



**Vapor Extraction / Groundwater Extraction (VE/GE) System
Initial Report**

**Gasoline Fueling Station – Royal Farms #96
500 Mechanics Valley Road
North East, MD 21901**

**MDE OCP Case No. 2011-0729-CE
Facility ID No. 13326**

AEC Project Number: 05-056RF096

Prepared for:

Maryland Department of the Environment
Oil Control Program
1800 Washington Boulevard
Baltimore, Maryland 21230-1719

And

Royal Farms / Two Farms, Inc.
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Prepared by:

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January 7, 2013

Regulatory Information

Regulatory Agency: Maryland Department of the Environment
Agency Contact: Susan Bull
Case Number: OCP Case No. 2011-0729-CE
Facility ID: 13326
Current Case Status: Quarterly groundwater sampling. On-site and Off-site Potable Well Monitoring. Vapor Extraction/ Groundwater Extraction (VE/GE) System in operation.
Reporting Period: 12-11-12 through 1-2-13

General Site Information

Royal Farms Contact: Tom Ruszin
Consultant Contact: Jeff Stein/James Wolf
Facility Status: Operating fuel station
Area Property Use: See Site Vicinity Map, Site Map and Site Area Map (Figures 1, 2 and 3)
Monitoring Wells: MW-1R thru MW-16, MW-10D, MW-12D, MW-13D, TP-1, TP-2, TP-3, TP-4
Recovery Wells: RW-1 thru RW-12
VE/GE System Wells: MW-7, RW-1, RW-2, RW-3, RW-4, RW-6, RW-8, RW-9, RW-10, RW-11, RW-12
Potable Wells: CE-94-3354 (site well), CE-88-0994, CE-94-0008, CE-81-0226, hand dug well (no permit), CE-81-0886, CE-94-6569

Introduction

Advantage Environmental Consultants (AEC) has completed installation of a dual-phase Vapor Extraction / Groundwater Extraction (VE/GE) System. The system consists of a network of recovery wells piped to a central treatment compound. This document is provided to illustrate the system location, dimensions, components, and functionality on an as-built basis. The report also summarizes the first 22 days of system operation.

Figure 1 in Attachment A illustrates the site vicinity. Figure 2 in Attachment A illustrates the groundwater monitoring well, tank-pit well, recovery well, bedrock monitoring well, and onsite potable drinking water well locations.

Recovery Well and Vault Installation

The VE/GE System has been built to perform recovery on eleven wells in the impacted area of the Site. MW-7, RW-1, RW-2, RW-3, RW-4, and RW-6 were installed in July 2011. RW-8, RW-9, RW-10, RW-11, and RW-12 were installed in October 2011. These wells range in depth from 18 to 25 feet below ground surface (bgs). Each well was constructed using 4-inch diameter PVC slotted screen and riser. The well heads are currently housed within 2 foot by 2 foot traffic grade well-vaults. Each vault contains a well head and two additional stub-ups for system components; a two-inch, pressure-tested, poly-vinyl chloride (PVC) line which ties into a central VE system and a four-inch PVC conduit containing hoses for GE treatment. The bottom of each well vault is finished with a Portland cement slab and a corner drain.

Trenching and Piping Installation

Trenching work began at the site on September 10, 2012. Two dedicated subsurface PVC pipes were run from each well into a central treatment compound. All piping connections were accomplished using primed and glued pressure couplings. The pipes were underlain by pea gravel and pea-gravel was used to fill 4-6 inches above the piping. Six inch lifts of native soils were then placed and compacted followed by a six-inch compacted CR-6 base course and approximately four inches of asphalt to the road surface. For piping runs under concrete; backfill was done with pea gravel to within approximately four inches of the surface before concrete was poured to meet the existing surface level. The VE lines were pressure tested at 20 pounds per square inch (psi) by the mechanical contractor.

In addition to the piping runs between the recovery well network and the treatment compound, an electrical conduit and a discharge line for treated water were also installed. The electrical conduit was routed from the treatment compound towards a service box located in the southwest portion of the Site. The discharge line was routed from the treatment compound to a storm water management pond located on the northwest portion of the site. Both the electrical conduit and discharge line trenches were placed in grass areas and backfilled with native soils. A scaled depiction of the system trench layout is included in Figure 3 of Attachment A.

