Project ID.: **AirBBus**
Engineer: **Jorge M. Szauer, P.E.**
Client: **AirBBus**
Date: **8/7/2019**

Surface Water Management Calculations for AirBBus.

Proposed is the construction of a 2.5 acre bus parking facility, a 0.58 acre dry retention area and a perimeter berm at elevation 8.75' NGVD to retain the 100-yeard, 3-day storm event with zero discharge runoff within the property site.

SITE DATA

The site is located 1,130 feet west of NW 137 Ave on NW 10 Street, in Miami Dade County, Florida, located in Section 34, Township 53 South, Range 39 East. The project consists of a bus parking facility with an on-site dry retention system. The existing land uses surrounding the site are industrial on the North, South, East and West.

Table 1 summarizes the proposed landuse breakdown of the project

Table 1 - Site Landuse Breakdown

Description	Proposed Site
Total Area:	2.5 ac
Building Area:	0.00 ac
Pavement:	1.67 ac
Outbank:	0.25 ac
Retention Bottom Area:	0.21 ac
Retention Bank Area:	0.37 ac

Wet season water table elevation = 4.8' NGVD (see October ground water level attached)

Design Storm Rainfall Amount (see SFWMD Rainfall Curves attached)

Roads (10-year, 1-day) = 7 Inches

Design (25-year, 3-day) = 12 inches

Berm and Finish Floor (100-year, 3-day) = 16.3 inches

DESIGN CRITERIA

The proposed stormwater retention system has been design to retain the 100-year, 3-day storm runoff volume as per Miami-Dade requirements. An existing earthen perimeter berm is propose to be constructed with a top of 8.75' NGVD to prevent offsite discharge during the design storm event (100-year, 3-day with zero discharge).

FEMA flood criteria assigned for this site is 7.00' NGVD

WATER QUALITY

Water quality requirements are defined based on the following criteria: the first inch of runoff over the entire site, or 2.5 inches times the percent impervious

2.5 inches times the perent impervious controls over the first inch of runoff over the entire site

2.5 inches times the percent impervious = 4.92 ac-in (see water quality calculations attached)

SOIL STORAGE

Soil Storage (S) was calculated to be 0.45 inches over the entire site (see soil storage calculations attached)

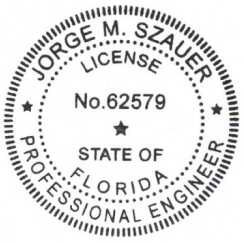
EXFILTRATION TRENCH CALCULATIONS

Exfiltration trench has been calculated to provide treatment for 1" over the entire site excluding the retention area. the rest of the required treatment will be provided in the retention area.

Exfiltration Trench 1 Length = Volume / (K($2*H_2*Du - Du^2 + 2*H_2*Ds$) + (1.39E-4*W*Du))

L=	80 Ft - Length of trench required
V=	1.92 Acre-inch - Volume treated
W=	4 Ft - Trench Width
K=	2.92.0E-04 CFS/FT^2-Ft. Head - Hydraulic Conductivity
H2=	2.9 Ft - Depth to Water Table
Du=	1.9 Ft - Non-Saturated Trench Depth
Ds=	12.1 Ft - Saturated Trench Depth

Length of Trench Provided = 80 LF (additional 80 LF of exfiltration trench is proposed on the retention area to help with drawdown)



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SITE STORAGE

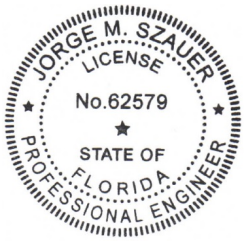
Stage (ft NGVD)	Retention Bottom (Ac-ft)	Retention Side Slope (Ac-ft)	Pavement (Ac-ft)	Exfiltration Trench (Ac-ft)	Total (Ac-ft)
5.00	0.00	0.00	0.00	0.16	0.16
5.50	0.00	0.00	0.00	0.16	0.16
6.00	0.05	0.00	0.00	0.16	0.21
6.50	0.15	0.04	0.00	0.16	0.35
7.00	0.26	0.12	0.00	0.16	0.54
7.50	0.36	0.22	0.00	0.16	0.74
8.00	0.47	0.37	0.30	0.16	1.30
8.50	0.57	0.53	1.13	0.16	2.39
9.00	0.68	0.72	1.96	0.16	3.52

Full water Quality provided on exfiltration trench and retention area

RUNOFF CALCULATIONS

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

Design Frequency	Precipitation P (in)	Soil Storage S (in)	Runoff Q (in)	Runoff Volume (Ac-ft)	Maximum Stage (ft-NGVD)
10y-1d	7	0.45	6.49	1.22	7.93
25y-3d	12	0.45	11.48	2.15	8.39
100y-3d	16.3	0.45	15.72	2.95	8.75



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Soil Type: Flatwoods (2)

