



# Geo-Science Engineering & Testing, LLC

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December 2, 2021

SMP Architects  
1600 Walnut Street, #2  
Philadelphia, Pennsylvania 19460

Attention: Todd Woodward, AIA, LEED AP

Reference: Supplemental Stormwater Infiltration Investigation @ Camp Shehaqua  
Hickory Run State Park  
White Haven, Pennsylvania 18661  
GSET Project Number: 20030392

Mr. Woodward,

Geo-Science Engineering & Testing, LLC. (GSET) has completed a site evaluation for stormwater infiltration facilities for Latrine Improvements at the Hickory Run State Park in White Haven, Pennsylvania. All testing was conducted in general accordance with the Pennsylvania Department of Environmental Protection (PADEP)'s *Pennsylvania Stormwater Best Management Practices Manual*, Appendix C – *Site Evaluation and Soil Testing– December 2006* (“BMP Manual”) specifications.

## **1.0 Project Site Conditions**

The purpose of this evaluation was to determine feasibility for stormwater infiltration facilities in support of four, single-story Latrine Buildings and associated parking located throughout the Hickory Run State Park.

This site is designated as the Shehaqua site.

Currently, the dominant land use is that of walking/hiking trails, camping sites and natural setting. Visual inspection of the area also indicates manicured grasses, scrub grasses including upland habitat and mature canopy.

## **2.0 Testing Methods**

In November 2021, two (2) additional test pits were excavated to evaluate and determine the suitability of the soils for stormwater infiltration. The test pit locations and depths were provided by Meliora. The location plan is attached to this report.

The soils were evaluated to determine if the soils have limitations that would affect the design, installation, and function of stormwater infiltration structures. Soil limitations are considered to be features such as a seasonal high water table, perched water table, restrictive soil horizons, massive bedrock, and fractured or open-jointed bedrock. The proposed infiltration sites are evaluated to determine feasibility and conformance to the BMP manual based on soil

morphology. The BMP manual recommends maintaining a two (2) foot separation from the bottom of the proposed infiltration structure and a soil limitation.

Upon documentation of conditions feasible for stormwater infiltration, infiltration tests are performed at the depth of the proposed infiltration structure. For this project, double ring infiltrometers were utilized for testing and are strongly preferred to percolation tests by PADEP for large basins because they discount the exfiltration of water from the sides of percolation holes and provide a much more accurate assessment of potential permeability. All infiltration tests should be performed within  $\pm 1'$  of the design depth.

### **3.0 Results and Recommendations**

Refer to the Test Location Plan, which shows the location of the test pits and infiltration testing. GSET completed a soil morphologic evaluation within each test pit, noting indications, if encountered, to the depth of redoximorphic features and soil horizons restrictive to infiltration based on soil morphology. Our findings are detailed in the Table 1, below.

<u>Test Pit</u>	<u>Ex. Elev.</u>	<u>Test Elev.</u>	<u>Test Depth</u>	<u>Test Pit Depth</u>	<u>Limiting Zone</u>	<u>Field Infiltration Rate 1 (in/hr.)</u>	<u>Field Infiltration Rate 2 (in/hr.)</u>	<u>Field Infiltration Rate Avg. (in/hr.)</u>
TP-8	1583	1581.6	1.4	3.4	NA	1.23	1.15	1.19
TP-9	1586	1581.25	4.75	6.75	NA	1.05	1.08	1.07

The infiltration values expressed in the table above represent actual field measurements, therefore it is recommended that a factor of safety of two (2) be applied to these rates. We also recommend performing post-construction infiltration testing in order to confirm your design parameters.

We appreciate the opportunity to work with you on this project and should you have any questions or require additional information please do not hesitate to contact our office.

