

TRIP REPORT

Date: November 17, 2015

To: Rob Simcik

From: Scott R. Anderson, Hydrogeologist

Subject: Summary of Soil Infiltration Tests
Valley Forge Road
Sunoco Pipeline/Valve Stations
Juniata Township, Blair County, Pennsylvania

This trip report provides results of soil infiltration tests that were completed as part of the Segment 2 Pipeline Project for Sunoco, in Juniata Township, Blair County, Pennsylvania.

1.0 PURPOSE

This report presents the field data and results of double ring soil infiltration tests conducted to support the design of stormwater management systems at several locations in Juniata Township, Blair County, Pennsylvania. Two shallow test (IT-1 and IT-2) were performed at the property. Test locations are listed by coordinates (latitude and longitude) in Table 1 and shown on the attached figures.

2.0 FIELD ACTIVITIES

The infiltration tests were conducted by Scott Anderson of Tetra Tech, Inc., on September 11, 2015. The test locations were positioned in the field using a handheld, WAAS-enabled GPS unit and reference to google earth map. Table 1 provides the coordinates recorded in the field. IT-1 and IT-2 were located in an open grass maintained field. Photographs of testing locations are attached to this report.

The infiltration tests were performed in accordance with the procedure specified in the 2006 Pennsylvania Stormwater Best Management Practices (BMP) Manual. Double ring tests were performed at this site. The double ring test locations were prepared for test locations with a shovel. The double-ring infiltrometers that were used for testing consisted of 10-inch and 6-inch diameter sections of 10-inch steel casing. After digging to the target depth, the test surface was leveled, and any loose soil or fallen vegetation was removed. The rings were driven a minimum of 2 inches into the soil. Infiltration test depths are provided on Table 1.

Test locations were pre-soaked for 1 hour. The tests were then conducted with measurements at 30-minute intervals, based on the observed water level drops during the pre-soak period. Pre-soak and test information was recorded on infiltration test sheets; copies of the test sheets are attached to this report.

During the testing, the weather was sunny and warm, approximately 80 degrees Fahrenheit, and no precipitation was observed during the tests.

In addition, two hand auger locations were advanced to 30 inches bgs near the testing locations to characterize the soil, determine the depth to bedrock, if encountered, and inspect for evidence of the seasonal high water table. The hand auger advancement was completed to refusal. Additionally, a test boring to auger refusal at 15 feet bgs was previously completed (July 14, 2015).

Descriptions of the soil were recorded on field logs, which were based on the form example in the BMP manual. Copies of the field soil logs and boring log are attached to this report.

3.0 RESULTS

3.1 SOILS DESCRIPTION

Soils encountered generally consisted of approximately 9 inches of topsoil/surface layer of dark brown silt with much angular rock and trace clay (silt loam). This layer was underlain by dark brown silt and sand with trace clay and angular rock (silt loam). Hand auguring was difficult below 9 inches bgs due to the numerous angular rocks. Thin grass roots were encountered in the topsoil/surface soils with trace roots being observed in the underlying soil horizon. Table 1 summarizes the depths of the infiltration tests (hand auger completed approximately 2 feet deeper than infiltration test depths).

The soils were noted to be dry during the hand augering activities. No mottling of soils or groundwater was recorded.

According to United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey¹ data, the soil types for the test locations are mapped as follows:

- IT-1 and IT-2 – Berks channery silt loam (BkD soil symbol) with 15 to 25 percent slopes

Based on the interactive website PaGEODE, the geology of the site is sandstone of the Catskill Formation. The Catskill Formation consists of grayish-red sandstone, siltstone, shale and mudstones, generally in a fining-upward sequence. A Geologic map is attached to this report.

3.2 INFILTRATION TEST RESULTS

¹ <http://websoilsurvey.nrcs.usda.gov/>. Accessed November 4, 2015.

Summary of Soil Infiltration Tests
Valley Forge Road
Sunoco Pipeline/Valve Stations

Table 1 summarizes the infiltration rates (inches per hour) calculated from the test data. Infiltration rates presented in Table 1 were calculated from the average water level drop of the last four readings measured in the inner ring.

