Long-Term Monitoring Program
Former Griffiss Air Force Base
Rome, New York

FIELD SAMPLING PLAN

DEPARTMENT OF THE AIR FORCE • UNITED STATES OF AMERICA •

Prepared by:

FPM Group, Ltd.
153 Brooks Road
Rome, NY 13441

Revision 2.0
December 2003

FPM group

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE AIR FORCE
AIR FORCE REAL PROPERTY AGENCY

MEMORANDUM FOR SEE DISTRIBUTION LIST

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FROM: AFRPA/DA-Griffiss
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SUBJECT: Draft Field Sampling Plan, Revision 2.0
Draft Site Safety and Health Plan, Revision 2.0
Long-Term Monitoring Program at the former Griffiss Air Force Base, Rome, NY

Enclosed please find the subject Draft Field Sampling Plan and Draft Site Safety and Health Plan for the Long-Term Monitoring Program at the former Griffiss Air Force Base.

The purpose of the plans is to consolidate and update information from previously submitted plans:

- Draft-Field Sampling Plan, Petroleum Spill Sites, Long-Term Monitoring Program, Rev. 0.0, August 2001 (including subsequent Addenda)
- Draft Field Sampling Plan, Areas of Concern Long-Term Monitoring Baseline Study, Vers. 1.2, December 1998.
- Draft Work Plan, Long-Term Monitoring, Three Mile Creek and Six Mile Creek AOCs, February 2003.

Please review and advise of any comments.

MICHAEL F. MCDERMOTT
BRAC Environmental Coordinator

Attachments: As Noted

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On behalf of FPM Group, Ltd. (FPM), the undersigned certify that the document(s) listed below were developed in conformance with FPM's Quality Control Plan, and further, that the work was performed in accordance with acceptable standards of engineering and scientific practice. Comments made by reviewers will be maintained in the project files in accordance with company policy.

Field Sampling Plan for Long Term Monitoring Program
Griffiss Air Force Base
Rome, New York
December 2003
Revision 2.0

Contract Number: DACW41-02-D-0020
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Prepared for:

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Project Manager

12/17/03
Date

FIELD SAMPLING PLAN

FOR

LONG TERM MONITORING PROGRAM

FORMER GRIFFISS AIR FORCE BASE
ROME, NEW YORK

Prepared for:

AIR FORCE REAL PROPERTY AGENCY
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FIELD SAMPLING PLAN
FOR LONG TERM MONITORING PROGRAM

FORMER GRIFFISS AIR FORCE BASE
ROME, NEW YORK

Revision 2.0, December 2003

Prepared by: Justin Damann/David P. Forse, FPM Group *Date:* 12/17/03

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LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFBCA	Air Force Base Conversion Agency
AFCEE	Air Force Center for Environmental Excellence
AFRPA	Air Force Real Property Agency
AOC	Area of Concern
ARAR	applicable or relevant and appropriate requirement
ASTM	American Society for Testing and Materials
bgs	below ground surface
BRAC	Base Realignment and Closure
°C	degrees Celsius
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CoC	chain-of-custody
COCs	contaminants of concern
COR	Contracting Officer Representative
CQCC	Chemical Quality Control Coordinator
DCQCRs	daily chemical quality control reports
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DNAPL	dense non-aqueous phase liquid
DO	delivery order
DOD	Department of Defense
DOT	Department of Transportation
DQO	data quality objective
EC	electrical conductivity
E.I.T.	Engineer-in-Training
EPA	Environmental Protection Agency
ERPIMS	Environmental Resources Program Information Management System
FID	flame ionization detector
FOM	Field Operations Manager
FPM	FPM Group, Ltd.
FS	Feasibility Study
FSP	Field Sampling Plan
ft	foot or feet
G	glass
g/cm^3	grams per cubic centimeter
gal/ft^3	gallons per cubic foot
HCl	hydrochloric acid

HSP	Health and Safety Plan
IRP	Installation Restoration Program
lbs/gal	pounds per gallon
LNAPL	light non-aqueous phase liquid
LTM	long-term monitoring
mg/L	milligrams per liter
mL	milliliter
mL/L	milliliters per liter
MS/MSD	matrix spike/matrix spike duplicate
NAD	North American Datum
NCP	National Contingency Plan
NTU	nephelometric turbidity unit
NYSDEC	New York State Department of Environmental Conservation
OD	outside diameter
OVM	organic vapor meter
OVA	organic vapor analyzer
P	polyethylene
P.E.	Professional Engineer
PID	photoionization detector
PM	Project Manager
POC	point of compliance
POTW	Publicly Owned Treatment Works
PVC	polyvinyl chloride
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SDG	sample delivery group
SOW	statement of work
SVOC	semi-volatile organic compound
T	California brass
USACE	United States Army Corps of Engineers

USAF	United States Air Force
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WP	Work Plan
µg/L	micrograms per liter

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1 INTRODUCTION

The Field Sampling Plan (FSP) presents, in specific terms, the requirements and procedures for conducting field operations and investigations. This project-specific FSP has been prepared to ensure: (1) the data quality objectives (DQOs) specified for this project are met; (2) the field sampling protocols are documented and reviewed in a consistent manner; and (3) the data collected are scientifically valid and defensible. This project-specific FSP, and the Air Force Center for Environmental Excellence (AFCEE) Quality Assurance Project Plan (QAPP) (Version 3.1), shall constitute, by definition, the Sampling and Analysis Plan (SAP).

The National Contingency Plan (NCP) specifies circumstances under which a FSP is necessary for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response actions. For cleanup actions at the remedial investigation/feasibility study (RI/FS) stage, the NCP requires lead agents to develop sampling and analysis plans, which provide a process for obtaining data of sufficient quality and quantity to satisfy data needs. Such sampling and analysis plans must include a field sampling plan (40 Code of Federal Regulations (CFR) 300.430 (b)(8)(ii)).

Guidelines followed in the preparation of this plan are set out in the: Data Quality Objectives (DQOs) Process for Superfund, Interim Final Guidance (U.S. Environmental Protection Agency [USEPA], 1993). Additional reference documents used in the preparation of this FSP include:. (1) Petroleum Spill Sites Field Sampling Plan (FPM Group, Ltd., 2001); (2) Areas of Concern (AOC) LTM Baseline Study (FPM Group, Ltd., 1998); (3) Draft Long Term Monitoring Work Plan: Three Mile Creek and Six Mile Creek AOC's (FPM Group, Ltd., 2003).

This FSP is required reading for all staff participating in the work effort. The FSP shall be in the possession of the field teams collecting the samples. All contractors and subcontractors shall be required to comply with the procedures documented in this FSP in order to maintain comparability and representativeness of the collected and generated data.

Controlled distribution of the FSP shall be implemented by the prime contractor to ensure the current approved version is being used. A sequential numbering system shall be used to identify controlled copies of the FSP. Controlled copies shall be provided to applicable Air Force Real Property Agency (AFRPA) managers, regulatory agencies, remedial project managers, project managers, and quality assurance (QA) coordinators. Whenever revisions are made or addenda added to the FSP, a document control system shall be put into place to assure: (1) all parties holding a controlled copy of the FSP shall receive the revisions/addenda; and (2) outdated material is removed from circulation. The document control system does not preclude making and using copies of the FSP; however, the holders of controlled copies are responsible for distributing additional material to update any copies within their organizations. The distribution list for controlled copies shall be maintained by the prime contractor.

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2 PROJECT BACKGROUND

2.1 The U.S. Air Force Installation Restoration Program

The objective of the U.S. Air Force (USAF) Installation Restoration Program (IRP) is to assess past hazardous waste disposal and spill sites at USAF installations and to develop remedial actions consistent with the NCP for sites that pose a threat to human health and welfare or the environment. This section presents information on the program origins, objectives, and organization.

The 1976 Resource Conservation Recovery Act (RCRA) is one of the primary federal laws governing the disposal of hazardous wastes. Sections 6001 and 6003 of RCRA require federal agencies to comply with local and state environmental regulations and provide information to the USEPA concerning past disposal practices at federal sites. RCRA Section 3012 requires state agencies to inventory past hazardous waste disposal sites and provide information to the USEPA concerning those sites.

In 1980, Congress enacted CERCLA (Superfund). CERCLA outlines the responsibility for identifying and re-mediating contaminated sites in the United States and its possessions. The CERCLA legislation identifies the USEPA as the primary policy and enforcement agency regarding contaminated sites.

The 1986 Superfund Amendments and Reauthorization Act (SARA) extends the requirements of CERCLA and modifies CERCLA with respect to goals for remediation and the steps that lead to the selection of a remedial process. Under SARA, technologies that provide permanent removal or destruction of a contaminant are preferable to action that only contains or isolates the contaminant. SARA also provides for greater interaction with public and state agencies and extends the USEPA's role in evaluating health risks associated with contamination. Under SARA, early determination of Applicable or Relevant and Appropriate Requirements (ARARs) is required, and the consideration of potential remediation alternatives is recommended at the initiation of an RI/FS. SARA is the primary legislation governing remedial action at past hazardous waste disposal sites.

Executive Order 12580, adopted in 1987, gave various federal agencies, including the Department of Defense (DOD), the responsibility to act as lead agencies for conducting investigations and implementing remediation efforts when they are the sole or co-contributor to contamination on or off their properties.

To ensure compliance with CERCLA, its regulations, and Executive Order 12580, the DOD developed the IRP, under the Defense Environmental Restoration Program, to identify potentially contaminated sites, investigate these sites, and evaluate and select remedial actions for potentially contaminated facilities. The DOD issued the Defense Environmental Quality Program Policy Memorandum (DEQPPM) 80-6 regarding the IRP program in June 1980, and implemented the policies outlined in this memorandum in December 1980. The NCP was issued by the USEPA in 1980 to provide guidance on a process by which: (1) contaminant release could be reported; (2) contamination could be identified and quantified; and (3) remedial actions could be selected. The NCP describes the responsibility of federal and state governments and those responsible for contaminant releases.

The DOD formally revised and expanded the existing IRP directives and amplified all previous directives and memoranda concerning the IRP through DEQPPM 81-5, dated 11 December 1981. The memorandum was implemented by a USAF message dated 21 January 1982.

The IRP is the DOD's primary mechanism for response actions on USAF installations affected by the provisions of SARA. In November 1986, in response to SARA and other USEPA interim guidance, the USAF modified the IRP to provide for an RI/FS program. The IRP was modified so that RI/FS studies could be conducted as parallel activities rather than serial activities. The program now includes ARAR determinations, identification and screening of technologies, and development of alternatives. The IRP may include multiple field activities and pilot studies prior to a detailed final analysis of alternatives. Over the years, requirements of the IRP have been developed and modified to ensure that DOD compliance with federal laws, such as RCRA, NCP, CERCLA, and SARA, can be met.

2.2 Project Purpose and Scope

FPM ("contractor") is under contract at the former Griffis Air Force Base (AFB), Rome, New York, to conduct Basewide Monitoring at various sites. The purpose of this FSP is to provide the requirements and procedures for all fieldwork to be conducted at Griffiss AFB sites, including analytical methods, quality assurance protocols, and details of field sampling procedures.

This FSP has been prepared to perform the activities that may occur later in the delivery order (DO) execution. That is, following data evaluation, well abandonment/well installation may occur in subsequent LTM rounds.

As per the requirements of the Statement of Work (SOW), this FSP provides standardized methods and procedures for conducting sample collection and analysis.

2.3 Environmental Setting

2.3.1 Local Topography and Hydrogeology

The former Griffiss AFB is located in the city of Rome in Oneida County, New York (refer to Figure 2-1). The former base lies within the Mohawk Valley between the Appalachian plateau and the Adirondack Mountains. The topography across the former base is relatively flat with elevations ranging from 435 to 595 feet above mean sea level (MSL). The highest elevations are to the northeast. A rolling plateau northeast of the former base reaches an elevation of 1300 feet. The New York State Barge Canal (NYSBC) and the Mohawk River valley south of the base lie below 430 feet above MSL.

Unconsolidated sediments at the Griffiss AFB consist primarily of glacial till with minor quantities of clay and sand and significant quantities of silt and gravel. The thickness of these sediments ranges from 0-12 feet in the northeast to 130 feet in the south. In general, the average thickness of the unconsolidated sediments is 25 to 50 feet in the central portion and 100 to 130 feet in the south and southwest portions of the former base. The bedrock beneath the base generally dips from the northeast to the southwest and consists of the black Utica Shale. It is a gray and black carbonaceous unit with a high/medium organic content (Law, 1996).

The shallow water table aquifer lies within the unconsolidated sediments, where depth to groundwater ranges from ground surface to 57 feet below ground surface (bgs). Groundwater across the base generally flows from the northeast to the south. Several surface water creeks act as discharge areas for shallow groundwater, and drainage culverts and sewers intercept surface water runoff.

A comprehensive description of regional and local geology, hydrogeology, lithology, and hydrology for the Griffiss Air Force Base is given in the (draft) Remedial Investigation by Law Engineering and Environmental Science (1996), and the (final) Supplemental Investigation prepared by Ecology and Environment, Inc (1998).

2.3.2 Climate

Griffiss AFB experiences a continental climate characterized by warm, humid, moderately wet summers and cold winters with moderately heavy snowfalls. The mean annual precipitation is 45.6 inches; the mean annual snowfall is 107 inches. The evapotranspiration rate is 23 inches. The average temperature during the winter season is 20 degrees Fahrenheit; temperatures during the spring, summer, and fall vary from 31 to 81 degrees Fahrenheit. The prevailing winds are from the southwest, with an average wind speed of 5 knots.

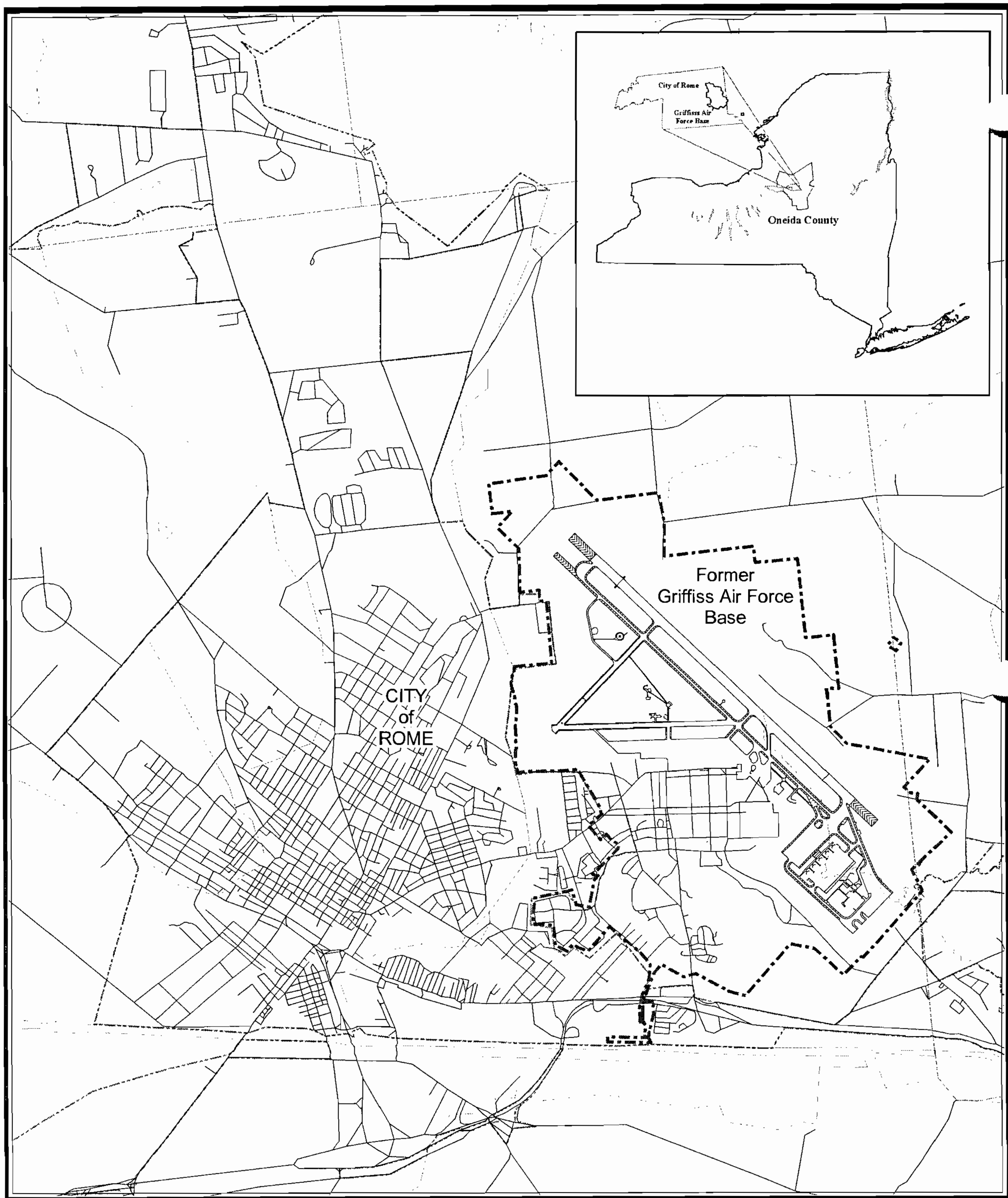

FIGURE 2-1
Base Location Map

N

4,800 2,400 0 4,800 9,600

Feet

UNITED STATES AIR FORCE
GRIFFISS AIR FORCE BASE
ROME,NEW YORK

Griffiss AFB is located in region prone to acid precipitation; the average pH of precipitation recorded for 1992 at the three closet stations ranged from 4.25 to 4.28. Fluctuations in pH exhibit an inverse correlation to precipitation, such that lower pH levels correlate with higher amounts of precipitation (Law, 1996).

2.3.3 Biology

The former Griffiss AFB, covering 3,552 acres of property within the Erie-Ontario ecozone of the Great Lakes Physiographic Province, has been heavily disturbed from an ecological perspective. Although there are very few undisturbed communities within the former base's boundary, the 1993 Inventory of Rare Plant Species and Significant Natural Communities identified six significant habitats of special-concern, occurring in the former base. There are five special-concern habitats identified by the Inventory that occur adjacent to AOC sampling events (New York National Heritage Program, 1994). These include: (1) a rich sloping fen downgradient of Landfill 1, and (2) a hemlock-hardwood forest occurring hydraulically upgradient of Landfill 1; (3) a rich graminiod fen adjacent to the southeast corner of the runway, situated downgradient of Landfill 2; and (4) a hemlock-hardwood swamp and (5) a pitch-pine-scarlet oak woods adjacent to Three Mile Creek in the vicinity of Landfills 5 and 6.

2.4 Site Descriptions and Contamination History

There are a total of 11 On-Base Groundwater Sites, 9 Landfill Sites, 6 Petroleum Source Removal Area Sites, and 15 Petroleum Spill Sites. The complete list of the sites covered under this FSP along with the matrices to be sampled at each site is provided in Table 2-1. For specific site descriptions and contaminated history and contaminant history information, please refer to the respective chapter in the site-specific Work Plans.

Table 2-1
Basewide Monitoring Sites

Site	Groundwater	Surface Water	Sediment	Fish
Contaminated On-Base Groundwater Sites				
Bldg 20	X			
Bldg 35	X			
Lot 69	X			
Bldg 101	X			
Bldg 301	X			
SD41 - Nose Docks 1&2	X			
Apron 2 VC Plume	X	X		
Pumphouse 3	X			
Landfill 6 TCE	X			
Weapon Storage Area TCE	X			
AOC 9 TCE	X			
Contaminated Landfill Sites				
LF01 - Landfill 1	X	X		
LF02 - Landfill 2/3	X	X		
LF03 - Landfill 7	X			
LF07 - Landfill 5	X	X		
LF09 - Landfill 6	X	X		
LF28 - Landfill 4	X			
Other AOC Sites				
SS54 - Pump House 1	X			
SD31 - Three Mile Creek		X	X	X
SD32 - Six Mile Creek		X	X	X
Contaminated Petroleum Source Removal Area Sites (Spill Numbers)				
Bldg 100 Fuel Hydrant System (#9704490)	X			
ST36 - Bldg 110 (#8603763)	X			
ST37 - Pumphouse 5 (#8903144)	X	X		
Bldg 43 (#9204543 & #9313076)	X			
SS20 - Tank Farms 1 & 3 (#9111733)	X			
FT30 - FPTA (#9510184)	X			
Contaminated Petroleum Spill Sites (Spill Numbers)				
Apron 1 (#9707954)	X			
Apron 2 (#9713631)	X			
T-9 (#9702173)	X			
T-10 (#9208334)	X			
Bldg 14 (#9605908)	X			
Bldg 786 (#8910168)	X			
Bldg 789 (#9810713)	X			
Bldg 7001 (#9706957)	X			
BFSA (#9810949)	X			
Bldg 5773 (#9704486)	X			
Pad 5750 (#9902802)	X			
Bldg 133 (#9702171)	X			
Bldg 15 (#9709366)	X			
UST 100 (#8907867)	X			
Pumphouse 1 (#9202658)	X			

Note: #NNNNNN is the NYSDEC spill number associated with the site.

3 PROJECT SCOPE AND OBJECTIVES

3.1 Objectives

The primary objective of this FSP is to present the procedures and requirements for the collection of various environmental samples at AOCs, AOIs, and Petroleum Spill Site locations included in the LTM program. By conducting the field investigations in accordance with the FSP, it is intended that the sampling effort will provide definitive data regarding each site.

3.1.1 Data Quality Objectives

The DQO is to collect data necessary to monitor potential constituent migration and identify statistically valid groundwater trends associated with the constraints of a groundwater LTM system. By collection of groundwater samples at point-of-compliance (POC) wells, the program will also provide an early warning system for the protection of potential receptors.

The LTM Work Plan identifies monitoring locations for inclusion in the LTM network and specifies sampling parameters and frequency of sampling. Specifically, wells that may be upgradient, within-plume, crossgradient, or downgradient are identified for the purpose of tracking plume migration, extent, and stability at each site. All monitoring wells selected will be screened in the same hydrogeologic unit as the contaminant plume or known/probable groundwater pathway from a potential source. Downgradient well locations to be used for LTM will be chosen to "immediately" detect any unexpected variations in groundwater quality. POC wells will be located upgradient from potential receptors to provide early warning (e.g., five years' plume travel time).

Where possible, existing monitoring wells will be used, insofar as they are adequately located to track plume migration. The LTM plan also recognizes that new permanent wells will need to be constructed throughout the monitoring process. Groundwater elevations will be measured at all wells.

Based on the intended use of the data, two analytical levels will be employed during the investigation: (1) screening data and (2) definitive data. Field screening methods are characterized by the use of portable instruments, which generate data regarding the presence of certain contaminants (particularly volatile organic compounds (VOCs)). This data is generated rapidly and may be relatively imprecise. Definitive data are generated using standard USEPA-approved laboratory procedures to identify and quantify contaminants. However, groundwater samples collected from temporary well points such as Geoprobes® will be considered screening data even when analyzed using standard USEPA laboratory procedure. Most data to be generated during this study will be definitive data corresponding to samples obtained at monitoring wells.

For this LTM program, water quality data will be retrieved from quarterly sampling rounds at new and existing monitoring wells. The groundwater chemistry data will be statistically evaluated relative to specific background conditions. If minimal deviation is found, then the sampling frequency at some monitoring points may be reduced.

Parameters of interest, as detailed in the following site-specific scopes of work, may change over time following receipt of sampling results (e.g., the analyte list may be either expanded or shortened). Depending upon the rate of contaminant migration and groundwater flow direction, based on groundwater elevation measurements, the frequency of sampling may also be subject to change. The results of the quarterly sampling rounds, including the identification of groundwater quality trends, will be documented in annual monitoring reports. Included in the annual monitoring report will be an optimization evaluation to ensure that the COC selection, sampling location, and sampling frequency result in a cost effective monitoring program.

Data generated through approved laboratory procedures have standardized quality assurance/quality control (QA/QC) requirements and documentation that will be performed. The QA/QC requirements are detailed in the QAPP Version 3.1 and its updates, which have been adopted from the AFCEE for use in conjunction with this FSP. The AFCEE QAPP Version 3.1 and the FSP shall constitute, by definition, the Project Sampling and Analysis Plan. Only AFCEE-approved laboratory variances from the AFCEE QAPP may be considered acceptable.

The AFCEE-approved laboratory variances applicable to this program are included in Appendix A. The above data quality objectives will allow for sound decision-making that will minimize unknown migration of groundwater contamination and ensure data integrity throughout the duration of the LTM program.

4 PROJECT ORGANIZATION AND RESPONSIBILITY

The key participants for the project are listed in Table 4-1.

The FPM Program Manager is responsible for ensuring that all work is performed in compliance with the USACE contract and that all work is performed to the satisfaction of USACE personnel. The Project Manager will be the primary point of contact between USACE and the contractor.

The FPM Project Manager (PM) has primary responsibility for plan development, plan implementation, and report production. The Project Manager also has primary responsibility for performance of the work within the established budget and schedule. The Project Manager is responsible for data assessment. The Project Manager has the authority to initiate corrective actions on any level of the work, subject to Program Manager approval.

The FPM Field Operations Manager (FOM) coordinates support staff for field activities and manages the day-to-day activities associated with the project. The FPM Field Operations Manager will be responsible for field audits conducted during field sampling activities, coordination of all site activities, and will report directly, as necessary, to the USACE Contracting Officer (CO). The Project Manager and Field Operations Manager will coordinate their efforts regarding implementation of project and field QA/QC procedures and adherence to applicable codes and regulations. The Field Operations Manager reports directly to the Project Manager and has the authority to initiate corrective actions concerning field operations, subject to Project Manager approval.

The Chemical Quality Control Coordinator (CQCC) will ensure that field operations achieve data quality objectives (DQO) for the project through consistent and reproducible sample collection, handling and analysis. The CQCC may delegate CQCC specific tasks to the FOM or other personnel as appropriate, with the condition that the CQCC shall review and/or approve deliverables (e.g., quality control summary reports).

Table 4-1
Key Participants for Griffiss AFB LTM Program

Position	Name	Affiliation	Phone Number
BRAC[1] Environmental Coordinator	Mr. Michael McDermott	AFRPA/DA	(315) 330-2275 mike.mcdermott@afrpa.pentagon.af.mil
Environmental Engineer	Mr. Mark Rabe	AFRPA/DA	(315) 330-2275 mark.rabe@afrpa.pentagon.af.mil
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USACE MRD Lab POC	Ms. Laura Percifield	USACE	(402) 444-4314 Laura.J.Percifield@nwo02.usace.army.mil
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AFCEE Field Engineer	Mr. Richard Petkovsek	AFCEE/ERB-F	(315) 330-4017 Richard.Petkovsek@brooks.af.mil
Program Manager	Dr. Kevin Phillips, P.E.	FPM	(631) 737-6200 k.phillips@fpm-group.com
Project Manager	Mr. Gaby A. Atik, P.E.	FPM	(315) 336-7721 g.atik@fpm-group.com

Chemical Quality Control Coordinator	Ms. Connie van Hoesel, E.I.T.	FPM	(315) 336-7721 c.vanhoesel@fpm-group.com
Site Health and Safety Manager	Mr. David Forse	FPM	(315) 336-7721 d.forse@fpm-group.com
Field Operations Manager/ Data Manager	Mr. Niels van Hoesel	FPM	(315) 336-7721 n.vanhoesel@fpm-group.com

[1] Base Realignment and Closure.

4.1 Subcontractors

The subcontractors to be utilized during the field activities are presented in Table 4-2.

Table 4-2
Subcontractors for Griffiss AFB LTM Program

Position	Name	Affiliation	Phone Number
Vice President Drilling Operations	Mr. William Morrow	Parratt-Wolff, Inc.	(315) 437-1429
Project Manager	Mr. Mark Nemec	Severn Trent Laboratories	(716) 691-2600

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5 FIELD OPERATIONS

Field operations to be conducted during this phase of the DO include groundwater sampling at existing wells, new well installation(s) and sampling, temporary vertical profile well point installation and sampling, surface water sampling at a limited number of locations, soil sediment sampling, and fish tissue sampling. In addition, field screening methods using a PID, visual, and olfactory observations will be performed at petroleum spill sites.

5.1 Geologic Standards

Section 5.1 has been included for reference in the event it becomes necessary to characterize the base geology. Subsurface samples collected by the methods intended for this DO (i.e., direct push probing) are not considered adequate for geological characterization. However, geologic standards (outlined below) can be applied to the subsurface material recovered via direct push probing to provide useful information for site interpretations.

The lithologic descriptions for consolidated materials (igneous, metamorphic, and sedimentary rocks) shall follow the standard professional nomenclature (cf. Tennissen, 1983), with special attention given to describing fractures, vugs, solution cavities and their fillings or coatings, and any other characteristics affecting permeability. Colors shall be designated by the Munsell Color System.

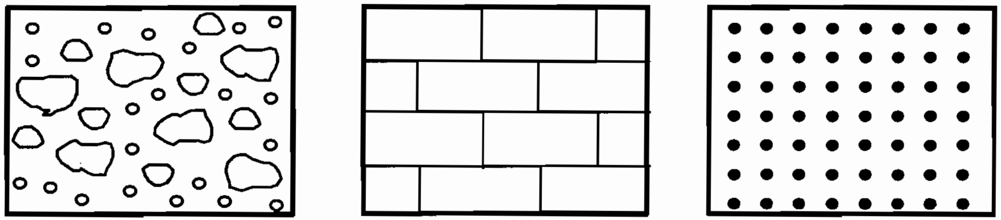
The lithologic descriptions for unconsolidated materials (soils [engineering usage] or deposits) shall use the name of the predominant particle size (e.g., silt, fine sand, etc.). The dimensions of the predominant and secondary sizes shall be recorded using the metric system. The grain size and name of the deposit shall be accompanied by the predominant mineral content, accessory minerals, color, particle angularity, and any other characteristics. The clastic deposit descriptions shall include, as a supplement, symbols of the Unified Soil Classification System (USCS). Colors shall be designated by the Munsell Color System.

The sedimentary, igneous, and metamorphic rocks and deposits shall be represented graphically by the patterns shown in Figure 5-1. Columnar sections, well and boring logs, well construction diagrams, cross sections, and three-dimensional (3-D) diagrams shall use these patterns. Supplementary patterns shall follow (Swanson, 1981). Geologic structure symbols shall follow (American Geological Institute Data Sheets, 1989).

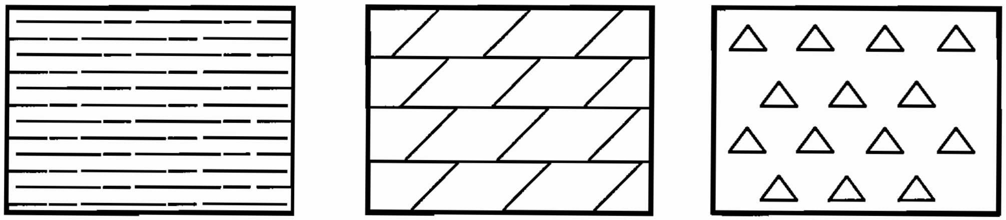
The scales for maps, cross sections, or 3-D diagrams shall be selected in accordance with the geologic and hydrologic complexity of the area and the purposes of the illustrations. Geophysical logs shall be run at a constant vertical scale of 1 inch equals 20 feet. When geophysical logs are superimposed on geologic logs, cross sections, or 3-D diagrams, the scales shall be the same. If defining geological conditions requires other scales, additional logs at those scales shall be provided.

Figure 5-1
Lithologic Patterns for Illustration

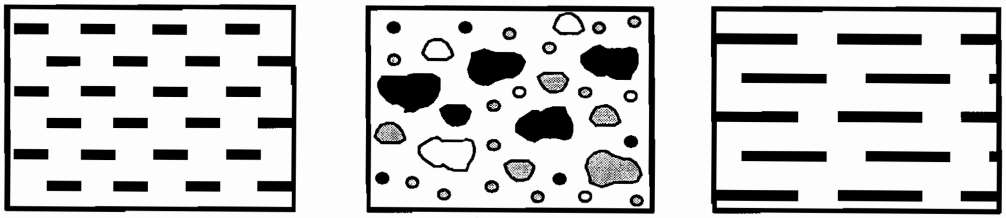
Sediments and Sedimentary Rocks



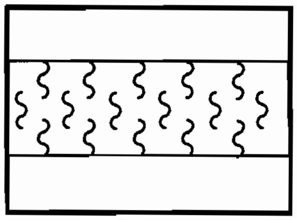
Gravel and Conglomerate   Limestone   Sand and Sandstone



Silt and Siltstone   Dolomite   Chert



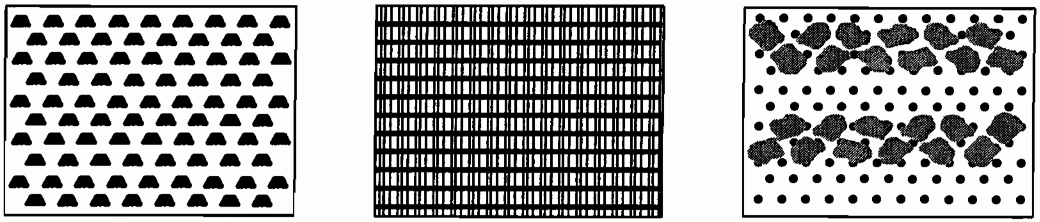
Clay   Glacial Till   Shale



Loess

Figure 5-1 (continued)
Lithologic Patterns for Illustration

Igneous Rocks

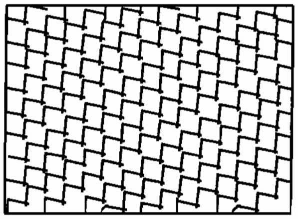


Undifferentiated Intrusive

Basalt

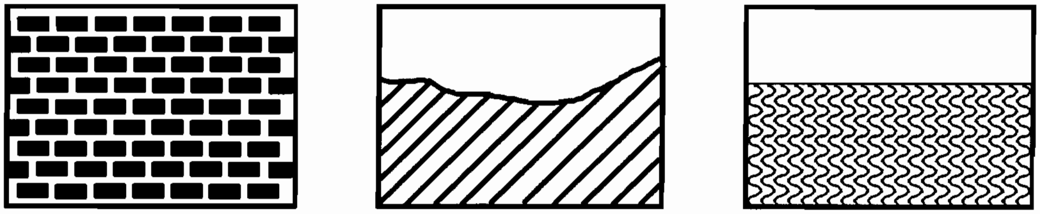
Volcanic Breccia and Tuff

Metamorphic Rocks



Undifferentiated

Miscellaneous



Fill

Undifferentiated Bedrock

Residium

For orientation, the cross sections shall show the Northern end on the viewer's right. If the line of cross section is predominantly East-West, the Eastern end is on the right. Maps shall be oriented with North toward the top, unless the shape of the area dictates otherwise. The orientation will be indicated with a North arrow.

5.2 Site Reconnaissance, Preparation, and Restoration Procedures

Areas designated for intrusive sampling shall be surveyed for the presence of underground utilities, if no dig permit has been approved. Vehicle access routes to sampling locations shall be determined prior to any field activity.

A centralized decontamination area adjacent to the work site or sampling location shall be provided for drilling rigs and equipment. The decontamination area shall be large enough to allow storage of cleaned equipment and materials prior to use, as well as to stage drums of decontamination waste. The decontamination area shall be lined with a heavy gauge plastic sheeting, and designed with a collection system to capture decontamination waters. Solid wastes shall be accumulated in 55-gallon drums and subsequently transported to a waste storage area designated by the USAF. Smaller decontamination areas for personnel and portable equipment shall be provided as necessary. These locations shall include basins or tubs to capture decontamination fluids, which shall be transferred to a large accumulation tank as necessary. These designated areas of decontamination shall be designated on the site maps in Section 3.0.

The FPM field office is located at 153 Brooks Road, in Rome, NY. Portable equipment and reusable sampling devices shall be decontaminated before its return to storage at the field office.

Each work site or sampling location shall be returned to its original condition when possible. Efforts shall be made to minimize impacts to work sites and sampling locations, particularly those in or near sensitive environments such as wetlands. Following the completion of work at a site, all drums, trash, and other waste shall be removed. Decontamination and/or purge water and soil cuttings shall be transported to the designated locations as described in Section 5.12. All boreholes created by direct push probing will be grouted to the surface with a bentonite grout (see Section 5.5.3).

5.3 Geophysical Surveys

A geophysical survey will be performed to identify subsurface utilities at all subsurface sampling locations. Additional hand probing prior to installing a direct push boring will also be performed at site locations that are in close proximity to utility lines. It is anticipated that the Base will issue a digging permit and will provide a utility markout service.

5.4 Soil Gas Surveys

Field screening for VOCs in soil samples recovered by direct push probing will be performed using a PID. It is not anticipated that any other forms of soil gas surveys will be performed.

5.5 Borehole Drilling, Lithologic Sampling, Logging, and Abandonment

5.5.1 General Drilling Procedures

All drilling activities shall comply with state and local regulations and shall be supervised by an experienced geologist or environmental engineer. The contractor shall obtain and pay for all permits, applications, and other documents required by state and local authorities.

The location of all borings shall be coordinated, in writing, with the base civil engineer or equivalent before drilling commences. When drilling boreholes through more than one water bearing zone or aquifer, the contractor shall take measures to prevent cross-connection or cross-contamination of the zones or aquifers.

The drill rig shall be cleaned and decontaminated in accordance with the procedure in Section 5.11. The drill rig shall not leak any fluids that may enter the borehole or contaminate equipment placed in the hole. The use of rags or absorbent materials to absorb leaking fluids is unacceptable.

Drilling fluids shall consist of air, water, or mud. If air is used, it shall be filtered to remove organic vapors, and filters shall be changed daily. The effectiveness of the air filter shall be checked at least every four hours using a photoionization detector (PID). If organic vapors are detected in air passing through the downstream end of the airline or drill stem, their source (i.e., filter, contaminated line, etc.) shall be decontaminated or replaced. Note that the use of air is not advisable at these sites for the following reasons: it might incur chemical, physical, and biological changes to the contaminated aquifer; recovery time of the aquifer to original conditions will be uncertain; it may be difficult to protect field personnel from contaminants and particles blown out of the borings; and it may affect the results of chemical analyses of the sampled groundwater. If water is used, the contractor shall provide chemical analyses of the water for USACE approval. Only water from a pre-approved source shall be used as a drilling fluid and the water quality shall be monitored daily for suspected analytes of concern. Drilling mud, if used, shall consist of 100 percent sodium bentonite and shall be approved by USACE. The use of drilling mud additives is strictly not permitted. Hollow-stem auger and cable tool drilling methods are most suitable for field investigation work. Water or mud shall be used only as a last resort.

A log of drilling activities shall be kept in a bound field notebook. Information in the log book shall include location, time on site, personnel and equipment present, down time, materials used, samples collected, measurements taken, and any other observations or information that would be necessary to reconstruct field activities at a later date. A Drilling Log shall be filled out as the drilling occurs. The Drilling Log shall be prepared by an experienced geologist, experienced environmental engineer, or experienced FPM employee, who was at the drill rig as the drilling/boring operation progressed. All items on the log must be completed, if known.

The contractor shall dispose of all trash, waste grout, cuttings, and drilling fluids as coordinated with Base personnel. When installing wells through more than one water-bearing zone or aquifer, the contractor shall take measures to prevent cross-connection or cross-contamination of the zones or aquifers.

5.5.2 Sampling and Logging

An experienced geologist or environmental engineer shall log the lithology in all boreholes. A boring log form, shown in Appendix B, shall be used for recording the lithologic logging information. Information on the boring log sheet includes the borehole location; drilling information; sampling information such as sample intervals, recovery, and blow counts; and sample description information.

Because the unconsolidated sub-surface material at the base changes rapidly, continuous sampling shall be conducted for lithologic description. Lithologic descriptions of unconsolidated materials encountered in the boreholes shall generally be described in accordance with American Society for Testing and Materials (ASTM) D-2488-90 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM, 1990). Descriptive information to be recorded in the field shall include: (1) identification of the predominant particles size and range of particle sizes, (2) percent of gravel, sand, fines, or all three, (3) description of grading and sorting of coarse particles, (4) particle angularity and shape, and (5) maximum particle size or dimension.

The plasticity of fines description includes: (1) color using Munsell Color System; (2) moisture (dry, wet, or moist); (3) consistency of fine-grained soils; (4) structure of consolidated materials; and (5) cementation (weak, moderate, or strong).

The documentation record and forms (Appendix B) shall document the following information for each boring: (1) boring or well identification (this identification shall be unique, and the contractor is responsible for ensuring it has not been used previously at the installation); (2) purpose of the boring (e.g., soil sampling, monitoring well); (3) location in relation to an easily identifiable landmark; (4) names of drilling contractor and logger; (5) start and finish dates and times; (6) drilling method; (7) types of drilling fluids and depths at which they were used; (8) diameters of surface casing, casing type, and methods of installation; (9) depth at which saturated conditions were first encountered; (10) lithologic descriptions and depths of lithologic boundaries; (11) sampling-interval depths; (12) zones of caving or heaving; (13) depth at which drilling fluid was lost and the amount lost; (14) changes in drilling fluid properties; (15) drilling rate; and (16) drilling rig reactions, such as chatter, rod drops, and bouncing.

Identification of the USCS group symbol shall be used. Additional information to be recorded includes the depth to the water table, caving or sloughing of the borehole, changes in drilling rate, depths of laboratory samples, presence of organic materials, presence of fractures or voids in consolidated materials, and other noteworthy observations or conditions, such as the locations of geologic boundaries.

Lithologic descriptions of consolidated materials encountered in the boreholes shall generally be described in accordance with Section 5.1. Consolidated samples for lithologic description shall be obtained at each change in lithology or at 5-foot intervals, whichever is less, or as specified in the SOW. All samples shall be monitored with an organic vapor monitor (e.g., PID). The samples shall be handled in such a way as to minimize the loss of volatiles, and these procedures shall be described in Section 6.0.

In addition to the above, the following information shall be recorded when rock core samples are collected: (1) the depth interval and top and bottom of each core shall be marked on the core box; (2) percentage of core recovered; (3) number of fractures per foot; (4) angle of fractures relative to the core axis; and (5) breaks due to coring and core handling shall be distinguished from naturally occurring fractures. Rock cores shall be stored in standard core boxes, and missing sections of core shall be replaced with spacers.

Cuttings shall be monitored with an organic vapor monitor (e.g., PID, OVA) and examined for their hazardous characteristics. Materials that are suspected to be hazardous because of abnormal color, odor, or organic vapor monitor readings shall be containerized in compliance with RCRA and the state and local requirements.

A standard penetration test shall be performed each time a split spoon sample is taken. The test shall be performed in accordance with ASTM D-1586.

5.5.3 Abandonment

Boreholes that are not converted to monitoring wells shall be abandoned in accordance with applicable federal, state or local requirements. All direct push boreholes shall be filled using a bentonite mud/solid (grout). The grout will be mixed according to the manufacturer's specifications. If the depth of the boring being filled is deeper than 5 feet, the grout shall be emplaced from the bottom to the top of the hole using a tremie pipe.

All exposed boreholes shall be checked 24 to 48 hours after mud/solid bentonite/cement grout emplacement to determine whether curing is occurring properly. More specific curing specifications may be recommended by the manufacturer and shall be followed. If settling has occurred, a sufficient amount of mud/solid bentonite/cement grout shall be added to fill the hole to the ground surface. These curing checks and any addition of mud/solid bentonite/cement grout shall be recorded in the field log.

5.6 Monitoring Well Construction

The on-site field manager shall supervise the drilling, soil boring, geophysical surveys, lithologic sampling, and monitoring well construction and shall be an experienced geologist, hydrogeologist, or environmental engineer, or shall be certified by the American Institute of Hydrology, American Institute of Professional Geologists, or the National Ground Water Association as a Certified Ground Water Professional. The supervising field manager shall affix his/her signature to all drilling logs, as-built well construction diagrams, lithologic logs, sampling records, and similar documents. When there is a possibility that floating petroleum products (i.e., light non-aqueous phase liquids, LNAPLs) may be encountered, shallow monitoring wells shall be screened across the water table (as is the case with all shallow wells). The length of the screen shall be such that tidal and seasonal water table fluctuations shall not cause water levels to rise above or fall below the screened interval. If dense petroleum products (i.e., dense non-aqueous phase liquids [DNAPLs]) may be encountered, monitoring wells shall be screened at the bottom of the aquifer to capture the DNAPL.

5.6.1 Drilling Requirements

All drilling and well installations shall conform to state and local regulations, and the contractor shall obtain and pay for all permits, applications, and other documents required by state and local authorities. The location of all borings shall be coordinated in writing with the Base Realignment and Closure (BRAC) project engineer or equivalent before drilling commences. Water-table monitoring wells will be installed using a truck-mounted hollow-stem auger drill rig. Bedrock monitoring wells will be installed using a combination of hollow stem auger, steel casing, and air rotary methods. Hollow stem augers will be used to drill through the unconsolidated deposits overlying the bedrock. Once bedrock is encountered, the hollow stem augers or steel casing will be advanced into the bedrock to form a seal separating the unconsolidated deposits from the bedrock. The boring will be continued into the bedrock using an air rotary drill bit and will be advanced to a depth of 15 feet below the surface of the bedrock.

5.6.2 Borehole Requirements

Borehole diameters shall be at least 4 inches larger than the outside diameter of the 2 inch well casing and well screen. In the case of a hollow-stem auger, the inside diameter of the auger shall be at least 4 inches larger than the outside diameter of the casing and well screen.

A completed monitoring well shall be straight and plumb. The monitoring well shall be sufficiently straight to allow passage of pumps or sampling devices. The monitoring well shall be plumb within 1 degree of vertical where the water level is greater than 30 feet below land surface unless otherwise approved by USACE. USACE may waive a plumbness requirement. Any request for a waiver from straightness or plumbness specifications shall be made, in writing, to USACE in advance of mobilization for drilling. The contractor shall use a single-shot declination tool to demonstrate plumbness. Monitoring wells not meeting straightness or plumbness specifications shall be re-drilled and/or reconstructed.

5.6.3 Casing Requirements

The casing requirements that shall be followed are: (1) all casing shall be new, unused, and decontaminated according to the specifications of Section 5.12; (2) glue shall not be used to join casing, and casings shall be flush joint casing and screen; (3) all casing will consist of 2-inch polyvinyl chloride (PVC) or stainless steel for water-table monitoring wells, and conform to the ASTM Standard F-480-88A or the National Sanitation Foundation Standard 14 (Plastic Pipe System); (4) the casing shall be flush joint straight and plumb within the tolerance stated for the borehole; and (5) the driller shall cut a notch in the top of the casing to be used as a measuring point for water levels, (alternatively, the driller shall mark the point with a permanent marker).

5.6.4 Well Screen Requirements

Well screen requirements are: (1) all requirements that apply to casing shall also apply to well screen, except for strength requirements; (2) monitoring wells shall not be screened across more than one water-bearing unit; (3) the anticipated well screen length for future activities is 10 feet; (4) screens shall be factory slotted or wrapped; (5) screen slots shall be sized to prevent 90 percent of the filter pack from entering the well, and for wells where no filter pack is used, the screen slot size shall be selected to retain 60 to 70 percent of the formation materials opposite the screen (for the anticipated activities 0.010 inch slot screen will be used); (6) the bottom of the screen is to be capped, and the cap shall be joined to the screen by threads; and (7) the screens used will be constructed of 2-inch PVC for the water-table monitoring wells.

5.6.5 Annular Space Requirements

The annular space requirements are the following: (1) the annular space shall be filled with a filter pack, a bentonite seal, and casing grout between the well string and the borehole wall; (2) any drilling fluids shall be thinned with potable water of known acceptable quality to a density less than 1.2 g/cm^3 (10 lbs/gal) before the annular space is filled, and a mud balance or Marsh Funnel shall be kept on site to allow measurement of drilling fluid density; and (3) as the annular space is being filled, the well string shall be centered and suspended such that it does not rest on the bottom of the hole, and for wells greater than 50 feet deep, at least two centralizers shall be used, one at the bottom and one at the top of the screen. Additional centralizers shall be used as needed.

5.6.6 Filter Pack Requirements

The filter pack shall consist of silica sand or gravel and shall extend from the bottom of the hole to at least 2 feet above the top of the well screen. The top of the sand pack shall be sounded to verify its depth during placement. Additional filter pack shall be placed as required to return the level of the pack to 2 feet above the screen. If gravel is used, 6 inches of fine uniform sand shall be placed on top of the gravel.

The filter pack material shall be clean, inert, and well-rounded quartz sand and shall contain less than two percent flat particles. The sand or gravel shall be certified free of contaminants by vendor or contractor. If decontamination is necessary, the methods shall be approved in writing by USACE. The filter pack shall have a grain size distribution and uniformity coefficient compatible with the formation materials and the screen, as described in Chapter 12, *Ground Water and Wells,* 2nd Edition, 1986. The filter pack shall not extend across more than one water-bearing unit. The contractor shall record the volume of the filter pack emplaced in the well. Potable water may be used, with the approval of the regulatory agency providing oversight, to emplace the filter pack so long as no contaminants are introduced.

5.6.7 Bentonite Seal Requirements

The bentonite seal requirements that shall be followed are the following: (1) the bentonite seal shall consist of at least 2 feet of bentonite above the top of filter pack; (2) the bentonite shall be hydrated before placement and shall be installed by pump tremie methods; and (3) only 100 percent sodium bentonite shall be used. For wells less than 15 feet, the contractor may propose alternate sealing methods. Prior approval for any alternate method shall be obtained, in writing, from USACE before well construction begins.

5.6.8 Casing Grout Requirements

The casing grout requirements are the following: (1) the casing grout shall extend from the top of the bentonite seal to 2 feet below ground surface (bgs); (2) protective casing will be installed; (3) one monolithic concrete pour will be made in the annular space; (4) a concrete pad will be constructed around the well to avoid frost damage to the well casing; (5) the grout shall be mixed in the following proportions: 94 pounds of neat Type I Portland or American Petroleum Institute Class A cement, not more than 4 pounds of 100 percent sodium bentonite powder, and not more than 8 gallons of potable water; (6) all grout shall be pump tremied using a side-discharge tremie pipe, and pumping shall continue until 20 percent of the grout has been returned to the surface; and (7) in wells where the bentonite seal is visible and within 30 feet of the land surface, the 20 percent return is not necessary so long as the tremie pipe is pulled back as the grout is emplaced.

5.6.9 Surface Completion Requirements

For flush-mounted completions, the casing shall be cut approximately 3 inches below the land surface and a watertight casing cap will be used to prevent surface water from entering the well. To allow for escape of gas, a small diameter (e.g., 1/4-inch) vent hole shall be placed in the upper portion of the casing, or a ventilated well cap shall be used. A freely draining valve box with a locking cover shall be placed over the casing. The top of the casing shall be at least 1 foot above the bottom of the box. The valve box lid shall be centered in a 3-foot diameter, 4-inch thick concrete pad that slopes away from the box at 1/4 inch per foot. The identity of the well shall be permanently marked on the valve box lid and the casing cap. Where heavy traffic may pass over the well or for other reasons, the concrete pad and valve box/lid assembly shall be constructed to meet the strength requirements of surrounding surfaces.

When aboveground surface completion is used, the well casing shall be extended 2 to 3 feet above land surface. A casing cap for each well shall be provided, and the extended casing shall be shielded with a steel sleeve that is placed over the casing and cap and seated in a 3-foot by 3-foot by 4-inch concrete surface pad. To allow for escape of gas, a small diameter (e.g., 1/4-inch) vent hole shall be placed in the well casing, or a ventilated well cap shall be used. The concrete surface pad shall be reinforced, if necessary, with steel reinforcing bars at least 1/4 inch in diameter. The ground surface shall be freed of grass and scoured to a depth of 2 inches before setting the concrete pad. The diameter of the sleeve shall be at least 6 inches greater than the diameter of the casing. The pad will be sloped away from the well sleeve. A lockable cap or lid on the guard pipe will be installed. The identity of the well shall be permanently marked on the casing cap and the protective sleeve. Three 3-inch diameter concrete-filled steel guard posts shall also be installed. The guard posts shall be 5 feet in total length and installed radially from each wellhead. The guard posts shall be recessed approximately 2 feet into the ground and set in concrete. The guard posts shall not be installed in the concrete pad placed at the well base. The protective sleeve and guard posts shall be painted with a color specified by the BRAC project engineer or equivalent.

All wells shall be secured as soon as possible after drilling. Corrosion-resistant locks for both flush and aboveground surface completions will be provided. The locks must either have identical keys or be keyed for opening with one master key. The lock keys will be delivered to the appropriate personnel following completion of the field effort.

5.6.10 Piezometer Requirements

A piezometer is a small diameter cased borehole primarily used for water-level measurements. The piezometers' requirements are the following: (1) piezometers shall be constructed using methods or materials that do not contaminate groundwater or allow hydraulic communication between water-bearing units or between the ground surface and water-bearing units, and will be constructed of 1-inch PVC; (2) piezometers that penetrate more than one water-bearing unit shall be constructed in a manner that allows fluid from only one unit to enter them; and (3) the straightness and plumbness of piezometers shall be the same as for boreholes and monitoring wells, Section 5.6.2.

5.6.11 Well/Piezometer Completion Diagrams

A completion diagram shall be submitted for each monitoring well or piezometer installed. It shall include the following information: (1) well identification (this shall be identical to the boring identification described); (2) drilling method; (3) installation date(s); (4) elevations of ground surface and the measuring point notch/mark; (5) total boring depth; (6) lengths and descriptions of the screen and casing; (7) lengths and descriptions of the filter pack, bentonite seal, casing grout, and any backfilled material; (8) elevation of water surface before and immediately after development; and (9) summary of the material penetrated by the boring.

5.7 Monitoring Well Development

The monitoring well development requirements are: (1) all newly installed monitoring wells shall be developed no sooner than 24 hours after the final well grouting to allow for grout curing nor longer than seven days after installation; (2) any water lost in the hole during well construction or during gravel pack installation shall be removed from the well during development (at a minimum, five times the water lost plus five well volumes used for the well development); (3) wells shall be developed using surge blocks and bailers, submersible pumps, or a Waterra with foot valve (prior approval for any alternate method shall be obtained, in writing, from USACE before well construction begins), and wells shall be developed until the stabilization criteria in Section 6.1.1.1.3 are met; (4) discharge water color and volume shall be documented; (5) to the extent practicable, no sediment shall remain in the bottom of the well; (6) no detergents, soaps, acids, bleaches, or other additives shall be used to develop a well; and (7) all development equipment shall be decontaminated according to the specifications of Section 5.11.

