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ADDENDUM #2 TO THE SAMPLING AND ANALYSIS PLAN FOR

PHASE II RCRA FACILITY INVESTIGATIONS AT THE FORMER 724TH TANKER PURGING STATION, SWMU 26 AT FORT STEWART, GEORGIA

Prepared for

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT

Contract No. DACA21-02-D-0004
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Prepared for

U.S. Army Corps of Engineers
Savannah District
Under Contract Number DACA21-02-D-0004
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Prepared by

Science Applications International Corporation
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Oak Ridge, TN 37830

Regulatory Authority

Resource Conservation and Recovery Act
40 *CFR* 264, Title II, Subpart C, Section 3004;
42 USC 6901 et seq.

September 2003

APPROVALS

ADDENDUM #2
TO THE
SAMPLING AND ANALYSIS PLAN
FOR
PHASE II RCRA FACILITY INVESTIGATIONS
AT THE
FORMER 724TH TANKER PURGING STATION, SWMU 26
AT
FORT STEWART, GEORGIA

Greg Grim, Program Manager — Date 9/2/03

Patricia Stoll, Project Manager — Date 9/2/03

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List of Abbreviations and Acronyms

BGS	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAP	Corrective Action Plan
CQC	Chemical Quality Control
GA EPD	Georgia Environmental Protection Division
MIP	membrane interface probe
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA field investigation
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SWMU	solid waste management unit

1.0 INTRODUCTION

This addendum supplements the *Sampling and Analysis Plan for Phase II RCRA Facility Investigations at the Former 724th Tanker Purging Station, Solid Waste Management Unit 26, at Fort Stewart, Georgia* (SAIC 1997). It addresses the delineation of hot spots of contamination in soil and groundwater at the Tanker Purging Station. It also presents changes and additions to the Sampling and Analysis Plan (SAP; SAIC 1997) and the specific sampling requirements for the performance of these field activities.

A Phase II Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) was completed at the site, and the revised final Phase II RFI report was submitted to the Georgia Environmental Protection Division (GA EPD) on November 24, 1998. The Phase II RFI report recommended that a Corrective Action Plan (CAP) be prepared, which was submitted to GA EPD in July 1999. The CAP recommended that an enhanced bioremediation system (PHOSter®II) be installed at the site.

The PHOSter®II system began operation on February 29, 2000, and was removed in January 2002. During operation of the PHOSter®II system, it became apparent that there was a continuing source of contamination tied up in the soil. As a result, in January 2001 a large area of contaminated soil was excavated to the top of a clay layer, which was located at 7 to 9 ft below ground surface (BGS). This clay layer is located below the water table. Analytical results of groundwater collected throughout and following the operation of the PHOSter®II system indicate that the hot spot with the highest level of contamination is located near the excavation area. The results of soil samples collected during installation of the temporary piezometers during the corrective action suggest that the clay at the bottom of the excavation is a source of contamination in the groundwater. During the Phase II RFI, soil samples were collected from 21 soil borings. The samples were collected above the water table, however, which would not have indicated that the clay layer was acting as a source of contamination. In addition, low levels of contaminants were found in some downgradient wells.

This addendum includes the installation of membrane interface probe (MIP) borings to delineate the vertical and horizontal extent of benzene, toluene, ethylbenzene, and xylenes (BTEX) contamination throughout the plume area, installation of additional monitoring wells, conducting of quarterly groundwater sampling, and installation of soil borings to delineate the extent of contamination in the clay layer and saturated zone.

2.0 PROJECT ORGANIZATION

The organizational chart for this addendum is presented in Figure 1.

3.0 FIELD ACTIVITIES

This section describes the field activities that will be conducted to delineate the soil and groundwater contamination at the Solid Waste Management Unit (SWMU) 26 site. Table 1 presents the sample numbering system that will be used for this investigation. The site-specific investigative activities for the site are presented in Table 2.

3.1 INSTALLATION OF MEMBRANE INTERFACE PROBE BORINGS

The MIP is a direct-push tool that produces continuous chemical logs of the vadose and saturated zones. The MIP will be deployed by means of a Geoprobe rig. The procedures and methodology for Geoprobe operation are presented in the SAP (SAIC 1997). The MIP heats the soil and groundwater adjacent to the probe to 120°C, which increases volatility, and the vapor-phase diffuses across a membrane into a closed, inert gas loop that carries these vapors to a series of detectors housed at the surface. A continuous chemical profile of BTEX will be generated from the water table down to 25 ft BGS.

