TRIP REPORT
SCHAEFFER ROAD VALVE 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 Schaeffer Road Valve site located in South Lebanon Township, Lebanon County, Pennsylvania, as part of the Pennsylvania Pipeline Project (PPP) for Sunoco Pipeline, LP. Two deep 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 Keith Simpson and Jake Marlow of Tetra Tech, Inc., on October 5, 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. The tests were located in an agricultural field on the west side of Schaeffer 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.

The 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 drop 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 70 degrees Fahrenheit, and no precipitation was observed during the time of testing. Additionally, no 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 thin (up to approximately 6 inches) dark yellowish brown (10YR 4/4) silt clay loam topsoil/surface layer which contained a few small roots. An illuvial layer was found from 4 to 39 inches below ground surface which consisted of a strong brown (7.5YR 4/6 to 5/6) silt clay loam with a few rock fragments. 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:

- Duffield Silt Loam - (DfA soil symbol) with 0-3 percent slopes; with low runoff and is well drained.

3.2 Infiltration Tests Results

Table 1 summarizes the infiltration rates (inches per hour) calculated from the test data. The 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.

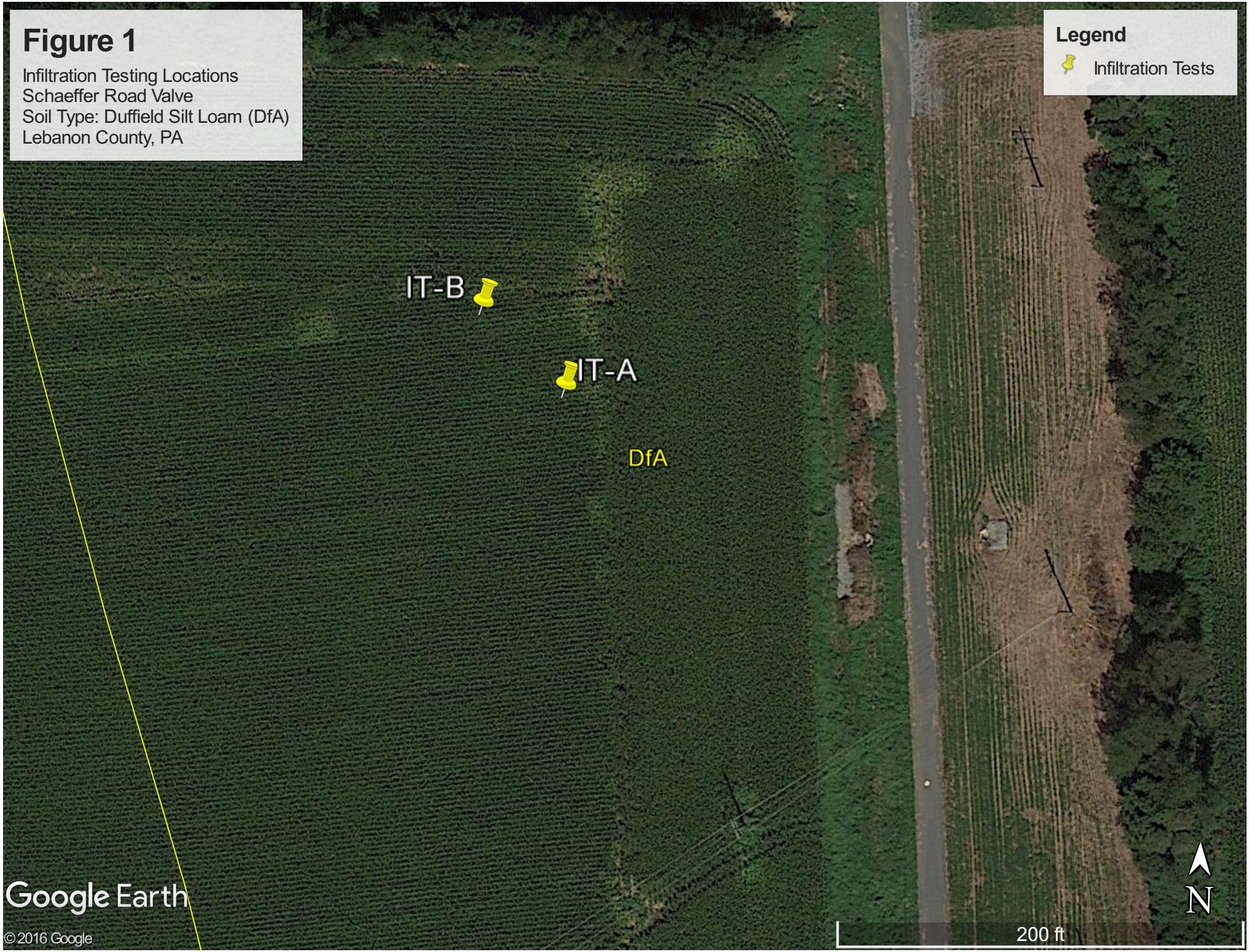
The pre-soak test results for both IT-A and IT-B indicated high infiltration rates, requiring 10 minute test cycles.

