FPM group — Engineering and Environmental Science

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RE: Long-Term Monitoring Report
Petroleum Source Removal Areas of Concern
Former Griffiss Air Force Base, Rome, New York
Contract No. F41624-03-D-8601-0027
FPM Project No. 40-05-27
Revision 1.0
December 2009

Submitted herewith for your review and comment is the subject report, provided in support of recently completed work at the former Griffiss Air Force Base. The work was completed under the above-referenced Performance-Based Contract (PBC).

Please provide written comments no later than January 29, 2009. If you have any questions pertaining to the report or the request for review, please call me at 315-336-7721 ext. 202, or e-mail me at g.atik@fpm-group.com.

Very truly yours,

Gaby A. Atik, P.E.
Executive Vice President

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Petroleum Source Removal Areas of Concern
Former Griffiss Air Force Base
Rome, New York

LONG-TERM MONITORING REPORT

(Spring 2009)

Contract No. F41624-03-D-8601
Delivery Order No. 0027

Revision 1.0
December 2009

FPM group

LONG TERM MONITORING REPORT (Spring 2009)

PETROLEUM SOURCE REMOVAL AREA of CONCERN

Prepared for:

Air Force Real Property Agency
Former Griffiss Air Force Base
Rome, New York

through

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Appendix B Daily Chemical Quality Control Reports
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Appendix E Temporary Biosparging Log Table and Field Forms

LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
AOI	Area of Interest
ARAR	Applicable or Relevant and Appropriate Requirements
AST	aboveground storage tank
AVGAS	aviation gasoline
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, xylene
BTOIC	below top of inner casing
COC	contaminant of concern
CQCR	Chemical Quality Control Reports
CSM	Conceptual Site Model
cy	cubic yard
DO	dissolved oxygen
EBS	Environmental Baseline Survey
E&E	Ecology and Environmental, Inc.
ESI	Expanded Site Investigation
FID	flame ionization detector
FPM	FPM Group, Ltd.
FSP	field sampling plan
JP-4	jet propulsion fuel grade 4
LAW	Law Engineering and Environmental Services, Inc.
LTM	long-term monitoring
MOGAS	automotive gasoline
MSL	mean sea level
NYS	New York State
NYSBC	New York State Barge Canal
NYSDEC	New York State Department of Environmental Conservation
ORC®	Oxygen Release Compound®
ppm	parts per million

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
SAP	sampling and analysis plan
SI	site investigation
SRA	source removal area of concern
STARS	Spill Technology and Remediation Series
SVOC	semi-volatile organic compound
TAGM	Technical and Administrative Guidance Memorandum
TPH	Total Petroleum Hydrocarbon
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
µg/L	micrograms per liter

1 INTRODUCTION

FPM Group Ltd. (FPM) has been contracted by the Air Force Center for Engineering and the Environment (AFCEE), to conduct a long-term monitoring (LTM) program for groundwater at the Tank Farms 1&3 Petroleum Source Removal Area of Concern (SRA) at the former Griffiss Air Force Base (AFB), New York. The LTM program was conducted in accordance with provisions of the Basic Contract No. F41624-03-D-8601 Delivery Order No. 0027. The purpose of the LTM program is to monitor the presence of contaminants of concern (COCs), assess the potential for migration of the COCs, statistically identify groundwater trends for the COCs, and establish an early warning system for assuring compliance with potential COC receptors.

Data evaluation and report preparation for the LTM program includes semi-annual summary updates and a more detailed annual report. The LTM program will also be reviewed periodically to revise sampling locations and/or sampling frequencies for optimal functioning. This semi-annual LTM report includes collection, analysis, and reporting of COCs for the following SRA from June 2002 through March 2009:

- Tank Farm 1 and 3 SRA SS-20 (New York State Department of Environmental Conservation [NYSDEC] Spill #9111733)

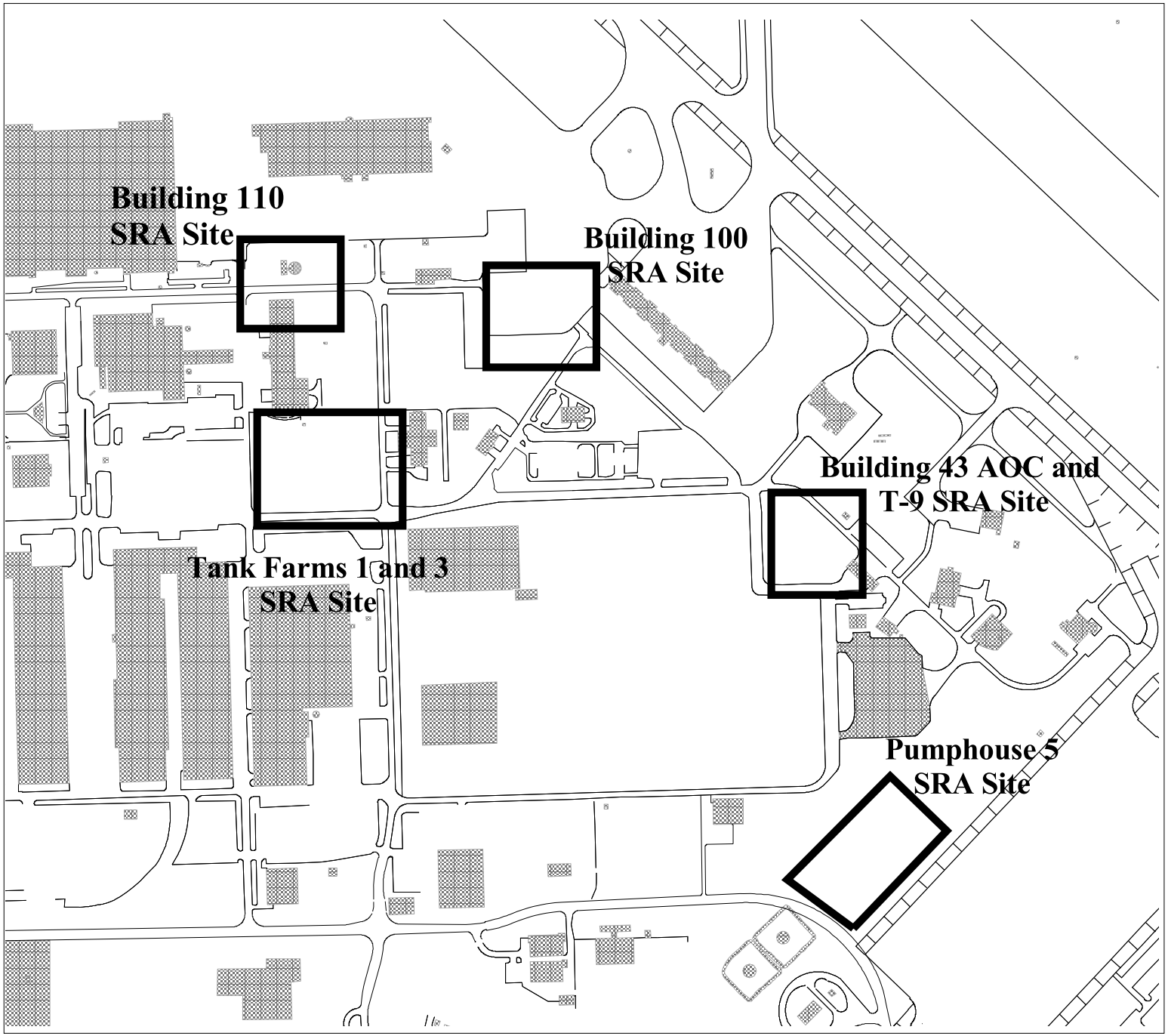
The locations of the Petroleum SRA can be reviewed in Figure 1-1. LTM was recommended by FPM and approved by NYSDEC in their approval of site-specific workplan and groundwater monitoring reports for Tank Farms 1 and 3 (FPM, November 2001).

