STORMWATER IMPACT ANALYSIS REPORT

THE PRESERVE AT MOODY FARM

ROLESVILLE, NC

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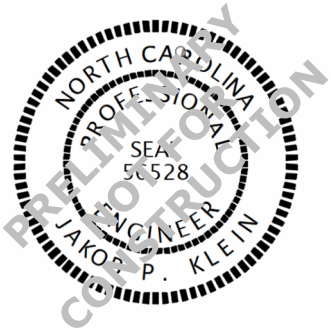


TABLE OF CONTENTS

REPORT

APPENDICES

D. STORMWATER CONTROL MEASURE CALCULATIONS

1. NCDEQ SNAP TOOL CALCULATIONS
2. WAKE COUNTY STORM DESIGN TOOL - ROLESVILLE
3. SCM SIZING & CALCULATIONS
4. HYDRAFLOW HYDROGRAPH POND REPORTS
5. HYDRAFLOW HYDROGRAPH - 1-YEAR REPORT (ATTENUATION)
6. HYDRAFLOW HYDROGRAPH - 10-YEAR REPORT (ATTENUATION & VELOCITY)
7. HYDRAFLOW HYDROGRAPH - 100-YEAR REPORT (FREEBOARD)

REPORT

I. SITE HISTORY

The existing parcel use is agricultural. It is located at the intersection of Rolesville Road and Amazon Trail. The property is divided into two (2) tax parcels, totaling 51.78 acres, consisting of PIN: 1767-28-4304 and 1767-28-4925. The parcel is bordered by agricultural fields to the north, south, and west, with a new subdivision being built directly across the property to the east. An existing stream with surrounding wetlands spans the length of the property from east to west, with a portion of the wetlands also on the southern half of the property. All existing ponds but the one in the far northwest part of the project are to be breached in a separate operation. There is no FEMA flood plain on this site.

The soil on site predominately consists of Rawlings-Rion (RgB), Wedowee-Saw (Wfb), Chewacla and Wehadkee soils (ChA), and Altavista fine sandy loam (AaA) according to the US Department of Agriculture (USDA) NRCS soil report. More detailed soil information can be found in the project Geotechnical Report (see separate document uploaded with project submission).

The existing site is relatively hilly, with high points on the southern border and southeast portion of the site, directing the site drainage towards the wetlands in the middle of the site and discharging to the west. The contours on the site range from 335' to 385' above mean sea level.

II. PROJECT DESCRIPTION

The Preserve at Moody Farm project is predominately surrounded on the north, west and south side by another development in progress known as Kalas Falls. A few small tracts at the northeast side of this project are not part of this project. There is a parcel in the middle of the project which will be referred to as the Moody Homestead. The Moody Homestead is not part of this project, however, the parcel drains onto the Moody Farm project and will be considered in the drainage calculations. The eastern boundary of this project is Rolesville Road which is currently undergoing road improvements to accommodate development in the area.

The project drains to Harris Creek which is part of the Neuse River basin. It is approximately one mile northwest of the intersection of Mitchell Mill Road and Rolesville Road in Wake County, North Carolina. The area of the project is 48.28 acres which does not include the Moody Homestead but does include the existing cemetery between lot #3 and #4. The project at final build out will include 82 single-family homes.

III. STORMWATER CONVEYANCE

Pipe Network

The stormwater conveyance on site is split into seven (7) networks, five (5) of which are designated respective wet ponds, one (1) for bypasses, and one (1) for culvert crossings. Stormwater pipe material is proposed to be reinforced concrete pipe (RCP) within the rights-of-way. RCP pipes on site range from 15" to 54" in diameter. Proposed public easements to allow for future access and maintenance of each SCM and infrastructure can be seen in the

Construction Drawings (CD) Plan set.

Modeling was performed in *Autodesk Hydrograph Storm Sewers* for the 10 and 25-year storm events, see Appendix C. The 10-year modeling ensured hydraulic grade lines (HGL) were maintained within the pipe networks, see Appendix C: Attachment 12. The 25-year modeling ensured HGL's were maintained within the structures, see Appendix C: Attachment 13. To accomplish modeling, inlet areas were delineated for each structure that is to accept overland flow, see Appendix B: Attachment 3. A uniform rational C-value of 0.57 was determined by implementing the post-development impervious area being conveyed to SCM's and the post-development total area being conveyed to SCM's, see Appendix C: Attachment 1. A uniform time of concentration of 10 minutes was used during modeling.

Energy Dissipation

Riprap dissipater pads have been sized for pipe outlets following NCDOT charts and methodology to reduce sediment erosion in areas where water is discharging to the surface, see Appendix C: Attachment 2. Flared-end sections or headwalls are proposed at the outlets of each system entering/exiting SCM's or proposed ditches. Either class "B" or class "1" riprap is proposed at each of these outlets, determined by pipe size and exit velocity.

Inlet Spreads

Spreads were determined on site using a storm intensity of 4 in/hr, see Appendix C: Attachment 10. The method by Limited Area was used to calculate spread sizes and determine the max drainage area per structure based off several variables including road width, longitudinal slope, cross slope, and curb and gutter profile by implementing Manning's Equation. If the max drainage area exceeded the actual drainage area, then a double inlet was implemented in design. Max spreads for this project could not exceed 7.5-feet (5.5-foot half lane + 2-foot gutter).

Permanent Ditches

Permanent diversion ditches are implemented on site to channelize flow to SCM's and divert stormwater around SCM's in specific areas (bypass). Modeling was performed in the *Hydraflow Express Extension* of Autodesk to ensure velocities of less than 10 fps were achieved, see table below. Modeling also ensured that the ditches were adequately sized so that storm water would not over top the ditch during the 10-year storm event, see Appendix B: Attachment 4 and Appendix C: Attachment 9. The contractor should ensure these ditches are stabilized immediately following grading operations to minimize sediment loss on site. See permanent ditch schedule in the CD Plan set.

Ditch Label	V_{10} (fps)	Ditch Label	V_{10} (fps)
Ditch #1A	3.49	Ditch #4B	2.43
Ditch #1B	2.69	Ditch #5A	3.69
Ditch #2	3.22	Ditch #5B	2.47
Ditch #3A	3.47	Ditch #5C	3.52
Ditch #3B	3.16	Ditch #5D	0.94
Ditch #3C	2.42	Ditch #6	3.77
Ditch #3D	2.10	Ditch #7	5.79
Ditch #4A	3.58	-	-

Table 1: *Calculated Velocities for Ditches*

Culvert Crossings

There are two (2) culvert crossings within the Moody project, see Appendix B: Attachment 5. One culvert is to be a 36" RCP pipe that will convey stormwater runoff underneath Mulberry Tree Drive. This 36" culvert conveys stormwater received from the northeast existing pond on site and the drainage area upstream. The second culvert crossing will consist of two (2) 54" RCP pipes that will convey water underneath Tansley Crest Loop. These 54" culverts convey stormwater received from Moody SCM's #1, #2, #3, onsite bypass, Kalas Falls Phase 2 (POI #7), and the Mulberry culvert upstream. All culverts pipes are to be buried to a depth of 20% of the pipe diameter to meet environmental engineering requirements.

Autodesk Hydraflow Hydrograph Extension was used to determine the peaks flows for the 10-year, 25-year, and 100-year storm events for each culvert, see Table 2: *Culvert Peak Flows*. This modeling can be seen in Appendix C. *Autodesk Hydraflow Express Extension* was used to model each culvert, by implementing peaks flows obtained from *Hydrographs*, ensuring that the 10-year hydraulic grade line remained in the pipe and the 100-year storm event does not over top the roadway, see Appendix C: Attachments 4-6. Due to the *Hydraflow Express Extension* not being capable of factoring in the loss of hydraulic capacity with a portion of the culvert pipe being buried, additional hydraulic calculations were performed to ensure culverts are sized adequately, see Appendix C: *Attachment 7*.

Culvert Label	Q_{10} (cfs)	Q_{25} (cfs)	Q_{100} (cfs)
Mulberry Culvert: 36"	24.42	33.20	47.93
Tansley Culvert: Dbl 54"	134.54	192.31	306.41

Table 2: *Culvert Peak Flows*

IV. STORMWATER CONTROL MEASURE

Quantity Control

The primary SCM's proposed on site to detain, treat, and attenuate storm-events are wet ponds. The wet ponds have been designed following the *North Carolina Department of Environmental Quality (NCDEQ) Stormwater Manual* (C-3), see Appendix D: Attachment 3. Each pond is to first be used as a sediment basin, later to be converted to a fully functioning wet pond (per design and sequencing) following installation of stormwater infrastructure and site stabilization.

Each wet pond was designed with a partially submerged vegetative shelf and their specific design elevations, control structures, and geometry can be seen in the Construction Drawing Plan Set, sheets C8.0 through C8.4. Each pond has a control structure that is designed to attenuate the 1-year 24-hour storm event less than or equal to the pre-development peak flow, see Appendix D: Attachment 5. Each emergency spillway has been designed to an elevation that will not be utilized (overtopped) during a 10-year storm event. Each wet pond is designed so that one- foot of freeboard is available during the 100-year storm event.

The SCS Method was implemented to determine curve numbers (CN) per point of discharge (POD). To do so, hydrologic soil group (HSG) data was uploaded from the USDA for determining CN calculations in each POD exhibit, see Appendix B: Attachment 1 & 2 and Appendix D: Attachment 3. During calculations, if a HSG had two values (E.g. A/D), the more conservative CN value was selected for that area (E.g. D group). Calculations were performed following the NCDEQ design manual (Section B). In doing so, a composite CN value was determined for each

POD area. These POD areas and composite CN values were entered into the *Autodesk Hydraflow Hydrograph Extension* to allow for each wet pond to be modeled for desired storm events, see Appendix D: Attachment 4-7.

For modeling purposes, the site had two notable points of discharges. In the post-development scenario, POD #2 was split into five (5) smaller points of discharge areas and the cumulative flow is represented in Table 4: *Post-Development Peak Flow* (see below).

The pre-development calculated peak flow from each POD area combined for a respective storm event can be seen below in Table 3: *Pre-Development Peak Flow.*

	Q_1 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
POD 1	11.80	34.24	65.08
POD 2	48.86	138.98	263.30

Table 3: *Pre-Development POD flows*

The post-development calculated peak flow from each POD area combined for a respective storm event can be seen below in Table 4: *Post-Development Peak Flow.*

	Q_1 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
POD 1	9.59	23.36	41.64
POD 2	39.89	137.28	329.46

Table 4: *Post-Development Peak Flow*

As seen in the tables above, the 1-year and 10-year storm event peak flows are lower in the post-development. Due to the 100-year storm hydraulic grade lines being within SCM emergency spillways, post-development peak flows surpass pre-development peak flows during the 100-year storm event.

Quality Control

Nutrient reduction was quantified on site by implementing the *North Carolina Department of Environmental Quality SNAP Tool*, see Appendix D: Attachment 1. Due to the site being within the Neuse River Basin, maintaining a total nitrogen (TN) load rate equal to or lower than 3.60 lb/ac/yr is required. If the TN load rate for the project is between 3.60 lb/ac/yr 6.00 lb/ac/yr buydown is required and an acceptable alternative to providing additional SCM treatment. The *SNAP Tool* calculated the project has a nitrogen export rate of 2.87 lb/ac/yr and no offset payment is required to a private nutrient bank.

V. METHODOLOGY

The stormwater design calculations are conducted using the following methods:

- Precipitation intensity and depths for the site were obtained from https://hdsc.nws.noaa.gov/pfds/pfds_map_cont.html?bkmrk=nc.
- Rational method was used to determined Q-values for inlet areas.
- The composite runoff coefficients (C-Value) were computed using the C-values from NCDEQ Stormwater Design Manual and are included in Appendix C: Attachments 1.
- SCS method was used to determine Q-values for drainage areas (POD's)

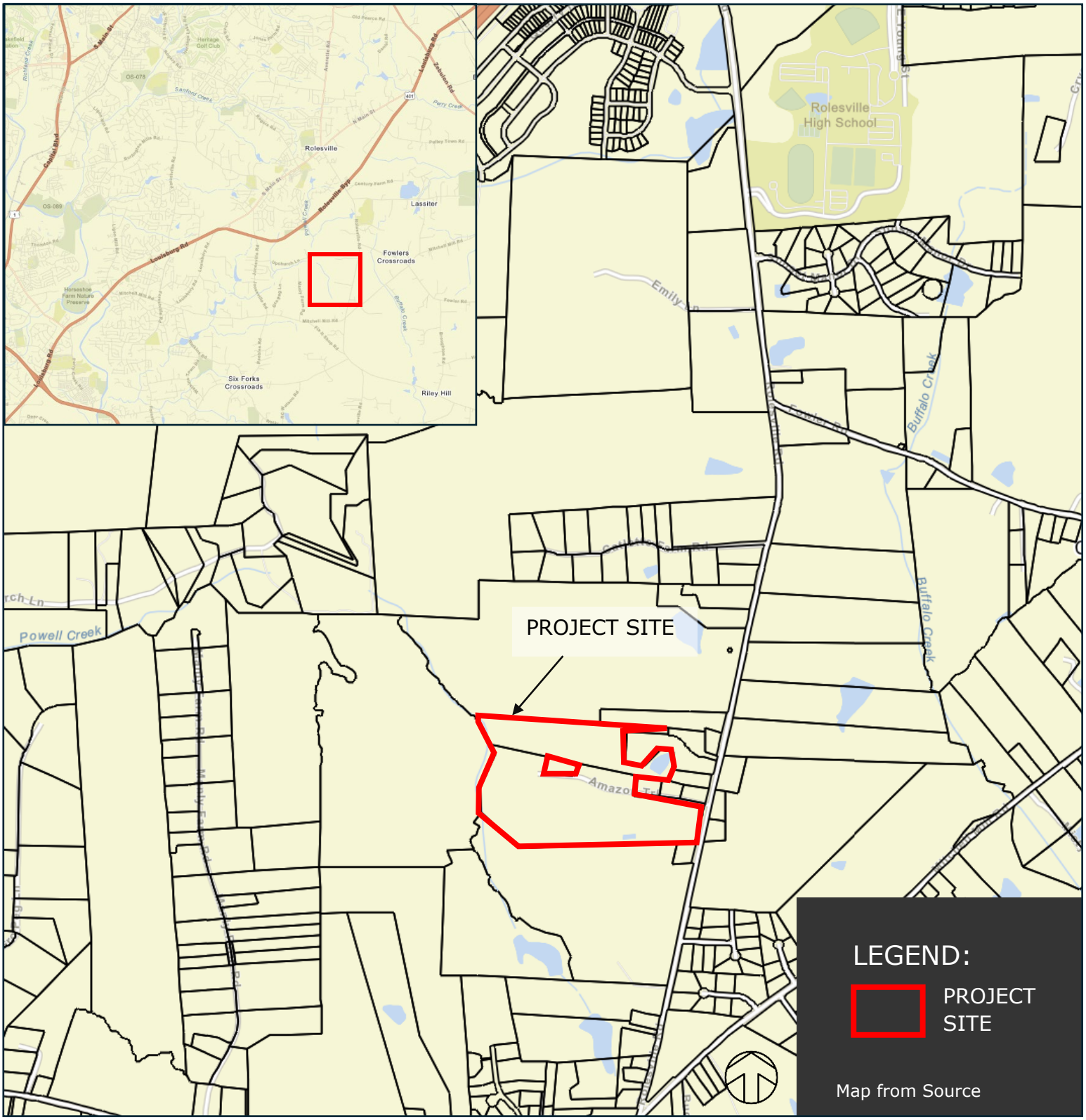
- The curve numbers (CN) were computed using the CN -values from NCDEQ Stormwater Design Manual and are included in Appendix D: Attachment 3.
- Time of concentration (Tc) was calculated using the Kirpich method where applicable. A minimum Tc of 10-minutes was used for stormwater conveyance calculations.
- For culvert modeling, TR-55 method was used to determine time of concentraions (Tc).
- *Autodesk Hydraflow Hydrograph Extension* program was used to model wet ponds and determine peak flows at culverts.
- *Autodesk Hydrograph Storm Sewers Extension* program was used to model storm pipes.
- *Autodesk Hydraflow Express Extension* program was used to model ditches and culverts.
- Riprap sizing for erosion and sediment control was determined using NCDOT standard detail #876.02 "*Guide for Rip Rap at Pipe Outlets*".
- Nutrient reduction was quantified by implementing the *NCDEQ SNAP Tool*.

VI. CONCLUSION

It is our professional opinion that the proposed stormwater design on site meets the requirements of the *NCDEQ Stormwater Manual* and the Wake County Stormwater Rules and Regulations.

APPENDIX A

PROJECT MAPS & DATA

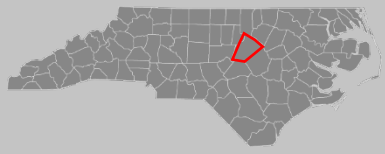


AMERICAN Engineering

VICINITY MAP

THE PRESERVE AT MOODY FARM

WAKE COUNTY



United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Wake County, North Carolina

November 19, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

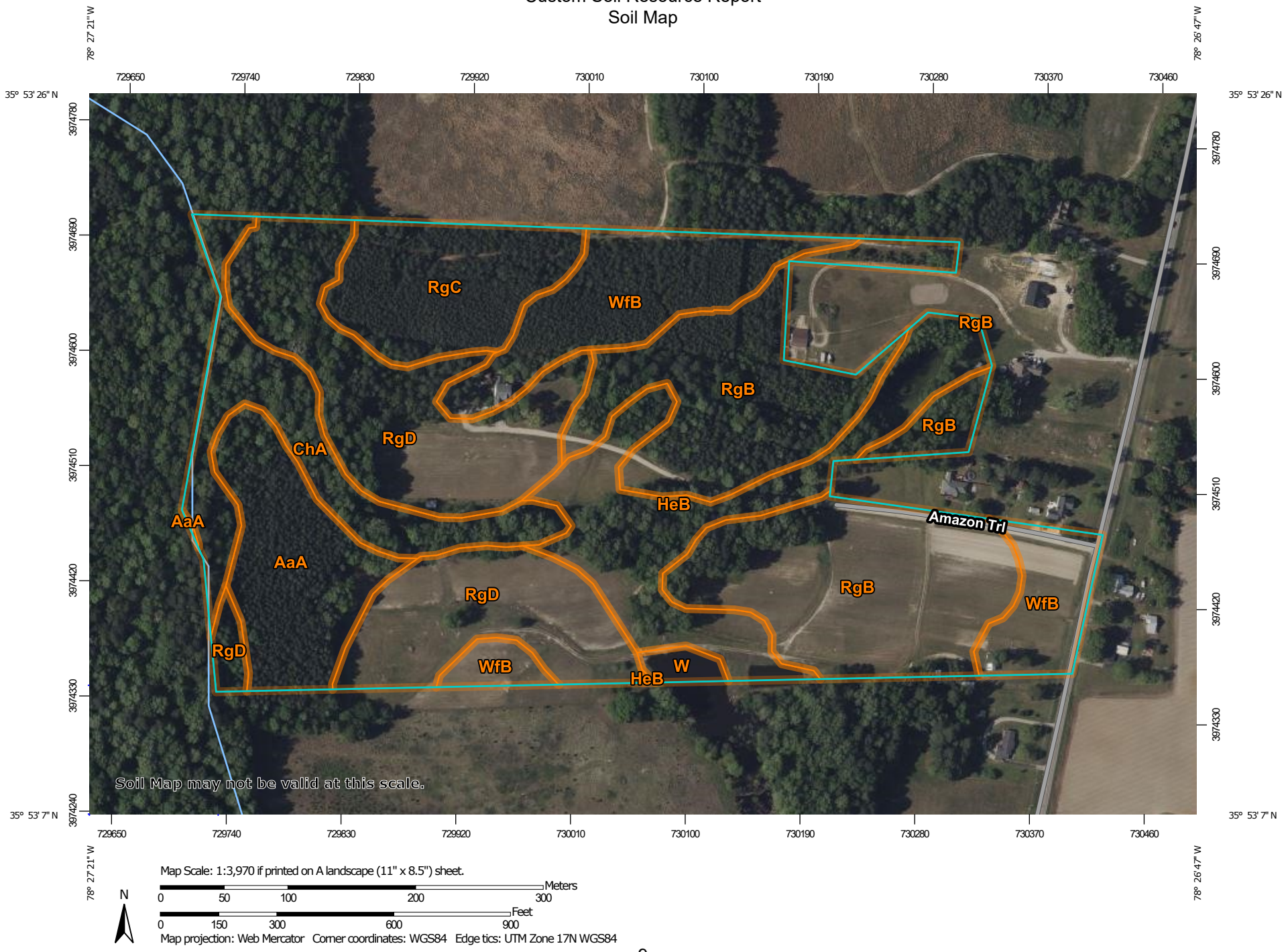
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,970 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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 26, Sep 9, 2024

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AaA	Altavista fine sandy loam, 0 to 4 percent slopes, rarely flooded	4.5	8.5%
ChA	Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded	4.5	8.6%
HeB	Helena sandy loam, 2 to 6 percent slopes	6.3	12.0%
RgB	Rawlings-Rion complex, 2 to 6 percent slopes	14.3	27.2%
RgC	Rawlings-Rion complex, 6 to 10 percent slopes	4.2	7.9%
RgD	Rawlings-Rion complex, 10 to 15 percent slopes	11.8	22.4%
W	Water	0.4	0.7%
WfB	Wedowee-Saw complex, 2 to 6 percent slopes	6.7	12.8%
Totals for Area of Interest		**52.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas

are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Wake County, North Carolina

AaA—Altavista fine sandy loam, 0 to 4 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: 2xh95
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Altavista, rarely flooded, and similar soils: 95 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Altavista, Rarely Flooded

Setting

Landform: Stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old loamy alluvium derived from igneous and metamorphic rock

Typical profile

Ap - 0 to 8 inches: fine sandy loam
E - 8 to 12 inches: fine sandy loam
BE - 12 to 15 inches: sandy clay loam
Bt - 15 to 35 inches: clay loam
BC - 35 to 42 inches: sandy loam
C - 42 to 80 inches: coarse sandy loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F136XY660NC - High terraces, very rare inundation
Hydric soil rating: No

Minor Components

Roanoke, occasionally flooded, undrained

Percent of map unit: 2 percent
Landform: Stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

ChA—Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2qwpj
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Chewacla, frequently flooded, and similar soils: 50 percent
Wehadkee, frequently flooded, and similar soils: 45 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chewacla, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 4 inches: loam
Bw1 - 4 to 26 inches: silty clay loam
Bw2 - 26 to 38 inches: loam
Bw3 - 38 to 60 inches: clay loam
C - 60 to 80 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: F136XY610GA - Flood plain forest, wet
Hydric soil rating: No

Description of Wehadkee, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 7 inches: silt loam
Bg - 7 to 49 inches: clay loam
Cg - 49 to 80 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: F136XY600NC - Flood plain forest, very wet
Hydric soil rating: Yes

HeB—Helena sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2qqgq

Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Helena and similar soils: 92 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Helena

Setting
Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss

Typical profile
Ap - 0 to 12 inches: sandy loam
BE - 12 to 19 inches: sandy clay loam
Bt1 - 19 to 39 inches: clay
Bt2 - 39 to 43 inches: clay loam
BCg - 43 to 46 inches: clay loam
C - 46 to 80 inches: sandy loam

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: F136XY810SC - Acidic upland forest, seasonally wet
Hydric soil rating: No

RgB—Rawlings-Rion complex, 2 to 6 percent slopes

Map Unit Setting
National map unit symbol: 2xhb9
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches

Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rawlings and similar soils: 55 percent
Rion and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rawlings

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: sandy clay loam
C - 20 to 40 inches: gravelly sandy loam
R - 40 to 80 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, depth restriction, dry-moist
Hydric soil rating: No

Description of Rion

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite derived from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt1 - 8 to 17 inches: sandy clay loam
Bt2 - 17 to 38 inches: sandy loam

C - 38 to 80 inches: sandy loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

RgC—Rawlings-Rion complex, 6 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2xhbb
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rawlings and similar soils: 55 percent
Rion and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rawlings

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: sandy clay loam
C - 20 to 40 inches: gravelly sandy loam
R - 40 to 80 inches: bedrock

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, depth restriction, dry-moist
Hydric soil rating: No

Description of Rion

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite derived from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt1 - 8 to 17 inches: sandy clay loam
Bt2 - 17 to 38 inches: sandy loam
C - 38 to 80 inches: sandy loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

RgD—Rawlings-Rion complex, 10 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2xhb8
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rawlings and similar soils: 55 percent
Rion and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rawlings

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: sandy clay loam
C - 20 to 40 inches: gravelly sandy loam
R - 40 to 80 inches: bedrock

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, depth restriction, dry-moist
Hydric soil rating: No

Description of Rion

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite derived from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt1 - 8 to 17 inches: sandy clay loam
Bt2 - 17 to 38 inches: sandy loam
C - 38 to 80 inches: sandy loam

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

W—Water

Map Unit Setting

National map unit symbol: 2qqjv
Elevation: 70 to 450 feet
Mean annual precipitation: 39 to 51 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

WfB—Wedowee-Saw complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2xn42
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Wedowee and similar soils: 60 percent
Saw and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wedowee

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from granite and gneiss and/or saprolite residuum weathered from schist

Typical profile

Ap - 0 to 4 inches: sandy loam
E - 4 to 7 inches: sandy loam
BC - 23 to 35 inches: clay loam
C - 35 to 80 inches: sandy clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

Description of Saw

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: clay
BC - 20 to 26 inches: sandy clay loam
C - 26 to 29 inches: sandy loam
R - 29 to 80 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, depth restriction, dry-moist
Hydric soil rating: No

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(Joins sheet 22)
(Joins sheet 23)
PROJECT
(Joins sheet 41)
(Joins sheet 42)

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

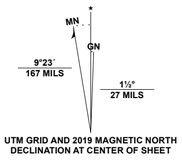
The National Map US Topo

ROLESVILLE QUADRANGLE
NORTH CAROLINA
7.5-MINUTE SERIES

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 17S

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery	NAIP,	July 2020 - July 2020
Roads	U.S. Census Bureau,	2016
Names	GNIS,	1980 - 2022
Hydrography	National Hydrography Dataset,	2001 - 2021
Contours	National Elevation Dataset,	2008
Boundaries	Multiple sources; see metadata file	2019 - 2021
Wetlands	FWS National Wetlands Inventory	Not Available



UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
QV
Grid Zone Designation
17S

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard.

QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 Grissom
2 Franklinton
3 Louisburg
4 Wake Forest
5 Bunn West
6 Raleigh East
7 Knightdale
8 Zebulon

ADJOINING QUADRANGLES

ROAD CLASSIFICATION

Expressway	Local Connector
Secondary Hwy	Local Road
Ramp	4WD
Interstate Route	US Route / State Route

ROLESVILLE, NC
2022

NSN 7643016379170
NGA REF NO. USGSX24K38453

This digital Flood Insurance Rate Map (FIRM) was produced through a unique cooperative partnership between the State of North Carolina and the Federal Emergency Management Agency (FEMA). The State of North Carolina has implemented a long term approach to floodplain management to decrease the costs associated with flooding. This is demonstrated by the State's commitment to map flood hazard areas at the local level. As a part of this effort, the State of North Carolina has joined in a Cooperating Technical State agreement with FEMA to produce and maintain this digital FIRM.

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR ZONE DESCRIPTIONS AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://FRIS.NC.GOV/FRIS

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *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*
OTHER AREAS	Areas Determined to be Outside the 0.2% Annual Chance Floodplain *Zone X*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
	012 18.2 Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
	8 Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
OTHER FEATURES	Hydrographic Feature
	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at https://msc.fema.gov. An accompanying Flood Insurance Study report, Letter of Map Revision (LOMR) or Letter of Map Amendment (LOMA) revising portions of this panel, and digital versions of this FIRM may be available. Visit the North Carolina Floodplain Mapping Program website at https://flood.nc.gov/ncflood, or contact the FEMA Map Service Center.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in the community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Flood Insurance Study (FIS) means an examination, evaluation, and determination of flood hazards, corresponding water surface elevations, flood hazard risk zones, and other flood data in a community issued by the North Carolina Floodplain Mapping Program (NCFMP). The Flood Insurance Study (FIS) is comprised of the following products used together: the Digital Flood Hazard Database, the Water Surface Elevation Rasters, the digitally derived, autogenerated Flood Insurance Rate Map and the Flood Insurance Survey Report. A Flood Insurance Survey is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community. This report contains detailed flood elevation data, data tables and FIRM indices. When a flood study is completed for the NFIP, the digital information, reports and maps are assembled into an FIS. Information shown on this FIRM is provided in digital format by the NCFMP. Base map information shown on this FIRM was provided in digital format by the NCFMP. The source of this information can be determined from the metadata available in the digital FLOOD database and in the Technical Support Data Notebook (TSDN).

ACCREDITED LEVEE NOTES TO USERS: If an accredited levee note appears on this panel check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

PROVISIONALLY ACCREDITED LEVEE NOTES TO USERS: If a Provisionally Accredited Levee (PAL) note appears on this panel, check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

LIMIT OF MODERATE WAVE ACTION NOTES TO USERS: For some coastal flooding zones the AE Zone category has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA (or between the shoreline and the LiMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

Limit of Moderate Wave Action (LiMWA)

SCALE

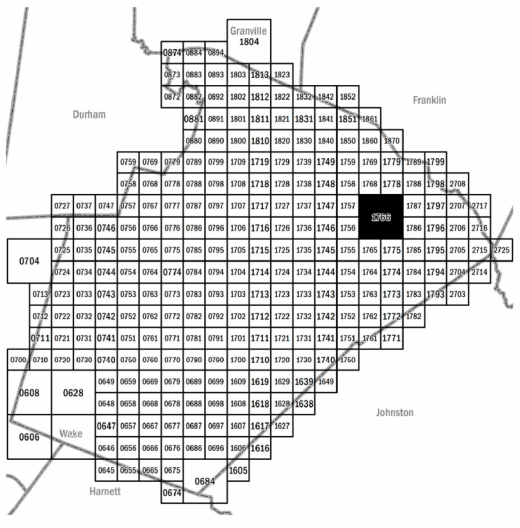
Map Projection:
North Carolina State Plane Projection Feet (Zone 3200)
Datum: NAD 1983 (Horizontal), NAVD 1988 (Vertical)

1 inch = 1,000 feet 1:12,000

0 500 1,000 2,000 Feet

0 150 300 600 Meters

PANEL LOCATOR



FEMA

National Flood Insurance Program

NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 1766

FEMA

Panel Contains:

COMMUNITY	CID	PANEL	SUFFIX
ROLESVILLE, TOWN OF	370468	1766	K
WAKE COUNTY	370368	1766	K

VERSION NUMBER
2.3.3.2

MAP NUMBER
3720176600K

MAP REVISED
July 19, 2022

NOAA Atlas 14, Volume 2, Version 3
Location name: Wake Forest, North Carolina, USA*
Latitude: 35.8876°, Longitude: -78.4479°
Elevation: 396 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_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.85** (4.44-5.30)	**5.63** (5.16-6.14)	**6.41** (5.87-7.00)	**7.20** (6.59-7.86)	**7.99** (7.28-8.72)	**8.64** (7.82-9.41)	**9.20** (8.29-10.0)	**9.71** (8.70-10.6)	**10.3** (9.12-11.2)	**10.8** (9.49-11.8)
10-min	**3.87** (3.55-4.24)	**4.50** (4.12-4.91)	**5.13** (4.70-5.60)	**5.76** (5.27-6.28)	**6.37** (5.80-6.95)	**6.88** (6.23-7.49)	**7.31** (6.59-7.97)	**7.69** (6.89-8.39)	**8.12** (7.22-8.87)	**8.48** (7.48-9.29)
15-min	**3.22** (2.95-3.53)	**3.77** (3.46-4.12)	**4.33** (3.96-4.72)	**4.86** (4.44-5.30)	**5.38** (4.90-5.87)	**5.80** (5.26-6.33)	**6.16** (5.55-6.71)	**6.47** (5.80-7.06)	**6.81** (6.06-7.44)	**7.10** (6.26-7.77)
30-min	**2.21** (2.02-2.42)	**2.60** (2.39-2.85)	**3.07** (2.82-3.35)	**3.52** (3.22-3.84)	**3.99** (3.63-4.35)	**4.37** (3.96-4.76)	**4.72** (4.25-5.14)	**5.04** (4.51-5.50)	**5.42** (4.82-5.92)	**5.75** (5.07-6.29)
60-min	**1.38** (1.26-1.51)	**1.63** (1.50-1.78)	**1.97** (1.80-2.15)	**2.29** (2.10-2.50)	**2.66** (2.42-2.90)	**2.96** (2.68-3.23)	**3.25** (2.93-3.54)	**3.53** (3.16-3.86)	**3.89** (3.46-4.25)	**4.20** (3.70-4.59)
2-hr	**0.805** (0.732-0.889)	**0.958** (0.874-1.05)	**1.17** (1.06-1.28)	**1.38** (1.25-1.51)	**1.62** (1.46-1.77)	**1.83** (1.65-2.00)	**2.04** (1.82-2.23)	**2.25** (2.00-2.46)	**2.53** (2.22-2.77)	**2.78** (2.41-3.04)
3-hr	**0.568** (0.516-0.630)	**0.676** (0.617-0.746)	**0.828** (0.753-0.913)	**0.981** (0.890-1.08)	**1.17** (1.05-1.28)	**1.33** (1.19-1.46)	**1.50** (1.33-1.64)	**1.67** (1.47-1.83)	**1.90** (1.66-2.09)	**2.12** (1.82-2.32)
6-hr	**0.341** (0.311-0.377)	**0.407** (0.372-0.448)	**0.498** (0.454-0.548)	**0.591** (0.538-0.649)	**0.706** (0.638-0.773)	**0.810** (0.727-0.885)	**0.914** (0.814-0.998)	**1.02** (0.903-1.12)	**1.17** (1.02-1.28)	**1.31** (1.13-1.43)
12-hr	**0.200** (0.183-0.220)	**0.238** (0.219-0.261)	**0.293** (0.268-0.322)	**0.350** (0.319-0.383)	**0.420** (0.381-0.459)	**0.486** (0.436-0.529)	**0.552** (0.491-0.600)	**0.623** (0.548-0.677)	**0.721** (0.624-0.784)	**0.813** (0.693-0.884)
24-hr	**0.119** (0.110-0.128)	**0.144** (0.134-0.155)	**0.181** (0.168-0.195)	**0.211** (0.195-0.227)	**0.251** (0.232-0.271)	**0.284** (0.262-0.306)	**0.318** (0.292-0.343)	**0.353** (0.323-0.381)	**0.402** (0.365-0.434)	**0.441** (0.399-0.478)
2-day	**0.069** (0.064-0.074)	**0.083** (0.077-0.089)	**0.103** (0.096-0.111)	**0.120** (0.111-0.129)	**0.142** (0.132-0.153)	**0.160** (0.148-0.173)	**0.179** (0.164-0.193)	**0.198** (0.181-0.214)	**0.225** (0.204-0.243)	**0.246** (0.222-0.266)
3-day	**0.048** (0.045-0.052)	**0.058** (0.054-0.063)	**0.073** (0.068-0.078)	**0.084** (0.078-0.090)	**0.099** (0.092-0.107)	**0.112** (0.103-0.120)	**0.125** (0.115-0.134)	**0.138** (0.126-0.148)	**0.156** (0.142-0.168)	**0.171** (0.154-0.184)
4-day	**0.038** (0.036-0.041)	**0.046** (0.043-0.049)	**0.057** (0.053-0.061)	**0.066** (0.061-0.070)	**0.078** (0.072-0.083)	**0.087** (0.081-0.094)	**0.097** (0.090-0.104)	**0.108** (0.099-0.115)	**0.122** (0.111-0.131)	**0.133** (0.121-0.143)
7-day	**0.025** (0.024-0.027)	**0.030** (0.028-0.032)	**0.037** (0.035-0.040)	**0.042** (0.040-0.045)	**0.050** (0.046-0.053)	**0.056** (0.052-0.060)	**0.062** (0.057-0.066)	**0.068** (0.063-0.073)	**0.077** (0.070-0.083)	**0.084** (0.076-0.090)
10-day	**0.020** (0.019-0.021)	**0.024** (0.022-0.025)	**0.029** (0.027-0.031)	**0.033** (0.031-0.035)	**0.038** (0.036-0.041)	**0.042** (0.039-0.045)	**0.047** (0.043-0.050)	**0.051** (0.047-0.055)	**0.057** (0.052-0.061)	**0.062** (0.056-0.066)
20-day	**0.013** (0.012-0.014)	**0.016** (0.015-0.017)	**0.019** (0.018-0.020)	**0.021** (0.020-0.023)	**0.024** (0.023-0.026)	**0.027** (0.025-0.029)	**0.029** (0.027-0.031)	**0.032** (0.030-0.034)	**0.036** (0.033-0.038)	**0.038** (0.035-0.041)
30-day	**0.011** (0.010-0.012)	**0.013** (0.012-0.014)	**0.015** (0.014-0.016)	**0.017** (0.016-0.018)	**0.019** (0.018-0.020)	**0.021** (0.020-0.022)	**0.023** (0.021-0.024)	**0.024** (0.023-0.026)	**0.027** (0.025-0.029)	**0.029** (0.026-0.031)
45-day	**0.009** (0.009-0.010)	**0.011** (0.010-0.011)	**0.012** (0.012-0.013)	**0.014** (0.013-0.015)	**0.015** (0.015-0.016)	**0.017** (0.016-0.018)	**0.018** (0.017-0.019)	**0.019** (0.018-0.020)	**0.021** (0.019-0.022)	**0.022** (0.021-0.023)
60-day	**0.008** (0.008-0.009)	**0.010** (0.009-0.010)	**0.011** (0.010-0.012)	**0.012** (0.011-0.013)	**0.013** (0.013-0.014)	**0.014** (0.014-0.015)	**0.015** (0.015-0.016)	**0.016** (0.015-0.017)	**0.018** (0.017-0.019)	**0.019** (0.017-0.020)

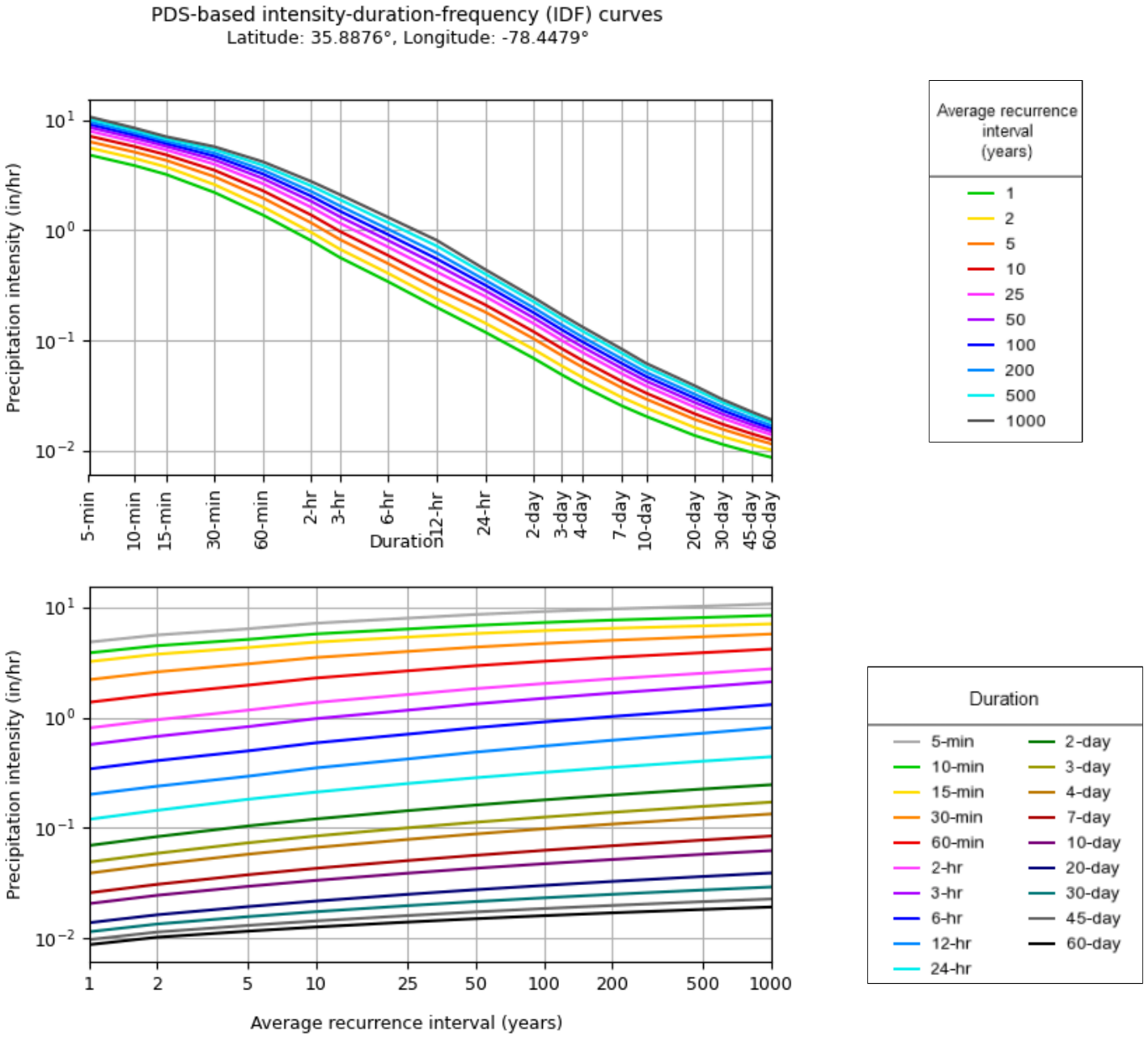
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



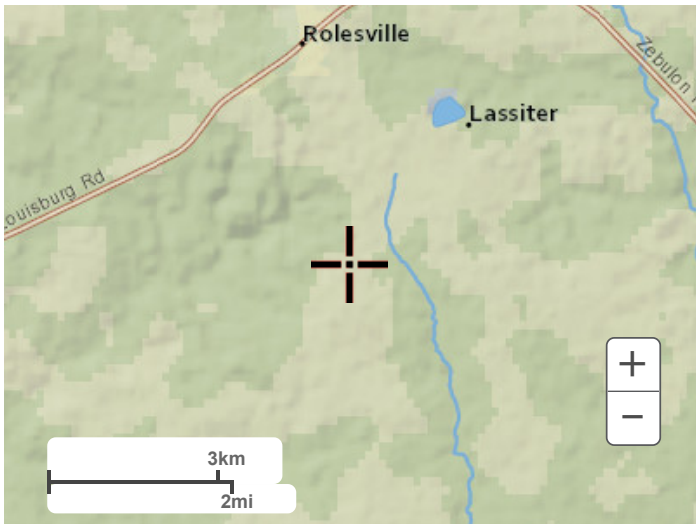
NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Tue Nov 12 22:22:08 2024

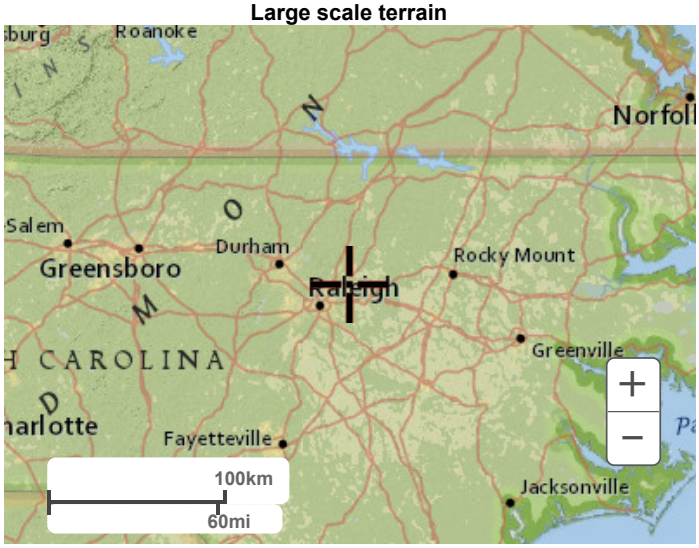
Back to Top

Maps & aerials

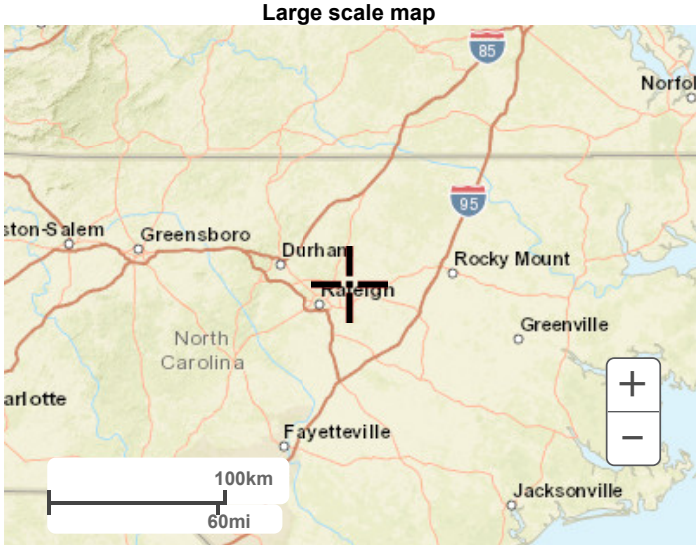
Small scale terrain



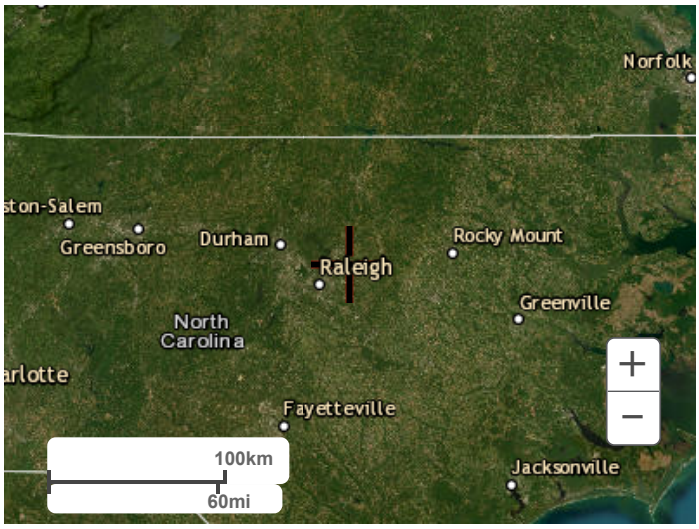
Large scale terrain



Large scale map



Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

NOAA Atlas 14, Volume 2, Version 3
Location name: Wake Forest, North Carolina, USA*
Latitude: 35.8876°, Longitude: -78.449°
Elevation: 385 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_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.404** (0.370-0.442)	**0.469** (0.430-0.512)	**0.534** (0.489-0.583)	**0.600** (0.549-0.655)	**0.666** (0.607-0.726)	**0.719** (0.652-0.784)	**0.766** (0.691-0.835)	**0.808** (0.724-0.882)	**0.854** (0.759-0.933)	**0.896** (0.790-0.981)
10-min	**0.645** (0.591-0.706)	**0.750** (0.688-0.819)	**0.855** (0.784-0.934)	**0.960** (0.878-1.05)	**1.06** (0.967-1.16)	**1.14** (1.04-1.25)	**1.22** (1.10-1.33)	**1.28** (1.15-1.40)	**1.35** (1.20-1.48)	**1.41** (1.24-1.54)
15-min	**0.806** (0.738-0.882)	**0.942** (0.864-1.03)	**1.08** (0.991-1.18)	**1.21** (1.11-1.32)	**1.35** (1.22-1.47)	**1.45** (1.32-1.58)	**1.54** (1.39-1.68)	**1.62** (1.45-1.76)	**1.70** (1.51-1.86)	**1.77** (1.56-1.94)
30-min	**1.10** (1.01-1.21)	**1.30** (1.19-1.42)	**1.54** (1.41-1.68)	**1.76** (1.61-1.92)	**1.99** (1.82-2.17)	**2.18** (1.98-2.38)	**2.36** (2.12-2.57)	**2.52** (2.25-2.74)	**2.71** (2.40-2.96)	**2.87** (2.53-3.14)
60-min	**1.38** (1.26-1.51)	**1.63** (1.50-1.78)	**1.97** (1.81-2.15)	**2.29** (2.10-2.50)	**2.65** (2.42-2.89)	**2.96** (2.68-3.23)	**3.25** (2.93-3.54)	**3.53** (3.16-3.85)	**3.88** (3.45-4.24)	**4.19** (3.69-4.58)
2-hr	**1.61** (1.46-1.78)	**1.92** (1.75-2.10)	**2.34** (2.13-2.57)	**2.75** (2.49-3.02)	**3.24** (2.92-3.54)	**3.66** (3.29-4.01)	**4.07** (3.63-4.46)	**4.50** (3.98-4.92)	**5.05** (4.43-5.52)	**5.53** (4.81-6.07)
3-hr	**1.71** (1.55-1.89)	**2.03** (1.86-2.24)	**2.49** (2.26-2.74)	**2.95** (2.67-3.24)	**3.50** (3.16-3.84)	**4.00** (3.58-4.39)	**4.49** (3.99-4.93)	**5.01** (4.42-5.49)	**5.70** (4.97-6.25)	**6.33** (5.46-6.96)
6-hr	**2.05** (1.87-2.26)	**2.44** (2.23-2.68)	**2.99** (2.72-3.28)	**3.54** (3.22-3.89)	**4.23** (3.82-4.63)	**4.85** (4.35-5.30)	**5.47** (4.87-5.97)	**6.12** (5.40-6.68)	**7.02** (6.10-7.65)	**7.84** (6.73-8.56)
12-hr	**2.41** (2.21-2.66)	**2.88** (2.64-3.15)	**3.54** (3.24-3.88)	**4.22** (3.84-4.62)	**5.07** (4.59-5.54)	**5.85** (5.26-6.37)	**6.64** (5.91-7.22)	**7.50** (6.60-8.14)	**8.68** (7.51-9.42)	**9.77** (8.33-10.6)
24-hr	**2.86** (2.66-3.09)	**3.46** (3.22-3.73)	**4.36** (4.05-4.70)	**5.07** (4.70-5.46)	**6.04** (5.58-6.51)	**6.82** (6.28-7.35)	**7.63** (7.00-8.22)	**8.47** (7.74-9.13)	**9.63** (8.75-10.4)	**10.6** (9.55-11.4)
2-day	**3.32** (3.08-3.57)	**3.99** (3.72-4.30)	**4.99** (4.64-5.38)	**5.78** (5.36-6.22)	**6.85** (6.33-7.38)	**7.71** (7.10-8.30)	**8.59** (7.89-9.26)	**9.50** (8.70-10.3)	**10.8** (9.79-11.6)	**11.8** (10.6-12.8)
3-day	**3.52** (3.28-3.77)	**4.23** (3.94-4.54)	**5.26** (4.90-5.64)	**6.07** (5.64-6.51)	**7.18** (6.65-7.70)	**8.07** (7.46-8.66)	**8.98** (8.27-9.65)	**9.93** (9.10-10.7)	**11.2** (10.2-12.1)	**12.3** (11.1-13.3)
4-day	**3.72** (3.48-3.98)	**4.46** (4.17-4.77)	**5.52** (5.15-5.90)	**6.36** (5.92-6.80)	**7.51** (6.97-8.03)	**8.44** (7.81-9.02)	**9.38** (8.65-10.0)	**10.4** (9.51-11.1)	**11.7** (10.7-12.6)	**12.8** (11.6-13.8)
7-day	**4.32** (4.04-4.61)	**5.15** (4.82-5.50)	**6.30** (5.89-6.72)	**7.20** (6.73-7.69)	**8.45** (7.87-9.02)	**9.44** (8.77-10.1)	**10.5** (9.68-11.2)	**11.5** (10.6-12.3)	**13.0** (11.9-13.9)	**14.1** (12.9-15.2)
10-day	**4.92** (4.61-5.24)	**5.85** (5.49-6.24)	**7.05** (6.61-7.51)	**8.00** (7.48-8.52)	**9.28** (8.65-9.88)	**10.3** (9.57-11.0)	**11.3** (10.5-12.1)	**12.3** (11.4-13.2)	**13.8** (12.7-14.7)	**14.9** (13.7-16.0)
20-day	**6.59** (6.20-7.02)	**7.79** (7.33-8.30)	**9.24** (8.68-9.83)	**10.4** (9.74-11.0)	**11.9** (11.2-12.7)	**13.1** (12.3-14.0)	**14.4** (13.4-15.3)	**15.6** (14.5-16.7)	**17.3** (16.0-18.5)	**18.6** (17.1-20.0)
30-day	**8.19** (7.72-8.70)	**9.64** (9.09-10.2)	**11.2** (10.6-11.9)	**12.5** (11.7-13.3)	**14.1** (13.2-15.0)	**15.4** (14.4-16.4)	**16.6** (15.5-17.7)	**17.9** (16.7-19.1)	**19.6** (18.2-20.9)	**20.9** (19.3-22.3)
45-day	**10.4** (9.89-11.0)	**12.2** (11.6-12.9)	**14.0** (13.3-14.8)	**15.4** (14.6-16.3)	**17.2** (16.3-18.2)	**18.6** (17.6-19.6)	**20.0** (18.8-21.1)	**21.3** (20.0-22.5)	**23.0** (21.6-24.4)	**24.4** (22.7-25.9)
60-day	**12.5** (11.9-13.2)	**14.6** (13.9-15.4)	**16.6** (15.7-17.4)	**18.1** (17.2-19.0)	**20.0** (19.0-21.1)	**21.5** (20.3-22.7)	**22.9** (21.6-24.2)	**24.3** (22.9-25.7)	**26.1** (24.5-27.6)	**27.5** (25.7-29.1)

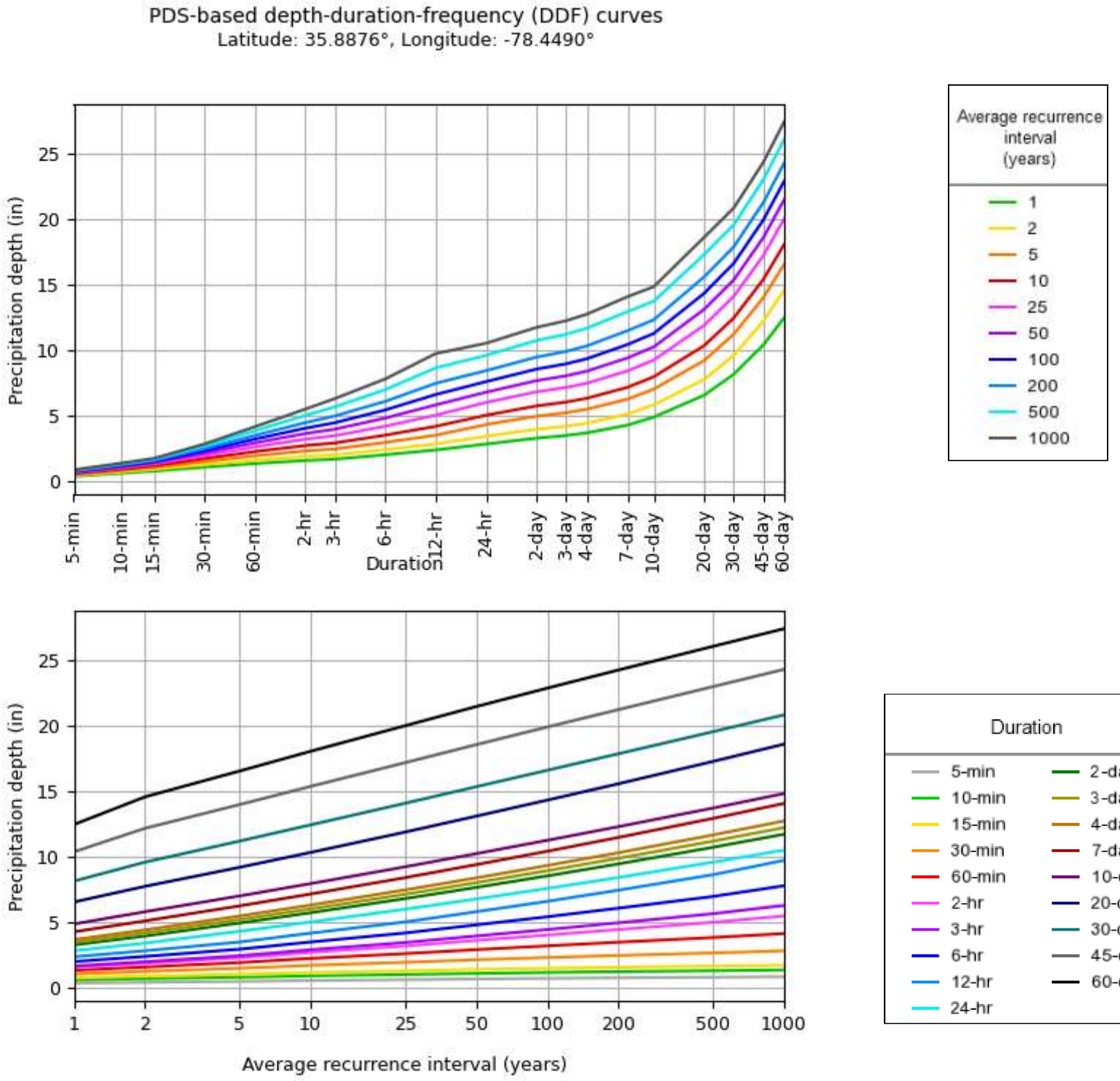
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



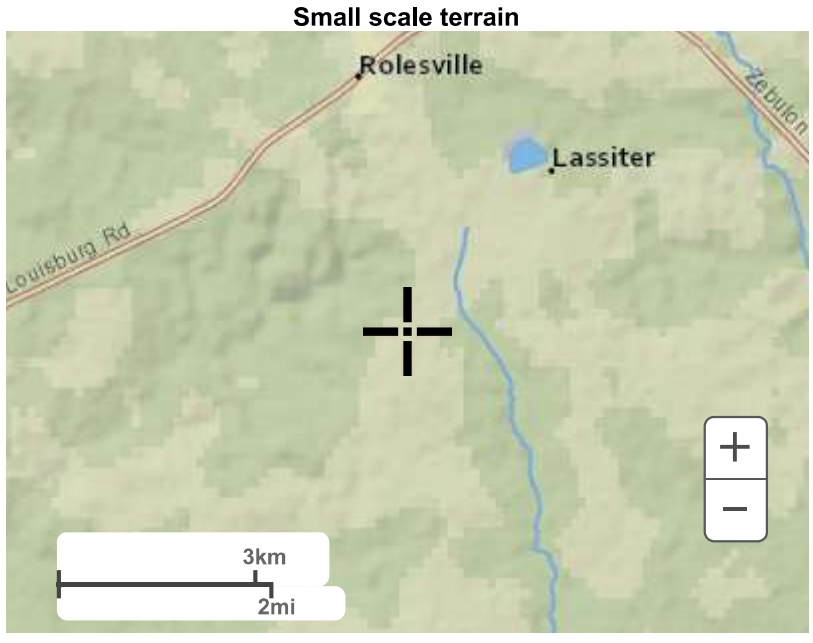
NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Wed Jan 15 19:30:08 2025

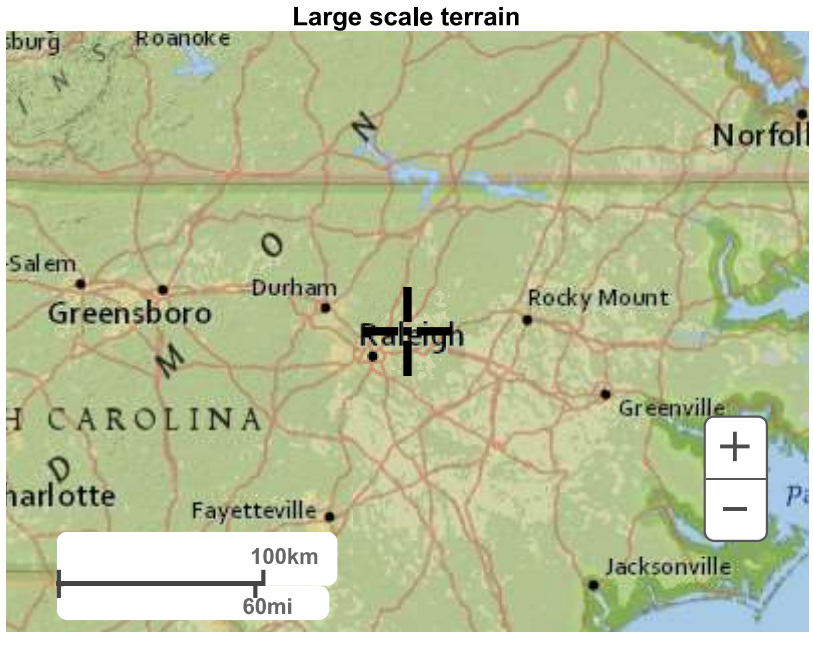
Back to Top

Maps & aerials

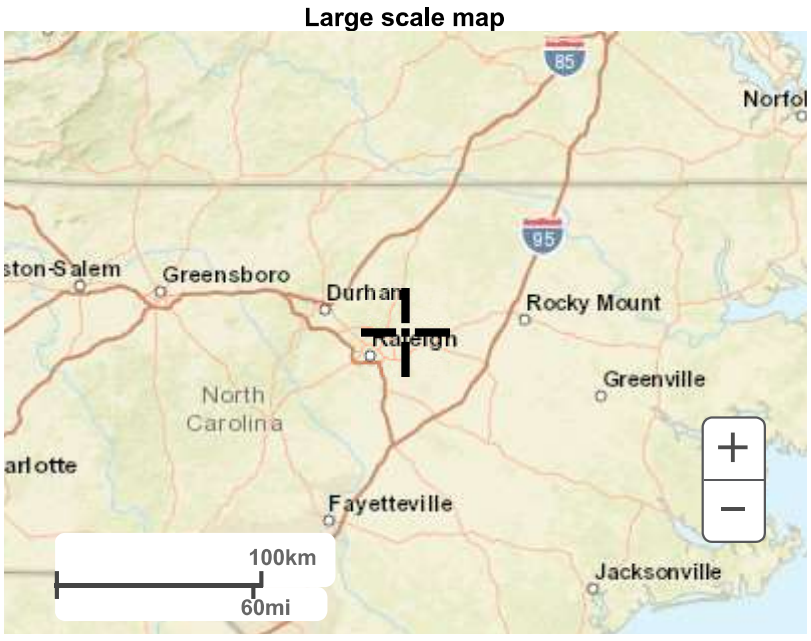
Small scale terrain



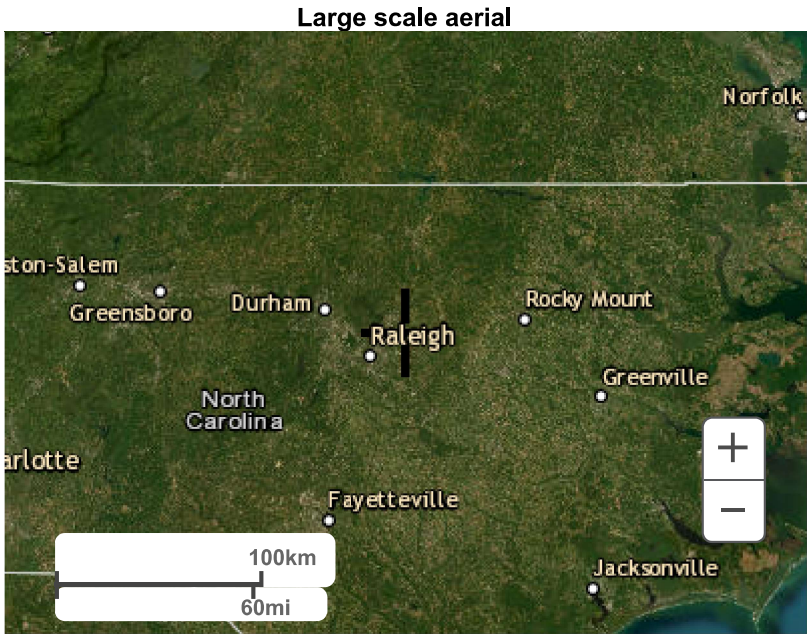
Large scale terrain



Large scale map



Large scale aerial

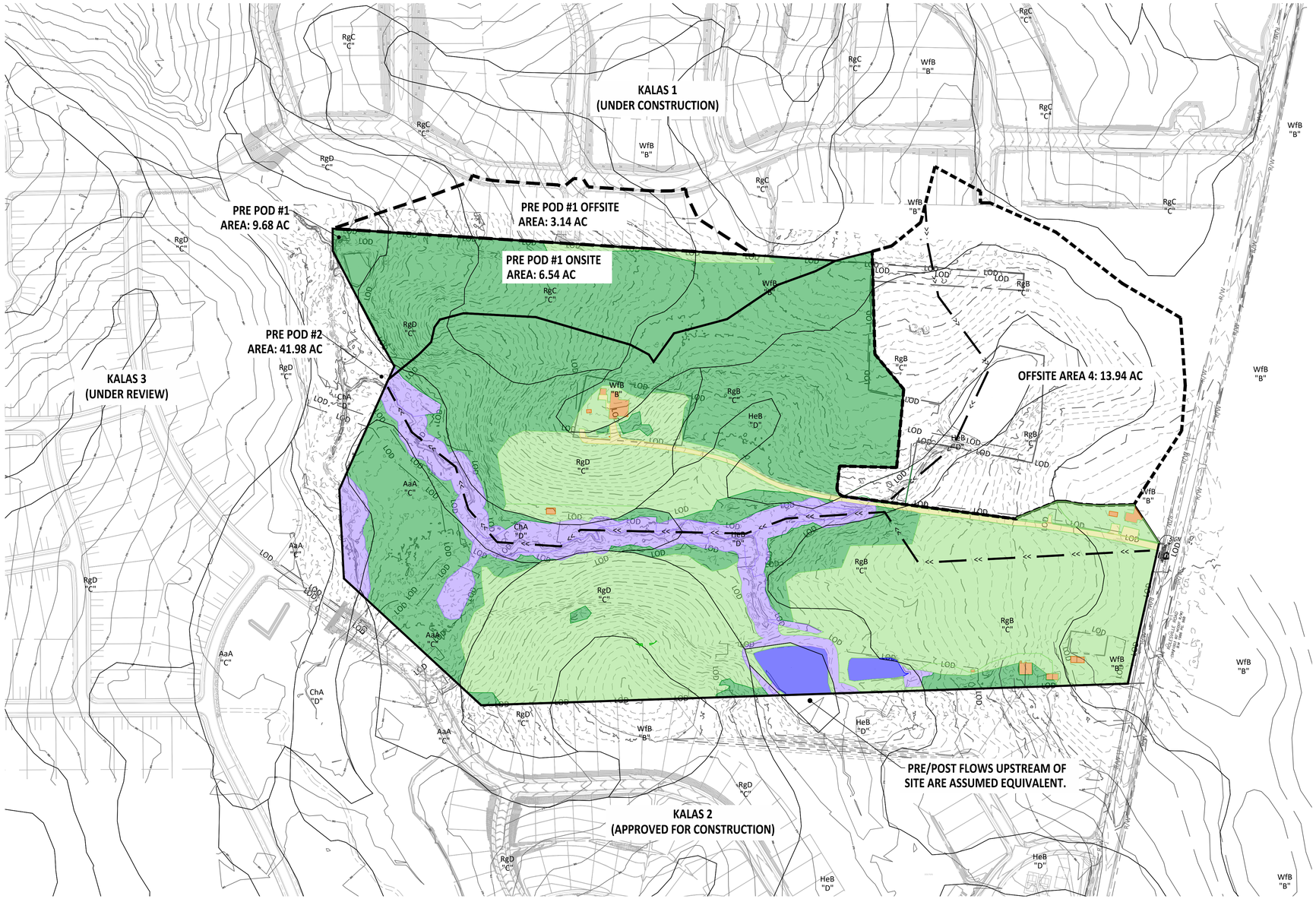


Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

APPENDIX B

DRAINAGE AREA MAPS



LEGEND	
WOODS	
OPEN SPACE	
DIRT ROAD (COMPACTED)	
ROOF	
SCM/OPEN WATER	
WETLAND	
OFFSITE AREA	
POD AREA	
SOIL LINE	
TIME OF CONCENTRATION	

NOTE:

1. OFFSITE DRAINAGE AREAS ARE TO HAVE A Cn VALUE OF 74 APPLIED FOR MODELING PURPOSES.
2. THIS EXHIBIT IS TO BE USED ALONGSIDE HYDRAFLOW HYDROGRAPH MODELING FOR PEAK FLOW ATTENUATION.
4. OFFSITE DRAINAGE THAT IS UPSTREAM OF THE PROJECT AREA (SOUTH OF PROJECT) IS NOT INCLUDED IN POD 2 MODELING. THIS IS DUE TO NO CHANGE IN DRAINAGE PATTERNS FROM PRE TO POST DEVELOPMENT, ASSUMING ANY FLOWS FROM THIS AREA WOULD OFFSET.
5. IN WAKE COUNTY STORMWATER TOOL, THE SUMMATION OF DRAINAGE AREAS #2 & #3 ARE POD #2 IN THIS EXHIBIT.

GRAPHIC SCALE
100 0 50 100 200 400
(IN FEET)
1 inch =100

PRE-DEVELOPMENT POINT OF DISCHARGE AREAS

AMERICAN Engineering

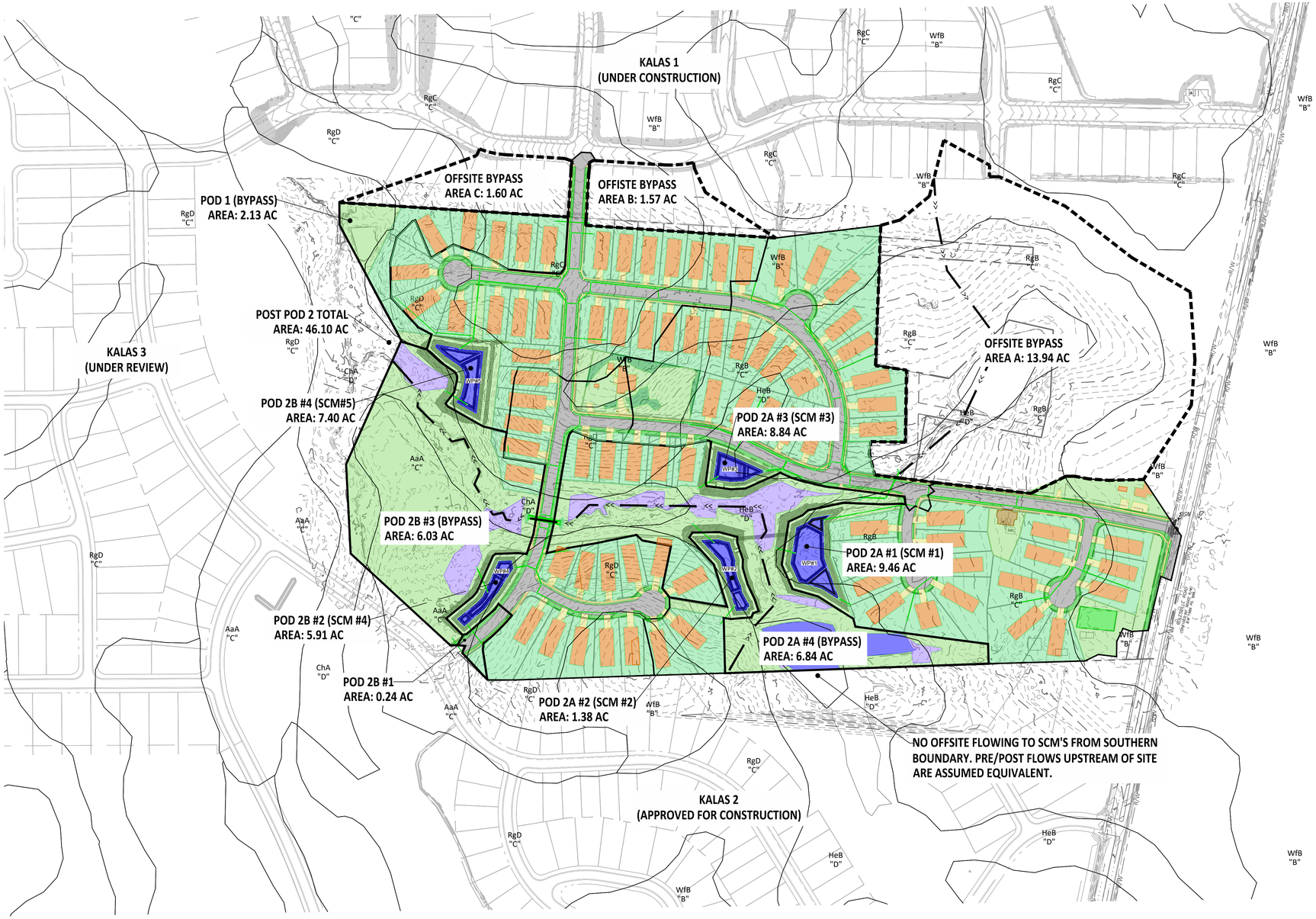
RALEIGH NC | CHARLOTTE NC | CHESAPEAKE VA

PROJECT # 220020

THE PRESERVE AT MOODY FARM

ROLESVILLE, NC | WAKE COUNTY

March 31, 2025



LEGEND	
WOODS	
OPEN SPACE	
SIDEWALK	
ROADWAY	
GRASS IN R/W	
ROOF	
SCM/OPEN WATER	
WETLAND	
OFFSITE AREA	
POD AREA	
SOIL LINE	
TIME OF CONCENTRATION	>>

NOTE:

1. OFFSITE DRAINAGE AREAS ARE TO HAVE A Cn VALUE OF 74 APPLIED FOR MODELING PURPOSES.
2. THIS EXHIBIT IS TO BE USED ALONGSIDE HYDRAFLOW HYDROGRAPH MODELING FOR PEAK FLOW ATTENUATION.
3. NO OFFSITE DRAINAGE BYPASS DELINEATED IS PROPOSED TO BE CONVEYED TO PROJECT SCM'S (DASH LINE).
4. OFFSITE DRAINAGE THAT IS UPSTREAM OF THE PROJECT AREA (SOUTH OF PROJECT) IS NOT INCLUDED IN POD 2 MODELING. THIS IS DUE TO NO CHANGE IN DRAINAGE PATTERNS FROM PRE TO POST DEVELOPMENT, ASSUMING ANY FLOWS FROM THIS AREA WOULD OFFSET.
5. IN THE WAKE COUNTY STORMWATER TOOL, THE SUMMATION OF DRAINAGE AREAS #2 & #3 ARE POD #2 IN THIS EXHIBIT.

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch =100

POST-DEVELOPMENT POINT OF DISCHARGE AREAS

AMERICAN Engineering
RALEIGH NC | CHARLOTTE NC | CHESAPEAKE VA

PROJECT # 210002

THE PRESERVE AT MOODY FARM

ROLESVILLE, NC | WAKE COUNTY

March 31, 2025

#18- Drainage area does not match contours (CB321/319)

#19- Please show all proposed contours

#18- Drainage area does not match contours (CB402/CB406)

NOTE: THIS EXHIBIT IS TO BE USED IN TANDEM WITH HYDRAFLOW STORM SEWERS MODELING FOR CONVEYANCE CALCULATIONS.

GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)

1 inch = 80 ft

POST-DEVELOPMENT INLET AREAS

AMERICAN Engineering

RALEIGH NC | CHARLOTTE NC | CHESAPEAKE VA

PROJECT # 220020

THE PRESERVE AT MOODY FARM

ROLESVILLE, NC | WAKE COUNTY

March 31, 2025

PDD #7 DA:
+/- 124,452 SF
OR 2.86 AC

PDD #6 + PDD #7

PDD #6 DA:
+/- 68,721 SF
OR 1.58 AC

PDD #6

PDD #3D

PDD #5B DA:
+/- 31,827 SF
OR 0.73 AC

PDD #5A DA:
+/- 61,979 SF
OR 1.42 AC

PDD #5A

PDD #3D DA:
+/- 31,185 SF
OR 0.72 AC

PDD #3C DA:
+/- 25,707 SF
OR 0.59 AC

PDD #5C DA:
+/- 32,438 SF
OR 0.75 AC

PDD #5C

PDD #5B

PDD #3C

PDD #3A DA:
+/- 104,099 SF
OR 2.39 AC

PDD #3A

SCM#5

PDD #5D DA:
+/- 61,979 SF
OR 1.42 AC

PDD #5D

PDD #3B DA:
+/- 25,158 SF
OR 0.58 AC

PDD #3B

SCM#3

PDD #4B

PDD #4B DA:
+/- 44,959 SF
OR 1.03 AC

SCM#2

SCM#1

SCM#4

PDD #1B

PDD #1B DA:
+/- 37,332 SF
OR 0.86 AC

PDD #1A DA:
+/- 169,981 SF
OR 3.90 AC

PDD #4A DA:
+/- 57,892 SF
OR 1.33 AC

PDD #2 DA:
+/- 33,240 SF
OR 0.76 AC

PDD #2

PDD #1A + PDD #1B

PDD #4A

#20- Existing contours indicate that additional area is draining towards PDD 4A. Please verify intent of grading and adjust PDD 4A drainage area as needed.

NOTE: THIS EXHIBIT IS TO BE USED IN TANDEM WITH HYDRAFLOW EXPRESS MODELING FOR DITCH VELOCITIES AND CAPACITY.

LEGEND & ABBREVIATIONS	
DITCH DRAINAGE AREA	
PERMANENT DIVERSION DITCH	PDD
STORMWATER CONTROL MEASURE	SCM

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)

1 inch = 100 ft

PERMANENT DIVERSION DITCH DRAINAGE AREAS

AMERICAN Engineering

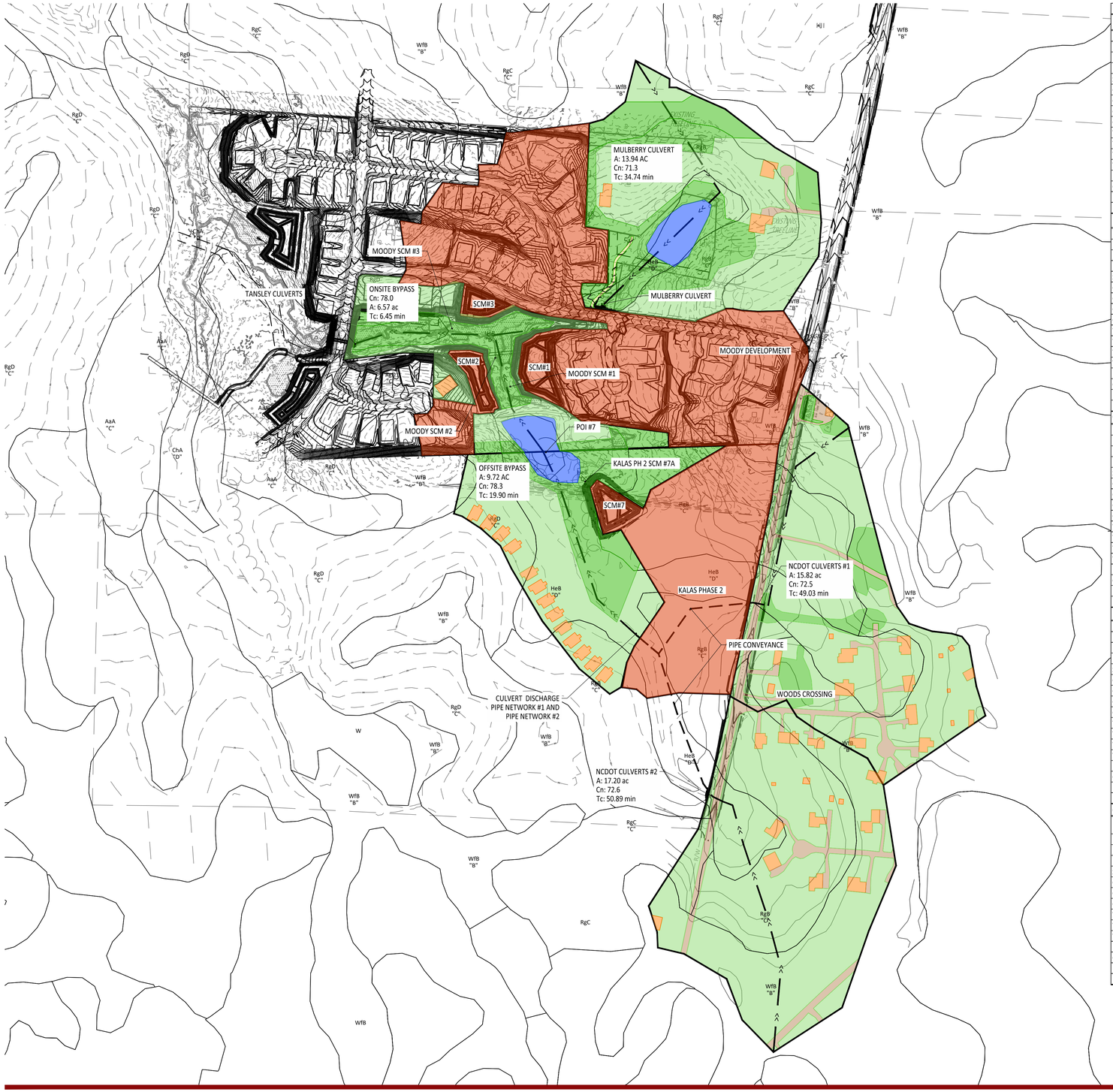
RALEIGH NC | CHARLOTTE NC | CHESAPEAKE VA

PROJECT # 220020

THE PRESERVE AT MOODY FARM

ROLESVILLE, NC

March 31, 2025



CULVERT DRAINAGE AREA SUPPORTING CALCULATIONS

NCDOT CULVERTS #1 AREA	**689195**	**S.F.**	**15.82**	**Ac**
Land Use	**Area, Ac.**	**"CN"**	**Wtd'd "CN"**	
Roadways + C&G (not Sidewalks)	1.94	98	12.02	
Roofs	0.62	98	3.82	
Driveways/Parking	0.00	98	0.00	
Sidewalks	0.00	98	0.00	
Openspace- A Soils Good Condition	0.00	39	0.00	
Openspace- B Soils Good Condition	5.99	61	23.11	
Openspace- C Soils Good Condition	3.07	74	14.35	
Openspace- D Soils Good Condition	2.40	80	12.11	
Woods-A Soils Good Condition	0.00	30	0.00	
Woods-B Soils Good Condition	1.24	55	4.30	
Woods-C Soils Good Condition	0.00	70	0.00	
Woods-D Soils Good Condition	0.57	77	2.78	
Lands Taken Up by BMP	0.00	98	0.00	
Open Water (Exist'g or Proposed Ponds)	0.00	98	0.00	
Total (Check):	**15.82**	Composite "CN"	**72.5**	
	Percent Impervious		16.2%	

NCDOT CULVERTS #2 AREA	**749114**	**S.F.**	**17.20**	**Ac**
Land Use	**Area, Ac.**	**"CN"**	**Wtd'd "CN"**	
Roadways + C&G (not Sidewalks)	1.61	98	9.20	
Roofs	0.67	98	3.80	
Driveways/Parking	0.00	98	0.00	
Sidewalks	0.00	98	0.00	
Openspace- A Soils Good Condition	0.00	39	0.00	
Openspace- B Soils Good Condition	6.74	61	23.89	
Openspace- C Soils Good Condition	6.75	74	29.03	
Openspace- D Soils Good Condition	1.43	80	6.67	
Woods-A Soils Good Condition	0.00	30	0.00	
Woods-B Soils Good Condition	0.00	55	0.00	
Woods-C Soils Good Condition	0.00	70	0.00	
Woods-D Soils Good Condition	0.00	77	0.00	
Lands Taken Up by BMP	0.00	98	0.00	
Open Water (Exist'g or Proposed Ponds)	0.00	98	0.00	
Total (Check):	**17.20**	Composite "CN"	**72.6**	
	Percent Impervious		13.3%	

OFFSITE BYPASS AREA	**423210**	**S.F.**	**9.72**	**Ac**
Land Use	**Area, Ac.**	**"CN"**	**Wtd'd "CN"**	
Roadways + C&G (not Sidewalks)	0.00	98	0.00	
Roofs	0.67	98	6.73	
Driveways/Parking	0.00	98	0.00	
Sidewalks	0.00	98	0.00	
Openspace- A Soils Good Condition	0.00	39	0.00	
Openspace- B Soils Good Condition	0.17	61	1.08	
Openspace- C Soils Good Condition	2.21	74	16.81	
Openspace- D Soils Good Condition	2.63	80	21.64	
Woods-A Soils Good Condition	0.00	30	0.00	
Woods-B Soils Good Condition	0.00	55	0.00	
Woods-C Soils Good Condition	1.20	70	8.68	
Woods-D Soils Good Condition	2.41	77	19.11	
Lands Taken Up by BMP	0.00	98	0.00	
Open Water (Exist'g or Proposed Ponds)	0.43	98	4.29	
Total (Check):	**9.72**	Composite "CN"	**78.3**	
	Percent Impervious		11.2%	

MULBERRY CULVERT AREA	**607226**	**S.F.**	**13.94**	**Ac**
Land Use	**Area, Ac.**	**"CN"**	**Wtd'd "CN"**	
Roadways + C&G (not Sidewalks)	0.19	98	1.31	
Roofs	0.28	98	1.94	
Driveways/Parking	0.00	98	0.00	
Sidewalks	0.07	98	0.52	
Openspace- A Soils Good Condition	0.00	39	0.00	
Openspace- B Soils Good Condition	2.39	61	10.46	
Openspace- C Soils Good Condition	4.55	74	24.13	
Openspace- D Soils Good Condition	0.07	80	0.43	
Woods-A Soils Good Condition	0.00	30	0.00	
Woods-B Soils Good Condition	1.62	55	6.39	
Woods-C Soils Good Condition	2.94	70	14.76	
Woods-D Soils Good Condition	1.04	77	5.77	
Lands Taken Up by BMP	0.00	98	0.00	
Open Water (Exist'g or Proposed Ponds)	0.79	98	5.54	
Total (Check):	**13.94**	Composite "CN"	**71.3**	
	Percent Impervious		9.5%	

ONSITE BYPASS AREA	**286108**	**S.F.**	**6.57**	**Ac**
Land Use	**Area, Ac.**	**"CN"**	**Wtd'd "CN"**	
Roadways + C&G (not Sidewalks)	0.00	98	0.00	
Roofs	0.00	98	0.00	
Driveways/Parking	0.00	98	0.00	
Sidewalks	0.00	98	0.00	
Openspace- B Soils Good Condition	0.00	61	0.00	
Openspace- C Soils Good Condition	1.51	74	16.97	
Openspace- D Soils Good Condition	1.66	80	20.25	
Woods-B Soils Good Condition	0.00	55	0.00	
Woods-C Soils Good Condition	0.68	70	7.23	
Woods-D Soils Good Condition	2.22	77	25.97	
Lands Taken Up by BMP	0.00	98	0.00	
Open Water (Exist'g or Proposed Ponds)	0.51	98	7.56	
Total (Check):	**6.57**	Composite "CN"	**78.0**	
	Percent Impervious		7.7%	

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)

1 inch = 200 ft

LEGEND	
WOODS B/C/D	
OPEN SPACE B/C/D	
SIDEWALK	
ROADWAY	
SCM AREA	
ROOF	
SCM/OPEN WATER	
DRAINAGE AREA	
SOIL LINE	

NOTE:

1. EACH RESPECTIVE SCM FLOW (Q) HAS BEEN DETERMINED BY UTILIZING AUTODESK HYDROGRAPH SOFTWARE AND WILL BE ADDED TO THE TOTAL FLOW FOR ANALYZING THE CULVERT OF INTEREST.
2. FOR RECORD KEEPING PURPOSES, THE CALCULATED DRAINAGE AREA TO RESPECTIVE SCM IS HATCHED IN RED (AREA USED IN HYDROGRAPH TO DETERMINE Q).
3. PLEASE REFER TO PROJECT STORMWATER IMPACT ANALYSIS REPORT FOR COMPLETE CALCULATIONS.

