Final Proposed Plan
On-base Groundwater AOC
at the
Former Griffiss Air Force Base
Rome, New York

September 2007

DEPARTMENT OF THE AIR FORCE
AIR FORCE REAL PROPERTY AGENCY

September 21, 2007

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153 Brooks Road
Rome NY 13441-4105

SUBJECT: Final Proposed Plan for On-Base Groundwater Areas of Concern

1. Enclosed please find the Final Proposed Plan for On-Base Groundwater Areas of Concern dated September 2007.

2. If you have any questions, please contact Cathy Jerrard at (315) 356-0810, Ext. 204.

MICHAEL F. MCDERMOTT
BRAC Environmental Coordinator

Attachment: As Noted

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Final Proposed Plan for
On-Base Groundwater Areas of Concern
Former Griffiss Air Force Base, Rome, New York

September 2007

On behalf of Ecology and Environment Engineering, P.C. (EEEPC), the undersigned certify that the attached document(s) were developed in conformance with EEEPC's Scope of Work, contract requirements and further, that the work was performed in accordance with acceptable standards of engineering and scientific practice.

Jacquelyn C. Dillinger — 9/21/07
Quality Control Manager (or designee) — Date

Timothy J. Sheff — 9/20/07
Program Manager (or designee) — Date

Robert A. Mazza — 9/20/07
Project Manager (or designee) — Date

Final Proposed Plan

ON-BASE GROUNDWATER AOC

Former Griffiss Air Force Base
Rome, New York
Public Comment Period
September 25, 2007 to October 25, 2007

September 2007

This proposed plan describes:

- The environmental investigations that have been conducted at the OBGW AOC.
- The proposed plan to perform remedial action and long-term monitoring.
- How you can participate in the final decision process for the OBGW AOC.

Proposed Plan
A document requesting public review and comment on a proposed remedial action at a particular site.

Area of Concern (AOC)
A location where hazardous substances are or may have been placed or may be located.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
Commonly known as Superfund; a federal law that establishes a program to identify, evaluate, and remediate sites where hazardous substances may have been released into the environment.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP)
The federal regulation that provides the organizational structure and procedures for responding to releases of hazardous substances, pollutants, and contaminants.

Federal Facility Agreement (FFA)
An agreement between the EPA, the State of New York, and the Air Force to evaluate waste disposal sites at the former Griffiss AFB and perform remediation if necessary.

Record of Decision (ROD)
A public document that identifies the selected action at a site, outlines the process used to reach a decision on the remedy, and confirms that the decision complies with CERCLA.

Air Force Recommends Remedial Action for On-base Groundwater Area of Concern

Public Comments Solicited

Former Griffiss Air Force Base is located in Rome, New York.

This ***proposed plan*** is issued by the United States Air Force (Air Force) following consultation with the United States Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC). The On-base Groundwater (OBGW) ***Area of Concern*** includes the groundwater associated with Landfill 6, Building 775, Building 817/Weapons Storage Area (WSA), and the Apron 2 Operable Unit (see Figure 1-1).

The document has been prepared in accordance with public participation requirements of the ***Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended***, ***the National Contingency Plan***, and the former Griffiss Air Force Base (AFB) ***Federal Facility Agreement***. In this document, the Air Force, EPA, and NYSDEC will be referred to as "the agencies." This plan is intended to elicit public comments on the proposal to perform remedial action and long-term monitoring for groundwater at the site. The final decision or ***Record of Decision*** will be made only after the public comment period has ended and responses and information submitted during this time period have been reviewed and considered. Soil vapor intrusion evaluations are being performed as discussed below. The selected groundwater remedies are not expected to increase contaminant concentrations in the soil vapor and in the long term, these remedies will remove groundwater contaminants thus reducing soil vapor concentrations. Please refer to Section 4, Community Participation, for information on submitting public comments.

Soil Vapor Intrusion Operable Unit

In 2006, an ***operable unit*** was established to focus on those sites where ***soil vapor intrusion*** (SVI) studies are being conducted. These studies are separate from the investigations and proposed remedial actions discussed in this OBGW proposed plan. The following sites have been included in the SVI operable unit:

Operable unit
A discreet portion of a site that is investigated and cleaned up separately from other portions of the site. Dividing a site into two or more operable units allows separate investigations and cleanups to proceed at their own pace. Common examples are investigating soil and groundwater contamination separately, and cleaning up and redeveloping small portions of a larger site.

Soil vapor intrusion
The phrase "soil vapor intrusion" refers to the process by which volatile chemicals migrate from a subsurface source into the indoor air of buildings.

- Building 775
- Building 817/WSA
- Apron 2
- Building 101
- Area of Concern (AOC) 9
- Building 100
- Building 110
- Tank Farms 1 and 3
- Building 133
- Building 43
- Building 771
- Fire Protection Training Area (FPTA)

The studies proposed at these sites are described in the following work plans:

- Final Work Plan, Soil Vapor Intrusion Sampling, Building 101, Rev. 0.0, September 2006 (FPM Group)

- Draft Work Plan, Soil Vapor Intrusion Sampling, Buildings 43, 100, 110, 133, 771, Tank Farms 1 and 3, and Fire Protection Training Area, Rev. 0.0, January 2007 (FPM Group)

- Final Work Plan, Soil Vapor Intrusion Survey at Apron 2, Building 817/WSA, Building 775, and AOC 9, September 2006 (Ecology and Environment Engineering, P.C.)

The schedule for implementation of the remedial program for the SVI Operable Unit is listed below.

- Draft SVI Report OBGW SITES – February 2007
- Final SVI Report OBGW SITES – August 2007
- Draft SVI Report B101 and basewide sites – June 2007
- Final SVI Report B101 and basewide sites – August 2007
- Draft Proposed Plans - September 2007
- Final Proposed Plans– January 2008
- Draft RODs – February 2008
- Final RODs Signed – May 2008

The parties of the Federal Facilities Agreement may request that additional sites be added to the SVI Operable Unit in the future.

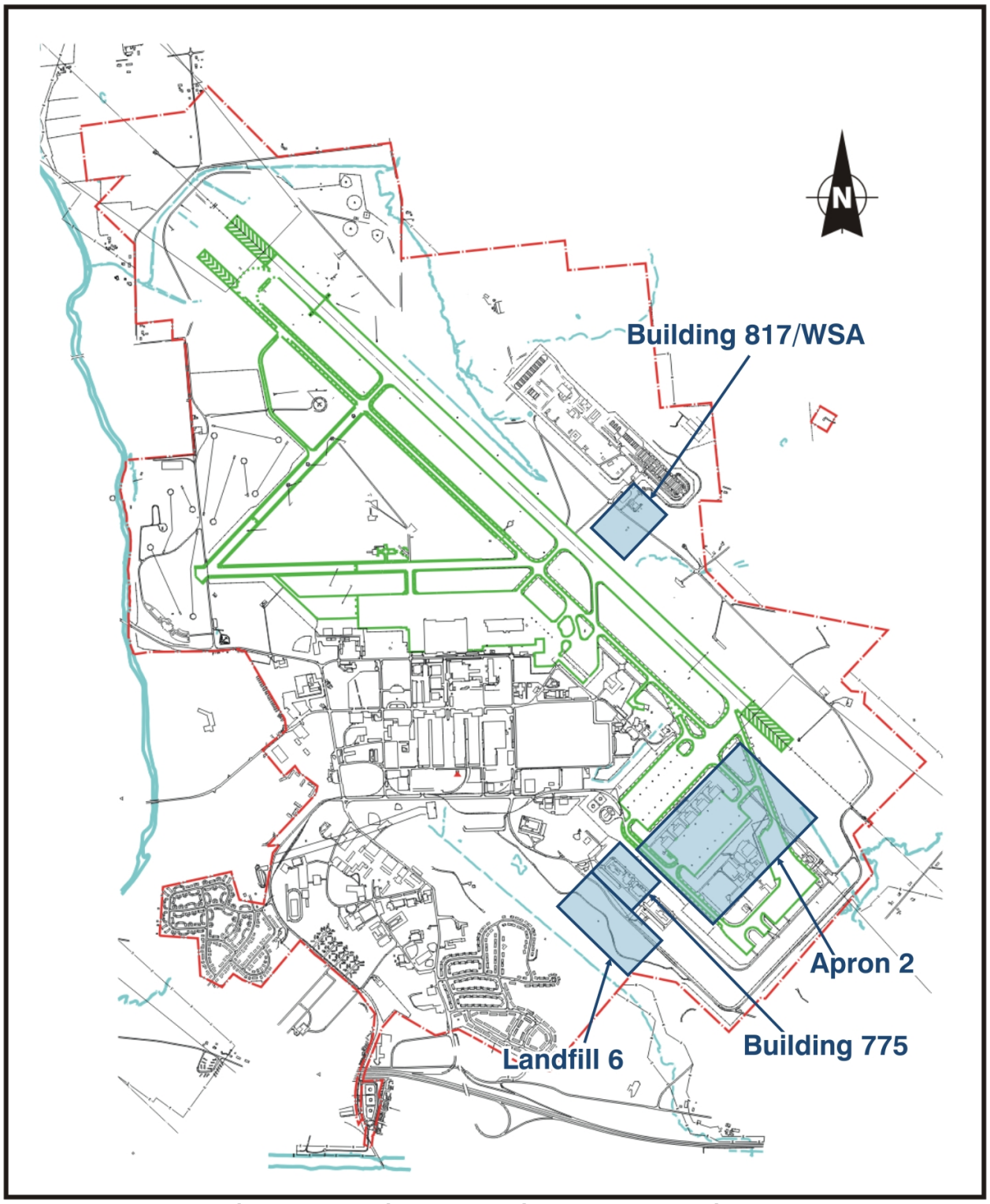

Figure 1-1 On-base Groundwater AOC Locations,
Former Griffiss Air Force Base, Rome, NY

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1. SITE DESCRIPTION

Regional

The former Griffiss AFB covered approximately 3,552 contiguous acres in the lowlands of the Mohawk River Valley in Rome, Oneida County, New York. Topography within the valley is relatively flat, with elevations on the former Griffiss AFB ranging from 435 to 595 feet above mean sea level. Three Mile Creek, Six Mile Creek (both of which drain into the New York State Barge Canal, located to the south of the base), and several state and/or federally regulated wetlands are located on the former Griffiss AFB, which is bordered by the Mohawk River on the west. Due to its high average precipitation and predominantly silty sands, the former Griffiss AFB is considered a ***groundwater recharge zone***.

Groundwater Recharge Zone
An area where the underlying aquifer (water-bearing zone) receives water (recharge) through downward flow of both precipitation, which infiltrates into the ground, and surface water bodies such as streams, lakes, etc.

Base Realignment and Closure Act (BRAC)
A federal law that established a commission to determine which military bases would be closed and which would remain active.

Griffiss AFB Operational History

The mission of the former Griffiss AFB varied over the years. The base was activated on February 1, 1942, as Rome Air Depot, with the mission of storage, maintenance, and shipment of material for the U.S. Army Air Corps. Upon creation of the Air Force in 1947, the depot was renamed Griffiss AFB. The base became an electronics center in 1950, with the transfer of Watson Laboratory Complex (later Rome Air Development Center [1951], Rome Laboratory, and then the Air Force Research Laboratory Information Directorate, established with the mission of accomplishing applied research, development, and testing of electronic air-ground systems). The 49th Fighter Interceptor Squadron was also added. The Headquarters of the Ground Electronics Engineering Installations Agency was added in June 1958 to engineer and install ground communications equipment throughout the world. On July 1, 1970, the 416th Bombardment Wing of the Strategic Air Command (SAC) was activated with the mission of maintenance and implementation of both effective air refueling operations and long-range bombardment capability. Griffiss AFB was designated for realignment under the ***Base Realignment and Closure Act*** in 1993 and 1995, resulting in deactivation of the 416th Bombardment Wing in September 1995. The Air Force Research Laboratory Information Directorate and the Northeast Air Defense Sector (NEADS) will continue to operate at their current locations; the New York Air National Guard (NYANG) operated the runway for the 10th Mountain Division deployments until October 1998, when they were relocated to Fort Drum; and the Defense Finance and Accounting Services (DFAS) has established an operating location at the former Griffiss AFB.

Environmental Background

As a result of the various national defense missions carried out at the former Griffiss AFB since 1942, hazardous and toxic substances were used and hazardous wastes were generated, stored, or disposed at various sites on the installation. The defense missions involved, among others, procurement, storage, maintenance, and shipping of war materiel; research and development; and aircraft operations and maintenance.

Numerous studies and investigations under the U.S. Department of Defense Installation Restoration Program have been carried out to locate, assess, and quantify the past toxic and hazardous waste storage, disposal, and spill sites. These investigations included a records search in 1981, interviews with base personnel, a field inspection, compilation of an inventory of wastes, evaluation of disposal practices, and an assessment to determine the nature and extent of site contamination; Problem Confirmation and Quantification studies (similar to what is now designated a Site Investigation) in 1982 and 1985; soil and

Agency for Toxic Substances and Disease Registry (ATSDR)

The federal agency responsible for performing health assessments for facilities on the National Priorities List.

National Priorities List (NPL)

A formal listing established by CERCLA of the nation's hazardous waste sites that have been identified for possible remediation. Sites are ranked by the EPA based on their potential for affecting human health and the environment.

Remedial Investigation (RI)

An environmental investigation that identifies the nature and extent of contamination at a site. It also provides an assessment of the potential risks associated with a site.

Baseline Risk Assessment

An assessment required by CERCLA to evaluate potential risks to human health and the environment. This assessment estimates risks/hazards associated with existing and/or potential human and environmental exposures to contaminants at an area.

Remedial Action

Actions taken to permanently prevent or minimize the release of hazardous substances so that they do not migrate to cause substantial danger to present or future public health, welfare, or the environment.

Applicable or Relevant and Appropriate Requirements (ARARs)

"Applicable" requirements mean those standards, criteria, or limitations promulgated under federal or state law that are required specific to a substance, pollutant, contaminant, action, location, or other circumstance at a CERCLA site, e.g., the New York State groundwater standards. "Relevant and appropriate" requirements mean those standards, requirements, or limitations that address problems or situations sufficiently similar to those encountered at the CERCLA sites so that their use is well suited to that particular site.

To-Be-Considereds (TBCs)

Advisories, criteria, or guidance that do not meet the definition of an ARAR, but may be useful in developing remedial action alternatives, e.g., the New York State groundwater guidance values.

Background Levels

The level of a chemical or contaminant naturally occurring in the vicinity of the site.

groundwater analyses in 1986; a basewide health assessment in 1988 by the U.S. Public Health Service, ***Agency for Toxic Substances and Disease Registry***; base-specific hydrology investigations in 1989 and 1990; a groundwater investigation in 1991; and site-specific investigations between 1989 and 1993. The ATSDR issued a Public Health Assessment for Griffiss AFB, dated October 23, 1995, and an addendum, dated September 9, 1996.

Pursuant to Section 105 of CERCLA, Griffiss AFB was included on the ***National Priorities List*** on July 15, 1987. On August 21, 1990, the agencies entered into an FFA under Section 120 of CERCLA.

Under the terms of the agreement, the Air Force was required to prepare and submit numerous reports to NYSDEC and EPA for review and comment. These reports address remedial activities that the Air Force is required to undertake under CERCLA and include identification of AOCs on base; a scope of work for a ***Remedial Investigation***; a work plan for the RI, including a sampling and analysis plan and a quality assurance project plan; a baseline risk assessment; a community relations plan; multiple RI reports; work plans and the reports for supplemental investigations (SI); and a Landfill Cover Investigation Report. The Air Force delivered the draft-final RI report covering 31 AOCs to EPA and NYSDEC on December 20, 1996. The final SI Report was delivered on July 24, 1998. Additional site-specific reports for the OBGW sites included: the final RI for Nosedocks/Apron 2 Chlorinated Plume (April 2004) and the final FS for Nosedocks/Apron 2 (August 2006); and the final FS for Landfill 6, Building 775, and Building 817 (April 2005). The final FS Addendums/Supplement for Landfill 6 Groundwater, Building 775 Groundwater, and Building 817 Groundwater were delivered in September 2006.

This proposed plan for remedial action is based on an evaluation of potential threats to human health and the environment due to contamination in the OBGW AOC. During the RI and SI, the levels of contaminants were compared to available standards and guidance values using federal and state environmental and public health laws that were identified as potentially ***applicable or relevant and appropriate requirements*** (ARARs) at the site. Chemical-specific ARARs are usually health- or risk-based numerical values or methodologies that result in a numerical value when applied to site-specific conditions. Therefore, other non-promulgated federal and state advisories and guidance values, referred to as ***To-Be-Considereds*** (TBCs), and ***background levels*** of the contaminants in the absence of TBCs, were considered. This comparison was used in the selection of the preferred remedial actions.

2. RISK ASSESSMENT PROCESS

Baseline risk assessments were performed at Landfill 6, Building 775, and Nosedocks/ Apron 2 to evaluate current and future potential risks to human health and the environment associated with contaminants found in the groundwater at the site. The risk assessments for Landfill 6 and Building 775 were performed as part of the 1994 RI and prior to collection of groundwater samples during the SIs (a risk assessment was not performed on the SI sample results). The risk assessment for Nosedocks/Apron 2 was performed during a subsequent RI in 2002. A site-specific risk assessment for Building 817/WSA was not performed because it was determined during the supplemental investigations that remedial action would be performed and groundwater is not currently in use.

Results of the site-specific risk assessments are summarized in this proposed plan in each respective section. A general description of the risk assessment process is provided below.

Human Health Risk Assessment Background Information

Baseline human health risk assessments were conducted to determine whether chemicals detected at the sites could pose health risks to individuals under current and proposed future land uses if no remediation occurs. As part of the baseline risk assessment, the following four-step process was used to assess site-related human health risks for a reasonable maximum exposure scenario: Hazard identification—identifies the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and concentration; Exposure Assessment—estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathway (e.g., ingestion of contaminated groundwater) by which humans are potentially exposed; Toxicity Assessment—determines the types of adverse health effects associated with chemical exposures and the relationship between magnitude of exposure (dose) and severity of adverse effects (response); and Risk Characterization—summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative (e.g., one-in-a-million excess carcinogenic risk and noncarcinogenic Hazard Index value) assessment of site-related risks and a discussion of uncertainties associated with the evaluation of the risks and hazards for the site.

Chemicals of potential concern (COPCs) were identified based on the analytical results and data quality evaluation from the RI. All contaminants detected in the groundwater samples from the site were considered COPCs with the exception of inorganics detected at concentrations less than twice the mean background concentrations; elements considered to be essential human nutrients (iron, magnesium, calcium, potassium, and sodium); and chemicals detected in less than 5% of the total samples and at concentrations below ARARs and TBCs. As a class, petroleum hydrocarbons were not selected as a chemical of concern; but the individual toxic constituents (e.g., benzene, toluene, ethylbenzene) were evaluated. The presence of petroleum hydrocarbons as a class of contaminants was considered in the selection of the preferred remedial action.

Quantitative estimates of carcinogenic and noncarcinogenic risks were calculated as part of a risk characterization. The risk characterization evaluates potential health risks based on estimated exposure intakes and toxicity values. For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen. The range of acceptable risk is generally considered to be 1 in 10,000 (1×10^{-4}) to 1 in 1,000,000 (1×10^{-6}) of an individual developing cancer over a 70-year lifetime from exposure to the contaminant(s) under specific

exposure assumptions. Therefore, sites with carcinogenic risk below the acceptable risk range for a reasonable maximum exposure do not generally require cleanup based upon carcinogenic risk under the National Contingency Plan (NCP).

Risk Uncertainties

There are inherent uncertainties associated with the overall risk assessment process and with each of its components. However, conservative (health-protective) assumptions are used throughout the process to ensure that the risk estimates will be protective of human health and the environment. Examples of uncertainties associated with the risk assessments presented in this proposed plan include: (1) Samples were collected from locations with known or suspected contamination rather than random locations, which may result in a potential overestimation of risk; (2) Actual natural background concentrations of inorganic compounds in the groundwater are uncertain, due to limited data sets; (3) For inhalation exposures, contaminant concentrations in air were estimated from soil and groundwater concentrations using modeling and conservative model input assumptions, which may result in a potential overestimation of risk; (4) Elevated levels of contaminants in groundwater that were measured following the RI were not factored into the risk assessments, which would result in an underestimation of risk; and (5) It was assumed that groundwater might be used as a potable water source, which is unlikely since the site has ready access to existing water supplies at the former base and in the city of Rome. This would result in a potential overestimation of risk.

3. ON-BASE GROUNDWATER AOC BACKGROUND INFORMATION

The OBGW AOC was originally developed to address groundwater contamination encompassing more than one AOC, groundwater contamination at sites that were not addressed under an RI, or the source removal sites where only soils were being addressed. However, as site investigations continued, groundwater contamination was addressed for individual sites, including the source removal sites, rather than being deferred to the OBGW AOC. The exceptions included the four sites addressed in this proposed plan and the Tin City sites, which were later addressed in a post-ROD explanation of significant difference (ESD). The evaluations of the four sites currently comprising the OBGW AOC included a determination that a ***plume*** existed at all of these sites and various treatability and feasibility studies were undertaken to evaluate potential remedies.

plume
A plume represents the groundwater that has been adversely affected by a contaminant or several contaminants. The boundaries of a plume are generally estimated based on monitoring well data.

A summary of the proposed remedies for the OBGW AOC sites included in this proposed plan is provided in Table 3-1. Brief descriptions of the results of soil investigations at these sites are provided in Section 3.1.

Summary information for the remaining sites originally addressed in the draft-final RI for the OBGW Contamination AOC (1996) is presented in Table 3-2. A brief discussion of off-base groundwater, which was deferred to SD-52 by EPA and NYSDEC with the acknowledgment that off-base groundwater was not a source of contamination, is provided in Section 3.2.

Table 3-1
SUMMARY OF SITES INCLUDED IN OBGW AOC

Site Designation	Site Name	Proposed Remedy
SD-52, Landfill 6 Operable Unit	Landfill 6	*Groundwater:* Enhanced bioremediation, groundwater extraction and re-circulation (if necessary), long-term monitoring of the groundwater plume and treatment performance during full-scale implementation, and institutional controls in the form of deed restrictions. *Soil:* No further action.
SD-52, Building 775 Operable Unit	Building 775 Groundwater	*Groundwater:* Groundwater extraction, treatment, and discharge, long-term monitoring of the groundwater plume and treatment performance during full-scale implementation, and institutional controls in the form of deed restrictions. *Soil:* No further action.
SD-52, Building 817/WSA Operable Unit	Building 817/Weapons Storage Area (WSA)	*Groundwater:* Enhanced bioremediation and air sparge wall (wall to be installed if necessary), long-term monitoring of the groundwater plume and treatment performance during full-scale implementation, and institutional controls in the form of deed restrictions. *Soil:* No further action.
SD-52, Apron 2 Operable Unit	Nosedocks/Apron 2 Groundwater	*Groundwater:* Monitored natural attenuation and air sparge barrier (barrier to be installed if necessary), institutional controls, and long-term monitoring. *Soil:* No further action.

3.1 OBGW AOC SITE SOILS

Landfill 6

The soil at Landfill 6 was addressed in the Landfill 6 ROD (February 2001). The human health and ecological risk assessments indicated that the soil exposure pathways did not present an unacceptable risk to future residents, recreational receptors or landscape workers. The presumptive remedy in the ROD included installation and maintenance of an impermeable cover, long-term monitoring of the groundwater and stream environment, and implementation of institutional controls in the form of deed restrictions within the main landfill boundary. Further assessment of the groundwater was deferred to the OBGW AOC.

