JUL 24 2014

DEPARTMENT OF THE AIR FORCE
AIR FORCE CIVIL ENGINEER CENTER

July 11, 2014

MEMORANDUM FOR: U.S. Environmental Protection Agency – Region 2
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New York State Department of Environmental Conservation
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Albany, NY 12233-7015

FROM: AFCEC/CIBE - Griffiss
706 Hangar Road
Rome, New York 13441

SUBJECT: Final Remedial Action Work Plan Addendum 3, Building 817 Supplemental Investigation, On-Base Groundwater Areas of Concern, Former Griffiss AFB, Rome, NY.

1. Attached please find the Final Remedial Action Work Plan Addendum 3, Building 817 Supplemental Investigation, On-Base Groundwater Areas of Concern.

2. The information from this additional investigation will be used to support the selected remedy at this site. If you have any questions, please contact Ms. Cathy Jerrard at (315) 356-0810, ext. 204.

DAVID S. FARNSWORTH
Program Manager/BRAC Environmental Coordinator
BRAC Program Execution Branh

cc: See Distribution List
Attachment: As noted

DISTRIBUTION: Remedial Action Work Plan Addendum 3, Building 817 Supplemental Investigation, Former Griffiss Air Force Base, Rome, New York.

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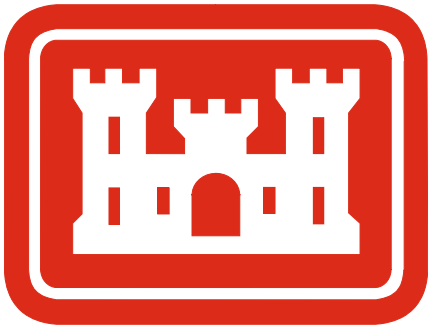
REMEDIAL ACTION WORK PLAN ADDENDUM 3
BUILDING 817 SUPPLEMENTAL INVESTIGATION
FORMER GRIFFISS AIR FORCE BASE
ROME, NEW YORK

Prepared For:



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JULY 2014

TABLE OF CONTENTS

PAGE

TABLE OF CONTENTS
CONTINUED

PAGE

TABLE OF CONTENTS
CONTINUED

PAGE

TABLE OF CONTENTS
CONTINUED

PAGE

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS

AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFRPA	Air Force Real Property Agency
AMSL	Above Mean Sea Level
AOC	Area of Concern
APP	Accident Prevention Plan
bgs	Below Ground Surface
BMP	Best Management Practice
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cis-1,2-DCE	Cis-1,2-dichloroethene
CPR	Cardiopulmonary Resuscitation
CVOC	Chlorinated Volatile Organic Compound
DFAS	Defense Finance and Accounting Service
DO	Dissolved Oxygen
DOC	Dissolved Organic Compound
EADS	Eastern Air Defense Sector
EBS	Environmental Baseline Survey
ECD	Electron Capture Detector
E&E	Ecology and Environment
EEEPC	Ecology and Environment Engineering, P.C.
FFA	Federal Facilities Agreement
FPM	FPM Remediations Inc.
ft	Foot/feet
GAFB	Griffiss Air Force Base
GLDC	Griffiss Local Development Corporation
gpm	Gallons Per Minute
GPR	Ground Penetrating Radar
HAS	Hollow Stem Auger
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDPE	High Density Polyethylene
H&S	Health and Safety
ID	Inner-diameter
IDW	Investigation-Derived Waste
LF6	Landfill 6
LTM	Long Term Monitoring

LIST OF ACRONYMS

(Continued)

mg/L	Milligrams Per Liter
MSDS	Material Safety Data Sheets
NA	Not Applicable
NAPL	Non-aqueous Phase Liquid
NYANG	New York Air National Guard
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
OBGW	On-Base Groundwater
OPS	Operating Properly and Successfully
ORP	Oxidation Reduction Potential
OSHA	Occupation Safety and Health Administration
MIP	Membrane Interface Probe
PCE	Tetrachloroethene
PDI	Pre Design Investigation
PHSM	Project Health and Safety Manager
PID	Photo Ionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
psi	Pounds Per Square Inch
PVC	Polyvinyl Chloride
RAWP	Remedial Action Work Plan
RI	Remedial Investigation
ROD	Record of Decision
SAC	Strategic Air Command
SHARP	Safety, Health, and Safety Risk Program
SHP	Safety and Health Plan
SI	Supplemental Investigation
SM	Site Manager
SPCC	Spill Prevention, Control, and Countermeasure
SPME	Solid Phase Micro-Extraction
SSHO	Site Safety and Health Officer
SSHP	Site-Wide Safety and Health Plan
START	Supervisor Training in Accident Reduction Techniques
SWPPP	Storm Water Pollution Prevention Plan
TCE	Trichloroethene
µg/kg	Micrograms per kilogram

LIST OF ACRONYMS

(Continued)

µg/L	Micrograms per liter
UIC	Underground Injection Control
US	United States
USACE	Unites States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VC	Vinyl Chloride
VOC	Volatile Organic Compound
WSA	Weapons Storage Area

SECTION 1

INTRODUCTION

The purpose of this remedial action work plan (RAWP) Addendum 3 is to provide details on the scope of the supplemental investigation planned at Building 817. The initial RAWP was issued in 2008 (RAWP On Base Groundwater Remediation [OBGW], Parsons, April 2008). The initial RAWP was amended in 2010 to provide detail on a second round of vegetable oil injections at Building 817 and nearby Landfill 6 (LF6) (RAWP Addendum On Base Groundwater Remediation, Parsons, May 2010). It was amended a second time in 2013 to perform an additional vegetable oil injection at LF6.

The basis of the supplemental investigation is: (1) to provide additional information about the chlorinated volatile organic compound (CVOC) source location near Building 817, and (2) to determine if a secondary CVOC source can be located downgradient of the existing injection points. Additionally, information will be collected on the building drains, sump, and utilities near Building 817 and in the vicinity of MW-16 near Perimeter Road. This work plan is organized into 11 sections and 2 appendices. The project background, project objectives, and physical characteristics of the site are presented in Section 1. Section 2 provides a summary of previous site activities and investigations. The remediation management plan is provided in Section 3. The required permits and approvals are discussed in Section 4. The supplemental investigation elements are described in Section 5. Section 6 is a placeholder for supplemental remedial action, if required. Control plans for the site are discussed in Section 7. The field activity procedures and site restoration are detailed in Sections 8 and 9, respectively. The anticipated project schedule is in Section 10. References are provided in Section 11. The United States Environmental Protection Agency (USEPA) Injection Well Inventory form is located in Appendix A. Appendix B contains the Standard Operating Procedure (SOP) for the SP22 sampler; the preliminary schedule is provided in Appendix C.

1.1 PROJECT BACKGROUND

The former Griffiss Air Force Base (GAFB) is located in Oneida County, New York, in the City of Rome. The base property covers approximately 3,540 acres and is situated in the relatively broad valley of the Mohawk River at an elevation of 504 feet above mean sea level (AMSL) **(Figure 1-1**).

The GAFB, originally named Rome Air Depot was activated on February 1, 1942, with the mission of storage, maintenance, and shipment of material for the U.S. Army Air Corps. Upon creation of the Air Force in 1947, the depot was renamed Griffiss Air Force Base. The base became an electronics center in 1950, with the transfer of Watson Laboratory Complex (later Rome Air Development Center [1951], Rome Laboratory, and then the Air Force Research Laboratory Information Directorate, established with the mission of accomplishing applied research, development, and testing of electronic airground systems). The 49th Fighter Interceptor Squadron was also added. The Headquarters of the Ground Electronics Engineering Installations Agency was added in June 1958 to engineer and install ground communications equipment

throughout the world. On July 1, 1970, the 416th Bombardment Wing of the Strategic Air Command (SAC) was activated with the mission of maintenance and implementation of both effective air refueling operations and long-range bombardment capability (AFRPA, 2009).

The GAFB was designated for realignment under the Base Realignment and Closure (BRAC) Act in 1993 and 1995, resulting in deactivation of the 416th Bombardment Wing in September 1995. The Air Force Research Laboratory Information Directorate and the Eastern Air Defense Sector (EADS) will continue to operate at their current locations; the New York Air National Guard (NYANG) operated the runway for the 10th Mountain Division deployments until October 1998, when they were relocated to Fort Drum; and the Defense Finance and Accounting Services (DFAS) has established an operating location at the former GAFB (AFRPA, 2009).

On July 22, 1987, the base was listed on the USEPA National Priority List, which brought the installation under the federal facilities provisions of Section 120 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). In August 1990, the Air Force, the USEPA, and the New York State Department of Environmental Conservation (NYSDEC) entered a Federal Facilities Agreement (FFA) for environmental remediation at a number of sites at the former GAFB (AFRPA, 2009).

1.2 BUILDING 817

1.2.1 Building 817 Background

The Building 817/Weapons Storage Area (WSA) site is located on the north side of the main runway between Building 817 and the culverted section of Six Mile Creek south of the former WSA. Building 817, constructed in the 1950s, was once used for electronics parts maintenance, and the solvents TCE and PCE were used in small quantities at this location.

TCE was initially detected in groundwater from well LAWMW-9 (7.6 micrograms per liter [µg/L]), south-south west of Building 817 during the Remedial Investigation (RI) in 1994 (Law Environmental Services, 1996), indicating that this area could be a source of contamination. A Supplemental Investigation (SI; Ecology & Environment, Inc. [E&E], 1998) was subsequently performed in which three temporary monitoring wells were installed around this well. An additional SI was conducted in Spring 2000 to complete the lateral and vertical delineation of the contaminant plume (E&E, 2001). This investigation included 56 Geoprobe® groundwater samples at 36 locations; 13 of the 36 locations were vertically profiled. A Bedrock Groundwater Study for Building 817/WSA conducted in 2002 (E&E, 2002) consisted of the installation of three new bedrock wells upgradient and downgradient of the contaminant plume and one new overburden monitoring well. Bedrock is located approximately 20 to 25 feet (ft) below ground surface (bgs). Contamination was not detected in samples of bedrock groundwater.

A pre-design investigation (PDI) using a Geoprobe-mounted Membrane Interface Probe (MIP) was performed in October 2006 to better define the suspected contaminant source area near Building 817 (E&E, 2007). Twenty-two MIP borings were advanced from just north of Perimeter Road to approximately 150 feet northeast of Building 817. The MIP borings were located north (hydraulically upgradient) of Building 817, near the southwest corner of Building

817 in the vicinity of an unlined sump along the south wall of Building 817 that was a suspected collection/disposal point for fluids, and southwest (hydraulically downgradient) of Building 817 along an underground utility corridor that was a suspected preferential contaminant migration pathway. Each location was advanced to refusal, which occurred at depths of 14 to 27 ft bgs. A 6-inch-thick, tight, silty clay layer was observed at approximately 15 ft bgs, indicating the potential for intervals of finer-grained sediments in the sand.

Based on historical groundwater quality data, MIP data, and confirmatory soil sample results, it was concluded that a contaminant source area was not present in the area north of Building 817. Similarly, the MIP investigation near the downgradient utility corridor extending to the southwest from Building 817 did not detect the presence of volatile organic compounds (VOCs) at levels that would indicate a source soil in the saturated or unsaturated zones. Because of elevated MIP readings near the southwest corner of Building 817 at a depth of 15 to 16 ft bgs, one soil and one groundwater sample were collected at this location and depth. The soil sample analysis detected 100 micrograms per kilogram (µg/kg) TCE, and the water sample contained 200 µg/L PCE, 560 µg/L TCE, 1,800 µg/L cis-1,2-dichloroethene (cis-1,2-DCE), and 88 µg/L vinyl chloride (VC). These concentrations were substantially higher than concentrations measured in groundwater samples from site monitoring wells installed upgradient and downgradient of Building 817. Observation of the soil sample indicated a six-inch-thick, tight, silty clay layer in this interval. The soil and groundwater sample results and MIP data indicated an area of elevated contaminant concentrations immediately adjacent to the southwest corner of Building 817 near the unlined sump within the building.

The fact that the MIP response adjacent to the southwest corner of Building 817 did not indicate contamination from 0 to 15 ft bgs indicates that the contamination detected at 15 to 16 ft bgs did not originate at that location (i.e. from a surface or near-surface release) but was likely sourced further upgradient, perhaps beneath Building 817.

The depth to groundwater across the site in September 2013 varied from approximately 2 ft bgs at well WSA-MW16 to 20 ft bgs at well WSA-MW21. Previous slug test results indicate the hydraulic conductivity ranges from approximately 5 to 100 ft/day with a geomean approximately 25 ft/day. Given the range in groundwater gradient and porosity, the average linear velocity is calculated at approximately 5 ft/day. However, site concentration data and remediation analyses suggest the actual velocity is lower (approximately 1 ft/day), which is closer to the velocity calculated when using the lower-magnitude slug tests results.

1.2.2 Selected Building 817 Remedy

The recommended remedy for Building 817 is enhanced bioremediation (Record of Decision (ROD) for OBGW, April 2009). This process is intended to increase biodegradation of the groundwater contaminants by injecting a vegetable oil emulsion into the ground. The vegetable oil emulsion increases the natural breakdown of the chemicals, reducing the concentration of contaminants. The injection fluid that has been deployed at Building 817 consists of a three-part emulsion of make-up water, vegetable oil, and pH buffering product.

To implement the enhanced bioremediation remedy, two separate vegetable oil injections have been performed at Building 817. The initial injection occurred in July 2008 (see Final

Interim Remedial Action Report, EEEPC, August 2011). The second injection occurred in July 2010 (see Spring 2010 Annual Report Performance Monitoring (FPM, January 2011, Appendix D)). In addition, a trial injection was performed as part of the 2006 Pre-Design Investigation (PDI).

1.2.3 Vegetable Oil Injections

Based on the results of the PDI, a food-grade vegetable oil emulsion was injected into a line of 8 permanent injection wells installed transecting the CVOC plume approximately 20 feet southwest (hydraulically downgradient) of the southwest corner of Building 817 (see **Figure 5-2**). Three separate vegetable oil injection events were performed in October 2006, July 2008, and August 2010. The injection wells are screened between 9 and 20 ft bgs, and the screens span the interval of the elevated MIP reading near the southwest corner of Building 817 at a depth of 15 to 16 ft bgs. The primary goal of the vegetable oil injections is to reductively dechlorinate PCE and TCE in source area groundwater, thereby reducing the toxicity of groundwater that migrates downgradient of the injection area.

1.2.4 Building 817 Remedy Effectiveness

Natural attenuation has caused the CVOC plume to stabilize prior to reaching Six Mile Creek, located approximately 800 feet southwest (hydraulically downgradient) of Building 817. The downgradient toe of the plume is located between wells WSA-MW21 and WSA-MW9, and the plume is estimated to extend approximately 650 feet downgradient of the source area at Building 817. If PCE and TCE were not attenuating, the plume would still be advancing toward Six Mile Creek, or would have reached the creek given the estimated timeframe of the initial release of solvents into the subsurface (at least 50 years ago given the age of Building 817), and the estimated groundwater seepage velocity (110 feet per year). TCE and PCE plumes over time are provided in **Figures 1-2** and **1-3**, respectively.

As summarized in **Table 1-1**, there is an overall decreasing trend in PCE/TCE concentrations over the 7- to 11-year sampling history of the wells. PCE/TCE concentrations in most of the wells in September 2013 were lower than the earliest measured concentrations in 2002, 2004, or 2006. PCE concentrations in well WSA-MW18 increased slightly when compared to the earliest PCE/TCE levels. The overall, longer-term decreasing trends for PCE and TCE exhibited on the time versus concentrations graphs are punctuated by shorter periods of increasing concentrations (except at WSA-VMW17). Periods of increasing concentrations, including in the September 2013 sampling round (the most recent event was April 2014, but results are not yet validated), suggest the presence of a continuing secondary source of contamination that is sorbed to the aquifer matrix in the transmissive zone and/or sorbed to fine-grained sediments (i.e., clay zones) interspersed within and/or underlying the transmissive zone. As dissolved mass in the plume is attenuated and concentrations decrease, additional mass desorbs from solid matrix particles and becomes dissolved in groundwater as a result of concentration gradients between the dissolved and solid phases in the saturated zone. At some point, the sorbed mass will be sufficiently depleted that it will no longer constitute a significant continuing source for the dissolved plume.

In addition, geochemical conditions near the injection points have been conducive to reductive dechlorination of PCE and TCE.

Table 1-1
Percentage Decrease in PCE/TCE Concentrations Over Historical Sampling Period

Well ID	Distance From Inection Points (ft)	Concentration (µg/L)			% Decrease		
		Earliest	Baseline (10-11/06)	Most Recent (9/13)	Prior to Injection	Post-injection	Overall
B817MW-001	30 upgradient	(baseline)	PCE: 0.4 TCE: 2.4	PCE: 1.05 TCE: 12	--	PCE: NDR TCE: NDR	PCE: NDR TCE: NDR
B817MW-002	30	(baseline)	PCE: 5.6 TCE: 25	PCE: ND PCE: ND	--	PCE: 100% TCE: 100%	PCE: 100% TCE: 100%
B817MW-003	75	(baseline)	PCE: 13 TCE: 21	PCE: ND TCE: 7.53	--	PCE: 100% TCE: 13%	PCE: 100% TCE: 13%
WSA-MW18	100	(baseline)	PCE: 53 TCE: 68	PCE: 42 TCE: 57	--	PCE: 21% TCE: 16%	PCE: 21% TCE: 16%
WSA-MW16	150	PCE: 48 (10/02) TCE: 61 (10/02)	PCE: 40 TCE: 48	PCE: 51 TCE: 48	PCE: 17% TCE: 21%	PCE: NDR TCE: NC	PCE: NDR TCE: 21%
WSA-MW19	250	(baseline)	PCE: 46 TCE: 68	PCE: 38 TCE: 47	--	PCE: 17% TCE: 31%	PCE: 17% TCE: 31%
WSA-VMW17	350	PCE: 22 (9/4/04) TCE: 94 (9/4/04)	PCE: 12.6 TCE: 24	PCE: 13 TCE: 14	PCE: 43% TCE: 74%	PCE: NDR TCE: 42%	PCE: 41% TCE: 85%
WSA-MW21	485	(baseline)	PCE: 1.1 TCE: 31	PCE: 0.9 TCE: 11	--	PCE: NA TCE: 65%	PCE: NA TCE: 65%

Concentrations are in ug/L

NA = not applicable, concentrations have been very low throughout monitoring period

NDR = negative decrease rate

NC = no change

(baseline) = baseline monitoring event is the earliest sampling event

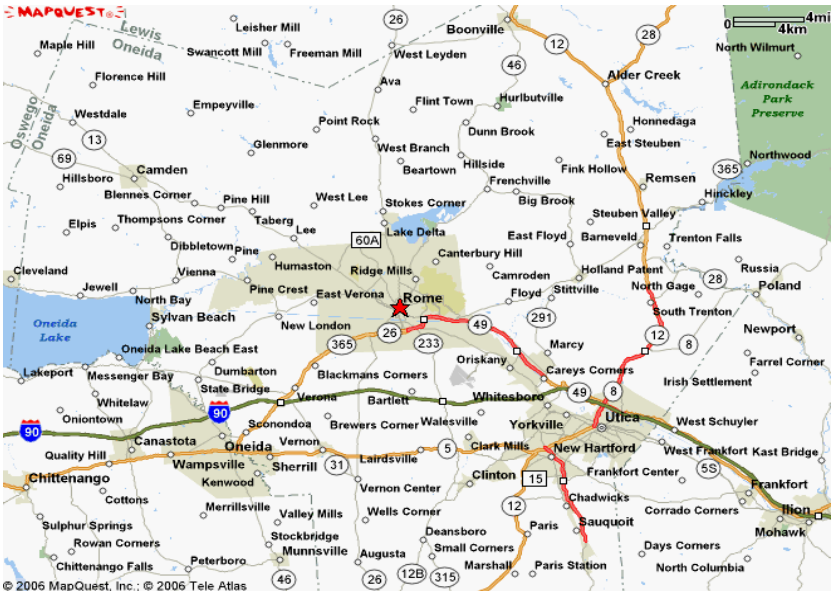
Most Recent event is April 2014; however, lab results are not in and September 2013 results are being used

1.2.5 Reason for Supplemental Investigation

Although the remedy is functioning as intended, there is continued uncertainty regarding the precise location of the primary CVOC source mass in relation to the injection points. It has been assumed that infiltration of CVOCs into the subsurface via the unlined sump beneath Building 817 is the most likely scenario. This assumption is supported by the detection of substantially elevated CVOC concentrations in soil and groundwater at MIP location M1 (depth = 15-16 ft bgs), which was advanced approximately 16 feet downgradient of the southwest corner of Building 817, about 2 feet upgradient of the injection points. The injection points are located approximately 18 feet south-southwest of the southwest corner of Building 817. However, CVOC concentrations in well B817-MW-001, located approximately 10 feet directly toward Building 817 from MIP location M1 and screened from 10 to 20 feet bgs, have been low (total CVOCs = 2.8 µg/L in October 2006, 1.8 µg/L in February 2007, and 15.5 µg/L in September 2013). It is possible that low magnitude CVOC concentrations in well B817-MW-001 are due to dilution as a result of the relatively long screen length.

