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July 15, 2016

Mr. Christopher Ralston
Maryland Department of the Environment
Remediation Division, Oil Control Program
1800 Washington Blvd., Suite 620
Baltimore, MD 21230-1719

RE: Conceptual Site Model
Inactive Exxon Facility #28077
14258 Jarrettsville Pike, Phoenix, Maryland
Case Number 2006-0303-BA2
Facility I.D. No. 12342
Kleinfelder Project No.: 20163496

Dear Mr. Ralston:

Enclosed please find the Conceptual Site Model for the above referenced site. As John Hoban discussed with you, we are providing one hard copy and three electronic copies of the report, with additional hard copies to follow at MDE's request.

Please feel free to contact us at 410.850.0404 if you have questions or require additional information.

Sincerely,

KLEINFELDER

Stacey E. Schiding
Project Manager

cc: Mr. John J. Hoban - ExxonMobil Environmental Services Company (project file)
Ms. Ellen Jackson - Maryland Department of the Environment
Mr. Andrew Miller - Maryland Department of the Environment
Carlos Bollar, Esquire - Archer & Greiner, P.C.

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CONCEPTUAL SITE MODEL
INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
MDE CASE NO. 2006-0303-BA2
MDE FACILITY I.D. NO. 12342

July 15, 2016

A Report Prepared for:

Mr. Christopher Ralston
Maryland Department of the Environment
Remediation Division, Oil Control Program
1800 Washington Boulevard, Suite 620
Baltimore, MD 21230-1719

CONCEPTUAL SITE MODEL
INACTIVE EXXON FACILITY #28077
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MDE CASE NO. 2006-0303-BA2
MDE FACILITY I.D. NO. 12342

Kleinfelder Project Number: 20163496

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TABLE OF CONTENTS

Section **Page**

FIGURES

APPENDICES

CONCEPTUAL SITE MODEL
FORMER EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE, PHOENIX, MARYLAND
MDE CASE NO. 2006-0303-BA2
MDE FACILITY I.D. NO. 12342

EXECUTIVE SUMMARY

This report is provided to the Maryland Department of the Environment (MDE) Oil Control Program (OCP) by Kleinfelder on behalf of ExxonMobil Environmental Services Company (ExxonMobil) for former Exxon retail station #28077 (MDE Case Number 2006-0303-BA2) located at 14258 Jarrettsville Pike in Phoenix Maryland.

Extensive site characterization, remediation, and monitoring activities have been conducted by ExxonMobil under the direction of the MDE upon detection of a release of unleaded gasoline at the former service station in 2006. These assessment and remediation activities have been conducted pursuant to an Interim Remedial Measures (IRM) Plan and a Corrective Action Plan (CAP) prepared in accordance with Code of Maryland Regulations (COMAR) 26.10.09, and requested by the MDE. The assessment and remediation activities are also being conducted under a 2008 Consent Decree between the State of Maryland and Exxon Mobil Corporation (Circuit Court for Baltimore County, Maryland, 2008).

A consolidated conceptual site model (CSM) is presented that integrates the chemical, geologic, and hydraulic information obtained from the multiple investigative, monitoring, and remediation activities conducted for the project. The CSM consists of the following elements, which are described in detail in the body of the report:

- Contaminant phases and affected media;
- Source, pathways, and potential receptors;
- Hydrogeologic framework;
- Response to remediation and remedial effectiveness;
- Summary of conditions and groundwater quality; and,
- Alternate sources of impacts.

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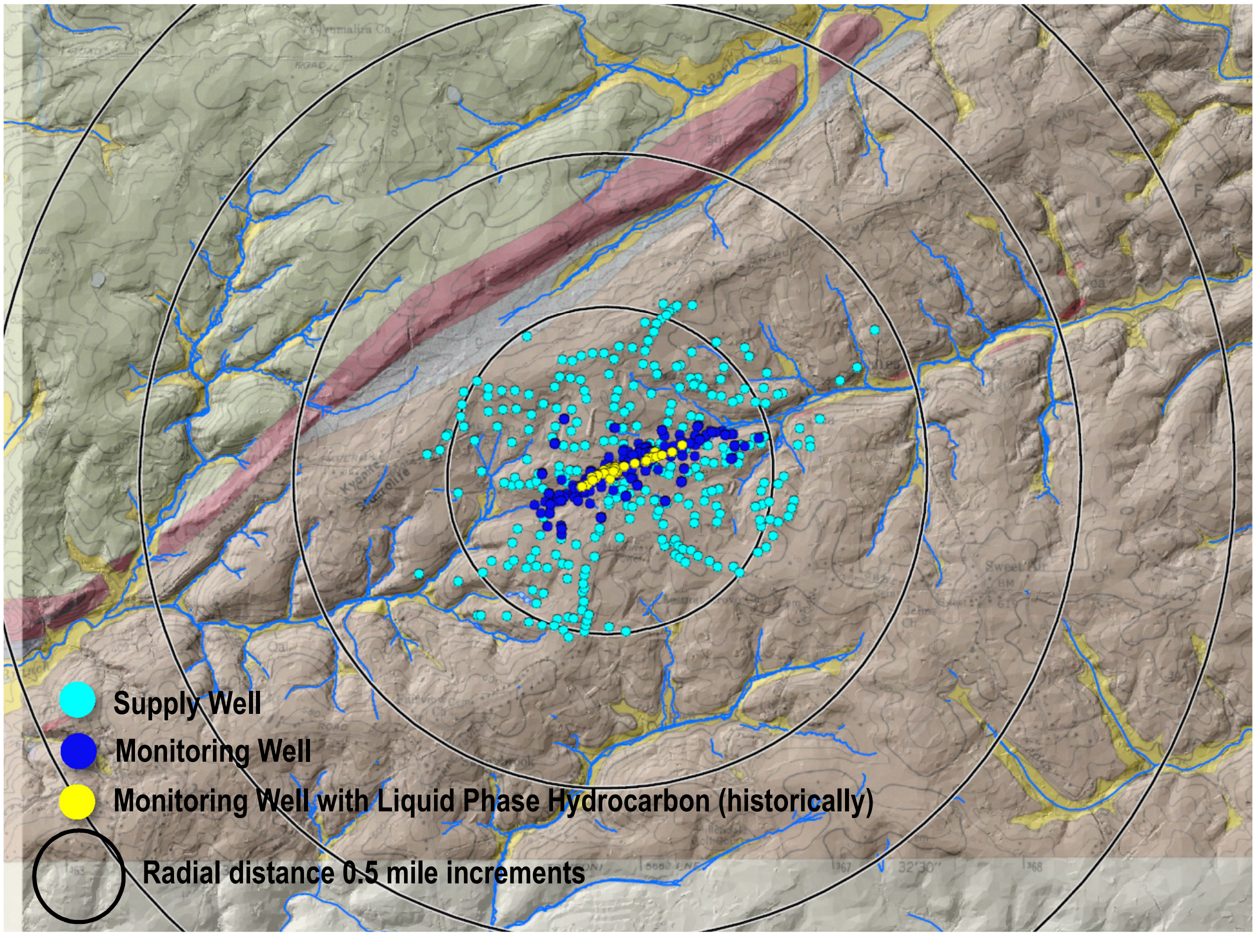
Key aspects of the CSM are summarized as follows:

Hydrogeology, Fate, and Transport

- The groundwater potentiometric gradient is toward the topographic valleys extending northeast and southwest from the former service station property (convergence from the valley sides and from below). Groundwater (un-impacted) discharges to tributaries of the Sawmill Branch of Little Gunpowder Falls and the Greene Branch of Gunpowder Falls.
- Influenced by the anisotropy of the metamorphic foliation and constrained by the aforementioned converging potentiometric gradient, liquid-phase hydrocarbons (LPH) and dissolved-phase hydrocarbons migrated along strike, coincident with the longitudinal axis of the topographic valleys extending from the former service station property. This migration principally occurred in the shallow groundwater (water table) interval.
- Private supply wells are generally not installed within the topographic valleys.
- Vertical downward migration of LPH and dissolved-phase hydrocarbon is impeded by several factors:
    - Gasoline is a non-aqueous phase liquid with a specific gravity less than water (i.e., LPH).
    - There is an upward hydraulic gradient beneath the topographic valleys extending northeast and southwest from the former service station property.
    - The porosity, permeability, fracture frequency, and fracture aperture decrease with depth in the fractured rock aquifer with maximum permeability occurring near the water table in the shallow weathered transition zone between saprolite above and more competent bedrock below.
    - Groundwater extraction for remediation has inhibited vertical downward migration and has instead induced an upward hydraulic gradient in remediation areas.



Graphic 1: Geologic map with well locations and historic extent of liquid phase hydrocarbon (LPH).

<u>Near Northeast Area</u>

- Elevated hydrocarbon concentrations exist beneath the water table in the near northeast area (14307 Jarrettsville Pike, 14311 Jarrettsville Pike, 3501 Hampshire Glen Court, 3506 Hampshire Glen Court, and 3508 Hampshire Glen Court) coincident with a lithologic contact between gneiss and schist that is parallel to and slightly off-set from the original linear migration direction to the northeast at the water table ("strike-line"). This is attributed to localized and above-average pumping rates for private supply wells (14307 Jarrettsville Pike and 3506 Hampshire Glen Court) proximate to and down dip from high source strength conditions (LPH and elevated dissolved concentrations) in the shallow water table zone along the "strike line". Vertical concentration profiling of MW-91, MW-168, and MW-

138D indicate that maximum concentrations occur between depths of 120 and 150 feet in MW-91C and MW-138D and at 235 feet at MW-168. Benzene and MtBE have been delineated to concentrations less than state action levels at elevations shallower than 420 feet deep in MW-91D and in MW-138D.

Response to Remediation

- The combination of total fluids pumping, multi-phase vacuum extraction, and soil vapor extraction has been effective at removing LPH and dissolved-phase mass while containing and contracting the extent of dissolved-phase hydrocarbons in groundwater.
- LPH that once extended in a linear, northeast-southwest direction over a distance of 1,870 feet has not been measurable in any of the more than 300 monitoring and recovery wells since 2008.
- In 2010, up to 26 monitoring/recovery wells in the northeast and 20 wells in the southwest had concentrations of MtBE above the MDE standard. In 2015, the number of monitoring/recovery wells above the MDE MtBE standard ranged up to 12 in the northeast and 6 in the southwest, a reduction of over 60%.
- Dissolved-phase hydrocarbons in groundwater have been significantly reduced in concentration and retracted in extent due to remediation activities.
- The percentage of monitoring wells exhibiting an MtBE exceedance of the state action level has been reduced from 63% in 2006 (207 monitoring wells total) to 9% in 2016 (277 monitoring wells total).
    - As of 2015, 72 out of 79 monitoring and recovery wells southwest of the former service station property on 8 residential properties are non-detect for MtBE and benzene.
    - As of 2015, 41 out of 47 monitoring and recovery wells southwest of the release area (former UST field) on the former service station property are less than state action levels.
    - As of 2015, all 30 groundwater monitoring and recovery wells to the distal northeast (beyond 3508 Hampshire Glen Court) on 6 residential properties are non-detect for MtBE and benzene.

- It has been observed that the concentrations in deeper monitoring wells (C zone) on 3501 Hampshire Glen Court tend to be suppressed by groundwater extraction for remediation and can rebound during a hiatus in pumping.
- In the near northeast area, previously increasing influent concentrations associated with private supply wells for 14307 Jarrettsville Pike and 3506 Hampshire Glen Court have reversed since supplemental remediation activities were implemented between April 2009 and December 2010 and both are below MDE standards.

Recent Conditions

- Residual concentrations above state action levels generally occur in the following areas:
  - Proximate to the release area (former tank field) on the former service station property;
  - Within or near the Paper Mill Road / Jarrettsville Pike intersection (MW-187A, B,C);
  - Properties bounding the intersection to the east (14301, 14307, and 14311 Jarrettsville Pike); and,
  - Associated with monitoring wells (MW-178C, MW-183, MW-168, MW-138D, MW-82D) in the "near northeast" area (3501, 3506, and 3508 Hampshire Glen Court).
- Of the private supply wells sampled on 245 properties in 2015, only one property (3627A Southside Avenue) exceeds any MDE standard for gasoline constituents. Influent concentrations in supply wells on 14 properties have gasoline constituents greater than 10%, but less than 50%, of an MDE standard. Six of these 14 properties with an influent concentration greater than 10% of an MDE standard for a gasoline constituent are located in areas of other suspected and/or documented sources of release.

1 INTRODUCTION

This report is provided to the Maryland Department of the Environment Oil Control Program by Kleinfelder on behalf of ExxonMobil for former Exxon retail station #28077 (MDE Case Number 2006-0303-BA2) located at 14258 Jarrettsville Pike in Phoenix Maryland (Figure 1).

Extensive site characterization, remediation, and monitoring activities have been conducted by ExxonMobil under the direction of the MDE upon detection of a release of unleaded gasoline at the former service station in 2006.

The purpose of this document is to consolidate and summarize key findings of site characterization and monitoring activities conducted to date, document the effectiveness of remedial measures, and consolidate this information into an updated conceptual site model (CSM). The CSM is intended to inform the appropriate degree of monitoring, remediation, reporting, and modifications to ensure protection of the environment and potential receptors while progressing the case towards and MDE issuance of No Further Action (NFA). As such, this document will facilitate MDE's determination when remediation is completed to an extent that is protective of public health and the environment per paragraph 34 of the 2008 Consent Decree.

The report is organized into the following sections:

- **Section 2.0 – Site Description and Setting**

This section provides the area context for the project including location and surrounding land use.

- **Section 3.0 – Current Monitoring and Remediation Status**

Extensive investigation and remediation activities have been conducted since the inception of the project in February 2006. This section summarizes those investigations and references the associated documentation that serves as the basis of the CSM described herein. This section also summarizes the remedial actions and the evolution of the remediation systems used at the Site.

- **Section 4.0 – Conceptual Site Model**

The CSM is documented in this section, including, the Site's physiographic and topographic setting, and underlying geology and hydrogeology, descriptions and visual presentations of 1) contaminant phases and affected media; 2) source, pathways, and potential receptors; 3) hydrogeologic framework; 4) response to remediation and remedial effectiveness; 5) summary of site conditions and groundwater quality; and 6) alternate source impacts.

- **Section 5.0 – Conclusions**

Key findings are presented as conclusions in this section.

- **Section 6.0 – Path Forward**

A series of next steps toward case closure are presented in this section based on site conditions and the CSM.

2 SITE DESCRIPTION AND SETTING

The 1.71-acre former service station property is located at 14258 Jarrettsville Pike, on the southwest corner of the intersection of Sweet Air Road/Paper Mill Road (MD 145) and Jarrettsville Pike (MD 146) in Phoenix, Baltimore County, Maryland (Figure 1).

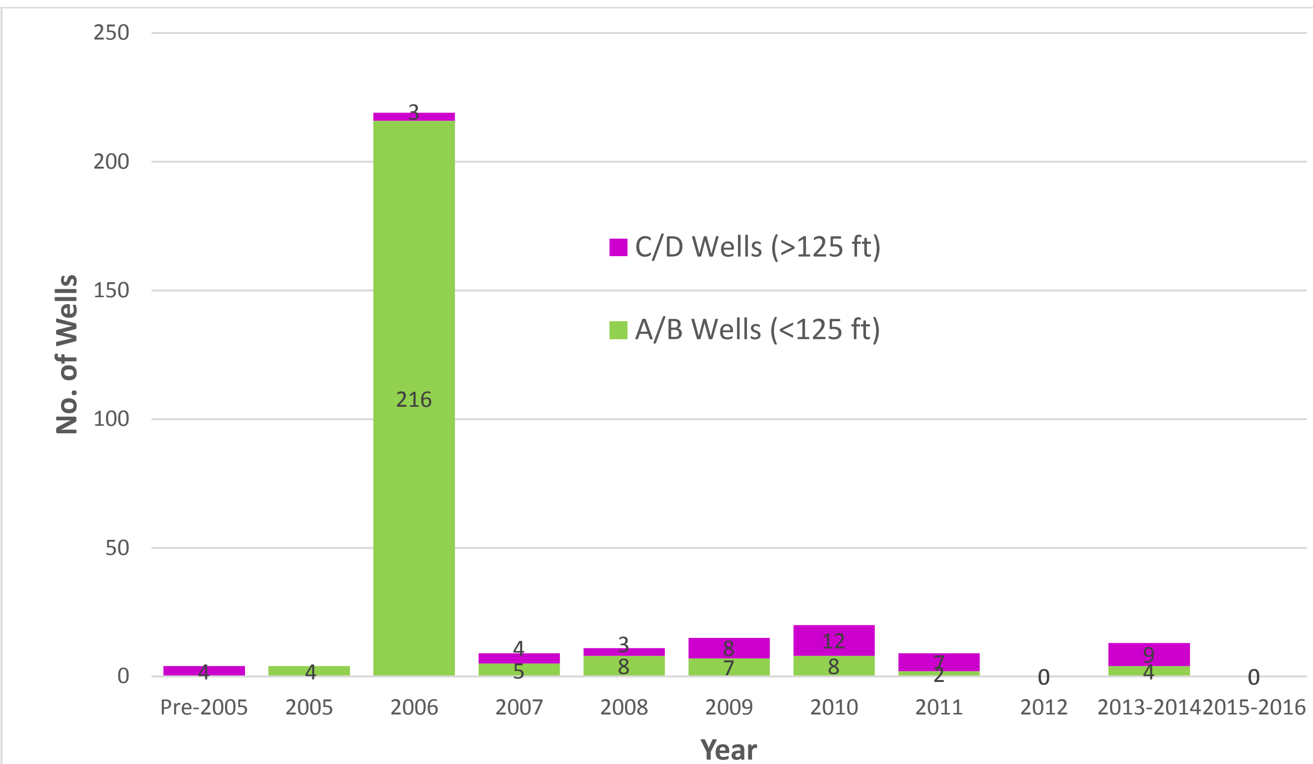
Local businesses (retail and commercial concerns) are concentrated around this intersection (Figure 2), including a retail petroleum distributor across Jarrettsville Pike to the east. Beyond this “business district” the land use is primarily single-family residential properties interspersed with some vacant, undeveloped lots and wooded areas (Figure 2). Sewage in the area is managed by private septic systems and sewage disposal is handled by septic tank waste contractors. Water is obtained from private supply wells (Figure 3).

3 CURRENT MONITORING AND REMEDIATION STATUS

3.1 CURRENT MONITORING / RECOVERY WELL NETWORK

The existing monitoring well network is comprised of 304 monitoring wells, of which up to 63 are in use as recovery wells at any given time (Kleinfelder, 2016b). The majority of the wells were installed in the first year of investigation with additional groups of wells installed over time to address specific data needs or requests. A summary of historical investigations and assessment activities can be found in Appendix B.

Number of Monitoring Wells Installed by Year



Graphic 2: Number of Monitoring Wells Installed by Year.

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Currently, 278 monitoring wells are sampled monthly (67 wells), quarterly (176 wells) or semi-annually (34 wells) as approved by the MDE and detailed in quarterly *Remedial Action Progress Reports* (Kleinfelder, 2016b).

Monitoring Well Network Installation

Project monitoring and remediation wells were installed to generally correspond to four relative depths:

- A zone – Shallowest wells screened across the water table (or close to it). Historical detection and remediation of LPH occurred in the A Zone monitoring wells (up to 60' total depth).
- B zone – Wells that typically have submerged well screens or open intervals beneath A zone and are approximately 125' in total depth.
- C zone – Relatively deep wells installed to depths comparable to areas supply wells. Depths of approximately 300 feet are typical for C zone wells.
- D zone – Deepest project monitoring wells intended to characterize groundwater conditions beneath the depth of area supply wells. D zone wells can be as deep as 400 feet.

The relatively deeper wells case off the shallower, letter-designated intervals.

3.2 CURRENT SUPPLY WELL SAMPLING PROGRAM

The current MDE-approved PSW sampling program includes sampling of 43 supply wells monthly, 86 supply wells quarterly, and 130 supply wells semi-annually. Since January 2013, only one supply well sampled on behalf of ExxonMobil (3627A Southside Avenue) has had detections of gasoline constituents (BTEX, five fuel oxygenates including MtBE or naphthalene) above regulatory standard, and only one other supply well has had detections of gasoline constituents above half of the standard – a single detection of naphthalene at 14225 Robcaste Road in April 2014 (Kleinfelder, 2016a). This detection is unlikely to be related to the release in question. ExxonMobil currently maintains 14 point-of-entry (POET) systems in the area (details can be found in Appendix B).

3.3 CURRENT REMEDIATION SYSTEM

Initial remediation following the January 2006 release began with the detection in February 2006 of LPH in existing monitoring wells on the former service station property. A full timeline of remediation activities and changes to the remediation systems can be found in Appendix C.

Currently, two SVE systems operate on the station property for extraction of soil vapor. Groundwater is recovered from up to 63 recovery wells on eight separate properties (Figure 5). Groundwater is recovered through a combination of submersible pneumatic pumps and high vacuum dual phase extraction. All extracted groundwater is treated with equipment on the service station property and discharged to two outfalls, one in the northeast and one in the southwest, proportional to the percentage of recovery from each quadrant. All recovered groundwater is currently treated via liquid phase granular activated carbon.

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4 CONCEPTUAL SITE MODEL

This section integrates the chemical, geologic, and hydraulic information obtained from the multiple investigative and monitoring activities conducted into a CSM that describes the following site characteristics and conditions:

- Contaminant phases and affected media;
- Source, pathways, and potential receptors;
- Hydrogeologic framework;
- Response to remediation and remedial effectiveness;
- Summary of conditions and groundwater quality; and,
- Alternate sources of impacts.

4.1 PHYSICAL SETTING

This section describes the physical setting and underlying geological framework in the project area. The area hydrogeology and physiography are described first followed by the geologic framework, which is related to the surface expression of topography and physiography.

4.1.1 Topography and Physiography

The site exists within Piedmont Physiographic Province of Maryland (Schmidt, 1993). The topography (Figures 1 and 6) is closely related to the geology of the region (e.g., foliated bedrock structure and differential weathering) (Figure 7). The local topographic features depicted on Figures 1 and 6 (e.g., drainages that trend southwesterly and northeasterly away from the service station property, and the ridge upon which the service station property is located) are geomorphic expressions of the underlying bedrock surface and structural orientation (Figure 8). The topographic features observed (the drainages and ridges) are also roughly parallel to the strike of the bedrock foliation, again northeast-southwest.

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These streams have formed by eroding into a weak zone within the bedrock which is generally parallel to the foliation of the rock. These are referred to in the literature as “strike streams” (Strahler, 1960), because they are linear and trend along strike of the bedrock foliation.

4.1.2 Geology

The project area is underlain by metamorphic rocks comprising the southern flank of the Phoenix Dome, regionally mapped by Moller (1979) as the Loch Raven Schist of the Wissahickon Group (Figure 7). Sub-units encountered during the investigation included gneiss and pegmatite. . The bedrock types encountered during the investigation are consistent with historical regional mapping.

The primary bedrock structural feature is the metamorphic foliation, which is mapped to strike northeast and dip northwest (Moller, 1979). This structural orientation is consistent with geologic observations, manual measurements, and borehole geophysical measurements of the foliation orientation completed as part of this investigation.

Conformably overlying bedrock is a layer of saprolite (Cleaves, 1974), which forms a gradational weathering profile with bedrock.

Graphic 3: Bedrock foliation looking southwest in tank field excavation.

The soils encountered during the site investigation overlay the saprolite and are generally composed of silty to sandy clay and clayey to silty sand. The thickness of the overburden (soils and saprolite) across the area ranges from 5 feet (higher elevations) to 65 feet (drainage channels and lower elevations). Soils in the region are primarily considered moderately eroded Glenelg Loam (GcB2 and GcC2) with lesser amounts of moderately to severely eroded Manor Loam (MbB2, MbC2, MbC3, and MbD3) occurring on some of the steeper slopes (Reybold, 1976). There are minor amounts of Glenville Silt Loam (GnB) limited to the drainage areas of the project. These soil types are deep, variable in the degree to which they drain, and may exhibit moderate permeability. These soils are consistent with the soils encountered during the investigation.

Graphic 4: Relict foliation in saprolite from tank field test pit.

4.2 HYDROGEOLOGY

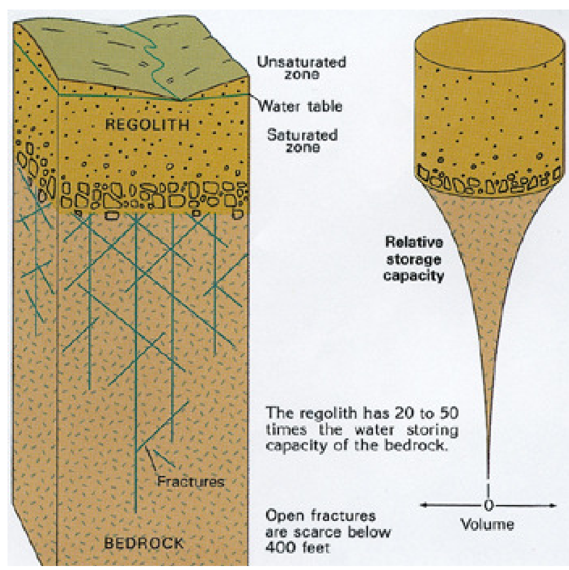
4.2.1 Hydrogeologic Setting

The Piedmont Physiographic Province is characterized by bedrock aquifers within metamorphic and igneous rocks of the region (Nutter, 1974). Primary (intergranular) porosity of the bedrock is relatively minimal compared to the secondary porosity (fractures, joints, foliation, etc.) of the bedrock, in which groundwater flow may occur. The spacing and extent (persistence) of the fractures, joints, and foliation affect the availability of groundwater within the bedrock aquifer. Groundwater within the bedrock is generally restricted to flow within the network of fractures, joints, and foliation. Regionally and at distal locations in the project area, the groundwater table may occur above or within the weathered bedrock transition zone or within the saprolite; these zones transmit groundwater where saturated. Fractures, joints, and foliation aperture decrease with depth (i.e., the bedrock is increasingly more competent with depth), resulting in diminished downward vertical movement of groundwater.

4.2.2 Hydrogeologic Framework

Within area bedrock aquifers, groundwater generally occurs under water table (unconfined) conditions. Locally, the top of bedrock surface may exist at an elevation above that of the water table (Figures 20a and 20b). In these areas, groundwater occurs and moves exclusively within the secondary porosity of the bedrock – the fractures, joints and foliation. The water table may also occur within the weathered residuum (saprolite or soil) above bedrock (Figures 20a and 20b). Within the saprolite layer, groundwater occurs and moves within the pore spaces between the weathered mineral grains and within the relict foliation.

The depth to groundwater ranges from near the ground surface (approximately 3 feet bgs) northeast and southwest of the former service station property where the gaining streams occur to approximately 40 feet bgs beneath the former service station property in the vicinity of the former tank field (static depth to water, not pumping-induced). Stream channels in the study area have the thickest layers of saprolite and alluvial sediments, and groundwater occurs closest to the ground surface in those areas. The water table in areas of higher topography generally exists within bedrock.



Graphic 5: Typical weather and fracture pattern for crystalline rocks in the Piedmont Physiographic Province

The embedded diagram illustrates the typical weathering and fracture profile for crystalline rocks within the Piedmont Physiographic Province. The diagram also illustrates the relationship of groundwater saturation and hydrogeology to the weathering and fracture profile. Specifically, the diagram indicates storage capacity and permeability are greatest near the saprolite-top of bedrock surface ("regolith") where there is more weathering, porosity, and greater fracture frequency. Conversely, open fractures decrease with depth with few, if any, open fractures below 400 feet from surface, indicating diminished storage capacity and permeability with depth.

4.2.3 Geologic Control of Groundwater Flow and Contaminant Migration

The direction of groundwater flow and contaminant migration is strongly influenced by the northeast-southwest trending strike of the foliation of the Loch Raven Schist, the formation comprising the bedrock aquifer. This resulting anisotropy influenced hydrocarbon migration (LPH and dissolved phase) to occur in a linear direction to the northeast and southwest. The direction of hydrocarbon migration was also influenced and constrained by the area topography and potentiometric surface, which is a subdued expression of the topography. This resulted in hydrocarbon migration that occurred within and is constrained to the erosional valleys extending to the northeast and southwest from the former service station property. Figure 13 illustrates the structural and topographic influence on hydrocarbon migration by superimposing the topography, underlying geology, and maximum historical extent of LPH migration. Figure 13 also includes surrounding supply wells, surface drainage features, and the monitoring and recovery well network. Inspection of this map (Figure 13) results in the following observations:

- LPH migration on the water table within the upper weathered and fractured portion of bedrock was linear to the northeast and southwest within the erosional valley that occurs along the foliation strike of the Lock Raven Schist.
- The maximum historical distribution of LPH is surrounded and delineated by the monitoring and recovery well network.
- Surrounding supply wells are generally located peripheral to the historical extent of LPH migration and are generally not installed within the topographic valleys where LPH and dissolved phase hydrocarbon migration occurred.

Dissolved phase hydrocarbon distribution maps (Figures 14a to 14t) also exhibit generally linear dissolved phase migration due to anisotropy and related topographic / potentiometric influence.

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A lineament trace analysis (Kleinfelder, 2008b) was conducted at the request of the MDE to identify the surficial expression of geologic, structural, and or topographic features that could potentially influence the direction of hydrocarbon migration relative to potential receptors in the area. Figure 15 presents a map illustrating potential lineaments in the area. The lineament trace analysis report concludes the potential for dissolved-phase migration to the regional lineament network is limited by the natural convergence of the potentiometric surface toward the "strike line" lineament, the hydraulic control maintained along the "strike line" and the paucity of cross-cutting lineaments that intersect the "strike line" in the vicinity of the project.

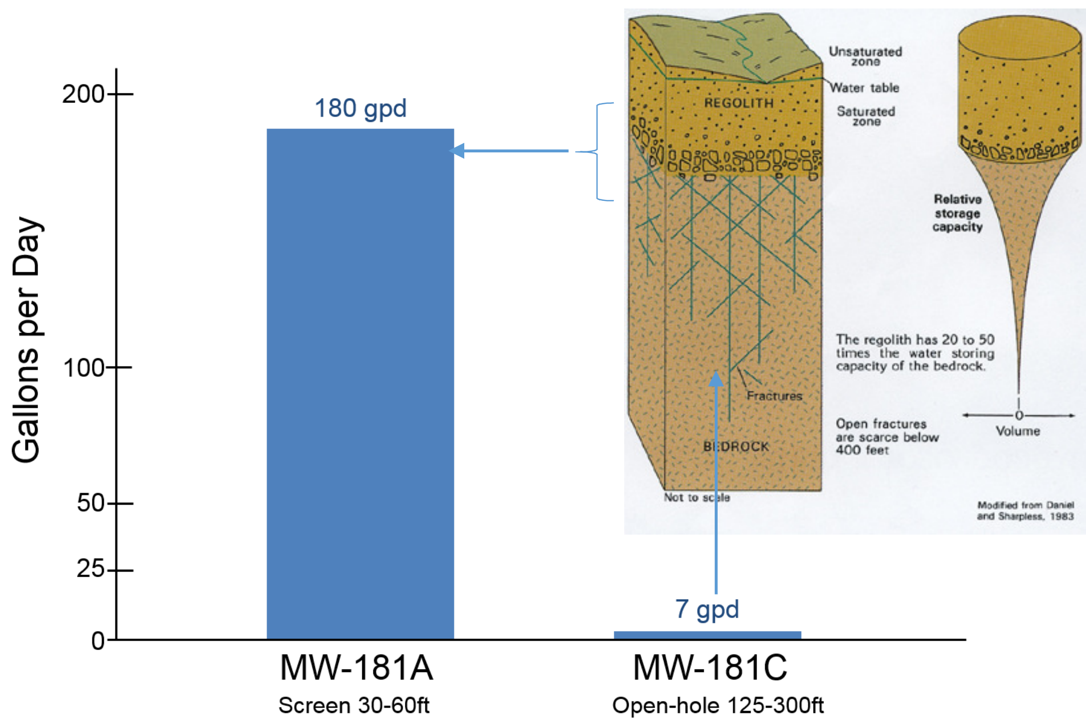
4.2.4 Hydrologic Influences on Groundwater Flow and Contaminant Migration

Potentiometric surface elevation maps (Figures 9a through 9c) exhibit the convergence of hydraulic gradients within the topographic valleys to the northeast and southwest, and the ultimate discharge of groundwater (un-impacted) to the headwaters of streams more distally located within the northeast and southwest stream valleys extending from the former service station property.

4.2.5 Vertical Profile of Hydrogeologic System

Vertical migration of hydrocarbons is inhibited by an upward vertical hydraulic gradient within the topographic valleys (Figure 10) where LPH and dissolved-phase hydrocarbons have been characterized and delineated. Vertical migration is further impeded by the diminishing frequency and aperture of fractures with depth in bedrock. The diminishing frequency and aperture of fractures with depth also results in lesser yield and lesser hydraulic conductivity with depth that is not conducive to vertical migration.

The bar graph below illustrates the difference in groundwater recharge rate for a shallow monitoring well (Zone A) versus a deeper monitoring well (Zone C) at the MW-181 well cluster. The graph illustrates that groundwater recharge rate in the shallow (water table) zone is 26 times greater than the groundwater recharge rate for the deeper zone (Zone C); however, the open interval for the shallow zone monitoring well (MW-181A) is four times less than that of the deeper zone monitoring well (MW-181C).



Graphic 6: Decreasing storage, permeability, and transmissivity with depth in bedrock

Limited downward migration is also evidenced by chemical concentration data from the release area by comparing analytical results and LPH detection for shallow release area well MW-27 and deeper release area well MW-27B.

Monitoring Well	Open Interval (ft-toc)	Max MtBE (µg/L)	Recent[3] MtBE (µg/L)	Comments
MW-27	27-43	869,000[1]	240	Last well to contain LPH
MW-27B	60-125	51.9[2]	1	

1) May 2007
2) July 2013
3) September 2015

Recent analytical results associated with the monitoring wells installed within the intersection of Paper Mill Road and Jarrettsville Pike also indicate limited vertical migration beneath the source near the release area. Elevated MtBE concentrations are noted in the intermediate depth zone, which is attributed to the hydraulic influence of the nearby private supply well at 14307 Jarrettsville Pike, which is discussed in more detail in the following section:

Monitoring Well	Open Interval (ft-toc)	MtBE (µg/L	Benzene (µg/L)
MW-187A	25-60	3,400	1,200
MW-187B	60-125	8,000	5J
MW-187C	125-300	140	ND(1)

Sampled September 2015

4.2.6 Potentiometric Surface and Hydraulic Gradients

Figures 9a and 9b present the groundwater potentiometric surface relative to topography and geology. These maps include the water table surface (Zone A) for a range of groundwater extraction conditions during the course of remediation represented by groundwater gauging conducted during the autumn in 2010 and 2015. Monthly potentiometric surface elevation contour maps, including gauging data, have been submitted to the MDE in quarterly remedial action progress reports (RAPRs) submitted over the past 10 years. Figure 9c presents potentiometric surface elevation maps for deeper portions of the bedrock aquifer (Zone C) corresponding to April 2010.

Inspection of these maps (Figures 9a through 9c) indicates the groundwater potentiometric surface is consistently a subdued expression of the topography with higher potentiometric elevation corresponding to upland areas and lower potentiometric surface corresponding to valleys for the water table (Zone A) and for deeper portions of the aquifer (Zone C). The potentiometric surface elevation pattern is also consistent with the top of bedrock surface elevation contour map (Figure 8) indicating that the groundwater potentiometric surface and associated flow direction is influenced by weakness and erosion of bedrock expressed as bedrock topography. Groundwater consequently converges in and flows toward stream valleys, eventually discharging to the headwaters of the gaining streams (tributaries of the Green Branch [southwest] and Sawmill Branch [northeast]) incised within the eroded metamorphic foliation.

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Comparison of the April 2010 potentiometric surface and elevations for Zones A, B, and C indicates the distribution of vertical hydraulic gradients within the aquifer.

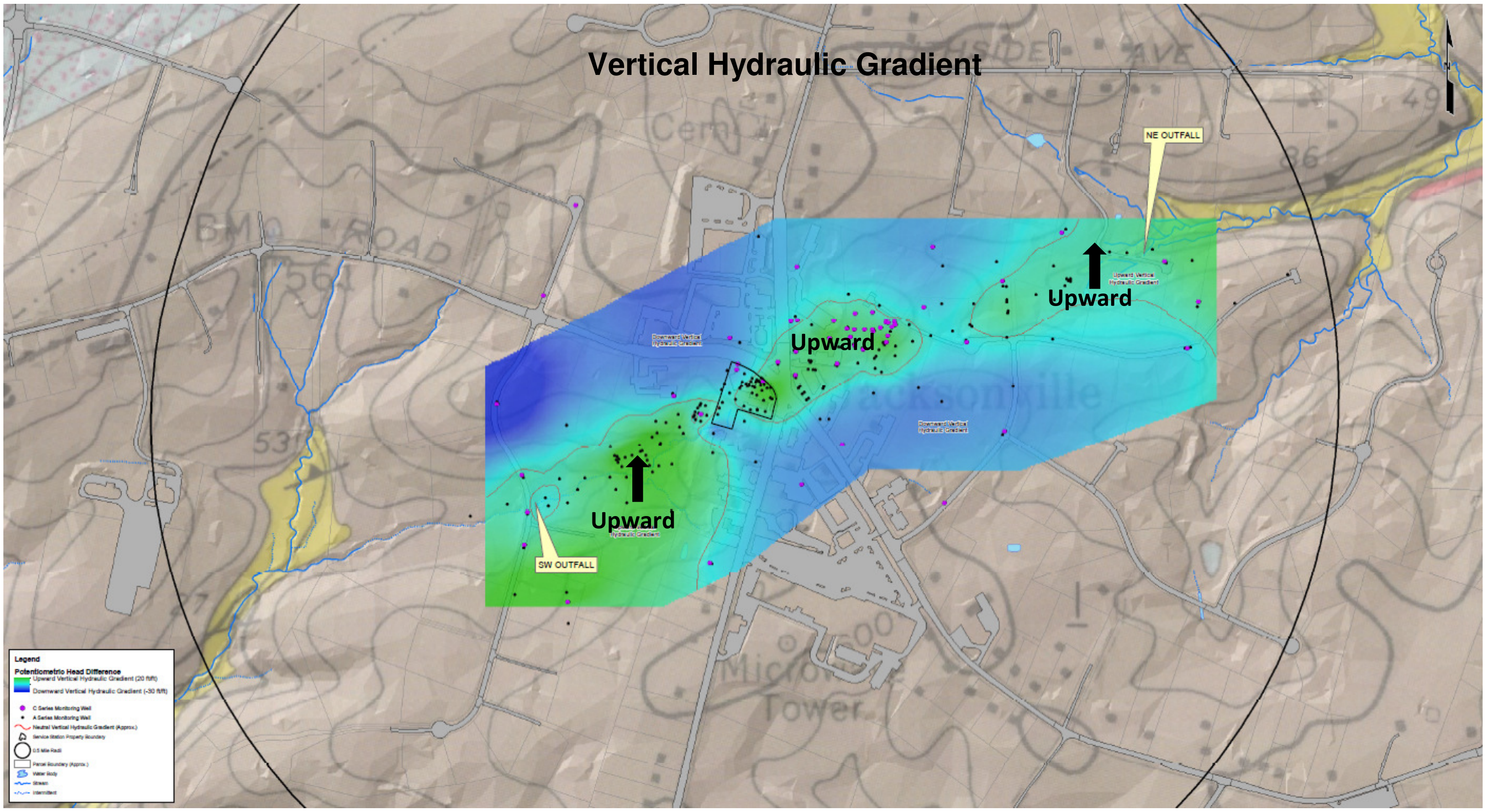
In February 2011, ExxonMobil proposed a vertical head study to isolate vertical intervals of the bedrock aquifer and obtain potentiometric measurements. The study used clusters of “A,” “B,” and “C” zone wells, as well as the installation of packers to subdivide the open boreholes of various “C” zone wells.

The Vertical Head Testing Report (Kleinfelder, 2011b) documents the following conclusions:

- The dominant vertical gradient between shallow and deep zones at upland locations is downward. This is consistent with expected infiltration and recharge and downward gradients associated with elevated topography / plateaus (Heath, 1983).
- The dominant vertical gradient between shallow and deep zones at locations proximate to the valley bottom/axis is upward. This is consistent with expected groundwater discharge and upward gradients associated with valley bottoms and surface drainage/streams (Heath, 1983).
- Valley side slope locations exhibit both upward and downward vertical gradients depending on the location with downward gradients being most common.

These conditions are illustrated on the Vertical Hydraulic Gradient Map (Figure 10) that represents the relative potentiometric elevation difference between the water table (Zone A) potentiometric surface and the deeper (Zone C) potentiometric surface:

- In the valleys (green areas), the potentiometric elevation for the deeper zone is higher than the potentiometric surface elevation of the shallow zone (upward gradient).
- In the uplands (blue areas), the potentiometric elevation for the shallow zone is higher than the potentiometric surface of the deeper zone (downward gradient).



Graphic 7: Vertical Hydraulic Gradient

4.2.7 Hydraulic Conductivity

Hydraulic conductivity was measured and calculated based on multiple slug tests and aquifer pumping tests, as documented in the Preliminary Hydrogeologic and Contaminant Assessment Report (Kleinfelder, 2006a). The hydraulic conductivity results are displayed and contoured on Figure 11. Inspection of this spatial presentation of hydraulic conductivity results reveals an elongate, longitudinal distribution pattern trending northeast-southwest with a core of greater hydraulic conductivity (8 to 28.9 ft/day) transitional to values of lesser hydraulic conductivity at the periphery (<1.0 ft/day). This pattern is generally coincident with the strike of the bedrock foliation and physiographic features (e.g., stream channels incised into bedrock).

4.2.8 Hydraulic Response to Groundwater Extraction

The following table summarizes the greatest distance at which drawdown was measured relative to the structural orientation of the bedrock foliation:

PUMPING WELL	OBSERVATION WELL	DISTANCE (FEET)	DRAWDOWN (FEET)	STRUCTURAL ORIENTATION
MW-77B	MW-61A	185	0.07	Up dip
	MW-81	223	0.09	Along Strike (Downgradient)
MW-112	MW-70	268	0.04	Up dip
	MW-113	122	0.08	Along Strike (Downgradient)

4.2.9 Mechanisms of Migration in Near Northeast at Depth

Routine monitoring of the private supply well at 3506 Hampshire Glen Court identified the potential for a migration pathway in addition to the hydrocarbon migration that occurred along foliation strike from the source area in the shallow (water table) zone ("strike line"). Additional investigation on 3501 Hampshire Glen Court identified an off-set fracture parallel to foliation strike and the primary migration direction that is coincident with a geologic contact between a zone of gneiss and the predominant Loch Raven Schist beneath the center of 3501 Hampshire Glen Court. The implementation and results of this investigation are documented in the Near Northeast Area Supplemental Investigation and Remedial Measures Report (Kleinfelder, 2011a), and summarized in the following paragraphs. Select graphics and figures from the August 15, 2011 Near Northeast Investigation are presented as Figure 4, and Figures 16 through 24.

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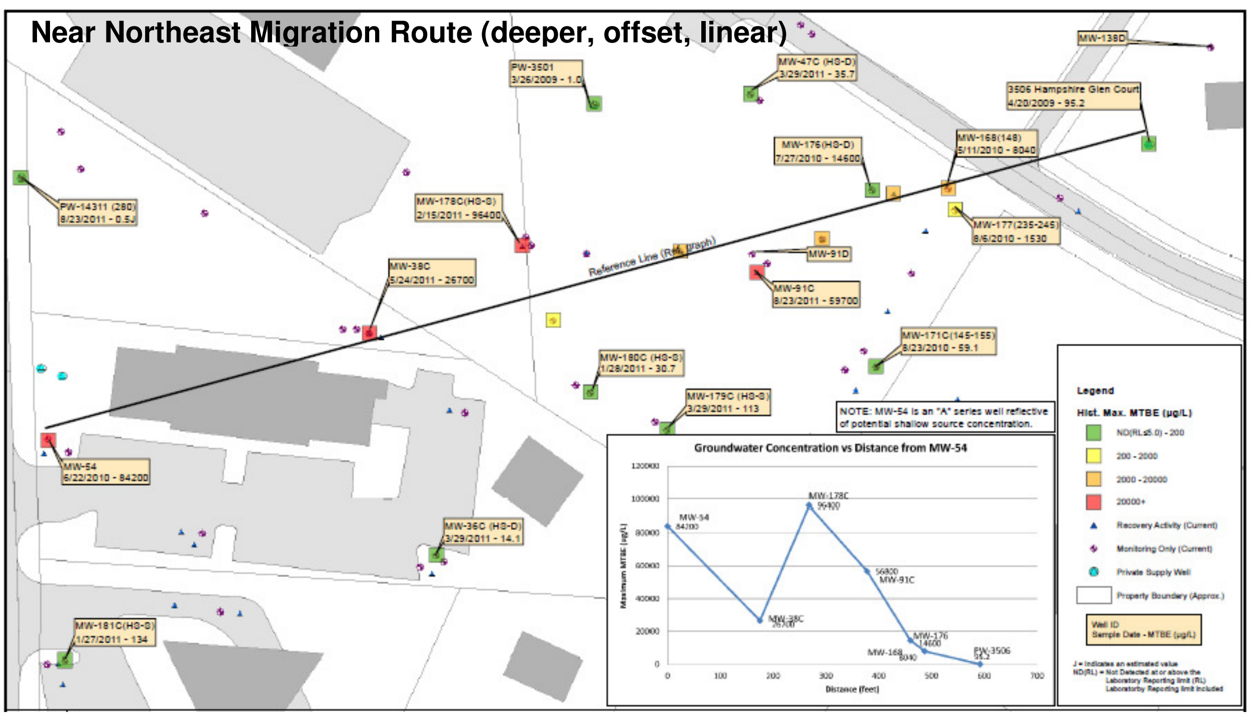
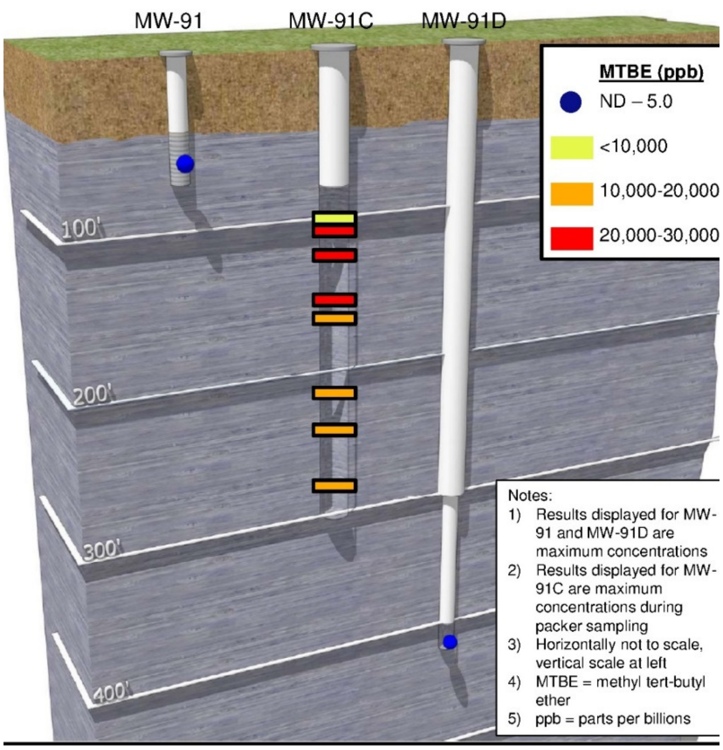
Characterization

Dissolved-phase hydrocarbon concentrations are characterized vertically and laterally beneath and in proximity to 3501 Hampshire Glen Court. The highest dissolved-phase concentrations through the near northeast (core concentrations) are associated with groundwater monitoring/recovery wells open at depths below the water table. From the western boundary of 3501 Hampshire Glen Court to the eastern boundary of 3508 Hampshire Glen Court, these wells consist of MW-178C, MW-91C, MW-176, MW-138D, and MW-82B (Figure 4). Maximum concentrations in these wells reflect a linear northeast-southwest distribution. This northeast-southwest orientation is generally parallel to the original orientation of hydrocarbon migration ("strike line"), and coincident with (1) the structural fabric beneath the property (i.e., foliation); (2) the structural orientation of open fractures measured in these wells; (3) a northeast-southwest trending microgravity anomaly; and (4) the orientation of a lithologic contact between schist and gneiss through this area.



