

May 24, 2017



Guidon Design, Inc.
905 North Capitol Avenue, Suite 100
Indianapolis, Indiana 46204

Attn: Mr. Mark VanderWoude, PE

Re: Infiltration Testing
Fort McPherson Parking Deck
1701 Hardee Ave, SW
Atlanta, Georgia
Terracon Project No. 49165249A

Dear Mr. VanderWoude:

Terracon Consultants, Inc. (Terracon) has completed the authorized geotechnical engineering services for the above referenced project. These services were performed in general accordance with our Proposal No. P49165249FM PERC dated May 5, 2017, and authorized by you via e-mail on May 8, 2017.

Background

It has been requested that Terracon perform infiltration testing for the proposed Fort McPherson Parking Deck to fulfill the City of Atlanta requirements related to on-site stormwater disposal. A soil test boring was performed to obtain samples for laboratory testing as in-situ testing could not be performed at the needed elevations. See the appended Location Plan for the approximate boring location.

Exploration Procedures

Terracon performed the field sampling on May 13, 2017. At the requested location, we drilled an auger boring (I-1) and collected two relatively undisturbed thin-walled tube samples at depths of 7 to 9 feet (Perm-1), and 11 to 13 feet (Perm-2). We note that the fill soils in this boring extended to a depth of about $\pm 7 \frac{1}{2}$ feet. The laboratory tests were performed on the residual soils as requested. The boring location and testing depths were provided, and established in the field by Terracon.

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The boring was extended to the planned sampling depths using auger boring methods. The penetration testing procedures and the thin-walled tube sampling procedures are appended to this report. Samples were sent to the laboratory for testing.

Findings and Conclusions

The tube samples were extruded and subjected to laboratory, saturated, falling head, hydraulic conductivity tests. See the appended data and results. These laboratory results were then adjusted to arrive at an approximate infiltration rate, similar to a percolation test. The results are as follows:

Perm-1 (7'-9'): The approximate percolation value is about 29 minutes per inch.

Perm-2 (11'-13'): The approximate percolation value is about 47 minutes per inch.

The information presented in this report is based upon the results of field and laboratory testing, as well as our understanding of the project information. Test results apply to the specific location sampled and tested, and conditions may differ at other locations on the site. This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.