Equipment Installation

The system equipment compound is stationed to the east of the Site building near the southeastern corner of the Site property (see Figure 3 in Attachment A). The system control panel and electrical panel are mounted on the outside of the system building. The interior of the system building houses a positive displacement vacuum blower for vapor removal, phase separation tank (moisture separator), an air compressor associated with the pneumatic submersible pumps for liquid removal, an integrated oil-water separator and air-stripper for liquid phase hydrocarbon (LPH) and dissolved phase hydrocarbon removal, two fluid transfer pumps, two bag filter housings, two activated carbon canisters connected in series for final groundwater polishing, and a flow totalizer to record total volume of groundwater treated. The equipment and wiring in the treatment room is rated for explosive environments. The exterior of the equipment compound contains a catalytic oxidation unit for vapor treatment, and activated carbon canisters connected in series for air stripper off-gas treatment. A piping and instrumentation diagram (P&ID) is included as Figure 4 of Attachment A.

VE/GE System Performance Summary

System Operation

Period: 12-11-12 through 1-2-13
Operating Days: 22 days

Groundwater and Vapor Recovery

Cumulative Water Discharge in Period: 774,000 gallons (estimated)
Average Water Flow Rate: 25 gallons per minute (gpm)
Average Vapor Flow Rate: 124.9 cubic feet per minute (cfm)

Hydrocarbon Recovery Estimates (gallons)

System Dissolved Phase Recovery:	2.07
System Vapor Phase Recovery:	71.12
Total Recovery:	73.19

As of January 2, 2013, approximately 774,300 gallons of liquid and approximately 3,866,904 cubic feet of air have been processed by the system, removing approximately 457 pounds (or 73 gallons) of volatile organic compounds. No LPH was recovered during this monitoring period. Table 1 in Attachment B summarizes the hydrocarbon recovery data, and Table 2 in Attachment B summarizes the hydrocarbon recovery estimates.

A groundwater gradient map and vacuum influence map after the system was initiated is included as Figures 5 and 6 of Attachment A. Both of these graphics indicate vapor and hydraulic control of the remediation zone.

Attachments

Attachment A Figures
Attachment B Tables

Figures

Figure 1	Site Vicinity Map
Figure 2	Site Features Map
Figure 3	Trench Layout Map
Figure 4	Process and Instrumentation Diagram
Figure 5	Groundwater Gradient Map
Figure 6	Vacuum Influence Map

