screening			X								
2/1/01	GAB-03-SB01-01	0 to 2	Split Spoon		X	X	X	X						
2/1/01	GAB-03-SB01-02	36 to 38	Split Spoon		X	X	X	X						
2/13/01	GAB-03-S3MW01-01	31.2 to 46.2	GW Monitoring	X	X	X	X		X	X	X	X	X	X
2/14/01	GAB-03-SDW004-01	43.41	GW Monitoring		X	X	X							
5/18/01	GAB-03-SDW004-02	43.41	GW Monitoring		X	X	X							
5/30/01	GAB-03-S3MW01-02	31.2 to 46.2	GW Monitoring	X	X	X	X		X	X	X	X	X	X

Notes:

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
VOCs	Volatile Organic Compounds
SVOCs	Semi-volatile Organic Compounds
PCBs	Polychlorinated Biphenyls
DRO	Diesel Range Organics
GRO	Gasoline Range Organics
CH_4	Methane
SO_4	Sulfate
X	Analysis Performed



PEER PROJ./003005-009 GAB/3NFRAP/FIG1.6	SITE 3 - LOCATIONS OF MONITORING WELLS AND DIRECT PUSH BORINGS (RI, 2000-2001) 106th RESCUE WING, NEW YORK AIR NATIONAL GUARD FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.6

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2.0 SUMMARY OF SITE CHARACTERISTICS

Section 2.0 provides a summary of the characteristics of Site 3, 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

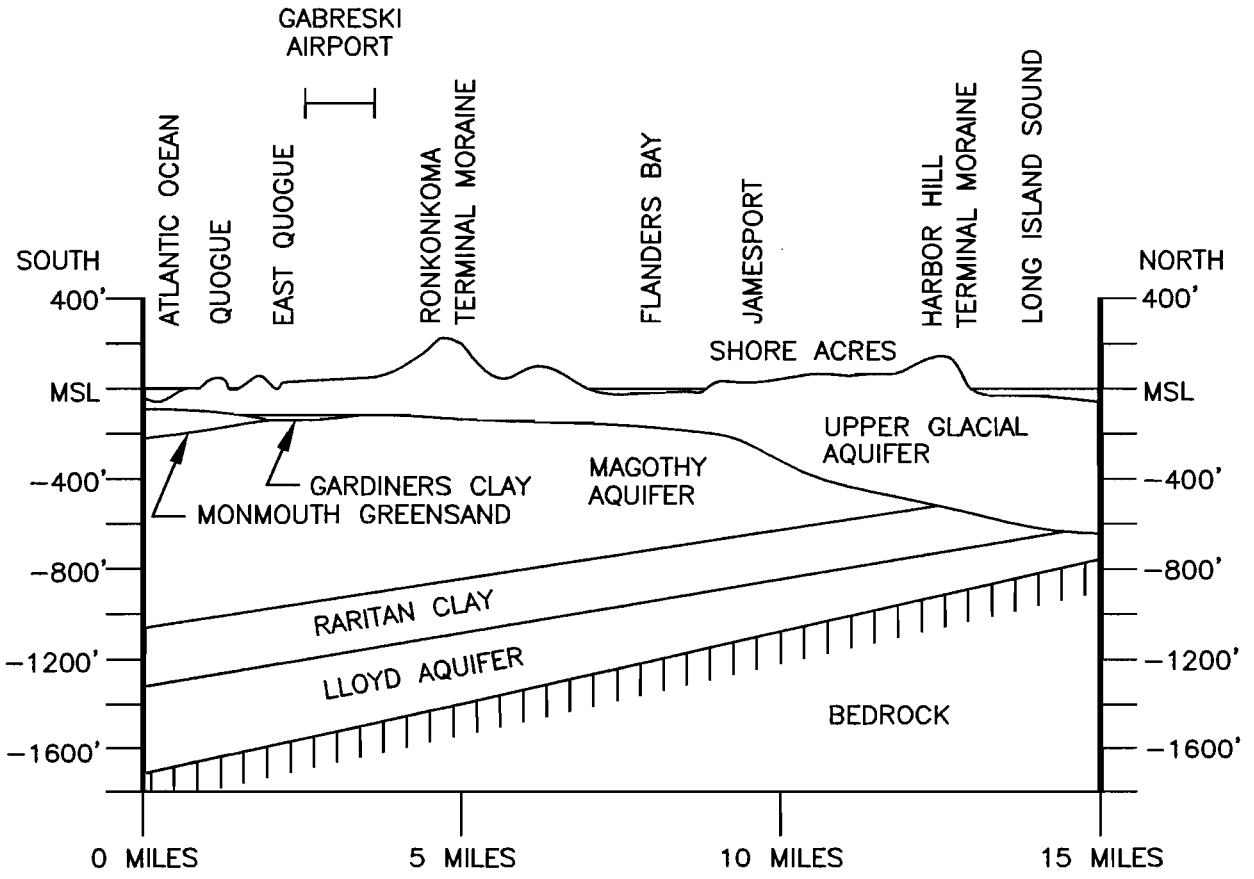
The base is located on the eastern end of Long Island. Long Island is included in the Atlantic Coastal Plain physiographic province. The island is characterized by glacial landforms related to the Wisconsin Glaciation. The island is located at the southern limit of glaciation, and exhibits a series of 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 north-south-trending cross-section of the geologic formations present in the region. The cross-section location is shown previously in Figure 1.1.

