THOMAS ENGINEERING GROUP

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Date: 2/5/2016
Project: Burger King- Margate
Project No: F160002

Calculated By: KNN
Checked By: ROT

PROPOSED DRAINAGE CALCULATIONS

Design Criteria:

Basin Control Elevation: 8.00 NAVD

Proposed Acreages

Lake Areas (A_L):	0 sf	or	0.000 ac
Roof Areas (A_R):	5,673 sf	or	0.130 ac
Paved Areas (A_P):	29,018 sf	or	0.666 ac
Green Areas (A_G):	11,650 sf	or	0.267 ac
Total (A_T):	46,341 sf	or	1.064 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 1.064 / 12
= 0.09 ac-ft or 1.06 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)
= 1.064-.130
= 0.93 ac of site area for water quality pervious/impervious

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

A_{IMP} = A_S - A_G
= .94-.267
= 0.67 ac of impervious area for water quality pervious/impervious

c) Percent of impervious for water quality calculation:

= A_{IMP} / A_S x 100%
= 0.666/0.93
= 71.3% impervious

d) For 2.5" times the percent impervious:

= 2.5" x % impervious area
= 2.5 x 0.713
= 1.78 inches to be treated

e) Compute volume required volume for quality detention

V_{PRE} = inches to be treated x (A_T - A_L)
1.78 x (1.064 - 0) x 1 foot / 12 inches)
= **0.16 ac-ft** or **1.89 ac-in**

3) Since the 1.89 ac-in is greater than the 1.064 ac-in computed for the first inch of runoff the volume of 1.89 ac-in controls.

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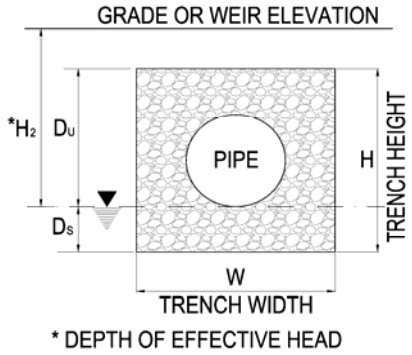
Exfiltration Trench Calculations

K-Value:

Test Hole #	(cfs/ft^2/ft hd)
P-1*	3.48E-04
P-2	3.07E-04
K_{AVG}	3.28E-04

* Walgreens SWM2009-059-0

Trench:



Water Table Elev. 8.00

Elev. 11.00 (Grade/Weir)

Elev. 10.75 (Top of Trench)

Elev. 7.50 (Bottom of Trench)

K =	3.28E-04	cfs/ft^2 - ft head
H_2 =	3.25	ft
W =	6.00	ft
D_u =	2.75	ft
D_s =	0.50	ft
H = Du + Ds =	3.25	ft

1) Trench Length for Water Quality Requirements:

V = 1.89 ac-in or 0.16 ac-ft

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

L = 144.0 feet

2) Compute Maximum Length Trench:

V = 3.28 inches x 1.064 acres = 3.49 ac-in or 0.29 ac-ft

L = 266.0 feet

3) Compute Provided Trench Volume:

L = 144 feet

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

V = 1.89 ac-in or **0.16** ac-ft

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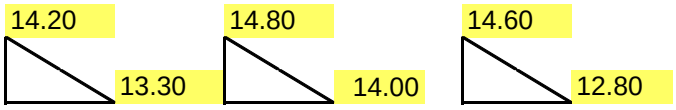
STAGE\STORAGE AREA CALCULATION - PROPOSED

Prop. Grades



Stage	Pavement Area Area 0.585 0.000 (ac.-ft.)	Sidewalk Area Area 0.084 0.000 (ac.-ft.)	Landscape Area Area 0.267 0.000 (ac.-ft.)	Total Affected Site 0.936
11.00	0.00	0.00	0.00	0.00
11.20	0.00	0.00	0.00	0.00
11.40	0.00	0.00	0.00	0.00
11.60	0.00	0.00	0.00	0.00
11.80	0.00	0.00	0.00	0.00
12.00	0.00	0.00	0.00	0.00
12.20	0.00	0.00	0.00	0.00
12.40	0.00	0.00	0.00	0.00
12.60	0.00	0.00	0.00	0.00
12.80	0.00	0.00	0.00	0.00
13.00	0.00	0.00	0.00	0.00
13.20	0.00	0.000	0.012	0.01
13.40	0.00	0.000	0.027	0.03
13.60	0.03	0.000	0.048	0.08
13.80	0.08	0.000	0.074	0.16
14.00	0.16	0.000	0.107	0.27
14.20	0.26	0.002	0.146	0.41
14.40	0.38	0.008	0.190	0.58
14.60	0.50	0.019	0.241	0.76
14.80	0.61	0.034	0.294	0.94
15.00	0.73	0.050	0.348	1.13
15.20	0.85	0.067	0.401	1.32
15.40	0.96	0.084	0.455	1.50
15.60	1.08	0.101	0.508	1.69

