



## **FINAL DRAINAGE REPORT**

FOR

### **MAYBERRY, COLORADO SPRINGS – FILING NO. 3**

**PREPARED FOR:**

**COLORADO SPRINGS MAYBERRY, LLC  
3296 DEVINE HEIGHTS #208  
COLORADO SPRINGS, CO 80922**

**PREPARED BY:**

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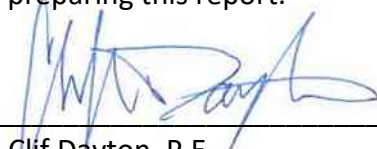
**R&R JOB #MC22110  
EPC PROJECT No. SF2219**

**ORIGINAL SUBMITTAL: MAY 2022  
2<sup>ND</sup> SUBMITTAL: SEPTEMBER 2022  
3<sup>RD</sup> SUBMITTAL: JANUARY 2023  
4<sup>TH</sup> SUBMITTAL: APRIL 2023**

**ENGINEER'S STATEMENT:**

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for liability caused by negligent acts, errors or omissions on my part in preparing this report.



SIGNATURE:   
Clif Dayton, P.E.  
Registered Professional Engineer  
State of Colorado No. 51674

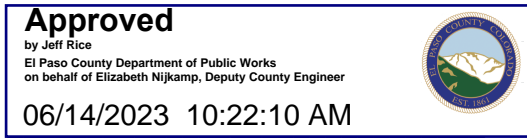
**DEVELOPER'S STATEMENT:**

I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

SIGNATURE: \_\_\_\_\_  
John Mick  
Colorado Springs Mayberry, LLC  
3296 Devine Heights #208  
Colorado Springs, CO 80922

**EL PASO COUNTY'S STATEMENT:**

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volumes 1 and 2, and Engineering Criteria Manual as amended.

SIGNATURE:   
Joshua Palmer, P.E.  
County Engineer/ECM Administrator

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## **I. GENERAL LOCATION AND DESCRIPTION**

### **A. Background**

Mayberry, Colorado Springs (formerly known as “Ellicott Town Center”) is a proposed subdivision located west of Ellicott, Colorado in El Paso County. The development is located on the south side of State Highway 94, approximately 1-1/2 miles west of Ellicott Highway, as shown in Appendix C. The approved Ellicott Town Center Sketch Plan and Overall PUD includes a total of 1,048 single-family dwelling units and 32 acres of commercial space. The Amended Mayberry, Colorado Springs Phase 1 PUD was approved by BOCC in April 2022, which maintained the originally approved 240 Phase 1 lots, but revised various street and lot configurations based on current market conditions. Filing No. 3 comprises the easterly 142 residential lots within the Amended Phase 1 PUD.

### **B. Scope**

This report has been prepared in support of the Final Plat application for Mayberry, Colorado Springs Filing No. 3. The report is intended to fulfill the El Paso County requirements for a Final Drainage Report (FDR).

The report will provide a summary of site drainage issues impacting the proposed development, including analysis of impacts from upstream drainage patterns, site-specific developed drainage patterns, and impacts on downstream facilities. This drainage report was prepared based on the guidelines and criteria presented in the El Paso County Drainage Criteria Manual, providing preliminary design of required drainage facilities for this phase of the project.

### **C. Site Location and Description**

The Mayberry, Colorado Springs (Ellicott Town Center) parcel comprises the west half of Section 14 along with the contiguous east quarter of Section 15, as well the west half of the northeast quarter of Section 14, Township 14 South, Range 63 West of the 6th Principal Meridian. The site is located at an elevation of approximately 6,060 feet above mean sea level. Filing No. 3 comprises 105.8-acres in the northeast area of the Mayberry development.

State Highway 94 borders Filing 3 to the north along with Filing 2, and unplatted agricultural properties (zoned A35) border Filing 3 on the east and south sides. Unplatted property zoned PUD and Filing 1 border Filing 3 to the west.

The primary access to Filing 3 will be provided by construction of Springs Road, which will run through the site from north to south as a minor collector roadway (65’ right-

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of-way). Additionally, Filing 3 will be accessed by New Log Road via Village Main Street (60' right-of-way). Both roads intersect SH94 to the north.

The intermittent streams throughout this area drain into the Black Squirrel Creek Basin which ultimately outfalls into the Arkansas River. Filing 3 is located within the Ellicott Consolidated Drainage Basin (CHBS1200). This basin conveys surface drainage to the West Fork of Black Squirrel Creek, which is located east of this parcel between the site and Ellicott Highway.

The terrain is generally flat with gentle northwest to southeast slopes ranging from one to two percent. Historic drainage patterns from the site are conveyed overland to the south and east boundaries of the site. The entire site is covered with native grasses.

**D. General Soil Conditions**

According to the Soil Survey of El Paso County prepared by the Soil Conservation Service, on-site soils are comprised primarily of “Blakeland series (type 8)” soils (see Appendix C). The Blakeland soils are characterized as well-drained loamy sand with rapid permeability, slow surface runoff rates, and moderate hazard of erosion. These soils are classified as hydrologic soils group “A” for drainage analysis purposes.

**E. References**

City of Colorado Springs “Drainage Criteria Manual, Vol 1 & 2”, May 2014.

CDOT, “CDOT Drainage Design Manual,” 2004.

David R. Sellon & Associates Inc., “Antelope Park Ranchettes Interior Drainage Plan,” March, 1972.

El Paso County “Drainage Criteria Manual County of El Paso, Colorado – Volumes 1 and 2” dated October 31, 2018. (Referred to throughout as EPC DCM)

El Paso County Planning Department, “Ellicott Valley Comprehensive Plan,” March, 1989.

El Paso County “Engineering Criteria Manual,” January 9, 2006.

El Paso County Resolution No. 15-042 (El Paso County adoption of “Chapter 6: Hydrology” and “Chapter 13, Section 3.2.1: Full Spectrum Detention” of the City of Colorado Springs Drainage Criteria Manual dated May 2014).

JPS Engineering, “Master Development Drainage Plan for Ellicott Town Center,”

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November 22, 2005 (approved by El Paso County 12/02/05).

JPS Engineering, “Master Development Drainage Plan and Preliminary Drainage Report for Springs East Village,” March 21, 2002 (approved by El Paso County 10/23/02).

JPS Engineering, “Master Development Drainage Plan and Preliminary Drainage Report for Viewpoint Village,” January 28, 2002 (approved by El Paso County 9/11/02).

JPS Engineering, “Preliminary Drainage Report for Ellicott Town Center - Phase 1,” January 15, 2007.

JPS Engineering, “Preliminary & Final Drainage Report for Mayberry, Colorado Springs - Filing No. 1,” revised October 27, 2020 (approved by El Paso County November 5, 2020).

JPS Engineering, “Preliminary Drainage Report Amendment for Mayberry, Colorado Springs – Phase 1 PUD,” revised February 2022

Leigh Whitehead & Associates, Inc., “Master Development Drainage Plan for Sunset Village,” May, 2000 (approved by El Paso County 8/31/00).

Pacific Summits Engineering, “Final Drainage Report for Viewpoint Estates,” January 6, 1998 (approved by El Paso County 10/6/99).

United Planning and Engineering, “Preliminary Drainage Plan & Report for Springs East,” November 19, 1999.

United Planning and Engineering, “Drainage Plan & Report for Viewpoint Subdivision,” May, 2000.

USDA/NRCS, “Soil Survey of El Paso County Area, Colorado,” June, 1981.

## **II. DRAINAGE BASINS AND SUB-BASINS**

### **A. Major Drainage Basins**

The proposed development lies primarily within the Ellicott Consolidated Drainage Basin (CHBS1200) as classified by El Paso County. This basin is comprised of the area tributary to the West Fork of Black Squirrel Creek, with the majority of the basin bounded by SH94 to the north and Ellicott Highway to the east. No drainage planning study has been completed for the Ellicott Consolidated Drainage Basin or any adjacent drainage basins.

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The major drainage basins lying in and around the proposed development are depicted in Figure EX1 and is sourced from the Phase 1 PUD Amended Drainage Report. Mayberry, Colorado Springs is located primarily within the Ellicott Consolidated Drainage Basin, which comprises a tributary area of about 13 square miles, or 8,320 acres. The proposed subdivision represents a total of 551 acres of development, or 7 percent of the total basin area. An “on-site” drainage planning approach has been proposed based on the relatively small developed area in comparison to the remaining undeveloped basin area, which is primarily agricultural land.

The existing site topography has one off-site drainage basin (EC-10) that enters the northeast corner of Filing 3. Triple 30-inch CMP culverts cross SH94 at this location combining with on-site flows, following existing grass-lined swales southeasterly through the site. Filing 3 historically consists of one major basin conveying flows towards the south and eastern boundaries of the site, as shown in Figure EX2. Flows from Filing 3 combine with the tributary areas from Filing 1 and surrounding offsite areas downstream of the site, flowing southeasterly to an existing natural channel towards Black Squirrel Creek.

**B. Floodplain Impacts**

Mayberry – Filing 3, Colorado Springs is located approximately one mile southwest of the 100-year floodplain limits for the West Fork of Black Squirrel Creek, as delineated by the Federal Emergency Management Agency (FEMA). The floodplain limits in the vicinity of the site are shown in Flood Insurance Rate Map (FIRM) Number 08041C0810G, dated December 7, 2018 (see Appendix C).

**C. Sub-Basin Description**

The developed drainage basins lying within Filing 3 are depicted in Figure D1. The interior site layout has been delineated into several major drainage basins (C-E) based on the proposed interior road layout and grading scheme. The natural drainage patterns will be impacted through development by site grading and concentration of runoff in subdivision street gutters, storm drains, and channels. Most sub-basins drain to the southeast, collecting in the interior roads and drainage channels. On-site flows will be diverted to a proposed extended detention basin (EDB) located at the southeast boundary of the site, and detained flows will discharge to the east, following historic drainage paths.



### III. DRAINAGE DESIGN CRITERIA

#### A. Development Criteria Reference

The Ellicott Consolidated Drainage Basin has not had a Drainage Basin Planning Study performed for the basin. Most areas within the basin are comprised of agricultural lands and rural residential uses.

