September 17, 2012

Ms. Susan Bull
Maryland Department of the Environment - Oil Control Program
1800 Washington Boulevard, Suite 620
Baltimore, Maryland 21230-1719

Re: **Addendum to Work Plan for Deep Well Discrete Groundwater Sampling**
Royal Farm Store #96
500 Mechanics Valley Road
North East, Maryland 21901
Case No. 2011-0729-CE
Facility I.D. No. 13326
AEC Project No. 05-056

Dear Ms. Bull:

As requested by the Maryland Department of the Environment (MDE) Oil Control Program (OCP) in e-mail correspondence to Advantage Environmental Consultants, LLC (AEC) and Royal Farms, dated August 17, 2012, AEC has prepared this work plan addendum in order to clarify the following concerns regarding the Work Plan for Deep Well Discrete Groundwater Sampling, dated April 12, 2012 for the Royal Farms Store No. 96, located at 500 Mechanics Valley Road, North East, Maryland. A Site Plan is included as Attachment A. The following concerns were noted by the MDE.

1. Specify the specific zones to be targeted for discrete zone sampling.

2. Specify the size of the HydraSleeve sampler that you intend to use, the number of samplers per borehole, or the standard operating procedures that your company will employ to ensure that samples collected will be consistent time series data.

3. Since we are looking for relatively low levels of methyl tert-butyl ether (MTBE) (up to 200 parts per billion (ppb)) within a very large water column and there seems to be very limited communication within the subsurface, the Department will require preliminary packer testing of the sampling zones selected to ensure that they are viable flow pathways and communication zones for off-site transport of contaminants.

The aforementioned concerns are addressed as follows:

Packer Testing

The objectives of the packer testing will be to:

1. Isolate the identified fracture zones within the deep wells at the Site.

2. Conduct a pump or slug test within each packed zone to ensure competent packer seal and collect fracture transmissivity/ specific capacity data.

3. Purge each packed zone prior to discrete sample collection.

4. Collect groundwater samples from each packed zone using low flow sampling procedures.

In order to ascertain if the selected sampling intervals are viable flow pathways and communication zones for off-site transport of contaminants, AEC will perform packer testing using the following procedures.

Select zones and packer spread will be based on the findings of the March 2012 geophysical survey, which are summarized in the following table.

Well ID	Geophysics Secondary Porosity Depth Intervals (ft)	Drillers Logs Fracture Zone Depth Intervals (ft)	Proposed Packer Testing and Discrete Sampling Intervals (ft)	Total Number of Samples	Approximate Well Depth (ft)
MW-10D (CE-10-0216)	75-80 80.5-85 85-90 174-177	95-96 130-131 190-191	75-85 85-90 174-177	3	201
MW-12D (CE-10-0217)	63-75 84-97 127-154	110-111	63-75 84-97 127-154	3	160
MW-13D (CE-10-0215)	56-66 119-131 140-142	65-66 125-130	56-66 119-131 140-142	3	180

AEC will perform three packer tests to evaluate the fracture zones at each deep well location at the depth intervals noted in the table above. The packer tests will provide data to allow a quantitative measurement of connectivity between the observed fracture zones in the deep wells. Monitoring of the shallow wells (MW-10, MW-12, and MW-13) associated with the deep wells during the packer testing will also be performed to provide data regarding possible connections between the surficial aquifer and the bedrock aquifer. Pumping of the fracture zone at a constant rate and head will also allow for estimation of fracture yield. Upon completion of the packer testing, discrete groundwater samples will be collected from each packed interval.

Prior to starting the testing, the pressure transducers will be calibrated so they all read the static water level in the selected wells. The packers will be inflated and the redistribution of water levels below, between and above the packers will be recorded. These baseline conditions will be used to compare the hydraulic response in the monitored test zones.

A slug test will be performed to estimate specific capacity of each packed interval. The data will be used to confirm previous Site characterization results. One slug test per packed interval will be performed by introducing 1 gallon of distilled water in the lift pipe to determine if the zone will produce water or to determine a specific capacity if it is a low producing zone. The water level within the packed zone will be monitored as a means of evaluating the transmissivity using conventional slug test analysis. Water levels above and below the packed zone will also be monitored to evaluate the tightness of the packer seal. An instantaneous change in water levels above or below the packed zone is an indication that the seal is not competent and the packers will have to be adjusted slightly in order to create an adequate seal.

Results of the slug test will be used to either estimate the pumping rate for pump-out testing or as a basis for moving the packer assembly to a more suitable testing zone. Once the estimated pumping rate has been established, the pump will be activated and drawdown and discharge data will be collected with data loggers. It may be necessary to adjust the flow rate to avoid dewatering the fracture zone. Once the constant pumping rate has been established, the test will continue for a period of 1 hour or once the drawdown has stabilized, whichever occurs first. At the completion of the test, the pump will be shut down and recovery data will be collected.

