**CORRECTIVE ACTION BASELINE REPORT
FOR UNDERGROUND STORAGE TANK
2331-U AT THE BUILDING 9201-1 SITE**

1331.940202.010

**OAK RIDGE Y-12 PLANT
OAK RIDGE, TENNESSEE
FACILITY ID #0-010117**

January 1994

**Environmental Management Department
Health, Safety, Environment,
and Accountability Organization**

Prepared by

**Science Applications International Corporation
Under Subcontract 18B-99069C
for the
Oak Ridge Y-12 Plant
Oak Ridge, Tennessee 37831**

Managed by

**Martin Marietta Energy Systems, Inc.
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LIST OF ACRONYMS

UST	underground storage tank
TDEC	Tennessee Department of Environment and Conservation
CAP	corrective action plan
TPH-GRO	total petroleum hydrocarbons - gasoline range organics
BTEX	benzene, toluene, ethylbenzene, and xylene

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this report is to provide baseline geochemical and hydrogeologic data relative to corrective action for underground storage tank (UST) 2331-U at the Building 9201-1 Site. This report has been prepared in accordance with the requirements of the Tennessee Department of Environment and Conservation (TDEC) Rule 1200-1-15, the TDEC UST Reference Handbook (TDEC 1992), and the approved revised corrective action plan (CAP) for this site (Energy Systems 1993). Progress in support of the Building 9201-1 Site has included monitoring well installation and baseline groundwater sampling and analysis.

This document represents the baseline report for corrective action at the Building 9201-1 site and is organized into three sections. Section 1 presents introductory information relative to the site, including the regulatory initiative, site description, and progress to date. Section 2 includes the summary of additional monitoring well installation activities and the results of baseline groundwater sampling. Section 3 presents the baseline hydrogeology and planned zone of influence for groundwater remediation.

1.2 SITE DESCRIPTION

The Building 9201-1 Site is located within the south central portion of the Exclusion Zone at the Oak Ridge Y-12 Plant. The site is generally defined as the area directly south of the concrete ramp/loading dock on the east side of Building 9201-1 (Figure 1-1). The site was previously the location of an active 560 gallon gasoline storage tank and dispensing pump used to fuel gasoline-powered equipment in the area. The tank has been excavated and removed from the site.

The topography of the Building 9201-1 Site gently decreases in elevation from north to south across the facility and any petroleum contamination resulting from past operations would be expected to migrate to the south/southeast away from the source area. A summary of the major events related to the tank at the site is presented in Table 1-1.

1.3 PROGRESS SUMMARY

Preceding TDEC approval of the Revised CAP in December 1993, steps were taken to implement the soil and groundwater corrective action at the site. In addition to monitoring well GW-193, installed during 1989, and GW-657, GW-707, and GW-708 installed in 1990, three groundwater monitoring wells were installed downgradient of the projected contaminant plume to complete delineation in accordance with the CAP. Monitoring wells GW-808, GW-809, and GW-810 were installed during late July 1993. These seven wells were sampled on November 2, 1993 and analytical results were received on November 29, 1993. Water level measurements for baseline hydrogeologic interpretation were taken in December 1993.

Activities completed to date are following the implementation schedule presented in the revised CAP. A comparison of the planned versus actual/projected dates for completion of milestone corrective action activities is presented in Table 1-2. A staged approach to installation of the groundwater recovery system will be pursued in order to limit or prevent continued migration of contaminants along the downgradient margins of the groundwater plume. Existing wells and/or installed extraction wells will be used for groundwater recovery.

Table 1-1 Chronological Summary of Events at the Building 9201-1 Site

- 1972 Underground storage tank 2331-U installed and placed into service at the Building 9201-1 Site.
- 1988 Tank 2331-U is tested for tightness in response to reports of gasoline vapors. Tightness test results indicated leakage in excess of regulatory allowable rate of 0.1 gal/h. The tank was removed and soil samples were analyzed.
- 1989 Initial Site Characterization Report and Site Investigation Plan was approved by the TDEC. Well GW-193 installed to determine if free product migration had occurred. A soil gas survey and slug test were performed as part of Initial Site Characterization Report and Site Investigation Plan activities.
- 1990 Field work for the Site Investigation began in July. Soil borings and groundwater monitoring well installation and sampling were performed.
- 1992 Original Corrective Action Plan submitted to TDEC.
- 1993 TDEC identifies deficiencies with the CAP and requests a revision. Revised CAP submitted and subsequently approved by TDEC. Installation of three downgradient groundwater wells.
-

Table 1-2 Planned/Actual Schedule for Corrective Action Activities

Corrective action activity	Planned date	Actual/ projected date
TDEC Approval of Revised CAP	N/A	12/7/93
Begin Installation of Additional Site Monitoring Wells, and Sampling and Analysis of Groundwater	1/21/94	7/21/94
Receipt of Groundwater Analytical Data	N/A	11/29/93
Receipt of Wet Season Water Level Measurements	N/A	12/13/93
Issue Baseline Report	1/13/94	~1/18/94
Issue Bid Specifications for Procurement of Thermal Desorption Services	2/1/94	—
Begin Soil Excavation	2/18/94	—
Begin Installation of Groundwater Recovery System	2/18/94	—
Begin Operation of Groundwater Recovery System and Treatment of Contaminated Groundwater	3/18/94	—
Issue First Monthly Report on Progress and Field Sample Analysis (if available)	Within 45 days soil excavation	As scheduled
Begin Aeration Treatment of Contaminated Soils	Within 60 days contract award	As scheduled
Issue Second and Third Monthly Reports on Progress and Field Sample Analysis	Monthly after first report	As scheduled
Issue Quarterly Reports on Progress and Field/Treatment Sample Analyses	Quarterly	As scheduled
Issue Final Corrective Action Report	Within 90 days completion	As scheduled

2.0 ANALYTICAL RESULTS

2.1 Groundwater Sample Collection and Analysis

2.1.1 New and Existing Well Locations

At present, seven groundwater monitoring wells are located south and east of the location of the former UST 2331-U. The location of the monitoring wells used in the groundwater monitoring at the facility are presented in Figure 2-1. Three wells were installed prior to approval of the revised CAP in December 1993. These wells are GW-808, GW-809, and GW-810, which were installed July 1993. The additional wells extend groundwater monitoring coverage to the east and south of the facility. Well installation reports for wells GW-808, GW-809, and GW-810 are contained in Appendix A. Well details for the seven groundwater monitoring wells are listed in Table 2-1.