A “Master Development Drainage Plan (MDDP) for Ellicott Town Center” was approved concurrent with the original Overall PUD, and a Preliminary Drainage Report for Ellicott Town Center Phase One was approved with the original Phase One PUD and Preliminary Plan.

JPS Engineering prepared the “Preliminary & Final Drainage Report for Mayberry, Colorado Springs - Filing No. 1,” revised October 27, 2020 (approved by El Paso County November 5, 2020) in support of the final approval and recording of Filing No. 1.

This “Final Drainage Report for Mayberry, Colorado Springs – Filing No. 3” fully conforms to the previously approved MDDP and Preliminary/Final Drainage Reports, along with the “Preliminary Drainage Report Amendment for Mayberry, Colorado Springs Phase 1 PUD” dated February, 2022 prepared in support of the Phase 1 PUD Amendment.

#### B. Hydrologic Criteria

SCS procedures were utilized for analysis of major basin flows impacting the site. In accordance with El Paso County drainage criteria, SCS hydrologic calculations were based on the following assumptions:

- Design storm (minor) 5-year
- Design storm (major) 100-year
- Storm distribution SCS Type IIA (eastern Colorado)
- 100-year, 24-hour rainfall 4.4 inches per hour (NOAA isopluvial map)
- 5-year, 24-hour rainfall 2.6 inches per hour (NOAA isopluvial map)
- Hydrologic soil type A

- SCS curve number - undeveloped conditions 61 (pasture / range)
- SCS curve number - developed conditions 80 (1/8-1/4 acre lots)
- SCS curve number - developed conditions 92 (commercial areas)

Hydraflow Hydrographs was utilized for the modeling of these storms.

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Rational method procedures were utilized for calculation of peak flows within the on-site drainage basins. Rational method hydrologic calculations were based on the following assumptions:

- Design storm (minor) 5-year
- Design storm (major) 100-year
- Rainfall Intensities El Paso County I-D-F Curve
- Hydrologic soil type A
- C5 C100
- Runoff Coefficients - undeveloped:
  - Existing pasture/range areas 0.25 0.35
- Runoff Coefficients - developed:
  - Proposed Residential (1/8-1/4 acre lots) 0.375 0.545
  - Proposed Neighborhood Commercial 0.49 0.62

Composite runoff coefficients for the developed residential areas have been calculated based on average lot sizes between 1/8-acre and 1/4-acre. A rational method spreadsheet was utilized for modeling these flows.

**C. Hydraulic Criteria**

Streets and Inlets

Street and inlet capacities were calculated using the UD\_Inlet utilizing the street geometries at each inlet. The criteria used for design was that of Local/Residential/Collector roads from Table 6-1 of the EPC DCM. The criteria states that for the 5 year storm, flow depths would not exceed 6 inches or overtop the street crown while for the 100 year storm, the depth of water at the flow line would not exceed 12 inches.

Underground Storm Sewer Pipe Systems

Three pipe systems are proposed as part of the Filing 3 development. Pipes are sized so that the 100 year HGLs are a minimum of 1 foot below finished grades. HGLs are derived using Bentley StormCAD software. Velocities in pipes do not exceed 18 fps as stated in the EPC DCM. All peak flows for pipes were derived via the Rational Method.

Channels

Four grass lined channels are proposed as part of the Filing 3 development: C2, D, E, and F. Channels are sized so that there is a minimum of 1 foot of freeboard between the 100 year water surface elevation and the top of channels. Where channels make defined bends, additional freeboard is provided per Equation 10-4 of the EPC DCM. Channels are designed to not exceed velocities of 5 fps and will be lined with native grasses.

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Because the EPC DCM does not give specific guidance on the use of native grasses for channel lining, Table 12-6 of the Colorado Springs DCM Vol. 1 was utilized to establish maximum velocities and roughness coefficients. Peak flows for Channels C2 and D were derived via the Rational Method while peak flows for Channels E and F were obtained using the SCS method due to the size of the offsite basins being routed through these channels.

Additional criteria has been referenced for the analysis of an existing roadside ditch along Log Road. Table 6-1 of the EPC DCM states that during the 100 Year storm, the flow shall not exceed 6 inches at the shoulder.

Rip-Rap and Plunge Pools

Rip-Rap and plunge pools were sized for the 100 year storm per UDFCD Chapter 9 Section 3.2.1 and 3.2.2. Rip-rap is placed where all pipes discharge into channels across the site and is sized to reduce velocities to 5 fps. A plunge pool is proposed where flows from the site enter the Log Road ROW. The plunge pool is sized to reduce velocities to 1.3 fps to ensure flows entering the ROW are as non erosive as possible.

Culverts

Two temporary culverts are proposed beneath temporary cul-de-sacs east of the proposed development. The culverts are designed so that during the 100 year storm event, water levels do not exceed 12 inches above finished grade when overtopping the roadway above per Table 6-4 of EPC DCM.

**D. Detention and Water Quality Criteria**

Detention volumes and required release rates will be calculated using the UD\_Detention Spreadsheet from UDFCD. An extended detention basin will be utilized to provide water quality and detention for Filing 3. The facility is designed to pass and release the water quality captured volume (WQCV), excess urban runoff volume (EURV), and 100 year storm to meet all local and state regulations by means of a multi-stage outlet structure.

The WQCV will be routed through an orifice plate installed within the outlet structure and sized to have a 40 hour draw down time. The orifice plate will also drain 97% the EURV within 72 hours. Finally, a restrictor plate and weir combination will pass the 100 year flow at 90% of the pre-developed rate.

Per El Paso County Engineering Criteria Manual Section 1.7.1.C.1, up to one acre of development may be exempt from stormwater treatment. Due to the requirement that temporary cul-de-sacs be provided for fire department access to Union Pacific and El Reno Way, these developed areas are unable to drain to the proposed detention pond. These areas will drain to Channel E and flow offsite undetained.

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These cul-de-sac areas total to 0.3 acres, so well below the 1 acre requirement.

#### **IV. DRAINAGE PLANNING FOUR STEP PROCESS**

El Paso County Drainage Criteria require drainage planning to include a Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls.

As stated in DCM Volume 2, the Four Step Process is applicable to all new and re-development projects with construction activities that disturb 1 acre or greater or that disturb less than 1 acre but are part of a larger common plan of development. The Four Step Process has been implemented as follows in the planning of this project:

##### Step 1: Employ Runoff Reduction Practices

- **Minimize Impacts:** The approved Planned Unit Development includes significant open space, play areas, and parks, resulting in a moderate level of impervious site development.
- **Minimize Directly Connected Impervious Areas (MDCIA):** The proposed development will include landscaped areas adjoining the proposed building and parking lots, providing for impervious areas to drain across pervious areas where feasible.
- **Grass Swales:** The proposed drainage plan incorporates grass-lined swales in selected locations to encourage stormwater infiltration while providing positive drainage through the site.

##### Step 2: Stabilize Drainageways

- Proper erosion control measures will be implemented along the grass-lined drainage channels to provide stabilized drainageways within the site.

##### Step 3: Provide Water Quality Capture Volume (WQCV)

- **EDB:** The developed areas of the site will drain through proposed Full-Spectrum Extended Detention Basins (EDB) southeast of the developed areas. Site drainage will be routed through the extended detention basins, which will capture and slowly release the WQCV over an extended release period.
- Stormwater detention and WQCV for Filing as well as future Filings 2 and 4 will be provided by EDB-D.

##### Step 4: Consider Need for Industrial and Commercial BMPs

- No industrial or commercial land uses are proposed as part of the Filing No. 3 residential development.

## **V. GENERAL DRAINAGE RECOMMENDATIONS**

The developed drainage plan for the site is to provide and maintain positive drainage away from structures and conform to the established drainage patterns for the overall site. Positive drainage shall be established and maintained away from all structures within the site in conformance with applicable building codes and geotechnical engineering recommendations.

Site grading and drainage improvements performed as a part of subdivision infrastructure development includes overlot grading and subdivision drainage improvements depicted on the subdivision construction drawings. Individual lot grading is the sole responsibility of the individual builders and property owners. Final grading of each home site should establish proper protective slopes and positive drainage in accordance with HUD guidelines and building codes. In general, main floor elevations for each home should be established approximately 2 feet above the top of curb of the adjoining street.

In general, we recommend a minimum of 6 inches clearance from the top of concrete foundation walls to adjacent finished site grades. Positive drainage slopes should be maintained away from all structures, with a minimum recommended slope of 5 percent for the first 10 feet away from buildings in landscaped areas, a minimum recommended slope of 2 percent for the first 10 feet away from buildings in paved areas, and a minimum slope of 1 percent for paved areas beyond buildings.

## **VI. DRAINAGE FACILITY DESIGN**

### **A. General Concept**

Consistent with generally accepted practices in eastern El Paso County, the general concept for management of stormwater from development of Mayberry – Filing 3 will be to construct an extended detention basin along the southeast boundary of the site to mitigate the impacts of developed runoff flows from the site.

Development of the Mayberry – Filing 3 project will require site grading and paving, resulting in additional impervious areas across the site. The general drainage pattern will consist of grading away from home sites to drainage swales and gutters along the internal roads within the subdivision, conveying runoff flows through the site. The Amended PUD includes 4-foot minimum side-lot drainage easements, and the proposed easements are adequate for the required side-lot drainage swales to accommodate proper grading of the individual home sites.

Runoff from the site will flow by street gutters to curb inlets at low points and road intersections, thence by storm drains and drainage channels to the proposed detention ponds. The storm inlets and storm sewer system within the development

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will be designed as the “minor” drainage system, sized for 5-year developed peak flows. The internal road system, drainage channels, and detention pond will be designed as the “major” drainage system, sized for 100-year peak flows. Street flows within subdivision streets will be maintained below allowable levels in accordance with El Paso County drainage criteria.

Due to an offsite basin north of SH94 flowing onto the subject property, the site has been designed to convey this flow through the site via a series of temporary swales and culverts. The offsite flow will be routed around the proposed development and will combine with the pond discharge via a swale that conveys flow east of the site.

