



July 2, 2010

Mr. James Richmond  
Maryland Department of the Environment  
Oil Control Program  
1800 Washington Boulevard  
Baltimore, Maryland 21230

- *Engineering*
- *Remediation*
- *Consulting*

Re: **CAP Addendum and Work Plan Modification**  
**Sheetz Store #177**  
**3281 Main Street**  
**Manchester, Maryland**  
**MDE Case # 06-0056CL**  
**MDE Facility ID No. 6297**

Dear Mr. Richmond:

Environmental Alliance, Inc. (Alliance) on behalf of Sheetz, Inc. submitted a CAP Addendum (CAPA) March 9, 2010 and an Update Report with a work plan March 31, 2010. Since that time, modifications have been made to the infiltration gallery and the proposed construction of monitoring well MW-17. The modifications are based on verbal discussions and e-mails with Jim Richmond of the Maryland Department of the Environment (MDE) based on the preliminary review of the March 2010 CAPA and Update Report.

#### **CAP Addendum Modification**

Following submittal of the CAPA, the Carroll County Health Department requested (to the MDE) that a double-ring infiltration test be completed in the area of the proposed infiltration gallery. The test was completed on June 2, 2010 by Foundation Test Group, Inc. The report is presented in Attachment I. The test was conducted utilizing the ASTM D 3385-09 test standards, in the area of the proposed infiltration gallery at a depth of approximately 7.5 feet below ground surface. Based on the results of the test, the design of the infiltration gallery, which was presented in Attachment II of the March 2010 CAP Addendum, was modified.

During the groundwater infiltration investigation (double-ring test), the calculated hydraulic conductivity rates ranged from 8.5 to 0.5 inches per hour (in/hr). The final test results indicated a saturated value of 0.5 in/hr. The design loading rate calculation (50%) with a unit head of 1

foot (ft) over a unit area of one square foot (ft<sup>2</sup>) results in a hydraulic rate of 0.5 feet per day (ft/d), which is equivalent to 3.74 gallons per day per square foot (gal/d/ft<sup>2</sup>). Although this is a similar hydraulic conductivity that was calculated during the previous testing, Alliance has verified the design and incorporated the new data since the March 2010 CAPA and is presenting the proposed infiltration gallery design.

Based on this information, assuming 12 gallons per minute which equals 17,280 per day (gal/d) of discharge, and using a hydraulic rate of 3.74 gal/d/ft<sup>2</sup>, the infiltration gallery should consist of at least 4,620 ft<sup>2</sup> of space. Based on the Sheetz rebuilding design, two 80 x 30 x 7 feet deep with approximately 4,800 ft<sup>2</sup> will handle the design flow rate with a 50 percent design loading rate. The proposed infiltration gallery consists of two 80 feet by 30 feet by 7 feet trenches set at least 20 feet apart.

Another modification to the design is the addition of three monitoring points around the infiltration gallery to monitor the groundwater levels. The modified design drawings for the infiltration gallery are presented as Attachment II.

### **Work Plan Modification**

The June 23, 2010 MDE directive recommended additional discrete interval sampling on monitoring well MW-17D to clarify the zone(s) that contain impacts. MDE further recommended that based on the interval sampling results that a recovery well be installed to target the impacted zones. Alliance considered the MDE recommendation and is proposing the installation of a cluster wells (shallow and deep) in the vicinity of monitoring well MW-17D, to conduct the recommended interval sampling. This is explained further in the next section.

#### *Monitoring Well MW-17D Construction*

As outlined in the March 2010 work plan, Alliance proposed a construction plan for monitoring well MW-17D which including sealing the bottom forty feet of the open borehole. Due the concerns from the MDE, and the fact that monitoring well MW-17D is an integral well in the proposed remediation system activities (including pilot testing data), Alliance has reconsidered the proposed construction plan, leaving monitoring well MW-17D as an open borehole and recovery well with a total depth of 110 feet. The possibility exists that based on additional analytical data that Alliance may recommend well construction at a later date. In order to accomplish the goals of the project for vertical delineation within the identified fracture zones while moving forward with remediation plans, monitoring well MW-17D will be retained as the main pumping well for remediation and in addition a cluster well will be installed nearby which

will be able to monitor the vertical intervals with higher quality control parameters for representative sampling in a vertical profile. Depending on sampling data results the remediation strategy can be adjusted but due to the presence of dissolved hydrocarbons in a potable aquifer we recommend aggressively pursuing active remediation. Alliance will continue to move forward with the remediation system permitting process and anticipates approval for system construction upon MDE approval of the CAP Addendum including this modification.

#### Cluster Well Installation

As monitoring well MW-17D is a key remedial well and was utilized for pilot testing, Alliance proposes an alternative for the MDE requested interval testing of this well at this time. Alliance proposes that to further evaluate the vertical delineation of the impact by the installation of one shallow monitoring well and one deeper cluster well within twenty feet of monitoring well MW-17D. Due to the potential for intermixing within an open borehole such as monitoring well MW-17D and the limited pumping effects during interval sampling of a well, a dedicated cluster well configuration provides a significantly higher level of data quality for delineation and monitoring of the vertical profile of an aquifer. Therefore, maintaining monitoring well MW-17D as a remediation well while installing dedicated vertical delineation wells the two objectives of accurate and reproducible monitoring while beginning remediation can be achieved. The proposed location of the replacement vertical delineation well(s) (shallow monitoring well with a deeper cluster well) is depicted indicated on Figure 1.

As a reminder, the packer test zones were as follows:

- Zone 1: 0 to 69 feet
- Zone 2: 69 to 84 feet
- Zone 3: 89 to 110 feet

One shallow monitoring well will be installed to evaluate MTBE concentrations in the shallow zone previously identified in Zone 1. The air rotary drill rig will be equipped with a nominal eight-inch drill bit to drill a eight-inch borehole to a depth of approximately 60 feet below ground surface (bgs) (same construction as on-site wells) and as in Zone 1 of the packer testing of monitoring well MW-17D. One permanent monitoring well will be constructed with PVC well screen set from 20 to 60 feet bgs and two-inch solid PVC well casing will be placed from the top of the screen to ground surface. Filter pack will be placed from 18 to 60 feet bgs. The remaining well void will be filled with grout mix to the surface. The completed monitoring well will be finished with a locking well cap contained within a bolt-down watertight flushmount manhole as required by COMAR.

In addition, a deep cluster well is proposed, adjacent to the shallow monitoring well described above. The air rotary drill rig will be equipped with a nominal eight-inch drill bit to drill an eight-inch borehole to a depth of approximately 110 feet below ground surface (bgs).

The deep cluster well construction will consist of an intermediate (I) monitoring well and deep (D) monitoring well. Two permanent monitoring wells will be constructed in a single boring with appropriate lengths of two-inch 20-slot PVC well screen to establish two separate sampling zones. PVC well screen will be set from 95 to 110 feet bgs to correlate with the zone 3 interval from the packer tests and two-inch solid PVC well casing will be placed from the top of the screen to ground surface. Filter pack will be placed from 90 to 110 feet bgs. Concrete/bentonite mix will be tremie piped from 85 to 90 feet bgs. After allowing the grout mix to cure for 24 hours, the intermediate well will be constructed with well screen from 70 to 85 feet to correlate to Zone 2 from the packer test and two-inch solid PVC well casing to ground surface. Filter pack will be placed from 68 to 85 feet bgs. The remaining well void will be filled with grout mix to the surface. The completed monitoring well will be finished with locking well caps contained within one bolt-down watertight flushmount manhole as required by COMAR. The shallow monitoring well and the deeper cluster well will replace the monitoring objectives for monitoring well MW-17D.

