

PRELIMINARY STORM WATER MANAGEMENT CALCULATIONS  
FOR  
**2202 LAKE WORTH ROAD, LLC**

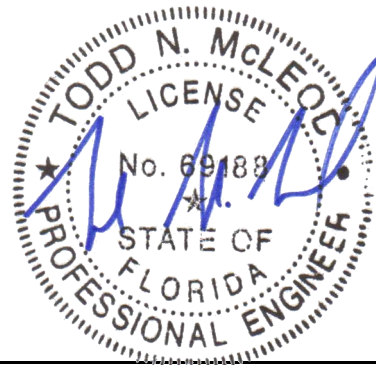
LAKE WORTH, FL  
MMA #19-046

July 15, 2019  
Revised:  
N/A

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**& Associates, P.A.**  
CIVIL ENGINEERS



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7/15/19

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Date

**PRELIMINARY STORM WATER MANAGEMENT CALCULATIONS**

Project Name: 2202 LAKE WORTH ROAD, LLC  
 Project #: MMA #19-046

Engineer: TNM  
 Date: 06/27/19  
 Revised: N/A

**LAND USE BREAKDOWN**

**PROPOSED**

Site Area = 1.74 ac  
 Basin Area = 1.74 ac

	Acres	%	Grading	
			From	To
<b>Impervious Area</b>				
Building	<u>0.38 ac</u>	(22%)	<u>14.50</u>	
Pavement	<u>0.90 ac</u>	(52%)	<u>12.50</u>	<u>14.50</u>
<b>Pervious Area</b>				
Green Space	<u>0.46 ac</u>	(26%)	<u>12.00</u>	<u>14.30</u>
<b>Subtotal Impervious Areas</b>	1.28 ac	(74%)		
<b>Subtotal Pervious Areas</b>	0.46 ac	(26%)		

**Find Curve Number:**

Avg. Pervious Ground El. = 13.15  
 Control EL. = 7.00 (8.5 NGVD; LWDD E-4 CANAL)  
 Depth to Water Table = 6.15  
 Soil Type = Flatwoods

**Soil Storage Table**

(SFWMD's Vol. IV, Basis of Review, page E-2)

Depth to W.T. (ft)	Coastal Storage (in)	Flatwoods Storage (in)	Depression Storage (in)
1.0	0.6	0.6	0.6
2.0	2.5	2.5	2.1
3.0	6.6	5.4	4.4
4.0	10.9	9.0	6.8

Pervious Area = 0.46 ac  
 Storage from Table = 6.75 in (w/ 25% compaction)  
 Avail Soil Storage = 0.26 af  
 Soil Moisture Storage (S) = 1.78 in  
 Curve Number = 85

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**STAGE -STORAGE CALCULATIONS**  
**PROPOSED**

Starting Stage	7.00
Ending Stage	15.00
Stage Increment	1.00

Name	Pavement	Green Space	Trench	
Area	0.90	0.46	0.71 (AF)	
Start Elev	12.50	12.00	7.00	
End Elev	14.50	14.30	10.50	
Stage	Linear	Linear	Linear	Total
Feet	Storage	Storage	Storage	Storage
NAVD	Ac-ft	Ac-ft	Ac-ft	Ac-ft
7.00	0.00	0.00	0.00	0.00
8.00	0.00	0.00	0.20	0.20
9.00	0.00	0.00	0.40	0.40
10.00	0.00	0.00	0.61	0.61
11.00	0.00	0.00	0.71	0.71
12.00	0.00	0.00	0.71	0.71
13.00	0.06	0.10	0.71	0.86
14.00	0.51	0.40	0.71	1.61
15.00	1.41	0.86	0.71	2.97

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**POST-DEVELOPMENT RUNOFF (ZERO DISCHARGE CALCULATIONS)**

Soil Moisture Storage ( $S_{exists}$ )	6.75 in
Soil Moisture Storage ( $S_{prop}$ )	1.78 in

5 Year, 1 Day Rainfall Amount (P):	6.5 in	Figure C-3
25 Year, 3 Day Rainfall Amount (P):	12.5 in	Figure C-8
100 Year, 3 Day Rainfall Amount (P):	15.5 in	Figure C-9