Attachment A

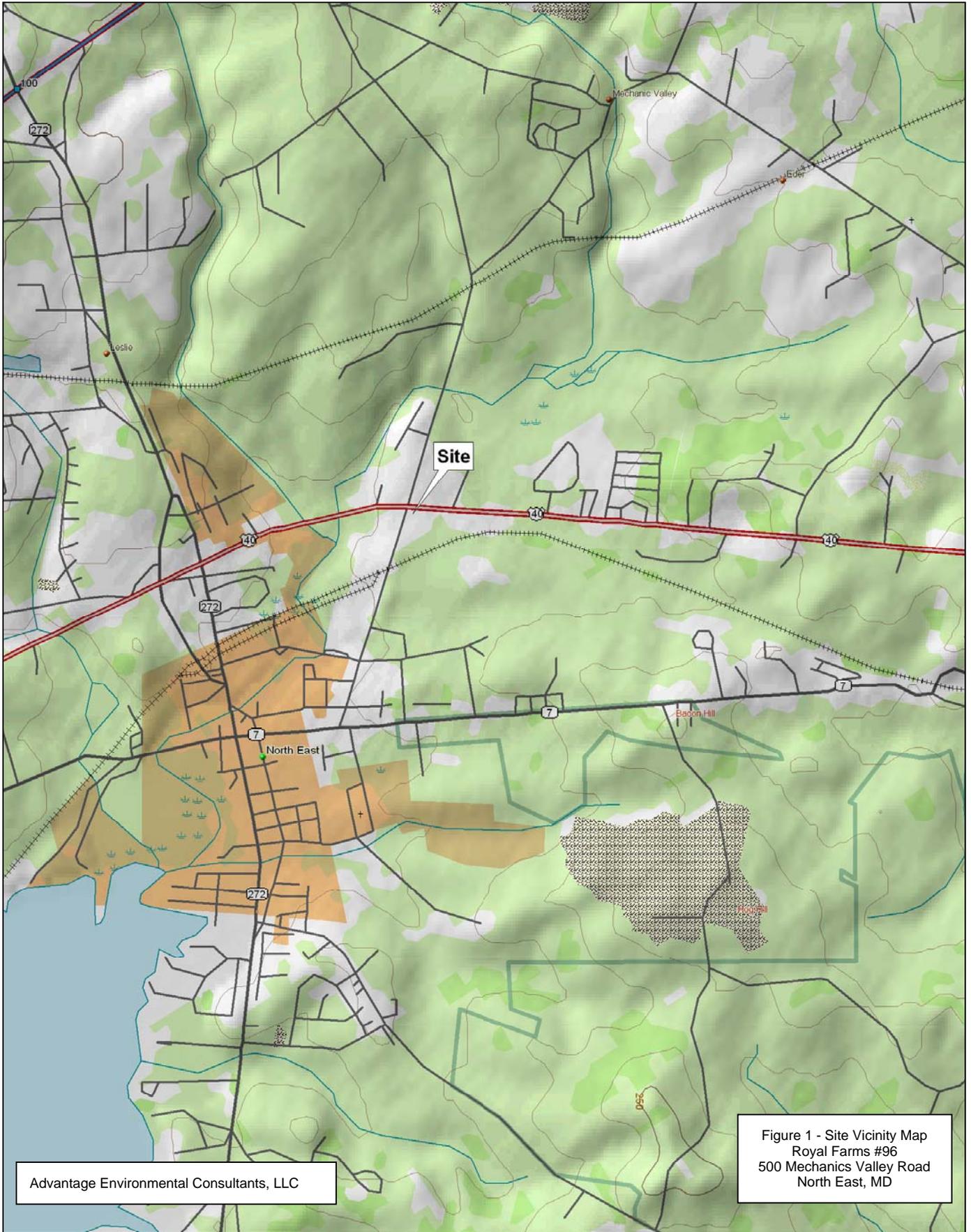
