



HYDROLOGY ANALYSIS TR-55 METHOD

NATIONAL PARK SEMINARY
LINDEN LN., SILVER SPRING, MD 20910



OWNER: JOHN JIAN & QIAN LI

SEPTEMBER 27, 2019

RAZTEC ASSOCIATES, INC C/O MIKE RAZAVI
341 W.PATRICK STREET, FREDERICK, MD 21701



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1. NARRATIVE:

The subjected site is located on Lower Rock Creek watershed. There is one drainage area on the site which drains toward Study Point "A" with Total Drainage Area of 10.06 acres. Some portion of this area in southern & western of the site are off-site (5.83 acres). The site is located on Hydrological Soil Group of types B & C.

Computations for run-off have done for Existing Condition & Developed Condition. For calculation of Run-off discharge for return period of 1 to 100 year, TR-55 method has been used. Run-off coefficient for whole of the site has been computed based on weighted CN.

2. NATURAL RESOURCE PROTECTION

A natural resource inventory has been approved for this site (NRI/FSD#4-04358, Date 7/7/2004). The plan has identified all the existing natural features and forest stands situated on this site. The proposed site design has attempted and succeeded in great measure in protecting of these natural resources and forest stands. This protection will be achieved by keeping the vast of the existing natural resources untouched and undisturbed.

The existing woodland areas will be protected, by placing of these areas in the proposed tree conservation easements. Out of an existing woodland area of 1.83 acres, only 0.48 acres will be cleared for construction, with 1.35 acres preserved, and therefore remaining undisturbed.

There are five specimen trees located on the site, which three of them will be cleared due to the proposed development.

The property contains two mapped highly erodible soil, (1C & 6A), which takes up approximately 41% of the site. This area is located in north western and north eastern of the site. The remaining mapped soils are not highly erodible because their K-factors are below 0.30. The site is not within 100 Year Flood plain, PMA or Wetland area.

Furthermore, there is an existing intermittent stream channel that is located on the southern side of the site. This stream channel has a length of 325 feet, which is regulated within the boundaries of the site, and an approximate 150 feet stream buffer. The existing stream channel and its buffer mainly will remain undisturbed and are located within the limits of the woodland preservation area.

The applicant will place 1.35 acres into a woodland conservation easement on site. The site, which currently lacks existing Stormwater Management, will be designed with ESDs to the maximum extent practicable.

There are four specimen trees which just one of them will be removed.

3. MAINTENANCE OF NATURAL FLOW PATTERNS

The site is comprised of one existing study points. The proposed site development has successfully maintained the drainage area to the study point, and maintained existing drainage patterns. Therefore, stability of the drainage areas have been maintained.

4. REDUCTION OF IMPERVIOUS AREAS THROUGH BETTER SITE DESIGN, ALTERNATIVE SURFACES, AND NON-STRUCTURAL PRACTICES

The existing site area is 4.23 acres, of which 2.44 acres will be retained and remain undisturbed, and outside the proposed development of the project.

Nonstructural practices are proposed to provide Stormwater Management for the project, and to meet the requirements of the ESD volumes for the site. Two Micro-Bioretention, two Landscape Infiltration, 7 Micro Infiltration Trench, 1 Permeable Pavement and 4 Drywell practices are proposed. These practices will attenuate impervious areas from the proposed project to meet the ESD volume requirements.

5. INTEGRATION OF THE EROSION AND SEDIMENT CONTROL INTO STORMWATER MANAGEMENT STRATEGY

Sediment control measures will be used to ensure that all construction activity will occur without erosion and transportation of sediment from the site. Furthermore, sediment control measures will be used in a manner to also protect the ultimate location of all Stormwater Management nonstructural practices. No structural sediment control practices are required for this project and therefore there will be no impact on proposed ESD practices. Silt fence and super silt fence will be utilized close to grading activity to prevent silt and sediment laden runoff from exiting from the site.

6. EVALUATION OF STABILIZATION REQUIREMENTS

Stabilization of the site will be achieved by both temporary stabilization as required during construction activity and permanent stabilization upon conclusion of all construction activity. Stabilization will be achieved as required by the 2011 Maryland standards and specifications for soil erosion and sediment control. All stabilization outside of paved areas and building areas will be per the vegetative standards. Stabilization will be provided in the required time frames allowed by state standards.