Building 775

An RI was performed at Building 775 in 1994. Surface soil samples contained low concentrations of chlorobenzene, toluene, and TCE, all below the most stringent criteria, and four polyaromatic hydrocarbons (PAHs) with concentrations exceeding the most stringent criteria. Concentrations of chemicals in subsurface soil samples were all below the most stringent criteria. The risk assessment performed during the RI indicated that the soil exposure pathway did not pose an unacceptable risk to the occupational receptors. The HI was below the benchmark level of 1.0 and the carcinogenic risk ranged from 2×10^{-9} to 4×10^{-6}, which was within EPA's acceptable target risk range. Therefore, no further action for soil was recommended at this site.

Building 817/WSA

In 1998, during an expanded site investigation (ESI), a surface soil/sludge sample was collected in the vicinity of Building 817 at the wastewater-related system WW-817 outfall to the tributary to Six Mile Creek. The sample and a duplicate were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyl (PCBs), and total recoverable petroleum hydrocarbons (TRPH). Concentrations of all VOCs and PCBs were below NYSDEC criteria. Concentrations of two SVOCs (benzo[a]pyrene and benzo[a]anthracene) and two metals (lead and selenium) slightly exceeded the NYSDEC criteria. TRPH was not detected. Because there was no significant soil contamination at the outfall, no further action for soil was recommended at the site.

Nosedocks/Apron 2

Soil sampling was conducted during the RI performed from November 2001 to February 2002. This sampling was conducted in an attempt to identify if there was remaining contamination in the soil at the approximate depth of the Nosedocks Wash Waste Line. The samples were analyzed for VOCs and all detected concentrations were reported below NYSDEC screening criteria. Because no significant soil contamination was identified, it was determined that there was no continuing source. Therefore, no further action for soil was recommended at the site.

Table 3-2 SUMMARY INFORMATION FOR AOCS			
Site Designation	**Site Name**	**ROD Remedy**	**Signed ROD Date**
FT-48	Suspected Fire Training Area (SFTA)	No further action for soil and groundwater.	09/30/99
SS-24	Fire Demonstration Area (FDA)	No further action for soil and groundwater.	09/30/99
SD-50	Building 214	Land use restrictions for industrial land use and groundwater use restrictions.	09/30/99
DP-15	Building 219 Drywell	Land use restrictions for industrial land use and groundwater use restrictions.	09/30/99
DP-12	Building 301	Institutional controls in the form of land use restrictions for commercial/administrative use and groundwater use restrictions.	09/30/99
LF-1	Landfill 1	Collection and treatment of groundwater/leachate from a trench at the landfill toe; treatment of contaminated water by carbon adsorption; installation and maintenance of impermeable cover; long-term monitoring of groundwater, surface water, and sediment; monitoring downgradient of the site; and implementation of institutional controls in the form of deed restrictions.	07/05/00
LF-2	Landfill 2/3	Long-term monitoring of groundwater and stream environment; monitoring downgradient of the site; installation and maintenance of a soil cover; and implementation of institutional controls in the form of deed restrictions.	07/05/00
LF-28	Landfill 4	No further action for soil with groundwater monitoring; deed restrictions incorporated in all property transfer documents for the duration of the groundwater monitoring program.	07/05/00
LF-7	Landfill 5	Long-term monitoring of groundwater and stream environment; monitoring downgradient of the site; installation and maintenance of a soil cover; and implementation of institutional controls in the form of deed restrictions.	07/05/00
LF-3	Landfill 7	Long-term monitoring of groundwater and stream environment; monitoring downgradient of the site; installation and maintenance of a soil cover; and implementation of institutional controls in the form of deed restrictions.	07/05/00
LF-9	Landfill 6	Long-term monitoring of groundwater and stream environment; monitoring downgradient of the site; installation and maintenance of impermeable cover; and implementation of institutional controls in the form of deed restrictions. The chlorinated solvent plume is to be addressed under SD-52, Landfill 6 Operable Unit.	06/07/01
SS-23	Building 20	Institutional controls in the form of land use restrictions for industrial/ commercial use and groundwater use restrictions.	09/27/01
DP-22	Building 222	Land use restrictions for industrial/commercial use and groundwater use restrictions.	09/27/01
DP-13	Building 255	Land use restrictions for industrial/commercial use and groundwater use restrictions.	09/27/01

Table 3-2 SUMMARY INFORMATION FOR AOCS			
Site Designation	**Site Name**	**ROD Remedy**	**Signed ROD Date**
SS-25	T-9 Storage Area	No further action for soil with land use restrictions for industrial/commercial use.	09/27/01
SS-8	Building 112	Land use restrictions for industrial/commercial use, soil relocation restrictions, and groundwater use restrictions.	09/27/01
ST-10	Building 117	No further action for soil and groundwater.	07/23/02
ST-04	Bulk Fuel Storage Area	No further action for soil and groundwater.	07/23/02
ST-35	Building 26	No further action for soil and groundwater.	07/23/02
ST-21	Building 210	No further action for soil and groundwater.	07/14/03
SD-31	Three Mile Creek	Excavation of contaminated sediments and long-term monitoring.	03/26/04
SD-32	Six Mile Creek	Source control and long-term monitoring.	03/26/04
SS-17	Lot 69 Former Hazardous Waste Storage Area	Institutional controls in the form of land use restrictions for industrial/commercial use and groundwater use restrictions.	03/17/05
DP-11	Building 3 Drywell	Land use restrictions for industrial/commercial use and groundwater use restrictions.	03/17/05
SS-44	Electrical Power Substation	Land use restrictions for industrial use as a restricted access electrical substation, soil relocation restrictions, and groundwater use restrictions.	03/17/05
SS-33	Coal Storage Yard Area	Land use restrictions for industrial/commercial use, soil relocation restrictions, and groundwater use restrictions.	Pending
ST-37	Building 771	No further action for soil and groundwater.	Pending
ST-06	Building 101	Institutional controls in the form of land use restrictions for industrial/commercial use and groundwater use restrictions with long-term groundwater monitoring.	Pending
FT-30	Fire Protection Training Area (FPTA)	No further action for soil and long-term groundwater monitoring.	Pending
SS-20	Tank Farms 1 and 3	No further action for soil with groundwater use control and long-term monitoring.	Pending
ST-37	Building 110	No further action for soil and groundwater.	Pending
ST-51	Building 100	No further action for soil and groundwater.	Pending
ST-53	Building 133	No further action for soil and groundwater.	Pending
OT-61	Small Arms Range	No further action for soil and groundwater.	Pending
ST-26	Building 43	No further action for soil and long-term groundwater monitoring.	Pending
XX-100	AOIs IRAs	No further action for soil and groundwater.	Pending
SS-38	Building 775 TCE Groundwater	No further action for soil and groundwater deferred to SD-52, Building 775 Operable Unit.	Not applicable
SD-41	Building 782, Nosedocks 1 & 2	Soil is to be addressed under the petroleum program and groundwater deferred to SD-52, Apron 2 Operable Unit.	Pending
SD-62	AOC9 Groundwater	No further action for soil and extent of groundwater contamination being further investigated. Groundwater remedy to be determined.	Pending
SS-46 SS-34	Glycol Storage/Use Area Building 786	These sites were removed from further consideration by EPA and NYSDEC in letters dated November 18, 2002 and November 25, 2002, respectively.	Not applicable

Table 3-2 SUMMARY INFORMATION FOR AOCS			
Site Designation	**Site Name**	**ROD Remedy**	**Signed ROD Date**
SS-43	Off-base Groundwater	No further action. Deferred to SD-52 by EPA and NYSDEC in letters dated September 19, 2000, and September 11, 2000, respectively.	Not applicable

3.2 OFF-BASE GROUNDWATER

Off-base groundwater encompasses the areas surrounding the base that are contiguous with the installation. In 1987, contamination of three off-base domestic water wells was identified by the Oneida County Department of Health (OCDOH) during routine monitoring activities. In 1989, the NYSDOH and the Air Force initiated an assessment of domestic water quality in the vicinity of the base. Approximately 300 domestic well water samples had been collected by December 1991. An additional year-long quarterly monitoring survey of private domestic wells was conducted in 1992 by the NYSDOH and OCDOH. From 1990 until the completion of municipal water service water mains, the Air Force provided either bottled water service or water filtration systems to residents in the vicinity of the base.

In 1991, 18 monitoring wells were installed in the shallow aquifer around the perimeter of the base and sampled for four events during 1992 and 1993. In 1994, during the RI, 12 off-base monitoring wells were installed and sampled. With the exception of the areas south and southeast of the base, groundwater flow in the area was determined to be across the base to the south-southwest, toward the Mohawk River and the New York State Barge Canal. Groundwater in the area south and southeast of the base was found to flow toward Six Mile Creek.

In general, sample results indicated that the downgradient concentrations of chemicals were comparable to upgradient concentrations and based on the results of the RI, it was determined that on-base groundwater contamination had no impact on the off-base groundwater. Therefore, no further action is required for the off-base groundwater.

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4. COMMUNITY PARTICIPATION

The agencies desire to have an open dialogue with citizens concerning the results of the RI/FS and encourage citizens to participate by commenting on the proposal to perform various remedial actions with long-term monitoring at this AOC. This interaction between the agencies and the public is critical to the CERCLA process and to making sound environmental decisions. Details on this AOC, the environmental program, and all reports referred to in this document are available for review in the ***administrative record*** file located at 153 Brooks Road in the Griffiss Business and Technology Park and on the administrative record Web site found at https:\\afrpaar.afrpa.pentagon.af.mil/ar/docsearch.aspx. The public is encouraged to review all aspects of the administrative record and comment on the agencies' proposal to perform remedial actions with long-term monitoring. The agencies will consider all public comments on this proposed plan in its selection of a remedy for this AOC, as will be documented in a ROD. Depending on the comments received, the plan presented in the ROD could be different from the alternative presented in this proposed plan. All written and verbal comments will be summarized and responded to in the responsiveness summary section of the ROD.

Administrative Record
Documents including correspondence, public comments, and technical reports upon which the agencies base their remedial action selection.

How You Can Participate

Whether you are reading this type of document for the first time or are familiar with the Superfund process, you are invited to participate in the process.

- Read the proposed plan and review additional documents in the administrative record file.
- Contact the Air Force, EPA, or NYSDEC project managers listed below to ask questions or request information.
- Attend a public meeting and give verbal comments (see details below).
- Submit written comments (see comment form below) by October 25, 2007.

Public Comment Period

The agencies have set a public comment period from September 25, 2007 to October 25, 2007, to encourage public participation in the selection process. Written comments should be sent to:

Mr. Michael McDermott
BRAC Environmental Coordinator
Air Force Real Property Agency
153 Brooks Road
Rome, NY 13441

Public Meeting

The comment period includes a public meeting at which the Air Force will present the proposed plan. Representatives from the agencies will be available to answer questions and accept both oral and written comments. The public meeting is scheduled for 5:00 p.m., Wednesday, October 3, 2007, and will be held at the MVE Conference Room, Air Force Real Property Agency, 153 Brooks Road, Griffiss Business and Technology Park, Rome, New York.

More Griffiss Air Force Base Environmental Information

General information concerning the environmental program at the former Griffiss AFB can be found at the AFRPA offices at 153 Brooks Road, Rome, New York 13441 (phone 315-330-2275).

Additional Information

Three agencies are parties to the FFA: Air Force, NYSDEC, and EPA. The agreement ensures that environmental impacts on public health, welfare, and the environment associated with past and present activities at the former Griffiss AFB are thoroughly investigated and appropriate remedial actions are taken as necessary to protect the public health, welfare, and the environment. Any of the following agency representatives may be contacted to obtain additional information:

The **Air Force** is legally responsible for the environmental activities at the former Griffiss AFB. Since this site is on the National Priorities List, all investigations and cleanup plans are finalized only after consultation with EPA and NYSDEC.

For additional information concerning the environmental program at the former Griffiss AFB and the Air Force's role in preparing this proposed plan, contact:

Mr. Michael McDermott
BRAC Environmental Coordinator
Air Force Real Property Agency
153 Brooks Road
Rome, NY 13441
(315) 330-2275

The **New York State Department of Environmental Conservation**

For additional information concerning the state's role in preparing this proposed plan, contact:

Ms. Heather Bishop
New York State Department of Environmental Conservation
625 Broadway, 11th Floor
Albany, NY 12233
(518) 402-9692

The **U.S. Environmental Protection Agency**

For additional information concerning the EPA's role in preparing this proposed plan, contact:

Mr. Douglas Pocze
U.S. Environmental Protection Agency, Region II
290 Broadway, 18th Floor
New York, NY 10007-1866
(212) 637-4432

(Comments continued. Attach additional pages, if necessary.)

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Mr. Michael McDermott
BRAC Environmental Coordinator
Air Force Real Property Agency
153 Brooks Road
Rome, NY 13441

On-base Groundwater AOC

This comment form is provided for your convenience in submitting written comments to the Air Force concerning the OBGW AOC. If you would like to receive a copy of the ROD and Responsiveness Summary, which address public comments received on this proposed plan, please make sure the information on the mailing label below is correct.

Comments:

(continued on reverse)

BRAC Environmental Coordinator
Air Force Real Property Agency
153 Brooks Road
Rome, NY 13441

This mailing is to inform you of the proposed environmental plan for the OBGW AOC at the former Griffiss AFB, and to solicit your comments.

5. LANDFILL 6 GROUNDWATER

Landfill 6 is a 15.7-acre area located in the southern portion of the former Griffiss AFB between Perimeter Road and Three Mile Creek (see Figure 5-1). The landfill was in operation from 1955 to 1959 and is unlined. Disposal activities were conducted in two areas separated by a dirt access road that passes along the southern boundary of the landfill and bisects the northern area of the landfill. The majority of disposal activity occurred on a hillside north and east of the road; between 38,000 and 62,000 cubic yards of hardfill and general refuse were placed on the ground and burned in this area. The layer of waste and burned residue is estimated to be 5 to 10 feet thick. In the 1980s, fuel-contaminated soils were disposed to a depth of 3 feet in the central and southern portions of Landfill 6, and in 1986 a clay cap was constructed over this disposal area.

The topography at the Landfill 6 area tends toward the southwest, with 40 feet of relief occurring across the site. Surface water runoff follows the topography, flowing across the site toward Three Mile Creek. Groundwater flow at the site is predominantly to the southwest with southerly components in localized areas. The depth to groundwater ranges from 2.6 feet to 64.7 feet below ground surface (BGS) with an average of about 19 feet across the site. The site geology primarily consists of an average 60-foot-deep fine silty/sand layer with minor quantities of gravel, cobbles, and clay, followed by a 1 to 15-foot-thick till deposit overlying shale bedrock. There are eight groundwater drainage areas on the former base; the Landfill 6 area falls within the east side of the Three Mile Creek drainage basin.

There is a trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE) contaminated groundwater plume associated with Landfill 6 that extends downgradient for approximately 800 feet and covers approximately 8.4 acres. The lateral extent of the plume ranges from 200 to 700 feet and the vertical extent ranges from 20 feet BGS to 70 feet BGS, which is the top of bedrock. The TCE concentrations range from non-detect to 1,600 micrograms per liter (µg/L) and the cis-1,2-DCE concentrations range from non-detect to 1,000 µg/L.

In 2005, landfill cover improvements specified in the Landfill 6 ROD (February 2001) and the Landfill 6 Closure Plan (March 2004) included installation of an impermeable cover to reduce the amount of water infiltrating into the landfill. The cover consists of a gas venting layer, a geomembrane cover, and a barrier protection layer over the entire landfill. Other remedial activities specified in the ROD that were implemented include: maintenance of the impermeable cover, long-term monitoring of the groundwater and stream environment downgradient of the site, institutional controls in the form of deed restrictions to prohibit use of the area and groundwater, and evaluation of site conditions at least once every five years.

5.1 SUMMARY OF SITE ACTIVITIES

A groundwater monitoring well (TMCMW-9) was installed at Landfill 6 in 1981. Groundwater samples collected in 1982 indicated the presence of phenols and dissolved chromium, copper, and zinc. A passive soil gas survey performed in 1993 indicated the presence of petroleum fuel constituents.

Remedial Investigation

In 1994, an RI was performed. The main objective of the RI was to investigate the nature and extent of environmental contamination from historical releases at the AOC in order to determine whether any remedial action was necessary to prevent potential threats to human health and the environment that might arise from exposure to site conditions. The RI included a geophysical survey consisting of a magnetometry survey and ground-penetrating radar (GPR) survey; a passive soil gas survey; and sampling and analysis of surface soil, the results of which were provided in the Landfill 6 proposed plan and ROD (signed by EPA on June 7, 2001).

Semivolatile Organic Compounds (SVOCs)
A group of organic compounds that are easily extracted from soil, water, etc., using an organic solvent.

Volatile Organic Compounds (VOCs)
A group of organic compounds that have a tendency to vaporize readily.

The RI also included the installation of six new groundwater monitoring wells. The seven groundwater monitoring wells were then sampled during the RI. Analytical results indicated the presence of four s***emivolatile organic compounds***, 16 ***volatile organic compounds***, three pesticides, and 17 metals. Three VOCs and six metals exceeded the most stringent criteria (see Table 5-1). The 1994 RI results indicated the presence of groundwater contamination, primarily consisting of TCE, cis-1,2-DCE, and vinyl chloride.

Table 5-1
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
LANDFILL 6 PLUME
REMEDIAL INVESTIGATION GROUNDWATER SAMPLES (1994)

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (µg/L)			
Benzene	1.4	1/7	1 [a]
Vinyl Chloride	0.12 J – 30	1/7	2 [a, b]
cis-1,2-Dichloroethene	0.4 J – 170	1/7	5 [a]
Metals (µg/L)			
Aluminum	130 – 210	2/7	50 [c]
Iron	40 – 14,100	1/7	300 [a, c]
Manganese	11 – 1,100	1/7	50 [c]
Nickel	380	1/7	100 [a, c]
Selenium	0.59 J – 1,700	1/7	10 [a]
Sodium	2,700 – 104,000	4/7	20,000 [a]

[a] NYSDEC Class GA groundwater standard, June 1998.
[b] EPA Federal primary maximum contaminant level.
[c] EPA Federal secondary maximum contaminant level.
Key: J = Estimated concentration.
µg/L = Micrograms per liter.

RI Risk Assessment

In 1994, as part of the RI, a baseline human health risk assessment was conducted to evaluate current and future potential risks to human health and the environment associated with contaminants found in the groundwater at the site. The results of this risk

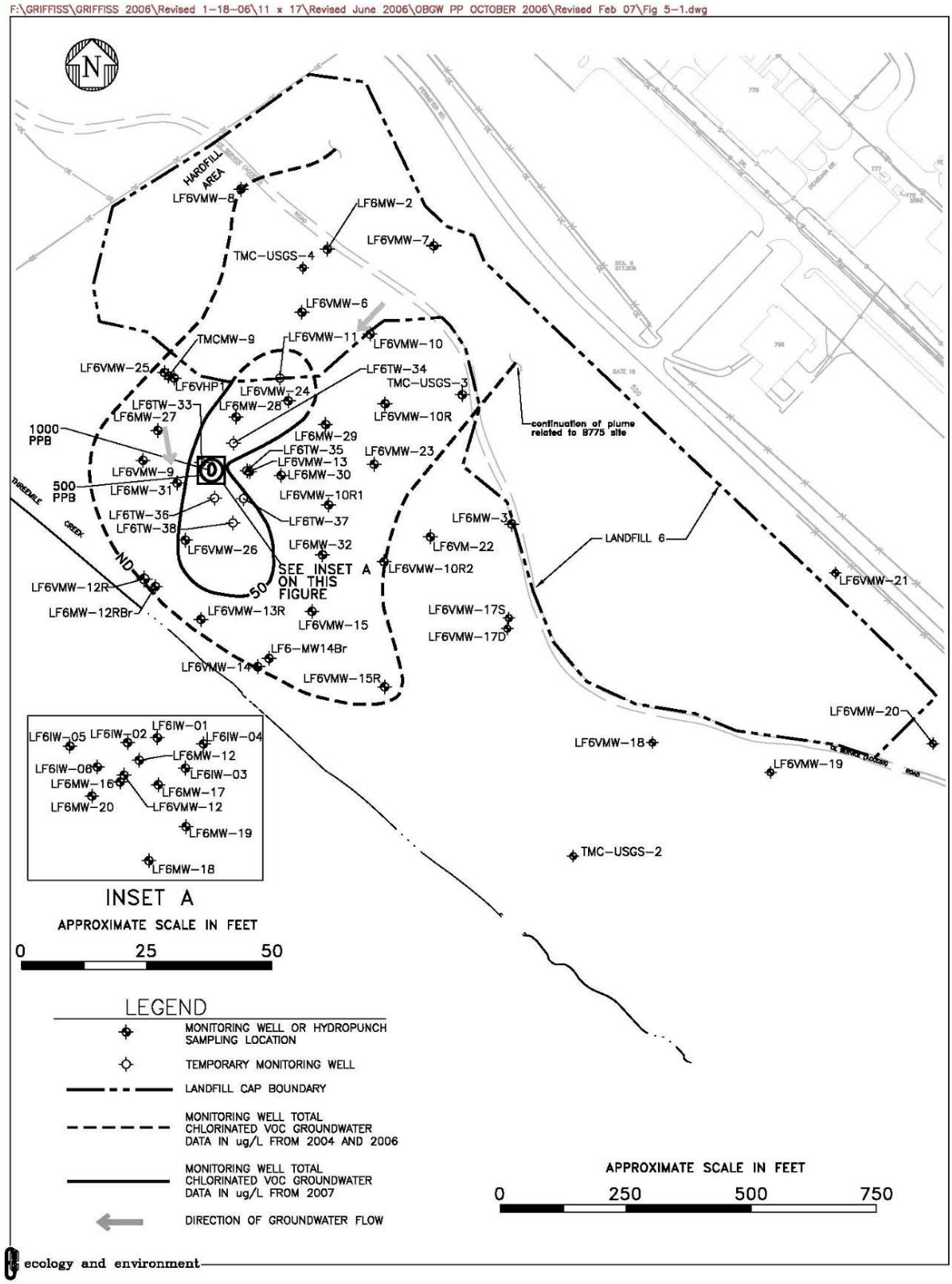

Figure 5-1 Landfill 6 Groundwater Monitoring Well and Sampling Locations

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assessment are reported here, however, because supplementary investigations (described below) yielded higher concentrations of contaminants than the RI, the risks are likely underestimated. The cleanup goals are based on ARARs and TBCs rather than the results of this risk assessment.

The risk assessment evaluated exposure to potential residential and occupational (industrial worker) populations. The exposure scenarios for each population are described in Table 5-2. The risk assessment process is described in Section 2 of this proposed plan. The exposure assumptions for each pathway and receptor, which were selected in accordance with EPA guidance, are more fully described in the RI report.

Table 5-2
LANDFILL 6 PLUME
RISK ASSESSMENT EXPOSURE SCENARIOS

Residential Receptor (groundwater used for potable water)	Industrial Worker (groundwater used for potable or process water)
■ Groundwater ingestion ■ Inhalation of volatiles in groundwater (bathing, showering) ■ Dermal contact with groundwater ■ Ingestion of irrigated crops	■ Groundwater ingestion ■ Inhalation of volatiles in groundwater ■ Dermal contact with groundwater

Carcinogenic Risk

Although it is unlikely that the land next to Landfill 6 will be developed, the hypothetical future use of this land for residential purposes was considered. The carcinogenic risks to adult residential receptors from dermal contact with compounds in the groundwater and ingestion of crops irrigated with groundwater were calculated as 4 in 100,000 (4×10^{-5}) and 6 in 100,000 (6×10^{-5}), which are below or within the EPA's acceptable target risk range. The total carcinogenic risks to adult residential receptors from inhalation of VOCs from groundwater and ingestion of groundwater were 5×10^{-4} and 1×10^{-3}, respectively, which are above EPA's acceptable target risk range. The greatest contributor to the excess risk for groundwater pathways was vinyl chloride.