As part of the performance based contract, it should be noted that the following sites were previously sampled under LTM, and were closed or proposed for closure.

- Building T-9 SRA SS-25 (NYSDEC Spill #9702173). Spill closed September 24, 2004
- Building 43 SRA ST-26 (NYSDEC Spill #9204543 and #9313076) proposed for closure, March 2005
- Building 110 SRA ST-36 (NYSDEC Spill #8603763). Spill closed September 29, 2004
- Building 771/Pumphouse 5 SRA ST-37 (NYSDEC Spill #8903144). Site closed October 20, 2004
- Building 100 SRA ST-51 (NYSDEC Spill #9704490). Spill closed September 29, 2004

Groundwater samples were collected from each of the sites listed and analyzed for the respective COCs as identified during previous investigations (e.g., volatile organic compounds [VOCs] and semivolatile organic compounds [SVOCs]). Both existing data and information from new sampling rounds are utilized for overall performance evaluation.

New wells were installed according to the protocol described in the Field Sampling Plan (FSP) (FPM, August 2003). Reference is also made to the AFCEE Quality Assurance Project Plan (QAPP) Version 3.1 (AFCEE, 2001), prior to June 2006. Version 4.0 (AFCEE, 2005) is



N

Legend

Road/Airfield

Demolished Building

Existing Building

200 0 200 Feet

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

Figure 1-1
Petroleum Source Removal Areas Location Map

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used currently, with project-specific variances. The QAPP together with the FSP form the Sampling and Analysis Plan (SAP).

1.1 LONG-TERM MONITORING APPROACH

1.1.1 Long-Term Monitoring Background

The following highlights the overall objectives, components, and constraints of the groundwater LTM Program in order to illustrate how this LTM Program will operate.

The objectives of LTM are:

- To continue refining the conceptual site model (CSM) for groundwater flow so that the predictions regarding the fate and transport of COCs are accurate;
- To establish an early warning monitoring system for the protection of potential receptors prior to completion of exposure pathways;
- To evaluate COC degradation due to remedial action or natural attenuation processes; and
- To collect data that support attainment of spill closure.

Typical components of a groundwater LTM system include:

- One or more upgradient well(s) representative of background conditions; and
- LTM wells that track the COC migration or degradation trend.

Constraints associated with a groundwater LTM system include:

- All monitoring wells must be screened in the same hydrogeologic unit as the COC plume or known/probable groundwater pathway from a potential source;
- Downgradient LTM wells must be located to detect unexpected variations in groundwater quality as efficiently as possible (i.e., with respect to groundwater migration rates and downgradient flow direction).

Given the above objectives and constraints the design of an LTM system considers the following tasks:

1. Selecting water-level observation wells and water quality monitoring wells from existing monitoring wells and piezometers,
2. Selecting locations for new wells, depending on the evaluation of existing data (i.e., well logs, water-level measurements, proximity to natural flow boundaries, trends and uncertainties in the existing data) and the specific intended and distinct role of that monitoring point;

3. Providing a statistical evaluation of water-level elevation data for groundwater flow direction, existing COC concentrations, and groundwater chemistry to predict long-term trends;
4. Identifying performance evaluation criteria (e.g., statistical tests), including appropriate analysis methods for evaluating data variations or closure attainment;
5. Identifying water quality sampling frequency at each monitoring point both for understanding the trends of COCs and/or their indicator analytes, and minimizing the costs and maximizing the benefits of the program;
6. Identifying physical and chemical parameters (e.g., transport and attenuation properties) for the COCs; and
7. Periodically assessing the LTM monitoring well network for addition of new monitoring wells or possible decommissioning of monitoring wells from the LTM program.

1.1.2 Purpose of LTM Program

Each site-specific LTM Work Plan has identified monitoring points that will best detect and track the presence of groundwater COCs at the Petroleum SRA over time. The information collected at these monitoring points will be used in order to support a decision for continued monitoring, remedial measures (i.e., free product recovery in those cases where free product is encountered), or spill closure. The LTM Program will collect data from the specified wells during annual and quarterly sampling rounds.

