

# 7-Eleven Store

1106 N. Arendell Ave

Proposed gas station and associated infrastructure  
Zebulon, North Carolina

COORDINATES: 35.8336261 N, -78.321664 W

Project No.: 220163-01-002

## Stormwater and Erosion Control Design Calculations

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JANUARY 18, 2024

## TABLE OF CONTENTS

|  |    |
|--|----|
| Overview   | 3  |
| <ul style="list-style-type: none"> <li>• Background</li> <li>• Floodplains and Streams</li> <li>• Soils</li> </ul>   |    |
| Storm Drainage Design Requirements   | 4  |
| Peak Runoff Analysis   | 4  |
| Downstream Impact Analysis   | 6  |
| Erosion Control  | 7  |
| Appendix A: Figures  | 8  |
| <ul style="list-style-type: none"> <li>• Aerial Map</li> <li>• Soil Report</li> <li>• Topography Map</li> <li>• FEMA Flood Map</li> <li>• HUC</li> <li>• Surface Waters Classification</li> <li>• NOAA Point Precipitation Frequency Estimates</li> <li>• Pre-Development Drainage Map</li> <li>• Post-Development Drainage Map</li> <li>• Post-Development Bypass Drainage Map</li> </ul> |    |
| Appendix B: Stormwater Analysis  | 9  |
| <ul style="list-style-type: none"> <li>• Wake County Stormwater Design Tool</li> <li>• CN Calculation (Bypass)</li> <li>• Stormwater Wetland Design and Details</li> <li>• Hydrographs (DA#1 &amp; DA#2)</li> <li>• Downstream Impact Analysis (DA#1 &amp; DA#2)</li> </ul>  |    |
| Appendix C: Storm Drainage Design Calculations   | 10 |
| <ul style="list-style-type: none"> <li>• Post-Development Drainage Map (Inlets)</li> <li>• 100 System</li> <li>• 200 System</li> <li>• 300 System</li> <li>• 400 System</li> <li>• 500 System</li> <li>• Pipe Inlet #1</li> </ul>  |    |
| Appendix D: Erosion Control Calculations   | 11 |
| <ul style="list-style-type: none"> <li>• Rip-Rap Apron</li> <li>• Skimmer Basin</li> <li>• Skimmer sizing</li> <li>• Anti-flotation Calculation</li> <li>• Temporary Diversion Ditches</li> </ul>  |    |

## OVERVIEW

This report contains the stormwater design calculations for the proposed 7-Eleven. The project site is located on the eastern corner of the intersection of N. Arendell Ave and Dogwood Dr. in the town of Zebulon, North Carolina, within Wake County. Currently, the project site is single-family residential and wooded area.

The proposed project site consists of 3.86 acres and approximately 4.30 acres will be disturbed as part of this project for the construction of the site improvements, widening of Dogwood Drive, construction of Jones Street, and the addition of a lane to the US-64 exit ramp. 0.46 acres will be dedicated to right-of-way. The proposed development consists of a 4,761 sf building, two fuel canopies, stormwater control measures, and associated pavement, including parking areas, driveways, and curbs.

### Background

The development on the site will result in an impervious area of 78,890 sf (1.81 ac). Table 1 below shows the break-down of the impervious area added to the site.

*Table 1. Impervious Area Summary*

| <b>Impervious Area Summary</b>           |                  |                |
|--|------------------|----------------|
| <b>Existing Impervious Area</b>          | <b>5,724 sf</b>  | <b>0.13 ac</b> |
| <b>Proposed On-site Impervious Area</b>  | <b>78,890 sf</b> | <b>1.81 ac</b> |
| Buildings                                | 4,895 sf         | 0.11 ac        |
| Pavement                                 | 69,870 sf        | 1.60 ac        |
| Sidewalk                                 | 4,125 sf         | 0.09 ac        |
| <b>Proposed Off-site Impervious Area</b> | <b>25,560 sf</b> | <b>0.59 ac</b> |
| Pavement                                 | 20,830 sf        | 0.48 ac        |
| Sidewalk                                 | 4,730 sf         | 0.11 ac        |

### Floodplains and Streams

The proposed parcel is not located within a FEMA designated flood zone as shown on the combined FEMA FIRM Panels 3720270500K and 3720270600K (July 19, 2022).

There are no existing streams and/or tributaries on the proposed property.

### Soils

Based on the NRCS Web Soil Survey, the project site consists of Wedowee sandy loam (WeB) soils.

WeB soils are Group B with 2 to 6 percent slopes.

## STORM DRAINAGE DESIGN REQUIREMENTS

The proposed stormwater drainage system design was based on standards presented in the Town of Zebulon Public Works Department Street and Storm Drainage Standards and Specifications Manual. The Town of Zebulon requires the following criteria:

- The minimum pipe culvert shall be 15" inches to minimize clogging and maintenance for all pipe culverts within Town of Zebulon Right-of-ways and easement.
- All pipe culverts to be a minimum class III reinforced concrete with a minimum pipe cover equal to 2 feet measured from the proposed finish grade to the top of the pipe. (Section 5.0.2C).

There are two storm drain systems proposed on site that drain to the proposed stormwater wetland. There is a third storm drain system that collects a portion of Jones Street that will bypass the stormwater wetland.

### Rainfall Intensity and Time of Concentration

The 10-year, 5-minute rainfall intensity used in the design of the storm drainage system is **7.21 in/hr**. The time of concentration used in the design of the storm drainage system was assumed to be **5 minutes**.

A complete analysis of the rainfall data can be found in Appendix A of this report. A complete analysis of the storm drain design and calculations can be found in Appendix C of this report.

## PEAK RUNOFF ANALYSIS

### Pre-Development Conditions

The site is currently a single-family residential and wooded area. The site has two drainage areas. For the purposes of SCM design and Downstream Impact Analysis, the drainage areas were analyzed in this report with their own study points, composite runoff curve numbers and points of analysis.

*DA#1 Pre-Developed Area* directs water to the southeast corner of the lot and is in the Moccasin Creek watershed. *DA#2 Pre-Developed Area* directs water to an existing storm sewer system in the northeast corner of the lot that drains to the Little River watershed. The characteristics for the pre-development condition are shown below and additional calculations such as can be found in Appendix B. A drainage map identifying the basin can also be found in Appendix B.

Table 2: Pre-Development Drainage Area Summaries

| Basin ID                | Total Area [acres] | On-Site Area [acres] | Composite Curve Number (CN) | Time of Concentration (Tc) [min.] |
|-------------------------|--------------------|----------------------|-----------------------------|-----------------------------------|
| DA#1 Pre-Developed Area | 3.41               | 2.62                 | 57                          | 24                                |
| DA#2 Pre-Developed Area | 0.84               | 0.76                 | 58                          | 22.2                              |



## Post-Development Conditions

The post-development condition contains two drainage areas and two bypass drainage areas.

*DA#1 Post-Developed Area* consists of the proposed development area. The drainage area collects runoff with catch basins, curb inlets, and drainage pipes that connect to the proposed Stormwater Wetlands and discharges in the southeast corner of the lot towards Moccasin Creek.

*DA#2 Post-Developed Area* directs water to an existing storm sewer system in the northeast corner of the lot that drains to the Little River watershed. The characteristics for the post-development drainage areas are shown below and calculations can be found in Appendix B. A drainage map identifying the area can be found in Appendix A.

*Table 3: Post-Development Drainage Area Summaries*

| Basin ID                 | Total Area [acres] | On-Site Area [acres] | Composite Curve Number (CN) | Time of Concentration (Tc) [min.] |
|--------------------------|--------------------|----------------------|-----------------------------|-----------------------------------|
| DA#1 Post-Developed Area | 3.16               | 2.87                 | 83                          | 4.2                               |
| DA#2 Post-Developed Area | 0.34               | 0.31                 | 60                          | 22.2                              |

*Table 4: Post Development Bypass Basin Summaries*

| Drainage Area ID                | Area [acres] | Composite Curve Number (CN) | Time of Concentration (Tc) [min.] |
|---------------------------------|--------------|-----------------------------|-----------------------------------|
| DA#1 Post-Developed Bypass Area | 0.13         | 73                          | 5                                 |
| DA#2 Post-Developed Bypass Area | 0.00         | 98                          | 5                                 |

## Comparison of Peak Discharges

The pre- and post- development peak discharges are shown below for both drainage areas. Full calculations and hydrographs can be found on Appendix B.

*Table 5: Drainage Area #1 Peak Discharges*

|              | Pre-Dev. Peak Discharge Rate | Post-Dev. w/o Detention Peak Discharge Rate | Post-Dev. w/ Detention Peak Discharge Rate |
|--------------|------------------------------|---|--|
| Storm Event  | (cfs)                        | (cfs)                                       | (cfs)                                      |
| 1-yr 24-hr   | 0.224                        | 7.077                                       | 0.198                                      |
| 2-yr 24-hr   | 0.743                        | 9.702                                       | 0.475                                      |
| 10-yr 24-hr  | 3.321                        | 17.25                                       | 2.697                                      |
| 100-yr 24-hr | 9.617                        | 30.29                                       | 11.62                                      |

Table 6: Drainage Area #2 Peak Discharges

| Storm Event  | Pre-Dev.<br>Peak Discharge Rate | Post-Dev. Peak<br>Discharge Rate |
|--------------|---------------------------------|----------------------------------|
|              | (cfs)                           | (cfs)                            |
| 1-yr 24-hr   | 0.078                           | 0.054                            |
| 2-yr 24-hr   | 0.237                           | 0.097                            |
| 10-yr 24-hr  | 0.977                           | 0.256                            |
| 100-yr 24-hr | 2.718                           | 1.193                            |

## DOWNSTREAM IMPACT ANALYSIS

A downstream impact analysis is included per the 10% rule. For Drainage Area #1, the StreamStats analysis point has a drainage area of approximately 89.6 acres, more than the 10% of the proposed development drainage area, and a 10-year peak flood flow of 123 cfs. This estimates an impervious area of 20.02% using the NLCD 2006 impervious data set. The “full build-out” condition was modeled by changing this impervious area to 100% and it produced a flow of 498 cfs. The 123 and 498 cfs conditions were modeled as channels. The existing channel was identified and measured using Wake County iMaps. The channels were modeled with an assumed height of 4 ft and was able to contain both scenarios.

For Drainage Area #1 the Pre-Developed flow for the 10-year storm event is 3.321 cfs (per hydrographs). The Post-Developed condition, including bypass, results in 2.697 cfs. This is an decrease of 0.624. Since the 10-year storm event is being attenuated through the stormwater wetland, there is a net decrease in peak flow from the pre-developed to post-developed condition. Therefore, there will be no impacts downstream.

Table 7: Downstream Impact Analysis Summary Table (Drainage Area 1)

|                          | Pre-Developed (Q-10) | Post-Developed (Q-10) |
|--------------------------|----------------------|-----------------------|
| Site                     | 3.061 cfs            | 2.697 cfs             |
| 10% Point                | 123 cfs              | 122.4 cfs             |
| Full Build-Out Condition | 498 cfs              | 497.4 cfs             |

For Drainage Area #2, the StreamStats analysis point has a drainage area of approximately 89.6 acres, more than the 10% of the proposed development drainage area, and a 10-year peak flood flow of 34.2 cfs. This estimates an impervious area of 14.48% using the NLCD 2006 impervious data set. The “full build-out” condition was modeled by changing this impervious area to 100% and it produced a flow of 153 cfs. The 34.2 and 153 cfs conditions were modeled as channels. The existing channel was identified and measured using Wake County iMaps. The channels were modeled with an assumed height of 4 ft and was able to contain both scenarios.

For Drainage Area #2 the Pre-Developed flow for the 10-year storm event is 0.977 cfs (per hydrographs). The Post-Developed condition, including bypass, results in 0.478 cfs. This is a

decrease of 0.490 cfs. There is a net decrease in peak flow from the pre-developed to post-developed condition. Therefore, there will be no impacts downstream.

*Table 8: Downstream Impact Analysis Summary Table (Drainage Area 2)*

|                          | Pre-Developed (Q-10) | Post-Developed (Q-10) |
|--------------------------|----------------------|-----------------------|
| Site                     | 0.977 cfs            | 0.478 cfs             |
| 10% Point                | 34.2 cfs             | 33.71 cfs             |
| Full Build-Out Condition | 153 cfs              | 152.5 cfs             |

## EROSION CONTROL

Erosion control measures have been designed in accordance with NCDEQ erosion control standards and regulations to minimize sediment laden runoff from exiting the site. Silt fence will be installed along the low sides of the site prior to construction. The construction entrance will be installed prior to construction commencing. A skimmer basin will be used to treat stormwater runoff prior to leaving the site. Accumulated sediment within the project site will need to be removed and the stormwater wetland constructed to final design conditions prior to final acceptance of the project.

### Site Stabilization

During construction phase, a temporary sediment basin will be placed on the site. Skimmers will be used in the temporary sediment basin to dewater the basin from the surface. After final grading is completed, permanent vegetation shall be applied in accordance with the seeding requirements from NCDEQ, the erosion control plan, and the landscape plan for this site.

## **APPENDIX A**

### **Figures**

Aerial Map

Soil Report

Topography Map

FEMA Flood Map

HUC

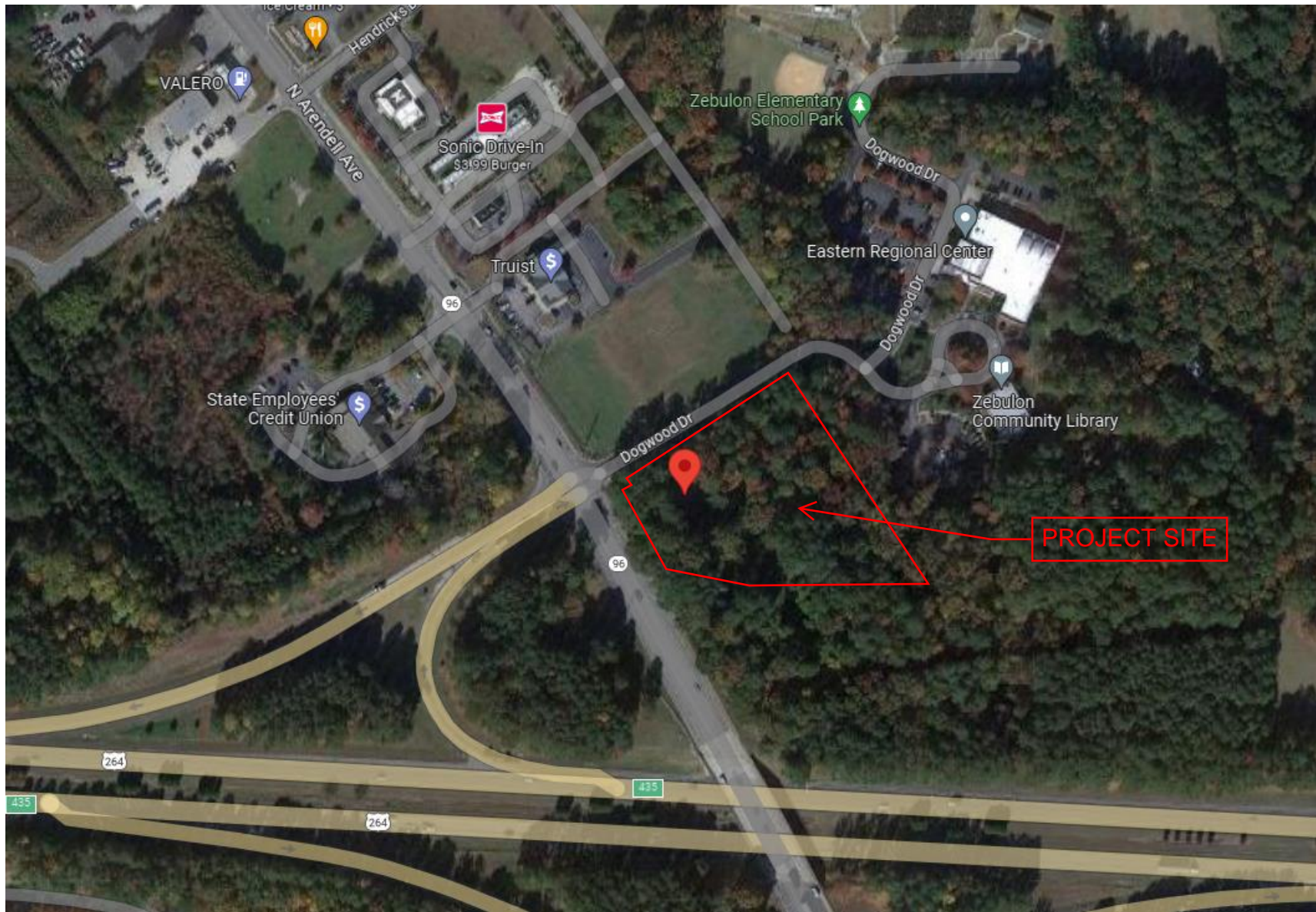
Surface Waters Classification

NOAA Point Precipitation Frequency Estimates

Pre-Development Drainage Map

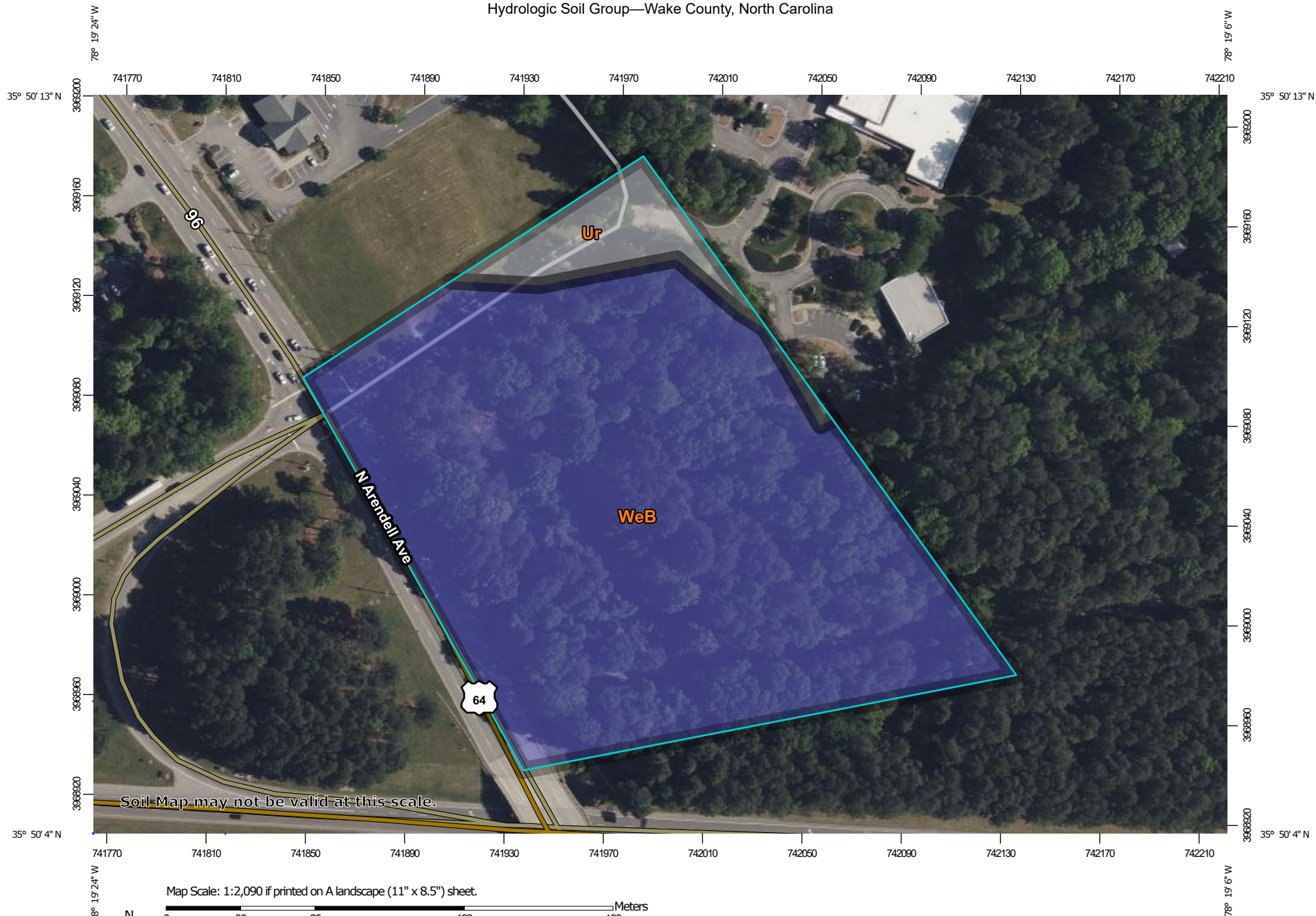
Post-Development Drainage Map

Post-Development Bypass Drainage Map

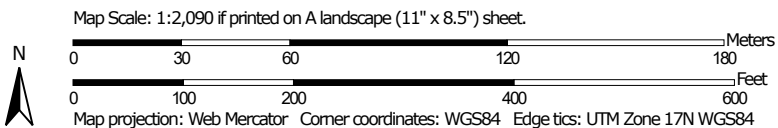




# Hydrologic Soil Group—Wake County, North Carolina



Soil Map may not be valid at this scale.



**Natural Resources  
Conservation Service**









Web Soil Survey  
National Cooperative Soil Survey

9/8/2023  
Page 1 of 4

**MAP LEGEND****Area of Interest (AOI)**
 Area of Interest (AOI)
**Soils****Soil Rating Polygons**





-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

**Soil Rating Lines**






-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

**Soil Rating Points**

-  A
-  A/D
-  B
-  B/D

-  C
-  C/D
-  D
-  Not rated or not available

**Water Features**
 Streams and Canals
**Transportation**

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

**Background**
 Aerial Photography
**MAP INFORMATION**

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL:  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wake County, North Carolina  
Survey Area Data: Version 23, Sep 12, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 24, 2022—May 9, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Hydrologic Soil Group

| Map unit symbol                    | Map unit name                             | Rating | Acres in AOI | Percent of AOI |
|------------------------------------|---|--------|--------------|----------------|
| Ur                                 | Urban land                                |        | 0.7          | 7.6%           |
| WeB                                | Wedowee sandy loam, 2 to 6 percent slopes | B      | 8.8          | 92.4%          |
| <b>Totals for Area of Interest</b> |   |        | <b>9.5</b>   | <b>100.0%</b>  |

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

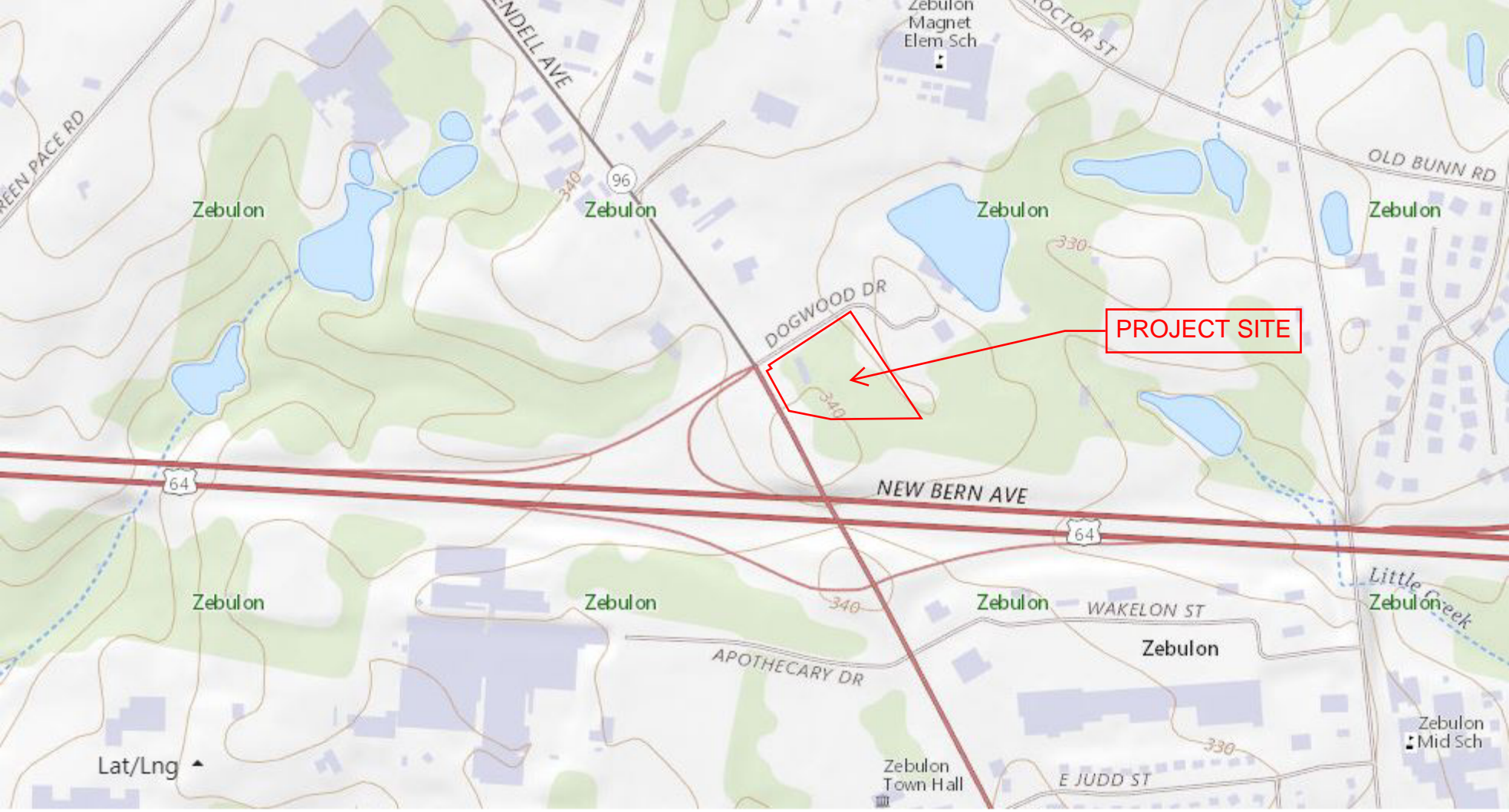
## Rating Options

*Aggregation Method:* Dominant Condition



*Component Percent Cutoff: None Specified*

*Tie-break Rule: Higher*

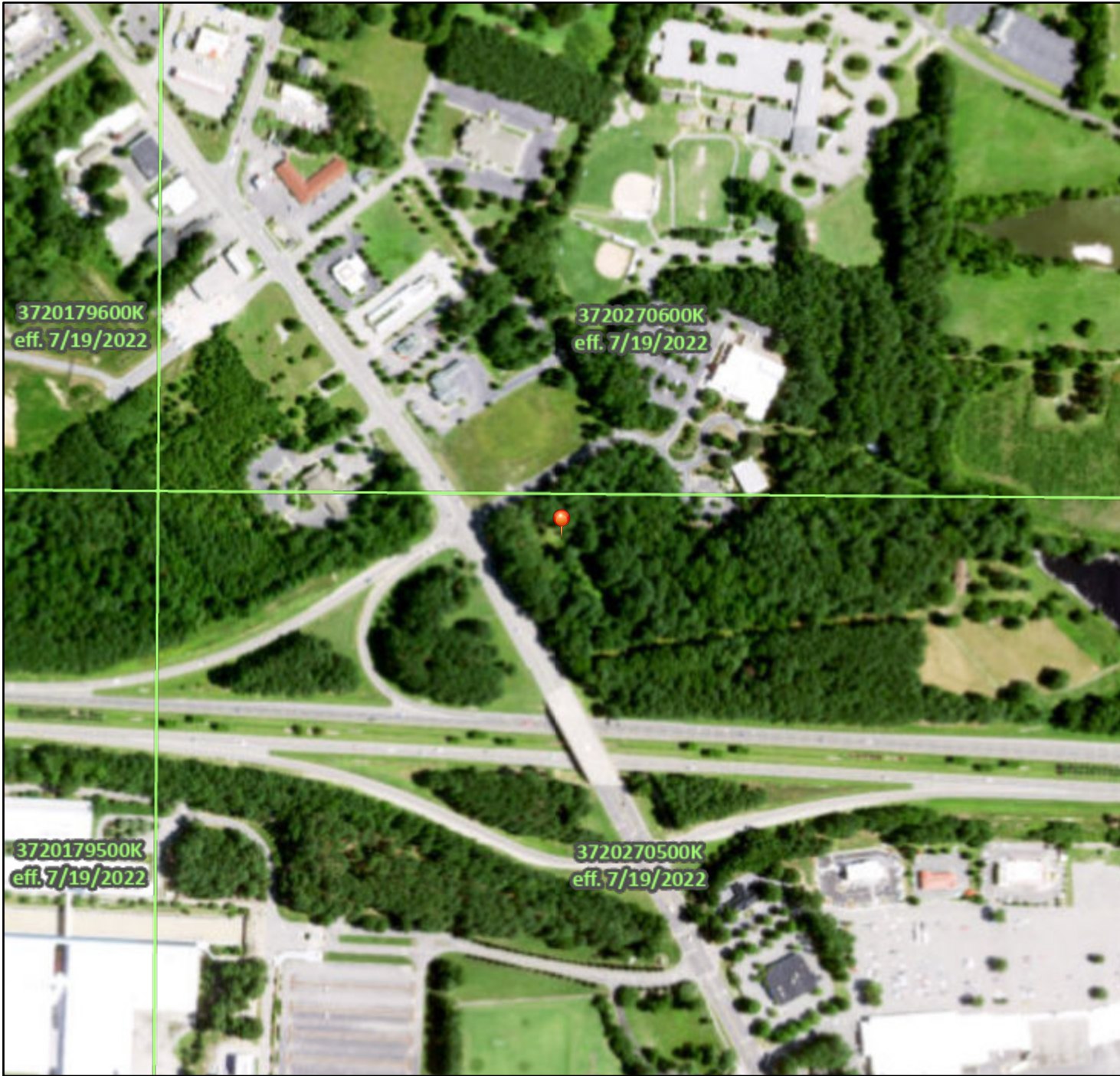




# National Flood Hazard Layer FIRMMette



78°19'36"W 35°50'24"N



1:6,000

78°18'59"W 35°49'55"N

Basemap Imagery Source: USGS National Map 2023

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

|                             |  |   |
|-----------------------------|--|---|
| SPECIAL FLOOD HAZARD AREAS  |  | Without Base Flood Elevation (BFE)<br>Zone A, V, A99  |
|                             |  | With BFE or Depth Zone AE, AO, AH, VE, AR   |
|                             |  | Regulatory Floodway   |
| OTHER AREAS OF FLOOD HAZARD |  | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X |
|                             |  | Future Conditions 1% Annual Chance Flood Hazard Zone X  |
|                             |  | Area with Reduced Flood Risk due to Levee. See Notes. Zone X  |
|                             |  | Area with Flood Risk due to Levee Zone D  |
| OTHER AREAS                 |  | NO SCREEN Area of Minimal Flood Hazard Zone X   |
|                             |  | Effective LOMRs   |
|                             |  | Area of Undetermined Flood Hazard Zone D  |
| GENERAL STRUCTURES          |  | Channel, Culvert, or Storm Sewer  |
|                             |  | Levee, Dike, or Floodwall   |
| OTHER FEATURES              |  | 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation   |
|                             |  | 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation   |
|                             |  | Coastal Transect  |
|                             |  | Base Flood Elevation Line (BFE)   |
|                             |  | Limit of Study  |
|                             |  | Jurisdiction Boundary   |
|                             |  | Coastal Transect Baseline   |
| MAP PANELS                  |  | Digital Data Available  |
|                             |  | No Digital Data Available   |
|                             |  | Unmapped  |



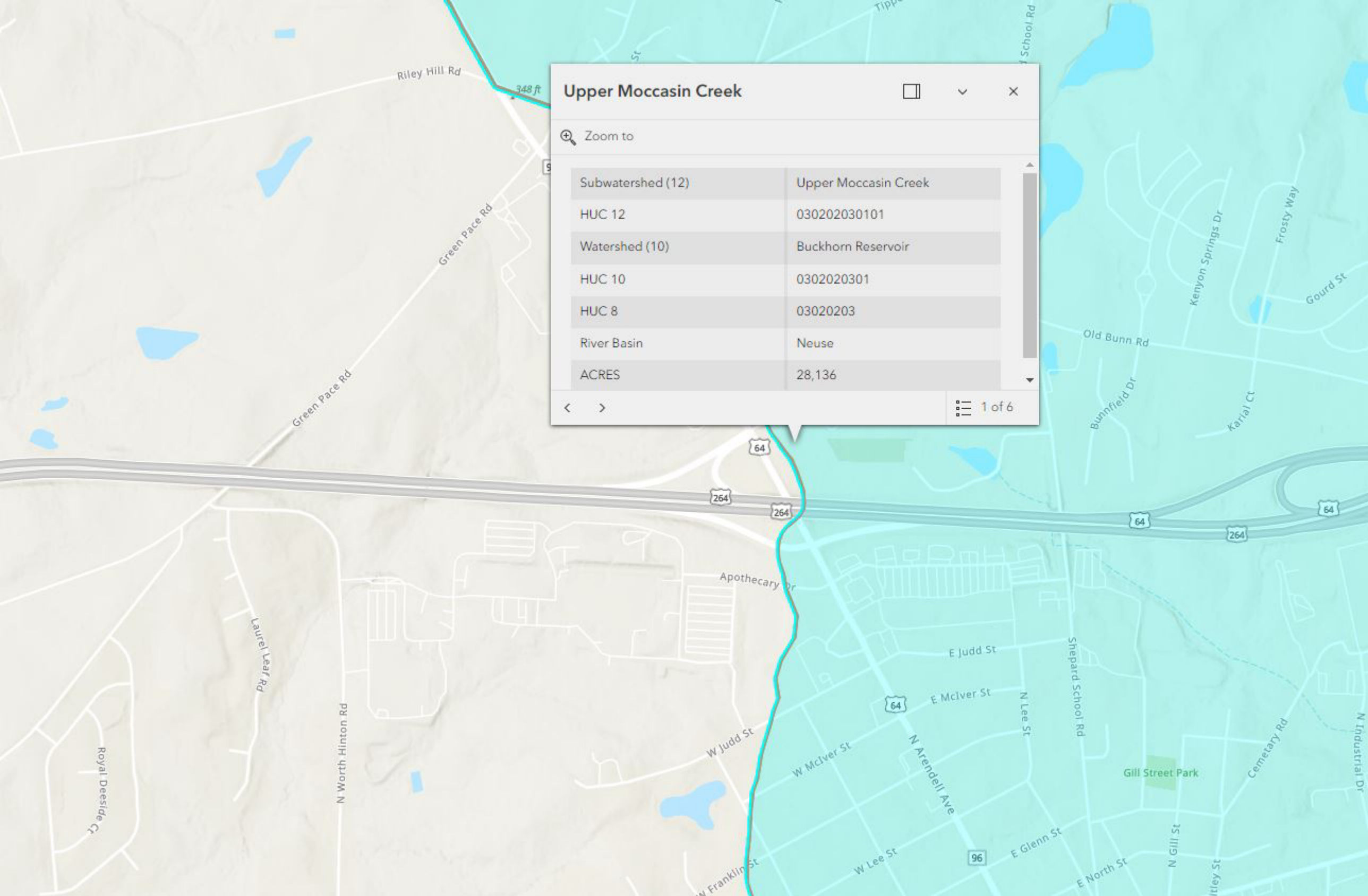
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **9/28/2023 at 8:31 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.





Upper Moccasin Creek

Zoom to

|                   |                      |
|-------------------|----------------------|
| Subwatershed (12) | Upper Moccasin Creek |
| HUC 12            | 030202030101         |
| Watershed (10)    | Buckhorn Reservoir   |
| HUC 10            | 0302020301           |
| HUC 8             | 03020203             |
| River Basin       | Neuse                |
| ACRES             | 28,136               |

<

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1 of 6

## Upper Little River

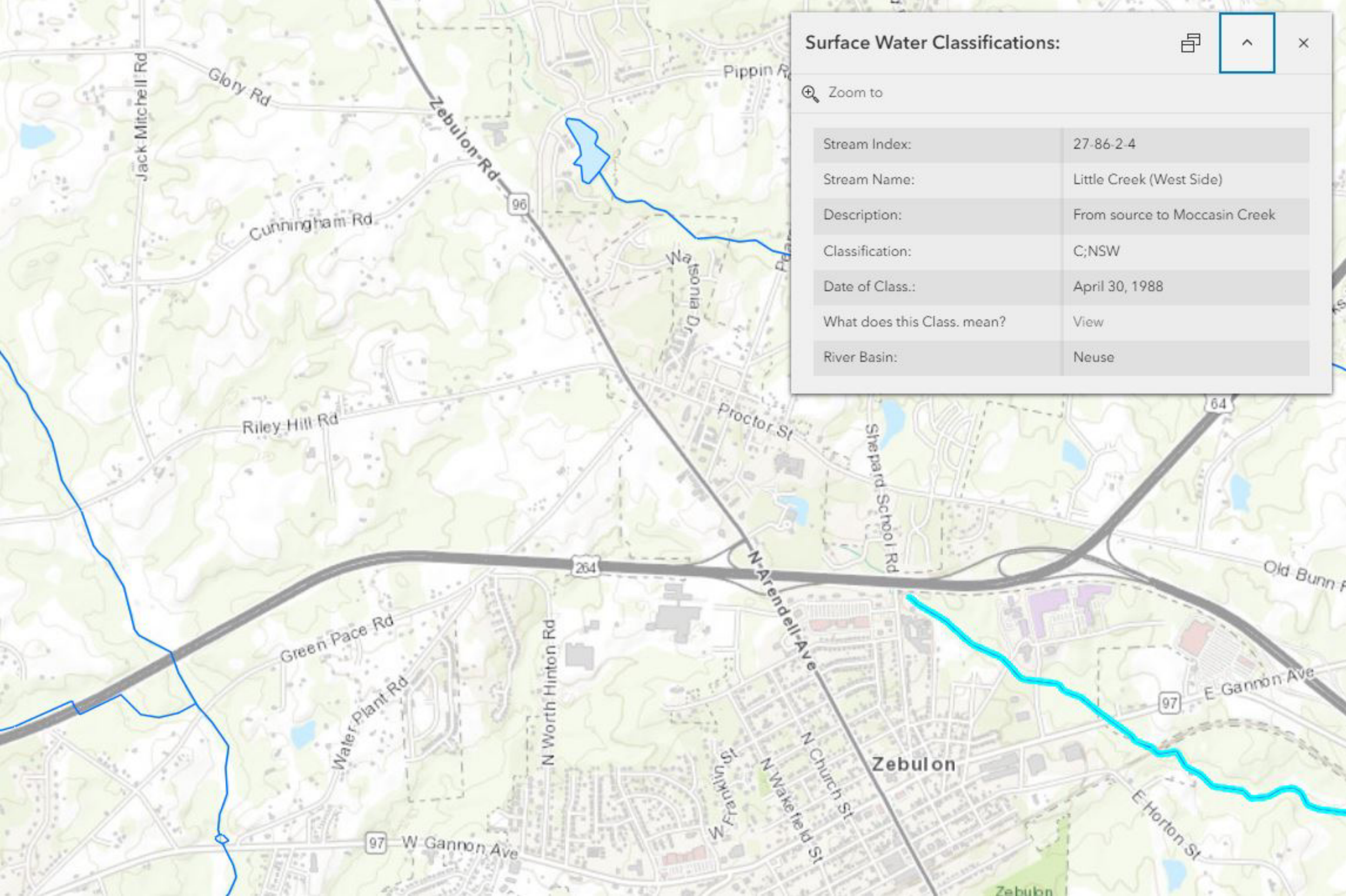
Zoom to

|                |                    |
|----------------|--------------------|
| Watershed Name | Upper Little River |
| 10-Digit HUC   | 0302020115         |
| River Basin    | Neuse              |
| Acres          | 121,403.4          |
| Area (sq. mi.) | 190                |

< >

1 of 4



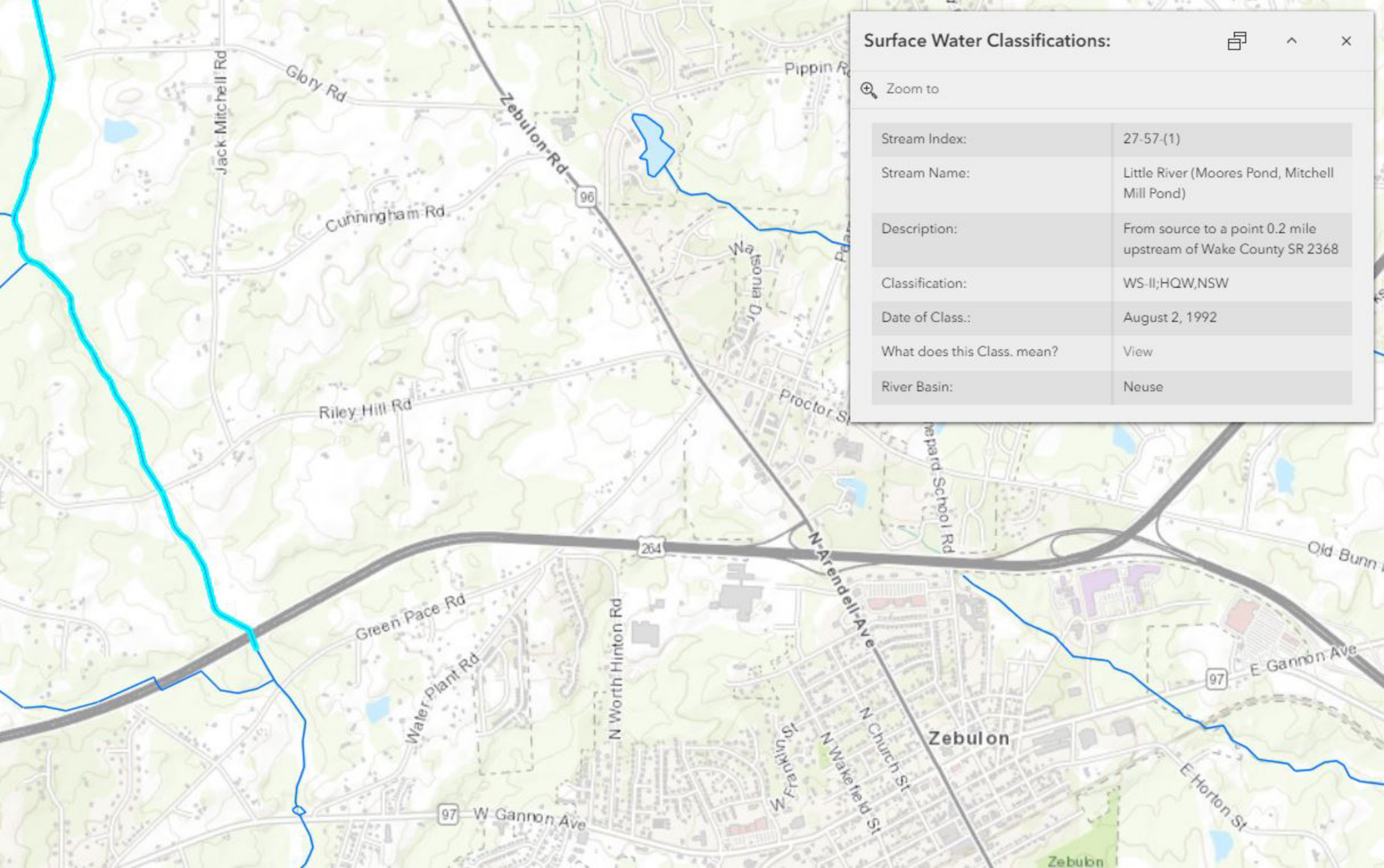


**Surface Water Classifications:**

Zoom to

|                             |                               |
|-----------------------------|-------------------------------|
| Stream Index:               | 27-86-2-4                     |
| Stream Name:                | Little Creek (West Side)      |
| Description:                | From source to Moccasin Creek |
| Classification:             | C;NSW                         |
| Date of Class.:             | April 30, 1988                |
| What does this Class. mean? | <a href="#">View</a>          |
| River Basin:                | Neuse                         |





**Surface Water Classifications:**

Zoom to

|                             |   |
|-----------------------------|---|
| Stream Index:               | 27-57-(1)   |
| Stream Name:                | Little River (Moores Pond, Mitchell Mill Pond)                  |
| Description:                | From source to a point 0.2 mile upstream of Wake County SR 2368 |
| Classification:             | WS-II;HQW,NSW   |
| Date of Class.:             | August 2, 1992  |
| What does this Class. mean? | <a href="#">View</a>  |
| River Basin:                | Neuse   |



**NOAA Atlas 14, Volume 2, Version 3**  
**Location name: Zebulon, North Carolina, USA\***  
**Latitude: 35.8359°, Longitude: -78.3212°**  
**Elevation: 336 ft\*\***  
 \* source: ESRI Maps  
 \*\* source: USGS



## POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

### PF tabular

| PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) <sup>1</sup> |                                     |                        |                        |                        |                        |                        |                        |                        |                        |                       |
|--|-------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------|
| Duration   | Average recurrence interval (years) |                        |                        |                        |                        |                        |                        |                        |                        |                       |
|  | 1                                   | 2                      | 5                      | 10                     | 25                     | 50                     | 100                    | 200                    | 500                    | 1000                  |
| 5-min  | 0.405<br>(0.369-0.444)              | 0.468<br>(0.428-0.512) | 0.530<br>(0.485-0.580) | 0.601<br>(0.548-0.657) | 0.670<br>(0.609-0.732) | 0.728<br>(0.658-0.795) | 0.780<br>(0.701-0.851) | 0.827<br>(0.739-0.904) | 0.880<br>(0.780-0.963) | 0.930<br>(0.818-1.02) |
| 10-min   | 0.646<br>(0.590-0.710)              | 0.748<br>(0.685-0.819) | 0.849<br>(0.777-0.929) | 0.961<br>(0.877-1.05)  | 1.07<br>(0.970-1.17)   | 1.16<br>(1.05-1.27)    | 1.24<br>(1.11-1.35)    | 1.31<br>(1.17-1.43)    | 1.39<br>(1.23-1.52)    | 1.46<br>(1.29-1.61)   |
| 15-min   | 0.808<br>(0.737-0.887)              | 0.941<br>(0.861-1.03)  | 1.07<br>(0.983-1.18)   | 1.22<br>(1.11-1.33)    | 1.35<br>(1.23-1.48)    | 1.47<br>(1.33-1.60)    | 1.57<br>(1.41-1.71)    | 1.65<br>(1.48-1.81)    | 1.75<br>(1.55-1.92)    | 1.84<br>(1.62-2.02)   |
| 30-min   | 1.11<br>(1.01-1.22)                 | 1.30<br>(1.19-1.42)    | 1.53<br>(1.40-1.67)    | 1.76<br>(1.61-1.92)    | 2.00<br>(1.82-2.19)    | 2.21<br>(2.00-2.42)    | 2.40<br>(2.16-2.62)    | 2.57<br>(2.30-2.81)    | 2.79<br>(2.47-3.05)    | 2.98<br>(2.62-3.27)   |
| 60-min   | 1.38<br>(1.26-1.52)                 | 1.63<br>(1.49-1.78)    | 1.96<br>(1.79-2.14)    | 2.29<br>(2.09-2.51)    | 2.67<br>(2.42-2.92)    | 3.00<br>(2.71-3.27)    | 3.30<br>(2.97-3.60)    | 3.61<br>(3.23-3.95)    | 4.00<br>(3.55-4.38)    | 4.35<br>(3.82-4.77)   |
| 2-hr   | 1.62<br>(1.46-1.79)                 | 1.91<br>(1.74-2.10)    | 2.32<br>(2.11-2.56)    | 2.76<br>(2.50-3.03)    | 3.27<br>(2.94-3.59)    | 3.74<br>(3.35-4.10)    | 4.19<br>(3.73-4.59)    | 4.66<br>(4.13-5.10)    | 5.29<br>(4.63-5.79)    | 5.86<br>(5.09-6.44)   |
| 3-hr   | 1.71<br>(1.55-1.90)                 | 2.03<br>(1.85-2.24)    | 2.47<br>(2.25-2.74)    | 2.96<br>(2.68-3.26)    | 3.54<br>(3.18-3.90)    | 4.08<br>(3.65-4.49)    | 4.62<br>(4.10-5.08)    | 5.20<br>(4.57-5.71)    | 5.97<br>(5.20-6.57)    | 6.71<br>(5.77-7.39)   |
| 6-hr   | 2.05<br>(1.87-2.27)                 | 2.43<br>(2.22-2.68)    | 2.97<br>(2.70-3.27)    | 3.55<br>(3.23-3.91)    | 4.27<br>(3.85-4.68)    | 4.94<br>(4.43-5.41)    | 5.62<br>(4.99-6.14)    | 6.34<br>(5.58-6.93)    | 7.34<br>(6.37-8.02)    | 8.28<br>(7.10-9.07)   |
| 12-hr  | 2.41<br>(2.20-2.66)                 | 2.86<br>(2.62-3.15)    | 3.51<br>(3.21-3.86)    | 4.22<br>(3.84-4.64)    | 5.11<br>(4.62-5.60)    | 5.96<br>(5.34-6.50)    | 6.82<br>(6.05-7.43)    | 7.76<br>(6.80-8.44)    | 9.06<br>(7.82-9.86)    | 10.3<br>(8.77-11.2)   |
| 24-hr  | 2.85<br>(2.65-3.09)                 | 3.46<br>(3.21-3.74)    | 4.38<br>(4.06-4.74)    | 5.14<br>(4.75-5.55)    | 6.20<br>(5.71-6.69)    | 7.07<br>(6.48-7.64)    | 8.00<br>(7.29-8.64)    | 8.99<br>(8.14-9.73)    | 10.4<br>(9.34-11.3)    | 11.6<br>(10.3-12.6)   |
| 2-day  | 3.30<br>(3.07-3.56)                 | 3.98<br>(3.71-4.30)    | 5.02<br>(4.66-5.41)    | 5.85<br>(5.42-6.31)    | 7.02<br>(6.47-7.58)    | 7.98<br>(7.32-8.61)    | 8.99<br>(8.21-9.71)    | 10.1<br>(9.13-10.9)    | 11.6<br>(10.4-12.6)    | 12.9<br>(11.4-14.0)   |
| 3-day  | 3.51<br>(3.27-3.77)                 | 4.22<br>(3.93-4.54)    | 5.29<br>(4.92-5.68)    | 6.14<br>(5.70-6.60)    | 7.35<br>(6.79-7.90)    | 8.33<br>(7.66-8.96)    | 9.36<br>(8.57-10.1)    | 10.5<br>(9.51-11.3)    | 12.0<br>(10.8-13.0)    | 13.3<br>(11.9-14.4)   |
| 4-day  | 3.71<br>(3.46-3.98)                 | 4.46<br>(4.16-4.78)    | 5.56<br>(5.18-5.95)    | 6.44<br>(5.99-6.89)    | 7.67<br>(7.11-8.22)    | 8.68<br>(8.00-9.30)    | 9.73<br>(8.93-10.4)    | 10.8<br>(9.89-11.7)    | 12.4<br>(11.2-13.4)    | 13.7<br>(12.3-14.8)   |
| 7-day  | 4.31<br>(4.03-4.61)                 | 5.16<br>(4.82-5.52)    | 6.35<br>(5.93-6.80)    | 7.31<br>(6.81-7.82)    | 8.64<br>(8.02-9.24)    | 9.71<br>(8.99-10.4)    | 10.8<br>(9.97-11.6)    | 12.0<br>(11.0-12.9)    | 13.6<br>(12.4-14.7)    | 15.0<br>(13.5-16.2)   |
| 10-day   | 4.92<br>(4.61-5.25)                 | 5.87<br>(5.50-6.26)    | 7.12<br>(6.67-7.59)    | 8.11<br>(7.59-8.64)    | 9.47<br>(8.83-10.1)    | 10.6<br>(9.81-11.3)    | 11.7<br>(10.8-12.5)    | 12.8<br>(11.8-13.7)    | 14.4<br>(13.2-15.5)    | 15.7<br>(14.3-16.9)   |
| 20-day   | 6.60<br>(6.21-7.03)                 | 7.82<br>(7.36-8.32)    | 9.33<br>(8.77-9.93)    | 10.5<br>(9.88-11.2)    | 12.2<br>(11.4-12.9)    | 13.5<br>(12.6-14.3)    | 14.8<br>(13.8-15.8)    | 16.2<br>(15.0-17.2)    | 18.0<br>(16.6-19.3)    | 19.5<br>(17.8-20.9)   |
| 30-day   | 8.20<br>(7.74-8.70)                 | 9.67<br>(9.13-10.3)    | 11.4<br>(10.7-12.0)    | 12.7<br>(11.9-13.4)    | 14.4<br>(13.5-15.3)    | 15.8<br>(14.8-16.8)    | 17.1<br>(16.0-18.2)    | 18.5<br>(17.2-19.7)    | 20.4<br>(18.9-21.7)    | 21.8<br>(20.1-23.3)   |
| 45-day   | 10.4<br>(9.90-11.0)                 | 12.3<br>(11.6-12.9)    | 14.2<br>(13.4-14.9)    | 15.6<br>(14.8-16.5)    | 17.6<br>(16.6-18.6)    | 19.0<br>(18.0-20.1)    | 20.5<br>(19.3-21.7)    | 22.0<br>(20.6-23.3)    | 23.9<br>(22.3-25.4)    | 25.4<br>(23.6-27.0)   |
| 60-day   | 12.5<br>(11.9-13.2)                 | 14.7<br>(13.9-15.4)    | 16.7<br>(15.9-17.6)    | 18.4<br>(17.4-19.3)    | 20.4<br>(19.4-21.5)    | 22.0<br>(20.8-23.2)    | 23.6<br>(22.2-24.9)    | 25.1<br>(23.6-26.5)    | 27.1<br>(25.4-28.7)    | 28.6<br>(26.7-30.4)   |

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

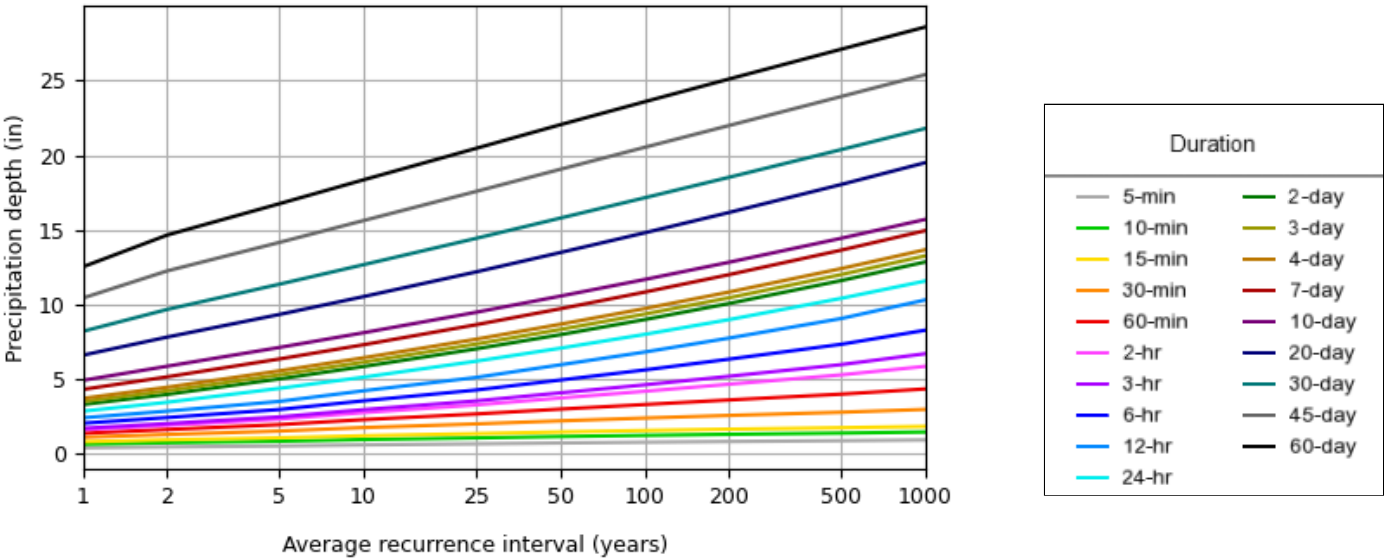
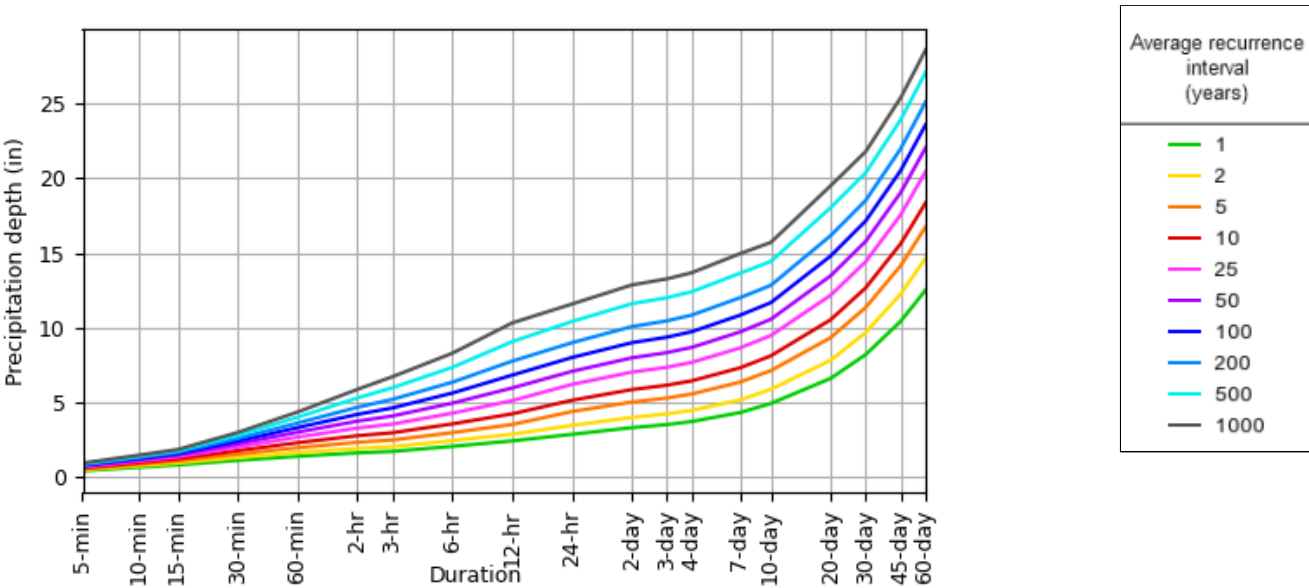
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[Back to Top](#)

### PF graphical

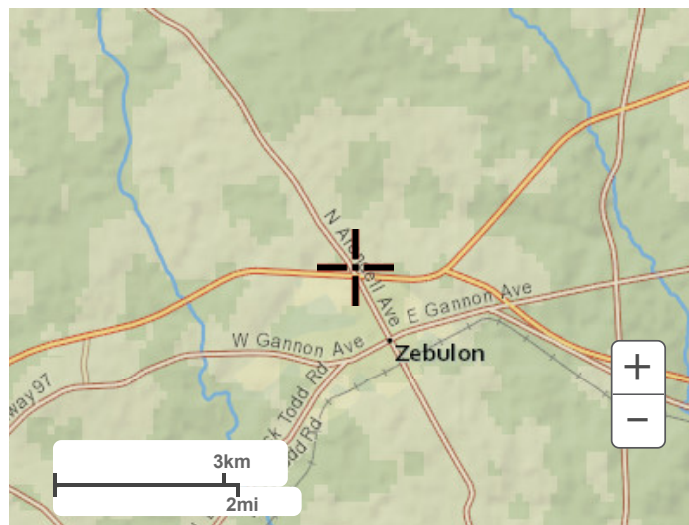


PDS-based depth-duration-frequency (DDF) curves  
Latitude: 35.8359°, Longitude: -78.3212°



Maps & aerials

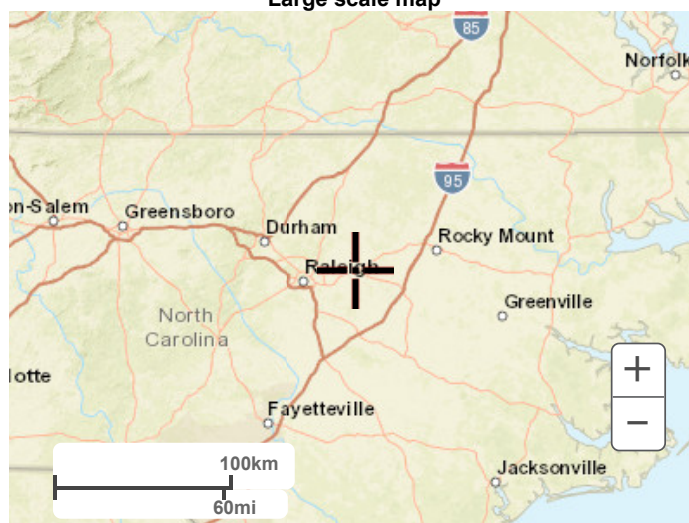
Small scale terrain



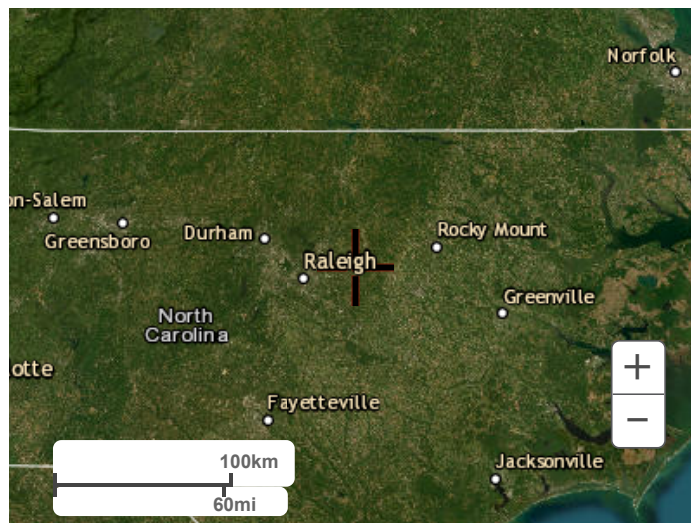
Large scale terrain



Large scale map



Large scale aerial



[Back to Top](#)

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**NOAA Atlas 14, Volume 2, Version 3**  
**Location name: Zebulon, North Carolina, USA\***  
**Latitude: 35.8359°, Longitude: -78.3212°**  
**Elevation: 336 ft\*\***  
 \* source: ESRI Maps  
 \*\* source: USGS



### POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

### PF tabular

| PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) <sup>1</sup> |                                     |                        |                        |                        |                        |                        |                        |                        |                        |                        |
|---|-------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Duration  | Average recurrence interval (years) |                        |                        |                        |                        |                        |                        |                        |                        |                        |
|   | 1                                   | 2                      | 5                      | 10                     | 25                     | 50                     | 100                    | 200                    | 500                    | 1000                   |
| 5-min   | 4.86<br>(4.43-5.33)                 | 5.62<br>(5.14-6.14)    | 6.36<br>(5.82-6.96)    | 7.21<br>(6.58-7.88)    | 8.04<br>(7.31-8.78)    | 8.74<br>(7.90-9.54)    | 9.36<br>(8.41-10.2)    | 9.92<br>(8.87-10.8)    | 10.6<br>(9.36-11.6)    | 11.2<br>(9.82-12.3)    |
| 10-min  | 3.88<br>(3.54-4.26)                 | 4.49<br>(4.11-4.91)    | 5.09<br>(4.66-5.57)    | 5.77<br>(5.26-6.30)    | 6.41<br>(5.82-7.00)    | 6.95<br>(6.29-7.60)    | 7.43<br>(6.68-8.11)    | 7.86<br>(7.03-8.59)    | 8.35<br>(7.40-9.14)    | 8.79<br>(7.73-9.64)    |
| 15-min  | 3.23<br>(2.95-3.55)                 | 3.76<br>(3.44-4.12)    | 4.30<br>(3.93-4.70)    | 4.86<br>(4.44-5.32)    | 5.41<br>(4.92-5.91)    | 5.87<br>(5.31-6.42)    | 6.26<br>(5.63-6.84)    | 6.61<br>(5.91-7.23)    | 7.01<br>(6.21-7.67)    | 7.36<br>(6.46-8.07)    |
| 30-min  | 2.22<br>(2.02-2.43)                 | 2.60<br>(2.38-2.84)    | 3.05<br>(2.79-3.34)    | 3.52<br>(3.21-3.85)    | 4.01<br>(3.64-4.38)    | 4.42<br>(4.00-4.83)    | 4.80<br>(4.31-5.23)    | 5.15<br>(4.60-5.63)    | 5.57<br>(4.94-6.10)    | 5.96<br>(5.23-6.53)    |
| 60-min  | 1.38<br>(1.26-1.52)                 | 1.63<br>(1.49-1.78)    | 1.96<br>(1.79-2.14)    | 2.29<br>(2.09-2.51)    | 2.67<br>(2.42-2.92)    | 3.00<br>(2.71-3.27)    | 3.30<br>(2.97-3.60)    | 3.61<br>(3.23-3.95)    | 4.00<br>(3.55-4.38)    | 4.35<br>(3.82-4.77)    |
| 2-hr  | 0.807<br>(0.731-0.894)              | 0.956<br>(0.870-1.05)  | 1.16<br>(1.06-1.28)    | 1.38<br>(1.25-1.52)    | 1.64<br>(1.47-1.79)    | 1.87<br>(1.68-2.05)    | 2.10<br>(1.86-2.29)    | 2.33<br>(2.06-2.55)    | 2.64<br>(2.32-2.90)    | 2.93<br>(2.54-3.22)    |
| 3-hr  | 0.569<br>(0.516-0.633)              | 0.675<br>(0.615-0.746) | 0.823<br>(0.748-0.911) | 0.985<br>(0.892-1.09)  | 1.18<br>(1.06-1.30)    | 1.36<br>(1.22-1.50)    | 1.54<br>(1.36-1.69)    | 1.73<br>(1.52-1.90)    | 1.99<br>(1.73-2.19)    | 2.23<br>(1.92-2.46)    |
| 6-hr  | 0.342<br>(0.311-0.379)              | 0.405<br>(0.370-0.447) | 0.495<br>(0.451-0.545) | 0.593<br>(0.538-0.652) | 0.712<br>(0.643-0.781) | 0.825<br>(0.739-0.903) | 0.938<br>(0.833-1.03)  | 1.06<br>(0.931-1.16)   | 1.22<br>(1.06-1.34)    | 1.38<br>(1.18-1.51)    |
| 12-hr   | 0.200<br>(0.182-0.220)              | 0.237<br>(0.217-0.261) | 0.291<br>(0.266-0.320) | 0.350<br>(0.319-0.385) | 0.424<br>(0.383-0.464) | 0.494<br>(0.443-0.539) | 0.565<br>(0.502-0.616) | 0.643<br>(0.564-0.700) | 0.751<br>(0.649-0.818) | 0.856<br>(0.727-0.932) |
| 24-hr   | 0.118<br>(0.110-0.128)              | 0.143<br>(0.133-0.155) | 0.182<br>(0.169-0.197) | 0.214<br>(0.197-0.231) | 0.258<br>(0.237-0.278) | 0.294<br>(0.270-0.318) | 0.333<br>(0.303-0.360) | 0.374<br>(0.339-0.405) | 0.433<br>(0.389-0.470) | 0.482<br>(0.429-0.525) |
| 2-day   | 0.068<br>(0.063-0.074)              | 0.082<br>(0.077-0.089) | 0.104<br>(0.097-0.112) | 0.121<br>(0.112-0.131) | 0.146<br>(0.134-0.157) | 0.166<br>(0.152-0.179) | 0.187<br>(0.170-0.202) | 0.209<br>(0.190-0.226) | 0.241<br>(0.217-0.262) | 0.267<br>(0.238-0.292) |
| 3-day   | 0.048<br>(0.045-0.052)              | 0.058<br>(0.054-0.063) | 0.073<br>(0.068-0.078) | 0.085<br>(0.079-0.091) | 0.102<br>(0.094-0.109) | 0.115<br>(0.106-0.124) | 0.129<br>(0.119-0.140) | 0.145<br>(0.132-0.156) | 0.166<br>(0.150-0.180) | 0.184<br>(0.164-0.200) |
| 4-day   | 0.038<br>(0.036-0.041)              | 0.046<br>(0.043-0.049) | 0.057<br>(0.053-0.062) | 0.067<br>(0.062-0.071) | 0.079<br>(0.074-0.085) | 0.090<br>(0.083-0.096) | 0.101<br>(0.092-0.108) | 0.112<br>(0.102-0.121) | 0.129<br>(0.116-0.139) | 0.142<br>(0.127-0.154) |
| 7-day   | 0.025<br>(0.023-0.027)              | 0.030<br>(0.028-0.032) | 0.037<br>(0.035-0.040) | 0.043<br>(0.040-0.046) | 0.051<br>(0.047-0.055) | 0.057<br>(0.053-0.061) | 0.064<br>(0.059-0.069) | 0.071<br>(0.065-0.076) | 0.081<br>(0.073-0.087) | 0.089<br>(0.080-0.096) |
| 10-day  | 0.020<br>(0.019-0.021)              | 0.024<br>(0.022-0.026) | 0.029<br>(0.027-0.031) | 0.033<br>(0.031-0.036) | 0.039<br>(0.036-0.042) | 0.043<br>(0.040-0.046) | 0.048<br>(0.045-0.051) | 0.053<br>(0.049-0.057) | 0.060<br>(0.055-0.064) | 0.065<br>(0.059-0.070) |
| 20-day  | 0.013<br>(0.012-0.014)              | 0.016<br>(0.015-0.017) | 0.019<br>(0.018-0.020) | 0.021<br>(0.020-0.023) | 0.025<br>(0.023-0.026) | 0.028<br>(0.026-0.029) | 0.030<br>(0.028-0.032) | 0.033<br>(0.031-0.035) | 0.037<br>(0.034-0.040) | 0.040<br>(0.037-0.043) |
| 30-day  | 0.011<br>(0.010-0.012)              | 0.013<br>(0.012-0.014) | 0.015<br>(0.014-0.016) | 0.017<br>(0.016-0.018) | 0.020<br>(0.018-0.021) | 0.021<br>(0.020-0.023) | 0.023<br>(0.022-0.025) | 0.025<br>(0.023-0.027) | 0.028<br>(0.026-0.030) | 0.030<br>(0.027-0.032) |
| 45-day  | 0.009<br>(0.009-0.010)              | 0.011<br>(0.010-0.011) | 0.013<br>(0.012-0.013) | 0.014<br>(0.013-0.015) | 0.016<br>(0.015-0.017) | 0.017<br>(0.016-0.018) | 0.019<br>(0.017-0.020) | 0.020<br>(0.019-0.021) | 0.022<br>(0.020-0.023) | 0.023<br>(0.021-0.025) |
| 60-day  | 0.008<br>(0.008-0.009)              | 0.010<br>(0.009-0.010) | 0.011<br>(0.011-0.012) | 0.012<br>(0.012-0.013) | 0.014<br>(0.013-0.014) | 0.015<br>(0.014-0.016) | 0.016<br>(0.015-0.017) | 0.017<br>(0.016-0.018) | 0.018<br>(0.017-0.019) | 0.019<br>(0.018-0.021) |

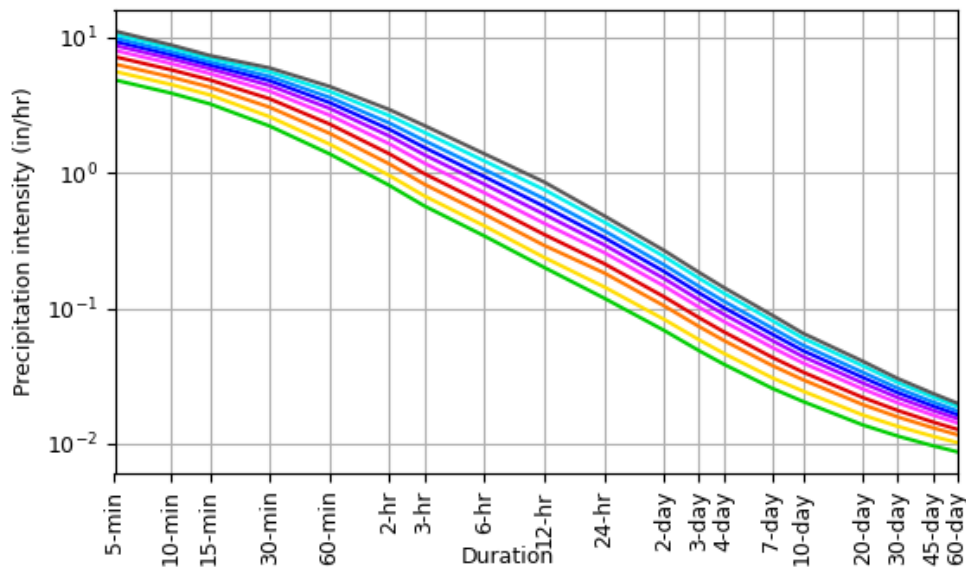
<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).  
 Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.  
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[Back to Top](#)

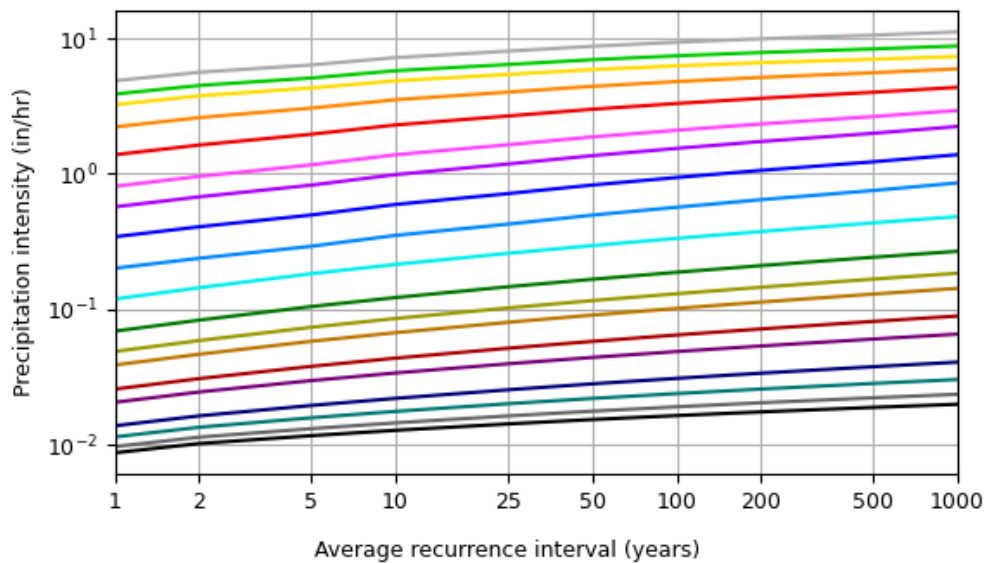
### PF graphical

## PDS-based intensity-duration-frequency (IDF) curves

Latitude: 35.8359°, Longitude: -78.3212°



| Average recurrence interval (years) |
|-------------------------------------|
| 1                                   |
| 2                                   |
| 5                                   |
| 10                                  |
| 25                                  |
| 50                                  |
| 100                                 |
| 200                                 |
| 500                                 |
| 1000                                |



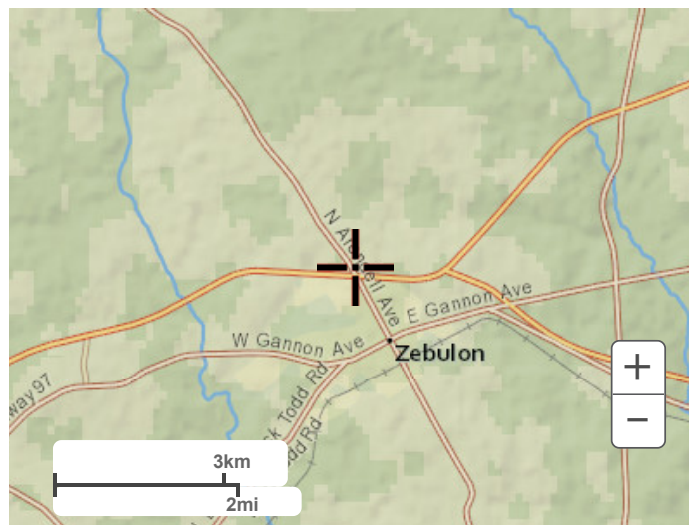
| Duration |        |
|----------|--------|
| 5-min    | 2-day  |
| 10-min   | 3-day  |
| 15-min   | 4-day  |
| 30-min   | 7-day  |
| 60-min   | 10-day |
| 2-hr     | 20-day |
| 3-hr     | 30-day |
| 6-hr     | 45-day |
| 12-hr    | 60-day |
| 24-hr    |        |

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[Back to Top](#)**Maps & aerials****Small scale terrain**

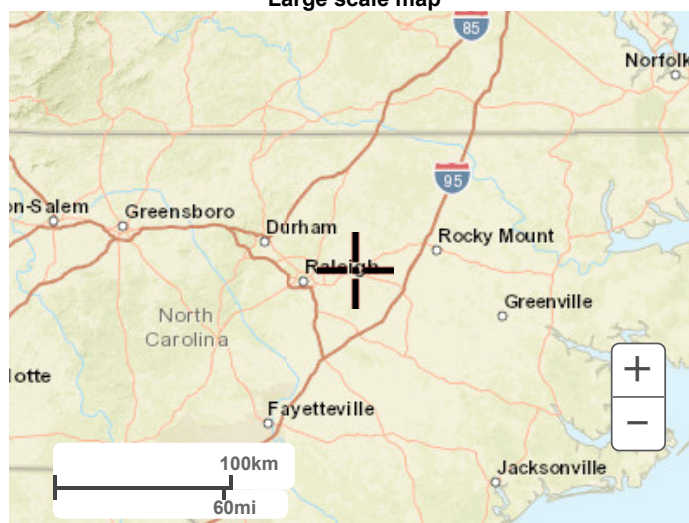




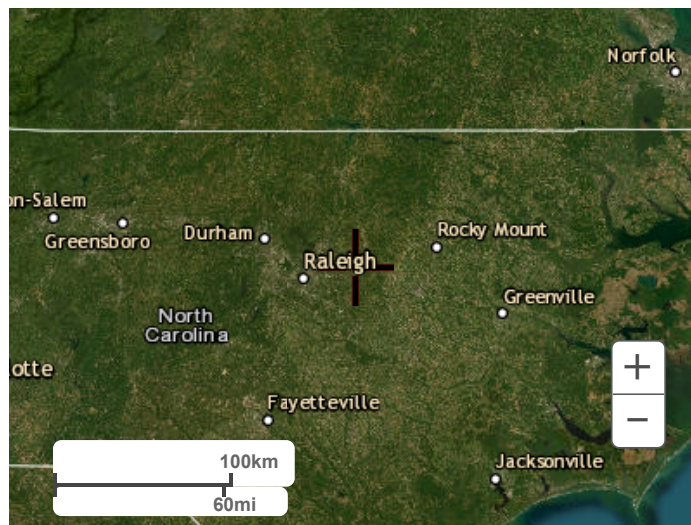
Large scale terrain



Large scale map



Large scale aerial



[Back to Top](#)

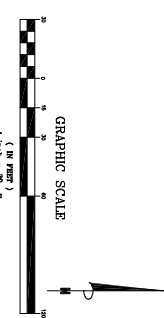
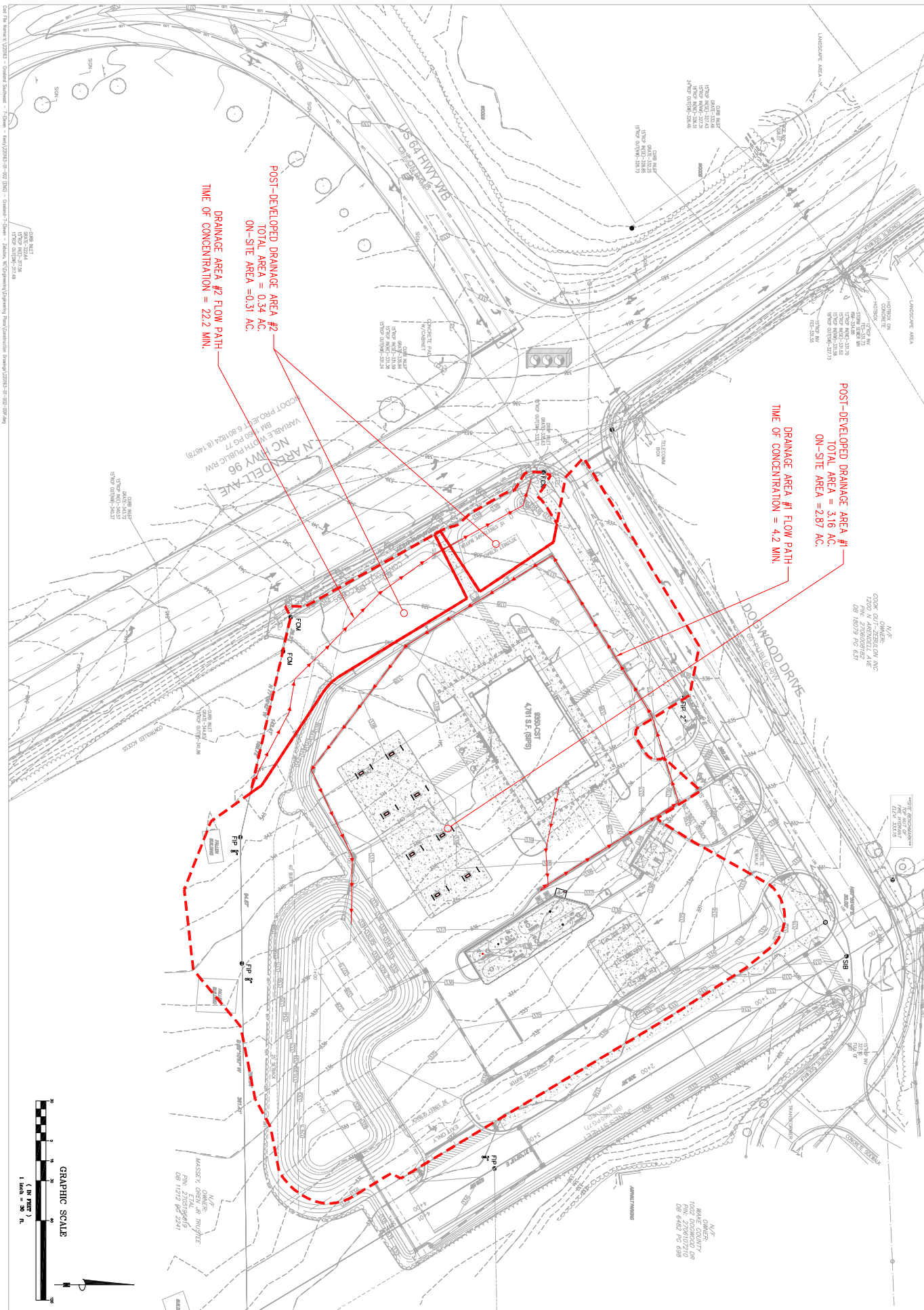
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**Crosland Southeast**  
**7-Eleven Store #42378**  
Zebulon, NC  
WAKE COUNTY

**PRELIMINARY  
DO NOT USE FOR  
CONSTRUCTION**

**Bowman**  
Bowman North Carolina Ltd.  
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**POST-DEVELOPED  
DRAINAGE AREA**

Cad File Name: V:\2006S - Creelwood Southwell - 7-Enh - Kelly\2006S-01-002 (DWG) - Creelwood-7-Enh - Zetula, MC\Engineering\Engineering Plans\Construction Drawings\2006S-01-002-000.dwg



## **APPENDIX B**

### **Stormwater Analysis**

Wake County Stormwater Design Tool  
CN Calculation (Bypass)  
Stormwater Wetland Design and Details  
Hydrographs (DA#1 & DA#2)  
Downstream Impact Analysis (DA#1 & DA#2)



## SITE DATA

| Project Information  |   |  |
|--|---|--|
| Project Name:  |   | 7-Eleven Zebulon   |
| Applicant:   |   | C4 Cstore Holdings III, LLC                                |
| Applicant Contact Name:  |   | Nick Carroll   |
| Applicant Contact Number:  |   | (502) 693-0396   |
| Contact Email:   |   | <a href="mailto:ncarroll@csere.com">ncarroll@csere.com</a> |
| Municipal Jurisdiction (Select from dropdown menu):  |   | Zebulon  |
| Last Updated:  |   | Tuesday, December 5, 2023                                  |
| Site Data:   |   |  |
| Total Site Area (Ac):  |   | 3.40   |
| Existing Lake/Pond Area (Ac):  |   | 0.00   |
| Proposed Disturbed Area (Ac):  |   | 4.30   |
| Impervious Surface Area (acre):  |   | 1.81   |
| Type of Development (Select from Dropdown menu):   |   | Non-Residential  |
| Percent Built Upon Area (BUA):   |   | 53%  |
| Project Density:   |   | High   |
| Is the proposed project a site expansion?  |   | No   |
| Number of Drainage Areas on Site:  |   | 2  |
| NOAA   | 1-Year, 24-Hour Storm (inches) (See NOAA Website):  | 2.85   |
|  | 2-Year, 24-Hour Storm (inches) (See NOAA Website):  | 3.46   |
|  | 10-Year, 24-Hour Storm (inches) (See NOAA Website): | 5.14   |
| Lot Data (if applicable):  |   |  |
| Total Acreage in Lots:   |   |  |
| Number of Lots:  |   |  |
| Average Lot Size (SF):   |   |  |
| Total Impervious Surface Area on Lots (SF):  |   |  |
| Average Impervious Surface Area Per Lot (SF):  |   |  |
| Stormwater Narrative (limit to 1,200 characters - attach additional pages with submittal if necessary):  |   |  |
| <p>There is proposed storm water management facility (Stormwater Wetland) on site. The design includes the 7-Eleven site (3.40 ac) and right-of-way improvements. The SCM outlined in this report has been designed for post-development peak attenuation and water quality. The proposed site will have 1.81 acres of impervious area, and 1.77 of those acres will go to the stormwater wetland. The SCM is designed to capture a drainage area of 3.16 ac with an impervious area of 1.91 ac. This includes on and off-site areas. Site grading and storm drainage systems are designed to convey stormwater runoff from the impervious areas of the site to the stormwater wetland. The site is not located within a coastal county, therefore the design storm for water quality is a 1.0" storm event. The SCMs are designed per the Town of Zebulon stormwater UDO.</p> |   |  |



Project Name: 7-Eleven Zebulon

**DRAINAGE AREA 1**  
**STORMWATER PRE-POST CALCULATIONS**

| LAND USE & SITE DATA                            | PRE-DEVELOPMENT                      |      |   |   | POST-DEVELOPMENT                      |      |   |   |
|---|--------------------------------------|------|---|---|---------------------------------------|------|---|---|
| Drainage Area (Acres)=                          | 3.41                                 |      |   |   | 3.16                                  |      |   |   |
| Site Acreage within Drainage=                   | 2.62                                 |      |   |   | 2.87                                  |      |   |   |
| One-year, 24-hour rainfall (in)=                | 2.85                                 |      |   |   |                                       |      |   |   |
| Two-year, 24-hour rainfall (in)=                | 3.46                                 |      |   |   |                                       |      |   |   |
| Ten-year, 24-hour storm (in)=                   | 5.14                                 |      |   |   |                                       |      |   |   |
| Total Lake/Pond Area (Acres)=                   |                                      |      |   |   |                                       |      |   |   |
| Lake/Pond Area not in the Tc flow path (Acres)= |                                      |      |   |   |                                       |      |   |   |
| <b>Site Land Use (acres):</b>                   | A                                    | B    | C | D | A                                     | B    | C | D |
| Pasture   |                                      |      |   |   |                                       |      |   |   |
| Woods, Poor Condition                           |                                      |      |   |   |                                       |      |   |   |
| Woods, Fair Condition                           |                                      |      |   |   |                                       |      |   |   |
| Woods, Good Condition                           |                                      | 2.29 |   |   |                                       | 0.22 |   |   |
| Open Space, Poor Condition                      |                                      |      |   |   |                                       |      |   |   |
| Open Space, Fair condition                      |                                      |      |   |   |                                       |      |   |   |
| Open Space, Good Condition                      |                                      | 0.25 |   |   |                                       | 0.88 |   |   |
| Reforestation (in dedicated OS)                 |                                      |      |   |   |                                       |      |   |   |
| Connected Impervious                            |                                      | 0.08 |   |   |                                       | 1.77 |   |   |
| Disconnected Impervious                         |                                      |      |   |   |                                       |      |   |   |
| <b>SITE FLOW</b>                                | <b>PRE-DEVELOPMENT T<sub>c</sub></b> |      |   |   | <b>POST-DEVELOPMENT T<sub>c</sub></b> |      |   |   |
| <b>Sheet Flow</b>                               |                                      |      |   |   |                                       |      |   |   |
| Length (ft)=                                    | 100.00                               |      |   |   | 82.00                                 |      |   |   |
| Slope (ft/ft)=                                  | 0.040                                |      |   |   | 0.010                                 |      |   |   |
| Surface Cover:                                  | Woods                                |      |   |   | Paved, Gravel, or Bare Soil           |      |   |   |
| n-value=  | 0.400                                |      |   |   | 0.011                                 |      |   |   |
| T <sub>t</sub> (hrs)=                           | 0.287                                |      |   |   | 0.024                                 |      |   |   |
| <b>Shallow Flow</b>                             |                                      |      |   |   |                                       |      |   |   |
| Length (ft)=                                    | 672.00                               |      |   |   |                                       |      |   |   |
| Slope (ft/ft)=                                  | 0.010                                |      |   |   |                                       |      |   |   |
| Surface Cover:                                  | Unpaved                              |      |   |   |                                       |      |   |   |
| Average Velocity (ft/sec)=                      | 1.61                                 |      |   |   |                                       |      |   |   |
| T <sub>t</sub> (hrs)=                           | 0.12                                 |      |   |   |                                       |      |   |   |
| <b>Channel Flow 1</b>                           |                                      |      |   |   |                                       |      |   |   |
| Length (ft)=                                    |                                      |      |   |   | 703.00                                |      |   |   |
| Slope (ft/ft)=                                  |                                      |      |   |   | 0.005                                 |      |   |   |
| Cross Sectional Flow Area (ft <sup>2</sup> )=   |                                      |      |   |   | 1.23                                  |      |   |   |
| Wetted Perimeter (ft)=                          |                                      |      |   |   | 3.93                                  |      |   |   |
| Channel Lining:                                 |                                      |      |   |   | Concrete, finished                    |      |   |   |
| n-value=  |                                      |      |   |   | 0.012                                 |      |   |   |
| Hydraulic Radius (ft)=                          |                                      |      |   |   | 0.31                                  |      |   |   |
| Average Velocity (ft/sec)=                      |                                      |      |   |   | 4.05                                  |      |   |   |
| T <sub>t</sub> (hrs)=                           |                                      |      |   |   | 0.05                                  |      |   |   |



Project Name: 7-Eleven Zebulon

**DRAINAGE AREA 1**  
**STORMWATER PRE-POST CALCULATIONS**

| Channel Flow 2   |                 |                  |
|--|-----------------|------------------|
| Length (ft)=   |                 |                  |
| Slope (ft/ft)=   |                 |                  |
| Cross Sectional Flow Area (ft <sup>2</sup> )=  |                 |                  |
| Wetted Perimeter (ft)=   |                 |                  |
| Channel Lining:  |                 |                  |
| n-value=   |                 |                  |
| Hydraulic Radius (ft)=   |                 |                  |
| Average Velocity (ft/sec)=   |                 |                  |
| T <sub>i</sub> (hrs)=  |                 |                  |
| Channel Flow 3   |                 |                  |
| Length (ft)=   |                 |                  |
| Slope (ft/ft)=   |                 |                  |
| Cross Sectional Flow Area (ft <sup>2</sup> )=  |                 |                  |
| Wetted Perimeter (ft)=   |                 |                  |
| Channel Lining:  |                 |                  |
| n-value=   |                 |                  |
| Hydraulic Radius (ft)=   |                 |                  |
| Average Velocity (ft/sec)=   |                 |                  |
| T <sub>i</sub> (hrs)=  |                 |                  |
| T <sub>c</sub> (hrs)=  | 0.40            | 0.07             |
| RESULTS  | PRE-DEVELOPMENT | POST-DEVELOPMENT |
| Composite Curve Number=  | 57              | 83               |
| Disconnected Impervious Adjustment   |                 |                  |
| Disconnected impervious area (acre) =  |                 |                  |
| CN <sub>adjusted (1-year)</sub> =  | 83              |                  |
| High Density Only  |                 |                  |
| Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft <sup>3</sup> ) = | 6,349           |                  |
| 1-year, 24-hour storm (Peak Flow)  |                 |                  |
| Runoff (inches) = Q* <sub>1-year</sub> =   | 0.20            | 1.35             |
| Volume of runoff (ft <sup>3</sup> ) =  | 1,917           | 14,050           |
| Volume change (ft <sup>3</sup> ) =   | 12,133          |                  |
| Peak Discharge (cfs)= Q <sub>1-year</sub> =  | 0.272           | 7.323            |
| 2-year, 24-hour storm (LID)  |                 |                  |
| Runoff (inches) = Q* <sub>2-year</sub> =   | 0.40            | 1.85             |
| Volume of runoff (ft <sup>3</sup> ) =  | 3,802           | 19,272           |
| Peak Discharge (cfs)= Q <sub>2-year</sub> =  | 0.540           | 10.045           |
| 10-year, 24-hour storm (DIA)   |                 |                  |
| Runoff (inches) = Q* <sub>10-year</sub> =  | 1.18            | 3.34             |
| Volume of runoff (ft <sup>3</sup> ) =  | 11,206          | 31,762           |
| Peak Discharge (cfs)= Q <sub>10-year</sub> =   | 1.591           | 18.091           |





Project Name: 7-Eleven Zebulon

**DRAINAGE AREA 2**  
**STORMWATER PRE-POST CALCULATIONS**

| LAND USE & SITE DATA                            | PRE-DEVELOPMENT                      |      |   |   | POST-DEVELOPMENT                      |      |   |   |
|---|--------------------------------------|------|---|---|---------------------------------------|------|---|---|
| Drainage Area (Acres)=                          | 0.84                                 |      |   |   | 0.34                                  |      |   |   |
| Site Acreage within Drainage=                   | 0.76                                 |      |   |   | 0.31                                  |      |   |   |
| One-year, 24-hour rainfall (in)=                | 2.85                                 |      |   |   |                                       |      |   |   |
| Two-year, 24-hour rainfall (in)=                | 3.46                                 |      |   |   |                                       |      |   |   |
| Ten-year, 24-hour storm (in)=                   | 5.14                                 |      |   |   |                                       |      |   |   |
| Total Lake/Pond Area (Acres)=                   |                                      |      |   |   |                                       |      |   |   |
| Lake/Pond Area not in the Tc flow path (Acres)= |                                      |      |   |   |                                       |      |   |   |
| <b>Site Land Use (acres):</b>                   | A                                    | B    | C | D | A                                     | B    | C | D |
| Pasture   |                                      |      |   |   |                                       |      |   |   |
| Woods, Poor Condition                           |                                      |      |   |   |                                       |      |   |   |
| Woods, Fair Condition                           |                                      |      |   |   |                                       |      |   |   |
| Woods, Good Condition                           |                                      | 0.66 |   |   |                                       | 0.06 |   |   |
| Open Space, Poor Condition                      |                                      |      |   |   |                                       |      |   |   |
| Open Space, Fair condition                      |                                      |      |   |   |                                       |      |   |   |
| Open Space, Good Condition                      |                                      | 0.06 |   |   |                                       | 0.25 |   |   |
| Reforestation (in dedicated OS)                 |                                      |      |   |   |                                       |      |   |   |
| Connected Impervious                            |                                      | 0.05 |   |   |                                       | 0.00 |   |   |
| Disconnected Impervious                         |                                      |      |   |   |                                       |      |   |   |
| <b>SITE FLOW</b>                                | <b>PRE-DEVELOPMENT T<sub>c</sub></b> |      |   |   | <b>POST-DEVELOPMENT T<sub>c</sub></b> |      |   |   |
| <b>Sheet Flow</b>                               |                                      |      |   |   |                                       |      |   |   |
| Length (ft)=                                    | 100.00                               |      |   |   | 100.00                                |      |   |   |
| Slope (ft/ft)=                                  | 0.025                                |      |   |   | 0.025                                 |      |   |   |
| Surface Cover:                                  | Woods                                |      |   |   | Woods                                 |      |   |   |
| n-value=  | 0.400                                |      |   |   | 0.400                                 |      |   |   |
| T <sub>t</sub> (hrs)=                           | 0.347                                |      |   |   | 0.347                                 |      |   |   |
| <b>Shallow Flow</b>                             |                                      |      |   |   |                                       |      |   |   |
| Length (ft)=                                    | 226.00                               |      |   |   | 190.00                                |      |   |   |
| Slope (ft/ft)=                                  | 0.023                                |      |   |   | 0.035                                 |      |   |   |
| Surface Cover:                                  | Unpaved                              |      |   |   | Unpaved                               |      |   |   |
| Average Velocity (ft/sec)=                      | 2.45                                 |      |   |   | 3.02                                  |      |   |   |
| T <sub>t</sub> (hrs)=                           | 0.03                                 |      |   |   | 0.02                                  |      |   |   |
| <b>Channel Flow 1</b>                           |                                      |      |   |   |                                       |      |   |   |
| Length (ft)=                                    |                                      |      |   |   | 24.00                                 |      |   |   |
| Slope (ft/ft)=                                  |                                      |      |   |   | 0.005                                 |      |   |   |
| Cross Sectional Flow Area (ft <sup>2</sup> )=   |                                      |      |   |   | 0.44                                  |      |   |   |
| Wetted Perimeter (ft)=                          |                                      |      |   |   | 2.36                                  |      |   |   |
| Channel Lining:                                 |                                      |      |   |   | Concrete, finished                    |      |   |   |
| n-value=  |                                      |      |   |   | 0.012                                 |      |   |   |
| Hydraulic Radius (ft)=                          |                                      |      |   |   | 0.19                                  |      |   |   |
| Average Velocity (ft/sec)=                      |                                      |      |   |   | 2.87                                  |      |   |   |
| T <sub>t</sub> (hrs)=                           |                                      |      |   |   | 0.00                                  |      |   |   |



Project Name: 7-Eleven Zebulon

**DRAINAGE AREA 2**  
**STORMWATER PRE-POST CALCULATIONS**

| Channel Flow 2   |                 |                    |
|--|-----------------|--------------------|
| Length (ft)=   |                 | 20.00              |
| Slope (ft/ft)=   |                 | 0.050              |
| Cross Sectional Flow Area (ft <sup>2</sup> )=  |                 | 1.23               |
| Wetted Perimeter (ft)=   |                 | 3.93               |
| Channel Lining:  |                 | Concrete, finished |
| n-value=   |                 | 0.012              |
| Hydraulic Radius (ft)=   |                 | 0.31               |
| Average Velocity (ft/sec)=   |                 | 12.80              |
| T <sub>i</sub> (hrs)=  |                 | 0.00               |
| Channel Flow 3   |                 |                    |
| Length (ft)=   |                 |                    |
| Slope (ft/ft)=   |                 |                    |
| Cross Sectional Flow Area (ft <sup>2</sup> )=  |                 |                    |
| Wetted Perimeter (ft)=   |                 |                    |
| Channel Lining:  |                 |                    |
| n-value=   |                 |                    |
| Hydraulic Radius (ft)=   |                 |                    |
| Average Velocity (ft/sec)=   |                 |                    |
| T <sub>i</sub> (hrs)=  |                 |                    |
| T <sub>c</sub> (hrs)=  | 0.37            | 0.37               |
| RESULTS  | PRE-DEVELOPMENT | POST-DEVELOPMENT   |
| Composite Curve Number=  | 58              | 60                 |
| Disconnected Impervious Adjustment   |                 |                    |
| Disconnected impervious area (acre) =  |                 |                    |
| CN <sub>adjusted (1-year)</sub> =  |                 | 60                 |
| High Density Only  |                 |                    |
| Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft <sup>3</sup> ) = |                 | 72                 |
| 1-year, 24-hour storm (Peak Flow)  |                 |                    |
| Runoff (inches) = Q* <sub>1-year</sub> =   | 0.23            | 0.29               |
| Volume of runoff (ft <sup>3</sup> ) =  | 640             | 325                |
| Volume change (ft <sup>3</sup> ) =   |                 |                    |
| Peak Discharge (cfs)= Q <sub>1-year</sub> =  | 0.080           | 0.052              |
| 2-year, 24-hour storm (LID)  |                 |                    |
| Runoff (inches) = Q* <sub>2-year</sub> =   | 0.44            | 0.52               |
| Volume of runoff (ft <sup>3</sup> ) =  | 1,227           | 591                |
| Peak Discharge (cfs)= Q <sub>2-year</sub> =  | 0.153           | 0.095              |
| 10-year, 24-hour storm (DIA)   |                 |                    |
| Runoff (inches) = Q* <sub>10-year</sub> =  | 1.26            | 1.40               |
| Volume of runoff (ft <sup>3</sup> ) =  | 3,482           | 3,884              |
| Peak Discharge (cfs)= Q <sub>10-year</sub> =   | 0.433           | 0.253              |





Project Name: **7-Eleven Zebulon**

**DA SITE SUMMARY**  
**STORMWATER PRE-POST CALCULATIONS**

| SITE SUMMARY  |                                   |       |              |     |           |     |     |     |     |      |
|---|-----------------------------------|-------|--------------|-----|-----------|-----|-----|-----|-----|------|
| DRAINAGE AREA SUMMARIES   |                                   |       |              |     |           |     |     |     |     |      |
| DRAINAGE AREA:  | DA1                               | DA2   | DA3          | DA4 | DA5       | DA6 | DA7 | DA8 | DA9 | DA10 |
| Pre-Development (1-year, 24-hour storm)   |                                   |       |              |     |           |     |     |     |     |      |
| Runoff (in) = $Q_{pre,1-year}$ =  | 0.20                              | 0.23  |              |     |           |     |     |     |     |      |
| Peak Flow (cfs) = $Q_{1-year}$ =  | 0.272                             | 0.080 |              |     |           |     |     |     |     |      |
| Post-Development (1-year, 24-hour storm)  |                                   |       |              |     |           |     |     |     |     |      |
| Proposed Impervious Surface (acre) =  | 1.77                              | 0.00  |              |     |           |     |     |     |     |      |
| Runoff (in) = $Q_{1-year}$ =  | 1.35                              | 0.29  |              |     |           |     |     |     |     |      |
| Peak Flow (cfs) = $Q_{1-year}$ =  | 7.323                             | 0.052 |              |     |           |     |     |     |     |      |
| Increase in volume per DA (ft <sup>3</sup> )_1-yr storm =                           | 12,133                            |       |              |     |           |     |     |     |     |      |
| Minimum Volume to be Managed for DA HIGH DENSITY REQUIREMENT = (ft <sup>3</sup> ) = | 6,349                             | 72    |              |     |           |     |     |     |     |      |
| TARGET CURVE NUMBER (TCN)   |                                   |       |              |     |           |     |     |     |     |      |
| Site Data   |                                   |       |              |     |           |     |     |     |     |      |
| SITE \SOIL COMPOSITION  |                                   |       |              |     |           |     |     |     |     |      |
| HYDROLOGIC SOIL GROUP   | Site Area                         |       | %            |     | Target CN |     |     |     |     |      |
| A   | 0.00                              |       | 0%           |     | N/A       |     |     |     |     |      |
| B   | 3.18                              |       | 100%         |     | N/A       |     |     |     |     |      |
| C   | 0.00                              |       | 0%           |     | N/A       |     |     |     |     |      |
| D   | 0.00                              |       | 0%           |     | N/A       |     |     |     |     |      |
| Total Site Area (acres) =   |                                   |       |              |     | 3.18      |     |     |     |     |      |
| Percent BUA (Includes Existing Lakes/Pond Areas) =                                  |                                   |       |              |     | 56%       |     |     |     |     |      |
| Project Density =   |                                   |       |              |     | High      |     |     |     |     |      |
| Target Curve Number (TCN) =   |                                   |       |              |     | N/A       |     |     |     |     |      |
| $CN_{adjusted(1-year)}$ =   |                                   |       |              |     | 81        |     |     |     |     |      |
| Minimum Volume to be Managed (Total Site) Per TCN Requirement = ft <sup>3</sup> =   |                                   |       |              |     | N/A       |     |     |     |     |      |
| Site Nitrogen Loading Data  |                                   |       |              |     |           |     |     |     |     |      |
| HSG   | TN export coefficient (lbs/ac/yr) |       | Site Acreage |     | N Export  |     |     |     |     |      |
| Pasture   | 1.2                               |       | 0.00         |     | 0.00      |     |     |     |     |      |
| Woods, Poor Condition   | 1.6                               |       | 0.00         |     | 0.00      |     |     |     |     |      |
| Woods, Fair Condition   | 1.2                               |       | 0.00         |     | 0.00      |     |     |     |     |      |
| Woods, Good Condition   | 0.8                               |       | 0.28         |     | 0.23      |     |     |     |     |      |
| Open Space, Poor Condition  | 1.0                               |       | 0.00         |     | 0.00      |     |     |     |     |      |
| Open Space, Fair Condition  | 0.8                               |       | 0.00         |     | 0.00      |     |     |     |     |      |
| Open Space, Good Condition  | 0.6                               |       | 1.12         |     | 0.67      |     |     |     |     |      |
| Reforestation (in dedicated OS)   | 0.6                               |       | 0.00         |     | 0.00      |     |     |     |     |      |
| Impervious  | 21.2                              |       | 1.77         |     | 37.55     |     |     |     |     |      |
| SITE NITROGEN LOADING RATE (lbs/ac/yr) =  |                                   |       |              |     | 12.10     |     |     |     |     |      |
| Nitrogen Load (lbs/yr) =  |                                   |       |              |     | 38.45     |     |     |     |     |      |
| TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)_Wendell Only =                             |                                   |       |              |     | 27.01     |     |     |     |     |      |
| Site Nitrogen Loading Data For Expansions Only                                      |                                   |       |              |     |           |     |     |     |     |      |
|   | Existing                          |       | New          |     |           |     |     |     |     |      |
| Impervious(acres) =   | NA                                |       | NA           |     |           |     |     |     |     |      |
| "Expansion Area" (acres) =  |                                   |       |              |     |           |     |     |     |     |      |
| Nitrogen Load (lbs/yr) =  | NA                                |       | NA           |     |           |     |     |     |     |      |
| SITE NITROGEN LOADING RATE (lbs/ac/yr) =  | NA                                |       | NA           |     |           |     |     |     |     |      |
| Total Site loading rate (lbs/ac/yr)   |                                   |       |              |     |           |     |     |     |     |      |
| TOTAL SITE NITROGEN TO MITIGATE (lbs/yr) =  |                                   |       |              |     | NA        |     |     |     |     |      |



Project Name: 7-Eleven Zebulon

**DRAINAGE AREA 1  
BMP CALCULATIONS**

|   |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
|---|---------------------|---------------------------------------|---|---|----------|-----------------------------|--|------------------------|-----------------------|--------------------|----------|
| <b>DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS</b>  |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
| DA1 Site Acreage=   |                     | 2.87                                  |   |   |          |                             |  |                        |                       |                    |          |
| DA1 Off-Site Acreage=   |                     | 0.29                                  |   |   |          |                             |  |                        |                       |                    |          |
| Total Required Storage Volume for Site TCN Requirement (ft³)=   |                     | N/A                                   |   |   |          |                             |  |                        |                       |                    |          |
| Total Required Storage Volume for DA1 1" Rainfall for High Density (ft³)=                                       |                     | 6,349                                 |   |   |          |                             |  |                        |                       |                    |          |
| Will site use underground detention/cistern?  |                     | No                                    | Enter % of the year water will be reused= |   | 0%       |                             | Note: Supporting information/details should be submitted to demonstrate water usage. |                        |                       |                    |          |
| <b>ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA</b>   |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
|   | HSG                 | Sub-DA1(a)<br>(Ac)                    |   | Sub-DA1(b)<br>(Ac)                                |          | Sub-DA1(c)<br>(Ac)          |  | Sub-DA1(d)<br>(Ac)     |                       | Sub-DA1(e)<br>(Ac) |          |
|   |                     | Site                                  | Off-site                                  | Site  | Off-site | Site                        | Off-site   | Site                   | Off-site              | Site               | Off-site |
| Pasture   |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
| Woods, Poor Condition   |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
| Woods, Fair Condition   |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
| Woods, Good Condition   |                     | 0.22                                  |   |   |          |                             |  |                        |                       |                    |          |
| Open Space, Poor Condition  |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
| Open Space, Fair Condition  |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
| Open Space, Good Condition  |                     | 0.88                                  |   |   |          |                             |  |                        |                       |                    |          |
| Reforestation (in dedicated OS)   |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
| Impervious  |                     | 1.77                                  |   |   |          |                             |  |                        |                       |                    |          |
| <b>Sub-DA1(a) BMP(s)</b>  |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
| Device Name (As Shown on Plan)  | Device Type         | Water Quality Volume for Sub-DA (ft³) |   | Provided Volume that will drawdown 2-5 days (ft³) |          | Nitrogen Removal Efficiency | Sub-DA Nitrogen (lbs)  | Nitrogen Removed (lbs) | Drawdown Time (hours) |                    |          |
| Stormwater Wetland  | Stormwater Wetlands | 6,296                                 |   | 11,948  |          | 40%                         | 38.19  | 15.27                  | 65.33                 |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 22.91  | 0.00                   |                       |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 22.91  | 0.00                   |                       |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 22.91  | 0.00                   |                       |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 22.91  | 0.00                   |                       |                    |          |
| Total Nitrogen remaining leaving the subbasin (lbs):  |                     |                                       |   |   | 22.91    |                             |  |                        |                       |                    |          |
| <b>Sub-DA1(b) BMP(s)</b>  |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
| If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs): |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
| Device Name (As Shown on Plan)  | Device Type         | Water Quality Volume for Sub-DA (ft³) |   | Provided Volume that will drawdown 2-5 days (ft³) |          | Nitrogen Removal Efficiency | Sub-DA Nitrogen (lbs)  | Nitrogen Removed (lbs) | Drawdown Time (hours) |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 0.00   | 0.00                   |                       |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 0.00   | 0.00                   |                       |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 0.00   | 0.00                   |                       |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 0.00   | 0.00                   |                       |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 0.00   | 0.00                   |                       |                    |          |
| Total Nitrogen remaining leaving the subbasin (lbs):  |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
| <b>Sub-DA1 (c) BMP(s)</b>   |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
| If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs): |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |
| Device Name (As Shown on Plan)  | Device Type         | Water Quality Volume for Sub-DA (ft³) |   | Provided Volume that will drawdown 2-5 days (ft³) |          | Nitrogen Removal Efficiency | Sub-DA Nitrogen (lbs)  | Nitrogen Removed (lbs) | Drawdown Time (hours) |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 0.00   | 0.00                   |                       |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 0.00   | 0.00                   |                       |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 0.00   | 0.00                   |                       |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 0.00   | 0.00                   |                       |                    |          |
|   |                     |                                       |   |   |          | 0%                          | 0.00   | 0.00                   |                       |                    |          |
| Total Nitrogen remaining leaving the subbasin (lbs):  |                     |                                       |   |   |          |                             |  |                        |                       |                    |          |



Project Name: 7-Eleven Zebulon

**DRAINAGE AREA 1  
BMP CALCULATIONS**

| Sub-DA1(d) BMP(s)   |             |  |  |                             |                       |                        |                       |
|---|-------------|--|--|-----------------------------|-----------------------|------------------------|-----------------------|
| If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs): |             |  |  |                             |                       |                        |                       |
| Device Name (As Shown on Plan)  | Device Type | Water Quality Volume for Sub-DA (ft <sup>3</sup> ) | Provided Volume that will drawdown 2-5 days (ft <sup>3</sup> ) | Nitrogen Removal Efficiency | Sub-DA Nitrogen (lbs) | Nitrogen Removed (lbs) | Drawdown Time (hours) |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
| <b>Total Nitrogen remaining leaving the subbasin (lbs):</b>   |             |  |  |                             |                       |                        |                       |
| Sub-DA1(e) BMP(s)   |             |  |  |                             |                       |                        |                       |
| If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs): |             |  |  |                             |                       |                        |                       |
| Device Name (As Shown on Plan)  | Device Type | Water Quality Volume for Sub-DA (ft <sup>3</sup> ) | Provided Volume that will drawdown 2-5 days (ft <sup>3</sup> ) | Nitrogen Removal Efficiency | Sub-DA Nitrogen (lbs) | Nitrogen Removed (lbs) | Drawdown Time (hours) |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
| <b>Total Nitrogen remaining leaving the subbasin (lbs):</b>   |             |  |  |                             |                       |                        |                       |
| DA1 BMP SUMMARY   |             |  |  |                             |                       |                        |                       |
| Total Volume Treated (ft <sup>3</sup> )=  |             | 11,948   |  |                             |                       |                        |                       |
| Nitrogen Mitigated(lbs)=  |             | 15.27  |  |                             |                       |                        |                       |
| 1-year, 24-hour storm   |             |  |  |                             |                       |                        |                       |
| Post BMP Volume of Runoff (ft <sup>3</sup> ) <sub>(1-year)</sub> =  |             | 2,102  |  |                             |                       |                        |                       |
| Post BMP Runoff (inches) = Q* <sub>(1-year)</sub> =   |             | 0.20   |  |                             |                       |                        |                       |
| Post BMP CN <sub>(1-year)</sub> =   |             | 56   |  |                             |                       |                        |                       |
| Post BMP Peak Discharge (cfs)= Q <sub>1-year</sub> =  |             | 0.198  |  |                             |                       |                        |                       |
| 2-year, 24-hour storm (LID)   |             |  |  |                             |                       |                        |                       |
| Post BMP Volume of Runoff (ft <sup>3</sup> ) <sub>(2-year)</sub> =  |             | 7,324  |  |                             |                       |                        |                       |
| Post BMP Runoff (inches) = Q* <sub>(2-year)</sub> =   |             | 0.70   |  |                             |                       |                        |                       |
| Post BMP CN <sub>(2-year)</sub> =   |             | 64   |  |                             |                       |                        |                       |
| Post BMP Peak Discharge (cfs)= Q <sub>(2-year)</sub> =  |             | 0.475  |  |                             |                       |                        |                       |
| 10-year, 24-hour storm (DIA)  |             |  |  |                             |                       |                        |                       |
| Post BMP Volume of Runoff (ft <sup>3</sup> ) <sub>(10-year)</sub> =   |             | 19,814   |  |                             |                       |                        |                       |
| Post BMP Runoff (inches) = Q* <sub>(10-year)</sub> =  |             | 1.90   |  |                             |                       |                        |                       |
| Post BMP CN <sub>(10-year)</sub> =  |             | 84   |  |                             |                       |                        |                       |
| Post BMP Peak Discharge (cfs)= Q <sub>(10-year)</sub> =   |             | 2.697  |  |                             |                       |                        |                       |



Project Name: 7-Eleven Zebulon

**DRAINAGE AREA 2  
BMP CALCULATIONS**

|  |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
|--|---------------------|---|---|--|----------|-----------------------------------|--|------------------------------|-----------------------------|--------------------|----------|
| <b>DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS</b>   |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
| DA2 Site Acreage=  |                     | 0.31  |   |  |          |                                   |  |                              |                             |                    |          |
| DA2 Off-Site Acreage=  |                     | 0.03  |   |  |          |                                   |  |                              |                             |                    |          |
| Total Required Storage Volume<br>TCN Requirement (ft <sup>3</sup> )=   |                     | N/A   |   |  |          |                                   |  |                              |                             |                    |          |
| Total Required Storage Volume for DA2<br>1" Rainfall for High Density (ft <sup>3</sup> )=                          |                     | 72  |   |  |          |                                   |  |                              |                             |                    |          |
| Will site use underground detention/cistern?   |                     | No  | Enter % of the year water will be reused= |  | 0%       |                                   | Note: Supporting information/details should be submitted to demonstrate water usage. |                              |                             |                    |          |
| <b>ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA</b>  |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
|  | HSG                 | Sub-DA2(a)<br>(Ac)                                    |   | Sub-DA2(b)<br>(Ac)   |          | Sub-DA2(c)<br>(Ac)                |  | Sub-DA2(d)<br>(Ac)           |                             | Sub-DA2(e)<br>(Ac) |          |
|  |                     | Site  | Off-site                                  | Site   | Off-site | Site                              | Off-site   | Site                         | Off-site                    | Site               | Off-site |
| Pasture  |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
| Woods, Poor Condition  |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
| Woods, Fair Condition  |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
| Woods, Good Condition  |                     | 0.06  |   |  |          |                                   |  |                              |                             |                    |          |
| Open Space, Poor Condition   |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
| Open Space, Fair Condition   |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
| Open Space, Good Condition   |                     | 0.25  |   |  |          |                                   |  |                              |                             |                    |          |
| Reforestation (in dedicated OS)  |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
| Impervious   |                     | 0.00  |   |  |          |                                   |  |                              |                             |                    |          |
| <b>Sub-DA1(a) BMP(s)</b>   |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
| Device Name (As Shown on Plan)   | Device Type         | Water Quality Volume<br>for Sub-DA (ft <sup>3</sup> ) |   | Provided<br>Volume that will<br><u>drawdown 2-5 days</u><br>(ft <sup>3</sup> ) |          | Nitrogen<br>Removal<br>Efficiency | Sub-DA<br>Nitrogen<br>(lbs)  | Nitrogen<br>Removed<br>(lbs) | Drawdown<br>Time<br>(hours) |                    |          |
|  | Stormwater Wetlands | 67  |   |  |          | 40%                               | 0.27   | 0.11                         | 50                          |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.16   | 0.00                         |                             |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.16   | 0.00                         |                             |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.16   | 0.00                         |                             |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.16   | 0.00                         |                             |                    |          |
| Total Nitrogen remaining leaving the subbasin (lbs):   |                     |   |   |  | 0.16     |                                   |  |                              |                             |                    |          |
| <b>Sub-DA1(b) BMP(s)</b>   |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
| If Sub-DA1(b) is connected to upstream subbasin(s),<br>enter the nitrogen leaving the most upstream subbasin(lbs): |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
| Device Name (As Shown on Plan)   | Device Type         | Water Quality Volume<br>for Sub-DA (ft <sup>3</sup> ) |   | Provided<br>Volume that will<br><u>drawdown 2-5 days</u><br>(ft <sup>3</sup> ) |          | Nitrogen<br>Removal<br>Efficiency | Sub-DA<br>Nitrogen<br>(lbs)  | Nitrogen<br>Removed<br>(lbs) | Drawdown<br>Time<br>(hours) |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.00   | 0.00                         |                             |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.00   | 0.00                         |                             |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.00   | 0.00                         |                             |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.00   | 0.00                         |                             |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.00   | 0.00                         |                             |                    |          |
| Total Nitrogen remaining leaving the subbasin (lbs):   |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
| <b>Sub-DA1 (c) BMP(s)</b>  |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
| If Sub-DA1(c) is connected to upstream subbasin(s),<br>enter the nitrogen leaving the most upstream subbasin(lbs): |                     |   |   |  |          |                                   |  |                              |                             |                    |          |
| Device Name (As Shown on Plan)   | Device Type         | Water Quality Volume<br>for Sub-DA (ft <sup>3</sup> ) |   | Provided<br>Volume that will<br><u>drawdown 2-5 days</u><br>(ft <sup>3</sup> ) |          | Nitrogen<br>Removal<br>Efficiency | Sub-DA<br>Nitrogen<br>(lbs)  | Nitrogen<br>Removed<br>(lbs) | Drawdown<br>Time<br>(hours) |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.00   | 0.00                         |                             |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.00   | 0.00                         |                             |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.00   | 0.00                         |                             |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.00   | 0.00                         |                             |                    |          |
|  |                     |   |   |  |          | 0%                                | 0.00   | 0.00                         |                             |                    |          |
| Total Nitrogen remaining leaving the subbasin (lbs):   |                     |   |   |  |          |                                   |  |                              |                             |                    |          |



Project Name: 7-Eleven Zebulon

**DRAINAGE AREA 2  
BMP CALCULATIONS**

|   |             |  |  |                             |                       |                        |                       |
|---|-------------|--|--|-----------------------------|-----------------------|------------------------|-----------------------|
| <b>Sub-DA1(d) BMP(s)</b>  |             |  |  |                             |                       |                        |                       |
| If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs): |             |  |  |                             |                       |                        |                       |
| Device Name (As Shown on Plan)  | Device Type | Water Quality Volume for Sub-DA (ft <sup>3</sup> ) | Provided Volume that will drawdown 2-5 days (ft <sup>3</sup> ) | Nitrogen Removal Efficiency | Sub-DA Nitrogen (lbs) | Nitrogen Removed (lbs) | Drawdown Time (hours) |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
| Total Nitrogen remaining leaving the subbasin (lbs):  |             |  |  |                             |                       |                        |                       |
| <b>Sub-DA1(e) BMP(s)</b>  |             |  |  |                             |                       |                        |                       |
| If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs): |             |  |  |                             |                       |                        |                       |
| Device Name (As Shown on Plan)  | Device Type | Water Quality Volume for Sub-DA (ft <sup>3</sup> ) | Provided Volume that will drawdown 2-5 days (ft <sup>3</sup> ) | Nitrogen Removal Efficiency | Sub-DA Nitrogen (lbs) | Nitrogen Removed (lbs) | Drawdown Time (hours) |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
|   |             |  |  | 0%                          | 0.00                  | 0.00                   |                       |
| Total Nitrogen remaining leaving the subbasin (lbs):  |             |  |  |                             |                       |                        |                       |
| <b>DA2 BMP SUMMARY</b>  |             |  |  |                             |                       |                        |                       |
| Total Volume Treated (ft <sup>3</sup> )=  |             |  |  |                             |                       |                        |                       |
| Nitrogen Mitigated(lbs)=  |             |  |  | 0.11                        |                       |                        |                       |
| <b>1-year, 24-hour storm</b>  |             |  |  |                             |                       |                        |                       |
| Post BMP Volume of Runoff (ft <sup>3</sup> ) <sub>(1-year)</sub> =  |             |  |  | 325                         |                       |                        |                       |
| Post BMP Runoff (inches) = Q* <sub>(1-year)</sub> =   |             |  |  | 0.29                        |                       |                        |                       |
| Post BMP CN <sub>(1-year)</sub> =   |             |  |  | 60                          |                       |                        |                       |
| Post BMP Peak Discharge (cfs)= Q <sub>1-year</sub> =  |             |  |  | 0.065                       |                       |                        |                       |
| <b>2-year, 24-hour storm (LID)</b>  |             |  |  |                             |                       |                        |                       |
| Post BMP Volume of Runoff (ft <sup>3</sup> ) <sub>(2-year)</sub> =  |             |  |  | 591                         |                       |                        |                       |
| Post BMP Runoff (inches) = Q* <sub>(2-year)</sub> =   |             |  |  | 0.52                        |                       |                        |                       |
| Post BMP CN <sub>(2-year)</sub> =   |             |  |  | 60                          |                       |                        |                       |
| Post BMP Peak Discharge (cfs)= Q <sub>(2-year)</sub> =  |             |  |  | 0.111                       |                       |                        |                       |
| <b>10-year, 24-hour storm (DIA)</b>   |             |  |  |                             |                       |                        |                       |
| Post BMP Volume of Runoff (ft <sup>3</sup> ) <sub>(10-year)</sub> =   |             |  |  | 3,884                       |                       |                        |                       |
| Post BMP Runoff (inches) = Q* <sub>(10-year)</sub> =  |             |  |  | 3.44                        |                       |                        |                       |
| Post BMP CN <sub>(10-year)</sub> =  |             |  |  | 98                          |                       |                        |                       |
| Post BMP Peak Discharge (cfs)= Q <sub>(10-year)</sub> =   |             |  |  | 0.277                       |                       |                        |                       |





Project Name: **7-Eleven Zebulon**

**DA SITE SUMMARY**  
**BMP CALCULATIONS**

| BMP SUMMARY  |       |       |     |     |     |     |     |     |     |      |  |
|--|-------|-------|-----|-----|-----|-----|-----|-----|-----|------|--|
| DRAINAGE AREA SUMMARIES                                  |       |       |     |     |     |     |     |     |     |      |  |
| DRAINAGE AREA:   | DA1   | DA2   | DA3 | DA4 | DA5 | DA6 | DA7 | DA8 | DA9 | DA10 |  |
| Pre-Development (1-year, 24-hour storm)                  |       |       |     |     |     |     |     |     |     |      |  |
| Runoff (in)=Q* <sub>1-year</sub> =                       | 0.20  | 0.23  |     |     |     |     |     |     |     |      |  |
| Peak Flow (cfs)=Q <sub>1-year</sub> =                    | 0.272 | 0.080 |     |     |     |     |     |     |     |      |  |
| Post-Development (1-year, 24-hour storm)                 |       |       |     |     |     |     |     |     |     |      |  |
| Target Curve Number (TCN) =                              | NA    |       |     |     |     |     |     |     |     |      |  |
| Post BMP Runoff (inches) = Q* <sub>(1-year)</sub> =      | 0.20  | 0.29  |     |     |     |     |     |     |     |      |  |
| Post BMP Peak Discharge (cfs)= Q <sub>1-year</sub> =     | 0.198 | 0.065 |     |     |     |     |     |     |     |      |  |
| Post BMP CN <sub>(1-year)</sub> =                        | 56    |       |     |     |     |     |     |     |     |      |  |
| Post-BMP Nitrogen Loading                                |       |       |     |     |     |     |     |     |     |      |  |
| TOTAL SITE NITROGEN MITIGATED (lbs)=                     | 15.38 |       |     |     |     |     |     |     |     |      |  |
| SITE NITROGEN LOADING RATE (lbs/ac/yr)=                  | 7.26  |       |     |     |     |     |     |     |     |      |  |
| TOTAL SITE NITROGEN LEFT TO MITIGATE_Wendell Only (lbs)= | 11.63 |       |     |     |     |     |     |     |     |      |  |



Project Name: 7-Eleven Zebulon

### LOW IMPACT DEVELOPMENT SUMMARY

| DRAINAGE AREA SUMMARIES   |   |       |     |     |     |     |     |     |     |      |
|---|---|-------|-----|-----|-----|-----|-----|-----|-----|------|
| DRAINAGE AREA:  | DA1   | DA2   | DA3 | DA4 | DA5 | DA6 | DA7 | DA8 | DA9 | DA10 |
| Pre-Development   |   |       |     |     |     |     |     |     |     |      |
| Runoff (in) = $Q_{pre, 2-year}$   | 0.40  | 0.44  |     |     |     |     |     |     |     |      |
| Total Runoff Volume (ft <sup>3</sup> ) =  | 3,802   | 1,227 |     |     |     |     |     |     |     |      |
| Peak Flow (cfs) = $Q_{2-year}$  | 0.540   | 0.153 |     |     |     |     |     |     |     |      |
| Post-Development  |   |       |     |     |     |     |     |     |     |      |
| 2-year, 24-hour storm (LID)   |   |       |     |     |     |     |     |     |     |      |
| Post BMP Runoff (inches) = $Q^*_{(2-year)}$   | 0.70  | 0.52  |     |     |     |     |     |     |     |      |
| Post BMP Peak Discharge (cfs) = $Q_{(2-year)}$  | 0.475   | 0.111 |     |     |     |     |     |     |     |      |
| Post BMP Volume of Runoff (ft <sup>3</sup> ) = $Q_{(2-year)}$   | 7,324   | 591   |     |     |     |     |     |     |     |      |
| Does Runoff meet LID requirements?  | No  | No    |     |     |     |     |     |     |     |      |
| Does Peak Flow meet LID requirements?   | Yes   | Yes   |     |     |     |     |     |     |     |      |
| Does Runoff Volume meet LID requirements?   | No  | Yes   |     |     |     |     |     |     |     |      |
| SITE SUMMARY  |   |       |     |     |     |     |     |     |     |      |
| Site Data   |   |       |     |     |     |     |     |     |     |      |
| Target CN =   | N/A   |       |     |     |     |     |     |     |     |      |
| Post-Development CN =   | 64  |       |     |     |     |     |     |     |     |      |
| Does CN meet LID requirements?  |   |       |     |     |     |     |     |     |     |      |
| LID CHECKLIST   |   |       |     |     |     |     |     |     |     |      |
| Complete the below checklist if all requirements have been met above:   |   |       |     |     |     |     |     |     |     |      |
| <p><b>LID Narrative</b> (limit to 600 characters - attach additional pages with submittal if necessary):<br/>Describe in detail how the proposed development has utilized "Natural Site Design". Narrative should include the location of site buildings, roads and other land disturbances in the least environmentally-sensitive areas, preservation of steep slopes, and preservation of naturally well draining soils and other hydrologically valuable features.</p> |   |       |     |     |     |     |     |     |     |      |
|   |   |       |     |     |     |     |     |     |     |      |
| <b>LID Techniques (check all that apply)</b><br>At least <b>one</b> of the following techniques must be used to achieve LID classification:   |   |       |     |     |     |     |     |     |     |      |
| <input type="checkbox"/>  | Bioretention  |       |     |     |     |     |     |     |     |      |
| <input type="checkbox"/>  | On-site infiltration  |       |     |     |     |     |     |     |     |      |
| <b>Additional LID Techniques (check all that apply)</b><br>At least <b>two (one for Wendell)</b> of the following techniques must be used to achieve LID classification:  |   |       |     |     |     |     |     |     |     |      |
| <input type="checkbox"/>  | Retention of 50% of vegetated area, including open space, landscaping or forests                                  |       |     |     |     |     |     |     |     |      |
| <input type="checkbox"/>  | Use of permeable pavement for <u>all</u> private driveways, private roads, sidewalks and parking areas            |       |     |     |     |     |     |     |     |      |
| <input type="checkbox"/>  | Installation of one rain cistern per lot or three rain barrels per lot  |       |     |     |     |     |     |     |     |      |
| <input type="checkbox"/>  | Installation of vegetative roofs  |       |     |     |     |     |     |     |     |      |
| <input type="checkbox"/>  | Increasing all buffers in the Riparian buffer zone or the Flood Protection Zone, whichever is greater, by 50 feet |       |     |     |     |     |     |     |     |      |
| <input type="checkbox"/>  | Use of reclaimed water for all buildings  |       |     |     |     |     |     |     |     |      |
| <input type="checkbox"/>  | Use of innovative LID techniques subject to approval  |       |     |     |     |     |     |     |     |      |



### DOWNSTREAM IMPACT ANALYSIS SITE SUMMARY

| DRAINAGE AREA SUMMARIES   |        |       |     |     |     |     |     |     |     |      |
|---|--------|-------|-----|-----|-----|-----|-----|-----|-----|------|
| DRAINAGE AREA:  | DA1    | DA2   | DA3 | DA4 | DA5 | DA6 | DA7 | DA8 | DA9 | DA10 |
| <b>Pre-Development</b>  |        |       |     |     |     |     |     |     |     |      |
| Peak Discharge (cfs)= $Q_{10\text{-year}}$ =                        | 1.59   | 0.43  |     |     |     |     |     |     |     |      |
| Volume of Runoff (ft <sup>3</sup> ) <sub>(10-year)</sub> =          | 11,206 | 3,482 |     |     |     |     |     |     |     |      |
| <b>Post-Development</b>   |        |       |     |     |     |     |     |     |     |      |
| <b>10-year, 24-hour storm (DIA)</b>                                 |        |       |     |     |     |     |     |     |     |      |
| Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$ =             | 2.70   | 0.28  |     |     |     |     |     |     |     |      |
| Post BMP Volume of Runoff (ft <sup>3</sup> ) <sub>(10-year)</sub> = | 19,814 | 3,884 |     |     |     |     |     |     |     |      |

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Bowman North Carolina, Ltd.

