Report of Subsurface Exploration and Infiltration Evaluation

Hightstown Redevelopment
Block 21, Lots 1 -14 and 26,
And Block 30, Lots 1-7 and 10
Bank Street and North Main Street
Township of Hightstown, Mercer County, New Jersey

July 18, 2017

Prepared For

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Prepared By

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MC Project No. 16001094A

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1.0 INTRODUCTION

This report presents the results of the geotechnical evaluation performed in June 2017, at the project site with respect to proposed stormwater management areas and infiltration rates for use in design. Maser Consulting P.A. understands that the purpose of the proposed project is to construct a mixed use development consisting of multi-family units and retail space along with typical appurtenant site improvements on an existing 6.9 acres of land located between North Academy Street, Bank Street and North Main Street in Hightstown Township, Mercer County, New Jersey.

Infiltration rate recommendations provided in this report are based on review of published data, accepted engineering practice, and field observations. Maser Consulting P.A. has evaluated the subsurface conditions at the site, and provides an evaluation of potential infiltration rates for soils encountered at depth within the area of the proposed stormwater management systems and design seasonal high water levels.

2.0 SITE DESCRIPTION

The subject project site is an approximately 6.9 acres site bounded by North Academy Street, Bank Street and North Main Street, in Hightstown Township, Mercer County, New Jersey and is referred to as Block 21, Lots 1-14 and 26, and Block 30, Lots 1-7 and 10 on the Hightstown Township Tax Maps. Rocky Brook runs through the center of the property. The current use consists primarily of warehouse structures (RTL Merchandising, Moving, Storage and Decorations).

We understand the purpose of the proposed project is to redevelop the site with a combination of multi-family units and retail space along with typical appurtenant site improvements.

3.0   SCOPE OF SERVICES

In order to evaluate the subsurface conditions within the influence of the proposed stormwater management areas and to subsequently provide consultation regarding anticipated subsurface infiltration rates and design estimated seasonal high water levels (ESHWL), we performed the following scope of services:

a)   Engaged the services of an excavation contractor to excavate test pits for exploration of subsurface soil and groundwater conditions within the proposed stormwater management areas;

b)   Provided full-time technical observation of the excavation work;

c)   Obtained representative soil samples encountered within the zone of influence of the proposed construction;

d)   Evaluated the field data and prepared test pit logs showing the types of soils observed, depths to groundwater, and depths to estimated seasonal high groundwater;

e)   Performed a combination of laboratory testing on select soil samples to evaluate groundwater infiltration rates for the subgrade soils; and

f)   Provided a Subsurface Exploration and Infiltration Evaluation Report that reviews potential soil infiltration rates for design and groundwater considerations for the proposed basin requirements.

4.0   SUBSURFACE EXPLORATION

The subsurface conditions were evaluated on June 16, 2017, through the excavation of a total of four (4) test pits, labeled TP-1 through TP-4, that were advanced to termination depths of approximately 15 feet (180 inches) below ground surface by Viersma & Sons of Allamuchy, NJ, using a CAT 315F trackhoe. Test pits for the exploration were excavated at the locations shown on the Exploration Location Plan, Figure No. 1.

Representatives from Maser Consulting's Geotechnical Department observed the test pit excavations. Soils encountered were classified in the field in accordance with N.J.A.C. 7:9A, Subchapter 5.3, Terminology Required for Soil Logs. The Burmister Soil Classification System was also used. Representative soil samples of strata encountered were collected and returned to Maser Consulting's Red Bank laboratory facilities for further evaluation and analyses. Details pertaining to the subsurface conditions encountered are presented on the Test Pit Logs in Appendix A.

The depth of groundwater was measured from the ground surface to the point of observed seepage or consistent soil moisture, and was encountered in the test pits at depths ranging from approximately 3.75 to 10 feet below existing grade. The subsurface strata were also evaluated with respect to mottling and soil staining, to determine if seasonal high groundwater levels extended into the test pit depths. Staining and mottling within a soil stratum can indicate seasonal high water level (SHWL) fluctuations, but is also found along wormholes, as a result of prior farming practices, or as an indication of geologic depositional factors. Evidence of SHWL was encountered at depths ranging from approximately 12 inches to 30 inches below existing ground surface within the four (4) test pits excavated as part of this exploration.

Please refer to Table 1 for a summary of depths to the groundwater table and to the estimated seasonal high water level (ESHWL).   Soil moisture and groundwater conditions should be expected to fluctuate with season, precipitation amounts, and other on-site and off-site factors including site utilization.

