DRAINAGE REPORT

2012-2014 NW 6th Street
DRAINAGE REPORT

Prepared by:
Ross Engineering, Inc.

Robert J. Ross, P.E.
FL P.E. #59485
January 29, 2020

A. PROJECT NARRATIVE

(Folio #02-3203-001-1040)

The existing site is comprised of an existing building (to remain) and a large parking area that will be removed. A new building is proposed as well as a new parking lot.

All elevation herein and on the drainage plan are in NAVD.

B. STORMWATER MANAGEMENT PLAN

The proposed drainage layout is designed to handle to meet the requirements of the 5yr-24hr, 10yr-24hr, 25yr-72hr, and 100yr-72hr rainfall events by means of:

- Dry Retention
- Exfiltration Trench
- R-Tanks

C. LAND USE BREAKDOWN TABLE

Land Use Breakdown (Post-Development)							
Land Use	Area			Grade			
	sf	ac	%	Low	High	Average	Wtd. Avg.
Impervious Areas	**11,008**	**0.25**	**75.9%**			**8.61**	**6.53**
Building (roofed)	3,989	0.09	27.5%	9.17		9.17	2.52
Lake/Pool	0	0.00	0.0%			0.00	0.00
Other Impervious >8.5	950	0.02	6.5%	8.50	9.00	8.75	0.57
Other Impervious 8.0 to 8.25	3,819	0.09	26.3%	8.00	8.25	8.13	2.14
Other Impervious 8.25 to 8.5	2,250	0.05	15.5%	8.25	8.50	8.38	1.30
Pervious Areas	**3,500**	**0.08**	**24.1%**			**7.66**	**1.85**
Retention 1 (V)	100	0.00	0.7%	6.50		6.50	0.04
Retention 1 (L)	425	0.01	2.9%	6.50	8.00	7.25	0.21
Retention 2 (V)	75	0.00	0.5%	6.50		6.50	0.03
Retention 2 (L)	500	0.01	3.4%	6.50	8.00	7.25	0.25
Retention 3 (V)	25	0.00	0.2%	7.00		7.00	0.01
Retention 3 (L)	175	0.00	1.2%	7.00	8.00	7.50	0.09
Retention 4 (V)	325	0.01	2.2%	7.50		7.50	0.17
Retention 4 (L)	500	0.01	3.4%	7.50	8.00	7.75	0.27
Retention 5 (L)							
Retention 6 (L)							
Green	1,375	0.03	9.5%	8.00	8.25	8.13	0.77
Total Site	**14,508**	**0.33**	**100.0%**			**8.38**	**8.38**

(V): Vertical Storage = Area x Depth

(L): Linear Storage = (1/2)Area x Depth

D. GENERAL DESIGN CRITERIA

- **Water Control Elevation = 0.50' NAVD**
  refer to Appendix A

- **Design Rainfall**

Return Period	SFWMD Rainfall Map
	(P)
100 year	17.50 in
25 year	14.00 in
10 year	8.75 in
5 year	7.50 in

E. DESIGN CALCULATIONS

- **Soil Storage = 1.97 in**

Soil Storage (Post-Development)		
Average Finished Grade	7.66 ft	NAVD
Average Water Table	.50 ft	NAVD
Depth to Water Table	7.16 ft	= (7.66 ft) - (.5 ft)
Soil Storage SFWMD (S*)	8.18 in	*interpolated per SFWMD*
Total Pervious Area	3,500 sf	*see land use breakdown*
*Trench Area @ Pervious	0 sf	*see calculation below*
Adjusted Pervious Area	3,500 sf	= (3,500) - ()
Total Site Area	14,508 sf	= (3,500) / (14,508)
%Adjusted Pervious Area ($\%A_P$)	24.1%	= (3,500) / (14,508)
Site Specific Soil Storage (S)	**1.97 in**	**= (S*) x (%Ap)**

S = Soil Storage (SFWMD Table)*

Runoff & Max Stage (Post-Development)			
SCS Equation	**Rainfall (P)**	**P Excess (Pe)**	**Runoff (Q)**
Storm Event	Taken from SFWMD Maps	$Pe = \frac{(P-0.2S)^2}{(P+0.8S)}$	$Q=Pe \times A \times \frac{1ft}{12in}$
100 yr 72 hr	17.50 in	15.34 in	0.4256 ac-ft
25 yr 72 hr	14.00 in	11.88 in	0.3298 ac-ft
10 yr 24 hr	8.75 in	6.76 in	0.1876 ac-ft
5 yr 24 hr	7.50 in	5.5609 in	0.1543 ac-ft

Area (A) = 0.33 ac

- **Storage Provided**
  - **Exfiltration Trench = 0.06 ac-ft**

Reverse Trench Calcs (Post-Development)		
Check for Governing Equation		
Ds>Du	False	
W>2(Ds+Du)	False	
Use Standard Equation unless either statement is True. If True, then use Conservative Equation.		
Reverse Standard Equation		
*V = L{K[H2W+2H2Du-Du2+2H2Ds]+1.39x10-4(W		
*V = FS[%WQ(Vwq)+Vadd]		
L	**23.38**	**ft**
W	4	ft
K	3.22E-04	CFS/SF-ft head
H_2	7.50	ft
D_u	6.00	ft
D_s	0.00	ft
***V**	**0.71**	**ac-in**
***V**	**0.06**	**ac-ft**
FS	2	
%WQ	50%	

V = Volume of Water Treated (ac-in.)

FS = Factor of Safety

%WQ = Percent Water Quality

L = Length of Trench Required (ft)

W = Trench Width (Feet)

K = Hydraulic Conductivity (cfs/ft2 - ft head)

H2 = Depth to Water Table (ft)

Du = Non-Saturated Trench Depth (ft)

Ds = Saturated Trench Depth (ft)

- **RTank = 0.17 ac-ft (refer to Appendix)**

- **Stage-Storage**
  - **Maximum Stage-Storage Table**

Event max. stage	Stage Storage (Post-Development)		Event max. stage
	Stage (Feet) NAVD	Total Storage (ac-ft)	
	1.00	0.00	
	1.50	0.03	
	2.00	0.05	
	2.50	0.02	
	3.00	0.09	
	3.50	0.11	
	4.00	0.13	
	4.50	0.15	
5 yr 24 hr	5.00	0.17	
	5.50	0.19	
10 yr 24 hr	6.00	0.21	
	6.50	0.23	
	7.00	0.23	
	7.50	0.24	
	8.00	0.26	
25 yr 72 hr	8.50	0.33	
	9.00	0.45	100 yr 72 hr
	9.50	0.57	

