IMA

MONITORING ONLY REPORT FOR THE FIFTH MONITORING EVENT

3d Inf Div (Mech)

Underground Storage Tank 89
Facility ID #9-089074
Building 1247
Fort Stewart, Georgia

Prepared for

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT

Contract No. DACA21-02-D-0004
Delivery Order 0044

October 2004

SAIC®

04-211(E)/100504

MONITORING ONLY REPORT
FOR THE
FIFTH MONITORING EVENT,
UNDERGROUND STORAGE TANK 89,
FACILITY ID #9-089074,
BUILDING 1247,
FORT STEWART, GEORGIA

Prepared for

U.S. Army Corps of Engineers, Savannah District
and
Fort Stewart Directorate of Public Works
Under Contract Number DACA21-02-D-0004
Delivery Order 44

Prepared by

Science Applications International Corporation
151 Lafayette Drive
Oak Ridge, TN 37830

October 2004

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List of Abbreviations and Acronyms

ACL	alternate concentration limit
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAP	Corrective Action Plan
GA EPD	Georgia Environmental Protection Division
IWQS	In-Stream Water Quality Standard
SAIC	Science Applications International Corporation
UST	underground storage tank
USTMP	Underground Storage Tank Management Program

MONITORING ONLY REPORT

Submittal Date: October 2004 Monitoring Report Number: 5th Event

For Period Covering: July 2003 to July 2004

Facility Name: UST 89, Building 1247 Street Address: McFarland Avenue between Divarty Avenue and W. 8th Street

Facility ID: 9-089074 City: Fort Stewart County: Liberty Zip Code: 31314

Latitude: 32° 15′ 82″ Longitude: 82° 05′ 02″

Submitted by UST Owner/Operator:		Prepared by Consultant/Contractor:	
Name:	Thomas C. Fry/ Environmental Branch	Name:	Patricia A. Stoll
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I. REGISTERED PROFESSIONAL ENGINEER OR PROFESSIONAL GEOLOGIST CERTIFICATION

I hereby certify that I have directed and supervised the field work and preparation of this plan, in accordance with State Rules and Regulations. As a registered professional geologist and/or professional engineer, I certify that I am a qualified groundwater professional, as defined by the Georgia State Board of Professional Geologists. All of the information and laboratory data in this plan and in all of the attachments are true, accurate, complete, and in accordance with applicable State Rules and Regulations.

Name: Patricia A. Stoll
Signature: Patricia A Stoll
Date: 10/11/04

GEORGIA REGISTERED 22851 PROFESSIONAL ENGINEER P. A. STOLL
Stoll 10/4/04
Georgia Stamp or Seal

II. PROJECT SUMMARY

(Appendix I, Figure 1: Site Location Map)

Provide a brief description or explanation of the site and a brief chronology of environmental events leading up to this report.

Former Underground Storage Tank (UST) 89, Facility ID #9-089074 was located near Building 1247 at Fort Stewart, Georgia. The tank and piping were excavated and removed on February 15, 1995. Science Applications International Corporation (SAIC) performed a Corrective Action Plan (CAP)–Part A investigation in 1996 and a CAP–Part B investigation in 1997 and 1998 to determine the extent of petroleum contamination at the site. Five monitoring wells and five soil borings were installed during these investigations. The CAP–Part B Report was submitted in March 1999 and recommended semiannual monitoring of four monitoring wells: 33-06, 33-07, 33-08, and 33-10 (SAIC 1999a).

The fate and transport modeling performed as part of the CAP–Part B Report reflected a continuous source of contamination. The closest receptor is 1,000 ft downgradient of the site, resulting in a benzene alternate concentration limit (ACL) of 2,410 µg/L based on the CAP–Part B fate and transport modeling results. Upon completion of the fourth semiannual monitoring event in July 2000, the fate and transport modeling results were revised using the results from the semiannual monitoring events to calibrate the model. The revised fate and transport modeling indicated that the benzene ACL would be infinity; therefore, the Second Annual Monitoring Only Report (SAIC 2000b) recommended that the original benzene ACL of 2,410 µg/L remain as the site-specific remedial level. The results were summarized in the Second Annual Monitoring Only Report.

In general, the benzene concentrations have been declining throughout the monitoring only program, and during the semiannual sampling in 1999 and 2000, the benzene concentrations at the site were below the ACL. The plume had not reached downgradient well 33-10, indicating that the plume was not expanding. Because the benzene concentrations were below the ACL and the plume was not expanding, the Second Annual Monitoring Only Report recommended that a no-further-action-required status be granted for the site. In accordance with the monitoring only plan, the ACL for benzene has been used to date in the monitoring program as the monitoring end point.

The Georgia Environmental Protection Division (GA EPD) Underground Storage Tank Management Program (USTMP) conducted a technical review of the Second Annual Monitoring Only Report, and in correspondence dated September 28, 2001, (Logan 2001) GA EPD requested that the free product in well 33-08 be monitored for a 6-month period. The technical review indicated that sampling and analysis of the site wells were not necessary. The Third Annual Monitoring Only Report was submitted in July 2002 summarizing these results (SAIC 2002). The report recommended that monthly change-out of the absorbent socks and product-level measurements be continued. The Fourth Annual Monitoring Only Report was submitted in July 2003 and summarized the activities conducted between July 2002 and May 2003 (SAIC 2003).

Because groundwater sampling had not occurred at this site since June 2000, GA EPD requested that the wells be sampled before submission of the next annual monitoring only report. The purpose of the semiannual monitoring, summarized in this report, is to confirm that natural attenuation is taking place at the site. The benzene concentrations have not decreased as rapidly as predicted in the fate and transport modeling conducted as part of the Second Annual Monitoring Only Report (SAIC 2000), but the concentrations are

continuing to decrease. The measured benzene concentrations have been below the benzene ACL for the last five sampling events (i.e., January 1999, July 1999, January 2000, June 2000, and July 2004). In 1999 and 2000, the benzene concentrations remained below the ACL; however, free product was observed in well 33-08 in July 1999. As a result, absorbent socks were removed and replaced at the site from 1999 to 2003. An additional sampling round was conducted in July 2004 to confirm that the benzene concentrations were continuing to decrease.

III. ACTIVITIES AND ASSESSMENT OF EXISTING CONDITIONS

A. Potentiometric Data:

(Appendix I, Figure 2: Potentiometric Surface Map)
(Appendix II, Table 1: Groundwater Elevations)

Discuss groundwater flow at this site and implications for this project.

As discussed in the First Annual Monitoring Only Report, free product consisting of heavy waste oil was initially observed in well 33-08 in July 1999. This was the first time that free product had been observed in any of the wells at this site and could have been caused by the water-level fluctuations associated with the 100-year rain event that occurred before the water-level measurements. An absorbent sock was placed in well 33-08 in July 1999 and replaced periodically from July 1999 to May 2003. The results of the free product measurements are provided in Table 1. SAIC was no longer under scope to replace the absorbent sock after May 2003.

Following the fifth sampling event in August 2004, groundwater elevations were measured in all of the monitoring wells to determine the groundwater flow direction. In August 2004, the groundwater flow direction was toward the south and southwest, and the groundwater gradient was approximately 0.011 ft/ft. An absorbent sock in 33-08 was removed before water-level measurements were taken, and no free product was observed in the well. The sock was replaced following the measurements.

B. Analytical Data:

(Appendix I, Figure 3: Groundwater Quality Map)
(Appendix I, Figure 4: Trend of Contaminant Concentrations)
(Appendix II, Table 2: Groundwater Analytical Results)
(Appendix III: Laboratory Analytical Results)

Discuss groundwater analysis results, trend of contaminant concentrations, and implications for this project.

During the fifth sampling event in July 2004, monitoring wells 33-06, 33-07, 33-08, and 33-10 were sampled for benzene, toluene, ethylbenzene, and xylenes (BTEX) in accordance with U.S. Environmental Protection Agency Method 8021B/8260B using low-flow sampling techniques. Analytical results from the sampling event are summarized below.

- Benzene was detected in one of the four groundwater samples at a concentration of 96.7 g/L. This sample exceeded the In-Stream Water Quality Standard (IWQS) of 72.18, but did not exceed the ACL.

- Toluene was not detected in any of the four groundwater samples.

- Ethylbenzene was detected in three of the four groundwater samples at concentrations ranging from 0.22J to 53.6 µg/L. None of the concentrations exceeded the IWQS.

- Total xylenes were detected in two of the four groundwater samples at concentrations of 0.37J and 154 µg/L. There is no ACL or IWQS for total xylenes; however, the concentrations or elevated detection limit did not exceed the maximum contaminant level.

The benzene concentration in 33-08 did not exceed the ACL of 2,410 µg/L, but it did exceed the IWQS of 71.28 µg/L. None of the other constituents exceeded their respective IWQSs. Figure 4 shows the trend in benzene concentrations in groundwater for the wells in the monitoring only program at the site.