2 ENVIRONMENTAL SETTING

2.1 PHYSIOGRAPHY AND TOPOGRAPHY

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. A rolling plateau northeast of the former Base reaches an elevation of 1300 feet above mean sea level (MSL). The New York State Barge Canal (NYSBC) and the Mohawk River valley south of the former Base lie below 430 feet above MSL. The topography across the former Base is relatively flat with elevations ranging from 435 feet above MSL in the southwest portion to 595 feet above MSL in the northwest portion of the former Base.

2.2 GEOLOGY

Unconsolidated sediments at the former 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 12 feet in the northeast portion to more than 130 feet in the southern portion of the former Base. 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 former AFB generally dips from the northeast to the southwest and consists of Utica Shale, a gray and black carbonaceous unit with a high/medium organic content (Remedial Investigation (RI), Law Engineering and Environmental Services, Inc. (LAW), December 1996).

2.3 HYDROGEOLOGY

The shallow water table aquifer lies within the unconsolidated sediments, where depth to groundwater, during the December 1998 synoptic Base-wide water-level measurement of wells, ranged from just below the ground surface (bgs) to approximately 57 feet bgs in the southwest portion of the base and to 63 feet bgs in the northeast portion of the former Base (FPM, September 2000). Several surface water creeks act as discharge areas for shallow groundwater. Drainage culverts and sewers intercept surface water runoff.

A comprehensive description of regional and local geology, hydrogeology, lithology, and hydrology for the former Griffiss AFB was given in the RI (LAW, December 1996), and in the Supplemental Investigation (SI) prepared by Ecology and Environment, Inc. (E&E, July 1998). Detailed site descriptions and the hydrology for each Petroleum SRA are presented with each site-specific section.

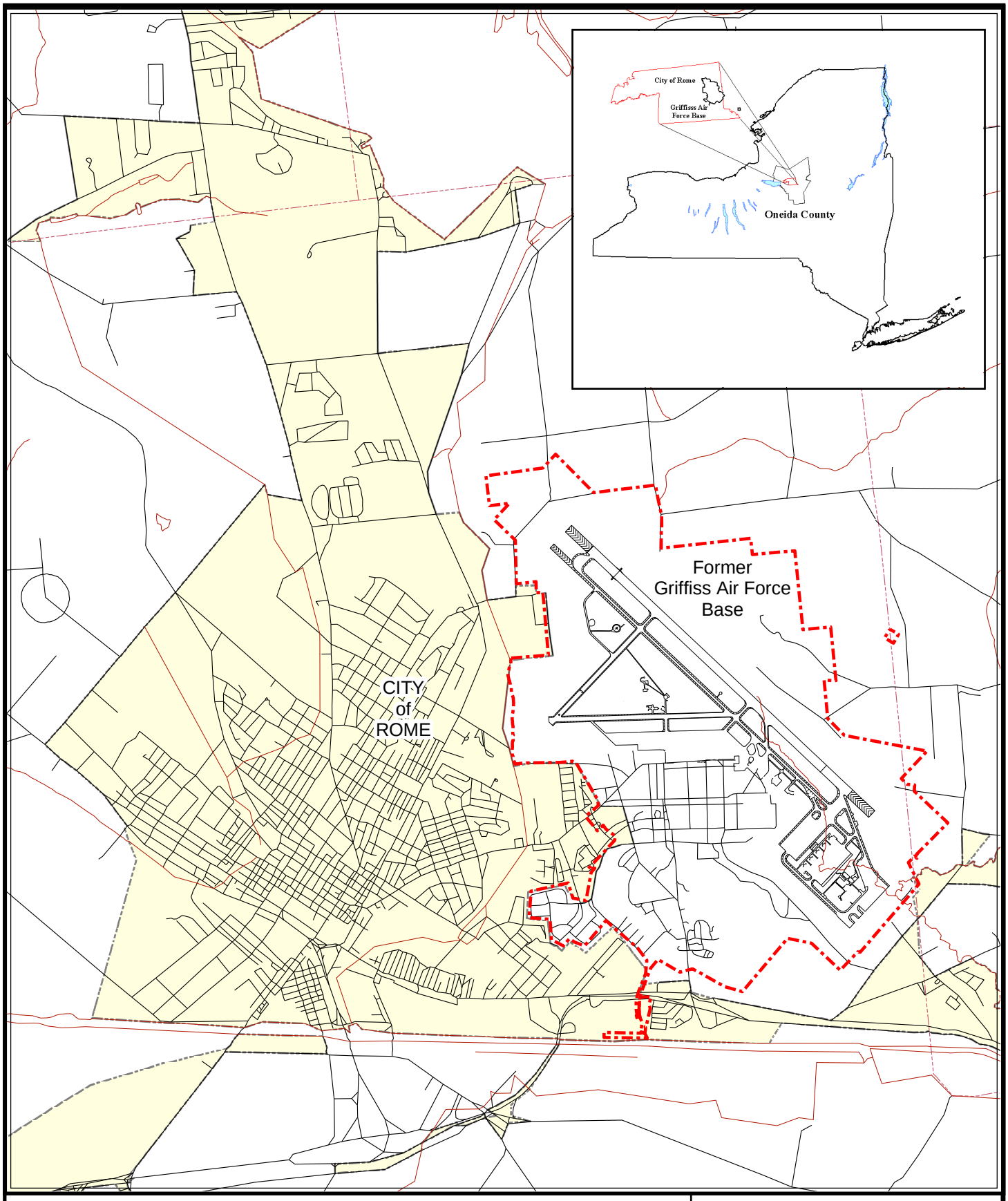

FIGURE 2-1
Base Location Map

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

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2.4 CLIMATE

The former 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, which includes the mean annual snowfall of 107 inches. The annual 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.

The former Griffiss AFB is located in a region prone to acid precipitation; the annual average pH of precipitation recorded for 1992 at the three closest stations ranged from 4.25 to 4.28. Fluctuations in pH have an inverse correlation to precipitation, such that lower pH levels correlate with higher amounts of precipitation (LAW, December 1996).

2.5 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 a 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 on the former Base (New York Natural Heritage Program, January 1994). None of these habitats occur adjacent to the Petroleum SRA described in this report.