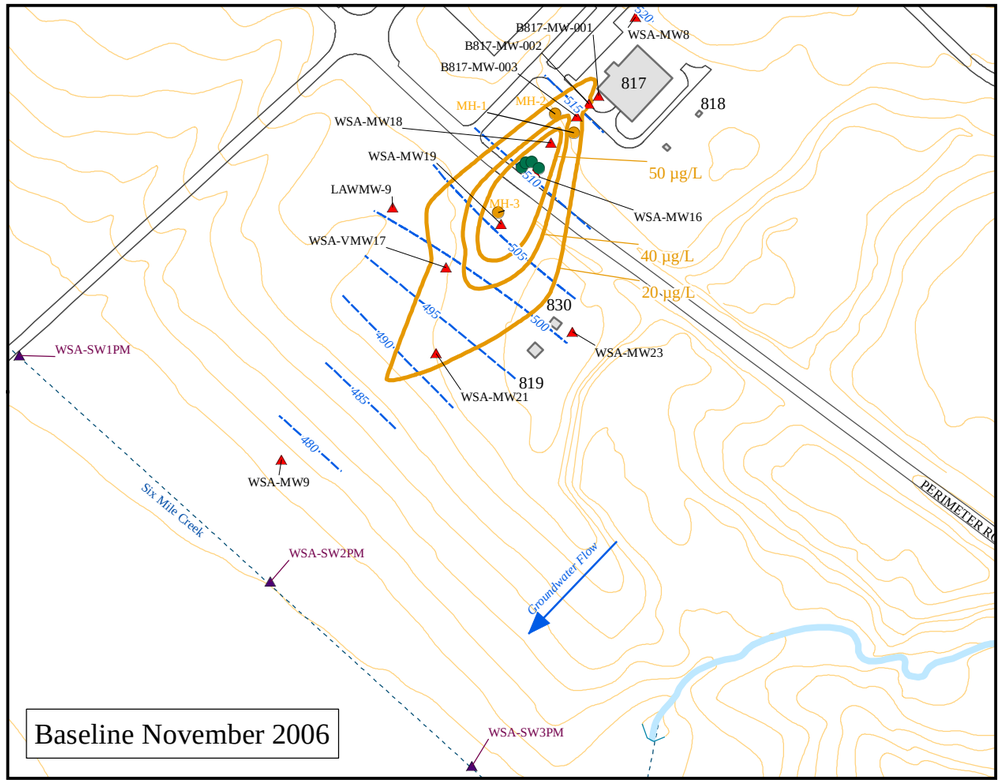
In addition, there have been periods of increasing PCE/TCE concentrations within the plume downgradient of the injection points, although overall concentration trends indicate a stable or decreasing plume. These rebounding concentrations suggest the presence of a continuing secondary source of contamination that is sorbed to the aquifer matrix in the transmissive zone and/or sorbed to fine-grained sediments (i.e., clay zones) interspersed within and/or underlying the transmissive zone. Additional data is suggested to confirm, and determine the location of, the secondary source.

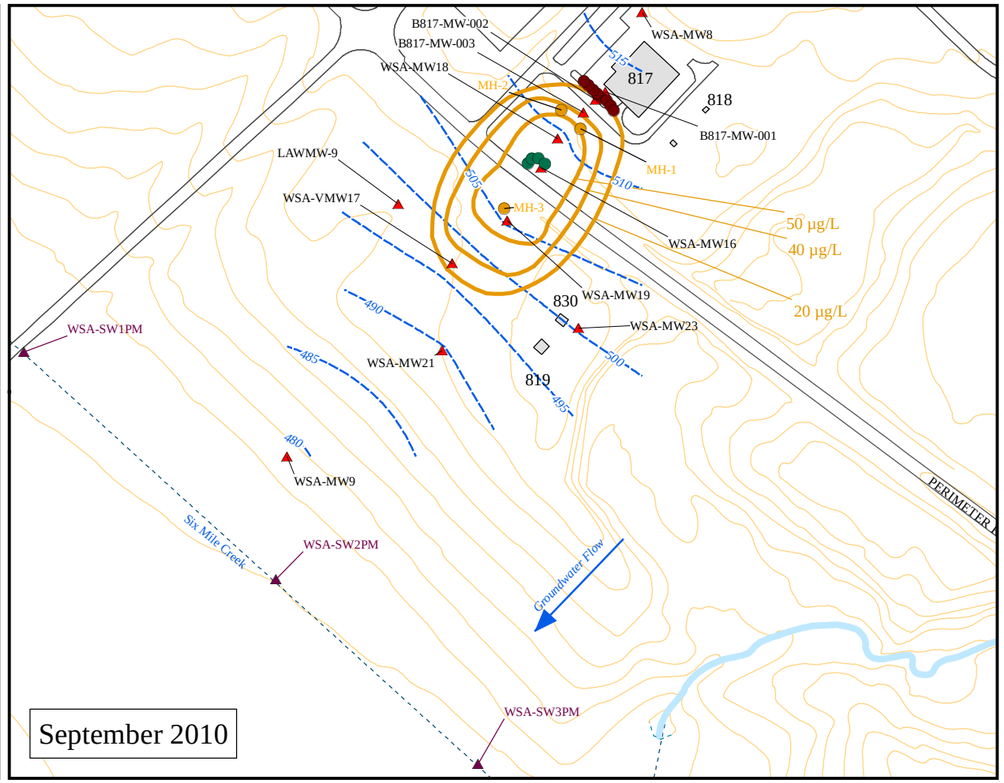
FIGURE 1-1
LOCATION OF ROME, NEW YORK

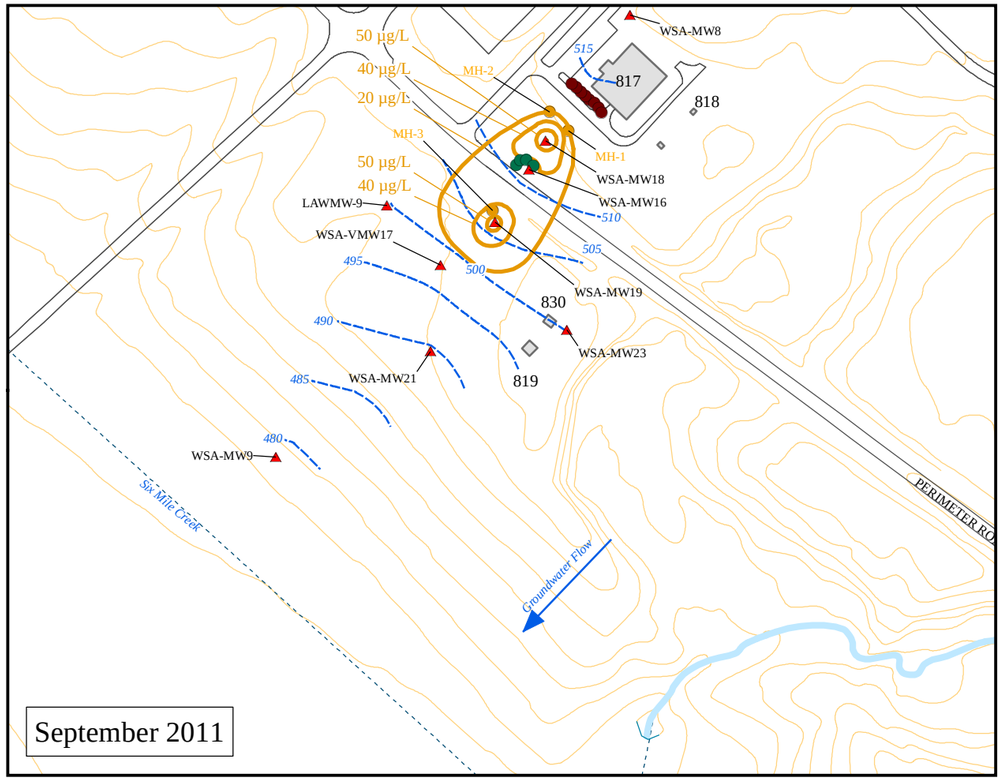


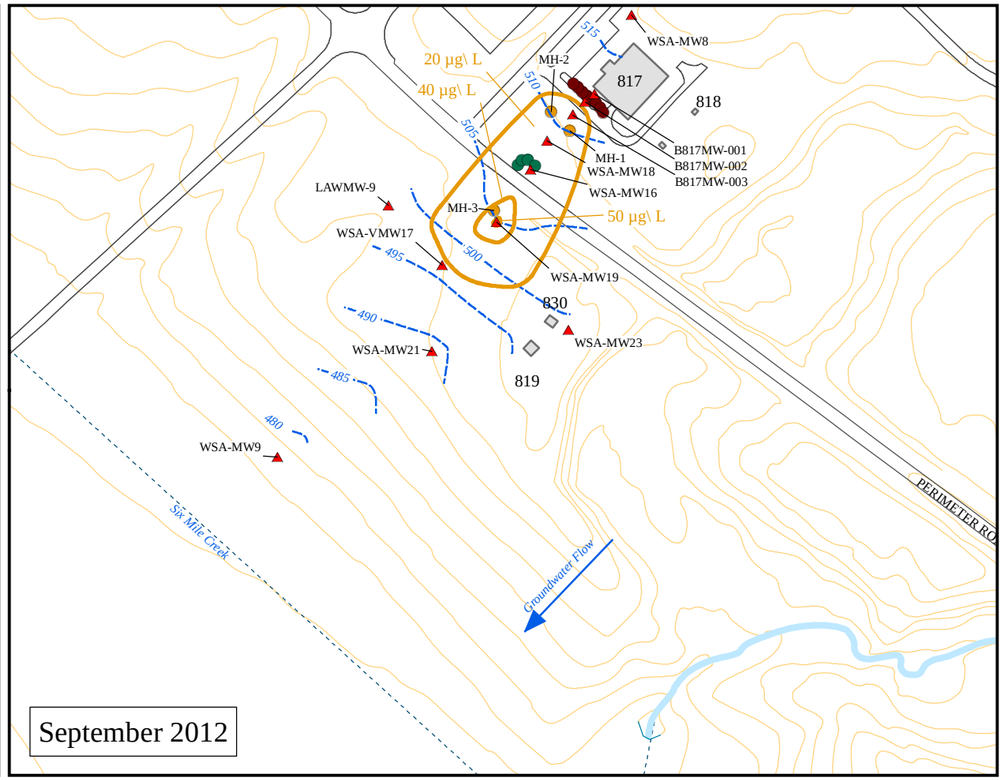
LOCATION OF THE FORMER GRIFFISS AIR FORCE BASE (NOW THE GRIFFISS BUSINESS AND TECHNOLOGY PARK)

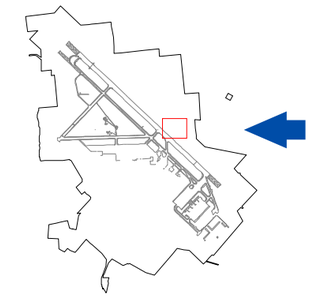
Maps Copied From www.mapquest.com











Site Location

Key to Features

- Permanganate Injection Point
- Vegetable Oil Injection Point
- Monitoring Well
- SW Sampling Location
- Manhole
- TCE Contour (µg/L)
- Groundwater Contour (ft. AMSL)
- Culvert
- Storm Drain
- Surface Water
- Road
- Topography (ft. AMSL)
- Demolished Facility
- Existing Facility

Date: August 2013

0 50 100 150 200 250 500

Feet

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

Figure 1-2
Building 817
TCE Plume and Sampling Locations

FPM group

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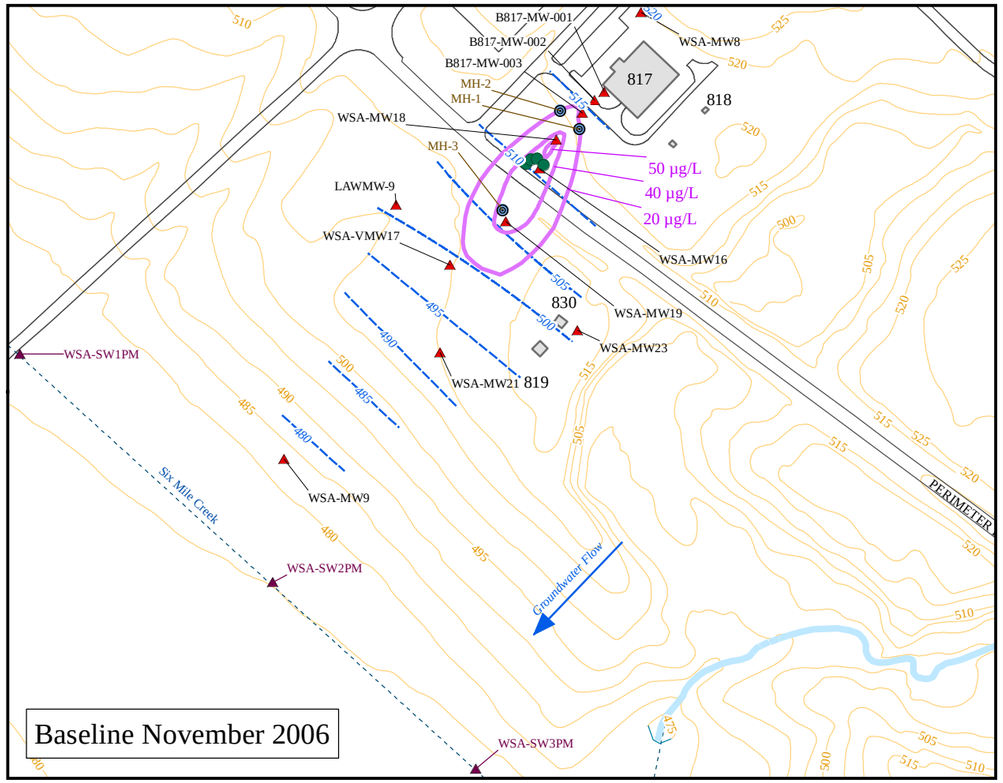