## Curve Number Calculation (CN) Post-Developed Bypass Conditions (Stormwater Wetland)

Drainage Area (acres): 0.13

Existing Soil Groups:

| <u>Soil Group</u> | <u>Map Symbol</u> | <u>Soil Description</u> | <u>Acres</u> | <u>Percent of DA</u> |
|-------------------|-------------------|-------------------------|--------------|----------------------|
| B                 | WeB               | Wedowee Sandy Loam      | 0.13         | 100%                 |

Existing Land Uses:

| <u>Land Use Description</u> | <u>Existing Soil Group</u> | <u>Acres</u> | <u>Curve #</u> | <u>Weighted CN</u> |
|-----------------------------|----------------------------|--------------|----------------|--------------------|
| Open Space - Good           | B                          | 0.09         | 61             | 41.1               |
| Impervious Area             |                            | 0.04         | 98             | 32.0               |

Cumulative Curve # = 73.1

1106 N Arendell Ave, Zebulon, NC  
Bowman North Carolina, Ltd.

| Curve Number Calculation (CN)              |                             |                            |                         |                |                      |
|--|-----------------------------|----------------------------|-------------------------|----------------|----------------------|
| Post-Developed Conditions (On-Site Bypass) |                             |                            |                         |                |                      |
| <u>Drainage Area (acres):</u>              |                             | 0.0034                     |                         |                |                      |
| <u>Existing Soil Groups:</u>               |                             |                            |                         |                |                      |
|  | <u>Soil Group</u>           | <u>Map Symbol</u>          | <u>Soil Description</u> | <u>Acres</u>   | <u>Percent of DA</u> |
|  | B                           | WeB                        | Wedowee Sandy Loam      | 0.00           | 100%                 |
| <u>Existing Land Uses:</u>                 |                             |                            |                         |                |                      |
|  | <u>Land Use Description</u> | <u>Existing Soil Group</u> | <u>Acres</u>            | <u>Curve #</u> | <u>Weighted CN</u>   |
|  | Impervious Area             |                            | 0.00                    | 98             | 98.0                 |
| Cumulative Curve # =                       |                             |                            |                         |                | 98.0                 |



## Proposed Stormwater Wetland

### Project Information

Project Name: 7-Eleven (Zebulon)  
Project #: 220163-01-002  
Designed by: MCB Date: 9/27/2023  
Revised by: MCB Date: 12/4/2023  
Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

### Site Information

Sub Area Location: Drainage To Proposed Stormwater Wetland  
Drainage Area (DA) = 3.16 Acres 137,464 sf  
Impervious Area (IA) = 1.91 Acres 83,063 sf  
Percent Impervious (I) = 60.43 %

### Required WQv Storage Volume

Design Storm = 1 inch (Non-Coastal county)  
Determine Rv Value =  $0.05 + .009 (I) =$  0.594 in/in  
Storage Volume Required = 6,802 cf (above Permanent Pool)

### Surface Area Requirements:

Storage Volume Required = 6,802 cf (above Permanent Pool)  
Maximum ponding depth = 1.25 ft  
Surface Area Required= 5,442 sf  
Surface Area Provided= 8130 sf

### Breakdown of Surface Area:

|                           |                |    |                                      |
|---------------------------|----------------|----|--------------------------------------|
| Forebay                   | <u>1200.00</u> | sf |                                      |
|                           | <u>14.8%</u>   |    | of Wetland Surface Area (10-15%)     |
| Non-Forebay Deep Pools    | <u>1020.00</u> | sf |                                      |
|                           | <u>12.5%</u>   |    | of Wetland Surface Area (5% to 15%)  |
| Shallow Water (low marsh) | <u>3490.00</u> | sf |                                      |
|                           | <u>42.9%</u>   |    | of Wetland Surface Area (35% to 45%) |
| Shallow Land (high marsh) | <u>2620.00</u> | sf |                                      |
|                           | <u>32.2%</u>   |    | of Wetland Surface Area (30% to 45%) |
| Total                     | <u>8,330</u>   | sf |                                      |
|                           | <u>102.5%</u>  |    | of Wetland Surface Area              |

## STORMWATER WETLAND INCREMENTAL DRAWDOWN METHOD-Water Quality Volume

### Project Information

Project Name: 7-Eleven (Zebulon)

Project #: 220163-01-002

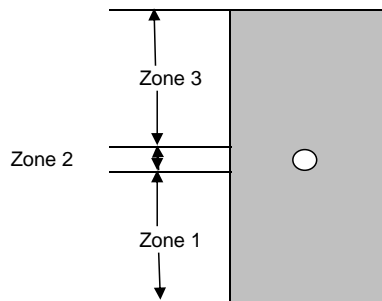
Designed by: MCB Date: 9/27/2023

Revised by: MCB Date: 12/4/2023

Checked by: Date:

### Water Quality Orifice

\* Incremental Determination of Water Quality Volume Drawdown Time



$$Q_3 = 0.0437 C_D * D^2 (Z-D/24-E_i)^{1/2}$$

$$Q_2 = 0.372 C_D * D * (Z-E_i)^{3/2}$$

$$Q_1 = 0$$

Orifice Diameter (D) = 1.5 in  
 Cd = 0.6 Orifice Inv. to 329.7  
 Ei = 329.7 to 329.8  
 Zone 1 Range = 0.00 to 329.8  
 Zone 2 Range = 329.7 to 330.95  
 Zone 3 Range = 329.8

| Incremental Drawdown Method |              |                    | Stage, Z | Zone | Q     | Drawdown Time |
|-----------------------------|--------------|--------------------|----------|------|-------|---------------|
| Countour                    | Contour Area | Incremental Volume | ft       |      | cfs   | min           |
|                             | sq ft        | cu ft              | 0.00     | 0.00 | 0.000 | --            |
| 329.70                      | 8,130        | 0                  | 0.30     | 3.00 | 0.029 | 1,488         |
| 330.00                      | 8,980        | 2,566              | 1.25     | 3.00 | 0.064 | 2,432         |
| 330.95                      | 10,770       | 9,381              |          |      |       |               |
|                             |              |                    |          |      |       |               |
|                             |              |                    |          |      |       |               |
|                             |              |                    |          |      |       |               |
|                             |              |                    | --       | --   | --    | 3,920         |
| <b>Total</b>                | --           | 11,947             |          |      |       |               |

Drawdown Time = Incremental Volume / Q / 60sec/min

### Summary

Total Volume = 11,947 cf  
 Total Time = 3,920 min  
 Total Time = 2.72 days

## Proposed Stormwater Wetland

*Anti-Floatation Calculations for OCS*

### Project Information

Project Name: 7-Eleven (Zebulon)

Project #: 220163-01-002

Designed by: MCB Date: 9/27/2023

Revised by: MCB Date: 12/4/2023

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

### Site Information

Sub Area Location: Drainage to Proposed Stormwater Wetland

Drainage Area (DA) = 3.16 Acres

Impervious Area (IA) = 1.91 Acres

Percent Impervious (I) = 60.43 % (Drainage Area)

### Anti-Flotation Device

4' x 4' Outlet Structure

Area: 16.0 sf

Volume: 64.0 cf

Weight: 3994 lbs

Factor of Safety 1.20

WT Req'd of Anti-Flotation Device: 4792 lbs

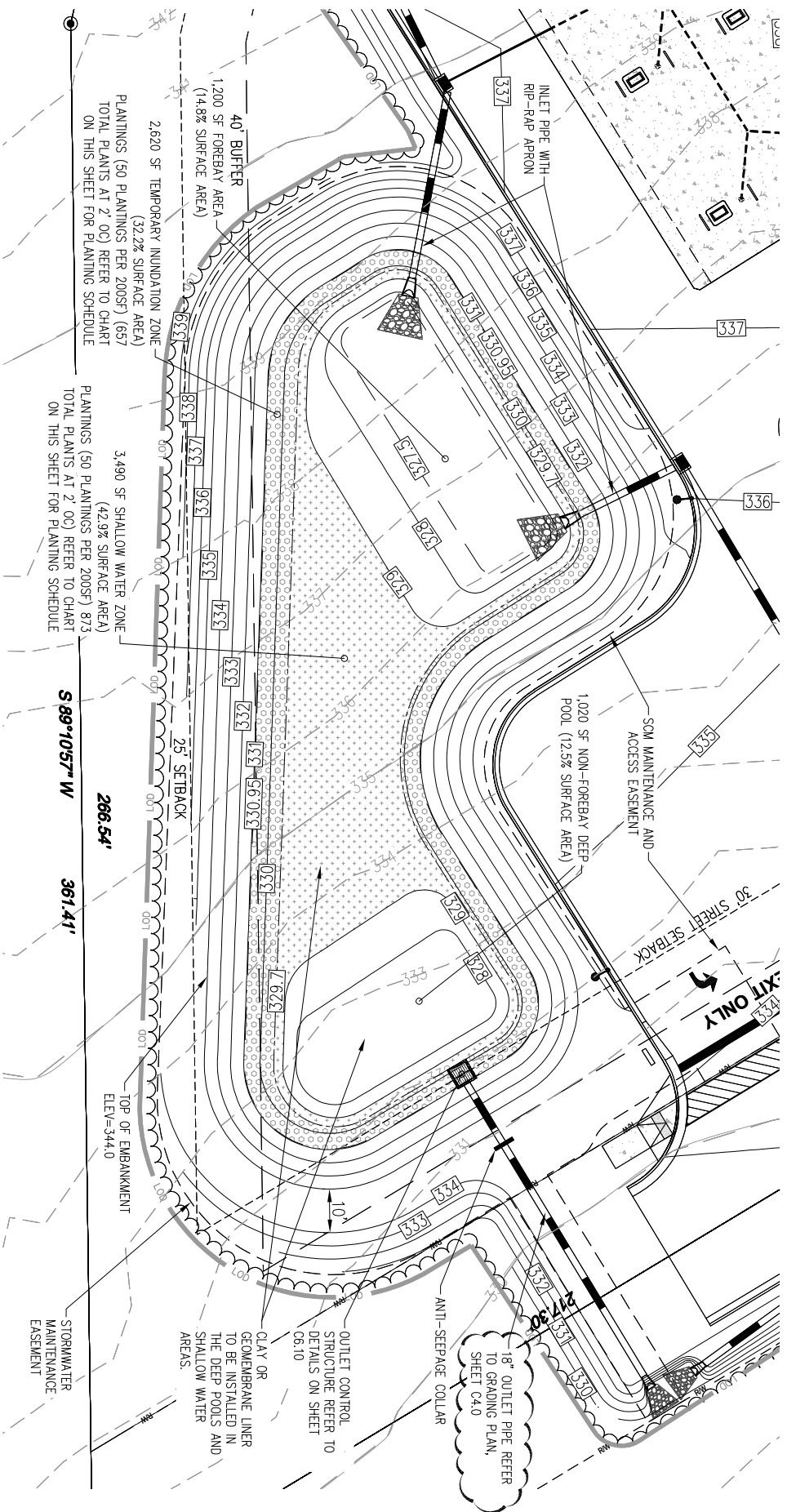
Volume of Concrete Req'd: 31.9 cf

Volume Provided: 69.5 cf

(Water Displaced - Top of Pond to Bottom of Pond)

(Unit WT of Concrete = 150 pcf)

(4'x4' riser x 2.0' = 32.0cf, 5'x5' footing x 1.5' = 37.5cf)



# PLAN VIEW

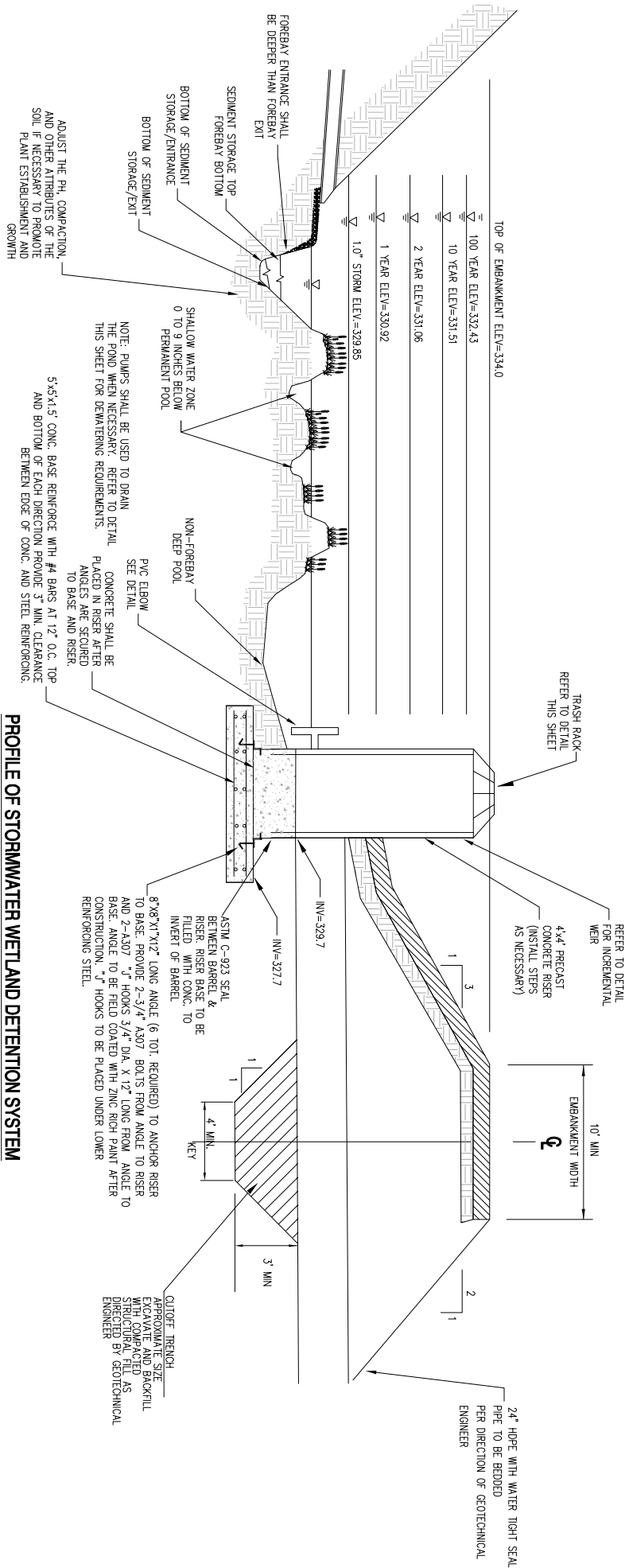


## GRAPHIC SCALE

( IN FEET )  
1 inch = 30 ft.



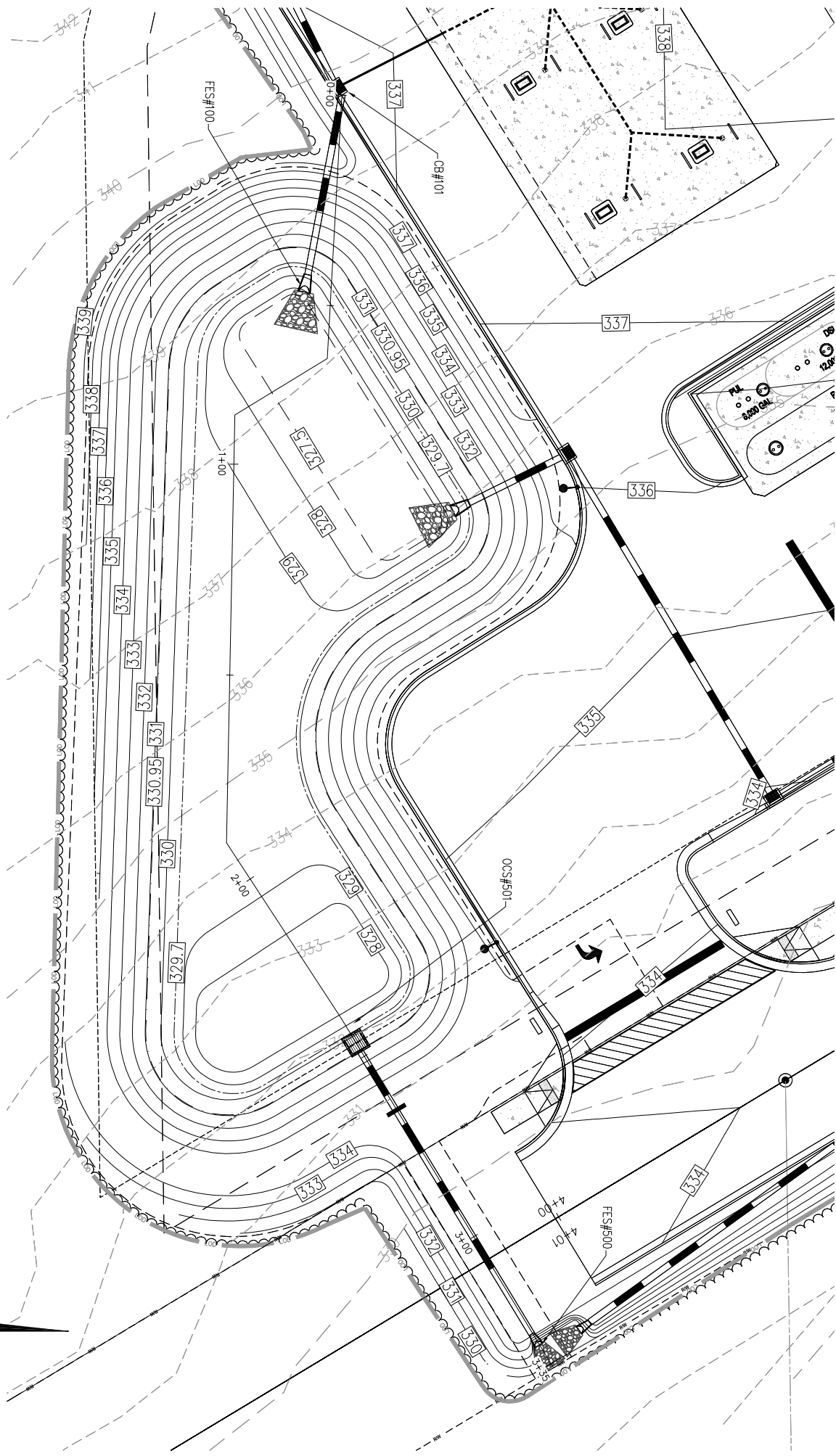
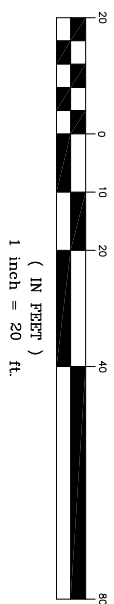


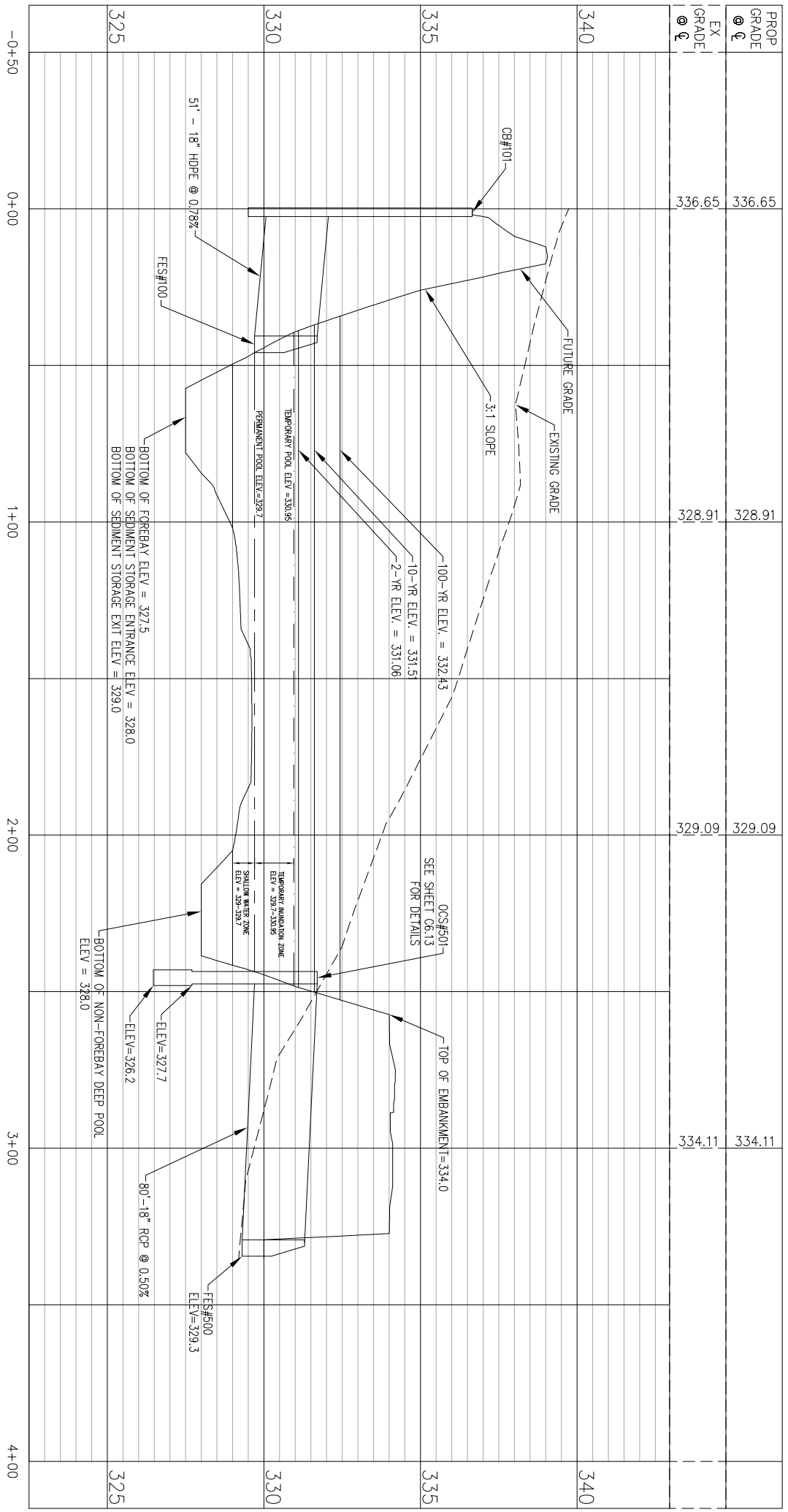


**PROFILE OF STORMWATER WETLAND DETENTION SYSTEM**  
 SCALE: N1:S

PLAN VIEW

GRAPHIC SCALE





POND PROFILE VIEW

HORIZONTAL SCALE: 1"=30'

VERTICAL SCALE: 1"=3'

| STAGE/STORAGE TABLE |                |                   |                          |                    |
|---------------------|----------------|-------------------|--------------------------|--------------------|
| STAGE (FT)          | ELEVATION (FT) | CONTOUR AREA (SF) | INCREMENTAL STORAGE (CF) | TOTAL STORAGE (CF) |
| 0.0                 | 329.7          | 8,130             | 0                        | 0                  |
| 0.3                 | 330.0          | 8,980             | 2,566                    | 2,566              |
| 1.25                | 330.95         | 10,770            | 9,381                    | 11,948 (WQV)       |
| 1.3                 | 331.0          | 10,840            | 540                      | 12,488             |
| 2.3                 | 332.0          | 12,400            | 11,620                   | 24,108             |
| 3.3                 | 333.0          | 14,010            | 13,205                   | 37,313             |
| 4.3                 | 334.0          | 15,680            | 14,845                   | 52,158             |

### STORMWATER MANAGEMENT DESIGN STORMWATER WETLAND:


RIVER BASIN: NEUSE  
 RECEIVING STREAM: MOCCASIN CREEK  
 STREAM INDEX: 27-86-2-4  
 STREAM CLASS: C;NSW  
 HUC: 03020203  
 PROJECT COORDINATES: 35.836261N, -78.321664W

#### POND DESIGN SUMMARY

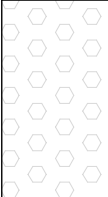
DRAINAGE AREA TO POND: 3.16 ACRES  
 SITE IMPERVIOUS AREA TO POND: 1.77 ACRES  
 OFF-SITE DESIGN IMPERVIOUS AREA TO POND: 0.14 ACRES  
 TOTAL DESIGN IMPERVIOUS AREA TO POND: 1.91 ACRES

|                        | PRE-DEVELOPED<br>TO POND | POST-DEVELOPED<br>TO POND | POST DEVELOPED<br>THROUGH POND | POST DEVELOPED<br>BYPASS | POST DEVELOPED<br>COMBINED |
|------------------------|--------------------------|---------------------------|--------------------------------|--------------------------|----------------------------|
| DRAINAGE AREA:         | 3.41 AC                  | 3.16 AC                   |                                | 0.13 AC                  |                            |
| CURVE NUMBER:          | 57                       | 83                        |                                | 73                       |                            |
| TIME OF CONCENTRATION: | 24 MIN                   | 5 MIN                     |                                | 10 MIN                   |                            |
| 1.0" STORM EVENT:      |                          | 0.245 CFS                 | 0.018 CFS                      |                          |                            |
| 1-YEAR STORM EVENT:    | 0.224 CFS                | 7.077 CFS                 | 0.062 CFS                      | 0.136 CFS                | 0.198 CFS                  |
| 2-YEAR STORM EVENT:    | 0.743 CFS                | 9.702 CFS                 | 0.263 CFS                      | 0.212 CFS                | 0.475 CFS                  |
| 10-EAR STORM EVENT:    | 3.321 CFS                | 17.25 CFS                 | 2.248 CFS                      | 0.449 CFS                | 2.697 CFS                  |
| 100-YEAR STORM EVENT:  | 9.617 CFS                | 30.29 CFS                 | 10.72 CFS                      | 0.902 CFS                | 11.62 CFS                  |

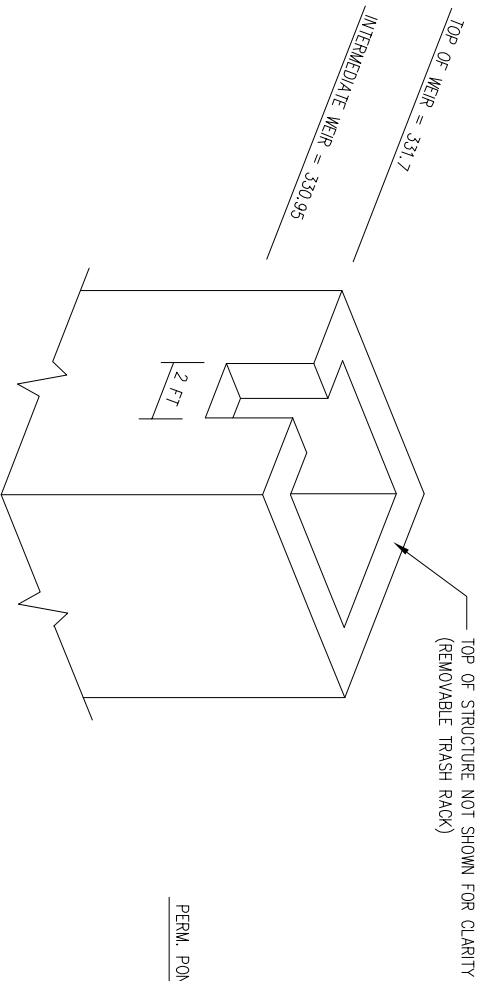
### TYPICAL SHALLOW WATER PLANTING SCHEDULE

|  | SCIENTIFIC NAME                | COMMON NAME        | PLANTING ZONE | QUANTITY | HEIGHT            | IDEAL DEPTH | NURSERY<br>CONTAINER TYPE | SPACING | PLANTING SEASON |
|--|--------------------------------|--------------------|---------------|----------|-------------------|-------------|---------------------------|---------|-----------------|
|  | Juncus effusus                 | Common Rush        | SHALLOW WATER | 291      | 9" FOLIAGE HEIGHT | 0-2"        | 4" TEA POT                | 2' O.C. | SPRING/SUMMER   |
|  | Lilaeopsis carolinensis        | Carolina Grasswort | SHALLOW WATER | 291      | 9" FOLIAGE HEIGHT | 0-9"        | 4" TEA POT                | 2' O.C. | SPRING/SUMMER   |
|  | Schoenoplectus tabernaemontani | Softstem Bulrush   | SHALLOW WATER | 291      | 9" FOLIAGE HEIGHT | 0-6"        | 4" TEA POT                | 2' O.C. | SPRING/SUMMER   |

### TYPICAL TEMPORARY INUNDATION ZONE PLANTING SCHEDULE

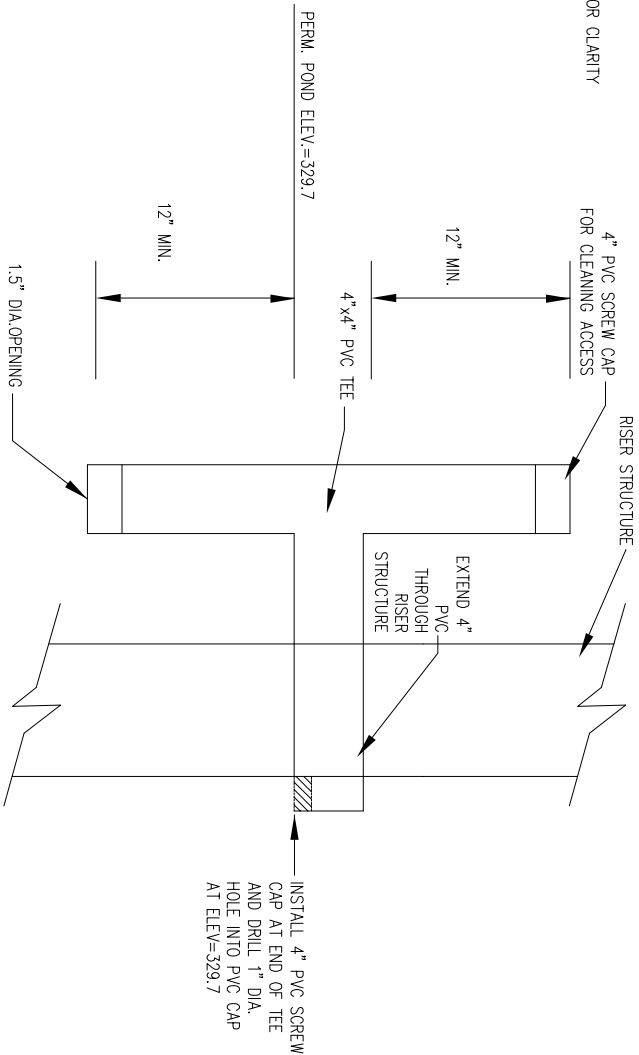
|   | SCIENTIFIC NAME       | COMMON NAME          | PLANTING ZONE | QUANTITY | HEIGHT            | NURSERY<br>CONTAINER TYPE | SPACING | PLANTING SEASON |
|---|-----------------------|----------------------|---------------|----------|-------------------|---------------------------|---------|-----------------|
|  | Eutrochium dubium     | Coastal Joy Pye Weed | SHALLOW LAND  | 219      | 9" FOLIAGE HEIGHT | 4" TEA POT                | 2' O.C. | SPRING/SUMMER   |
|   | Eupatorium erfoliatum | Boneset              | SHALLOW LAND  | 219      | 9" FOLIAGE HEIGHT | 4" TEA POT                | 2' O.C. | SPRING/SUMMER   |
|   | Rhynchospora colorata | Starrush Whitetop    | SHALLOW LAND  | 219      | 9" FOLIAGE HEIGHT | 4" TEA POT                | 2' O.C. | SPRING/SUMMER   |

### PLANTINGS



# **OUTLET CONTROL STRUCTURE - INCREMENTAL WEIR**

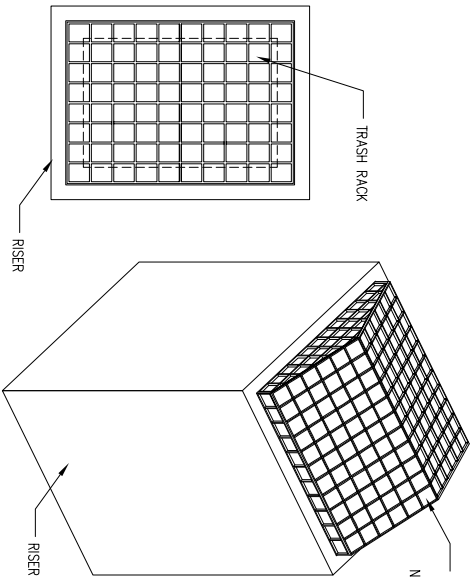
SCALE: N.T.S.



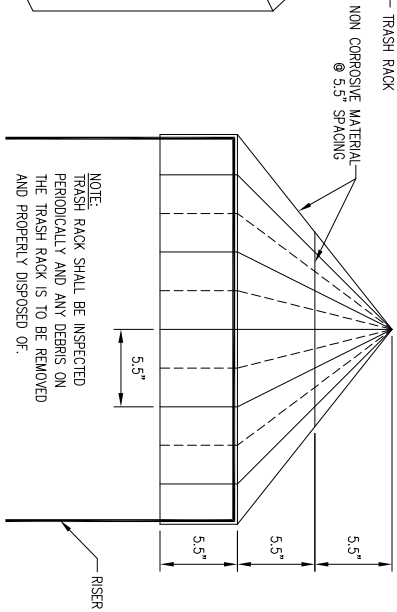
# **PVC DRAIN OUTLET**

SCALE: N.T.S.



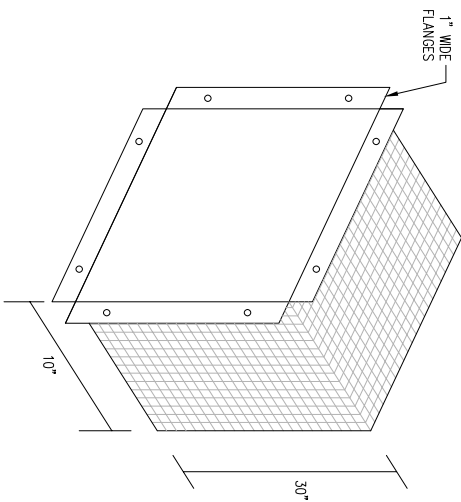


- NOTES:
1. SEE DESIGN PLANS FOR SPECIFIED DIMENSIONS OF RISER.
  2. TRASH RACK DIMENSION CRITERIA SPECIFIED IS APPROXIMATE AND VARIES BY MANUFACTURER.
  3. INSTALLATION OF TRASH RACK SHALL BE ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
  4. ALL COMPONENTS OF TRASH RACK SHALL BE OF STAINLESS STEEL OR OTHER NON-CORROSIVE MATERIAL.
  5. ALL MOUNTING HARDWARE SHALL BE OF STAINLESS STEEL OR OTHER NON-CORROSIVE MATERIAL.



NOTE:  
TRASH RACK SHALL BE INSPECTED PERIODICALLY AND ANY DEBRIS ON THE TRASH RACK IS TO BE REMOVED AND PROPERLY DISPOSED OF.

### TRASH RACK DETAIL



CONTRACTOR SHALL FABRICATE THE TRASH TRAP FROM  $\frac{3}{8}$ " MESH, GALVANIZED WIRE, ATTACHED TO CONCRETE STRUCTURE TO BE MADE USING 8-#8 STAINLESS STEEL CONCRETE SCREWS AND WASHERS.

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

| Hyd. No.                          | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft)    | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description    |
|-----------------------------------|--------------------------|-----------------|---------------------|--------------------|-----------------------|---------------|------------------------|-------------------------|---------------------------|
| 1                                 | SCS Runoff               | 0.224           | 2                   | 740                | 2,464                 | -----         | -----                  | -----                   | BMP Pre-Developed         |
| 2                                 | SCS Runoff               | 7.077           | 2                   | 718                | 14,268                | -----         | -----                  | -----                   | BMP Post-Developed        |
| 3                                 | Reservoir                | 0.062           | 2                   | 1442               | 13,023                | 2             | 330.92                 | 11,643                  | Post Through Detention    |
| 4                                 | SCS Runoff               | 0.136           | 2                   | 722                | 375                   | -----         | -----                  | -----                   | BMP Post-Developed Bypass |
| 7                                 | SCS Runoff               | 0.245           | 2                   | 152                | 1,420                 | -----         | -----                  | -----                   | BMP Post-Developed        |
| 8                                 | Reservoir                | 0.018           | 2                   | 366                | 1,234                 | 7             | 329.85                 | 1,289                   | 1.0-in Storm Thru Pond    |
| Stormwater Wetland-(7-Eleven).gpw |                          |                 |                     |                    | Return Period: 1 Year |               |                        | Tuesday, 12 / 5 / 2023  |                           |

# Hydrograph Report

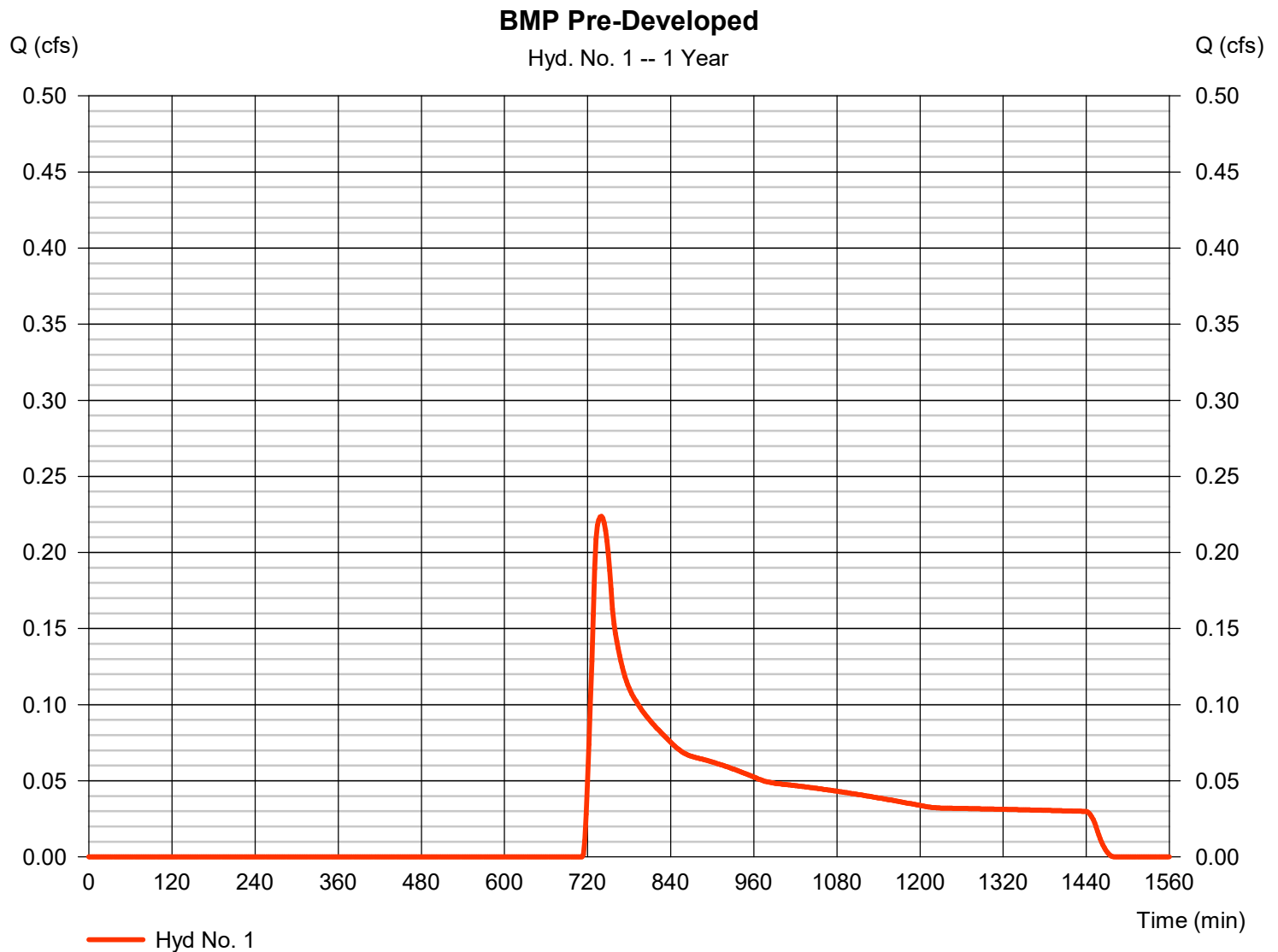
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 1

### BMP Pre-Developed

|                 |              |                    |              |
|-----------------|--------------|--------------------|--------------|
| Hydrograph type | = SCS Runoff | Peak discharge     | = 0.224 cfs  |
| Storm frequency | = 1 yrs      | Time to peak       | = 740 min    |
| Time interval   | = 2 min      | Hyd. volume        | = 2,464 cuft |
| Drainage area   | = 3.410 ac   | Curve number       | = 57         |
| Basin Slope     | = 0.0 %      | Hydraulic length   | = 0 ft       |
| Tc method       | = User       | Time of conc. (Tc) | = 24.00 min  |
| Total precip.   | = 2.85 in    | Distribution       | = Type II    |
| Storm duration  | = 24 hrs     | Shape factor       | = 484        |

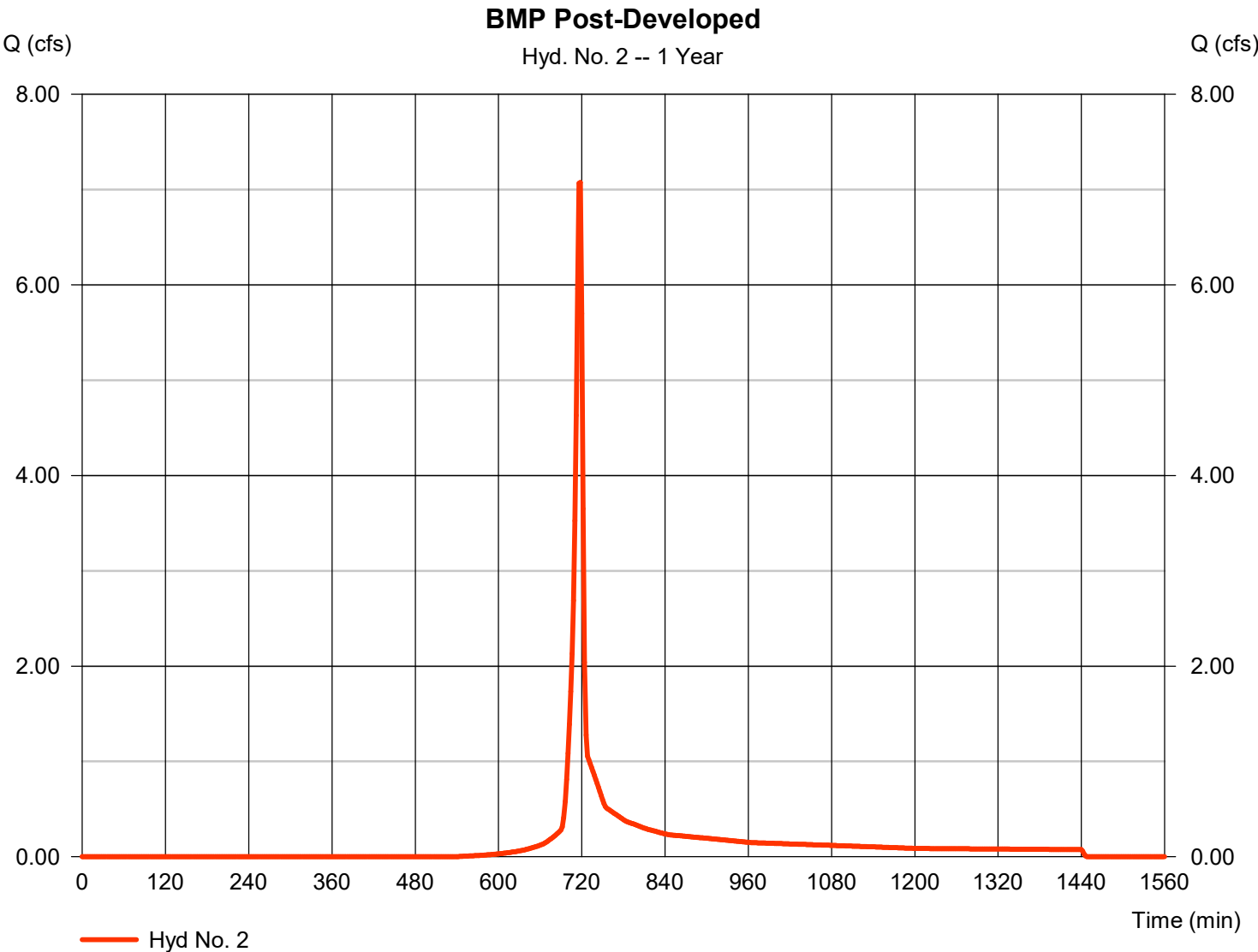


# Hydrograph Report

## Hyd. No. 2

BMP Post-Developed

|                 |   |            |                    |   |             |
|-----------------|---|------------|--------------------|---|-------------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 7.077 cfs   |
| Storm frequency | = | 1 yrs      | Time to peak       | = | 718 min     |
| Time interval   | = | 2 min      | Hyd. volume        | = | 14,268 cuft |
| Drainage area   | = | 3.160 ac   | Curve number       | = | 83          |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft        |
| Tc method       | = | User       | Time of conc. (Tc) | = | 5.00 min    |
| Total precip.   | = | 2.85 in    | Distribution       | = | Type II     |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484         |



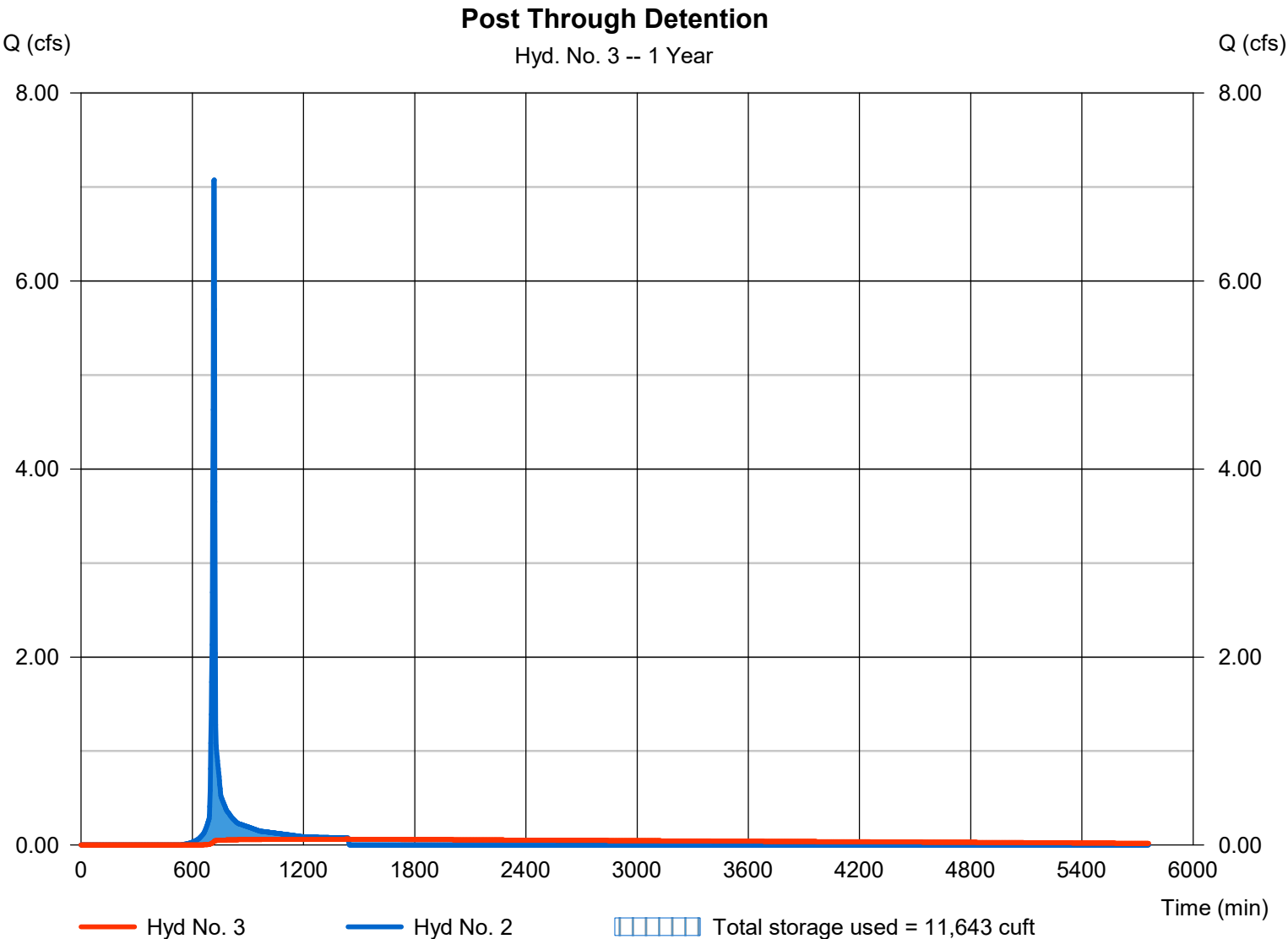
# Hydrograph Report

## Hyd. No. 3

### Post Through Detention

|                 |                          |                |               |
|-----------------|--------------------------|----------------|---------------|
| Hydrograph type | = Reservoir              | Peak discharge | = 0.062 cfs   |
| Storm frequency | = 1 yrs                  | Time to peak   | = 1442 min    |
| Time interval   | = 2 min                  | Hyd. volume    | = 13,023 cuft |
| Inflow hyd. No. | = 2 - BMP Post-Developed | Max. Elevation | = 330.92 ft   |
| Reservoir name  | = BMP Pond               | Max. Storage   | = 11,643 cuft |

Storage Indication method used.





Pond No. 1 - BMP Pond

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 329.70 ft

Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00       | 329.70         | 8,130               | 0                    | 0                    |
| 0.30       | 330.00         | 8,980               | 2,566                | 2,566                |
| 1.25       | 330.95         | 10,770              | 9,381                | 11,948               |
| 1.30       | 331.00         | 10,840              | 540                  | 12,488               |
| 2.30       | 332.00         | 12,400              | 11,620               | 24,108               |
| 3.30       | 333.00         | 14,010              | 13,205               | 37,313               |
| 4.30       | 334.00         | 15,680              | 14,845               | 52,158               |

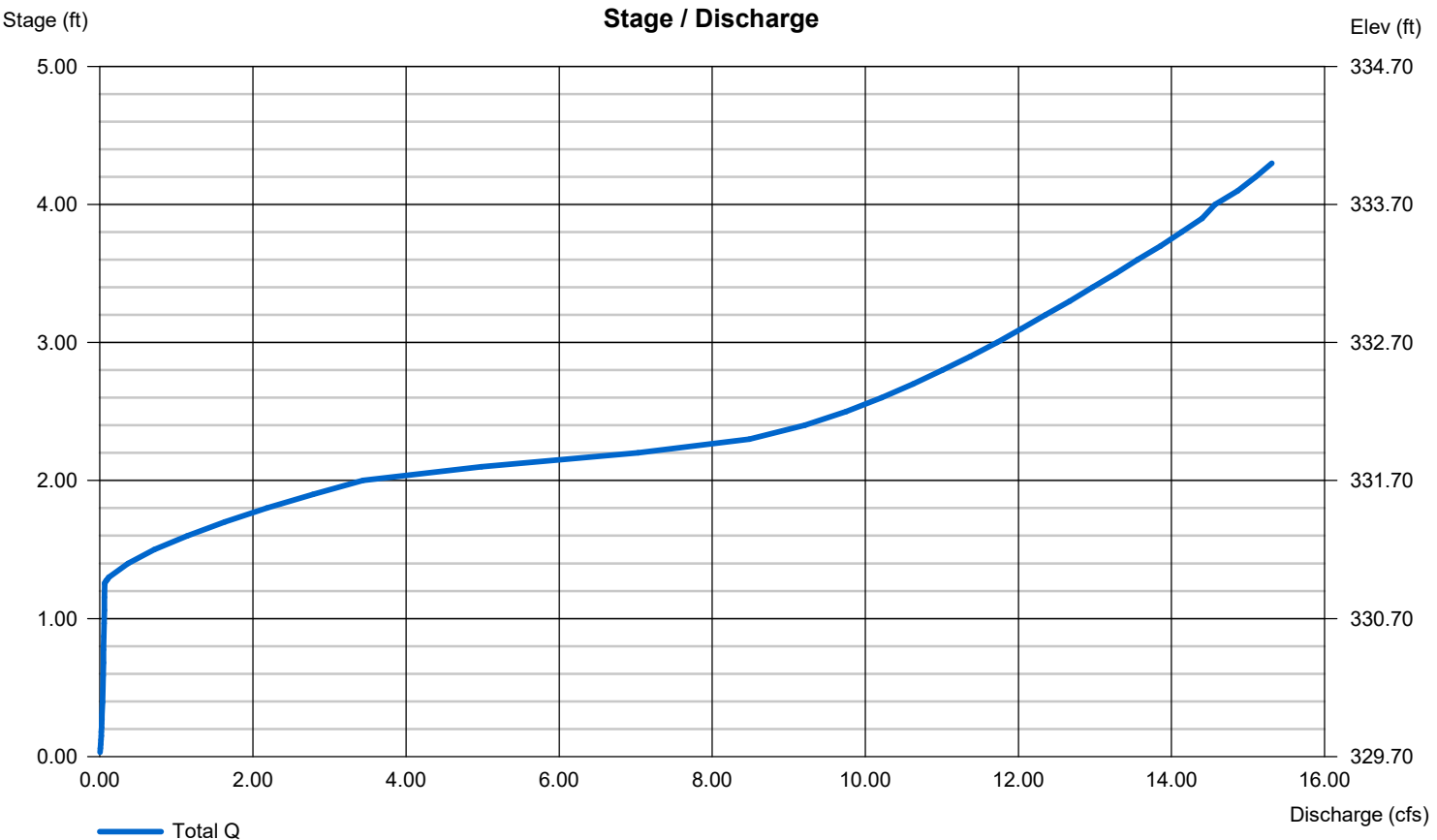
Culvert / Orifice Structures

|                 | [A]      | [B]    | [C]      | [PrfRsr] |
|-----------------|----------|--------|----------|----------|
| Rise (in)       | = 18.00  | 1.50   | Inactive | 0.00     |
| Span (in)       | = 18.00  | 1.50   | 0.00     | 0.00     |
| No. Barrels     | = 1      | 1      | 1        | 0        |
| Invert El. (ft) | = 329.70 | 329.70 | 330.95   | 0.00     |
| Length (ft)     | = 62.00  | 0.50   | 0.00     | 0.00     |
| Slope (%)       | = 0.50   | 1.00   | 0.00     | n/a      |
| N-Value         | = .013   | .013   | .013     | n/a      |
| Orifice Coeff.  | = 0.60   | 0.60   | 0.60     | 0.60     |
| Multi-Stage     | = n/a    | Yes    | No       | No       |

Weir Structures

|                | [A]                  | [B]    | [C]      | [D]      |
|----------------|----------------------|--------|----------|----------|
| Crest Len (ft) | = 2.00               | 14.00  | Inactive | Inactive |
| Crest El. (ft) | = 330.95             | 331.70 | 0.00     | 0.00     |
| Weir Coeff.    | = 2.60               | 2.60   | 3.33     | 3.33     |
| Weir Type      | = Rect               | Broad  | Rect     | ---      |
| Multi-Stage    | = Yes                | Yes    | No       | No       |
| Exfil.(in/hr)  | = 0.000 (by Contour) |        |          |          |
| TW Elev. (ft)  | = 0.00               |        |          |          |

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

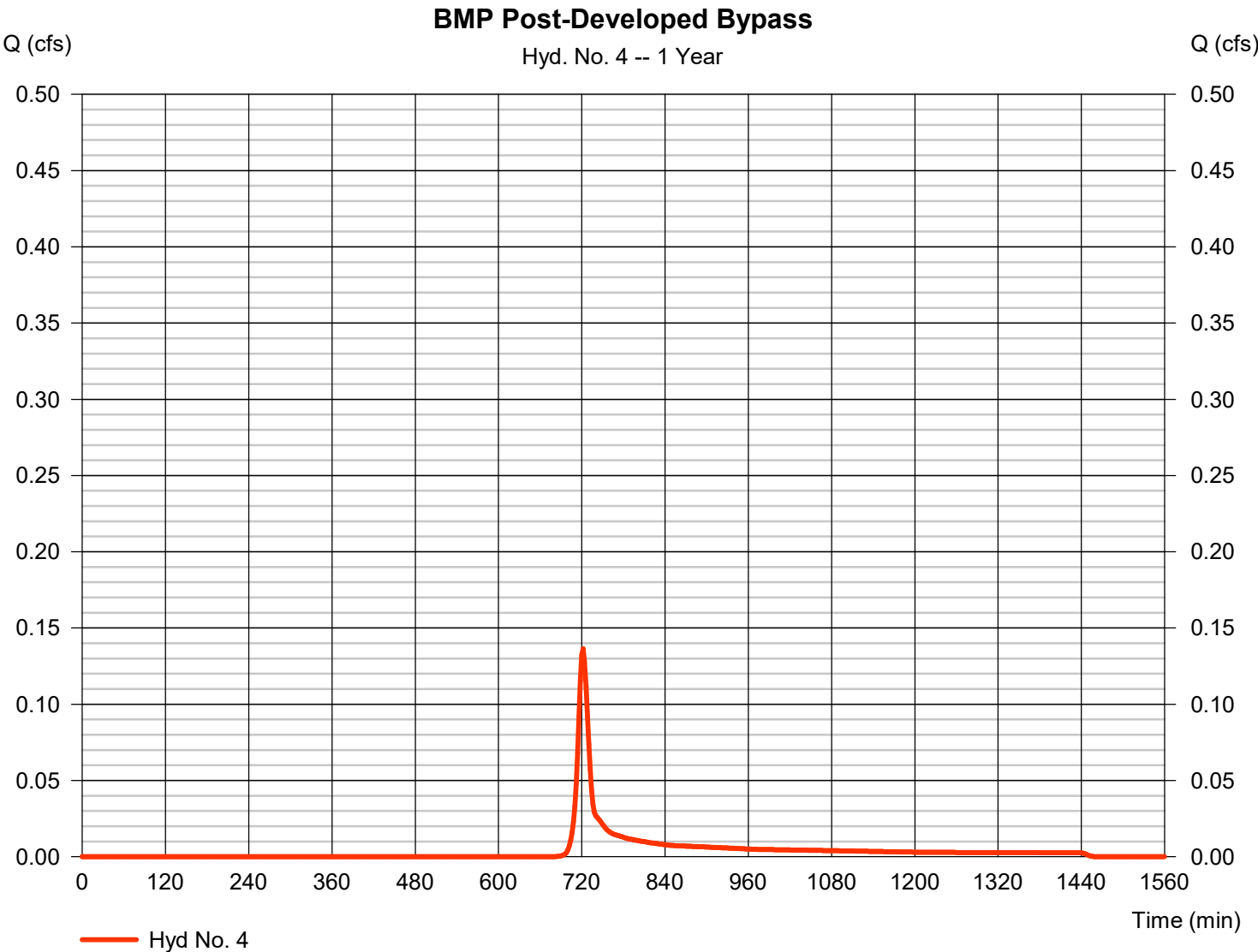


# Hydrograph Report

## Hyd. No. 4

### BMP Post-Developed Bypass

|                 |   |            |                    |   |           |
|-----------------|---|------------|--------------------|---|-----------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 0.136 cfs |
| Storm frequency | = | 1 yrs      | Time to peak       | = | 722 min   |
| Time interval   | = | 2 min      | Hyd. volume        | = | 375 cuft  |
| Drainage area   | = | 0.130 ac   | Curve number       | = | 73.1      |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft      |
| Tc method       | = | User       | Time of conc. (Tc) | = | 10.00 min |
| Total precip.   | = | 2.85 in    | Distribution       | = | Type II   |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484       |



# Hydrograph Report

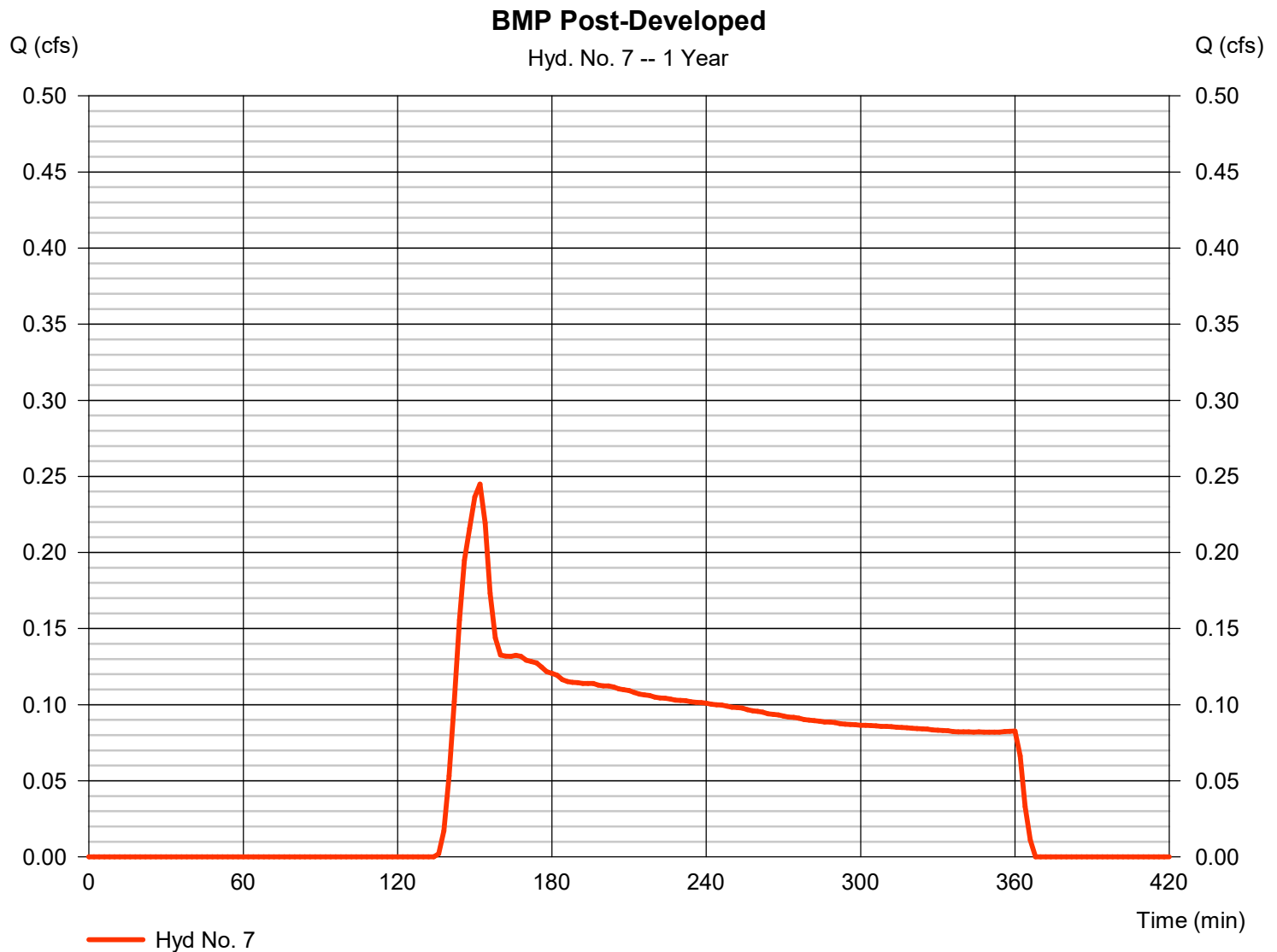
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 7

### BMP Post-Developed

|                 |              |                    |              |
|-----------------|--------------|--------------------|--------------|
| Hydrograph type | = SCS Runoff | Peak discharge     | = 0.245 cfs  |
| Storm frequency | = 1 yrs      | Time to peak       | = 152 min    |
| Time interval   | = 2 min      | Hyd. volume        | = 1,420 cuft |
| Drainage area   | = 3.160 ac   | Curve number       | = 83         |
| Basin Slope     | = 0.0 %      | Hydraulic length   | = 0 ft       |
| Tc method       | = User       | Time of conc. (Tc) | = 5.00 min   |
| Total precip.   | = 1.00 in    | Distribution       | = SCS 6-Hr   |
| Storm duration  | = 6.00 hrs   | Shape factor       | = 484        |



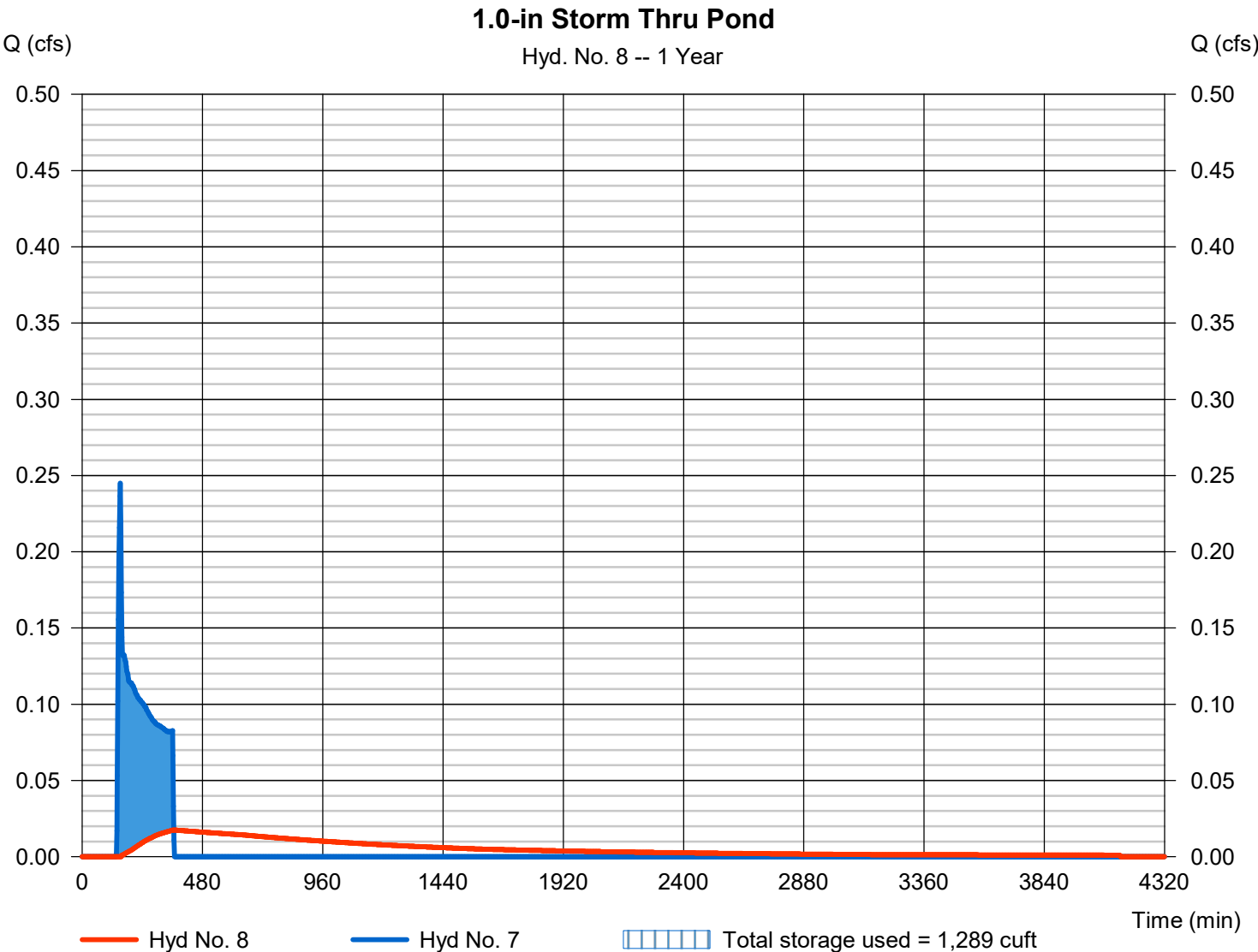
# Hydrograph Report

## Hyd. No. 8

1.0-in Storm Thru Pond

|                 |                          |                |              |
|-----------------|--------------------------|----------------|--------------|
| Hydrograph type | = Reservoir              | Peak discharge | = 0.018 cfs  |
| Storm frequency | = 1 yrs                  | Time to peak   | = 366 min    |
| Time interval   | = 2 min                  | Hyd. volume    | = 1,234 cuft |
| Inflow hyd. No. | = 7 - BMP Post-Developed | Max. Elevation | = 329.85 ft  |
| Reservoir name  | = BMP Pond               | Max. Storage   | = 1,289 cuft |

Storage Indication method used.