7. HYDROLOGY ANALYSIS FOR STUDY POINT "A" - EXISTING CONDITION (TR-55)

| | | |
|--|--|--|
| HYDRAULOGY COMPUTATION SUMMARY (TR-55 METHOD) | | |
| STUDY POINT "A" | | |
| EXISTING CONDITION | | |

| | | |
|----------------------|--|--|
| DRAINAGE AREA | | |
|----------------------|--|--|

| | |
|-------------------------|------------|
| OFF-SITE DRAINAGE AREA: | 5.825 Ac. |
| ON-SITE DRAINAGE AREA: | 4.230 Ac. |
| TOTAL DRAINAGE AREA: | 10.055 Ac. |

| | | |
|--------------------|--|--|
| WEIGHTED CN | | |
|--------------------|--|--|

| LAND USE | CN | AREA |
|---|----|-----------|
| IMPERVIOUS AREAS (Paved parking lots, roofs, driveways) | 98 | 2.490 AC. |
| GREEN AREAS (Good condition; grass cover > 75% , HSG-B) | 61 | 1.099 AC. |
| GREEN AREAS (Good condition; grass cover > 75% , HSG-C) | 74 | 2.305 AC. |
| WOOD (Good condition , HSG-B) | 55 | 1.343 AC. |
| WOOD (Good condition , HSG-C) | 70 | 2.818 AC. |
| WEIGHTED CN = | 75 | |

| | | |
|--|--|--|
| TIME OF CONCENTRATION (T_c) | | |
|--|--|--|

| |
|---|
| FOR SHEET FLOW FROM POINT# 1 TO 2 (L=100 ft , S=1%) , T _t = 0.027 hr |
| FOR CHANNEL FLOW FROM POINT# 2 TO A (L=1023 ft , S=6.5%) , T _t = 0.051 hr |
| T _c = 0.027 + 0.051 = 0.078 hr (5 minutes) is less than 0.1 hour so will be replaced with 0.1 hour (6 minutes) |

| | | |
|----------------------|--|--|
| DISCHARGE (Q) | | |
|----------------------|--|--|

| RETURN PERIOD | 24-Hr RAINFALL DEPTH | Q |
|---------------|----------------------|-----------|
| 1 Year | 2.64" | 9.51 cfs |
| 2 Year | 3.19" | 14.49 cfs |
| 5 Year | 4.10" | 23.55 cfs |
| 10 Year | 4.91" | 32.16 cfs |
| 25 Year | 6.14" | 45.78 cfs |
| 50 Year | 7.23" | 58.11 cfs |
| 100 Year | 8.51" | 72.88 cfs |

WinTR-55 Current Data Description

--- Identification Data ---

User: Payman G Date: 9/26/2019
 Project: NPS Units: English
 SubTitle: Existing-Condition Areal Units: Acres
 State: Maryland
 County: Montgomery NOAA-C
 Filename: D:\(339) 09.26.19 - (Raztec)\17-04 _ NPS\C-Common files\TR-55\Existing.w55

--- Sub-Area Data ---

| Name | Description | Reach | Area(ac) | RCN | Tc |
|------|--------------------|--------|----------|-----|-----|
| A1 | On-Site & Off-Site | Outlet | 10.06 | 75 | 0.1 |

Total area: 10.06 (ac)

--- Storm Data ---

Rainfall Depth by Rainfall Return Period

| 2-Yr (in) | 5-Yr (in) | 10-Yr (in) | 25-Yr (in) | 50-Yr (in) | 100-Yr (in) | 1-Yr (in) |
|--------------|--------------|---------------|---------------|---------------|----------------|--------------|
| 3.19 | 4.1 | 4.91 | 6.14 | 7.23 | 8.51 | 2.64 |

Storm Data Source: User-provided custom storm data
 Rainfall Distribution Type: Type NO_C
 Dimensionless Unit Hydrograph: <standard>

Payman G

NPS
Existing-Condition
Montgomery NOAA-C County, Maryland

Watershed Peak Table

| Sub-Area or Reach Identifier | Peak Flow by Rainfall Return Period | | | | | | |
|------------------------------------|-------------------------------------|---------------|----------------|----------------|----------------|-----------------|---------------|
| | 2-Yr (cfs) | 5-Yr (cfs) | 10-Yr (cfs) | 25-Yr (cfs) | 50-Yr (cfs) | 100-Yr (cfs) | 1-Yr (cfs) |
| ----- | | | | | | | |
| SUBAREAS | | | | | | | |
| A1 | 14.49 | 23.55 | 32.16 | 45.78 | 58.11 | 72.88 | 9.51 |
| REACHES | | | | | | | |
| OUTLET | 14.49 | 23.55 | 32.16 | 45.78 | 58.11 | 72.88 | 9.51 |

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Montgomery NOAA-C County, Maryland

Sub-Area Time of Concentration Details

| Sub-Area Identifier/ | Flow Length (ft) | Slope (ft/ft) | Mannings's n | End Area (sq ft) | Wetted Perimeter (ft) | Velocity (ft/sec) | Travel Time (hr) |
|-------------------------|------------------------|------------------|-----------------|------------------------|-----------------------------|-----------------------|------------------------|
| ----- | | | | | | | |
| A1 | | | | | | | |
| SHEET | 100 | 0.0100 | 0.011 | | | | 0.027 |
| CHANNEL | 1023 | 0.0650 | 0.050 | 3.00 | 4.28 | 6.046 | 0.047 |
| | | | | | | Time of Concentration | 0.1 |
| | | | | | | | ===== |