As recommended in the First Annual Monitoring Only Report (SAIC 1999c), polynuclear aromatic hydrocarbon analysis was discontinued for the site beginning with the second semiannual sampling event in July 1999.

IV. SITE RANKING (NOTE: RE-RANK SITE AFTER EACH MONITORING EVENT.)

(Appendix IV: Site Ranking Form)

Environmental Site Sensitivity Score:
(April 1999 version of the Site Ranking Form was used for January 2000 score.)

2,600 (Jan. 1999 – First Semiannual Monitoring Event)
27,600 (July 1999 – Second Semiannual Monitoring Event)
2,600 (Jan. 2000 – Third Semiannual Monitoring Event)
15,100 (June 2000 – Fourth Semiannual Monitoring Event)
15,100 (June 2002 – Free Product Measurements)
15,100 (May 2003 – Free Product Measurements)
350 (July 2004 – Fifth Monitoring Event)

V. CONCLUSIONS/RECOMMENDATIONS

Provide justification of no-further-action-required recommendation or briefly discuss future monitoring plans for this site.

The Monitoring Only Plan was conducted in accordance with Section III.D of the CAP–Part B Report (SAIC 1999a) and approved by GA EPD USTMP in correspondence dated June 28, 1999 (Logan 1999). Termination conditions approved in the CAP–Part B Report (SAIC 1999a) and the First Annual Monitoring Only Report (SAIC 1999c) in correspondence dated January 25, 2000, (Logan 2000) indicated that termination would be requested after 2 years if the measured benzene concentrations were below the ACL. The monitoring only program was terminated following the June 2000 monitoring event, and no-further-action-required status was requested in the Second Annual Monitoring Only Report (SAIC 2000b). GA EPD denied this request in correspondence dated September 28, 2001, because of the presence of free product at the site and a site ranking score above 1,000 (Logan 2001). The site was returned to the monitoring only program in 2004.

The results of the five rounds of monitoring events indicate that the benzene plume is not expanding and that the benzene concentrations have been decreasing. The slower decrease in concentrations than that predicted by the fate and transport modeling could be the result of a small amount of waste oil that is caught in the capillary fringe above the water table and being released as water-table conditions fluctuate. Free product was not observed in August 2004; however, an absorbent sock is located in well 33-08. The closest potential receptor is a drainage ditch located approximately 1,000 ft downgradient of the site; thus, the UST 89 site does not have the potential to impact any surface water bodies. The fate and transport modeling will be revised in the next annual monitoring only report using the results of the semiannual monitoring to calibrate the model. If site conditions remain similar to those observed during the last five semiannual sampling events, then a request for no further action will be made in the next annual monitoring only report.

Semiannual monitoring will continue in wells 33-06, 33-07, 33-08, and 33-10, and groundwater samples will be collected for BTEX only. Water- and product-level measurements will be collected during the next monitoring event in January 2005. An absorbent sock will be placed in well 33-08 if necessary.

VI. REIMBURSEMENT

Attached _____ N/A __X__

(Appendix V: Reimbursement Application)

Fort Stewart is a federally owned facility and has funded the investigation for the UST site, Building 1247, Facility ID #9-089074 using U.S. Department of Defense Environmental Restoration Account Funds. Application for Georgia Underground Storage Tank Trust Fund reimbursement is not being pursued at this time.

APPENDIX I

FIGURES

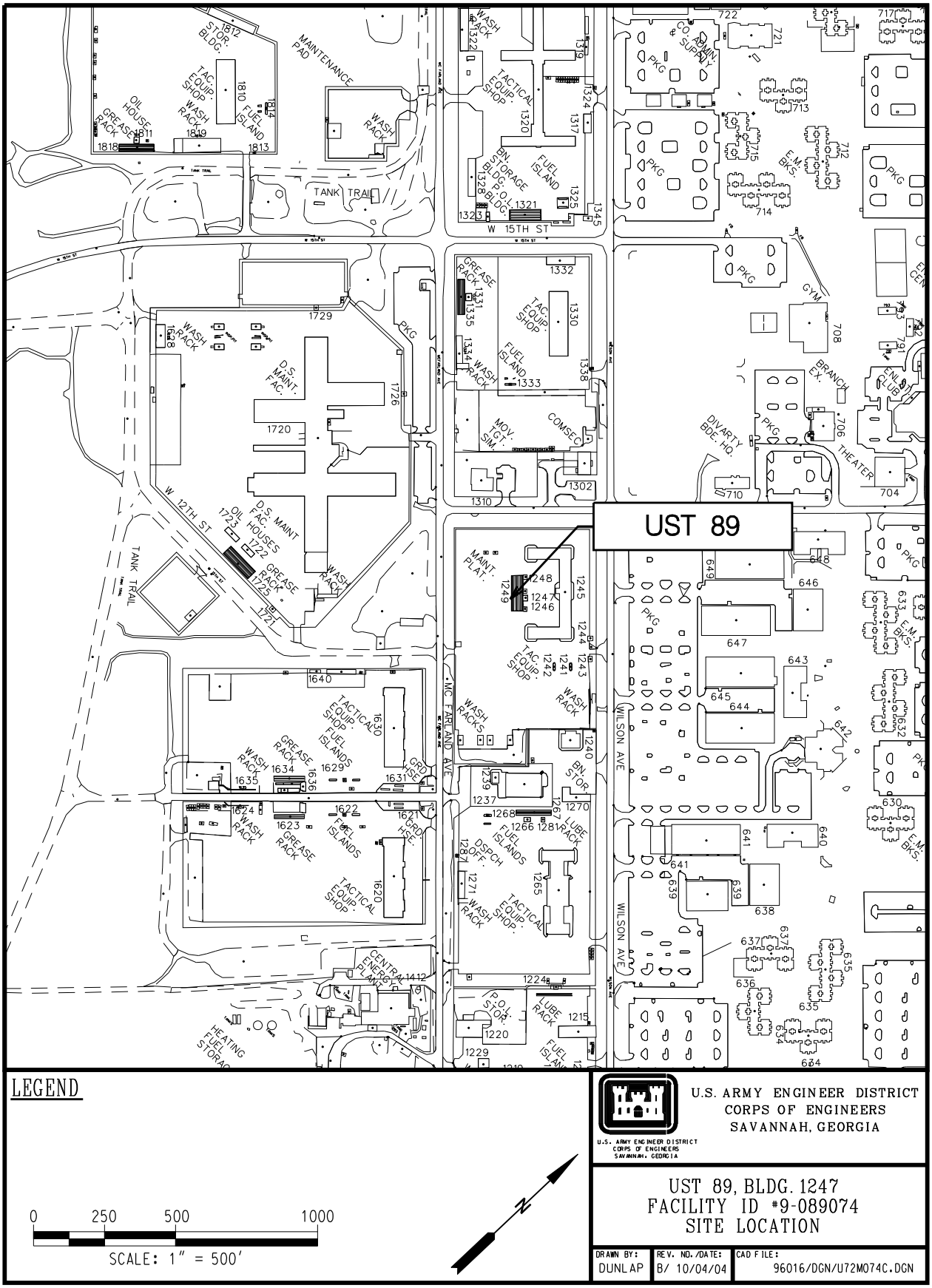

Figure 1. Location Map of the UST 89 Site at Fort Stewart, Liberty County, Georgia

