MARYLAND DEPARTMENT OF THE ENVIRONMENT
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October 11, 2005

Ms. Stephanie McQueen
ExxonMobil Refining & Supply Company
Room 8B0416
3225 Gallows Road
Fairfax VA 22037

RE: Case No. 94-1251-HA
Former Upper Crossroads Exxon
2800 Fallston Road
Fallston, Maryland
Facility I.D. No. 0004873

Dear Ms. McQueen:

The Maryland Department of the Environment, Oil Control Program, has completed oversight of the removal of underground storage tanks at the above-referenced property and review of the *Comprehensive Site Assessment Report - March 22, 2005* and the *Corrective Action Plan – March 22, 2005* prepared on behalf of ExxonMobil by Roux Associates, Inc. and Groundwater & Environmental Services, Inc. (GES). This letter stipulates the Department's requirements for additional site and remediation performance assessment of the subject property and surrounding area. This letter also addresses the comments in the *Corrective Action Plan* (*CAP*) and conditional *CAP* approval.

Comprehensive Site Assessment Report:

Study Area:

The Department does not concur with Exxon's position to restrict the study area. The size of the study area is dictated by the extent of contamination that can reasonably be attributed to the subject site and provides peripheral background data important to the understanding of the distribution of methyl tertiary-butyl ether (MTBE). Until sufficient data has been compiled to unambiguously determine the source, fate, and transport of site contaminants, the study area must remain regional. Future expansion and development in the area slated for residential development and/or potable well installation within a half-mile radius of the site must also be considered. Reduction of the study area as requested by ExxonMobil is denied.

Visual Interpretation:

Despite the Department's repeated requests for a visual representation of geomorphology, well and infrastructure locations, and hydrostratigraphy controlling fate and transport of contaminants, ExxonMobil has not been forthcoming. With the installation of an additional monitoring well network, required by this letter, the Department anticipates that ExxonMobil will be able to produce the visual interpretation in the near future.

Monitoring Well Network:

Representatives of the Department have examined the core obtained at monitoring well location MW-22 and the down hole video recording of the well bore. Just below the well casing, the small-diameter core borehole can be seen intersecting the well bore. The Department is concerned that this intersection is allowing the water table aquifer to enter the bedrock borehole. Therefore, the well must be cased below this level to properly seal off the well. As discussed with representatives of GES at the Crofton location, this well must not be abandoned. A smaller diameter casing must be installed in the present casing and grouted below the small borehole intersection with the well. Unfettered access to the well is desired and the largest possible diameter of casing used.

The complex stratigraphy in the study area, summarized as unconsolidated sediments/saprolite over lying folded and fractured bedrock of differing lithology and permeability, make this site very difficult to interpret, particularly with regard to fate and transport of water born contaminants. To date, the primary data set for interpreting and monitoring the study area consists of private, potable wells. In addition, several small-scale subsurface investigations have been undertaken but with differing purposes and methods. The aerial distribution of data is a significant factor in interpreting data. The data points (generally private potable wells) are distributed in relatively narrow bands and clusters radiating away from the site. Therefore, considerable amounts of data exist in some areas with other areas completely devoid of data. The logistics of obtaining sufficiently comparable data from potable wells are prohibitive and inconvenience the public to an unacceptable degree. All of these factors render comparison of data difficult. Therefore, the Department requires that a network of monitoring wells be installed in sufficient number to be representative of stratigraphic and hydrologic conditions of surrounding potable wells. The network must be capable of monitoring remediation progress and the fate and transport of area contamination. Select private, potable wells must also be included in this network to continue to obtain groundwater quality data for the purpose of time series trend analysis. The enclosed site map depicts specific locations to be evaluated by the installation of monitoring wells, and Table 1 outlines the rationale for each location.

