Report on Implementation of Remedial Action at Landfill 6 AOC

Former Griffiss Air Force Base Rome, NY

September 2008

Air Force Real Property Agency

DEPARTMENT OF THE AIR FORCE
AIR FORCE REAL PROPERTY AGENCY

30 SEP 2008

MEMORANDUM FOR SEE DISTRIBUTION LIST

FROM: AFRPA-Griffiss
Environmental Section
153 Brooks Road
Rome NY 13441-4105

SUBJECT: Griffiss Landfill 6 Closure

1. Attached is the final Report on Implementation of Remedial Action at Landfill 6.

2. Included are the Response to Comments to comments received from the U.S. EPA on August 15th, 2008.

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

MICHAEL F. MCDERMOTT
BRAC Environmental Coordinator

Attachment: As Noted

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RESPONSE TO EPA COMMENTS ON
TECHNICAL REVIEW OF THE
REPORT ON IMPLEMENTATION OF REMEDIAL ACTION AT LANDFILL 6
AUGUST 2008
FORMER GRIFFISS AIR FORCE BASE
ROME, NEW YORK

RECEIVED ON AUGUST 15, 2008

#	Page, Section	USEPA Comment	Response
General Comments			
1	-	While reviewing the Implementation Report, the *Landfill 6 Cover Improvements: Engineer's Certification Report*, dated January 2007 (Engineers Report) was also evaluated to determine if such information was available. Based on my review, I did not see information regarding the following comments in either report.	The Engineer's Certification Report is utilized to document the remedy implementation in accordance with the design, noting any variances, and was completed in conformance with the USEPA and NYSDEC approved Closure Plan for Landfill 6 (Conti/EA, March 2004). Accordingly, the following text has been added to Section 1: "Detailed information regarding specific variations to the implementation of remedial actions can be located in the Final Landfill 6 Cover Improvements, Engineer's Certification Report (Conti/EA, January 2007)."
ER1	**Section 2.3.3.1, Three Mile Creek Sediment, Page 8 of 22**	This section of the Engineers Report states that some of the materials stockpiled from the creek excavation exceeded the moisture content dictated by the project specifications. Cement or sand was added to the sediments to reduce the moisture content. The amended sediments were then visually inspected prior to placement in the landfill. This construction issue was not discussed in the Implementation Report. Please discuss how wastes that exceeded the project moisture content specifications were addressed prior to waste placement, and how it was determined the project specified moisture content was achieved. Further, ensure that the Implementation Report includes a description of each instance where a field condition did not initially comply with the design requirements, and discuss how each instance was resolved.	Specifics on the soil moisture content are located in the Engineer's Certification Report. "…, the sediment with high moisture content was transported and stockpiled in a specified area within the landfill footprint. The material was then conditioned by adding Calciment and/or sand to reduce the moisture content and stabilize the material. The stabilized material was then placed in the landfill. All material was visually approved by Conti and/or EA prior to placement in the landfill." Page 8 of 22, first paragraph Conti/EA, January 2007) The Implementation Report was not changed.

#	Page, Section	USEPA Comment	Response
ER2	**Section 2.3.3.1, Additional Material Sources, Page 8 of 22**	This section of the Engineers Report states that cobbles were placed in the hardfill area of the landfill. The Implementation Report addresses instances of additional materials being incorporated into the final remedy, but a drawing showing the locations where these materials were placed was not included in the Implementation Report. Please revise the Implementation Report to provide a figure showing the locations of the additional hardfill materials.	For consistency, the AFRPA recommends that the Landfill 6 Implementation Report does not get modified to include the detailed figure from the Engineer's Report (As-Built Drawing, C-2, Subgrade Plan, Appendix F).
ER3	**Section 2.3.3.2, Gas Monitoring Probes, page 9 of 22**	This section of the Engineers Report indicates that a total of 16 Gas Monitoring Probes were installed. Figure 1 of the Implementation Report depicts sixteen gas monitoring probes, but does not include a LF6GMP-14 location. It is my recollection that GMP-14 could not be installed due to an elevated water table. Please revise the Implementation Report to include a note on Figure 1 which addresses this inconsistency.	Figure 1 will be revised to illustrate the proposed location of LF6GMP-14. The revised figure will also incorporate the following explanation for the variance: "Planned gas monitoring probe LF6GMP-14 could not be installed, due to an elevated water table at the proposed location."
ER4	**Section 2.3.3.5, Barrier Protection Layer, Page 10 of 22**	This section of the Engineers Report states that several minor variations were encountered with regard to the Barrier Protection Layer; however, no discussion regarding these variations has been provided in the Implementation Report. The remedial design allowed for realignment of the limits of waste for Landfill 6. First, the limits of waste along the western boundary of the landfill between points IPS-108 and IPS-110 were determined to be east of the limit of waste as depicted on the design drawings. The limit of waste was revised via visual confirmation from an excavated trench, and the cap components were constructed over the revised footprint. Please include within the Implementation Report each variation in the barrier protection layer. Second, the volume of soils accepted from Three Mile Creek was greater than anticipated, which required the contractor to reshape the northern portion of the landfill in order to compensate for the additional materials. The required minimum and maximum slope criteria were reportedly still achieved. Ensure that this variation is also discussed in the Implementation Report.	The following text will be inserted in Paragraph 3 of Section 3.3: "In order to account for the increase of material, Conti reshaped the northern portion of the landfill. The reshaped portion was within the required minimum and maximum slope requirements set forth in the Closure Plan. Details of the minor variations are documented in Section 2.3.3 of the Engineer's Report."

#	Page, Section	USEPA Comment	Response
ER5	**Section 3.2.6, Daylighted and Non-Daylighted Drainage Systems, Page 20 of 22**	This section of the Engineers Report states that several changes were made to the drainage system based on field conditions, but a discussion of these modifications has not been provided in the Implementation Report. Part of the drainage layer was substituted with triplanar material in lieu of a biplanar material. The triplanar material was approved for use at the Landfill 1 and Landfill 2/3 caps, and is of greater flow capacity than the material specified for Landfill 6. Please revise the Implementation Report to provide a discussion of the modifications made to the drainage systems.	The following text has been added to the document: "As documented in the Engineer's Certification Report (Conti/EA, 2007), the majority of the Landfill 6 drainage layer component is comprised of a biplanar geocomposite. A small portion of the northern area was covered with a triplanar geocomposite. The variance is the result of unused materials from the Landfill 1 and 2/3 cap being utilized in the Landfill 6 cap construction."
ER6	**Appendix F, Figure C-4**	Based on this figure included in the Engineers Report, the original Landfill 6 cap design included the use of geogrid on certain slopes. Additional friction testing conducted of the actual materials to be used in the cap design indicated that it was not necessary to place geogrid in certain areas of the landfill. Thus, a portion of the landfill did not receive a geogrid. This approach has not been discussed in the text of the Implementation Report and should be included.	The following text has been added to the Implementation Report: Results from the additional interface friction testing indicated that the use of geogrid was unnecessary throughout the site. As such, the areas identified in Appendix F, As-Built Drawings, C-2, Subgrade Plan and C-4, Closure Cap Details of the Engineer's Certification Report, were only meant to identify the proposed locations for geogrid.

Specific Comments			
#	**Page, Section**	**USEPA Comment**	**Response**
1	**Section 2.1, Property Proposed for Transfer, Page 4:**	This section indicates the Implementation Report and a Finding of Suitability to Transfer (FOST) will be used "for transfer of the Landfill 6 AOC property." However, the text does not address how either document will be used to provide information related to the property transfer. Section 5.0, Specific Guidelines for Institutional Controls, of EPA's *Institutional Controls and Transfer of Real Property under CERCLA Section 120(h)(3)(A), (B) or (C)* lists and discusses the types of information EPA needs to determine if the institutional controls are operating properly and successfully. It is suggested that Section 2.1 be revised to explain how the Implementation Report and the FOST will support the transfer of the Landfill 6 Area of Concern (AOC) property. As part of the explanation, identify the types of information related to institutional controls and property transfer that will be included in the Implementation Report. Furthermore, ensure all information identified for inclusion in the Implementation Report is actually provided in the revised document.	The Implementation Report provides the necessary background information for determining the effectiveness of the selected remedies/institutional controls, as identified in the ROD, and ensuring the protection of human health and the environment set forth in the ROD. The purpose of the FOST is to identify environmental factors associated with the property and to determine whether the proposed transfer of such property is consistent with the protection of human health and the environment. Both documents follow the Specific Guidelines for Institutional Controls, of EPA's *Institutional Controls and Transfer of Real Property under CERCLA Section 120(h)(3)(A), (B) or (C).* The AFRPA plans on maintaining Landfill 6 as open space and wetlands/surface water throughout the post-closure period as required by the ROD. Land-use controls have been implemented by the AFRPA. Once the property is deeded, the land-use controls will be recorded as deed restrictions. Monitoring and enforcement of the institutional controls is accomplished through landfill site inspections. Contingency maintenance activities are addressed through the Landfill 6 Post-Closure Operations and Maintenance Manual (Conti/EA, December 2006).