The cumulative carcinogenic risk to industrial workers at Landfill 6 from the groundwater pathways was calculated as 2 in 10,000 (2×10^{-4}), which is above EPA's acceptable target risk range. The greatest contributor to this risk was vinyl chloride through the ingestion of groundwater pathway.

Noncarcinogenic Risk

For noncarcinogenic risks, the child is the receptor generally assumed to have the greatest estimated risk; therefore, HIs were calculated for the adult, adolescent, youth, and child.

The total HIs for the future residential adult, adolescent, youth, and child exposed to groundwater were 10, 10, 20, and 30, respectively, which are above the acceptable level of 1. Ingestion of groundwater contaminated with selenium and manganese was the major contributor to this risk.

The total HIs for industrial workers exposed to groundwater was calculated as 4, which is above the acceptable level of 1. The HIs calculated for ingestion of groundwater, inhalation of volatiles released from groundwater, and dermal exposure to groundwater were 4, 0.0003, and 0.04, respectively.

The results of the human health risk assessment indicated that the potential risk of COPCs in groundwater would be reduced substantially if groundwater was not used for drinking water purposes. The quantitative evaluation of risk is subject to several conservative assumptions and should not be considered an absolute measure of risk.

Ecological Risk Assessment

A baseline risk assessment for ecological receptors from exposures to surface soil at Landfill 6 was conducted during the RI. An ecological risk assessment for exposure to groundwater was not performed because wildlife does not have access to groundwater at Landfill 6.

Supplemental Investigation

In 1997, as part of the OBGW AOC SI activities, two test pits were excavated; no drums were encountered in the test pits. Additional activities at Landfill 6 included Geoprobe groundwater screening sample collection at four locations (LF6DGP-1 through 4), the installation of one vertical profile monitoring well (LF6VM-6), and re-sampling of four existing (two Landfill 6 and two Three Mile Creek) wells. Analytical results of the four Geoprobe groundwater screening samples were all nondetect. Analytical results for the monitoring wells indicated the presence of three SVOCs and five VOCs. Four VOCs were detected at concentrations exceeding the most stringent criteria (see Table 5-3).

Table 5-3
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
LANDFILL 6 PLUME
SUPPLEMENTAL INVESTIGATION GROUNDWATER SAMPLES (1997)

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (µg/L)			
cis-1,2-Dichloroethene	0.30 J – 180	2/5	5 [a]
Benzene	1.0 – 1.2 J	2/5	1 [a]
Trichloroethene	26	1/5	5 [a, b]
Vinyl Chloride	20 – 29	2/5	2 [a, b]

[a] NYSDEC Class GA groundwater standard, June 1998.
[b] EPA Federal primary maximum contaminant level.
Key: J = Estimated concentration.
µg/L = Micrograms per liter.

Groundwater Study

A comprehensive groundwater study to define the vertical and lateral extent of groundwater contamination at the site was completed in spring 2000. This investigation consisted of drilling and vertically profiling 16 boreholes (including 105 Hydropunch samples to vertically and horizontally delineate the Landfill 6 plume), installation and sampling of eight wells, and sampling of two existing Three Mile Creek wells.

Based on Hydropunch data, the contamination plume was delineated both vertically and horizontally. The four contaminants of concern (COCs) detected in the Hydropunch samples and the highest concentrations were: cis-1,2-DCE at 983 µg/L in LF6VMW-12; tetrachloroethene (PCE) at 1.1 µg/L in LF6VMW-7; TCE at 1,587 µg/L in LF6VMW-12, and vinyl chloride at 8.4 µg/L in LF6VMW-11. Cis-1,2-DCE was detected in eight of

the 16 boreholes, PCE was detected in four boreholes, TCE was detected in nine boreholes, and vinyl chloride was detected in one borehole.

During this study, nine VOCs were detected in the monitoring well samples. Three VOCs (cis-1,2-DCE, TCE, and vinyl chloride) were detected in the monitoring wells at concentrations exceeding the most stringent criteria (see Table 5-4). The vertical profiling data indicated that there does not appear to be a single-point source of contamination. The width of the plume was estimated at approximately 200 feet near the top of Landfill 6 and 700 feet at the leading edge (approximately 100 feet from Three Mile Creek) with the base of the plume beneath the top of Landfill 6 appearing to merge or nearly merge with the leading edge of another plume called the Building 775 plume (*Landfill 6 and Building 775 Areas of Concern Groundwater Study*, Ecology and Environment, Inc., August 2000).

Table 5-4
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
LANDFILL 6 PLUME
2000 GROUNDWATER STUDY GROUNDWATER SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (µg/L)			
cis-1,2-Dichloroethene	0.254J – 35.4	3/12	5[a]
Trichloroethene	0.864 – 26.3	2/12	5 [a, b]
Vinyl Chloride	0.2457 J – 6.21	1/12	2 [a, b]

[a] NYSDEC Class GA groundwater standard, June 1998.
[b] EPA Federal primary maximum contaminant level.
Key: J = Estimated concentration.
µg/L = Micrograms per liter.

Bedrock Groundwater Study

Overburden
The top layer of soil, which is a silty, fine, sandy soil at the former Griffiss AFB.

A Bedrock Groundwater Study for Landfill 6 was conducted in 2002. The study included the installation and groundwater sampling (VOCs, methane, ethane, ethene, anions, and dissolved organic carbon) of two new downgradient bedrock wells (LF6MW-12RBr and LF6MW-14Br) and one new overburden monitoring well. Analytical results for the bedrock groundwater samples indicated the presence of six VOCs, which were considered to be field or laboratory artifacts. All concentrations were below the most stringent criteria.

The overburden monitoring well (LF6MW-12) was installed and sampled at the most contaminated portion of the plume. Analytical results for the new overburden well and the two Hydropunch samples indicated the presence of five VOCs at concentrations exceeding the most stringent criteria (see Table 5-5). None of these contaminants were detected in the bedrock groundwater samples.

The Bedrock Groundwater Study concluded that the bedrock was free of contamination (TCE, DCE) observed in the overlying overburden aquifer and no further action was recommended for the bedrock groundwater.

Table 5-5
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
LANDFILL 6 PLUME
OVERBURDEN MONITORING WELL LF6MW-12 GROUNDWATER SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (µg/L)			
Benzene	2.31	1/1	1 [a]
cis-1,2-Dichloroethene	485	1/3	5 [a]
trans-1,2-Dichloroethene	14.9	1/3	5 [a]
Trichloroethene	1,110	1/3	5 [a, b]
Vinyl chloride	6.90	1/3	2 [a, b]

[a] NYSDEC Class GA groundwater standard, June 1998.
[b] EPA Federal primary maximum contaminant level.
Key: J = Estimated concentration.
µg/L = Micrograms per liter.

Feasibility Study (FS)

A draft FS was developed for Landfill 6 in March 2001 and was subsequently revised in the final FS, dated April 2005, using information collected during the treatability studies described below. Following additional groundwater sampling performed at the site, groundwater contamination contours were reevaluated in 2006 along with the remedial alternative selected in the final FS. This reevaluation is described in the final FS Addendum for this site, dated September 2006.

The purpose of the FS was to identify and evaluate technologies that are available to remediate the areas identified in the previous investigations as requiring remedial action. Technologies evaluated for Landfill 6 groundwater contamination are discussed in detail in Section 5.2, Remedial Action.

Treatability Studies

The 2001 draft FS recommended that in-situ treatment technologies presented in the report be pursued further to evaluate their site-specific effectiveness of remediating the COCs at this site (primarily TCE, with secondary COCs of cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride). From this recommendation, it was decided to proceed forward with a phased approach (bench-scale to pilot-scale to full-scale implementation if warranted) for in-situ chemical oxidation as it has historically proven to be an effective technology with the ability to destroy contaminants found at the site.

Bench-scale Study
Bench-scale tests using potassium permanganate as the oxidant were performed for groundwater at Landfill 6 in June 2002. Results from the tests on the groundwater indicated that site COCs were effectively destroyed by potassium permanganate. The successful bench-scale results using potassium permanganate prompted the performance of a field pilot-scale study.

Field Pilot-scale Study
The pilot-scale studies at Landfill 6 conducted from November 2002 through November 2003 included two rounds of injections using six injection points located in the vicinity of the LF6MW-12 boring location. Analytical results for the baseline samples (LF6MW-12

and the 11 new wells) collected prior to the potassium permanganate injections indicated the presence of 19 VOCs and 17 metals, with five VOCs and seven metals detected at concentrations exceeding the most stringent criteria (see Table 5-6).

The first injection event (November 2002) consisted of delivering 12,000 gallons of 0.6% by weight of potassium permanganate by gravity. In November 2003, the second injection event consisted of delivering 39,000 gallons of 1.5% by weight of potassium permanganate by gravity.

Table 5-6
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
LANDFILL 6 PLUME
GROUNDWATER TREATABILITY STUDY - BASELINE SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (µg/L)			
Benzene	0.343 J - 1.52	3/12	1 [a]
cis-1,2-Dichloroethene	21.6 - 491	13/12	5 [a]
trans-1,2-Dichloroethene	0.176 J - 30.1	12/12	5 [a]
Trichloroethene	98.0 - 1,180	13/12	5 [a, b]
Vinyl chloride	0.220 J - 10.8	12/12	2 [a, b]
Metals (µg/L)			
Aluminum	50.5 J - 1,010	4/4	50 [c]
Iron	1,640 - 2,220	4/4	300 [a, c]
Lead	2.11 J	3/4	15 [b]
Magnesium	32,400 - 44,400	3/4	35,000 [d]
Manganese	1,030 - 2,000	4/4	50 [c]
Sodium	14,900 - 36,900	3/4	20,000 [a]
Thallium	17.2 J - 27.1	4/4	0.5 [d]

[a] NYSDEC Class GA groundwater standard, June 1998.
[b] EPA Federal primary maximum contaminant level.
[c] EPA Federal secondary maximum contaminant level.
[d] NYSDEC Class GA groundwater guidance value; June 1998.
Key: J = Estimated concentration.
µg/L = Micrograms per liter.

The results of the pilot study indicated a general decrease in VOC concentrations. Although there was no indication of contaminant reduction in the treatment area within a six-week performance monitoring period after the first injection, there was an approximately 30% to 50% reduction of VOCs in all of the injection wells and some of the monitoring wells one year after the first injection event (but before the second injection event). The poor response of the oxidant after the first injection is believed to have been the result of a higher natural oxidant demand (NOD) in the treatment area than anticipated, which consumed most of the oxidant before it could reduce site contaminants (not enough oxidant mass was injected to overcome the NOD). The results of the second injection exhibited a full reduction of TCE in the injection wells within two weeks of the injection, followed by a rebound four months after the injection. Two injection wells sustained a 50% to 77% overall TCE reduction and approximately 50% total VOC reduction after the second injection from baseline conditions (prior to the first injection). In general, the pilot study results indicated that conditions at the site are conducive to treating TCE and other VOCs at the site with in-situ chemical oxidation.

Pre-Design Investigations

In 2006 and 2007, seven monitoring wells (LF6MW-27 through -32 and LF6MW-13RD) and six temporary monitoring wells (LF6TW-33 through LF6TW-38) were installed and sampled to better define the aerial extent of the portion of the plume with the highest level of contamination, which surrounds monitoring well LF6VMW-12. Additional activities at Landfill 6 included re-sampling of four existing monitoring wells (LF6VMW-12, LF6MW-18, LF6MW-19, and LF6MW-20). Analytical results for the monitoring wells indicated the presence of three VOCs at concentrations exceeding the most stringent criteria (see Table 5-7).

Table 5-7
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
LANDFILL 6 PLUME
2006 AND 2007 PRE-DESIGN INVESTIGATIONS - GROUNDWATER SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (µg/L)			
cis-1,2-Dichloroethene	0.52J - 284	11/17	5 [a]
trans-1,2-Dichloroethene	0.12J - 9.85	1/17	5 [a]
Trichloroethene	5.7 - 1,140	15/17	5 [a, b]

[a] NYSDEC Class GA groundwater standard, June 1998.
[b] EPA Federal primary maximum contaminant level.
Key: J = Estimated concentration.
µg/L = Micrograms per liter.

5.2 REMEDIAL ACTION

Remedial Action Objectives

For the Landfill 6 groundwater, the remedial action objectives (RAOs), as identified in the FS, are to make the groundwater potable for domestic or municipal use, or to prevent exposure to groundwater until groundwater standards are achieved while maintaining institutional controls to prevent groundwater use and to prevent contaminated groundwater from adversely impacting surface water and sediment.

Description and Evaluation of Remedial Action Alternatives

CERCLA regulations mandate that a remedial action must be protective of human health and the environment. The following remedial alternatives were developed for the Landfill 6 plume. For purposes of the FS, each alternative assumes a maximum 30-year remediation duration which is typically used in FSs for evaluation purposes. A summary of estimated remediation durations and costs are presented in Table 5-8.

- Alternative 1: No action involves no remedial action for treatment of the Landfill 6 plume. The plume would be allowed to migrate and naturally attenuate. No monitoring would be conducted to evaluate the progress of these natural processes.

- Alternative 2: Institutional actions would employ methods such as deed restrictions to prevent future use of the groundwater, and a groundwater monitoring program to evaluate the extent of migration and attenuation of the plume. For purposes of the FS, it is assumed that on-site contaminant concentrations would remain above cleanup goals for the assumed 30-year alternative duration.

- Alternative 3: Monitored natural attenuation would employ natural processes to reduce contaminant concentrations within the aquifer. Long-term monitoring and institutional controls would also be included in this alternative. For purposes of the FS, it was assumed that on-site contaminant concentrations would remain above cleanup goals for the assumed 30-year alternative duration.

- Alternative 4: In-situ chemical oxidation would involve the delivery of a strong oxidizing agent into the subsurface to oxidize COCs to non-toxic compounds. In addition, institutional controls, including long-term monitoring of groundwater, would be implemented to minimize the potential for future exposure to contaminated groundwater until cleanup goals were achieved. During this action, there would be continued monitoring of the extent of migration or natural attenuation of the plume. Since this alternative involves active treatment of and destruction of contaminants of concern, maintenance of institutional controls and the long-term monitoring program was assumed for an estimated 10 years.

- Alternative 5: In-well air stripping would involve the installation of groundwater-circulating/air-stripping wells to strip the contaminated groundwater of contaminants. Long-term monitoring of the groundwater plume would also be included in this alternative. Monitoring is assumed to be required for an estimated 15 years (5 years during operation of the air stripping system and 10 years into the future).

- Alternative 6: This alternative would involve in-situ bioremediation combined with groundwater extraction and re-circulation if necessary. In-situ bioremediation of the area of the plume with the highest COC concentrations would be performed to enhance remediation efforts at the site. Long-term monitoring of the groundwater plume would also be included in this alternative. For purposes of the FS, it was assumed that on-site contaminant concentrations would remain above cleanup goals for an estimated 20 years.

TABLE 5-8
SUMMARY OF REMEDIAL ALTERNATIVE DURATIONS AND COSTS FOR LANDFILL 6

Description	Alternative					
	1	2	3	4	5	6
	No Action	Institutional Actions	Natural Attenuation	In-situ Oxidation	In Well Air Stripping	In-situ Bioremediation
Total Approximate Project Duration (Years)	0	30	30	10	15	20
Total Present Value (in $ 2004)	**$0**	**$635,400**	**$1,651,800**	**$4,102,500**	**$1,917,300**	**$1,940,700**

Key:
LTM = Long-term monitoring.

Under Alternatives 1, 2, and 3, no actions would be taken to reduce levels of contaminants in groundwater. Alternatives 1, 2, and 3 represent the least expensive alternatives; however, treatment technologies would not be implemented and RAOs are not expected to be achieved within the assumed 30-year period.

Under Alternatives 4, 5, and 6, several active treatment technologies would be employed. Although a chemical oxidation (Alternative 4) pilot study performed at the site illustrated

that contaminant mass can be reduced within the shortest treatment duration, the estimated present-worth cost to implement this technology full-scale is approximately double the next most expensive alternative (Alternative 6 – In-situ Bioremediation). Full-scale implementation costs of Alternatives 5 and 6 are on the same order of magnitude. For Alternative 5, RAOs are expected to be achieved within five years of operation, with long-term monitoring continuing into the future for 10 years. Uncertainties associated with the effectiveness must be determined with a pilot-scale study before full-scale implementation. Alternative 6 (In-situ Bioremediation) is expected to meet RAOs in about 20 years which assumes 10 years of operation and maintenance (O&M) of a treatment system and 10 years of long-term monitoring.

Based on a comparative analysis of remedial alternatives, according to established criteria, the recommended alternative for the Landfill 6 plume is Alternative 6, In-situ Bioremediation (see final FS Report [April 2005] and final FS Addendums/Supplement [September 2006] for Landfill 6 Groundwater, Building 775 Groundwater, and Building 817/Weapons Storage Area Groundwater). In-situ bioremediation when used to remediate contaminated groundwater, represents an active remedial approach to permanently reduce the toxicity, mobility, and volume of site COCs, which is the preferred approach, when practical. This alternative also provides for protection of human health and the environment. During the remediation process, deed and/or lease restrictions would be required.

Evaluation Criteria for Remedial Action Alternatives

Remedial alternatives are assessed on the basis of both a detailed and a comparative analysis pursuant to the NCP. The detailed analysis of Landfill 6 groundwater in the FS reports consisted of (1) an assessment of the individual alternatives against seven evaluation criteria and (2) a comparative analysis focusing upon the relative performance of each alternative against the criteria.

In general, the following "threshold" criteria must be satisfied by an alternative for it to be eligible for selection. The proposed alternative is briefly evaluated below for each of the first seven criteria:

1. Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

   No human or environmental receptors are currently impacted by this plume. The proposed alternative will remove contaminants from the subsurface through in-situ bioremediation. Deed restrictions for use of the area and groundwater will be in place during remediation.

2. Compliance with ARARs addresses whether a remedy would (1) meet all of the ARARs or (2) provide grounds for invoking a waiver.

   Through removal of contaminants via bioremediation, concentrations in the aquifer would be reduced to levels below groundwater standards, meeting chemical-specific ARARs.

In addition, the following "primary balancing" criteria are used to make comparisons and identify the major trade-off among alternatives:

3. Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

   Because contaminants would be removed from the aquifer through biodegradation, the proposed alternative is effective in the long term.

4. Reduction of toxicity, mobility, or volume via treatment refers to a remedial technology's expected ability to reduce the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants at the site.

   The proposed alternative removes contaminants from the aquifer by bioremediation thus reducing volume through treatment.

5. Short-term effectiveness addresses (1) the period of time needed to achieve protection and (2) any adverse impacts on human health and the environment that may be posed during the construction and implementation periods until cleanup goals are achieved.

   The remedy will consist of injecting vegetable oil into the impacted area causing limited ground disturbance. Property transfer may be impacted until RAOs have been achieved.

6. Implementability refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed.

   The proposed alternative is readily implemented.

7. Cost includes estimated capital, O&M, and present-worth costs.

   The estimated capital cost of Alternative 6 was $880,800 (in 2001 dollars). The estimated present worth O&M cost of $944,600 (in 2001 dollars) includes the treatment system maintenance, treatment media replacement and disposal, and long-term monitoring. The 2004 total present worth cost of the proposed alternative is estimated at $1,940,700.

Finally, the following "modifying" criteria are considered fully after the formal public comment period on the proposed plan is complete:

8. State acceptance indicates whether, based on its review of the proposed plan and RI, SI, and FS reports, the State supports or opposes the preferred alternative and/or has identified any reservations with respect to the preferred alternative.

9. Community acceptance refers to the public's general response to the alternatives described in the proposed plan and the RI, SI, and FS reports. Factors of community acceptance include support, reservation, or opposition by the community.

5.3 DESCRIPTION OF THE PREFERRED ALTERNATIVE

The selected remedial approach (Alternative 6) includes bioremediation of the plume in the area exhibiting the highest COC concentrations and if necessary, installation of recovery wells to extract groundwater for recirculation. An in-situ bioreactor is being proposed because the predesign groundwater investigation indicated that biodegradation of COCs is occurring at the site. Considering the information obtained during the predesign investigations with respect to the limited size of the groundwater plume containing the highest total VOC concentrations, the remedy at this site will be implemented in a phased approach. First, bioremediation will occur, then groundwater extraction and recirculation will be implemented, if needed.

The in-situ bioreactor will be created by increasing and sustaining a higher level of dissolved organic carbon in the groundwater contaminated with greater than 500 parts per billion (ppb) of total VOCs. The organic carbon will be added to the subsurface via injections of a vegetable oil emulsion into injection points within the 500 ppb contour line, see Figure 5-1. If total VOCs exceed threshold criteria (to be determined during the design stage) in monitoring wells outside of the treatment area, additional actions such as additional vegetable oil injection and/or recirculation of on-site groundwater would be considered for implementation.

If elevated levels of DCE and vinyl chloride attributable to site groundwater are detected in Three Mile Creek, implementation of a contingency plan will be employed including an in-situ air sparge wall (or other action agreed upon by the Air Force, EPA, and NYSDEC).

Long-term monitoring of the groundwater plume and treatment performance during full-scale implementation will be performed. In order to properly monitor the plume, groundwater sampling will be performed to determine and monitor seasonal water table and contaminant concentration fluctuations. Sampling of 12 monitoring wells is proposed for long-term monitoring. The number and location of the proposed long-term monitoring network will be finalized during the design stage. The sampling will be coordinated with the sampling required to evaluate the effectiveness of the Landfill 6 impermeable cover (see Section 3.1). Institutional controls in the form of deed restrictions within the main landfill boundary and for affected groundwater (see Figure 5-2) will also be implemented as follows:

- Development and use of the entire SD-52, Landfill 6 Operable Unit AOC property for residential housing, elementary and secondary schools, childcare facilities and playgrounds will be prohibited unless prior approval is received from the Air Force, EPA, and NYSDEC.

- The owner or occupant of this site shall not extract, utilize, consume, or permit to be extracted, any water from the subsurface aquifer within the boundary of the site unless such owner or occupant obtains prior written approval from the NYSDOH.

- The owner or occupant of this site will not engage in any activities that will disrupt required remedial investigation, response actions and oversight activities, should any be required.