Prior to soil boring and/or monitoring well installation, well permits will be secured from the county along with utility clearance. A Maryland licensed driller will conduct the drilling and installation of the monitoring wells. A supervising geologist, provided by Alliance, will be on site to log the hole and direct the drilling activities. The soil cuttings will be evaluated down to top of bedrock. Soils will be screened using a PID, logged for grain size, texture, color, odor, and hydrocarbon staining by Alliance's supervising geologist.

Overpumping via the air rotary rig will initially be utilized to develop the monitoring wells and remove potential suspended material from the water column prior to setting the PVC well casing. After cluster well construction, the monitoring wells will be developed by a combination of pumping with a submersible pump and surging with a surge block until a relatively clear discharge is observed. During these activities, liquid will be pumped to a storage tank and removed with a vac truck. In addition, soil cuttings will be drummed for proper off-site disposal.

The three new vertical definition wells will be incorporated into the quarterly groundwater monitoring plan.

### Deep Monitoring Well Installation

As outlined in the June 23, 2010 MDE directive, additional deep monitoring wells were approved for installation. Alliance has been diligently working on access agreements with property owners including the Town of Manchester.

MDE approved the proposed location for the installation of two additional wells on Walnut Street. At this time, only one property owner has agreed to the access (3021 Walnut Street), therefore, two monitoring wells are planned for installation, MW-23D on the Town of Manchester property (previously approved) and 3021 Walnut Street. Proposed well locations are presented on Figure 1.

Three additional monitoring wells were recommended for installation to further delineate the horizontal extent of the plume, to assist as sentinel wells for monitoring impacted groundwater movement, and to facilitate the chemical characterization of groundwater conditions, as presented in the March 2010 work plan. To date, Alliance has only been able to negotiate one agreement (BGE Property) for one of the three proposed locations (Figure 1). The proposed monitoring well on the BGE electrical substation property will be installed as indicated in the work plan, with the exception that metal will not be used as casing in the well (at the request of BGE), and the well will not be left as an open borehole, but will be completed as a four-inch diameter monitoring well. Since BGE has requested that the monitoring well be completed during one mob, Alliance has also selected this monitoring well for geophysical testing prior to the installation of the PVC monitoring well in the borehole (geophysical testing was proposed in the work plan in two of the new monitoring wells).

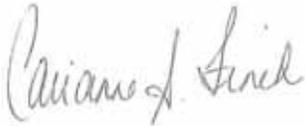
Alliance continues to negotiate access for monitoring well installation, but wanted to take this opportunity to provide the MDE with the status of the access agreements. As directed, Alliance will provide a copy of the signed access agreements prior to installing off-site monitoring wells.

### Potable Well Sampling

During access agreement research, Alliance identified four potable wells within a half-mile radius of the site. Two of the potable wells are between the site and the Town of Manchester Bachman Road Well. In a letter dated June 16, 2010, Alliance notified the MDE that we had attempted to collect samples, but were denied or no one was home. Alliance requested that the MDE assist in the collection of potable well samples from these residents. This data could greatly aid in the placement of the additional monitoring wells.

If you have any questions regarding this request or further information is required, please contact me at (410) 729-9000. Thank you for your attention.

Sincerely,  
**ENVIRONMENTAL ALLIANCE, INC.**



Carianne A. Finch  
Professional Engineer



William Smith, P.G.  
Principal Hydrogeologist

**Attachments**

<b>Figure 1:</b>	Proposed Monitoring Well Location Map
<b>Attachment I:</b>	Double-Ring Infiltration Test Report
<b>Attachment II:</b>	Modified Design Drawings
<b>Figure II-1:</b>	Remediation System Layout
<b>Figure II-2:</b>	Process & Instrumentation Diagram Legend
<b>Figure II-3:</b>	Process & Instrumentation Diagram (Groundwater Recovery/Treatment System)
<b>Figure II-4:</b>	Process & Instrumentation Diagram (SVE Treatment System)
<b>Figure II-5:</b>	Infiltration Gallery Cross Section and Monitoring Point Details

- c: Mr. David Dodson, Sheetz, Inc. (one copy plus CD)  
Ms. Susan Bull, MDE – Oil Control (one copy plus CD)  
Mr. Chris Ralston, MDE – Oil Control (one copy)  
Mr. Edwin Singer, Carroll County Health Department (CD only)  
Mr. Steve Miller, Town of Manchester (CD only)  
Mr. Warren Fox, XL Insurance (one copy plus CD)  
Mr. Hugh Murphy, Carroll County (CD only)  
Mr. John Grace, MDE Water Supply (CD only)  
Mr. Peter Garey, Garey Business Center (CD only)

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ATTACHMENT I

Geotechnical Field Infiltration Study  
Sheetz Property  
Carroll County, Maryland  
FTG Job No. F10027



Prepared For:

Ms. Megan Brown  
Environmental Alliance  
1035 Benfield Boulevard, Suite I  
Millersville, MD 21108

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From: Carroll County Soils Testing Policy for Proposed Infiltration/Recharge Facilities, March 16, 2005

Infiltration Testing Certification

I was onsite and either I or personnel under my direct supervision conducted the field infiltration testing described in this report. I certify that the testing met the requirements of the current Carroll County Soils Testing Policy for Proposed Infiltration/Recharge Facilities and all referenced standards.

  
\_\_\_\_\_  
Jeffrey W. Goodwin, P.E.  
Maryland Professional Engineer No. 18875

6/10/10  
\_\_\_\_\_  
Date



Professional Certification: I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland License No. 18875, Expiration Date: 10/14/2010



June 10, 2010

Ms. Megan Brown  
1035 Benfield Boulevard, Suite I  
Millersville, MD 21108

Attention: Ms. Megan Brown

Re: Geotechnical Field Infiltration Study  
**Sheetz Property**  
3281 Main St.  
Manchester, Maryland 21102  
FTG Job No.: F10027



Dear Ms. Brown:

Foundation Test Group, Inc. (FTG, Inc.) is pleased to submit this report concerning the subsurface exploration and subsequent geotechnical evaluation for the proposed infiltration structure located at 3281 Main St., Manchester, Maryland.

The following report discusses the characteristics of the project and the subsurface exploration procedures, describes existing site and subsurface conditions, and presents evaluations and recommendations relevant to the geotechnical engineering considerations for the project.

The project characteristics formed the basis for our recommendations; therefore, if the project characteristics are different from those outlined herein or are changed during further project development, this Office should be notified as the evaluations and recommendations may no longer be valid.

FTG, Inc. appreciates having had the opportunity to provide the geotechnical consultation for this project, and we will remain available for further consultation during the various design stages. Should you have any questions concerning the contents of this report, or require additional consultation, design, inspection, or testing services, please contact our Office at (410)517-0715.

Very truly yours,  
for FOUNDATION TEST GROUP, Inc.

Thomas A. Clingan

Jeffrey W. Goodwin, P.E.



Professional Certification & I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland License No. 18875, Expiration Date: 10/14/2010



## 1.0 PURPOSE AND SCOPE

The purpose of this study was to determine the ground infiltration rate in order to provide accurate design recommendations for the construction of an infiltration structure.

The evaluations and recommendations presented in this report were developed from an analysis of project characteristics and an interpretation of the general subsurface conditions at the site based on field observations and acquired data.

The Appendix contains a summary of the field data and corresponding analysis on which this report is based.

## 2.0 PROJECT CHARACTERISTICS

The project site is located at the northern corner of the property at 3281 Main St., Manchester, MD (currently occupied by Sheetz). Project location is shown on the Project Location Map and is marked as Figure 1 in the Appendix.