Each well location must consist of a bedrock well that is representative of nearby potable wells. Each well location must be continuously cored and described by a trained geologist in sufficient detail to aid in determining fluid and contaminant movement. Each monitoring well must have a means of obtaining discrete groundwater samples at sufficient time and spatial intervals to unambiguously determine which stratigraphic units and individual fractures and fracture zones contribute to contaminant fate and transport. Each well must be Flute tested (or similar technique that will yield vertically discrete, permeability data) to determine if the three-zone, stratigraphic model currently favored by ExxonMobil is verified. This is particularly important in wells deeper than those that have been Flute tested and/or packer tested to date.

Future Sampling:

With the exception of potable well sample analyses, the chemical analysis requirements and reporting frequency for the expanded monitoring well network are approved as proposed in the *CAP*. Potable well sample analyses must be conducted using EPA Method 524.2. If ExxonMobil is concerned that comparing EPA 8260b data with 524.2 data introduces an unacceptable variable in the data, then potable wells in the monitoring network should periodically be split sampled and analyzed using both methods.

Infiltration Galleries:

The post system removal site assessment must determine if the site surface drainage infrastructure (i.e., infiltration galleries) is a contributing factor to the transport of surface and subsurface dissolved MTBE into the aquifer. The Department strongly recommends removal of these infiltration galleries.

Site Conceptual Model:

Critical to the understanding of the regional MTBE distribution is the *Site Conceptual Model* (*SCM*). A *SCM* must be constructed to summarize the source/source areas, fate and transport of the contamination, hydrogeologic characteristics, geomorphology, and relevant man-made infrastructure. In addition, relevant recharge and discharge areas must be factored into the fate and transport conceptual model. The *SCM* is a dynamic document and must address two basic questions: Where/how did MTBE enter the hydrologic cycle and where is it being transported? The answers to these two basic questions may differ with time. The *SCM* must be revised on a regular basis to account for new data and assumptions. No later than November 28, 2005, submit a *Work Plan* to the Oil Control Program for review and approval addressing the above comments.

Corrective Action Plan:

The Department hereby approves the proposed *Corrective Action Plan* provided the following comments are incorporated in the design and implementation of the *CAP*. This approval is contingent upon ExxonMobil's submittal of a *CAP Addendum* to expand the remediation area.

(1) Since the soil vacuum extraction (SVE) system was destroyed during site decommissioning and tank removal process, the SVE system must be replaced as soon as practical to mitigate loss of capture during down time. Although there is no definitive determination of the mechanism for hydrocarbon release from the storage system, principally MTBE, the primary release mechanism, is believed to be a vapor release. Therefore, it is likely that residual MTBE vapor and MTBE dissolved in groundwater in the vadose zone (and the "natural" capillary fringe and saturated zone when exposed through groundwater withdrawal) will be reduced by the continued application of SVE.

(2) Groundwater withdrawal should remove dissolved MTBE from the source area and retard horizontal migration. A robust dual phase extraction system is required.

(3) Insufficient remedial coverage is proposed for the site. Additional groundwater and SVE extraction wells must be installed in the storage system footprint and to the north of the proposed extraction well field to ensure capture and remediation of residual

hydrocarbons. The storm water discharge areas (storm water trenches and piping) must be considered potential source areas. Additional investigation is required to determine the best distribution of groundwater extraction and SVE points. The groundwater and SVE remediation equipment may require alteration to accommodate the increased SVE and groundwater effluent.

(4) Monitoring of both liquid and vapor phase streams of each extraction well is required. The vapor and liquid volumes and contaminant concentrations of each well must be recorded on a monthly basis at the same time discharge permit compliance samples are collected. The sample analysis requirements must be proposed in the *CAP* for the monitoring wells. The individual well effluent data must be used to fine tune operation of the remediation system and the *SCM*.

(5) The Department understands that the 18-inch storm water infrastructure will be utilized for the discharge of treated effluent to the stream. Please note that this stream must be sampled immediately down-gradient of the effluent discharge for BTEX, MTBE, and TPH constituents.

(6) No later than November 28, 2005, submit a *CAP Addendum* to the Oil Control Program for review and approval addressing the above comments (1 through 5). Also provide an updated implementation schedule. Note that the tank field area SVE system must be reinstalled, if necessary, as soon as site conditions permit.

