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APPENDICES

1.0 INTRODUCTION

Versar, Inc. (Versar) has been contracted by the United States (U.S.) Army Fort Monmouth (Fort Monmouth), Directorate of Public Works (DPW), Fort Monmouth, New Jersey to prepare UST closure reports at sixty (60) sites at Fort Monmouth, New Jersey. Sixteen (16) of the sites, 600A, 600B, 611, 615, 618, 619, 621, 634, 638, 639-2, 640, 641, 644, 664, 666, and 686, are in the vicinity of Building 600 on the Main Post West Area. These sites cover a relatively small area surrounding Building 600, which has a high level of security. This workplan combines the investigations of the 16 sites into one investigation in order to reduce the amount of disturbance to a sensitive area and streamline the reporting process. This workplan has been prepared in partial fulfillment of Contract No. DACA 51-00-D-004, Delivery Order No. 27 for submittal to the New Jersey Department of Environmental Protection (NJDEP) for review and approval.

1.1 Background

Fort Monmouth is located in the central-eastern portion of New Jersey in Monmouth County, approximately 45 miles south of New York City and 70 miles northeast of Philadelphia. In addition to the Main Post, the installation includes two subposts, the Charles Wood Area and the Evans Area. The Main Post (Figure 1) encompasses approximately 630 acres and is generally bounded by State Highway 35, Parkers Creek, Lafetra Brook, the New Jersey Transit Railroad, and a residential area to the south. The post was established during WW I, in 1918, as an Army Signal Corps training center. The Main Post currently provides supporting administrative, training, and housing functions, as well as many of the community facilities for Fort Monmouth. The primary mission of Fort Monmouth is to provide command, administrative, and logistical support for Headquarters, U.S. Army Communications and Electronics Command (CECOM). CECOM is a major subordinate command of the U.S. Army Material Command (AMC) and is the host tenant at Fort Monmouth. The sites in the vicinity of Building 600 encompass an area of approximately 20 acres. Figure 2 shows the layout of the area.

1.2 Objective

The objective of this workplan is to summarize the work that has already been performed in the 600 Area and present a plan to complete the remaining work. The purpose of the remaining work is to close the remaining 16 UST sites in the 600 Area.

This workplan includes:

- The presentation and summary of the results of soil samples collected from UST sites in the 600 Area;

- The presentation and summary of the results of the groundwater collected from existing monitoring wells in the 600 Area;
- The proposed plan for Geoprobe soil sampling at UST sites which have not been sampled or which need additional sampling;
- The proposed plan for Geoprobe groundwater sampling across the 600 Area; and
- The proposed plan for preparation of one Site Investigation Report to document findings and seek closure at all 16 UST sites in the 600 Area.

2.0 SITE SETTING

2.1 Site Description

Figure 2 illustrates the 600 Area and the UST sites within the area. Each of the 16 UST sites is associated with a former building in the area. The approximate location of each of the buildings and its associated USTs was determined from historical photographs and figures. The USTs each contained No. 2 Fuel Oil for heating the former buildings. The tanks were removed throughout 1994.

The 600 Area is bordered by Saltzman Avenue to the south, Sherrill Avenue to the north, Messenger Avenue to the west, and Irwin Avenue to the east. The area covers approximately 20 acres. The site contains a large military office building with a high level of security that is surrounded by well-groomed landscaping and fencing on three sides. Beyond the immediate Building 600 grounds there are paved parking lots, several small support buildings, and secondary roadways. Topography at the site is relatively flat but is centered over a topographic high, sloping gradually to the northwest.