- **Stage-Storage Breakdown Table**

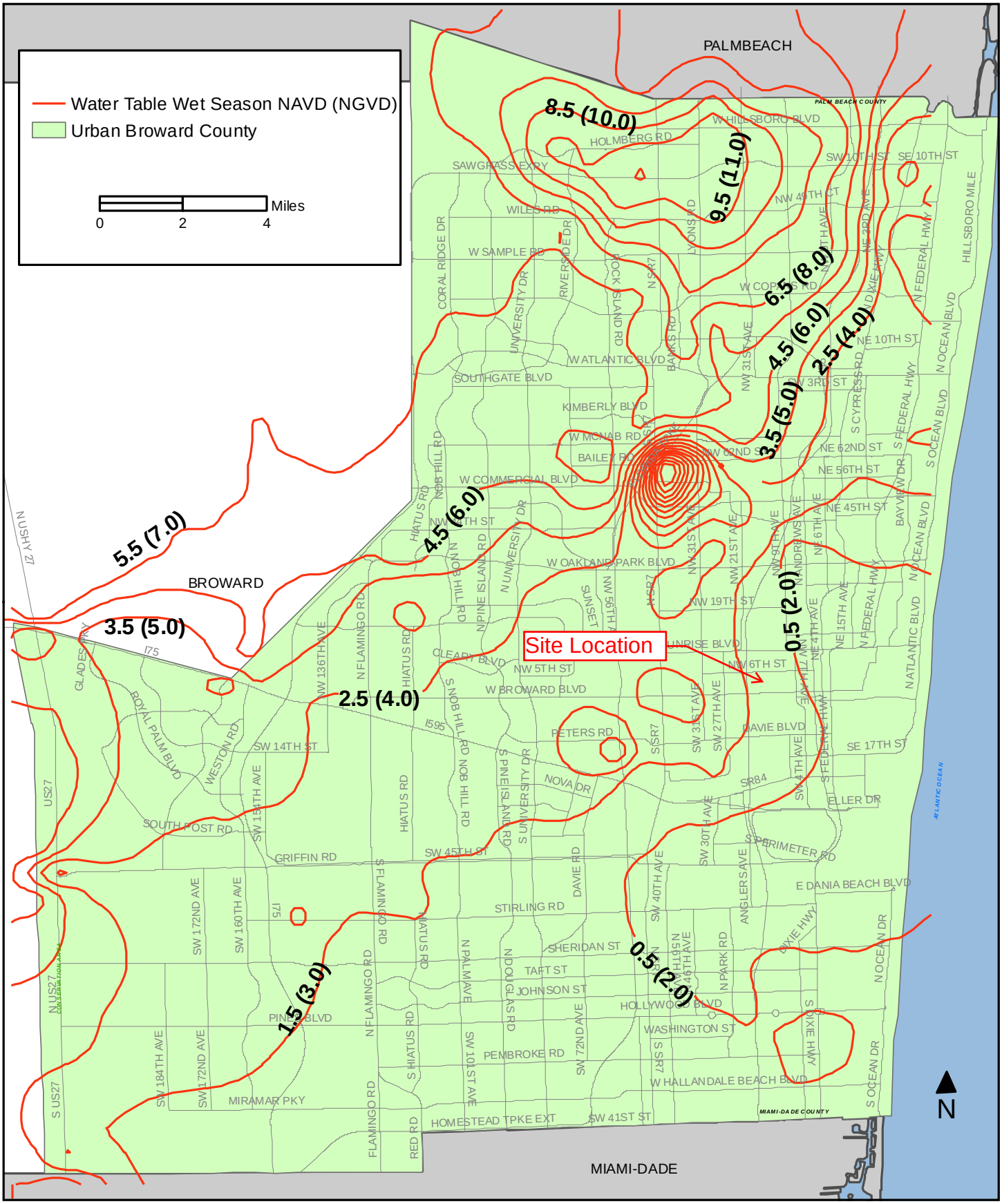
Stage Storage (Post-Development)								
	Lake/Pool	Other Impervious > 8.5	Other Impervious 8.0 to 8.25	Other Impervious 8.25 to 8.5	Retention 1 (V)	Retention 1 (L)	Retention 2 (V)	Retention 2 (L)
Area (AC)	0.00	0.02	0.09	0.05	0.00	0.01	0.00	0.01
Low Elev		8.50	8.00	8.25	6.50	6.50	6.50	6.50
High Elev		9.00	8.25	8.50	8.00	8.00	8.00	8.00
Stage Feet NAVD	Linear Storage ac-ft	Linear Storage ac-ft	Linear Storage ac-ft	Linear Storage ac-ft	Vertical Storage ac-ft	Linear Storage ac-ft	Vertical Storage ac-ft	Linear Storage ac-ft
1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
8.50	0.00	0.00	0.03	0.01	0.00	0.01	0.00	0.01
9.00	0.00	0.01	0.08	0.03	0.01	0.02	0.00	0.02
9.50	0.00	0.02	0.12	0.06	0.01	0.02	0.01	0.03

Stage Storage (Post-Development)								
	Retention 3 (V)	Retention 3 (L)	Retention 4 (V)	Retention 4 (L)	Green	Trench 1	Rtank	Total
Area (AC)	0.00	0.00	0.01	0.01	0.03	n/a	n/a	0.24
Low Elev	7.00	7.00	7.50	7.50	8.00	0.50	1.00	
High Elev	8.00	8.00	8.00	8.00	8.25	6.50	6.50	
Stage Feet NAVD	Vertical Storage ac-ft	Linear Storage ac-ft	Vertical Storage ac-ft	Linear Storage ac-ft	Linear Storage ac-ft	Exfiltration Storage ac-ft	Exfiltration Storage ac-ft	Total Storage ac-ft
1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.50	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03
2.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.05
2.50	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02
3.00	0.00	0.00	0.00	0.00	0.00	0.02	0.06	0.09
3.50	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.11
4.00	0.00	0.00	0.00	0.00	0.00	0.03	0.09	0.13
4.50	0.00	0.00	0.00	0.00	0.00	0.04	0.11	0.15
5.00	0.00	0.00	0.00	0.00	0.00	0.04	0.12	0.17
5.50	0.00	0.00	0.00	0.00	0.00	0.05	0.14	0.19
6.00	0.00	0.00	0.00	0.00	0.00	0.05	0.15	0.21
6.50	0.00	0.00	0.00	0.00	0.00	0.06	0.17	0.23
7.00	0.00	0.00	0.00	0.00	0.00	0.06	0.17	0.23
7.50	0.00	0.00	0.00	0.00	0.00	0.06	0.17	0.24
8.00	0.00	0.00	0.00	0.00	0.00	0.06	0.17	0.26
8.50	0.00	0.00	0.01	0.01	0.01	0.06	0.17	0.33
9.00	0.00	0.01	0.01	0.01	0.03	0.06	0.17	0.45
9.50	0.00	0.01	0.01	0.02	0.04	0.06	0.17	0.57