## **B. Specific Details**

### **Existing Basins**

Historic drainage conditions for Filing 3 are depicted in Figure EX2. The site has been divided into two major basins (EX-D1 and EX-D2). The undeveloped site currently has no drainage facilities within the area. The existing off-site drainage basins north of Filing 3 generally combine with on-site basins as shown on Sheet EX2, flowing southeasterly through the site within existing grass-lined drainage swales and channels.

Basin EX-D2 flows offsite to the south towards Design Point 4-A while Basin EX-D1 flows southeasterly towards Design Point EX-5. Off-site flows from Basin EC10 north of this property cross State Highway 94 in a triple 30-inch CMP culvert crossing near the northeast corner of this site. Additionally, basin OS-1 which consists of water from the CDOT ROW flows south onto the site. Flows from EX-D1 combined with offsite flows from Basin EC10 and OS-1 at Design Point EX-5 with 5 year and 100 year peak flows of 23.7 and 183.9 cfs respectively.

From here flows are stopped by an existing berm along the southern property line and are forced eastward, combining with offsite basins EX-E and LOG. Basin EX-E is east of the subject property and generally flows southeast towards Log Road. Basin LOG consists of the Lot Road ROW. Flows from design point EX-5 combine with basins EX-E and LOG at design point EX-6 with 5 year and 100 year peak flows of 30.5 cfs and 231.4 cfs respectively.

An existing roadside swale along Log Road conveys flows to the south and combines with an offsite Basin EX-Z at design point EX-7 with 5 year and 100 year peak flows of 36.9 cfs and 285.4 cfs respectively.

From here flows turn east and follow the southerly ditch of Handle Road to its confluence with the main channel of the Middle Fork of Black Squirrel Creek.

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An analysis of the major downstream drainage patterns comparing the historic and developed flows in more detail is discussed later in this report.

**Developed Drainage Basins**

The developed drainage basins and projected flows are shown in Sheets D1.1-D1.5. The developed Filing 3 site has been divided into three major basins (C2, D and E) and one major design point (EX-5), as shown on the enclosed Drainage Plans. Hydrologic flow schematics and calculations are enclosed in Appendix B.

Major Basin C2 (Sub-basins C2.1-C2.4, C3.0) will be routed to the extended detention basin via Channel C2 where it will combine with major basin D (Sub-basins D1.1-D1.11, C2.0-D2.1). Channels C2 and D are also sized to convey future flows from the area south of Filing 3 which is currently undeveloped. Offsite basin EC-10 will combine with onsite major Basin E (Sub-basin E1) revised develop at Channel E. Basin EC-10 will be routed around Filing 3 and will combine with Pond D's discharge downstream of the pond at Channel F.

All onsite basin peak flows were derived via the Rational Method while the offsite basins EC-10 and OS-1 were analyzed by the SCS Method due to the tributary area. Detailed breakdowns of each sub-basin are listed below:

**Sub-basin C2.1** is a 0.77 acre onsite area that is collected by a curb inlet. This basin consists of single family lots and a portion of Solaire Loop. Runoff from this basin drains to the street curb and gutter and enters the public storm sewer system. The 5 year and 100 year developed peak flows are 1.1 and 2.7 cfs respectively

**Sub-basin C2.2** is a 0.33 acre onsite area that is collected by a curb inlet. This basin consists of single family lots and a portion of Solaire Loop. Runoff from this basin drains to the street curb and gutter and enters the public storm sewer system. The 5 year and 100 year developed peak flows are 0.6 and 1.4 cfs respectively

**Sub-basin C2.3** is a 1.81 acre onsite area that is collected by a curb inlet in Mayberry Drive. This basin consists of single family lots and a portion of Mayberry Drive. Runoff from this basin is routed via curb/gutter, enters a Type R curb inlet, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 2.1 and 5.2 cfs respectively.

**Sub-basin C2.4** is a 1.16 acre onsite area that will not be fully developed until future phases. In the future the basin will be collected by a curb inlet on the south side of Mayberry Drive. This basin consists of south section of the Mayberry Drive ROW. Runoff from this basin will be routed via curb/gutter, enter a Type R curb inlet, and will be discharged into the piped storm sewer system. A stub will be installed during Filing 3 and the future Type R inlet will discharge to the main storm sewer system via this stub. The 5 year and 100 year developed peak flows are 4.1 and 7.8 cfs

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respectively.

**Sub-basin C2.5** is a 9.61 acre onsite area that is collected by a curb inlet in Mayberry Drive. This basin consists of single family lots and a portion of Solaire Loop, Galveston Terrace, Cattlemen Run, Achison Way, and Village Main Street. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 14.2 and 34.6 cfs respectively.

**Sub-basin C3.0\*** is a 35.40 acre basin south of the Filing 3 development. The basin was analyzed for future development and assumed to comprise both single family lots and park area. During the interim condition the basin will be undeveloped with part of the basin bypassing Pond D following existing drainage patterns. Once fully developed, the entire basin will ultimately drain to Pond D via future storm sewer improvements. The 5 year and 100 year developed peak flows are 22 and 72.7 cfs respectively.

**\*C3.0** was also analyzed using an interim condition that represents the runoff patterns prior to development. Under this condition the basin would flow southeast and southwest into Channel C2, ultimately discharging into Pond D. The 5 year and 100 year undeveloped peak flows are 7.4 and 54.4 cfs respectively.

**Sub-basin D1.1** is a 1.73 acre basin comprising commercial lots of Filing 2. The basin was analyzed for future development of Filing 2. The developed basin will drain via a swale along the southern Filing 2 boundary and enter the Springs Road storm system via a flared end section. The 5 year and 100 year developed peak flows are 6.7 and 12.2 cfs respectively.

**Sub-basin D1.2** is a 2.56 acre basin comprising single family lots and portions of Solaire Loop and Besseyi Way. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet on the south side of Besseyi Way, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 3.4 and 8.3 cfs respectively.

**Sub-basin D1.3** is a 2.02 acre basin comprising single family lots and portions of Union Pacific Way and El Reno Way. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet on the north side of El Reno Way, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 3.1 and 7.5 cfs respectively.

**Sub-basin D1.4** is a 3.75 acre basin comprising single family lots and portions of Besseyi Way, Union Pacific Way, Springs Road and El Reno Way. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet on the south side of El Reno Way, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 5.4 and 12.7 cfs respectively.



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**Sub-basin D1.5\*** is a 9.88 acre basin comprising the future Filing 4 area and is assumed to be Commercial/Industrial in nature. Developed runoff from this basin will be routed via curb/gutter and crosspans and enter inlets within the future development. The inlets will be piped to the proposed piping to the south of the basin that will be stubbed as part of Filing 3. The 5 year and 100 year developed peak flows are 31.6 and 57.6 cfs respectively.

**\*D1.5** was also analyzed using an interim condition that represents the runoff patterns prior to development. Under this condition the basin would flow east into Channel E, combining with offsite basins EC-10 and OS-1 along with onsite basin E1. The flows would ultimately be routed to the Log Road ROW. The basin was analyzed using the SCS method due to the combining with the large offsite basins. The 5 year and 100 year undeveloped peak flows are 1.4 and 12.2 cfs respectively.

**Sub-basin D1.6** is a 1.96 acre basin comprising single family lots and portions of Union Pacific Way. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet on the north side of Union Pacific Way, and is discharged into the piped storm sewer system to the east. The 5 year and 100 year developed peak flows are 2.6 and 6.3 cfs respectively.

**Sub-basin D1.7** is a 1.56 acre basin comprising single family lots and portions of Union Pacific Way. Runoff from this basin is routed via curb/gutter, enters a Type R curb inlet on the south side of Union Pacific Way, and is discharged into the piped storm sewer system to the east. The 5 year and 100 year developed peak flows are 2.1 and 5.0 cfs respectively.

**Sub-basin D1.8** is a 1.27 acre basin comprising single family lots and portions of El Reno Way. Runoff from this basin is routed via curb/gutter, enters a Type R curb inlet on the north side of El Reno Way, and is discharged into the piped storm sewer system to the east. The 5 year and 100 year developed peak flows are 1.8 and 4.3 cfs respectively.

**Sub-basin D1.9** is a 0.54 acre basin comprising single family lots and portions of El Reno Way. Runoff from this basin is routed via curb/gutter, enters a Type R curb inlet on the south side of El Reno Way, and is discharged into the piped storm sewer system to the east. The 5 year and 100 year developed peak flows are 0.9 and 2.1 cfs respectively.

**Sub-basin D1.10** is a 2.13 acre onsite area that will not be fully developed until future phases. In the future the basin will be collected by a curb inlet on the north side of Mayberry Drive. This basin consists of the north section of the Mayberry Drive ROW. Runoff from this basin will be routed via curb/gutter, enter a Type R curb inlet, and will be discharged into the piped storm sewer system. A stub will be installed during

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Filing 3 and the future Type R inlet will discharge to the main storm sewer system via this stub. The 5 year and 100 year developed peak flows are 3.3 and 8.0 cfs respectively.

**Sub-basin D1.11** is a 1.23 acre onsite area that will not be fully developed until future phases. In the future the basin will be collected by a curb inlet on the south side of Mayberry Drive. This basin consists of the south section of the Mayberry Drive ROW. Runoff from this basin will be routed via curb/gutter, enter a Type R curb inlet, and will be discharged into the piped storm sewer system. A stub will be installed during Filing 3 and the future Type R inlet will discharge to the main storm sewer system via this stub. The 5 year and 100 year developed peak flows are 4 and 7.7 cfs respectively.

**Sub-basin D1.12** is a 3.42 acre basin comprising single family lots and portions of Cattlemen Run, Solaire Loop, and Besseyi Way. The basin drains via curb and gutter to a Type R inlet on the north side of Besseyi Way. The 5 year and 100 year developed peak flows are 3.8 and 9.3 cfs respectively.

**Sub-basin D1.13** is a 3.07 acre basin comprising commercial lots of Filing 2. The basin was analyzed for future development of Filing 2. The developed basin will drain into a future road's curb and gutter system and enter the Springs Road storm system via a Type R inlet within Springs Road. The 5 year and 100 year developed peak flows are 10.9 and 19.9 cfs respectively.

**Sub-basin D1.14** is a 0.91 acre basin comprising both single family lots and the southeast commercial lots of Filing 2. The basin was analyzed for future development of Filing 2. The basin drains via curb and gutter to a Type R inlet on the north side of Besseyi Way. The 5 year and 100 year developed peak flows are 1.8 and 3.9 cfs respectively.