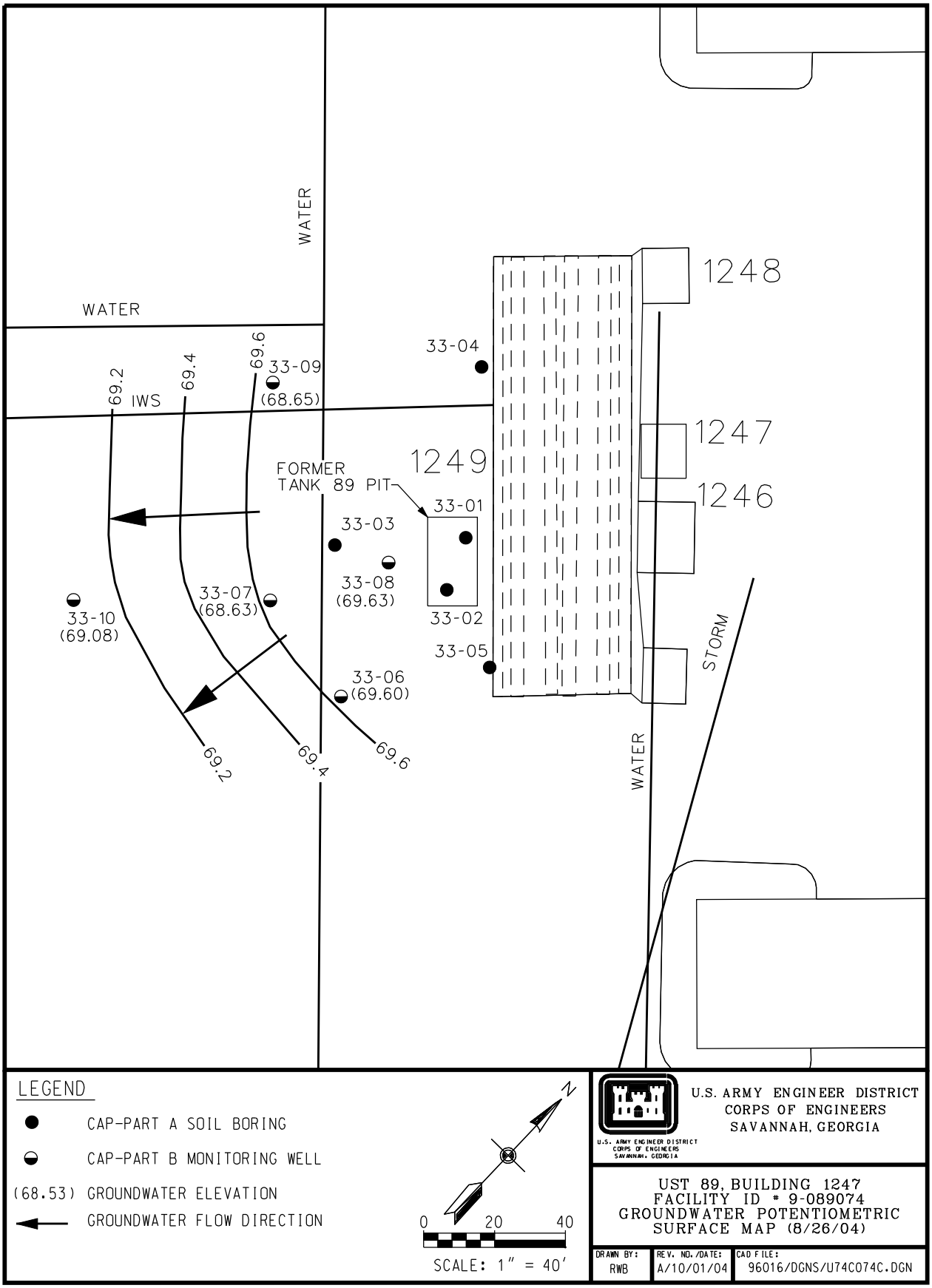

Figure 2. Potentiometric Surface Map of the UST 89 Site (August 2004)

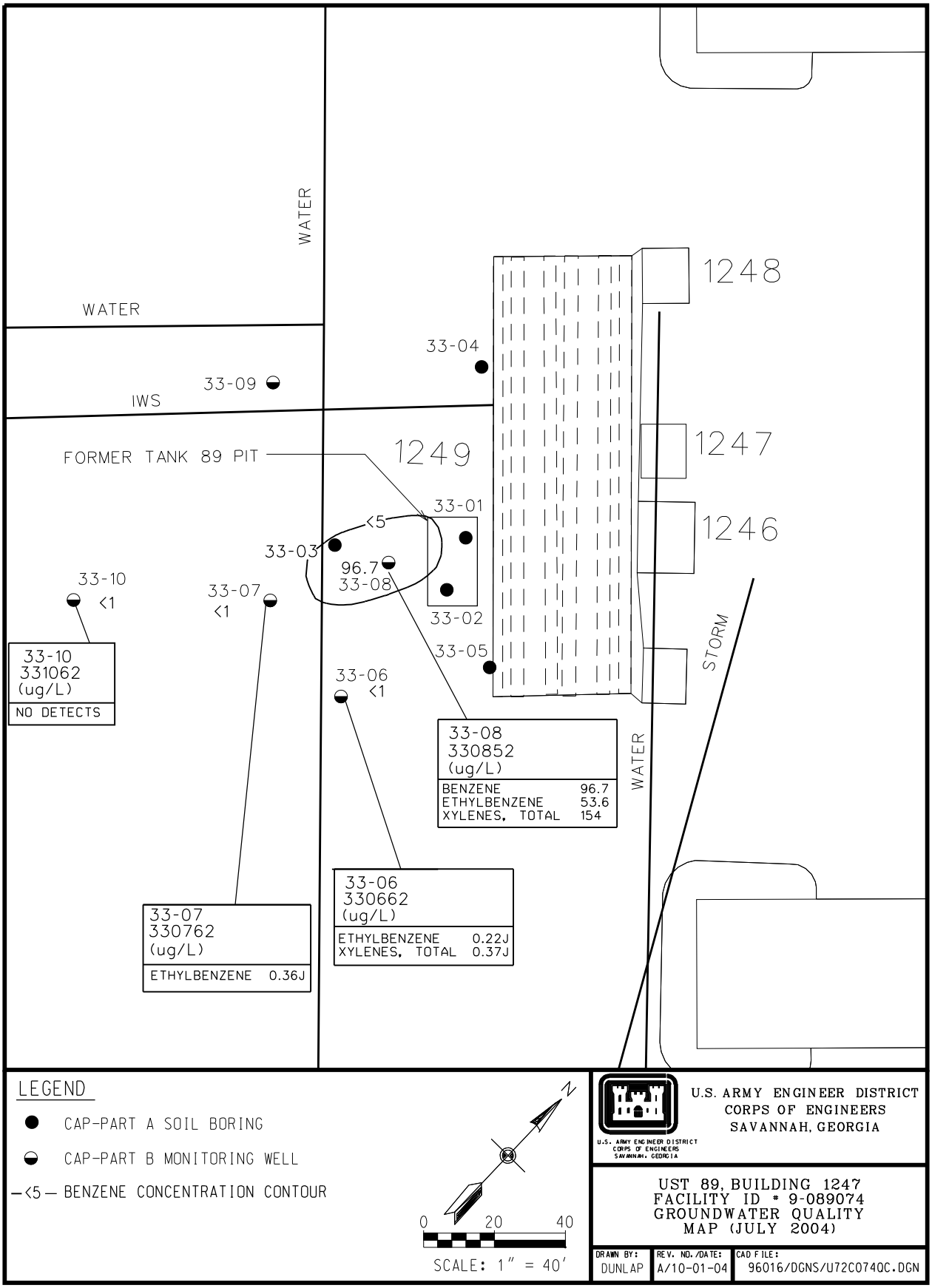

Figure 3. Groundwater Quality Map for the UST 89 Site (July 2004)