A total of 30 MIP borings will be installed along two transects to delineate the vertical and horizontal extent of BTEX contamination. One transect will run from the soil contamination area near TP-01 to MW-23. The second transect will run from MW-23 toward MW-33. MIP borings will be installed every 25 ft along these two transects. Approximately 12 borings will be installed along the TP-01 to MW-23 transect, and approximately eight borings will be installed along the MW-23 to MW-33 transect. Locations for the remaining borings will be determined in the field based on the field results of the first 20 borings along the two transects. No analytical samples will be collected during the installation of the MIP borings.

3.2 MONITORING WELL INSTALLATION

Seven new 2-in. monitoring wells will be installed using the hollow-stem auger drilling method. The procedures and methodology for hollow-stem auger drilling are presented in the SAP (SAIC 1997). The locations of the seven new wells will be based on the results of the MIP borings. The seven wells will consist of two new shallow monitoring wells installed to approximately 15 ft BGS and five new deep monitoring wells installed to approximately 25 ft BGS. Waste characterization samples will be collected during well installation. The monitoring wells will be developed in accordance with the procedures and methodology presented in the SAP (SAIC 1997).

3.3 GROUNDWATER SAMPLING

Groundwater samples will be collected from a total of 38 monitoring wells—the 31 existing wells and the 7 new wells—using low-flow techniques. Samples will be analyzed at an off-site laboratory for BTEX. Field parameters measured during sampling will include dissolved oxygen, temperature, oxidation-reduction potential, conductivity, and pH. Procedures and equipment for groundwater sampling are presented in the SAP (SAIC 1997).

3.4 WATER-LEVEL MEASUREMENT

Static water-level measurements will be collected from each monitoring point before groundwater sampling. Procedures and equipment are presented in the SAP (SAIC 1997).

3.5 OPTIONAL FIELD ACTIVITIES

3.5.1 Quarterly Groundwater Sampling (Option 1)

Based on the results of the MIP borings and the first round of groundwater sampling, three quarterly rounds of groundwater sampling and water-level measurements will be conducted. All of the site wells, a total of 38, will be sampled for BTEX as described in Section 3.3.

3.5.2 Soil Borings (Option 2)

Based on the results of the MIP borings and the first round of groundwater sampling, 30 soil borings will be installed. These borings will be installed using a Geoprobe rig as described in the SAP (SAIC 1997).

Five soil borings will be installed in the former excavation area. Three soil samples will be collected at 1-ft intervals from the clay layer below the gravel fill that is approximately 7 to 9 ft BGS. The soil samples will be sent to an off-site laboratory for BTEX analysis. One geotechnical sample will also be collected from each soil boring at the clay layer and sent to an off-site laboratory for analysis of grain-size distribution and Atterberg limits.

Twenty-five soil borings will be installed around the area of known soil contamination to further delineate this area of contamination. Fifteen of the soil borings will be installed to a depth of 15 ft BGS, and ten soil borings will be installed to a depth of 25 ft BGS. Two analytical soil samples will be collected from each of these soil borings based on the criteria below.

- In cases in which contamination is detected by field headspace-gas analysis in one or more of the borehole intervals, one soil sample will be collected from the 2.0-ft interval exhibiting the highest detected organic vapor concentration and one soil sample from the top of the clay layer. If no clay layer is encountered, the second soil sample will be collected from the second-highest detected organic vapor concentration.

- In cases in which no contamination is detected by field headspace-gas analysis in any of the borehole intervals, one soil sample will be collected from the 2.0-ft interval before encountering the water table and one soil sample from the clay layer. If no clay layer is encountered, the second soil sample will be collected from the 13- to 15-ft BGS interval.

Soil analytical samples will be sent to an off-site analytical laboratory for BTEX analysis. Soil samples collected for BTEX analysis will be collected using Encore™ sampling devices. Three Encore™ samples will be collected from each 2.0-ft interval.