**Sub-basin D2.0\*** is a 11.90 acre basin south of the Filing 3 development. The basin was analyzed for future development and assumed to comprise both single family lots and park area. The basin will ultimately drain to Pond D via future storm sewer improvements. The 5 year and 100 year developed peak flows are 10.3 and 27.7 cfs respectively.

**\*D3.0** was also analyzed using an interim condition that represents the runoff patterns prior to development. Under this condition the basin would flow southeast into Channel D, ultimately discharging into Pond D. The 5 year and 100 year undeveloped peak flows are 2.4 and 17.9 cfs respectively.

**Sub-basin D2.1** is a 3.15 acre basin south of the Filing 3 development. The basin comprises the area around Detention Pond D. The basin will ultimately surface flow. The 5 year and 100 year developed peak flows are 0.9 and 6.6 cfs respectively.

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**Sub-basin E1** is a 3.92 acre basin east/northeast of the Filing 3 development. The basin comprises Channel E south of SH94 and bypasses the site to the east, ultimately discharging into Channel F to the east of Pond D. The basin also comprises the temporary cul-de-sacs required at the ends of El Reno Way and Union Pacific Drive. The basin was analyzed using the SCS method due to it combining with the large upstream offsite basin EC10. The 5 year and 100 year developed peak flows are 0.3 and 2.8 cfs respectively.

**Sub-basin OS-1** is a 2.65 acre offsite basin North of the Filing 3 development. The basin comprises of CDOT ROW which drains into a roadside ditch that flows east into Channel E south of SH94 and bypasses the site to the east, ultimately discharging into Channel F to the east of Pond D. The basin was analyzed using the SCS method due to it combining with the large upstream offsite basin EC10. The 5 year and 100 year developed peak flows are 1.4 and 4.3 cfs respectively.

**Sub-basin EC-10** is a 320 acre agricultural basin north of SH94 and drains into Channel E via culverts beneath SH94. The basin combines with flows generated by Basin E1 and OS-1 and bypasses the site to the east, ultimately discharging into Channel F to the east of Pond D. Due to the size of the basin, the generated peak flows were derived via the SCS Method. The 5 year and 100 year peak flows are 18.4 and 144.7 cfs respectively.

**C. Emergency Conditions Analysis**

In the event of clogging, the storm inlets within the Filing 3 development area will overflow to the adjoining public streets, which all generally flow southeasterly. Emergency overflows would sheet flow southeasterly along the public streets, flowing into Channels C2, D, and Detention Pond D.

Pond D also has measures in place to mitigate an emergency condition. A buried riprap emergency spillway will route emergency flows over the embankment and into a swale that will carry flows east of the site.

**D. Comparison of Developed to Historic Discharges**

Based on the hydrologic calculations in the Appendix, the total developed flows from the site will exceed historic flows from the parcel. Due to the increased impervious areas in the developed site, the total undetained flow from the site would be significantly higher than the historic flow. The increase in developed flows will be mitigated by an on-site extended detention basin.

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Historic to Post Developed Comparison		
	5 Year Flow (cfs)	100 Year Flow (cfs)
Historic Site (Basin EX-D1 and EX-D2)	9.6	86.2
Post Developed Site Undetained (DP22)	98.5	237.8
Post Developed Site Detained (Pond D Discharge – DP23)	1.2	39.5

**E. Detention Design**

The total developed storm runoff downstream of the Filing No. 3 development along with the future developments of Filings 2, 2A, 4, and the area south of Filing 3 area will be maintained at historic levels by routing flows through the proposed Detention Pond D located at the southeast corner of the subdivision. The proposed detention facility has been sized to attenuate onsite peak flows through the pond, mitigating developed drainage impacts.

The total volume requiring storage is equivalent to the 100 Year + ½ WQCV produced by the onsite developed area. The required pond volume was determined using the ultimate buildout conditions for all areas tributary to the pond. The calculated volume to be stored is 9.1 ac-ft and was calculated by means of the UD\_Detention spreadsheet. The detention volume will be routed through the extended detention basin by means of a modified CDOT Type C structure. The WQCV and EURV will be controlled by a multi-stage orifice plate within the Type C structure while the 100-year volume will be routed through a 36” pipe with restrictor plate within the Type C structure.

Two scenarios for Pond D have been examined for design purposes within and downstream of the pond: Interim Condition and Ultimate Development. The interim condition assumes all tributary basins except Basins D1.5, D2.0, and C3.0 are fully developed while ultimate development assumes all tributary basins are fully developed. The proposed Type C outlet structure and multi-stage orifice plate proposed with Filing 3 will meet the required release rates during the interim condition with the intention that with the development of future filings the orifice plate and restrictor plate will be replaced as needed to ensure release rates remain in compliance.

Release rates for ultimate development were utilized for sizing riprap and channels downstream of the pond to ensure these facilities will not need to be replaced as the tributary area upstream is developed.

The proposed detention pond will be privately owned and maintained by the Metropolitan District, under the terms of a “Private Detention Basin Maintenance

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Agreement” recorded during final platting. Gravel maintenance access roads will be provided around the perimeter of the detention ponds to facilitate maintenance access.

The pond outlet structures have been designed to release historic flows southeast of the site towards the existing natural swales downstream. Based on the proposed approach of reducing developed flows to historic levels at the site boundaries, no significant downstream drainage impacts are anticipated, and no downstream drainage improvements are proposed.

**F. Onsite Drainage Facility Design**

**Storm Sewer System Layout**

Generally, streets are designed with cross slopes of 2%, pushing water from the centerlines to curb and gutter systems. The streets convey flows to low points at various points around the site where Type R curb inlets are proposed to convey street flows to an underground storm sewer system. The storm sewer system contains reinforced concrete pipes (RCP) with minimum sizes of 18 inches and minimum slopes of 0.5%.

Basins C2.1-C2.5 drain to a dedicated storm sewer system that discharged to channel C2. Basins D1.1-D1.4 and D1.10-D1.14 drain to another dedicated storm sewer system that discharges into Channel D at DP19. Basins D1.5-D1.9 drain into a third dedicated storm sewer system on the eastern edge of the Filing 3 boundary. This system also discharges into Channel D at DP19. Both channels ultimately drain to Detention Pond D.

**Open Channel System Layout**

Four open channels are proposed as part of this development: C2, D, E, and F. These channels will generally be designed as stable native grass-lined channels with subcritical flow regimes. Drainage channels will be designed to convey 100-year flows, with trapezoidal cross-sections, side slopes of 4:1, and minimum freeboard of 1-foot.

Channel C2 conveys flows from DP4 along with flows from future basin C3.0. The channel is trapezoidal with a bottom width of 8 feet and a depth of 3 feet. The channel will be lined with a native grass mixture.

Channel D conveys flows from DP19 along with flows from future basin D2.0. The channel is trapezoidal with a bottom width of 8 feet and a depth of 4 feet. The channel will be lined with a native grass mixture.

Channel E conveys flows from offsite basins EC-10 and OS-1 along with flows from onsite basins E1 and undeveloped basin D1.5. The channel is trapezoidal with a bottom width of 8 feet and a depth of 3.25 feet. Where channel E discharges into Channel F, riprap protection has been provided to lower velocities at this bend. By lowering the velocity to

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3 fps, adequate freeboard is provided as the channel bends into Channel F. The channel will be lined with a native grass mixture.

Channel F conveys flows from the outfalls of Detention Pond D and combines with Channel E downstream of the pond. Where channel E discharges into Channel F, riprap protection has been provided to lower velocities at this bend. Additionally, a riprap plunge pool has been placed upstream of the Log Road ROW to ensure velocities are non erosive. The plunge pool also acts as a level spreader, forcing water to sheet flow into the roadside ditch as opposed to entering the as erosive concentrated flow. The channel will convey flows to the eastern ditch adjacent to Log Road. The channel is trapezoidal with a bottom width of 8 feet and a depth of 4 feet. The channel will be lined with a native grass mixture.

**G. Analysis of Existing and Proposed Downstream Facilities**

The general concept of the proposed drainage plan is to attenuate peak flows from the developed site by routing flows through the proposed on-site detention pond D. An analysis of drainage patterns downstream of the site was performed as part of this report to ensure historic drainage patterns are maintained. Historic and developed flows were compared at key design points downstream of the site. The design points are EX-5, EX-6, and EX-7. This is illustrated as Filing 3 – Log Road Drainage Plan on Sheet D1.7 in the Appendix. In addition to this sheet, a Sheet D1.8 shows cross sections at Design Points EX-5, EX-6, and EX-7 illustrating what the 100 year flow looks like in the developed condition at each of these design points. In general, developed flows are lower than historic rates at each design point.

**Design Point EX-5** is located at the eastern property line where flows from the subject property combine with offsite flows from Basins EC10 and OS-1. In the existing condition flows are conveyed east by means of an existing berm to the south. In the proposed condition, these flows will be conveyed by Channel F in the same easterly direction. The historic and developed 100 year flows are 183.9 and 177.6 cfs respectively.

**Design Point EX-6** is located where flows from EX-5 enter the Log Road ROW. This is the case for both the historic and developed condition. At this design point, flows from EX-5 combine with Basins EX-E (offsite eastern basin) and LOG (offsite basin comprising the Log Road ROW) and enter an existing roadside ditch along Log Road. The historic and developed 100 year flows are 231.4 and 203.5 cfs respectively with the developed 100 year flow depth less than 6 inches deep at the Log Road Shoulder.

**Design Point EX-7** is located near the intersection of Log Road and Handle Road. In both the historic and developed conditions, flows from EX-6 are diverted to the east along Handle Road. At this design point, flows from EX-6 combine with Basins EX-Z (offsite basin south of the Site) and enters an existing roadside ditch along Handle Road. The historic and developed 100 year flows are 285.4 and 240.4 cfs respectively with the developed 100 year flow depth less than 6 inches deep at the Log Road Shoulder.