2.6 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS IDENTIFICATION

At the Petroleum SRA to be monitored under the LTM Program, the Applicable or Relevant and Appropriate Requirements (ARARs) and other criteria and guidelines to be considered include the NYSDEC Spill Technology and Remediation Series (STARS), Technical and Administrative Guidance Memorandum (TAGM): Determination of Soil Cleanup Objectives and Cleanup Levels, January 1994, NYSDEC Interim Procedures for Inactivation of Petroleum-Impacted Sites, January 1997, and NYSDEC Ambient Water Quality Standards and Guidance Values, June 1998.

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3 TANK FARMS 1 AND 3 SRA (IRP SITE SS-20, NYSDEC SPILL #9111733)

3.1 SITE LOCATION AND HISTORY

The Tank Farms 1 and 3 SRA is located in the central portion of the former Griffiss AFB, as shown in Figure 1-1. The site is a grass-covered area that is located southeast of Building 112 and is bounded by Brooks Road to the south, Otis Street to the east, and Moody Street to the west. Groundwater flow direction is to the south-southeast. The SRA encompasses the former fuel storage facilities for the following products: aviation gasoline (AVGAS), jet propulsion fuel grade 4 (JP-4), automotive gasoline (MOGAS), diesel fuel, fuel oil, and deicing fluid. The Tank Farms 1 and 3 site layout is shown in Figure 3-1.

Tank Farm 1 is the former location of eight 25,000-gallon underground storage tanks (USTs). The USTs are numerically identified as UST 114-1 through UST 114-8. The tanks originally contained AVGAS, then were used for diesel fuel, MOGAS, and finally fuel oil. Other former facilities associated with Tank Farm 1 include one 50,000-gallon aboveground storage tank (AST) for deicing fluid (AST 6045), one underground 50,000-gallon deicing fluid tank (UST 5885), one pumphouse (Building 114), one pump pit, separator tanks, and one water separator pit. The pumphouse was connected to a railroad car unloading stand with three outlets used to off-load fuel from railroad cars into the tanks (Tetra Tech, September 1994; E&E, December 1997). Open NYSDEC Spill #9111733 is associated with former USTs 114-1 through 114-8.

Tank Farm 3 is the former location of four 25,000-gallon USTs (UST 147-1 through -4) that contained JP-4. Other former facilities associated with Tank Farm 3 include two pumphouses (Buildings 147 and 165), one pump pit, separator tanks, one water separator pit, and three aboveground bulk fuel storage tanks (ASTs 161, 162, and 163). The former bulk fuel ASTs originally contained JP 4 but were later used to store fuel oil. Former AST 161 was 840,000 gallons in capacity and former ASTs 162 and 163 were both 420,000 gallons in capacity. Each bulk fuel AST was surrounded by a soil berm.

3.2 DESCRIPTION OF PREVIOUS SAMPLING AND INVESTIGATIONS

In November 1981, Base Fuels verified that 2 to 3 gallons per day of JP-4 leaked from eight valves at Tank Farm 3 for an indefinite period (LAW, February 1995).

In the fall of 1982, investigative soil borings associated with the construction of a steam line were installed to the south of Brooks Road and former Tank Farm 1, where free product was found floating above the water table in the area. In October 1983, the Base Civil Engineering Department installed and sampled well TF3-CE3, shown in Figure 3-1. The well was found to contain free product. When monitoring well TF3-CE3 was sampled again during the summer of 1984, no free product was detected.

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Figure 3-1 Tank Farms 1 and 3 SRA Site Layout Map

In October 1983, the Base Civil Engineering Department installed and sampled well TF3-CE3, shown in Figure 3-1. The well was found to contain free product. When monitoring well TF3-CE3 was sampled again during the summer of 1984, no free product was detected.

In the summer of 1984, Roy F. Weston, Inc. installed 33 temporary wells and eight permanent wells. The Weston report hypothesized that the source of the fuel in the groundwater resulted from: (1) numerous small spills and leaks from the Tank Farms, and (2) from a former truck maintenance shed that was located north of Building 3, where base personnel informed Weston that waste fuels were discharged to the subsurface via a drywell (Weston, November 1985). Review of the 1994 Environmental Baseline Survey (EBS) did not confirm information on drywells or a truck maintenance shed north of Building 3, prior to 1985. The Expanded Site Investigation (ESI) of Area of Interest (AOI) Site 58/101 detected minor SVOCs in surficial soils north of Building 3; however, the groundwater was not impacted (Tetra Tech, September 1994).

In November 1985, all ASTs and USTs associated with Tank Farms 1 and 3 were removed, with the exception of the bulk fuel ASTs (AST 161, 162, and 163). While underground piping was being cut and capped at Tank Farm 1, a 4-inch pipe was found to be full of AVGAS. While a similar action was being performed at Tank Farm 3, the contractor discovered 3 inches of fuel on the floor of Building 147 (Tank Farm 3 pumphouse) and fuel in a header pipe. Industrial Tank and Oil Company subsequently removed the fuel (1,200 gallons). There is no indication in the administrative records that endpoint sampling was performed following the removal of the ASTs and USTs.

In December 1985, Barsons Construction Company removed 60,000 cubic yards (cy) of contaminated soil and replaced it with clean fill.

In 1988, the bulk fuel ASTs (AST 161, 162, and 163) and associated underground facilities were removed, along with all contaminated soils. The soil berms surrounding the bulk fuel ASTs were used to fill the excavated area previously occupied by the removed contaminated soil and underground facilities. Additional cover soil was placed on top of the former berm material to bring the excavated area to grade.

In 1993 and 1994, monitoring wells TF3MW-21, -25, -27 and TF3-CE3 were sampled as part of the quarterly sampling program. The analytical results indicated no VOC or SVOC exceedances of the New York State (NYS) Groundwater Standards. No VOC, SVOC, or metal data were found to exist for wells TF3MW-22, -23, -24, -26, and -28. Based on the October 1998 well/piezometer inventory (E&E, January 1999), and visual inspection, these additional wells do not exist at the present time.