Groundwater removed during well development procedures shall be contained in labeled, U.S. Department of Transportation (DOT)-approved steel 55-gallon drums and properly sealed, unless prior approval is obtained to otherwise dispose of development water. Detailed information regarding the ultimate disposal of waste generated during well development is discussed in Section 5.12.

5.8 Abandoning Monitoring Wells

All abandonment of monitoring wells, when directed to do so by the SOW, shall be performed in accordance with 6 NYCRR Part 360-2.11 (a)(8)(vi) and the 1996 version Ground-Water Monitoring Well Decommissioning Procedures, Sections 2.2, 9.0, and 10.0. If slurry is used, a mud balance and/or Marsh Funnel shall be used to ensure that the density (lbs/gal) of the abandonment mud mixture conforms to the manufacturer's specification. All abandoned monitoring wells shall be checked 24 to 48 hours after mud/solid bentonite emplacement to determine whether curing is occurring properly. More specific curing specifications or quality assurance checks may be recommended by the manufacturer and shall be followed. Additionally, if significant settling has occurred, a sufficient amount of mud/solid bentonite shall be added to attain its initial level. These slurry/solid bentonite curing checks and any addition of mud/solid bentonite shall be recorded in the field logs.

5.9 Aquifer Tests

5.9.1 Aquifer Testing For Hydraulic Properties

The use of historic data (FPM July, 2000) shall present a good picture of the hydraulic properties. Water level measurements will be taken at the monitoring wells specified for each AOC, AOI, and Petroleum Spill Site location. In addition, water levels will be collected from all of the currently existing monitoring wells/piezometers located at the former Griffis AFB to determine site wide groundwater elevations, flow direction and hydraulic gradients. These attributes will be re-evaluated each time a sampling round is conducted. Additional slug tests may be required in some monitoring wells to determine the site-specific hydraulic properties of certain areas.

5.9.1.1 General

Equipment shall be decontaminated and water levels measured according to the specifications of Sections 5.11. The contractor shall demonstrate that the assumptions of the selected analytical methods for deriving the hydraulic properties match the hydrogeological conceptual site model, and meet the data quality objectives in Section 3.0.

5.9.1.2 Slug Tests

Slug tests are applicable to rocks or unconsolidated deposits of low hydraulic conductivity. Testing of several wells is necessary to characterize an aquifer because slug tests only measure aquifer properties immediately adjacent to the borehole or well. The water level shall be static before the test begins. That is, it must not be recovering or receding as a result of sampling, development, pumping of nearby wells, or related activities. The test shall be performed by the introduction of a decontaminated slug of known volume. No fluid shall be put in the well. The contractor shall use monitoring wells as observation wells to identify the hydraulic properties of the aquifer by calculating influence of the slug on local groundwater conditions. In addition, barometric pressures shall be monitored at the beginning and at least at the end of the test to evaluate the impact barometric pressure may have on the test. The test shall not begin until water levels in all wells have completely recovered.

5.10 Surveying

All surveying locations of field activities shall be measured by a certified land surveyor as the distance in feet from a reference location that is tied to the state plane system. The surveys shall be third order (Urquhart, 1962). An XY-coordinate system shall be used to identify locations. The X-coordinate shall be the East-West axis; the Y-coordinate shall be the North-South axis. The reference location is the origin. All surveyed locations shall be reported using the NYS Plane Coordinate System (NAD 83). The surveyed control information for all data collection points shall be recorded and displayed in a table. The table shall give the X and Y coordinates in state plane coordinate values, the ground elevation, and the measuring point elevation if the location is a groundwater monitoring well. The elevation of all newly installed wells and piezometers shall be surveyed at the water level measuring point (notch) on the riser pipe. Include the elevation of the ground surface in the survey.

5.11 Equipment Decontamination

All equipment that may directly or indirectly contact contaminants shall be decontaminated in a designated decontamination area or, as an alternative, will be decontaminated in a mobile or fixed decontamination area. This includes all non-disposable sampling devices, instruments, augers, and monitoring equipment.

The following procedure shall be used to decontaminate sampling and smaller drilling devices that can be hand manipulated, such as water level indicators, non-disposable bailers, water monitoring probes, split spoons, hand augers, and stainless steel bowls/spoons. This type of equipment shall be scrubbed with a solution of potable water and Alconox®, or equivalent laboratory-grade detergent (for creek sediment sampling devices, the equipment can first be scrubbed with creek water to remove any sediment or debris). The equipment shall then be rinsed with potable water and/or distilled water.

In extreme cases when the equipment has come in contact with free product, oil, or grease and the Alconox®/water wash has not been effective, the equipment may be rinsed pesticide-grade methanol. Pesticide-grade methanol shall be purchased, stored, and dispensed only in glass, stainless steel, or Teflon® containers. These containers shall have Teflon® caps or cap liners. It is the contractor's responsibility to assure that these materials remain free of contaminants. If any question of purity exists, new materials shall be used.

The equipment will then be air-dried on a clean surface or rack, such as Teflon®, stainless steel, or oil-free aluminum elevated at least 2 feet above ground. If the sampling device shall not be used immediately after being decontaminated, it shall be wrapped in oil-free aluminum foil, or placed in a closed stainless steel, glass, or Teflon® container.

Larger drilling equipment will also be decontaminated. This includes casing, drilling bits, auger flights, the portions of drill rigs that stand above boreholes, sampling devices, and instruments, such as slugs and sounders. In addition, the contractor shall take care to prevent the sample from coming into contact with potentially contaminating substances, such as tape, oil, engine exhaust, corroded surfaces, and dirt.

The following procedures shall be used to decontaminate large pieces of equipment. The external surfaces of equipment shall be washed with high-pressure hot water and Alconox®, or equivalent laboratory-grade detergent, and if necessary, scrubbed until visible dirt, grime, grease, oil, loose paint, rust flakes, etc., have been removed. The equipment shall then be rinsed with potable water. The inside surfaces of casing, drill rod, and auger flights shall also be washed and described. Appendix C provides the Materials Safety Data Sheets (MSDSs) for chemicals used to decontaminate equipment.

5.12 Waste Handling

Waste handling shall be dealt with on a site-by-site basis as it is generated. Waste may be classified as non-investigative waste or investigative waste. Non-investigative waste, such as litter and household garbage, shall be collected on an as-needed basis to maintain each site in a clean and orderly manner. This waste shall be containerized and transported to the designated sanitary landfill or collection bin. Acceptable containers shall be sealed boxes or plastic garbage bags.

During the LTM Program field activities, the investigation-derived waste shall mostly consist of disposable equipment and supplies, decontamination fluids, and well purging fluids. The ultimate disposal of these wastes will be dependent upon the degree of environmental contamination present at each site.

Investigation-derived waste from either decontamination procedures or well purging activities will be field screened by visual inspection and the use of a PID to initially determine whether these wastes are contaminated. If volatile visual contamination is noted, or contaminants are suspected, the wastes from these sites will be properly containerized and temporarily stored at each site, prior to transportation.

Investigative-derived waste from well development activities or wastes otherwise generated but deemed contaminated shall be segregated at the site according to matrix (solid or liquid) and as to how it was derived (drill cuttings, drilling fluid, decontamination fluids, and purged groundwater). Each container shall be properly labeled with site identification, sampling point, depth, matrix, constituents of concern, and other pertinent information for handling. The wastes will then be characterized, manifested, and disposed of off-base, or disposed in sanitary sewers following Publicly Owned Treatment Works (POTW) approval.

The contaminated waste shall be transferred to labeled U.S. Department of Transportation (DOT)-approved steel 55-gallon drums and properly sealed. The number of containers shall be estimated on an as-needed basis. The containers shall be transported in such a manner to prevent spillage or particulate loss to the atmosphere. To facilitate handling, the containers shall be no more than half full when moved. The investigative waste will be stored at the designated decontamination area until the end of the drilling operations or when no additional investigative waste is being generated. At that time, the waste will be sampled for characterization by the subcontractor and disposed of according to local, state, and federal regulations. In the event that any of the investigative waste is characterized as hazardous, FPM will act as liaison between the disposal subcontractor and the appropriate Base personnel to facilitate execution of the manifests. Base personnel will approve and sign as the generator for both hazardous and non-hazardous materials. Depending on the constituents of concern, fencing or other special marking may be required. A Waste Inventory Tracking Form (or similar) shall be completed for investigative and non-investigative wastes and is provided in Appendix B.

Uncontaminated purged groundwater (based on field screening) or decontamination fluid will be disposed of adjacent to the well or at a location approved by AFRPA and USACE.

5.13 Corrective Action

Field performance and system audits will be conducted as described in Section 7.5 by the FOM.

6 ENVIRONMENTAL SAMPLING

6.1 Sampling Procedures

The construction material of the sampling devices (e.g., plastic, PVC, metal) discussed below shall be appropriate for the contaminant of concern and shall not interfere with the chemical analyses being performed. Maps for all LTM sites and LTM sample analysis summary tables have been added to Appendix D. Also included in Appendix D is a sampling schedule.

All purging and sampling equipment shall be decontaminated according to the specifications in Section 5.11 prior to any sampling activities and shall be protected from contamination until ready for use.

6.1.1 Groundwater Sampling

6.1.1.1 Monitoring Well Sampling

When numerous monitoring wells are to be sampled in succession, those with low levels of contamination or having no contamination shall be sampled prior to those that have higher levels of contamination. This practice will help reduce the potential for cross contamination between wells. All sampling activities shall be recorded in the field logbook. Additionally, all sampling data shall be recorded on a well sampling form. A well sampling form is included in Appendix B.

Before groundwater sampling begins, wells shall be inspected for signs of tampering or other damage. If tampering is suspected, (i.e., casing is damaged, lock or cap is missing) this shall be recorded in the field logbook and on the well sampling form, and reported to the FOM. Wells that are suspected to have been tampered with shall not be sampled until the FOM has discussed the matter with the PM.

Samples shall not be taken within 24 hours of monitor well development. Except as noted below, at least three well volumes shall be removed from the well before it is sampled.

If free product is present at a monitoring well, plastic sheeting shall be placed on the ground surrounding the well, when necessary to prevent surficial contamination. The plastic sheeting will provide a clean working area around the wellhead, and prevent any purged fluids from contaminating surrounding soils. Water in the protective casing or in the vaults around the well casing shall be removed prior to venting and purging. If it is the first time samples are going to be drawn from the well or historical data deems it necessary to conduct a field screening, the air in the breathing zone shall be checked with an organic vapor meter or PID and the air in the well bore shall be checked with an explosimeter. Procedures in the Health and Safety Plan (HSP) shall be followed when high concentrations of organic vapors or explosive gases are detected. Air monitoring data shall be recorded on the well sampling form.

Purge pump intakes shall be equipped with a positive foot check valve to prevent purged water from flowing back into the well. Purging and sampling shall be performed in a manner that minimizes aeration in the well bore and the agitation of sediments in the well and formation. Equipment shall not be allowed to free-fall into a well.

In addition to the information required in Section 8.0, the following information shall be recorded each time a well is purged and sampled. This information shall be encoded in the AFCEE Environmental Resources Program Information Management System (ERPIMS) files when required: (1) depth to water before and after purging; (2) well bore volume calculation; (3) sounded total depth of the monitoring well; (4) the condition of each well, including visual (mirror) survey; (5) the thickness of any non-aqueous layer; and (6) field parameters, such as pH, temperature, specific conductance, and turbidity.

6.1.1.1.1 Water Level Measurement

An interface probe shall be used if a nonconductive floating product layer is suspected in the well. The interface probe shall be used to determine the presence of floating product, if any, prior to measurement of the groundwater level. The groundwater level shall then be measured to the nearest 0.01 foot using an electric water level meter. Water levels shall be measured from the notch/mark located at the top of the well casing and recorded on the well sampling form. If well casings are not notched or marked, measurements shall be taken from the north edge of the top of the well casing, and a notch shall be made using a decontaminated metal file, or the point shall be marked with a permanent marker.

Following water level measurement, the total depth of the well from the top of the casing shall be determined using a water level meter, weighted tape or electric sounder and recorded on the well sampling form. The water level depth shall then be subtracted from the total depth of the well to determine the height of the water column present in the well casing. All water level and total depth measuring devices shall be routinely checked with a tape measure to ensure measurements are accurate.

6.1.1.1.2 Purging Prior to Sampling

Purging of monitoring wells is performed to evacuate water that has been stagnant in the well and may not be representative of the aquifer. Purging shall be accomplished using a Teflon® disposable bailer or a submersible pump.

For wells sampled with a disposable bailer, at least three to five well volumes shall be removed from the well before it is sampled; field parameters shall be checked using the stabilization criteria (as discussed in Section 6.1.1.1.3). The well bore volume is defined as the volume of submerged casing and screen. One well volume can be calculated using the following equation (Ohio USEPA, June 1993):

$$V = H \times F$$

where V = one well volume
H = the difference between the depth of well and depth to water (ft)
F = factor for volume of one foot section of casing (gallons) from Table 6-1

Table 6-1
Volume of Water in One-Foot Section of Well Casing

Diameter of Casing (inches)	F Factor (gallons)
1.5	0.09
2	0.16
3	0.37
4	0.65
6	1.47

F can also be calculated from the formula:

$$F = \frac{1}{4} \pi D^2 \times 7.48 \text{ gal/ft}^3$$

where D = the inside diameter of the well casing (feet).

Wells with yields too low to produce three well volumes before the well goes dry shall be purged to dryness.

The temperature, pH, electrical conductivity (EC), and turbidity (among other groundwater quality parameters such as redox and dissolved oxygen) shall be measured and recorded on the well sampling form after removing each well volume during purging. Information concerning investigative wastes generated during purging is presented in Section 5.13.

Micropurge is an alternative acceptable procedure to use for Griffiss LTM Program projects. Micropurge is a low flow-rate monitoring well purging and sampling method that induces laminar (non-turbulent) flow in the immediate vicinity of the sampling pump intake, thus drawing groundwater directly from the sampled aquifer, horizontally through the well screen, and into the sampling device. Low-flow pumping rates associated with the micropurge technique are in the approximate range of 0.2 to 2.0 liters/min. These low flow-rates minimize disturbance in the screened aquifer, resulting in: (1) minimal production of artificial turbidity and oxidation; (2) minimal mixing of chemically distinct zones; (3) minimal loss of volatile organic compounds; and (4) collection of representative samples while minimizing purge volume.

6.1.1.1.3 Sample Collection

Samples shall not be taken within 24 hours of monitoring well development. Except as noted below, at least three to five well volumes shall be removed from the well before it is sampled.

Groundwater samples shall be collected employing either the low-flow method or the use of a bailer. The sample may be collected after three to five well volumes have been removed and the temperature, pH, EC, D.O., ORP, and turbidity have stabilized. Stabilization shall be defined as follows: temperature ± 1° C, pH ± 0.1 units, EC ± 5%, D.O. ± 10%, ORP ±10 mV, turbidity ± 10 NTU for at least 30 minutes or three consecutive measurements and suspended sediment < 0.75 mL/L. If these parameters do not stabilize, the sample shall be collected after six well volumes have been removed, and the anomalous parameters shall be brought to the FOM's attention. Field equipment shall be calibrated in accordance with the AFCEE QAPP 3.1, Section 6.0 and in Section 7.2 of this FSP.

Samples shall be collected after the water level has recovered to 80 percent of its static level or 16 hours after completion of purging, whichever occurs first. If a monitoring well is bailed or pumped dry before three well volumes can be obtained, the sample shall be collected when a sufficient volume of water has accumulated in the well.

Low-flow sampling shall use small positive-displacement pumps (e.g., bladder, centrifugal) to minimize possible sample degassing effects. When employing the low-flow method, care shall be taken to sample at flow rates between 100-250 mL/min for samples to be analyzed for VOCs or other gaseous constituents. Other samples may be taken at flow rates between 100-450 mL/min, such as metals. The flow rate for purging should be maintained between 200-500 mL/min. Water-quality indicators shall be monitored during low-flow sampling (turbidity, dissolved oxygen, specific conductance, temperature, etc.). If after three successive measurements, the water-quality indicators remain in their given parameters, stabilization conditions has been met. In the case of a low recharge rate, the following steps should be taken in succeeding order to acquire stabilization: (1) decrease flow rate; (2) increase the draw-down level; (3) switch to bailing method. Samples to be analyzed for volatile or gaseous constituents shall not be withdrawn with pumps that exert a vacuum on the sample (e.g., centrifugal and peristaltic).

Before collecting groundwater samples, the sampler shall don clean, phthalate-free protective gloves. When using a bottom-filling Teflon® or PVC bailer, samples to be analyzed for VOCs shall be collected first. If DNAPL are suspected, a bailer shall be lowered to the bottom of the well before purging, retrieved, and observed for the presence of DNAPL.

Disposable nylon rope or string shall be used to lower and retrieve disposable bailers used to collect samples. A new length of nylon rope or string shall be used for each well, and the rope shall be disposed of following the sampling activities. Each dedicated bailer that may be used shall be equipped with a dedicated stainless steel or Teflon®-coated leader so that the nylon rope shall not contact the water in the well.

For the collection of VOC samples, the preservative hydrochloric acid shall be added to the VOC sample bottle before introducing the sample water. The sample shall be collected from the bailer using a slow, controlled pour down the side of a tilted sample vial to minimize volatilization. The sample vial shall be filled until a meniscus is visible and immediately sealed. When the bottle is capped, it shall be inverted and gently tapped to ensure no air bubbles are present in the vial. If, after the initial filling, bubbles are present, the vials shall be discarded and the VOC sampling effort shall be repeated. Refilling of vials will result in loss of preservatives. After the containers are sealed, sample degassing may cause bubbles to form. These bubbles shall be left in the container. These samples shall never be composited, homogenized, or filtered.

Following collection of VOC samples (when applicable), remaining water samples shall be collected in the following order (when applicable): SVOCs, including polynuclear aromatic hydrocarbons (PAHs); metals; mercury; cyanide; total organic carbon; anions; dissolved oxygen; other remaining analytes (no specific order).

Water samples requiring filtering (i.e., those for metals analysis) shall be filtered prior to preservation. Vacuum filtration or any method that may aerate the samples will not be used. Exposure of samples to atmospheric oxygen shall be kept to a minimum. In-line filtration and use of disposable filter assemblies are preferred. If filtration is performed in the field, filters with larger pores may be used as pre-filters. If samples are filtered, the contractor shall prepare a blank by filtering ASTM Type II Reagent-Grade water and submitting the blank for analysis for metals. This shall be done once per sampling round to assure that filtration does not bias sample results. Sample turbidity shall be recorded and reported.

Samples shall be chilled in a cooler with ice immediately after being collected and labeled. Required sample containers, preservation methods, volumes and holding times are given in Section 6.2 and Table 6-2. Sampling equipment shall be decontaminated in accordance with Section 5.11 upon completion of sampling activities

6.1.2 Subsurface Soil Sampling

Soil samples shall be collected based on odors, discoloration, organic vapor meter readings and/or any other field screening method.

6.1.2.1 Split-Spoon Sampling

When soil samples are to be submitted for laboratory analysis, they shall be collected using stainless steel, continuous drive, California modified split-spoon samplers, or equivalent. These samplers are 24 inches in length and have an outside diameter (OD) of 3 inches to accommodate four 2-inch diameter brass/stainless steel rings, each of which is 6 inches in length.

At the field geologist/field engineer's discretion, a standard penetration test may be performed in accordance with ASTM D-1586 "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils," to ascertain more concise geo-technical information. The sample is obtained by driving the sampler a distance of 1 foot into undisturbed soil with a 140-pound hammer free falling a distance of 30 inches. The sampler is first driven 6 inches to seat it in undisturbed soil; then the test is performed. The number of hammer blows for seating the spoon and making the test are then recorded for each 6 inches of penetration on the drill log (i.e., 5/7/8). The standard penetration test result (N) is obtained by adding the last two figures (i.e., 7+8=15 blows per foot). The sampler is then driven an additional 6 inches to fill the remainder of the split-spoon prior to retrieval.

As soon as the split-spoon is opened, the open ends of the brass/stainless steel rings shall be monitored for organic vapors using the PID or FID. Air monitor results shall be recorded on the boring log and in the field log book. Samples for VOC analysis shall be collected as an entire brass/stainless steel ring sample. Brass/stainless steel rings selected for VOC analysis shall be completely filled, if possible, to minimize headspace. Rings with large gravel or debris shall not be used. Following monitoring for organic vapors, the brass/stainless steel rings shall be capped on both ends with Teflon® sheeting and plastic end caps to prevent volatilization. The brass/stainless steel rings shall then be affixed with a completed sample label, placed in a zip lock plastic bag and placed in an iced cooler held at a temperature below 4°C.

Samples collected concurrently with VOC samples to be tested for other analytical parameters shall be collected by extruding the soil out of the brass/stainless steel rings immediately adjacent to (above and below) the VOC sample interval. Soil chemistry samples not being analyzed for VOCs shall be placed in 4, 8, or 16-ounce, laboratory cleaned, USEPA-approved glass containers with Teflon® lined lids. This shall be done using clean stainless steel sampling tools. If soil from several brass/stainless steel rings must be composited to provide sufficient sample volume for a particular analysis, the sample shall be composited and homogenized in a disposable plastic bag or a stainless steel bowl using a stainless steel trowel/scoop . The sample shall then be transferred into the appropriate sample container, sealed, labeled, and place in an iced cooler held at a temperature below 4°C.

If initial screening results indicate the presence of organic vapors, a headspace analysis shall be conducted on remaining portions of the sample.

6.1.2.2 Hand Auger Sampling

Hand augering is generally used to collect soil samples from depths up to 10 feet below grade surface. Deeper sampling by this method becomes time consuming and impractical if several holes are intended. Each hand auger boring shall be advanced by manually turning a hand auger, equipped with a three-inch cylindrical stainless steel bit, until the auger head fills with cuttings. The hand auger is then pulled from the boring and the cuttings are deposited on plastic sheeting or in a disposable plastic bag to be field screened using a PID while visual and olfactory observations are made. The sample is then logged using the USCS. The hand augering is continued until the desired depth is achieved.

For VOC analysis, the sample obtained from the desired depth is transferred directly from the auger head to the sample container or a disposable plastic bag for composting, thereby reducing loss of VOCs. For all other analysis, the sample shall be homogenized and quartered before being containerized. Stainless steel scoops or trowels and glass jars with Teflon® lids or equivalent equipment compatible with the chemical analyses proposed shall be used to collect and store samples. Above ground plant parts and debris will be excluded from the sample with the hand auger. The auger head will be decontaminated using the methods specified in Section 5.11.

6.1.2.3 Direct Push Sampling

Direct push sampling involves advancing a sampling probe from the point below the water table from which the sample is desired by direct hydraulic pressure or by using both hydraulic pressure and a rotary hammer. Samples may be collected continuously or at specific depths. The samples are collected in acetate sleeves or in split spoons so that the entire sample interval may be captured for screening and prepared for analysis without risking cross-contamination. During characterization, the appropriate information shall be recorded in the field logbook, and samples will be screened using a PID. Soil samples shall be collected based on odors, discoloration, PID readings and any other field screening method.

For VOC analysis of soil, the soil sample is transferred directly from the sleeve to the sample container, thereby reducing loss of VOCs. For all other analysis, the sample shall be homogenized and quartered before being containerized. Stainless steel scoops or spoons and glass jars with Teflon® lids or equivalent compatible with the chemical analyses proposed shall be used to collect and store samples. Above ground plant parts and debris will be excluded from the sample by the direct push method. Samples will be stored in a cooler at 4 degrees Celsius pending off-Base laboratory analysis. Prior to initiating a boring, all down-hole equipment will be decontaminated using the methods specified in Section 5.11.

6.1.3 Surface Soil Sampling

Surface soil samples will be collected from the ground surface to 6" below the surface. The sample shall be homogenized and quartered before being containerized. Stainless steel scoops or trowels and glass jars with Teflon® lids or equivalent equipment compatible with the chemical analyses proposed shall be used to collect and store samples. Above ground plant parts and debris will be excluded from the sample. Samples being analyzed for VOCs will not be homogenized and quartered in order to prevent VOC loss.

In addition to records outlined in Section 8.0, unusual surface conditions that may affect the chemical analyses, will be recorded such as the following: (1) asphalt chunks that may have been shattered by mowers, thus spreading small fragments of asphalt over the sampling area, (2) distance to roadways or buildings, (3) obvious, deposition of contaminated or clean soil at the site, (4) evidence of dumping or spillage of chemicals, and/or (5) soil discoloration.

6.1.4 Surface Water Sampling

The surface water samples will be obtained from the sampling locations using the following procedures:

- Assess the presence of "normal" conditions at the sampling location;
- Assess the presence of surface water;
- Identify sediment deposition locations in close proximity to proposed locations; and
- Sample the sediment and surface water in the appropriate order of sample collection.

After "normal" conditions have been assessed at the sampling location (i.e. no excessively high or low water levels), the sediment deposition locations at the sampling location are identified and targeted for sampling.

In order to avoid cross-contamination, the surface water samples will be collected first. Water quality measurements will be collected with a water quality monitoring system before sampling and will include pH, temperature, specific conductance, and dissolved oxygen (when required) at each surface water sampling location. The sample for these measurements will be collected while minimizing disturbance to the surface water or sediment in the creek. The sample will be freshly collected into a beaker in which the probe from the water quality monitoring system will be inserted and measurements will be recorded immediately. The sample locations will be permanently marked with an obvious and hard to move object (e.g., flagged stake in stream bank). The exact location will be recorded on project maps.

After water quality parameter collection, the surface water sample will be collected. Unpreserved sample bottles and sample bottles that will be preserved after sample collection, will be directly filled with sample water by immersion. Previously preserved sample bottles will be filled by pouring sample water from a disposable beaker. If VOCs will be analyzed, the portion of the sample to be analyzed for VOCs will be collected first. VOC vials will be checked for bubbles by inverting the vials and gently tapping them to dislodge any possible bubbles. If bubbles are present in the VOC vials after they are filled, the vials will be discarded and additional vials will be filled for analysis. After the bottles are filled they will immediately be placed in a sample cooler with ice. A CoC will be completed and kept in a plastic bag in each cooler to document the sequence of sample possession. Copies of the CoC forms will be kept on file at the FPM field office and will be included in future status reports.

6.1.5 Sediment Sampling

Hand augers will be the preferred method of sediment collection. The sediment samples will be transferred directly from the auger bit into the sampling containers. If VOCs will be analyzed, the portion of the sample to be analyzed for VOCs will be collected first. The VOC sample bottles will be filled completely to the top by slowly "pouring" the sediment to reduce the loss of VOCs through agitation. The bottle will be closed when all headspace has been eliminated. After the bottles are filled they will immediately be placed in a sample cooler with ice. A CoC will be completed and kept in a plastic bag in each cooler to document the sequence of sample possession. Copies of the CoC forms will be kept on file at the FPM field office and will be included in future status reports.

6.1.6 Fish Tissue Sampling

Fish tissue sampling will be performed in accordance with the EPA Guidelines (EPA, November 2000). Electrofishing will be used as the preferred method of fish collection. During electrofishing, the fish will be temporarily stunned and float to surface. All fish will be collected with dipnets and separated by species into 5-gallon buckets with aerators. They will then have their total length (mm) and weight (g) measured. The utmost care will be given to minimize stress to the fish.

For ecological evaluation, a bottom feeder (White sucker) and a predatory species (Creek chub) will be targeted. For human health evaluation, a bottom feeder (White sucker) and a different predatory species (Trout) will be targeted. Fish specimens of edible and filletable size (i.e larger than 6"), which also are representative sample of this group, will be collected and filleted for human health evaluation. If the fillets of one large fish are less than the required 200 grams of tissue, then additional fish will be collected and combined into one sample so that the minimum requirement is met. Smaller fish (i.e. forage fish) of one species will be composited for piscivorous wildlife evaluation. This composite sample will contain at least five different specimens for each species to be analyzed. The sample size required for analysis will be no less than 200 grams, but is dependent upon laboratory and analysis requirements. Creek chub and white sucker will be used as target species because of their relative high concentrations in past sampling efforts. Benthic organisms (crayfish, caddisfly larvae, etc.) will be collected instead of fish when there is insufficient fish tissue to conduct ecological evaluation analysis.

The fish samples that are large enough to be filleted will be sorted from the fish species groups, individually wrapped in aluminum foil, and inserted into plastic bags (Zip-Loc) including a completed sample tag. The fish will be filleted at the laboratory in a controlled environment.

Smaller fish that will be combined for analysis must be composited before they are wrapped in aluminum foil and packed into plastic bags with their sample tag. These smaller fish will be analyzed for whole body composition. All packed fish will be put in a cooler on ice immediately and shipped to the laboratory that same day.

6.2 Sample Handling

6.2.1 Sample Containers

Sample containers are purchased pre-cleaned and treated according to USEPA specifications for the methods. Sampling containers that are reused are decontaminated between uses by the USEPA-recommended procedures (i.e., USEPA 540/R-93/051). Containers are stored in clean areas to prevent exposure to fuels, solvents, and other contaminants. Amber glass bottles are used routinely where glass containers are specified in the sampling protocol.

6.2.2 Sample Volumes, Container Types, and Preservation Requirements

Sample volumes, container types, and preservation requirements for the analytical methods performed on samples are listed in Table 6-2.

Sample holding time tracking begins with the collection of samples and continues until the analysis is complete. Holding times for methods required routinely in the Griffiss LTM Program are specified in Table 6-2.

Table 6-2
Requirements for Containers, Preservation Techniques, Sample Volumes, and Holding Times

Name	Analytical Methods	Container[a]	Preservation[b,c]	Minimum Sample Volume or Weight[d]	Maximum Holding Time
Hydrogen ion (pH) (W, S)	Direct probe measurement	P, G	None requireed	N/A	Analyze immediately
Temperature	Direct probe measurement	P, G	None required	N/A	Analyze immediately
Dissolved oxygen	Direct probe measurement	P, G	None required	500 mL	Analyze immediately
Turbidity	Direct probe measurement	P, G	4°C	N/A	Analyze Immediately
Volatile organics	SW8260B	G, Teflon®-lined septum, T	4°C, 0.008% $Na_2S_2O_3$ (HCl to pH < 2 for volatile aromatics by SW8260)[b]	2 x 40 mL or 4 ounces	14 days (water and soil); 7 days if unpreserved by acid
Semi Volatile Organics	SW8270B	G, Teflon®-lined cap, T	None required	1000 mL or 4 ounces	7 days until extraction and 40 days after extraction (water); 14 days until extraction and 40 days after extraction (soil)
Metals (except chromium (VI) and mercury)	SW6010B	P, G, T	HNO_3 to pH<2, 4°C	500 mL or 4 ounces	180 days (water and soil)
Mercury	SW7470 (water) SW7471 (soil, fish)	P, G, T	HNO_3 to pH<2, 4°C	500 mL or 4 ounces	28 days (water and soil)
Organochlorine pesticides and polychlorinated biphenyls (PCBs)	SW8081/ SW8082	G, Teflon®-lined cap, T	4°C, pH 5-9	1 Liter or 4 ounces	7 days until extraction and 40 days after extraction (water); 14 days until extraction and 40 days after extraction (soil)
Cyanide, total and amenable to chlorination	SW9010B	P, G, T	4°C; NaOH to pH>12, 0.6 g ascorbic acid	500 mL or 4 ounces	14 days (water and soil)
Common anions	SW9056	P, G	None required	50 mL	28 days for Br^-, F^-, Cl^- and SO_4^{-2}; 48 hours for NO_3^-, NO_2^- and PO_4^{-3}

Name	Analytical Methods	Container[a]	Preservation[b,c]	Minimum Sample Volume or Weight[d]	Maximum Holding Time
Nitrogen, nitrate + nitrite, TKN	353.1, 351.3	P, G	4°C, H_2SO_4 to pH<2	500 mL	28 days
Total Organic Carbon	SW9060	P, G, T	4°C, HCI or H_2SO_4 to pH <2	500 mL	28 days (water)
Filterable residue	E160.1	P, G	4°C	100 mL	7 days
Alkalinity	310.1	P, G	4°C	50 mL	14 days

a. Polyethylene (P); glass (G); brass sleeves in the sample barrel, sometimes called California brass (T).

b. No pH adjustment for soil

c. Preservation with 0.008 percent $Na_2S_2O_3$ is only required when residual chlorine is present.

d. The amount of fish tissue sample needed for all analyses (metals, pesticides/PCBs, and % lipid) is estimated at 200 g.

6.2.3 Sample Identification

Each sample will be assigned a unique alphanumeric number that identifies the installation, the site, the specific sampling location, and the matrix sampled. These numbers will be used to track the sample from collection, through laboratory analysis, and into the report writing process. The sample identification numbering system described below was formulated to be consistent with many laboratory information systems and ERPIMS. Normal field samples (non-quality control) will be numbered according to the following convention:

i.e. - LF1M0220AB

LF1 = the Landfill 1 AOC (3 digit alpha-numeric)
M = the sample type, monitoring well groundwater sample (1 characters)
02 = the sample location number, 2 (2 digit number)
20 = the sample depth, 20 feet (2 digit number)
A = sampling round, A (1 number)
B = QA/QC, primary sample (1 character)

The list of abbreviations for On-Base Groundwater Sites, Petroleum Source Removal Area Sites, Landfill Sites, and Petroleum Spill Sites at Griffiss AFB are as follows:

B20 = Building 20
B35 = Building 35
L69 = Lot 69
101 = Building 101
301 = Building 301
782, AP2, HE4[1] = Nose Docks 1 & 2
782 = Apron 2 VC Plume
775 = Building 775 / Pumphouse 7
LF6 = Landfill 6
WSAT = Weapon Storage Area TCE
AOC9 = AOC 9 TCE
LF1 = Landfill 1
LF23 = Landfill 2/3
LF4 = Landfill 4
LF5 = Landfill 5
LF6 = Landfill 6
LF7 = Landfill 7
781 = Pumphouse 1
TMC = Three Mile Creek
SMC = Six Mile Creek
100 = Building 100 Fuel Hydrant System
110 = Building 110

771 = Pumphouse 5
B43 = Building 43
TF3 = Tank Farms 1 & 3
FPTA = FPTA
AP1, HE, LE[1] = Apron 1
T9 = T-9
T10 = T-10
B14 = Building 14
786 = Building 786
789 = Building 789
7001 = UST 7001
BFSA = BFSA
HH = 5773
P5750 = Pad 5750
133 = Building 133
B15 = Building 15
UST100 = Building 100 South
AP2 = Apron 2

[1] Note: These sites are so extensive that many different sample location identifiers have been used, but the identifier(s) listed will be applied during this field effort.

The sample type codes for this project include:

FS = Fish (tissue) sample
LL = Leachate sample
MW = Groundwater sample from monitoring well
PZ = Piezometer
SD = Sediment sample
SO = Soil sample
SW = Surface water
TW = Temporary well sample
WL = Wetland sample

The QA/QC characters include:

A = Primary Sample
B = Primary Sample
C = Field Duplicate sample
D = Matrix Spike Duplicate (MSD)
E = Equipment blank
F = Ambient blank
P = Performance evaluation sample
R = Trip blank
S = Matrix Spike (MS)
T = Field Replicate
X = Resample of confirmation

e.g.: T10MW0220AB represents a primary groundwater sample obtained at a depth of 20 feet from monitoring well 02 at the T-10 Petroleum Spill Site during the first sampling round.

In addition to the sample identification number, the following information will be documented on the label affixed to each sample:

- Sample ID
- Site name
- Date and time of sample collection
- Name of collector(s)
- Analyses required
- Preservation method
- Client name

6.3 Sample Custody

Possession of all samples will be tracked from the time of sample collection through sample analysis by the use of a Griffiss CoC form. The list of items to be recorded on a completed CoC form includes the following:

- The project name;
- Signature of sampler;
- Sampling location;
- Unique sample number;
- Date and time of collection;
- Matrix;
- Analysis to be performed;
- Preservatives;

- Pertinent field data (including ERPIMS codes);
- Custody transfer signatures and dates and times of sample transfer from the field to transporters and to the laboratory;
- Sequential CoC number; and
- Sample delivery group (SDG) number.

All samples shall be uniquely identified, labeled, and documented in the field at the time of collection as specified in Section 6.2.3 of the FSP.

All sample containers shall be sealed in a manner that shall prevent or detect tampering if it occurs. In no case shall tape be used to seal sample containers. Samples shall not be packaged with activated carbon unless prior approval is obtained from the USACE.

Samples collected in the field shall be transported to the laboratory or field-testing site as expeditiously as possible. When a 4°C requirement for preserving the sample is indicated, the samples shall be packed in ice or chemical refrigerant to keep them cool during collection and transportation. During transit, it is not always possible to rigorously control the temperature of the samples. As a general rule, storage at low temperature is the best way to preserve most samples.

When same-day shipment of the samples to an off-site laboratory is not possible, the samples shall be maintained in coolers at 4°C in the FPM field office no longer than 24 hours; the samples shall be shipped no later than one day after sample collection.

The individual ultimately responsible for all field activities, (i.e. FOM or PM) will oversee all individuals involved in collecting, shipping, and receiving of the samples and shall sign and date the CoC forms to document the actual chain of possession of the samples. A copy of each completed CoC form will be sealed in a plastic bag and shipped in the appropriate cooler. A copy of each completed CoC form will be placed in the FPM project files. The CoC forms will be numbered sequentially for tracking purposes. Copies of all completed GRIFFISS CoC forms will be included in the annual status report.

6.4 Field Quality Control Samples

Environmental monitoring and measurement projects require the use of quality assurance/quality control (QA/QC) samples as an integral part of the sampling plan. Field duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples as well as equipment, ambient, and trip blanks will be prepared and analyzed. Temperature blank measurements will also be obtained for each cooler transported to the laboratory.

QA = Sample to USACE for their lab
QC = EB/AB/TB/FD/MS/MSD

6.4.1 Ambient Blank

The ambient blank consists of ASTM Type II Reagent-Grade water poured into a VOC sample vial at the sampling site. It is handled like an environmental sample and transported to the laboratory for analysis. Ambient blanks are prepared only when VOC samples are taken and are analyzed only for VOC analytes.

Ambient blanks are used to assess the potential introduction of contaminants from ambient sources (e.g., active runways, engine test cells, gasoline motors in operation, etc.) to the samples during sample collection. Ambient blanks shall be collected downwind of possible VOC sources. Ambient blanks shall be collected every day that VOC samples are collected.

6.4.2 Equipment Blank

An equipment blank is a sample of ASTM Type II Reagent-Grade water poured into or over or pumped through the sampling device, collected in a sample container, and transported to the laboratory for analysis. Equipment blanks are used to assess the effectiveness of equipment decontamination procedures. Equipment blanks shall be collected immediately after the equipment has been decontaminated. The blank shall be analyzed for all laboratory analyses requested for the environmental samples collected at the site.

6.4.3 Trip Blank

The trip blank consists of a VOC sample vial filled in the laboratory with ASTM Type II Reagent-Grade water, transported to the sampling site, handled like an environmental sample and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks are prepared only when VOC samples are taken and are analyzed only for VOC analytes. Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. One trip blank shall accompany each cooler of samples sent to the laboratory for analysis of VOCs.

6.4.4 Field Duplicates

A field duplicate sample is a second sample collected at the same location as the original sample. Duplicate samples are collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis. Duplicate sample results are used to assess precision of the sample collection process. Precision of soil samples to be analyzed for VOCs is assessed from collocated samples because the compositing process required to obtain uniform samples could result in loss of the compounds of interest. Field duplicates are collected at a rate of 10 percent, i.e. one in ten samples.

6.4.5 Field Replicates

A field replicate sample, also called a split, is a single sample divided into two equal parts for analysis. The sample containers are assigned an identification number in the field such that they cannot be identified as replicate samples by laboratory personnel performing the analysis. Specific locations are designated for collection of field replicate samples prior to the beginning of sample collection. Replicate sample results are used to assess precision.

6.4.6 QA/QC Sampling Frequencies

The estimated numbers, frequencies, and types of field QA/QC samples that are collected are based on the following guidelines:

- **Trip Blanks**: One shall be provided for each cooler containing samples for VOC analysis;
- **Equipment Blanks**: At least on equipment blank shall be collected per day of matrix. In general, equipment blanks shall be performed so as to evaluate each of the types of sampling equipment utilized during the field-sampling event. Additional equipment blank samples may be collected if field conditions warrant;
- **Ambient Blanks**: At least one ambient blank shall be collected per day during each VOC sampling event. Additional ambient blank samples may be collected if conditions warrant;
- **Field Duplicates**: Field duplicate samples shall be collected at the rate of at least ten percent of the primary samples collected per event. Therefore, each SDG of up to 20 environmental samples will include up to two field duplicate samples. Field duplicate samples and QA split samples will be a triplicate split, with one split sample sent to the USACE QA laboratory in Omaha;
- **Matrix Spike/Matrix Spike Duplicates**: Matrix spike and matrix spike duplicates shall be collected and analyzed at a rate of one per SDG of up to 20 analytical samples collected per matrix per event; and
- **Temperature Blanks**: One temperature blank measurement shall be obtained.

6.5 Sample Packaging and Shipping

Samples collected in the field shall be transported to the laboratory or field testing site as expeditiously as possible. Field samples will be transported to Severn Trent Laboratories-Buffalo, 10 Hazelwood Dr., Amherst, New York 14228, telephone: (716) 691-2600. QA samples will be transported to the USCACE-CQAB, 420 South 18th, Omaha, Nebraska 68102, telephone: (402) 444-4314. When a 4°C requirement for preserving the sample is indicated, the samples shall be packed in ice to keep them cool during collection and transportation. During transit, it is not always possible to rigorously control the temperature of the samples. As a general rule, storage at low temperature is the best way to preserve most samples. A temperature blank shall be included in every cooler and used to determine the internal temperature of the cooler upon receipt of the cooler at the laboratory.

Packaging and shipping procedures will be based on the presumption that the samples are classified as low concentration environmental samples. The following packing and shipping procedures will be utilized for low concentration environmental samples and are in general compliance with the AFCEE QAPP and U.S. Department of Transportation (DOT) regulations (49 CFR 171-179):

- Seal sample containers by firmly affixing the lids to the containers;
- Wrap all glass containers in non-water-absorbent packing materials (bubble-wrap bags or similar) to reduce the potential for container breakage during shipment;
- Place each sample container with the lid facing upward in a DOT-approved cooler;
- Check to assure that all required QA/QC samples are present inside each cooler;
- Place sufficient ice above and around the sealed sample containers to depress the sample temperatures to 4°C;
- Fill the balance of the cooler with non-water-absorbent packing materials so as to reduce the potential for container movement or breakage during shipment;
- Place a copy of the appropriate completed CoC form in a sealed plastic bag inside the top of the cooler;
- Close the cooler(s), seal the lid opening with strapping tape, secure the lid by placing additional strapping tape around the body of the cooler, and assure that any drains that may be present are also sealed with tape;
- Affix "This Side Up" labels to all four sides and "Fragile" labels to two sides of each Cooler, also add "wet ice" labels;
- Place a signed dated custody seal over the cooler lid opening on the front right and left sides of each cooler; and
- Transfer the sealed cooler(s) to an overnight courier within 24 hours of sample collection using a standard airbill. Tape the completed shipping label to the top of each cooler. Airbill numbers shall be recorded on the Contractor's copy of the completed CoC form.

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7 FIELD MEASUREMENTS

7.1 Field Parameters

The static water level, total well depth, and thickness of phase-separated product (if present) will be measured at each monitoring well prior to sampling.

Water quality parameters will be recorded at the beginning and during purging at each monitoring well. The water quality parameters will include temperature, pH, specific conductivity, dissolved oxygen, turbidity, and oxidation/reduction (redox) potential. A multi-parameter probe will be used for collecting the water quality measurements.

Field screening measurements at Griffiss AFB will consist of observation of odors, discoloration of soil, and detection of VOCs using a PID. Soil samples at all sites will be screened with a PID for the purpose of identifying the presence of VOCs and to determine which samples will be submitted for laboratory analysis. Ambient air screening for VOCs will be performed during direct push probing for the purpose of health and safety.

7.2 Equipment Calibration and Quality Control

The multi-parameter probe requires calibration with known standards and buffers that are supplied by the manufacturer for use with the instrument. The instrument will be initially calibrated prior to use in the field, and daily calibration checks and adjustments will be performed according to the manufacturers instructions. Calibration checks may also be performed if obvious incorrect measurements are observed.

A PID will be used during the groundwater sampling activities in accordance with the health and safety plan and for obtaining information relative to contaminant presence at each monitoring well. The PID will be calibrated daily with isobutylene in accordance with the manufacturer's specifications. Calibration records for both the multi-parameter probe and PID will be maintained in the field logbook, and will be recorded on Equipment Calibration Log forms, as provided in Appendix B.

7.3 Equipment Maintenance and Decontamination

All field measurement equipment shall be decontaminated according to the specifications in Section 5.11 prior to use and between each monitoring well. Following decontamination, the equipment will be placed in unused plastic (trash) bags for transport to the next location.

7.4 Field Monitoring Measurements

7.4.1 Groundwater Level Measurements

Water-level measurements shall be taken in all wells and piezometers to determine the elevation of the water table or piezometric surface at a given site at least once within a single 24-hour period. These measurements shall be taken after all wells and piezometers have been installed and developed and their water levels have recovered completely. Any conditions (e.g., barometric pressure) that may affect water levels shall be recorded in the field log. The field log shall also include the previous water level measurement for each well (to determine if current water level is reasonable).

Groundwater elevations shall be measured using an electronic water level meter with interface probe. Water level measurements will be measured from a notch or mark located at the top of the casing. If one does not exist, then a mark or notch should be positioned on the north edge of the casing and the measurement taken from that point. The notch or mark should be made with an appropriate tool (e.g., permanent marker, rasp, or a file) that will not risk contamination of the samples. Pressure gauges, manometers, or equivalent devices shall be used for flowing wells to measure the elevation of the piezometric surface. All measuring equipment shall be decontaminated according to the specifications in Sections 7.3 and 5.11. Groundwater elevations shall be measured to the nearest 0.01 foot. (Two or more sequential measurements shall be taken at each location until two measurements agree to within + or - 0.01 foot.)

Static water levels shall be measured each time a well is sampled, and before any equipment enters the well. If the casing cap is airtight, the water level will be allowed to equilibrate after the cap is removed before taking a measurement. Measurements will be repeated until the water level is stabilized.

7.4.2 Floating Hydrocarbon Measurements

The thickness of hydrocarbons floating in monitoring wells shall be measured with an electronic interface probe. Any method that may affect water chemistry shall not be used. When detected, the presence of floating hydrocarbons shall be confirmed by withdrawing a sample with a clear, bottom-fill Teflon® bailer.

7.4.3 Groundwater Discharge Measurements

Prior to sampling, each monitoring well will be purged of groundwater to allow for collection of representative samples. Depending on the specific well conditions, pumping or manual bailing techniques will be employed. Pre-sample purging will involve removing a minimum of three wetted casing volumes from the well and measuring the water quality parameters of the discharge. Water quality measurements will be collected at the beginning and throughout purging. Each well will be considered successfully purged when the volume requirements have been met, the discharge is reasonably free of sediment, and when three replicate sets of water quality parameters are consistent (see Section 6.1.1.1.3). Following successful purging, the monitoring wells will be sampled.

When necessary, groundwater discharge measurements shall be obtained during monitoring well purging and aquifer testing. Groundwater discharges may be measured with orifice meters, containers of known volume, in-line meters, flumes, or Weirs, following the guidelines specified in the Water Measurement Manual (Bureau of Reclamation, 1967). Measurement devices shall be calibrated using containers of known volume.

7.5 Field Performance and System Audits

Periodic in-field performance audits will be conducted by the appropriate technical QA Officers for the particular discipline of field activities. The purpose of the field audits will be to ensure that the methods and protocols detailed in the FSP and QAPP are being consistently adhered to in the field.

Prior to the audit, the auditing QA Officer will prepare a checklist to ensure completeness of the review and to document the results of the audit. Items to be examined may include, as appropriate, the implementation of approved work procedures; packaging, storage, and shipping of samples obtained; and documentation procedures.

The records of field operations will be reviewed to verify that field-related activities were performed in accordance with appropriate project procedures. Items reviewed may include, but are not limited to daily field activity logs, chain-of-custody documentation, and field logs. Audits of field activities will occur at least once during the field activities.

During an audit and upon its completion, the auditors will discuss the findings with the individuals audited and cite any corrective actions to be initiated. Minor administrative findings that can be resolved to the satisfaction of the auditors during an audit shall not require citation as items requiring corrective action. Findings that are not resolved during the course of the audit and findings affecting the overall quality of the project, regardless of when they are resolved, will be noted on the audit checklist and the results provided to the PM, who will ensure that the corrective actions have been implemented.

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8 RECORD KEEPING

FPM shall maintain field records sufficient to recreate all sampling and measurement activities and to meet all ERPIMS data loading requirements. The requirements listed in this section apply to all measuring and sampling activities. Requirements specific to individual activities are listed in the section that addresses each activity. The information shall be recorded with indelible ink in a permanently bound notebook with sequentially numbered pages. These records shall be archived in an easily accessible form and made available upon request.

The following information shall be recorded for all field activities: (1) location, (2) date and time, (3) identity of people performing activity, and (4) weather conditions. For field measurements: (1) the numerical value and units of each measurement, (2) the identity of and calibration results for each field instrument, (3) field observations, and (4) cross-reference to photographs, if photographs are taken.

The following additional information shall be recorded for all sampling activities: (1) sample type and sampling method; (2) the identity of each sample and depth(s), where applicable, from which it was collected; (3) the amount of each sample; (4) sample description (e.g., color, odor, clarity); (5) identification of sampling devices; and (6) identification of conditions that might affect the representativeness of a sample (e.g., refueling operations, damaged casing, etc.).

FPM forms, including the Field Sampling Report, Boring Log Form and the Waste Inventory Tracking Form, will be utilized during field sampling activities associated with this FSP. These forms are provided in Appendix B.

A separate logbook of information pertinent to health and safety may be maintained. Examples of this information include:

- Heat/cold stress monitoring data, if applicable.
- Upgrades or downgrades of personnel protective equipment.
- Reason(s) for upgrades or downgrades (documenting appropriate approvals).

The logbook may also contain the information required to complete the forms described above and under Section 8.2.

8.1 Annotation of Maps

Copies of the base maps or sketches will be used by the field teams to record key site conditions. The maps or sketches will be maintained by the field team leader during field activities and transferred to the project files and be submitted with the issuance of semi-annual or annual reports.

8.2 FPM Forms

FPM forms, including the Field Sampling Report, Boring Log Form and the Waste Inventory Tracking Form, will be utilized during field sampling activities associated with this FSP. These forms are provided in Appendix B.

9 QUALITY CONTROL

9.1 Chemical Quality Control Plan

Throughout the project activities, compliance with the DQOs will be achieved by a three-phase quality control process. This process will provide an internal check for data quality for each distinct feature of work to be implemented according to the work plan: (1) installation of temporary vertical profile wells and permanent monitoring wells; (2) groundwater sample collection; and (3) surface water sample collection. The three-phase process will consist of a preparatory review of the project requirements for each task, initial work task review of the task specific needs, and a follow-up review of all analytical tasks. These reviews will be executed by the CQCC and/or FOM, as appropriate, in conjunction with the PM and other QA management staff. Any deficiencies will immediately initiate corrective action as discussed in Section 7.5.

9.1.1 Preparatory Review

Prior to mobilization, the CQCC or FOM will conduct a scope review with the entire field analytical staff. This review will consist of a detailed analysis of the SAP requirements, including a review of the field equipment checklist and the checklist of activities for each work task, review of calibration procedures and standard operating procedures for all field analytical equipment, as appropriate, and verification that all needed forms are available. This phase will be repeated as necessary for new field staff members that may arrive onsite during the work effort.