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Combined flows from the Mayberry site flow southeasterly towards the existing Middle Fork of Black Squirrel Creek. The existing channels downstream of the site consist of broad grass-lined swales with no signs of active erosion. As previously discussed, there is an existing drainage crossing of Ellicott Highway approximately 2-1/2 miles downstream of this site where a future culvert should be installed. Recognizing that this historically deficient crossing is miles downstream of the site, no cost contribution to this off-site drainage improvement was requested during previous approval of the Ellicott Town Center MDDP, and no contribution is proposed at this time.

#### **H. Anticipated Drainage Problems and Solutions**

The proposed stormwater detention pond is designed to mitigate the impacts of developed drainage from this project. The overall drainage plan for the subdivision includes a system of improved public streets with curb and gutter, storm inlets, and storm sewers conveying developed flows to improved drainage channels running through the site. The primary drainage problems anticipated within this development will consist of maintenance of these storm sewer systems, culverts, drainage channels, and detention pond facilities. Care will need to be taken to implement proper erosion control measures in the proposed channels and swales, which will be designed to meet allowable velocity criteria.

A trail system will be constructed along the major drainage channels to provide maintenance access to the drainage facilities throughout the development. Proper construction and maintenance of the proposed detention facilities will minimize downstream drainage impacts. The proposed public streets will be owned and maintained by El Paso County. The proposed detention ponds and channels running through open space tracts and storm drains through private alleys will be privately owned and maintained by the homeowners association or metropolitan district.

### **VII. EROSION CONTROL**

The Contractor will be required to implement best management practices (BMP's) for erosion control during construction. The proposed erosion control plan is included in the Grading & Erosion Control (GEC) Plans submitted with the subdivision construction drawings. Erosion control measures will include installation of silt fence at the toe of disturbed slopes and hay bales protecting drainage ditches. Cut and fill slopes will be stabilized during excavation if necessary and vegetation will be established for stabilization of the disturbed areas. All ditches have been designed to meet El Paso County criteria for slope and velocity. Additionally, gravel vehicle tracking pads will be installed at construction access points and inlet protection will be provided to minimize conveyance of sediment into storm inlets.

## **VIII. COST ESTIMATE AND DRAINAGE FEES**

The developer will pay all capital costs for roadway and drainage improvements. As detailed in Appendix C, the engineer’s estimate for Filing 3 drainage improvements is approximately \$1,088,557.80. Filing 3 is located entirely within the Ellicott Consolidated Drainage Basin, which currently does not have a drainage or bridge fee requirement. As such, no drainage basin fees are applicable.

## **IX. MAINTENANCE**

All proposed road and drainage construction within the Mayberry – Filing 3, Colorado Springs project will be performed to El Paso County Standards. Interior roads will be dedicated as public right-of-way. Roads and drainage facilities within the public right-of-way will be maintained by El Paso County upon final acceptance of these facilities after the warranty period. The Metropolitan District will maintain drainage channels and stormwater detention pond within the proposed open space areas.

## **X. SUMMARY**

The Mayberry – Filing 3, Colorado Springs consists of 142 residential lots in the northeast part of the master development, with access connections to State Highway 94 at Springs Road. The residential lots are platted within Filing 3. The development will generate an increase in developed runoff from the site, which will be mitigated through on-site stormwater detention and water quality facility.

The proposed drainage patterns will remain consistent with historic conditions, and new drainage facilities constructed to El Paso County standards will safely convey runoff to adequate outfalls. Construction of the proposed Detention Pond D southeast of the development areas will ensure that developed flows remain below historic levels. Construction and proper maintenance of the proposed drainage and erosion control facilities will ensure that this subdivision has no significant adverse drainage impacts on downstream or surrounding areas.



## **XI. APPENDICES**

### **Appendix A - Hydrologic Computations**

1. Hydrologic References
2. Pre Developed Flow Rates
3. Post Developed Flow Rates

### **Appendix B – Hydraulic Computations**

1. Detention and Water Quality Facility Design
2. Storm Sewer Capacity
3. Inlet and Street Capacity
4. Rip Rap Calculations
5. Channel Design

### **Appendix C – Reference Information**

1. Cost Estimate
2. NRCS Soils Report
3. FEMA Flood Insurance Maps
4. Drainage Maps

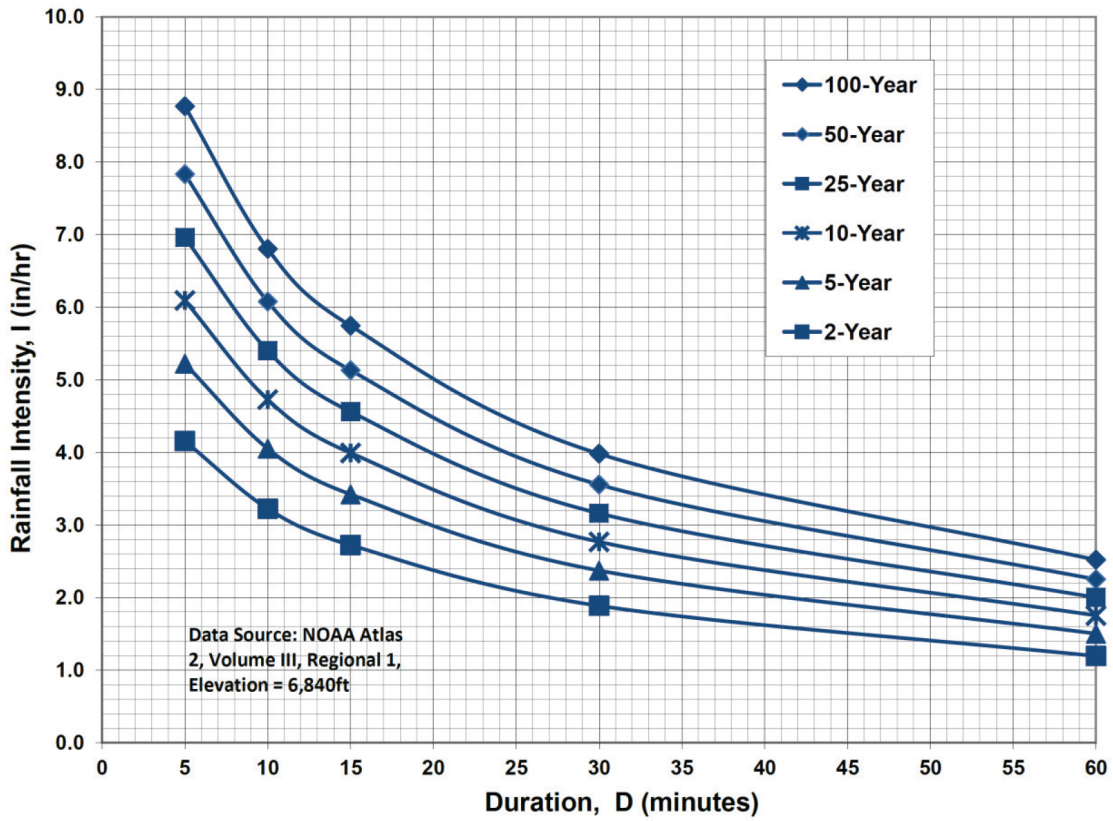
## **APPENDIX A - HYDROLOGIC COMPUTATIONS**

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients												
		2-year		5-year		10-year		25-year		50-year		100-year		
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	
Business														
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89	
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68	
Residential		Lots are 1/6 acre, used 0.375								Lots are 1/6 acre, used 0.545				
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65	
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58	
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57	
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56	
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55	

Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis— Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
<b>Streets</b>													
<b>Paved</b>	<b>100</b>	0.89	0.89	<b>0.90</b>	0.90	0.92	0.92	0.94	0.94	0.95	0.95	<b>0.96</b>	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
<b>Lawns</b>	<b>0</b>	0.02	0.04	<b>0.08</b>	0.15	0.15	0.25	0.25	0.37	0.30	0.44	<b>0.35</b>	0.50

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



**IDF Equations**

$$I_{100} = -2.52 \ln(D) + 12.735$$

$$I_{50} = -2.25 \ln(D) + 11.375$$

$$I_{25} = -2.00 \ln(D) + 10.111$$

$$I_{10} = -1.75 \ln(D) + 8.847$$

$$I_5 = -1.50 \ln(D) + 7.583$$

$$I_2 = -1.19 \ln(D) + 6.035$$

Note: Values calculated by equations may not precisely duplicate values read from figure.

TABLE 6-10. NRCS CURVE NUMBERS FOR FRONTAL STORMS & THUNDERSTORMS FOR DEVELOPED CONDITIONS (ARCI)

EXPAND

Fully Developed Urban Areas (vegetation established) <sup>1</sup>	Treatment	Hydrologic Condition	% I	Pre-Development CN			
				HSG A	HSG B	HSG C	HSG D
Open space (lawns, parks, golf courses, cemeteries, etc.):							
Poor condition (grass cover < 50%)	---	---	---	68	79	86	89
Fair condition (grass cover 50% to 75%)	---	---	---	49	69	79	84
Good condition (grass cover > 75%)	---	---	---	39	81	74	80
Impervious areas:							
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	---	---	---	98	98	98	98
Streets and roads:							
Paved, curbs and storm sewers (excluding right-of-way)	---	---	---	98	98	98	98
Paved, open ditches (including right-of-way)	---	---	---	83	89	92	93
Gravel (including right-of-way)	---	---	---	76	85	89	91
Dirt (including right-of-way)	---	---	---	72	82	87	89
Western desert urban areas:							
Natural desert landscaping (pervious areas only)	---	---	---	63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)	---	---	---	96	96	96	96
Urban districts:							