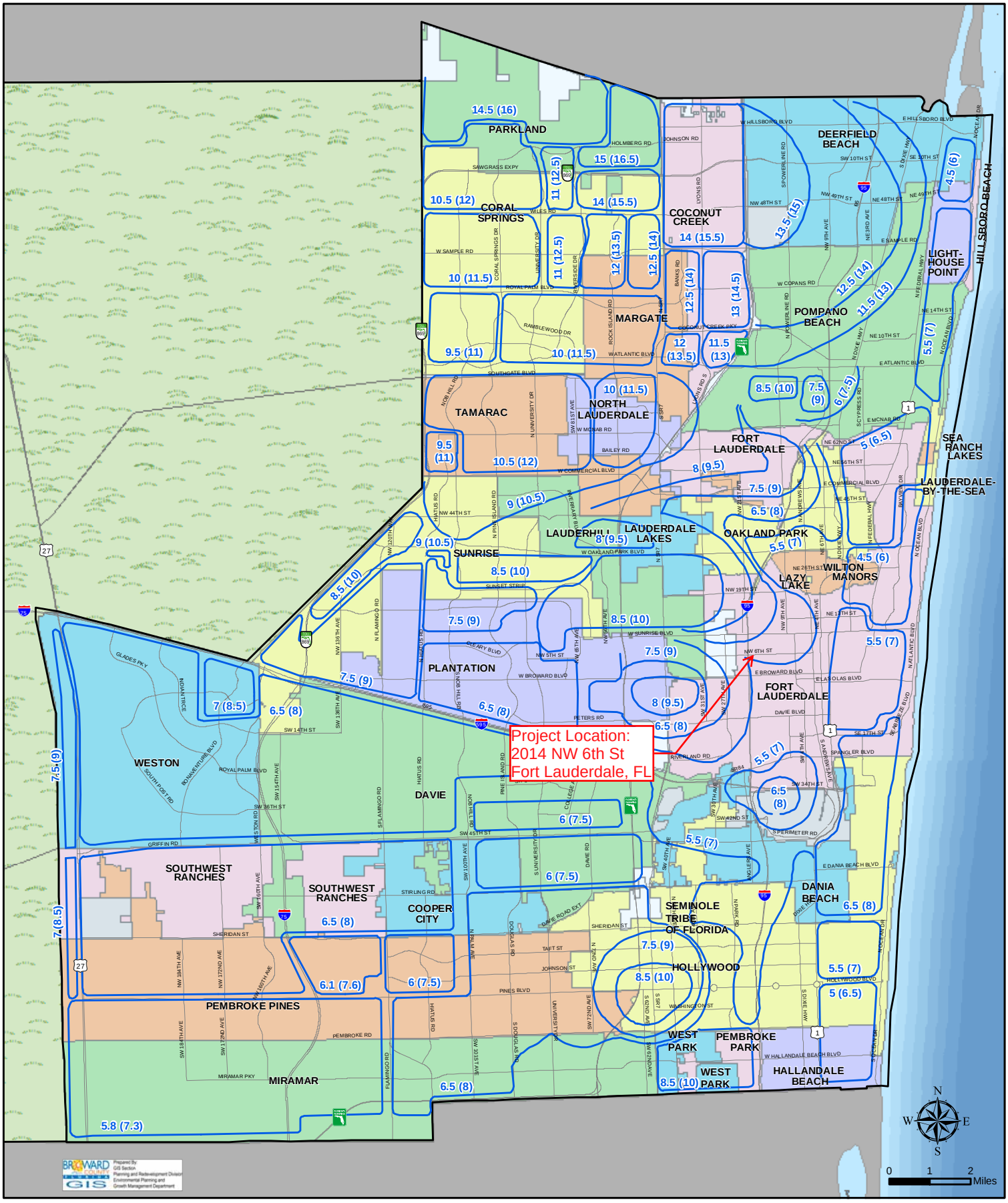
APPENDIX A

Water Table Map
Rainfall Maps

WATER TABLE MAP - AVERAGE WET SEASON



BROWARD COUNTY 100 YEAR FLOOD ELEVATIONS



100 Year Flood Contours NAVD (NGVD)
Example: 6.5 (8)

This map is for conceptual purposes only and should not be used for legal boundary determinations.
Elevations converted from NGVD to NAVD using the FEMA approved conversion factor for Broward County of (-)1.5, based on 1997 FEMA Flood Data