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DESIGN CRITERIA

PROPOSED LAND USE SUMMARY

Areas:	Square Ft.	Acres	Percent
Lake	0	0.00	0.0%
Building	5,673	0.130	12.2%
Paved and Sidewalk	29,018	0.666	62.6%
Pervious	11,650	0.267	25.1%
Total Area:	46,341	1.064	100.0%

STAGE\STORAGE AREA CALCULATION

Stage	Site Stage-Storage (previous page)	Exfiltration Trench Storage (ac.-ft.)	Total Storage Area (ac.-ft.)
11.00	0.00	0.16	0.16
11.20	0.00	0.16	0.16
11.40	0.00	0.16	0.16
11.60	0.00	0.16	0.16
11.80	0.00	0.16	0.16
12.00	0.00	0.16	0.16
12.20	0.00	0.16	0.16
12.40	0.00	0.16	0.16
12.60	0.00	0.16	0.16
12.80	0.00	0.16	0.16
13.00	0.00	0.16	0.16
13.20	0.01	0.16	0.17
13.40	0.03	0.16	0.19
13.60	0.08	0.16	0.23
13.80	0.16	0.16	0.31
14.00	0.27	0.16	0.42
14.20	0.41	0.16	0.57
14.40	0.58	0.16	0.74
14.60	0.76	0.16	0.91
14.80	0.94	0.16	1.10
15.00	1.13	0.16	1.29
15.20	1.32	0.16	1.47
15.40	1.50	0.16	1.66
15.60	1.69	0.16	1.85

Soil Storage

Land Use Summary:

	Acres	Percent
Lake Areas (A_L):	0.000	0.0%
Roof Areas (A_R):	0.130	12.2%
Paved Areas (A_P):	0.666	62.6%
Green Areas (A_G):	0.267	25.1%
Total (A_T):	1.064	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	4.05
4	6.75

Average Pervious Grade (Elev.): 13.70

Depth to Water Table: 5.70 ft

Soil Storage at Average Depth (S_S): 6.75 inches

Weighted S value:

= S_S x % Pervious

= 6.75 x 0.251

= **1.69 inches**

Rainfalls

10-Year, 1 day Storm = 6.20 inches

25-Year, 3 day Storm = 14.50 inches

100-Year, 3 day Storm = 18.50 inches

Results from Stage Storage Elevations

Runnoff (Q) = (P - 0.2S)^2 / (P + 0.8S)
= (6.20- 0.2(1.69))^2 / (6.20+ 0.8(1.69))
= 4.55 inches of total runnoff
Runoff Volume = Q * Project Area
= 1.064 ac * 4.55" = 4.84 acre-inches **=** **0.40** acre-ft.

Maximum Stage for 10-Year 1-day Storm (zero discharge) **13.96**

Runnoff (Q) = (P - 0.2S)^2 / (P + 0.8S)
= (14.5- 0.2(1.69))^2 / (14.5+ 0.8(1.69))
= 12.65 inches of total runnoff
Runoff Volume = Q * Project Area
= 1.064 ac * 12.30" = 13.46 acre-inches **=** **1.12** acre-ft.

Maximum Stage for 25-Year 3-Day Storm (zero discharge) **14.82**

Runnoff (Q) = (P - 0.2S)^2 / (P + 0.8S)
= (18.5- 0.2(1.69))^2 / (18.5+ 0.8(1.69))
= 16.62 inches of total runnoff
Runoff Volume = Q * Project Area
= 1.064 ac * 16.25" = 17.68 acre-inches **=** **1.47** acre-ft.

Maximum Stage for 100-Year 3-Day Storm (zero discharge) **15.20**