2.2.1 Upper Glacial Deposits

The upper Pleistocene glacial deposits are of greatest importance in regards to Site 3. These deposits form the soil surface across the base, makeup all of the subsurface soils of interest regarding Site 3, and form the matrix for the Upper Glacial Aquifer, described below in Section



SCALE: 1 IN = APPROXIMATELY 3 MILES

PEER PROJ./003005-009 GAB/3NFRAP/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 3 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 1, 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 rare 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 35 ft BGS to 36 ft BGS at Site 3. 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 RI at Site 3 are listed in Section 1.4. Figure 1.5 depicts the sampling locations. The findings of the soil investigation at Site 3 are discussed in this subsection.

2.4.1 Site 3 Geologic Results

The surface soil at S3-DP02 was observed to be a dark gray, loose, dry mix of medium and fine sand and silt. This soil had accumulated on top of the deteriorated asphalt paving at the southwest corner of the site. This soil appeared suspicious due to its dark gray to black color, oily appearance, and its very fine-grained texture, and was therefore sampled for analysis. A layer of dark yellowish-brown medium sand from 0 to 1.7 ft BGS was observed to have a fetid odor at S2-DB01, but had no associated elevated PID readings. Subsurface soils at Site 3 were light gray to pale yellow, gravelly medium sands. No odors, elevated PID readings, or stains other than rare iron stain were noted. Saturation was encountered at 35 ft BGS at S2-SB01 to 36 ft BGS at S3-DP02.

2.4.2 Site 3 Soil and Groundwater Screening Samples

During direct-push sampling, soil and groundwater screening samples were submitted for fast turnaround time analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX). No BTEX compounds were detected in any of the samples. The soil samples were also screened during sample collection using the PID. The soil screening results were non-detect.

2.4.3 Site 3 Confirmatory Soil Samples

Confirmatory soil samples were collected at Site 3 from two direct-push borings (S3-DP01 and S3-DP02), and one soil boring (SB-01) and analyzed for:

- volatile and semivolatile organic compounds;

- PCBs; and
- TAL metals.

Volatile and semivolatile organic compounds that were detected in the confirmatory soil samples are summarized on Table 2.1. No volatile organic compounds were detected, except for acetone and methylene chloride, which were determined to be laboratory contaminants. Analytes with exceedances of the NYSDEC Action Levels at Site 3 are shown graphically on Figure 2.2. One detection of BEHP was confirmed, but did not exceed its NYSDEC saturated soil action level.

Table 2.2 summarizes the results of the TAL metals analysis for confirmatory soil samples at Site 3. Cadmium, chromium, and lead were detected in the surface soil sample from S3-DP02 at concentrations exceeding the NYSDEC RSCOs. Copper, iron, and zinc were also detected at levels exceeding NYSDEC RSCOs. The detected concentrations of copper and iron fall within the range of background concentrations for eastern United States soils, as reported in TAGM #4046 (NYSDEC 1994). Therefore, copper and iron are considered to be naturally occurring, and are not considered as Contaminants of potential Concern (COPCs). The single exceedance of zinc in surface soil was an isolated, unconfirmed occurrence. Therefore, zinc was not considered as a COPC. Chromium was detected at 3.6 mg/kg at a depth of 32 to 36 ft BGS at S3-DP02, exceeding the subsurface soil Upper Limit of Background Concentrations (ULBC), and slightly higher than subsurface chromium levels detected at the soil background site, but did not exceed NYSDEC RSCOs. Chromium was determined to be naturally occurring during the RI, as established by background sample results.