We encourage ExxonMobil to continue working with the Department and local community to ensure the protection of Maryland's citizens and groundwater. If you have any questions or concerns, please contact the Oil Control Program at 410-537-3443.

Sincerely,

Yolande J.C. Norman, Chief
Remediation Division, Oil Control Program

FRK/nln
Enclosure
cc: Mr. Greg Martin (Roux Assoc., Inc.)
Ms. Susan Kelly (Harford County Health Department)
Mr. John Grace
Mr. Herbert M. Meade
Mr. Horacio Tablada

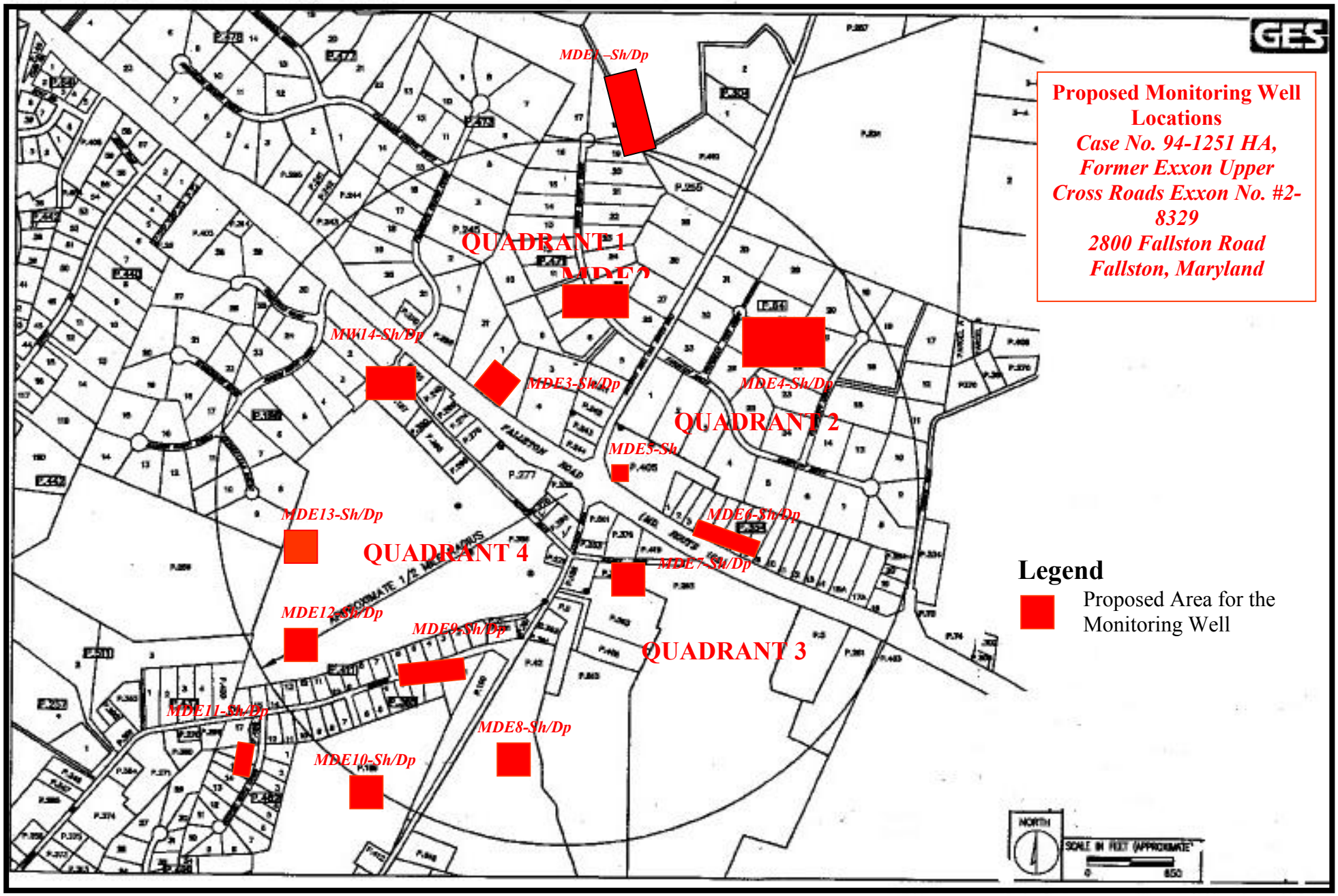
GES
Proposed Monitoring Well Locations
Case No. 94-1251 HA,
Former Exxon Upper Cross Roads Exxon No. #2-8329
2800 Fallston Road
Fallston, Maryland
MDE1 –Sh/Dp
QUADRANT 1
MDE2
MW14-Sh/Dp
MDE3-Sh/Dp
MDE4-Sh/Dp
QUADRANT 2
MDE5-Sh
MDE6-Sh/Dp
MDE7-Sh/Dp
MDE13-Sh/Dp
QUADRANT 4
MDE12-Sh/Dp
MDE9-Sh/Dp
QUADRANT 3
MDE11-Sh/Dp
MDE8-Sh/Dp
MDE10-Sh/Dp
FALLSTON ROAD
Legend
Proposed Area for the Monitoring Well
NORTH
SCALE IN FEET (APPROXIMATE)
0
850