Once the recovery data has been collected, discrete sampling will be performed at each packed interval. The sampling will be performed using low-flow sampling procedures in general accordance with USEPA Low-Flow Purging and Sampling of Groundwater Monitoring Well procedures (Bulletin No. QAD023). The low-flow samples will be collected with a Grundfos Redi-Flow or equivalent submersible pump. New PVC tubing and nylon rope will be used at each sampling location. The groundwater quality will be monitored using a Horiba U-22 Multi-meter with a flow-through cell. The monitored groundwater quality parameters will include include pH, conductivity, turbidity, dissolved oxygen (DO), temperature, and oxidation-reduction potential (ORP).

Upon completion of the testing and sampling within a particular zone, the packers will be deflated and re-positioned within the next zone to be tested. Testing procedures for each zone will be the same. Once each zone within a particular well has been tested, a short pumping test will be performed with the packers deflated to determine the open borehole specific capacity. Upon completion of testing at each well location, the packers, pump and transducers will be removed from the well and decontaminated prior to being deployed in the next well location.

All investigation derived waste will be containerized for off-site disposal via vacuum truck.

Quarterly Monitoring - Discreet Zone Sampling

A cross section illustrating the locations of the secondary porosity zones based on the results of the April 2012 geophysical profiling and lithologic logging is provided as Attachment B. The cross section shows the discrete sample locations which were based on the following criteria: vertical profile of all secondary porosity zones identified by the geophysical survey; collection of samples from the three identified lithologic variations (i.e., sand and gravel unit, silty sandy clay unit and the top of the bedrock unit); and, collection of samples from the associated shallow wells (MW-13, MW-10 and MW-12). The proposed groundwater sampling zones and number of samples from each well are summarized on the following table. It should be noted that the proposed sampling zones may be modified based on the findings of the packer testing.

Well ID	Geophysics Secondary Porosity Depth Intervals (ft)	Drillers Logs Fracture Zone Depth Intervals (ft)	Proposed Discrete Groundwater Sample Depth Intervals (ft)	Total Number of Samples	Approximate Well Depth (ft)
MW-10	NA	NA	10-15	1	24.5
MW-10D	75-80 80.5-85 85-90 174-177	95-96 130-131 190-191	25-30 45-50 80-85 175-180	4	201
MW-12	NA	NA	15-20	1	25
MW-12D	63-75 84-97 127-154	110-111	30-35 45-50 65-70 85-90 125-130 135-140 145-150	7	160
MW-13	NA	NA	5-10	1	25
MW-13D	56-66 119-131 140-142	65-66 125-130	20-25 35-40 50-55 60-65 120-125 135-140	6	180

NA- Not Applicable

In order to meet the site-specific sampling and analytical requirements, AEC will use 1.6-liter HydraSleeve samplers. These samplers will have a length of 30 inches and a filled diameter of 2.3 inches. In wells requiring only one sample, the HydraSleeve will be hung at the desired sampling depth (this will be at the bottom of the sampling zone). The upper end of the suspension line will be connected to the wellcap to suspend the HydraSleeve at the correct depth until activated for sampling.

In wells requiring more than one sample, the HydraSleeve Samplers will be deployed in series along a single suspension line in order to collect samples from the selected intervals simultaneously. A weight will be attached to the suspension line and allowed to rest on the bottom of the well. The top and bottom of each HydraSleeve will be attached to the suspension line at the desired sample intervals. Cable tie or stainless steel clips will be used to attach the HydraSleeves to the line.

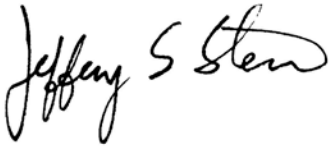
The HydraSleeve retrieval method is the same for single and multi-sample wells. The HydraSleeves must move upward at a rate of one foot per second or faster (about the speed a bailer is usually pulled upward) for water to pass through the check valve into the sample sleeve. The total upward distance the check valve must travel to fill the sample sleeve is about 1 to 2 times the length of the sampler. For example, a 30-inch HydraSleeve needs a total upward movement of 30 inches to no more than 60 inches to fill. The upward motion can be accomplished using one long continuous pull, several short strokes, or any combination that moves the check valve the required distance in the open position.