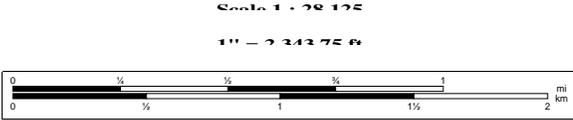
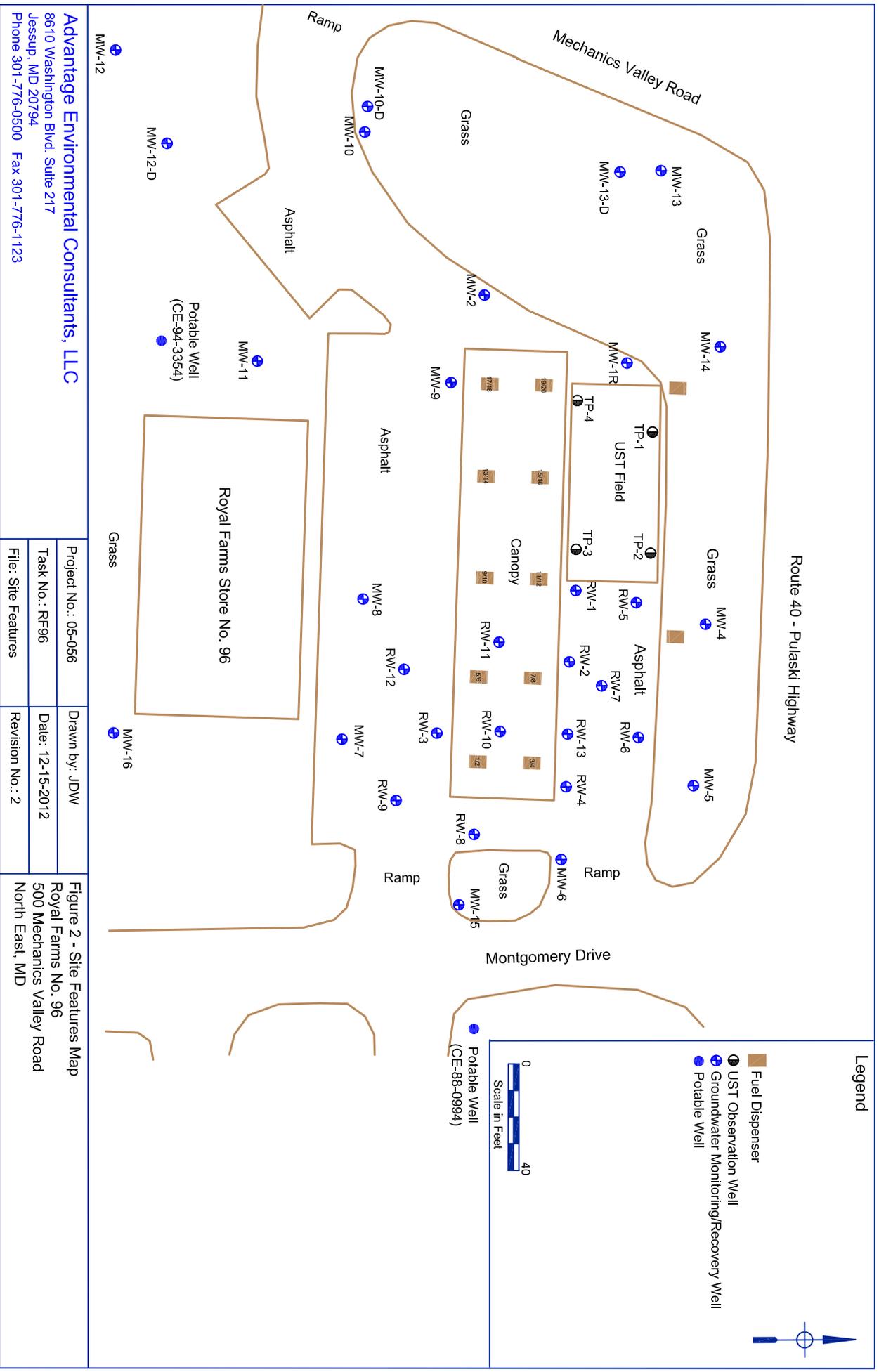