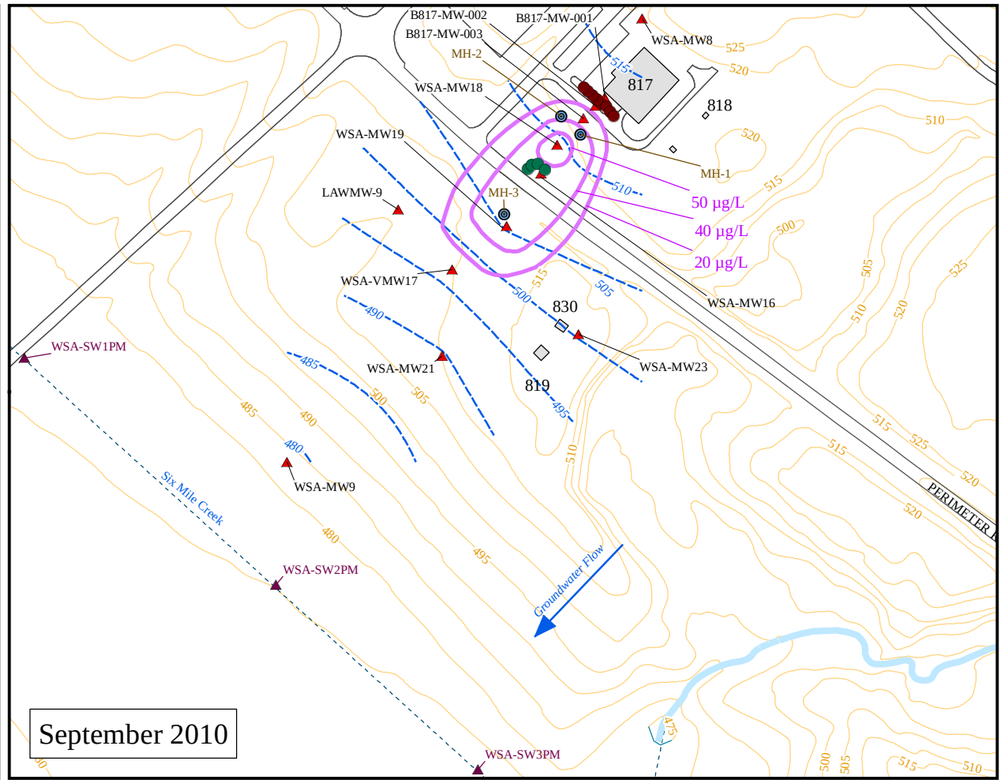

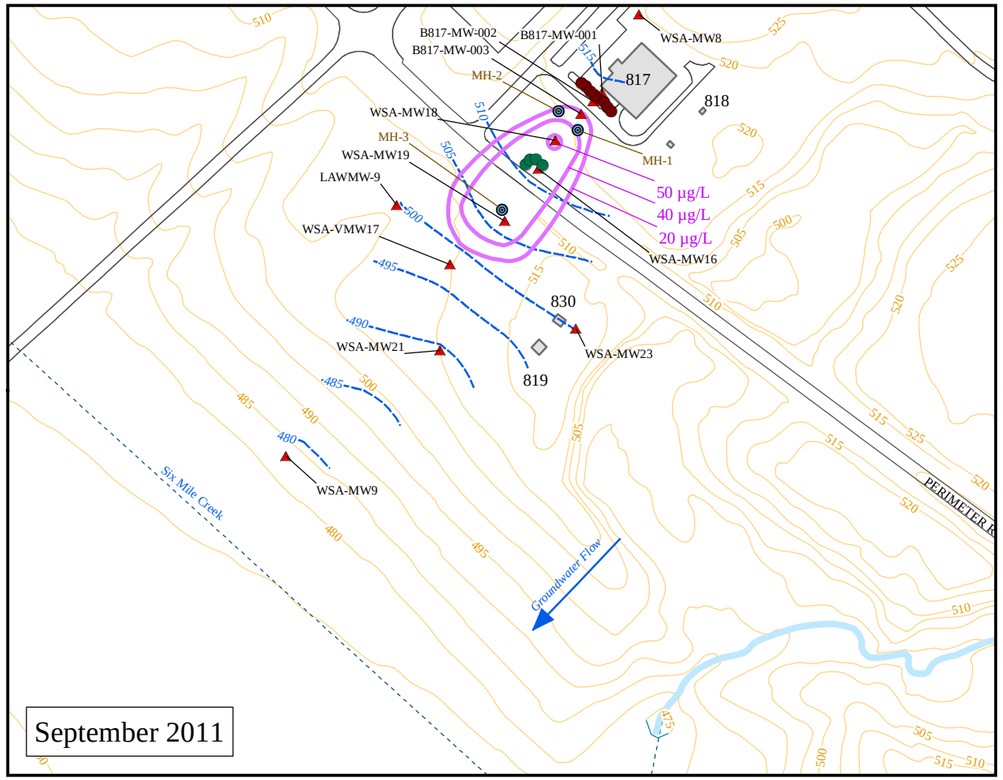

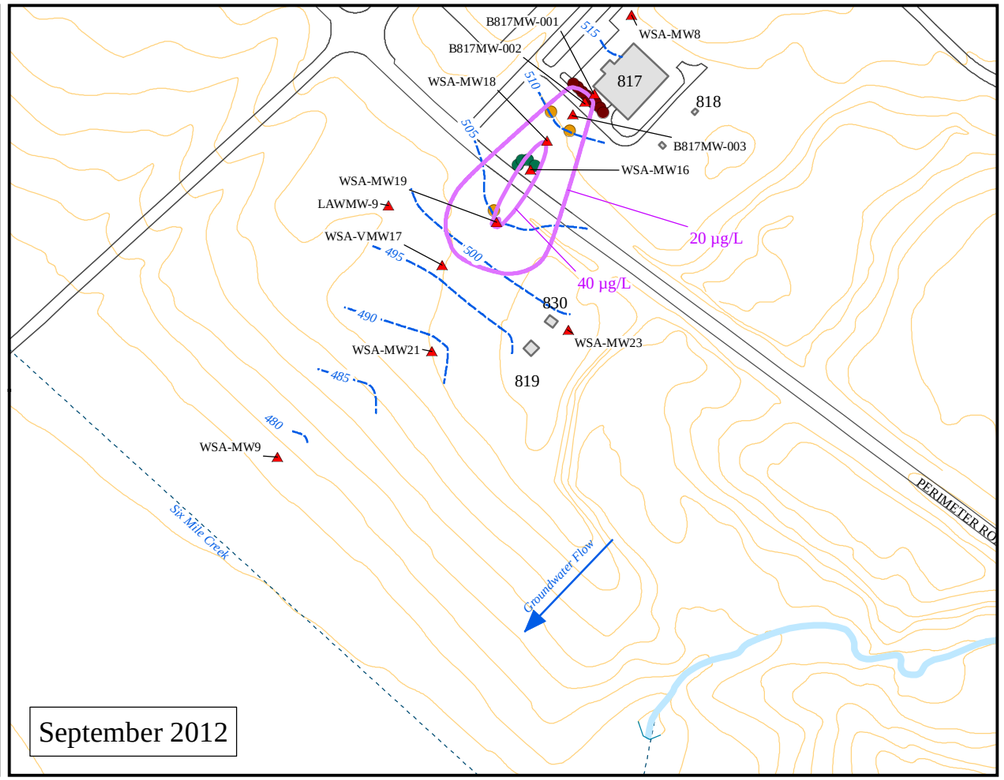

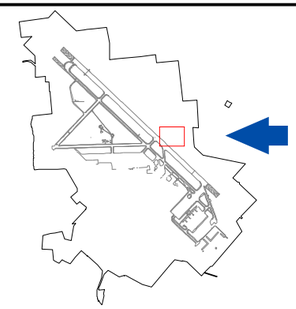

Site Location

Key to Features

- Monitoring Well
- Permanganate Injection Points
- Vegetable Oil Injection Points
- SW Sampling Location
- Manhole
- PCE Contour (µg/L)
- Grounwater Contour (ft. AMSL)
- Culvert
- Storm Drain
- Surface Water
- Road
- Topography (ft. AMSL)

Date: August 2013

0 50 100 150 200 250 500
Feet

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

Figure 1-3
Building 817
PCE Plume and Sampling Locations

FPM group

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SECTION 2

SUMMARY OF PREVIOUS REMEDIAL STUDIES/INVESTIGATIONS/ACTIVITIES

2.1 SUMMARY

Numerous studies and investigations under the U.S. Department of Defense Installation Restoration Program have been carried out at the former GAFB to locate, assess, and quantify the past toxic and hazardous waste storage, disposal, and spill sites. Prior to 1990, groundwater and soil analyses, record searches, health assessments, hydrology investigations, and site specific investigations were conducted. In 1990, the Air Force entered into a FFA under Section 120 of CERCLA. The purpose of this section it to identify some of the remedial studies and investigations conducted in support of the Building 817 remediation efforts.

The table below represents a few of the major activities for Building 817. A more detailed description of these activities can be found in the *Final Proposed Plan On-Base Groundwater Area of Concern (AOC) (AFRPA 2007).*

Activity	Date
Groundwater Monitoring Well Installation	1992 (part of Site Investigation)
Remedial Investigation	1994 (included Risk Assessment)
Supplemental Investigation	1997 and additional in 2000
Expanded Site Investigation	1998
Bedrock Groundwater Study	2002
Feasibility Study (FS)	2001/2005/2006
Treatability Studies[1]	2002/2003/2006
OBGW ROD	2008
Building 817 OBGW Remedy Installation (Vegetable Oil Injection)	2008/2010

[1] Treatability Studies included Bench-scale Study, a Field Pilot Study, and an Initial Vegetable Oil Injection Pilot Study dependent on the site location and current conditions.

Since 2008, annual performance monitoring reports have been prepared to document the progress in OBGW remediation, including Building 817. The most recent performance monitoring report is the Draft Spring 2013 Annual Performance Monitoring Report (FPM, 2013) which includes all of the performance monitoring data 2008 through March 2013. Two additional sampling rounds occurred in September 2013 and April 2014.

SECTION 3

REMEDIATION MANAGEMENT PLAN

3.1 PROJECT MANAGEMENT ORGANIZATION

A team of appropriately trained and qualified professionals from Parsons will conduct this project. Each member of the team has been assigned various duties related to the project. The key project team members are briefly described below in terms of their project responsibilities.

1. **Parsons Project Manager** (PM) - Mr. John Lanier will perform the duties of Project Manager. The PM will be responsible for all project activities. Mr. Lanier will also function as the primary client contact, and ensure that all project and client requirements are met.
2. **The Project Health and Safety Manager** (PHSM) - Mr. Timothy Mustard is responsible for oversight and direction to ensure full compliance with all health and safety requirements at the project site. The PHSM, or his designee will oversee/review all aspects of site safety, including any updates to safety plans, performance of the initial site-specific training, and the periodic auditing of site operations to verify Occupational Safety and Health Administration (OSHA), United States Army Corps of Engineers (USACE), and SHP compliance. While the PHSM will not necessarily visit the site, he will ensure that personnel carry out the required activities.
3. **The Site Safety and Health Officer** (SSHO) - Mr. Dale Dolph is responsible for carrying out the provisions of the Accident Prevention Plan (APP) and the Site-Wide Safety and Health Plan (SSHP) with regards to site work, and will ensure that all personnel entering the site understand and adhere to the provisions of the Safety and Health Plans (SHPs) and that personnel meet the training and medical monitoring requirements of 29 CFR §1910.120. The SSHO will be approved by the Project Health and Safety Manager (PHSM), or designee and should have the following qualifications (unless confirmed acceptable by the PHSM): current 40-hr (8-hr refresher) Hazardous Waste Operations and Emergency Response (HAZWOPER) training; HAZWOPER Supervisor training; Parsons Supervisor Training in Accident Reduction Techniques (START)/Safety, Health and Risk Program (SHARP) training; OSHA 10-hr or 30-hr safety training; current medical monitoring (if applicable); current first aid/Cardiopulmonary Resuscitation (CPR); experienced at the highest level of respiratory protection expected at the site; demonstrated proficiency in air monitoring instrumentation to be used at the site; demonstrated familiarity with company policies, procedures, and health and safety (H&S) program; and the ability to make decisions. Any changes in the provisions of the APP and SSHP shall be made in writing by the SSHO and shall be approved by the PHSM or Corporate Health and Safety Manager. Any personal protective equipment upgrades or downgrades shall be documented in writing by the SSHO. The SSHO shall have the authority to stop an operation or site work if, in the opinion of the SSHO, the site conditions or the manner in which the work is being conducted, presents a hazard to site personnel, surrounding

populations, or the environment. The name and contact information for the SSHO or, if the SSHO is absent, the name of the acting SSHO, shall be provided in the SSHP and posted on the bulletin board in the field office. The SSHO is responsible for all air monitoring. Additional site-specific information is provided in the SSHP.

4. **Field personnel** will be involved in well installation, sampling, inspections, field monitoring, and decontamination, as specified. Site personnel will only perform tasks for which they have received appropriate training.
5. **Site Manager** – Mr. Dale Dolph will perform the role of site manager as well as SSHO. Mr. Dolph will be responsible for overall management of site personnel and activities.

3.2 POINTS OF CONTACT

Parsons will take the lead role in planning, organizing, health and safety issues, and overall quality assurance for all work under this task order. The Parsons Team will report to the USACE and the Air Force Civil Engineer Center (AFCEC) through a single point of contact, Parsons PM, Mr. John Lanier.

Client contact information is presented below:

USACE, KC Project Manager	**AFCEC Project Manager**
Nanci Higginbotham US Army Corps of Engineers Kansas City District 601E. 12th Street Kansas City, MO 64106 Phone: 816-389-3359 Email: nanci.e.higginbotham@usace.army.mil	Cathy Jerrard AFCEC/CIB-Griffiss 706 Brooks Road Rome, NY 13441 Phone: 315-356-0810 x204 Email: Catherine.jerrard@us.af.mil

Contact names and telephone numbers for key Parsons Program personnel are listed below:

Name	Function	Location	Telephone No.
Ross Miller	Program Manager	Salt Lake City, UT	Office: 801-572-5999 Cell: 801-721-9243
Todd Heino	Environmental Remediation Sector Manager	Boston, MA	Office: 617-449-1405
John Lanier	Project Manager	Syracuse, NY	Office: 315-552-9704 Cell: 716-998-3485
Tim Mustard	Project Health and Safety Manager	Denver, CO	Cell: 303-564-3537
Jim Buchannan	PGS Project Controls Manager	Atlanta, GA	Office: 678-969-2459
John Hicks	Technical Director	Denver, CO	Office: 303-764-1941
Deb Albert	Billing Manager	Chesterfield, MO	Office: 314-819-5011

Jerry Ostrowiecki	Contract Administrator	Pasadena, CA	Office: 626-440-2037
Tom Kartachak	Project Quality Control Coordinator	Abingdon, MD	Office: 410-596-9178
Corey Martin	Procurement Manager	Huntsville, AL	Office: 256-217-2566
Bill Bradford	Syracuse PGS Health and Safety Officer	Syracuse, NY	Office: 315-552-9677 Cell: 315-546-5146
Bob Meyers	Ecology & Environment Engineering, PC	Lancaster, NY	Office: 716-684-8060
Niels Van Hoesel, P.E.	FPM Group, Ltd.	GAFB Rome, NY	Office: 315-336-7721
Dale Dolph	Site Safety and Health Officer and Site Manager	Syracuse, NY	Cell: 315-506-3939

3.3 PROJECT PLANS

Parsons project plans from the 2008 OBGW RAWP and 2010 Addendum will be used for this project, as noted:

- APP (June 2006) and APP updates (June 2008, October 2013)
- Performance Monitoring Work Plan, Section 6 for sampling of new monitoring wells (September 2008) –
- Spill Prevention, Control and Countermeasure Plan (July 2010)

Only portions of the reports above related to field investigation and injection activities at Building 817 are applicable to this Addendum RAWP.

SECTION 4

PERMITS AND APPROVALS

Prior to the start of work, the following permits and approval activities will be conducted:

4.1 UNDERGROUND IDENTIFICATION

Dig Safely New York will be contacted at 1-800-962-7962 to locate underground utilities prior to excavation and/or geoprobe/drilling activities. New York State law requires that Dig Safely New York be notified at least two working days, and not more than ten working days, before subsurface work is conducted. Regulations pertaining to the protection of underground facilities in New York State are governed by 16 New York Codes Rules and Regulations (NYCRR) Part 753. All intrusive work will be coordinated with the Air Force Civil Engineer Center AFCEC personnel to identify any other potential privately owned utilities prior to the start of work.

A Dig Safely New York representative will mark all buried utility lines in the work area. All proposed drilling locations and the excavation area will be marked out in white paint (or equal) prior to utility company coming onsite. In addition, alternate locations will be identified to avoid any additional mark out requirements if original locations impede on subsurface utilities. In addition, site representatives will be contacted to identify any other facility utilities, sewer lines, or other obstructions that may pose a risk to health and safety. After the existing utilities have been marked in the field, the Contractor and the USACE will inspect and photograph the markings and affected work area prior to allowing any intrusive work to begin.

Information that will be required when placing the call to Dig Safely New York:

- The excavator/driller's company name;
- The excavator/driller's address, telephone and fax number;
- The caller's name;
- Who the work is being done for, when appropriate;
- A Parsons representative and telephone number that member utilities can call with questions about the request;
- The county and place (town, village, or city) of the excavation according to legally incorporated municipal boundaries. The FULL street address of the excavation/drilling.
- The name of the nearest intersecting street on either side of the excavation;
- The date and time the excavation is scheduled to begin;
- A description of where, on the property, the work is to be performed and details about the extent of the excavation;
- The type of work being done, and the type of equipment being used to do it; and
- Any special instructions.

Previous investigations have identified an active water line south of Perimeter Road and on the west side of the B817 drive way. No active electrical or gas utilities are thought to be in the Building 817 area.

4.2 PROPERTY OWNERSHIP

Prior to the start of work, coordination with the property owners, must be conducted to ensure that any privately owned utilities are identified and that permission to work on the land has been granted.

All coordination with property owners will be coordinated through the AFCEC Representative:

Ms. Cathy Jerrard
AFCEC/CIB-Griffiss Project Manager
315-356-0810 x204

Ms. Jerrard, AFCEC, will assist in coordinating with:

City of Rome Public Works: Mr. Frank Tallarino, Commissioner of Public Works 315-339-7632
City of Rome Water Pollution Control Facility: Mr. Matthew Coppola 315-339-7775
Griffiss Local Development Corporation (GLDC): Mr. Frank Sanzone 315-534-0643

4.3 PERMITTING AND APPROVAL AUTHORITIES

All permits and approvals will be reviewed and approved by AFCEC prior to submittal to the appropriate agencies. Permits are only required if additional injection activities will be conducted.

4.3.1 Building 817

The City of Rome Public Works Department (Mr. Frank Tallarino, 315-339-7632) will be contacted one (1) month prior to the start of injection activities to coordinate the use of water from the fire hydrant located near Building 817.

4.3.2 Underground Injection Permitting

In New York, the USEPA is the regulatory authority that administers the Underground Injection Control (UIC) Program. Injection of the substrate at the site is considered subject to 40 CFR Part 144 because the injection points fall under the definition, “any dug hole or well that is deeper than its largest surface dimension, where the principal function of the hole is

emplacement of fluids" (40 CFR 144.1(g)(1)(ii)). The injection wells are classified as Class V wells because they are not included in the descriptions of Class I, II, III, or IV wells. Class V wells are authorized by the rule contingent upon provision of basic operator information and notification of planned injection activities, as described in 40 CFR Part 144.24. Although a permit will not be required, a notification to the United States Environmental Protection Agency (USEPA) will need to be filed prior to injection activities.

The "Inventory of Injection Wells" USEPA Form 7520-16 (OMB No. 2040-0042) must be submitted (Appendix A) 90 days prior to start of injection unless the UIC Program Director indicates otherwise. This notification was sent prior to the initial vegetable oil injection in July 2008. An update was sent prior to the second injection in August 2010. An update for any 2014 injections will be submitted prior to the start of injections, if required following the supplemental investigation (see Section 6).

SECTION 5

SUPPLEMENTAL INVESTIGATION

This section provides an overview of all possible supplemental investigation components, including a Building 817 site walk and utility evaluation using a ground penetrating radar (GPR), geoprobe soil sampling, groundwater sampling, and additional monitoring well installation. This work plan addendum is intended to be a dynamic work plan that incorporates the flexibility to change or adapt to data collected in the field. As an overview, the GPR investigation will provide data to further define the area for the geoprobe investigation and determine the optimal location for an additional monitoring well, soil and groundwater samples will be collected and analyzed using an on-site laboratory with locations based on information to date as well as the GPR investigation, and a new monitoring well will be installed.

As information is gathered, it is used to make decisions about what subsequent activities will best resolve remaining data and decision uncertainties and/or meet the project goals. **Figure 5-1**, the Decision Logic Diagram, illustrates the dynamic nature of the work plan, including which components may be included in the investigation, how those decisions will be made, and if the investigation results support the need for additional remedial activities at the site. Calls will be made daily during the supplemental investigation field work to discuss events and ensure concurrence on field specifics. Any decisions made will be clearly stated in the Daily Field Report (DFR - see Section 8 of this report), and any variances will be clearly noted. The 2015 Performance Monitoring Report will include a detailed description of the supplemental investigation and any supplemental remedial actions.

5.1 SITE MOBILIZATION

No permits are required for the supplemental investigation. Site access will be coordinated with GLDC one month before start to obtain access and approval.

Dig Safely notification will occur before mobilization (see 4.1). Exclusion zones, contamination reduction, and clean work zones will be established with visible barriers to maintain site safety requirements and prevent waste migration. Barriers will be orange construction style fencing staked into the ground or similar. The work zones shall be relocated, as needed, based on existing site conditions and upon agreement of the Site Manager (SM) and SSHO.

5.2 BUILDING EVALUATION

The building evaluation will include a site walk and geophysics. The building evaluation will include a site walk to assess Building 817 more thoroughly, including inspecting the building for manholes, floor drains, or anything that would indicate any preferential contaminant migration pathway for subsurface CVOCs that have been previously overlooked.