#	Page, Section	USEPA Comment	Response
2	**Section 2.2, Institutional Controls/Deed Restrictions, Page 5**	The discussion at the top of Page 5 indicates "Institutional controls in the form of deed restrictions and signage will be implemented…" Further, the text notes "Through deed restrictions, the property owner is restricted..." Section 2.2 closes with "Each identified institutional control will specify…" Thus, it is unclear whether the deed restrictions have been implemented or not. Further, Section 4.0, General Guidelines for Institutional Controls, in EPA's *Institutional Controls and Transfer of Real Property under CERCLA Section 120(h)(3)(A), (B) or (C)* states "An institutional control must be implemented in much the same way as an engineered remedy described in a ROD is designed and constructed." This level of detail is not provided in Section 2.2. Please revise Section 2.2 to clearly indicate if the deed restrictions have been implemented or not. If implemented, identify each deed restriction and the restriction it imposes on the Landfill 6 AOC property. If not yet implemented, provide a list of intended deed restrictions, identify the restriction each will impose, and include a schedule for implementation. In either case, provide a detailed discussion describing how the deed restriction will be implemented, monitored, and enforced. If these details are intended for a separate project document, this should be noted and the title of the document and proposed submittal date included in Section 2.2	The text will be revised to clarify that land-use controls have been implemented by the AFRPA. The AFRPA plans on maintaining Landfill 6 as open space and wetlands/surface water throughout the post-closure period as required by the ROD. Land-use controls have been implemented by the AFRPA. Once the property is deeded, the land-use controls will be recorded as deed restrictions. Monitoring and enforcement of the institutional controls is accomplished through landfill site inspections. Contingency maintenance activities are addressed through the Landfill 6 Post-Closure Operations and Maintenance Manual (Conti/EA, December 2006).

#	Page, Section	USEPA Comment	Response
3	**Section 3.1, Record of Decision, Page 6**	As specified in the *Final Record of Decision for the Landfill 6 Area of Concern (LF-09) at the Former Griffiss Air Force Base Rome, New York* (LF-09 ROD), the eighth bulleted item on Page 6 indicates long term monitoring will be used to evaluate the effectiveness of the Presumptive Remedy and "groundwater will be monitored in accordance with the Air Force's On-base Groundwater Monitoring Plan and the stream environment will be monitored in accordance with the Three Mile Creek AOC work plan…" Later, Section 3.4.2.1, Groundwater, and Section 3.4.2.2, Surface Water, describe an existing long-term monitoring (LTM) effort for groundwater and quarterly sampling at Three Mile Creek from June 2006 to April 2008 for groundwater and surface water, respectively. According to Section 3.4.2.1, LTM for groundwater is conducted in accordance with the *Final Long-Term Monitoring Work Plan, Landfill 6 Area of Concern*. To provide a more clear and transparent description of the LTM effort at the Landfill 6 AOC, it is suggested that the Implementation Report be revised to include proposed submittal dates for the On-base Groundwater Monitoring Plan and the Three Mile Creek AOC work plan. Further, the Implementation Report should include a discussion that establishes the relationship between the existing LTM of groundwater and surface water at Three Mile Creek and the efforts that will be outlined in the plans to be submitted. The discussion of LTM for groundwater should specifically establish the relationship between the *Final Long-Term Monitoring Work Plan, Landfill 6 Area of Concern* and the On-base Groundwater Monitoring Plan.	The intent of the referenced bullet is to clarify that the Landfill 6 TCE plume is being addressed under the On-base Groundwater AOC and the Three Mile Creek is being addressed under the Three Mile Creek AOC. The Landfill 6 TCE, On-Base Groundwater Plume is currently in the Performance Monitoring stage and the associated work plan is pending finalization. The Three Mile Creek AOC Long Term Monitoring Work Plan was finalized in December 2003. As a result, the Landfill 6 AOC Implementation Report focuses on the Part 360 required monitoring and demonstrating that the groundwater conditions immediately downgradient of the landfill are either stable or improving. The text in Section 3.4.2 will be revised to clarify accordingly.

#	Page, Section	USEPA Comment	Response
4	**Section 3.2, Remedial Design, Page 7**	Section 3.2 closes by stating the final design of the cap at the Landfill 6 AOC met the requirements of the LF-06 ROD. Information supporting this statement includes a reference to the *Landfill 6 Cover Improvements, Engineer's Certification Report* and a summary of the components included in the cap in the first paragraph of Section 3.3, Remedial Action Construction. To provide further support to the assertion made at the close of Section 3.2, it is suggested that a figure illustrating the as-installed cross section of the Landfill 6 AOC cap should be included as part of the Installation Report. The figure should identify all design components, including those specified in the LF-06 ROD, and include thicknesses for each as-installed cap layer.	For consistency, the AFRPA recommends that the Implementation Report does not get modified to include the detailed figure from the Engineer's Report (As-Built Drawing, C-4, Closure Cap Details, Appendix F).
5	**Section 3.3, Remedial Action Construction, Page 8**	The last sentence of the first paragraph refers the reader to the *Landfill 6 Cover Improvements, Engineer's Certification Report* for information related to field modifications effected during construction of the Landfill 6 AOC cap. While this reference is helpful, Section 3.3 should be revised to list and summarize all modifications made in the field during cap construction. Please revise Section 3.3 to address this issue.	Please refer to the response to Comment ER4.
6	**Section 3.3, Remedial Action Construction, Page 8**	The second paragraph of this section indicates that a decontamination pad was constructed and after construction completion, it was removed. The location of the former decontamination pad has not been provided on either of the Implementation Report figures. In addition, the same is true for the discussion in the last paragraph on this page regarding the vernal pools. The text states that vernal pools were constructed, but the locations of the vernal pools have not been depicted on either of the provided figures. Please revise the Implementation Report to include a figure showing the location of the former decontamination pad and vernal pools.	Considering that the vernal pools are current site features, they will be shown on the revised figures. The AFRPA recommends that the temporary decontamination pad not be detailed in the Implementation Report figures. The location of the decontamination pad is detailed in the Engineer's Report (As-Built Drawing, C-2, Subgrade Plan, Appendix F).

#	Page, Section	USEPA Comment	Response
7	**Section 3.3, Remedial Action Construction, Page 8**	The third paragraph of Section 3.3 indicates the limit of waste along the western boundary of Landfill 6 was moved to the east and the cap was constructed over the revised limit of waste. The landfill boundary is illustrated in both Figure 1 and Figure 2 of the Implementation Report. To provide a more clear and transparent description of implementation activities, it is suggested that Figures 1 and 2 be modified to depict the original limit of waste at the Landfill 6 AOC as well as the as-installed limits of the landfill cap. Further, references to the modified figures should be included in the third paragraph of Section 3.3.	The figures will be revised as suggested.
8	**Section 3.4.1, Operations and Maintenance, Pages 9 and 10**	The second paragraph of Section 3.4.1, Page 9, notes that periodic inspections of the Landfill 6 AOC are performed. Further, the area is inspected to "ensure compliance with institutional control measures." The discussion also notes that checklists are used to facilitate and standardize these inspections. A bulleted list of inspection activities is also included on Pages 9 and 10 of Section 3.4.1. However, additional details are needed to demonstrate that the inspections are a key component in the effective maintenance of the installed cap and in establishing the effectiveness of the installed remedy. It is suggested that a copy of each inspection checklist associated with the Landfill 6 AOC be included in the revised Implementation Report.	The landfill inspection check lists suggested for inclusion are identical to the check list included on Pages 9 and 10 of Section 3.4.1. Completed post-closure inspection forms are provided in the Landfill 6 AOC Long Term Monitoring Report (FPM, June 2008). In addition, completed inspection reports can be found in the Annual LUC/IC Site Inspection Report.

#	Page, Section	USEPA Comment	Response
9	**Section 3.4.1, Operations and Maintenance, Pages 9 and 10**	As previously noted, Section 3.4.1 indicates inspections are performed to ensure compliance with institutional control measures. Further, the third bulleted item at the top of Page 10 states that the area is inspected for evidence of activities, such as construction, not approved by the Air Force, NYSDEC, and EPA. Additional information is needed regarding inspections conducted to ensure compliance with institutional control measures is based on the information provided in the Implementation Report; it is not clear that all institutional controls for the Landfill 6 AOC have been designed and implemented. Please revise Section 3.4.1 to discuss how inspections are used to ensure compliance with institutional controls measures. Expand the descriptions in the second and third bullets on Page 10 to identify and discuss all types of observations that will be made during inspections to establish the effectiveness of the institutional control measures. The discussion should address currently implemented institutional controls as well as those to be implemented at a later date. Provide references to inspection checklists included with the revised Implementation Report as appropriate.	As previously stated, land-use controls have been implemented by the AFRPA. Once the property is deeded, the land-use controls will be implemented through deed restrictions. Monitoring and enforcement of the institutional controls is accomplished through on-going landfill site inspections. Contingency maintenance activities are addressed through the Landfill 6 Post-Closure Operations and Maintenance Manual (Conti/EA, December 2006). The text will be revised to clarify accordingly.