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

Table 2.1
Site 3
Round 1 Analytical Results - Confirmatory Soils - Volatile and Semivolatile Organic Compounds
106th Rescue Wing
New York Air National Guard
Westhampton Beach, New York

Parameter	Action Levels [b]		Concentration									
			Location/Depth/Type [a]									
	Saturated [c]	Unsaturated [d]	*DP01-01* (0-2 ft)-U	DP01-21 (0-2 ft)-U	DP01-02 (24-28 ft)-U	DP01-03 (36-40 ft)-S	DP02-SS01 (0-0.2 ft)-SS	DP02-01 (0-2 ft)-U	DP02-02 (32-36 ft)-S	DP02-03 (36-40 ft)-S	SB01-01 (0-2 ft)-U	SB01-02 (36-38 ft)-S
Volatile Organic Compounds (µg/kg)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/L)												
Bis(2-ethylhexyl)phthalate	4350	50,000	41 J [f]	ND	ND	130 BJ	ND	ND	ND	ND	ND	60 J [f]
PCBs (µg/kg) [e]												
Aroclor 1254	1000 (Surface)	10,000 (Subsurface)	ND	ND	ND	ND	380	ND	ND	ND	ND	ND
Aroclor 1260	1000 (Surface)	10,000 (Subsurface)	ND	ND	ND	ND	400	ND	ND	ND	ND	ND

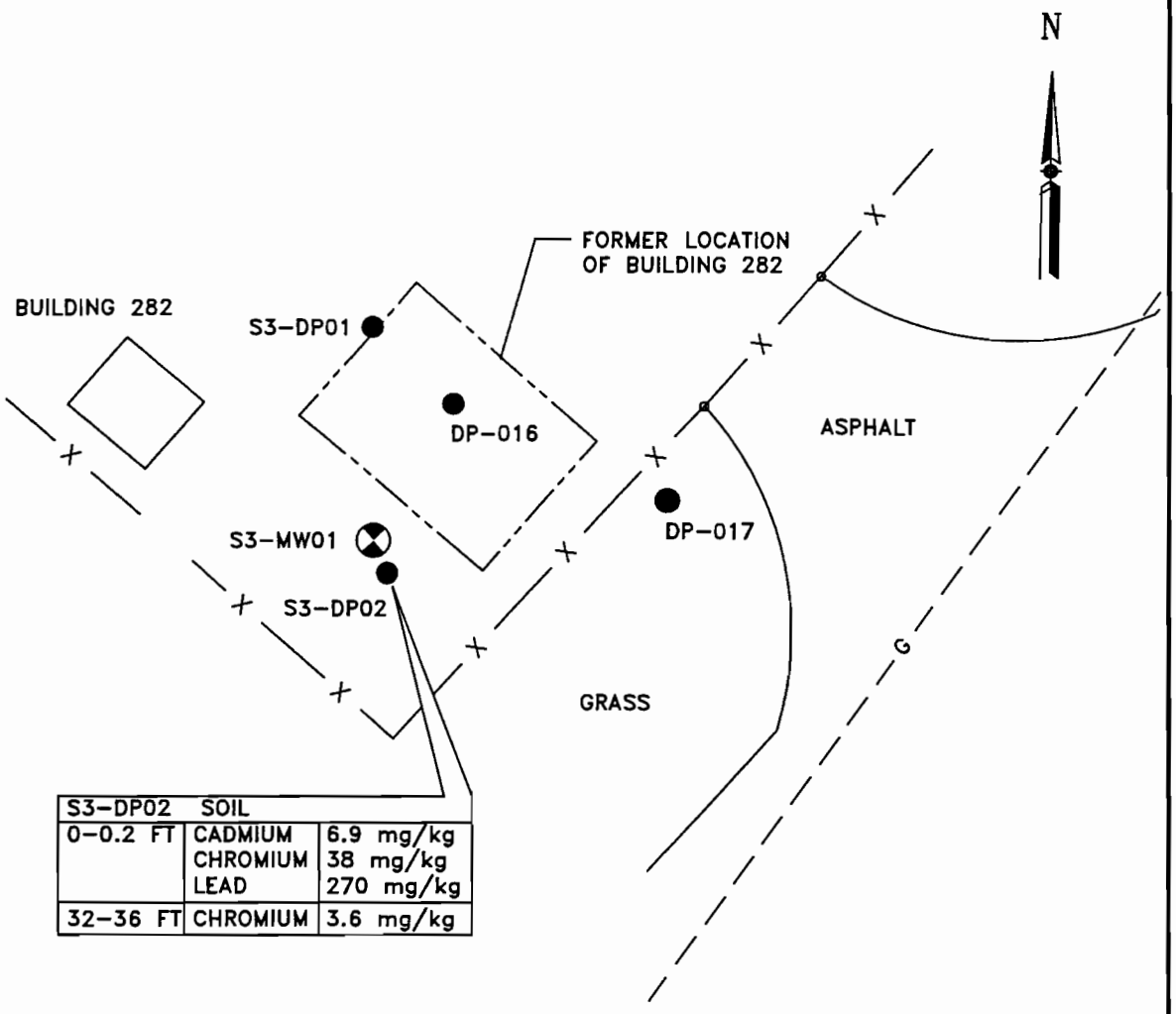
B Analyte is also found in associated blank.
J Estimated value.
ND Not detected.
PCBs Polychlorinated biphenyls.

