

Drainage Analysis Report

for

Tax Lot 113.06 in Block 108

9 Jay Road

Township of Chatham

Morris County, New Jersey

Date: Sept. 29, 2017

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License No. GB041056

New Roof Area = s.f.

Disturbance Area = s.f.

Existing Impervious Area = s.f.

Proposed Impervious Area * = s.f. *

CN for Impervious =

CN for Grass =

Tc = hours

2-year Rainfall = inches

10-year rainfall = inches

100-year rainfall = inches

* Proposed Impervious Area is based upon total **allowable** coverage.
Actual coverage proposed for this project is 4,548 s.f..

Standard Drainage Calculations

For required storage of a 3" - 24 hour rainfall event over the roof area.
Based on formula: Required Storage = (3"/12)(Roof Area)

New Roof Area = 2,436 s.f.

Required Storage = 609 cu. ft.

SCS Drainage Calculations

For reducing the proposed development peak flow to 50% and 75% of existing peak flows for the 2-year and 10-year storms, respectively, using the SCS Method - Technical Release No. 55 (TR-55).

Drainage Areas:

Drainage areas were calculated based upon the area of disturbance on the subject premises only - see Lot Grading Plan for pre-construction (existing) and post-construction (proposed) conditions.

Pre-Construction Conditions (Existing):

$$\begin{array}{rclclcl} \text{Impervious} & = & 3,412 \text{ s.f.} & = & 0.0783 \text{ Ac.} & & \\ \text{Grass} & = & \frac{13,588 \text{ s.f.}}{17,000 \text{ s.f.}} & = & \frac{0.3119 \text{ Ac.}}{0.3903 \text{ Ac.}} & = & 0.0006 \text{ sq. mi.} \end{array}$$

Post-Construction Conditions (Proposed):

$$\begin{array}{rclclcl} * \text{ Impervious} & = & 6,005 \text{ s.f.} & = & 0.1379 \text{ Ac.} & & \\ \text{Grass} & = & \frac{10,995 \text{ s.f.}}{17,000 \text{ s.f.}} & = & \frac{0.2524 \text{ Ac.}}{0.3903 \text{ Ac.}} & = & 0.0006 \text{ sq. mi.} \end{array}$$

Soil Type:

Based on Soil Survey for Morris County, N.J.

Urban Land - Riverhead Complex (U_p)

Hydrological Soil Group (HSG) = B

* Proposed Impervious Area is based upon total **allowable** coverage.
Actual coverage proposed for this project is 4,548 s.f..

2-Year Storm - Pre-Construction Conditions

| <u>Land Use</u> | <u>HSG</u> | <u>Area</u> | <u>CN</u> | <u>(Area)(CN)</u> |
|-----------------|------------|-------------|-----------|-------------------|
| Impervious | B | 0.07833 Ac. | 98 | 7.6762 |
| Grass | B | 0.31194 Ac. | 61 | 19.0282 |
| | | 0.39027 Ac. | | 26.7044 |

$$\text{CN} = 26.7044 \div 0.3903 = 68.43 \quad \sim \text{Use} \quad 68$$

Time of Concentration: $T_c = 0.1 \text{ Hr.}$; 662 CSM/IN.
(Type III Rainfall Distribution - Exhibit 5-III)

Rainfall: 3.5 in. for 2-year - 24 hour storm

Runoff: (Table 2-1) 0.91 in. For this Storm and CN

Peak Runoff: $Q_{2\text{-PRE}} = Q_0 = (662)(0.80)(0.0006) = 0.37 \text{ cfs}$

50% of Peak Runoff = $0.5Q_0 = (0.32 \text{ cfs})(0.50) = 0.18 \text{ cfs}$

2-Year Storm - Post-Construction Conditions

| <u>Land Use</u> | <u>HSG</u> | <u>Area</u> | <u>CN</u> | <u>(Area)(CN)</u> |
|-----------------|------------|-------------|-----------|-------------------|
| Impervious | B | 0.13786 Ac. | 98 | 13.5099 |
| Grass | B | 0.25241 Ac. | 61 | 15.3970 |
| | | 0.39027 Ac. | | 28.9069 |

$$\text{CN} = 28.9069 \div 0.3903 = 74.07 \quad \sim \text{Use} \quad 74$$

Time of Concentration: $T_c = 0.1 \text{ Hr.}$; 662 CSM/IN.
(Type III Rainfall Distribution - Exhibit 5-III)

Rainfall: 3.5 in. for 2-year - 24 hour storm

Runoff: (Table 2-1) 1.24 in. For this Storm and CN

Peak Runoff: $Q_{2\text{-PRE}} = Q_0 = (662)(1.24)(0.0006) = 0.50 \text{ cfs}$

Storage Required:

$$Q_{2\text{-PRE}} = Q_0 = 0.18 \text{ cfs}$$

$$Q_{2\text{-POST}} = Q_1 = 0.50 \text{ cfs}$$

$$Q_0/Q_1 = 0.365$$

$$V_s/V_r = 0.343 \quad \text{From Table 6-1}$$

$$V_s = (0.368)(1.24/12)(17000) = 603 \text{ cu. ft.}$$

Storage required for the 2-year storm = 603 cu. ft. ←

10-Year Storm - Pre-Construction Conditions

| <u>Land Use</u> | <u>HSG</u> | <u>Area</u> | <u>CN</u> | <u>(Area)(CN)</u> |
|-----------------|------------|-------------|-----------|-------------------|
| Impervious | B | 0.07833 Ac. | 98 | 7.6762 |
| Grass | B | 0.31194 Ac. | 61 | 19.0282 |
| | | 0.39027 Ac. | | 26.7044 |

$$\text{CN} = 26.7044 \div 0.3903 = 68.43 \quad \sim \text{Use} \quad 68$$

Time of Concentration: $T_c = 0.1 \text{ Hr.}$; 662 CSM/IN.
 (Type III Rainfall Distribution - Exhibit 5-III)

