535 Route 38 East, Suite 355
Cherry Hill, NJ 08002

T: 856.382.7170
F: 201.236.1607

Submitted via Fedex, Tracking No. 8689-1879-2369

March 6, 2013

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

Subject: Well Installation Work Plan – Additional Activities
MDE Case No. 2011-0112-HA and 2013-0007-HA
Bel Air Xtra Fuels Station
2476 East Churchville Road, Bel Air, Harford County, Maryland

Dear Ms. Bull:

Brown and Caldwell (BC), on behalf of Drake Petroleum Company, Inc. (Drake), provides the following response in accordance with the established March 8, 2013 deadline in response to the December 11, 2012 and February 25, 2013 Maryland Department of the Environment (MDE) request for clarification of the August 30, 2012 Supplemental Investigation Work Plan (Work Plan) prepared and submitted by Groundwater and Environmental Services, Inc. (GES), on behalf of Drake for the Bel Air Xtra Fuels site in Bel Air, Maryland (Site).

It is our understanding that the work proposed in the Supplemental Subsurface Investigation Work Plan generally consists of the following:

- Two (2) monitoring well pairs are to be installed consisting of one (1) overburden monitoring well installed approximately ten (10) feet beyond the groundwater interface and a bedrock monitoring well drilled to approximately 200 feet below ground surface (bgs).
- The bedrock monitoring wells are to be drilled using hollow stem augers until bedrock interface is reached (estimated at approximately 30 feet bgs based on a review of the soil boring log for monitoring well MW-15D), followed by setting steel conductor casing five (5) feet into competent bedrock, then drilled with air rotary to approximately 200 feet bgs.
- Once total depth is reached, a down-hole geophysical survey will be conducted in the uncased portion of the borehole to evaluate bedrock structure, orientation, and potential water bearing zones using a suite of geophysical analyses. Based on these results one (1) or two (2) bedrock monitoring wells will be nested within each deep bedrock borehole, depending on whether the geophysical evaluation show multiple potential water bearing units.

Herein BC has provided responses to the December 11, 2012 MDE letter requesting clarification on the following points:

1) *As proposed, each bedrock borehole has the potential to stand open for an extended period of time prior to final completion, thus increasing the potential for borehole communication of contaminants to deeper levels. Provide the proposed schedule for drilling, geophysical data collection, and well completion for each deep well.*

   Response - BC estimates it will take approximately four (4) days for each boring to reach approximately 200 feet bgs, one half (½) to three quarters (¾) of a day to complete the geophysics, and another half (½) day for a total of five (5) to six (6) days to complete each bedrock monitoring well.

2) *Previous drilling events indicate that there may be difficulty in keeping the borehole open during and after drilling. If the borehole does not remain open and geophysical data cannot be collected, provide a contingency plan to determine the deep well sampling zones.*

   Response - The August 30, 2012 Supplemental Investigation Work Plan indicates that the conductor casing will be installed approximately five (5) feet into the bedrock formation. In order to minimize the potential for the borehole to collapse as a result of the weathered bedrock surface, the conductor casing will be installed to a depth at least ten (10) feet below the first encountered contact with bedrock as these zones tend to be more highly fractured and/or poorly cemented. Once bedrock is encountered after drilling the overburden, and prior to drilling into bedrock to set the conductor casing, the upper approximately ten (10) to fifteen (15) feet of bedrock will be cored to confirm that competent bedrock has been encountered in the interval into which the casing will be set. This will also provide characterization of the interval of bedrock over which the conductor casing will be set. Furthermore, a review of the well construction diagram for monitoring well MW-15D, included as Attachment A, indicates that bedrock was first encountered approximately 30 feet below ground surface (bgs) and the conductor casing was set to approximately 40 feet bgs. Monitoring well MW-15D was subsequently drilled to approximately 90 feet bgs using air rotary drilling methods and the bedrock monitoring well was presumably constructed in the open borehole without collapse. During drilling rock cores will be collected to provide a visual observation of the lithology. These descriptions will provide data about fractured zones that may indicate higher hydraulic conductivity and groundwater flow. These data will be used to determine appropriate monitoring well screening intervals.

   If the conditions indicate that the borehole is collapsing during drilling as a result of a highly fractured rock, several approaches will be considered upon review of the conditions encountered and consultation with the drilling contractor. Approaches to be considered include the following:

   - Using mud rotary drilling techniques with a mud mixture designed to stabilize the borehole. Most of the proposed geophysical logging techniques are effective in a mud-filled borehole
   - Using drilling techniques that advance a temporary casing as drilling is progressed. This technique may limit the effectiveness of borehole geo-

physical logging by limiting the length of open borehole exposed during logging.

