TRIP REPORT
MIDDLETOWN ROAD EFRD SITE – INFILTRATION TESTING

1.0 PURPOSE

This Trip Report presents the field data and results of double-ring soil infiltration tests conducted to support the design of a stormwater management system at the Middletown Road EFRD site located in Edgmont Township, Delaware County, Pennsylvania, as part of the Pennsylvania Pipeline Project (PPP) for Sunoco Pipeline, LP. Two deep and two shallow tests (IT-A and IT-B) were performed at the site. The test locations are listed by coordinates (latitude and longitude) in Table 1 and shown on the attached figure.

2.0 FIELD ACTIVITIES

The infiltration tests were conducted by Jim Goerdt and Jim Coffman of Tetra Tech, Inc., on October 6, 2016. The test locations were positioned in the field using a handheld, WAAS-enabled GPS unit. Table 1 provides the coordinates of the test locations. Both tests were located in a grassy area, approximately 40 feet southwest of Middletown Road.

The infiltration tests were performed in accordance with the procedure specified in the 2006 Pennsylvania Stormwater Best Management Practices (BMP) Manual. The test locations were prepared with hand tools and a mini-excavator, and care was taken to minimize disturbance of the soil surface to be tested. Double-ring infiltrometers were used for testing and consisted of 10-inch diameter and 6-inch diameter sections of steel casing, each 10 inches in height. After digging to the target depth, the test surface was leveled, and loose soil and debris were removed. The rings were driven a minimum of 2 inches into the soil. The infiltration test depths are presented in Table 1.

Test locations were pre-soaked for 1 hour. The tests were then conducted with measurements at 10-minute or 30-minute intervals, based on the observed water level drops during the last half of the pre-soak period. Pre-soak and test information was recorded on infiltration test data sheets; copies of the test data sheets are attached to this report.

During the testing, the weather was sunny, approximately 65 degrees Fahrenheit, and no precipitation was observed during the time of testing. Additionally, less than 0.5 inches of precipitation was observed 24 hours prior to testing.

Test pits were excavated near each testing location to characterize the soil, determine the depth to bedrock, if encountered, and inspect for evidence of the seasonal high water table. The test pits were identified with the corresponding infiltration test name. The test pits were machine-excavated to 2 feet below the target infiltration test depth or refusal, whichever was encountered first. 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 are attached to this report.

3.0 RESULTS

3.1 Soil Description

Soils encountered generally consisted of a deep (up to approximately 36 inches) yellowish red (5YR 4/6) sandy loam topsoil/surface layer with rock fragments ranging from small cobble to small boulder sized. This topsoil/surface layer was underlain by a yellowish red (7.5YR 4/6) loamy sand with rock fragments of similar size as the previous layer. Bedrock was not encountered.

Seasonal high water was not observed at the testing location, nor was any mottling observed.

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

- Glenelg Channery Silt Loam - (GeC2 soil symbol) with 8-15 percent slopes; with medium runoff and is well drained.

3.2 Infiltration Tests Results

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 stabilized readings measured in the inner ring.

The pre-soak test results for IT-A (surface and deep) and IT-B (surface) indicated low infiltration rates, requiring 30 minute test cycles; whereas, the pre-soak test results for IT-B (deep) indicated a high infiltration rate, requiring a 10 minute test cycle.

Two additional test locations (IT-C and IT-D) were not conducted due to their locations being on a berm. The project engineer was notified and a decision was made to cancel the tests.

Table 1
Summary of Infiltration Test Results
Middletown Road ERFD
Edgmont Township, Delaware County, PA
Sunoco PPP

Test Location (IT-)	Location Data		Test Depth (inches)	Infiltration Test Result (inches/hour)
	LATITUDE	LONGITUDE		
IT-A (shallow)	39.9476638°	- 075.5063165°	4	3.34
IT-A (deep)			36	0.13
IT-B (shallow)	39.9475682°	- 075.5061965°	3	0.97
IT-B (deep)			36	2.81