Figure 1 - Site Vicinity Map
 Royal Farms #96
 500 Mechanics Valley Road
 North East, MD

Advantage Environmental Consultants, LLC

DeLORME
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 Zoom Level: 12-7 Datum: WGS84





Legend

- Fuel Dispenser
- UST Observation Well
- Groundwater Monitoring/Recovery Well
- Potable Well

Scale in Feet

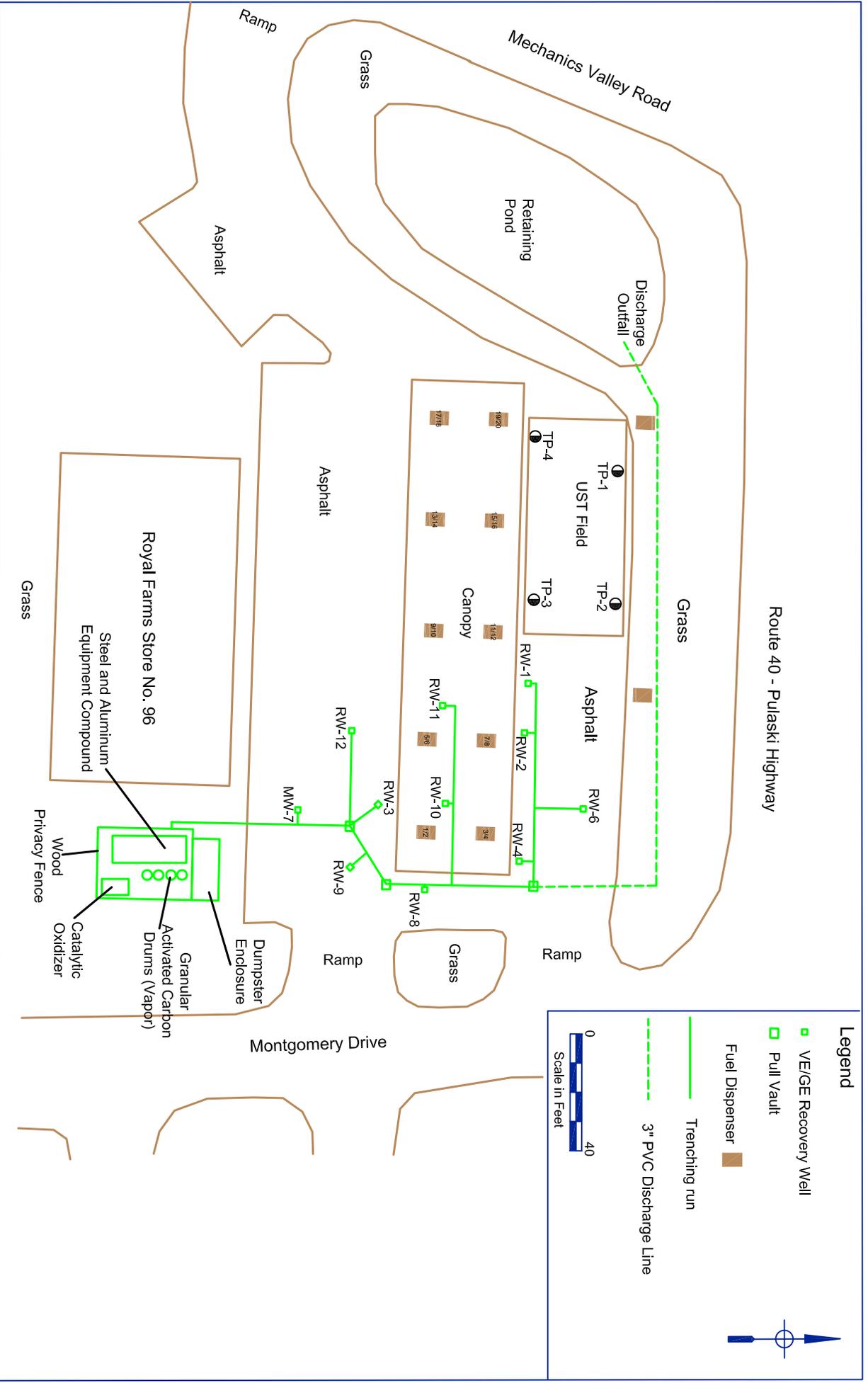
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Potable Well
(CE-88-0994)