The project-specific field equipment checklists for each of the three tasks described above are included in Tables 9-1, 9-2, 9-3, and 9-4. For the preparatory phase of the quality control process, a preparatory meeting shall take place in which the activities shall be conducted for each work task: (Note: for monitoring well installations, steps 1 through 4 only are applicable):

(1) The CQCC shall review with all field staff all sections of the plans and specifications to ensure that awareness of the overall DQOs and task-specific SAP requirements;
(2) The SAP shall be reviewed in detail at the preparatory meeting;
(3) The calibration of all field instruments shall be demonstrated during the preparatory meeting using certified calibration standards, gases, etc.;
(4) Equipment decontamination procedures shall be demonstrated using the procedures as outlined in the SAP;

(5) A full set of sample CoC forms shall be completed for use as a guide during sampling, and the sampling identification system shall be explained. Information to be entered on the form includes laboratory addresses and phone numbers, analytical test methods, sample preservation, and other required data as discussed in Section 6.3;

Table 9-1
Field Equipment Checklist for Well Installations

Check	Field Equipment Checklist for Well Installations
	✓ Work Plan, including contract specifications and plans
	✓ SAP and HSP
	✓ Drilling Logs
	✓ Field Logbooks and pens; Munsell Color Chart
	✓ Well Development Forms and other forms for recording data, as appropriate
	✓ Base maps/site maps for documenting sample locations
	✓ Measuring tape
	✓ Well locks
	✓ Hazardous waste manifest forms
	✓ Reference materials for proper completion of manifests
	✓ Field screening instruments (Multi-parameter probe, organic vapor meter (OVM)/organic vapor analyzer (OVA)/PID)
	✓ Calibration gas
	✓ Calibration standards
	✓ Instrument operating manual
	✓ Surge block and bailer or pump, as appropriate, for development
	✓ Backup instrument for field screening
	✓ 55-gallon drum
	✓ Established procedures for instrument repair
	✓ Standard operating procedures for decontamination
	✓ Decontamination materials including Alconox, rinse water, paper towels, etc.
	✓ Gloves, safety glasses, hard hat, ear plugs and other PPE as appropriate; first aid kit
	✓ Other: ✓ ✓ ✓

Table 9-2
Field Equipment Checklist for Groundwater Sample Collection

Check	Field Equipment Checklist for Groundwater Sample Collection
	✓ Work Plan, including contract specifications and plans
	✓ SAP and HSP
	✓ Field Logbooks and pens
	✓ Well Development & Forms, Well Purging & Sampling Forms and other forms for recording data, as appropriate
	✓ Base maps/site maps for locating monitoring wells and well keys
	✓ Hazardous waste manifest forms
	✓ Reference materials for proper completion of manifests
	✓ Explosimeter, if appropriate
	✓ Water-level indicator
	✓ Field screening instruments (multi-parameter probe, OVM/OVA/PID)
	✓ Instrument operating manuals
	✓ Calibration gas
	✓ Calibration standards
	✓ Equipment Calibration Log forms
	✓ Pumps (for purging purposes), tubing, and batteries (as appropriate)
	✓ Established procedures for instrument repair
	✓ Standard operating procedures for decontamination
	✓ Decontamination materials including Alconox, rinse water, paper towels, trash bags, etc.
	✓ Sample collection equipment (bailers, string, tubing, as appropriate)
	✓ Peristaltic pump (for low-flow sampling only)
	✓ Labels for sample containers
	✓ Sample containers of the types to be used for each analysis, including sample preservatives as appropriate
	✓ Sample shipping coolers
	✓ CoC forms
	✓ Chain-of-custody seals
	✓ Strapping tape and shipping handling labels
	✓ Sample packing materials, including plastic bags
	✓ Ice/ice packs
	✓ Laboratory information including name, address, phone number, point of contact, turnaround time for analyses, and documentation that labs have been notified that the samples will be shipped and that labs can accept the samples
	✓ Gloves, safety glasses and other PPE as appropriate; first aid kit
	✓ Other:

Table 9-3
Field Equipment Checklist for Surface Water Sample Collection

Check	Field Equipment Checklist for Surface Water Sample Collection
	✓ Work Plan, including contract specifications and plans
	✓ SAP and HSP
	✓ Field Logbooks and pens
	✓ Field Sampling Report forms and other forms for recording data, as appropriate
	✓ Base maps/site maps for identifying sampling locations
	✓ Stakes, if appropriate
	✓ Measuring stick/measuring tape
	✓ Field screening instruments (multi-parameter probe)
	✓ Instrument operating manuals
	✓ Calibration standards
	✓ Equipment Calibration Log forms
	✓ Established procedures for instrument repair
	✓ Standard operating procedures for decontamination
	✓ Decontamination materials including Alconox, rinse water, paper towels, etc.
	✓ Sample collection equipment (Van Dorn Sampler/Kemmerer Sampler, as appropriate)
	✓ Labels for sample containers
	✓ Sample containers of the types to be used for each analysis, including sample preservatives as appropriate
	✓ Sample shipping coolers
	✓ CoC forms
	✓ Chain-of-custody seals
	✓ Strapping tape and shipping handling labels
	✓ Sample packing materials, including plastic bags
	✓ Ice/ice packs
	✓ Laboratory information including name, address, phone number, point of contact, turnaround time for analyses, and documentation that labs have been notified that the samples will be shipped and that labs can accept the samples
	✓ Gloves, safety glasses and other PPE as appropriate (hip boots); first aid kit
	✓ Other: ✓ ✓ ✓

Table 9-4
Field Equipment Checklist for Soil Sediment Sample Collection

Check	Field Equipment Checklist for Soil Sample Collection
	✓ Work Plan, including contract specifications and plans
	✓ SAP and HSP
	✓ Field Logbooks and pens
	✓ Field Sampling Report forms and other forms for recording data, as appropriate
	✓ Base maps/site maps for identifying sampling locations
	✓ Hazardous waste manifest forms
	✓ Stakes, if appropriate
	✓ Measuring stick/measuring tape
	✓ Field screening instruments (PID)
	✓ Instrument operating manuals
	✓ Calibration standards
	✓ Equipment Calibration Log forms
	✓ Established procedures for instrument repair
	✓ Standard operating procedures for decontamination
	✓ Decontamination materials including Alconox, rinse water, paper towels, etc.
	✓ Sample collection equipment (Auger, split-spoon sampler, trowel, etc.)
	✓ Labels for sample containers
	✓ Sample containers of the types to be used for each analysis, including sample preservatives as appropriate
	✓ Sample shipping coolers
	✓ CoC forms
	✓ Chain-of-custody seals
	✓ Strapping tape and shipping handling labels
	✓ Sample packing materials, including plastic bags
	✓ Ice/ice packs
	✓ Laboratory information including name, address, phone number, point of contact, turnaround time for analyses, and documentation that labs have been notified that the samples will be shipped and that labs can accept the samples
	✓ Gloves, safety glasses and other PPE as appropriate (hip boots); first aid kit
	✓ Other: ✓ ✓ ✓

(6) The sampling collection method will be discussed and demonstrated in detail, using the intended sample containers, sampling equipment, and decontamination procedures, and applying the data reporting requirements; and
(7) Laboratory turnaround times shall be established as will the policy that the CQCC is to be sent a copy of the CoC form after the completion of each day of field sampling.

During this phase for the groundwater and surface water sampling effort, the CQCC will also contact the subcontractor laboratory and establish lines of communication and schedule for the project. The laboratory will be provided with a copy of the SAP for review prior to the start of the project. The laboratory will also be provided with generic copies of all the FPM forms (including the CoC) as listed in the QAPP.

9.1.2 Initial Review

Prior to commencement of each day's activities, the FOM shall review the planned tasks with the CQCC and the PM. The FOM shall then ensure that all equipment and supplies are gathered, that proper decontamination is performed, and that any needed calibrations are performed and documented (Equipment Calibration Log form, Appendix B). No sampling tasks will be initiated until this process is completed.

When the field activities are initiated, the CQCC shall oversee all sampling activities and review the work for compliance with contract requirements. At the end of each day, the FOM shall review individual sample labels and CoC forms for accuracy, completeness, and consistency. The FOM shall also inspect the packaging and shipping of the samples (this shall be performed at least once by the CQCC). The FOM shall also review all field logbooks and documentation for compliance with the SAP, and shall ensure that the field logbook includes a sample delivery group (SDG) table, which matches up primary and QA samples (a sample is shown in Table 9-5). He/she will date and initial each page and/or form and generate copies for the project files and the CQCC. Additionally, the CQCC will receive a copy of the CoCs and the sample receipt forms from the subcontractor laboratory each day that samples are received. Finally, the on-site FOM or the CQCC, as appropriate, shall prepare daily chemical quality control reports (DCQCRs), which shall be reviewed and signed by the CQCC, and filed until submittal to USACE as discussed in Section 9.2.

Table 9-5
Sample Delivery Group Table

Sample Location	Sample Depth	Sample Number (Primary Lab)	Associated Trip Blank Number (Primary Lab)	Associated Equipment Blank (Primary Lab)	Associated Ambient Blank (Primary Lab)	Sample Number (QA Lab)	Associated Trip Blank Number (QA Lab)	Associated Equipment Blank (QA Lab)	Associated Ambient Blank (QA Lab)	EPA Method Number

9.1.3 Follow-up Review

The CQCC shall be responsible to ensure the continued compliance of the Chemical Quality Control Plan until the work task is completed. To facilitate this task, the CQCC shall review and sign the DCQCRs, which shall be prepared as discussed Section 9.2. The CQCC shall also prepare Quality Control Summary Reports, and perform validation of all data for method and DQO compliance from the subcontractor laboratory. A data validation report shall be prepared and attached to the data package and maintained in the project file. Additional information regarding the data validation process is provided in Section 8.0 of the QAPP.

9.2 Chemical Quality Control Reports

For each day of field activities, DCQCRs shall be prepared, dated, signed by the CQCC, as appropriate, and will be kept in the project files. Copies will be provided to USACE on a weekly basis or as requested. These reports shall include the following:

- Project number, task name, and site identification numbers;
- Weather including temperature, wind speed and direction, barometric reading, significant wind changes, etc.
- Field sampling forms, including the Well Development & Sampling Record and/or the Well Purging & Sampling Form (Appendix B) for groundwater samples and the Field Sampling Report for surface water samples, including the following information:
  - Weather information at the time of sampling;
  - Field instrument measurements and any chemical parameter measurement problems;
  - Departures from the approved SAP or procedures;
- Calibrations (as recorded on the Equipment Calibration Log form, Appendix B);
- Copies of CoCs;
- Copy of page in field logbook showing QA sample table (Table 9-5);
- Verification of sample shipment;
- Any other project forms that are generated;
- Any problems encountered, including instrument malfunction, equipment failure, unforeseen circumstances which postpone completion of task, shipping problems, etc.; and
- Any instructions received by the Field Engineer or project management.

A sample DCQCR form is provided in Table 9-6. The form may be revised as needed or as upon request of the USACE COR. A Quality Control Summary Report shall be prepared and submitted to USACE on a quarterly basis, subject to review by the CQCC as explained in Section 9.1.3.

Table 9-6
Daily Chemical Quality Control Report

Project/Delivery Order Number:____________________________Date:___________________

Project Name/Site Number: ____

Weather conditions: Temperature:__________Barometric reading: __________
Wind speed and direction: __________________________
Significant wind changes:___________________________

General description of tasks completed: ____

Explain any departures from the SAP or deviations from approved procedures during the day's field activities:____

Explain any technical problems encountered in the field or field equipment/field analytical instrument malfunction: ____

Corrective actions taken or instructions obtained from USACE personnel: __________________

Sampling shipment completed: ☐ Yes ☐ No Airbill #:________________________________

DCQCR Prepared by: ______________________________ Date:________________________

CQCC Signature: _________________________________ Date:________________________

ATTACHMENTS:

Checklist	Daily Chemical Quality Control Report Attachments
	✓ Field sampling forms
	✓ Equipment Calibration Log
	✓ Copies of CoCs
	✓ SDG Table
	✓ Daily Health and Safety Meeting Form

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Appendix A

Approved Laboratory Variances, Reporting Limits, and Percent Recoveries

STL Buffalo
Variances to AFCEE Model QAPP – Version 3.1
for
Environmental Sampling, Griffiss Air Force Base, Rome, NY
Contract DACW41-02-D-0020-0001

1. Section 4.4.3 Surrogates, pg. 4-8

A variance is requested from the prescribed corrective action for surrogate failures (re-preparation and re-analysis of affected samples) in the instance where clearly established matrix interferences are the cause as determined through the analysis of MS/MSD samples (i.e.: the base sample, the matrix spike and the matrix spike duplicate exhibited similar surrogate failures). In such instances the laboratory will document the event and will forward this information to the client. For any other sample in the batch, which is not a parent sample of the MS/MSD samples, surrogate failures will be subject to the corrective action prescribed in the QAPP.
Rationale: The instances described above provide objective evidence of matrix effect as determined through the analysis of sample MS/MSD. Re-analysis should not be necessary where conclusive matrix effects are demonstrated.

2. Section 4.5.3 Standard Materials, pg. 4-13

The laboratory complies with the stated requirements where available. The laboratory has not found EPA, A2LA or NIST standards for volatile gases. Two sources are used where available. NSI, Supelco and ERA are the primary sources of standards. Wet chemistry tests utilize principally salts (from two different sources) to prepare its standards. These salts are at least 96% purity. Neat standards from at least two sources are used for herbicides, organo-phosphorus pesticides. Some appendix IX compounds are not available from NIST, EPA or A2LA certified sources. Two vendors are used in these cases.
Rationale: Some analytes are not available from the sources prescribed in the QAPP.

3. Section 7, various tables – Reporting Limits and Control Limits

The laboratory reviewed the AFCEE required RLs in section 7 of the QAPP. Several compounds in the QAPP have RLs below levels that the laboratory can reliably achieve during routine laboratory operations. The attached tables contain, in highlights, the laboratory RLs that are higher than the AFCEE limits. STL Buffalo requests variance for all compounds in highlight.
Rationale: Instrument performance parameters do not indicate that the stated QAPP RL can be reliably achieved. The laboratory provided RL tables include historically achievable RLs.

4. Section 7.2.10 Method SW8270C, pg. 7-67, Table 7.2.10-3 - Surrogates

This table does not distinguish between acid and the base/neutral fractions for applying the surrogate criteria. The laboratory requests that corrective action and qualification of data is employed only if any surrogate recovery is less than 10% or when more than one acid or base surrogate exceeds the criteria.

5. Section 8.8 Hardcopy Data Reports for Screening and Definitive Data, pg. 8-9

The laboratory requests the opportunity to discuss with the prime contractor a mutually agreeable hard copy data deliverable format. The laboratory is not currently capable of providing the exact data reporting forms contained in the QAPP. STL Buffalo believes its current reporting format provides all the information necessary to validate a data package. STL requests a variance from specifically using the QAPP forms and to provide, instead, a format agreeable to all parties. The suggested hard copy report shall include sufficient information in the case narrative, reporting forms and raw data, to allow prime contractors to conduct validation and flagging of the data in accordance with AFCEE QAPP guidelines.

6. Table 7.2.9-3 Summary of Calibration and QC Procedure for Method SW8260B, pg. 7-56, Calibration Verification:

The laboratory requests a modification of the CCV criteria requiring all analytes to be within +/- 20%. STL will ensure that no less than 80% of all compounds, including all compounds of known concern at Griffiss Air Force Base will be within +/- 20%. The remaining compounds will not exceed +/- 30%. A list of compounds of known concern will be generated by the client on a quarterly basis and shared with the laboratory (Table 1.1) In the event that the laboratory is not able to meet this requirement, and all attempts of sample analysis have been exhausted (i.e. extraction/analytical holding time expired, sample volume consumed), the laboratory will document the event and contact the client to take further action. The compounds that have consistently exhibited recoveries outside of +/- 20% criteria are Bromomethane, Chloroethane, Dichlorodifluoromethane, Trichlorofluoromethane, and Hexachlorobutadiene.
Rationale: Historically the front end gases and heavier semi-volatile compounds have shown routine recoveries at +/- 30% drift while remaining compounds stay roughly within +/- 20%. The proposed criterion eliminates the potential for low bias or false negatives.

7. Table 7.2.10-3 Summary of Calibration and QC Procedure for Method SW8270C, pg. 7-65, Calibration Verification:

The laboratory requests a modification of the CCV criteria requiring all analytes to be within +/- 20%. STL will ensure that no less than 80%, including all compounds of known concern at Griffiss Air Force Base, of all compounds will be within +/- 20%. The remaining compounds will not exceed +/- 30%, with the exceptions of the reactive compounds Benzoic Acid and 2,4-Dinitrophenol, which STL will ensure remain within +/- 40%. A list of compounds of known concern will be generated by the client on a quarterly basis and shared with the laboratory (Table 1.1) In the event that the laboratory is not able to meet this requirement, and all attempts of sample analysis have been exhausted (i.e. extraction/analytical holding time expired, sample volume consumed), the laboratory will document the event and contact the client to take further action.
Rationale: Historically the listed compounds have shown routine recoveries at +/- 40% drift while remaining compounds stay roughly within +/- 20% to +/-30%.

8. Section 8.2 Data Review, Validation, and Reporting Requirements for Definitive Data, pg. 8-2

The laboratory requests a variance from the requirement to use a wet weight aliquot equivalent to the dry weight of the sample for analysis. The laboratory requests to use the method specified wet weight aliquot and subsequently adjust the results for moisture content.
Rationale: The requested approach may lead to widely different sample weights used for samples in an analytical batch. The laboratory believes that the variability in weight may affect certain methods extraction efficiencies thus leading to variable (not comparable) analytical results.

9. Section 7, various tables – Control Limits

The laboratory requests a variance to use a tiered approach to data evaluation and acceptability based on control limits. The laboratory shall strive to achieve the AFCEE control limits and shall use these limits as the first tier in determining data acceptability. If the surrogate or spike fall outside the AFCEE recovery or RPD specifications, the laboratory shall perform a second tier evaluation using the laboratory internal statistically derived quality control limits. If the recovery or RPD fall within the laboratory limits in the 2nd tier review, the data shall be deemed acceptable and will not require qualification. If the data fails both the 1st and 2nd tier evaluation, corrective action shall be performed as specified in the AFCEE 3.1 Model QAPP. The current laboratory control limits are attached. As these limits are updated annually, the 2nd tier evaluation shall be performed using the most current laboratory developed statistical limits.
Rationale: The laboratory internal control limits were evaluated by USACE and determined to be acceptable. Data which falls outside the AFCEE 3.1 limits but falls within the laboratory internal control limits would not be adversely impacted.

Table 1.1
Contaminants of Known Concern
former Griffiss AFB, NY

Analyte	Method
ALUMINUM	SW6010
ANTIMONY	SW6010
ARSENIC	SW6010
BARIUM	SW6010
IRON	SW6010
MAGNESIUM	SW6010
MANGANESE	SW6010
NICKEL	SW6010
SELENIUM	SW6010
SODIUM	SW6010
THALLIUM	SW6010
ZINC	SW6010
LEAD	SW7421
1,2,3-TRICHLOROBENZENE	SW8260
1,2,4-TRIMETHYLBENZENE	SW8260
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	SW8260
1,4-DICHLOROBENZENE	SW8260
ACETONE	SW8260
BENZENE	SW8260
CHLOROFORM	SW8260
cis-1,2-DICHLOROETHYLENE	SW8260
ETHYLBENZENE	SW8260
ISOPROPYLBENZENE (CUMENE)	SW8260
METHYL ETHYL KETONE (2-BUTANONE)	SW8260
METHYLENE CHLORIDE	SW8260
M-XYLENE (1,3-DIMETHYLBENZENE)	SW8260
NAPHTHALENE	SW8260
n-BUTYLBENZENE	SW8260
n-PROPYLBENZENE	SW8260
O-XYLENE (1,2-DIMETHYLBENZENE)	SW8260
P-CYMENE (p-ISOPROPYLTOLUENE)	SW8260
SEC-BUTYLBENZENE	SW8260
STYRENE	SW8260
tert-BUTYL METHYL ETHER	SW8260
TOLUENE	SW8260
trans-1,2-DICHLOROETHENE	SW8260
TRICHLOROETHYLENE (TCE)	SW8260
VINYL CHLORIDE	SW8260
bis(2-ETHYLHEXYL) PHTHALATE	SW8270
NAPHTHALENE	SW8270
PHENANTHRENE	SW8270
PHENOL	SW8270

STL Buffalo
AFCEE 3.1 RL vs. MDL

Method	Parameter	Matrix	AFCEE RL	STL Buffalo PQL	STL Buffalo MDL	Unit of Measure	RL/2 ≥ MDL
110.2	Color	W	0	0	0	C.U.	Yes
130.2	Total Hardness	W	2	2	0.185	MG/L	Yes
160.1	Total Dissolved Solids	W	20	10	2.8	MG/L	Yes
310.1	Total Alkalinity	W	10	5	2.47	MG/L	Yes
325.2	Chloride	W	1	1	0.491	MG/L	Yes
350.1	Ammonia	W	0.05	0.02	0.009	MG/L-N	Yes
351.2	Total Kjeldahl Nitrogen	W	0.2	0.1	0.055	MG/L-N	Yes
353.2	Nitrate	W	0.1	0.05	0.036	MG/L-N	Yes
375.4	Sulfate	W	2	1	0.689	MG/L	Yes
376.2	Sulfide	W	0.1	0.1	0.04	MG/L	Yes
405.1	Biochemical Oxygen Demand	W	2	2	0.574	MG/L	Yes
410.4	Chemical Oxygen Demand	W	10	10	3.744	MG/L	Yes
6010	Aluminum - Total	W	0.2	3.3	0.0237	MG/L	Yes
6010	Antimony - Total	W	0.05	0.02	0.00585	MG/L	Yes
6010	Arsenic - Total	W	0.03	0.007	0.0046	MG/L	Yes
6010	Barium - Total	W	0.05	0.001	0.00074	MG/L	Yes
6010	Beryllium - Total	W	0.004	0.005	0.00029	MG/L	Yes
6010	Boron - Total	W	0.01	0.01	0.00318	MG/L	Yes
6010	Cadmium - Total	W	0.005	0.001	0.00032	MG/L	Yes
6010	Calcium - Total	W	1.1	0.5	0.0155	MG/L	Yes
6010	Chromium - Total	W	0.01	0.002	0.00134	MG/L	Yes
6010	Cobalt - Total	W	0.06	0.005	0.0014	MG/L	Yes
6010	Copper - Total	W	0.01	0.005	0.00166	MG/L	Yes
6010	Iron - Total	W	0.2	0.05	0.0334	MG/L	Yes
6010	Lead - Total	W	0.025	0.01	0.0038	MG/L	Yes
6010	Magnesium - Total	W	1	0.2	0.0182	MG/L	Yes
6010	Manganese - Total	W	0.01	0.003	0.00024	MG/L	Yes
6010	Molybdenum - Total	W	0.015	0.01	0.00195	MG/L	Yes
6010	Nickel - Total	W	0.02	0.01	0.0024	MG/L	Yes
6010	Potassium - Total	W	1	0.5	0.0561	MG/L	Yes
6010	Selenium - Total	W	0.03	0.01	0.0062	MG/L	Yes
6010	Silver - Total	W	0.01	0.003	0.00185	MG/L	Yes
6010	Sodium - Total	W	1	1	0.349	MG/L	Yes
6010	Thallium - Total	W	0.08	0.02	0.0058	MG/L	Yes
6010	Vanadium - Total	W	0.01	0.005	0.00144	MG/L	Yes
6010	Zinc - Total	W	0.02	0.02	0.00224	MG/L	Yes
7470	Mercury - Total	W	0.001	0.0002	0.00017	MG/L	Yes
8081	4,4'-DDD	W	0.1	0.05	0.01854	UG/L	Yes
8081	4,4'-DDE	W	0.1	0.05	0.01949	UG/L	Yes
8081	4,4'-DDT	W	0.1	0.05	0.01792	UG/L	Yes
8081	Aldrin	W	0.1	0.05	0.03457	UG/L	Yes
8081	alpha-BHC	W	0.1	0.05	0.01509	UG/L	Yes
8081	alpha-Chlordane	W	0.1	0.05	0.0154	UG/L	Yes
8081	beta-BHC	W	0.1	0.05	0.02074	UG/L	Yes
8081	delta-BHC	W	0.1	0.05	0.01634	UG/L	Yes
8081	Dieldrin	W	0.1	0.05	0.02609	UG/L	Yes
8081	Endosulfan I	W	0.1	0.05	0.01949	UG/L	Yes
8081	Endosulfan II	W	0.1	0.05	0.01289	UG/L	Yes
8081	Endosulfan Sulfate	W	0.1	0.05	0.01603	UG/L	Yes
8081	Endrin	W	0.1	0.05	0.02703	UG/L	Yes
8081	Endrin aldehyde	W	0.1	0.05	0.02483	UG/L	Yes
8081	gamma-BHC (Lindane)	W	0.1	0.05	0.01572	UG/L	Yes
8081	gamma-Chlordane	W	0.1	0.05	0.0374	UG/L	Yes
8081	Heptachlor	W	0.1	0.05	0.03332	UG/L	Yes
8081	Heptachlor epoxide	W	0.1	0.05	0.01666	UG/L	Yes
8081	Methoxychlor	W	0.5	0.05	0.03426	UG/L	Yes
8081	Toxaphene	W	1	1	0.42273	UG/L	Yes
8082	Aroclor 1016	W	0.5	0.5	0.176	UG/L	Yes
8082	Aroclor 1221[2]	W	0.5	0.5	0.332	UG/L	No
8082	Aroclor 1232	W	0.5	0.5	0.185	UG/L	Yes
8082	Aroclor 1242[2]	W	0.5	0.5	0.31	UG/L	No

STL Buffalo
AFCEE 3.1 RL vs. MDL

Method	Parameter	Matrix	AFCEE RL	STL Buffalo PQL	STL Buffalo MDL	Unit of Measure	RL/2 ≥ MDL
8082	Aroclor 1248	W	0.5	0.5	0.0833	UG/L	Yes
8082	Aroclor 1254	W	0.5	0.5	0.0751	UG/L	Yes
8082	Aroclor 1260	W	0.5	0.5	0.25	UG/L	Yes
8260	1,1,1,2-Tetrachloroethane	W	0.5	0.5	0.11378	UG/L	Yes
8260	1,1,1-Trichloroethane	W	1	0.5	0.19455	UG/L	Yes
8260	1,1,2,2-Tetrachloroethane	W	0.5	0.5	0.10623	UG/L	Yes
8260	1,1,2-Trichloroethane	W	1	0.5	0.11849	UG/L	Yes
8260	1,1-Dichloroethane	W	1	0.5	0.15746	UG/L	Yes
8260	1,1-Dichloroethene	W	1	0.5	0.12446	UG/L	Yes
8260	1,1-Dichloropropene	W	1	0.5	0.14238	UG/L	Yes
8260	1,2,3-Trichlorobenzene	W	1	0.5	0.16061	UG/L	Yes
8260	1,2,3-Trichloropropane	W	1	0.5	0.20775	UG/L	Yes
8260	1,2,4-Trichlorobenzene	W	1	0.5	0.13641	UG/L	Yes
8260	1,2,4-Trimethylbenzene	W	1	0.5	0.22818	UG/L	Yes
8260	1,2-Dibromo-3-chloropropane	W	2	0.5	0.22284	UG/L	Yes
8260	1,2-Dibromoethane	W	1	0.5	0.14049	UG/L	Yes
8260	1,2-Dichlorobenzene	W	1	0.5	0.13546	UG/L	Yes
8260	1,2-Dichloroethane	W	0.5	0.5	0.12289	UG/L	Yes
8260	1,2-Dichloropropane	W	1	0.5	0.12383	UG/L	Yes
8260	1,3,5-Trimethylbenzene	W	1	0.5	0.25113	UG/L	Yes
8260	1,3-Dichlorobenzene	W	1	0.5	0.12666	UG/L	Yes
8260	1,3-Dichloropropane	W	0.4	0.5	0.12541	UG/L	Yes
8260	1,4-Dichlorobenzene	W	0.5	0.5	0.13766	UG/L	Yes
8260	1-Chlorohexane	W	1	0.5	0.14206	UG/L	Yes
8260	2,2-Dichloropropane	W	1	0.5	0.26936	UG/L	Yes
8260	2-Butanone	W	10	2.5	1.19497	UG/L	Yes
8260	4-Methyl-2-pentanone	W	10	2.5	1.43384	UG/L	Yes
8260	Acetone	W	10	2.5	1.34678	UG/L	Yes
8260	Benzene	W	0.4	0.5	0.14929	UG/L	Yes
8260	Bromobenzene	W	1	0.5	0.15778	UG/L	Yes
8260	Bromochloromethane	W	1	0.5	0.13641	UG/L	Yes
8260	Bromodichloromethane	W	0.5	0.5	0.11189	UG/L	Yes
8260	Bromoform	W	1	0.5	0.08329	UG/L	Yes
8260	Bromomethane	W	3	0.5	0.13138	UG/L	Yes
8260	Carbon Tetrachloride	W	1	0.5	0.18261	UG/L	Yes
8260	Chlorobenzene	W	0.5	0.5	0.14458	UG/L	Yes
8260	Chloroethane	W	1	0.5	0.13798	UG/L	Yes
8260	Chloroform	W	0.3	0.5	0.16029	UG/L	No
8260	Chloromethane	W	1	0.5	0.21121	UG/L	Yes
8260	cis-1,2-Dichloroethene	W	1	0.5	0.14238	UG/L	Yes
8260	cis-1,3-Dichloropropene	W	0.5	0.5	0.10309	UG/L	Yes
8260	Dibromochloromethane	W	0.5	0.5	0.09995	UG/L	Yes
8260	Dibromomethane	W	1	0.5	0.12226	UG/L	Yes
8260	Dichlorodifluoromethane	W	1	0.5	0.22284	UG/L	Yes
8260	Ethylbenzene	W	1	0.5	0.14552	UG/L	Yes
8260	Hexachlorobutadiene	W	0.6	0.5	0.22975	UG/L	Yes
8260	Isopropylbenzene	W	1	0.5	0.24861	UG/L	Yes
8260	m/p-Xylenes	W	2	1	0.33567	UG/L	Yes
8260	Methyl tert butyl ether	W	5	0.5	0.09429	UG/L	Yes
8260	Methylene chloride	W	1	0.5	0.22378	UG/L	Yes
8260	Naphthalene	W	1	0.5	0.11378	UG/L	Yes
8260	n-Butylbenzene	W	1	0.5	0.2175	UG/L	Yes
8260	n-Propylbenzene	W	1	0.5	0.21435	UG/L	Yes
8260	o-Chlorotoluene	W	1	0.5	0.2549	UG/L	Yes
8260	o-Xylene	W	1	0.5	0.16469	UG/L	Yes
8260	p-Chlorotoluene	W	1	0.5	0.19801	UG/L	Yes
8260	p-Cymene	W	1	0.5	0.19392	UG/L	Yes
8260	sec-Butylbenzene	W	1	0.5	0.25458	UG/L	Yes
8260	Styrene	W	1	0.5	0.12383	UG/L	Yes
8260	tert-Butylbenzene	W	1	0.5	0.21467	UG/L	Yes
8260	Tetrachloroethene	W	1	0.5	0.18481	UG/L	Yes
8260	Toluene	W	1	0.5	0.17004	UG/L	Yes

STL Buffalo
AFCEE 3.1 RL vs. MDL

Method	Parameter	Matrix	AFCEE RL	STL Buffalo PQL	STL Buffalo MDL	Unit of Measure	RL/2 ≥ MDL
8260	trans-1,2-Dichloroethene	W	1	0.5	0.12163	UG/L	Yes
8260	trans-1,3-Dichloropropene	W	1	0.5	0.10246	UG/L	Yes
8260	Trichloroethene	W	1	0.5	0.16186	UG/L	Yes
8260	Trichlorofluoromethane	W	1	0.5	0.14301	UG/L	Yes
8260	Vinyl chloride	W	1	0.5	0.19361	UG/L	Yes
8270	1,2,4-Trichlorobenzene	W	10	10	2.58166	UG/L	Yes
8270	1,2-Dichlorobenzene	W	10	10	2.43708	UG/L	Yes
8270	1,3-Dichlorobenzene	W	10	10	2.55117	UG/L	Yes
8270	1,4-Dichlorobenzene	W	10	10	2.48957	UG/L	Yes
8270	2,2'-Oxybis(1-Chloropropane)	W	10	10	1.77674	UG/L	Yes
8270	2,4,5-Trichlorophenol	W	50	25	1.92572	UG/L	Yes
8270	2,4,6-Trichlorophenol	W	10	10	1.81634	UG/L	Yes
8270	2,4-Dichlorophenol	W	10	10	1.56679	UG/L	Yes
8270	2,4-Dimethylphenol	W	10	10	1.321	UG/L	Yes
8270	2,4-Dinitrophenol	W	50	50	10.14906	UG/L	Yes
8270	2,4-Dinitrotoluene	W	10	10	2.34814	UG/L	Yes
8270	2,6-Dinitrotoluene	W	10	10	2.15673	UG/L	Yes
8270	2-Chloronaphthalene	W	10	10	1.95872	UG/L	Yes
8270	2-Chlorophenol	W	10	10	1.20691	UG/L	Yes
8270	2-Methylnaphthalene	W	10	10	2.06149	UG/L	Yes
8270	2-Methylphenol	W	10	10	2.07	UG/L	Yes
8270	2-Nitroaniline	W	50	50	1.84777	UG/L	Yes
8270	2-Nitrophenol	W	10	10	1.47375	UG/L	Yes
8270	3,3'-Dichlorobenzidine	W	20	20	9.78133	UG/L	Yes
8270	3-Nitroaniline	W	50	50	1.63059	UG/L	Yes
8270	4,6-Dinitro-2-methylphenol	W	50	50	9.43466	UG/L	Yes
8270	4-Bromophenyl phenyl ether	W	10	10	2.49743	UG/L	Yes
8270	4-Chloro-3-methylphenol	W	20	10	1.76385	UG/L	Yes
8270	4-Chloroaniline	W	20	10	4	UG/L	Yes
8270	4-Chlorophenyl phenyl ether	W	10	1	2.49931	UG/L	Yes
8270	4-Methylphenol	W	50	10	3	UG/L	Yes
8270	4-Nitroaniline	W	50	50	2.08287	UG/L	Yes
8270	4-Nitrophenol	W	50	50	4	UG/L	Yes
8270	Acenaphthene	W	10	10	2.2155	UG/L	Yes
8270	Acenaphthylene	W	10	10	2.04232	UG/L	Yes
8270	Anthracene	W	10	10	2.89345	UG/L	Yes
8270	Benzo(a)anthracene	W	10	10	2.76678	UG/L	Yes
8270	Benzo(a)pyrene	W	10	10	2.5364	UG/L	Yes
8270	Benzo(b)fluoranthene	W	10	10	2.71304	UG/L	Yes
8270	Benzo(ghi)perylene	W	10	10	2.83247	UG/L	Yes
8270	Benzo(k)fluoranthene	W	10	10	3.85646	UG/L	Yes
8270	Benzoic acid	W	100	50	31.43723	UG/L	Yes
8270	Benzyl alcohol	W	20	20	1.78711	UG/L	Yes
8270	Bis(2-chloroethoxy) methane	W	10	10	1.62336	UG/L	Yes
8270	Bis(2-chloroethyl) ether	W	10	10	1.51335	UG/L	Yes
8270	Bis(2-ethylhexyl) phthalate	W	10	10	2.55809	UG/L	Yes
8270	Butyl benzyl phthalate	W	10	10	2.54237	UG/L	Yes
8270	Chrysene	W	10	10	2.82713	UG/L	Yes
8270	Dibenzo(a,h)anthracene	W	10	10	2.97202	UG/L	Yes
8270	Dibenzofuran	W	10	10	2.30068	UG/L	Yes
8270	Diethyl phthalate	W	10	10	2.27742	UG/L	Yes
8270	Dimethyl phthalate	W	10	10	2.23907	UG/L	Yes
8270	Di-n-butyl phthalate	W	10	10	3.07668	UG/L	Yes
8270	Di-n-octyl phthalate	W	10	10	2.39151	UG/L	Yes
8270	Fluoranthene	W	10	10	2.69449	UG/L	Yes
8270	Fluorene	W	10	10	2.45311	UG/L	Yes
8270	Hexachlorobenzene	W	10	10	2.52729	UG/L	Yes
8270	Hexachlorobutadiene	W	10	10	3.61696	UG/L	Yes
8270	Hexachloroethane	W	10	10	3.2442	UG/L	Yes
8270	Indeno(1,2,3-cd)pyrene	W	10	10	2.80513	UG/L	Yes
8270	Isophorone	W	10	10	1.27009	UG/L	Yes
8270	Naphthalene	W	10	10	1.80691	UG/L	Yes

STL Buffalo
AFCEE 3.1 RL vs. MDL

Method	Parameter	Matrix	AFCEE RL	STL Buffalo PQL	STL Buffalo MDL	Unit of Measure	RL/2 ≥ MDL
8270	Nitrobenzene	W	10	10	1.42566	UG/L	Yes
8270	N-Nitroso-Di-n-propylamine	W	10	10	1.5099	UG/L	Yes
8270	N-nitrosodiphenylamine	W	10	10	2.74572	UG/L	Yes
8270	Pentachlorophenol	W	50	50	10.81695	UG/L	Yes
8270	Phenanthrene	W	10	10	2.58983	UG/L	Yes
8270	Phenol	W	10	10	3	UG/L	Yes
8270	Pyrene	W	10	10	2.42828	UG/L	Yes
9012	Cyanide - Total	W	0.02	0.01	0.006	MG/L	Yes
9056	Bromide	W	0.5	0.2	0.174	MG/L	Yes
9056	Chloride	W	1	0.5	0.325	MG/L	Yes
9056	Fluoride	W	1	0.05	0.03	MG/L	Yes
9056	Nitrate	W	1	0.05	0.026	MG/L	Yes
9056	Sulfate	W	1	2	0.699	MG/L	No
9060	Total Organic Carbon	W	1	1	0.496	MG/L	Yes
9066	Total Recoverable Phenolics	W	0.01	0.01	0.003	MG/L	Yes

Notes:

▨ MDL is more than half the AFCEE RL

2 - MDL is more than half the AFCEE RL, but the analyte is not a COC at Griffiss AFB.

The PQL's set by STL are at or lower than those set in the NYSDEC 6 NYCRR Part 360-2.11 (d)(6), therefore any reported values will be referenced to the STL PQL's.

STL Buffalo
AFCEE 3.1RL vs. MDL

Method	Parameter	Matrix	AFCEE RL	STL Buffalo PQL	STL Buffalo MDL	Unit of Measure	RL/2 ≥ MDL
6010	Aluminum - Total	S	20	10	2.2	MG/KG	Yes
6010	Antimony - Total	S	10	15	3.65	MG/KG	Yes
6010	Arsenic - Total	S	5	2	0.64	MG/KG	Yes
6010	Barium - Total	S	1	0.5	0.13	MG/KG	Yes
6010	Beryllium - Total	S	1	0.2	0.04	MG/KG	Yes
6010	Cadmium - Total	S	0.5	0.2	0.063	MG/KG	Yes
6010	Calcium - Total	S	100	10	4.4	MG/KG	Yes
6010	Chromium - Total	S	1	0.5	0.139	MG/KG	Yes
6010	Cobalt - Total	S	1	0.5	0.107	MG/KG	Yes
6010	Copper - Total	S	2	1	0.238	MG/KG	Yes
6010	Iron - Total[2]	S	3	10	3.1	MG/KG	No
6010	Lead - Total	S	3	1	0.307	MG/KG	Yes
6010	Magnesium - Total	S	100	20	0.9	MG/KG	Yes
6010	Manganese - Total	S	1	0.2	0.053	MG/KG	Yes
6010	Molybdenum - Total	S	3	1	0.21	MG/KG	Yes
6010	Nickel - Total	S	2	0.5	0.12	MG/KG	Yes
6010	Potassium - Total	S	200	30	8.4	MG/KG	Yes
6010	Selenium - Total	S	3	4	1.1	MG/KG	Yes
6010	Silver - Total	S	1	0.5	0.145	MG/KG	Yes
6010	Sodium - Total	S	100	140	41.7	MG/KG	Yes
6010	Thallium - Total	S	6	6	2.468	MG/KG	Yes
6010	Vanadium - Total	S	1	0.5	0.095	MG/KG	Yes
6010	Zinc - Total	S	2	2	0.64	MG/KG	Yes
7471	Mercury - Total	S	0.1	0.02	0.0136	MG/KG	Yes
8081	4,4'-DDD	S	4	16	0.3077	UG/KG	Yes
8081	4,4'-DDE	S	4	16	0.20712	UG/KG	Yes
8081	4,4'-DDT	S	4	16	0.3847	UG/KG	Yes
8081	Aldrin	S	4	8	0.4	UG/KG	Yes
8081	alpha-BHC	S	4	8	0.4	UG/KG	Yes
8081	alpha-Chlordane	S	4	40	0.26181	UG/KG	Yes
8081	beta-BHC	S	4	8	0.19801	UG/KG	Yes
8081	delta-BHC	S	4	8	0.4	UG/KG	Yes
8081	Dieldrin	S	4	16	0.4	UG/KG	Yes
8081	Endosulfan I	S	4	16	0.30079	UG/KG	Yes
8081	Endosulfan II	S	4	16	1.37255	UG/KG	Yes
8081	Endosulfan Sulfate	S	4	16	0.2131	UG/KG	Yes
8081	Endrin	S	4	16	0.18858	UG/KG	Yes
8081	Endrin aldehyde	S	4	32	0.67575	UG/KG	Yes
8081	gamma-BHC (Lindane)	S	4	8	0.4	UG/KG	Yes
8081	gamma-Chlordane	S	4	40	0.4	UG/KG	Yes
8081	Heptachlor	S	4	8	0.21561	UG/KG	Yes
8081	Heptachlor epoxide	S	4	8	0.18009	UG/KG	Yes
8081	Methoxychlor	S	20	80	0.38125	UG/KG	Yes
8081	Toxaphene	S	100	160	9.41737	UG/KG	Yes
8082	Aroclor 1016	S	50	17	4.41	UG/KG	Yes
8082	Aroclor 1221	S	50	17	6.96	UG/KG	Yes
8082	Aroclor 1232	S	50	17	11.84	UG/KG	Yes
8082	Aroclor 1242	S	50	17	2.9	UG/KG	Yes
8082	Aroclor 1248	S	50	17	4.09	UG/KG	Yes
8082	Aroclor 1254	S	50	17	8.66	UG/KG	Yes
8082	Aroclor 1260	S	50	17	6.57	UG/KG	Yes
8260	1,1,1,2-Tetrachloroethane	S	3	2	0.20084	UG/KG	Yes
8260	1,1,1-Trichloroethane	S	5	2	0.11252	UG/KG	Yes

STL Buffalo
AFCEE 3.1RL vs. MDL

Method	Parameter	Matrix	AFCEE RL	STL Buffalo PQL	STL Buffalo MDL	Unit of Measure	RL/2 ≥ MDL
8260	1,1,2,2-Tetrachloroethane	S	3	2	0.22661	UG/KG	Yes
8260	1,1,2-Trichloroethane	S	5	2	0.20241	UG/KG	Yes
8260	1,1-Dichloroethane	S	5	2	0.22347	UG/KG	Yes
8260	1,1-Dichloroethene	S	6	2	0.20618	UG/KG	Yes
8260	1,1-Dichloropropene	S	5	2	0.2439	UG/KG	Yes
8260	1,2,3-Trichlorobenzene	S	5	2	0.24107	UG/KG	Yes
8260	1,2,3-Trichloropropane	S	5	2	0.85238	UG/KG	Yes
8260	1,2,4-Trichlorobenzene	S	5	2	0.64211	UG/KG	Yes
8260	1,2,4-Trimethylbenzene	S	6	2	0.22095	UG/KG	Yes
8260	1,2-Dibromo-3-chloropropane	S	10	2	0.65689	UG/KG	Yes
8260	1,2-Dibromoethane	S	5	2	0.24861	UG/KG	Yes
8260	1,2-Dichlorobenzene	S	5	2	0.16281	UG/KG	Yes
8260	1,2-Dichloroethane	S	3	2	0.10026	UG/KG	Yes
8260	1,2-Dichloropropane	S	5	2	0.17538	UG/KG	Yes
8260	1,3,5-Trimethylbenzene	S	5	2	0.14269	UG/KG	Yes
8260	1,3-Dichlorobenzene	S	6	2	0.22598	UG/KG	Yes
8260	1,3-Dichloropropane	S	2	2	0.20209	UG/KG	Yes
8260	1,4-Dichlorobenzene	S	2	2	0.26778	UG/KG	Yes
8260	1-Chlorohexane	S	5	2	0.25867	UG/KG	Yes
8260	2,2-Dichloropropane	S	5	2	0.2461	UG/KG	Yes
8260	2-Butanone	S	20	10	1.23646	UG/KG	Yes
8260	4-Methyl-2-pentanone	S	20	10	0.87313	UG/KG	Yes
8260	Acetone	S	50	10	3.74646	UG/KG	Yes
8260	Benzene	S	2	2	0.11975	UG/KG	Yes
8260	Bromobenzene	S	5	2	0.3451	UG/KG	Yes
8260	Bromochloromethane	S	5	2	0.48559	UG/KG	Yes
8260	Bromodichloromethane	S	2	2	0.21184	UG/KG	Yes
8260	Bromoform	S	6	2	0.56291	UG/KG	Yes
8260	Bromomethane	S	10	2	0.71818	UG/KG	Yes
8260	Carbon Tetrachloride	S	5	2	0.17349	UG/KG	Yes
8260	Chlorobenzene	S	2	2	0.2087	UG/KG	Yes
8260	Chloroethane	S	5	2	0.2835	UG/KG	Yes
8260	Chloroform	S	2	2	0.22692	UG/KG	Yes
8260	Chloromethane	S	5	2	0.29073	UG/KG	Yes
8260	cis-1,2-Dichloroethene	S	5	2	0.33819	UG/KG	Yes
8260	cis-1,3-Dichloropropene	S	3	2	0.2439	UG/KG	Yes
8260	Dibromochloromethane	S	3	2	0.45919	UG/KG	Yes
8260	Dibromomethane	S	5	2	0.31681	UG/KG	Yes
8260	Dichlorodifluoromethane	S	5	2	0.26055	UG/KG	Yes
8260	Ethylbenzene	S	5	2	0.10655	UG/KG	Yes
8260	Hexachlorobutadiene	S	3	2	0.47082	UG/KG	Yes
8260	Isopropylbenzene	S	5	2	0.26118	UG/KG	Yes
8260	m/p-Xylenes	S	5	4	0.47711	UG/KG	Yes
8260	Methyl tert butyl ether	S	20	2	0.15841	UG/KG	Yes
8260	Methylene chloride	S	5	2	1.2968	UG/KG	Yes
8260	Naphthalene	S	5	2	0.42053	UG/KG	Yes
8260	n-Butylbenzene	S	5	2	0.15841	UG/KG	Yes
8260	n-Propylbenzene	S	5	2	0.20555	UG/KG	Yes
8260	o-Chlorotoluene	S	5	2	0.15181	UG/KG	Yes
8260	o-Xylene	S	5	2	0.21687	UG/KG	Yes
8260	p-Chlorotoluene	S	5	2	0.32341	UG/KG	Yes
8260	p-Cymene	S	6	2	0.18607	UG/KG	Yes
8260	sec-Butylbenzene	S	5	2	0.22252	UG/KG	Yes

STL Buffalo
AFCEE 3.1RL vs. MDL

Method	Parameter	Matrix	AFCEE RL	STL Buffalo PQL	STL Buffalo MDL	Unit of Measure	RL/2 ≥ MDL
8260	Styrene	S	5	2	0.17192	UG/KG	Yes
8260	tert-Butylbenzene	S	5	2	0.19518	UG/KG	Yes
8260	Tetrachloroethene	S	5	2	0.26464	UG/KG	Yes
8260	Toluene	S	5	2	0.39288	UG/KG	Yes
8260	trans-1,2-Dichloroethene	S	5	2	0.25773	UG/KG	Yes
8260	trans-1,3-Dichloropropene	S	5	2	0.2109	UG/KG	Yes
8260	Trichloroethene	S	5	2	0.22504	UG/KG	Yes
8260	Trichlorofluoromethane	S	5	2	0.2835	UG/KG	Yes
8260	Vinyl chloride	S	5	10	0.16438	UG/KG	Yes
8270	1,2,4-Trichlorobenzene	S	700	330	85.05492	UG/KG	Yes
8270	1,2-Dichlorobenzene	S	700	330	90.33799	UG/KG	Yes
8270	1,3-Dichlorobenzene	S	700	330	81.25692	UG/KG	Yes
8270	1,4-Dichlorobenzene	S	700	330	81.19658	UG/KG	Yes
8270	2,2'-Oxybis(1-Chloropropane)	S	700	330	91.44433	UG/KG	Yes
8270	2,4,5-Trichlorophenol	S	3300	800	44.74438	UG/KG	Yes
8270	2,4,6-Trichlorophenol	S	300	330	69.37858	UG/KG	Yes
8270	2,4-Dichlorophenol	S	300	330	68.84773	UG/KG	Yes
8270	2,4-Dimethylphenol	S	300	330	78.64886	UG/KG	Yes
8270	2,4-Dinitrophenol	S	3300	1600	268.69853	UG/KG	Yes
8270	2,4-Dinitrotoluene	S	700	330	73.92807	UG/KG	Yes
8270	2,6-Dinitrotoluene	S	700	330	63.14821	UG/KG	Yes
8270	2-Chloronaphthalene	S	700	330	64.05214	UG/KG	Yes
8270	2-Chlorophenol	S	300	330	81.12963	UG/KG	Yes
8270	2-Methylnaphthalene	S	700	330	72.02782	UG/KG	Yes
8270	2-Methylphenol	S	300	330	84.68468	UG/KG	Yes
8270	2-Nitroaniline	S	3300	1600	65.17199	UG/KG	Yes
8270	2-Nitrophenol	S	300	330	91.70488	UG/KG	Yes
8270	3,3'-Dichlorobenzidine	S	1300	660	376.47577	UG/KG	Yes
8270	3-Nitroaniline	S	3300	1600	54.07783	UG/KG	Yes
8270	4,6-Dinitro-2-methylphenol	S	3300	1600	211.62542	UG/KG	Yes
8270	4-Bromophenyl phenyl ether	S	700	330	61.85267	UG/KG	Yes
8270	4-Chloro-3-methylphenol	S	1300	330	46.45888	UG/KG	Yes
8270	4-Chloroaniline	S	1300	330	104.07007	UG/KG	Yes
8270	4-Chlorophenyl phenyl ether	S	700	330	56.84084	UG/KG	Yes
8270	4-Methylphenol	S	2000	330	95.98565	UG/KG	Yes
8270	4-Nitroaniline	S	3300	1600	72.46344	UG/KG	Yes
8270	4-Nitrophenol	S	1600	1600	189.58953	UG/KG	Yes
8270	Acenaphthene	S	700	330	61.23978	UG/KG	Yes
8270	Acenaphthylene	S	700	330	58.81779	UG/KG	Yes
8270	Anthracene	S	700	330	53.77893	UG/KG	Yes
8270	Benzo(a)anthracene	S	700	330	69.18969	UG/KG	Yes
8270	Benzo(a)pyrene	S	700	330	63.44586	UG/KG	Yes
8270	Benzo(b)fluoranthene	S	700	330	85.21522	UG/KG	Yes
8270	Benzo(ghi)perylene	S	700	330	68.44983	UG/KG	Yes
8270	Benzo(k)fluoranthene	S	700	330	60.98897	UG/KG	Yes
8270	Benzoic acid	S	5000	1600	381.2195	UG/KG	Yes
8270	Benzyl alcohol	S	1300	330	85.04581	UG/KG	Yes
8270	Bis(2-chloroethoxy) methane	S	700	330	91.60808	UG/KG	Yes
8270	Bis(2-chloroethyl) ether	S	700	330	87.71987	UG/KG	Yes
8270	Bis(2-ethylhexyl) phthalate	S	700	330	82.95351	UG/KG	Yes
8270	Butyl benzyl phthalate	S	700	330	75.69821	UG/KG	Yes
8270	Chrysene	S	700	330	68.8339	UG/KG	Yes
8270	Dibenzo(a,h)anthracene	S	700	330	69.35187	UG/KG	Yes

STL Buffalo
AFCEE 3.1RL vs. MDL

Method	Parameter	Matrix	AFCEE RL	STL Buffalo PQL	STL Buffalo MDL	Unit of Measure	RL/2 ≥ MDL
8270	Dibenzofuran	S	700	330	47.745	UG/KG	Yes
8270	Diethyl phthalate	S	700	330	61.38342	UG/KG	Yes
8270	Dimethyl phthalate	S	700	330	53.19999	UG/KG	Yes
8270	Di-n-butyl phthalate	S	700	330	63.10107	UG/KG	Yes
8270	Di-n-octyl phthalate	S	700	330	79.12282	UG/KG	Yes
8270	Fluoranthene	S	700	330	72.49361	UG/KG	Yes
8270	Fluorene	S	700	330	53.25185	UG/KG	Yes
8270	Hexachlorobenzene	S	700	330	77.2496	UG/KG	Yes
8270	Hexachlorobutadiene	S	700	330	102.92476	UG/KG	Yes
8270	Hexachloroethane	S	700	330	82.77939	UG/KG	Yes
8270	Indeno(1,2,3-cd)pyrene	S	700	330	115.32610	UG/KG	Yes
8270	Isophorone	S	700	330	80.03304	UG/KG	Yes
8270	Naphthalene	S	700	330	74.05568	UG/KG	Yes
8270	Nitrobenzene	S	700	330	78.88459	UG/KG	Yes
8270	N-Nitroso-Di-n-propylamine	S	700	330	101.17694	UG/KG	Yes
8270	N-nitrosodiphenylamine	S	700	330	149.5826	UG/KG	Yes
8270	Pentachlorophenol	S	3300	1600	184.14554	UG/KG	Yes
8270	Phenanthrene	S	700	330	47.02965	UG/KG	Yes
8270	Phenol	S	300	330	93.41405	UG/KG	Yes
8270	Pyrene	S	700	330	64.15492	UG/KG	Yes
9012	Cyanide - Total	S	0.5	1	0.235	UG/G	Yes
9056	Bromide	S	5	2	1.74	MG/KG	Yes
9056	Chloride	S	10	5	3.25	MG/KG	Yes
9056	Fluoride	S	10	0.5	0.3	MG/KG	Yes
9056	Nitrate	S	10	0.5	0.26	MG/KG	Yes
9056	Sulfate[2]	S	10	20	6.99	MG/KG	No

Notes:

▨ MDL is more than half the AFCEE RL.

2 - The analyte is not a COC at Griffiss AFB.

The PQL's set by STL are at or lower than those set in the NYSDEC 6 NYCRR Part 360-2.11 (d)(6), therefore any reported values will be referenced to the STL PQL's.