In order to retrieve the sample from the HydraSleeve with the least amount of aeration and agitation, a short plastic discharge tube will be used. The full sampler will be squeezed just below the top to expel water resting above the flexible check valve. The pointed discharge tube will then be inserted through the outer polyethylene sleeve about 3-4 inches below the white reinforcing strips. The sample will then be collected using the appropriate containers. HydraSleeve sampling will be performed during the 4th quarter 2012 sampling event. Groundwater samples collected with the Hydrasleeves will be analyzed for volatile organic compounds (VOCs) including oxygenates via EPA analytical Method 8260 and total petroleum hydrocarbons (TPH) gasoline range organics (GRO) and diesel range organics (DRO) via EPA analytical method 8015.

If you have any question regarding this information, or if we can be of further assistance, please contact AEC at (301) 766-0500.

Sincerely,

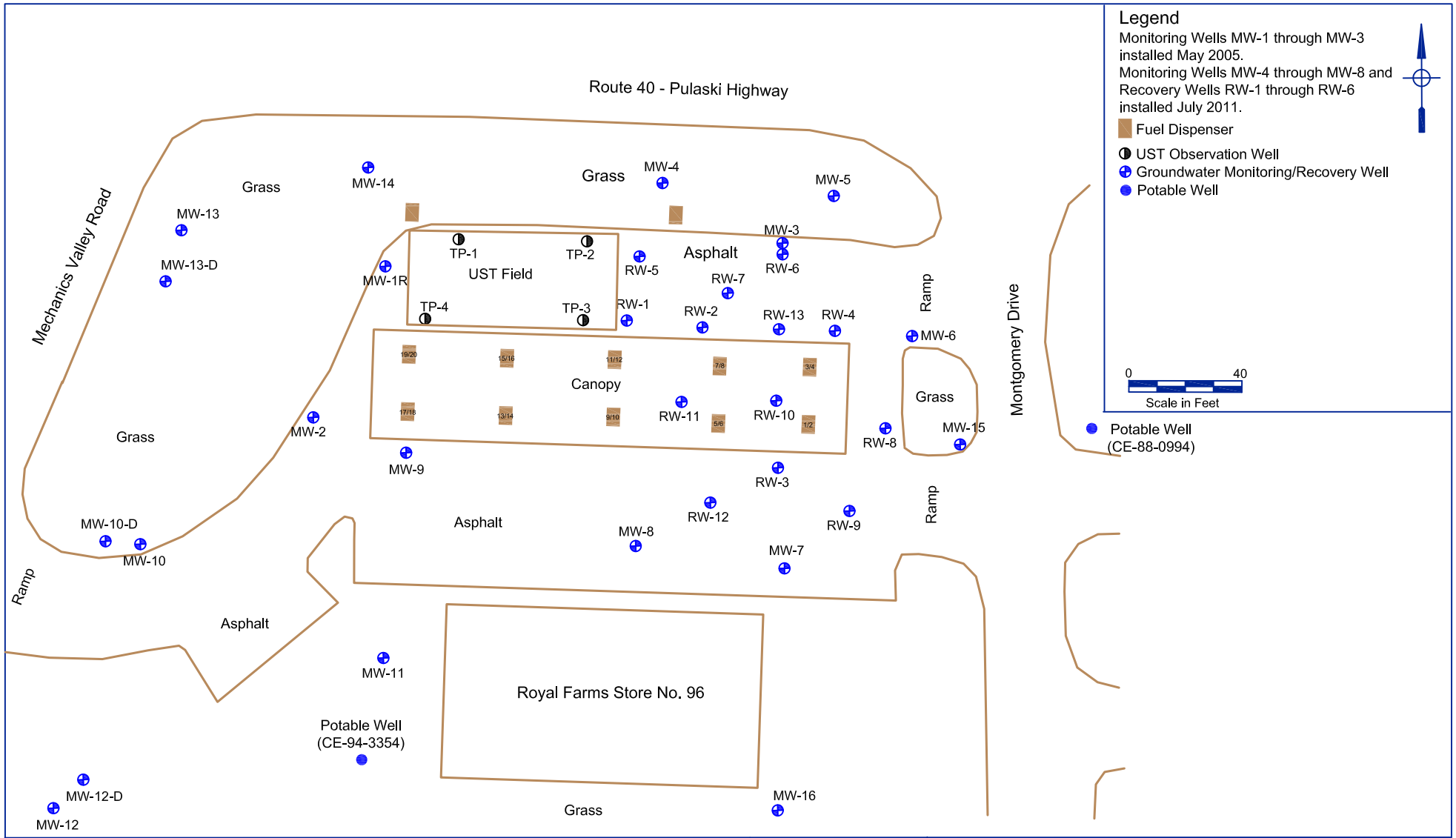
ADVANTAGE ENVIRONMENTAL CONSULTANTS, LLC



Jeffery S. Stein
Project Manager

Attachments

ATTACHMENT A



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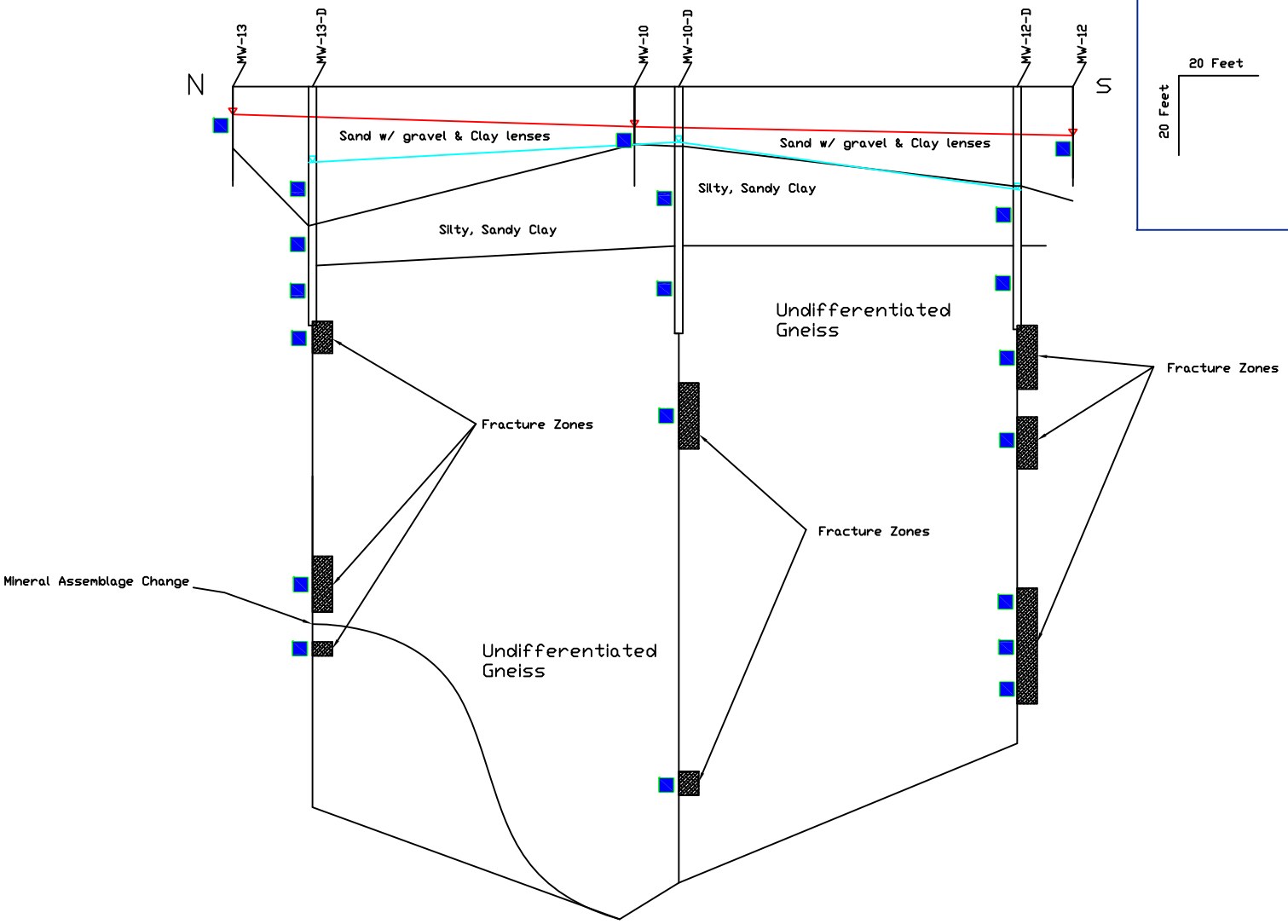
Project No.: 05-056	Drawn by: JSS
Task No.: RF96	Date: 2-7-12
File: Site Features	Revision No.: 3

Figure 1 - Site Features Map
Royal Farms No. 96
500 Mechanics Valley Road
North East, MD

ATTACHMENT B



Legend

- Shallow Groundwater Table
- Deep Groundwater Potentiometric Surface
- Discrete sample Interval

Fracture zones identified using 3-arm Caliper logs, and Acoustic Borehole Imaging

20 Feet

20 Feet

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Project No. 05-056-RF96

Date: 3-15-2012

Cross Section
Royal Farms No. 96
500 Mechanics Valley Road
North East, MD 21901