Based on the information provided by the client, we understand that proposed for development at the site is an infiltration structure capable of processing a peak demand of 20,000 gallons per day. The proposed facility is to be generally located on the site as shown on the Test Location Plan (Figure 3) in the Appendix.

## 3.0 FIELD EXPLORATION

To determine the general foundation soil types and to develop design parameters, a single soil test pit was excavated at the site by the contractor. The test pit was gradually stepped to allow access to the base of the pit. The pit was excavated to a depth of approximately 7 and ½ feet below the existing ground surface and measured approximately 12 ft. by 15 ft. in plan view.

At the base of the pit a double ring infiltration test apparatus was placed per ASTM D3385. The inner and outer cylinders were seated approximately one inch in the native soil. Sufficient soil to prevent leaking of water from the interior of the cylinders to the exterior was then piled around the outer base of the cylinders.

Representative portions of each soil sample were placed in plastic bags and transported to FTG, Inc.'s laboratory. In the laboratory, the samples were visually examined by the Geotechnical Engineer to verify the field technician's



classifications. The samples were classified in accordance with the Unified Soil Classification System and the field classifications were revised where necessary. The Unified Soil Classification Symbols appear on the Records of Soil Exploration and the system nomenclature is briefly described in the Appendix.

#### 4.0 SUBSURFACE CONDITIONS

Details of the subsurface conditions encountered at the site are shown on the Records of Soil Exploration. A brief description of the subsurface conditions and pertinent engineering characteristics of the soils are given below.

##### 4.1 Site Geology

The Geologic Map of Maryland shows that the project site is located in the Wissahickon Formation. The residual soils are highly variable interbedded silty sand, and sandy silt mixtures. The soils are residual soils developed from the insitu chemical and physical weathering of the underlying rock.

##### 4.2 Surficial Materials

The test pit excavated at the proposed building location. (Figure 3) indicated a 6 inch thick layer of topsoil was encountered below the ground surface in most locations.

##### 4.3 Fill

Silty Sand and Sandy Silt fill from previous site construction was encountered to a depth of 2.5 ft.

##### 4.4 Natural Soils

Below the fill, natural soils were encountered to the limits of excavation. Typical materials, common to the Piedmont Province, were encountered. The soils encountered at the site typically consisted of Sandy SILT and Silty SAND with rock fragments and trace of mica at depth. These soils are residual soils developed from the insitu chemical and physical weathering of underlying rock.



#### 4.5 Rock

Beginning at a depth of approximately 5 feet below grade, rock fragments were encountered. As depth increased the condition of the rock became gradually more competent, up to about 30% rock fragments by volume. Bedrock was not encountered.

#### 4.6 Groundwater

Groundwater was not encountered in the test pit.

A more accurate determination of the hydrostatic water table would require the installation of perforated pipes or piezometers, which could be monitored over an extended period of time. The actual level of the hydrostatic water table should be anticipated to fluctuate throughout the year, depending on variations in precipitation, surface run-off, infiltration, site topography, and drainage.

### 5.0 EVALUATIONS AND RECOMMENDATIONS

**Our findings indicate that the site is marginal and care should be given if developed for an infiltration structure.**

#### 5.1 Infiltration

We have evaluated the site subsurface conditions for recharge in the vicinity of the proposed infiltration structure in accordance with the State of Maryland's, "2000 Stormwater Design Manual", General Subsurface Exploration Guidelines. The following information is provided for planning stormwater management measures:

1. Location of seasonal high groundwater table.

Groundwater was monitored during the excavation. No groundwater was encountered.



2. Infiltration Rates

An in-situ double ring infiltration test conducted per ASTM D 3385 indicated infiltration rates of 0.5 inches per hour after 4 hours. The minimal allowable infiltration rate is 0.5 inches per hour, as detailed below.

3. Depth to Bedrock

Rock was not encountered within the depths explored at any location.

Based on the State of Maryland's, "2000 Stormwater Design Manual", a minimum field infiltration rate of 0.5 inches per hour is required for infiltration practices." Also, "... it is recommended that infiltration structures be located only in areas where the bottom of the structure will be 2 to 4 feet above the seasonally high groundwater table and/or bedrock". Lastly, "the use of SWM infiltration systems on fill material is not recommended..."

Based on the results of our subsurface exploration, the above-outlined criteria, and our experience with infiltration facilities in the project vicinity, **this site is marginal if infiltration methods of water management are used, extreme care must be taken.**

6.0 REMARKS

This report has been prepared to aid in the evaluation of the site for the construction of the proposed structure. It is considered that adequate recommendations have been provided to serve as a basis for design and preparation of plans and specifications. Additional recommendations can be provided as needed.

These analyses and recommendations are, of necessity, based on the information made available to us at the time of the actual writing of the report and the on-site conditions, surface and subsurface, which existed at the time the exploratory investigation was performed. Further assumption has been made that the limited exploration, in relation both to the areal extent of the site and to depth, are representative of conditions across the site.



If subsurface conditions are encountered which differ from those reported herein, this Office should be notified immediately so that the analyses and recommendations can be reviewed and/or revised as necessary. It is also recommended that we be given the opportunity to review any plans and specifications in order to comment on the interaction of the soil conditions as described herein and the design requirements.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties either implied or expressed. Foundation Test Group, Inc. assumes no responsibility for interpretations made by others based on work or recommendations made by FTG.



Appendix

Figure 1: Project Location Map

Figure 2: Aerial Photo

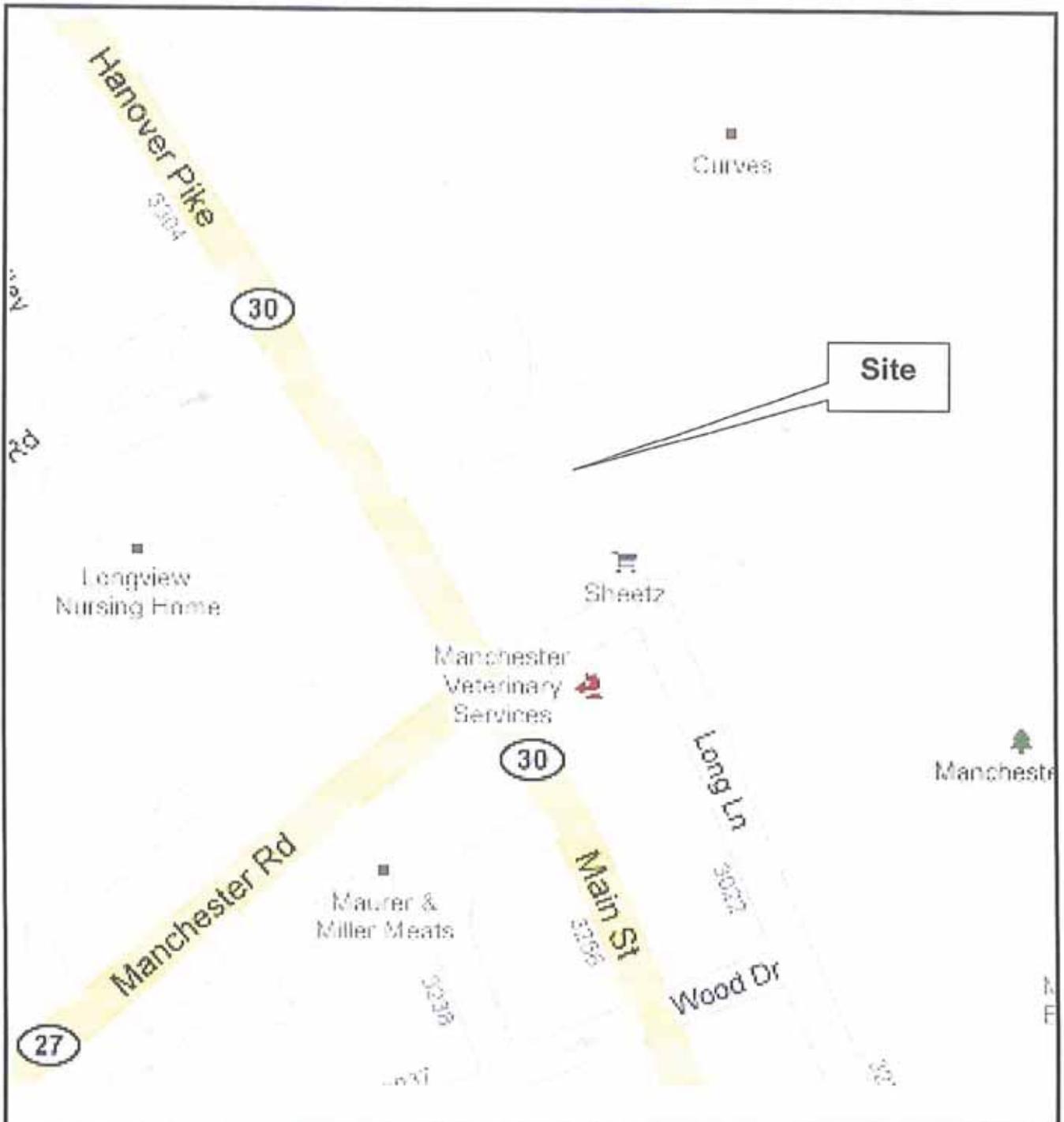
Figure 3: Project Location Plan and Test Location