Commercial and business	Treatment	Hydrologic Condition	% I	HSG A	HSG B	HSG C	HSG D
Commercial and business	---	---	---	85	89	92	94
Industrial	---	---	---	72	81	88	91
Residential districts by average lot size:							
1/4 acre or less (town houses)	---	---	---	65	77	85	90
1/4 acre	---	---	---	38	61	75	83
1/2 acre	---	---	---	30	57	72	81
1 acre	---	---	---	25	54	70	80
1 acre	---	---	---	20	51	68	79
2 acres	---	---	---	12	46	65	77
Developing Urban Areas <sup>2</sup>	Treatment <sup>2</sup>	Hydrologic Condition <sup>3</sup>	% I	HSG A	HSG B	HSG C	HSG D
Newly graded areas (pervious areas only, no vegetation)	---	---	---	77	86	91	94
Cultivated Agricultural Lands <sup>4</sup>	Treatment	Hydrologic Condition	% I	HSG A	HSG B	HSG C	HSG D
Fallow	Bare soil	---	---	77	86	91	94
Crop residue cover (CR)	Poor	---	---	76	85	90	93
	Good	---	---	74	83	88	90
Row crops	Straight row (SR)	Poor	---	72	81	88	91
		Good	---	67	78	85	89
SR + CR	SR + CR	Poor	---	71	80	87	90
		Good	---	64	75	82	85
Contoured (C)	Contoured (C)	Poor	---	70	79	84	88
		Good	---	65	75	82	86
C + CR	C + CR	Poor	---	69	78	83	87
		Good	---	64	74	81	85
Contoured & terraced (C&T)	Contoured & terraced (C&T)	Poor	---	66	74	80	82
		Good	---	62	71	78	81
C&T + CR	C&T + CR	Poor	---	65	73	79	81
		Good	---	61	70	77	80

1/6 AC - USE 80

Small grain	SR	Poor	---	65	76	84	88
		Good	---	63	75	83	87
	SR + CR	Poor	---	64	75	83	86
		Good	---	60	72	80	84
	C	Poor	---	63	74	82	85
		Good	---	61	73	81	84
	C + CR	Poor	---	62	73	81	84
		Good	---	60	72	80	83
	C&T	Poor	---	61	72	79	82
		Good	---	59	70	78	81
	C&T + CR	Poor	---	60	71	78	81
		Good	---	58	69	77	80
Pasture, grassland, or range—continuous forage for grazing <sup>4</sup>	---	Poor	---	68	79	86	89
	---	Fair	---	49	69	79	84
	---	Good	---	39	81	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay	---	---	---	30	58	71	78
Brush-brush-weed-grass mixture with brush the major element <sup>5</sup>	---	Poor	---	48	67	77	83
	---	Fair	---	35	56	70	77
	---	Good	---	30	48	65	73
Woods-grass combination (orchard or tree farm) <sup>6</sup>	---	Poor	---	57	73	82	86
	---	Fair	---	43	65	76	82
	---	Good	---	32	58	72	79
Woods <sup>7</sup>	---	Poor	---	45	66	77	83
	---	Fair	---	36	60	73	79
	---	Good	---	30	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots	---	---	---	59	74	82	86
Arid and Semi-arid Rangelands <sup>1</sup>	Treatment	Hydrologic Condition <sup>8</sup>	% I	HSG A	HSG B	HSG C	HSG D
Herbaceous—mixture of grass, weeds, and low-	---	Poor	---	---	80	87	93

growing brush, with brush the minor element	---	Fair	---	71	81	89	
	---	Good	---	62	74	85	
Oak-aspen-mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush	---	Poor	---	66	74	79	
	---	Fair	---	48	57	63	
Pinyon-juniper-pinyon, juniper, or both; grass understory	---	Good	---	30	41	48	
	---	Poor	---	75	85	89	
Sagebrush with grass understory	---	Fair	---	58	73	80	
	---	Good	---	41	61	71	
	---	Poor	---	67	80	85	
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus	---	Fair	---	55	72	81	
	---	Good	---	49	68	79	
	---	Poor	---	63	77	85	
<sup>1</sup> Ia = 0.1 S							
<sup>2</sup> Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.							
<sup>3</sup> Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness. Poor: Factors impair infiltration and tend to increase runoff. Good: Factors encourage average and better than average infiltration and tend to decrease runoff.							
<sup>4</sup> Poor: <50% ground cover or heavily grazed with no mulch. Fair: 50 to 75% ground cover and not heavily grazed. Good: > 75% ground cover and lightly or only occasional							
<sup>5</sup> Poor: <50% ground cover. Fair: 50 to 75% ground cover. Good: >75% ground cover.							
<sup>6</sup> CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods							
<sup>7</sup> Poor: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning. Fair: Woods are grazed but not burned, and some forest litter covers the soil. Good: Woods are protected from grazing, and litter and brush adequately cover the soil.							
<sup>8</sup> Poor: <30% ground cover (litter, grass, and brush overstory). Fair: 30 to 70% ground cover. Good: > 70% ground cover.							

Table 6-9. NRCS Curve Numbers for Pre-Development Thunderstorms Conditions (ARC 1)

EXPAND

Fully Developed Urban Areas (vegetation established) <sup>1</sup>	Treatment	Hydrologic Condition	% I	Pre-Development CN			
				HSG A	HSG B	HSG C	HSG D
Open space (lawns, parks, golf courses, cemeteries, etc.):							
Poor condition (grass cover < 50%)	—	—	—	47	61	72	77
Fair condition (grass cover 50% to 75%)	—	—	—	29	48	61	69
Good condition (grass cover > 75%)	—	—	—	21	40	54	63
Impervious areas:							
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	—	—	—	95	95	95	95
Streets and roads:							
Paved; curbs and storm sewers (excluding right-of-way)	—	—	—	95	95	95	95
Paved; open ditches (including right-of-way)	—	—	—	67	77	83	85
Gravel (including right-of-way)	—	—	—	57	70	77	81
Dirt (including right-of-way)	—	—	—	52	66	74	77
Western desert urban areas:							
Natural desert landscaping (pervious areas only)	—	—	—	42	58	70	75
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)	—	—	—	91	91	91	91
<b>Developing Urban Areas<sup>1</sup></b>	<b>Treatment<sup>2</sup></b>	<b>Hydrologic Condition<sup>3</sup></b>	<b>% I</b>	<b>HSG A</b>	<b>HSG B</b>	<b>HSG C</b>	<b>HSG D</b>

Newly graded areas (pervious areas only, no vegetation)	Treatment	Hydrologic Condition	% I	HSG A	HSG B	HSG C	HSG D
	—	—	—	58	72	81	87
<b>Cultivated Agricultural Lands<sup>1</sup></b>	<b>Treatment</b>	<b>Hydrologic Condition</b>	<b>% I</b>	<b>HSG A</b>	<b>HSG B</b>	<b>HSG C</b>	<b>HSG D</b>
Fallow	Bare soil	—	—	58	72	81	87
	Crop residue cover (CR)	Poor	—	57	70	79	85
		Good	—	54	67	75	79
Row crops	Straight row (SR)	Poor	—	52	64	75	81
		Good	—	46	60	70	77
	SR + CR	Poor	—	51	63	74	79
		Good	—	43	56	66	70
	Contoured (C)	Poor	—	49	61	69	75
		Good	—	44	56	66	72
	C + CR	Poor	—	48	60	67	74
		Good	—	43	54	64	70
	Contoured & terraced (C&T)	Poor	—	45	54	63	66
		Good	—	41	51	60	64
	C&T + CR	Poor	—	44	53	61	64
		Good	—	40	49	58	63
Small grain	SR	Poor	—	44	57	69	75
		Good	—	42	56	67	74
	SR + CR	Poor	—	43	56	67	72
		Good	—	39	52	63	69
	C	Poor	—	42	54	66	70
		Good	—	40	53	64	69
	C + CR	Poor	—	41	53	64	69
	Poor	Good	—	39	52	63	67
	C&T	Poor	—	40	52	61	66
		Good	—	38	49	60	64
	C&T + CR	Poor	—	39	51	60	64
		Good	—	37	48	58	63

Close-seeded or broadcast legumes or rotation meadow	SR	Poor	—	45	58	70	77
		Good	—	37	52	64	70
	C	Poor	—	43	56	67	70
		Good	—	34	48	60	67
	C&T	Poor	—	42	53	63	67
		Good	—	30	46	57	63
Pasture, grassland, or range-continuous forage for grazing <sup>4</sup>	—	Poor	—	47	61	72	77
	—	Fair	—	29	48	61	69
	—	Good	—	21	40	54	63
Meadow-continuous grass, protected from grazing and generally mowed for hay	—	—	—	15	37	51	60
Brush-brush-weed-grass mixture with brush the major element <sup>5</sup>	—	Poor	—	28	46	58	67
	—	Fair	—	18	35	49	58
	—	Good	—	15	28	44	53
Woods-grass combination (orchard or tree farm) <sup>6</sup>	—	Poor	—	36	53	66	72
	—	Fair	—	24	44	57	66
	—	Good	—	17	37	52	61
Woods <sup>7</sup>	—	Poor	—	26	45	58	67
	—	Fair	—	19	39	53	61
	—	Good	—	15	34	49	58
Farmsteads-buildings, lanes, driveways, and surrounding lots	—	—	—	38	54	66	72
<b>Arid and Semi-arid Rangelands<sup>1</sup></b>	<b>Treatment</b>	<b>Hydrologic Condition<sup>4</sup></b>	<b>% I</b>	<b>HSG A</b>	<b>HSG B</b>	<b>HSG C</b>	<b>HSG D</b>
Herbaceous-mixture of grass, weeds, and low-growing brush, with brush the minor element	—	Poor	—	63	74	85	
	—	Fair	—	51	64	77	
	—	Good	—	41	54	70	
Oak-aspens-mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush	—	Poor	—	45	54	61	
	—	Fair	—	28	36	42	
—	Good	—	15	23	28		
Pinyon-juniper-pinyon.	—	Poor	—	56	70	77	

Juniper, or both: grass understory	—	Fair	—	37	53	63
	—	Good	—	23	40	51
Sagebrush with grass understory	—	Poor	—	46	63	70
	—	Fair	—	30	42	49
	—	Good	—	18	27	34
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus	—	Poor	—	42	58	70
	—	Fair	—	34	52	64
	—	Good	—	29	47	61
<sup>1</sup> Average runoff condition, and Ia = 0.1S.						
<sup>2</sup> Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.						
<sup>3</sup> Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness. Poor: Factors impair infiltration and tend to increase runoff. Good: Factors encourage average and better than average infiltration and tend to decrease runoff.						
<sup>4</sup> Poor: <50% ground cover or heavily grazed with no mulch. Fair: 50 to 75% ground cover and not heavily grazed. Good: > 75% ground cover and lightly or only occasionally grazed.						
<sup>5</sup> Poor: <50% ground cover. Fair: 50 to 75% ground cover. Good: >75% ground cover.						
<sup>6</sup> CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.						
<sup>7</sup> Poor: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning. Fair: Woods are grazed but not burned, and some forest litter covers the soil. Good: Woods are protected from grazing, and litter and brush adequately cover the soil.						
<sup>8</sup> Poor: <30% ground cover (litter, grass, and brush overstory). Fair: 30 to 70% ground cover. Good: > 70% ground cover.						