TABLE 1 DEPTH TO GWT AND ESHWL SUMMARY			
Test Pit ID	Approx. Ground Surface Elev. (ft)	Depth to Groundwater Water Table, GWT (in)	Depth to Estimated Seasonal High Water Level, ESHWL (in)
TP-1	±84.0	96	12
TP-2	±88.0	102	20
TP-3	±86.0	120	16
TP-4	±85.5	45	30

5.0   SUBSURFACE CONDITIONS

The soils encountered during our exploration consisted of the existing pavement layer, approximately 6 to 12 inches thick, consisting of light brownish gray loamy sand with up to 50% gravel, underlain by layers of grayish brown, brown and yellowish brown sandy loam. Loam and silty clay loam, with varying amounts of gravel (up to 25%). These layers were underlain by a black clay loam, which was encountered at depths ranging from approximately 7.5 to 12 feet below existing grade and extended to the termination depth of the test pits at approximately 15 feet below existing grade.

6.0   SOIL INFILTRATION EVALUATION

Selected soil samples were tested by the Maser Consulting Geotechnical Laboratory in Red Bank, New Jersey. The testing consisted of eight (8) Tube Permeameter Tests performed to estimate the infiltration rate of groundwater through the soils at depth. Tube Permeameter testing was performed in accordance with New Jersey Administrative Code (N.J.A.C.) 7:9A-6.2 and BMP-E requirements. The soil samples were selected based on review of test pit logs by design personnel, the proposed infiltration depths, and comparison to other strata encountered at each test pit location. The tube samples were collected from the soils directly by inserting the sample tube into the ground and retrieving the tube by excavating the soils surrounding it.

Infiltration test results are summarized in Table 2 on the following page, with laboratory testing results provided in Appendix B.

TABLE 2 INFILTRATION TEST SUMMARY			
Test Pit ID	**Approx. Ground Surface Elev. (ft)**	**Depth below Existing Grade (in)**	**Infiltration Rate (in/hr)**
TP-1	±84.0	72	0.0
		96	0.0
TP-2	±88.0	43	11.4 / 18.2
		96	0.0
		144	0.0
TP-3	±86.0	68	0.0
TP-4	±85.5	39	5.6 / 3.7
		96	0.0

7.0   GENERAL CONSTRUCTION DISCUSSION

Although representative samples of near surface granular soils indicated good infiltration rates, potential indicators of the estimated seasonal high water level (ESHWL) were observed at very shallow depths (12 to 30 inches below ground surface) in the test pits excavated as part of this subsurface exploration. Given that the ESHWL was found to be within 24 inches of the existing ground surface in three of the four test pits, it is our opinion that the site is not viable for infiltration purposes per BMP-E requirements.

Excavated soils with high silt and clay contents are unsuitable for use as structural fill throughout the site. Soils containing significant quantities of organic materials may need to be removed from the site and disposed in a manner consistent with local, state and federal regulations. Stripped topsoil and cohesive materials may be used to raise site grades in lawn areas, but may be difficult to re-handle and place in a manner that will minimize post-construction subsidence. During periods of inclement weather, placing and compaction difficulties will also occur since the materials, in general, will be moisture sensitive. Granular materials encountered during site earthwork operations should be segregated for reuse as general fills for this project.

8.0   CLOSING

Successful construction of the project will require competent field observation of the construction operations. Earthwork, including clearing and grubbing, subgrade identification, grading, and fill placement should be observed by a competent individual familiar with the recommendations contained herein. We are available to perform construction observation services, if requested.

The recommendations contained herein are contingent upon the actual field conditions being consistent with those encountered during our field exploration. Should any variation in the anticipated conditions be encountered or site regrading be proposed, Maser Consulting P.A. should be notified immediately to determine what impact the changed conditions may have upon the presented recommendations.

9.0   LIMITATIONS

Services performed by Maser Consulting P.A. during this project have been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended in the services provided. This is not an Environmental Assessment.