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Task No.: RF96	Date: 12-15-2012
File: Site Features	Revision No.: 2

Figure 2 - Site Features Map
 Royal Farms No. 96
 500 Mechanics Valley Road
 North East, MD



Route 40 - Pulaski Highway

Legend

- VE/GE Recovery Well
- Pull Vault
- Fuel Dispenser
- Trenching run
- - - 3" PVC Discharge Line

0 40
Scale in Feet

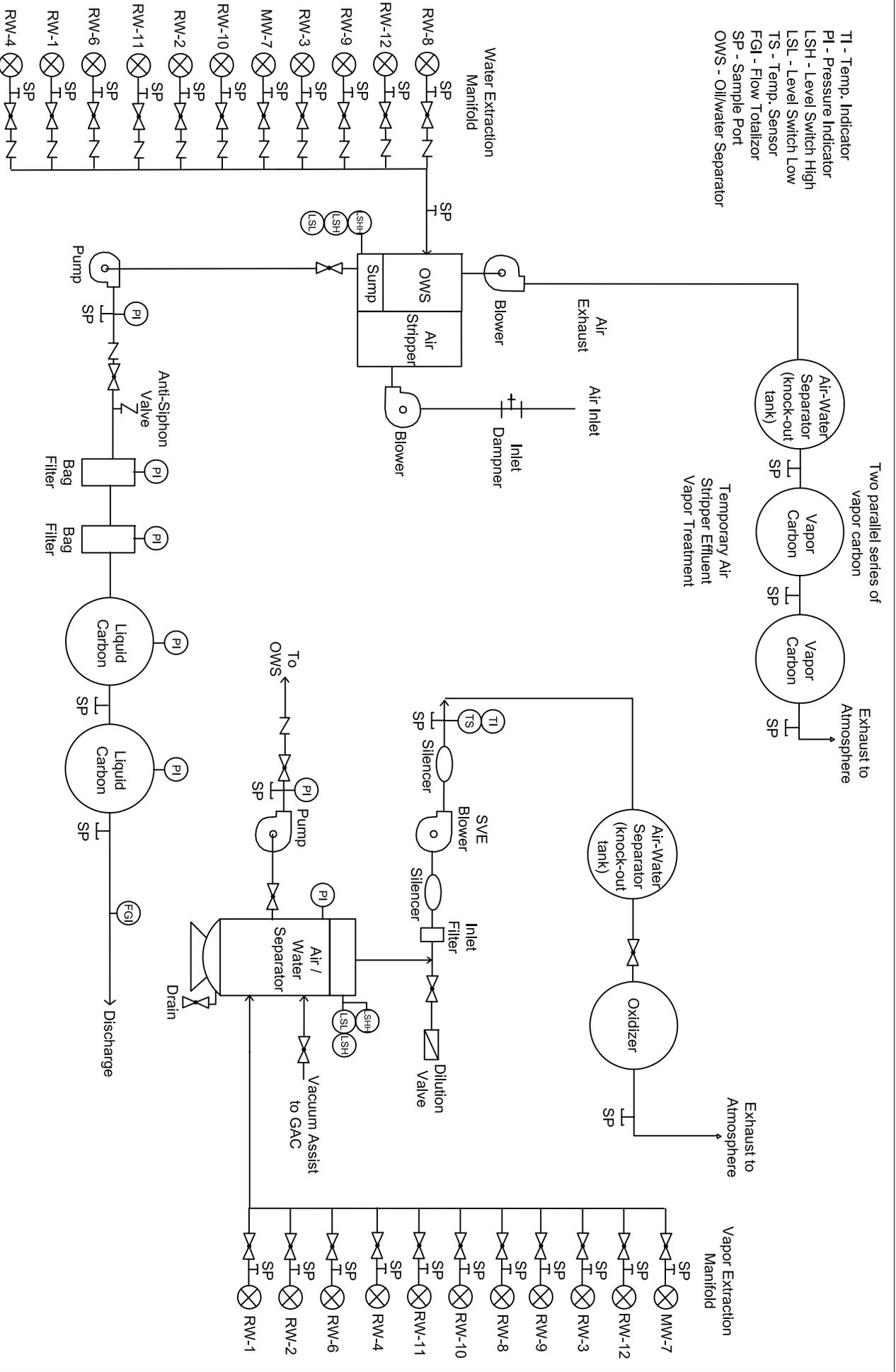
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Task No.: RFP96	Date: 1-2-13
File: Site Features	Revision No.: 1

