TRIP REPORT
GATES ROAD VALVE SITE – INFILTRATION TESTING

1.0 PURPOSE

This Trip Report presents the field data and results of the double-ring soil infiltration test conducted to support the design of a stormwater management system at the Gates Road Valve site located in Conewago Township, Dauphin County, Pennsylvania, as part of the Pennsylvania Pipeline Project (PPP) for Sunoco Pipeline, LP. One shallow test (IT-A) was performed at the site. The test location is listed by coordinates (latitude and longitude) in Table 1 and shown on the attached figure.

2.0 FIELD ACTIVITIES

The infiltration test was conducted by Jim Goerdt and Jim Coffman of Tetra Tech, Inc., on October 5, 2016. The test location was positioned in the field using a handheld, WAAS-enabled GPS unit. Table 1 provides the coordinates of the test location. IT-A was located within an agricultural field approximately 140 feet east of the existing valve and 105 feet north of Gates Road.

The infiltration test was performed in accordance with the procedure specified in the 2006 Pennsylvania Stormwater Best Management Practices (BMP) Manual. The test location was prepared with hand tools, 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 depth is presented in Table 1.

The test location was pre-soaked for 1 hour. The test was 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 were recorded on an infiltration test data sheet; a copy of the test data sheet is 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. Rainfall within the past 24 hours was less than 0.5 inches.

A hand auger was utilized to characterize the soil, determine the depth to bedrock, if encountered, and inspect for evidence of the seasonal high water table near the test area. This was completed from the ground surface down to 27 inches below ground surface. Descriptions of the soil were documented on a field log, which was based on the form example in the BMP manual. A copy of the soil log is attached to this report.

3.0 RESULTS

3.1 Soil Description

Soils encountered generally consisted of a deep (approximately 27 inches) dark reddish brown (5YR 3/4) sandy clay which contained trace sandstone rock fragments. The original test unit was offset due to a gravel layer being found approximately 8 inches below ground surface. It is believed that this gravel layer is a result of farm use. 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 location is mapped as follows:

- Penn Shaly Silt Loam - (PeB2 soil symbol) with 3-8 percent slopes; with low runoff and is well drained.

3.2 Infiltration Tests Results

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

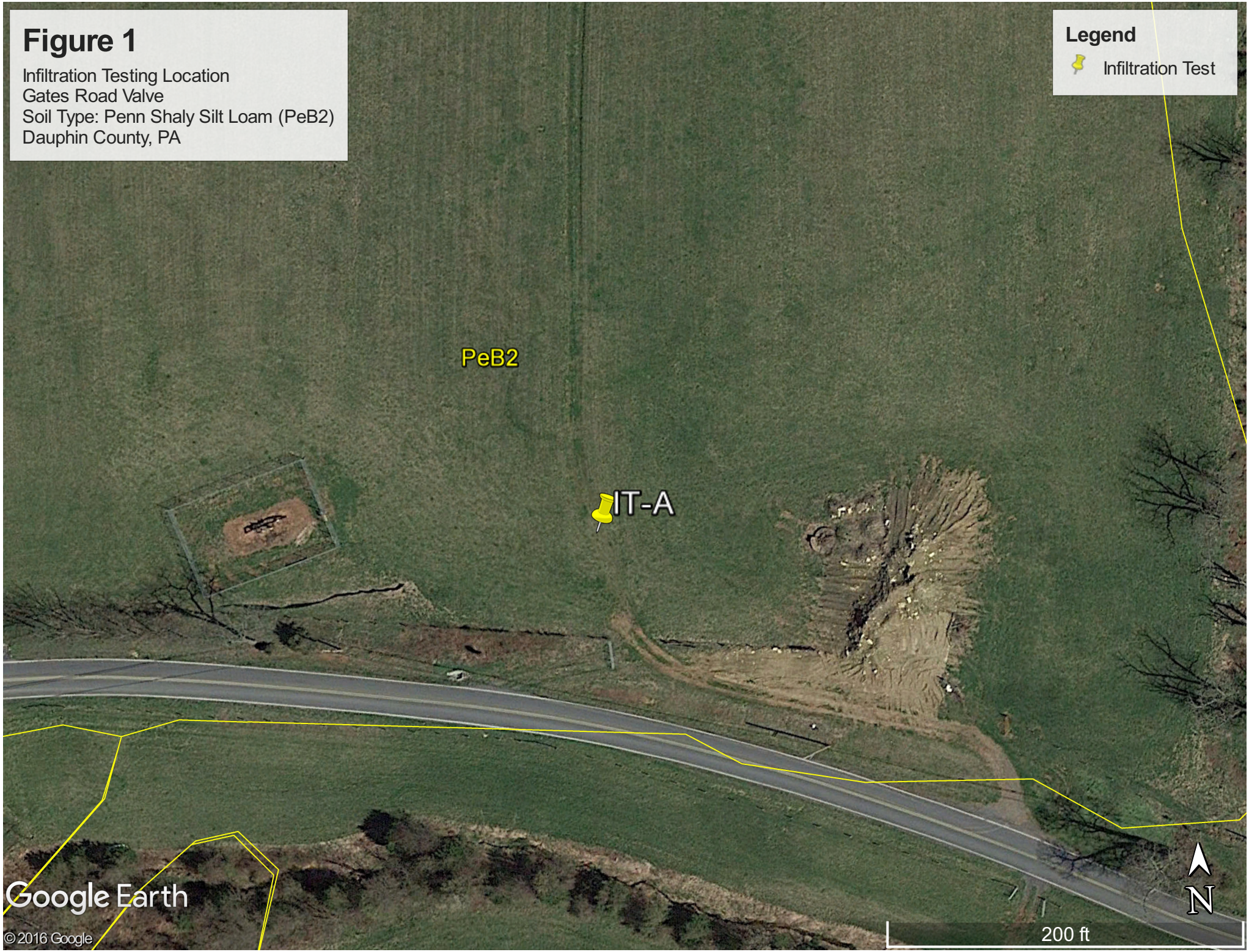
The pre-soak test results for IT-A indicated a high infiltration rate, requiring a 10 minute test cycle.