Respectfully Submitted,  
 Geo-Science Engineering Co., Inc



Jeremy C. Wint  
 SR Soil Scientist

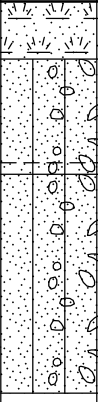
# LOG OF TEST PIT TP-8R

Date Excavated: 11/9/21

Logged by: JW

Equipment: Bobcat Mini Excavator

Surface Elevation(ft): 1583.0

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE	HAND PEN. (tsf)	MOISTURE (%)	DRY UNIT WT. (pcf)	LAB TESTS
		Root mat - O - Silty Sand - Brown w/root mat					
		SILTY SAND with GRAVEL (SM) brown - medium dense, moist					
		----- Infiltration Test Elevation					
		SILTY SAND with GRAVEL (SM) - red brown, dense, moist					
		EOP @ 3.4'					

TEST\_PIT\_20030392\_TP.GPJ LAGNN07.GDT 12/2/21



Geo-Science Engineering & Testing, LLC  
 1252 Mid Valley Drive  
 Jessup, PA 18434  
 Phone: 570-489-8717 Fax:

Hickory Run State Park  
 White Haven, PA

## INFILTRATION TEST REPORT

**Project Name:** Hickory Run State Park

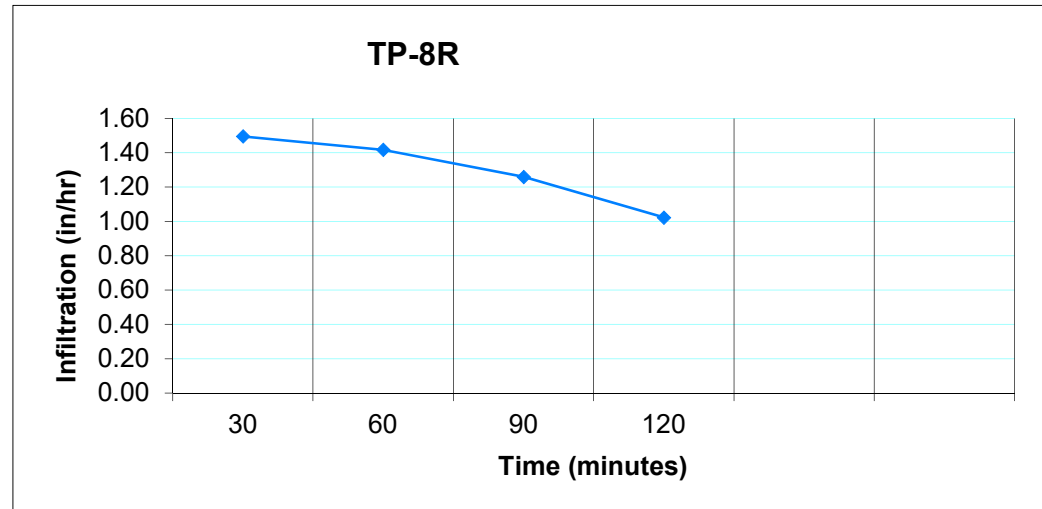
**Project #:** 20030392

**Date:** 11/9/2021

**Location:** TP-8R

Surface Elevation = 1583  
Depth of Test = 1.4 feet  
Testing Equipment = Double Ring Infiltrometer

Time (min)	Reading (mm)	(inches)	(in/hr)
30	19	0.75	1.50
60	18	0.71	1.42
90	16	0.63	1.26
120	13	0.51	1.02



Average of last 4 = **1.23 in/hr**

Reference: Pennsylvania Stormwater Best Management Practices Manual, Appendix C

Infiltration rates represent actual field measurements. It is recommended that a factor of safety of two (2) be applied to this rate.