2.2 Regional Geology

As reported in the RAWA (GES, 1999), Monmouth County lies within the New Jersey Section of the Atlantic Coastal Plain Physiographic province. The site is located in what may be referred to as the Outer Coastal Plain subprovince, or the Outer Lowlands. In general, New Jersey Coastal Plain formations consist of a seaward-dipping wedge of unconsolidated deposits of clay, silt, and gravel. The mineralogy ranges from quartz to glauconite. The New Jersey Coastal Plain formations record several major transgressive/regressive cycles and contain units, which are generally thicker to the southeast and reflect a deeper water environment. Over twenty (20) regional geologic units are present within the sediments of the Coastal Plain. Regressive, upward coarsening deposits are usually aquifers (e.g., Englishtown and Kirkwood Formations, and the Cohansey Sand), while the transgressive deposits act as confining units (e.g., the

Merchantville, Marshaltown, and Navensink Formations). The individual thickness for these units varies greatly (i.e., from several ft. to several hundred ft.). The lithologies observed in borings installed within the Main Post area have reportedly consisted of fine-to-medium grained sands, with occasional lenses or lamentations of gravel silt and/or clay.

Based on past drilling, the depth to bedrock is greater than twenty (20) ft. A generalized stratigraphic sequence at the site (progressing upward) includes a lower (Sandy Hook) and upper (Shrewsbury) member of the Red Bank sand. The lower member is a dark gray to black, medium-to-fine grained sand with abundant clay, mica, and glauconite. The upper is a yellowish-gray to reddish brown clayey, medium-to-coarse grained sand that contains abundant rock fragments, minor mica, and glauconite.

2.3 Hydrogeology

Groundwater has been encountered at depths between two (2) and fourteen (14) ft. below ground surface (bgs) in the 600 area. During soil sampling in the area, unsaturated soils were reportedly encountered up to twelve (12) ft. bgs. Seasonal water table fluctuations are expected to be limited to two (2) to three (3) ft. Fluctuations may also be due to tidal influence (based on proximity to the Atlantic Ocean, rivers, tributaries), the nature of fill material, presence of clay and silt lenses in the overburden, and local recharge areas (streams and lakes). The interbedded sequences of sand and clay transmit water under both confined and unconfined conditions. The intermittent clay strata serve as semi-confining beds, where present. The 600 area is located on a topographic mound, generally causing the groundwater to flow away from Building 600 in nearly every direction.

3.0 SITE CHARACTERIZATION

Soil samples were collected at some of the former UST sites when the tanks were removed. Illustrations of each site and analytical data are presented in Appendix B at the end of this document. The existing soil sampling data is also summarized in Table 3-1. Table 3-2 summarizes groundwater sample data collected from wells in the area.

3.1 Previous Soil Sampling Summary

Soil samples were collected and analyzed for total petroleum hydrocarbon compounds (TPHC) at six of the UST sites in the 600 area, 600B, 611, 618, 619, 621, and 686. Results of the soil sample analyses are summarized in Table 3-1. This section describes the results in detail.

Six soil samples were collected from the excavation walls at 600B on November 10, 1994. Concentrations of TPH in the six samples ranged from 1,020 mg/kg to 13,000 mg/kg, each exceeding the cleanup criteria of 1,000 mg/kg.

Two post-excavation samples collected during the August 8, 1994 removal of the UST at Building 611 contained 27.6 and 2,450 mg/kg TPH. Geoprobe samples collected on September 6, 1994 contained up to 2,830 mg/kg TPH. Additional excavating was conducted on December 16, 1994. Samples collected that day contained either no TPH or concentrations well below the cleanup criteria.

Soil samples collected on September 6, 1994 from 6 locations surrounding the former UST excavation at Building 618 contained concentrations of TPH ranging from 1,000 to 5,360 mg/kg. Additional soil removal was conducted on September 22, 1994. Soil samples were collected in six locations correlating to the original six sample locations. Two of soil samples still contained concentrations of TPH above the cleanup criteria. On September 27, 1994, following additional soil removal, these two locations were sampled a third time. Additional remediation and sampling was conducted on January 4, 1995 at sample location 618-A. That soil sample contained only 35 mg/kg TPH.

Six soil samples were collected August 25, 1994 from the extent of the UST excavation at former building 619. Additional soil removal was conducted in three areas of the excavation where samples exceeded the cleanup criteria. Results of the second round of soil sampling conducted September 9, 1994 ranged from 45.1 to 543 mg/kg, which is below the cleanup criteria.