2.1.2 Groundwater Sampling

The groundwater monitoring wells at the Building 9201-1 Site were sampled for baseline data on November 2, 1993. Wells were purged for three well volumes with field measurement of pH, conductivity, temperature, and dissolved oxygen during the purging operation to ensure representativeness for sampling. The wells were allowed to recover and samples were collected for analysis in pre-prepared bottles.

2.1.3 Sample Analysis

Samples were analyzed for total petroleum hydrocarbons for gasoline range organics (TPH-GRO) and for benzene, toluene, ethylbenzene, and xylene (BTEX). Analytical results for the November 1993 sampling event are summarized in Table 2-2 with laboratory reports presented in Appendix B.

2.2 Groundwater Data Evaluation

2.2.1 Baseline Sampling Analysis Results

Analytical data to support delineation of the ground water contamination at the Building 9201-1 Site has been collected through the Site Investigation in October 1990 and as part of the Y-12 Plant Groundwater Quality Assessment Program during the years 1990 and 1991. Data generated from these investigations are presented in Appendices F and G of the revised CAP. Based on results of previous groundwater quality investigations, the groundwater at the Building 9201-1 Site is classified as a nondrinking water source. According to this classification, the TDEC closure action levels for groundwater at the Building 9201-1 Site are 0.070 ppm for benzene and 1.0 ppm for TPH. Analytical results from the baseline sampling event that exceed the TDEC Closure Action Limits are indicated with an asterisk in Table 2-2.

Groundwater samples analyzed from wells GW-193, GW-707, and GW-708 have historically produced groundwater samples with analysis in excess of the 0.070 ppm benzene Closure Action Levels for contaminated groundwater and these limits were again exceeded with samples from the November, 1993 baseline sampling in wells GW-193 and GW-707. Analysis of samples collected from the remaining wells, GW-657, GW-708, GW-808, GW-809, and GW-810 did not exceed the TDEC Closure Action Limits.

Table 2-1 Groundwater Monitoring Well Details for the Building 9201-1 Site

Well #	Aquifer Zone	Well Depth	T.O.C. ¹ Elevation (MSL) ²	Surface Elevation (MSL)	Installation Date	WL ³ Readings	Time Frame	Average WL Depth BTOC ⁴	High WL BTOC	Low WL BTOC
GW-193	WT ⁵	18.4	934.00	931.11	8/89	11	1990,91, 92, 93	5.73	5.31	6.36
GW-657	WT	17.1	930.53	930.80	10/90	9	1991,92, 93	6.30	5.27	7.25
GW-707	WT	26.0	930.91	931.16	10/90	9	1991,92, 93	6.02	5.25	6.35
GW-708	WT	13.9	930.87	931.03	10/90	9	1991,92, 93	5.07	4.51	5.51
GW-808	WT	40.4	930.75	931.24	7/93	1	12/1993	8.05 ⁶	NA ⁷	NA
GW-809	WT	40.0	931.04	931.27	7/93	1	12/1993	8.81 ⁶	NA	NA
GW-810	WT	26.8	931.44	931.68	7/93	1	12/1993	8.67 ⁶	NA	NA

¹Top of Casing

²Mean Sea Level

³Water Level

⁴Below Top of Casing

⁵Water Table

⁶December, 1993 measurement only

⁷Not Applicable

Table 2-2 Baseline Groundwater Analytical Results, November 2, 1993

WELL #	TPH-GRO (ppm)	Benzene (ppm)	Ethyl- benzene (ppm)	Toluene (ppm)	Xylene (ppm)
GW-193	5.50*	1.68E*	0.575	0.235	0.353
GW-657	<0.100	<0.001	<0.001	<0.001	<0.001
GW-707	7.50*	0.900*	0.800	0.095	1.575
GW-708	<0.100	<0.001	<0.001	<0.001	<0.001
GW-808	0.140	<0.001	0.016	<0.001	0.111
GW-809	<0.100	0.001	0.003	0.001	0.016
GW-810	0.190	0.001	0.019	0.001	0.136

E = benzene exceeded calibration range

*The closure action levels at the Building 9201-1 Site are TPH-1.0 ppm; benzene - 0.070 ppm

2.2.2 Changes in Contaminant Extent

The analytical results confirm the lateral extent of contamination as previously delineated in the revised CAP (Energy Systems, 1993). The additional data from the 1993 installed wells (GW-808, GW-809, and GW-810) suggests a slight extension of the contamination area further to the south toward the GW-808 location (Figure 2-2) based on observed contaminant concentrations. The contaminant plume does not appear to extend to the location of GW-809, GW-810, or further south to GW-657, as indicated by the low level values for benzene and TPH. Migration of the contaminant plume is also indicated by the nondetection of contaminants in GW-708, a monitoring well with a previous history of contamination.

2.3 Confirmatory Soil Sampling

Soil excavation activities have not been initiated at the tank 2331-U site. Confirmatory sampling in accordance with the revised CAP will be conducted during soil corrective action. The results of this sampling will be reported in subsequent progress reports.

3.0 ZONE OF INFLUENCE

3.1 Baseline Hydrogeologic Conditions

Mapping of the potentiometric surface based on seasonal water level measurements obtained during May and June 1990 and 1992 indicated groundwater generally flows from the north/northwest to the south/southeast across the Building 9201-1 Site (Energy Systems 1993). Additional measurement of water levels was made prior to the issuance of this report to confirm established trends and update potentiometric maps with data from recently installed wells.

3.1.1 Water Level Measurements

Water level measurement for the seven groundwater monitoring wells at the Building 9201-1 Site are listed in Table 3.1. Water level measurements were taken in late December 1993 and therefore correspond closely to the expected fall/winter water levels.