#	Page, Section	USEPA Comment	Response
10	**Section 3.4.4.1, Soil and Solid Waste, Page 13**	The discussion in Section 3.4.4.1 asserts that the additional soil cover reduces infiltration of rainwater and snowmelt and minimizes the potential for leachate generation and groundwater contamination. These assertions, while generally applicable to an engineered cap, are not supported by site specific data or observations. Please revise Section 3.4.4.1 to include a discussion of operating and maintenance experience and observations as well as information available through the LTM Program that supports these assertions and/or demonstrates remedy performance as it relates to the remedial action objects established in the LF-06 ROD.	As documented in post-closure inspection reports (FPM, June 2008), significant ponding of water has been observed at the toe of Landfill 6 and within the constructed vernal pools. This surplus of water has been attributed to the increased flow across the landfill surface because the landfill cap installation reduced rainwater infiltration. The text will be updated to address the comment. Durov plots of water chemistry for samples collected at the Landfill 6 AOC suggest that groundwater migrating through Landfill 6 is not impacting the surface water at Three Mile Creek. Comparisons of downgradient monitoring well samples, upgradient monitoring well samples, and surface water samples indicate a notable distinction in the water quality type as groundwater migrates downgradient through the landfill and into Three Mile Creek. Downgradient monitoring wells showed a predominately calciumbicarbonate- type water (indicative of reducing conditions). Surface water sampling locations demonstrated a water quality type that consisted equally of sodium-chloride and calciumbicarbonate. Upgradient monitoring wells not impacted by the Building 775 TCE plume demonstrated water quality types dominated by magnesium and sodium chloride. In addition, the leachate sampling locations demonstrated water quality types similar to those of downgradient monitoring wells in their vicinity.

#	Page, Section	USEPA Comment	Response
11	**Section 3.4.4.2, Groundwater and Surface Water Quality, Page 14**	The third full paragraph on Page 14 states that comparisons of sample results from upgradient and downgradient wells at the Landfill 6 AOC and surface water sample results from Three Mile Creek indicate "a notable distinction in water quality type as groundwater migrates downgradient through the landfill and into Three Mile Creek." This point is not elaborated. Neither the data considered nor the results of the comparative analysis are provided in the Implementation Report. Please revise Section 3.4.4.2 to provide additional information on the comparison of sampling results from upgradient and downgradient monitoring wells and Three Mile Creek. Present the data considered in the analysis. Further, include a summary of methodology used in performing the analysis. Finally, present the results of the analysis and discuss the results as they relate to remedy performance.	The requested supporting data will be provided.
12	**Section 3.4.4.2, Groundwater and Surface Water Quality, Page 14**	The fourth full paragraph on Page 14 states that "the cover is expected to reduce leachate generation, which in turn will reduce the potential for transporting COCs from the landfill to Three Mile Creek via groundwater." The Implementation Report does not indicate how this will be quantified. Revise the Implementation Report to identify the types of monitoring to be conducted for determining that a reduction in leachate generation has occurred. Further, describe how the monitoring results will be used to make this determination.	The text will be revised similar to the responses to comments # 10 and 11.
13	**Section 3.4.4.4, Landfill Gas Monitoring, Page 15**	This section of the Implementation Report indicates that methane concentrations were detected in two gas monitoring probes. However, the text does discuss the specific locations were the detections occurred. Please revise the Implementation Report to identify which two landfill gas monitoring probes had the methane detections.	The two gas monitoring probes will be detailed in the text.

#	Page, Section	USEPA Comment	Response
14	**Section 3.4.5, Protection of Human Health and the Environment, Page 15**	The fifth bullet in Section 3.4.5 indicates that risks to human health and the environment have been reduced through implementation of institutional controls that prevent exposure to groundwater and limit future use of the site. Based on the information provided in the Implementation Report, it is not clear what institutional controls have been implemented and what measures must still be implemented. Please revise the fifth bullet to identify those institutional controls fully implemented at the Landfill 6 AOC that prevent exposure to groundwater and limit use of the site. If necessary, add a bullet to the discussion addressing institutional controls that will be implemented in the future for the purpose of limiting exposure to groundwater and site usage.	See response to Comment 2.
15	**Section 3.4.6, Technology Reliability and Uncertainty Analysis, Page 16**	The Implementation Report indicates that the distinction between the downgradient monitoring well water matrices and those of the surface water sampling locations suggests that the landfill cap is reducing leachate generation and transport of COCs as shown by the results of the eight completed sampling rounds. The Implementation Report does not present sufficient data to substantiate these statements. Please include a data assessment discussion which substantiates these statements, or provide a reference which presents sufficient data assessment. Further, the Implementation Report discusses the lack of elevated methane readings, despite the methane detections. Please clarify, within the Implementation Report, the significant difference between methane detections versus elevated methane readings.	Please refer to Response #11.
Minor Comment			
1	**Section 2.2, Institutional Controls/Deed Restrictions, Page 5**	The first bullet of this section refers the reader to Figure 1 to view the area which has groundwater extraction/utilization/ consumption restrictions. This area is shown on Figure 2. Please revise the Implementation Report to correct this discrepancy.	The figure number will be updated.
		////////END OF COMMENTS////	

REPORT ON IMPLEMENTATION OF REMEDIAL ACTION AT LANDFILL 6
Former Griffiss Air Force Base, Rome, New York

1 INTRODUCTION AND SITE BACKGROUND

The purpose of this report is to document the implementation and performance of remedial actions for the Landfill 6 Area of Concern (AOC) at the former Griffiss Air Force Base (AFB). Detailed information regarding specific variations to the implementation of remedial actions can be located in the Final Landfill 6 Cover Improvements, Engineer's Certification Report (Conti/EA, January 2007). The Engineer's Certification Report is utilized to document the remedy implementation in accordance with the design, noting any variances, and was completed in conformance with the USEPA and NYSDEC approved Closure Plan for Landfill 6 (Conti/EA, March 2004).

1.1 Site History

Landfill 6 is an unlined landfill comprising approximately 15.7 acres located near the southern boundary of the former Griffiss AFB, between Perimeter Road and Three Mile Creek. The southern edge of the landfill is bound by a dirt access road. Figure 1 illustrates the landfill boundary and the locations of existing monitoring wells.

The sources of potential contamination at Landfill 6 are an estimated 38,000 to 62,000 cubic yards of waste, reportedly consisting of general refuse and hardfill, that was buried and some of which was burned at the site between 1955 and 1959. The wastes were reportedly placed at the top of the hill and burned on the hillside. The layer of waste and burned residue is approximated to be 5 to 10 feet thick. In addition, an unknown quantity of fuel-contaminated soils from Tank Farms 1 and 3 were disposed of during the 1980s in the southern portion of the landfill, and were capped in 1986. The contaminated fill was reportedly placed in compacted 6-inch layers to a total depth of 3 ft below ground surface (bgs), and the cap consisted of a 12-inch clay layer, covered by at least 6 inches of topsoil and seeded with grass. A hardfill area consisting of construction and other debris is located adjacent to the northwest side of Landfill 6.

1.2 Characterization Results

Preliminary studies of Landfill 6 were performed in 1982, 1992, and 1993. Groundwater monitoring at one monitoring well (TMCMW-9), installed downgradient of the Landfill 6 AOC, was conducted by Roy F. Weston, Inc. in 1982 and by the USAF in 1992 and 1993, as part of the quarterly groundwater sampling study. In 1982, groundwater was analyzed for dissolved metals, phenols, and VOCs; phenols were reported at 14 µg/L, and dissolved chromium, copper and zinc were reported above detection limits. During the quarterly sampling, groundwater was analyzed for VOCs, SVOCs, pesticides, PCBs, total metals, cyanide, and total glycols. Total glycols were reported in March 1993 at levels exceeding the NYS Groundwater Standards, and methylene chloride and acetone were also reported; however, the VOC data were suspected to be the result of sample contamination in the laboratory. Inorganic constituents measured at levels exceeding NYS Groundwater Standards included iron, magnesium, manganese, sodium, and zinc; however,

concentrations of most detected metals were found within the range of concentrations encountered off-site.

The results of these studies led to the performance of a Remedial Investigation (RI) in 1993. The RI (Law, December 1996) involved the collection of numerous surface soil and groundwater samples and a passive soil gas survey for contamination detection. Also, geophysical data were collected on an extensive grid, which included the entire area of the landfill. Based on these geophysical data, two test pits were dug during the SI (E&E, November 1998) at locations where anomalous geophysical indicators suggested buried drums, but none were discovered.

The passive soil gas survey indicated the presence of either toluene or benzene at 12 of the 33 locations. Surface soil samples collected at two erosion gullies indicated SVOCs and PCBs (primarily in the sample from the south erosion gulley), pesticides, metals, and petroleum hydrocarbons (on the order of 100 mg/kg). Surface soil samples collected at three sample locations downhill from the Landfill 6 AOC indicated that surface water runoff from the landfill may have impacted the area; however, only acetone, benzo(a)anthracene, benzo(a)pyrene, and 12 metals were found at levels above potential applicable or relevant and appropriate requirements (ARARs).

During the RI (Law, December 1996), seven monitoring wells were sampled, and groundwater was found to contain three VOCs, six metals, total glycols, and petroleum hydrocarbons at levels above ARARs. These wells are generally located along the southwest edge of the landfill. LF6MW-1, an upgradient well, was also reported with sodium and total glycols levels above ARARs. LF6MW-2, located in the northern, uncapped portion of the Landfill 6 AOC, was reported with concentrations of 1.4 µg/L benzene, 170 µg/L cis-1,2-dichloroethene (DCE), and 30 µg/L vinyl chloride [=VC] (Law, December 1996). cis-1,2-DCE and VC are the reductive dechlorination products of trichloroethene (TCE), and contamination is believed to be the result of the landfill, or spills or discharges of TCE upgradient of the landfill.