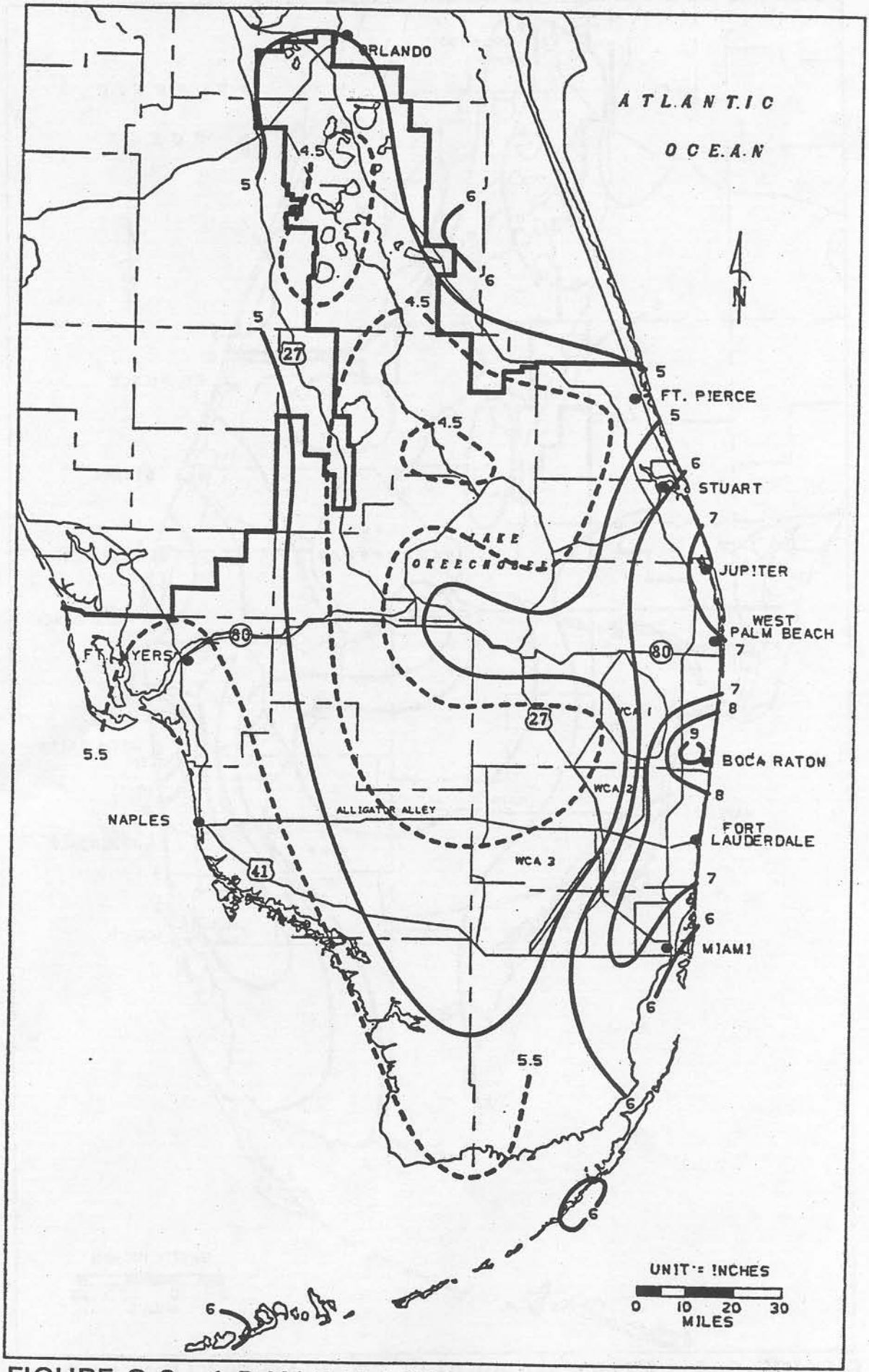


FIGURE C-3. 1-DAY RAINFALL: 5-YEAR RETURN PERIOD

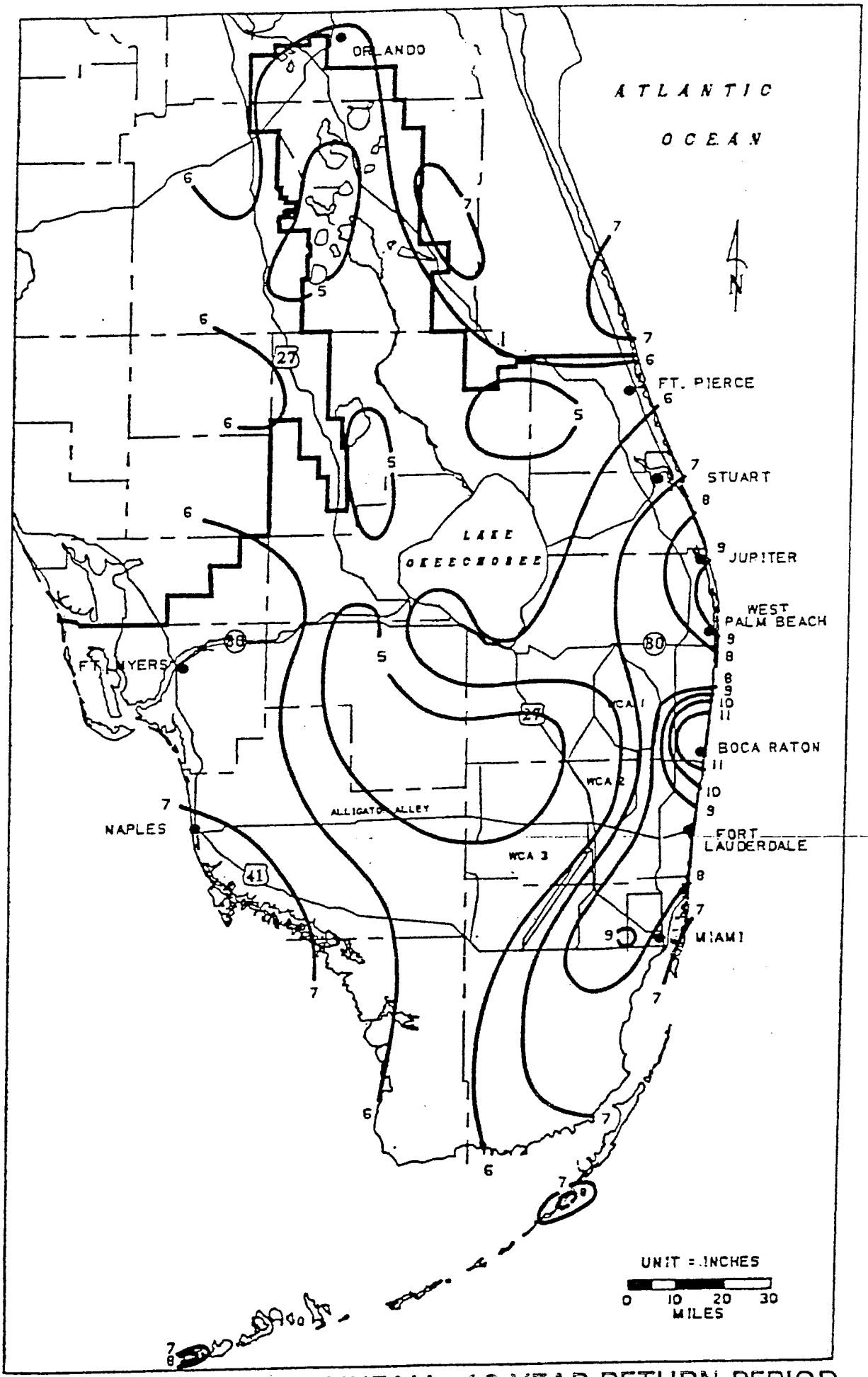


FIGURE C-4. 1-DAY RAINFALL: 10-YEAR RETURN PERIOD

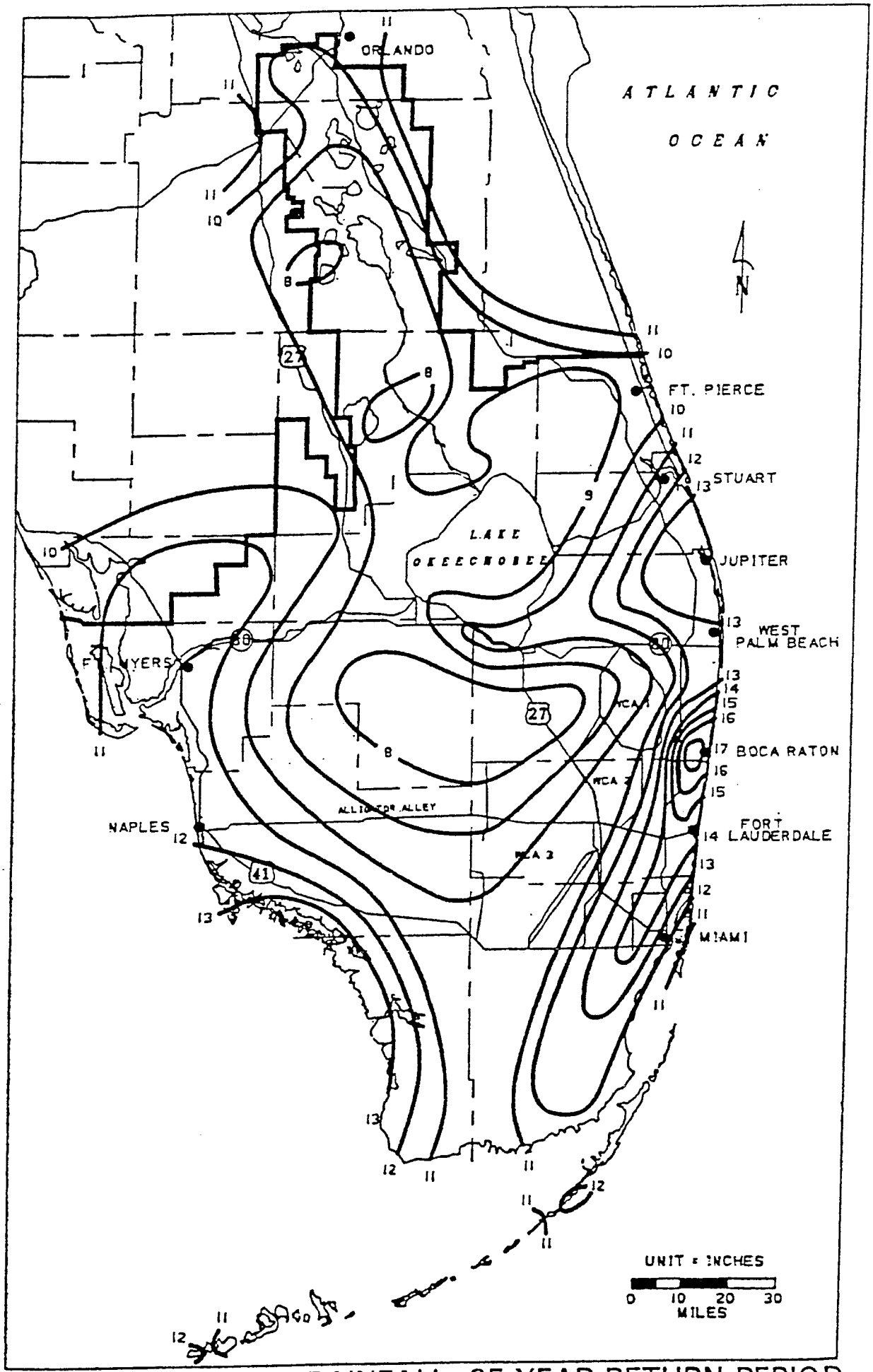


FIGURE C-8. 3-DAY RAINFALL: 25-YEAR RETURN PERIOD

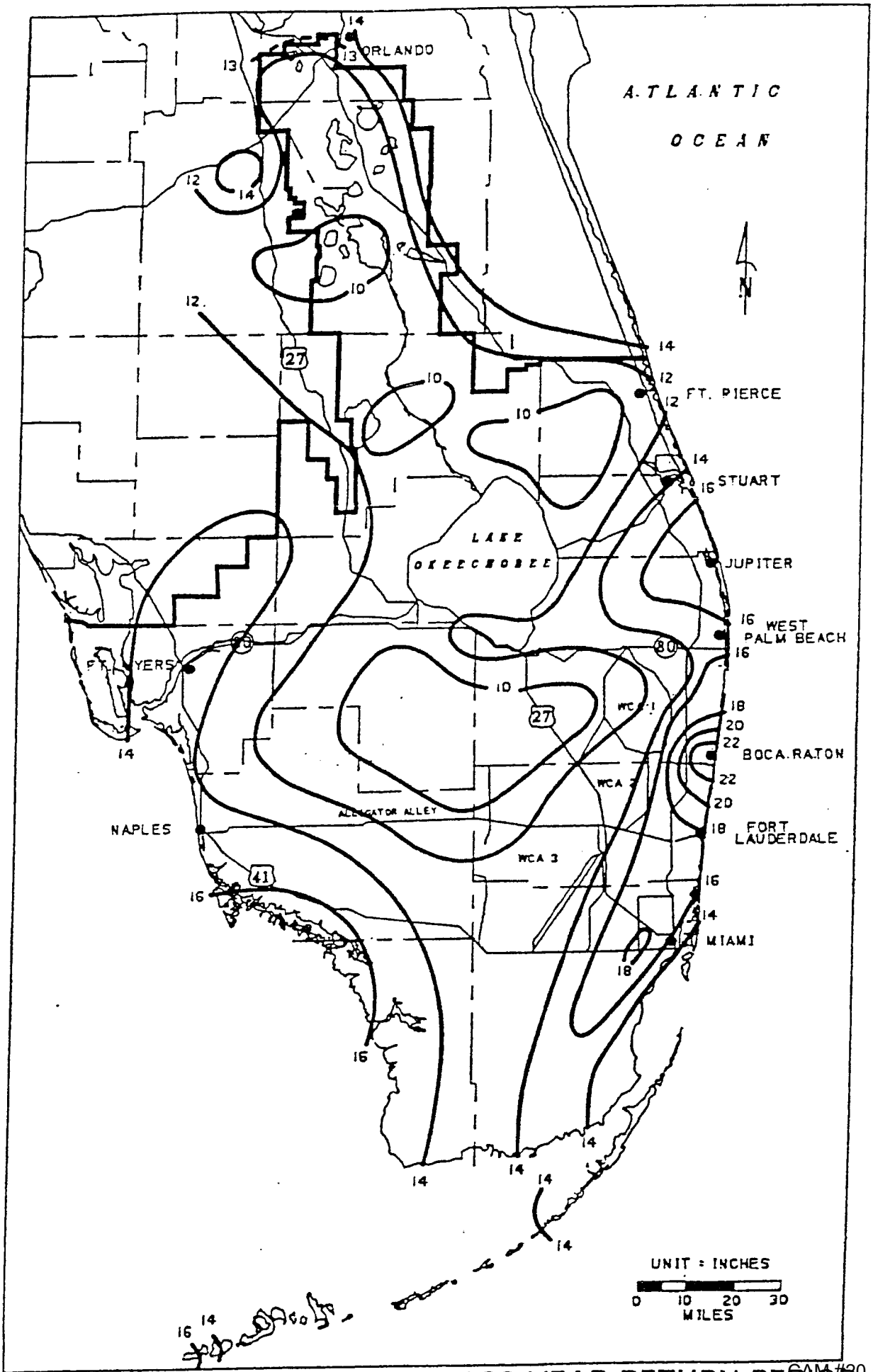


FIGURE C-9. 3-DAY RAINFALL: 100-YEAR RETURN PERIOD

APPENDIX B

Geotechnical Report

B3 MATERIAL TESTING ENGINEERING
Essence of Perfection

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October 6, 2019 Project No. 19-0390

Leward Design, LLC.
18242 NW. 20th Street
Hollywood, Florida 33029

Attn.: Mr. Bertram Leward

RE: Report of Geotechnical exploration for **Proposed drive thru restaurant Located at 2012-2014 NW. 6 Street, Ft. Lauderdale, Florida**

Dear Mr. Leward:

In accordance with your request, we have completed the subsurface exploration and geotechnical evaluation for a proposed drive thru for restaurant lot in Fort Lauderdale, Florida. Enclosed are two (2) copies of the report that includes our findings and construction considerations.