GPR will be used to help identify underground utility corridors and other potential pathways. Cameras and/or smoke will be used to confirm the direction/outfall of the pipe from

the sump, as well as to determine the condition and direction of any previously unidentified underground pathways within or immediately surrounding the building. The GPR investigation will focus on underground utilities in the entire area between Building 817 and Perimeter Road. If conditions warrant (evidence of utilities in adjacent areas), areas south of Perimeter Road may also be investigated as well as the area between B817 and the pump houses to the east.

5.3 SOIL AND GROUNDWATER INVESTIGATION

A geoprobe soil investigation, with adjacent groundwater samples, will take place after the GPR building evaluation.

Near Building 817, upgradient of the existing injection points, the investigation will be used to determine the location of the original source and a suitable location for monitoring well(s).

Downstream of the existing injection points, soil samples will be used to confirm the conceptual model that the increased CVOC concentrations downstream of the injection points are due to sorbed CVOCs within a low permeability silt/clay lens area, and to determine the extent of the silt/clay lens(s).

Figure 5-2 shows approximate lines along which geoprobes will be advanced for soil and groundwater sampling. The transects shown are in areas where the previous MIP investigation indicated more elevated levels of VOCs. Up to five samples will be analyzed within each boring. Transect 1, as labeled in the figure, is located between the building and injection wells. The transect includes six boring at an approximate 20-foot spacing, and extends from just east of the sump to approximately 30 feet west of the end of the line of substrate injection wells. During the geoprobe grab sampling, elevated CVOC concentrations were detected in groundwater in that area (81 ug/L total CVOCs at WSA-GP02S, approximately 10 feet west of the line of injection wells).

Transect 2 is located near monitoring well B817-MW-003. Transect 2 includes 4 borings (minimum) at a 20-foot spacing. The rationale for this location is that there was a sharp spike at MIP-02 at 16 to 17 feet bgs, which may indicate the presence of the clay lens that is suspected to be present. Also, the groundwater data indicate that PCE/TCE concentrations fully rebound between well MW-002 and MW18, indicating a primary (non-aqueous phase liquid, or NAPL) or secondary (sorbed) source mass somewhere in that portion of the site. More borings will be advanced along the transect if needed to better laterally define any areas of high concentrations.

Transect 3 is proposed at monitoring well WSA-MW18. This transect includes 5 borings at a 20-foot spacing, and is located in an area where the MIP investigation indicated more elevated levels of VOCs. Any additional transects farther downgradient, such as across Perimeter Road, are optional and based on findings of the first three transects. In addition, up to three samples will be collected beneath the building, as practicable and if evidence suggests there may be an upstream source below the building. The contractor will provide necessary coring equipment; the primary limiting factor is a 10-foot overhead clearance requirement.

Note that the locations indicate the approximate sampling locations based on information to date; they will be modified if the GPR results indicate that the investigation area should be

altered or further refined. Any additional transects farther downgradient, such as across Perimeter Road, are optional and based on findings of the first three transects.

Soil samples will be collected using a discrete sampler mounted onto a Geoprobe® system. A photoionization detector (PID) will be used to screen the entire length of the soil core to focus on soil samples in intervals with the highest concentrations of VOCs. Continuous core will be collected from the surface to bedrock. It is anticipated that samples will be collected at depths that have correlated to higher CVOC concentrations during previous sampling events (generally 14 to 18 feet bgs). In addition, samples will be obtained from finer-grained, low permeability (i.e., silt/clay) layers. Field observations such as odor, staining, etc. may also be used to determine sample locations if applicable

Groundwater sampling will be conducted using a Geoprobe® Screen Point 22 (SP22) sampler. The sampler will be equipped with a 6-inch screen to allow profiling at a sub-foot interval. Samples will be collected when soil sample results indicate elevated levels of VOCs, and will be advanced adjacent to the soil boring. The Standard Operating Procedure (SOP) for the SP22 sampler is provided in Appendix B.

Samples will be analyzed on-site using a field laboratory. The field laboratory method is based on SW846 USEPA Method 8260C for the analysis of VOCs, and is designed to measure the concentration of specific VOCs, including CVOCs, in water, soil and air using a solid phase micro-extraction (SPME) and Gas Chromatograph equipped with a capillary column and mass spectrometer. Results provide quantified results with a fast (less than an hour) processing time, allowing for fast lateral and vertical snapshot of the subsurface. Results from the mobile lab will be shared with the USACE POC once processed. An electronic figure with sample names and locations will be available on a project website for reference when discussing laboratory results. It is anticipated that USACE will be on-site for most field activities. In the event that a POC is not on-site, results will be discussed over the phone, using the electronic figure as a reference. Copies of SOPs for on-site laboratory procedures and methodologies will be provided in the QCFP Addendum.

5.4 MONITORING WELL INSTALLATION AND COMPLETION

Following geoprobe soil and groundwater investigation, a cluster of three monitoring wells will be installed upgradient of the injection points with the intent of monitoring a small, vertically discrete zone of groundwater. The purpose of this well cluster will be to obtain additional contaminant source characterization information that is not possible with 10-foot screened wells that currently exist in the area. The exact location will be determined by the investigation results. Three monitoring wells will be installed using direct push technology in a location where the highest contamination is found. The wells will be adjacent to each other and will have 3’ screens (nominally 10-13’ bgs, 13-16’ bgs and 16-19’ bgs) to prevent cross-dilution of different areas. These depths may be revised if the groundwater investigation determines that the highest CVOC concentration zone is at a depth not included within these screen zones, or if it extends between two zones. The well will be constructed from 2-inch PVC pipe with a 0.010” slotted PVC screens and a #0 sand pack. The outer layer of the prepacked well will be a 65 mesh stainless steel screen. A typical prepacked well and is shown in **Figure 5-3**.

After installation, the wells will be developed by using a decontaminated submersible pump at the maximum flow rate that would not draw the water level down to the pump until the required purge volumes are achieved. Temperature, pH, conductivity, turbidity, DO, and ORP measurements will be recorded to monitor the progress of the development process.

No sooner than 14 days after well development, the water level will be recorded, and the cluster sampled and analyzed for VOCs using USEPA Method 8260.

New monitoring wells will be completed consistent with the existing 2008 QCFP. Existing injection wells will be fitted with a flush mount enclosure and a 1-inch male cam-lock coupler on the top of the casing. The cam lock will be covered with a female cap which can be easily removed for a hose connection.

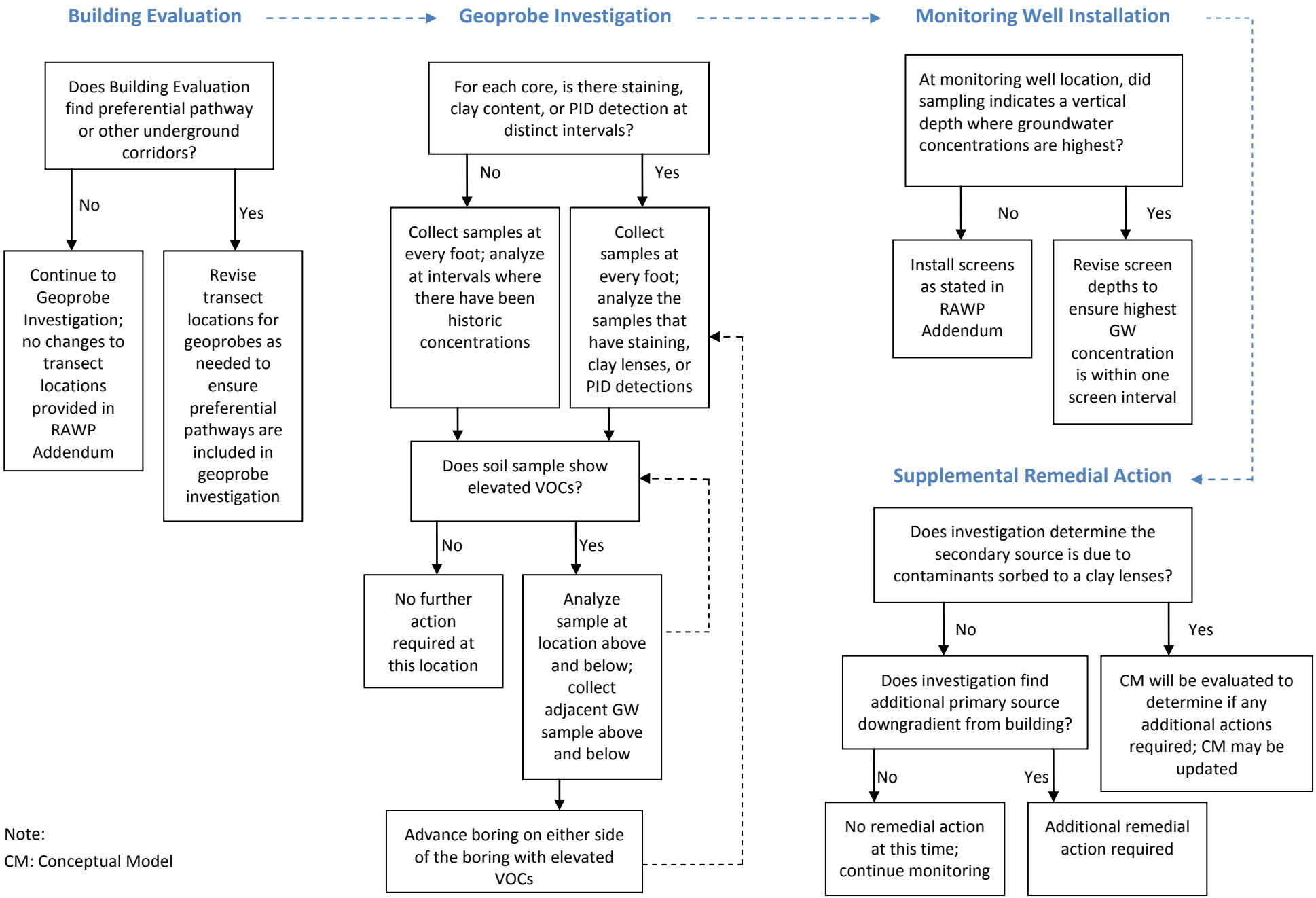
5.5 SITE SURVEY

After activities are complete, a ground survey will be conducted to obtain horizontal locations and vertical elevations of all monitoring wells and geoprobe locations. The ground survey will utilize existing benchmarks located on the Griffiss AFB, and will use the NAD 83 State Plane coordinate system. Horizontal and vertical measurements will be obtained to an accuracy of 0.001 feet and 0.01 feet, respectively.

5.7 INVESTIGATION VERIFICATION CHECKLIST

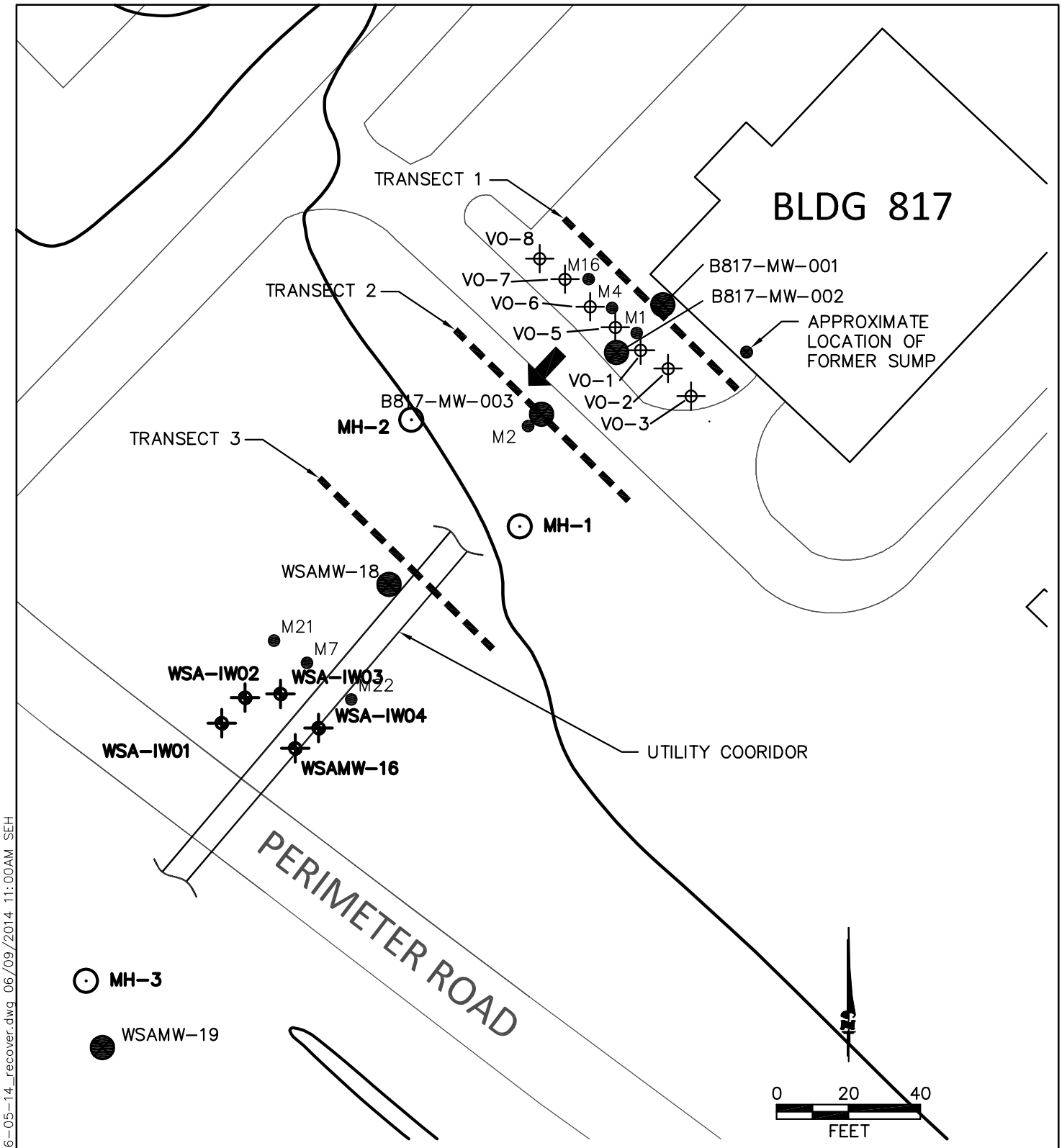
To ensure that all aspects of the Building 817 investigation have been accounted for, a verification checklist has been prepared and is provided as **Figure 5-4**. This checklist identifies the steps and requirements associated with the supplemental investigation. This checklist will be maintained in the project files following completion. This checklist is designed to be used in addition to the project field log book and can be modified if necessary to better document field activities. The checklist is also provided in the Quality Control Field Plan (QCFP) Addendum which is described in Section 7.7 of this RAWP Addendum and will be submitted prior to the start of field activities.

Figure 5-1 Decision Diagram for Building 817 Supplemental Investigation



Note:

CM: Conceptual Model



LEGEND

VO-8	INJECTION POINT
B817-MW-003	MONITORING WELLS
WSA-IW01	INJECTION WELLS
MH-2	MANHOLE
	FORMER SUMP
	TRANSECTS

FIGURE 5-2

PROPOSED GEOPROBE INVESTIGATION LOCATIONS

GRIFFISS AFB OBGW SITES
BUILDING 817/WSA SITE
ROME, NEW YORK

PARSONS

Denver, Colorado

S:\ES\cad\746809\DWG\Fig_5_2_B817_06-05-14_recover.dwg 06/09/2014 11:00AM SEH

.

Figure 5-3 Typical Prepacked Well

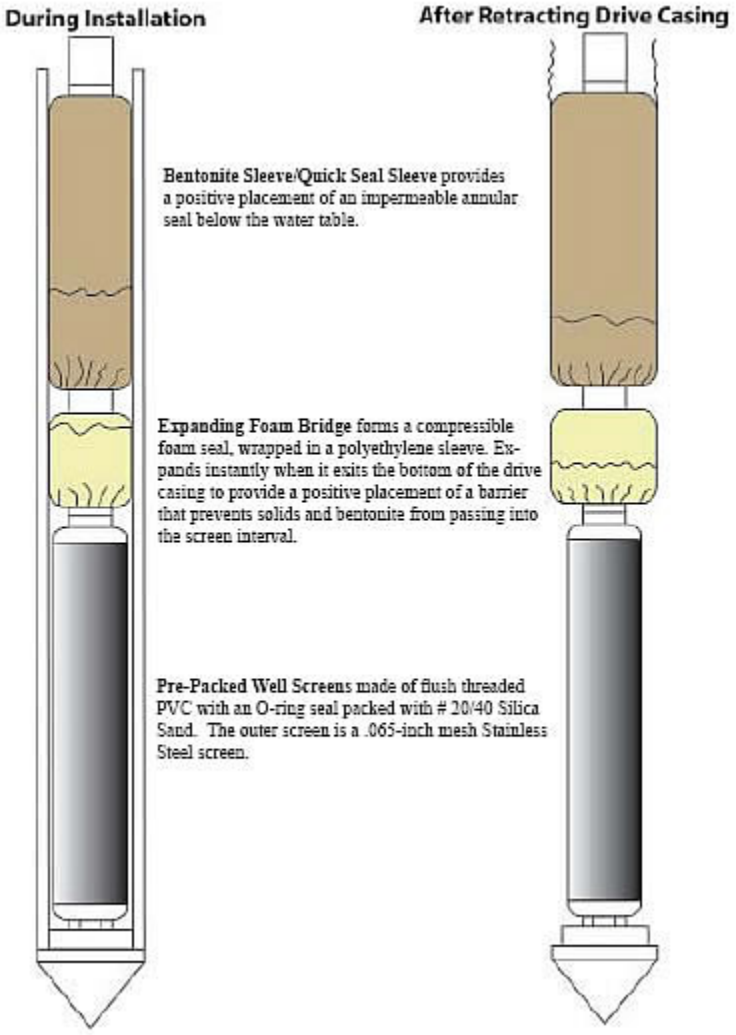


Figure 5-4
Building 817 Investigation Verification Checklist

SITE MOBILIZATION

Dig Safely New York Contacted	Date		Oneida County Representative Contacted	Date	
Utilities Marked and Cleared	Date		Decontamination Area	yes/no	
Griffiss Air Park Flight Personnel Contacted	Date		Building 817 Storage Access Approved	yes/no	
Access Confirmed	yes/no		Equipment/Supplies Staging Area	yes/no	
Approval/Confirmation to Continue	yes/no		Survey Conducted	Date	
Site Facilities Prepared	yes/no		Drilling Contractor Mobilized	yes/no	

BUILDING INSPECTION

Inspection Dates:			Camera Used	yes/no
GPR Dates:		yes/no	Smoke Used	yes/no
Observations:				

SOIL/GROUNDWATER SAMPLING

Number of GW samples collected		Number of GW samples analyzed	
Number of soil samples collected		Number of soil samples analyzed	

Figure 5-4
Building 817 Investigation Verification Checklist, Continued

MONITORING WELL INSTALLATION

Well Installation

Well ID:	Start	Finish

Well Testing Performed:

_____ ☐ Falling Head Slug Test ☐ Step Testing ☐ Constant Pump Testing

Groundwater Sample Completed

Well ID:

_____ ☐ Yes ☐ No ☐ NA

_____ ☐ Yes ☐ No ☐ NA

_____ ☐ Yes ☐ No ☐ NA

Personnel Air Monitoring Conducted during Installation

_____ ☐ Yes ☐ No ☐ NA

Drill cuttings in drums ☐ Yes ☐ No ☐ NA

INSTALLATION DETAILS

Well Diameter

Well ID:

_____ ☐ 4.5 inch ID ☐ 10 inch ID

_____ ☐ 4.5 inch ID ☐ 10 inch ID

_____ ☐ 4.5 inch ID ☐ 10 inch ID

Auger Refusal

Well ID:

_____ ☐ Yes (Depth)_____ ☐ No

_____ ☐ Yes (Depth)_____ ☐ No

_____ ☐ Yes (Depth)_____ ☐ No

Auger/Casing Installation Depth

Well ID: Depth Well ID: Depth

Figure 5-4
Building 817 Investigation Verification Checklist, Continued

Screen

Well ID:	Depth		Interval
		to	
		to	
		to	
		to	

Well Casing Material: _____

Well Filter Pack Installed

Well ID:

	☐ Yes	☐ No	☐ NA
	☐ Yes	☐ No	☐ NA
	☐ Yes	☐ No	☐ NA

Well Seal Installed

Well ID:

	☐ Yes	☐ No	☐ NA
	☐ Yes	☐ No	☐ NA
	☐ Yes	☐ No	☐ NA

COMPLETION

Well ID:

	☐ Well Casing Installed	☐ Well Lock
	☐ Concrete Drainage Pad	☐ Protective Post/bollards installed
	☐ Well Casing Installed	☐ Well Lock
	☐ Concrete Drainage Pad	☐ Protective Post/bollards installed
	☐ Well Casing Installed	☐ Well Lock
	☐ Concrete Drainage Pad	☐ Protective Post/bollards installed

SECTION 6

SUPPLEMENTAL REMEDIAL ACTION (TBD)

(This section is a placeholder in the event that supplemental remedial actions are required)

SECTION 7

CONTROL PLANS

7.1 SITE FACILITIES

Temporary facilities will be available for use during the supplemental investigation and potential remediation activities. These facilities will include portable toilets, equipment storage, and will be available for authorized personnel. The June 2006 APP will be updated with a new appendix for 2014 activities.