Figure 4: Geologic Map of Project Location

Sheet 5: ASTM description of Soil

Sheet 6: Records of Soil Exploration

Sheet 7: Infiltration Data



# FOUNDATION TEST GROUP

## Site Location Map

Sheetz Property  
 Geotechnical Field Infiltration Study  
 3281 Main St.  
 Manchester, Maryland  
 FTG Project No.: F10027

2601 Emory Road, Bldg 1-A, Finksburg, Maryland 21048  
 Phone: (410)517-0715 • Fax: (410)517-0716

Figure No. : 1



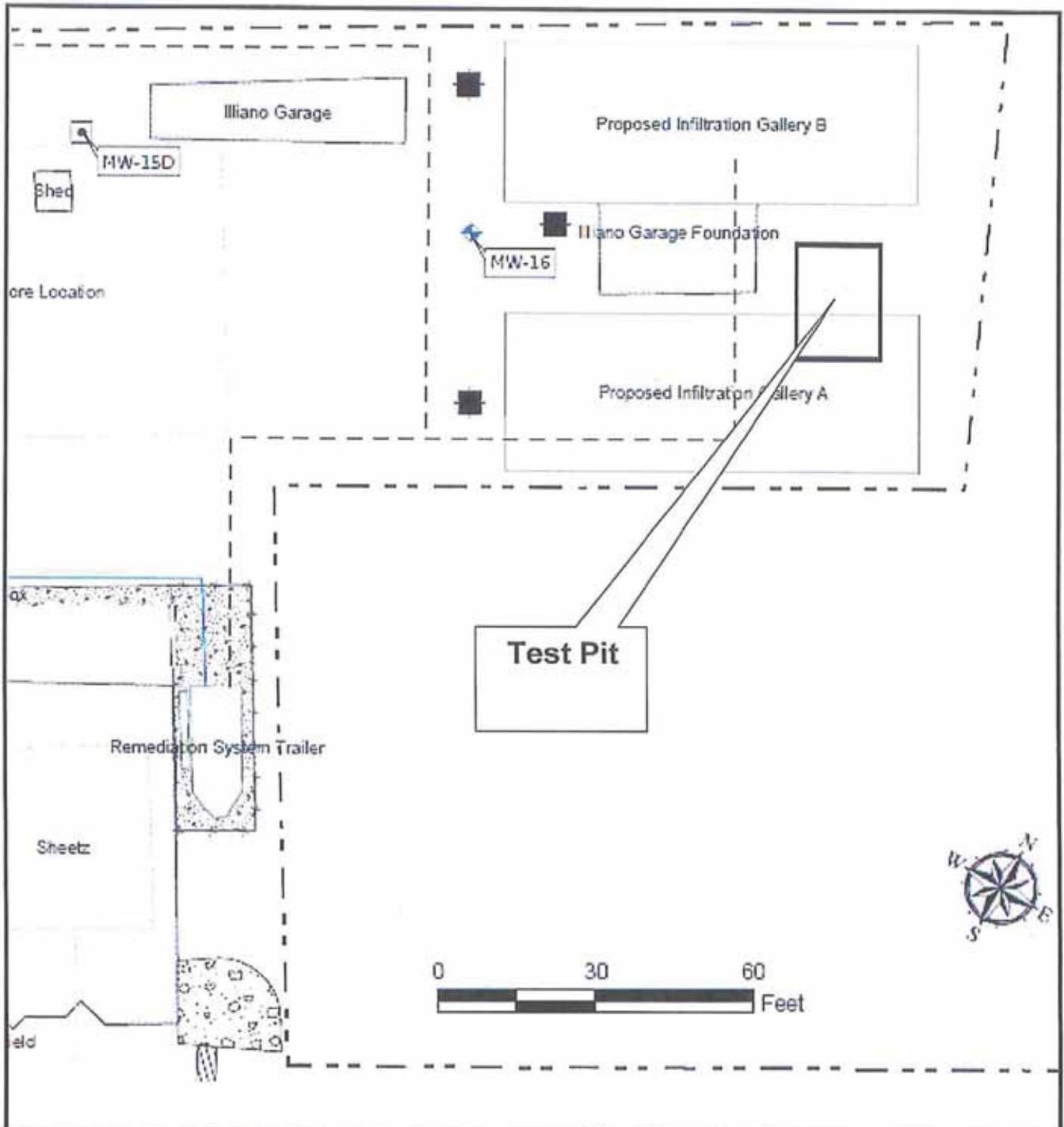
# FOUNDATION TEST GROUP

## Site Aerial Photo

Sheetz Property  
 Geotechnical Field Infiltration Study  
 3281 Main St.  
 Manchester, Maryland  
 FTG Project No.: F10027

2601 Emory Road, Bldg 1-A, Finksburg, Maryland 21048  
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Figure No. : 2



