

**STORMWATER MANAGEMENT CALCULATIONS**

PZ23-12000046

04/03/2024

**I. GIVEN:****A. POST DEVELOPMENT ACREAGE:**

1. Buildings = 0.000 ac.
2. Total Impervious = 0.090 ac.
3. Pervious = 0.010 ac.
4. Dry Retention Area = 0.000 ac.
  
4. Total Site Area = **0.100** ac.

**B. ZONING:**

1. **Commercial**

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

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02/29/2024

**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:
 
$$= 1.00 \text{ inch} \times 0.100 \text{ acres} \times (1 \text{ foot} / 12 \text{ inches})$$

$$= \boxed{0.008} \text{ ac-ft for the first inch of runoff}$$
2. Compute 2.5 inches times the percent impervious for the developed project site:
  - a. Site area for water quality pervious / impervious calculations only:
 
$$= \text{Total Project Area} - (\text{Water / Retention Area} + \text{Buildings})$$



$$= 0.100 \text{ acres} - ( 0.000 \text{ acres} + 0.000 \text{ acres} )$$

PZ23-120000 **0.100** acres of site area for water quality calculations

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

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

$$= 0.100 \text{ acres} - 0.010 \text{ acres}$$

$$= \mathbf{0.090} \text{ acres of impervious area for water quality calculations}$$

c. Percentage of impervious area for water quality:

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

$$= 0.090 \text{ acres} / 0.100 \text{ acres} \times 100\%$$

$$= \mathbf{90.0\%} \text{ Impervious}$$

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

$$= 2.5 \text{ inches} \times 90.0\%$$

$$= \mathbf{2.250} \text{ inches to be treated}$$

e. Compute volume required for quality:

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

$$= 2.250 \text{ inches} \times ( 0.100 \text{ acres} - 0.000 \text{ acres} ) \times ( 1 \text{ foot} / 12 \text{ inches} )$$

$$= \mathbf{0.019} \text{ ac-ft required for detention storage}$$

3. → The first inch of runoff from the entire developed site =  $\mathbf{0.008} \text{ ac-ft}$

→ 2.5 inches times the percentage of impervious area =  $\mathbf{0.019} \text{ ac-ft}$

→ Volume of  $\mathbf{0.019} \text{ ac-ft}$  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:

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

$$= 0.5 \text{ inches} \times ( 0.100 \text{ acres} - 0.000 \text{ acres} ) \times ( 1 \text{ foot} / 12 \text{ inches} )$$

$$= \mathbf{0.004} \text{ ac-ft required for pre-treatment}$$

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

a. Wet detention volume to be provided:

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

$$= 0.019 \text{ ac-ft} - 0.004 \text{ ac-ft}$$

$$= \mathbf{0.015} \text{ ac-ft of volume required for wet detention}$$

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

$$= \text{Total required detention volume} \times 75\%$$

$$= 0.019 \text{ ac-ft} \times 0.75 \%$$

$$= \mathbf{0.014} \text{ ac-ft of volume required for dry detention}$$

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

= Total required detention volume X 50%

PZ23-1200046.019 ac-ft X 0.50 %

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**B. SUMMARY OF WATER QUALITY COMPUTATIONS:**

Item	Description	Quantity
A.1	First inch of runoff from the entire developed project site	0.008 ac-ft
A.2	2.5 inches times percent impervious for the developed project site	0.019 ac-ft
A.3	Detention volume to be treated	0.019 ac-ft
A.4	Pre-treatment required for Commercial site	0.004 ac-ft
A.6.a	Wet detention volume required	0.015 ac-ft
A.6.b	Dry detention volume required	0.014 ac-ft
A.6.c	Dry retention volume required	0.009 ac-ft

**C. EXFILTRATION TRENCH COMPUTATIONS:**

$$L = \frac{FS[(\%WQ)(V_{wq}) + V_{add}]}{K(H_2W + 2H_2D_u - D_u^2 + 2H_2D_s) + (1.39 \times 10^{-4})WD_u}$$