3.1.2 Potentiometric Surface

Mapping of the groundwater potentiometric surface present at the Building 9201-1 Site based on the December 1993 data confirms water flows to the south-southeast across the site (Figure 3.1). Average water level data are not available for the recently installed wells thus a comparison of winter levels to May/June levels has not been performed. A comparison of Figure 3.1 to the potentiometric surface presented in the approved CAP reflects the control of the additional water levels from wells GW-808, GW-809, and GW-810. The December water level data suggest a strong southerly component to groundwater flow southeast of the UST site. It should be noted the configuration of the contours reflects a single event measurement and is representative of the seasonal water table.

3.2 Adjusted Zone of Influence

The delineated area of hydrocarbon contamination (Figure 2.2) is supported by the projected groundwater flow as contoured in Figure 3-1 and validated by groundwater samples from the seven groundwater monitoring wells. Therefore, adjustment of the zone of influence, as depicted in the approved CAP, has been performed. The adjusted zone of influence (Figure 3-2) occupies an area of approximately 2,296 ft². Assuming an effective aquifer depth of 8 ft and 10% porosity in the saturated soil, the current contaminated groundwater volume is estimated to be approximately 13,730 gallons.

The planned zone of influence of the groundwater recovery system will be sufficient to encompass the current area of contaminated groundwater without adjustment of the planned location of the extraction wells, as depicted in the CAP and Figure 3-2 of this document. The actual drawdown produced by the groundwater recovery system will be mapped and presented in subsequent status reports following implementation of groundwater corrective action. Any deficiency in the zone of influence of the groundwater recovery system will be corrected by adjusting pumping rates or utilization of existing wells to complement the recovery system.

Table 3.1 Water Level Measurements-Building 9201-1 Site

Monitoring Well #	Date Measured	Total Well Depth (BGL) ¹	Top of Casing (MSL) ²	Top of Casing to Water Level (BTOC) ³	Potentiometric Surface (MSL)
GW-193	12/18/93	18.4 ft	934.00 ft	8.71 ft	925.29 ft
GW-657	12/18/93	17.1 ft	930.53 ft	6.96 ft	923.57 ft
GW-707	12/18/93	26.0 ft	930.91 ft	6.22 ft	924.69 ft
GW-708	12/18/93	13.9 ft	930.87 ft	4.53 ft	926.34 ft
GW-808	12/18/93	40.4 ft	930.75 ft	8.05 ft	922.70 ft
GW-809	12/18/93	40.0 ft	931.04 ft	8.31 ft	922.73 ft
GW-810	12/18/93	26.8 ft	931.44 ft	8.67 ft	922.77 ft

¹BGL - Below Ground Level

²MSL - Mean Sea Level

³BTOC - Below Top of Casing

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Appendix A

Monitoring Well Installation and Development Reports

A.1 GW-808

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		WELL NO. <u>GW-808</u>
WELL LOG		FACILITY ID <u>0-010117</u> BUILDING <u>9201-1</u>
LOCATION: <u>Building 9201-1</u>		DATE: START: <u>7-21-93</u>
DRILLERS: <u>Randy Phillips - Highland Drilling Co.</u>		FINISH: <u>7-23-93</u>
HELPERS: <u>Steve Brown, Greg Shillings - Highland</u>		DRILLING METHOD: <u>Air Rotary</u>
DRILL: <u>Ingersoll- Rand T4W</u>		LOGGED BY: <u>S.L. Abston - SAIC</u>
NOTES: <u>UST, PVC, screened well monitoring water zone in fracture of the Maynardville formation.</u>		

DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		
0.0	0.3		Asphalt
0.3	6.0	Beta + gamma = 60 cpm (background = 60 cpm); Organic vapor (breathing zone) = 0.2 ppm (background = 0.4 ppm); Alpha = 0.0 cpm (background = 30 cpm)	Moderate brown (5YR 4/4) clay with medium light gray to black (N6-N2) fragments of chert and limestone. Weathered bedrock (TOWR) at 4.0 ft BGS
6.0	10.0	Beta + gamma = 50 cpm . Organic vapor (breathing zone) = 0 ppm; Alpha = 0 cpm	Medium light gray to medium gray (N6-N5) limestone (microcrys- talline) with $\approx$ 40 % having microcalcite coatings. Fresh bedrock (TOFR) at 6.2 ft BGS.
10.0	25.0	Beta + gamma = 50 cpm . Organic vapor (breathing zone) = 0 ppm; Alpha = 0 cpm	Medium light gray to medium gray (N5-N6) microcrystalline limestone.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-808

FACILITY ID 0-010117
BUILDING 9201-1

WELL LOG - continued

PAGE 2 of 2

[illegible]

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-808

WELL INSTALLATION DIAGRAM

LOGGED BY: S.L. Abston - SAIC

DRILLING DATES

DRILLING COMPANY: Highland Drilling Co.STARTED: 7-21-93DRILLER: Hubert Hall/Randy Phillips HELPER: Steve Brown
Greg ShillingsFINISHED: 7-23-93

NOT TO SCALE

WELL NO. GW-808

WELL INSTALLATION COMPLETION DATE: 7-28-93

***Note: Initial water sample taken for health and safety and waste management screening only. Initial sample is not considered part of well development.**