**MIN PARKING LOT: 5-YEAR, 1-DAY RUNOFF CALCULATIONS (PER SFWMD):**

**Proposed:**

$$Q = (P - (0.2XS))^2 / (P + (0.8*S))$$

$$= 4.8 \text{ in}$$

$$\text{Volume} = Q \times \text{Site Area} \times 1\frac{1}{12}''$$

$$= 4.8 \text{ in} \times 1.74 \times 1\frac{1}{12}'' = 0.69 \text{ AF}$$

**ALLOWABLE DISCHARGE: 25-YEAR, 3-DAY RUNOFF CALCULATIONS:**

**Proposed:**

$$Q = (P - (0.2XS))^2 / (P + (0.8*S))$$

$$= 10.6 \text{ in}$$

$$\text{Volume} = Q \times \text{Site Area} \times 1\frac{1}{12}''$$

$$= 10.6 \text{ in} \times 1.74 \times 1\frac{1}{12}'' = 1.54 \text{ AF}$$

**FINISHED FLOORS: 100-YEAR, 3-DAY RUNOFF CALCULATIONS:**

**Proposed:**

$$Q = (P - (0.2XS))^2 / (P + (0.8*S))$$

$$= 13.5 \text{ in}$$

$$\text{Volume} = Q \times \text{Site Area} \times 1\frac{1}{12}''$$

$$= 13.5 \text{ in} \times 1.74 \times 1\frac{1}{12}'' = 1.96 \text{ AF}$$

**RAINFALL/ ROUTING SUMMARY** (See attached CASCADE routings)

Based on attached CASCADE Routings w/LWDD 6"X6" Min. Bleeder

Storm Event	Rainfall (in)	Peak Stage (ft-NAVD)	Peak Discharge (cfs)	Design Criteria	Prop Stage (ft-NAVD)
5-yr, 1-day =	6.5	10.50	0.00	Min Parking Lot Grade	12.50
25-yr, 3-day =	12.5	13.39	0.75	Perimeter Berm	13.40
100-yr, 3-day =	15.5	14.26	0.00	Finished Floors - Zero Discharge	14.50

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**WATER QUALITY CALCULATIONS**

**1-inch Over the Project Area**

$$\text{(Treated Volume)} \quad 1\text{-inch} \quad * \quad 1\text{-ft/12-in} \quad * \quad \frac{1.69}{\text{PROJECT AREA (AC)}} \quad = \quad \boxed{0.14} \text{ ac-ft} \quad \text{TREATED VOLUME}$$

**2.5-inches Times the Percent Impervious**

$$\begin{aligned} \text{(Site Area)} \quad & \frac{1.69}{\text{PROJECT AREA (AC)}} - \left( \frac{0.00}{\text{LAKES (AC)}} + \frac{0.38}{\text{ROOFS (AC)}} \right) = \frac{1.31}{\text{SITE AREA}} \text{ ac} \\ \text{(Impervious Area)} \quad & \frac{1.31}{\text{SITE AREA (AC)}} - \frac{0.46}{\text{PERVIOUS AREA (AC)}} = \frac{0.85}{\text{IMPERVIOUS AREA}} \text{ ac} \\ \text{(% Impervious)} \quad & \frac{\text{IMPERVIOUS AREA} * 100\%}{\text{SITE AREA (AC)}} = \frac{64.89\%}{\text{SITE AREA (AC)}} \\ \text{(2.5-in * \% Imp.)} \quad & 2.5\text{-inches} * \frac{64.89\%}{\text{PERCENT IMPERVIOUS}} = \frac{1.62}{\text{INCHES TO BE TREATED}} \text{ in} \\ \text{(Treated Volume)} \quad & \frac{1.62}{\text{TREATED (IN)}} * 1\text{-ft/12-in} * \frac{1.69}{\text{PROJECT AREA - LAKES (AC)}} = \boxed{0.23} \text{ ac-ft} \quad \text{TREATED VOLUME} \end{aligned}$$

**THEREFORE 2.5-INCHES X %IMP GOVERNS**

Required WQ Treatment = 0.23 ac-ft

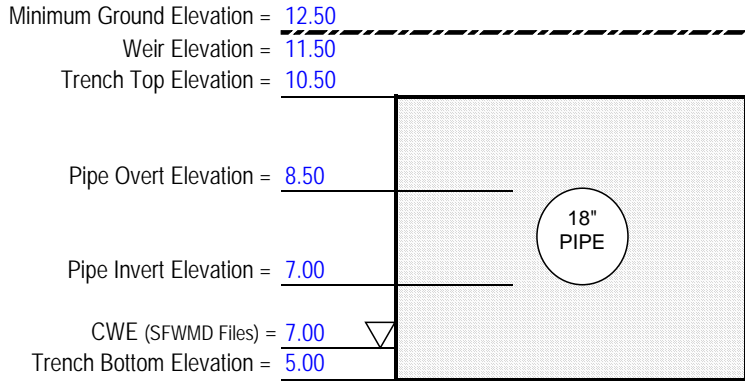
Provided WQ Treatment (Via Exfil Trench @ EL. 10.50) = 0.71 ac-ft