IT-1 and IT-2 tests exhibited slow rates of infiltration requiring a 30-minute test cycle.

Table 1
Summary of Infiltration Test Results
Valley Forge Road
Juniata Township, Blair County, PA
Sunoco Pipeline/Valve Stations

Test Location (IT-)	Location Data		Test Depth (inches)	Infiltration Test Result (inches/hour)
	LATITUDE	LONGITUDE		
IT-1	40° 24' 16.85"	78° 29' 37.51"	6	0.5
IT-2	40° 24' 16.56"	78° 29' 37.63"	6	1.0

ATTACHMENTS

SITE FIGURE

Figure 1

Infiltration Testing and Soil Boring Locations
Valley Forge Road EFRD
Soil Type: Bedington Channery Silt Loam (BeC)
Blair County, PA

Legend
📌 Infiltration Tests or Test Borings



Google Earth

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Dry Run Rd

300 ft



SOIL LOGS

Soil Log

Tested By: Scott Anderson

Project: Sunoco Pipeline

Project No.: 1121C07306 25

Test Pit: Valley Forge Road Date: 9/11/15

Elevation: _____

Equipment Used: Hand Auger

Geology: Catskill Formation Soil Type: BKD - Berks cherty silt loam

Land Use: Agricultural

Weather: 80°F, Sunny

Additional Comments

Horizon	Upper Boundary	Lower Boundary	Soil Textural Class	Type, Size, Coarse Fragments, etc.	Soil Color	Color Patterns	Pores, Roots, Rock Structure	Depth to Bedrock	Depth to Water	Comments
O	0"	9"	Silt loam	Silt with rock and trace clay	Dark Brown	NONE	Numerous roots, pores	> 3'	> 3'	Topsoil
A	9"	30"	Silt loam	Silt and sand with trace clay and rocks	Dark Brown	NONE	NONE	> 3'	> 3'	

Horizon:	USDA Definition	Soil Textural Class	Boundary	Notes:
O	Organic debris	Use ternary diagram from US Department of Agriculture Soil Conservation Service	Use depth and classification	- Very rocky (> 1/4 to 1/2" flat, sandstones)
A	Dark colored, mixed mineral organic matter		Classification as Follows:	
B	Maximum accumulation of silicate clay minerals		Abrupt	
C	Weathered parent material		<u>Clear</u>	
R	Layer of consolidated rock beneath the soil		Gradual	
			Diffuse	



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 240 Continental Drive, Suite 200
 Newark, Delaware 19713
 302.798.7551
 fax: 302.454.5988

TEST BORING LOG

Project Name:	SUNOCO PENNSYLVANIA PIPELINE PROJECT	Project No.:	1031P3406
Project Location:	VALLEY FORGE ROAD, DUNCANSVILLE, PA	Page 1 of 1	
EFRD No.:	VALLEY FORGE ROAD	Dates(s) Drilled:	07-14-15
Boring No.:	VB-01 (SURF. ELEV. ~1455)	Drilling Method:	SPT - ASTM D1586
Drilling Contractor:	HYNES	Groundwater Depth (ft):	NOT ENCOUNTERED
Boring Location Coordinates:	40°24'16.45"N	Total Depth (ft):	1 15.0
			78°29'37.94"W

Sample No	Sample Depth (ft)		Strata Depth (ft)		SPT (blows)	Strata (USCS)	Description of Materials	6" Increment Blows *			N	
	From	To	From	To								
1	1.0	2.5	0.0	0.8	8		TOPSOIL (10")					
2	3.5	5.0			16	A (SC/CL)	DR. DARK BROWN FINE SAND AND CLAY, TRACE FINE ROCK FRAGMENTS.	2	3	6		9
3	6.0	7.5			0		DR. DARK BROWN FINE SAND AND CLAY, WITH PARTIALLY WEATHERED LAYERS OF SILTSTONE (OR SHALE)	5	24	15		39
							NO RECOVERY DUE TO TIP PLUGGED WITH SHALE.	15	24	15		39
4	8.5	9.5	8.0		4	B	PARTIALLY WEATHERED GRAY AND RED SILTSTONE (OR SHALE)	15	50/6"			>50
5	13.5	14.3			5		PARTIALLY WEATHERED GRAY SILTSTONE (OR SHALE)	12	50/3"			>50
							AUGER REFUSAL AT 15'					
							CAVED AND DRY AT 7'.					