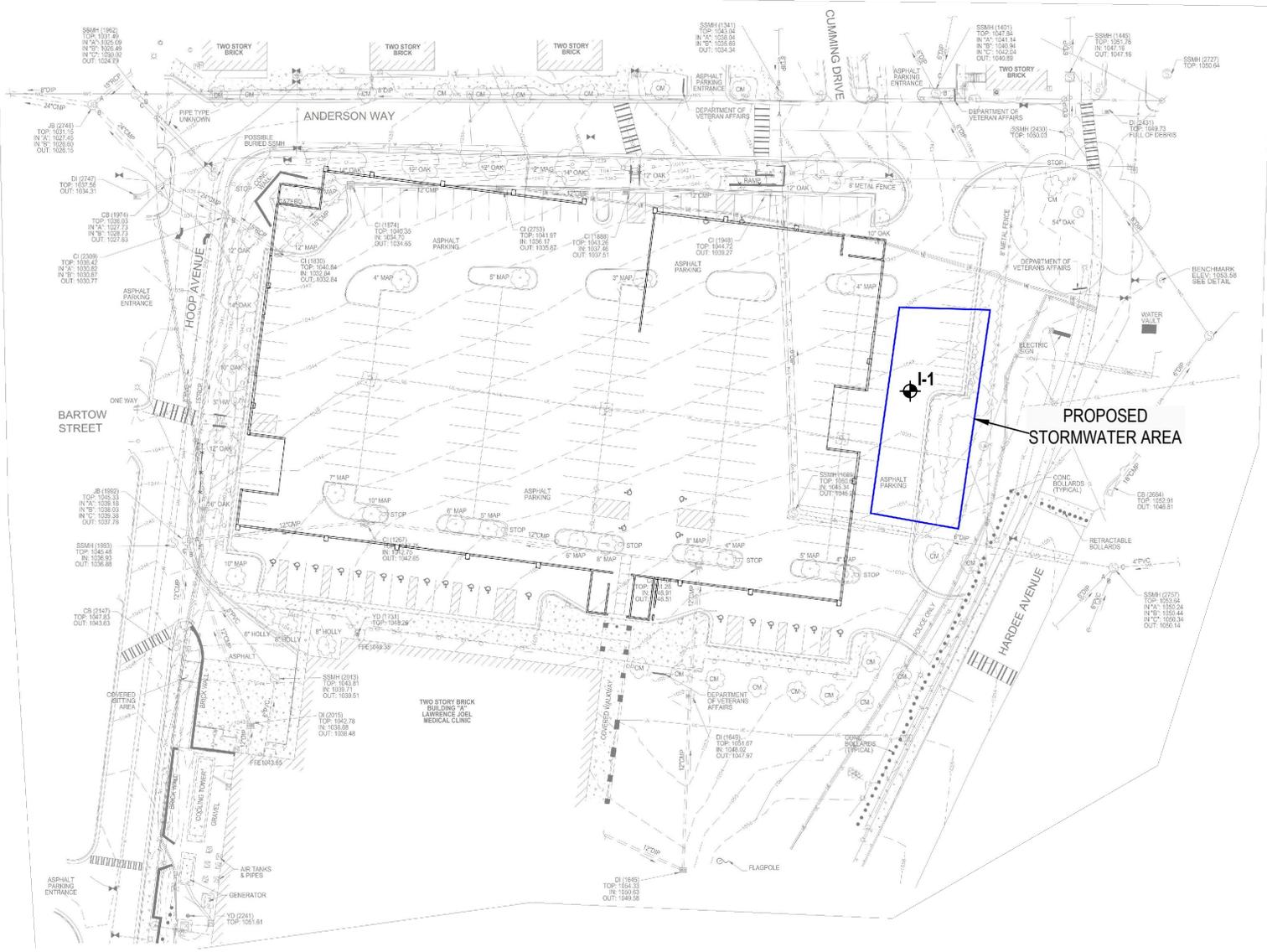
Veronica V. Finol, E.I.T.
Senior Staff Geotechnical Engineer



Timothy A. Brown, P.E.
Senior Principal/Office Manager

Attachments Infiltration Test Location Plan
 Field and Laboratory Procedures
 Laboratory Test Results –Hydraulic Conductivity

Copies via email to: Addressee



NOT TO SCALE

LEGEND


 APPROXIMATE
INFILTRATION TEST
LOCATION

Project Mngr:	VF	Project No.	49165249A
Drawn By:	JSL	Scale:	AS SHOWN
Checked By:	MRF/VF	File No.	IT49165249A-1
Approved By:	VF	Date:	MAY 2017


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INFILTRATION TEST LOCATION PLAN
 INFILTRATION TESTING
 FORT MCPHERSON PARKING DECK
 1701 HARDEE AVENUE SOUTHWEST
 ATLANTA, GA

EXHIBIT
 A-1

THIS DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Infiltration Recommendation Services

Fort McPherson Parking Deck ■ Atlanta, Georgia
May 24, 2017 ■ Terracon Project No. 49165249A

**Field Exploration Description**

The boring location was established in the field by Terracon personnel. Distances from reference features indicated on the attached plan are approximate and were measured from site features. The location of the boring should be considered accurate only to the degree implied by the means and methods used to define them.

The boring was drilled with a truck-mounted rotary drill rig using hollow stem augers to advance the boreholes. Relatively undisturbed soil samples (UDs) are collected during the drilling operations and returned to the laboratory for specialty laboratory tests. UD's are collected from the bottom of boreholes by pushing approximate 3-inch diameter thin-walled steel tubes. The tubes are retrieved, then sealed to preserve moisture, and carefully transported to the laboratory.