Figure 6-12. 2-Year, 24-Hour Precipitation Tenths of an Inch (NOAA Atlas 2)

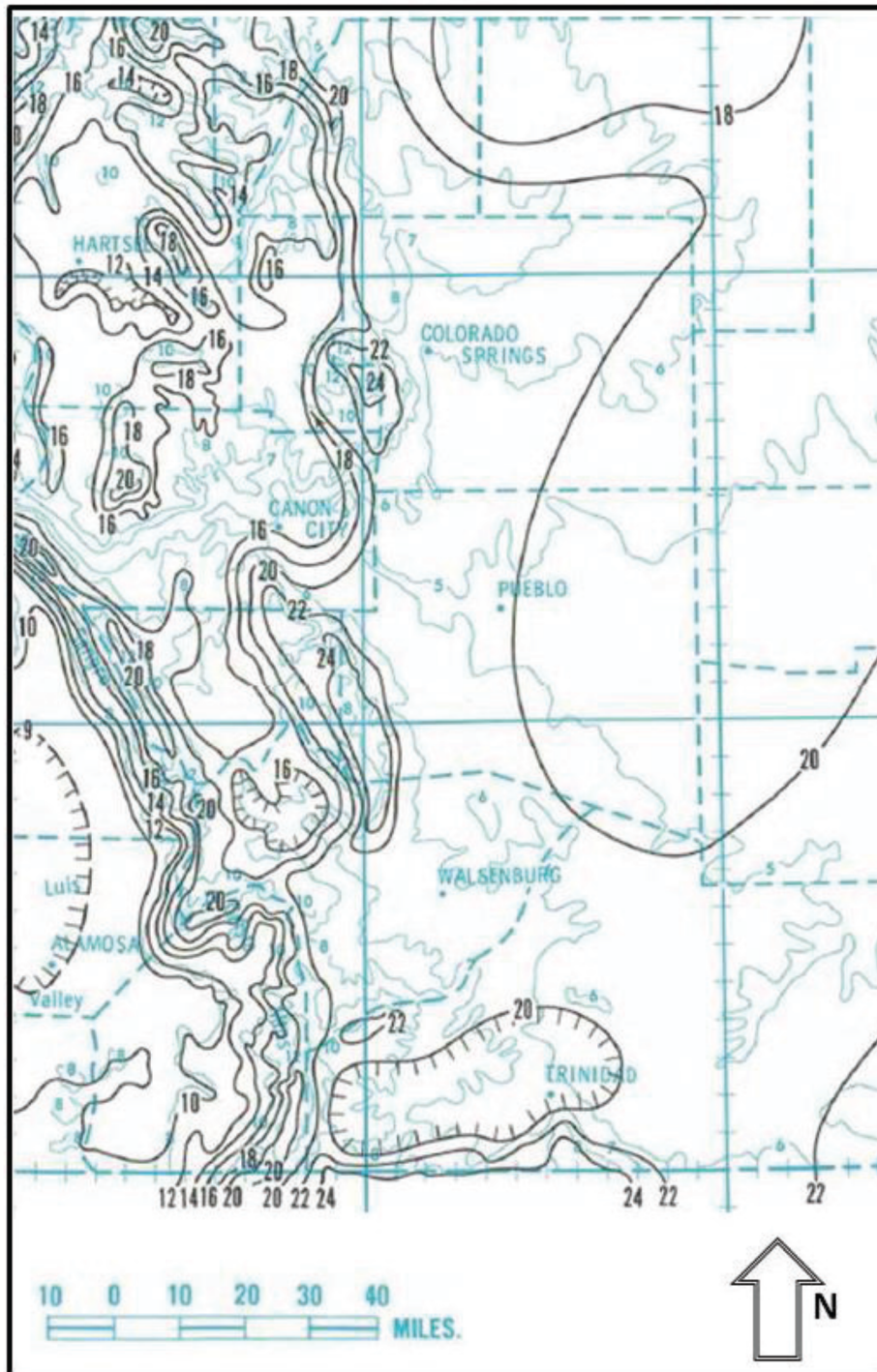


Figure 6-13. 5-Year, 24-Hour Precipitation Tenths of an Inch (NOAA Atlas 2)

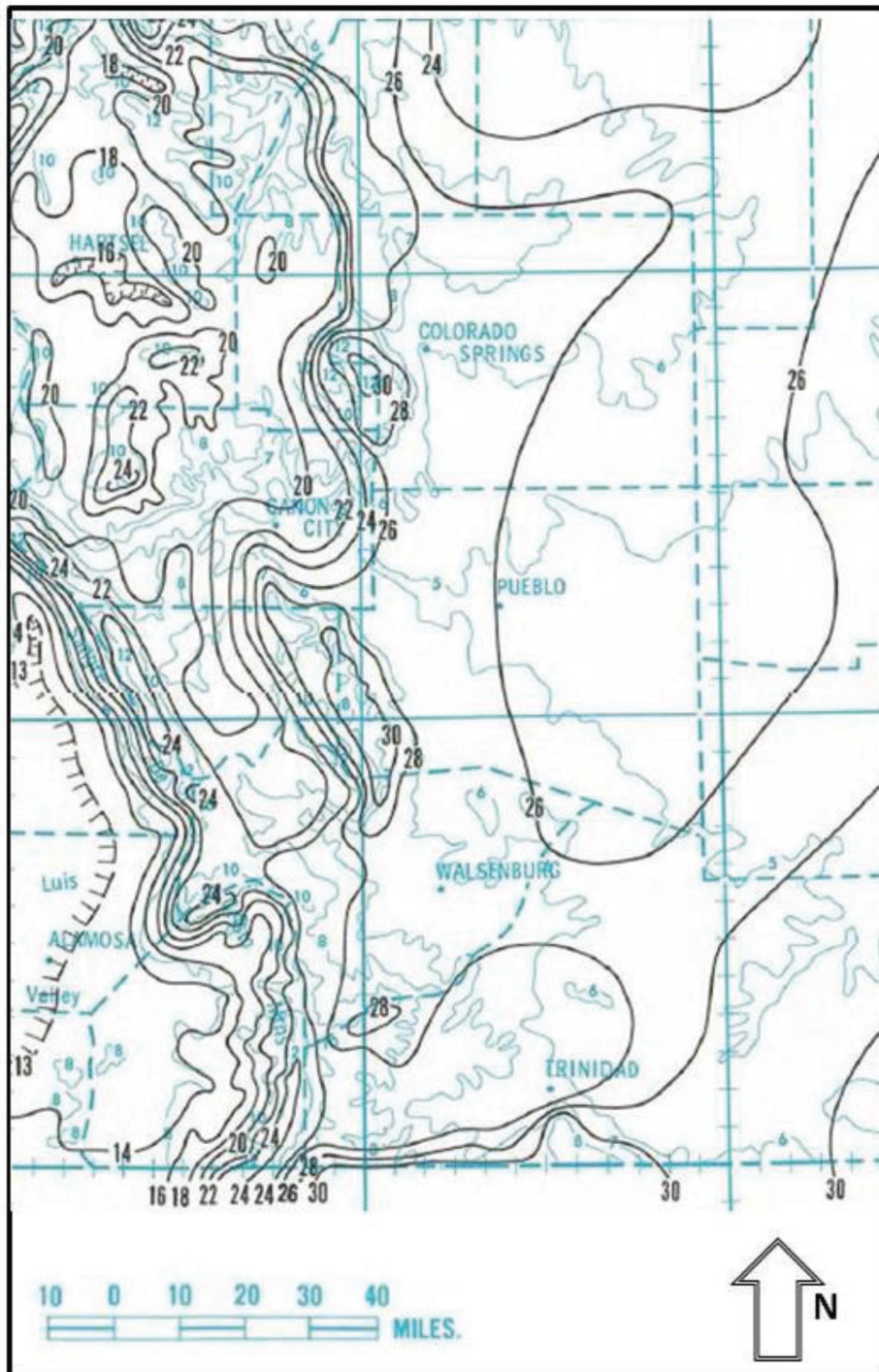
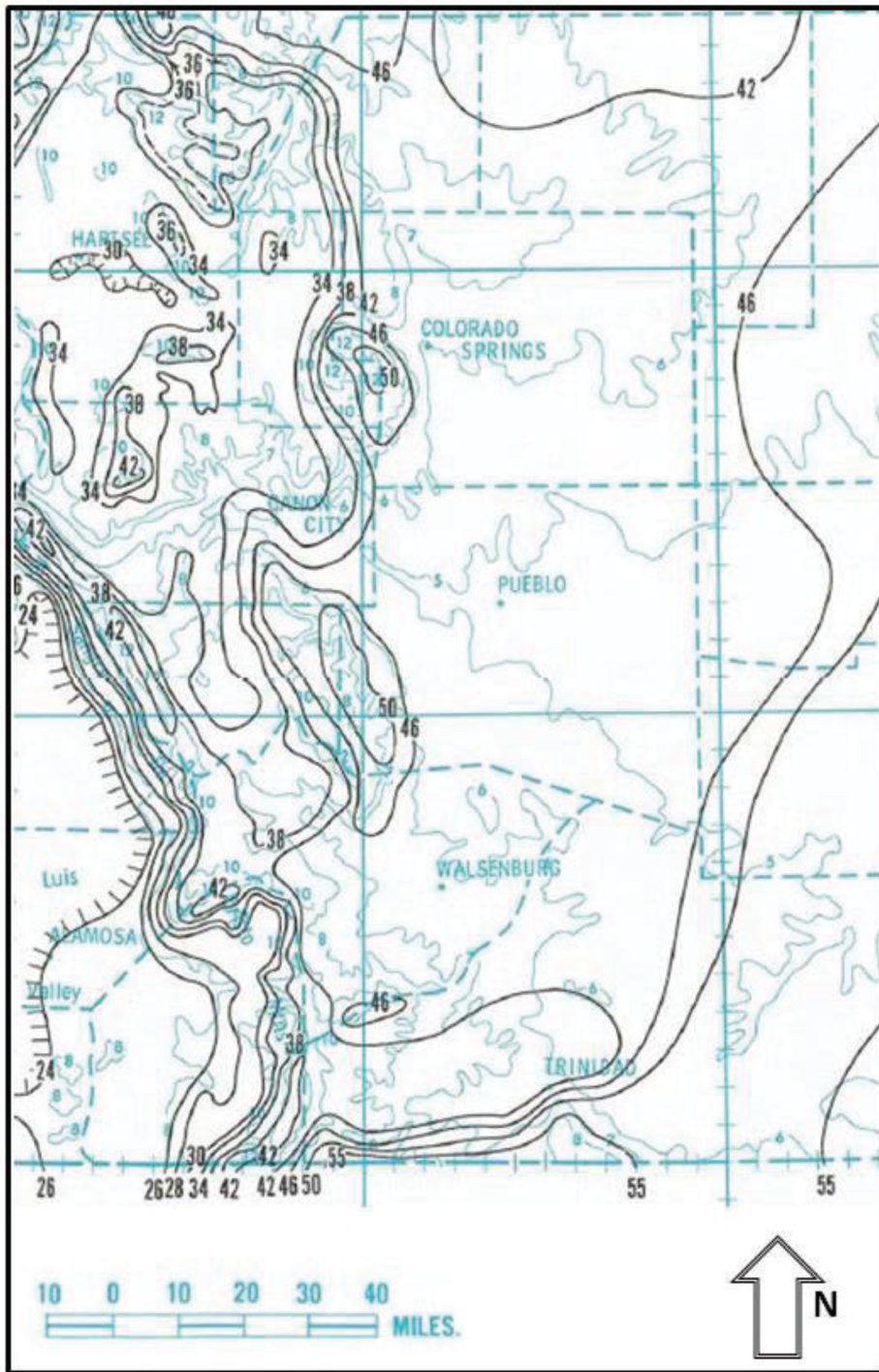