-- No applicable action level.

Notes:

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. Type: SS = surface soil; 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 for Surface and Subsurface Soils, NYSDEC, TAGM #4046.
(f) Detected concentrations are less than 10 times the associated laboratory method blank and are therefore considered laboratory contamination; see Appendix J.



S3-DP02	SOIL	
0-0.2 FT	CADMIUM	6.9 mg/kg
	CHROMIUM	38 mg/kg
	LEAD	270 mg/kg
32-36 FT	CHROMIUM	3.6 mg/kg

LEGEND

- DIRECT PUSH BORING
- MONITORING WELL
- G GAS

ACTION LEVELS		
ANALYTE	SURFACE (1) SOIL (mg/kg)	SUBSURFACE (1) SOIL (mg/kg)
CADMIUM	0.39	0.27
CHROMIUM	6.1	0.84
LEAD	4.4	2.7

NOTE:
(1) NYSDEC, TOGS 1991

10 0 10
SCALE IN FEET

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

PEER	SITE 3 - SOIL SAMPLE RESULTS (RI, 2000-2001) 106th RESCUE WING, NEW YORK AIR NATIONAL GUARD FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 2.2
PROJ./003005-009 GAB/3NFRAP/FIG2.2		

Table 2.2
Site 3
Round 1 Analytical Results - Confirmatory Soils - Metals
106th Rescue Wing
New York Air National Guard
Westhampton Beach, New York

Parameter	Action Levels		Concentration									
			Location/Depth [a]									
	NYSDEC RSCO [b]	BKG [c] or ULBC [d]	DP01-01 (0-2 ft)	DP01-21 (0-2 ft)	DP01-02 (24-28 ft)	DP01-03 (36-40 ft)	DP02-SS01 (0-0.2 ft)	DP02-01 (0-2 ft)	DP02-02 (32-36 ft)	DP02-03 (36-40 ft)	SB01-01 (0-2 ft)	SB01-02 (36-38 ft)
Metals (mg/kg)												
Aluminum	SB	33,000	480 *	1910*	310	260	3300	460	310	220	810	200
Arsenic	7.5 or SB	7.7/5.5 [d]	ND	0.85	ND	ND	ND	ND	ND	ND	ND	ND
Barium	300	15 - 600	1.1 *	3.2*	1.3	1.4	70	1.0	ND	ND	1.5	1.2
Cadmium	1 or SB	0.39/0.27 [d]	ND	0.10	ND	ND	**6.9**	ND	ND	ND	ND	ND
Calcium	SB	130 - 35,000	ND	150	ND	ND	1300	ND	ND	ND	110	ND
Chromium	10 or SB	6.1/0.84 [d]	0.95 *	5.7*	ND	ND	**38**	ND	**3.6**	ND	ND	ND
Cobalt	30 or SB	2.5 - 60	ND	0.66	ND	ND	3.4	ND	ND	ND	ND	ND
Copper	25 or SB	1 - 50	1.5	2.0	2.2	ND	**55**	ND	ND	ND	2.8	2.6
Iron	2000 or SB	2000 - 550,000	700 E*	2200 E*	620	560	**13,000**	700	1100	420	1000	330
Lead	SB [d]	4.4/2.7 [d] [e]	1.1 *	2.4*	ND	ND	**270**	ND	ND	ND	ND	ND
Magnesium	SB	100 - 5000	41 *	180	60	54	980	55	63	40	180	41
Manganese	SB	50 - 5000	12 EN*	15 EN*	23	12	61	20	4.7	8.0	12	2.0
Mercury	0.1	0.001 - 0.2	ND	ND	ND	ND	0.12	ND	ND	ND	ND	ND
Nickel	13 or SB	0.5 - 25	ND	1.1	ND	ND	7.5	ND	ND	ND	ND	ND
Sodium	SB	6000 - 8000	ND	ND	ND	ND	170	ND	ND	ND	ND	ND
Vanadium	150 or SB	1 - 300	1.4 *	4.1*	1.7	1.3	28	1.7	2.4	ND	2.2	ND
Zinc	20 or SB	9 - 50	4.6 *	3.1*	2.4	3.3	**140**	2.0	2.9	2.6	2.4	1.6