Laboratory Testing

Measurement of laboratory hydraulic conductivity of saturated porous material using a flexible wall permeameter. A cylindrical soil sample with porous plates on the ends is placed inside a flexible rubber membrane. The prepared sample is then placed inside a pressure chamber, subjected to a small confining stress and back-saturated. Testing is performed by applying a small head of water pressure onto one end of the sample and measuring the outflow with a mercury filled sensing device. The test is repeated several times to confirm repeatability.

HYDRAULIC CONDUCTIVITY DETERMINATION

(FLEXIBLE-WALL PERMEAMETER - FALLING-HEAD-ASTM D 5084 Method C)

Project : Fort McPherson Parking Deck
 Date: 5/19/2017
 Project No. : 49165249a
 Boring No.: I-1
 Sample: Perm1
 Depth (ft): 7-9'

Other Location: _____

Tube Number : 1 Tube Capacity: 25.0 cm
 Area (sq. centimeter): 0.8755 Factor (cm) = 1.14

Material Description : SANDY SILT, red-brown with mica
 Specimen Type: Shelby Tube

SAMPLE DATA

Wet Wt. sample + ring or tare :	751.4 g		
Tare or ring Wt. :	0.0 g	Before Test	After Test
Wet Wt. of Sample :	751.4 g	Tare No.:	S-13 102
Diameter :	2.85 in 7.239 cm ²	Wet Wt.+tare:	126.70 811.45
Length :	3.92 in 9.9568 cm	Dry Wt.+tare:	108.63 636.45
Area:	6.379 in ² 41.157 cm ²	Tare Wt:	26.00 41.99
Volume :	25.007 in ³ 409.795 cm ³	Dry Wt.:	82.63 594.46
Unit Wt.(wet):	1.83 g/cm ³ 114.4 pcf	Water Wt.:	18.07 175
Unit Wt.(dry):	1.50 g/cm ³ 93.9 pcf	% moist.:	21.9 29.4

Specific Gravity : 2.70 Max Dry Density = _____ OMC % = _____
 (estimated: X actual:) % of max = _____ % +/- OMC = _____
 Calculated % saturation: 100.0 Void ratio (e) = 0.795 Porosity (n)= 0.443

Pressure Differential (psi) = 1.0 Pressure Head (cm) = 70.41

Hydraulic Gradient:	Maximum*	Minimum*	Average*
	7.1	4.2	6.5

TEST READINGS

Date/time (i)	Date/time (f)	elapsed t	elapsed t	H initial	H final	Flow in	Flow out	temp	α	k	k
m/d hr:min	m/d/hr:min	(day)	(sec)	Hi (cm)	Hf (cm)	qi (cc)	qo (cc)	(deg C)	(temp corr)	(cm/sec)	(ft./day)
5/19 9:00	5/19 9:02	0.0014	120	19.5	24.5	5.0	5.0	22	0.954	1.49E-04	4.22E-01
5/19 9:00	5/19 9:02	0.0017	150	0.0	6.0	6.0	6.0	22	0.954	1.46E-04	4.13E-01
6/16 9:00	6/16 9:01	0.0007	60	8.0	13.0	5.0	5.0	22	0.954	2.98E-04	8.44E-01
6/16 9:00	6/16 9:01	0.0010	90	14.0	19.5	5.5	5.5	22	0.954	2.21E-04	6.25E-01

SUMMARY

	ka =	2.03E-04 cm/sec		(k Acceptance criteria: Vm <=	50	%)
Reading	qo/qi	acceptance	ki	Vm		
1	1.00	ok	k1 =	26.7	%	
2	1.00	ok	k2 =	28.3	%	
3	1.00	ok	k3 =	46.5	%	
4	1.00	ok	k4 =	8.5	%	

k = 2.03E-04 cm/sec (hydraulic conductivity)

Acceptance criteria as Vm:
 (Variation from ASTM D 5084)
 50 % for ka >= 1.00E-08
 95% for ka < 1.00E-08

Acceptance criteria for qo/qi ratio:
 0.75 <= qo/qi <= 1.25

(All acceptance criteria for 4 consecutive readings)

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

***Hydraulic Gradient Notes:**

Maximum and **Minimum** refer to the range possible during the test. The maximum and/or minimum limits may not be reached. **Average** is the average of **actual** hydraulic gradients achieved during the test.