Graphic 8: Near Northeast migration route

These core concentrations are bounded laterally by nine C-series groundwater monitoring wells: PW-14311, PW-3501, MW-47C, MW-73C, MW-171C, MW-179C, MW-180C, MW-36C, and MW-181C (Figure 4). Maximum concentrations associated with these perimeter monitoring wells directly surrounding the core concentrations are less than 150 ug/L MTBE, which is one to three orders of magnitude less than the core concentrations. Collectively, these perimeter wells characterize the lateral extent (across foliation strike) of dissolved-phase hydrocarbons at depths to 300 ft-bgs beneath 3501 Hampshire Glen Court and vicinity. Additionally, supply wells outside of this core concentration area have exhibited low to no MTBE concentrations.



Graphic 9: Vertical Concentration Profiling - Center of Near Northeast Area (MW-91 Well Cluster)

The vertical extent of dissolved phase hydrocarbons beneath the core concentration area is characterized at depth by MW-91D (Figure 4). MW-91D is located within the core concentration area; it is a double-cased monitoring well open to the bedrock from a depth of 400 to 420 ft-bgs. Historical MtBE concentrations associated with MW-91D range from non-detect to 1.1 ug/L. Published literature and various lines of site-specific evidence indicate that fractures decrease with depth, reducing the overall permeability with depth and the potential for vertical transport.

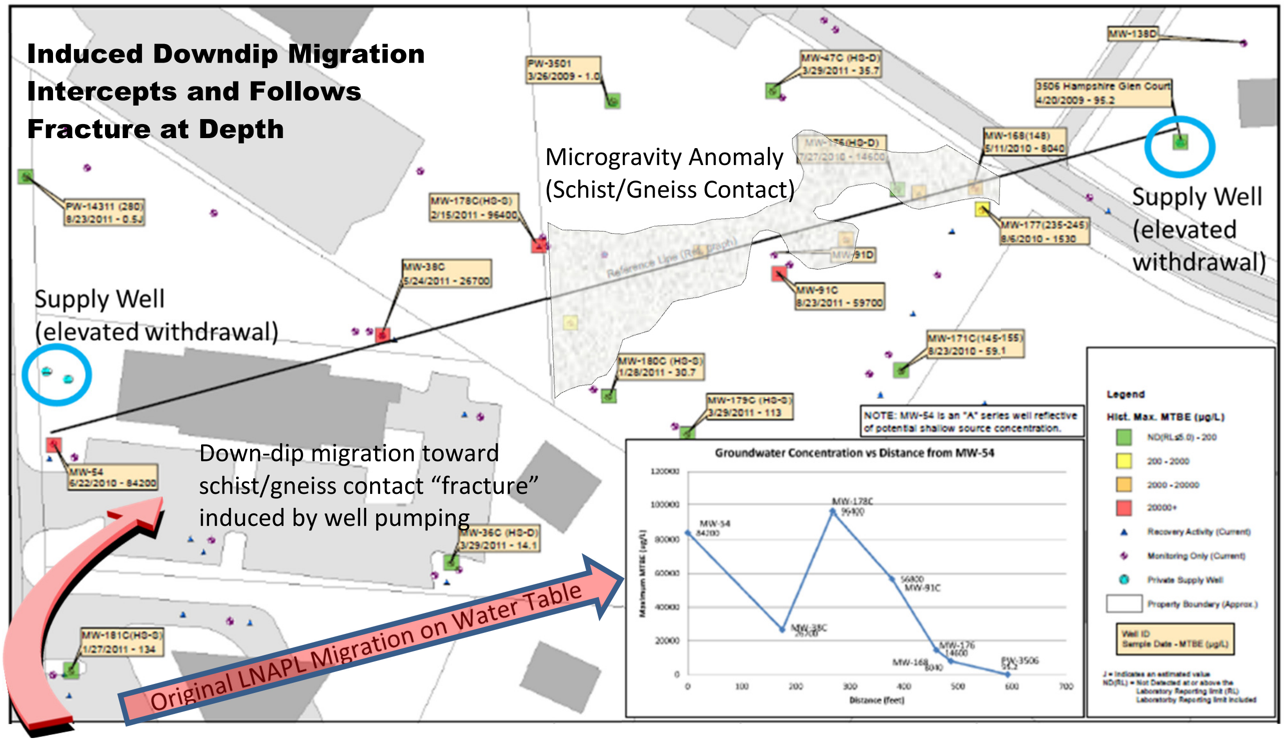
Though in a low permeability zone, MW-91D yields some groundwater, and groundwater sampled from this monitoring well is characteristic of groundwater quality at depth beneath the near northeast area. Low to non-detect MtBE concentrations associated with MW-91D are consistent with decreasing concentrations beneath 145 feet, as sampled in MW-91C during packer sampling.

Additionally, dissolved-phase hydrocarbon concentrations associated with wells MW-178C, MW-91C, MW-176, and MW-168 have been vertically profiled by packer and discrete interval HydraSleeve^{TM} groundwater sampling methods. Vertical concentration profiling has been conducted via discrete interval sampling with a FLUTe liner in downgradient monitoring well MW-138D. These results indicate that the 120 to 125 ft-bgs depth interval exhibits the highest concentrations among the other intervals monitored in this well, and concentrations decline with depth (Appendix A).

Migration Mechanisms

A unique combination of a preferential structural pathway and hydraulic influences in proximity to core hydrocarbon concentrations exists in the near northeast area:

- **Residual Dissolved Hydrocarbon Source** - A maximum concentration of 84,200 ug/L MtBE occurred in MW-54 shortly after MW-54 was activated as a recovery well. This suggests sufficient source strength in the area of 14307 Jarrettsville Pike to result in the concentrations measured at depth (downdip) and in the direction of MW- 78C, MW-91C, MW-176, and MW-168 (along strike).
- **Pathway** - The lines of evidence presented herein are indicative of a northeast trending, northwest dipping zone of relative permeability associated with a geologic contact extending through the 3501 Hampshire Glen Court property.
- **Hydraulic Influence** - Liquid phase hydrocarbon was detected beneath 14301 Jarrettsville Pike, 14307 Jarrettsville Pike, and in proximity to 3506 Hampshire Glen Court in 2006. Additionally, water usage from the 3506 Hampshire Glen Court and 14307 Jarrettsville Pike supply wells was measured to be above that used at other properties in the area. This suggests a proximal hydraulic stress which intermittently induces downdip groundwater movement from the original location of hydrocarbon migration ("strike line") in the direction of the geologic contact (geophysical anomaly) trending through 3501 Hampshire Glen Court. As a result of the increased pumping, the supply wells serving these properties were affected by gasoline or its constituents.



Graphic 10: Near northeast area graphic conceptual model

Concentrations associated with the intersection wells (MW187-A,B,C), located proximate to the 14307 Jarrettsville Pike private supply well suggest the start of localized downward migration due to the pumping of this supply well, as evidenced by elevated MtBE concentrations associated with the intermediate depth (Zone B) from 60 to 125 ft-toc:

Monitoring Well	Open Interval (ft-toc)	MtBE (µg/L	Benzene (µg/L)
MW-187A	25-60	3,400	1,200
MW-187B	60-125	8,000	5J
MW-187C	125-300	140	ND(1)

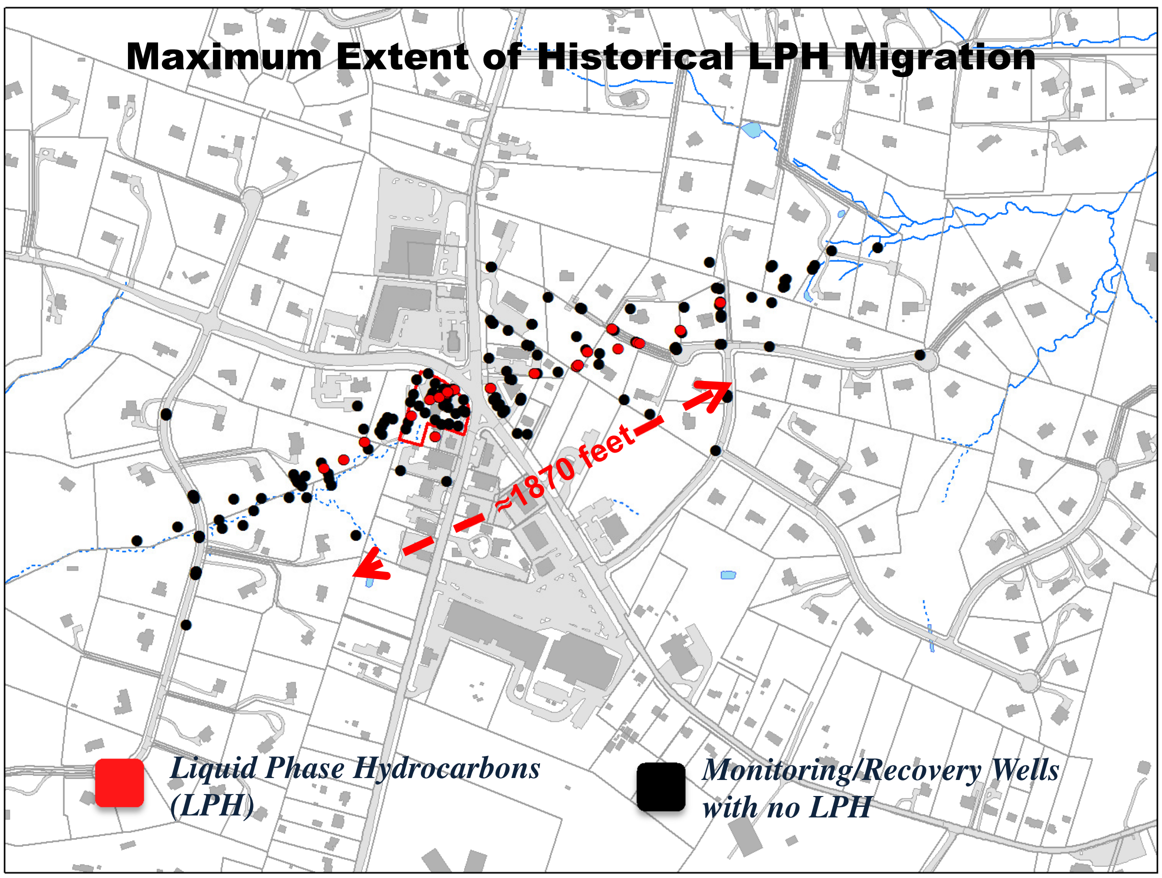
Sampled September 2015

4.3 CONTAMINANT PHASES AND AFFECTED MEDIA

LPH, in the form of unleaded gasoline, and hydrocarbon constituents of gasoline dissolved in groundwater within the fractured bedrock aquifer represent the principal contaminant phases and affected media. These phases have also occurred in groundwater within saturated overburden at distal / downgradient areas to the northeast and southwest where the water table occurs in the overburden above bedrock. The former tank field, where the gasoline release occurred, was excavated to the top of bedrock where the gasoline directly infiltrated the bedrock vertically via the inclined foliation of the schist bedrock. Groundwater occurs within bedrock (water table beneath top of bedrock surface) at this location. Consequently, the main gasoline release did not directly affect the soil medium.

4.4 SOURCE, PATHWAYS, POTENTIAL RECEPTORS

The former UST field where the gasoline release occurred and entered bedrock is the release area. The extent of gasoline LPH that migrated within bedrock on top of the water table along the



Graphic 11: Maximum Extent of LPH Migration (historical)

strike of the foliation to the northeast and the southwest was a source of dissolved-phase gasoline constituents in groundwater.

LPH has been removed via the groundwater remediation system through total fluids pumping, multi-phase vacuum extraction, and soil vapor extraction. LPH has not been detected in any monitoring or recovery wells since 2008. Migration of dissolved-phase gasoline constituents in groundwater has occurred via advection along strike within the foliation of the saturated bedrock to the northeast and southwest.

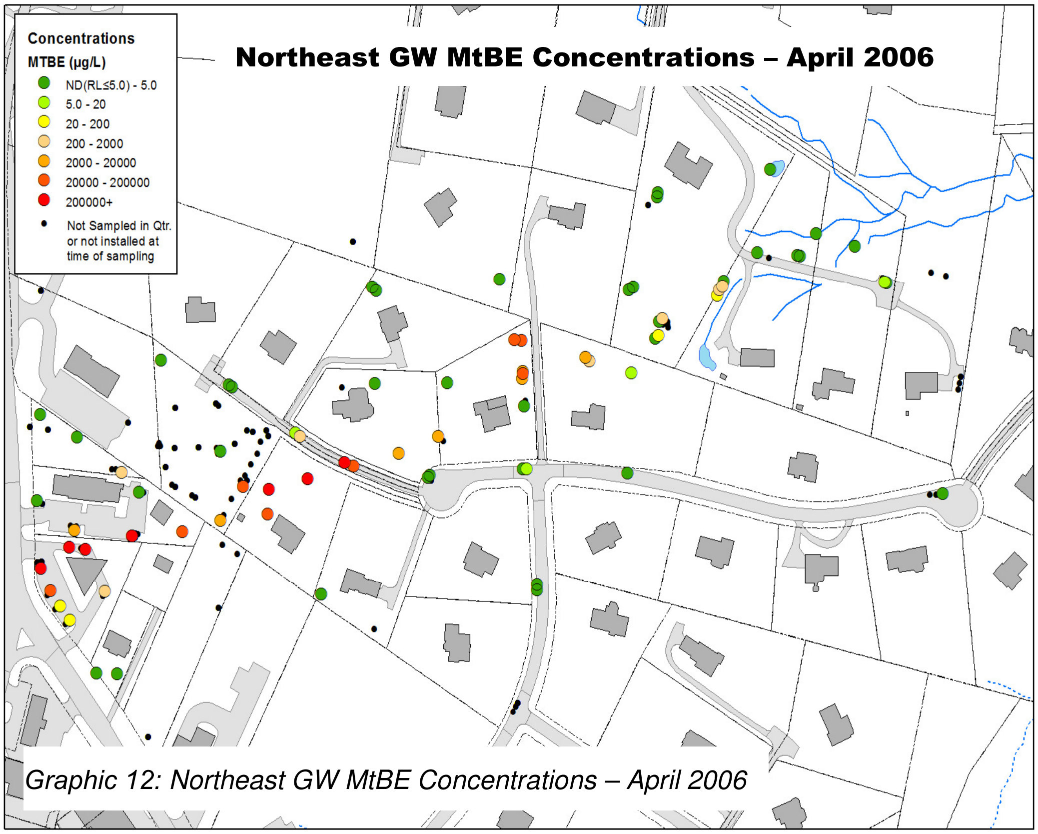
Area supply wells and streams to the northeast (tributary to the Sawmill Branch of Little Gunpowder Falls) and southwest (tributary to the Greene Branch of Gunpowder Falls) represent potential receptors for the groundwater advection pathway. These receptors have been protected through implementation of remedial measures (mass removal and containment through groundwater extraction), monitoring, and deployment of POET systems where necessary.

4.5 RESPONSE TO REMEDIATION AND REMEDIAL EFFECTIVENESS

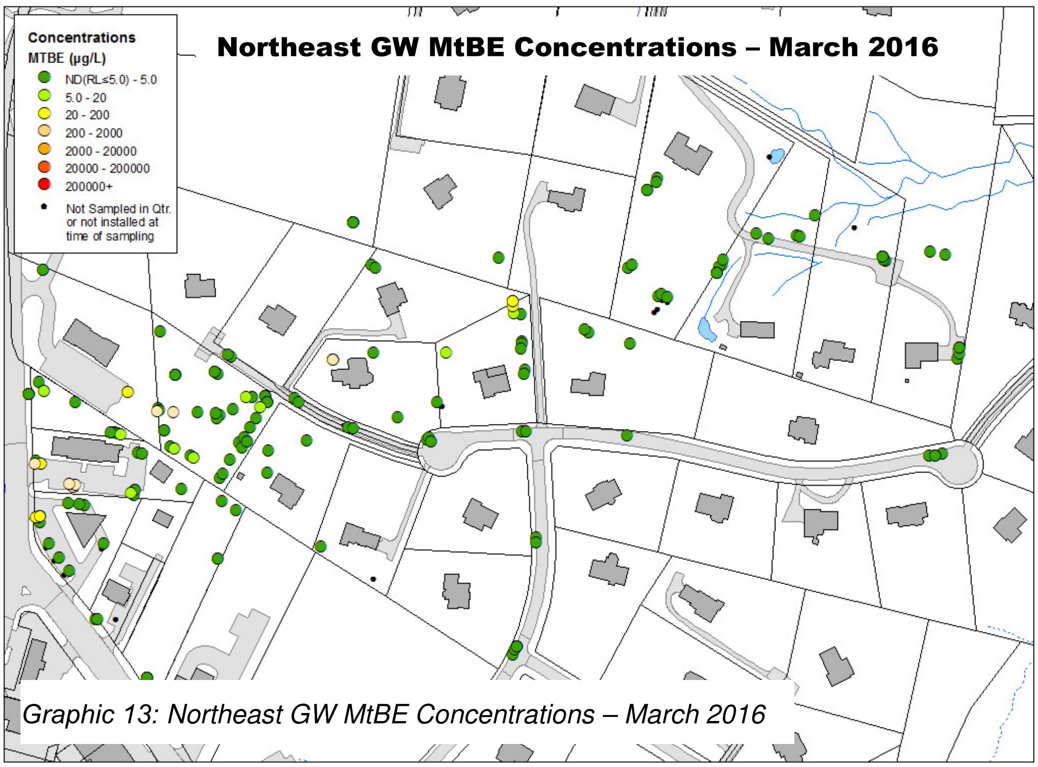
The combination of total fluids pumping, multi-phase vacuum extraction, and soil vapor extraction has been effective at removing LPH and dissolved-phase mass while containing and contracting the extent of dissolved-phase hydrocarbons in groundwater.

Figure 13 illustrates the historical maximum extent of LPH migration. The maximum extent of LPH was 1,870 feet from southwest to northeast along the strike of the bedrock foliation. LPH has not been detected in any monitoring or recovery well since 2008.

Comparison of historical (2006) and recent (2015) groundwater analytical results from across the project indicates a marked reduction in the magnitude and extent of dissolved concentrations (Figures 14a – 14t).



Graphic 12: Northeast GW MtBE Concentrations – April 2006



Graphic 13: Northeast GW MtBE Concentrations – March 2016

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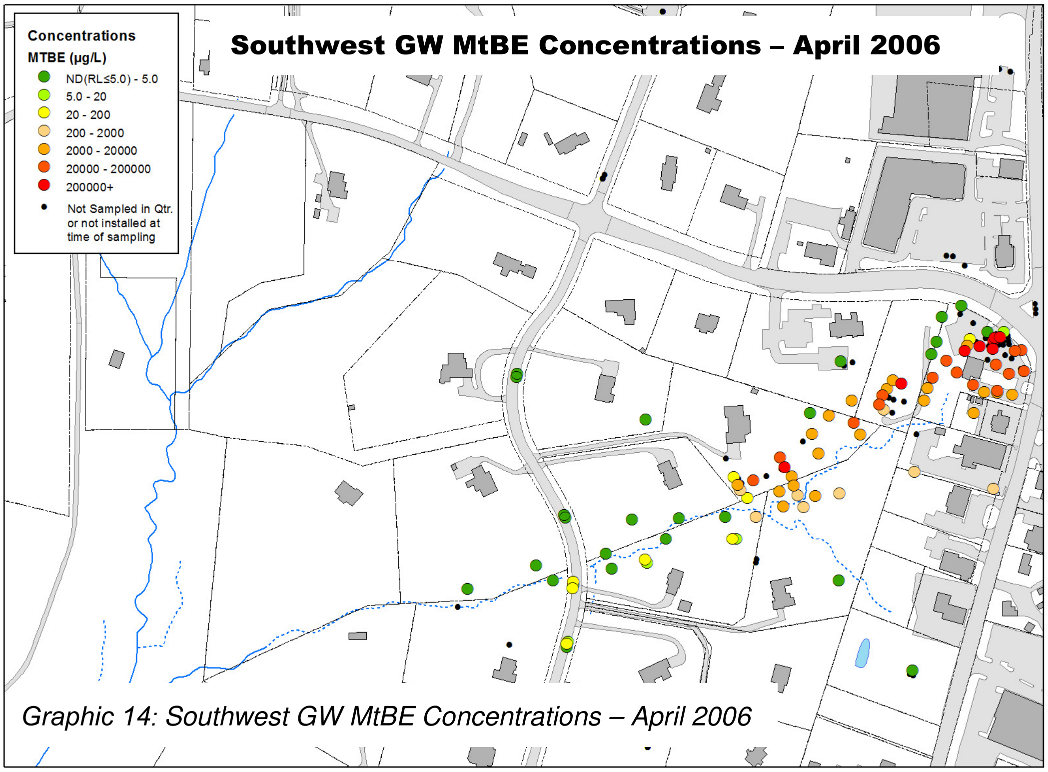
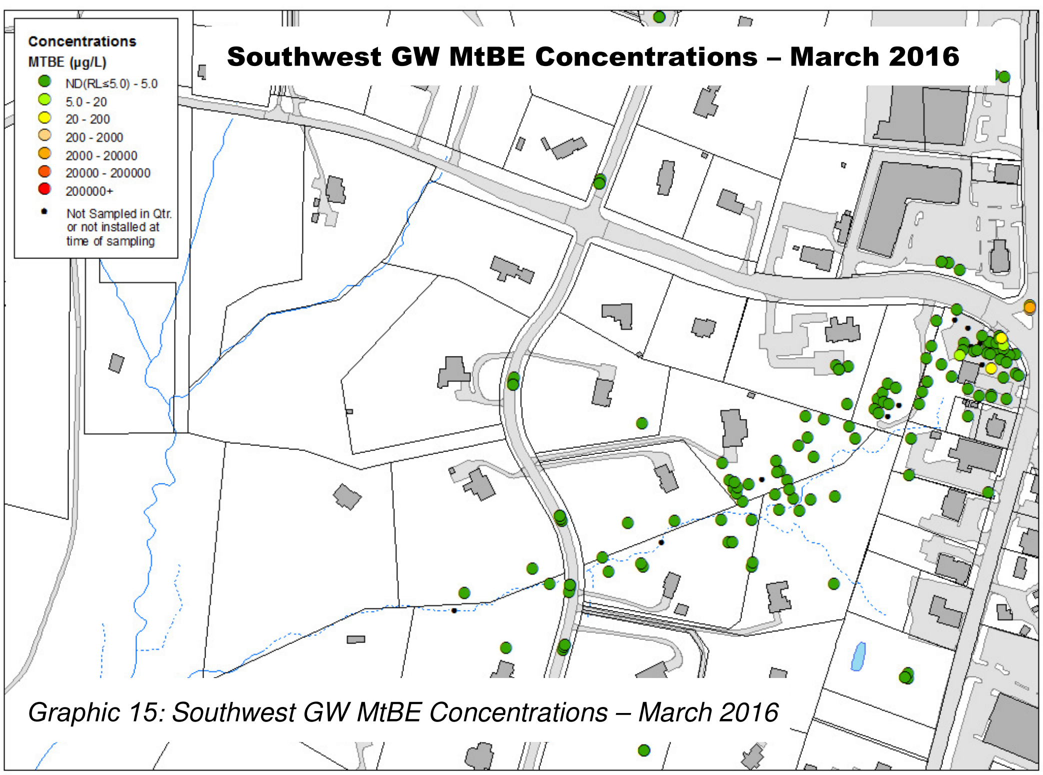
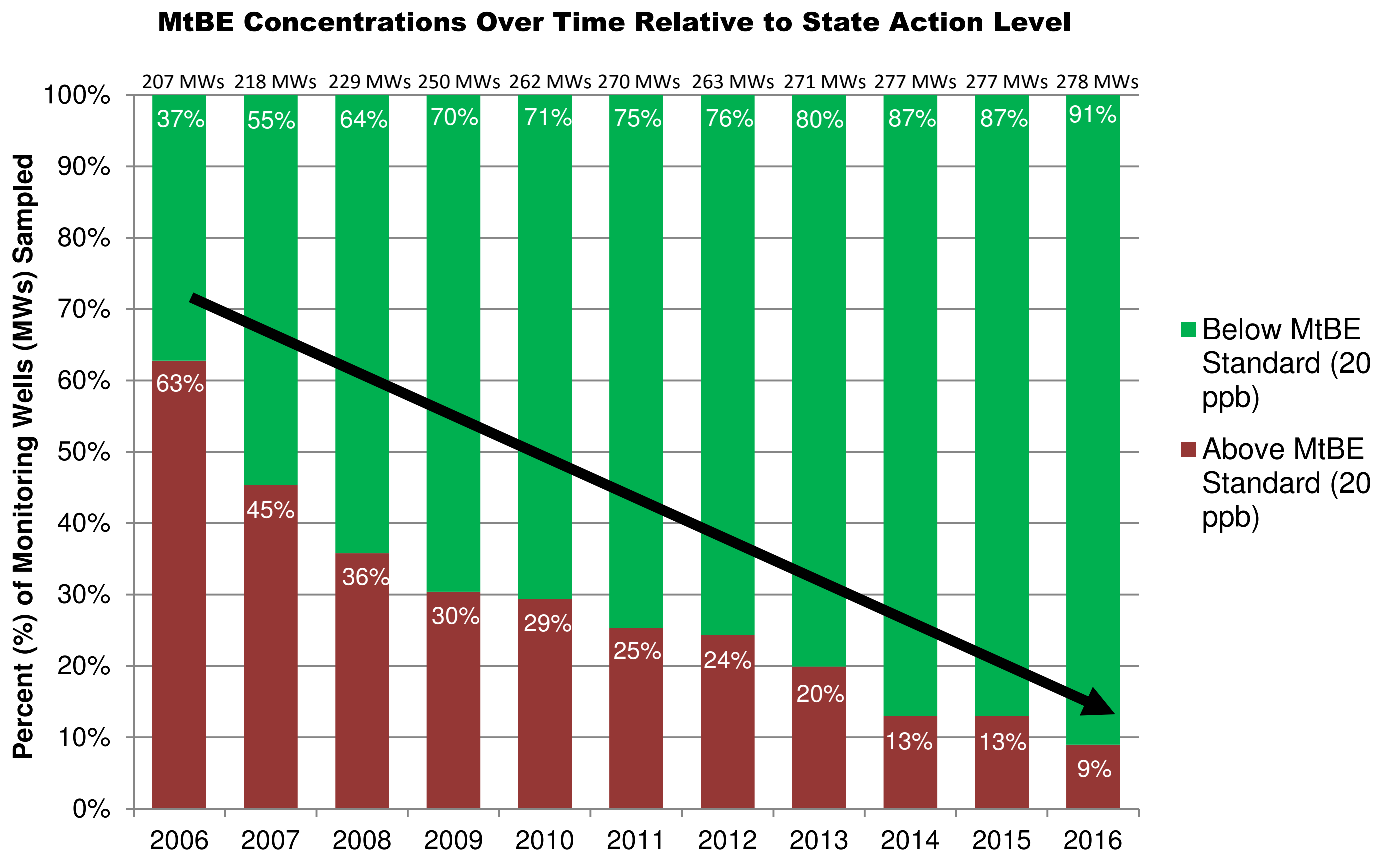


Graphic 14: Southwest GW MtBE Concentrations – April 2006



Graphic 15: Southwest GW MtBE Concentrations – March 2016

The following bar chart indicates the relative percentage of monitoring wells with concentrations above and below the state action level for MtBE since the project inception in 2006. It is evident from this graph that there has been a marked and steady decline in MtBE concentrations to below the state action level resulting in relatively few remaining monitoring wells above the state action level:

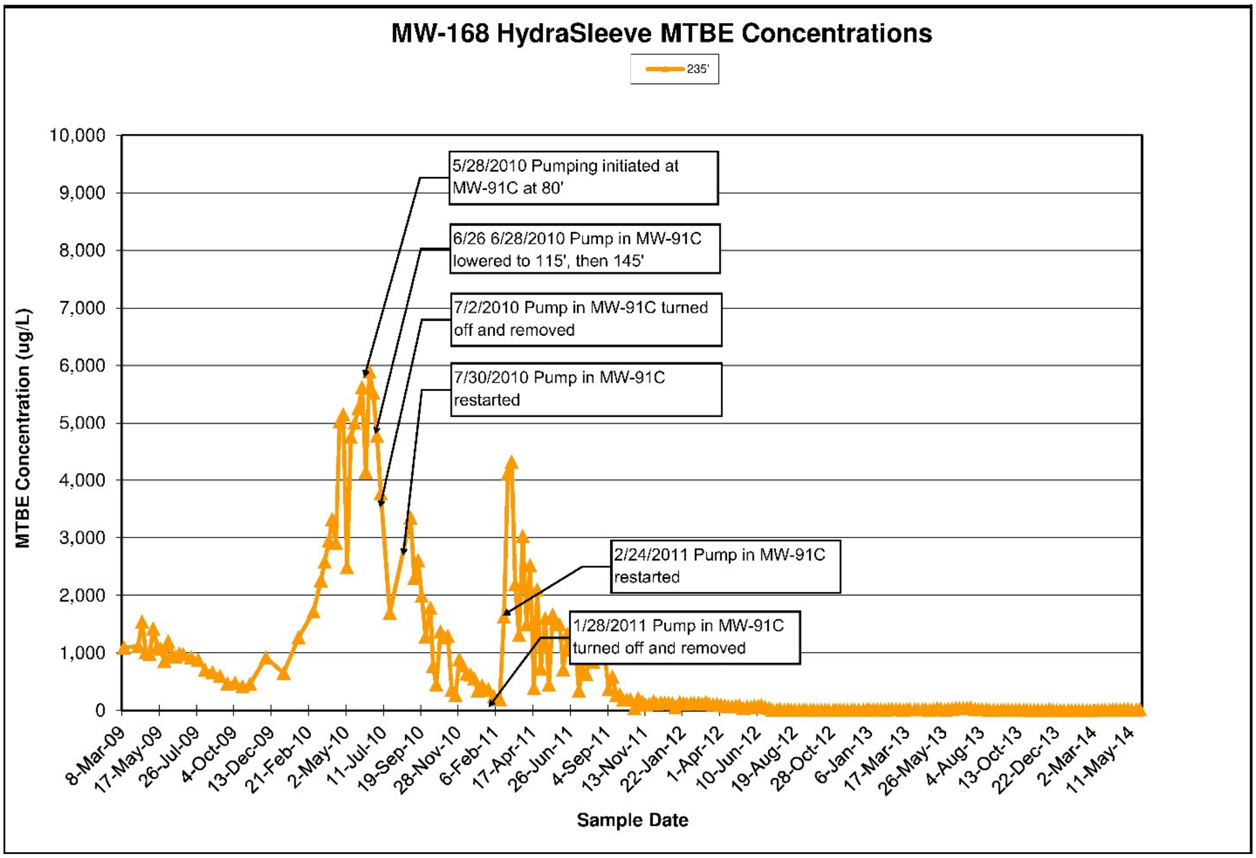


Graphic 16: MtBE concentrations over time relative to state action level

Appendix A presents concentration versus time plots for select monitoring wells. These plots indicate that monitoring wells that exhibit concentrations above state action levels are generally declining in concentration.

It has been observed that concentrations in deeper monitoring wells (C-Zone) on 3501 Hampshire Glen Court tend to be suppressed by groundwater extraction for remediation and can rebound during a hiatus in pumping.

This is illustrated in the following graph for MW-168, annotated with information regarding starts and stops in pumping from nearby MW-91C.



Graphic 17: MW-168 MtBE Concentrations at 235' HydraSleeve sampling interval

In the near northeast area, previously increasing influent concentrations associated with supply wells for 14307 Jarrettsville Pike and 3506 Hampshire Glen Court have reversed since additional recovery wells were brought online between April 2009 and December 2010. The MtBE concentration associated with the downgradient 3506 Hampshire Glen Court supply well has been less than the state action level of 20 ug/L since June of 2009, and has been non-detect or J-value for gasoline constituents since September 2009. The MtBE concentrations associated with the 14307 Jarrettsville Pike supply well have exhibited an overall decreasing trend since March 2010 and have been less than the state action level of 20 ug/L since June of 2011. Both of these supply wells, like others in the area, remain protected by POET systems.

4.6 SUMMARY OF SITE CONDITIONS AND GROUNDWATER QUALITY

Monitoring Wells

Recent data (Figures 14s through 14t) (Kleinfelder, 2016b) indicate the vast majority of analytical results for the indicator constituents benzene and MtBE are less than reporting limits with most of the detections less than state action levels:

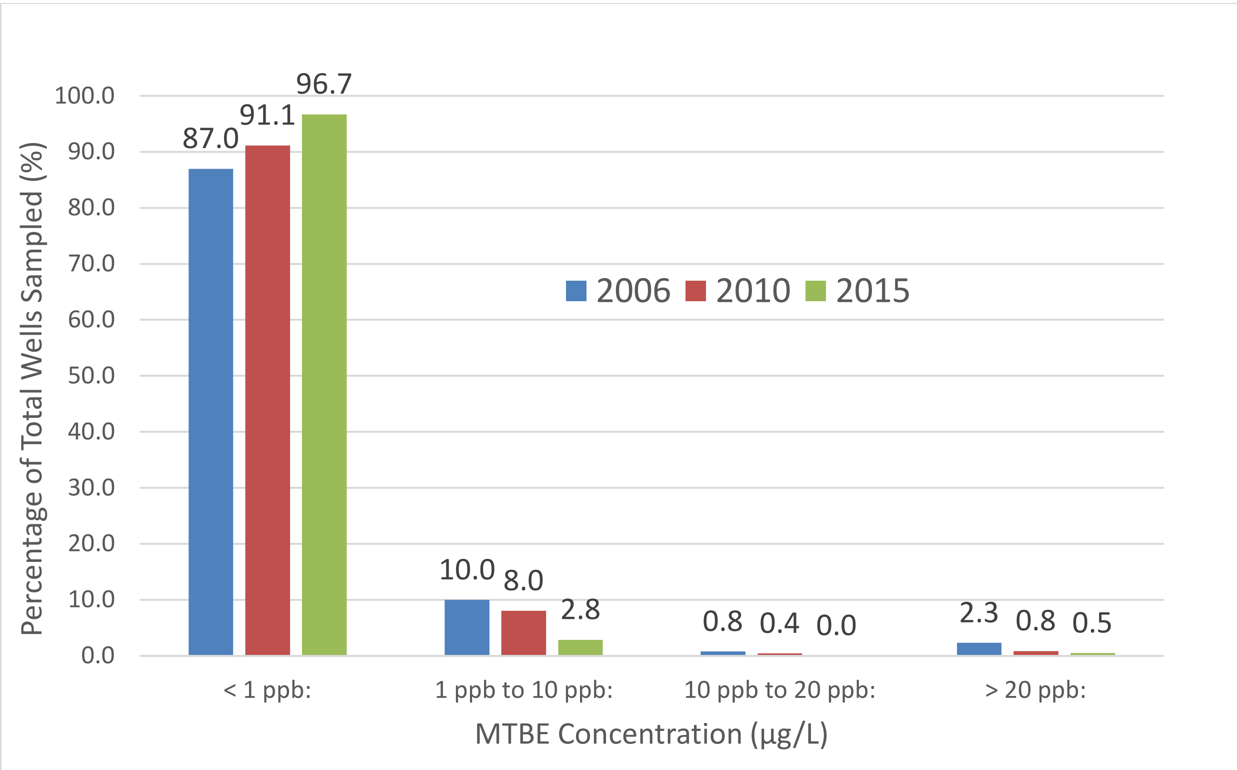
- The percentage of monitoring wells exhibiting an MtBE exceedance of the state action level has been reduced from 63% in 2006 (207 total monitoring wells sampled) to 9% in 2016 (278 total monitoring wells sampled).
    - 72 out of 79 monitoring and recovery wells southwest of the former service station property on 8 residential properties are non-detect for MtBE and benzene.
    - 41 out of 47 monitoring and recovery wells southwest of the release area (former UST field) on the former service station property are less than state action levels.
    - All 30 groundwater monitoring and recovery wells to the distal northeast (beyond 3508 Hampshire Glen Court) on 6 residential properties are non-detect for MtBE and benzene.

Residual concentrations above state action levels generally occur in the following areas:

- Proximate to the release area (former tank field) on the former service station property;
- Within or near the Paper Mill Road / Jarrettsville Pike intersection (MW-187A, B,C);
- Properties bounding the intersection to the east-northeast (14301, 14307, and 14311 Jarrettsville Pike); and,
- Associated with monitoring wells (MW-178C, MW-183, MW-168, MW-138D, MW-82D) in the "near northeast" area (3501, 3506, and 3508 Hampshire Glen Court).

Private Supply Wells

MtBE Concentration Reduction Over Time



Graphic 18: MtBE concentration reduction over time in private supply wells

Of the private supply wells sampled on 245 properties, only one of those properties exceeds a criterion for gasoline constituents, and 14 properties have had influent detections greater than 10% but less than 50% of a criterion for gasoline constituents. Six of the 14 properties with a concentration greater than 10% but less than 50% of a criterion for gasoline constituents are located in areas of other suspected and/or documented sources of release. These results are presented on Figures 26a through 26d.

4.7 ALTERNATE SOURCE IMPACTS

Multiple other potential sources of hydrocarbon detections and impacts are known or suspected within the site investigation and private supply well monitoring area. These include other gasoline service stations (BP and Citgo), fire department training activities, and residential / commercial uses such as gasoline storage, use, transfer; use of plumbing compounds and solvents; and disposal of waste materials into the multiple on-lot septic systems in the area.

The extensive supply well monitoring program includes 259 supply wells on 245 properties, at distances up to 0.75 miles from the former service station property. This robust sampling network has resulted in analytical detections at some properties that are inconsistent with the conceptual model presented herein, based on distance, direction, and/or the type/pattern of compounds detected. Analytical detections at these locations are attributed to suspected or known alternate sources. These alternate source locations are summarized as follows:

- **Jarrettsville Pike 0.25 to 0.5 miles south of the former service station property.** Localized detections of chlorinated aliphatic hydrocarbons, specifically tetrachloroethylene (PCE), have been observed in this area, but not at intermediate locations tracing back to the former service station. Chlorinated aliphatic hydrocarbons are not gasoline constituents. These localized detections of chlorinated aliphatic hydrocarbons, located due south of the former service station property, are inconsistent with the CSM.
- **Jackson Cabin 0.25 to 0.5 miles southeast of the former service station property.** Private supply wells in this area have exhibited detections of benzene in the absence of other gasoline compounds such as MtBE. The southeast direction from the former service station property is inconsistent with the CSM.
- **Meredith Ridge 0.25 miles north of the former service station property.** This location approximately due north of the former service station property at a higher elevation and hydraulically upgradient is inconsistent with the CSM.
- **Jarrettsville Pike / Stansbury Mill approximately 0.5 miles north-northeast of the former service station property.** The distance and direction of this area from the former service station property hydraulically upgradient or across groundwater divides is inconsistent with the CSM, and concentrations do not trace contiguously back to the former service station. This area has been under a separate investigation by the MDE.
- **3627A Southside Avenue approximately ½ mile northeast of the former service station property.** Private supply well concentrations associated with this property are

suspected to be due to an alternate source due to the distance from the service station release, the variety of constituents detected, and the proximity of potential local sources (e.g. automobile parking near supply well). However, the location is coincident with the northeast flow direction described in the conceptual model, and is therefore retained for further consideration.

5 CONCLUSIONS

Key aspects of the CSM determined through extensive investigative activities and monitoring, data acquired, and analyses conducted are summarized as follows:

Hydrogeology, Fate, and Transport

- The groundwater potentiometric gradient is toward the topographic valleys extending northeast and southwest from the former service station property (convergence from the valley sides and from below). Groundwater (un-impacted) discharges to tributaries of the Sawmill Branch of Little Gunpowder Falls and the Greene Branch of Gunpowder Falls.
- Influenced by the anisotropy of the metamorphic foliation and constrained by the aforementioned converging potentiometric gradient, LPH and dissolved-phase hydrocarbons migrated along strike, coincident with the longitudinal axis of the topographic valleys extending from the former service station property. This migration principally occurred in the shallow groundwater (water table) interval.
- Vertical downward migration of LPH and dissolved-phase hydrocarbon is impeded by several factors:
    - Gasoline is a non-aqueous phase liquid with a specific gravity less than water (i.e., LPH).
    - There is an upward hydraulic gradient beneath the topographic valleys extending northeast and southwest from the former service station property.
    - The porosity, permeability, fracture frequency, and fracture aperture decrease with depth in the fractured rock aquifer with maximum permeability occurring near the water table in the shallow weathered transition zone between saprolite above and more competent bedrock below.
    - Groundwater extraction for remediation has inhibited vertical downward migration and has instead induced an upward hydraulic gradient in remediation areas.

Response to Remediation

- The combination of total fluids pumping, multi-phase vacuum extraction, and soil vapor extraction has been effective at removing LPH and dissolved-phase mass while containing and contracting the extent of dissolved-phase hydrocarbons in groundwater.
- LPH that once extended in a linear, northeast-southwest direction over a distance of 1,870 feet has not been measurable in any of the more than 300 monitoring and recovery wells since 2008.
- In 2010, up to 26 wells in the northeast and 20 wells in the southwest had concentrations of MtBE above the MDE standard, compared with up to 12 in the northeast and six in the southwest with MtBE above the MDE standard in 2015.
- Dissolved-phase hydrocarbons in groundwater have been significantly reduced in concentration and retracted in extent due to remediation activities:
- The percentage of monitoring wells exhibiting an MtBE exceedance of the state action level has been reduced from 63% in 2006 (207 wells) to 9% in 2016 (277 wells).
    - The vast majority of groundwater monitoring and recovery wells southwest of the former service station property are non-detect for MtBE and benzene.
    - The vast majority of groundwater monitoring and recovery wells on the former service station property, southwest of the former UST field (release area) are less than state action levels.
    - The vast majority of groundwater monitoring and recovery wells to the distal northeast (beyond 3508 Hampshire Glen Court) are non-detect for MtBE and benzene.
- It has been observed that the concentrations in deeper monitoring wells (C zone) on 3501 Hampshire Glen Court tend to be suppressed by groundwater extraction for remediation and can rebound during a hiatus in pumping.
- In the near northeast area, previously increasing influent concentrations associated with supply wells for 14307 Jarrettsville Pike and 3506 Hampshire Glen Court have reversed since supplemental remediation activities have been implemented.

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Recent Conditions

- Residual concentrations above state action levels generally occur in the following areas:
  - Proximate to the release area (former tank field) on the former service station property;
  - Within or near the Paper Mill Road / Jarrettsville Pike intersection (MW-187A, B,C);
  - Properties bounding the intersection to the east (14301, 14307, and 14311 Jarrettsville Pike); and,
  - Associated with monitoring wells (MW-178C, MW-183, MW-168, MW-138D, MW-82D) in the "near northeast" area (3501, 3506, and 3508 Hampshire Glen Court).
- Of the private supply wells sampled on 245 properties, only one of those properties exceeds a criterion for gasoline constituents and 14 properties have influent detections greater than 10% but less than 50% of a criterion for gasoline constituents. Six of the 14 properties with a concentration greater than 10% and less than 50% of a criterion for gasoline constituents are located in areas of other suspected and/or documented sources of release.
- Other suspected and documented sources of groundwater impact include:
  - Jarrettsville Pike 0.25 to 0.5 miles south of the former service station property.
  - Jackson Cabin 0.25 to 0.5 miles southeast of the former service station property.
  - Meredith Ridge 0.25 miles north of the former service station property.
  - Jarrettsville Pike / Stansbury Mill approximately 0.5 miles north-northeast of the former service station property.
  - 3627A Southside Avenue approximately ½ mile northeast of the former service station property. Private supply well concentrations associated with this property may be due to an alternate source due to the distance from the service station release and the proximity of potential local sources (e.g. automobile parking near supply well). However, the location is coincident with the northeast flow direction described in the conceptual model, and is therefore retained for further consideration.