* Analysis is not within quality control limits.
E Estimated value or not reported due to the presence of interferences.
N Spike sample recovery is not within quality control limits.
ND Not detected.
SB Soil background.

-- No applicable action level.

Notes:
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 Recommended Cleanup Objectives, NYSDEC, TAGM #4049.
(c) Eastern USA Background, NYSDEC, TAGM #4049.
(d) Upper limits of background concentration 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).

Quantuck Bay, a tidal estuary which is separated from the Atlantic Ocean by a narrow barrier island (S&W 1997).

In the vicinity of Site 3, 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 3. Therefore, no surface water or sediment sampling was performed in association with Site 3.

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 3. 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 further are 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

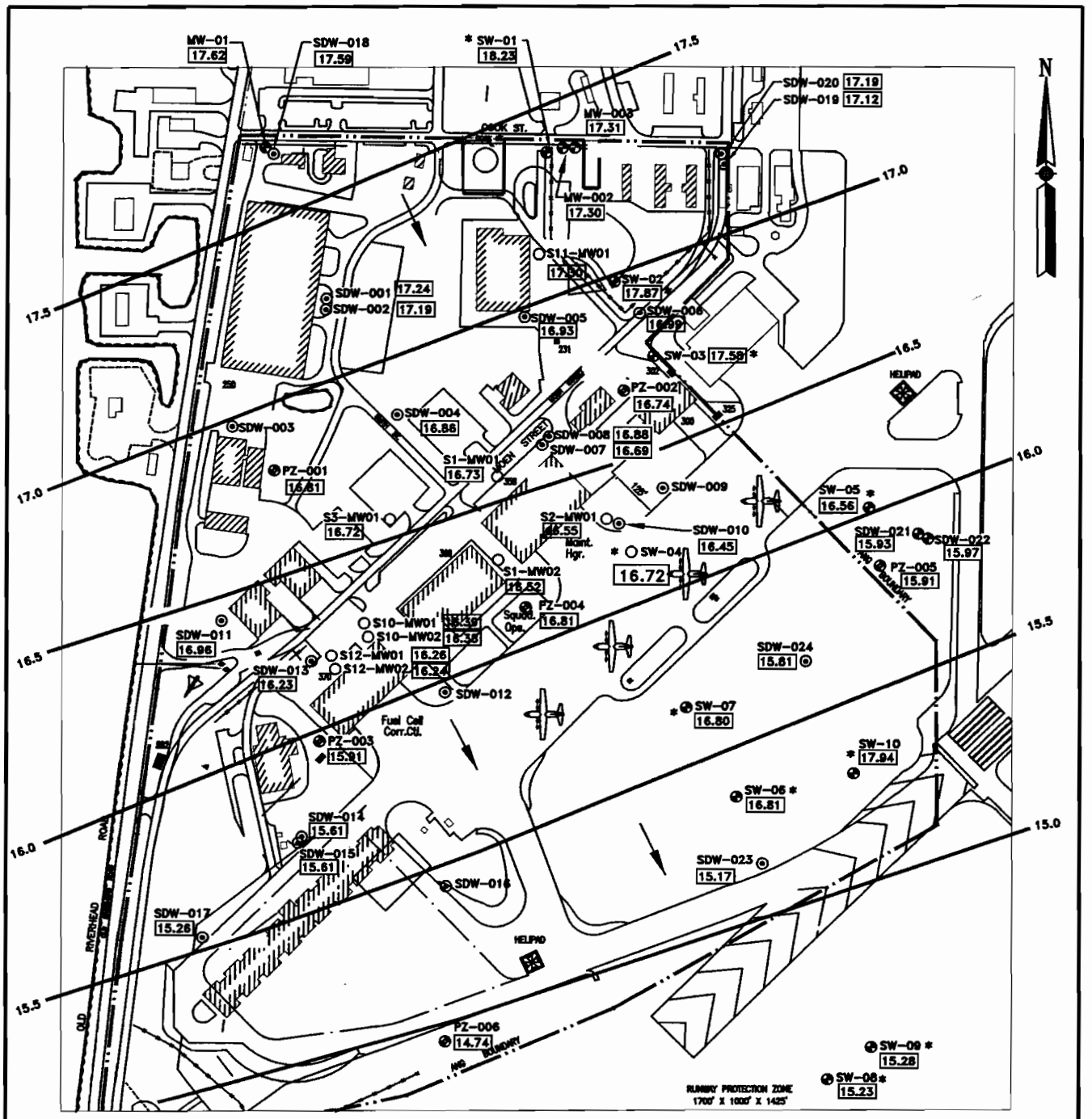
glacial sediments beneath the base and airport. Groundwater elevations are approximately 15 to 19 ft above the National Geodetic Vertical Datum, but may be less or more due to seasonal variations. The clean, coarse sand and gravel of this unit is very porous and highly permeable. It makes a porous soil, 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 ANG 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 flow horizontally toward surface water discharge points. Migration of contaminants downward into lower aquifers is very unlikely (Dames & Moore 1986).