Portable toilets will be provided and maintained in sufficient quantity based on crew size. Equipment decontamination facilities will be constructed as appropriate to include equipment decontamination area and personnel wash area (as necessary).

Approval for the use of Building 817 will be coordinated with appropriate Griffiss personnel prior to the start of field activities. Building 817 will be used to store equipment, supplies and chemicals required as part of the injection activities, if required.

7.2 SITE SECURITY PLAN

Temporary orange fencing or equal, will be used to demarcate the work zones around the work area. It will be the responsibility of all field workers to report any security breaches to the SM. The SM will initiate an appropriate response which may consist of escorting the violator out of the work area or calling the police, if necessary.

At the end of each workday, the site will be inspected to ensure the site is left in a safe and secure condition during periods of inactivity.

7.3 TRAFFIC CONTROL PLAN

Traffic control procedures are included in the APP, Appendix A- Site-Wide Health and Safety Plan (Parsons, 2006).

7.4 SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN

This section is applicable only if injection activities described in Section 6 are deemed necessary after the supplemental investigation (Section 5).

7.4.1 Oil Pollution Plan

Oils stored on site are subject to 40 CFR 112, Oil Pollution Prevention. If the total volume of vegetable oil stored on site is greater than 1,320 gallons, Spill Prevention, Control, and Countermeasure (SPCC) Plan regulations apply under 40 CFR 112 Subpart C. Under this subpart, an SPCC plan would need to be developed as well as considerations given to drainage of secondary containment systems.

If supplemental remedial activities are required, vegetable oil will be stored on-site. The amount of vegetable oil is dependent on the number of wells required and the amount of vegetable oil determined per well. If the vegetable oil required exceeds 1,320 gallons, a SPCC plan (or addendum) will be required. The plan will address the design, operation, and maintenance procedures established to prevent spills from occurring, including countermeasures to control, contain, cleanup, and mitigate the effects of an oil spill.

7.4.2 Bulk Chemical Storage Plan

The vegetable oil and the pH buffer are not considered hazardous substances as defined in New York State Bulk Chemical Storage Regulations (6 New York Codes, Rules, and Regulations [NYCRR] Part 597) and therefore, the bulk chemical regulations do not apply. The chemicals will be stored under cover when not in use and in accordance to manufacturer's directions. Materials and equipment will be stored in Building 817 following coordination and approval with the GAFB Personnel.

7.4.3 Additional Hazardous Waste/Material

There may be other hazardous materials, which may be brought to the site as identified by the Hazard Communication Program and details of their properties can be found in the MSDS catalog maintained at Building 817.

7.4.4 Categorization of Levels of Spills and Discharges

The SM will assess all spills and discharges. Spills will be categorized by the source from which they came.

All petroleum spills (e.g., oil, gasoline, kerosene, etc.) that occur within New York State must be reported to the NYSDEC Spill Response (1-800-457-7362) within two hours of discovery, except spills which meet all of the following criteria:

- The quantity is known to be less than five gallons;
- The spill is contained and under the control of the spiller;
- The spill has not and will not reach the State's water or any land; and
- The spill is cleaned up within two hours of discovery.

A spill is considered to have not impacted land if it occurs on a paved surface such as asphalt or concrete. A spill in a dirt or gravel parking lot is considered to have impacted land and is reportable.

7.4.5 Control Procedures and Protective Measures

The spill prevention plan includes the diking/berming of all storage of contaminated liquids and/or fuel, the following of operating procedures to include spill prevention design, and the training of employees in spill prevention and control techniques.

In the event of accidental spillage, the following spill response measures will be implemented:

A. First aid will be administered to injured/contaminated persons. Any employee observing a spill will act immediately to remove and/or protect injured/contaminated persons from any life-threatening situation without endangering himself or herself. Emergency Services (911) will be contacted, if necessary and first aid and/or decontamination procedures will be implemented as appropriate.

B. Warn unsuspecting person/vehicle of the hazard. Personnel will act to prevent any unsuspecting persons from coming in contact with spilled material by alerting other nearby persons and by obtaining assistance of other personnel who are familiar with spill control cleanup techniques.

C. Stop the spill at the source, if possible. Without taking unnecessary risks, personnel will attempt to stop the spill at the source. This may involve activities such as uprighting a drum, closing a valve, or temporarily sealing a hole with a plug. Personnel will not expend more than a brief effort prior to notifying the project supervisor.

D. Notify the Site Manager. Utilizing available personal radio communications or other rapid communication procedures, the SM will be notified of the spill, including information on material spilled, quantity, personal injuries, and any immediate life-threatening hazards.

E. Spill assessment and primary containment. The SM will make a rapid assessment of the spill and direct primary containment measures. Depending upon the nature of the spill, primary containment measures may include, but are not limited to:

- Construction of a temporary containment berm utilizing on-site clay absorbent earth.
- The spill area shall be staked and isolated with the hazard tape to keep the general public away from the containment area.
- Digging a sump, installing a polyethylene liner, and diverting the spilled material to the sump.
- Placing drums under the leak to collect the spilling material before it flows over the ground.
- Transferring the material from its original container to another container.

F. Notify the Project Manager. The SM will notify the PM of the spill and steps taken to institute primary containment.

G. Spill Cleanup Procedures. The SM will develop a spill cleanup procedure taking into consideration associated hazards, quantity of spilled material, disposal methods and costs. The spill cleanup plan will be reviewed for acceptance by the PM.

H. Spill Cleanup. Personnel will clean up all spills in accordance with the spill cleanup plan developed by the project supervisor. The SM will supervise the spill cleanup. Most equipment, material, and supplies necessary to clean up a spill will be immediately available on-site. Such items may include, but are not limited to front-end loader, shovels, rakes, clay absorbent earth, polyethylene, personal safety equipment, steel drums, pumps, and miscellaneous hand tools.

I. Spill cleanup inspection. The PM and the SM jointly will inspect the spill site to determine that the spill has been adequately cleaned up.

7.5 WETLANDS MITIGATION PLAN

A wetlands mitigation plan is not required for the activities planned at the Building 817 site.

7.6 STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

Building 817 site activities are not expected to disturb more than an acre of soil as a result of the supplemental investigation and potential remedial actions. However, storm water will be managed in accordance with the NYSDEC state pollutant discharge elimination system general permit for construction activities. Best Management Procedures (BMP) will be used to control erosion and sediment run-off.

7.7 QUALITY CONTROL FIELD PLAN

A Quality Control Field Plan (QCFP) Addendum 3 will be prepared for Building 817 to identify quality control requirements that are to be implemented on a daily basis through the duration of the 2014 supplemental investigation. The QCFP will outline the three phase quality control and quality assurance approach that will be conducted during the implementation of the Building 817 supplemental investigation. The three phase approach ensures that a high level of quality remains a significant part of the injection activities. The QCFP will specifically identify the requirements for the quality control of day to day activities.

7.8 HEALTH AND SAFETY PLAN

Work will be done in accordance with the approved site APP (Parsons, 2006). The APP has been prepared in accordance with the Parsons SHARP and USACE Health and Safety Requirements Manual EM 385-1-1. The APP will be updated by appendix prior to the start of investigation activities and will address any conditions that may be encountered during the duration of work. This may include electrical hazards, chemical hazards, emergency contact information, routes to hospital, and use of personal protection equipment (PPE) for various site activities. Additional site hazards not listed here are described in the APP (bound separately).

7.9 PERFORMANCE EVALUATION

7.9.1 Performance Monitoring Work Plan and Long Term Monitoring

A Performance Monitoring Work Plan was approved and implemented for the Building 817 site (Final Performance Monitoring Work Plan, FPM, September, 2008). This plan established the monitoring well network, the sampling frequency, and the sampling parameters at each location in accordance with the requirements identified in the RDWP (EEEPC, 2007). Upon approval of the OPS Report for Building 817, the Performance Monitoring Plan may be modified to optimize the monitoring well network for long term monitoring (LTM). In addition, the Performance Monitoring Plan will be modified if any additional injection wells are installed as a result of the supplemental investigation. LTM will continue until the remediation goals have been reached.

The Performance Monitoring for the Building 817 site is documented in an annual performance monitoring report. The investigation and any remedial activities that are described in this work plan will be documented in the 2015 performance monitoring report.

7.9.2 Data Evaluation

To measure the effectiveness of the remediation effort at the Building 817 site and ensure that the remedial goals are being met, specific performance criteria have been developed. Following the monitoring and sampling efforts, a data review will be conducted, and performance reports will be prepared and submitted annually to the NYSDEC, USEPA, Air Force Real Property Agency (AFRPA), and USACE.

The performance reports will include a summary of site activities, evaluation of new sampling data, and comparison to previous data. Tables, graphs, figures, progress, recommendations, and evaluation of the current efforts as appropriate for each site will also be included in the reports. These annual evaluation reports will determine if any subsequent remediation phases or contingency phases will be required.

7.10 DEMOBILIZATION

The SM will coordinate the removal of all temporary facilities and injection equipment (if used). Construction equipment will be decontaminated and loaded onto vehicles for return to the vendor.

If any injection activities are required, the injections wells will remain in place and be secured with locking caps upon completion.

SECTION 8

FIELD ACTIVITY PROCEDURES

8.1 FIELD LOGBOOKS

All field activities will be carefully documented in field logbooks. Entries will be of sufficient detail that a complete daily record of significant events, observations, and measurements is obtained. The field books will provide a legal record of the activities conducted at the site. Accordingly:

- Field logbooks will be bound with consecutively numbered pages.
- Field logbooks will be controlled by the SM while fieldwork is in progress.
- Entries will be written with waterproof ink.
- Entries will be signed and dated at the conclusion of each day of fieldwork.
- Erroneous entries made while fieldwork is in progress will be corrected by the person that made the entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing the correction.
- Corrections made after departing the field will be made by the person who made the original entries. The correction will be made by drawing a line through the error, entering the correct information, and initialing and dating the time of the correction.
- The PM will control field logbooks when fieldwork is not in progress.

At a minimum, daily field logbook entries will include:

- Date and page number on each page or set of pages.
- Location of field activity.
- Date and time of entry.
- Names and titles of field team members.
- Names and titles of any site visitors and site contacts.
- Weather information: temperature, cloud coverage, precipitation, wind speed and direction.
- Purpose of field activity.
- A detailed description of the fieldwork conducted, observations and any measurements or readings. Where appropriate, a hand-drawn sketch map will also be included that identifies significant landmarks, features, sample locations, and utilities.
- When appropriate. boring numbers, well numbers, sample point ID or key activities should be identified on the top of each page to facilitate retrieval of data at a later date.

8.2 DAILY FIELD REPORTS

In addition to the field log books, daily field reports (DFRs) will be prepared by the SM or designee. These daily field reports will summarize the work activities as well as document daily follow up-inspections, and the identification, tracking and correction of any deficiencies. The DFRs will include photo documentation appropriate to the work performed, photocopies of the field log book, and include additional inspection forms completed as part of the work activities. A copy of the DFR is provided in the QCFP Addendum.

8.3 EQUIPMENT DECONTAMINATION

All decontamination of equipment will be performed in accordance with the approved OBGW Remedial Action Work Plan Section 10.2 Equipment Decontamination (Parsons, 2008).

8.4 INVESTIGATION-DERIVED WASTE (IDW)

All Investigation-derived Waste (IDW) will be handled in accordance with the approved OBGW Remedial Action Work Plan Section 10.3 Investigation-Derived Waste (IDW) (Parsons, 2008). Characterization and disposal paperwork will be submitted to USACE and the AF for approval. Bill of Lading forms and/or hazardous waste manifests for disposal will be signed by the AF.

8.5 SITE VERIFICATION CHECKLISTS

To ensure that all aspects of the investigation and remediation efforts have been accounted for, a site verification checklist has been prepared and is located at the end of Section 5.

SECTION 9

SITE RESTORATION

All areas that are disturbed by site activities will be returned to their pre-construction state.

All disturbed grades will be restored to maintain existing surface water drainage patterns. Any topsoil imported will meet the following requirements:

- Organic loam, well drained, homogenous;
- pH between 4.5 and 7;
- Free of any vegetation (especially invasive species), debris or other objectionable materials; and
- Free of stones or particles greater than 1-inch in diameter.

Approximately six-inches of topsoil will be placed on earth fill in any areas of soil disturbance and grass seed will be at a minimum of three pounds/1000 square feet. The grass seed will be a mixture of 30% annual ryegrass and 70% perennial ryegrass. The grass seed is to be spread by hand, hydro seed, or seed spread evenly on dry to moderately dry soil. Fertilizer (commercial grade 5-10-5 mixture) will be applied in accordance with manufacture written directions. Soil moisture will be maintained until young plants are well established.

All restored areas will be protected from traffic, erosion, and damage until surface is stabilized. The contractor will be responsible for repairing or replacing any restored areas damaged within six (6) months of project completion. The contractor will be responsible to cut and maintain any initial restoration grass growth in the first six weeks after restoration.

SECTION 10

ANTICIPATED PROJECT SCHEDULE

The anticipated project schedule is located in Appendix C. This schedule is consistent with the Task Order requirements specified by USACE. Significant project milestones directly associated with this RAWP Addendum are summarized as follows:

- Building 817 evaluation – July 2014
- Soil/groundwater geoprobe sampling with on-site laboratory analysis – July/august 2014
- Groundwater sampling event for new well cluster – August 2014
- Additional remedial actions, if necessary – Fall 2014

SECTION 11

REFERENCES

Air Force Real Property Agency, 2007, Final Proposed Plan On-Base Groundwater AOC at the Former Griffiss Air Force Base, Rome, New York, September 2007.

Air Force Real Property Agency, 2009, Final Record of Decision for the On-Bage Groundwater AOC (SD-52) at the Former Griffiss Air Force Base, Rome, New York, April 2009.

Ecology and Environment, Inc. (E+E), 1998, Final Report for the Supplemental Investigations of Areas of Concern at the Former Griffiss Air Force Base, Rome, New York, July 1998.

E&E, 2002. Final Bedrock Groundwater Study Technical Memorandum, Former Griffiss Air Force Base, Rome, New York, December 2002.

E&E Final Predesign Investigation Data Summary Report at Landfill 6, Building 817/WSA, Building 775/Pumphouse 3, and AOC 9, Former Griffiss Air Force Base, Rome, New York. February 2007.

Ecology and Environment Engineering, P.C. (EEEPC), 2008, Final Remedial Design Work Plan and 90% Design Drawings, Former Griffiss Air Force Base, Rome, New York, November 2007.

Ecology and Environment Engineering, P.C. (EEEPC), 2006c, Final Work Plan Predesign Investigations at Landfill 6, Building 817/WSA, Building 775, and AOC9, Former Griffiss Air Force Base, Rome, New York, September 2006.

Ecology and Environment Engineering, P.C. (EEEPC), Final Interim Remedial Action Report for Construction Complete and Remedy-In-Place, Former Griffiss Air Force Base, Rome, New York, August 2011.

FPM, Final Performance Monitoring Work Plan, On-Base Groundwater Remediation, Former Griffiss Air Force Base, Rome, New York, September, 2008.

FPM, Spring 2010 Annual Report Performance Monitoring On-Base Groundwater Remediation, Former Griffiss Air Force Base Rome, New York, January 2011.

FPM, Spring 2012 Annual Report Performance Monitoring On-Base Groundwater Remediation Former Griffiss Air Force Base Rome New York, November 2013.

FPM, Draft Spring 2012 Annual Report Performance Monitoring On-Base Groundwater Remediation, Former Griffiss Air Force Base Rome, New York, April 2013.

Law Engineering and Environmental Services, Inc., Draft Final Primary Report, Remedial Investigation at Griffiss Air Force Base, December 1996.

Parsons, 2006, Accident Prevention Plan, On-Base Groundwater Remediation, Former Griffiss Air Force Base, Rome, New York, July 2006.

Parsons, Quality Control Field Plan, On-Base Groundwater Remediation, Former Griffiss Air Force Base, Rome, New York, May 2008.

Parsons, Remedial Action Work Plan, On Base Groundwater Remediation, Former Griffiss Air Force Base, Rome, NY, Parsons, April 2008.

Parsons, Remedial Action Work Plan Addendum, On Base Groundwater Remediation, Former Griffiss Air Force Base, Rome, NY, Parsons, May 2010.

Parsons, Remedial Action Work Plan Addendum 2, Landfill 6 Organic Substrate Injection, Former Griffiss Air Force Base, Rome, NY, Parsons, August 2013.

USEPA, Technical Protocol for Evaluating Natural Attenuation of Chlorination Solvents in Groundwater, EPA/600/R/128, Washington D.C., September 1998.

APPENDIX A

INJECTION WELL INVENTORY FORM

Type or print all information. See reverse for instructions.