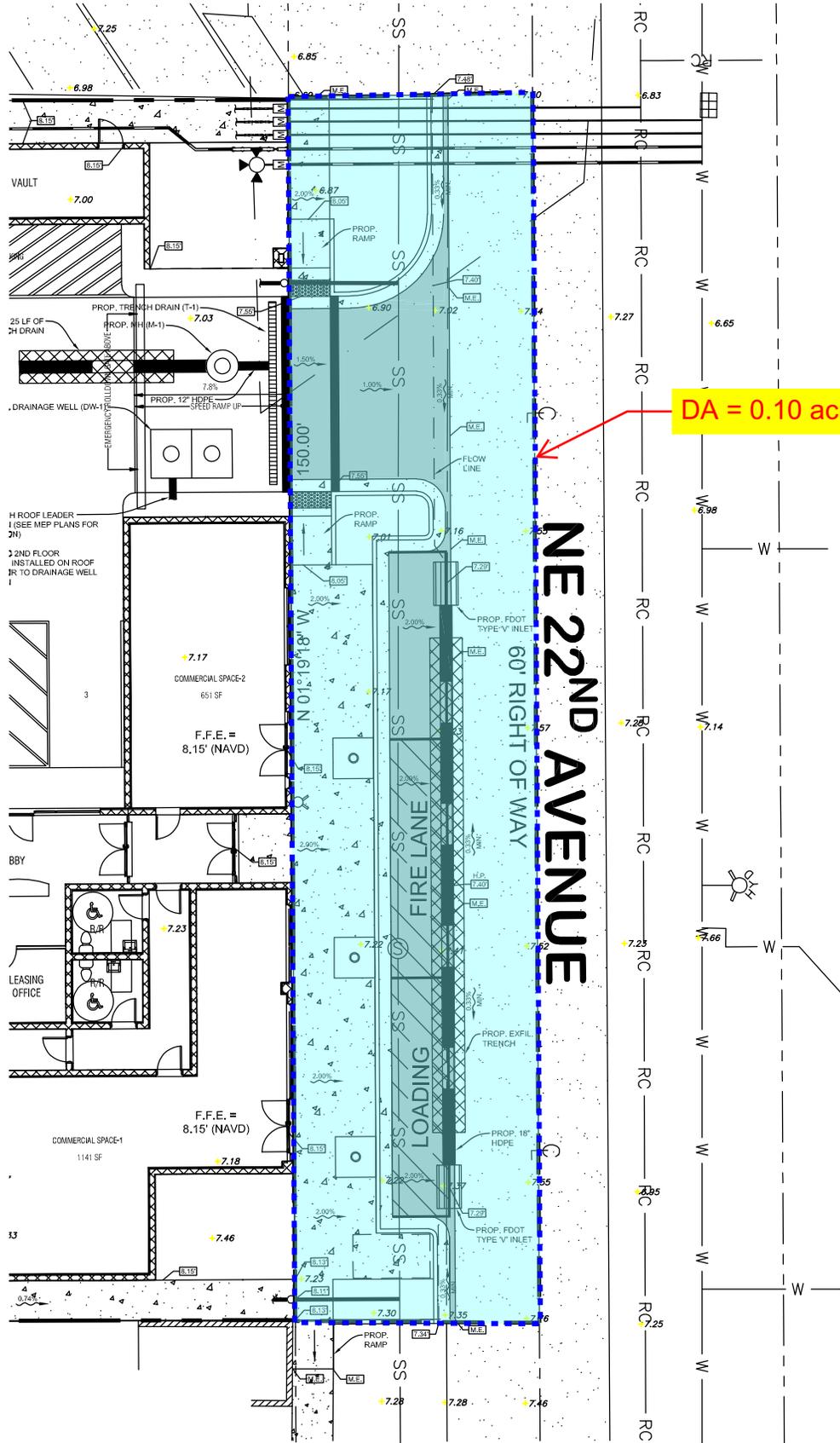
- H<sub>2</sub> = 4 ft
- D<sub>s</sub> = 2 ft
- D<sub>u</sub> = 2 ft
- W = 12 ft
- K = 1.15e-4 cfs/ft<sup>2</sup>-ft
- V<sub>wq</sub> = 0.225 ac-in
- V<sub>add</sub> = 0 ac-in

**L<sub>(req)</sub> = 18.6 Feet**

**Rainfall Deduction = 0.225 ac-in / 0.10 ac = 2.25 in.**

**IV. CONCLUSIONS**

The length of exfiltration trench required to treat the frontage drainage for NE 22nd Avenue is 18.6 feet. 61 feet of exfiltration trench is being proposed.



DA = 0.10 acres