THOMAS ENGINEERING GROUP
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Date: 3/3/2021
Project: Raceway - Atlantic
Project No: F150047

Calculated By: KAB
Checked By:

PROPOSED DRAINAGE CALCULATIONS

Design Criteria:

Estimated Seasonal High Water Level: 5.00 NAVD

Proposed Acreages

Lake Areas (A_L):	0	sf	or	0.000 ac
Roof Areas (A_R):	3,715	sf	or	0.085 ac
Paved Areas (A_P):	36,056	sf	or	0.828 ac
Green Areas (A_G):	12,602	sf	or	0.289 ac
Total (A_T):	52,373	sf	or	1.202 ac

Compute Required Water Quality Volume:

1) Provide at least 1 inch over the developed project:

V_{PRE} = 1 inch x A_T x 1 ft / 12 inches
= 1 x 1.202 / 12
= 0.10 ac-ft or 1.20 ac-in

2) Provide 2.5" over % impervious area:

a) Site Area for water quality pervious/impervious calculation:

A_S = A_T - (A_L + A_R)
= 1.202 - (0 + 0.085)
= 1.12 ac of site area for water quality pervious/impervious

b) Impervious area for water quality pervious/impervious calculation:

A_{IMP} = A_S - A_G
= 1.117 - 0.289
= 0.83 ac of impervious area for water quality pervious/impervious

c) Percent of impervious for water quality calculation:

= A_{IMP} / A_S x 100%
= 0.828 / 1.117 x 100%
= 74.1% impervious

d) For 2.5" times the percent impervious:

= 2.5" x % impervious area
= 2.5 x 0.741
= 1.85 inches to be treated

e) Compute volume required volume for quality detention

V_{PRE} = inches to be treated x (A_T - A_L)
= 1.85 x (1.202 - 0) x 1 foot / 12 inches)
= 0.19 ac-ft or **2.22 ac-in**

3) Since the 2.22 ac-in is greater than the 1.2 ac-in computed for the first inch of runoff the volume of 2.22 ac-in controls.

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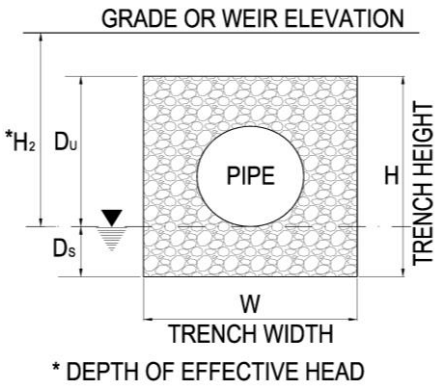
Exfiltration Trench Calculations

K-Value:

Test Hole #	(cfs/ft^2/ft hd)
1	2.20E-04
2	
K_{AVG}	2.20E-04

Trench:

Water Table Elev. 5.00



Elev. 8.75 (Grade or Wier)

Elev. 8.50 (Top of Trench)

Elev. 4.00 (Bottom of Trench)

K =	2.20E-04	cfs/ft^2 - ft head
H_2 =	3.75	ft
W =	6.50	ft
D_u =	3.50	ft
D_s =	1.00	ft
H = Du + Ds =	4.50	ft

1) Trench Length for Water Quality Requirements:

V = 2.22 ac-in or 0.19 ac-ft

$$L = \frac{V}{K(H2W + 2H2Du - Du^2 + 2H2Ds) + (1.39 \times 10^{-4})WDu}$$

L = 167.5 feet

2) Compute Maximum Length Trench:

V = 3.28 inches x 1.202 acres = 3.94 ac-in or 0.33 ac-ft

L = 297.4 feet

3) Compute Provided Trench Volume:

L = 297 feet

V = L x (K(H2W + 2H2Du - Du^2 + 2H2Ds) + (1.39 x 10^-4)Wdu)

V = 3.94 ac-in or 0.33 ac-ft

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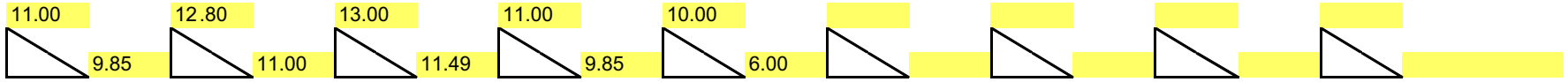
STAGE\STORAGE AREA CALCULATION