CULVERT DRAINAGE AREA EXHIBIT (SUPPORTS HYDROGRAPH MODELING & ALLOWS FOR CULVERT SIZING)

AMERICAN Engineering

RALEIGH NC | CHARLOTTE NC | CHESAPEAKE VA

PROJECT # 220020

THE PRESERVE AT MOODY FARM

ROLESVILLE, NC

March 31, 2025

APPENDIX C

STORMWATER CONVEYANCE CALCULATIONS

AMERICAN Engineering

4020 Westchase Boulevard Suite 450 Raleigh, NC 27607
OFFICE: 919.469.1101 | **AMERICAN-EA.COM**

Project Name:	**Moody**
Project Number:	**R210002**
Date:	**3/31/2025**
Calculated By:	**RC**
Checked By:	**JK**

Input data in blue boxes

Rational C-Value Calculations for Inlet Areas

Area ID	Drainage Area (ac)	SCM (ac)	Roof (ac)	Roadway (ac)	Driveway (ac)	Sidewalk (ac)	Open Space (ac)	Impervious C	Open Space C	Composite C Value
Catchments	32.29	1.86	7.45	3.90	1.89	0.88	16.31	0.95	0.2	**0.57**

Note C Value of 0.60 used for safety factor

AMERICAN Engineering

4020 Westchase Boulevard Suite 450 Raleigh, NC 27607
OFFICE: 919.469.1101 | **AMERICAN-EA.COM**

Project Name:	**Moody**
Project Number:	**R210002**
Date:	**3/31/2025**
Calculated By:	**RC**
Checked By:	**JK**

Rip Rap Dissipater Calculations 10-Year Storm

Outlet ID	Pipe Diameter (in)	Pipe Velocity (fps)	Stone Class	Stone Depth (in)	Stone Material (tons)	Geo-Textile (SY)	Start Width (ft)	End Width (ft)	Length (ft)
FES 100	18	2.20	B	12	2	7	3	9	6
FES 125	24	4.48	B	12	3	11	4	12	8
FES OS 100	24	0.18	B	12	3	11	4	12	8
FES 110	18	4.48	B	12	2	7	3.0	9	6
FES 120	15	2.61	B	12	2	7	2.5	7.5	5
EW 101	36	4.21	I	18	13	30	6	18	12
FES OS 200	18	0.10	B	12	2	7	3	9	6
FES 203	18	2.05	B	12	2	7	3	9	6
FES 300	36	4.67	I	18	10	23	6	18	12
FES OS 300	24	5.98	I	18	4	12	4	12	8
FES 400	24	2.89	B	12	3	11	4	12	8
FES OS 400	24	3.57	B	12	3	11	4	12	8
FES 410	18	3.53	B	12	2	7	3	9	6
FES 420	15	2.45	B	12	2	7	2.5	7.5	5
FES 500	30	4.92	B	12	5	16	5	15	10
FES OS 500	24	0.32	B	12	3	11	4	12	8
FES 602	18	5.01	B	12	3	10	3	9	6
EW 610	54 (DBL)	5.17	I	18	40	75	16	16	40

Calculations were determined from NCDOT Detail 876.02 *Guide for Rip Rap at Pipe Outlets*

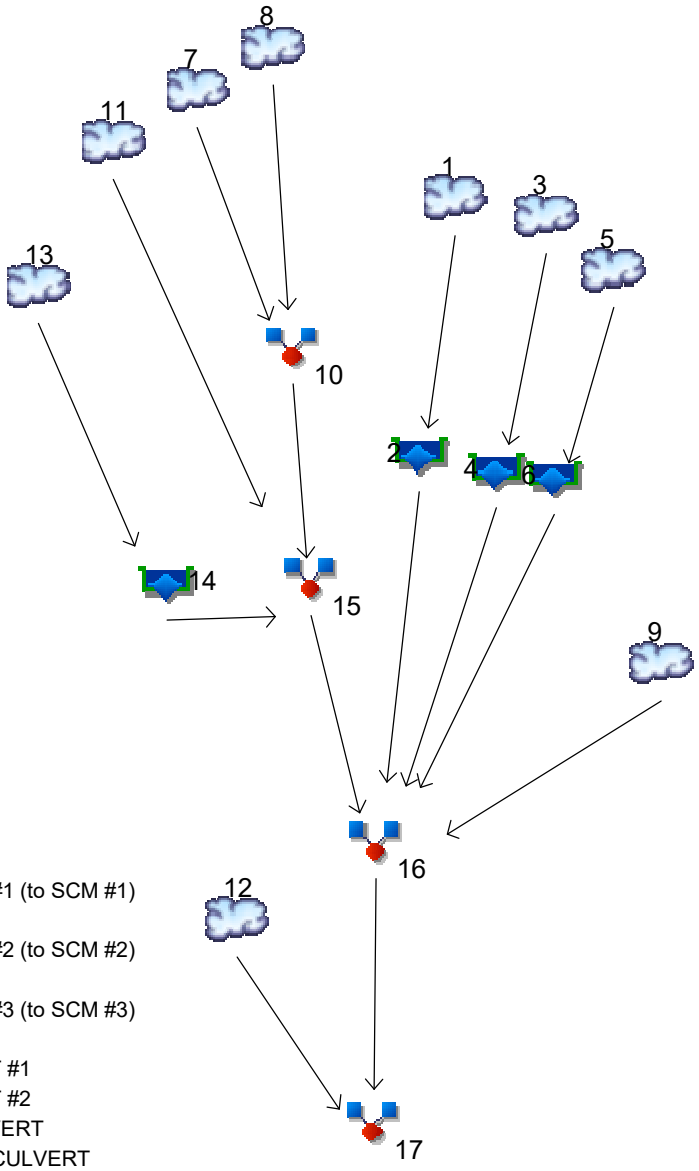
Values shown in table above are minimum quantities and dimensions

DBL is double barell pipe

Watershed Model Schematic

CULVERT SIZING

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023



Legend

Hyd.	Origin	Description
1	SCS Runoff	MOODY POD 2A #1 (to SCM #1)
2	Reservoir	MOODY SCM #1
3	SCS Runoff	MOODY POD 2A #2 (to SCM #2)
4	Reservoir	MOODY SCM #2
5	SCS Runoff	MOODY POD 2A #3 (to SCM #3)
6	Reservoir	MOODY SCM #3
7	SCS Runoff	NCDOT CULVERT #1
8	SCS Runoff	NCDOT CULVERT #2
9	SCS Runoff	MULBERRY CULVERT
10	Combine	KALAS PHASE 2 CULVERT
11	SCS Runoff	OFFSITE BYPASS (FROM KALAS 2)
12	SCS Runoff	ONSITE BYPASS
13	SCS Runoff	KALAS 2 SCM7 POST DEV DA
14	Reservoir	KALAS 2 SCM #7A
15	Combine	POI 7
16	Combine	COMBINE AT ONSITE BYPASS
17	Combine	TANSLEY CULVERTS

Hydrograph Return Period Recap CULVERT SIZING

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	-------	-------	-------	47.24	59.87	-------	80.14	MOODY POD 2A #1 (to SCM #1)
2	Reservoir	1	-------	-------	-------	-------	6.829	22.89	-------	59.45	MOODY SCM #1
3	SCS Runoff	------	-------	-------	-------	-------	7.521	9.544	-------	12.79	MOODY POD 2A #2 (to SCM #2)
4	Reservoir	3	-------	-------	-------	-------	0.123	0.332	-------	1.006	MOODY SCM #2
5	SCS Runoff	------	-------	-------	-------	-------	45.23	57.07	-------	76.01	MOODY POD 2A #3 (to SCM #3)
6	Reservoir	5	-------	-------	-------	-------	34.62	48.78	-------	70.48	MOODY SCM #3
7	SCS Runoff	------	-------	-------	-------	-------	22.96	31.01	-------	44.43	NCDOT CULVERT #1
8	SCS Runoff	------	-------	-------	-------	-------	23.94	32.32	-------	46.30	NCDOT CULVERT #2
9	SCS Runoff	------	-------	-------	-------	-------	24.42	33.20	-------	47.93	MULBERRY CULVERT
10	Combine	7, 8,	-------	-------	-------	-------	46.78	63.17	-------	90.50	KALAS PHASE 2 CULVERT
11	SCS Runoff	------	-------	-------	-------	-------	31.14	40.31	-------	55.22	OFFSITE BYPASS (FROM KALAS 2)
12	SCS Runoff	------	-------	-------	-------	-------	27.36	35.35	-------	48.32	ONSITE BYPASS
13	SCS Runoff	------	-------	-------	-------	-------	37.75	48.32	-------	65.36	KALAS 2 SCM7 POST DEV DA
14	Reservoir	13	-------	-------	-------	-------	1.793	5.755	-------	24.08	KALAS 2 SCM #7A
15	Combine	10, 11, 14	-------	-------	-------	-------	60.60	84.27	-------	138.29	POI 7
16	Combine	2, 4, 6, 9, 15	-------	-------	-------	-------	117.04	163.87	-------	262.83	COMBINE AT ONSITE BYPASS
17	Combine	12, 16	-------	-------	-------	-------	134.54	192.31	-------	306.41	TANSLEY CULVERTS

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

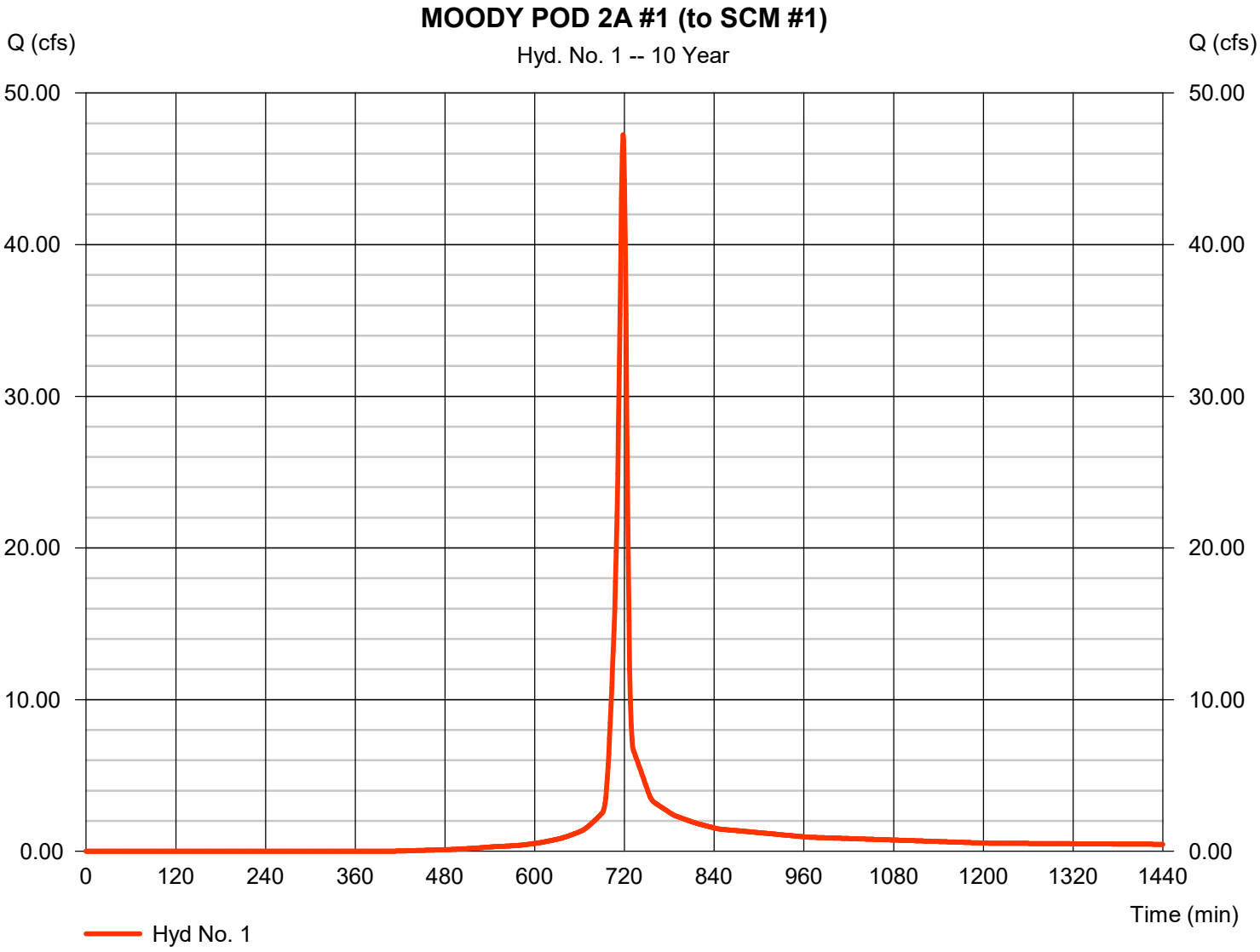
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	47.24	1	718	101,170	------	------	------	MOODY POD 2A #1 (to SCM #1)
2	Reservoir	6.829	1	731	71,530	1	366.22	95,191	MOODY SCM #1
3	SCS Runoff	7.521	1	718	15,465	------	------	------	MOODY POD 2A #2 (to SCM #2)
4	Reservoir	0.123	1	1042	6,526	3	362.83	27,876	MOODY SCM #2
5	SCS Runoff	45.23	1	718	97,191	------	------	------	MOODY POD 2A #3 (to SCM #3)
6	Reservoir	34.62	1	722	89,512	5	363.95	39,963	MOODY SCM #3
7	SCS Runoff	22.96	1	743	128,914	------	------	------	NCDOT CULVERT #1
8	SCS Runoff	23.94	1	745	141,854	------	------	------	NCDOT CULVERT #2
9	SCS Runoff	24.42	1	735	110,272	------	------	------	MULBERRY CULVERT
10	Combine	46.78	1	744	270,767	7, 8,	------	------	KALAS PHASE 2 CULVERT
11	SCS Runoff	31.14	1	725	97,228	------	------	------	OFFSITE BYPASS (FROM KALAS 2)
12	SCS Runoff	27.36	1	720	66,239	------	------	------	ONSITE BYPASS
13	SCS Runoff	37.75	1	721	95,690	------	------	------	KALAS 2 SCM7 POST DEV DA
14	Reservoir	1.793	1	819	68,016	13	374.10	60,603	KALAS 2 SCM #7A
15	Combine	60.60	1	730	436,011	10, 11, 14	------	------	POI 7
16	Combine	117.04	1	727	713,852	2, 4, 6, 9, 15	------	------	COMBINE AT ONSITE BYPASS
17	Combine	134.54	1	725	780,090	12, 16	------	------	TANSLEY CULVERTS

Hydrograph Report

Hyd. No. 1

MOODY POD 2A #1 (to SCM #1)

Hydrograph type	= SCS Runoff	Peak discharge	= 47.24 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 101,170 cuft
Drainage area	= 9.460 ac	Curve number	= 81.2
Basin Slope	= 2.4 %	Hydraulic length	= 1000 ft
Tc method	= KIRPICH	Time of conc. (Tc)	= 6.69 min
Total precip.	= 5.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



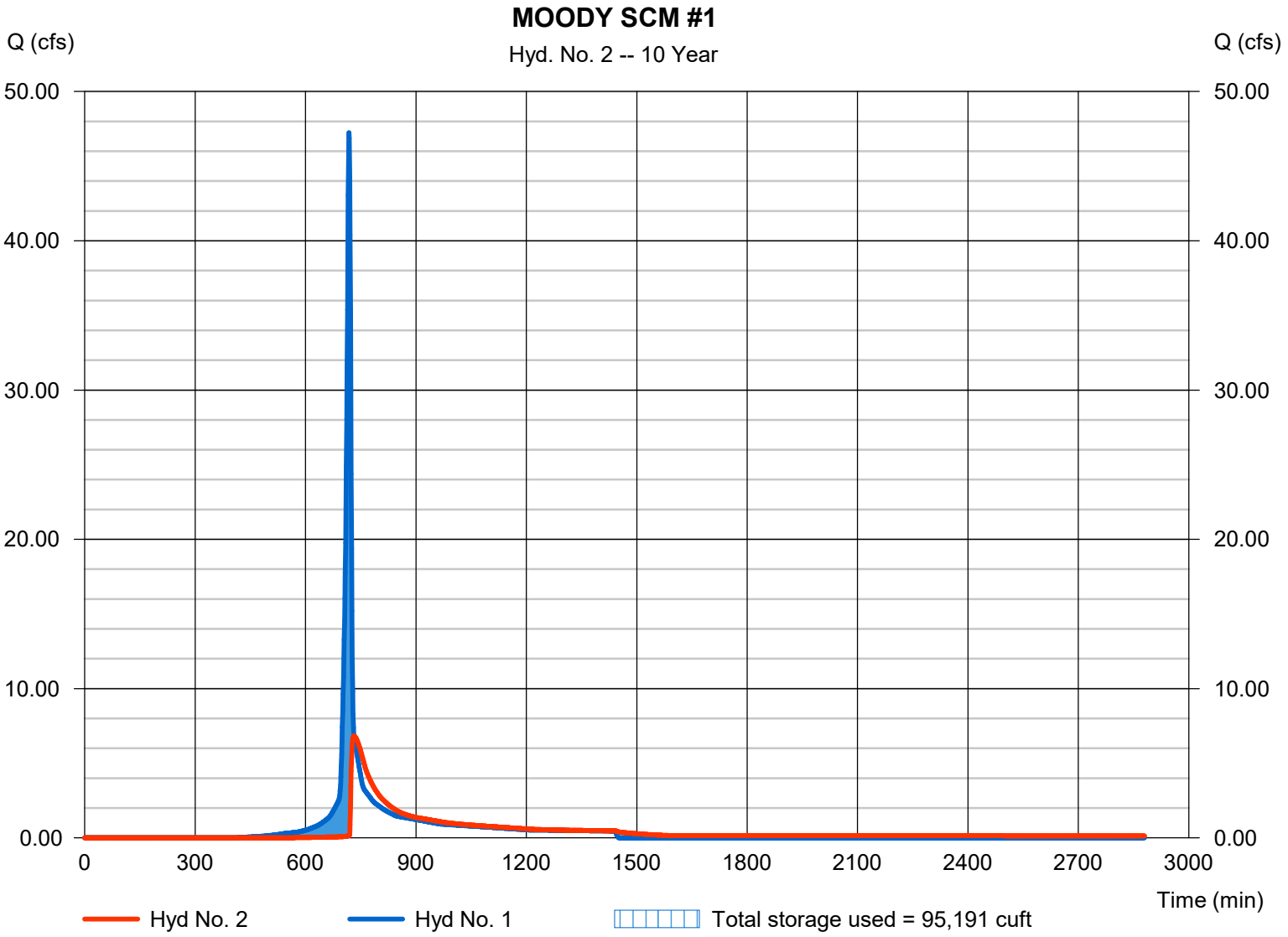
Hydrograph Report

Hyd. No. 2

MOODY SCM #1

Hydrograph type	=	Reservoir	Peak discharge	=	6.829 cfs
Storm frequency	=	10 yrs	Time to peak	=	731 min
Time interval	=	1 min	Hyd. volume	=	71,530 cuft
Inflow hyd. No.	=	1 - MOODY POD 2A #1 (to SCM #1)	Max. Elevation	=	366.22 ft
Reservoir name	=	SCM #1	Max. Storage	=	95,191 cuft

Storage Indication method used. Wet pond routing start elevation = 363.50 ft.

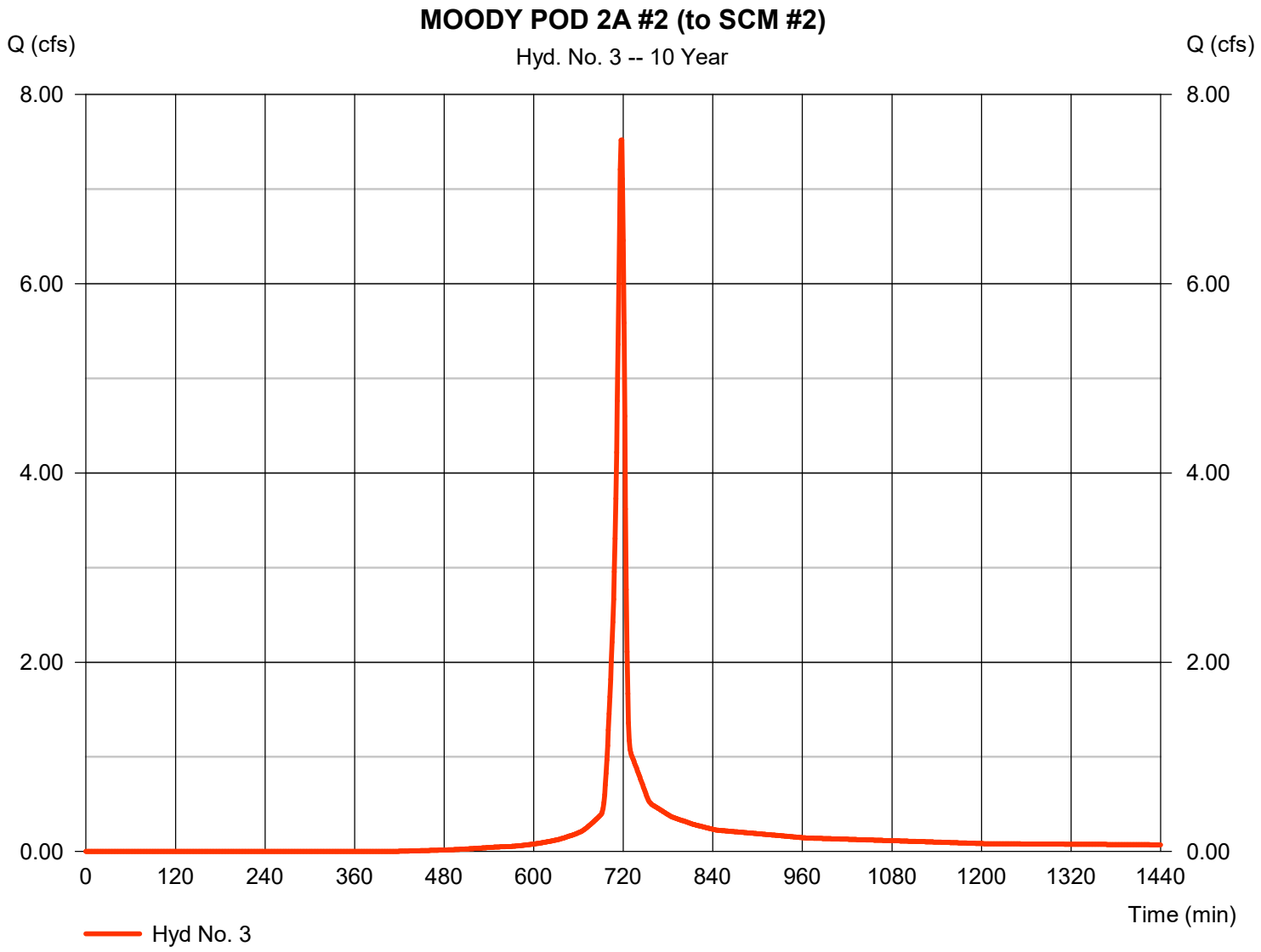


Hydrograph Report

Hyd. No. 3

MOODY POD 2A #2 (to SCM #2)

Hydrograph type	= SCS Runoff	Peak discharge	= 7.521 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 15,465 cuft
Drainage area	= 1.380 ac	Curve number	= 80.9
Basin Slope	= 0.5 %	Hydraulic length	= 450 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



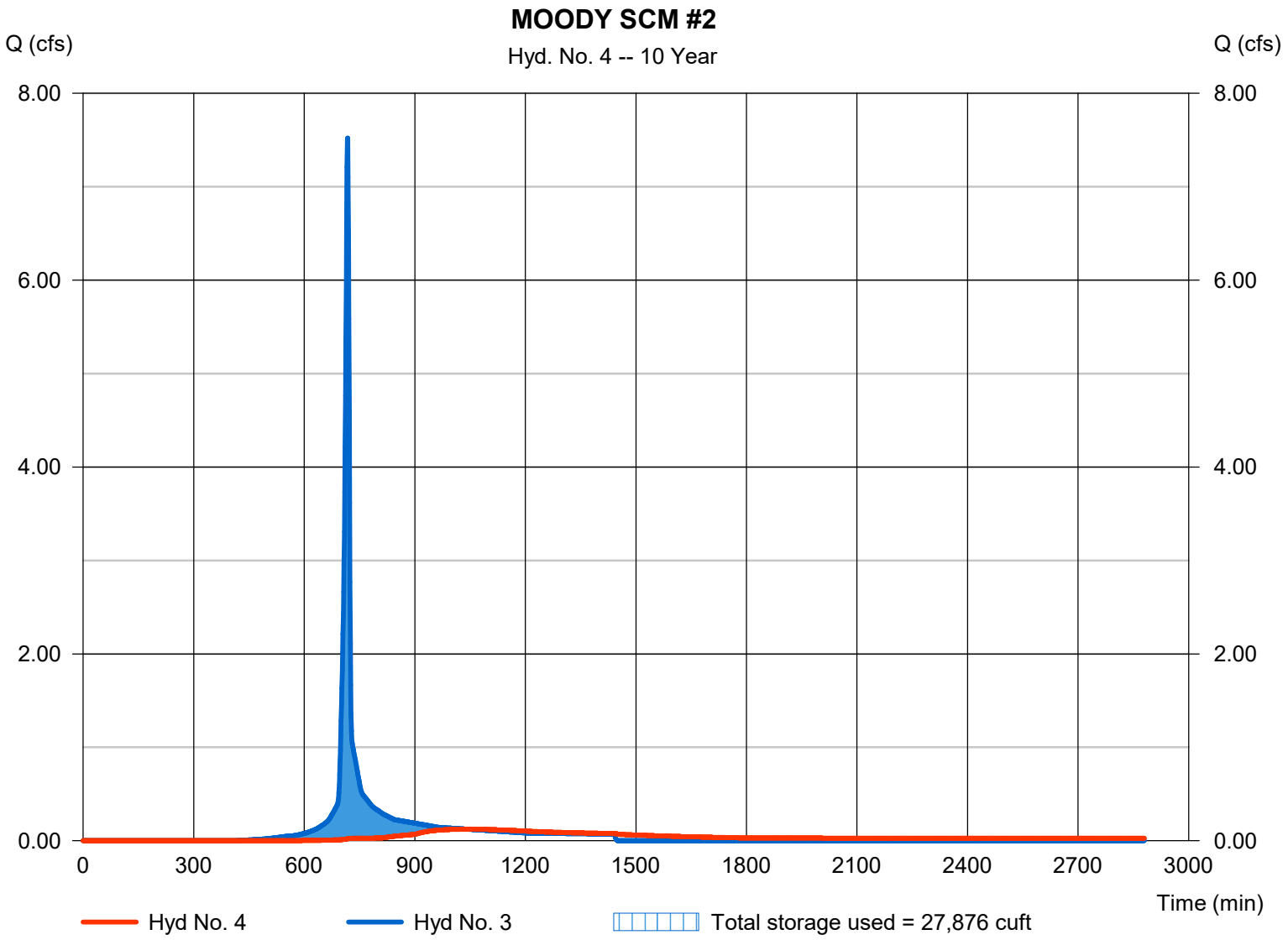
Hydrograph Report

Hyd. No. 4

MOODY SCM #2

Hydrograph type	=	Reservoir	Peak discharge	=	0.123 cfs
Storm frequency	=	10 yrs	Time to peak	=	1042 min
Time interval	=	1 min	Hyd. volume	=	6,526 cuft
Inflow hyd. No.	=	3 - MOODY POD 2A #2 (to SCM #2)	Max. Elevation	=	362.83 ft
Reservoir name	=	SCM #2	Max. Storage	=	27,876 cuft

Storage Indication method used. Wet pond routing start elevation = 361.50 ft.

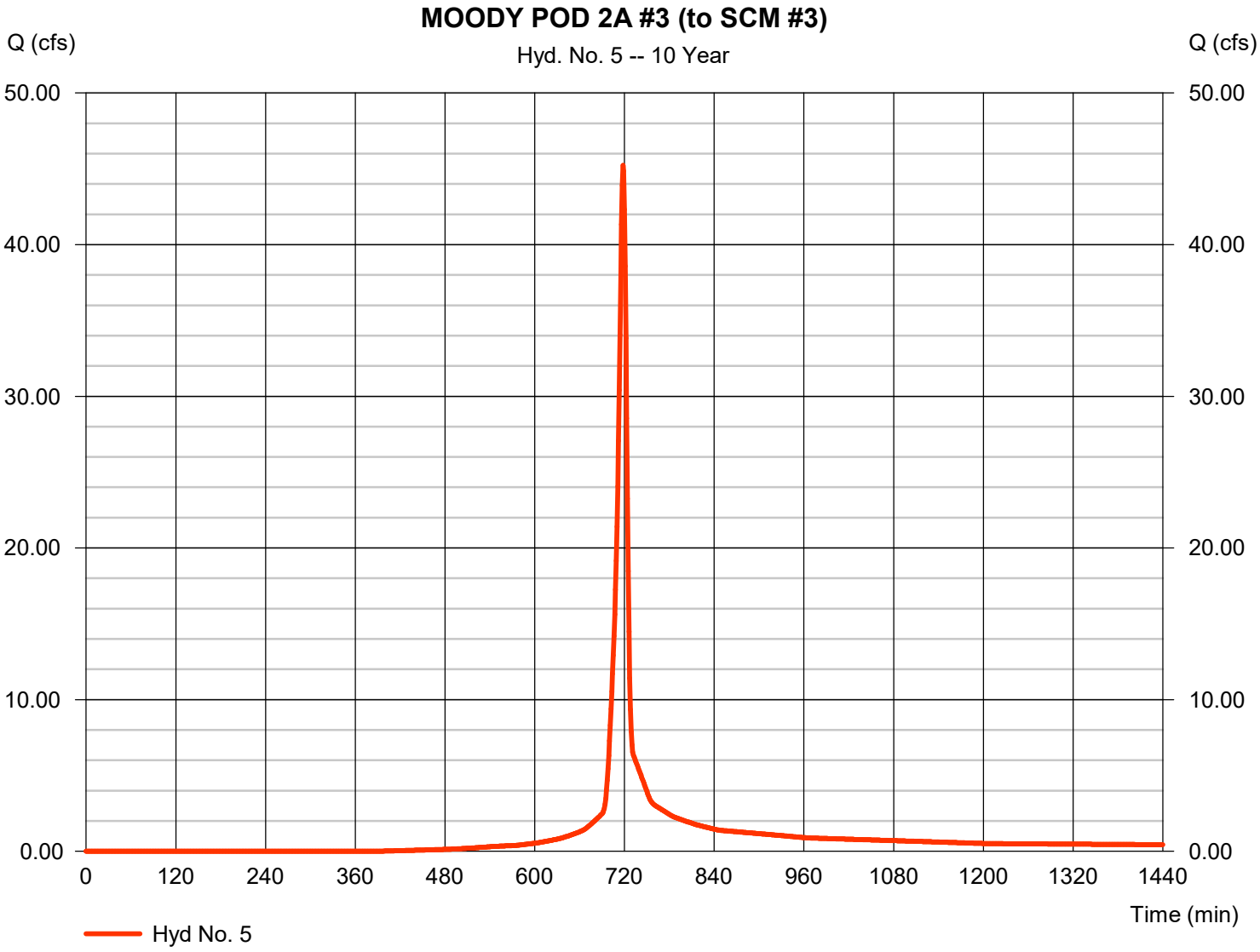


Hydrograph Report

Hyd. No. 5

MOODY POD 2A #3 (to SCM #3)

Hydrograph type	= SCS Runoff	Peak discharge	= 45.23 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 97,191 cuft
Drainage area	= 8.840 ac	Curve number	= 82.1
Basin Slope	= 2.6 %	Hydraulic length	= 1120 ft
Tc method	= KIRPICH	Time of conc. (Tc)	= 7.08 min
Total precip.	= 5.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



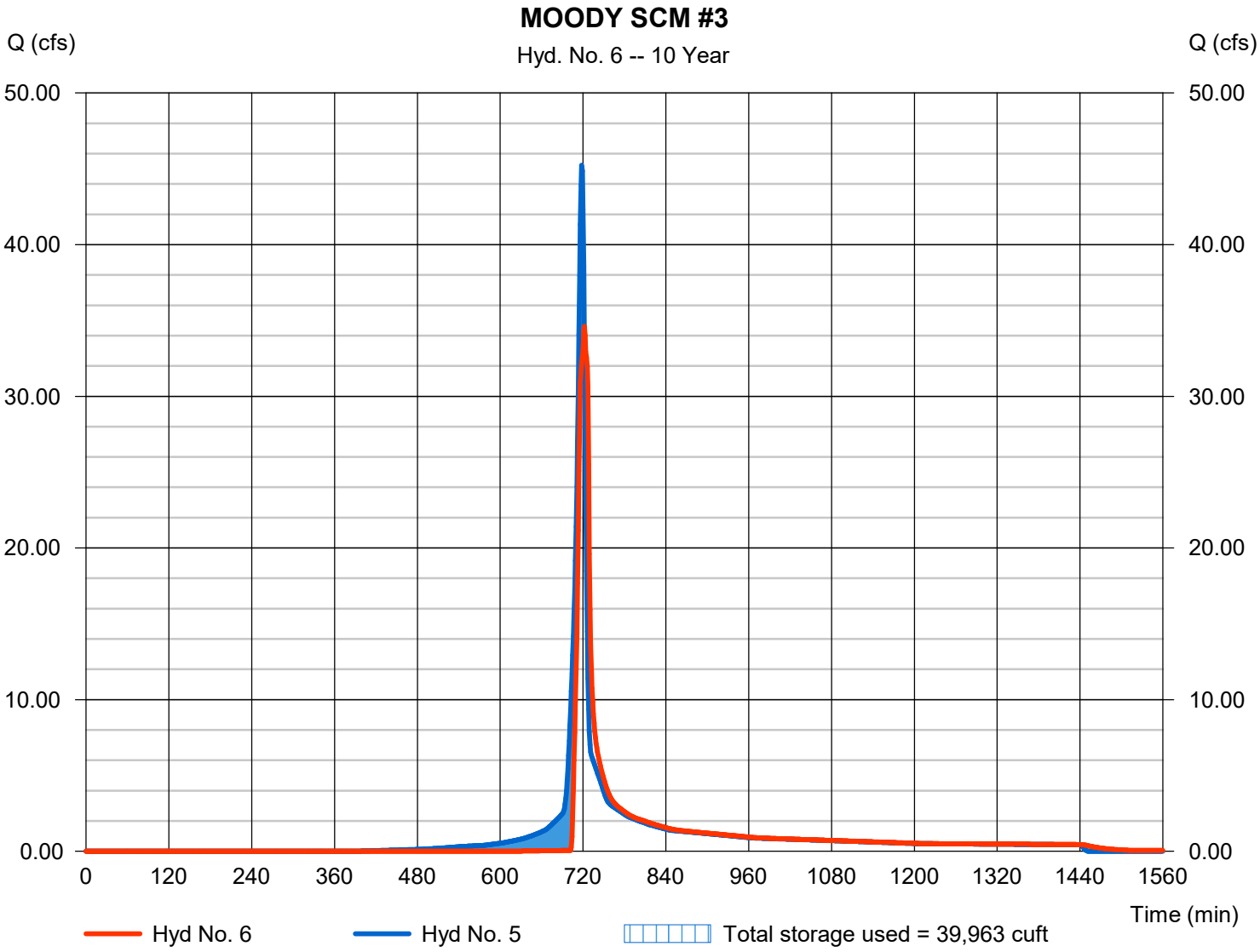
Hydrograph Report

Hyd. No. 6

MOODY SCM #3

Hydrograph type	=	Reservoir	Peak discharge	=	34.62 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	89,512 cuft
Inflow hyd. No.	=	5 - MOODY POD 2A #3 (to SCM #3)	Max. Elevation	=	363.95 ft
Reservoir name	=	SCM #3	Max. Storage	=	39,963 cuft

Storage Indication method used. Wet pond routing start elevation = 361.00 ft.

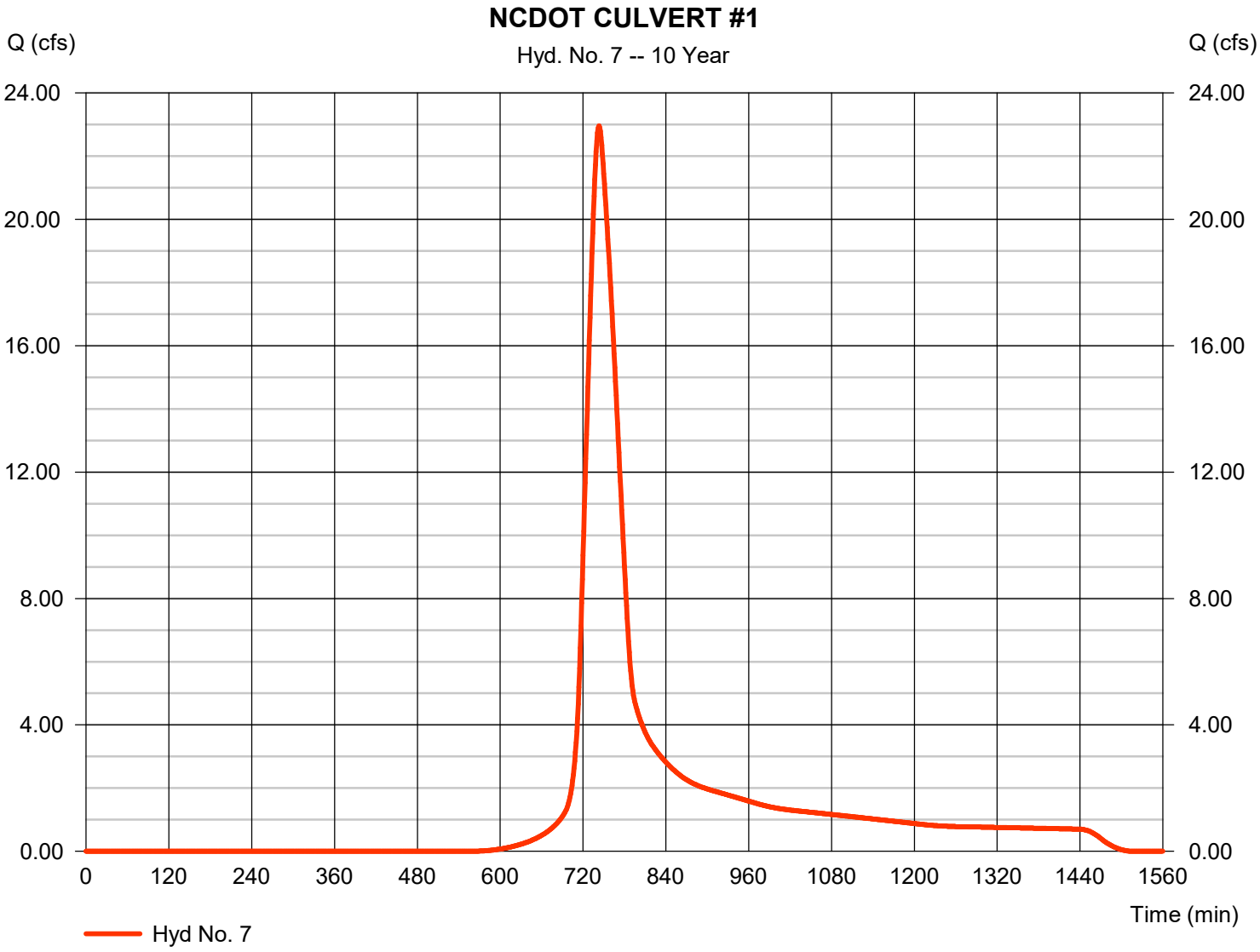


Hydrograph Report

Hyd. No. 7

NCDOT CULVERT #1

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.96 cfs
Storm frequency	=	10 yrs	Time to peak	=	743 min
Time interval	=	1 min	Hyd. volume	=	128,914 cuft
Drainage area	=	15.820 ac	Curve number	=	72.5
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	49.03 min
Total precip.	=	5.02 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

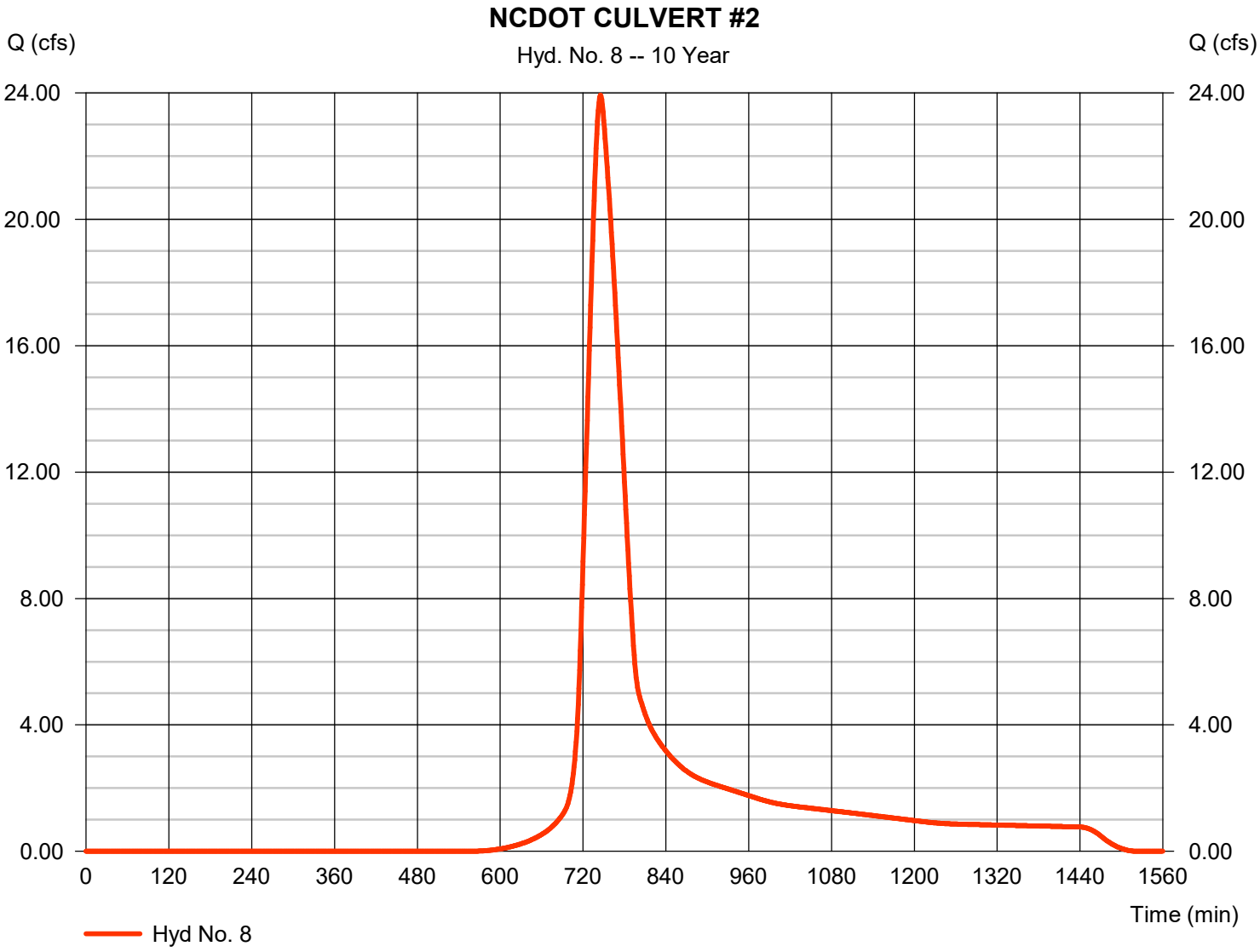


Hydrograph Report

Hyd. No. 8

NCDOT CULVERT #2

Hydrograph type	=	SCS Runoff	Peak discharge	=	23.94 cfs
Storm frequency	=	10 yrs	Time to peak	=	745 min
Time interval	=	1 min	Hyd. volume	=	141,854 cuft
Drainage area	=	17.200 ac	Curve number	=	72.6
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	50.89 min
Total precip.	=	5.02 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

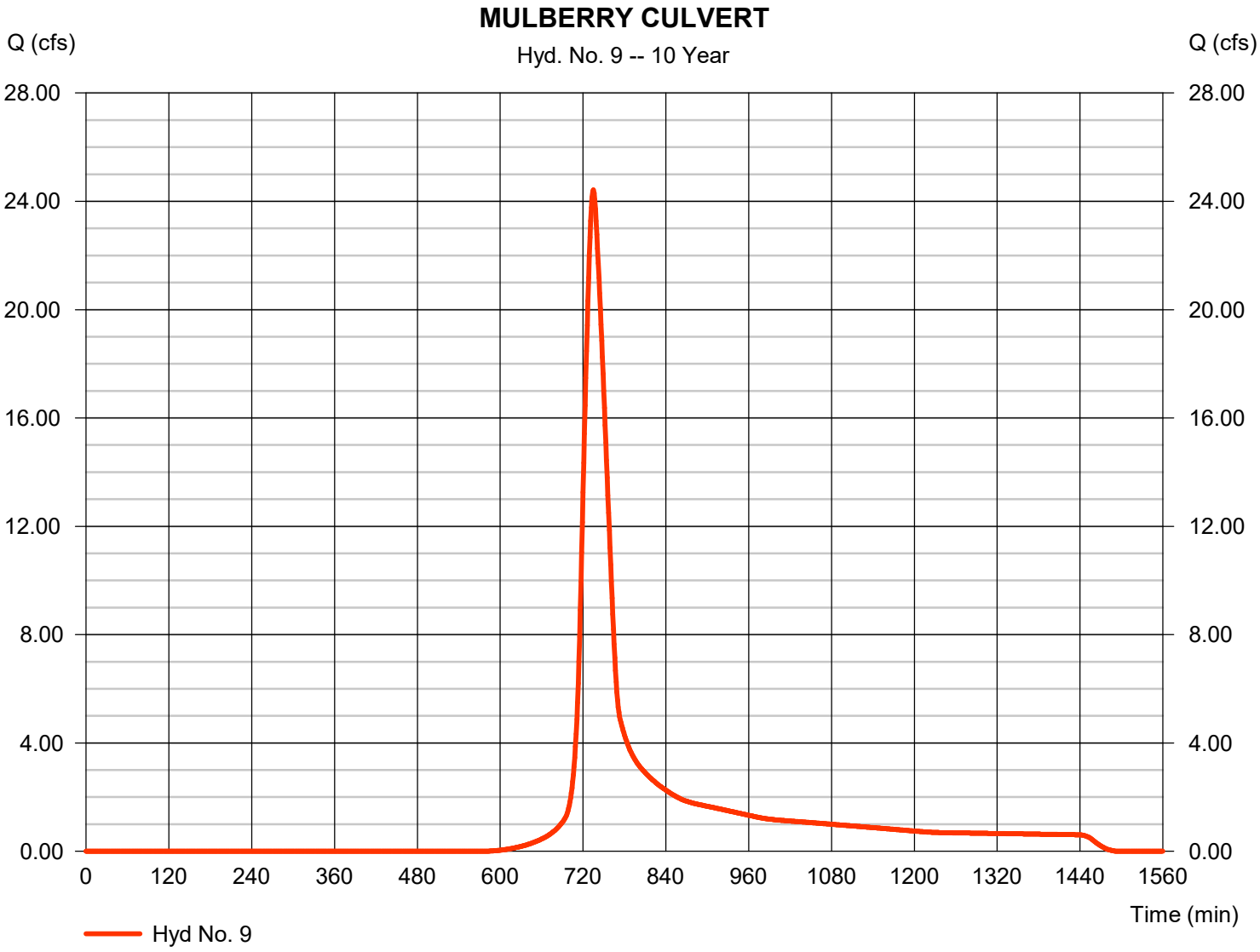


Hydrograph Report

Hyd. No. 9

MULBERRY CULVERT

Hydrograph type	=	SCS Runoff	Peak discharge	=	24.42 cfs
Storm frequency	=	10 yrs	Time to peak	=	735 min
Time interval	=	1 min	Hyd. volume	=	110,272 cuft
Drainage area	=	14.090 ac	Curve number	=	71.3
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	34.74 min
Total precip.	=	5.02 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

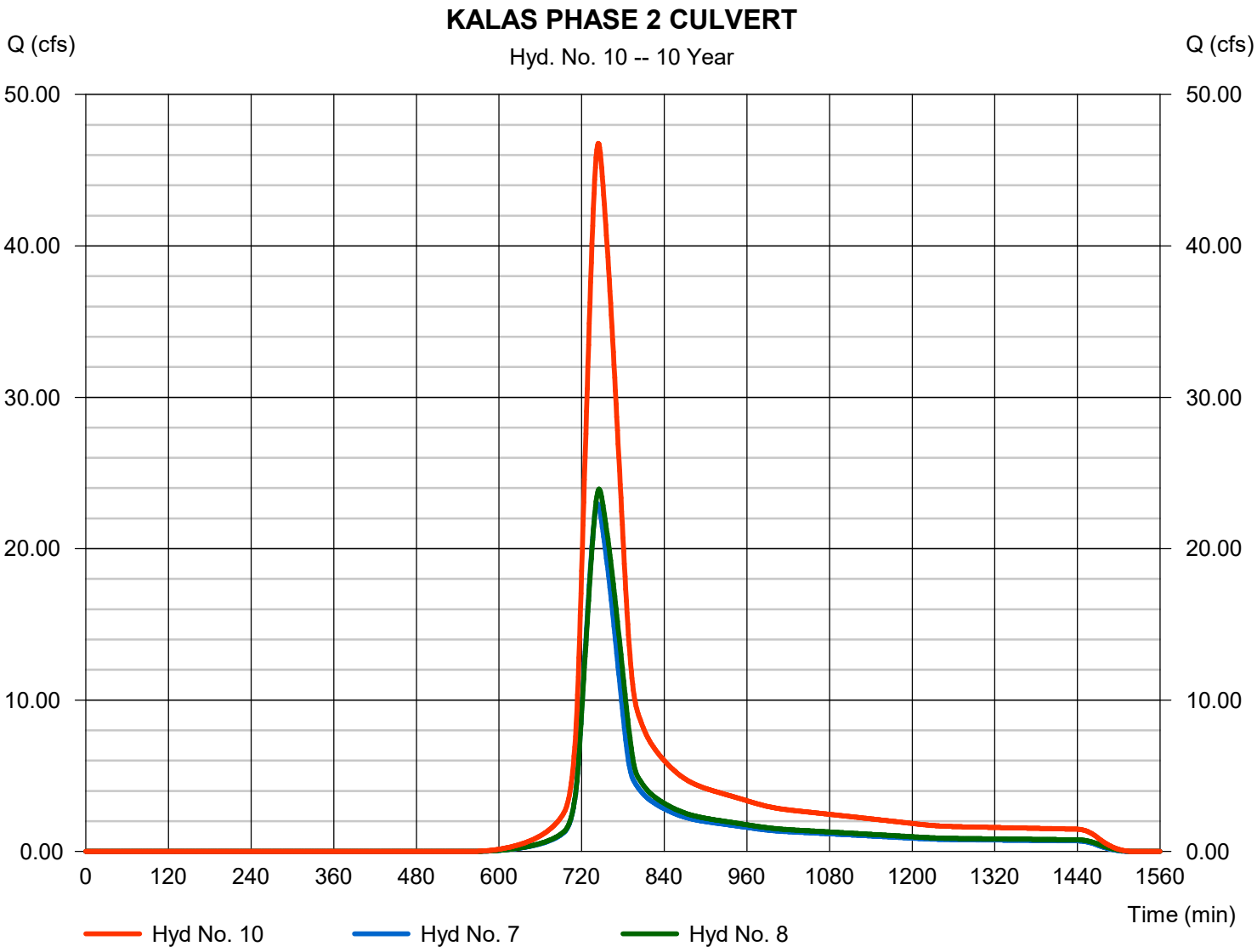


Hydrograph Report

Hyd. No. 10

KALAS PHASE 2 CULVERT

Hydrograph type	= Combine	Peak discharge	= 46.78 cfs
Storm frequency	= 10 yrs	Time to peak	= 744 min
Time interval	= 1 min	Hyd. volume	= 270,767 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 33.020 ac

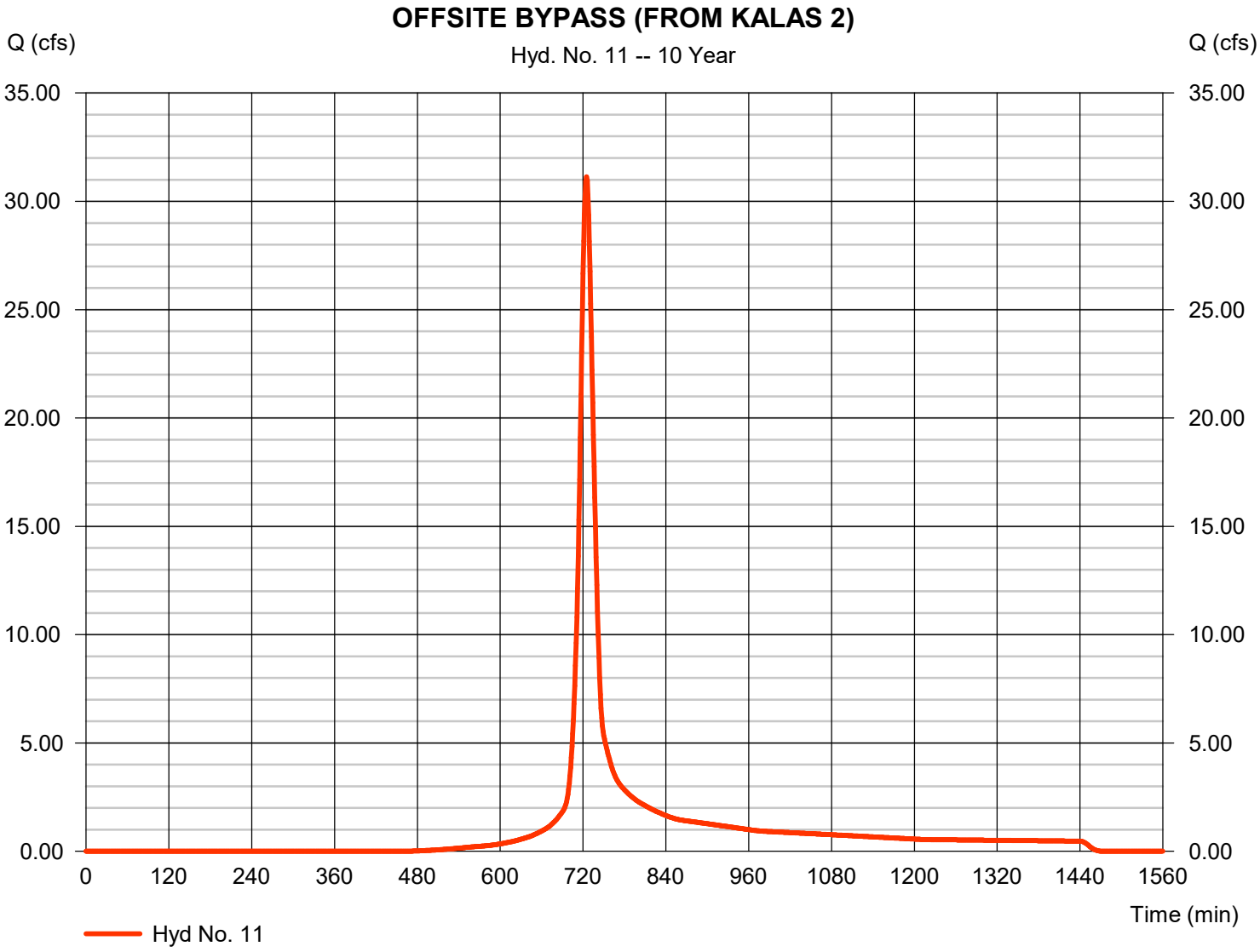


Hydrograph Report

Hyd. No. 11

OFFSITE BYPASS (FROM KALAS 2)

Hydrograph type	=	SCS Runoff	Peak discharge	=	31.14 cfs
Storm frequency	=	10 yrs	Time to peak	=	725 min
Time interval	=	1 min	Hyd. volume	=	97,228 cuft
Drainage area	=	9.720 ac	Curve number	=	78.3
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.90 min
Total precip.	=	5.02 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

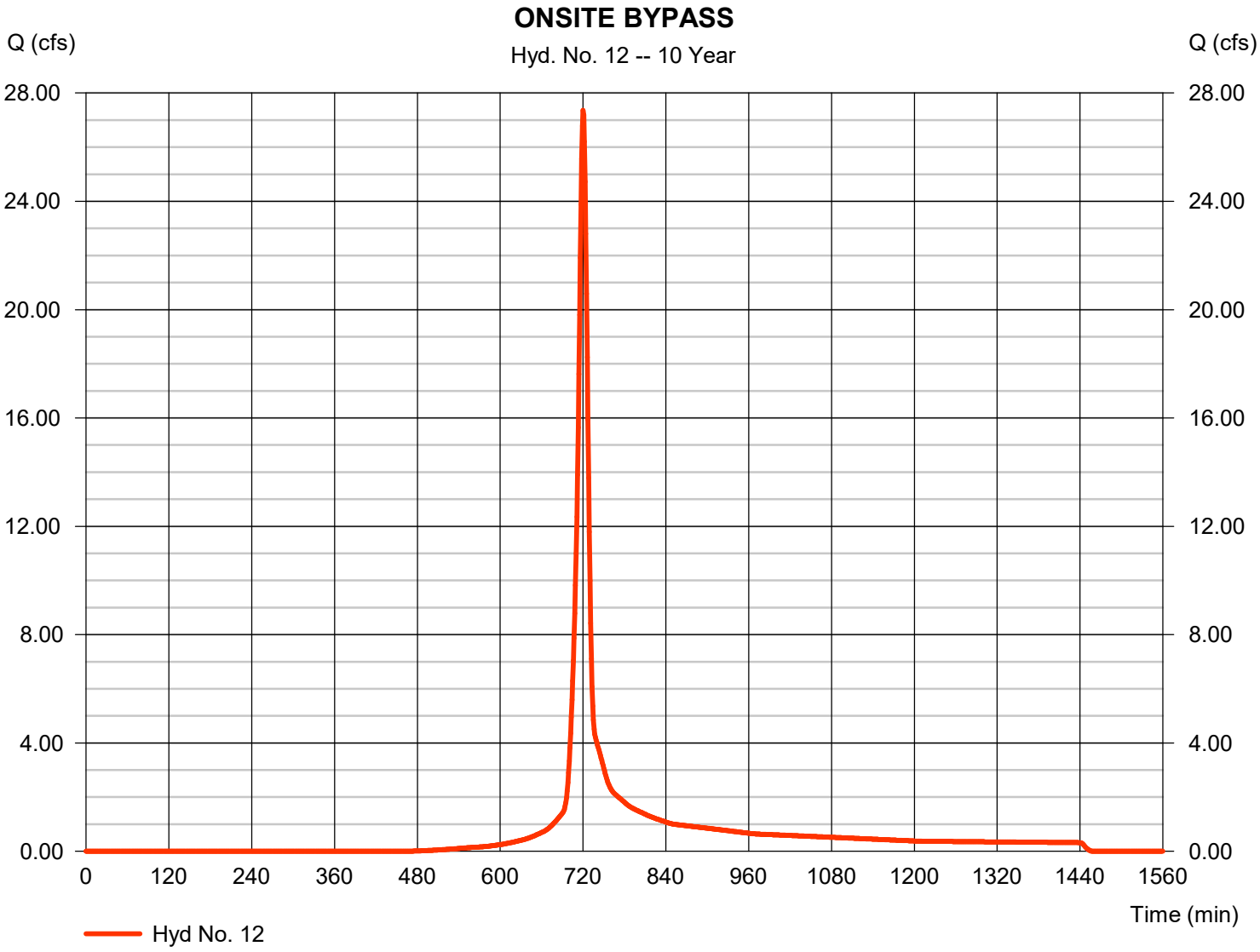


Hydrograph Report

Hyd. No. 12

ONSITE BYPASS

Hydrograph type	=	SCS Runoff	Peak discharge	=	27.36 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	66,239 cuft
Drainage area	=	6.570 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.56 min
Total precip.	=	5.02 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

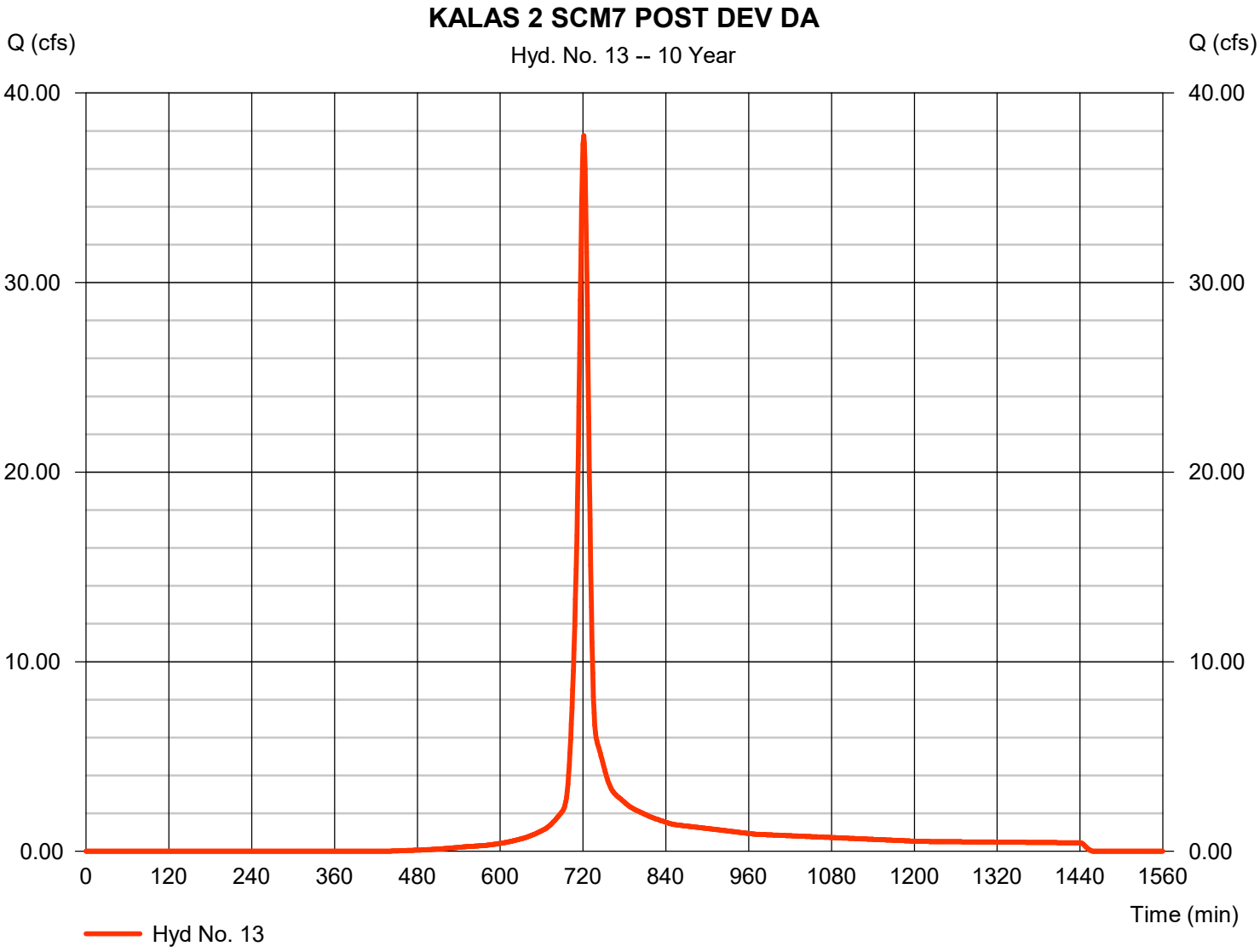


Hydrograph Report

Hyd. No. 13

KALAS 2 SCM7 POST DEV DA

Hydrograph type	=	SCS Runoff	Peak discharge	=	37.75 cfs
Storm frequency	=	10 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	95,690 cuft
Drainage area	=	9.260 ac	Curve number	=	79.8
Basin Slope	=	1.1 %	Hydraulic length	=	1505 ft
Tc method	=	KIRPICH	Time of conc. (Tc)	=	12.38 min
Total precip.	=	5.02 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



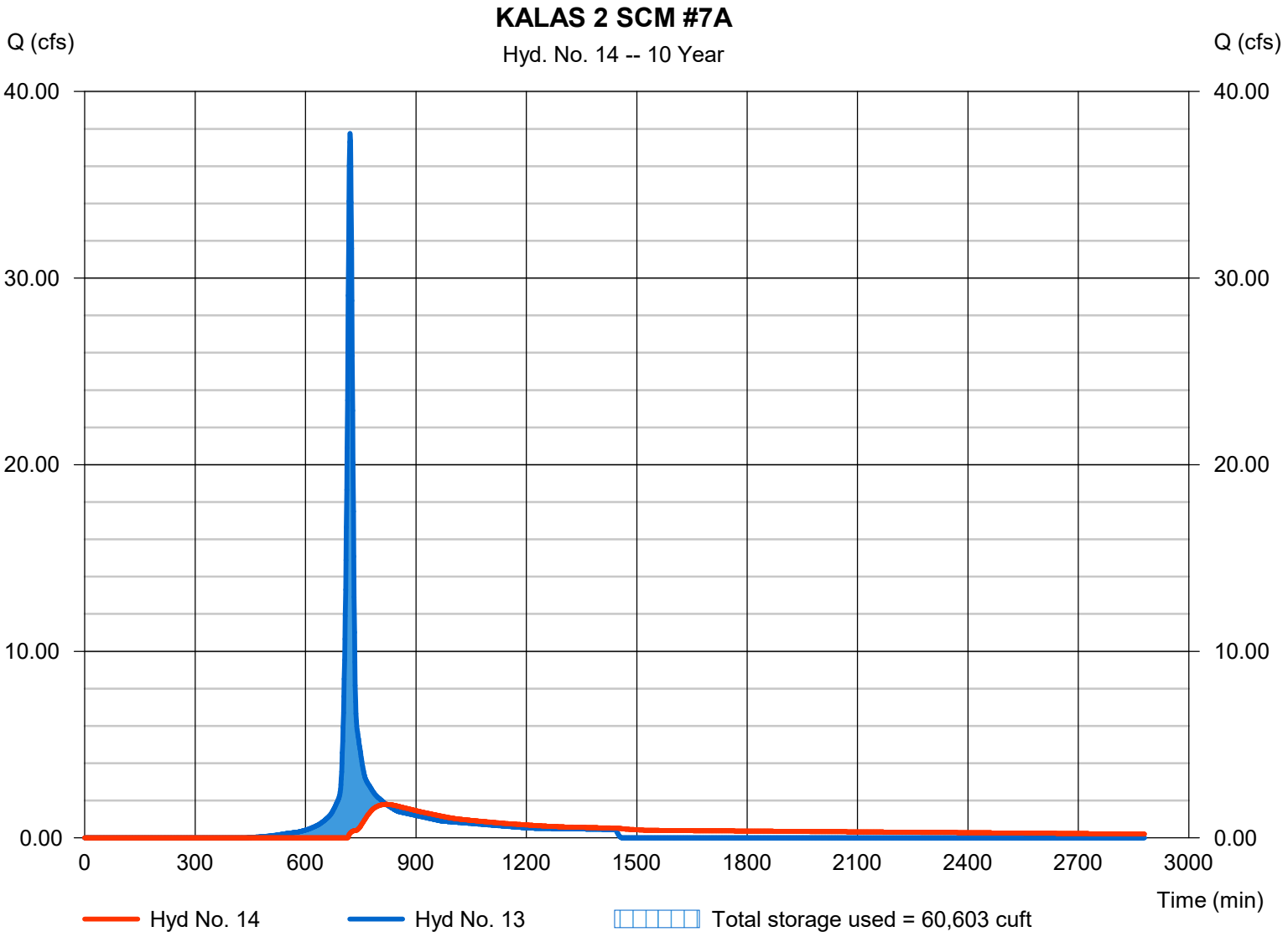
Hydrograph Report

Hyd. No. 14

KALAS 2 SCM #7A

Hydrograph type	=	Reservoir	Peak discharge	=	1.793 cfs
Storm frequency	=	10 yrs	Time to peak	=	819 min
Time interval	=	1 min	Hyd. volume	=	68,016 cuft
Inflow hyd. No.	=	13 - KALAS 2 SCM7 POST DEVDA	Max. Elevation	=	374.10 ft
Reservoir name	=	SCM #7A	Max. Storage	=	60,603 cuft

Storage Indication method used.