- Setting intermediate casing to isolate a collapsing interval. Depending on borehole conditions, geophysical logging may be conducted prior to setting the intermediate casing (if feasible/practicable). Drilling to the target depth would then be conducted from the base of the intermediate casing.
- Drilling/coring in increments (e.g., ten [10] to fifteen [15] feet) and conducting packer testing in each increment, either as injection tests to identify potential water-bearing zones, or as pumping tests to obtain water samples for analysis. With this approach, if the borehole collapse occurs at depth, there may be sufficient characterization of the intervals above that well screen intervals can be selected in the interval above the collapse. Alternatively, if the data from the packer testing indicate that deeper exploration is still required, this may provide data to help plan and justify the additional investigation efforts.

These contingencies would be planned prior to mobilizing so that appropriate equipment and casing diameters are selected.

3) *The Work Plan does not detail how the geophysical data will be used to determine the depths for installation of the "nested" screen intervals in the bedrock. Provide the rationale for determining zones for the nested well completion. Note that the Department must approve the final depths for the multi-level well screens prior to construction.*

Response - As stated in the August 30, 2012 Supplemental Investigation Work Plan submitted by GES, on behalf of Drake, "If the corresponding geophysical investigation identifies specific zones of interest in regard to groundwater flow for each bedrock wells, then one (1) to two (2) 2-inch wells may be installed within the each of the six (6) inch steel bedrock casings. Each of these "nested" internal wells would have a limited screen interval across an identified fracture or flow zone at depth." That is, if the geophysical survey indicates fractured zones that are potentially relatively transmissive water-bearing zones, these areas will be targeted for well screening as they have a higher potential for lateral transport of impacted groundwater. The uses for each of the geophysical logs are detailed below:

- 3-Arm Caliper: Records borehole diameter. Increases in the borehole diameter can be indicative of a more fractured and potentially higher groundwater conductivity zone to be targeted for well screening.
- Fluid Temperature: Records water temperature changes indicating potential inflow and outflow zones identifying vertical flow in the borehole between zones of differing hydraulic head to be targeted for monitoring well screening.
- Fluid Conductivity: Records electrical conductivity of water in the borehole, and can identify and discriminate between different water-bearing

zones if the total dissolved solid (TDS) or ionic content of the water in the two (2) zones is substantially different. Fluid conductivity useful for identifying vertical flow and delineating water-bearing zones to be targeted for well screening.

- Natural gamma: Records clay content of the formation(s), and can therefore detect clay-enriched soils and saprolite, weathered fracture zones, and hydrogeological boundaries. The weathered fracture zones potentially have higher groundwater conductivity and may be targeted for monitoring well screening. Also, in the appropriate setting, can be used for lithologic correlation between boreholes.
- High-Resolution Acoustic Borehole Televiewer or Optical Borehole Televiewer: Records an accurately-scaled image of the borehole walls, allowing identification of features such as fractures and solution openings, and semi-quantitative estimation of fracture orientation and thickness using visible light (optical) or sonar pulses (acoustic). Fractures and solution openings potentially have higher groundwater conductivity and may be targeted for monitoring well screening.
- Heat Pulse Flowmeter: Records the rate of vertical water flow at depth intervals in a boring. A flowmeter is used to record the vertical flow rate at selected depths in a borehole, as well as the magnitude and direction of flow (up/down). Flowmeter data can often be used to determine which fractures may be conduits for water (into or out-of a monitoring well), and provide an indication of potential water production rates relative to other intervals in the borehole. These fractures may be targeted for monitoring well screening.

In addition to the geophysical log evaluation, consideration will be given to using a packer/pump system to isolate and collect groundwater samples from individual water-bearing zones identified by the geophysical logs. The groundwater samples would be submitted for laboratory analysis on a rapid turn-around basis and the laboratory analytical results will be used to support the selection of the well screen position.

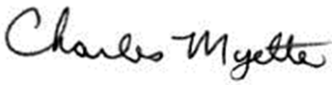
4) *The Department requires all new wells be surveyed in conjunction with the existing monitoring well network.*

Response - Each new monitoring well will be surveyed in relation to the existing monitoring well network by a professionally licensed surveyor.

If you have any questions regarding the contents of this submittal please do not hesitate to contact me.

Very truly yours,

Brown and Caldwell



Charles F. Myette, Vice President

cc: Scott Nelson, Brown and Caldwell, via email
Eric Harvey, Drake Petroleum Company, Inc. via electronic submittal
Michele Alabiso, Drake Petroleum Company, Inc. via electronic submittal
Jeff Walker, Warren Equities, Inc., via electronic submittal

Attachments (1)