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Sub-Area Land Use and Curve Number Details

| Sub-Area Identifier | Land Use | | Hydrologic Soil Group | Sub-Area Area (ac) | Curve Number |
|---------------------|--------------------------------------|--------|-----------------------|--------------------|--------------|
| A1 | Open space; grass cover > 75% | (good) | B | 1.099 | 61 |
| | Open space; grass cover > 75% | (good) | C | 2.305 | 74 |
| | Paved parking lots, roofs, driveways | | B | 2.49 | 98 |
| | Woods | (good) | B | 1.343 | 55 |
| | Woods | (good) | C | 2.818 | 70 |
| | Total Area / Weighted Curve Number | | | 10.06 | 75 |
| | | | | ===== | == |

**8. HYDROLOGY ANALYSIS FOR STUDY POINT "A" - PROPOSED
CONDITION (TR-55)**

**HYDRAULOGY COMPUTATION SUMMARY (TR-55 METHOD)
STUDY POINT "A"
EXISTING CONDITION**

| DRAINAGE AREA | |
|-------------------------|------------|
| OFF-SITE DRAINAGE AREA: | 5.825 Ac. |
| ON-SITE DRAINAGE AREA: | 4.230 Ac. |
| TOTAL DRAINAGE AREA: | 10.055 Ac. |

| WEIGHTED CN | | |
|---|-----------|-------------|
| LAND USE | CN | AREA |
| IMPERVIOUS AREAS (Paved parking lots, roofs, driveways) | 98 | 2.490 AC. |
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| WOOD (Good condition , HSG-C) | 70 | 2.818 AC. |
| WEIGHTED CN = | 75 | |

| TIME OF CONCENTRATION (Tc) |
|---|
| FOR SHEET FLOW FROM POINT# 1 TO 2 (L=100 ft , S=1%) , Tt = 0.027 hr |
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| Tc = 0.027 + 0.051 = 0.078 hr (5 minutes) is less than 0.1 hour so will be replaced with 0.1 hour (6 minutes) |

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|----------------------|-----------------------------|-----------|
| RETURN PERIOD | 24-Hr RAINFALL DEPTH | Q |
| 1 Year | 2.64" | 9.51 cfs |
| 2 Year | 3.19" | 14.49 cfs |
| 5 Year | 4.10" | 23.55 cfs |
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 County: Montgomery NOAA-C
 Filename: D:\(339) 09.26.19 - (Raztec)\17-04 _ NPS\C-Common files\TR-55\Existing - Copy.w55

--- Sub-Area Data ---

| Name | Description | Reach | Area(ac) | RCN | Tc |
|------|--------------------|--------|----------|-----|-----|
| A1 | On-Site & Off-Site | Outlet | 10.06 | 77 | 0.1 |

Total area: 10.06 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

| 2-Yr (in) | 5-Yr (in) | 10-Yr (in) | 25-Yr (in) | 50-Yr (in) | 100-Yr (in) | 1-Yr (in) |
|--------------|--------------|---------------|---------------|---------------|----------------|--------------|
| 3.19 | 4.1 | 4.91 | 6.14 | 7.23 | 8.51 | 2.64 |

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 Rainfall Distribution Type: Type NO_C
 Dimensionless Unit Hydrograph: <standard>

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Proposed-Condition
Montgomery NOAA-C County, Maryland

Watershed Peak Table

| Sub-Area or Reach Identifier | Peak Flow by Rainfall Return Period | | | | | | |
|------------------------------------|-------------------------------------|---------------|----------------|----------------|----------------|-----------------|---------------|
| | 2-Yr (cfs) | 5-Yr (cfs) | 10-Yr (cfs) | 25-Yr (cfs) | 50-Yr (cfs) | 100-Yr (cfs) | 1-Yr (cfs) |
| ----- | | | | | | | |
| SUBAREAS | | | | | | | |
| A1 | 16.21 | 25.58 | 34.40 | 48.22 | 60.76 | 75.50 | 10.94 |
| REACHES | | | | | | | |
| OUTLET | 16.21 | 25.58 | 34.40 | 48.22 | 60.76 | 75.50 | 10.94 |

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Sub-Area Time of Concentration Details

| Sub-Area Identifier/ | Flow Length (ft) | Slope (ft/ft) | Mannings's n | End Area (sq ft) | Wetted Perimeter (ft) | Velocity (ft/sec) | Travel Time (hr) |
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| | Open space; grass cover > 75% | (good) | C | 2.27 | 74 |
| | Paved parking lots, roofs, driveways | | B | 3.13 | 98 |
| | Woods | (good) | B | 1.034 | 55 |
| | Woods | (good) | C | 2.775 | 70 |
| | Total Area / Weighted Curve Number | | | 10.06 | 77 |
| | | | | ===== | == |