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Near Northeast Area

- Elevated hydrocarbon concentrations exist beneath the water table in the near northeast area (14307 Jarrettsville Pike to 3508 Hampshire Glen Court) coincident with a lithologic contact between gneiss and schist that is parallel to and slightly off-set from the original linear migration direction to the northeast at the water table ("strike-line"). This is attributed to localized and above-average pumping rates for private supply wells (14307 Jarrettsville Pike and 3506 Hampshire Glen Court) proximate to and down dip from high source strength conditions (LPH and elevated dissolved concentrations) in the shallow water table zone along the "strike line". Vertical concentration profiling of MW-91, MW-168, and MW-138D indicate that maximum concentrations occur between depths of 120 and 150 feet in MW-91C and MW-138D and at 235 feet at MW-168. Benzene and MtBE have been delineated to concentrations less than state action levels at elevations shallower than 420 feet deep in MW-91D and in MW-138D.

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6 PATH FORWARD

This section provides a path forward to progress the project to case closure while maintaining continued protection of public health and the environment. Based on the marked reduction in hydrocarbon mass (LPH and dissolved phase), the contraction of the dissolved-phase hydrocarbon constituents in groundwater, the extensive groundwater monitoring well network and supply well sampling program, the following recommendations are provided:

- Investigate whether the 3627A Southside Avenue supply well should be retained or excluded from the conceptual model by installing one additional deep monitoring well (C-zone) between the MW-82 well cluster (near northeast area extent) and the 3627A Southside Avenue property. The 3627A Southside supply well will be retained in the conceptual model if the following conditions occur: 1) concentrations in the newly installed monitoring well are sufficient to account for concentrations detected at the 3627A Southside supply well; and 2) the analytes associated with the 3627A Southside supply well occur in samples from the newly installed monitoring well. If either of these criteria are not satisfied, 3627A Southside will be excluded from the conceptual model.
- Conduct a rebound assessment in the near northeast area to assess the potential for rebound of hydrocarbon constituents in area monitoring wells due to a hiatus in remediation groundwater extraction. This will aid in determining expected equilibrated concentrations under non-pumping conditions versus suppressed concentrations under pumping conditions.
- Implement a natural attenuation evaluation to determine whether natural attenuation processes may effectively complement potential reductions in active remediation, and be protective of private supply wells and surface water receptors in the area.
- Reduce the private supply well sampling program (number of wells and frequency) to be consistent with current groundwater conditions and the CSM presented herein, relying on the extended monitoring well network installed at the request of the MDE, which was intended to install monitoring wells of similar depth, construction, and location to area private supply wells for the eventual purpose of groundwater monitoring in lieu of private supply well sampling.
- In conjunction with the natural attenuation evaluation, reduce the monitoring well sampling program (number and frequency) to be consistent with current groundwater conditions

and the CSM presented herein, reducing or eliminating the sampling of monitoring wells in distal areas from the former service station property that have demonstrated sustained concentrations less than state action levels and/or eliminating monitoring wells that are redundant with other nearby monitoring wells intend for initial detailed characterization.

- Contingent upon the rebound assessment, natural attenuation evaluation, and an appropriate monitoring well network and supply well sampling program, evaluate remediation reduction to focus on residual impacts from the release area (tank field / station property) across the Paper Mill Road / Jarrettsville Pike intersection through the near northeast area to 3508 Hampshire Glen Court.
- Elimination of bottled water delivery in accordance with the Proposed Discontinuation of Bottled Water Delivery Program submitted to the MDE on July 23, 2015
- Parcel by parcel closure based on MW data, starting with the ExxonMobil-owned property at 14209 Robcaste Road and the former ExxonMobil-owned property at 14222 Jarrettsville Pike.

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FIGURES

0 400 800 1,600
Feet

G:\Projects\0507606-8077\Projects\Site_Conceptual_Model_2016\1 Fig2_TopoMap_WaterShed_36x22.mxd

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DRAWN BY:	B. Myers
CHECKED BY:	J. Hale
FILE NAME:	1 Fig2_TopoMap_WaterShed_36x22

TOPOGRAPHIC MAP

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
1

G:\Projects\0507606-6077\Projects\Site_Conceptual_Model_2016\2 Figure 3 Surrounding Land Use 062606.mxd

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SURROUNDING LAND USE

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
2

Source: Moller, S.A., 1979, Geologic Map of the Phoenix Quadrangle, MD, State of Maryland, Department of Natural Resources, Maryland Geological Survey

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DRAWN BY:	B. Myers
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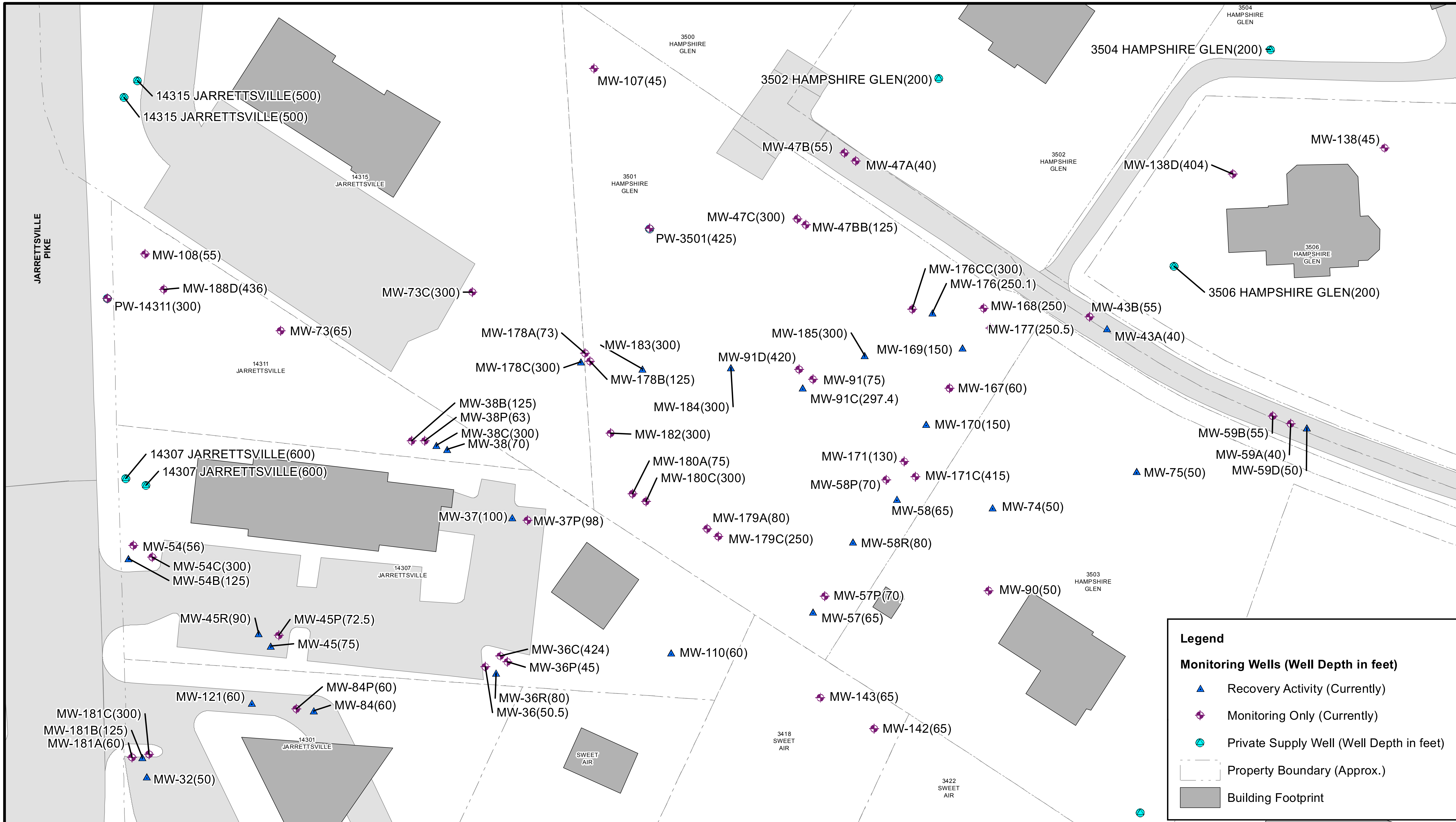
PRIVATE SUPPLY AND MONITORING WELL LOCATIONS

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE 3



N

0 25 50 100 150 200 Feet

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Cartography By: B. Myers | Date: 01/19/16

NEAR NORTHEAST AREA MONITORING WELL LOCATION AND DEPTH MAP

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

Figure
4

Project Number: 20163496 | File Name: Investigation

PROJECT NO.	20153942
DRAWN:	1/20/2016
DRAWN BY:	B. Myers
CHECKED BY:	M. Baird

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REMEDIATION LAYOUT
AS OF DECEMBER 31, 2015

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
5

G:\Projects\0507606-8077\Projects\Site_Conceptual_Model_2016\12_Remediation_Layout.mxd

Source: Moller, S.A., 1979, Geologic Map of the Phoenix Quadrangle, MD,
State of Maryland, Department of Natural Resources, Maryland Geological Survey

0 300 600 900 1,200
Feet

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AREA MAP with LiDAR DATA

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
6

Source: Moller, S.A., 1979, Geologic Map of the Phoenix Quadrangle, MD, State of Maryland, Department of Natural Resources, Maryland Geological Survey

0 300 600 900 1,200 Feet

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AREA MAP with GEOLOGY AND LiDAR DATA

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE 7

Source: Moller, S.A., 1979, Geologic Map of the Phoenix Quadrangle, MD,
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0 200 400 600 800 Feet

G:\Projects\0507606-8077\Projects\Site Conceptual Model 2016\6 Top Bedrock Elevation Map012016.mxd

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TOP OF BEDROCK SURFACE ELEVATION MAP

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
8

Source: Moller, S.A., 1979, Geologic Map of the Phoenix Quadrangle, MD,
State of Maryland, Department of Natural Resources, Maryland Geological Survey

NOTE: Recovery wells excluded from interpolation

0 300 600 900 1,200 Feet

G:\Projects\0507606-8077\Projects\Site_Conceptual_Model_2016\8_Potentiometric_Surfaces.mxd

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SHALLOW (ZONE A) - Sept. 2010 POTENTIOMETRIC SURFACE MAP

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
9a

Source: Moller, S.A., 1979, Geologic Map of the Phoenix Quadrangle, MD,
State of Maryland, Department of Natural Resources, Maryland Geological Survey

NOTE: Recovery wells excluded from interpolation

0 300 600 900 1,200 Feet

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SHALLOW (ZONE A) - Sept. 2015
POTENTIOMETRIC SURFACE MAP

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
9b

Source: Moller, S.A., 1979, Geologic Map of the Phoenix Quadrangle, MD,
State of Maryland, Department of Natural Resources, Maryland Geological Survey

NOTE: Recovery wells excluded from interpolation

0 300 600 900 1,200 Feet

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DEEP (ZONE C) April 5, 2010
POTENTIOMETRIC SURFACE MAP

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
9c

Source: Moller, S.A., 1979, Geologic Map of the Phoenix Quadrangle, MD, State of Maryland, Department of Natural Resources, Maryland Geological Survey

0 300 600 900 1,200 Feet

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VERTICAL HYDRAULIC GRADIENT MAP

Gauging Date: April 5, 2010

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE **10**

Source: Moller, S.A., 1979, Geologic Map of the Phoenix Quadrangle, MD,
State of Maryland, Department of Natural Resources, Maryland Geological Survey

0 200 400 600 800 Feet

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HYDRAULIC CONDUCTIVITY DISTRIBUTION MAP

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
11

0 120 240 360 480 Feet

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SITE PLAN
AS OF DECEMBER 31, 2015

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
12

Source: Moller, S.A., 1979, Geologic Map of the Phoenix Quadrangle, MD, State of Maryland, Department of Natural Resources, Maryland Geological Survey

0 300 600 900 1,200 Feet

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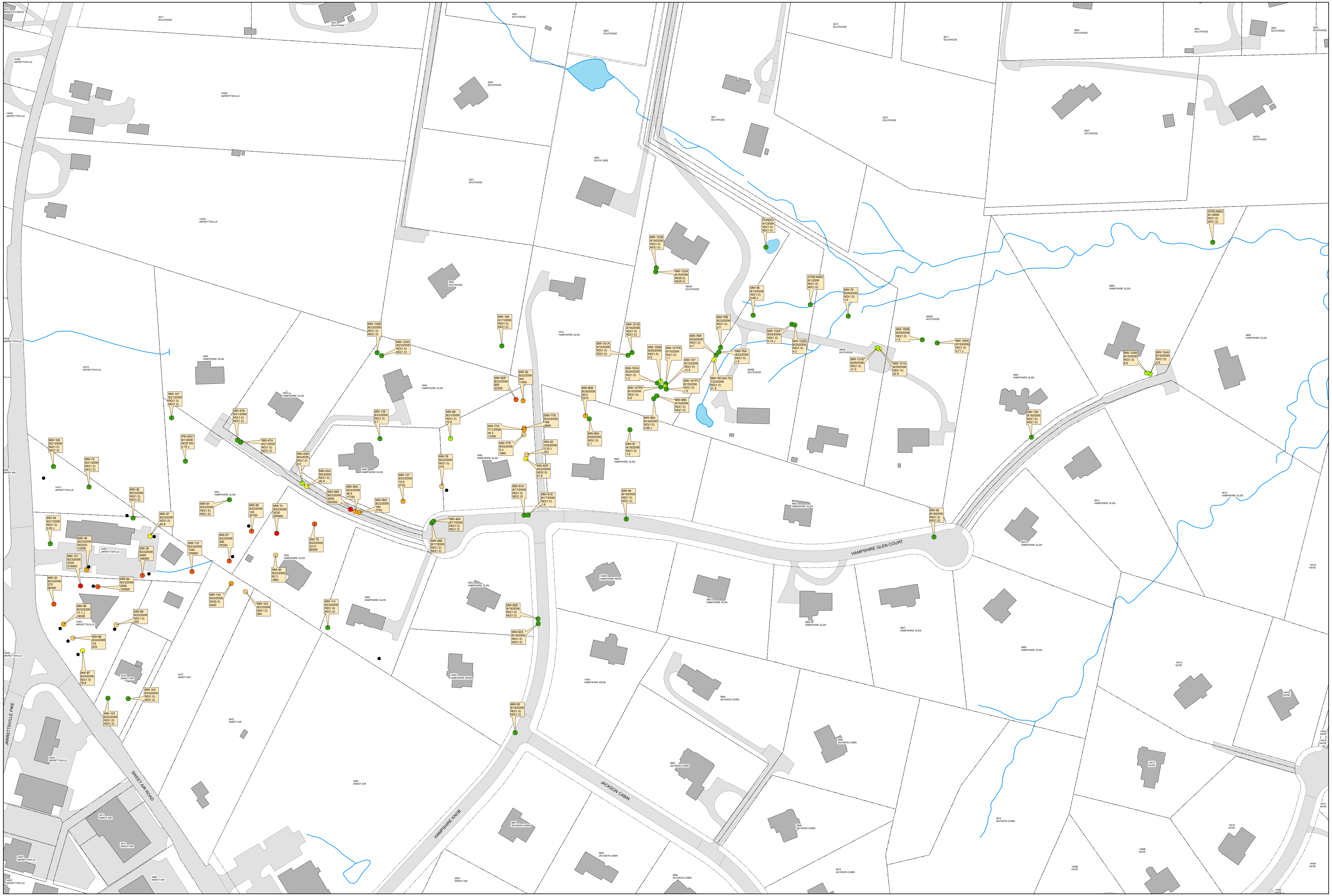
AREA GEOLOGIC / LiDAR OVERLAY with SUPPLY WELLS, MONITORING WELLS AND HISTORIC LPH

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE 13



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WORK IN PROGRESS

Legend

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled / Pending
- Parcel Boundary (Approx.)
- Building Footprints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

(µg/L) = MICROGRAMS PER LITER
E = VALUE EXCEEDS CALIBRATION RANGE
J = INDICATES AN ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT (RL). LABORATORY REPORTING LIMIT INCLUDED
Pending = LABORATORY ANALYSIS IN PROGRESS

For historical data of specific well, refer to the historical sampling table.

0 90 180 Feet
0 27 54 Meters

FIGURE 14a
EAST GROUNDWATER CONCENTRATION MAP
AVAILABLE DATA THROUGH SEPTEMBER 18, 2006 06:00

EXXON RAS #2-8077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND

DRAWN BY:	BNM	SCALE:	1:1,080
REVISED BY:	MAEA	PROJECT No.:	69112
DATE:	09/18/06	SOURCE: contact Kleinfelder for metadata	
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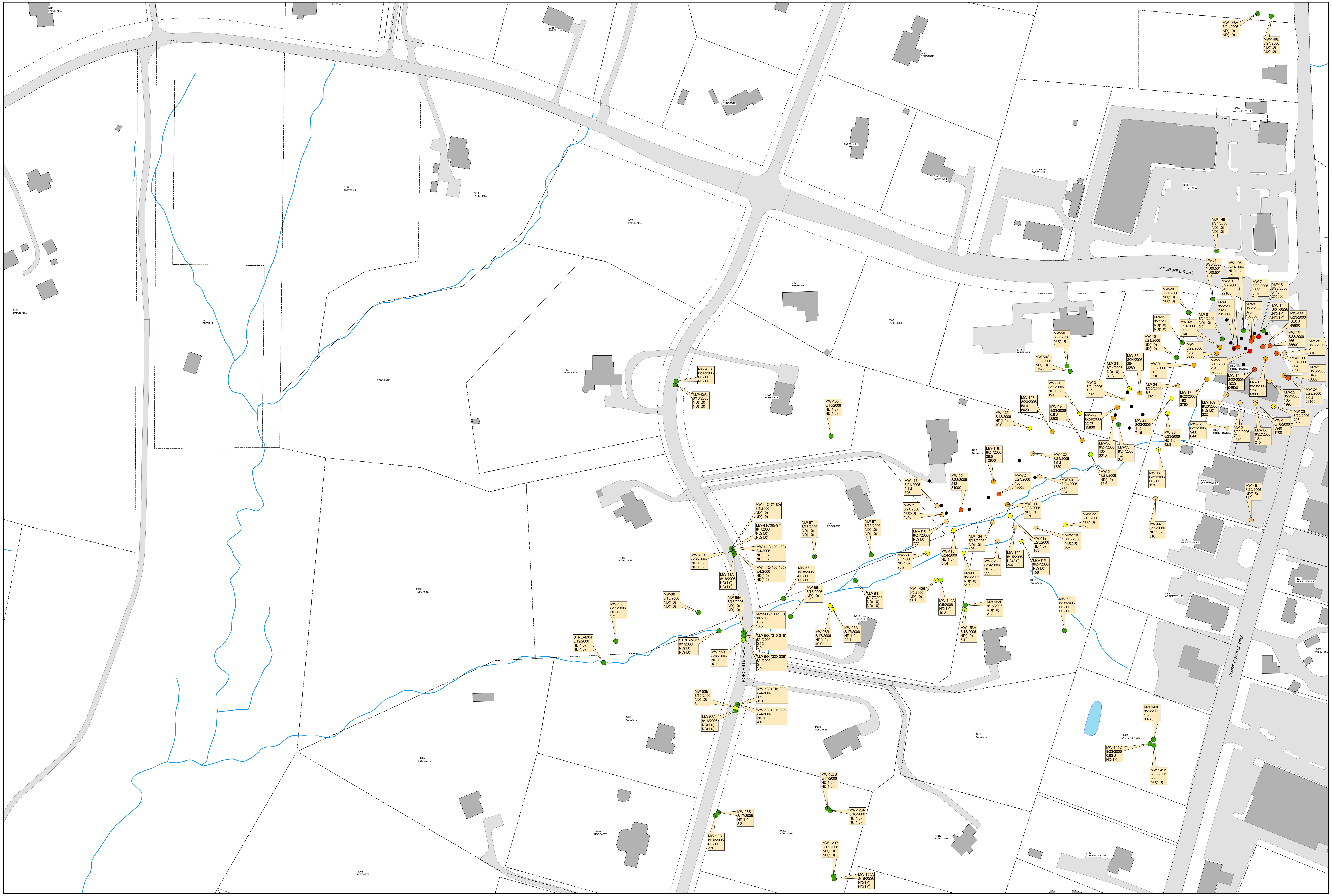

DRAFT
WORK IN PROGRESS

Legend

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled / Pending
- Parcel Boundary (Approx.)
- Building Footprints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

(µg/L) = MICROGRAMS PER LITER
E = VALUE EXCEEDS CALIBRATION RANGE
J = INDICATES AN ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT (RL). LABORATORY REPORTING LIMIT INCLUDED
Pending = LABORATORY ANALYSIS IN PROGRESS

For historical data of specific well, refer to the historical sampling table.

0 90 180 Feet
0 27 54 Meters

FIGURE 14b
WEST GROUNDWATER CONCENTRATION MAP
AVAILABLE DATA THROUGH SEPTEMBER 18, 2006 06:00

EXXON RAS #2-8077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND

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REVISED BY: MAEA	PROJECT No.: 69112
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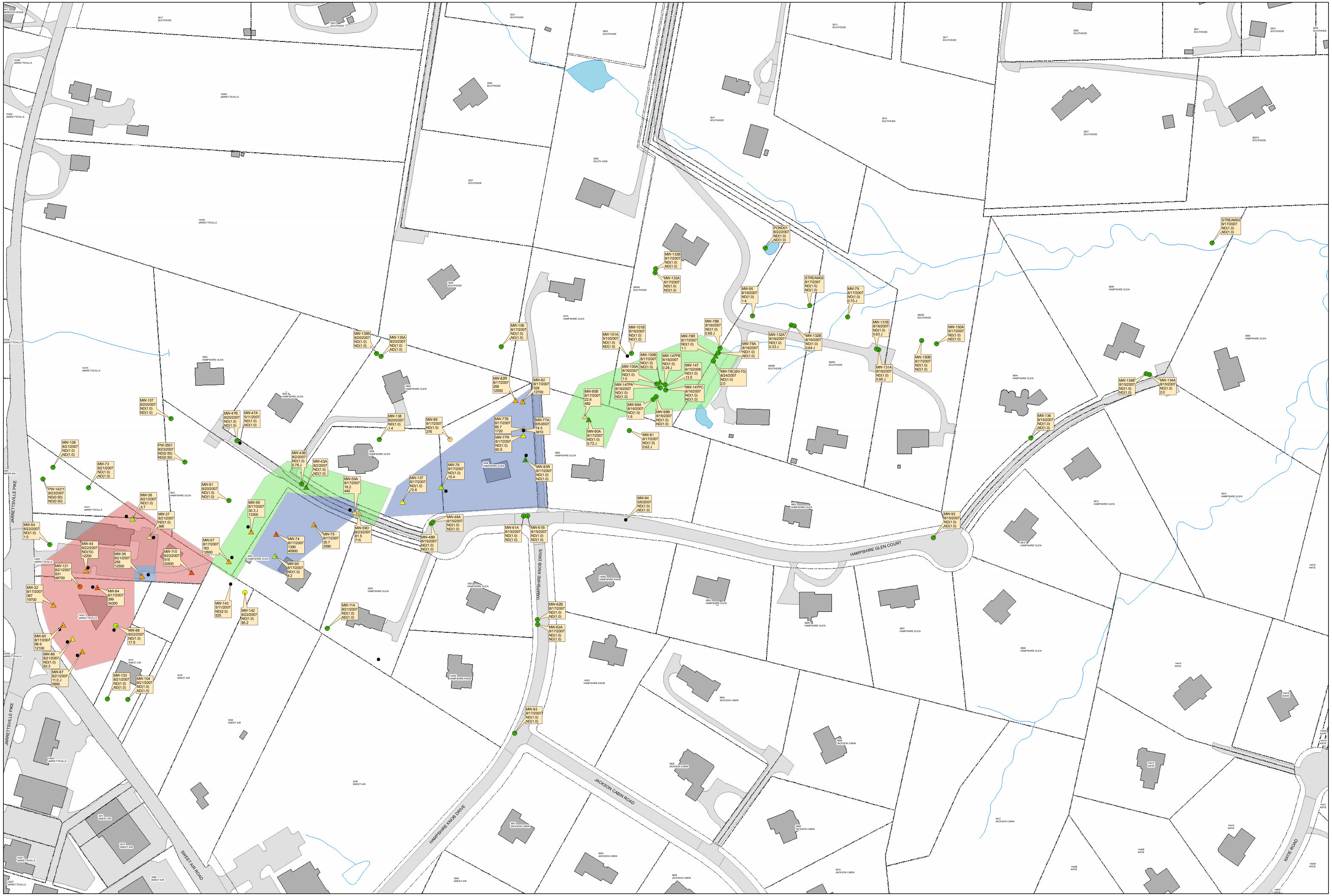

DRAFT
WORK IN PROGRESS

Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled
- Monitoring Only
- Recovery Activity

Groundwater Recovery Zones

- Zone 1
- Zone 2
- Zone 3
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = INDICATES AN ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT (RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:
1. MW-83 WAS DRY AT THE TIME OF SAMPLING
2. MW-59B WAS NOT SAMPLED DUE TO IN-WELL REMEDIAL EQUIPMENT

GROUNDWATER RECOVERY ZONES:

ZONE 1:
MW-36, MW-59A, MW-59B, MW-74, MW-75, MW-76, MW-77A, MW-77B, MW-77R, MW-82, MW-82R, MW-83, MW-83R, MW-90, MW-137

ZONE 2:
MW-43A, MW-57, MW-58, MW-59D, MW-78A, MW-80B, MW-100B, MW-78R, MW-80A

ZONE 3:
MW-37, MW-38, MW-45, MW-84, MW-85, MW-86, MW-87, MW-88, MW-110

0 90 180 Feet

0 27 54 Meters

FIGURE 14c
EAST GROUNDWATER CONCENTRATION MAP 2007

EXXON RAS #2-8077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND

DRAWN BY:	BNM	SCALE:	1:1,080
REVISED BY:	BNM	PROJECT No.:	88407
DATE:	10/11/07	SOURCE: contact Kleinfelder for metadata	
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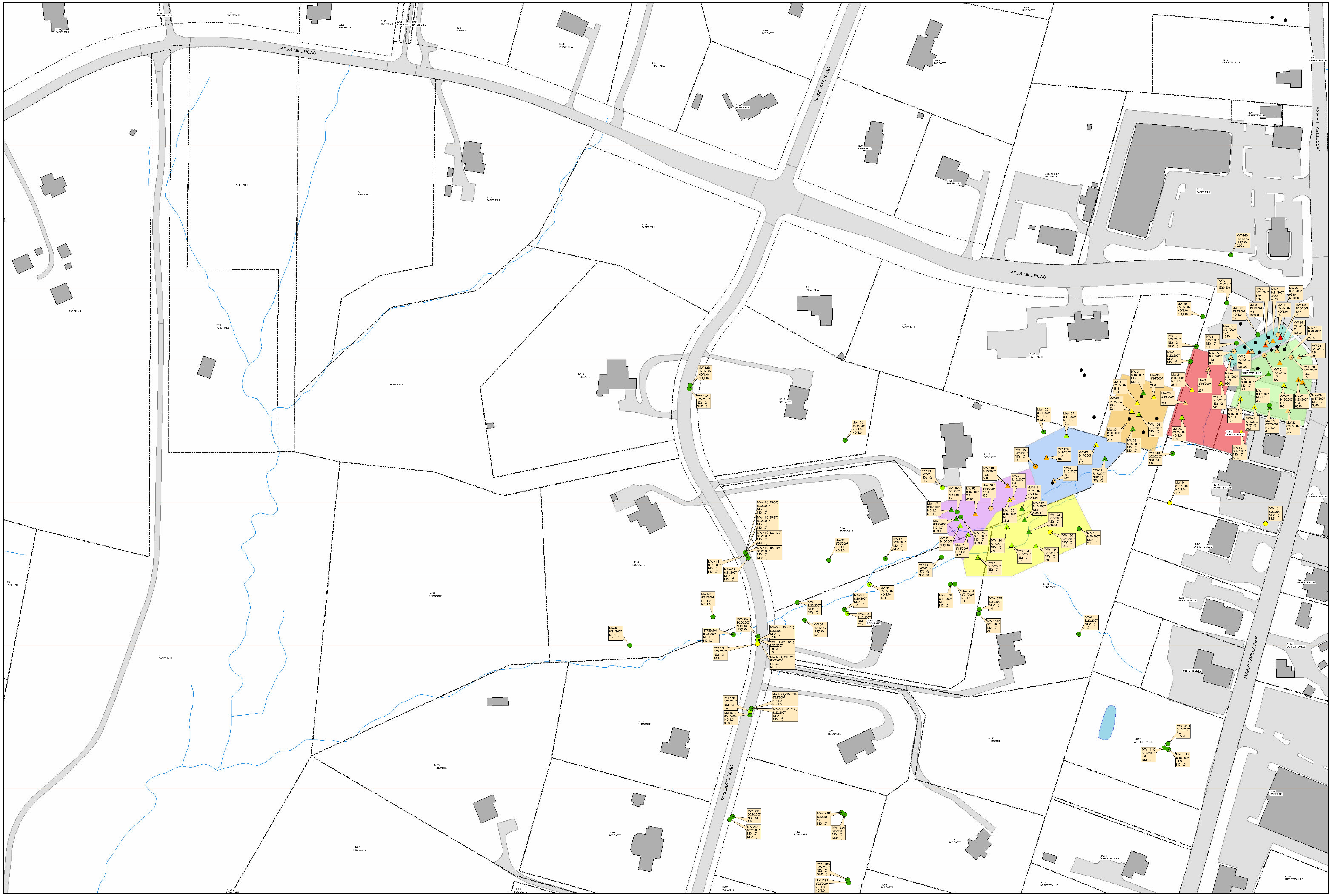

DRAFT
WORK IN PROGRESS

Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled
- Monitoring Only
- Recovery Activity

Groundwater Recovery Zones

- Zone A
- Zone B
- Zone C
- Zone D
- Dispenser Island
- DPE
- Zone E
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT(RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:
1. MW-155 WAS DRY AT THE TIME OF SAMPLING
2. STREAM04 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM01 (UPGRADIENT)
3. MW-50, MW-50C, MW-148A, AND MW-148B WERE NOT ACCESSIBLE AT THE TIME OF THE QUARTERLY SAMPLING EVENT.

GROUNDWATER RECOVERY ZONES:

ZONE DISPENSER ISLAND:
MW-1A, MW-2A, MW-6, MW-13, MW-19, MW-21, MW-22

ZONE DPE:
MW-3, MW-4, MW-6, MW-7, MW-13, MW-16, MW-27

ZONE A:
MW-4, MW-9, MW-24, MW-26, MW-28

ZONE B:
MW-29, MW-30, MW-31, MW-33, MW-34, MW-35

ZONE C:
MW-40, MW-49, MW-51, MW-126, MW-127

ZONE D:
MW-60, MW-111, MW-112, MW-119, MW-123, MW-124

ZONE E:
MW-55, MW-71, MW-72, MW-113, MW-117, MW-116, MW-118

0 80 160 Feet

0 24 48 Meters

FIGURE 14d
WEST GROUNDWATER CONCENTRATION MAP 2007

EXXON RAS #2-8077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND

DRAWN BY:	BNM	SCALE:	1:1,080
REVISED BY:	BNM	PROJECT No.:	88407
DATE:	10/11/07	SOURCE: contact Kleinfelder for metadata	
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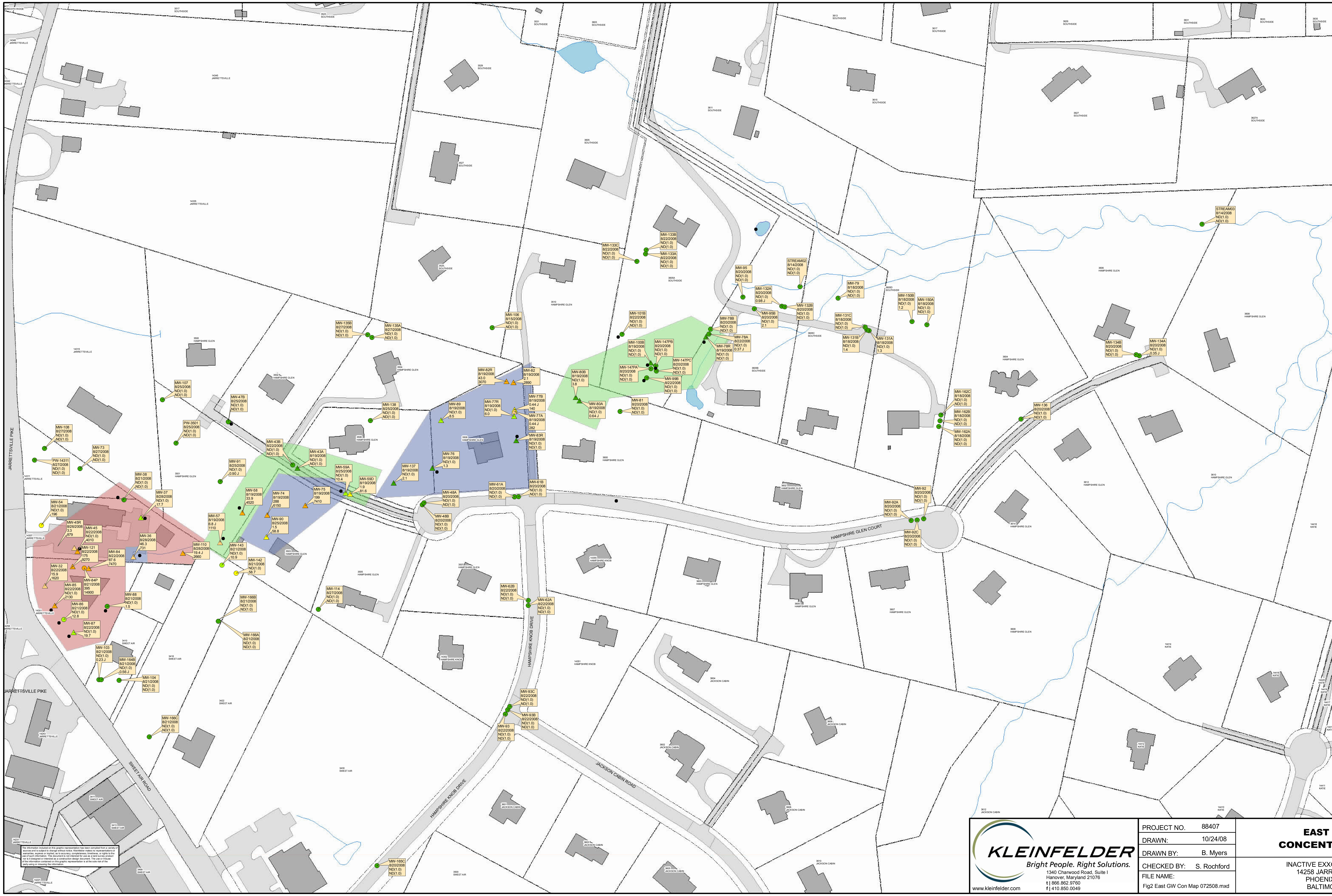

Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled in Qtr.:Dry/Inaccessible
- Monitoring Only
- Recovery Activity

Groundwater Recovery Zones

- Zone 1
- Zone 2
- Zone 3
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = INDICATES AN ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT (RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:
1. MW-47A, MW-78C(60-70), MW-83 AND MW-94, MW-99A, MW-100A, MW-101A WERE DRY AT THE TIME OF SAMPLING
2. MW-59B WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
3. MW-15, MW-20, MW-41A, MW-41B, MW-42B, MW-47B, MW-48A, MW-48B, MW-61A, MW-62B, MW-73, MW-78A, MW-83R, MW-91, MW-92, MW-93, MW-97, MW-99B, MW-101B, MW-104, MW-106, MW-108, MW-114, MW-128A, MW-129A, MW-129B, MW-130, MW-133A, MW-133B, MW-135A, MW-135B, MW-136, MW-50A WERE REVISED TO A BI-ANNUAL SCHEDULE

GROUNDWATER RECOVERY ZONES:

ZONE 1:
MW-36, MW-59A, MW-59B, MW-74, MW-75, MW-76, MW-77A, MW-77B, MW-77R, MW-82, MW-82R, MW-83R, MW-89, MW-90, MW-137

ZONE 2:
MW-43A, MW-57, MW-58, MW-59D, MW-78A, MW-80B, MW-100B, MW-78R, MW-80A

ZONE 3:
MW-37, MW-38, MW-45, MW-45R, MW-84, MW-85, MW-86, MW-87, MW-88, MW-110, MW-121

0 45 90 180 Feet

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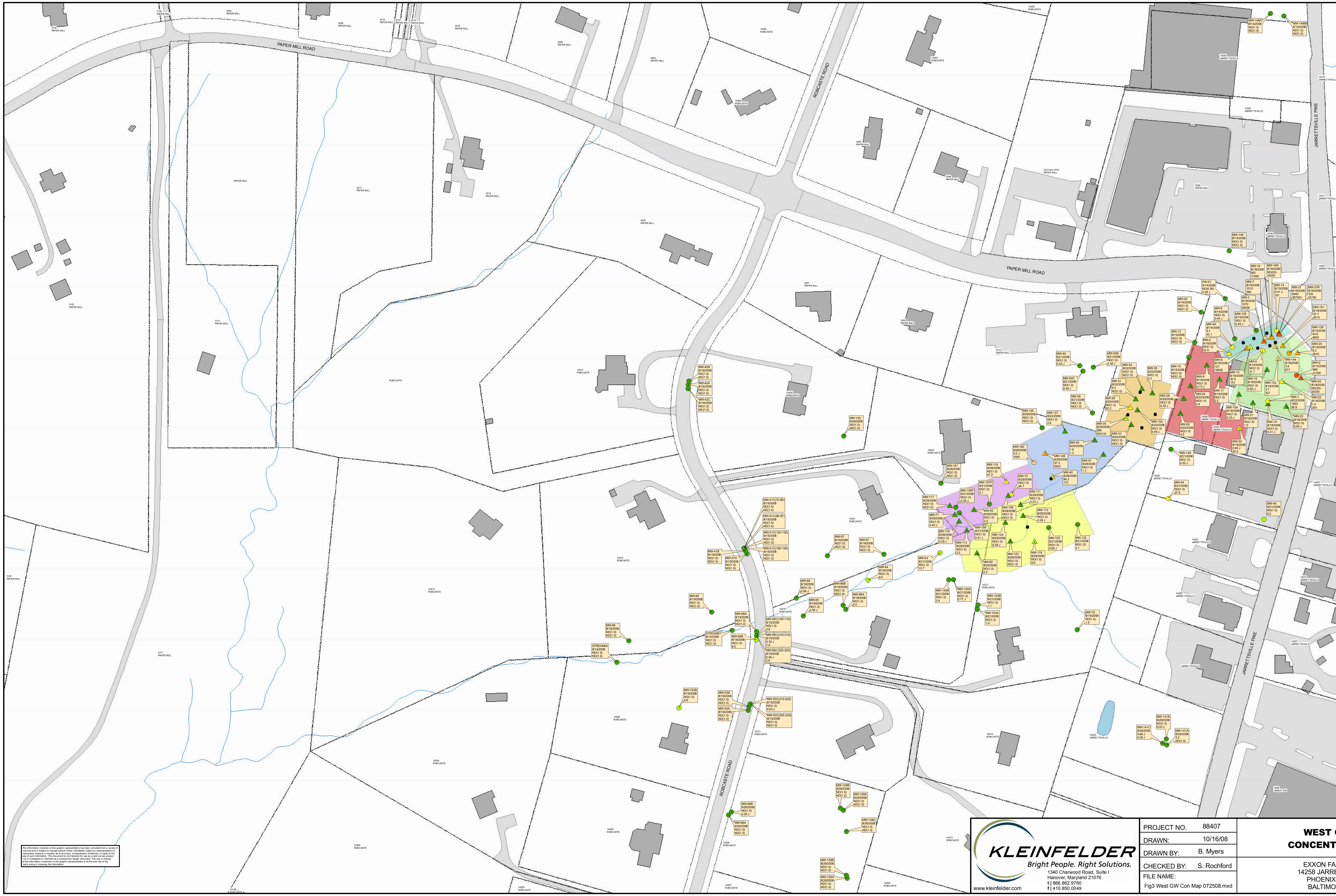
PROJECT NO.	88407
DRAWN:	10/24/08
DRAWN BY:	B. Myers
CHECKED BY:	S. Rochford
FILE NAME:	Fig2 East GW Con Map 072508.mxd

EAST GROUNDWATER CONCENTRATION MAP 2008

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE **14e**



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled in Qtr.:Dry/Inaccessible
- Monitoring Only
- Recovery Activity

Groundwater Recovery Zones

- Zone A
- Zone B
- Zone C
- Zone D
- Dispenser Island
- DPE
- Zone E
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT(RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:
1. MW-102 WAS DRY AT THE TIME OF SAMPLING
2. MW-155 WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
3. STREAM04 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM01 (UPGRADIENT)
4. MW-15, MW-20, MW-41A, MW-41B, MW-42B, MW-47B, MW-48A, MW-48B, MW-61A, MW-62B, MW-73, MW-78A, MW-83R, MW-91, MW-92, MW-93, MW-97, MW-99B, MW-101B, MW-104, MW-106, MW-108, MW-114, MW-128A, MW-129A, MW-129B, MW-130, MW-133A, MW-133B, MW-135A, MW-135B, MW-136, MW-50A WERE REVISED TO A BI-ANNUAL SCHEDULE

GROUNDWATER RECOVERY ZONES:

ZONE DISPENSER ISLAND:
MW-1A, MW-2A, MW-19, MW-21, MW-22, MW-23, MW-25, MW-109, MW-151, MW-152

ZONE DPE:
MW-3, MW-4, MW-6, MW-7, MW-13, MW-16, MW-16R, MW-27, MW-27R

ZONE A:
MW-9, MW-17, MW-24, MW-26, MW-28, MW-52

ZONE B:
MW-29, MW-30, MW-31, MW-33, MW-34, MW-35, MW-154

ZONE C:
MW-40, MW-49, MW-51, MW-126, MW-127, MW-155

ZONE D:
MW-60, MW-102, MW-111, MW-112, MW-119, MW-123, MW-124

ZONE E:
MW-55, MW-71, MW-72, MW-113, MW-117, MW-116, MW-118

0 45 90 180 Feet

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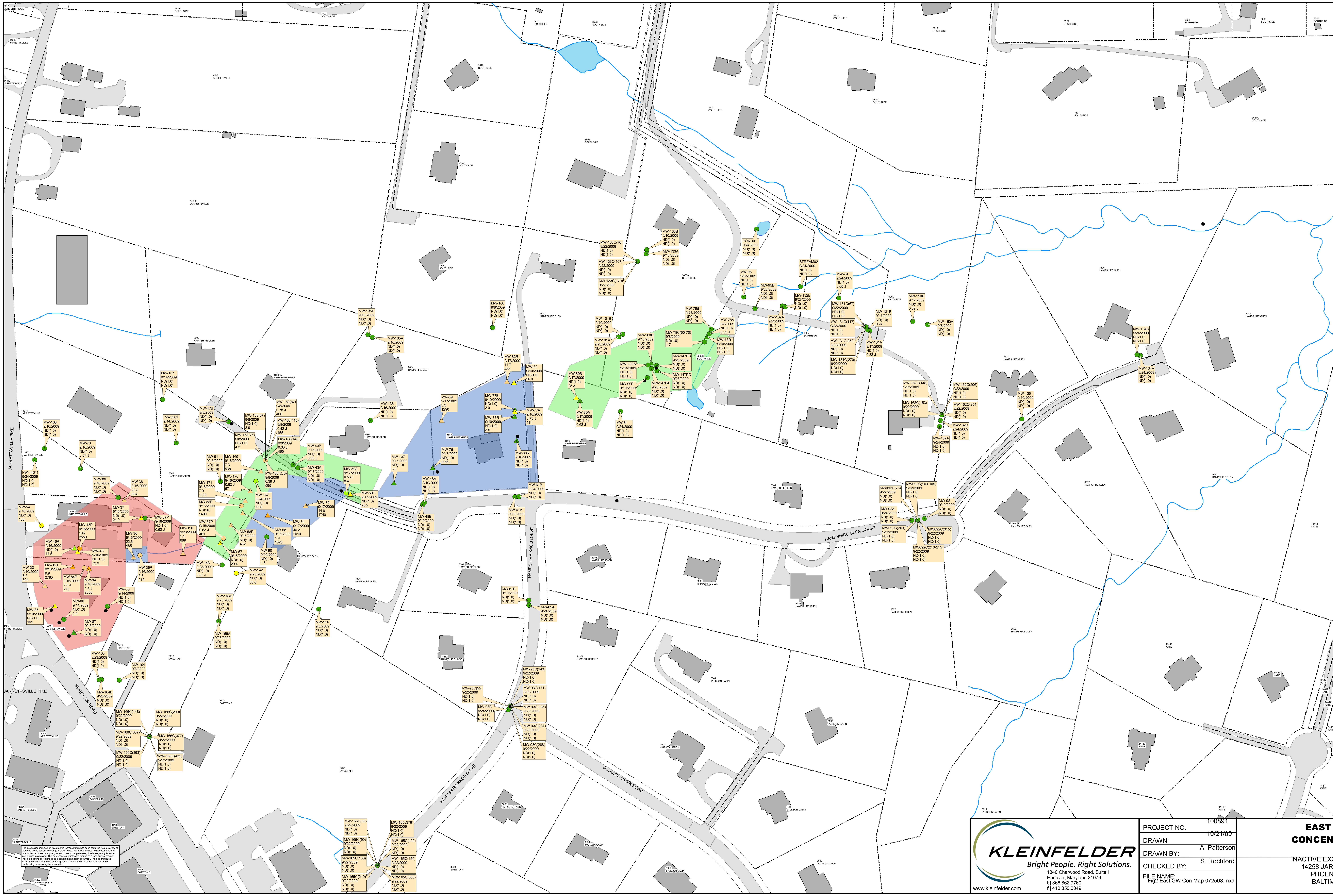
PROJECT NO.	88407
DRAWN:	10/16/08
DRAWN BY:	B. Myers
CHECKED BY:	S. Rochford
FILE NAME:	Fig3 West GW Con Map 072508.mxd

WEST GROUNDWATER CONCENTRATION MAP 2008

EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE **14f**



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled in Qtr.:Dry/Inaccessible
- Monitoring Only
- Recovery Activity