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PLAN NORTH

Bank St

Roger C. Cook Greenway

TP-3

TP-1

TP-2

TP-4
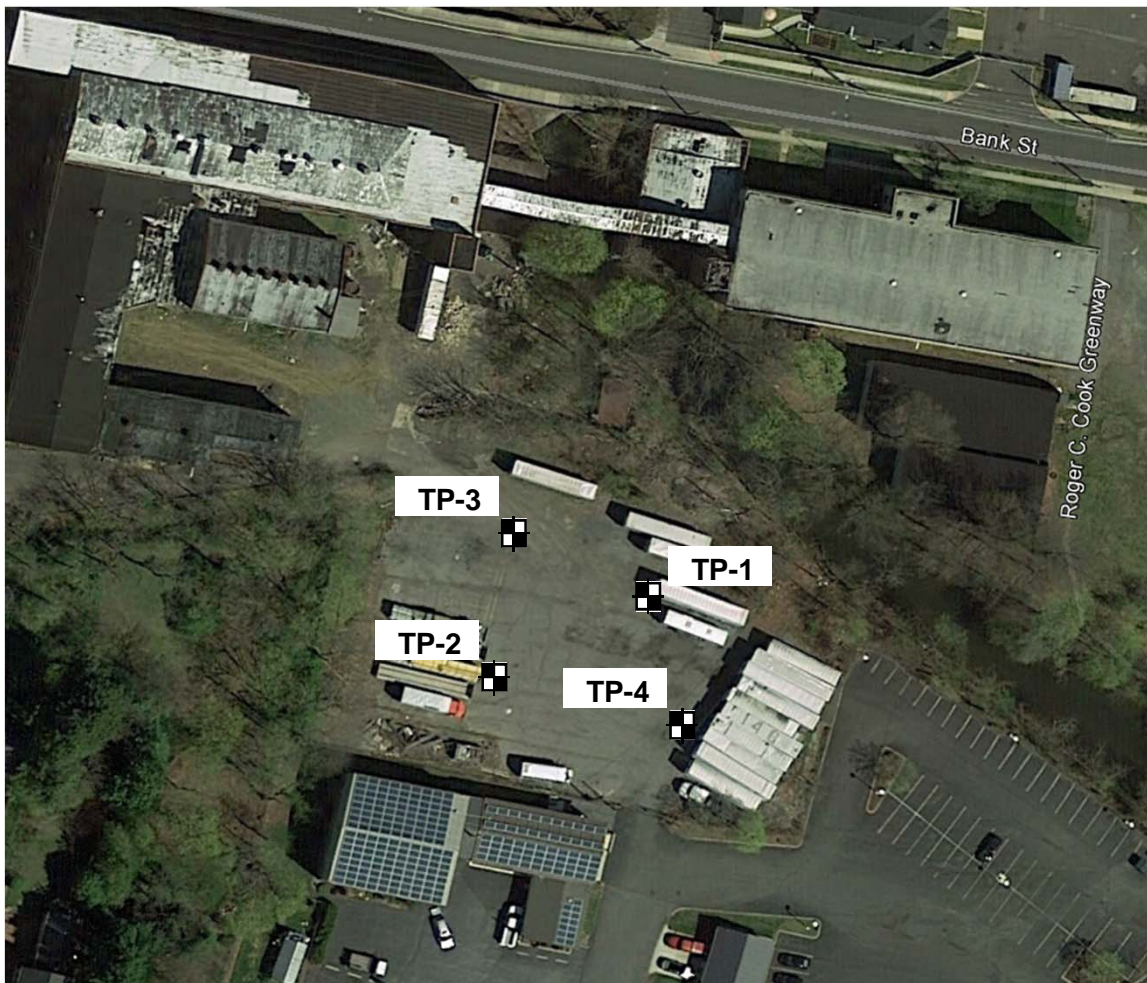
LEGEND:

TP-1   TEST PIT LOCATION (APPROX.)

NOTES:

1.) *BASE PLAN OBTAINED FROM GOOGLE EARTH PRO IMAGE, BY MASER CONSULTING, PA, REVISED JUNE 20, 2017.

2.) THIS DRAWING IS PART OF MASER's GEOTECHNICAL REPORT (PROJECT NO. 16001094A) DATED JULY 2017 AND SHOULD ONLY BE USED IN CONJUNCTION WITH THE REPORT.

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New Jersey   New York   Pennsylvania   Virginia
Customer Loyalty *through* Client Satisfaction

Title:
EXPLORATION LOCATION PLAN

Project:
HIGHTSTOWN REDEVELOPMENT
101 Bank Street
Borough of Hightstown
Mercer County, NJ

| Drawn By: PA | Checked By: MC | Project No.: 16001094A |
| Scale: N.T.S. | Date: 06-20-2017 | Figure No.: 1 |