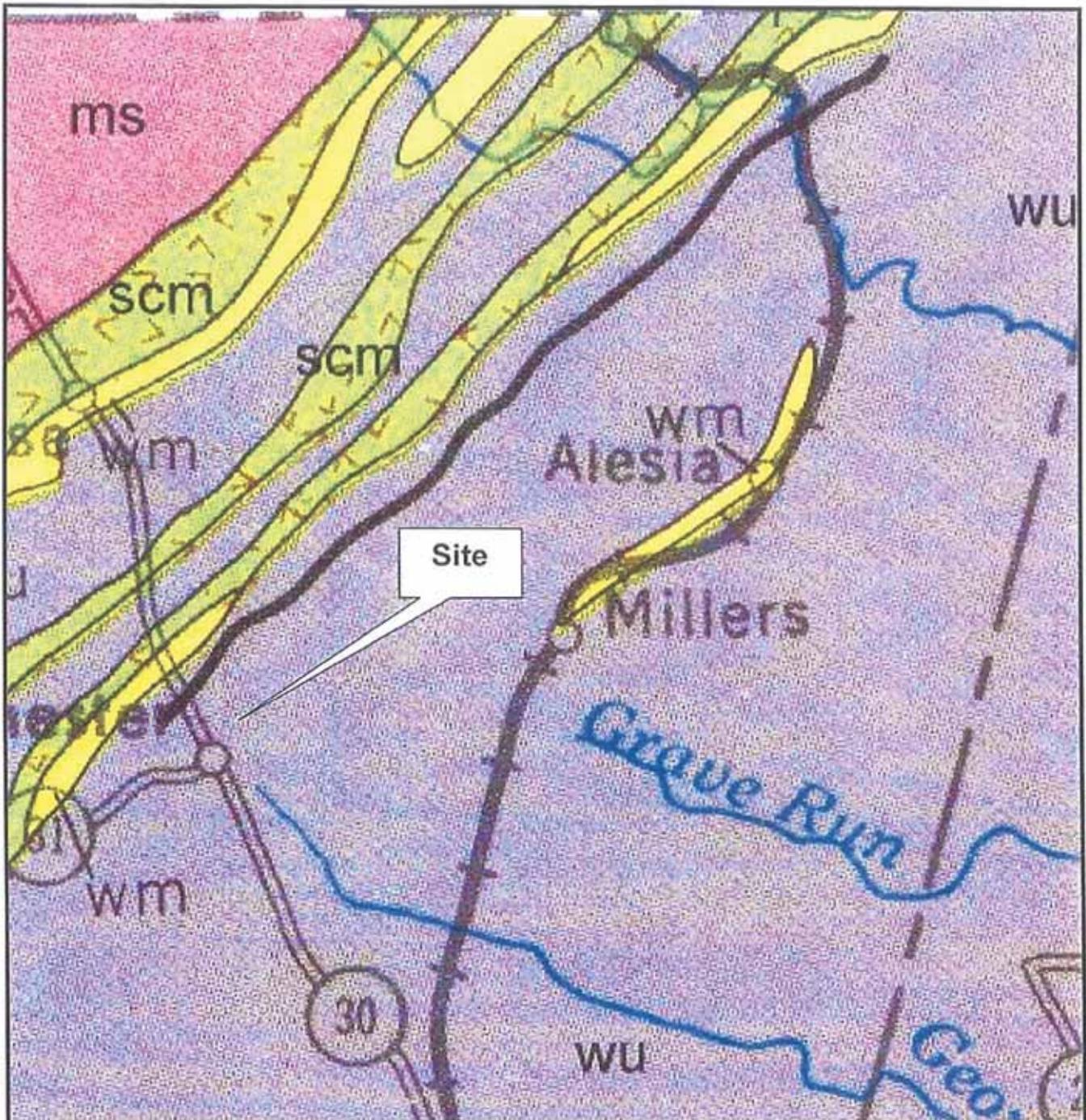
# FOUNDATION TEST GROUP

## Test Location Plan

Sheetz Property  
 Geotechnical Field Infiltration Study  
 3281 Main St.  
 Manchester, Maryland  
 FTG Project No.: F10027

2601 Emory Road, Bldg 1-A, Finksburg, Maryland 21048  
 Phone: (410)517-0715 • Fax: (410)517-0716

Figure No. : 3



**FOUNDATION  
TEST GROUP**

**Site Geologic Map**

Sheetz Property  
Geotechnical Field Infiltration Study  
3281 Main St.  
Manchester, Maryland  
FTG Project No.: F10027

2601 Emory Road, Bldg 1-A, Finksburg, Maryland 21048  
Phone: (410)517-0715 • Fax: (410)517-0716

**Figure No. : 4**



# FOUNDATION TEST GROUP, INC.

2601 Emory Road, Building 1-A • P.O. Box 242 • Finksburg, Maryland 21048  
(410) 517-0715 • FAX (410) 517-0716

## Description of Soils – per ASTM D2487

Major Component	Component Type	Component Description	Symbol	Group Name
Coarse-Grained Soils, More than 50% is retained on the No. 200 sieve	Gravels – More than 50% of the coarse fraction is retained on the No. 4 sieve. Coarse = 1" to 3" Medium = 1/2" to 1" Fine = 1/4" to 1/2"	Clean Gravels <5% Passing No. 200 sieve	GW	Well Graded Gravel
		Gravels with fines, >12% Passing the No. 200 sieve	GP	Poorly Graded Gravel
			GM	Silty Gravel
	Sands – More than 50% of the coarse fraction passes the No. 4 sieve. Coarse = No. 10 to No. 4 Medium = No. 10 to No. 40 Fine = No. 40 to No. 200	Clean Sands <5% Passing No. 200 sieve	SW	Well Graded Sand
		Sands with fines, >12% Passing the No. 200 sieve	SP	Poorly Graded Sand
			SM	Silty Sand
Fine Grained Soils, More than 50% passes the No. 200 sieve	Silts and Clays Liquid Limit is less than 50 Low to medium plasticity	Inorganic	ML	Silt
			CL	Lean Clay
		Organic	OL	Organic silt
				Organic Clay
	Silts and Clays Liquid Limit of 50 or greater Medium to high plasticity	Inorganic	MH	Elastic Silt
			CH	Fat Clay
		Organic	OH	Organic Silt
				Organic Clay
Highly Organic Soils	Primarily Organic matter, dark color, organic odor		PT	Peat

## Proportions of Soil Components

Component Form	Description	Approximate percent by weight
Noun	Sand, Gravel, Silt, Clay, etc.	50% or more
Adjective	Sandy, silty, clayey, etc.	35% to 49%
Some	Some sand, some silt, etc.	12% to 34%
Trace	Trace sand, trace mica, etc.	1% to 11%
With	With sand, with mica, etc.	Presence only

## Particle Size Identification

Particle Size	Particle dimension
Boulder	12" diameter or more
Cobble	3" to 12" diameter
Gravel	1/4" to 3" diameter
Sand	0.005" to 1/4" diameter
Silt/Clay (fines)	Cannot see particle

## Cohesive Soils

Field Description	No. of SPT Blows/ft	Consistency
Easily Molded in Hands	0 – 3	Very Soft
Easily penetrated several inches by thumb	4 – 5	Soft
Penetrated by thumb with moderate effort	6 – 10	Medium
Penetrated by thumb with great effort	11 – 30	Stiff
Indented by thumb only with great effort	Greater than 30	Hard

## Granular Soils

No. of SPT Blows/ft	Relative Density
0 – 4	Very Loose
5 – 10	Loose
11 – 30	Medium Dense
31 – 50	Dense
Greater than 50	Very Dense

## Other Definitions:

- **Fill:** Encountered soils that were placed by man. Fill soils may be controlled (engineered structural fill) or uncontrolled fills that may contain rubble and/or debris.
- **Saprolite:** Soil material derived from the in-place chemical and physical weathering of the parent rock material. May contain relic structure. Also called residual soils. Occurs in Piedmont soils, found west of the fall line.
- **Disintegrated Rock:** Residual soil material with rock-like properties, very dense, N = 60 to 51/0".
- **Karst:** Descriptive term which denotes the potential for solutioning of the limestone rock and the development of sinkholes.
- **Alluvium:** Recently deposited soils placed by water action, typically stream or river floodplain soils.
- **Groundwater Level:** Depth within borehole where water is encountered either during drilling, or after a set period of time to allow groundwater conditions to reach equilibrium.
- **Caved Depth:** Depth at which borehole collapsed after removal of augers/casing. Indicative of loose soils and/or groundwater conditions.