Groundwater Recovery Zones

- Zone 1
- Zone 2
- Zone 3
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = INDICATES AN ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT (RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:

1. MW-47A, MW-83, MW-94, AND MW-99A WERE DRY AT THE TIME OF SAMPLING
2. MW-59B WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
3. MW-15, MW-20, MW-41A, MW-41B, MW-42B, MW-47B, MW-48A, MW-48B, MW-61A, MW-62B, MW-78A, MW-83R, MW-92, MW-93, MW-97, MW-99B, MW-101B, MW-104, MW-106, MW-114, MW-128A, MW-129A, MW-129B, MW-130, MW-133A, MW-133B, MW-135A, MW-135B, MW-136, MW-150A ARE ON A BI-ANNUAL SCHEDULE

GROUNDWATER RECOVERY ZONES:

ZONE 1:
MW-36, MW-59A, MW-59B, MW-74, MW-75, MW-76, MW-77A, MW-77B, MW-77R, MW-82, MW-82R, MW-83R, MW-89, MW-90, MW-137, MW-169, MW-170, MW-171

ZONE 2:
MW-43A, MW-57, MW-58, MW-58R, MW-59D, MW-80B, MW-100B, MW-78R, MW-80A

ZONE 3:
MW-37, MW-38, MW-45, MW-45R, MW-84, MW-85, MW-86, MW-87, MW-88, MW-110, MW-121

0 45 90 180 Feet

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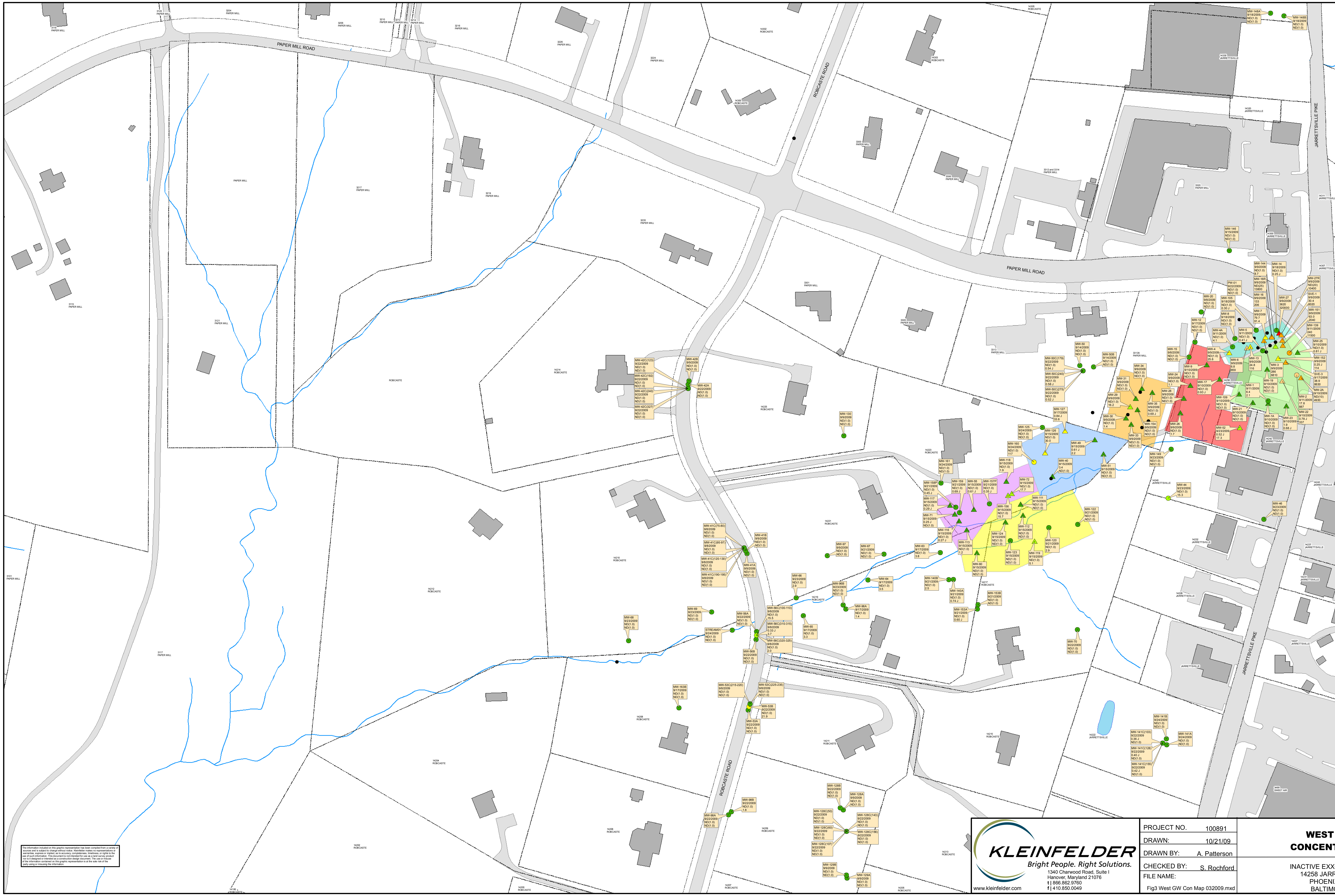
PROJECT NO.	100891
DRAWN:	10/21/09
DRAWN BY:	A. Patterson
CHECKED BY:	S. Rochford
FILE NAME:	Fig2 East GW Con Map 072508.mxd

EAST GROUNDWATER CONCENTRATION MAP 2009

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
14g



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled in Qtr.:Dry/Inaccessible
- Monitoring Only
- Recovery Activity

Groundwater Recovery Zones

- Zone A
- Zone B
- Zone C
- Zone D
- Dispenser Island
- DPE
- Zone E
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT(RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:
1. MW-39 AND MW-102 WERE DRY AT THE TIME OF SAMPLING
2. MW-155 WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
3. STREAM04 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM01 (UPGRADIENT)
4. MW-15, MW-20, MW-41A, MW-41B, MW-42B, MW-47B, MW-48A, MW-48B, MW-61A, MW-62B, MW-78A, MW-83R, MW-92, MW-93, MW-97, MW-99B, MW-101B, MW-104, MW-106, MW-114, MW-128A, MW-129A, MW-129B, MW-130, MW-133A, MW-133B, MW-135A, MW-135B, MW-136, MW-150A ARE ON A A BI-ANNUAL SCHEDULE

GROUNDWATER RECOVERY ZONES:

ZONE DISPENSER ISLAND:
MW-1A, MW-2A, MW-19, MW-21, MW-22, MW-23, MW-25, MW-109, MW-151, MW-152

ZONE DPE:
MW-3, MW-4, MW-6, MW-7, MW-13, MW-16, MW-16R, MW-27, MW-27R

ZONE A:
MW-9, MW-17, MW-24, MW-26, MW-28, MW-52

ZONE B:
MW-29, MW-30, MW-31, MW-33, MW-34, MW-35, MW-154

ZONE C:
MW-40, MW-49, MW-51, MW-126, MW-127, MW-155

ZONE D:
MW-60, MW-102, MW-111, MW-112, MW-119, MW-123, MW-124

ZONE E:
MW-55, MW-71, MW-72, MW-113, MW-117, MW-116, MW-118

0 45 90 180 Feet

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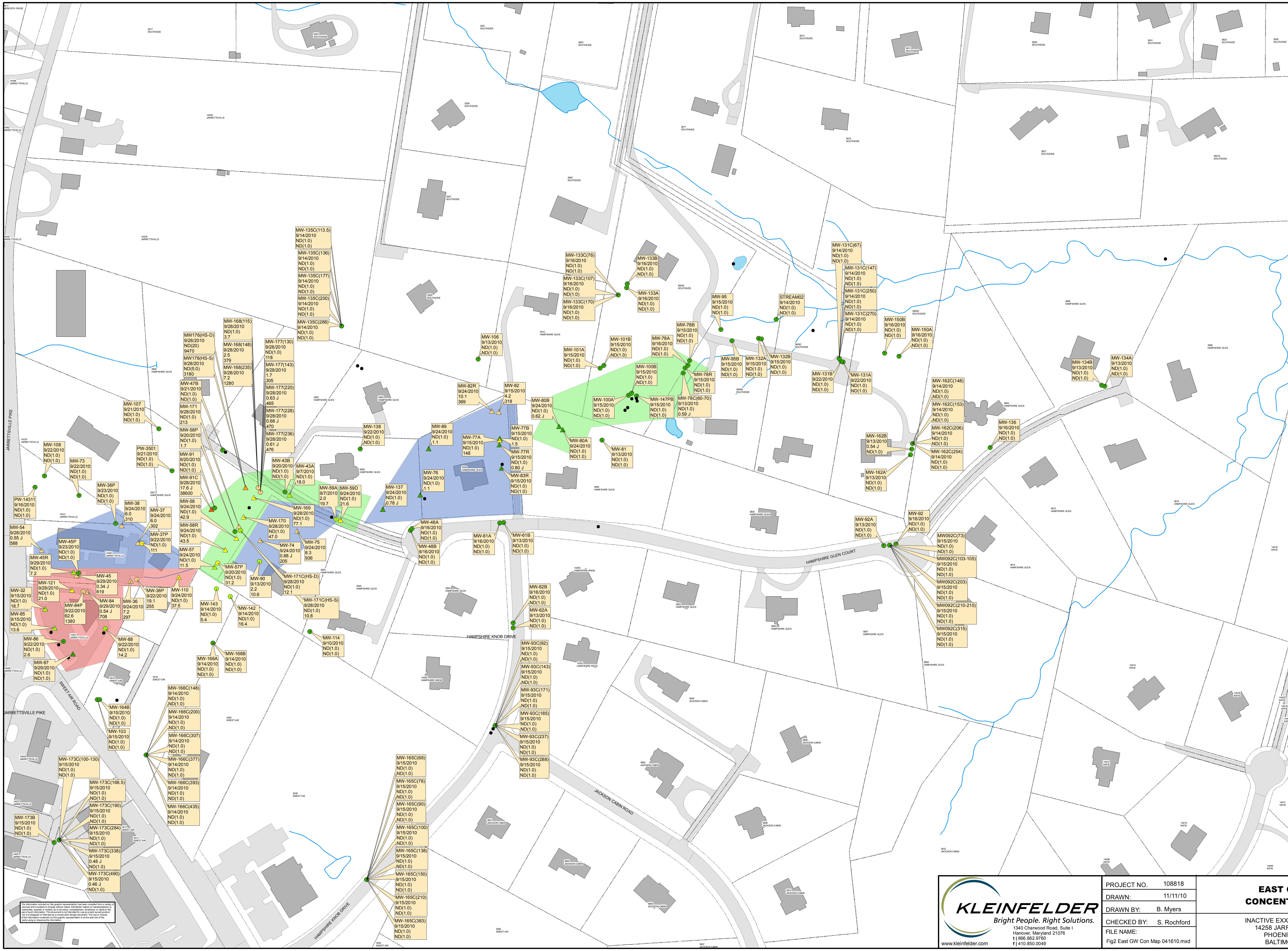
PROJECT NO. 100891
DRAWN: 10/21/09
DRAWN BY: A. Patterson
CHECKED BY: S. Rochford
FILE NAME: Fig3 West GW Con Map 032009.mxd

WEST GROUNDWATER CONCENTRATION MAP 2009

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
14h



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled in Qtr.:Dry/Inaccessible
- Monitoring Only
- Recovery Activity

Groundwater Recovery Zones

- Zone 1
- Zone 2
- Zone 3
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = INDICATES AN ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT (RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:
1. MW-43A, MW-47A, MW-59A, MW-83, MW-94, MW-167, AND POND01 WERE DRY AT THE TIME OF SAMPLING
2. MW-59B WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
3. STREAM03 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM02 (UP GRADIENT)
4. MW-15, MW-20, MW-61A, MW-62B, MW-67, MW-78A, MW-83R, MW-92, MW-97, MW-114, MW-130, MW-136, MW-149, AND POND01 ARE ON A BI-ANNUAL SAMPLING SCHEDULE
5. MW-41A, MW-41B, MW-48A, MW-48B, MW-129A, MW-129B, MW-133A, MW-133B, MW-148A, MW-148B, MW-150A, MW-150B ARE ON A 1st AND 3rd QUARTER BI-ANNUAL SAMPLING SCHEDULE
6. MW-42A, MW-42B, MW-93, MW-93B, MW-99A, MW-99B, MW-128A, MW-128B, MW-135A, AND MW-135B ARE ON A 2nd AND 4th QUARTER BI-ANNUAL SAMPLING SCHEDULE

GROUNDWATER RECOVERY ZONES:

ZONE 1:
MW-37, MW-38, MW-54, MW-74, MW-75, MW-76, MW-77A, MW-77B, MW-77R, MW-82, MW-82R, MW-83R, MW-89, MW-90, MW-137, MW-169, MW-170, MW-171, MW-176

ZONE 2:
MW-43A, MW-57, MW-58, MW-58R, MW-59D, MW-80B, MW-80A, MW-91C

ZONE 3:
MW-36, MW-45, MW-45R, MW-84, MW-85, MW-86, MW-87, MW-88, MW-110, MW-121

0 45 90 180
Feet

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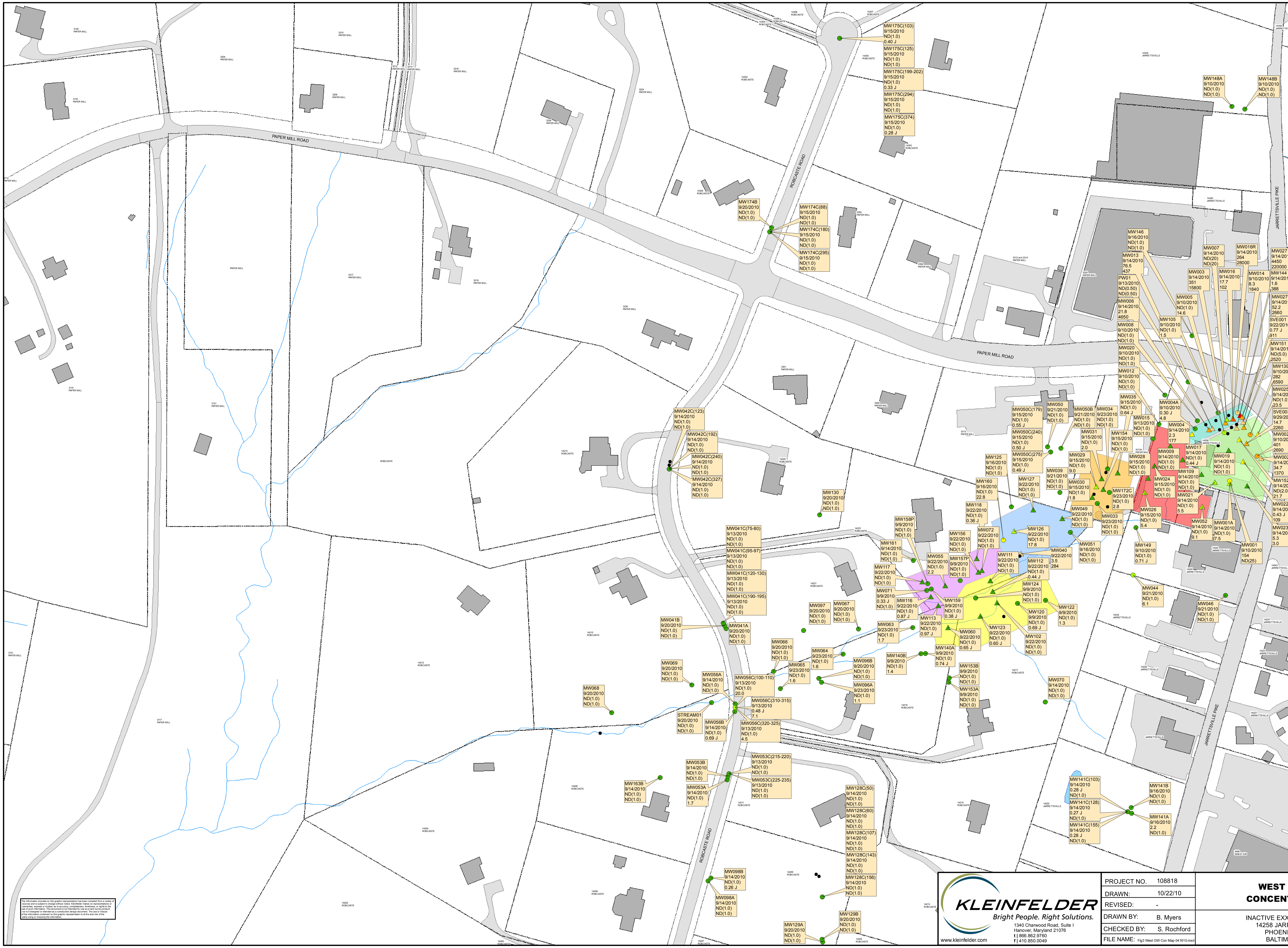
PROJECT NO.	108818
DRAWN:	11/11/10
DRAWN BY:	B. Myers
CHECKED BY:	S. Rochford
FILE NAME:	Fig2 East GW Con Map 041610.mxd

EAST GROUNDWATER CONCENTRATION MAP 2010

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
14i



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled in Qtr.:Dry/Inaccessible
- Monitoring Only
- Recovery Activity

Groundwater Recovery Zones

- Zone A
- Zone B
- Zone C
- Zone D
- Dispenser Island
- DPE
- Zone E
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT(RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:
1. NO MONITORING WELLS WERE DRY AT THE TIME OF SAMPLING
2. MW-155 WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
3. STREAM04 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM01 (UPGRADIENT)
4. MW-15, MW-20, MW-61A, MW-62B, MW-67, MW-78A, MW-83R, MW-92, MW-97, MW-114, MW-130, MW-136, MW-149, AND POND01 ARE ON A BI-ANNUAL SAMPLING SCHEDULE
5. MW-41A, MW-41B, MW-42B, MW-48A, MW-48B, MW-129A, MW-129B, MW-133A, MW-133B, MW-148A, MW-148B, MW-150A, MW-150B ARE ON A 1st AND 3rd QUARTER BI-ANNUAL SAMPLING SCHEDULE
6. MW-42A, MW-42B, MW-93, MW-93B, MW-99A, MW-99B, MW-128A, MW-128B, MW-135A, AND MW-135B ARE ON A 2nd AND 4th QUARTER BI-ANNUAL SAMPLING SCHEDULE

GROUNDWATER RECOVERY ZONES:

ZONE DISPENSER ISLAND:
MW-1A, MW-2A, MW-19, MW-21, MW-22, MW-23, MW-25, MW-109, MW-151, MW-152, SVE-1, SVE-3

ZONE DPE:
MW-3, MW-4, MW-6, MW-7, MW-13, MW-16, MW-16R, MW-27, MW-27R

ZONE A:
MW-9, MW-17, MW-24, MW-26, MW-28, MW-52

ZONE B:
MW-29, MW-30, MW-31, MW-35, MW-154

ZONE C:
MW-40, MW-49, MW-126, MW-127, MW-155

ZONE D:
MW-60, MW-102, MW-111, MW-112, MW-119, MW-123

ZONE E:
MW-55, MW-72, MW-113, MW-117, MW-116, MW-118

0 45 90 180 Feet

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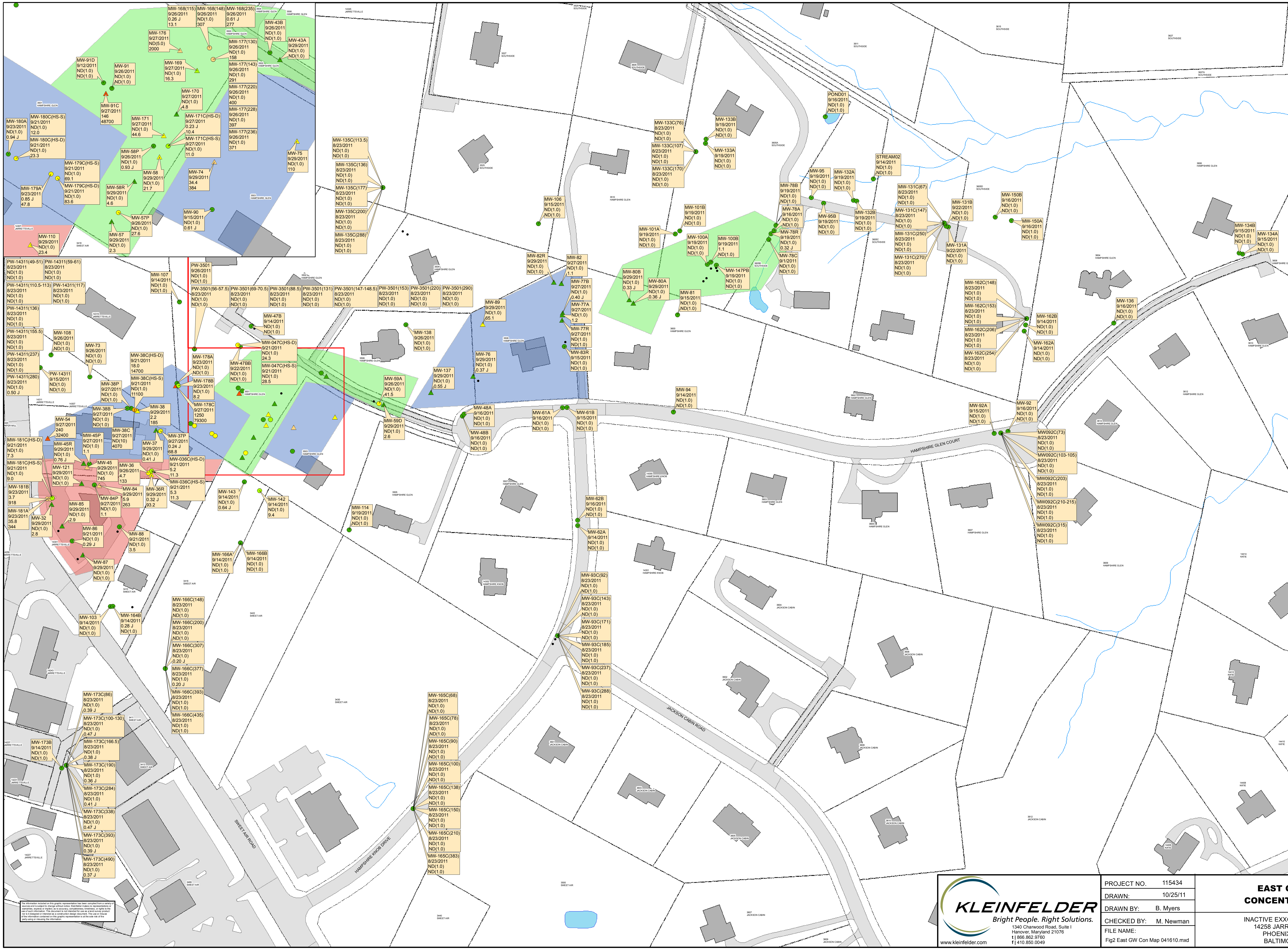
PROJECT NO.	108818
DRAWN:	10/22/10
REVISED:	-
DRAWN BY:	B. Myers
CHECKED BY:	S. Rochford
FILE NAME:	Fig3 West GW Con Map 041610.mxd

WEST GROUNDWATER CONCENTRATION MAP 2010

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
14j



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled in Qtr.:Dry/Inaccessible
- Monitoring Only
- Recovery Activity

Groundwater Recovery Zones

- Zone 1
- Zone 2
- Zone 3
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = INDICATES AN ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT (RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:

1. MW-36P, MW-47A, MW-83, AND MW-167 WERE DRY AT THE TIME OF SAMPLING
2. MW-59B WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
3. STREAM03 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM02 (UP GRADIENT)
4. MW-15, MW-20, MW-61A, MW-62B, MW-78A, MW-83R, MW-92, MW-114, MW-136, AND POND01 ARE ON A BI-ANNUAL SAMPLING SCHEDULE
5. MW-48A, MW-48B, MW-129A, MW-129B, MW-133A, MW-133B, MW-148A, MW-148B, MW-150A, MW-150B ARE ON A 1st AND 3rd QUARTER BI-ANNUAL SAMPLING SCHEDULE
6. MW-93, MW-93B, MW-99A, MW-99B, MW-128A, MW-128B, MW-135A, AND MW-135B ARE ON A 2nd AND 4th QUARTER BI-ANNUAL SAMPLING SCHEDULE

GROUNDWATER RECOVERY ZONES:

ZONE 1:
MW-37, MW-38, MW-54, MW-74, MW-75, MW-76, MW-77A, MW-77B, MW-77R, MW-82, MW-82R, MW-89, MW-137, MW-178C

ZONE 2:
MW-43A, MW-57, MW-58, MW-58R, MW-59D, MW-80B, MW-80A, MW-91C, MW-169, MW-170, MW-171, MW-176

ZONE 3:
MW-32, MW-36R, MW-45, MW-45R, MW-84, MW-85, MW-87, MW-110, MW-121

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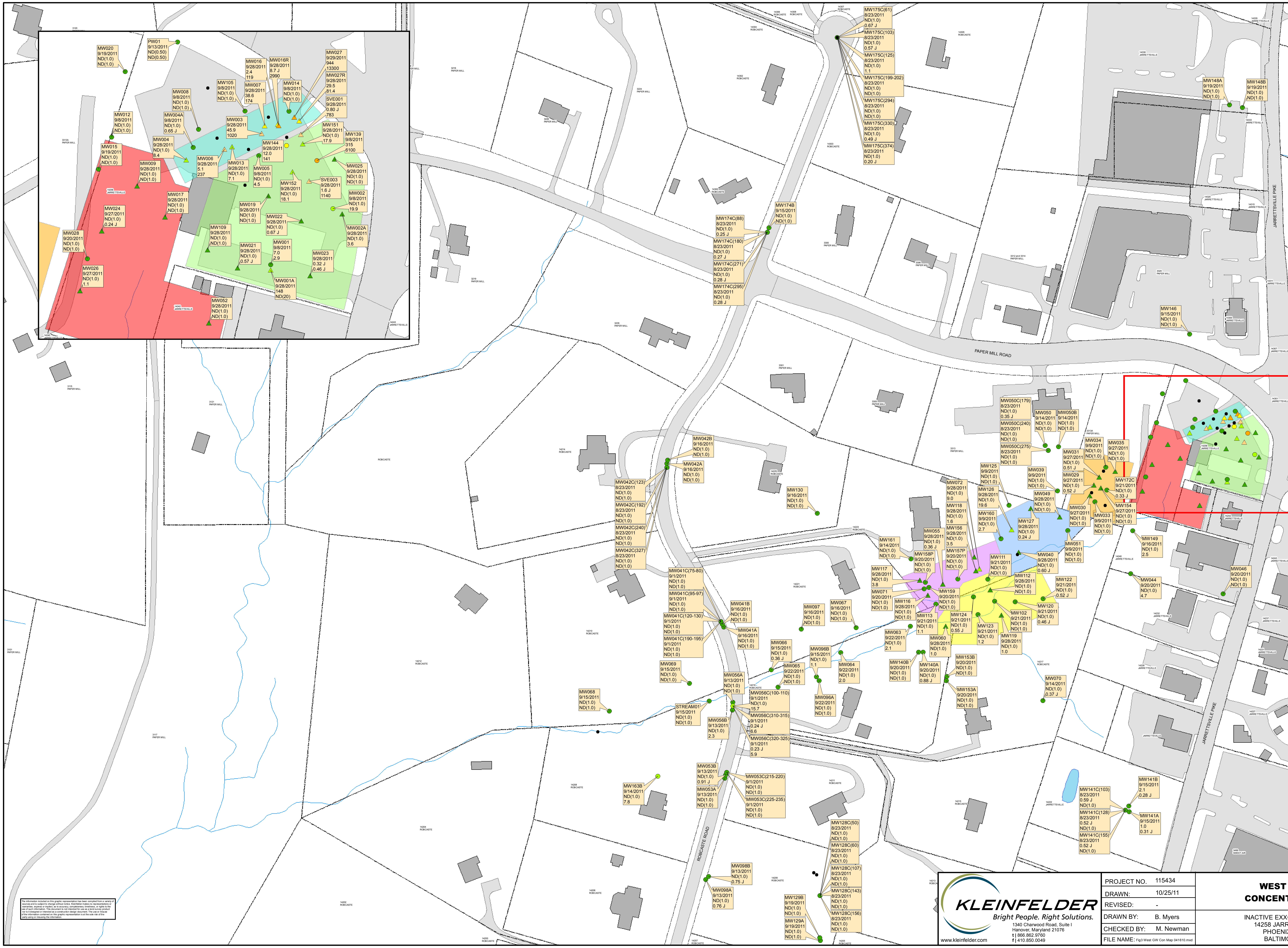
PROJECT NO.	115434
DRAWN:	10/25/11
DRAWN BY:	B. Myers
CHECKED BY:	M. Newman
FILE NAME:	Fig2 East GW Con Map 041610.mxd

EAST GROUNDWATER CONCENTRATION MAP 2011

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE **14k**



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled in Qtr.:Dry/Inaccessible
- Monitoring Only
- Recovery Activity

Groundwater Recovery Zones

- Zone A
- Zone B
- Zone C
- Zone D
- Dispenser Island
- DPE
- Zone E
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT(RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:
1. NO WELLS WERE DRY AT THE TIME OF SAMPLING
2. MW-155 WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
3. STREAM04 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM01 (UPGRADIENT)
4. MW-15, MW-20, MW-61A, MW-62B, MW-78A, MW-83R, MW-92, MW-114, MW-136, AND POND01 ARE ON A BI-ANNUAL SAMPLING SCHEDULE
5. MW-48A, MW-48B, MW-129A, MW-129B, MW-133A, MW-133B, MW-148A, MW-148B, MW-150A, MW-150B ARE ON A 1st AND 3rd QUARTER BI-ANNUAL SAMPLING SCHEDULE
6. MW-93, MW-93B, MW-99A, MW-99B, MW-128A, MW-128B, MW-135A, AND MW-135B ARE ON A 2nd AND 4th QUARTER BI-ANNUAL SAMPLING SCHEDULE

GROUNDWATER RECOVERY ZONES:

ZONE DISPENSER ISLAND:
MW-1A, MW-2A, MW-19, MW-21, MW-22, MW-23, MW-25, MW-109, MW-151, MW-152, SVE-1, SVE-3

ZONE DPE:
MW-3, MW-4, MW-6, MW-7, MW-13, MW-16, MW-16R, MW-27, MW-27R

ZONE A:
MW-9, MW-17, MW-24, MW-26, MW-52

ZONE B:
MW-29, MW-30, MW-31, MW-35, MW-154

ZONE C:
MW-40, MW-49, MW-126, MW-127, MW-155

ZONE D:
MW-60, MW-112, MW-119

ZONE E:
MW-55, MW-72, MW-116, MW-117, MW-118, MW-156

0 45 90 180 Feet

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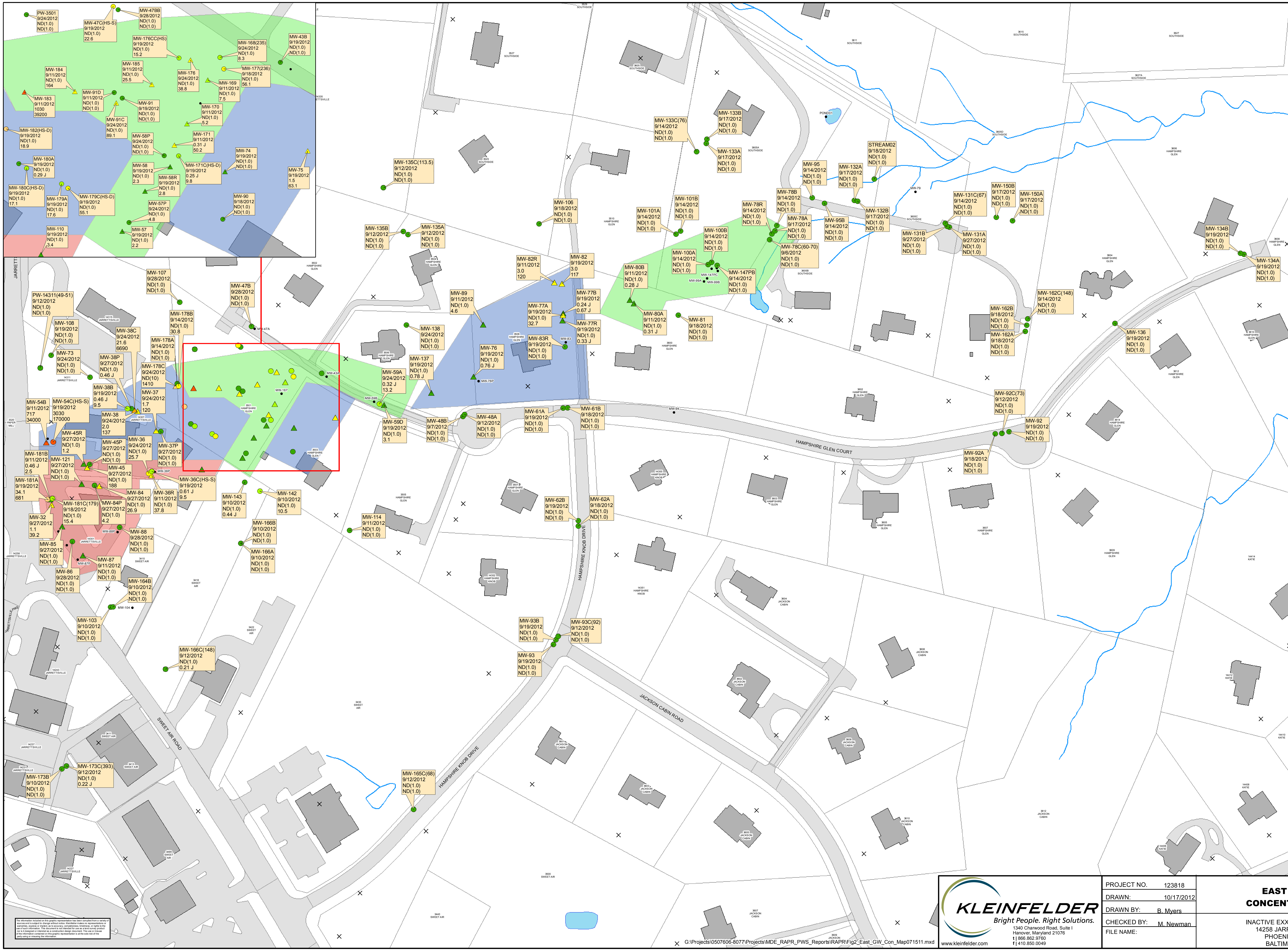
PROJECT NO.	115434
DRAWN:	10/25/11
REVISED:	-
DRAWN BY:	B. Myers
CHECKED BY:	M. Newman
FILE NAME:	Fig3 West GW Con Map 041610.mxd

WEST GROUNDWATER CONCENTRATION MAP 2011

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
14I



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled
- Monitoring Only
- Recovery Activity
- Private Supply Well

Groundwater Recovery Zones

- Zone 1
- Zone 2
- Zone 3
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = INDICATES AN ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT (RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:
1. LOCATIONS WITH DEPTH INTERVAL SAMPLES DISPLAY LABEL FOR MAX. MTBE CONCENTRATION. IF ALL INTERVALS ARE "ND(RL)", LABEL WILL BE DEFAULTED TO THE MOST SHALLOW INTERVAL.
2. MW-36P, MW-43A, MW-47A, MW-54, MW-83, MW-94 and MW-167 WERE DRY AT THE TIME OF SAMPLING
3. MW-59B WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
4. STREAM03 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM02 (UP GRADIENT)
5. MW-15, MW-20, MW-41A, MW-41B, MW-42A, MW-42B, MW-48A, MW-48B, MW-61A, MW-62B, MW-67, MW-78A, MW-83R, MW-92, MW-93, MW-93B, MW-94, MW-97, MW-114, MW-129A, MW-129B, MW-130, MW-133A, MW-133B, MW-134A, MW-134B, MW-135A, MW-135B, MW-136, MW-148A, MW-148B, MW-149, MW-150A, AND MW-150B ARE ON A BI-ANNUAL (1ST AND 3RD QUARTER) SAMPLING SCHEDULE

GROUNDWATER RECOVERY ZONES:

ZONE 1:
MW-37, MW-38, MW-38C, MW-54, MW-54B, MW-74, MW-75, MW-76, MW-77A, MW-77B, MW-77R, MW-82, MW-82R, MW-89, MW-137, MW-178C

ZONE 2:
MW-43A, MW-57, MW-58, MW-58R, MW-59D, MW-80B, MW-80A, MW-91C, MW-169, MW-170, MW-171, MW-176, MW-183, MW-184, MW-185

ZONE 3:
MW-32, MW-36R, MW-45, MW-45R, MW-84, MW-85, MW-87, MW-110, MW-121, MW-181B

0 45 90 180 Feet

G:\Projects\0507606-8077\Projects\MDE_RAPR_PWS_Reports\RAPR\Fig2_East_GW_Con_Map071511.mxd

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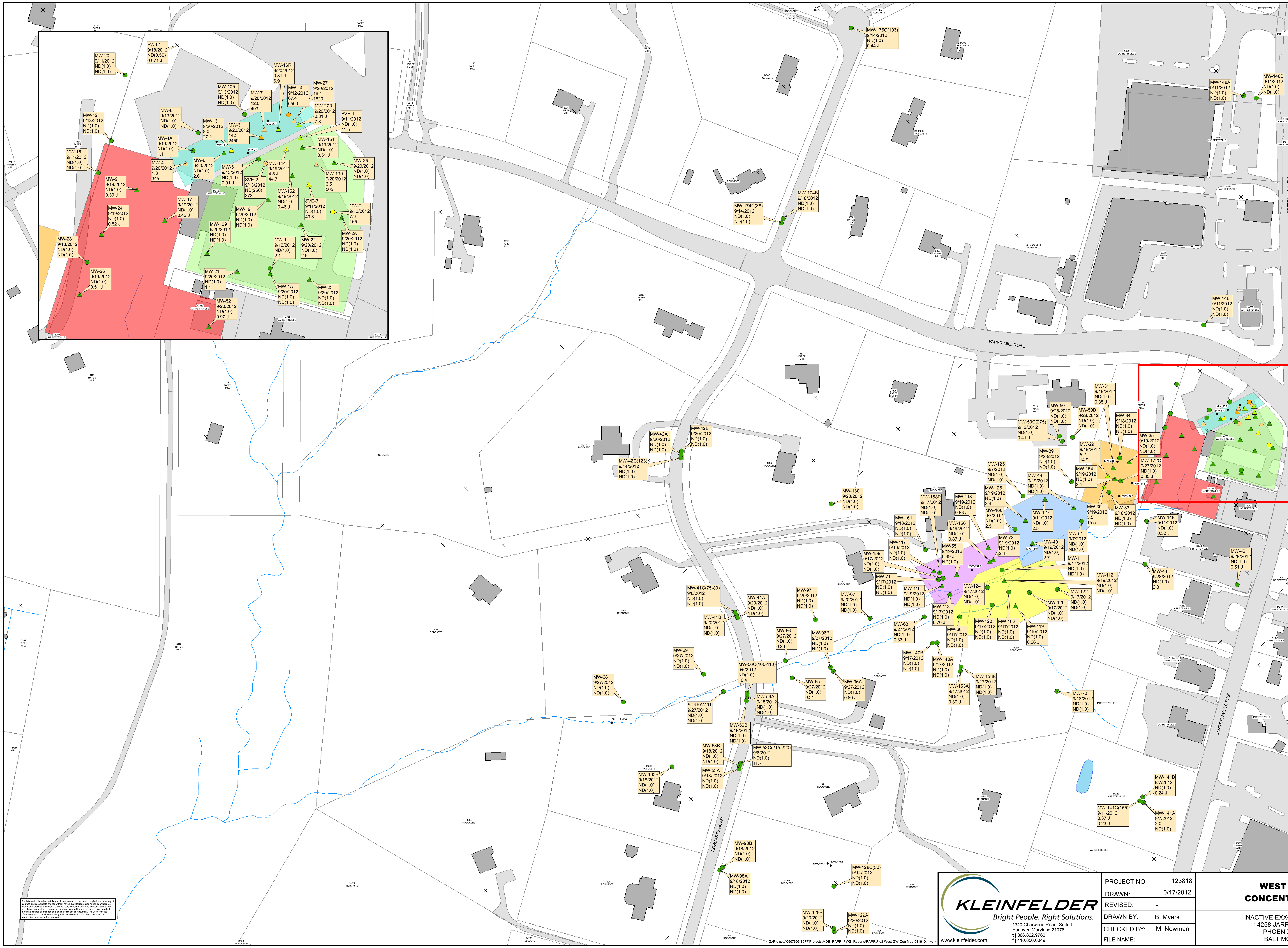
PROJECT NO.	123818
DRAWN:	10/17/2012
DRAWN BY:	B. Myers
CHECKED BY:	M. Newman
FILE NAME:	

EAST GROUNDWATER CONCENTRATION MAP 2012

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
14m



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled
- Monitoring Only
- Recovery Activity
- Private Supply Well

Groundwater Recovery Zones

- Zone A
- Zone B
- Zone C
- Zone D
- Dispenser Island
- DPE
- Zone E
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT(RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:

1. LOCATIONS WITH DEPTH INTERVAL SAMPLES DISPLAY LABEL FOR MAX. MTBE CONCENTRATION. IF ALL INTERVALS ARE "ND(RL)", LABEL WILL BE DEFAULTED TO THE MOST SHALLOW INTERVAL.
2. MW-16 WAS DRY AT THE TIME OF SAMPLING
3. MW-155 WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
4. STREAM04 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM01 (UPGRADIENT)
5. MW-15, MW-20, MW-41A, MW-41B, MW-42A, MW-42B, MW-48A, MW-48B, MW-61A, MW-62B, MW-67, MW-78A, MW-83R, MW-92, MW-93, MW-93B, MW-94, MW-97, MW-114, MW-129A, MW-129B, MW-130, MW-133A, MW-133B, MW-134A, MW-134B, MW-135A, MW-135B, MW-136, MW-148A, MW-148B, MW-149, MW-150A, AND MW-150B ARE ON A BI-ANNUAL (1ST AND 3RD QUARTER) SAMPLING SCHEDULE
6. MW-128A, MW-128B, MW-157P, AND PIEZOMETER ('P') MONITORING WELLS ARE NOT SAMPLED AND ARE USED FOR GROUNDWATER GAUGING ONLY

GROUNDWATER RECOVERY ZONES:

ZONE DISPENSER ISLAND:
MW-1A, MW-2A, MW-19, MW-21, MW-22, MW-23, MW-25, MW-109, MW-139, MW-151, MW-152, SVE-1, SVE-3

ZONE DPE:
MW-3, MW-4, MW-6, MW-7, MW-13, MW-16, MW-16R, MW-27, MW-27R

ZONE A:
MW-9, MW-17, MW-24, MW-26, MW-52

ZONE B:
MW-29, MW-30, MW-31, MW-35, MW-154

ZONE C:
MW-40, MW-49, MW-126, MW-127

ZONE D:
MW-112, MW-119

ZONE E:
MW-55, MW-72, MW-116, MW-117, MW-118, MW-156

0 45 90 180
Feet

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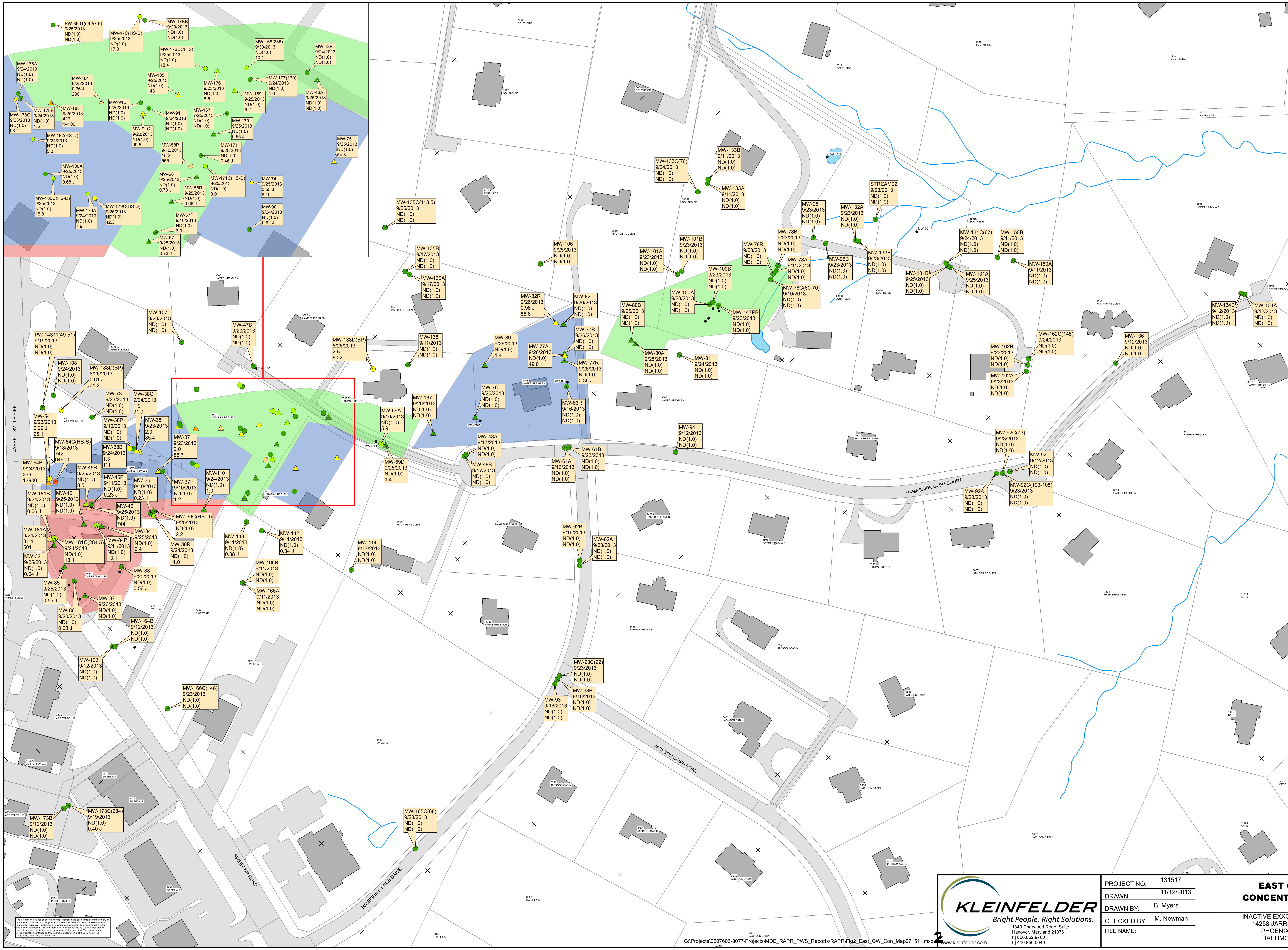
PROJECT NO.	123818
DRAWN:	10/17/2012
REVISED:	-
DRAWN BY:	B. Myers
CHECKED BY:	M. Newman
FILE NAME:	