Rainfall: 5.2 in. for 10-year - 24 hour storm

Runoff: (Table 2-1) 2.03 in. For this Storm and CN

Peak Runoff: $Q_{10\text{-PRE}} = Q_0 = (662)(2.03)(0.0006) = 0.82 \text{ cfs}$

75% of Peak Runoff = $0.75Q_0 = (0.82 \text{ cfs})(0.75) = 0.62 \text{ cfs}$

10-Year Storm - Post-Construction Conditions

| <u>Land Use</u> | <u>HSG</u> | <u>Area</u> | <u>CN</u> | <u>(Area)(CN)</u> |
|-----------------|------------|-------------|-----------|-------------------|
| Impervious | B | 0.13786 Ac. | 98 | 13.5099 |
| Grass | B | 0.25241 Ac. | 61 | 15.3970 |
| | | 0.39027 Ac. | | 28.9069 |

$$\text{CN} = 28.9069 \div 0.3903 = 74.07 \quad \sim \text{Use} \quad 74$$

Time of Concentration: $T_c = 0.1 \text{ Hr.}$; 662 CSM/IN.
(Type III Rainfall Distribution - Exhibit 5-III)

Rainfall: 5.2 in. for 10-year - 24 hour storm

Runoff: (Table 2-1) 2.53 in. For this Storm and CN

Peak Runoff: $Q_{10\text{-POST}} = Q_1 = (662)(2.44)(0.0006) = 1.02 \text{ cfs}$

Storage Required:

$$Q_{10\text{-PRE}} = Q_0 = 0.62 \text{ cfs}$$

$$Q_{10\text{-POST}} = Q_1 = 1.02 \text{ cfs}$$

$$Q_0/Q_1 = 0.602$$

$$V_s/V_r = 0.244 \quad \text{From Table 6-1}$$

$$V_s = (0.244)(2.53/12)(17000) = 875 \text{ cu. ft.}$$

Storage required for the 10-year storm = 875 cu. ft. ←

100-Year Storm - Pre-Construction Conditions

| <u>Land Use</u> | <u>HSG</u> | <u>Area</u> | <u>CN</u> | <u>(Area)(CN)</u> |
|-----------------|------------|-------------|-----------|-------------------|
| Impervious | B | 0.07833 Ac. | 98 | 7.6762 |
| Grass | B | 0.31194 Ac. | 61 | 19.0282 |
| | | 0.39027 Ac. | | 26.7044 |

$$\text{CN} = 26.7044 \div 0.3903 = 68.43 \quad \sim \text{Use} \quad 68$$

Time of Concentration: $T_c = 0.1 \text{ Hr.}$; 662 CSM/IN.
 (Type III Rainfall Distribution - Exhibit 5-III)

Rainfall: 8.3 in. for 100-year - 24 hour storm

Runoff: (Table 2-1) 4.49 in. For this Storm and CN

$$\text{Peak Runoff: } Q_{100\text{-PRE}} = Q_0 = (662)(4.49)(0.0006) = 1.81 \text{ cfs}$$

100-Year Storm - Post-Construction Conditions

| <u>Land Use</u> | <u>HSG</u> | <u>Area</u> | <u>CN</u> | <u>(Area)(CN)</u> |
|-----------------|------------|-------------|-----------|-------------------|
| Impervious | B | 0.13786 Ac. | 98 | 13.5099 |
| Grass | B | 0.25241 Ac. | 61 | 15.3970 |
| | | 0.39027 Ac. | | 28.9069 |

$$\text{CN} = 28.9069 \div 0.3903 = 74.07 \quad \sim \text{Use} \quad 74$$

Time of Concentration: $T_c = 0.1 \text{ Hr.}$; 662 CSM/IN.
(Type III Rainfall Distribution - Exhibit 5-III)

Rainfall: 8.3 in. for 100-year - 24 hour storm

Runoff: (Table 2-1) 5.19 in. For this Storm and CN

$$\text{Peak Runoff: } Q_{100\text{-PRE}} = Q_0 = (662)(5.19)(0.0006) = 2.10 \text{ cfs}$$

Storage Required:

$$Q_{100\text{-PRE}} = Q_0 = 1.81 \text{ cfs}$$

$$Q_{100\text{-POST}} = Q_1 = 2.10 \text{ cfs}$$

$$Q_0/Q_1 = 0.864$$

$$V_s/V_r = 0.160 \quad \text{From Table 6-1}$$

$$V_s = (0.160)(5.19/12)(17000) = 1174 \text{ cu. ft.}$$

Storage required for the 100-year storm = 1174 cu. ft. ←

Conclusion

Storm Analysis

Storage Required

Standard Calculation for a 3-inch storm

609 cu. ft.

2-Year Storm

603 cu. ft.

10-Year Storm

875 cu. ft.

100-Year Storm

1174 cu. ft.

100-Year Storm controls.

1174 cu. ft. Is the Required Storage ←