4.0 REFERENCES

SAIC (Science Applications International Corporation) 1997. *Sampling and Analysis Plan for Phase II RCRA Facility Investigations at the Former 724th Tanker Purging Station, Solid Waste Management Unit 26, at Fort Stewart, Georgia*, April.

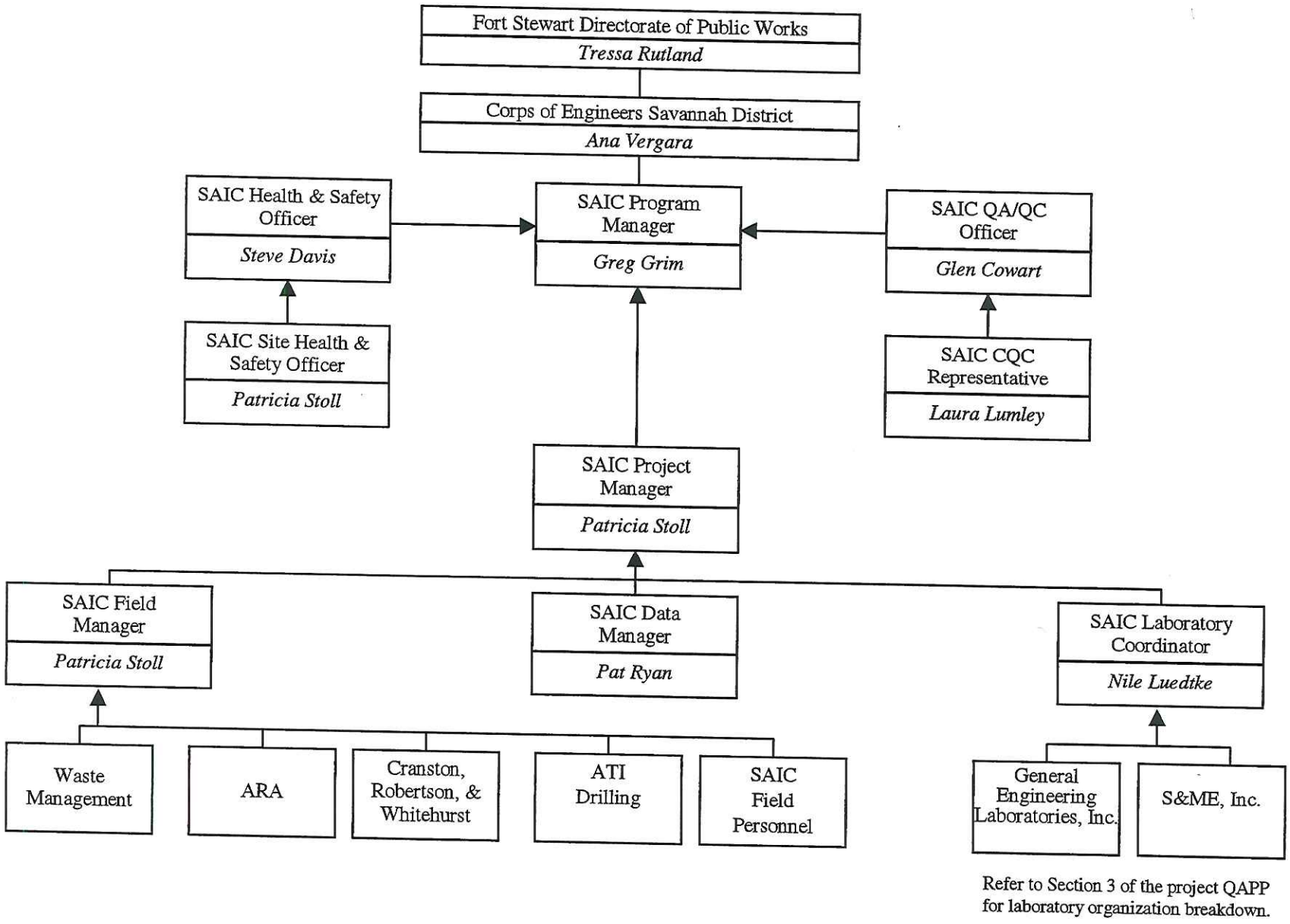

Figure 1. Revised Organizational Chart for SWMU 26 at Fort Stewart, Georgia

Table 1. Sample Number System for SWMU 26

Sample Identification: XXMLT#	
XX = Area Designator	Area designators used for the project will be the SWMU number. **Examples** 26 = SWMU-26
M = Sample Media	**Examples** 1 = Soil 2 = Sediment 3 = Surface water 4 = Groundwater 5 = Soil screening 6 = Groundwater screening 7 = Soil from injection-point installation 8 = Pre-pilot soil from inside trench 9 = Injection-point groundwater 0 = Gas A = Temporary piezometer groundwater B = Temporary piezometer groundwater C = Monitoring well soil D = Monitoring well groundwater
L = Borehole/Sample Location	Sample locations will be consecutive starting from the last sample location. Examples 1 = First sample location (MW-1,BS-1) 2 = Second sample location (MW-2,BS-2) 0 = Tenth sample location (MW-10, TP-10) J = Nineteenth location (MW-19, TP-19) M = Twenty-first location (MW-21, TP-21) P = Twenty-third location (MW-23, TP-23) R = Twenty-fourth location (MW-24, TP-24) **B, C, or D** 1 = Thirty-third location (MW-33, TP-33) 2 = Thirty-fourth location (MW-34, TP-34)
T = Sample Type	Examples 1 = Environmental sample 2 = Duplicate sample 3 = QA split sample 4 = Rinsate blank 5 = Investigation-derived waste sample
# = Sample Number	Sample number will be a sequential number. **Examples** 1 = First sample from borehole 2 = Second sample from borehole

All trip blanks used during the project will be consecutively identified.

Table 2. Summary of Soil and Groundwater Samples to Be Collected at SWMU 26