Groundwater observation wells TF3TW-1 and -2 were placed as close as practical to boring locations TF3SB-16 and -17, respectively, to identify the presence of free product. No free product was observed in either temporary well. However, the boring logs and field notes from

TF3TW-1 indicated flame ionization detector (FID) readings as high as 1,000 parts per million (ppm) near the surface of the water table (14 ft bgs) and sheen on all split-spoon samples. The field notes for TF3TW-2 indicated a maximum FID reading of 100 ppm at an interval from 4 to 6 ft bgs (vadose zone) and a slight sheen on all split-spoon samples, except the interval from 0 to 2 ft bgs.

In 1999 and 2000, FPM completed a Supplemental Study to fill data gaps and fully delineate groundwater contamination at the site (FPM, September 2000). A total of 96 soil borings were installed with 72 groundwater samples collected and analyzed using United States Environmental Protection Agency (USEPA) methods 8021 for VOCs and 8270 for SVOCs. In addition, groundwater samples were collected from existing monitoring wells TF3MW-1, TF3-CE3, and TF3MW-21 and newly installed TF3MW-2. These locations are shown in Figure 3-1.

In general, groundwater sample analysis showed numerous exceedances downgradient of USTs 114-1 through -8 (NYSDEC open Spill #9111733) and USTs 147-1 through -4. Except for minor exceedances at TF3TW-43 and -55, groundwater samples immediately downgradient from former Building 165, bulk fuel storage ASTs 161, 163, and 6045, and UST 5885 showed no groundwater exceedances.

In November 2001, monitoring wells TF3MW-116, -117, -118, -119, -120, -121, -123, -124, -125, -126, -127, -128, -129, and -130 were installed and developed prior to sampling. A source removal action in Fall 2002, at the Tank Farms 1 and 3 site, removed residual soil contamination that was identified during the previous soil boring activities and not removed during the Barson's excavation in 1985. Approximately 12,800 cy of soil was excavated from locations within the former bermed area and vicinity including the former building 147 footprint at Tank Farms site. Removal of the residual soil contamination continued into the saturated zone until all contaminated areas were identified, thereby preventing any additional contamination from the vadose zone from leaking into the groundwater (Parsons, December 2003).

In December 2005, Oxygen Release Compound (ORC®) Advanced was injected into seventeen borings. Site utilities made injection impossible south of Brooks Road and ORC® socks were installed in existing monitoring wells instead. Five pounds of ORC® per foot were injected from 20 to 14 feet bgs. Injection took place in the source area of Tank Farms 1 & 3 as shown on Figure 3-1 and added to downgradient monitoring wells TF3MW-21, -116, -117, -119R, -121R and -123 by the use of ORC® socks in October 2005.

In summary, separate petroleum plumes may have originated from three locations including, USTs 114-1 through -8 and USTs 147-1 through -4, as well as the former truck maintenance shed north of Building 3, possibly in the vicinity of TF3MW-123 or -125. The dissolved groundwater plume appears to be well defined and to be naturally attenuating. Based on observations at the site and based on the size and stability of the dissolved plume, residual free product has not been identified (FPM, February 2004).

3.3 TEMPORARY BIOSPARGING

Temporary biosparging was performed at monitoring well TF3MW-123 in summer and fall 2008. Temporary biosparging was performed at monitoring well TF3MW-127 in 2008 and in spring 2009. Biosparging was conducted at these wells in order to enhance the biodegradation of petroleum contamination at Tank Farms 1 and 3. The temporary biosparging log table and field forms from each event are provided in Appendix E.