Soil Storage Calculation

Project: **Air-B Bus**

Date: **7-Aug-19**

User Enter Data is Shown in Blue & Bold Font

DWT	S (inches)
0	0
1	0.6
2	2.5
3	5.4
4	9

SHGWT (Seasonal high groundwater table elevation: **4.8** ft NGVD

Total Impervious area (see note below): **1.670** acres

Pervious Area Description	Pervious Area Acreage (acres)	Low Elevation of Ground Surface (ft NGVD)	High Elevation of Ground Surface (ft NGVD)	Calculated Avg. Ground Surface Elvation (ft NGVD)	Calculated Depth to Groundwater (ft)	Calculated Uncompacted Soil Storage per SFWMD (inches)	Calculated Uncompacted Soil Storage per SFWMD (ac-ft)	Is Soil Compacted (enter Y or N)	Adjusted Soil Storage based on 75% Factor (ac-ft)	Note
Swale Bot	**0.210**	**5.8**	**5.8**	5.80	1.00	0.600	0.011	**Y**	0.008	Compacted Soil
Swale Ban	**0.140**	**5.8**	**7.6**	6.70	1.90	2.310	0.027	**Y**	0.020	Compacted Soil
Bank 2	**0.230**	**5.8**	**8.8**	7.28	2.48	3.878	0.074	**y**	0.056	Compacted Soil
				0.00	0.00	0.000	0.000	**Y**	0.000	
				0.00	0.00	0.000	0.000	**Y**	0.000	
				0.00	0.00	0.000	0.000	**Y**	0.000	
				0.00	0.00	0.000	0.000	**Y**	0.000	
				0.00	0.00	0.000	0.000	**Y**	0.000	
				0.00	0.00	0.000	0.000	**Y**	0.000	
				0.00	0.00	0.000	0.000	**Y**	0.000	
Total	**0.580**	**<- total pervious area**							**0.084**	**<- ac-ft (Total)**

Calculated Composite Soil Storage: 0.447 inches CN = 1000/(S+10) = 95.7

Note: The composite soil storage calculated above is based on the total ac-ft of soil storage divided over the entire site area including pervious and impervious area. If the user desires to calculate the composite soil storage over only the pervious area, then the impervious area should be entered as zero above.

Exfiltration Trench Calculation

Reference: SFWMD Vol. IV 8/16/2019

AirBBus

Case 1:

Length = Volume / (K(H_2*W + 2*H_2*Du - Du^2 + 2*H_2*Ds) + (1.39E-4*W*Du))

This formula takes into consideration a safety factor of 2 and a 50% credit for retention system.

Variable Definitions:

Ds =	Saturated Depth of Trench (ft)
Du =	Unsaturated Depth (ft)
H_2 =	Depth from Land Surface to Water Table (ft)
W =	Trench Width (ft)
Volume =	Required Wet Detention Volume (ac-in)
Length =	Calculated Trench Length (ft)
K =	Hydraulic Conductivity (ft/sec)

Note: (a)This equation **(Case 1)** is a special case. Validity criteria: (1) Ds<Du. (2) W < 2* (Ds+Du)
(b) Minimum pipe diameter is 12 inches, minimum trench width (W) is 3 ft.

Input:

Ds =	12.1	ft	Validity Check:	
Du =	1.9	ft	(1) Ds < Du ?	criterion NOT met
H_2 =	2.9	ft	(2) W < 2* (Ds+Du)?	Yes
W =	4	ft	(3) W > 3 ?	Yes
Volume =	1.92	ac-in		
K =	2.92E-04	cfs/ft^2 (i.e. ft/sec)		

Case 1: **Calulated Trench Length =** **71 ft**

Case 2:

Length = Volume / (K(2*H_2*Du - Du^2 + 2 *H_2*Ds) + (1.39E-4*W*Du))

This formula takes into consideration a safety factor of 2 and a 50% credit for retention system.
This formula is valid if W > 2(Ds+Du) and Ds>Du.

Note: (a)This equation **(case 2)** is a special case. Validity criteria: (1) Ds>Du. (2) W > 2* (Ds+Du)
(b) Minimum pipe diameter is 12 inches, minimum trench width (W) is 3 ft.