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**EXFILTRATION TRENCH DESIGN**  
 (Project Area = 1.74 AC)



**Standard Formula**

$$L = V / (K(H_2 \cdot W + 2 \cdot H_2 \cdot D_u - D_u^2 + 2 \cdot H_2 \cdot D_s) + (1.39 \cdot 10^{-4}) \cdot W \cdot D_u)$$

<=== INPUT ONLY IN GRAY CELLS		
V	Volume Treated (acre-in)	8.28 (5y-1d: 6.5" x 1.74 AC)
W	Trench Width (feet)	8.5
K	Hydraulic Conductivity (cfs/ft <sup>2</sup> -ft.head)	1.83E-04 (SFWMD App. No. 051212-7)
H <sub>2</sub>	Depth to Water Table (feet)	4.50 <=== H <sub>2</sub> can extend no lower than the CWE
D <sub>u</sub>	Non Saturated Trench Depth (feet)	3.50
D <sub>s</sub>	Saturated Trench Depth (feet)	2.00

**L Length of Trench Required** 461

$$V = L \cdot (K(H_2 \cdot W + 2 \cdot H_2 \cdot D_u - D_u^2 + 2 \cdot H_2 \cdot D_s) + (1.39 \cdot 10^{-4}) \cdot W \cdot D_u)$$

<=== INPUT ONLY IN GRAY CELLS		
L	Length of Trench Provided	473
W	Trench Width (feet)	8.5
K	Hydraulic Conductivity (cfs/ft <sup>2</sup> -ft.head)	1.83E-04
H <sub>2</sub>	Depth to Water Table (feet)	4.5
D <sub>u</sub>	Non Saturated Trench Depth (feet)	3.5
D <sub>s</sub>	Saturated Trench Depth (feet)	2

**V Volume Treated (acre-in)** 8.49  
**Volume Treated (acre-ft)** 0.71

POST-DEVELOPMENT CASCADE ROUTINGS



Project Name: 2202 LW ROAD

Reviewer: T. McLeod

Project Number: 19046

Period Begin: Jan 01, 2000;0000 hr End: Jan 04, 2000;0000 hr Duration: 72 hr

Time Step: 0.1 hr, Iterations: 200

Basin 1: OnSite

Method: Santa Barbara Unit Hydrograph

Rainfall Distribution: SFWMD - 3day

Design Frequency: 25 year

3 Day Rainfall: 12.5 inches

Area: 1.74 acres

Ground Storage: 1.78 inches

Time of Concentration: 0.08 hours

Initial Stage: 7 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
7.00	0.00
8.00	0.20
9.00	0.40
10.00	0.61
11.00	0.70
12.00	0.71
13.00	0.86
14.00	1.61
15.00	2.97

Offsite Receiving Body: Offsitel

Time	Stage
0.00	7.00
72.00	9.00

Structure: 1

From Basin: OnSite

To Basin: Offsitel

Structure Type: Gravity

Weir: None

Bleeder: Inv-Tri, Invert Elev = 11.5 ft NGVD, Height = 0.5 ft

Width = 0.5 ft

Default Coefs: Weir Coef = 2.5, Orifice Coef = 0.6

Pipe: Diameter = 1.5 ft, Manning's n = 0.013, Length = 29 ft

Time (hr)	Cumulative Rainfall (in)	Instant Runoff (cfs)	Current Discharge (cfs)	Cumulative Discharge (acre-ft)	Head Water Stage (ft NGVD)	Tail Water Stage (ft NGVD)
0.00	0.00	0.00	0.00	0.00	7.00	7.00
1.00	0.06	0.00	0.00	0.00	7.00	7.03
2.00	0.11	0.00	0.00	0.00	7.00	7.06
3.00	0.17	0.00	0.00	0.00	7.00	7.08
4.00	0.22	0.00	0.00	0.00	7.00	7.11
5.00	0.28	0.00	0.00	0.00	7.00	7.14
6.00	0.34	0.00	0.00	0.00	7.00	7.17
7.00	0.39	0.00	0.00	0.00	7.00	7.19
8.00	0.45	0.01	0.00	0.00	7.00	7.22
9.00	0.50	0.01	0.00	0.00	7.01	7.25
10.00	0.56	0.02	0.00	0.00	7.01	7.28
11.00	0.62	0.02	0.00	0.00	7.02	7.31
12.00	0.67	0.03	0.00	0.00	7.03	7.33
13.00	0.73	0.03	0.00	0.00	7.05	7.36
14.00	0.78	0.03	0.00	0.00	7.06	7.39
15.00	0.84	0.04	0.00	0.00	7.07	7.42
16.00	0.90	0.04	0.00	0.00	7.09	7.44