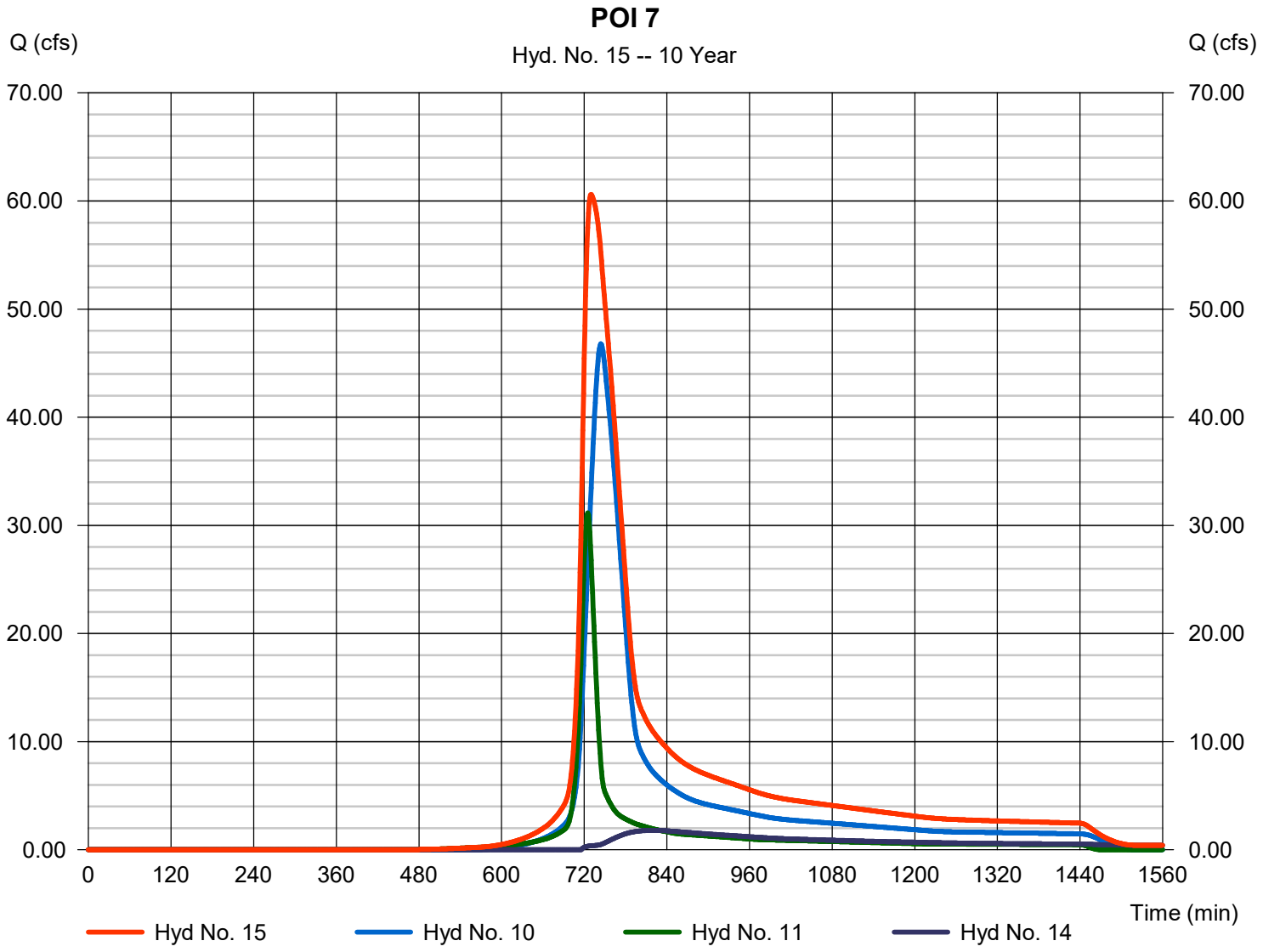


Hydrograph Report

Hyd. No. 15

POI 7

Hydrograph type	=	Combine	Peak discharge	=	60.60 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	436,011 cuft
Inflow hyds.	=	10, 11, 14	Contrib. drain. area	=	9.720 ac

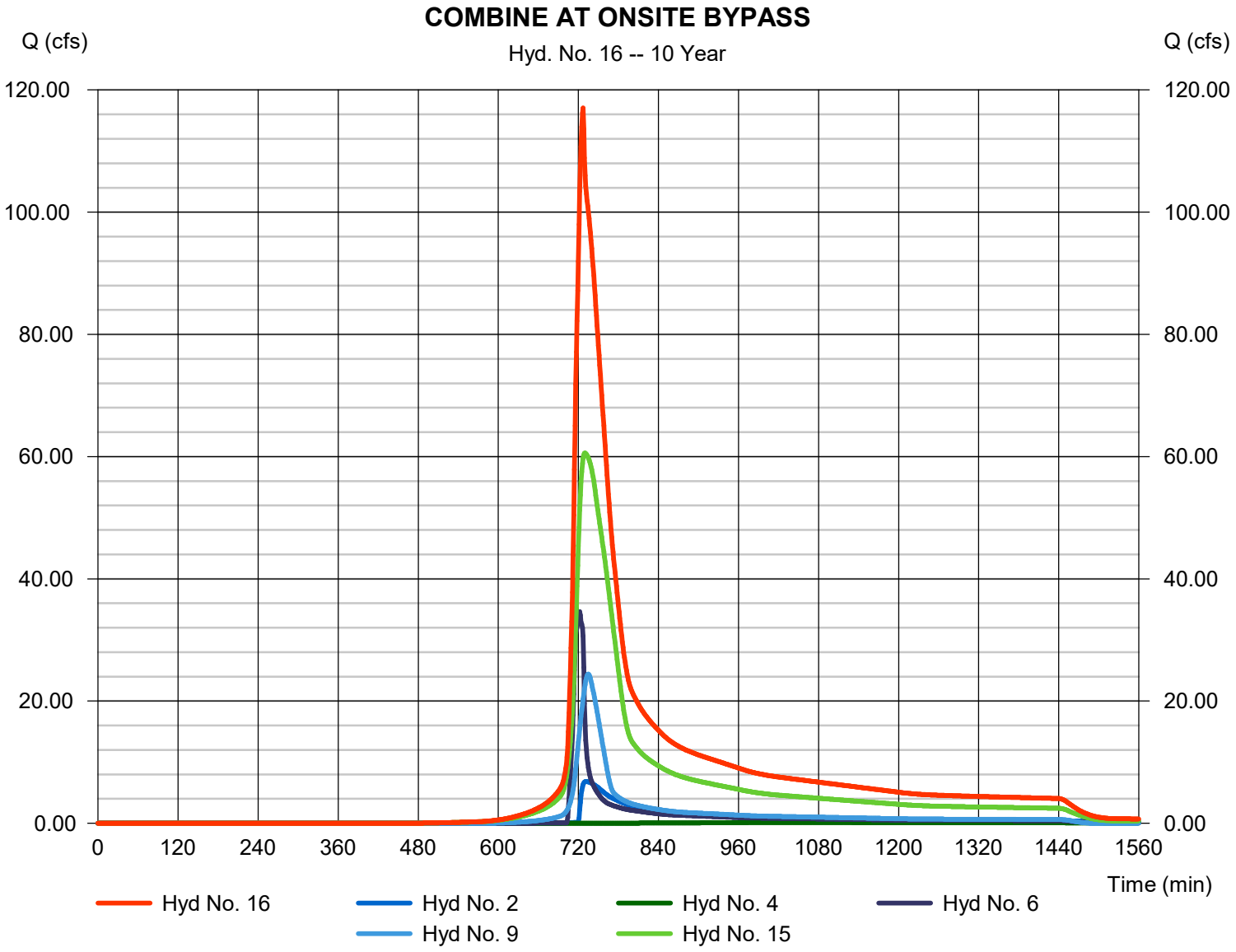


Hydrograph Report

Hyd. No. 16

COMBINE AT ONSITE BYPASS

Hydrograph type	=	Combine	Peak discharge	=	117.04 cfs
Storm frequency	=	10 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	713,852 cuft
Inflow hyds.	=	2, 4, 6, 9, 15	Contrib. drain. area	=	14.090 ac

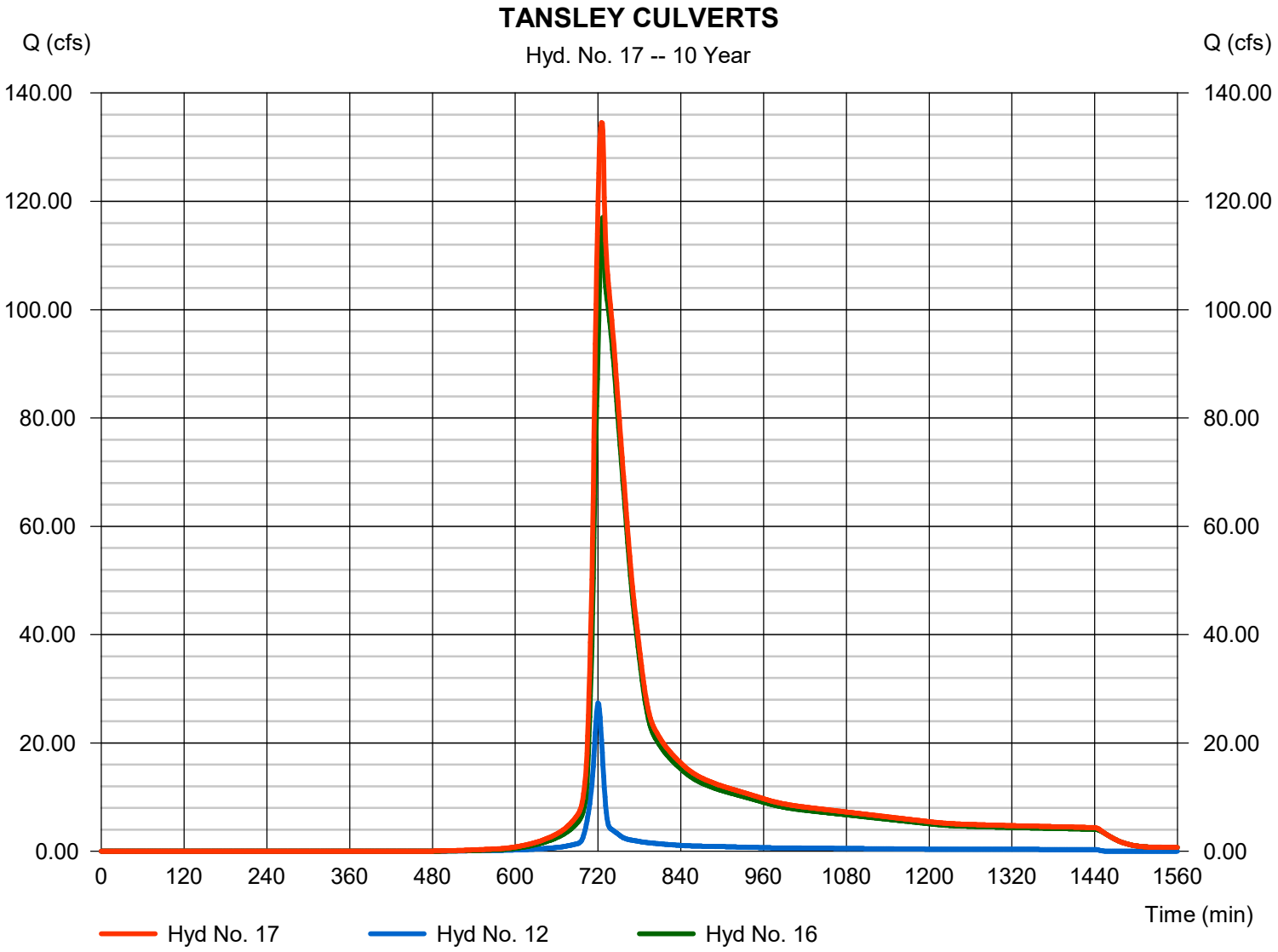


Hydrograph Report

Hyd. No. 17

TANSLEY CULVERTS

Hydrograph type	=	Combine	Peak discharge	=	134.54 cfs
Storm frequency	=	10 yrs	Time to peak	=	725 min
Time interval	=	1 min	Hyd. volume	=	780,090 cuft
Inflow hyds.	=	12, 16	Contrib. drain. area	=	6.570 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

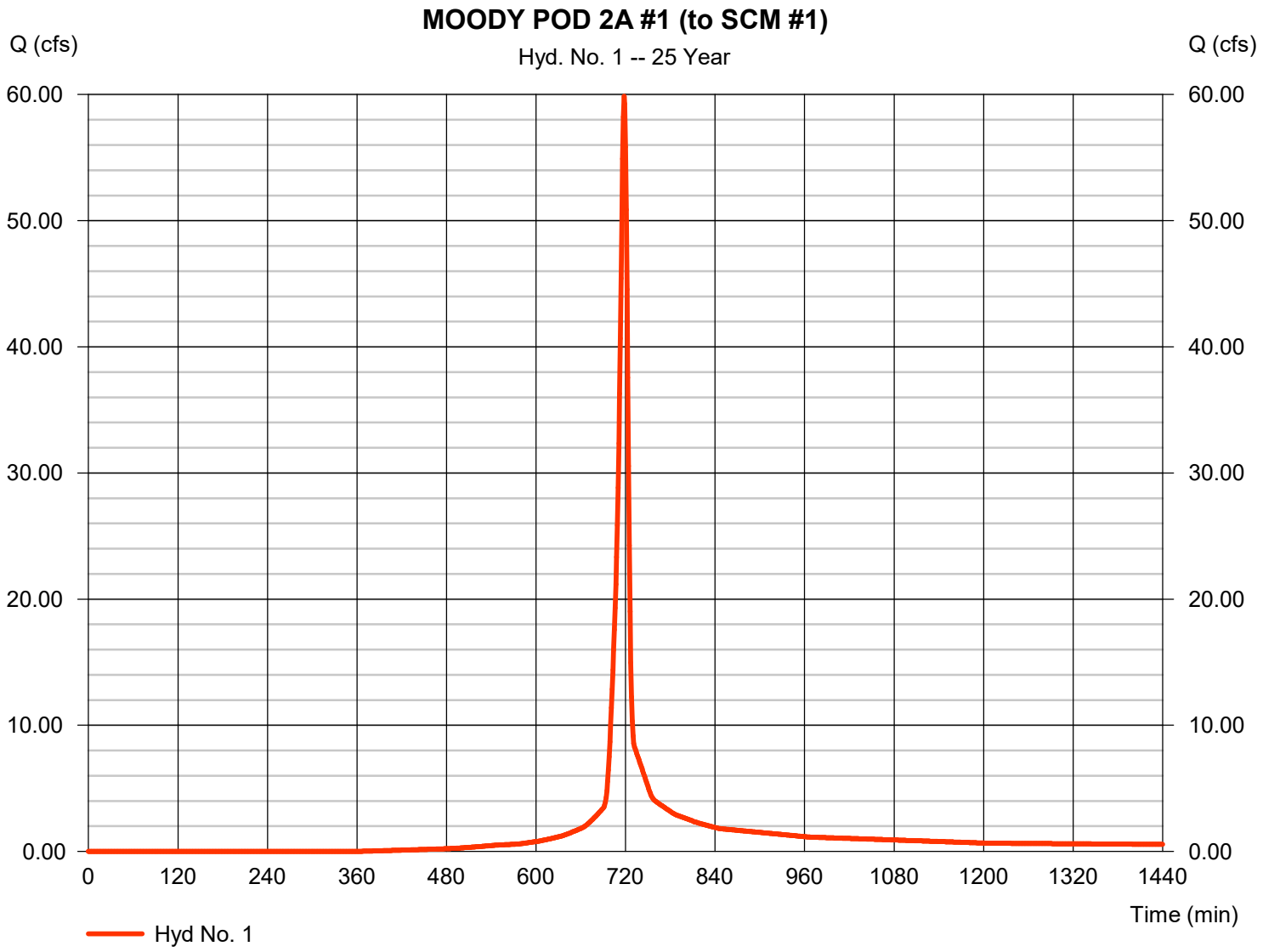
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	59.87	1	718	129,500	------	------	------	MOODY POD 2A #1 (to SCM #1)
2	Reservoir	22.89	1	725	99,804	1	366.64	104,512	MOODY SCM #1
3	SCS Runoff	9.544	1	717	19,822	------	------	------	MOODY POD 2A #2 (to SCM #2)
4	Reservoir	0.332	1	822	10,851	3	362.95	28,936	MOODY SCM #2
5	SCS Runoff	57.07	1	718	123,918	------	------	------	MOODY POD 2A #3 (to SCM #3)
6	Reservoir	48.78	1	721	116,231	5	364.22	42,730	MOODY SCM #3
7	SCS Runoff	31.01	1	743	171,988	------	------	------	NCDOT CULVERT #1
8	SCS Runoff	32.32	1	745	189,153	------	------	------	NCDOT CULVERT #2
9	SCS Runoff	33.20	1	735	148,052	------	------	------	MULBERRY CULVERT
10	Combine	63.17	1	744	361,141	7, 8,	------	------	KALAS PHASE 2 CULVERT
11	SCS Runoff	40.31	1	725	126,090	------	------	------	OFFSITE BYPASS (FROM KALAS 2)
12	SCS Runoff	35.35	1	720	86,021	------	------	------	ONSITE BYPASS
13	SCS Runoff	48.32	1	721	123,250	------	------	------	KALAS 2 SCM7 POST DEV DA
14	Reservoir	5.755	1	749	95,254	13	374.60	68,006	KALAS 2 SCM #7A
15	Combine	84.27	1	734	582,485	10, 11, 14	------	------	POI 7
16	Combine	163.87	1	728	957,423	2, 4, 6, 9, 15	------	------	COMBINE AT ONSITE BYPASS
17	Combine	192.31	1	723	1,043,443	12, 16	------	------	TANSLEY CULVERTS

Hydrograph Report

Hyd. No. 1

MOODY POD 2A #1 (to SCM #1)

Hydrograph type	= SCS Runoff	Peak discharge	= 59.87 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 129,500 cuft
Drainage area	= 9.460 ac	Curve number	= 81.2
Basin Slope	= 2.4 %	Hydraulic length	= 1000 ft
Tc method	= KIRPICH	Time of conc. (Tc)	= 6.69 min
Total precip.	= 5.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



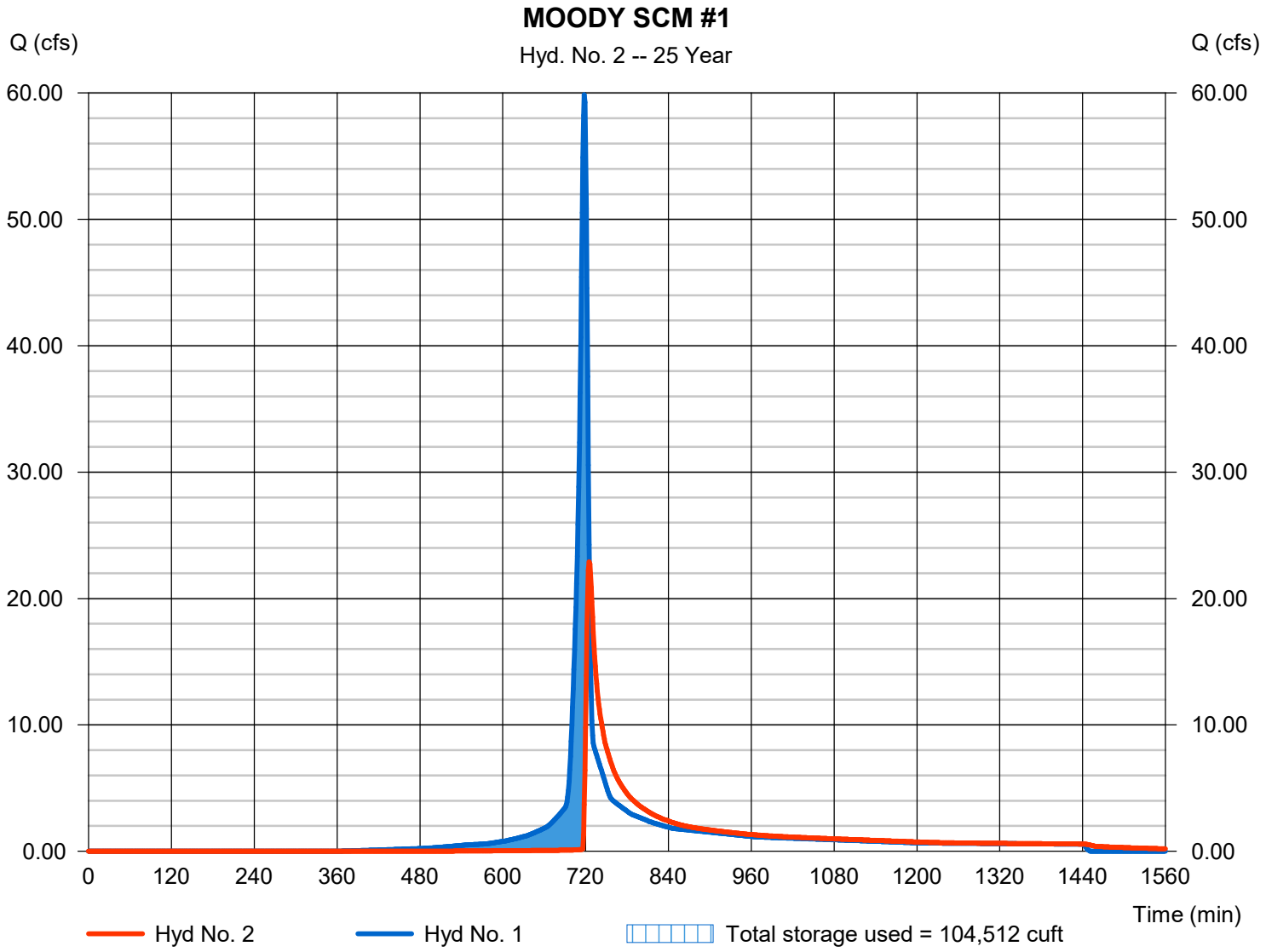
Hydrograph Report

Hyd. No. 2

MOODY SCM #1

Hydrograph type	=	Reservoir	Peak discharge	=	22.89 cfs
Storm frequency	=	25 yrs	Time to peak	=	725 min
Time interval	=	1 min	Hyd. volume	=	99,804 cuft
Inflow hyd. No.	=	1 - MOODY POD 2A #1 (to SCM #1)	Max. Elevation	=	366.64 ft
Reservoir name	=	SCM #1	Max. Storage	=	104,512 cuft

Storage Indication method used. Wet pond routing start elevation = 363.50 ft.

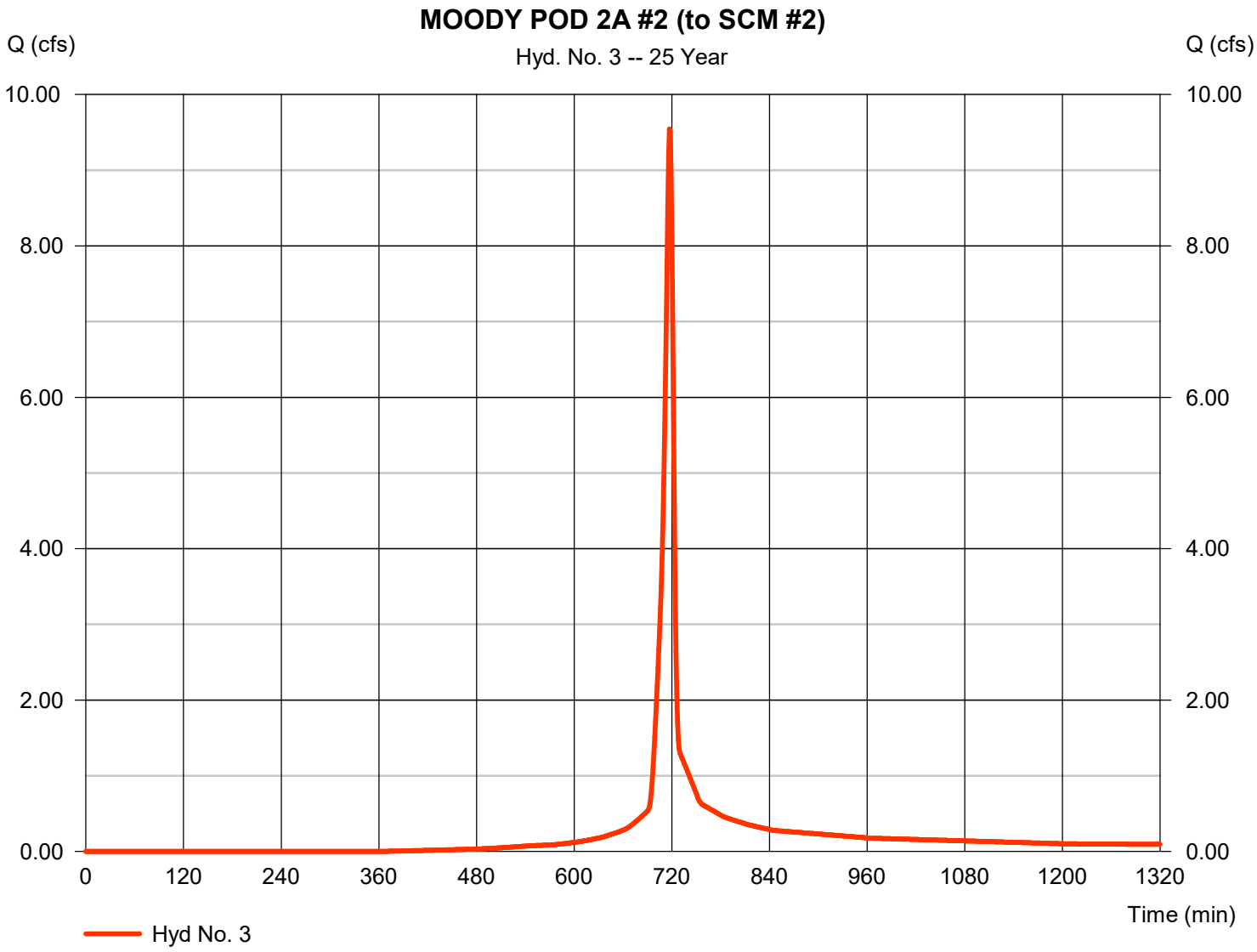


Hydrograph Report

Hyd. No. 3

MOODY POD 2A #2 (to SCM #2)

Hydrograph type	= SCS Runoff	Peak discharge	= 9.544 cfs
Storm frequency	= 25 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 19,822 cuft
Drainage area	= 1.380 ac	Curve number	= 80.9
Basin Slope	= 0.5 %	Hydraulic length	= 450 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



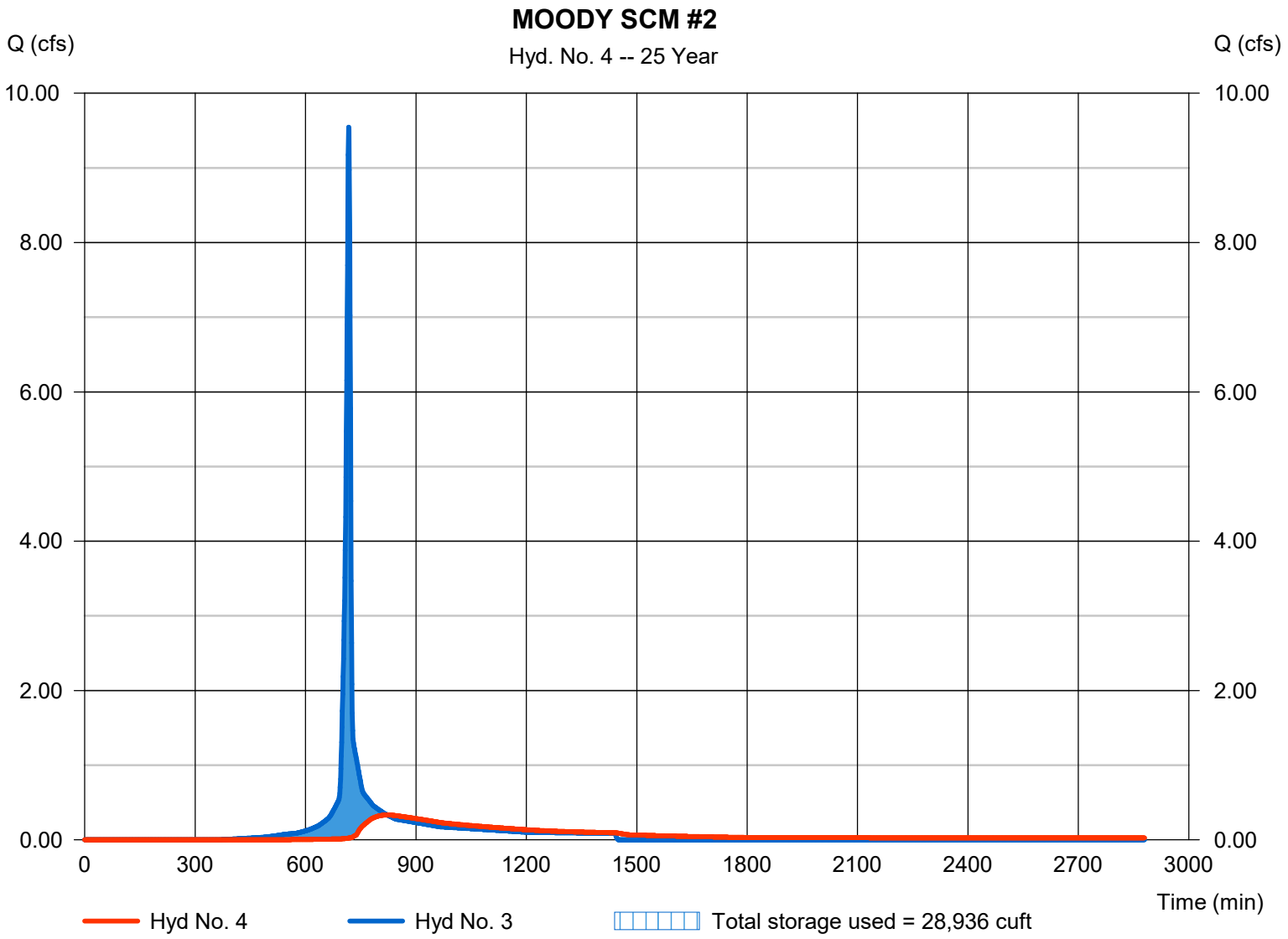
Hydrograph Report

Hyd. No. 4

MOODY SCM #2

Hydrograph type	=	Reservoir	Peak discharge	=	0.332 cfs
Storm frequency	=	25 yrs	Time to peak	=	822 min
Time interval	=	1 min	Hyd. volume	=	10,851 cuft
Inflow hyd. No.	=	3 - MOODY POD 2A #2 (to SCM #2)	Max. Elevation	=	362.95 ft
Reservoir name	=	SCM #2	Max. Storage	=	28,936 cuft

Storage Indication method used. Wet pond routing start elevation = 361.50 ft.

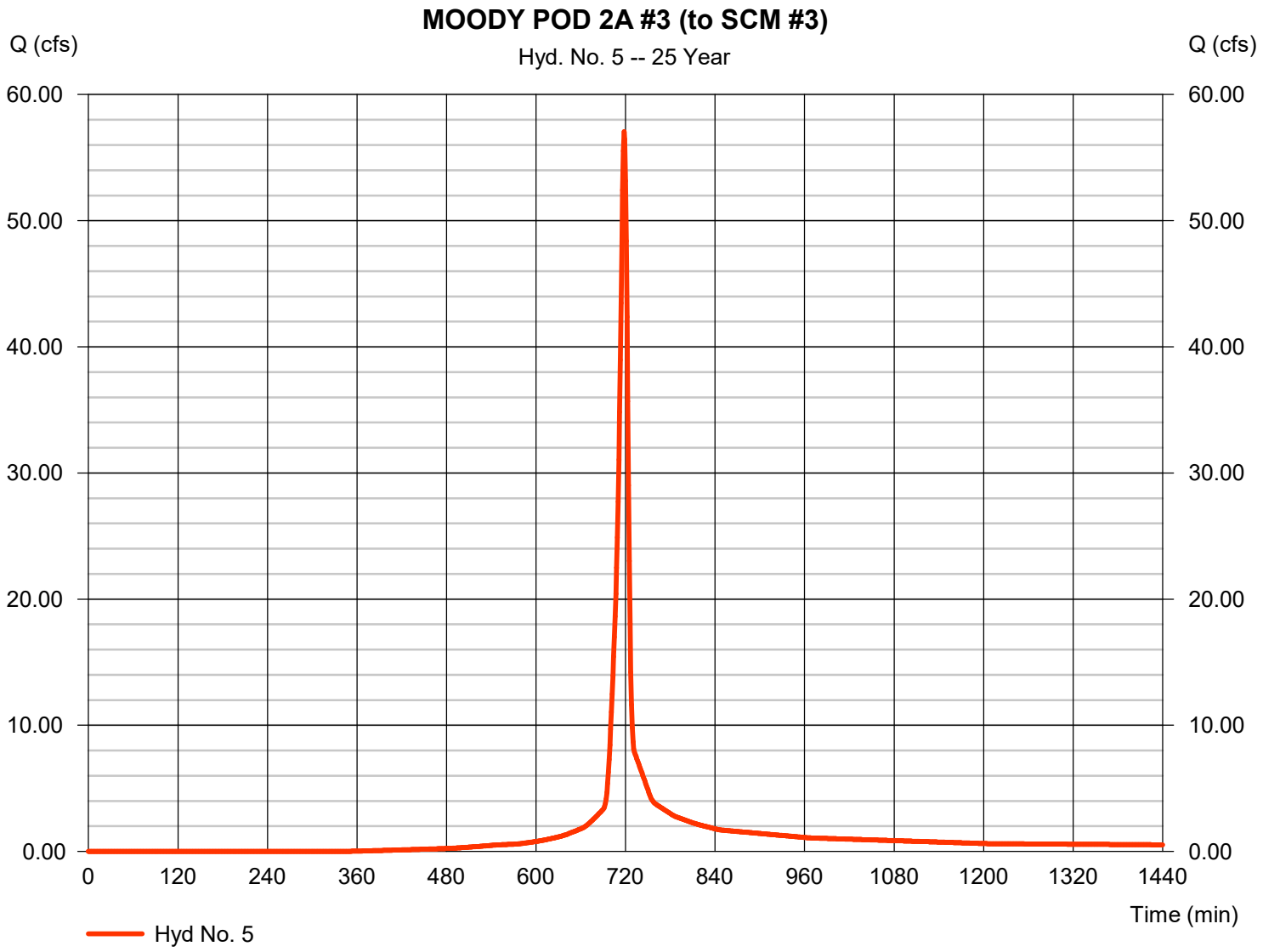


Hydrograph Report

Hyd. No. 5

MOODY POD 2A #3 (to SCM #3)

Hydrograph type	=	SCS Runoff	Peak discharge	=	57.07 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	1 min	Hyd. volume	=	123,918 cuft
Drainage area	=	8.840 ac	Curve number	=	82.1
Basin Slope	=	2.6 %	Hydraulic length	=	1120 ft
Tc method	=	KIRPICH	Time of conc. (Tc)	=	7.08 min
Total precip.	=	5.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



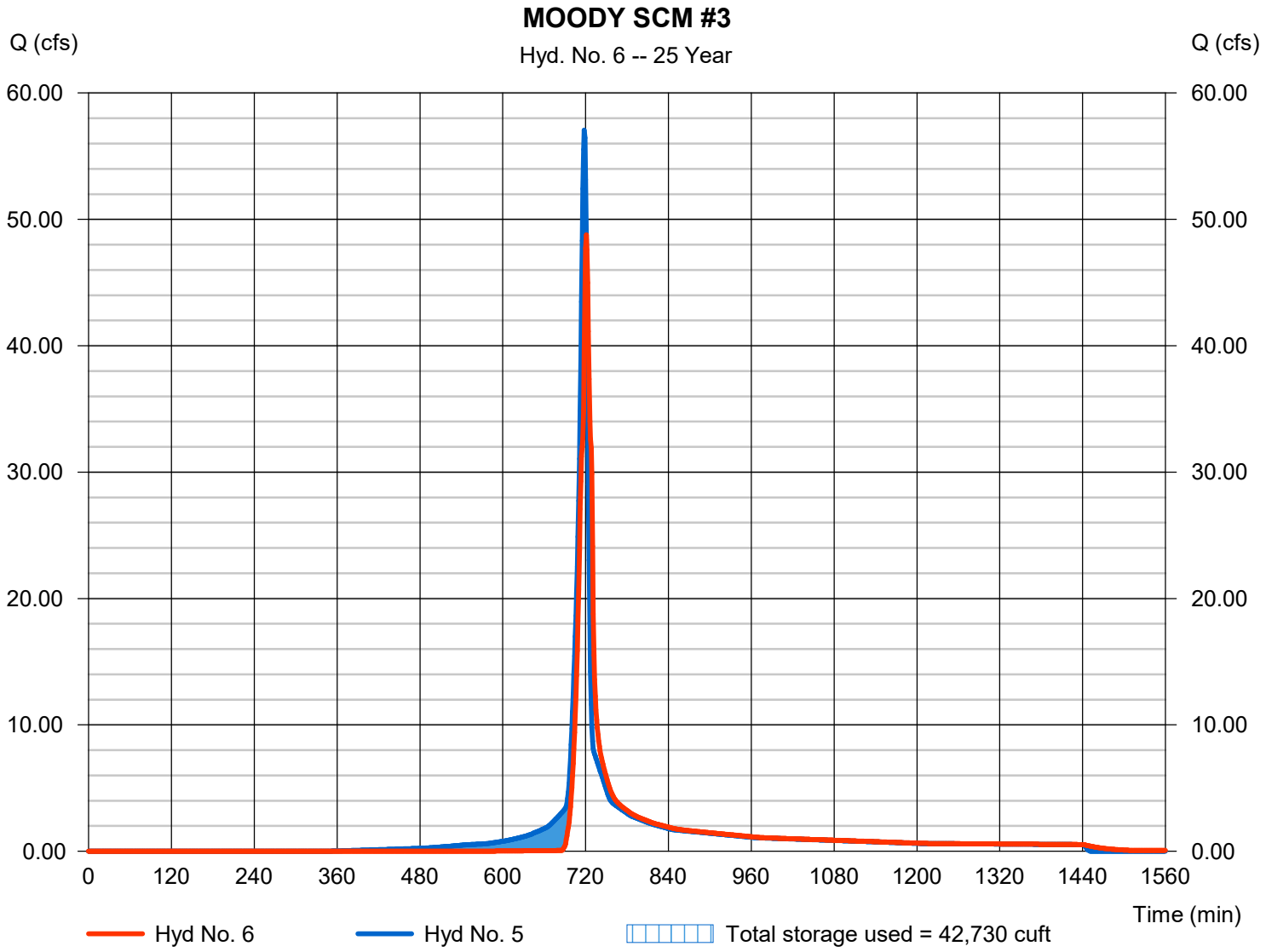
Hydrograph Report

Hyd. No. 6

MOODY SCM #3

Hydrograph type	=	Reservoir	Peak discharge	=	48.78 cfs
Storm frequency	=	25 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	116,231 cuft
Inflow hyd. No.	=	5 - MOODY POD 2A #3 (to SCM #3)	Max. Elevation	=	364.22 ft
Reservoir name	=	SCM #3	Max. Storage	=	42,730 cuft

Storage Indication method used. Wet pond routing start elevation = 361.00 ft.

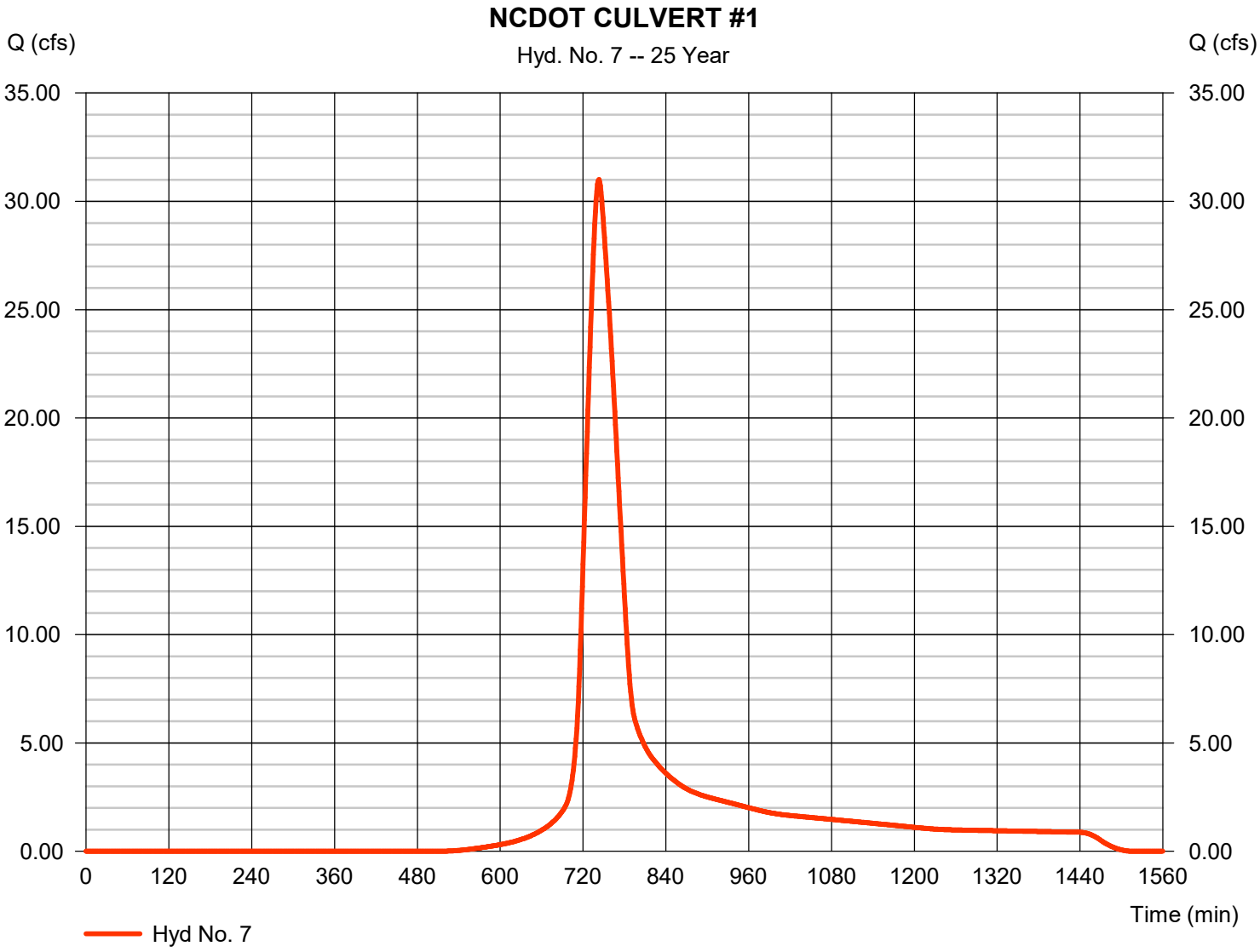


Hydrograph Report

Hyd. No. 7

NCDOT CULVERT #1

Hydrograph type	=	SCS Runoff	Peak discharge	=	31.01 cfs
Storm frequency	=	25 yrs	Time to peak	=	743 min
Time interval	=	1 min	Hyd. volume	=	171,988 cuft
Drainage area	=	15.820 ac	Curve number	=	72.5
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	49.03 min
Total precip.	=	5.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

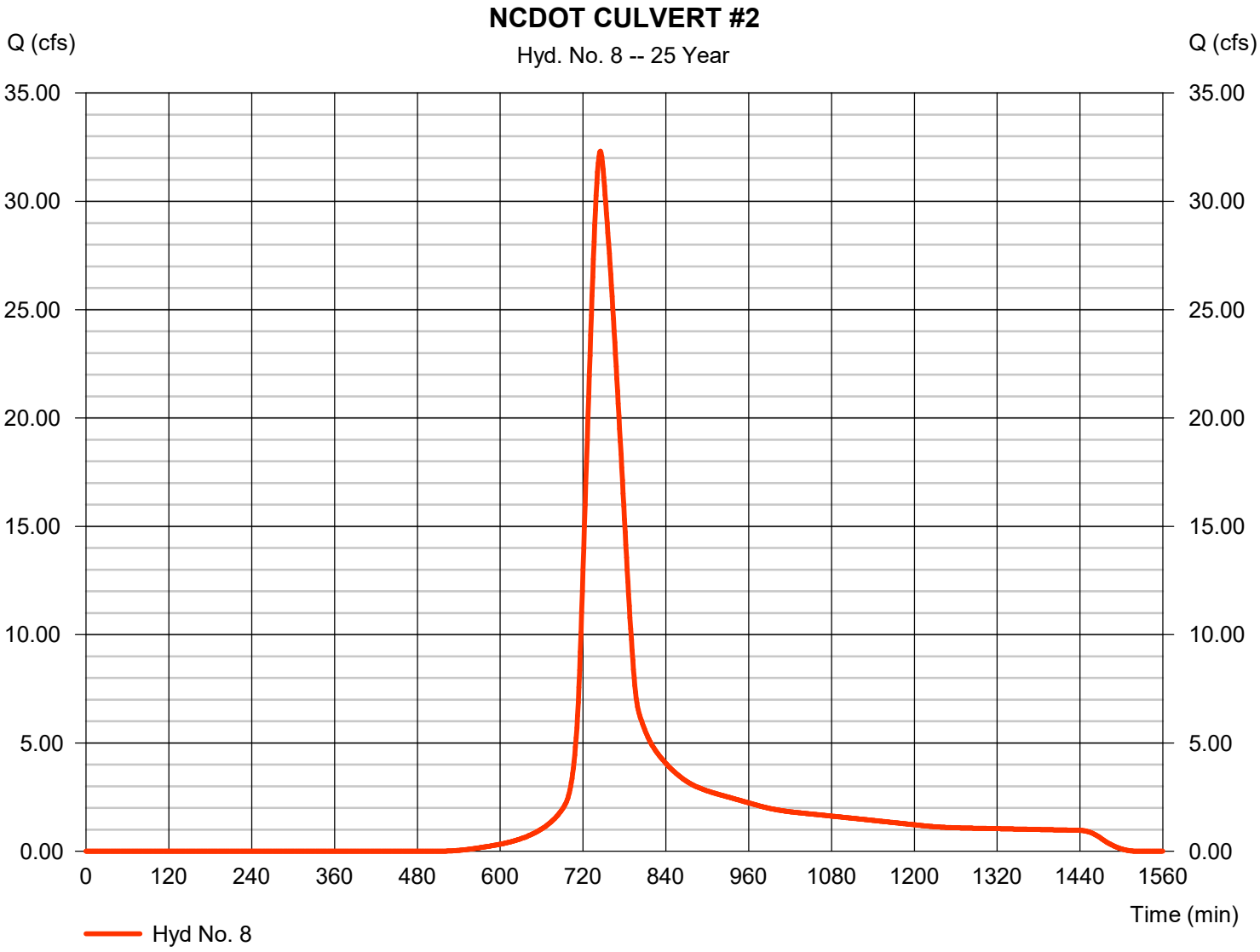


Hydrograph Report

Hyd. No. 8

NCDOT CULVERT #2

Hydrograph type	=	SCS Runoff	Peak discharge	=	32.32 cfs
Storm frequency	=	25 yrs	Time to peak	=	745 min
Time interval	=	1 min	Hyd. volume	=	189,153 cuft
Drainage area	=	17.200 ac	Curve number	=	72.6
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	50.89 min
Total precip.	=	5.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

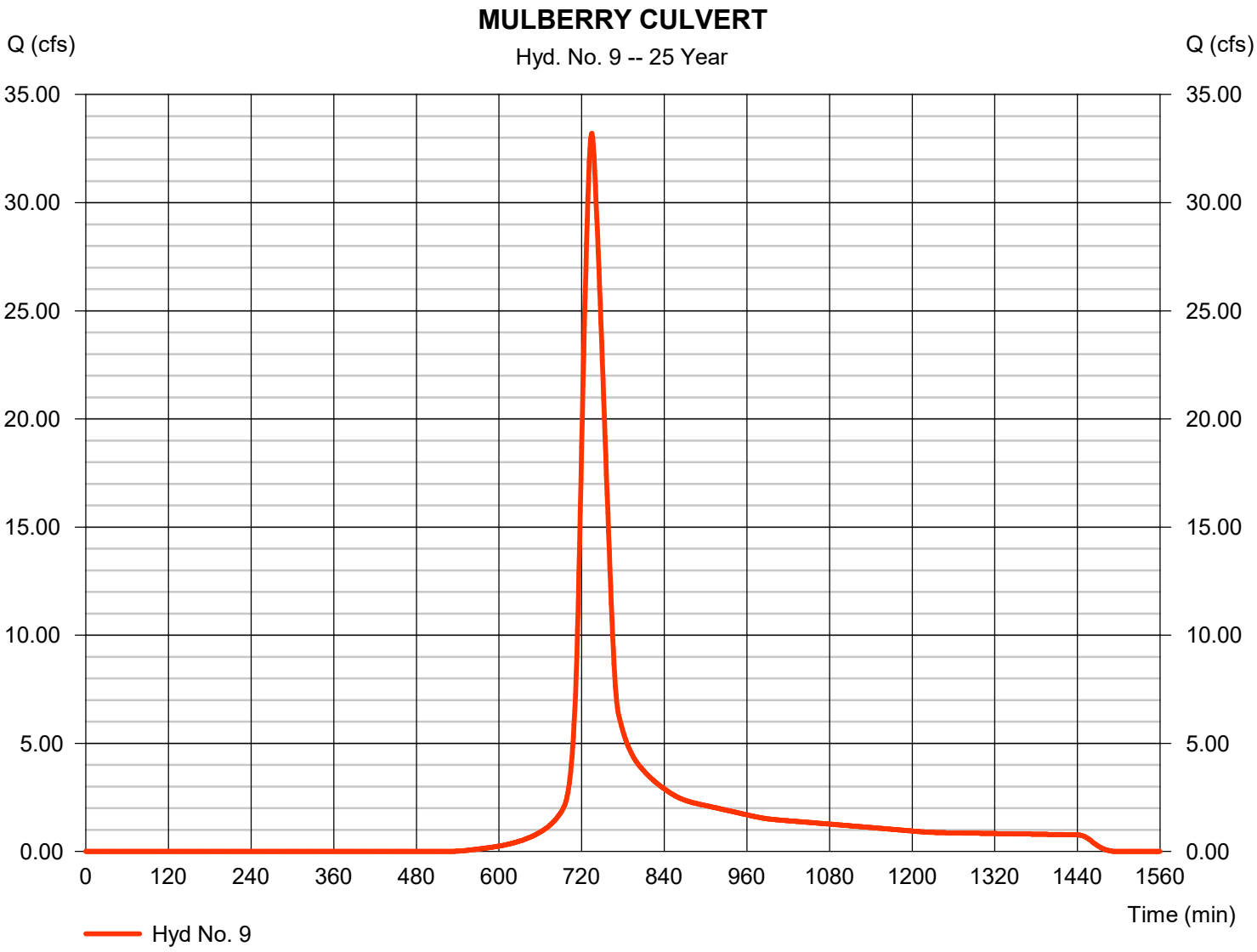


Hydrograph Report

Hyd. No. 9

MULBERRY CULVERT

Hydrograph type	=	SCS Runoff	Peak discharge	=	33.20 cfs
Storm frequency	=	25 yrs	Time to peak	=	735 min
Time interval	=	1 min	Hyd. volume	=	148,052 cuft
Drainage area	=	14.090 ac	Curve number	=	71.3
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	34.74 min
Total precip.	=	5.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

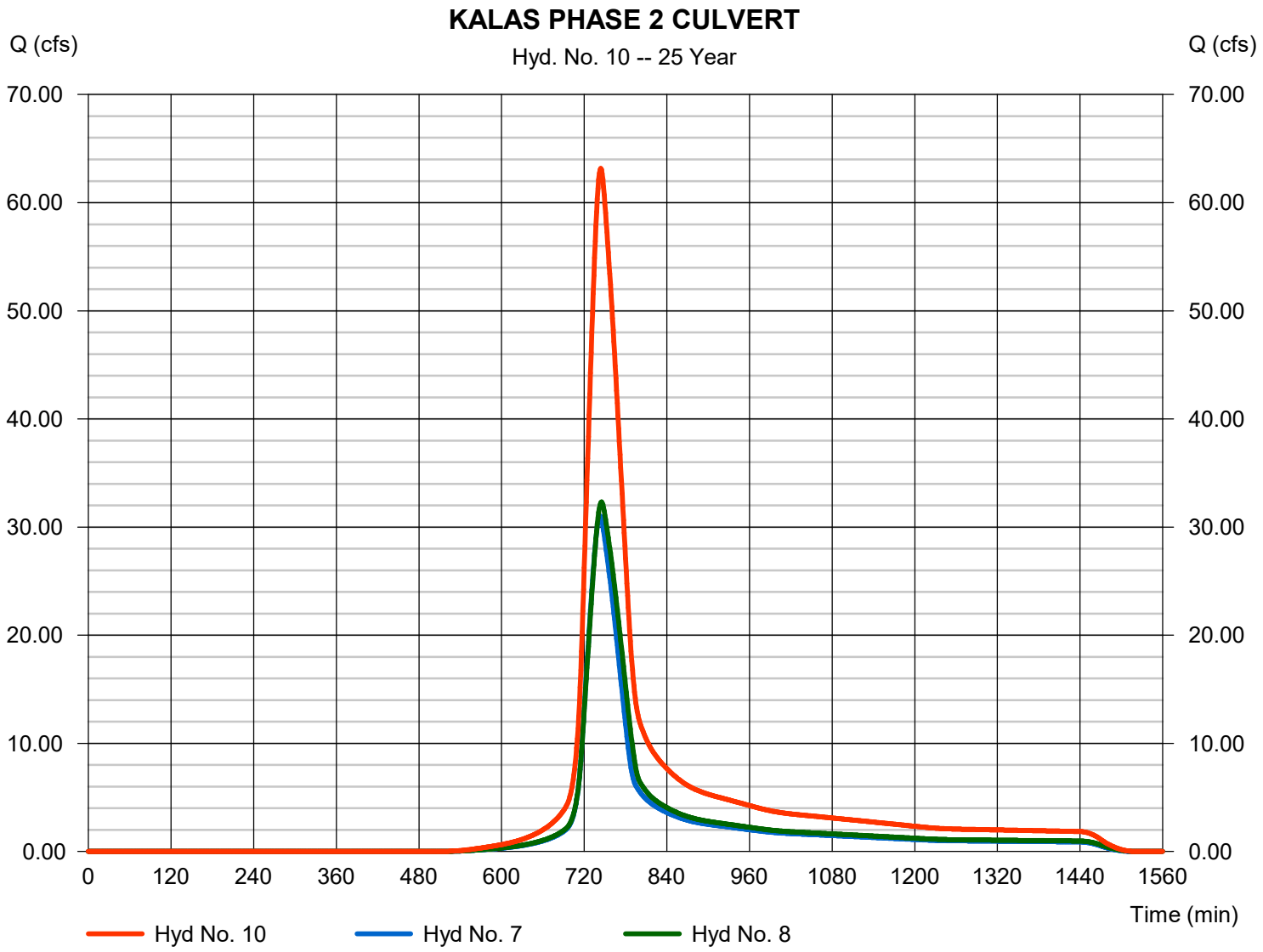


Hydrograph Report

Hyd. No. 10

KALAS PHASE 2 CULVERT

Hydrograph type	= Combine	Peak discharge	= 63.17 cfs
Storm frequency	= 25 yrs	Time to peak	= 744 min
Time interval	= 1 min	Hyd. volume	= 361,141 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 33.020 ac

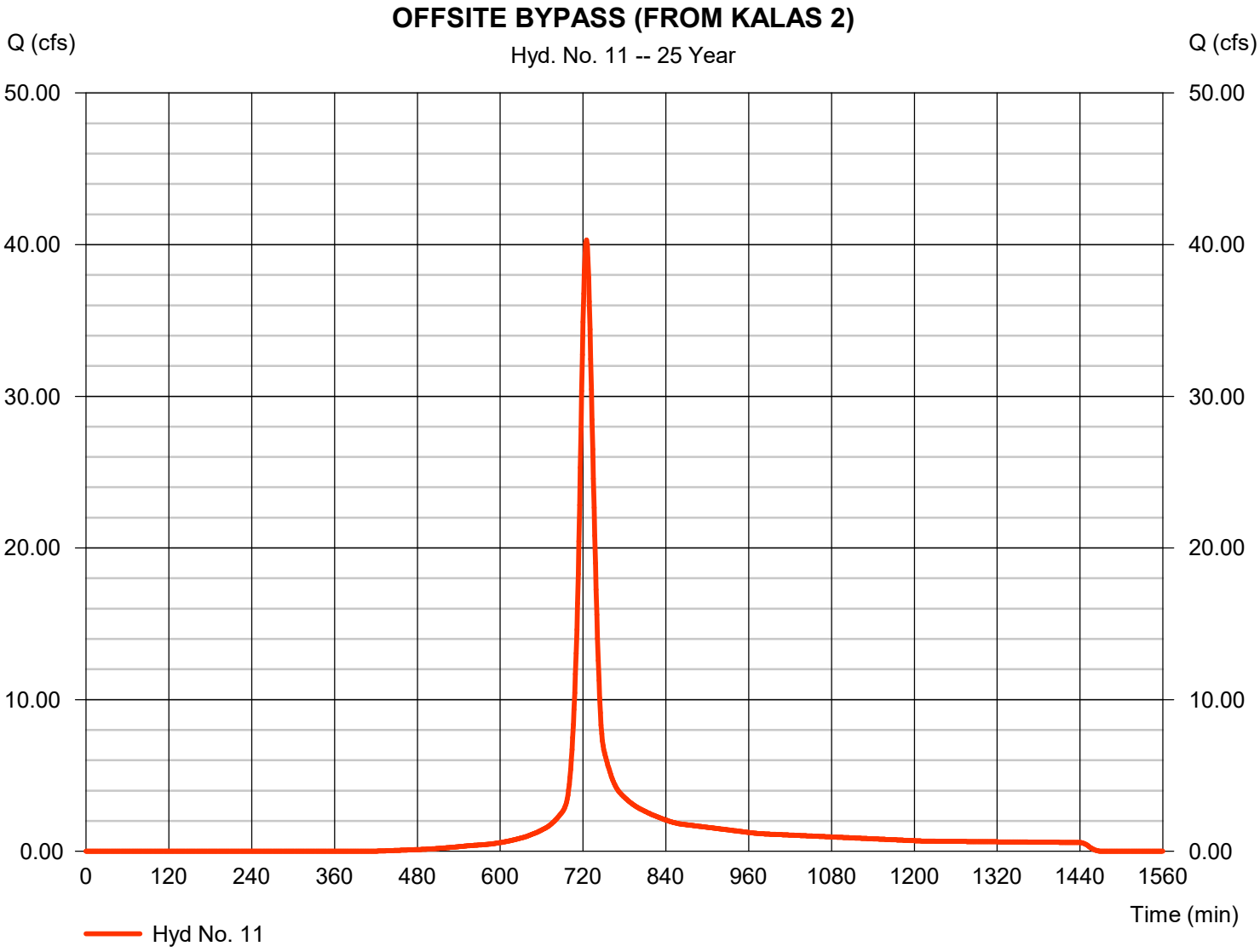


Hydrograph Report

Hyd. No. 11

OFFSITE BYPASS (FROM KALAS 2)

Hydrograph type	=	SCS Runoff	Peak discharge	=	40.31 cfs
Storm frequency	=	25 yrs	Time to peak	=	725 min
Time interval	=	1 min	Hyd. volume	=	126,090 cuft
Drainage area	=	9.720 ac	Curve number	=	78.3
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.90 min
Total precip.	=	5.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

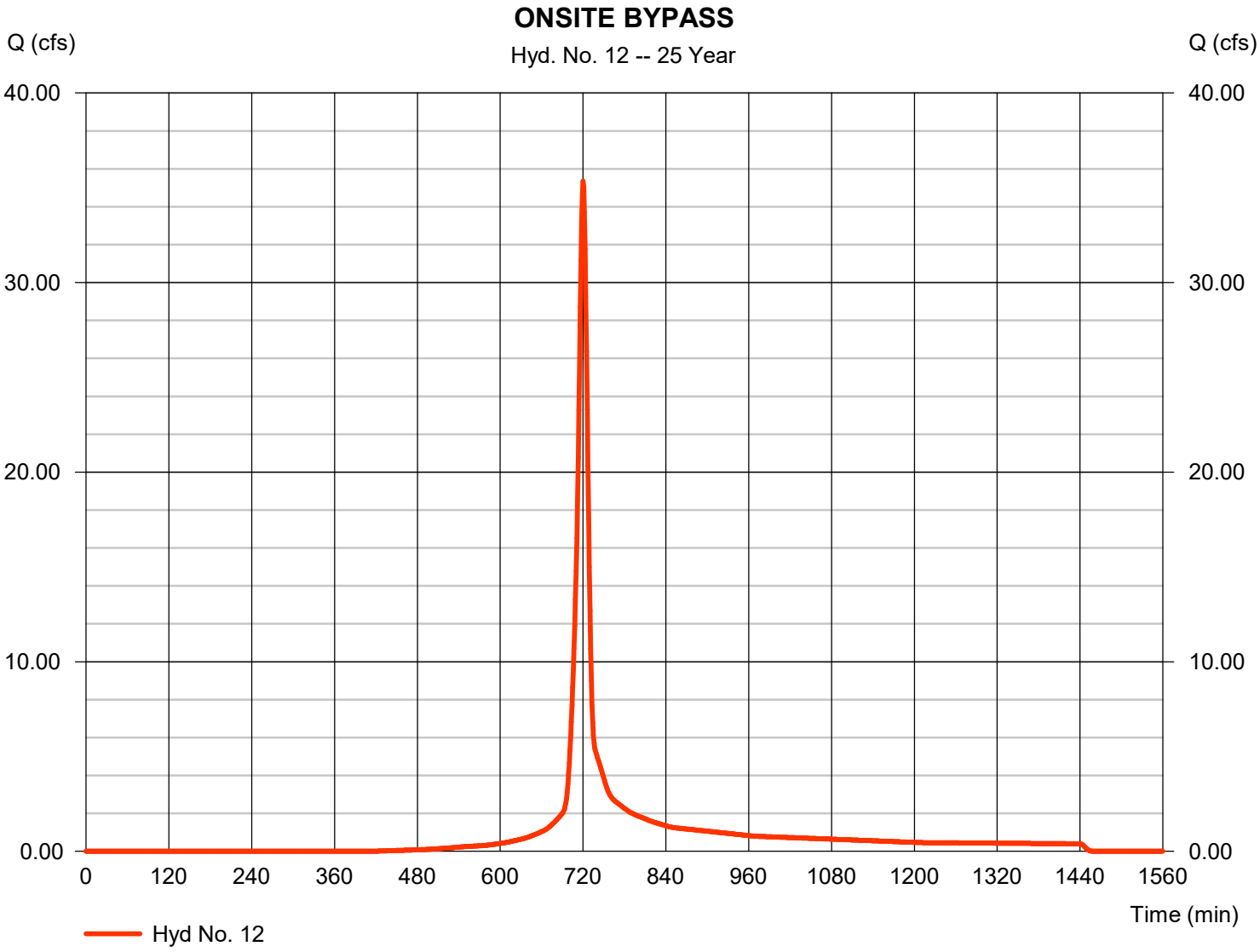


Hydrograph Report

Hyd. No. 12

ONSITE BYPASS

Hydrograph type	=	SCS Runoff	Peak discharge	=	35.35 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	86,021 cuft
Drainage area	=	6.570 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.56 min
Total precip.	=	5.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

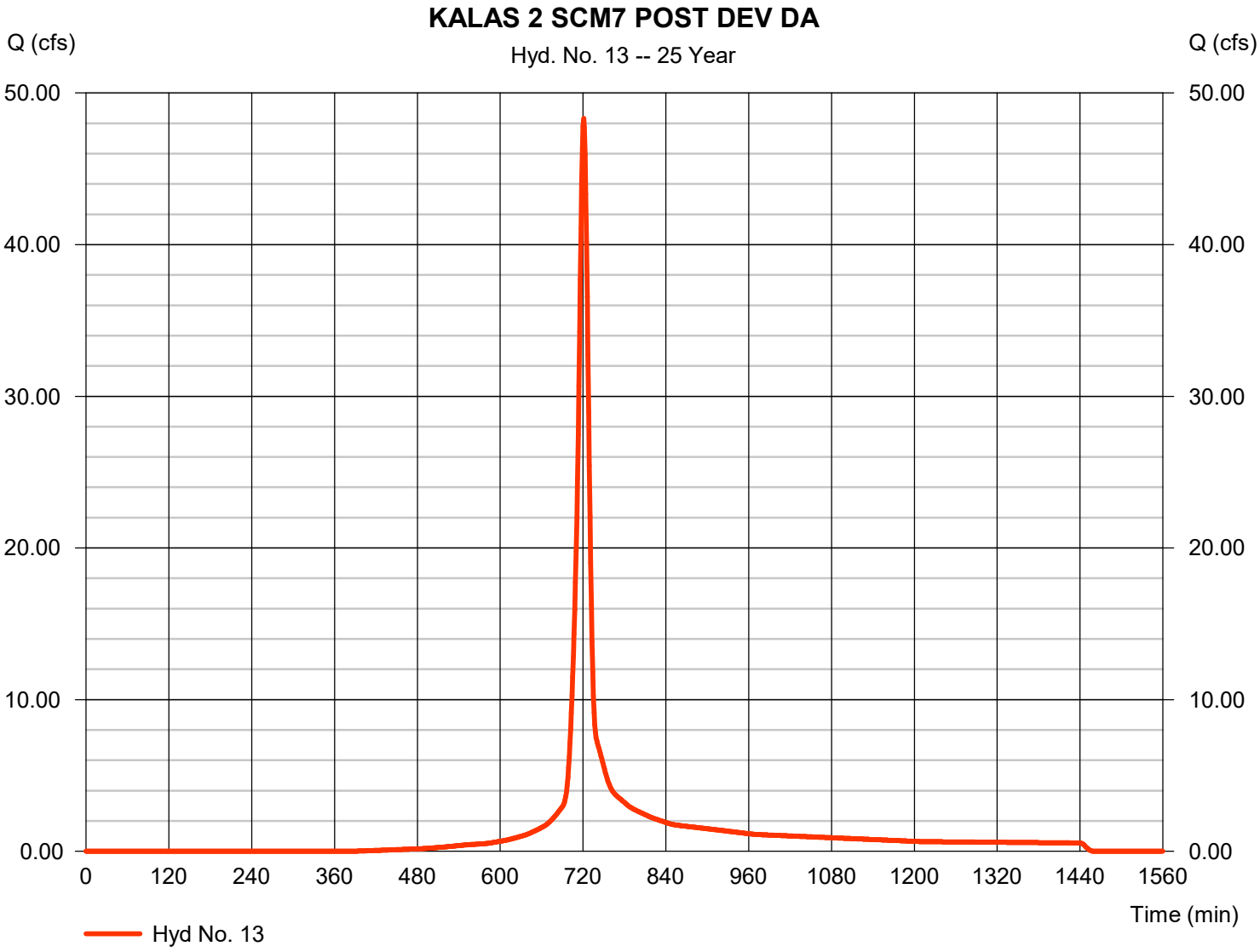


Hydrograph Report

Hyd. No. 13

KALAS 2 SCM7 POST DEV DA

Hydrograph type	=	SCS Runoff	Peak discharge	=	48.32 cfs
Storm frequency	=	25 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	123,250 cuft
Drainage area	=	9.260 ac	Curve number	=	79.8
Basin Slope	=	1.1 %	Hydraulic length	=	1505 ft
Tc method	=	KIRPICH	Time of conc. (Tc)	=	12.38 min
Total precip.	=	5.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



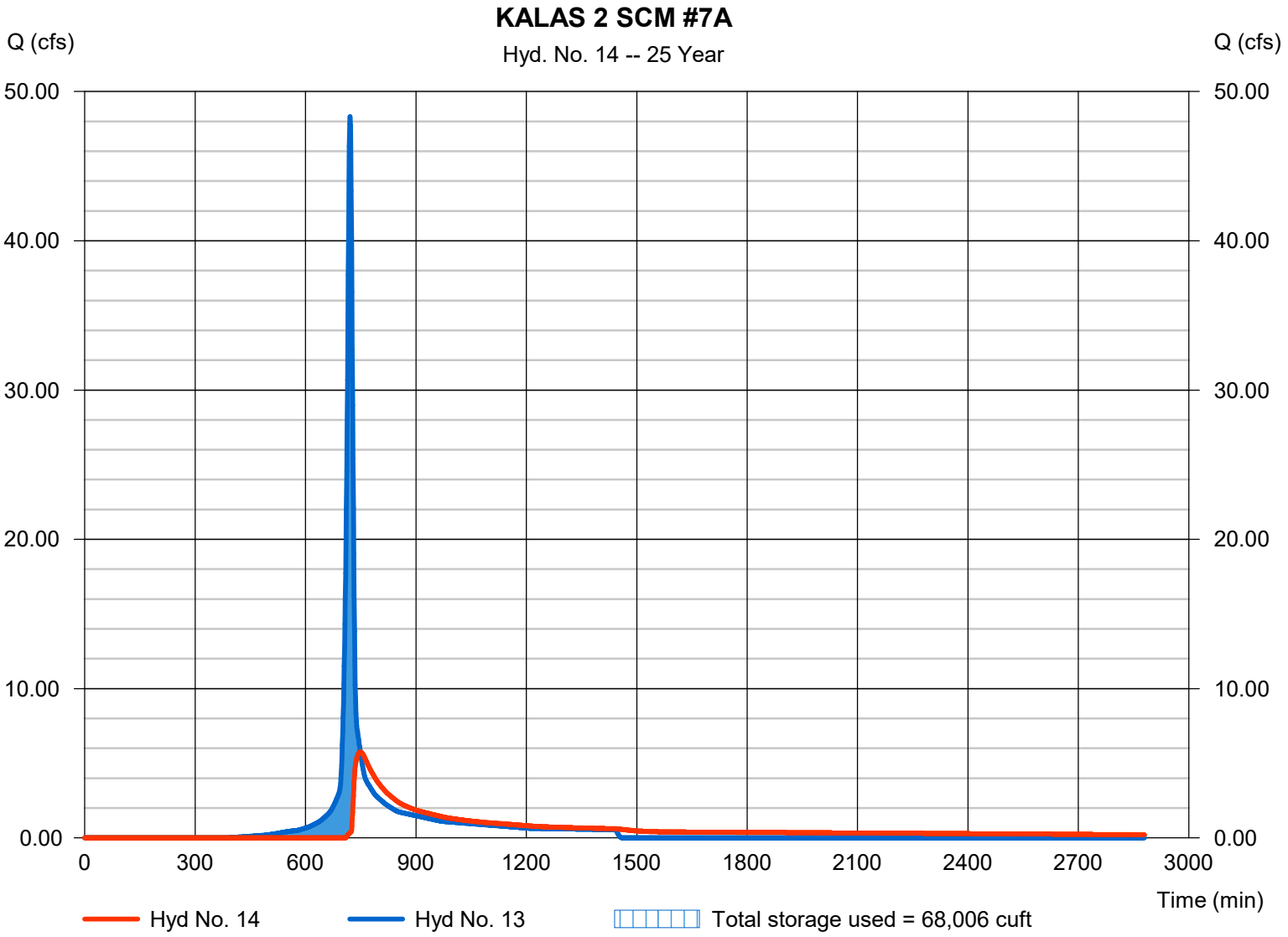
Hydrograph Report

Hyd. No. 14

KALAS 2 SCM #7A

Hydrograph type	=	Reservoir	Peak discharge	=	5.755 cfs
Storm frequency	=	25 yrs	Time to peak	=	749 min
Time interval	=	1 min	Hyd. volume	=	95,254 cuft
Inflow hyd. No.	=	13 - KALAS 2 SCM7 POST DEVDA	Max. Elevation	=	374.60 ft
Reservoir name	=	SCM #7A	Max. Storage	=	68,006 cuft

Storage Indication method used.

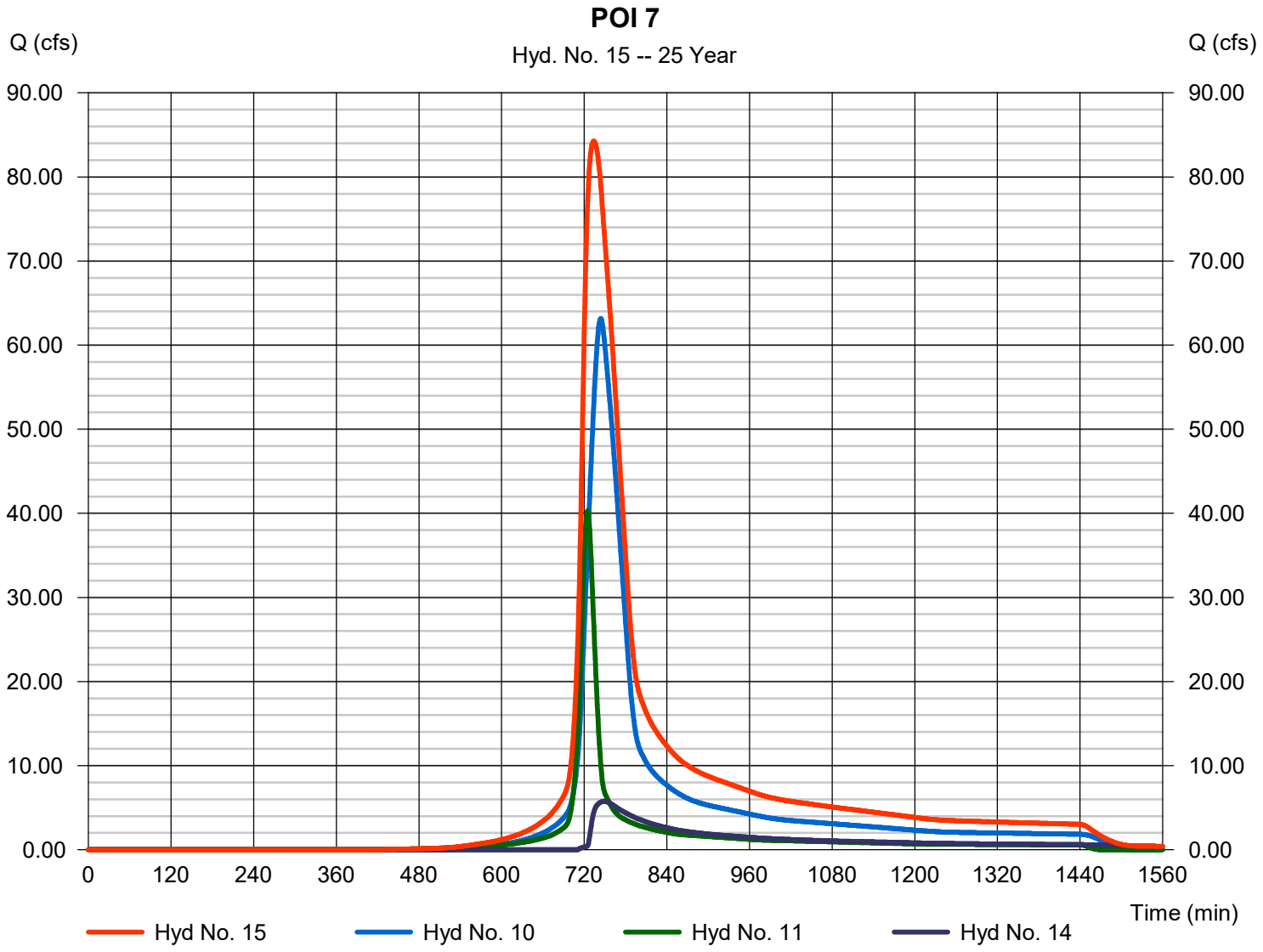


Hydrograph Report

Hyd. No. 15

POI 7

Hydrograph type	=	Combine	Peak discharge	=	84.27 cfs
Storm frequency	=	25 yrs	Time to peak	=	734 min
Time interval	=	1 min	Hyd. volume	=	582,485 cuft
Inflow hyds.	=	10, 11, 14	Contrib. drain. area	=	9.720 ac

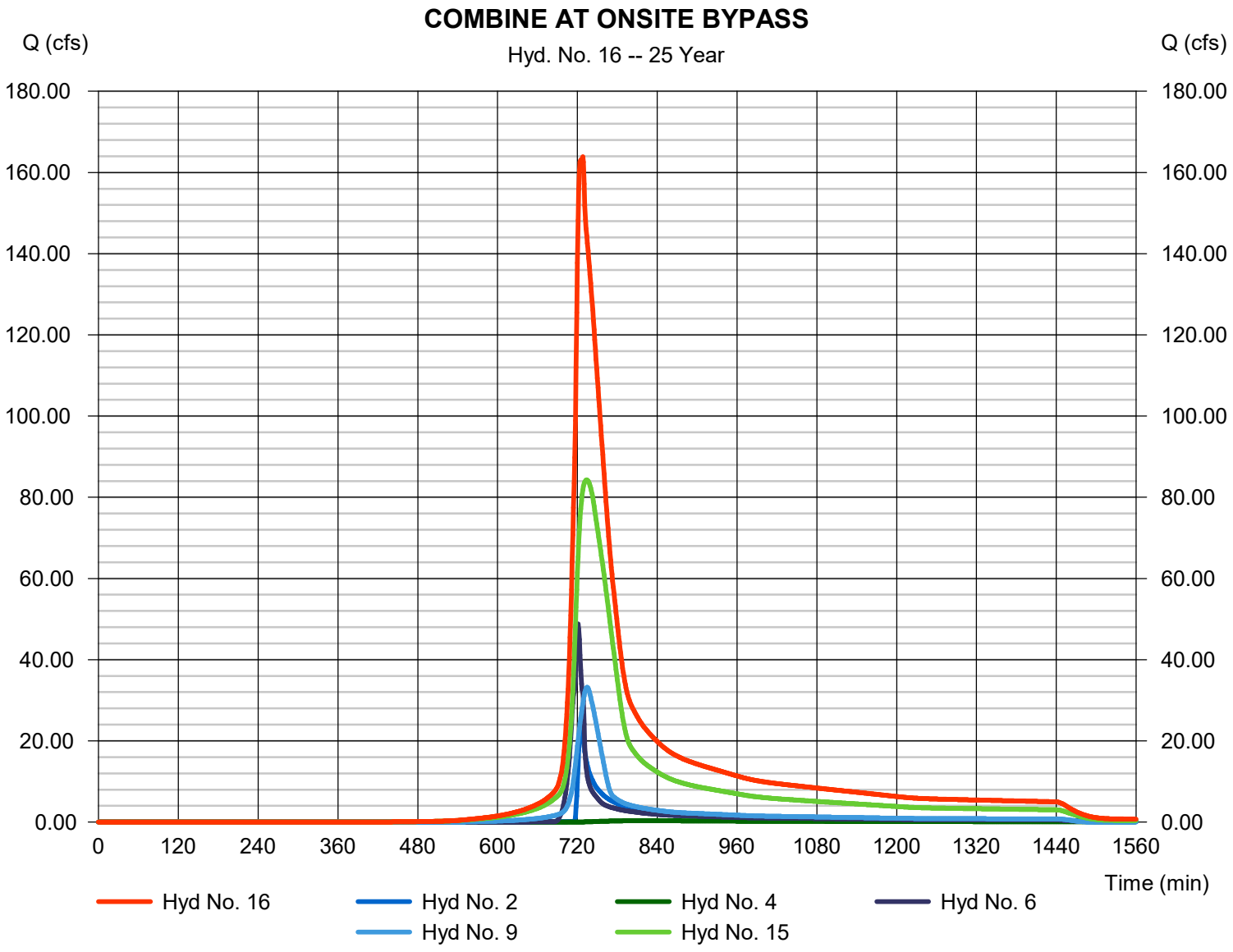


Hydrograph Report

Hyd. No. 16

COMBINE AT ONSITE BYPASS

Hydrograph type	=	Combine	Peak discharge	=	163.87 cfs
Storm frequency	=	25 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	957,423 cuft
Inflow hyds.	=	2, 4, 6, 9, 15	Contrib. drain. area	=	14.090 ac

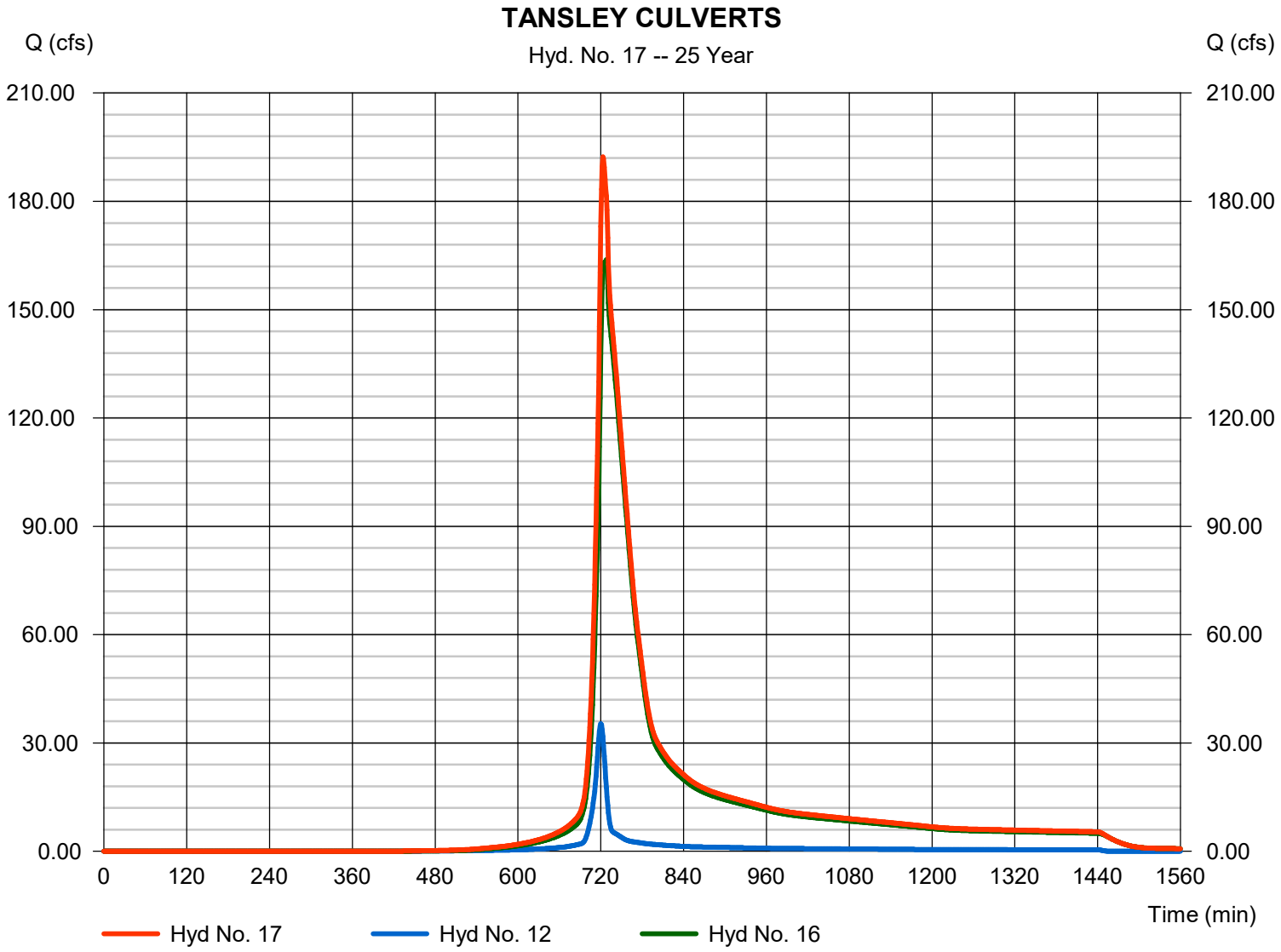


Hydrograph Report

Hyd. No. 17

TANSLEY CULVERTS

Hydrograph type	=	Combine	Peak discharge	=	192.31 cfs
Storm frequency	=	25 yrs	Time to peak	=	723 min
Time interval	=	1 min	Hyd. volume	=	1,043,443 cuft
Inflow hyds.	=	12, 16	Contrib. drain. area	=	6.570 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

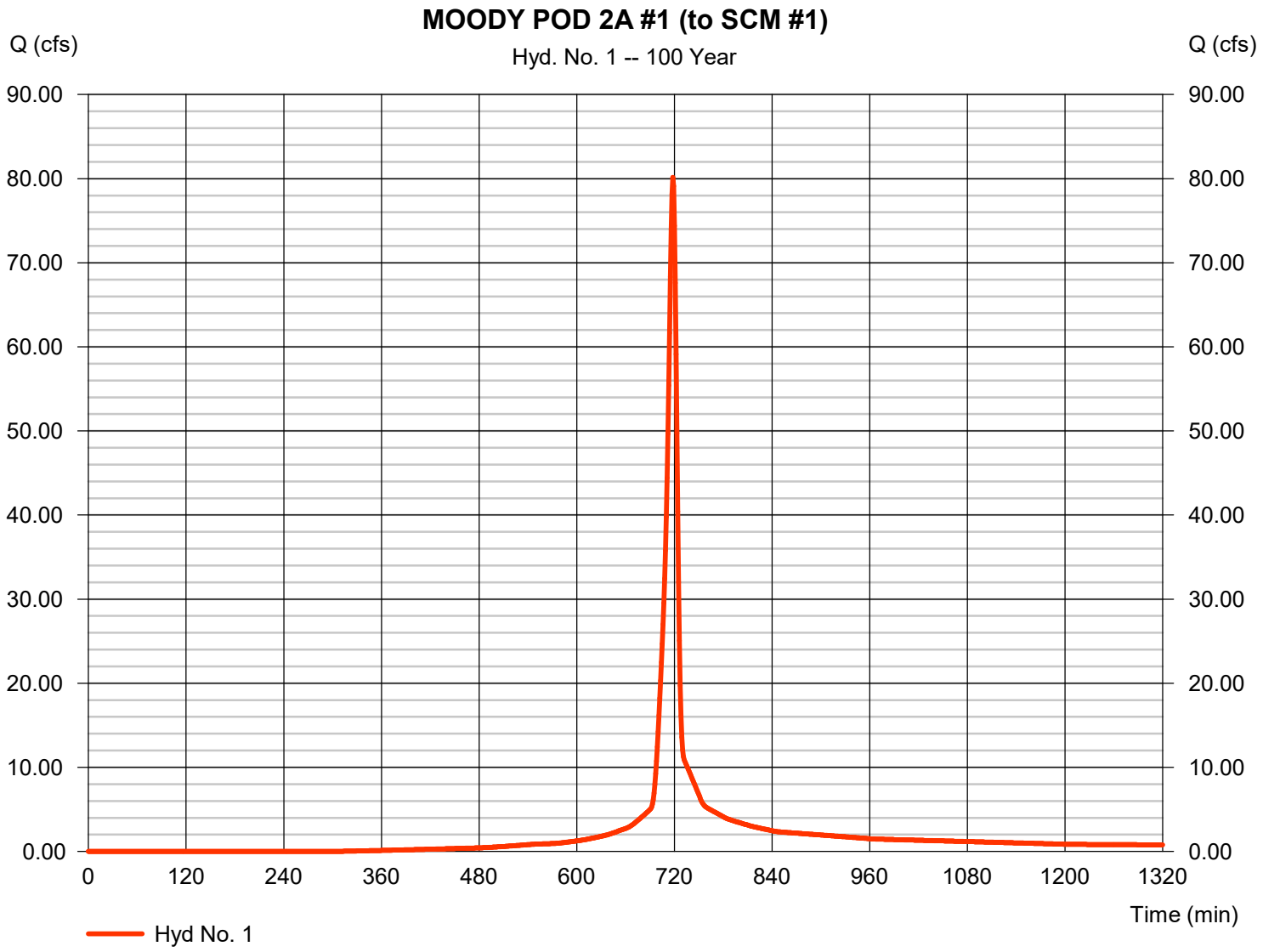
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	80.14	1	718	176,021	------	------	------	MOODY POD 2A #1 (to SCM #1)
2	Reservoir	59.45	1	722	146,255	1	367.03	113,594	MOODY SCM #1
3	SCS Runoff	12.79	1	717	26,982	------	------	------	MOODY POD 2A #2 (to SCM #2)
4	Reservoir	1.006	1	750	17,972	3	363.18	31,526	MOODY SCM #2
5	SCS Runoff	76.01	1	718	167,702	------	------	------	MOODY POD 2A #3 (to SCM #3)
6	Reservoir	70.48	1	720	160,010	5	364.48	45,503	MOODY SCM #3
7	SCS Runoff	44.43	1	743	244,683	------	------	------	NCDOT CULVERT #1
8	SCS Runoff	46.30	1	745	268,950	------	------	------	NCDOT CULVERT #2
9	SCS Runoff	47.93	1	734	212,094	------	------	------	MULBERRY CULVERT
10	Combine	90.50	1	744	513,634	7, 8,	------	------	KALAS PHASE 2 CULVERT
11	SCS Runoff	55.22	1	725	173,878	------	------	------	OFFSITE BYPASS (FROM KALAS 2)
12	SCS Runoff	48.32	1	720	118,805	------	------	------	ONSITE BYPASS
13	SCS Runoff	65.36	1	721	168,684	------	------	------	KALAS 2 SCM7 POST DEV DA
14	Reservoir	24.08	1	731	140,354	13	375.56	82,868	KALAS 2 SCM #7A
15	Combine	138.29	1	731	827,866	10, 11, 14	------	------	POI 7
16	Combine	262.83	1	723	1,364,194	2, 4, 6, 9, 15	------	------	COMBINE AT ONSITE BYPASS
17	Combine	306.41	1	722	1,483,001	12, 16	------	------	TANSLEY CULVERTS

Hydrograph Report

Hyd. No. 1

MOODY POD 2A #1 (to SCM #1)

Hydrograph type	=	SCS Runoff	Peak discharge	=	80.14 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	1 min	Hyd. volume	=	176,021 cuft
Drainage area	=	9.460 ac	Curve number	=	81.2
Basin Slope	=	2.4 %	Hydraulic length	=	1000 ft
Tc method	=	KIRPICH	Time of conc. (Tc)	=	6.69 min
Total precip.	=	7.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



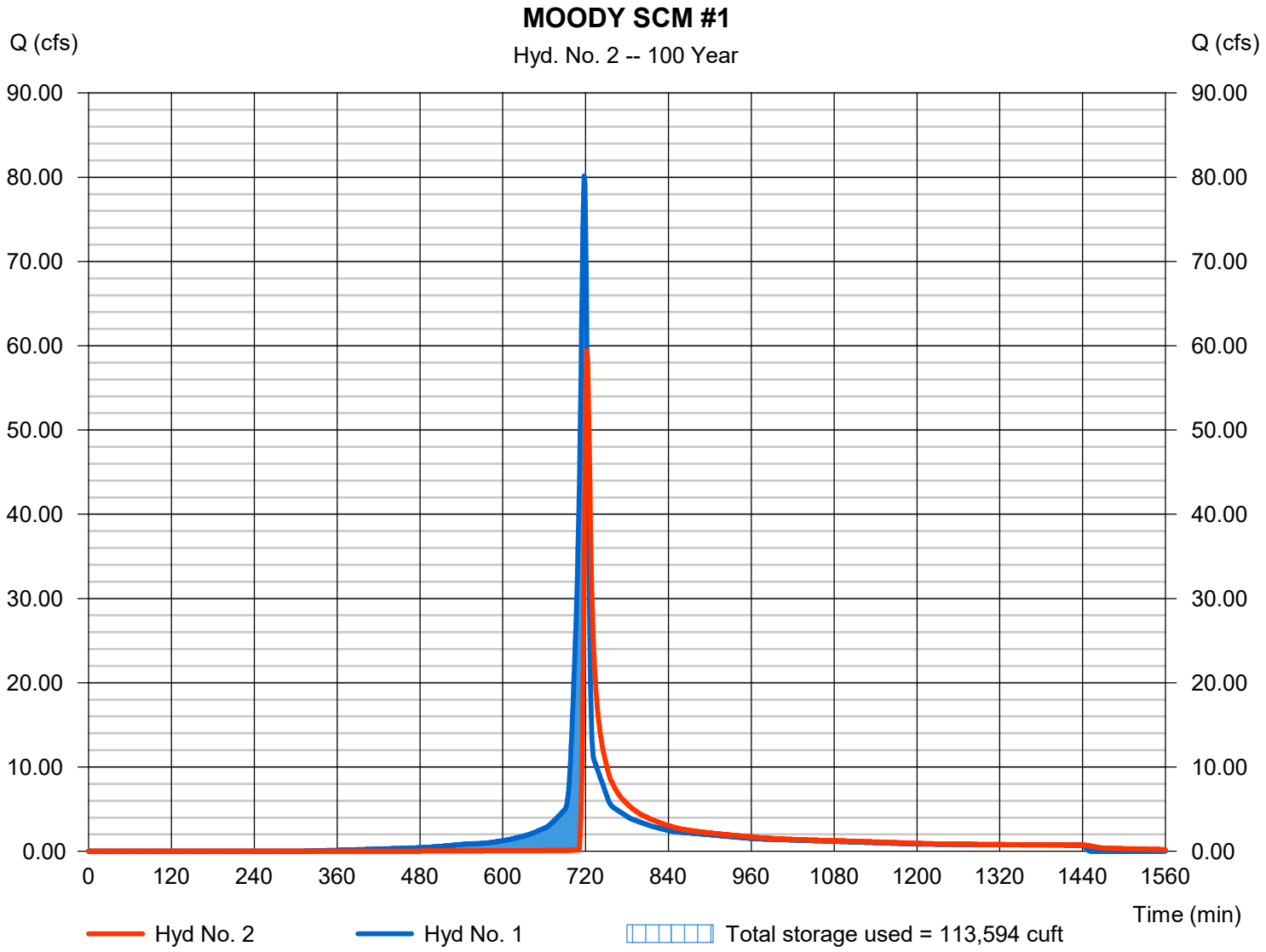
Hydrograph Report

Hyd. No. 2

MOODY SCM #1

Hydrograph type	=	Reservoir	Peak discharge	=	59.45 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	146,255 cuft
Inflow hyd. No.	=	1 - MOODY POD 2A #1 (to SCM #1)	Max. Elevation	=	367.03 ft
Reservoir name	=	SCM #1	Max. Storage	=	113,594 cuft

Storage Indication method used. Wet pond routing start elevation = 363.50 ft.