Pond No. 1 - BMP Pond

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 329.70 ft

Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00       | 329.70         | 8,130               | 0                    | 0                    |
| 0.30       | 330.00         | 8,980               | 2,566                | 2,566                |
| 1.25       | 330.95         | 10,770              | 9,381                | 11,948               |
| 1.30       | 331.00         | 10,840              | 540                  | 12,488               |
| 2.30       | 332.00         | 12,400              | 11,620               | 24,108               |
| 3.30       | 333.00         | 14,010              | 13,205               | 37,313               |
| 4.30       | 334.00         | 15,680              | 14,845               | 52,158               |

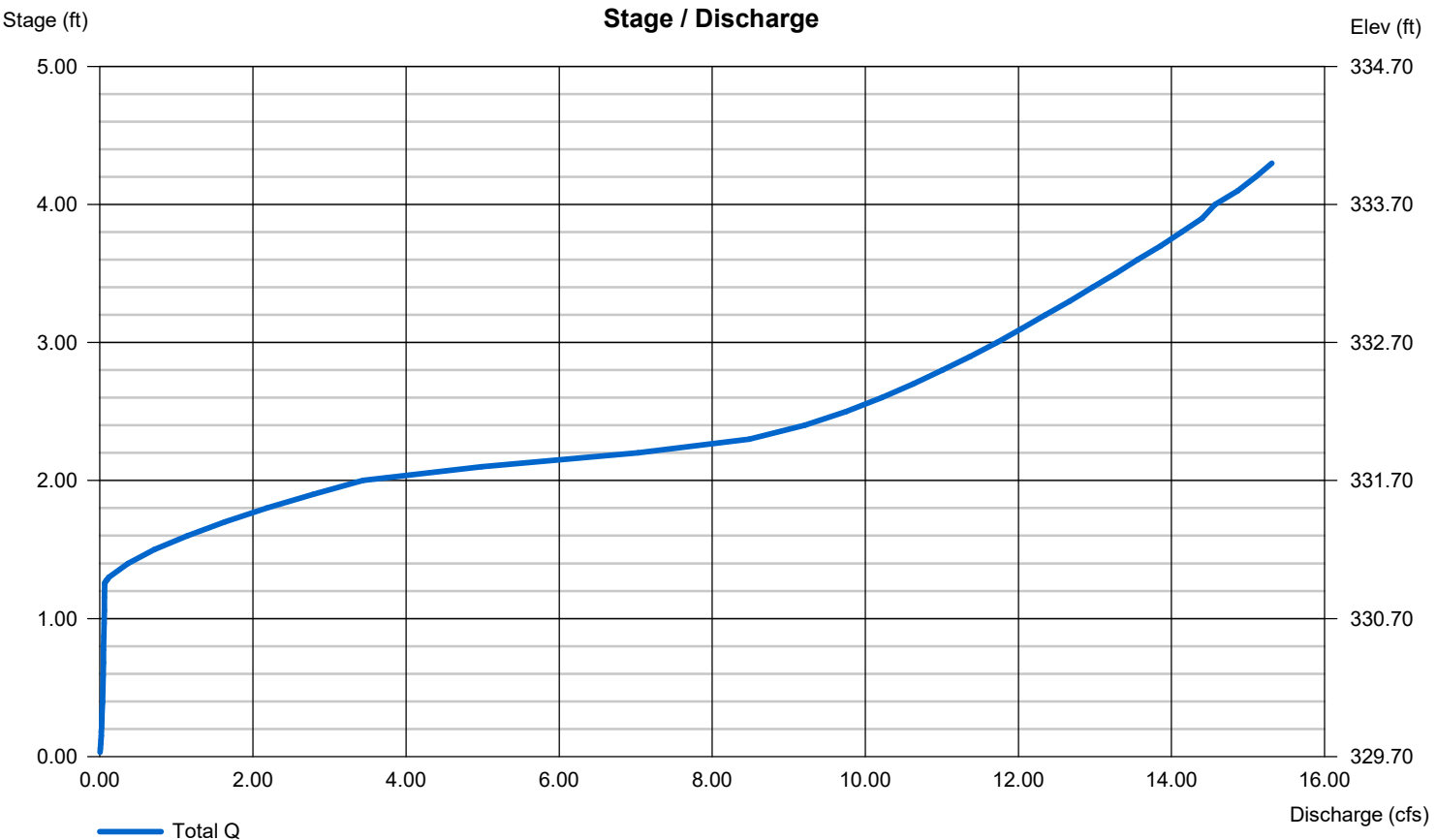
Culvert / Orifice Structures

|                 | [A]      | [B]    | [C]      | [PrfRsr] |
|-----------------|----------|--------|----------|----------|
| Rise (in)       | = 18.00  | 1.50   | Inactive | 0.00     |
| Span (in)       | = 18.00  | 1.50   | 0.00     | 0.00     |
| No. Barrels     | = 1      | 1      | 1        | 0        |
| Invert El. (ft) | = 329.70 | 329.70 | 330.95   | 0.00     |
| Length (ft)     | = 62.00  | 0.50   | 0.00     | 0.00     |
| Slope (%)       | = 0.50   | 1.00   | 0.00     | n/a      |
| N-Value         | = .013   | .013   | .013     | n/a      |
| Orifice Coeff.  | = 0.60   | 0.60   | 0.60     | 0.60     |
| Multi-Stage     | = n/a    | Yes    | No       | No       |

Weir Structures

|                | [A]                  | [B]    | [C]      | [D]      |
|----------------|----------------------|--------|----------|----------|
| Crest Len (ft) | = 2.00               | 14.00  | Inactive | Inactive |
| Crest El. (ft) | = 330.95             | 331.70 | 0.00     | 0.00     |
| Weir Coeff.    | = 2.60               | 2.60   | 3.33     | 3.33     |
| Weir Type      | = Rect               | Broad  | Rect     | ---      |
| Multi-Stage    | = Yes                | Yes    | No       | No       |
| Exfil.(in/hr)  | = 0.000 (by Contour) |        |          |          |
| TW Elev. (ft)  | = 0.00               |        |          |          |

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).





# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

| Hyd. No.                          | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft)    | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description    |
|-----------------------------------|--------------------------|-----------------|---------------------|--------------------|-----------------------|---------------|------------------------|-------------------------|---------------------------|
| 1                                 | SCS Runoff               | 0.743           | 2                   | 732                | 4,885                 | -----         | -----                  | -----                   | BMP Pre-Developed         |
| 2                                 | SCS Runoff               | 9.702           | 2                   | 716                | 19,625                | -----         | -----                  | -----                   | BMP Post-Developed        |
| 3                                 | Reservoir                | 0.263           | 2                   | 888                | 18,194                | 2             | 331.06                 | 13,164                  | Post Through Detention    |
| 4                                 | SCS Runoff               | 0.212           | 2                   | 722                | 564                   | -----         | -----                  | -----                   | BMP Post-Developed Bypass |
| 7                                 | SCS Runoff               | 0.000           | 2                   | n/a                | 0                     | -----         | -----                  | -----                   | BMP Post-Developed        |
| 8                                 | Reservoir                | 0.000           | 2                   | n/a                | 0                     | 7             | 329.70                 | 0.000                   | 1.0-in Storm Thru Pond    |
| Stormwater Wetland-(7-Eleven).gpw |                          |                 |                     |                    | Return Period: 2 Year |               |                        | Tuesday, 12 / 5 / 2023  |                           |

# Hydrograph Report

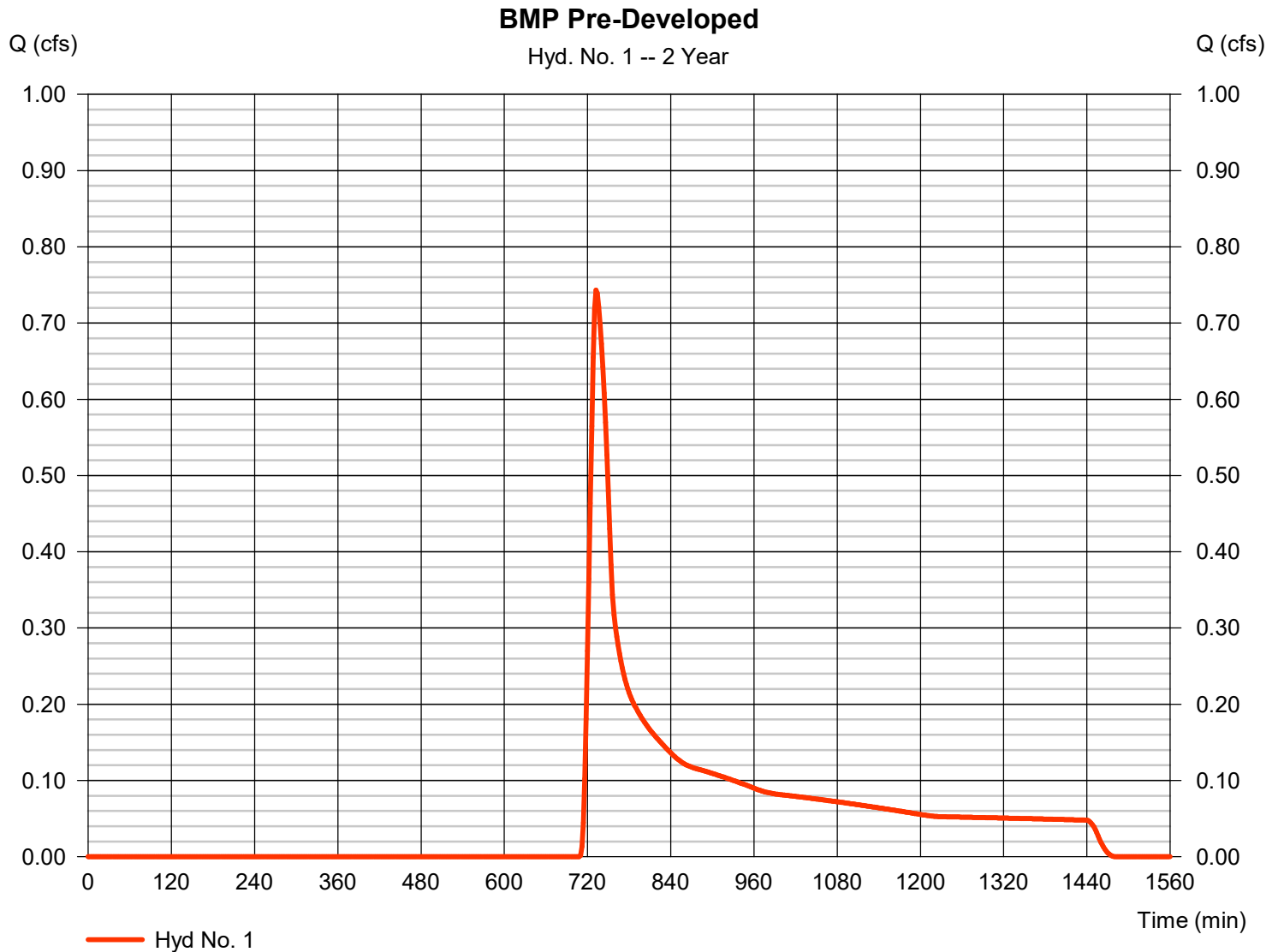
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 1

### BMP Pre-Developed

|                 |              |                    |              |
|-----------------|--------------|--------------------|--------------|
| Hydrograph type | = SCS Runoff | Peak discharge     | = 0.743 cfs  |
| Storm frequency | = 2 yrs      | Time to peak       | = 732 min    |
| Time interval   | = 2 min      | Hyd. volume        | = 4,885 cuft |
| Drainage area   | = 3.410 ac   | Curve number       | = 57         |
| Basin Slope     | = 0.0 %      | Hydraulic length   | = 0 ft       |
| Tc method       | = User       | Time of conc. (Tc) | = 24.00 min  |
| Total precip.   | = 3.46 in    | Distribution       | = Type II    |
| Storm duration  | = 24 hrs     | Shape factor       | = 484        |

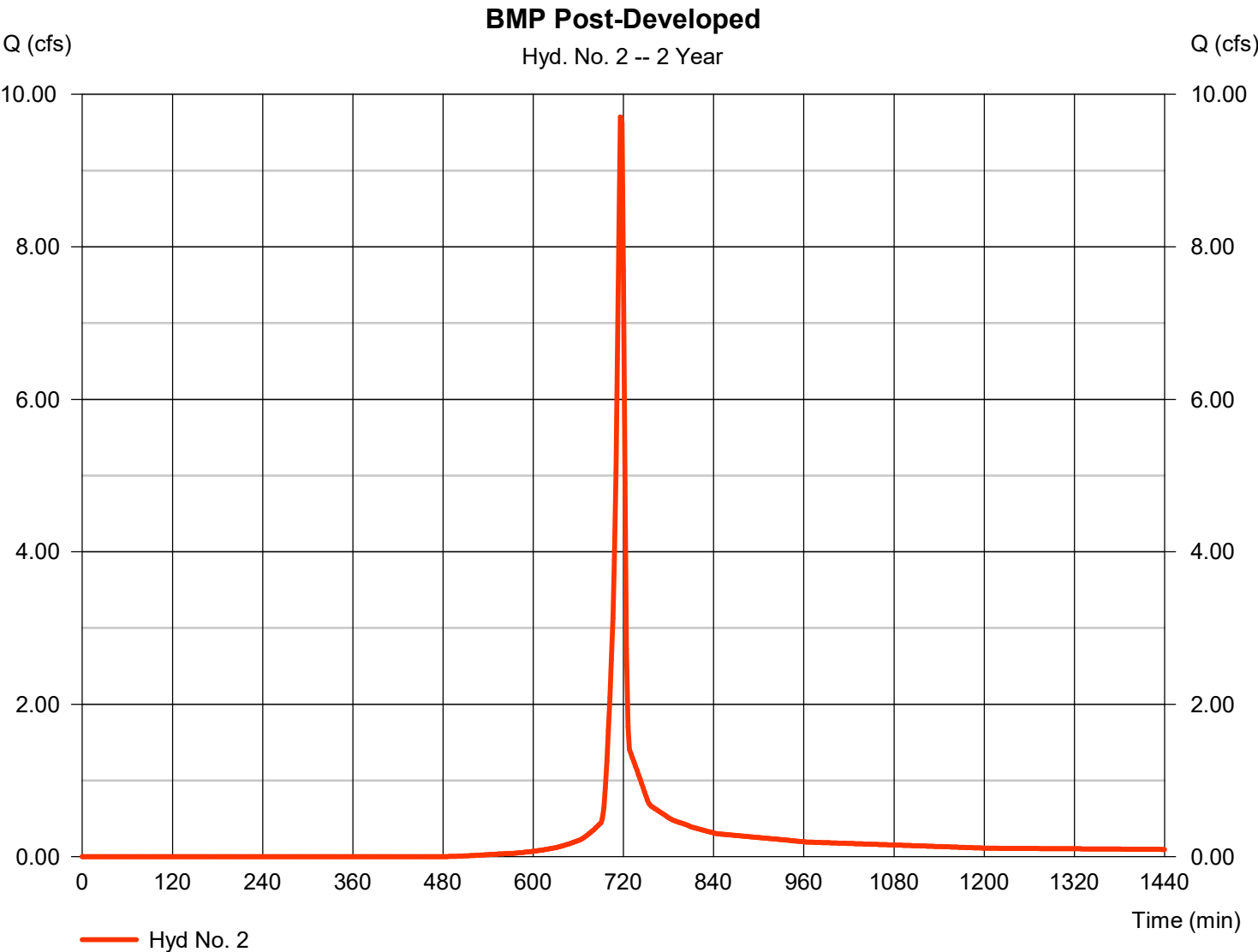


# Hydrograph Report

## Hyd. No. 2

BMP Post-Developed

|                 |   |            |                    |   |             |
|-----------------|---|------------|--------------------|---|-------------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 9.702 cfs   |
| Storm frequency | = | 2 yrs      | Time to peak       | = | 716 min     |
| Time interval   | = | 2 min      | Hyd. volume        | = | 19,625 cuft |
| Drainage area   | = | 3.160 ac   | Curve number       | = | 83          |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft        |
| Tc method       | = | User       | Time of conc. (Tc) | = | 5.00 min    |
| Total precip.   | = | 3.46 in    | Distribution       | = | Type II     |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484         |



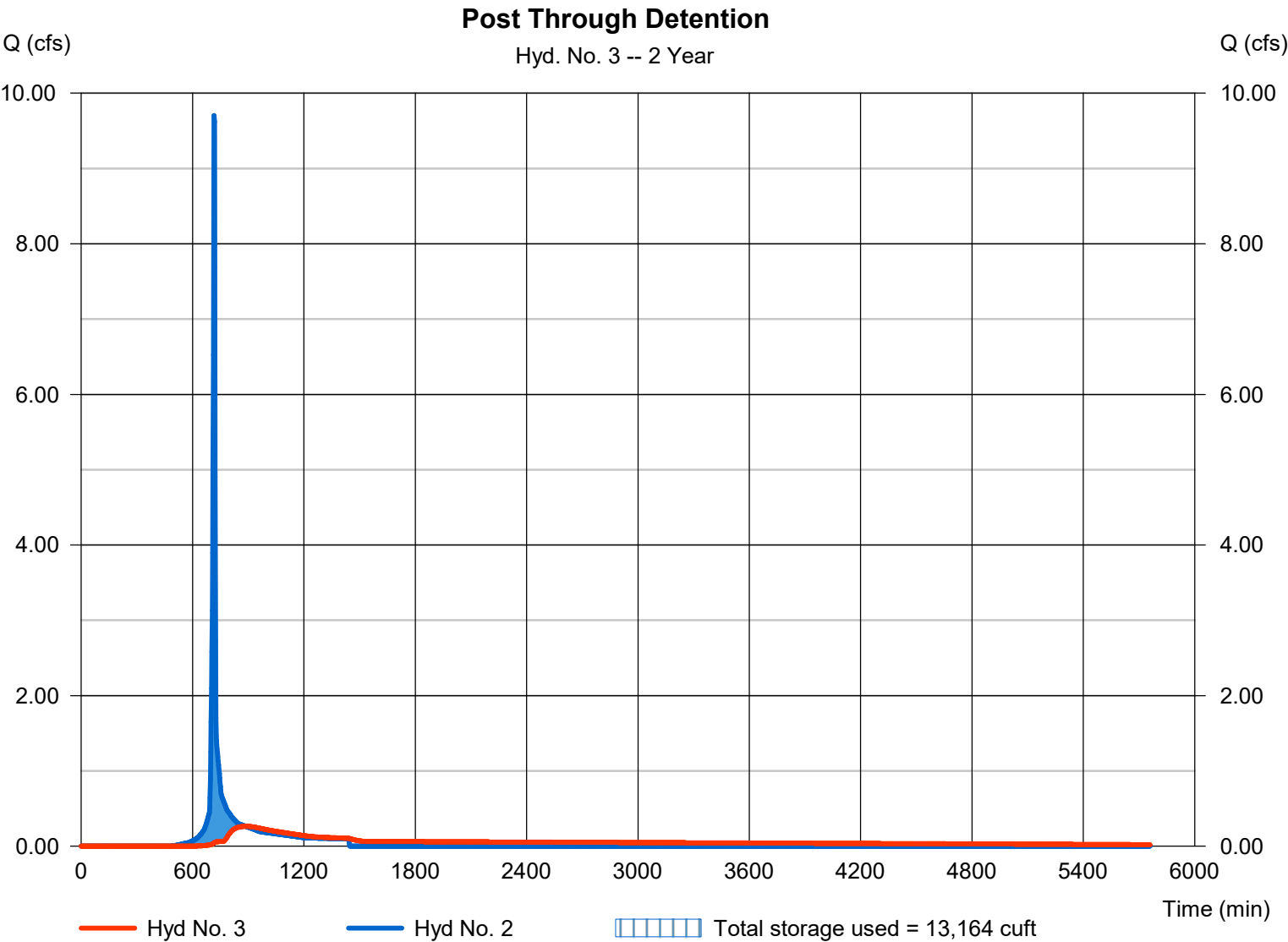
# Hydrograph Report

## Hyd. No. 3

### Post Through Detention

|                 |                          |                |               |
|-----------------|--------------------------|----------------|---------------|
| Hydrograph type | = Reservoir              | Peak discharge | = 0.263 cfs   |
| Storm frequency | = 2 yrs                  | Time to peak   | = 888 min     |
| Time interval   | = 2 min                  | Hyd. volume    | = 18,194 cuft |
| Inflow hyd. No. | = 2 - BMP Post-Developed | Max. Elevation | = 331.06 ft   |
| Reservoir name  | = BMP Pond               | Max. Storage   | = 13,164 cuft |

Storage Indication method used.



# Hydrograph Report

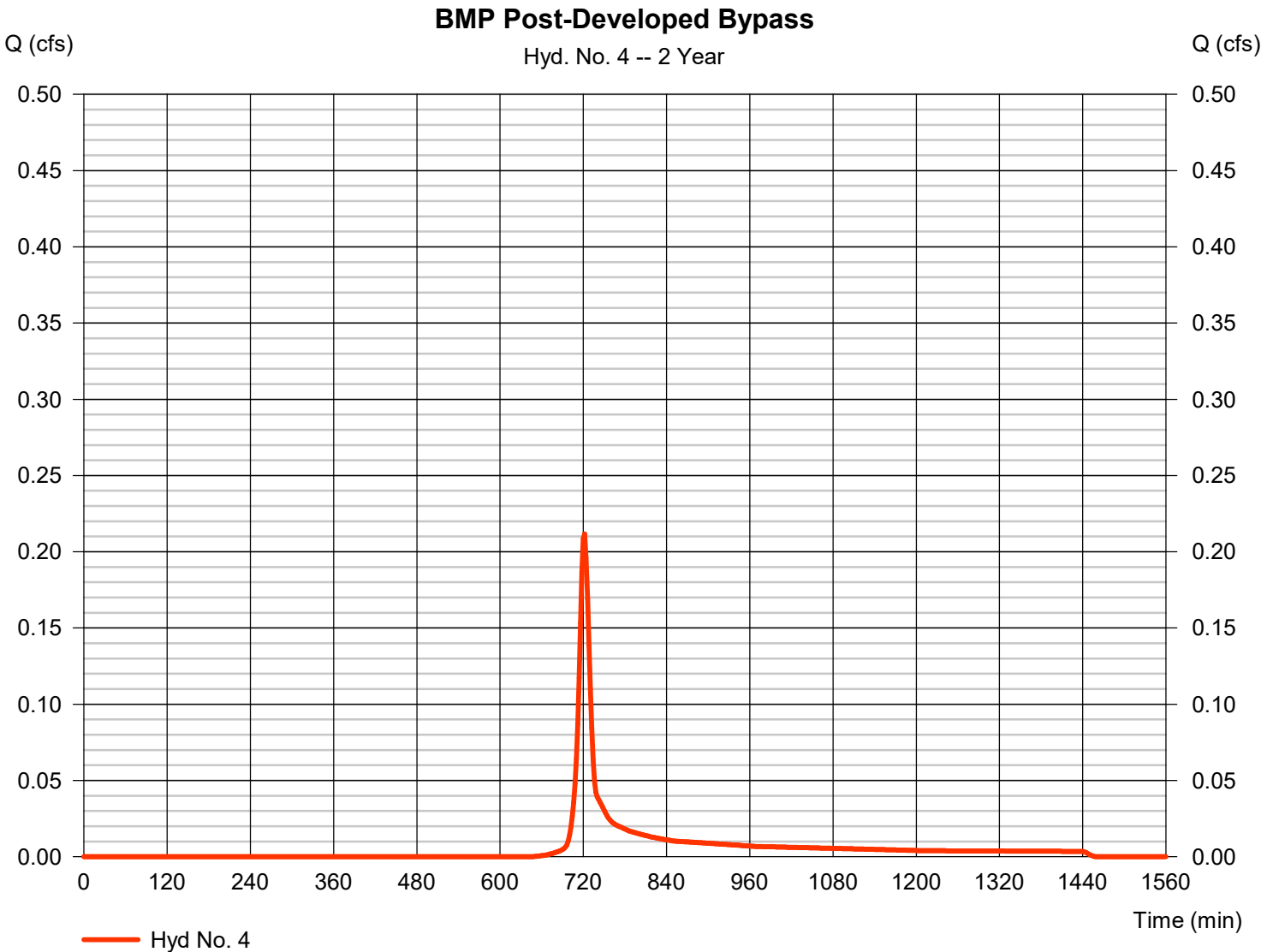
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 4

### BMP Post-Developed Bypass

|                 |   |            |                    |   |           |
|-----------------|---|------------|--------------------|---|-----------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 0.212 cfs |
| Storm frequency | = | 2 yrs      | Time to peak       | = | 722 min   |
| Time interval   | = | 2 min      | Hyd. volume        | = | 564 cuft  |
| Drainage area   | = | 0.130 ac   | Curve number       | = | 73.1      |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft      |
| Tc method       | = | User       | Time of conc. (Tc) | = | 10.00 min |
| Total precip.   | = | 3.46 in    | Distribution       | = | Type II   |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484       |

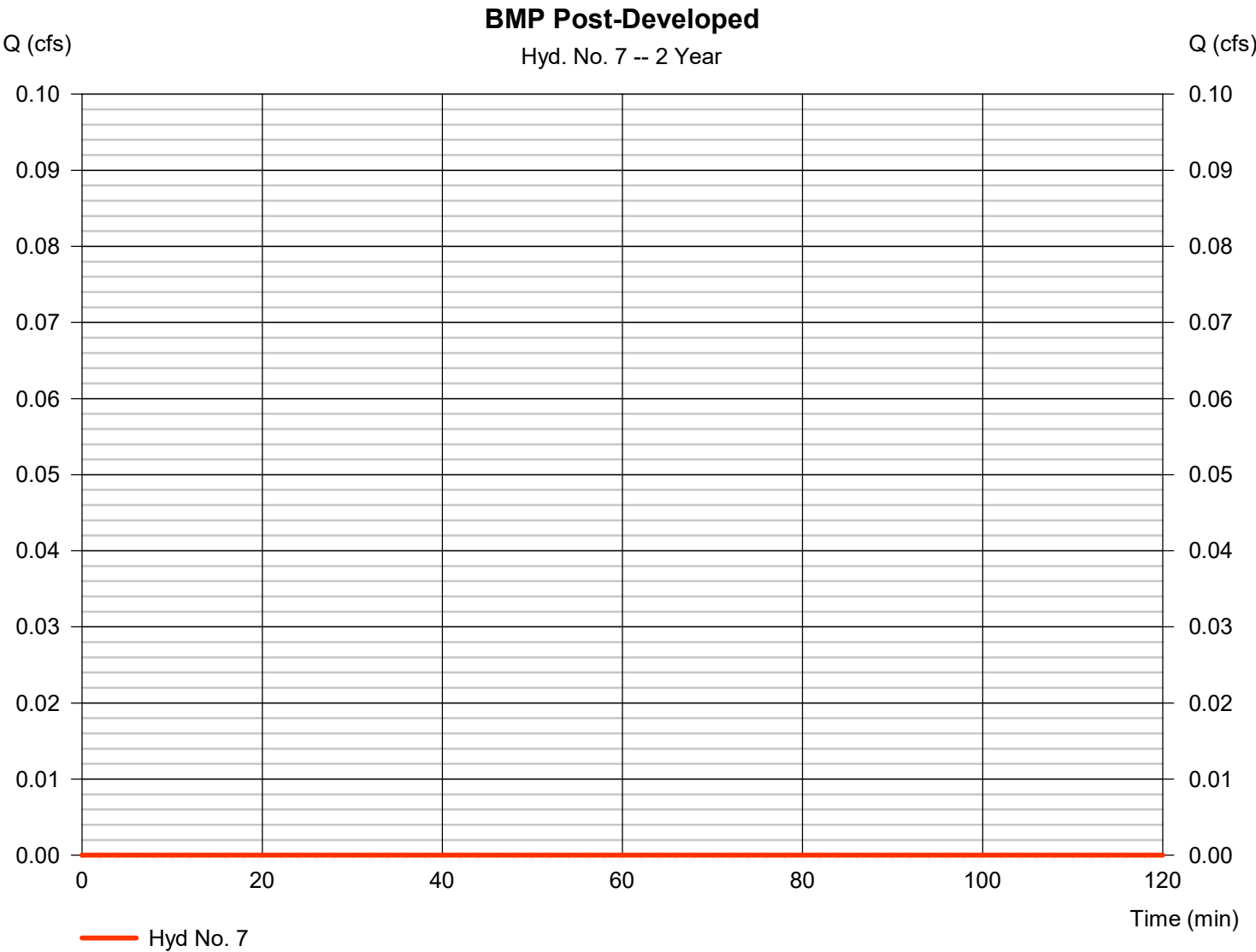


# Hydrograph Report

## Hyd. No. 7

BMP Post-Developed

|                 |              |                    |             |
|-----------------|--------------|--------------------|-------------|
| Hydrograph type | = SCS Runoff | Peak discharge     | = 0.000 cfs |
| Storm frequency | = 2 yrs      | Time to peak       | = n/a       |
| Time interval   | = 2 min      | Hyd. volume        | = 0 cuft    |
| Drainage area   | = 3.160 ac   | Curve number       | = 83        |
| Basin Slope     | = 0.0 %      | Hydraulic length   | = 0 ft      |
| Tc method       | = User       | Time of conc. (Tc) | = 5.00 min  |
| Total precip.   | = 0.00 in    | Distribution       | = SCS 6-Hr  |
| Storm duration  | = 6.00 hrs   | Shape factor       | = 484       |





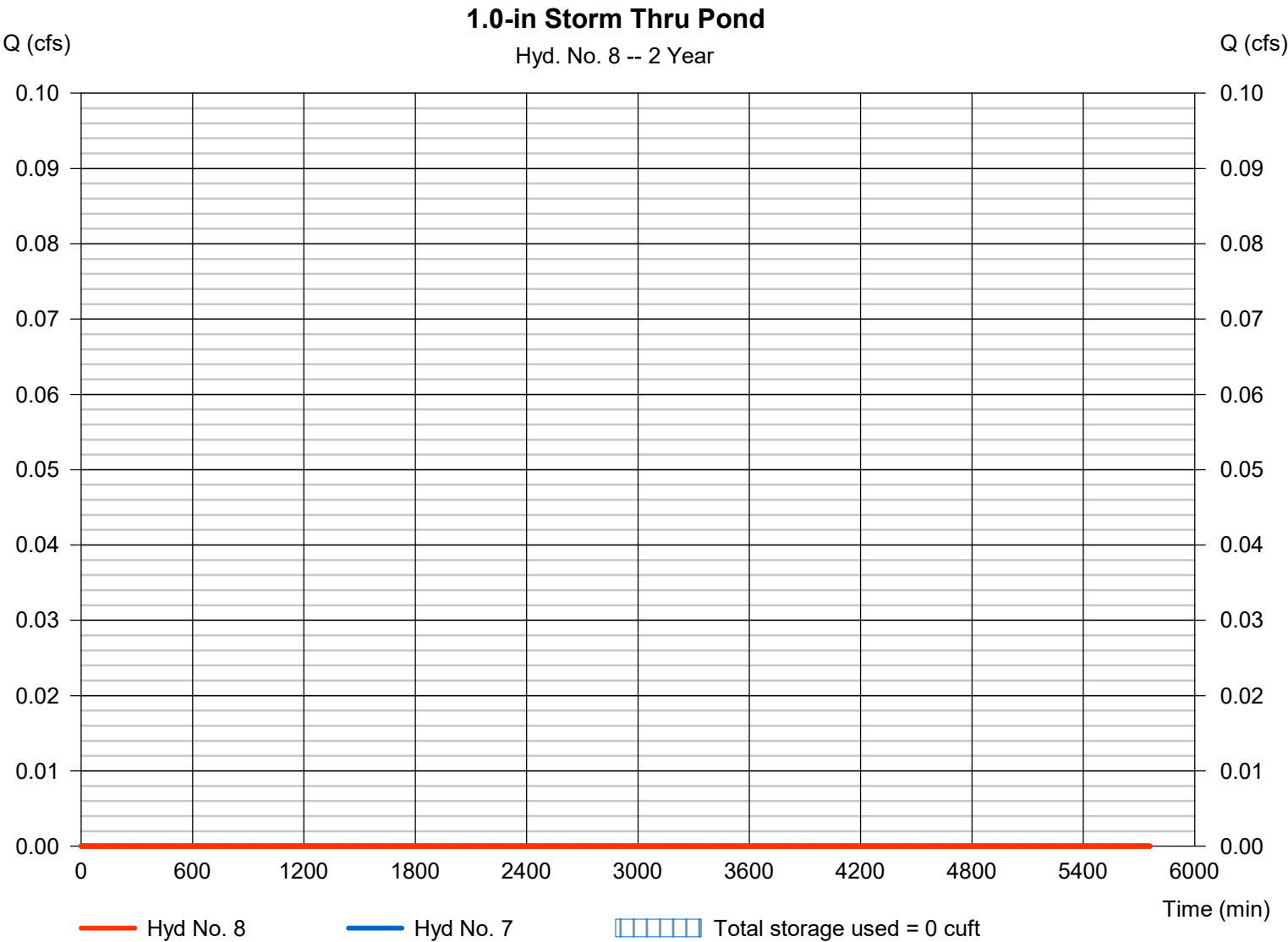
# Hydrograph Report

## Hyd. No. 8

1.0-in Storm Thru Pond

|                 |                          |                |             |
|-----------------|--------------------------|----------------|-------------|
| Hydrograph type | = Reservoir              | Peak discharge | = 0.000 cfs |
| Storm frequency | = 2 yrs                  | Time to peak   | = n/a       |
| Time interval   | = 2 min                  | Hyd. volume    | = 0 cuft    |
| Inflow hyd. No. | = 7 - BMP Post-Developed | Max. Elevation | = 329.70 ft |
| Reservoir name  | = BMP Pond               | Max. Storage   | = 0 cuft    |

Storage Indication method used.



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

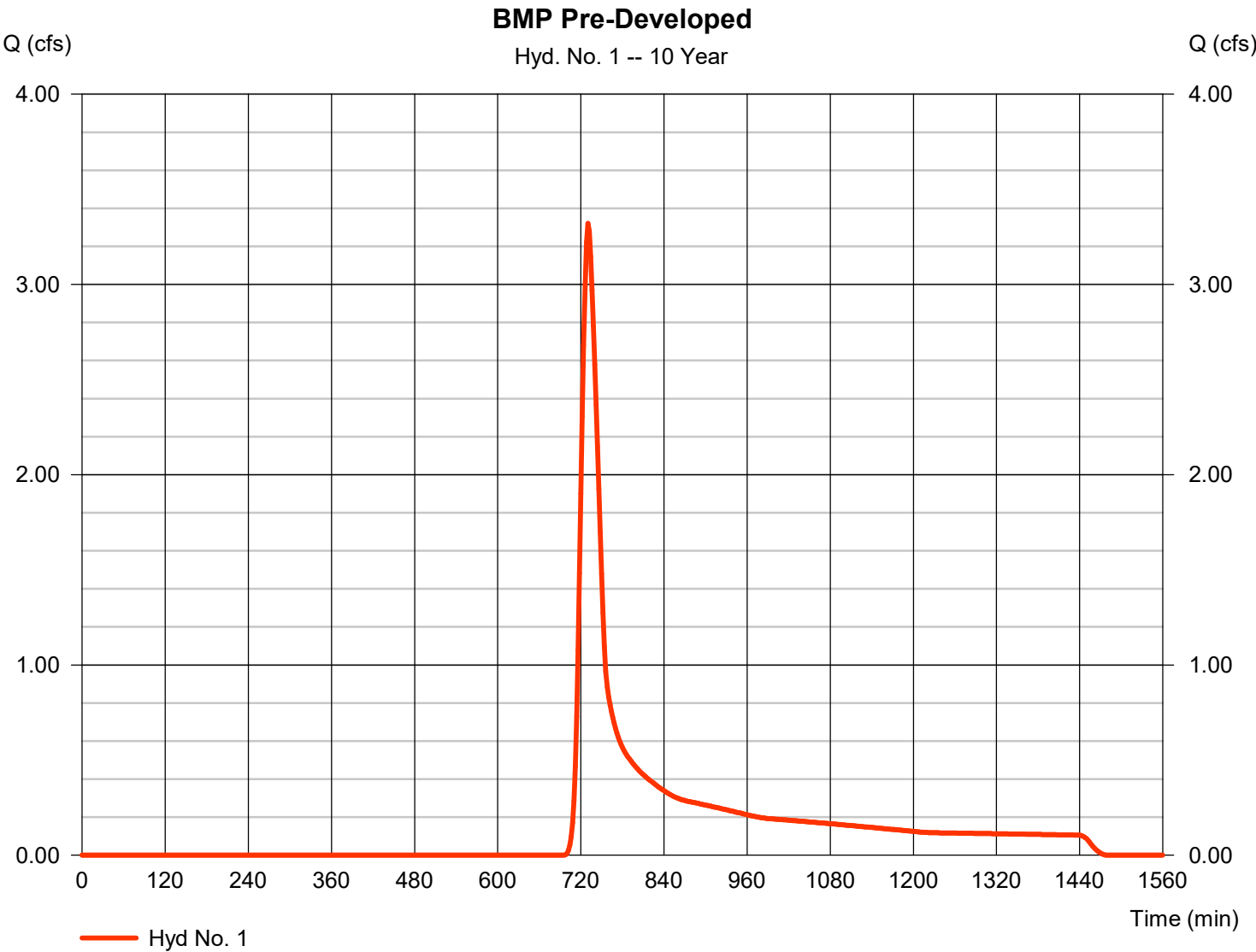
| Hyd. No.                          | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft)     | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description    |
|-----------------------------------|--------------------------|-----------------|---------------------|--------------------|------------------------|---------------|------------------------|-------------------------|---------------------------|
| 1                                 | SCS Runoff               | 3.321           | 2                   | 730                | 14,377                 | -----         | -----                  | -----                   | BMP Pre-Developed         |
| 2                                 | SCS Runoff               | 17.25           | 2                   | 716                | 35,499                 | -----         | -----                  | -----                   | BMP Post-Developed        |
| 3                                 | Reservoir                | 2.248           | 2                   | 730                | 34,021                 | 2             | 331.51                 | 18,422                  | Post Through Detention    |
| 4                                 | SCS Runoff               | 0.449           | 2                   | 720                | 1,168                  | -----         | -----                  | -----                   | BMP Post-Developed Bypass |
| 7                                 | SCS Runoff               | 0.000           | 2                   | n/a                | 0                      | -----         | -----                  | -----                   | BMP Post-Developed        |
| 8                                 | Reservoir                | 0.000           | 2                   | n/a                | 0                      | 7             | 329.70                 | 0.000                   | 1.0-in Storm Thru Pond    |
| Stormwater Wetland-(7-Eleven).gpw |                          |                 |                     |                    | Return Period: 10 Year |               |                        | Tuesday, 12 / 5 / 2023  |                           |

# Hydrograph Report

## Hyd. No. 1

BMP Pre-Developed

|                 |   |            |                    |   |             |
|-----------------|---|------------|--------------------|---|-------------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 3.321 cfs   |
| Storm frequency | = | 10 yrs     | Time to peak       | = | 730 min     |
| Time interval   | = | 2 min      | Hyd. volume        | = | 14,377 cuft |
| Drainage area   | = | 3.410 ac   | Curve number       | = | 57          |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft        |
| Tc method       | = | User       | Time of conc. (Tc) | = | 24.00 min   |
| Total precip.   | = | 5.14 in    | Distribution       | = | Type II     |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484         |

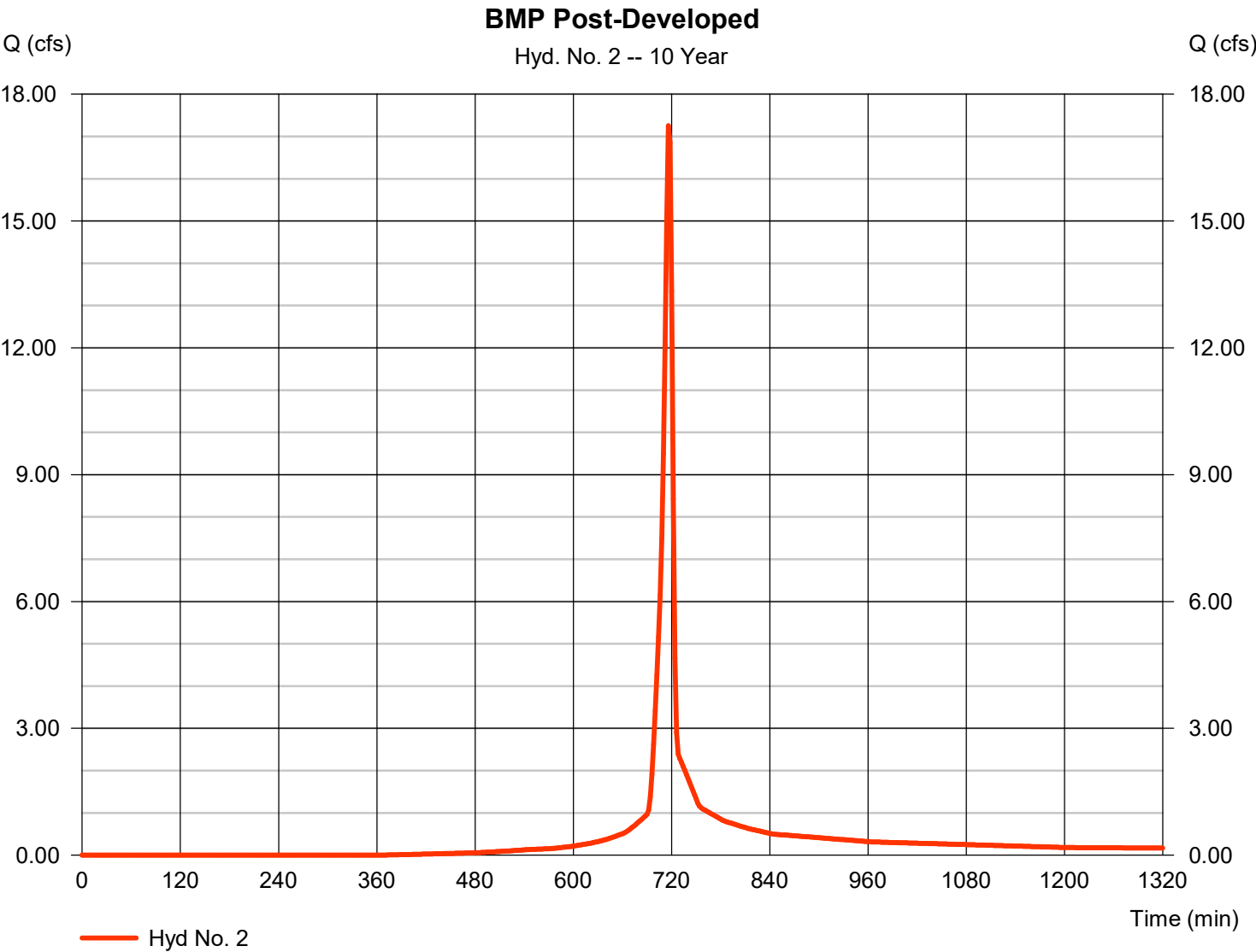


# Hydrograph Report

## Hyd. No. 2

BMP Post-Developed

|                 |   |            |                    |   |             |
|-----------------|---|------------|--------------------|---|-------------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 17.25 cfs   |
| Storm frequency | = | 10 yrs     | Time to peak       | = | 716 min     |
| Time interval   | = | 2 min      | Hyd. volume        | = | 35,499 cuft |
| Drainage area   | = | 3.160 ac   | Curve number       | = | 83          |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft        |
| Tc method       | = | User       | Time of conc. (Tc) | = | 5.00 min    |
| Total precip.   | = | 5.14 in    | Distribution       | = | Type II     |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484         |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

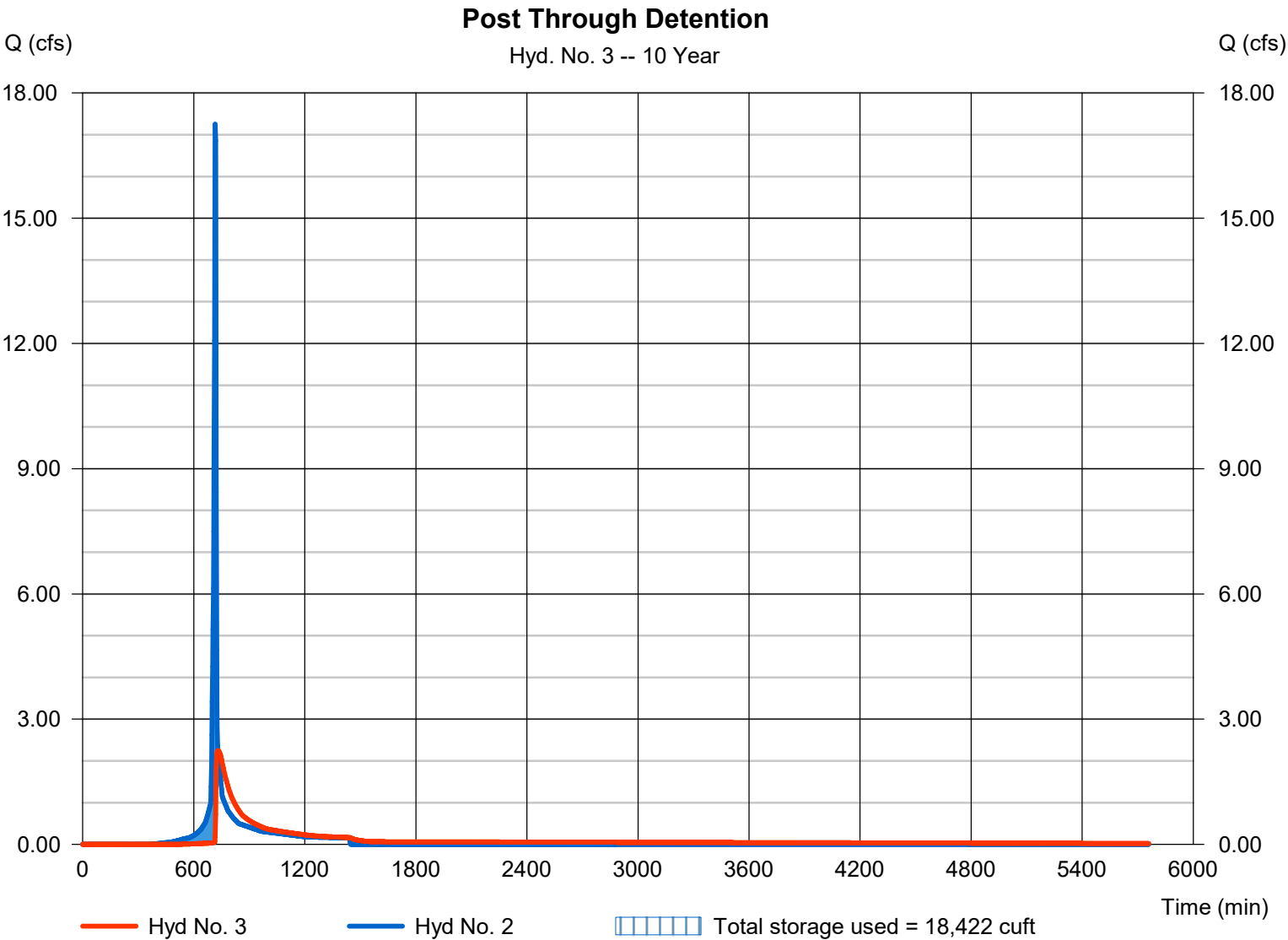
Tuesday, 12 / 5 / 2023

## Hyd. No. 3

### Post Through Detention

|                 |                          |                |               |
|-----------------|--------------------------|----------------|---------------|
| Hydrograph type | = Reservoir              | Peak discharge | = 2.248 cfs   |
| Storm frequency | = 10 yrs                 | Time to peak   | = 730 min     |
| Time interval   | = 2 min                  | Hyd. volume    | = 34,021 cuft |
| Inflow hyd. No. | = 2 - BMP Post-Developed | Max. Elevation | = 331.51 ft   |
| Reservoir name  | = BMP Pond               | Max. Storage   | = 18,422 cuft |

Storage Indication method used.



# Hydrograph Report

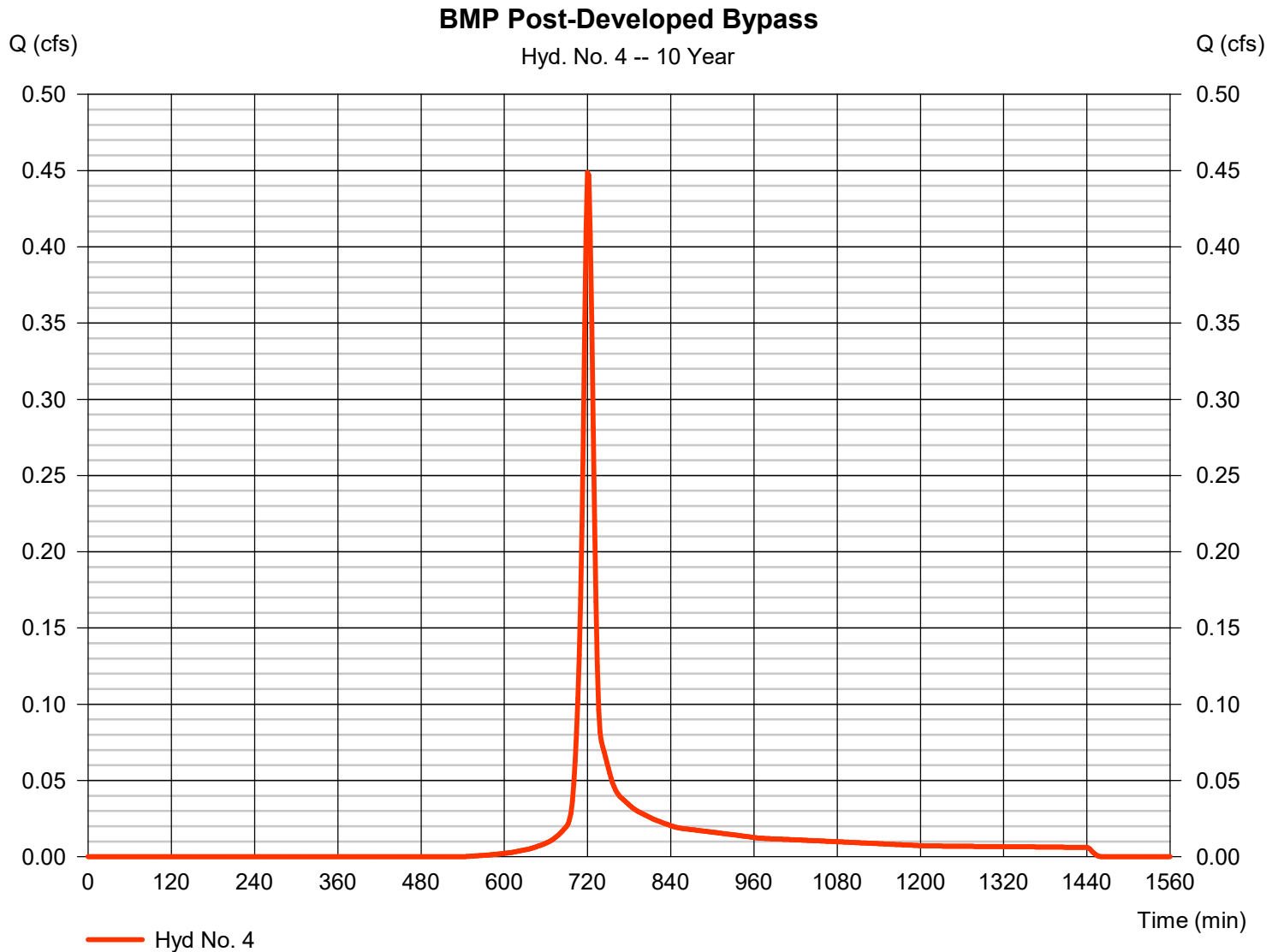
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 4

### BMP Post-Developed Bypass

|                 |              |                    |              |
|-----------------|--------------|--------------------|--------------|
| Hydrograph type | = SCS Runoff | Peak discharge     | = 0.449 cfs  |
| Storm frequency | = 10 yrs     | Time to peak       | = 720 min    |
| Time interval   | = 2 min      | Hyd. volume        | = 1,168 cuft |
| Drainage area   | = 0.130 ac   | Curve number       | = 73.1       |
| Basin Slope     | = 0.0 %      | Hydraulic length   | = 0 ft       |
| Tc method       | = User       | Time of conc. (Tc) | = 10.00 min  |
| Total precip.   | = 5.14 in    | Distribution       | = Type II    |
| Storm duration  | = 24 hrs     | Shape factor       | = 484        |



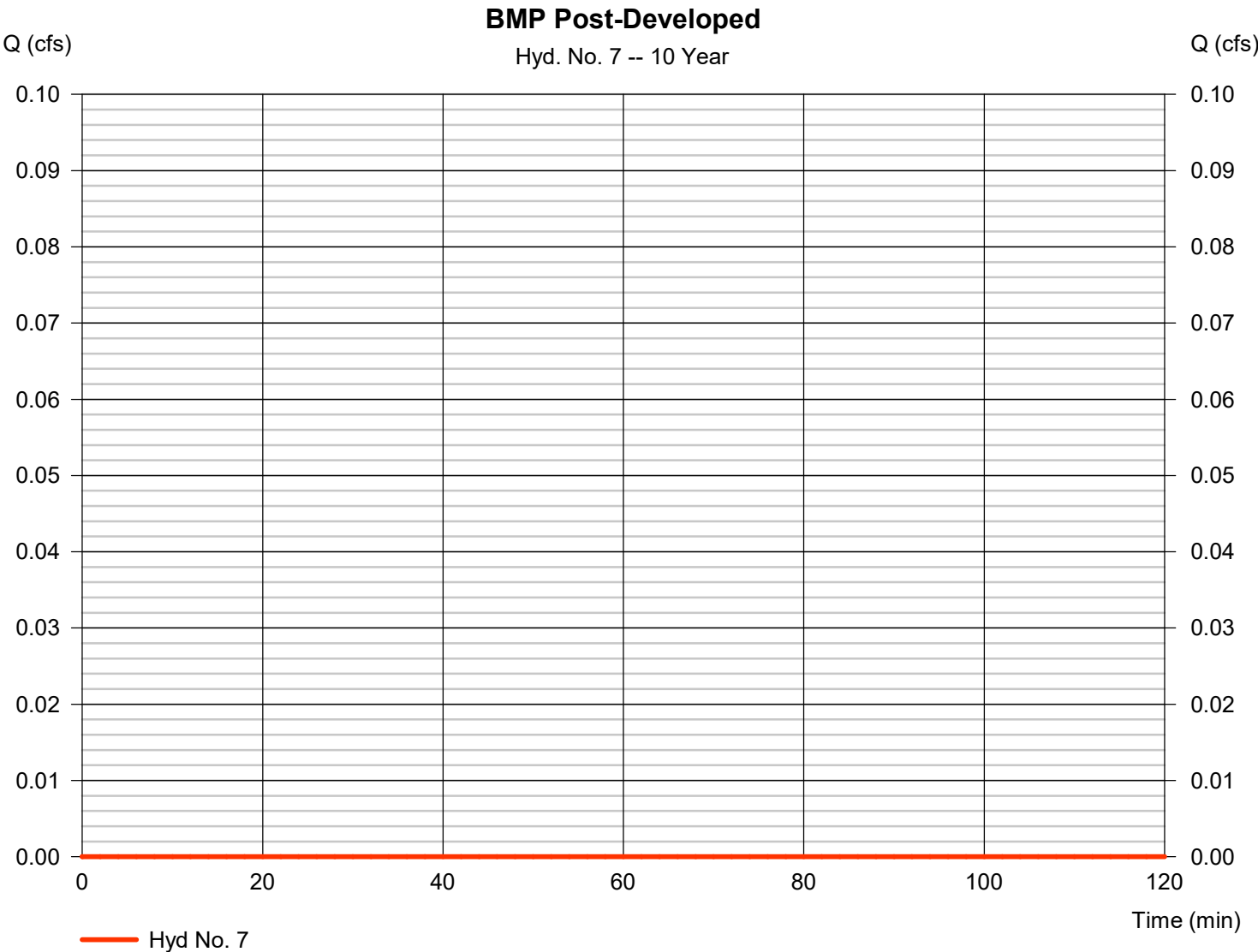


# Hydrograph Report

## Hyd. No. 7

BMP Post-Developed

|                 |   |            |                    |   |           |
|-----------------|---|------------|--------------------|---|-----------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 0.000 cfs |
| Storm frequency | = | 10 yrs     | Time to peak       | = | n/a       |
| Time interval   | = | 2 min      | Hyd. volume        | = | 0 cuft    |
| Drainage area   | = | 3.160 ac   | Curve number       | = | 83        |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft      |
| Tc method       | = | User       | Time of conc. (Tc) | = | 5.00 min  |
| Total precip.   | = | 0.00 in    | Distribution       | = | SCS 6-Hr  |
| Storm duration  | = | 6.00 hrs   | Shape factor       | = | 484       |



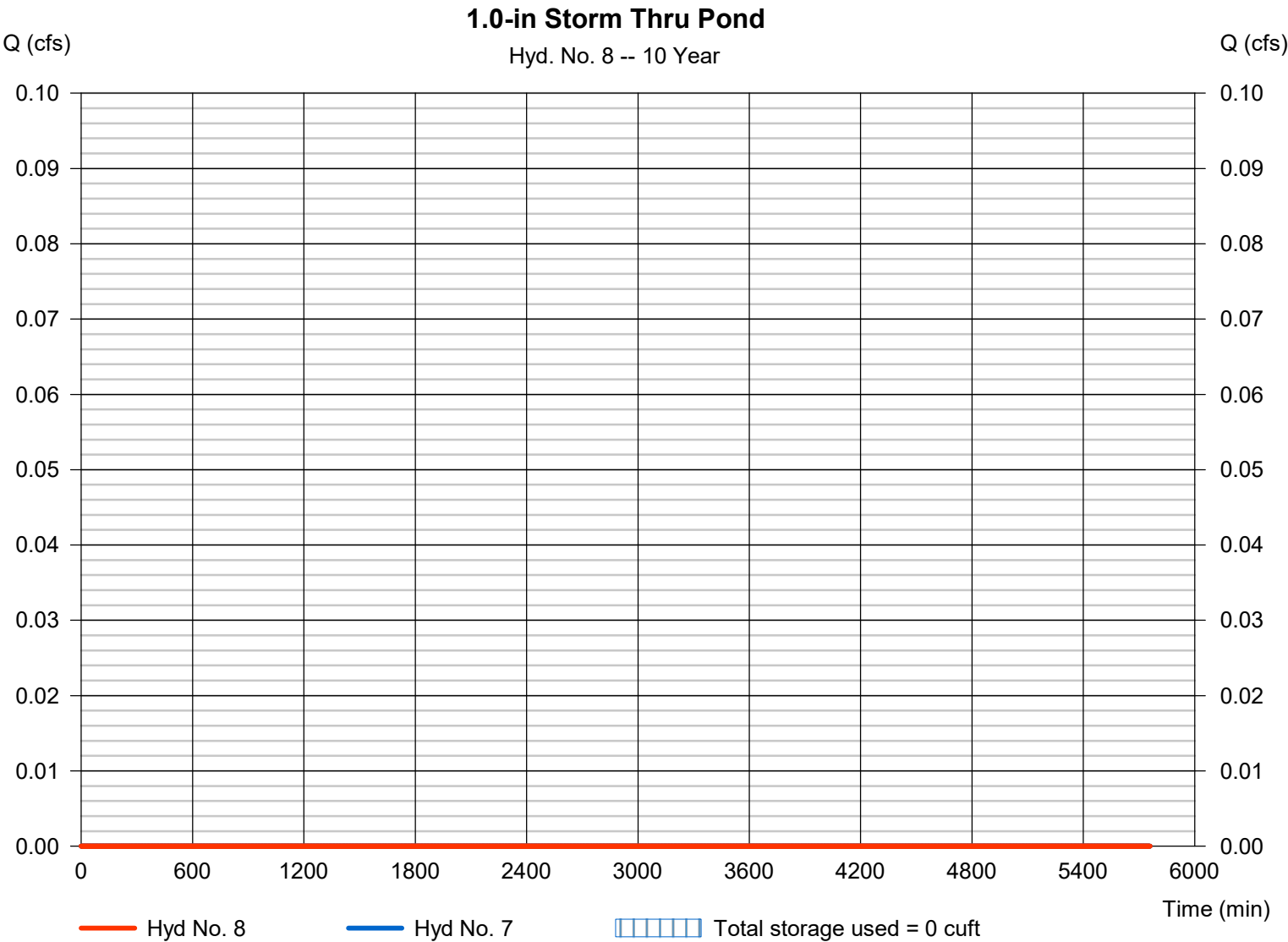
# Hydrograph Report

## Hyd. No. 8

1.0-in Storm Thru Pond

|                 |                          |                |             |
|-----------------|--------------------------|----------------|-------------|
| Hydrograph type | = Reservoir              | Peak discharge | = 0.000 cfs |
| Storm frequency | = 10 yrs                 | Time to peak   | = n/a       |
| Time interval   | = 2 min                  | Hyd. volume    | = 0 cuft    |
| Inflow hyd. No. | = 7 - BMP Post-Developed | Max. Elevation | = 329.70 ft |
| Reservoir name  | = BMP Pond               | Max. Storage   | = 0 cuft    |

Storage Indication method used.