Case 2: **Calulated Trench Length =** **81 ft**

Validity Check:
(1) Ds > Du ? criterion NOT met

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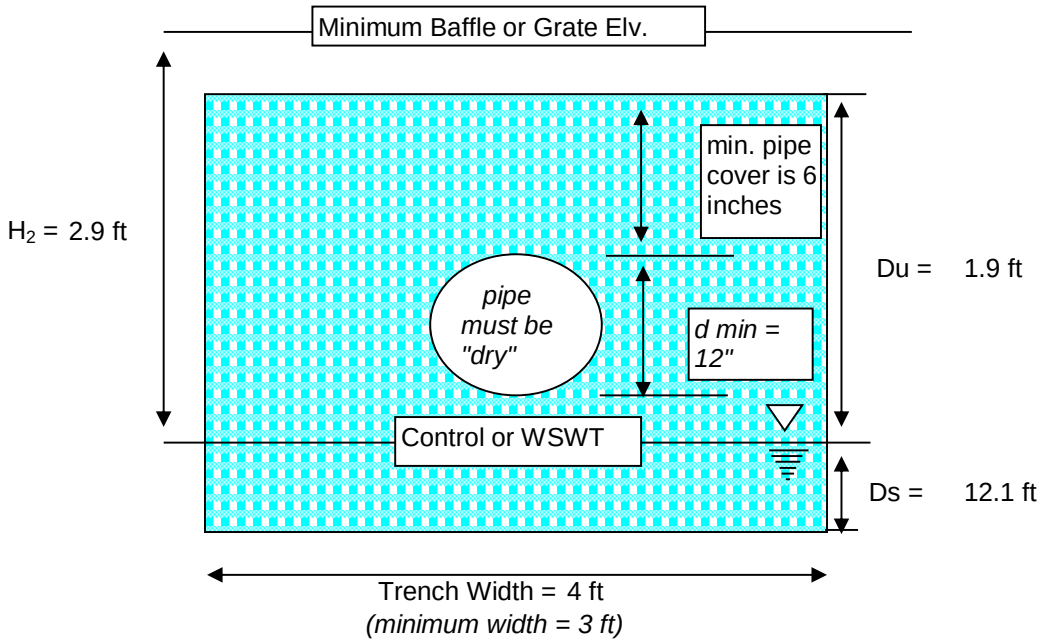
Minimum Baffle or Grate Elv.
H2 = 2.9 ft
min. pipe cover is 6 inches
Du = 1.9 ft
pipe must be "dry"
d min = 12"
Control or WSWT
Ds = 12.1 ft
Trench Width = 4 ft
(minimum width = 3 ft)

Click here for Directions:

Site Storage Calculation

Project Name: *AirBBus 8-7-19*
Date: *enter*
User: *enter*

Minimum Stage: *5.000* feet, NGVD
Incremental Stage: *0.500* feet

Area Number	1	2	3	4	5	Total Area	
Area Description	Ret Bottom	Ret Berm	Berm 2	Exf Trench	Parking		
Area (acres)	*0.21*	*0.14*	*0.23*		*1.67*	**2.25 ac**	
Area (ft^2)	9.15E+03	6.10E+03	1.00E+04	0.00E+00	7.27E+04		
Low Elv.	*5.8*	*5.8*	*5.8*		*7.6*		
High Elv.	*5.8*	*7.6*	*8.8*		*8.1*		
Stage (ft, NGVD)	Storage (ac-ft)	Storage (ac-ft)	Storage (ac-ft)	Storage (ac-ft)	Storage (ac ft)	Stage (ft, NGVD)	Total Storage (ac-ft)
5.000	0.00	0.00	0.00	0.16	0.00	5.00	0.16
5.500	0.00	0.00	0.00	0.16	0.00	5.50	0.16
6.000	0.05	0.00	0.00	0.16	0.00	6.00	0.21
6.500	0.15	0.02	0.02	0.16	0.00	6.50	0.35
7.000	0.26	0.06	0.06	0.16	0.00	7.00	0.53
7.500	0.36	0.11	0.11	0.16	0.00	7.50	0.75
8.000	0.47	0.18	0.19	0.16	0.30	8.00	1.29
8.500	0.57	0.25	0.28	0.16	1.13	8.50	2.40
9.000	0.68	0.32	0.40	0.16	1.96	9.00	3.52
9.500	0.78	0.39	0.51	0.00	2.80	9.50	4.48
10.000	0.89	0.46	0.63	0.00	3.63	10.00	5.61
10.500	0.99	0.53	0.74	0.00	4.47	10.50	6.73
11.000	1.10	0.60	0.86	0.00	5.30	11.00	7.86
11.500	1.20	0.67	0.97	0.00	6.14	11.50	8.98
12.000	1.31	0.74	1.09	0.00	6.97	12.00	10.11
12.500	1.41	0.81	1.20	0.00	7.81	12.50	11.23

SCS Runoff Equation:

AirBBus 8-7-19

Rainfall & Basin Information:

Total Site Area (including buildings):	*2.25*	acres
Composite Soil Storage:	*0.45*	inches
10-yr 24-hr storm event:	*7.0*	inches
10-yr 72-hr storm event:		inches
25-yr 24-hr storm event:		inches
25-yr 72-hr storm event:	*12.0*	inches
100-yr 72-hr storm event:	*16.3*	inches

Zero-Discharge Runoff Volume & Interpolated Stages:

Runoff (inches) = (P-0.2S)^2 / (P + 0.8*S)

Design Storms (from above)	Runoff (in)	Runoff (ac-ft)	Stage (ft)
10-yr 24-hr storm event:	6.488	1.216	7.928
10-yr 72-hr storm event:	0.023	0.004	#N/A
25-yr 24-hr storm event:	0.023	0.004	#N/A
25-yr 72-hr storm event:	11.476	2.152	8.389
100-yr 72-hr storm event:	15.722	2.948	8.75