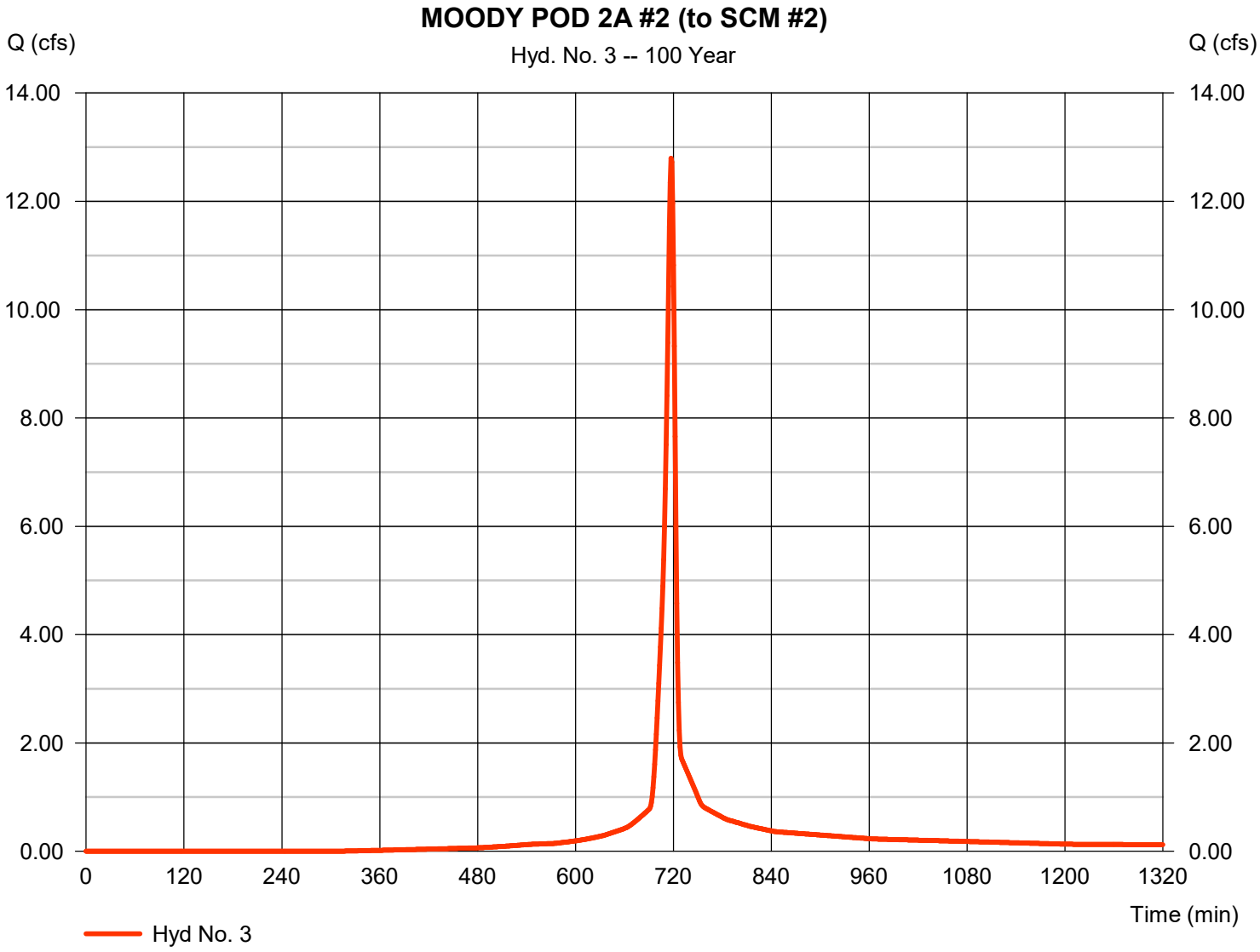


Hydrograph Report

Hyd. No. 3

MOODY POD 2A #2 (to SCM #2)

Hydrograph type	= SCS Runoff	Peak discharge	= 12.79 cfs
Storm frequency	= 100 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 26,982 cuft
Drainage area	= 1.380 ac	Curve number	= 80.9
Basin Slope	= 0.5 %	Hydraulic length	= 450 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.46 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



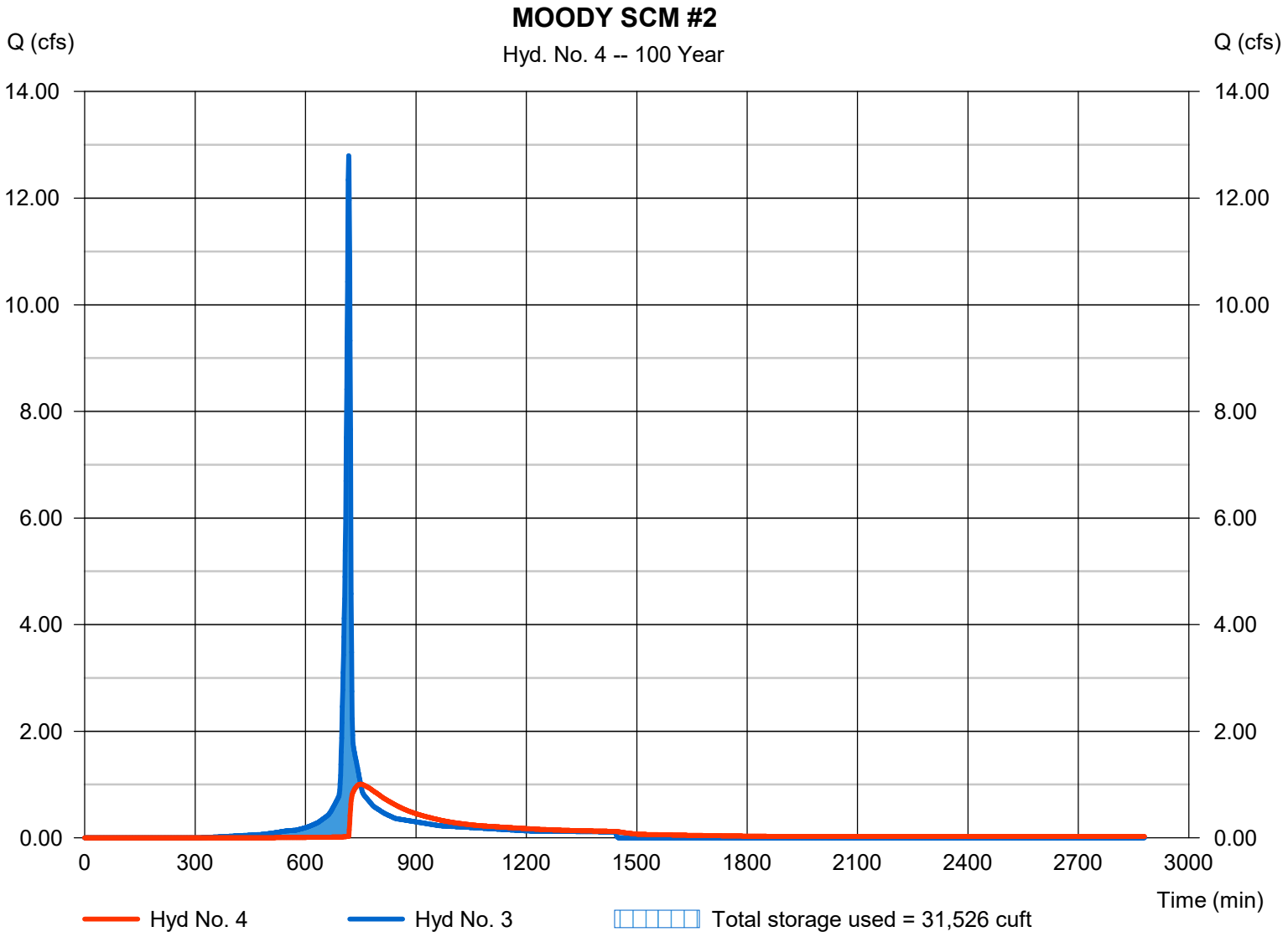
Hydrograph Report

Hyd. No. 4

MOODY SCM #2

Hydrograph type	=	Reservoir	Peak discharge	=	1.006 cfs
Storm frequency	=	100 yrs	Time to peak	=	750 min
Time interval	=	1 min	Hyd. volume	=	17,972 cuft
Inflow hyd. No.	=	3 - MOODY POD 2A #2 (to SCM #2)	Max. Elevation	=	363.18 ft
Reservoir name	=	SCM #2	Max. Storage	=	31,526 cuft

Storage Indication method used. Wet pond routing start elevation = 361.50 ft.

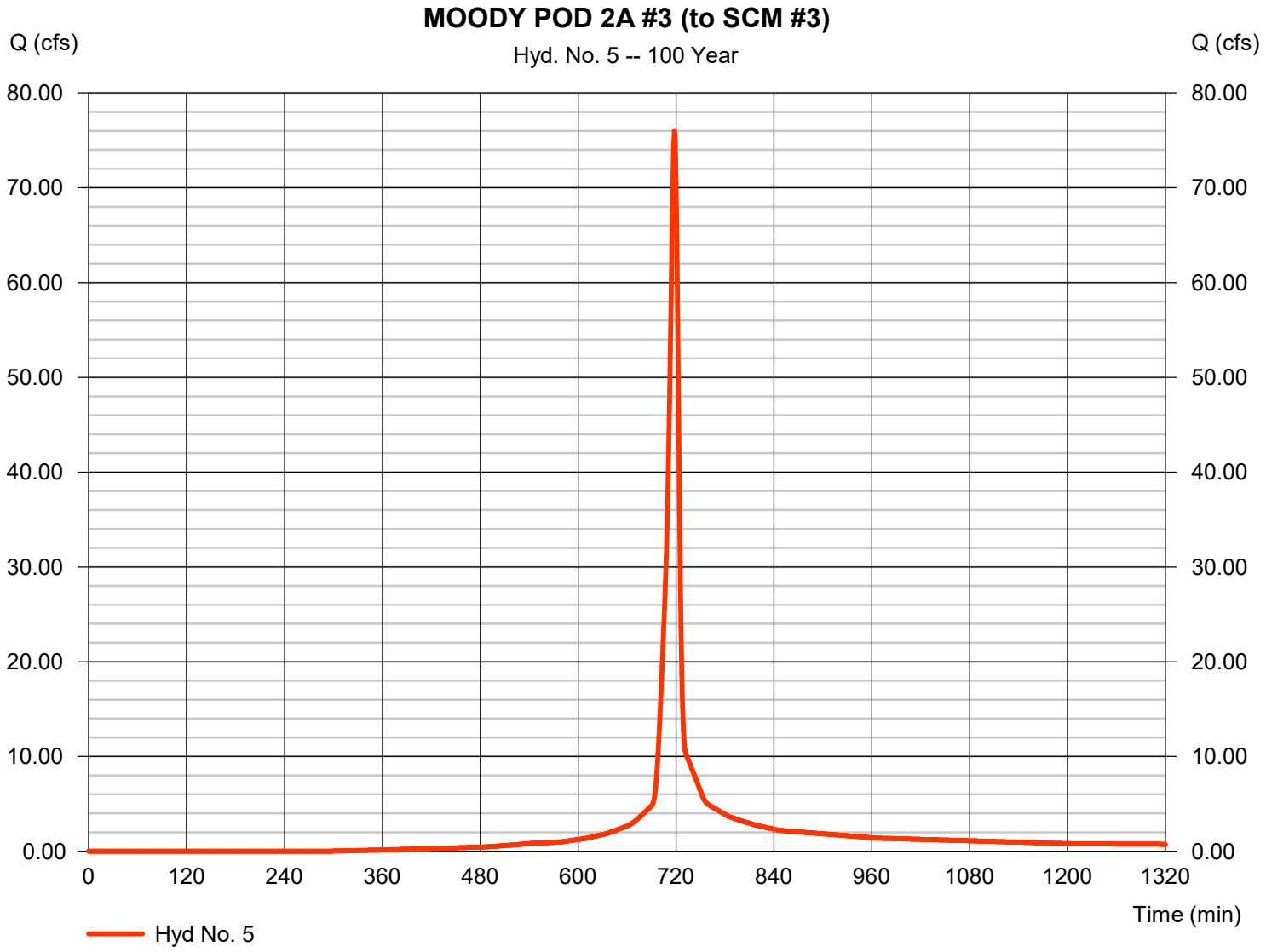


Hydrograph Report

Hyd. No. 5

MOODY POD 2A #3 (to SCM #3)

Hydrograph type	=	SCS Runoff	Peak discharge	=	76.01 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	1 min	Hyd. volume	=	167,702 cuft
Drainage area	=	8.840 ac	Curve number	=	82.1
Basin Slope	=	2.6 %	Hydraulic length	=	1120 ft
Tc method	=	KIRPICH	Time of conc. (Tc)	=	7.08 min
Total precip.	=	7.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



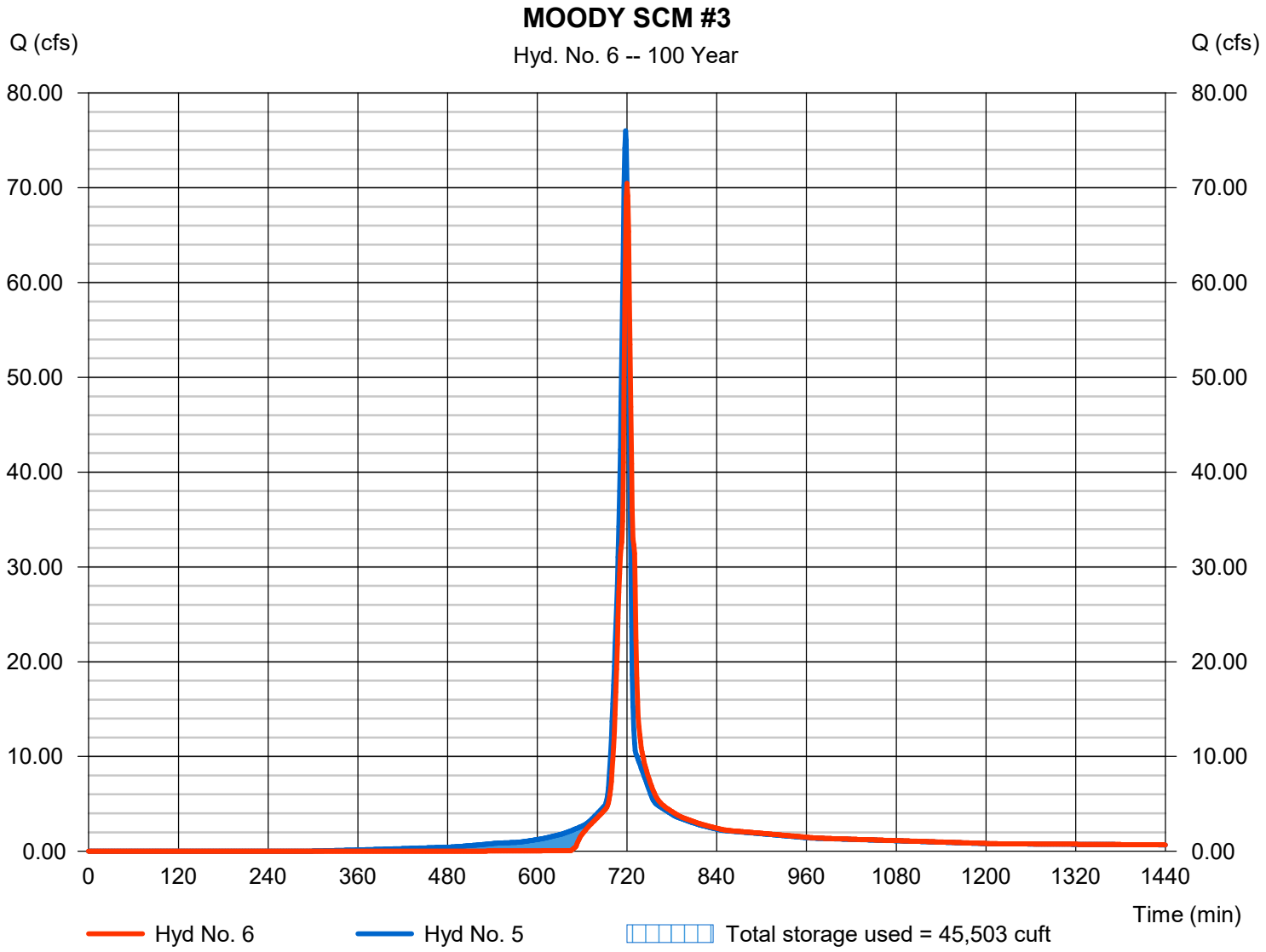
Hydrograph Report

Hyd. No. 6

MOODY SCM #3

Hydrograph type	=	Reservoir	Peak discharge	=	70.48 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	160,010 cuft
Inflow hyd. No.	=	5 - MOODY POD 2A #3 (to SCM #3)	Max. Elevation	=	364.48 ft
Reservoir name	=	SCM #3	Max. Storage	=	45,503 cuft

Storage Indication method used. Wet pond routing start elevation = 361.00 ft.

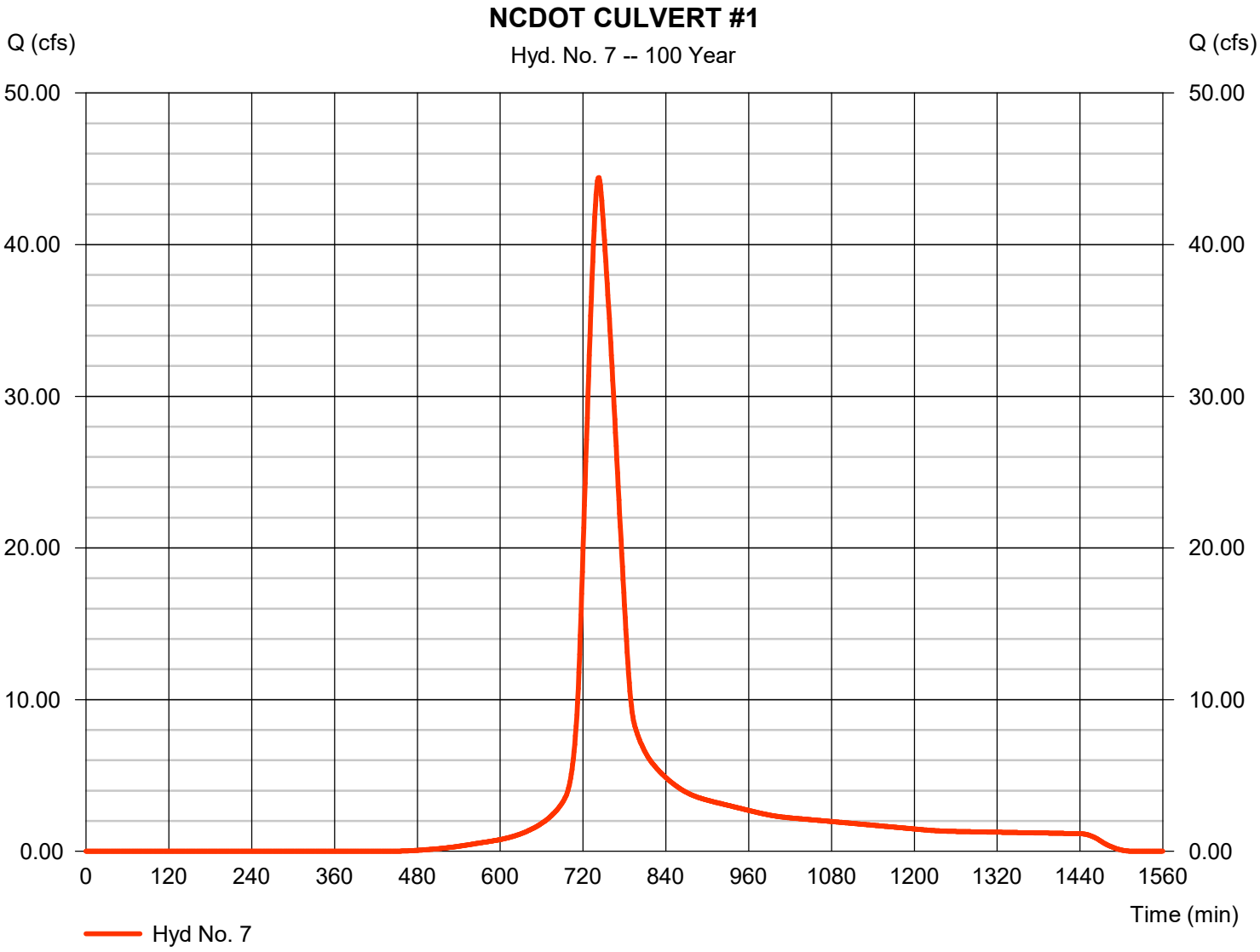


Hydrograph Report

Hyd. No. 7

NCDOT CULVERT #1

Hydrograph type	=	SCS Runoff	Peak discharge	=	44.43 cfs
Storm frequency	=	100 yrs	Time to peak	=	743 min
Time interval	=	1 min	Hyd. volume	=	244,683 cuft
Drainage area	=	15.820 ac	Curve number	=	72.5
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	49.03 min
Total precip.	=	7.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

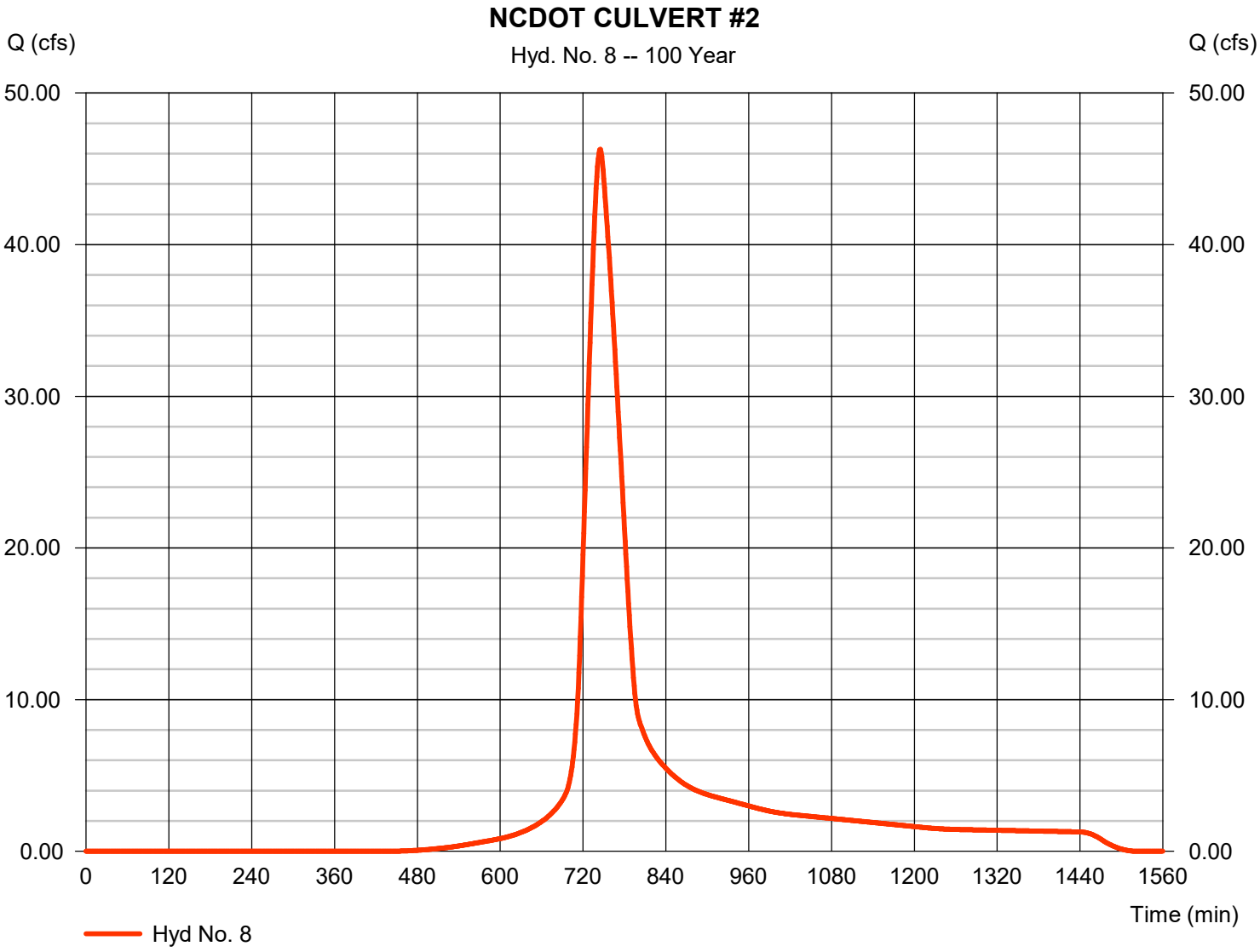


Hydrograph Report

Hyd. No. 8

NCDOT CULVERT #2

Hydrograph type	=	SCS Runoff	Peak discharge	=	46.30 cfs
Storm frequency	=	100 yrs	Time to peak	=	745 min
Time interval	=	1 min	Hyd. volume	=	268,950 cuft
Drainage area	=	17.200 ac	Curve number	=	72.6
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	50.89 min
Total precip.	=	7.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

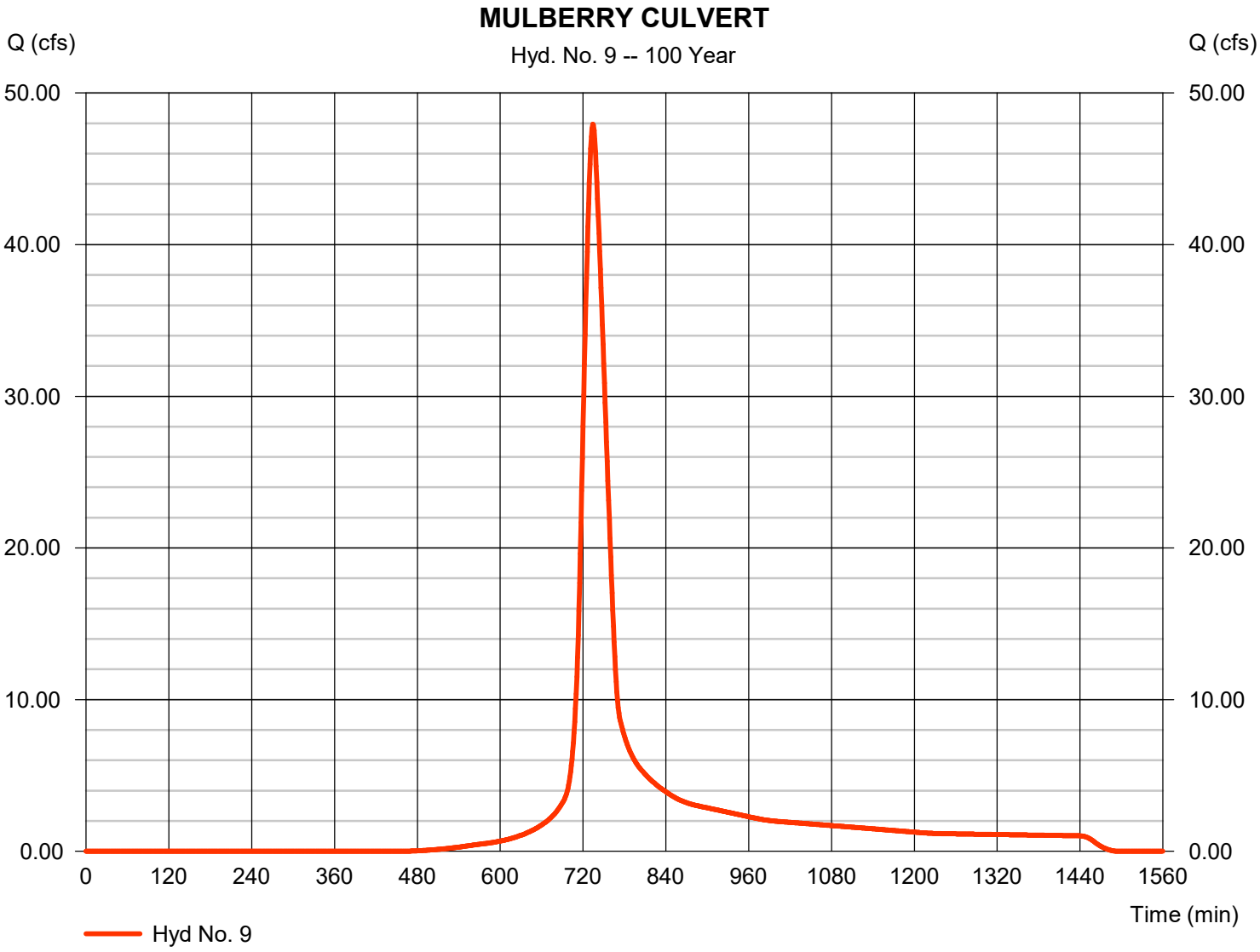


Hydrograph Report

Hyd. No. 9

MULBERRY CULVERT

Hydrograph type	=	SCS Runoff	Peak discharge	=	47.93 cfs
Storm frequency	=	100 yrs	Time to peak	=	734 min
Time interval	=	1 min	Hyd. volume	=	212,094 cuft
Drainage area	=	14.090 ac	Curve number	=	71.3
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	34.74 min
Total precip.	=	7.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

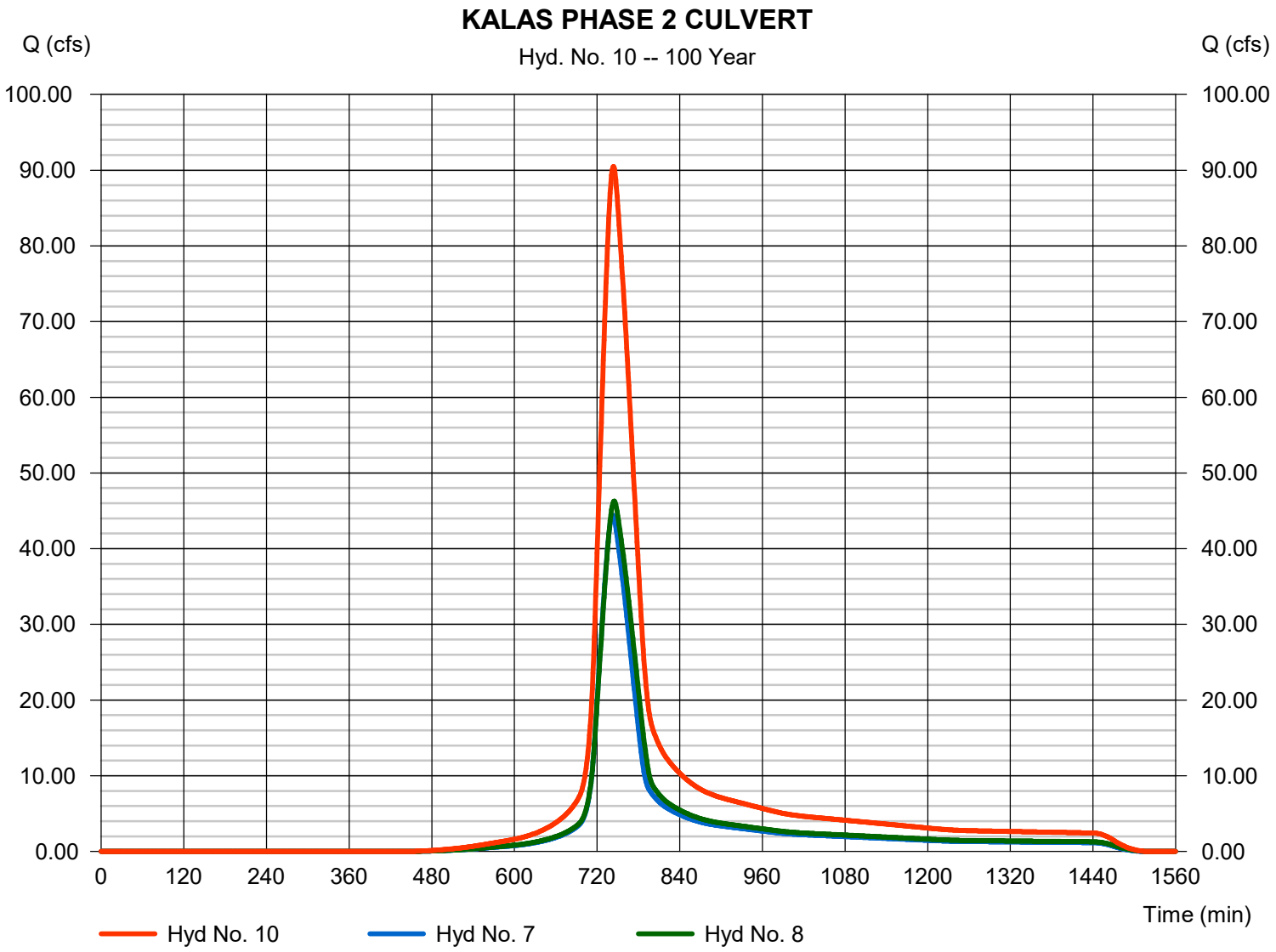


Hydrograph Report

Hyd. No. 10

KALAS PHASE 2 CULVERT

Hydrograph type	= Combine	Peak discharge	= 90.50 cfs
Storm frequency	= 100 yrs	Time to peak	= 744 min
Time interval	= 1 min	Hyd. volume	= 513,634 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 33.020 ac

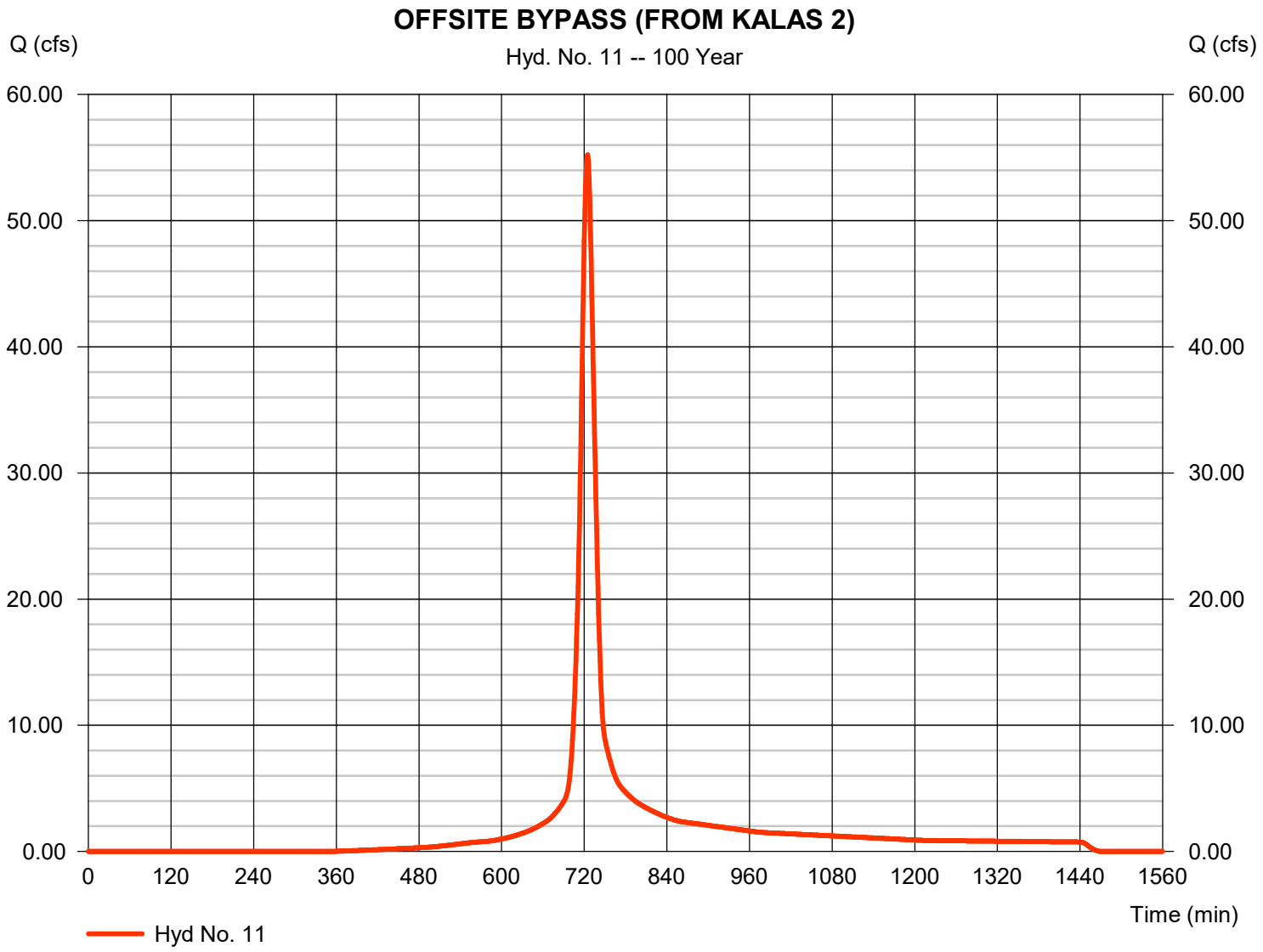


Hydrograph Report

Hyd. No. 11

OFFSITE BYPASS (FROM KALAS 2)

Hydrograph type	=	SCS Runoff	Peak discharge	=	55.22 cfs
Storm frequency	=	100 yrs	Time to peak	=	725 min
Time interval	=	1 min	Hyd. volume	=	173,878 cuft
Drainage area	=	9.720 ac	Curve number	=	78.3
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.90 min
Total precip.	=	7.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

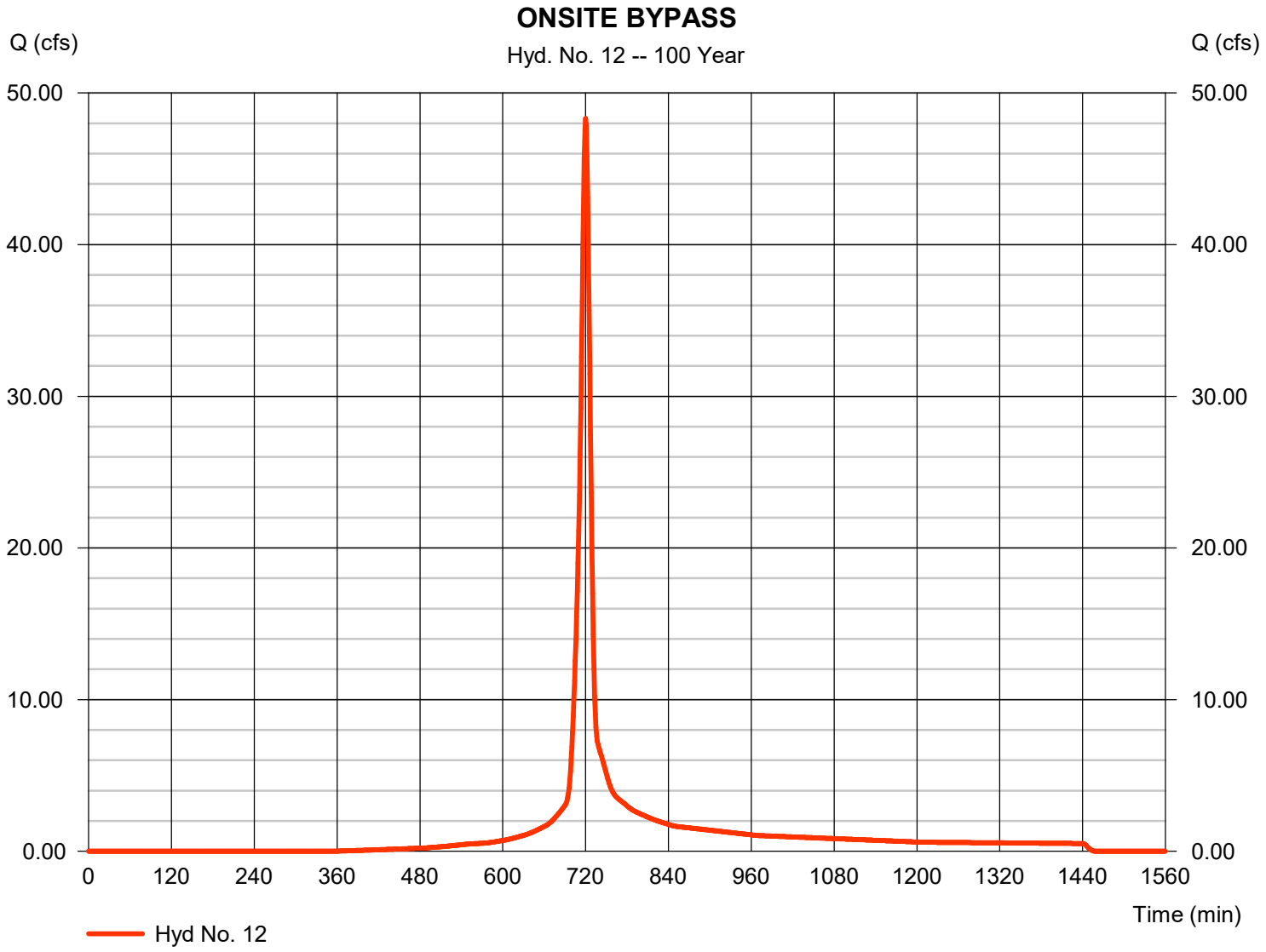


Hydrograph Report

Hyd. No. 12

ONSITE BYPASS

Hydrograph type	=	SCS Runoff	Peak discharge	=	48.32 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	118,805 cuft
Drainage area	=	6.570 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.56 min
Total precip.	=	7.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

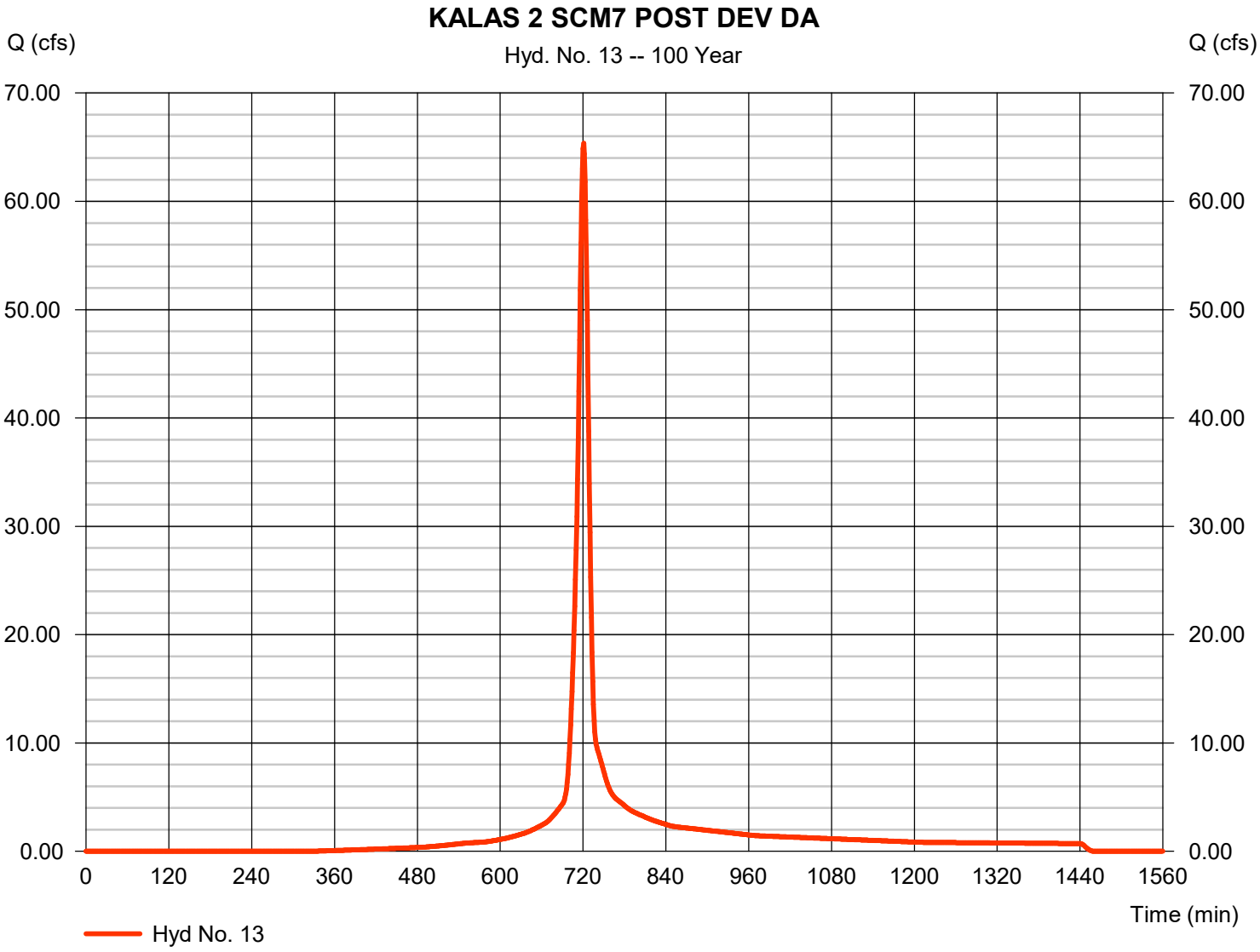


Hydrograph Report

Hyd. No. 13

KALAS 2 SCM7 POST DEV DA

Hydrograph type	=	SCS Runoff	Peak discharge	=	65.36 cfs
Storm frequency	=	100 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	168,684 cuft
Drainage area	=	9.260 ac	Curve number	=	79.8
Basin Slope	=	1.1 %	Hydraulic length	=	1505 ft
Tc method	=	KIRPICH	Time of conc. (Tc)	=	12.38 min
Total precip.	=	7.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



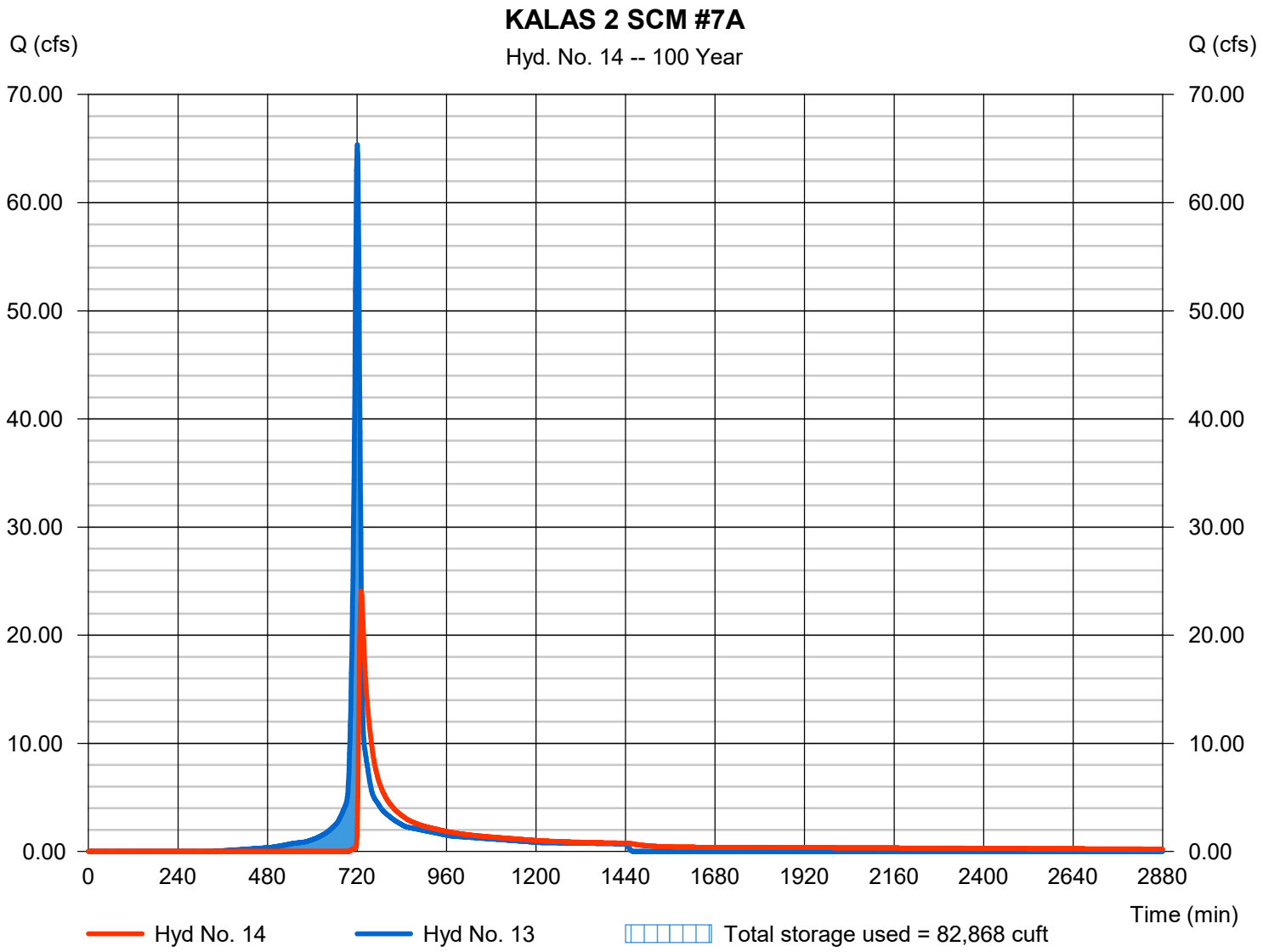
Hydrograph Report

Hyd. No. 14

KALAS 2 SCM #7A

Hydrograph type	=	Reservoir	Peak discharge	=	24.08 cfs
Storm frequency	=	100 yrs	Time to peak	=	731 min
Time interval	=	1 min	Hyd. volume	=	140,354 cuft
Inflow hyd. No.	=	13 - KALAS 2 SCM7 POST DEVA	Max. Elevation	=	375.56 ft
Reservoir name	=	SCM #7A	Max. Storage	=	82,868 cuft

Storage Indication method used.

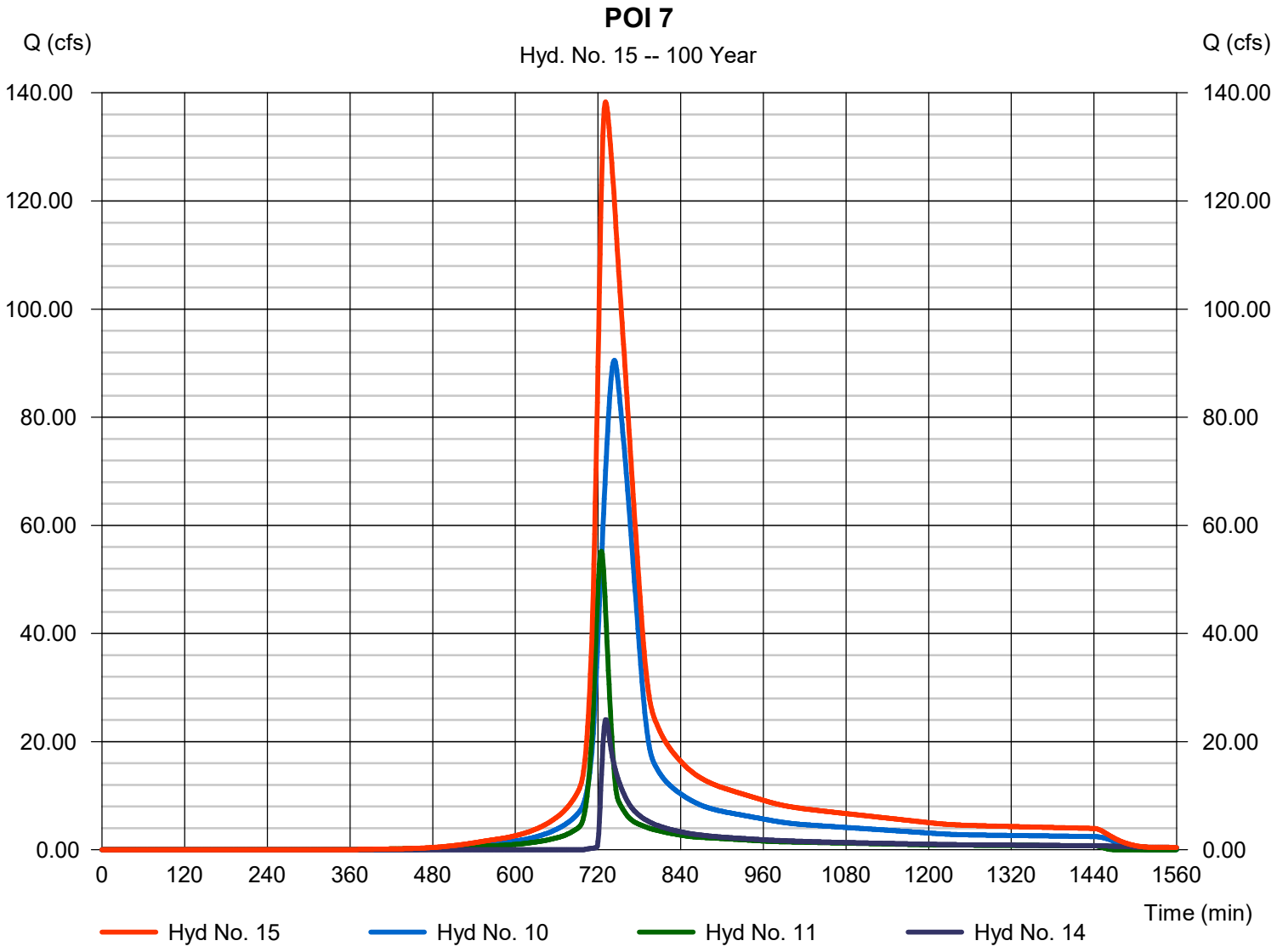


Hydrograph Report

Hyd. No. 15

POI 7

Hydrograph type	=	Combine	Peak discharge	=	138.29 cfs
Storm frequency	=	100 yrs	Time to peak	=	731 min
Time interval	=	1 min	Hyd. volume	=	827,866 cuft
Inflow hyds.	=	10, 11, 14	Contrib. drain. area	=	9.720 ac

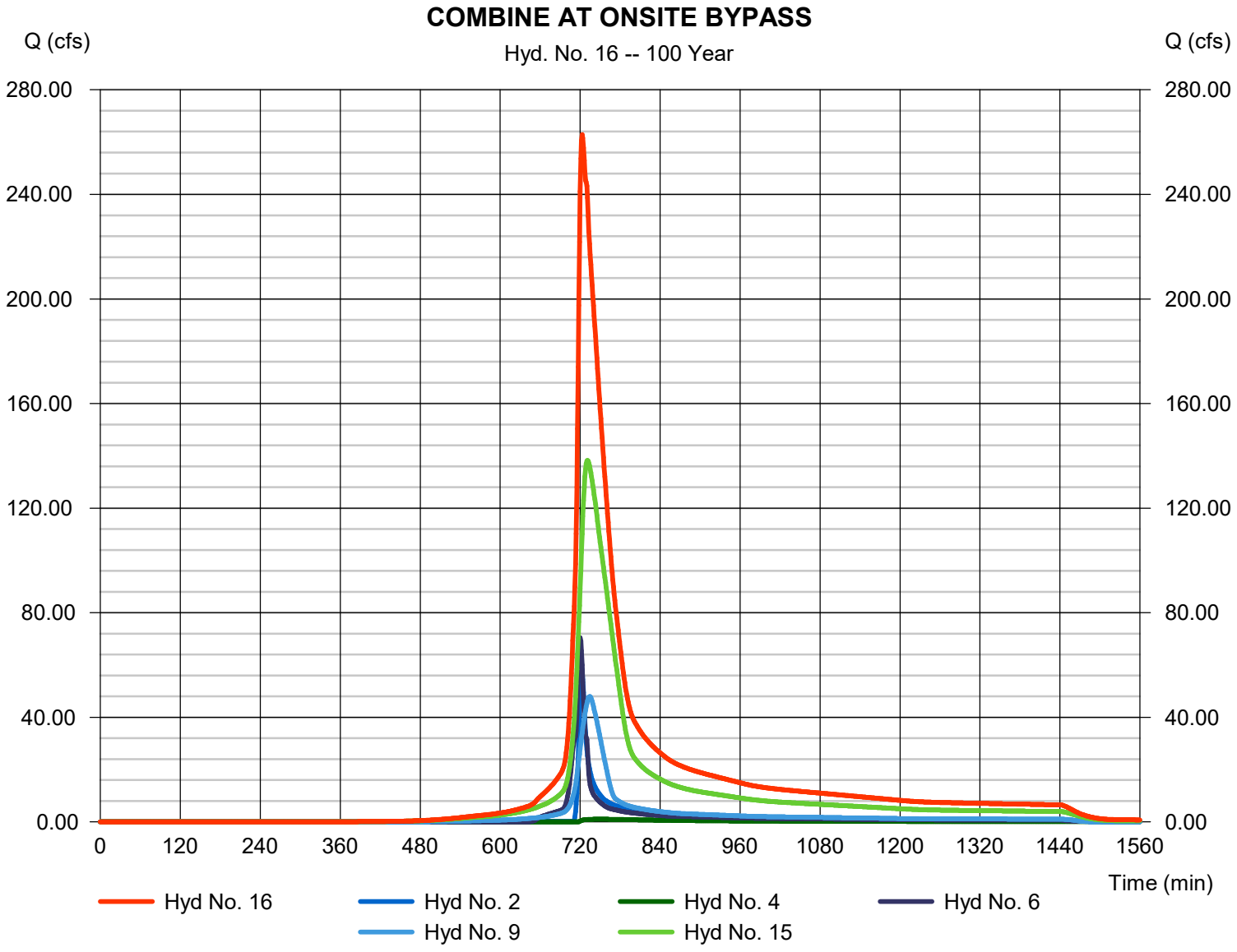


Hydrograph Report

Hyd. No. 16

COMBINE AT ONSITE BYPASS

Hydrograph type	=	Combine	Peak discharge	=	262.83 cfs
Storm frequency	=	100 yrs	Time to peak	=	723 min
Time interval	=	1 min	Hyd. volume	=	1,364,194 cuft
Inflow hyds.	=	2, 4, 6, 9, 15	Contrib. drain. area	=	14.090 ac

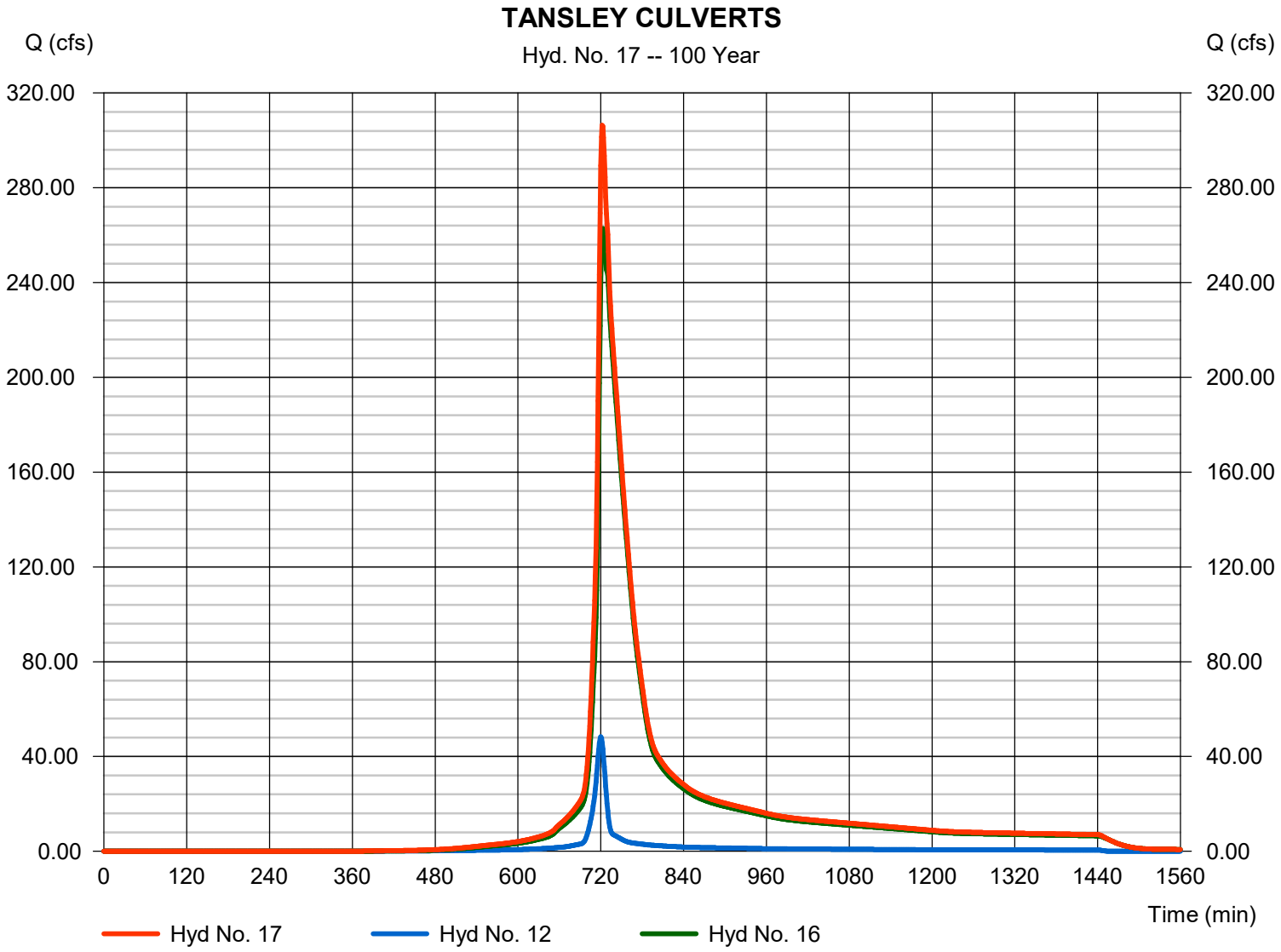


Hydrograph Report

Hyd. No. 17

TANSLEY CULVERTS

Hydrograph type	=	Combine	Peak discharge	=	306.41 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	1,483,001 cuft
Inflow hyds.	=	12, 16	Contrib. drain. area	=	6.570 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	69.0305	12.5000	0.8674	--------
3	0.0000	0.0000	0.0000	--------
5	0.0000	0.0000	0.0000	--------
10	74.0861	12.5000	0.8066	--------
25	62.8559	11.0000	0.7384	--------
50	56.0596	9.9000	0.6909	--------
100	53.0414	9.3000	0.6596	--------

File name: 20241113 Moody IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.76	4.64	3.89	3.37	2.98	2.67	2.42	2.22	2.05	1.91	1.79	1.68
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	7.36	6.01	5.11	4.47	3.98	3.60	3.29	3.04	2.82	2.64	2.48	2.34
25	8.11	6.64	5.67	4.98	4.46	4.05	3.72	3.45	3.22	3.02	2.85	2.70
50	8.67	7.10	6.08	5.36	4.82	4.39	4.05	3.76	3.52	3.32	3.14	2.98
100	9.17	7.53	6.47	5.72	5.15	4.71	4.35	4.06	3.81	3.59	3.40	3.24

Tc = time in minutes. Values may exceed 60.

Precip. file name: F:\Kalas Assemblage\Raleigh-Wake County 24Hr Rain.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	3.00	3.45	0.00	4.33	5.02	5.96	6.80	7.46
SCS 6-Hr	2.05	2.46	0.00	3.04	3.55	0.00	0.00	5.32
Huff-1st	0.00	0.00	0.00	2.75	0.00	5.38	6.50	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	2.80	0.00	5.25	6.00	0.00

Hydraflow Table of Contents

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

Culvert Crossing on Mulberry +/- 18+00 (Q10)

Invert Elev Dn (ft)	=	365.60
Pipe Length (ft)	=	116.00
Slope (%)	=	0.50
Invert Elev Up (ft)	=	366.18
Rise (in)	=	36.0
Shape	=	Circular
Span (in)	=	36.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

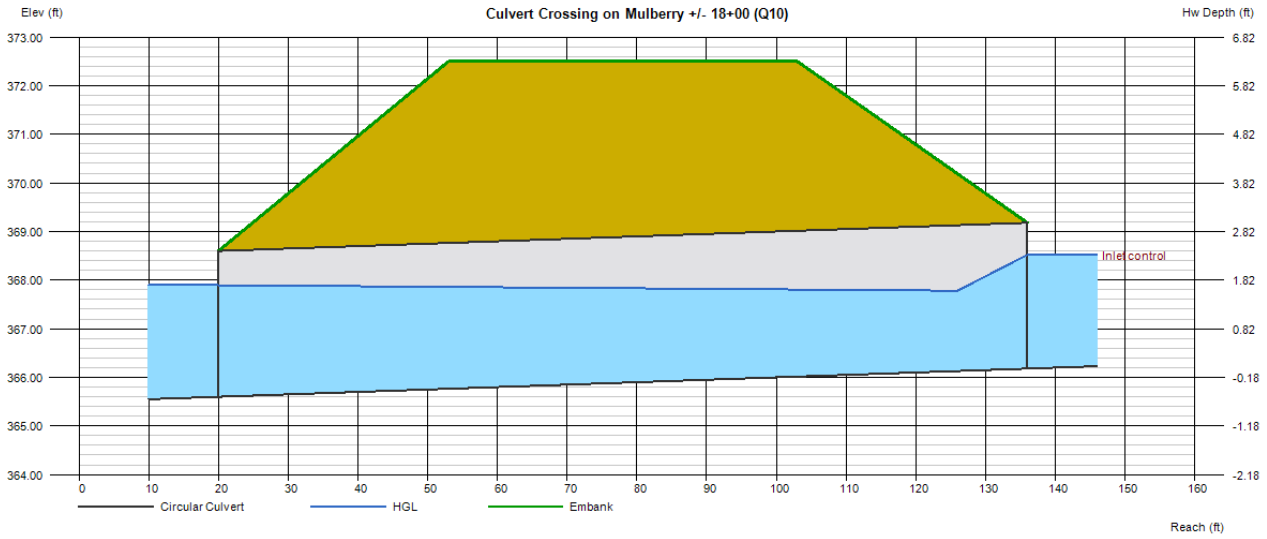
Top Elevation (ft)	=	372.50
Top Width (ft)	=	50.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	24.42
Qmax (cfs)	=	24.42
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	24.42
Qpipe (cfs)	=	24.42
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.21
Veloc Up (ft/s)	=	6.41
HGL Dn (ft)	=	367.90
HGL Up (ft)	=	367.77
Hw Elev (ft)	=	368.52
Hw/D (ft)	=	0.78
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

Culvert Crossing on Mulberry +/- 18+00 (Q25)

Invert Elev Dn (ft)	=	365.60
Pipe Length (ft)	=	116.00
Slope (%)	=	0.50
Invert Elev Up (ft)	=	366.18
Rise (in)	=	36.0
Shape	=	Circular
Span (in)	=	36.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

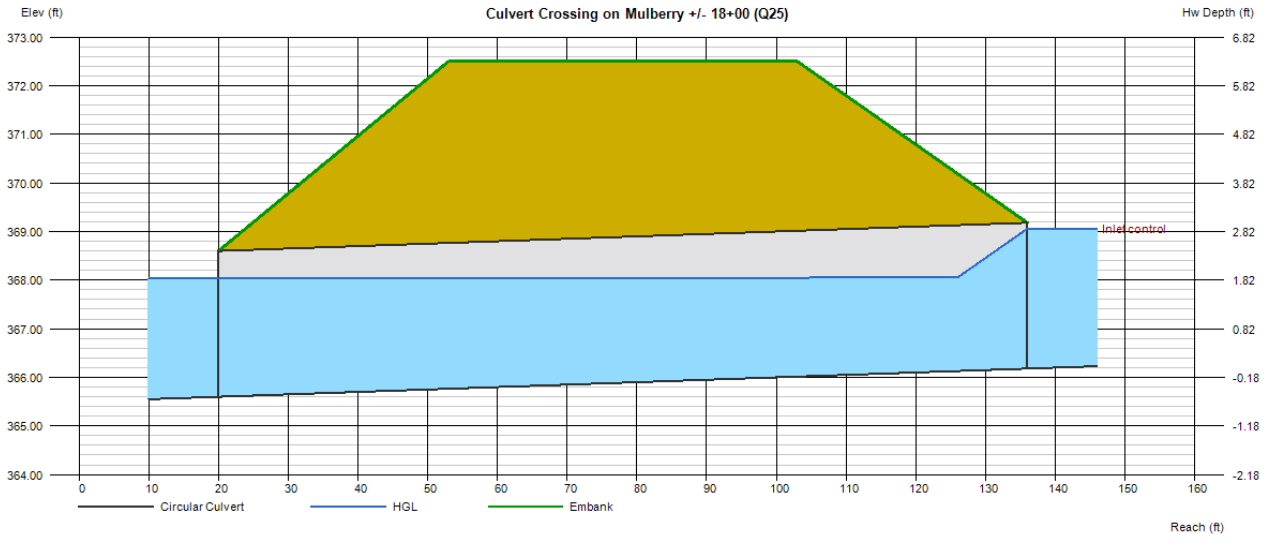
Top Elevation (ft)	=	372.50
Top Width (ft)	=	50.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	33.20
Qmax (cfs)	=	33.20
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	33.20
Qpipe (cfs)	=	33.20
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.40
Veloc Up (ft/s)	=	7.14
HGL Dn (ft)	=	368.03
HGL Up (ft)	=	368.06
Hw Elev (ft)	=	369.06
Hw/D (ft)	=	0.96
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

Culvert Crossing on Mulberry +/- 18+00 (Q100)

Invert Elev Dn (ft)	=	365.60
Pipe Length (ft)	=	116.00
Slope (%)	=	0.50
Invert Elev Up (ft)	=	366.18
Rise (in)	=	36.0
Shape	=	Circular
Span (in)	=	36.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

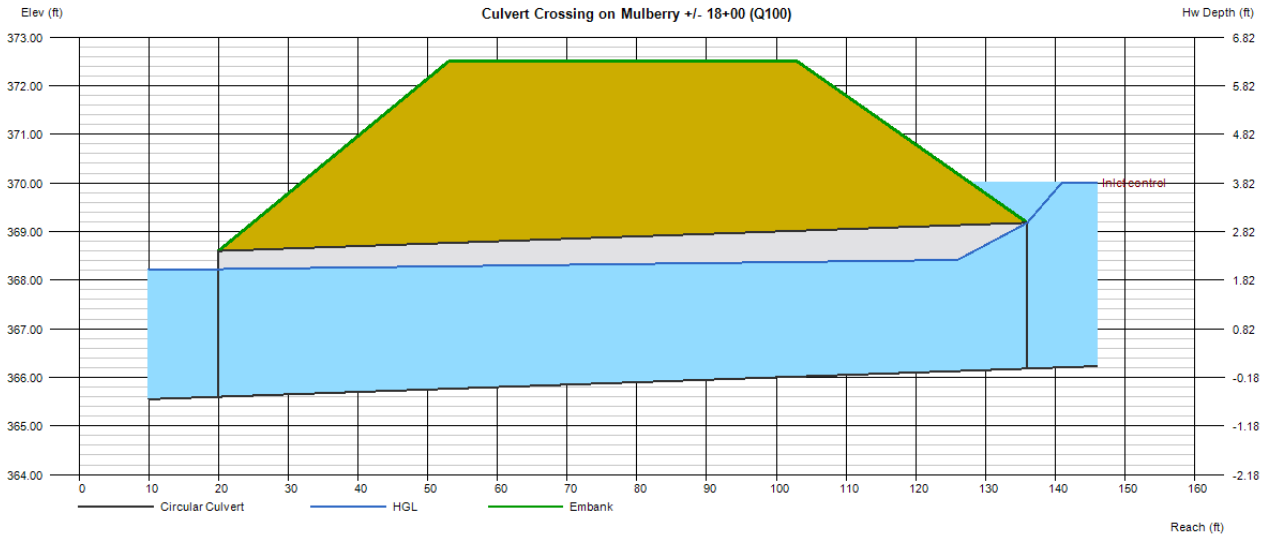
Top Elevation (ft)	=	372.50
Top Width (ft)	=	50.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	47.93
Qmax (cfs)	=	47.93
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	47.93
Qpipe (cfs)	=	47.93
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.30
Veloc Up (ft/s)	=	8.42
HGL Dn (ft)	=	368.23
HGL Up (ft)	=	368.43
Hw Elev (ft)	=	370.01
Hw/D (ft)	=	1.28
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

Culvert at Tansley Loop-Moody Property-Q10

Invert Elev Dn (ft)	=	347.00
Pipe Length (ft)	=	86.00
Slope (%)	=	1.16
Invert Elev Up (ft)	=	348.00
Rise (in)	=	54.0
Shape	=	Circular
Span (in)	=	54.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

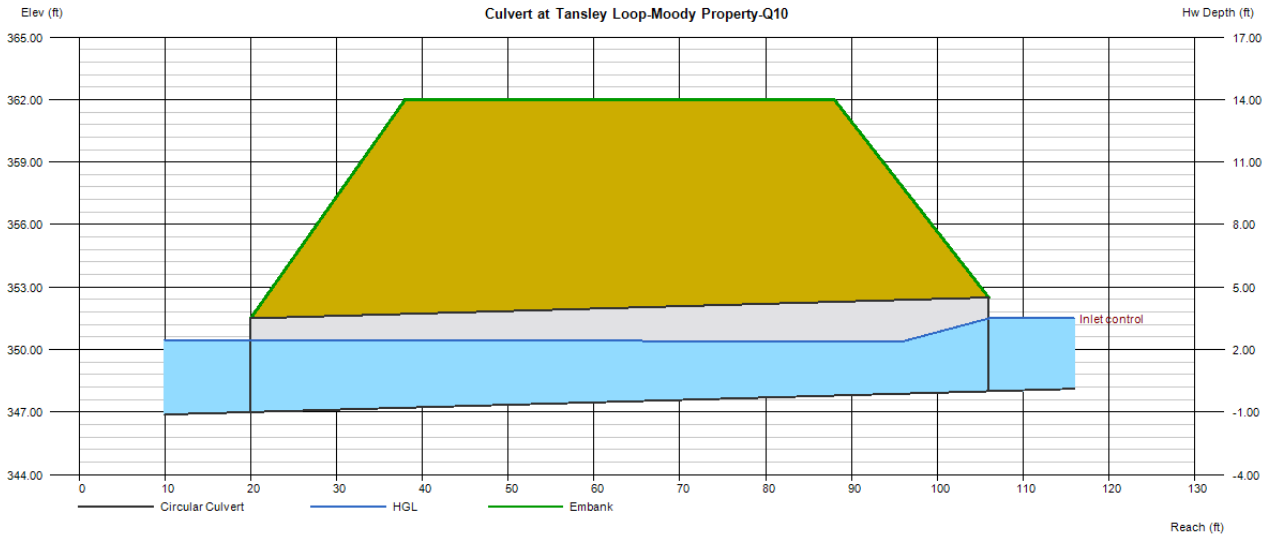
Top Elevation (ft)	=	362.00
Top Width (ft)	=	50.00
Crest Width (ft)	=	80.00

Calculations

Qmin (cfs)	=	134.54
Qmax (cfs)	=	134.54
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	134.54
Qpipe (cfs)	=	134.54
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.15
Veloc Up (ft/s)	=	7.85
HGL Dn (ft)	=	350.44
HGL Up (ft)	=	350.39
Hw Elev (ft)	=	351.49
Hw/D (ft)	=	0.78
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

Culvert at Tansley Loop-Moody Property-Q25

Invert Elev Dn (ft)	=	347.00
Pipe Length (ft)	=	86.00
Slope (%)	=	1.16
Invert Elev Up (ft)	=	348.00
Rise (in)	=	54.0
Shape	=	Circular
Span (in)	=	54.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

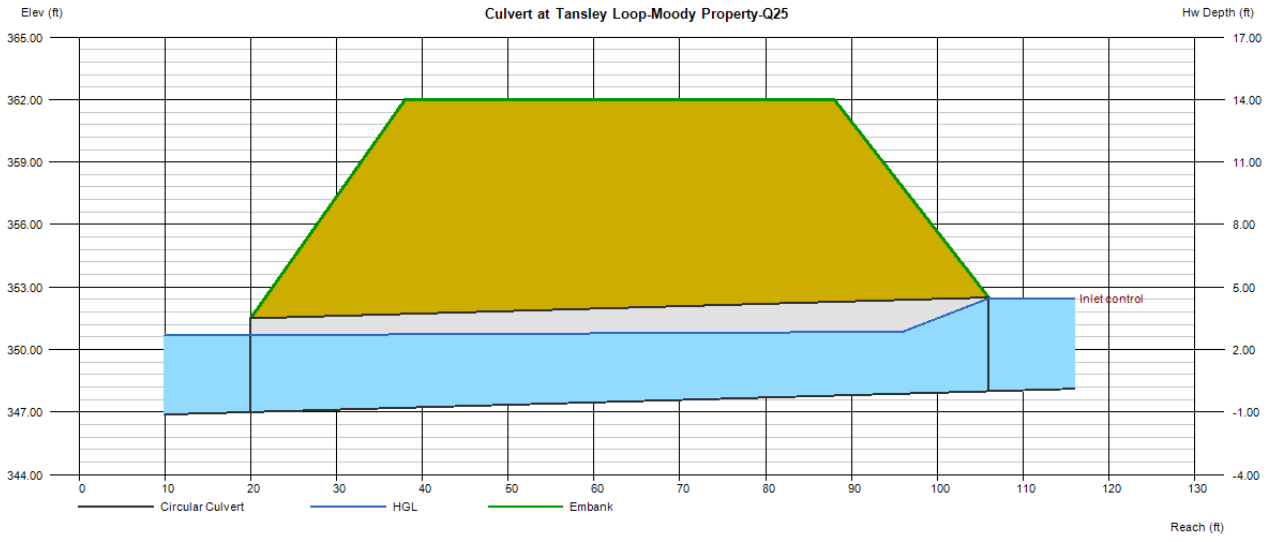
Top Elevation (ft)	=	362.00
Top Width (ft)	=	50.00
Crest Width (ft)	=	80.00

Calculations

Qmin (cfs)	=	192.31
Qmax (cfs)	=	192.31
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	192.31
Qpipe (cfs)	=	192.31
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.89
Veloc Up (ft/s)	=	8.96
HGL Dn (ft)	=	350.69
HGL Up (ft)	=	350.88
Hw Elev (ft)	=	352.46
Hw/D (ft)	=	0.99
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

Culvert at Tansley Loop-Moody Property-Q100

Invert Elev Dn (ft)	=	347.00
Pipe Length (ft)	=	86.00
Slope (%)	=	1.16
Invert Elev Up (ft)	=	348.00
Rise (in)	=	54.0
Shape	=	Circular
Span (in)	=	54.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

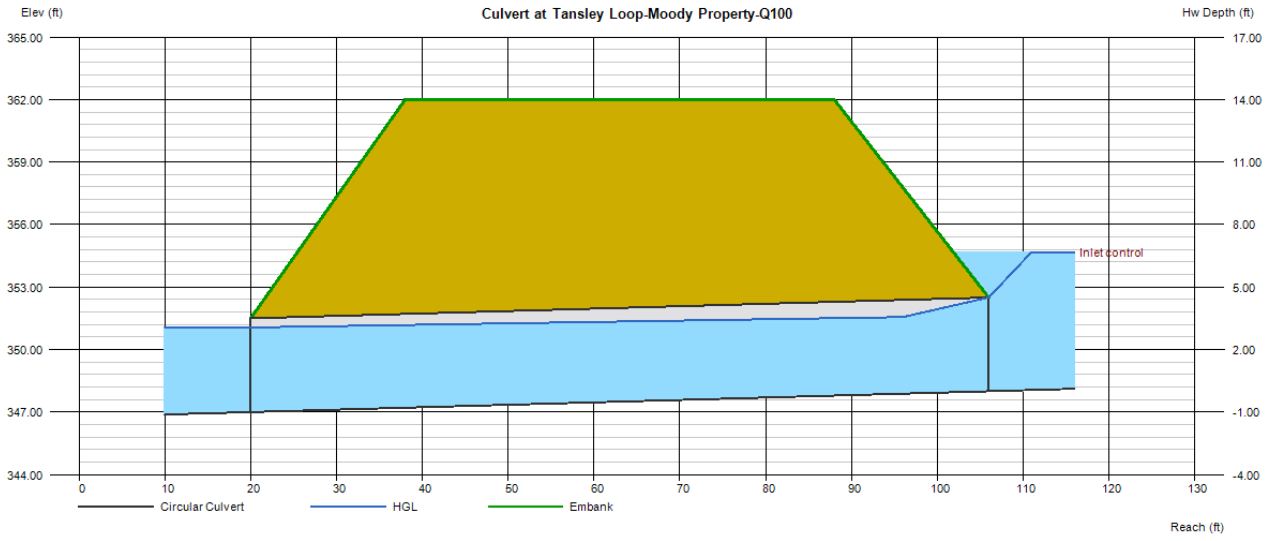
Top Elevation (ft)	=	362.00
Top Width (ft)	=	50.00
Crest Width (ft)	=	80.00

Calculations

Qmin (cfs)	=	306.41
Qmax (cfs)	=	306.41
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	306.41
Qpipe (cfs)	=	306.41
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	10.14
Veloc Up (ft/s)	=	11.16
HGL Dn (ft)	=	351.06
HGL Up (ft)	=	351.63
Hw Elev (ft)	=	354.68
Hw/D (ft)	=	1.48
Flow Regime	=	Inlet Control



AMERICAN Engineering

4020 Westchase Boulevard Suite 450 Raleigh, NC 27607
OFFICE: 919.469.1101 | **AMERICAN-EA.COM**

Project Name:	**Moody Development**
Project Number:	**R210002**
Date:	**3/31/2025**
Calculated By:	**RC**
Checked By:	**JK**

CULVERT SIZING WORKSHEET (INLET CONTROL)- Mulberry

Step 1: Determine Q (cfs) by using Rational Equation or inputting Known Q

Enter Known Q_{25} (cfs):	34

Q value can be determined by using Hydrograph, Express, or Storm Sewers, etc…

Step 2: Q_{25} culvert sizing with a minimum HW/D = 1.20 (Inlet Control)

Culvert Invert Up Elevation (ft):	348

Nomenclature	Embedded?	Diamater (ft)	C-S A (sf)	Centroid Value (ft)
Culvert #1	yes	3	6.06	1.31
Culvert #2	n/a	0	0	0

HW (ft):	3.60

Head h_1 (ft):	1.91
Head h_2 (ft):	~~0.60~~

Culvert #1 Capacity Q_1 (cfs):	40.33	$Q_1 = KeA(2gh_1)^{1/2}$
Culvert #2 Capacity Q_2 (cfs):	0.00	$Q_2 = KeA(2gh_2)^{1/2}$
Total Capacity Q_T (cfs):	40.33	ADEQUATE $Q_T = Q_1 + Q_2$

Step 3: Q_{100} culvert sizing to not overtop roadway

Culvert invert (ft elev.):	366.50
Top elevation of grade above culvert (ft elev.):	373.00
Enter Known Q_{100} (cfs):	48
Ke coefficient	0.60

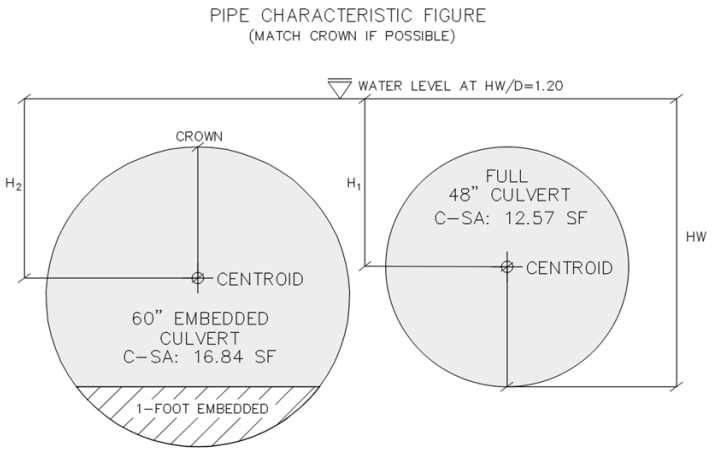
Note: The Ke coefficient of 0.60 is standard for a head wall-beveled inlet

Total C-S A (sf) available:	6.06	
Q_{100} Head, H (ft)	2.71	$H=[(Q/KeA)^2]/2g$
Headwater Depth, HW (ft):	4.21	$HW=H+D/2$
Headwater Elevation (ft)	370.71	
Q_{100} Overtopping Roadway?	NO	

Pipe Characteristics Table

Pipe Diameter	Full Pipe		Embedded Pipe	
(ft)	C-S A (sf)	Centroid of C-S A (ft)	C-S A (sf)	Centroid to Crown Distance (ft)
2	3.14	1.00	2.69	0.87
2.5	4.91	1.25	4.21	1.09
3	7.07	1.50	6.06	1.31
3.5	9.62	1.75	8.25	1.53
4	12.57	2.00	10.78	1.75
4.5	15.90	2.25	13.64	1.97
5	19.64	2.50	16.84	2.18
6	28.27	3.00	25.18	2.70

FIGURE BELOW IS FOR EXAMPLE PURPOSES ONLY (NOT PROJECT SPECIFIC)



AMERICAN Engineering

4020 Westchase Boulevard Suite 450 Raleigh, NC 27607
OFFICE: 919.469.1101 | **AMERICAN-EA.COM**

Project Name:	**Moody Development**
Project Number:	**R210002**
Date:	**3/31/2025**
Calculated By:	**RC**
Checked By:	**JK**

CULVERT SIZING WORKSHEET (INLET CONTROL)- Tansley Loop

Step 1: Determine Q (cfs) by using Rational Equation or inputting Known Q

Enter Known Q_{25} (cfs):	193

Q value can be determined by using Hydrograph, Express, or Storm Sewers, etc…

Step 2: Q_{25} culvert sizing with a minimum HW/D = 1.20 (Inlet Control)

Culvert Invert Up Elevation (ft):	348

Nomenclature	Embedded?	Diamater (ft)	C-S A (sf)	Centroid Value (ft)
Culvert #1	yes	4.5	13.64	1.97
Culvert #2	yes	4.5	13.64	1.97

HW (ft):	5.40

Head h_1 (ft):	2.87
Head h_2 (ft):	2.87

Culvert #1 Capacity Q_1 (cfs):	111.26	$Q_1 = KeA(2gh_1)^{1/2}$
Culvert #2 Capacity Q_2 (cfs):	111.26	$Q_2 = KeA(2gh_2)^{1/2}$
Total Capacity Q_T (cfs):	222.53	ADEQUATE $QT=Q1+Q2$

Step 3: Q_{100} culvert sizing to not overtop roadway

Culvert invert (ft elev.):	348.00
Top elevation of grade above culvert (ft elev.):	362.00
Enter Known Q_{100} (cfs):	307
Ke coefficient	0.60

Note: The Ke coefficient of 0.60 is standard for a head wall-beveled inlet

Total C-S A (sf) available:	27.28	
Q_{100} Head, H (ft)	5.46	$H=[(Q/KeA)^2]/2g$
Headwater Depth, HW (ft):	7.71	$HW=H+D/2$
Headwater Elevation (ft)	355.71	
Q_{100} Overtopping Roadway?	NO	

Pipe Characteristics Table

Pipe Diameter	Full Pipe		Embedded Pipe	
(ft)	C-S A (sf)	Centroid of C-S A (ft)	C-S A (sf)	Centroid to Crown Distance (ft)
2	3.14	1.00	2.69	0.87
2.5	4.91	1.25	4.21	1.09
3	7.07	1.50	6.06	1.31
3.5	9.62	1.75	8.25	1.53
4	12.57	2.00	10.78	1.75
4.5	15.90	2.25	13.64	1.97
5	19.64	2.50	16.84	2.18
6	28.27	3.00	25.18	2.70

FIGURE BELOW IS FOR EXAMPLE PURPOSES ONLY (NOT PROJECT SPECIFIC)

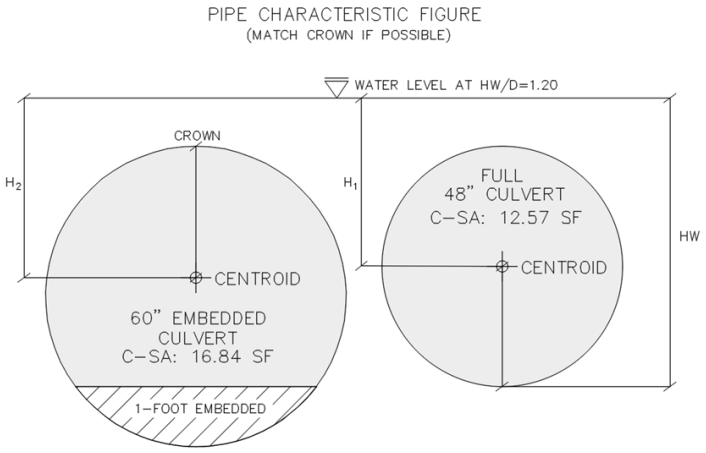
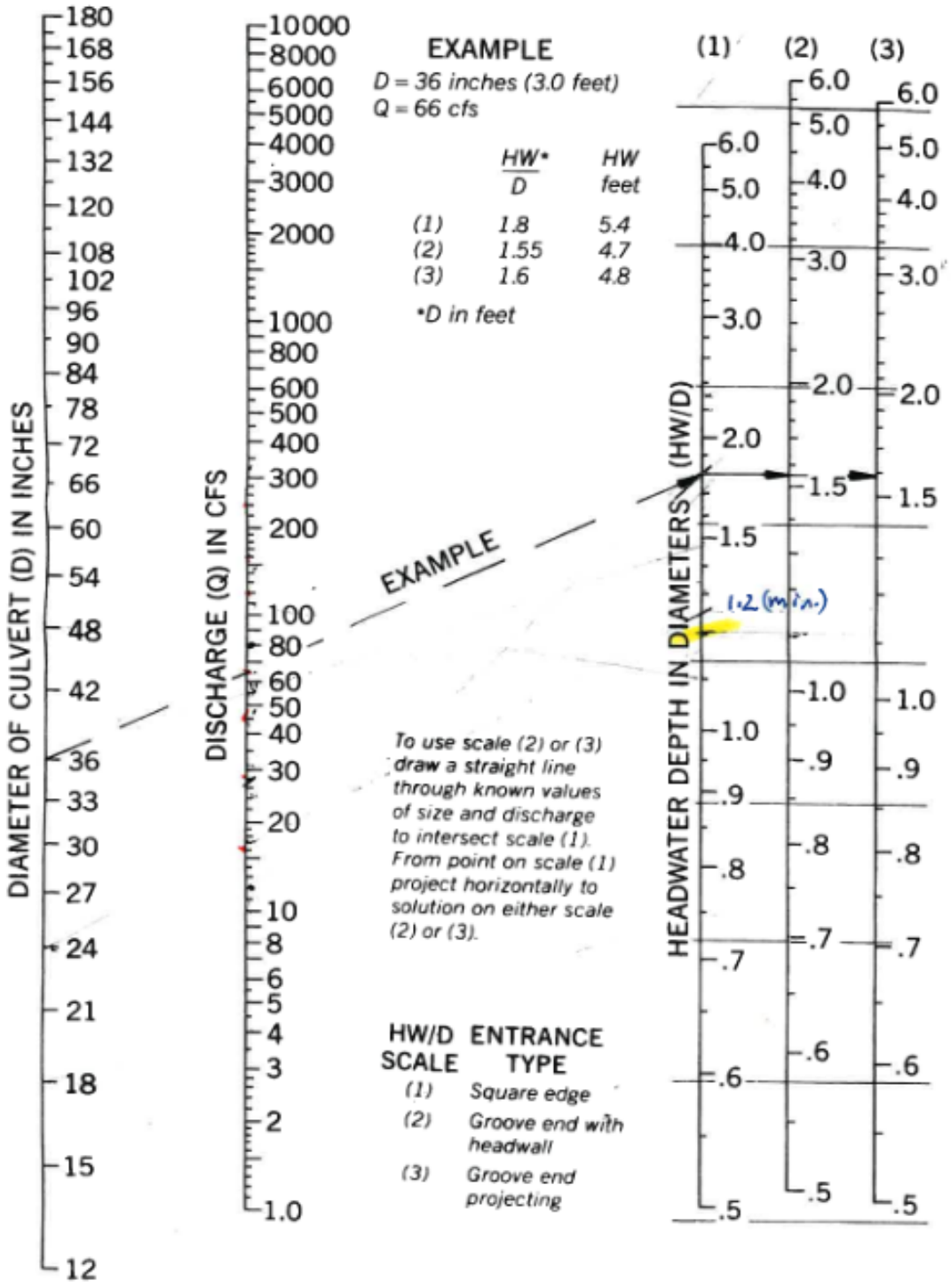


FIGURE 33

HEADWATER DEPTH FOR CIRCULAR CONCRETE PIPE CULVERTS WITH INLET CONTROL



TIME OF CONCENTRATION & TRAVEL TIME

AMERICAN Engineering

CALCULATIONS BY:	**RC**
CHECKED BY:	**JK**
DATE:	**1/27/2025**
PROJECT:	**Moody**
PROJECT #	**R210002**
AREA:	**NCDOT CULVERT #1**

Calculate the Travel Time and/or Time of Concentration with Overland (Sheet) Flow, Shallow Concentrated Flow, and Channel Flow. Based on Chapter 3 of the NRCS TR-55 Method.