APPENDIX A

TEST PIT LOGS

I. Definition of Soil Components and Fractions

Material	Symbol	Fraction	Sieve Size	Definition
Boulders	Bldr	-----	9" +	Material retained on 9" sieve.
Cobbles	Cbl	----	3" to 9"	Material passing the 9" sieve and retained on the 3" sieve.
Gravel	G	coarse (c) medium (m) fine (f)	1" to 3" 3/8" to 1" No. 10 to 3/8"	Material passing the 3" sieve and retained on the No. 10 sieve.
Sand	S	coarse (c) medium (m) fine (f)	No. 30 to No. 10 No. 60 to No. 30 No. 200 to No. 60	Material passing the No. 10 sieve and retained on the No. 200 sieve.
Silt	$	---	Passing No. 200 (0.075 mm)	Material passing the No. 200 sieve that is non-plastic in character and exhibits little or no strength when air dried.
Clayey SILT	Cy$	Slight (SL)	1 to 5	Clay - Soil
SILT & CLAY	$ & C	Low (L)	5 to 10	Material passing the No. 200 which can be made to exhibit plasticity and clay qualities within a certain range of moisture content, and which exhibits considerable strength when air-dried.
CLAY & SILT	C & $	Medium (M)	10 to 20	
Silty CLAY	$yC	High (H)	20 to 40	
CLAY	C	Very High (VH)	40 Plus	
Organic Silt	(O$)			Material passing the No. 200 sieve which exhibits plastic properties within a certain range of moisture content, and exhibits fine granular and organic characteristics.

II. Definition of Component Proportions

Component	Written	Proportions	Symbol	Percentage Range by Weight*
Principal	CAPITALS	---		50 or more
Minor	Lower Case	and	a.	35 to 50
		some	s.	20 to 35
		little	l.	10 to 20
		trace	t.	1 to 10

* Minus sign (-) lower limit, plus sign (+) upper limit, no sign middle range.

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TEST PIT No. TP-1

DATE EXCAVATED: 6/15/17

SURFACE ELEVATION: 84.0+/−

Project: Hightstown Redevelopment
Location: Hightstown, NJ.
Job Number: 16001094A

EXCAVATED BY: Kevin Viersma
EQUIPMENT USED: CAT 315F Trackhoe
INSPECTED BY: Pavle A./Anastasia D.

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	3 / 6 / 9 / 12	(10 YR 6/2) Lt. Brownish Gray Loamy Sand. >50% Gravel. (Existing Pavement) (Dry).	
	24	(10 YR 3/2) Very Dk. Grayish Brown Sandy Loam. Subangular−Blocky, Friable. 20% Gravel. Frequent Fine Roots. (Possible Topsoil, Moist).	
	36 / 48	(7.5 YR 5/6) Strong Brown Loam. Subangular−Blocky, Friable. 10% Gravel. Common, Distinct, Med−Fine (5 YR 5/8) Yellowish Red Mottles at 12"−45". (Moist).	
5	60 / 72 / 84	(10 YR 4/2) Dk. Grayish Brown Silty Clay Loam. Subangular−Blocky, Friable. Common, Distinct, Fine (5 YR 5/8) Yellowish Red Mottles at 45"−90". (Moist).	
	96 / 108		
10	120 / 132 / 144	(7.5 YR 2.5/1) Black Clay Loam. Massive, Firm. (Wet throughout).	
	156 / 168		
15	180	END OF TEST PIT AT 180 INCHES	
	192 / 204 / 216 / 228	N.E. = Not Encountered N.A. = Not Applicable	
20	240		

GROUNDWATER:	DEPTH (ft.)	DATE
First Encountered ▽	8.0	6/15/17
At Completion (0 hrs.) ▼	8.0	6/15/17
After Completion (>24 hrs.) ▽	N.A.	6/15/17

ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: 12 Inches

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TEST PIT No. TP-2

DATE EXCAVATED: 6/15/17

SURFACE ELEVATION: 88.0+/-

Project: Hightstown Redevelopment
Location: Hightstown, NJ.
Job Number: 16001094A

EXCAVATED BY: Kevin Viersma
EQUIPMENT USED: CAT 315F Trackhoe
INSPECTED BY: Pavle A./Anastasia D.

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	3 6 9 12	8" (10 YR 6/2) Lt. Brownish Gray Loamy Sand. >50% Gravel. (Existing Pavement) (Dry).	
	24 36 48	(7.5 YR 3/1) Very Dk. Gray Sandy Loam. Subangular-Blocky, Friable. 20% Gravel. Frequent Fine Roots. Common, Distinct, Med-Fine (10 YR 4/6) Dk. Yellowish Brown Mottles at 20"-46". (Possible Fill) (Possibly Organic) (Moist). 46"	
5	60 72 84 96 108	(7.5 YR 4/4) Brown Silty Clay Loam. Subangular-Blocky, Friable. 10% Gravel. Common, Distinct, Fine (5 YR 5/8) Yellowish Red Mottles at 46"-102". Wet throughout at 102"-144".	
10	120 132 144		
	156 168	(7.5 YR 2.5/1) Black Clay Loam. Massive, Firm. (Wet throughout).	
15	180 192 204 216 228	END OF TEST PIT AT 180 INCHES N.E. = Not Encountered N.A. = Not Applicable	
20	240		