Form Approved OMB No. 2040-0042

INVENTORY OF INJECTION WELLS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF GROUND WATER AND DRINKING WATER

(This information is collected under the authority of the Safe Drinking Water A

1. DATE PREPARED *(Year, Month, Day)* — YR / MO / DY

2. FACILITY ID NUMBER

PAPERWORK REDUCTION ACT NOTICE

The public reporting burden for this collection of information is estimated at about 1 hour per year, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Chief, Information Policy Branch, 2136, U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460, and to the Office of Management and Budget, Paperwork Reduction Project, Washington, DC 20503.

3. TRANSACTION TYPE *(Please mark one of the following)*

- ☐ Deletion
- ☐ First Time Entry
- ☐ Entry Change
- ☐ Replacement

4. FACILITY NAME AND LOCATION

A. NAME *(last, first, and middle initial)*

B. STREET ADDRESS/ROUTE NUMBER

C. LATITUDE — DEG / MIN / SEC .

D. LONGITUDE — DEG / MIN / SEC .

E. TOWNSHIP/RANGE — TOWNSHIP / RANGE / SECT / 1/4 SECT

F. CITY/TOWN

G. STATE

H. ZIP CODE

I. NUMERIC COUNTY CODE

J. INDIAN LAND *(mark "x")* ☐ Yes ☐ No

5. LEGAL CONTACT:

A. TYPE *(mark "x")* ☐ Owner ☐ Operator

B. NAME *(last, first, and middle initial)*

C. PHONE *(area code and number)*

D. ORGANIZATION

E. STREET/P.O. BOX

F. CITY/TOWN

G. STATE

H. ZIP CODE

I. OWNERSHIP *(mark "x")*

- ☐ PRIVATE
- ☐ PUBLIC
- ☐ SPECIFY OTHER
- ☐ STATE
- ☐ FEDERAL

6. WELL INFORMATION:

A. CLASS AND TYPE		B. NUMBER OF WELLS		C. TOTAL NUMBER OF WELLS	D. WELL OPERATION STATUS				
		COMM	NON-COMM		UC	AC	TA	PA	AN

COMMENTS *(Optional):*

KEY:

DEG = Degree
MIN = Minute
SEC = Second

SECT = Section
1/4 SECT = Quarter Section

COMM = Commercial
NON-COMM = Non-Commercial

AC = Active
UC = Under Construction
TA = Temporarily Abandoned
PA = Permanently Abandoned and Approved by State
AN = Permanently Abandoned and not Approved by State

Instructions and Definitions

Section 1. Date Prepared: Enter date in order of year, month, and day.

Section 2. Facility ID Number: In the first two spaces, insert the appropriate U.S. Postal Service State Code. In the third space, insert one of the following one letter alphabetic identifiers:

D - DUNS Number,
G - GSA Number, or
S - State Facility Number.

In the remaining space, insert the appropriate nine digit DUNS, GSA, or State Facility Number. For example, A Federal facility (GSA - 123456789) located in Virginia would be entered as: VAG123456789.

Section 3. Transaction Type: Place an "x" in the applicable box. See below for further directions.

Deletion. Fill in the Facility ID Number.
First Time Entry. Fill in all the appropriate information.
Entry Change. Fill in the Facility ID Number and the information has changed.
Replacement.

Section 4. Facility Name and Location:

A. **Name.** Fill in the facility's official or legal name.
B. **Street Address.** Self Explanatory.
C. **Latitude.** Enter the facility's latitude (all latitudes assume North except for American Samoa).
D. **Longitude.** Enter the facility's longitude (all longitudes assume West except for Guam).
E. **Township/Range.** Fill in the complete township and range. The first 3 spaces are numerical and the fourth is a letter (N, S, E, W) specifying a compass direction. A township is North or South of the baseline, and a range is East or West of the principal meridian (e.g., 132N, 343W).
F. **City/Town.** Self Explanatory.
G. State. Insert the U.S. Postal Service State abbreviation.
H. **Zip Code.** Insert the five digit zip code plus any extension.
I. **Numeric Country Code.** Insert the numeric country code from the Federal Information Processing Standards Publication (FIPS Pub 6-1) June 15, 1970, U.S. Department of Commerce, National Bureau of Standards. For Alaska, use the Census Division Code developed by the U.S. Census Bureau.
J. **Indian Land.** Mark an "x" in the appropriate box (Yes or No) to indicate if the facility is located on Indian land.

Section 5. Legal Contact:

A. **Type.** Mark an "x" in the appropriate box to indicate the type of legal contact (Owner or Operator). For wells operated by lease, the operator is the legal contact.
B. **Name.** Self Explanatory.
C. **Phone.** Self Explanatory.
D. **Organization.** If the legal contact is an individual, give the name of the business organization to expedite mail distribution.
E. **Street/P.O. Box.** Self Explanatory.
F. **City/Town.** Self Explanatory.
G. **State.** Insert the U.S. Postal Service State abbreviation.
H. **Zip Code.** Insert the five digit zip code plus any extension.
I. **Ownership.** Place an "x" in the appropriate box to indicate ownership state.

Section 6. Well Information:

A. **Class and Type.** Fill in the Class and Type of injection wells located at the listed facility. User the most pertinent code (specified below) to accurately describe each type of injection well. For example, 2R for a Class II Enhanced Recovery Well, or 3M for a Class III Solution Mining Well, etc.
B. **Number of Commercial and Non-Commercial Wells.** Enter the total number of commercial and non-commercial wells for each Class/Type, as applicable.
C. **Total Number of Wells.** Enter the total number of injection wells for each specified Class/Type.
D. **Well Operation Status.** Enter the number of wells for each Class/Type under each operation status (see key on other side).

Injection Well Class and Type Codes

Class I Industrial, Municipal, and Radioactive Waste Disposal Wells used to inject waste below the lowermost Underground Source of Drinking Water (USDW).

Type 1I Non-Hazardous Industrial Disposal Well.
1M Non-Hazardous Municipal Disposal Well.
1H Hazardous Waste Disposal Well injecting below the lowermost USDW.
1R Radioactive Waste Disposal Well.
1X Other Class I Wells.

Class II Oil and Gas Production and Storage Related Injection Wells.

Type 2A Annular Disposal Well.
2D Produced Fluid Disposal Well.
2H Hydrocarbon Storage Well.
2R Enhanced Recovery Well.
2X Other Class II Wells.

Class III Special Process Injection Wells.

Type 3G *In Situ* Gassification Well.
3M Solution Mining Well.
3S Sulfur Mining Well by Frasch Process.
3T Geothermal Well.
3U Uranium Mining Well.
3X Other Class III Wells.

Class IV Wells that inject hazardous waste into/above USDWs.

Type 4H Hazardous Facility Injection Well.
4R Remediation Well at RCRA or CERCLA site.

Class V Any Underground Injection Well not included in Classes I through IV.

Type 5A Industrial Well.
5B Beneficial Use Well.
5C Fluid Return Well.
5D Sewage Treatment Effluent Well.
5E Cesspools (non-domestic).
5F Septic Systems (non-domestic).
5G Experimental Technology Well.
5H Drainage Well.
5I Mine Backfill Well.
5J Waste Discharge Well.

APPENDIX B

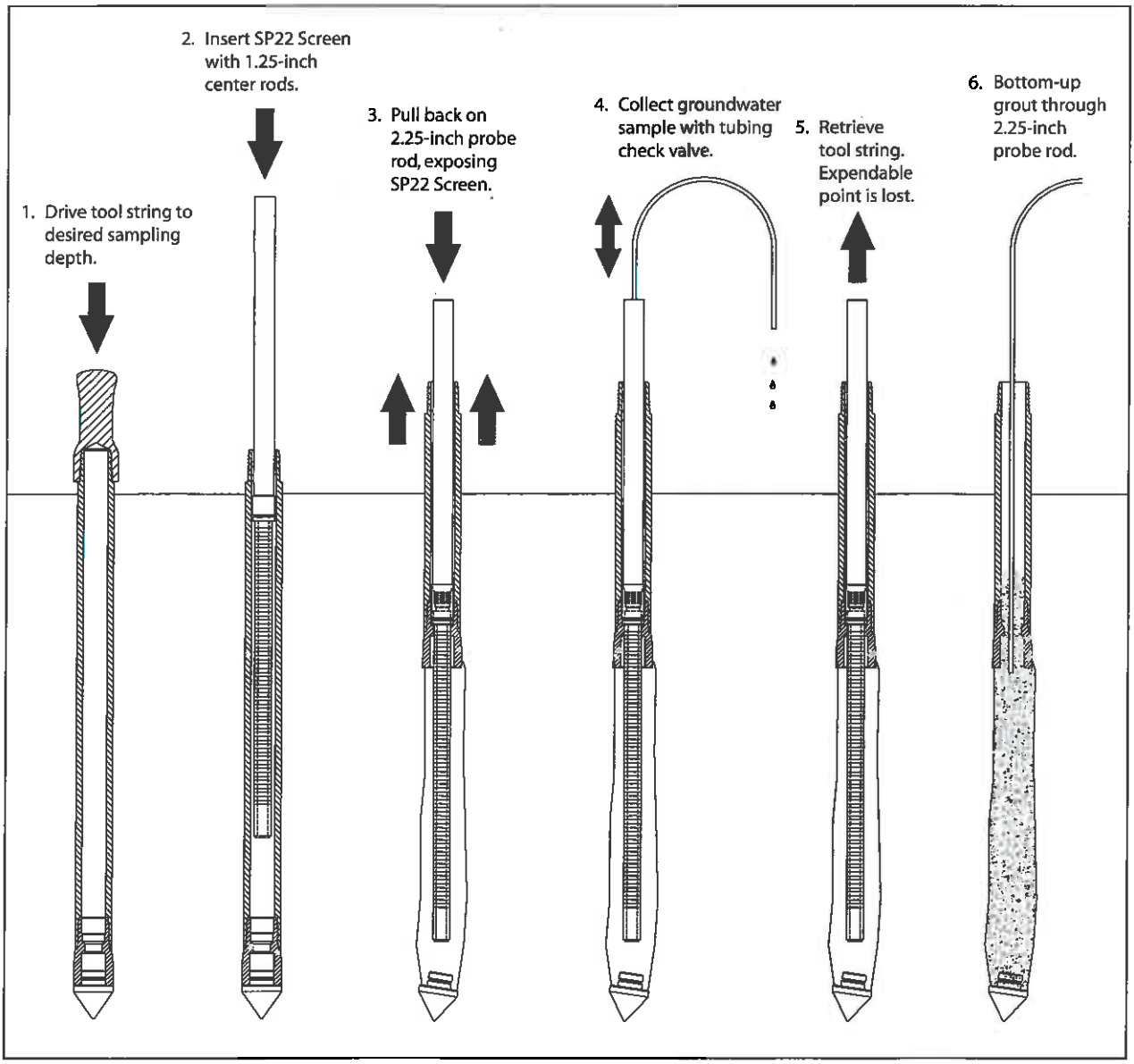
STANDARD OPERATING PROCEDURE FOR SP22 SAMPLER

GEOPROBE® SCREEN POINT 22 GROUNDWATER SAMPLER

STANDARD OPERATING PROCEDURE

Technical Bulletin No. MK3173

PREPARED: April 2010



OPERATION OF THE GEOPROBE® SCREEN POINT 22 GROUNDWATER SAMPLER

Geoprobe® and Geoprobe Systems®, Macro-Core® and Direct Image® are Registered Trademarks of Kejr, Inc., Salina, Kansas

Screen Point 22 Groundwater Sampler is manufactured under U.S. Patent 5,612,498

1.0 OBJECTIVE

The objective of this procedure is to deploy a stainless steel or PVC screen at depth, obtain a representative water sample from the screen interval, and grout the probe hole during abandonment. The Screen Point 22 Groundwater Sampler enables the operator to conduct abandonment grouting that meets American Society for Testing and Materials (ASTM) Method D 5299 requirements for decommissioning wells and borings for environmental activities (ASTM 1993).

2.0 BACKGROUND

2.1 Definitions

Geoprobe®: A brand name of high quality, hydraulically powered machines that utilize static force and percussion or rotation to advance sampling and logging tools into the subsurface. The Geoprobe® brand name refers to both machines and tools manufactured by Geoprobe Systems®, Salina, Kansas. Geoprobe® tools are used to perform activities such as soil core and soil gas sampling, groundwater sampling and monitoring, soil conductivity and contaminant logging, grouting, and materials injection.

Screen Point 22 (SP22) Groundwater Sampler: A direct push device consisting of a PVC or stainless steel screen that is lowered (post-run) to depth within a sealed string of steel probe rods and then deployed for the collection of representative groundwater samples. Upon deployment, up to 48 inches (1219 mm) of screen can be exposed to the formation. There is also an optional 12-inch screen that can be used. The Screen Point 22 Groundwater Sampler is designed for use with 2.25-inch probe rods and machines equipped with the more powerful GH60 and GH80 series hydraulic hammers. Operators with GH40 series hammers may choose to use this sampler in soils where driving is easier.

Rod Grip Pull System: An attachment mounted on the hydraulic hammer of a direct push machine which makes it possible to retract the tool string with probe rods or flexible tubing protruding from the top of the probe rods. The Rod Grip Pull System includes a pull block with rod grip jaws that are bolted directly to the machine. A removable handle assembly straddles the tool string while hooking onto the pull block to effectively grip the probe rods as the hammer is raised. A separate handle assembly is required for each probe rod diameter.

2.2 Discussion (Fig. 2.1)

In this procedure, 2.25-inch probe rods are advanced into the subsurface with a Geoprobe® subsurface machine (Fig. 2.1, Step 1). While the tool string is advanced to depth, O-ring seals at each rod joint, the expendable point holder, and the expendable drive point provide a watertight system. This eliminates the threat of formation fluids entering the screen before deployment and assures sample integrity.

Once the leading end of the 2.25-inch probe rods reaches the desired sampling interval, an SP22 screen is lowered to the bottom of the rods using a string of either 1.25-inch outside diameter (OD) light-weight center rods, 1.25-inch probe rods, or 0.75-inch schedule 40 flush-thread PVC riser (Fig. 2.1, Step 2). The 2.25-inch rods are then retracted while the SP22 screen is held in place with the 1.25-inch rods or PVC riser (Fig 2.1, Step 3). As the 2.25-inch tool string is retracted, the expendable point is released from the expendable point holder. The tool string and expendable point holder may be retracted the full length of the screen or as little as a few inches if a small sampling interval is desired.

The SP22 Sampler can also be used with the Geoprobe® DT22 system. (Fig. 2.2)

(continued on following page)

Expendable Drive Points
The SP22 system utilizes an SP22 Expendable Point Holder (33764) and standard 2.45-inch (62-mm) OD steel Expendable Drive Points for 2.25-inch probe rods (AT2015K). Extended Shank Expendable Drive Points (19442) are available for soft soil conditions where standard points may be advanced out of the point holder during percussion. A third option is to use a part number 43128 SP22 Expendable Point Holder along with 1.625-inch (41-mm) steel Expendable Drive Points (GW1555K). These smaller drive points are more economical to purchase and ship, but must not be used with GH80 Series Hydraulic Hammers as they may not stay seated during percussion.

Screens
Two types of screens have been developed for use in the Screen Point 22 Groundwater Sampler - a stainless steel screen with a standard slot size of 0.004 inches (0.10 mm) and a PVC screen with a standard slot size of 0.010 inches (0.25 mm). These screens are available in nominal 48- and 12-inch lengths. Effective screen lengths for the 48- and 12-inch PVC screens are 48 inches (1219 mm) and 12 inches (305 mm), while 48- and 12-inch stainless steel screens have effective screen lengths of 43 inches (1092 mm) and 14 inches (356 mm) respectively. Both types of screens are recovered with the tool string after sampling.

The SP22 PVC Screen Head Adapter (37871) provides yet another screen option for the SP22 sampler. Using this adapter, a section of slotted 0.75-inch Schedule 40 PVC pipe may be lowered through the 2.25-inch probe rods using a string of flush-threaded 0.75-inch Schedule 40 PVC Riser. An SP22 PVC Screen Plug (38968) is installed in the leading end of the slotted pipe prior to use. The slotted pipe may be cut and the screen plug installed to provide custom screen lengths .

An O-ring is located at the top of each stainless screen and on the screen adapters. When a screen is deployed, this O-ring maintains a seal between the top of the screen and the inner wall of the probe rods or expendable point holder as indicated in Figure 2.1. As a result, any liquid entering the tool string must first pass through the screen.

Screens are constructed such that equipment can be inserted into the screen cavity for sample collection as noted in the following section and illustrated in Figure 2.1, Step 4. This makes direct sampling possible from anywhere within the saturated zone.

The inner rod string and screen are generally removed prior to grouting through the 2.25-inch rod string as shown in Figure 2.1, Steps 5-6. However, a removable plug in the lower end of the screens allows for grouting through flexible tubing extending out the bottom of the screen as with the Geoprobe® SP15/16 Groundwater Samplers if desired.

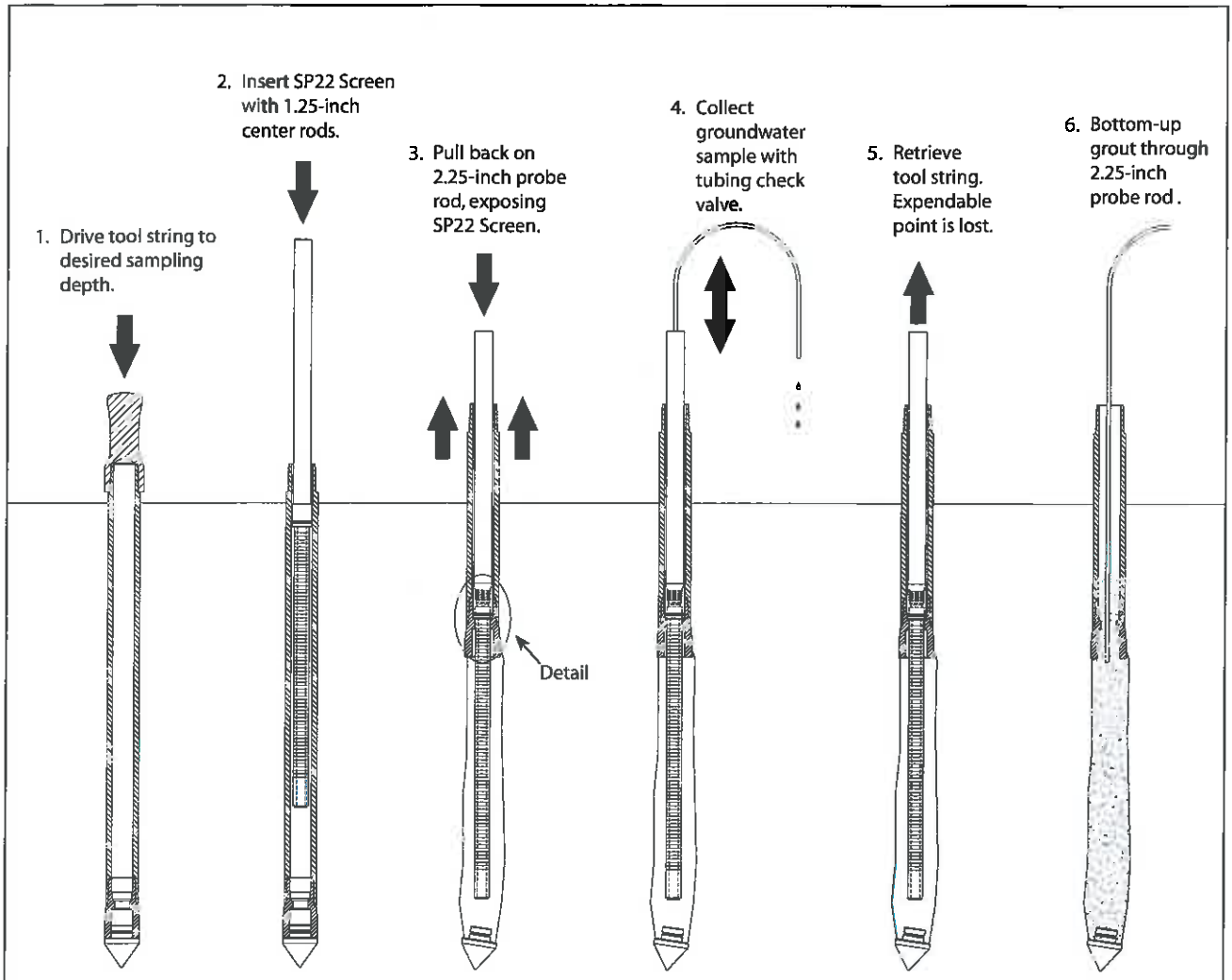
Sample Collection
Groundwater samples can be obtained from the SP22 screen in a number of ways. A common method utilizes 0.375-inch OD polyethylene (TB25L) or Teflon® (TB25T) tubing and a check valve assembly. The check valve (with check ball) is attached to one end of the tubing and inserted down the casing until it is immersed in groundwater. Water is then pumped through the tubing and to the ground surface by oscillating the tubing up and down.