AFCEE 3.1 vs [illegible]L Buffalo
QC Acceptance Criteria

Method	Spike	CAS #	Parameter	Aqueous QC Limits						Soil QC Limits					
				AFCEE 3.1			STL Buffalo			AFCEE 3.1			STL Buffalo		
				LCL %	UCL %	RPD	LCL %	UCL %	RPD	LCL %	UCL %	RPD	LCL %	UCL %	RPD
110.2	LCS/SPK		COLOR	90	110	20	90	110	20						
130.2	LCS/SPK		HARDNESS	91	112	20	90	110	15						
160.1	LCS/SPK		TOTAL DISSOLVED SOLID	45	154	20	85	115	20						
310.1	LCS/SPK		TOTAL ALKALINITY	71	129	20	90	110	20						
310.2	LCS/SPK		ALKALINITY	22	128	20									
325.2	LCS/SPK		CHLORIDE	90	110	20	90	110	20						
350.1	LCS/SPK		AMMONIA	82	119	20	90	110	20						
351.2	LCS/SPK		TOTAL KJELDAHL NITROGEN	66	127	20	90	110	27						
353.2	LCS/SPK		NITRATE	90	110	20	90	110	20						
375.4	LCS/SPK		SULFATE	90	110	27	90	110	27						
376.2	LCS/SPK		SULFIDE	90	110	20	90	110	20						
405.1	LCS/SPK		BIOCHEMICAL OXYGEN DEMAND	67	119	20	85	115	20						
410.4	LCS/SPK		CHEMICAL OXYGEN DEMAND	90	110	20	90	110	20						
6010	LCS/SPK	7429-905-5	ALUMINUM	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-36-0	ANTIMONY	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-38-2	ARSENIC	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-39-3	BARIUM	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-41-7	BERYLLIUM	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-42-8	BORON	80	120	20	80	120	20	80	120	20	80	120	20
6010	LCS/SPK	7440-43-9	CADMIUM	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-70-2	CALCIUM	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-47-3	CHROMIUM	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-48-4	COBALT	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-50-8	COPPER	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7439-89-6	IRON	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7439-92-1	LEAD	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7439-95-4	MAGNESIUM	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7439-96-5	MANGANESE	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7439-97-6	MOLYBDENUM	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-02-0	NICKEL	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-09-07	POTASSIUM	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7782-49-2	SELENIUM	80	120	20	80	120	20	80	120	20	80	120	20
6010	LCS/SPK	7440-22-4	SILVER	75	125	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-23-5	SODIUM	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-28-0	THALLIUM	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-62-2	VANADIUM	80	120	20	80	120	20	75	125	20	80	120	20
6010	LCS/SPK	7440-66-6	ZINC	80	120	20	80	120	20	75	125	20	80	120	20
7470	LCS/SPK	7439-97-6	MERCURY	80	120	20	80	120	20	80	120	20	80	120	20
8081	LCS/SPK	72-54-8	4,4'-DDD	50	139	30	49	142	30	50	139	50	42	133	30

AFCEE 3.1 vs STL Buffalo
QC Acceptance Criteria

Method	Spike	CAS #	Parameter	AFCEE 3.1			STL Buffalo			AFCEE 3.1			STL Buffalo		
				LCL %	UCL %	RPD	LCL %	UCL %	RPD	LCL %	UCL %	RPD	LCL %	UCL %	RPD
8081	LCS/SPK	72-55-9	4,4'-DDE	48	137	30	34	142	30	68	126	50	44	136	30
8081	LCS/SPK	50-29-3	4,4'-DDT	47	138	30	50	141	30	46	135	50	49	148	30
8081	LCS/SPK	309-00-2	Aldrin	42	138	30	28	125	30	47	120	50	48	128	30
8081	LCS/SPK	319-84-6	alpha-BHC	60	128	30	37	134	30	62	125	50	47	123	30
8081	LCS/SPK	5103-71-9	alpha-Chlordane	63	123	30	63	123	30	63	121	50	63	121	50
8081	LCS/SPK	319-85-7	beta-BHC	66	126	30	44	135	30	62	127	50	56	129	30
8081	LCS/SPK	319-86-8	delta-BHC	46	136	30	41	131	30	57	130	50	42	127	30
8081	LCS/SPK	60-57-1	Dieldrin	62	129	30	46	136	30	67	125	50	51	132	30
8081	LCS/SPK	959-98-8	Endosulfan I	49	120	30	46	135	30	41	147	50	42	132	30
8081	LCS/SPK	33213-65-9	Endosulfan II	42	130	30	41	136	30	37	141	50	44	135	30
8081	LCS/SPK	1031-07-8	Endosulfan Sulfate	54	137	30	47	143	30	62	135	50	42	136	30
8081	LCS/SPK	72-20-8	Endrin	56	134	30	30	147	30	61	133	50	41	132	30
8081	LCS/SPK	7421-93-4	Endrin aldehyde	56	137	30	43	130	30	37	147	50	37	123	30
8081	LCS/SPK	58-89-9	gamma-BHC (Lindane)	30	146	30	32	127	30	59	123	50	42	136	30
8081	LCS/SPK	5103-74-2	gamma-Chlordane	67	120	30	67	120	30	48	124	50	48	124	50
8081	LCS/SPK	76-44-8	Heptachlor	51	128	30	37	125	30	51	140	50	43	127	30
8081	LCS/SPK	1024-57-3	Heptachlor epoxide	62	131	30	49	134	30	66	130	50	45	128	30
8081	LCS/SPK	72-43-5	Methoxychlor	56	150	30	38	153	30	57	143	50	42	140	30
8081	SUR	REI-002	Decachlorobiphenyl	34	133		32	130		36	153		36	153	
8081	SUR	877-09-8	Tetrachloro-m-xylene	45	125		28	132		32	130		32	130	
8082	LCS/SPK	12674-11-2	Aroclor 1016	40	144	30	29	123	30	41	138	50	39	131	35
8082	LCS/SPK	11096-82-5	Aroclor 1260	45	145	30	50	122	30	61	131	50	41	139	35
8082	SUR		Decachlorobiphenyl	42	133		28	132		58	125		36	153	
8260	IS	SU106-46-7	1,4-Dichlorobenzene-D4	50	200		50	200		50	200		50	200	
8260	IS	3114-55-4	Chlorobenzene-D5	50	200		50	200		50	200		50	200	
8260	IS	462-06-6	Fluorobenzene	50	200		50	200		50	200		50	200	
8260	LCS/SPK	630-20-6	1,1,1,2-Tetrachloroethane	81	129	20	76	122	20	74	125	30	75	123	20
8260	LCS/SPK	71-55-6	1,1,1-Trichloroethane	67	132	20	73	126	15	68	130	30	69	125	15
8260	LCS/SPK	79-34-5	1,1,2,2-Tetrachloroethane	63	128	20	70	126	15	59	140	30	74	118	15
8260	LCS/SPK	79-00-5	1,1,2-Trichloroethane	75	125	20	76	122	15	62	127	30	74	120	15
8260	LCS/SPK	75-34-3	1,1-Dichloroethane	69	133	20	71	129	20	73	125	30	67	132	19
8260	LCS/SPK	75-35-4	1,1-Dichloroethene	68	130	20	65	138	31	65	136	30	61	146	31
8260	LCS/SPK	563-58-6	1,1-Dichloropropene	73	132	20	72	122	20	70	135	30	67	120	20
8260	LCS/SPK	87-61-6	1,2,3-Trichlorobenzene	67	137	20	64	121	20	62	133	30	69	118	20
8260	LCS/SPK	96-18-4	1,2,3-Trichloropropane	73	124	20	68	131	14	63	130	30	74	122	14
8260	LCS/SPK	120-82-1	1,2,4-Trichlorobenzene	66	134	20	70	122	20	65	131	30	71	120	20
8260	LCS/SPK	95-63-6	1,2,4-Trimethylbenzene	74	132	20	76	121	20	65	135	30	76	120	20
8260	LCS/SPK	96-12-8	1,2-Dibromo-3-chloropropan	50	132	20	56	134	15	49	135	30	56	124	20
8260	LCS/SPK	106-93-4	1,2-Dibromoethane	80	121	20	77	120	15	70	124	30	75	118	20
8260	LCS/SPK	95-50-1	1,2-Dichlorobenzene	71	122	20	77	120	20	74	120	30	75	120	20

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Method	Spike	CAS #	Parameter	AFCEE 3.1			STL Buffalo			AFCEE 3.1			STL Buffalo		
				LCL %	UCL %	RPD	LCL %	UCL %	RPD	LCL %	UCL %	RPD	LCL %	UCL %	RPD
8260	LCS/SPK	107-06-2	1,2-Dichloroethane	69	132	20	75	127	20	72	137	30	73	137	20
8260	LCS/SPK	78-87-5	1,2-Dichloropropane	75	125	20	76	120	20	71	120	30	66	123	15
8260	LCS/SPK	108-67-8	1,3,5-Trimethylbenzene	74	131	20	77	121	20	65	133	30	76	119	20
8260	LCS/SPK	541-73-1	1,3-Dichlorobenzene	75	124	20	77	119	20	72	124	30	77	118	20
8260	LCS/SPK	142-28-9	1,3-Dichloropropane	73	126	20	75	120	20	76	123	30	72	122	20
8260	LCS/SPK	106-46-7	1,4-Dichlorobenzene	74	123	20	75	119	20	72	125	30	77	115	20
8260	LCS/SPK	544-10-5	1-Chlorohexane	70	125	20	72	130	20	60	135	30	80	120	20
8260	LCS/SPK	594-20-7	2,2-Dichloropropane	69	137	20	63	136	20	67	134	30	67	126	20
8260	LCS/SPK	78-93-3	2-Butanone	49	136	20	57	140	15	40	135	30	37	176	15
8260	LCS/SPK	591-78-6	2-Hexanone	65	127	20	65	127	15	47	157	15	47	157	15
8260	LCS/SPK	108-10-1	4-Methyl-2-pentanone	58	134	20	63	124	20	47	147	30	48	156	20
8260	LCS/SPK	67-64-1	Acetone	40	135	20	56	142	15	40	141	30	41	165	15
8260	LCS/SPK	107-13-1	Acrylonitrile	63	138	20	63	138	20	57	134	20	57	134	20
8260	LCS/SPK	71-43-2	Benzene	81	122	20	71	124	13	73	126	30	71	128	17
8260	LCS/SPK	108-86-1	Bromobenzene	76	124	20	78	118	15	66	121	30	76	138	15
8260	LCS/SPK	74-97-5	Bromochloromethane	65	129	20	72	130	15	71	127	30	72	132	15
8260	LCS/SPK	75-27-4	Bromodichloromethane	76	121	20	79	122	20	72	128	30	60	132	20
8260	LCS/SPK	75-25-2	Bromoform	69	128	20	66	128	15	66	137	30	67	126	15
8260	LCS/SPK	74-83-9	Bromomethane	53	141	20	36	150	15	45	141	30	22	150	20
8260	LCS/SPK	75-15-0	Carbon Disulfide	59	134	20	59	134	15	54	156	20	54	156	20
8260	LCS/SPK	56-23-5	Carbon Tetrachloride	66	138	20	72	134	15	67	133	30	68	132	15
8260	LCS/SPK	108-90-7	Chlorobenzene	81	122	20	72	120	15	75	123	30	72	126	20
8260	LCS/SPK	75-00-3	Chloroethane	58	133	20	69	136	15	41	141	30	54	146	15
8260	LCS/SPK	67-66-3	Chloroform	69	128	20	73	127	15	72	124	30	69	126	17
8260	LCS/SPK	74-87-3	Chloromethane	56	131	20	49	142	15	51	129	30	39	143	18
8260	LCS/SPK	156-59-2	cis-1,2-Dichloroethene	72	126	20	74	124	15	67	125	30	71	122	15
8260	LCS/SPK	10061-01-5	cis-1,3-Dichloropropene	69	131	20	74	124	15	72	126	30	80	123	20
8260	LCS/SPK	124-48-1	Dibromochloromethane	66	133	20	75	125	15	66	130	30	72	123	21
8260	LCS/SPK	74-95-3	Dibromomethane	76	125	20	76	127	15	73	128	30	77	122	15
8260	LCS/SPK	75-71-8	Dichlorodifluoromethane	53	153	20	33	157	20	34	136	30	34	162	20
8260	LCS/SPK	100-41-4	Ethylbenzene	73	127	20	77	123	15	74	127	30	74	119	20
8260	LCS/SPK	87-68-3	Hexachlorobutadiene	67	131	20	62	124	20	53	142	30	60	121	20
8260	LCS/SPK	74-88-4	Iodomethane	52	151	20	52	151	20	20	165	20	20	165	20
8260	LCS/SPK	98-82-8	Isopropylbenzene	75	127	20	77	122	20	77	129	30	74	118	20
8260	LCS/SPK	M/P XYLENE	m/p-Xylenes	76	128	20	78	123	20	79	126	30	79	126	30
8260	LCS/SPK	1634-04-4	Methyl tert butyl ether	65	123	20	64	127	37	50	135	30	54	126	37
8260	LCS/SPK	75-09-2	Methylene chloride	63	137	20	70	122	20	63	137	30	57	132	15
8260	LCS/SPK	91-20-3	Naphthalene	54	138	20	64	119	20	51	135	30	54	140	20
8260	LCS/SPK	104-51-8	n-Butylbenzene	69	137	20	71	128	15	65	138	30	74	123	15
8260	LCS/SPK	103-65-1	n-Propylbenzene	72	129	20	77	124	20	63	135	30	67	135	20

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8260	LCS/SPK	95-49-8	o-Chlorotoluene	73	126	20	76	121	20	69	128	30	79	113	20
8260	LCS/SPK	95-47-6	o-Xylene	80	121	20	80	123	20	77	125	30	77	125	30
8260	LCS/SPK	106-43-4	p-Chlorotoluene	74	128	20	77	121	15	73	126	30	78	116	20
8260	LCS/SPK	99-87-6	p-Cymene	73	130	20	76	123	20	75	133	30	73	120	20
8260	LCS/SPK	135-98-8	sec-Butylbenzene	72	127	20	74	127	15	63	132	30	76	121	15
8260	LCS/SPK	100-42-5	Styrene	65	134	20	81	124	20	74	128	30	76	120	15
8260	LCS/SPK	98-06-6	tert-Butylbenzene	70	129	20	75	123	15	65	132	30	78	120	20
8260	LCS/SPK	127-18-4	Tetrachloroethene	66	128	20	74	122	15	67	139	30	69	126	15
8260	LCS/SPK	108-88-3	Toluene	77	122	20	70	122	15	71	127	30	69	129	20
8260	LCS/SPK	156-60-5	trans-1,2-Dichloroethene	63	137	20	73	127	20	66	134	30	68	131	20
8260	LCS/SPK	10061-02-6	trans-1,3-Dichloropropene	59	135	20	72	123	15	65	127	30	71	134	20
8260	LCS/SPK	110-57-6	trans-1,4-Dichloro-2-buten	58	135	20	58	135	20						
8260	LCS/SPK	79-01-6	Trichloroethene	70	127	20	74	123	15	77	124	30	69	128	15
8260	LCS/SPK	75-69-4	Trichlorofluoromethane	57	129	20	62	152	20	49	139	30	61	136	20
8260	LCS/SPK	108-05-4	Vinyl acetate	50	144	20	50	144	23						
8260	LCS/SPK	75-01-4	Vinyl chloride	50	134	20	65	133	15	58	126	30	53	138	15
8260	SUR	SU107-06-2	1,2-Dichloroethane-D4	72	119		72	143		52	149		61	136	
8260	SUR	1868-53-7	Dibromofluoromethane	85	115		84	115		65	135		86	117	
8260	SUR	460-00-4	p-Bromofluorobenzene	76	119		73	117		84	118		68	124	
8260	SUR	2037-26-5	Toluene-D8	81	120		76	116		84	116		71	125	
8270	IS	SU106-46-7	1,4-Dichlorobenzene-D4	50	200		50	200		50	200		50	200	
8270	IS	SU83-32-9	Acenaphthene-D10	50	200		50	200		50	200		50	200	
8270	IS	SU218-01-9	Chrysene-D12	50	200		50	200		50	200		50	200	
8270	IS	1146-65-2	Naphthalene-D8	50	200		50	200		50	200		50	200	
8270	IS	198-55-0	Perylene-D12	50	200		50	200		50	200		50	200	
8270	IS	SU85-01-8	Phenanthrene-D10	50	200		50	200		50	200		50	200	
8270	LCS/SPK	120-82-1	1,2,4-Trichlorobenzene	37	120	20	23	120	30	44	125	30	38	120	30
8270	LCS/SPK	95-50-1	1,2-Dichlorobenzene	33	120	20	28	120	29	45	125	30	18	120	29
8270	LCS/SPK	541-73-1	1,3-Dichlorobenzene	32	120	20	21	120	37	39	125	30	14	120	37
8270	LCS/SPK	106-46-7	1,4-Dichlorobenzene	32	120	20	35	120	36	35	125	30	15	120	36
8270	LCS/SPK	108-60-1	2,2'-Oxybis(1-Chloropropan	26	131	20	39	120	24	25	125	30	32	128	24
8270	LCS/SPK	95-95-4	2,4,5-Trichlorophenol	49	120	20	57	130	18	49	125	30	49	137	18
8270	LCS/SPK	88-06-2	2,4,6-Trichlorophenol	49	126	20	56	125	19	43	125	30	47	129	19
8270	LCS/SPK	120-83-2	2,4-Dichlorophenol	48	120	20	57	120	19	45	125	30	34	121	19
8270	LCS/SPK	105-67-9	2,4-Dimethylphenol	28	120	20	53	124	42	32	125	30	28	125	42
8270	LCS/SPK	51-28-5	2,4-Dinitrophenol	25	130	20	32	147	22	25	132	30	32	147	22
8270	LCS/SPK	121-14-2	2,4-Dinitrotoluene	51	120	20	52	130	20	48	125	30	49	127	20
8270	LCS/SPK	606-20-2	2,6-Dinitrotoluene	19	120	20	74	135	15	48	125	30	59	148	15
8270	LCS/SPK	91-58-7	2-Chloronaphthalene	49	120	20	49	112	21	45	125	30	32	117	21
8270	LCS/SPK	95-57-8	2-Chlorophenol	37	120	20	40	120	25	44	125	30	40	120	25

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8270	LCS/SPK	91-57-6	2-Methylnaphthalene	46	120	20	41	120	21	47	125	30	32	111	21
8270	LCS/SPK	95-48-7	2-Methylphenol	38	120	20	28	125	27	40	125	30	22	120	27
8270	LCS/SPK	88-74-4	2-Nitroaniline	48	120	20	59	153	15	44	125	30	54	167	15
8270	LCS/SPK	88-75-5	2-Nitrophenol	39	123	20	54	120	18	42	125	30	33	124	18
8270	LCS/SPK	91-94-1	3,3'-Dichlorobenzidine	20	120	20	63	160	25	25	128	30	41	149	25
8270	LCS/SPK	99-09-2	3-Nitroaniline	20	126	20	70	143	19	27	125	30	64	144	19
8270	LCS/SPK	534-52-1	4,6-Dinitro-2-methylphenol	40	130	20	56	144	15	29	137	30	61	147	15
8270	LCS/SPK	101-55-3	4-Bromophenyl phenyl ether	52	120	20	66	130	15	46	125	30	70	131	15
8270	LCS/SPK	59-50-7	4-Chloro-3-methylphenol	47	120	20	53	123	27	46	125	30	54	121	27
8270	LCS/SPK	106-47-8	4-Chloroaniline	20	120	20	57	125	22	25	125	30	42	127	22
8270	LCS/SPK	7005-72-3	4-Chlorophenyl phenyl ethe	50	120	20	59	125	16	47	125	30	51	122	16
8270	LCS/SPK	106-44-5	4-Methylphenol	32	120	20	23	120	24	41	125	30	20	120	24
8270	LCS/SPK	100-01-6	4-Nitroaniline	36	120	20	71	142	24	34	125	30	69	145	24
8270	LCS/SPK	100-02-7	4-Nitrophenol	20	120	20	18	53	25	25	138	30	35	134	48
8270	LCS/SPK	83-32-9	Acenaphthene	47	120	20	52	120	24	46	125	30	55	120	24
8270	LCS/SPK	208-96-8	Acenaphthylene	50	120	20	57	120	18	44	125	30	48	120	18
8270	LCS/SPK	120-12-7	Anthracene	54	120	20	71	126	15	53	125	30	59	133	15
8270	LCS/SPK	56-55-3	Benzo(a)anthracene	56	100	20	74	133	15	52	125	30	65	141	15
8270	LCS/SPK	50-32-8	Benzo(a)pyrene	53	120	20	72	126	15	50	125	30	61	133	15
8270	LCS/SPK	205-99-2	Benzo(b)fluoranthene	45	124	20	62	138	15	45	125	30	65	141	15
8270	LCS/SPK	191-24-2	Benzo(ghi)perylene	38	123	20	42	160	15	38	126	30	47	146	15
8270	LCS/SPK	207-08-9	Benzo(k)fluoranthene	45	124	20	63	136	22	45	125	30	52	145	22
8270	LCS/SPK	65-85-0	Benzoic acid	20	120	20	1	20	50	25	125	30	13	120	50
8270	LCS/SPK	100-51-6	Benzyl alcohol	30	120	20	50	150	34	25	125	30	15	145	34
8270	LCS/SPK	111-91-1	Bis(2-chloroethoxy)methan	46	120	20	57	120	17	43	125	30	41	124	17
8270	LCS/SPK	111-44-4	Bis(2-chloroethyl)ether	37	120	20	47	120	21	38	125	30	35	120	21
8270	LCS/SPK	117-81-7	Bis(2-ethylhexyl) phthalat	42	126	20	64	185	15	47	127	30	61	161	15
8270	LCS/SPK	85-68-7	Butyl benzyl phthalate	46	120	20	64	144	16	49	125	30	62	156	16
8270	LCS/SPK	218-01-9	Chrysene	55	120	20	76	133	15	53	125	30	55	149	15
8270	LCS/SPK	53-70-3	Dibenzo(a,h)anthracene	42	127	20	50	148	15	41	125	30	40	156	15
8270	LCS/SPK	132-64-9	Dibenzofuran	54	120	20	59	120	15	51	125	30	56	120	15
8270	LCS/SPK	84-66-2	Diethyl phthalate	41	120	20	68	160	15	50	125	30	66	126	15
8270	LCS/SPK	131-11-3	Dimethyl phthalate	25	127	20	70	132	15	49	125	30	64	130	15
8270	LCS/SPK	84-74-2	Di-n-butyl phthalate	54	120	20	68	136	15	56	125	30	62	140	15
8270	LCS/SPK	117-84-0	Di-n-octyl phthalate	37	137	20	68	153	16	41	132	30	64	160	16
8270	LCS/SPK	206-44-0	Fluoranthene	54	120	20	67	134	15	54	125	30	56	141	15
8270	LCS/SPK	86-73-7	Fluorene	50	120	20	61	123	15	49	125	30	52	127	15
8270	LCS/SPK	118-74-1	Hexachlorobenzene	52	120	20	39	132	15	47	125	30	49	132	15
8270	LCS/SPK	87-68-3	Hexachlorobutadiene	27	120	20	10	120	44	40	125	30	10	120	44
8270	LCS/SPK	67-72-1	Hexachloroethane	28	120	20	10	120	46	34	125	30	10	120	46

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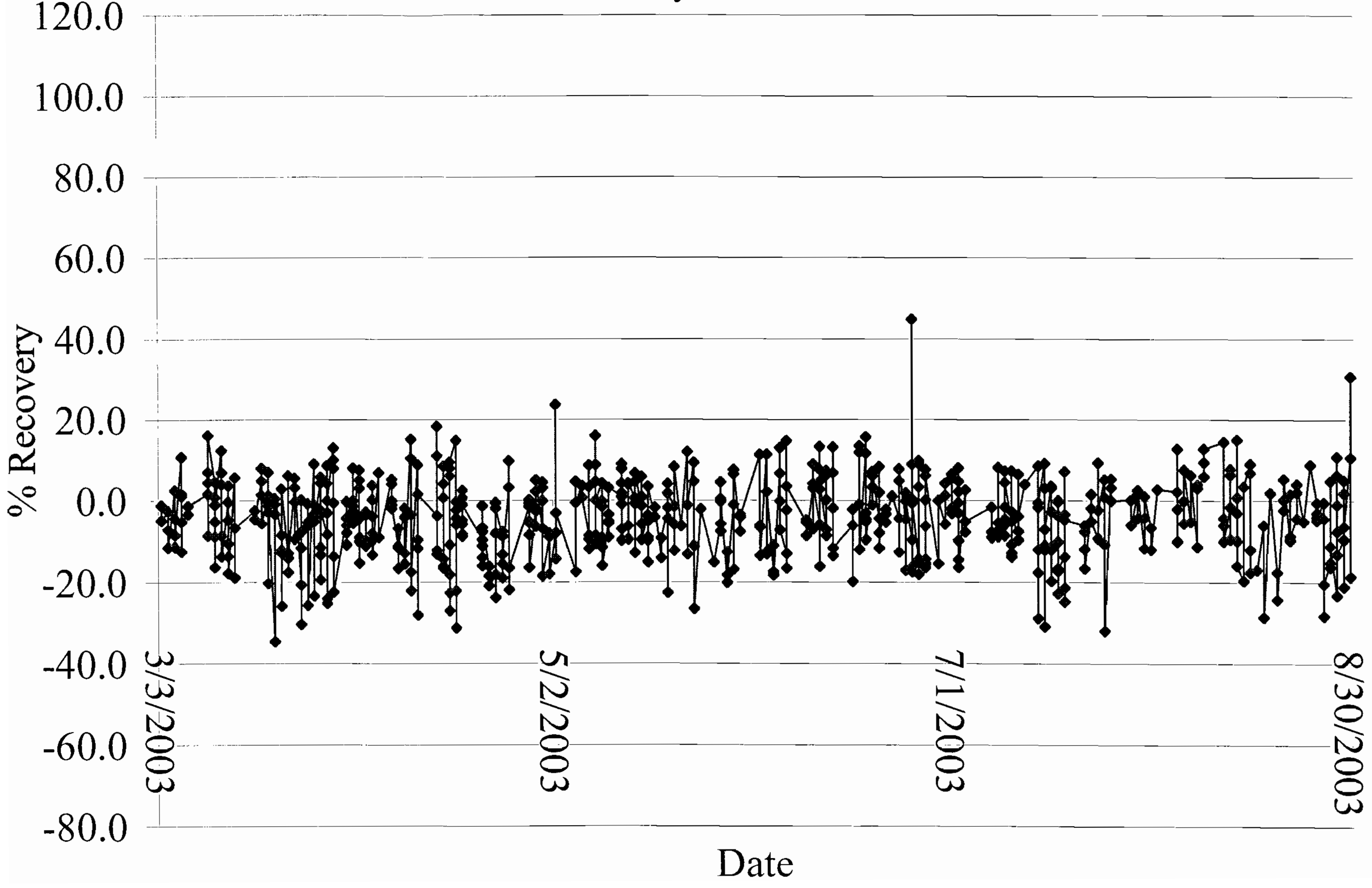
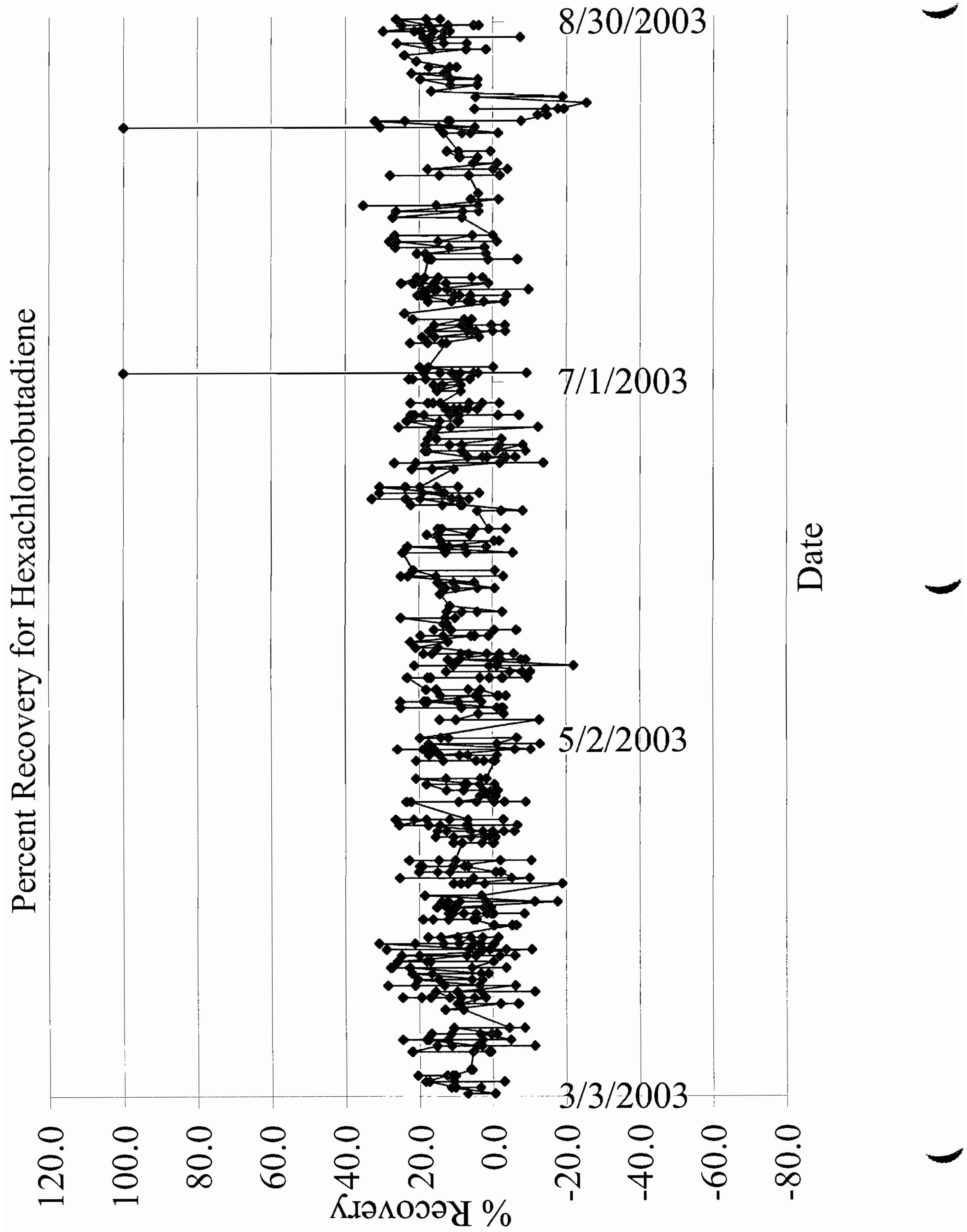
8270	LCS/SPK	193-39-5	Indeno(1,2,3-cd)pyrene	43	125	20	52	148	15	38	125	30	50	145	15
8270	LCS/SPK	78-59-1	Isophorone	50	120	20	44	120	17	43	125	30	37	122	17
8270	LCS/SPK	91-20-3	Naphthalene	39	120	20	38	120	29	40	125	30	30	120	29
8270	LCS/SPK	98-95-3	Nitrobenzene	44	120	20	38	120	24	41	125	30	30	124	24
8270	LCS/SPK	621-64-7	N-Nitroso-Di-n-propylamine	34	128	20	37	120	31	40	125	30	44	120	31
8270	LCS/SPK	86-30-6	N-nitrosodiphenylamine	48	120	20	60	120	15	49	125	30	56	120	15
8270	LCS/SPK	87-86-5	Pentachlorophenol	38	120	20	22	131	37	25	125	30	35	126	37
8270	LCS/SPK	85-01-8	Phenanthrene	51	120	20	72	128	15	50	125	30	61	134	15
8270	LCS/SPK	108-95-2	Phenol	20	120	20	12	149	34	39	125	30	38	120	34
8270	LCS/SPK	129-00-0	Pyrene	49	128	20	60	140	19	46	125	30	58	137	19
8270	SUR	118-79-6	2,4,6-Tribromophenol	42	124		41	149		36	126		36	139	
8270	SUR	321-60-8	2-Fluorobiphenyl	48	120		47	120		43	125		43	125	
8270	SUR	367-12-4	2-Fluorophenol	20	120		18	120		37	125		25	125	
8270	SUR	4165-60-0	Nitrobenzene-D5	41	120		37	120		37	125		34	120	
8270	SUR	SU108-95-2	Phenol-D5	20	120		10	110		40	125		34	120	
8270	SUR	1718-51-0	p-Terphenyl-d14	51	135		31	154		32	125		38	141	
9012	LCS/SPK		TOTAL CYANIDE	79	114	20	90	110	15	75	125	30	16	131	15
9056	LCS/SPK		BROMIDE	85	115	20	90	110	20						
9056	LCS/SPK		CHLORIDE	85	115	20	90	110	20						
9056	LCS/SPK		NITRATE	85	115	20	90	110	20						
9056	LCS/SPK		SULFATE	85	115	20	90	110	20						
9060	LCS/SPK		TOTAL ORGANIC CARBON	84	116	20	90	110	20						
9066	LCS/SPK		TOTAL RECOVERABLE PHENOL	56	145	20	90	110	20						

VOA VARIANCE HISTORY

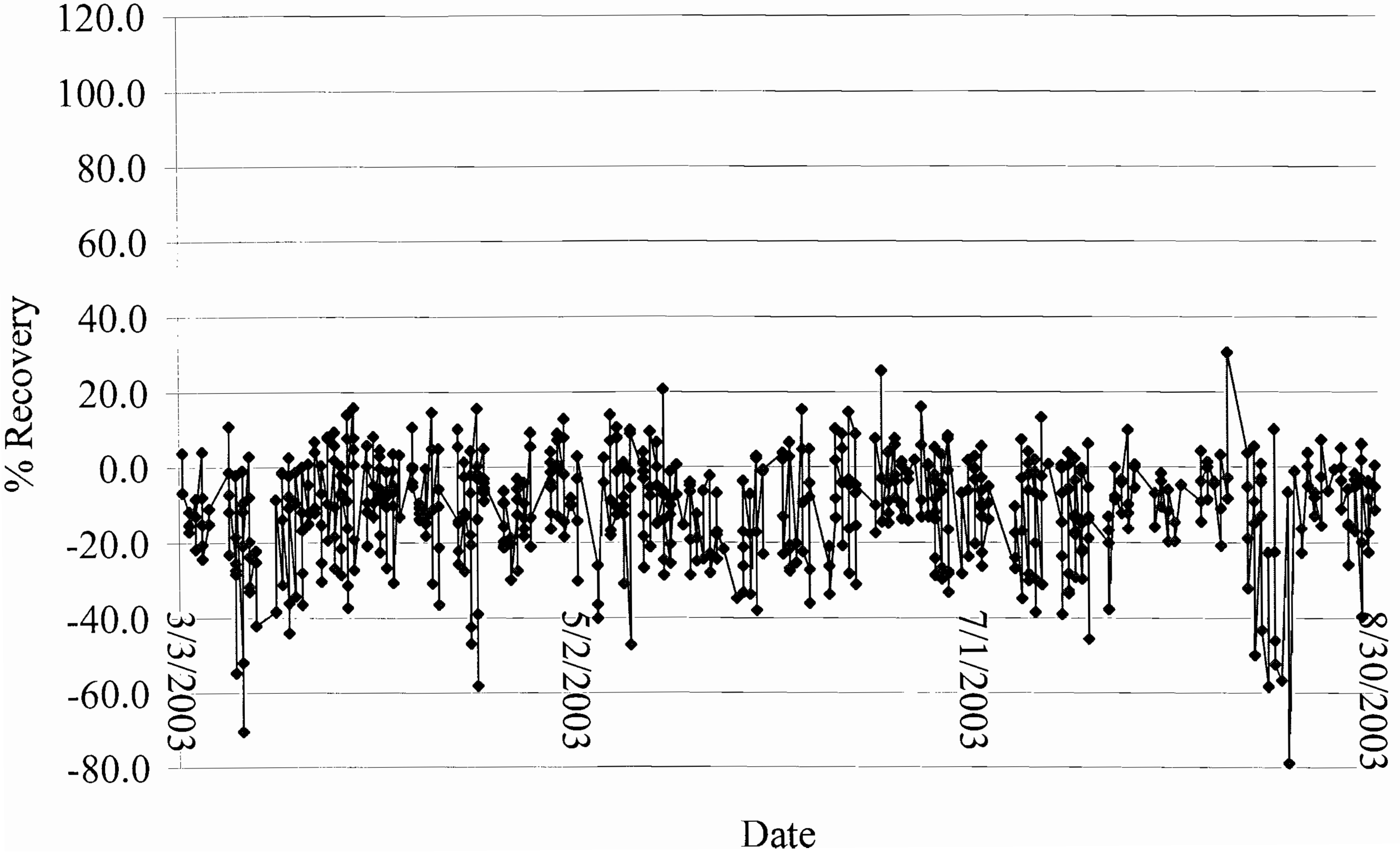
Percent Recovery for Chloroethane

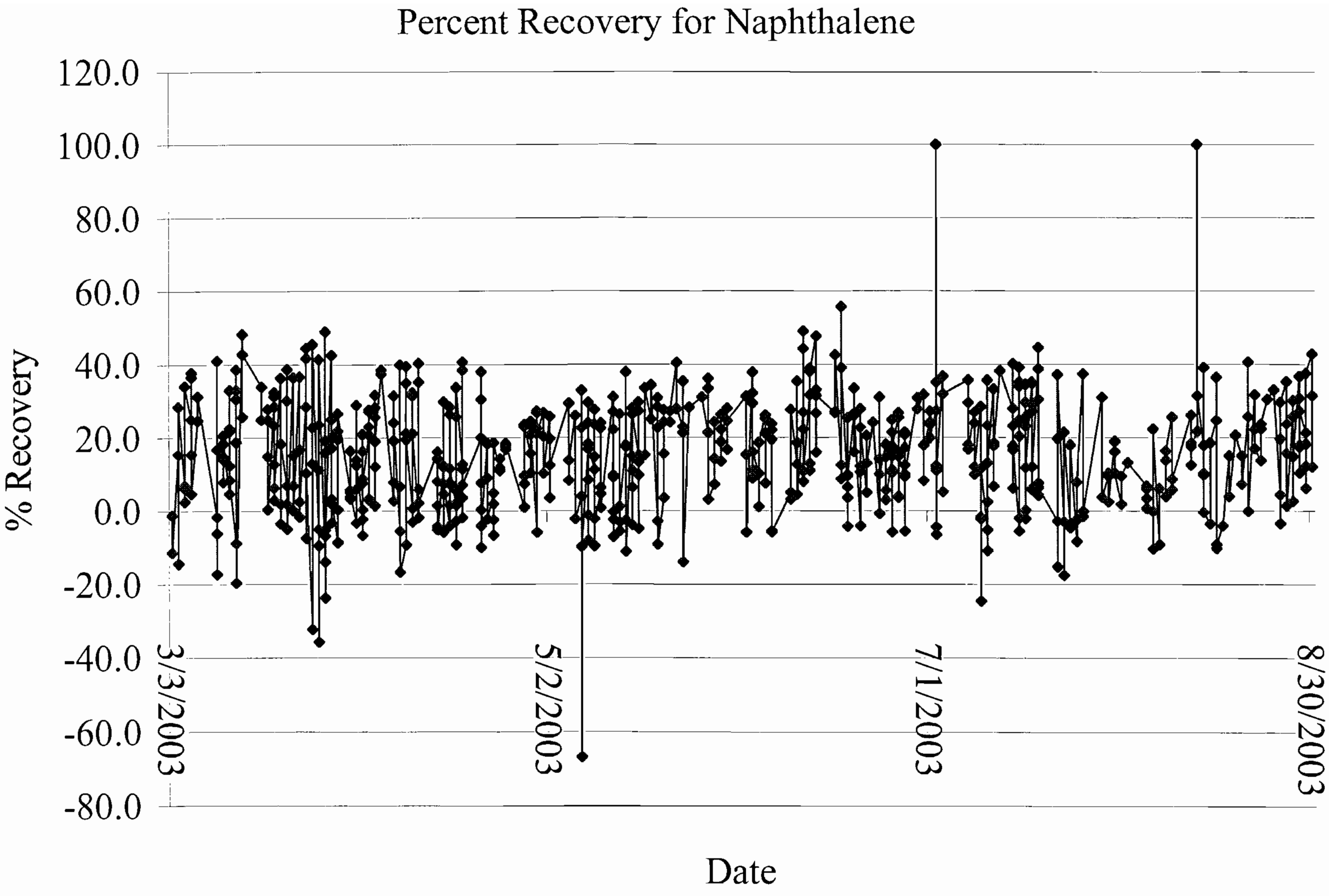




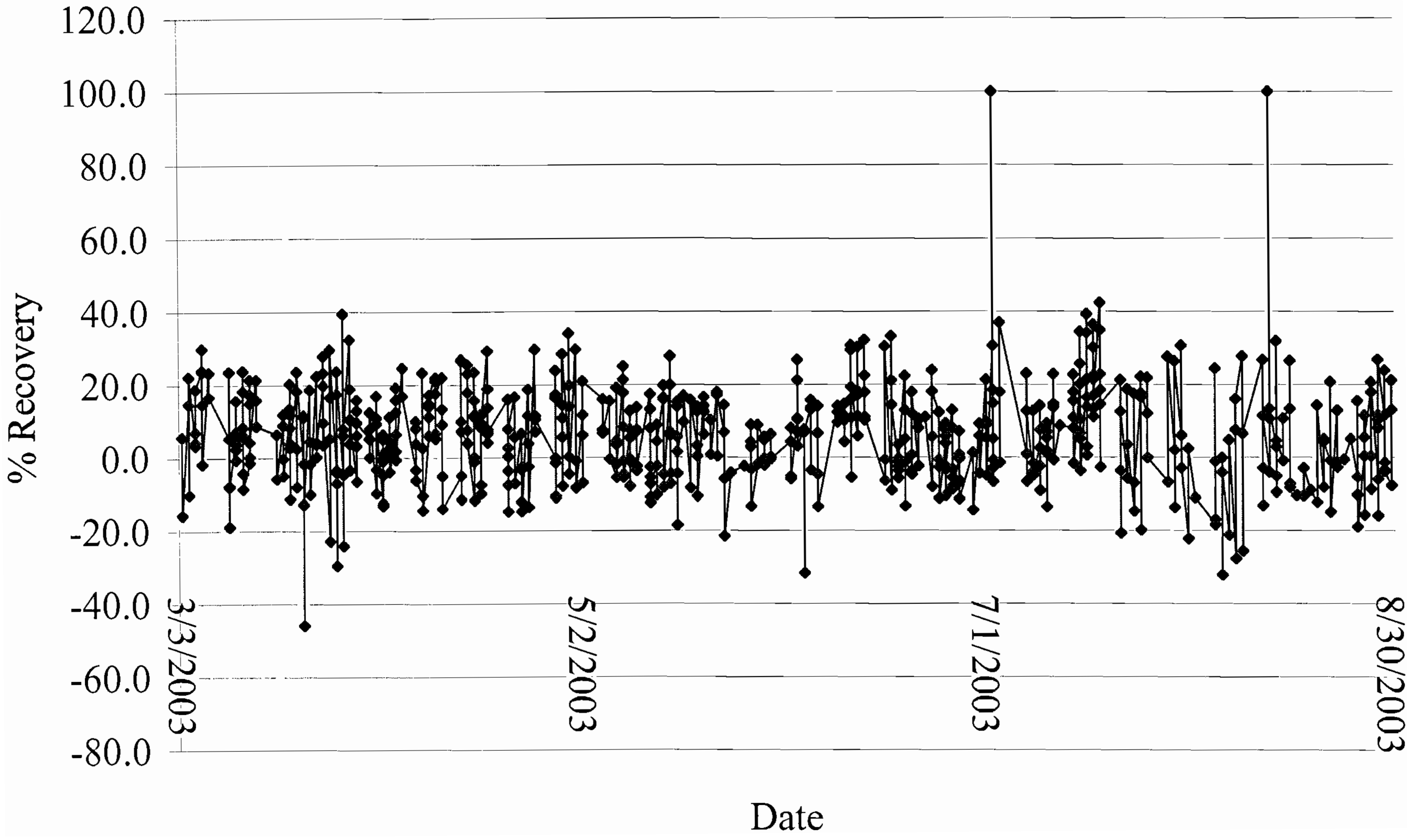
Percent Recovery for Hexachlorobutadiene
% Recovery
120.0
100.0
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
3/3/2003
5/2/2003
7/1/2003
8/30/2003
Date

Percent Recovery for Trichlorofluormethane

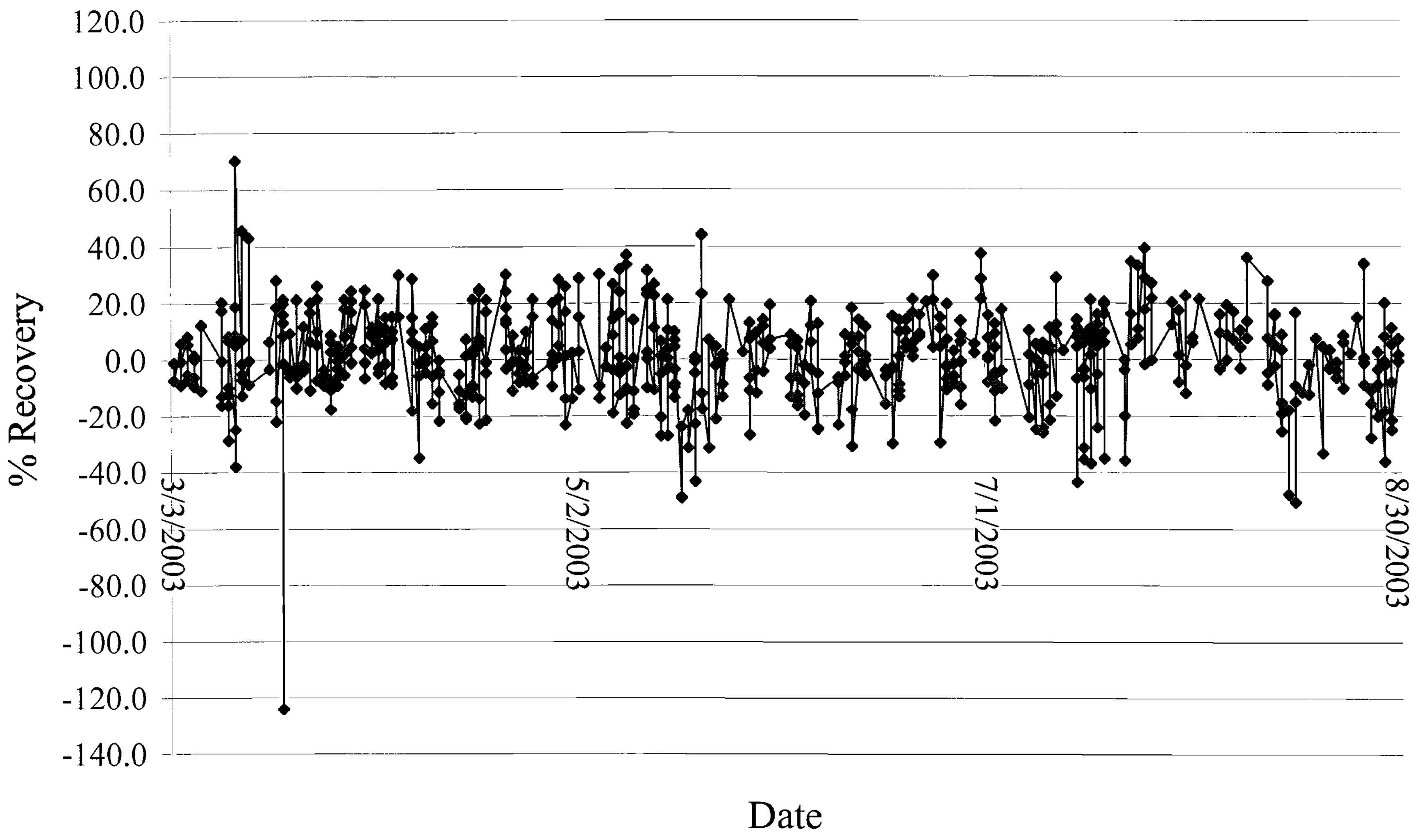


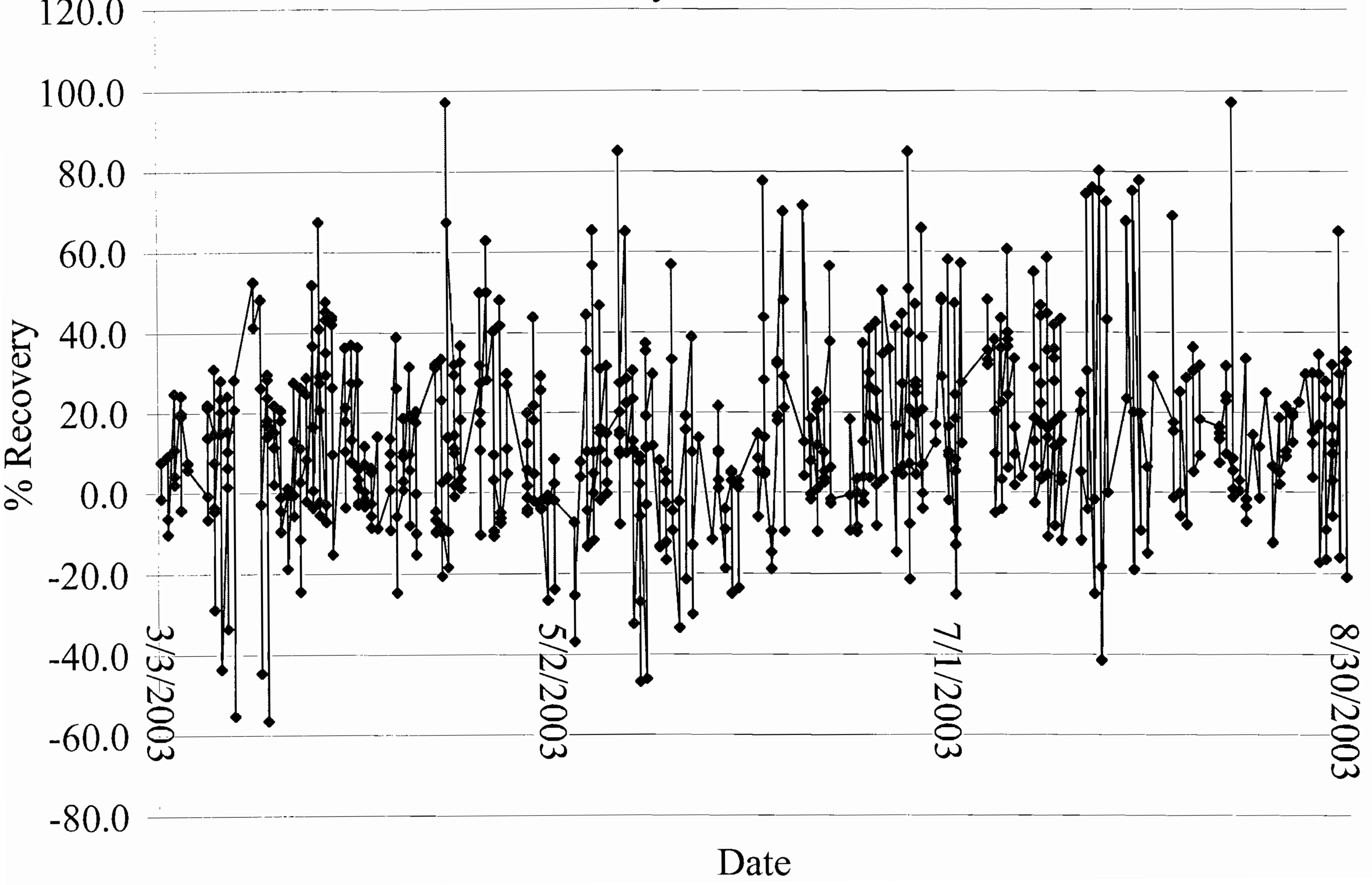

Percent Recovery for Naphthalene
% Recovery
120.0
100.0
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
3/3/2003
5/2/2003
7/1/2003
8/30/2003
Date

Percent Recovery for 1,2-Dibromo-3-chloropropane



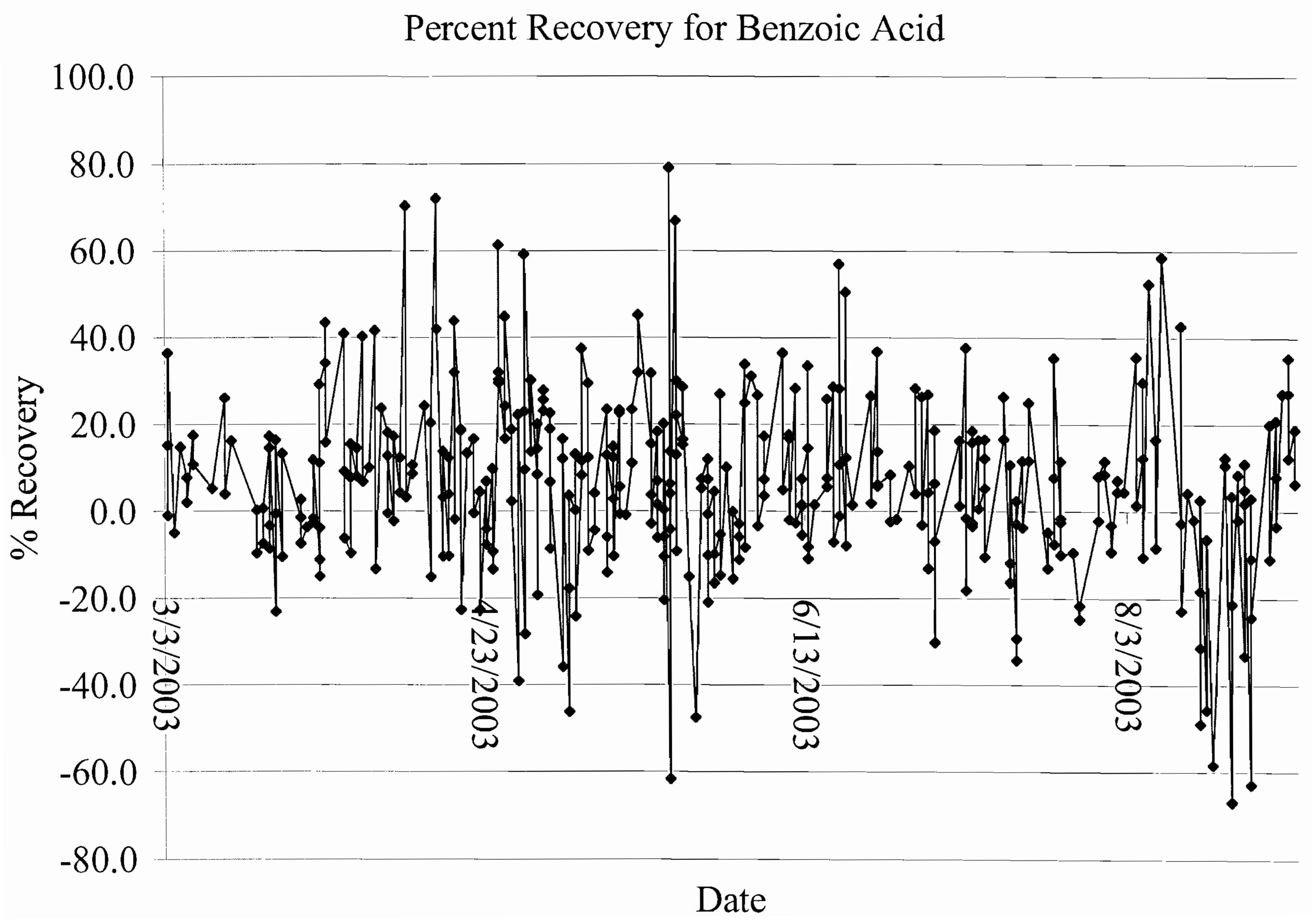
Percent Recovery for Dichlorodifluoromethane