GROUNDWATER:	DEPTH (ft.)	DATE
First Encountered ▽	8.5	6/15/17
At Completion (0 hrs.) ▼	8.5	6/15/17
After Completion (>24 hrs.) ▽	N.A.	6/15/17

ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: 20 Inches

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TEST PIT No. TP-3

DATE EXCAVATED: 6/15/17
SURFACE ELEVATION: 86.0+/−

Project: Hightstown Redevelopment
Location: Hightstown, NJ.
Job Number: 16001094A

EXCAVATED BY: Kevin Viersma
EQUIPMENT USED: CAT 315F Trackhoe
INSPECTED BY: Pavle A./Anastasia D.

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	3 / 6 / 9 / 12	(10 YR 6/2) Lt. Brownish Gray Loamy Sand. >50% Gravel. (Existing Pavement) (Dry).	
	22" 24 35" 36	(10 YR 3/3) Dk. Brown Sandy Loam. Subangular−Blocky, Friable. 25% Gravel. Common, Distinct, Med−Fine (5 YR 5/8) Yellowish Red Mottles at 16"−22". (Possible Fill) (Moist).	
5	48 60 72	(10 YR 3/2) Very Dk. Grayish Brown Sandy Loam. Subangular−Blocky, Firm. 20% Gravel. Frequent Medium−Fine Roots. Common, Distinct, Med−Fine (7.5 YR 6/8) Reddish Yellow Mottles at 22"−35". (Possible Fill) (Moist).	
	84 96	(10 YR 2/2) Very Dk. Brown Sandy Loam. Subangular−Blocky, Friable. 20% Gravel. Few Fine Roots. Few, Distinct, Med−Fine (7.5 YR 6/8) Reddish Yellow Mottles at 35"−48". (Moist).	
10	108 120 132	(10 YR 4/4) Dk. Yellowish Brown Silty Clay Loam. Subangular−Blocky, Firm. 10% Gravel. Common, Distinct, Med−Fine Mottles at 53"−120". (Moist).	
	144 156 168	(7.5 YR 2.5/1) Black Clay Loam. Massive, Firm. Lt. Seepage at 127"−144". (Wet throughout).	
15	180 192 204 216 228	END OF TEST PIT AT 180 INCHES * Seepage due to perched condition. N.E. = Not Encountered N.A. = Not Applicable	
20	240		

GROUNDWATER:	DEPTH (ft.)	DATE
First Encountered ▽	10.0	6/15/17
At Completion (0 hrs.) ▼	10.0	6/15/17
After Completion (>24 hrs.) ▽	N.A.	6/15/17

ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: 16 inches

TEST PIT No. TP-3

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TEST PIT No. TP-4

DATE EXCAVATED: 6/15/17

SURFACE ELEVATION: 85.5+/-

Project: Hightstown Redevelopment

Location: Hightstown, NJ.

Job Number: 16001094A

EXCAVATED BY: Kevin Viersma

EQUIPMENT USED: CAT 315F Trackhoe

INSPECTED BY: Pavle A./Anastasia D.

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	3 / 6 / 9 / 12	(10 YR 6/2) Lt. Brownish Gray Loamy Sand. >50% Gravel. (Existing Pavement) (Dry).	
	24	(10 YR 5/8) Brown Sandy Loam. Subangular–Blocky, Loose. 25% Gravel. (Moist throughout).	
5	36 / 48 / 60 / 72 / 84 / 96	(10 YR 4/6) Dk. Yellowish Brown Loam. Subangular–Blocky, Firm. Common, Distinct, Fine (5 YR 4/4) Reddish Brown Mottles at 30"–45". Lt. Seepage at 45"–80". Wet throughout at 80"–98".	
10	108 / 120 / 132 / 144 / 156 / 168	98" (7.5 YR 2.5/1) Black Clay Loam. Massive, Firm. (Wet throughout).	
15	180 / 192 / 204 / 216 / 228	**END OF TEST PIT AT 180 INCHES** * Seepage due to perched condition. N.E. = Not Encountered N.A. = Not Applicable	
20	240		

GROUNDWATER:	DEPTH (ft.)	DATE
First Encountered ▽	3.75	6/15/17
At Completion (0 hrs.) ▼	3.75	6/15/17
After Completion (>24 hrs.) ▽	N.A.	6/15/17

ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: 30 Inches

APPENDIX B

LABORATORY TESTING

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-1	Date Collected:	6/15/2017
Material Tested:	TP-1	Replicate:	A
Depth of Sample:	72"	Sample Type:	Undisturbed