B3 Material Testing Engineering, LLC (B3 MTE) appreciates the opportunity to be of service during this phase of the project. If there are any questions or comments you may have regarding the content of this report, or if you may need of any further service, please contact us at your convenience.

If there are any questions regarding the information submitted herein, please do not hesitate to contact us.

Sincerely yours,

B3 Material Testing Engineering, LLC.

DARIO A. HERRERO LICENSE No. 67796 STATE OF FLORIDA PROFESSIONAL ENGINEER

Dario A. Herrero P.E.
Florida Reg. 67796
DDA@b3mtesting.com

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October 6, 2019
Leward Design, LLC.

Project No. 19-0390

INTRODUCTION

B3 Material Testing Engineering LLC. (B3 MTE) conducted a subsurface investigation at the above referenced project. The investigation was performed on **October 3, 2019,** authorized by Mr. Bertam Leward.

The purpose of the investigation was to obtain information concerning the sub-surface condition to provide site preparation and foundation design alternatives for support of the proposed construction. To achieve the desired objective two (2) standard penetration test borings, and two (2) percolation tests were performed. The approximate boring locations are indicated on the attached Boring Location Plan. We have also attached the Boring Logs, which include the types of materials encountered, results of the field tests and measured groundwater depths.

SCOPE

The scope of services included a reconnaissance of the site, geotechnical investigation, field and engineering analysis and evaluation of the data.

PROJECT AND SITE DESCRIPTION

The proposed project consists of a drive thru for a restaurant in Fort Lauderdale, Florida.

SUBSURFACE INVESTIGATION PROCEDURES

The soil borings were performed in **October 3, 2019** with a drilling rig and were advanced using hollow stem auger drilling methods. A total of two (2) soil borings were performed to a depth of 15 feet. Representative soil samples were obtained employing split spoon sampling procedures in accordance with ASTM Specification D-1586.

A two (2) foot long two (2) inches O.D. Split Spoon Sampler was driven into the ground by successive blows with 140 lb. Hammer dropping thirty (30) inches. The soil sampler was driven two (2) feet at a time or at every change in soil characteristics, then extracted for visual examination and classification of the retained soil samples.

The number of blows required for a one (1) foot penetration of the sampler is designated as "N" (known as the standard penetration resistance value). The "N" value provides an indication of the relative density of non-cohesive soils and the consistency of cohesive soils.

Suitable corrections are applied to this number to include the effects of soil overburden pressure and other factors. A general evaluation of soils is made from the established correlation between "N" and the relative density or consistency of soils.

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October 6, 2019 Project No. 19-0390
Leward Design, LLC.

This dynamic method of soil testing has been widely accepted by foundation engineers and architects to conservatively evaluate the bearing capacity of soils. A continuous drilling and sampling procedure were used therefore, the samples were taken at intervals of two (2) feet

SOIL AND GROUND WATER CONDITIONS

Specific soil conditions encountered in the borings are indicated on the soil boring logs included with this report. The existing surface consists of 0' to 4" Asphalt , 4" to 4', Gray fine to medium sand, 4' to 6' Light gray fine to medium sand, 6' to 10' Dark brown fine to medium sand, 10' to 15' Tan fine to medium sand with lime rock.

Fluctuations in the amount of water accumulated and in the hydrostatic water table can be anticipated depending upon variations in precipitation and surface runoff.

The types of foundation material encountered have been visually classified and are described in detail in the boring logs. The results of the field penetration tests are presented in the boring logs in numerical and graphic forms.

Groundwater was measure immediately at the completion of each soil boring and was found at an average of approximately **four (4) feet six (6) inches**, below the existing surface (see logs). Design engineers must verify existing ground elevations as well as FEMA Flood and County highest and lowest groundwater elevation for their design. Surface flooding may result under hurricane conditions and should be taken into consideration in the design of the project. Specialty groundwater and water proofing contractors shall be consulted for all work below the groundwater level. Fluctuation in the observed ground water level should be expected due to seasonal climatic changes rainfall variation, surface water run-off and other, specific factors related to the site in question. Dewatering for pile caps shall be considered.

FOUNDATION RECOMMENDATIONS:

Based on the sub-surface conditions encountered **B3 Material Testing Engineering LLC**), has evaluated a few foundation systems for providing additional support to the existing structure. Based on our understanding of the proposed structure and our field boring logs

Existing land elevation was not provided to us; therefore, the proposed pile length is based on the existing ground elevation at the time of drilling. Pile length will need to be adjusted accordingly based on proposed final designs.

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July 9, 2019 Project No. 19-0249
88 Biscayne Management, LLC

FOUNDATION RECOMMENDATIONS:

Our recommendations are based on the information provided from the client as to the type of structure planned and on our subsurface investigation performed on the proposed site. Our recommendations are as follows:

1. Clear entire building area plus 5'-0" outside the perimeter of construction and remove all topsoil, and unsuitable subsurface material to the necessary depth. We anticipate an average excavation depth of approximately six (6) inches.

2. Compact excavated area to a minimum compaction of 98% of the optimum dry density as per AASHTO T-180. Verify densification procedures by taking an adequate number of field density compaction tests, especially in the footing area. The excavated area should be inspected prior to the commencement of the backfilling operation to ensure that all the unsuitable material has been removed.

3. Backfill building area, plus 5'-0" outside the perimeter of the structure to the required elevation with a clean mixture of sand, lime rock and lime sand fill (or approved fill material) in maximum 10" loose lifts to a minimum of 98% of the optimum dry density as per AASHTO T180.

4. Verify densification procedures by taking an adequate number of field density tests, especially in the footing area.

5. Excavate footing trenches to the required depth from the ground elevation. Compact the bottom of the footing trench to a minimum compaction of 98% of the optimum dry density as per AASHTO T-180. Verify densification procedures by taking an adequate number of field density compaction tests.

Special Considerations:

a) The subgrade at the design elevation should be observed by a geotechnical engineer and any topsoil, organic, unsuitable or deleterious material removed. Proof rolling of the resultant subgrade should be performed to locate objectionable soils that should be removed. During the proof rolling procedure, the stripped soil surface is rolled with the heaviest piece of construction equipment available at the site, such as a heavily loaded tandem axle dump truck having a gross weight of not less than 25 tons. Areas exhibiting deflection or rutting over 1.25 in (32 mm) should be removed and the proof rolling continued until all unsuitable soils have been located and removed or improved in-place. However, the on-site inspector should ensure that the finished subgrade does not exhibit more than 0.5 inch (12.5 mm) of rutting.

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October 6, 2019
Leward Design, LLC.

Project No. 19-0390

b) **Floor Slab:** After the existing building is demolished and the debris carter off-site, all buried structures and utilities should be removed from the planned building area plus 5-foot wide perimeter. Obtain demolition permit after conducting asbestos surveys, before commencement of demolition activities. The cleared site should be graded and filled to required elevation. Fill used to raise the building pad should be granular in texture, have not particle size larger than three inches and have a fines content of no more than 12%.

   i. A vapor barrier should be placed over the building pad fill, prior to placement of concrete for the floor slab. This will tend to minimize the entrance of subgrade moisture into the slab. Normally a 10-mil film of polyethylene is used for this purpose.

c) Also, note that as a common engineering practice for existing and new construction, outside ground surfaces, must be sloped away from the structure to avoid water accumulation and ponding. Rain gutters shall be installed, and all rainwater shall be discharged over splash guards a minimum of 5 feet away from building foundation.