Table 1
Summary of Infiltration Test Results
Gates Road Valve
Conewago Township, Dauphin County, PA
Sunoco PPP

Test Location (IT-)	Location Data		Test Depth (inches)	Infiltration Test Result (inches/hour)
	LATITUDE	LONGITUDE		
IT-A	40.2470401°	- 076.6182108°	4	6.0

Figure 1

Infiltration Testing Location
Gates Road Valve
Soil Type: Penn Shaly Silt Loam (PeB2)
Dauphin County, PA



ATTACHMENTS

SOIL LOGS

TETRA TECH

Soil Log

Tested By: Gates Rd AS ↙ **Project:** Sunoco/Mariner E2 **Project No.:** 112IC05958

Test Pit: J. Coffman **Date:** 10/5/16 **Elevation:** _____ **Equipment Used:** hand auger/shovel

Geology: Soil **Soil Type:** sandy loam **Land Use:** farmers field (currently grass field) **Weather:** Sunny 70°

Additional Comments Test location moved ^NNE 9' to be located 2 to 3' off farmer's road

NE / N

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"	8"	sandy loam	abundant gravel	Brn-Red 5R 3/4	solid no mottling	small roots (top 2")	—	—	moist, 4 hand auger ft one shovel hole –
	8"		gravel layer			solid no mottling		—	—	refusal consistently on gravel
A	0"	27"	sandy clay	trace SS frag (up to 2"s ea)	Brn-Red 5R 3/4	solid no mottling		—	—	moist one hand auger hole near field fence (perimeter)

2.5' to 7' away from test loc

~50' away (SW) from test loc

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	*gravel may be related to farm use. Photo #18
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

TETRA TECH

Soil Log

Tested By: Jim Coffman **Project:** Sunoco Marine E2 **Project No.:** 112IC05958

Test Pit: Gates Rd A **Date:** 10/5/16 **Elevation:** _____ **Equipment Used** hand auger/shovel

Geology: soil **Soil Type:** sandy loam **Land Use:** farmer's field (currently grass field) **Weather:** Sunny 70°

Additional Comments This soil profile from holes close to (less than 10') test location (See P. 2 for deeper soil log from diff. loc.)

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"	8"	Sandy loam	abundant gravel	Brn-Red 5R 3/4	solid no mottling	Small roots (top 2")	—	—	moist, 4 hand auger + 1 shovel hole-
	8"		gravel layer			solid no mottling		—	—	refusal consistently on gravel (8" deep)

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	Several holes attempted for soil log, as gravel was encountered, possibly related to farm use (former paths). Test location was moved 9' NNE to be 2 to 3' off of farmer's road. Photo #18
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

TETRA TECH **Soil Log**

Tested By: Jim Coffman **Project:** Sunoco Mariner E 2 **Project No.:** 112IC05958

Test Pit: Gates Rd A **Date:** 10/5/16 **Elevation:** _____ **Equipment Used** hand auger/~~shovel~~

Geology: Soil **Soil Type:** Sandy clay **Land Use:** farmer's field-edge of (currently grass field) **Weather:** Sunny 70°

Additional Comments This soil profile from holes ~50' SW of test location on edge of field to hopefully avoid gravel refusal layer from Pg. 1 log

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"	27"	Sandy clay	trace SS frag (up to 2" size)	Burn-Red 5R 3/4	solid no mottling		—	—	moist, one hand-auger hole near field fence (perimeter)

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 for Classification as Follows: Abrupt	Test location moved 9' NNE from plan coords to be 2 to 3' off of farmer's road.
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: 112IC05958
TEST AREA ID: IT. A Gates Road
PERSONNEL: J. Goerdt

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

Location Coordinates or Description:
~150' E of valve fence
40.2470401
-076.6182108

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

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

DATE(s): 10/5/16 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): 8"

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				
1500	—	----------	4.3 L	Start Pre-Soak
1530	30	3 4/16	1.9 L	
1600	60	2 12/16	1.5 L	End Pre-Soak
TEST DATA				
1600	0 (60)	----------	—	Start test
1610	10 (70)	15/16	0.50 L	
1620	20 (80)	1"	0.50 L	
1630	30 (90)	1 1/16"	0.50 L	
1640	40 (100)	1"		End test