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	FACILITY ID 01010117 BUILDING 9201-1 WELL NO. GW-808
MONITORING WELL DEVELOPMENT SUMMARY	
METHOD OF DEVELOPMENT: <u>Swab</u>	
DEVELOPMENT OBSERVED BY: <u>Timothy Coffey - SAIC</u>	
ONE WELL VOLUME: <u>19.0</u> GALLONS	
TOTAL GALLONS PUMPED: <u>157</u> TOTAL WELL VOLUMES PUMPED: <u>8.3</u>	
INITIAL pH: <u>8.2</u> FINAL pH: <u>7.8</u>	
INITIAL SPECIFIC CONDUCTANCE: <u>501 μmhos/cm</u> FINAL: <u>495 μmhos/cm</u>	
DESCRIPTION OF INITIAL TURBIDITY: <u>Turbid</u>	
DESCRIPTION OF FINAL TURBIDITY: <u>Moderately Turbid</u>	
FINAL MEASURED TURBIDITY: <u>Not Analyzed</u>	
WELL APPROVED BY: <u>Steven B. Jones - HSEA</u>	
ODOR OF WATER: <u>Faint sewage-like odor.</u>	
WATER DISCHARGED TO: <div style="display: flex; justify-content: space-between;"> <div> ☐ GROUND SURFACE ☐ STORM SEWERS ☐ DRUMS </div> <div> ☐ TANK TRUCK ☒ STORAGE TANKS ☐ OTHER _____ </div> </div>	
INITIAL PRE-DEVELOPMENT WATER DEPTH: <u>7.9 ft BGS on 8-18-93</u>	
DEVELOPMENT OBSERVATIONS: <u>Well exhibits excellent recharge as evidenced by inability to draw water level down appreciably during development sessions. Development water cleared only slightly. Well development of GW-808 drew water level in GW-809 down 2.8 ft.</u>	
OBSERVER SIGNATURE: _____	
DATE: <u>8-18-93</u>	

A.2 GW-809

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-809</u>
WELL LOG			FACILITY ID <u>0-010117</u> BUILDING <u>9201-1</u>
LOCATION: <u>Building 9201-1</u>			PAGE 1 of 2
DRILLERS: <u>Randy Phillips/Hubert Hall - Highland Drilling</u>		DATE: START: <u>7-23-93</u>	
HELPERS: <u>Hubert Hall/Steve Brown - Highland Drilling</u>		FINISH: <u>7-30-93</u>	
DRILL: <u>Ingersoll-Rand T4W</u>		DRILLING METHOD: <u>Air Rotary</u>	
		LOGGED BY: <u>S.L. Abston - SAIC</u>	
NOTES: <u>UST, PVC, screened well monitoring water zone in fracture of the Maynardville Formation.</u>			
DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		
0.0	0.5	Beta + gamma =	Asphalt
		20 cpm (background	
		= 50 cpm); Organic	
		vapor (breathing	
		zone) = 0.0 ppm;	
		Alpha = 0 ppm	
		(background 0 cpm)	
0.5	1.6		Brown clay (10 YR 5/4) with medium gray (N5) limestone and
			some asphalt fragments.
1.6	6.2	Beta + gamma =	Brown clay (10 YR 5/4) with 30% medium gray (N5) limestone
		20 cpm; Organic	fragments.
		vapor, (breathing	
		zone) = 0.0 ppm;	
		Alpha = 0 cpm	
6.2	12.0	Beta + Gamma =	Medium gray (N5) microcrystalline limestone with 3% very light
		50 cpm; Organic	gray (N8) to white (N9) fragments of limestone. Fresh bedrock
		vapor (breathing	at 6.8 ft BGS. Weathered bedrock interval appears to be
		zone) = 0.1 ppm;	missing.
		Alpha = 0 cpm	

FACILITY ID 0-010117
BUILDING 9201-1

WELL LOG - continued

A-10

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

FACILITY ID 0-0101
BUILDING 9201-1

WELL INSTALLATION DIAGRAM

WELL NO. GW-809

LOGGED BY: S.L. Abston - SAIC

DRILLING DATES

DRILLING COMPANY: Highland Drilling Co.

STARTED: 7-23-93

DRILLER: Randy Phillips HELPER: Hubert Hall
Steve Brown

FINISHED: 7-30-93

FACILITY ID 0-010117
BUILDING 9201-1

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-809

MONITORING WELL DEVELOPMENT PROGRESS

LOCATION: Building 9201-1 ONE WELL VOLUME: 17.9 GALLONSWELL INSTALLATION COMPLETION DATE: 7-30-93

DATE	GALLONS PUMPED	DESCRIPTION OF TURBIDITY	pH	DISSOLVED SOLIDS (μmhos)	TOTAL GALLONS PUMPED	WELL VOLUMES PUMPED	COMMENTS
8-16-93	0	Clear	12.1	8200	0	0	Initial *
8-16-93	15	Turbid (silty)	12.2	4450	15	0.8	(1)
8-16-93	40	Turbid (silty)	11.4	795	55	3.1	(1)
8-16-93	55	Turbid	9.9	409	110	6.1	(2)
8-16-93	55	Turbid	9.4	471	165	9.2	(3)
8-16-93	55	Moderately turbid	8.9	412	220	12.3	(3)
8-17-93	20	Moderately turbid	8.4	460	240	13.4	(2)
8-17-93	32	Moderately turbid	7.7	495	272	15.2	(2)
8-17-93	20	Moderately turbid	7.5	500	292	16.3	(2) faint
8-17-93	32	Slightly turbid	7.5	500	324	18.1	(2) faint
RESULTS AT END OF DEVELOPMENT		Slightly Turbid	7.5	500	324	18.1	

COMMENTS

Swab tubing to 35.9 1 ft BGS.

(1): Water has cement odor.

(2): Sewage-like odor.

(3): Petroliferous odor.

*Note: Initial sample for health and safety and waste management screening only. Not included in well development summary.

FACILITY ID 0-010117
BUILDING 9201-1

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-809

MONITORING WELL DEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Swab

DEVELOPMENT DATE:

DEVELOPMENT OBSERVED BY: Timothy Coffey - SAICSTART: 8-16-93FINISH: 8-17-93ONE WELL VOLUME: 17.9 GALLONSTOTAL GALLONS PUMPED: 324 TOTAL WELL VOLUMES PUMPED: 18.1INITIAL pH: 12.2 FINAL pH: 7.5INITIAL SPECIFIC CONDUCTANCE: 4450 μ mhos/cm FINAL: 500 μ mhos/cmDESCRIPTION OF INITIAL TURBIDITY: Turbid (silty)DESCRIPTION OF FINAL TURBIDITY: Slightly TurbidFINAL MEASURED TURBIDITY: Not AnalyzedWELL APPROVED BY: Steven B. Jones - HSEAODOR OF WATER: Observed cement, sewage-like odor, and petroliferous odors.