1. Attachment A: MW-15D boring/well construction log

WELL LOG

ID NO. **MW-15D**

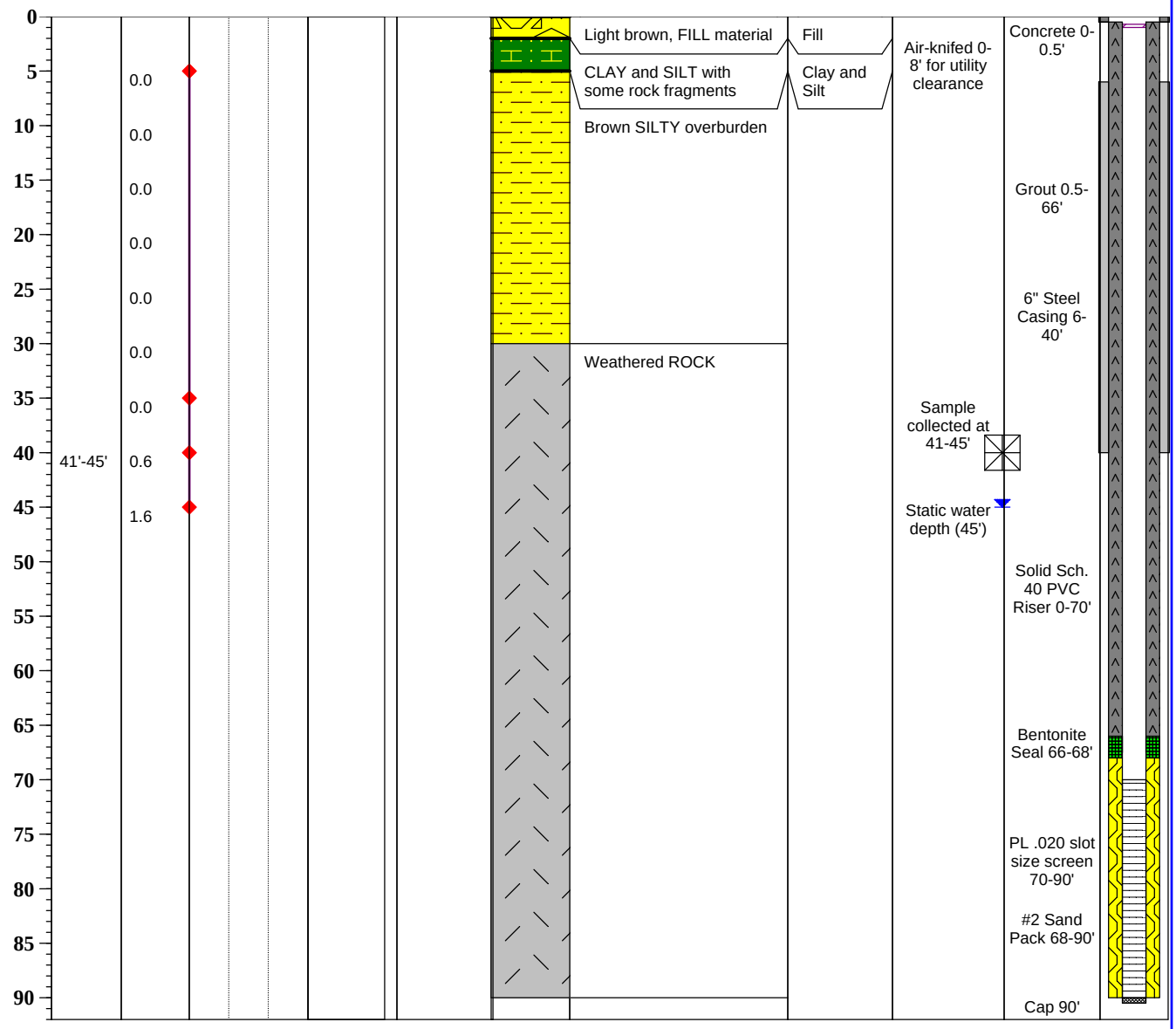
Groundwater and Environmental Services, Inc.

PROJECT: **Drake Bel Air** | WATER DEPTH: **45'** | TOTAL DEPTH: **90'**

ADDRESS: **2476 Churchville Road, Bel Air, Maryland** | CASING EL.: **N/A**

JOB NO. **0402652** | BOREHOLE DIA.: **2"** | WELL DIA.: **1"**

Logged By:	**Adam Dennis**	Drilling Method:	**Air Rotary Drilling Rig**
Dates Drilled:	**12/07/2011**	Sampling Method:	**Direct Push 4' Macrocore**
Drilling Company:	**B.L. Myers**	Soil Class. System:	**Unified Soil Classification System**
Well Permit #:	**HA-95-2117**	Field Screening:	**PID, 10.2 eV Lamp (results in ppm)**



LEGEND

Proportion Descriptions:

Trace = <10% Some = <50%

Little = <25% And = 50%

Symbol Key:

Water Level

Sample Location

fbg = feet below grade
NA = not available
ppm = parts per million
in. = inches

Groundwater & Environmental Services, Inc.
2142 Priest Bridge Court, Crofton, Maryland 800.220.3606 Fax 410.721.3733