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

| Hyd. No.                          | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft)      | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description    |
|-----------------------------------|--------------------------|-----------------|---------------------|--------------------|-------------------------|---------------|------------------------|-------------------------|---------------------------|
| 1                                 | SCS Runoff               | 9.617           | 2                   | 730                | 36,581                  | -----         | -----                  | -----                   | BMP Pre-Developed         |
| 2                                 | SCS Runoff               | 30.29           | 2                   | 716                | 64,280                  | -----         | -----                  | -----                   | BMP Post-Developed        |
| 3                                 | Reservoir                | 10.72           | 2                   | 724                | 62,756                  | 2             | 332.43                 | 29,723                  | Post Through Detention    |
| 4                                 | SCS Runoff               | 0.902           | 2                   | 720                | 2,346                   | -----         | -----                  | -----                   | BMP Post-Developed Bypass |
| 7                                 | SCS Runoff               | 0.000           | 2                   | n/a                | 0                       | -----         | -----                  | -----                   | BMP Post-Developed        |
| 8                                 | Reservoir                | 0.000           | 2                   | n/a                | 0                       | 7             | 329.70                 | 0.000                   | 1.0-in Storm Thru Pond    |
| Stormwater Wetland-(7-Eleven).gpw |                          |                 |                     |                    | Return Period: 100 Year |               |                        | Tuesday, 12 / 5 / 2023  |                           |

# Hydrograph Report

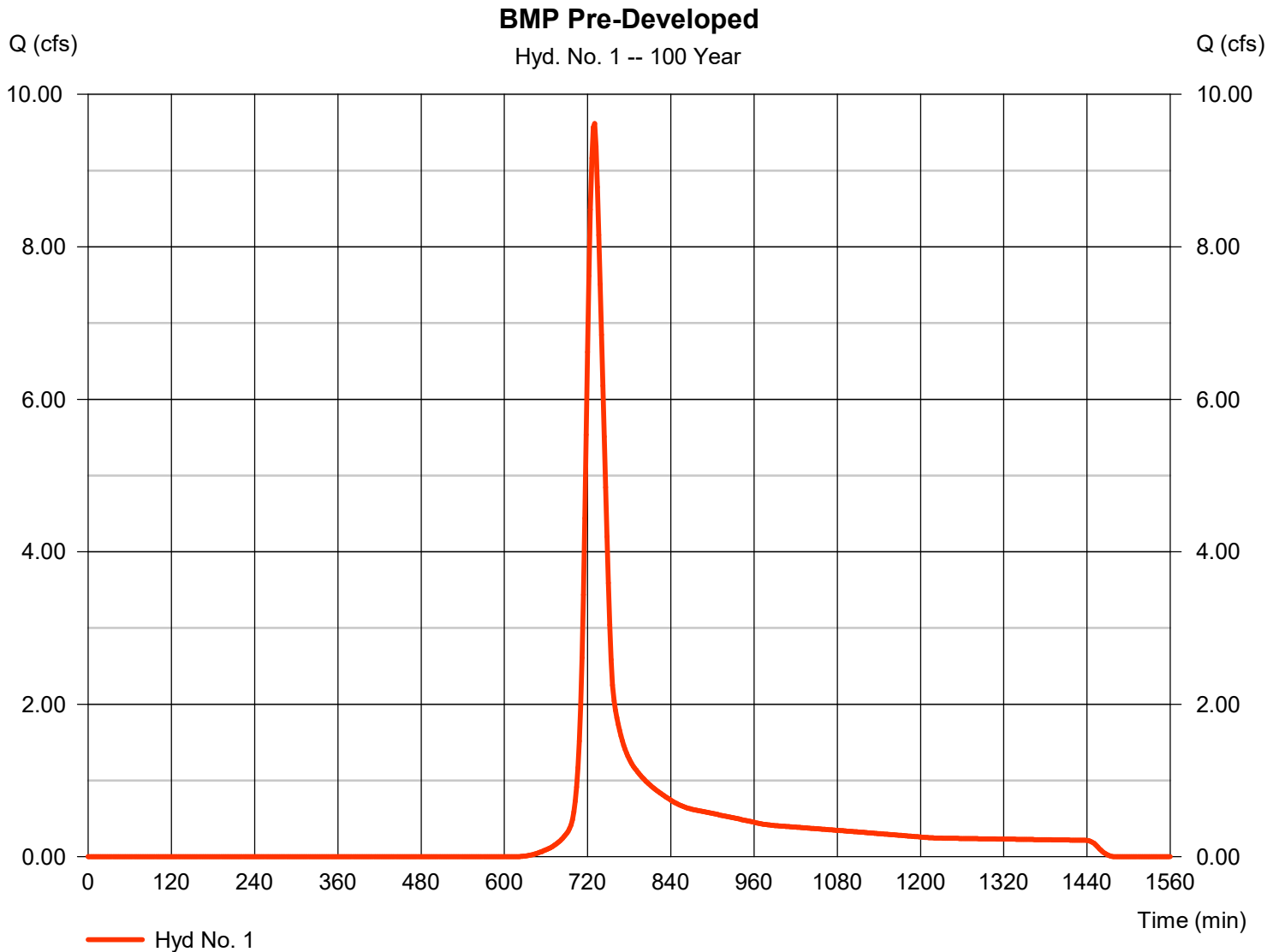
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 1

### BMP Pre-Developed

|                 |              |                    |               |
|-----------------|--------------|--------------------|---------------|
| Hydrograph type | = SCS Runoff | Peak discharge     | = 9.617 cfs   |
| Storm frequency | = 100 yrs    | Time to peak       | = 730 min     |
| Time interval   | = 2 min      | Hyd. volume        | = 36,581 cuft |
| Drainage area   | = 3.410 ac   | Curve number       | = 57          |
| Basin Slope     | = 0.0 %      | Hydraulic length   | = 0 ft        |
| Tc method       | = User       | Time of conc. (Tc) | = 24.00 min   |
| Total precip.   | = 8.00 in    | Distribution       | = Type II     |
| Storm duration  | = 24 hrs     | Shape factor       | = 484         |



# Hydrograph Report

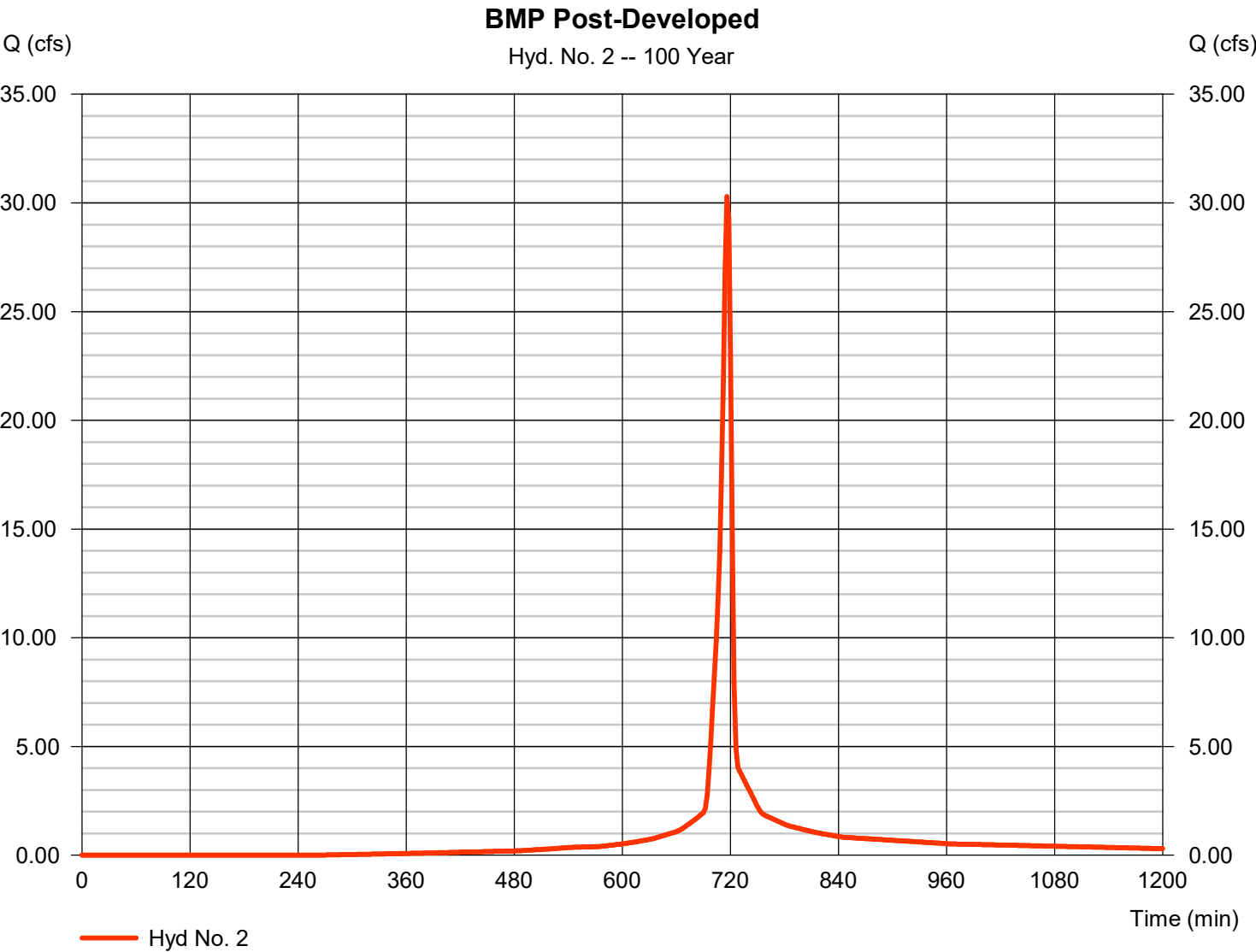
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 2

BMP Post-Developed

|                 |              |                    |               |
|-----------------|--------------|--------------------|---------------|
| Hydrograph type | = SCS Runoff | Peak discharge     | = 30.29 cfs   |
| Storm frequency | = 100 yrs    | Time to peak       | = 716 min     |
| Time interval   | = 2 min      | Hyd. volume        | = 64,280 cuft |
| Drainage area   | = 3.160 ac   | Curve number       | = 83          |
| Basin Slope     | = 0.0 %      | Hydraulic length   | = 0 ft        |
| Tc method       | = User       | Time of conc. (Tc) | = 5.00 min    |
| Total precip.   | = 8.00 in    | Distribution       | = Type II     |
| Storm duration  | = 24 hrs     | Shape factor       | = 484         |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

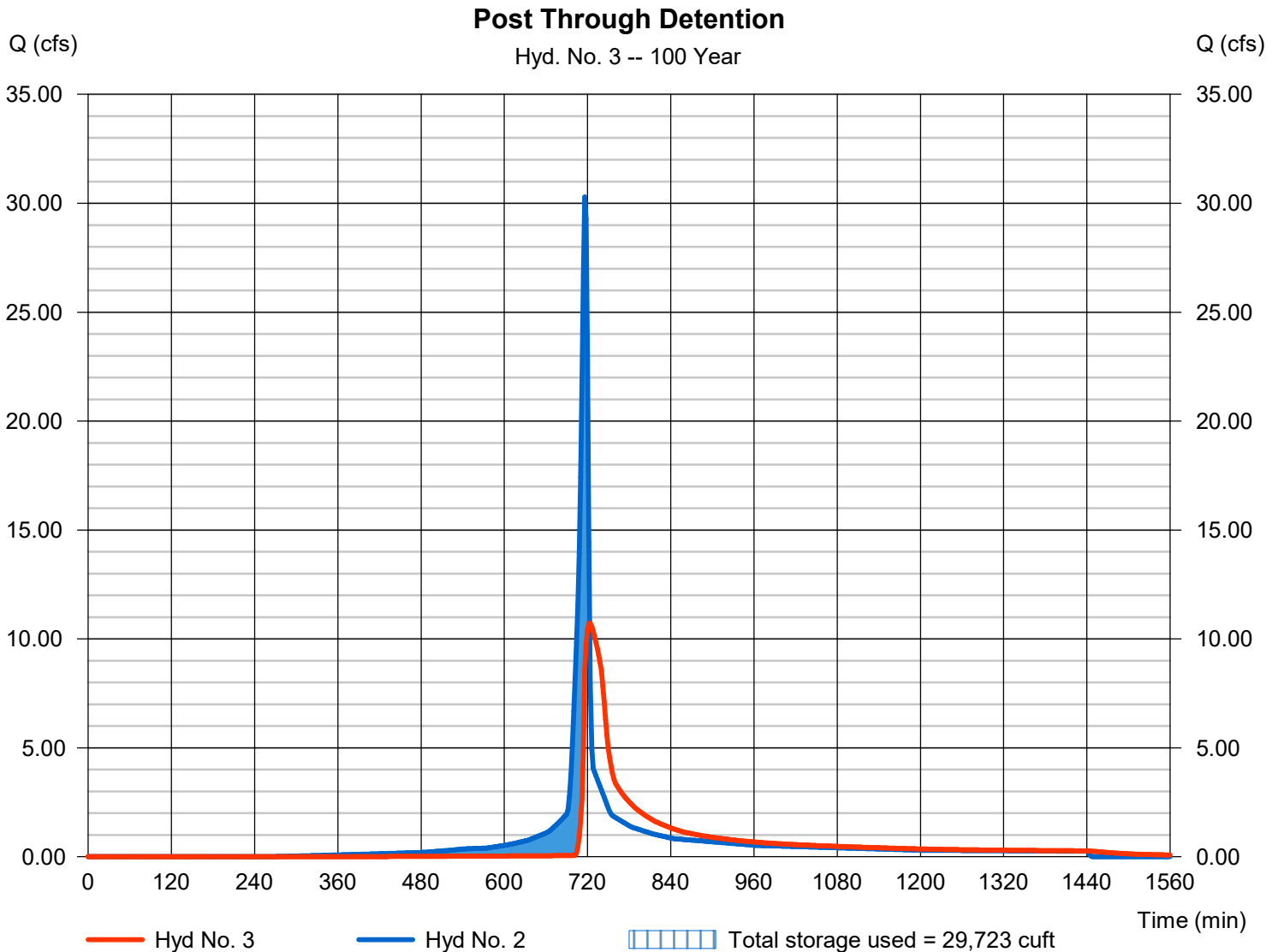
Tuesday, 12 / 5 / 2023

## Hyd. No. 3

### Post Through Detention

|                 |                          |                |               |
|-----------------|--------------------------|----------------|---------------|
| Hydrograph type | = Reservoir              | Peak discharge | = 10.72 cfs   |
| Storm frequency | = 100 yrs                | Time to peak   | = 724 min     |
| Time interval   | = 2 min                  | Hyd. volume    | = 62,756 cuft |
| Inflow hyd. No. | = 2 - BMP Post-Developed | Max. Elevation | = 332.43 ft   |
| Reservoir name  | = BMP Pond               | Max. Storage   | = 29,723 cuft |

Storage Indication method used.





# Hydrograph Report

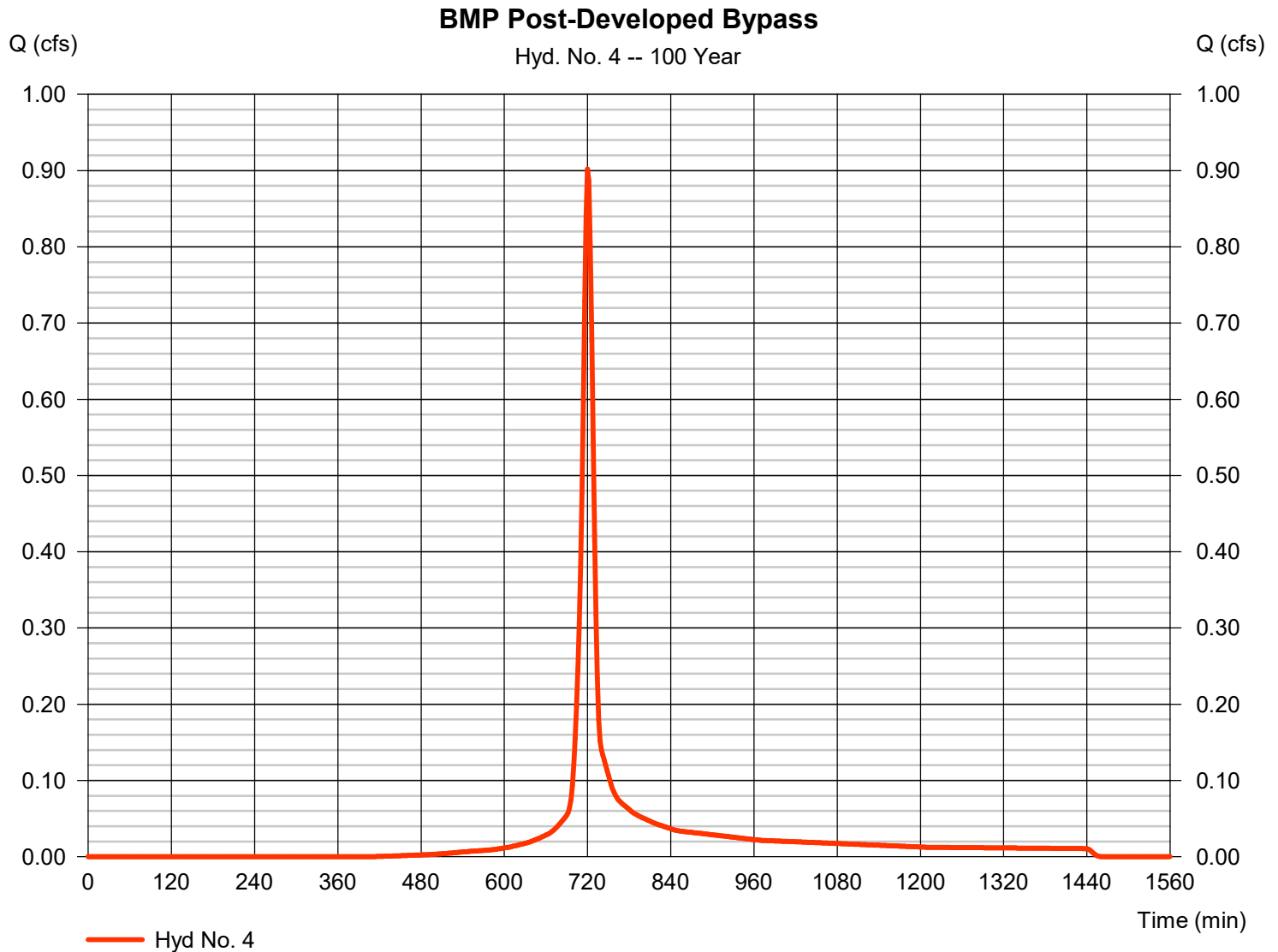
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 4

### BMP Post-Developed Bypass

|                 |              |                    |              |
|-----------------|--------------|--------------------|--------------|
| Hydrograph type | = SCS Runoff | Peak discharge     | = 0.902 cfs  |
| Storm frequency | = 100 yrs    | Time to peak       | = 720 min    |
| Time interval   | = 2 min      | Hyd. volume        | = 2,346 cuft |
| Drainage area   | = 0.130 ac   | Curve number       | = 73.1       |
| Basin Slope     | = 0.0 %      | Hydraulic length   | = 0 ft       |
| Tc method       | = User       | Time of conc. (Tc) | = 10.00 min  |
| Total precip.   | = 8.00 in    | Distribution       | = Type II    |
| Storm duration  | = 24 hrs     | Shape factor       | = 484        |

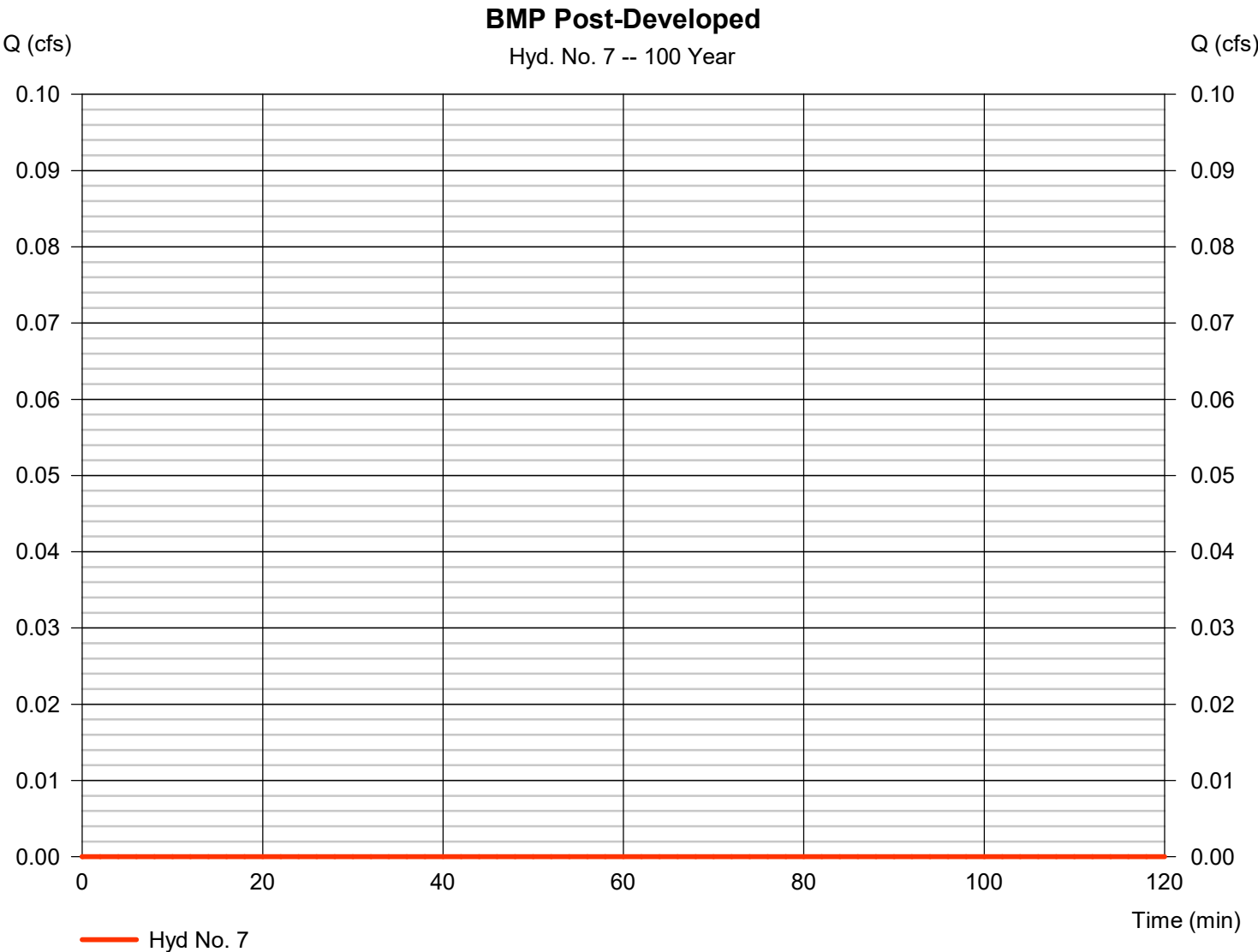


# Hydrograph Report

## Hyd. No. 7

### BMP Post-Developed

|                 |              |                    |             |
|-----------------|--------------|--------------------|-------------|
| Hydrograph type | = SCS Runoff | Peak discharge     | = 0.000 cfs |
| Storm frequency | = 100 yrs    | Time to peak       | = n/a       |
| Time interval   | = 2 min      | Hyd. volume        | = 0 cuft    |
| Drainage area   | = 3.160 ac   | Curve number       | = 83        |
| Basin Slope     | = 0.0 %      | Hydraulic length   | = 0 ft      |
| Tc method       | = User       | Time of conc. (Tc) | = 5.00 min  |
| Total precip.   | = 0.00 in    | Distribution       | = SCS 6-Hr  |
| Storm duration  | = 6.00 hrs   | Shape factor       | = 484       |



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

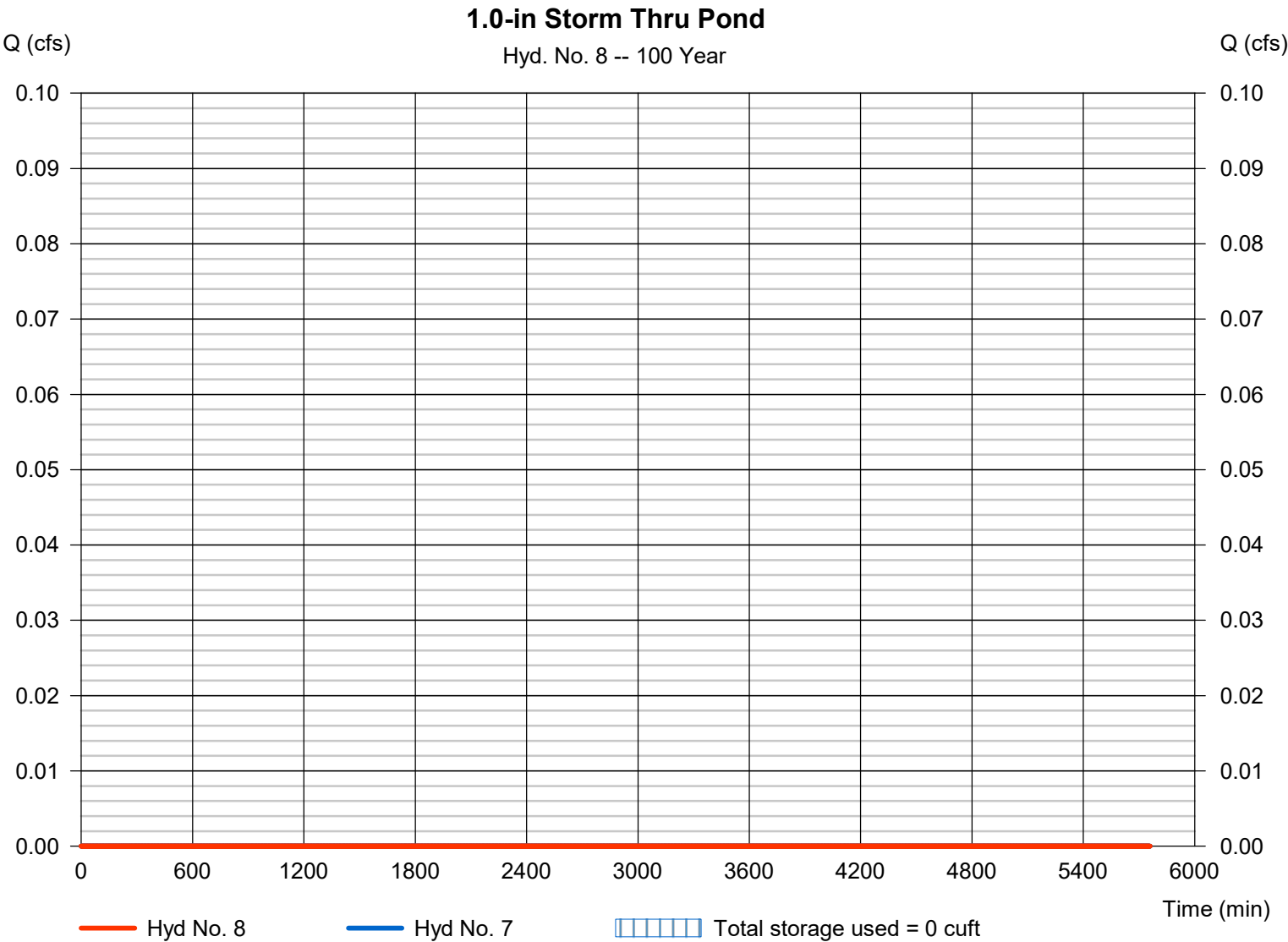
Tuesday, 12 / 5 / 2023

## Hyd. No. 8

1.0-in Storm Thru Pond

|                 |                          |                |             |
|-----------------|--------------------------|----------------|-------------|
| Hydrograph type | = Reservoir              | Peak discharge | = 0.000 cfs |
| Storm frequency | = 100 yrs                | Time to peak   | = n/a       |
| Time interval   | = 2 min                  | Hyd. volume    | = 0 cuft    |
| Inflow hyd. No. | = 7 - BMP Post-Developed | Max. Elevation | = 329.70 ft |
| Reservoir name  | = BMP Pond               | Max. Storage   | = 0 cuft    |

Storage Indication method used.



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

| Hyd. No.                     | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft)    | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description    |
|------------------------------|--------------------------|-----------------|---------------------|--------------------|-----------------------|---------------|------------------------|-------------------------|---------------------------|
| 1                            | SCS Runoff               | 0.078           | 2                   | 732                | 705                   | -----         | -----                  | -----                   | BMP Pre-Developed         |
| 2                            | SCS Runoff               | 0.049           | 2                   | 732                | 353                   | -----         | -----                  | -----                   | BMP Post-Developed        |
| 3                            | SCS Runoff               | 0.013           | 2                   | 716                | 30                    | -----         | -----                  | -----                   | BMP Post-Developed Bypass |
| 7-Eleven Drainage Area 2.gpw |                          |                 |                     |                    | Return Period: 1 Year |               |                        | Tuesday, 12 / 5 / 2023  |                           |

# Hydrograph Report

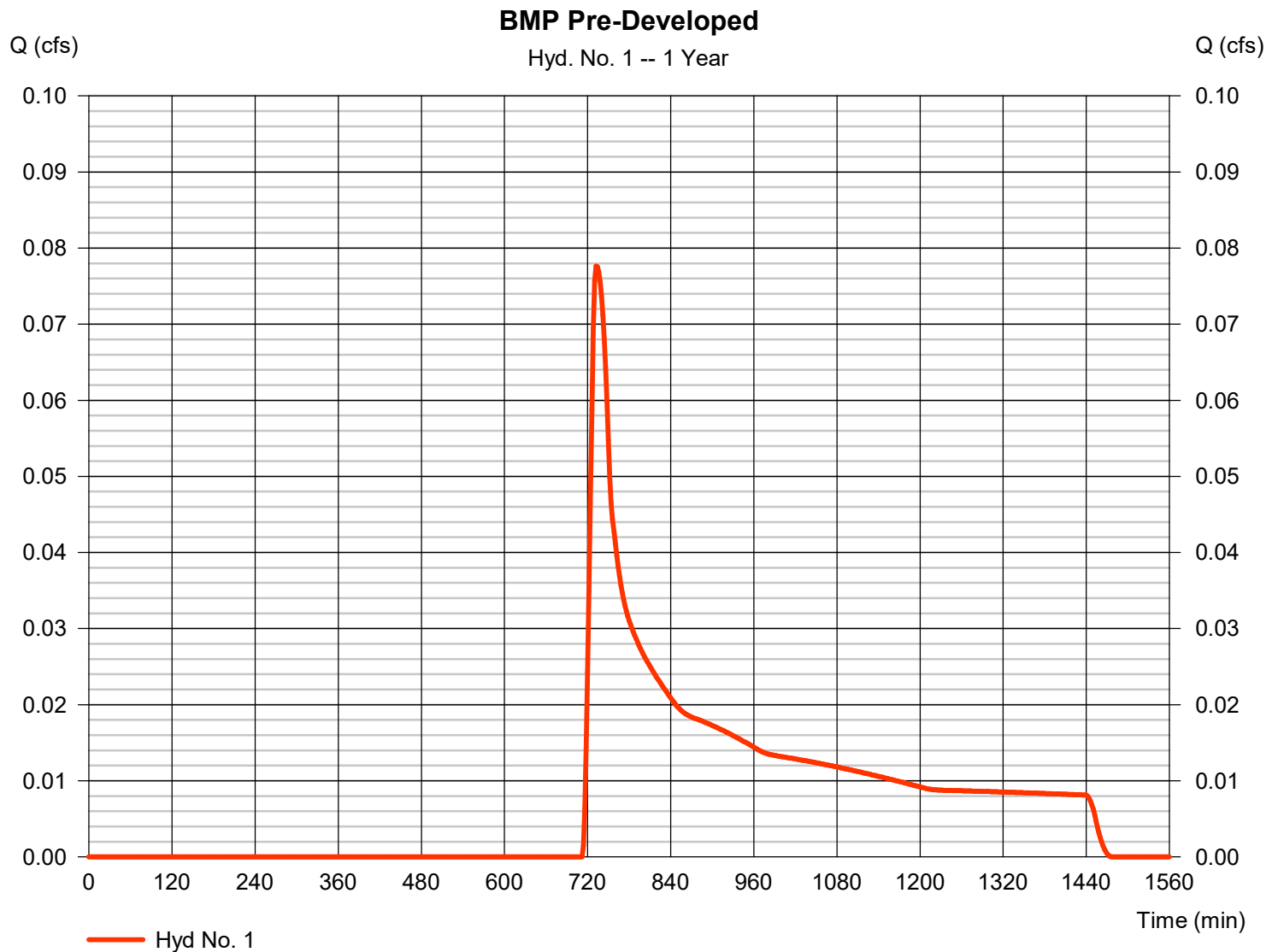
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 1

### BMP Pre-Developed

|                 |              |                    |             |
|-----------------|--------------|--------------------|-------------|
| Hydrograph type | = SCS Runoff | Peak discharge     | = 0.078 cfs |
| Storm frequency | = 1 yrs      | Time to peak       | = 732 min   |
| Time interval   | = 2 min      | Hyd. volume        | = 705 cuft  |
| Drainage area   | = 0.840 ac   | Curve number       | = 58        |
| Basin Slope     | = 0.0 %      | Hydraulic length   | = 0 ft      |
| Tc method       | = User       | Time of conc. (Tc) | = 22.20 min |
| Total precip.   | = 2.85 in    | Distribution       | = Type II   |
| Storm duration  | = 24 hrs     | Shape factor       | = 484       |

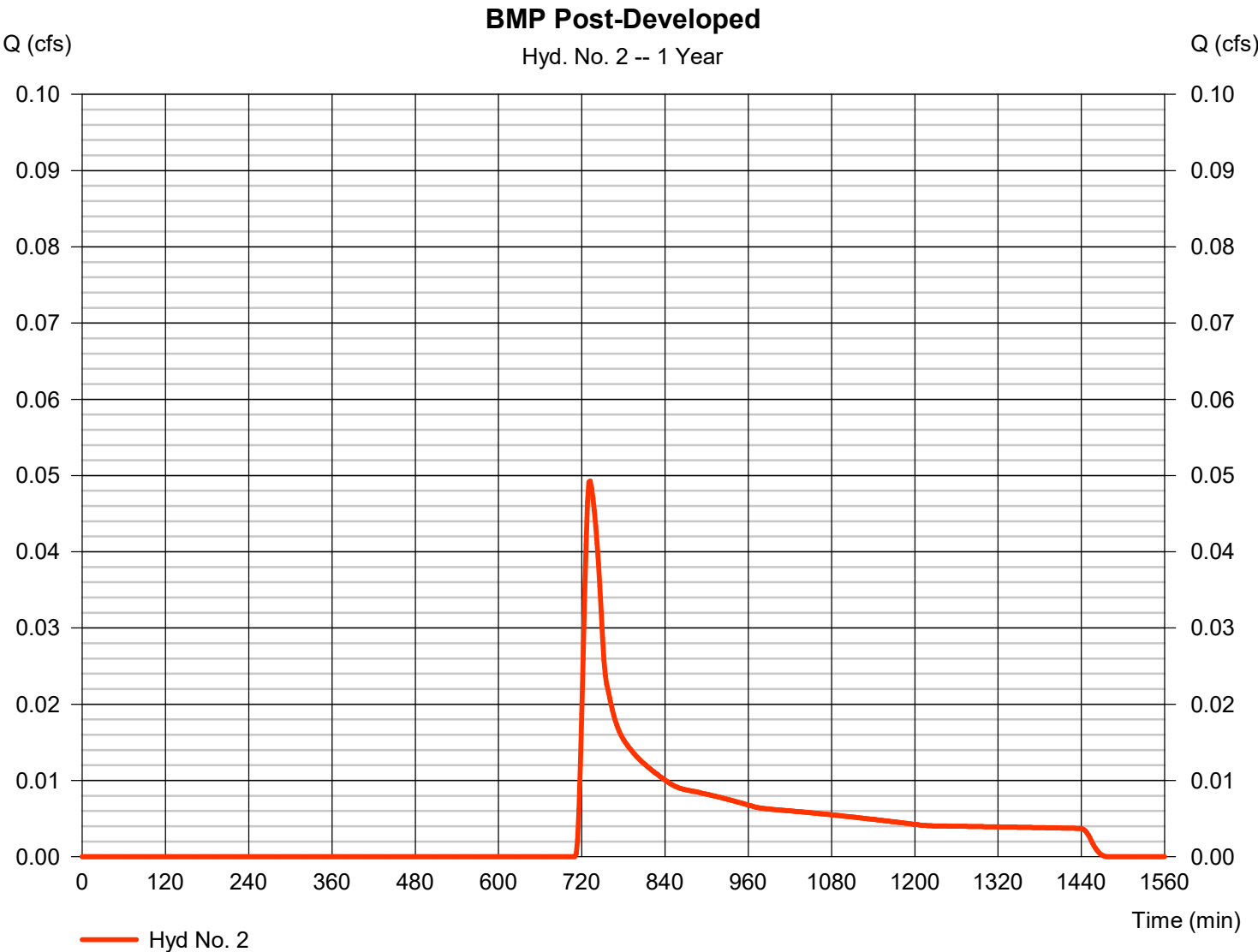


# Hydrograph Report

## Hyd. No. 2

BMP Post-Developed

|                 |   |            |                    |   |           |
|-----------------|---|------------|--------------------|---|-----------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 0.049 cfs |
| Storm frequency | = | 1 yrs      | Time to peak       | = | 732 min   |
| Time interval   | = | 2 min      | Hyd. volume        | = | 353 cuft  |
| Drainage area   | = | 0.340 ac   | Curve number       | = | 60        |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft      |
| Tc method       | = | User       | Time of conc. (Tc) | = | 22.20 min |
| Total precip.   | = | 2.85 in    | Distribution       | = | Type II   |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484       |



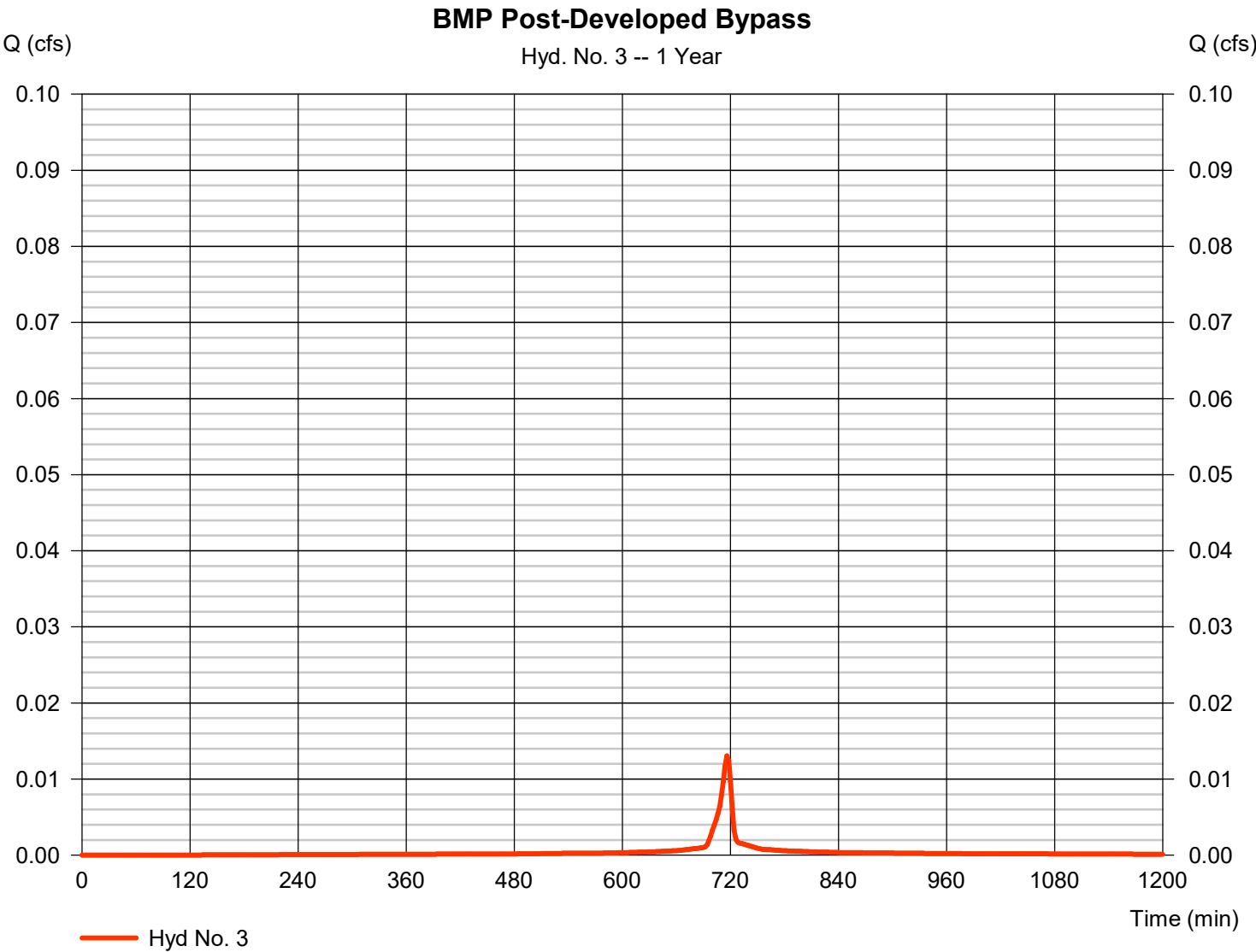


# Hydrograph Report

## Hyd. No. 3

### BMP Post-Developed Bypass

|                 |   |            |                    |   |           |
|-----------------|---|------------|--------------------|---|-----------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 0.013 cfs |
| Storm frequency | = | 1 yrs      | Time to peak       | = | 716 min   |
| Time interval   | = | 2 min      | Hyd. volume        | = | 30 cuft   |
| Drainage area   | = | 0.003 ac   | Curve number       | = | 98        |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft      |
| Tc method       | = | User       | Time of conc. (Tc) | = | 5.00 min  |
| Total precip.   | = | 2.85 in    | Distribution       | = | Type II   |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484       |



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

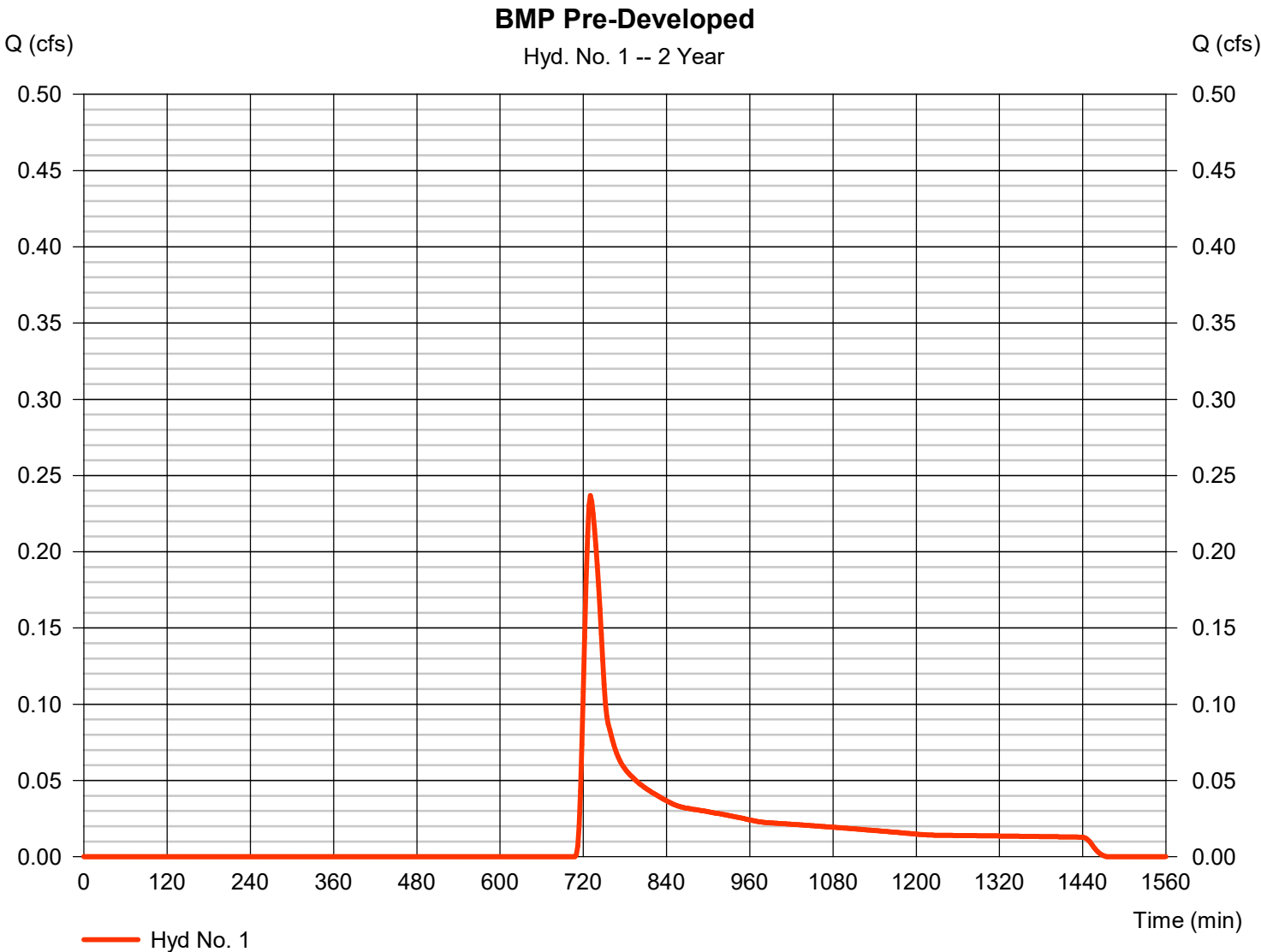
| Hyd. No.                     | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft)    | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description    |
|------------------------------|--------------------------|-----------------|---------------------|--------------------|-----------------------|---------------|------------------------|-------------------------|---------------------------|
| 1                            | SCS Runoff               | 0.237           | 2                   | 730                | 1,357                 | -----         | -----                  | -----                   | BMP Pre-Developed         |
| 2                            | SCS Runoff               | 0.127           | 2                   | 730                | 646                   | -----         | -----                  | -----                   | BMP Post-Developed        |
| 3                            | SCS Runoff               | 0.016           | 2                   | 716                | 37                    | -----         | -----                  | -----                   | BMP Post-Developed Bypass |
| 7-Eleven Drainage Area 2.gpw |                          |                 |                     |                    | Return Period: 2 Year |               |                        | Tuesday, 12 / 5 / 2023  |                           |

# Hydrograph Report

## Hyd. No. 1

BMP Pre-Developed

|                 |   |            |                    |   |            |
|-----------------|---|------------|--------------------|---|------------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 0.237 cfs  |
| Storm frequency | = | 2 yrs      | Time to peak       | = | 730 min    |
| Time interval   | = | 2 min      | Hyd. volume        | = | 1,357 cuft |
| Drainage area   | = | 0.840 ac   | Curve number       | = | 58         |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft       |
| Tc method       | = | User       | Time of conc. (Tc) | = | 22.20 min  |
| Total precip.   | = | 3.46 in    | Distribution       | = | Type II    |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484        |



# Hydrograph Report

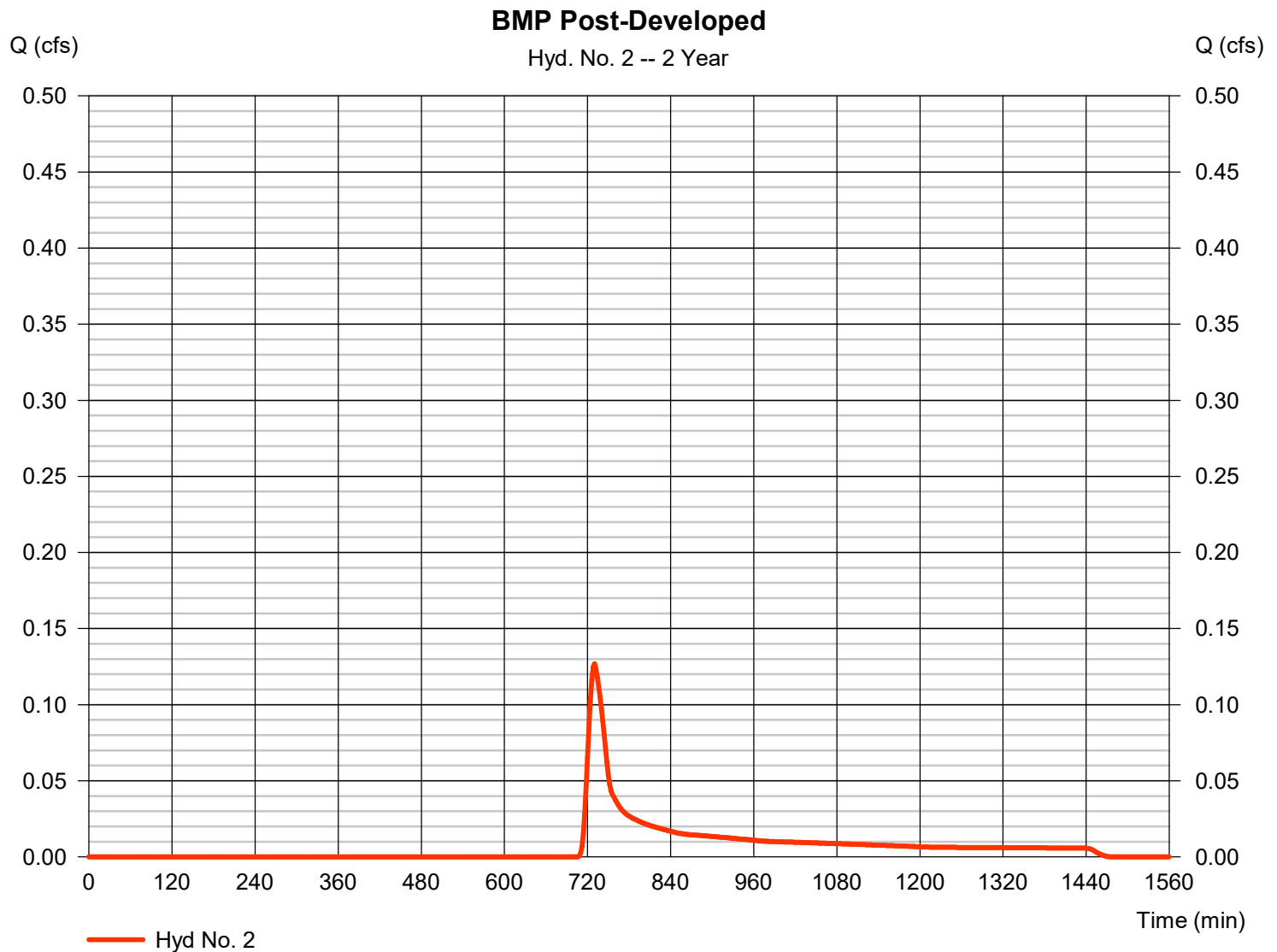
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 2

### BMP Post-Developed

|                 |              |                    |             |
|-----------------|--------------|--------------------|-------------|
| Hydrograph type | = SCS Runoff | Peak discharge     | = 0.127 cfs |
| Storm frequency | = 2 yrs      | Time to peak       | = 730 min   |
| Time interval   | = 2 min      | Hyd. volume        | = 646 cuft  |
| Drainage area   | = 0.340 ac   | Curve number       | = 60        |
| Basin Slope     | = 0.0 %      | Hydraulic length   | = 0 ft      |
| Tc method       | = User       | Time of conc. (Tc) | = 22.20 min |
| Total precip.   | = 3.46 in    | Distribution       | = Type II   |
| Storm duration  | = 24 hrs     | Shape factor       | = 484       |



# Hydrograph Report

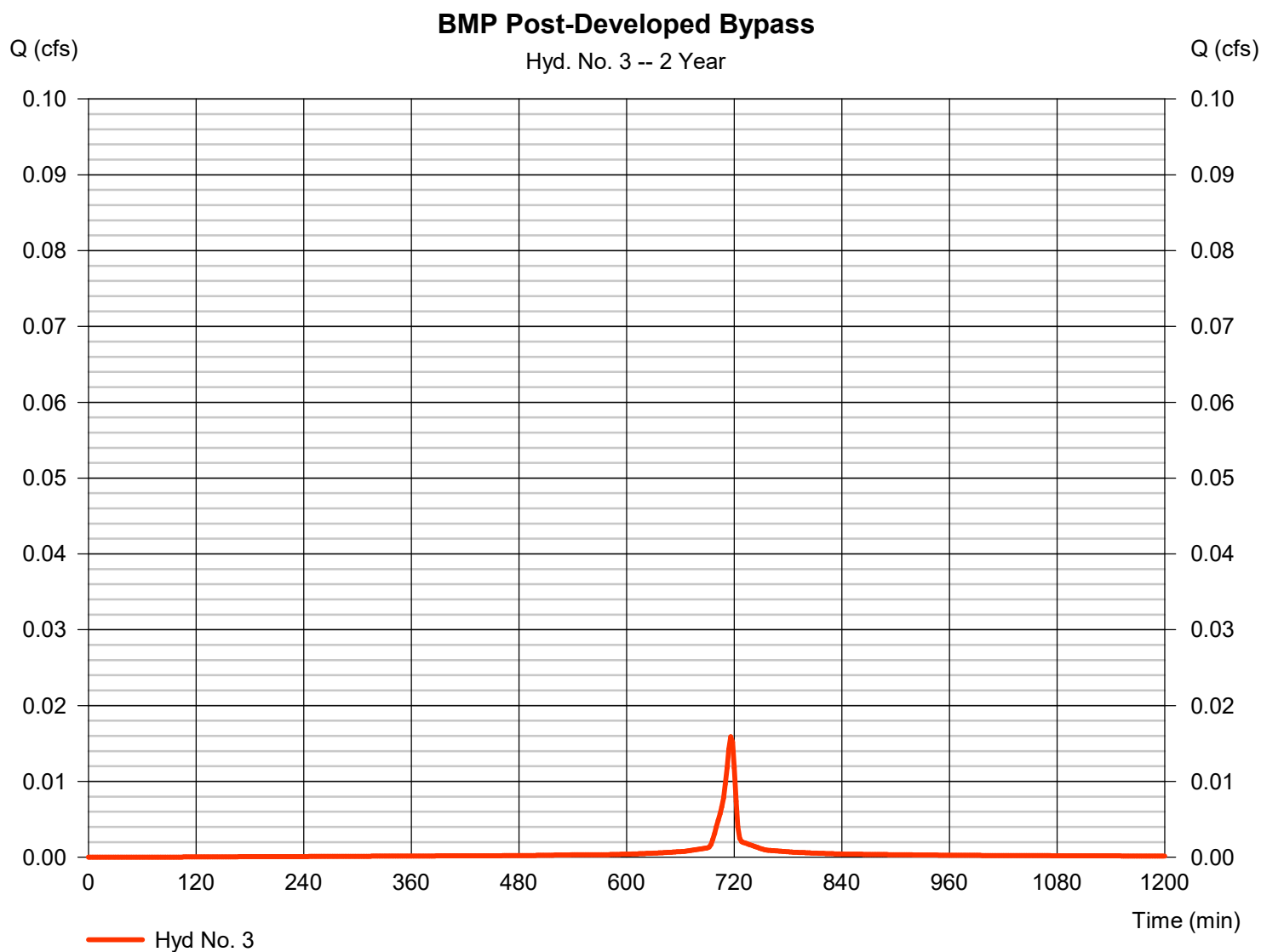
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 3

### BMP Post-Developed Bypass

|                 |              |                    |             |
|-----------------|--------------|--------------------|-------------|
| Hydrograph type | = SCS Runoff | Peak discharge     | = 0.016 cfs |
| Storm frequency | = 2 yrs      | Time to peak       | = 716 min   |
| Time interval   | = 2 min      | Hyd. volume        | = 37 cuft   |
| Drainage area   | = 0.003 ac   | Curve number       | = 98        |
| Basin Slope     | = 0.0 %      | Hydraulic length   | = 0 ft      |
| Tc method       | = User       | Time of conc. (Tc) | = 5.00 min  |
| Total precip.   | = 3.46 in    | Distribution       | = Type II   |
| Storm duration  | = 24 hrs     | Shape factor       | = 484       |



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

| Hyd. No.                     | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft)     | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description    |
|------------------------------|--------------------------|-----------------|---------------------|--------------------|------------------------|---------------|------------------------|-------------------------|---------------------------|
| 1                            | SCS Runoff               | 0.977           | 2                   | 728                | 3,869                  | -----         | -----                  | -----                   | BMP Pre-Developed         |
| 2                            | SCS Runoff               | 0.454           | 2                   | 728                | 1,738                  | -----         | -----                  | -----                   | BMP Post-Developed        |
| 3                            | SCS Runoff               | 0.024           | 2                   | 716                | 57                     | -----         | -----                  | -----                   | BMP Post-Developed Bypass |
| 7-Eleven Drainage Area 2.gpw |                          |                 |                     |                    | Return Period: 10 Year |               |                        | Tuesday, 12 / 5 / 2023  |                           |

# Hydrograph Report

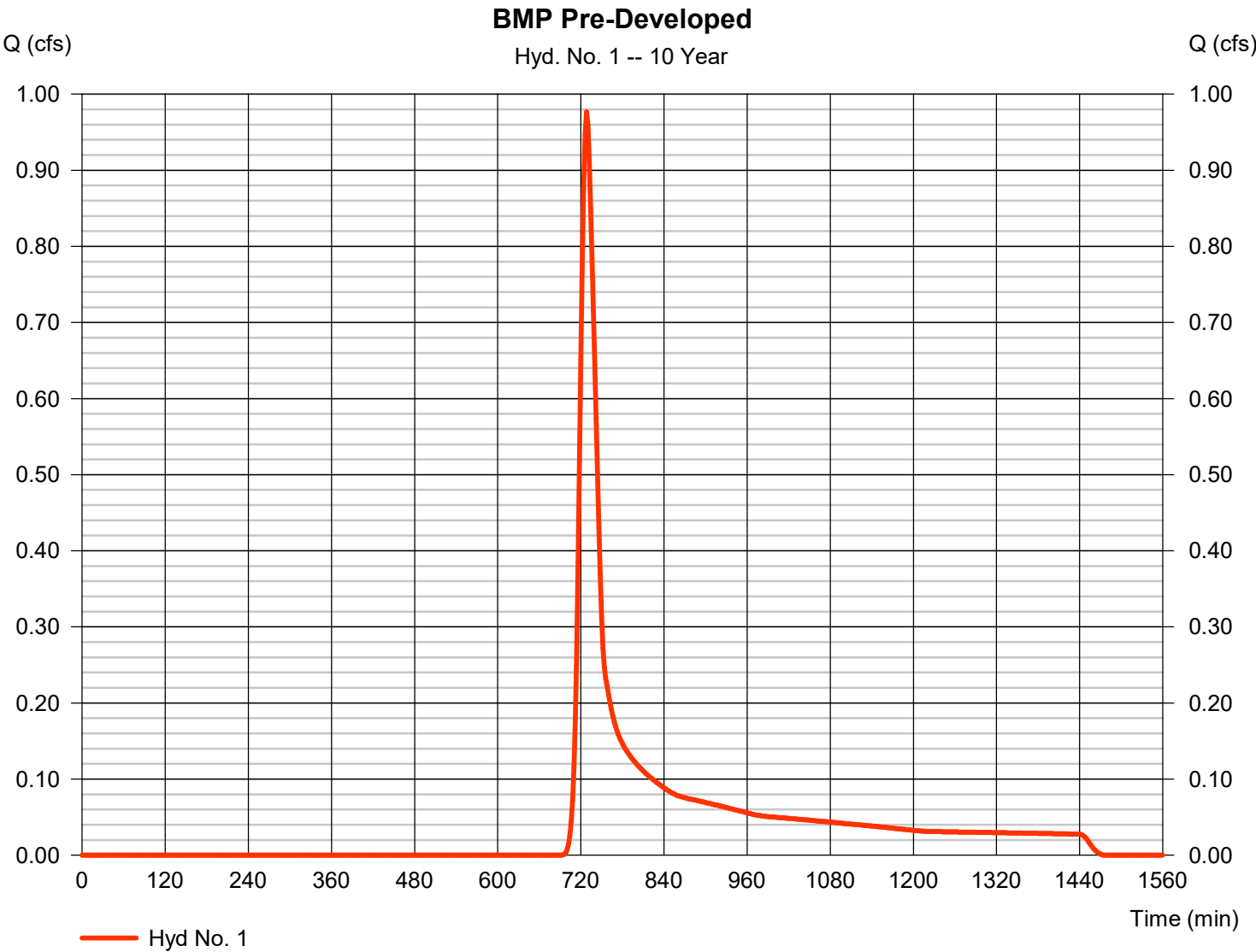
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 1

BMP Pre-Developed

|                 |   |            |                    |   |            |
|-----------------|---|------------|--------------------|---|------------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 0.977 cfs  |
| Storm frequency | = | 10 yrs     | Time to peak       | = | 728 min    |
| Time interval   | = | 2 min      | Hyd. volume        | = | 3,869 cuft |
| Drainage area   | = | 0.840 ac   | Curve number       | = | 58         |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft       |
| Tc method       | = | User       | Time of conc. (Tc) | = | 22.20 min  |
| Total precip.   | = | 5.14 in    | Distribution       | = | Type II    |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484        |



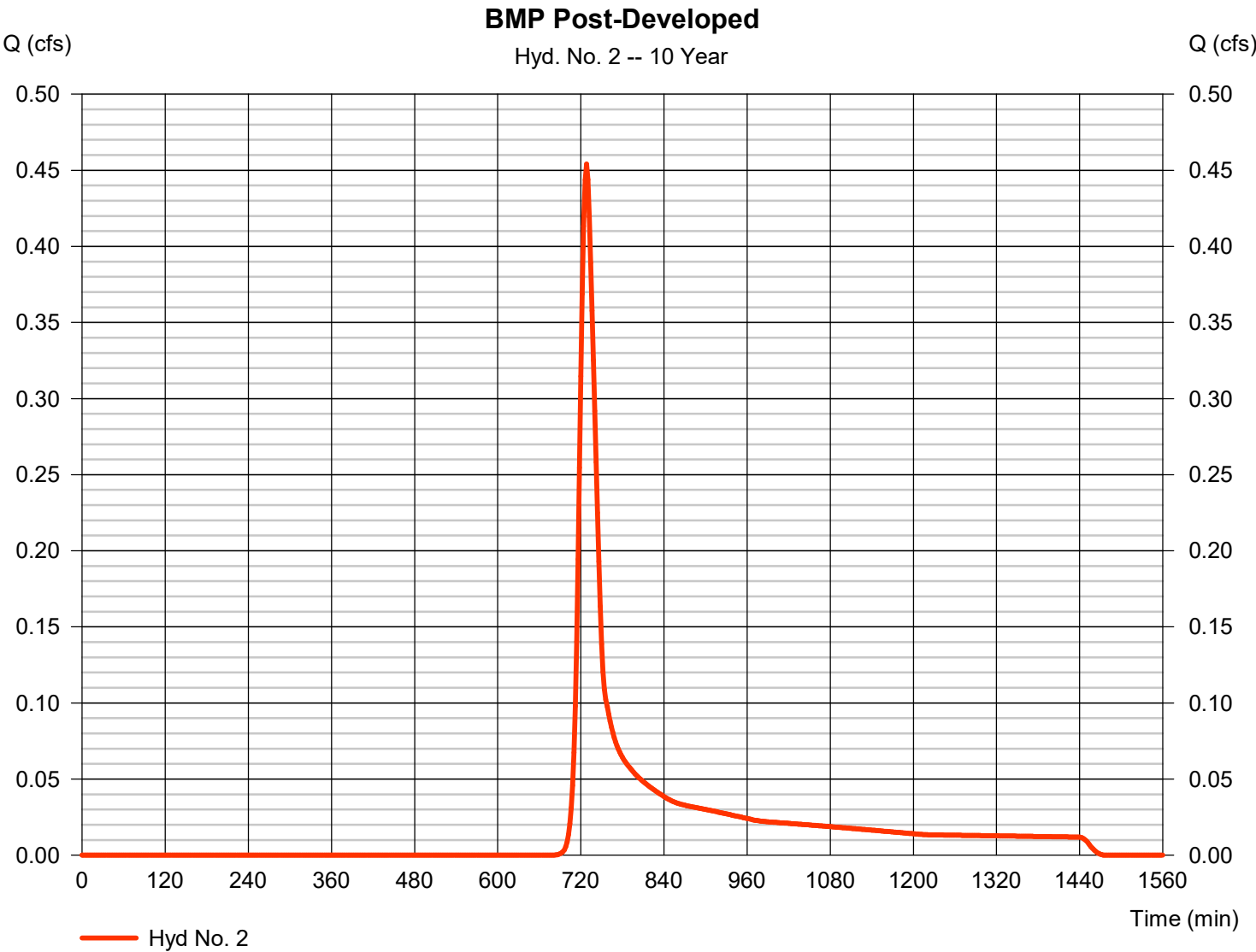


# Hydrograph Report

## Hyd. No. 2

BMP Post-Developed

|                 |   |            |                    |   |            |
|-----------------|---|------------|--------------------|---|------------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 0.454 cfs  |
| Storm frequency | = | 10 yrs     | Time to peak       | = | 728 min    |
| Time interval   | = | 2 min      | Hyd. volume        | = | 1,738 cuft |
| Drainage area   | = | 0.340 ac   | Curve number       | = | 60         |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft       |
| Tc method       | = | User       | Time of conc. (Tc) | = | 22.20 min  |
| Total precip.   | = | 5.14 in    | Distribution       | = | Type II    |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484        |



# Hydrograph Report

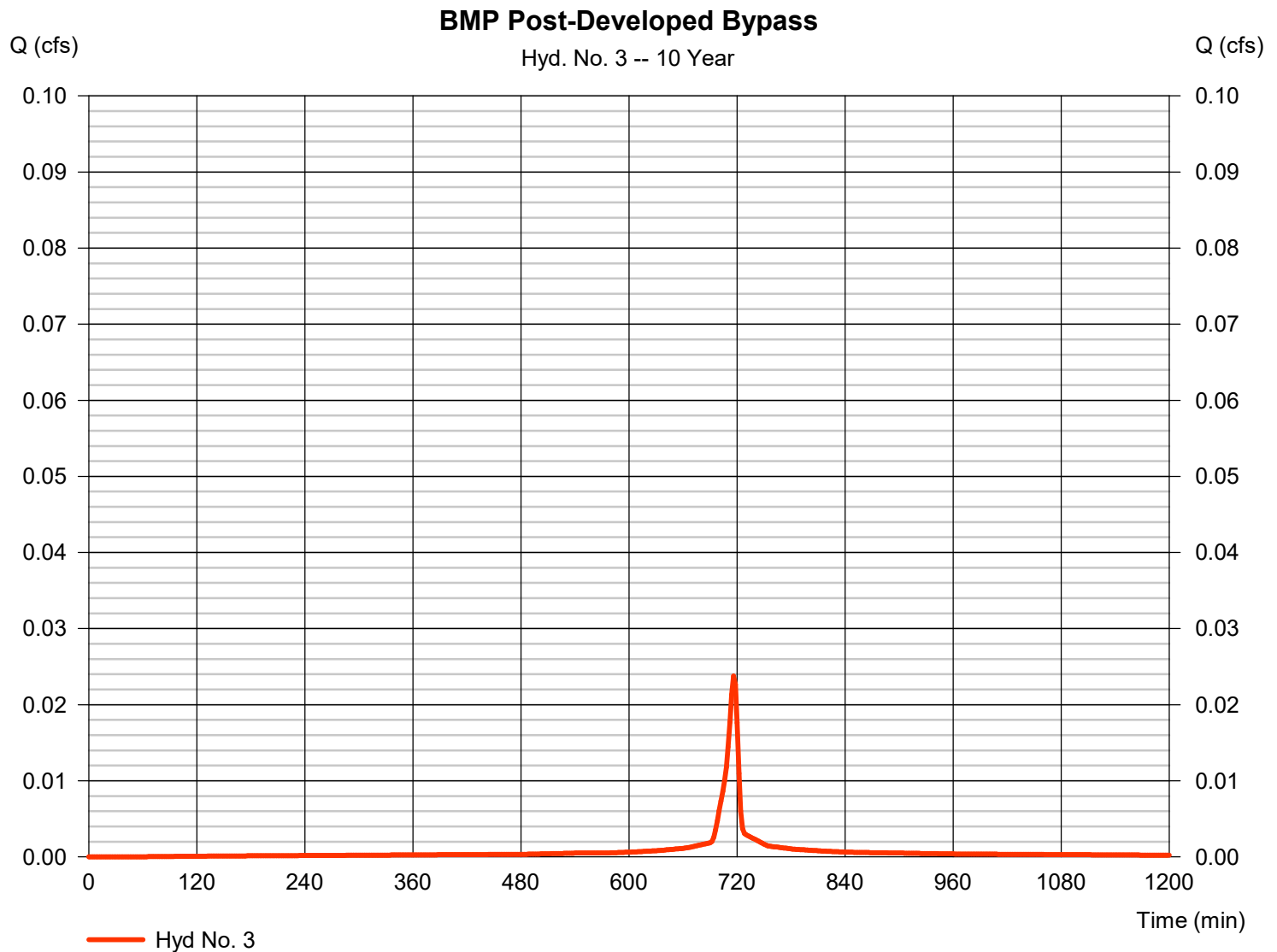
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 3