Sheet flow (Applicable to Tc only) using Manning's Kinematic Solution

$$T_t = 0.007 * \frac{(nL)^{0.8}}{\left(P_2^{0.5} * s^{0.4}\right)}$$

Suface description (table 3-1)	Dense Grass	
Manning's roughness coefficient, n (table 3-1)	0.240	
Flow Length, L (Max. 300')*	300	ft
Two-year 24-hour rainfall, P2	3.46	in
Land slope, s	0.010	ft/ft
Travel Time, Tt	**0.73 hr**	**43.61 min**

*Once flow exceeds 300' it becomes shallow concentration flow (a maximum of 150' is typical)

Shallow concentrated flow using graphical method (see Figure 3-1)

$$T_t = \frac{L}{3600V}$$

Surface description (paved or unpaved)	Unpaved	
Flow Length, L	500	ft
Watercourse slope, s	0.015	ft/ft
Average velocity, V (Figure 3-1)	2	ft/s
Travel Time, Tt	**0.07 hr**	**4.17 min**

Channel flow using Manning's Equation

$$T_t = \frac{L}{3600V} \qquad V = \frac{1.49 * r^{\frac{2}{3}} * s^{\frac{1}{2}}}{n} \qquad r = \frac{a}{p_w}$$

Cross sectional flow area, a	7.00	sf
Wetted perimeter, pw	9.50	ft
Hydraulic Radius, r	0.74	ft
Channel slope, s	0.005	ft/ft
Manning's roughness coefficient, n	0.011	
Flow Length, L	590	ft
Velocity, V	7.81	ft/s
Travel Time, Tt	**0.02 hr**	**1.26 min**
Total Travel Time/Time of Concentration	**0.82 hr**	**49.03 min**

TIME OF CONCENTRATION & TRAVEL TIME

AMERICAN Engineering

CALCULATIONS BY:	**RC**
CHECKED BY:	**JK**
DATE:	**1/27/2025**
PROJECT:	**Moody**
PROJECT #	**R210002**
AREA:	**NCDOT CULVERT #2**

Calculate the Travel Time and/or Time of Concentration with Overland (Sheet) Flow, Shallow Concentrated Flow, and Channel Flow. Based on Chapter 3 of the NRCS TR-55 Method.

Sheet flow (Applicable to Tc only) using Manning's Kinematic Solution

$$T_t = 0.007 * \frac{(nL)^{0.8}}{\left(P_2^{0.5} * s^{0.4}\right)}$$

Suface description (table 3-1)	Dense Grass		
Manning's roughness coefficient, n (table 3-1)	0.240		
Flow Length, L (Max. 300')*	300	ft	
Two-year 24-hour rainfall, P2	3.46	in	
Land slope, s	0.010	ft/ft	
Travel Time, Tt	**0.73**	**hr**	**43.61 min**

*Once flow exceeds 300' it becomes shallow concentration flow (a maximum of 150' is typical)

Shallow concentrated flow using graphical method (see Figure 3-1)

$$T_t = \frac{L}{3600V}$$

Surface description (paved or unpaved)	Unpaved		
Flow Length, L	691	ft	
Watercourse slope, s	0.015	ft/ft	
Average velocity, V (Figure 3-1)	2	ft/s	
Travel Time, Tt	**0.10**	**hr**	**5.76 min**

Channel flow using Manning's Equation

$$T_t = \frac{L}{3600V} \qquad V = \frac{1.49 * r^{\frac{2}{3}} * s^{\frac{1}{2}}}{n} \qquad r = \frac{a}{p_w}$$

Cross sectional flow area, a	7.00	sf	
Wetted perimeter, pw	9.50	ft	
Hydraulic Radius, r	0.74	ft	
Channel slope, s	0.005	ft/ft	
Manning's roughness coefficient, n	0.011		
Flow Length, L	714	ft	
Velocity, V	7.81	ft/s	
Travel Time, Tt	**0.03**	**hr**	**1.52 min**
Total Travel Time/Time of Concentration	**0.85**	**hr**	**50.89 min**

TIME OF CONCENTRATION & TRAVEL TIME

AMERICAN Engineering

CALCULATIONS BY:	**RC**
CHECKED BY:	**JK**
DATE:	**1/27/2025**
PROJECT:	**Moody**
PROJECT #	**R210002**
AREA:	**OFFSITE BYPASS**

Calculate the Travel Time and/or Time of Concentration with Overland (Sheet) Flow, Shallow Concentrated Flow, and Channel Flow. Based on Chapter 3 of the NRCS TR-55 Method.

Sheet flow (Applicable to Tc only) using Manning's Kinematic Solution

$$T_t = 0.007 * \frac{(nL)^{0.8}}{\left(P_2^{0.5} * s^{0.4}\right)}$$

Suface description (table 3-1)	DENSE GRASS	
Manning's roughness coefficient, n (table 3-1)	0.240	
Flow Length, L (Max. 300')*	50	ft
Two-year 24-hour rainfall, P2	3.46	in
Land slope, s	0.010	ft/ft
Travel Time, Tt	**0.17 hr**	**10.40 min**

*Once flow exceeds 300' it becomes shallow concentration flow (a maximum of 150' is typical)

Shallow concentrated flow using graphical method (see Figure 3-1)

$$T_t = \frac{L}{3600V}$$

Surface description (paved or unpaved)	Unpaved	
Flow Length, L	684	ft
Watercourse slope, s	0.005	ft/ft
Average velocity, V (Figure 3-1)	1.2	ft/s
Travel Time, Tt	**0.16 hr**	**9.50 min**

Channel flow using Manning's Equation

$$T_t = \frac{L}{3600V} \qquad V = \frac{1.49 * r^{\frac{2}{3}} * s^{\frac{1}{2}}}{n} \qquad r = \frac{a}{p_w}$$

Cross sectional flow area, a	7.00	sf
Wetted perimeter, pw	9.50	ft
Hydraulic Radius, r	0.74	ft
Channel slope, s	0.005	ft/ft
Manning's roughness coefficient, n	0.011	
Flow Length, L	0	ft
Velocity, V	7.81	ft/s
Travel Time, Tt	**0.00 hr**	**0.00 min**

Total Travel Time/Time of Concentration	**0.33 hr**	**19.90 min**

TIME OF CONCENTRATION & TRAVEL TIME

AMERICAN Engineering

CALCULATIONS BY:	**RC**
CHECKED BY:	**JK**
DATE:	**3/31/2025**
PROJECT:	**Moody**
PROJECT #	**R210002**
AREA:	**ONSITE BYPASS**

Calculate the Travel Time and/or Time of Concentration with Overland (Sheet) Flow, Shallow Concentrated Flow, and Channel Flow. Based on Chapter 3 of the NRCS TR-55 Method.

Sheet flow (Applicable to Tc only) using Manning's Kinematic Solution

$$T_t = 0.007 * \frac{(nL)^{0.8}}{\left(P_2^{0.5} * s^{0.4}\right)}$$

Suface description (table 3-1)	N/A		
Manning's roughness coefficient, n (table 3-1)	0.400		
Flow Length, L (Max. 300')*	0	ft	
Two-year 24-hour rainfall, P2	3.46	in	
Land slope, s	0.010	ft/ft	
Travel Time, Tt	**0.00**	**hr**	**0.00 min**

*Once flow exceeds 300' it becomes shallow concentration flow (a maximum of 150' is typical)

Shallow concentrated flow using graphical method (see Figure 3-1)

$$T_t = \frac{L}{3600V}$$

Surface description (paved or unpaved)	Unpaved		
Flow Length, L	592	ft	
Watercourse slope, s	0.013	ft/ft	
Average velocity, V (Figure 3-1)	1.6	ft/s	
Travel Time, Tt	**0.10**	**hr**	**6.17 min**

Channel flow using Manning's Equation

$$T_t = \frac{L}{3600V} \qquad V = \frac{1.49 * r^{\frac{2}{3}} * s^{\frac{1}{2}}}{n} \qquad r = \frac{a}{p_w}$$

Cross sectional flow area, a	30.00	sf	
Wetted perimeter, pw	12.00	ft	
Hydraulic Radius, r	2.50	ft	
Channel slope, s	0.015	ft/ft	
Manning's roughness coefficient, n	0.011		
Flow Length, L	518	ft	
Velocity, V	30.57	ft/s	
Travel Time, Tt	**0.00**	**hr**	**0.28 min**

Total Travel Time/Time of Concentration	**0.11 hr**	**6.45 min**

TIME OF CONCENTRATION & TRAVEL TIME

AMERICAN Engineering

CALCULATIONS BY:	**RC**
CHECKED BY:	**JK**
DATE:	**1/27/2025**
PROJECT:	**Moody**
PROJECT #	**R210002**
AREA:	**MULBERRY CULVERT**

Calculate the Travel Time and/or Time of Concentration with Overland (Sheet) Flow, Shallow Concentrated Flow, and Channel Flow. Based on Chapter 3 of the NRCS TR-55 Method.

Sheet flow (Applicable to Tc only) using Manning's Kinematic Solution

$$T_t = 0.007 * \frac{(nL)^{0.8}}{\left(P_2^{0.5} * s^{0.4}\right)}$$

Suface description (table 3-1)	Dense Grass		
Manning's roughness coefficient, n (table 3-1)	0.240		
Flow Length, L (Max. 300')*	175	ft	
Two-year 24-hour rainfall, P2	3.46	in	
Land slope, s	0.010	ft/ft	
Travel Time, Tt	**0.47**	**hr**	**28.33 min**

*Once flow exceeds 300' it becomes shallow concentration flow (a maximum of 150' is typical)

Shallow concentrated flow using graphical method (see Figure 3-1)

$$T_t = \frac{L}{3600V}$$

Surface description (paved or unpaved)	Unpaved		
Flow Length, L	1000	ft	
Watercourse slope, s	0.025	ft/ft	
Average velocity, V (Figure 3-1)	2.6	ft/s	
Travel Time, Tt	**0.11**	**hr**	**6.41 min**

Channel flow using Manning's Equation

$$T_t = \frac{L}{3600V} \qquad V = \frac{1.49 * r^{\frac{2}{3}} * s^{\frac{1}{2}}}{n} \qquad r = \frac{a}{p_w}$$

Cross sectional flow area, a	7.00	sf	
Wetted perimeter, pw	9.50	ft	
Hydraulic Radius, r	0.74	ft	
Channel slope, s	0.005	ft/ft	
Manning's roughness coefficient, n	0.011		
Flow Length, L	0	ft	
Velocity, V	7.81	ft/s	
Travel Time, Tt	**0.00**	**hr**	**0.00 min**
Total Travel Time/Time of Concentration	**0.58**	**hr**	**34.74 min**

Figure 3-1 Average velocities for estimating travel time for shallow concentrated flow

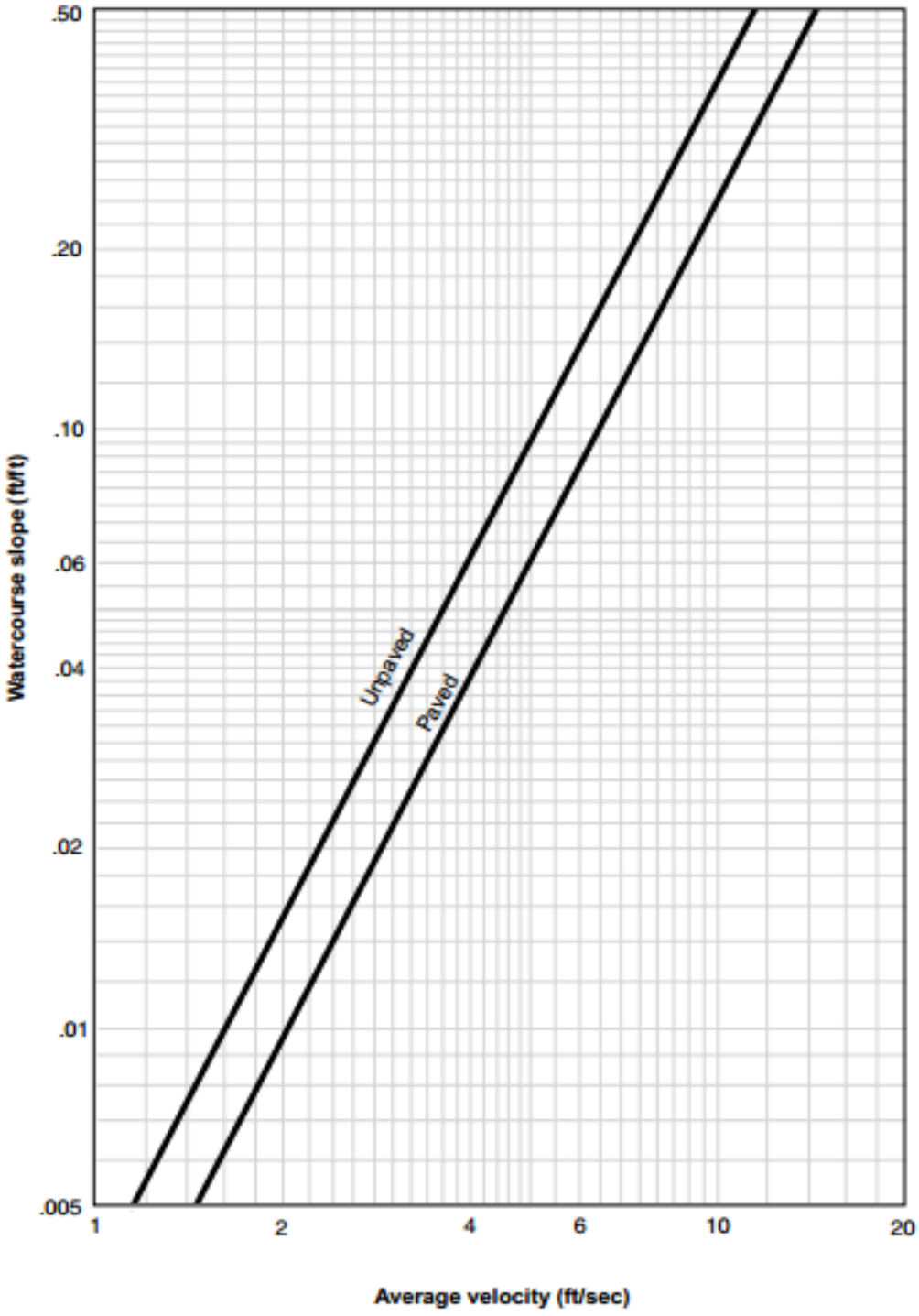


Table 3-1 Roughness coefficients (Manning's n) for sheet flow

Surface description	n [1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses [2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods:[3]	
Light underbrush	0.40
Dense underbrush	0.80

[1] The n values are a composite of information compiled by Engman (1986).

[2] Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.

[3] When selecting n , consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

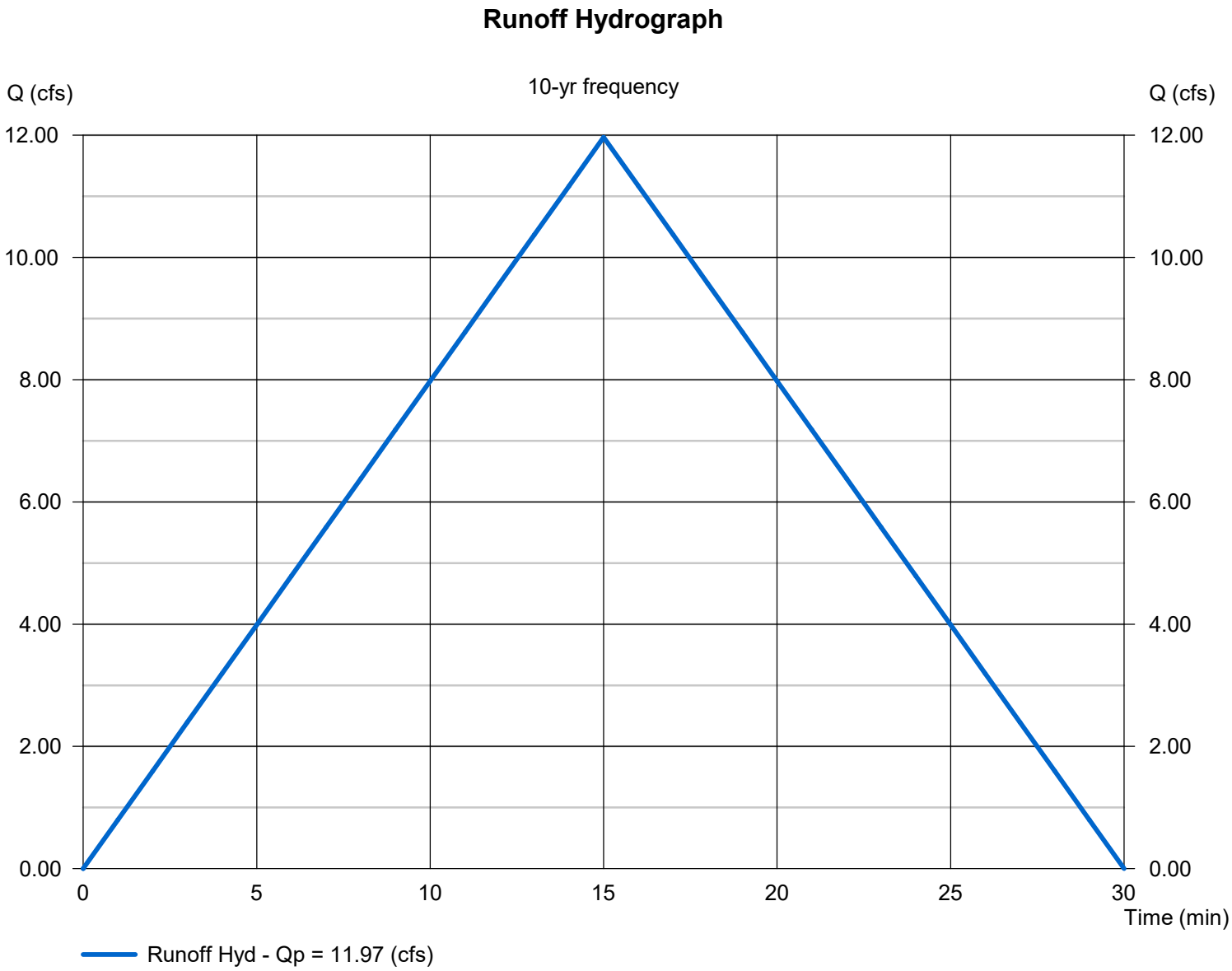
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #1A

Hydrograph type	= Rational	Peak discharge (cfs)	= 11.97
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 3.900	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 5.114	Tc by User (min)	= 15
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 10,771 (cuft); 0.247 (acft)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #1A

Triangular

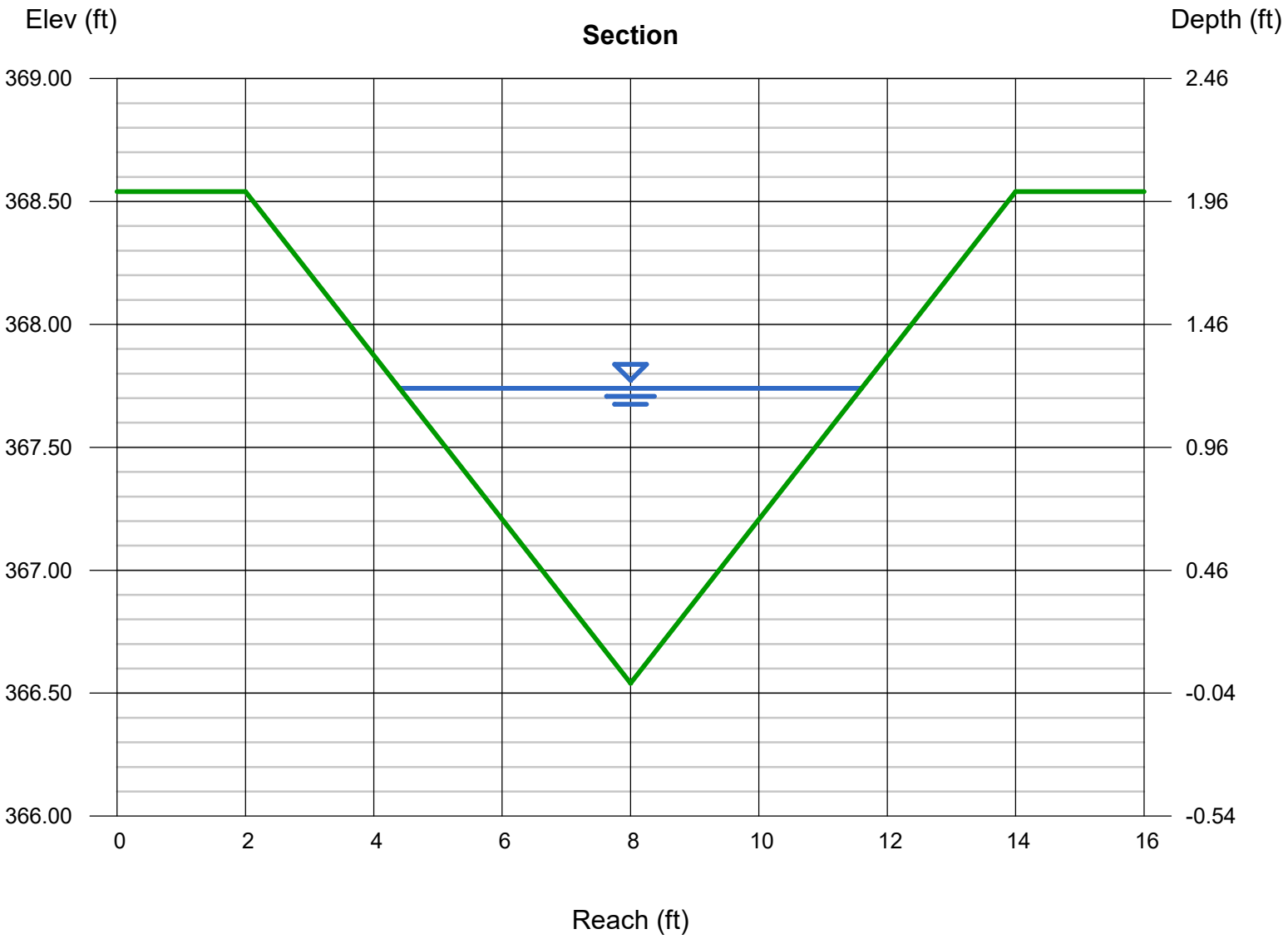
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 366.54
Slope (%)	= 1.30
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 15.07 (DITCH 1A + DITCH 1B)

Highlighted

Depth (ft)	= 1.20
Q (cfs)	= 15.07
Area (sqft)	= 4.32
Velocity (ft/s)	= 3.49
Wetted Perim (ft)	= 7.59
Crit Depth, Yc (ft)	= 1.10
Top Width (ft)	= 7.20
EGL (ft)	= 1.39



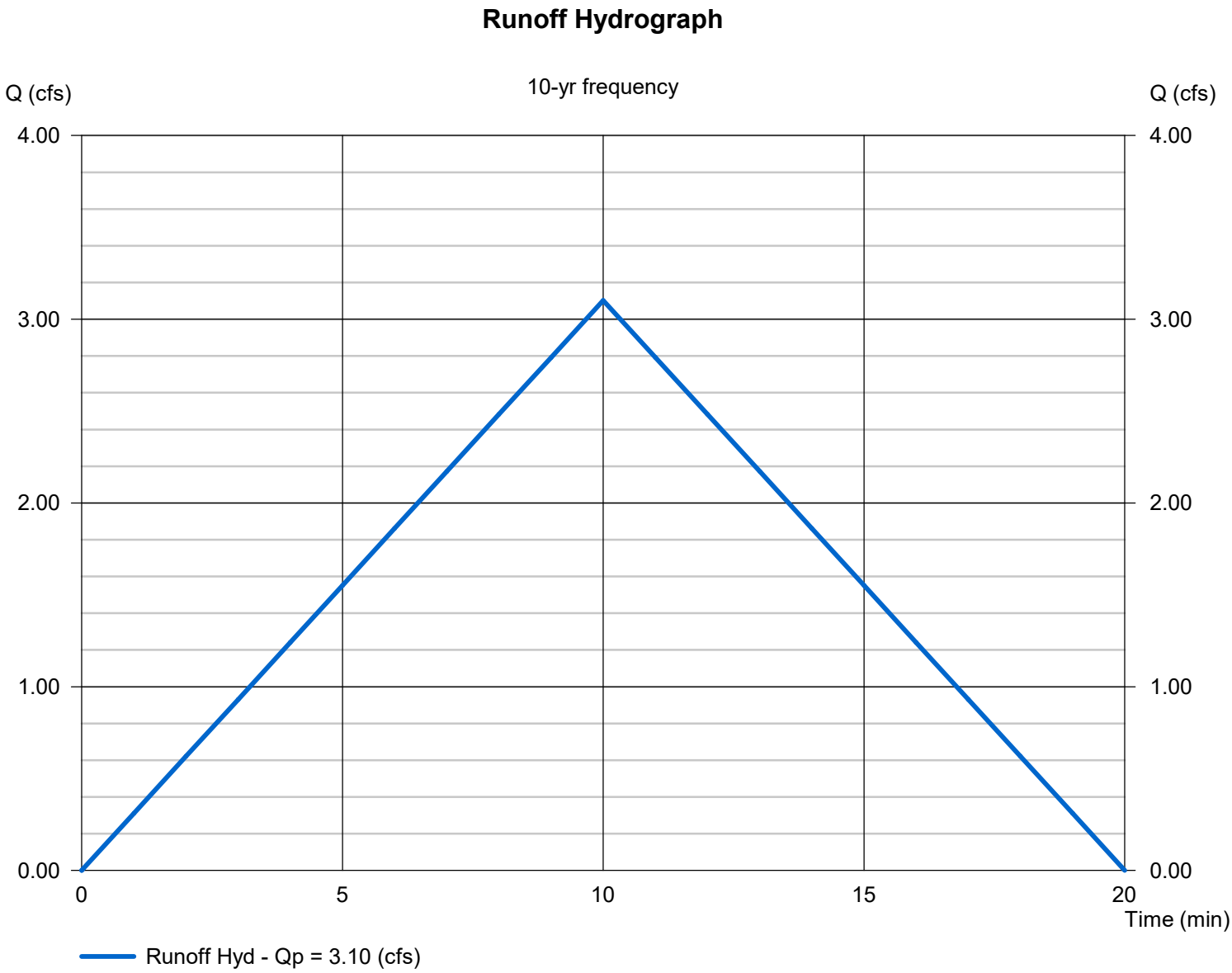
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #1B

Hydrograph type	= Rational	Peak discharge (cfs)	= 3.103
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 0.860	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 6.013	Tc by User (min)	= 10
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 1,862 (cuft); 0.043 (acft)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #1B

Triangular

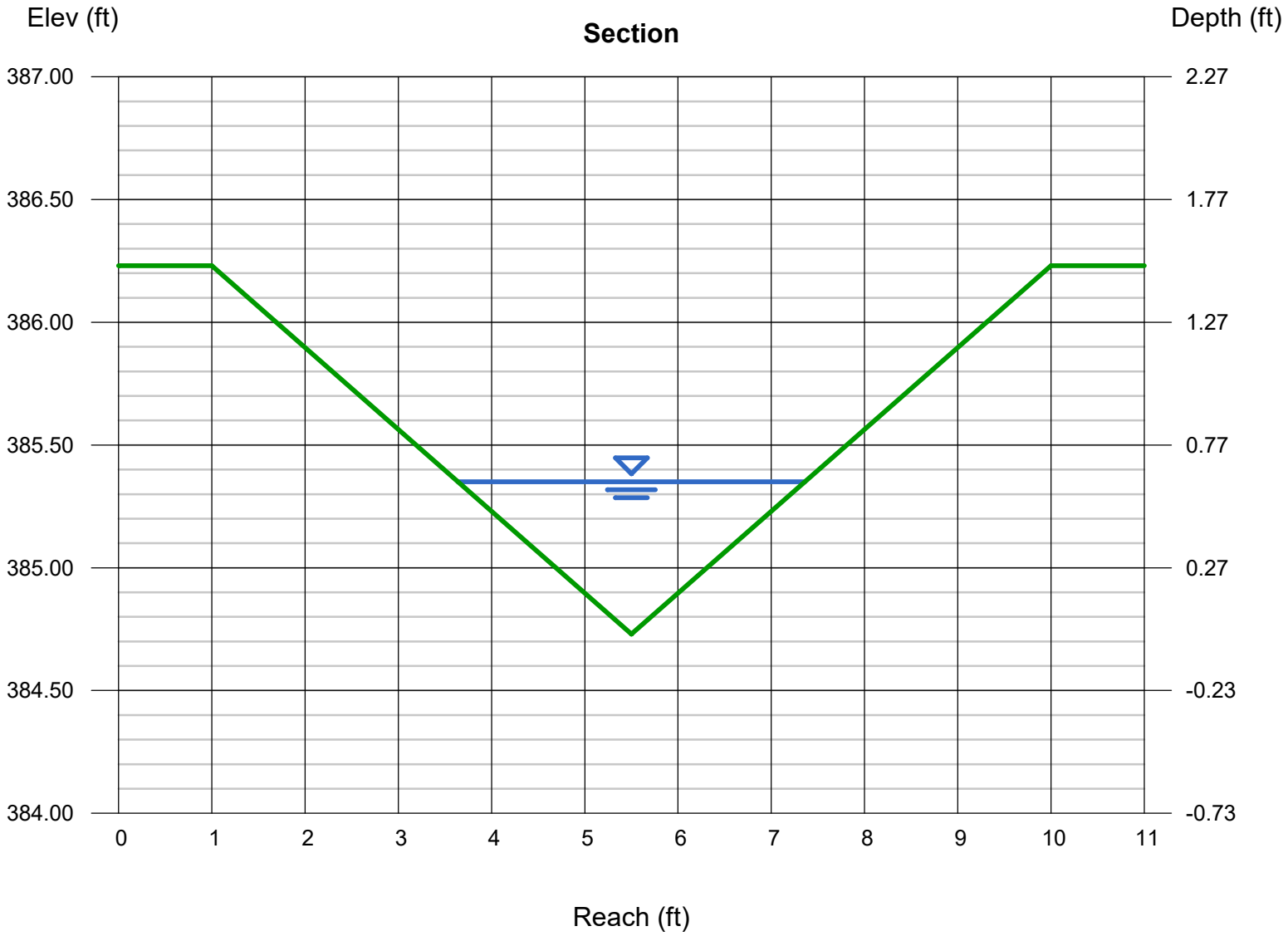
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 384.73
Slope (%)	= 1.84
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.10

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 3.100
Area (sqft)	= 1.15
Velocity (ft/s)	= 2.69
Wetted Perim (ft)	= 3.92
Crit Depth, Yc (ft)	= 0.59
Top Width (ft)	= 3.72
EGL (ft)	= 0.73



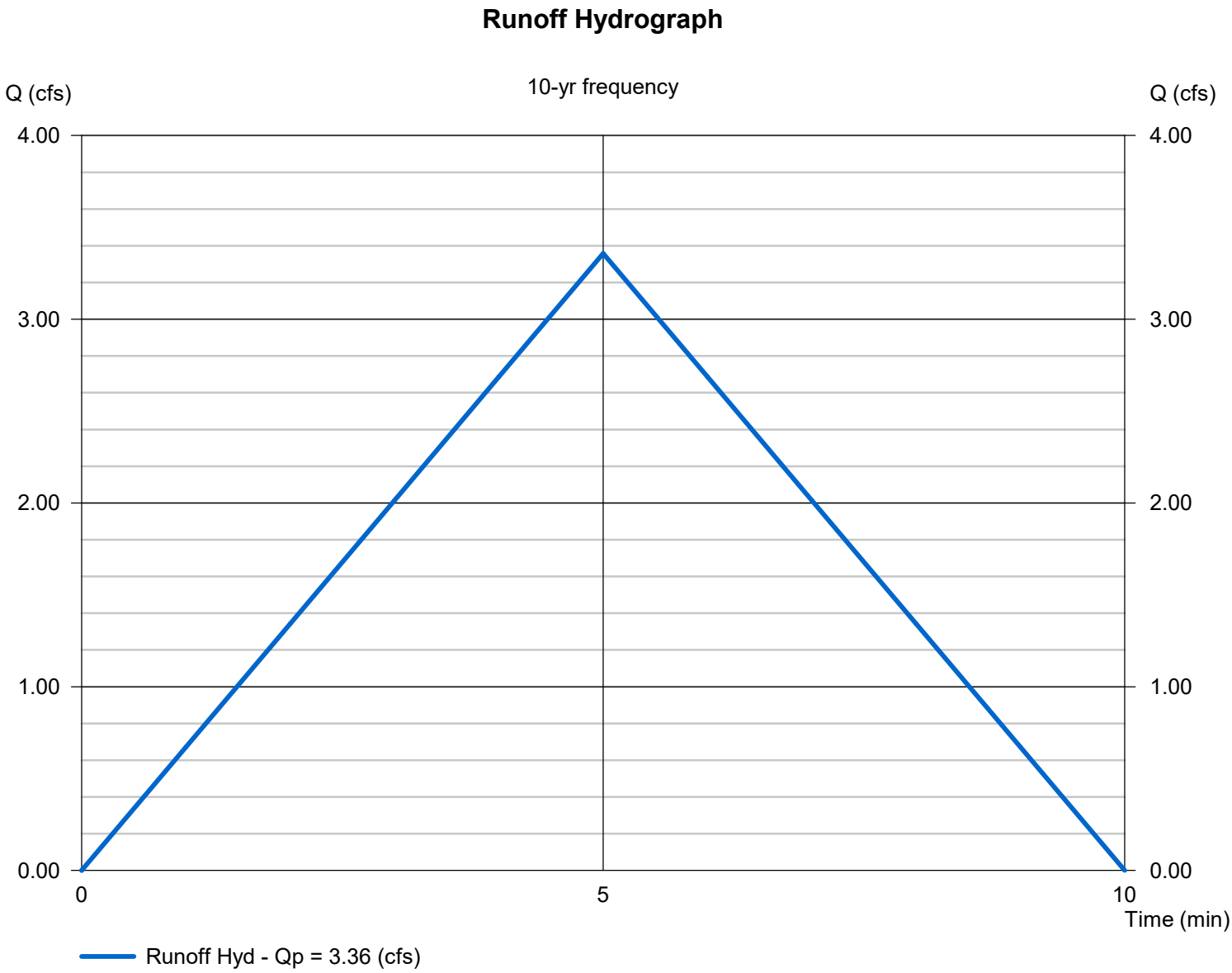
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #2

Hydrograph type	= Rational	Peak discharge (cfs)	= 3.358
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 0.760	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 7.364	Tc by User (min)	= 5
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 1,007 (cuft); 0.023 (acft)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #2

Triangular

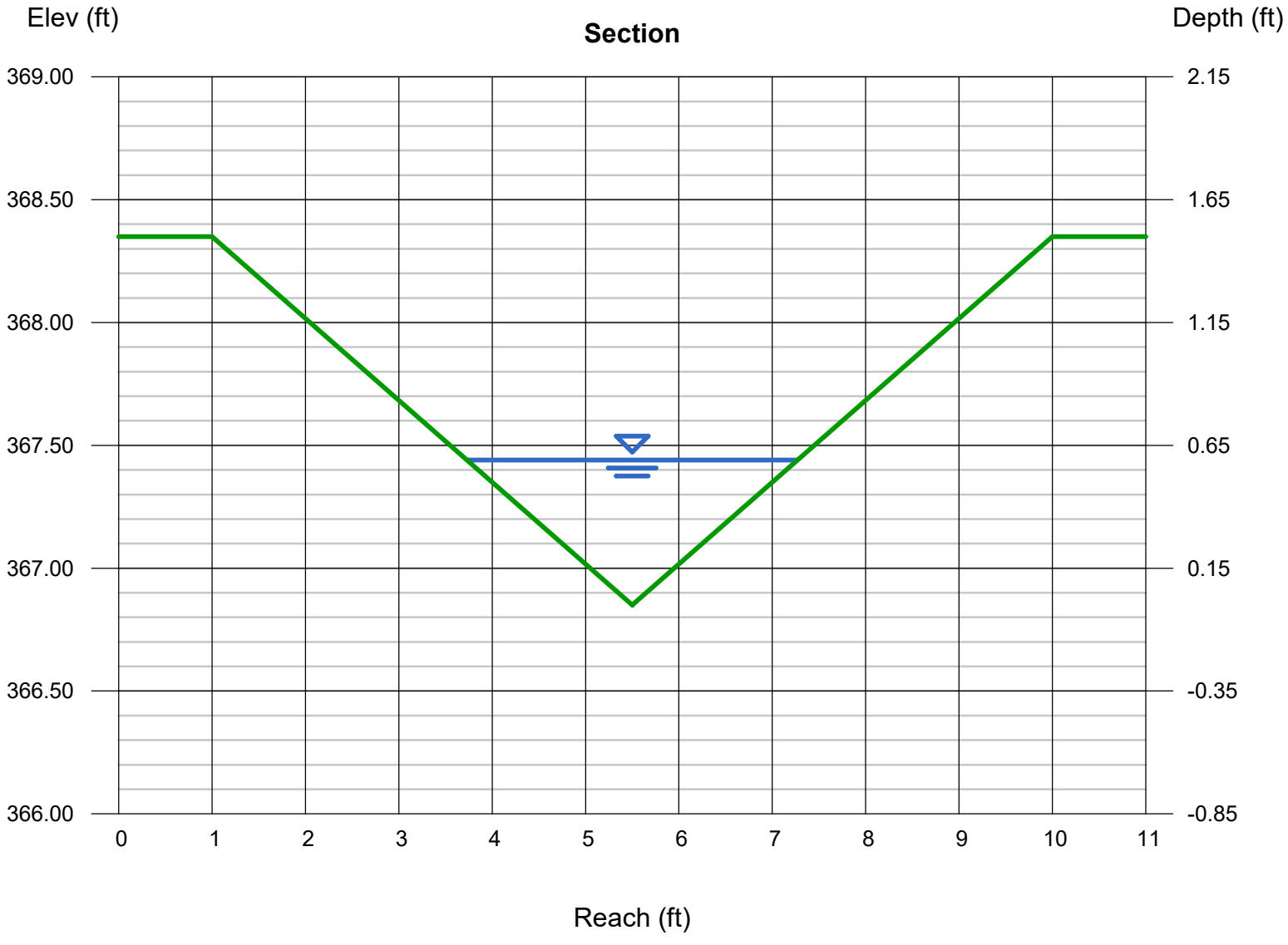
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 366.85
Slope (%)	= 3.00
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.36

Highlighted

Depth (ft)	= 0.59
Q (cfs)	= 3.360
Area (sqft)	= 1.04
Velocity (ft/s)	= 3.22
Wetted Perim (ft)	= 3.73
Crit Depth, Yc (ft)	= 0.61
Top Width (ft)	= 3.54
EGL (ft)	= 0.75



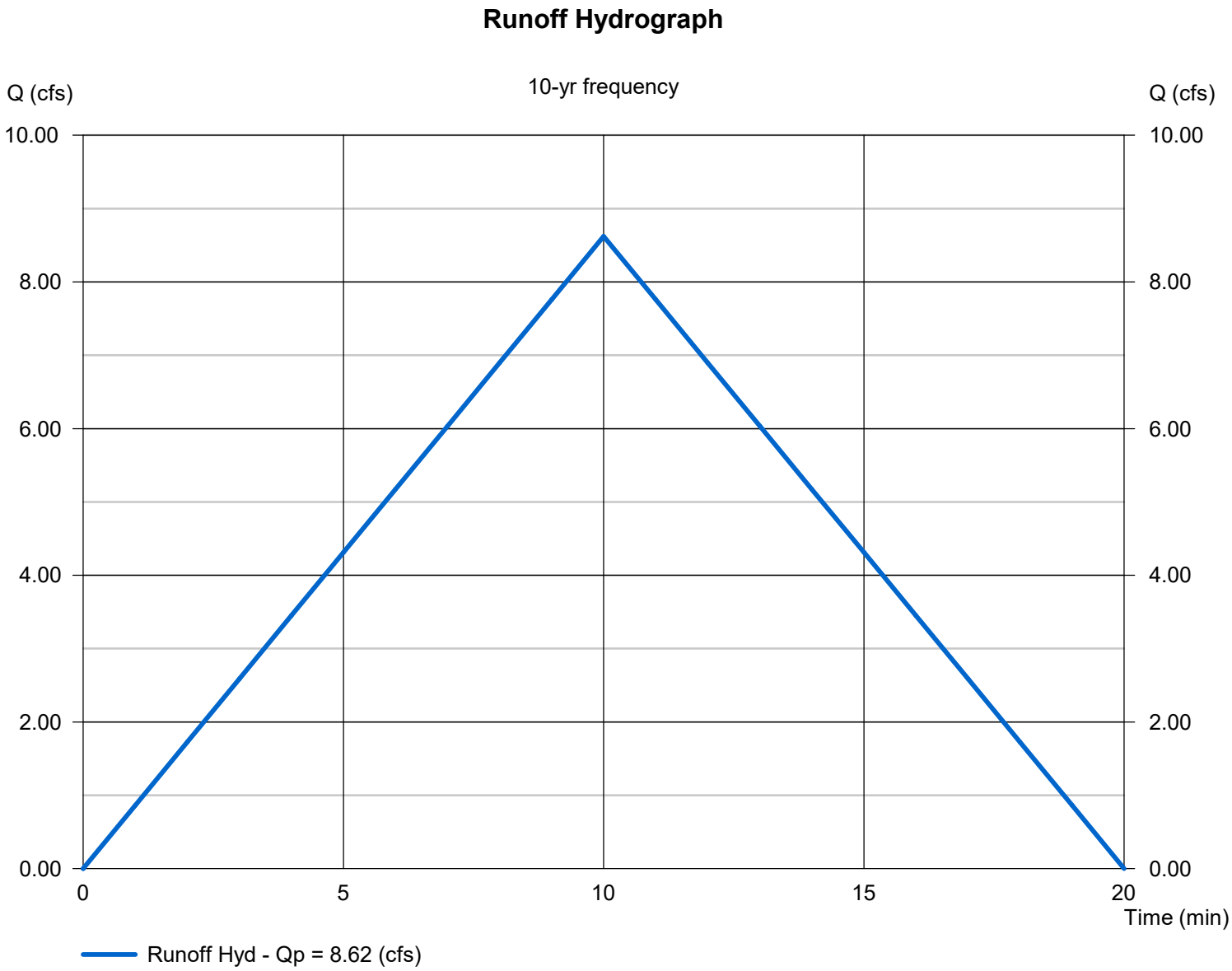
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #3A

Hydrograph type	= Rational	Peak discharge (cfs)	= 8.623
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 2.390	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 6.013	Tc by User (min)	= 10
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 5,174 (cuft); 0.119 (acft)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #3A

Triangular

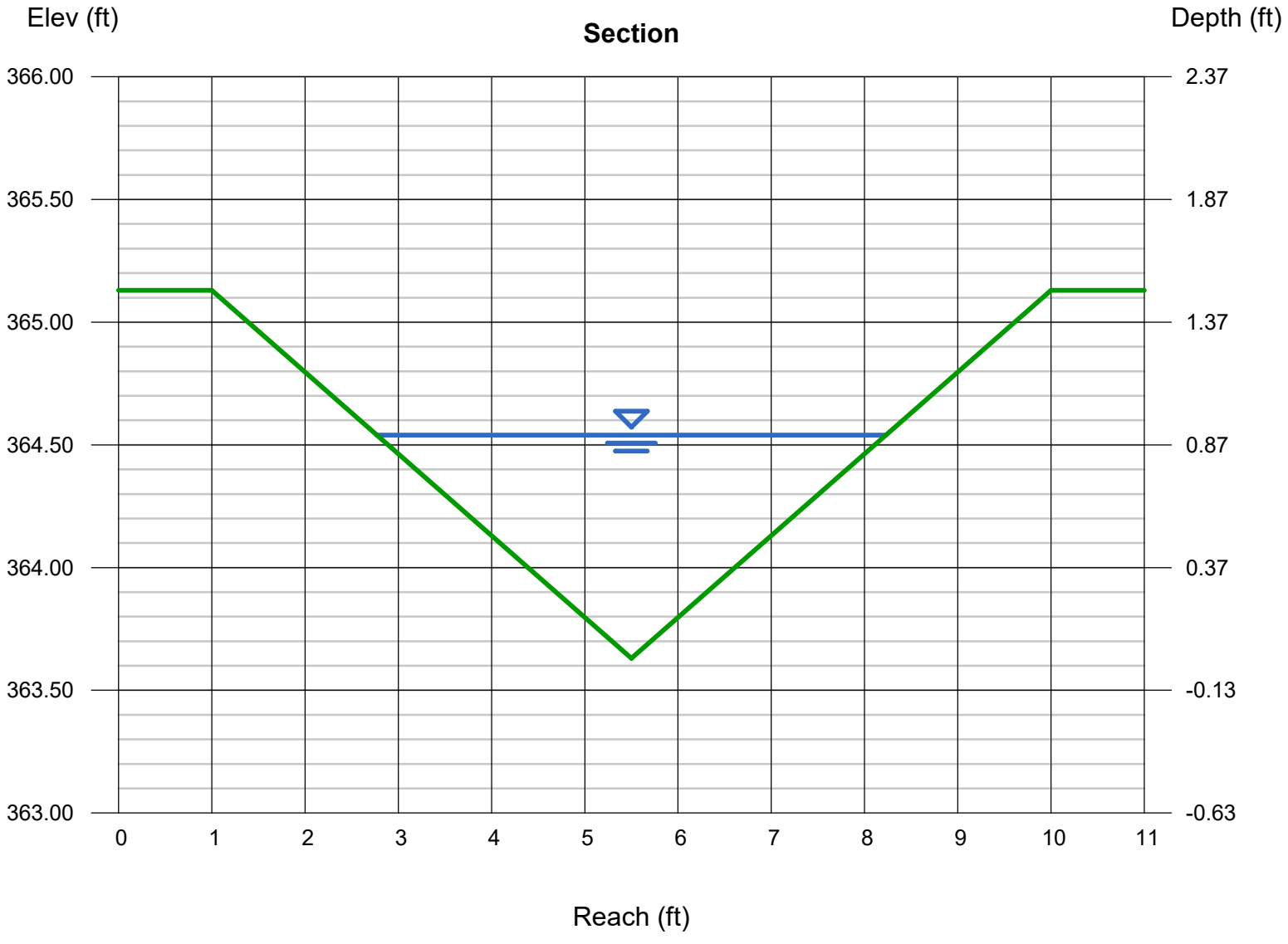
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 363.63
Slope (%)	= 1.84
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 8.62

Highlighted

Depth (ft)	= 0.91
Q (cfs)	= 8.620
Area (sqft)	= 2.48
Velocity (ft/s)	= 3.47
Wetted Perim (ft)	= 5.76
Crit Depth, Yc (ft)	= 0.88
Top Width (ft)	= 5.46
EGL (ft)	= 1.10



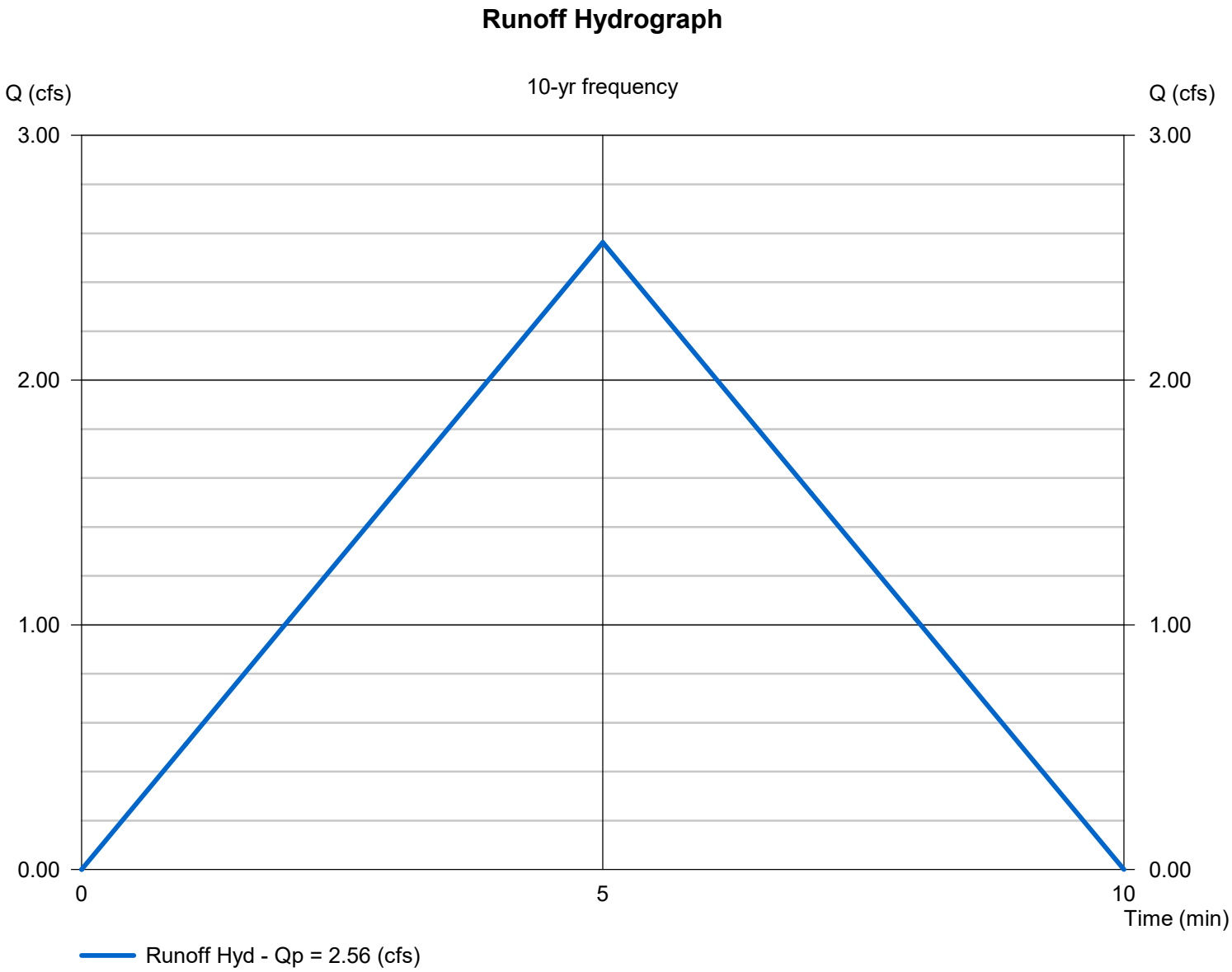
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #3B

Hydrograph type	= Rational	Peak discharge (cfs)	= 2.563
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 0.580	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 7.364	Tc by User (min)	= 5
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 769 (cuft); 0.018 (acft)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #3B

Triangular

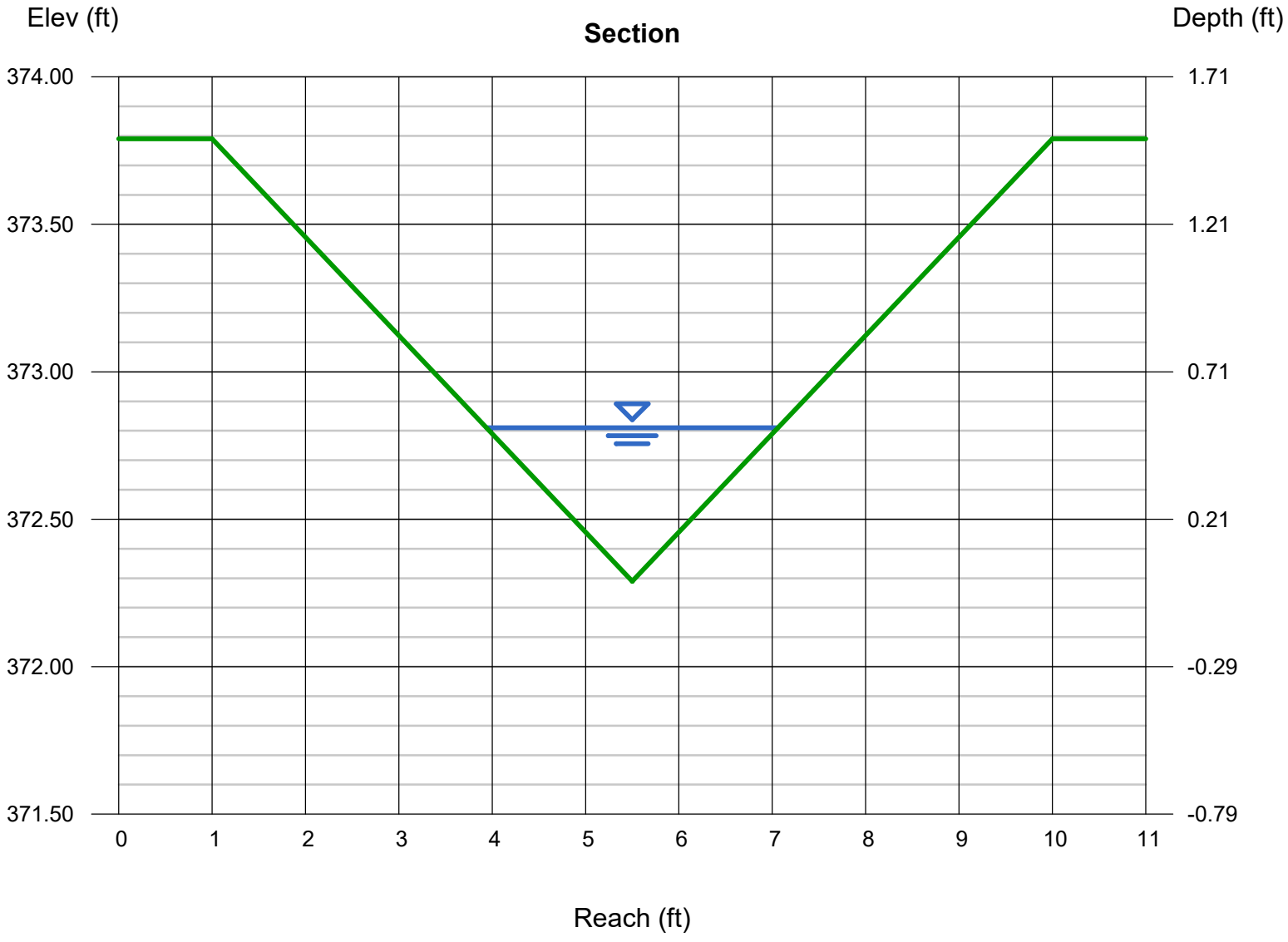
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 372.29
Slope (%)	= 3.43
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.56

Highlighted

Depth (ft)	= 0.52
Q (cfs)	= 2.560
Area (sqft)	= 0.81
Velocity (ft/s)	= 3.16
Wetted Perim (ft)	= 3.29
Crit Depth, Yc (ft)	= 0.54
Top Width (ft)	= 3.12
EGL (ft)	= 0.67



Hydrology Report

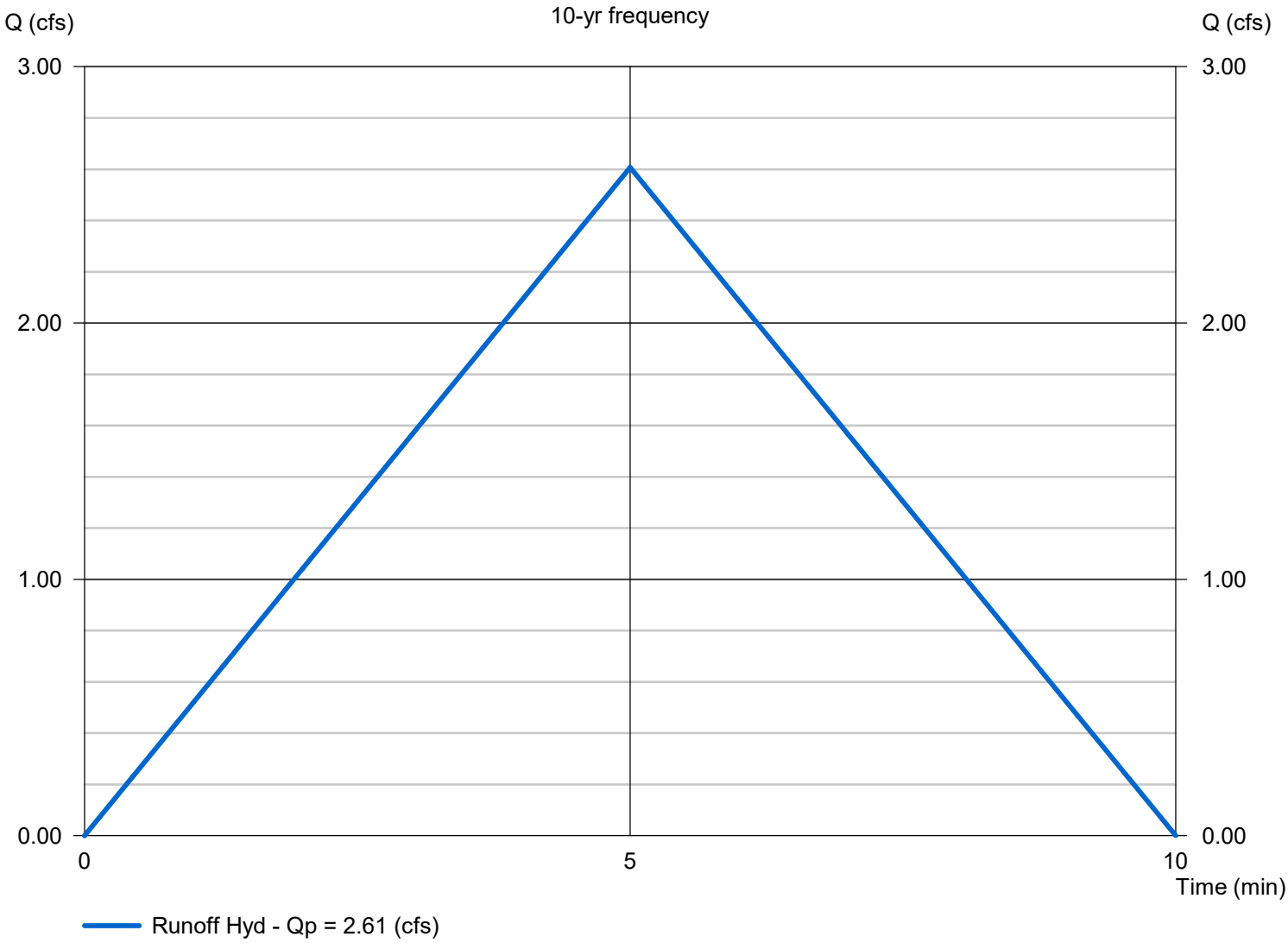
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #3C

Hydrograph type	= Rational	Peak discharge (cfs)	= 2.607
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 0.590	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 7.364	Tc by User (min)	= 5
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 782 (cuft); 0.018 (acft)

Runoff Hydrograph



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #3C

Triangular

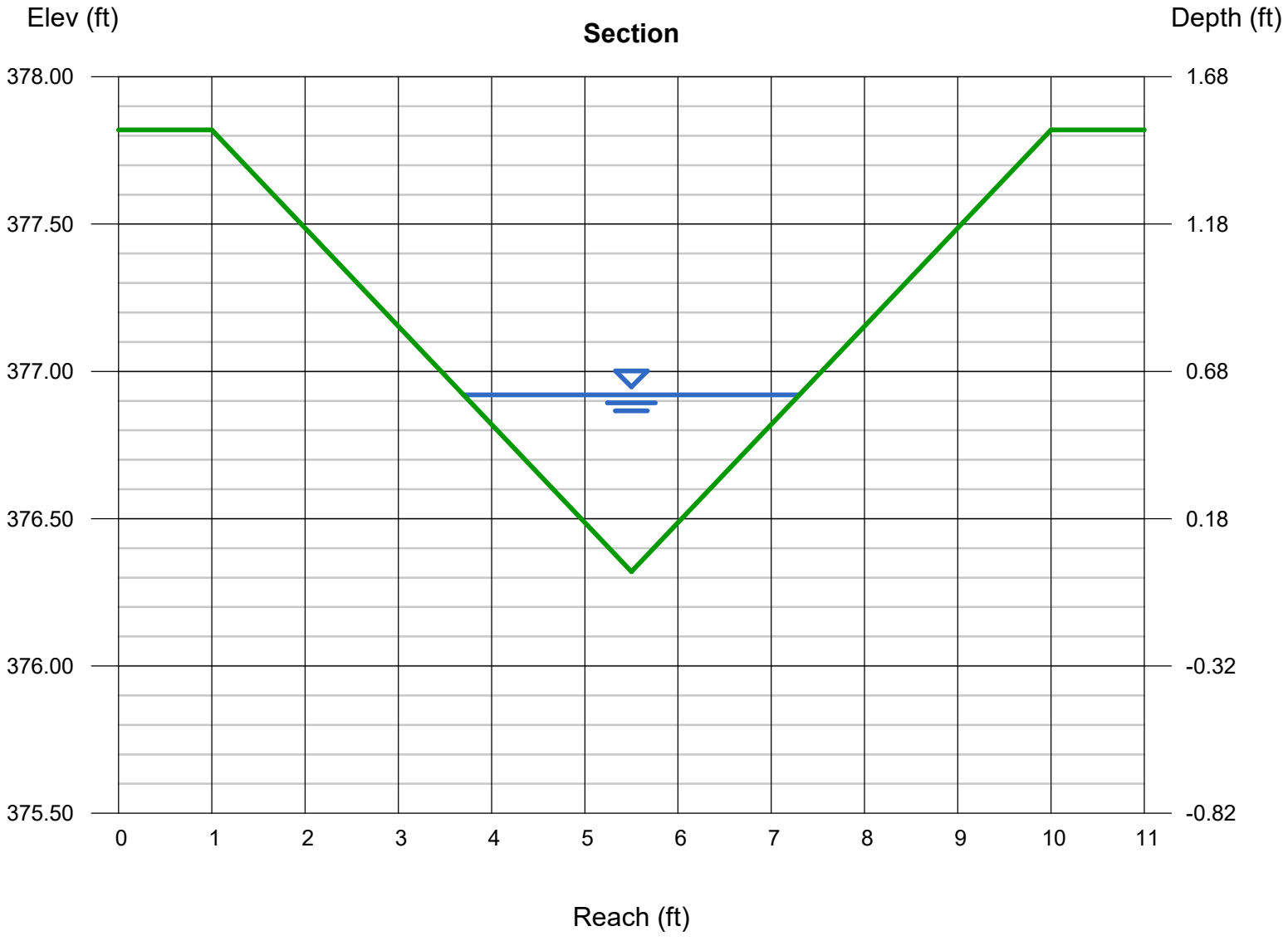
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 376.32
Slope (%)	= 1.64
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.61

Highlighted

Depth (ft)	= 0.60
Q (cfs)	= 2.610
Area (sqft)	= 1.08
Velocity (ft/s)	= 2.42
Wetted Perim (ft)	= 3.79
Crit Depth, Yc (ft)	= 0.55
Top Width (ft)	= 3.60
EGL (ft)	= 0.69



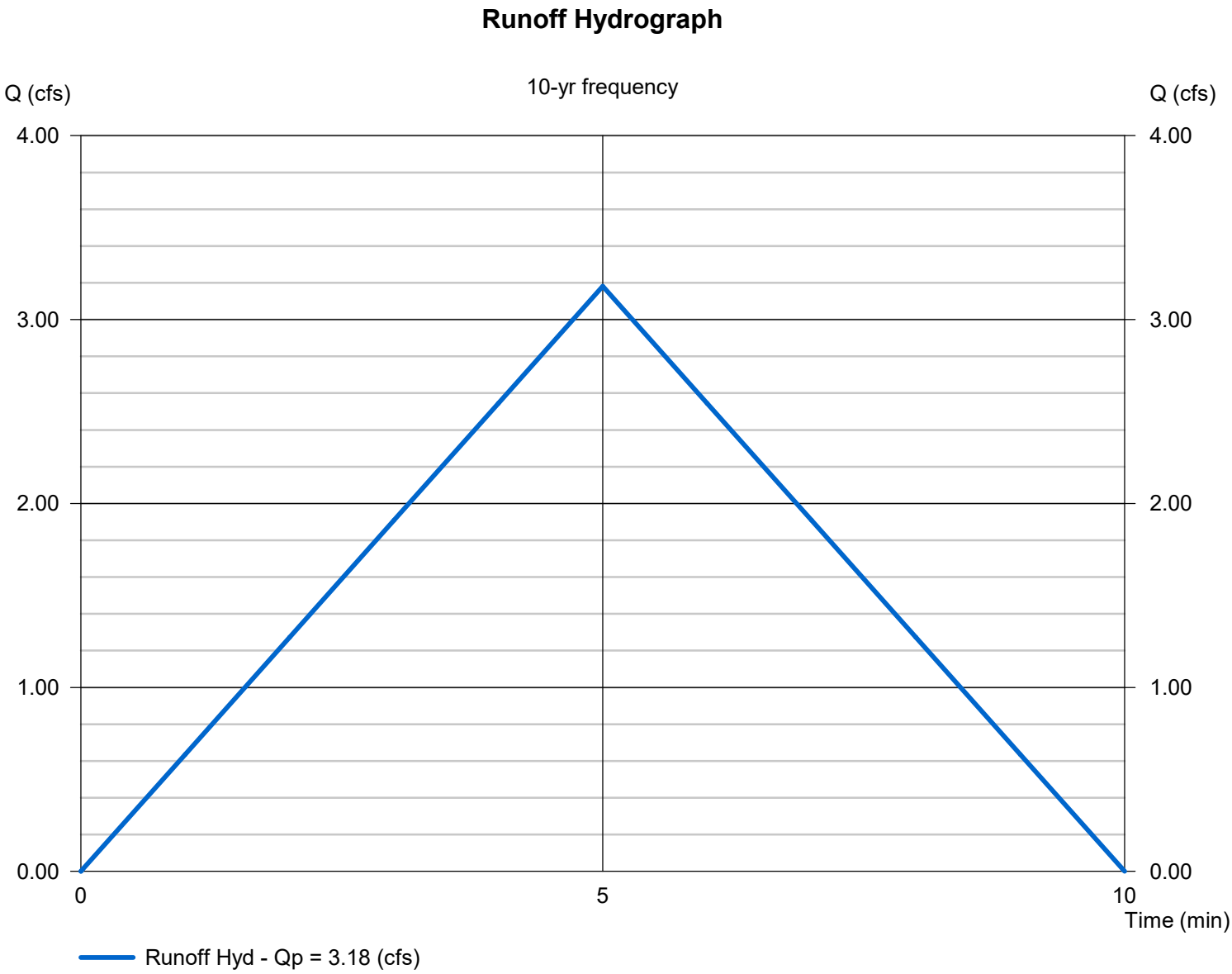
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #3D

Hydrograph type	= Rational	Peak discharge (cfs)	= 3.181
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 0.720	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 7.364	Tc by User (min)	= 5
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 954 (cuft); 0.022 (acft)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #3D

Triangular

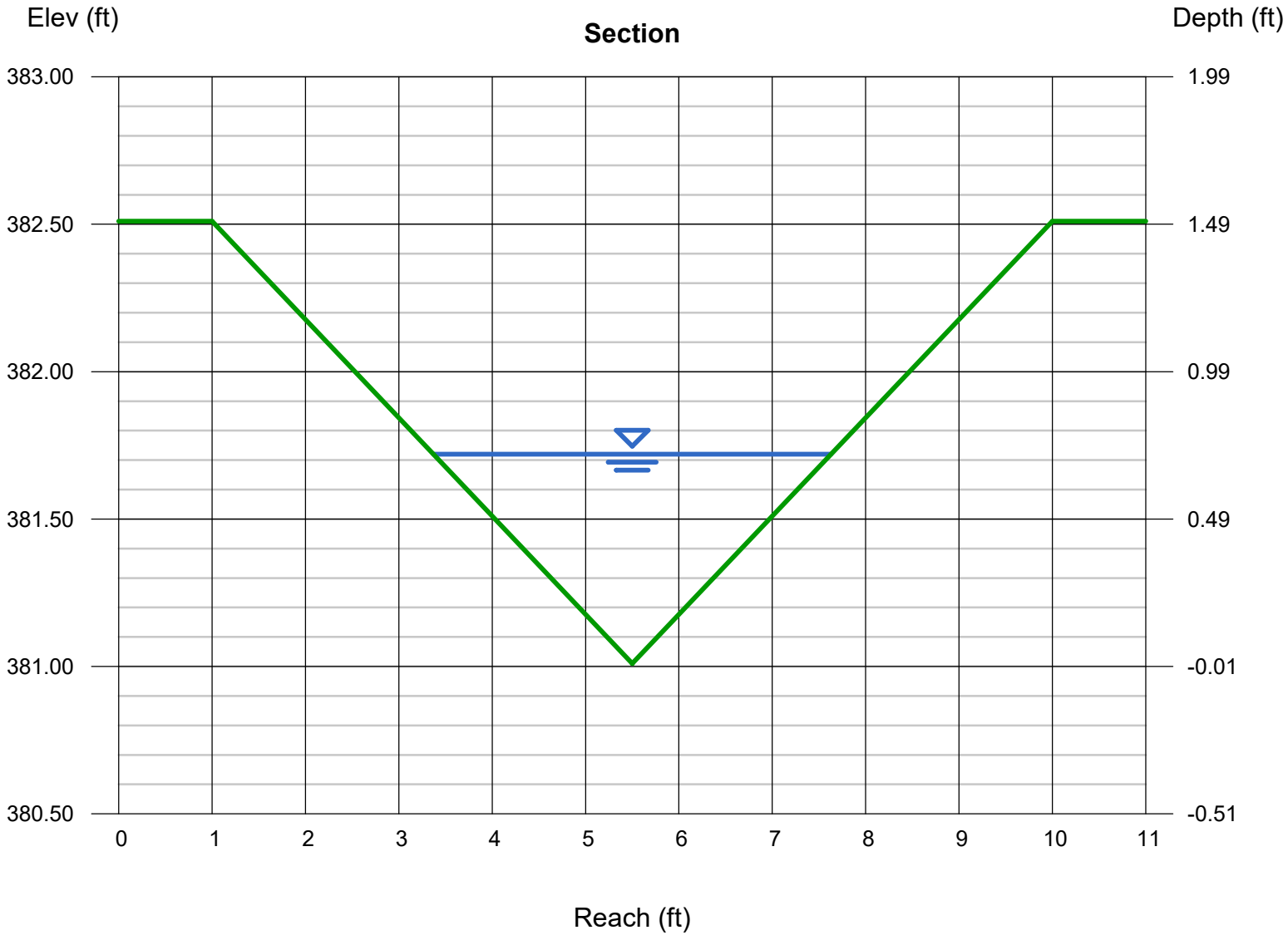
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 381.01
Slope (%)	= 1.00
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.18

Highlighted

Depth (ft)	= 0.71
Q (cfs)	= 3.180
Area (sqft)	= 1.51
Velocity (ft/s)	= 2.10
Wetted Perim (ft)	= 4.49
Crit Depth, Yc (ft)	= 0.59
Top Width (ft)	= 4.26
EGL (ft)	= 0.78