Figure 3 - Trenching Layout Map - As Built
 Royal Farms No. 96
 500 Mechanics Valley Road
 North East, MD

TI - Temp. Indicator
 PI - Pressure Indicator
 LSH - Level Switch High
 LSL - Level Switch Low
 TS - Temp. Sensor
 FGI - Flow Totalizer
 SP - Sample Port
 OWS - Oil/water Separator

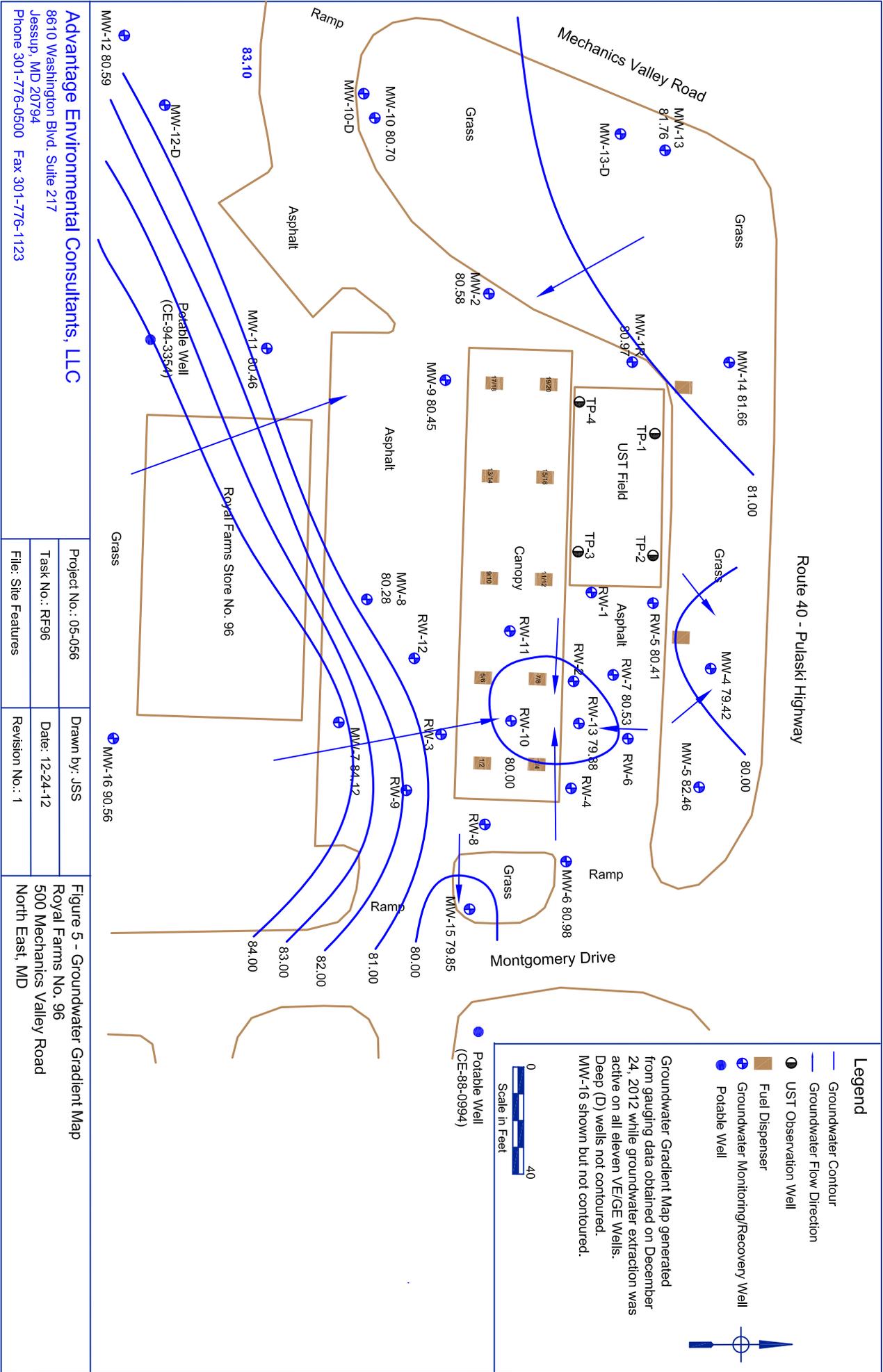


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Drawn by:	JSS	Checked by:	JSS
Date:	1-3-12	Revision:	2nd

Process & Instrumentation Diagram
 Royal Farms No. 96
 500 Mechanics Valley Road
 North East, Maryland