The SI was performed in 1997 (E&E), and included the excavation of two test pits, the collection of Geoprobe® groundwater screening samples at four locations, the resampling of four existing wells, and the installation and sampling of one vertical profile monitoring well. Samples were submitted for VOCs and SVOCs analysis, as well as natural attenuation parameters, including anions (chloride, sulfate, sulfide, nitrate, and nitrite), methane/ethane/ethene, total organic carbon, ferrous iron, and alkalinity. The groundwater-related activities were performed as part of the On-Base Groundwater AOC, which is being evaluated separate from the soils. The Landfill 6 AOC is associated with the east side of the Three Mile Creek drainage basin, and the groundwater wells at the Landfill 6 AOC will be evaluated in this context.

During the test pit excavation, although no drums were encountered (as discussed above), at test pit LF6TP-2, a petroleum odor was noticed at 6 ft bgs and headspace readings conducted using a photoionization detector (PID) indicated VOCs ranging from 100 to 400 parts per million (ppm). Also, at test pit LF6TP-1, at a depth of 2 ft bgs, three large 2.5 to 5-inch ID steel pipes ranging in length from 6 to 10 ft were encountered.

The results of the four Geoprobe® groundwater screening samples, installed 200 to 300 feet downgradient of LF6MW-2, collected from approximately 15 to 19 ft bgs, were non-detect for VOCs and SVOCs. The groundwater screening samples collected during vertical profiling at LF6VMW-6, installed within 150 feet directly downgradient of LF6MW-2, indicated the presence of TCE at the 39 to 40 ft bgs interval only (27 µg/L) (screening was conducted every 10 ft from approximately 17 ft bgs to 80 ft bgs). Samples collected from the permanent well LF6VMW-6, screened from 35 to 45 ft bgs, contained cis-1,2-DCE (180 µg/L), VC (29 µg/L), TCE (26 µg/L), and benzene (1.0 µg/L). Resampling at LF6MW-2 indicated contaminants at similar concentrations as those measured during the RI: cis-1,2-DCE (83 µg/L), VC (20 µg/L), and benzene (1.2 µg/L). These compounds were not reported above the detection limit at wells LF6MW-1, TMC-USGS-3, and TMCMW-9, with the exception of cis-1,2-DCE at TMCMW-9 at 0.30 J µg/L.

A groundwater study was performed in spring 2000 at the Landfill 6 AOC to define the vertical and lateral extent of the TCE plume (in association with the On-Base Groundwater AOC discussed above) (E&E, August 2000). Up to 105 Hydropunch® samples for vertical profiling were collected, eight new wells were installed and sampled, and four existing wells were resampled. Results indicated a chlorinated solvents plume approximately 800 feet long, 80 feet deep, and 200 feet wide near the top of the Landfill 6 AOC and 700 feet wide near the leading edge of the plume (located approximately 100 feet from Three Mile Creek). The base of the plume beneath the top of the Landfill 6 AOC was found to merge or nearly merge with the leading edge of a chlorinated solvents plume delineated in association with Building 775 (E&E, August 2002).

A bedrock well study was performed in February and March of 2002 at the Landfill 6 AOC. The study concluded that groundwater contamination from the Landfill 6 TCE plume is not impacting the underlying bedrock and its aquifer (E&E, August 2002).

LTM sampling was started in June 2006. Based on previous investigations, the LTM network consisted of 19 groundwater monitoring wells, three surface water sampling locations, and one wetland sampling location. The LTM network also included 16 gas monitoring probes and 16 gas vents. LTM sampling at the Landfill 6 AOC is performed quarterly. Prior to the December 2006 sampling round, two landfill leachate sampling locations were added to the LF6 LTM network. These leachate locations were added to the LTM network based on comments received from Ms. Christine Dowd of the NYSDEC Bureau of Habitat during an October 11th, 2006 site visit. The site visit was conducted to assess the impact of construction activities from the Three Mile Creek Remediation Project on the local ecological community.

Results from the LTM sampling confirm that a TCE plume remains at the Landfill 6 AOC. TCE exceedances are limited to two monitoring wells, 775VMW-10 (upgradient) and LF6MW-12. As documented in the Spring 2006 LTM Report (FPM, June 2006), the high TCE concentrations at the upgradient monitoring well are likely the result of the Building 775 TCE plume migrating into the Landfill 6 AOC. As such, sampling and analysis for the Building 775 TCE plume will be addressed under the ongoing On-base Groundwater Remediation Project (E&E, September 2002).

The continued lack of TCE detections at monitoring wells between 775VMW-10 (upgradient monitoring well) and LF6MW-12 (downgradient monitoring well) suggests that the Landfill 6 AOC and Building 775 TCE plumes do not overlap at this time.

Daughter compounds associated with the breakdown of TCE (cis-1,2-DCE, trans-1,2-DCE, and VC) were only found at two groundwater monitoring wells, LF6MW-12 and LF6VMW-26. Concentrations of these compounds at LF6MW-12 have shown a general decline since LTM began in June 2006. Results from eight LTM sampling rounds have also shown a sustained, but stable, concentration of cis-1,2-dichloroethene at LF6VMW-26 that exceeds the NYS Groundwater Standard.

The relatively high concentrations of cis-1,2-dichloroethene and TCE found at monitoring wells LF6MW-12 and LF6VMW-26 do not appear to be directly impacting downgradient surface water locations along Three Mile Creek. TCE detections were recorded at surface water sampling locations LF6SW-1 and -2, but they were one-time occurrences with concentrations well below their respective reporting limits. Daughter compounds associated with the breakdown of TCE have not been detected at any of the three surface water sampling locations through all eight rounds of LTM sampling.

Wetland sampling location LF6W-1 was able to be sampled in the December 2006, April 2007 and April 2008 sampling rounds. Results from the December 2006 LTM sampling round showed a VC concentration above the NYS Surface Water Standard. It should be noted that the concentration had an "F" data qualifier attached, which indicates that the concentration is considered an estimate. The qualifier denotes that the analyte was positively identified above MDL (0.0380 µg/L); however the concentration is below the RL (1 µg/L). During the April 2007 sampling round, cis-1,2-dichloroethene was detected, but at a level below the NYS Surface Water Standard. Results from the April 2008 LTM sampling round did not show any detections of TCE or its associated daughter compounds. The concentrations of TCE and corresponding daughter compounds at LF6W-1 would suggest that portions of the Landfill 6 TCE plume are attenuating within the wetland area.

Additional details on the site characterization and investigation results for Landfill 6 AOC are provided in the Spring 2008 Annual Long Term Monitoring Report, Revision 1.0 (FPM, June 2008), Final Landfill 6 Cover Improvements, Engineer's Certification Report (Conti Environment and Infrastructure, Inc., January 2007), and Final Long Term Monitoring Work Plan for the Landfill 6 AOC (FPM, February 2004).

2 REAL ESTATE ISSUES

2.1 Property Proposed for Transfer

This document will be used in conjunction with the preparation and submission of a Finding of Suitability to Transfer (FOST), as required in Section 120(h) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for transfer of the Landfill 6 AOC property. A complete description of the Landfill 6 AOC can be found in the Landfill 6 AOC ROD (E&E, February 2001).

2.2 Institutional Controls/Deed Restrictions

CERCLA Section 12(h)(3) requires that deeds transferring property where hazardous substances had been stored, released or disposed of, shall contain a covenant warranting that " all remedial action necessary to protect human health and the environment with respect to any (hazardous) substance remaining on the property has been taken before the date of such transfer." CERCLA Section 120 (h)(3) was amended in October 1992 to add language stating that all necessary actions have been taken "if the construction and installation of an approved remedial design has been completed and the remedy has been demonstrated to the (EPA) Administrator to be operating properly and successfully."

The AFRPA has implemented land use controls at the Landfill 6 AOC. The AFRPA plans on maintaining Landfill 6 as open space and wetlands/surface water throughout the post-closure period as required by the ROD. Once the property is deeded, the land-use controls will be recorded as deed restrictions.

Land use controls and signage are implemented and enforced during the 30-year post-closure maintenance period. Through land use controls, the property owner is restricted as follows:

- Groundwater extraction/ utilization/ consumption by any current or future landowner within the groundwater restriction area (see Figure 2) will not be permitted without prior testing and written approval from the New York State Department of Health (NYSDOH).

- Activities that disrupt or interfere with the post-closure activities will not be permitted.

- Intrusive work within the intrusive area will not be permitted without prior written approval from the Air Force Real Property Agency (AFRPA), New York State Department of Environmental Conservation (NYSDEC), and the United States Environmental Protection Agency (USEPA).

- Intrusive work or other activities that impact the effectiveness or integrity of the landfill closure or effectiveness of post-closure activities will not be allowed within the restricted landfill boundary.

Signs erected during closure construction will serve to minimize the potential for interference with closure and post-closure activities. Signs have been posted along the landfill property boundary that read "SOLID WASTE LANDFILL – CONTAINS HAZARDOUS SUBSTANCES – NO TRESPASSING."

Monitoring and enforcement of the institutional controls is accomplished through landfill site inspections. Contingency maintenance activities are addressed through the Landfill 6 Post-Closure Operations and Maintenance Manual (Conti/EA, December 2006).

2.3 Adjacent properties

A hardfill area (Hardfill 49c) is located adjacent to the northwest boundary of Landfill 6. The northwestern boundary of Landfill 6 is bound by Perimeter Road. A regulated forested wetland lies between Landfill 6 and Three Mile Creek.

3 DOCUMENTATION OF REMEDIAL ACTION IMPLEMENTATION

3.1 Record of Decision

The Landfill 6 ROD was issued after public comment period (November 17, 2000 to December 18, 2000). A public meeting on the proposed plan was held on December 6, 2000. The ROD was signed on June 7, 2001, by the Air Force and the EPA, with concurrence from the NYSDEC.