Table 2.3
Hydrologic Properties of Regional Aquifers [a]
106th Rescue Wing
New York Air National Guard
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

(a) Source: Dames & Moore 1986.



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

SOURCE: BASE MAP AND ABB-ES, 1997

NOTE: WELL LOCATIONS APPROXIMATE

0 200 400
SCALE IN FEET

PEER

PROJ./003005-009

GAB/Final 3 NFRAP DD/FIG 2.3

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

FIGURE 2.3

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 3. The SI results were summarized above in Section 1.4.1. Chromium was subsequently determined to be naturally occurring during the RI, and is not considered a COPC.

The RI groundwater investigation included collection of both screening and confirmatory ground water samples, as discussed below in Sections 2.7.1 and 2.7.2. Screening and confirmatory samples were collected from direct-push borings S3-DP01 and S3-DP02, and two rounds of confirmatory groundwater samples were collected from two monitoring wells at Site 3.

2.7.1 Site 3 Groundwater Screening Samples

During direct-push sampling, two groundwater-screening samples were collected from direct-push borings S3-DP01 and S3-DP02, and were submitted for fast turnaround time analysis of BTEX by the field laboratory. No BTEX compounds were detected in either sample.

2.7.2 Direct-Push Confirmatory Groundwater Samples

Direct-push groundwater confirmatory samples were collected from direct-push borings S3-DP01 and S3-DP02. The sample from S3-DP01 was analyzed for volatile and semivolatile organic compounds; the sample from S3-DP02 was analyzed only for semivolatile organic compounds. Both were submitted for confirmatory analysis at the state-certified laboratory. No organic compounds were detected.

2.7.3 Groundwater Monitoring Samples

Groundwater monitoring samples were collected from small-diameter well SDW-004 and newly installed monitoring well S3-MW01 during Rounds 1 and 2 and analyzed for:

- volatile organic compounds;
- semivolatile organic compounds; and
- TAL metals.

Tables 2.4 and 2.5 summarize the volatile and semivolatile organic metals results for the groundwater monitoring samples at Site 3. No volatile or semivolatile organic compounds or TAL metals were detected above the NYSDEC Action Levels in groundwater monitoring samples collected from Site 3. BEHP was detected, but was considered laboratory-introduced contamination. TPH-DRO was detected in S3-MW01 at a concentration of 1.6 mg/L during Round 1, and at an estimated value of 0.44 J mg/kg during Round 2. TPH-GRO was not detected. There are no NYSDEC action levels for TPH.