WEST GROUNDWATER CONCENTRATION MAP 2012

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
14n



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled
- Monitoring Only
- Recovery Activity
- Private Supply Well

Groundwater Recovery Zones

- Zone 1
- Zone 2
- Zone 3
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = INDICATES AN ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT (RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:

1. LOCATIONS WITH DEPTH INTERVAL SAMPLES DISPLAY LABEL FOR MAX. MTBE CONCENTRATION. IF ALL INTERVALS ARE "ND(RL)", LABEL WILL BE DEFAULTED TO THE MOST SHALLOW INTERVAL.
2. MW-47A, MW-83, and MW-36P WERE DRY AT THE TIME OF SAMPLING
3. MW-59B WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
4. STREAM03 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM02 (UP GRADIENT)
5. MW-15, MW-20, MW-41A, MW-41B, MW-42A, MW-42B, MW-48A, MW-48B, MW-61A, MW-62B, MW-67, MW-78A, MW-83R, MW-92, MW-93, MW-93B, MW-94, MW-97, MW-114, MW-129A, MW-129B, MW-130, MW-133A, MW-133B, MW-134A, MW-134B, MW-135A, MW-135B, MW-136, MW-148A, MW-148B, MW-149, MW-150A, AND MW-150B ARE ON A BI-ANNUAL (1ST AND 3RD QUARTER) SAMPLING SCHEDULE

GROUNDWATER RECOVERY ZONES:

ZONE 1:
MW-37, MW-38, MW-38C, MW-54B, MW-74, MW-75, MW-76, MW-77A, MW-77B, MW-77R, MW-82, MW-82R, MW-89, MW-137, MW-178C

ZONE 2:
MW-43A, MW-57, MW-58, MW-58R, MW-59D, MW-80B, MW-80A, MW-91C, MW-169, MW-170, MW-171, MW-176, MW-183, MW-184, MW-185

ZONE 3:
MW-32, MW-36R, MW-45, MW-45R, MW-84, MW-85, MW-87, MW-110, MW-121, MW-181B

0 45 90 180 Feet

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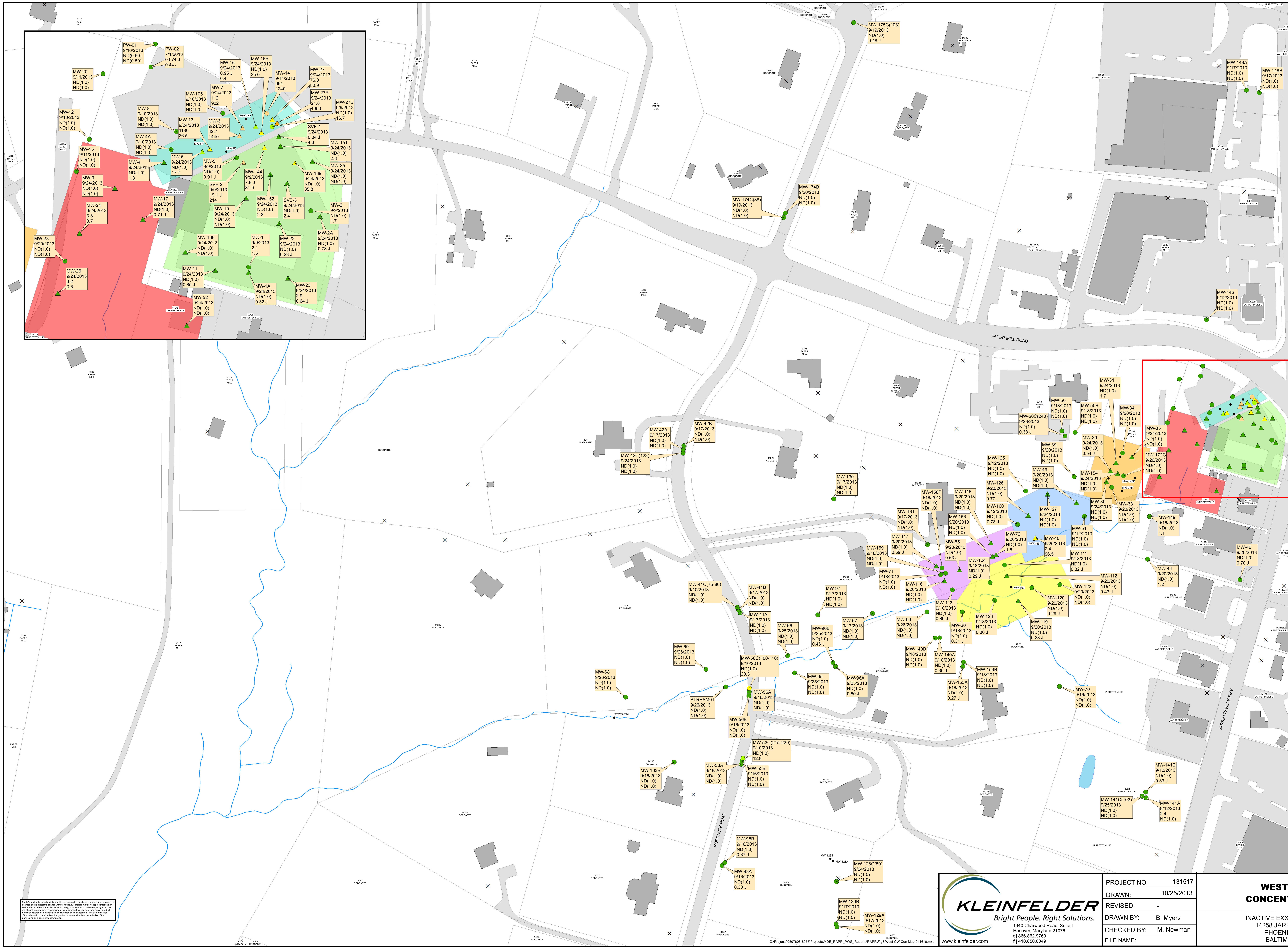
PROJECT NO.	131517
DRAWN:	11/12/2013
DRAWN BY:	B. Myers
CHECKED BY:	M. Newman
FILE NAME:	

EAST GROUNDWATER CONCENTRATION MAP 2013

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
14o



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled
- Monitoring Only
- Recovery Activity
- Private Supply Well

Groundwater Recovery Zones

- Zone A
- Zone B
- Zone C
- Zone D
- Dispenser Island
- DPE
- Zone E
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT(RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:

1. LOCATIONS WITH DEPTH INTERVAL SAMPLES DISPLAY LABEL FOR MAX. MTBE CONCENTRATION. IF ALL INTERVALS ARE "ND(RL)", LABEL WILL BE DEFAULTED TO THE MOST SHALLOW INTERVAL.
2. MW-155 WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
3. STREAM04 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM01 (UPGRADIENT)
4. MW-15, MW-20, MW-41A, MW-41B, MW-42A, MW-42B, MW-48A, MW-48B, MW-61A, MW-62B, MW-67, MW-78A, MW-83R, MW-92, MW-93, MW-93B, MW-94, MW-97, MW-114, MW-129A, MW-129B, MW-130, MW-133A, MW-133B, MW-134A, MW-134B, MW-135A, MW-135B, MW-136, MW-148A, MW-148B, MW-149, MW-150A, AND MW-150B ARE ON A BI-ANNUAL (1ST AND 3RD QUARTER) SAMPLING SCHEDULE
5. MW-128A, MW-128B, MW-157P, AND PIEZOMETER ('P') MONITORING WELLS ARE NOT SAMPLED AND ARE USED FOR GROUNDWATER GAUGING ONLY
6. MW-102 WAS DRY AT THE TIME OF SAMPLING

GROUNDWATER RECOVERY ZONES:

ZONE DISPENSER ISLAND:
MW-1A, MW-2A, MW-19, MW-21, MW-22, MW-23, MW-25, MW-109, MW-139, MW-151, MW-152, SVE-1, SVE-2, SVE-3

ZONE DPE:
MW-3, MW-4, MW-6, MW-7, MW-13, MW-16, MW-16R, MW-27, MW-27R

ZONE A:
MW-9, MW-17, MW-24, MW-26, MW-52

ZONE B:
MW-29, MW-30, MW-31, MW-35, MW-154

ZONE C:
MW-40, MW-49, MW-126, MW-127

ZONE D:
MW-112, MW-119

ZONE E:
MW-55, MW-72, MW-116, MW-117, MW-118, MW-156

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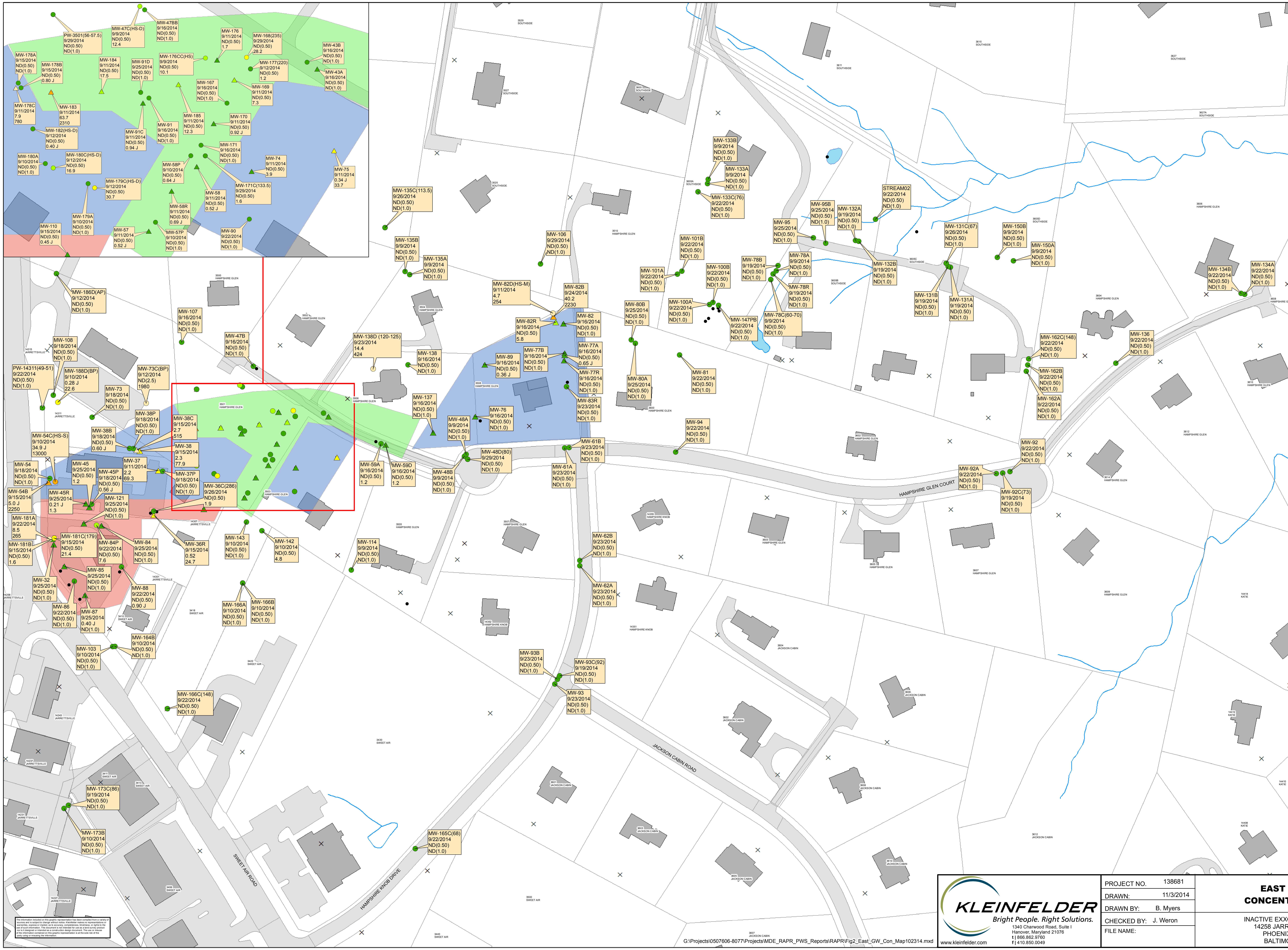
PROJECT NO.	131517
DRAWN:	10/25/2013
REVISED:	-
DRAWN BY:	B. Myers
CHECKED BY:	M. Newman
FILE NAME:	

WEST GROUNDWATER CONCENTRATION MAP 2013

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
14p



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled
- Monitoring Only
- Recovery Activity
- Private Supply Well

Groundwater Recovery Zones

- Zone 1
- Zone 2
- Zone 3
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = INDICATES AN ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT (RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:
1. LOCATIONS WITH DEPTH INTERVAL SAMPLES DISPLAY LABEL FOR MAX. MTBE CONCENTRATION. IF ALL INTERVALS ARE "ND(RL)", LABEL WILL BE DEFAULTED TO THE MOST SHALLOW INTERVAL.
2. NO DRY AT THE TIME OF SAMPLING
3. MW-59B WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
4. STREAM03 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM02 (UP GRADIENT)
5. MW-15, MW-20, MW-41A, MW-41B, MW-42A, MW-42B, MW-48A, MW-48B, MW-61A, MW-62B, MW-67, MW-78A, MW-83R, MW-92, MW-93, MW-93B, MW-94, MW-97, MW-114, MW-129A, MW-129B, MW-130, MW-133A, MW-133B, MW-134A, MW-134B, MW-135A, MW-135B, MW-136, MW-148A, MW-148B, MW-149, MW-150A, AND MW-150B ARE ON A BI-ANNUAL (1ST AND 3RD QUARTER) SAMPLING SCHEDULE

GROUNDWATER RECOVERY ZONES:

ZONE 1:
MW-37, MW-38, MW-38C, MW-54B, MW-74, MW-75, MW-76, MW-77A, MW-77B, MW-77R, MW-82, MW-82B, MW-82R, MW-89, MW-137, MW-178C

ZONE 2:
MW-43A, MW-57, MW-58, MW-58R, MW-59D, MW-91C, MW-169, MW-170, MW-176, MW-183, MW-184, MW-185

ZONE 3:
MW-32, MW-36R, MW-45, MW-45R, MW-84, MW-85, MW-87, MW-110, MW-121, MW-181B

0 45 90 180 Feet

G:\Projects\0507606-8077\Projects\MDE_RAPR_PWS_Reports\RAPR\Fig2_East_GW_Con_Map102314.mxd

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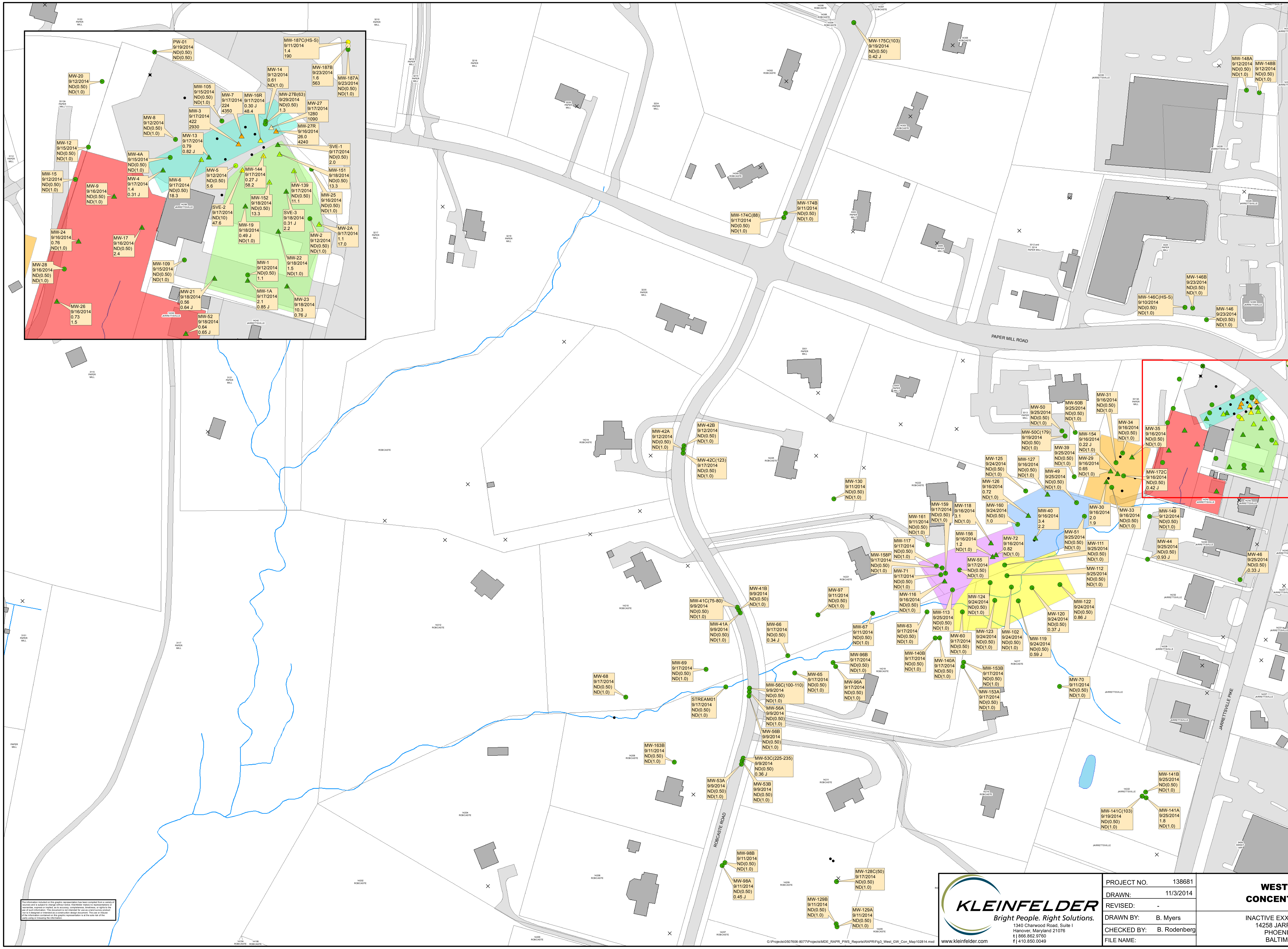
PROJECT NO.	138681
DRAWN:	11/3/2014
DRAWN BY:	B. Myers
CHECKED BY:	J. Weron
FILE NAME:	

EAST GROUNDWATER CONCENTRATION MAP 2014

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
14q



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled
- Monitoring Only
- Recovery Activity
- Private Supply Well

Groundwater Recovery Zones

- Zone A
- Zone B
- Zone C
- Zone D
- Dispenser Island
- DPE
- Zone E
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT(RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:

1. LOCATIONS WITH DEPTH INTERVAL SAMPLES DISPLAY LABEL FOR MAX. MTBE CONCENTRATION. IF ALL INTERVALS ARE "ND(RL)", LABEL WILL BE DEFAULTED TO THE MOST SHALLOW INTERVAL.
2. MW-155 WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
3. STREAM04 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM01 (UPGRADIENT)
4. MW-15, MW-20, MW-41A, MW-41B, MW-42A, MW-42B, MW-48A, MW-48B, MW-61A, MW-62B, MW-67, MW-78A, MW-83R, MW-92, MW-93, MW-93B, MW-94, MW-97, MW-114, MW-129A, MW-129B, MW-130, MW-133A, MW-133B, MW-134A, MW-134B, MW-135A, MW-135B, MW-136, MW-148A, MW-148B, MW-149, MW-150A, AND MW-150B ARE ON A BI-ANNUAL (1ST AND 3RD QUARTER) SAMPLING SCHEDULE
5. MW-128A, MW-128B, MW-157P, AND PIEZOMETER ('P') MONITORING WELLS ARE NOT SAMPLED AND ARE USED FOR GROUNDWATER GAUGING ONLY

GROUNDWATER RECOVERY ZONES:

ZONE DISPENSER ISLAND:
MW-1A, MW-2A, MW-19, MW-21, MW-22, MW-23, MW-139, MW-151, MW-152, SVE-1, SVE-2, SVE-3

ZONE DPE:
MW-3, MW-4, MW-6, MW-7, MW-13, MW-16, MW-16R, MW-27, MW-27R

ZONE A:
MW-9, MW-17, MW-24, MW-26, MW-52

ZONE B:
MW-29, MW-30, MW-35, MW-154

ZONE C:
MW-40, MW-126, MW-127

ZONE D:
No active recovery wells in Zone D during quarter

ZONE E:
MW-72, MW-116, MW-118, MW-156

0 45 90 180 Feet

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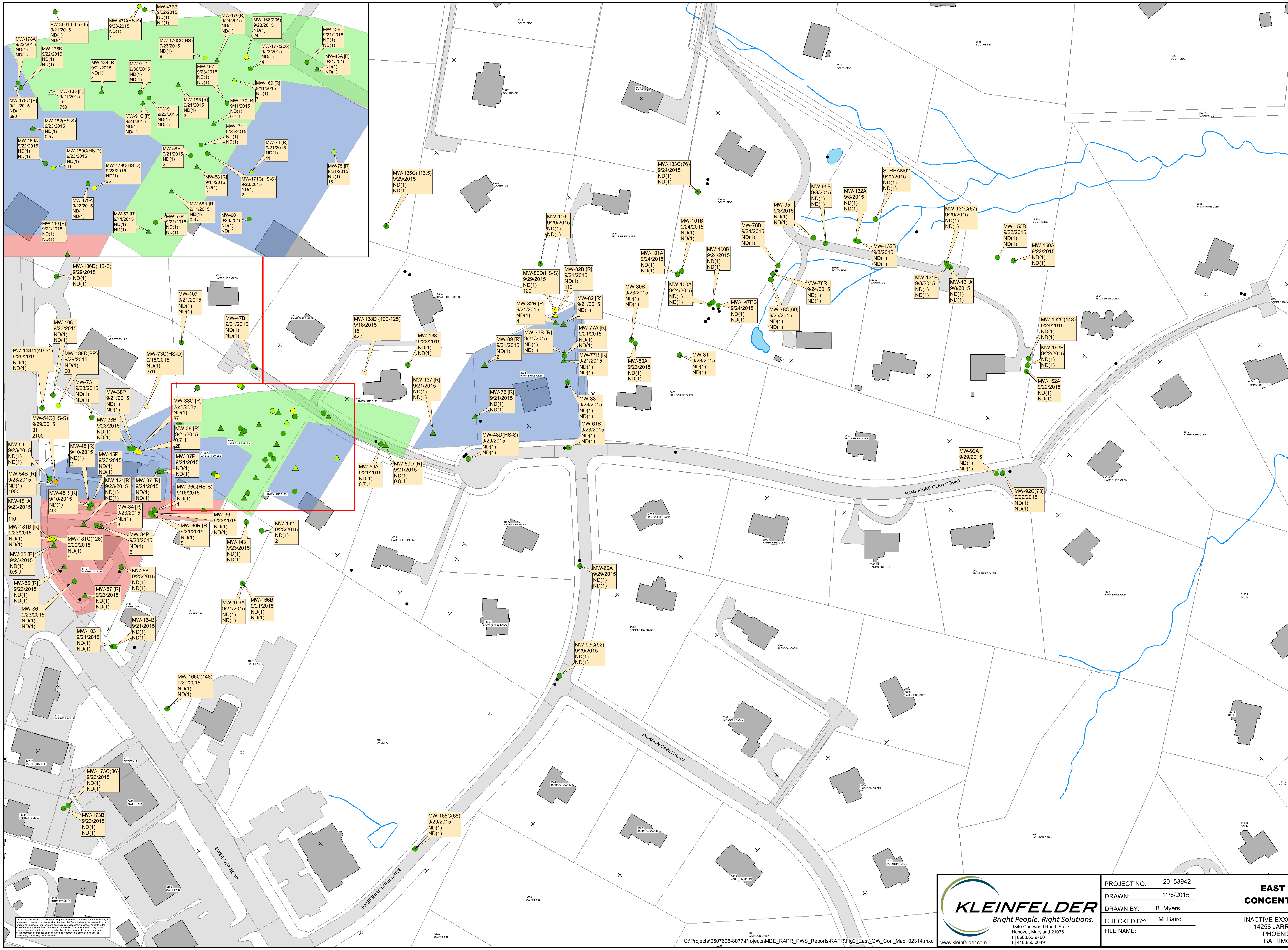
PROJECT NO.	138681
DRAWN:	11/3/2014
REVISED:	-
DRAWN BY:	B. Myers
CHECKED BY:	B. Rodenberg
FILE NAME:	

WEST GROUNDWATER CONCENTRATION MAP 2014

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE **14r**



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled
- Monitoring Only
- Recovery Activity
- Private Supply Well

Groundwater Recovery Zones

- Zone 1
- Zone 2
- Zone 3
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = INDICATES AN ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT (RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:

1. LOCATIONS WITH DEPTH INTERVAL SAMPLES DISPLAY LABEL FOR MAX. MTBE CONCENTRATION. IF ALL INTERVALS ARE "ND(RL)", LABEL WILL BE DEFAULTED TO THE MOST SHALLOW INTERVAL
2. MW-36P, MW-47A WERE DRY AT THE TIME OF SAMPLING
3. MW-59B WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
4. STREAM03 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM02 (UP GRADIENT)
5. MW-15, MW-20, MW-41A, MW-41B, MW-42A, MW-42B, MW-48A, MW-48B, MW-61A, MW-62B, MW-67, MW-78A, MW-83R, MW-92, MW-93, MW-93B, MW-94, MW-97, MW-114, MW-129A, MW-129B, MW-130, MW-133A, MW-133B, MW-134A, MW-134B, MW-135A, MW-135B, MW-136, MW-148A, MW-148B, MW-149, MW-150A, AND MW-150B ARE ON A BI-ANNUAL (1ST AND 3RD QUARTER) SAMPLING SCHEDULE

GROUNDWATER RECOVERY ZONES:

ZONE 1:
MW-37, MW-38, MW-38C, MW-54B, MW-74, MW-75, MW-76, MW-77A, MW-77B, MW-77R, MW-82, MW-82B, MW-82R, MW-89, MW-137, MW-178C

ZONE 2:
MW-43A, MW-57, MW-58, MW-58R, MW-59D, MW-91C, MW-169, MW-170, MW-176, MW-183, MW-184, MW-185

ZONE 3:
MW-32, MW-36R, MW-45, MW-45R, MW-84, MW-85, MW-87, MW-110, MW-121, MW-181B

G:\Projects\0507606-8077\Projects\MDE_RAPR_PWS_Reports\RAPR\Fig2_East_GW_Con_Map102314.mxd

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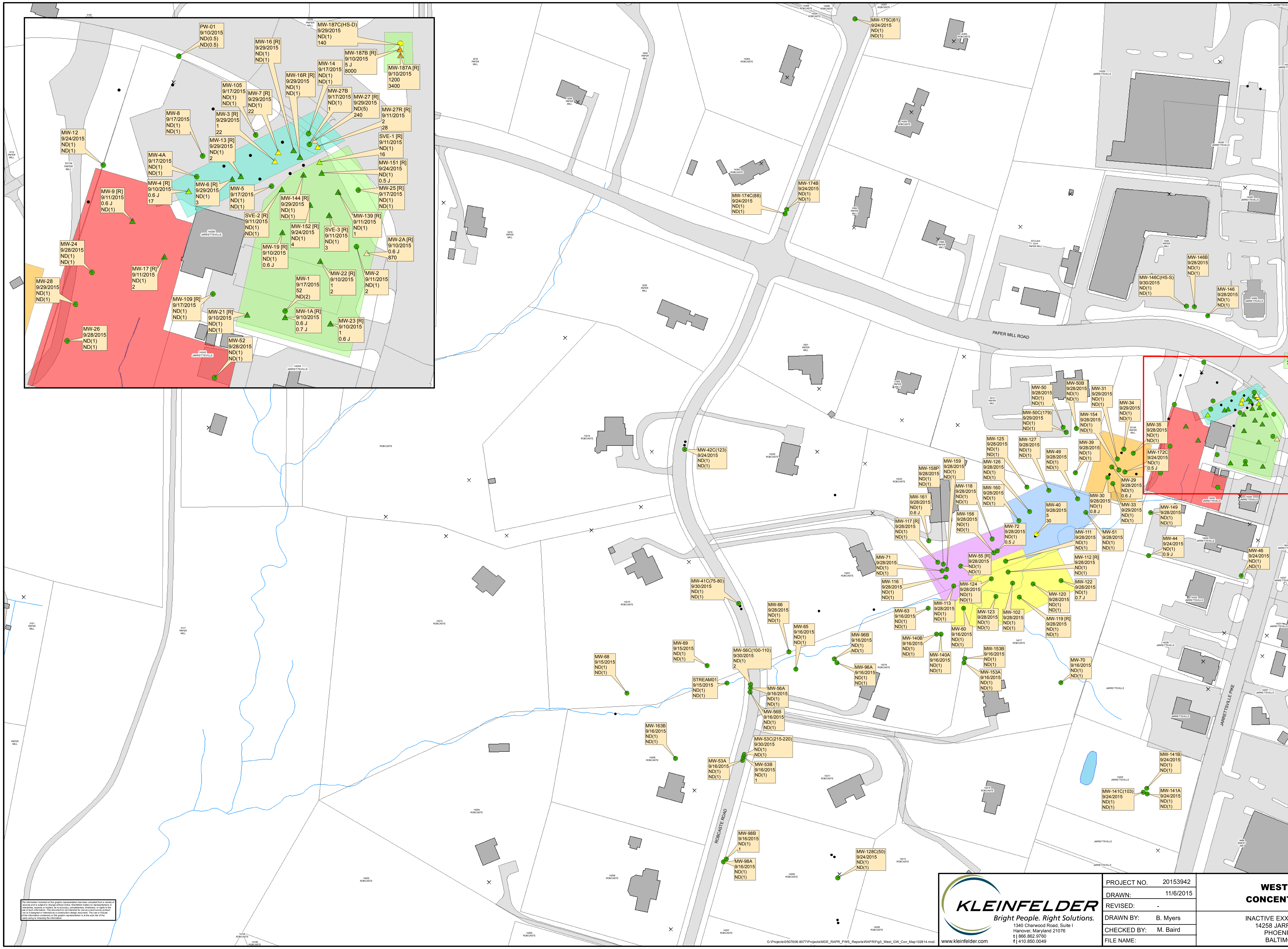
PROJECT NO.	20153942
DRAWN:	11/6/2015
DRAWN BY:	B. Myers
CHECKED BY:	M. Baird
FILE NAME:	

EAST GROUNDWATER CONCENTRATION MAP 2015

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE **14s**



Legend

Concentrations

MTBE (µg/L)

- ND(RL≤5.0) - 5.0
- 5.0 - 20
- 20 - 200
- 200 - 2000
- 2000 - 20000
- 20000 - 200000
- 200000+
- Not Sampled
- Monitoring Only
- Recovery Activity
- Private Supply Well

Groundwater Recovery Zones

- Zone A
- Zone B
- Zone C
- Zone D
- Dispenser Island
- DPE
- Zone E
- Parcel Boundary (Approx.)
- Building Foot Prints
- Streams
- Water Bodies

Well ID
Sample Date
Benzene (µg/L)
MTBE (µg/L)

J = ESTIMATED VALUE
ND(RL) = NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT(RL) LABORATORY REPORTING LIMIT INCLUDED

NOTES:

1. LOCATIONS WITH DEPTH INTERVAL SAMPLES DISPLAY LABEL FOR MAX. MTBE CONCENTRATION. IF ALL INTERVALS ARE "ND(RL)", LABEL WILL BE DEFAULTED TO THE MOST SHALLOW INTERVAL.
2. MW-36P, MW-47A WERE DRY AT THE TIME OF SAMPL ING
3. MW-155 WAS NOT SAMPLED DUE TO IMMOVABLE IN-WELL REMEDIAL EQUIPMENT
4. STREAM04 IS AN ALTERNATE SAMPLE LOCATION FOR STREAM01 (UPGRADIENT)
5. MW-15, MW-20, MW-41A, MW-41B, MW-42A, MW-42B, MW-48A, MW-48B, MW-61A, MW-62B, MW-67, MW-78A, MW-83R, MW-92, MW-93, MW-93B, MW-94, MW-97, MW-114, MW-129A, MW-129B, MW-130, MW-133A, MW-133B, MW-134A, MW-134B, MW-135A, MW-135B, MW-136, MW-148A, MW-148B, MW-149, MW-150A, AND MW-150B ARE ON A BI-ANNUAL (1ST AND 3RD QUARTER) SAMPLING SCHEDULE
6. MW-128A, MW-128B, MW-157P, AND PIEZOMETER ('P') MONITORING WELLS ARE NOT SAMPLED AND ARE USED FOR GROUNDWATER GAUGING ONLY

GROUNDWATER RECOVERY ZONES:

ZONE DISPENSER ISLAND:
MW-1A, MW-2A, MW-19, MW-21, MW-22, MW-23, MW-139, MW-151, MW-152, SVE-1, SVE-2, SVE-3, MW-187A, MW-187B

ZONE DPE:
MW-3, MW-4, MW-6, MW-7, MW-13, MW-16, MW-16R, MW-27, MW-27R

ZONE A:
MW-9, MW-17

ZONE B:
No active recovery wells in Zone B as of 5/15/15, due to rebound testing

ZONE C:
MW-40, MW-126, MW-127

ZONE D:
No active recovery wells in Zone D during quarter

ZONE E:
MW-72, MW-116, MW-118, MW-156

0 45 90 180 Feet

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PROJECT NO.	20153942
DRAWN:	11/6/2015
REVISED:	-
DRAWN BY:	B. Myers
CHECKED BY:	M. Baird
FILE NAME:	

WEST GROUNDWATER CONCENTRATION MAP 2015

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE 14t

Source: Moller, S.A., 1979, Geologic Map of the Phoenix Quadrangle, MD, State of Maryland, Department of Natural Resources, Maryland Geological Survey

G:\Projects\0507606-8077\Projects\Site_Conceptual_Model_2016\15_Lineaments_Geology.mxd

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DRAWN:	1/20/2016
DRAWN BY:	B. Myers
CHECKED BY:	J. Hale

LINEAMENT STUDY MAP

INACTIVE EXXON FACILITY #28077
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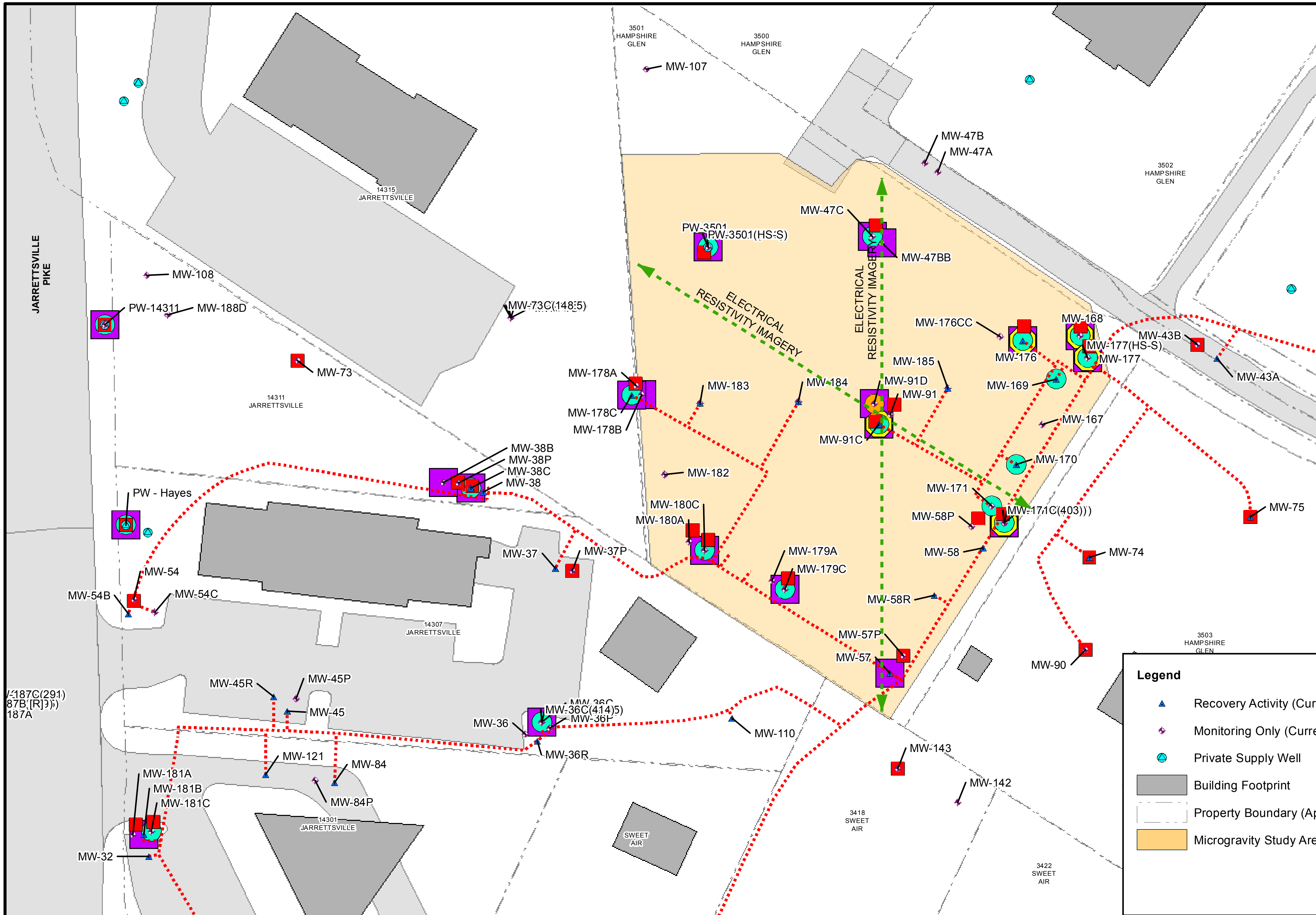
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
15



Well ID	Transducer Location	HydraSleeve Location	Packer Location	Downhole Geophysical Testing
MW-143	X			
MW-168	X	X	X	X
MW-169		X		X
MW-170		X		X
MW-171		X		X
MW-171C	X	X	X	X
MW-176	X	X	X	X
MW-177	X	X	X	X
MW-178B				X
MW-178C	X	X		X
MW-179A				
MW-179C	X	X		X
MW-180A	X			
MW-180C	X	X		X
MW-181A	X			
MW-181B				X
MW-181C	X	X		X
MW-36C		X		X
MW-37P	X			
MW-38B				X
MW-38C	X	X		X
MW-38P	X			
MW-43B	X			
MW-47BB				X
MW-47C	X	X		X
MW-54	X			
MW-57				
MW-57P	X			
MW-58P	X			
MW-73	X			
MW-74	X			
MW-75	X			
MW-90	X			
MW-91	X			
MW-91C	X	X	X	X
MW-91D				X
PW-14311	X	X		X
PW-3501	X	X		X
PW-Hayes	X	X		X

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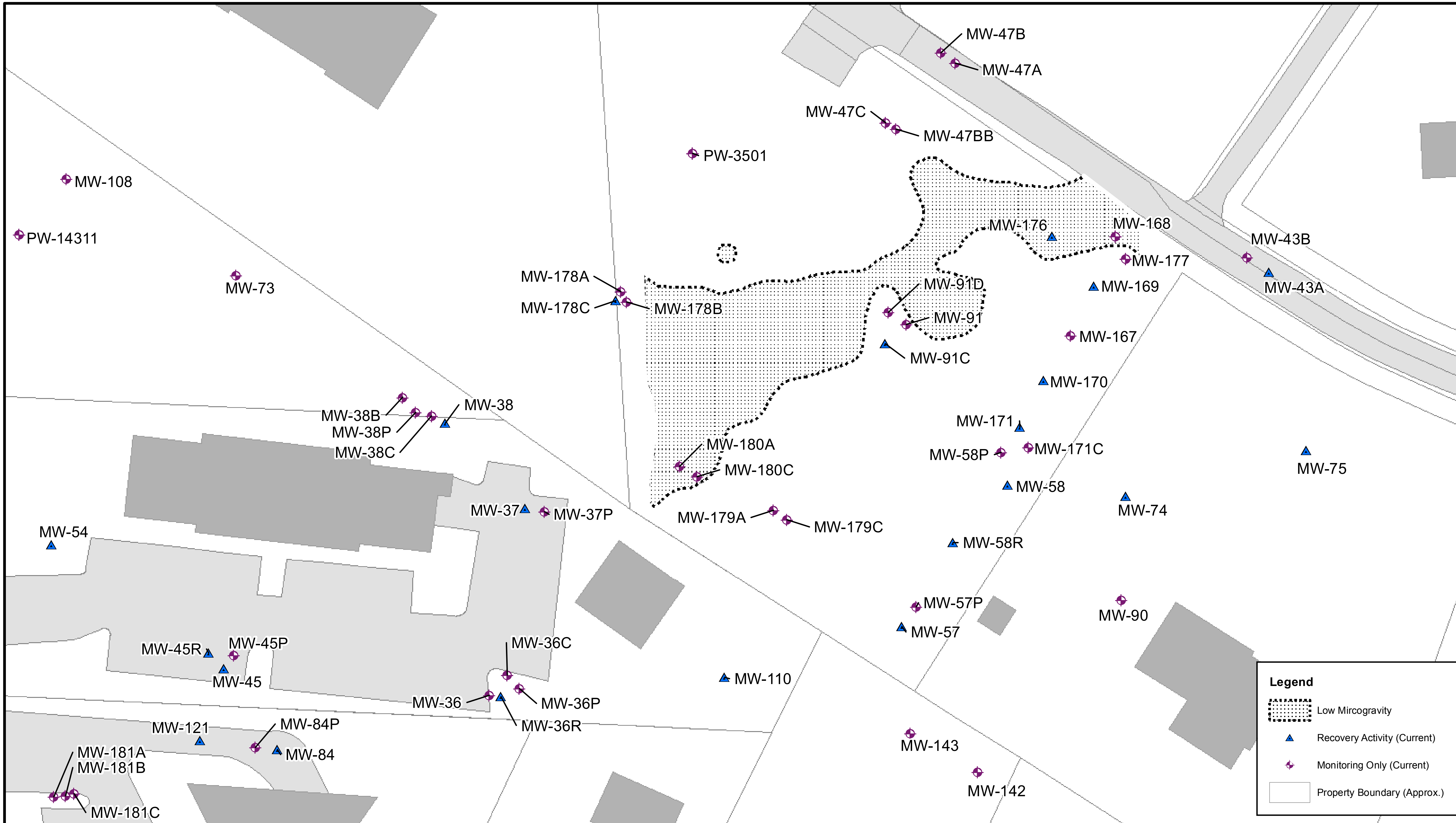
NEAR NORTHEAST AREA INVESTIGATION/REMEDIATION ACTIVITIES

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

Figure 16

Project Number: 115434 | File Name: Investigation



N

NOTE: Data derived from August 31, 2010 Enviroscan Report -
"Report Geophysical Survey 3501 Hampshire Glen Court Phoenix MD"
Enviroscan Reference Number 051001

0 20 40 80 120 160 Feet

G:\Projects\0507606-8077\Projects\NE Near Investigation 2011\Fig5_MicroGravity_040411.mxd

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MICROGRAVITY ANOMALY MAP

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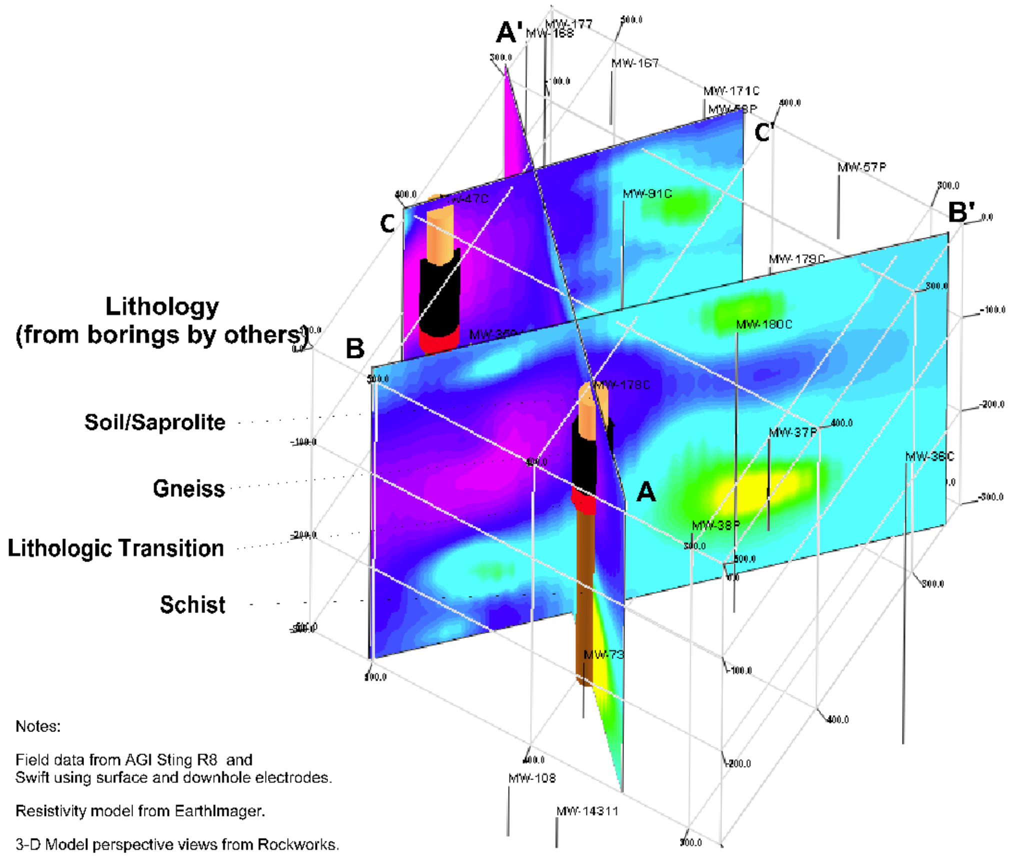
PHOENIX, MARYLAND
BALTIMORE COUNTY

Figure
17

Project Number: 115434 | File Name: MicroGravity

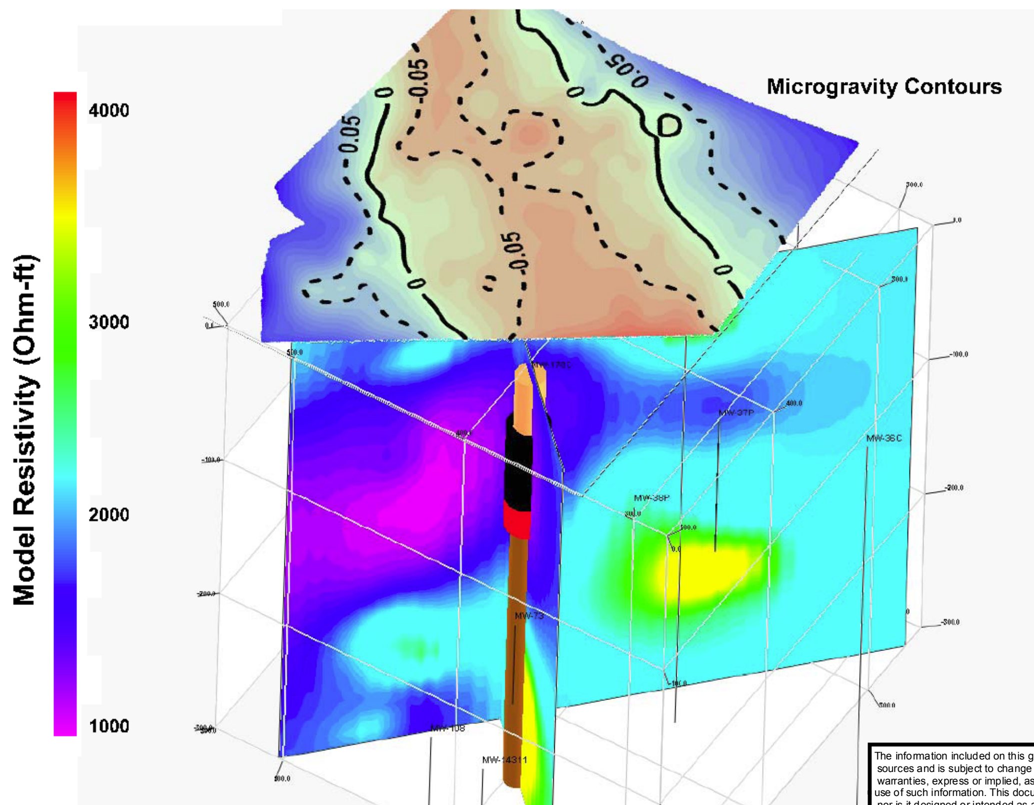


Notes:

Field data from AGI Sting R8 and Swift using surface and downhole electrodes.