**FOUNDATION TEST GROUP, Inc.**

2601 Emory Road, Bldg. 1A, Finksburg, Maryland 21048

Phone:(410)517-0715, Fax:(410)517-0716

Project Name Geo. Field Infiltration Study

Location Sheetz Property

Job Number F10027

Test Pit Number TP-1

Page Number 1 of 1

**TEST PIT LOG**

Surf. Elev. approx. 980'

Date Started 6/2/2010

Completed 6/2/2010

Inspector Thomas Clingan

ELEV.	SOIL DESCRIPTION Color,Moisture,Density,Size,Proportion	STRA. DEPTH	DEPTH SCALE	SAMPLING NOTES
980.0	SURFACE		0.0	
	FILL. Silt to Sandy Silt with slight to moderately weathered (phyllite/schist) rock fragments with roots; medium brown to slightly red -brown; slightly moist			Topsoil = 0.75 - 1.2 ft
978.8		1.2	1.0	
	FILL, Poorly-Graded Sand, predominately very fine grained, trace silt, trace mica, trace (sandstone) rock fragments; loose, light grey to tan, slightly moist.			Probable Fill
			2.0	
975.5		2.5	3.0	
	SILT to Sandy SILT (ML), with coarse to very coarse moderately weathered rock fragments (phyllite schist); red-brown to brick red to silvery red, slightly moist			
			4.0	
			5.0	
			6.0	
			7.0	Double Ring Infiltration Test at 7.5 ft Final Infiltration Rate = 0.5 in./hr
972.5	% Rock fragments = 30%	7.5		
	Bottom of Test Pit @7.5 ft.		8.0	

Groundwater Readings				
	Time	Date	Depth	Cave-In
Encountered	9:00 AM	6/2/2010	none	
At Completion	11:00 AM	6/2/2010	none	

**Double Ring Infiltration Test - ASTM D 3385**

Project Name: Sheetz Property  
 Test Location: TP-1  
 Test Depth: 7.5 ft  
 Test By: TAC  
 Date of Test: 6/2/2010

Area: 730.0 cm<sup>2</sup>  
 Inner Ring: 2180.0 cm<sup>2</sup>  
 Annular Space: 0.0  
 Ground Temp: 65 °F  
 Water Temp: 60 °F

Depth of Liquid: 5.0 cm  
 5.2 cm

Container Volume: 3000.0 cm<sup>3</sup>  
 10000.0 cm<sup>3</sup>

Unit Volume: 79.0 cm<sup>3</sup>/cm  
 170.0 cm<sup>3</sup>/cm

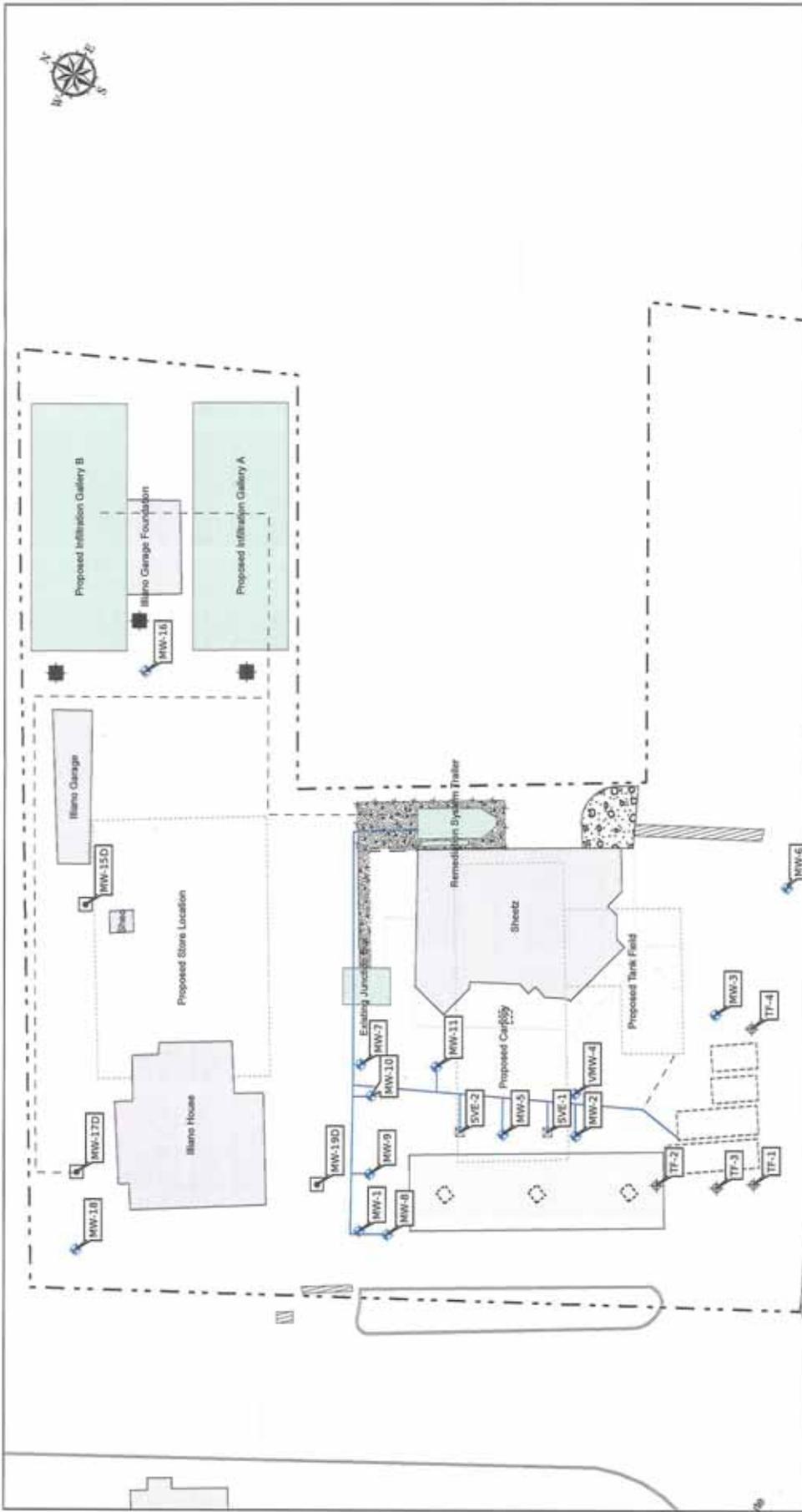
Increment	Time Start	Elapsed Time (Min)	Flow Readings		Annular Space Reading	Flow	Incremental Infiltration Rate (cm/hr)		Remarks
			Inner Ring Reading	Flow			Inner	Annular	
0	11:24 AM	0.0	0.0	---	0.0	---	---	---	
1	11:39 AM	15.0	660.0	2640.0	1860.0	7440.0	14.5	5.7	5.4
2	11:54 AM	30.0	1580.0	3680.0	3460.0	6400.0	20.2	7.9	4.6
3	12:09 PM	45.0	2560.0	3920.0	4420.0	3840.0	21.5	8.5	2.8
4	12:24 PM	60.0	3530.0	3880.0	5370.0	3800.0	21.3	8.4	2.7
5	12:54 PM	90.0	4490.0	1920.0	8110.0	5480.0	5.3	2.1	2.0
6	1:24 PM	120.0	5470.0	1960.0	10960.0	5700.0	5.4	2.1	2.1
7	2:24 PM	180.0	6410.0	940.0	16860.0	5900.0	1.3	0.5	1.1
8	3:24 PM	240.0	7310.0	900.0	22460.0	5600.0	1.2	0.5	1.0