1. **Sample Dimensions**
   Radius = 2.54 cm
   Length = 4.25 in

2. **Measurements**
   tube #: A20
   Tube Weight = 358.68 g
   Total Weight = 722.91 g
   Soil Weight = 364.23 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 218.69

   Bulk Density = Soil Weight / Volume
   Bulk Density = 1.67

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 4.25 H_1
   At end of interval: 4.25 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	2:00:00	120	0.000
b.	0:00	2:00:00	120	0.000
c.	0:00	2:00:00	120	0.000
d.	0:00	2:00:00	120	0.000
		av =	120	0

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln(H_1/H_2)$

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer _____   License #

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-1	Date Collected:	6/15/2017
Material Tested:	TP-1	Replicate:	B
Depth of Sample:	72"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 2.54 cm
   Length = 4.000 in

2. **Measurements** Tube Weight = 358.43 g
   Total Weight = 696.45 g
   tube #: Bm-69   Soil Weight = 338.02 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 205.82

   Bulk Density = Soil Weight / Volume
   Bulk Density = 1.64

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 4.125 H_1
   At end of interval: 4.125 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	02:00:00	120	0.000
b.	0:00	02:00:00	120	0.000
c.	0:00	02:00:00	120	0.000
d.	0:00	02:00:00	120	0.000
		av =	120	0

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln (H_1/H_2)$

   K = 0.00   in/hr = Soil Permeability Class   K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer _____   License #

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-2	Date Collected:	6/15/2017
Material Tested:	TP-1	Replicate:	A
Depth of Sample:	96"	Sample Type:	Undisturbed

1. **Sample Dimensions**

   Radius = 2.54 cm
   Length = 4 in

2. **Measurements**

   Tube Weight = 358.3 g
   Total Weight = 723.98 g
   tube #: Bm552   Soil Weight = 365.68 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 205.82

   Bulk Density = Soil Weight / Volume
   Bulk Density = 1.78

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 4.25 H_1
   At end of interval: 4.25 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	02:00:00	120	0.000
b.	0:00	02:00:00	120	0.000
c.	0:00	02:00:00	120	0.000
d.	0:00	02:00:00	120	0.000
		av =	120	0

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln(H_1/H_2)$

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer _____ License #

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-2	Date Collected:	6/15/2017
Material Tested:	TP-1	Replicate:	B
Depth of Sample:	96"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 2.54 cm
   Length = 4.000 in

2. **Measurements** Tube Weight = 362.12 g
   Total Weight = 746.86 g
   tube #: PA-1 Soil Weight = 384.74 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 205.82

   Bulk Density = Soil Weight / Volume
   Bulk Density = 1.87

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 4.25 H_1
   At end of interval: 4.25 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	02:00:00	120	0.000
b.	0:00	02:00:00	120	0.000
c.	0:00	02:00:00	120	0.000
d.	0:00	02:00:00	120	0.000
		av =	120	0

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln (H_1/H_2)$

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-1	Date Collected:	6/15/2017
Material Tested:	TP-2	Replicate:	A
Depth of Sample:	43"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 2.54 cm
    Length = 4.125 in

2. **Measurements** Tube Weight = 350.87 g
    Total Weight = 696.86 g
    tube #: Bm-46 Soil Weight = 345.99 g

    Volume = Length * 2.54 cm/inch * π * Radius²
    Volume = 212.25

    Bulk Density = Soil Weight / Volume
    Bulk Density = 1.63

    Height of Water Level above Rim of Test Basin (inches)

    At beginning of interval: 3.875 H_1
    At end of interval: 2.75 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	00:06:36	6.6	1.125
b.	0:00	00:07:53	7.88	1.125
c.	0:00	00:07:40	7.66	1.125
d.	0:00	00:07:37	7.62	1.125
		av =	7.44	1.125

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln(H_1/H_2)$

    K = 11.41 in/hr = Soil Permeability Class K4

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-1	Date Collected:	6/15/2017
Material Tested:	TP-2	Replicate:	B
Depth of Sample:	43"	Sample Type:	Undisturbed

1. **Sample Dimensions**

Radius =	2.54	cm
Length =	4.500	in

2. **Measurements**   tube #: Bm-6

Tube Weight =	355.35	g
Total Weight =	747.2	g
Soil Weight =	391.85	g

Volume = Length * 2.54 cm/inch * π * Radius²
Volume = 231.55

Bulk Density = Soil Weight / Volume
Bulk Density = 1.69

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval:	3.875	H_1
At end of interval:	2.625	H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	00:05:15	5.25	1.250
b.	0:00	00:06:03	6.05	1.250
c.	0:00	00:05:50	5.83	1.250
d.	0:00	00:05:42	5.7	1.250
		av =	5.7075	1.25