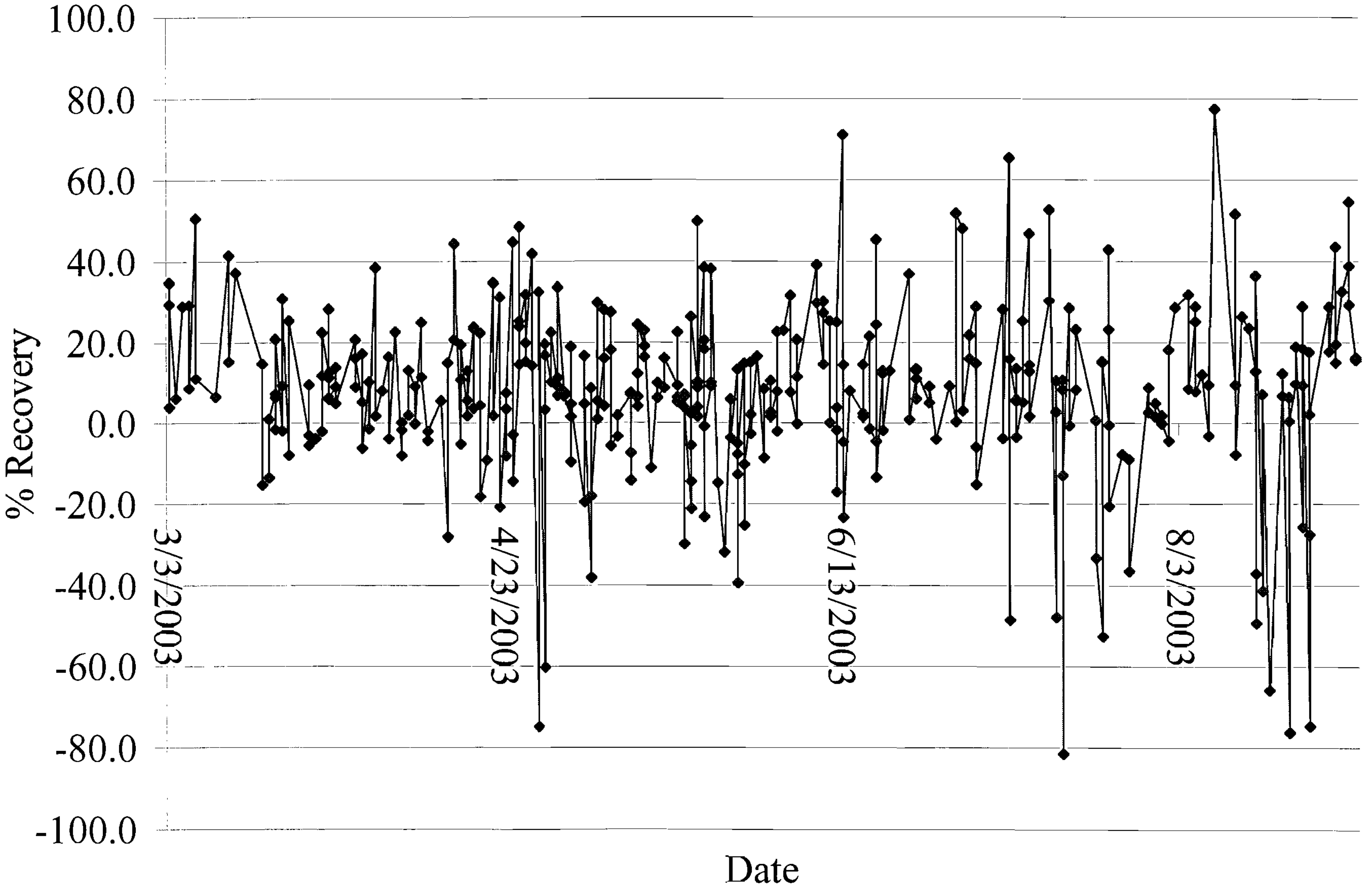


Percent Recovery for Bromomethane

S-VOA VARIANCE HISTORY


Percent Recovery for Benzoic Acid
100.0
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
% Recovery
3/3/2003
4/23/2003
6/13/2003
8/3/2003
Date

Percent Recovery for 2,4-Ditrophenol



Appendix B
FPM Field Sampling Forms

Page ____of ____

EQUIPMENT CALIBRATION LOG

Instrument Name: ________________________________

Model No.: ________________________________

Date and Time	First Standard Concentration	First Standard Reading	Second Standard Concentration	Second Standard Reading	Comments

FPM

FIELD SAMPLING REPORT

LOCATION: ____________________ PROJECT : ____________________

SITE: ____________________

SAMPLE INFORMATION

MATRIX ____________________ SAMPLE ID: ____________________

SAMPLING METHOD ____________ DUP./REP. OF : ____________________

BEGINNING DEPTH ____________ MATRIX SPIKE/MATRIX SPIKE DUPLICATE
YES ( ) NO ( )

END DEPTH ____________________

GRAB ( ) COMPOSITE ( ) DATE: __________ TIME: __________

CONTAINER		PRESERVATIVE/ PREPARATION	EXTRACTION METHOD	ANALYTICAL METHOD	ANALYSIS
SIZE/TYPE	#				

NOTABLE OBSERVATIONS

PID READINGS	SAMPLE CHARACTERISTICS	MISCELLANEOUS
1st	COLOR:	
2nd	ODOR:	
	OTHER:	

pH ______ Temperature ________ Dissolved oxygen __________ Specific Conductivity__________

GENERAL INFORMATION

WEATHER: SUN/CLEAR _____ OVERCAST/RAIN _____ WIND DRIECTION _______ AMBIENT TEMP ______

SHIPMENT VIA: FED-X _____ HAND DELIVER ______ COURIER _______ OTHER _______

SHIPPED TO: ____

COMMENTS: ____

SAMPLER: ____________________ OBSERVER: ____________________

MATRIX TYPE CODES

DC=DRILL CUTTINGS
WG=GROUND WATER
LH=HAZARDOUS LIQUID WASTE
SH=HAZARDOUS SOLID WASTE
SE=SEDIMENT
SL=SLUDGE
SO=SOIL
GS=SOIL GAS
WS=SURFACE WATER
SW=SWAP\WIPE

SAMPLING METHOD CODES

B=BAILER
BR=BRASS RING
CS=COMPOSITE SAMPLE
C=CONTINUOUS FLIGHT AUGER
DT=DRIVEN TUBE
W=SWAB\WIPE
G=GRAB
HA=HAND AUGER
H=HOLLOW STEM AUGER
HP=HYDRO PUNCH
SS=SPLIT SPOON
SP=SUBMERSIBLE PUMP

FORM SR.11

DRILLING LOG

PAGE ____ OF ____

FPM Group Ltd. **Engineering and Environmental Science**

Ronkonkoma **New York**

PROJECT __________ SITENAME AND SITEID __________

[illegible]LL No. __________ SURFACE ELEV __________

WATER LEVEL INITIAL __________ STABILIZED __________

DRILLING COMP. __________ DRILLING METHOD __________

DRILLER __________ LOG BY __________ DATE DRILLED __________

WELL TYPE CODE __________

☐ FLUSH MOUNT ☐ STEEL STANDPIPE (DETAILS LISTED BELOW)

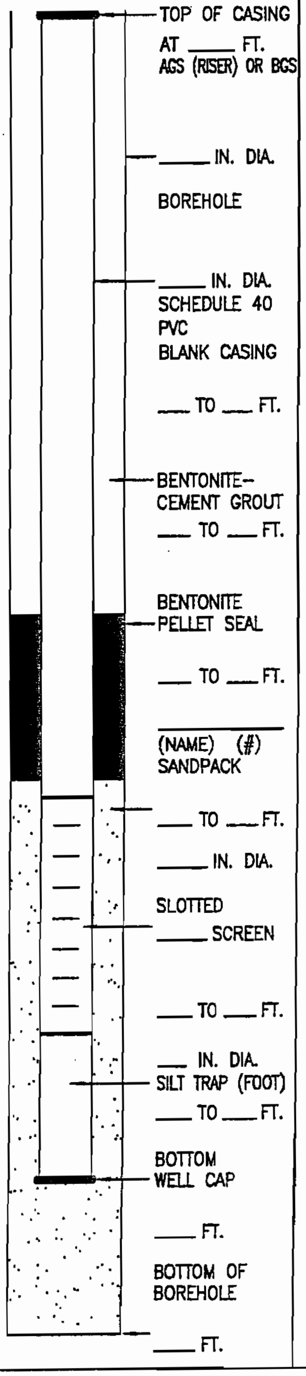
SKETCH MAP

NOTES:

LATITUDE __________

LONGITUDE __________

DEPTH (FT.)	SOIL SAMPLE INTERVAL	ORGANIC VAPORS (ppm)	LITHOLOGY	WELL CONSTRUCTION	DEPTH	REC	DESCRIPTION/SOIL CLASSIFICATION (COLOR, CLASS, MOISTURE CONTENT, STIFFNESS)



WELL CONSTRUCTION DETAILS AND ABANDONMENT FORM

FIELD REPRESENTATIVE:

DRILLING CONTRACTOR:

DRILLING TECHNIQUE:
AUGER SIZE AND TYPE:

BOREHOLE IDENTIFICATION:
BOREHOLE DIAMETER:
WELL IDENTIFICATION:

WELL CONSTRUCTION START DATE:
WELL CONSTRUCTION COMPLETE DATE:

SCREEN MATERIAL:
SCREEN DIAMETER:
STRATUM-SCREENED INTERVAL (FT):

CASING MATERIAL:
CASING DIAMETER:

TYPE OF FILTER PACK:
GRADIATION:
AMOUNT OF FILTER PACK USED:

TYPE OF BENTONITE:
AMOUNT BENTONITE USED:

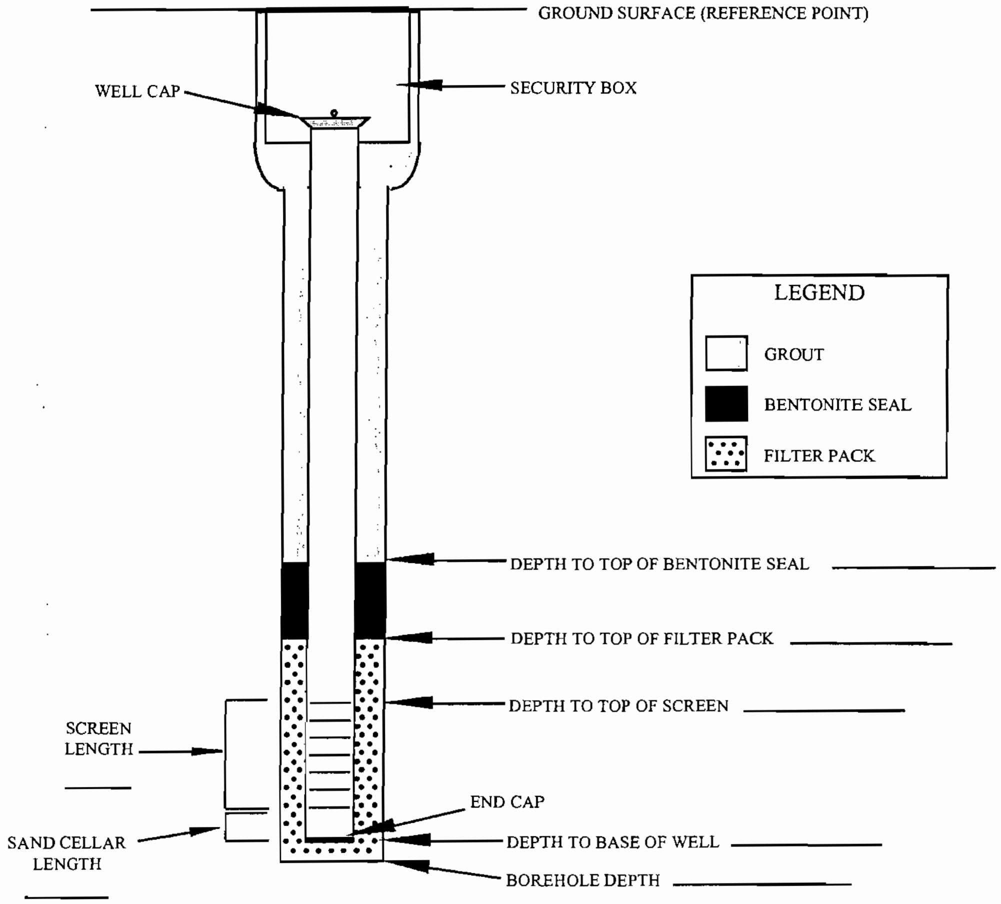
TYPE OF CEMENT:
AMOUNT CEMENT USED:
GROUT MATERIALS USED:

DIMENSIONS OF SECURITY BOX:

TYPE OF WELL CAP:
TYPE OF END CAP:

COMMENTS:

SPECIAL CONDITIONS
(describe and draw)



NOT TO SCALE

INSTALLED BY:
INSTALLATION OBSERVED BY:

DISCREPANCIES:

FORM WAB.11

WELL CONSTRUCTION DETAILS AND ABANDONMENT FORM

FIELD REPRESENTATIVE: ____________________

DRILLING CONTRACTOR: ____________________

DRILLING TECHNIQUE: ____________________
AUGER SIZE AND TYPE: ____________________

BOREHOLE IDENTIFICATION: ____________________
BOREHOLE DIAMETER: ____________________
WELL IDENTIFICATION: ____________________

WELL CONSTRUCTION START DATE: __________
WELL CONSTRUCTION COMPLETE DATE: __________

SCREEN MATERIAL: ____________________
SCREEN DIAMETER: ____________________
STRATUM-SCREENED INTERVAL (FT): __________

CASING MATERIAL: ____________________
CASING DIAMETER: ____________________

TYPE OF FILTER PACK: ____________________
GRADIATION: ____________________
AMOUNT OF FILTER PACK USED: ____________________

TYPE OF BENTONITE: ____________________
AMOUNT BENTONITE USED: ____________________

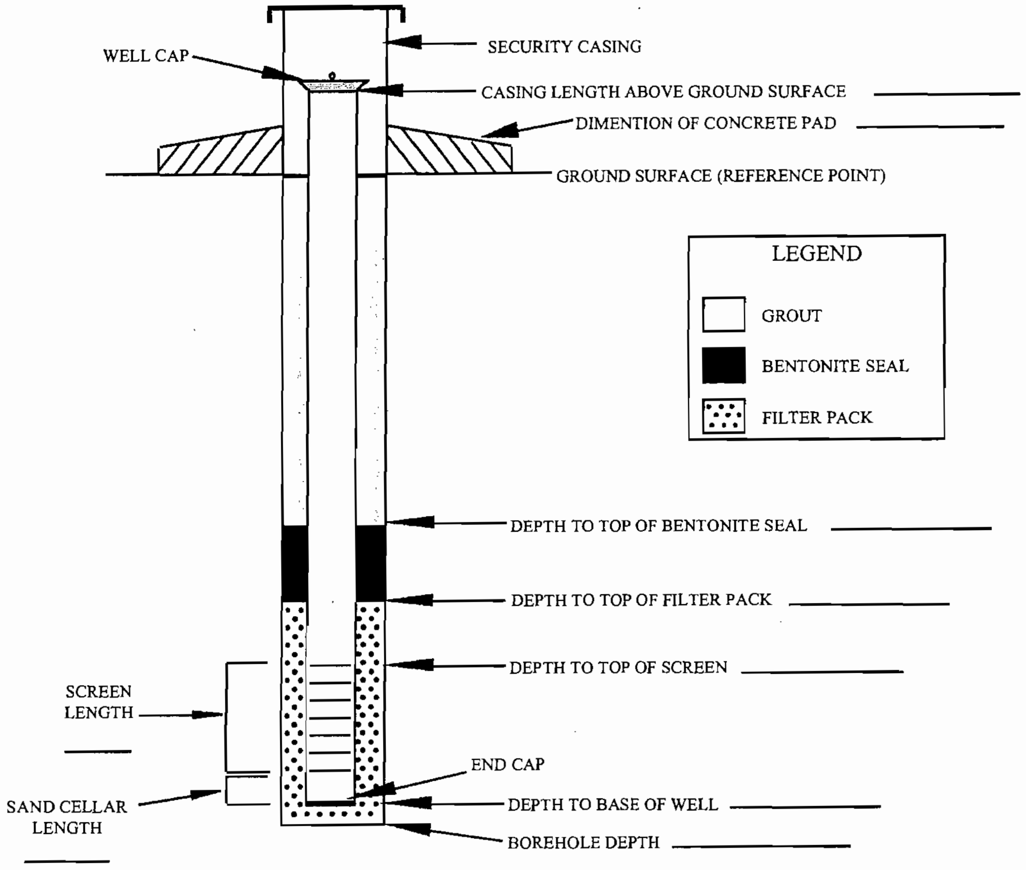
TYPE OF CEMENT: ____________________
AMOUNT CEMENT USED: ____________________
GROUT MATERIALS USED: ____________________

DIMENSIONS OF SECURITY CASING: __________

TYPE OF WELL CAP: ____________________
TYPE OF END CAP: ____________________

COMMENTS:

SPECIAL CONDITIONS
(describe and draw)



NOT TO SCALE

INSTALLED BY: ____________________ INSTALLATION OBSERVED BY: ____________________

DISCREPANCIES: ____

WELL DEVELOPMENT RECORD

WELL/PIEZOMETER ID ________
SHEET ______ of ______

PROJECT NAME: ________________ PROJECT NO. : ___________________________ DATE: ______________________

LOCATION: ______________________ DATE INSTALLED: ____

TOTAL DEPTH (FTOC) _____________ CASING DIAMETER ____

METHODS OF DEVELOPMENT

☐ Swabbing ☐ Bailing ☐ Pumping ☐ Describe ____

Equipment decomtaminated prior to development ☐ Yes ☐ NO

Describe____

EQUIPMENT NUMBERS:

pH Meter ______________ EC Meter ______________ Turbidity Meter ______________ Thermometer ______________

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

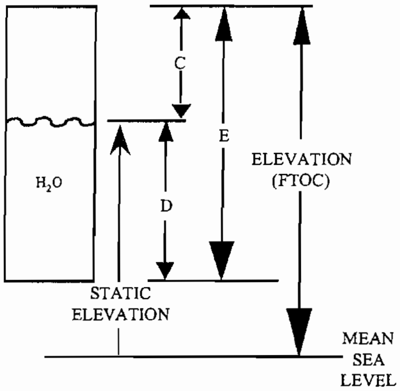
Measured Well Depth (B) ______________________ft.

Measured Water Level Depth (C) ___________________ft.

Length of Static Water Colume (D) _______ - _______ = _________ ft.
(B) (C)

Casing Water Volume (E) + _______ x _______ = _________ gal
(A) (D)

Total Purge Volume = _________ (gal)



Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments

WASTE INVENTORY TRACKING FORM

LOCATION : ____

PROJECT NAME: ____

ACTIVITIES: ____

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: ______________________________

FORM WT.11

Page ___ of ___

SLUG TEST DATA FORM

SLUG TEST DATA

LOCATION ______________________ SLUG VOLUME (FT^3) ______________

LOCATION I.D. ____________________ LOGGER CODE ________________

LOGDATE ______________________ ACCEPTANCE CODE ______________

TEST METHOD: ☐ SLUG INJECTION OR ☐ SLUG WITHDRAWAL

COMMENTS: ____

____

____

ELAPSED TIME (MIN)	DEPTH-TO-WATER (FT)
0.00	

ELAPSED TIME (MIN)	DEPTH-TO-WATER (FT)

ACCEPTANCE CODES: A - ACCEPTABLE R - RECONNAISSANCE U - UNACCEPTABLE N - NOT DETERMINED

______________________________ ______________________________

FORM COMPLETED BY / DATE TECHNICAL REVIEWER / DATE

FORM ST.11

Page ____ of ____

WELL PURGING & SAMPLING FORM

Project: ______________________ Sampled by: ______________________

Location and Site Code (**SITENAME, SITEID**): ______________________

Well No. (**LOCID**): ______________ Well Diameter (**CASDIAM**): __________

Date (**LOGDATE**): ______________ Weather: ______________________

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0
Unit Casing Volume (A) (gal/ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0

PURGING INFORMATION:

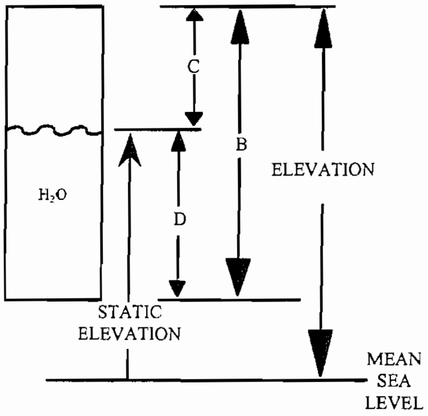
Measured Well Depth (B) (**TOTDEPTH**) ______________ ft.

Measured Water Level Depth (C) (**STATDEP**) ______________ ft.

Length of Static Water Column (D) = _______ - _______ = _______ ft.
(B) (C) (D)

Casing Water Volume (E) = _______ x _______ = _______ gal
(A) (D)

Total Purge Volume = _______ (gal)



Purge Date and Method: ______________________________

Physical Appearance/Comments: ______________________________

FIELD MEASUREMENTS:

Time	Volume Removed (gal)	pH	EC (µS/cm)	Temp. (F or C)	Turbidity (NTU)	D.O. (mg/L)	ORP (mV)

MONITOR WELL / PIEZOMETER STATIC WATER LEVEL FORM

PROJECT NAME: ______________________ DATE: ________________

WATER LEVEL INDICATOR ID # ___________ FIELD BOOK # __________

LOCATION: __________________________ PAGE # _______________

Monitor Well Number	Total Well Depth	Well Screen Length	Measuring Point Elev.	Time	Depth to Static Water Level	Explosimeter Reading (above background)	PID Reading (above background)

Note: Total well depth to be measured at time of gauging.

Comments: ____

____

____

Sampler ________________________ Observer ________________________

Page __of__

WELL PURGING & SAMPLING FORM
(LOW FLOW)

Project: ______________________ Sampled by: ______________________

Location and Site Code (**SITEID**): ______________________

Well No. (**LOCID**): ______________ Well Diameter (**SDIAM**): ______________

Date (**LOGDATE**): ______________ Weather: ______________________

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

Measured Well Depth (B) (**TOTDEPTH**) ______________ft. (optional)

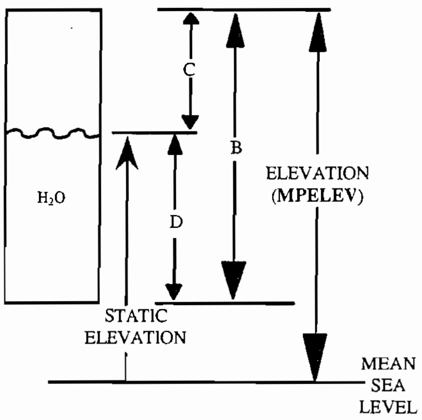
Measured Water Level Depth (C) (**STATDEP**)______________ft.

Length of Static Water Column (D) = ________ - ________ = ________ ft. (optional)
(B) (C) (D)

Pump Intake Depth (ft):______________

Depth during Purging/Sampling:______________________ft
(provide range)

Comments (re: Depth during purging/sampling):______________________



Purge Date and Method: BLADDER PUMP______________________

Physical Appearance/Comments: ______________________

Dissolved Ferrous Iron (mg/L): ______________________

FIELD MEASUREMENTS:

Allowable Range: ± 0.1 ± 3% ± 10% ± 10% ± 10mV

Time	Depth to Water (ft BTOC)	pH	EC (mS/cm)	Temp. (F or C)	Turbidity (NTU)	D.O. (mg/L)	ORP (mV)	Flow Rate (mL/min)

Sample Time: __________ Sample ID: ______________________

Note: Maintain a flow rate of 200-500 mL/min during purging. Purge a minimum of 1L between readings. Collect samples at a flow rate between 100-250 mL/min. VOC and gas sensitive (e.g. alkalinity, Fe^{2+}, CH$_4$, H$_2$S) parameters should be sampled first.

PETROLEUM SPILL SITES

FREE PRODUCT LOG

DATE	WELL NO.	TOP OF PRODUCT	BOTTOM OF PRODUCT	LENGTH OF PRODUCT COLUMN

Appendix C
MSDS Sheets for Preservatives and Decontamination Chemicals

Please reduce your browser font size for better viewing and printing.

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

MSDS *Material Safety Data Sheet*

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ALCONOX(tm)

MSDS Number: A2052 — *Effective Date: 12/08/96*

1. Product Identification

Synonyms: Alkyl Aryl Sulfonates
CAS No.: Not applicable.
Molecular Weight: Not applicable.
Chemical Formula: Not applicable.
Product Codes: A461

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Alconox(tm)	N/A	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! CAUSES IRRITATION.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 1 - Slight

Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
None identified.

Ingestion:
May be harmful.

Skin Contact:
Irritation.

Eye Contact:
Irritation.

Chronic Exposure:
No information found.

Aggravation of Pre-existing Conditions:
No information found.

4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Prompt action is essential.

Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes.

Eye Contact:
In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

5. Fire Fighting Measures

Fire:
Not expected to be a fire hazard.

Explosion:
None identified.

Fire Extinguishing Media:
Use extinguishing media appropriate for surrounding fire.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

7. Handling and Storage

Keep container tightly closed. Suitable for any general chemical storage area. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None established.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
For conditions of use where exposure to the substance is apparent, consult an industrial hygienist. For emergencies, or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
White Powder.

Odor:
No information found.

Solubility:
Appreciable (>10%)

Specific Gravity:
0.00

pH:
No information found.

% Volatiles by volume @ 21C (70F):
N/A

Boiling Point:
No information found.

Melting Point:
No information found.

Vapor Density (Air=1):
Not applicable.

Vapor Pressure (mm Hg):
Not applicable.

Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
No information found.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
No information found.

Conditions to Avoid:
No information found.

11. Toxicological Information

--------\Cancer Lists\--

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Alconox(tm)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.

Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Alconox(tm)	Yes	No	No	No

--------\Chemical Inventory Status - Part 2\--------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Alconox(tm)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 1\--------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Alconox(tm)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\--------

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
Alconox(tm)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: No information found.
Poison Schedule: No information found.

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

Label Hazard Warning:
WARNING! CAUSES IRRITATION.

Label Precautions:
Keep in tightly closed container. Wash thoroughly after handling.

Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15

minutes. Remove contaminated clothing and shoes. Wash clothing before reuse.

Product Use:
Laboratory Reagent. Research and Development Use Only.

Revision Information:
Pure. New 16 section MSDS format, all sections have been revised.

Disclaimer:

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Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

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MSDS Number: **H3880** * * * * * *Effective Date:* ***05/07/03*** * * * * * *Supercedes:* ***05/10/01***

MSDS *Material Safety Data Sheet*

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

HYDROCHLORIC ACID, 33 - 40%

1. Product Identification

Synonyms: Muriatic acid; hydrogen chloride, aqueous
CAS No.: 7647-01-0
Molecular Weight: 36.46
Chemical Formula: HCl
Product Codes:
J.T. Baker: 5367, 5537, 5575, 5800, 5814, 5839, 5894, 5994, 6900, 7831, 9529, 9530, 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9544, 9548
Mallinckrodt: 2062, 2612, 2624, 2626, 5587, H611, H613, H987, H992, H999, V078, V628

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Hydrogen Chloride	7647-01-0	33 - 40%	Yes
Water	7732-18-5	60 - 67%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.

Ingestion:
Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea. Swallowing may be fatal.

Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and discolor skin.

Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never

give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:

Extreme heat or contact with metals can release flammable hydrogen gas.

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

If involved in a fire, use water spray. Neutralize with soda ash or slaked lime.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

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7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Hydrochloric acid:
- OSHA Permissible Exposure Limit (PEL):
5 ppm (Ceiling)
- ACGIH Threshold Limit Value (TLV):
2 ppm (Ceiling), A4 Not classifiable as a human carcinogen

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless, fuming liquid.

Odor:
Pungent odor of hydrogen chloride.

Solubility:
Infinite in water with slight evolution of heat.

Density:
1.18

pH:
For HCL solutions: 0.1 (1.0 N), 1.1 (0.1 N), 2.02 (0.01 N)
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
53C (127F) Azeotrope (20.2%) boils at 109C (228F)
Melting Point:
-74C (-101F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
190 @ 25C (77F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes. Thermal oxidative decomposition produces toxic chlorine fumes and explosive hydrogen gas.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A strong mineral acid, concentrated hydrochloric acid is incompatible with many substances and highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides, sulfides, sulfites, and formaldehyde.
Conditions to Avoid:
Heat, direct sunlight.

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11. Toxicological Information

Inhalation rat LC50: 3124 ppm/1H; oral rabbit LD50: 900 mg/kg (Hydrochloric acid concentrated); investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\--

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Hydrogen Chloride (7647-01-0)	No	No	3
Water (7732-18-5)	No	No	None

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12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to biodegrade. When released into the soil, this material may leach into groundwater.
Environmental Toxicity:
This material is expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789
Packing Group: II
Information reported for product/size: 475LB

International (Water, I.M.O.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789
Packing Group: II
Information reported for product/size: 475LB

15. Regulatory Information

```
--------\Chemical Inventory Status - Part 1\---------------------------------
Ingredient                                        TSCA  EC   Japan  Australia
----------------------------------------- ------  ----  ---  -----  ---------
Hydrogen Chloride (7647-01-0)                      Yes  Yes   Yes      Yes
Water (7732-18-5)                                  Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\---------------------------------
                                                        --Canada--
```

Ingredient	Korea	DSL	NDSL	Phil.
Hydrogen Chloride (7647-01-0)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\---------------

	-SARA 302-		------ SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Hydrogen Chloride (7647-01-0)	5000	500*	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\---------------

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
Hydrogen Chloride (7647-01-0)	5000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2R
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get

medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 8.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

LIQUID AIR -- 100 PPM ISOBUTYLENE IN AIR
MATERIAL SAFETY DATA SHEET
NSN: 683000N074507
Manufacturer's CAGE: 18260
Part No. Indicator: A
Part Number/Trade Name: 100 PPM ISOBUTYLENE IN AIR

===

General Information

===

Company's Name: LIQUID AIR CORP
Company's Street: 2121 NORTH CALIFORNIA BLVD
Company's City: WALNUT CREEK
Company's State: CA
Company's Country: US
Company's Zip Code: 94596
Company's Emerg Ph #: 800-231-1366;800-424-9300(CHEMTREC)
Company's Info Ph #: 800-231-1366
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 04JUN90
Safety Data Review Date: 25FEB97
MSDS Serial Number: CDMVG

===

Ingredients/Identity Information

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Proprietary: NO
Ingredient: PROPENE, 2-METHYL-; (ISOBUTYLENE)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: UD0890000
CAS Number: 115-11-7
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: AIR
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: 1005486AI
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: SUP DAT: DO NOT ALLOW TEMP WHERE CYLS ARE STORED TO EXCEED 130F (54C). CYLS SHOULD BE STORED UPRIGHT & FIRMLY (ING 4)
Ingredient Sequence Number: 03
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 3: SECURED TO PVNT FALLING/BEING KNOCKED OVER. FULL & EMPTY CYLS SHOULD BE SEGREGATED. USE A "FIRST IN-FIRST (ING 5)
Ingredient Sequence Number: 04
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 4: OUT" INVENTORY SYS TO PVNT FULL CYLS BEING STORED FOR EXCESS PERIODS OF TIME. IF THIS MIX IS DRY IT IS (ING 6)
Ingredient Sequence Number: 05
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 5: NON-CORR & MAY BE USED W/ALL MATLS OF CONSTRUCTION. MOISTURE CAUSES METAL OXIDES WHICH ARE FORMED W/AIR (ING 7)
Ingredient Sequence Number: 06
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 6: TO BE HYDRATED SO THAT THEY INCREASE IN VOL & LOSE THEIR PROT ROLE (RUST FORM). CONCS OF SO*2, CL*2, (ING 8)
Ingredient Sequence Number: 07
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 7: SALT, ETC, IN THE MOISTURE ENHANCES THE RUSTING OF METALS IN THIS MIX. COMPRESSED GAS CYLS SHOULD NOT BE (ING 9)
Ingredient Sequence Number: 08
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 8: REFILLED EXCEPT BY QUALIFIED PRODUCERS OF COMPRESSED GASES. SHIPMENT OF A COMPRESSED GAS CYL WHICH HAS (ING 10)
Ingredient Sequence Number: 09
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 9: NOT BEEN FILLED BY THE OWNER/WITH HIS (WRITTEN) CONSENT IS A VIOLATION OF FED LAW (49 CFR). ALWAYS (ING 11)
Ingredient Sequence Number: 10
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 10: SECURE CYLS IN AN UPRIGHT POSITION BEFORE TRANSPORTING THEM. NEVER TRANSPORT CYLS IN TRUNKS OF (ING 12)
Ingredient Sequence Number: 11
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 11: VEHICLES, ENCLOSED VANS, TRUCK CABS/IN PASSENGER COMPARTMENTS. TRANSPORT CYLINDERS SECURED IN OPEN (ING 13)
Ingredient Sequence Number: 12
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 12: FLATBED OR IN OPEN PICK-UP TYPE VEHICLES.
Ingredient Sequence Number: 13
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS GAS WITH POSSIBLE VERY SLIGHT OLEFINIC ODOR
Boiling Point: -318F,-194C
Solubility In Water: SUP DAT

Fire and Explosion Hazard Data

Flash Point: N/A
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A
Extinguishing Media: NON-FLAMMABLE GAS. USE MEDIA SUITABLE FOR SURROUNDING FIRE (FP N).
Special Fire Fighting Proc: WEAR NIOSH APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: COMPRESSED AIR AT HIGH PRESSURES WILL ACCELERATE THE BURNING OF MATERIALS TO A GREATER RATE THAN THEY BURN AT ATMOSPHERIC PRESSURE.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: NONE.
Hazardous Decomp Products: NONE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT.

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: ACUTE: THE AMT OF ISO-BUTYLENE IN THIS MIX SHOULD NOT PRESENT ANY SYMPS OF TOX IF THIS MIX IS BREATHED. AIR IS NON-TOX & NEC TO SUPPORT LIFE. INHAL OF AIR IN A HIGH PRESS ENVIRON SUCH AS UNDERWATER DIVING, CAISSONS/HYPERBARIC CHAMBERS CAN RSLT IN SYMPS SIMILAR TO OVEREXP TO PURE OXYGEN. THESE INCL (EFTS OF OVEREXP)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT.
Signs/Symptoms Of Overexp: HLTH HAZ: TINGLING OF FINGERS & TOES, ABNORMAL SENSATIONS, IMPAIRED COORD & CONFUSION. DECOMPRESSION SICKNESS PAINS OR "BENDS" ARE POSS FOLLOWING RAPID DECOMPRESSION. TOX PROPERTIES: HIGH PRESS EFTS (GREATER THAN 2 ATM OF OXYGEN) ARE ON CNS. IMPROPER DECOMPRESSION RESULTS IN THE ACCUMULATION OF NITROGEN IN THE BLOOD.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: FACILITIES/PRACT AT WHICH AIR IS BREATHED IN HIGH PRESS ENVIRON SHOULD BE PREPARED TO DEAL W/ILLNESSES ASSOC W/ DECOMPRESSION (BENDS/CAISSON DISEASE). DECOMPRESSION EQUIP MAY BE REQUIRED. EYE:FLUSH W/POTABLE WATER FOR AT LEAST 15 MIN. SEE MD(FP N). SKIN:FLUSH W/ COPIOUS AMTS OF WATER. SEE MD(FP N). INHAL:REMOVE TO FRESH AIR. SUPPORT BRTHG (GIVE OXYGEN/ARTF RESP)(FP N). INGEST:CALL MD IMMED(FP N).

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: NONE SPECIFIED BY MANUFACTURER.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS (FP N).
Precautions-Handling/Storing: VALVE PROT CAPS MUST REMAIN IN PLACE UNLESS

CONTR IS SECURED W/VALVE OUTLET PIPED TO USE POINT. DO NOT DRAG, SLIDE/ROLL CYLINDERS.
Other Precautions: USE SUITABLE HAND TRUCK FOR CYL MOVEMENT. USE PRESS REDUCING REGULATOR WHEN CONNECTING CYL TO LOWER PRESS (<3,000 PSIG) PIPING/ SYS. DO NOT HEAT CYL BY ANY MEANS TO INCR DISCHARGE RATE OF PROD FROM CYL. USE CHECK VALVE/TRAP IN THE (SUP DAT)

Control Measures

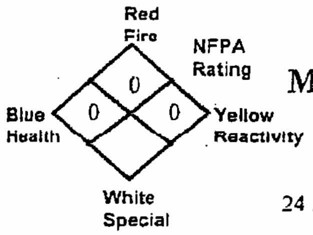
Respiratory Protection: USE NIOSH APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation: NONE SPECIFIED BY MANUFACTURER.
Protective Gloves: ANY MATERIAL.
Eye Protection: ANSI APPRVD CHEM WORKERS GOGGLES (FP N).
Other Protective Equipment: EMERGENCY EYEWASH AND DELUGE SHOWER MEETING ANSI DESIGN CRITERIA (FP N). SAFETY SHOES.
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Suppl. Safety & Health Data: SOL IN H*2O: BUNSEN COEFFICIENT: 0.0183. OTHER PREC: DISCHARGE LINE TO PVNT HAZ BACK FLOW INTO CYL. DO NOT TAMPER W/ (VALVE) SFTY DEVICE. CLOSE VALVE AFTER EACH USE & WHEN EMPTY. PROTECT CYLS FROM PHYSICAL DMG. STORE IN COOL, DRY, WELL-VENTILATED AREA AWAY FROM HEAVILY TRAFFICKED AREAS & EMER EXITS. (ING 3)

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 25FEB97
Label Date: 25FEB97
Label Status: G
Common Name: 100 PPM ISOBUTYLENE IN AIR
Chronic Hazard: NO
Signal Word: CAUTION!
Acute Health Hazard-Slight: X
Contact Hazard-Slight: X
Fire Hazard-Slight: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE: THE AMOUNT OF ISO-BUTYLENE IN THIS MIXTURE SHOULD NOT PRESENT ANY SYMPTOMS OF TOXICITY IF THIS MIXTURE IS BREATHED. AIR IS NON-TOXIC AND NECESSARY TO SUPPORT LIFE. INHALATION OF AIR IN A HIGH PRESSURE ENVIRONMENT SUCH AS UNDERWATER DIVING, CAISSONS OR HYPERBARIC CHAMBERS CAN RESULT IN SYMPTOMS SIMILAR TO OVEREXPOSURE TO PURE OXYGEN. THESE INCLUDE TINGLING OF FINGERS AND TOES, ABNORMAL SENSATIONS, IMPAIRED COORDINATION AND CONFUSION. DECOMPRESSION SICKNESS PAINS OR "BENDS" ARE POSSIBLE FOLLOWING RAPID DECOMPRESSION WHICH RESULTS IN ACCUMULATION OF NITROGEN IN THE BLOOD. CHRONIC: NONE SPECIFIED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: LIQUID AIR CORP
Label Street: 2121 NORTH CALIFORNIA BLVD
Label City: WALNUT CREEK
Label State: CA
Label Zip Code: 94596
Label Country: US
Label Emergency Number: 800-231-1366;800-424-9300(CHEMTREC)



Liqui-Nox ®

MATERIAL SAFETY DATA SHEET

Alconox, Inc.
30 Glenn Street, Suite 309
White Plains, NY 10603
24 Hour Emergency Number – Chem-Tel (800) 255-3924

I. IDENTIFICATION

Product Name (as appears on label)	LIQUI-NOX
CAS Registry Number:	Not Applicable
Effective Date:	January 1, 1999
Chemical Family:	Anionic Liquid Detergent
Manufacturer Catalog Numbers for sizes	1232, 1201, 1215 and 1255

II. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

There are no hazardous ingredients in LIQUI-NOX® as defined by the OSHA Standard and Hazardous Substance List 29 CFR 1910 Subpart Z.

III. PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point (F):	214°F
Vapor Pressure (mm Hg):	No Data
Vapor Density (AIR=1):	No Data
Specific Gravity (Water=1):	1.075
Melting Point:	Not Applicable
Evaporation Rate (Butyl Acetate=1):	Slower
Solubility in Water:	Completely soluble in all proportions.
Appearance:	Yellow liquid, nearly odorless

IV. FIRE AND EXPLOSION DATA

Flash Point:	None (Cleveland Open Cup)
Flammable Limits:	LEL: No Data UEL: No Data
Extinguishing Media:	Water, dry chemical, CO$_2$, foam
Special Fire fighting Procedures:	Self-contained positive pressure breathing apparatus and protective clothing should be worn when fighting fires involving chemicals.
Unusual Fire and Explosion Hazards:	None

V. REACTIVITY DATA

Stability:	Stable
Conditions To Avoid:	None
Incompatibility (Materials To Avoid):	Oxidizing agents.
Hazardous Decomposition or Byproducts:	May release SO$_2$ on burning

VI. HEALTH HAZARD DATA

Route(s) of Entry:	Inhalation? No Skin? Yes Ingestion? Yes
Health Hazards (Acute and Chronic):	Skin contact may prove locally irritating, causing drying and/or chapping. Ingestion may cause discomfort and/or diarrhea.
Carcinogenicity:	NTP? No IARC Monographs? No OSHA Regulated? No
Signs and Symptoms of Exposure:	Prolonged skin contact may cause drying and/or chapping.
Medical Conditions Generally Aggravated by Exposure:	Not established. Unnecessary exposure to this product or any industrial chemical should be avoided.
Emergency and First Aid Procedures:	Eyes: Immediately flush eyes with water for at least 15 minutes. Call a physician. Skin: Flush with plenty of water. Ingestion: Drink large quantities of water or milk. Do not induce vomiting. If vomiting occurs administer fluids. See a physician for discomfort.

VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken if Material is Released or Spilled:	Material foams profusely. For small spills recover as much as possible with absorbent material and flush remainder to sewer. Material is biodegradable.
Waste Disposal Method:	Small quantities may be disposed of in sewer. Large quantities should be disposed of in accordance with local ordinances for detergent products.
Precautions to be Taken in Storing and Handling:	No special precautions in storing. Use protective equipment when handling undiluted material.
Other Precautions:	No special requirements other than the good industrial hygiene and safety practices employed with any industrial chemical.

VIII. CONTROL MEASURES

Respiratory Protection (Specify Type):	Not Required
Ventilation:	Local Exhaust-Normal Special-Not Required Mechanical-Not Required Other-Not Required
Protective Gloves:	Impervious gloves are recommended.
Eye Protection:	Goggles and/or splash shields are recommended.
Other Protective Clothing or Equipment:	Not required
Work/Hygienic Practices:	No special practices required

THE INFORMATION HEREIN IS GIVEN IN GOOD FAITH BUT NO WARRANTY IS EXPRESSED OR IMPLIED.

Please reduce your browser font size for better viewing and printing.

MSDS *Material Safety Data Sheet*

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

METHYL ALCOHOL

MSDS Number: M2015 --- ***Effective Date: 08/15/98***

1. Product Identification

Synonyms: Wood alcohol; methanol; carbinol
CAS No.: 67-56-1
Molecular Weight: 32.04
Chemical Formula: CH_3OH
Product Codes:
J.T. Baker: 5217, 5370, 5794, 5807, 5811, 5842, 5869, 9049, 9063, 9066, 9067, 9069, 9070, 9071, 9073, 9075, 9076, 9077, 9091, 9093, 9096, 9097, 9098, 9263, 9893
Mallinckrodt: 3004, 3006, 3016, 3017, 3018, 3024, 3041, 3701, 4295, 5160, 8814, H080, H488, H603, V079, V571

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Methyl Alcohol	67-56-1	100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! VAPOR HARMFUL. MAY BE FATAL OR CAUSE BLINDNESS IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED

THROUGH SKIN. CANNOT BE MADE NONPOISONOUS. FLAMMABLE LIQUID AND VAPOR. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM AND LIVER.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 4 - Extreme (Flammable)
Reactivity Rating: 1 - Slight
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Once absorbed into the body, it is very slowly eliminated. Symptoms of overexposure may include headache, drowsiness, nausea, vomiting, blurred vision, blindness, coma, and death. A person may get better but then worse again up to 30 hours later.

Ingestion:
Toxic. Symptoms parallel inhalation. Can intoxicate and cause blindness. Usual fatal dose: 100-125 milliliters.

Skin Contact:
Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure.

Eye Contact:
Irritant. Continued exposure may cause eye lesions.

Chronic Exposure:
Marked impairment of vision and enlargement of the liver has been reported. Repeated or prolonged exposure may cause skin irritation.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired liver or kidney function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Flash point: 11C (52F) CC
Autoignition temperature: 464C (867F)
Flammable limits in air % by volume:
lel: 6.0; uel: 36
Flammable Liquid and Vapor!
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Moderate explosion hazard and dangerous fire hazard when exposed to heat, sparks or flames. Sensitive to static discharge.
Fire Extinguishing Media:
Use alcohol foam, dry chemical or carbon dioxide. (Water may be ineffective.)
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Use water spray to blanket fire, cool fire exposed containers, and to flush non-ignited spills or vapors away from fire. Vapors can flow along surfaces to distant ignition source and flash back.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(tm) solvent adsorbent is recommended for spills of this product.

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7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Methyl Alcohol:
- OSHA Permissible Exposure Limit (PEL):
200 ppm (TWA)
- ACGIH Threshold Limit Value (TLV):
200 ppm (TWA), 250 ppm (STEL) skin

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. This substance has poor warning properties.

Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure.

Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.

Odor:
Characteristic odor.

Solubility:
Miscible in water.
Specific Gravity:
0.8
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
64.5C (147F)
Melting Point:
-98C (-144F)
Vapor Density (Air=1):
1.1
Vapor Pressure (mm Hg):
97 @ 20C (68F)
Evaporation Rate (BuAc=1):
5.9

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
May form carbon dioxide, carbon monoxide, and formaldehyde when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents such as nitrates, perchlorates or sulfuric acid. Will attack some forms of plastics, rubber, and coatings. May react with metallic aluminum and generate hydrogen gas.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Methyl Alcohol (Methanol) Oral rat LD50: 5628 mg/kg; inhalation rat LC50: 64000 ppm/4H; skin rabbit LD50: 15800 mg/kg; Irritation data-standard Draize test: skin, rabbit: 20mg/24 hr. Moderate; eye, rabbit: 100 mg/24 hr. Moderate. Investigated as a mutagen, reproductive effector.

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--------\Cancer Lists\------------------------------------------------------
                                    ---NTP Carcinogen---
Ingredient                          Known    Anticipated     IARC Category
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Methyl Alcohol (67-56-1)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. When released into water, this material is expected to readily biodegrade. When released into the air, this material is expected to exist in the aerosol phase with a short half-life. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into air, this material is expected to have a half-life between 10 and 30 days. When released into the air, this material is expected to be readily removed from the atmosphere by wet deposition.
Environmental Toxicity:
This material is expected to be slightly toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: METHANOL
Hazard Class: 3
UN/NA: UN1230
Packing Group: II
Information reported for product/size: 350LB

International (Water, I.M.O.)

Proper Shipping Name: METHANOL
Hazard Class: 3.2, 6.1
UN/NA: UN1230
Packing Group: II
Information reported for product/size: 350LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Methyl Alcohol (67-56-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Methyl Alcohol (67-56-1)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Methyl Alcohol (67-56-1)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Methyl Alcohol (67-56-1)	5000	U154	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 1 Flammability: 3 Reactivity: 0
Label Hazard Warning:
POISON! DANGER! VAPOR HARMFUL. MAY BE FATAL OR CAUSE BLINDNESS IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CANNOT BE MADE NONPOISONOUS. FLAMMABLE LIQUID AND VAPOR. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM AND LIVER.
Label Precautions:
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.

Wash thoroughly after handling.
Keep container closed.
Use only with adequate ventilation.
Keep away from heat, sparks and flame.

Label First Aid:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3, 4, 5, 6, 7, 8, 11, 16.

Disclaimer:

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

MSDS *Material Safety Data Sheet*

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID, 50-70%

MSDS Number: N3660 — *Effective Date: 07/13/00*

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%
CAS No.: 7697-37-2
Molecular Weight: 63.01
Chemical Formula: HNO_3
Product Codes:
J.T. Baker: 411D, 412D, 5371, 5555, 5801, 5826, 5876, 9597, 9598, 9600, 9601, 9602, 9603, 9604, 9606, 9607, 9616, 9617
Mallinckrodt: 1409, 2703, 2704, 412D, 6623, H988, H993, H998, V069, V077, V336, V561, V633, V650

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	50 - 70%	Yes
Water	7732-18-5	30 - 50%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER

MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Yellow (Reactive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:

DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.

Explosion:

Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.

Fire Extinguishing Media:

Water spray may be used to keep fire exposed containers cool. Do not get water inside container.

Special Information:

Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB(R) or TEAM(R) 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.

Odor:

Suffocating, acrid.
Solubility:
Infinitely soluble.
Specific Gravity:
1.41
pH:
1.0 (0.1M solution)
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
122C (252F)
Melting Point:
-42C (-44F)
Vapor Density (Air=1):
2-3
Vapor Pressure (mm Hg):
48 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Light and heat.

11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

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--------\Cancer Lists\------------------------------------------------------
                                              ---NTP Carcinogen---
Ingredient                                    Known    Anticipated    IARC Category
------------------------------------          -----    -----------    -------------
Nitric Acid (7697-37-2)                        No          No             None
```

Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 150LB

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 150LB

International (Air, I.C.A.O.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8

UN/NA: UN2031
Packing Group: II
Information reported for product/size: 150LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------------------------------

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED.

INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

Label Precautions:

Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 1.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

MSDS *Material Safety Data Sheet*

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SODIUM HYDROXIDE SOLUTIONS (MORE THAN 10% NaOH)

MSDS Number: S4037 — ***Effective Date: 08/20/98***

1. Product Identification

Synonyms: Caustic soda solution; lye solution; sodium hydroxide liquid; sodium hydrate solution,Sodium Hydroxide Concentrate Solution StandARd(R), Sodium Hydroxide, DILUT-IT(R) Analytical Concentrates, sodium hydroxide volumetric solutions
CAS No.: 1310-73-2
Molecular Weight: 40.00
Chemical Formula: NaOH in water
Product Codes:
J.T. Baker: 0337, 3719, 3725, 3727, 3729, 4689, 4690, 5000, 5661, 5666, 5668, 5669, 5671, 5672, 5674, 5676
Mallinckrodt: 6290, 7701, 7703, 7705, 7706, 7775, H369, H382, H385, V038, V039, V264

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Hydroxide	1310-73-2	10 - 60%	Yes
Water	7732-18-5	40 - 90%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White Stripe (Store Separately)

Potential Health Effects

Inhalation:
Severe irritant. Effects from inhalation of mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Severe pneumonitis may occur.
Ingestion:
Corrosive! Swallowing may cause severe burns of mouth, throat, and stomach. Severe scarring of tissue and death may result. Symptoms may include bleeding, vomiting, diarrhea, fall in blood pressure. Damage may appears days after exposure.
Skin Contact:
Corrosive! Contact with skin can cause irritation or severe burns and scarring with greater exposures.
Eye Contact:
Corrosive! Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.
Chronic Exposure:
Prolonged contact with dilute solutions or dust has a destructive effect upon tissue.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:

DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:

Perform endoscopy in all cases of suspected sodium hydroxide ingestion. In cases of severe esophageal corrosion, the use of therapeutic doses of steroids should be considered. General supportive measures with continual monitoring of gas exchange, acid-base balance, electrolytes, and fluid intake are also required.

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard. Hot or molten material can react violently with water. Can react with certain metals, such as aluminum, to generate flammable hydrogen gas.

Explosion:

May cause fire and explosions when in contact with incompatible materials.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Adding water to caustic solution generates large amounts of heat.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRACIT(R)-2 or BuCAIM(R) caustic neutralizers are recommended for spills of this product.

7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Store above 16C (60F) to prevent freezing. Always add the caustic to water while stirring; never the reverse. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do not store with aluminum or magnesium. Do not mix with acids or organic materials.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
2 mg/m3 Ceiling
- ACGIH Threshold Limit Value (TLV):
2 mg/m3 Ceiling

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Physical data is displayed for 10%, 30% and 50% aqueous sodium hydroxide solutions. (Merck Index).

Appearance:
Clear, colorless solution.

Odor:
Odorless.

Solubility:
Completely miscible with water.

Density:
10% solution - 1.11; 30% solution - 1.33; 50% solution - 1.53

pH:
14.0 (10%, 30% and 50% solutions)

% Volatiles by volume @ 21C (70F):
No information found.

Boiling Point:
For 10% solution = 105C (221F); for 30% solution = 115C (239F); for 50% solution = 140C (284F).

Melting Point:
For 10% solution = -10C (14 F); for 30% solution = 1C (34F); for 50% solution = 12C (53.6F).

Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
13 @ 60C (140F) (50% solution)

Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
Sodium oxide. Decomposition by reaction with certain metals releases flammable and explosive hydrogen gas.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Sodium hydroxide in contact with acids and organic halogen compounds, especially trichloroethylene, may causes violent reactions. Contact with nitromethane and other similar nitro compounds causes formation of shock-sensitive salts. Contact with metals such as aluminum, magnesium, tin, and zinc cause formation of flammable hydrogen gas. Sodium hydroxide, even in fairly dilute solution, reacts readily with various sugars to produce carbon monoxide. Precautions should be taken including monitoring the tank atmosphere for carbon monoxide to ensure safety of personnel before vessel entry.

Conditions to Avoid:
Heat, moisture, incompatibles.

11. Toxicological Information

Sodium hydroxide: irritation data: skin, rabbit: 500 mg/24H severe; eye rabbit: 50 ug/24H severe. Investigated as a mutagen.

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--------\Cancer Lists\------------------------------------------------------
                                           ---NTP Carcinogen---
Ingredient                                 Known    Anticipated     IARC Category
------------------------------------       -----    -----------     -------------
Sodium Hydroxide (1310-73-2)                No          No              None
Water (7732-18-5)                           No          No              None
```

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SODIUM HYDROXIDE SOLUTION
Hazard Class: 8
UN/NA: UN1824
Packing Group: II
Information reported for product/size: 360LB

International (Water, I.M.O.)