Resistivity model from EarthImager.

3-D Model perspective views from Rockworks.



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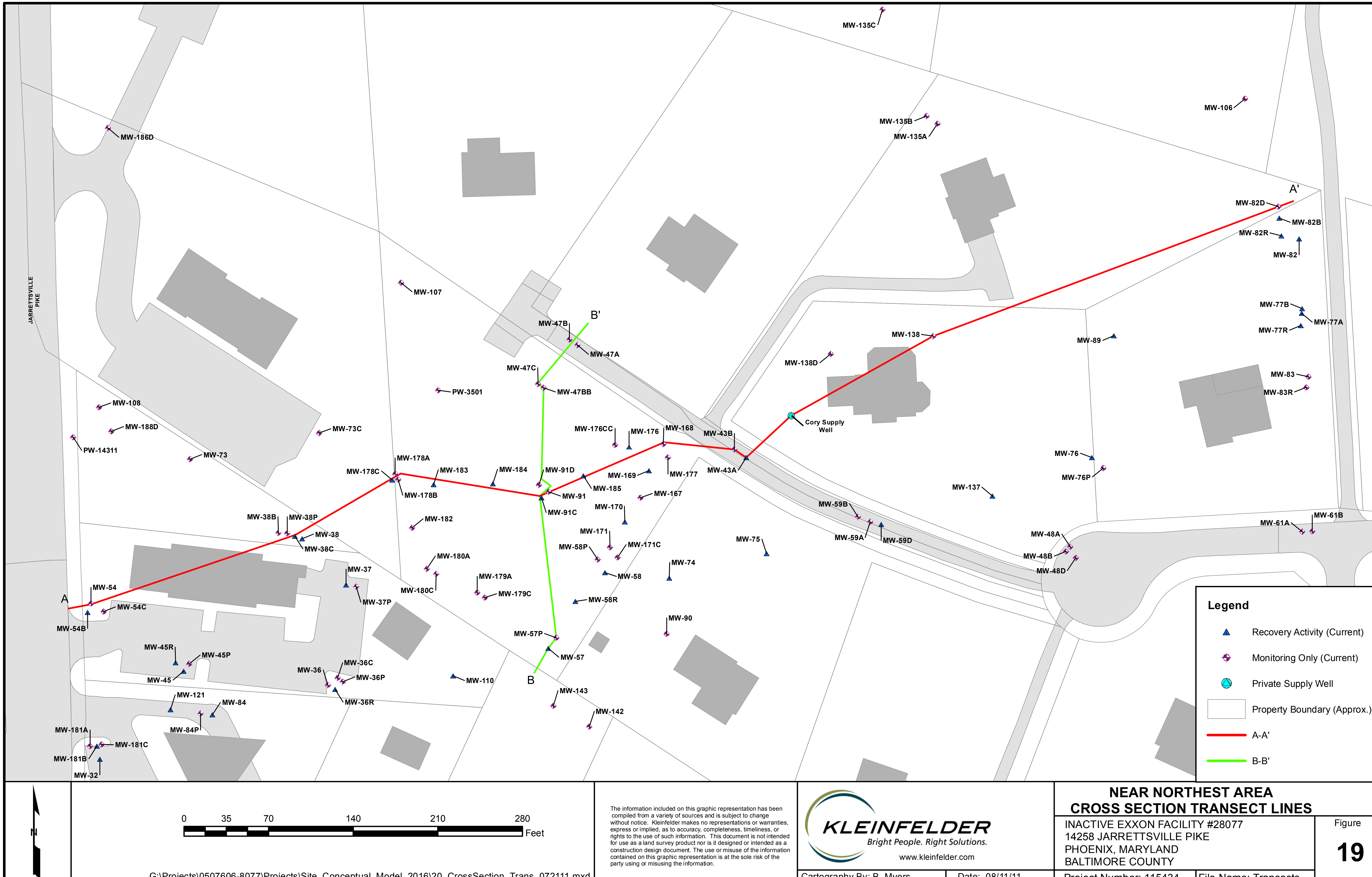
DRAWN BY:	EnviroScan
CHECKED BY:	J. Hale
FILE NAME:	

Electrical Tomography
3-D Model
Cross Sections

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
18



G:\Projects\0507606-8077\Projects\Site_Conceptual_Model_2016\20_CrossSection_Trans_072111.mxd

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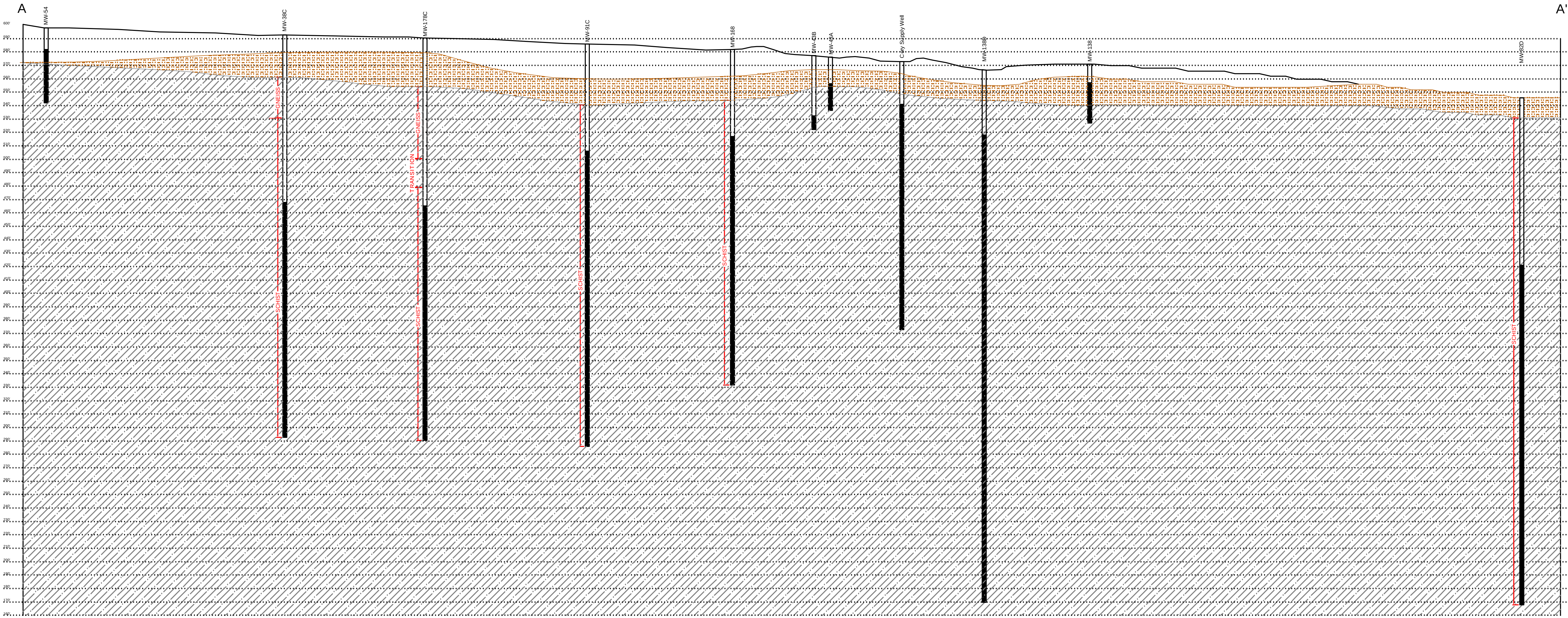
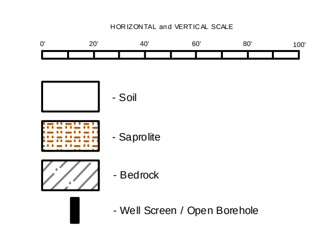
NEAR NORTHEAST AREA CROSS SECTION TRANSECT LINES

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

Figure
19

Project Number: 115434 | File Name: Transects





Note: Contacts are approximate due to variability in weathering profile.

Horizontal and vertical scales are equal and include no vertical exaggeration.

75 37.5 0 75
APPROXIMATE SCALE (feet)

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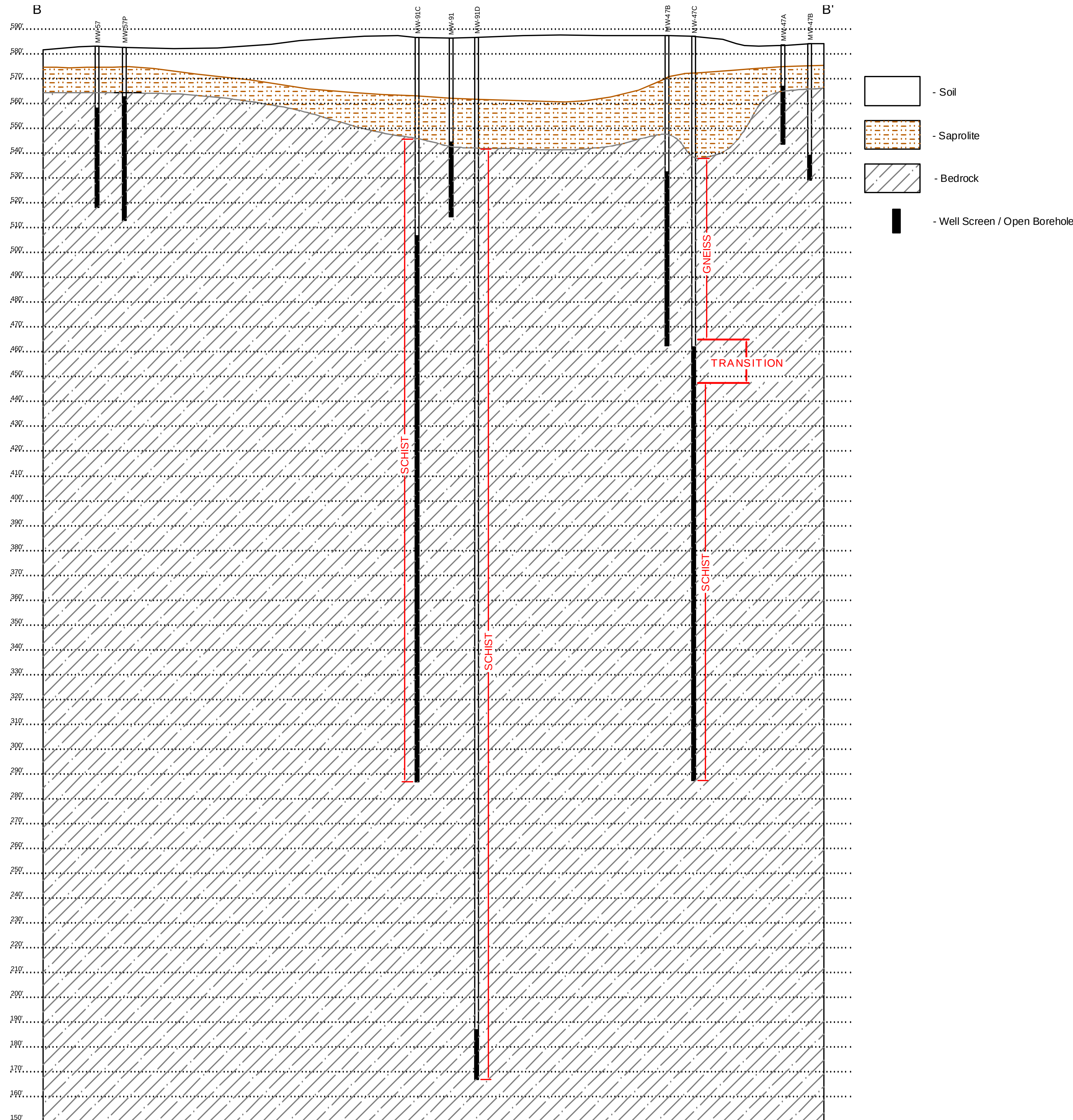
FILE NAME:	21_NNE_CrossSections_022316.dwg

NEAR NORTHEAST AREA A - A' CROSS SECTION

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND

FIGURE
20a

PLOTTED: 23 Feb 2016, 2:53pm, WRandle LAYOUT: A-A' 11x17 L CAD FILE: U:\WRandle_Projects\NNE_CrossSections\ HANOVER, MD



Note: Contacts are approximate due to variability in weathering profile.

Horizontal and vertical scales are equal and include no vertical exaggeration.

50 25 0 50
APPROXIMATE SCALE (feet)

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NEAR NORTHEAST AREA B - B'
CROSS SECTION

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND

FIGURE
20b

PLOTTED: 23 Feb 2016, 2:53pm, WRandle
LAYOUT: B-B' 11x17 L
CAD FILE: U:\WRandle_Projects\NNE_CrossSections\
HANOVER, MD

G:\Projects\0507606-8077\Projects\Site_Conceptual_Model_2016\Overall_CrossSection_Trans_030716.mxd

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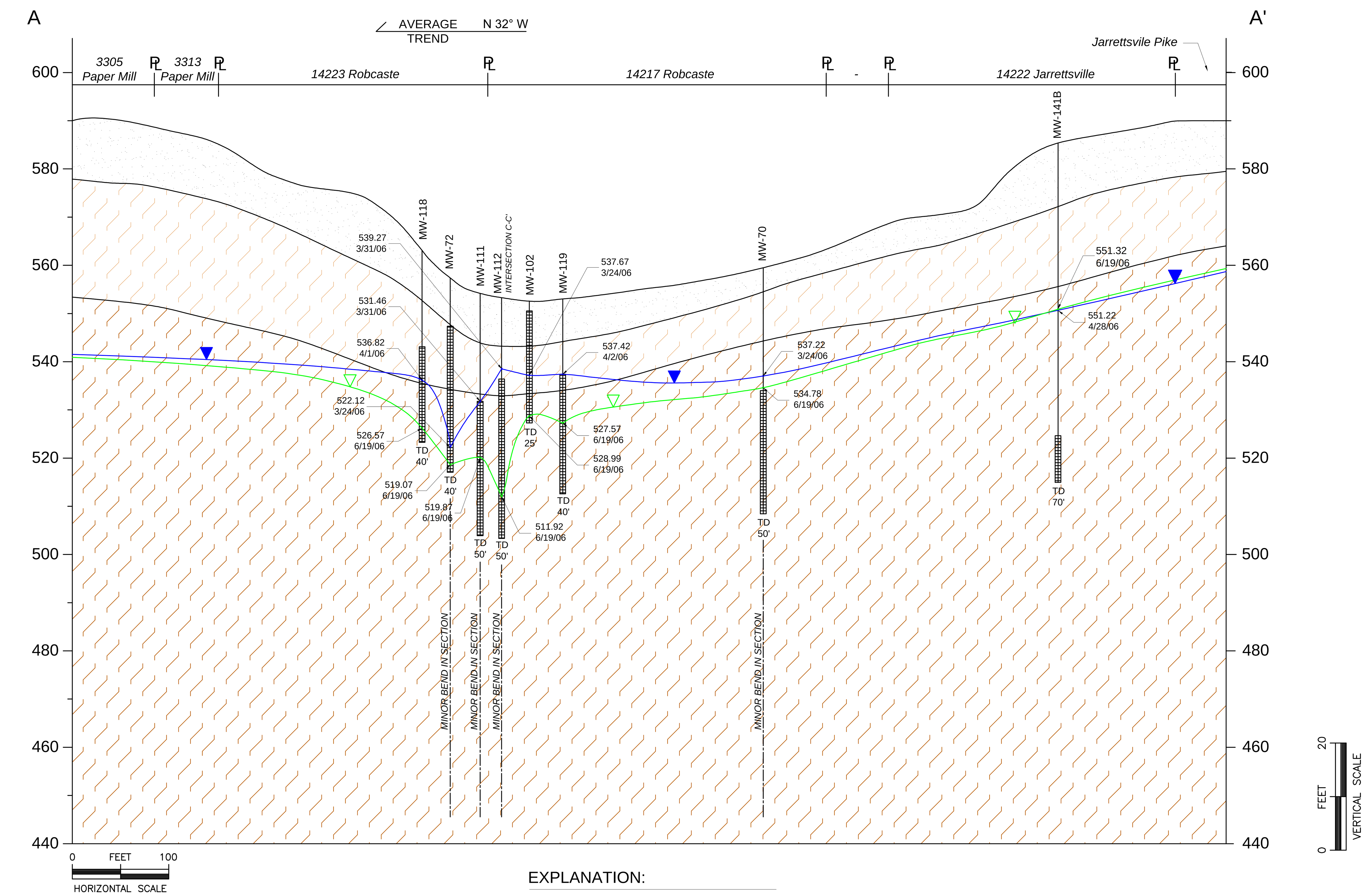
DRAWN BY:	B. Myers
CHECKED BY:	M. Baird

Longitudinal and Transverse Cross-Section Transect Lines

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

FIGURE
21

CAD FILE: C:\Users\WRandle\appdata\local\temp\AcPublish_1088\ LAYOUT: CS A-A' and B-B' PLOTTED: 10 Mar 2016, 4:03pm, WRandle



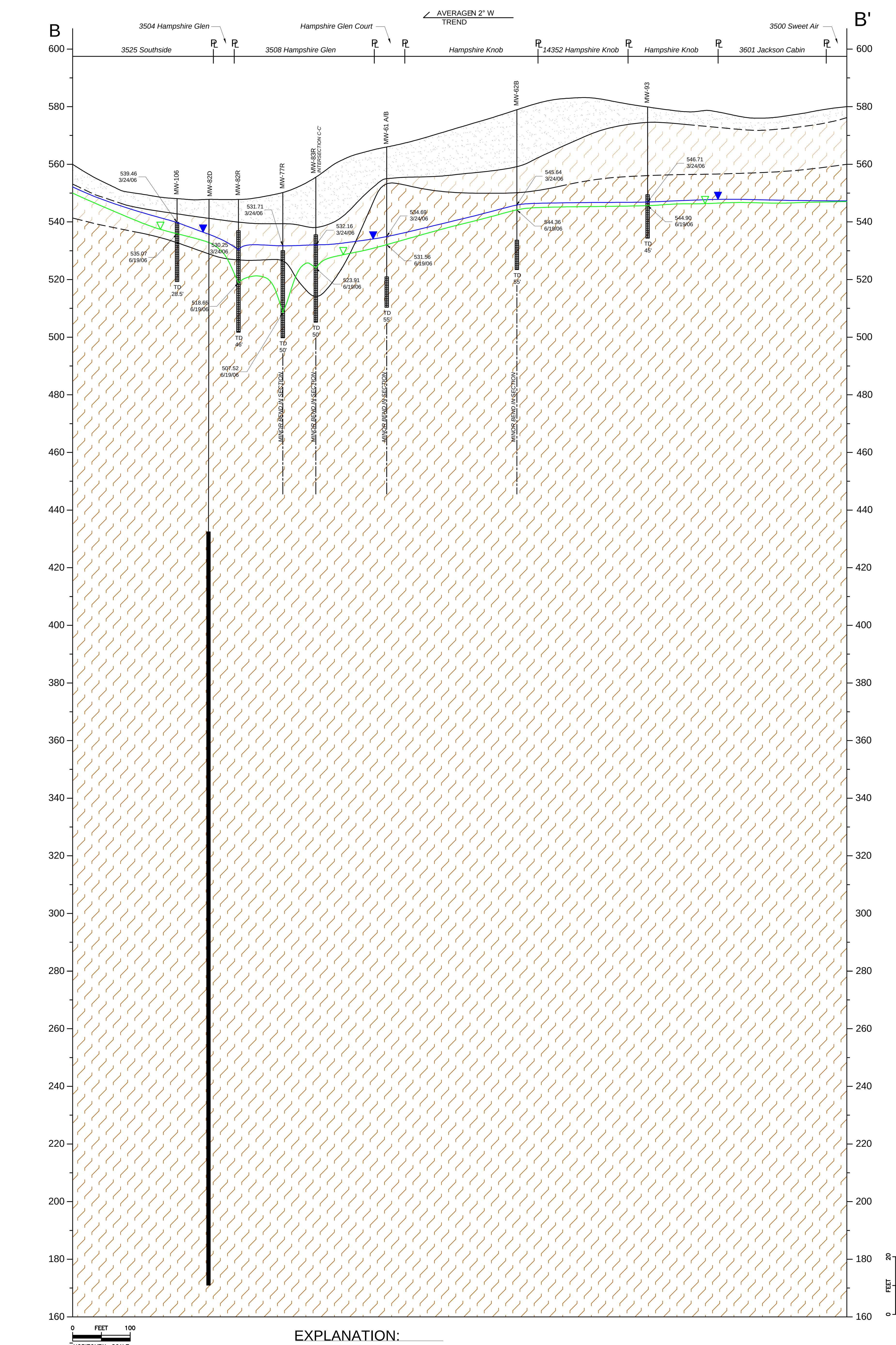
NOTE: 5x vertical exaggeration.

NOTE: 5x vertical exaggeration.

EXPLANATION:

: Approximate Water Table - 3/24/06

: Approximate Water Table - 6/19/06



NOTE: 5x vertical exaggeration.
NOTE: Potentiometric elevation for recovery wells may reflect well loss due to pumping.

EXPLANATION:

: Approximate Water Table - 3/24/06

: Approximate Water Table - 6/19/06

HANOVER, MD

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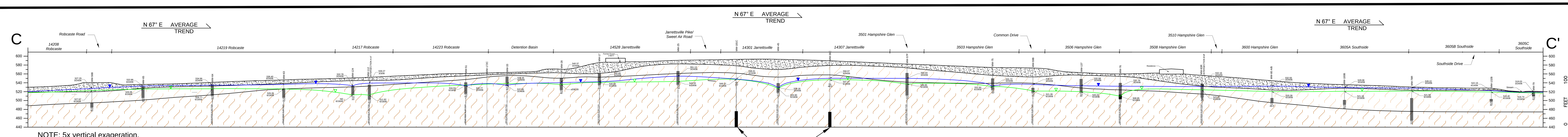
FILE NAME:	02292016_CrossSections.dwg

AREA A - A' & B - B' CROSS SECTION

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND

FIGURE 22A

CAD FILE: C:\Users\WRandle\appdata\local\temp\AcPublish_1088\ LAYOUT: CS C-C' PLOTTED: 10 Mar 2016, 4:03pm, WRandle



NOTE: 5x vertical exageration.

EXPLANATION:

▼ : Approximate Water Table - 3/24/06

▽ : Approximate Water Table - 6/19/06

NOTE:

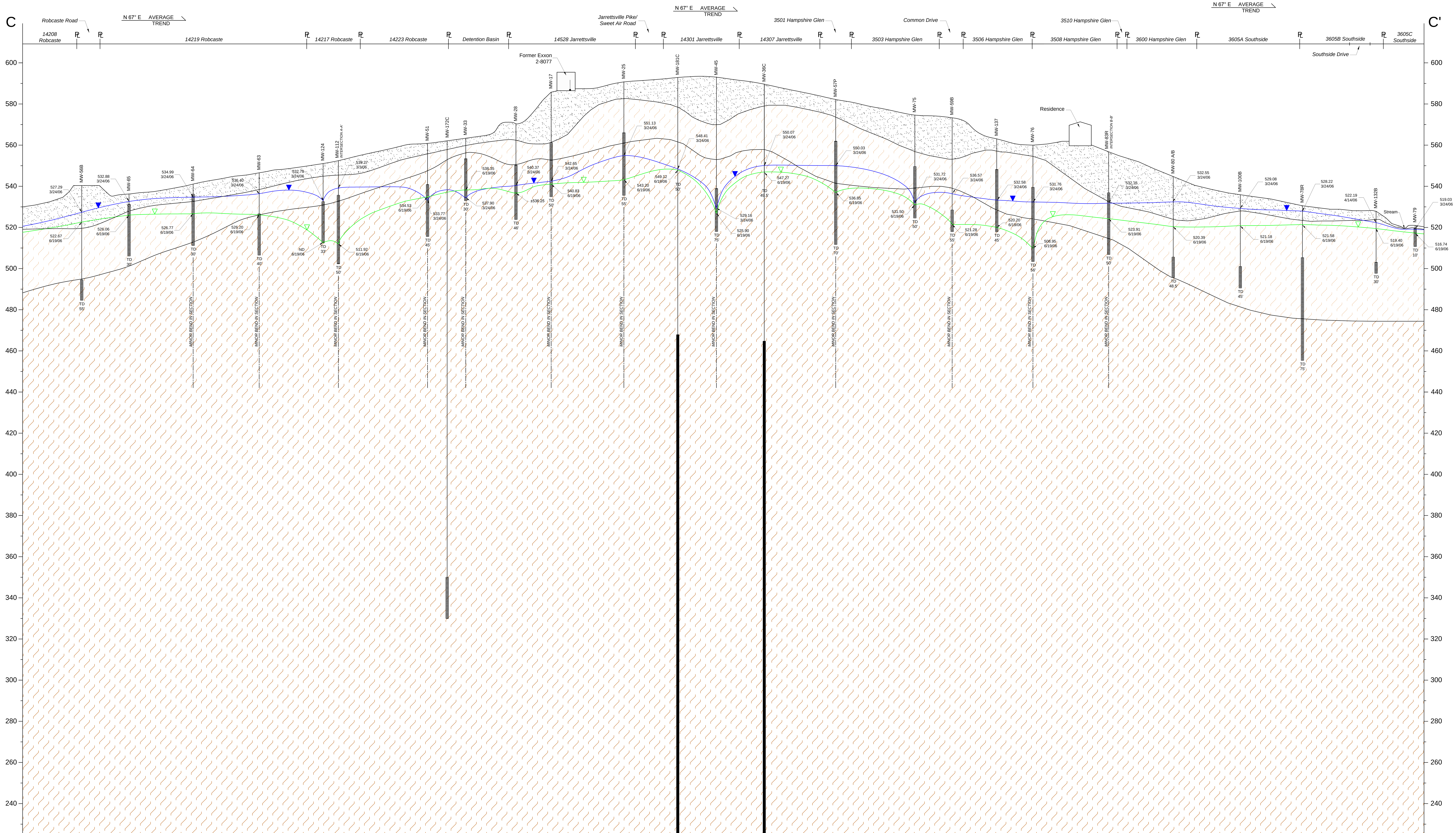
Well MW-80 A/B - well MW-80B plotted on section, water level data from MW-80A

NOTE: Depth of well /boring = 300 ft/bgs

NOTE: Depth of well /boring = 300 ft/bgs

0 FEET 100 HORIZONTAL SCALE

0 100 FEET VERTICAL SCALE



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NOTE: Potentiometric Elevation for recovery wells may reflect well loss due to pumping.

NOTE: Depth of well /boring = 300 ft/bgs

NOTE: Depth of well /boring = 300 ft/bgs

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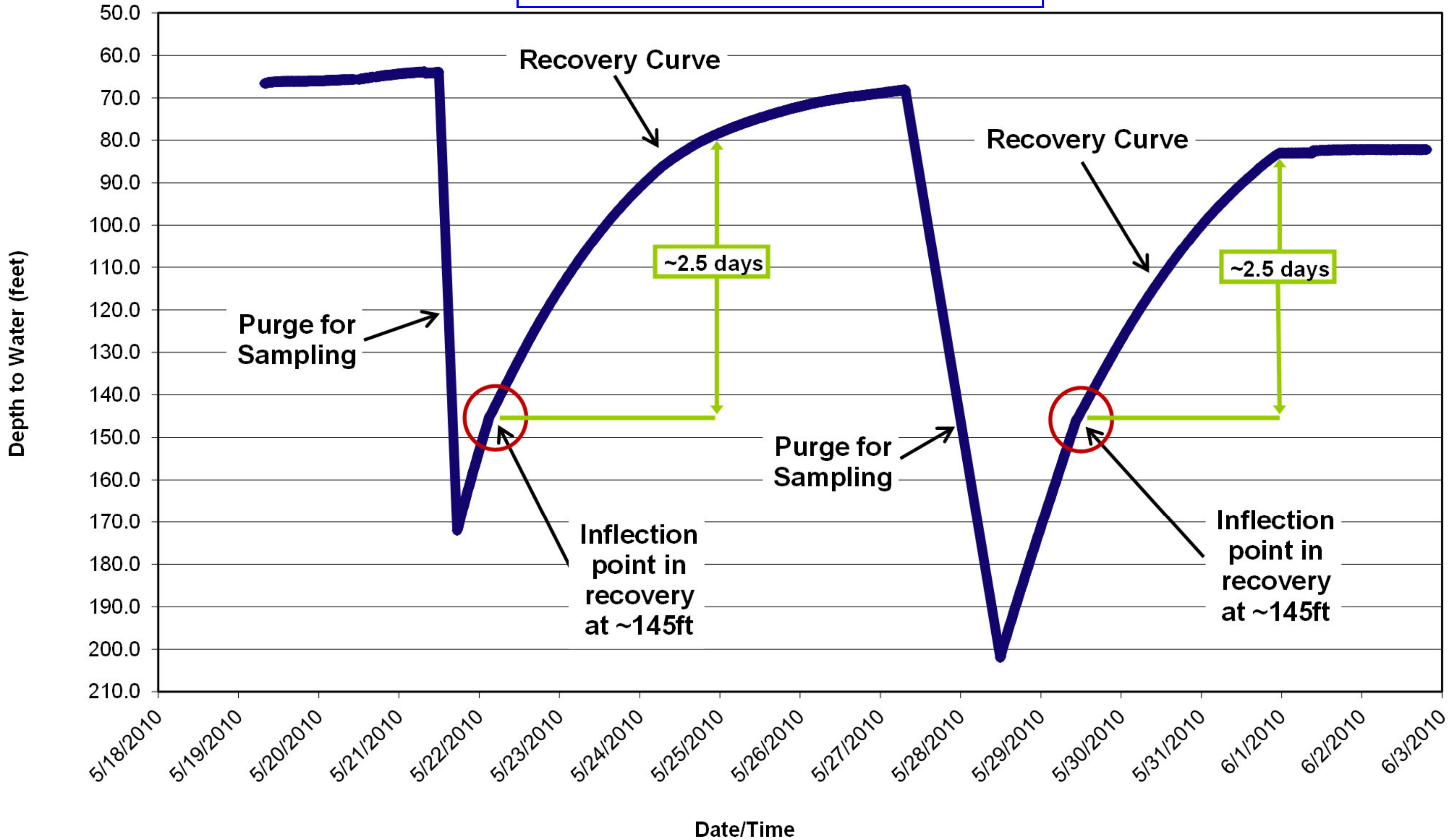
FILE NAME:	02292016_CrossSections.dwg

AREA C-C' CROSS SECTION

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND

FIGURE 22B

Figure 23: MW-91C Transducer Data Chart
Inactive Exxon Facility #28077
14258 Jarrettsville Pike
Phoenix, MD



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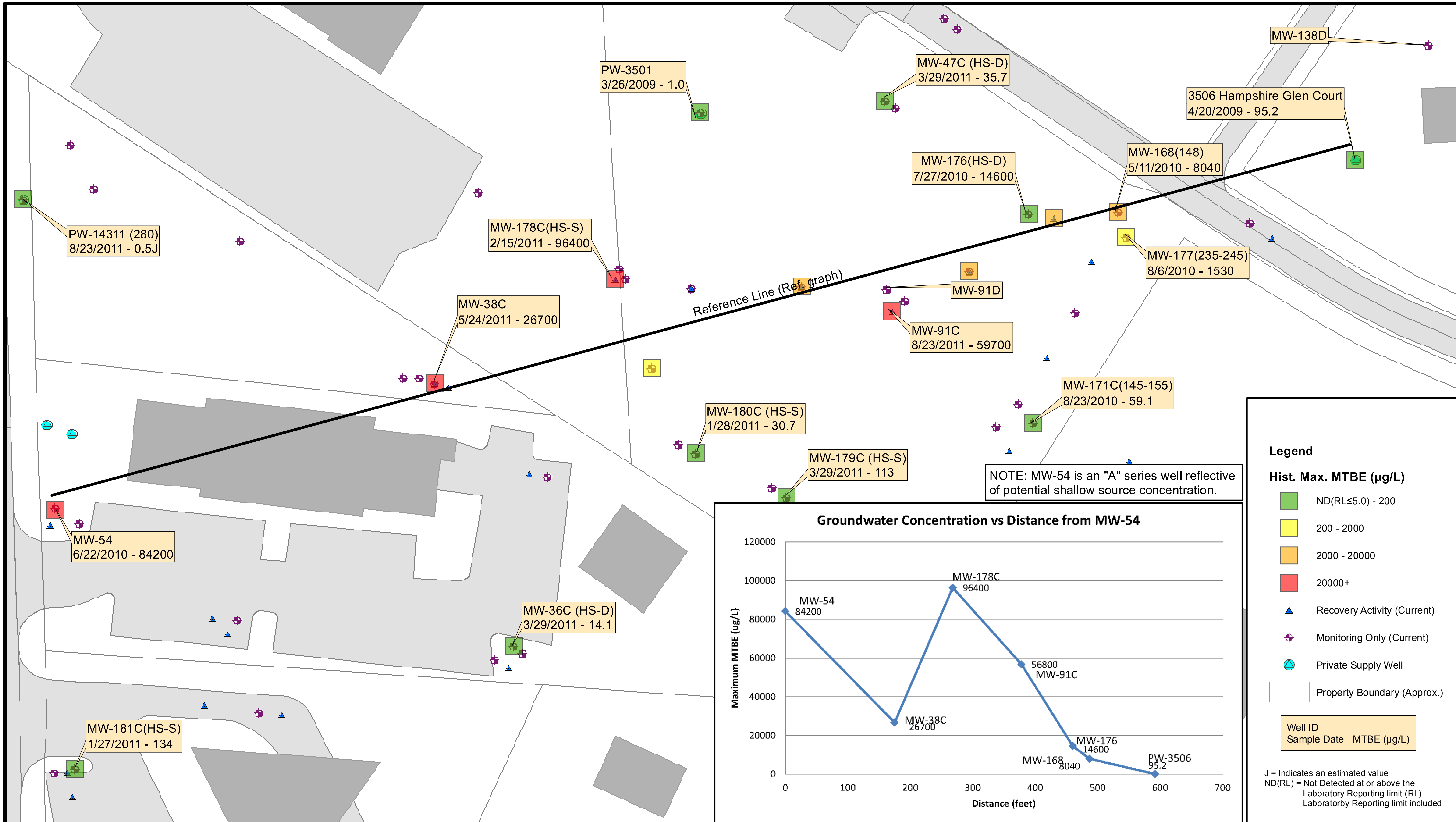

N

0 20 40 80 120 160 Feet

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NEAR NORTHEAST AREA "C" AND "D" SERIES WELLS MAX. MTBE CONCENTRATION MAP

INACTIVE EXXON FACILITY #28077
14258 JARRETTSVILLE PIKE
PHOENIX, MARYLAND
BALTIMORE COUNTY

Figure
24

Project Number: 115434 | File Name: Max. MTBE

Figure 25: MW-91 Well Cluster Cross Section Illustration
Inactive Exxon Facility #28077
14258 Jarrettsville Pike
Phoenix, MD

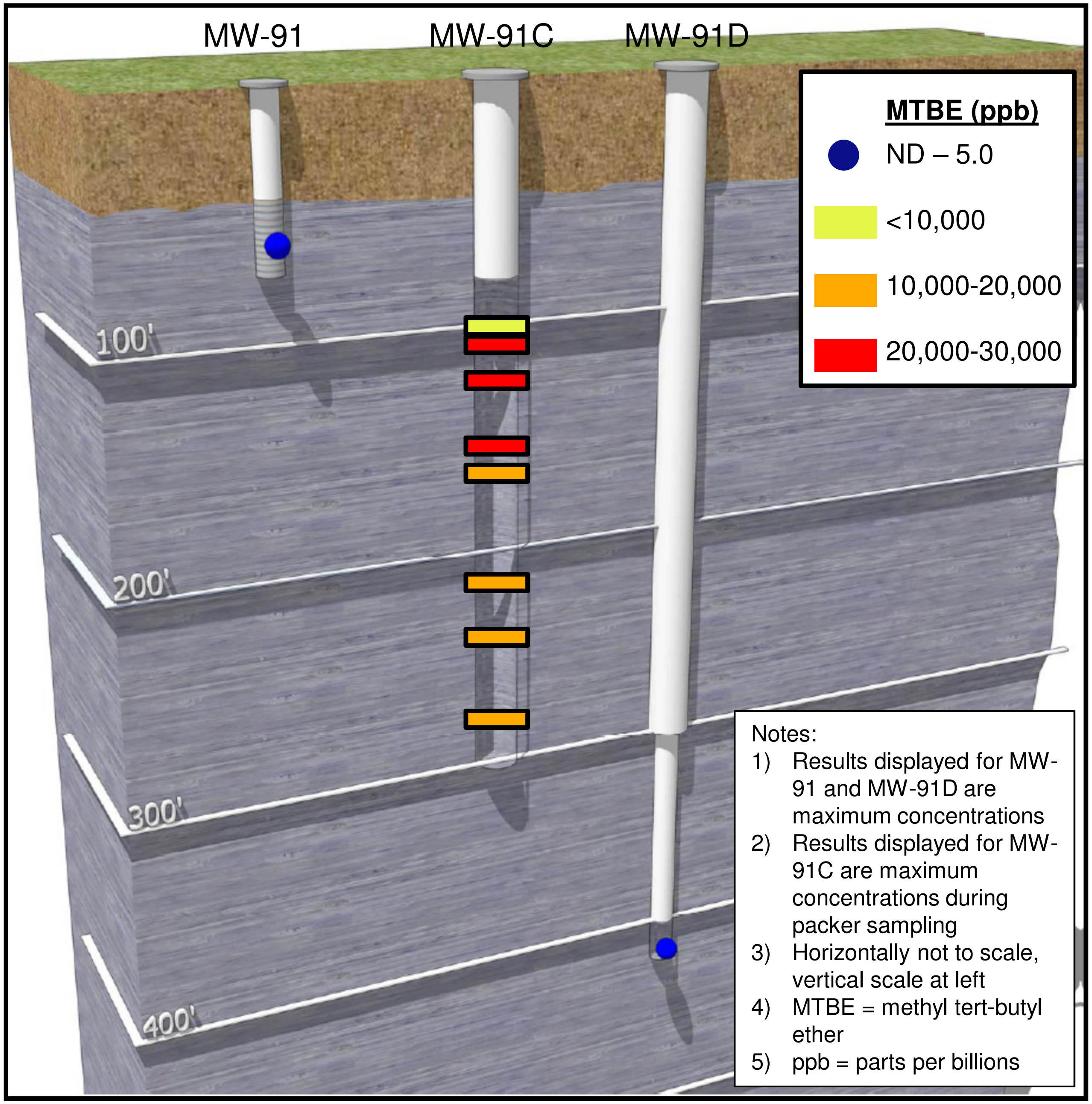

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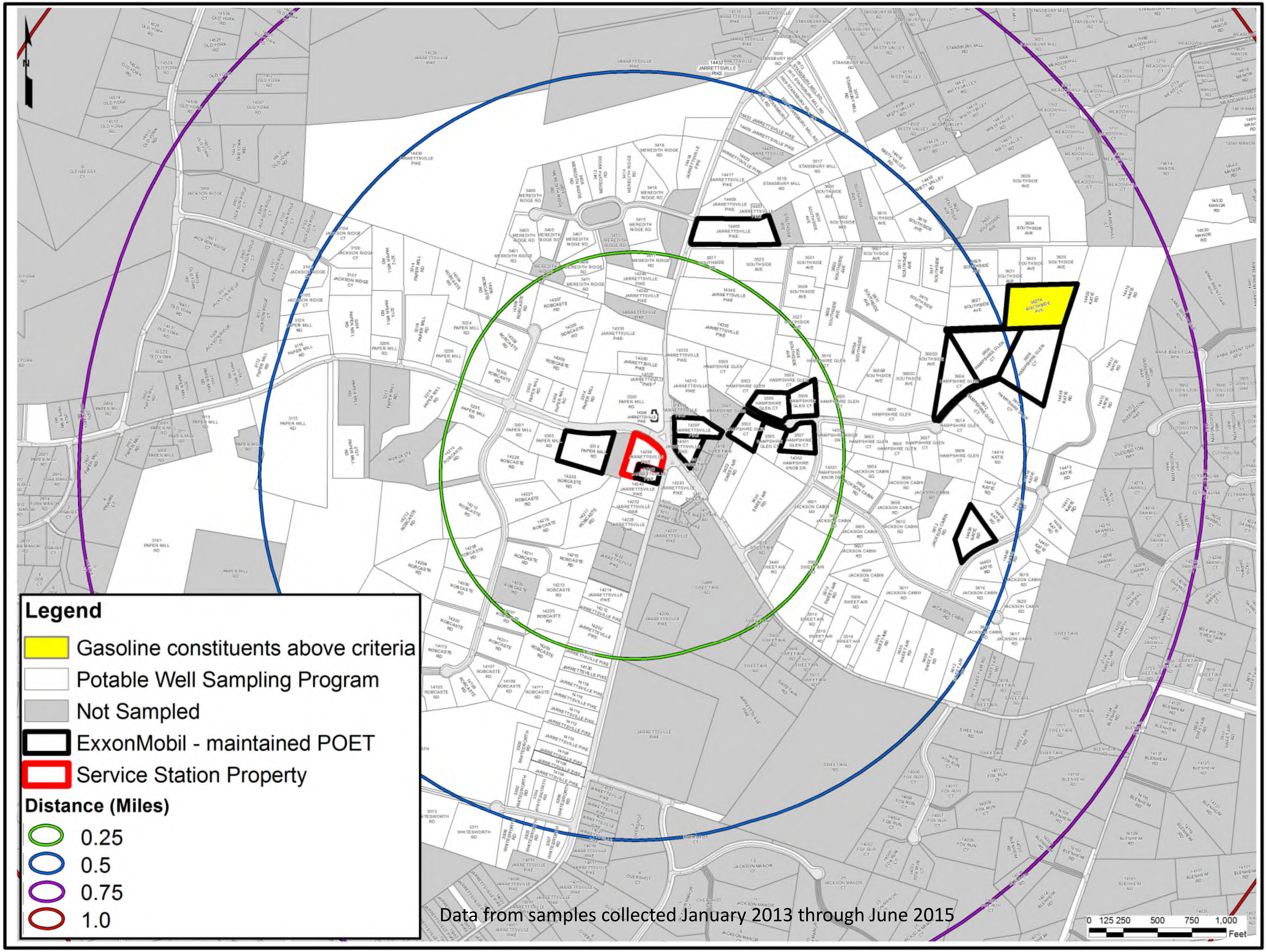
Figure 26a – PSWs with Gasoline Constituents > Criteria