The Landfill 6 ROD presented in the following remedial action objectives (RAOs) to address existing and future potential threats to the environment posed by Landfill 6:

- Consolidation of various debris and waste areas into the main landfill boundary in order to reduce the area to be capped and the potential for nearby wildlife and human populations to be exposed to the landfill mass;

- Reduce infiltration of rainwater and snow-melt water through the landfill mass in order to minimize the potential for leachate generation and groundwater contamination;

- Monitoring the groundwater and stream environment (which may include, but it is not necessarily limited to, sediment, surface water, and biota) downgradient of the site to evaluate the effectiveness of the presumptive remedy; and

- Implementation of institutional controls in the form of deed restrictions of the main landfill boundary to prohibit use of the area and groundwater.

To address the RAOs listed above, the presumptive remedy (i.e., preferred alternative) in the Landfill 6 ROD called for:

- The landfill surface will be cleared, grubbed, and regraded. Any wetlands disturbed during the remedial action will be restored. Any monitoring wells located within the construction limits will be decommissioned;

- Installation of an impermeable cover in accordance with 6 New York Codes, Rules and Regulations (NYCRR) Part 360 landfill closure regulations, dated November 26, 1996; this action would include placing a gas venting layer, a geomembrane cover and a barrier protection layer over the entire landfill to reduce the amount of water infiltrating through the landfill;

- Maintenance of the impermeable cover;

- Long-term monitoring of the groundwater and stream environment downgradient of the site to evaluate the effectiveness of the Presumptive Remedy; the groundwater will be monitored in accordance with the Air Force's On-base Groundwater Monitoring Plan and the stream environment will be monitored in accordance with the Three Mile Creek AOC work plan; both plans will be subject to the approval of the EPA and NYSDEC;

- Implementation of institutional controls in the form of deed restrictions of the main landfill boundary and groundwater to prohibit use of the area and groundwater, and to ensure the impermeable cover is not damaged and the area is maintained as a landfill. Routine landfill inspections will be performed in accordance with the Post-closure Operations and Maintenance Manual to ensure that the deed restrictions are being met and the RAOs maintained; and

- Inspections of the landfill on a routine basis (at least semiannually or as agreed by the AFRPA, EPA, and NYSDEC) and evaluation of site conditions at least once every five years to ensure that the remedy is protective of human health and the environment.

The Landfill 6 ROD also identified, in accordance with Executive Order 11990, that there were no practicable alternatives to prevent the disturbance of wetlands in the vicinity of Landfill 6 during the construction of the landfill cover. A separate Basewide Wetlands Management Plan was prepared, with consideration from the Army Corps of Engineers, EPA, and NYSDEC, to evaluate disturbances at all AOC wetlands located on base. As stated in the ROD, any wetlands disturbed during the remedial action would be restored.

The presumptive remedy provides adequate protection from exposure to groundwater by limiting the future use of the landfill through the implementation of institutional controls. The installation of the impermeable cover will eliminate the possibility of human exposure to the landfill mass and reduce the amount of water infiltration through the landfill. The landfill cover will also reduce leachate generation and transportation of contaminants from the landfill to Three Mile Creek through groundwater migration. In addition, if leachate discharges are observed during routine walkovers of the landfill, this information will be documented on the inspection form and samples will be collected. This information and sample results would be included in the subsequent monitoring reports to EPA and NYSDEC.

Contaminant concentrations in the groundwater would not immediately comply with the groundwater applicable or relevant and appropriate requirements (ARARs) under the presumptive remedy. Groundwater monitoring will be conducted to assure that there is no further contaminant migration and that groundwater standards will be achieved over time. As described in the presumptive remedy, portions of Landfill 6 require further evaluation under the On-base Groundwater Site. The On-base Groundwater site will address the chlorinated plumes identified at Landfill 6, as documented in Landfill 6, Building 775, AOC 9, and Building 817/WSA Technical Memorandum No.1: Bedrock Groundwater Study (E&E, August 2002) and the Landfill 6 and Building 775 Areas of Concern Groundwater Study, Technical Memorandum No.1: Field Investigation Conducted in Spring 2000 (E&E, August 2002). The remedy for the On-base Groundwater Landfill 6 TCE plume is currently at the Record of Decision/Remedial Action stage.

3.2 Remedial Design

The final design for Landfill 6 cover improvements included the clearing of vegetation from the cap, grubbing, subgrade preparation, placement of a 12-inch barrier protection layer and a geocomposite drainage layer, placement of a 6-inch layer of topsoil, and installation of erosion control features. Details of the remedial design are presented in the Landfill 6 Cover Improvements, Engineer's Certification Report (Conti and EA, January 2007). Prior to the installation of any of the cap components, common borrow fill material was placed on Landfill 6 to achieve the design grades. A portion of the fill material used at Landfill 6 consisted of soil/ debris from various on-base projects, including: approximately 52,600 cubic yards of material from the Three Mile Creek restoration project, approximately 3,000 cubic yards of cobbles from the Apron 1 biopile remediation project, and approximately 2 cubic yards of soil from the Rainbow Creek remediation project. In order to account for the increase of material, Conti reshaped the northern portion of the landfill. The reshaped portion was within the required minimum and maximum slope requirements set forth in the Closure Plan. The final design of the Landfill 6 cap met the substantive requirements of 6 NYCRR Part 360 landfill closure regulations, dated November 26, 1996, and the requirements of the ROD for Landfill 6 (E&E, February 2001).

3.3 Remedial Action Construction

In March 2004, the final versions of the Landfill 6 Closure Plan, Project Work Plan, Site Safety Health Plan, Contractor Quality Control Plan (CQCP), and Sampling and Analysis Plan were approved by USACE. These documents were subsequently approved by the EPA and NYSDEC. Field work was initiated in July 2004. The final design included clearing and grubbing of vegetation, subgrade preparation (including placement of common borrow material to achieve minimum grades), placement of a geosynthetic gas venting layer, installation of gas vents and gas monitoring probes, installation of a 40-mil linear low density polyethylene (LLDPE) geomembrane, installation of a geocomposite drainage net, installation of a geosynthetic geogrid, placement of a 12-in. barrier protection layer, placement of a 6-in. topsoil layer, seeding and mulching, and monitoring well decommissioning. A dense vegetative cover was established by July 2006. Details of field modifications during construction can be found in the Landfill 6 Cover Improvements, Engineer's Certification Report (Conti and EA, January 2007).

Results from the additional interface friction testing indicated that the use of geogrid was unnecessary throughout the site. As such, the areas identified in Appendix F, As-Built Drawings, C-2, Subgrade Plan and C-4, Closure Cap Details of the Engineer's Certification Report, were only meant to identify the proposed locations for geogrid.

Prior to the cap construction activities, Conti installed a decontamination pad adjacent to the northwestern access road in accordance with the Closure Plan (Conti and EA, March 2004). Upon completion of the landfill construction activities, the pad was removed and disposed of in accordance with the project requirements. In addition, erosion and sedimentation control measures were taken prior any intrusive construction activities and the clearing of vegetation from within the limit of waste.

During the landfill construction activities a limit of waste verification was performed along the western boundary of Landfill 6. Results from the investigation showed that the limit of waste was east of the boundary depicted in the design drawings. In order to account for the increase of material, Conti reshaped the northern portion of the landfill. The reshaped portion was within the required minimum and maximum slope requirements set forth in the Closure Plan. Details of the minor variations are documented in Section 2.3.3 of the Engineer's Certification Report. Soil samples collected during the limit of waste verification [analyzed for VOC, SVOCs, PCBs, pesticides, and TAL metals and compared to NYSDEC Technical Guidance Memorandum (TAGM) 4046] reported no exceedances for any of the COCs, with the exception of iron. The iron exceedances were attributed to site background conditions.

As documented in the Engineer's Certification Report (Conti/EA, 2007), the majority of the Landfill 6 drainage layer component is comprised of a biplanar geocomposite. A small portion of the northern area utilized a triplanar geocomposite. The variance is the result of unused materials from the Landfill 1 and 2/3 cap being utilized in the Landfill 6 cap construction.

As documented in the Closure Plan, a passive gas collection and venting system was included in the closure design for Landfill 6 in accordance with 6NYCRR Part 360-2.13(p)(2) (Conti and EA, March 2004). Passive gas vents were installed at Landfill 6 at a minimum frequency of 1 per acre. A total of 16 passive gas vents were installed. Gas monitoring probes were installed around the perimeter of the landfill at a minimum spacing of 400 linear feet, except in areas delineated as wetlands or other areas with high groundwater elevations. Thirteen gas probes were installed. Three additional gas probes were installed to the east of Perimeter Road to provide additional monitoring of potential gas migration towards the occupied buildings (Conti and EA, January 2007). Figure 1 illustrates the distribution of passive gas vents and gas monitoring probes at Landfill 6.

As part of the landfill construction activities several vernal pools were constructed in a naturally low-lying area south of the landfill. The vernal pools would be utilized in capturing storm water runoff from the constructed cap, as well as provide an environmentally friendly area for temporary wetland organisms (e.g., wood frogs, salamanders). The vernal pools were not part of the original Landfill 6 cap design, and therefore were not certified in the Landfill 6 Cover Improvements, Engineer's Certification Report (Conti and EA, January 2007).