Time (hr)	Cumulative Rainfall (in)	Instant Runoff (cfs)	Current Discharge (cfs)	Cumulative Discharge (acre-ft)	Head Water Stage (ft NGVD)	Tail Water Stage (ft NGVD)
17.00	0.95	0.04	0.00	0.00	7.11	7.47
18.00	1.01	0.05	0.00	0.00	7.12	7.50
19.00	1.06	0.05	0.00	0.00	7.14	7.53
20.00	1.12	0.05	0.00	0.00	7.16	7.56
21.00	1.18	0.05	0.00	0.00	7.19	7.58
22.00	1.23	0.05	0.00	0.00	7.21	7.61
23.00	1.29	0.06	0.00	0.00	7.23	7.64
24.00	1.34	0.06	0.00	0.00	7.25	7.67
25.00	1.42	0.09	0.00	0.00	7.29	7.69
26.00	1.51	0.09	0.00	0.00	7.32	7.72
27.00	1.59	0.09	0.00	0.00	7.36	7.75
28.00	1.67	0.10	0.00	0.00	7.40	7.78
29.00	1.75	0.10	0.00	0.00	7.44	7.81
30.00	1.83	0.10	0.00	0.00	7.48	7.83
31.00	1.91	0.10	0.00	0.00	7.52	7.86
32.00	2.00	0.10	0.00	0.00	7.57	7.89
33.00	2.08	0.11	0.00	0.00	7.61	7.92
34.00	2.16	0.11	0.00	0.00	7.65	7.94
35.00	2.24	0.11	0.00	0.00	7.70	7.97
36.00	2.32	0.11	0.00	0.00	7.74	8.00
37.00	2.40	0.11	0.00	0.00	7.79	8.03
38.00	2.49	0.11	0.00	0.00	7.84	8.06
39.00	2.57	0.11	0.00	0.00	7.88	8.08
40.00	2.65	0.12	0.00	0.00	7.93	8.11
41.00	2.73	0.12	0.00	0.00	7.98	8.14
42.00	2.81	0.12	0.00	0.00	8.03	8.17
43.00	2.89	0.12	0.00	0.00	8.08	8.19
44.00	2.98	0.12	0.00	0.00	8.13	8.22
45.00	3.06	0.12	0.00	0.00	8.18	8.25
46.00	3.14	0.12	0.00	0.00	8.23	8.28
47.00	3.22	0.12	0.00	0.00	8.28	8.31
48.00	3.30	0.12	0.00	0.00	8.33	8.33
49.00	3.39	0.14	0.00	0.00	8.38	8.36
50.00	3.49	0.14	0.00	0.00	8.44	8.39
51.00	3.60	0.17	0.00	0.00	8.51	8.42
52.00	3.72	0.20	0.00	0.00	8.58	8.44
53.00	3.87	0.26	0.00	0.00	8.68	8.47
54.00	4.07	0.32	0.00	0.00	8.80	8.50
55.00	4.30	0.38	0.00	0.00	8.95	8.53
56.00	4.56	0.44	0.00	0.00	9.12	8.56
57.00	4.87	0.53	0.00	0.00	9.31	8.58
58.00	5.26	0.66	0.00	0.00	9.56	8.61
59.00	5.78	0.97	0.00	0.00	9.88	8.64
60.00	9.34	10.52	0.70	0.02	13.18	8.67
61.00	10.36	1.20	0.75	0.08	13.38	8.69
62.00	10.83	0.73	0.75	0.14	13.39	8.72
63.00	11.12	0.47	0.74	0.20	13.37	8.75
64.00	11.40	0.47	0.74	0.27	13.34	8.78
65.00	11.56	0.28	0.73	0.33	13.29	8.81
66.00	11.73	0.29	0.71	0.39	13.24	8.83
67.00	11.89	0.29	0.70	0.44	13.19	8.86
68.00	12.06	0.29	0.69	0.50	13.15	8.89
69.00	12.17	0.19	0.68	0.56	13.10	8.92
70.00	12.28	0.19	0.66	0.61	13.04	8.94
71.00	12.39	0.19	0.64	0.67	12.96	8.97
72.00	12.50	0.19	0.57	0.72	12.73	9.00

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)
1	0.75	61.70	0.00	0.00

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
OnSite	13.39	61.70	7.00	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
OnSite	1.53	0.00	0.71	0.00	0.82	0.00