An SP22 Check Valve Assembly (37893) is recommended if sampling through 1.25-inch light-weight center rods. The SP22 Check Valve Assembly is approximately 20 inches long to enable it to pass through the stepped diameters at each rod joint that may cause problems for other, shorter check valves.

An alternative means of collecting groundwater samples is to attach a peristaltic or vacuum pump to tubing that is inserted through the inner rods to within the SP22 screen. This method is limited in that water can be pumped to the surface from a maximum depth of approximately 26 feet (8 m). Another technique for groundwater sampling is to use a stainless steel Mini-Bailer Assembly (GW41). The mini-bailer is lowered down the inside of the casing below the water level where it fills with water and is then retrieved from the casing.

The latest option for collecting groundwater from the SP22 Sampler is to utilize a Geoprobe® MB470 Series Mechanical Bladder Pump (MBP)*. The MBP may be used to meet requirements of the low-flow sampling protocol (Puls and Barcelona 1996, ASTM 2003). Through participation in a U.S. EPA Environmental Technology Verification study, it was confirmed that the MB470 can provide representative samples (EPA 2003).

**The Mechanical Bladder Pump is manufactured under U.S. Patent No. 6,877,965 issued April 12, 2005.*



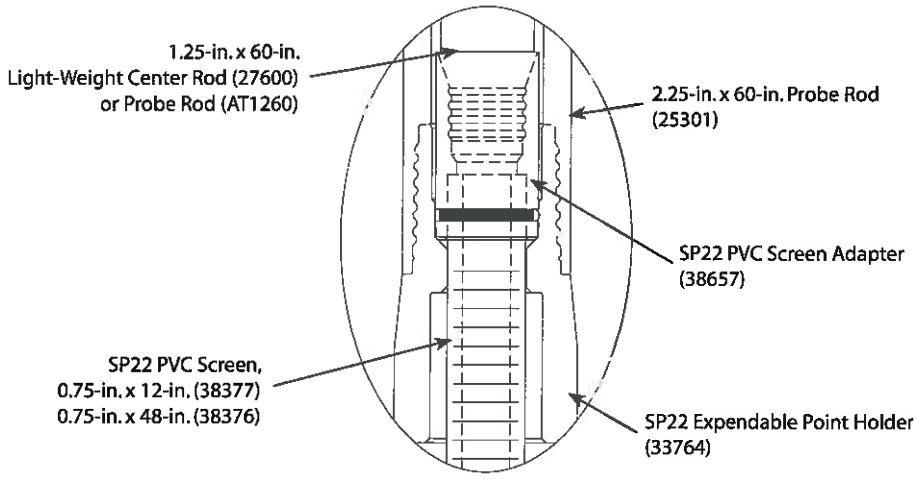


FIGURE 2.1
Screen Point 22 Groundwater Sampler - 0.75-inch PVC Screen Option

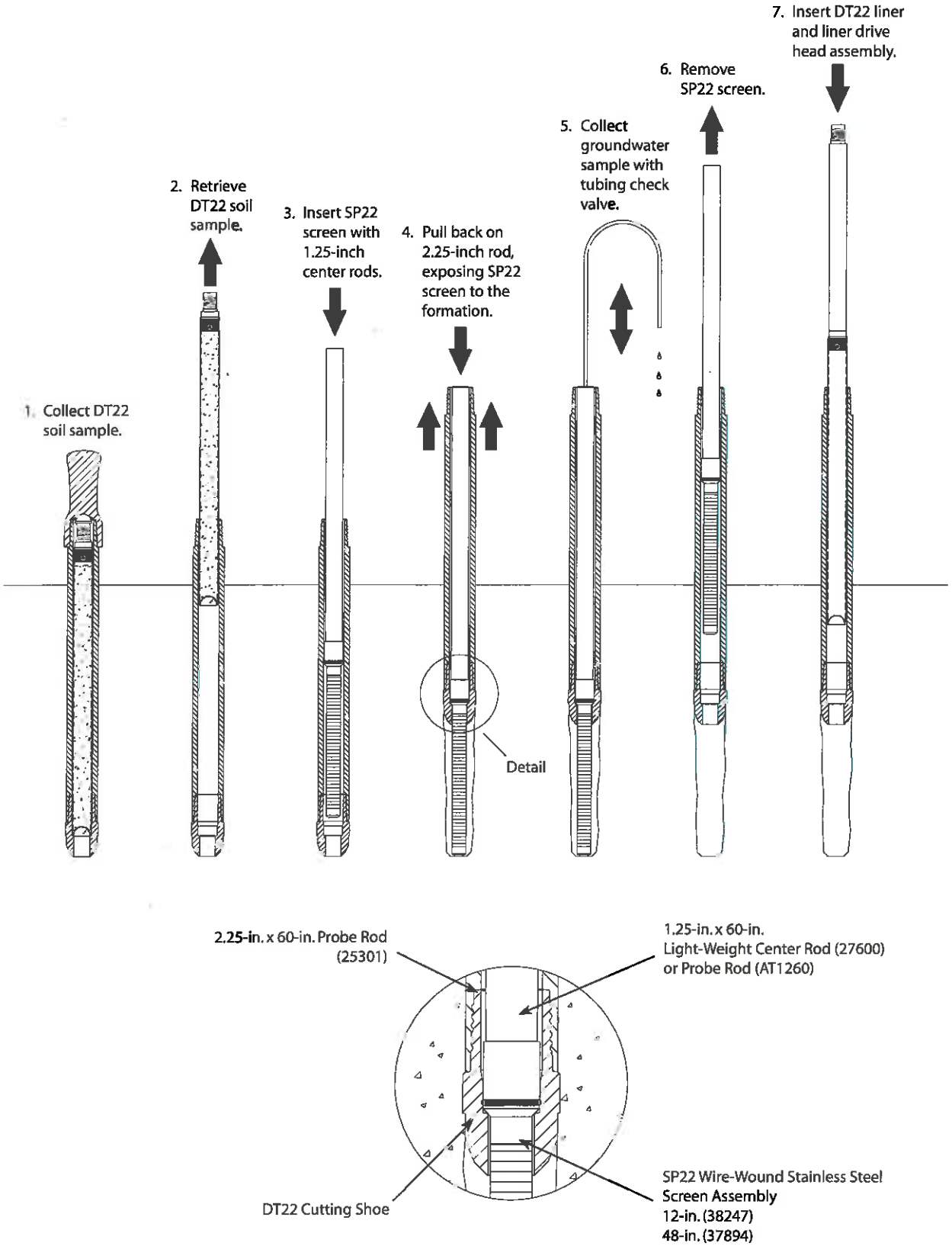


FIGURE 2.2
Screen Point 22 Groundwater Sampler Operation with DT22 Sampling System

3.0 TOOLS AND EQUIPMENT

The following tools and equipment can be used to successfully recover representative groundwater samples with the Geoprobe® Screen Point 22 Groundwater Sampler. Refer to Figures 3.1 and 3.2 for identification of the specified parts. Tools are listed below for the most common SP22 / 2.25-inch probe rod configurations. Additional rod sizes and accessories are available. Contact Geoprobe Systems® for information regarding tools and equipment options.

SP22 Sampler Parts	**Part Number**
SP22 Screen, Wire-Wound Stainless Steel, 4-Slot (48-in.)	37894
SP22 Screen, Wire-Wound Stainless Steel, 4-Slot (12-in.)	38247
Grout Plugs, PE (Pkg. of 25)	GW1552K
SP22 Screen, PVC, 10-Slot, 0.75-in. x 48-in	38376
SP22 Screen, PVC, 10-Slot, 0.75-in. x 48-inch, Kit (includes 2 each of 38376 and 38429)	*38664*
SP22 Screen, PVC, 10-Slot, 0.75-in. x 12-in	38377
SP22 Screen, PVC, 10-Slot 0.75-in. x 12-in., Kit (includes 2 each of 38377 and 38429)	*38667*
SP22 PVC Screen Plug	38968
SP22 PVC Screen Plug Kit (includes 10 of 38968)	*38530*
SP22 PVC Screen Adapter, 0.75-in. PVC x 1.25-in. Probe Rod Box	38657
SP22 PVC Screen Head Adapter, 0.75-in. (for flush-threaded 0.75-in. Schedule 40 PVC)	37871
SP22 O-ring Kit (Pkg. of 10 O-rings for SP22 PVC screen adapters and stainless steel screens)	37853
O-rings, 0.75-in. PVC Riser (Pkg. of 25)	GW4401R
SP22 Expendable Point Holder, 2.25-in. Probe Rods, AT2045K and 19442 Points	33764
SP22 Expendable Point Holder, 2.25-in. Probe Rods, GW1555 Points*	43128

Outer Casing (2.125-inch Probe Rods) and Inner Rod String	**Part Number**
Probe Rod, 2.25-in. x 60-in.	25301
Expendable Drive Points, Steel, 2.45-in. OD (Pkg. of 25)	AT2015K
Expendable Drive Points, Steel, 2.45-in. OD, extended shank	19442
Expendable Points, steel, 1.625-in. OD (Pkg. of 25)*	GW1555K
Drive Cap, 2.25-in. Probe Rods, Threadless, (for GH60 and GH80 Series Hammers)	31530
O-Rings, 2.25-in. Probe Rods (Pkg. of 25)	AT2100R
Rod Grip Handle, 2.25-in. Probe Rods, (for GH60 and GH80 Series Hammers)	29385
Light-Weight Center Rod, 1.25-in. x 60-in.	27600
Probe Rod, 1.25-in. x 60-in.	AT1260
O-ring, 1.25-in. rods (Pkg. of 25)	AT1250R
Rod Grip Handle, 1.25/1.5-in. Rods, (for GH60 and GH80 Series Hammers)	15554
PVC Riser, 0.75-in. Schedule 40 x 60-inch	11747
PVC Pipe, 0.75-in. Schedule 40 x 60-inch, 10-Slot	17474

Grout Accessories	**Part Number**
High-Pressure Nylon Tubing, 0.375-in. OD / 0.25-in. ID, 100-ft. (30 m)	11633
Grout Machine, Auxiliary-Powered	GS2200
Grout System Accessories Package, 2.25-in. rods	GS1015

Groundwater Purging and Sampling Accessories	**Part Number**
Polyethylene Tubing, 0.375-in. OD, 500 ft	TB25L
Check Valve Assembly, 0.375-in. OD Tubing x 20 in. Long	37893
Water Level Meter, 0.438-in. OD Probe, 100 ft. cable	GW2000
Mechanical Bladder Pump**	MB470
Mini Bailer Assembly, Stainless Steel	GW41

* Not for use with GH80 Series Hydraulic Hammers

** Refer to the Standard Operating Procedure (SOP) for the Mechanical Bladder Pump (Technical Bulletin No. MK3013) for additional tooling needs.

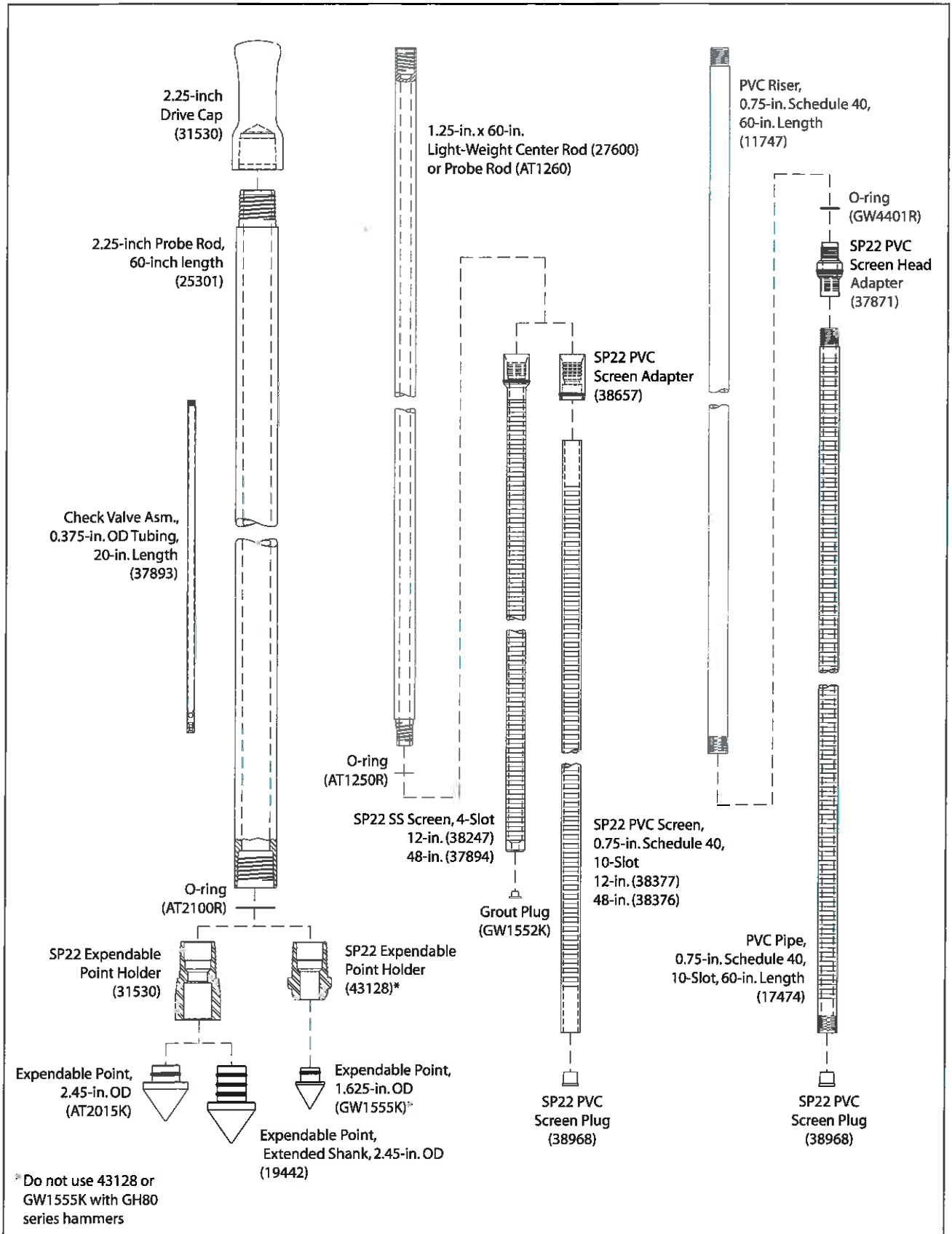


FIGURE 3.1
SP22 Sampler Parts

4.0 OPERATION

4.1 Basic Operation

The SP22 Sampler utilizes a stainless steel or PVC screen which is lowered (post-run) through an alloy steel 2.25-inch OD probe rod tool string. An expendable drive point is placed in an expendable point holder on the leading 2.25-inch probe rod prior to advancement (Fig. 4.1). This expendable point is removed and stays in the subsurface as the rods are pulled back to exposes the SP22 screen. O-rings on the probe rods , the expendable point holder, and the expendable drive point provide a watertight tool string which keeps contaminants out of the system as the 2.25-inch rods are driven to depth in preparation for installation of the SP22 screen.

Once the sampling interval is reached with the 2.25-inch probe rods, the stainless steel or PVC screen is lowered through the rods using 1.25-inch probe rods, 1.25-inch light-weight center rods, or 0.75-inch PVC riser pipe. The 2.25-inch tool string is then retracted while the screen is held in place with the inner rods or riser. The system is now ready for groundwater sampling. When sampling is complete, the inner rods and screen are removed for grouting during retrieval or the 2.25-inch rods. Alternatively, a removable plug is located in the bottom of the screens to allow grouting directly through the inner tool string with high-pressure tubing during retrieval.

4.2 Decontamination

In order to collect representative groundwater samples, all sampler parts must be thoroughly cleaned before and after each use. Scrub all metal parts using a stiff brush and a nonphosphate soap solution. Steam cleaning may be substituted for hand-washing if available. Rinse with distilled water and allow to air-dry before assembly.

4.3 Lead Rod Assembly (Fig. 4.1)

1. Place an O-ring on the expendable point holder.
2. Thread expendable point holder into the 2.25-inch probe rod.
3. Place an O-ring on a steel expendable drive point.
4. Firmly seat the expendable point in the expendable point holder.
5. Place 2.25-inch Drive Cap (31530) on the top of the 2.25-inch probe rod. The lead rod assembly is now ready to be driven to depth.