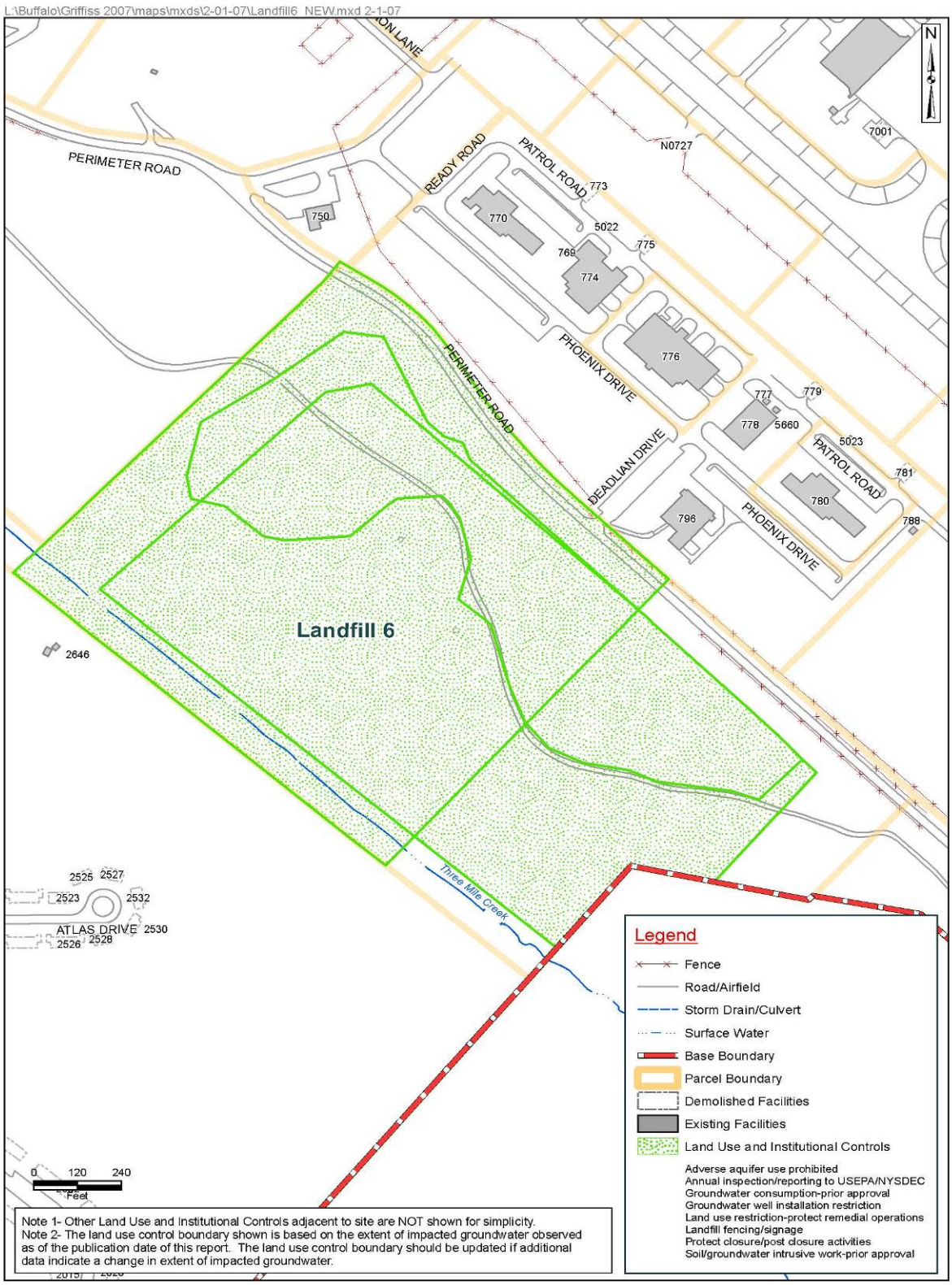

Figure 5-2 Landfill 6 Land Use and Institutional Controls Boundary

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- The owner or occupant of this site will be restricted from access to all subsurface soils and groundwater at or below the groundwater interface at this AOC until the BRAC cleanup team identifies appropriate cleanup requirements**,** and cleanup actions are executed by the Air Force to the satisfaction of the BRAC cleanup team.

- Intrusive work or other activities that impact the effectiveness of the landfill closure and post-closure activities will not be allowed within the restricted landfill boundary (see Figure 5-1).

- Posting of notices and signs to minimize the interference with the landfill closure and post-closure activities. Signs will be posted along the landfill property boundary that read "SOLID WASTE LANDFILL – CONTAINS HAZARDOUS SUBSTANCES – NO TRESPASSING."

Monitoring is assumed to be required for 20 years. If COCs remain above proposed cleanup goals after the assumed 20-year period, additional monitoring would be considered.

Five-year reviews will be performed by the Air Force, in conjunction with the EPA and NYSDEC, to ensure the remedy is still performing as planned and is protective of public health and the environment.

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6. BUILDING 775 GROUNDWATER

Building 775 is located in the SAC Hill area in the south-central portion of the former Griffiss AFB (see Figure 6-1). The site is situated on a topographic high relative to the runway and flight aprons. Building 775 (Pumphouse 3) was one of four pumphouses located east of Ready Road. Building 774 located across from Building 775 to the west, was identified as a TCE storage area housing a 400-gallon TCE vat. The vat has been removed and the area where the drums were stored is currently paved or grass covered.

It was originally thought that Pumphouse 3 was the origin of a TCE plume at the site, but during the RI and SI investigations (described below), it was determined that the actual source of contamination was the degreasing room/vat in Building 774. This degreasing system utilized a monorail to carry equipment to the degreasing vat for solvent cleaning when the building was used as an armament and electronics shop. Chlorinated solvents that have contributed to the groundwater contamination are suspected to have originated from this area. No evidence of the degreasing system was found during the basewide environmental baseline survey (EBS) site inspection in April 1994.

The topography at the Building 775 area is relatively flat with less than 1 foot of topographic relief. Run-off from the site is channeled into the base storm system discharging to Three Mile Creek. The site geology primarily consists of sand, silt, gravel, and clay.

Groundwater flow beneath the Building 775 site is predominantly to the southwest with a slight southerly component in localized areas. The average depth to groundwater is about 60 feet. The water table exhibits a very low gradient (0.005 ft/ft) to an even lower gradient (0.0011 ft/ft) to the northeast between the Nosedock area and the northeast edge of SAC Hill.

Vertical profiling data have indicated that the source area for the Building 775 site is the area around former Buildings 773 and 775 and current Building 774. The TCE contamination has traveled both laterally, approximately 1,000 feet to the south/southwest, and vertically, a total of 120 feet BGS (including 60 feet through vadose and 60 feet through the water table to the top of bedrock). The width of the TCE plume, which covers approximately 14 acres, is approximately 500 feet in the source area and 800 feet at the leading edge.

6.1 SUMMARY OF SITE ACTIVITIES

Three groundwater monitoring wells (775MW-1, -2, and -3) were installed at Pumphouse 3 in 1989 as part of a monitoring well installation program for the four pumphouses. Groundwater samples collected from Building 775 wells in 1989 indicated the presence of PCE and TCE. In August 1991, a leak detection and monitoring system was installed on the hydrant piping system and associated underground storage tanks (USTs) at the four pumphouses at the former Griffiss AFB, and in December 1991 the USTs at Pumphouse 3 passed the initial tightness testing. Groundwater samples collected at Pumphouse 3 in 1991 indicated the presence of PCE, TCE, chloroform, methylene chloride, and several metals. Groundwater samples collected from Building 775 wells in 1991 indicated the presence of PCE, TCE, chloroform, methylene chloride, bis(2-ethylhexyl)phthalate, and several metals.

Groundwater samples collected from Building 775 wells in 1992 indicated the presence of chrysene and benzo(a)anthracene. In 1992 and 1993, quarterly groundwater sampling indicated the presence of benzene, chloroform, xylenes, PCE, and TCE, as well as several

metals. Benzene, xylenes, and TCE were detected at concentrations exceeding the most stringent criteria (see Table 6-1).

Table 6-1
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
BUILDING 775 PLUME
1992 - 1993 QUARTERLY AND 1994 RI GROUNDWATER SAMPLING

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (µg/L)			
Benzene	1.2 – 3.9	3/13	1 [a]
Xylenes	10	1/13	5 [a]
Trichloroethene	11 - 100	12/13	5 [a, b]
SVOCs (µg/L)			
Bis(2-ethylhexyl)phthalate	2 – 16 J	2/13	5 [a]
Metals (µg/L)			
Aluminum	285 – 620	2/13	50 [c]
Iron	60 – 1,710	4/13	300 [a, c]
Lead	3.4	1/13	2.9 [c]
Manganese	29 – 140	3/13	50 [c]
Thallium	0.7 J	1/13	0.5 [d]

[a] NYSDEC Class GA groundwater standard, June 1998.
[b] EPA Federal primary maximum contaminant level.
[c] EPA Federal secondary maximum contaminant level.
[d] NYSDEC Class GA groundwater guidance value, June 1998.
Key: J = Estimated concentration.
µg/L = Micrograms per liter.

Remedial Investigation

In 1994, an RI was performed. The main objective of the RI was to investigate the nature and extent of environmental contamination from historical releases at the Building 775 site in order to determine whether any remedial action was necessary to prevent potential threats to human health and the environment. The RI included an active soil survey, grab groundwater sampling, resampling of one Building 775 well and one Building 773 well, collection of three surface soil samples in the vicinity of the former location of the TCE vat and drum storage area (previously located on the east side of Building 774), and installation and sampling of one soil boring near Building 774.

The active soil gas/groundwater screening survey indicated the presence of chloroform, 1,1,1-trichloroethane, TCE, and PCE, with the highest TCE concentrations in groundwater found in samples located south and west of Building 774. The highest TCE concentrations in soil gas were found in samples located northeast of Building 774. Two groundwater samples were collected from Building 775. Analytical results indicated the presence of three VOCs, three SVOCs, four pesticides, and 11 metals. One VOC (TCE), one SVOC (bis(2-ethylhexyl)phthalate), and five metals were detected at concentrations exceeding the most stringent criteria (see Table 6-1).

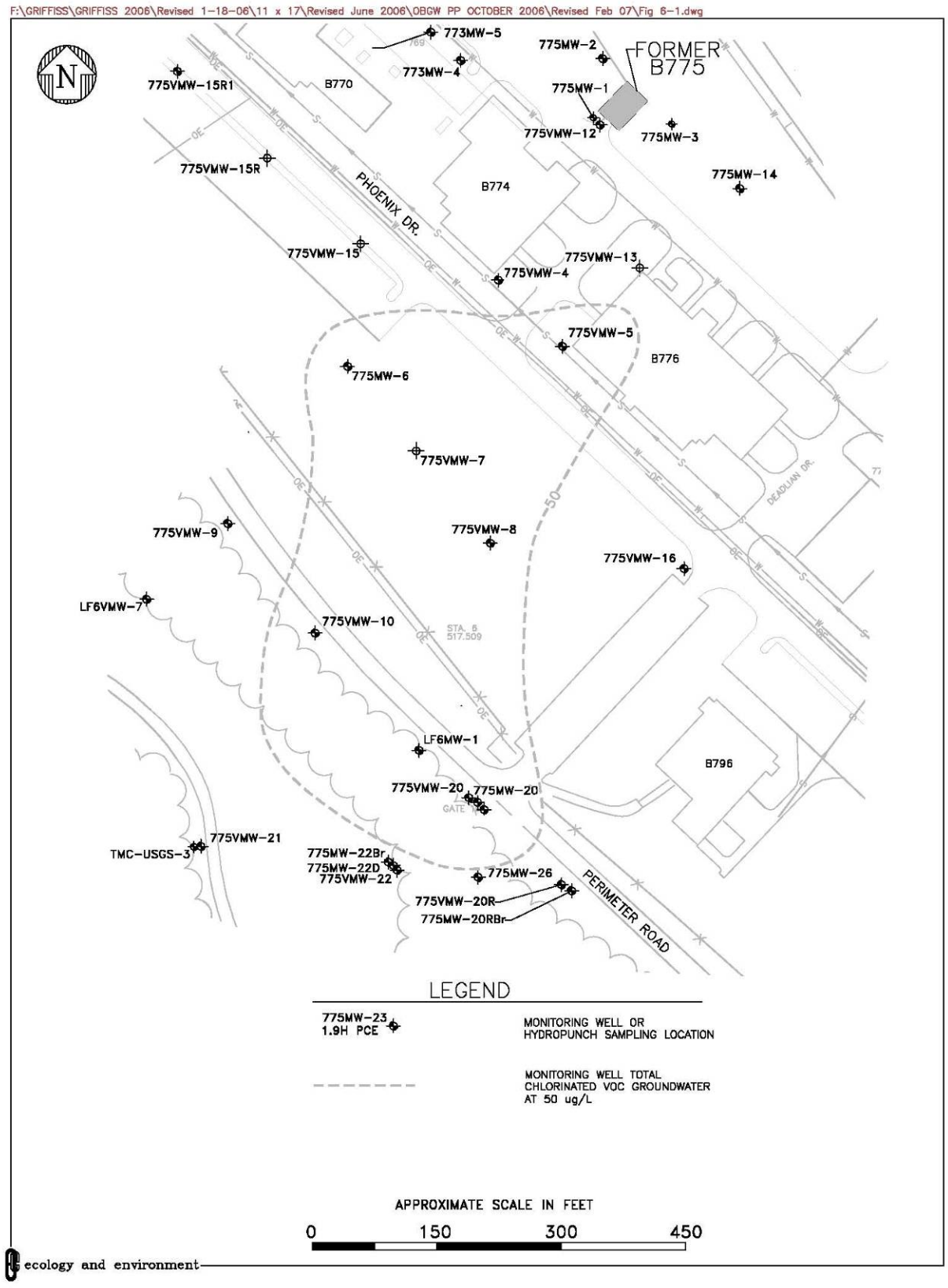

Figure 6-1 Building 775 Groundwater Monitoring Well and Sampling Locations

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RI Risk Assessment

In 1994, as part of the RI, a baseline human health risk assessment was conducted to evaluate current and future potential risks to human health and the environment associated with contaminants found in the groundwater at the site. The results of this risk assessment are reported here, however, because supplementary investigations (described below) yielded higher concentrations of contaminants than the RI, the risks are likely underestimated. The cleanup goals are based on ARARs and TBCs rather than the results of this risk assessment.

The current and future land use designation for the Building 775 area is industrial. The 1994 human health risk assessment evaluated exposure to potential industrial workers if groundwater at the site was used as process water for industrial purposes or as a potable water source. The receptors and pathways evaluated for groundwater exposure in the risk assessment are summarized in Table 6-2. The exposure assumptions were selected in accordance with EPA guidance and are more fully described in the RI report

Table 6-2 BUILDING 775 PLUME RISK ASSESSMENT EXPOSURE SCENARIO
INDUSTRIAL WORKER (Future) **(groundwater used for potable or process water)**
■ Groundwater ingestion ■ Inhalation of volatiles in groundwater ■ Dermal contact with groundwater

Carcinogenic Risk

The cumulative carcinogenic risk to industrial workers from site contaminants in groundwater was calculated as 8 in 1,000,000 (8×10^{-6}), which is within EPA's acceptable target risk range. The pathway-specific risks from ingestion, inhalation of volatiles released from groundwater, and dermal exposure to groundwater were 7×10^{-6}, 3×10^{-7}, and 9×10^{-7}, respectively.

Noncarcinogenic Risk

The total HI for industrial workers exposed to groundwater was calculated as 0.4, which is below the acceptable level of 1.

Ecological Risk Assessment

An ecological risk assessment for exposure to groundwater was not performed because wildlife does not have access to groundwater at Building 775.

Supplemental Investigation

In 1997, an SI was performed. Four existing monitoring wells were resampled, and seven new wells were installed and sampled (775VMW-4, -5, -7, -8, -9, -10, which were vertically profiled prior to installation, and 775MW-6). Analytical results for the monitoring wells indicated the presence of 10 SVOCs and six VOCs. One VOC, TCE, was detected at concentrations (2.9 to 100 µg/L) exceeding the most stringent criteria (5 µg/L) in eight wells. Analytical results for the vertical profile Hydropunch samples indicated the presence of TCE in concentrations between 18 to 230 µg/L.

Groundwater Study

In the spring of 2000, a comprehensive groundwater study to define the vertical and lateral extent of groundwater contamination at the site was completed. The groundwater study at Building 775 consisted of drilling and vertically profiling 19 boreholes (775VMW-11 through -25; see Figure 6-1) and 104 Hydropunch samples; installation, development, sampling, and slug testing of 13 new wells; and sampling and slug testing of eight existing wells.

During this study, three VOCs were detected in the monitoring wells at concentrations exceeding the most stringent criteria (see Table 6-3).

Table 6-3
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
BUILDING 775 PLUME
2000 GROUNDWATER STUDY MONITORING WELL GROUNDWATER SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (µg/L)			
1,2-Dichloroethane	1.14	1/21	0.6 [a]
1,1,1,-Trichloroethane	1.1 – 7.1	1/21	5 [a]
Trichloroethene	0.429 J – 218	7/21	5 [a, b]

[a] NYSDEC Class GA groundwater standard, June 1998.
[b] EPA Federal primary maximum contaminant level.
Key: J = Estimated concentration.
µg/L = Micrograms per liter.

The Building 775 contamination plume was delineated both vertically and horizontally using Hydropunch data. Three chlorinated solvents were detected in the Hydropunch samples: cis-1,2-DCE, which was detected in one of the 19 boreholes with a maximum concentration of 12.1 µg/L in 775VMW-15R; PCE, which was detected in 13 of 19 boreholes with a maximum concentration of 5.2 µg/L in 775VMW-13; and TCE, which was detected in 12 of 19 boreholes with a maximum concentration of 608 µg/L in 775VMW-20R.

Based on the Hydropunch data, the source area for the Building 775 is the area around former buildings 773, 774 and 775. The width of the plume was estimated at approximately 500 feet near the source and 800 feet at the leading edge with the base of the leading edge appearing to merge or nearly merge with the leading edge of the Landfill 6 plume (see Figure 6-1).

Bedrock Groundwater Study

A Bedrock Groundwater Study for Building 775 was conducted in 2002 to determine whether contamination was present in the bedrock. The study consisted of the installation, sampling, and slug testing of two new bedrock wells (775MW-20RBr and 775MW-22Br). Analytical results indicated the presence of six VOCs all at concentrations below the most stringent criteria.

Three new overburden monitoring wells were installed and sampled (775MW-20, 775MW-20D, and 775MW-22D), and a grab groundwater sample was collected from existing well 775VMW-7. Analytical results for the three new overburden wells, the four

Hydropunch samples, and the grab sample from the existing well indicated the presence of 16 VOCs; the concentration of two VOCs, chloroform and TCE, exceeded the most stringent criteria (see Table 6-4).

The Bedrock Groundwater Study concluded that groundwater contamination observed in the overlying overburden aquifer does not appear to have migrated downward into the underlying bedrock at the site. Therefore, no further action was recommended for bedrock groundwater.

Table 6-4
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
BUILDING 775 PLUME
BEDROCK GROUNDWATER STUDY
2002 OVERBURDEN GROUNDWATER SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (µg/L)			
Chloroform	0.309 J – 30.3	1/8	7 [a]
Trichloroethene	0.168 J – 84.6	2/8	5 [a, b]
Anions (mg/L)			
Chloride	11.1 – 1,350	2/3	250 [a, b]

[a] NYSDEC Class GA groundwater standard, June 1998.
[b] EPA Federal secondary maximum contaminant level.
Key: J = Estimated concentration.
µg/L = Micrograms per liter.
mg/L = Milligrams per liter.

Feasibility Study (FS)

A draft FS was developed for Building 775 in March 2001 and was subsequently revised in the final FS, dated April 2005, using information collected during the treatability studies described below. Following additional groundwater sampling performed at the site, groundwater contamination contours were reevaluated in 2006 along with the remedial alternative selected in the final FS. This reevaluation is described in the final FS Addendum for this site, dated September 2006. The purpose of the FS was to identify and evaluate technologies that are available to remediate the areas identified in the previous investigations as requiring remedial action. Technologies evaluated for Building 775 groundwater contamination are discussed in detail in Section 6.2, Remedial Action.

Treatability Studies

The 2001 draft FS recommended that several in-situ treatment technologies be pursued further to evaluate their effectiveness in remediating the COCs. From this recommendation, it was decided to proceed forward with a phased approach (bench-scale to pilot-scale to full-scale implementation, if warranted) for in-situ chemical oxidation as it has historically proven to be an effective technology with the ability to destroy the contaminants found at the site.

Bench-scale Study
Between February and June 2002, an in-situ chemical oxidation bench-scale study (treatability study) for groundwater contamination was conducted for Building 775. Tests indicated that COCs were effectively destroyed by the oxidant potassium permanganate. Upon evaluation of the findings of the bench-scale studies, a field-scale pilot study was

performed at the adjacent Landfill 6 site. A pilot study was not performed at Building 775 because the contaminants and geology at Building 775 are similar to Landfill 6, but the plume is much deeper in the aquifer.

6.2 REMEDIAL ACTION

Remedial Action Objectives

For the Building 775 groundwater, the RAOs, as identified in the FS, are to make the groundwater potable for domestic or municipal use, or to prevent exposure to groundwater until groundwater standards are achieved while maintaining institutional controls to prevent groundwater use and to prevent contaminated groundwater from adversely impacting surface water and sediment.

Description and Evaluation of Remedial Action Alternatives

CERCLA regulations mandate that a remedial action must be protective of human health and the environment.

The following five remedial alternatives were developed for the Building 775 plume, which consists of a relatively deep plume that has migrated southwest from its apparent original source area near Building 774. For purposes of the FS, each alternative assumes a maximum 30-year remediation duration which is typically used in FSs for evaluation purposes. A summary of estimated remediation durations and costs are presented in Table 6-5.

- Alternative 1: No action involves no remedial action to remediate the Building 775 plume. The plume would be allowed to migrate and naturally attenuate. No monitoring would be conducted to evaluate the progress of these natural processes.

- Alternative 2: Institutional actions would employ methods such as deed restrictions to prevent future use of the groundwater at the Building 775 AOC, and a groundwater monitoring program to evaluate the extent of migration and attenuation of the plume. For purposes of the FS, it is assumed that on-site contaminant concentrations would remain above cleanup goals for the assumed 30-year alternative duration.

- Alternative 3: In-situ chemical oxidation would involve the delivery of a strong oxidizing agent into the subsurface through temporary injection points (i.e., direct push points) to oxidize COCs to non-toxic compounds. In addition, institutional controls, including long-term monitoring of groundwater, would be implemented to minimize the potential for future exposure to contaminated groundwater until cleanup goals were achieved. During this action, there would be continued monitoring of the extent of migration or natural attenuation of the plume. This alternative would involve full-scale remediation for the area contained within the 50-µg/L total VOC concentrations contour line, thus removing about 95% of the contaminant mass while addressing approximately 46% (or 6.5 acres) of the plume area. Since this alternative involves active treatment of and destruction of contaminants of concern, maintenance of institutional controls and the long-term monitoring program was assumed for and estimated 10 years.

- Alternative 4: In-well air stripping would involve the installation of groundwater-circulating/air-stripping wells to strip the contaminated groundwater of contaminants. The contaminated vapors would be treated and processed in a closed loop system. The treated groundwater would not be removed from the subsurface but cycled

through a groundwater circulation cell created around the well. Long-term monitoring of the groundwater plume would also be included in this alternative. This alternative would involve full-scale remediation for the area contained within the 50-µg/L total VOC concentrations contour line (see Figure 6-2), thus removing about 95% of the contaminant mass while addressing approximately 46% (or 6.5 acres) of the plume area. Monitoring is assumed to be required for an estimated 15 years (5 years during operation of the air stripping system and 10 years into the future).

- Alternative 5: Extraction, treatment, and discharge would involve installation of recovery wells to extract groundwater from the Building 775 plume, treating the groundwater, and then discharging the treated water. The treatment system pumping capacity will be established during design and will be adequate to remove groundwater from within the 50 µg/L total VOC plume area. Long-term monitoring of the groundwater plume would also be included in this alternative. Treated water would be discharged to Three Mile Creek under the requirements of a SPDES permit or to the sanitary sewer. For purposes of the FS, it was assumed that on-site contaminant concentrations would remain above cleanup goals for an estimated 20 years.

TABLE 6-5
SUMMARY OF REMEDIAL ALTERNATIVE DURATIONS AND COSTS FOR BUILDING 775

Description	Alternative				
	1	2	3	4	5
	No Action	Institutional Actions	In-situ Oxidation	In Well Air Stripping	Extraction, Treatment, and Discharge
Total Project Approximate Duration (Years)	0	30	10	15	20
Total Present Value (in $ 2004)	**$0**	**$665,600**	**$4,944,200**	**$2,195,700**	**$1,246,900**

Key:
LTM = Long-term monitoring.

Under Alternatives 1 and 2, no actions would be taken to reduce levels of contaminants in groundwater. Alternatives 1 and 2 represent the least expensive alternatives; however, treatment technologies would not be implemented and RAOs are not expected to be achieved within the assumed 30-year period.