## INFILTRATION TEST REPORT

**Project Name:** Hickory Run State Park

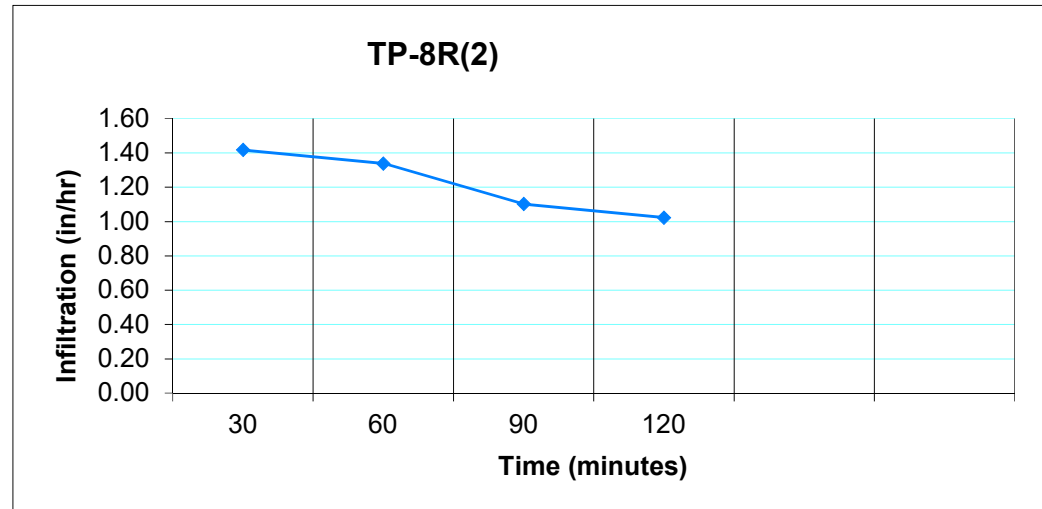
**Project #:** 20030392

**Date:** 11/9/2021

**Location:** TP-8R(2)

Surface Elevation = 1583  
Depth of Test = 1.4 feet  
Testing Equipment = Double Ring Infiltrometer

Time (min)	Reading (mm)	(inches)	(in/hr)
30	18	0.71	1.42
60	17	0.67	1.34
90	14	0.55	1.10
120	13	0.51	1.02



Average of last 4 = **1.15 in/hr**

Reference: Pennsylvania Stormwater Best Management Practices Manual, Appendix C  
Infiltration rates represent actual field measurements. It is recommended that a factor of safety of two (2) be applied to this rate.

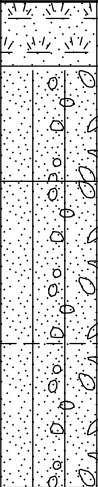
# LOG OF TEST PIT TP-9R

Date Excavated: 11/9/21

Logged by: JW

Equipment: Bobcat Mini Excavator

Surface Elevation(ft): 1586.0

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE	HAND PEN. (tsf)	MOISTURE (%)	DRY UNIT WT. (pcf)	LAB TESTS
		Root mat - O - Silty Sand - Brown w/root mat					
		SILTY SAND with GRAVEL (SM) brown - medium dense, moist					
		SILTY SAND with GRAVEL (SM) red brown, medium dense to dense, moist					
5		Infiltration Test Elevation					
		EOP @ 7'					