TABLE 1
MDE Proposed Monitoring Well Locations
Case No. 1994-1251 HA
Former Exxon Upper Crossroads Service Station, 2800 Fallston Road, Fallston, Maryland

Well Number	Well Location Area*	Nearby Well Information	RATIONALE
Quadrant 1			
MDE-1 Shallow	Parcel 471, Lot s18 and 19	Casing Depth: Well 108 (36'), 109 (21'), 110 (33'), 111 (32'), 112 (50'), and 118 (25')	To evaluate shallow zone ground water flow and contaminant transport.
MDE-1 Deep		Well Depth: Well 108 (110'), 109 (275'), 110 (125'), 111 (175'), 112 (250'), and 118 (250')	To evaluate fracture flow and contaminate transport in the vicinity of the topographical expression of a potential fracture zone (stream). To provide a well for various types of down hole characterization testing (geophysical, chemical, pumping etc.) in the vicinity of domestic wells on Cross Country Court. To evaluate potential impacts on fracture flow and contaminant transport from the pumping of nearby domestic wells and operation of the remediation system. To evaluate regional recharge/discharge flow paths.
MDE-2 Shallow	Parcel 471 Lots 8,7 and 25	Casing Depth: Well 96 (40'),97 (57'),98 (40'), 101 (35'), 113 (75'), 114 (47'), 115 (40'),116 (44'), and 117 (50')	To evaluate shallow zone flow and contaminant transport.
MDE-2 Deep		Well Depth: Well 96 (200'),97 (200'),98 (340'), 101 (250'), 113 (175'), 114 (150'), 115 (350'),116 (308'), and 117 (320')	To evaluate fracture flow and contaminate transport in the vicinity of several lineaments identified from aerial photos. To provide a well for various types of down hole characterization testing (geophysical, chemical, pumping etc.) in the vicinity of domestic wells on Cross Country Court. To evaluate potential impacts on fracture flow and contaminant transport from the pumping of nearby domestic wells and operation of the remediation system. To evaluate regional recharge/discharge flow paths.
MDE-3 Shallow	Parcel 471 Lots 1 and 2	Casing Depth: Well 91 (45'), 92 (62'), 93 (42'), 94(67'), and 119 (31')	To evaluate the impact on the regional hydrology from of the discharge of the remediation system. To evaluate shallow groundwater flow and contaminant transport.
MDE-3 Deep		Well Depth: Well 91 (188'), 92 (270'), 93 (150'), 94(300'), and 119 (200')	To provide a well for various types of down hole characterization testing (geophysical, chemical, pumping etc.) in the vicinity of domestic wells on Fallston Road. To evaluate potential impacts on fracture flow and contaminant transport from the pumping of nearby domestic wells and operation of the remediation system. To evaluate regional recharge/discharge flow paths.
Quadrant 2			
MDE-4 Shallow	Parcel 64 Lots 21,22, 26, 27 and 28	Casing Depth: Well 22 (60'), 23 (55'), 24 (66'), 25 (80'), 26 (80'), 27 (82'), 28 (75'), 29 (80'), and 30 (52')	To evaluate shallow zone flow and contaminant transport.
MDE-4 Deep		Well Depth: Well 22 (125'), 23 (425'), 24 (275'), 25 (300'), 26 (300'), 27 (125'), 28 (300'), 29 (125'), 30 (350') and lot 28 (300')	To evaluate fracture flow and contaminate transport in the vicinity of the topographical expression of a potential fracture zone (stream) and near several lineaments identified on aerial photos. To provide a well for various types of downhole characterization testing (geophysical, chemical, pumping etc.) in the vicinity of domestic wells on Victorian View Court and Windswept Court. To evaluate potential impacts on fracture flow and contaminant transport from the pumping of nearby domestic wells and allow long term monitoring as additional residential development is completed To evaluate regional recharge/discharge flow paths.
MDE-5 Shallow	Parcel 405 In the vicinity of the intersection of Route 152 and Route 165	Casing depths: MW-25 (61'), MW-26 (40'), Well 83 (53'), 84 (59'), and 85 (60')	To evaluate the shallow groundwater flow direction in the vicinity of the bedrock high. To evaluate effects from the proposed remediation system. To evaluate shallow zone contaminant transport.
MDE-6 Shallow	Parcel 354, Front Portion of Lots 4,5, 6, 7 and 8	Casing depths: Well 66 (40'), 67(59'), 68(81'),69 (70'),70 (52') 71 (43'), 72 (49'), 73 (97'), 74 (69'), and 75 (52')	To evaluate the shallow groundwater flow direction in the vicinity of the bedrock high. To evaluate effects from the proposed remediation system. To evaluate contaminant transport.
MDE-6 Deep		Well depths: Well 66 (260'), 67(125'), 68(275'),69 (300'),70 (250') 71 (325'), 72 (300'), 73 (225'), 74 (400'), and 75 (170')	To provide a testing point in the vicinity of the domestic wells located along Fallston Road. . To evaluate the impact from pumping nearby domestic wells and future development in the Fields of Delmar. To evaluate fracture zone transport, which may be influenced by several liniments identified on Figure 6.