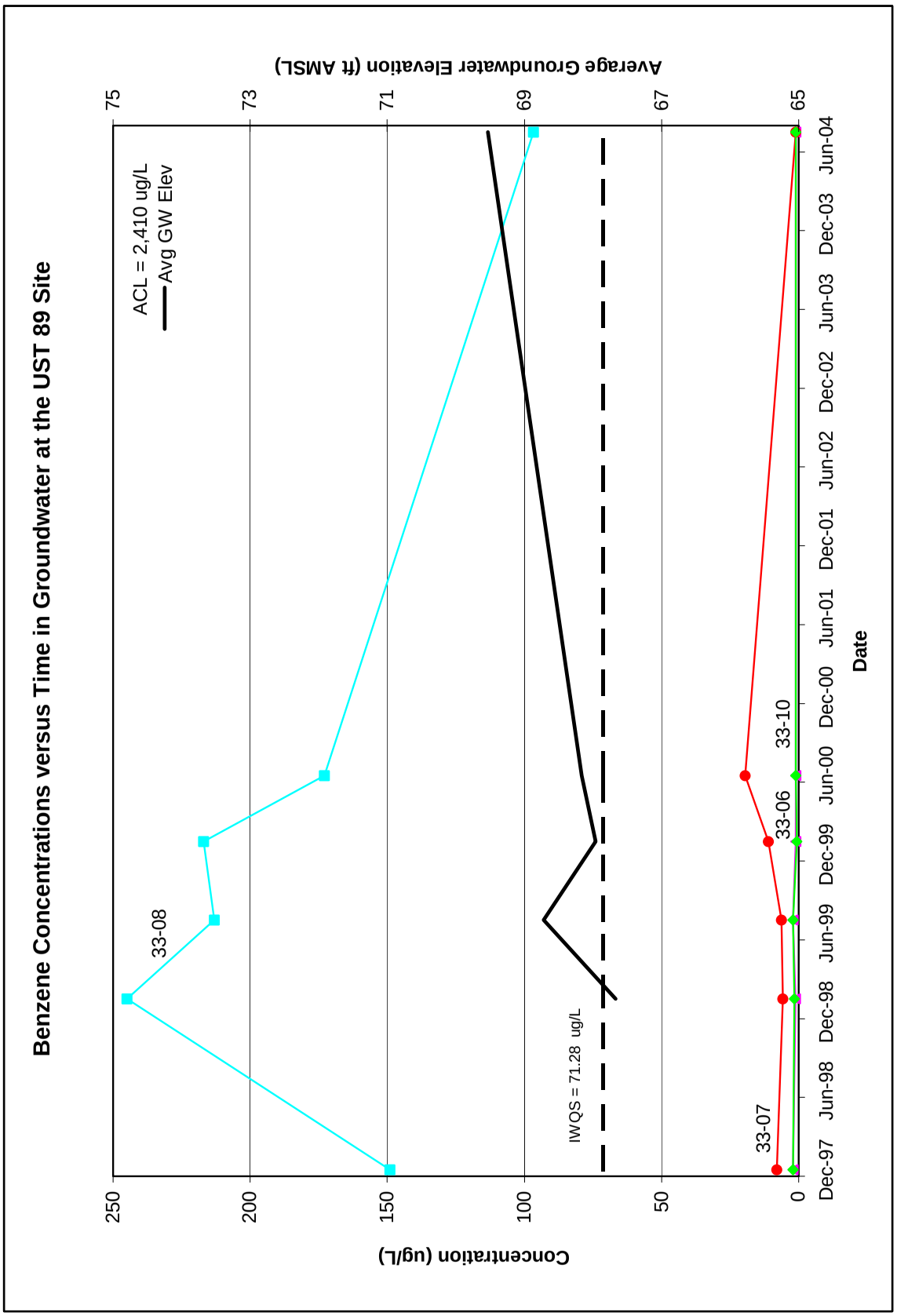

Figure 4. Trend of Benzene Concentrations for the UST 89 Site

APPENDIX II

TABLES

Table 1. Groundwater Elevations

Well Number	Date Sock Removed	Date Water Level Measured & Sock Replaced	Top of Casing Elevation (ft AMSL)	Depth of Screened Interval (ft BGS)	Depth to Free Product (ft BTOC)	Depth to Water (ft BTOC)	Product Thickness (ft)	Corrected Groundwater Elevation[a] (ft AMSL)
First Semiannual Monitoring Event – January 1999								
33-06	—	01/07/99	72.27	3.0 – 13.0	—	4.41	0	67.86
33-07	—	01/07/99	72.25	3.0 – 13.0	—	4.55	0	67.70
33-08	—	01/07/99	72.23	3.0 – 13.0	—	4.07	0	68.16
33-09	—	01/07/99	72.09	3.0 – 13.0	—	4.44	0	67.65
33-10	—	01/07/99	71.79	6.7 – 16.7	—	4.82	0	66.97
Second Semiannual Monitoring Event – July/August 1999								
33-06	—	08/23/99	72.27	3.0 – 13.0	—	3.11	0	69.16
33-07	—	08/23/99	72.25	3.0 – 13.0	—	3.52	0	68.73
33-08[b]	—	08/23/99	72.23	3.0 – 13.0	sheen	2.96	sheen	69.27
33-09	—	08/23/99	72.09	3.0 – 13.0	—	3.35	0	68.74
33-10	—	08/23/99	71.79	6.7 – 16.7	—	4.08	0	67.71
Third Semiannual Monitoring Event – January/February 2000								
33-06	—	02/22/00	72.27	3.0 – 13.0	—	4.07	0	68.20
33-07	—	02/22/00	72.25	3.0 – 13.0	—	4.27	0	67.98
33-08	01/25/00	02/22/00	72.23	3.0 – 13.0	—	3.72	0	68.51
33-09	—	02/22/00	72.09	3.0 – 13.0	—	4.12	0	67.97
33-10	—	02/22/00	71.79	6.7 – 16.7	—	4.63	0	67.16
Fourth Semiannual Monitoring Event – June 2000								
33-06	—	06/29/00	72.27	3.0 – 13.0	—	3.74	0	68.53
33-07	—	06/29/00	72.25	3.0 – 13.0	—	4.15	0	68.10
33-08[c]	06/22/00	06/29/00	72.23	3.0 – 13.0	sheen	3.17	sheen	69.06
33-09	—	06/29/00	72.09	3.0 – 13.0	—	3.95	0	68.14
33-10	—	06/29/00	71.79	6.7 – 16.7	—	4.81	0	66.98
Free Product Monitoring Period – December 2001 through June 2002								
33-08	12/14/01	12/17/01	72.23	3.0 – 13.0	3.64	3.65	0.01	68.59
33-08	01/23/02	01/25/02	72.23	3.0 – 13.0	3.66	3.67	0.01	68.57
33-08	02/19/02	02/21/02	72.23	3.0 – 13.0	3.59	3.60	0.01	68.64
33-08	03/18/02	03/20/02	72.23	3.0 – 13.0	3.43	3.44	0.01	68.80
33-08	04/10/02	04/12/02	72.23	3.0 – 13.0	3.34	3.49	0.15	68.88
33-08	05/14/02	05/17/02	72.23	3.0 – 13.0	—	3.65	0	68.58

[a] Groundwater elevation was corrected for free product assuming a density of 912 kg/m^3 for the oil.
[b] Free product was observed in well 33-08 during sampling on July 11, 1999, and an absorbent sock was placed in the well on July 14, 1999.
[c] On May 26, 2000, 0.12 ft of free product was observed in well 33-08, and an absorbent sock was placed in the well on May 26, 2000. The absorbent sock was removed from well 33-08 before sampling in June 2000 and was replaced on June 29, 2000. The absorbent sock was removed again on September 25, 2000, and replaced on September 29, 2000, but no free product accumulated during the 4 days of equilibration time.

AMSL Above mean sea level.
BGS Below ground service.
BTOC Below top of casing.

Table 1. Groundwater Elevations (continued)

Well Number	Date Sock Removed	Date Water Level Measured & Sock Replaced	Top of Casing Elevation (ft AMSL)	Depth of Screened Interval (ft BGS)	Depth to Free Product (ft BTOC)	Depth to Water (ft BTOC)	Product Thickness (ft)	Corrected Groundwater Elevation[a] (ft AMSL)
33-06	—	06/05/02	72.27	3.0 – 13.0	—	3.74	0	68.53
33-07	—	06/05/02	72.25	3.0 – 13.0	—	4.15	0	68.10
33-08	06/05/02	06/05/02	72.23	3.0 – 13.0	sheen	3.55	sheen	68.68
33-09	—	06/05/02	72.09	3.0 – 13.0	—	4.08	0	68.01
33-10	—	06/05/02	71.79	6.7 – 16.7	—	4.68	0	67.11
Free Product Monitoring Period – July 2002 through May 2003								
33-08	07/15/02	07/18/02	72.23	3.0 – 13.0	2.64	2.70	0.06	69.58
33-08	08/14/02	08/16/02	72.23	3.0 – 13.0	3.30	3.31	0.01	68.93
33-08	09/23/02	09/25/02	72.23	3.0 – 13.0	—	2.61	0	69.62
33-08	10/22/02	10/22/02	72.23	3.0 – 13.0	—	3.23	0	69.00
33-08	12/19/02	12/19/02	72.23	3.0 – 13.0	3.11	3.45	0.34	69.09
33-08	01/28/03	01/28/03	72.23	3.0 – 13.0	—	3.73	0	68.50
33-08	02/21/03	02/24/03	72.23	3.0 – 13.0	2.98	3.03	0.05	69.24
33-08	03/19/03	03/21/03	72.23	3.0 – 13.0	1.90	1.92	0.02	70.33
33-08	04/25/03	04/25/03	72.23	3.0 – 13.0	2.17	2.27	0.1	70.05
33-06	—	05/15/03	72.27	3.0 – 13.0	—	3.31	0	68.96
33-07	—	05/15/03	72.25	3.0 – 13.0	—	3.11	0	69.14
33-08	05/15/03	05/15/03	72.23	3.0 – 13.0	sheen	2.54	sheen	69.69
33-09	—	05/15/03	72.09	3.0 – 13.0	—	3.02	0	69.07
33-10	—	05/15/03	71.79	6.7 – 16.7	—	4.03	0	67.76
Fifth Monitoring Event –July 2004								
33-06	—	08/26/04	72.27	3.0 – 13.0	—	2.67	0	69.60
33-07	—	08/26/04	72.25	3.0 – 13.0	—	2.62	0	69.63
33-08	—	08/26/04	72.23	3.0 – 13.0	—	2.60	0	69.63
33-09	—	08/26/04	72.09	3.0 – 13.0	—	2.44	0	69.65
33-10	—	08/26/04	71.79	6.7 – 16.7	—	2.71	0	69.08

[a] Groundwater elevation was corrected for free product assuming a density of 912 kg/m^3 for the oil.
[b] Free product was observed in well 33-08 during sampling on July 11, 1999, and an absorbent sock was placed in the well on July 14, 1999.
[c] On May 26, 2000, 0.12 ft of free product was observed in well 33-08, and an absorbent sock was placed in the well on May 26, 2000. The absorbent sock was removed from well 33-08 before sampling in June 2000 and was replaced on June 29, 2000. The absorbent sock was removed again on September 25, 2000, and replaced on September 29, 2000, but no free product accumulated during the 4 days of equilibration time.
AMSL Above mean sea level.
BGS Below ground service.
BTOC Below top of casing.