Table 1
Summary of Infiltration Test Results
Schaeffer Road Valve
South Lebanon Township, Lebanon County, PA
Sunoco PPP

Test Location (IT-)	Location Data		Test Depth (inches)	Infiltration Test Result (inches/hour)
	LATITUDE	LONGITUDE		
IT-A (deep)	40.2893769°	- 076.3754592°	12	15.19
IT-B (deep)	40.2894416°	- 076.3756122°	12	9.19

Figure 1

Infiltration Testing Locations
Schaeffer Road Valve
Soil Type: Duffield Silt Loam (DfA)
Lebanon County, PA



ATTACHMENTS

SOIL LOGS

TETRA TECH

Soil Log

Tested By: Jake Marlow **Project:** Sunoco - PPP **Project No.:** 112IC05958

Test Pit: Schaffer Road Valve IT-A **Date:** 10/5/16 **Elevation:** _____ **Equipment Used** Mini Excavator

Geology: Buffalo Springs Formation **Soil Type:** Duffield silt loam (DfA) **Land Use:** _____ **Weather:** 70's Sunny

Additional Comments Mini Excavator to 37"

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"	4"	silt clay loam	Clay w/silt trace Fine Sand F-C Gravel	10YR 4/4	Solid	Pores Few roots	-	-	Moist Top soil
B	4"	37"	Silt clay loam	Silt w/clay trace Fine Sand Fe Gravel to Cobble	7.5YR 4/6	Solid	Pores >2" Rock Fragments	-	-	Moist to Damp

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	- Did Not Encounter Seasonal High Groundwater - No Refusal - <0.5" of Rain in Past 24 hours
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

TETRA TECH **Soil Log**

Tested By: Jake Marlow **Project:** Sunoco - PPP **Project No.:** 112IC05958

Test Pit: Schaeffer Road Valve IT-B **Date:** 10/5/16 **Elevation:** _____ **Equipment Used** Mini Excavator

Geology: Buffalo Springs Formation **Soil Type:** Duffield Silt loam (DfA) **Land Use:** _____ **Weather:** 70's Sunny

Additional Comments Mini Excavator to 39"

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"	6"	Silt clay loam	Fine silt w/clay trace to Minor Fine Sand	10YR4/4	Solid	Pores, Few roots	-	-	Moist
B	6"	39"	Silt clay loam	Silt w/clay trace to Minor Fine Sand	7.5YR5/6	Solid	Pores, >1" Rock Fragments	-	-	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	- Did Not Encounter Seasonal High Groundwater - No Refusal - <0.5" of Rain in Past 24hours
A	Dark colored, mixed mineral organic matter		Classification as Follows: Abrupt	
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

A

INFILTRATION TEST DATA SHEET

Tetra Tech, Inc.

KS
~~STA~~ SCHAEFFER RD VALVE

PROJECT NAME: SUNOCO LOGISTICS
PROJECT NUMBER: 112IC05958 - 17
TEST AREA ID: IT - A
PERSONNEL: K. SIMPSON, J. MARLOW

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

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

Location Coordinates or Description:
40.2893769
-076.3754592

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

DATE(s): 10/5/16

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: 1' BGS

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				
15:28	0	----------	3.4	1535 DROP 2" ADD 1.4L
				1545 DROP 2" ADD 1.3L
1558	30	12/16	0.95	1551 " 2" " 1.3L
1628	60	30/16	1.1	~~1554 H~~ KS
				1606 DROP 2" " 1.3L
				1613 " 2" " 1.3L
				1620 " 2" " 1.3L
TEST DATA		10 MIN TEST		
1628	0 (60)	----------	—	START TEST
1638	10 (70)	40/16	1.4	
1648	20 (80)	40/16	1.4	
1658	30 (90)	42/16	1.45	
1708	40 (100)	40/16	1.4	
1718	50 (110)	40/16	1.4	END TEST
	NO RAIN IN THE LAST 24 HRS			

SEE ALSO PHOTO & SOIL LOG

B

INFILTRATION TEST DATA SHEET

Tetra Tech, Inc.

SCHAEFFER RD VALLEY

PROJECT NAME: SUNOCO LOGISTICS
PROJECT NUMBER: 112IC05958 - 17
TEST AREA ID: IT - B
PERSONNEL: K. SIMPSON, J. MARLOW

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

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

Location Coordinates or Description:
40.2894416
-076.3756122

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

DATE(s): 10/5/16

Distance from the bottom of the inner ring/hole to measuring point (minimum water column of 6-8 inches): 6.25"

MEASURING POINT: (Ring Rim) Indicator Mark

DEPTH OF TEST: 1' BGS

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				
15:33	0	----------	3.4	1536 DROP 2" ADD 1.3L 1543 DROP 2" ADD 1.3L
16:03	30	32/16	1.0	1554 " 2" " 1.3L
16:33	60	36/16	1.3	1607 " 2" " 1.3L 1623 " 2" " 1.3
TEST DATA		10 MIN TEST		
1633	0 (60)	----------	—	START TEST
1643	10 (70)	36/16	1.3	
1653	20 (80)	32/16	1.0	
1703	30 (90)	29/16	0.8	
1713	40 (100)	27/16	~~0.65~~ (JM)	Vol. of Water = 0.75
1723	50 (110)	24/16	0.6	
1733	60 (120)	24/16	0.6	
1743	70 (130)	23/16	0.6	End Test
	NO RAIN IN LAST 24 HRS			

SEE ALSO PHOTO & SOIL LOG