TABLE 1
MDE Proposed Monitoring Well Locations
Case No. 1994-1251 HA
Former Exxon Upper Crossroads Service Station, 2800 Fallston Road, Fallston, Maryland

Well Number	Well Location Area*	Nearby Well Information	RATIONALE
Quadrant 3			
MDE-7 Shallow	Parcel 263 Parcel 392 Parcel 393	Casing Depth: Well 53 (59') and 81 (62')	To evaluate shallow zone flow and contaminant transport.
MDE-7 Deep		Well Depth: Well 53 (500') and 81 (470')	To evaluate ground water flow on the southern portion of the bedrock high area. To provide a well for various types of down hole characterization testing (geophysical, chemical, pumping etc.) in the vicinity of domestic wells on Scarf Road. To evaluate potential impacts on fracture flow and contaminant transport from the pumping of nearby domestic wells and operation of the remediation system. To provide additional information on the regional hydrology which may be used to evaluate the potential impact of future development. To provide additional information in an area where there are a limited number of domestic wells. To evaluate regional recharge/discharge flow paths.
MDE-8 Shallow	Parcel 42	Casing Depth: Well 4 (38') and 137 (58')	To evaluate shallow zone flow and contaminant transport.
MDE-8 Deep		Well Depth: Well 4 (305') and 137 (500')	To provide a well for various types of down hole characterization testing (geophysical, chemical, pumping etc.) To provide additional information on the regional hydrology which may be used to evaluate the potential impact of future development. To provide additional information in an area where there are a limited number of domestic wells. To evaluate regional recharge/discharge flow paths.
Quadrant 4			
MDE-9 Shallow	Parcel 365 Lots 1,2, and 3 Parcel 191 Parcel 411 Lots 4,5, and 6	Casing Depth: Well 59(54'), 86 (70'), and 87 (70')	To evaluate shallow zone flow and contaminant transport.
MDE-9 Deep		Well Depth: Well 59(135'), 86 (200'), and 87 (300')	To provide a well for various types of down hole characterization testing (geophysical, chemical, pumping etc.) in the vicinity of domestic wells on Cross Country Court. To evaluate potential impacts on fracture flow and contaminant transport from the pumping of nearby domestic wells and operation of the remediation system. To evaluate regional recharge/discharge flow paths.
MDE-10 Shallow	Parcel 189	Casing Depth: Well 137(58')	To evaluate shallow zone flow and contaminant transport.
MDE-10 Deep		Well Depth: Well 137 (500')	To provide a well for various types of downhole characterization testing (geophysical, chemical, pumping etc.) in the vicinity of domestic wells on Cross Country Court. To evaluate potential impacts on fracture flow and contaminant transport from the pumping of nearby domestic wells and operation of the remediation system. To evaluate regional recharge/discharge flow paths.