Matrix	Analysis	Analytical Procedures	No. Field Samples	QC Duplicates[a]	Field Rinsates[b]	QC Trip Blanks	Total Samples	Holding Time	Preservation Requirements	Sample Containers
Groundwater	BTEX	EPA 8260B	38	4	2	3	47	14 days	Cool to 4°C HCl pH<2	Two 40-mL GSV[c]
IDW Water	VOCs	EPA 8260B	1	0	0	0	1	14 days	Cool to 4°C[c] HCl pH <2	Two 40-mL GSV[c]
	Oil & grease	EPA 413.2	1	0	0	0	1	28 days	Cool to 4°C H_2SO_4	Two 1-L AG
	Total phenols	EPA 420.1/420.2	1	0	0	0	1	28 days	Cool to 4°C H_2SO_4	Two 1-L AG
	pH	EPA 150.1	1	0	0	0	1	ASAP	Cool to 4°C	One 250-mL HDPE
Option 1 Groundwater	BTEX	EPA 8260B	114	12	6	9	141	14 days	Cool to 4°C HCl pH<2	Two 40-mL GSV[c]
Option 1 IDW Water	VOCs	EPA 8260B	3	0	0	0	3	14 days	Cool to 4°C[c] HCl pH <2	Two 40-mL GSV[c]
	Oil & grease	EPA 413.2	3	0	0	0	3	28 days	Cool 4°C H_2SO_4	Two 1-L AG
	Total phenols	EPA 420.1/420.2	3	0	0	0	3	28 days	Cool to 4°C H_2SO_4	Two 1-L AG
	pH	EPA 150.1	3	0	0	0	3	ASAP	Cool to 4°C	One 250-mL HDPE
Option 2 Soil	BTEX	EPA 8260B	65	7	0	0	72	48 hours	Cool to 0°C	Encore™

AG = Amber glass.
ASAP = As soon as possible.
BTEX = Benzene, toluene, ethylbenzene, and xylenes.
EPA = U.S. Environmental Protection Agency.
GSV = Glass septa vial.
HDPE = High-density polyethylene.
IDW = Investigation-derived waste.
QC = Quality control
SWMU = Solid waste management unit.
VOC = Volatile organic compound.
(This table is in conformance with EM200-1-3).

[a] The number of Qc duplicate samples represents a 10% distribution between the different types of investigations to be conducted; however, the actual number of duplicates collected for each investigation type might vary slightly from the distribution presented.

[b] The number of QC rinsate blank samples represents a 5% distribution between the different types of investigations to be conducted; however, the actual number of blanks collected for each investigation type might vary slightly from the distribution presented.