DESIGN RECOMMENDATIONS:

The above foundation recommendation having been achieved and verified; we anticipate that the foundation may be appropriately proportioned for a safe soil bearing capacity not to exceed **2,500 psf** (pounds per square foot). The use of spread footings and single column pads is suggested. A monolithic slab foundation may also be adopted.

GENERAL QUALIFICATIONS

The analysis and recommendations presented in this report are based upon the data obtained from the soil borings performed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations that may occur between borings or across the site. Any statements which appear in this report or on the boring logs regarding odors, color, unusual or suspicious items or conditions are strictly for the information of the client. In addition, the soils samples cannot be relied on to accurately reflect the strata variations that usually exist between sampling locations. The nature and extent of such variations may not become evident until construction. If variations appear evident, it will be necessary to reevaluate the recommendations of the report. In addition, it is recommended that B3 Material Testing Engineering, LLC. be retained to perform construction observation and thereby provide a complete professional geotechnical engineering service through the observational method. For environmental due to diligence; a phase I and/or phase II Environmental Site Assessments is recommended.

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October 6, 2019
Leward Design, LLC.

Project No. 19-0390

This report has been prepared for the exclusive use of **Leward Design, LLC.** for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. If any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions of this report modified or verified in writing by the geotechnical engineer. Also, note that B3 Material Testing Engineering, LLC. is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or reuse of the report's' subsurface data or engineering analyses without the express written authorization of B3 Material Testing Engineering, LLC.

B3 Material Testing Engineering, LLC. appreciates the opportunity to be of service to you at this phase of you project. Please feel free to contact us if there are any questions or comments pertaining to this report.

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SOIL PERCOLATION AND PERCOLATION TEST

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PERCOLATION TEST

USUAL OPEN HOLE TEST (CONSTANT HEAD)

PROJECT NO.	**19-0390**	DATE:	**10/3/2019**
PROJECT	**Propose Drive-thru Restaurant** 2012-2014 NW. 6th Street Ft. Lauderdale, Fl.		
CLIENT	**Lewars Design, LLC** 18242 NW. 20th street Hollywood, Florida 33029		

LOCATION OF TEST	**15' West of East sidewalk & NW. 20th Ave South of fence line**				
DIAMETER OF HOLE (IN)	**6**	LATITUD:		LONGITUD:	
DEPTH HOLE (FEET)	**15**	DATE TEST PERFORMED:		**10/3/2019**	
WATER TABLE BELOW GROUNG SURFACE (FT.)		**4.5**	TEST #:	**1**	

No.	ELAPSE TIME (min)	GPM
1	1	13.0
2	1	13.0
3	1	12.9
4	1	12.8
5	1	12.9
6	1	12.7
7	1	12.7
8	1	12.6
9	1	12.5
10	1	

DEPTH (FT)	SOIL DESCRIPTION
0' to 4"	Asphalt.
4" to 3'	Dark brown fine to medium sand.
3' to 6'	Lime rock light brown fine to medium sand.
6" to 15'	Dark brown fine to medium sand with traces of lime rock..
-	
-	

PERCOLATION RATE :	**12.8**
K-VALUE:	**3.133E-04**

FIELD TECH.:	al/lp
TYPE BY:	bm

Report Distribution:
1 Client
1 BIII Office

Respectfully submitted,

DARIO A. HERRERO LICENSE No. 67796 STATE OF FLORIDA PROFESSIONAL ENGINEER

Dario A. Herrero, P.E.
FLA. Reg. #67796

B3 MATERIAL TESTING ENGINEERING
Essence of Perfection
1676 West 31 PL., Hialeah FL, 33012 - Off. 786.773.5871/5889 - Fax. 786.615.5801

PERCOLATION TEST

USUAL OPEN HOLE TEST (CONSTANT HEAD)

PROJECT NO.	19-0390	DATE:	10/3/2019
PROJECT	Propose Drive-thru Restaurant 2012-2014 NW. 6th Street Ft. Lauderdale, Fl.		
CLIENT	Lewars Design, LLC 18242 NW. 20th street Hollywood, Florida 33029		

LOCATION OF TEST	5' West of sidewalk & 50' North of fence line				
DIAMETER OF HOLE (IN)	6	LATITUD:		LONGITUD:	
DEPTH HOLE (FEET)	15	DATE TEST PERFORMED:		10/3/2019	
WATER TABLE BELOW GROUNG SURFACE (FT.)		4.6	TEST #:		2

No.	ELAPSE TIME (min)	GPM
1	1	14.7
2	1	14.3
3	1	14.2
4	1	14.2
5	1	14.0
6	1	13.8
7	1	13.6
8	1	13.2
9	1	13.0
10	1	

DEPTH (FT)	SOIL DESCRIPTION
0' to 4"	Asphalt.
4" to 3'	Dark brown fine to medium sand.
3' to 6'	Lime rock light brown fine to medium sand.
6" to 15'	Dark brown fine to medium sand with traces of lime rock..
-	
-	

PERCOLATION RATE :	13.9
K-VALUE:	3.341E-04

FIELD TECH.:	al/lp
TYPE BY:	bm

Report Distribution:

1 Client
1 BIII Office

Respectfully submitted,

DARIO A. HERRERO LICENSE No. 67796 STATE OF FLORIDA PROFESSIONAL ENGINEER

Dario A. Herrero, P.E.
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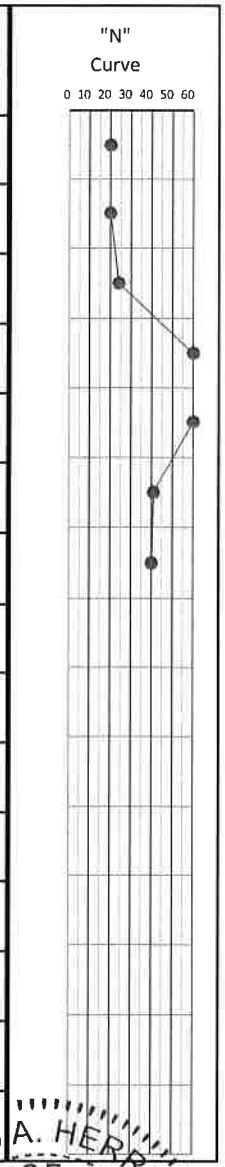
B3 MATERIAL TESTING ENGINEERING
Essence of Perfection
1676 WEST 31st Place, Hialeah, Florida 33012/Off: 786-773-5871/ Fax: 786-773-5889