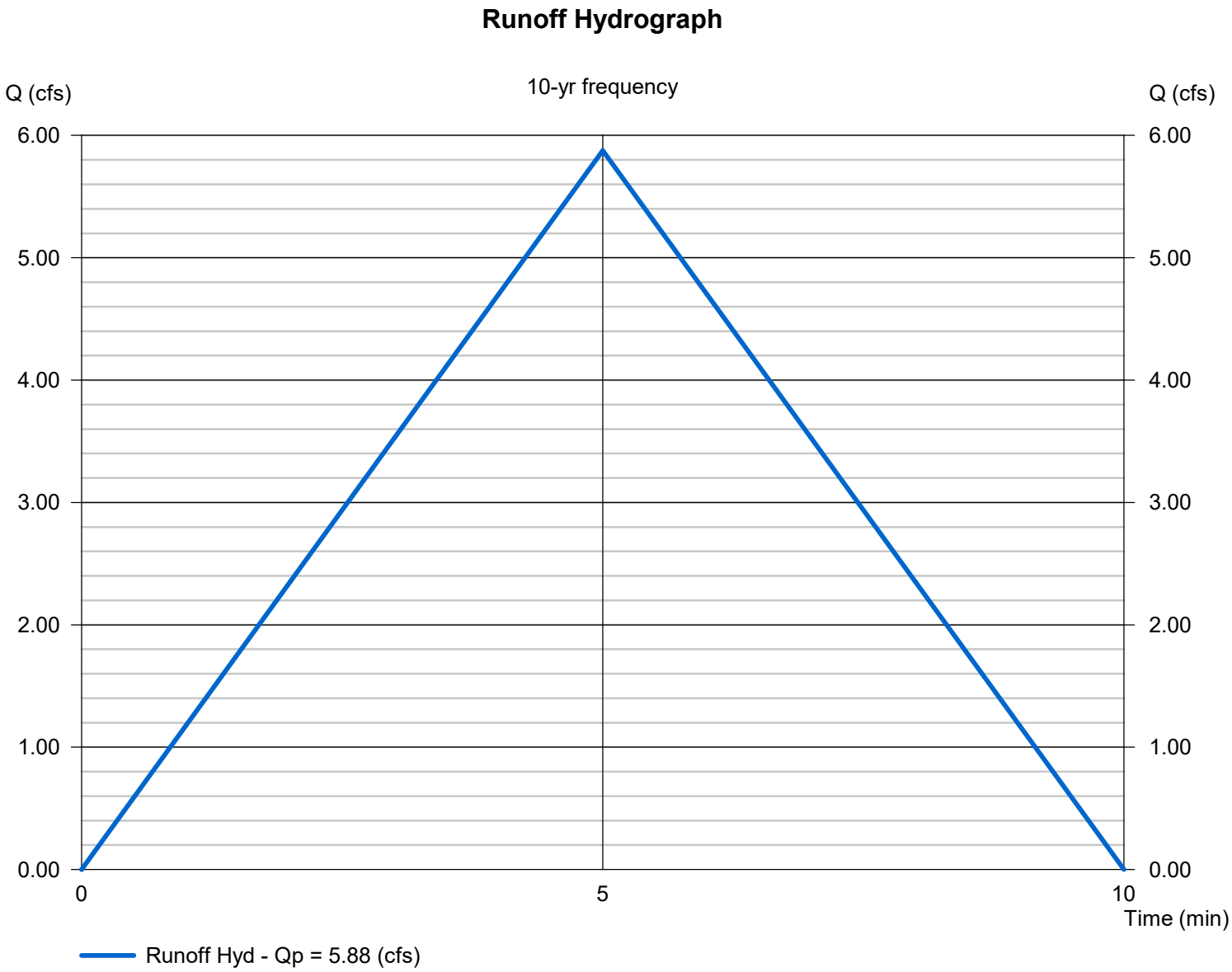
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #4A

Hydrograph type	= Rational	Peak discharge (cfs)	= 5.877
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 1.330	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 7.364	Tc by User (min)	= 5
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 1,763 (cuft); 0.040 (acft)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #4A

Triangular

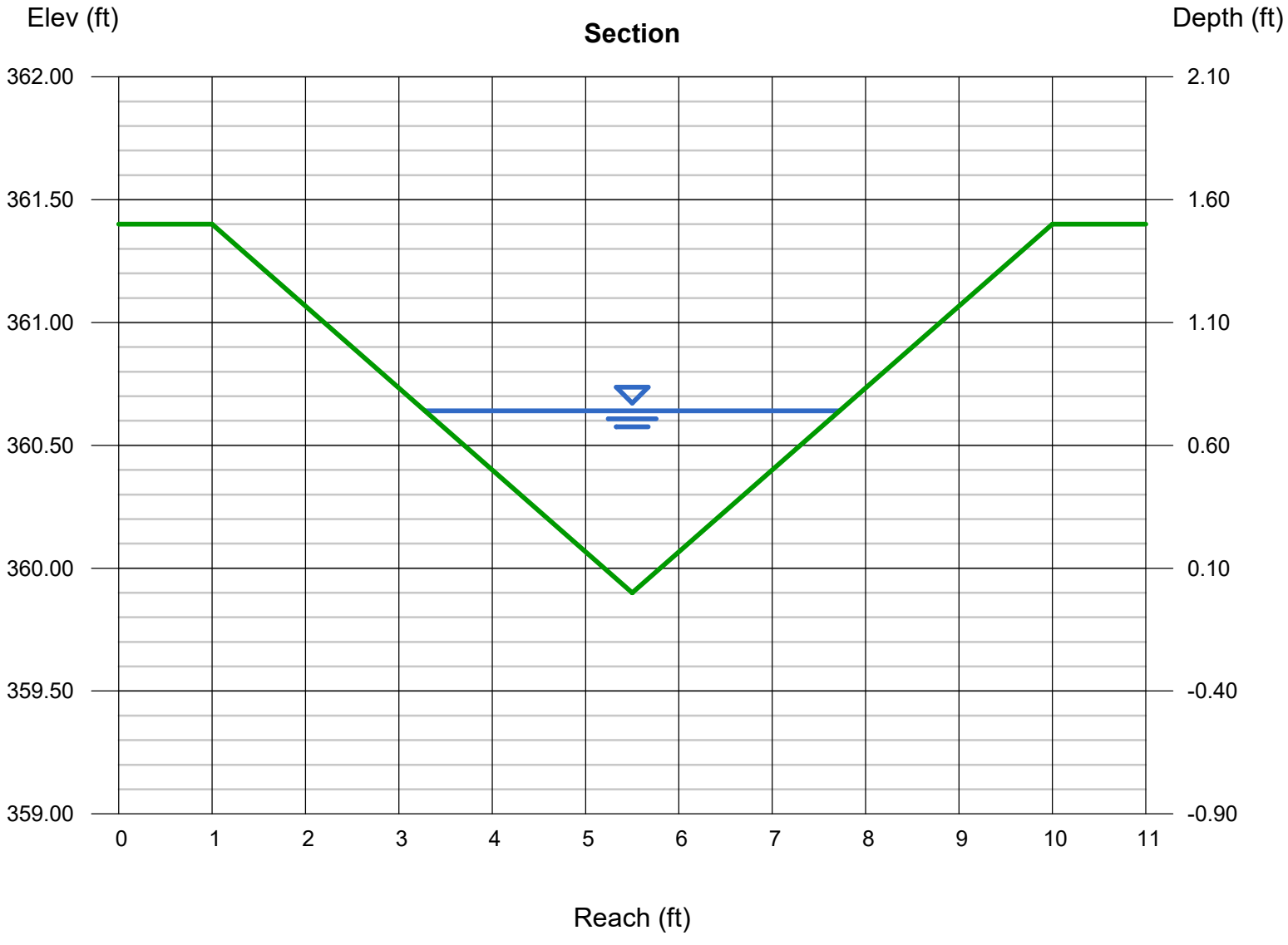
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 359.90
Slope (%)	= 2.73
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.88

Highlighted

Depth (ft)	= 0.74
Q (cfs)	= 5.880
Area (sqft)	= 1.64
Velocity (ft/s)	= 3.58
Wetted Perim (ft)	= 4.68
Crit Depth, Yc (ft)	= 0.76
Top Width (ft)	= 4.44
EGL (ft)	= 0.94



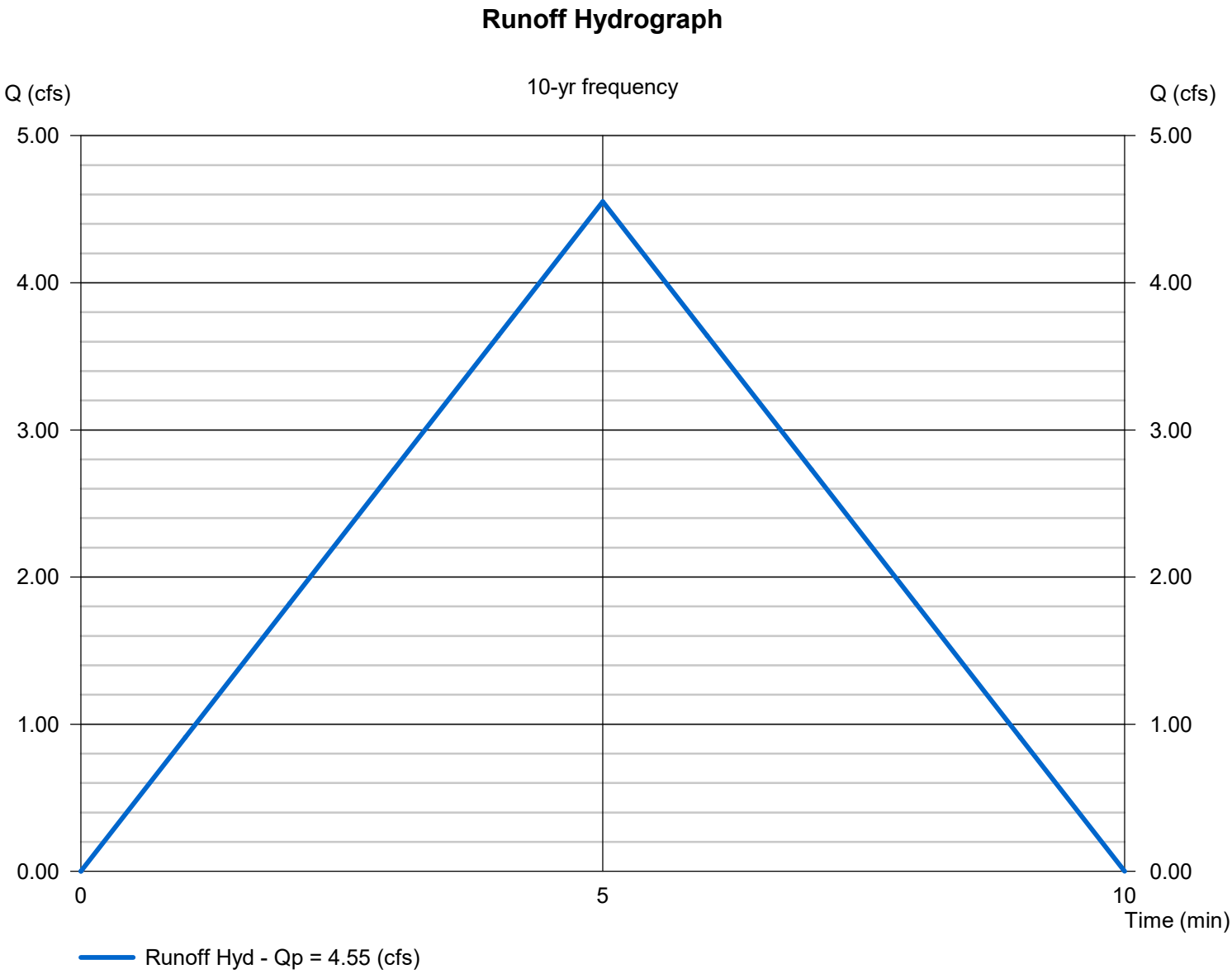
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #4B

Hydrograph type	= Rational	Peak discharge (cfs)	= 4.551
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 1.030	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 7.364	Tc by User (min)	= 5
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 1,365 (cuft); 0.031 (acft)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #4B

Triangular

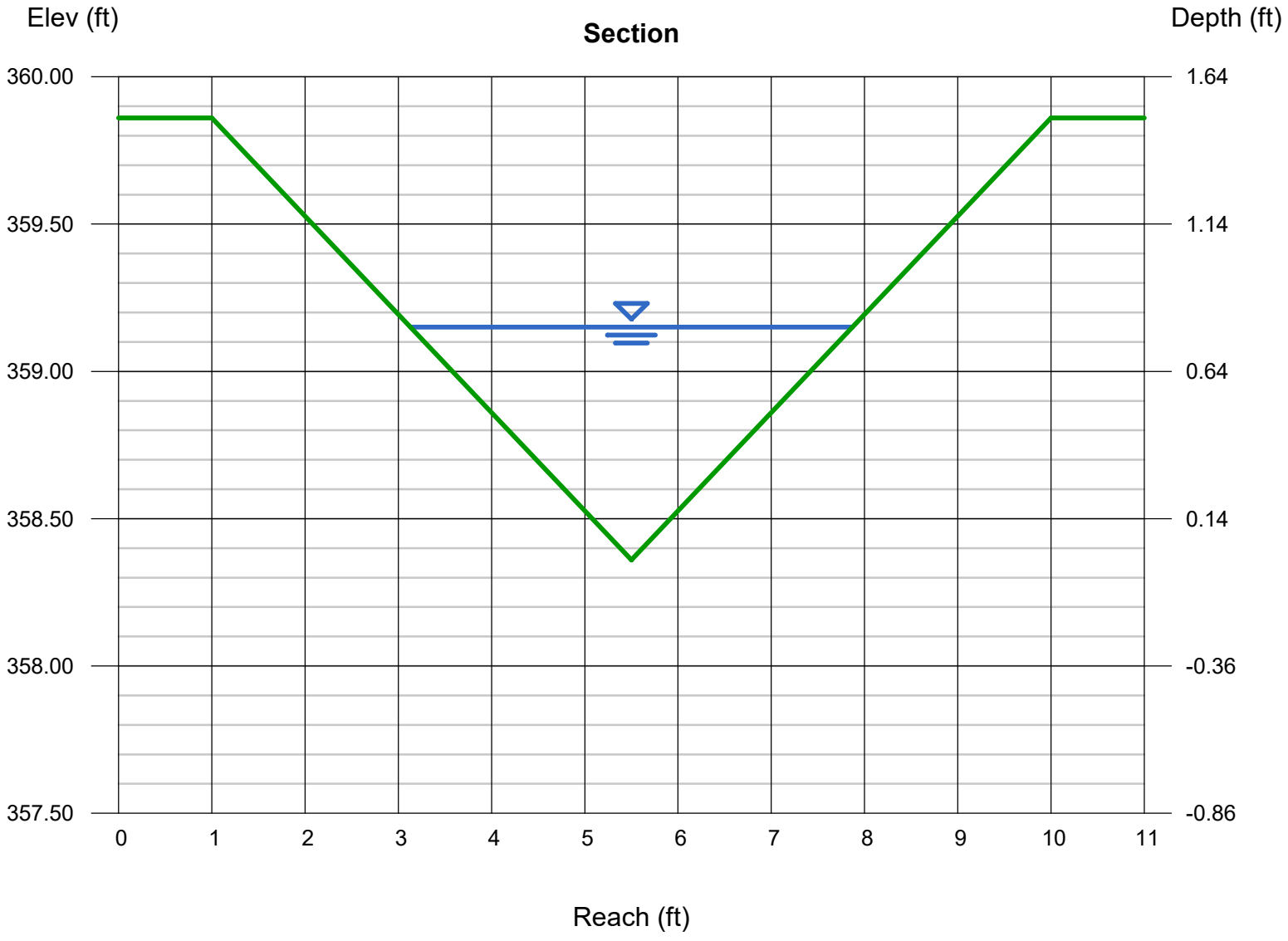
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 358.36
Slope (%)	= 1.11
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.55

Highlighted

Depth (ft)	= 0.79
Q (cfs)	= 4.550
Area (sqft)	= 1.87
Velocity (ft/s)	= 2.43
Wetted Perim (ft)	= 5.00
Crit Depth, Yc (ft)	= 0.68
Top Width (ft)	= 4.74
EGL (ft)	= 0.88



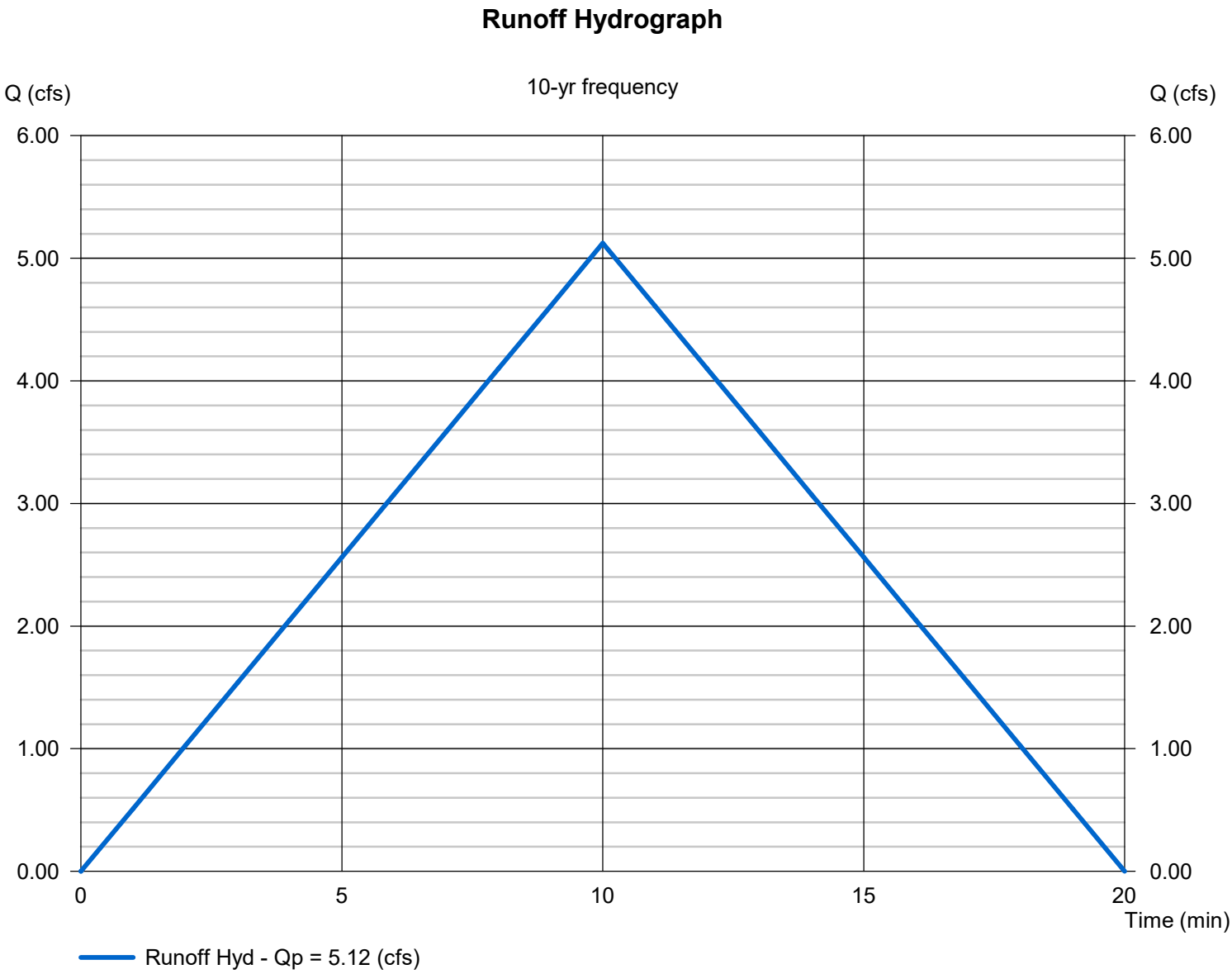
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #5A

Hydrograph type	= Rational	Peak discharge (cfs)	= 5.123
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 1.420	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 6.013	Tc by User (min)	= 10
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 3,074 (cuft); 0.071 (acft)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #5A

Triangular

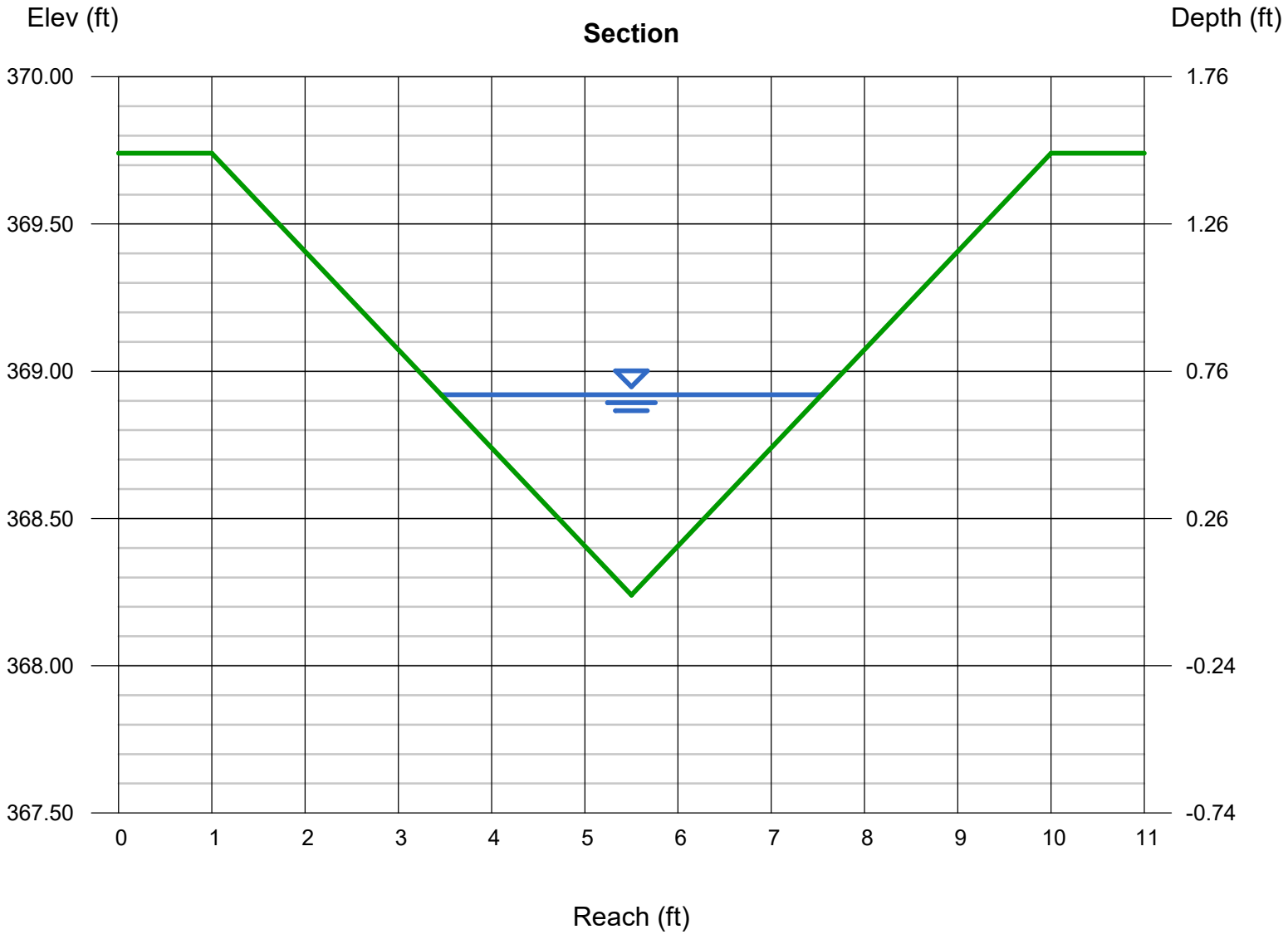
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 368.24
Slope (%)	= 3.16
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.12

Highlighted

Depth (ft)	= 0.68
Q (cfs)	= 5.120
Area (sqft)	= 1.39
Velocity (ft/s)	= 3.69
Wetted Perim (ft)	= 4.30
Crit Depth, Yc (ft)	= 0.72
Top Width (ft)	= 4.08
EGL (ft)	= 0.89



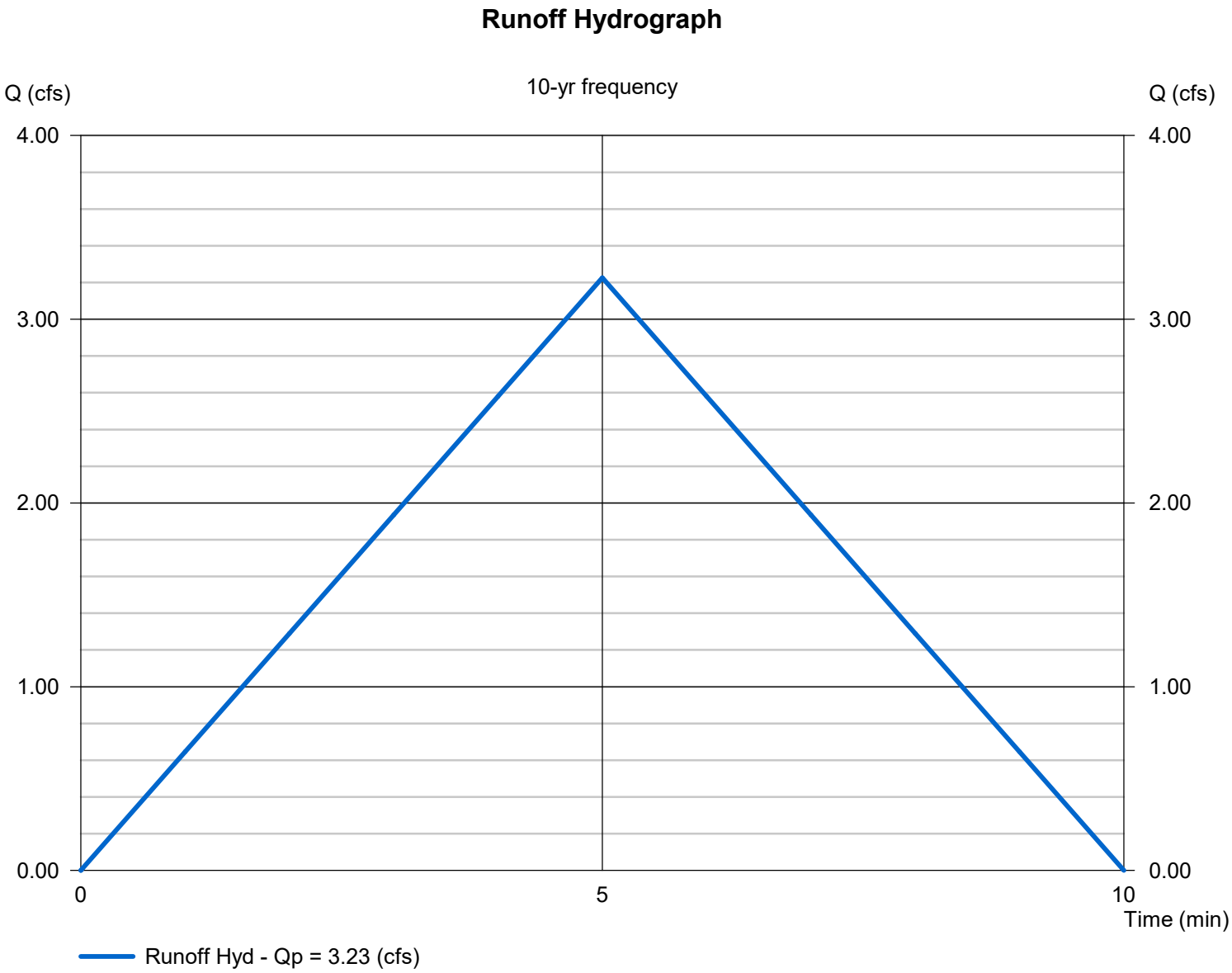
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #5B

Hydrograph type	= Rational	Peak discharge (cfs)	= 3.225
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 0.730	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 7.364	Tc by User (min)	= 5
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 968 (cuft); 0.022 (acft)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #5B

Triangular

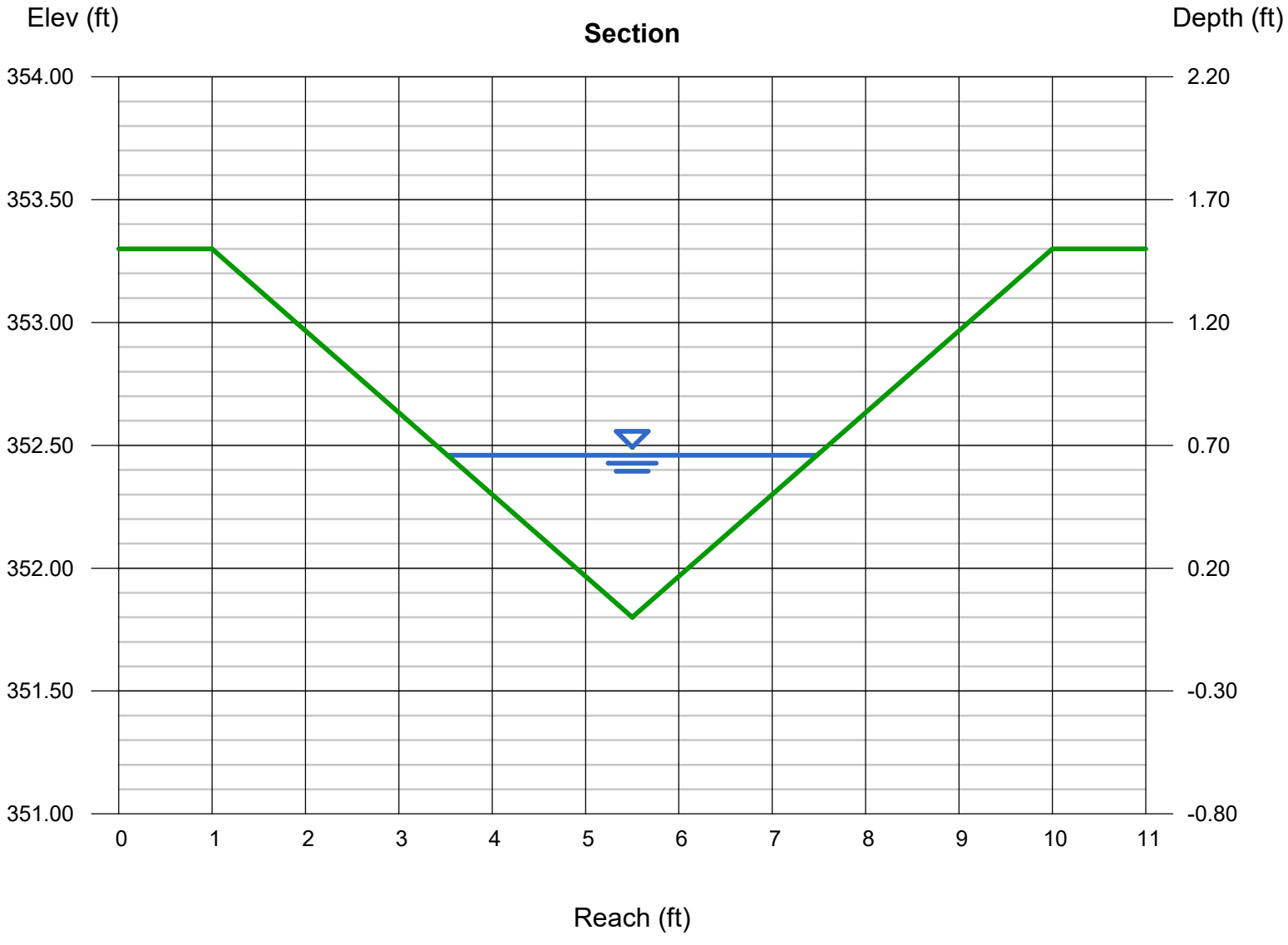
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 351.80
Slope (%)	= 1.46
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.23

Highlighted

Depth (ft)	= 0.66
Q (cfs)	= 3.230
Area (sqft)	= 1.31
Velocity (ft/s)	= 2.47
Wetted Perim (ft)	= 4.17
Crit Depth, Yc (ft)	= 0.60
Top Width (ft)	= 3.96
EGL (ft)	= 0.75



Hydrology Report

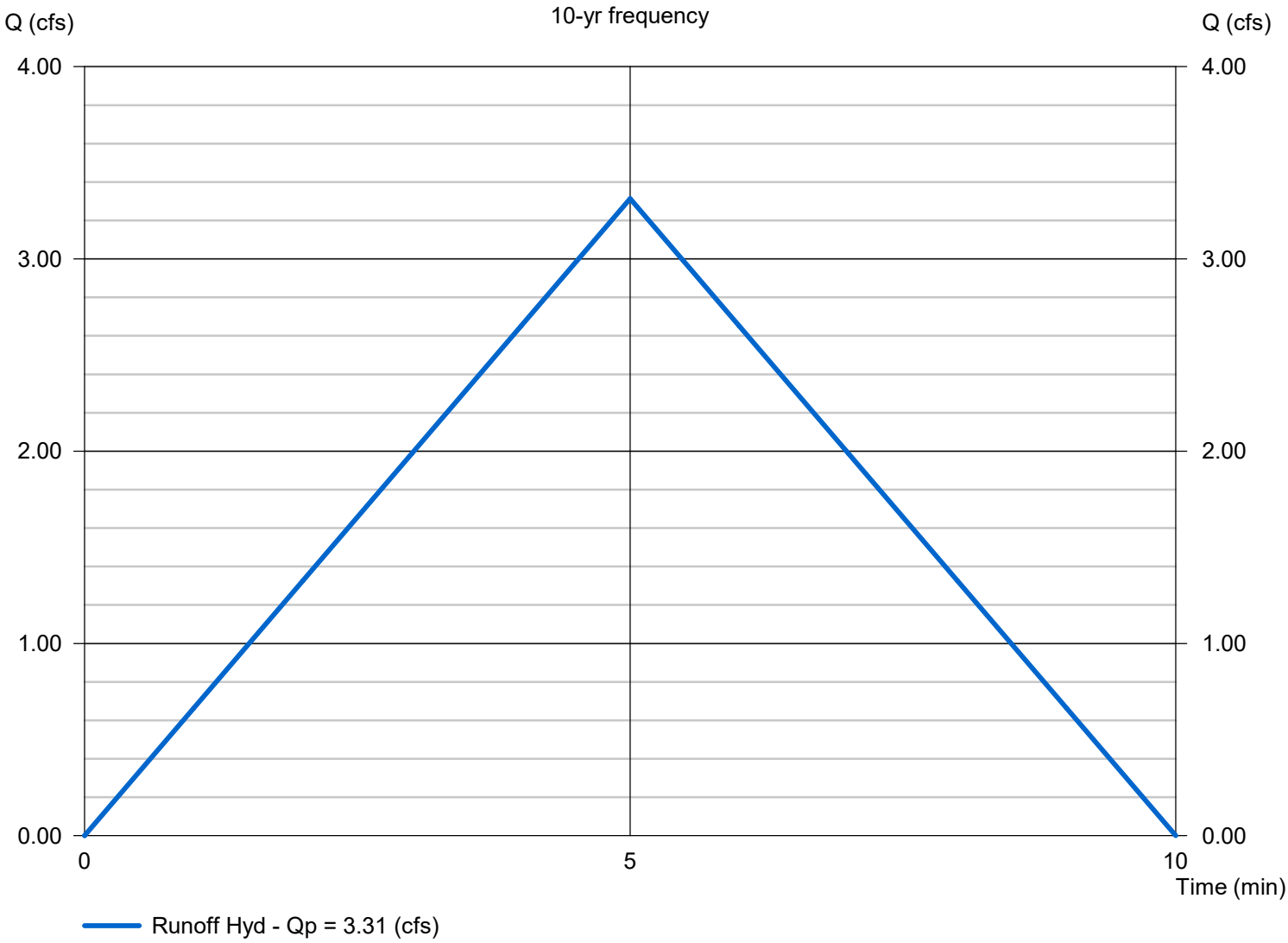
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #5C

Hydrograph type	= Rational	Peak discharge (cfs)	= 3.314
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 0.750	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 7.364	Tc by User (min)	= 5
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 994 (cuft); 0.023 (acft)

Runoff Hydrograph



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #5C

Triangular

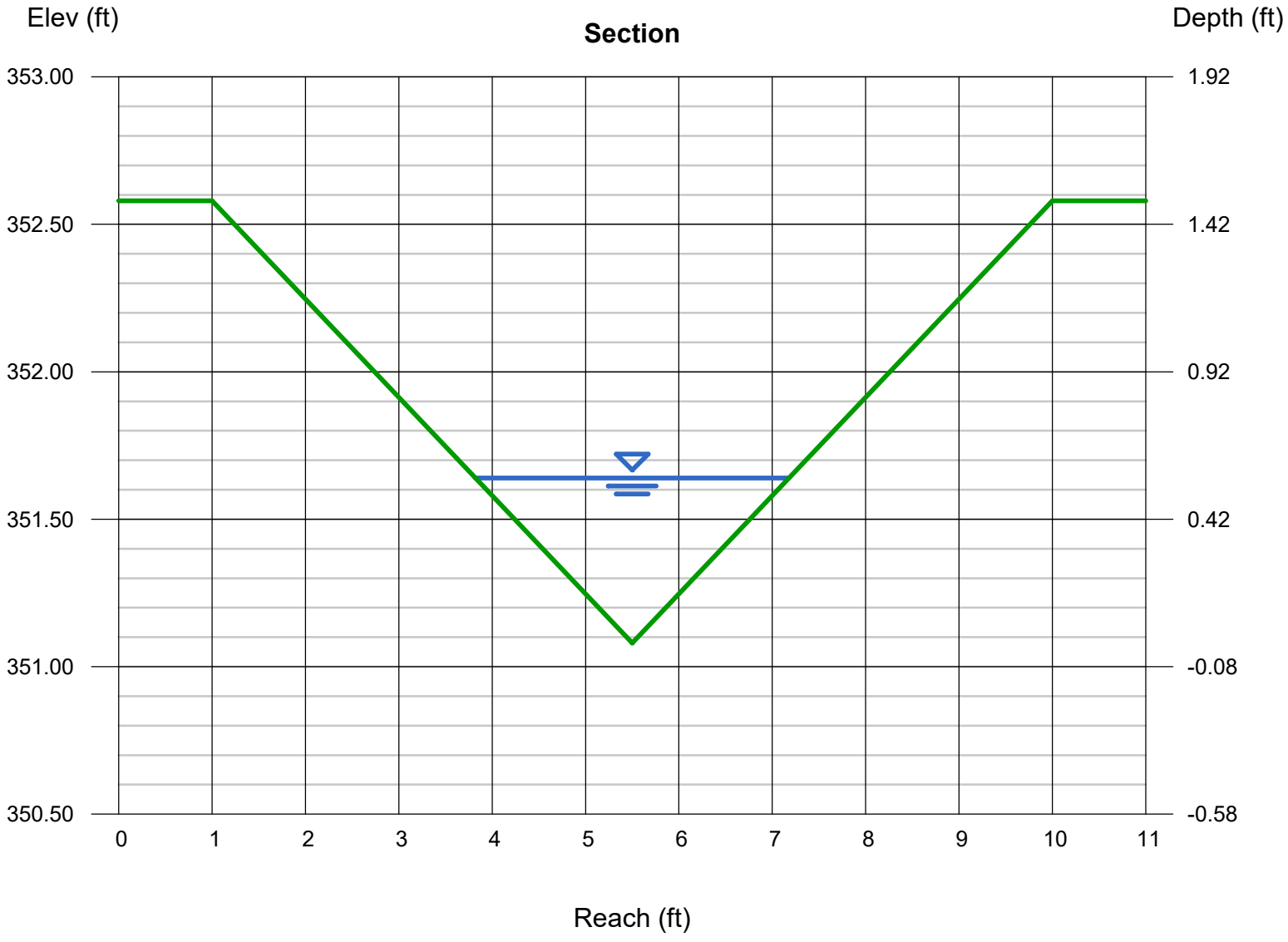
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 351.08
Slope (%)	= 3.85
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.31

Highlighted

Depth (ft)	= 0.56
Q (cfs)	= 3.310
Area (sqft)	= 0.94
Velocity (ft/s)	= 3.52
Wetted Perim (ft)	= 3.54
Crit Depth, Yc (ft)	= 0.60
Top Width (ft)	= 3.36
EGL (ft)	= 0.75



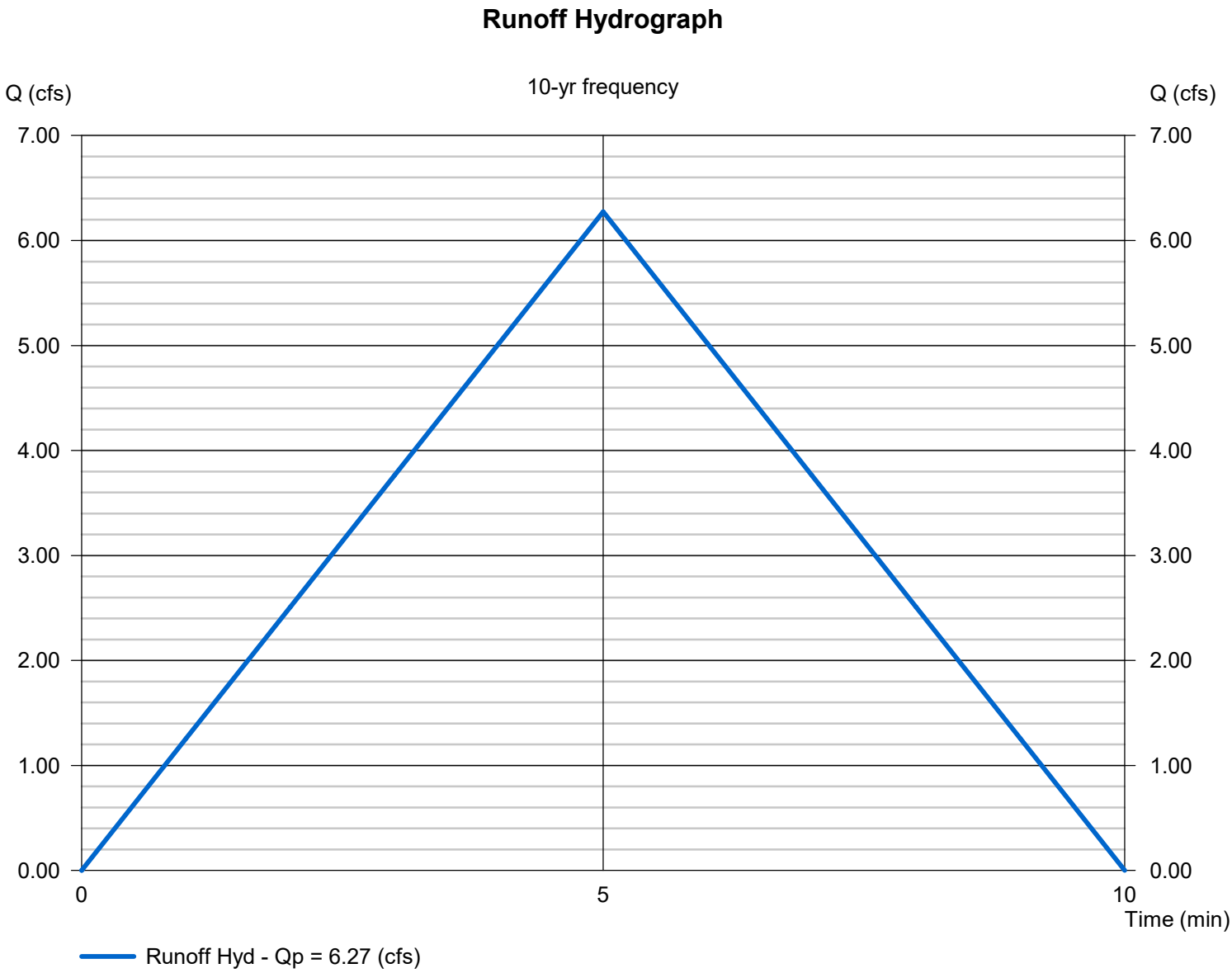
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #5D

Hydrograph type	= Rational	Peak discharge (cfs)	= 6.274
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 1.420	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 7.364	Tc by User (min)	= 5
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 1,882 (cuft); 0.043 (acft)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Apr 1 2025

PDD #5D

Triangular

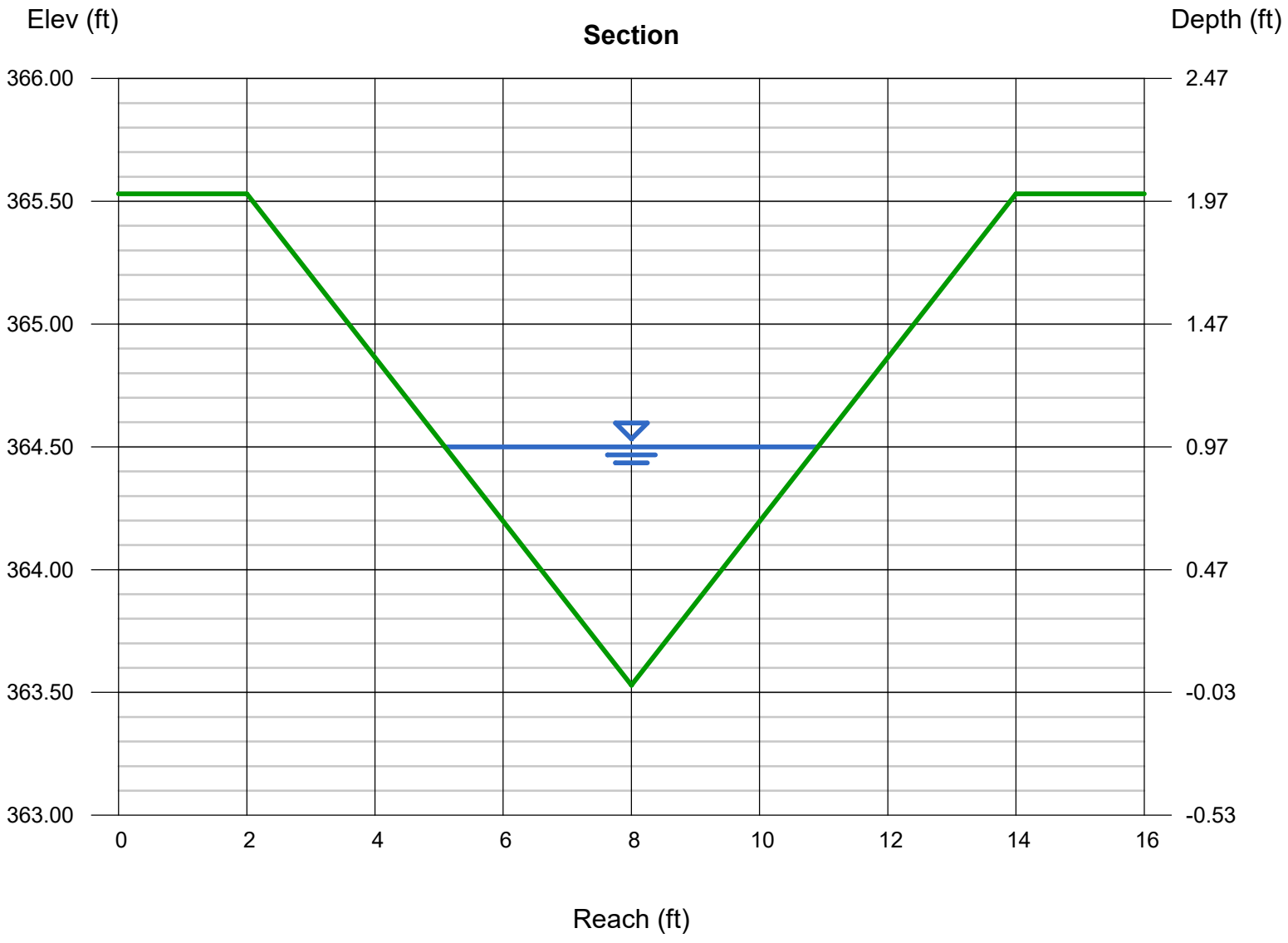
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 363.53
Slope (%)	= 0.70
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.27

Highlighted

Depth (ft)	= 0.97
Q (cfs)	= 6.270
Area (sqft)	= 2.82
Velocity (ft/s)	= 2.22
Wetted Perim (ft)	= 6.13
Crit Depth, Yc (ft)	= 0.78
Top Width (ft)	= 5.82
EGL (ft)	= 1.05



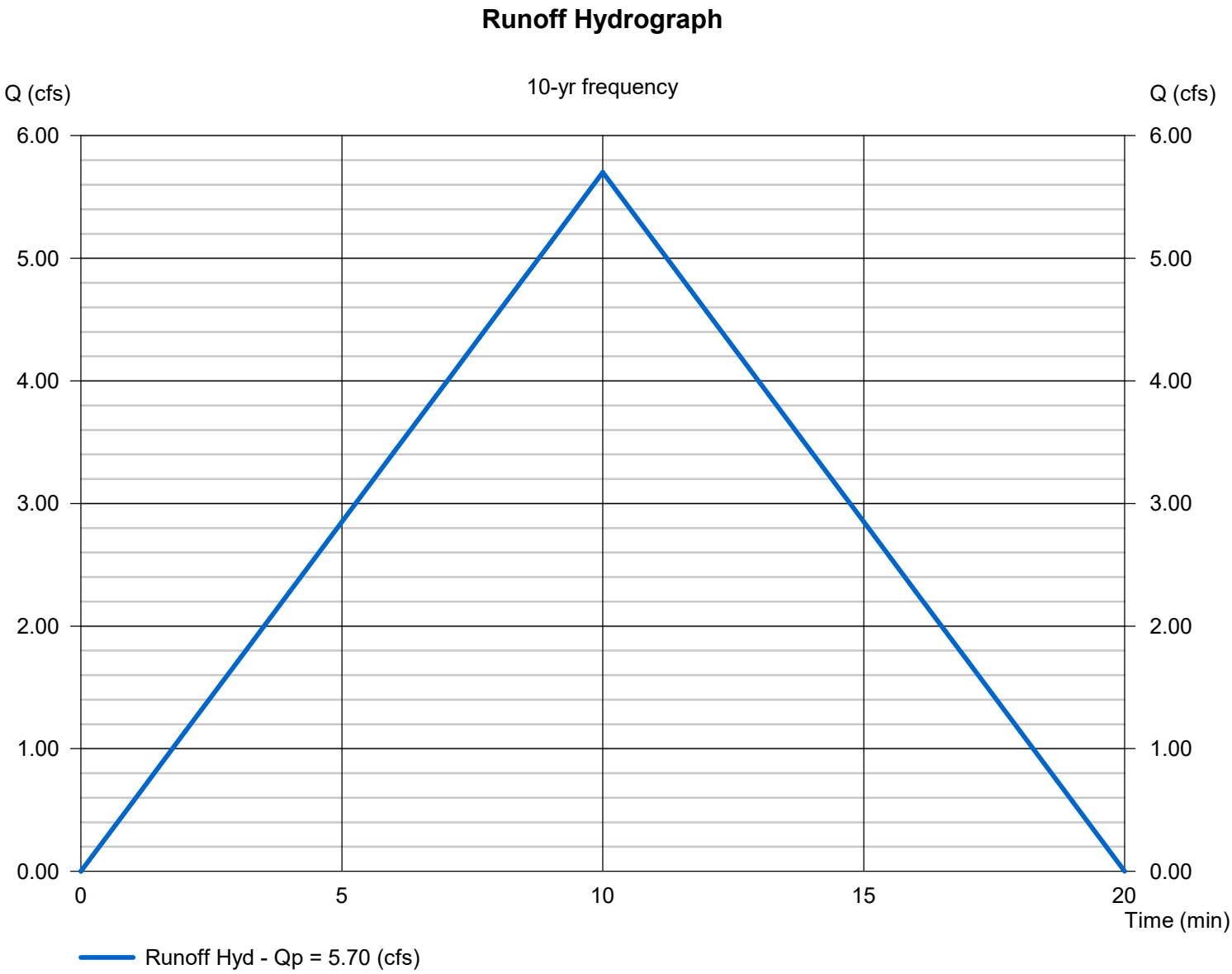
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #6

Hydrograph type	= Rational	Peak discharge (cfs)	= 5.700
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 1.580	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 6.013	Tc by User (min)	= 10
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 3,420 (cuft); 0.079 (acft)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #6

Triangular

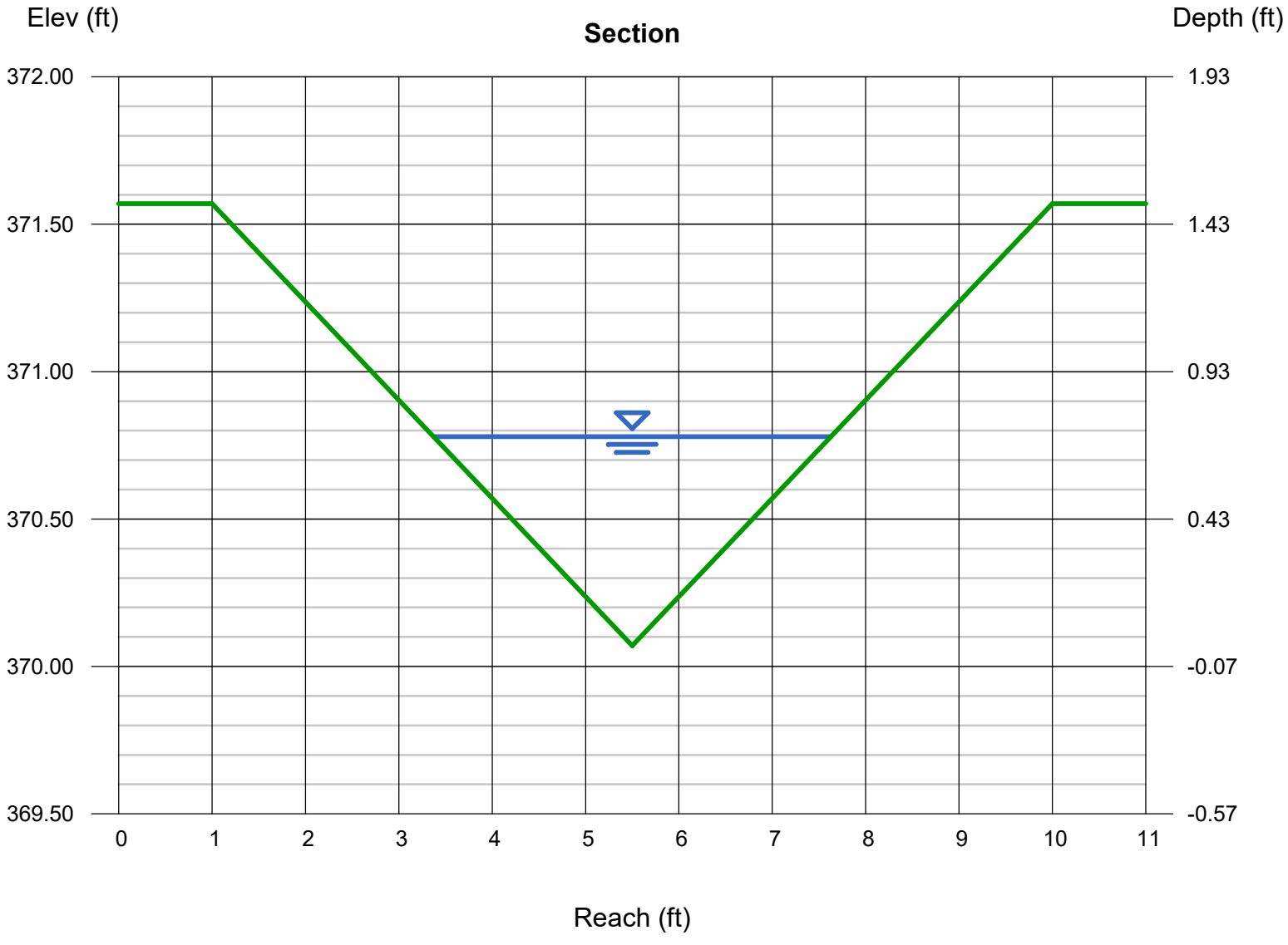
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 370.07
Slope (%)	= 3.16
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.70

Highlighted

Depth (ft)	= 0.71
Q (cfs)	= 5.700
Area (sqft)	= 1.51
Velocity (ft/s)	= 3.77
Wetted Perim (ft)	= 4.49
Crit Depth, Yc (ft)	= 0.75
Top Width (ft)	= 4.26
EGL (ft)	= 0.93



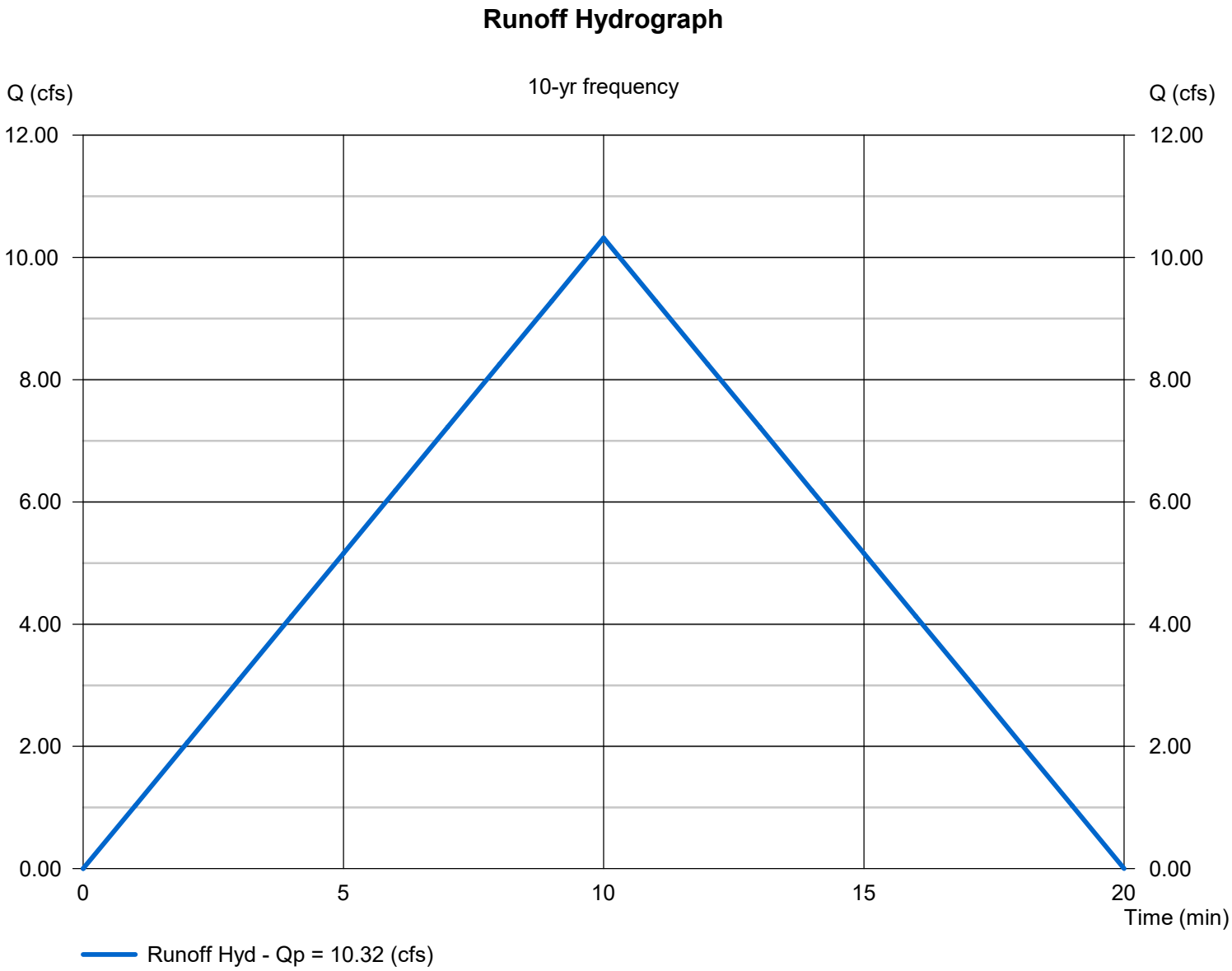
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #7

Hydrograph type	= Rational	Peak discharge (cfs)	= 10.32
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 2.860	Runoff coeff. (C)	= 0.6
Rainfall Inten (in/hr)	= 6.013	Tc by User (min)	= 10
IDF Curve	= 20241113 Moody IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 6,191 (cuft); 0.142 (acft)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 31 2025

PDD #7

Triangular

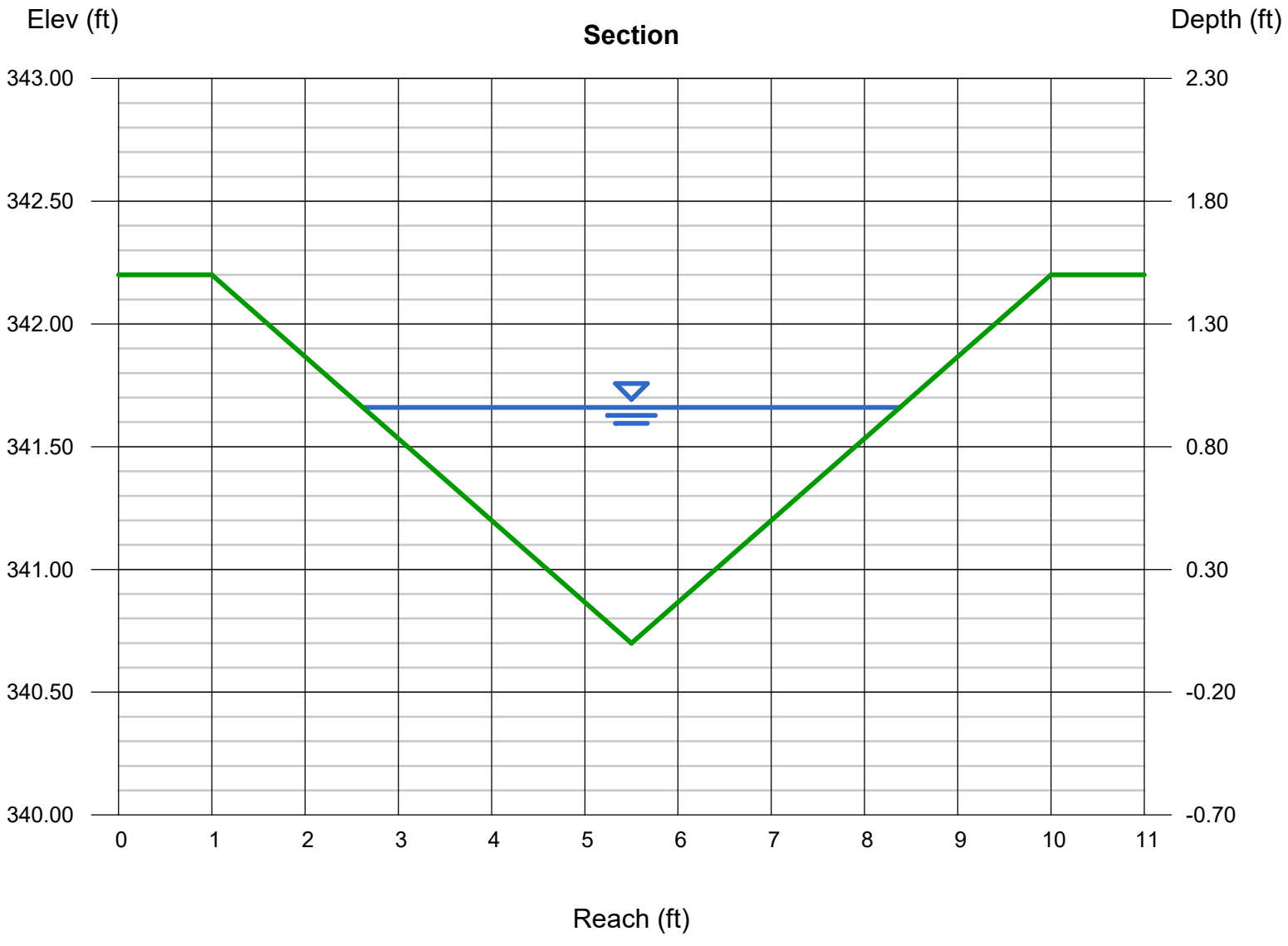
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 340.70
Slope (%)	= 5.00
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 16.02 (DITCH 6 + DITCH 7)

Highlighted

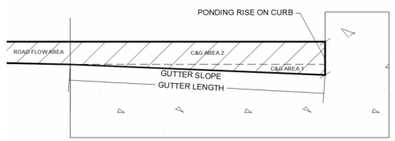
Depth (ft)	= 0.96
Q (cfs)	= 16.02
Area (sqft)	= 2.76
Velocity (ft/s)	= 5.79
Wetted Perim (ft)	= 6.07
Crit Depth, Yc (ft)	= 1.13
Top Width (ft)	= 5.76
EGL (ft)	= 1.48



Gutter Spread by Limited Area

Determine maximum area to on-grade inlet using input factors as shown below.

Project: **Moody** Road: **Mulberry Tree Drive (27' B-B)** Date: 3/31/25



Inlet No. **1** Allowable Spread=Pvm't + Gutter Width: 7.5 ft

Compute "C" Factor: One Half R/W Width: 25 One Half B/B Width: 13.5 S/W Width 5

Paved Area "C": 0.95 Grass Area 0.2

0.70 0.05

Gutter Width= 2.00 ft.

Total Allow. Spread = 7.50 ft. Manning's n = 0.015 Weir C = 3.33

Inlet Type 1 Inlet Types 1 NCDOT Std. 840.03

Composite Rational C = 0.76 I (2yr.) = 4.00 iph

Roadway X-slope = 0.02 Varies Manual Input

Standard Curb and Gutter Profile (see diagram above)

Gutter Length (ft)	2
Gutter Slope (ft/ft)	0.04
Ponding Rise on Curb (ft)	0.19

Max Flow for Limited Spread

C.B. NUMBER	Long. Slope	ROAD X-SLOPE	E. O. P. Depth	Weir Depth	C&G Flow Area 1	C&G Flow Area 2	C&G WP	Road Flow Area	Road WP	Total Flow A	Total WP	MAX Q FOR SPREAD, CFS	On-Grade Spread	Max Drainage Area (S.F.)	tual Drainage Ar Area (S.F.)	al Drainage Area (ACRE)	Check	
CB 107	0.030	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.91**	7.50	25436	8712	0.20	GOOD	
CB 105	0.030	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.91**	7.50	25436	8276	0.19	GOOD	
CB 106	0.030	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.91**	7.50	50872	32234	0.74	GOOD	*dbl
CB 104	0.030	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.91**	7.50	25436	6534	0.15	GOOD	
CB 103	0.030	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.91**	7.50	25436	8712	0.20	GOOD	
CB 305	0.030	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.91**	7.50	25436	7405	0.17	GOOD	
CB 306	0.030	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.91**	7.50	25436	5227	0.12	GOOD	
CB 304	0.015	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.35**	7.50	17986	3049	0.07	GOOD	
CB 303	0.015	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.35**	7.50	17986	3049	0.07	GOOD	
CB 302	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	29371	20909	0.48	GOOD	
CB 301	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	14686	8712	0.20	GOOD	
CB 330	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	14686	5227	0.12	GOOD	
CB 332	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	14686	12197	0.28	GOOD	
CB 333	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	14686	5663	0.13	GOOD	
CB 334	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	29371	20038	0.46	GOOD	*dbl
CB 412	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	14686	7405	0.17	GOOD	
CB 413	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	29371	22651	0.52	GOOD	*dbl

E. O. P. - Edge of Pavement
C&G - Curb and gutter
WP - Wetted Perimeter (ft.)

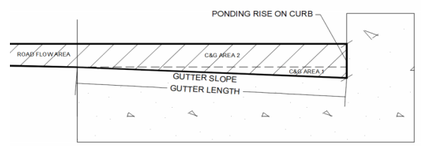
A - Area (s. f.)
V - Velocity (fps)

Note: Program uses Manning's formula for open channel flow.

Gutter Spread by Limited Area

Determine maximum area to on-grade inlet using input factors as shown below.

Project: **Moody** Road: **Tansley Crest Loop (27' B-B)** Date: 3/31/25



Inlet No. 1
Allowable Spread=Pvm't + Gutter Width: 7.5 ft
Compute "C" Factor:
One Half R/W Width: 25 One Half B/B Width: 13.5 S/W Width 5
Paved Area "C": 0.95 Grass Area 0.2
0.70 0.05

Gutter Width= 2.00 ft.
Total Allow. Spread = 7.50 ft. Manning's n = 0.015 Weir C = 3.33

Inlet Type 1 Inlet Types 1 NCDOT Std. 840.03

Composite Rational C = 0.76 I (2yr.) = 4.00 iph

Roadway X-slope = 0.02 Varies Manual Input

Standard Curb and Gutter Profile (see diagram above)

Gutter Length (ft)	2
Gutter Slope (ft/ft)	0.04
Ponding Rise on Curb (ft)	0.19

Max Flow for Limited Spread

C.B. NUMBER	Long. Slope	ROAD X-SLOPE	E. O. P. Depth	Weir Depth	C&G Flow Area 1	C&G Flow Area 2	C&G WP	Road Flow Area	Road WP	Total Flow A	Total WP	MAX Q FOR SPREAD, CFS	On-Grade Spread	Max Drainage Area (S.F.)	ctual Drainage Ar Area (S.F.)	al Drainage Area (ACRE)	Check
CB 421	0.030	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.91**	7.50	25436	3485	0.08	GOOD
CB 422	0.030	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.91**	7.50	25436	3920	0.09	GOOD
CB 401	0.012	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.21**	7.50	16087	3049	0.07	GOOD
CB 402	0.012	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.21**	7.50	16087	1742	0.04	GOOD
CB 407	0.012	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.21**	7.50	16087	1307	0.03	GOOD
CB 408	0.012	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.21**	7.50	16087	2614	0.06	GOOD
CB 408A	0.012	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.21**	7.50	16087	3485	0.08	GOOD
CB 409	0.020	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.56**	7.50	20769	3049	0.07	GOOD
CB 409A	0.020	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.56**	7.50	20769	3049	0.07	GOOD
CB 410	0.036	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.09**	7.50	55728	2614	0.06	GOOD
CB 410A	0.036	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.09**	7.50	27864	6970	0.16	GOOD
CB 411	0.027	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.81**	7.50	24131	871	0.02	GOOD
CB 505	0.020	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.56**	7.50	20769	16553	0.38	GOOD
CB 506	0.020	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.56**	7.50	20769	10890	0.25	GOOD
CB 510	0.042	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.26**	7.50	30097	2614	0.06	GOOD
CB 511	0.042	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.26**	7.50	30097	2614	0.06	GOOD
CB 512	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	14686	1879	0.04	GOOD
CB 513	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	14686	6098	0.14	GOOD
CB 516	0.030	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.91**	7.50	25436	5663	0.13	GOOD
CB 517	0.030	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.91**	7.50	25436	5227	0.12	GOOD

E. O. P. - Edge of Pavement
C&G - Curb and gutter
WP - Wetted Perimeter (ft.)

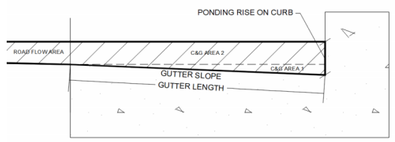
A - Area (s. f.)
V - Velocity (fps)

Note: Program uses Manning's formula for open channel flow.

Gutter Spread by Limited Area

Determine maximum area to on-grade inlet using input factors as shown below.

Project: **Moody** Road: **Vintage Vinery Court (27' B-B)** Date: 3/31/25



Inlet No. 1 Allowable Spread=Pvm't + Gutter Width: 7.5 ft

Compute "C" Factor: One Half R/W Width: 25 One Half B/B Width: 13.5 S/W Width 5

Paved Area "C": 0.95 Grass Area 0.2

0.70 0.05

Standard Curb and Gutter Profile (see diagram above)

Gutter Length (ft)	2
Gutter Slope (ft/ft)	0.04
Ponding Rise on Curb (ft)	0.19

Gutter Width= 2.00 ft.

Total Allow. Spread = 7.50 ft. Manning's n = 0.015 Weir C = 3.33

Inlet Type 1 Inlet Types 1 NCDOT Std. 840.03

Composite Rational C = 0.76 I (2yr.) = 4.00 iph

Roadway X-slope = 0.02 Varies Manual Input

Max Flow for Limited Spread

C.B. NUMBER	Long. Slope	ROAD X-SLOPE	E. O. P. Depth	Weir Depth	C&G Flow Area 1	C&G Flow Area 2	C&G WP	Road Flow Area	Road WP	Total Flow A	Total WP	MAX Q FOR SPREAD, CFS	On-Grade Spread	Max Drainage Area (S.F.)	tual Drainage Ar Area (S.F.)	al Drainage Area (ACRE)	Check	
CB 307	0.050	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.47**	7.50	32838	5663	0.13	GOOD	
CB 308	0.050	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.47**	7.50	32838	9148	0.21	GOOD	
CB 309	0.050	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.47**	7.50	32838	3049	0.07	GOOD	
CB 311	0.040	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.21**	7.50	29371	2614	0.06	GOOD	
CB 312	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	14686	3920	0.09	GOOD	
CB 313	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	14686	12632	0.29	GOOD	
CB 315	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	29371	24829	0.57	GOOD	*dbl
CB 319	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	14686	12632	0.29	GOOD	
CB 321	0.028	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.85**	7.50	24574	8276	0.19	GOOD	
CB 325	0.005	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**0.78**	7.50	20769	3485	0.08	GOOD	
CB 514	0.039	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.18**	7.50	29002	10454	0.24	GOOD	
CB 515	0.039	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.18**	7.50	29002	4792	0.11	GOOD	
CB 507	0.039	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.18**	7.50	58004	7405	0.17	GOOD	
CB 508	0.039	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.18**	7.50	29002	10454	0.24	GOOD	
CB 504	0.047	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.39**	7.50	31838	1742	0.04	GOOD	
CB 503	0.025	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.74**	7.50	23220	14810	0.34	GOOD	
CB 502	0.025	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.74**	7.50	23220	16553	0.38	GOOD	

E. O. P. - Edge of Pavement
C&G - Curb and gutter
WP - Wetted Perimeter (ft.)

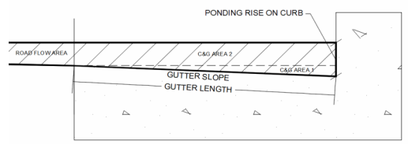
A - Area (s. f.)
V - Velocity (fps)

Note: Program uses Manning's formula for open channel flow.

Gutter Spread by Limited Area

Determine maximum area to on-grade inlet using input factors as shown below.

Project: **Moody** Road: **Cranapple Lane (27' B-B)** Date: 3/31/25



Inlet No. **1** Allowable Spread=Pvm't + Gutter Width: 7.5 ft

Compute "C" Factor: One Half R/W Width: 25 One Half B/B Width: 13.5 S/W Width 5

Paved Area "C": 0.95 Grass Area 0.2

0.70 0.05

Gutter Width= 2.00 ft.

Total Allow. Spread = 7.50 ft. Manning's n = 0.015 Weir C = 3.33

Inlet Type 1 Inlet Types 1 NCDOT Std. 840.03

Composite Rational C = 0.76 I (2yr.) = 4.00 iph

Roadway X-slope = 0.02 Varies Manual Input

Standard Curb and Gutter Profile (see diagram above)

Gutter Length (ft)	2
Gutter Slope (ft/ft)	0.04
Ponding Rise on Curb (ft)	0.19

Max Flow for Limited Spread

C.B. NUMBER	Long. Slope	ROAD X-SLOPE	E. O. P. Depth	Weir Depth	C&G Flow Area 1	C&G Flow Area 2	C&G WP	Road Flow Area	Road WP	Total Flow A	Total WP	MAX Q FOR SPREAD, CFS	On-Grade Spread	Max Drainage Area (S.F.)	ctual Drainage Ar Area (S.F.)	al Drainage Area (ACRE)	Check
CB 406	0.018	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.48**	7.50	19703	10890	0.25	GOOD
CB 405	0.035	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.06**	7.50	27474	3049	0.07	GOOD
CB 404	0.035	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.06**	7.50	27474	8276	0.19	GOOD
CB 403	0.035	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**2.06**	7.50	27474	6534	0.15	GOOD

E. O. P. - Edge of Pavement
C&G - Curb and gutter
WP - Wetted Perimeter (ft.)

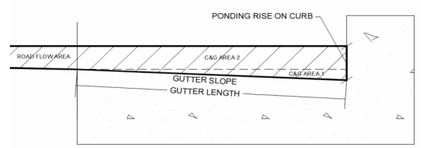
A - Area (s. f.)
V - Velocity (fps)

Note: Program uses Manning's formula for open channel flow.

Gutter Spread by Limited Area

Determine maximum area to on-grade inlet using input factors as shown below.

Project: **Moody** Road: **Wineberry Bush Lane (27' B-B)** Date: 3/31/25



Inlet No. **1** Allowable Spread=Pvm't + Gutter Width: 7.5 ft

Compute "C" Factor: One Half R/W Width: 25 One Half B/B Width: 13.5 S/W Width 5

Paved Area "C": 0.95 Grass Area 0.2

0.70 0.05

Gutter Width= 2.00 ft.

Total Allow. Spread = 7.50 ft. Manning's n = 0.015 Weir C = 3.33

Inlet Type 1 Inlet Types 1 NCDOT Std. 840.03

Composite Rational C = 0.76 I (2yr.) = 4.00 iph

Roadway X-slope = 0.02 Varies Manual Input

Standard Curb and Gutter Profile (see diagram above)

Gutter Length (ft)	2
Gutter Slope (ft/ft)	0.04
Ponding Rise on Curb (ft)	0.19

Max Flow for Limited Spread

C.B. NUMBER	Long. Slope	ROAD X-SLOPE	E. O. P. Depth	Weir Depth	C&G Flow Area 1	C&G Flow Area 2	C&G WP	Road Flow Area	Road WP	Total Flow A	Total WP	MAX Q FOR SPREAD, CFS	On-Grade Spread	Max Drainage Area (S.F.)	ctual Drainage Ar Area (S.F.)	al Drainage Area (ACRE)	Check	
CB 101	0.025	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.74**	7.50	23220	8276	0.19	GOOD	
CB 102	0.025	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.74**	7.50	23220	7841	0.18	GOOD	
CB 121	0.020	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.56**	7.50	41537	22651	0.52	GOOD	*dbl
CB 122	0.020	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.56**	7.50	20769	9583	0.22	GOOD	

E. O. P. - Edge of Pavement
C&G - Curb and gutter
WP - Wetted Perimeter (ft.)

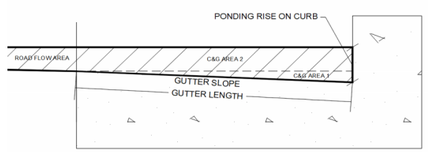
A - Area (s. f.)
V - Velocity (fps)

Note: Program uses Manning's formula for open channel flow.

Gutter Spread by Limited Area

Determine maximum area to on-grade inlet using input factors as shown below.

Project: **Moody** Road: **Clover Cottage Lane (27' B-B)** Date: 3/31/25



Inlet No. **1** Allowable Spread=Pvm't + Gutter Width: 7.5 ft

Compute "C" Factor: One Half R/W Width: 25 One Half B/B Width: 13.5 S/W Width 5

Paved Area "C": 0.95 Grass Area 0.2

0.70 0.05

Gutter Width= 2.00 ft.

Total Allow. Spread = 7.50 ft. Manning's n = 0.015 Weir C = 3.33

Inlet Type 1 Inlet Types 1 NCDOT Std. 840.03

Composite Rational C = 0.76 I (2yr.) = 4.00 iph

Roadway X-slope = 0.02 Varies Manual Input

Standard Curb and Gutter Profile (see diagram above)

Gutter Length (ft)	2
Gutter Slope (ft/ft)	0.04
Ponding Rise on Curb (ft)	0.19

Max Flow for Limited Spread

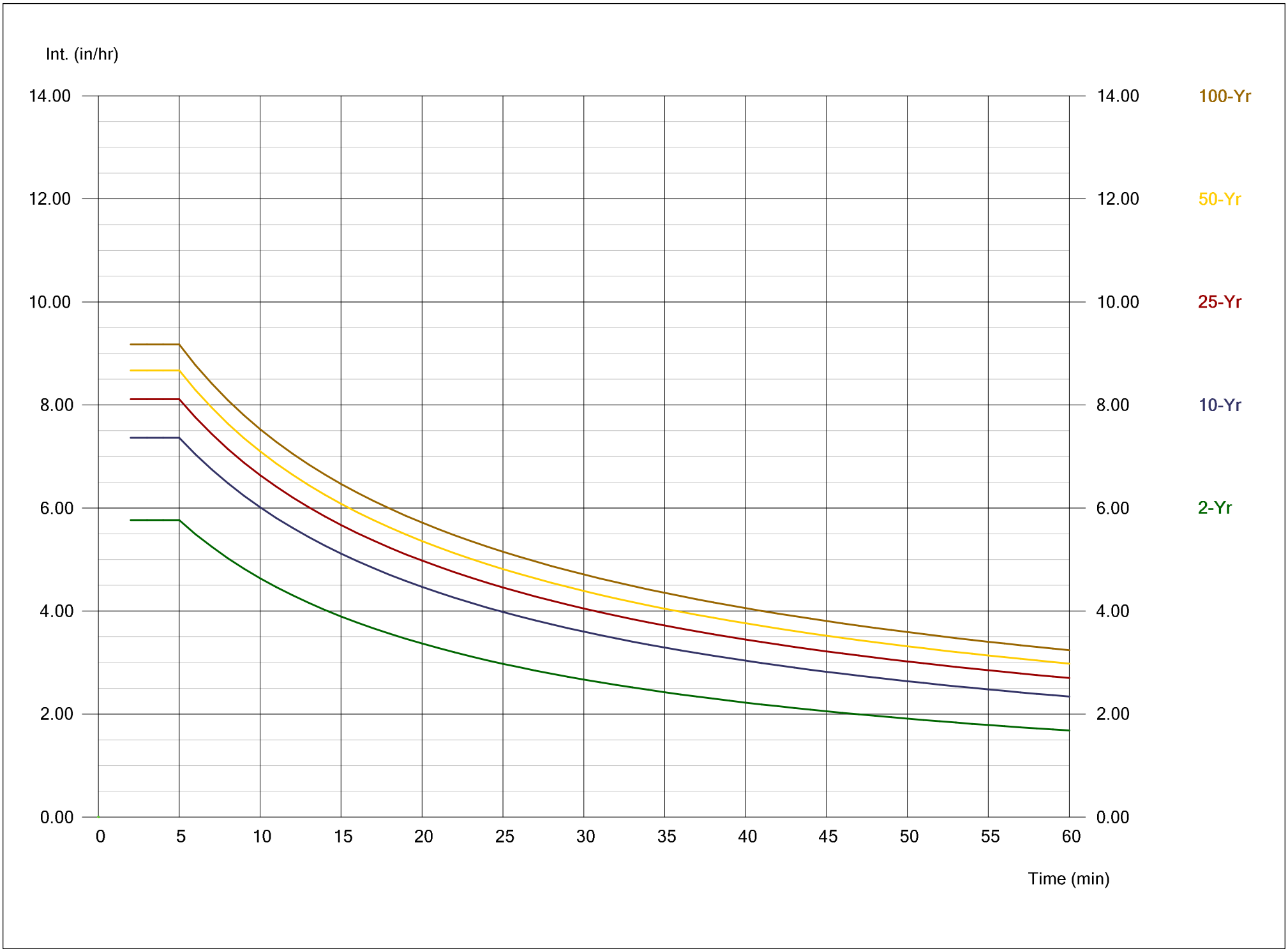
C.B. NUMBER	Long. Slope	ROAD X-SLOPE	E. O. P. Depth	Weir Depth	C&G Flow Area 1	C&G Flow Area 2	C&G WP	Road Flow Area	Road WP	Total Flow A	Total WP	MAX Q FOR SPREAD, CFS	On-Grade Spread	Max Drainage Area (S.F.)	tual Drainage Ar Area (S.F.)	al Drainage Area (ACRE)	Check	
CB 111	0.020	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.56**	7.50	41537	32234	0.74	GOOD	*dbl
CB 114	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	14686	8276	0.19	GOOD	
CB 115	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	29371	4356	0.10	GOOD	
CB 116	0.010	0.020	0.11	0.11	0.08	0.22	2.19	0.30	5.50	0.61	7.69	**1.10**	7.50	29371	7841	0.18	GOOD	

E. O. P. - Edge of Pavement
C&G - Curb and gutter
A - Area (s. f.)
V - Velocity (fps)
WP - Wetted Perimeter (ft.)

Note: Program uses Manning's formula for open channel flow.