WATER DISCHARGED TO: ☐ GROUND SURFACE ☐ TANK TRUCK
☐ STORM SEWERS ☒ STORAGE TANKS
☐ DRUMS ☐ OTHER _____

INITIAL PRE-DEVELOPMENT

WATER DEPTH: 9.2 ft BGS on 8-16-93

DEVELOPMENT OBSERVATIONS: Well exhibits excellent recharge as evidenced by the inability to draw water level down appreciably during development sessions. Unable to clear the water entirely.

Swabbing of GW-809 drew water level in GW-808 down 1.5 ft on 8-16-93 and 2.8 ft on 8-17-93.

OBSERVER SIGNATURE: DATE: 8-17-93

A.3 GW-810

Y-12 PLANT GROUNDWATER PROTECTION PROGRAMWELL NO. GW-810**WELL LOG**FACILITY ID 0-010117
BUILDING 9201-1

PAGE 1 of 2

LOCATION: Building 9201-1DATE: START: 7-28-93DRILLERS: Hubert Hall - Highland Drilling Co.FINISH: 7-30-93HELPERS: David Hewitt - Highland Drilling Co.DRILLING METHOD: Air RotaryDRILL: Ingersoll-Rand T4WLOGGED BY: S.L. Abston - SAICNOTES: UST, PVC, screened well monitoring water zone in fracture of the Maynardville Formation.

DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		
0.0	0.5	Beta + gamma = 30 ppm (background = 40 cpm), Organic vapor, breathing zone = 1 ppm (background = 0.8 ppm); Alpha = 0 ppm (background = 0 cpm)	Asphalt
0.5	3.5	Beta + gamma = 40 cpm; Organic vapor, (breathing zone); = 1.4 ppm; Alpha = 0 cpm	Moderate brown (5YR 3/4) clay with very small medium gray (N6) limestone fragments. Competent bedrock @ 3.5 ft BGS. Weathered bedrock interval is apparently missing.
3.5	6.5	Beta + Gamma = 40 cpm; Organic vapor (breathing zone) = 1.4 ppm; Alpha = 0 cpm	Medium gray (N5) small to medium 1-5 mm microcrystalline limestone fragments with moderate yellowish brown (10YR 5N) weather staining.
6.5	19.5	Beta + Gamma = 45 cpm; Organic vapor (breathing zone) = 1.2 ppm; Alpha = 0 cpm	Medium gray N5 with some areas of light gray to white (N8 to N9) microcrystalline limestone.

FACILITY ID 0-010117
BUILDING 9201-1

WELL LOG - continuedA-16

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

FACILITY ID 0-0701
BUILDING 9201-1

WELL NO. GW-810

WELL INSTALLATION DIAGRAM

LOGGED BY: S.L. Abston - SAIC

DRILLING DATES

DRILLING COMPANY: Highland Drilling Co.

STARTED: 7-28-93

DRILLER: Hubert Hall

HELPER: David Hewitt

FINISHED: 7-30-93

NOT TO SCALE

-NA-: Not Applicable

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM					FACILITY ID 0-010117 BUILDING 9201-1 WELL NO. <u>GW-810</u>		
MONITORING WELL DEVELOPMENT PROGRESS							
LOCATION: <u>Building 9201-1</u>					ONE WELL VOLUME: <u>11.2</u> GALLONS		
WELL INSTALLATION COMPLETION DATE: <u>7-30-93</u>							
DATE	GALLONS PUMPED	DESCRIPTION OF TURBIDITY	pH	DISSOLVED SOLIDS (μ mhos)	TOTAL GALLONS PUMPED	WELL VOLUMES PUMPED	COMMENTS
8-16-93	0	Clear	10.8	920	0	0	Initial *
8-16-93	20	Turbid	7.7	498	20	1.8	
8-16-93	17	Moderately turbid	7.7	500	37	3.3	(1)
8-16-93	16	Moderately turbid	7.5	501	53	4.7	(1)
8-16-93	15	Slightly turbid	7.5	505	68	6.1	(1) (2)
8-16-93	25	Slightly turbid	7.7	510	93	8.3	(1) (2) (3)
RESULTS AT END OF DEVELOPMENT		Slightly Turbid	7.7	510	93	8.3	
COMMENTS		Swab tubing to 26.1 ft BGS.					
		(1): Sewage odor.					
		(2): Water also has a rotten-egg odor.					
		(3): Well is beginning to dry up, not producing as much water with each swab.					
*Note: Initial sample for health and safety and waste management screening only. Not included in well development summary.							

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	FACILITY ID 0-010117 BUILDING 9201-1 WELL NO. GW-810
MONITORING WELL DEVELOPMENT SUMMARY	
METHOD OF DEVELOPMENT: <u>Swab</u>	
DEVELOPMENT OBSERVED BY: <u>Timothy Coffey - SAIC</u>	
ONE WELL VOLUME: <u>11.2</u> GALLONS	
TOTAL GALLONS PUMPED: <u>93</u> TOTAL WELL VOLUMES PUMPED: <u>8.3</u>	
INITIAL pH: <u>7.7</u> FINAL pH: <u>7.7</u>	
INITIAL SPECIFIC CONDUCTANCE: <u>498 μmhos/cm</u> FINAL: <u>510 μmhos/cm</u>	
DESCRIPTION OF INITIAL TURBIDITY: <u>Turbid</u>	
DESCRIPTION OF FINAL TURBIDITY: <u>Slightly Turbid</u>	
FINAL MEASURED TURBIDITY: <u>Not Analyzed</u>	
WELL APPROVED BY: <u>Steven B. Jones - HSEA</u>	
ODOR OF WATER: <u>Observed a sewage-like odor and rotten-egg odor.</u>	
WATER DISCHARGED TO: <div style="display: flex; justify-content: space-between;"> <div> ☐ GROUND SURFACE ☐ STORM SEWERS ☐ DRUMS </div> <div> ☐ TANK TRUCK ☒ STORAGE TANKS ☐ OTHER _____ </div> </div>	
INITIAL PRE-DEVELOPMENT WATER DEPTH: <u>9.2 ft BGS on 8-16-93</u>	
DEVELOPMENT OBSERVATIONS: <u>Well exhibits excellent recharge as evidenced by the inability to draw water level down appreciably during development sessions. Unable to clear the water completely.</u>	
OBSERVER SIGNATURE:
DATE: <u>8-16-93</u>	