Table 2. Groundwater Analytical Results

Sample Location	Sample ID	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Total BTEX (µg/L)	Total PAH (µg/L)
First Semiannual Monitoring Event – January 1999								
33-06	330622	01/08/99	1.2 J	7.6 =	2.7 =	14.5 =	26.0	ND
33-07	330722	01/08/99	5.8 =	15.2 =	10.5 =	31.9 =	63.4	ND
33-08	330822	01/08/99	**245 =**	143 =	79.2 =	297 =	764.2	71.4
33-10	341022	01/08/99	1.5 J	7.9 =	3.9 =	14.0 =	27.3	41.7
Second Semiannual Monitoring Event – July/August 1999								
33-06	330632	07/11/99	2 U	2 U	2 U	6 U	ND	NA
33-07	330732	07/11/99	6.2 =	0.64 J	3.3 =	3.4 J	13.54	NA
33-08	330832	07/11/99	**213 J**	213 J	95.4 =	452 =	973.4	NA
33-10	331032	07/11/99	2 U	2 U	1.6 J	3.3 J	4.9	NA
Third Semiannual Monitoring Event – January 2000								
33-06	330642	01/28/00	1 U	1 U	0.06 J	3 U	0.06	NA
33-07	330752	01/28/00	11 =	1 U	5.7 =	1.1 J	17.8	NA
33-08	330842	01/28/00	**217 =**	108 =	70.4 =	267 =	662.4	NA
33-10	331042	01/28/00	0.64 J	1 U	1.7 =	0.32 J	2.66	NA
Fourth Semiannual Monitoring Event – June 2000								
33-06	330652	06/22/00	1 U	1 U	1 U	3 U	ND	NA
33-07	330752	06/22/00	19.4 =	1.1 =	11.5 =	1.6 J	33.6	NA
33-08	330852	06/22/00	**173 =**	204 =	42.4 =	232 =	651.4	NA
33-10	331052	06/22/00	1 U	1 U	1.9 =	0.22 J	2.12	NA
Fifth Monitoring Event – July 2004								
33-06	330662	07/16/04	1 U	2.2 U	0.22 J	0.37 J	2.79	NA
33-07	330762	07/16/04	1 U	1 U	0.36 J	1 U	0.36	NA
33-08	330862	07/16/04	**96.7 =**	4.4 U	53.6 =	154 =	304.3	NA
33-10	331062	07/16/04	1 U	1.2 U	1 U	1 U	ND	NA
In-Stream Water Quality Standard (GA EPD Chapter 391-3-6)			72.18	200,000	28,718	NRC	NRC	NRC
Alternate Concentration Limit			2,410	—	—	—	—	—

NOTE:

Bold values exceed In-Stream Water Quality Standard.

BTEX Benzene, toluene, ethylbenzene, and xylenes.
GA EPD Georgia Environmental Protection Division.
NA Not applicable.
ND Not detected.
NRC No regulatory criteria.
PAH Polynuclear aromatic hydrocarbon.

Laboratory Qualifiers

U Indicates the compound was not detected at the concentration reported.
J Indicates the value for the compound is an estimated value.
= Indicates the compound was detected at the concentration reported.

APPENDIX III

LABORATORY ANALYTICAL RESULTS

ANALYTICAL LABORATORY INFORMATION AND DATA VALIDATION CODES

STATE OF GEORGIA
ENVIRONMENTAL LABORATORY ACCREDITATION

	Name of Laboratory:	**General Engineering Laboratories, Inc.**
	Address:	P.O. Box 30712 2040 Savage Road Charleston, SC 29407
	Contact:	Wendy Dimmick
	Telephone number:	(843) 556-8171
	Fax number:	(843) 766-1178
#1	Accrediting Authority:	**State of South Carolina**
	Accreditation Number:	SC-10120001
	Effective Date:	Extension granted while recertification in process; January 27, 2003
	Expiration Date:	March 26, 2005
	Accreditation Scope:	SDWA, CWA, RCRA, CERCLA
#2	Accrediting Authority:	**State of Florida**
	Accreditation Number:	E-87156
	Effective Date:	July 1, 2001 (initial and reaccredited on July 1 each year thereafter)
	Expiration Date:	June 30, 2005
	Accreditation Scope:	SDWA, CWA, RCRA, CERCLA

DATA VALIDATION REASON CODES
Organic, Inorganic, and Radiological Analytical Data

Holding Times

A01 Extraction holding times were exceeded.
A02 Extraction holding times were grossly exceeded.
A03 Analysis holding times were exceeded.
A04 Analysis holding times were grossly exceeded.
A05 Samples were not preserved properly.
A06 Professional judgment was used to qualify the data.

Gas Chromatography/Mass Spectroscopy Tuning

B01 Mass calibration was in error, even after applying expanded criteria.
B02 Mass calibration was not performed every 12 hours.
B03 Mass calibration did not meet ion abundance criteria.
B04 Professional judgment was used to qualify the data.

Initial/Continuing Calibration – Organics

C01 Initial calibration relative response factor (RRF) was <0.05.
C02 Initial calibration relative standard deviation (RSD) was >30%.
C03 Initial calibration sequence was not followed as required.
C04 Continuing calibration RRF was <0.05.
C05 Continuing calibration percent difference (%D) was >25%.
C06 Continuing calibration was not performed at the required frequency.
C07 Resolution criteria were not met.
C08 Relative percent difference (RPD) criteria were not met.
C09 RSD criteria were not met.
C10 Retention time of compounds was outside windows.
C11 Compounds were not adequately resolved.
C12 Breakdown of endrin or dichlorodiphenyltrichloroethane (DDT) was >30%.
C13 Combined breakdown of endrin/DDT was >30%.
C14 Professional judgment was used to qualify the data.

Initial/Continuing Calibration – Inorganics

D01 Initial calibration verification (ICV) or continuing calibration verification (CCV) was not performed for every analyte.
D02 ICV recovery was above the upper control limit.
D03 ICV recovery was below the lower control limit.
D04 CCV recovery was above the upper control limit.
D05 CCV recovery was below the lower control limit.
D06 Standard curve was not established with the minimum number of standards.
D07 Instrument was not calibrated daily or each time the instrument was set up.
D08 Correlation coefficient was <0.995.
D09 Mid-range cyanide standard was not distilled.
D10 Professional judgment was used to qualify the data.

Inductively Coupled Plasma and Furnace Requirements

E01 Interference check sample recovery was outside the control limit.
E02 Duplicate injections were outside the control limit.
E03 Post-digestion spike recovery was outside the control limit.
E04 Method of standard additions (MSA) was required but not performed.
E05 MSA correlation coefficient was <0.995.
E06 MSA spikes were not at the correct concentration.
E07 Serial dilution criteria were not met.
E08 Professional judgment was used to qualify the data.

Blanks

F01 Sample data were qualified as a result of the method blank.
F02 Sample data were qualified as a result of the field blank.
F03 Sample data were qualified as a result of the equipment rinsate.
F04 Sample data were qualified as a result of the trip blank.
F05 Gross contamination exists.
F06 Concentration of the contaminant was detected at a level below the contract-required quantitation limit (CRQL).
F07 Concentration of the contaminant was detected at a level less than the action limit, but greater than the CRQL.
F08 Concentration of the contaminant was detected at a level that exceeds the action level.
F09 No laboratory blanks were analyzed.
F10 Blank had a negative value >2 times the instrument detection limit.
F11 Blanks were not analyzed at the required frequency.
F12 Professional judgment was used to qualify the data.

DATA VALIDATION REASON CODES (continued)
Organic, Inorganic, and Radiological Analytical Data