Proper Shipping Name: SODIUM HYDROXIDE, SOLUTION
Hazard Class: 8
UN/NA: UN1824
Packing Group: II
Information reported for product/size: 360LB

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Sodium Hydroxide (1310-73-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Sodium Hydroxide (1310-73-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Sodium Hydroxide (1310-73-2)	No	No	No	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\--------

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
Sodium Hydroxide (1310-73-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: Yes (Mixture / Liquid)

Australian Hazchem Code: 2R
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **1**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL

IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.

Label Precautions:

Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.

Label First Aid:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 10.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **S5236** * * * * * *Effective Date:* ***10/31/00*** * * * * * *Supercedes:* ***11/06/97***

MSDS *Material Safety Data Sheet*

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SODIUM THIOSULFATE 0.01 TO 1.0 NORMAL VOLUMETRIC SOLUTIONS

1. Product Identification

Synonyms: Sodium thiosulfate 0.01 to 1.0 Normal volumetric solutions
CAS No.: 7772-98-7
Molecular Weight: 158.11
Chemical Formula: $Na2S2O3$ in aqueous solution
Product Codes:
J.T. Baker: 5637, 5654
Mallinckrodt: 4682, 5531, 6840, 8097, H362, H371

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Thiosulfate	7772-98-7	0.02 - 25%	Yes
Water	7732-18-5	75 - 99%	No

3. Hazards Identification

Emergency Overview

CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO

SKIN, EYES, AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 0 - None
Flammability Rating: 0 - None
Reactivity Rating: 0 - None
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
May cause mild irritation to the respiratory tract.
Ingestion:
May cause mild irritation to the gastrointestinal tract.
Skin Contact:
May cause mild irritation and redness.
Eye Contact:
May cause mild irritation, possible reddening.
Chronic Exposure:
Chronic exposure may cause skin effects.
Aggravation of Pre-existing Conditions:
No information found.

---

4. First Aid Measures

Inhalation:
Not expected to require first aid measures.
Ingestion:
Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.
Skin Contact:
Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:
Wash thoroughly with running water. Get medical advice if irritation develops.

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5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
Use protective clothing and breathing equipment appropriate for the surrounding fire.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust.

---

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None established.
Ventilation System:
Not expected to require any special ventilation.
Personal Respirators (NIOSH Approved):
Not expected to require personal respirator usage.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, colorless solution.
Odor:
Odorless.
Solubility:
Infinitely miscible.
Specific Gravity:
ca. 1.01-1.14
pH:
Aqueous solution is neutral.
% Volatiles by volume @ 21C (70F):
> 60
Boiling Point:
ca. 100C (ca. 212F)
Melting Point:
ca. 0C (ca. 32F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Burning may produce sulfur oxides.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Metal nitrates, sodium nitrite, iodine, acids, lead, mercury, and silver salts.
Conditions to Avoid:
Incompatibles.

---

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

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--------\Cancer Lists\------------------------------------------------------
                                          ---NTP Carcinogen---
Ingredient                                Known    Anticipated    IARC Category
------------------------------------      -----    -----------    -------------
Sodium Thiosulfate (7772-98-7)             No          No             None
Water (7732-18-5)                          No          No             None
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12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Dilute with water and flush to sewer if local ordinances allow, otherwise, whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Sodium Thiosulfate (7772-98-7)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Sodium Thiosulfate (7772-98-7)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Sodium Thiosulfate (7772-98-7)	No	No	No	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sodium Thiosulfate (7772-98-7)	No	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **1** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Avoid breathing mist.
Keep container closed.
Use with adequate ventilation.
Label First Aid:
If inhaled, remove to fresh air. Get medical attention for any breathing difficulty. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Get medical attention if irritation

develops or persists. If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Product Use:

Laboratory Reagent.

Revision Information:

No changes.

Disclaimer:

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****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS *Material Safety Data Sheet*

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
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NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

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SULFURIC ACID, 52 - 100 %

MSDS Number: S8234 — *Effective Date: 09/14/00*

1. Product Identification

Synonyms: Oil of vitriol; Babcock acid; sulphuric acid
CAS No.: 7664-93-9
Molecular Weight: 98.08
Chemical Formula: H2SO4 in H2O
Product Codes:
J.T. Baker: 5030, 5137, 5374, 5802, 5815, 5889, 5960, 5961, 5971, 6902, 9673, 9674, 9675, 9676, 9679, 9680, 9681, 9682, 9684, 9687, 9691, 9693, 9694
Mallinckrodt: 2468, 2876, 2878, 2900, 2904, 3780, 4222, 5524, 5557, H644, H976, H996, V344, V651

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sulfuric Acid	7664-93-9	52 - 100%	Yes
Water	7732-18-5	0 - 48%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR

CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Water Reactive)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema, a medical emergency.

Ingestion:
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death.

Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burn can occur. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death.

Eye Contact:
Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.

Chronic Exposure:
Long-term exposure to mist or vapors may cause damage to teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult,

give oxygen. Call a physician immediately.

Ingestion:

DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Excess acid on skin can be neutralized with a 2% solution of bicarbonate of soda. Call a physician immediately.

Eye Contact:

Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

5. Fire Fighting Measures

Fire:

Concentrated material is a strong dehydrating agent. Reacts with organic materials and may cause ignition of finely divided materials on contact.

Explosion:

Contact with most metals causes formation of flammable and explosive hydrogen gas.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Do not use water on material. However, water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving this material. Stay away from sealed containers.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB(R) or TEAM(R) 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the acid to water; never add water to the acid. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Sulfuric Acid:
- OSHA Permissible Exposure Limit (PEL) -
1 mg/m3 (TWA)
- ACGIH Threshold Limit Value (TLV) -
1 mg/m3(TWA), 3 mg/m3 (STEL), A2 - suspected human carcinogen for sulfuric acid contained in strong inorganic acid mists.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge and particulate filter (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P particulate filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Clear oily liquid.
Odor:
Odorless.
Solubility:
Miscible with water, liberates much heat.
Specific Gravity:
1.84 (98%), 1.40 (50%), 1.07 (10%)
pH:
1 N solution (ca. 5% w/w) = 0.3; 0.1 N solution (ca. 0.5% w/w) = 1.2; 0.01 N solution (ca. 0.05% w/w) = 2.1.
% Volatiles by volume @ 21C (70F):
No information found.
Boiling Point:
ca. 290C (ca. 554F) (decomposes at 340C)
Melting Point:
3C (100%), -32C (93%), -38C (78%), -64C (65%).
Vapor Density (Air=1):
3.4
Vapor Pressure (mm Hg):
1 @ 145.8C (295F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Concentrated solutions react violently with water, spattering and liberating heat.
Hazardous Decomposition Products:
Toxic fumes of oxides of sulfur when heated to decomposition. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas, and with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Water, potassium chlorate, potassium perchlorate, potassium permanganate, sodium, lithium, bases, organic material, halogens, metal acetylides, oxides and hydrides, metals (yields hydrogen gas), strong oxidizing and reducing agents and many other reactive substances.
Conditions to Avoid:
Heat, moisture, incompatibles.

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11. Toxicological Information

Toxicological Data:
Oral rat LD50: 2140 mg/kg; inhalation rat LC50: 510 mg/m3/2H; standard Draize, eye rabbit, 250 ug (severe); investigated as a tumorigen, mutagen, reproductive effector.
Carcinogenicity:
Cancer Status: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a known human carcinogen, (IARC category 1). This classification applies only to mists containing sulfuric acid and not to sulfuric acid or sulfuric acid solutions.

--------\Cancer Lists\--------

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Sulfuric Acid (7664-93-9)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material may be removed from the atmosphere to a moderate extent by dry deposition.
Environmental Toxicity:
LC50 Flounder 100 to 330 mg/l/48 hr aerated water/Conditions of bioassay not specified;
LC50 Shrimp 80 to 90 mg/l/48 hr aerated water /Conditions of bioassay not specified;
LC50 Prawn 42.5 ppm/48 hr salt water /Conditions of bioassay not specified.
This material may be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 440LB

International (Water, I.M.O.)

Proper Shipping Name: SULPHURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 440LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Sulfuric Acid (7664-93-9)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Sulfuric Acid (7664-93-9)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Sulfuric Acid (7664-93-9)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sulfuric Acid (7664-93-9)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: Yes (Pure / Liquid)

Australian Hazchem Code: 2P
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products

Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 2 Other: **Water reactive**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Do not contact with water.
Label First Aid:
In all cases call a physician immediately. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use. Excess acid on skin can be neutralized with a 2% bicarbonate of soda solution. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
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24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

MSDS *Material Safety Data Sheet*

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ZINC ACETATE

MSDS Number: Z1140 --- *Effective Date: 11/17/99*

1. Product Identification

Synonyms: Acetic acid, zinc salt, dihydrate; zinc diacetate; zinc acetate dihydrate
CAS No.: 557-34-6 (Anhydrous)
Molecular Weight: 219.50
Chemical Formula: (CH3COO)2Zn 2H2O
Product Codes:
J.T. Baker: 4296, 4297, 4304, 5658
Mallinckrodt: 8740

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Zinc Acetate	557-34-6	98 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 1 - Slight
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath.
Ingestion:
Irritation of the mucous membranes due to hydrolysis and formation of acid in the stomach can occur. Large amounts can produce stomach cramps, stricture of the esophagus, nausea, and vomiting.
Skin Contact:
Causes irritation to skin. Symptoms include redness, itching, and pain.
Eye Contact:
Causes irritation, redness, and pain.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None established.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear protective gloves and clean body-covering clothing.

Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
White crystals or powder.
Odor:
Slight acetic acid (vinegar) odor.
Solubility:
43g in 100g water.
Density:
1.74
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
Decomposes.
Melting Point:
237C (459F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Loses water of hydration above 100C.

Hazardous Decomposition Products:
Freshly-formed zinc oxide or zinc oxide fumes at high temperatures (over 800C).
Hazardous Polymerization:
Will not occur.
Incompatibilities:
No incompatibility data found. Oxidizing agents, zinc salts in general, alkalis and their carbonates, oxalates, phosphates, sulfides.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

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11. Toxicological Information

Oral rat: LD50: 2510 mg/kg. Reproductive effects cited. Mutation references cited.

--------\Cancer Lists\--

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Zinc Acetate (557-34-6)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------------------------------

Ingredient	TSCA	EC	Japan	Australia
Zinc Acetate (557-34-6)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Zinc Acetate (557-34-6)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

-SARA 302- ------SARA 313------

```
Ingredient                                 RQ    TPQ     List  Chemical Catg.
-----------------------------------------  ---   -----   ----  --------------
Zinc Acetate (557-34-6)                    No    No      No    Zinc compoun

--------\Federal, State & International Regulations - Part 2\----------------
                                                   -RCRA-     -TSCA-
Ingredient                                 CERCLA  261.33      8(d)
-----------------------------------------  ------  ------     ------
Zinc Acetate (557-34-6)                    1000    No          No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes     Chronic: No   Fire: No  Pressure: No
Reactivity: No          (Mixture / Solid)
```

Australian Hazchem Code: No information found.
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **1** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes, skin and clothing.
Avoid breathing dust.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
No changes.
Disclaimer:
****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This

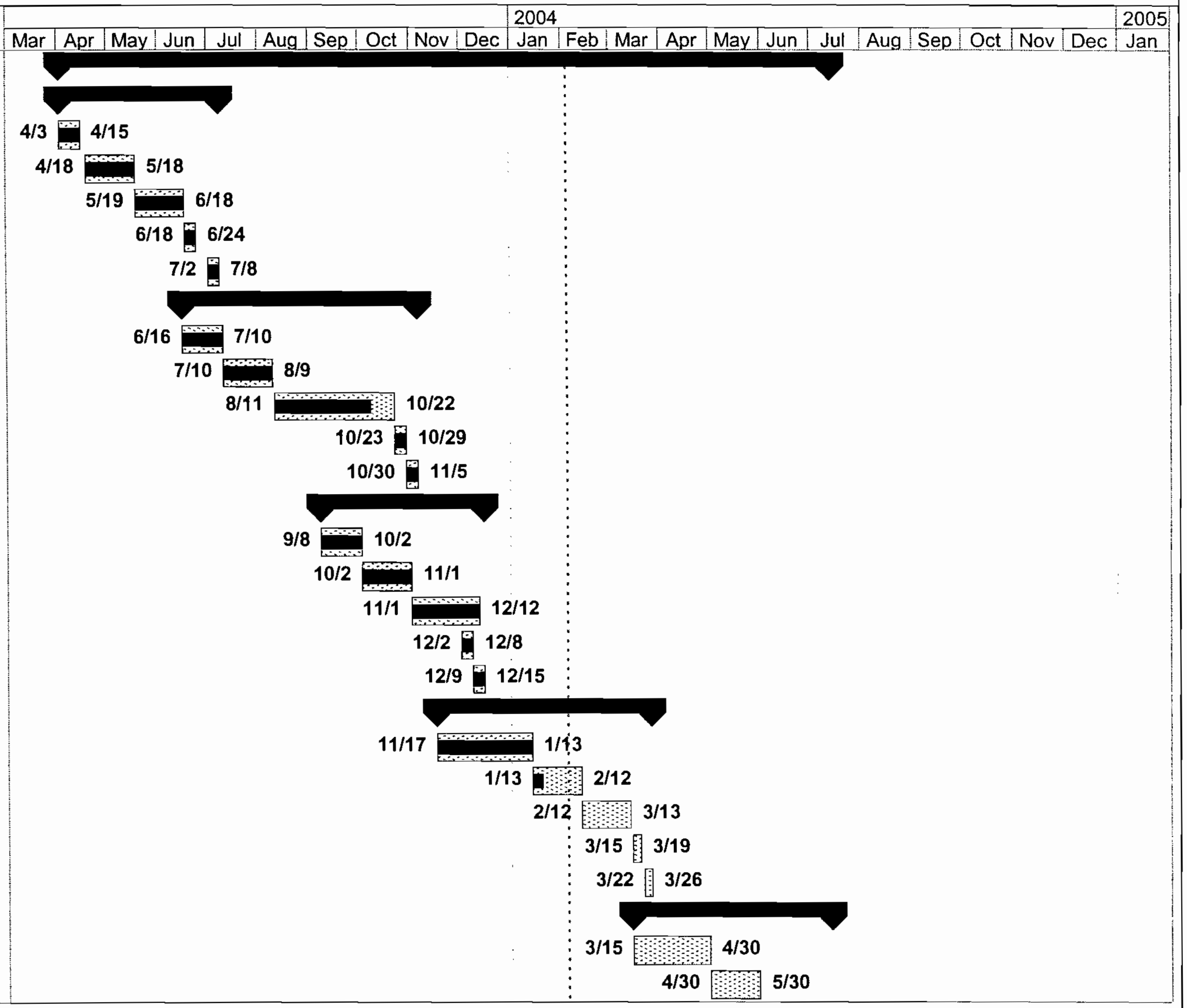
****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

Appendix D
Sampling Schedule, Figures of LTM Sites, and LTM Sample Analysis Summaries

Basewide Monitoring Schedule
Griffiss AFB

ID	Task Name
22	**SAMPLING**
23	**Spring 2003 Sampling Round**
24	Task 5.1: Field Sampling
25	Task 5.1a: Laboratory Analysis
26	Task 6.1/6.2: QCS
27	Task 6.3: Data Reduction
28	Task 6.4: ERPIMS
29	**Summer 2003 Sampling Round**
30	Task 5.1: Field Sampling
31	Task 5.1a: Laboratory Analysis
32	Task 6.1/6.2: QCS
33	Task 6.3: Data Reduction
34	Task 6.4: ERPIMS
35	**Fall 2003 Sampling Round**
36	Task 5.1: Field Sampling
37	Task 5.1a: Laboratory Analysis
38	Task 6.1/6.2: QCS
39	Task 6.3: Data Reduction
40	Task 6.4: ERPIMS
41	**Winter 2003 Sampling Round**
42	Task 5.1: Field Sampling
43	Task 5.1a: Laboratory Analysis
44	Task 6.1/6.2: QCS
45	Task 6.3: Data Reduction
46	Task 6.4: ERPIMS
47	**Spring 2004 Sampling Round**
48	Task 5.1: Field Sampling
49	Task 5.1a: Laboratory Analysis

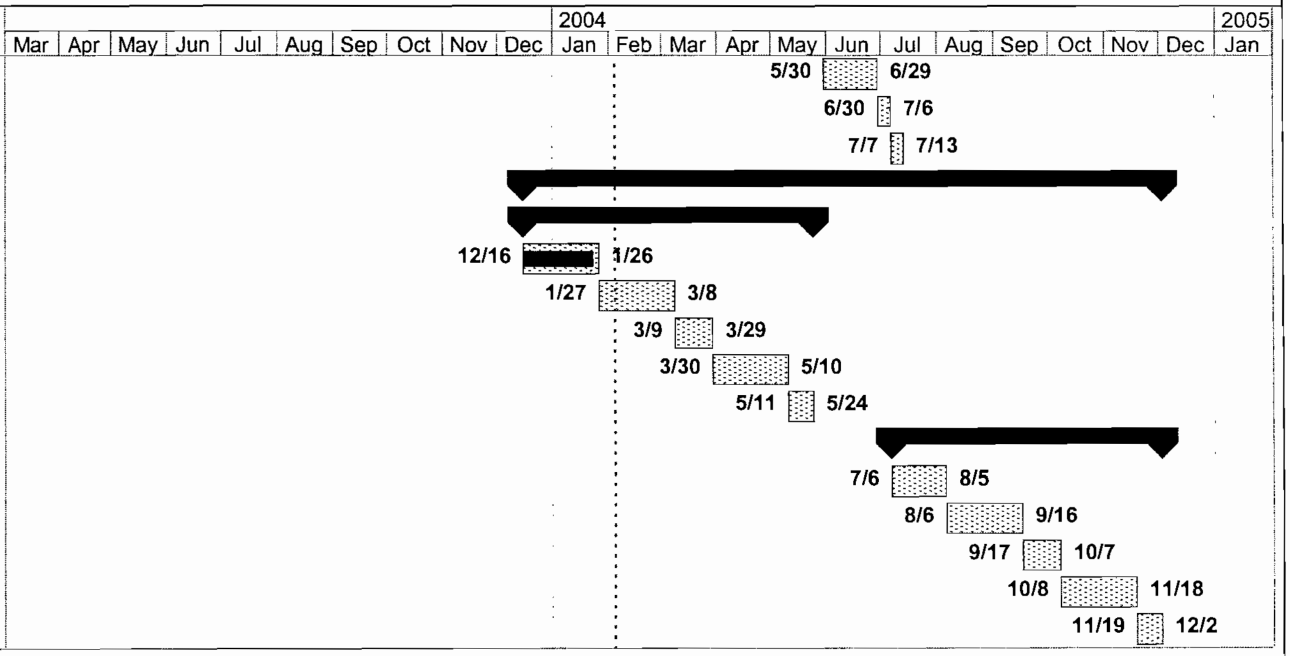


Project: Griffiss FPM Basewide Samp
Date: 2/4/04

Task	▨	Rolled Up Task	▨	External Tasks	▨
Progress	▬	Rolled Up Milestone	◇	Project Summary	▬
Milestone	◆	Rolled Up Progress	▬	Group By Summary	▬
Summary	▬	Split	………		

Basewide Monitoring Schedule
Griffiss AFB

ID	Task Name
50	Task 6.1/6.2: QCS
51	Task 6.3: Data Reduction
52	Task 6.4: ERPIMS
53	**REPORTING**
54	**Semi-Annual Report Including Fall 03**
55	Working Draft
56	AF/USACE Review
57	Draft
58	Regulatory Review
59	Final
60	**Semi-Annual Report Including Spring 04**
61	Working Draft
62	AF/USACE Review
63	Draft
64	Regulatory Review
65	Final



Project: Griffiss FPM Basewide Samp
Date: 2/4/04

Task	▨	Rolled Up Task	▨	External Tasks	▨
Progress	▬	Rolled Up Milestone	◇	Project Summary	▬
Milestone	◆	Rolled Up Progress	▬	Group By Summary	▬
Summary	▬	Split	......		

23 **Spring 2003 Sampling Round**
AP2, T10, B14, B786, B789, B7001
29 **Summer 2003 Sampling Round**
LANDFILLS 4,5&7,ST36,ST37,B43,SS20,SS25,ST51,B101,SD41,AP2VC,AP1,AP2,T10,B14,B786,B789,B7001,B133
35 **Fall 2003 Sampling Round**
LANDFILLS 4,5&7,ST36,ST37,B43,SS20,SS25,ST51,B101,SD41,AP2VC,SS54,AP1,AP2,T10,B14,B786,B789,B7001,B133
41 **Winter 2003 Sampling Round**
LANDFILLS 1,2/3,4,5 & 7,ST36,ST37,B43,SS20,FT30,SS25,ST51,B101,SD41,AP2VC,SS54,AP1,AP2,B786,B789,B7001,B133,BFSA,PAD5750,B15,B5773...
47 **Spring 2004 Sampling Round**
LANDFILLS 1,2/3,4,5 & 7,ST36,ST37,B43,SS20,FT30,SS25,ST51,B20,B35,LOT69,B301B101,SD41,AP2VC,SS54,AP1,AP2,T10,B14,B786,B789,B7001,B133,BFSA,PAD5750,B15,B5773

54 **Semi-Annual Report Including Fall 03**
LANDFILLS 4,5&7,ST36,ST37,SS20,SS25,ST51,SD41,AP2VC,AP1,AP2,T10,B14,B786,B789,B7001,B133
60 **Semi-Annual Report Including Spring 04**
LANDFILLS 1,2/3,4,5 & 7,ST36,ST37,B43,SS20,FT30,SS25,ST51,B20,B35,LOT69,B301B101,SD41,AP2VC,SS54,AP1,AP2,T10,B14,B786,B789,B7001,B133,BFSA,PAD5750,B15,B5773...

Table 3-3 Landfill 1 Routine Sample Analysis Summary

Sample Type/ Locations	Screen Interval Depth (ft bgs)[1]	Sampling Rationale	Target Analytes/ EPA Method Numbers[2,3]	Matrix	# of Samples	Sampling Frequency	Evaluation Criteria
Groundwater		------------------	• VOCs – 8260B Target COCs • Metals (except Hg) 6010B • Landfill Leachate Indicators: Anions-9056 Nitrogen (TKN) – 351.3 Ammonia – 350.2 COD – 5220C BOD – 5210B TOC – 9060 TDS – 160.1 Alkalinity – 310.1 Phenols – 9065 Hardness – 130.2	Water	14[4]	Quarterly[5]	If downgradient wells do not exhibit exceedances of NYS Groundwater Standards or Base background levels for two successive monitoring events, evaluate monitoring frequency and number of wells.
LF1P-2	8' – 13'	Downgradient from source, within plume					
LF1P-3	12' – 17'	Downgradient from source and plume					
LF1P-5	15' – 20'	Downgradient from source and plume					
LF1MW-5	10' – 20'	Downgradient from source, within plume					
LF1MW-6	5' – 15'	Downgradient from source, crossgradient from plume					
LF1MW-10[6]	17' – 27'	Downgradient from source					
LF1MW-11[6]	6' – 16'	Downgradient from source					
LF1MW-12[6]	6' – 16'	Downgradient from source					
LF1MW-13[6]	9' – 19'	POC well					
LF1MW-103[6]	top of bedrock – 10'	Bedrock, Downgradient from source					
MWSAR03	12' – 22'	Downgradient from source					
Surface Water (Six Mile Creek)	Depth to ground-water ranges from 0.0 to 27 ft bgs.	------------------					Vary surface water analytes and frequency to follow groundwater program.
LF1SW-1		Potential contaminant receptor					
LF1SW-2		Potential contaminant receptor					
LF1SW-3		Potential contaminant receptor					
Methane All gas monitoring probes		In accordance with 6 NYCRR 360-2.17(f)	• CGI Methane or %LEL[7]	Gas	10	Quarterly	

[1] Screen intervals provided for new wells requiring installation are estimated; screen interval depths will be finalized in the field. Assumes the 10-ft screen interval is between 3' above water table and 7' below water table.

[2] Routine parameters based on 6 NYCRR Part 360, Subpart 2, Appendix A.

[3] If additional analytes are detected during the baseline sampling, they will be included in the routine analysis until results comply with Acceptable Limits on Decision Errors.

[4] Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

[5] The first sampling quarter will include baseline parameters (Table 3-4); the second through fourth quarters will include routine parameters.

[6] Indicates new monitoring well requiring installation.

[7] Combustible Gas Indicator (CGI); Lower Explosive Limit (LEL).

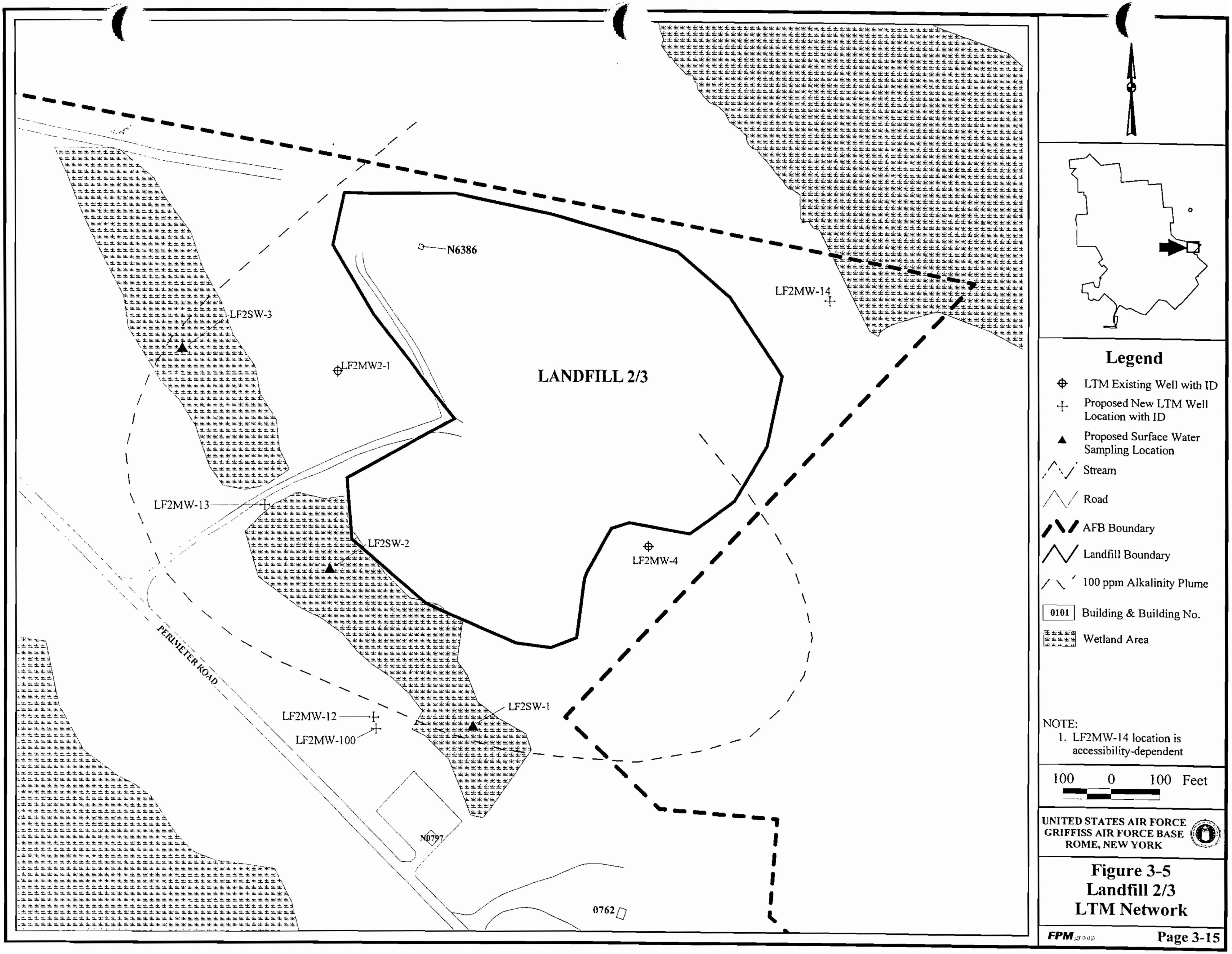


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Figure 3-5
Landfill 2/3
LTM Network

FPM group

Table 3-1 Landfill 4 LTM Sample Analysis Summary

Site/ Sampling Locations	Screen Interval Depth (ft AMSL)	Sampling Rationale	Target Analytes/ EPA Method Numbers	Matrix	# of Samples[1]	Sampling Frequency	Evaluation Criteria
Landfill 4		------------------	• Gross Alpha & Beta– 9310 • Ra-226– 903 • Ra-228– 904	Water	4	Quarterly	Evaluate COC concentrations with respect to re-evaluation criteria.
LF6MW-1	460.8’ – 450.8’	Upgradient from former source					
TMC-USGS-3	447.9’ – 445.4’	Crossgradient from former source					
LF4MW-1	460.59’ – 450.59’	Downgradient POC					
LF4MW-2	462.2’ – 452.7’	Downgradient POC					

[1] Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

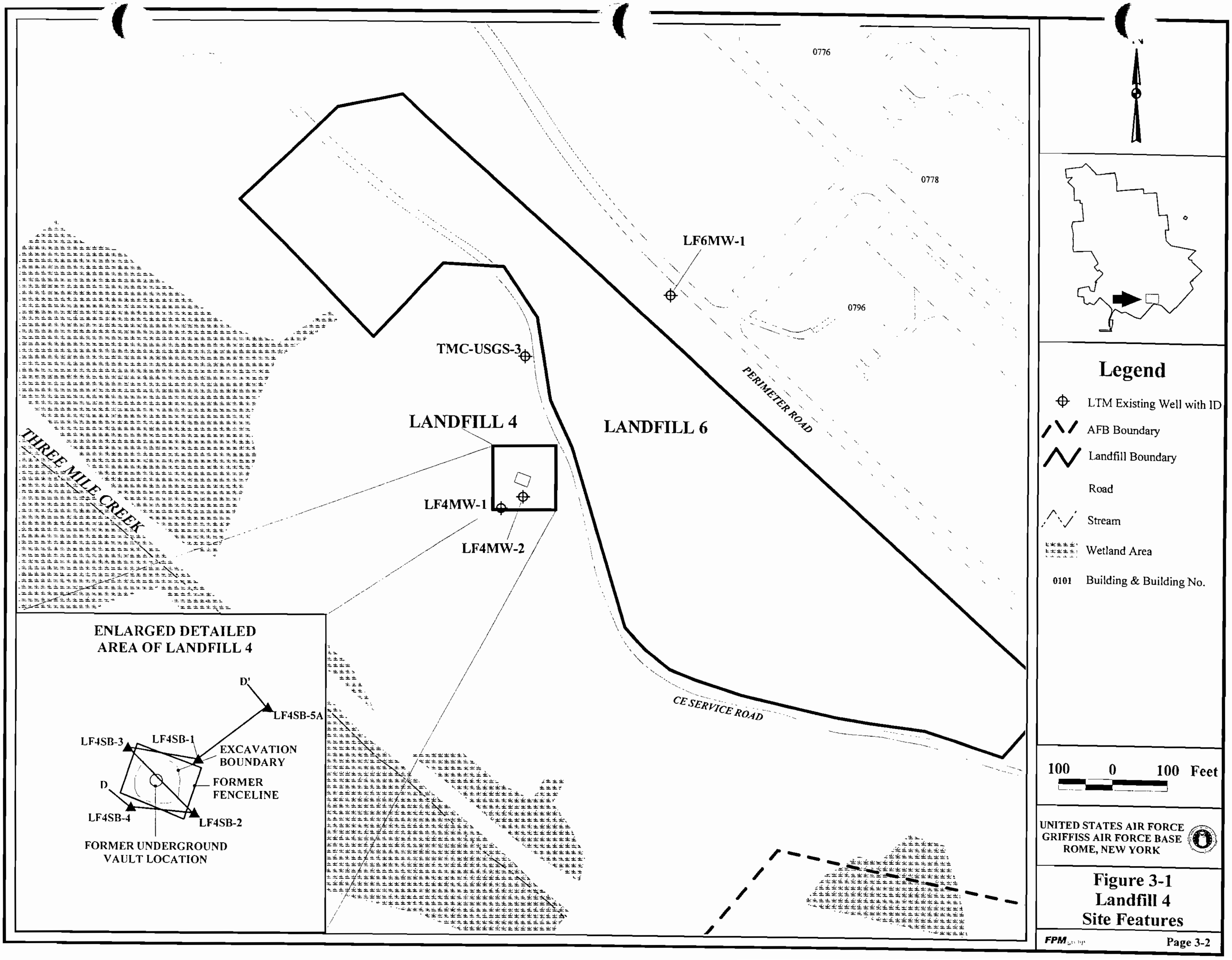

Figure 3-1
Landfill 4
Site Features

Table 4-1 Landfill 5 Baseline Sample Analysis Summary

Site/ Sampling Locations	Screen Interval Depth (ft bgs)	Sampling Rationale	Target Analytes/ EPA Method Numbers[1]	Matrix	# of Samples[2]	Sampling Frequency	Evaluation Criteria
Landfill 5		--------------------	VOCs – 8260B Metals (except Hg) – 6010B Mercury – SW-846, Method 7470A PCBs – 8082 (groundwater/leachate only) Landfill Leachate Indicators: Anions-SW9056 Nitrogen (TKN) – 351.2 Ammonia – 350.2 COD – 410.4 BOD – 405.1 TOC – SW9060 TDS – 160.1 Alkalinity – 310.1 Phenols – SW9066 Hardness – 130.2 Color – 110.2 Boron – 6010B	Water	8	Annually	If downgradient wells do not exhibit exceedances of NYS Groundwater Standards or Base background levels for two successive monitoring events, evaluate monitoring frequency and number of wells.
LF5MW-3	3.2’ – 13.2’	Downgradient of potential source and between landfill and hardfill					
MW49D07	4’ – 14’	Downgradient from potential source					
LF5MW-5	3’ – 13’	Downgradient from potential source					
LF5MW-100	60’ – 70’	Bedrock, downgradient					
LF5MW-1A	12.9’ – 22.9’	Upgradient from potential					
Leachate Samples		If encountered					
	---------- Depth to groundwater ranges from 2.8 to 19.9 ft bgs.	--------------------					
Three Mile Creek							
LF5SW-1		Potential contaminant receptor					
LF5SW-2		Potential contaminant receptor					
LF5SW-3		Potential contaminant receptor					

[1] Baseline parameters based on 6 NYCRR Part 360, Subpart 2, Appendix A.

[2] Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

Table 4-2 Landfill 5 Routine Sample Analysis Summary

Site/ Sampling Locations	Screen Interval Depth (ft bgs)	Sampling Rationale	Target Analytes/ EPA Method Numbers[1]	Matrix	# of Samples[2]	Sampling Frequency	Evaluation Criteria
Landfill 5		--------------------	Metals (except Hg) – 6010B PCBs – 8082 (groundwater/leachate only) Landfill Leachate Indicators: Anions-SW9056 Nitrogen (TKN) – 351.2 Ammonia – 350.2 COD – 410.4 BOD – 405.1 TOC – SW9060 TDS – 160.1 Alkalinity – 310.1 Phenols – SW9066 Hardness – 130.2	Water	8	Quarterly	If downgradient wells do not exhibit exceedances of NYS Groundwater Standards or Base background levels for two successive monitoring events, evaluate monitoring frequency and number of wells.
LF5MW-3	3.2' – 13.2'	Downgradient of potential source and between landfill and hardfill					
MW49D07	4' – 14'	Downgradient from potential source					
LF5MW-5	3' – 13'	Downgradient from potential source					
LF5MW-100	60' – 70'	Bedrock, downgradient					
LF5MW-1A	12.9' – 22.9'	Upgradient from potential source					
Leachate Samples		If encountered					
	----------- Depth to groundwater ranges from 2.8 to 19.9 ft bgs.	--------------------					
Three Mile Creek							
LF5SW-1		Potential contaminant receptor					
LF5SW-2		Potential contaminant receptor					
LF5SW-3		Potential contaminant receptor					

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[1] Routine parameters based on 6 NYCRR Part 360, Subpart 2, Appendix A.

[2] Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

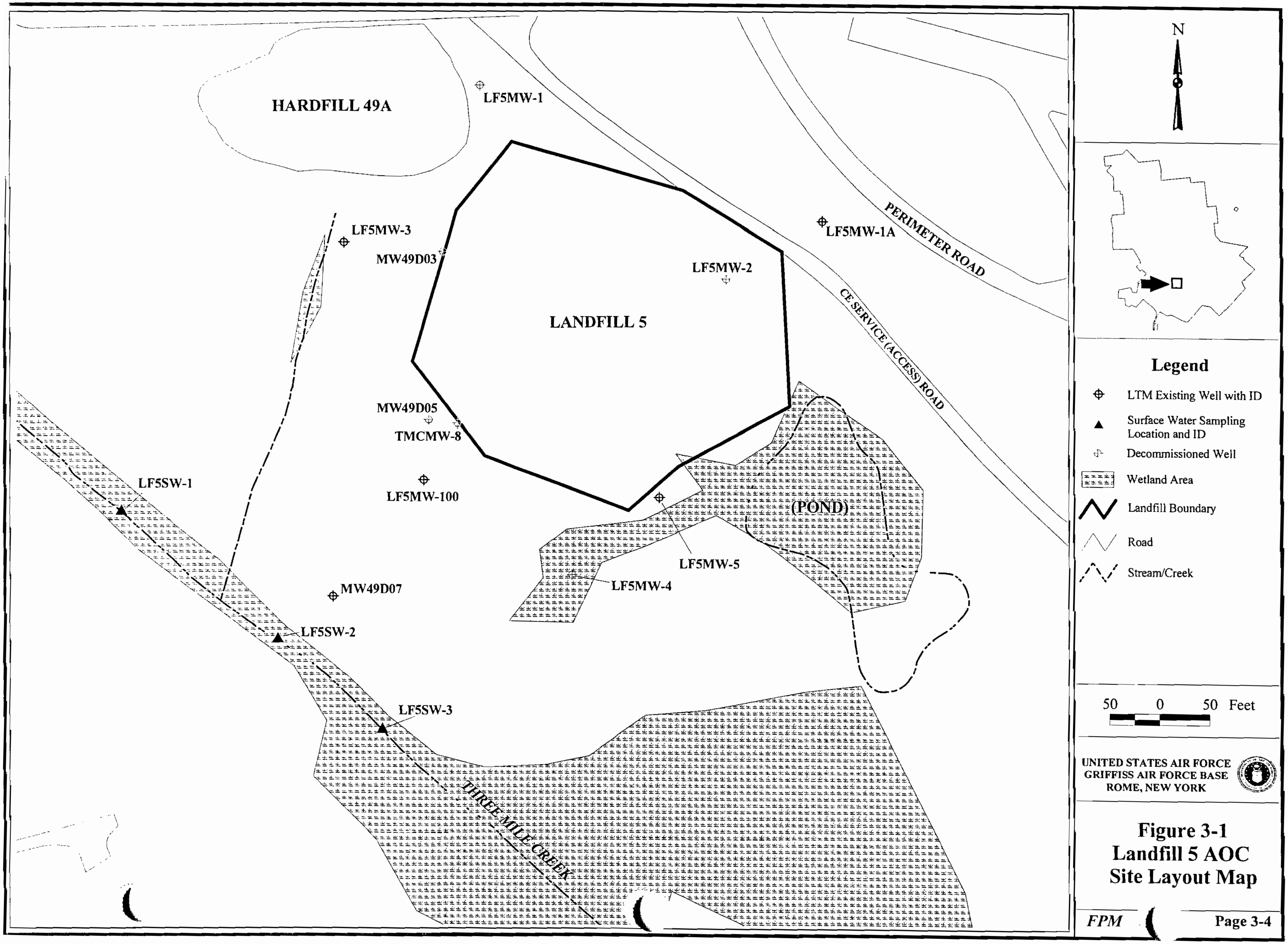

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Figure 3-1
Landfill 5 AOC
Site Layout Map

Table 5-1 Landfill 7 Baseline Sample Analysis Summary

Site/ Sampling Locations	Screen Interval Depth (ft bgs)	Sampling Rationale	Target Analytes/ EPA Method Numbers[1]	Matrix	# of Samples[2]	Sampling Frequency	Evaluation Criteria
Landfill 7		------------------	VOCs – 8260B Metals (except Hg) 6010B Mercury – SW-846 Method 7470A Cyanide – 9010B Landfill Leachate Indicators: Anions-SW9056 Nitrogen (TKN) – 351.2 Ammonia – 350.2 COD – 410.4 BOD – 405.1 TOC – SW9060 TDS – 160.1 Alkalinity – 310.1 Phenols – SW9066 Hardness – 130.2 Color – 110.2 Boron – 6010B	**Water**	10	**Annually**	If downgradient wells do not exhibit exceedances of NYS Groundwater Standards or Base background levels for two successive monitoring events, evaluate monitoring frequency and number of wells.
LF7MW-22	5.9' – 10.9'	Downgradient from source, within plume					
LF7MW-23	4' – 14'	Downgradient from source, cross-gradient from plume					
LF7MW-100	33' – 43'	Downgradient from source, within plume					
LF7MW-26	6.5' – 16.5'	Downgradient from source, within plume					
LF7MW-27	2.5' – 12.5'	Downgradient from source					
LF7MW-28	1.5' – 11.5'	POC well					
LF7MW-29	11' – 21'	Upgradient from source					
LF7MW-30	1.5' – 11.5'	Downgradient from source					
Wetlands - Southwest	Depth to groundwater ranges from less than 1 ft to 28 ft bgs.	------------------					
LF7WL-3		Potential contaminant receptor					
LF7WL-4		Potential contaminant receptor					

1 Baseline parameters based on 6 NYCRR Part 360, Subpart 2, Appendix A.

2 Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

Table 5-2 Landfill 7 Routine Sample Analysis Summary

Site/ Sampling Locations	Screen Interval Depth (ft bgs)	Sampling Rationale	Target Analytes/ EPA Method Numbers[1]	Matrix	# of Samples[2]	Sampling Frequency	Evaluation Criteria
Landfill 7		------------------	VOCs – 8260B Target COCs[3]: TCE, DCE, vinyl chloride only Metals (except Hg) 6010B Landfill Leachate Indicators: Anions-9056 Nitrogen (TKN) – 351.3 Ammonia – 350.2 COD – 5220C BOD – 5210B TOC – 9060 TDS – 160.1 Alkalinity – 310.1 Phenols – 9065 Hardness – 130.2	**Water**	10	**Quarterly**	If downgradient wells do not exhibit exceedances of NYS Groundwater Standards or Base background levels for two successive monitoring events, evaluate monitoring frequency and number of wells.
LF7MW-22	5.9’ – 10.9’	Downgradient from source, within plume					
LF7MW-23	4’ – 14’	Downgradient from source, cross-gradient from plume					
LF7MW-100	33’ – 43’	Downgradient from source, within plume					
LF7MW-26	6.5’ – 16.5’	Downgradient from source, within plume					
LF7MW-27	2.5’ – 12.5’	Downgradient from source					
LF7MW-28	1.5’ – 11.5’	POC well					
LF7MW-29	11’ – 21’	Upgradient from source					
LF7MW-30	1.5’ – 11.5’	Downgradient from source					
Wetlands - Southwest	Depth to groundwater ranges from less than 1 ft to 28 ft bgs.	------------------					
LF7WL-3		Potential contaminant receptor					
LF7WL-4		Potential contaminant receptor					

[1] Routine parameters based on 6 NYCRR Part 360, Subpart 2, Appendix A.

[2] Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

[3] If additional target COCs are detected during the baseline sampling, they will be included in the routine analysis until results comply with Acceptable Limits on Decision Errors.

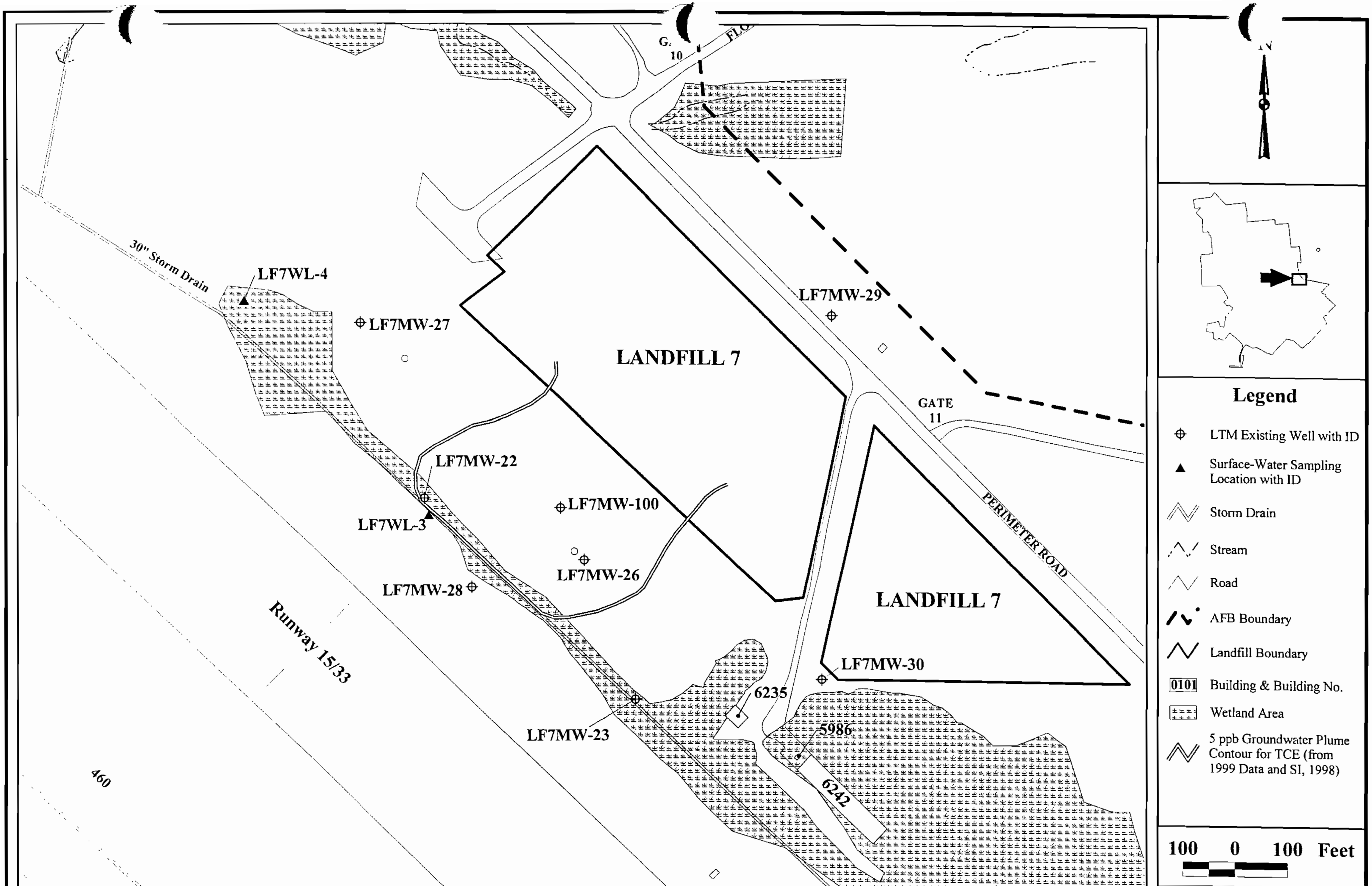

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Figure 3-2
Landfill 7
LTM Network

FPM group

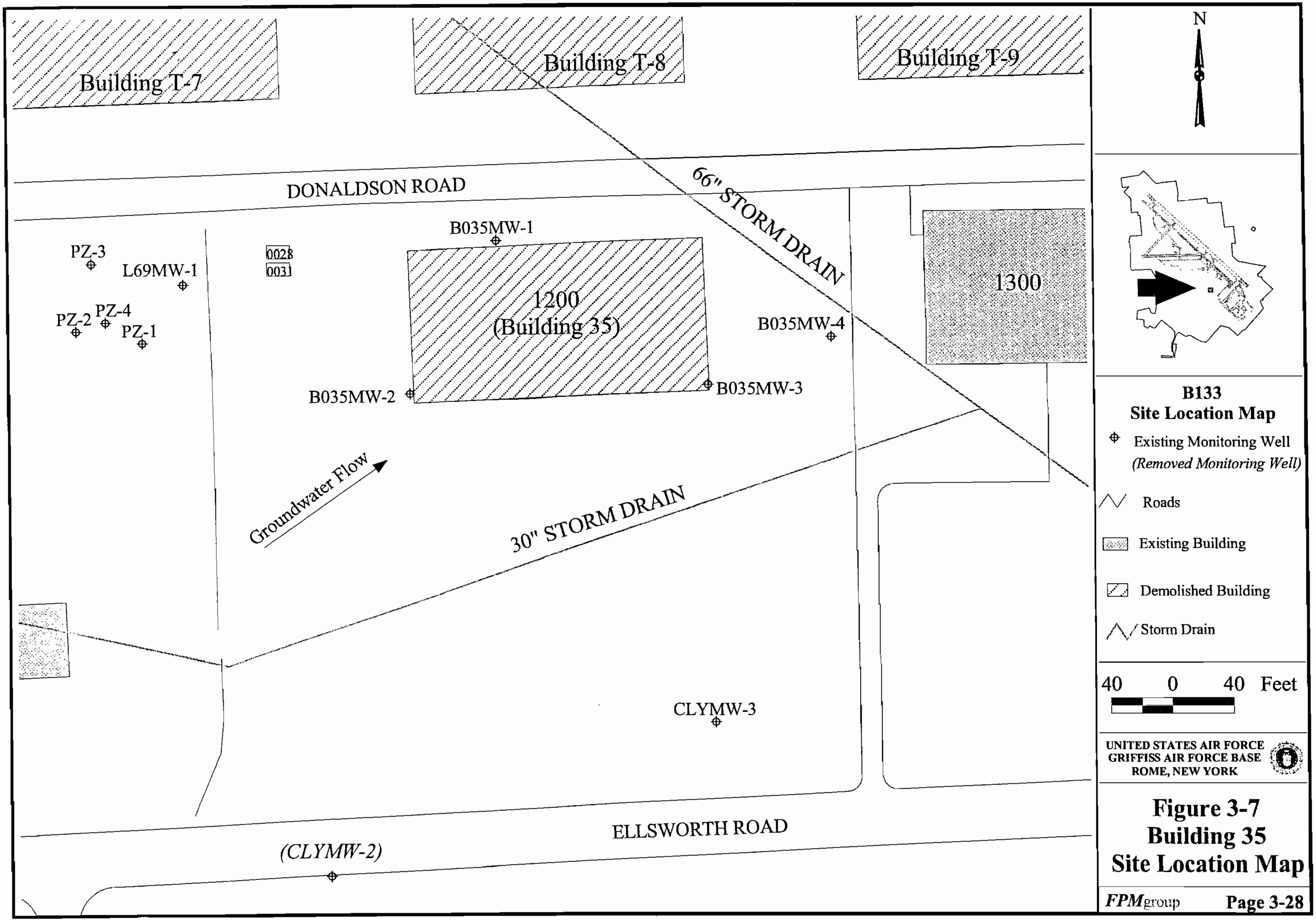

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Figure 3-7
Building 35
Site Location Map

FPMgroup

Table 3-3 Building 35 AOC LTM Sample Analysis Summary

Site/ Sampling Locations	Screen Interval Depth (ft above MSL)	Sampling Rationale	Target Analytes/EPA Method Numbers	Matrix	# of Samples[1]	Sampling Frequency	Evaluation Criteria
Building 35			• VOCs (EPA Method 8260): Target COCs; chloroform, DCE, PCE, TCE, vinyl chloride. • Total and Dissolved Metals (EPA Method 6010)	Water	4 (1 from each well)	Annually	If downgradient wells do not exhibit exceedances of NYS Groundwater Standards or Base background levels for two successive monitoring events, evaluate monitoring frequency and number of wells.
B035MW-1	449.2 – 459.2’	Upgradient					
B035MW-2	449.2 – 459.2’	Crossgradient					
B035MW-3	449.0 – 459.0’	Potential Source Area					
B035MW-4	449.3 – 459.3’	Downgradient of potential source					
	Depth to groundwater ranges from 456.4 to 456.5 ft MSL.						