Table 2.4
Site 3 Rounds 1 and 2 Analytical Results
Groundwater Monitoring - Volatile and Semivolatile Organic Compounds
106th Rescue Wing
New York Air National Guard
Westhampton Beach, New York

Parameter	Action Levels		Concentration Location [a] Site 3			
	NYS [b]	MCL [c]	SDW004-01	SDW004-02	S3MW01-01	S3MW01-02
BTEX (µg/L)						
Toluene	5	1000	NA	NA	ND	ND
m/p-Xylenes	5	10,000	NA	NA	ND	ND
Volatile Organic Compounds (µg/L)						
Carbon Disulfide	50	--	0.4 J	ND	0.6 J	7.0
Chlorobenzene	5	--	ND	ND	ND	ND
Chloroform	7	80	ND	ND	ND	ND
1,2-Dichloroethene (Total)	5 [e] [f]	[f]	ND	ND	ND	2.0
Ethylbenzene	5	70	ND	ND	ND	ND
Methylene Chloride	--	--	ND	ND	ND	ND
Tetrachloroethene	5	5	ND	ND	ND	2.0
Toluene	5	1000	ND	ND	ND	ND
1,1,1-Trichloroethane	5	200	ND	ND	ND	1.0
Trichloroethene	5	5	ND	ND	ND	ND
Total Xylenes	5	10,000	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/L)						
2-Methylnaphthalene	50 [g]	--	ND	ND	ND	ND
TPH-GRO (µg/L)	--	--	NA	NA	ND	ND
TPH-DRO (mg/L)	--	--	NA	NA	1.6	0.44 J
TCP (mg/L)	--	--	NA	NA	NA	NA

Notes:

BTEX	Benzene, toluene, ethylbenzene, and xylenes.
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.

(a) "SDW" refers to small-diameter well; "SW" refers to Stone & Webster well; "MW" refers to monitoring well; "-01" refers to Round 1 sampling, February - March 2001; "-02" refers to Round 2 sampling, May - June 2001; "R" refers to replicate sample collected at top of well screen.

(b) New York State (NYS), Class GA Groundwater; NYSDEC TAGM #4046.

(c) Maximum Contaminant Level (MCL), United States Environmental Protection Agency.

(d) Guidance value.

(e) Compound is a Principal Organic Compound (POC). Under New York State Drinking Water Standards, a general standard of 5 µg/L applies to all POCs unless a more stringent compound specific standard has been set (ABB-ES 1997).

(f) MCL is 70 µg/L for cis-1,2-dichloroethene, and 100 µg/L for trans-1,2-dichloroethene.

(g) Compound is an Unspecified Organic Contaminant. Under New York Drinking Water Standards, a general standard of 50 µg/L applies.

Table 2.5
Site 3
Rounds 1 and 2 Analytical Results -
Groundwater Monitoring - Metals
106th Rescue Wing
New York Air National Guard
Westhampton Beach, New York

Parameter	Action Levels		Concentration Location [a] Site 3			
	NYS [b]	MCL [c]	SDW004-01	SDW004-02	S3MW01-01	S3MW01-02
Metals (µg/L)						
Aluminum	--	--	3100	1600	ND	2200
Arsenic	25	50 [d]	ND	ND	ND	ND
Barium	--	--	12	11	33	49
Cadmium	10	5.0	ND	ND	ND	ND
Calcium	--	--	13,000	11,000	9400	9800
Chromium	50	100	6.1	5.5	6.5	8.7
Cobalt	--	--	ND	ND	ND	ND
Copper	--	1300 [e]	11	ND	ND	ND
Iron	--	--	4200	2500	120	3500
Lead	25	15 [e]	ND	ND	ND	ND
Magnesium	--	--	4800	3500	2900	3300
Manganese	--	--	29	56	17	91
Nickel	--	--	ND	ND	ND	ND
Potassium	--	--	1000	1600	1600	1300
Sodium	--	--	40,000	7800	37,000	53,000
Thallium	--	--	ND	ND	ND	ND
Vanadium	--	--	17	17	ND	6.3
Zinc	--	--	66	42	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.

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 3. The contaminants detected at Site 3 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 3 is located within the boundaries of the ANG facility, a secured government installation, and the Francis S. Gabreski Airport, itself a secure facility. Access to Site 3 is restricted. The site surface is 80% covered with asphalt. The shallow groundwater in the immediate vicinity of the site is not used for water supply; groundwater occurs at approximately 30 to 35 ft BGS; therefore, there is no potential exposure route for groundwater at Site 3. Exposure to off-site receptors via surface water runoff is considered highly unlikely due to the soil characteristics at the site. 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 3 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 4.3.