MDE-11 Shallow	Parcel 462 Lots 15 and 16	Casing Depth: Well lot 15 (52') and lot 16 (77')	To evaluate shallow zone flow and contaminant transport.
MDE-11 Deep		Well Depth: Well lot 15 (125') and lot 16 (100')	To provide a well for various types of downhole characterization testing (geophysical, chemical, pumping etc.) in the vicinity of domestic wells on Cross Country Court. To evaluate potential impacts on fracture flow and contaminant transport from the pumping of nearby domestic wells and operation of the remediation system. To evaluate regional recharge/discharge flow paths.
MDE-12 Shallow	Parcel 386, SW corner	No applicable wells	To evaluate shallow zone flow and contaminant transport.
MDE-12 Deep		No applicable wells	To provide a well for various types of downhole characterization testing (geophysical, chemical, pumping etc.) in the vicinity of domestic wells on Cross Country Court. To evaluate potential impacts on fracture flow and contaminant transport from the pumping of nearby domestic wells and operation of the remediation system. To evaluate regional recharge/discharge flow paths.

TABLE 1

MDE Proposed Monitoring Well Locations

Case No. 1994-1251 HA

Former Exxon Upper Crossroads Service Station, 2800 Fallston Road, Fallston, Maryland

Well Number	Well Location Area*	Nearby Well Information	RATIONALE
Quadrant 4			
MDE-13 Shallow	Parcel 386, near Parcel 186, Lots 8 and 9	Casing Depth: Well 39(61'), 40 (60'), 41 (50'), 42 (45') and 43 (72')	To evaluate shallow zone flow and contaminant transport.
MDE-13 Deep		Well Depth: Well 39 (200'), 40(450'), 41(700'), 42 (250') and 43 (300')	To provide a well for various types of downhole characterization testing (geophysical, chemical, pumping etc.) in the vicinity of domestic wells on Cross Country Court. To evaluate potential impacts on fracture flow and contaminant transport from the pumping of nearby domestic wells and operation of the remediation system. To evaluate regional recharge/discharge flow paths.
MDE-14 Shallow	Parcel 359, Parcel 391 Parcel 253	Casing Depth: Well 34 (60'), 35 (68'), 36 (44'), 37 (75') and 61 (33')	To evaluate shallow zone flow and contaminant transport.
MDE-15 Deep		Well Depth: Well 34 (500'), 35 (350') 36 (225'), 37(225') and 61 (300')	To provide a well for various types of downhole characterization testing (geophysical, chemical, pumping etc.) in the vicinity of domestic wells on Cross Country Court. To evaluate potential impacts on fracture flow and contaminant transport from the pumping of nearby domestic wells and operation of the remediation system. To evaluate regional recharge/discharge flow paths.

*The final monitoring well locations will be selected based on field conditions and obtaining property access. The Department must approve the location selected prior to installation.

** Domestic well numbering system provided by Exxon