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln(H_1/H_2)$

K = 18.42 in/hr = Soil Permeability Class K4

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-2	Date Collected:	6/15/2017
Material Tested:	TP-2	Replicate:	A
Depth of Sample:	96"	Sample Type:	Undisturbed

1. **Sample Dimensions**

   Radius = 2.54 cm
   Length = 4 in

2. **Measurements**

   Tube Weight = 357.24 g
   Total Weight = 751.25 g
   tube #: Bm-65   Soil Weight = 394.01 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 205.82

   Bulk Density = Soil Weight / Volume
   Bulk Density = 1.91

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 4 H_1
   At end of interval: 4 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	02:00:00	120	0.000
b.	0:00	02:00:00	120	0.000
c.	0:00	02:00:00	120	0.000
d.	0:00	02:00:00	120	0.000
		av =	120	0

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln (H_1/H_2)$

   K = 0.00 in/hr = Soil Permeability Class   K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-2	Date Collected:	6/15/2017
Material Tested:	TP-2	Replicate:	B
Depth of Sample:	96"	Sample Type:	Undisturbed

1. **Sample Dimensions**

   Radius = 2.54 cm
   Length = 4.500 in

2. **Measurements**

   Tube Weight = 354.77 g
   tube #: Bm-41 Total Weight = 772.35 g
   Soil Weight = 417.58 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 231.55

   Bulk Density = Soil Weight / Volume
   Bulk Density = 1.80

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 4 H_1
   At end of interval: 4 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	02:00:00	120	0.000
b.	0:00	02:00:00	120	0.000
c.	0:00	02:00:00	120	0.000
d.	0:00	02:00:00	120	0.000
		av =	120	0

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln (H_1/H_2)$

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-3	Date Collected:	6/15/2017
Material Tested:	TP-2	Replicate:	A
Depth of Sample:	144"	Sample Type:	Undisturbed

1. **Sample Dimensions**

Radius =	2.54	cm
Length =	4.75	in

2. **Measurements**

tube #: A8

Tube Weight =	366.04	g
Total Weight =	799.77	g
Soil Weight =	433.73	g

Volume = Length * 2.54 cm/inch * π * Radius²
Volume = 244.41

Bulk Density = Soil Weight / Volume
Bulk Density = 1.77

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 4 H_1
At end of interval: 4 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	02:00:00	120	0.000
b.	0:00	02:00:00	120	0.000
c.	0:00	02:00:00	120	0.000
d.	0:00	02:00:00	120	0.000
		av =	120	0

4. **Permeability Calculation**

$$K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln (H_1/H_2)$$

K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-3	Date Collected:	6/15/2017
Material Tested:	TP-2	Replicate:	B
Depth of Sample:	144"	Sample Type:	Undisturbed

1. **Sample Dimensions**   Radius = 2.54 cm
                            Length = 4.500 in

2. **Measurements**   Tube Weight = 355.14 g
                       Total Weight = 767.59 g
    tube #: AV-1   Soil Weight = 412.45 g

    Volume =   Length * 2.54 cm/inch * π * Radius²
    Volume =   231.55

    Bulk Density =   Soil Weight / Volume
    Bulk Density =   1.78

    Height of Water Level above Rim of Test Basin (inches)

    At beginning of interval: 4 H_1
    At end of interval: 4 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	02:00:00	120	0.000
b.	0:00	02:00:00	120	0.000
c.	0:00	02:00:00	120	0.000
d.	0:00	02:00:00	120	0.000
		av =	120	0

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln(H_1/H_2)$

    K =   0.00   in/hr =   Soil Permeability Class   K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-1	Date Collected:	6/15/2017
Material Tested:	TP-3	Replicate:	A
Depth of Sample:	68"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius =   2.54   cm
                              Length =   3.75   in

2. **Measurements**   Tube Weight =   358.45   g
                           Total Weight =   732.88   g
      tube #:   Ay-17   Soil Weight =   374.43   g

    Volume =   Length * 2.54 cm/inch * π * Radius²
    Volume =   192.96

    Bulk Density =   Soil Weight / Volume
    Bulk Density =   1.94

    Height of Water Level above Rim of Test Basin (inches)

    At beginning of interval: 3.875 H_1
         At end of interval: 3.875 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	02:00:00	120	0.000
b.	0:00	02:00:00	120	0.000
c.	0:00	02:00:00	120	0.000
d.	0:00	02:00:00	120	0.000
		av =	120	0