Surrogate/Radiological Chemical Recovery G01 Surrogate/radiological chemical recovery was above the upper control limit. G02 Surrogate/radiological chemical recovery was below the lower control limit. G03 Surrogate recovery was <10%. G04 Surrogate recovery was zero. G05 Surrogate/radiological chemical recovery data were not present. G06 Professional judgment was used to qualify the data. G07 Radiological chemical recovery was <20%. G08 Radiological chemical recovery was >150%.	**Matrix Spike/Matrix Spike Duplicate** H01 Matrix spike (MS)/matrix spike duplicate (MSD) recovery was above the upper control limit. H02 MS/MSD recovery was below the lower control limit. H03 MD/MSD recovery was <10%. H04 MS/MSD pairs exceeded the RPD limit. H05 No action was taken on MS/MSD limit. H06 Professional judgment was used to qualify the data. H07 Radiological MS/MSD recovery was <20%. H08 Radiological MS/MSD recovery was >160%. H09 Radiological MS/MSD samples were not analyzed at the required frequency.
Matrix Spike I01 MS recovery was above the upper control limit. I02 MS recovery was below the lower control limit. I03 MS recovery was <30%. I04 No action was taken on MS data. I05 Professional judgment was used to qualify the data.	**Laboratory Duplicate** J01 Duplicate RPD/radiological duplicate error ratio (DER) was outside the control limit. J02 Duplicate sample results were >5 times the contract-required detection limit (CRDL). J03 Duplicate sample results were <5 times the CRDL. J04 Professional judgment was used to qualify the data. J05 Duplicate was not analyzed at the required frequency.
Internal Area Summary K01 Area counts were outside the control limits. K02 Extremely low area counts or performance was exhibited by a major drop-off. K03 IS retention time varied by more than 30 sec. K04 Professional judgment was used to qualify the data.	**Pesticide Cleanup Checks** L01 10% recovery was obtained during either check. L02 Recoveries during either check were >120%. L03 Gel permeation chromatography cleanup recoveries were outside the control limits. L04 Florisil cartridge cleanup recoveries were outside the control limits. L05 Professional judgment was used to qualify the data.
Target Compound Identification M01 Incorrect identifications were made. M02 Qualitative criteria were not met. M03 Cross contamination occurred. M04 Confirmatory analysis was not performed M05 No results were provided. M06 Analysis occurred outside 12-hour gas chromatography/mass spectroscopy window. M07 Professional judgment was used to qualify the data. M08 The %D between the two pesticide/polychlorinated biphenyl column checks was >25%.	**Compound Quantitation and Reported CRQLs** N01 Quantitation limits were affected by large off-scale peaks. N02 Method detection limits reported by the laboratory exceeded corresponding CRQLs. N03 Professional judgment was used to qualify the data.
Tentatively Identified Compounds O01 Compound was suspected laboratory contaminant and was not detected in the blank. O02 Tentatively identified compound result was not above 10 times the level found in the blank. O03 Professional judgment was used to qualify analytical data.	**Laboratory Control Samples** P01 Laboratory control sample (LCS) recovery was above the upper control limit. P02 LCS recovery was below the lower control limit. P03 LCS recovery was <50%. P04 No action was taken on the LCS data. P05 LCS was not analyzed at the required frequency. P06 Radiological LCS recovery was <50% for aqueous samples, <40% for solid samples. P07 Radiological LCS recovery was >150% for aqueous samples, >160% for solid samples. P08 Professional judgment was used to qualify the data.

DATA VALIDATION REASON CODES (continued)
Organic, Inorganic, and Radiological Analytical Data

Field Duplicate Q01 Field duplicate RPDs were >30% for waters and/or >50% for soils. Q02 Radiological DER was outside the control limit. Q03 Duplicate sample results were >5 times the CRDL. Q04 Duplicate sample results were <5 times the CRDL.	**Radiological Calibration** R01 Efficiency calibration criteria were not met. R02 Energy calibration criteria were not met. R03 Resolution calibration criteria were not met. R04 Background determination criteria were not met. R05 Quench curve criteria were not met. R06 Absorption curve criteria were not met. R07 Plateau curve criteria were not met. R08 Professional judgment was used to qualify the data.
Radiological Calibration Verification S01 Efficiency verification criteria were not met. S02 Energy verification criteria were not met. S03 Resolution verification criteria were not met. S04 Background verification criteria were not met. S05 Cross-talk verification criteria were not met. S06 Professional judgment was used to qualify the data.	

FIFTH MONITORING EVENT

JULY 2004

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

330662

Lab Name: GEL, LLC. Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 117165-1

Matrix: (soil/water) WATER Lab Sample ID: 117166011

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 7U336

Level: (low/med) LOW Date Received: 07/19/04

% Moisture: not dec. _____ Date Analyzed: 07/29/04

GC Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q	
71-43-2	Benzene	1.0	U	U
108-88-3	Toluene	2.2		U F04, F07
100-41-4	Ethylbenzene	0.22	J	J
1330-20-7	Xylenes (total)	0.37	J	J

FORM I VOA OLM03.0

DATA VALIDATION COPY

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

330762

Lab Name: GEL, LLC. Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 117165-1

Matrix: (soil/water) WATER Lab Sample ID: 117166009

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 7U414

Level: (low/med) LOW Date Received: 07/19/04

% Moisture: not dec. _____ Date Analyzed: 07/29/04

GC Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q	
71-43-2	Benzene	1.0	U	U
108-88-3	Toluene	1.0 ~~0.89~~	J	U F04, F06
100-41-4	Ethylbenzene	0.36	J	J
1330-20-7	Xylenes (total)	1.0	U	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

330862

Lab Name: GEL, LLC. Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 117165-1

Matrix: (soil/water) WATER Lab Sample ID: 117166010

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 7U415

Level: (low/med) LOW Date Received: 07/19/04

% Moisture: not dec. _____ Date Analyzed: 07/29/04

GC Column: DB-624 ID: 0.25 (mm) Dilution Factor: 2.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L		Q
71-43-2	Benzene	96.7		=
108-88-3	Toluene	4.4		U F04, F07
100-41-4	Ethylbenzene	53.6		=
1330-20-7	Xylenes (total)	154		=

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.
330866

Lab Name: GEL, LLC. Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 117165-1

Matrix: (soil/water) WATER Lab Sample ID: 117166007

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 7U413

Level: (low/med) LOW Date Received: 07/19/04

% Moisture: not dec. _____ Date Analyzed: 07/29/04

GC Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L		Q	
71-43-2	Benzene	1.0	1.0	U	U
108-88-3	Toluene	0.90		J	U F04, F06
100-41-4	Ethylbenzene	1.0		U	U
1330-20-7	Xylenes (total)	1.0		U	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

331062

Lab Name: GEL, LLC. Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 117165-1

Matrix: (soil/water) WATER Lab Sample ID: 117166006

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 7U412

Level: (low/med) LOW Date Received: 07/19/04

% Moisture: not dec. _____ Date Analyzed: 07/29/04

GC Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q	
71-43-2	Benzene	1.0	U	U
108-88-3	Toluene	1.2		U F04,F07
100-41-4	Ethylbenzene	1.0	U	U
1330-20-7	Xylenes (total)	1.0	U	U

My 09 3

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Science Applications International Corporation
PO Box 2501, 151 Lafayette Dr., Tennessee 37830 (423) 481-4600

CHAIN OF CUSTODY RECORD

COC NO.: GLTM43

PROJECT NAME: Fort Stewart LTM, D.O. 44

PROJECT NUMBER: 01-1055-04-8991-200

PROJECT MANAGER: ~~Patty Stoll~~ Sharon Stoller

Sampler (Signature): Patricia A. Stoll (Printed Name): PATRICIA A. STOLL

LABORATORY NAME: General Engineering Laboratory

LABORATORY ADDRESS: 2040 Savage Raod, Charleston, SC 29407

PHONE NO: (843) 556-8171

	Sample ID	Date Collected	Time Collected	Matrix	BTEX	VOC	SVOC	Nitrite, Nitrate, Sulfate	Sulfide	Total Iron	Methane	Carbon Dioxide	Total Phosphorus	No. of Bottles/ Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
07	33Ø866	7/16/04	1450	water	2									2		
08	32Ø762		1125		2									2		
09	33Ø762		1335		2									2		
10	33Ø862		1300		2									2		
11	33Ø662		1220		2									2		
12	32Ø862		1050		2									2		
13	32Ø864		1050		2									2		
14	321162		0945		2									2		
15	321Ø62		0910		2									2		
16	TBØ4Ø2		0745		2									2		
						P.C. Stoll 7/19/04										

REQUESTED PARAMETERS

RELINQUISHED BY: Patricia A. Stoll	Date/Time 7/19/04 1140	RECEIVED BY: [illegible]	Date/Time 7/19/04 1430
COMPANY NAME: SAIC		COMPANY NAME: GEL	
RECEIVED BY: [illegible]	Date/Time 7/19/04 1140	RELINQUISHED BY:	Date/Time
COMPANY NAME: GEL		COMPANY NAME:	
RELINQUISHED BY: [illegible]	Date/Time 7/19/04 1430	RECEIVED BY:	Date/Time
COMPANY NAME: GEL		COMPANY NAME:	

TOTAL NUMBER OF CONTAINERS: 72

Cooler ID: 123

Cooler Temperature: 4°C

FEDEX NUMBER: N/A

APPENDIX IV

SITE RANKING FORM

FIFTH MONITORING EVENT

JULY 2004

SITE RANKING FORM

Facility Name: UST 89, Building 1247 **Ranked by:** S. Stoller

County: Liberty **Facility ID #:** 9-089074 **Date Ranked:** 9/3/04

SOIL CONTAMINATION (Closure and CAP–Part B soil data)

A. Total PAHs -
Maximum Concentration found on the site
(assume <0.660 mg/kg if only gasoline was stored on the site)

* ☒	≤0.660 mg/kg	=	0
☐	>0.66 - 1 mg/kg	=	10
☐	>1 - 10 mg/kg	=	25
☐	>10 mg/kg	=	50

* *Elevated PAH reporting limit for one sample; however, no estimated concentrations below that limit.*