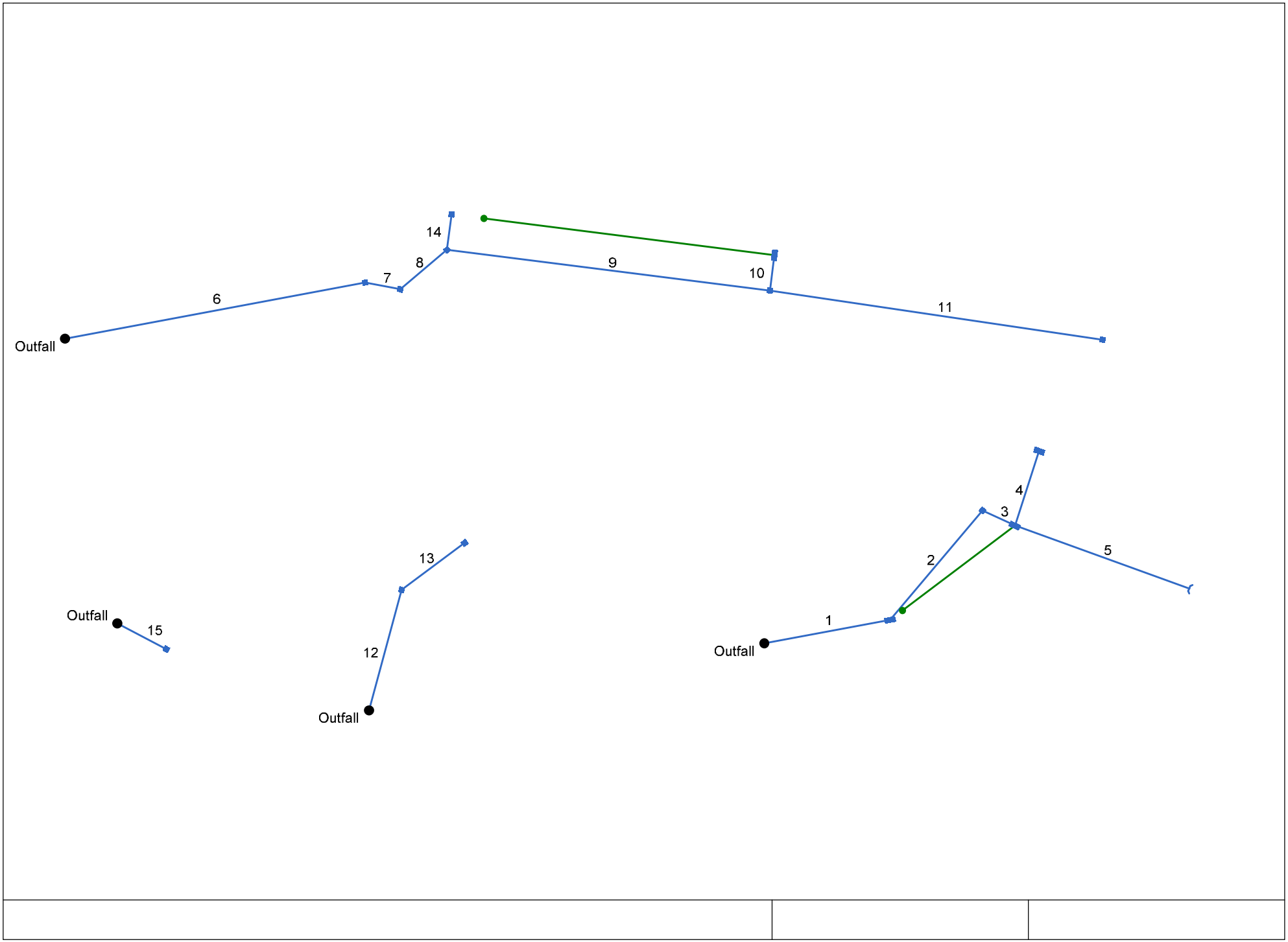
Storm Sewer IDF Curves

IDF file: 20241113 Moody IDF.IDF



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

SCM #1 10-YEAR REPORT



Storm Sewer Inventory Report

SCM #1 10-YEAR 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	96.027	-10.617	Comb	0.00	0.74	0.60	10.0	380.50	0.58	381.06	18	Cir	0.013	1.03	386.00	Pipe - (97)
2	1	107.815	-39.453	Comb	0.00	0.19	0.60	10.0	381.26	1.00	382.34	15	Cir	0.013	1.46	387.03	Pipe - (95)
3	2	26.999	75.004	Comb	0.00	0.10	0.60	10.0	382.54	0.52	382.68	15	Cir	0.013	1.82	387.04	Pipe - (94)
4	3	59.003	-96.968	Comb	0.00	0.18	0.60	10.0	382.88	0.51	383.18	15	Cir	0.013	1.00	387.89	Pipe - (93)
5	3	139.352	-4.932	Hdwl	0.00	0.86	0.60	15.0	382.78	0.50	383.48	15	Cir	0.013	1.00	385.00	Pipe - (175)
6	End	229.120	-10.656	Comb	0.00	0.19	0.60	10.0	363.00	2.20	368.04	18	Cir	0.013	0.63	373.98	Pipe - (86)
7	6	27.000	21.423	Comb	0.00	0.18	0.60	10.0	368.14	0.52	368.28	18	Cir	0.013	1.22	373.87	Pipe - (85)
8	7	45.912	-51.157	Comb	0.00	0.20	0.60	10.0	368.48	3.27	369.98	18	Cir	0.013	1.62	375.04	Pipe - (84)
9	8	244.371	47.632	Comb	0.00	0.19	0.60	10.0	370.18	2.92	377.31	15	Cir	0.013	1.50	382.61	Pipe - (83)
10	9	27.044	-90.017	Comb	0.00	0.74	0.60	10.0	378.23	0.63	378.40	15	Cir	0.013	1.00	382.57	Pipe - (88)
11	9	252.428	1.235	Comb	0.00	0.20	0.60	10.0	377.41	2.98	384.92	15	Cir	0.013	1.00	390.04	Pipe - (82)
12	End	94.321	-74.896	Comb	0.00	0.52	0.60	10.0	369.93	0.51	370.41	15	Cir	0.013	1.00	374.00	Pipe - (92)
13	12	59.044	38.083	Comb	0.00	0.22	0.60	10.0	370.61	0.49	370.90	15	Cir	0.013	1.00	374.05	Pipe - (91)
14	8	27.000	-42.459	Comb	0.00	0.15	0.60	10.0	370.18	0.52	370.32	15	Cir	0.013	1.00	375.04	Pipe - (87)
15	End	41.513	27.855	Comb	0.00	3.90	0.60	10.0	363.50	0.51	363.71	24	Cir	0.013	1.00	366.59	Pipe - (89)

Project File: SCM#1.stm | Number of lines: 15 | Date: 3/27/2025

Structure Report

SCM #1 10-YEAR 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	CB 111	Combination	386.00	Rect	8.00	4.00	18	Cir	381.06	15	Cir	381.26
2	CB 114	Combination	387.03	Rect	4.00	4.00	15	Cir	382.34	15	Cir	382.54
3	CB 115	Combination	387.04	Rect	8.00	4.00	15	Cir	382.68	15 15	Cir Cir	382.88 382.78
4	CB 116	Combination	387.89	Rect	4.00	8.00	15	Cir	383.18			
5	FES 115	OpenHeadwall	385.00	n/a	n/a	n/a	15	Cir	383.48			
6	CB 101	Combination	373.98	Rect	4.00	4.00	18	Cir	368.04	18	Cir	368.14
7	CB 102	Combination	373.87	Rect	4.00	4.00	18	Cir	368.28	18	Cir	368.48
8	CB 103	Combination	375.04	Rect	4.00	4.00	18	Cir	369.98	15 15	Cir Cir	370.18 370.18
9	CB 105	Combination	382.61	Rect	4.00	4.00	15	Cir	377.31	15 15	Cir Cir	378.23 377.41
10	CB 106	Combination	382.57	Rect	8.00	4.00	15	Cir	378.40			
11	CB 107	Combination	390.04	Rect	4.00	4.00	15	Cir	384.92			
12	CB 121	Combination	374.00	Rect	4.00	4.00	15	Cir	370.41	15	Cir	370.61
13	CB 122	Combination	374.05	Rect	4.00	4.00	15	Cir	370.90			
14	CB 104	Combination	375.04	Rect	4.00	4.00	15	Cir	370.32			
15	DI 126	Combination	366.59	Rect	4.00	4.00	24	Cir	363.71			

Project File: SCM#1.stm | Number of Structures: 15 | Run Date: 3/27/2025

Storm Sewer Summary Report

SCM #1 10-YEAR 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	Pipe - (97)	6.11	18	Cir	96.027	380.50	381.06	0.583	381.58	382.02	0.42	382.44	End	Combination
2	Pipe - (95)	3.97	15	Cir	107.815	381.26	382.34	1.002	382.44	383.15	n/a	383.15 j	1	Combination
3	Pipe - (94)	3.42	15	Cir	26.999	382.54	382.68	0.518	383.34	383.48	0.48	383.96	2	Combination
4	Pipe - (93)	0.65	15	Cir	59.003	382.88	383.18	0.508	383.96	383.97	0.01	383.98	3	Combination
5	Pipe - (175)	2.64	15	Cir	139.352	382.78	383.48	0.502	383.96	384.22	0.19	384.41	3	OpenHeadwall
6	Pipe - (86)	5.98	18	Cir	229.120	363.00	368.04	2.200	364.50	368.98	n/a	368.98 j	End	Combination
7	Pipe - (85)	5.39	18	Cir	27.000	368.14	368.28	0.518	369.08	369.21	0.41	369.63	6	Combination
8	Pipe - (84)	4.83	18	Cir	45.912	368.48	369.98	3.267	369.63	370.82	n/a	370.82 j	7	Combination
9	Pipe - (83)	3.78	15	Cir	244.371	370.18	377.31	2.918	370.82	378.10	n/a	378.10	8	Combination
10	Pipe - (88)	2.67	15	Cir	27.044	378.23	378.40	0.629	378.87	379.05	n/a	379.05	9	Combination
11	Pipe - (82)	0.72	15	Cir	252.428	377.41	384.92	2.975	378.10	385.25	n/a	385.25 j	9	Combination
12	Pipe - (92)	2.61	15	Cir	94.321	369.93	370.41	0.509	370.88	371.08	0.23	371.32	End	Combination
13	Pipe - (91)	0.79	15	Cir	59.044	370.61	370.90	0.491	371.32	371.34	0.06	371.41	12	Combination
14	Pipe - (87)	0.54	15	Cir	27.000	370.18	370.32	0.519	370.82	370.83	0.02	370.85	8	Combination
15	Pipe - (89)	14.07	24	Cir	41.513	363.50	363.71	0.506	365.50	365.64	0.32	365.96	End	Combination

Project File: SCM#1.stm | Number of lines: 15 | Run Date: 3/27/2025

NOTES: Return period = 10 Yrs. ; j - Line contains hyd. jump.

Inlet Report

SCM #1 10-YEAR REPORT

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	CB 111	2.67	0.00	2.22	0.45	Comb	6.0	1.50	0.00	6.00	2.50	0.054	2.00	0.060	0.020	0.013	0.20	5.99	0.11	1.81	0.0	Off
2	CB 114	0.69	0.00	0.69	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.13	2.37	0.01	0.10	0.0	1
3	CB 115	0.36	0.00	0.36	0.00	Comb	6.0	1.50	0.00	6.00	2.50	0.054	2.00	0.060	0.020	0.013	0.10	1.67	0.00	0.00	0.0	1
4	CB 116	0.65	0.00	0.65	0.00	Comb	6.0	1.50	0.00	6.00	2.50	0.054	2.00	0.060	0.020	0.013	0.12	2.25	0.00	0.00	0.0	3
5	FES 115	2.64	0.00	2.64	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	3
6	CB 101	0.69	0.00	0.69	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.13	2.37	0.01	0.10	0.0	Off
7	CB 102	0.65	0.00	0.65	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.12	2.25	0.00	0.00	0.0	6
8	CB 103	0.72	0.00	0.72	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.13	2.49	0.01	0.23	0.0	Off
9	CB 105	0.69	0.00	0.69	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.13	2.38	0.01	0.11	0.0	8
10	CB 106	2.67	0.00	2.22	0.45	Comb	6.0	1.50	0.00	6.00	2.50	0.054	2.00	0.060	0.020	0.013	0.20	5.99	0.11	1.81	0.0	14
11	CB 107	0.72	0.00	0.72	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.13	2.49	0.01	0.22	0.0	9
12	CB 121	1.88	0.00	1.63	0.25	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.18	4.97	0.09	1.45	0.0	Off
13	CB 122	0.79	0.00	0.79	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.13	2.72	0.02	0.33	0.0	12
14	CB 104	0.54	0.45	0.96	0.02	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.15	3.26	0.04	0.61	0.0	Off
15	DI 126	14.07	0.00	6.41	7.66	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.33	12.57	0.28	9.76	0.0	Off

Project File: SCM#1.stm | Number of lines: 15 | Run Date: 3/27/2025

NOTES: Inlet N-Values = 0.016; Intensity = 74.09 / (Inlet time + 12.50) ^ 0.81; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Hydraulic Grade Line Computations

SCM #1 10-YEAR REPORT

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	18	6.11	380.50	381.58	1.08	1.19	4.48	0.31	381.89	0.449	96.027	381.06	382.02	0.96**	1.19	5.13	0.41	382.43	0.622	0.536	0.514	1.03	0.42
2	15	3.97	381.26	382.44	1.18	0.84	3.31	0.35	382.79	0.000	107.815	382.34	383.15 j	0.81**	0.84	4.75	0.35	383.50	0.000	0.000	n/a	1.46	n/a
3	15	3.42	382.54	383.34	0.80*	0.83	4.14	0.27	383.60	0.518	26.999	382.68	383.48	0.80	0.83	4.14	0.27	383.74	0.518	0.518	0.140	1.82	0.48
4	15	0.65	382.88	383.96	1.08	1.13	0.58	0.01	383.97	0.009	59.003	383.18	383.97	0.79	0.81	0.80	0.01	383.98	0.019	0.014	0.008	1.00	0.01
5	15	2.64	382.78	383.96	1.18	1.20	2.20	0.08	384.04	0.144	139.352	383.48	384.22	0.74	0.75	3.50	0.19	384.41	0.389	0.267	0.372	1.00	0.19
6	18	5.98	363.00	364.50	1.50*	1.17	3.39	0.18	364.68	0.325	229.120	368.04	368.98 j	0.94**	1.17	5.11	0.41	369.39	0.623	0.474	n/a	0.63	n/a
7	18	5.39	368.14	369.08	0.94*	1.16	4.65	0.34	369.41	0.518	27.000	368.28	369.21	0.93	1.16	4.66	0.34	369.55	0.521	0.520	0.140	1.22	0.41
8	18	4.83	368.48	369.63	1.15	1.02	3.34	0.35	369.97	0.000	45.912	369.98	370.82 j	0.84**	1.02	4.72	0.35	371.17	0.000	0.000	n/a	1.62	n/a
9	15	3.78	370.18	370.82	0.64	0.64	5.93	0.34	371.16	0.000	244.371	377.31	378.10	0.79**	0.81	4.66	0.34	378.43	0.000	0.000	n/a	1.50	n/a
10	15	2.67	378.23	378.87	0.64*	0.63	4.21	0.26	379.13	0.000	27.044	378.40	379.05	0.65**	0.65	4.10	0.26	379.32	0.000	0.000	n/a	1.00	n/a
11	15	0.72	377.41	378.10	0.69	0.26	1.05	0.12	378.21	0.000	252.428	384.92	385.25 j	0.33**	0.26	2.76	0.12	385.37	0.000	0.000	n/a	1.00	0.12
12	15	2.61	369.93	370.88	0.95	1.00	2.61	0.11	370.99	0.191	94.321	370.41	371.08	0.67	0.67	3.88	0.23	371.32	0.513	0.352	0.332	1.00	0.23
13	15	0.79	370.61	371.32	0.71	0.72	1.11	0.02	371.34	0.040	59.044	370.90	371.34	0.44	0.39	2.03	0.06	371.41	0.206	0.123	0.073	1.00	0.06
14	15	0.54	370.18	370.82	0.64	0.64	0.85	0.01	370.84	0.025	27.000	370.32	370.83	0.51	0.46	1.16	0.02	370.85	0.060	0.042	0.011	1.00	0.02
15	24	14.07	363.50	365.50	2.00*	3.14	4.48	0.31	365.81	0.387	41.513	363.71	365.64	1.93	3.11	4.52	0.32	365.96	0.340	0.363	0.151	1.00	0.32

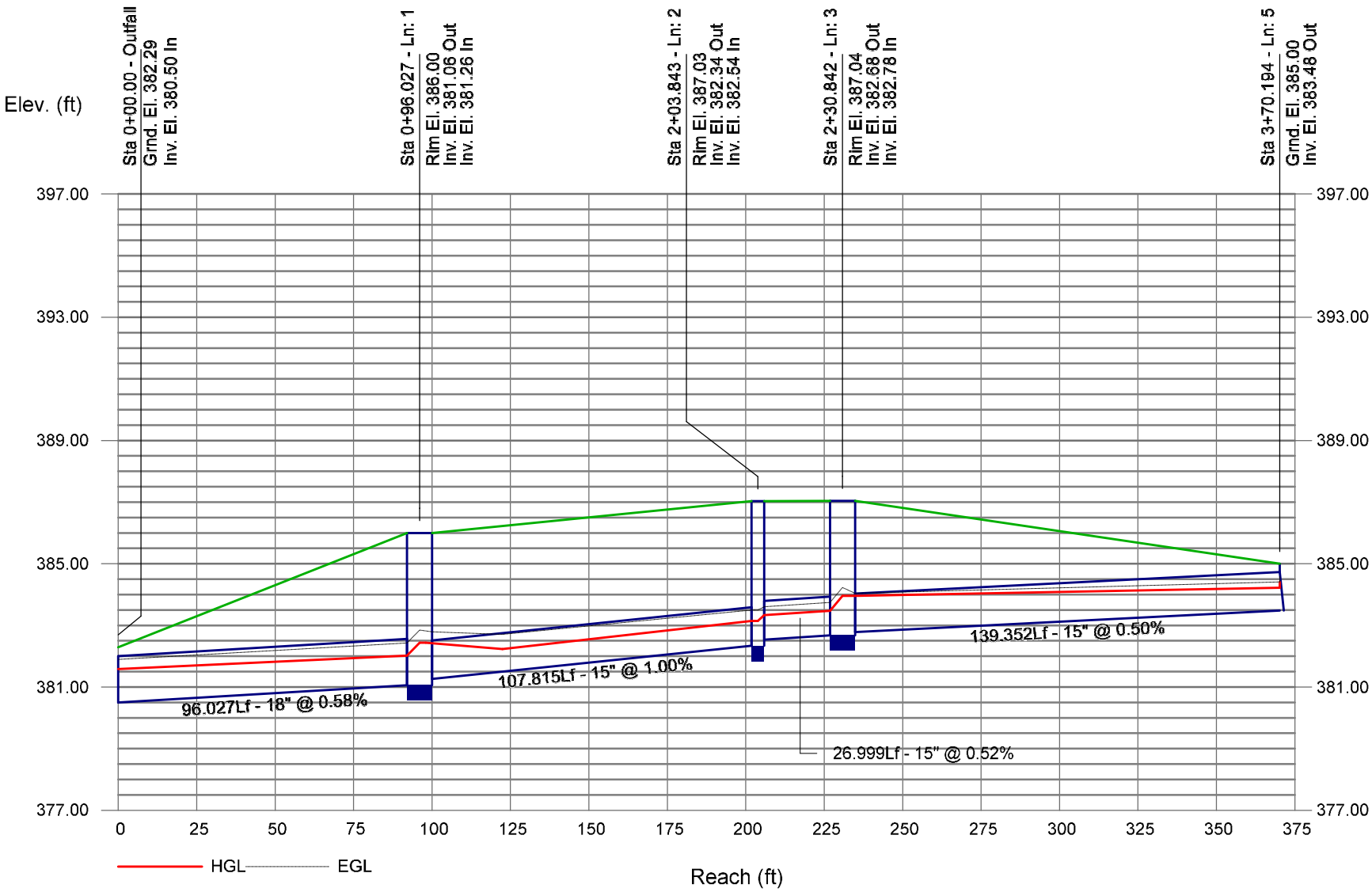
Project File: SCM#1.stm | Number of lines: 15 | Run Date: 3/27/2025

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Storm Sewer Profile

SCM #1 10-YEAR PROFILE 1-5

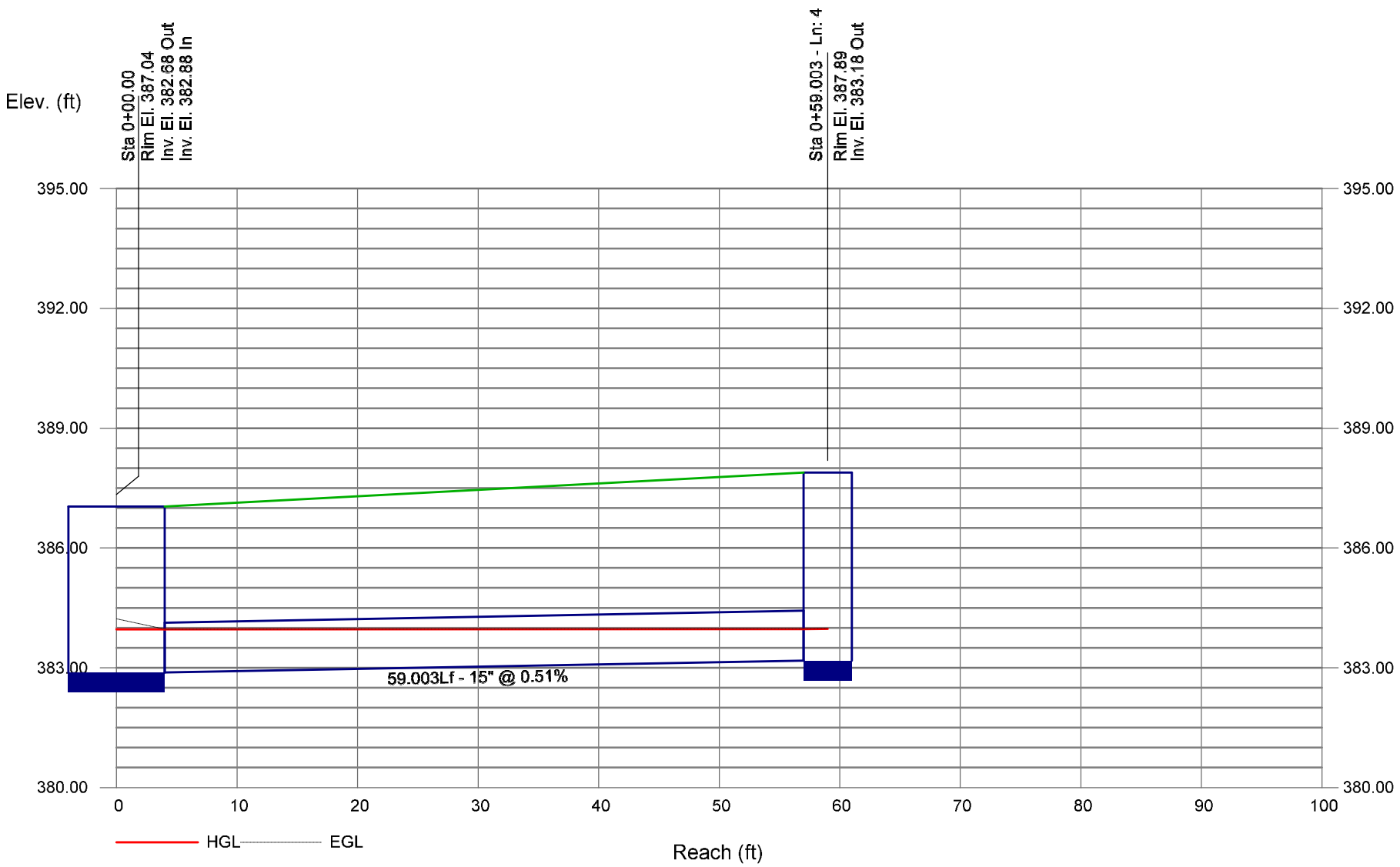
Proj. file: SCM#1.stm



Storm Sewer Profile

SCM #1 10-YEAR PROFILE 4-4

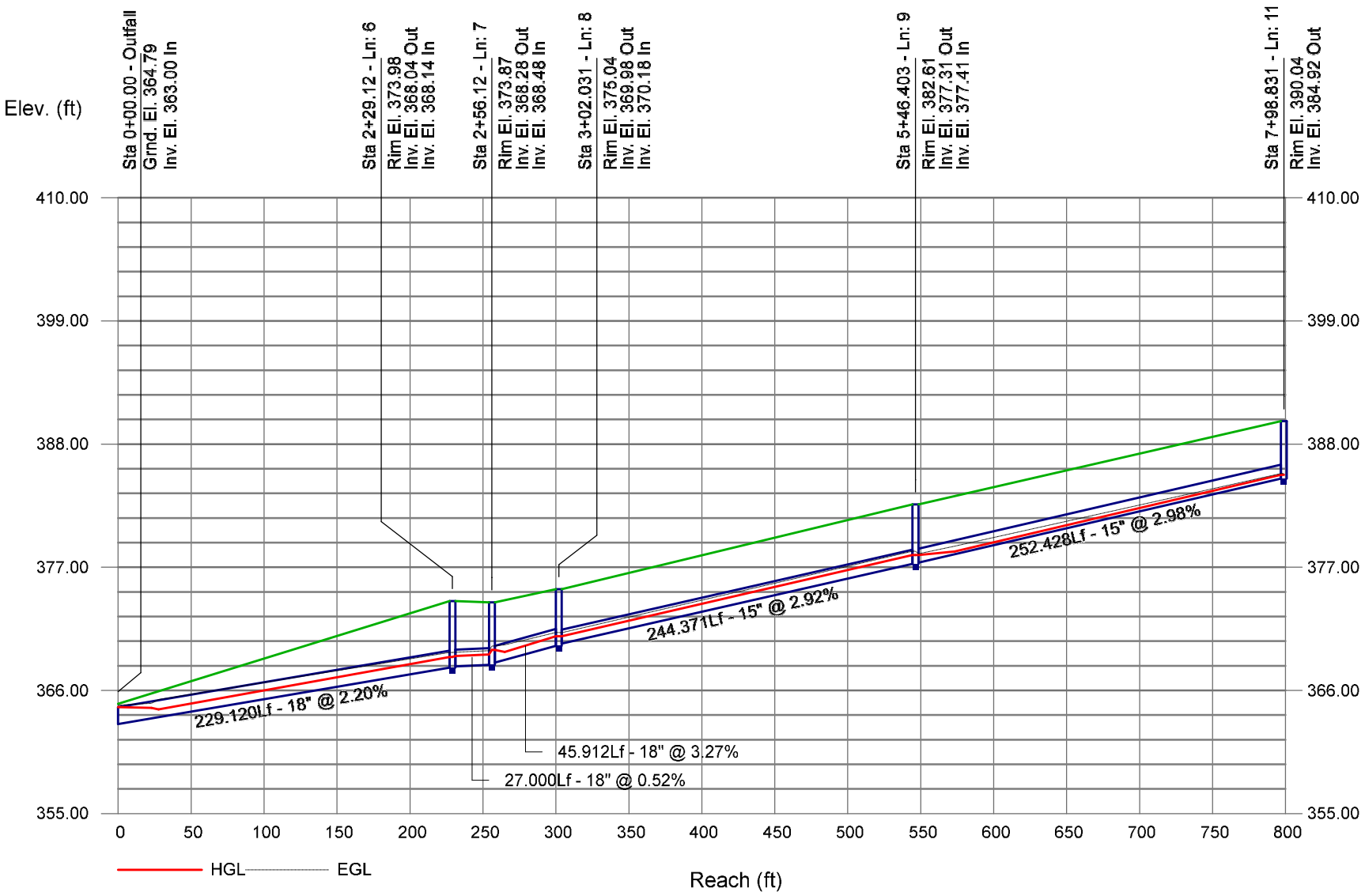
Proj. file: SCM#1.stm



Storm Sewer Profile

SCM #1 10-YEAR PROFILE 6-11

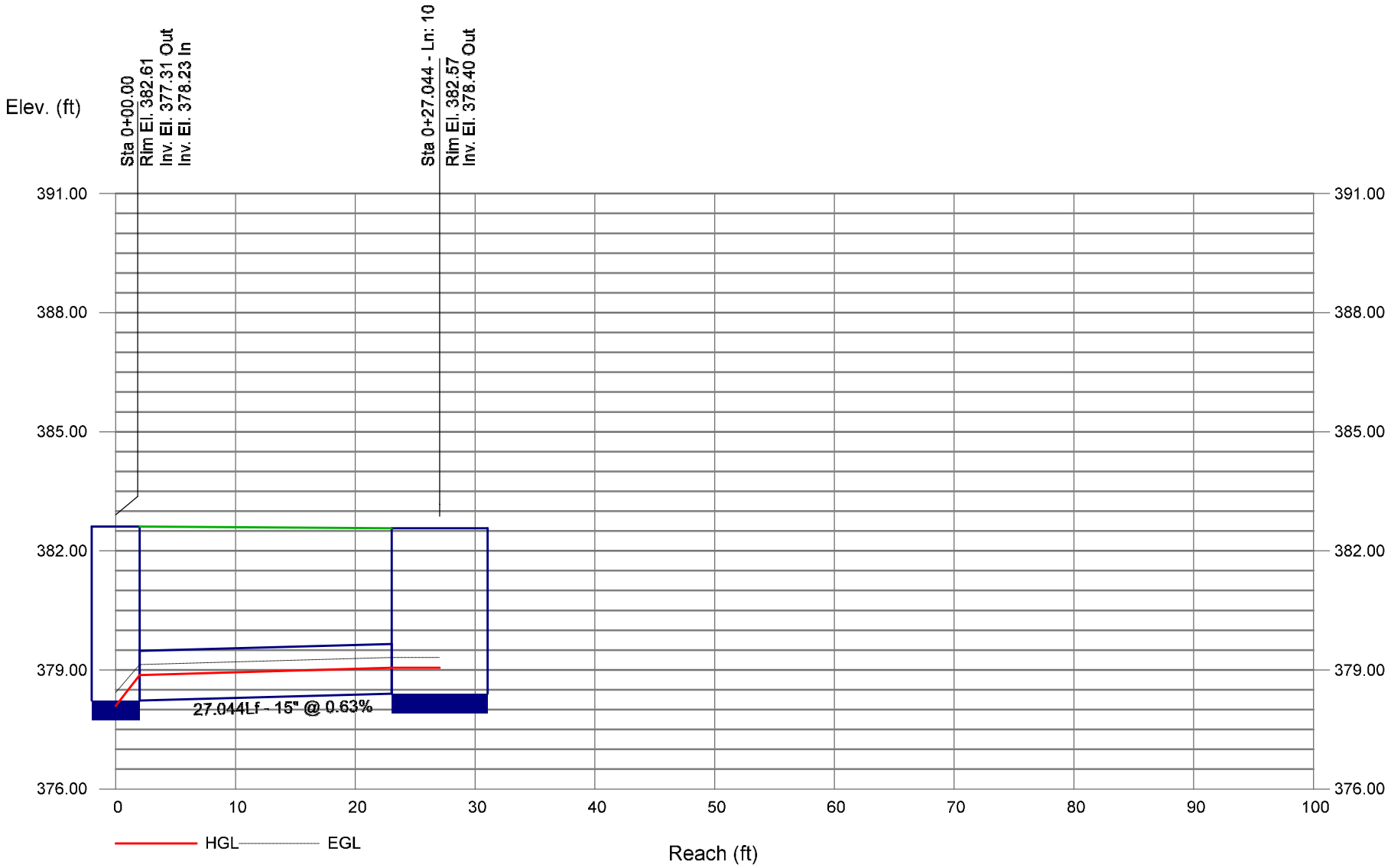
Proj. file: SCM#1.stm



Storm Sewer Profile

SCM #1 10-YEAR PROFILE 10-10

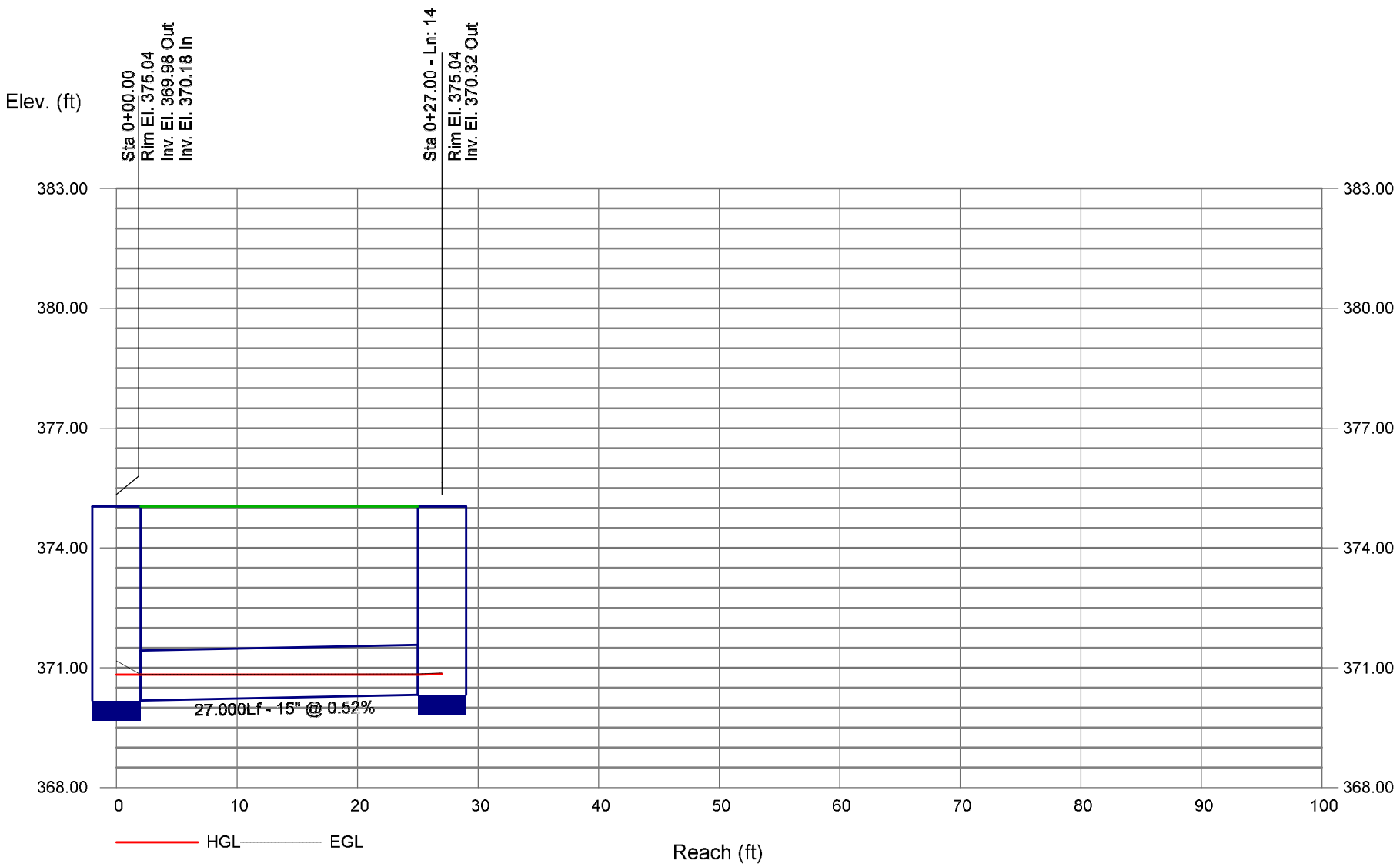
Proj. file: SCM#1.stm



Storm Sewer Profile

SCM #1 10-YEAR PROFILE 14-14

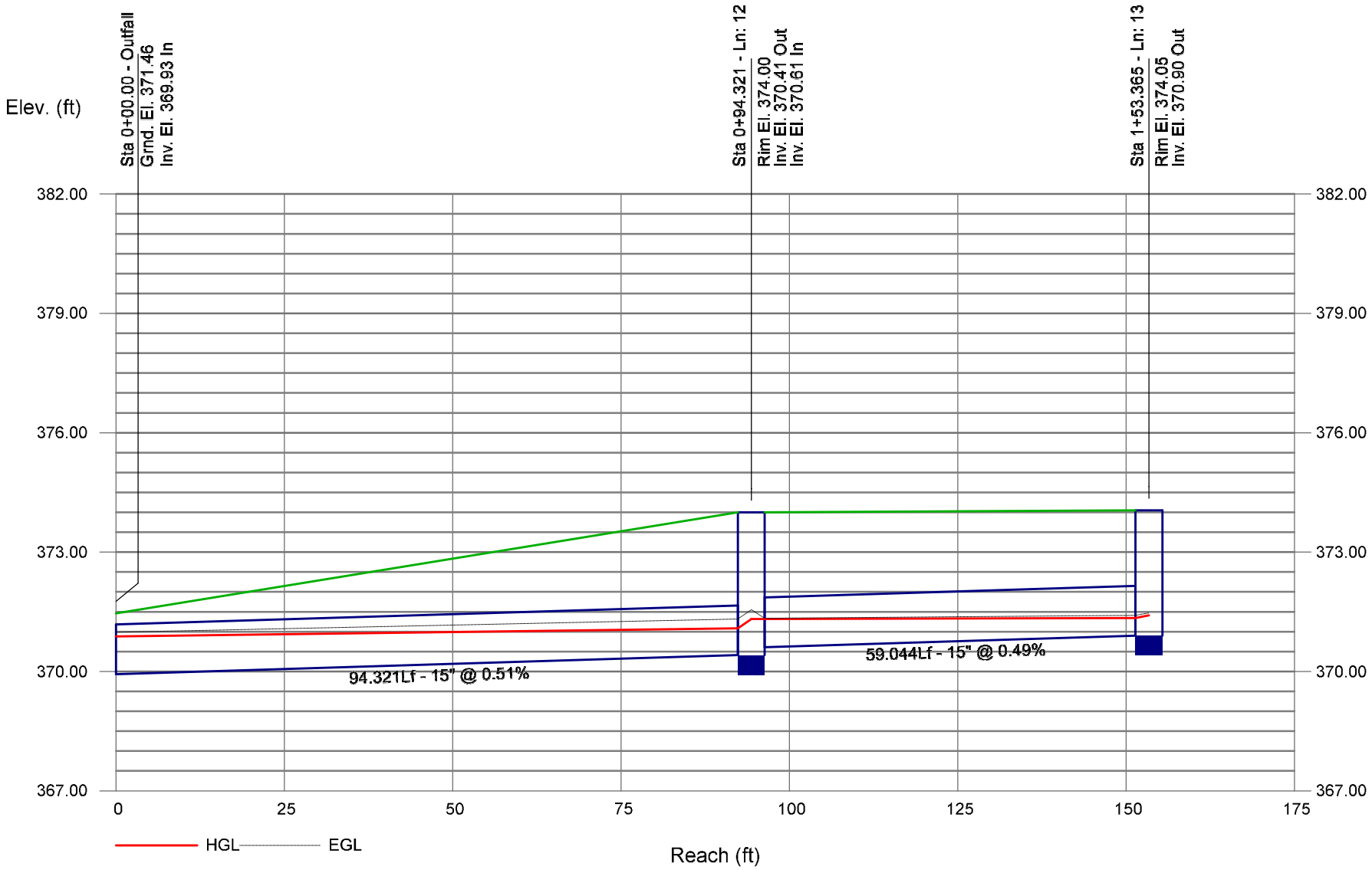
Proj. file: SCM#1.stm



Storm Sewer Profile

SCM #1 10-YEAR PROFILE 12-13

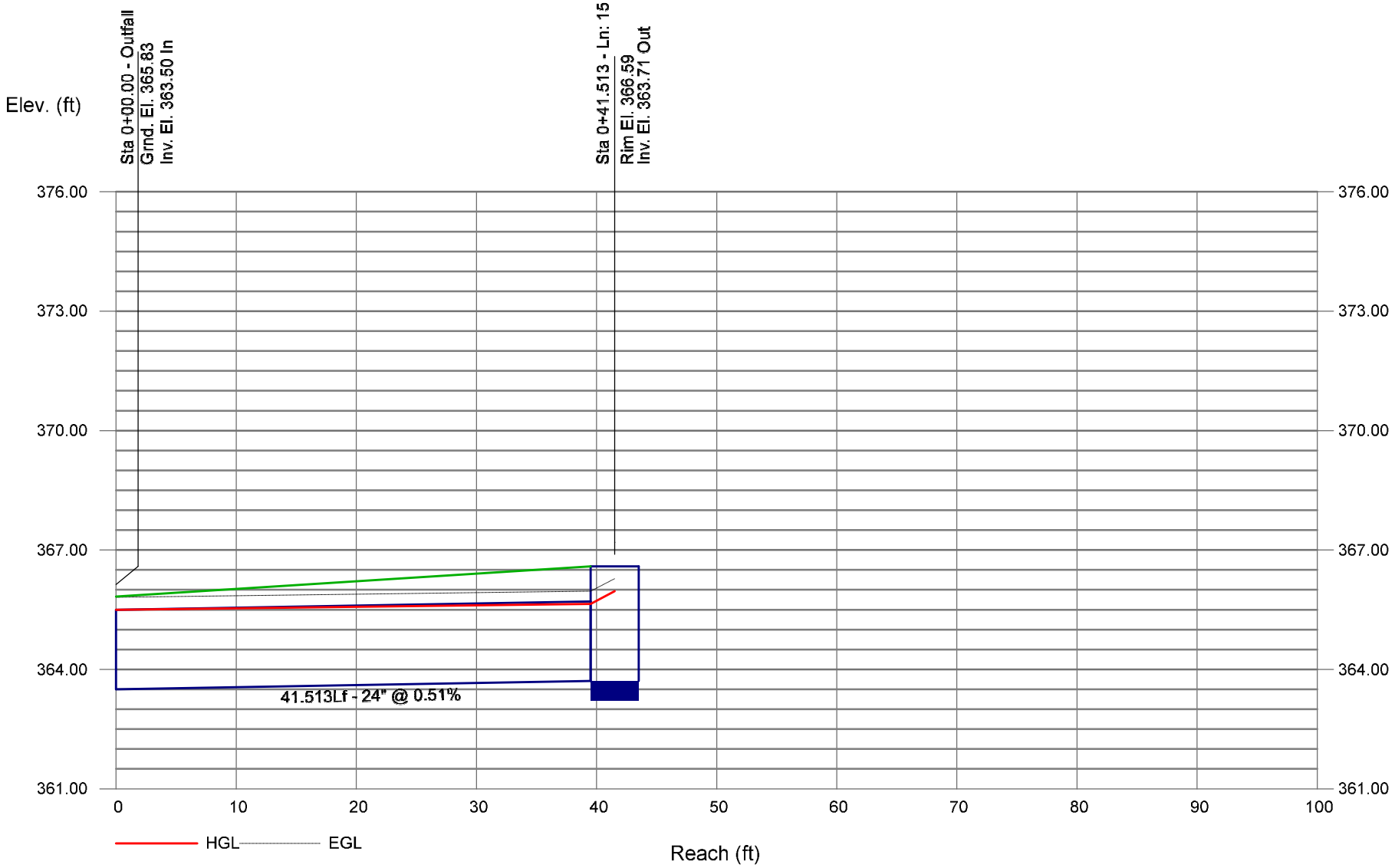
Proj. file: SCM#1.stm



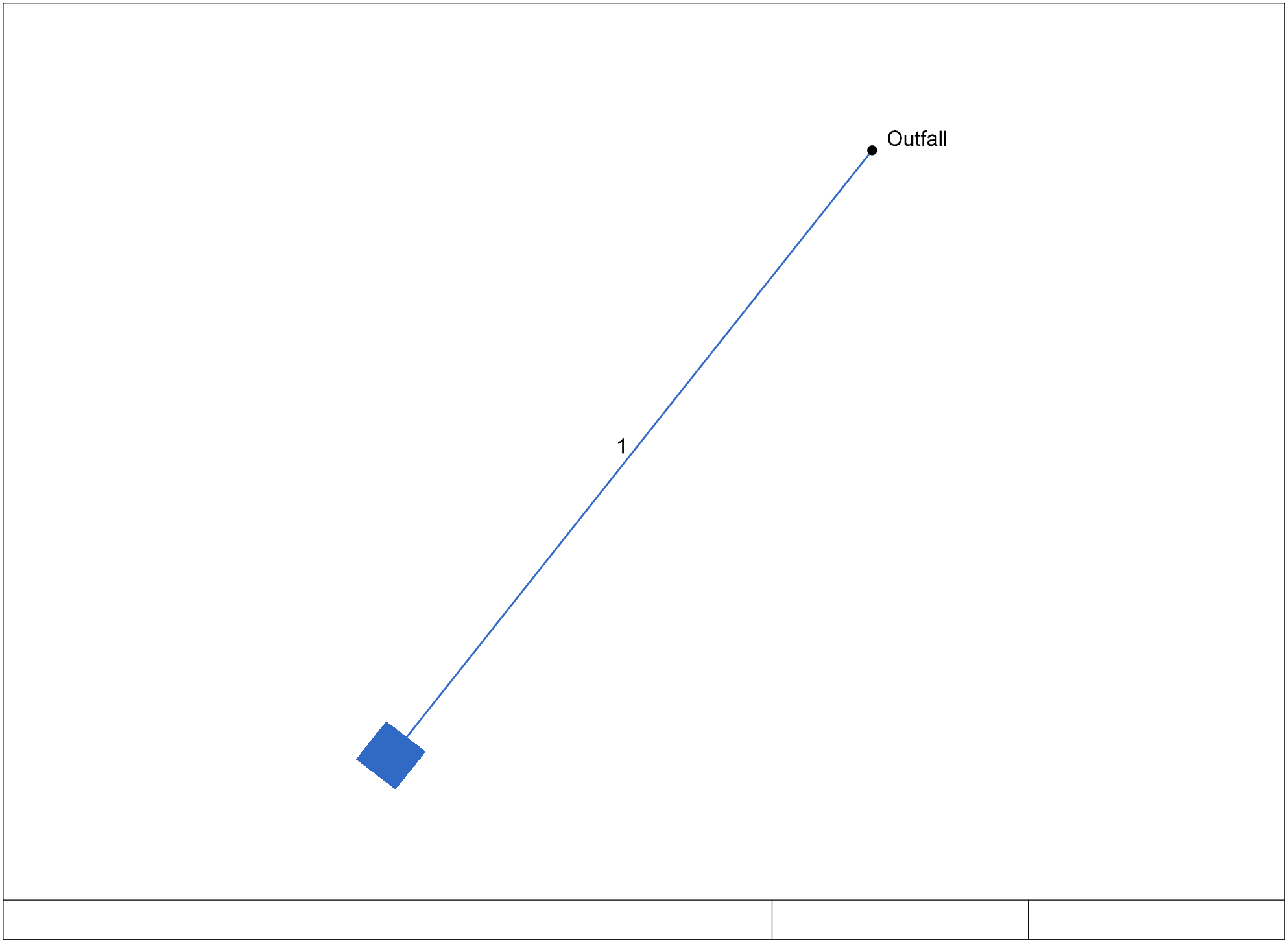
Storm Sewer Profile

SCM #1 10-YEAR PROFILE 15-15

Proj. file: SCM#1.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan SCM #2 10-YEAR REPORT



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	64.790	128.444	DrGrt	0.00	0.76	0.60	10.0	361.50	1.16	362.25	18	Cir	0.013	1.00	366.26	Pipe - (164)

Project File: SCM#2.stm | Number of lines: 1 | Date: 3/27/2025

Structure Report

SCM #2 10-YEAR 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	YI 204	DropGrate	366.26	Rect	4.00	4.00	18	Cir	362.25			

Project File: SCM#2.stm | Number of Structures: 1 | Run Date: 3/27/2025

Storm Sewer Summary Report

SCM #2 10-YEAR 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	Pipe - (164)	2.74	18	Cir	64.790	361.50	362.25	1.158	362.56	362.88	n/a	362.88 j	End	DropGrate

Project File: SCM#2.stm | Number of lines: 1 | Run Date: 3/27/2025

NOTES: Return period = 10 Yrs. ; j - Line contains hyd. jump.

Inlet Report

SCM #2 10-YEAR REPORT

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	YI 204	2.74	0.00	2.74	0.00	DrGrt	0.0	0.00	7.50	3.00	2.50	Sag	2.00	0.020	0.020	0.013	0.19	21.53	0.19	21.53	0.0	Off

Project File: SCM#2.stm

Number of lines: 1

Run Date: 3/27/2025

NOTES: Inlet N-Values = 0.016; Intensity = 74.09 / (Inlet time + 12.50) ^ 0.81; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	18	2.74	361.50	362.56	1.06	0.70	2.05	0.24	362.80	0.000	64.790	362.25	362.88 j	0.63**	0.70	3.91	0.24	363.12	0.000	0.000	n/a	1.00	n/a

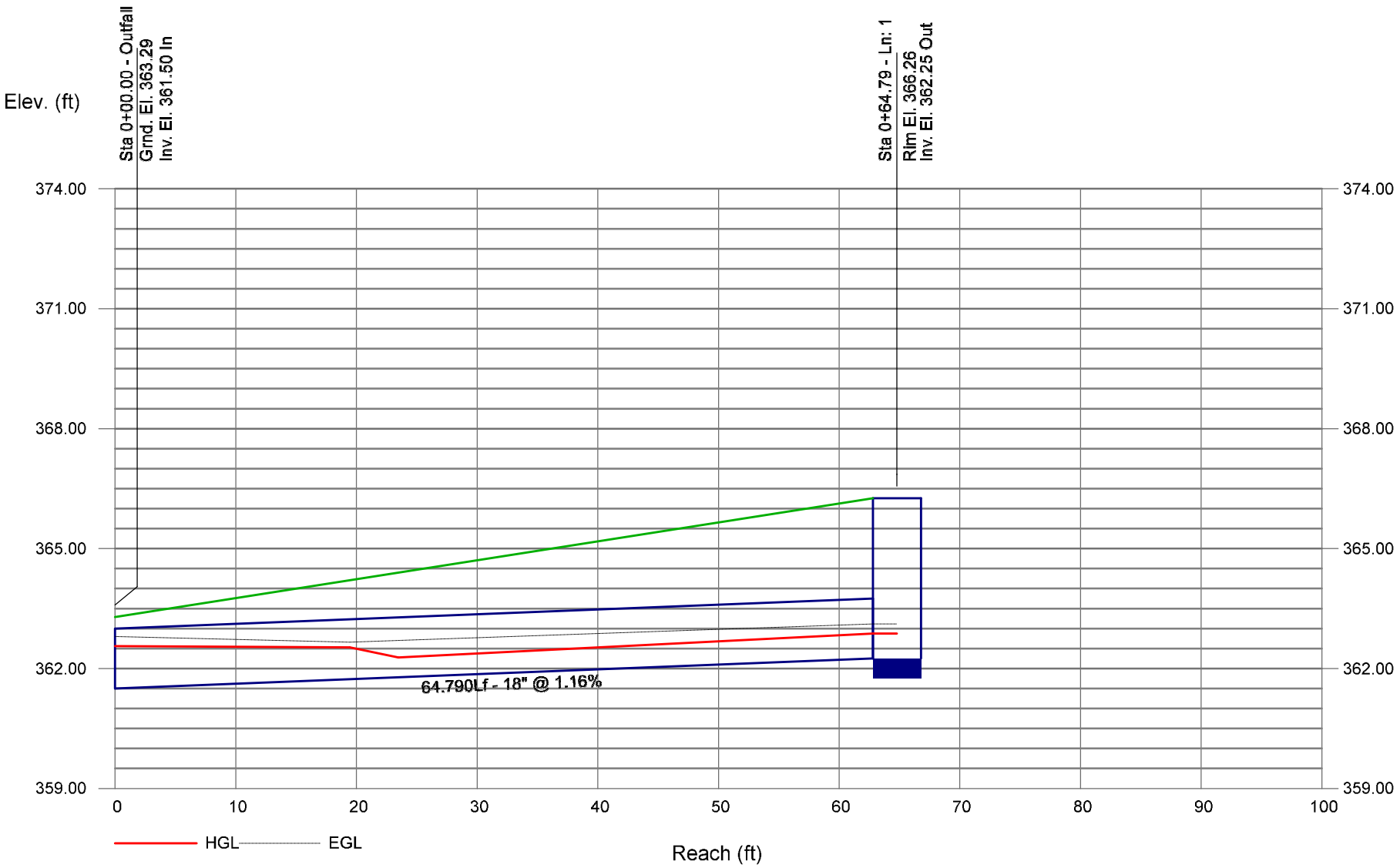
Project File: SCM#2.stm | Number of lines: 1 | Run Date: 3/27/2025

Notes: ; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

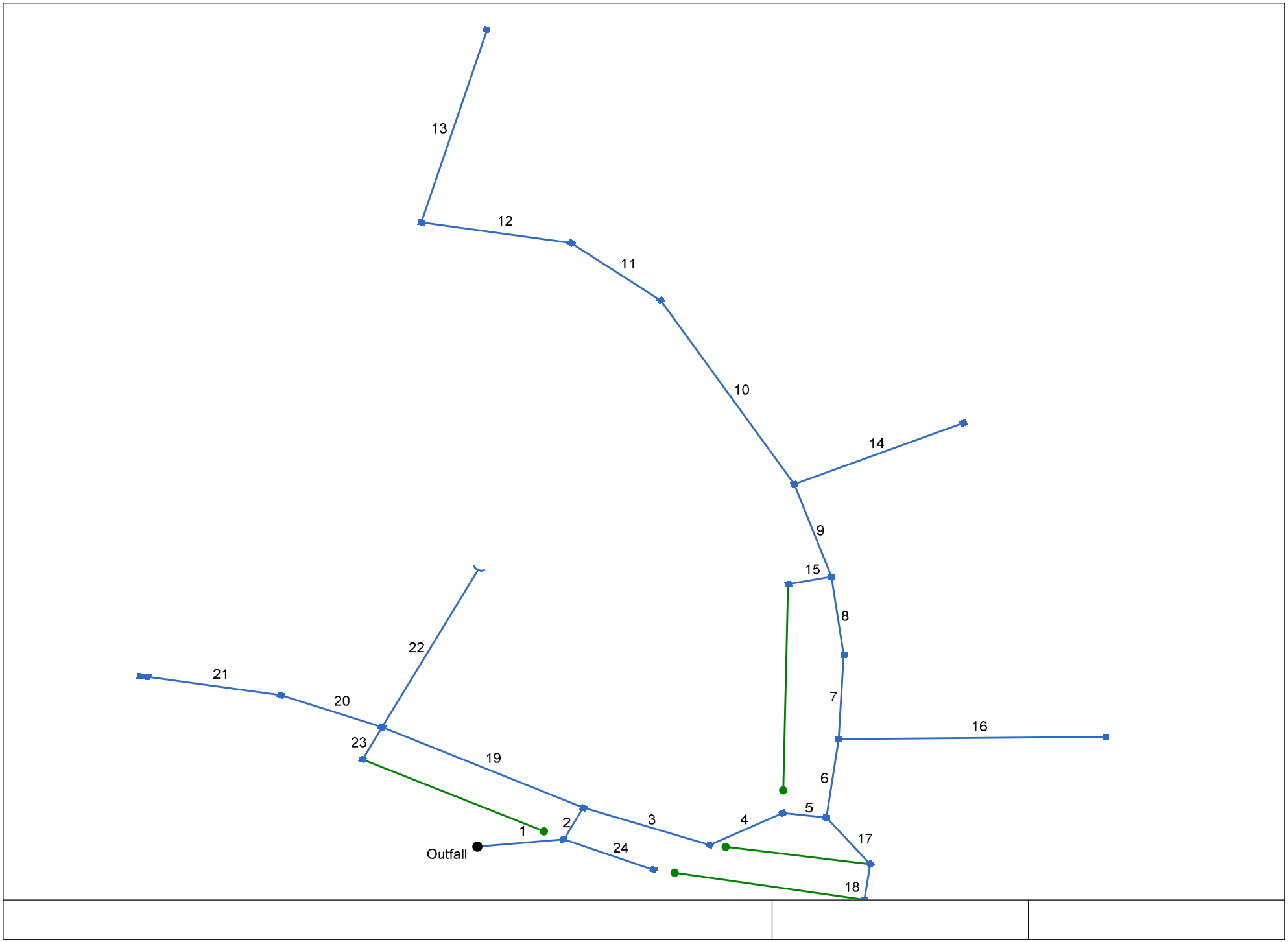
Storm Sewer Profile

SCM #2 10-YEAR PROFILE 1-1

Proj. file: SCM#2.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan SCM #3 10-YEAR REPORT



Storm Sewer Inventory Report

SCM #3 10-YEAR 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	53.315	-5.817	Comb	0.00	0.12	0.60	10.0	360.94	0.51	361.21	36	Cir	0.013	1.31	366.00	Pipe - (51)
2	1	26.578	-57.823	Comb	0.00	0.48	0.60	10.0	361.31	0.49	361.44	36	Cir	0.013	1.50	366.04	Pipe - (50)
3	2	82.337	83.564	Comb	0.00	0.07	0.60	10.0	361.64	0.50	362.05	30	Cir	0.013	1.17	366.98	Pipe - (49) (1)
4	3	50.862	-48.069	Comb	0.00	0.13	0.60	10.0	362.25	0.49	362.50	24	Cir	0.013	0.95	367.04	Pipe - (68)
5	4	27.000	35.381	Comb	0.00	0.21	0.60	10.0	362.70	0.52	362.84	24	Cir	0.013	1.70	367.03	Pipe - (67)
6	5	59.521	-90.000	Comb	0.00	0.10	0.60	10.0	363.34	2.91	365.07	24	Cir	0.013	1.49	370.03	Pipe - (66)
7	6	63.410	-4.578	Comb	0.00	0.07	0.60	10.0	365.17	2.96	367.05	18	Cir	0.013	0.50	373.00	Pipe - (65)
8	7	59.348	-9.943	Comb	0.00	0.09	0.60	10.0	367.25	2.83	368.93	18	Cir	0.013	1.50	374.74	Pipe - (64)
9	8	73.131	-10.753	Comb	0.00	0.57	0.60	10.0	369.03	1.55	370.16	18	Cir	0.013	1.49	375.97	Pipe - (63)
10	9	160.765	-12.581	Comb	0.00	0.29	0.60	10.0	370.94	0.50	371.75	18	Cir	0.013	0.62	377.13	Pipe - (61)
11	10	69.865	-21.142	Comb	0.00	0.19	0.60	10.0	373.45	0.79	374.00	15	Cir	0.013	0.80	378.00	Pipe - (60) (1)
12	11	92.962	-28.715	Comb	0.00	0.08	0.60	10.0	374.60	0.50	375.07	15	Cir	0.013	1.50	378.78	Pipe - (59)
13	12	150.515	95.984	DrGrt	0.00	0.72	0.60	10.0	375.27	0.50	376.03	15	Cir	0.013	1.00	379.46	Pipe - (177)
14	9	113.000	84.063	DrGrt	0.00	0.59	0.60	10.0	371.88	1.18	373.21	15	Cir	0.013	1.00	376.09	Pipe - (178)
15	8	27.000	-94.816	Comb	0.00	0.29	0.60	10.0	369.94	0.67	370.12	15	Cir	0.013	1.00	374.73	Pipe - (71)
16	6	163.438	82.157	DrGrt	0.00	0.58	0.60	10.0	365.80	1.00	367.43	15	Cir	0.013	1.00	370.35	Pipe - (70)
17	5	44.000	45.555	Comb	0.00	0.12	0.60	10.0	363.24	0.50	363.46	24	Cir	0.013	1.12	368.91	Pipe - (56) (1)
18	17	27.000	44.445	Comb	0.00	0.17	0.60	10.0	364.58	1.15	364.89	15	Cir	0.013	1.00	368.93	Pipe - (56)
19	2	137.219	-90.157	Comb	0.00	0.12	0.60	10.0	361.64	0.50	362.33	24	Cir	0.013	2.25	367.00	Pipe - (49)
20	19	66.365	-4.859	Comb	0.00	0.13	0.60	10.0	363.00	0.50	363.33	24	Cir	0.013	0.50	367.90	Pipe - (48)
21	20	85.141	-11.831	Comb	0.00	0.46	0.60	10.0	363.53	0.51	363.96	18	Cir	0.013	1.00	368.63	Pipe - (47)
22	19	132.305	90.179	Hdwl	0.00	2.66	0.60	10.0	363.12	0.50	363.78	24	Cir	0.013	1.00	366.12	Pipe - (53)
23	19	27.000	-89.981	Comb	0.00	0.28	0.60	10.0	363.50	0.52	363.64	18	Cir	0.013	1.00	367.03	Pipe - (54)

Project File: SCM#3Revised.stm

Number of lines: 24

Date: 3/31/2025

Storm Sewer Inventory Report

SCM #3 10-YEAR 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)	
24	1	59.390	28.452	Comb	0.00	0.07	0.60	10.0	362.30	0.51	362.60	24	Cir	0.013	1.00	366.75	Pipe - (58)

Structure Report

SCM #3 10-YEAR 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	CB 301	Combination	366.00	Rect	4.00	4.00	36	Cir	361.21	36 24	Cir Cir	361.31 362.30
2	CB 302	Combination	366.04	Rect	4.00	4.00	36	Cir	361.44	30 24	Cir Cir	361.64 361.64
3	CB 304	Combination	366.98	Rect	4.00	4.00	30	Cir	362.05	24	Cir	362.25
4	CB 307	Combination	367.04	Rect	4.00	4.00	24	Cir	362.50	24	Cir	362.70
5	CB 308	Combination	367.03	Rect	4.00	4.00	24	Cir	362.84	24 24	Cir Cir	363.34 363.24
6	CB 309	Combination	370.03	Rect	4.00	4.00	24	Cir	365.07	18 15	Cir Cir	365.17 365.80
7	CB 311	Combination	373.00	Rect	4.00	4.00	18	Cir	367.05	18	Cir	367.25
8	CB 312	Combination	374.74	Rect	4.00	4.00	18	Cir	368.93	18 15	Cir Cir	369.03 369.94
9	CB 315	Combination	375.97	Rect	4.00	4.00	18	Cir	370.16	18 15	Cir Cir	370.94 371.88
10	CB 319	Combination	377.13	Rect	4.00	4.00	18	Cir	371.75	15	Cir	373.45
11	CB 321	Combination	378.00	Rect	4.00	4.00	15	Cir	374.00	15	Cir	374.60
12	CB 325	Combination	378.78	Rect	4.00	4.00	15	Cir	375.07	15	Cir	375.27
13	YI 325A	DropGrate	379.46	Rect	4.00	4.00	15	Cir	376.03			
14	YI 316B	DropGrate	376.09	Rect	4.00	4.00	15	Cir	373.21			
15	CB 313	Combination	374.73	Rect	4.00	4.00	15	Cir	370.12			
16	YI 310	DropGrate	370.35	Rect	4.00	4.00	15	Cir	367.43			
17	CB 306	Combination	368.91	Rect	4.00	4.00	24	Cir	363.46	15	Cir	364.58
18	CB 305	Combination	368.93	Rect	4.00	4.00	15	Cir	364.89			
19	CB 330	Combination	367.00	Rect	4.00	4.00	24	Cir	362.33	24 24 18	Cir Cir Cir	363.00 363.12 363.50

Project File: SCM#3Revised.stm | Number of Structures: 24 | Run Date: 3/31/2025

Structure Report

SCM #3 10-YEAR 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)
20	CB 333	Combination	367.90	Rect	4.00	4.00	24	Cir	363.33	18	Cir	363.53
21	CB 334	Combination	368.63	Rect	8.00	4.00	18	Cir	363.96			
22	FES INLET 331	OpenHeadwall	366.12	n/a	n/a	n/a	24	Cir	363.78			
23	CB 332	Combination	367.03	Rect	4.00	4.00	18	Cir	363.64			
24	CB 303	Combination	366.75	Rect	4.00	4.00	24	Cir	362.60			

Project File: SCM#3Revised.stm | Number of Structures: 24 | Run Date: 3/31/2025

Storm Sewer Summary Report

SCM #3 10-YEAR 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	Pipe - (51)	27.78	36	Cir	53.315	360.94	361.21	0.506	363.29	362.91	n/a	362.91	End	Combination
2	Pipe - (50)	27.22	36	Cir	26.578	361.31	361.44	0.489	362.96	363.13	n/a	363.13	1	Combination
3	Pipe - (49) (1)	13.96	30	Cir	82.337	361.64	362.05	0.498	363.13	363.31	n/a	363.31	2	Combination
4	Pipe - (68)	13.79	24	Cir	50.862	362.25	362.50	0.492	363.69	363.94	0.48	364.42	3	Combination
5	Pipe - (67)	13.41	24	Cir	27.000	362.70	362.84	0.518	364.42	364.48	0.62	365.11	4	Combination
6	Pipe - (66)	11.84	24	Cir	59.521	363.34	365.07	2.907	365.11	366.30	n/a	366.30 j	5	Combination
7	Pipe - (65)	9.63	18	Cir	63.410	365.17	367.05	2.965	366.30	368.25	0.32	368.25	6	Combination
8	Pipe - (64)	9.44	18	Cir	59.348	367.25	368.93	2.831	368.25	370.12	n/a	370.12	7	Combination
9	Pipe - (63)	8.22	18	Cir	73.131	369.03	370.16	1.545	370.12	371.27	n/a	371.27	8	Combination
10	Pipe - (61)	4.40	18	Cir	160.765	370.94	371.75	0.504	371.77	372.58	0.19	372.77	9	Combination
11	Pipe - (60) (1)	3.43	15	Cir	69.865	373.45	374.00	0.787	374.15	374.75	0.25	374.75	10	Combination
12	Pipe - (59)	2.81	15	Cir	92.962	374.60	375.07	0.500	375.31	375.78	0.36	376.13	11	Combination
13	Pipe - (177)	2.60	15	Cir	150.515	375.27	376.03	0.502	376.13	376.67	n/a	376.67	12	DropGrate
14	Pipe - (178)	2.13	15	Cir	113.000	371.88	373.21	1.177	372.35	373.79	n/a	373.79	9	DropGrate
15	Pipe - (71)	1.05	15	Cir	27.000	369.94	370.12	0.667	370.32	370.52	0.15	370.52	8	Combination
16	Pipe - (70)	2.09	15	Cir	163.438	365.80	367.43	0.997	366.30	368.01	0.22	368.01	6	DropGrate
17	Pipe - (56) (1)	1.04	24	Cir	44.000	363.24	363.46	0.500	365.11	363.81	0.14	363.81	5	Combination
18	Pipe - (56)	0.61	15	Cir	27.000	364.58	364.89	1.148	364.83	365.20	n/a	365.20	17	Combination
19	Pipe - (49)	12.73	24	Cir	137.219	361.64	362.33	0.503	363.13	363.64	1.20	364.84	2	Combination
20	Pipe - (48)	2.10	24	Cir	66.365	363.00	363.33	0.497	364.84	363.83	n/a	363.83	19	Combination
21	Pipe - (47)	1.66	18	Cir	85.141	363.53	363.96	0.505	364.01	364.44	n/a	364.44	20	Combination
22	Pipe - (53)	9.60	24	Cir	132.305	363.12	363.78	0.499	364.84	365.02	0.34	365.36	19	OpenHeadwall
23	Pipe - (54)	1.01	18	Cir	27.000	363.50	363.64	0.519	364.84	364.01	n/a	364.01	19	Combination
24	Pipe - (58)	0.25	24	Cir	59.390	362.30	362.60	0.505	362.91	362.92	0.01	362.93	1	Combination

Project File: SCM#3Revised.stm | Number of lines: 24 | Run Date: 3/31/2025

NOTES: Return period = 10 Yrs. ; j - Line contains hyd. jump.

Inlet Report

SCM #3 10-YEAR REPORT

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	CB 301	0.43	0.03	0.46	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.11	1.83	0.00	0.00	0.0	Off
2	CB 302	1.73	0.00	1.53	0.20	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.17	4.73	0.08	1.34	0.0	Off
3	CB 304	0.25	0.00	0.25	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.09	1.46	0.00	0.00	0.0	2
4	CB 307	0.47	0.04	0.51	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.11	1.90	0.00	0.00	0.0	3
5	CB 308	0.76	0.00	0.75	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.13	2.61	0.02	0.29	0.0	4
6	CB 309	0.36	0.00	0.36	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.10	1.67	0.00	0.00	0.0	5
7	CB 311	0.25	0.00	0.25	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.09	1.46	0.00	0.00	0.0	6
8	CB 312	0.32	0.32	0.65	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.12	2.23	0.00	0.00	0.0	7
9	CB 315	2.06	0.03	1.77	0.32	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.19	5.27	0.10	1.60	0.0	8
10	CB 319	1.05	0.00	1.01	0.03	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.15	3.40	0.04	0.68	0.0	9
11	CB 321	0.69	0.00	0.69	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.13	2.37	0.01	0.10	0.0	10
12	CB 325	0.29	0.00	0.29	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.09	1.54	0.00	0.00	0.0	11
13	YI 325A	2.60	0.00	2.60	0.00	DrGrt	0.0	0.00	7.50	3.00	2.50	Sag	2.00	0.020	0.020	0.013	0.18	20.85	0.18	20.85	0.0	Off
14	YI 316B	2.13	0.00	2.13	0.00	DrGrt	0.0	0.00	7.50	3.00	2.50	Sag	2.00	0.020	0.020	0.013	0.16	18.57	0.16	18.57	0.0	Off
15	CB 313	1.05	0.00	1.01	0.03	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.15	3.40	0.04	0.68	0.0	4
16	YI 310	2.09	0.00	2.09	0.00	DrGrt	0.0	0.00	7.50	3.00	2.50	Sag	2.00	0.020	0.020	0.013	0.16	18.39	0.16	18.39	0.0	Off
17	CB 306	0.43	0.00	0.43	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.11	1.79	0.00	0.00	0.0	3
18	CB 305	0.61	0.00	0.61	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.12	2.11	0.00	0.00	0.0	24
19	CB 330	0.43	0.00	0.43	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.11	1.79	0.00	0.00	0.0	2
20	CB 333	0.47	0.14	0.61	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.12	2.10	0.00	0.00	0.0	19
21	CB 334	1.66	0.00	1.52	0.14	Comb	6.0	1.50	0.00	6.00	2.50	0.054	2.00	0.060	0.020	0.013	0.17	4.62	0.07	1.17	0.0	20
22	FES INLET 331	9.60	0.00	9.60	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
23	CB 332	1.01	0.00	0.98	0.03	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.15	3.32	0.04	0.63	0.0	1

Project File: SCM#3Revised.stm | Number of lines: 24 | Run Date: 3/31/2025

NOTES: Inlet N-Values = 0.016; Intensity = 74.09 / (Inlet time + 12.50) ^ 0.81; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

SCM #3 10-YEAR REPORT

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
24	CB 303	0.25	0.00	0.25	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.09	1.46	0.00	0.00	0.0	1

Project File: SCM#3Revised.stm

Number of lines: 24

Run Date: 3/31/2025

NOTES: Inlet N-Values = 0.016; Intensity = 74.09 / (Inlet time + 12.50) ^ 0.81; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Hydraulic Grade Line Computations

SCM #3 10-YEAR REPORT

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	36	27.78	360.94	363.29	2.35	4.14	4.67	0.70	363.99	0.000	53.315	361.21	362.91	1.70**	4.14	6.71	0.70	363.61	0.000	0.000	n/a	1.31	n/a
2	36	27.22	361.31	362.96	1.65*	3.97	6.85	0.69	363.65	0.000	26.578	361.44	363.13	1.69**	4.09	6.66	0.69	363.81	0.000	0.000	n/a	1.50	n/a
3	30	13.96	361.64	363.13	1.49	2.47	4.59	0.50	363.62	0.000	82.337	362.05	363.31	1.26**	2.47	5.65	0.50	363.80	0.000	0.000	n/a	1.17	n/a
4	24	13.79	362.25	363.69	1.44*	2.43	5.68	0.50	364.20	0.491	50.862	362.50	363.94	1.44	2.42	5.69	0.50	364.44	0.492	0.492	0.250	0.95	0.48
5	24	13.41	362.70	364.42	1.72	2.87	4.66	0.34	364.76	0.325	27.000	362.84	364.48	1.64	2.76	4.86	0.37	364.85	0.350	0.338	0.091	1.70	0.62
6	24	11.84	363.34	365.11	1.77	2.04	4.03	0.53	365.63	0.000	59.521	365.07	366.30 j	1.23**	2.04	5.81	0.53	366.83	0.000	0.000	n/a	1.49	0.78
7	18	9.63	365.17	366.30	1.13	1.43	6.72	0.63	366.94	0.000	63.410	367.05	368.25	1.20**	1.51	6.37	0.63	368.88	0.000	0.000	n/a	0.50	0.32
8	18	9.44	367.25	368.25	1.00	1.25	7.57	0.62	368.86	0.000	59.348	368.93	370.12	1.19**	1.50	6.30	0.62	370.73	0.000	0.000	n/a	1.50	n/a
9	18	8.22	369.03	370.12	1.09	1.37	6.00	0.54	370.65	0.000	73.131	370.16	371.27	1.11**	1.40	5.87	0.54	371.81	0.000	0.000	n/a	1.49	n/a
10	18	4.40	370.94	371.77	0.83*	1.00	4.39	0.30	372.07	0.504	160.765	371.75	372.58	0.83	1.00	4.39	0.30	372.88	0.502	0.503	0.809	0.62	0.19
11	15	3.43	373.45	374.15	0.70*	0.70	4.88	0.31	374.46	0.000	69.865	374.00	374.75	0.75**	0.76	4.49	0.31	375.06	0.000	0.000	n/a	0.80	0.25
12	15	2.81	374.60	375.31	0.71*	0.72	3.91	0.24	375.55	0.500	92.962	375.07	375.78	0.71	0.72	3.91	0.24	376.01	0.499	0.499	0.464	1.50	0.36
13	15	2.60	375.27	376.13	0.86	0.64	2.88	0.13	376.26	0.240	150.515	376.03	376.67	0.65**	0.64	4.06	0.26	376.93	0.581	0.411	n/a	1.00	n/a
14	15	2.13	371.88	372.35	0.47*	0.43	5.00	0.23	372.58	0.000	113.000	373.21	373.79	0.58**	0.56	3.81	0.23	374.02	0.000	0.000	n/a	1.00	n/a
15	15	1.05	369.94	370.32	0.38*	0.31	3.35	0.15	370.46	0.000	27.000	370.12	370.52	0.40**	0.34	3.07	0.15	370.67	0.000	0.000	n/a	1.00	0.15
16	15	2.09	365.80	366.30	0.50	0.46	4.51	0.22	366.53	0.000	163.438	367.43	368.01	0.58**	0.55	3.78	0.22	368.23	0.000	0.000	n/a	1.00	0.22
17	24	1.04	363.24	365.11	1.87	0.37	0.34	0.12	365.23	0.000	44.000	363.46	363.81	0.35**	0.37	2.80	0.12	363.93	0.000	0.000	n/a	1.12	0.14
18	15	0.61	364.58	364.83	0.25*	0.18	3.48	0.11	364.94	0.000	27.000	364.89	365.20	0.31**	0.23	2.64	0.11	365.30	0.000	0.000	n/a	1.00	n/a
19	24	12.73	361.64	363.13	1.49	2.50	5.09	0.40	363.53	0.390	137.219	362.33	363.64	1.31	2.17	5.86	0.53	364.17	0.546	0.468	0.643	2.25	1.20
20	24	2.10	363.00	364.84	1.84	0.62	0.69	0.18	365.02	0.000	66.365	363.33	363.83	0.50**	0.62	3.39	0.18	364.01	0.000	0.000	n/a	0.50	n/a
21	18	1.66	363.53	364.01	0.48*	0.49	3.39	0.18	364.19	0.000	85.141	363.96	364.44	0.48**	0.49	3.37	0.18	364.62	0.000	0.000	n/a	1.00	n/a
22	24	9.60	363.12	364.84	1.72	2.87	3.34	0.17	365.01	0.167	132.305	363.78	365.02	1.24	2.04	4.69	0.34	365.36	0.362	0.264	0.350	1.00	0.34

Project File: SCM#3Revised.stm | Number of lines: 24 | Run Date: 3/31/2025

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

SCM #3 10-YEAR REPORT

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
23	18	1.01	363.50	364.84	1.34	0.34	0.61	0.13	364.97	0.000	27.000	363.64	364.01	0.37**	0.34	2.93	0.13	364.15	0.000	0.000	n/a	1.00	n/a
24	24	0.25	362.30	362.91	0.61	0.82	0.31	0.00	362.91	0.003	59.390	362.60	362.92	0.32	0.32	0.79	0.01	362.93	0.042	0.022	0.013	1.00	0.01