### BMP Post-Developed Bypass

|                 |   |            |                    |   |           |
|-----------------|---|------------|--------------------|---|-----------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 0.024 cfs |
| Storm frequency | = | 10 yrs     | Time to peak       | = | 716 min   |
| Time interval   | = | 2 min      | Hyd. volume        | = | 57 cuft   |
| Drainage area   | = | 0.003 ac   | Curve number       | = | 98        |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft      |
| Tc method       | = | User       | Time of conc. (Tc) | = | 5.00 min  |
| Total precip.   | = | 5.14 in    | Distribution       | = | Type II   |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484       |



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

| Hyd. No.                     | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft)      | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description    |
|------------------------------|--------------------------|-----------------|---------------------|--------------------|-------------------------|---------------|------------------------|-------------------------|---------------------------|
| 1                            | SCS Runoff               | 2.718           | 2                   | 728                | 9,659                   | -----         | -----                  | -----                   | BMP Pre-Developed         |
| 2                            | SCS Runoff               | 1.188           | 2                   | 728                | 4,187                   | -----         | -----                  | -----                   | BMP Post-Developed        |
| 3                            | SCS Runoff               | 0.037           | 2                   | 716                | 90                      | -----         | -----                  | -----                   | BMP Post-Developed Bypass |
| 7-Eleven Drainage Area 2.gpw |                          |                 |                     |                    | Return Period: 100 Year |               |                        | Tuesday, 12 / 5 / 2023  |                           |

# Hydrograph Report

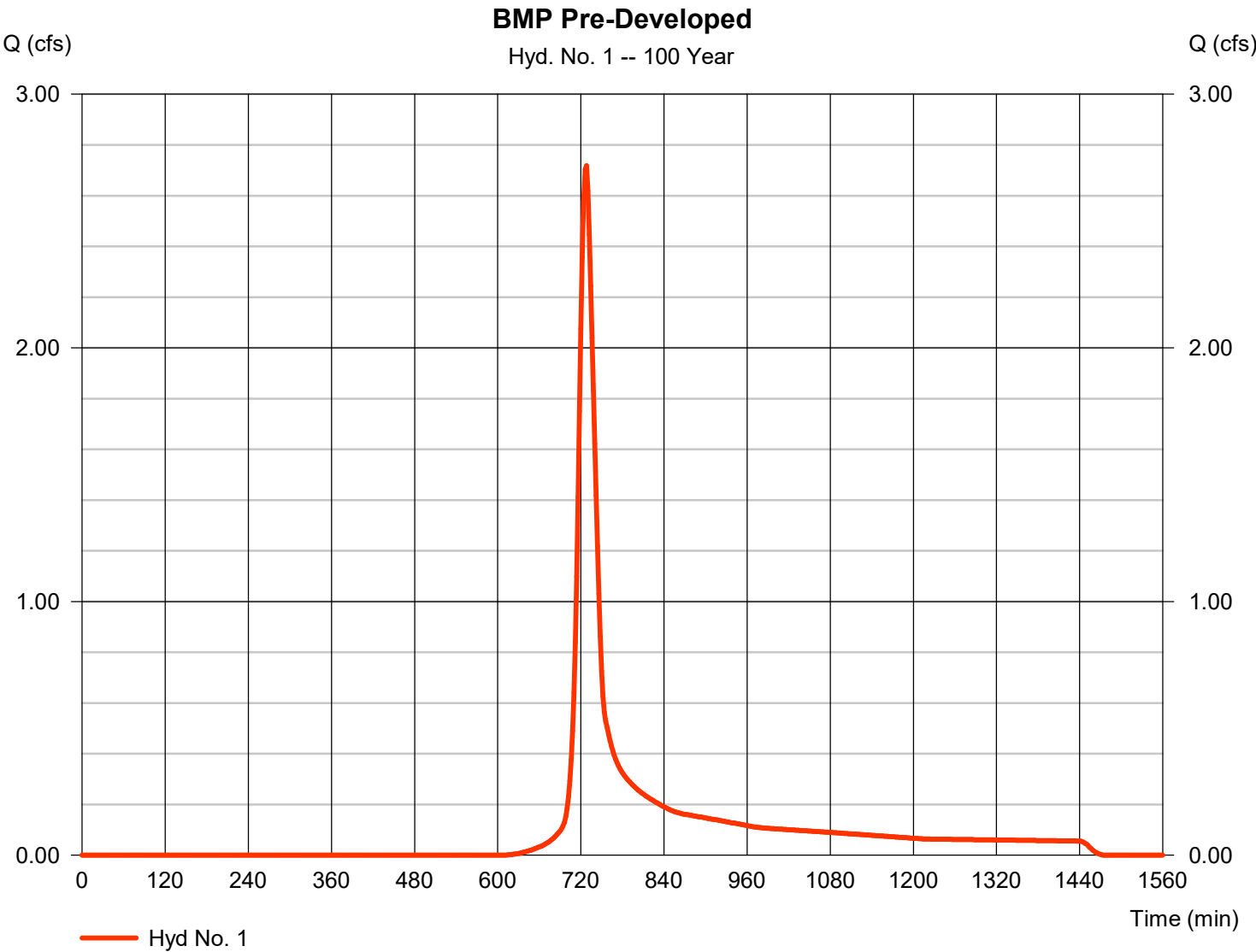
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

## Hyd. No. 1

BMP Pre-Developed

|                 |   |            |                    |   |            |
|-----------------|---|------------|--------------------|---|------------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 2.718 cfs  |
| Storm frequency | = | 100 yrs    | Time to peak       | = | 728 min    |
| Time interval   | = | 2 min      | Hyd. volume        | = | 9,659 cuft |
| Drainage area   | = | 0.840 ac   | Curve number       | = | 58         |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft       |
| Tc method       | = | User       | Time of conc. (Tc) | = | 22.20 min  |
| Total precip.   | = | 8.00 in    | Distribution       | = | Type II    |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484        |

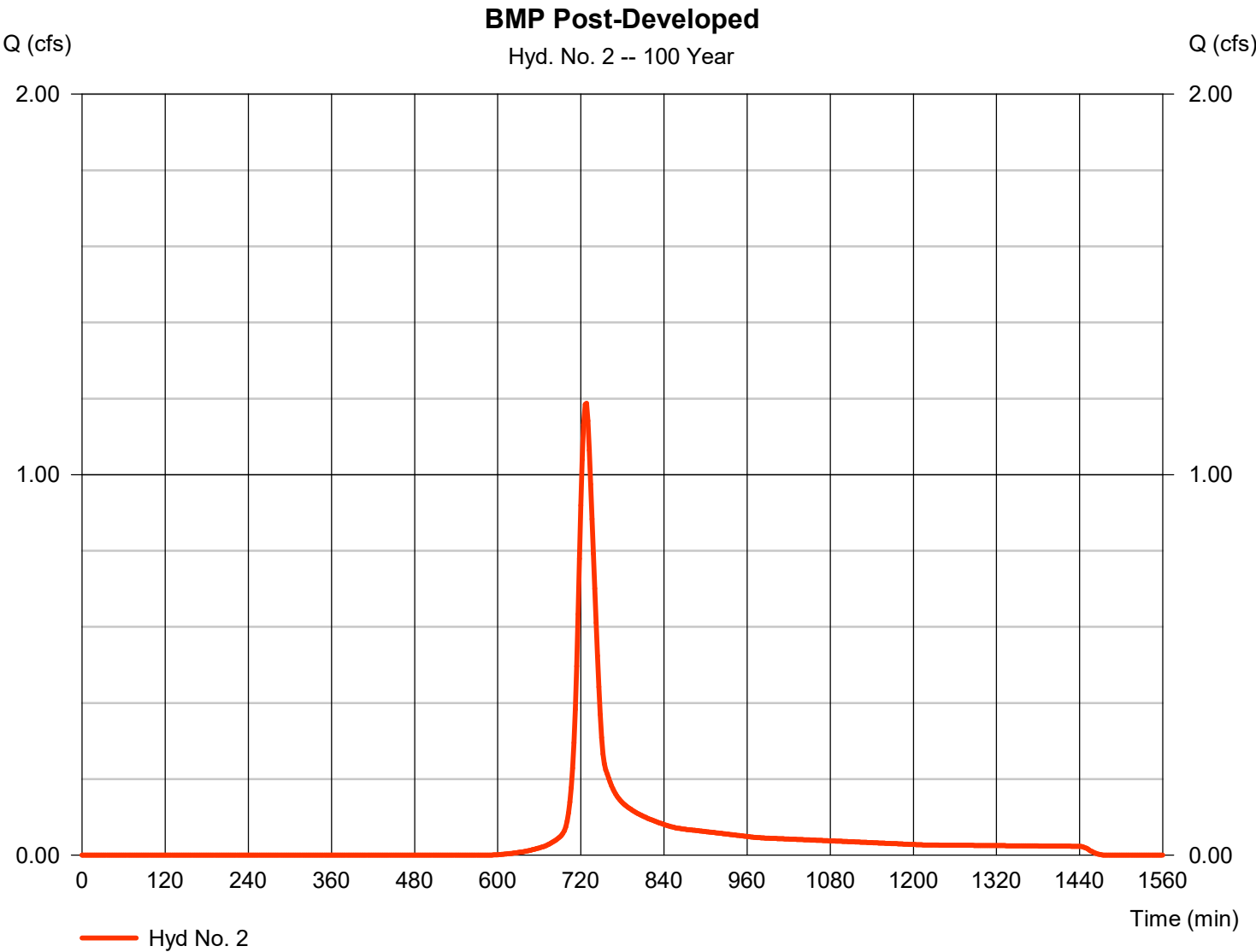


# Hydrograph Report

## Hyd. No. 2

BMP Post-Developed

|                 |   |            |                    |   |            |
|-----------------|---|------------|--------------------|---|------------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 1.188 cfs  |
| Storm frequency | = | 100 yrs    | Time to peak       | = | 728 min    |
| Time interval   | = | 2 min      | Hyd. volume        | = | 4,187 cuft |
| Drainage area   | = | 0.340 ac   | Curve number       | = | 60         |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft       |
| Tc method       | = | User       | Time of conc. (Tc) | = | 22.20 min  |
| Total precip.   | = | 8.00 in    | Distribution       | = | Type II    |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484        |



# Hydrograph Report

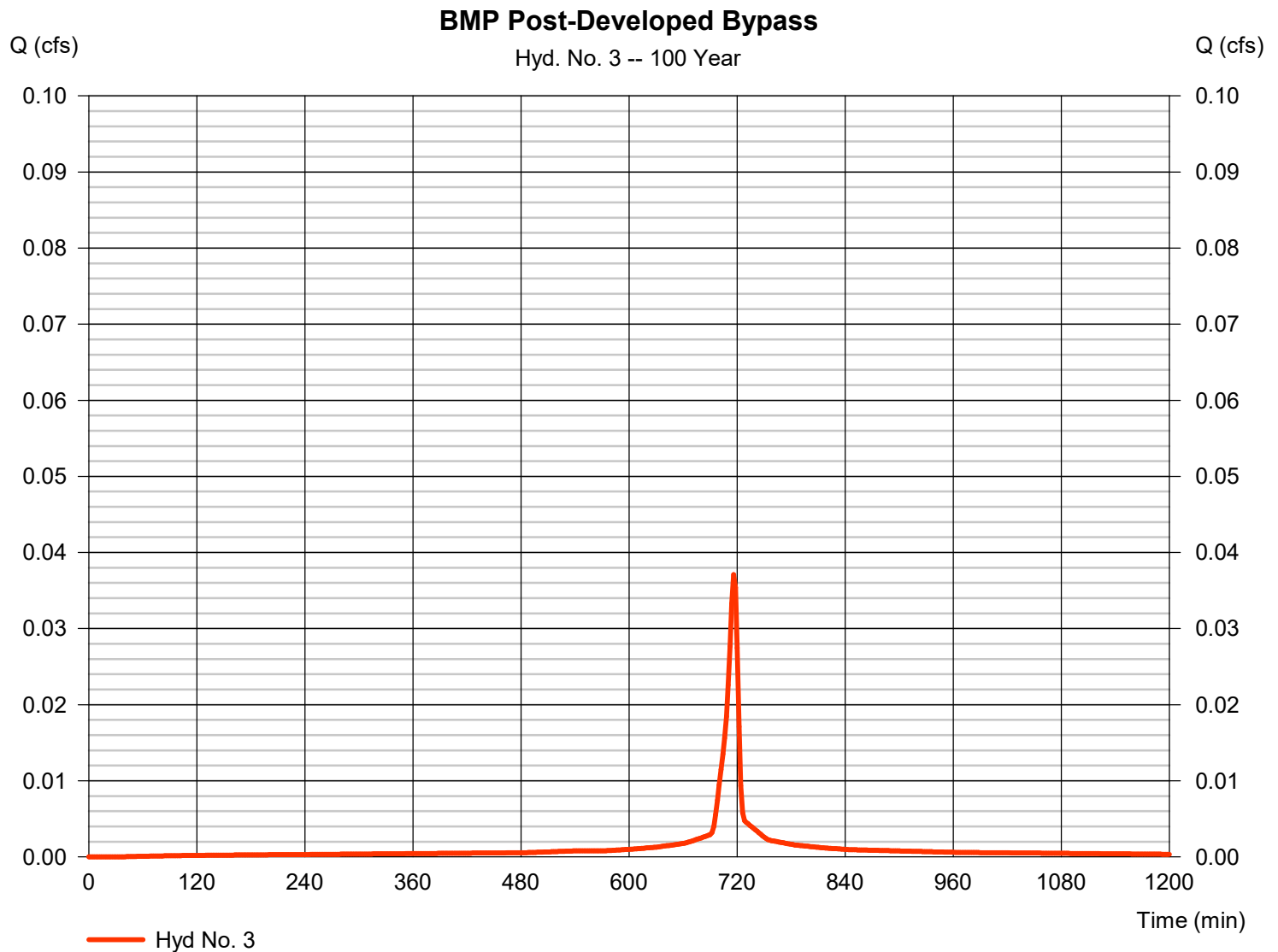
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Tuesday, 12 / 5 / 2023

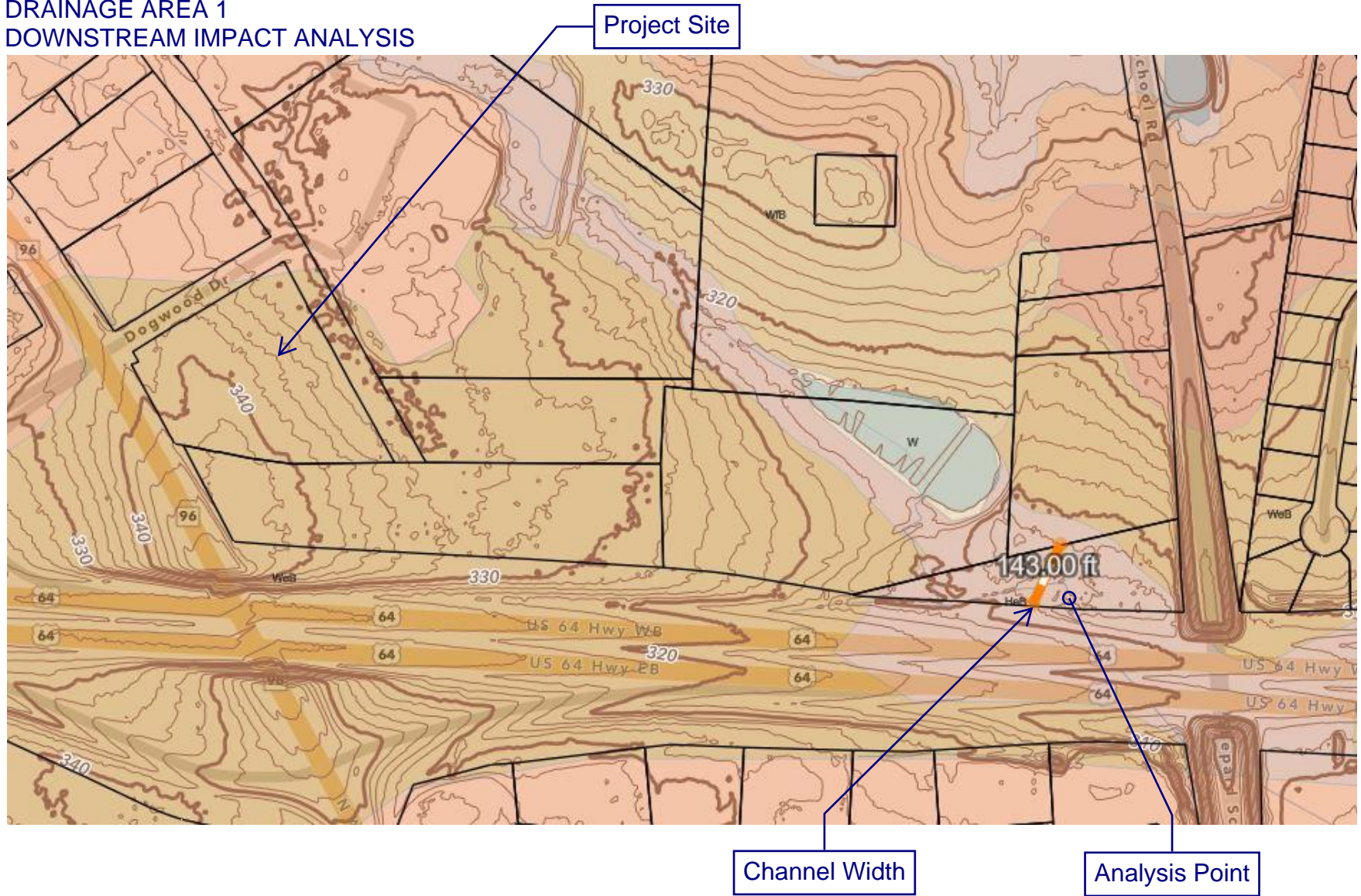
## Hyd. No. 3

### BMP Post-Developed Bypass

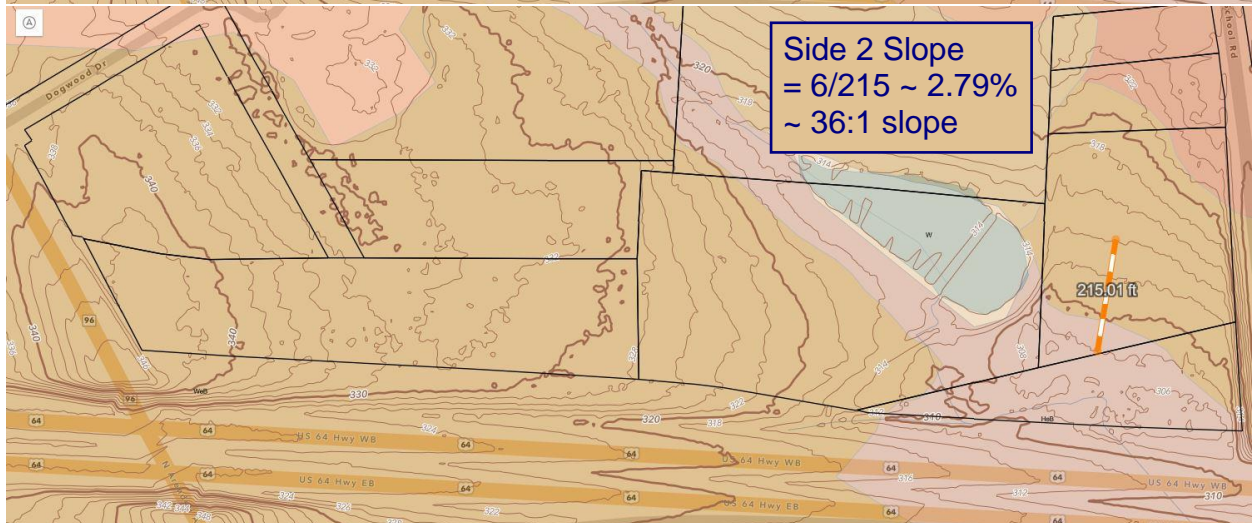
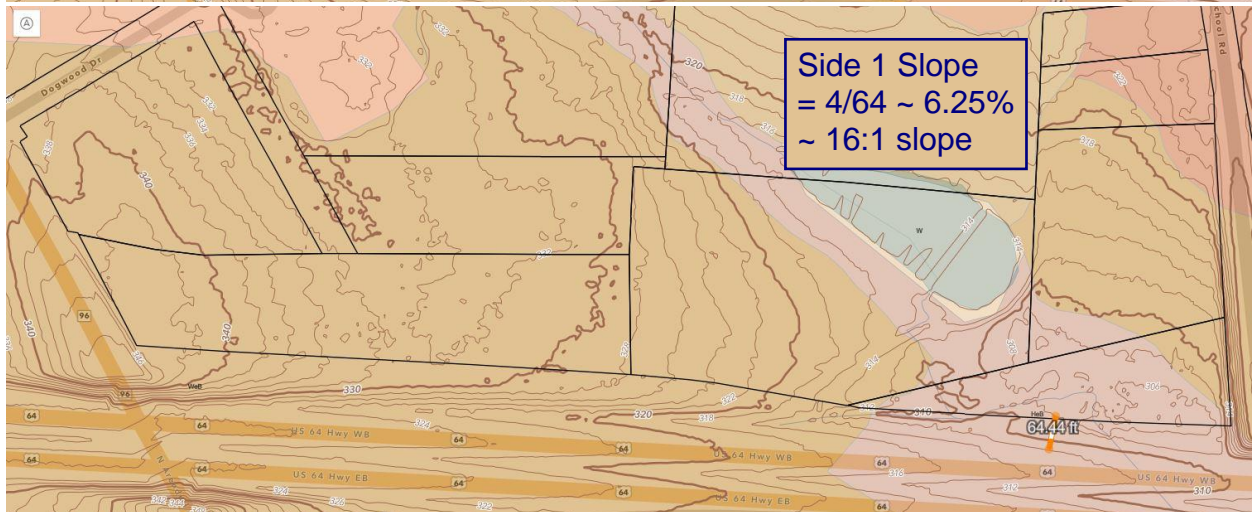
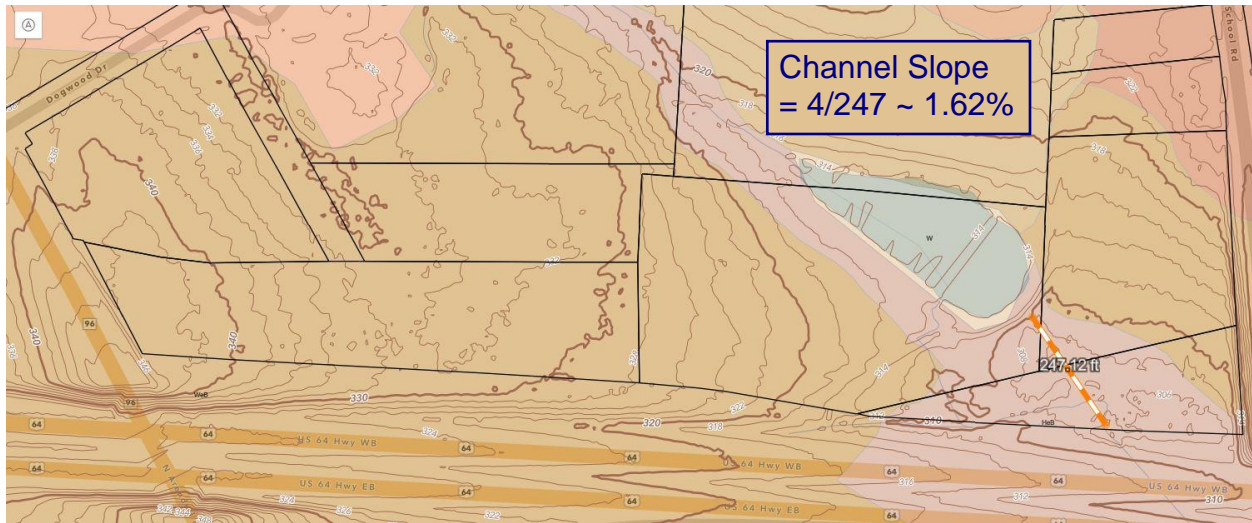
|                 |   |            |                    |   |           |
|-----------------|---|------------|--------------------|---|-----------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 0.037 cfs |
| Storm frequency | = | 100 yrs    | Time to peak       | = | 716 min   |
| Time interval   | = | 2 min      | Hyd. volume        | = | 90 cuft   |
| Drainage area   | = | 0.003 ac   | Curve number       | = | 98        |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft      |
| Tc method       | = | User       | Time of conc. (Tc) | = | 5.00 min  |
| Total precip.   | = | 8.00 in    | Distribution       | = | Type II   |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484       |



DRAINAGE AREA 1  
DOWNSTREAM IMPACT ANALYSIS



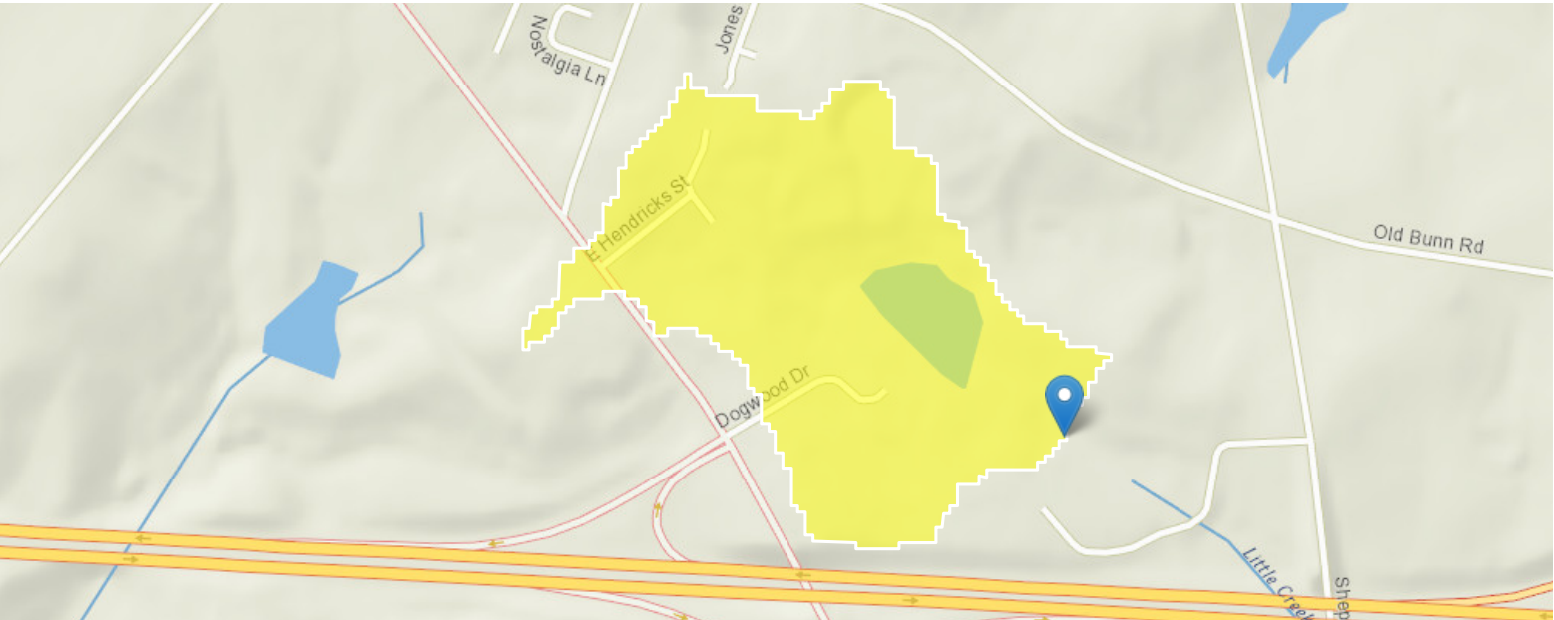






# StreamStats Report

Region ID: NC  
Workspace ID: NC20231128205353275000  
Clicked Point (Latitude, Longitude): 35.83610, -78.31765  
Time: 2023-11-28 15:54:15 -0500



+ Collapse All

## Basin Characteristics

| Parameter Code | Parameter Description   | Value  | Unit         |
|----------------|---|--------|--------------|
| DRNAREA        | Area that drains to a point on a stream                                       | 0.0829 | square miles |
| LC06IMP        | Percentage of impervious area determined from NLCD 2006 impervious dataset    | 21.62  | percent      |
| PCTREG1        | Percentage of drainage area located in Region 1 - Piedmont / Ridge and Valley | 100    | percent      |
| PCTREG2        | Percentage of drainage area located in Region 2 - Blue Ridge                  | 0      | percent      |
| PCTREG3        | Percentage of drainage area located in Region 3 - Sandhills                   | 0      | percent      |
| PCTREG4        | Percentage of drainage area located in Region 4 - Coastal Plains              | 0      | percent      |
| PCTREG5        | Percentage of drainage area located in Region 5 - Lower Tifton Uplands        | 0      | percent      |

## Peak-Flow Statistics

Peak-Flow Statistics Parameters [Region 1 Piedmont rural under 1 sqmi 2014 5030]

| Parameter Code | Parameter Name              | Value  | Units        | Min Limit | Max Limit |
|----------------|-----------------------------|--------|--------------|-----------|-----------|
| DRNAREA        | Drainage Area               | 0.0829 | square miles | 0.1       | 1         |
| LC06IMP        | Percent Impervious NLCD2006 | 21.62  | percent      | 0         | 47.9      |

Peak-Flow Statistics Parameters [Peak Southeast US NC 2023 5006]

| Parameter Code | Parameter Name           | Value | Units   | Min Limit | Max Limit |
|----------------|--------------------------|-------|---------|-----------|-----------|
| PCTREG1        | Percent Area in Region 1 | 100   | percent | 0         | 100       |

| Parameter Code | Parameter Name           | Value  | Units        | Min Limit | Max Limit |
|----------------|--------------------------|--------|--------------|-----------|-----------|
| PCTREG2        | Percent Area in Region 2 | 0      | percent      | 0         | 100       |
| PCTREG3        | Percent Area in Region 3 | 0      | percent      | 0         | 100       |
| PCTREG5        | Percent Area in Region 5 | 0      | percent      | 0         | 100       |
| DRNAREA        | Drainage Area            | 0.0829 | square miles | 0.08      | 8902      |
| PCTREG4        | Percent Area in Region 4 | 0      | percent      | 0         | 100       |

Peak-Flow Statistics Disclaimers [Region 1 Piedmont rural under 1 sqmi 2014 5030]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Region 1 Piedmont rural under 1 sqmi 2014 5030]

| Statistic             | Value | Unit   |
|-----------------------|-------|--------|
| 50-percent AEP flood  | 54.1  | ft^3/s |
| 20-percent AEP flood  | 73.4  | ft^3/s |
| 10-percent AEP flood  | 85.2  | ft^3/s |
| 4-percent AEP flood   | 97.9  | ft^3/s |
| 2-percent AEP flood   | 106   | ft^3/s |
| 1-percent AEP flood   | 115   | ft^3/s |
| 0.5-percent AEP flood | 122   | ft^3/s |
| 0.2-percent AEP flood | 137   | ft^3/s |

Peak-Flow Statistics Flow Report [Peak Southeast US NC 2023 5006]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

| Statistic             | Value | Unit   | PIL  | PIU  | ASEp |
|-----------------------|-------|--------|------|------|------|
| 50-percent AEP flood  | 29.9  | ft^3/s | 16.3 | 54.7 | 36.8 |
| 20-percent AEP flood  | 55.4  | ft^3/s | 31.1 | 98.7 | 35.8 |
| 10-percent AEP flood  | 76.6  | ft^3/s | 42.7 | 138  | 36.3 |
| 4-percent AEP flood   | 106   | ft^3/s | 56.6 | 199  | 38.4 |
| 2-percent AEP flood   | 133   | ft^3/s | 70.3 | 252  | 39.8 |
| 1-percent AEP flood   | 160   | ft^3/s | 82.7 | 310  | 41.3 |
| 0.5-percent AEP flood | 188   | ft^3/s | 95   | 372  | 42.8 |
| 0.2-percent AEP flood | 225   | ft^3/s | 111  | 456  | 44.4 |

Peak-Flow Statistics Citations

**Feaster, T.D., Gotvald, A.J., and Weaver, J.C.,2014, Methods for estimating the magnitude and frequency of floods for urban and small, rural streams in Georgia, South Carolina, and North Carolina, 2011 (ver. 1.1, March 2014): U.S. Geological Survey Scientific Investigations Report 2014–5030, 104 p. (<http://pubs.usgs.gov/sir/2014/5030/>)**  
**Feaster, T.D., Gotvald, A.J., Musser, J.W., Weaver, J.C, Kolb, K.R., Veilleux, A.G., and Wagner, D.M.2023, Magnitude and frequency of floods for rural streams in Georgia, South Carolina, and North Carolina, 2017—Results: U.S. Geological Survey Scientific Investigations Report 2023-5006, 75 p. (<https://pubs.er.usgs.gov/publication/sir20235006>)**

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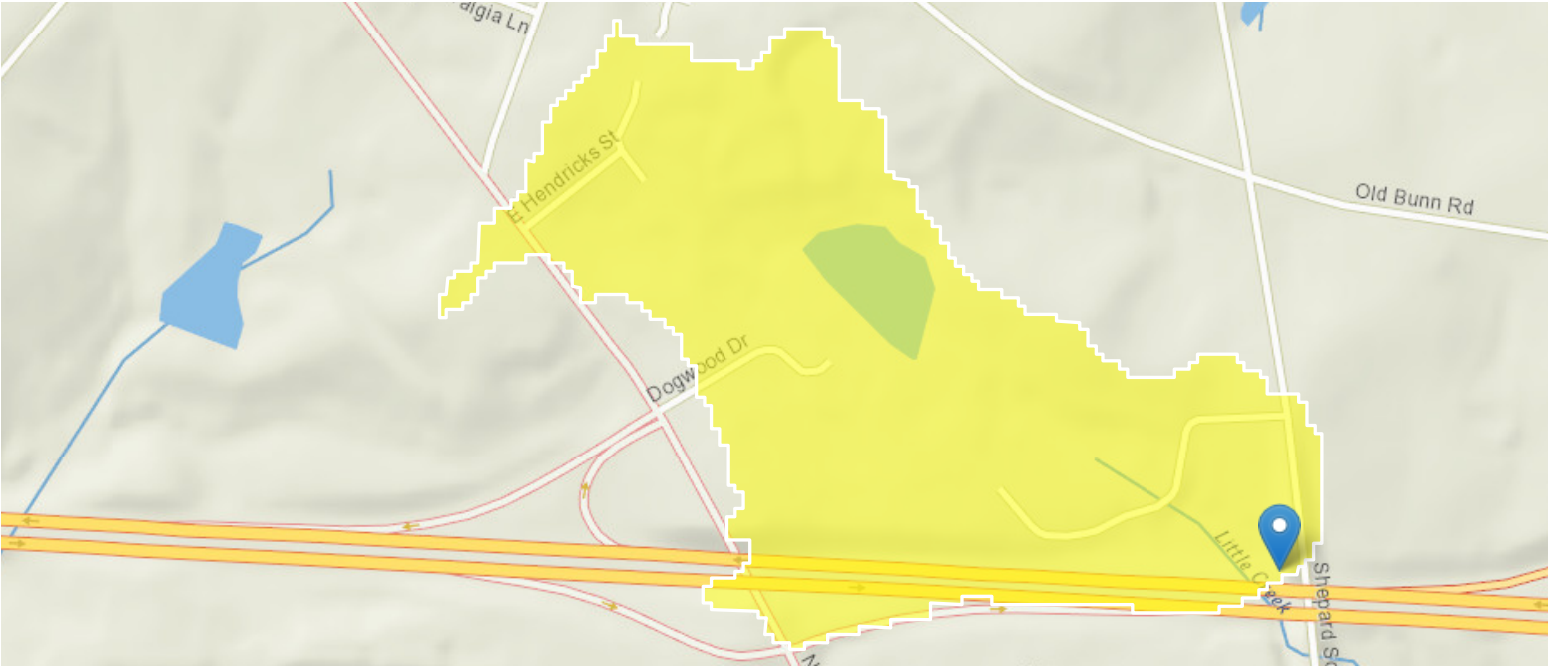
Application Version: 4.18.1

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

# StreamStats Report

Region ID: NC  
Workspace ID: NC20231128212959058000  
Clicked Point (Latitude, Longitude): 35.83438, -78.31432  
Time: 2023-11-28 16:30:21 -0500



+ Collapse All

## > Basin Characteristics

| Parameter Code | Parameter Description   | Value | Unit         |
|----------------|---|-------|--------------|
| DRNAREA        | Area that drains to a point on a stream                                       | 0.14  | square miles |
| LC06IMP        | Percentage of impervious area determined from NLCD 2006 impervious dataset    | 100   | percent      |
| PCTREG1        | Percentage of drainage area located in Region 1 - Piedmont / Ridge and Valley | 100   | percent      |
| PCTREG2        | Percentage of drainage area located in Region 2 - Blue Ridge                  | 0     | percent      |
| PCTREG3        | Percentage of drainage area located in Region 3 - Sandhills                   | 0     | percent      |
| PCTREG4        | Percentage of drainage area located in Region 4 - Coastal Plains              | 0     | percent      |
| PCTREG5        | Percentage of drainage area located in Region 5 - Lower Tifton Uplands        | 0     | percent      |

## General Disclaimers

Parameter values have been edited, computed flows may not apply.

➤ Peak-Flow Statistics

Peak-Flow Statistics Parameters [Region 1 Piedmont rural under 1 sqmi 2014 5030]

| Parameter Code | Parameter Name              | Value | Units        | Min Limit | Max Limit |
|----------------|-----------------------------|-------|--------------|-----------|-----------|
| DRNAREA        | Drainage Area               | 0.14  | square miles | 0.1       | 1         |
| LC06IMP        | Percent Impervious NLCD2006 | 100   | percent      | 0         | 47.9      |

Peak-Flow Statistics Parameters [Peak Southeast US NC 2023 5006]

| Parameter Code | Parameter Name           | Value | Units        | Min Limit | Max Limit |
|----------------|--------------------------|-------|--------------|-----------|-----------|
| PCTREG1        | Percent Area in Region 1 | 100   | percent      | 0         | 100       |
| PCTREG2        | Percent Area in Region 2 | 0     | percent      | 0         | 100       |
| PCTREG3        | Percent Area in Region 3 | 0     | percent      | 0         | 100       |
| PCTREG5        | Percent Area in Region 5 | 0     | percent      | 0         | 100       |
| DRNAREA        | Drainage Area            | 0.14  | square miles | 0.08      | 8902      |
| PCTREG4        | Percent Area in Region 4 | 0     | percent      | 0         | 100       |

Peak-Flow Statistics Disclaimers [Region 1 Piedmont rural under 1 sqmi 2014 5030]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Region 1 Piedmont rural under 1 sqmi 2014 5030]

| Statistic             | Value | Unit   |
|-----------------------|-------|--------|
| 50-percent AEP flood  | 865   | ft^3/s |
| 20-percent AEP flood  | 610   | ft^3/s |
| 10-percent AEP flood  | 498   | ft^3/s |
| 4-percent AEP flood   | 382   | ft^3/s |
| 2-percent AEP flood   | 313   | ft^3/s |
| 1-percent AEP flood   | 269   | ft^3/s |
| 0.5-percent AEP flood | 228   | ft^3/s |
| 0.2-percent AEP flood | 210   | ft^3/s |

Peak-Flow Statistics Flow Report [Peak Southeast US NC 2023 5006]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

| Statistic             | Value | Unit   | PIL  | PIU  | ASEp |
|-----------------------|-------|--------|------|------|------|
| 50-percent AEP flood  | 41.9  | ft^3/s | 22.9 | 76.6 | 36.8 |
| 20-percent AEP flood  | 77.1  | ft^3/s | 43.3 | 137  | 35.8 |
| 10-percent AEP flood  | 106   | ft^3/s | 59.1 | 190  | 36.3 |
| 4-percent AEP flood   | 147   | ft^3/s | 78.5 | 275  | 38.4 |
| 2-percent AEP flood   | 183   | ft^3/s | 96.8 | 346  | 39.8 |
| 1-percent AEP flood   | 219   | ft^3/s | 113  | 423  | 41.3 |
| 0.5-percent AEP flood | 258   | ft^3/s | 131  | 510  | 42.8 |

| Statistic  | Value | Unit   | PIL | PIU | ASEp |
|--|-------|--------|-----|-----|------|
| 0.2-percent AEP flood  | 308   | ft^3/s | 152 | 623 | 44.4 |
| <i>Peak-Flow Statistics Citations</i>  |       |        |     |     |      |
| <b>Feaster, T.D., Gotvald, A.J., and Weaver, J.C.,2014, Methods for estimating the magnitude and frequency of floods for urban and small, rural streams in Georgia, South Carolina, and North Carolina, 2011 (ver. 1.1, March 2014): U.S. Geological Survey Scientific Investigations Report 2014–5030, 104 p. (<a href="http://pubs.usgs.gov/sir/2014/5030/">http://pubs.usgs.gov/sir/2014/5030/</a>)</b><br><b>Feaster, T.D., Gotvald, A.J., Musser, J.W., Weaver, J.C, Kolb, K.R., Veilleux, A.G., and Wagner, D.M.2023, Magnitude and frequency of floods for rural streams in Georgia, South Carolina, and North Carolina, 2017—Results: U.S. Geological Survey Scientific Investigations Report 2023-5006, 75 p. (<a href="https://pubs.er.usgs.gov/publication/sir20235006">https://pubs.er.usgs.gov/publication/sir20235006</a>)</b> |       |        |     |     |      |

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Application Version: 4.18.1  
StreamStats Services Version: 1.2.22  
NSS Services Version: 2.2.1

# Channel Report

<Name>

Trapezoidal

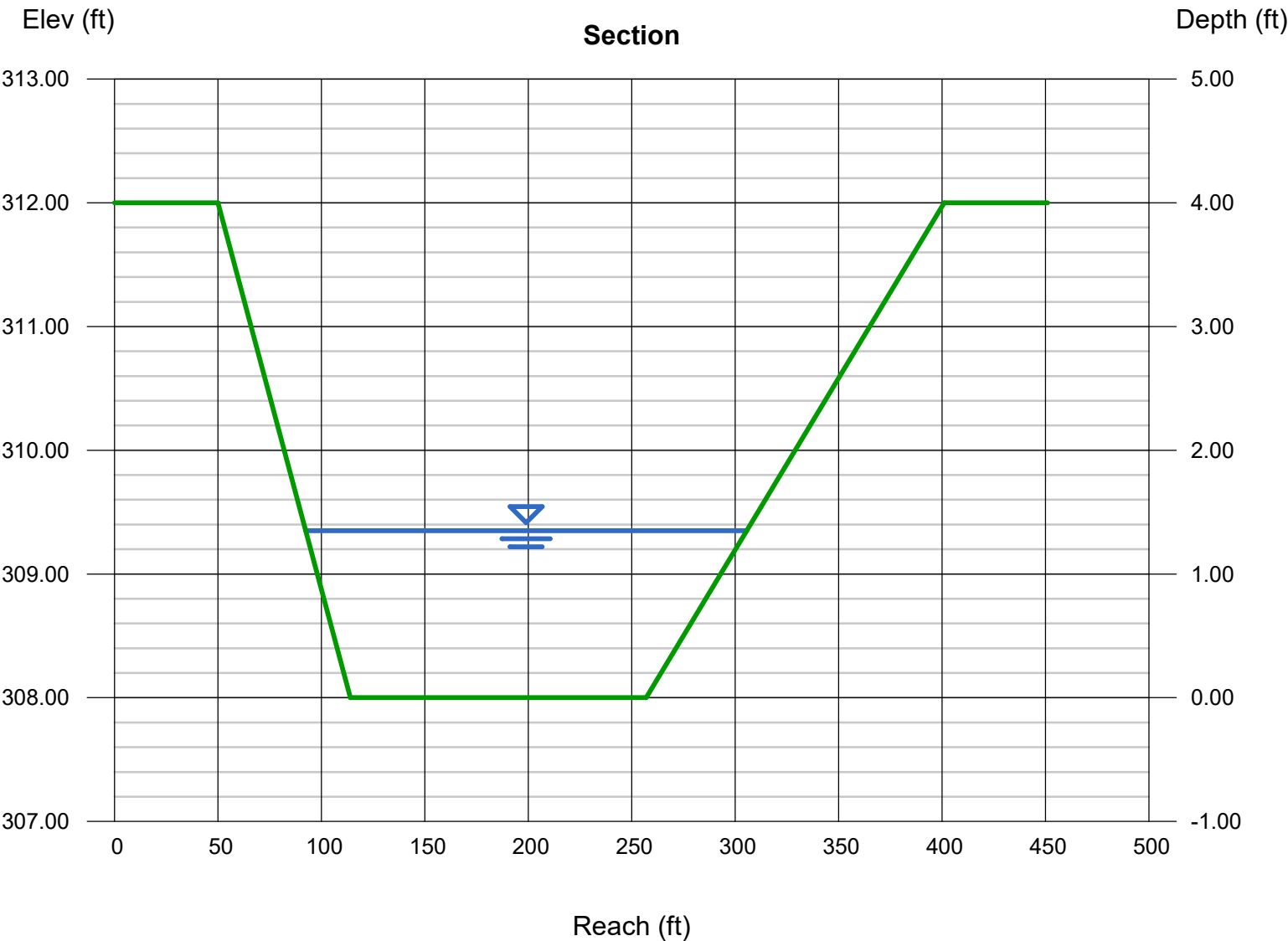
Bottom Width (ft) = 143.00  
Side Slopes (z:1) = 16.00, 36.00  
Total Depth (ft) = 4.00  
Invert Elev (ft) = 308.00  
Slope (%) = 1.62  
N-Value = 0.400

Highlighted

Depth (ft) = 1.35  
Q (cfs) = 123.00  
Area (sqft) = 240.43  
Velocity (ft/s) = 0.51  
Wetted Perim (ft) = 213.26  
Crit Depth, Yc (ft) = 0.28  
Top Width (ft) = 213.20  
EGL (ft) = 1.35

Calculations

Compute by: Known Q  
Known Q (cfs) = 123.00



# Channel Report

<Name>

Trapezoidal

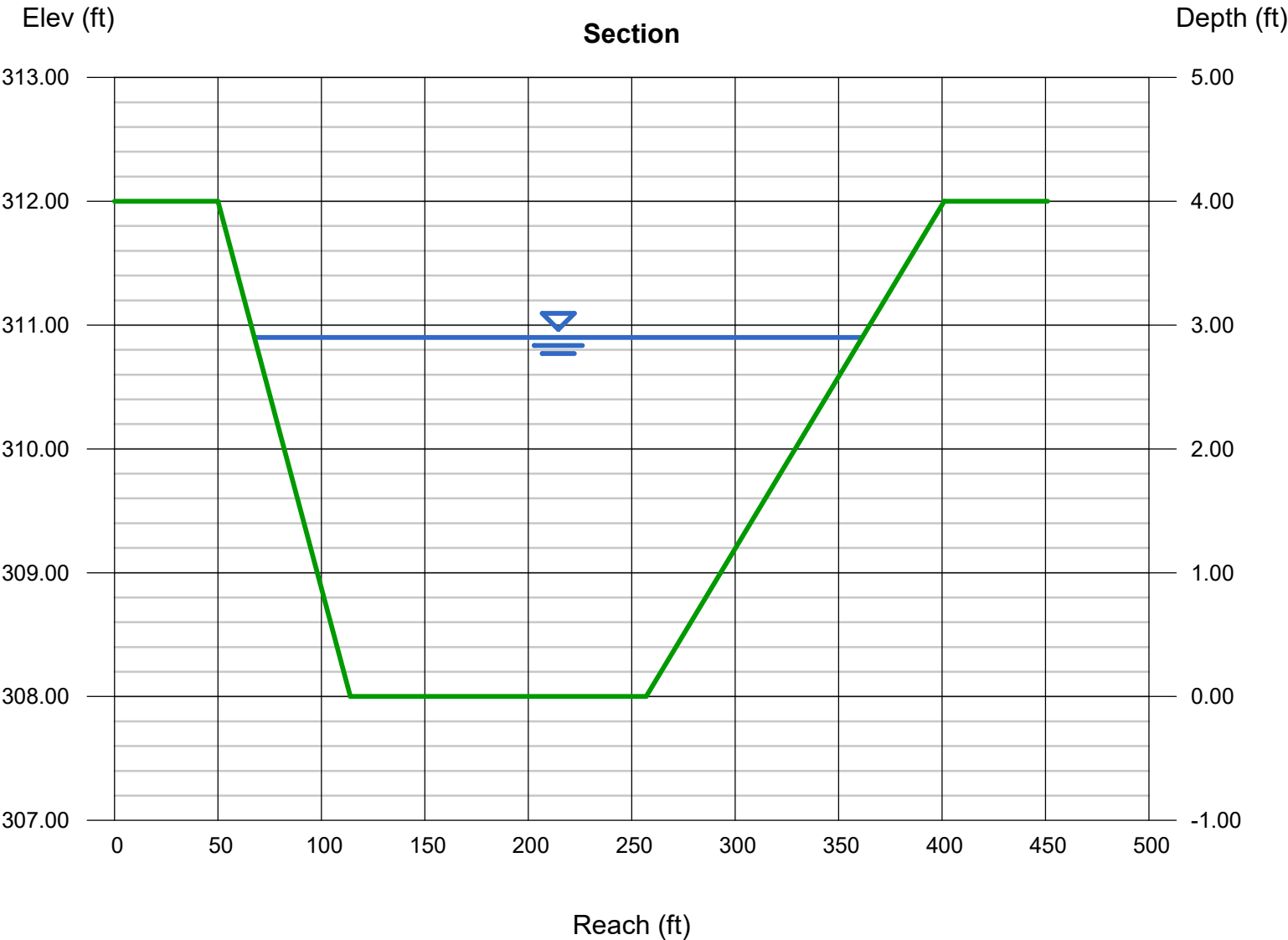
Bottom Width (ft) = 143.00  
Side Slopes (z:1) = 16.00, 36.00  
Total Depth (ft) = 4.00  
Invert Elev (ft) = 308.00  
Slope (%) = 1.62  
N-Value = 0.400

Highlighted

Depth (ft) = 2.90  
Q (cfs) = 498.00  
Area (sqft) = 633.36  
Velocity (ft/s) = 0.79  
Wetted Perim (ft) = 293.93  
Crit Depth, Yc (ft) = 0.70  
Top Width (ft) = 293.80  
EGL (ft) = 2.91

Calculations

Compute by: Known Q  
Known Q (cfs) = 498.00



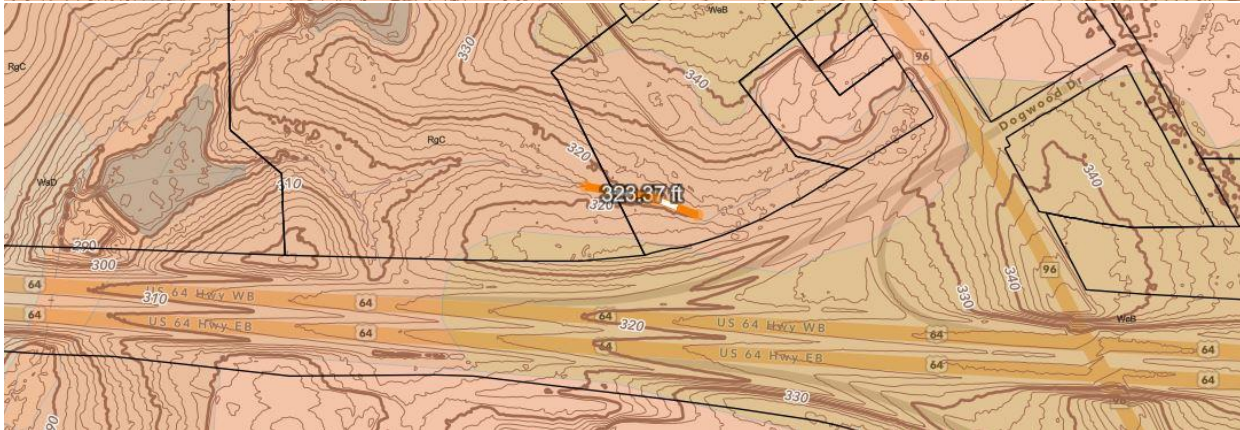
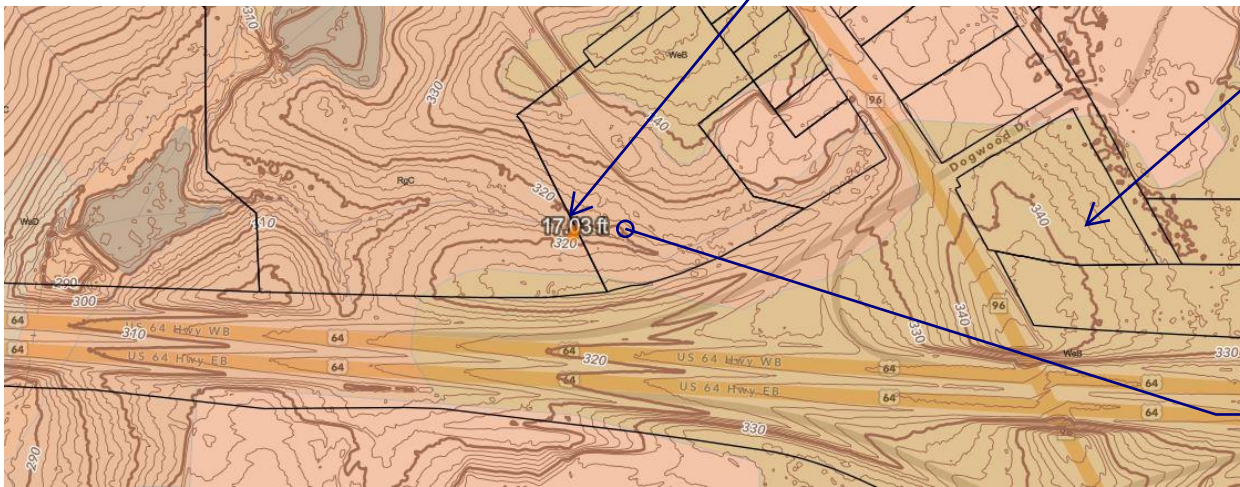


# DRAINAGE AREA 2 DOWNSTREAM IMPACT ANALYSIS

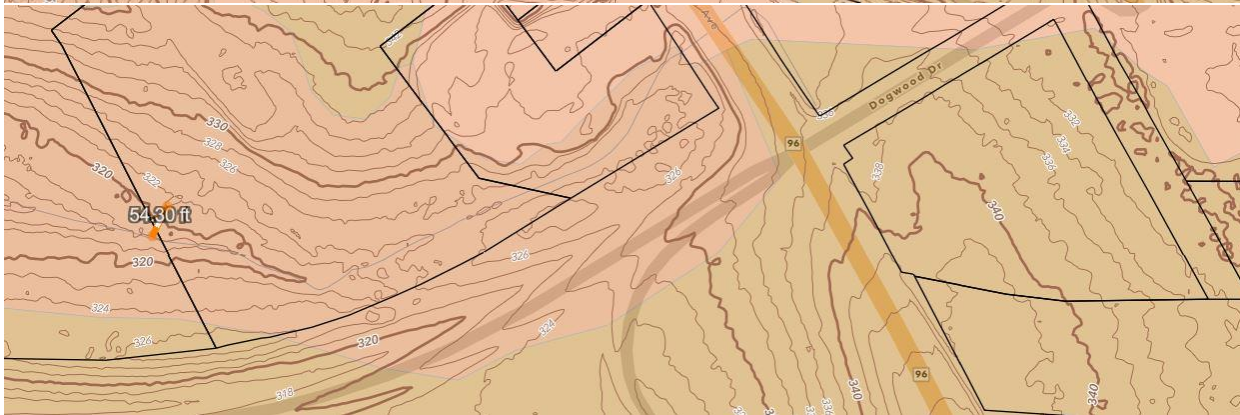
Channel Width

Project Site

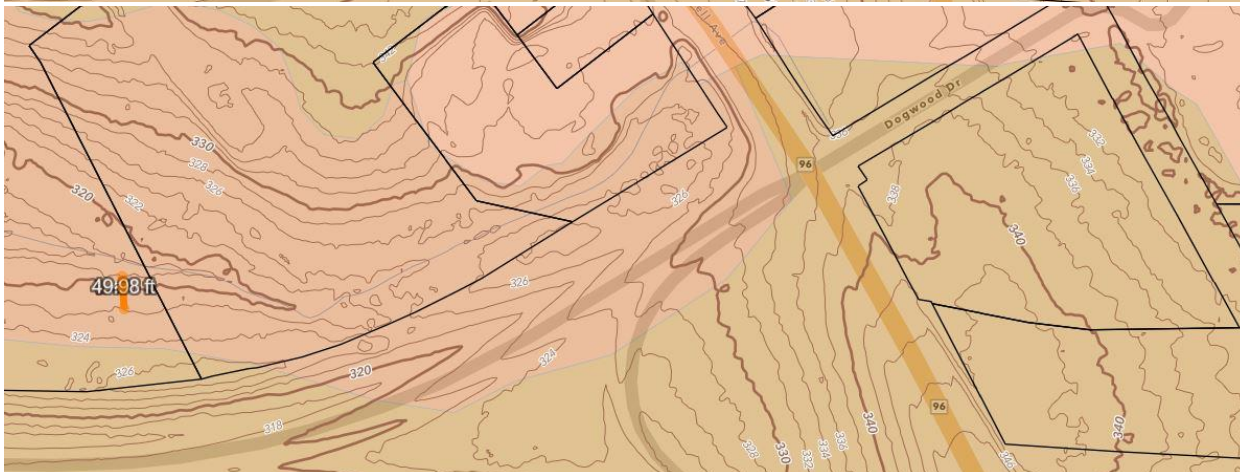
Analysis Point



Channel Slope  
= 4/324 ~ 1.23%



Side 1 Slope  
= 4/54 ~ 7.41%  
~ 13.5:1 slope

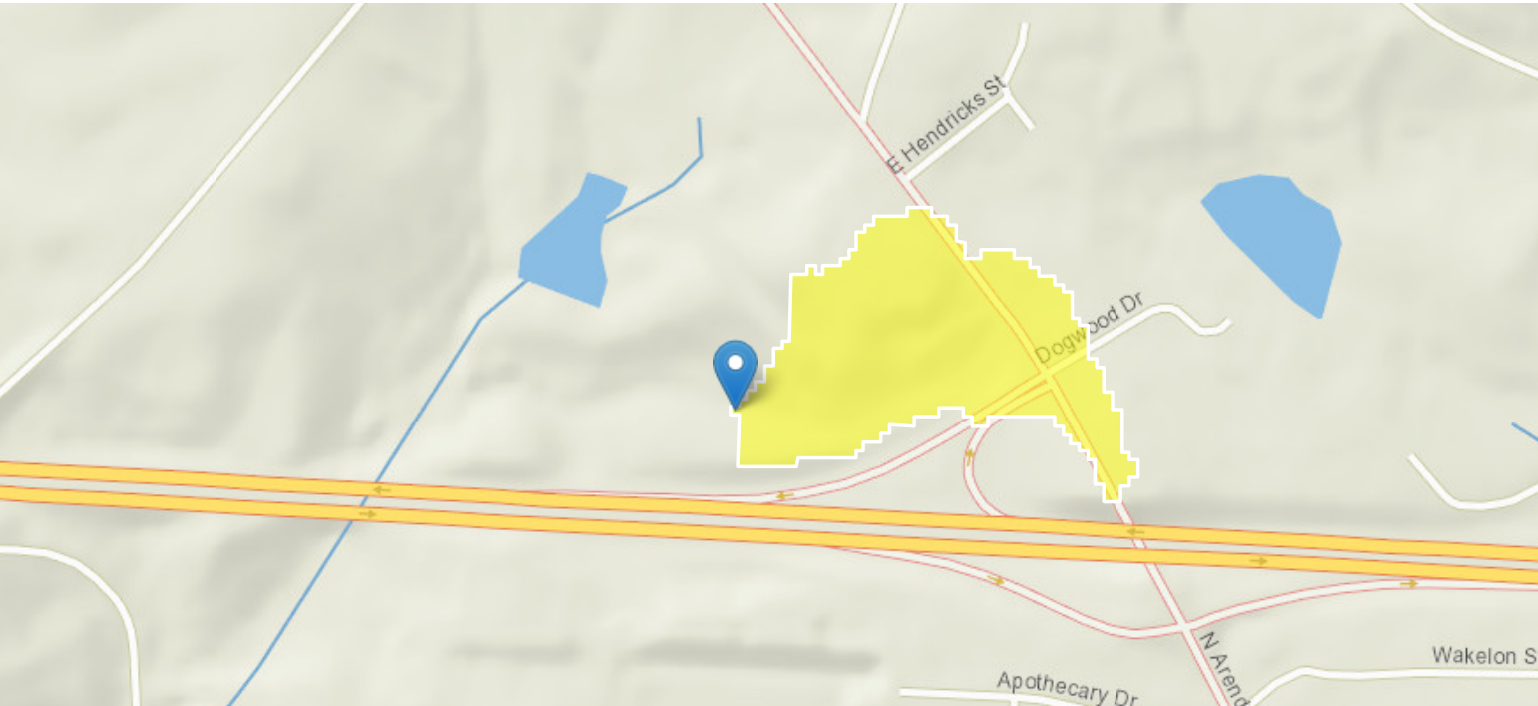


Side 2 Slope  
= 4/50 ~ 8.0%  
~ 12.5:1 slope



# StreamStats Report

Region ID: NC  
Workspace ID: NC20231129140440784000  
Clicked Point (Latitude, Longitude): 35.83572, -78.32615  
Time: 2023-11-29 09:05:02 -0500



Collapse All

➤ Basin Characteristics

| Parameter Code | Parameter Description   | Value  | Unit         |
|----------------|---|--------|--------------|
| DRNAREA        | Area that drains to a point on a stream                                       | 0.0292 | square miles |
| LC06IMP        | Percentage of impervious area determined from NLCD 2006 impervious dataset    | 14.48  | percent      |
| PCTREG1        | Percentage of drainage area located in Region 1 - Piedmont / Ridge and Valley | 100    | percent      |
| PCTREG2        | Percentage of drainage area located in Region 2 - Blue Ridge                  | 0      | percent      |
| PCTREG3        | Percentage of drainage area located in Region 3 - Sandhills                   | 0      | percent      |
| PCTREG4        | Percentage of drainage area located in Region 4 - Coastal Plains              | 0      | percent      |
| PCTREG5        | Percentage of drainage area located in Region 5 - Lower Tifton Uplands        | 0      | percent      |

➤ Peak-Flow Statistics

Peak-Flow Statistics Parameters [Region 1 Piedmont rural under 1 sqmi 2014 5030]

| Parameter Code | Parameter Name              | Value  | Units        | Min Limit | Max Limit |
|----------------|-----------------------------|--------|--------------|-----------|-----------|
| DRNAREA        | Drainage Area               | 0.0292 | square miles | 0.1       | 1         |
| LC06IMP        | Percent Impervious NLCD2006 | 14.48  | percent      | 0         | 47.9      |

Peak-Flow Statistics Parameters [Peak Southeast US NC 2023 5006]

| Parameter Code | Parameter Name           | Value  | Units        | Min Limit | Max Limit |
|----------------|--------------------------|--------|--------------|-----------|-----------|
| PCTREG1        | Percent Area in Region 1 | 100    | percent      | 0         | 100       |
| PCTREG2        | Percent Area in Region 2 | 0      | percent      | 0         | 100       |
| PCTREG3        | Percent Area in Region 3 | 0      | percent      | 0         | 100       |
| PCTREG5        | Percent Area in Region 5 | 0      | percent      | 0         | 100       |
| DRNAREA        | Drainage Area            | 0.0292 | square miles | 0.08      | 8902      |
| PCTREG4        | Percent Area in Region 4 | 0      | percent      | 0         | 100       |

Peak-Flow Statistics Disclaimers [Region 1 Piedmont rural under 1 sqmi 2014 5030]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Region 1 Piedmont rural under 1 sqmi 2014 5030]

| Statistic             | Value | Unit   |
|-----------------------|-------|--------|
| 50-percent AEP flood  | 20.7  | ft^3/s |
| 20-percent AEP flood  | 29.1  | ft^3/s |
| 10-percent AEP flood  | 34.2  | ft^3/s |
| 4-percent AEP flood   | 39.9  | ft^3/s |
| 2-percent AEP flood   | 43.8  | ft^3/s |
| 1-percent AEP flood   | 47.6  | ft^3/s |
| 0.5-percent AEP flood | 50.9  | ft^3/s |
| 0.2-percent AEP flood | 58.5  | ft^3/s |