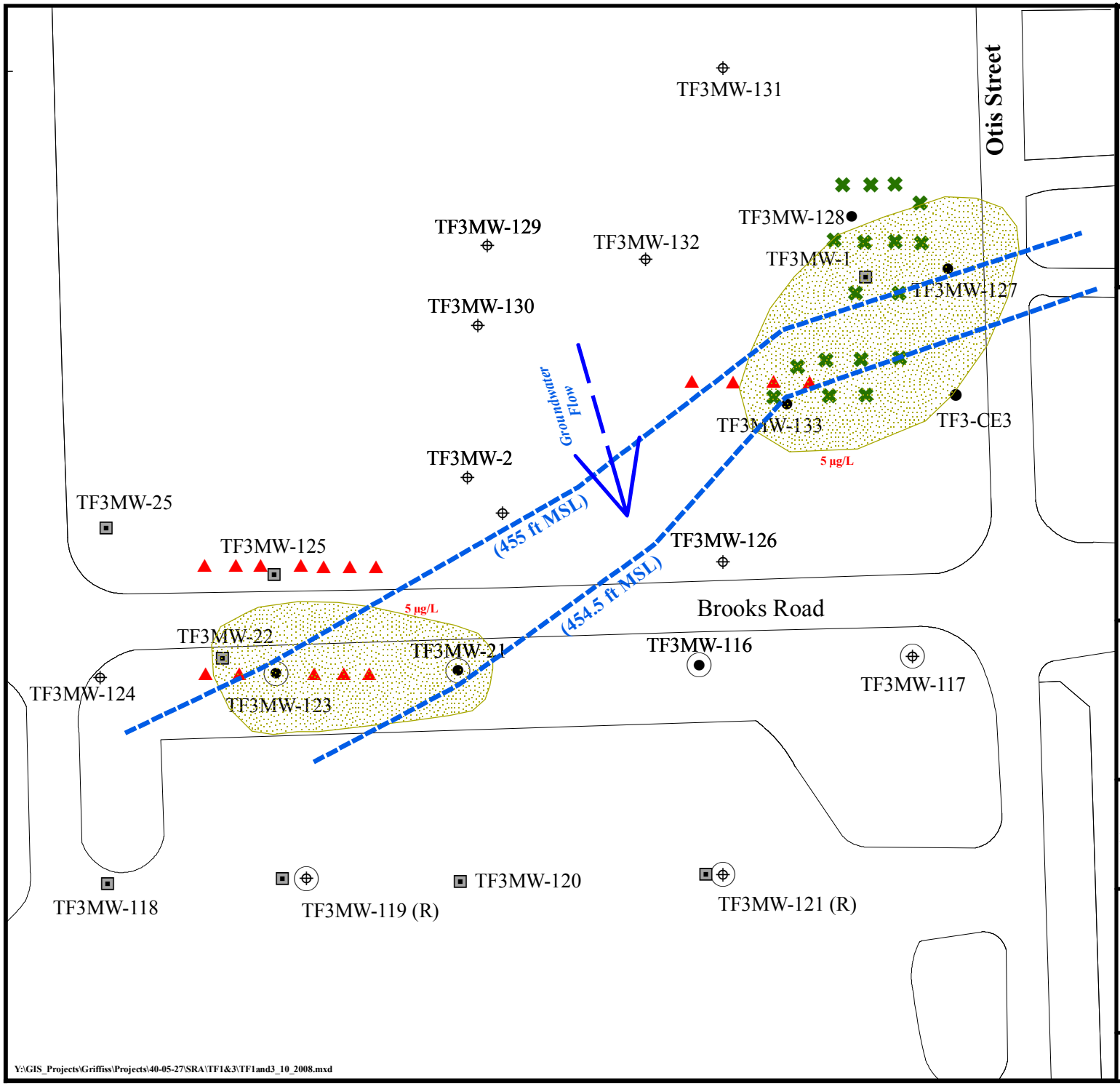
3.4 LTM PLAN

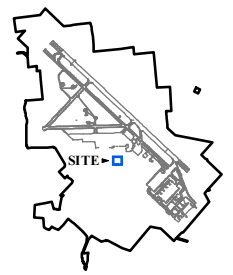
Table 3-1 summarizes the original LTM sampling and analysis plan. The objectives of the Tank Farm 1 and 3 LTM program include the following:

- Monitor the groundwater to track plume migration using sampling locations identified on Figure 3-2.

Table 3-1
Tank Farms 1 and 3 Quarterly Sampling Analysis Summary

Site/ Sampling Locations	Screen Interval (ft. MSL)	Sampling Rationale	Target Analytes/ USEPA Method Numbers	Sampling Frequency
TF3-CE3	442-457	Downgradient, within plume	VOCs, 8260 AFCEE QAPP 3.1 List	Annual
TF3MW-2	450-460	Downgradient, within plume		
TF3MW-21	445-465	Downgradient within plume		
TF3MW-25	444-464	Crossgradient	SVOCs, 8270,	
TF3MW-116	449-459	Downgradient within plume		
TF3MW-117	448-458	Crossgradient from plume	* Natural attenuation	
TF3MW-123	449-459	Downgradient within plume	parameters pH, temperature,	
TF3MW-124	449-459	Crossgradient from plume	redox potential, ferrous	
TF3MW-125	449-459	Downgradient	iron, and dissolved oxygen	
TF3MW-126	449-459	Downgradient within plume	will be measured in the	
TF3MW-127	450-460	Upgradient within plume	field.	
TF3MW-128	451-461	Upgradient within plume		
TF3MW-129	451-461	Upgradient from plume	Alkalinity, nitrate, sulfate,	
TF3MW-130	451-461	Upgradient within plume	sulfide	





Location Map

Key Features

- Decomissioned Monitoring Well
- Existing Monitoring Well
- LTM Well
- ORC Socks Installed
- March 2009 Plume Extent
- March 2009 Groundwater Elevation

ORC Injection Location

- Dec 2005
- Aug 2006

N

0 40 80

Feet

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

Figure 3-2
Tank Farms 1 and 3
Sample Locations and
Groundwater Contamination
(March 2009)

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3.5 RESULTS

In order to increase the readability of the report, all discussion of past sampling rounds has been eliminated. Only the sampling round relevant to this report (March 2009) is discussed in detail. Groundwater results from this sampling round and all previous sampling rounds are presented in Appendix A. Detailed descriptions of past sampling rounds can be found in a previously issued Fall 2006 LTM Report (FPM, August 2007), Spring 2007 LTM Report (FPM, March 2008), and Spring 2008 LTM Report (FPM, December 2008). Daily Chemical Quality Control Reports (CQCRs) completed during the March 2009 sampling round are provided in Appendix B. The complete list of analytes and the validated data are attached in Appendix C and the raw lab data are available in Appendix D.

March 2009:
Monitoring wells with VOC exceedances include TF3MW-21, -123, -127, and -133.

- Minimum exceedance concentration: 1,3,5-trimethylbenzene at 5.02 µg/L (NYS Groundwater Standard is 5 µg/L) at TF3MW-133.
- Maximum exceedance concentration: 1,2,4-trimethylbenzene at 104 µg/L (NYS Groundwater Standard is 5 µg/L) at TF3MW-127.
- Maximum total VOCs: 338.6 µg/L reported at TF3MW-127.

In summary, two plumes from two source areas have stabilized and are attenuating. The plume located near monitoring wells TF3MW-127, -128, and -133 is associated with former UST 147-1 through -4. The second plume, located in the vicinity of TF3MW-21, -116, -123 and decommissioned well TF3MW-125, has most likely resulted from USTs 114-1 through -8 and the former truck maintenance shed that was located north of Building 3 (possibly near TF3MW-123 and -125). These areas have been previously injected with ORC® and have shown attenuation over time. In addition, temporary biosparging has taken place at TF3MW-123 and -127. Most of the contaminants at the site have attenuated to within one order of magnitude of the applicable groundwater standard.

Total VOC detections and groundwater elevations are illustrated in Figures 3-3 and 3-4. VOC contaminated groundwater plumes are shown on Figure 3-2.