**FOUNDATION TEST GROUP, Inc.**

2601 Emory Road, Bldg. 1A  
 Finksburg, Maryland 21048  
 Phone: (410)517-0715  
 Fax: (410)517-0716

ATTACHMENT II



**Legend**

- Infiltration Gallery
- Monitoring Point (Figure II-2)
- Deep Well
- Shallow Well
- Tank Field
- Well
- Potable Well
- Soil Vapor Point
- Fence
- Gate
- Existing Piping
- Proposed Piping
- Curbing
- Building
- Canopy
- Dispenser
- UST
- Proposed Features
- Remediation System
- Riprap
- Storm Drain
- Site Boundary
- Concrete
- Stone Pathway

**Scale:** 0 30 60 Feet

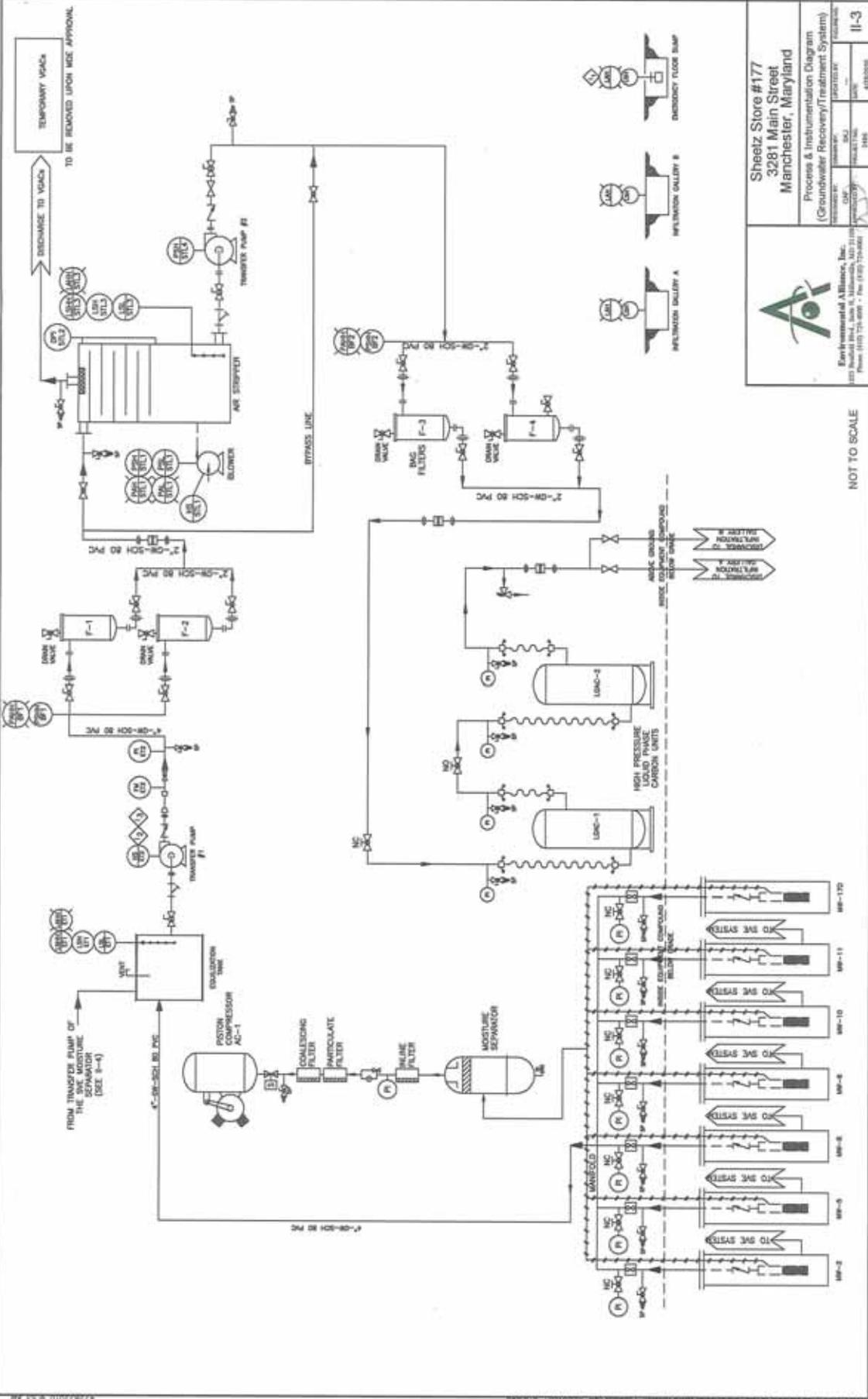
**Source:** Google Earth, 2009

**Sheetz Store #177**  
 3281 Main Street  
 Manchester, Maryland  
 Remediation System Layout

**Environmental Alliance, Inc.**  
 1810 Redwood Blvd., Suite 10, Silver Spring, MD 20910  
 Phone: (301) 726-6666 Fax: (301) 726-6667

**II-1**





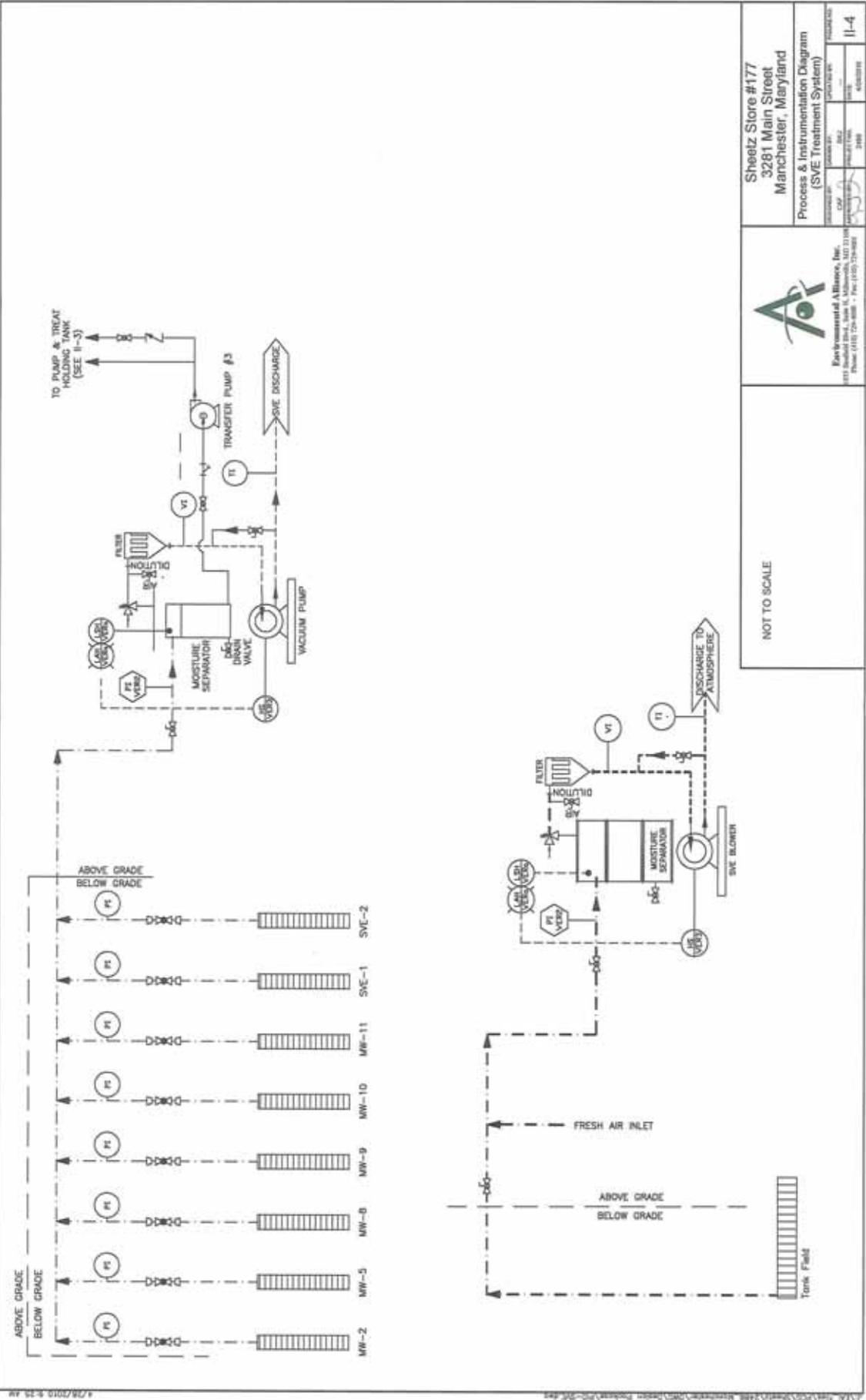
Sheet Store #177  
 3281 Main Street  
 Manchester, Maryland