Soil samples were collected from the walls of the UST excavation at former building 621 on August 26, 1994. The highest concentration of TPH detected was 174.3 mg/kg. Most of the samples did not contain detectable concentrations of TPH.

On January 18, 1995 six soil samples were collected from the area of the former UST at the former building 686. The concentrations of TPH detected in these samples ranged from 79.6 to 14,700 mg/kg. Following additional excavating activities on January 27, 1994, soil samples were collected from four locations that exceeded the cleanup criteria. The concentration of TPH was still above cleanup criteria in one location.

3.2 Existing Groundwater Data in the 600 Area

Six monitoring wells in the vicinity of the 600 area were installed in association with unrelated investigations. Three of the wells, M5-MW15, M5-MW16, and M5-MW25, are located in the northwest corner of the 600 area. Three wells, 699-MW2, 699-MW15, and 616-MW1 are located in the southeast corner of the area. Quarterly samples have

been collected from these wells since the time of their installation. Samples were analyzed for volatile and semi-volatile compounds. Because groundwater generally flows away from the center of the 600 area, analytical data collected from these wells located at the edge of the area may be indicative of any impact the former USTs may have made on groundwater quality in the area. The groundwater data is summarized in Table 3-2. This section discusses the data in detail.

Quarterly samples collected from 616-MW1 between April 1997 and September 2000 contained small concentrations of xylenes below NJDEP groundwater quality criteria. No other volatile or semi-volatile compounds were detected at that location. Two of the quarterly samples collected from 699-MW15 between November 1995 and September 2000 contained concentrations of methylene chloride below the NJDEP groundwater quality criteria. No other compounds were detected in groundwater collected from 699-MW15. The first sample collected from 699-MW2 in May 1995 contained several compounds including benzene at 3.7 ug/L, which is above the criteria of 0.2 ug/L. Benzene was not detected in the subsequent quarterly samples at 699-MW2. Acetone and total xylenes were each detected once, at low levels, during subsequent rounds.

Quarterly samples collected from M5-MW25 between April 1999 and August 2000 contained no volatile or semi-volatile compounds except one, chloroform, which was detected during one round at a concentration below the groundwater quality criteria concentration. Groundwater collected in September 1999 from M5-MW15 contained tetrachloroethylene at a concentration of 2.15 ug/L, which is greater than the groundwater quality criteria concentration of 0.4 ug/L. That compound has not been detected in subsequent sample rounds. No other compounds were detected at M5-MW15. Tetrachloroethylene was detected at concentrations ranging form 8.35 ug/L to 639.7 ug/L, each exceeding the groundwater quality criteria concentration, in samples collected from M5-MW16 between April 1999 and August 2000. No other compounds were detected at M5-MW16.

4.0 SOIL AND GROUNDWATER SAMPLING PLAN

Soil samples will be collected from each of the 16 former UST excavation areas that have either not yet been investigated or that require additional investigation. Geoprobe groundwater samples will be collected from 5 locations across the 600 area. In addition to Geoprobe groundwater sampling, additional groundwater samples will be collected from six existing monitoring wells. The following sections provide a detailed plan of the field activities that will be conducted to facilitate closure of all 16 sites in the 600 area.

4.2 Soil Sampling

Prior to soil sampling activities, all sites will be marked-out for clearance from underground and overhead utilities. Soil samples will be collected using the Geoprobe soil sampling system. All soil samples will be screened using a PID in the field and then submitted to the laboratory and analyzed for TPHC. Soil samples will be labeled with the site number followed by consecutive letters starting with the letter A. All sample IDs will be recorded on the site figure and in the log book. Soil samples will be collected, containerized, preserved, and analyzed according to the SOP included in Appendix A. Figures labeled 4-1 through 4-16 illustrate the proposed sample locations at each site. These figures also illustrate soil sample results where they exist.