3.4 Remedial Action Performance

3.4.1 Operations and Maintenance

The landfill 6 Post-Closure Operations and Maintenance Manual (Conti and EA, December 2006) provides a comprehensive guide to the landfill owners for maintenance and facility monitoring for a period of 30 years. The manual fulfills NYSDEC's requirements for post-closure operations and maintenance for closed solid waste landfills (6 NYCRR Part 360-2.15[k]).

In accordance with the Operations and Maintenance (O&M) Manual, periodic inspections of the landfill have been and continue to be performed. During the first year after final inspection of the construction, quarterly inspections of the landfill cover and inspections following major rainfall events were performed to ensure that the final landfill cover materials, site drainage

swales, and on-site monitoring wells were maintained and functioning within the design standards. The property has also been inspected to ensure compliance with institutional control measures. A checklist is utilized to facilitate and standardize post-closure inspections. Contingency maintenance measures are performed if any deficiencies are encountered during these inspections, and the AFRPA is notified if unauthorized activity is observed on the landfill property.

The following post-closure inspection activities are included in the quarterly landfill inspections, and inspections following major storm events:

- Soil cover integrity is inspected for holes, rifts, ruts, washouts, or similar damage;
- Slopes and top surface of the landfill are inspected for major deviations from as-built grades and any areas of significant surface water ponding;
- The vegetative cover and grass-lined swales are inspected for proper establishment, thickness, growth, and signs of stress or disturbance due to erosion;
- The landfill, particularly the base of the slopes, is inspected for leachate breakouts;
- The monitoring wells are inspected for integrity and damage to the surface protective casings;
- The landfill surface is inspected for the presence of vectors (intrusive animals such as groundhogs or similar inhabitants);
- Drainage structure is inspected for erosion and loss;
- Gas monitoring probes and vents are inspected for integrity and damage during each quarterly inspection;
- All fences and gates are inspected for integrity and damage during each quarterly inspection;
- All signs and support structures are inspected for damage and wear; and
- To ensure compliance with institutional control measures, the landfill property is inspected for evidence of activities, such as construction activities that have not been approved by the Air Force, NYSDEC, and EPA.

Landfill maintenance activities include grass mowing and any contingency maintenance measures required as a result of the above inspections. The O&M Manual specifies two mowings in the first year (one in late/early summer and one after September 1st) and one mowing after September 1st every year thereafter, which allows for grass germination and full coverage development. Mowing has been performed at Landfill 6 as specified in the O&M Manual.

3.4.2 Environmental Monitoring

The LTM program for Landfill 6 groundwater is described in the Final Long-Term Monitoring Work Plan, Landfill 6 Area of Concern (FPM, December 2003). This LTM sampling focuses on the Part 360 required monitoring and demonstrating that the groundwater conditions immediately downgradient of the landfill lare either stable or improving. The monitoring results through April 2008 are provided in the Long Term Monitoring Report, Landfill AOCs LTM Program (FPM, June 2008). Environmental monitoring reports and summary reports are prepared annually.

3.4.2.1 Groundwater

The LTM groundwater monitoring network at Landfill 6 consists of 19 groundwater monitoring wells (see Figure 1). Target analytes are based on COCs and 6 NYCRR Part 360 baseline (annually) and routine (quarterly) parameters. Data collected from monitoring wells LF6MW-12, LF6VMW-10R2, -17S, -17D, -18, -19, -20, -22, -23, -24, -25, -26, TMCMW-9, and TMC-USGS-2 monitor the effectiveness of attenuation process on COCs at the AOC. Upgradient monitoring wells 775VMW-10, -18R, -20R, LF6MW-1, and LF6VMW-21 monitor groundwater conditions prior to migration through the landfill.

Quarterly sampling was conducted at all 19 monitoring wells from June 2006 to April 2008. A summary of the groundwater monitoring parameters analyzed from June 2006 to April 2008 and prescribed analytical methodologies are provided below:

- VOCs (EPA Method SW8260);
- Metals (EPA Method SW6010B, total and dissolved);
- Mercury (EPA Method SW7470A, Baseline only);
- Cyanide (EPA Method SW9010B), Baseline only);
- Anions (EPA Method SW9056);
- Nitrogen (TKN) (EPA Method 351.2);
- Ammonia (EPA Method 350.2);
- Chemical Oxygen Demand (EPA Method 410.4);
- Biological Oxygen Demand (EPA Method 405.1);
- Total Organic Carbon (EPA Method SW9060);
- Total Dissolved Solids (EPA Method 160.1);
- Alkalinity (EPA Method 310.1);
- Phenols (EPA Method SW9066);
- Hardness (EPA Method 130.2);
- Color (EPA Method 110.2, Baseline only); and
- Boron (EPA Method SW6010B, Baseline only).

Additional field measurements which will be collected at the time of sample collection are:

- pH
- Electrical Conductivity
- Temperature

- Turbidity
- Dissolved Oxygen
- Oxidative Reduction Potential

3.4.2.2 Surface Water

Monitoring at surface water sampling locations LF6W-1 (wetland sampling location), LF6SW-1, -2, and -3 (all three are Three Mile Creek locations), is performed for determining the potential levels of exposure to contamination caused by groundwater/leachate discharge into jurisdictional wetlands surrounding Landfill 6, and ultimately into Three Mile Creek.

Quarterly sampling was conducted at all four surface water sampling locations from June 2006 to April 2008. All surface water sampling locations are analyzed for the same list of parameters identified for groundwater monitoring wells.

3.4.2.3 Leachate

Prior to the December 2006 sampling round, two landfill leachate locations were observed and added to the Landfill 6 LTM network. The landfill leachate sampling locations were identified as LF6LH-1 and -2. Both sampling locations are located on Figure 1. The landfill leachate sampling locations were added to the LTM network based on comments received from Ms. Christine Dowd of the NYSDEC Bureau of Habitat during an October 11th, 2006 site visit. The site visit was conducted by the NYSDEC to assess the impact construction activities from the Three Mile Creek Remediation Project had imposed on the local ecological community.

Six quarterly sampling rounds were conducted at landfill leachate sampling locations LF6LH-1 and -2 from the December 2006 to April 2008. The leachate samples are analyzed for the same list of parameters identified for groundwater (see Section 3.4.2.1 above) which is identical to Tables 3-2 (Baseline) and 3-3 (Routine) of the Final LTM Work Plan.

3.4.2.4 Landfill Gas

The gas monitoring LTM network currently consists of 16 gas monitoring probes and 16 gas vents (see Figure 1). Three gas probes were installed to the east of Perimeter Road to provide additional monitoring of potential gas migration towards the occupied buildings. These three gas monitoring probes will only be sampled if gas monitoring probes west of Perimeter Road show any concentration of methane. Quarterly sampling was conducted at the gas monitoring probes and vents from June 2006 to April 2008 to identify and evaluate trends in landfill gas concentrations and to assure that the landfill continued to comply with 6 NYCRR Part 360-2.17(f).

Gas samples are analyzed for methane, LEL, oxygen, and carbon dioxide, in accordance 6 NYCRR Part 360-2.17(f).

As prescribed in the Landfill 6 O&M Plan, if the perimeter gas probe monitoring shows explosive gas levels in excess of 25% of the LEL at the property boundary, the EPA and NYSDEC are to be notified within 7 days of detection and further actions will be evaluated. A

remediation plan to address the landfill gas migration will be submitted within 45 days of detection of the elevated levels of explosive gas at the perimeter. The plan will describe the nature and extent of the problem, and the proposed remedy. A schedule implementation of the proposed remedy within 60 days of the date of detection will be included with the plan.

3.4.2.5 Sediment and Biota

The long term monitoring of sediment and biota is being performed under the approved Three Mile Creek LTM plan.

3.4.3 Recordkeeping

Records are maintained of all site inspections, sampling, events, and any contingency maintenance measures. The O&M contractor prepares environmental monitoring reports and annual summary reports outlining the previous year's monitoring and maintenance activities. Site conditions will be evaluated every five years to ensure that the remedy is protective of human health and the environment. Alterations to the frequency and duration of the landfill inspections and environmental monitoring may be sought at any time and are subject to the approval of EPA and NYSDEC.

3.4.4 Remedy Performance

The key documenting implementation of remedy is the evaluation of remedy performance as it relates to applicable RAOs presented in the ROD. Two years of O&M and LTM sampling have been completed for Landfill 6. The quarterly reports are provided in the Spring 2008 Long Term Monitoring Report, Landfills AOCs LTM Program (FPM, June 2008). An evaluation of the Landfill 6 presumptive remedy activities is provided below.

3.4.4.1 Soil and Solid Waste

The placement of low-permeability cover soil and topsoil was completed in 2006. The additional cover soil reduces infiltration of rainwater and snowmelt water through the landfill and minimizes the potential for leachate generation and groundwater contamination. This is shown by the significant ponding of water observed at the toe of Landfill 6 and within the constructed vernal pools. This surplus of water has been attributed to the increased flow across the landfill surface because the landfill cap installation reduced rainwater infiltration. The potential for nearby wildlife and human populations to be exposed to the landfill has also been reduced by this measure. Thus, this action of the presumptive remedy satisfies the RAOs established for Landfill 6.

