

# STORMWATER MANAGEMENT CALCULATIONS

## I. GIVEN:

### A. ACREAGE:

1. Buildings = 0.000 ac.
2. Impervious = 0.008 ac.
3. Pervious = 0.005 ac.
4. Water / Retention Area = 0.000 ac.
4. Total Site Area = 0.013 ac.

### B. ZONING:

1. Commercial

## II. DESIGN CRITERIA:

### A. WATER QUALITY CRITERIA:

1. If a wet detention system, then whichever is the greater of the following:
  - a. The first inch of runoff from the entire project site.
  - b. The amount of 2.5 inches times the percent impervious for the project site.
2. If a dry detention system, then 75% of the volume required for the wet detention system.
3. If a retention system, then 50% of the volume required.
4. If the property is zoned "Commercial", at least 1/2 inch of retention or dry detention pre-treatment will be required.
5. Any detention system shall be designed to discharge no more than 0.5 inches of the detained volume per day.

## III. COMPUTATIONS

### A. WATER QUALITY COMPUTATIONS:

1. Compute the first inch of runoff from the entire developed project site:
 
$$= 1.00 \text{ inch} \times 0.013 \text{ acres} \times (1 \text{ foot} / 12 \text{ inches})$$

$$= 0.001 \text{ ac-ft for the first inch of runoff}$$
2. Compute 2.5 inches times the percent impervious for the developed project site:
  - a. Site area for water quality pervious / impervious calculations only:
 
$$= \text{Total Project Area} - (\text{Water / Retention Area} + \text{Buildings})$$

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$$= 0.013 \text{ acres} - (0.000 \text{ acres} + 0.000 \text{ acres})$$

$$= \boxed{0.013} \text{ acres of site area for water quality calculations}$$

b. Impervious area for water quality pervious / impervious calculations only:

$$= \text{Site area for water quality} - \text{Pervious area}$$

$$= 0.013 \text{ acres} - 0.005 \text{ acres}$$

$$= \boxed{0.008} \text{ acres of impervious area for water quality calculations}$$

c. Percentage of impervious area for water quality:

$$= \text{Impervious area for water quality} / \text{Site area for water quality} \times 100\%$$

$$= 0.008 \text{ acres} / 0.013 \text{ acres} \times 100\%$$

$$= \boxed{61.5\%} \text{ Impervious}$$

d. For 2.5 inches times the percentage of impervious area:

$$= 2.5 \text{ inches} \times 61.5\%$$

$$= \boxed{1.538} \text{ inches to be treated}$$

e. Compute volume required for quality:

$$= \text{Inches to be treated} \times (\text{Total Site Area} - \text{Water / Retention Area})$$

$$= 1.538 \text{ inches} \times (0.013 \text{ acres} - 0.000 \text{ acres}) \times (1 \text{ foot} / 12 \text{ inches})$$

$$= \boxed{0.002} \text{ ac-ft required for detention storage}$$

3. → The first inch of runoff from the entire developed site =  $\boxed{0.001} \text{ ac-ft}$

→ 2.5 inches times the percentage of impervious area =  $\boxed{0.002} \text{ ac-ft}$

→ Volume of  $\boxed{0.002} \text{ ac-ft controls}$

4. If the project is zoned "Commercial" or if the project were discharging directly to a sensitive receiving body and is more than 40% impervious, 0.5 inches of dry detention pre-treatment must be provided:

$$= 0.5 \text{ inches} \times (\text{Total Site Area} - \text{Water / Retention Area})$$

$$= 0.5 \text{ inches} \times (0.013 \text{ acres} - 0.000 \text{ acres}) \times (1 \text{ foot} / 12 \text{ inches})$$

$$= \boxed{0.001} \text{ ac-ft required for pre-treatment}$$

5. Compute total volume required:

$$= \text{Total required detention} + \text{Pre-treatment}$$

$$= 0.002 \text{ ac-ft} + 0.001 \text{ ac-ft}$$

$$= \boxed{0.002} \text{ ac-ft of total volume required}$$

6. Compute credit for using one of the following systems:

a. Wet detention volume to be provided:

$$= \text{Total required detention} - \text{Pre-treatment}$$

$$= 0.002 \text{ ac-ft} - 0.001 \text{ ac-ft}$$

$$= \boxed{0.001} \text{ ac-ft of volume required for wet detention}$$

b. Dry detention volume to be provided ( 75% of the total required detention volume )

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$$\begin{aligned}
 &= \text{Total required detention volume} \times 75\% \\
 &= 0.002 \text{ ac-ft} \times 0.75\% \\
 &= \boxed{0.001} \text{ ac-ft of volume required for dry detention}
 \end{aligned}$$

c. Dry retention volume to be provided ( 50% of the total required detention volume ):

$$\begin{aligned}
 &= \text{Total required detention volume} \times 50\% \\
 &= 0.002 \text{ ac-ft} \times 0.50\% \\
 &= \boxed{0.001} \text{ ac-ft of volume required for dry retention}
 \end{aligned}$$

## B. SUMMARY OF WATER QUALITY COMPUTATIONS:

Item	Description	Quantity
A.1	First inch of runoff from the entire developed project site	0.001 ac-ft
A.2	2.5 inches times percent impervious for the developed project site	0.002 ac-ft
A.3	Detention volume to be treated	0.002 ac-ft
A.4	Pre-treatment required for Commercial site	0.001 ac-ft
A.5	Total volume to be treated	0.002 ac-ft
A.6.a	Wet detention volume required	0.001 ac-ft
A.6.b	Dry detention volume required	0.001 ac-ft
A.6.c	Dry retention volume required	0.001 ac-ft

## C. STAGE - STORAGE TABLE:

WSEL (ft)	Area (sf)	Average Area (sf)	Head Diff (ft)	Change in Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	Site Feature
7.15	26				0	0.000	
		99	1.00	99			
8.15	171				99	0.002	

## IV. CONCLUSIONS

The required storage volume to treat 100% of the impervious area to the raingarden is **0.002 ac-ft**.

The proposed storage volume in the raingarden is **0.002 ac-ft**.

This item has been digitally signed and sealed by Justin Thompson, PE, on the date adjacent to the seal.

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