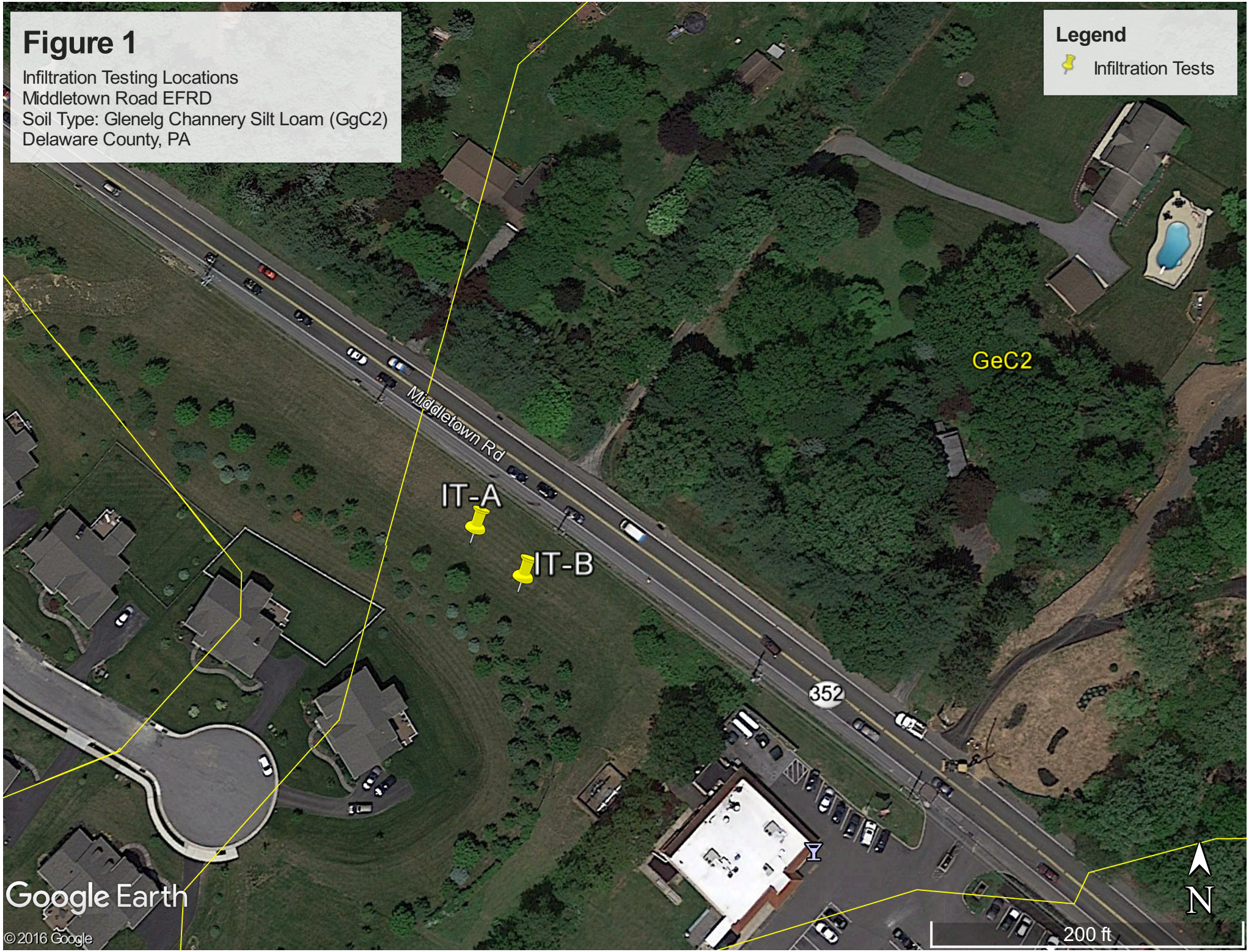
Figure 1
Infiltration Testing Locations
Middletown Road EFRD
Soil Type: Glenelg Channery Silt Loam (GgC2)
Delaware County, PA
Legend
Infiltration Tests
GeC2
Middletown Rd
IT-A
IT-B
352
N
200 ft
Google Earth
© 2016 Google