3.4.4.2 Groundwater and Surface Water Quality

As was noted in previous investigations, a TCE plume that is being separately managed under the On-base Groundwater site exists at Landfill 6. During the December 2007 and April 2008 sampling rounds, TCE exceedances at Landfill 6 were limited to one upgradient well (775VMW-10) and one downgradient well (LF6MW-12). Concentrations of TCE at these wells ranged from 791µg/L (December 2007) to 767µg/L (April 2008) at LF6MW-12 and 65.6 µg/L (December 2007) to 60.4 µg/L (April 2008) at 775VMW-10.

As documented in the Spring 2008 LTM Report (FPM, June 2008), the high concentrations of TCE at the upgradient monitoring well are likely the result of the Building 775 TCE plume migrating into the Landfill 6 AOC. As such, sampling and analysis for the Building 775 TCE plume will be addressed under the ongoing On-base Groundwater Remediation Project.

The continued lack of TCE detections at monitoring wells between 775VMW-10 (upgradient monitoring well) and LF6MW-12 (downgradient monitoring well) suggests that the Landfill 6 AOC and Building 775 TCE plumes do not overlap at this time.

Daughter compounds associated with the breakdown of TCE (cis-1,2-dichloroethene, trans-1,2-DCE, and VC) were only found at two groundwater monitoring wells, LF6MW-12 and LF6VMW-26. Concentrations of these compounds at LF6MW-12 have shown a general decline through all eight LTM sampling rounds. Results from the eight LTM sampling rounds have also shown a sustained, but stable, concentration of cis-1,2-DCE at LF6VMW-26 that exceeds the NYS Groundwater Standard.

The relatively high concentrations of cis-1,2-DCE and TCE found at monitoring wells LF6MW-12 and LF6VMW-26 do not appear to be directly impacting downgradient surface water locations along Three Mile Creek. TCE detections were recorded at surface water sampling locations LF6SW-1 and -2, but they were one-time occurrences with trace concentrations well below their respective NYS Surface Water Standards. Daughter compounds associated with the breakdown of TCE have not been detected at any of the three surface water sampling locations through the eight rounds of LTM sampling.

Wetland sampling location LF6W-1 was able to be sampled in the December 2006, April 2007 and April 2008 sampling rounds. Results from the December 2006 LTM sampling round showed a VC concentration above the NYS Surface Water Standard. It should be noted that the concentration had an "F" data qualifier attached, which indicates that the concentration is considered an estimate. The qualifier denotes that the analyte was positively identified above MDL (0.0380 µg/L); however the concentration is below the RL (1 µg/L). During the April 2007 sampling round, cis-1,2-DCE was detected, but at a level below the NYS Surface Water Standard. Results from the April 2008 LTM sampling round did not show any detections of TCE or its associated daughter compounds. The concentrations of TCE and corresponding daughter compounds at LF6W-1 would suggest that portions of the Landfill 6 TCE plume are attenuating within the wetland area. Further sampling at this location is required to determine if the concentrations are intermittent or sustained exceedances/detections.

Based on the results of the December 2007 and April 2008 sampling rounds, the Landfill 6 TCE plume appears to be centralized around monitoring well LF6MW-12. Figure 2 has been provided to illustrate the current TCE plume at Landfill 6.

Results from the dissolved metals analysis and total metals analysis have been for the most part indistinguishable through the eight LTM sampling rounds. Total metal analysis did reveal that the majority of upgradient monitoring wells (775VMW-10, -18R, -20R, and LF6VMW-21) have shown elevated concentrations of suspended aluminum, chromium, iron, manganese, and/or

nickel. The concentrations of these metals were significantly less when analyzed via the dissolved metals method (field filtration), except for manganese in 775VMW-20R. The high concentrations of both suspended and dissolved metals at upgradient monitoring wells, suggests that high levels reported downgradient are in part the result of background conditions.

Water chemistry analysis for samples collected at the Landfill 6 AOC during the June 2006 to April 2008 sampling rounds suggest that groundwater migrating through Landfill 6 is not impacting the surface water at Three Mile Creek. Comparisons of downgradient monitoring well samples, upgradient monitoring well samples, and surface water samples indicate a notable distinction in the water quality type as groundwater migrates downgradient through the landfill and into Three Mile Creek. Downgradient monitoring wells showed a predominately calciumbicarbonate- type water (indicative of reducing conditions). Surface water sampling locations demonstrated a water quality type that consisted equally of sodium-chloride and calciumbicarbonate. Upgradient monitoring wells not impacted by the Building 775 TCE plume demonstrated water quality types dominated by magnesium and sodium chloride. In addition, the leachate sampling locations demonstrated water quality types similar to those of downgradient monitoring wells in their vicinity.

The landfill has been capped, thereby eliminating direct contact to the public. The remedial actions, which included placement of additional landfill cover materials and grading the landfill to reduce rain and surface water infiltration and the migration of contaminated soil, have satisfied the RAOs. In addition, the cover is expected to reduce leachate generation, as shown by the above referenced water chemistry analysis, which in turn will reduce the potential for transporting COCs from the landfill to Three Mile Creek via groundwater.

The remedial action implementation for the On-Base Groundwater Landfill 6 Site started in 2008 to address the TCE Groundwater plume. It is a separate Area of Concern.

3.4.4.3 Leachate Monitoring

In six sampling rounds, no VOC exceedances were reported at either leachate sampling location. Metal exceedances have been limited to aluminum, iron, manganese and sodium. The iron, manganese and sodium exceedances have been observed during all past sampling rounds and are common for the geographic area. The aluminum exceedances that were found at both leachate sampling locations only occurred in the total concentrations and not in the dissolved concentrations. These exceedances can be attributed to dissolved sediments found within the sample. Sulfate was the only leachate indicator reported above state standards. This occurred during the April 2007 sampling round. Continued sampling at these locations is required to determine if the concentrations are intermittent or sustained exceedances/detections.

3.4.4.4 Landfill Gas Monitoring

In seven sampling rounds, methane concentrations at the landfill gas vents were limited to the northwestern portion of the landfill. Only three of sixteen landfill gas vents (LF6VENT-02, -03 and -04) showed a methane concentration above the LEL. The elevated methane concentrations at LFVENT-04 were observed in all but one of the seven sampling rounds. Methane concentrations have only been detected in two gas monitoring probes (LF6GMP-07 and -08).

The detections occurred in the June 2006, September 2006 and April 2008 sampling rounds. All three gas monitoring probe detections were well below the LEL.

3.4.5 Protection of Human Health and the Environment

The presumptive remedy implemented at Landfill 6 has reduced the risks posed to human health and the environment by eliminating, reducing, or controlling the exposure to human and environmental receptors through engineering controls, institutional controls, and monitoring.

Specifically, this has been established through:

- Grading the landfill to promote surface water drainage and minimize infiltration;
- Covering the landfill with several layers including: gas venting layer (consisting of a drainage net geotextile geocomposite), 40-mil linear low density polyethylene (LLDPE) geomembrane, geocomposite drainage net, geosynthetic geogrid, 12-inch barrier protection layer, and 6-inch topsoil layer to reduce water infiltration and reduce receptor exposure to contaminants by reducing leachate generation and potential transportation of contaminants from the landfill to the creek via groundwater migration;
- Installation of gas vents and gas monitoring probes
- Placement of additional landfill cover materials to eliminate the possibility of human exposure to contaminated soils;
- Implementation of institutional controls to provide adequate protection from exposure to groundwater by limiting the future use of the landfill; and
- Conducting LTM and gas monitoring to ensure that the remedial action is continuing to operate properly and successfully.

3.5 Enforceability

Griffiss AFB was placed on the National Priorities List on July 15, 1987. On August 21, 1990, the Air Force, EPA, and NYSDEC entered into a Federal Facility Agreement (FFA) under Section 120 of CERCLA. Both the EPA and NYSDEC have been continuously involved in the enforcement of remedial actions undertaken at the former Griffiss AFB. The FFA provides the enforcement vehicle for continued action at the former Griffiss AFB, including all work associated with implementation and monitoring of remedial actions. Additionally, the Landfill 6 ROD is a vehicle of enforceability in itself. These two documents provide sufficient enforcement avenues to ensure actions are continued as necessary to achieve the Landfill 6 RAOs.