Notes/Comments:
 Pocket Pentameter Testing
 S1: 3.5 TSF
 S2: >4 TSF

DR. DECOMPOSED ROCK

Strata (USCS) Designations are approximated based on visual review, except where indicated in Description of Materials
 * Number of blows of 140 lb Hammer dropped 30 in, required to drive 2 in split-spoon sampler in 6 in increments.
 N: Number of blows to drive spoon from 6" to 18" interval.

INFILTRATION TEST DATA SHEETS

Valley Forge Rd. #1		Test Loc. 6" deep	Test Date 9/11/2015	
Time	Elapsed Time (minutes)	Water Level Drop (in)	Volume of Water Added (L)	
1100	30	0.25	0.1	
1130	60	0.25	0.1	
1200	90	0.25	0.1	
1230	120	0.25	0.1	
1300	150	0.25	0.1	
1330	180	0.25	0.1	
1400	210	0.25	NA	
				Infiltration Rate
				Average Stabilized Rate (in/hr)
				0.5

Valley Forge Rd. #2		Test Loc. 6" deep	Test Date 9/11/2015	
Time	Elapsed Time (minutes)	Water Level Drop (in)	Volume of Water Added (L)	
1140	30	0.50	0.3	
1210	60	0.50	0.3	
1240	90	0.50	0.3	
1310	120	0.50	0.3	
1340	150	0.50	0.3	
1410	180	0.50	0.3	
				Infiltration Rate
				Average Stabilized Rate (in/hr)
				1.0



TETRA TECH

INFILTRATION TEST DATA SHEET

PROJECT NAME: Sunoco Preline TEST AREA ID: Valley Forge Road IT #1
 PROJECT NUMBER: 1121107309 PERSONNEL: SA + TR

TEST METHOD: Double-Ring Infiltrometer Percolation
 INNER RING INSIDE DIAMETER: 6" Location Coordinates or Description:
 OUTER RING INSIDE DIAMETER: 10" N: 40, 24, 16.85
 W: 78, 29, 37.51

PERCOLATION HOLE DIAMETER: — (If performing an open hole percolation test)
 DATE(S): 9/11/2015
 Distance from the bottom of the inner ring/hole to measuring point 7"
 (minimum water column of 4-6 inches):
 MEASURING POINT: Ring Rim Indicator Mark — DEPTH OF TEST: — 6"

TIME	ELAPSED TIME SINCE START OF TEST (minutes)	WATER LEVEL DROP, INNER RING OR PERCOLATION HOLE (inches)	VOLUME OF WATER ADDED AT EACH CYCLE* (units <u>dm³/L</u>)	REMARKS
PRESOAK DATA				
1000	30 0	0		Filled (450ml) Start Test
1030	30 (30)	1/2" In, 1/2" Out	350ml In, 1200ml Out	
1100	60 (60)	1/4" In, 1" Out	150ml In, 850ml Out	
TEST DATA				
1100	30 60	— see above		
1130	30 (90)	1/4" In, 3/4" Out	100ml In, 700ml Out	
1200	60 (120)	1/4" In, 3/4" Out	100ml In, 700ml Out	
1230	90 (150)	1/4" In, 3/4" Out	100ml In, 700ml Out	
1300	120 (180)	1/4" In, 3/4" Out	100ml In, 700ml Out	
1330	150 (210)	1/4" In, 3/4" Out	100ml In, 700ml Out	
1400	180 (240)	1/4" In, 3/4" Out	—	END OF TEST

*For double ring test, the volume of water added equals the sum for the inner and outer rings.