Data from samples collected January 2013 through June 2015

Figure 26b - PSWs with Gasoline Constituents >50% of Criteria

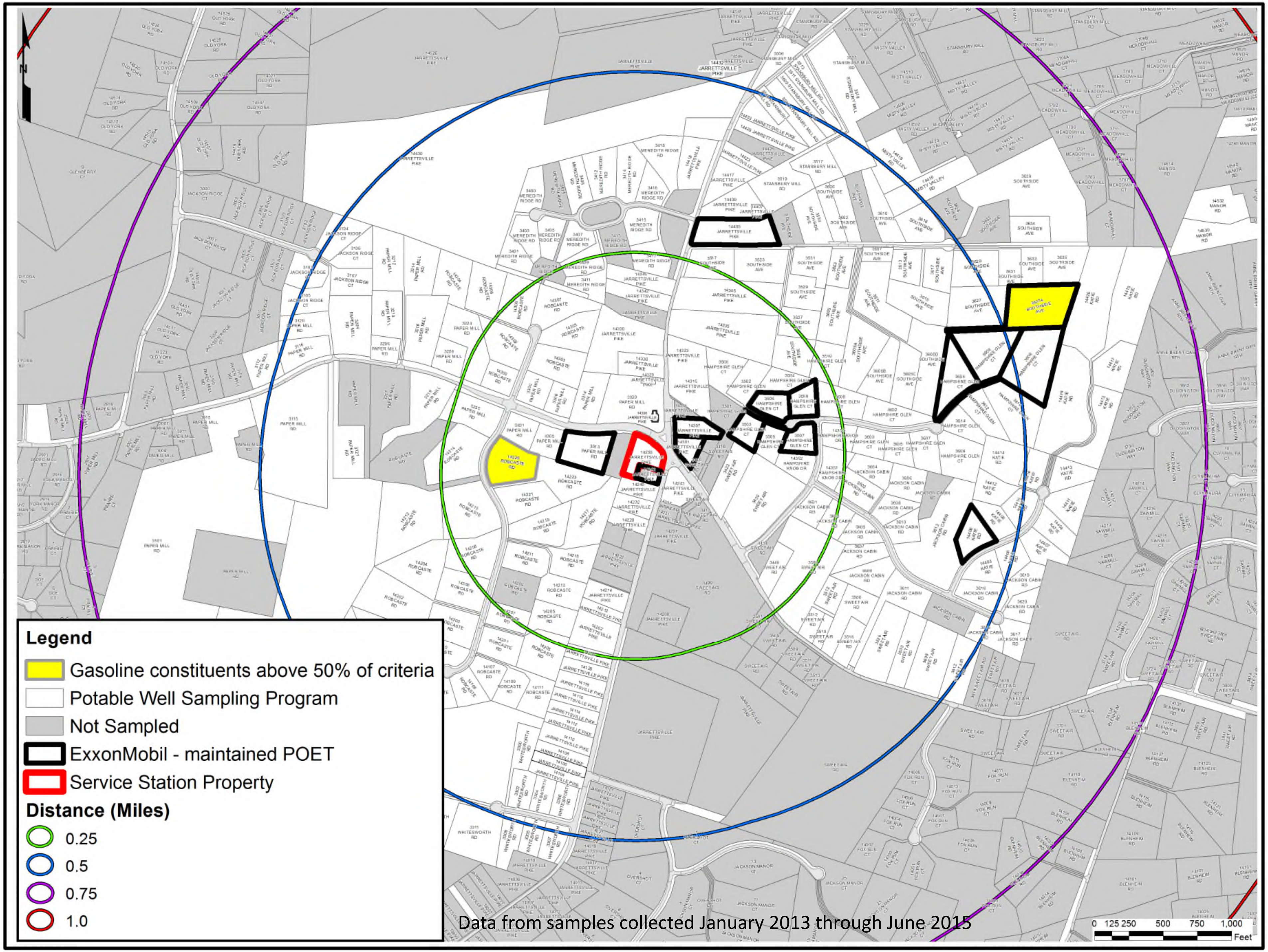


Figure 26c - PSWs with Gasoline Constituents >10% of Criteria

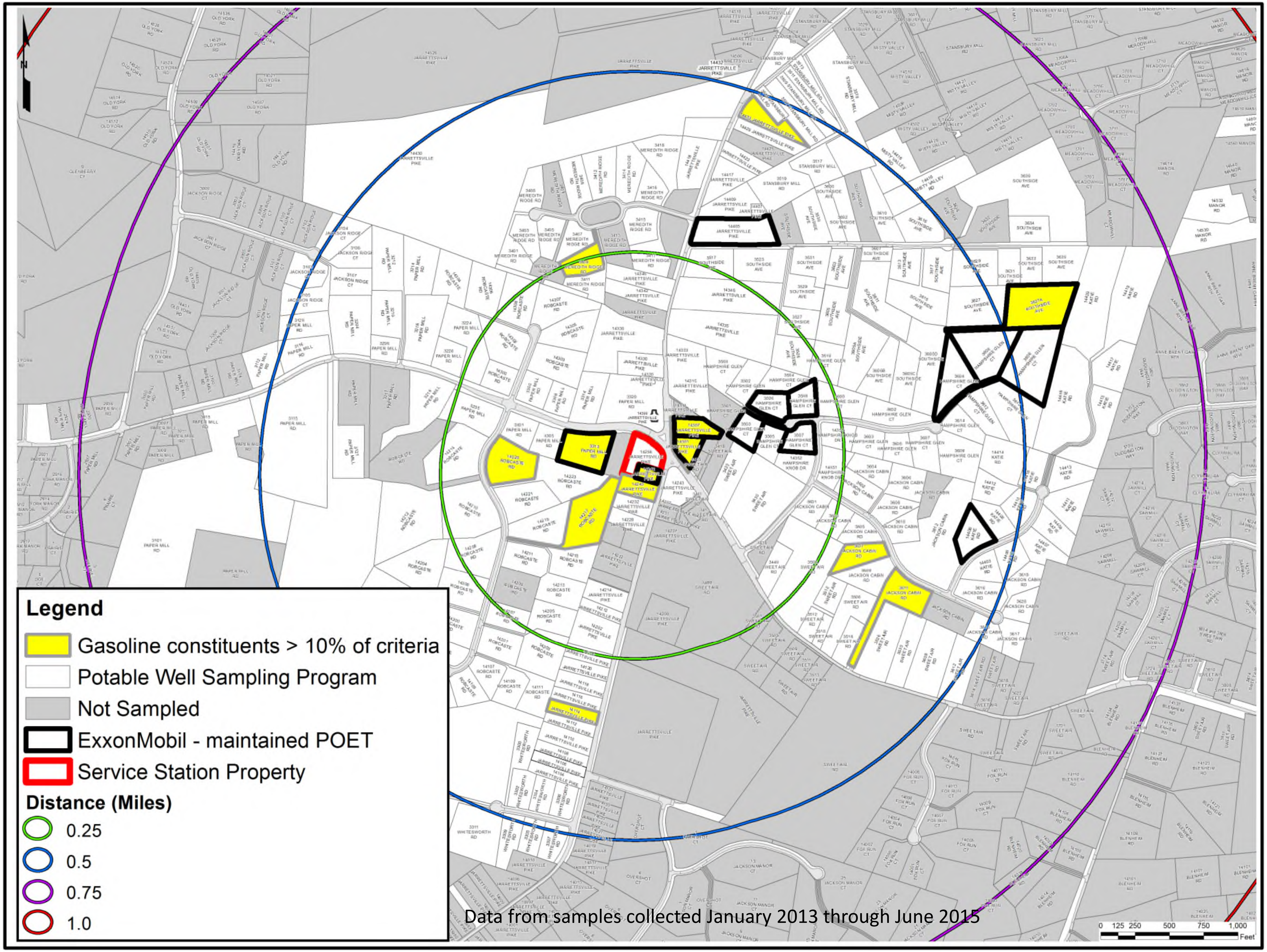
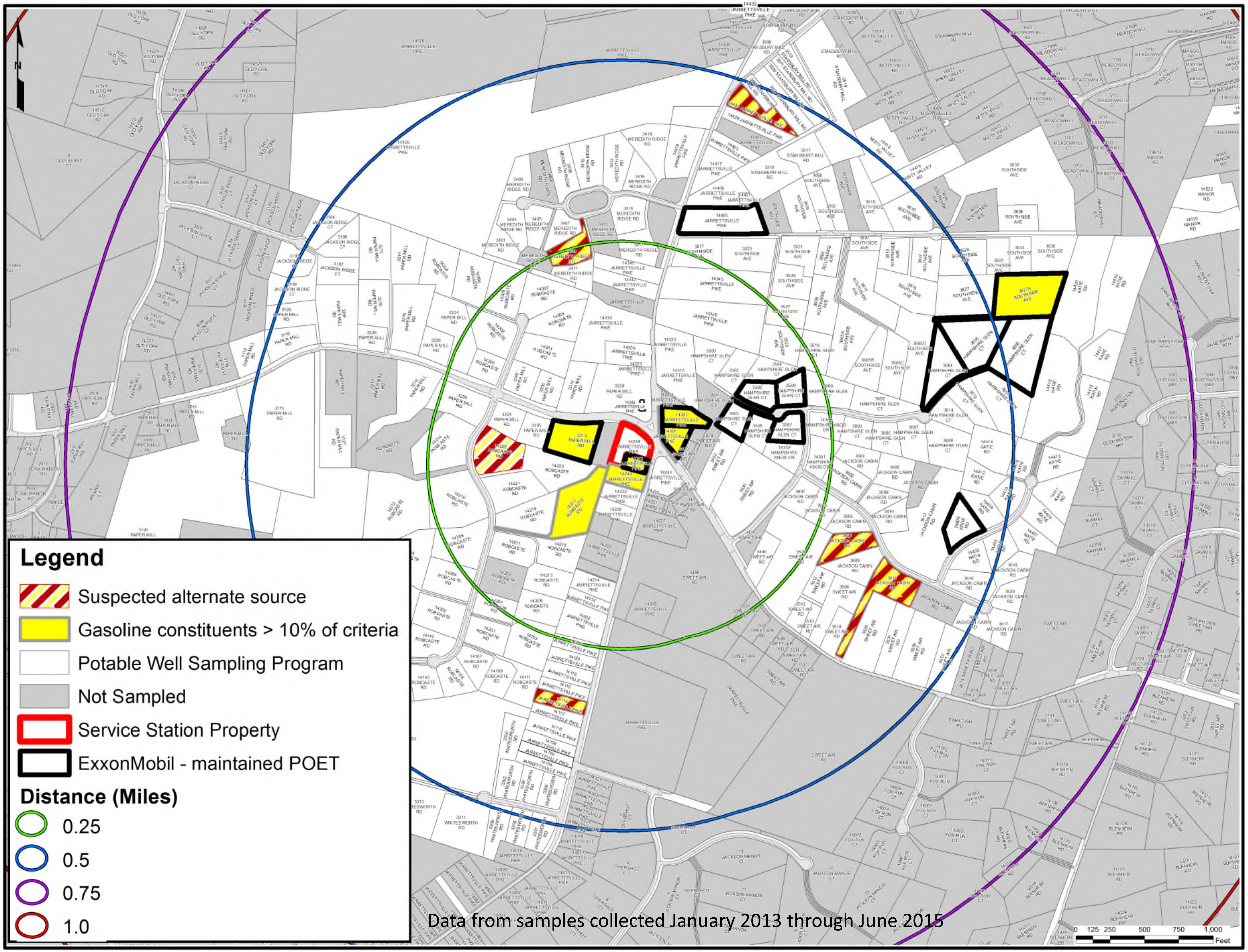


Figure 26d - PSWs with Gasoline Constituents >10% of Criteria – Alternate Sources



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APPENDIX A

SELECT MONITORING WELL CHARTS

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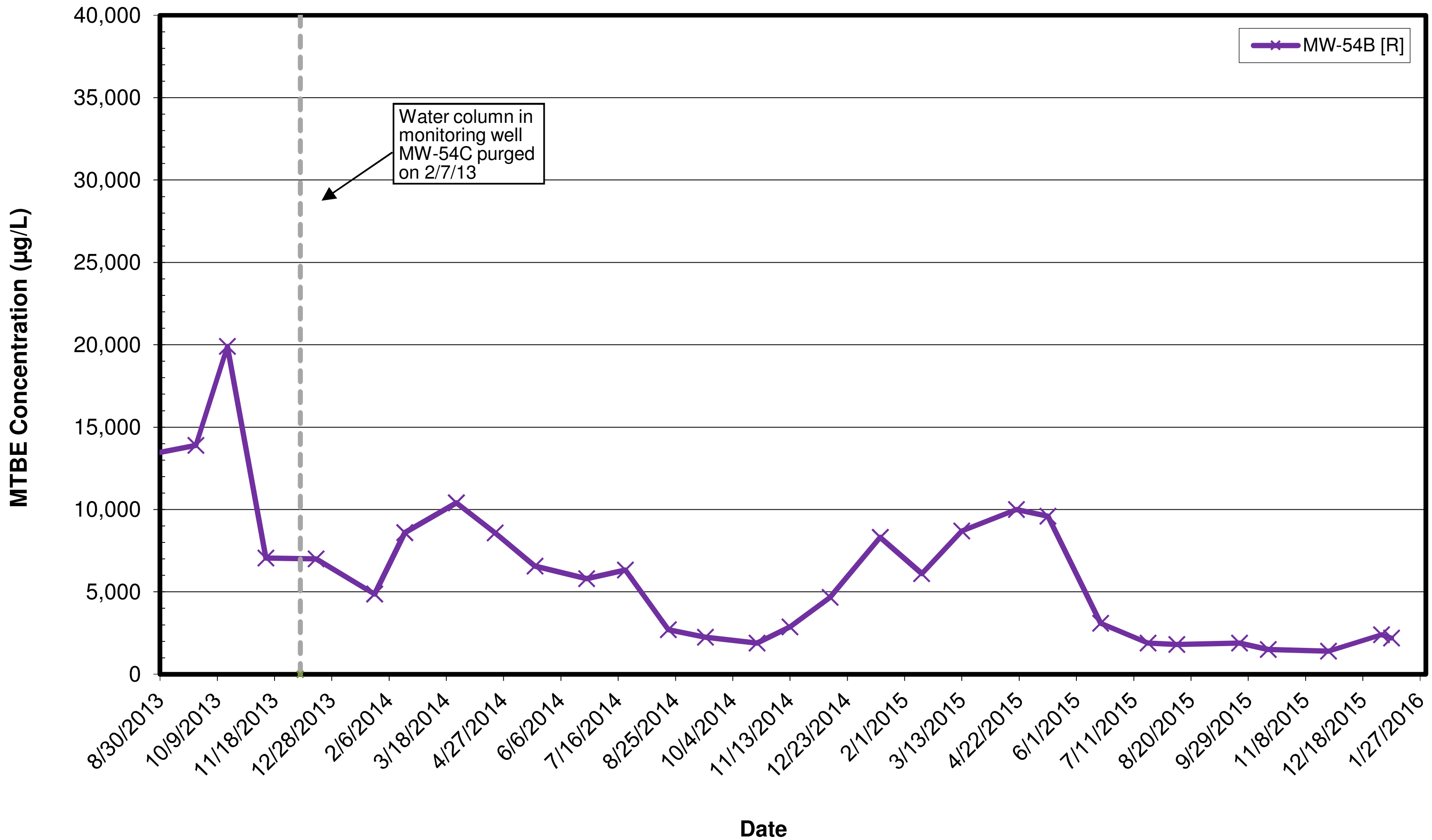
MW-54B

MTBE Concentration Over Time (2-Year)
Inactive Exxon Facility # 28077
14258 Jarrettsville Pike
Phoenix, Maryland



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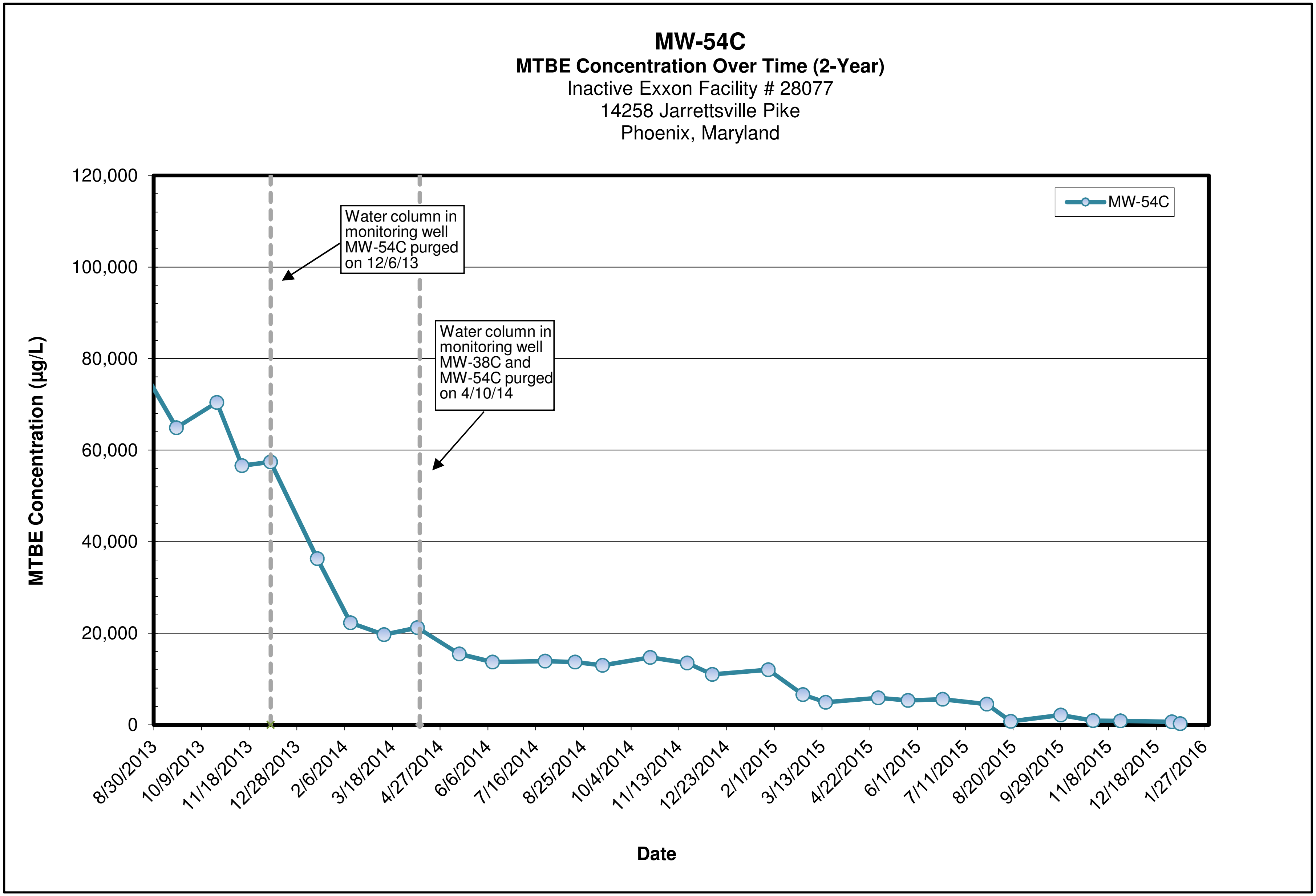

Max MTBE concentration data used for sampling events with multiple intervals

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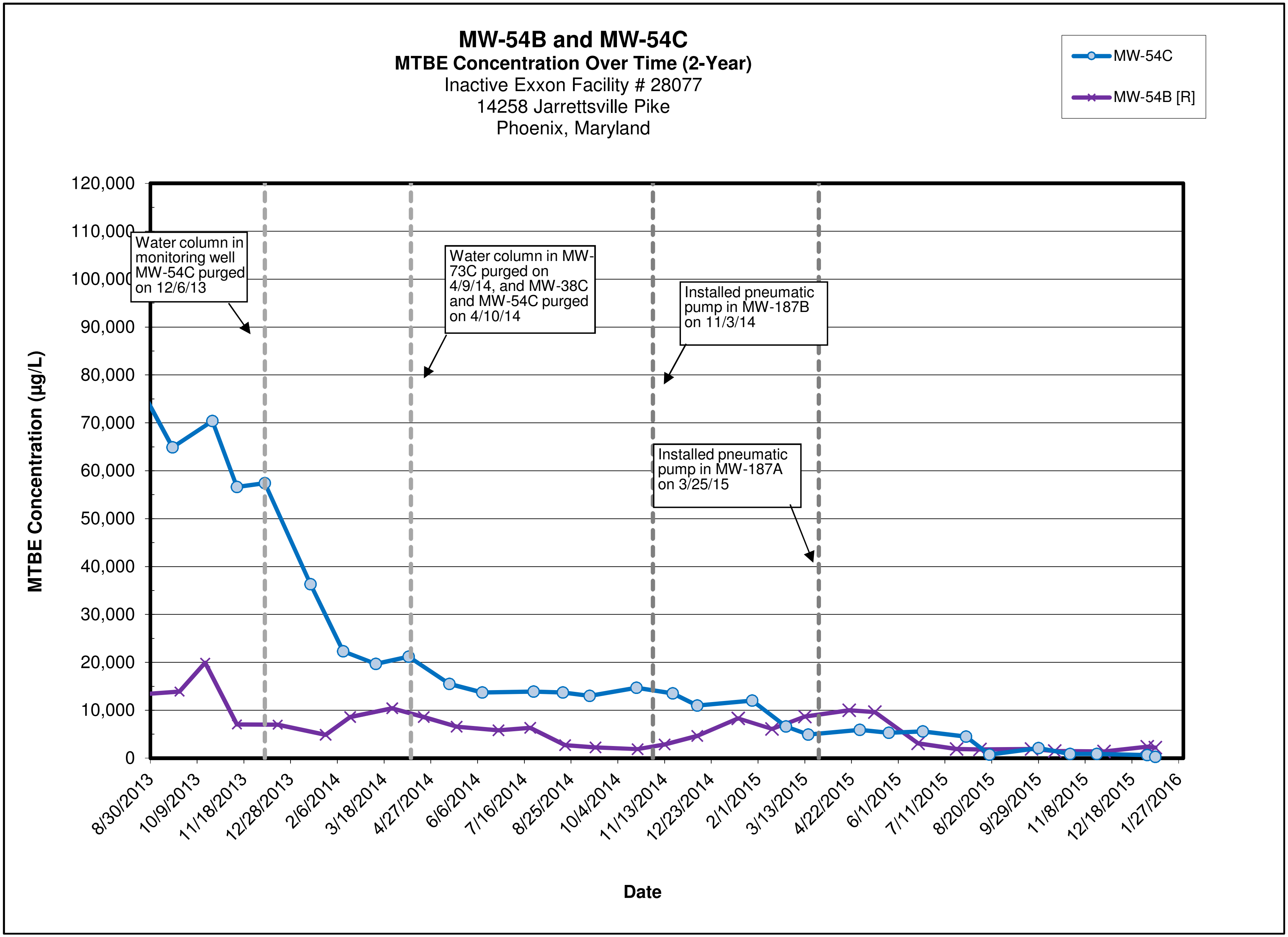
MW-54B and MW-54C
MTBE Concentration Over Time (2-Year)
Inactive Exxon Facility # 28077
14258 Jarrettsville Pike
Phoenix, Maryland
MW-54C
MW-54B [R]
Water column in monitoring well MW-54C purged on 12/6/13
Water column in MW-73C purged on 4/9/14, and MW-38C and MW-54C purged on 4/10/14
Installed pneumatic pump in MW-187B on 11/3/14
Installed pneumatic pump in MW-187A on 3/25/15
MTBE Concentration (µg/L)
120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
8/30/2013
10/9/2013
11/18/2013
12/28/2013
2/6/2014
3/18/2014
4/27/2014
6/6/2014
7/16/2014
8/25/2014
10/4/2014
11/13/2014
12/23/2014
2/1/2015
3/13/2015
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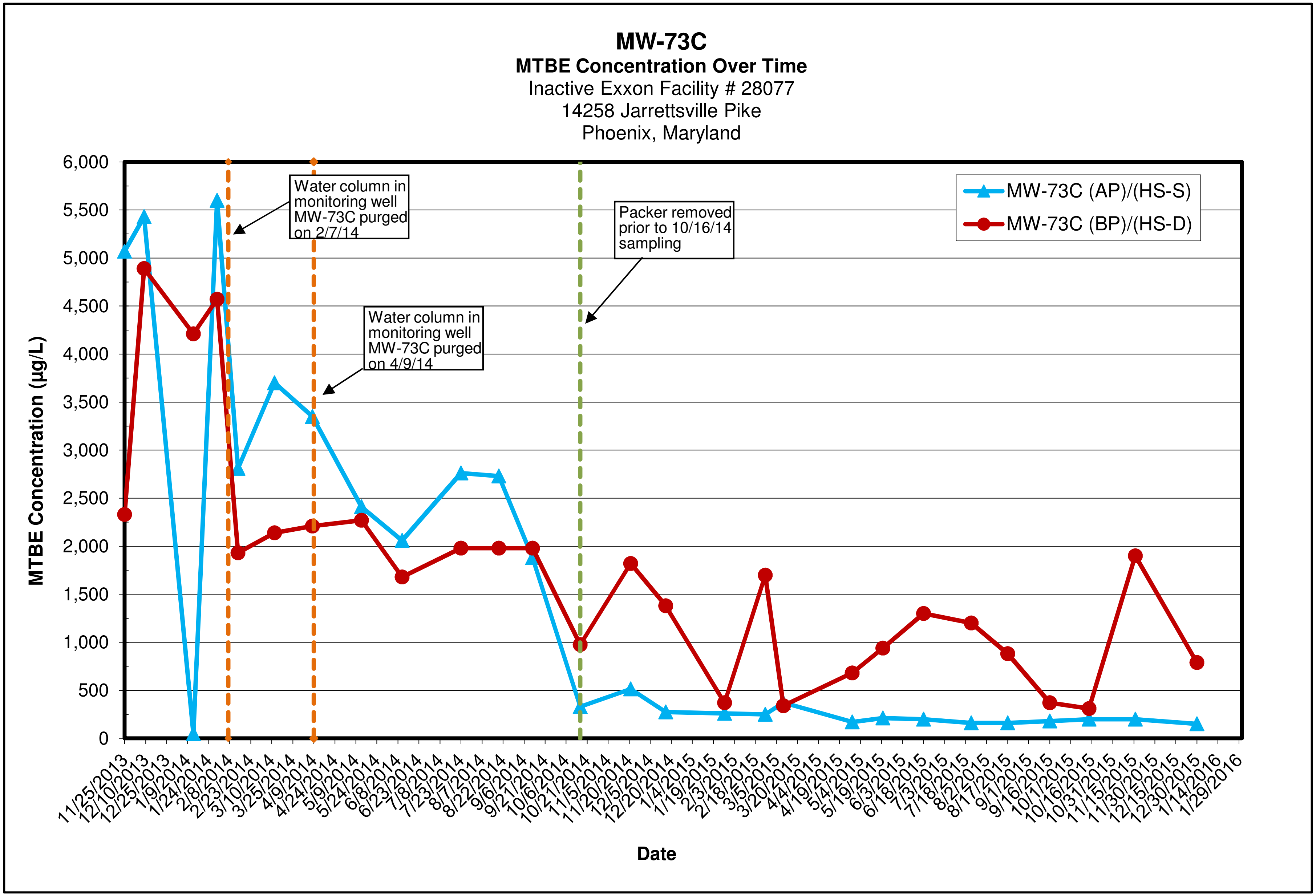
11/8/2015
12/18/2015
1/27/2016
Date



A/BP = above/below packer
HS-S/D = shallow/ deep hydrasleeve

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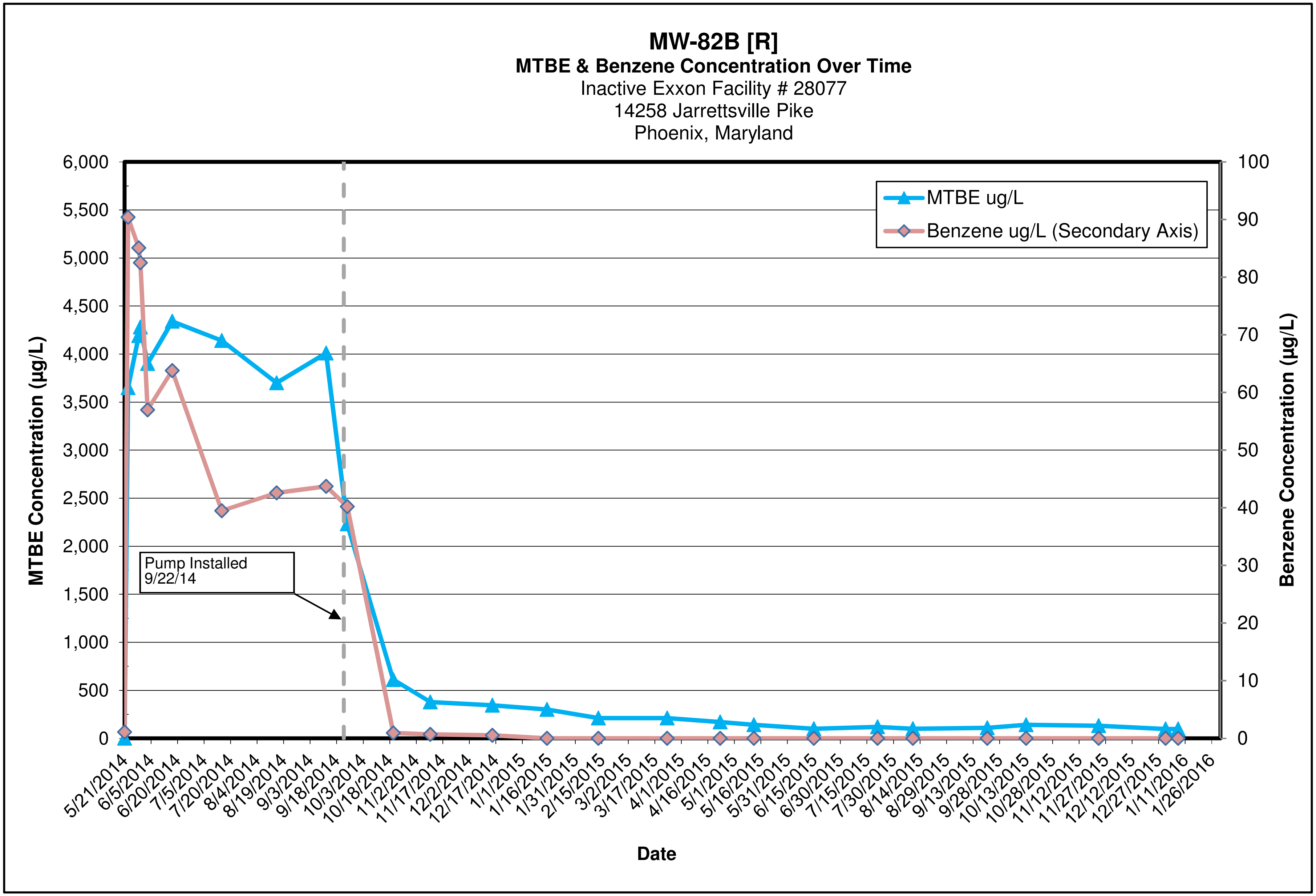

Max MTBE concentration data used for sampling events with multiple intervals

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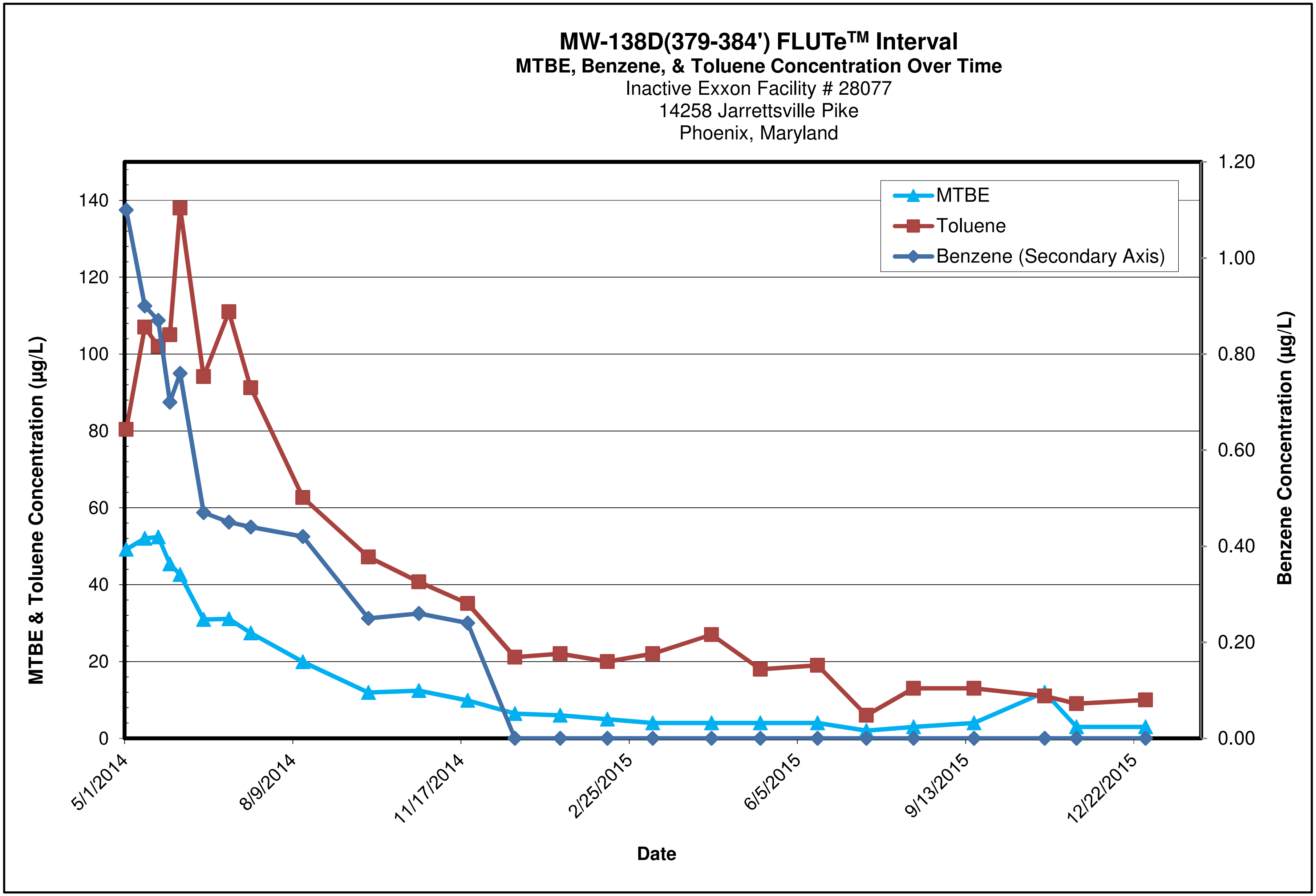

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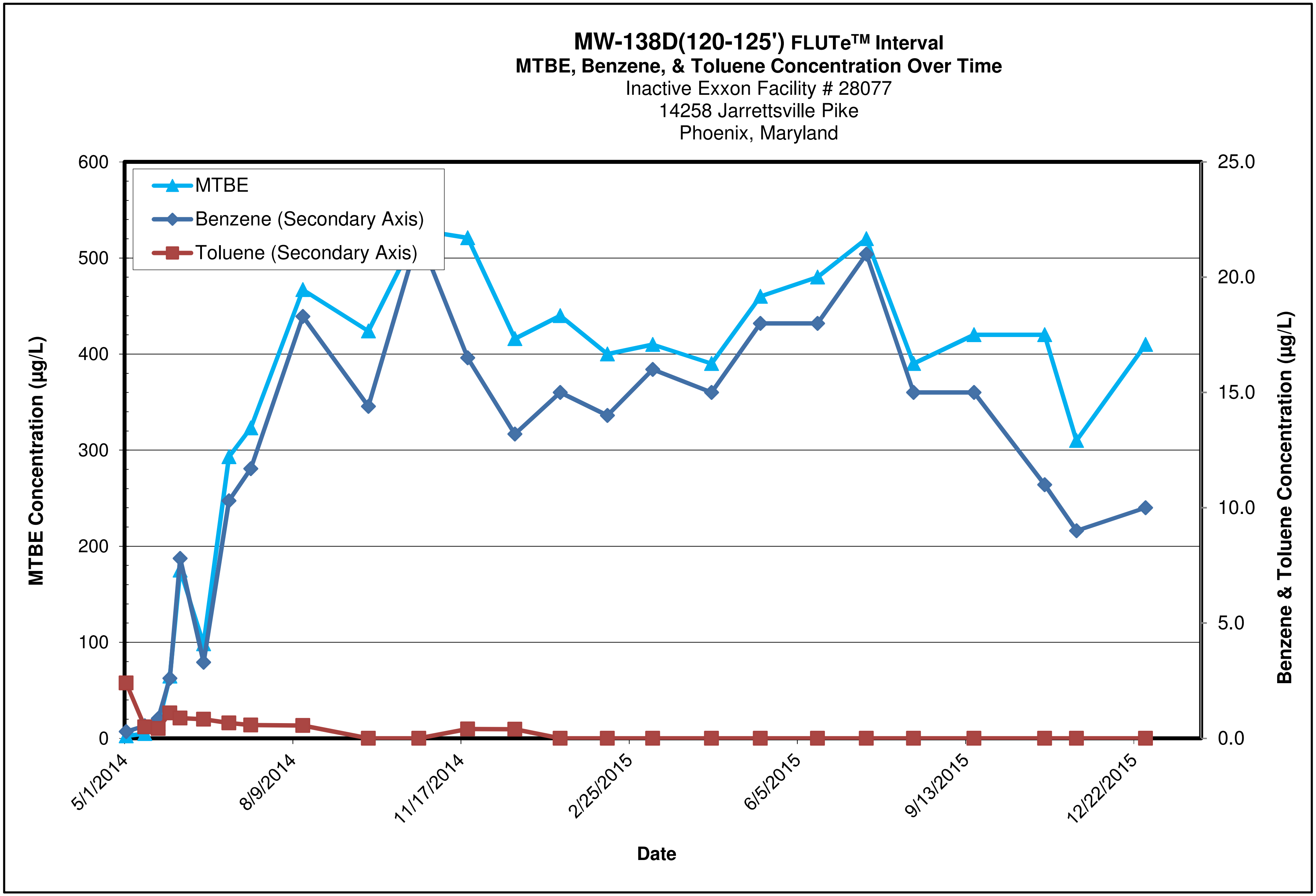
Hanover, Maryland



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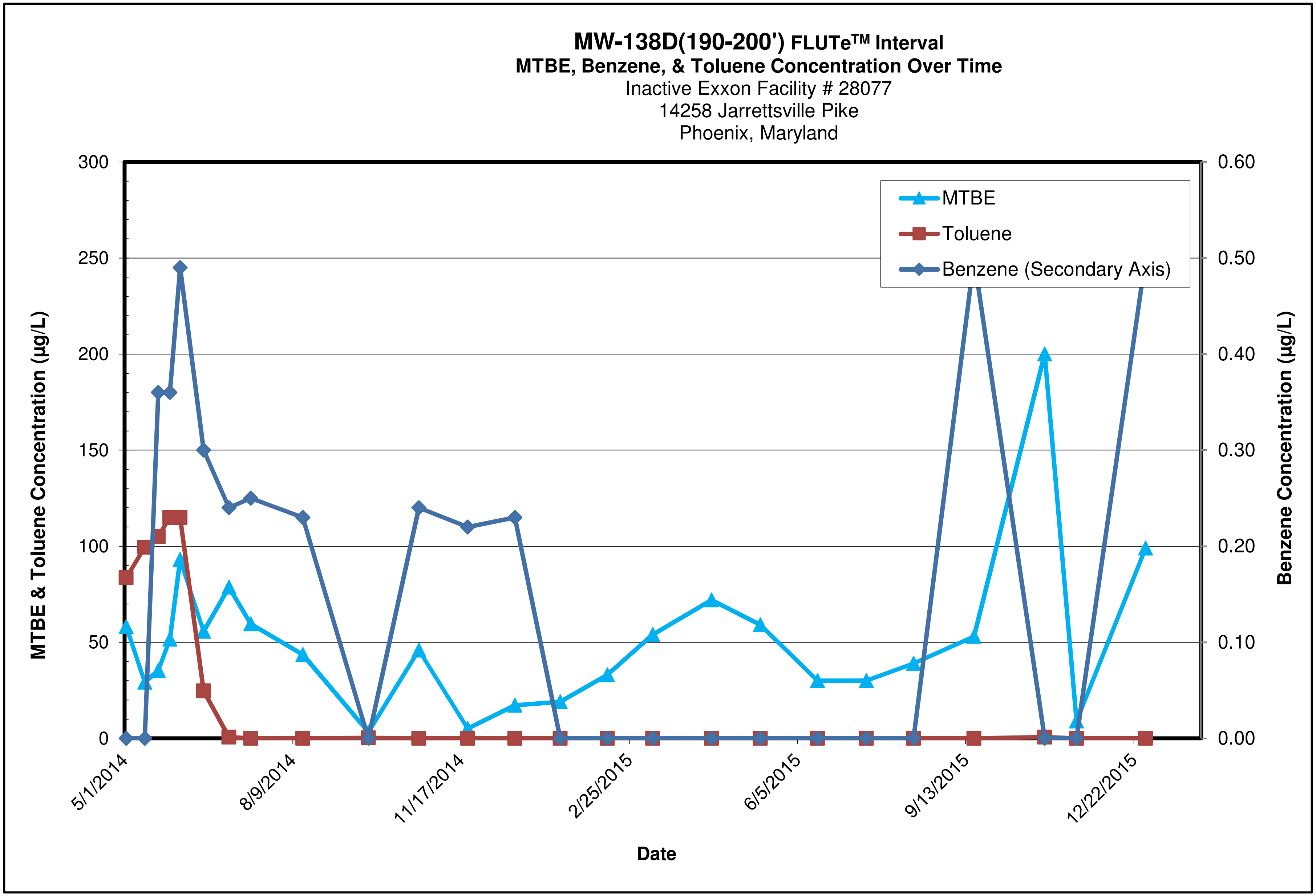

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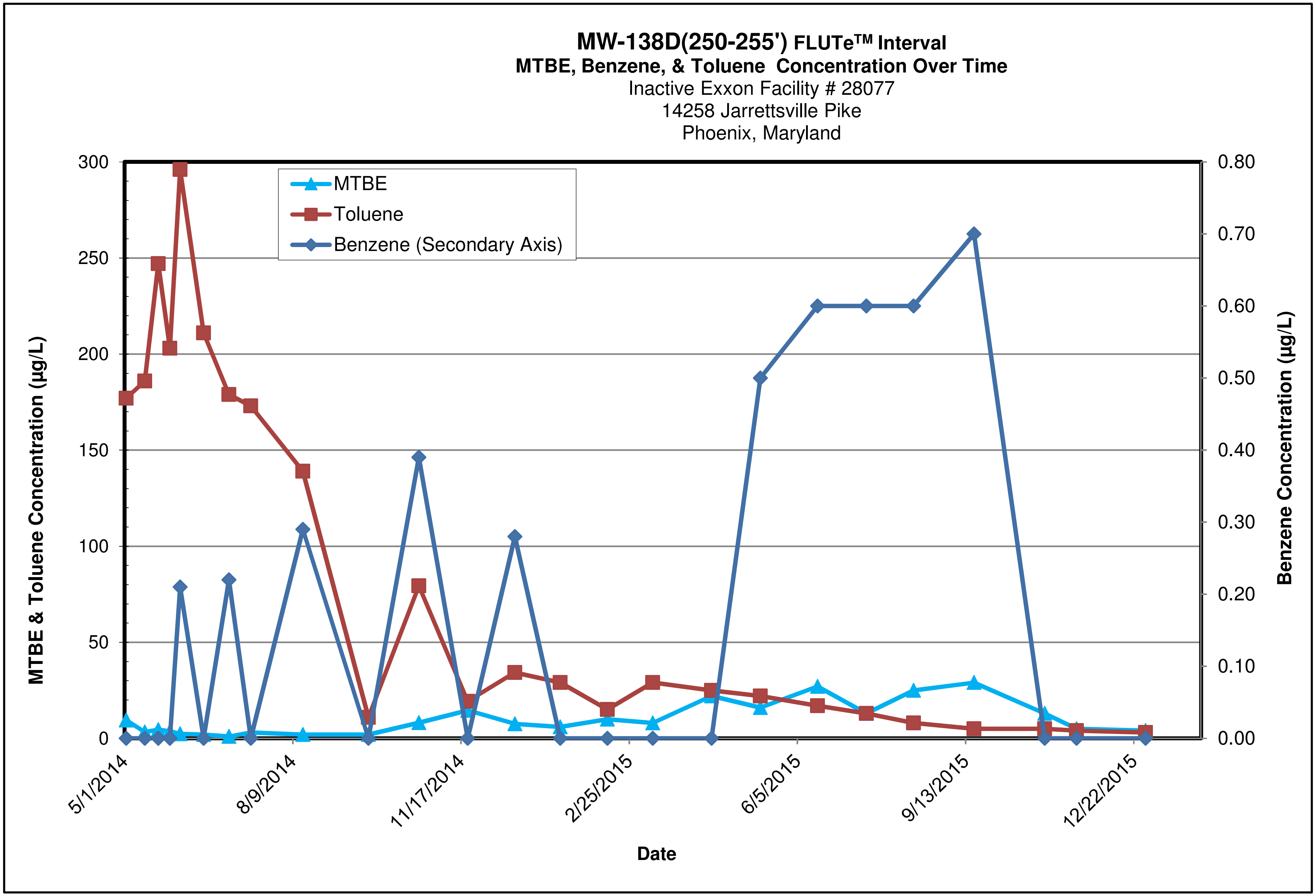