3.6 Technology Reliability and Uncertainty Analysis

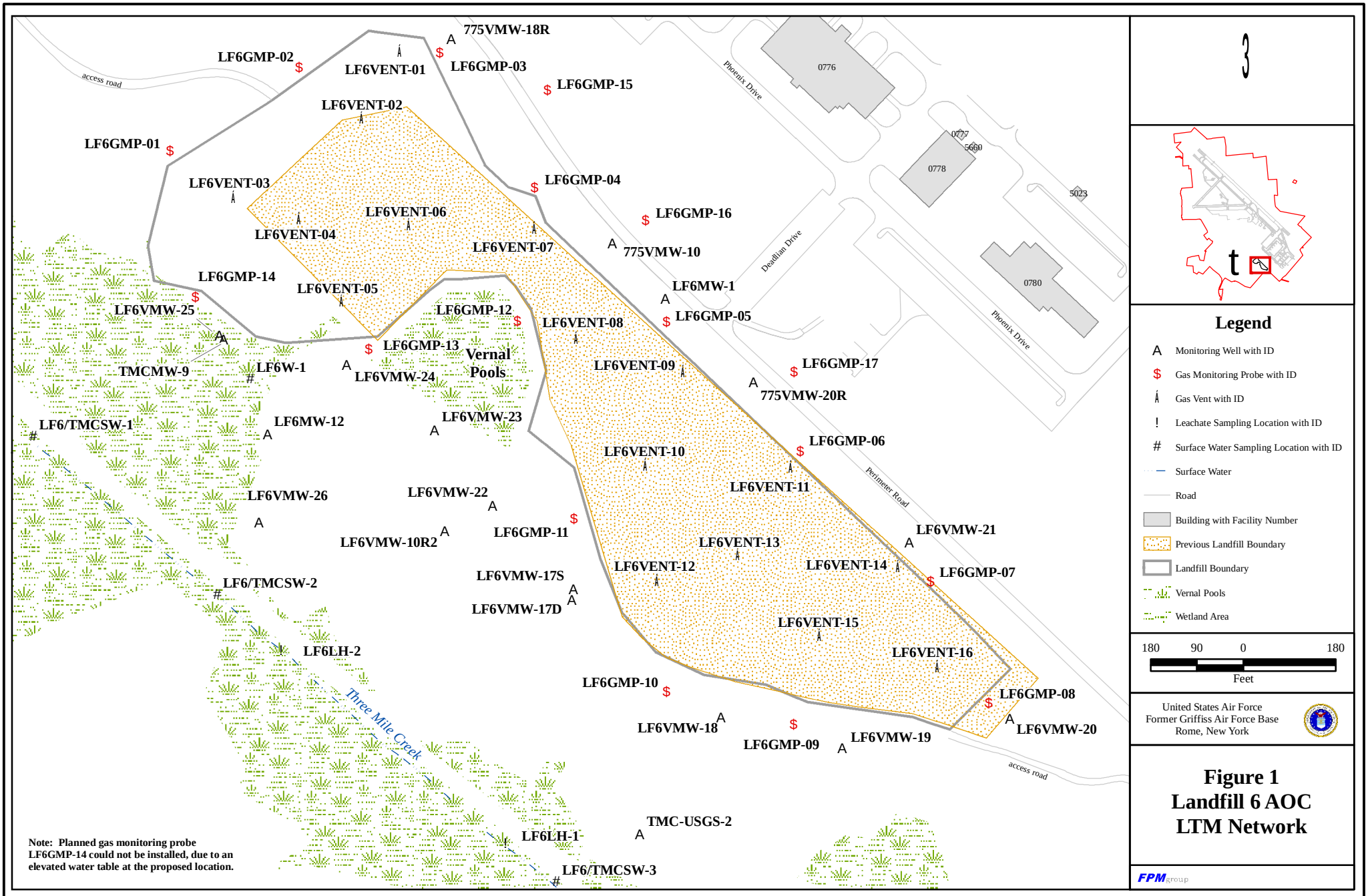
Placement of a gas vent layer, geomembrane, drainage net, geogrid, barrier protection layer and top soil cover is a presumptive remedy for closure of landfills and has been demonstrated to be

effective for similar military landfills. Landfill 6 was covered in accordance with 6 NYCRR Part 360 landfill closure regulations, dated November 26, 1996, as agreed upon by the EPA, NYSDEC, and the Air Force. At Landfill 6, the monitoring results indicate that VOCs, metals, and leachate indicators remain at elevated concentrations in groundwater monitoring wells. The majority of these exceedances, however appear to have stable concentrations within one order of magnitude of their respective state standards. As suggested in Section 3.4.4.2, water chemistry analysis performed for Landfill 6 appears to show that groundwater migrating through Landfill 6 is not impacting the surface water at Three Mile Creek. The distinction between the downgradient monitoring well water matrices and those of the surface water sampling locations suggest that the landfill cap is reducing leachate generation and transportation of COCs as shown by the results of the eight completed sampling rounds. The elevated TCE concentrations at Landfill 6 will be addressed under the ongoing On-base Groundwater Remediation Project.

The lack of elevated methane readings at Landfill 6 gas monitoring probes suggests that migration pathways off-site do not appear likely. Continued monitoring is necessary to verify that elevated concentrations found at landfill gas vents within the cap remain stable.

4 CONCLUSIONS

The Air Force concludes that the remedial actions at Landfill 6 are being properly and successfully implemented consistent with the provisions of CERCLA Section 120(h)(3) and that further monitoring is needed to confirm successful reduction of COCs to below the NYS Groundwater and Surface Water Standards and acceptable levels of explosive gases.



3

Legend

- A Monitoring Well with ID
- $ Gas Monitoring Probe with ID
- Gas Vent with ID
- ! Leachate Sampling Location with ID
- # Surface Water Sampling Location with ID
- Surface Water
- Road
- Building with Facility Number
- Previous Landfill Boundary
- Landfill Boundary
- Vernal Pools
- Wetland Area

180 90 0 180
Feet

United States Air Force
Former Griffiss Air Force Base
Rome, New York

Figure 1
Landfill 6 AOC
LTM Network

FPM group

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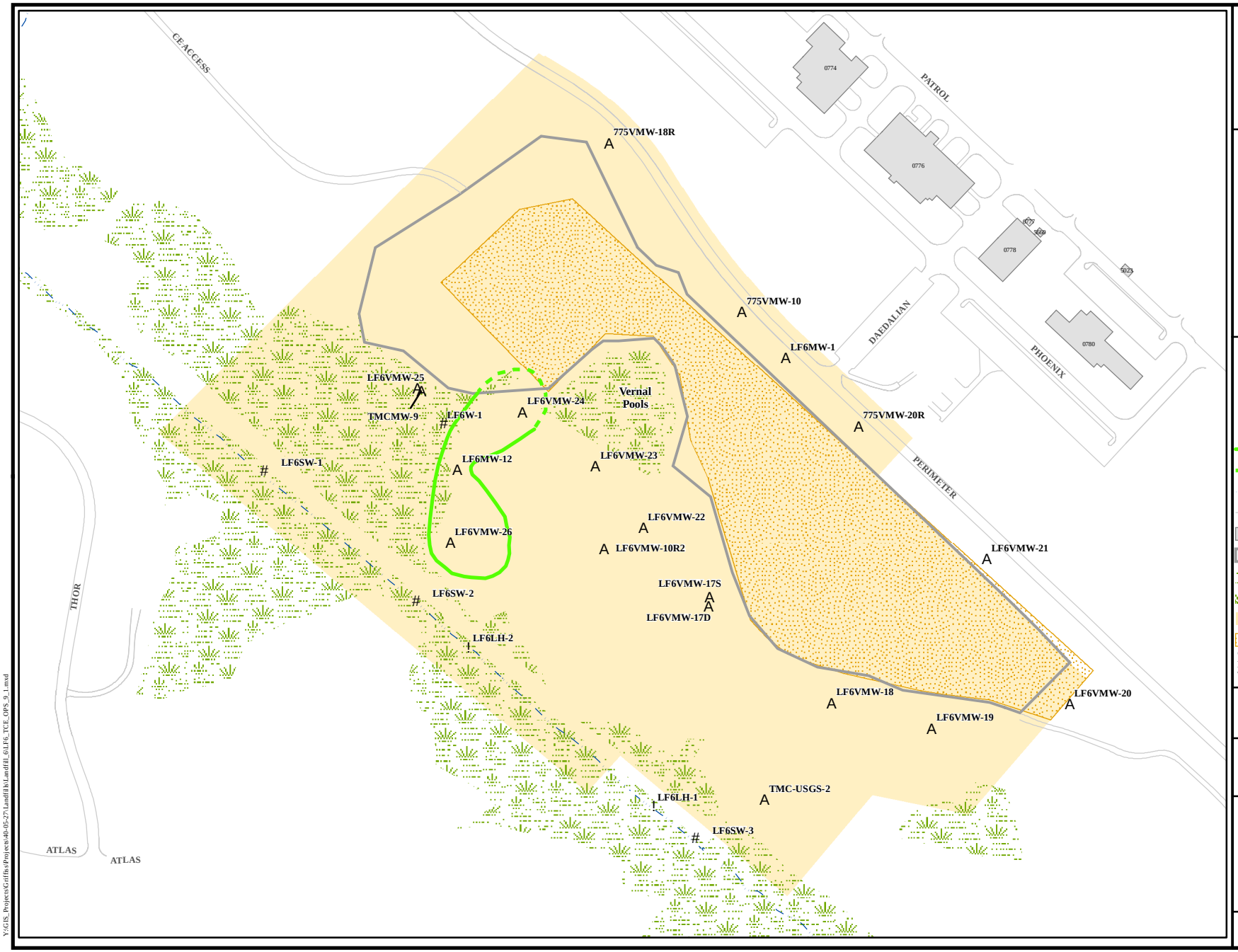
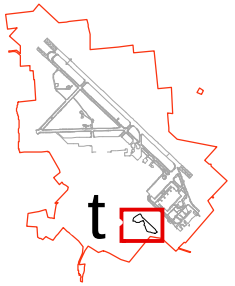


3



Legend

- A Monitoring Well with ID
- ! Leachate Sampling Location with ID
- # Surface Water Sampling Location with ID
- 50 ppb TCE plume
- 50 ppb plume (dashed)
- Surface Water
- Road
- Building with Facility Number
- Landfill Boundary
- Vernal Pools
- Wetland Area
- Groundwater Land Use Restriction
- Previous Landfill Boundary

* The TCE plume was adapted from the May 2008 LF6 Drawings included in the the final Remedial Action Work Plan (Parsons, July 2008).

120 60 0 120 240

Feet

United States Air Force
Former Griffiss Air Force Base
Rome, New York

Figure 2
Landfill 6
Land Use Restriction

FPM group

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