TETRA TECH

INFILTRATION TEST DATA SHEET

PROJECT NAME: Sunoco Pipeline
PROJECT NUMBER: 1121102309

TEST AREA ID: Valley Forge Road IT #2
PERSONNEL: SAH/HR

TEST METHOD: Double-Ring Infiltrometer Percolation

Location Coordinates or Description:

N: 40° 24' 16.56"
W: 78° 29' 37.63"

INNER RING INSIDE DIAMETER: 6"

OUTER RING INSIDE DIAMETER: 10"

PERCOLATION HOLE DIAMETER: —

-(If performing an open hole percolation test)

DATE(s): 9/11/15

7"

Distance from the bottom of the inner ring/hole to measuring point
(minimum water column of 4-6 inches):

MEASURING POINT: Ring Rim Indicator Mark

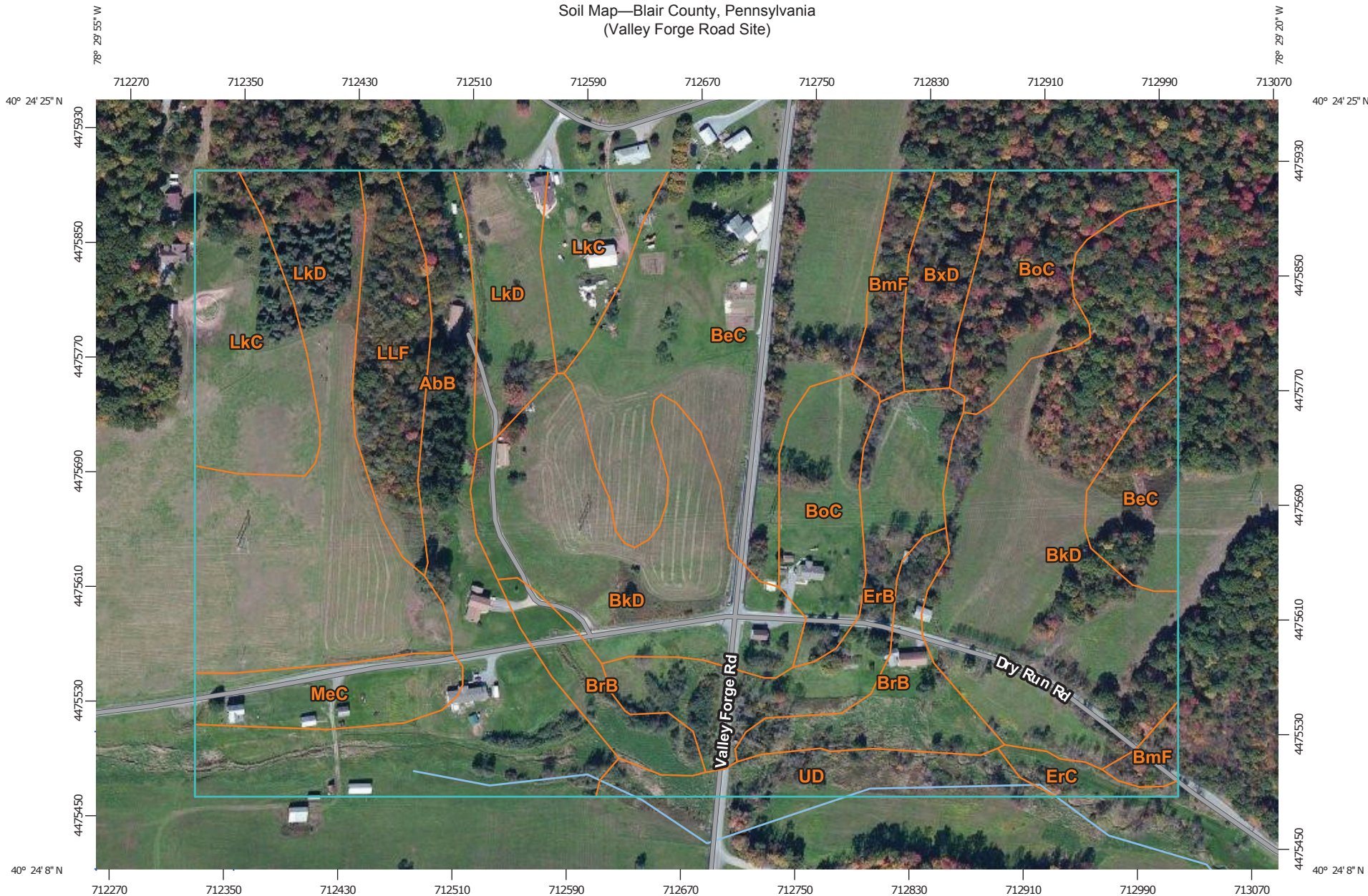
DEPTH OF TEST: 6"