Under Alternatives 3, 4, and 5, several active treatment technologies would be employed. Although a chemical oxidation (Alternative 3) pilot study performed at the adjacent Landfill 6 site illustrated that contaminant mass can be reduced within the shortest treatment duration, the estimated present-worth cost to implement this technology full-scale is approximately double the next most expensive alternative (Alternative 4, In-well Air Stripping). Alternative 5 (Extraction, Treatment, and Discharge), is approximately half of the cost of Alternative 4 and the least expensive active alternative. For Alternative 4, RAOs are expected to be achieved within five years of operation, with long-term monitoring continuing into the future for 10 years. Uncertainties associated with effectiveness must be determined through performance of a pilot study before full-scale implementation. Alternative 5 (Extraction, Treatment, and Discharge) is expected to meet RAOs in about 20 years, which assumes 10 years of O&M of a treatment system and 10 years of long-term monitoring.

Based on a comparative analysis of remedial alternatives, according to established criteria, the recommended alternative for the Building 775 plume is Alternative 5, Extraction, Treatment, and Discharge (see final FS Report [April 2005] and final FS Addendums/Supplement [September 2006] for Landfill 6 Groundwater, Building 775 Groundwater, and Building 817/Weapons Storage Area Groundwater). Extraction, treatment, and discharge, when used to remediate contaminated groundwater, represents an active remedial approach to permanently reduce the toxicity, mobility, and volume of site COCs, which is the preferred approach, when practical. This alternative also provides for protection of human health and the environment. During the remediation process, deed and/or lease restrictions would be required.

Evaluation Criteria for Remedial Action Alternatives

Remedial alternatives are assessed on the basis of both a detailed and a comparative analysis pursuant to the NCP. The detailed analysis of Building 775 groundwater in the FS reports consisted of (1) an assessment of the individual alternatives against seven evaluation criteria and (2) a comparative analysis focusing upon the relative performance of each alternative against the criteria.

In general, the following "threshold" criteria must be satisfied by an alternative for it to be eligible for selection. The proposed alternative is briefly evaluated below for each of the first seven criteria:

1. Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

   No human or environmental receptors are currently impacted by this plume. The proposed alternative will remove contaminants from the subsurface through direct extraction of contaminated groundwater, eliminating future potential exposure threats. Deed restrictions for use of the area and groundwater will be in place during remediation

2. Compliance with ARARs addresses whether a remedy would (1) meet all of the ARARs or (2) provide grounds for invoking a waiver.

   Through removal of contaminants via extraction, concentrations in the aquifer would be reduced to levels below groundwater standards, meeting chemical-specific ARARs. To discharge treated water, concentrations of chemicals in the groundwater would have to meet the discharge requirements of a SPDES permit or as set forth by the sanitary sewer district depending on the disposal method.

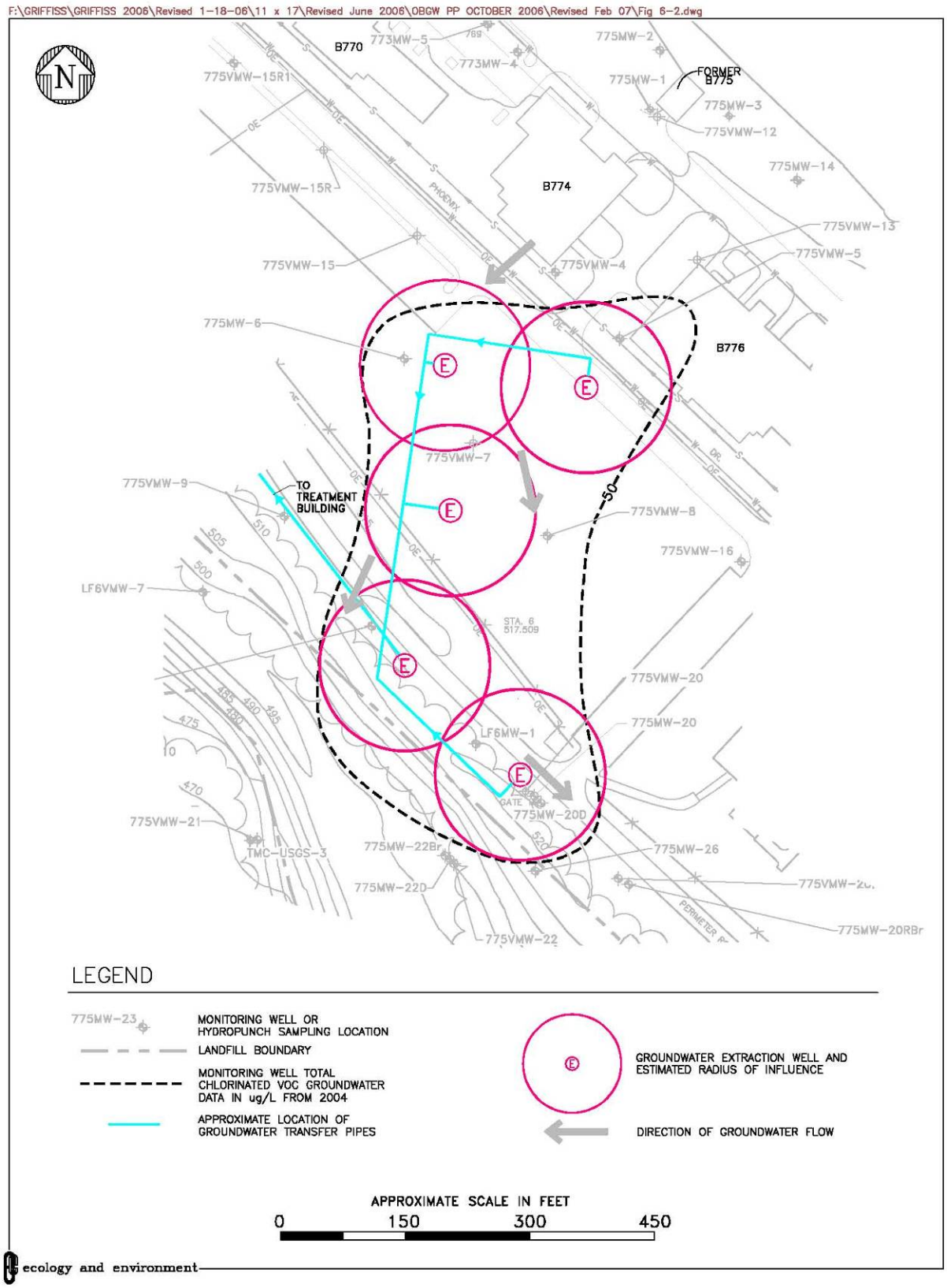

Figure 6-2 Building 775 Alternative 5 Extraction, Treatment and Discharge

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In addition, the following "primary balancing" criteria are used to make comparisons and identify the major trade-off among alternatives:

3. Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

   Because contaminants would be removed from the aquifer, the proposed alternative is effective in the long term.

4. Reduction of toxicity, mobility, or volume via treatment refers to a remedial technology's expected ability to reduce the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants at the site.

   The proposed alternative removes contaminants from the aquifer and concentrates them onto treatment media, reducing volume through treatment. When the treatment media is spent, it is sent off site for regeneration, where the contaminants are destroyed. Thus, the proposed alternative is effective in reducing toxicity through treatment.

5. Short-term effectiveness addresses (1) the period of time needed to achieve protection and (2) any adverse impacts on human health and the environment that may be posed during the construction and implementation periods until cleanup goals are achieved.

   Implementation of the proposed alternative would require the installation of five wells to recover the groundwater and a small treatment building and discharge pipeline. These actions would require clearing of vegetation and associated well drilling activities, which would result in minor impacts to on-site workers and the environment. Property transfer may be impacted until RAOs have been achieved.

6. Implementability refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed.

   Fouling issues, such as clogging with sediments or mineral deposits, must be considered upon implementation of the proposed alternative. Otherwise, this alternative is readily implemented.

7. Cost includes estimated capital, O&M, and present-worth costs.

   The estimated capital cost of $520,100 (in 2001 dollars) includes the treatment system, extraction and monitoring wells, underground piping, and electrical distribution. The present worth estimated O&M cost of $652,700 (in 2001 dollars) includes the treatment system maintenance, treatment media replacement and disposal, and long-term monitoring. The 2004 total present-worth cost of the proposed alternative is estimated at $1,246,900.

Finally, the following "modifying" criteria are considered fully after the formal public comment period on the proposed plan is complete:

8. State acceptance indicates whether, based on its review of the proposed plan and the RI, SI, and FS reports, the State supports or opposes the preferred alternative and/or has identified any reservations with respect to the preferred alternative.

9. Community acceptance refers to the public's general response to the alternatives described in the proposed plan and the RI, SI, and FS reports. Factors of community acceptance include support, reservation, or opposition by the community.

6.3 DESCRIPTION OF THE PREFERRED ALTERNATIVE

The selected remedial approach (Alternative 5) includes installation of recovery wells to extract the groundwater from the Building 775 plume and then treat the groundwater. The treated groundwater will then be discharged to Three Mile Creek or a sanitary sewer.

Extraction wells located throughout the plume and within the approximated 50 µg/L contamination contour are proposed for the extraction scheme in order to provide sufficient overlap and redundancy in the system. The preliminary layout of the recovery wells is shown in Figure 6-2. The layout of the recovery wells will be based on field studies completed during the design stage.

The extracted groundwater will be pumped to a treatment system located near the existing service road for Landfill 6 (see Figure 6-2). The existing overhead electric lines are assumed to be sufficient to power the treatment building and the extraction wells. The piping from the recovery wells would be connected to a common underground pipe to convey the contaminated groundwater to the treatment system.

Long-term maintenance of the treatment system will likely require treatment media and/or filter replacement and sampling of the influent and effluent VOC concentrations. Treated groundwater that meets the requirements of the SPDES permit will be discharged to Three Mile Creek via a dedicated underground pipeline. Discharge of treated water to the sanitary sewer is an option at this site and will be addressed during the design stage.

Long-term monitoring of the groundwater plume and treatment performance during full-scale implementation will be performed. In order to properly monitor the plume, groundwater sampling will be performed to monitor any seasonal water table and contaminant concentration fluctuations. Sampling of 11 monitoring wells is proposed for long-term monitoring. The number and locations of the wells for the proposed long-term monitoring network will be finalized during the design stage. Portions of the site have been transferred with remaining portions planned for future transfer. Institutional controls in the form of deed restrictions for affected groundwater have been/will be implemented as follows (see Figure 6-3):

- Development and use of the entire SD-52, Building 775 Operable Unit AOC property for residential housing, elementary and secondary schools, childcare facilities and playgrounds will be prohibited unless prior approval is received from the Air Force, EPA, and NYSDEC.

- The owner or occupant of this site shall not extract, utilize, consume, or permit to be extracted, any water from the subsurface aquifer within the boundary of the site unless such owner or occupant obtains prior written approval from the NYSDOH.

- The owner or occupant of this site will not engage in any activities that will disrupt required remedial investigation, response actions and oversight activities, should any be required.

- The owner or occupant of this site will be restricted from access to all subsurface soils and groundwater at or below the groundwater interface at this AOC until the BRAC cleanup team identifies appropriate cleanup requirements**,** and cleanup actions are executed by the Air Force to the satisfaction of the BRAC cleanup team.

- The owner or occupant of this site shall provide the Air Force with sixty days advance notice of any proposed alterations that will involve excavating in and/or disturbing soil and/or groundwater and shall not proceed with any such proposed alterations until it has received written notice from the Air Force that the alterations are acceptable to the BRAC cleanup team.

If additional restrictions are required, a deed modification will be issued. Monitoring is assumed to be required for 20 years (10 years during O&M of the extraction and treatment system and 10 years of long-term monitoring). If COCs remain above proposed cleanup goals after the assumed 20-year period, additional monitoring would be considered.

Five-year reviews will be performed by the Air Force, in conjunction with the EPA and NYSDEC, to ensure the remedy is still performing as planned and is protective of public health and the environment.

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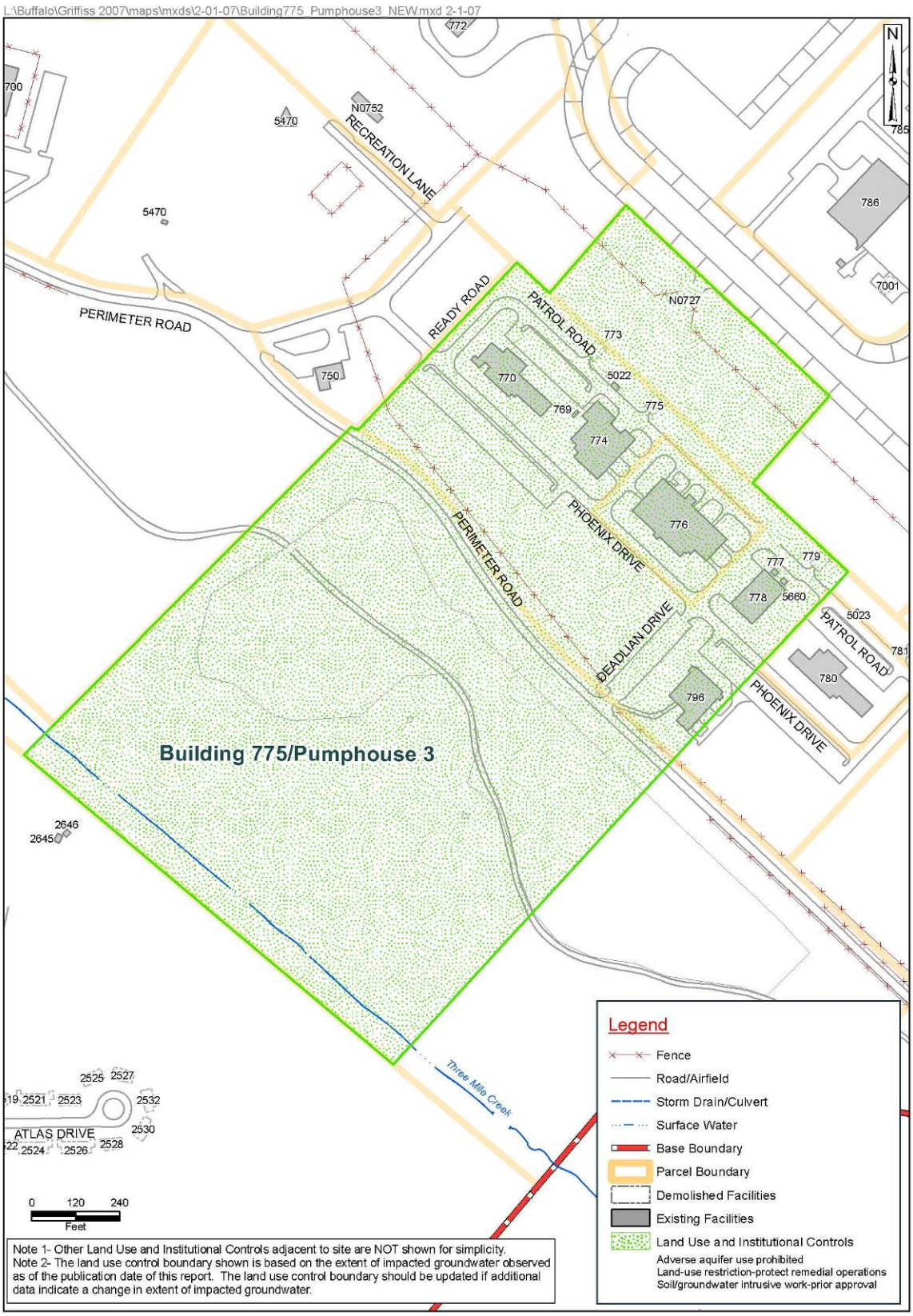

Figure 6-3 Building 775 Land Use and Institutional Controls Boundary

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7. BUILDING 817/WEAPONS STORAGE AREA GROUNDWATER

The Building 817/WSA portion of the OBGW AOC is located on the north side of the main runway south of the southeast end of the WSA (see Figure 7-1). The site includes Building 817, a former electronic equipment research laboratory, and a wastewater-related system (WW-817). According to a 1960 drawing, WW-817 was used to treat flow from the restrooms and floor drains inside Building 817. Although the system may still be operational, the building is no longer in use.

In general, the groundwater in this area eventually discharges to Six Mile Creek or to its tributaries that flank the WSA to the north and south. The water table exhibits a shallow gradient (0.04 foot per foot) across the site. The site geology consists of an approximately 10 to 30 foot silty sand layer overlying a 1 to 16.5-foot thick weathered zone of bedrock.

TCE/PCE contaminated groundwater extends downgradient from the WSA for approximately 1,000 feet and covers approximately 8 acres. The lateral extent of the plume is approximately 250 feet, and the vertical extent ranges from 5 feet BGS to 25 feet BGS, which is the top of bedrock. The TCE and PCE concentrations range from non-detect to 100 µg/L and 57 µg/L, respectively. The plume has not reached the culverted section of Six Mile Creek.

7.1 SUMMARY OF SITE ACTIVITIES

In 1992, an initial site investigation was performed to determine whether contamination was present from historical releases at the WSA including petroleum hydrocarbons, the discharge of aqueous film forming foam into a lagoon, use of paints and solvents for vehicle maintenance, and potential use of PCBs. During this investigation, one well was installed at the Building 817/WSA site (WSAMW-2). Groundwater from this well was analyzed for VOCs, SVOCs, total and dissolved metals, and total hexavalent chromium. None of the analytes were detected at levels of concern.

Remedial Investigation

In 1994, an RI was performed for the OBGW AOC. The RI included drilling, installation and sampling of 23 new monitoring wells basewide, aquifer testing of 22 new monitoring wells, and groundwater sampling of 16 existing wells. Only one well (LAWMW-9) was installed near the area south of Building 817/WSA. One VOC (TCE) was found at a concentration of 7.6 µg/L, which was above the most stringent criteria of 5 µg/L.

Supplemental Investigation

In 1997, an SI was performed to determine the levels and extent of contamination at this site. Three temporary wells were installed and sampled and existing well WSAMW-2 was resampled. Analytical results for the monitoring wells indicated the presence of two SVOCs and three VOCs. One SVOC and the three VOCs were detected at concentrations exceeding the most stringent criteria (see Table 7-1).

Table 7-1 COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES BUILDING 817/WSA PLUME 1997 SI GROUNDWATER SAMPLES			
Compound	**Range of Detected Concentrations**	**Frequency of Detection Above Most Stringent Criterion**	**Most Stringent Criterion**
VOCs (µg/L)			
Chloroform	0.66 – 9.0	1/5	7 [a]
Tetrachloroethene	7.5	1/5	5 [a, b]
Trichloroethene	0.31 J – 31	1/5	5 [a, b]
SVOCs (µg/L)			
Bis (2-ethylhexyl) phthalate	83 J	1/5	5 [a]

[a] NYSDEC Class GA groundwater standard, June 1998.
[b] EPA Federal primary maximum contaminant level.
Key: J = Estimated concentration.
µg/L = Micrograms per liter.

Expanded Site Investigation

In 1998, during an ESI and confirmatory sampling at the AOIs, one temporary well was drilled to a depth of 15 feet between Buildings 816 and 818. Analytical results for VOCs, SVOCs, PCBs, and TRPH were nondetect. Several metals were detected but they were below NYSDEC criteria.

Additional Supplemental Investigation

In 2000, an additional SI was conducted to further define the source and areal extent of the TCE plume. Temporary Geoprobe wells were installed and sampled at 36 locations (13 of these locations were vertically profiled); three new wells (WSAMW-8, -9, and -10) outside the plume area were drilled, installed, developed, and sampled; one existing well (LAWMW-9) within the plume was sampled; and a surface water sample from the culverted section of Six Mile Creek was collected. Analytical results for the Geoprobe groundwater samples indicated the presence of 17 VOCs with only four exceeding the most stringent criteria (see Table 7-2).

Table 7-2 COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES BUILDING 817/WSA PLUME 2000 SI GEOPROBE GROUNDWATER SAMPLES			
Compound	**Range of Detected Concentrations**	**Frequency of Detection Above Most Stringent Criterion**	**Most Stringent Criterion**
VOCs (µg/L)			
Benzene	Trace – 1.7	7/56	1 [a]
Tetrachloroethene	Trace – 56.9	11/56	5 [a, b]
Trichloroethene	Trace – 98.5	17/56	5 [a, b]
Vinyl Chloride	3.4 J	1/56	2 [a, b]

[a] NYSDEC Class GA groundwater standard, June 1998.
[b] EPA Federal primary maximum contaminant level.
Key: J = Estimated concentration.
µg/L = Micrograms per liter.

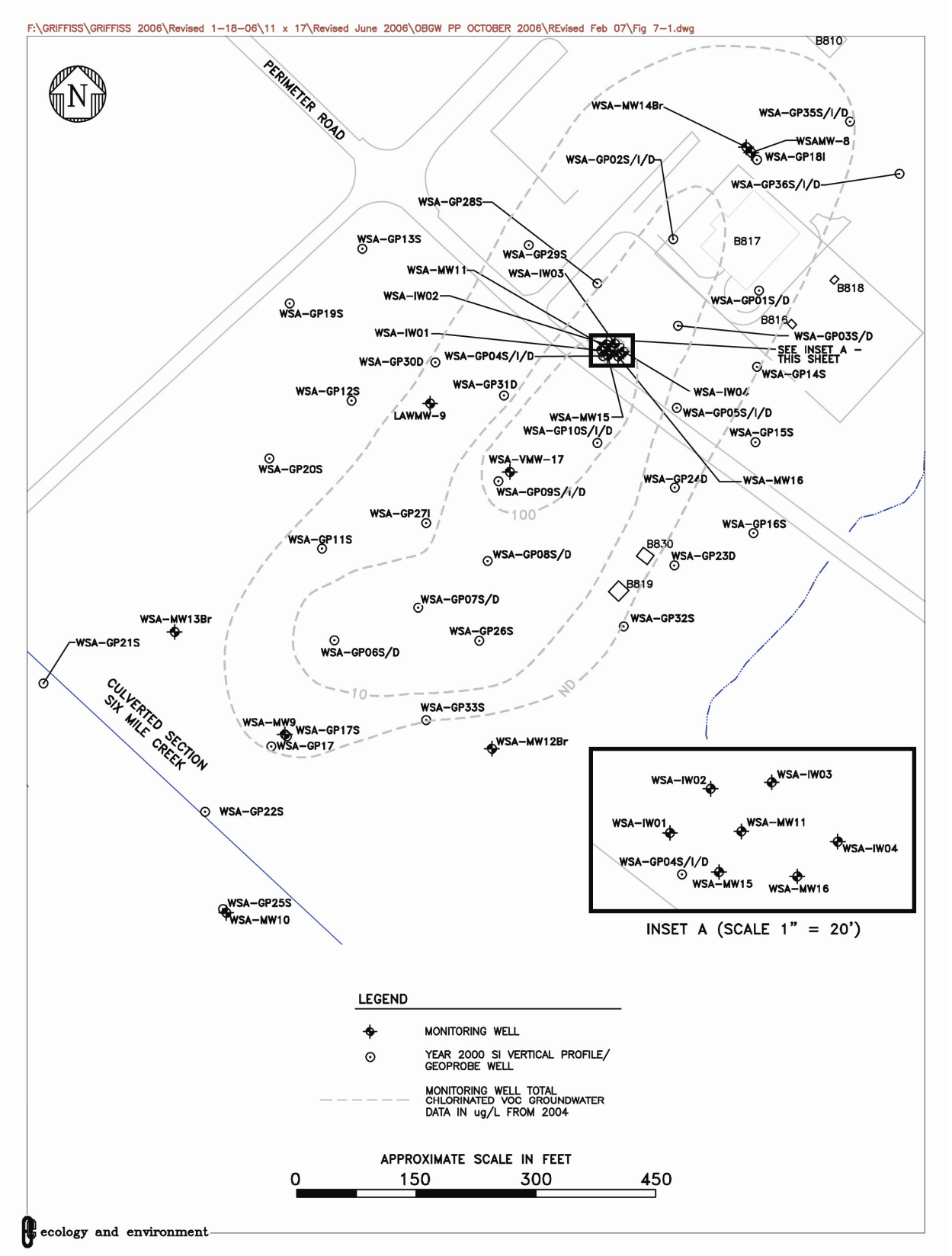

Figure 7-1 B817/WSA Groundwater Monitoring Well and Sampling Locations

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Bedrock Groundwater Study

In 2002, a Bedrock Groundwater Study for the Building 817/WSA site was conducted to determine whether contamination was present in the bedrock. Three new bedrock wells (WSA-MW12Br, WSA-MW13Br, and WSA-MW14Br) were drilled, installed, developed, aquifer tested, and sampled for VOCs, methane, ethane, ethene, anions, and dissolved organic carbon. In addition, one overburden well (WSA-MW11; see inset on Figure 7-1) was drilled to provide a soil sample for the groundwater treatability bench-scale study and to serve as a monitoring point for future investigations. The location of the sample was the site of the highest level of groundwater contamination detected in the 2000 SI. Depth to bedrock at the site is approximately 20 feet BGS.