Peak-Flow Statistics Disclaimers [Peak Southeast US NC 2023 5006]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Peak Southeast US NC 2023 5006]

| Statistic            | Value | Unit   |
|----------------------|-------|--------|
| 50-percent AEP flood | 15.2  | ft^3/s |
| 20-percent AEP flood | 28.7  | ft^3/s |

| Statistic  | Value | Unit   |
|--|-------|--------|
| 10-percent AEP flood   | 40    | ft^3/s |
| 4-percent AEP flood  | 55.9  | ft^3/s |
| 2-percent AEP flood  | 70.3  | ft^3/s |
| 1-percent AEP flood  | 85    | ft^3/s |
| 0.5-percent AEP flood  | 100   | ft^3/s |
| 0.2-percent AEP flood  | 121   | ft^3/s |
| <i>Peak-Flow Statistics Citations</i>  |       |        |
| <b>Feaster, T.D., Gotvald, A.J., and Weaver, J.C.,2014, Methods for estimating the magnitude and frequency of floods for urban and small, rural streams in Georgia, South Carolina, and North Carolina, 2011 (ver. 1.1, March 2014): U.S. Geological Survey Scientific Investigations Report 2014–5030, 104 p.</b><br><b>(<a href="http://pubs.usgs.gov/sir/2014/5030/">http://pubs.usgs.gov/sir/2014/5030/</a>)</b><br><b>Feaster, T.D., Gotvald, A.J., Musser, J.W., Weaver, J.C, Kolb, K.R., Veilleux, A.G., and Wagner, D.M.2023, Magnitude and frequency of floods for rural streams in Georgia, South Carolina, and North Carolina, 2017–Results: U.S. Geological Survey Scientific Investigations Report 2023-5006, 75 p.</b><br><b>(<a href="https://pubs.er.usgs.gov/publication/sir20235006">https://pubs.er.usgs.gov/publication/sir20235006</a>)</b> |       |        |

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Application Version: 4.18.1  
StreamStats Services Version: 1.2.22  
NSS Services Version: 2.2.1

# Channel Report

<Name>

Trapezoidal

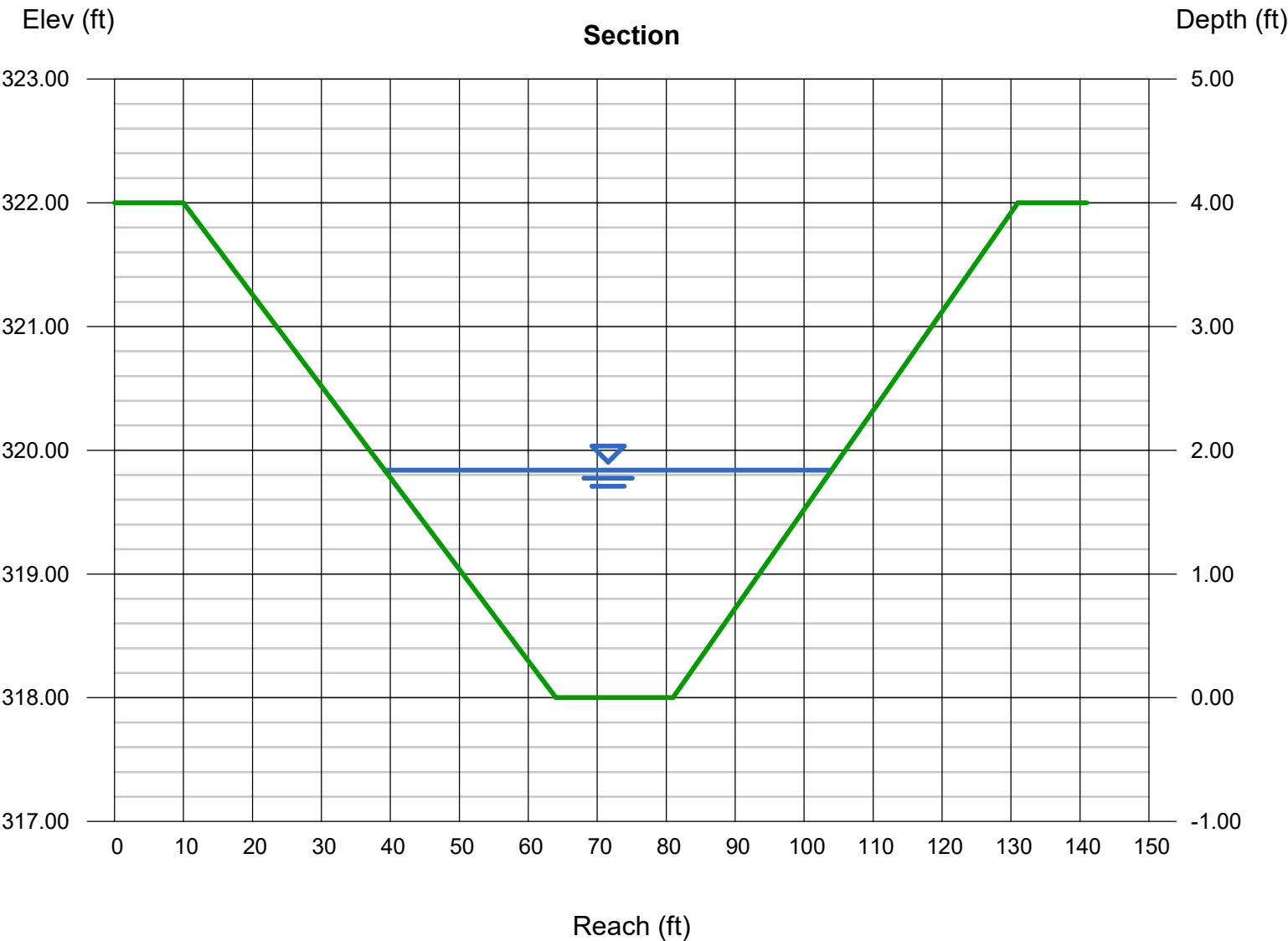
Bottom Width (ft) = 17.00  
Side Slopes (z:1) = 13.50, 12.50  
Total Depth (ft) = 4.00  
Invert Elev (ft) = 318.00  
Slope (%) = 1.23  
N-Value = 0.400

Highlighted

Depth (ft) = 1.84  
Q (cfs) = 34.20  
Area (sqft) = 75.29  
Velocity (ft/s) = 0.45  
Wetted Perim (ft) = 64.98  
Crit Depth, Yc (ft) = 0.45  
Top Width (ft) = 64.84  
EGL (ft) = 1.84

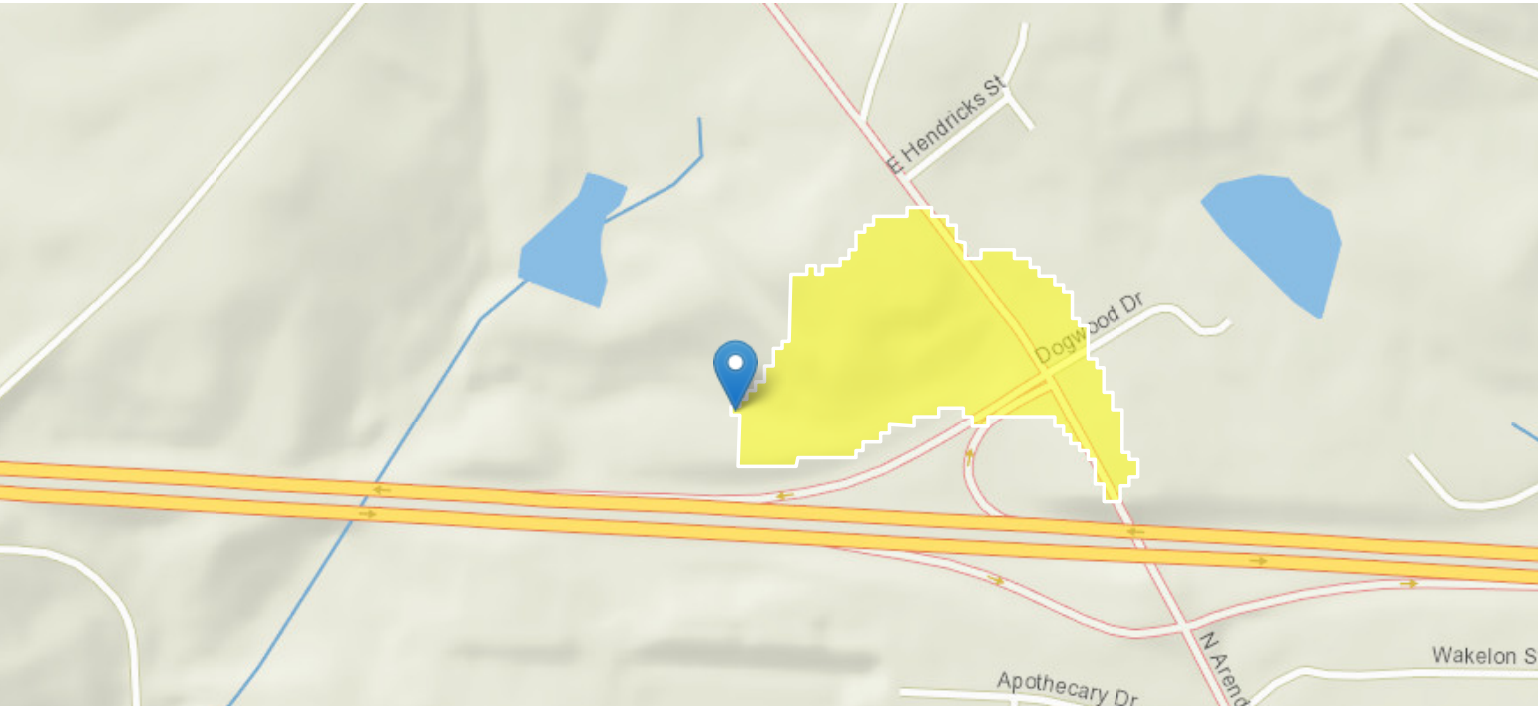
Calculations

Compute by: Known Q  
Known Q (cfs) = 34.20



# StreamStats Report

Region ID: NC  
Workspace ID: NC20231129140440784000  
Clicked Point (Latitude, Longitude): 35.83572, -78.32615  
Time: 2023-11-29 09:05:02 -0500



Collapse All

## ➤ Basin Characteristics

| Parameter Code | Parameter Description   | Value  | Unit         |
|----------------|---|--------|--------------|
| DRNAREA        | Area that drains to a point on a stream                                       | 0.0292 | square miles |
| LC06IMP        | Percentage of impervious area determined from NLCD 2006 impervious dataset    | 100    | percent      |
| PCTREG1        | Percentage of drainage area located in Region 1 - Piedmont / Ridge and Valley | 100    | percent      |
| PCTREG2        | Percentage of drainage area located in Region 2 - Blue Ridge                  | 0      | percent      |
| PCTREG3        | Percentage of drainage area located in Region 3 - Sandhills                   | 0      | percent      |
| PCTREG4        | Percentage of drainage area located in Region 4 - Coastal Plains              | 0      | percent      |
| PCTREG5        | Percentage of drainage area located in Region 5 - Lower Tifton Uplands        | 0      | percent      |

General Disclaimers

Parameter values have been edited, computed flows may not apply.

➤ Peak-Flow Statistics

Peak-Flow Statistics Parameters [Region 1 Piedmont rural under 1 sqmi 2014 5030]

| Parameter Code | Parameter Name              | Value  | Units        | Min Limit | Max Limit |
|----------------|-----------------------------|--------|--------------|-----------|-----------|
| DRNAREA        | Drainage Area               | 0.0292 | square miles | 0.1       | 1         |
| LC06IMP        | Percent Impervious NLCD2006 | 100    | percent      | 0         | 47.9      |

Peak-Flow Statistics Parameters [Peak Southeast US NC 2023 5006]

| Parameter Code | Parameter Name           | Value  | Units        | Min Limit | Max Limit |
|----------------|--------------------------|--------|--------------|-----------|-----------|
| PCTREG1        | Percent Area in Region 1 | 100    | percent      | 0         | 100       |
| PCTREG2        | Percent Area in Region 2 | 0      | percent      | 0         | 100       |
| PCTREG3        | Percent Area in Region 3 | 0      | percent      | 0         | 100       |
| PCTREG5        | Percent Area in Region 5 | 0      | percent      | 0         | 100       |
| DRNAREA        | Drainage Area            | 0.0292 | square miles | 0.08      | 8902      |
| PCTREG4        | Percent Area in Region 4 | 0      | percent      | 0         | 100       |

Peak-Flow Statistics Disclaimers [Region 1 Piedmont rural under 1 sqmi 2014 5030]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Region 1 Piedmont rural under 1 sqmi 2014 5030]

| Statistic             | Value | Unit   |
|-----------------------|-------|--------|
| 50-percent AEP flood  | 285   | ft^3/s |
| 20-percent AEP flood  | 193   | ft^3/s |
| 10-percent AEP flood  | 153   | ft^3/s |
| 4-percent AEP flood   | 113   | ft^3/s |
| 2-percent AEP flood   | 90.8  | ft^3/s |
| 1-percent AEP flood   | 76.4  | ft^3/s |
| 0.5-percent AEP flood | 63.2  | ft^3/s |
| 0.2-percent AEP flood | 58.5  | ft^3/s |

Peak-Flow Statistics Disclaimers [Peak Southeast US NC 2023 5006]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Peak Southeast US NC 2023 5006]

| Statistic             | Value | Unit   |
|-----------------------|-------|--------|
| 50-percent AEP flood  | 15.2  | ft^3/s |
| 20-percent AEP flood  | 28.7  | ft^3/s |
| 10-percent AEP flood  | 40    | ft^3/s |
| 4-percent AEP flood   | 55.9  | ft^3/s |
| 2-percent AEP flood   | 70.3  | ft^3/s |
| 1-percent AEP flood   | 85    | ft^3/s |
| 0.5-percent AEP flood | 100   | ft^3/s |
| 0.2-percent AEP flood | 121   | ft^3/s |

Peak-Flow Statistics Citations

**Feaster, T.D., Gotvald, A.J., and Weaver, J.C.,2014, Methods for estimating the magnitude and frequency of floods for urban and small, rural streams in Georgia, South Carolina, and North Carolina, 2011 (ver. 1.1, March 2014): U.S. Geological Survey Scientific Investigations Report 2014–5030, 104 p.**  
**(<http://pubs.usgs.gov/sir/2014/5030/>)**

**Feaster, T.D., Gotvald, A.J., Musser, J.W., Weaver, J.C, Kolb, K.R., Veilleux, A.G., and Wagner, D.M.2023, Magnitude and frequency of floods for rural streams in Georgia, South Carolina, and North Carolina, 2017– Results: U.S. Geological Survey Scientific Investigations Report 2023-5006, 75 p.**  
**(<https://pubs.er.usgs.gov/publication/sir20235006>)**

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USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.18.1  
StreamStats Services Version: 1.2.22  
NSS Services Version: 2.2.1



# Channel Report

<Name>

Trapezoidal

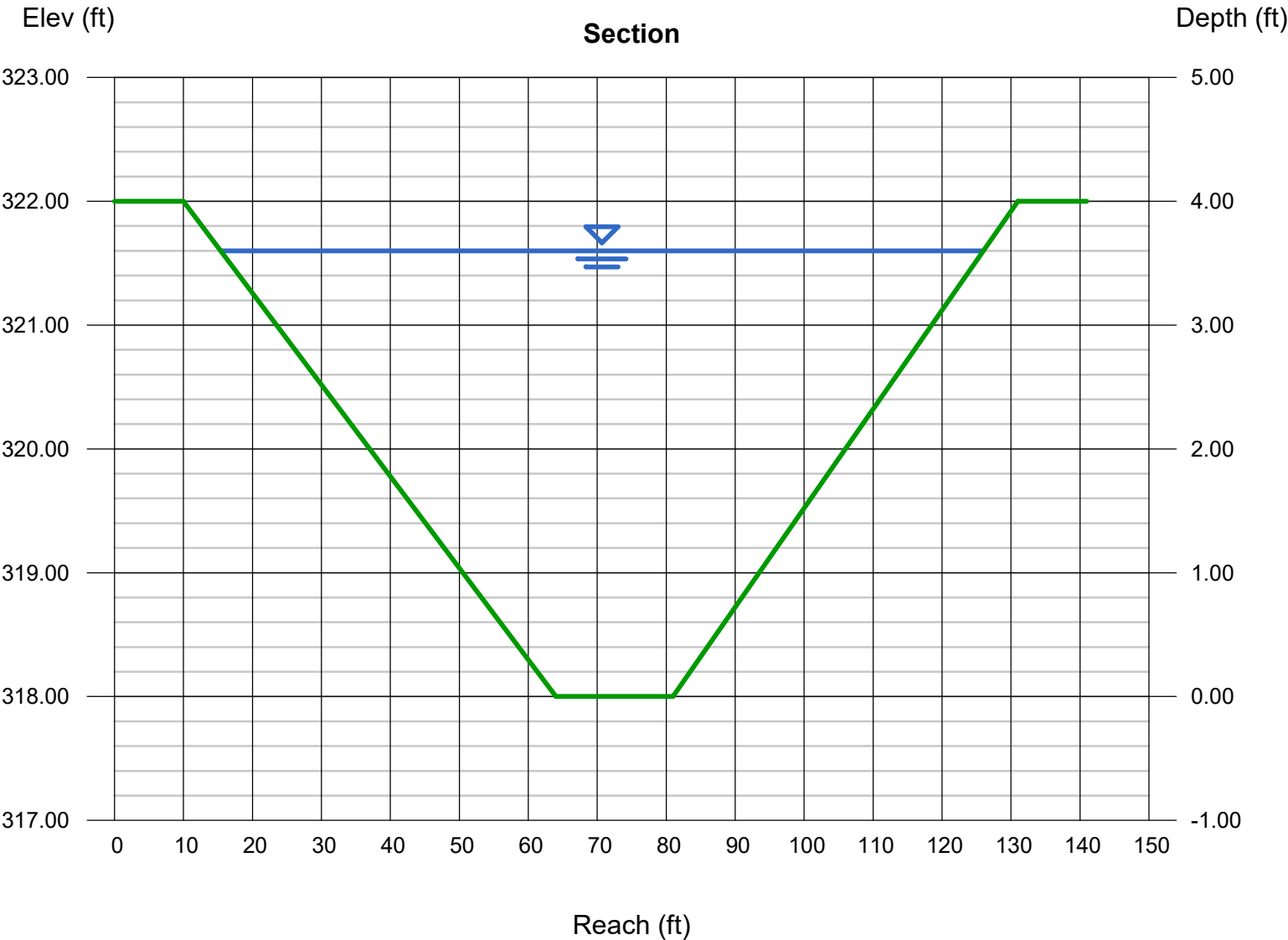
Bottom Width (ft) = 17.00  
Side Slopes (z:1) = 13.50, 12.50  
Total Depth (ft) = 4.00  
Invert Elev (ft) = 318.00  
Slope (%) = 1.23  
N-Value = 0.400

Highlighted

Depth (ft) = 3.60  
Q (cfs) = 153.00  
Area (sqft) = 229.68  
Velocity (ft/s) = 0.67  
Wetted Perim (ft) = 110.88  
Crit Depth, Yc (ft) = 1.05  
Top Width (ft) = 110.60  
EGL (ft) = 3.61

Calculations

Compute by: Known Q  
Known Q (cfs) = 153.00



## **APPENDIX C**

### **Storm Drainage Design Calculations**

Post-Development Drainage Map (Inlets)

100 System

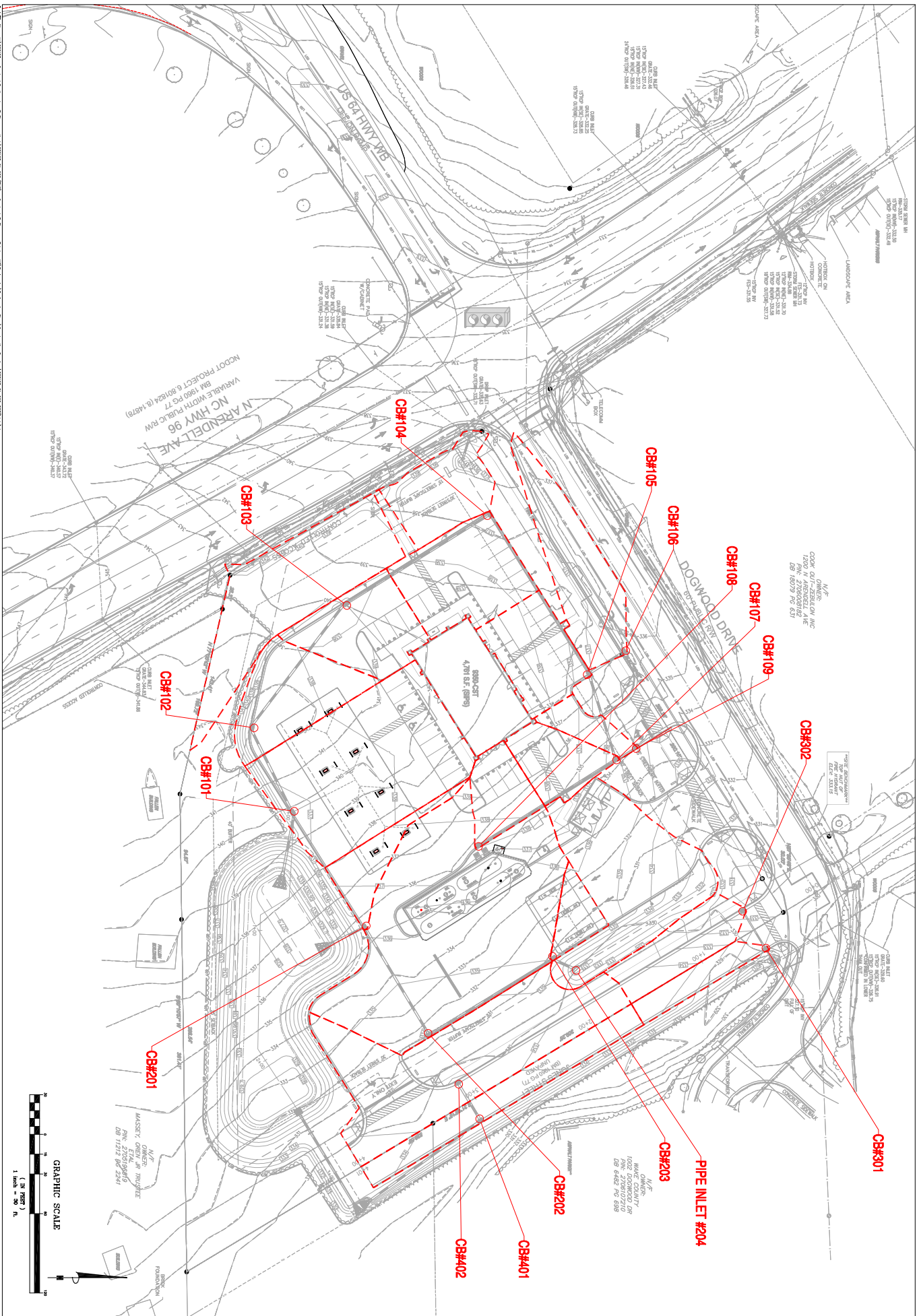
200 System

300 System

400 System

500 System

Pipe Inlet #1



**7-Eleven**

**Crosland Southeast**  
7-Eleven Store #42378  
Zebulon, NC  
WAKE COUNTY

**Bowman**

Bowman North Carolina Ltd.  
4000 LAMAR BLVD  
Suite 104  
RALEIGH, NC 27605  
Phone: (919) 555-0570  
bowman.com  
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**POST-DEVELOPED DRAINAGE AREA TO INLETS**

| INLET NO. | INLET TYPE | INLET SIZE | INLET LOCATION | INLET ELEVATION | INLET DRAINAGE AREA | INLET COMMENTS |
|-----------|------------|------------|----------------|-----------------|---------------------|----------------|
| 1         | 1          | 1          | 1              | 1               | 1                   | 1              |
| 2         | 2          | 2          | 2              | 2               | 2                   | 2              |
| 3         | 3          | 3          | 3              | 3               | 3                   | 3              |
| 4         | 4          | 4          | 4              | 4               | 4                   | 4              |
| 5         | 5          | 5          | 5              | 5               | 5                   | 5              |
| 6         | 6          | 6          | 6              | 6               | 6                   | 6              |
| 7         | 7          | 7          | 7              | 7               | 7                   | 7              |
| 8         | 8          | 8          | 8              | 8               | 8                   | 8              |
| 9         | 9          | 9          | 9              | 9               | 9                   | 9              |
| 10        | 10         | 10         | 10             | 10              | 10                  | 10             |
| 11        | 11         | 11         | 11             | 11              | 11                  | 11             |
| 12        | 12         | 12         | 12             | 12              | 12                  | 12             |
| 13        | 13         | 13         | 13             | 13              | 13                  | 13             |
| 14        | 14         | 14         | 14             | 14              | 14                  | 14             |
| 15        | 15         | 15         | 15             | 15              | 15                  | 15             |
| 16        | 16         | 16         | 16             | 16              | 16                  | 16             |
| 17        | 17         | 17         | 17             | 17              | 17                  | 17             |
| 18        | 18         | 18         | 18             | 18              | 18                  | 18             |
| 19        | 19         | 19         | 19             | 19              | 19                  | 19             |
| 20        | 20         | 20         | 20             | 20              | 20                  | 20             |
| 21        | 21         | 21         | 21             | 21              | 21                  | 21             |
| 22        | 22         | 22         | 22             | 22              | 22                  | 22             |
| 23        | 23         | 23         | 23             | 23              | 23                  | 23             |
| 24        | 24         | 24         | 24             | 24              | 24                  | 24             |
| 25        | 25         | 25         | 25             | 25              | 25                  | 25             |
| 26        | 26         | 26         | 26             | 26              | 26                  | 26             |
| 27        | 27         | 27         | 27             | 27              | 27                  | 27             |
| 28        | 28         | 28         | 28             | 28              | 28                  | 28             |
| 29        | 29         | 29         | 29             | 29              | 29                  | 29             |
| 30        | 30         | 30         | 30             | 30              | 30                  | 30             |
| 31        | 31         | 31         | 31             | 31              | 31                  | 31             |
| 32        | 32         | 32         | 32             | 32              | 32                  | 32             |
| 33        | 33         | 33         | 33             | 33              | 33                  | 33             |
| 34        | 34         | 34         | 34             | 34              | 34                  | 34             |
| 35        | 35         | 35         | 35             | 35              | 35                  | 35             |
| 36        | 36         | 36         | 36             | 36              | 36                  | 36             |
| 37        | 37         | 37         | 37             | 37              | 37                  | 37             |
| 38        | 38         | 38         | 38             | 38              | 38                  | 38             |
| 39        | 39         | 39         | 39             | 39              | 39                  | 39             |
| 40        | 40         | 40         | 40             | 40              | 40                  | 40             |
| 41        | 41         | 41         | 41             | 41              | 41                  | 41             |
| 42        | 42         | 42         | 42             | 42              | 42                  | 42             |
| 43        | 43         | 43         | 43             | 43              | 43                  | 43             |
| 44        | 44         | 44         | 44             | 44              | 44                  | 44             |
| 45        | 45         | 45         | 45             | 45              | 45                  | 45             |
| 46        | 46         | 46         | 46             | 46              | 46                  | 46             |
| 47        | 47         | 47         | 47             | 47              | 47                  | 47             |
| 48        | 48         | 48         | 48             | 48              | 48                  | 48             |
| 49        | 49         | 49         | 49             | 49              | 49                  | 49             |
| 50        | 50         | 50         | 50             | 50              | 50                  | 50             |
| 51        | 51         | 51         | 51             | 51              | 51                  | 51             |
| 52        | 52         | 52         | 52             | 52              | 52                  | 52             |
| 53        | 53         | 53         | 53             | 53              | 53                  | 53             |
| 54        | 54         | 54         | 54             | 54              | 54                  | 54             |
| 55        | 55         | 55         | 55             | 55              | 55                  | 55             |
| 56        | 56         | 56         | 56             | 56              | 56                  | 56             |
| 57        | 57         | 57         | 57             | 57              | 57                  | 57             |
| 58        | 58         | 58         | 58             | 58              | 58                  | 58             |
| 59        | 59         | 59         | 59             | 59              | 59                  | 59             |
| 60        | 60         | 60         | 60             | 60              | 60                  | 60             |
| 61        | 61         | 61         | 61             | 61              | 61                  | 61             |
| 62        | 62         | 62         | 62             | 62              | 62                  | 62             |
| 63        | 63         | 63         | 63             | 63              | 63                  | 63             |
| 64        | 64         | 64         | 64             | 64              | 64                  | 64             |
| 65        | 65         | 65         | 65             | 65              | 65                  | 65             |
| 66        | 66         | 66         | 66             | 66              | 66                  | 66             |
| 67        | 67         | 67         | 67             | 67              | 67                  | 67             |
| 68        | 68         | 68         | 68             | 68              | 68                  | 68             |
| 69        | 69         | 69         | 69             | 69              | 69                  | 69             |
| 70        | 70         | 70         | 70             | 70              | 70                  | 70             |
| 71        | 71         | 71         | 71             | 71              | 71                  | 71             |
| 72        | 72         | 72         | 72             | 72              | 72                  | 72             |
| 73        | 73         | 73         | 73             | 73              | 73                  | 73             |
| 74        | 74         | 74         | 74             | 74              | 74                  | 74             |
| 75        | 75         | 75         | 75             | 75              | 75                  | 75             |
| 76        | 76         | 76         | 76             | 76              | 76                  | 76             |
| 77        | 77         | 77         | 77             | 77              | 77                  | 77             |
| 78        | 78         | 78         | 78             | 78              | 78                  | 78             |
| 79        | 79         | 79         | 79             | 79              | 79                  | 79             |
| 80        | 80         | 80         | 80             | 80              | 80                  | 80             |
| 81        | 81         | 81         | 81             | 81              | 81                  | 81             |
| 82        | 82         | 82         | 82             | 82              | 82                  | 82             |
| 83        | 83         | 83         | 83             | 83              | 83                  | 83             |
| 84        | 84         | 84         | 84             | 84              | 84                  | 84             |
| 85        | 85         | 85         | 85             | 85              | 85                  | 85             |
| 86        | 86         | 86         | 86             | 86              | 86                  | 86             |
| 87        | 87         | 87         | 87             | 87              | 87                  | 87             |
| 88        | 88         | 88         | 88             | 88              | 88                  | 88             |
| 89        | 89         | 89         | 89             | 89              | 89                  | 89             |
| 90        | 90         | 90         | 90             | 90              | 90                  | 90             |
| 91        | 91         | 91         | 91             | 91              | 91                  | 91             |
| 92        | 92         | 92         | 92             | 92              | 92                  | 92             |
| 93        | 93         | 93         | 93             | 93              | 93                  | 93             |
| 94        | 94         | 94         | 94             | 94              | 94                  | 94             |
| 95        | 95         | 95         | 95             | 95              | 95                  | 95             |
| 96        | 96         | 96         | 96             | 96              | 96                  | 96             |
| 97        | 97         | 97         | 97             | 97              | 97                  | 97             |
| 98        | 98         | 98         | 98             | 98              | 98                  | 98             |
| 99        | 99         | 99         | 99             | 99              | 99                  | 99             |
| 100       | 100        | 100        | 100            | 100             | 100                 | 100            |

7-Eleven, Zebulon, NC  
Bowman North Carolina, Ltd.

|                                 |
|---------------------------------|
| Rational Runoff Coefficient "C" |
|---------------------------------|

|                               |              |                  |                   |            |
|-------------------------------|--------------|------------------|-------------------|------------|
| Catch Basin#101               |              |                  |                   |            |
| <u>Drainage Area (acres):</u> |              | 0.33             |                   |            |
| <u>Proposed Land Uses:</u>    |              |                  |                   |            |
| <u>Land Use Description</u>   | <u>Acres</u> | <u>% Site</u>    | <u>Runoff "C"</u> | <u>"C"</u> |
| Roofs                         | 0.00         | 0%               | 0.95              | 0.00       |
| Asphalt/Concrete Pavement     | 0.31         | 95%              | 0.95              | 0.90       |
| Lawn                          | 0.02         | 5%               | 0.3               | 0.02       |
| Wooded                        | 0.00         | 0%               | 0.2               | 0.00       |
| Total Area=                   | 0.33         | Cumulative "C" = |                   | 0.91       |
|                               |              | i10=             |                   | 7.21       |
|                               |              | Q10=             |                   | 2.16       |

|                               |              |                  |                   |            |
|-------------------------------|--------------|------------------|-------------------|------------|
| Catch Basin#102               |              |                  |                   |            |
| <u>Drainage Area (acres):</u> | 0.12         |                  |                   |            |
| <u>Proposed Land Uses:</u>    |              |                  |                   |            |
| <u>Land Use Description</u>   | <u>Acres</u> | <u>% Site</u>    | <u>Runoff "C"</u> | <u>"C"</u> |
| Roofs                         | 0.00         | 0%               | 0.95              | 0.00       |
| Asphalt/Concrete Pavement     | 0.10         | 83%              | 0.95              | 0.79       |
| Lawn                          | 0.02         | 17%              | 0.3               | 0.05       |
| Wooded                        | 0.00         | 0%               | 0.2               | 0.00       |
| Total Area=                   | 0.12         | Cumulative "C" = |                   | 0.84       |
|                               |              | i10=             |                   | 7.21       |
|                               |              | Q10=             |                   | 0.75       |

|                               |              |                  |                   |            |
|-------------------------------|--------------|------------------|-------------------|------------|
| Catch Basin#103               |              |                  |                   |            |
| <u>Drainage Area (acres):</u> | 0.11         |                  |                   |            |
| <u>Proposed Land Uses:</u>    |              |                  |                   |            |
| <u>Land Use Description</u>   | <u>Acres</u> | <u>% Site</u>    | <u>Runoff "C"</u> | <u>"C"</u> |
| Roofs                         | 0.00         | 0%               | 0.95              | 0.00       |
| Asphalt/Concrete Pavement     | 0.09         | 79%              | 0.95              | 0.75       |
| Lawn                          | 0.02         | 21%              | 0.3               | 0.06       |
| Wooded                        | 0.00         | 0%               | 0.2               | 0.00       |
| Total Area=                   | 0.11         | Cumulative "C" = |                   | 0.81       |
|                               |              | i10=             |                   | 7.21       |
|                               |              | Q10=             |                   | 0.67       |

|                               |              |                  |                   |            |
|-------------------------------|--------------|------------------|-------------------|------------|
| Catch Basin#104               |              |                  |                   |            |
| <u>Drainage Area (acres):</u> | 0.14         |                  |                   |            |
| <u>Proposed Land Uses:</u>    |              |                  |                   |            |
| <u>Land Use Description</u>   | <u>Acres</u> | <u>% Site</u>    | <u>Runoff "C"</u> | <u>"C"</u> |
| Roofs                         | 0.00         | 0%               | 0.95              | 0.00       |
| Asphalt/Concrete Pavement     | 0.13         | 89%              | 0.95              | 0.84       |
| Lawn                          | 0.02         | 11%              | 0.3               | 0.03       |
| Wooded                        | 0.00         | 0%               | 0.2               | 0.00       |
| Total Area=                   | 0.14         | Cumulative "C" = |                   | 0.88       |
|                               |              | i10=             |                   | 7.21       |
|                               |              | Q10=             |                   | 0.91       |

|                               |              |                  |                   |            |
|-------------------------------|--------------|------------------|-------------------|------------|
| Catch Basin#105               |              |                  |                   |            |
| <u>Drainage Area (acres):</u> | 0.21         |                  |                   |            |
| <u>Proposed Land Uses:</u>    |              |                  |                   |            |
| <u>Land Use Description</u>   | <u>Acres</u> | <u>% Site</u>    | <u>Runoff "C"</u> | <u>"C"</u> |
| Roofs                         | 0.11         | 53%              | 0.95              | 0.50       |
| Asphalt/Concrete Pavement     | 0.10         | 45%              | 0.95              | 0.43       |
| Lawn                          | 0.00         | 2%               | 0.3               | 0.01       |
| Wooded                        | 0.00         | 0%               | 0.2               | 0.00       |
| Total Area=                   | 0.21         | Cumulative "C" = |                   | 0.94       |
|                               |              | i10=             |                   | 7.21       |
|                               |              | Q10=             |                   | 1.44       |

#### Catch Basin#106

Drainage Area (acres): 0.14

##### Proposed Land Uses:

| <u>Land Use Description</u> | <u>Acres</u> | <u>% Site</u> | <u>Runoff "C"</u> | <u>"C"</u> |
|-----------------------------|--------------|---------------|-------------------|------------|
| Roofs                       | 0.00         | 0%            | 0.95              | 0.00       |
| Asphalt/Concrete Pavement   | 0.11         | 75%           | 0.95              | 0.71       |
| Lawn                        | 0.04         | 25%           | 0.3               | 0.08       |
| Wooded                      | 0.00         | 0%            | 0.2               | 0.00       |
| Total Area=                 | 0.14         |               | Cumulative "C" =  | 0.79       |
|                             |              |               | i10=              | 7.21       |
|                             |              |               | Q10=              | 0.80       |

#### Catch Basin#107

Drainage Area (acres): 0.08

##### Proposed Land Uses:

| <u>Land Use Description</u> | <u>Acres</u> | <u>% Site</u> | <u>Runoff "C"</u> | <u>"C"</u> |
|-----------------------------|--------------|---------------|-------------------|------------|
| Roofs                       | 0.00         | 0%            | 0.95              | 0.00       |
| Asphalt/Concrete Pavement   | 0.07         | 88%           | 0.95              | 0.83       |
| Lawn                        | 0.01         | 12%           | 0.3               | 0.04       |
| Wooded                      | 0.00         | 0%            | 0.2               | 0.00       |
| Total Area=                 | 0.08         |               | Cumulative "C" =  | 0.87       |
|                             |              |               | i10=              | 7.21       |
|                             |              |               | Q10=              | 0.52       |

#### Catch Basin#108

Drainage Area (acres): 0.06

##### Proposed Land Uses:

| <u>Land Use Description</u> | <u>Acres</u> | <u>% Site</u> | <u>Runoff "C"</u> | <u>"C"</u> |
|-----------------------------|--------------|---------------|-------------------|------------|
| Roofs                       | 0.00         | 0%            | 0.95              | 0.00       |
| Asphalt/Concrete Pavement   | 0.06         | 94%           | 0.95              | 0.89       |
| Lawn                        | 0.00         | 6%            | 0.3               | 0.02       |
| Wooded                      | 0.00         | 0%            | 0.2               | 0.00       |
| Total Area=                 | 0.06         |               | Cumulative "C" =  | 0.91       |
|                             |              |               | i10=              | 7.21       |
|                             |              |               | Q10=              | 0.41       |

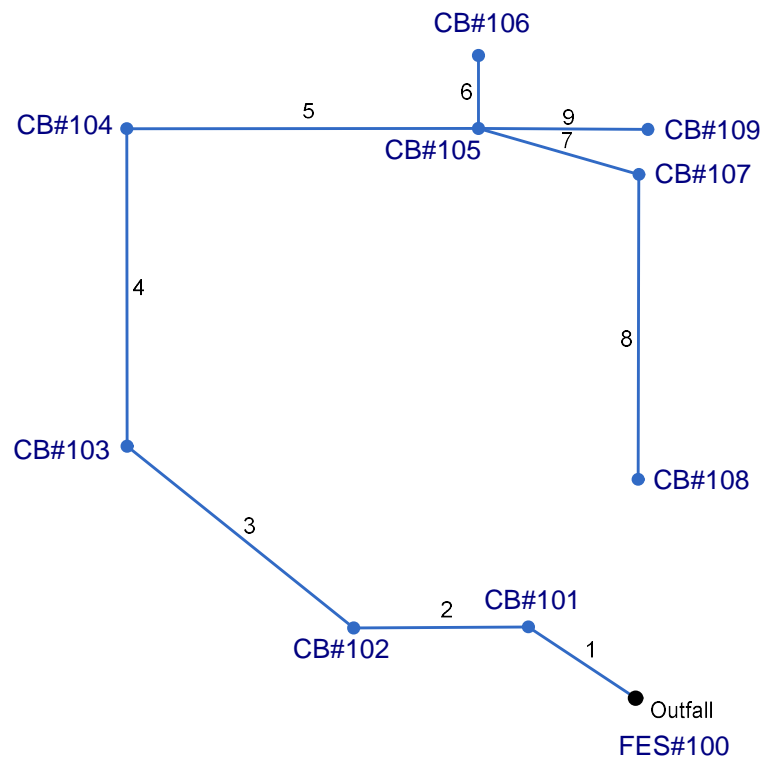
#### Catch Basin#109

Drainage Area (acres): 0.03

##### Proposed Land Uses:

| <u>Land Use Description</u> | <u>Acres</u> | <u>% Site</u> | <u>Runoff "C"</u> | <u>"C"</u> |
|-----------------------------|--------------|---------------|-------------------|------------|
| Roofs                       | 0.00         | 0%            | 0.95              | 0.00       |
| Asphalt/Concrete Pavement   | 0.03         | 100%          | 0.95              | 0.95       |
| Lawn                        | 0.00         | 0%            | 0.3               | 0.00       |
| Wooded                      | 0.00         | 0%            | 0.2               | 0.00       |
| Total Area=                 | 0.03         |               | Cumulative "C" =  | 0.95       |
|                             |              |               | i10=              | 7.21       |
|                             |              |               | Q10=              | 0.23       |

# Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



# Storm Sewer Inventory Report

| Line No.                     | Alignment      |                  |                  |           | Flow Data     |                |                  |                  | Physical Data     |                |                   |                    |            |             |                  |                    | Line ID |
|------------------------------|----------------|------------------|------------------|-----------|---------------|----------------|------------------|------------------|-------------------|----------------|-------------------|--------------------|------------|-------------|------------------|--------------------|---------|
|                              | Dnstr Line No. | Line Length (ft) | Defl angle (deg) | Junc Type | Known Q (cfs) | Drng Area (ac) | Runoff Coeff (C) | Inlet Time (min) | Invert El Dn (ft) | Line Slope (%) | Invert El Up (ft) | Line Size (in)     | Line Shape | N Value (n) | J-Loss Coeff (K) | Inlet/ Rim El (ft) |         |
| 1                            | End            | 51.000           | -146.310         | Curb      | 2.16          | 0.00           | 0.00             | 0.0              | 329.70            | 0.78           | 330.10            | 18                 | Cir        | 0.012       | 0.92             | 336.60             |         |
| 2                            | 1              | 69.000           | -34.053          | Curb      | 0.75          | 0.00           | 0.00             | 0.0              | 330.10            | 0.58           | 330.50            | 18                 | Cir        | 0.012       | 1.02             | 337.00             |         |
| 3                            | 2              | 115.000          | 39.225           | Curb      | 0.67          | 0.00           | 0.00             | 0.0              | 330.60            | 0.52           | 331.20            | 18                 | Cir        | 0.012       | 1.22             | 337.40             |         |
| 4                            | 3              | 126.000          | 51.059           | Curb      | 0.91          | 0.00           | 0.00             | 0.0              | 331.20            | 0.63           | 332.00            | 15                 | Cir        | 0.012       | 1.50             | 336.70             |         |
| 5                            | 4              | 139.000          | 90.054           | Curb      | 1.44          | 0.00           | 0.00             | 0.0              | 332.10            | 0.58           | 332.90            | 15                 | Cir        | 0.012       | 1.50             | 336.50             |         |
| 6                            | 5              | 29.000           | -89.926          | Curb      | 0.80          | 0.00           | 0.00             | 0.0              | 333.00            | 0.69           | 333.20            | 15                 | Cir        | 0.012       | 1.00             | 335.70             |         |
| 7                            | 5              | 66.000           | 16.053           | Curb      | 0.52          | 0.00           | 0.00             | 0.0              | 333.00            | 0.61           | 333.40            | 15                 | Cir        | 0.012       | 1.45             | 335.60             |         |
| 8                            | 7              | 121.000          | 74.103           | Curb      | 0.41          | 0.00           | 0.00             | 0.0              | 333.50            | 0.58           | 334.20            | 15                 | Cir        | 0.012       | 1.00             | 337.50             |         |
| 9                            | 5              | 67.000           | 0.318            | Curb      | 0.23          | 0.00           | 0.00             | 0.0              | 332.98            | 0.51           | 333.32            | 8                  | Cir        | 0.012       | 1.00             | 334.83             |         |
| Project File: 100 System.stm |                |                  |                  |           |               |                |                  |                  |                   |                |                   | Number of lines: 9 |            |             |                  | Date: 12/5/2023    |         |

# Structure Report

| Struct No.                   | Structure ID | Junction Type | Rim Elev (ft) | Structure |             |            | Line Out                |       |             | Line In             |                   |                            |
|------------------------------|--------------|---------------|---------------|-----------|-------------|------------|-------------------------|-------|-------------|---------------------|-------------------|----------------------------|
|                              |              |               |               | Shape     | Length (ft) | Width (ft) | Size (in)               | Shape | Invert (ft) | Size (in)           | Shape             | Invert (ft)                |
| 1                            |              | Curb-         | 336.60        | Cir       | 4.00        | 4.00       | 18                      | Cir   | 330.10      | 18                  | Cir               | 330.10                     |
| 2                            |              | Curb-         | 337.00        | Cir       | 4.00        | 4.00       | 18                      | Cir   | 330.50      | 18                  | Cir               | 330.60                     |
| 3                            |              | Curb-         | 337.40        | Cir       | 4.00        | 4.00       | 18                      | Cir   | 331.20      | 15                  | Cir               | 331.20                     |
| 4                            |              | Curb-         | 336.70        | Cir       | 4.00        | 4.00       | 15                      | Cir   | 332.00      | 15                  | Cir               | 332.10                     |
| 5                            |              | Curb-         | 336.50        | Cir       | 4.00        | 4.00       | 15                      | Cir   | 332.90      | 15<br>15<br>8       | Cir<br>Cir<br>Cir | 333.00<br>333.00<br>332.98 |
| 6                            |              | Curb-         | 335.70        | Cir       | 4.00        | 4.00       | 15                      | Cir   | 333.20      |                     |                   |                            |
| 7                            |              | Curb-         | 335.60        | Cir       | 4.00        | 4.00       | 15                      | Cir   | 333.40      | 15                  | Cir               | 333.50                     |
| 8                            |              | Curb-         | 337.50        | Cir       | 4.00        | 4.00       | 15                      | Cir   | 334.20      |                     |                   |                            |
| 9                            |              | Curb-         | 334.83        | Cir       | 4.00        | 4.00       | 8                       | Cir   | 333.32      |                     |                   |                            |
| Project File: 100 System.stm |              |               |               |           |             |            | Number of Structures: 9 |       |             | Run Date: 12/5/2023 |                   |                            |



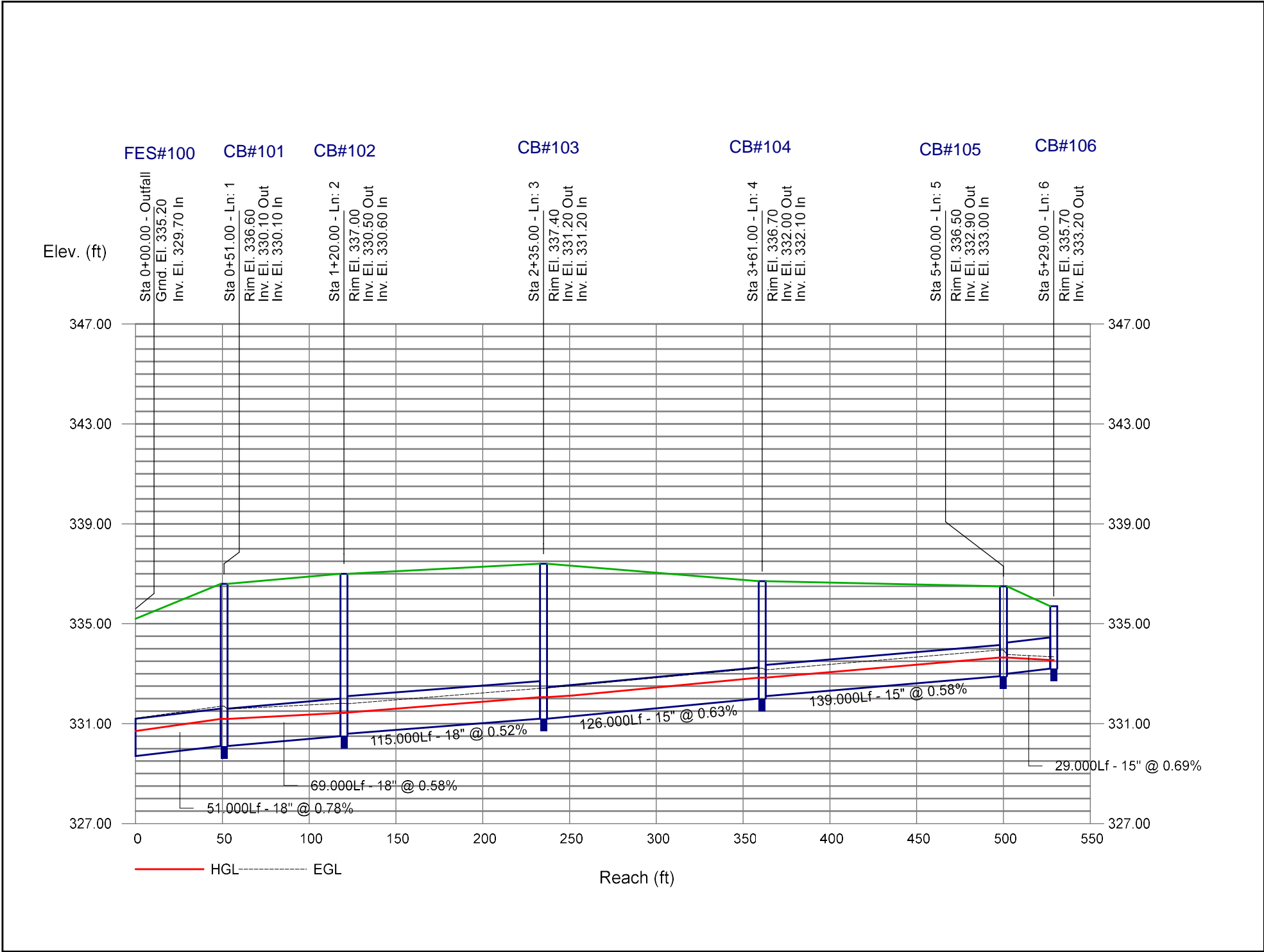
# Storm Sewer Summary Report

| Line No.  | Line ID | Flow rate (cfs) | Line Size (in) | Line shape | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line Slope (%) | HGL Down (ft)      | HGL Up (ft) | Minor loss (ft) | HGL Junct (ft)      | Dns Line No. | Junction Type |
|---|---------|-----------------|----------------|------------|------------------|-------------------|-------------------|----------------|--------------------|-------------|-----------------|---------------------|--------------|---------------|
| 1   |         | 7.89            | 18             | Cir        | 51.000           | 329.70            | 330.10            | 0.784          | 330.70             | 331.19      | 0.47            | 331.19              | End          | Curb-         |
| 2   |         | 5.73            | 18             | Cir        | 69.000           | 330.10            | 330.50            | 0.580          | 331.19             | 331.42      | n/a             | 331.42              | 1            | Curb-         |
| 3   |         | 4.98            | 18             | Cir        | 115.000          | 330.60            | 331.20            | 0.522          | 331.44             | 332.06      | 0.43            | 332.06              | 2            | Curb-         |
| 4   |         | 4.31            | 15             | Cir        | 126.000          | 331.20            | 332.00            | 0.635          | 332.06             | 332.84      | n/a             | 332.84 j            | 3            | Curb-         |
| 5   |         | 3.40            | 15             | Cir        | 139.000          | 332.10            | 332.90            | 0.576          | 332.84             | 333.64      | n/a             | 333.64              | 4            | Curb-         |
| 6   |         | 0.80            | 15             | Cir        | 29.000           | 333.00            | 333.20            | 0.690          | 333.64             | 333.55      | n/a             | 333.55              | 5            | Curb-         |
| 7   |         | 0.93            | 15             | Cir        | 66.000           | 333.00            | 333.40            | 0.606          | 333.64             | 333.78      | n/a             | 333.78 j            | 5            | Curb-         |
| 8   |         | 0.41            | 15             | Cir        | 121.000          | 333.50            | 334.20            | 0.579          | 333.78             | 334.45      | n/a             | 334.45 j            | 7            | Curb-         |
| 9   |         | 0.23            | 8              | Cir        | 67.000           | 332.98            | 333.32            | 0.507          | 333.64             | 333.67      | 0.02            | 333.69              | 5            | Curb-         |
| Project File: 100 System.stm                                  |         |                 |                |            |                  |                   |                   |                | Number of lines: 9 |             |                 | Run Date: 12/5/2023 |              |               |
| NOTES: Return period = 10 Yrs. ; j - Line contains hyd. jump. |         |                 |                |            |                  |                   |                   |                |                    |             |                 |                     |              |               |

# Hydraulic Grade Line Computations

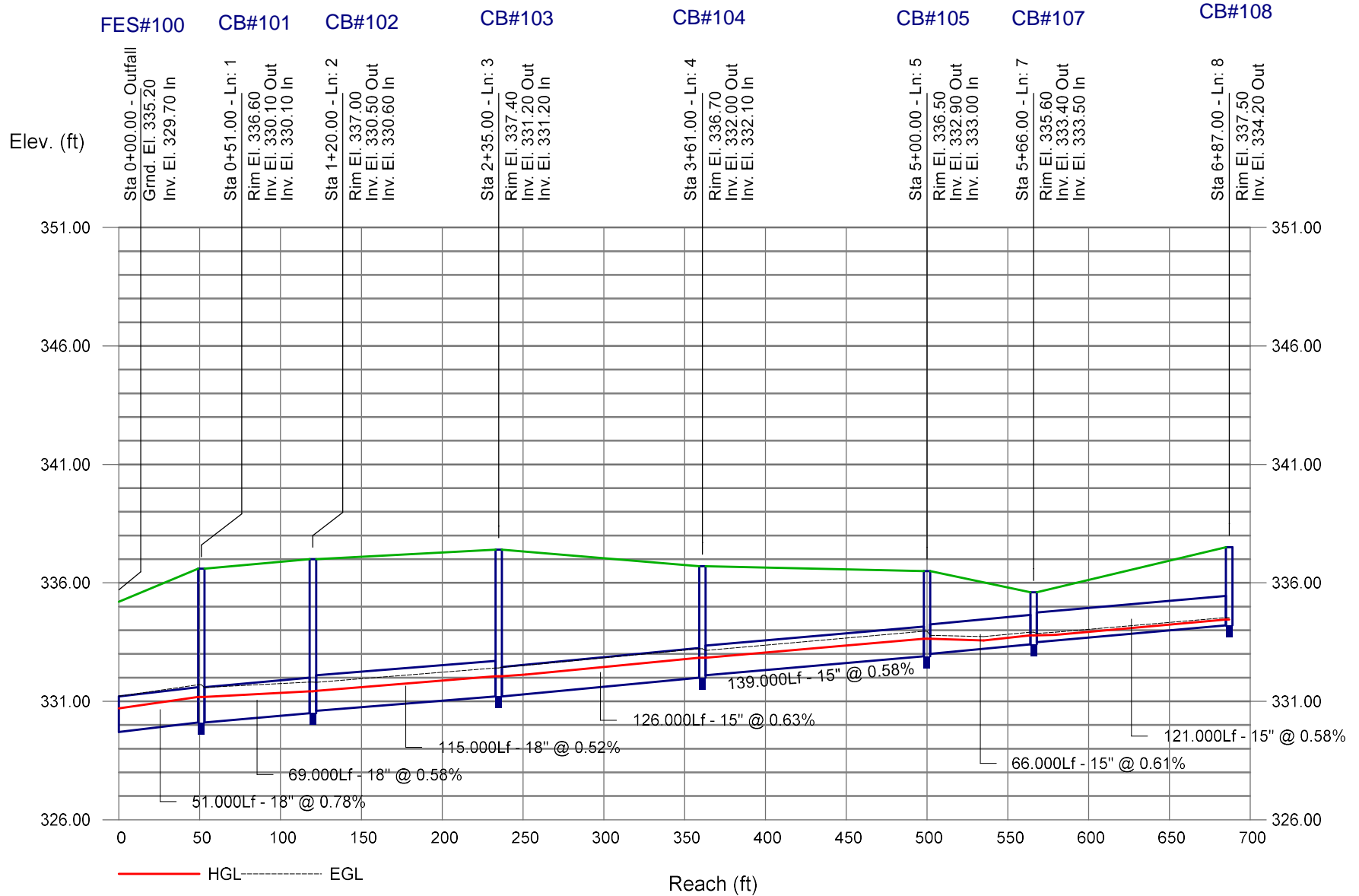
| Line  | Size<br><br>(in) | Q<br><br>(cfs) | Downstream             |                     |               |                |               |                     |                     |           | Len<br><br>(ft) | Upstream               |                     |                    |                |               |                     |                     |                     | Check            |                       | JL<br>coeff<br><br>(K) | Minor<br>loss<br><br>(ft) |
|---|------------------|----------------|------------------------|---------------------|---------------|----------------|---------------|---------------------|---------------------|-----------|-----------------|------------------------|---------------------|--------------------|----------------|---------------|---------------------|---------------------|---------------------|------------------|-----------------------|------------------------|---------------------------|
|   |                  |                | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft) | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%) |                 | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft)      | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%)           | Ave<br>Sf<br>(%) | Enrgy<br>loss<br>(ft) |                        |                           |
| 1   | 18               | 7.89           | 329.70                 | 330.70              | 1.00          | 1.25           | 6.31          | 0.51                | 331.21              | 0.000     | 51.000          | 330.10                 | 331.19              | 1.09**             | 1.37           | 5.75          | 0.51                | 331.70              | 0.000               | 0.000            | n/a                   | 0.92                   | 0.47                      |
| 2   | 18               | 5.73           | 330.10                 | 331.19              | 1.09          | 1.14           | 4.18          | 0.39                | 331.58              | 0.000     | 69.000          | 330.50                 | 331.42              | 0.92**             | 1.14           | 5.02          | 0.39                | 331.82              | 0.000               | 0.000            | n/a                   | 1.02                   | n/a                       |
| 3   | 18               | 4.98           | 330.60                 | 331.44              | 0.84*         | 1.02           | 4.87          | 0.35                | 331.80              | 0.000     | 115.000         | 331.20                 | 332.06              | 0.86**             | 1.04           | 4.77          | 0.35                | 332.41              | 0.000               | 0.000            | n/a                   | 1.22                   | 0.43                      |
| 4   | 15               | 4.31           | 331.20                 | 332.06              | 0.86          | 0.88           | 4.80          | 0.38                | 332.43              | 0.000     | 126.000         | 332.00                 | 332.84 j            | 0.84**             | 0.88           | 4.91          | 0.38                | 333.22              | 0.000               | 0.000            | n/a                   | 1.50                   | n/a                       |
| 5   | 15               | 3.40           | 332.10                 | 332.84              | 0.74          | 0.76           | 4.49          | 0.31                | 333.15              | 0.000     | 139.000         | 332.90                 | 333.64              | 0.74**             | 0.76           | 4.47          | 0.31                | 333.95              | 0.000               | 0.000            | n/a                   | 1.50                   | n/a                       |
| 6   | 15               | 0.80           | 333.00                 | 333.64              | 0.64          | 0.28           | 1.26          | 0.13                | 333.77              | 0.000     | 29.000          | 333.20                 | 333.55              | 0.35**             | 0.28           | 2.85          | 0.13                | 333.68              | 0.000               | 0.000            | n/a                   | 1.00                   | n/a                       |
| 7   | 15               | 0.93           | 333.00                 | 333.64              | 0.64          | 0.31           | 1.46          | 0.14                | 333.78              | 0.000     | 66.000          | 333.40                 | 333.78 j            | 0.38**             | 0.31           | 2.97          | 0.14                | 333.92              | 0.000               | 0.000            | n/a                   | 1.45                   | 0.20                      |
| 8   | 15               | 0.41           | 333.50                 | 333.78              | 0.28          | 0.17           | 2.01          | 0.09                | 333.87              | 0.000     | 121.000         | 334.20                 | 334.45 j            | 0.25**             | 0.17           | 2.37          | 0.09                | 334.54              | 0.000               | 0.000            | n/a                   | 1.00                   | n/a                       |
| 9   | 8                | 0.23           | 332.98                 | 333.64              | 0.66          | 0.35           | 0.66          | 0.01                | 333.65              | 0.029     | 67.000          | 333.32                 | 333.67              | 0.35               | 0.19           | 1.24          | 0.02                | 333.69              | 0.105               | 0.067            | 0.045                 | 1.00                   | 0.02                      |
| Project File: 100 System.stm  |                  |                |                        |                     |               |                |               |                     |                     |           |                 |                        |                     | Number of lines: 9 |                |               |                     |                     | Run Date: 12/5/2023 |                  |                       |                        |                           |
| Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box |                  |                |                        |                     |               |                |               |                     |                     |           |                 |                        |                     |                    |                |               |                     |                     |                     |                  |                       |                        |                           |

Storm Sewer Profile

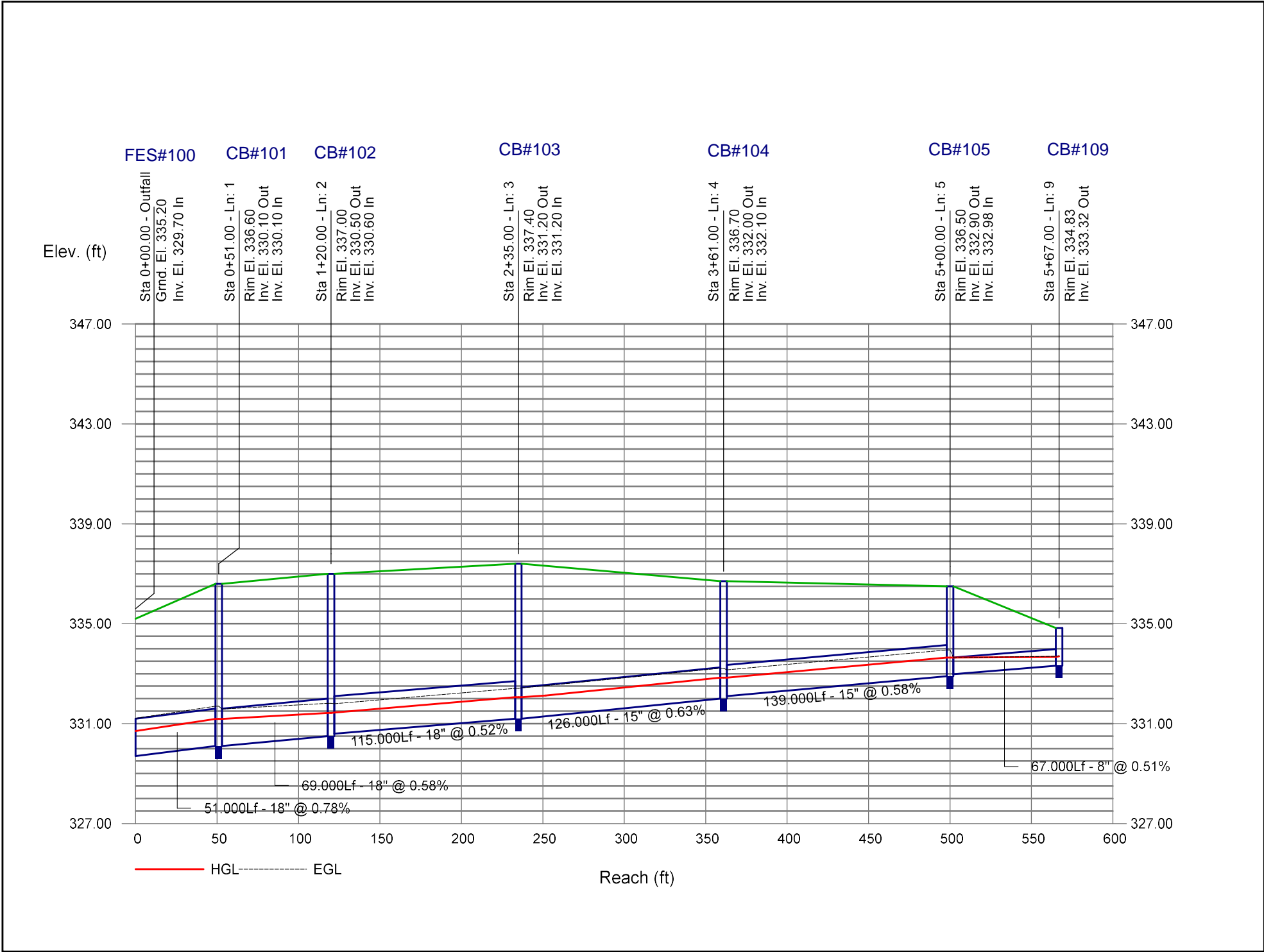


# Storm Sewer Profile

Proj. file: 100 System.stm



Storm Sewer Profile



7-Eleven, Zebulon, NC  
Bowman North Carolina, Ltd.