TIME	ELAPSED TIME SINCE START OF TEST (minutes)	WATER LEVEL DROP, INNER RING OR PERCOLATION HOLE (Inches)	VOLUME OF WATER ADDED AT EACH CYCLE* (units _____)	REMARKS
PRESOAK DATA				
1040	0	0		
1110	30 (30)	2 1/4" In, 7/8" Out	1100 ml In 700 ml Out	Filled (first In) Start of Test Soils were very dry Soils were good (no red clay)
1140	60 (60)	1/2" In, 1/8" Out	300 ml In 200 ml Out	
TEST DATA				
1140	0 (60)	1/2" In, 1/8" Out	300 ml In 200 ml Out	
1210	30 (90)	1/2" In, 1/8" Out	300 ml In 200 ml Out	
1240	60 (120)	1/2" In, 1/8" Out	300 ml In 200 ml Out	
1310	90 (150)	1/2" In, 1/8" Out	300 ml In 200 ml Out	
1340	120 (180)	1/2" In, 1/8" Out	300 ml In 200 ml Out	
1410	150 (210)	1/2" In, 1/8" Out	—	END OF TEST

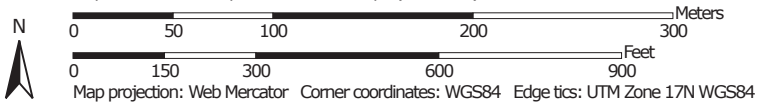
*For double ring test, the volume of water added equals the sum for the inner and outer rings.

SOIL MAP FIGURE AND SUPPORTING MATERIAL

Soil Map—Blair County, Pennsylvania
(Valley Forge Road Site)




Map Scale: 1:3,780 if printed on A landscape (11" x 8.5") sheet.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Blair County, Pennsylvania
Survey Area Data: Version 8, Sep 28, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