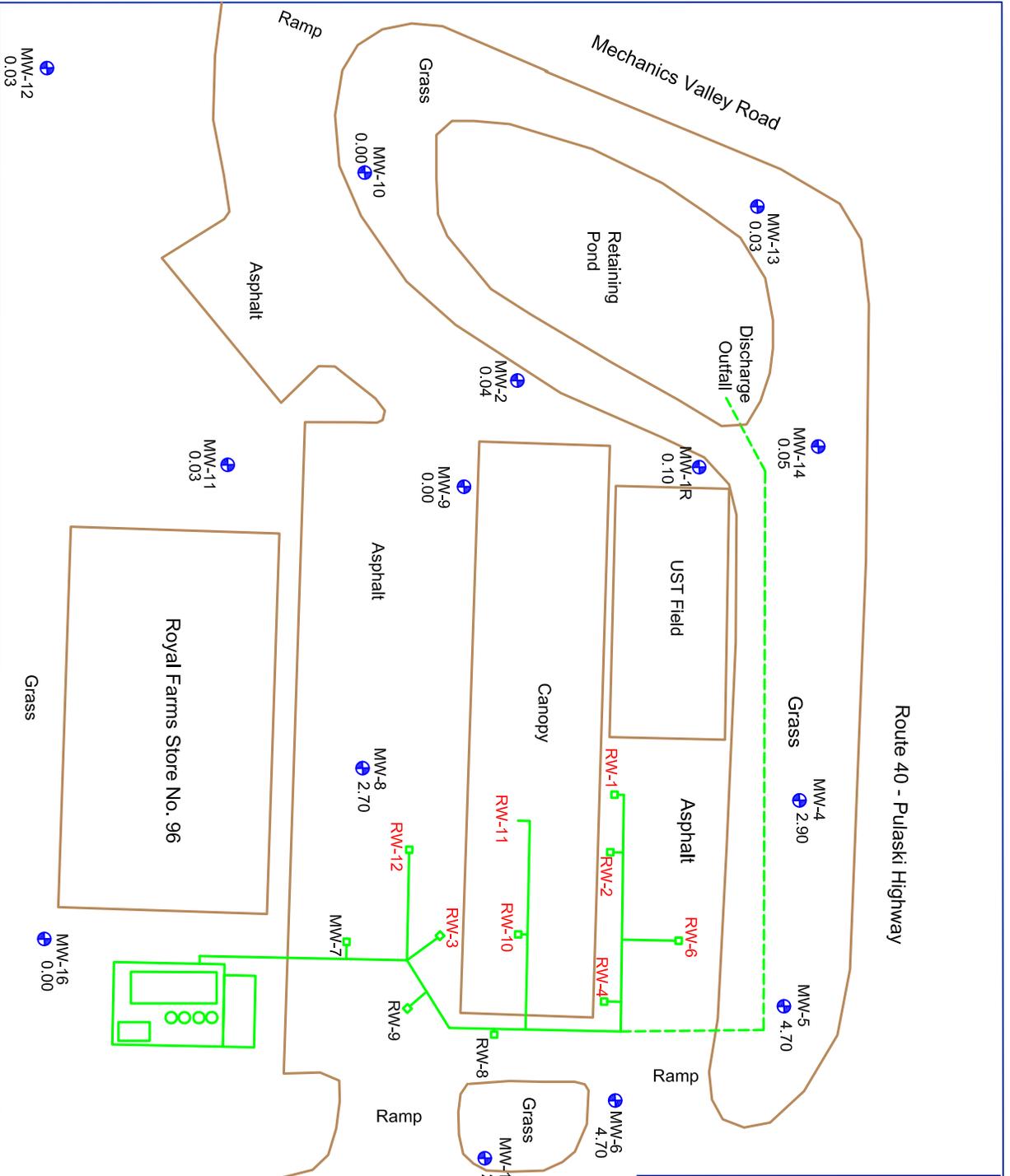


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File: Site Features	Revision No.: 1

Figure 5 - Groundwater Gradient Map
 Royal Farms No. 96
 500 Mechanics Valley Road
 North East, MD



Route 40 - Pulaski Highway

Legend

0.06 - Vacuum Pressure gauged on December 20, 2012. (inches of water)
RW-1 - Red indicates wells which were actively used for vapor extraction at the time of gauging.



- Monitoring Well
- VE/GE Recovery Well
- Trenching run
- 3" PVC Discharge Line



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Project No.: 05-056	Drawn by: JDW	Figure 6 - Vacuum Influence Map Royal Farms No. 96 500 Mechanics Valley Road North East, MD
Task No.: RFE96	Date: 1-2-13	
File: Site Features	Revision No.: 1	

Attachment B

Table 1 - VE/GE System Quarterly Hydrocarbon Recovery Data
Fueling Station – Royal Farms #96
500 Mechanics Valley Road, North East, MD 21901

Monitoring Period	Operating Days	Dissolved Phase				Maximum System Discharge Flow Rate (gpm)	Period GW Discharge (gallons)	Cumulative GW Discharge (gallons)	Average Extraction Rate per Well (gpm)	Average Extraction Rate for System (gpm)	Vapor Phase	
		System Influent Dissolved Benzene Concentration (ug/L)	System Influent Dissolved BTEX Concentration (ug/L)	System Influent Dissolved MTBE Concentration (ug/L)	System Influent Dissolved TPH-GRO Concentration (ug/L)						PID (ppm)	Airflow (cfm)
12/11/12 - 1/2/13	21.5	503	2007	0	2870	25	774,000.0	774,000.0	2.27	25.00	392.6	124.9

BTEX = Benzene, toluene, ethylbenzene and xylenes

Calculation used for dissolved phase recovery in pounds: Flow rate gpm * contaminate concentration ug/L * 3.785 L/gal * 1440 min/day *(2.205 lbs/10^9 ug)

Calculation used for dissolved phase recovery in gallons: Flow rate gpm * contaminate concentration ug/L * 3.785 L/gal * 1440 min/day *(2.205 lbs/10^9 ug) / 6.25 lbs/gal

Groundwater discharge is estimated for period 12/11/12 through 1/2/13 due to malfunction in discharge totalizer

Table 2 - VE/GE System Quarterly Hydrocarbon Recovery Estimates
Fueling Station – Royal Farms #96
500 Mechanics Valley Road, North East, MD 21901

Monitoring Period	Gallons of Hydrocarbons (BTEX) Recovered During Period			Period Total Gallons	Cumulative Gallons to Date	Pounds of Hydrocarbons (BTEX) Recovered During Period					Period Total Pounds	Cumulative Pounds to Date
	Liquid (gallons)	Dissolved (gallons)	Vapor (gallons)			Liquid (lbs)	Dissolved (lbs)	Dissolved (lbs/day)	Vapor (lbs)	Vapor (lbs/day)		
2/14/11 - 12/29/11	0	2.07	71.12	73.19	73.19	0.00	12.96	0.60	444.49	20.67	457.45	457.45

BTEX = Benzene, toluene, ethylbenzene and xylenes

Calculation used for dissolved phase recovery in pounds: Flow rate gpm * contaminate concentration ug/L * 3.785 L/gal * 1440 min/day *(2.205 lbs/10^9 ug)

Calculation used for dissolved phase recovery in gallons: Flow rate gpm * contaminate concentration ug/L * 3.785 L/gal * 1440 min/day *(2.205 lbs/10^9 ug) / 6.25 lbs/gal