ATTACHMENTS

SOIL LOGS

TETRA TECH

Soil Log

Tested By: J. Coffman **Project:** Sunoco Mariner E2 **Project No.:** 112IC05958

Test Pit: Middletown Rd (Glen Mills) A/B **Date:** 10/6/16 **Elevation:** _____ **Equipment Used:** akeuch. TB260 track hoe

Geology: Soil **Soil Type:** sand/loam **Land Use:** grass field **Weather:** Sunny 70°

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
A	0"	36"	Sandy loam	little schist (crystalline rock) up to small cobble and boulder size	Org-Brn 5YR 4/6	Solid no mottling	small roots top 2"	—	—	moist
A	36"	60"	loamy sand	smoky quartz ↓	Org-Brn 5YR 4/6	Solid no mottling		—	—	moist

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 Classification as Follows: Abrupt	*Locations C & D canceled - due to berm (Engineer's decision) (see photo #21, pit lays in upper left and right of photo. Photo #23 after backfilling.
A	Dark colored, mixed mineral organic matter			
B	Maximum accumulation of silicate clay minerals		Clear	
C	Weathered parent material		Gradual	
R	Layer of consolidated rock beneath the soil		Diffuse	

Table based on: Sample soil log located on page 12 of the Pennsylvania Stormwater Best Management Practices Manual
USDA Definitions located from: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054308

INFILTRATION TEST DATA SHEETS

INFILTRATION TEST DATA SHEET

Tetra Tech, Inc.

PROJECT NAME: Sunoco PPP
PROJECT NUMBER: 112IC07~~77980~~ 5958
TEST AREA ID: IT-A (Glen Mills) Middletown Rd
PERSONNEL: J. Goodt

TEST METHOD: (Double Ring Infiltrometer) Percolation
Single Ring Infiltrometer

39.9476638 -075.5063165
Location Coordinates or Description:
Grassy area just SW of Middletown Rd. Approx 100' SE NW of valve.

INNER RING INSIDE DIAMETER/HEIGHT: 6"
OUTER RING INSIDE DIAMETER/HEIGHT: 10"

PERCOLATION HOLE DIAMETER: — (If performing an open hole perc test)

DATE(s): 10/6/16 Rainfall within last 24 hrs < 0.5

Distance from the bottom of the inner ring/hole to measuring point (minimum water column of 6-8 inches): 7"

MEASURING POINT: (Ring Rim) Indicator Mark

DEPTH OF TEST: 4"

TIME	ELAPSED TIME SINCE START OF TEST (minutes)	WATER LEVEL DROP, INNER RING OR PERCOLATION HOLE (inches)	VOLUME OF WATER ADDED AT EACH CYCLE, INNER RING (liters)	REMARKS
PRESOAK DATA				
1220	—	----------	3.7 L	Start Pre-soak
1250	30	1 1/16"	0.90 L	
1320	60	1 3/16"	0.95 L	End Pre-Soak
TEST DATA				
1320	0 (60)	----------	—	Start Test
1350	30 (90)	1 1/16"	0.90 L	
1420	60 (120)	1 10/16"	0.90 L	
1450	90 (150)	1 10/16"	0.90 L	
1520	120 (180)	1 12/16"	—	End test

INFILTRATION TEST DATA SHEET

Tetra Tech, Inc.

PROJECT NAME: Sunoco Marple E 2 TEST AREA ID: Middletown Rd (Glen Mills) A
PROJECT NUMBER: 112IC05958 PERSONNEL: J. Coffman

TEST METHOD: ~~Double Ring Infiltrometer~~ Percolation
~~Single Ring Infiltrometer~~

39.9476638 -075.5063165
Location Coordinates or Description:
grass field, slight slope
Photo #19, 22

INNER RING INSIDE DIAMETER/HEIGHT: 6"
OUTER RING INSIDE DIAMETER/HEIGHT: 10"

PERCOLATION HOLE DIAMETER: — (If performing an open hole perc test)

DATE(s): 10/6/16 Rainfall within last 29 hrs < 0.5"

Distance from the bottom of the inner ring/hole to measuring point (minimum water column of 6-8 inches): 7"

MEASURING POINT: (Ring Rim) Indicator Mark DEPTH OF TEST: 36"