B. Total Benzene -
Maximum Concentration found on the site

☐	≤0.005 mg/kg	=	0
☐	>0.005 - .05 mg/kg	=	1
* ☒	>0.05 - 1 mg/kg	=	10
☐	>1 - 10 mg/kg	=	25
☐	>10 - 50 mg/kg	=	40
☐	>50 mg/kg	=	50

* *Elevated detection limits in two CAP-Part B samples*

C. Depth to Groundwater
(bls = below land surface)

☐	>50' bls	=	1
☐	>25' - 50' bls	=	2
☐	>10' - 25' bls	=	5
☒	≤10' bls	=	10

Fill in the blanks: (A. 0) + (B. 10) = (10) x (C. 10) = (D. 100)

GROUNDWATER CONTAMINATION

E. Free Product (nonaqueous-phase liquid hydrocarbons; see Guidelines for definition of "sheen").

* ☒	No free product	=	0
☐	Sheen - 1/8"	=	250
☐	>1/8" - 6"	=	500
☐	>6" - 1 ft.	=	1,000
☐	For every additional inch, add another 100 points = 1,000 +		

* *No free product in July 2004*

F. Dissolved Benzene -
Maximum Concentration at the site
(one well must be located at the source of the release.)

☐	≤5 µg/L	= 0
* ☒	>5 - 100 µg/L	= 5
☐	>100 - 1,000 µg/L	= 50
☐	>1,000 - 10,000 µg/L	= 500
☐	>10,000 µg/L	= 1500

* *LTM sample 330862 (July 2004)*

Fill in the blanks: (E. 0) + (F. 5) = (G. 5)

Facility Name: UST 89, Building 1247 **County:** Liberty **Facility ID #:** 9-089074

POTENTIAL RECEPTORS (MUST BE FIELD-VERIFIED)

Distance from nearest contaminant plume boundary to the nearest downgradient and hydraulically connected Point of Withdrawal for water supply. **If the point of withdrawal is not hydraulically connected, evidence as outlined in the CAP-A guidance document MUST be presented to substantiate this claim.**

H. Public Water Supply

☐	Impacted	=	2000
☐	≤500'	=	500
☐	>500' - ¼ mi	=	25
☐	¼ mi - 1 mi	=	10
☐	>1 mi - 2 mi	=	2
* ☒	> 2 mi	=	0

For lower susceptibility areas only:

☐	>1 mi	=	0

I. Non-Public Water Supply

☐	Impacted	=	1000
☐	≤100'	=	500
☐	>100' - 500'	=	25
☐	>500' - ¼ mi	=	5
☐	>¼ - ½ mi	=	2
☒	>½ mi	=	0

For lower susceptibility areas only:

☐	>¼ mi	=	0

Note: If site is in lower susceptibility area, do not use the shaded areas.

* For justification that withdrawal point is not hydraulically connected, see attached text.

J. Distance from nearest Contaminant Plume boundary to downgradient Surface Waters **OR UTILITY TRENCHES & VAULTS** (a utility trench may be omitted from ranking if its invert elevation is more than 5 feet above the water table)

☐	Impacted	=	500
* ☒	≤500'	=	50
☐	>500' - 1,000'	=	5
☐	>1,000'	=	2

* *Underground utilities in the vicinity, closest receptor is 1000 feet.*

K. Distance from any Free Product to basements and crawl spaces

☐	Impacted	=	500
☐	<500'	=	50
☐	>500' - 1,000'	=	5
☒	>1,000' or no free product.	=	0

Fill in the blanks: (H. 0) + (I. 0) + (J. 50) + (K. 0) = L. 50

(G. 5) x (L. 50) = M. 250

(M. 250) + (D. 100) = N. 350

P. **SUSCEPTIBILITY AREA MULTIPLIER**

☐ If site is located in a Low Ground-Water Pollution Susceptibility Area = 0.5

☒ All other sites = 1

Q. **EXPLOSION HAZARD**

Have any explosive petroleum vapors, possibly originating from this release, been detected in any subsurface structure (e.g., utility trenches, basements, vaults, crawl spaces, etc.)?

☐ Yes = 200,000

☒ No = 0

Fill in the blanks: (N. 350) x (P. 1) = (350) + (Q. 0)

= 350 (July 2004 - Fifth Monitoring Event)
ENVIRONMENTAL SENSITIVITY SCORE

ADDITIONAL GEOLOGIC AND HYDROGEOLOGIC DATA

The following provides supplemental information to Item H of the Site Ranking Form. It also provides details relating to the geologic and hydrogeologic conditions at Fort Stewart that support Fort Stewart's determination that the water withdrawal points located at the site are not hydraulically connected to the surficial aquifer.

1.0 REGIONAL AND LOCAL GEOLOGY

Fort Stewart is located within the coastal plain physiographic province. This province is typified by nine southeastward-dipping strata that increase in thickness from 0 ft at the fall line, located approximately 150 miles inland from the Atlantic coast, to approximately 4,200 ft at the coast. State geologic records describe a probable petroleum exploration well (the No. 1 Jelks-Rogers) located in the region as encountering crystalline basement rocks at a depth of 4,254 ft below ground surface (BGS). This well provides the most complete record for Cretaceous, Tertiary, and Quaternary sedimentary strata in the region.

The Cretaceous section was found to be approximately 1,970 ft thick and dominated by clastics. The Tertiary section was found to be approximately 2,170 ft thick and dominated by limestone, with a 175-ft-thick cap of dark green phosphatic clay. This clay is regionally extensive and is known as the Hawthorn Group. The interval from approximately 110 ft to the surface is Quaternary in age and composed primarily of sand with interbeds of clay or silt. This section is undifferentiated into separate formations (Herrick and Vochis 1963).

State geologic records contain information regarding a well drilled in October 1942, 1.8 miles north of Flemington at Liberty Field of Camp Stewart (now known as Fort Stewart). This well is believed to be an artesian well located approximately 1/4 mile north of the runway at Wright Army Airfield within the Fort Stewart Military Reservation. The log for this well describes a 410-ft section, the lowermost 110 ft of which consisted predominantly of limestone sediments, above which 245 ft of dark green phosphatic clay typical of the Hawthorn Group were encountered. The uppermost portion of the section was found to be Quaternary-age interbedded sands and clays. The top 15 ft of these sediments were described as sandy clay (Herrick and Vochis 1963).

The surface soil located throughout the Fort Stewart garrison area consists of Stilson loamy sand. The surface layer of this soil is typically dark grayish-brown loamy sand measuring approximately 6 in. in depth. The surface layer is underlain by material consisting of pale yellow loamy sand and extends to a depth of approximately 29 in. The subsoil is predominantly sandy clay loam and extends to a depth of 72 in. or more (Herrick and Vochis 1963).

2.0 REGIONAL AND LOCAL HYDROGEOLOGY

The hydrogeology in the vicinity of Fort Stewart is dominated by two aquifers referred to as the Principal Artesian and the surficial aquifers. The Principal Artesian Aquifer is the lowermost hydrologic unit and is regionally extensive from South Carolina through Georgia, Alabama, and most of Florida. Known elsewhere as the Floridan, this aquifer is composed primarily of Tertiary-age limestone, including the Bug Island Formation, Ocala Group, and Suwannee Limestone. These formations are approximately 800 ft thick, and groundwater from this aquifer is used primarily for drinking water (Arora 1984).

The uppermost hydrologic unit is the surficial aquifer, which consists of widely varying amounts of sand and clay ranging from 55 to 150 ft in thickness. This aquifer is used primarily for domestic lawn and agricultural irrigation. The top of the water table ranges from approximately 2 to 10 ft BGS (Geraghty and Miller 1993). The base of the aquifer corresponds to the top of the underlying dense clay of the Hawthorn Group. The Hawthorn Group was not encountered during drilling at this site but is believed to be located at 40 to 50 ft BGS; therefore, the effective aquifer thickness would be approximately 35 to 45 ft. Soil surveys for Liberty and Long Counties describe the occurrence of a perched water table within the Stilson loamy sands present within Fort Stewart (Looper 1980).

The confining layer for the Principal Artesian Aquifer is the phosphatic clay of the Hawthorn Group and ranges in thickness from 15 to 90 ft. The vertical hydraulic conductivity of this confining unit is on the order of 10^{-8} cm/second. There are minor occurrences of aquifer material within the Hawthorn Group; however, they have limited utilization (Miller 1990). The Hawthorn Group has been divided into three formations: Coosawhatchie, Markshead, and Parachula, listed from youngest to oldest.

The Coosawhatchie Formation is predominantly composed of clay but also has sandy clay, argillaceous sand, and phosphorite units. The formation is approximately 170 ft thick in the Savannah, Georgia, area. This unit disconformably overlies the Markshead Formation and is distinguished from the underlying unit by dark phosphatic clays or phosphorite in the lower part and fine-grained sand in the upper part.

The Markshead Formation is approximately 70 ft thick in the Savannah, Georgia, area and consists of light-colored phosphatic, slightly dolomitic, argillaceous sand to fine-grained sandy clay with scattered beds of dolostone and limestone.