TEST\_PIT\_20030392\_TP.GPJ LAGNN07.GDT 12/2/21



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## INFILTRATION TEST REPORT

**Project Name:** Hickory Run State Park

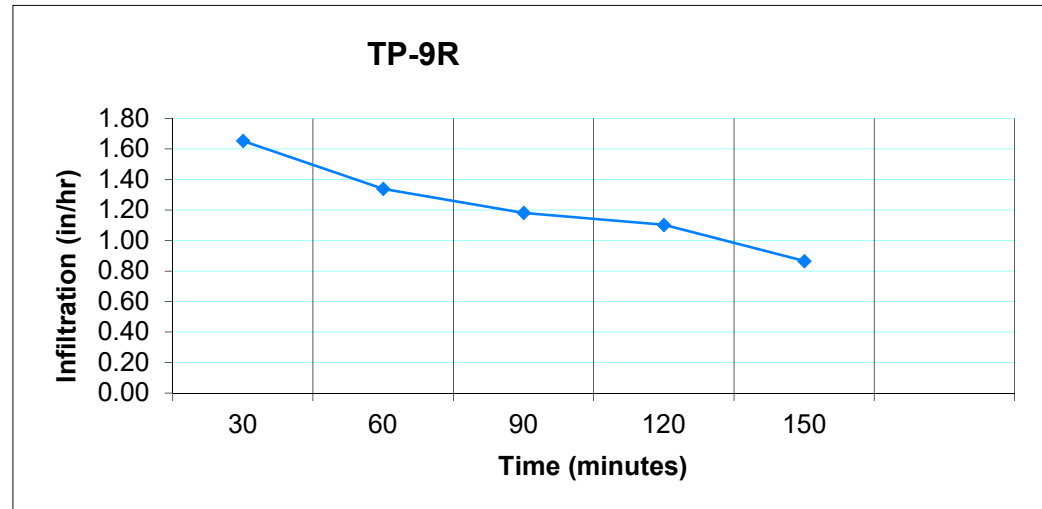
**Project #:** 20030392

**Date:** 11/9/2020

**Location:** TP-9R

Surface Elevation = 1586  
Depth of Test = 4.8 feet  
Testing Equipment = Double Ring Infiltrometer

Time (min)	Reading (mm)	(inches)	(in/hr)
30	21	0.83	1.65
60	17	0.67	1.34
90	15	0.59	1.18
120	14	0.55	1.10
150	11	0.43	0.87



Average of last 4 = **1.05 in/hr**

Reference: Pennsylvania Stormwater Best Management Practices Manual, Appendix C  
Infiltration rates represent actual field measurements. It is recommended that a factor of safety of two (2) be applied to this rate.

## INFILTRATION TEST REPORT

**Project Name:** Hickory Run State Park

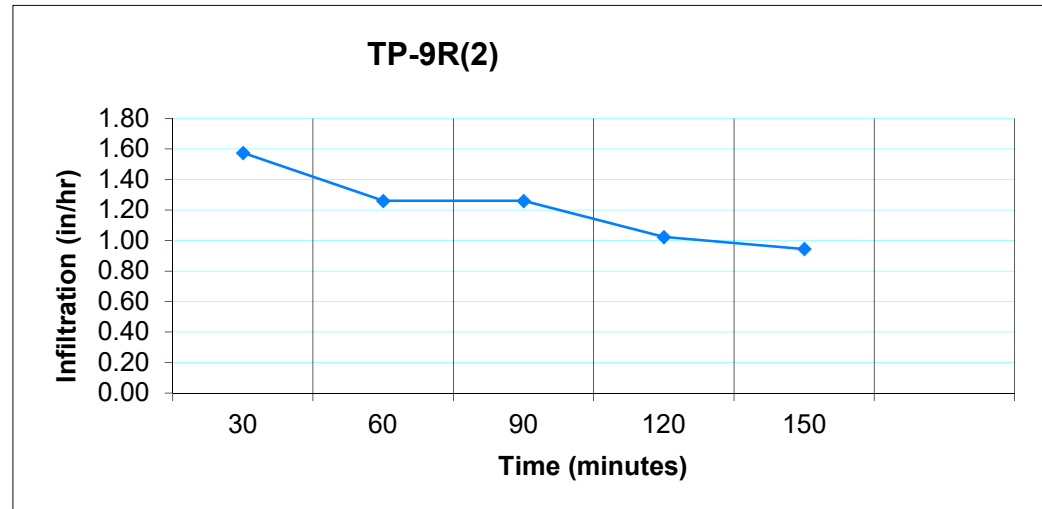
**Project #:** 20030392

**Date:** 11/9/2020

**Location:** TP-9R(2)

Surface Elevation = 1586  
Depth of Test = 4.8 feet  
Testing Equipment = Double Ring Infiltrometer

Time (min)	Reading (mm)	(inches)	(in/hr)
30	20	0.79	1.57
60	16	0.63	1.26
90	16	0.63	1.26
120	13	0.51	1.02
150	12	0.47	0.94



Average of last 4 = **1.08 in/hr**

Reference: Pennsylvania Stormwater Best Management Practices Manual, Appendix C  
Infiltration rates represent actual field measurements. It is recommended that a factor of safety of two (2) be applied to this rate.