HYDRAULIC CONDUCTIVITY DETERMINATION

(FLEXIBLE-WALL PERMEAMETER - FALLING-HEAD-ASTM D 5084 Method C)

Project : Fort McPherson Parking Deck
 Date: 5/19/2017
 Project No. : 49165249a
 Boring No.: I-1
 Sample: Perm2
 Depth (ft): 11'-13'

Other Location:
 Tube Number : 1
 Tube Capacity: 25.0 cm
 Area (sq. centimeter): 0.8755
 Factor (cm) = 1.14

Material Description : SILTY SAND, brown
 Specimen Type: Shelby Tube

SAMPLE DATA

Wet Wt. sample + ring or tare :	989.1 g				
Tare or ring Wt. :	0.0 g				
Wet Wt. of Sample :	989.1 g				
Diameter :	2.786 in	7.07644 cm ²			
Length :	5.399 in	13.71346 cm			
Area:	6.096 in ²	39.330 cm ²			
Volume :	32.913 in ³	539.345 cm ³			
Unit Wt.(wet):	1.83 g/cm ³	114.4 pcf			
Unit Wt.(dry):	1.61 g/cm ³	100.7 pcf			

	Before Test	After Test
Tare No.:	B-20	AU21
Wet Wt.+tare:	40.59	1204.6
Dry Wt.+tare:	38.94	990.5
Tare Wt:	26.80	115.88
Dry Wt.:	12.14	874.62
Water Wt.:	1.65	214.1
% moist.:	13.6	24.5

Specific Gravity : 2.67
 (estimated: X actual:)
 Calculated % saturation: 100.0

Max Dry Density =
 % of max =
 Void ratio (e) = 0.654

OMC % =
 % +/- OMC =
 Porosity (n)= 0.395

Pressure Differential (psi) = 1.0 Pressure Head (cm) = 70.41

Hydraulic Gradient:	Maximum*	Minimum*	Average*
	5.1	3.1	4.9

TEST READINGS

Date/time (i)	Date/time (f)	elapsed t	elapsed t	H initial	H final	Flow in	Flow out	temp	α	k	k
m/d hr:min	m/d/hr:min	(day)	(sec)	Hi (cm)	Hf (cm)	qi (cc)	qo (cc)	(deg C)	(temp corr)	(cm/sec)	(ft./day)
5/19 9:00	5/19 9:01	0.0010	90	16.3	19.5	3.2	3.2	22	0.954	1.77E-04	5.02E-01
5/19 9:00	5/19 9:02	0.0014	120	19.5	22.5	3.0	3.3	22	0.954	1.31E-04	3.71E-01
6/16 9:00	6/16 9:02	0.0017	150	0.0	3.2	3.2	3.2	22	0.954	1.06E-04	3.01E-01
6/16 9:00	6/16 9:03	0.0021	180	3.2	6.2	3.0	3.0	22	0.954	8.28E-05	2.35E-01

SUMMARY

Reading	qo/qi	acceptance	ka = 1.24E-04 cm/sec	ki	Vm	(k Acceptance criteria: Vm<= 50 %)
1	1.00	ok	k1 = 1.77E-04 cm/sec	k1	42.6	%
2	1.10	ok	k2 = 1.31E-04 cm/sec	k2	5.2	%
3	1.00	ok	k3 = 1.06E-04 cm/sec	k3	14.4	%
4	1.00	ok	k4 = 8.28E-05 cm/sec	k4	33.4	%

k = 1.24E-04 cm/sec (hydraulic conductivity)

Acceptance criteria as Vm:
 (Variation from ASTM D 5084)
 50 % for ka >= 1.00E-08
 95% for ka < 1.00E-08

Acceptance criteria for qo/qi ratio:
 0.75 <= qo/qi <= 1.25

(All acceptance criteria for 4 consecutive readings)

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

***Hydraulic Gradient Notes:**

Maximum and **Minimum** refer to the range possible during the test. The maximum and/or minimum limits may not be reached. **Average** is the average of **actual** hydraulic gradients achieved during the test.