Figure 3-3
Tank Farms 1 and 3 SRA VOC Concentrations and Groundwater Elevation Trends

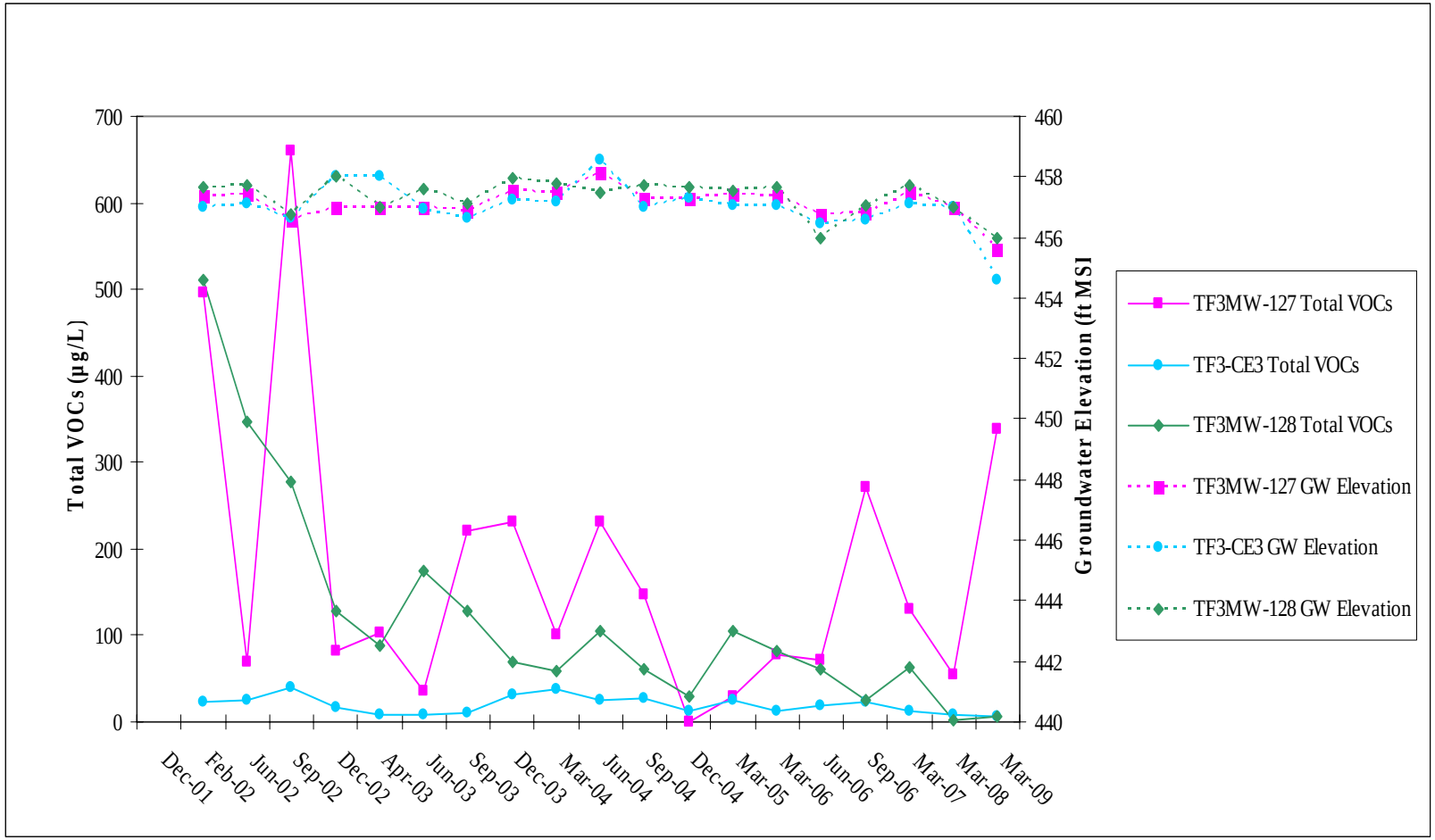
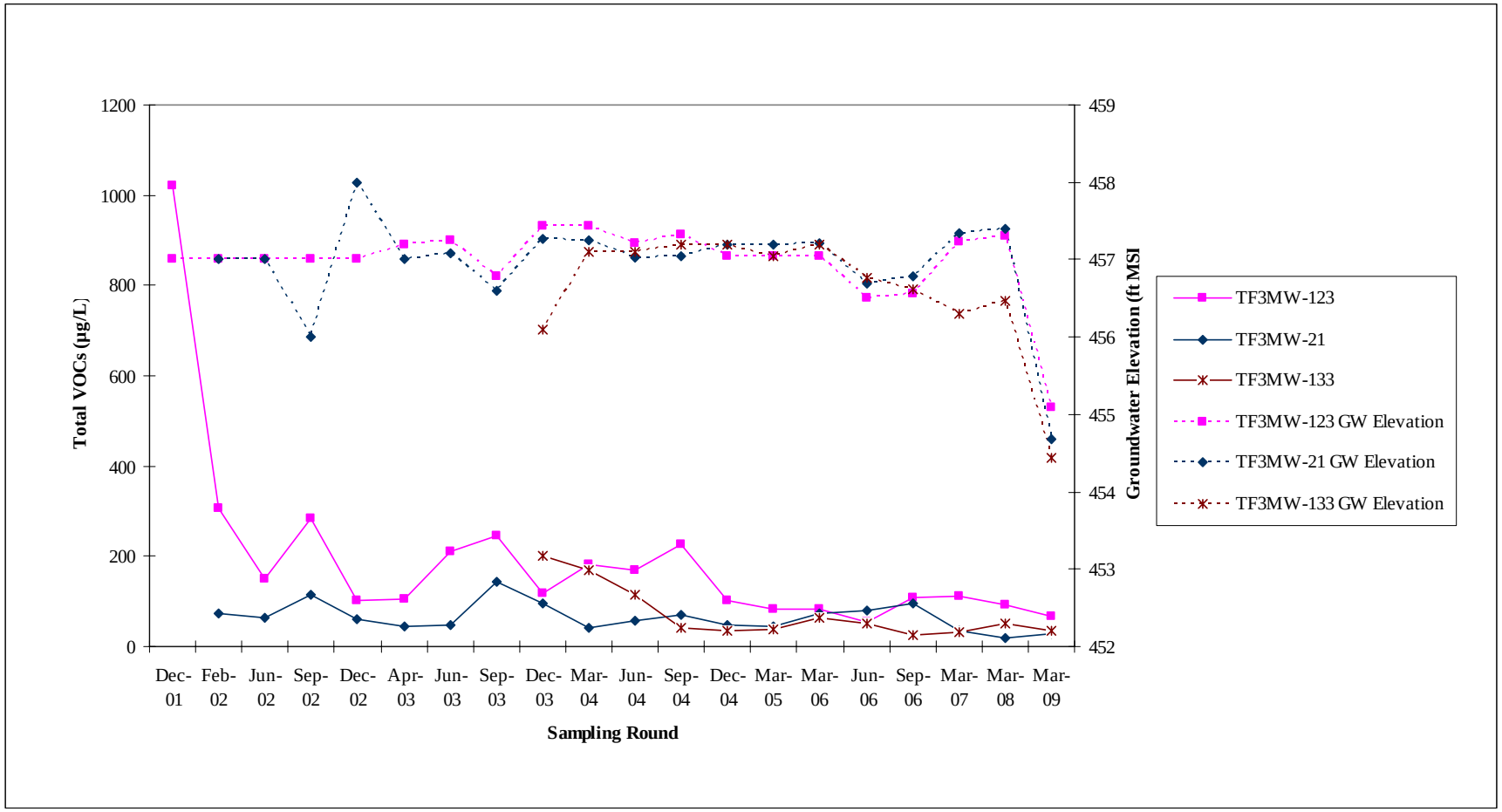