TIME	ELAPSED TIME SINCE START OF TEST (minutes)	WATER LEVEL DROP, INNER RING OR PERCOLATION HOLE (inches)	VOLUME OF WATER ADDED AT EACH CYCLE, INNER RING (liters)	REMARKS
PRESOAK DATA				
1425	0	----------	2 1/2 gallons	start of presoak
1455	30	0 0/16	0	
1525	60	0 0/16	0	End Presoak
TEST DATA				
1525	0	----------	—	Start test
1555	30	0 1/16	0.05	
1625	60	0 1/16	0.05	
1655	90	0 1/16	0.05	
1725	120	0 1/16	—	end of test

INFILTRATION TEST DATA SHEET

Tetra Tech, Inc.

PROJECT NAME: Sunoco Mariner E 2 TEST AREA ID: Middletown Rd / Glen Mills B
PROJECT NUMBER: 112IC05958 PERSONNEL: J. Coffman

TEST METHOD: (Double Ring Infiltrometer) Percolation
Single Ring Infiltrometer

39.9475682 -075.506/965
Location Coordinates or Description:
grass area toe of berm - berm looks like fill to sound/privacy proof residential area

INNER RING INSIDE DIAMETER/HEIGHT: 6"
OUTER RING INSIDE DIAMETER/HEIGHT: 10"

PERCOLATION HOLE DIAMETER: — (If performing an open hole perc test)

DATE(s): 10/6/16 Rainfall within last 24 hrs < 0.5"

Distance from the bottom of the inner ring/hole to measuring point (minimum water column of 6-8 inches): 7"

MEASURING POINT: (Ring Rim) Indicator Mark DEPTH OF TEST: 3"

TIME	ELAPSED TIME SINCE START OF TEST (minutes)	WATER LEVEL DROP, INNER RING OR PERCOLATION HOLE (inches)	VOLUME OF WATER ADDED AT EACH CYCLE, INNER RING (liters)	REMARKS
PRESOAK DATA				
1342	0	----------	3.85 L	start of presoak
1412	30	1 1/16"	0.60 L	
1442	60	10/16"	0.40 L	End pre soak
TEST DATA				
1442	0 (60)	----------	—	Start test
1512	30 (90)	7/16"	0.30 L	
1542	60 (120)	9/16"	0.40 L	
1612	90 (150)	7/16"	0.30 L	
1642	120 (180)	8/16"	—	Stop test

INFILTRATION TEST DATA SHEET

Tetra Tech, Inc.

PROJECT NAME: Sunoco Mariner E2 TEST AREA ID: Middletown Rd (Glen Mills) B
PROJECT NUMBER: 112Ic05458 PERSONNEL: J. Coffman

TEST METHOD: (Double Ring Infiltrometer) Percolation
Single Ring Infiltrometer

39.9475682 -075.5061965
Location Coordinates or Description:
toe of berm - berm looks like may be fill to soundwall/visual block residential behind it

INNER RING INSIDE DIAMETER/HEIGHT: 6 "
OUTER RING INSIDE DIAMETER/HEIGHT: 10 "

PERCOLATION HOLE DIAMETER: — (If performing an open hole perc test) * Photo 20

DATE(s): 10/6/16 Rainfall within last 24 hrs < 0.5"

Distance from the bottom of the inner ring/hole to measuring point (minimum water column of 6-8 inches): 6.5"

MEASURING POINT: (Ring Rim) Indicator Mark DEPTH OF TEST: 36"

TIME	ELAPSED TIME SINCE START OF TEST (minutes)	WATER LEVEL DROP, INNER RING OR PERCOLATION HOLE (inches)	VOLUME OF WATER ADDED AT EACH CYCLE, INNER RING (liters)	REMARKS
PRESOAK DATA				
1442	0	----------	2 1/4 gallons	start of presoak
1512	30	2 9/16	1.5 L	
1542	60	2 1/16	1.1 L	End pre-soak
TEST DATA				
1542	0	----------	—	start test
1552	10	0 7/16	0.5	
1602	20	0 8/16	0.3	
1612	30	0 7/16	0.25	
1622	40	0 8/16	0.3	end of test (stabilized)
1632	50			