Appendix B

Laboratory Analytical Results for Baseline Groundwater Sampling

B.1 Groundwater Sample Analytical Results

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FACILITY ID 0-010117
BUILDING 9201-1

OFFICIAL REPORT

1/29/93 08:00:52

Y-12 ANALYTICAL SERVICES ORGANIZATION

PAGE 1 OF 1

<u>JBMITTER</u>	<u>ADDRESS</u>	<u>CUSTOMER ID</u>	<u>REQ NO</u>	<u>SAMPLE NO</u>	<u>MTC</u>	<u>STATUS</u>
asterling, Samuel D	BUILDING 9207 MS 8225	A11576	A11576	E933060045	8601	APPROVED
DATE SAMPLED: 11/02/93 15:39:00	DATE NEEDED: 11/05/93	LOCATION: GW-193			CHARGE #: S2205F26	
DATE RECEIVED: 11/03/93	DATE COMPLETED: 11/29/93	PROJECT CODE:			CASE: UO3130	
AMPLER: 13303/29776	SAMPLE DESCRIPTION: GRAB					

FINAL APPROVAL:

R. E. Slagle

OMMENTS: RESULTS NEEDED AS SOON AS POSSIBLE

EST: GRO	TPH Gasoline Range Organics Including BTEX	REPLICATE: 1	STATUS: APPROVED
REP MTH:	PROC MTH: SW846 8020 PHASE:	TIME ANALYZED: 11/15/93 00:00:00	APPROVER: E021503
OMMENTS: E indicates that benzene exceeded calibration range			

<u>AS NUMBER</u>	<u>DETERMINATION</u>	<u>DT</u>	<u>RESULT</u>	<u>CONFIDENCE</u>	<u>UNIT</u>
	Gasoline Range Organics		5500		ug/L
1432	Benzene		1675E		ug/L
00414	Ethylbenzene		575		ug/L
08883	Toluene		235		ug/L
330207	Xylene		353		ug/L

EST: VOABTEX	VOA Analysis, BTEX Compounds (SW846 8260)	REPLICATE: 1	STATUS: CANCELLED
REP MTH:	PROC MTH: SW846 8260 PHASE:	TIME ANALYZED:	APPROVER:
THIS TEST WAS CANCELLED			

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*** LAST PAGE ***

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FACILITY ID 0-010117
BUILDING 9201-1

OFFICIAL REPORT

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Y-12 ANALYTICAL SERVICES ORGANIZATION

PAGE 1 OF 1

BMITTER	ADDRESS	CUSTOMER ID	REQ NO	SAMPLE NO	NTC	STATUS
sterling, Samuel D	BUILDING 9207 HS 8225	A11577	A11577	E933060046	8601	APPROVED
TE SAMPLED: 11/02/93 17:53:00	DATE NEEDED: 11/05/93	LOCATION: GW-657			CHARGE #: S2205F26	
TE RECEIVED: 11/03/93	DATE COMPLETED: 11/29/93	PROJECT CODE:			CASE: U03130	
MPLER: 13303/29776	SAMPLE DESCRIPTION: GRAB					

FINAL APPROVAL:

R. E. Slagle

MENTS: NEED RESULTS AS SOON AS POSSIBLE/ ADDITIONAL ANALYSIS FOR TPHGRO

ST: GRO	TPH Gasoline Range Organics Including BTEX	REPLICATE: 1	STATUS: APPROVED
EP MTH:	PROC MTH: SW846 8020 PHASE:	TIME ANALYZED: 11/15/93 00:00:00	APPROVER: E021503

S NUMBER	DETERMINATION	DT	RESULT	CONFIDENCE	UNIT
	Gasoline Range Organics		<100		ug/L
432	Benzene		<1		ug/L
0414	Ethylbenzene		<1		ug/L
8883	Toluene		<1		ug/L
30207	Xylene		<1		ug/L

ST: VOABTEX	VOA Analysis, BTEX Compounds (SW846 8260)	REPLICATE: 1	STATUS: CANCELLED
EP MTH:	PROC MTH: SW846 8260 PHASE:	TIME ANALYZED:	APPROVER:
	THIS TEST WAS CANCELLED		

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*** LAST PAGE ***

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FACILITY ID 0-010117
BUILDING 9201-1

OFFICIAL REPORT

/29/93 09:27:10

Y-12 ANALYTICAL SERVICES ORGANIZATION

PAGE 1 OF 1

SUBMITTER	ADDRESS	CUSTOMER ID	REQ NO	SAMPLE NO	HTC	STATUS
sterling, Samuel D	BUILDING 9207 MS 8225	A11578	A11578	E933060047	8601	APPROVED
DATE SAMPLED: 11/02/93 16:30:00	DATE NEEDED: 11/05/93	LOCATION: GW-707			CHARGE #:	S2205F26
DATE RECEIVED: 11/03/93	DATE COMPLETED: 11/29/93	PROJECT CODE:			CASE:	U03130
AMPLER: 13303/29776	SAMPLE DESCRIPTION: GRAB				FINAL APPROVAL:	

R. E. Slagle

REMARKS: NEED RESULTS AS SOON AS POSSIBLE / ADDITIONAL ANALYSIS FOR TPHGRO

TEST: GRO	TPH Gasoline Range Organics Including BTEX	REPLICATE: 1	STATUS: APPROVED
REP MTH:	PROC MTH: SW846 8020 PHASE:	TIME ANALYZED: 11/15/93 00:00:00	APPROVER: E021503

IS NUMBER	DETERMINATION	DT	RESULT	CONFIDENCE	UNIT
	Gasoline Range Organics		7500		ug/L
432	Benzene		900		ug/L
10414	Ethylbenzene		800		ug/L
18883	Toluene		95		ug/L
130207	Xylene		1575		ug/L