### Rational Runoff Coefficient "C"

#### Catch Basin#201

Drainage Area (acres): 0.05

Proposed Land Uses:

| <u>Land Use Description</u> | <u>Acres</u> | <u>% Site</u> | <u>Runoff "C"</u> | <u>"C"</u> |
|-----------------------------|--------------|---------------|-------------------|------------|
| Roofs                       | 0.00         | 0%            | 0.95              | 0.00       |
| Asphalt/Concrete Pavement   | 0.05         | 98%           | 0.95              | 0.93       |
| Lawn                        | 0.00         | 2%            | 0.3               | 0.01       |
| Wooded                      | 0.00         | 0%            | 0.2               | 0.00       |
| Total Area=                 | 0.05         |               |                   |            |
| Cumulative "C" =            |              |               |                   | 0.94       |
| i10=                        |              |               |                   | 7.21       |
| Q10=                        |              |               |                   | 0.37       |

#### Catch Basin#202

Drainage Area (acres): 0.48

Proposed Land Uses:

| <u>Land Use Description</u> | <u>Acres</u> | <u>% Site</u> | <u>Runoff "C"</u> | <u>"C"</u> |
|-----------------------------|--------------|---------------|-------------------|------------|
| Roofs                       | 0.00         | 0%            | 0.95              | 0.00       |
| Asphalt/Concrete Pavement   | 0.44         | 91%           | 0.95              | 0.87       |
| Lawn                        | 0.04         | 9%            | 0.3               | 0.03       |
| Wooded                      | 0.00         | 0%            | 0.2               | 0.00       |
| Total Area=                 | 0.48         |               |                   |            |
| Cumulative "C" =            |              |               |                   | 0.89       |
| i10=                        |              |               |                   | 7.21       |
| Q10=                        |              |               |                   | 3.12       |

#### Catch Basin#203

Drainage Area (acres): 0.04

Proposed Land Uses:

| <u>Land Use Description</u> | <u>Acres</u> | <u>% Site</u> | <u>Runoff "C"</u> | <u>"C"</u> |
|-----------------------------|--------------|---------------|-------------------|------------|
| Roofs                       | 0.04         | 100%          | 0.95              | 0.95       |
| Asphalt/Concrete Pavement   | 0.00         | 0%            | 0.95              | 0.00       |
| Lawn                        | 0.00         | 0%            | 0.3               | 0.00       |
| Wooded                      | 0.00         | 0%            | 0.2               | 0.00       |
| Total Area=                 | 0.04         |               |                   |            |
| Cumulative "C" =            |              |               |                   | 0.95       |
| i10=                        |              |               |                   | 7.21       |
| Q10=                        |              |               |                   | 0.25       |

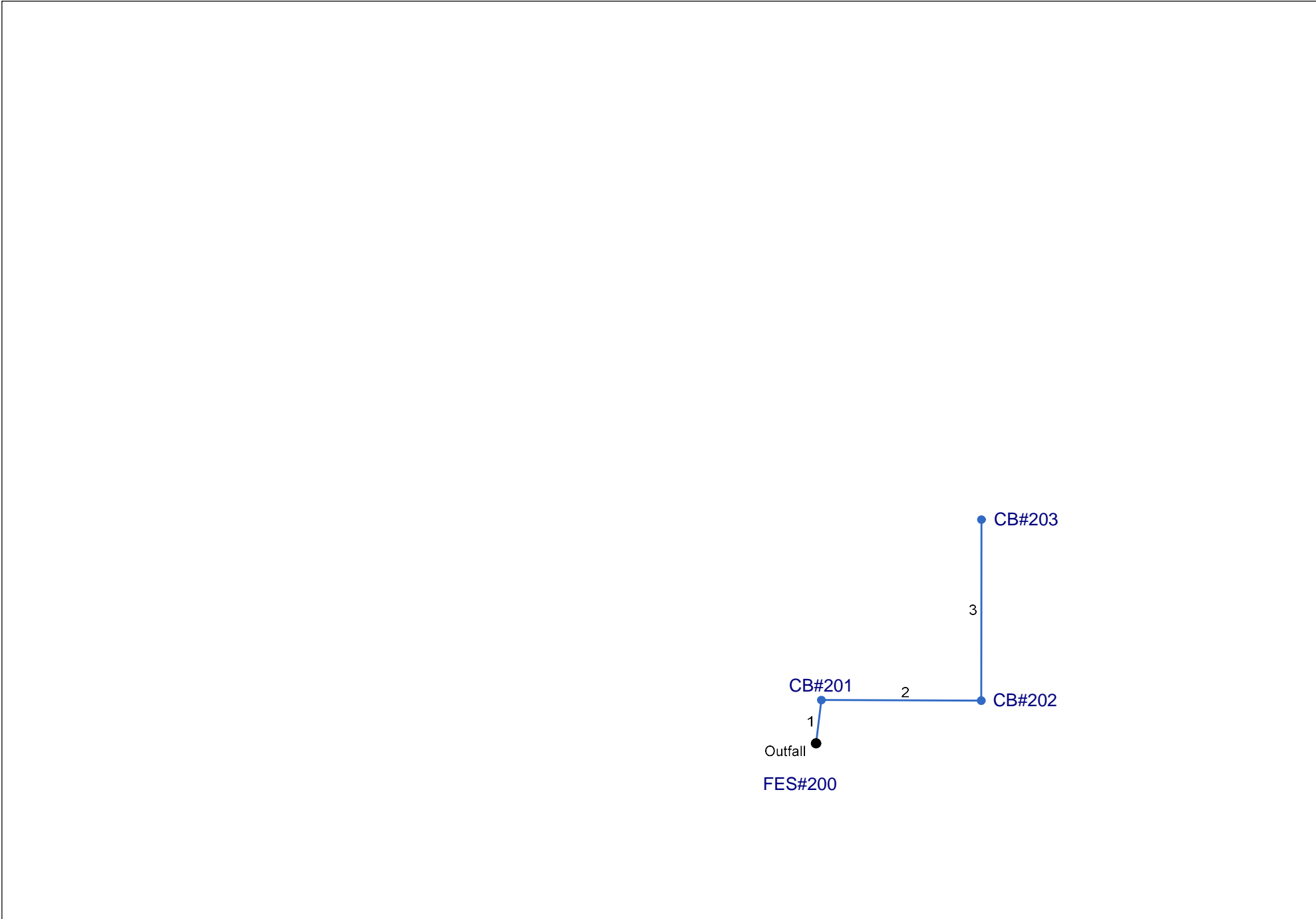
#### Pipe Inlet #204

Drainage Area (acres): 0.25

Proposed Land Uses:

| <u>Land Use Description</u> | <u>Acres</u> | <u>% Site</u> | <u>Runoff "C"</u> | <u>"C"</u> |
|-----------------------------|--------------|---------------|-------------------|------------|
| Roofs                       | 0.00         | 0%            | 0.95              | 0.00       |
| Asphalt/Concrete Pavement   | 0.15         | 60%           | 0.95              | 0.57       |
| Lawn                        | 0.10         | 40%           | 0.3               | 0.12       |
| Wooded                      | 0.00         | 0%            | 0.2               | 0.00       |
| Total Area=                 | 0.25         |               |                   |            |
| Cumulative "C" =            |              |               |                   | 0.69       |
| i10=                        |              |               |                   | 7.21       |
| Q10=                        |              |               |                   | 1.23       |

# Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



|                              |                    |                 |
|------------------------------|--------------------|-----------------|
| Project File: 200 System.stm | Number of lines: 3 | Date: 12/5/2023 |
|------------------------------|--------------------|-----------------|

# Storm Sewer Inventory Report

| Line No.  | Alignment      |                  |                  |           | Flow Data     |                |                  |                  | Physical Data     |                |                   |                |            |             |                  |                    | Line ID |
|---|----------------|------------------|------------------|-----------|---------------|----------------|------------------|------------------|-------------------|----------------|-------------------|----------------|------------|-------------|------------------|--------------------|---------|
|   | Dnstr Line No. | Line Length (ft) | Defl angle (deg) | Junc Type | Known Q (cfs) | Drng Area (ac) | Runoff Coeff (C) | Inlet Time (min) | Invert El Dn (ft) | Line Slope (%) | Invert El Up (ft) | Line Size (in) | Line Shape | N Value (n) | J-Loss Coeff (K) | Inlet/ Rim El (ft) |         |
| 1   | End            | 26.000           | -83.058          | Curb      | 0.37          | 0.00           | 0.00             | 0.0              | 329.70            | 0.77           | 329.90            | 18             | Cir        | 0.012       | 1.49             | 336.30             |         |
| 2   | 1              | 95.000           | 83.248           | Comb      | 3.12          | 0.00           | 0.00             | 0.0              | 329.90            | 0.53           | 330.40            | 18             | Cir        | 0.012       | 1.50             | 333.90             |         |
| 3   | 2              | 108.000          | -90.139          | Curb      | 1.57          | 0.00           | 0.00             | 0.0              | 330.40            | 0.56           | 331.00            | 18             | Cir        | 0.012       | 1.00             | 335.00             |         |
| <div> <div>Project File: 200 System.stm</div> <div>Number of lines: 3</div> <div>Date: 12/5/2023</div> </div> |                |                  |                  |           |               |                |                  |                  |                   |                |                   |                |            |             |                  |                    |         |



# Structure Report

| Struct No.                   | Structure ID | Junction Type | Rim Elev (ft) | Structure |             |            | Line Out                |       |             | Line In             |       |             |
|------------------------------|--------------|---------------|---------------|-----------|-------------|------------|-------------------------|-------|-------------|---------------------|-------|-------------|
|                              |              |               |               | Shape     | Length (ft) | Width (ft) | Size (in)               | Shape | Invert (ft) | Size (in)           | Shape | Invert (ft) |
| 1                            |              | Curb-         | 336.30        | Cir       | 4.00        | 4.00       | 18                      | Cir   | 329.90      | 18                  | Cir   | 329.90      |
| 2                            |              | Combination   | 333.90        | Cir       | 4.00        | 4.00       | 18                      | Cir   | 330.40      | 18                  | Cir   | 330.40      |
| 3                            |              | Curb-         | 335.00        | Cir       | 4.00        | 4.00       | 18                      | Cir   | 331.00      |                     |       |             |
| Project File: 200 System.stm |              |               |               |           |             |            | Number of Structures: 3 |       |             | Run Date: 12/5/2023 |       |             |

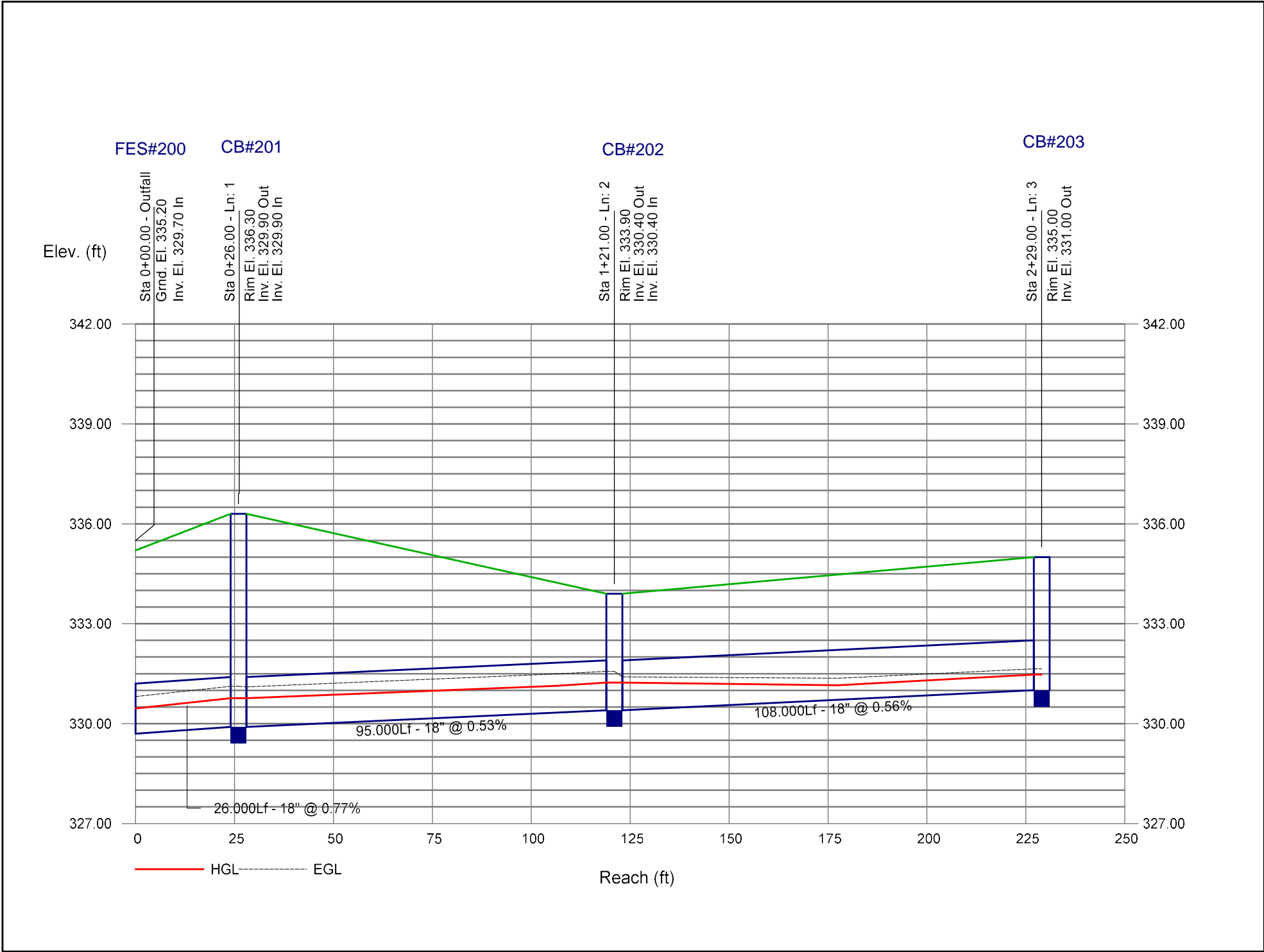
# Storm Sewer Summary Report

| Line No.  | Line ID | Flow rate (cfs) | Line Size (in) | Line shape | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line Slope (%) | HGL Down (ft)      | HGL Up (ft) | Minor loss (ft) | HGL Junct (ft)      | Dns Line No. | Junction Type |
|---|---------|-----------------|----------------|------------|------------------|-------------------|-------------------|----------------|--------------------|-------------|-----------------|---------------------|--------------|---------------|
| 1   |         | 5.06            | 18             | Cir        | 26.000           | 329.70            | 329.90            | 0.769          | 330.46             | 330.76      | 0.53            | 330.76              | End          | Curb-         |
| 2   |         | 4.69            | 18             | Cir        | 95.000           | 329.90            | 330.40            | 0.526          | 330.76             | 331.23      | n/a             | 331.23 j            | 1            | Combination   |
| 3   |         | 1.57            | 18             | Cir        | 108.000          | 330.40            | 331.00            | 0.560          | 331.23             | 331.47      | n/a             | 331.47 j            | 2            | Curb-         |
| Project File: 200 System.stm                                  |         |                 |                |            |                  |                   |                   |                | Number of lines: 3 |             |                 | Run Date: 12/5/2023 |              |               |
| NOTES: Return period = 10 Yrs. ; j - Line contains hyd. jump. |         |                 |                |            |                  |                   |                   |                |                    |             |                 |                     |              |               |

# Hydraulic Grade Line Computations

| Line   | Size<br><br>(in) | Q<br><br>(cfs) | Downstream             |                     |               |                |               |                     |                     |           | Len<br><br>(ft) | Upstream               |                     |                    |                |               |                     |                     |                     | Check            |                       | JL<br>coeff<br><br>(K) | Minor<br>loss<br><br>(ft) |
|--|------------------|----------------|------------------------|---------------------|---------------|----------------|---------------|---------------------|---------------------|-----------|-----------------|------------------------|---------------------|--------------------|----------------|---------------|---------------------|---------------------|---------------------|------------------|-----------------------|------------------------|---------------------------|
|  |                  |                | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft) | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%) |                 | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft)      | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%)           | Ave<br>Sf<br>(%) | Enrgy<br>loss<br>(ft) |                        |                           |
| 1  | 18               | 5.06           | 329.70                 | 330.46              | 0.76          | 0.89           | 5.66          | 0.36                | 330.81              | 0.000     | 26.000          | 329.90                 | 330.76              | 0.86**             | 1.06           | 4.80          | 0.36                | 331.12              | 0.000               | 0.000            | n/a                   | 1.49                   | 0.53                      |
| 2  | 18               | 4.69           | 329.90                 | 330.76              | 0.86          | 1.01           | 4.44          | 0.34                | 331.10              | 0.000     | 95.000          | 330.40                 | 331.23 j            | 0.83**             | 1.01           | 4.67          | 0.34                | 331.57              | 0.000               | 0.000            | n/a                   | 1.50                   | n/a                       |
| 3  | 18               | 1.57           | 330.40                 | 331.23              | 0.83          | 0.47           | 1.56          | 0.17                | 331.40              | 0.000     | 108.000         | 331.00                 | 331.47 j            | 0.47**             | 0.47           | 3.31          | 0.17                | 331.65              | 0.000               | 0.000            | n/a                   | 1.00                   | 0.17                      |
| Project File: 200 System.stm   |                  |                |                        |                     |               |                |               |                     |                     |           |                 |                        |                     | Number of lines: 3 |                |               |                     |                     | Run Date: 12/5/2023 |                  |                       |                        |                           |
| Notes: ; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box |                  |                |                        |                     |               |                |               |                     |                     |           |                 |                        |                     |                    |                |               |                     |                     |                     |                  |                       |                        |                           |

Storm Sewer Profile



7-Eleven, Zebulon, NC  
Bowman North Carolina, Ltd.

|                                 |
|---------------------------------|
| Rational Runoff Coefficient "C" |
|---------------------------------|

|                               |              |                  |                   |            |
|-------------------------------|--------------|------------------|-------------------|------------|
| Catch Basin#301               |              |                  |                   |            |
| <u>Drainage Area (acres):</u> |              | 0.04             |                   |            |
| <u>Proposed Land Uses:</u>    |              |                  |                   |            |
| <u>Land Use Description</u>   | <u>Acres</u> | <u>% Site</u>    | <u>Runoff "C"</u> | <u>"C"</u> |
| Roofs                         | 0.00         | 0%               | 0.95              | 0.00       |
| Asphalt/Concrete Pavement     | 0.04         | 100%             | 0.95              | 0.95       |
| Lawn                          | 0.00         | 0%               | 0.3               | 0.00       |
| Wooded                        | 0.00         | 0%               | 0.2               | 0.00       |
| Total Area=                   | 0.04         | Cumulative "C" = |                   | 0.95       |
|                               |              | i10=             |                   | 7.21       |
|                               |              | Q10=             |                   | 0.30       |

|                               |              |                  |                   |            |
|-------------------------------|--------------|------------------|-------------------|------------|
| Catch Basin#302               |              |                  |                   |            |
| <u>Drainage Area (acres):</u> | 0.08         |                  |                   |            |
| <u>Proposed Land Uses:</u>    |              |                  |                   |            |
| <u>Land Use Description</u>   | <u>Acres</u> | <u>% Site</u>    | <u>Runoff "C"</u> | <u>"C"</u> |
| Roofs                         | 0.00         | 0%               | 0.95              | 0.00       |
| Asphalt/Concrete Pavement     | 0.06         | 70%              | 0.95              | 0.67       |
| Lawn                          | 0.02         | 30%              | 0.3               | 0.09       |
| Wooded                        | 0.00         | 0%               | 0.2               | 0.00       |
| Total Area=                   | 0.08         | Cumulative "C" = |                   | 0.76       |
|                               |              | i10=             |                   | 7.21       |
|                               |              | Q10=             |                   | 0.46       |

# Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



# Storm Sewer Inventory Report

| Line No.   | Alignment      |                  |                  |           | Flow Data     |                |                  |                  | Physical Data     |                |                   |                |            |             |                  |                    | Line ID |
|--|----------------|------------------|------------------|-----------|---------------|----------------|------------------|------------------|-------------------|----------------|-------------------|----------------|------------|-------------|------------------|--------------------|---------|
|  | Dnstr Line No. | Line Length (ft) | Defl angle (deg) | Junc Type | Known Q (cfs) | Drng Area (ac) | Runoff Coeff (C) | Inlet Time (min) | Invert El Dn (ft) | Line Slope (%) | Invert El Up (ft) | Line Size (in) | Line Shape | N Value (n) | J-Loss Coeff (K) | Inlet/ Rim El (ft) |         |
| 1  | End            | 10.000           | -179.326         | Curb      | 0.31          | 0.00           | 0.00             | 0.0              | 327.40            | 0.50           | 327.45            | 15             | Cir        | 0.012       | 0.50             | 330.80             |         |
| 2  | 1              | 32.000           | -0.954           | Curb      | 0.47          | 0.00           | 0.00             | 0.0              | 327.45            | 0.62           | 327.65            | 15             | Cir        | 0.012       | 1.00             | 330.70             |         |
| <div> <div>Project File: 300 System.stm</div> <div>Number of lines: 2</div> <div>Date: 12/20/2023</div> </div> |                |                  |                  |           |               |                |                  |                  |                   |                |                   |                |            |             |                  |                    |         |

# Structure Report

| Struct No.                   | Structure ID | Junction Type | Rim Elev (ft) | Structure |             |            | Line Out                |       |             | Line In              |       |             |
|------------------------------|--------------|---------------|---------------|-----------|-------------|------------|-------------------------|-------|-------------|----------------------|-------|-------------|
|                              |              |               |               | Shape     | Length (ft) | Width (ft) | Size (in)               | Shape | Invert (ft) | Size (in)            | Shape | Invert (ft) |
| 1                            |              | Curb-         | 330.80        | Cir       | 4.00        | 4.00       | 15                      | Cir   | 327.45      | 15                   | Cir   | 327.45      |
| 2                            |              | Curb-         | 330.70        | Cir       | 4.00        | 4.00       | 15                      | Cir   | 327.65      |                      |       |             |
| Project File: 300 System.stm |              |               |               |           |             |            | Number of Structures: 2 |       |             | Run Date: 12/20/2023 |       |             |



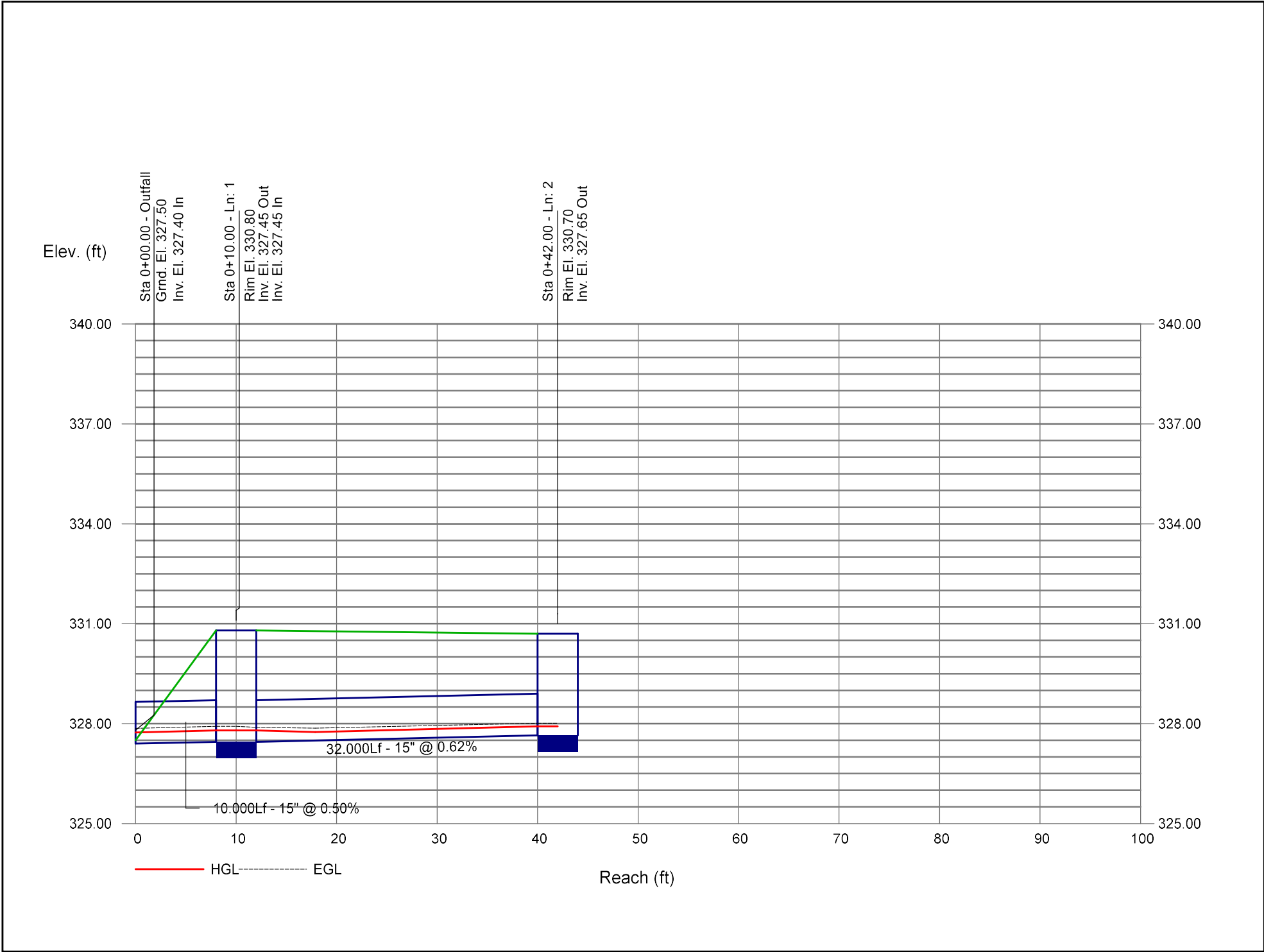
# Storm Sewer Summary Report

| Line No. | Line ID | Flow rate (cfs) | Line Size (in) | Line shape | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line Slope (%) | HGL Down (ft) | HGL Up (ft) | Minor loss (ft) | HGL Junct (ft) | Dns Line No. | Junction Type |
|----------|---------|-----------------|----------------|------------|------------------|-------------------|-------------------|----------------|---------------|-------------|-----------------|----------------|--------------|---------------|
| 1        |         | 0.78            | 15             | Cir        | 10.000           | 327.40            | 327.45            | 0.500          | 327.74        | 327.80      | 0.06            | 327.80         | End          | Curb-         |
| 2        |         | 0.47            | 15             | Cir        | 32.000           | 327.45            | 327.65            | 0.625          | 327.80        | 327.92      | n/a             | 327.92 j       | 1            | Curb-         |
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# Hydraulic Grade Line Computations

| Line | Size | Q    | Downstream             |                     |               |                |               |                     |                     |           | Len    | Upstream               |                     |               |                |               |                     |                     |           |                  | Check                 |      | JL<br>coeff | Minor<br>loss |
|------|------|------|------------------------|---------------------|---------------|----------------|---------------|---------------------|---------------------|-----------|--------|------------------------|---------------------|---------------|----------------|---------------|---------------------|---------------------|-----------|------------------|-----------------------|------|-------------|---------------|
|      |      |      | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft) | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%) |        | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft) | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%) | Ave<br>Sf<br>(%) | Enrgy<br>loss<br>(ft) |      |             |               |
| 1    | 15   | 0.78 | 327.40                 | 327.74              | 0.34          | 0.27           | 2.94          | 0.12                | 327.86              | 0.000     | 10.000 | 327.45                 | 327.80              | 0.35**        | 0.28           | 2.82          | 0.12                | 327.92              | 0.000     | 0.000            | n/a                   | 0.50 | 0.06        |               |
| 2    | 15   | 0.47 | 327.45                 | 327.80              | 0.35          | 0.19           | 1.70          | 0.09                | 327.89              | 0.000     | 32.000 | 327.65                 | 327.92 j            | 0.27**        | 0.19           | 2.45          | 0.09                | 328.01              | 0.000     | 0.000            | n/a                   | 1.00 | 0.09        |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |        |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
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|      |      |      |                        |                     |               |                |               |                     |                     |           |        |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |        |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |

Storm Sewer Profile



7-Eleven, Zebulon, NC  
Bowman North Carolina, Ltd.

Rational Runoff Coefficient "C"

Catch Basin#401

Drainage Area (acres): 0.10

Proposed Land Uses:

| <u>Land Use Description</u> | <u>Acres</u> | <u>% Site</u> | <u>Runoff "C"</u> | <u>"C"</u> |
|-----------------------------|--------------|---------------|-------------------|------------|
| Roofs                       | 0.00         | 0%            | 0.95              | 0.00       |
| Asphalt/Concrete Pavement   | 0.10         | 100%          | 0.95              | 0.95       |
| Lawn                        | 0.00         | 0%            | 0.3               | 0.00       |
| Wooded                      | 0.00         | 0%            | 0.2               | 0.00       |
| Total Area=                 | 0.10         |               |                   |            |
| Cumulative "C" =            |              |               |                   | 0.95       |
| i10=                        |              |               |                   | 7.21       |
| Q10=                        |              |               |                   | 0.69       |

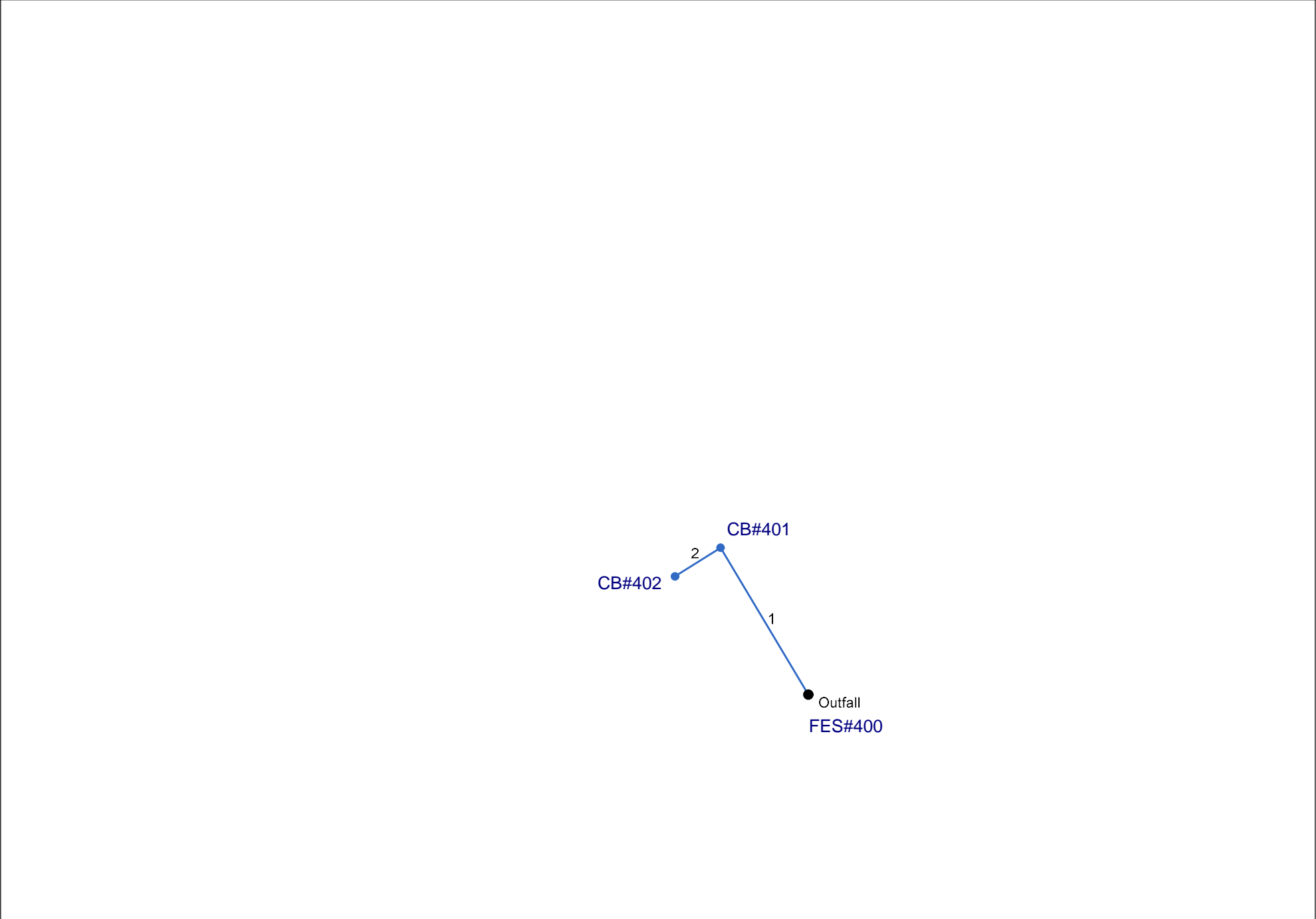
Catch Basin#402

Drainage Area (acres): 0.32

Proposed Land Uses:

| <u>Land Use Description</u> | <u>Acres</u> | <u>% Site</u> | <u>Runoff "C"</u> | <u>"C"</u> |
|-----------------------------|--------------|---------------|-------------------|------------|
| Roofs                       | 0.00         | 0%            | 0.95              | 0.00       |
| Asphalt/Concrete Pavement   | 0.21         | 67%           | 0.95              | 0.64       |
| Lawn                        | 0.10         | 33%           | 0.3               | 0.10       |
| Wooded                      | 0.00         | 0%            | 0.2               | 0.00       |
| Total Area=                 | 0.32         |               |                   |            |
| Cumulative "C" =            |              |               |                   | 0.74       |
| i10=                        |              |               |                   | 7.21       |
| Q10=                        |              |               |                   | 1.69       |

# Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



|                              |                    |                 |
|------------------------------|--------------------|-----------------|
| Project File: 400 System.stm | Number of lines: 2 | Date: 12/5/2023 |
|------------------------------|--------------------|-----------------|

# Storm Sewer Inventory Report

| Line No.                     | Alignment      |                  |                  |           | Flow Data     |                |                  |                  | Physical Data     |                |                   |                    |            |             |                  |                    | Line ID |
|------------------------------|----------------|------------------|------------------|-----------|---------------|----------------|------------------|------------------|-------------------|----------------|-------------------|--------------------|------------|-------------|------------------|--------------------|---------|
|                              | Dnstr Line No. | Line Length (ft) | Defl angle (deg) | Junc Type | Known Q (cfs) | Drng Area (ac) | Runoff Coeff (C) | Inlet Time (min) | Invert El Dn (ft) | Line Slope (%) | Invert El Up (ft) | Line Size (in)     | Line Shape | N Value (n) | J-Loss Coeff (K) | Inlet/ Rim El (ft) |         |
| 1                            | End            | 102.000          | -120.750         | Curb      | 0.69          | 0.00           | 0.00             | 0.0              | 329.40            | 0.49           | 329.90            | 15                 | Cir        | 0.012       | 1.50             | 333.38             |         |
| 2                            | 1              | 32.000           | -91.522          | Curb      | 1.69          | 0.00           | 0.00             | 0.0              | 329.90            | 0.63           | 330.10            | 15                 | Cir        | 0.012       | 1.00             | 333.38             |         |
| Project File: 400 System.stm |                |                  |                  |           |               |                |                  |                  |                   |                |                   | Number of lines: 2 |            |             | Date: 12/5/2023  |                    |         |

# Structure Report

| Struct No.                   | Structure ID | Junction Type | Rim Elev (ft) | Structure |             |            | Line Out                |       |             | Line In             |       |             |
|------------------------------|--------------|---------------|---------------|-----------|-------------|------------|-------------------------|-------|-------------|---------------------|-------|-------------|
|                              |              |               |               | Shape     | Length (ft) | Width (ft) | Size (in)               | Shape | Invert (ft) | Size (in)           | Shape | Invert (ft) |
| 1                            |              | Curb-         | 333.38        | Cir       | 4.00        | 4.00       | 15                      | Cir   | 329.90      | 15                  | Cir   | 329.90      |
| 2                            |              | Curb-         | 333.38        | Cir       | 4.00        | 4.00       | 15                      | Cir   | 330.10      |                     |       |             |
| Project File: 400 System.stm |              |               |               |           |             |            | Number of Structures: 2 |       |             | Run Date: 12/5/2023 |       |             |

# Storm Sewer Summary Report

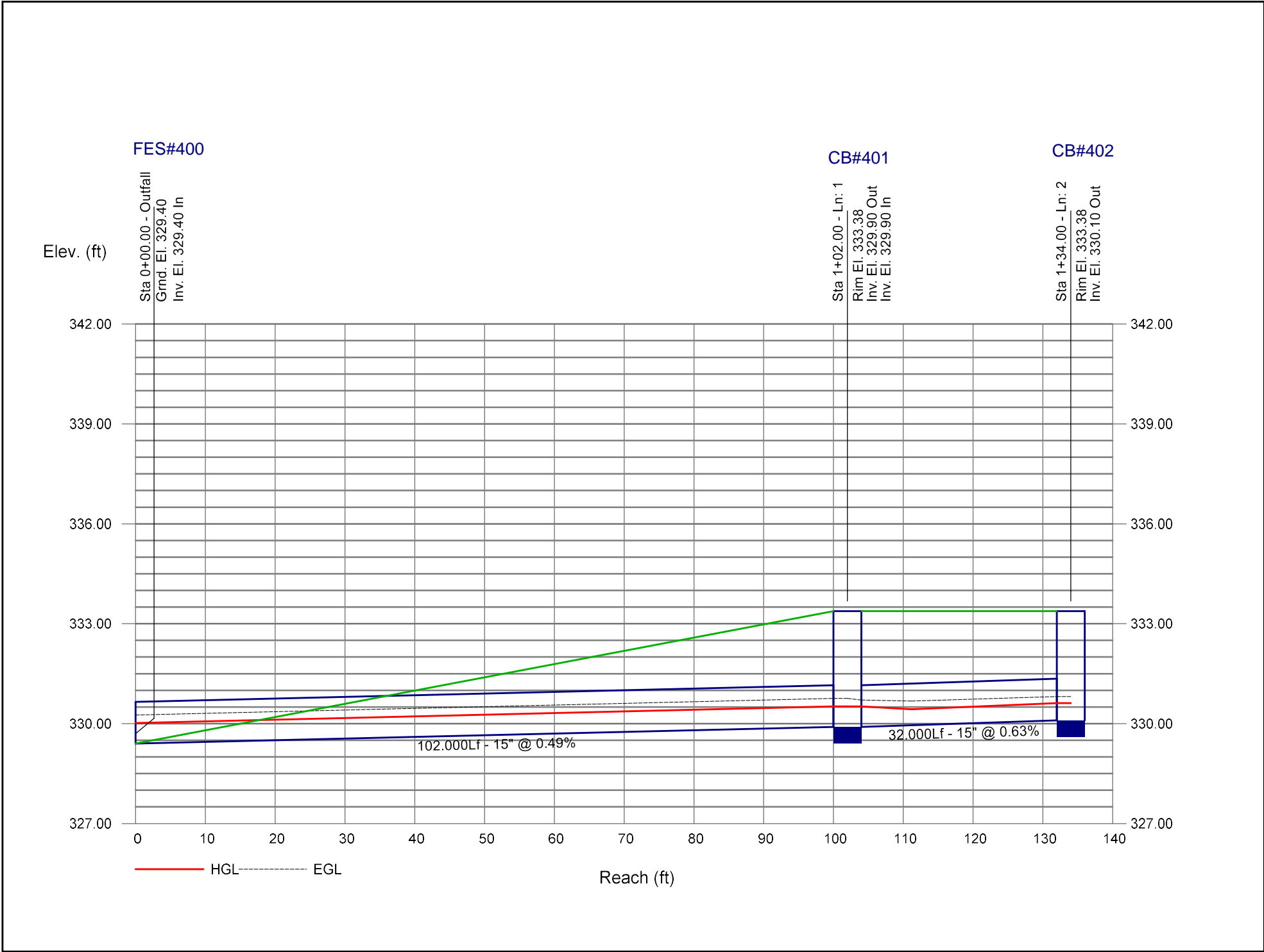
| Line No.  | Line ID | Flow rate (cfs) | Line Size (in) | Line shape | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line Slope (%) | HGL Down (ft)      | HGL Up (ft) | Minor loss (ft) | HGL Junct (ft)      | Dns Line No. | Junction Type |
|---|---------|-----------------|----------------|------------|------------------|-------------------|-------------------|----------------|--------------------|-------------|-----------------|---------------------|--------------|---------------|
| 1   |         | 2.38            | 15             | Cir        | 102.000          | 329.40            | 329.90            | 0.490          | 330.01             | 330.52      | n/a             | 330.52              | End          | Curb-         |
| 2   |         | 1.69            | 15             | Cir        | 32.000           | 329.90            | 330.10            | 0.625          | 330.52             | 330.62      | n/a             | 330.62 j            | 1            | Curb-         |
| Project File: 400 System.stm                                  |         |                 |                |            |                  |                   |                   |                | Number of lines: 2 |             |                 | Run Date: 12/5/2023 |              |               |
| NOTES: Return period = 10 Yrs. ; j - Line contains hyd. jump. |         |                 |                |            |                  |                   |                   |                |                    |             |                 |                     |              |               |



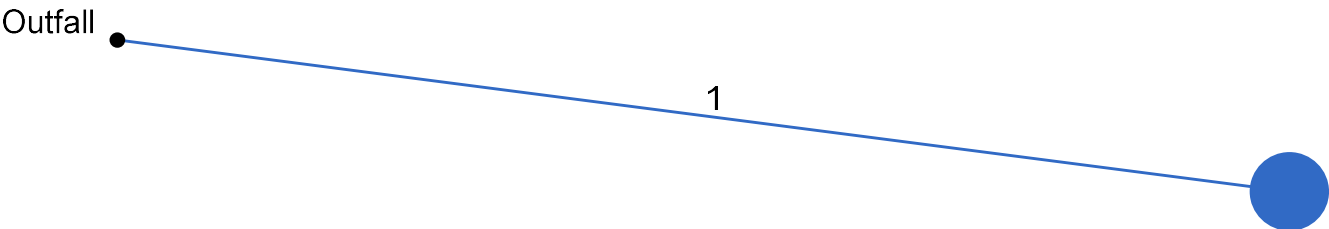
# Hydraulic Grade Line Computations

| Line | Size | Q    | Downstream             |                     |               |                |               |                     |                     |           | Len     | Upstream               |                     |               |                |               |                     |                     |           |                  | Check                 |      | JL<br>coeff | Minor<br>loss |
|------|------|------|------------------------|---------------------|---------------|----------------|---------------|---------------------|---------------------|-----------|---------|------------------------|---------------------|---------------|----------------|---------------|---------------------|---------------------|-----------|------------------|-----------------------|------|-------------|---------------|
|      |      |      | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft) | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%) |         | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft) | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%) | Ave<br>Sf<br>(%) | Enrgy<br>loss<br>(ft) |      |             |               |
| 1    | 15   | 2.38 | 329.40                 | 330.01              | 0.61          | 0.60           | 3.96          | 0.24                | 330.26              | 0.000     | 102.000 | 329.90                 | 330.52              | 0.62**        | 0.60           | 3.95          | 0.24                | 330.76              | 0.000     | 0.000            | n/a                   | 1.50 | n/a         |               |
| 2    | 15   | 1.69 | 329.90                 | 330.52              | 0.62          | 0.48           | 2.80          | 0.19                | 330.71              | 0.000     | 32.000  | 330.10                 | 330.62 j            | 0.52**        | 0.48           | 3.54          | 0.19                | 330.81              | 0.000     | 0.000            | n/a                   | 1.00 | n/a         |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
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|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
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|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
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|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
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|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
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|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |
|      |      |      |                        |                     |               |                |               |                     |                     |           |         |                        |                     |               |                |               |                     |                     |           |                  |                       |      |             |               |

Storm Sewer Profile



# Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



|                              |                    |                  |
|------------------------------|--------------------|------------------|
| Project File: 500 System.stm | Number of lines: 1 | Date: 12/20/2023 |
|------------------------------|--------------------|------------------|

# Storm Sewer Inventory Report

| Line No.                     | Alignment      |                  |                  |           | Flow Data     |                |                  |                  | Physical Data     |                |                   |                    |            |             |                  |                    | Line ID |
|------------------------------|----------------|------------------|------------------|-----------|---------------|----------------|------------------|------------------|-------------------|----------------|-------------------|--------------------|------------|-------------|------------------|--------------------|---------|
|                              | Dnstr Line No. | Line Length (ft) | Defl angle (deg) | Junc Type | Known Q (cfs) | Drng Area (ac) | Runoff Coeff (C) | Inlet Time (min) | Invert El Dn (ft) | Line Slope (%) | Invert El Up (ft) | Line Size (in)     | Line Shape | N Value (n) | J-Loss Coeff (K) | Inlet/ Rim El (ft) |         |
| 1                            | End            | 62.000           | 7.392            | MH        | 2.25          | 0.00           | 0.00             | 0.0              | 329.40            | 0.48           | 329.70            | 18                 | Cir        | 0.012       | 1.00             | 334.00             |         |
| Project File: 500 System.stm |                |                  |                  |           |               |                |                  |                  |                   |                |                   | Number of lines: 1 |            |             |                  | Date: 12/20/2023   |         |

# Structure Report

| Struct No.                   | Structure ID | Junction Type | Rim Elev (ft) | Structure |             |            | Line Out                |       |             | Line In              |       |             |
|------------------------------|--------------|---------------|---------------|-----------|-------------|------------|-------------------------|-------|-------------|----------------------|-------|-------------|
|                              |              |               |               | Shape     | Length (ft) | Width (ft) | Size (in)               | Shape | Invert (ft) | Size (in)            | Shape | Invert (ft) |
| 1                            |              | Manhole       | 334.00        | Cir       | 4.00        | 4.00       | 18                      | Cir   | 329.70      |                      |       |             |
| Project File: 500 System.stm |              |               |               |           |             |            | Number of Structures: 1 |       |             | Run Date: 12/20/2023 |       |             |

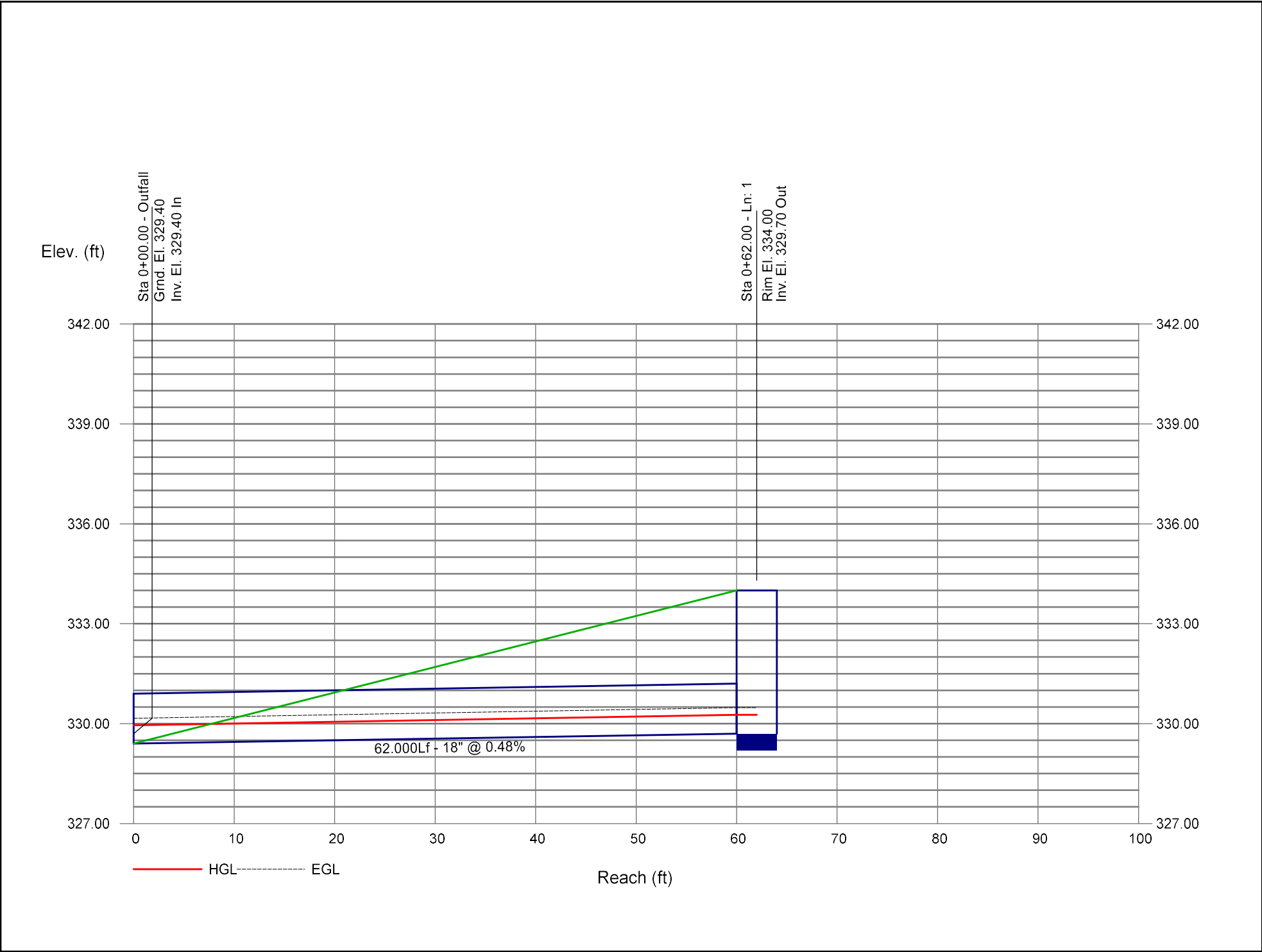
# Storm Sewer Summary Report

| Line No.                       | Line ID | Flow rate (cfs) | Line Size (in) | Line shape | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line Slope (%) | HGL Down (ft)      | HGL Up (ft) | Minor loss (ft) | HGL Junct (ft)       | Dns Line No. | Junction Type |
|--------------------------------|---------|-----------------|----------------|------------|------------------|-------------------|-------------------|----------------|--------------------|-------------|-----------------|----------------------|--------------|---------------|
| 1                              |         | 2.25            | 18             | Cir        | 62.000           | 329.40            | 329.70            | 0.484          | 329.95             | 330.27      | n/a             | 330.27               | End          | Manhole       |
| Project File: 500 System.stm   |         |                 |                |            |                  |                   |                   |                | Number of lines: 1 |             |                 | Run Date: 12/20/2023 |              |               |
| NOTES: Return period = 10 Yrs. |         |                 |                |            |                  |                   |                   |                |                    |             |                 |                      |              |               |

# Hydraulic Grade Line Computations

| Line  | Size<br><br>(in) | Q<br><br>(cfs) | Downstream             |                     |               |                |               |                     |                     |           | Len<br><br>(ft) | Upstream               |                     |                    |                |               |                     |                     |                      | Check            |                       | JL<br>coeff<br><br>(K) | Minor<br>loss<br><br>(ft) |
|---|------------------|----------------|------------------------|---------------------|---------------|----------------|---------------|---------------------|---------------------|-----------|-----------------|------------------------|---------------------|--------------------|----------------|---------------|---------------------|---------------------|----------------------|------------------|-----------------------|------------------------|---------------------------|
|   |                  |                | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft) | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%) |                 | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft)      | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%)            | Ave<br>Sf<br>(%) | Enrgy<br>loss<br>(ft) |                        |                           |
| 1   | 18               | 2.25           | 329.40                 | 329.95              | 0.55          | 0.58           | 3.85          | 0.21                | 330.16              | 0.000     | 62.000          | 329.70                 | 330.27              | 0.57**             | 0.61           | 3.68          | 0.21                | 330.48              | 0.000                | 0.000            | n/a                   | 1.00                   | n/a                       |
| Project File: 500 System.stm                            |                  |                |                        |                     |               |                |               |                     |                     |           |                 |                        |                     | Number of lines: 1 |                |               |                     |                     | Run Date: 12/20/2023 |                  |                       |                        |                           |
| Notes: ; ** Critical depth. ; c = cir e = ellip b = box |                  |                |                        |                     |               |                |               |                     |                     |           |                 |                        |                     |                    |                |               |                     |                     |                      |                  |                       |                        |                           |

# Storm Sewer Profile





7-Eleven, Zebulon, NC  
Bowman North Carolina, Ltd.

Rational Runoff Coefficient "C"

|                               |              |                  |                   |            |
|-------------------------------|--------------|------------------|-------------------|------------|
| Pipe Inlet #1                 |              |                  |                   |            |
| <u>Drainage Area (acres):</u> |              | 0.32             |                   |            |
| <u>Proposed Land Uses:</u>    |              |                  |                   |            |
| <u>Land Use Description</u>   | <u>Acres</u> | <u>% Site</u>    | <u>Runoff "C"</u> | <u>"C"</u> |
| Roofs                         | 0.00         | 0%               | 0.95              | 0.00       |
| Asphalt/Concrete Pavement     | 0.00         | 1%               | 0.95              | 0.01       |
| Lawn                          | 0.32         | 99%              | 0.3               | 0.30       |
| Wooded                        | 0.00         | 0%               | 0.2               | 0.00       |
| Total Area=                   | 0.32         | Cumulative "C" = |                   | 0.31       |
|                               |              | i10=             |                   | 7.21       |
|                               |              | Q10=             |                   | 0.71       |

## **APPENDIX D**

### **Erosion Control Calculations**

Rip-Rap Apron  
Skimmer Basin  
Skimmer Sizing  
Anti-flotation Calculation  
Temporary Diversion Ditches



## EROSION CONTROL CALCS (RIP-RAP CALCULATIONS)

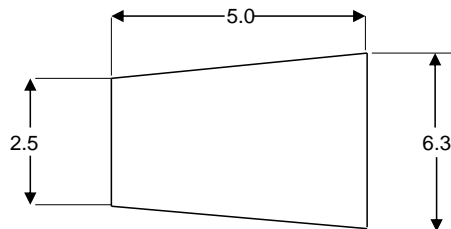
### Project Information

Project Name: 7-Eleven Zebulon, NC  
 Project #: 220163-01-002  
 Designed by: MCB Date: 10/4/2023  
 Revised by: MCB Date: 12/20/2023  
 Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

### Rip-Rap Apron#1

Pipe Diameter d= 15  
 Pipe Slope s= 0.59 %  
 Manning's number n= 0.013  
 Flow Q= 4.49 cfs  
 Velocity V = 4.89 ft/s

Dissipator Dimensions \* Zone = 1  
 Stone Filling Class = A  
 Entry Width ( 2 X D<sub>0</sub> ) = 2.5 ft  
 Length ( 4 X D<sub>0</sub> ) = 5.0 ft  
 Width (La + D<sub>0</sub>) = 6.3 ft  
 Min. Thickness = 12 inches  
 Min. Stone Diameter= 3 inches



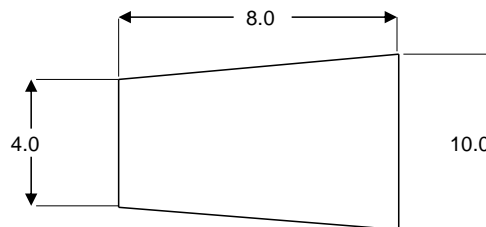
\* All units are in feet

\*\* Dissipator pad designed for full flow of pipe

### Rip-Rap Apron#2

Pipe Diameter d= 24 in  
 Pipe Slope s= 0.77 %  
 Manning's number n= 0.013  
 Flow Q= 10.61 cfs  
 Velocity V = 6.82 ft/s

Dissipator Dimensions \* Zone = 1  
 Stone Filling Class = A  
 Entry Width ( 3 X D<sub>0</sub> ) = 4.0 ft  
 Length ( 6 X D<sub>0</sub> ) = 8.0 ft  
 Width (La + D<sub>0</sub>) = 10.0 ft  
 Min. Thickness = 12 inches  
 Min. Stone Diameter= 3 inches



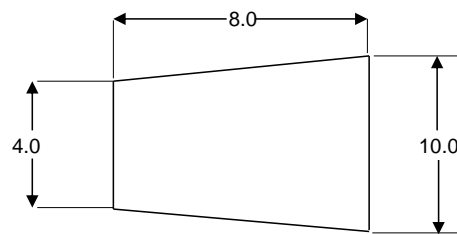
\* All units are in feet

\*\* Dissipator pad designed for full flow of pipe

### Rip-Rap Apron#3

|                  |     |           |
|------------------|-----|-----------|
| Pipe Diameter    | d=  | 24        |
| Pipe Slope       | s=  | 0.5 %     |
| Manning's number | n=  | 0.013     |
| Flow             | Q=  | 3.519 cfs |
| Velocity         | V = | 4.27 ft/s |

|                                      |                       |           |
|--------------------------------------|-----------------------|-----------|
| Dissipator Dimensions *              | Zone =                | 1         |
|                                      | Stone Filling Class = | A         |
| Entry Width ( 3 X D <sub>0</sub> ) = |                       | 4.0 ft    |
| Length ( 6 X D <sub>0</sub> ) =      |                       | 8.0 ft    |
| Width (La + D <sub>0</sub> ) =       |                       | 10.0 ft   |
| Min. Thickness =                     |                       | 12 inches |
| Min. Stone Diameter=                 |                       | 3 inches  |



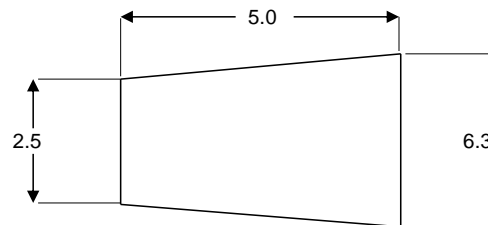
\* All units are in feet

\*\* Dissipator pad designed for full flow of pipe

### Rip-Rap Apron#4

|                  |     |           |
|------------------|-----|-----------|
| Pipe Diameter    | d=  | 15 in     |
| Pipe Slope       | s=  | 0.5 %     |
| Manning's number | n=  | 0.013     |
| Flow             | Q=  | 0.78 cfs  |
| Velocity         | V = | 2.94 ft/s |

|                                      |                       |           |
|--------------------------------------|-----------------------|-----------|
| Dissipator Dimensions *              | Zone =                | 1         |
|                                      | Stone Filling Class = | A         |
| Entry Width ( 3 X D <sub>0</sub> ) = |                       | 2.5 ft    |
| Length ( 6 X D <sub>0</sub> ) =      |                       | 5.0 ft    |
| Width (La + D <sub>0</sub> ) =       |                       | 6.3 ft    |
| Min. Thickness =                     |                       | 12 inches |
| Min. Stone Diameter=                 |                       | 3 inches  |



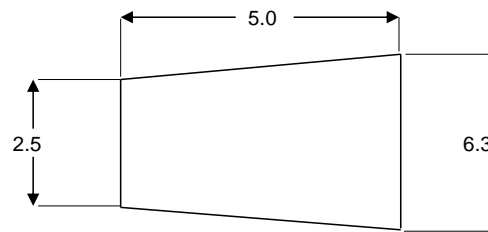
\* All units are in feet

\*\* Dissipator pad designed for full flow of pipe

### Rip-Rap Apron#5

|                  |    |           |
|------------------|----|-----------|
| Pipe Diameter    | d= | 15 in     |
| Pipe Slope       | s= | 0.5 %     |
| Manning's number | n= | 0.013     |
| Flow             | Q= | 2.38 cfs  |
| Velocity         | V= | 3.96 ft/s |

|                         |                                  |           |
|-------------------------|----------------------------------|-----------|
| Dissipator Dimensions * | Zone =                           | 1         |
|                         | Stone Filling Class =            | A         |
|                         | Entry Width ( $3 \times D_0$ ) = | 2.5 ft    |
|                         | Length ( $6 \times D_0$ ) =      | 5.0 ft    |
|                         | Width ( $L_a + D_0$ ) =          | 6.3 ft    |
|                         | Min. Thickness =                 | 12 inches |
|                         | Min. Stone Diameter=             | 3 inches  |



\* All units are in feet

\*\* Dissipator pad designed for full flow of pipe

## EROSION CONTROL CALCS (SKIMMER BASINS)

### Project Information

|               |                      |       |            |
|---------------|----------------------|-------|------------|
| Project Name: | 7-Eleven Zebulon, NC |       |            |
| Project #:    | 220163-01-002        |       |            |
| Designed by:  | MCB                  | Date: | 10/4/2023  |
| Revised by:   | MCB                  | Date: | 11/29/2023 |
| Checked by:   |                      | Date: |            |

### Skimmer Basin #1

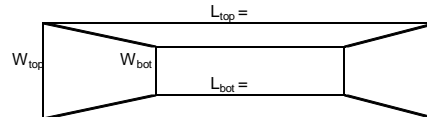
|                       |                    |                 |
|-----------------------|--------------------|-----------------|
| Initial Drainage Area | Total, $A_T$ =     | 1.95 Ac         |
|                       | Disturbed, $A_D$ = | 1.95 Ac         |
| Final Drainage Area   | Total, $A_T$ =     | 3.39 Ac         |
|                       | Disturbed, $A_D$ = | 3.39 Ac         |
| 25-year Runoff (Q25)  | C =                | 0.50            |
|                       | $T_c$ =            | 5.00 min        |
|                       | I25 =              | 8.04 in/hr      |
|                       | <b>Q25 =</b>       | <b>13.6 cfs</b> |

|                       |                  |                 |
|-----------------------|------------------|-----------------|
| Surface Area Required | SA = 425sf x Q25 |                 |
|                       | <b>SA =</b>      | <b>5,792 sf</b> |

|                 |  |                 |
|-----------------|--|-----------------|
| Volume Required | V <sub>R</sub> = 1800 cf/Ac x A <sub>D</sub> |                 |
|                 | <b>V<sub>R</sub> =</b>                       | <b>6,102 cf</b> |

|                          |               |        |                    |
|--------------------------|---------------|--------|--------------------|
| Sediment Trap Dimensions | L =           | 180 ft | (Spillway Length)  |
|                          | W =           | 33 ft  | (Spillway Width)   |
|                          | D =           | 2.0 ft | (Depth of Storage) |
|                          | Side Slopes = | 2 :1   |                    |

|                    |        |
|--------------------|--------|
| L <sub>top</sub> = | 188 ft |
| L <sub>bot</sub> = | 172 ft |
| W <sub>top</sub> = | 41 ft  |
| W <sub>bot</sub> = | 25 ft  |



L/W Ratio= 5.5 :1 (must be 2:1 to 6:1)

| <u>Description</u> | <u>Elevation</u> |  |
|--------------------|------------------|--|
| Top of Berm        | 334.00           | (allow 1ft freeboard above spillway flow height) |
| Emergency Spillway | 332.50           |  |
| Sediment Storage   | 332.00           |  |
| Cleanout Mark      | 331.00           | (half of storage height)                         |
| Bottom             | 330.00           |  |

|          |                   |             |   |       |
|----------|-------------------|-------------|---|-------|
| Provided | SA <sub>p</sub> = | 5,940 sf    | > | 5,792 |
|          | V <sub>p</sub> =  | 10,240.0 cf | > | 6,102 |

|                                    |                        |                  |
|------------------------------------|------------------------|------------------|
| Emergency Spillway - 10 Year Storm | I25 =                  | 8.04 in/hr       |
|                                    | <b>Q25 =</b>           | <b>13.63 cfs</b> |
|                                    | h =                    | 0.5 ft           |
|                                    | C <sub>w</sub> =       | 3                |
|                                    | <b>L<sub>w</sub> =</b> | <b>10 ft</b>     |

### Calculate Skimmer Size

Basin Volume in Cubic Feet

|        |       |
|--------|-------|
| 10,240 | Cu.Ft |
|--------|-------|

Days to Drain\*

|   |      |
|---|------|
| 3 | Days |
|---|------|

Skimmer Size

2.5 Inch

Orifice Radius

0.9 Inch[es]

Orifice Diameter

1.9 Inch[es]

\*In NC assume 3 days to drain

### Estimate Volume of Basin

Top of water surface in feet

| Length | Width |
|--------|-------|
| 180    | 33    |

 Feet

Bottom dimensions in feet

|     |    |
|-----|----|
| 172 | 25 |
|-----|----|

 Feet

Depth in feet

|   |
|---|
| 2 |
|---|

 Feet

VOLUME

10240 Cu. Ft.



## EROSION CONTROL CALCS (SKIMMER BASINS)

### Project Information

|               |                             |                         |
|---------------|-----------------------------|-------------------------|
| Project Name: | <u>7-Eleven Zebulon, NC</u> |                         |
| Project #:    | <u>220163-01-002</u>        |                         |
| Designed by:  | <u>MCB</u>                  | Date: <u>10/4/2023</u>  |
| Revised by:   | <u>MCB</u>                  | Date: <u>11/29/2023</u> |
| Checked by:   | <u></u>                     | Date: <u></u>           |

### Anti-Flotation Device

4' x 4' Outlet Structure

|                                    |              |     |  |
|------------------------------------|--------------|-----|--|
| Area:                              | <u>16.0</u>  | sf  |  |
| Top of Basin Elev.:                | <u>332.0</u> |     |  |
| Bottom of Basin Elev.:             | <u>330.0</u> |     |  |
| Volume:                            | <u>32.0</u>  | cf  | (Water Displaced - Top of Pond to Bottom of Pond)          |
| Weight:                            | <u>1997</u>  | lbs |  |
| Factor of Safety                   | <u>1.20</u>  |     |  |
| WT Req'd of Anti-Flotation Device: | <u>2396</u>  | lbs |  |
| Volume of Concrete Req'd:          | <u>16.0</u>  | cf  | (Unit WT of Concrete = 150 pcf)                            |
| Volume Provided:                   | <u>69.5</u>  | cf  | (4'x4' riser x 2.0' = 32 cf, 5'x5' footing x 1.5' =37.5cf) |

### EROSION CONTROL CALCS (TEMPORARY DITCH #1)

## Project Information

Project Name: 7-Eleven Zebulon, NC

Project #: 220163-01-002

Designed by: MCB Date: 10/4/2023

Revised by: \_\_\_\_\_ Date: \_\_\_\_\_

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

### Temporary Ditch #1

Drainage Area                      Total,  $A_T =$                       1.67 Ac

25-year Runoff ( $Q_{25}$ )      C = 0.50  
                                        $T_c$  = 5.00 min  
                                        $I_{25}$  = 8.04 in/hr  
 **$Q_{25}$  = 6.7 cfs**



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Poseyville, Indiana 47633  
Tel. 800.772.2040  
>Fax 812.867.0247  
www.nagreen.com  
ECMDS v7.0

CHANNEL ANALYSIS

> > > Temporary Ditch #1

Name Temporary Ditch #1  
Discharge 6.7  
Channel Slope 0.009  
Channel Bottom Width 1  
Left Side Slope 2  
Right Side Slope 2  
Low Flow Liner  
Retardence Class C 6-12 in  
Vegetation Type None  
Vegetation Density None  
Soil Type Sandy Loam (GM)

DS75

| Phase                | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|----------------------|----------|-----------|-----------|--------------|------------|--------------------------|-------------------------|---------------|---------|----------------|
| Underlying Substrate | Straight | 6.7 cfs   | 2.55 ft/s | 0.92 ft      | 0.035      | 1.51 lbs/ft2             | 0.29 lbs/ft2            | 5.27          | STABLE  | D              |
| DS75 Unvegetated     | Straight | 6.7 cfs   | 2.55 ft/s | 0.92 ft      | 0.035      | 1.6 lbs/ft2              | 0.52 lbs/ft2            | 3.09          | STABLE  | D              |