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 2,000 ft east of Site 7 and the airport. Potential mechanisms for transport of contaminants from the sites include surface water run off. Surface water may be potentially impacted by contaminated surface water runoff from Sites 3.

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 3 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 1700 ft) southeast of Site 3. Additionally, Site 3 is covered with 80% asphalt 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 3, exposure of endangered species to contaminants from the sites is not expected.

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3.0 BASELINE RISK ASSESSMENT

A baseline risk assessment was conducted for Site 3 in accordance with guidelines in the EPA Risk Assessment Guidance (RAGs) document (EPA 1989), except for lead detected in site surface soils. 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, 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. 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. Only one other COPC was identified in association with Site 3, cadmium in surface soils. Cadmium was evaluated according to standard risk assessment procedures (EPA 1989), as presented below in Section 3.2.

The COPC that was identified at Sites 3 (cadmium) 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 Sites 3. 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 95^{th} percentile (USEPA 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 3 (270 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 3. In order to obtain reasonably conservative risk estimates, the values 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 3 is 2.4. 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 USEPA (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: USEPA 1996.

RBRGs Risk-based remediation goals.

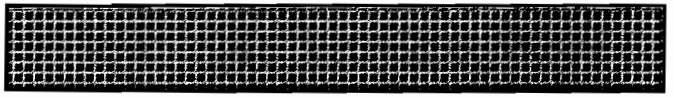
Table 3.2
Calculation of Blood Lead Concentrations and
Probability of Risk for Site 3
106th Rescue Wing
New York Air National Guard Base
Westhampton Beach, New York

Site ID	PbS	$PbB_{adult, central}$	$PbB_{fetal, 0.95}$	PbB_t	P
3	270	2.4	7.3	10 µg/L	1.9%

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.

Figure 3.1
Gabreski ANG Site 3 TRW ALM 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*	PbB Equation[1] 2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario			
					Using Equation 1		Using Equation 2	
					GSDi = 1.8	GSDi = 2.1	GSDi = 1.8	GSDi = 2.1
PbS	X	X	Soil lead concentration	ug/g or ppm	270.0	270.0	270.0	270.0
$R_{fetal/maternal}$	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	**2.4**	**2.4**	**2.4**	**2.4**
$PbB_{fetal,\ 0.95}$	**95th percentile PbB among fetuses of adult workers**			ug/dL	**5.7**	**7.3**	**5.7**	**7.3**
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**			%	**0.4%**	**1.9%**	**0.4%**	**1.9%**

[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 approaeh based onEq. 1, 2, and A-19 in USEPA (1996).**

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

3.2 BASELINE RISK ASSESSMENT FOR CADMIUM IN SITE 3 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 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 generally describes the physical characteristics of Site 3, as investigated during this RI. Additional information concerning the physical characteristics of the base and Site 3 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 3 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.

Site 3 Exposure Setting

Site 3, a former hazardous waste storage area, is located at the intersection of Moen Street and Smith Avenue in the west-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 34 ft BGS and flows toward the southeast.

The COPCs at the site include the metals cadmium and lead, 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 3. Therefore, only risks associated with cadmium will be assessed in the following sections. Potential receptors to the contaminated surface soils at Site 3 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 1,600 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 sites, and/or the mechanism(s) by which a potential receptor may be exposed to contaminants that have been transported from the sites. 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 some or all of the sites.

Exposure pathways are identified based on consideration of the sources, types, and locations of contaminants at Site 3, in this case, cadmium 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.

Site 3 Exposure Pathway Evaluation

Impacted media at Site 3 is limited to surface soil which contains elevated concentrations of cadmium 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 80% 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 1,600 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 3. 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. One other COPC (cadmium) was identified in surface soil at Site 3. However, cadmium was present at a low levels and exposure would only be likely during excavation activities at the sites. 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 sites.

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 3. 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) (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 7000 ft east of Site 3. Potential mechanisms for transport of contaminants from the sites include surface water run off.

Surface water may be potentially impacted by contaminated surface water runoff from the sites 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 3. 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 3000 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 3 groundwater, or by contaminated surface runoff, exposure of endangered species to contaminants from the sites is not expected.

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4.0 SELECTED ACTION: NO FURTHER RESPONSE ACTION PLANNED

A NFRAP decision is proposed for Site 3 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 3, these criteria have been met.

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APPENDIX A

REFERENCES

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