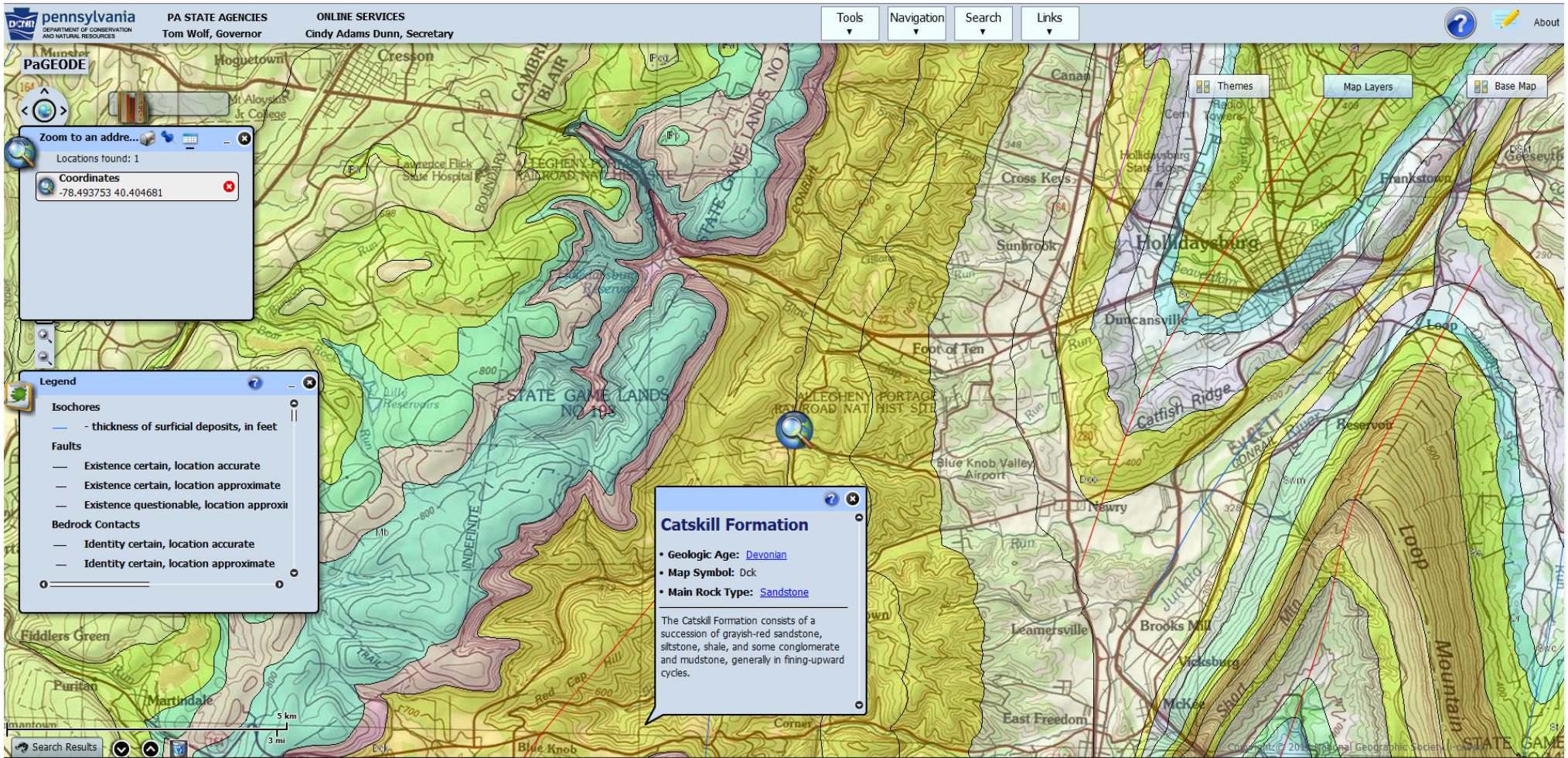
Date(s) aerial images were photographed: Oct 6, 2011—Oct 17, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Blair County, Pennsylvania (PA013)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AbB	Albrights gravelly silt loam, 3 to 8 percent slopes	7.7	10.3%
BeC	Bedington channery silt loam, 8 to 15 percent slopes	11.1	14.9%
BkD	Berks channery silt loam, 15 to 25 percent slopes	16.9	22.7%
BmF	Berks-Weikert channery silt loams, 25 to 70 percent slopes	1.4	1.9%
BoC	Blairton silt loam, 8 to 15 percent slopes	5.8	7.7%
BrB	Brinkerton silt loam, 3 to 8 percent slopes	3.6	4.8%
BxD	Buchanan extremely stony silt loam, 8 to 25 percent slopes	1.6	2.1%
ErB	Ernest silt loam, 3 to 8 percent slopes	4.1	5.4%
ErC	Ernest silt loam, 8 to 15 percent slopes	0.5	0.7%
LkC	Leck kill channery silt loam, 8 to 15 percent slopes	5.4	7.2%
LkD	Leck kill channery silt loam, 15 to 25 percent slopes	9.8	13.2%
LLF	Leck kill channery silt loam, very steep	2.7	3.7%
MeC	Meckesville gravelly silt loam, 8 to 15 percent slopes	1.9	2.6%
UD	Udifluvents-Dystrochrepts complex	2.0	2.7%
Totals for Area of Interest		74.6	100.0%

SITE GEOLOGY MAP



Geologic Map of the Valley Forge Road Site

PHOTOGRAPHS

**PHOTOGRAPHS
INFILTRATION TESTING
SUNOCO PIPELINE
VALLEY FORGE ROAD SITE
BLAIR COUNTY, PA**



Description: Test at Valley Forge Rd. IT-1, approximately 6 inches deep.

Date: September 11, 2015



Description: Test at Valley Forge Rd. IT-2, approximately 6 inches deep.

Date: September 11, 2015