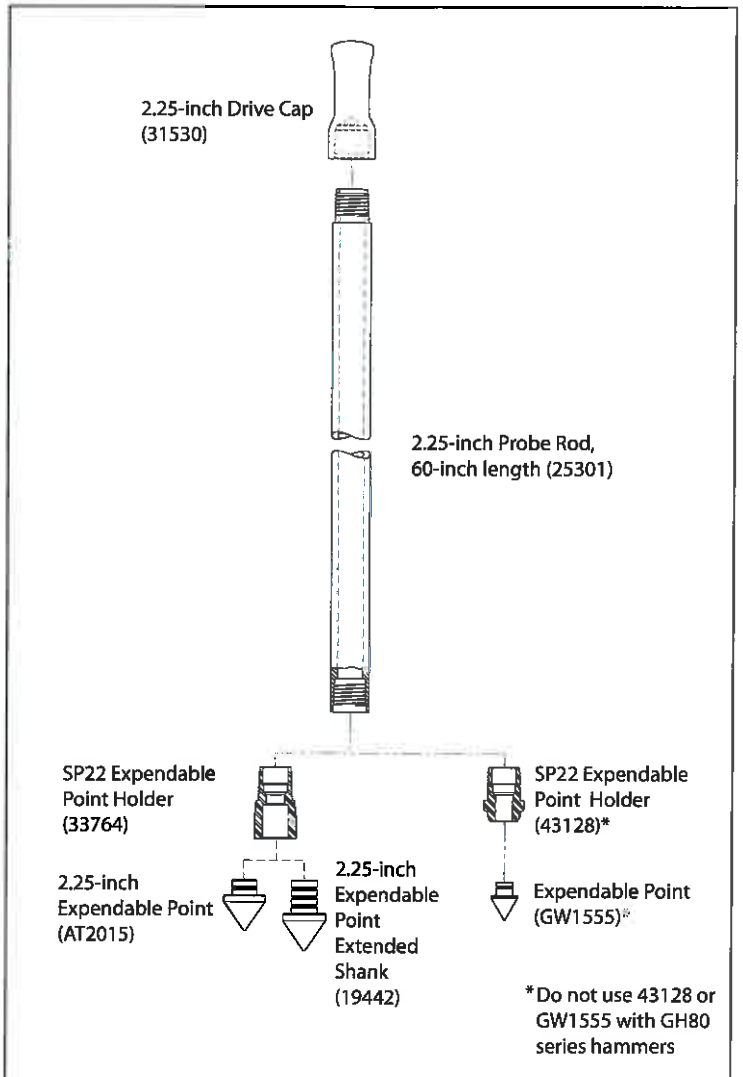


FIGURE 4.1
Lead Rod Assembly for the SP22 Groundwater Sampler

4.4 Advancing the Tool String (Fig. 4.2, step 1)

To provide adequate room for screen deployment with the Rod Grip Pull System, the probe derrick should be extended a little over halfway out of the carrier vehicle when positioning for operation.

1. Drive first 2.25-inch probe rod (as assembled in section 4.3).

2. Advance the tool string at a slow speed for the first few feet to ensure that the string is aligned properly.

3. Completely raise the hammer assembly. Remove the drive cap and place an O-ring in the top groove of the driven probe rod. Distilled water may be used to lubricate the O-ring if needed.

   Add a probe rod (length to be determined by operator) and reattach the drive cap to the rod string. Drive the tool string the entire length of the new rod.

4. Repeat Step 3 until the desired sampling interval is reached. Approximately 12 inches (305 mm) of the last probe rod must extend above the ground surface to allow attachment of the puller assembly. A 12-inch (305 mm) rod may be added if the tool string is over-driven.

5. Remove the drive cap and retract the probe derrick away from the tool string.

4.5 Screen Deployment (Fig 4.2, step 2 - 4)

1. Attach an SP22 stainless steel or PVC screen to a 1.25-inch probe rod, 1.25-inch light-weight center rod, or 0.75-inch flush-thread PVC riser using an SP22 PVC Screen Adapter (38657) or SP22 PVC Screen Head Adapter (37871) as shown in Figure 3.1. Note that the 38657 screen adapter is connected to the SP22 PVC screen using the setscrews provided with the adapter.

and lower it into the driven casing.

2. Lower the screen into the 2.25-inch probe rod casing and add rods or riser until the screen head contacts the bottom of the tool string.

3. Ensure that at least 48 inches (1219 mm) of rods or riser protrudes from the top 2.25-inch probe rod.

4. Maneuver the probe assembly into position for pulling.

5. Raise (pull) the outer 2.25-inch tool string while physically holding the screen in place with the inner 1.25-inch rods or 0.75-inch riser. A slight knock with the inner tool string will help to dislodge the expendable point and start the screen moving inside the probe rod.

   Raise the hammer and outer tool string to expose the desired length of screen. The inner rods will begin raising with the outer rods when the screen adapter contacts the necked portion of the expendable point holder or DT22 Cutting Shoe. Use care when deploying a PVC screen so as not to break the screen when it contacts the expendable point.

6. Remove the rod grip handle, lower the hammer assembly, and retract the probe derrick. Remove the top 2.25-inch probe rod.

7. Groundwater samples can now be collected with a mini-bailer, peristaltic or vacuum pump, tubing bottom check valve assembly, bladder pump, or other acceptable small diameter sampling device.

   When inserting tubing or a bladder pump down the rod string, ensure that it enters the screen interval. The leading end of the tubing or bladder pump will sometimes catch at the screen head giving the illusion that the bottom of the screen has been reached. An up-and-down motion combined with rotation helps move the tubing or bladder pump past the lip and into the screen.

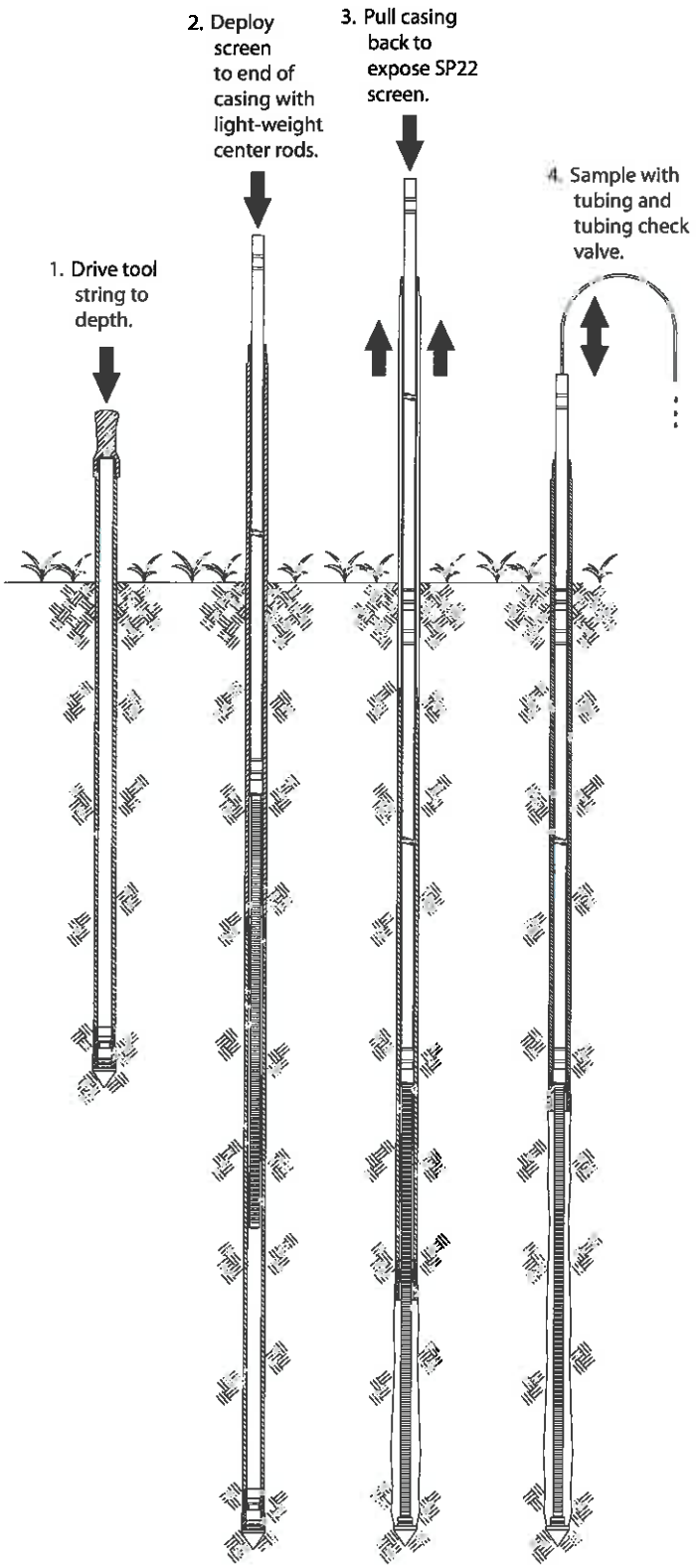


FIGURE 4.2
Screen Deployment for SP22 Sampler

4.6 Abandonment Grouting for SP22 Screens

The SP22 Sampler can meet ASTM D 5299 requirements for abandoning environmental wells or borings when grouting is conducted properly. A removable grout plug makes it possible to deploy tubing through the bottom of the SP22 screens, but the easiest method is to remove the inner string of rods; including the SP22 screen. A Grout Machine is then used to pump grout into the open probe hole as the outer casing is withdrawn. The following procedure is presented as an example only and should be modified to satisfy local abandonment grouting regulations. (Figure 4.3)

1. Maneuver the probe assembly into position for pulling.

2. High-Pressure Nylon Tubing (11633) is inserted down through the probe rods through the bottom of the expendable point holder (Fig. 4.3).

   Note: *All probe rods remain strung on the tubing as the tool string is pulled. Provide extra tubing length to allow sufficient room to lay the rods on the ground as they are removed. An additional 20 feet is generally enough.*

3. Operate the grout pump while pulling the first rod with the rod grip pull system. Coordinate pumping and pulling rates so that grout fills the void left by the sampler. After pulling the first rod, release the rod grip handle, fully lower the hammer, and regrip the tool string. Unthread the top probe and slide it over the tubing placing it on the ground near the end of the tubing.

4. Repeat Step 5 until the tool string is retrieved. Do not bend or kink the tubing when pulling and laying out the probe rods. Sharp bends create weak spots in the tubing which may burst when pumping grout. Remember to operate the grout pump only when pulling the rod string. The probe hole is thus filled with grout from the bottom up as the rods are extracted.

5. Promptly clean all probe rods and sampler parts before the grout sets up and clogs the equipment.

4.7 Retrieving the Screen Point 22 Sampler

If grouting is not required, the Screen Point 22 Sampler can be retrieved by pulling the probe rods as with most other Geoprobe® applications. The Rod Grip Pull System should be used for this process as it allows the operator to remove rods without completely releasing the tool string. This avoids having the probe rods fall back downhole when released during the pulling procedure. A standard Pull Cap (33622) may still be used if preferred. Refer to the Owner's Manual for your Geoprobe® direct push machine for specific instructions on pulling the tool string.

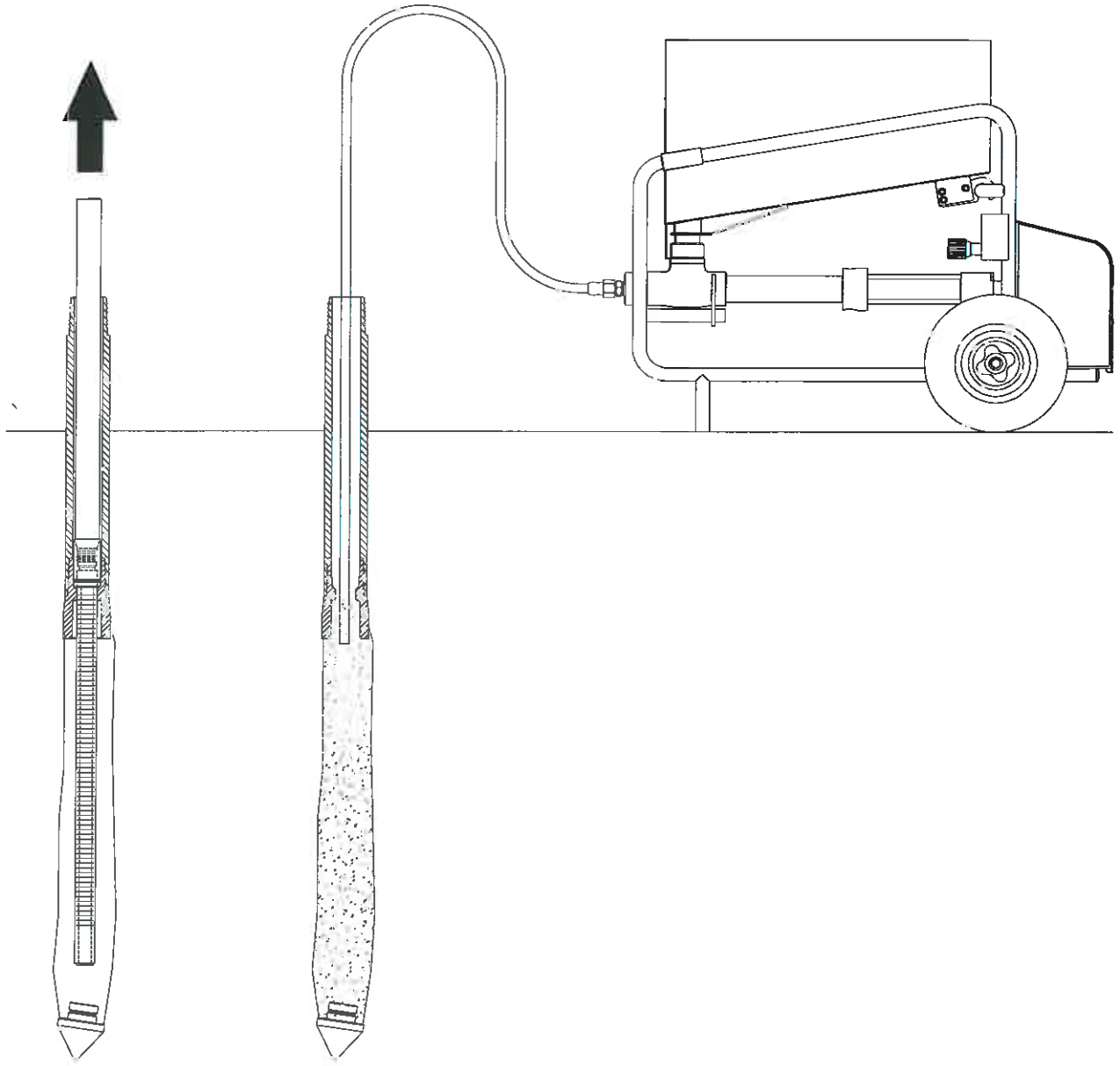


FIGURE 4.3
Abandonment Grouting for the SP22 Sampler

5.0 REFERENCES

American Society of Testing and Materials (ASTM), 2003. D6771-02 Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations. ASTM, West Conshocken, PA. (www.astm.org)

American Society of Testing and Materials (ASTM), 1993. ASTM 5299 *Standard Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.* ASTM West Conshohocken, PA. (www.astm.org)

Geoprobe Systems®, 2003, *Tools Catalog, V.6.*

Geoprobe Systems®, 2006, *Model MB470 Mechanical Bladder Pump Standard Operating Procedure (SOP), Technical Bulletin No. MK3013.*

Puls, Robert W., and Michael J. Barcelona, 1996. Ground Water Issue: Low-Flow (Minimal Drawdown) Ground Water Sampling Procedures. EPA/540/S-95/504. April.

U.S. Environmental Protection Agency (EPA), 2003. Environmental Technology Verification Report: Geoprobe Inc., Mechanical Bladder Pump Model MB470. Office of Research and Development, Washington, D.C. EPA/600R-03/086. August.

Equipment and tool specifications, including weights, dimensions, materials, and operating specifications included in this brochure are subject to change without notice. Where specifications are critical to your application, please consult Geoprobe Systems®.

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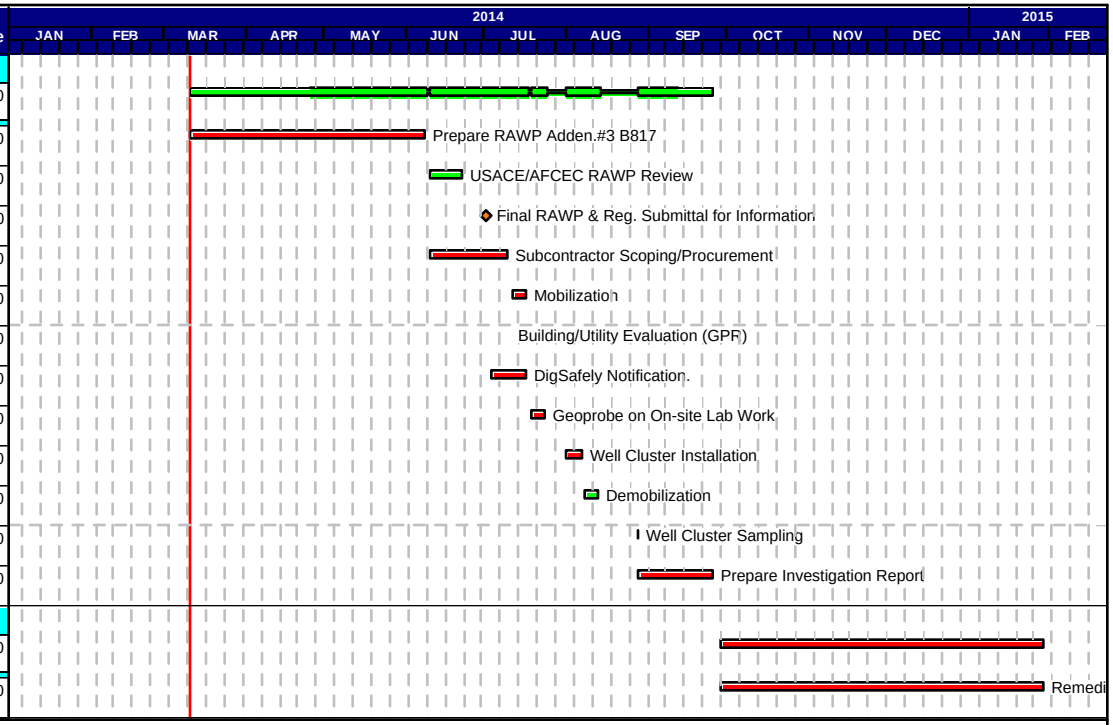
APPENDIX C

PRELIMINARY SCHEDULE

Act ID	Description	Orig Dur	Rem Dur	Early Start	Early Finish	Percent Complete
Investigation Activites						
		143d	143d	11MAR14 A	26SEP14	0
1000	Prepare RAWP Adden.#3 B817	40d	65d	11MAR14 A	09JUN14	0
1010	USACE/AFCEC RAWP Review	10d	10d	10JUN14	23JUN14	0
1020	Final RAWP & Reg. Submittal for Information	0	0	01JUL14		0
1030	Subcontractor Scoping/Procurement	22d	22d	10JUN14	10JUL14	0
1050	Mobilization	5d	5d	11JUL14 *	17JUL14	0
1060	Building/Utility Evaluation (GPR)	1d	1d	11JUL14	11JUL14	0
1070	DigSafely Notification.	10d	10d	03JUL14	17JUL14	0
1080	Geoprobe on On-site Lab Work	5d	5d	18JUL14	24JUL14	0
1090	Well Cluster Installation	5d	5d	01AUG14	07AUG14	0
1095	Demobilization	5d	5d	08AUG14	14AUG14	0
1100	Well Cluster Sampling	2d	2d	28AUG14	29AUG14	0
1110	Prepare Investigation Report	22d	22d	28AUG14	26SEP14	0
		88d	88d	29SEP14	30JAN15	0
2000	Remediation Activities TBD	88d	88d	29SEP14	30JAN15	0



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Finish date	30JAN15
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Run date	09JUN14
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Parsons
B817 Supp. Invest. Prelim Schedule

Early bar
Progress bar
Critical bar
Summary bar
Start milestone point
Finish milestone point