Prop. Grades



Stage	Pavement Area Low Area 0.350 0.000 (ac.-ft.)	Pavement Area High Area 0.342 0.000 (ac.-ft.)	Sidewalk Area Area 0.200 0.000 (ac.-ft.)	Landscape Area Area 0.249 0.000 (ac.-ft.)	Retention Area Area 0.040 0.002 (ac.-ft.)	Area 0.000 0.000 (ac.-ft.)	Area 0.000 0.000 (ac.-ft.)	Exfiltation Trench Area 0.000 0.000 (ac.-ft.)	Building Area 0.085 0.000 (ac.-ft.)	Total Site 1.202
5.00	0.00	0.00	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	0.00	0.00
6.00	0.00	0.00	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	0.04	0.00	0.04
7.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.07	0.00	0.08
7.50	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.11	0.00	0.12
8.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.15	0.00	0.17
8.50	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.18	0.00	0.22
9.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.22	0.00	0.27
9.50	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.26	0.00	0.32
10.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.29	0.00	0.38
10.50	0.06	0.00	0.00	0.05	0.10	0.00	0.00	0.33	0.00	0.54
11.00	0.20	0.00	0.00	0.14	0.12	0.00	0.00	0.33	0.00	0.80
11.50	0.38	0.02	0.00	0.27	0.14	0.00	0.00	0.33	0.00	1.14
12.00	0.55	0.10	0.02	0.39	0.16	0.00	0.00	0.33	0.00	1.55
12.50	0.73	0.21	0.07	0.52	0.18	0.00	0.00	0.33	0.00	2.04
13.00	0.90	0.38	0.15	0.64	0.20	0.00	0.00	0.33	0.00	2.60

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DESIGN CRITERIA

October Water Elevation	5.00
FEMA Elevation	N/A

PROPOSED LAND USE SUMMARY

Areas:	Square Ft.	Acres	Percent
Lake	0	0.00	0.0%
Building	3,715	0.085	7.1%
Paved and Sidewalk	36,056	0.828	68.9%
Pervious	12,602	0.289	24.1%
Total Area:	52,373	1.202	100.0%

STAGE\STORAGE AREA CALCULATION

Stage	Site Stage-Storage (previous page)	Additional Underground Storage (StormTech) (ac.-ft.)	Total Storage Area (ac.-ft.)
5.00	0.00	0.00	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.04	0.00	0.04
7.00	0.08	0.00	0.08
7.50	0.12	0.00	0.12
8.00	0.17	0.00	0.17
8.50	0.22	0.00	0.22
9.00	0.27	0.62	0.88
9.50	0.32	0.62	0.94
10.00	0.38	0.62	1.00
10.50	0.54	0.62	1.16
11.00	0.80	0.62	1.41
11.50	1.14	0.62	1.76
12.00	1.55	0.62	2.16
12.50	2.04	0.62	2.65
13.00	2.60	0.62	3.22

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Soil Storage

Land Use Summary:

	Acres	Percent
Lake Areas (A_L):	0.000	0.0%
Roof Areas (A_R):	0.085	7.1%
Paved Areas (A_P):	0.828	68.9%
Green Areas (A_G):	0.289	24.0%
Total (A_T):	1.202	100.0%

Compacted Soil Storage per SFWMD Vol. IV Page C-III-1

Depth to Water Table (feet)	Water Storage (inches)
1	0.45
2	1.88
3	4.95
4	8.18

Average Pervious Grade (Elev.): 9.80
Depth to Water Table: 4.80 ft
Soil Storage at Average Depth (S_S): 8.18 inches

Weighted S value:

= S_S x % Pervious

= 8.18 x 0.24

= **1.96 inches**

Rainfalls

From Figure C-I-6, 100-Year Storm 14.50 inches

100-Year 3-Day Storm = 14.50 inches x 1.359 = 19.71 inches

From Figure C-I-5, 25-Year Storm = 11.40 inches

25-Year 3-Day Storm = 11.40 inches x 1.359 = 15.49 inches

From Figure C-I-4, 10-Year Storm = 9.00 inches

Results from Flood Routings

Runnoff (Q) = $(P - 0.2S)^2 / (P + 0.8S)$
= (19.71 - (0.2 x 1.96))^2 / (19.71 + (0.8 x 1.96))
= 17.54 inches of total runnoff
Runoff Volume = Q * Project Area
= 17.54 x 1.202 = 21.08 acre-inches = 1.76 acre-ft.

Maximum Stage for 100-Year 3-Day Storm (no discharge) **11.50** NGVD

Runnoff (Q) = $(P - 0.2S)^2 / (P + 0.8S)$
= (- (0.2 x))^2 / (+ (0.8 x))
= 13.36 inches of total runnoff
Runoff Volume = Q * Project Area
= 13.36 x 1.202 = 16.06 acre-inches = 1.34 acre-ft.

Maximum Stage for 25-Year 3-Day Storm (no discharge) **10.85** NGVD

Runnoff (Q) = $(P - 0.2S)^2 / (P + 0.8S)$
= (9 - (0.2 x 1.96))^2 / (9 + (0.8 x 1.96))
= 7.01 inches of total runnoff
Runoff Volume = Q * Project Area
= 7.01 x 1.202 = 8.43 acre-inches = 0.70 acre-ft.

Maximum Stage for 10-Year 1-Day Storm (no discharge) **8.86** NGVD

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