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln(H_1/H_2)$

    K =   0.00   in/hr =   Soil Permeability Class   K0

5.   Any **Defects** in Sample: No

6.   I hereby certify that the information on Form 3b of this application is true and accurate. I am aware
        that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.)
        and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-1	Date Collected:	6/15/2017
Material Tested:	TP-3	Replicate:	B
Depth of Sample:	68"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 2.54 cm
   Length = 4.750 in

2. **Measurements** Tube Weight = 368.01 g
   Total Weight = 830.87 g
   tube #: AV-1 Soil Weight = 462.86 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 244.41

   Bulk Density = Soil Weight / Volume
   Bulk Density = 1.89

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 4.125 H_1
   At end of interval: 4.125 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	02:00:00	120	0.000
b.	0:00	02:00:00	120	0.000
c.	0:00	02:00:00	120	0.000
d.	0:00	02:00:00	120	0.000
		av =	120	0

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln(H_1/H_2)$

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-1	Date Collected:	6/15/2017
Material Tested:	TP-4	Replicate:	A
Depth of Sample:	39"	Sample Type:	Undisturbed

1. **Sample Dimensions**

Radius =	2.54	cm
Length =	4.625	in

2. **Measurements**

tube #: Bm-43

Tube Weight =	356.47	g
Total Weight =	818.05	g
Soil Weight =	461.58	g

Volume = Length * 2.54 cm/inch * π * Radius²
Volume = 237.98

Bulk Density = Soil Weight / Volume
Bulk Density = 1.94

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 4 H_1
At end of interval: 2.875 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	00:16:15	16.25	1.125
b.	0:00	00:14:30	14.5	1.125
c.	0:00	00:16:45	16.75	1.125
d.	0:00	00:17:30	17.5	1.125
		av =	16.25	1.125

4. **Permeability Calculation**

$$K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln(H_1/H_2)$$

K = 5.64 in/hr = Soil Permeability Class K3

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-1	Date Collected:	6/15/2017
Material Tested:	TP-4	Replicate:	B
Depth of Sample:	39"	Sample Type:	Undisturbed

1. **Sample Dimensions**   Radius =   2.54   cm
                              Length =   4.625   in

2. **Measurements**   Tube Weight =   350.17   g
                         Total Weight =   781.94   g
   tube #: Bm-74   Soil Weight =   431.77   g

   Volume =   Length * 2.54 cm/inch * π * Radius²
   Volume =   237.98

   Bulk Density =   Soil Weight / Volume
   Bulk Density =   1.81

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 4.125 H_1
         At end of interval: 3.25 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	00:16:10	16.17	0.875
b.	0:00	00:18:38	18.63	0.875
c.	0:00	00:19:00	19	0.875
d.	0:00	00:18:10	18.17	0.875
		av =	17.9925	0.875

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln(H_1/H_2)$

   K =   3.68   in/hr =   Soil Permeability Class   K3

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-2	Date Collected:	6/15/2017
Material Tested:	TP-4	Replicate:	A
Depth of Sample:	96"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 2.54 cm
   Length = 4 in

2. **Measurements** Tube Weight = 365.8 g
   Total Weight = 746.63 g
   tube #: A14 Soil Weight = 380.83 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 205.82

   Bulk Density = Soil Weight / Volume
   Bulk Density = 1.85

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 4 H_1
   At end of interval: 4 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	02:00:00	120	0.000
b.	0:00	02:00:00	120	0.000
c.	0:00	02:00:00	120	0.000
d.	0:00	02:00:00	120	0.000
		av =	120	0

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln(H_1/H_2)$

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	Hightstown Redevelopment	Project Number:	16001094A
Block:	21	Municipality:	Hightstown
Lot:	21	County:	Mercer
Test Number:	S-2	Date Collected:	6/15/2017
Material Tested:	TP-4	Replicate:	B
Depth of Sample:	96"	Sample Type:	Undisturbed

1. **Sample Dimensions**

Radius =	2.54	cm
Length =	4.125	in

2. **Measurements**

Tube Weight =	358.91	g
Total Weight =	748.99	g
tube #: Bm551 Soil Weight =	390.08	g

Volume = Length * 2.54 cm/inch * π * Radius²
Volume = 212.25

Bulk Density = Soil Weight / Volume
Bulk Density = 1.84

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 3.875 H_1
At end of interval: 3.875 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00	02:00:00	120	0.000
b.	0:00	02:00:00	120	0.000
c.	0:00	02:00:00	120	0.000
d.	0:00	02:00:10	120	0.000
		av =	120	0

4. **Permeability Calculation** $K \text{ (in/hr)} = 60 \text{ min/hr} * r^2/R^2 * L \text{ (in)}/T \text{ (min)} * \ln (H_1/H_2)$

K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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