Groundwater samples were collected during installation of the bedrock wells (Hydropunch samples) and following installation of all four wells. Analytical results for Hydropunch samples indicated the presence of six VOCs in one well (WSA-MW12Br) with only one VOC (TCE at 5.13 µg/L) at a concentration slightly above the most stringent criteria (5 µg/L). Groundwater samples from the three bedrock wells indicated the presence of chloroform, which is believed to be a field or laboratory artifact, at a concentration below the most stringent criterion. Five VOCs were detected in the groundwater sample from the overburden well, with PCE (46.9 µg/L) and TCE (58.7 µg/L) exceeding the most stringent criteria of 5 µg/L. These concentrations are similar to those found at the corresponding Geoprobe boring during the 2000 SI.

The Bedrock Groundwater Study concluded that groundwater contamination observed in the overlying overburden aquifer does not appear to have migrated downward into the underlying bedrock at the site. Therefore, no further action was recommended for bedrock groundwater.

Feasibility Study (FS)

A draft FS was developed for Building 817/WSA in March 2001 and was subsequently revised in the final FS, dated April 2005. Following additional groundwater sampling performed at the site, groundwater contamination contours were reevaluated in 2006 along with the remedial alternative selected in the final FS. This reevaluation is described in the final FS Supplement for this site, dated September 2006. The purpose of the FS was to identify and evaluate technologies to remediate the areas identified in the previous investigations as requiring remedial action. Technologies evaluated for Building 817/WSA groundwater contamination are discussed in detail in Section 7.2, Remedial Action.

Treatability Studies

Building 817/WSA was included in the in-situ chemical oxidation groundwater treatability studies for Landfill 6 and Building 775 due to the similarity of their contaminants. The treatability studies evaluated the effectiveness of the technology at these sites.

Bench-scale Study

Bench-scale tests using potassium permanganate as the oxidant were performed for groundwater at Building 817/WSA in June 2002. Results from the tests on the groundwater indicated that COCs were effectively destroyed by potassium permanganate.

Field Pilot-scale Study

The pilot-scale field study at Building 817/WSA included one round of injections in the vicinity of the WSA-MW11 boring location. Injection activities consisted of delivering

8,000 gallons of potassium permanganate (0.6% by weight) by gravity. As part of these studies, four injection wells were installed to target the contaminant zone. Existing wells were sampled once prior to the potassium permanganate injections (baseline sampling). Analytical results for the baseline samples (WSA-MW11 and the six new wells) indicated the presence of seven VOCs and 10 metals, with two VOCs (TCE and PCE) and three metals detected at concentrations exceeding the most stringent criteria (see Table 7-3).

Table 7-3
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
BUILDING 817/WEAPONS STORAGE AREA PLUME
GROUNDWATER TREATABILITY STUDY - BASELINE SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (µg/L)			
Tetrachloroethene	34.4 - 60.5	7/7	5 [a, b]
Trichloroethene	40.7 - 87.9	7/7	5 [a, b]
Metals (µg/L)			
Iron	197 - 356	1/3	300 [a, c]
Sodium	11200 - 20900	1/3	20,000 [a]
Thallium	5.40 J - 6.16 J	3/3	0.5 [d]

[a] NYSDEC Class GA groundwater standard, June 1998.
[b] EPA Federal primary maximum contaminant level.
[c] EPA Federal secondary maximum contaminant level.
[d] NYSDEC Class GA groundwater guidance value; June 1998.
Key: J = Estimated concentration.
µg/L = Micrograms per liter.

The results of the pilot study indicated a general decrease in VOC concentrations from the study area. The comparison between pre- and post-treatment analytical results in the injection wells indicated a reduction of TCE and PCE of up to 54% and 21%, respectively, after six weeks and further reduction up to 25% and 5%, respectively, after 72 weeks in a different injection well. The monitoring wells showed no initial reduction of TCE and PCE after six weeks; however, the largest reduction of these contaminants was estimated at 47% and 36% respectively in the four injection/monitoring wells 72 weeks after the injection. Based on the bench-scale testing, more significant contaminant reduction was anticipated. There are two possible primary reasons for the lack of significant reduction: 1) more oxidant was consumed by the NOD than was estimated by the bench-scale testing and 2) the presence of preferential pathways (both vertically and horizontally) would allow the oxidant to move away from the monitored treatment area before sufficient treatment could occur. The pilot study and additional subsurface work suggest that an underground utility is located in the downgradient part of the treatment area. This utility could have provided a preferential pathway for oxidant during the pilot study. The presence of a gravelly till layer between the silty fine sands and shale bedrock may also be serving as a preferential pathway. This layer is present at a depth of approximately 20 feet BGS, at the base of the injection and monitoring wells.

7.2 REMEDIAL ACTION

Remedial Action Objectives

For the Building 817/WSA groundwater, the RAOs, as identified in the FS, are to make the groundwater potable for domestic or municipal use, or to prevent exposure to groundwater until groundwater standards are achieved while maintaining institutional controls to prevent groundwater use and to prevent contaminated groundwater from adversely impacting surface water and sediment.

Description and Evaluation of Remedial Action Alternatives

CERCLA regulations mandate that a remedial action must be protective of human health and the environment.

The following seven remedial alternatives were developed for the Building 817/WSA plume, which consists of a relatively shallow plume that has migrated southwest from its assumed original source area near Building 817. For purposes of the FS, each alternative assumes a maximum 30-year remediation duration which is typically used in FSs for evaluation purposes. A summary of estimated remediation durations and costs are presented in Table 7-4.

- Alternative 1: No action involves no remedial action to remediate the Building 817/WSA plume. The plume would be allowed to migrate and naturally attenuate. No monitoring would be conducted to evaluate the progress of these natural processes.

- Alternative 2: Institutional actions would employ methods such as deed restrictions to prevent future use of the groundwater at the Building 817/WSA AOC, and a groundwater monitoring program to evaluate the extent of migration and attenuation of the plume. For purposes of the FS, it is assumed that on-site contaminant concentrations would remain above cleanup goals for the assumed 30-year alternative duration.

- Alternative 3: In-situ chemical oxidation would involve the delivery of a strong oxidizing agent into the subsurface through temporary injection points (i.e., direct push points) to oxidize COCs to non-toxic compounds. In addition, institutional controls, including long-term monitoring of groundwater, would be implemented to minimize the potential for future exposure to contaminated groundwater until cleanup goals were achieved. This alternative would involve full-scale remediation using this technology for the area contained within the 10-µg/L total VOC concentrations contour line (see Figure 7-2), thus removing about 90% of the contaminant mass while addressing approximately 58% (or 4.7 acres) of the plume area. Since this alternative involves active treatment of and destruction of contaminants of concern, maintenance of institutional controls and the long-term monitoring program was assumed for an estimated 10 years.

- Alternative 4: In-well air stripping would involve the installation of groundwater-circulating/air-stripping wells to strip the contaminated groundwater of contaminants. The contaminated vapors would be treated and processed in a closed loop system. The treated groundwater would not be removed from the subsurface but cycled through a groundwater circulation cell created around the well. Long-term monitoring of the groundwater plume would also be included in this alternative. This alternative would involve full-scale remediation for the area contained within the 10-µg/L

total VOC concentrations contour line, thus removing about 90% of the contaminant mass while addressing approximately 58% (or 4.7 acres) of the plume area. Monitoring is assumed to be required for an estimated 15 years (5 years during operation of the air stripping system and 10 years into the future).

- Alternative 5: Zero-valent iron wall would involve the installation of an in-situ permeable reactive barrier (PRB) containing commercially available granular iron. The groundwater flows through the iron wall barrier where metal-enhanced reductive dehalogenation reactions reduce the chlorinated ethenes present in the groundwater to ethene and chloride. Long-term monitoring of the groundwater plume would also be included in this alternative. Because the treatment mechanism relies on the plume migrating through the PRB, a portion of the plume upgradient of the PRB will remain contaminated during the treatment process. For this reason, a deed restriction would have to be placed over the area that defines the plume. For purposes of the FS, it was assumed that on-site contaminant concentrations would remain above cleanup goals for the 30-year alternative duration.

- Alternative 6: Extraction, treatment, and discharge would involve collection of contaminated groundwater using a 275-foot long, 11-foot deep intercepting trench, followed by treatment with a carbon-adsorption system. Treated groundwater would then be discharged to the culverted section of Six Mile Creek. Long-term monitoring of the groundwater plume would also be included in this alternative. Treated water would be discharged to the creek under the requirements of a SPDES permit. For purposes of the FS, it was assumed that on-site contaminant concentrations would remain above cleanup goals for the 30-year alternative duration.

- Alternative 7: Enhanced bioremediation would involve removal of a contaminant source through soil excavation (if a source could be found) and enhanced bioremediation. Prior to full-scale implementation of the bioremediation, an in-situ probe-type survey would be performed to identify and excavate soil areas with elevated concentrations of COCs. Enhanced bioremediation at this site would consist of vegetable oil/lactate injection(s) directly into the subsurface in the most contaminated part of the site. The vegetable oil/lactate would stimulate biodegradation of site COCs over a two- to three-year period. Monitoring of the groundwater plume would be performed during the injection(s) as well as into the long-term. If elevated concentrations of DCE and vinyl chloride attributable to site groundwater are detected in Six Mile Creek, implementation of a contingency air sparge wall will be installed. If an air sparge wall is needed, the wall would consist of a line of in-situ air sparging wells approximately 150 feet long (see Figure 7-2). For purposes of the FS, it was assumed that on-site contaminant concentrations would remain above cleanup goals for at least 15 years.

Under Alternatives 1 and 2, no actions would be taken to reduce levels of contaminants in groundwater. Alternatives 1 and 2 represent the least expensive alternatives; however, treatment technologies would not be implemented and RAOs are not expected to be achieved within the assumed 30-year period.

Under Alternatives 3, 4, 5, 6, and 7, several active treatment technologies would be employed. Of the active alternatives, chemical oxidation (Alternative 3) is the second most expensive alternative presented and this technology assumes the shortest treatment duration at approximately one year to achieve RAOs and 10 years of long-term monitoring. In addition, the chemical oxidation pilot study performed at this site indicated that

TABLE 7-4
SUMMARY OF REMEDIAL ALTERNATIVE DURATIONS AND COSTS FOR BUILDING 817/WEAPONS STORAGE AREA

Description	Alternative						
	1	**2**	**3**	**4**	**5**	**6**	**7**
	No Action	**Institutional Actions**	**In-situ Oxidation**	**In Well Air Stripping**	**Zero Valent Iron Wall**	**Extraction, Treatment, and Discharge**	**Enhanced Bioremediation**
Total Approximate Project Duration (Years)	0	30	10	15	30	30	15
2004 Total Present Value of Alternative	**$0**	**$478,600**	**$2,267,700**	**$2,912,900**	**$1,201,900**	**$1,155,700**	**$1,443,000**

Key:
LTM = Long-term monitoring.

contaminant mass can effectively be reduced and this technology is viable at this site, although the existence of preferential pathways would have to be investigated (see Field Pilot-scale Study discussion). Alternative 4, in-well air stripping, is estimated as the most expensive alternative. The RAOs are expected to be achieved within five years of operation for Alternative 4, with long-term monitoring continuing into the future for 10 years. However, uncertainties associated with effectiveness must be determined with a pilot-scale study before full-scale implementation. Present value costs of Alternatives 5, 6, and 7 are on the same order of magnitude (least expensive of the active treatment alternatives). Rejuvenation of the iron wall in Alternative 5 is assumed to occur once, with RAOs estimated to be achieved in approximately 20 to 30 years; long-term monitoring was assumed to continue for 30 years. For Alternative 6, which is expected to meet RAOs some time after the 30-year evaluation period, continuous O&M of a treatment system would be required. For Alternative 7, up to two injections would be performed within 2 years of full-scale implementation; maintenance of institutional controls and the long-term monitoring program was assumed for 15 years. RAOs are estimated to be achieved in at least 15-years.

Based on comparative analysis of remedial alternatives, according to established criteria, the recommended alternative for the Building 817/WSA plume is Alternative 7, enhanced bioremediation (see final FS Addendums/Supplement for Landfill 6 Groundwater, Building 775 Groundwater, and Building 817/Weapons Storage Area Groundwater, September 2006). Considering the potential for contaminated groundwater at the site to impact Six Mile Creek in the future, alternatives with shorter remediation durations are more desirable. Enhanced bioremediation combined with an air sparge wall (as a contingency) represents an active remedial approach to permanently reduce the toxicity, mobility, and volume of site COCs, which is the preferred approach, when practical. This alternative also provides for protection of human health and the environment and has the ability to have one of the shortest treatment durations of the alternatives presented. During the remediation process, deed and/or lease restrictions would be required.

Evaluation Criteria for Remedial Action Alternatives

Remedial alternatives are assessed on the basis of both a detailed and a comparative analysis pursuant to the NCP. The detailed analysis of Building 817/WSA groundwater in the FS report consisted of (1) an assessment of the individual alternatives against seven evaluation criteria and (2) a comparative analysis focusing upon the relative performance of each alternative against the criteria.

In general, the following “threshold” criteria must be satisfied by an alternative for it to be eligible for selection. The proposed alternative is briefly evaluated below for each of the first seven criteria:

1. Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

   No human or environmental receptors are currently impacted by this plume. The proposed alternative will treat the contaminants in-situ, preventing the migration to potential receptors and eliminating future potential exposure threats.

2. Compliance with ARARs addresses whether a remedy would (1) meet all of the ARARs or (2) provide grounds for invoking a waiver.

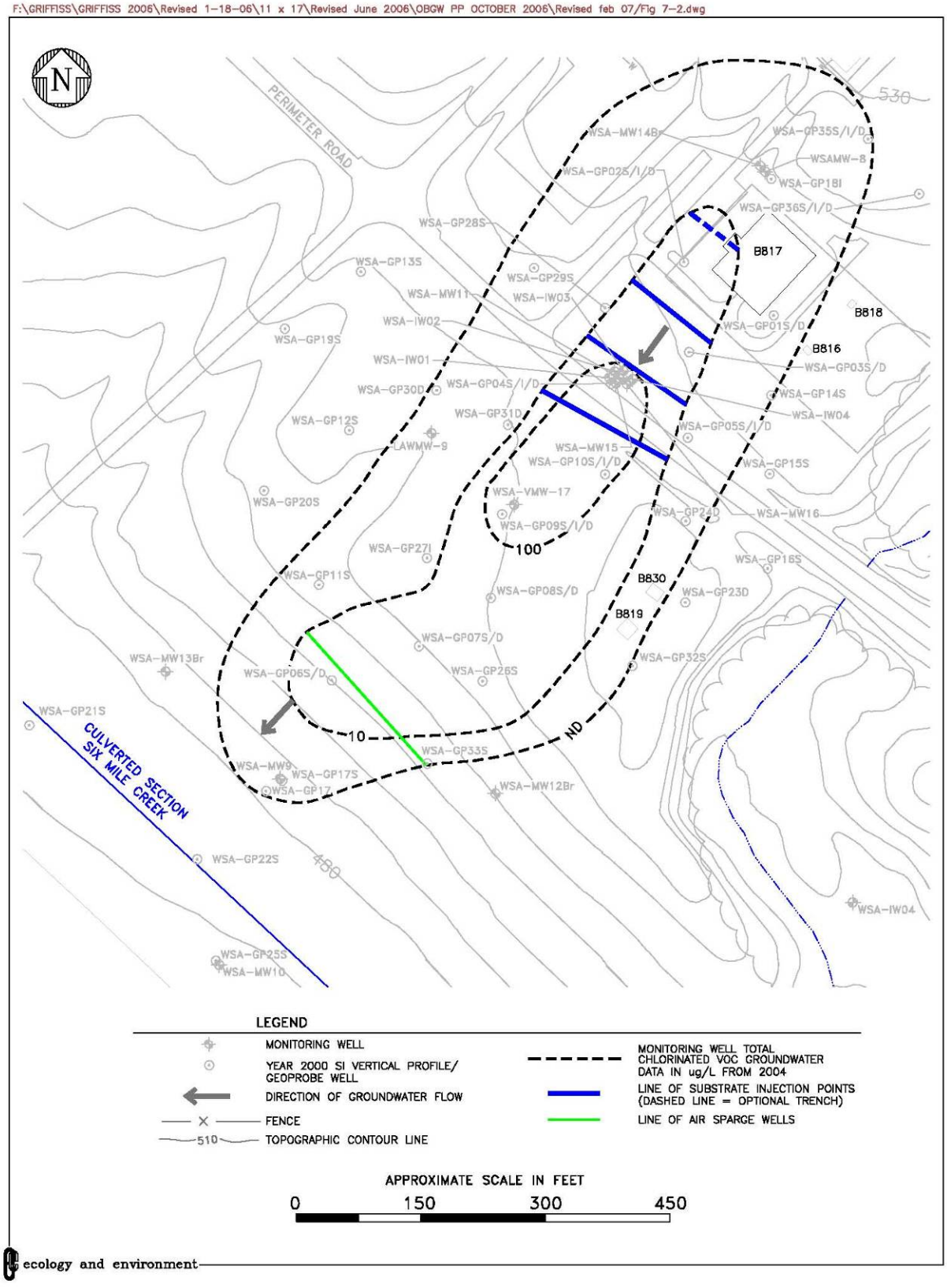

Figure 7-2 B817/WSA Enhanced Bioremediation and Air Sparge Wall

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The proposed alternative treats groundwater by organic substrate injections and an air sparge wall (if necessary) to levels below groundwater standards and thus meets chemical-specific ARARs. While residual COCs (potentially DCE and vinyl chloride) could remain in the plume after the injection treatment, the installation of a downgradient air sparging wall would intercept and treat the groundwater prior to potentially entering Six Mile Creek or flowing off site if the sparge wall is deemed necessary.

In addition, the following "primary balancing" criteria are used to make comparisons and identify the major trade-off among alternatives:

3. Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

   Because the majority of the contaminants would be removed from the aquifer and be permanently destroyed, this alternative is effective in the long-term.

4. Reduction of toxicity, mobility, or volume via treatment refers to a remedial technology's expected ability to reduce the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants at the site.

   The proposed alternative employs reductive dechlorination and volatilization via organic substrate treatment and an air sparge wall to reduce contamination levels, thus resulting in toxicity reduction through treatment.

5. Short-term effectiveness addresses (1) the period of time needed to achieve protection and (2) any adverse impacts on human health and the environment that may be posed during the construction and implementation periods until cleanup goals are achieved.

   Implementation of the proposed alternative will include the excavation/disposal of soil with elevated concentrations of COCs (if identified), delivery of injection points, and placement of air sparge wells in the path of the plume. Excavation/disposal and injections are expected to be completed within one year while the air sparge wall system (if needed) is anticipated to be in operation for two to three years. Because the area is already developed and relatively open and operation of the sparge wall system would be located close to Six Mile Creek (approximately 500 feet away from the developed portion of the site), this site would have minor short-term impacts. Monitoring is assumed for approximately 15 years. Property transfer may be impacted until RAOs have been achieved.

6. Implementability refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed.

   The proposed alternative will require initial testing to demonstrate its effectiveness and establish design parameters prior to full-scale implementation. This technology has been used successfully at similar sites and should be effective on this plume. There are no anticipated technical barriers to implementation.

7. Cost includes estimated capital, O&M, and present-worth costs.

The estimated capital cost of $1,147,700 (in 2001 dollars) includes the delivery of organic substrate through injection points, installation of air sparge wells and long-term monitoring wells, compressors/blowers, initial injection study, and full-scale implementation costs. The estimated present worth O & M cost for long-term monitoring is $209,500 (in 2001 dollars). The 2004 total present worth cost of the proposed alternative is $1,443,000.

Finally, the following "modifying" criteria are considered fully after the formal public comment period on the proposed plan is complete:

8. State acceptance indicates whether, based on its review of the proposed plan and the RI, SI, and FS reports, the State supports or opposes the preferred alternative and/or has identified any reservations with respect to the preferred alternative.

9. Community acceptance refers to the public's general response to the alternatives described in the proposed plan and the RI, SI, and FS reports. Factors of community acceptance include support, reservation, or opposition by the community.

7.3 DESCRIPTION OF THE PREFERRED ALTERNATIVE

Under the selected remedial approach (Alternative 7) for Building 817/WSA, a combination of soil excavation source removal (if a source can be identified) and enhanced bioremediation will be performed to remove VOCs from site groundwater. If elevated concentrations of DCE and vinyl chloride attributable to site groundwater are detected in Six Mile Creek, implementation of a contingency air sparge wall will be installed. Enhanced bioremediation has proven historically to degrade residual PCE, TCE, and DCE while the air sparging wall can be used to volatilize or aerobically degrade any DCE or vinyl chloride that might be created during degradation and have the potential to migrate to Six Mile Creek.

During the design phase, historical research will be performed to determine whether a source area can be identified. Additionally, a probe-type survey will be completed to identify elevated concentrations of VOCs in site soils. If a source area can be defined, soils with elevated VOC levels will be excavated. Assuming excavation is performed, the bottom of the source excavation area will be backfilled with pea gravel followed by clean backfill.

The two-step groundwater remediation approach would include enhanced reductive dechlorination followed by air sparging to both volatilize and aerobically-degrade DCE and vinyl chloride residuals (if needed). An initial injection of vegetable oil/lactate will be performed to demonstrate the feasibility of the approach and to collect injection design data. This injection will be completed in the most contaminated part of the site. Upon successful completion of the initial injection, enhanced reductive dechlorination will be completed with a second injection event of a vegetable oil/lactate emulsion in the event TCE/PCE rebound has occurred or if the initial injection does not achieve reasonable reductions in average source area concentrations. If necessary, the second injection will be performed approximately two years after the initial injection has been completed. Approximately 30 injection points will be used for the suspected source area north of Perimeter Road and an additional 20 injection points for the plume south of Perimeter Road. Figure 7-2 shows the proposed location of injection points based on existing site data. Unlike the short reaction time of oxidation injections, which may only impact the contaminants within a few feet of the injection points, vegetable oil has the advantage of a

delayed breakdown over a two to three year period creating long-term biological reduction of VOCs not only at the point of injection but tens to hundreds of feet downgradient of the injection. Lactate provides a highly soluble organic substrate to immediately stimulate biodegradation. Given the relatively low concentrations of TCE and PCE in this plume, significant reductive dechlorination can be expected in two to three years. The injection point configuration may be refined during the design stage.

Implementation of the contingency air sparge wall (or other action agreed upon by the Air Force, EPA, and NYSDEC) will be completed if surface water samples from the culverted section of Six Mile Creek contain elevated concentrations of DCE and vinyl chloride that could be attributed to site groundwater. If installed, the wall is assumed to be a line of in-situ air sparging wells approximately 150 feet long (see Figure 7-2). The purpose of this sparging wall would be to remove any residual daughter products (such as DCE and vinyl chloride) from the aquifer through volatilization and the addition of oxygen at the leading edge of the plume. A blower would inject air into the groundwater via the sparge wells acting as an underground stripper to remove contaminants by volatilization. This remedy would also ensure protection of Six Mile Creek.