[1] Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

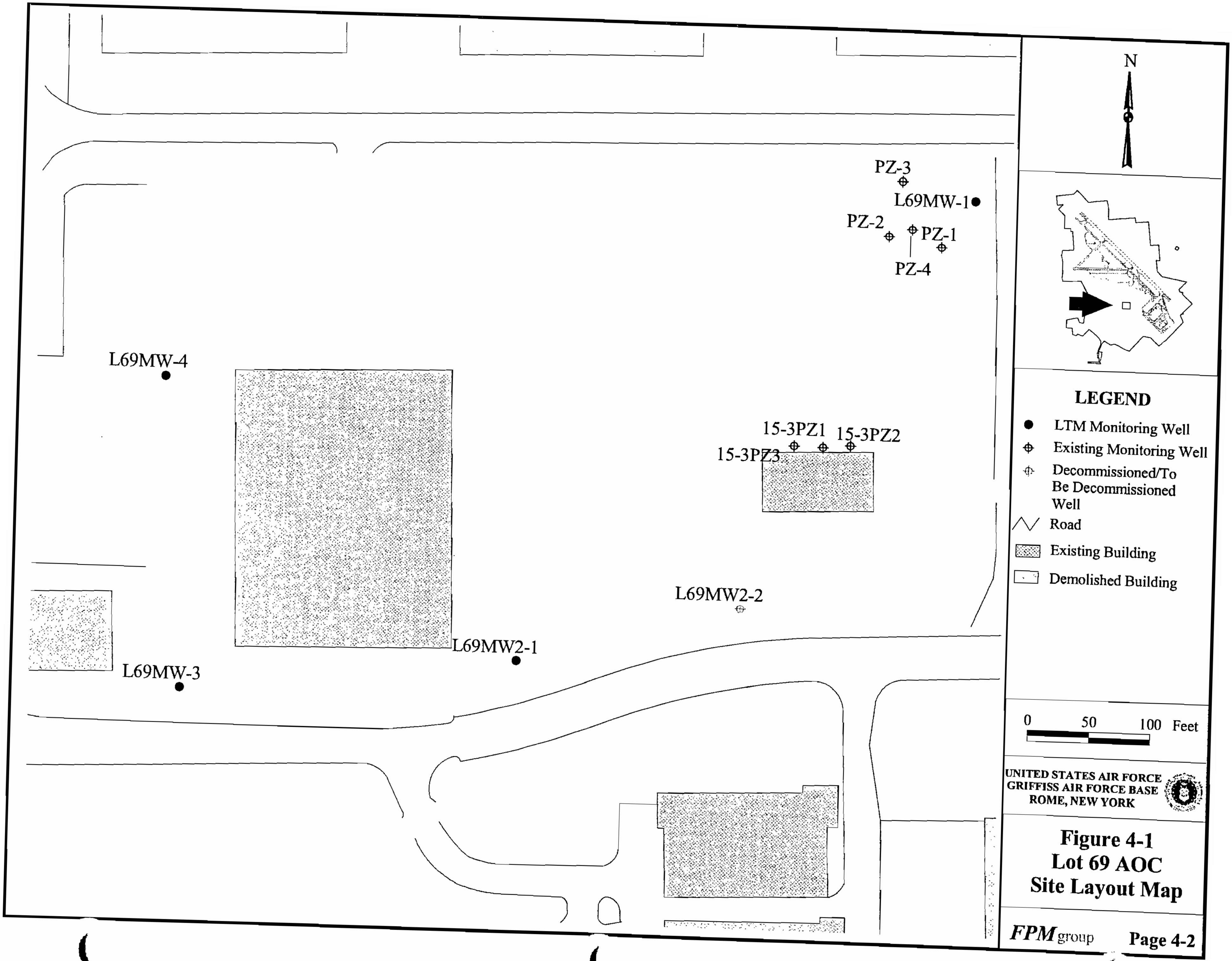

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Figure 4-1
Lot 69 AOC
Site Layout Map

Table 4-1
Lot 69 AOC LTM Sampling Plan Summary

Site/ Sampling Locations	Sampling Rationale	Target Analytes/ EPA Method Numbers	Sampling Frequency	Sampling Frequency
L69MW-1 L69MW2-1 L69MW2-2 L69MW-3 L69MW-4	Upgradient Crossgradient Crossgradient Downgradient Downgradient	• SVOCs (EPA Method 8270): • Total and Dissolved Metals (EPA Method 6010 and 7470/7471)	Annually	If downgradient wells do not exhibit exceedances of NYS Groundwater Standards or Base background levels; No Further Action (NFA) And Site Closure Will Be Considered.

4.5 RESULTS

In March 2002 the groundwater at the Lot 69 AOC was monitored for total and dissolved metals (SW6010 list plus mercury). The groundwater analytical results are shown in Table 4-2.

The groundwater analytical results at location L69MW-1 showed three exceedances of the NYS Groundwater Standards for total (762 M µg/L) and dissolved manganese (514 µg/L), dissolved selenium (12.6 F µg/L), and for total sodium (27,300 µg/L) and dissolved sodium (27,500 µg/L). There were detections of eight other metals, all at levels below their respective NYS Groundwater Standards.

The groundwater analytical results at location L69MW2-1 showed four exceedances of the NYS Groundwater Standards for total iron (1,940 µg/L), total manganese (709 µg/L), dissolved selenium (10.6 F µg/L) and total sodium (94,000 µg/L) and dissolved sodium (91,000 µg/L). Dissolved iron was not detected and the concentration for dissolved manganese was only 3.9 µg/L. There were detections of ten other metals, all at levels below their respective NYS Groundwater Standards.

The groundwater analytical results at locations L69MW-3 showed three exceedances of the NYS Groundwater Standards for total chromium (140 µg/L), total iron (1,300 µg/L), and total sodium (546,000 µg/L) and dissolved sodium (216,000 µg/L). Dissolved chromium and iron were not detected. There were detections of ten other metals, all at levels below their respective NYS Groundwater Standards.

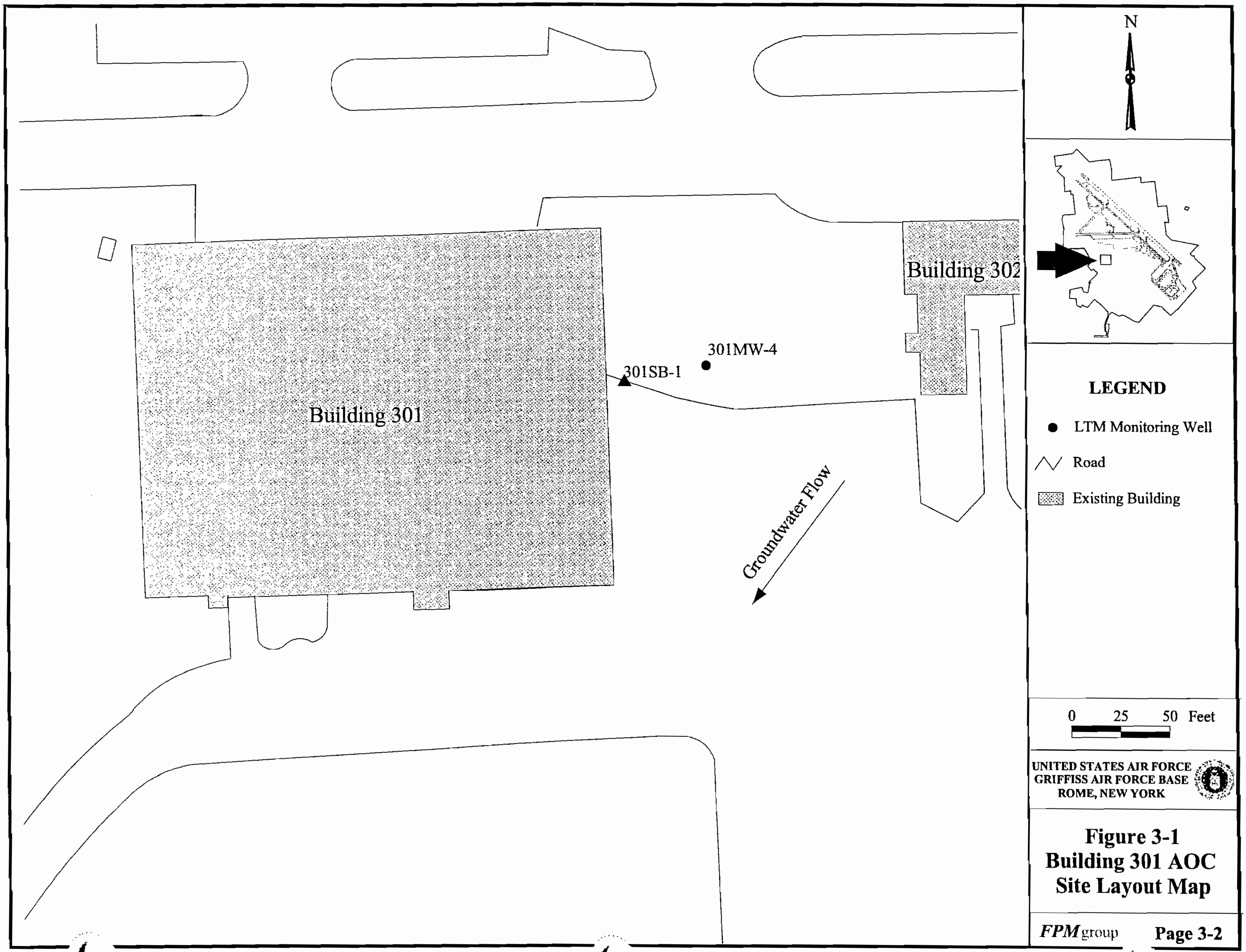

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Figure 3-1
Building 301 AOC
Site Layout Map

FPM group

1994 and a second groundwater sample was collected in April 1995 from a temporary monitoring well drilled adjacent to the first. The groundwater samples showed five VOCs, six SVOCs, nine pesticides, 22 metals, cyanide, and glycol, with only two VOCs and three SVOC exceedances. Twelve metals (aluminum, arsenic, beryllium, chromium, copper, iron, lead, manganese, nickel, selenium, sodium, and thallium) were detected above standards or guidance values. The elevated metals concentrations were attributed to the suspended particulate matter (turbidity) that was contained in the collected samples.

3.4 LTM Plan

Table 3-1 summarizes the LTM sampling and analysis plan. The objectives of the Building 301 LTM program include the following:

- Monitor the COC levels across the Building 301 AOC;
- Monitor the attenuation of COCs at the Building 301 AOC;

Confirm that metal detections were isolated and that concentration levels remain below the NYS Standards; and

- Confirm that metals concentrations are stabilizing or decreasing.

Table 3-1
Building 301 AOC LTM Sampling Plan Summary

Site/ Sampling Locations	Sampling Rationale	Target Analytes/ EPA Method Numbers	Sampling Frequency	Sampling Frequency
301MW-4	Within potential plume	• VOCs (EPA Method SW 8260) • SVOCs (EPA Method 8270), • Total and Dissolved Metals (EPA Method 6010 and 7470/7471).	Annually	If well 301MW-4 does not exhibit exceedances of NYS Groundwater Standards or Base background levels; No Further Action (NFA) And Site Closure Will Be Considered.

3.5 Results

In March 2002, groundwater at the Building 301 AOC was monitored for SVOCs (SW8270 list), and total and dissolved metals (SW6010 list plus mercury). At the request of AFRPA personnel, VOC analysis (SW8260) was added to the sample analysis list for the April 2003 sampling round. The sample was collected applying EPA-approved low flow technique with a bladderpump. The groundwater analytical results are shown in Table 3-2.

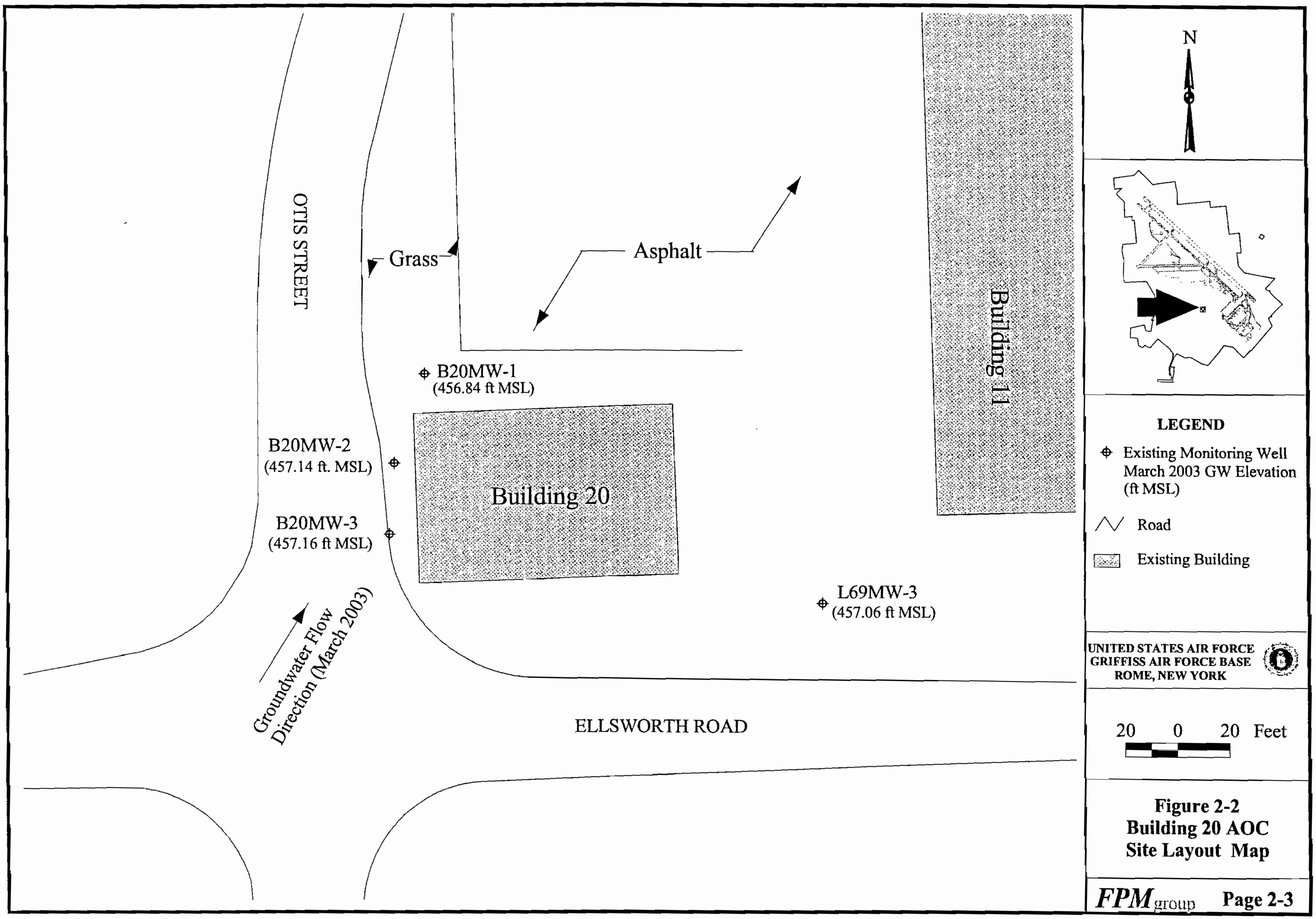

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Figure 2-2
Building 20 AOC
Site Layout Map

FPM group

2.4 LTM Plan

Table 2-1 summarizes the LTM sampling and analysis plan. The objectives of the Building 20 LTM program include the following:

- Monitor the COC levels across the Building 20 AOC;
- Monitor the attenuation of COCs at Building 20 AOC;
- Confirm that metal detections were isolated and that concentration levels remain below the NYS Standards; and
- Confirm that metals concentrations are stabilizing or decreasing.

Table 2-1
Building 20 AOC LTM Sampling Plan Summary

Site/ Sampling Locations	Sampling Rationale	Target Analytes/ EPA Method Numbers	Sampling Frequency	Sampling Frequency
B20MW-1 B20MW-2 B20MW-3	Downgradient Crossgradient Crossgradient	• SVOCs (EPA Method 8270): • Total and Dissolved Metals (EPA Method 6010 and 7470/7471)	Annually	If downgradient wells do not exhibit exceedances of NYS Groundwater Standards or Base background levels No Further Action (NFA) and Site Closure Will Be Considered.

2.5 Results

Monitoring wells B20MW-1, -2, and -3 were sampled in April 2001 using a peristaltic pump and the low flow sampling method; samples were submitted to the laboratory for analysis for SVOCs, total and dissolved metals, including lead and mercury, using EPA Methods SW8270C, SW6010B, SW7421 and SW7470A, respectively. No SVOCs were detected in any of the sampling locations. Table 2-2, 2-3, and 2-4 contain the results of the April 2001, March 2002, and March 2003 groundwater analytical results separated per sampling location.

In March 2002, the groundwater at the Building 20 AOC was monitored for SVOCs (SW8270 List), and total and dissolved metals (SW6010 list plus mercury). Total metals analyses was performed on raw groundwater that contained suspended solids and dissolved metals analyses were performed on the groundwater after it was filtered and thus contained no suspended solids.

The groundwater analytical results for SVOCs indicated no detections at sampling locations B020MW-1, -2, and -3. Previous sampling results from March 2001 similarly indicated no SVOC detections.

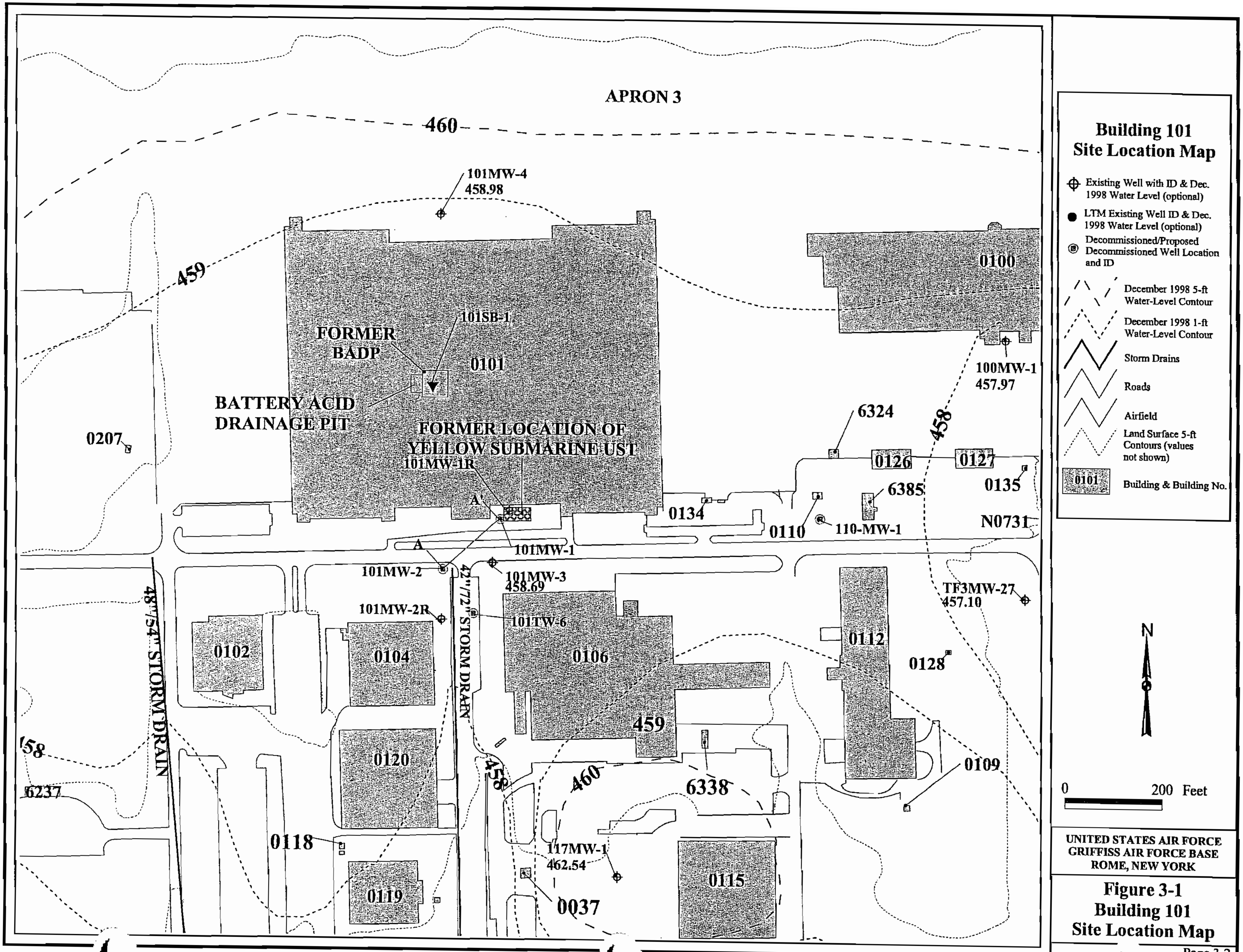

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Figure 3-1
Building 101
Site Location Map

Table 3-2 Building 101 LTM Sample Analysis Summary

Site/ Sampling Locations	Screen Interval Depth (ft bgs)	Sampling Rationale	Target Analytes/ EPA Method Numbers	Matrix	# of Samples[1]	Sampling Frequency	Evaluation Criteria
Building 101		------------------	• VOCs – 8260B Target COCs: PCE, TCE, cis-1,2-DCE, vinyl chloride, chloroform	Water	3	Semi-annually	If downgradient wells do not exhibit exceedances of NYS Groundwater Standards or Base background levels for two successive monitoring events, evaluate monitoring frequency and number of wells.
101MW-1R	9.4' – 19.4'	Downgradient from source, within plume					
101MW-2R	13.8' - 23.8'	Downgradient from plume					
101MW-3	8.9' – 18.9'	Downgradient from source, within plume					
	Depth to groundwater ranges from 13.63 to 14.14 ft. bgs.						

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[1] Please refer to FSP for details concerning the number of quality assurance/quality control (QA/QC) samples and their locations. At least one matrix spike/matrix spike duplicate (MS/MSD) and two field duplicates will be collected per sample delivery group (SDG); one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

Table 2
Building 782 Site
Groundwater Sample Analysis Summary

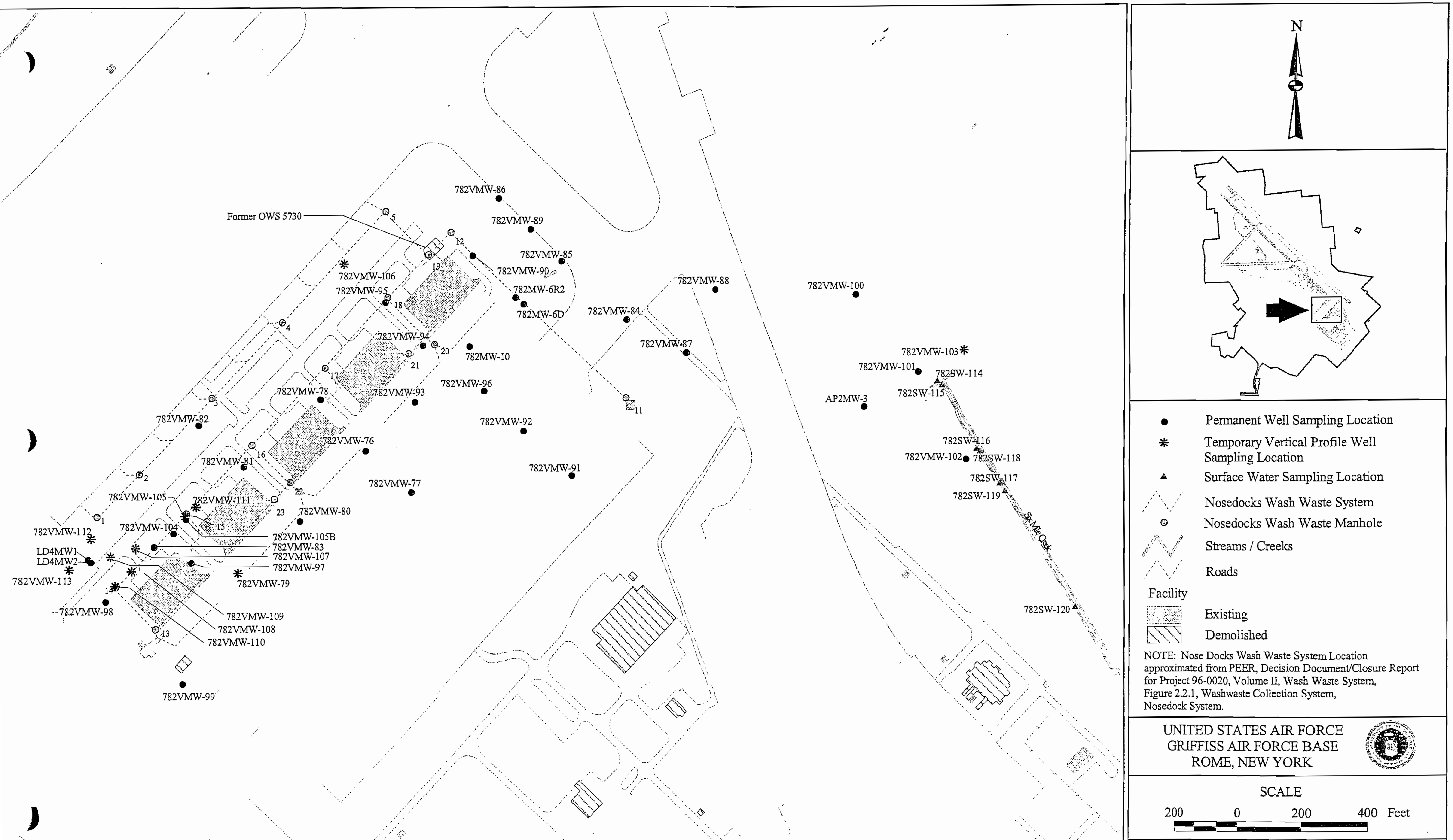
Analyte/ EPA Method Numbers	Matrix	No. of Samples	No. of Equip. Blanks[1]	No. of Ambient Blanks[1]	No. of Trip Blanks[1]	No. of Field Dups./ Reps.[1]	No. of MS and MSD[1]	Total No. of Samples
VOCs – SW8260B	Water	7 (1 from each boring)	1	1	1	1	1	12

[1] *At least one MS/MSD and two field duplicates will be collected per SDG (20 field samples); one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs. All quality assurance/quality control blanks will be coordinated with other long-term monitoring sites.*

* *Use of EPA Method 8260 for STARS VOC analysis is acceptable because the method utilizes gas Chromatography and Mass Spectroscopy to confirm the concentrations of the target hydrocarbons.*

Table 3
Building 782 Site Field Activity Summary

Activity	Rationale	Analytical Parameters
Confirmation of groundwater flow direction.	The groundwater flow direction and elevation will be confirmed using the existing monitoring wells.	For all Groundwater: Volatiles List 8260B. Field parameters for all groundwater: pH, conductivity, DO, turbidity, temp., and oxidation/reduction potential. No soil sampling is planned at this time; however, soil cuttings from drilling operations will be screened with a PID and inspected for staining and odors. Soil samples for laboratory analysis (Method 8260B) will be collected if contamination is identified.
Installation of initial three sampling points northeast of Building 783.	Three temporary wells will be installed approximately 50 feet apart crossgradient of the previously detected contamination at Building 782, as shown in Figure 1. The data collected will characterize the groundwater upgradient of Manhole 21.	
Installation of four additional sampling points southwest of Building 783.	Four additional temporary wells will be installed approximately 50 feet apart southwest of Building 783 and upgradient of the previously detected contamination at Building 782, as shown in Figure 1. The data collected will characterize the groundwater downgradient of Manhole 17 and LCP-C2.	
Optional additional temporary points and/or monitoring wells.	Based on the results of field screening and analytical results, or should the existing suite of monitoring wells be deemed insufficient to track the migration of the plume, additional temporary points may be installed to further delineate the extent of contamination. An additional monitoring well may also be installed should results indicate that the source area has been located.	



NOTE: Nose Docks Wash Waste System Location approximated from PEER, Decision Document/Closure Report for Project 96-0020, Volume II, Wash Waste System, Figure 2.2.1, Washwaste Collection System, Nosedock System.

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Figure 2-1
Nosedocks / Apron 2 Chlorinated Plume Sampling Locations

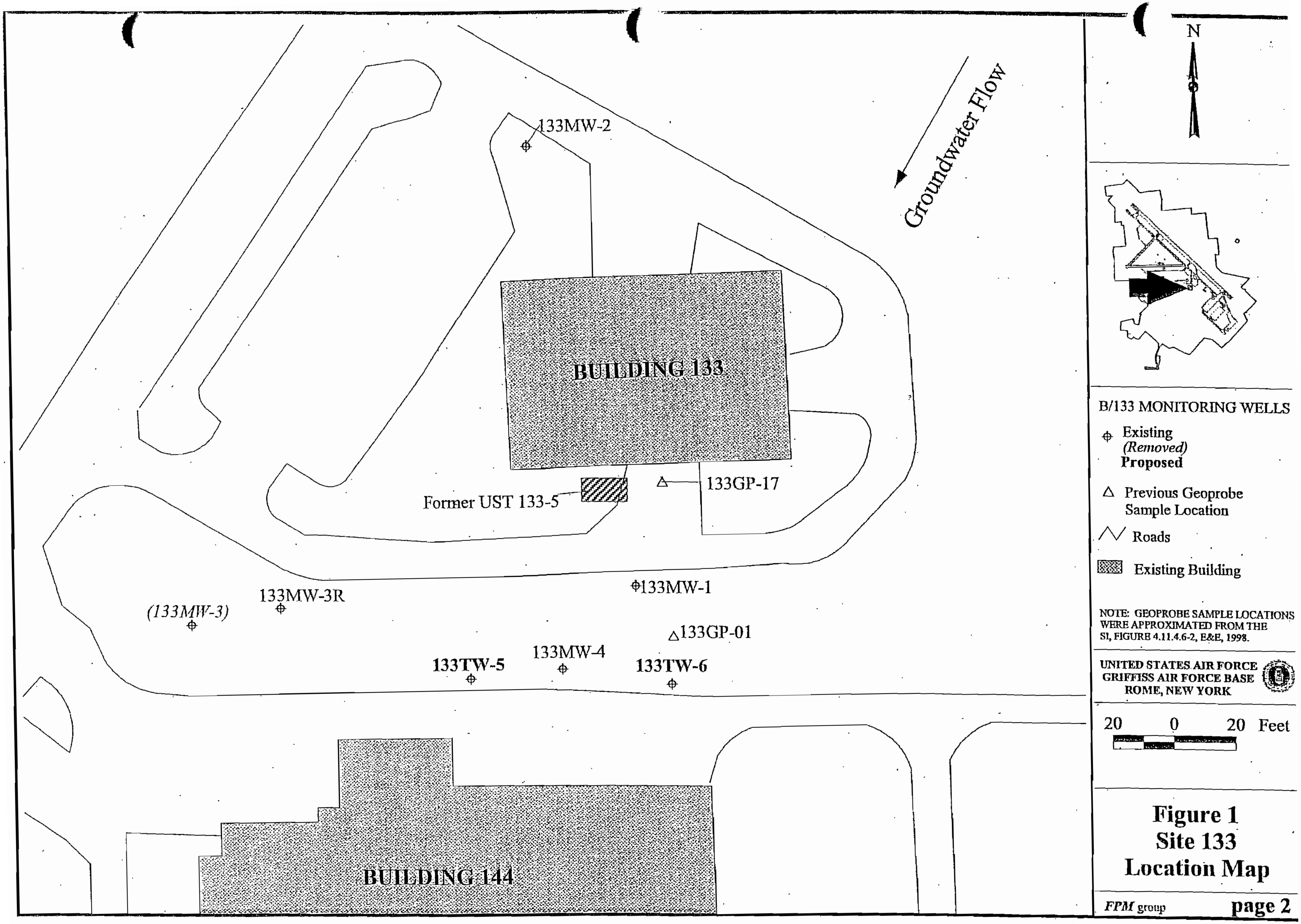

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Figure 1
Site 133
Location Map

FPM group

Table 1
Building 133 Site
Groundwater Sample Analysis Summary

Analyte/ EPA Method Numbers	Matrix	No. of Samples	No. of Equip. Blanks	No. of Ambient Blanks	No. of Trip Blanks	No. of Field Dups./ Reps.	No. of MS and MSD	Total No. of Samples
VOCs – SW8260B SVOC – SW8270	**Water**	6-8	--[1]	--[1]	--[1]	--[1]	--[1]	6-8

[1] *At least one MS/MSD and two field duplicates will be collected per SDG (20 field samples); one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs. All quality assurance/quality control blanks will be coordinated with other long-term monitoring sites.*

Table 2
Building 133 Site Field Activity Summary

Activity	Rationale	Analytical Parameters
Confirmation of groundwater flow direction.	The groundwater flow direction and elevation will be confirmed using the existing monitoring wells.	No soil sampling is planned at this time; however, soil cuttings from drilling operations will be screened with a PID and inspected for staining and odors. Soil samples for laboratory analysis (Method 8260B for VOCs and 8270 for SVOCs) will be collected if contamination is identified. For groundwater samples: VOCs SW8260B. SVOCs SW8270.
Installation of two sampling points south of Building 133, 133TW-5 and 133TW-6.	Two temporary vertical profile wells will be installed approximately 40 feet apart downgradient of the previously detected contamination at Building 133, as shown in Figure 1. Each location will be sampled at 5-ft intervals until bedrock is reached. The data collected will characterize the groundwater downgradient of Building 133.	

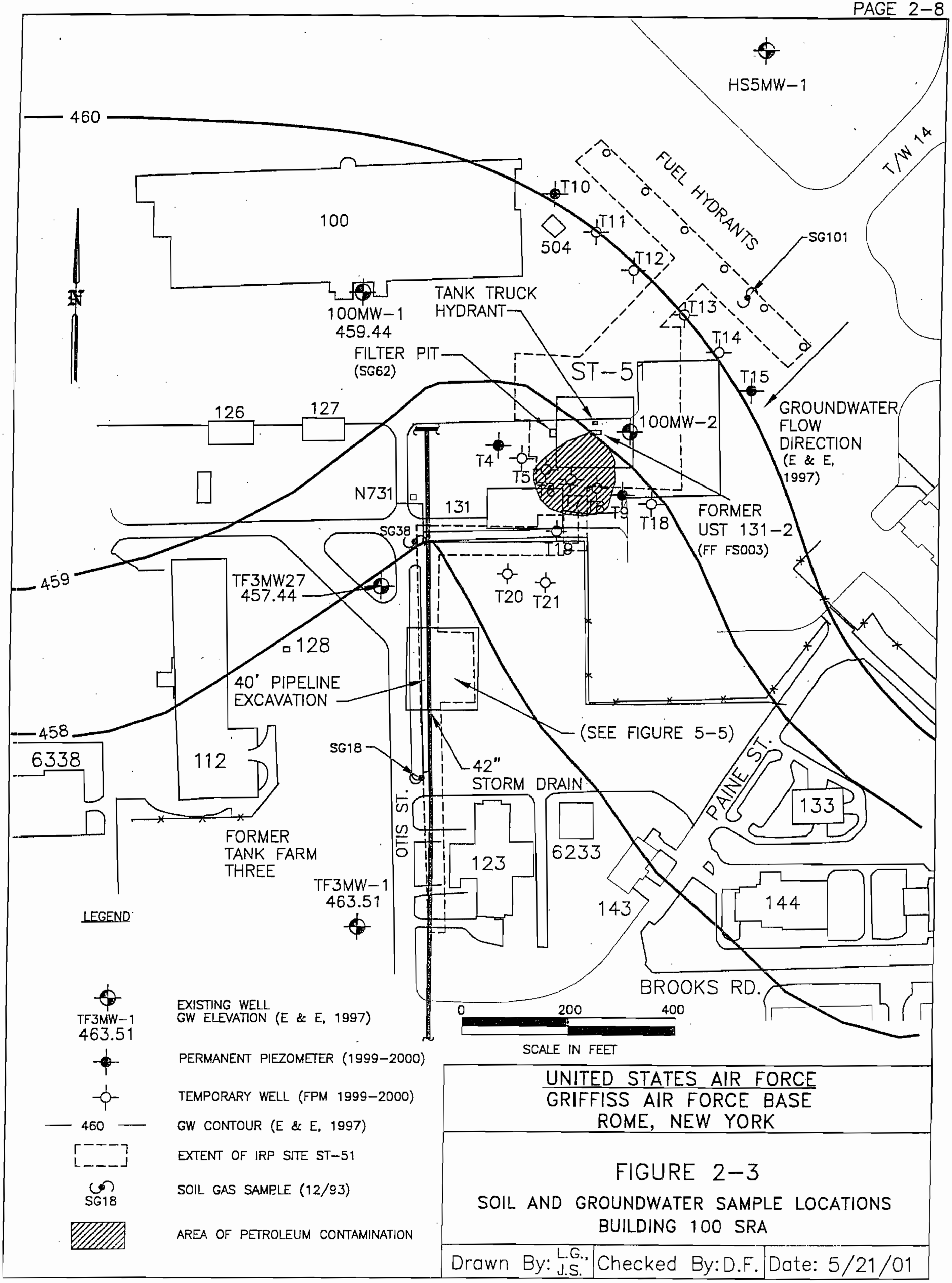

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FIGURE 2-3
SOIL AND GROUNDWATER SAMPLE LOCATIONS
BUILDING 100 SRA

Drawn By: L.G., J.S.	Checked By: D.F.	Date: 5/21/01

3 DESCRIPTION OF ADDITIONAL SAMPLING AND INVESTIGATIONS

The purpose of additional sampling at the Building 100 SRA sites is to monitor the presence of petroleum contamination within and down gradient of the site. The installation of three monitoring wells at the Building 100 SRA site will monitor plume attenuation, characterize contamination and delineate localized groundwater flow. Following the confirmation of free product in proposed monitoring wells 100MW-7 and –8, a free product recovery system may be implemented.

A summary of the sampling analyses and field activities for the Building 100 SRA site is provided below in Tables 3-1 and 3-2, respectively.

Table 3-1 Building 100 SRA Quarterly Sample Analysis Summary

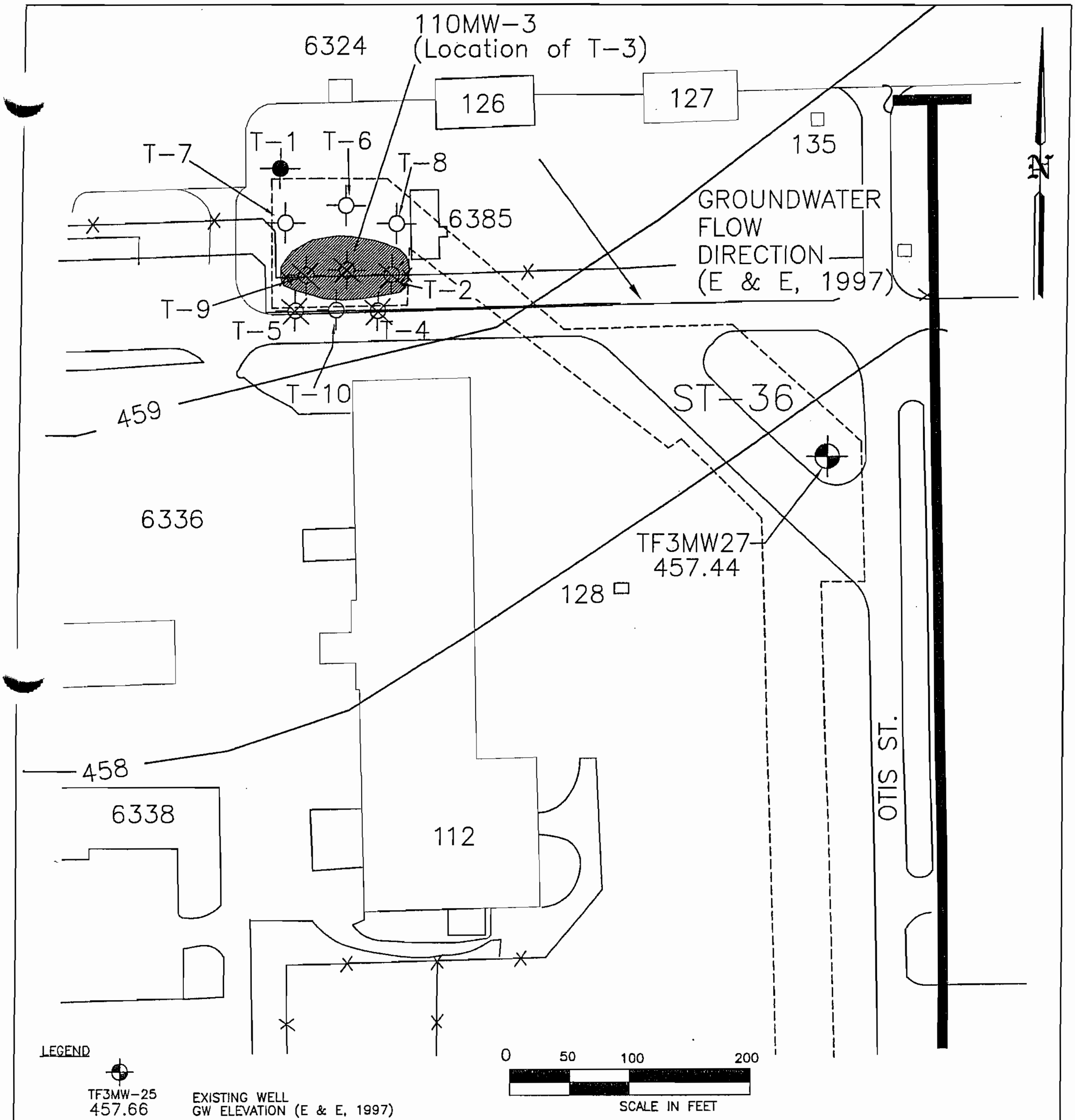
Site/ Sampling Locations	Screen Interval Depth (ft MSL)[1]	Sampling Rationale	Target Analytes/ EPA Method Numbers	# of Samples [2]	Sampling Frequency
100MW-2	10-20	Crossgradient from plume	VOCs – 8260		Quarterly. After one year of quarterly sampling, the results will be evaluated to assess whether continued monitoring or spill closure will be recommended.
100MW-7[3,4]	[1]	Downgradient, within plume	Full List		
100MW-8[3,4]	[1]	Downgradient, within plume			
100MW-19	[1]	Downgradient from plume	SVOCs		
100T-10	10-20	Upgradient from plume	8270		

[1] Screen intervals provided for new wells requiring installation are estimated; screen interval depths will be finalized in the field. Assumes the 10-ft screen interval is between 3' above water table and 7' below water table.

[2] Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

[3] New monitoring wells requiring installation.

[4] Free product has been previously identified at this location and is recommended for quarterly free product Measurement. If free product is not observed, the proposed well will be used as part of the quarterly groundwater monitoring network



LEGEND

TF3MW-25 457.66	EXISTING WELL GW ELEVATION (E & E, 1997)
⊗	PROPOSED MONITORING WELL
●	PERMANENT PIEZOMETER
○	TEMPORARY WELL
— 458 —	GW CONTOUR (E & E, 1997)
┌ ─ ┐	EXTENT OF IRP SITE ST-36
▨	EXTENT OF PETROLEUM PLUME

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FIGURE 3-1
PROPOSED MONITORING WELL LOCATIONS
BUILDING 110 SRA

Drawn By: L.G.	Checked By: D.F.	Date: 7/5/2000

Table 3-1 Building 110 SRA Quarterly Sample Analysis Summary

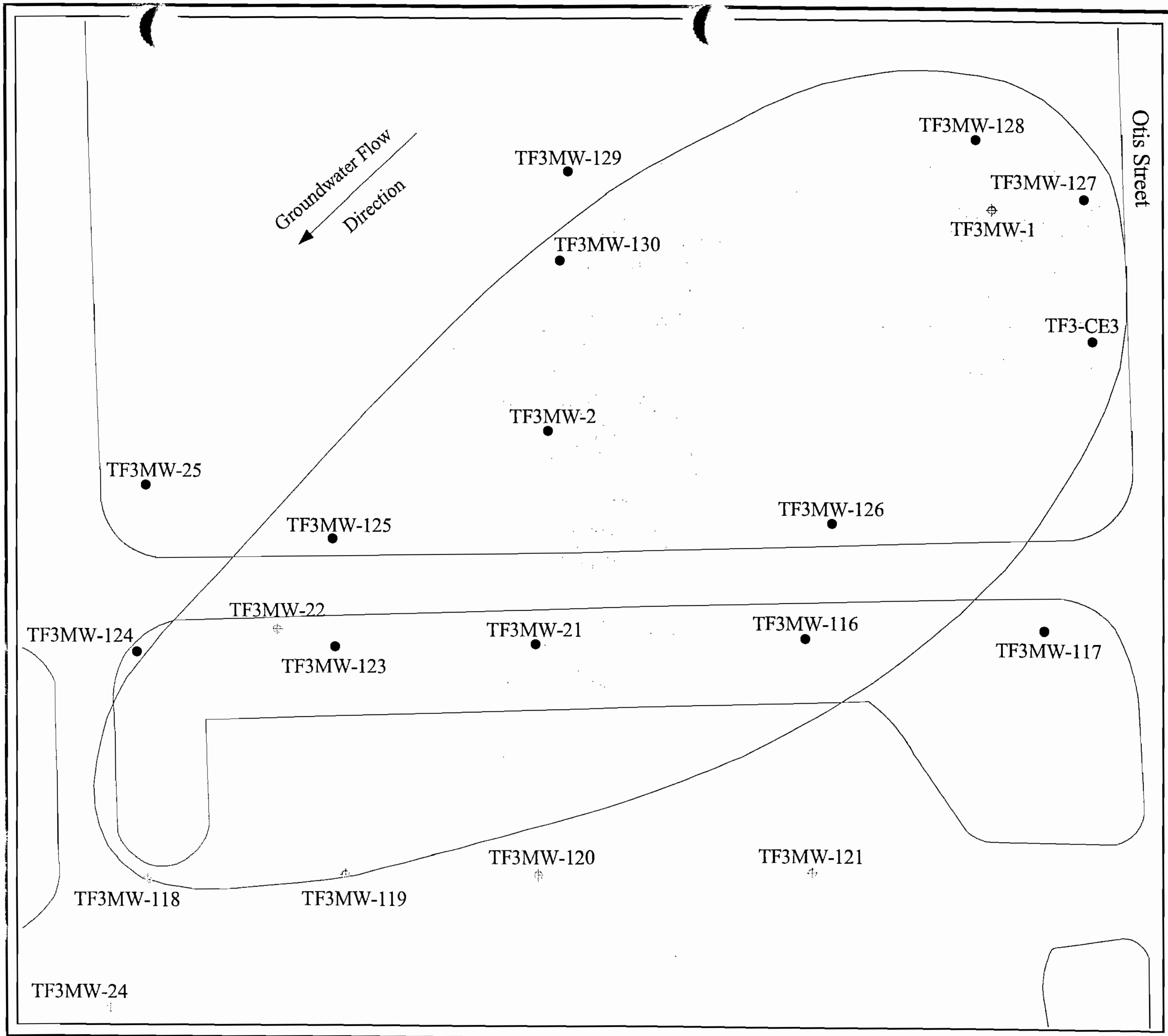
Site/ Sampling Locations	Screen Interval Depth (ft MSL)[1]	Sampling Rationale	Target Analytes/ EPA Method Numbers	# of Samples [2]	Sampling Frequency
110MW-3[3,4]	452-462	Downgradient within plume	VOCs/ SW8260 (Full List) SVOCs/ SW 8270	6	Quarterly
110T-1	452-462	Upgradient from plume			
110MW-2[3]	452-462	Crossgradient within plume			
110MW-4[3]	452-462	Downgradient from plume			
110MW-5[3]	452-462	Downgradient from plume			
110MW-9[3]	452-462	Crossgradient within plume			
	Groundwater elevations range from 458 to 460 ft MSL				

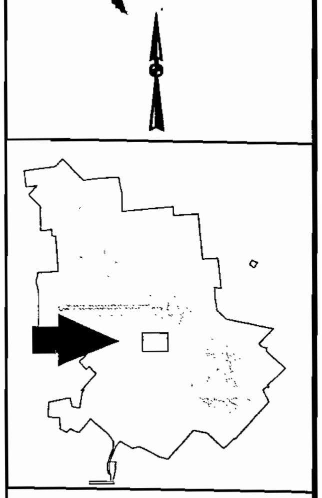
[1] Screen intervals provided for new wells requiring installation are estimated; screen interval depths will be finalized in the field. Assumes the 10-ft screen interval is between 3' above water table and 7' below water table.

[2] Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

[3] New monitoring wells requiring installation.

[4] Free product has been previously identified at this location and is recommended for quarterly free product Measurement. If free product is not observed, the proposed well will be used as part of the quarterly groundwater monitoring network.





Legend

- ● LTM Monitoring Wells
- ⌖ Existing Monitoring Wells
- ⌖ Decommissioned/Proposed for Decommissioning
- ☐ Plume Extent (exceeds NYS GW standards)
- ╱╲ Roads

30 0 30 Feet

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Figure 2-1
Tank Farms 1 and 3
Sample Location Map

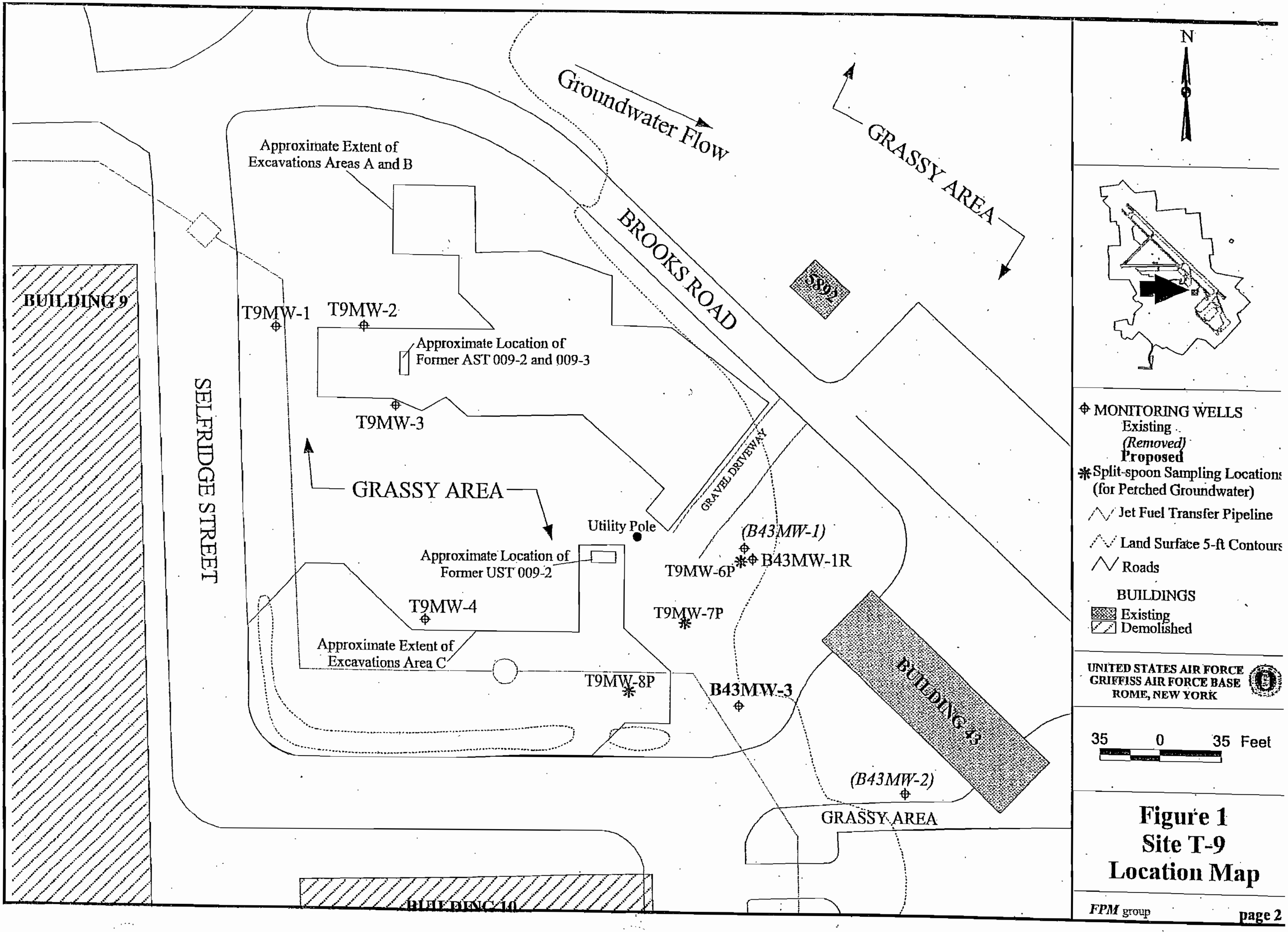


Figure 1
Site T-9
Location Map

FPM group

Table 1
Site T-9
Groundwater Sample Analysis Summary

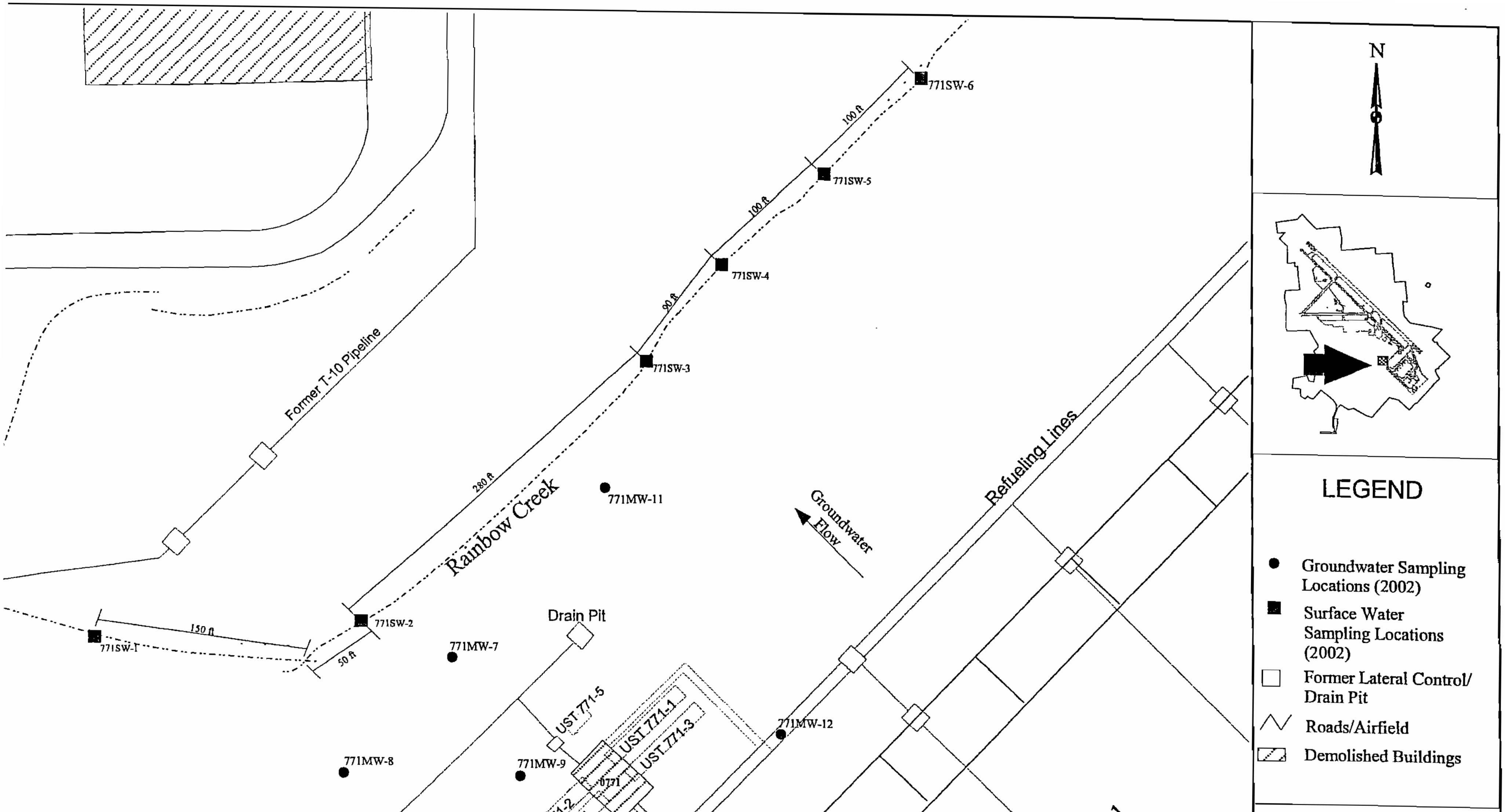
Analyte/ EPA Method Numbers	Matrix	No. of Samples	No. of Equip. Blanks[1]	No. of Ambient Blanks[1]	No. of Trip Blanks[1]	No. of Field Dups./ Reps.[1]	No. of MS and MSD[1]	Total No. of Samples
VOCs – SW8260B[2]	Water	4-7	-[1]	-[1]	-[1]	-[1]	-[1]	4-7
SVOCs – SW8270	Water	4-7	-[1]	NA	NA	-[1]	-[1]	4-7

[1] *At least one MS/MSD and two field duplicates will be collected per SDG (20 field samples); one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs. All quality assurance/quality control blanks will be coordinated with other long-term monitoring sites.*

[2] *Use of EPA Method SW8260 for STARS VOC analysis is acceptable because the method utilizes gas chromatography and mass spectroscopy to confirm the concentrations of the target compounds.*

Table 2
Site T-9 Field Activity Summary

Activity	Rationale	Analytical Parameters
Confirmation of groundwater flow direction.	The groundwater flow direction and elevation will be confirmed using existing wells T9MW-1 through -4, B43MW-1R, and the newly installed monitoring well, B43MW-3.	No soil sampling is planned at this time; however, soil cuttings from drilling operations will be screened with a photoionization detector and inspected for staining and odors. Soil samples for laboratory analysis will be collected if contamination is identified.
Installation of permanent well T9MW-6P, -7P, -8P.	Two-inch permanent well(s) will be installed to monitor perched groundwater, if encountered.	
Quarterly sampling of monitoring wells T9MW-1, T9MW-2, T9MW-6P, -7P, -8P, B43MW-1R, and B43MW-3 (to be installed in conjunction with the draft Letter Work Plan for the Building 43 Site, Glycols Storage/Use AOC, April 2001).	Four quarters of LTM are planned for the collection of groundwater samples to characterize the groundwater downgradient of Site T-9. The data collected will help characterize the groundwater downgradient of former ASTs 009-2 and 009-3 (associated with NYSDEC Spill No. 9702173).	STARS Volatiles List 8260B. STARS Semi Volatiles List 8270.