SOIL BORING LOG

PROJECT NO.	**19-0390**	**Date**	**10/03/19**
PROJECT	**Proposed drive thru restaurant**		
	2012-2014 NW. 6th Street, Fort, Lauderdale, Fl.		
	Location: 15' West of East sidewalk of NW. 20 St. & 15' North of South fence		
CLIENT	**Lewars Design, LLC.**		**B-2**
	18242 NW. 20th street, Hollywood, Florida 33029		
	CONTACT Mr. Bertram Lewars		

LATITUDE	-	LONGITUDE	-	Driller	AL	Helper	CC

Depth (feet)	DESCRIPTION OF MATERIALS	Sample No.	Hammer blows on sampler	"N"
	Soil Boring from 0' to 30'			
1	0' - 4" Asphalt.	0' - 2'	24 25 / **10 10**	**20**
2				
3	4" - 4' Gray fine to medium sand	2' - 4'	8 9 / **9 11**	**20**
4				
5 ▼	4' - 6' Light gray fine sand.	4' - 6'	10 18 / **10 14**	**24**
6				
7	6' - 10' Dark brown fine to medium sand (Hard).	6' - 8'	39 38 / **37 36**	**73**
8				
9		8' - 10'	39 38 / **45 40**	**85**
10				
11	10' - 15' Tan fine to medium sand with lime rock.	10' - 12'	40 29 / **20 21**	**41**
12				
13		12' - 14'	21 20 / **21 19**	**40**
14				
15	**End at 15'**	14' - 16'	21 **24**	
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				



Water Level: (▼) 4'6"
Sample Type: Split Spoon (SS)
Boring performed 07/30/19

Respectfully submitted,

Dario A. Herrero, P.E.
Florida Reg. #67796

DARIO A. HERRERO LICENSE No. 67796 STATE OF FLORIDA PROFESSIONAL ENGINEER

B3 MATERIAL TESTING ENGINEERING
Essence of Perfection
1676 WEST 31st Place, Hialeah, Florida 33012/Off: 786-773-5871/ Fax: 786-773-5889

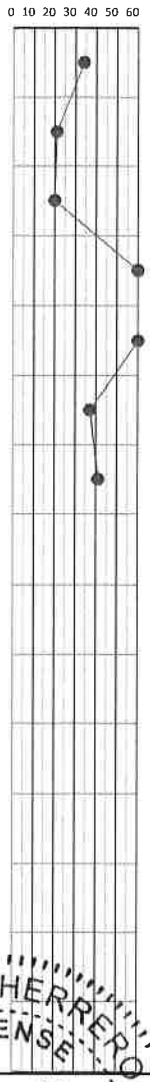
SOIL BORING LOG

PROJECT NO.	**19-0390**	**Date**	**10/03/19**
PROJECT	**Proposed drive thru restaurant**		
	2012-2014 NW. 6th Street, Fort, Lauderdale, Fl.		
	Location: 10' south of NW. 6 St, Sidewalk & 20' West of NW. 20 St.		
CLIENT	**Lewars Design, LLC.**		**B-1**
	18242 NW. 20th street, Hollywood, Florida 33029		
	CONTACT Mr. Bertram Lewars		

LATITUDE	-	LONGITUDE	-	Driller	AL	Helper	CC

Depth (feet)	DESCRIPTION OF MATERIALS	Sample No.	Hammer blows on sampler	"N"
	Soil Boring from 0' to 30'			
1	0' - 4" Asphalt.	0' - 2'	12 19	34
2			**16 18**	
3	4" - 4' Gray fine to medium sand.	2' - 4'	10 11	21
4			**10 11**	
5	4' - 6' Gray very fine sand.	4' - 6'	10 12	20
6			**10 10**	
7	6' - 10' Dark brown fine to medium sand (Hard).	6' - 8'	32 32	79
8			**40 39**	
9		8' - 10'	29 29	71
10			**33 38**	
11	10' - 15' Tan fine to medium Sand with traces of lime rock.	10' - 12'	20 18	37
12			**17 20**	
13		12' - 14'	20 18	41
14			**21 20**	
15	**End at 15'**	14' - 16'	21 24	
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

"N" Curve



Water Level: (▼) 4'6"
Sample Type: Split Spoon (SS)
Boring performed 07/30/19

Respectfully submitted,

DARIO A. HERRERO LICENSE No. 67796 STATE OF FLORIDA PROFESSIONAL ENGINEER

10/16/19

Dario A. Herrero, P.E.
Florida Reg. #67796

APPENDIX C

R-Tank Design Calculations

R-TANK HD SUBSURFACE STORAGE SYSTEM

R-TANK HD STAGE-STORAGE TABLE

R-Tank Module Size	**HD QUAD**
Width of R-Tank	15.75 in
Length of R-Tank	28.15 in
Height of R-Tank	66.93 in
Volume of Storage per Module	16.31 cf
Total Number of R-Tank Modules	**452**
Base Thickness	3 in
Cover Thickness	12 in
Excavation Footprint	1,711.87 sq.ft.
Effective Footprint of System (Tanks Only)	1,391.67 sq.ft.
Quantity of Backfill Required	144 cy
Volume Provided in R-Tank Only	7,372 cf
Volume Provided in Stone (40% Voids)	cf
Total System Storage Volume	**7,372 cf**

Elevations	
R-Tank Invert Elevation	1.00
Top of R-Tank	6.58
Top of Cover	7.58
Base Invert Elevation	0.75
Maximum Cover Elevation	13.57
HS-20 Minimum Cover Elevation	8.25
Storage Volume Increment	0.10 ft
Dead Storage	
Dead Storage Required	NO
Stone Storage Not Included	
Use Stone Base for Storage	NO
Use Stone Cover for Storage	NO
Stone Void Ratio	40%

Elevation	Volume	Elevation	Volume
1.00	0	3.80	3700.93
1.10	132.18	3.90	3833.11
1.20	264.35	4.00	3965.28
1.30	396.53	4.10	4097.46
1.40	528.70	4.20	4229.63
1.50	660.88	4.30	4361.81
1.60	793.06	4.40	4493.99
1.70	925.23	4.50	4626.16
1.80	1057.41	4.60	4758.34
1.90	1189.58	4.70	4890.51
2.00	1321.76	4.80	5022.69
2.10	1453.94	4.90	5154.87
2.20	1586.11	5.00	5287.04
2.30	1718.29	5.10	5419.22
2.40	1850.46	5.20	5551.39
2.50	1982.64	5.30	5683.57
2.60	2114.82	5.40	5815.75
2.70	2246.99	5.50	5947.92
2.80	2379.17	5.60	6080.10
2.90	2511.35	5.70	6212.28
3.00	2643.52	5.80	6344.45
3.10	2775.70	5.90	6476.63
3.20	2907.87	6.00	6608.80
3.30	3040.05	6.10	6740.98
3.40	3172.23	6.20	6873.16
3.50	3304.40	6.30	7005.33
3.60	3436.58	6.40	7137.51
3.70	3568.75	6.50	7269.68