Long-term monitoring of the groundwater plume and treatment performance during full-scale implementation will be performed. In order to properly monitor the plume, groundwater sampling will be performed to determine and monitor seasonal water table and contaminant concentration fluctuations. Sampling of six wells is proposed for long-term monitoring. The number and location of wells for the proposed long-term monitoring network will be finalized during the design stage. Institutional controls in the form of deed restrictions for affected groundwater will also be implemented as follows (see Figure 7-3):

- Development and use of the entire SD-52, Building 817/WSA Operable Unit property for residential housing, elementary and secondary schools, childcare facilities and playgrounds will be prohibited unless prior approval is received from the Air Force, EPA, and NYSDEC.

- The owner or occupant of this site shall not extract, utilize, consume, or permit to be extracted, any water from the subsurface aquifer within the boundary of the site unless such owner or occupant obtains prior written approval from the NYSDOH.

- The owner or occupant of this site will not engage in any activities that will disrupt required remedial investigation, response actions and oversight activities, should any be required.

- The owner or occupant of this site will be restricted from access to all subsurface soils and groundwater at or below the groundwater interface at this AOC until the BRAC cleanup team identifies appropriate cleanup requirements**,** and cleanup actions are executed by the Air Force to the satisfaction of the BRAC cleanup team.

In addition, during the time between the adoption of the ROD (after public review of this proposed plan) and deeding of the property, equivalent restrictions will be implemented by lease terms, which will not be less restrictive than the use restrictions and controls described above. These lease terms shall remain in place until the property is transferred by deed, at which time they will be superseded by the institutional controls described in the ROD.

Monitoring is assumed to be required for 15 years. If COCs remain above proposed cleanup goals after the assumed 15-year period, additional monitoring would be considered.

Five-year reviews will be performed by the Air Force, in conjunction with the EPA and NYSDEC, to ensure the remedy is still performing as planned and is protective of public health and the environment.

Figure 7-3 B817/WSA Land Use and Institutional Controls Boundary

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8. NOSEDOCKS/APRON 2 GROUNDWATER

Apron 2, a former aircraft parking apron and refueling area, and the Nosedocks, each used as aircraft maintenance facilities, are located in the southeast portion of the former Griffiss AFB (see Figure 8-1). Apron 2 is approximately 1,600 feet by 900 feet in size. The Apron is a relatively flat, 18-inch thick, steel-reinforced concrete pad. The concrete paving is flanked by 50-foot wide areas of asphalt paving on the northwest and southeast sides. The surrounding surface is unpaved lawn. The Apron is sloped toward the center, where storm water collection drains channel runoff into trenches that discharge through an oil/water separator (OWS) and into the Six Mile Creek drainage area. The site covers an area of approximately 420,000 square feet.

The vicinity of the Nosedocks encompasses the buildings themselves, two oil/water separators (OWS 5730 [removed in 2001] and 6389-3), and several underground utilities (storm drains and sanitary sewers). The buildings are surrounded by grassy areas with several asphalt parking areas and driveways. The topography across the site is relatively flat.

Before 1950, the land in the Nosedocks area was part of a family farm. Two houses, a large barn, a hayfield, and a chicken coop were located at the site, and Six Mile Creek flowed through the site in an open channel. High-voltage power lines, including several 45-foot towers, cut through the southern portion of the site. The government procured the Nosedocks and Apron 2 property in the 1950s. After acquisition, the land was significantly altered to accommodate the large aircraft aprons (including Apron 1) and the Nosedocks. Six Mile Creek was diverted into an underground culvert, and the old channel was filled in. The high-voltage power lines in the area were rerouted (Law 1996). The main JP-4 fuel line for the refueling system at Apron 2 originated from the Bulk Fuel Storage Area (BFSA) located at the southern boundary of the base. The fuel line extended from the BFSA in generally a northwest direction onto the base, turned east along Brookley Road, passed above Three Mile Creek, turned north to the SAC Hill, and branched off to Pumphouses 1 through 5.

The five Nosedocks (Buildings 782 through 786) were also used as aircraft maintenance buildings. Interior drains at each Nosedock received a variety of liquid wastes generated by maintenance activities, while exterior drains received drainage from the apron. The Nosedock Wash Waste system was installed in 1959 to receive wash wastes from the Apron 2 interior and exterior trench drains. The system collected drainage from the five Nosedocks and a wash rack that was set up in the corner of Building 786, and drained to Manhole 19, where the effluent was pumped to former OWS 5730. Currently, the Nosedocks buildings house either private businesses or are vacant and all of the interior floor drains/trenches have been plugged by the Air Force.

Surface soils (from 0 feet BGS to approximately 20 feet BGS) consist of uniform brown, silty fine sand, with variable quantities of gravel and occasional clay. The soil appears to be fill material. The native material beneath the fill underneath the Apron area consists of brown, silty fine to coarse sand with variable quantities of gravel. Surface runoff in the vicinity of Nosedocks 1 and 2 flows into storm drains by way of a large unpaved drainage swale that extends several hundred feet from the southwest to the northeast. The storm drains of the Nosedocks flow through to OWS 6389-3 before discharging into Six Mile Creek.

The depth to groundwater ranges from 4 to 14.5 feet. Groundwater flow in the area of the Nosedocks is complicated due to the large surface pavements of Aprons 1 and 2. Massive construction has altered the natural hydrology in the area of the Aprons and has compacted the subsurface layers, leading to perched groundwater conditions in the area. In general, however, the groundwater flow direction is northeasterly.

The groundwater plume at Nosedocks/Apron 2 appears to extend from the northern vicinity of Building 786 east-northeast to Six Mile Creek. The suspected source area may be associated with the former Wash Waste System between Manholes 14 and 15. The manholes are upgradient of those locations where elevated concentrations of chlorinated hydrocarbons were detected. The RI documented that natural attenuation processes are ongoing. Continued groundwater monitoring following the RI for two years has indicated that the plume is stable and that Six Mile Creek is not impacted (see Section 9.1, Summary of Site Activities, Groundwater Study).

8.1 SUMMARY OF SITE ACTIVITIES

The following summarizes the site activities that led to the delineation of the Nosedocks/Apron 2 chlorinated plume including previous investigations at adjacent sites, specifically Nosedocks 1 and 2.

Remedial Investigation – Nosedocks 1 and 2

In 1994, an RI was performed. The main objective of the RI was to investigate the nature and extent of environmental contamination from historical releases. The RI included a passive soil gas survey; collection of one waste oil sample from the OWS; collection of surface soil samples, and the installation and sampling of 24 soil borings and four new monitoring wells.

Groundwater and soil samples were collected from the north and northwest sides of Nosedocks 1 and 2 (Buildings 782 and 783) during this RI. Analytical results indicated the presence of 20 VOCs, nine SVOCs, six metals and 11 pesticides. No chlorinated hydrocarbons were detected in soil samples. Thirteen VOCs and six metals exceeded the most stringent criteria (see Table 8-1).

Supplemental Investigation – Nosedocks 1 and 2

In 1997, an SI was performed to address the data gaps and uncertainties identified in the RI. New monitoring wells were installed including 782MW-5, 782MW-6R1, and 782MW-6R2 (see Figure 8-1). Existing wells 782MW-1R, -2, and -3R were also sampled during the SI. A groundwater sample collected at 782MW-6R2 indicated the presence of cis-1,2-DCE (37 µg/L) and vinyl chloride (26 µg/L) above the most stringent criterion of 5 µg/L; no chlorinated hydrocarbons were reported above the detection limits in 782MW-2, -3R, or -5. The SI recommended that additional wells be installed to the east of Building 782 to characterize the extent of groundwater contamination.

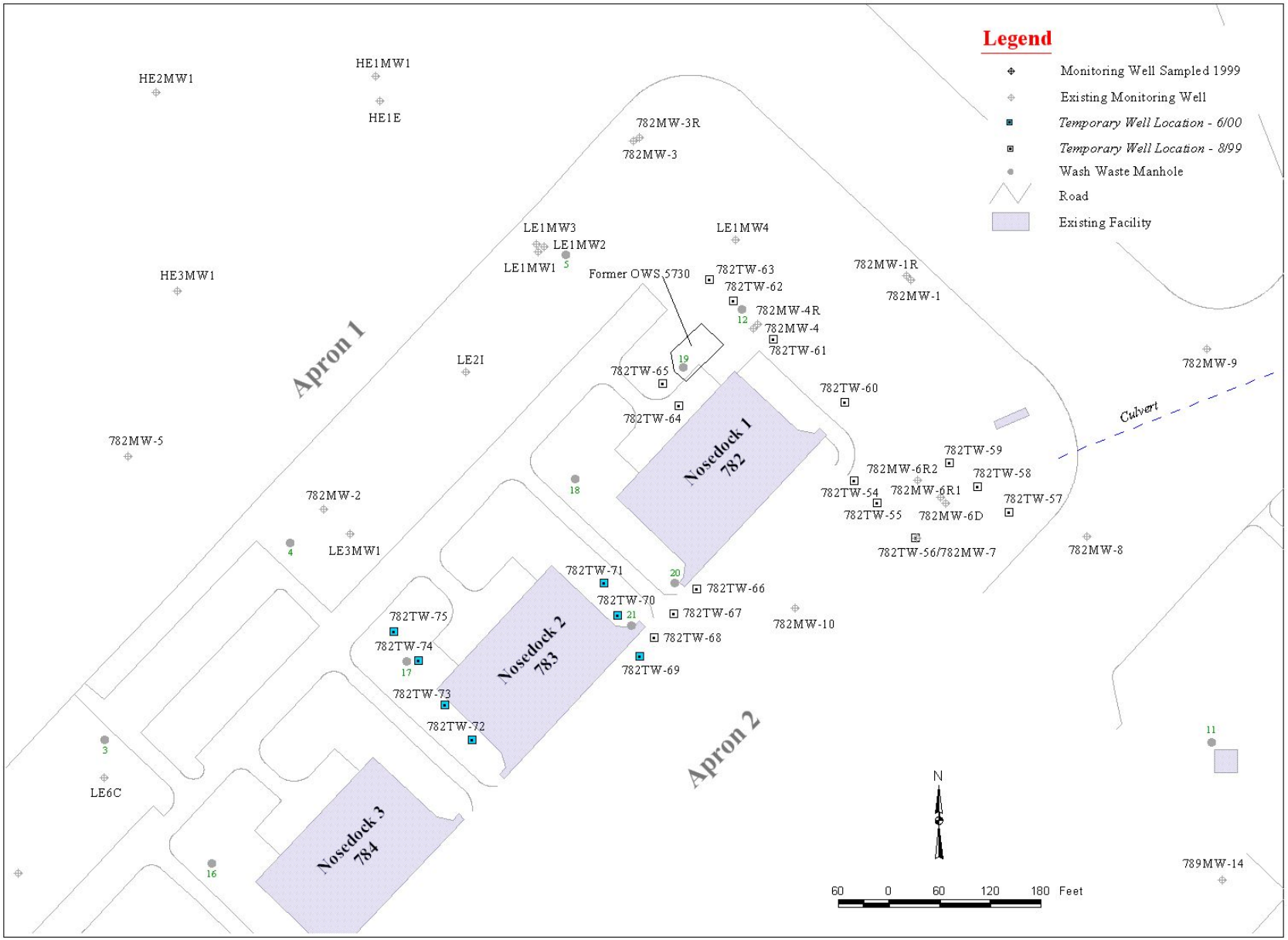

Figure 8-1 Nosedocks/Apron 2 Groundwater Monitoring Well and Sampling Locations

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Table 8-1
COMPOUNDS EXCEEDING GUIDANCE VALUES
NOSEDOCKS 1 AND 2
REMEDIAL INVESTIGATION GROUNDWATER SAMPLES (1994)

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (µg/L)			
Acetone	3.4J – 66	1/4	50 [a]
Benzene	4.8 -410	3/4	1 [a]
sec-Butylbenzene	0.8 – 29	1/4	5 [a]
cis-1,2-Dichloroethene	0.4J – 12	1/4	5 [a]
Ethylbenzene	36 – 39	2/4	5 [a]
Hexachlorobutadiene	1.2	2/4	0.5 [a]
Isopropylbenzene	4.5 – 21	1/4	5 [a]
Naphthalene	17 – 28D	2/4	10 [b]
Toluene	0.8 – 1,400	1/4	5 [a]
1,2,4-Trimethylbenzene	62 – 530D	2/4	5 [a]
1,3,5-Trimethylbenzene	24 – 180D	2/4	5 [a]
m,p-Xylene	100D – 220	2/4	5 [a]
o-Xylene	4.2 – 130	1/4	5 [a]
Metals (µg/L)			
Aluminum	400	1/4	50 [d]
Arsenic	2.16J – 29	1/4	10 [c]
Iron	12,700 – 66,100	4/4	300 [a, d]
Manganese	2,960 – 9,210	4/4	50 [d]
Sodium	20,040 – 23,800	4/4	20,000 [a]
Thallium	0.7J	1/4	0.5 [b]

[a] NYSDEC Class GA groundwater standard, June 1998.
[b] NYSDEC Class GA groundwater guidance value, June 1998.
[c] EPA Federal primary maximum contaminant level.
[d] EPA Federal secondary maximum contaminant level.

Key: D = Sample required dilution.
J = Estimated concentration.
µg/L = Micrograms per liter.

2002 Remedial Investigation – Nosedocks/Apron 2

In 2002, a second RI was performed for Nosedocks/Apron 2 site. This RI included plume delineation and potential source area identification. This remedial investigation included:

- Drilling and vertically profiling 39 boreholes, including the collection of 110 Hydro-punch samples;
- Installation of 28 new groundwater monitoring wells screened across the zone with the highest concentration of chlorinated hydrocarbons reported during the vertical profiling;
- Collection of groundwater samples from the 28 new wells and six existing wells for the analysis of VOCs and geochemical parameters to evaluate the extent of ongoing biodegradation across the contaminated plume; and

- Collection of surface water and groundwater seepage samples downgradient of the detected contamination to evaluate the plume transport off site.

Four contaminants were detected at levels exceeding the most stringent criteria (NYSDEC groundwater standards) from plume extent wells sampled in February 2002. These permanent wells include: 782VMW-76, -78, -80, -81, -83, -84, -87, -88, -90, -92, through -97, -101 -104, -105B, 782MW-4R, -6D, -6R2, -10, and AP2MW-3.

TCE was reported in five wells ranging from 0.85 µg/L to 49.95 µg/L, and at levels exceeding the most stringent criteria in four wells. Cis-1,2-DCE, which was detected in eight wells ranging from 1.47 µg/L to 66 µg/L, and at levels exceeding the most stringent criteria in five wells. Vinyl chloride, was detected in 13 wells ranging from 1.39 µg/L to 77.8 µg/L, and at levels exceeding the most stringent criteria in 11 wells. Methyl tert-butyl ether (MTBE), was reported in eight wells ranging from 9.59 µg/L to 251 µg/L, and at levels exceeding the most stringent criteria in five wells. There were no chlorinated hydrocarbon detections present at any surface water locations. Figure 8-2 illustrates the groundwater contamination identified at the site during the 2002 RI.

Groundwater Study

Supplemental to the previous field activities, groundwater monitoring was performed quarterly at the 33 monitoring wells and four surface water locations from February 2003 to September 2004 (the monitoring network for the site is illustrated in Figure 8-3, including surface water locations). The objectives of sampling the groundwater at the Nosedocks/Apron 2 were to monitor for the presence of chlorinated hydrocarbons within and downgradient of the site, monitor plume attenuation, and characterize and delineate localized contamination.

Each monitoring well location was sampled and tested for VOCs, metals, natural attenuation parameters (chloride, nitrate, sulfate, sulfide, total alkalinity, and total organic carbon), and ferrous iron, which was measured in the field. Surface water samples were analyzed for VOCs.

Table 8-2 summarizes the results for chlorinated hydrocarbons from February 2003 to September 2004. Four consecutive rounds of no exceedances for VOCs warranted either the removal or a frequency change for that particular location. Based on the laboratory data, modifications included frequency changes from quarterly to semi-annually at well locations 782VMW-77, -85, -86, and -100 and monitoring wells 782VMW-82, -95, -98 and -99 were removed from the monitoring program.

Recent groundwater data indicates that chlorinated hydrocarbon contamination formerly associated with the northern cis-1,2-DCE plume has attenuated to levels below NYSDEC groundwater standards. The data also indicate that the contamination is not migrating off site through seepages or discharges to Six Mile Creek. However, based on the data, the southern chlorinated hydrocarbon plume (TCE, DCE, and vinyl chloride contamination) has shown relative stability with minor attenuation along the eastern edge of the plume throughout the sampling rounds as is evident with the optimization of the monitoring network. Figure 8-3 also illustrates the chlorinated hydrocarbon contamination along with the petroleum contamination plumes present at the site. Vinyl chloride contamination at the site appears to be peripherally commingling with petroleum contamination downgradient at the Apron 2 location of the site (Figure 8-3). Biosparging is currently anticipated to be the recommended alternative for cleanup of the petroleum-related

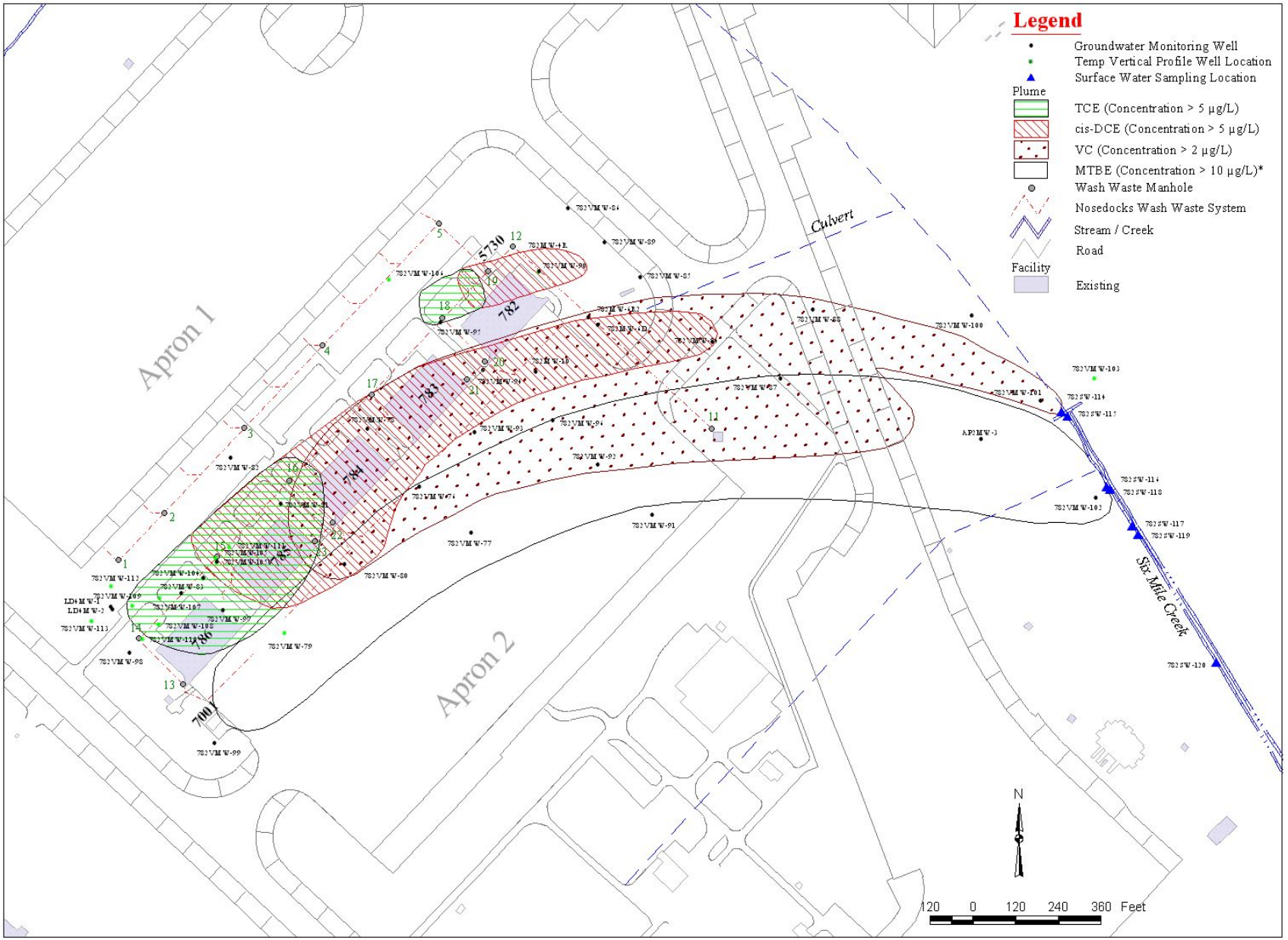

Figure 8-2 Nosedocks/Apron 2 Groundwater Contamination (February 2002)

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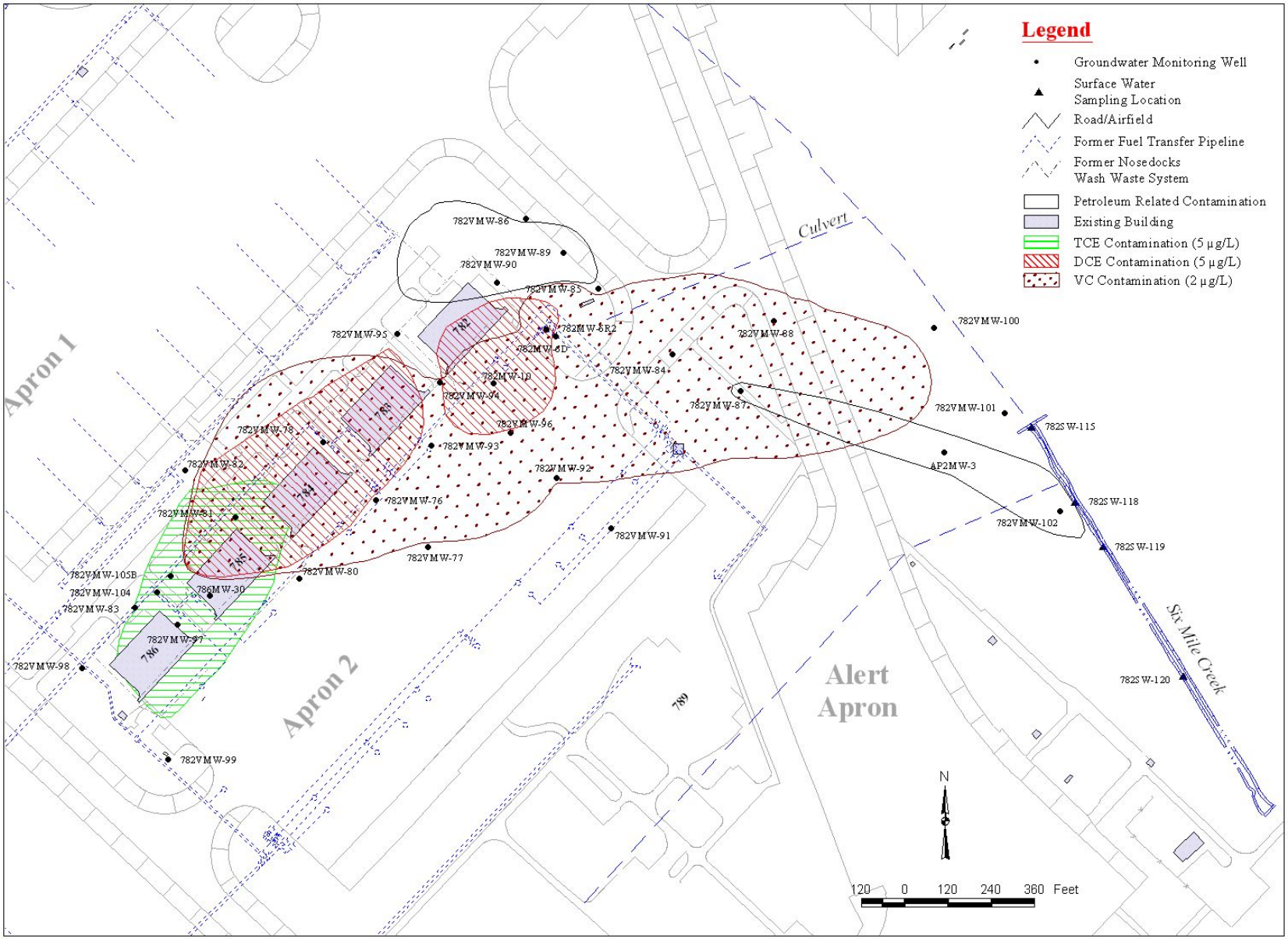

Figure 8-3 Nosedocks/Apron 2 Groundwater Plumes (September 2004)

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contamination northeast and northwest of Aprons 1 and 2. The effect of this alternative was considered during the development of the remedy selection. Recent data has indicated that petroleum-related MTBE contamination previously identified during the RI has naturally attenuated as indicated in Figure 8-3. All remaining petroleum contamination is addressed under the NYSDEC Petroleum Spills Program.