[c] Sample containers will be filled so that no headspace is present.

APPENDIX A

PROPOSED SAMPLING LOCATIONS
FOR SWMU 26
FORT STEWART, GEORGIA

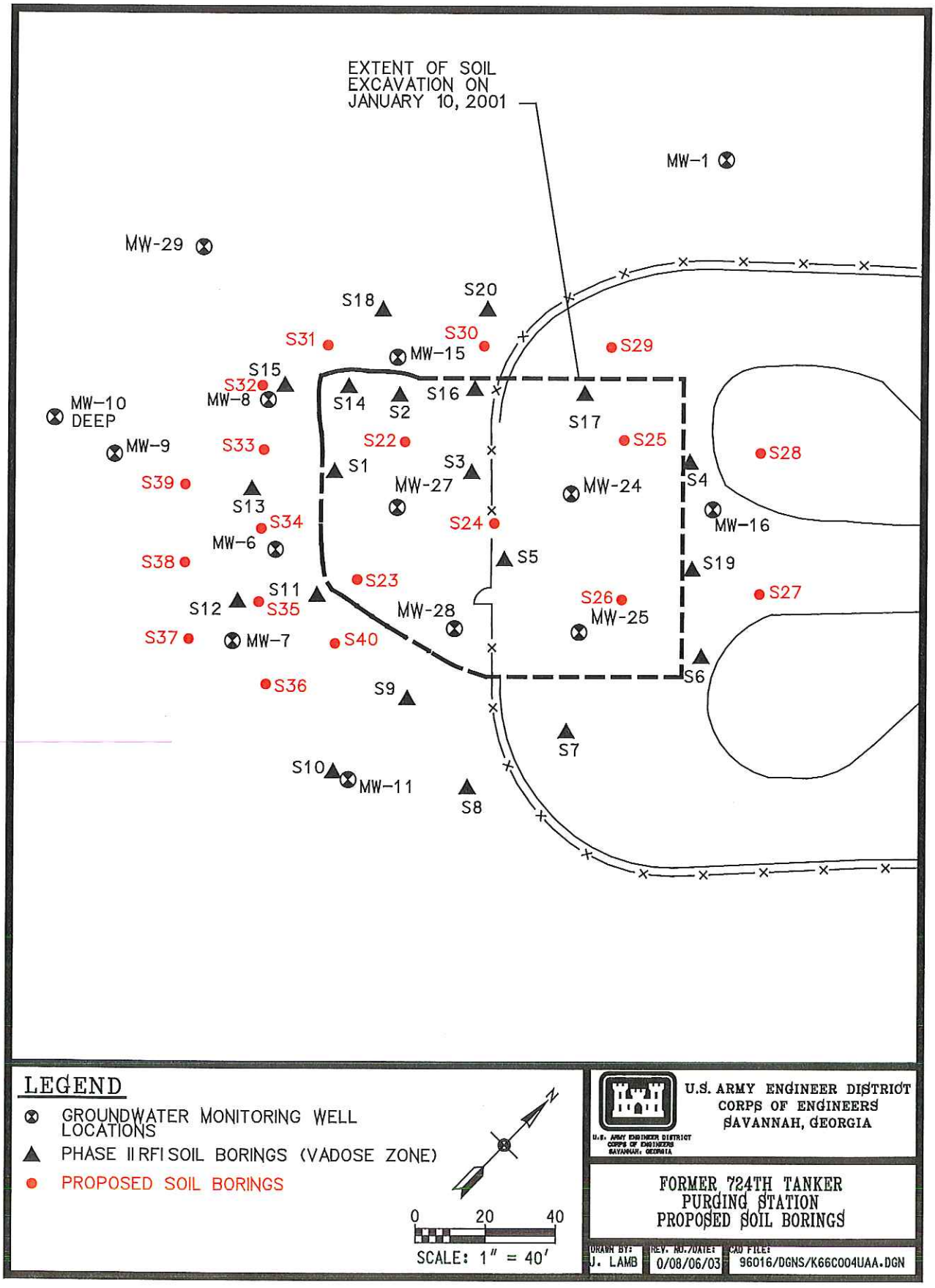

Figure A-2. Proposed Soil Boring Locations at SWMU 26