Process & Instrumentation Diagram  
 (Groundwater Recovery/Treatment System)

PROJECT NO.	177
DATE	11-83
SCALE	AS SHOWN
DRAWN BY	MS
CHECKED BY	MS
APPROVED BY	MS
DATE	11-83

**Environmental Alliance, Inc.**  
 100 South Hill, Suite 6, Baltimore, MD 21206  
 Phone: (410) 724-8000 • Fax: (410) 724-8001

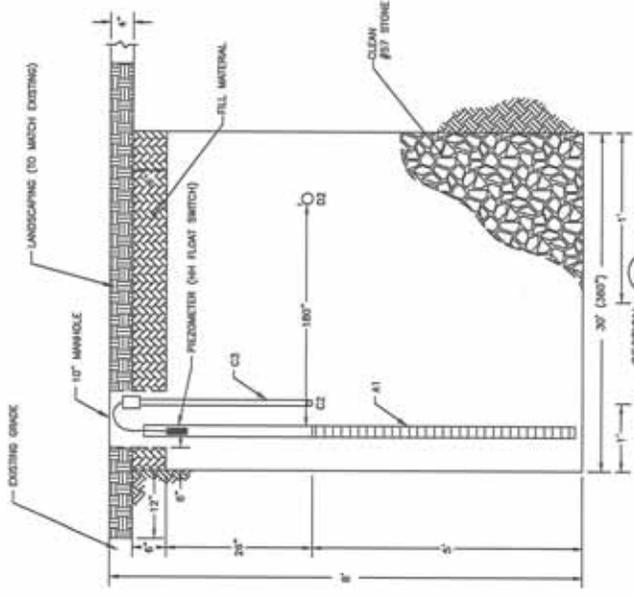
NOT TO SCALE



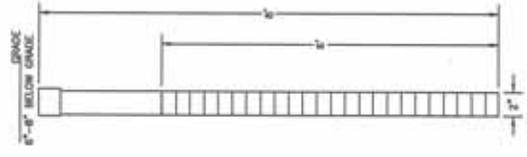
Sheet Store #177  
 3281 Main Street  
 Manchester, Maryland  
 Process & Instrumentation Diagram  
 (SVE Treatment System)

Environmental Alliance, Inc.  
 8715 Indian Rock Lane, A. Silver Spring, MD 20910  
 Phone: (410) 274-3888 • Fax: (410) 274-9688

NOT TO SCALE



SECTION E 2/5  
TYPICAL CHARACTERISTIC OF INFILTRATION GALLERY



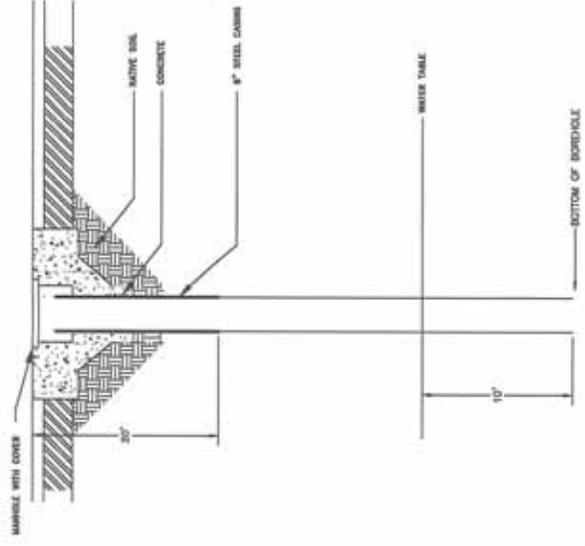
PEZIMETER CONSTRUCTION DETAILS

Number of Points - Three  
Well Construction - Schedule 40 PVC  
Well Head - 10" Manhole

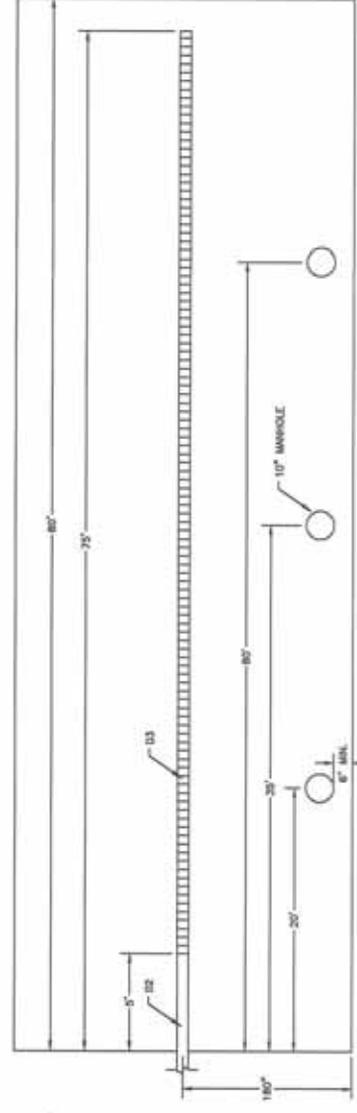
PVC	DESCRIPTION
A1	2" SCH 40 PVC w/ 3' of solid 3/4" 5' of screen.
C3	1" Carbon Conduit from system to infiltration gallery.
C3	1/2" Carbon Conduit from C3 in the infiltration gallery to the well head.
B3	2" SCH 40 PVC discharge line from system to infiltration gallery.
B3	2" SCH 40 screened PVC which either infiltration gallery.

NOTES

1. ONLY ONE PEZIMETER IN EACH GALLERY
2. WELL COVER A HIGH-HIGH FLIGHT SWITCH
3. WELL TO SOLE



TOOL DEPTH = 10' INTO ORIGINAL GROUNDWATER TABLE  
OPEN BOREHOLE = 20" TO TO  
NUMBER OF POINTS = THREE  
WELL HEAD = 10" MANHOLE  
WELL COVER = 6" OPEN BOREHOLE



TYPICAL INFILTRATION GALLERY CROSS SECTION

Sheetz Store #177  
2381 Main Street  
Manchester, Maryland  
Infiltration Gallery Cross Section  
and Monitoring Point Details



Environmental Alliance, Inc.  
803 North Main Street, Suite 200  
Phone (410) 724-2000 • Fax (410) 724-6491

PROJECT NO.	11-5
DATE	11-5
DESIGNER	11-5