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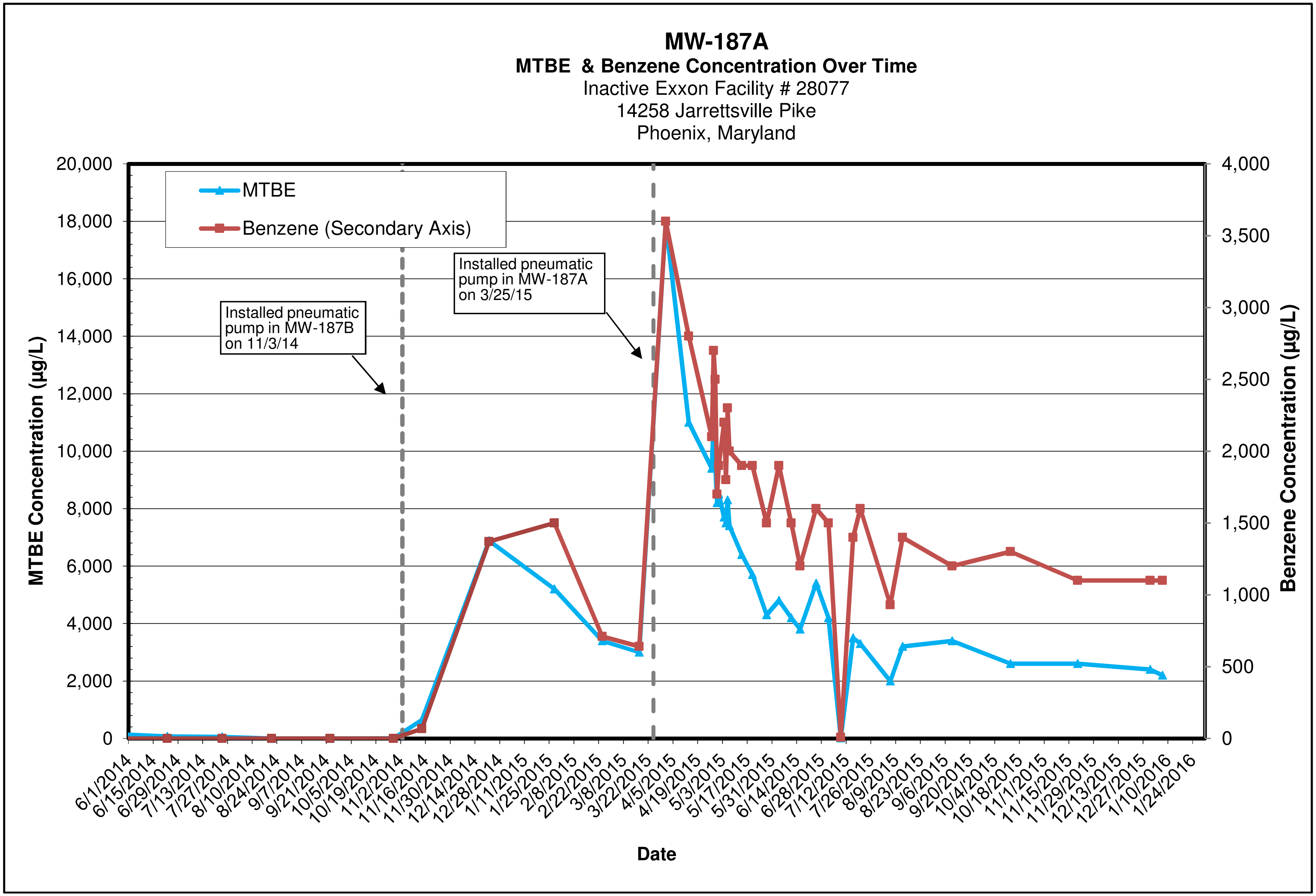

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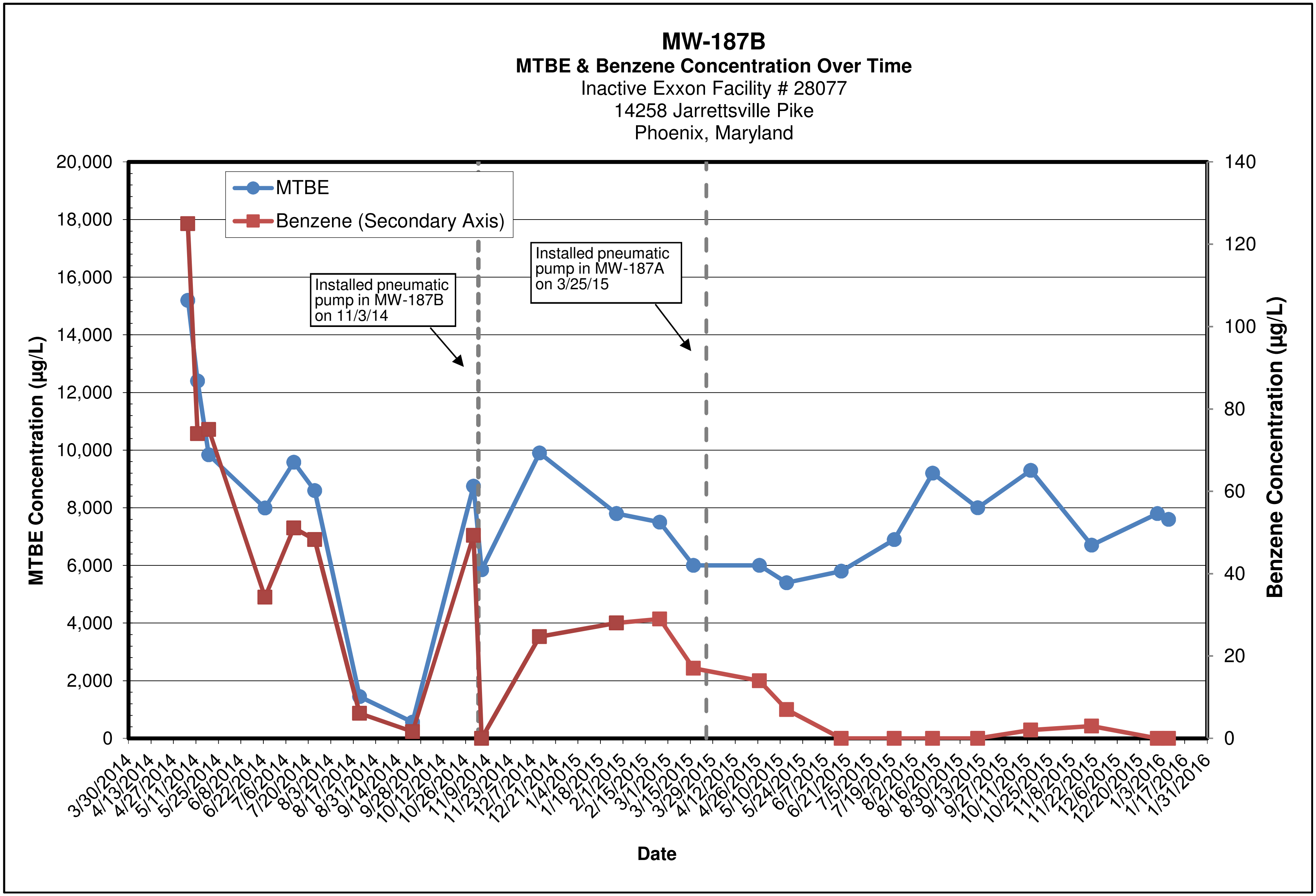
Max concentration data used for sampling events with multiple intervals



Max concentration data used for sampling events with multiple intervals

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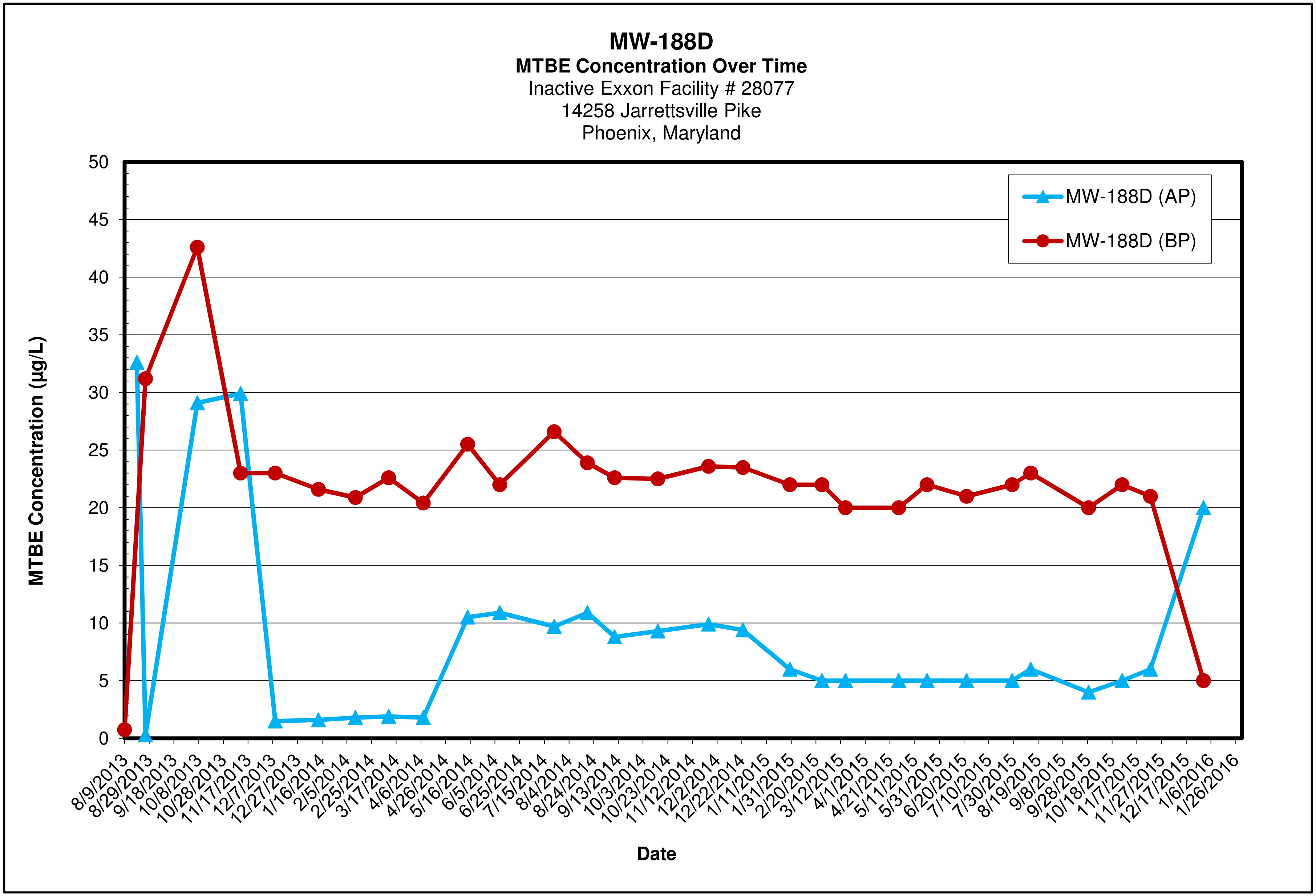

AP = above packer
BP = below packer

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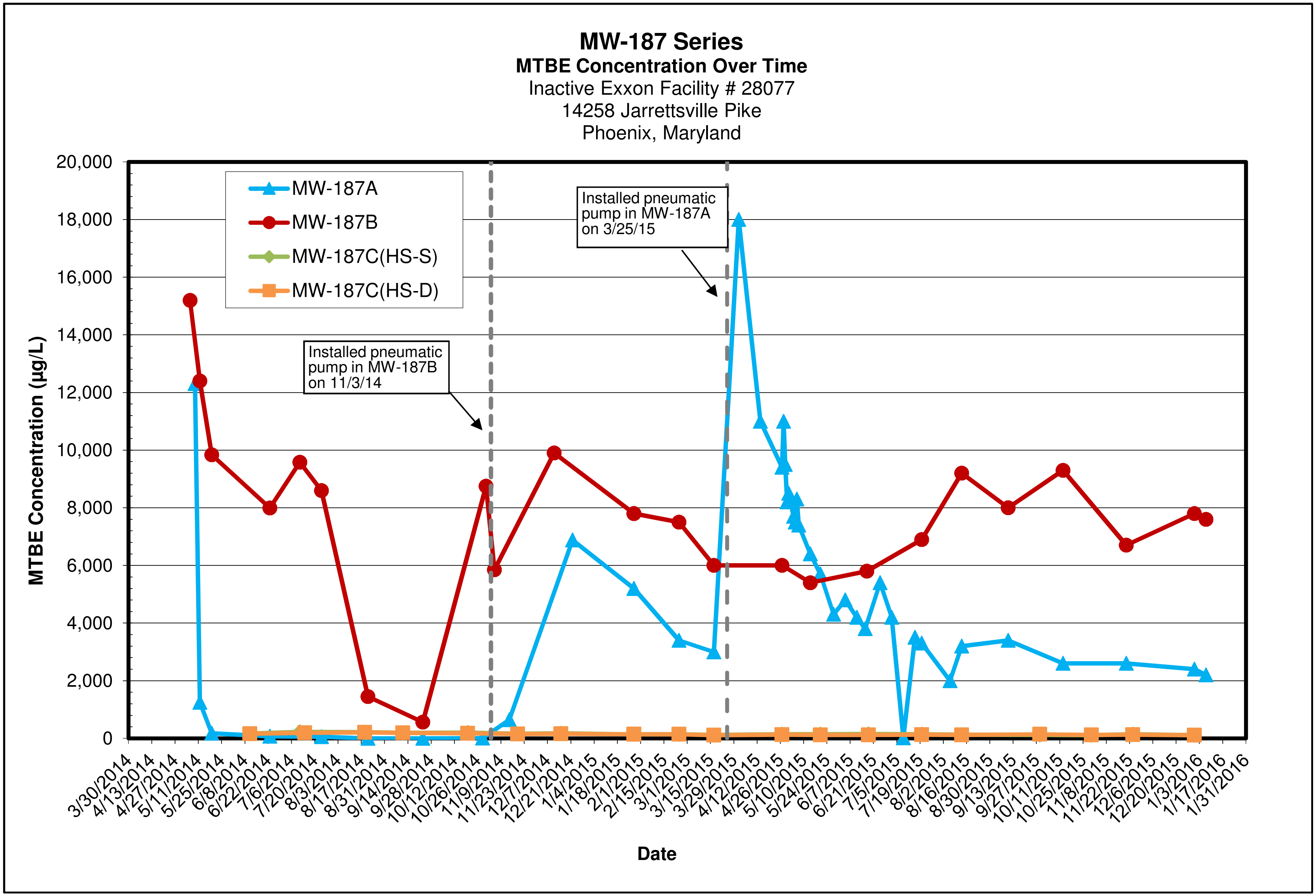

HS-S = shallow hydrasleeve
HS-D = deep hydrasleeve
Max MTBE concentration data used for sampling events with multiple intervals

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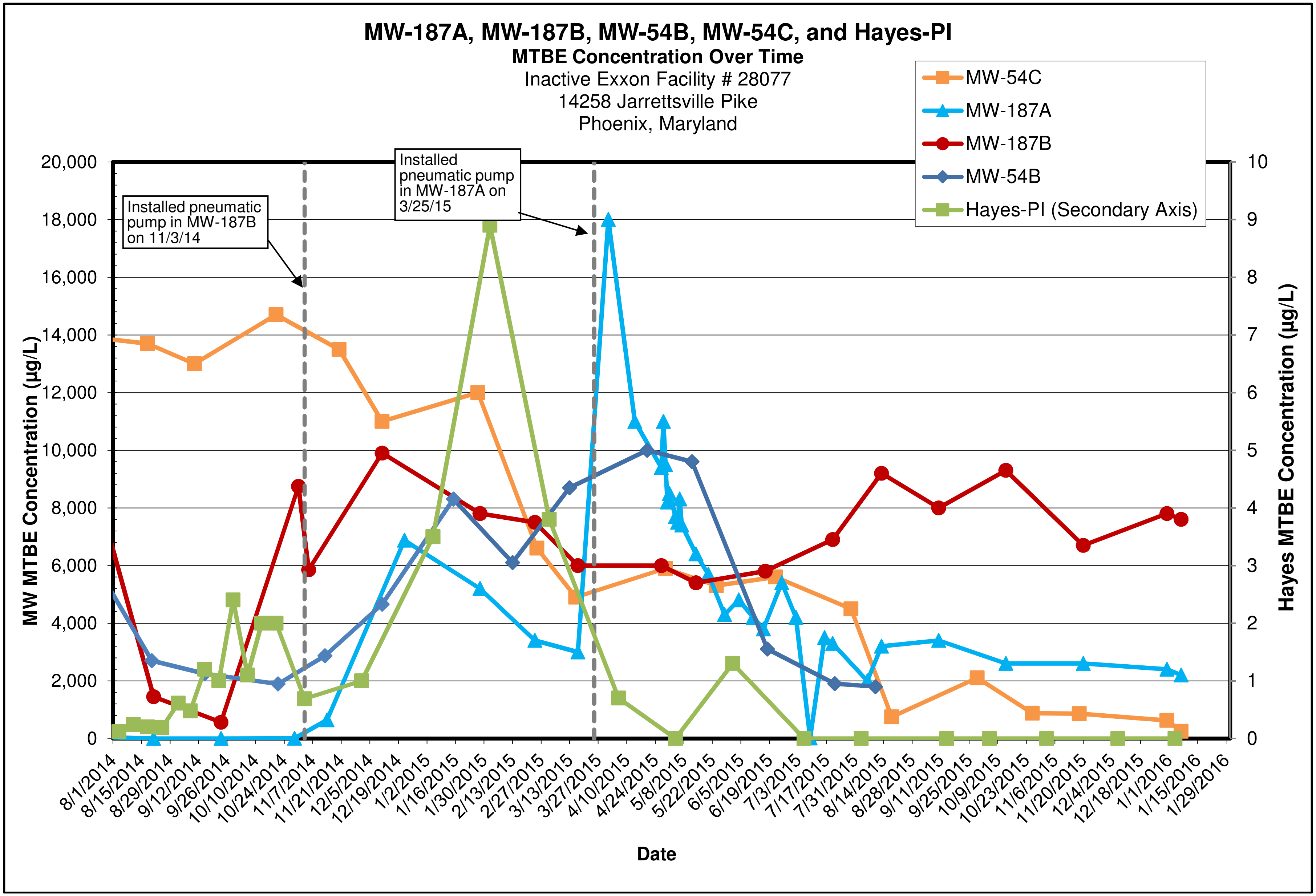

Kleinfelder
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Hanover, Maryland

Max concentration data used for sampling events with multiple intervals

APPENDIX B

SUMMARY OF INVESTIGATIONS AND ASSESSMENT ACTIVITIES

SUMMARY OF INVESTIGATIONS AND ASSESSMENT ACTIVITIES

1.1 INITIAL INVESTIGATION

Assessment activities were initiated in February 2006 in response to the discovery of LPH in existing monitoring wells following a release of approximately 26,000 gallons of gasoline from the former Exxon service station. These monitoring wells had been installed to comply with COMAR regulations applicable to High Risk Groundwater Use Areas.

The underground storage tanks (USTs), associated piping, and dispenser islands were removed from the service station property between March 4, 2006 and April 10, 2006. These activities were reported to the MDE in the Tank Excavation Assessment Report (GSC/Kleinfelder, 2006b). Prior to UST removal activities, the service station features consisted of a canopy covering three dispenser islands, two 8,000-gallon gasoline USTs, one 10,000-gallon diesel UST, one 12,000-gallon gasoline UST and associated single-walled fiberglass piping. The USTs were installed in 1985 and were constructed of double-walled, fiberglass-coated steel. In July 1992 and May 1997, one 1,000-gallon fiberglass used-oil UST and one 1,000-gallon fiberglass heating oil UST were removed from the service station property, respectively.

By June 2006, the following assessment activities had been completed (Kleinfelder, 2006a):

- Advancement of 213 boreholes, of which 208 were completed as monitoring wells;
- Acquisition of three bedrock core samples;
- Sampling of 273 private supply wells within an approximately ½-mile radius from the former service station property;
- Completion of four seismic survey profiles;
- Completion of five electrical resistivity imaging profiles;
- Completion of one area microgravity survey and four microgravity survey profiles;
- Downhole geophysics/logging of 11 bedrock boreholes;
- Completion of hydraulic profiling with blank Flexible Liner Underground Technologies (FLUTe ™) liners in three bedrock boreholes;
- Installation of custom FLUTe™ water liners with discrete sampling ports in four bedrock boreholes;
- Implementation and analysis of two constant-rate aquifer pumping tests – one in the northeast and one in the southwest;

- Implementation of 127 slug tests in 42 monitoring wells;
- Completion of soil gas sampling adjacent to buildings on six properties in the northeast;
- Geologic inspection of the tank field excavation area;
- Collection and analysis of 1,483 groundwater samples;
- Collection and analysis of 31 surface water (stream and pond) samples;
- Implementation of 170 rounds of groundwater potentiometric surface and product thickness level gauging events.

1.2 PRIVATE SUPPLY WELL (PSW) SAMPLING / POINT OF ENTRY TREATMENT (POET) SYSTEMS

Since 2006, more than 270 private supply wells surrounding the former service station have been sampled by ExxonMobil. Starting on February 19, 2006, supply wells on three properties in the immediate vicinity of the station were sampled (3313 Paper Mill Road, 3305 Paper Mill Road and 14242 Jarrettsville Pike). The sampling program was expanded at the MDE's direction on February 21, 2006, to include properties within a ½-mile radius of the former service station property to the southwest (MDE, 2006). The program was expanded again in March 2006 to include properties within a ¼-mile radius of the station to the northeast. Based on MDE correspondence dated March 10, 2006, a precautionary round of sampling was conducted for private supply wells within a ½-mile radius of the station that had not yet been sampled.

Over the course of the project, 15 point-of-entry (POET) systems have been installed and maintained by ExxonMobil in cooperation with the MDE:

- 14242 Jarrettsville Pk. (installed 3/4/2006)
- 3507 Hampshire Glen Ct. (installed 3/16/2006)
- 3606 Hampshire Glen Ct. (installed 3/22/2006)
- 3608 Hampshire Glen Ct. (installed 3/22/2006)
- 3503 Hampshire Glen Ct. (installed 4/27/2006)
- 3506 Hampshire Glen Ct. (installed 4/27/2006)
- 3508 Hampshire Glen Ct. (installed 4/27/2006)
- 3604 Hampshire Glen Ct. (installed 4/28/2006)
- 14301 Jarrettsville Pk. (installed 8/15/2006)
- 3313 Paper Mill Rd. (installed 5/16/2007)

- 14406 Katie Rd. (7/5/2007)
- 14307 Jarrettsville Pk. (installed 8/7/2007)
- 14405 Jarrettsville Pk. (installed 9/12/2008)
- 3605B Southside Ave. (installed 10/20/2008)
- 3627A Southside Ave. (installed 10/22/2013)

Of these 15 POETs, ExxonMobil continues to maintain all but one.[1]

1.3 SOIL VAPOR SAMPLING

MDE evaluates indoor air hazards based on the Environmental Protection Agency (EPA) Regional Screening Level (RSL) table, using a tiered approach.

- Tier 2 (screening) - Provided indoor air contamination is below acceptable risk thresholds, soil gas concentrations below the Tier 2 screening values do not require additional monitoring or assessment, as long as the known source conditions are stable.
- Tier 1 (action) - When soil gas concentrations are between the Tier 2 screening levels and the Tier 1 action levels, and indoor air is "acceptable," long-term monitoring/source reduction is required. When soil gas concentrations exceed the Tier 1 values, remedial measures are necessary.

All soil gas sampling was discontinued by August 2014 with the approval of the MDE (MDE, 2011; MDE, 2014). All soil gas concentrations were below Tier 2 screening levels when sampling ended. Historically, 99.4% of all samples for all six properties were below Tier 1 action levels.

1.4 GROUNDWATER SAMPLING/MONITORING

Initial Assessment (2006-2007)

As part of the initial assessment, 208 monitoring wells were installed from February 18, 2006 through May 17, 2006 (Kleinfelder, 2006b).

[1] Ownership, including maintenance, of the POET at 3605B Southside Avenue was conveyed to the property owner on 1/21/2011 as part of the "Water Supply Well Installation and Connection Agreement Release."

FLUTe™ liners were installed in four C zone monitoring wells to obtain discrete-depth sampling data and to protect against the potential for vertical migration during early stages of investigation as the hydrocarbon distribution was being investigated.

Expanded MW Network (2008-2010)

In August 2007, a phased expansion of the monitoring well network was agreed to by ExxonMobil and the MDE (MDE, 2007). Between 2008 and 2010, 26 wells were installed and downhole geophysical logging was conducted on wells with a depth greater than 250 ft-bgs ("C Zone" wells). Initial sampling of the wells following installation indicated dissolved phase hydrocarbons were minimal to non-detect, with the exception of low-level MtBE concentrations in MW-175C and higher concentrations of MtBE in MW-172C (Kleinfelder, 2010), both of which are now non-detect.

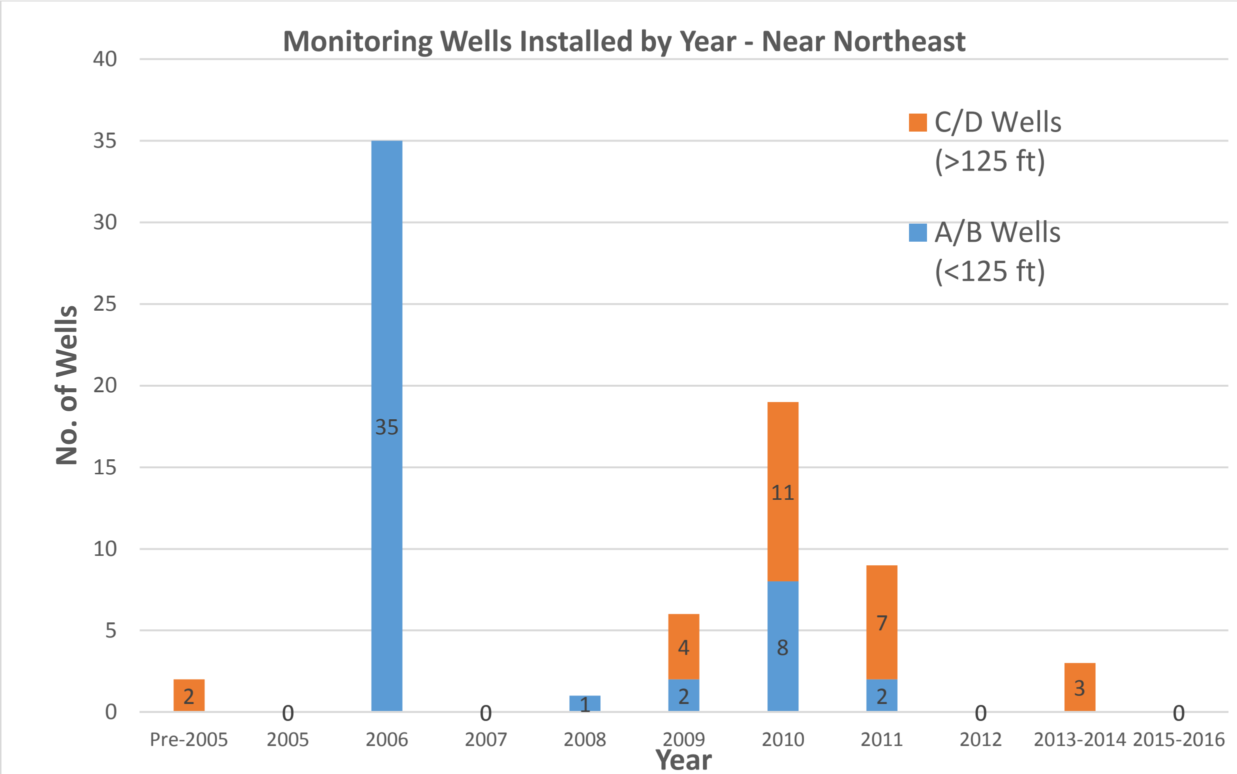
As directed by the MDE, the C zone wells of the expanded monitoring well network were constructed and located to replicate private supply well construction, ultimately to serve in lieu of private supply well sampling.

Near Northeast Area Investigation (2009-2011)

Due to increasing MtBE trends associated with two supply wells in the near northeast (3506 Hampshire Glen Court and 14307 Jarrettsville Pike) further assessment activities were conducted in the "near northeast area" from the former service station property (Figure 4). The near northeast investigation encompassed the following activities:

- Monitoring well installation
- Increased sampling of existing monitoring wells
- HydraSleeve™ interval and composite sampling of the open borehole portions of "C" wells
- Packer sampling
- Water usage assessment
- Geophysical investigation, including borehole logging, surface geophysics (microgravity and electrical resistivity), and tomography (electrical resistivity and seismic)

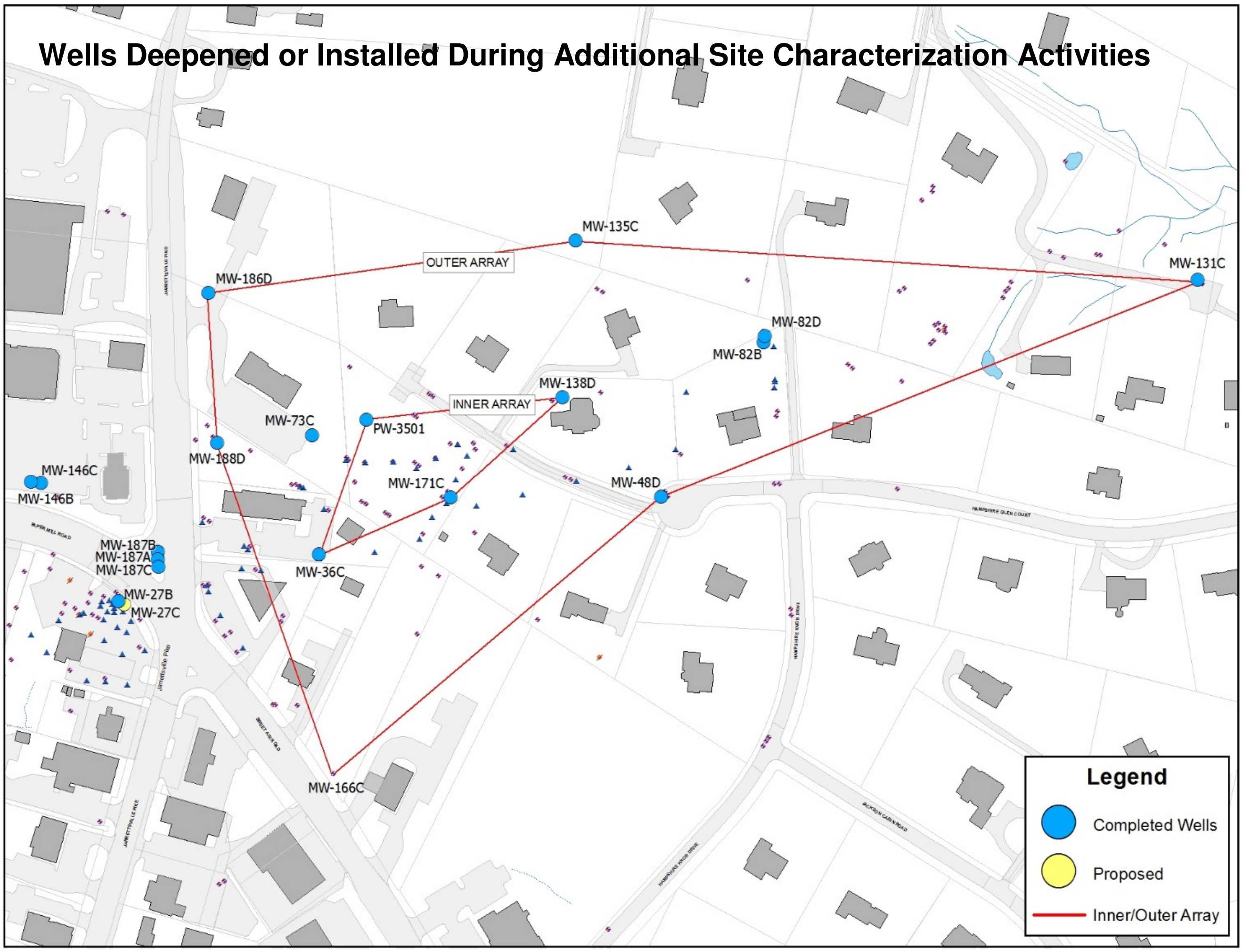
Between March 2009 and March 2011, 27 additional monitoring wells were installed, and between April 2009 and December 2010, nine additional recovery wells were activated. The remedial activities implemented concurrently with the near northeast investigation successfully reversed increasing supply well concentration trends (Kleinfelder, 2011a).



Additional Site Characterization

In June 2012, ExxonMobil submitted a work plan to install and/or deepen 17 monitoring wells with the following objectives (Kleinfelder 2012):

- Establish additional D zone monitoring points (greater than 300 feet bgs) in the near northeast area ("inner array");
- Encompass the near northeast area with additional D zone monitoring points to provide a sentinel array ("outer array");
- Provide supplemental characterization data beneath, along strike and down dip of the original release area on the former service station property and within relatively close proximity.



Ultimately, 16 of the proposed wells were installed, excluding only MW-27C on the station property, which was deemed unnecessary, given concentrations in monitoring well MW-27B delineated the vertical extent of gasoline constituents. Downhole geophysical logging was completed on all installed and deepened wells in the "D" zone. Eleven wells were completed between July and December 2013; five were completed between March and May 2014. Two additional wells (MW-82B and MW-82D) were proposed and installed in 2014 at 3508 Hampshire Glen Court to further characterize groundwater beyond the original "inner array," based on results from the FLUTe™ samples collected from MW-138D.

1.5 SUPPLEMENTAL INVESTIGATIONS

Lineament Trace Analysis - 2007

In 2007, at the request of the MDE, a lineament trace analysis was completed to identify surface linear features, show possible relationships between the lineaments and known geological structure, and help identify potential structural features that could correlate to known regional hydrogeologic conditions. The lineament pattern primarily corresponds with the regional drainage patterns, oriented in a northeast/southwest pattern. Discrete interval sampling was proposed as a complimentary data set to better correlate the three-dimensional model of identified lineaments, fractures identified during downhole geophysical logging, and the distribution of dissolved-phase hydrocarbons (Kleinfelder 2008b).

Vertical Head Testing – 2011

In February 2011, ExxonMobil proposed a vertical head study to isolate vertical intervals of the bedrock aquifer and obtain potentiometric measurements. The study used clusters of “A,” “B,” and “C” zone wells, as well as the installation of packers to subdivide the open boreholes of various “C” zone wells. Work was conducted between April 11 and May 26, 2011 and reported to the MDE in September 2011 (Kleinfelder, 2011b). The data obtained from the vertical head study illustrated an upward hydraulic gradient beneath the northeast and southwest drainage valleys, and beneath the enhanced pumping remediation in the near northeast area. Downward hydraulic gradients were observed beneath the upland areas of the project. In general, the dominant vertical gradients between shallow and deep zones were consistent with what would be expected from elevated topography and from valley bottoms and surface drainage/streams (Kleinfelder 2011b).

APPENDIX C

SUMMARY OF REMEDIAL ACTIVITIES AND SYSTEM CHANGES

History of Remedial System Activities/Modifications

- February 17, 2006 – Onset of groundwater recovery activities using mobile remediation equipment.
- February 2006 to September 2006 – Temporary mobile groundwater recovery and treatment system; three SVE systems in the southwest quadrant - Flame Oxidizer 750, Bisco Dual Claw, and Bisco Liquid Ring Pump (LRP) DPE system; and, four SVE systems in the northeast quadrant - Flame Oxidizer 500, Airtech LRPs, MLE Claw 2, and ThermCat 500. Equipment operation and performance is detailed in the IRM Plan and Updated IRM Plan. Bisco LRP was shutdown in July 2006 and replaced with the MLE DPE Claw in August 2006, which extracts soil vapors and groundwater from the service station property extraction wells.
- October 2006 to March 2007 – Temporary groundwater treatment systems operated in the northeast quadrant; these were shutdown when the integrated groundwater treatment system was brought online.
- October 2006 to March 2008 – Temporary soil vapor extraction equipment was replaced with equipment designed for prolonged use at the site.
- February 5, 2007 – All recovered groundwater is treated on the service station property utilizing a combination of air stripping, a fluidized bed bioreactor, and liquid phase GAC.
- February 9, 2007 – ThermCat 500 (thermal oxidizer) was shutdown and was replaced by the Flame Oxidizer 500 SVE Blower extracting vapor from extraction wells in the northeast quadrant on 14307 Jarrettsville Pike, 3501 Hampshire Glen Court, and 3506 Hampshire Glen Court.
- February 9, 2007 – ESD Dual Claw SVE system was brought online, operating on wells formerly operated by the Flame Oxidizer 500 SVE Blower, extracting vapor from extraction wells in the northeast quadrant on 14301 Jarrettsville Pike and 14307 Jarrettsville Pike.
- May 31, 2007 – Temporary DPE system, Airtech LRPs (located on the Sweet Air Road property in the northeast quadrant) was shutdown, and replaced with the Bisco LRP DPE system (formerly used on the Service Station Property), extracting vapor and groundwater from extraction wells on 14307 Jarrettsville Pike and 3503 Hampshire Glen Court.
- May 31, 2007 – Flame Oxidizer 500 vapor treatment unit was shutdown (SVE Blower still operated) because soil vapor is below SVE general permit discharge limits and the vapors are now directed through vapor phase GAC prior to discharge to the atmosphere.
- May 31, 2007 – Flame Oxidizer 750 vapor treatment unit was shutdown (SVE Blower still operated) because soil vapors are below SVE general permit discharge limits and the vapors are now directed through vapor phase GAC prior to discharge to the atmosphere.
- August 9, 2007 – The Bisco LRP was relocated from 3410 Sweet Air Road to 3418 Sweet Air Road (northeast quadrant).
- August 10, 2007 – Flame Oxidizer 500 was taken offline, and transported offsite.

- August 10, 2007 – ESD Dual Claw Skid I was brought online to replace the Flame Oxidizer 500, extracting vapors from the extraction wells in the northeast quadrant on 14307 Jarrettsville Pike, 3501 Hampshire Glen Court, and 3506 Hampshire Glen Court and treating the vapors with vapor phase GAC.
- October 4, 2007 – Flame Oxidizer 750 was taken offline and transported offsite. Piping retrofit and installation of the ESD Tri-Lobe was initiated in the former Flame Oxidizer 750 area.
- October 12, 2007 – Bisco LRP was taken offline due to liquid ring pump failure, SVE wells operated by the Bisco LRP were re-directed to the ESD Dual Claw and ESD Dual Claw Skid I, and pneumatic pumps were added to MW-36, MW-74, and MW-75.
- October 31, 2007 – ESD Tri-Lobe SVE system was brought online to replace the Flame Oxidizer 750, extracting vapors from extraction wells on the service station property and treating vapors with vapor phase GAC.
- February 18, 2008 – MLE Claw 2 was taken offline and transported offsite, extracted vapors were temporarily re-directed to the ESD Dual Claw Skid I while installation of replacement system was initiated.
- March 11, 2008 – Northeast Bisco Dual Claw was brought online to replace the MLE Claw 2 (located on the 3508 Hampshire Glen Court property), extracting vapors from extraction wells on 3506, 3508, and 3600 Hampshire Glen Court, and treating vapors with vapor phase GAC on 3418 Sweet Air Road.
- March 31, 2008 – New recovery wells, MW-16R and MW-27R, were connected to the groundwater remediation system and brought online for both groundwater extraction using pneumatic pumps (GWP&T) and soil vapor extraction (SVE).
- May 7, 2008 – Two SW groundwater storage fractionating tanks were transported offsite.
- May 12, 2008 – New air compressor installed, Plant Air Compressor, supplying air to all SW and NE pneumatic pumps. Former air compressors remain in place as back-ups.
- June 10, 2008 – Effluent groundwater fractionating tank (T702) emptied into effluent fractionating tank (T701) and transported offsite.
- June 17, 2008 – Monitoring well MW-89 was brought online for both GWP&T and SVE.
- August 13, 2008 – Monitoring well MW-121 was connected to the groundwater remediation system and brought online for both GWP&T and SVE.
- September 10, 2008 – Monitoring well MW-45R was connected to the groundwater remediation system and brought online for both GWP&T and SVE.
- January 19-23, 2009 – Three SVE pilot test wells were installed on the service station property to further evaluate onsite SVE recovery in the former UST field area.
- February 6, 2009 – New air compressor installed as a back-up to the Plant Air Compressor; capable of supplying air to all SW and NE pneumatic pumps
- March 3, 2009 – Recovery well MW-36 converted from DPE to GWP&T and SVE.

- April 17, 2009 – Monitoring well MW-58R was connected to the groundwater remediation system and brought online for both GWP&T (NE02 Zone) and SVE (ESD Dual Claw Skid). Groundwater recovery and soil vapor extraction was re-started on MW-38.
- May 26, 2009 – Monitoring wells, MW-169, MW-170, and MW-171 were connected to the groundwater remediation system and brought online for both GWP&T (NE01) and SVE (ESD Dual Claw Skid).
- November 11, 2009 – Bisco Dual Claw SVE system permanently taken offline.
- November 13, 2009 – Recovery well, SVE-3, was transitioned to all-season below grade piping and reconnected to the groundwater recovery system.
- December 15, 2009 – Recovery wells, MW-78R and MW-100B, were taken offline for GWP&T. Northeast Bisco Dual SVE system permanently taken offline.
- February 18, 2010 – Recovery well, MW-34, was taken offline for GWP&T.
- March 17, 2010 – Recovery well, MW-33, was taken offline for GWP&T.
- April 19, 2010 – Recovery well, MW-51, was taken offline for GWP&T.
- May 24, 2010 – Recovery well, MW-124, was taken offline for GWP&T.
- May 28, 2010 – Monitoring well MW-91C was connected to the groundwater remediation system using temporary above grade piping; and brought online for GWP&T.
- June 1, 2010 – Monitoring well MW-54 was connected to the groundwater remediation system using temporary below grade piping; and brought online for GWP&T.
- June 22, 2010 – Recovery well MW-71 was taken offline for GWP&T.
- July 7, 2010 – Monitoring well SVE-1 was connected to the groundwater remediation system using temporary above grade piping; and brought online for GWP&T.
- September 20, 2010 – Begin LGAC-only treatment for low-concentration groundwater stream. Air stripper is maintained onsite.
- September 25, 2010 – Recovery well MW-54 was transitioned to all-season below grade piping.
- September 29, 2010 - Monitoring well MW-176 was connected to the groundwater remediation system using temporary above grade piping; and brought online for GWP&T.
- December 2, 2010 – Recovery wells MW-91C, MW-176, and SVE-1 were transitioned to all-season below grade piping.
- December 28, 2010 – Monitoring well MW-36R was connected to the groundwater remediation system and brought online for GWP&T. Recovery well MW-36 was taken offline for GWP&T.
- December 29, 2010 – Monitoring well MW-178C was connected to the groundwater remediation system and brought online for GWP&T.
- May 20, 2011 – Recovery well MW-28 was taken offline for GWP&T.
- June 15, 2011 – Recovery well MW-111 was taken offline for GWP&T.
- July 15, 2011 – Recovery well MW-102 was taken offline for GWP&T.
- August 15, 2011 – Recovery well MW-123 was taken offline for GWP&T.
- September 15, 2011 – Recovery well MW-113 was taken offline for GWP&T.

- October 12, 2011 – Recovery well MW-60 was taken offline for GWP&T.
- April 24, 2012 – Pneumatic pump in recovery well MW-171 identified as not operating properly and lodged in place inside the well borehole. Currently being used for monitoring only and “grab” sampling.
- May 15, 2012 – Monitoring well MW-54B was connected to the groundwater remediation system and brought online for GWP&T.
- June 20, 2012 – Monitoring well MW-139 was connected to the groundwater remediation system and brought online for GWP&T.
- July 20, 2012 – Monitoring well MW-181B was connected to the groundwater remediation system and brought online for GWP&T.
- July 31, 2012 – Monitoring wells MW-183, MW-184, and MW-185 were connected to the groundwater remediation system and brought online for GWP&T.
- August 31, 2012 – ESD TriLobe SVE system taken offline due to high temperature.
- September 6, 2012 – ESD TriLobe SVE system repaired and resumed operations.
- September 20, 2012 – Monitoring well MW-38C was connected to the groundwater remediation system and brought online for GWP&T.
- August 21, 2013 – Exposed piping was removed from a stream bed in southwest in accordance with MDE approved work plan.
- September 17, 2013 – Monitoring well SVE-2 was connected and activated to the groundwater remediation system using temporary above grade piping.
- October 2, 2013 – Soil vapor extraction initiated at SVE-2.
- October 10, 2013 – ESD Dual Claw Trailer and ESD Dual Claw Skid I SVE systems permanently taken offline.
- November 19, 2013 – Temporary groundwater recovery and soil vapor extraction was ceased at SVE-2 following completion of a two-month evaluation period using above grade piping.
- November 19, 2013 – Recovery wells MW-25 and MW-80A taken offline for GWP&T.
- December 13, 2013 – Recovery wells MW-80B and MW-109 taken offline for GWP&T.
- January 16, 2014 – Recovery well MW-31 was taken offline for GWP&T.
- February 12, 2014 – Recovery well MW-49 was taken offline for GWP&T.
- March 12, 2014 – Recovery well MW-119 was taken offline for GWP&T.
- April 11, 2014 – Recovery wells MW-55 and MW-112 were taken offline for GWP&T.
- May 12, 2014 – Recovery well MW-117 was taken offline for GWP&T.
- May 13, 2014 – MLE DPE Claw system permanently taken offline.
- June 18, 2014 – ESD DPE Claw system (former ESD Dual Claw Trailer in the Northeast) was brought online as a replacement for MLE DPE Claw.
- June 20, 2014 – Monitoring well SVE-2 was connected to the groundwater remediation system with all-weather below-grade piping, and brought online for GWP&T and SVE.
- September 22, 2014 – Monitoring well MW-82B was connected to the groundwater remediation system with all-weather below-grade piping, and brought online for GWP&T.

- November 3, 2014 – Monitoring well MW-187B was connected to the groundwater remediation system with all-weather below-grade piping, and brought online for GWP&T.
- March 25, 2015 – Monitoring well MW-187A was connected to the groundwater remediation system with all-weather below-grade piping, and brought online for GWP&T.
- April 14, 2015 – Bioreactor taken offline, subsequently approved for decommissioning on June 16, 2015.
- May 6, 2015 – Recovery wells MW-24, MW-26, MW-29, MW-30, MW-35, MW-52, and MW-154 were taken offline for GWP&T.
- June 15, 2015 – Soil vapor extraction initiated at MW-187A.
- July 21, 2015 – Electric pump in monitoring well MW-82B replaced with pneumatic pump.
- August 11, 2015 – Soil vapor extraction initiated at MW-187B.
- August 31, 2015 - Recovery wells MW-40, MW-72, MW-116, MW-118, MW-126, MW-127, and MW-156 were taken offline for GWP&T.
- September 18, 2015 – Soil vapor extraction discontinued from MW-187A
- September 21, 2015 – Removal of FLUTe™ liner from MW-78C