TEST: VOABTEX	VOA Analysis, BTEX Compounds (SW846 8260)	REPLICATE: 1	STATUS: CANCELLED
REP MTH:	PROC MTH: SW846 8260 PHASE:	TIME ANALYZED:	APPROVER:
	THIS TEST WAS CANCELLED		

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FACILITY ID 0-010117
BUILDING 9201-1

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Y-12 ANALYTICAL SERVICES ORGANIZATION

PAGE 1 OF 1

SMITTER	ADDRESS	CUSTOMER ID	REQ NO	SAMPLE NO	MTG	STATUS
sterling, Samuel D	BUILDING 9207 MS 8225	A11579	A11579	E933060048	8601	APPROVED
TE SAMPLED: 11/02/93 17:10:00	DATE NEEDED: 11/05/93	LOCATION: GW-708			CHARGE #: S2205F26	
TE RECEIVED: 11/03/93	DATE COMPLETED: 11/29/93	PROJECT CODE:			CASE: U03130	
MPLER: 13303/29776	SAMPLE DESCRIPTION: GRAB					

FINAL APPROVAL:

R. E. Slagle

REMARKS: NEED RESULTS AS SOON AS POSSIBLE / ADDITIONAL ANALYSIS FOR TPHGRO

ST: GRO	TPH Gasoline Range Organics Including BTEX	REPLICATE: 1	STATUS: APPROVED
EP MTH:	PROC MTH: SW846 8020 PHASE:	TIME ANALYZED: 11/15/93 00:00:00	APPROVER: E021503

S NUMBER	DETERMINATION	DT	RESULT	CONFIDENCE	UNIT
	Gasoline Range Organics		<100		ug/L
432	Benzene		<1		ug/L
0414	Ethylbenzene		<1		ug/L
8883	Toluene		<1		ug/L
30207	Xylene		<1		ug/L

ST: VOABTEX	VOA Analysis, BTEX Compounds (SW846 8260)	REPLICATE: 1	STATUS: CANCELLED
EP MTH:	PROC MTH: SW846 8260 PHASE:	TIME ANALYZED:	APPROVER:
	THIS TEST WAS CANCELLED		

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FACILITY ID 0-010117
BUILDING 9201-1

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11/29/93 09:27:28

Y-12 ANALYTICAL SERVICES ORGANIZATION

PAGE 1 OF 1

SMITTER	ADDRESS	CUSTOMER ID	REQ NO	SAMPLE NO	MTC	STATUS
sterling, Samuel D	BUILDING 9207 MS 8225	A11580	A11580	E933060049	8601	APPROVED
TE SAMPLED: 11/02/93 15:08:00	DATE NEEDED: 11/05/93	LOCATION: GW-808				CHARGE #: S2205F26
TE RECEIVED: 11/03/93	DATE COMPLETED: 11/29/93	PROJECT CODE:				CASE: U03130
AMPLER: 13303/29776	SAMPLE DESCRIPTION: GRAB					

FINAL APPROVAL:

REMARKS: NEED AS SOON AS POSSIBLE / ADDITIONAL ANALYSIS FOR TPHGRO

R. E. Slagle

ST: GRO	TPH Gasoline Range Organics Including BTEX	REPLICATE: 1	STATUS: APPROVED
EP MTH:	PROC MTH: SW846 8020 PHASE:	TIME ANALYZED: 11/15/93 00:00:00	APPROVER: E021503

S NUMBER	DETERMINATION	DT	RESULT	CONFIDENCE	UNIT
	Gasoline Range Organics		140		ug/L
432	Benzene		<1		ug/L
0414	Ethylbenzene		16		ug/L
8883	Toluene		<1		ug/L
30207	Xylene		111		ug/L

ST: VOABTEX	VOA Analysis, BTEX Compounds (SW846 8260)	REPLICATE: 1	STATUS: CANCELLED
EP MTH:	PROC MTH: SW846 8260 PHASE:	TIME ANALYZED:	APPROVER:
	THIS TEST WAS CANCELLED		

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FACILITY ID 0-010117
BUILDING 9201-1

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11/29/93 09:27:38

Y-12 ANALYTICAL SERVICES ORGANIZATION

PAGE 1 OF 1

INITIALS	ADDRESS	CUSTOMER ID	REQ NO	SAMPLE NO	MTC	STATUS
sterling, Samuel D	BUILDING 9207 MS 8225	A11581	A11581	E933060050	8601	APPROVED
DATE SAMPLED: 11/02/93 15:35:00	DATE NEEDED: 11/05/93	LOCATION: GW-809			CHARGE #: S2205F26	
DATE RECEIVED: 11/03/93	DATE COMPLETED: 11/29/93	PROJECT CODE:			CASE: UO3130	
AMPLER: 13303/29776	SAMPLE DESCRIPTION: GRAB					

FINAL APPROVAL:

R. E. Slagle

REMARKS: NEED RESULTS AS SOON AS POSSIBLE / ADDITIONAL ANALYSIS FOR TPHGRO

TEST: GRO	TPH Gasoline Range Organics Including BTEX	REPLICATE: 1	STATUS: APPROVED
PROC MTH: SW846 8020	PHASE:	TIME ANALYZED: 11/15/95 00:00:00	APPROVER: E021503

TEST NUMBER	DETERMINATION	DT	RESULT	CONFIDENCE	UNIT
	Gasoline Range Organics		<100		ug/L
132	Benzene		<1		ug/L
1414	Ethylbenzene		2.6		ug/L
1883	Toluene		<1		ug/L
10207	Xylene		16		ug/L

TEST: VOABTEX	VOA Analysis, BTEX Compounds (SW846 8260)	REPLICATE: 1	STATUS: CANCELLED
PROC MTH: SW846 8260	PHASE:	TIME ANALYZED:	APPROVER:
THIS TEST WAS CANCELLED			

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FACILITY ID 0-010117
BUILDING 9201-1

OFFICIAL REPORT

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Y-12 ANALYTICAL SERVICES ORGANIZATION