There are ten UST sites, 600A, 615, 634, 638, 639, 640, 641, 644, 664, and 666, that have not yet been investigated. The historical files for former UST site 600A are unavialable for review. Because the exact location of the former UST is unknown, 5 soil samples will be collected from locations on the west, north, and east sides of the former building 600. The south side of the building has been investigated because it is the location of the former UST 600B. At each of the other nine sites where the former UST location is known, soil will be collected from the four sides and in the center of each former tank excavation. Soil will be collected at the depth of the bottom of the former excavation or if the depth is unknown, at the deepest unsaturated depth interval.

Two of the six sites that were previously investigated require additional sampling. At 600B and 686, previous sample locations with TPH concentrations that exceed the soil quality criteria of 1,000 mg/kg will be resampled and analyzed for both TPHC and VOC.

4.3 Groundwater Sample Collection

Groundwater will be collected from the six existing wells in the area, M5-MW15, M5-MW16, M5-MW25, 616-MW1, 699-MW2, and 699-MW15. Groundwater will be collected using the Geoprobe sample method at 5 locations strategically located across the 600 area to complete the groundwater quality data by filling the data gaps left by the existing wells. The proposed geoprobe groundwater sample locations and existing monitoring well locations are illustrated on Figure 2.

Groundwater samples will be submitted for laboratory analysis of VOC and SVOC. Locations where groundwater samples do not exceed NJDEP groundwater quality criteria will be resampled a minimum of 30 days after the initial round of sampling. Two consecutive clean rounds of groundwater samples from a given location will indicate that no further action is necessary. If the analytical results from the first round of groundwater sampling exceed NJDEP groundwater quality criteria, monitoring wells will be installed in the impacted area. Groundwater samples will be collected, containerized, preserved, and analyzed according to the SOP included in Appendix A.

5.0 REPORT PREPARATION

The Closure Reports for each of the 16 former UST sites in the 600 area will be combined into one report containing details of the sample locations, analytical results, conclusions, and recommendations.

6.0 QUALITY ASSURANCE PROJECT PLAN

Field sampling activities will be conducted in accordance with the NJDEP Field Sampling Manual. All analyses will be conducted in accordance with the NJ Laboratory Certification Program by the Fort Monmouth Environmental Testing Laboratory (NJDEP Certification #13461). A separate Quality Assurance Project Plan will not be submitted for the field sampling activities.

7.0 SOIL AND SEDIMENT EROSION

As described within this document, the soil and groundwater sampling will be accomplished using a Geoprobe®. A soil and sediment erosion control and monitoring plan, and a dust and odor control and monitoring plan (N.J.A.C. 7:26E-6.2(a)10) are not applicable to the proposed site efforts presented within this document.

