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Project: 321 Broadway Drainage Improvements

Project #: MCI01P001

Subject: Stormwater Management Report

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1 Introduction

Hudson Engineering, LLC (HE) was engaged by Dr. Jonathan Michael to prepare a stormwater management system required to obtain a variance for an addition proposed at 321 Broadway, Bayonne, NJ 07002 (Block:252 Lot:19).

The existing site consists of a 55'-1" L by 24'-11" W two-story brick and frame multi-use building built on a parcel with approximate dimensions of 108.5-feet by 25-feet. The remainder of the parcel consists of ± 200 square feet (SF) of concrete pavement and $\pm 1,135$ SF of lawn area. The existing lot coverage is 58%.

An addition is proposed at the site and will consist of the following:

1. 88'-6" L x 25' W three-story brick and frame multi-use building
2. ± 87.5 SF of concrete pavement
3. ± 412.5 SF of lawn area

Per City of Bayonne Zoning Regulations, the maximum lot coverage of principal and accessory structure is 70%; however, the proposed addition at 321 Broadway, Bayonne, NJ will result in lot coverage of 84%. Stormwater management of the runoff from the lot coverage that exceeds 70% (14% of the proposed lot coverage) will be required to obtain a variance for this proposed addition.

This stormwater management report has been developed to demonstrate compliance with the City of Bayonne Zoning Regulations, which requires a stormwater management system for any coverage that exceeds the zoning coverage threshold of 70%.

2 Stormwater Management Design

The drainage area to be captured is the 14% of lot coverage which exceeds the City of Bayonne Zoning requirements; this is approximately 380 SF of impervious coverage. The system will be

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designed to manage the New Jersey Department of Environmental Protection (NJDEP) Water Quality Storm or 1.25 inches of rain over two hours.

2.1 Runoff Volume Calculation

$$\text{Runoff Volume (cubic feet)} = \text{Drainage Area (SF)} \times \text{Rainfall Depth (in)} \times \frac{1 \text{ ft}}{12 \text{ in}}$$

$$\text{Runoff Volume} = 380 \text{ SF} \times 1.25 \text{ in} \times \frac{1 \text{ ft}}{12 \text{ in}} = \mathbf{39.6 \text{ cubic feet (CF) or 300 gallons}}$$

2.2 Storage Volume of Prefabricated Dry Well

A prefabricated dry well system (Flo-Well as manufactured by NDS, or equal) is recommended to reduce installation costs and the footprint required. The prefabricated dry well units will be surrounded by ¾" clean gravel which will provide additional storage in the void spaces of the stone.

Each Flo-Well unit is 2-feet in diameter and 28-¾ inches in height, which provides a storage volume of 6.7 cubic feet (50 gallons) each. The bottom 24 inches of the Flo-Well unit will be installed within the gravel backfill.

Assumptions:

- Thickness of gravel backfill around Flo-Well 1 feet
- Depth of gravel backfill beneath Flo-Well 1.25 feet
 - Total depth of gravel backfill 3.25 feet
- Depth of soil cover over Flo-Well 8 inches
- Void space of ¾" clean gravel 40%

The additional storage in the gravel backfill is calculated as follows:

$$\text{Stone Storage Volume (CF)} = \left[\left(\frac{\pi}{4} \times 4^2 \right) \times (3.25) - (6.7) \right] \times 0.40 = 13.7 \text{ CF}$$

$$\mathbf{\text{Total Storage Volume Per Flo-Well Unit} = 13.7 + 6.7 = 20.3 \text{ CF}}$$

Therefore, two (2) Flo-Well units will provide 40.3 CF of storage which is sufficient to capture the runoff volume of 39.6 CF.

Depth to groundwater is not known for this exact site but is not anticipated to be excessively shallow. To avoid any complications with the water table, it is recommended to install the Flow-Well units side-by-side rather than stacked to keep the system as shallow as possible.

2.3 Drain Time of Dry Well

Dry wells must drain in less than 72 hours (hr) to eliminate mosquito concerns. The following equation was used to determine the drain time of the proposed dry well system:

$$\text{Drain Rate} \left(\frac{\text{CF}}{\text{hr}} \right) = \text{Soil Permeability Rate} \left(\frac{\text{in}}{\text{hr}} \right) \times \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) \times \text{Bottom Area (SF)}$$

Since measured data is not available, a conservative soil permeability rate of 0.5 in/hr was selected for this calculation.

$$\text{Drain Rate } \left(\frac{CF}{hr} \right) = 0.5 \times \left(\frac{1ft}{12in} \right) \times 25.1 SF = 1.05 Cf/hr$$

The drain time is calculated by dividing the runoff volume (39.6 CF) by the drain rate (1.05 CF/hr). As such, the drain time is calculated as 37.8 hours.

3 Project Coordination

The dry well system has been designed to capture stormwater runoff generated by the 14% of lot coverage (380 SF) that exceeds the zoning coverage threshold of 70%. It is anticipated that the drainage area to the dry well system will be approximately 380 SF of the new building's rooftop. To convey stormwater from 380 SF of rooftop, the Project Architect will design roof drainage so ± 380 SF of the back portion of the roof is collected and conveyed via a downspout to the rear yard as shown on the Civil Site Plans. The rest of the rooftop runoff shall be conveyed and discharge to the roadway to avoid overwhelming the dry well system.

The system overflow is currently a pop-up emitter that will gently disperse any runoff that exceeds the capacity of the dry well system to the lawn area in the rear yard. Since 90% of storm events in New Jersey are less than 1.25 inches, excessive overflows of the system are not anticipated.