Figure 3-4
Tank Farms 1 and 3 SRA VOC Concentrations and Groundwater Elevation Trends



3.6 CONCLUSIONS AND RECOMMENDATIONS

Monitoring wells TF3MW-21, -123, -127, and -133 are the remaining contaminated wells at the site. COCs detected at these monitoring wells are primarily isopropylbenzene, ethylbenzene, and 1,2,4-trimethylbenzene. COC concentrations are generally within one order of magnitude from the groundwater standard and appear to be attenuating naturally. However, during the March 2009 sampling round, VOC concentrations at TF3MW-127 increased. This increase may be attributed to the migration of residual soil and groundwater contamination caused by the ongoing temporary biosparging at the well. Downgradient sampling locations showed no increases in contamination.

Groundwater sampling will continue on an annual basis at the monitoring wells listed in Table 3-2 and shown in Figure 3-2. In addition to groundwater sampling, mobile biosparging will be conducted periodically at TF3MW-123, and -127 to enhance the attenuation of petroleum constituents in the surrounding water table. Site closure is expected once residual contamination areas surrounding TF3MW-21, -123, -127, and -133 are fully attenuated and all associated analytical data is below NYS Class GA Groundwater Standards.

Table 3-2
Tank Farms 1 and 3 Proposed Future LTM Sampling

Sampling Locations	Sampling Rationale	Target Analytes/ Method Numbers	Sampling Frequency	Evaluation Criteria/ Modification Justification
TF3-CE3 TF3MW-21 TF3MW-116 TF3MW-123 TF3MW-127 TF3MW-128 TF3MW-133	Within plume Within plume Within plume Within plume Within plume Within plume Within plume	VOCs (AFCEE QAPP 4.0 List)/SW8260	Annually	The plume is stable.
Recommended LTM Changes				
September 2008				
Removed Sampling Locations				
TF3MW-117 TF3MW-126 TF3MW-119R TF3MW-121R	Crossgradient of plume Crossgradient of plume Downgradient of plume Downgradient of plume	VOCs (AFCEE QAPP 4.0 List)/SW8260	Annually	The plume is stable and consistently contains contamination at or below the NYSDEC Class GA groundwater Standards, historical analysis shows that wells are no longer needed to track contamination.
September 2007				
Analysis Changes				
All sampled wells	_ _	Alkalinity/310.2	Annually	Analysis is no longer needed

Table 3-2 (continued)
Tank Farms 1 and 3 Proposed Future LTM Sampling

Sampling Locations	Sampling Rationale	Target Analytes/ Method Numbers	Sampling Frequency	Evaluation Criteria/ Modification Justification
Historical LTM Network Changes				
June 2006 Analysis/Frequency Change				
TF3MW-119R TF3MW-121R	Downgradient of plume Downgradient of plume	SVOCs/SW8270	_ _	SVOCs were not identified at these wells following six sampling rounds. SVOC sampling is no longer needed.
All sampled wells	_ _	Nitrate/353.2		Nitrate is no longer a useful biodegradation indicator at the Tank Farms 1 and 3 site, and will not be sampled after the Winter 2006 sampling round.
November 2005 Removed Sampling Locations				
TF3MW-131 TF3MW-132	Upgradient of plume Upgradient of plume			Previous quarterly LTM samples indicate that no contamination is present and additional groundwater sampling is not needed.
February 2005 Removed Sampling Locations				
TF3MW-124 TF3MW-129 TF3MW-130	Crossgradient of plume Upgradient of plume Upgradient of plume			Previous quarterly LTM samples indicate that no contamination is present and additional groundwater sampling is not needed.
June 2004				
Analysis/Frequency Changes				
All sampled wells	_ _	Sulfate/376.3 Sulfide/375.4	_ _	Sulfate reduction is depleted and will no longer be sampled during June 2004 round.

Table 3-2 (continued)
Tank Farms 1 and 3 Proposed Future LTM Sampling

Sampling Locations	Sampling Rationale	Target Analytes/ Method Numbers	Sampling Frequency	Evaluation Criteria/ Modification Justification
Added Sampling Locations				
TF3MW-119R TF3MW-121R	Downgradient of plume Downgradient of plume	VOCs and SVOCs(AFCEE QAPP 3.1 List)/SW8260 and SW8270 Alkalinity/310.2 Nitrate/353.2	Quarterly	Quarterly monitoring with semi-annual evaluation and recommendations. SVOC analysis was added due to previous identification of SVOC contamination. Monitoring well locations were replacements for previous well locations.
Removed Sampling Locations				
TF3MW-118 TF3MW-119 TF3MW-120 TF3MW-121	Downgradient of plume Downgradient of plume Downgradient of plume Downgradient of plume	VOCs (AFCEE QAPP 3.1 List)/SW8260	Quarterly	Decomissioned March 2002 due to site construction. Its
TF3MW-1 TF3MW-25 TF3MW-125	Within plume Crossgradient of plume Within plume	VOCs (AFCEE QAPP 3.1 List)/SW8260	Quarterly	Destroyed 2003 due to site construction.

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