Note: USTs 771-1 through -5 and all Pumphouse 5 appurtenances were removed in 1997

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Figure 2-2
Pumphouse 5 SRA
2002 Sample Locations

FPM group

3 DESCRIPTION OF ADDITIONAL SAMPLING AND INVESTIGATIONS

In accordance with NYSDEC and United States Environmental Protection Agency (USEPA) recommendations, additional surface and groundwater monitoring is required to demonstrate the absence of contamination at the Pumphouse 5 SRA. The proposed sampling locations are identical to the 2001 and 2002 sampling rounds, thus facilitating comparisons. Table 3-1 summarizes the sample analysis and Table 3-2 summarizes the field activity.

Table 3-1
Pumphouse 5 Sample Analysis Summary

Site/ Sampling Locations	Screen Interval Depth (ft bgs)*	Sampling Rationale **	Target Analytes/ EPA Method Numbers	Sampling Frequency
771MW-7	3 - 13	In former plume area	VOCs-8260 (STARS List) SVOCs-8270 (STARS List) PCBs-8082	Quarterly. After one year of quarterly sampling the results will be evaluated to assess whether continued monitoring or spill closure will be recommended.
771MW-8	6 - 16	In former plume area		
771MW-9	8 - 18	In former plume area		
771MW-10	8 - 18	Upgradient of plume		
771MW-11	4 - 14	Crossgradient and downgradient of plume		
771MW-12	14 - 24	In former plume area		
771SW-1		250' upstream from Pumphouse 5	VOCS-8260 (STARS List) SVOCs-8270 (STARS List) PCBs-8082 Total and Dissolved Lead-6010	
771SW-2		50' upstream from Pumphouse 5		
771SW-3		230' downstream from Pumphouse 5		
771SW-4		320' downstream from Pumphouse 5		
771SW-5		420' downstream from Pumphouse 5		
771SW-6		520' downstream from Pumphouse 5		

* Only for groundwater sampling locations.
** Surface water samples were collected from Rainbow Creek downgradient to Pumphouse 5.

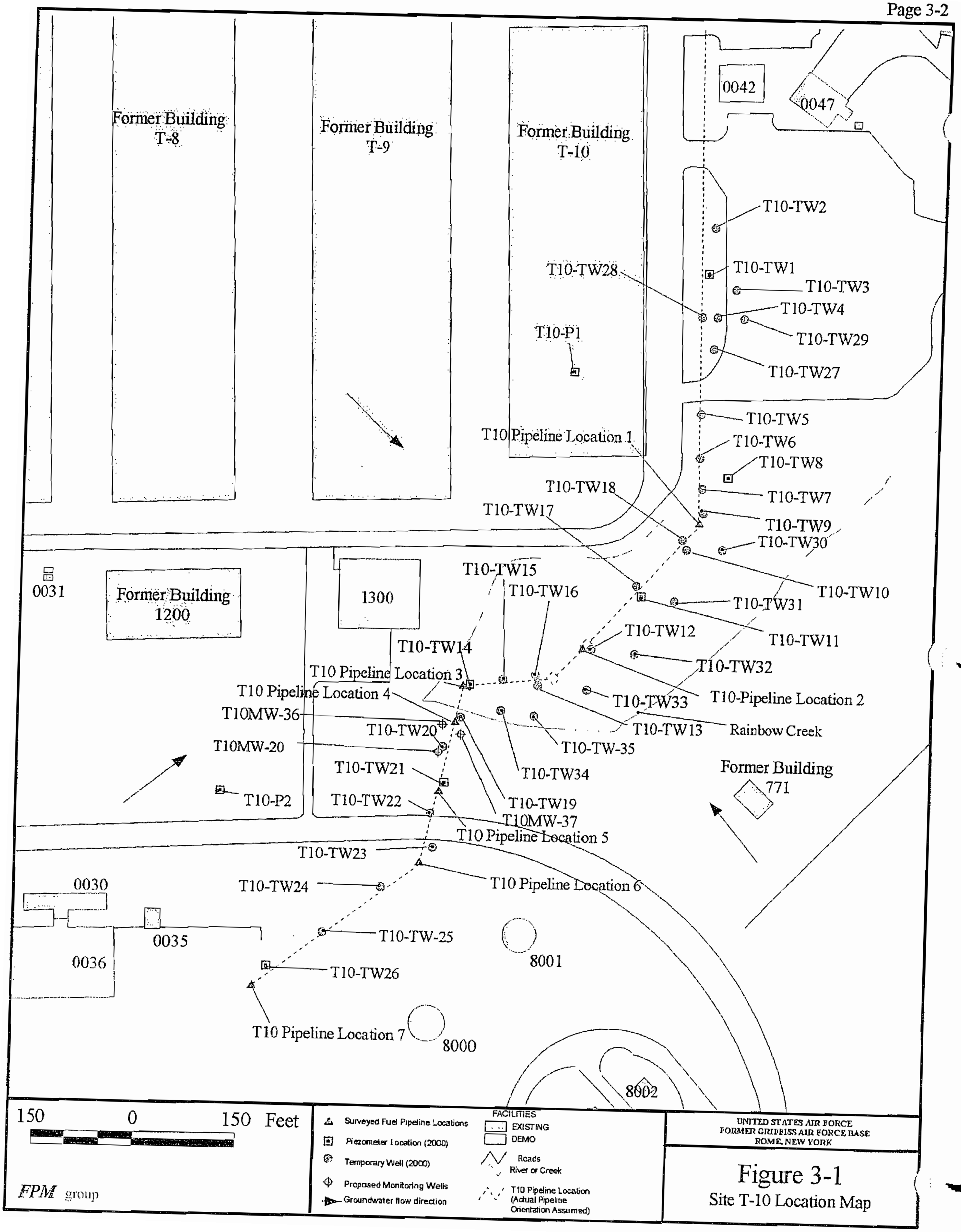

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Figure 3-1
Site T-10 Location Map

Table 3-3
T-10 Quarterly Sample Analysis Summary

Sampling Locations	Screen Interval Depth (ft MSL)[1]	Sampling Rationale	Target Analytes/ EPA Method Numbers	Matrix	# of Samples[2]	Sampling Frequency	Evaluation Criteria
T10MW-20[3]	460' – 450'	Within plume	VOCs – 8260B (STARS List) or 8021 SVOCs – 8270 (STARS List)	Water	3	Quarterly	After one year of quarterly sampling, the results will be evaluated to assess whether continued monitoring or spill closure will be recommended.
T10TW-21	462.4' - 452.4'	Upgradient					
T10MW-36[3]	460' - 450'	Downgradient					
T10MW-37[3]	460' – 450'	Downgradient					
	Average depth to groundwater recorded at approximately 457 ft MSL (May 2000).						

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1 Screen intervals provided for new wells requiring installation are estimated; screen interval depths will be finalized in the field. Assumes the 10-ft screen interval is between 3' above water table and 7' below water table.

2 Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

3 New monitoring wells requiring installation.

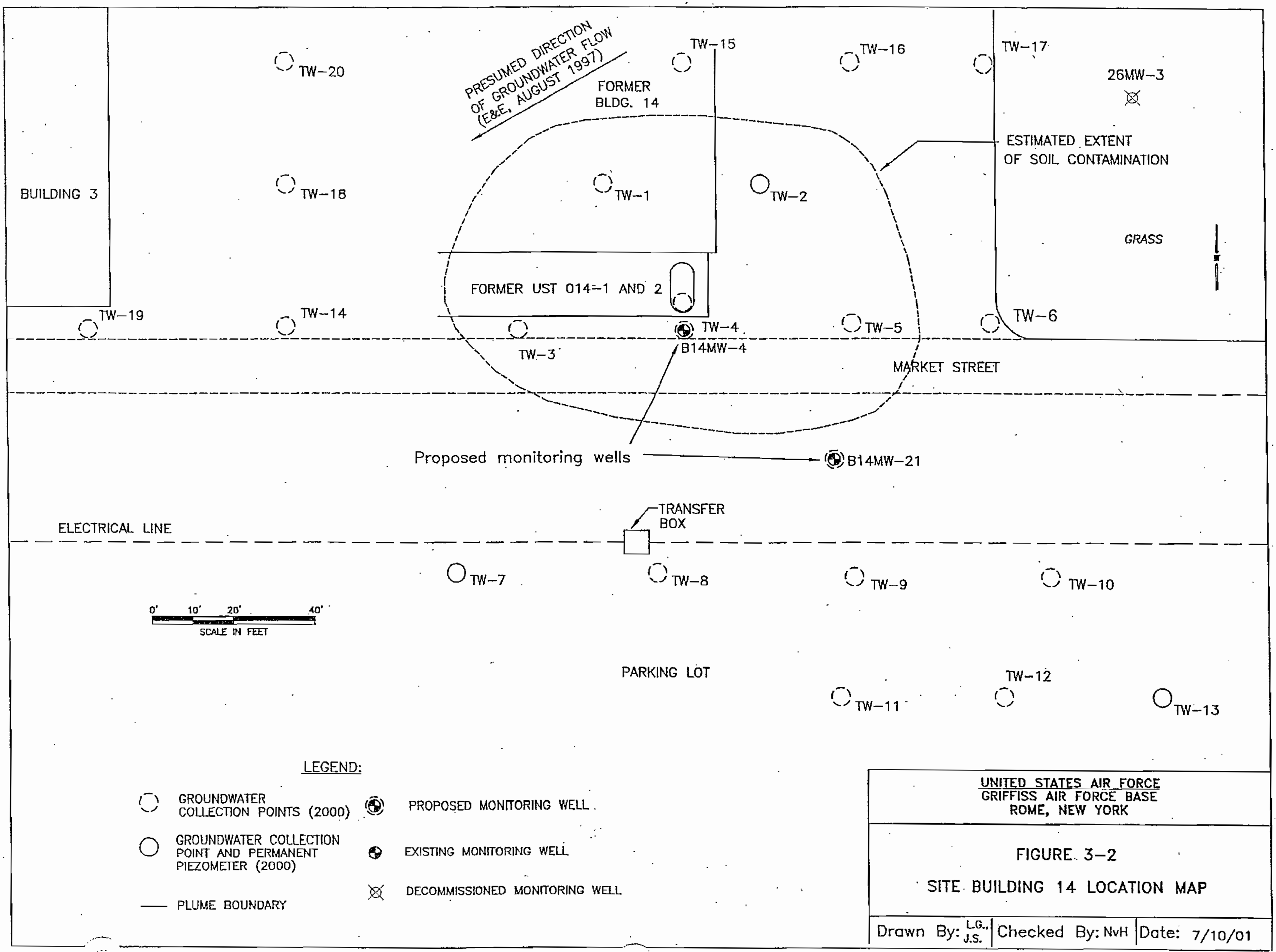

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FIGURE 3-2

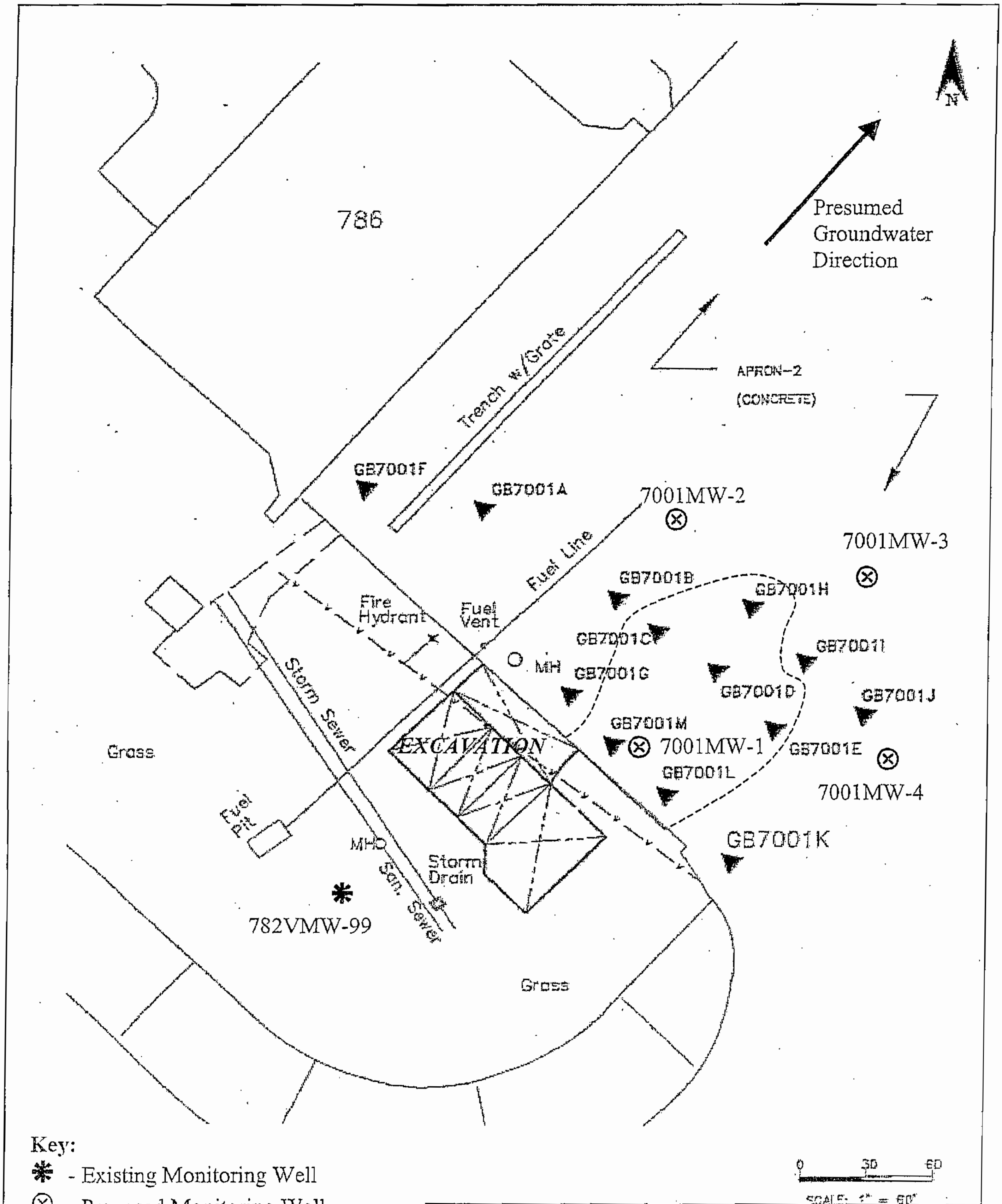
SITE BUILDING 14 LOCATION MAP

Drawn By: L.G., J.S. | Checked By: NvH | Date: 7/10/01

Table 3-6
Building 14 Quarterly Sample Analysis Summary

Sampling Locations	Screen Interval Depth (ft MSL)[1]	Sampling Rationale	Target Analytes/ EPA Method Numbers	Matrix	# of Samples[2]	Sampling Frequency	Evaluation Criteria
B14TW-2	459.4' - 449.4'	Upgradient, within plume	VOCs – 8260 (Full List) SVOCs – 8270 (Full List)	Water	5	Quarterly	After one year of quarterly sampling, the results will be evaluated to assess whether continued monitoring or spill closure will be recommended.
B14TW-7	461.2' - 451.2'	Downgradient					
B14TW-13	460.1' - 450.1'	Down/crossgradient					
B14MW-4[3]	460' - 450'	Crossgradient within plume					
B14MW-21[3]	460' - 450'	Downgradient, possible within plume					
	Depth to groundwater ranges from 456 to 458 ft MSL (April 2000).						

1. Screen intervals provided for new wells requiring installation are estimated; screen interval depths will be finalized in the field. Assumes the 10-ft screen interval is between 3' above water table and 7' below water table.
2. Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.
3. New monitoring wells requiring installation.



Key:

✱ - Existing Monitoring Well

⊗ - Proposed Monitoring Well

▼- Previous Geoprobe Sample

⌒ - Petroleum Plume Boundary

FIGURE 3-8
PREVIOUS GROUNDWATER INVESTIGATION AND PROPOSED MONITORING WELL LOCATIONS
SITE 7001

Table 3-19 Site 7001 Site Field Activity Summary

Activity	**Rationale**	**Analytical Parameters**
Confirmation of groundwater flow direction.	The groundwater flow direction and elevation will be confirmed using the newly installed monitoring wells.	For all groundwater: STARS List VOCs EPA Method 8260 or 8021 (including MTBE and naphthalene).
Installation of within-plume monitoring well 7001MW-1.	One 2-inch monitoring well will be installed within the suspected plume extent area. The 10-ft, 0.010" slot screen will be installed so that the screen is approximately 3 ft above the groundwater level and 7 ft below the groundwater to account for seasonal groundwater fluctuations.	
Installation of downgradient monitoring wells 7001MW-2 through -4.	Three 2-inch monitoring wells will be installed surrounding the identified extent of the plume. The 10-ft, 0.010" slot screen will be installed so that the screen is 3 ft above the groundwater level and 7 ft in the groundwater to account for seasonal groundwater fluctuations.	
Quarterly sampling of monitoring wells 782VMW-99, 7001MW-1 through -4.	Quarterly monitoring for one year is planned after which a recommendation will be made for either continued monitoring or spill closure.	

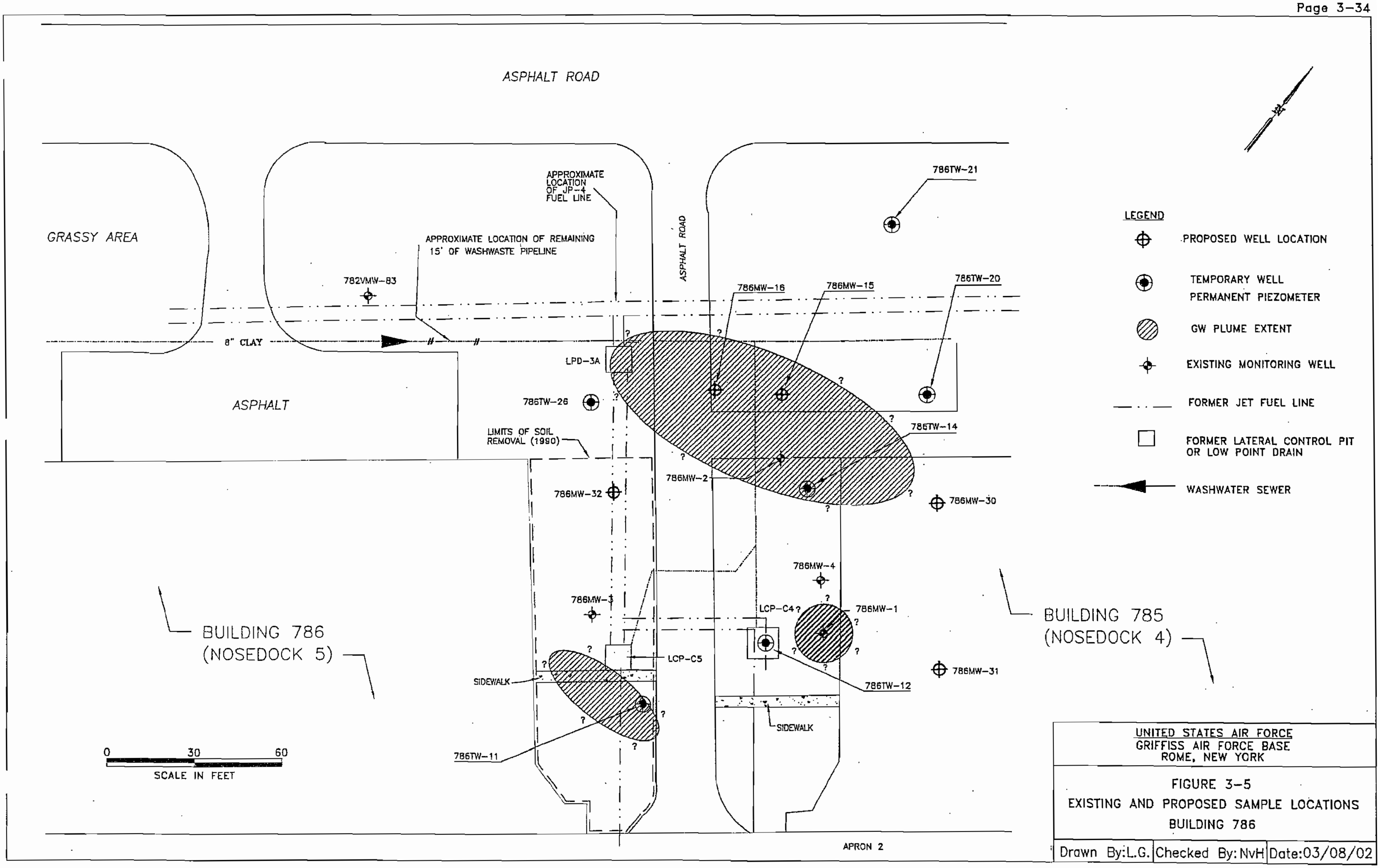


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FIGURE 3-5
EXISTING AND PROPOSED SAMPLE LOCATIONS
BUILDING 786

Drawn By:L.G.	Checked By:NvH	Date:03/08/02

Table 3-14 Building 786 Quarterly Sample Analysis Summary

Sampling Locations	Screen Interval Depth (ft MSL)[1]	Sampling Rationale	Target Analytes/ EPA Method Numbers	Matrix	# of Samples[2]	Sampling Frequency	Evaluation Criteria
786MW-1	461.4' – 451.4'	Downgradient from plume	VOCs – EPA Superfund TCL (Full List)	Water	16	Quarterly	After one year of quarterly sampling, the results will be evaluated to assess whether continued monitoring or spill closure will be recommended.
786MW-2	470.9' – 455.9'	Within plume					
786MW-3	474.2' – 459.2'	Crossgradient from plume					
786MW-4	462.7' – 452.7'	Downgradient from plume					
786MW-15[3,4]	466.3' – 456.3'	Downgradient, within plume					
786MW-16[3,4]	466.1' – 456.1'	Downgradient, within plume					
786MW-30[3]	463' – 453'	Possibly downgradient					
786MW-31[3]	463' – 453'	Possibly downgradient					
786MW-32[3]	463' – 453'	Possibly downgradient					
786TW-11	466.9' – 456.9'	Crossgradient, possibly downgradient					
786TW-12	465.3' – 455.3'	Crossgradient, possibly downgradient					
786TW-14	465.4' – 455.4'	Upgradient/crossgradient from plume					
786TW-20	463.1' – 453.1'	Possibly crossgradient					
786TW-21	464.9' – 454.9'	Upgradient from plume					
786TW-26	465.7' – 455.7'	Downgradient from plume					
782VMW-83	455.5' – 445.5'	Upgradient from plume					
	Depth to groundwater ranges from 459 to 464 ft MSL.						

1 Screen intervals provided for new wells requiring installation are estimated; screen interval depths will be finalized in the field. Assumes the 10-ft screen interval is between 3' above water table and 7' below water table.

2 Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

3 New wells proposed for installation.

4 Sampling may not be possible at these locations due to the presence of free product.

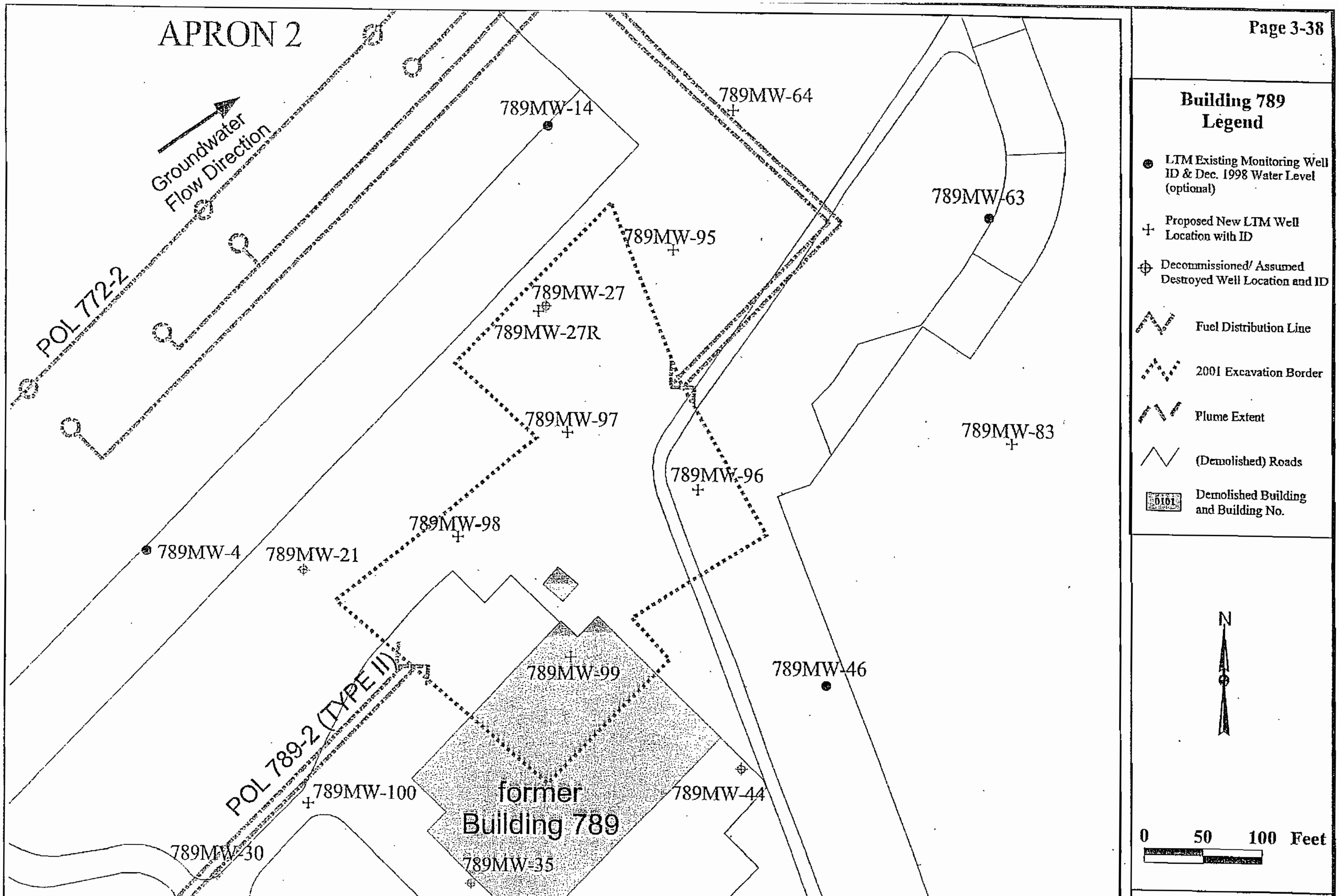

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Figure 3-6
Building 789
Site Location Map

Table 3-17 Building 789 Quarterly Sample Analysis Summary

Sampling Locations	Screen Interval Depth (ft MSL)[1]	Sampling Rationale	Target Analytes/ EPA Method Numbers	# of Samples[2]	Sampling Frequency	Evaluation Criteria
789MW-4	462.5' – 452.5'	Upgradient from plume	VOCs – 8260 (STARS List) or 8021	14	Quarterly	After one year of quarterly sampling, the results will be evaluated to assess whether continued monitoring or spill closure will be recommended.
789MW-14	462.5' – 452.5'	Crossgradient, within plume				
789MW-27R[3,4]	462' – 452'	Within plume				
789MW-46	462.1' – 452.1'	Crossgradient, within plume				
789MW-63	462.3' – 452.3'	Downgradient				
789MW-64[3]	462' – 452'	Crossgradient, within plume				
789MW-83[3]	462' – 452'	Downgradient				
789MW-95[3]	462' – 452'	Within plume				
789MW-96[3]	462' – 452'	Within plume				
789MW-97[3]	462' – 452'	Within plume				
789MW-98[3]	462' – 452'	Within plume				
789MW-99[3]	462' – 452'	Within plume				
789MW-100[3]	462' – 452'	Upgradient from plume				
782VMW-87	450' – 440'	Downgradient				
	Depth to groundwater ranges from 456 to 460 ft MSL.					

1. Screen intervals provided for new wells requiring installation are estimated; screen interval depths will be finalized in the field. Assumes the 10-ft screen interval is between 3' above water table and 7' below water table.
2. Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.
3. New monitoring well requiring installation.
4. Free product had been observed at this location prior to the removal action, and is recommended for quarterly free product thickness measurements. If no free product is encountered, the well will be included in the LTM quarterly sampling network.

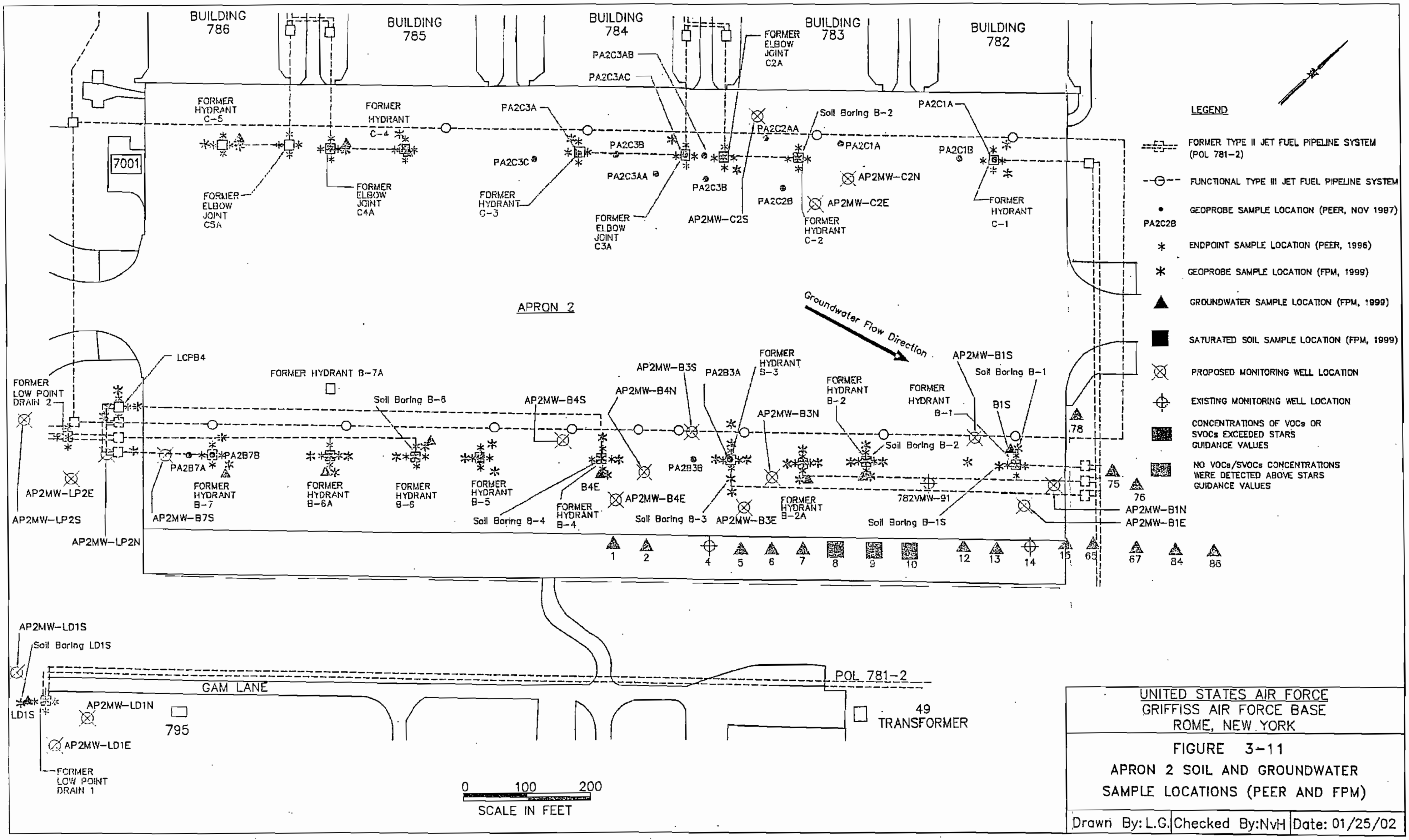

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FIGURE 3-11

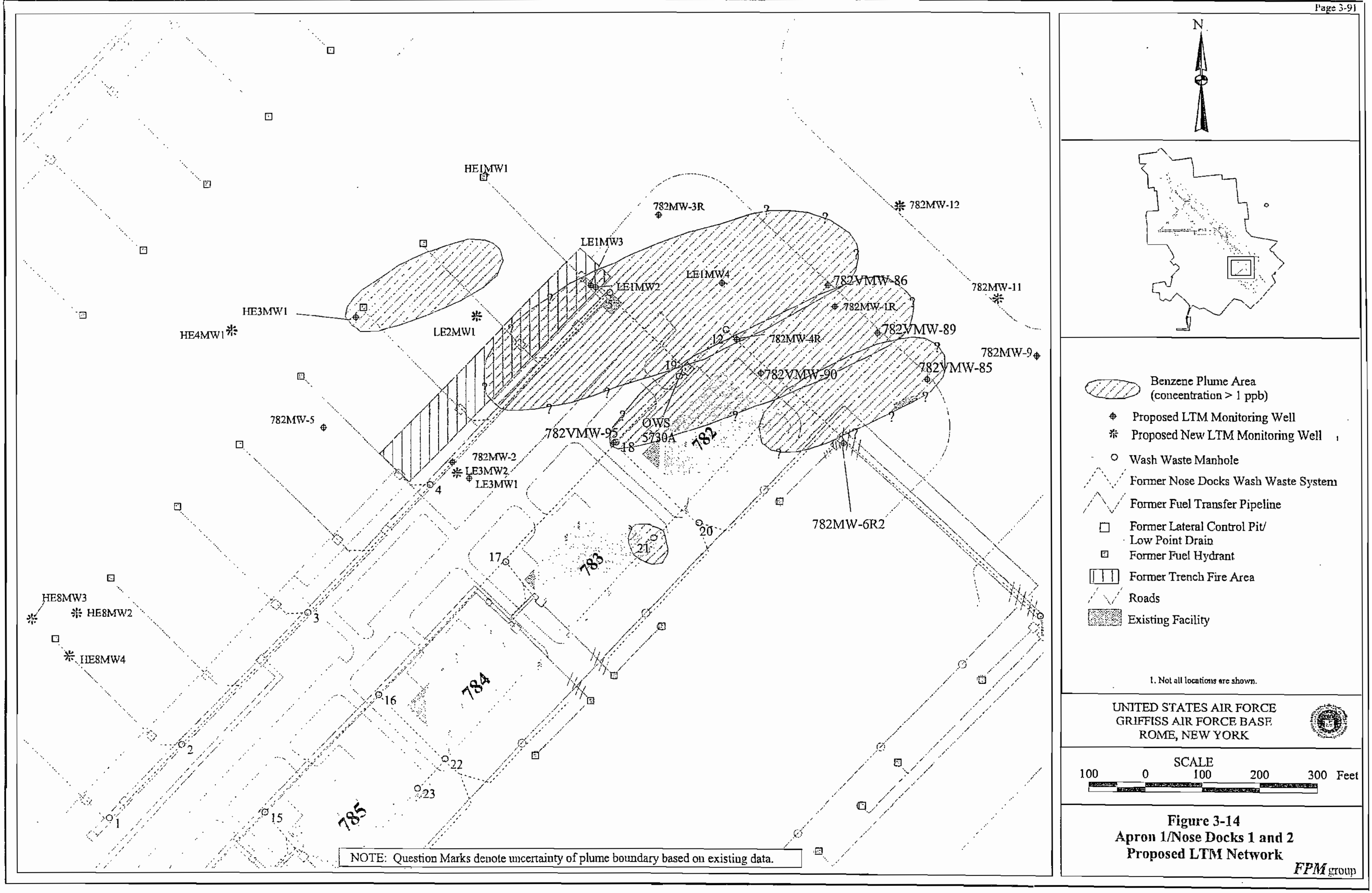
APRON 2 SOIL AND GROUNDWATER SAMPLE LOCATIONS (PEER AND FPM)

Drawn By: L.G.	Checked By: NvH	Date: 01/25/02

Table 3-23 Apron 2 Quarterly Sample Analysis Summary

Site/ Sampling Locations	Screen Interval Depth (ft MSL)[1]	Sampling Rationale	Target Analytes/ EPA Method Numbers	Matrix	# of Samples[2]	Sampling Frequency	Evaluation Criteria
AP2MW-LD1N[3]	462' – 452'	Downgradient from plume	VOCs – EPA Method SW 8260 or 8021 SVOCs – EPA Method SW 8270	Water	19	Quarterly	After one year of quarterly sampling, the results will be evaluated to assess whether continued monitoring, remediation or spill closure will be recommended.
AP2MW-LD1S[3]	462' – 452'	Upgradient					
AP2MW-LD1E[3]	462' – 452'	Downgradient from plume					
AP2MW-LD2N[3]	462' – 452'	Downgradient from plume					
AP2MW-LD2S[3]	462' – 452'	Upgradient					
AP2MW-LD2E[3]	462' – 452'	Downgradient from plume					
AP2MW-B7S[3]	462' – 452'	Upgradient					
AP2MW-B1N[3]	462' – 452'	Downgradient from plume					
AP2MW-B1E[3]	462' – 452'	Downgradient from plume					
AP2MW-B3N[3]	462' – 452'	Downgradient from plume					
AP2MW-B3S[3]	462' – 452'	Upgradient					
AP2MW-B3E[3]	460' – 450'	Downgradient from plume					
AP2MW-B4N[3]	460' – 450'	Downgradient from plume					
AP2MW-B4S[3]	460' – 450'	Upgradient					
AP2MW-B4E[3]	460' – 450'	Downgradient from plume					
AP2MW-C2N[3]	460' – 450'	Downgradient from plume					
AP2MW-C2S[3]	460' – 450'	Upgradient					
AP2MW-C2E[3]	460' – 450'	Downgradient from plume					
782VMW-91	458.5' – 448.5'	Upgradient					
	Depth to groundwater ranges from 457 to 460 ft MSL (FPM, 2000).						

1. Screen intervals provided for new wells requiring installation are estimated; screen interval depths will be finalized in the field. Assumes the 10-ft screen interval is between 3' above water table and 7' below water table.
2. Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.
3. New monitoring wells requiring installation.



NOTE: Question Marks denote uncertainty of plume boundary based on existing data.

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Figure 3-14
Apron 1/Nose Docks 1 and 2
Proposed LTM Network

FPM group

Table 3-26
Apron 1/Nose Docks 1 and 2 Quarterly Sample Analysis Summary

Sampling Locations	Screen Interval Depth (ft MSL)[1, 5]	Sampling Rationale	Target Analytes/ EPA Method Numbers	Matrix	# of Samples[2]	Sampling Frequency	Evaluation Criteria
782MW-1R	455.2' - 445.2'	Downgradient, within plume	• VOCs – 8260B (Full List)	Water	26	Quarterly to semi-annually contingent upon results.	After one year of quarterly/-semiannual sampling, the results will be evaluated to assess whether continued monitoring or remediation will be recommended.
782MW-2	464.6' - 454.6'	Upgradient from plume, shallow					
782MW-3R	457.1' - 442.1'	Crossgradient, north side					
782MW-4R	456.7' - 446.7'	Downgradient, within plume					
782MW-5[3]	463.1' - 453.1'	Upgradient, within plume (?), shallow					
782MW-6R2	457.3' - 442.3'	Crossgradient from plume, south side					
782MW-9	461.8' – 446.8'	Downgradient					
HE1MW1	457.4' - 447.4'	Crossgradient from plume, north side					
HE3MW1	458.4' - 448.4'	Within plume					
LE1MW2	453.4' - 443.4'	Within plume					
LE1MW3	468' - 458'	Within plume, perched zone					
LE1MW4	457.8' - 447.8'	Within plume					
LE3MW1	465.1' - 455.1'	Upgradient from plume, shallow					
LE2MW1[4]	458' – 448'	Within plume between HE3MW1 and LE1MW1					
LE3MW2[4]	457' – 447'	Crossgradient, southwestern side, deeper					
HE4MW1[4]	458' – 448'	Upgradient, deeper					
782MW-11[4]	455' – 445'	Downgradient					
782MW-12[4]	455' – 445'	Downgradient					
782VMW-85	446.7' – 436.7'	Downgradient, within plume, deeper					
782VMW-86	448.7' – 438.7'	Downgradient, within plume, deeper					
782VMW-89	450.9' – 435.9'	Downgradient, within plume, deeper					
782VMW-90	457.1' – 447.1'	Within plume					
782VMW-95	457.2' – 442.2'	Within plume					
HE8MW2[4]	460' – 450'	Monitor Hydrant E-8 removal action					
HE8MW3[4]	460' – 450'	Monitor Hydrant E-8 removal action					
HE8MW4[4]	460' – 450'	Monitor Hydrant E-8 removal action					

[1] Screen intervals provided for new wells requiring installation are estimated; screen interval depths will be finalized in the field. Assumes the 10-ft screen interval is between 3' above water table and 7' below water table.

[2] Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG;

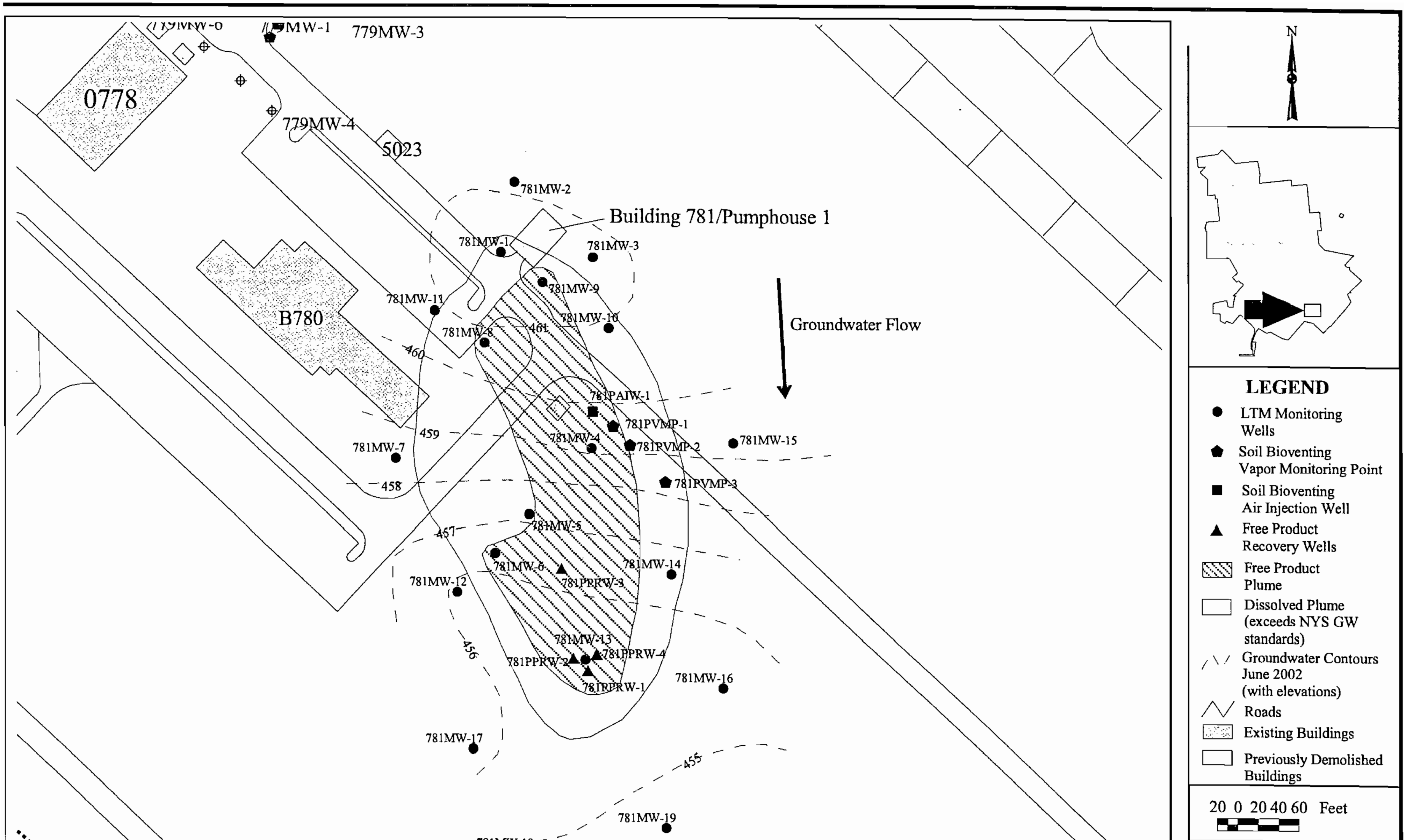

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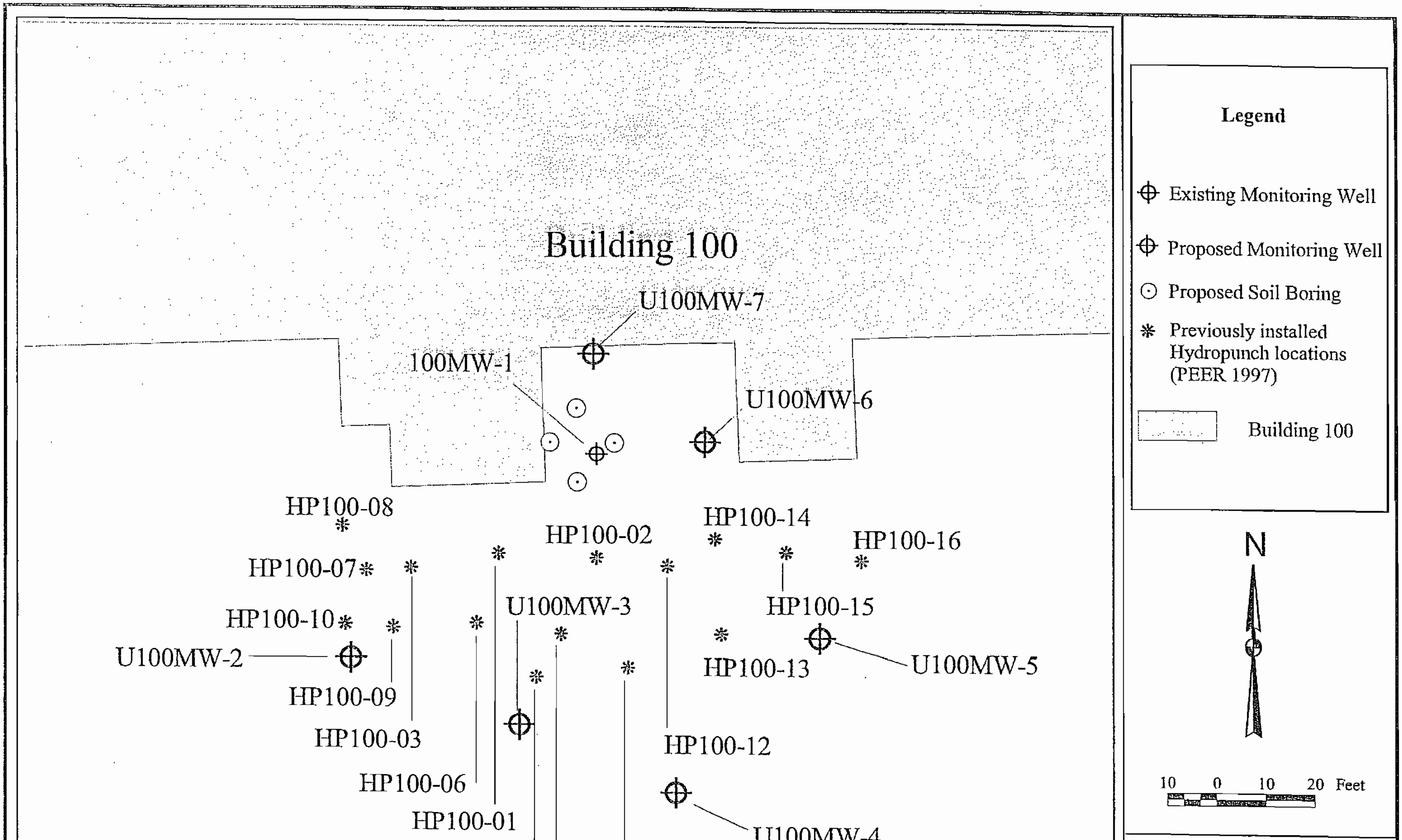
Figure 2-1
Building 781
(Pump House 1)
Site Location Map

FPMgi

Building 781
Quarterly Sample Analysis Summary

Sampling Locations	Screen Interval Depth (ft MSL)	Sampling Rationale	Target Analytes/ EPA Method Numbers	Matrix	# of Samples[1]	Sampling Frequency	Evaluation Criteria
781MW-1	466.21’ – 450.21’		VOCs – SW8260 (AFCEE QAPP 3.1 List) SVOCs – SW8270 AFCEE QAPP 3.1 List)	Water	19	Quarterly	After one year of quarterly sampling, the results will be evaluated to assess whether continued monitoring or spill closure will be recommended.
781MW-2	460.41’ - 445.41’						
781MW-3	460.98’ - 445.98’						
781MW-4	464.41’ - 454.41’						
781MW-5	465.04’ - 455.04’						
781MW-6	463.26’ - 453.26’						
781MW-7	459.35’ - 449.35’						
781MW-8	462.8’ - 452.8’						
781MW-9	462.9’ - 452.9’						
781MW-10	462.25’ - 452.25’						
781MW-11	458.81’ - 448.81’						
781MW-12	459.16’ - 449.16’						
781MW-13	455.75’ - 445.75’						
781MW-14	458.22’ - 448.22’						
781MW-15	461.61’ - 451.61’						
781MW-16	457.65’ - 447.65’						
781MW-17	457.2’ - 447.2’						
781MW-18	453.48’ - 443.48’						
781MW-19	457.41’ - 447.41’						

[1] Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.



UNITED STATES AIR FORCE
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ROME, NEW YORK

Figure 3-1
Former UST 100
Proposed Sampling
Locations

Table 3-2 UST-100 Quarterly Sample Analysis Summary

Site/ Sampling Locations	Screen Interval Depth (ft MSL)[1]	Sampling Rationale	Target Analytes/ EPA Method Numbers	# of Samples	Sampling Frequency
U100SB-1		Soil boring north side of excavation	VOCs/ SW8260 Full List SVOCs/ SW8270 Full List PCBs/ SW8082	1	Will be determined following review of groundwater sampling results
U100SB-2		Soil boring south side of excavation		1	
U100SB-3		Soil boring east side of excavation		1	
U100SB-3		Soil boring west side of excavation		1	
100MW-1	10-20	Source Area, within plume		1	
100MW-3[2]	10-20[1]	Downgradient, within plume		1	
100MW-4[2]	10-20[1]	Downgradient, within plume		1	
100MW-5[2]	10-20[1]	Downgradient from plume		1	
100MW-6[2]	10-20[1]	Downgradient from plume		1	

1 Screen intervals provided for new wells requiring installation are estimated; screen interval depths will be finalized in the field. Assumes the 10-ft screen interval is 3' above water table and 7' below water table. Please refer to FSP for details concerning the number of QA/QC samples and their locations. At least one MS/MSD and two field duplicates will be collected per SDG; one equipment blank per day and one ambient blank per day; one trip blank per cooler containing VOCs.

2 New monitoring wells requiring installation.