Table 8-2
CHLORINATED HYDROCARBONS DETECTED IN GROUNDWATER
NOSEDOCKS/APRON 2 CHLORINATED PLUME
GROUNDWATER MONITORING (February 2003 through September 2004)

Compound	NYS GW Std	Range of Detection Feb 2003	Range of Detection June 2003	Range of Detection Sept 2003	Range of Detection Dec 2003	Range of Detection April 2004	Range of Detection July 2004	Range of Detection Sept 2004
VOCs (µg/L)								
cis-1,2-DCE	5	0.45F - 64	0.21F - 68	0.4F - 68	0.3F - 55	0.33F - 75	0.46F - 60	0.2F - 56
TCE	5	0.21F - 39	3.3 - 32	0.22F - 26	0.28F - 21	0.21F - 32	0.2F - 25	0.27F - 29
Trans-1,2-DCE	5	0.28F - 3.6	0.29F - 3.8	0.2F – 5.5	0.21F - 4.3	0.23F - 1.3	0.66F - 3.7	0.24F - 4.6
Vinyl Chloride	2	0.66F - 96	0.22F - 130J	0.35F - 120	0.34F - 97	0.46F - 130	0.34F - 62	0.25F - 80

Key: F = The analyte was detected above the minimum detection limit, but below the reporting level.
J = The analyte was positively identified, the quantitation is approximate.
µg/L = Micrograms per liter.

Risk Assessment

A baseline human health risk assessment was conducted during the 2002 RI to determine whether chemicals detected at the Nosedocks/Apron 2 could pose health risks to individuals under current and proposed future land uses if no remediation occurs.

The current and future land use designation for Nosedocks/Apron 2 is industrial/commercial. The human health risk assessment for groundwater evaluated exposure to potential industrial workers. The receptors and pathways evaluated for groundwater exposure in the risk assessment are summarized in Table 8-3. The risk assessment process is described in Section 2 of this proposed plan. The exposure assumptions, which were selected in accordance with EPA guidance, are more fully described in the RI report.

Table 8-3
RISK ASSESSMENT EXPOSURE SCENARIOS
NOSEDOCKS/APRON 2

INDUSTRIAL WORKERS (groundwater used for potable or process water)
■ Ingestion of groundwater ■ Dermal contact with groundwater ■ Inhalation of VOCs from groundwater

Carcinogenic Risk

The cumulative carcinogenic risk from exposure to contaminants in groundwater by industrial workers was 5×10^{-5}, which is also within EPA's acceptable target risk range. Benzene and pentachlorophenol were the major risk contributors for this exposure scenario.

Noncarcinogenic Risk

The total HIs for industrial workers from ingestion of groundwater, inhalation of VOCs released from groundwater, and dermal contact with groundwater were 20, 0.08, and 2,

respectively. The exposure pathway presenting the greatest potential hazard was from the ingestion of groundwater contaminated with benzene and manganese.

Ecological Risk Assessment
A baseline risk assessment for ecological receptors from exposures to surface soil at the Nosedocks/Apron 2 site was conducted during the RI. An ecological risk assessment for exposure to groundwater was not performed because wildlife does not have access to groundwater in this area.

8.2 REMEDIAL ACTION

Remedial Action Objectives

For the Nosedocks/Apron 2 site, the RAOs are to make the groundwater potable for domestic or municipal use, or to prevent exposure to groundwater until groundwater standards are achieved while maintaining institutional controls to prevent groundwater use and to prevent contaminated groundwater from adversely impacting surface water and sediment.

Description and Evaluation of Remedial Action Alternatives

CERCLA regulations mandate that a remedial action must be protective of human health and the environment.

The following seven remedial alternatives were developed for the Nosedocks/Apron 2 chlorinated plumes, which are relatively deep plumes (32 to 40 ft BGS) that have migrated northeast from their apparent original source area near Buildings 785 and 786. For purposes of the FS, each alternative assumes a maximum 30-year remediation duration which is typically used in FSs for evaluation purposes. A summary of estimated remediation durations and costs are presented in Table 8-4:

- Alternative 1: No-action involves no remedial action for treatment of the plumes. The plumes would be allowed to migrate and naturally attenuate. No monitoring would be conducted to evaluate the progress of these natural processes.

- Alternative 2: Institutional controls in the form of legally enforceable groundwater use restrictions would be implemented together with a long-term monitoring program to periodically ensure that the controls remain in place and that they remain protective of human health and the environment. Based on monitoring data collected over several years, the chlorinated groundwater plume has stabilized or is shrinking in extent over time and the overall mass of contamination in the chlorinated plume within contours defined by target cleanup concentration levels is reducing over time due to hydrogeologic and natural attenuation processes. The proposed long-term monitoring would be performed for the assumed 30-year remediation period to verify that the chlorinated plume is stable and that the current trend toward gradual reduction in volume of plume and mass of contaminants within the plume continues.

- Alternative 3: Monitored natural attenuation would employ natural processes to reduce contaminant concentrations within the aquifer. To implement monitored natural attenuation a groundwater monitoring network would be established to evaluate

TABLE 8-4
SUMMARY OF REMEDIAL ALTERNATIVE DURATIONS AND COSTS FOR BUILDING NOSEDOCKS/APRON 2

Description	Alternative						
	1	2	3	4	5	6	7
	No Action	Institutional Controls and LTM	Monitored Natural Attenuation	Air Sparging and Soil Vapor Extraction	In-situ Permeable Reactive Barriers	In-situ Active Chemical Oxidation	Six Mile Creek Horizontal Air Sparging Barrier
Total Approximate Project Duration (Years)	0	30	30	5	15	10	30
Total Present Value of Alternative	**$50,000**	**$1,480,000**	**$1,565,000**	**$31,090,000**	**$4,920,000**	**$2,925,000**	**$2,785,000**

Key:
LTM = Long-term monitoring.

contaminant and natural attenuation parameter concentrations within the plume, and gather additional data required for evaluating site hydraulics and in-situ natural attenuation parameters. Long-term monitoring and institutional controls would also be included in this alternative for an assumed 30-year remediation duration.

- Alternative 4: In-situ air sparging and soil vapor extraction (AS/SVE) would involve the installation of groundwater air-sparging wells to inject pressurized air into the groundwater within the chlorinated plume such that the air enters the groundwater from the bottom of the contaminated zone. As the injected air traverses up through the plume, the VOCs present in the groundwater would be transferred to the air medium and transported toward the surface. The contaminated vapors would be captured by SVE wells (by means of vacuum extraction) and either treated above ground or discharged directly into the atmosphere. Operation and maintenance of the AS/SVE system is estimated to occur over 2 years with monitoring to extend 3 years beyond. Groundwater, surface water, and soil vapor monitoring would be conducted during the implementation period. Institutional controls would be implemented and a long-term groundwater and surface water monitoring program would be conducted to verify that the remedy remains protective.

- Alternative 5: In-situ inactive enhanced abiotic degradation using permeable reactive barriers (PRBs) is proposed for the portions of the plumes with concentrations greater than 20 µg/L TCE in the TCE plume, greater than 30 µg/L DCE in the DCE plume (in both plume zones), and greater than 80 µg/L vinyl chloride in the vinyl chloride plume. In this alternative, PRB walls constructed of zero-valent iron would be used for remediation of the TCE and DCE plumes via reductive dechlorination, and ORC® would be injected at multiple locations for remediation of the vinyl chloride plume via aerobic degradation. Institutional controls would be implemented and a long-term groundwater and surface water monitoring program for an assumed 15-year duration would be conducted for the entire plume to verify that the remedy remains protective.

- Alternative 6: In-situ chemical oxidation would involve the delivery of a strong oxidizing agent into the subsurface through temporary injection points (i.e., direct push points) to oxidize COCs to non-toxic compounds. In addition, institutional controls, including long-term monitoring of groundwater for an estimated 10-year duration, would be implemented to minimize the potential for future exposure to contaminated groundwater until cleanup goals were achieved. During this action, there would be continued monitoring of the extent of migration or natural attenuation of the plume. This alternative would involve full-scale remediation for those portions of the plumes with concentrations greater than 20 µg/L for TCE, greater than 30 µg/L for DCE and greater than 80 µg/L for vinyl chloride.

- Alternative 7: A Six Mile Creek in-situ air sparging barrier system would be implemented under this alternative. A biosparge horizontal treatment system would treat the residual vinyl chloride component of the plume prior to discharge to Six Mile Creek. Air sparging would be used to inject pressurized air into the groundwater across the plume width and upgradient of Six Mile Creek (which at this discharge point is expected to have residual or negligible concentrations of contaminants). As the injected air traverses up though the groundwater, any VOCs that may be present are transferred to the air medium and transported toward the surface (unsaturated zone), where they are discharged to ambient air as aerially-distributed (non-point source) emissions. No SVE system is proposed since it is not needed for controlling and collecting the vapors due to the absence of buildings or other habitable structures

in this area near the creek. Institutional controls would be implemented and a long-term groundwater and surface water monitoring program for an estimated 30-year period would be conducted to evaluate the extent of migration and attenuation of the plume upgradient and downgradient from the barrier system and to verify that the remedy remains protective.

Under Alternatives 1 and 2, no action would be taken to reduce levels of contaminants in groundwater. Alternative 1 represents the least expensive alternative as no action is performed. A nominal cost of $50,000 was assumed for administrative expenses. Alternative 2 is more expensive ($1,500,000) as it includes monitoring to verify that natural processes continue to reduce contaminant levels for 30 years. Based on extrapolation of historical monitoring data, RAOs are expected to be achieved within the assumed 30-year period used for evaluation purposes in the FS. Alternative 3 is slightly more expensive ($1,600,000) including costs for 30 years of monitored natural attenuation and long-term monitoring.

Under Alternatives 4, 5, 6, and 7, several active treatment technologies would be employed. Alternative 4 would result in the shortest treatment period (five years) but is associated with the highest cost ($31,100,000). The estimated cost for Alternative 5 is approximately $4,900,000, including costs for 15 years of long-term monitoring. Alternatives 6, and 7 have comparable cost ($2,900,000 and $2,800,000 respectively), however Alternative 6 includes costs for 10 years of long-term monitoring while Alternative 7 includes costs for 30 years of long-term monitoring.

Based on a comparative analysis of remedial alternatives according to established criteria (see Final FS Report for the Nosedocks/Apron 2 Chlorinated Plume, August 2006), the recommended alternative is Alternative 3, monitored natural attenuation with institutional controls and long-term monitoring. Given the relatively low concentrations, groundwater use deed restrictions, and lack of current or future impact to Six Mile Creek, this alternative represents a remedial approach that provides for the protection of human health and the environment. A more active alternative that reduces the toxicity, mobility, and volume of site COCs, which is typically the preferred approach, is not practical for the Nosedocks/Apron 2 plume primarily due to the large size of the plume and the relatively low concentrations of contaminants. If elevated concentrations of vinyl chloride attributable to site groundwater are detected in Six Mile Creek, implementation of a contingency alternative will be performed. Alternative 7 would be considered as a primary contingency alternative.

Evaluation Criteria for Remedial Action Alternatives

Remedial alternatives are assessed on the basis of both a detailed and a comparative analysis pursuant to the NCP. The detailed analysis of the Nosedocks/Apron 2 chlorinated plume in the FS report consisted of (1) an assessment of the individual alternatives against seven evaluation criteria and (2) a comparative analysis focusing upon the relative performance of each alternative against the criteria.

In general, the following “threshold” criteria must be satisfied by an alternative for it to be eligible for selection. The proposed alternative is briefly evaluated below for each of the first seven criteria:

1. Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each exposure

pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

There are currently no human or environmental receptors impacted by this plume. The proposed alternative will further limit future potential exposure threats and verify the protectiveness of human health and the environment.

2. Compliance with ARARs addresses whether a remedy would (1) meet all of the ARARs or (2) provide grounds for invoking a waiver.

   Institutional controls will be in place as long as it is necessary for the contaminants to naturally attenuate to levels below ARARs. At this time, groundwater discharges into Six Mile Creek at levels that meet surface water ARAR levels.

In addition, the following "primary balancing" criteria are used to make comparisons and identify the major trade-off among alternatives:

3. Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

   Because the available data demonstrates ongoing complete biodegradation of TCE, DCE, and vinyl chloride, with data trends supporting complete removal from the aquifer, the proposed alternative is effective in the long term.

4. Reduction of toxicity, mobility, or volume via treatment refers to a remedial technology's expected ability to reduce the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants at the site.

   The proposed alternative does not interfere with the ongoing natural degradation of TCE, DCE, and vinyl chloride or the plume stability. Institutional controls and monitoring will ensure and verify that human health and the environment are protected.

5. Short-term effectiveness addresses (1) the period of time needed to achieve protection and (2) any adverse impacts on human health and the environment that may be posed during the construction and implementation periods until cleanup goals are achieved.

   The proposed alternative can be readily implemented with no short-term impacts through the adaptation of existing monitoring wells. Long-term monitoring will be required for an assumed 30 years. Deed restrictions will be required until RAOs have been achieved.

6. Implementability refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed.

   The proposed alternative can be readily implemented through the use of existing and proposed deed restrictions as well as existing monitoring wells. Sufficient monitoring data (2002 – 2005) is available to support the monitoring network design and acceptance.

7. Cost includes estimated capital, O&M, and present-worth costs.

   The 2004 total present-worth cost of the proposed alternative of $1,600,000 was based on monitoring a network of 10 groundwater wells and 3 surface water locations for monitoring VOCs and monitored natural attenuation parameters. Quarterly monitoring was assumed during the first year and semiannual monitoring thereafter during the 30-year monitoring period. Present-worth estimates were generated using Remedial Action Cost Engineering and Requirements 2004 cost-estimating system. The first year cost in 2004 dollars is approximately $192,000 with annual costs thereafter of $47,500.

Finally, the following "modifying" criteria are considered fully after the formal public comment period on the proposed plan is complete:

8. State acceptance indicates whether, based on its review of the proposed plan and the RI, SI, and FS reports, the State supports or opposes the preferred alternative and/or has identified any reservations with respect to the preferred alternative.

9. Community acceptance refers to the public's general response to the alternatives described in the proposed plan and the RI, SI, and FS reports. Factors of community acceptance include support, reservation, or opposition by the community.

8.3 DESCRIPTION OF THE PREFERRED ALTERNATIVE

Under the selected remedial approach, monitored natural attenuation, including groundwater and surface water monitoring, would be conducted to verify that the FS assumptions are valid and that the human health and the environment are protected. It is proposed that the monitoring network will be developed using existing wells that have proven to be capable of tracking the plume. Given the flat water table in the vicinity of Apron 2 and the stable nature of the plume, which is evident from years of monitoring data, it is believed that contaminant level variations can be adequately tracked with quarterly monitoring of VOCs for the first year and semi-annual thereafter. A higher monitoring frequency is proposed for the first year to identify seasonal fluctuations and uncertainties within the plume. Actual monitoring network revision/optimization will be conducted as data is collected and reviewed by the Air Force, EPA, and NYSDEC. Similarly, the actual monitoring period will depend on the observed contaminant levels and locations over time. A contingency alternative, such as a horizontal air sparging barrier (or other action agreed upon by the Air Force, EPA, and NYSDEC) will be implemented if surface water samples from Six Mile Creek contain elevated concentrations of vinyl chloride that could be attributed to site groundwater.

Institutional controls in the form of deed restrictions for affected groundwater will also be implemented as follows (see Figure 8-4):

- Development and use of the entire SD-52, Nosedocks/Apron 2 Operable Unit AOC property for residential housing, elementary and secondary schools, childcare facilities and playgrounds will be prohibited unless prior approval is received from the Air Force, EPA, and NYSDEC.

- The owner or occupant of this site shall not extract, utilize, consume, or permit to be extracted, any water from the subsurface aquifer within the boundary of the site unless such owner or occupant obtains prior written approval from the NYSDOH.

- The owner or occupant of this site will not engage in any activities that will disrupt required remedial investigation, response actions and oversight activities, should any be required.

- The owner or occupant of this site will be restricted from access to all subsurface soils and groundwater at or below the groundwater interface at this AOC until the BRAC cleanup team identifies appropriate cleanup requirements**,** and cleanup actions are executed by the Air Force to the satisfaction of the BRAC cleanup team.

In addition, during the time between the adoption of the ROD (after public review of this proposed plan) and deeding of the property, equivalent restrictions will be implemented by lease terms, which will not be less restrictive than the use restrictions and controls described above. These lease terms shall remain in place until the property is transferred by deed, at which time they will be superseded by the institutional controls described in the ROD.

Five-year reviews will be performed by the Air Force, in conjunction with the EPA and NYSDEC, to ensure the remedy is still performing as planned and is protective of public health and the environment.

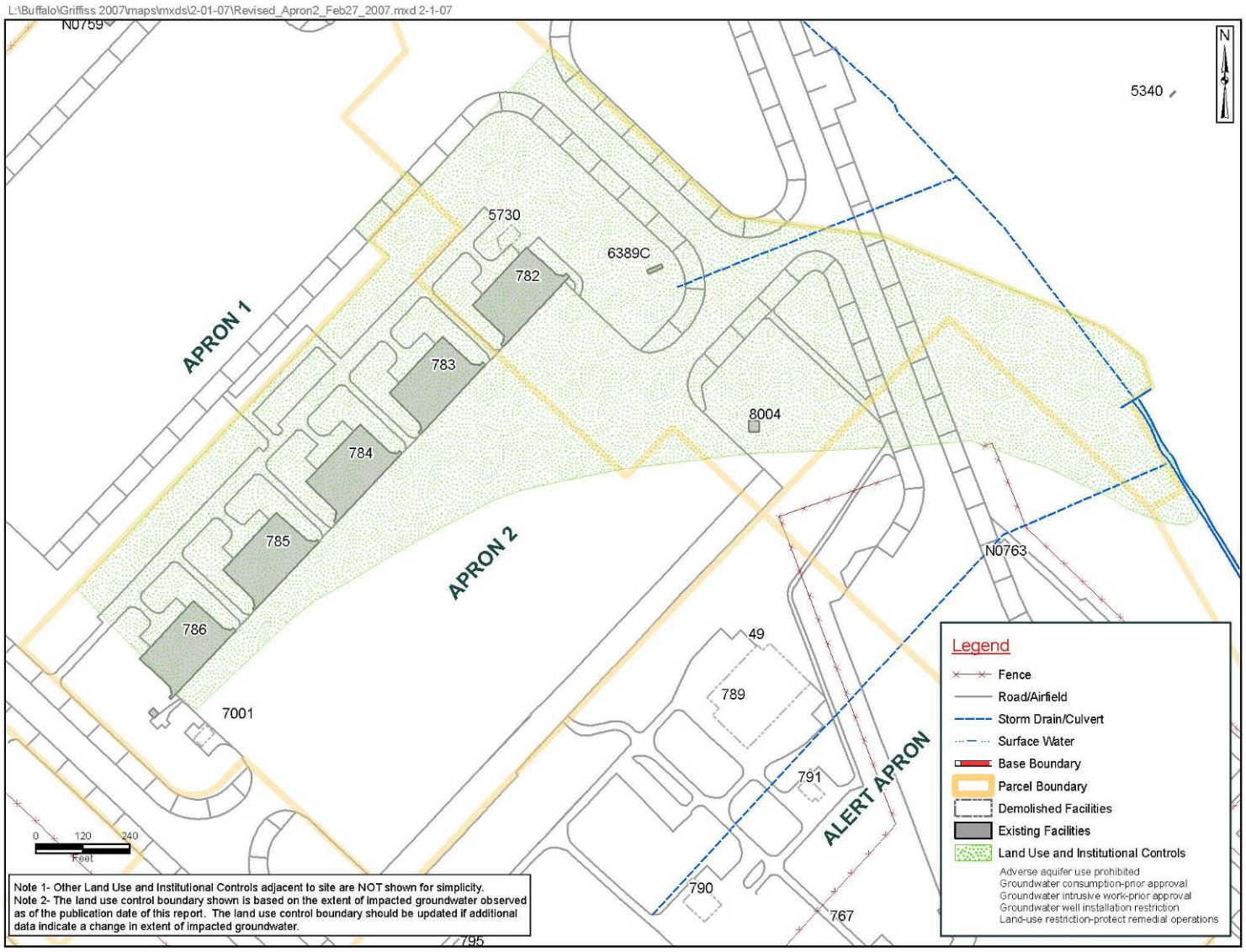

Figure 8-4 Nosedocks/Apron 2 Land Use and Institutional Controls Boundary

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LIST OF ACRONYMS

AFB	Air Force Base
Air Force	United States Air Force
AOC	Area of Concern
AOI	Area of Interest
ARAR	applicable or relevant and appropriate requirements
AS/SVE	air sparging/soil vapor extraction
ATSDR	Agency for Toxic Substances and Disease Registry
B817/WSA	Building 817/Weapons Storage Area
BFSA	Bulk Fuel Storage Area
BGS	below ground surface
BRAC	Base Realignment and Closure Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	chemicals of concern
COPCs	chemicals of potential concern
DCB	dichlorobenzene
DCE	dichloroethene
DFAS	Defense Finance and Accounting Services
EPA	United States Environmental Protection Agency
ESI	Expanded Site Investigation
FFA	Federal Facility Agreement
FS	Feasibility Study
GPR	ground-penetrating radar
HI	hazard index
HQ	hazard quotient
MTBE	methyl tert-butyl ether
NCP	National Contingency Plan
NEADS	Northeast Air Defense Sector
NPL	National Priorities List
NYANG	New York Air National Guard
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
O&M	operation and maintenance
OBGW	On-base Groundwater
OWS	oil/water separator
PCE	tetrachloroethene

LIST OF ACRONYMS (CONT.)

PRB	permeable reactive barrier
RAO	remedial action objective
RI	Remedial Investigation
ROD	Record of Decision
SAC	Strategic Air Command
SGC	standards, criteria, and guidelines
SI	Supplemental Investigation
SPDES	State Pollutant Discharge Elimination System
SVOC	semivolatile organic compound
TAGM	Technical and Administrative Guidance Memorandum
TBC	to be considered
TCE	trichloroethene
TRPH	total recoverable petroleum hydrocarbon
µg/L	micrograms per liter
UST	underground storage tank
VOC	volatile organic compound
WSA	Weapons Storage Area