Project File: SCM#3Revised.stm

Number of lines: 24

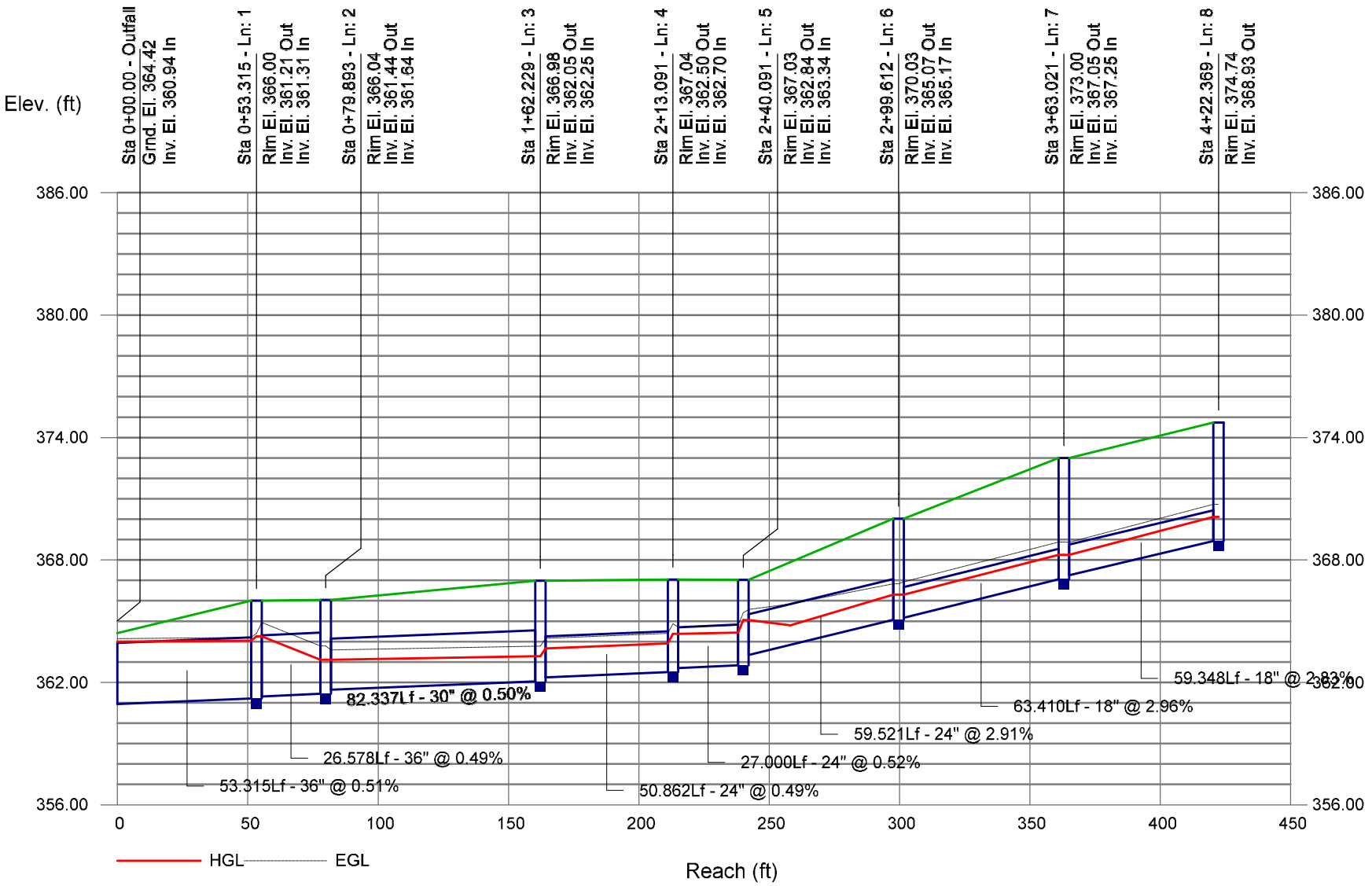
Run Date: 3/31/2025

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Storm Sewer Profile

SCM #3 10-YEAR PROFILE 1-8

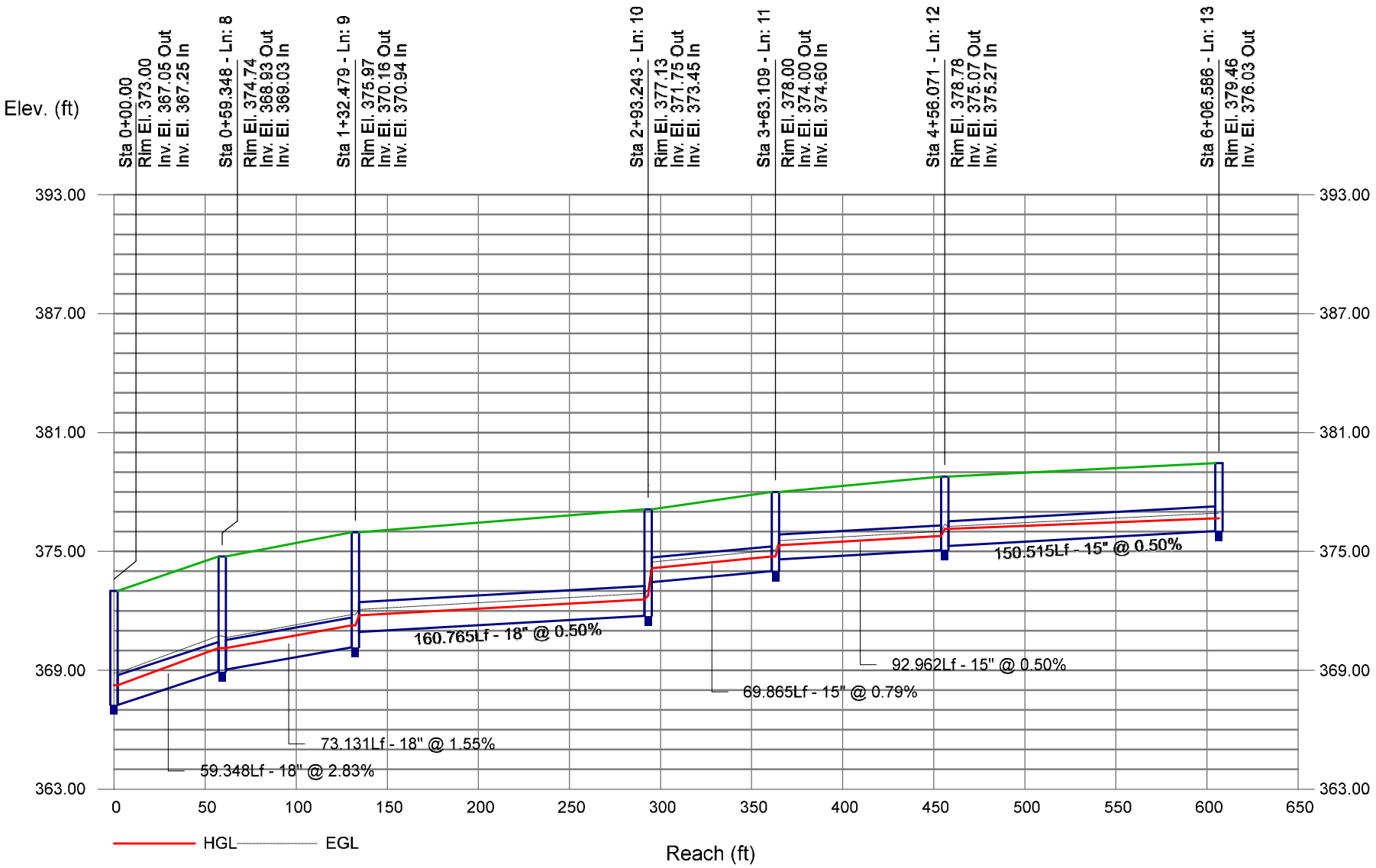
Proj. file: SCM#3Revised.stm



Storm Sewer Profile

SCM #3 10-YEAR PROFILE 8-13

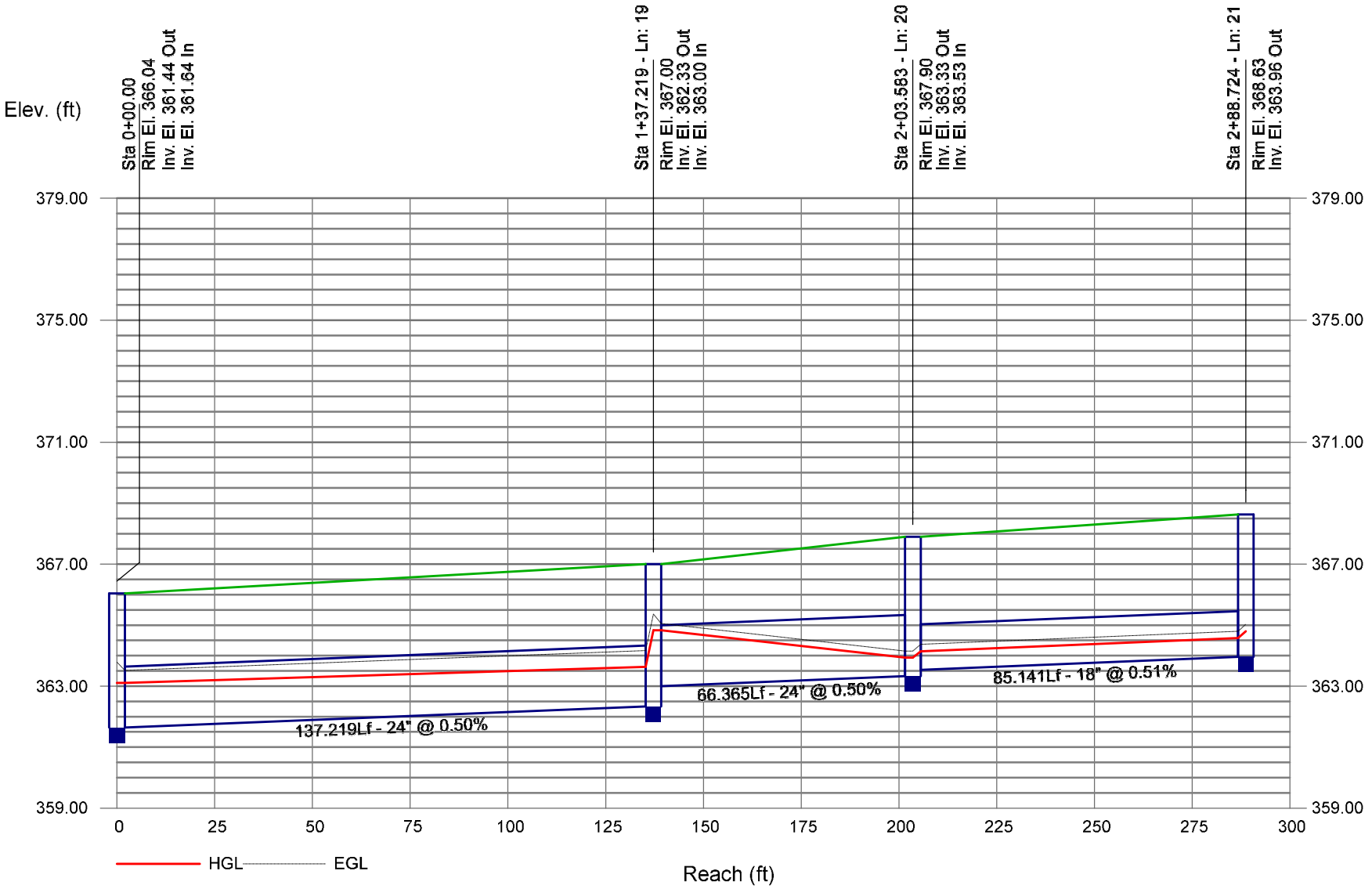
Proj. file: SCM#3Revised.stm



Storm Sewer Profile

SCM #3 10-YEAR PROFILE 19-21

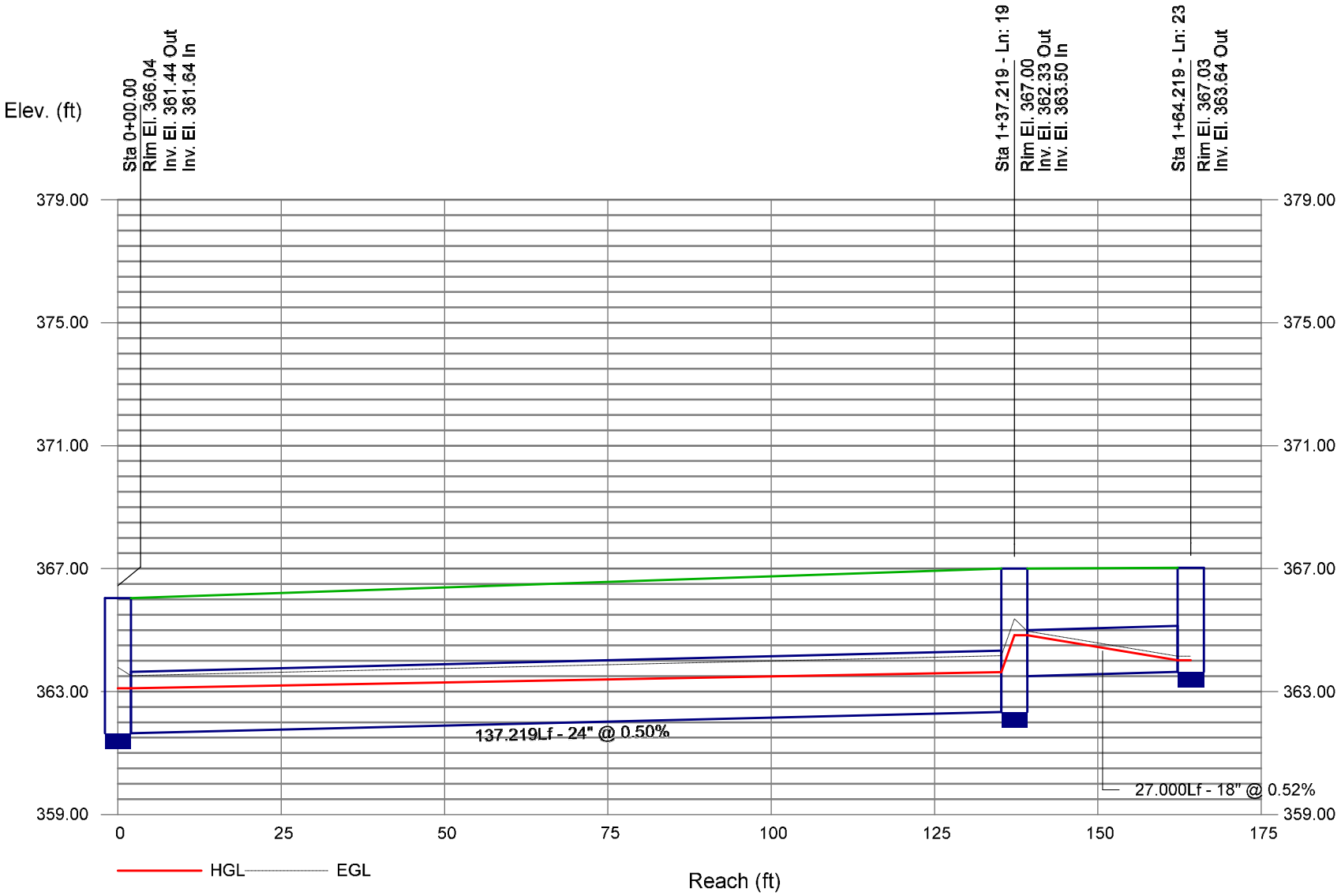
Proj. file: SCM#3Revised.stm



Storm Sewer Profile

SCM #3 10-YEAR PROFILE 22-23

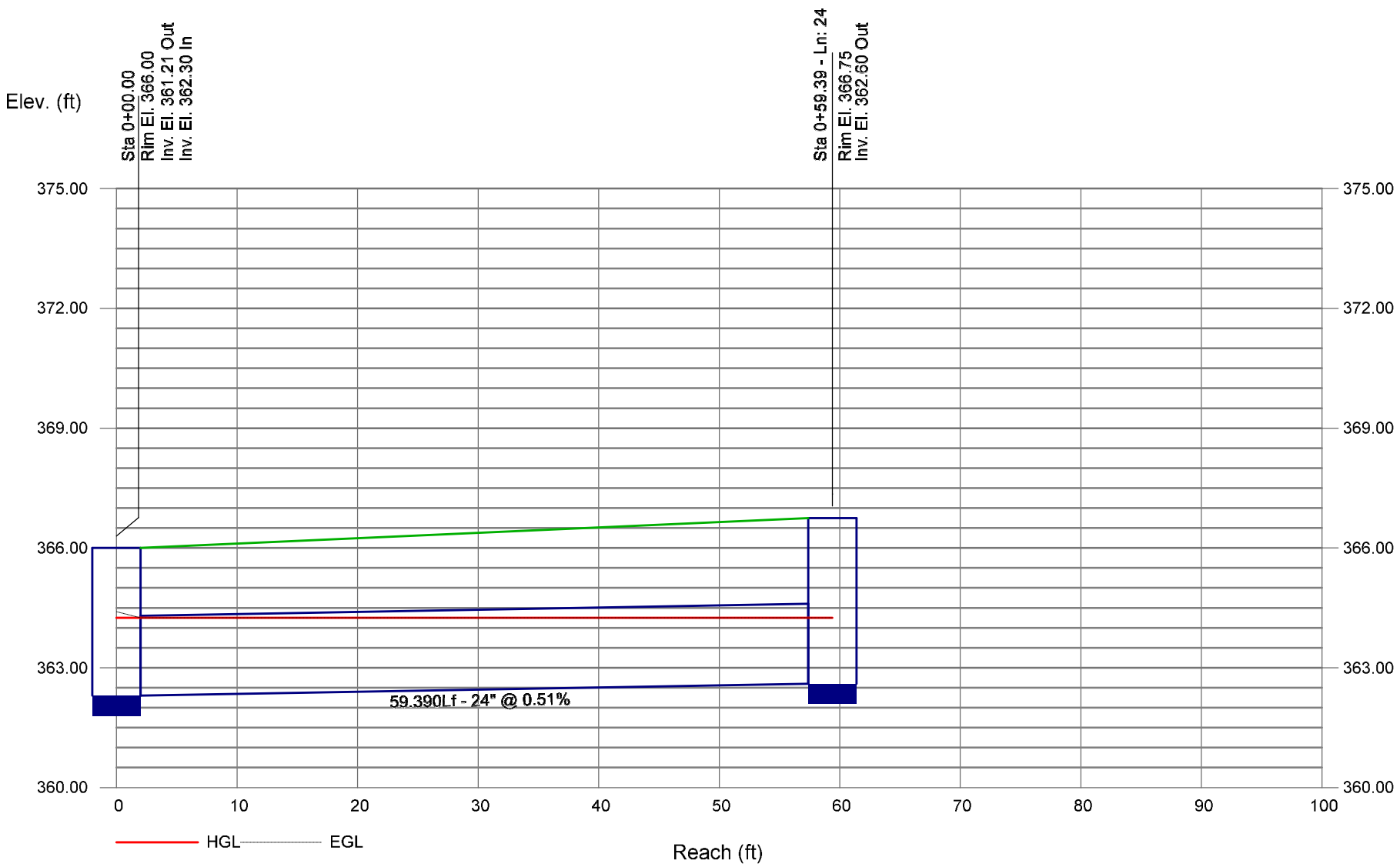
Proj. file: SCM#3Revised.stm



Storm Sewer Profile

SCM #3 10-YEAR PROFILE 24-24

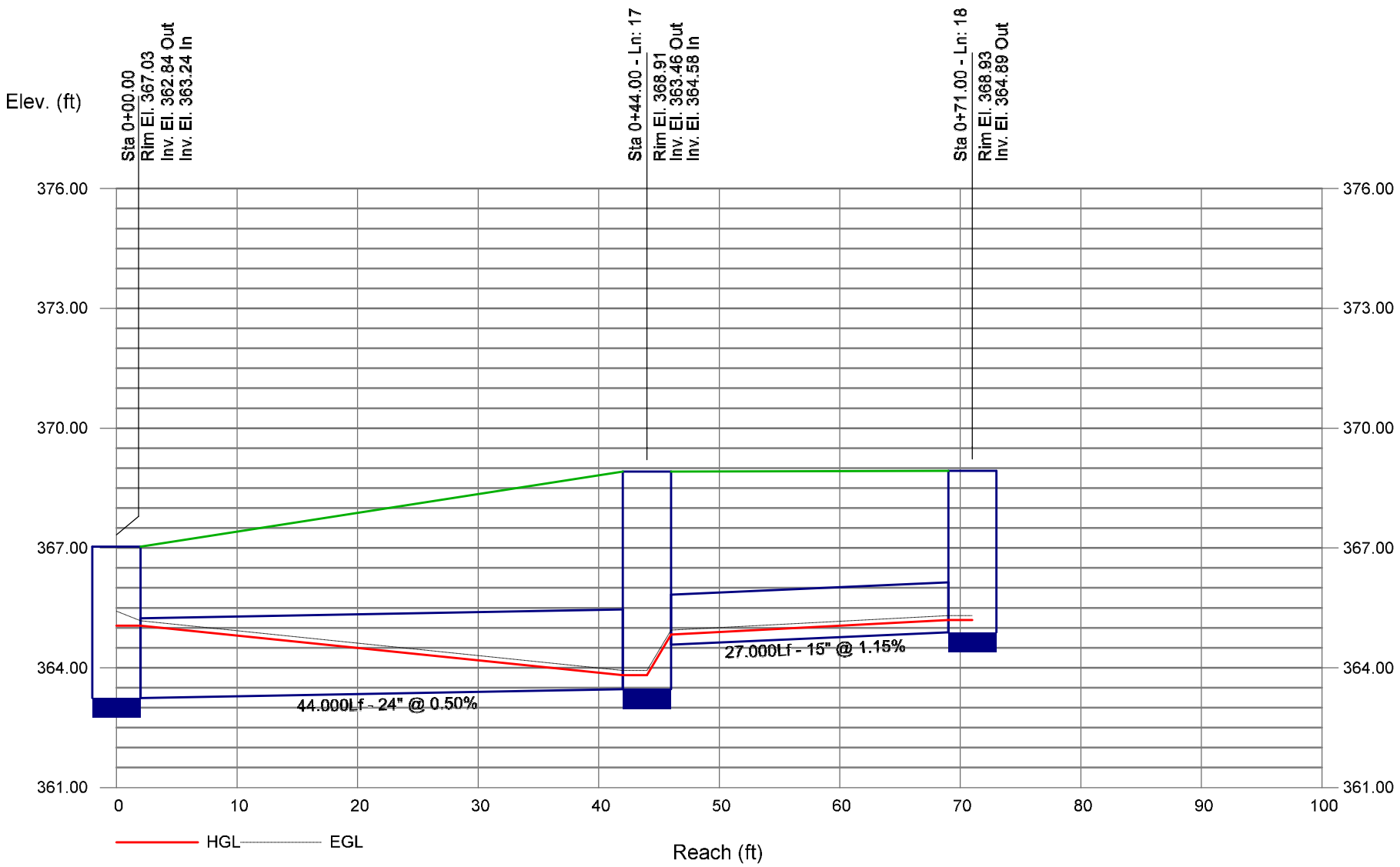
Proj. file: SCM#3Revised.stm



Storm Sewer Profile

SCM #3 10-YEAR PROFILE 17-18

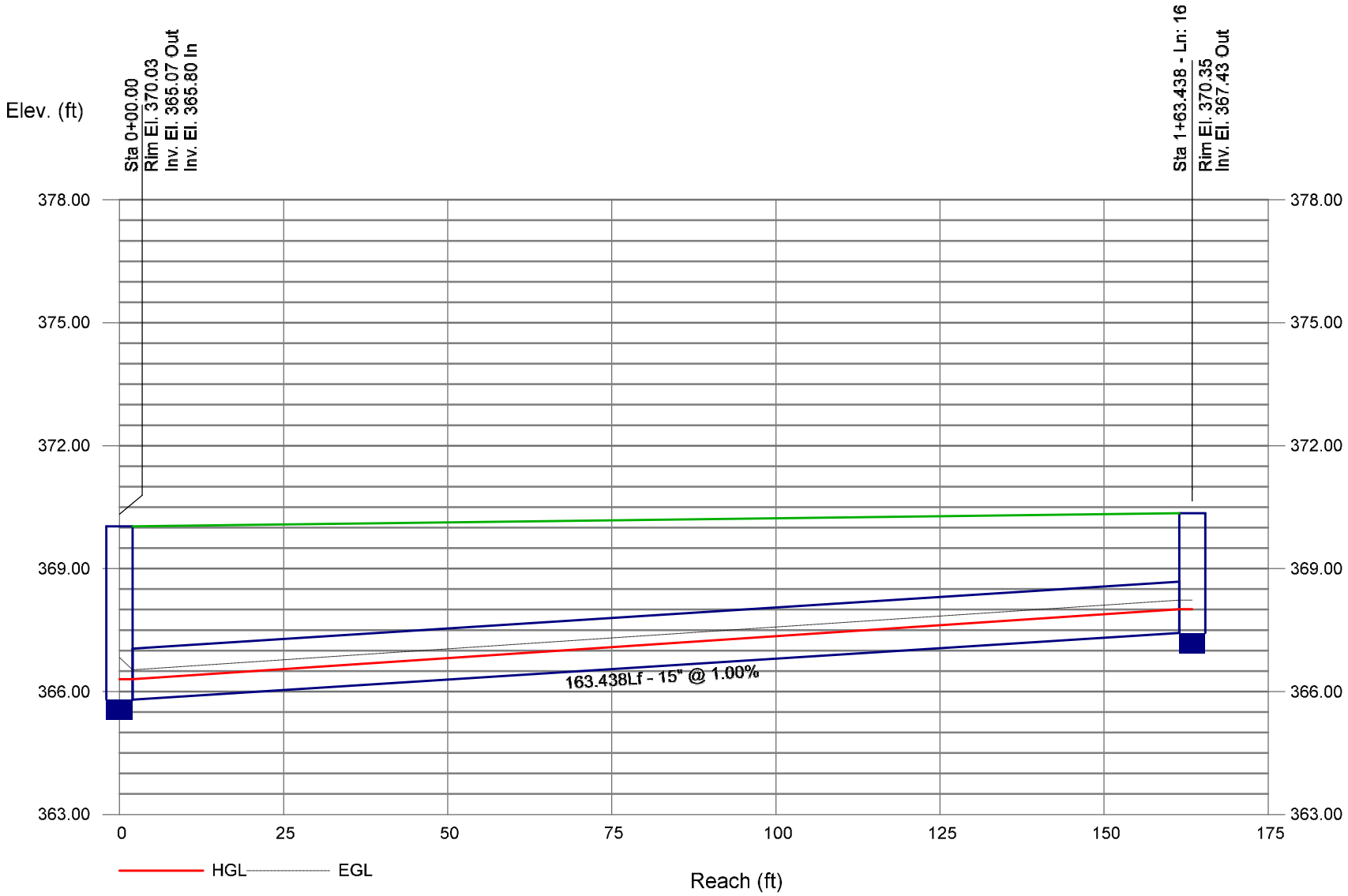
Proj. file: SCM#3Revised.stm



Storm Sewer Profile

SCM #3 10-YEAR PROFILE 16-16

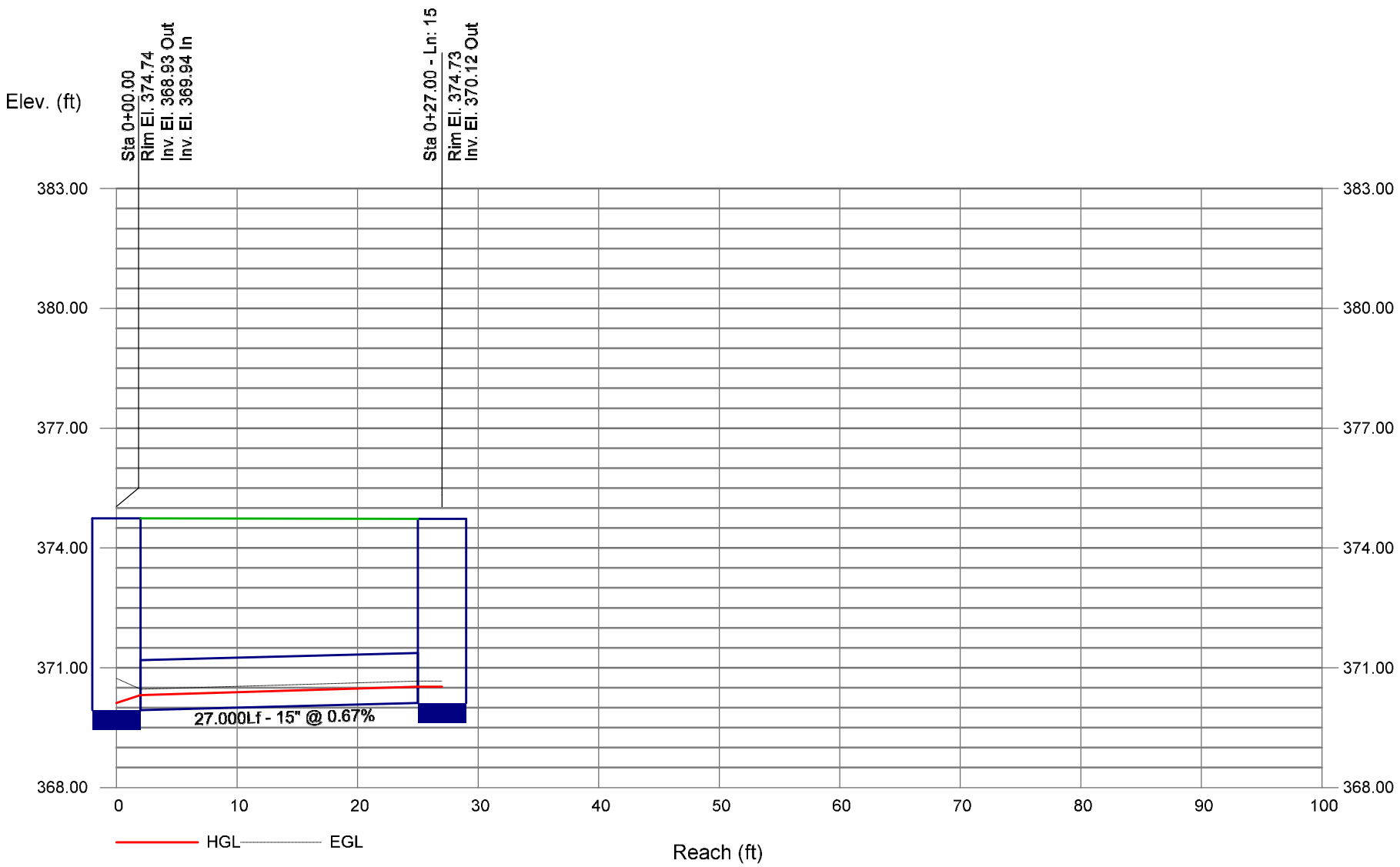
Proj. file: SCM#3Revised.stm



Storm Sewer Profile

SCM #3 10-YEAR PROFILE 15-15

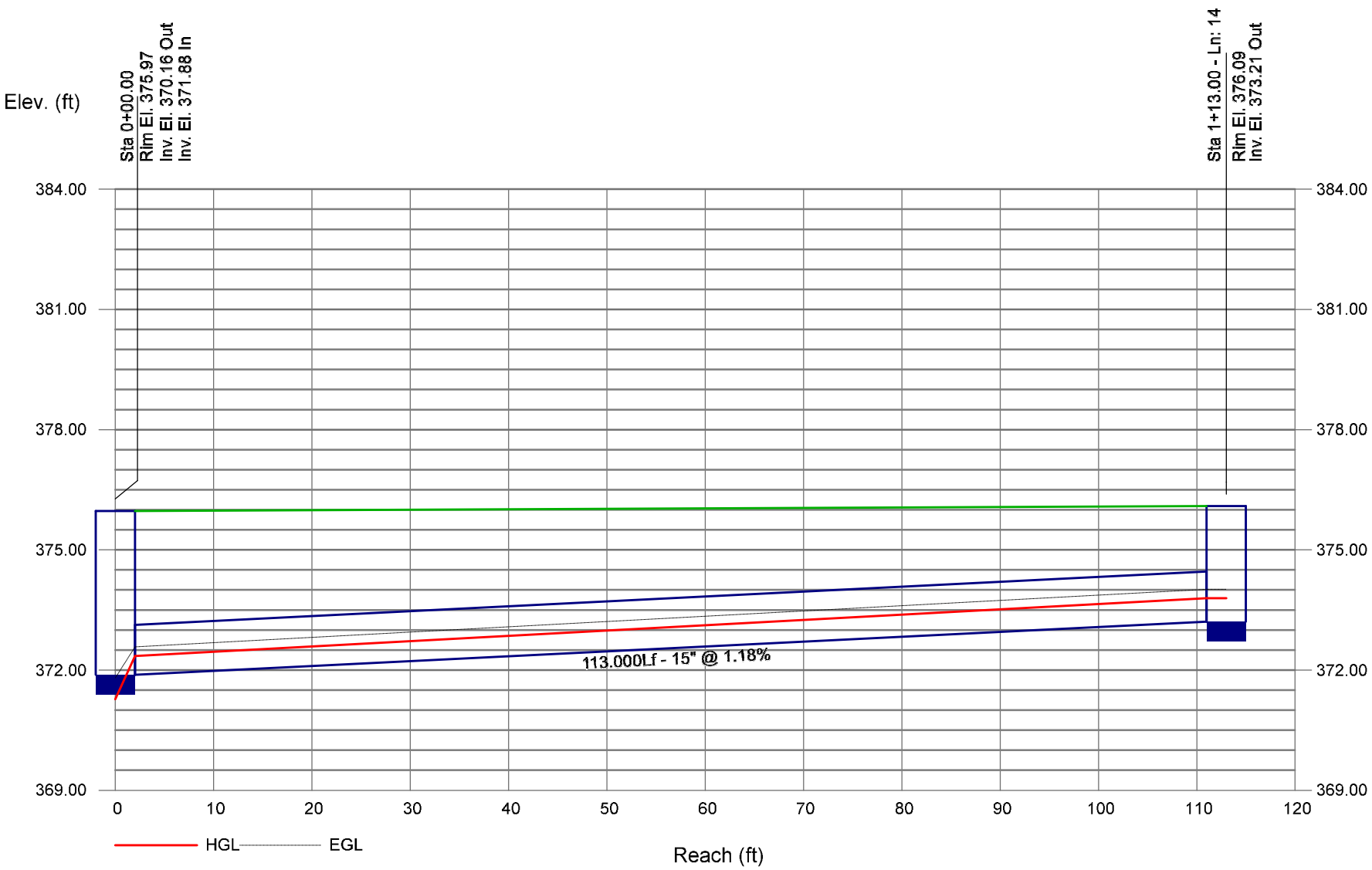
Proj. file: SCM#3Revised.stm



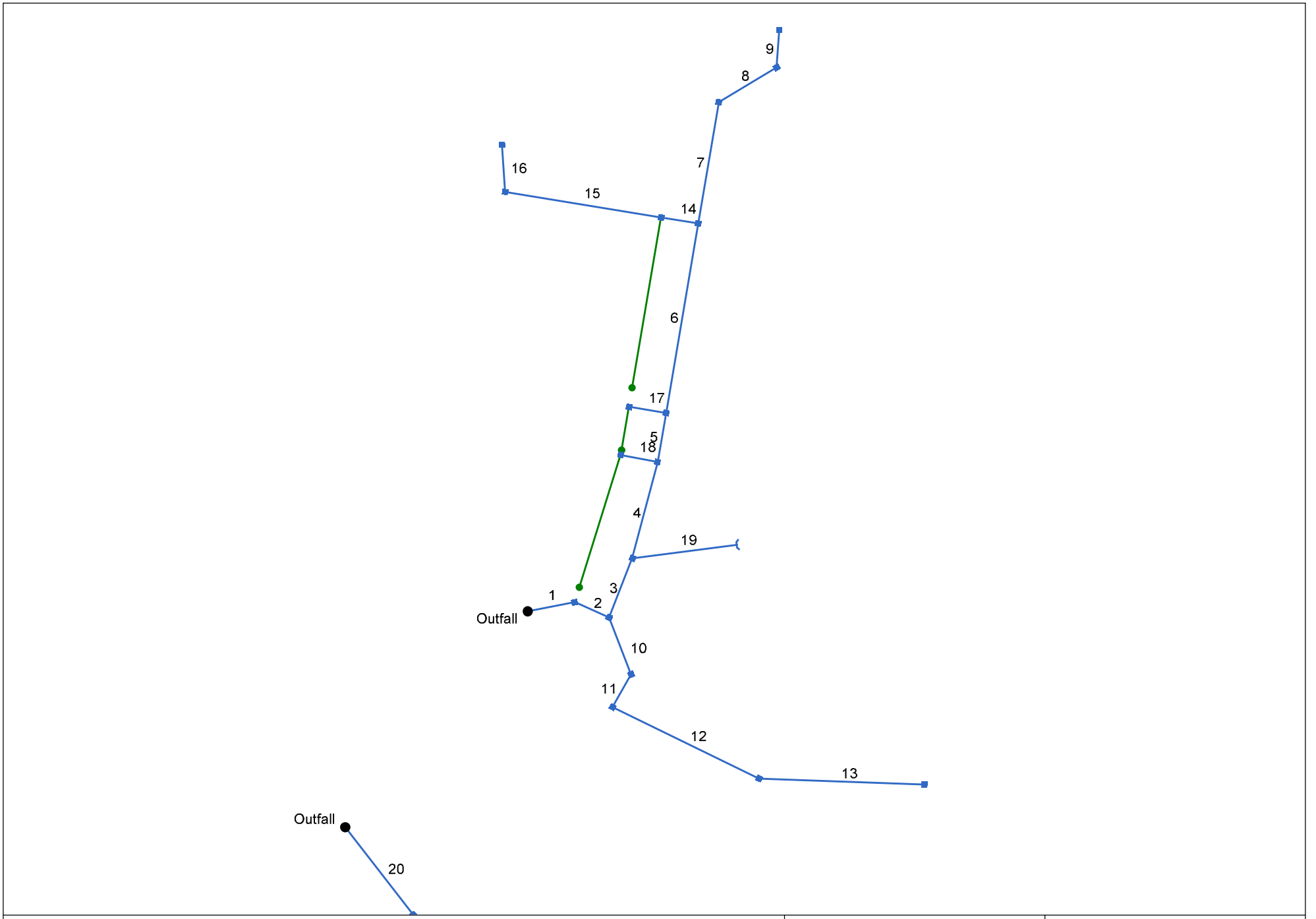
Storm Sewer Profile

SCM #3 10-YEAR PROFILE 14-14

Proj. file: SCM#3Revised.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan SCM #4 10-YEAR REPORT



Project File: SCM#4.stm	Number of lines: 20	Date: 3/28/2025

Storm Sewer Inventory Report

SCM #4 10-YEAR 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	34.253	-11.231	Comb	0.00	0.07	0.60	10.0	357.00	0.50	357.17	30	Cir	0.013	0.95	363.04	Pipe - (14)
2	1	27.000	35.364	Comb	0.00	0.04	0.60	10.0	357.27	0.52	357.41	24	Cir	0.013	1.68	363.02	Pipe - (19)
3	2	45.598	-92.825	Comb	0.00	0.03	0.60	10.0	357.60	0.50	357.83	24	Cir	0.013	1.35	362.81	Pipe - (13) (1)
4	3	71.733	-6.548	Comb	0.00	0.06	0.60	10.0	357.93	0.50	358.29	24	Cir	0.013	1.50	362.39	Pipe - (13)
5	4	35.770	-5.010	Comb	0.00	0.07	0.60	10.0	358.49	0.50	358.67	18	Cir	0.013	1.50	362.56	Pipe - (12)
6	5	138.243	-0.182	Comb	0.00	0.06	0.60	10.0	358.87	1.00	360.25	18	Cir	0.013	1.50	365.52	Pipe - (11)
7	6	88.557	0.022	Comb	0.00	0.02	0.60	10.0	360.58	4.21	364.31	15	Cir	0.013	1.19	368.85	Pipe - (9)
8	7	48.252	49.402	Comb	0.00	0.17	0.60	10.0	364.51	0.50	364.75	15	Cir	0.013	1.27	369.03	Pipe - (8)
9	8	26.989	-54.988	Comb	0.00	0.52	0.60	10.0	364.95	0.52	365.09	15	Cir	0.013	1.00	369.03	Pipe - (7)
10	2	43.911	44.750	Comb	0.00	0.15	0.60	10.0	357.60	0.50	357.82	24	Cir	0.013	1.21	362.71	Pipe - (18)
11	10	27.000	50.538	Comb	0.00	0.19	0.60	10.0	358.02	1.00	358.29	18	Cir	0.013	1.50	362.73	Pipe - (17)
12	11	116.822	-93.303	Comb	0.00	0.07	0.60	10.0	358.79	3.00	362.29	15	Cir	0.013	0.69	368.09	Pipe - (16)
13	12	118.495	-24.005	Comb	0.00	0.25	0.60	10.0	363.30	3.00	366.85	15	Cir	0.013	1.00	372.03	Pipe - (15)
14	6	26.980	-90.285	Comb	0.00	0.16	0.60	10.0	360.45	0.48	360.58	15	Cir	0.013	0.50	365.51	Pipe - (10)
15	14	113.243	0.000	MH	0.00	0.00	0.60	10.0	360.69	0.50	361.26	15	Cir	0.013	0.98	366.21	Pipe - (181)
16	15	34.087	76.970	DrGrt	0.00	0.68	0.60	10.0	361.36	0.50	361.53	15	Cir	0.013	1.00	363.50	Pipe - (180)
17	5	27.000	-90.174	Comb	0.00	0.07	0.60	10.0	358.97	0.52	359.11	15	Cir	0.013	1.00	361.82	Pipe - (20)
18	4	27.000	-94.006	Comb	0.00	0.08	0.60	10.0	358.68	0.74	358.88	15	Cir	0.013	1.00	361.65	Pipe - (21)
19	3	75.640	61.294	Hdwl	0.00	1.03	0.60	10.0	358.53	0.50	358.91	18	Cir	0.013	1.00	360.20	Pipe - (163)
20	End	79.656	52.362	DrGrt	0.00	1.73	0.60	10.0	356.95	0.50	357.35	18	Cir	0.013	1.00	359.68	Pipe - (24)(0)

Project File: SCM#4.stm | Number of lines: 20 | Date: 3/28/2025

Structure Report

SCM #4 10-YEAR 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	CB 401	Combination	363.04	Rect	4.00	4.00	30	Cir	357.17	24	Cir	357.27
2	CB 402	Combination	363.02	Rect	4.00	4.00	24	Cir	357.41	24 24	Cir Cir	357.60 357.60
3	CB 407	Combination	362.81	Rect	4.00	4.00	24	Cir	357.83	24 18	Cir Cir	357.93 358.53
4	CB 408	Combination	362.39	Rect	4.00	4.00	24	Cir	358.29	18 15	Cir Cir	358.49 358.68
5	CB 409	Combination	362.56	Rect	4.00	4.00	18	Cir	358.67	18 15	Cir Cir	358.87 358.97
6	CB 410	Combination	365.52	Rect	4.00	4.00	18	Cir	360.25	15 15	Cir Cir	360.58 360.45
7	CB 411	Combination	368.85	Rect	4.00	4.00	15	Cir	364.31	15	Cir	364.51
8	CB 412	Combination	369.03	Rect	4.00	4.00	15	Cir	364.75	15	Cir	364.95
9	CB 413	Combination	369.03	Rect	4.00	4.00	15	Cir	365.09			
10	CB 403	Combination	362.71	Rect	4.00	4.00	24	Cir	357.82	18	Cir	358.02
11	CB 404	Combination	362.73	Rect	4.00	4.00	18	Cir	358.29	15	Cir	358.79
12	CB 405	Combination	368.09	Rect	4.00	4.00	15	Cir	362.29	15	Cir	363.30
13	CB 406	Combination	372.03	Rect	4.00	4.00	15	Cir	366.85			
14	CB 410A	Combination	365.51	Rect	4.00	4.00	15	Cir	360.58	15	Cir	360.69
15	JB 410B	Manhole	366.21	Rect	4.00	4.00	15	Cir	361.26	15	Cir	361.36
16	YI 410C	DropGrate	363.50	Rect	4.00	4.00	15	Cir	361.53			
17	CB 409A	Combination	361.82	Rect	4.00	4.00	15	Cir	359.11			
18	CB 408A	Combination	361.65	Rect	4.00	4.00	15	Cir	358.88			
19	FES 407A	OpenHeadwall	360.20	n/a	n/a	n/a	18	Cir	358.91			
20	YI 421	DropGrate	359.68	Rect	4.00	4.00	18	Cir	357.35			

Project File: SCM#4.stm | Number of Structures: 20 | Run Date: 3/28/2025

Storm Sewer Summary Report

SCM #4 10-YEAR 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	Pipe - (14)	12.18	30	Cir	34.253	357.00	357.17	0.496	359.00	358.34	0.43	358.34	End	Combination
2	Pipe - (19)	11.98	24	Cir	27.000	357.27	357.41	0.519	358.55	358.69	0.84	359.52	1	Combination
3	Pipe - (13) (1)	9.76	24	Cir	45.598	357.60	357.83	0.504	359.52	359.58	0.24	359.81	2	Combination
4	Pipe - (13)	6.32	24	Cir	71.733	357.93	358.29	0.502	359.81	359.18	n/a	359.18	3	Combination
5	Pipe - (12)	5.88	18	Cir	35.770	358.49	358.67	0.503	359.50	359.67	0.51	360.18	4	Combination
6	Pipe - (11)	5.64	18	Cir	138.243	358.87	360.25	0.998	360.18	361.17	n/a	361.17 j	5	Combination
7	Pipe - (9)	2.53	15	Cir	88.557	360.58	364.31	4.212	361.17	364.95	n/a	364.95	6	Combination
8	Pipe - (8)	2.48	15	Cir	48.252	364.51	364.75	0.497	365.17	365.41	0.28	365.69	7	Combination
9	Pipe - (7)	1.88	15	Cir	26.989	364.95	365.09	0.519	365.69	365.71	0.15	365.86	8	Combination
10	Pipe - (18)	2.30	24	Cir	43.911	357.60	357.82	0.501	359.52	358.35	0.23	358.35	2	Combination
11	Pipe - (17)	1.78	18	Cir	27.000	358.02	358.29	1.000	358.44	358.79	0.28	358.79	10	Combination
12	Pipe - (16)	1.14	15	Cir	116.822	358.79	362.29	2.996	359.06	362.71	n/a	362.71	11	Combination
13	Pipe - (15)	0.90	15	Cir	118.495	363.30	366.85	2.996	363.54	367.22	0.13	367.22	12	Combination
14	Pipe - (10)	2.96	15	Cir	26.980	360.45	360.58	0.482	361.19	361.32	0.12	361.44	6	Combination
15	Pipe - (181)	2.44	15	Cir	113.243	360.69	361.26	0.503	361.44	361.89	0.24	362.13	14	Manhole
16	Pipe - (180)	2.45	15	Cir	34.087	361.36	361.53	0.499	362.13	362.19	0.21	362.41	15	DropGrate
17	Pipe - (20)	0.25	15	Cir	27.000	358.97	359.11	0.518	360.18	360.19	0.00	360.19	5	Combination
18	Pipe - (21)	0.29	15	Cir	27.000	358.68	358.88	0.741	359.18	359.09	0.07	359.09	4	Combination
19	Pipe - (163)	3.72	18	Cir	75.640	358.53	358.91	0.502	359.81	359.88	0.15	360.03	3	OpenHeadwall
20	Pipe - (24)(0)	6.24	18	Cir	79.656	356.95	357.35	0.502	358.45	358.69	0.22	358.91	End	DropGrate

Project File: SCM#4.stm | Number of lines: 20 | Run Date: 3/28/2025

NOTES: Return period = 10 Yrs. ; j - Line contains hyd. jump.

Inlet Report

SCM #4 10-YEAR REPORT

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	CB 401	0.25	0.00	0.25	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.09	1.46	0.00	0.00	0.0	Off
2	CB 402	0.14	0.00	0.14	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.07	1.19	0.00	0.00	0.0	Off
3	CB 407	0.11	0.00	0.11	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.06	1.06	0.00	0.00	0.0	2
4	CB 408	0.22	0.00	0.22	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.08	1.38	0.00	0.00	0.0	Off
5	CB 409	0.25	0.00	0.25	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.09	1.46	0.00	0.00	0.0	4
6	CB 410	0.22	0.00	0.22	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.08	1.38	0.00	0.00	0.0	5
7	CB 411	0.07	0.01	0.08	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.06	0.96	0.00	0.00	0.0	6
8	CB 412	0.61	0.25	0.85	0.01	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.14	2.92	0.03	0.43	0.0	7
9	CB 413	1.88	0.00	1.63	0.25	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.18	4.96	0.09	1.45	0.0	8
10	CB 403	0.54	0.00	0.54	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.12	1.94	0.00	0.00	0.0	2
11	CB 404	0.69	0.00	0.69	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.13	2.37	0.01	0.10	0.0	Off
12	CB 405	0.25	0.01	0.27	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.09	1.49	0.00	0.00	0.0	11
13	CB 406	0.90	0.00	0.89	0.01	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.14	3.03	0.03	0.50	0.0	12
14	CB 410A	0.58	0.00	0.58	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.12	1.99	0.00	0.00	0.0	17
15	JB 410B	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
16	YI 410C	2.45	0.00	2.45	0.00	DrGrt	0.0	0.00	7.50	3.00	2.50	Sag	2.00	0.020	0.020	0.013	0.18	20.16	0.18	20.16	0.0	Off
17	CB 409A	0.25	0.00	0.25	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.09	1.46	0.00	0.00	0.0	18
18	CB 408A	0.29	0.00	0.29	0.00	Comb	6.0	1.50	0.00	3.00	2.50	0.054	2.00	0.060	0.020	0.013	0.09	1.54	0.00	0.00	0.0	1
19	FES 407A	3.72	0.00	3.72	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
20	YI 421	6.24	0.00	6.24	0.00	DrGrt	0.0	0.00	7.50	3.00	2.50	Sag	2.00	0.020	0.020	0.013	0.33	35.43	0.33	35.43	0.0	Off

Project File: SCM#4.stm | Number of lines: 20 | Run Date: 3/28/2025

NOTES: Inlet N-Values = 0.016; Intensity = 74.09 / (Inlet time + 12.50) ^ 0.81; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Hydraulic Grade Line Computations

SCM #4 10-YEAR REPORT

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	30	12.18	357.00	359.00	2.00	2.26	2.89	0.45	359.45	0.000	34.253	357.17	358.34	1.17**	2.26	5.40	0.45	358.79	0.000	0.000	n/a	0.95	0.43
2	24	11.98	357.27	358.55	1.28*	2.11	5.67	0.50	359.04	0.518	27.000	357.41	358.69	1.28	2.12	5.66	0.50	359.18	0.517	0.518	0.140	1.68	0.84
3	24	9.76	357.60	359.52	1.92	3.10	3.14	0.15	359.68	0.162	45.598	357.83	359.58	1.75	2.91	3.35	0.17	359.75	0.169	0.166	0.075	1.35	0.24
4	24	6.32	357.93	359.81	1.88	1.35	2.06	0.34	360.16	0.000	71.733	358.29	359.18	0.89**	1.35	4.68	0.34	359.52	0.000	0.000	n/a	1.50	n/a
5	18	5.88	358.49	359.50	1.01*	1.26	4.67	0.34	359.83	0.503	35.770	358.67	359.67	1.00	1.26	4.68	0.34	360.01	0.505	0.504	0.180	1.50	0.51
6	18	5.64	358.87	360.18	1.31	1.13	3.44	0.39	360.57	0.000	138.248	360.25	361.17 j	0.92**	1.13	5.00	0.39	361.55	0.000	0.000	n/a	1.50	n/a
7	15	2.53	360.58	361.17	0.59	0.56	4.48	0.25	361.42	0.000	88.557	364.31	364.95	0.64**	0.63	4.03	0.25	365.20	0.000	0.000	n/a	1.19	n/a
8	15	2.48	364.51	365.17	0.66*	0.65	3.79	0.22	365.39	0.497	48.252	364.75	365.41	0.66	0.65	3.78	0.22	365.63	0.496	0.497	0.240	1.27	0.28
9	15	1.88	364.95	365.69	0.74	0.76	2.48	0.10	365.79	0.195	26.989	365.09	365.71	0.62	0.61	3.09	0.15	365.86	0.349	0.272	0.073	1.00	0.15
10	24	2.30	357.60	359.52	1.92	0.66	0.74	0.19	359.71	0.000	43.911	357.82	358.35	0.53**	0.66	3.48	0.19	358.53	0.000	0.000	n/a	1.21	0.23
11	18	1.78	358.02	358.44	0.42*	0.40	4.43	0.18	358.62	0.000	27.000	358.29	358.79	0.50**	0.52	3.44	0.18	358.98	0.000	0.000	n/a	1.50	0.28
12	15	1.14	358.79	359.06	0.27*	0.19	5.85	0.15	359.21	0.000	116.822	362.29	362.71	0.42**	0.36	3.14	0.15	362.86	0.000	0.000	n/a	0.69	n/a
13	15	0.90	363.30	363.54	0.24*	0.16	5.47	0.13	363.67	0.000	118.495	366.85	367.22	0.37**	0.31	2.94	0.13	367.36	0.000	0.000	n/a	1.00	0.13
14	15	2.96	360.45	361.19	0.74*	0.76	3.90	0.24	361.43	0.482	26.980	360.58	361.32	0.74	0.76	3.91	0.24	361.56	0.484	0.483	0.130	0.50	0.12
15	15	2.44	360.69	361.44	0.75	0.61	3.18	0.16	361.60	0.318	113.248	361.26	361.89	0.63**	0.62	3.95	0.24	362.13	0.563	0.440	0.498	0.98	0.24
16	15	2.45	361.36	362.13	0.77	0.79	3.11	0.15	362.28	0.300	34.087	361.53	362.19	0.66	0.66	3.71	0.21	362.41	0.472	0.386	0.132	1.00	0.21
17	15	0.25	358.97	360.18	1.21	1.22	0.21	0.00	360.18	0.001	27.000	359.11	360.19	1.08	1.12	0.22	0.00	360.19	0.001	0.001	0.000	1.00	0.00
18	15	0.29	358.68	359.18	0.50	0.13	0.63	0.07	359.25	0.000	27.000	358.88	359.09	0.21**	0.13	2.15	0.07	359.16	0.000	0.000	n/a	1.00	0.07
19	18	3.72	358.53	359.81	1.28	1.61	2.31	0.08	359.90	0.117	75.640	358.91	359.88	0.97	1.21	3.08	0.15	360.03	0.223	0.170	0.128	1.00	0.15
20	18	6.24	356.95	358.45	1.50*	1.77	3.53	0.19	358.64	0.353	79.656	357.35	358.69	1.34	1.67	3.74	0.22	358.91	0.312	0.333	0.265	1.00	0.22

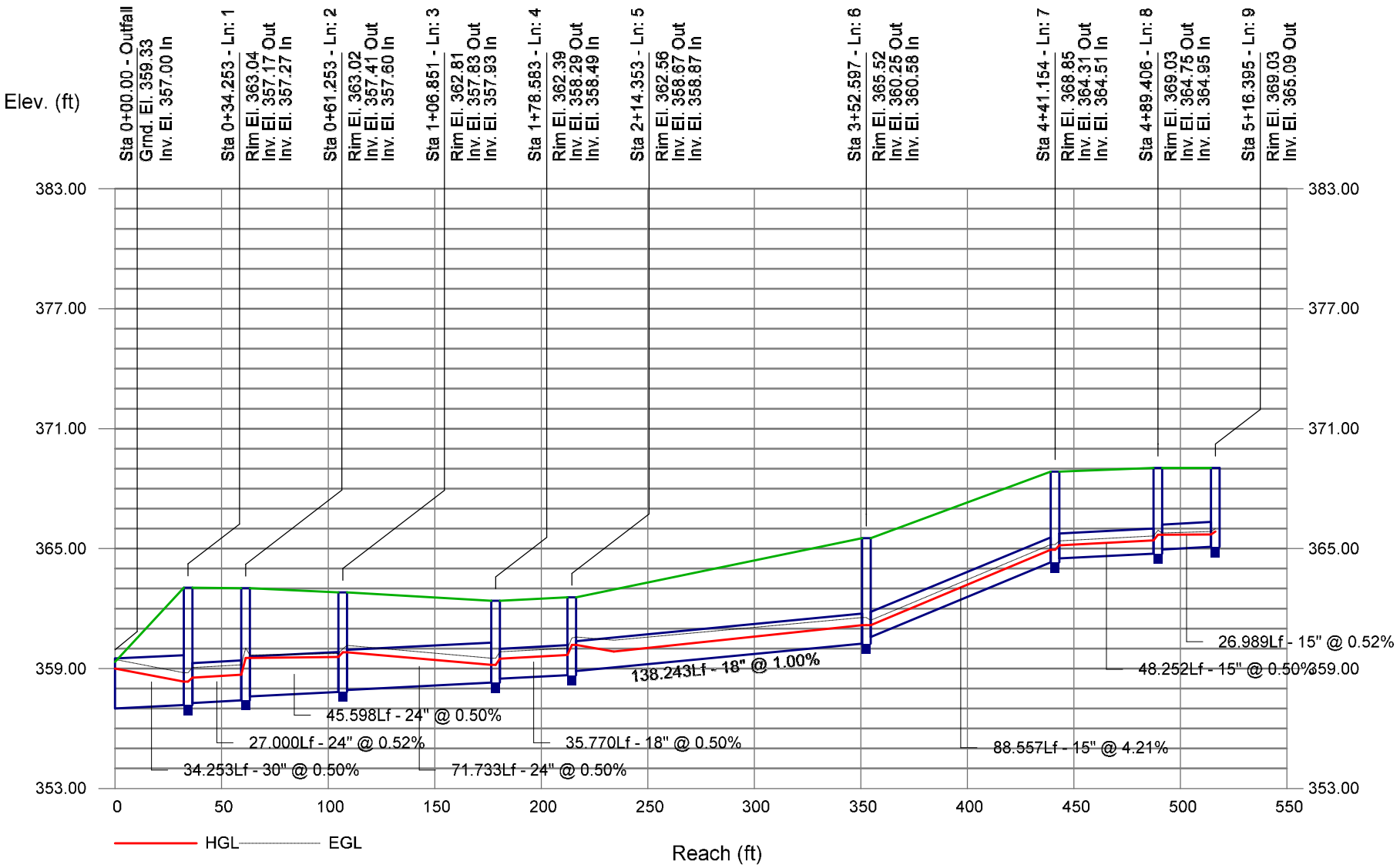
Project File: SCM#4.stm | Number of lines: 20 | Run Date: 3/28/2025

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Storm Sewer Profile

SCM #4 10-YEAR PROFILE 1-9

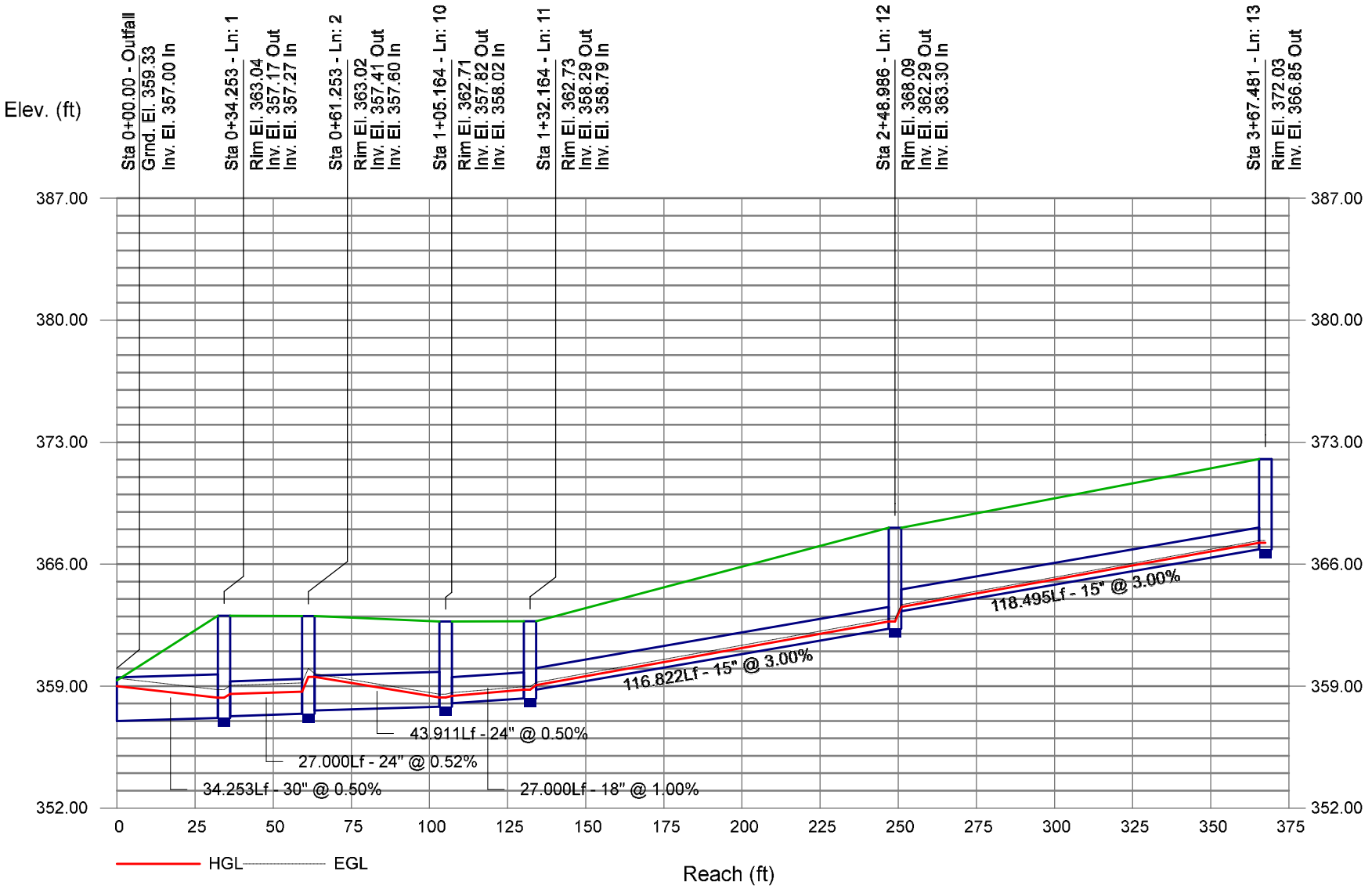
Proj. file: SCM#4.stm



Storm Sewer Profile

SCM #4 10-YEAR PROFILE 1-13

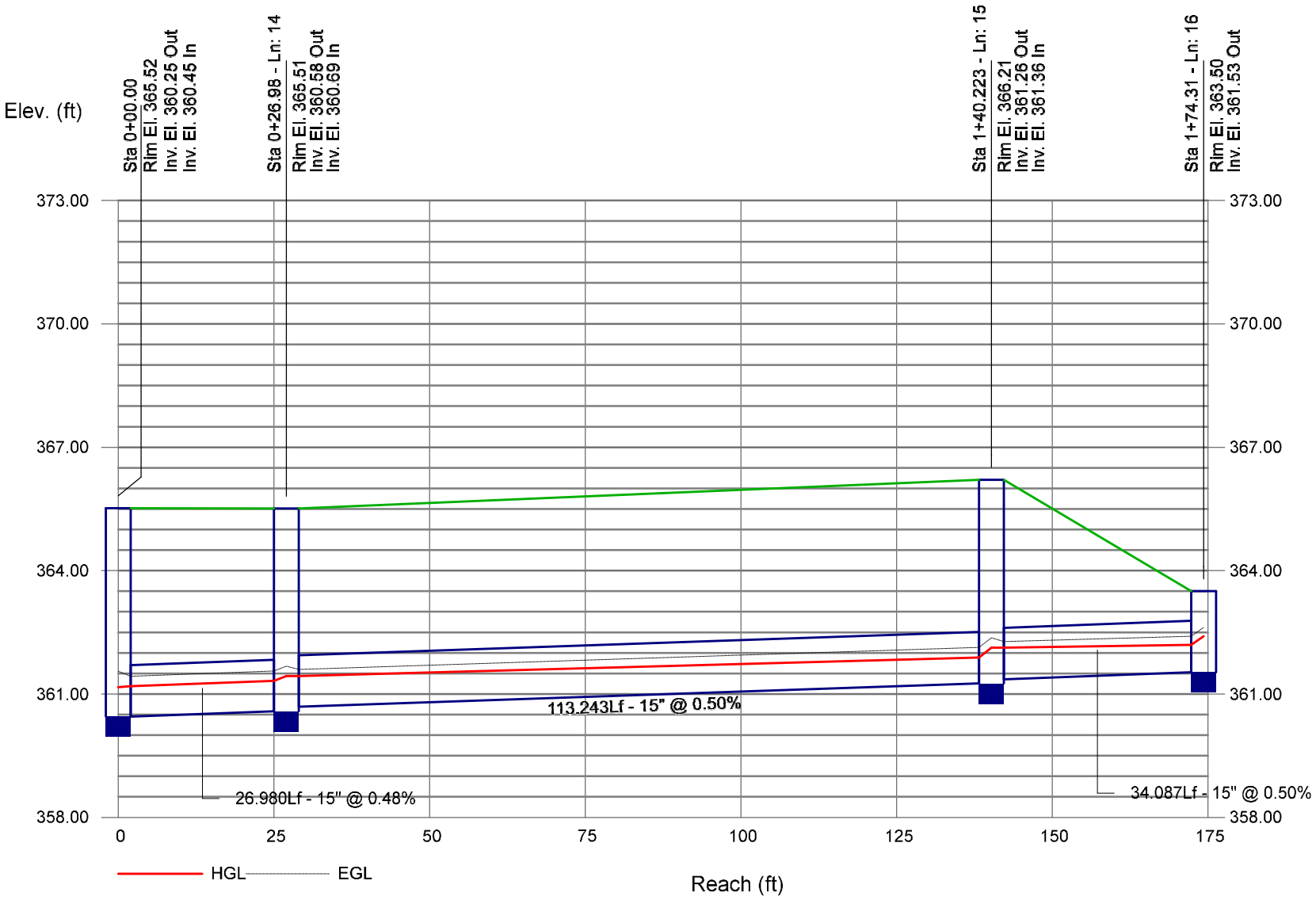
Proj. file: SCM#4.stm



Storm Sewer Profile

SCM #4 10-YEAR PROFILE 14-16

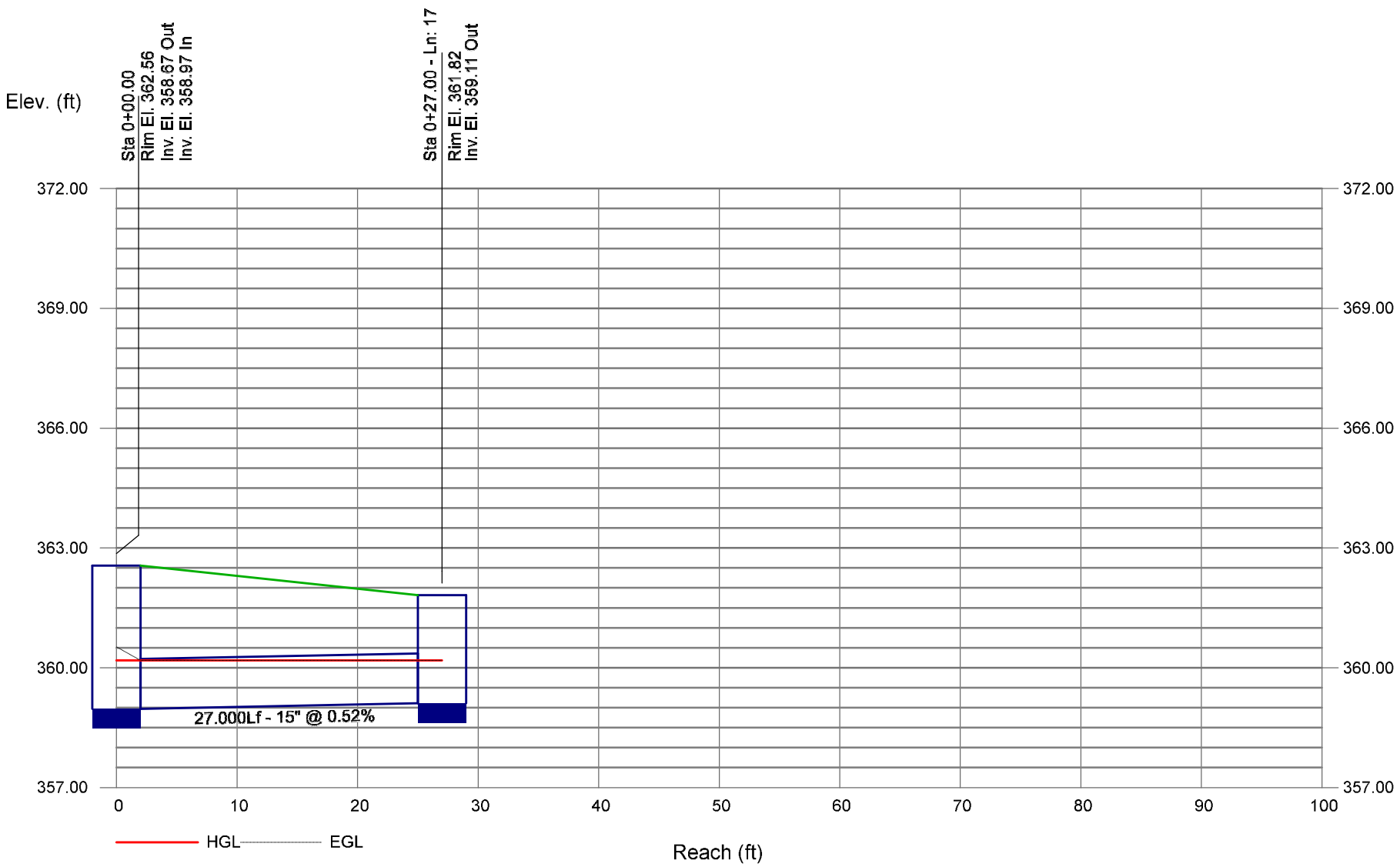
Proj. file: SCM#4.stm



Storm Sewer Profile

SCM #4 10-YEAR PROFILE 17-17

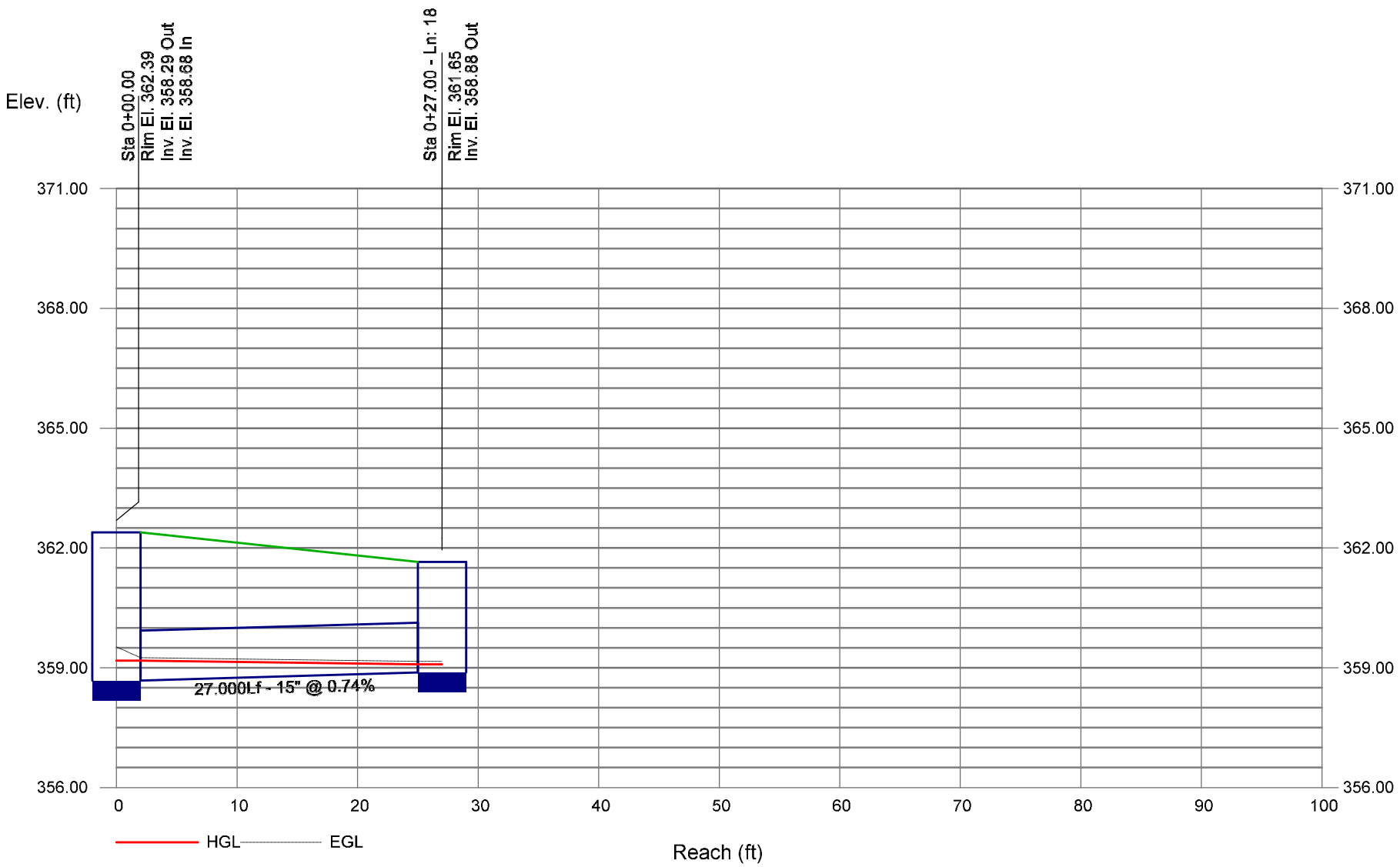
Proj. file: SCM#4.stm



Storm Sewer Profile

SCM #4 10-YEAR PROFILE 18-18

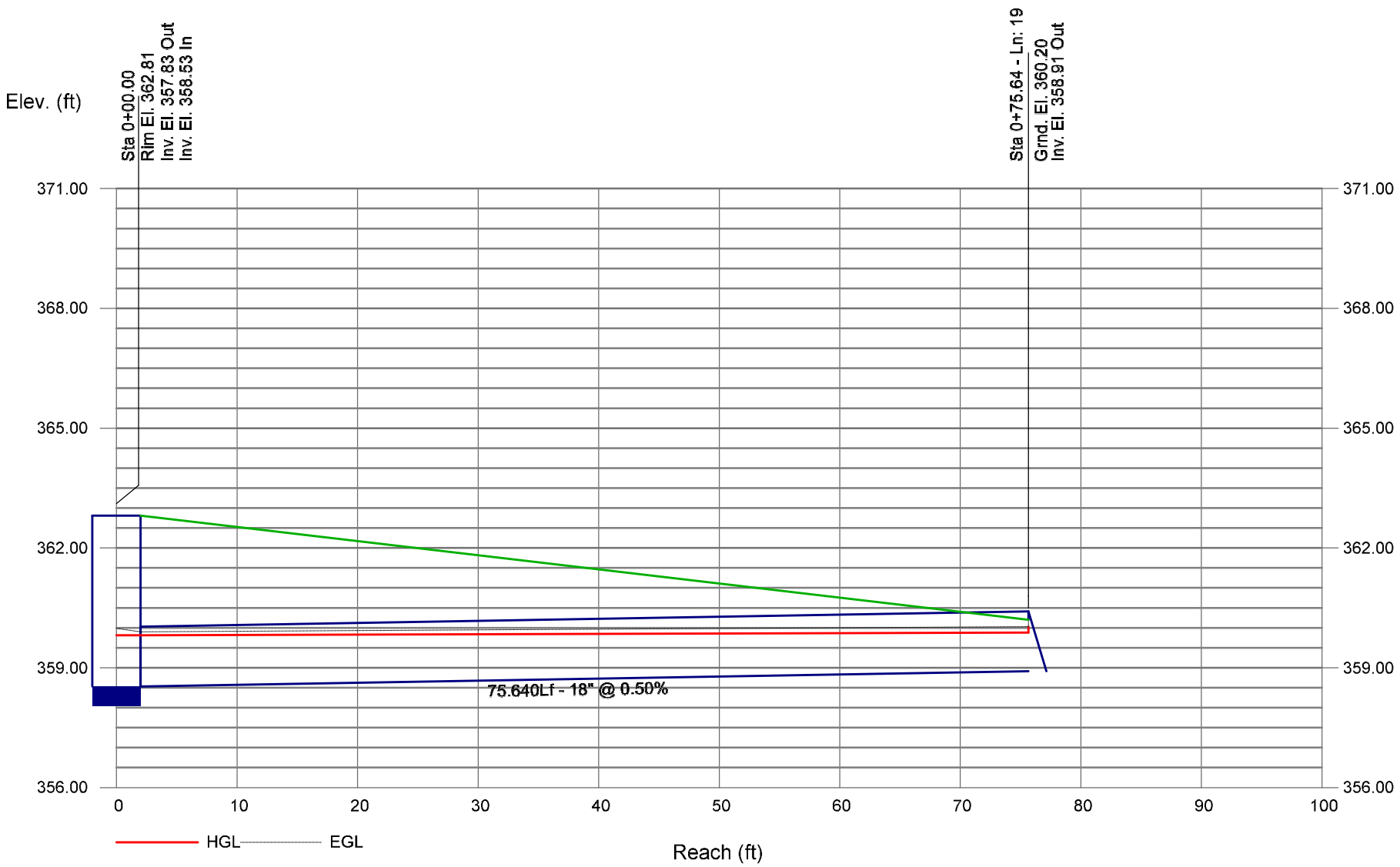
Proj. file: SCM#4.stm



Storm Sewer Profile

SCM #4 10-YEAR PROFILE 19-19

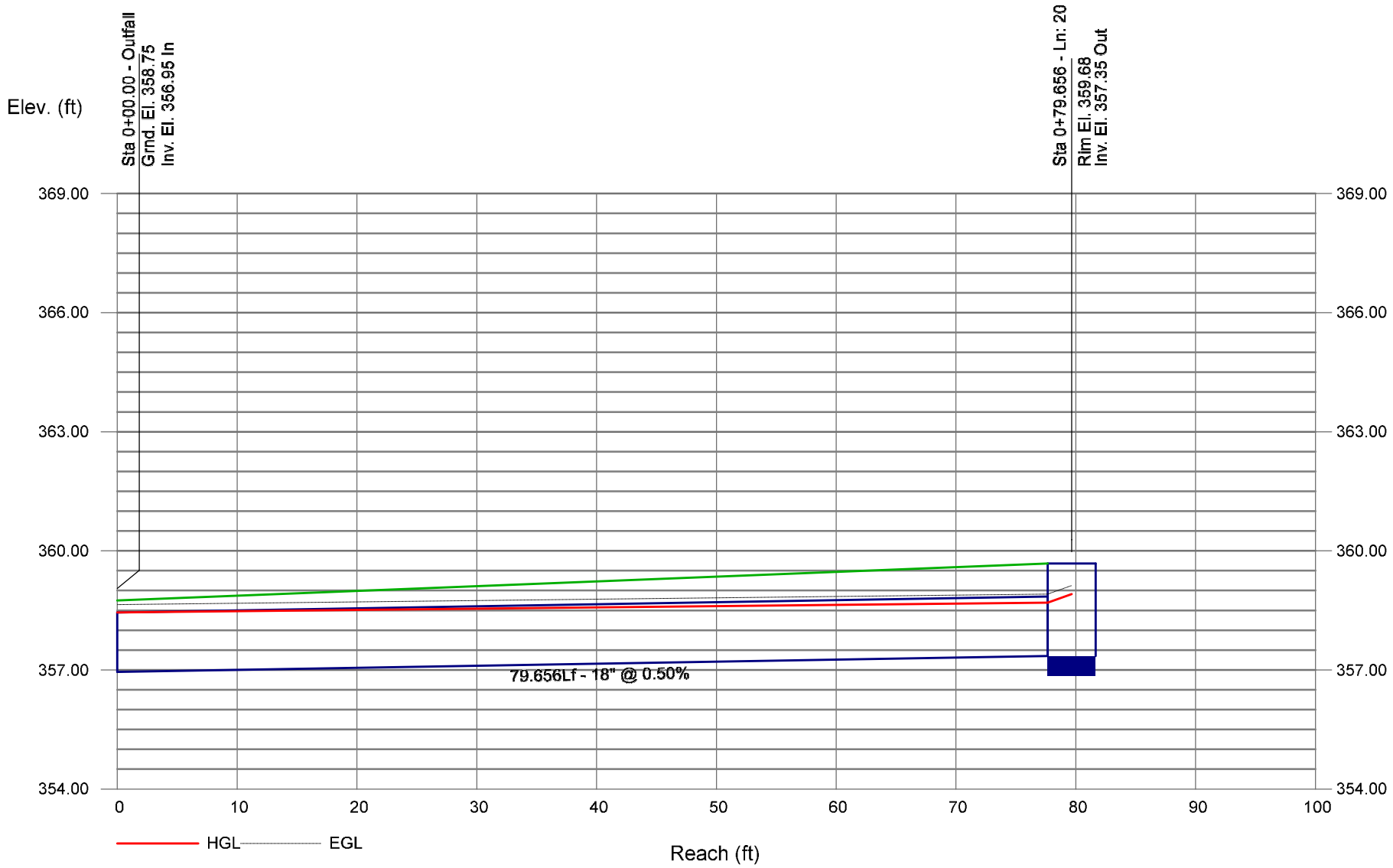
Proj. file: SCM#4.stm



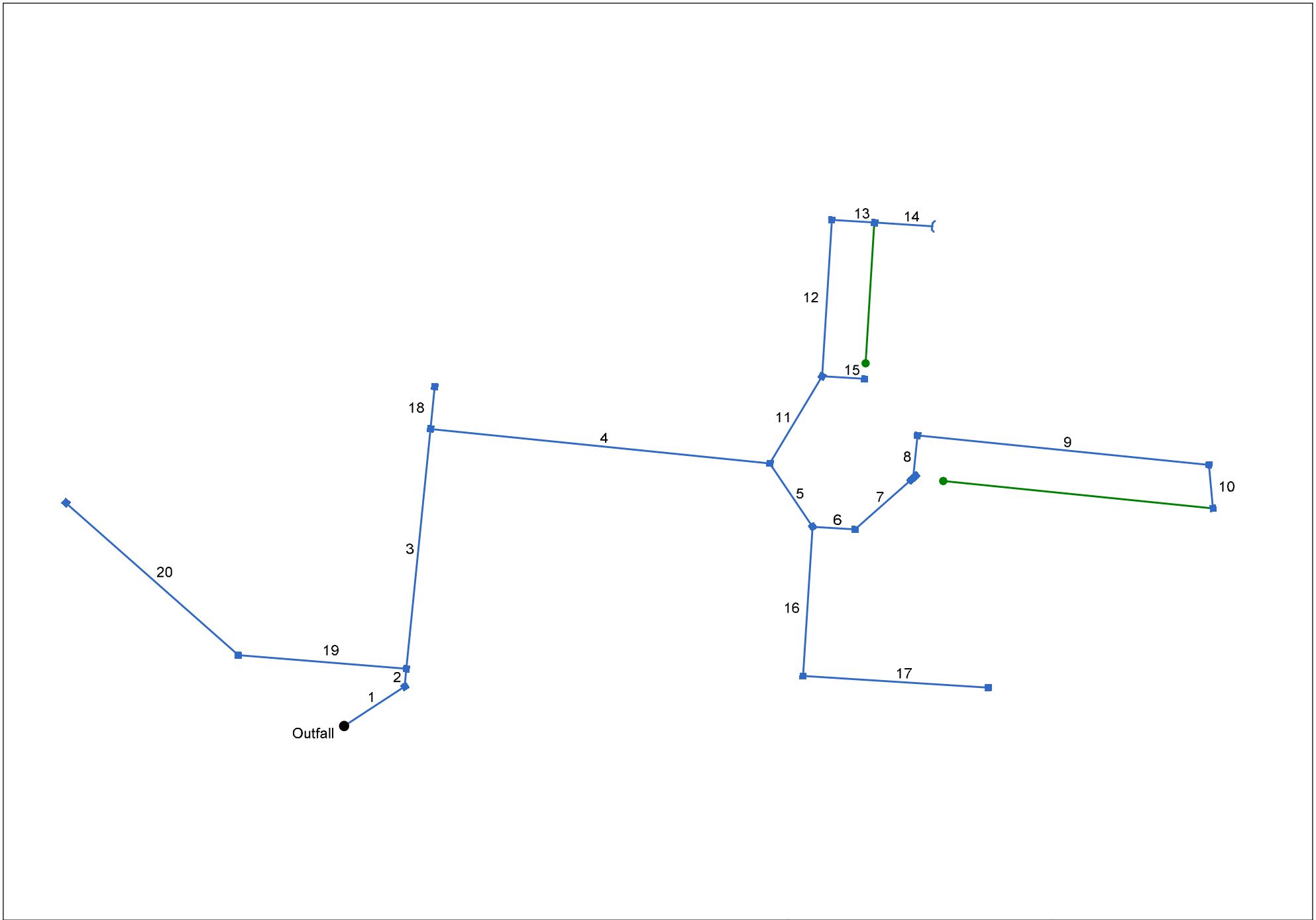
Storm Sewer Profile

SCM #4 10-YEAR PROFILE 20-20

Proj. file: SCM#4.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan SCM #5 10-YEAR REPORT



Project File: SCM#5.stm	Number of lines: 20	Date: 3/28/2025

Storm Sewer Inventory Report

SCM #5 10-YEAR 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	45.553	-33.168	DrGrt	0.00	0.74	0.60	10.0	346.92	0.50	347.15	30	Cir	0.013	1.22	350.87	Pipe - (39)
2	1	11.310	-51.139	DrGrt	0.00	0.13	0.60	10.0	347.35	0.53	347.41	30	Cir	0.013	1.50	351.17	Pipe - (38) (1)
3	2	152.248	0.000	Comb	0.00	0.38	0.60	10.0	347.61	2.00	350.66	30	Cir	0.013	1.50	357.04	Pipe - (38)
4	3	215.399	90.101	Comb	0.00	0.04	0.60	10.0	351.06	4.69	361.17	24	Cir	0.013	1.38	366.04	Pipe - (37)
5	4	48.260	50.241	Comb	0.00	0.25	0.60	10.0	361.37	0.99	361.85	18	Cir	0.013	1.49	367.77	Pipe - (36)
6	5	27.000	-52.412	Comb	0.00	0.38	0.60	10.0	362.35	0.52	362.49	18	Cir	0.013	1.13	367.48	Pipe - (35)
7	6	49.032	-45.200	Comb	0.00	0.17	0.60	10.0	362.69	0.51	362.94	15	Cir	0.013	1.08	367.00	Pipe - (34)
8	7	27.000	-42.628	Comb	0.00	0.24	0.60	10.0	363.14	0.52	363.28	15	Cir	0.013	1.50	367.00	Pipe - (33)
9	8	184.905	90.000	Comb	0.00	0.24	0.60	10.0	363.48	3.50	369.95	15	Cir	0.013	1.48	374.03	Pipe - (31)
10	9	27.526	78.789	Comb	0.00	0.11	0.60	10.0	370.15	1.02	370.43	15	Cir	0.013	1.00	374.10	Pipe - (30)
11	4	64.208	-64.883	Comb	0.00	0.06	0.60	10.0	362.27	1.32	363.12	15	Cir	0.013	1.36	368.61	Pipe - (44)
12	11	98.954	-27.289	Comb	0.00	0.12	0.60	10.0	363.62	3.00	366.59	15	Cir	0.013	1.50	371.62	Pipe - (150)
13	12	27.000	90.000	Comb	0.00	0.13	0.60	10.0	367.09	1.52	367.50	15	Cir	0.013	0.50	371.63	Pipe - (28)
14	13	36.500	0.000	Hdwl	0.00	1.42	0.60	10.0	367.70	1.62	368.29	15	Cir	0.013	1.00	369.81	Pipe - (176)
15	11	27.000	62.711	Comb	0.00	0.06	0.60	10.0	364.00	0.89	364.24	15	Cir	0.013	1.00	368.57	Pipe - (43)
16	5	94.508	37.588	Comb	0.00	0.14	0.60	10.0	362.69	0.50	363.16	15	Cir	0.013	1.50	368.66	Pipe - (42)
17	16	117.000	-90.000	DrGrt	0.00	0.75	0.60	10.0	363.36	0.50	363.95	15	Cir	0.013	1.00	367.63	Pipe - (168)
18	3	27.001	0.467	Comb	0.00	0.34	0.60	10.0	353.30	0.52	353.44	15	Cir	0.013	1.00	357.04	Pipe - (40)
19	2	106.328	-91.098	DrGrt	0.00	0.28	0.60	10.0	347.82	0.50	348.35	15	Cir	0.013	0.98	351.81	Pipe - (183)
20	19	145.494	36.855	DrGrt	0.00	0.46	0.60	10.0	348.45	0.50	349.18	15	Cir	0.013	1.00	353.72	Pipe - (182)

Project File: SCM#5.stm | Number of lines: 20 | Date: 3/28/2025