The Parachula Formation consists of sand, clay, limestone, and dolomite and is approximately 10 ft thick in the Savannah, Georgia, area. The Parachula Formation generally overlies the Suwannee Limestone in Georgia.

Groundwater encountered at all the underground storage tank (UST) investigation sites is part of the surficial aquifer system. Based on the fact that all public and nonpublic water supply wells draw water from the Principal Artesian (Floridan) Aquifer and that the Hawthorn confining unit separates the Principal Artesian Aquifer from the surficial aquifer, it is concluded that there is no hydraulic interconnection between the surficial aquifer (and associated groundwater plumes, if applicable) located beneath former UST sites and identified water supply withdrawal points at Fort Stewart.

3.0 REFERENCES

Arora, Ram 1984. *Hydrologic Evaluation for Underground Injection Control in the Coastal Plain of Georgia,* Department of Natural Resources, Environmental Protection Division, Georgia Geological Survey.

Geraghty and Miller 1993. *RCRA Facility Investigation Work Plan, Fort Stewart, Georgia*.

Herrick, S. M., and R. C. Vochis 1963. *Subsurface Geology of the Georgia Coastal Plain*, Georgia Geologic Survey Information Circular 25.

Looper, Edward E. 1980. *Soil Survey of Liberty and Long Counties, Georgia*, U. S. Department of Agriculture, Soil Conservation Service.

Miller, James A. 1990. *Groundwater Atlas of the United States*, U. S. Department of the Interior, U. S. Geological Survey, Hydrologic Inventory Atlas 730G.

APPENDIX V

REIMBURSEMENT APPLICATION

Fort Stewart is a federally owned facility and has funded the investigation for the Underground Storage Tank 89 site, Building 1247, Facility ID #9-089074 using U.S. Department of Defense Environmental Restoration Account Funds. Application for Georgia Underground Storage Tank Trust Fund reimbursement is not being pursued at this time.

ATTACHMENT A

SUMMARY OF FATE AND TRANSPORT MODELING RESULTS

A.1 FATE AND TRANSPORT MODELING

In summary, the Analytical Transient 1-, 2-, 3-Dimensional Model was used to model contaminant migration to two potential downgradient receptors: a drainage ditch located approximately 1,000 ft southwest of the site and Mill Creek located approximately 3,000 ft southwest of the site. An underground water line located in the vicinity of the site is above the water table and was not considered a potential preferential pathway for contaminant migration.

A.1.1 Summary of CAP–Part A Report Fate and Transport Modeling Results

The fate and transport modeling performed as part of the *Corrective Action Plan–Part B Report for UST 89, Facility ID #9-089074, Building 1247, Fort Stewart, Georgia,* (SAIC 1999) was based on the assumption of a continuous source of contamination of infinite duration at the site given the maximum observed benzene concentration in groundwater [i.e., 149 µg/L in well 33-08 during the Corrective Action Plan (CAP)–Part A investigation in December 1997]. The fate and transport modeling results indicated that the benzene plume would not reach the drainage ditch or Mill Creek at detectable concentrations. Benzene was the only constituent at the site that exceeded its In-Stream Water Quality Standard (IWQS); therefore, an alternate concentration limit (ACL) was developed for only benzene. The estimated dilution attenuation factor (DAF) for benzene was 482, which resulted in an ACL of 2,410 µg/L based on the maximum concentration limit of 5 µg/L.

A.1.2 Summary of Second Annual Monitoring Only Report Fate and Transport Modeling Results

As a result of the benzene concentrations observed during the CAP–Part A and Part B investigations and 2 years of semiannual monitoring, the fate and transport modeling results were revised in the *Second Annual Monitoring Only Report for UST 89, Facility ID #9-089074, Building 1247, Fort Stewart, Georgia,* (SAIC 2000) to reflect more recent site conditions assuming a continuous source of contamination and using the maximum observed benzene concentration in groundwater during the semiannual monitoring events (i.e., 245 µg/L at well 33-08 in January 1999). The benzene concentrations in well 33-08 in the following three semiannual sampling events were used in calibrating the model. Well 33-08 is not located within the source area; thus, the maximum predicted concentration of benzene in the source area (i.e., tank pit) was predicted to be 494 µg/L. A near steady-state source was assumed for conservatism. The source, together with hydraulic conductivity and longitudinal dispersivity, were reevaluated through the calibration process and modified from the original fate and transport modeling presented in the CAP–Part B Report. The source was calibrated as a 2.18 mg/hour continuous pulse for 5 years that was shut off 6 months before the first measurement. The hydraulic conductivity was calibrated to be 7.2×10^{-4} m/hour, which was two orders of magnitude slower than the value used in the original fate and transport model. The receptor locations remained the same as those in the previous fate and transport modeling. Based on the revised modeling results, the DAF for benzene is infinity at the drainage ditch and Mill Creek.

Benzene is the only constituent that exceeds its respective IWQS of 71.28 µg/L. An ACL of 2,410 µg/L was developed during the CAP–Part B and was based on the maximum contaminant level for benzene and the DAF determined during the CAP–Part B fate and transport model. The IWQS could have been used as the regulatory level because the surficial aquifer is not a drinking water aquifer, and the most likely receptor for the surficial aquifer is a surface water body; however, the use of the IWQS would have just increased the ACL. By using the results of the fate and transport modeling performed as part of the Second Annual Monitoring Only Report, the ACL would become infinity because of the infinite DAF. Thus, it was proposed that the ACL remain the same as calculated in the CAP–Part B Report (SAIC 1999).

A.1.3 Fate and Transport Modeling Conclusions

The revised fate and transport model assumed the source is a continuous pulse for 5 years that was shut off 6 months before the first measurement at the site based on the maximum observed benzene concentration (i.e., 245 μg/L) in groundwater during the semiannual monitoring events. The continuous pulse was used to calibrate the model based on the results of semiannual sampling. The conclusions based on the revised fate and transport modeling results are listed below.

- Benzene concentrations in groundwater do not exceed the ACL of 2,410 μg/L in any of the wells at the site and have not exceeded the ACL during the CAP–Part A investigation, CAP–Part B investigation, and/or the four semiannual sampling events.

- Benzene does not impact the closest downgradient receptor, a drainage ditch located 1,000 ft downgradient of the site, at concentrations above the IWQS.

- Benzene concentrations in groundwater will continue to decrease as a result of natural attenuation.

A.2 REFERENCES

SAIC (Science Applications International Corporation) 1999. *CAP–Part B Report for UST 89, Facility ID #9-089074, Building 1247, Fort Stewart, Georgia*, Oak Ridge, Tennessee, March.

SAIC 2000. *Second Annual Monitoring Only Report for UST 89, Facility ID #9-089074, Building 1247, Fort Stewart, Georgia*, Oak Ridge, Tennessee, November.

ATTACHMENT B

REFERENCES

REFERENCES

Logan, William E. 1999. Letter to Thomas C. Fry (Fort Stewart Directorate of Public Works, Environmental Branch), June 28.

Logan, William E. 2000. Letter to Ovidio Perez (Fort Stewart Directorate of Public Works, Environmental Branch), January 25.

Logan, William E. 2001. Letter to Gregory Stanley (Fort Stewart Directorate of Public Works, Environmental Branch), September 28.

SAIC (Science Applications International Corporation) 1997. *CAP–Part A Report for UST 89, Facility ID #9-089074, Building 1247, Fort Stewart, Georgia*, Oak Ridge, Tennessee, May.

SAIC 1999a. *CAP–Part B Report for UST 89, Facility ID #9-089074, Building 1247, Fort Stewart, Georgia*, Oak Ridge, Tennessee, March.

SAIC 1999b. *First Semiannual Monitoring Progress Report for UST 89, Facility ID #9-089074, Building 1247, Fort Stewart, Georgia*, Oak Ridge, Tennessee, May.

SAIC 1999c. *First Annual Monitoring Only Report for UST 89, Facility ID #9-089074, Building 1247, Fort Stewart, Georgia*, Oak Ridge, Tennessee, October.

SAIC 2000a. *Third Semiannual Monitoring Only Report for UST 89, Facility ID #9-089074, Building 1247, Fort Stewart, Georgia*, Oak Ridge, Tennessee, May.

SAIC 2000b. *Second Annual Monitoring Only Report for UST 89, Facility ID #9-089074, Building 1247, Fort Stewart, Georgia*, Oak Ridge, Tennessee, November.

SAIC 2002. *Third Annual Monitoring Only Report for UST 89, Facility ID #9-089074, Building 1247, Fort Stewart, Georgia*, Oak Ridge, Tennessee, July.

SAIC 2003. *Fourth Annual Monitoring Only Report for UST 89, Facility ID #9-089074, Building 1247, Fort Stewart, Georgia*, Oak Ridge, Tennessee, July.

ATTACHMENT C

CERTIFICATES OF ANALYSIS

The original certificates of analysis and chain-of-custody forms will be provided in the Fifth Annual Monitoring Only Report.