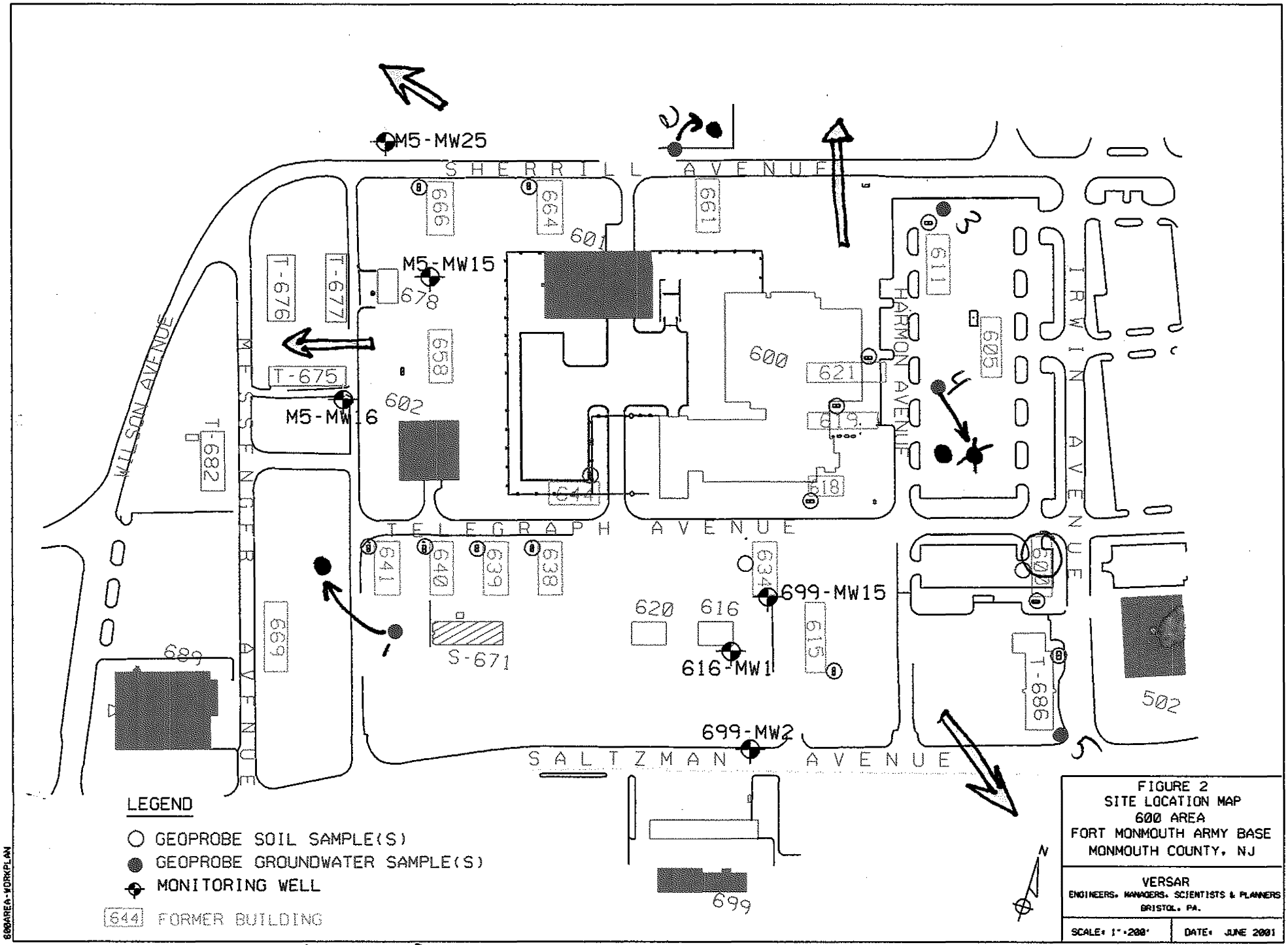
8.0 SITE SPECIFIC HEALTH AND SAFETY PLAN

The existing Site Specific Health and Safety Plan, as required by N.J.A.C. 7:26E-6.2(a)(11) was prepared by the selected Geoprobe contractor to address the planned site activities presented within this document.

APPENDIX – A
FORT MONMOUTH
STANDARD OPERATING PROCEDURE

APPENDIX – B
Figures

Figure 1 – Site Location Map
Figure 2 – Site Map
Figures 3-1 through Figure 3-16 – Former UST Site Location Maps
Figures 4-1 through 4-16 – Former UST Site Sample Location Maps


M5-MW25
SHERRILL AVENUE
M5-MW15
M5-MW16
WILSON AVENUE
MESSENGER AVENUE
HARMON AVENUE
IRWIN AVENUE
TELEGRAPH AVENUE
SALTZMAN AVENUE
699-MW15
616-MW1
699-MW2
S-671
T-676
T-677
T-675
T-682
T-686
600
601
602
616
620
621
699
502
LEGEND
GEOPROBE SOIL SAMPLE(S)
GEOPROBE GROUNDWATER SAMPLE(S)
MONITORING WELL
644 FORMER BUILDING
Expected GW Flow Direction
FIGURE 2
SITE LOCATION MAP
600 AREA
FORT MONMOUTH ARMY BASE
MONMOUTH COUNTY, NJ
VERSAR
ENGINEERS, MANAGERS, SCIENTISTS & PLANNERS
BRISTOL, PA.
SCALE: 1"=200'
DATE: JUNE 2001
600AREA-WORKPLAN