PAGE 1 OF 1

<u>SMITTER</u>	<u>ADDRESS</u>	<u>CUSTOMER ID</u>	<u>REQ NO</u>	<u>SAMPLE NO</u>	<u>MTG</u>	<u>STATUS</u>
sterling, Samuel D	BUILDING 9207 MS 8225	A11582	A11582	E933060051	8601	APPROVED
TE SAMPLED: 11/02/93 17:22:00	DATE NEEDED: 11/05/93	LOCATION: GW-810				CHARGE #: S2205F26
TE RECEIVED: 11/03/93	DATE COMPLETED: 11/29/93	PROJECT CODE:				CASE: U03130
MPLER: 13303/29776	SAMPLE DESCRIPTION: GRAB					

FINAL APPROVAL:

REMARKS: NEED RESULTS AS SOON AS POSSIBLE / ADDITIONAL ANALYSIS FOR TPHGRO

R.E. Slagle

ST: GRO	TPH Gasoline Range Organics Including BTEX	REPLICATE: 1	STATUS: APPROVED
EP MTH:	PROC MTH: SW846 8020 PHASE:	TIME ANALYZED: 11/15/93 00:00:00	APPROVER: E021503

<u>S. NUMBER</u>	<u>DETERMINATION</u>	<u>DT</u>	<u>RESULT</u>	<u>CONFIDENCE</u>	<u>UNIT</u>
	Gasoline Range Organics		190		ug/L
432	Benzene		1.1		ug/L
0414	Ethylbenzene		19		ug/L
8883	Toluene		1.3		ug/L
30207	Xylene		136		ug/L

ST: VOABTEX	VOA Analysis, BTEX Compounds (SW846 8260)	REPLICATE: 1	STATUS: CANCELLED
EP MTH:	PROC MTH: SW846 8260 PHASE:	TIME ANALYZED:	APPROVER:
	THIS TEST WAS CANCELLED		

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B.2 Quality Control Sample Analytical Results

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FACILITY ID 0-010117
BUILDING 9201-1

OFFICIAL REPORT

11/29/93 09:28:03

Y-12 ANALYTICAL SERVICES ORGANIZATION

PAGE 1 OF 1

SMITTER	ADDRESS	CUSTOMER ID	REQ NO	SAMPLE NO	MTC	STATUS
sterling, Samuel D	BUILDING 9207 MS 8225	A11583	A11583	E933060052	8601	APPROVED
TE SAMPLED: 11/02/93 12:35:00	DATE NEEDED: 11/16/93	LOCATION: TRIP BLANK/UST WELLS	CHARGE #: S2205F26			
TE RECEIVED: 11/03/93	DATE COMPLETED: 11/29/93	PROJECT CODE:	CASE: U03130			
AMPLER: 13303/29776	SAMPLE DESCRIPTION: GRAB	FINAL APPROVAL:				

R. E. Slagle

REMARKS:

ST: GRO	TPH Gasoline Range Organics Including BTEX	REPLICATE: 1	STATUS: APPROVED
EP MTH:	PROC MTH: SW846 8020 PHASE:	TIME ANALYZED: 11/15/93 00:00:00	APPROVER: E021503

S NUMBER	DETERMINATION	DT	RESULT	CONFIDENCE	UNIT
	Gasoline Range Organics		<100		ug/L
432	Benzene		<1		ug/L
3414	Ethylbenzene		<1		ug/L
3883	Toluene		<1		ug/L
30207	Xylene		<1		ug/L

ST: VOA	Volatile Organics by GC/MS (SW846 8260)	REPLICATE: 1	STATUS: CANCELLED
EP MTH:	PROC MTH: SW846 8260 PHASE:	TIME ANALYZED:	APPROVER:
	THIS TEST WAS CANCELLED		

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*** LAST PAGE ***

All location information presented in this figure is based upon MMES engineering drawings, results of previous MMES investigations, and/or field determinations of feature and sampling locations. No representation or warranty, expressed or implied, is made as to the accuracy of the information or statements presented in this figure.

Legend

- Curb
- Fence
- Sidewalk

Martin Marietta Energy Systems, Inc.
Environmental Management Department

FIGURE 1-1

Building 9201-1 Site Map

All location information presented in this figure is based upon MMES engineering drawings, results of previous MMES investigations, and/or field determinations of feature and sampling locations. No representation or warranty, expressed or implied, is made as to the accuracy of the information or statements presented in this figure.

G:\93021R1\DWGS\5702-1

Legend

▲ GW-193 Groundwater Mo.
(18.4 BGS) Total Depth Bel.

Monitoring Well Location
w Ground Surface (BGS)

Martin Marietta Energy Systems, Inc.
Environmental Management Department

FIGURE 2-1
Building 9201-1 Site Investigation
Monitoring Well Location Map

All location information presented in this figure is based upon MMES engineering drawings, results of previous MMES investigations, and/or field determinations of feature and sampling locations. No representation or warranty, expressed or implied, is made as to the accuracy of the information or statements presented in this figure.

G:\93021R1\DWGS\5702-2

Y-12 Plant North

Legend

Groundwater Contaminant
>0.07ppm Benzene &

All location information presented in this figure is based upon MMES engineering drawings, results of previous MMES investigations, and/or field determinations of feature and sampling locations. No representation or warranty, expressed or implied, is made as to the accuracy of the information or statements presented in this figure.

G:\93021R1\DWGS\5703-1

Legend

- 925 — Groundwater Potential Line (Feet Above MS)
- - 924 - - Inferred Groundwater Contour Line (Feet)

All location information presented in this figure is based upon MMES-engineering drawings, results of previous MMES investigations, and/or field determinations of feature and sampling locations. No representation or warranty, expressed or implied, is made as to the accuracy of the information or statements presented in this figure.

G:\93021R1\DWGS\5703-2

Legend

Groundwater Contaminated
>0.07ppm Benzene &

Approximate Extraction
Well Locations

<p>tion >1.0ppm TPH</p> <p>▲ GW-193</p> <p>Groundwater Monitoring Well Locations</p>	<p>Martin Marietta Energy Systems, Inc. Environmental Management Department</p> <p>FIGURE 3-2</p> <p>Building 9201-1 Site Groundwater Extraction Well Locations</p>
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