Figure 6-17. 100-Year, 24-Hour Precipitation Tenths of an Inch (NOAA Atlas 2)



**EX DEVELOPMENT CN VALUES**

**Designer:** ESJ  
**Company:** R&R Engineers-Surveyors  
**Date:** 1/5/2023  
**Project:** Mayberry Filing 3  
**Location:** El Paso County



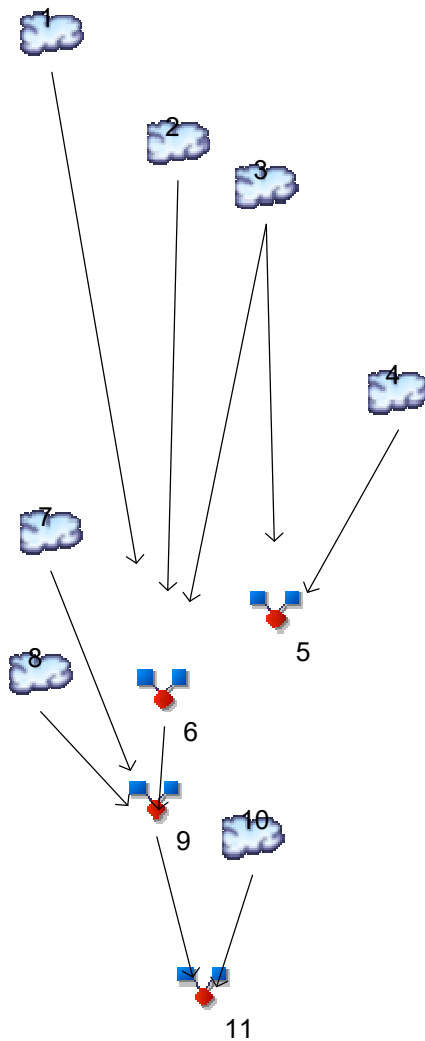
Global Parameters <sup>1</sup>	
Land Use	CN
PASTURE/GRASS - GOOD	61
ROAD	98

Basin Name	Area (ac)	NRCS Hydrologic Soil Group	PASTURE/GRASS - GOOD		ROAD		% Check	SCS CN
			Area (ac)	%	Area (ac)	%		CN
EC10	320.00	A	320.00	100.0%	0.00	0.0%		61
EX-D1	93.50	A	93.50	100.0%	0.00	0.0%		61
EX-D2	11.50	A	11.50	100.0%	0.00	0.0%		61
EX-E	76.00	A	76.00	100.0%	0.00	0.0%		61
EX-LOG	1.80	A	0.00	0.0%	1.80	100.0%		98
EX-Z	83.50	A	81.94	98.1%	1.56	1.9%		62
OS-1	2.65	A	1.74	65.7%	0.91	34.3%		74

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# Watershed Model Schematic

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



## Legend

Hyd.	Origin	Description
1	SCS Runoff	EC10
2	SCS Runoff	OS-1
3	SCS Runoff	EX-D1
4	SCS Runoff	EX-D2
5	Combine	TOTAL ONSITE FLOW
6	Combine	DP EX-5
7	SCS Runoff	EX-E
8	SCS Runoff	EX-LOG
9	Combine	DP EX-6
10	SCS Runoff	EX-Z
11	Combine	DP EX-7

# Hydrograph Summary Report

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

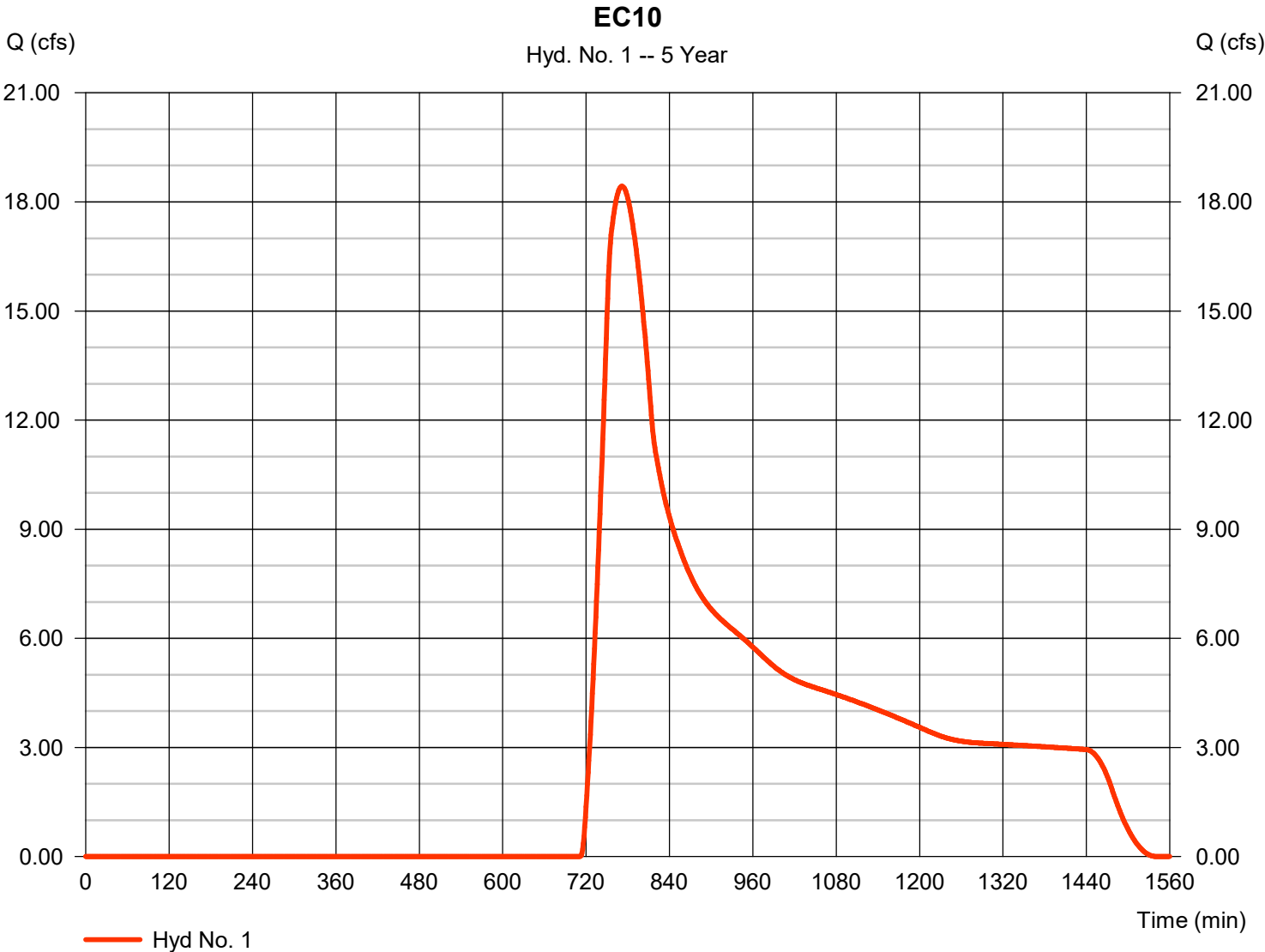
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	18.43	1	772	262,007	-----	-----	-----	EC10
2	SCS Runoff	1.349	1	734	6,442	-----	-----	-----	OS-1
3	SCS Runoff	8.399	1	737	76,243	-----	-----	-----	EX-D1
4	SCS Runoff	1.367	1	728	9,340	-----	-----	-----	EX-D2
5	Combine	9.557	1	735	85,583	3, 4	-----	-----	TOTAL ONSITE FLOW
6	Combine	23.73	1	755	344,692	1, 2, 3,	-----	-----	DP EX-5
7	SCS Runoff	6.054	1	745	62,432	-----	-----	-----	EX-E
8	SCS Runoff	3.682	1	729	15,373	-----	-----	-----	EX-LOG
9	Combine	30.51	1	752	422,497	6, 7, 8	-----	-----	DP EX-6
10	SCS Runoff	8.146	1	742	76,284	-----	-----	-----	EX-Z
11	Combine	38.16	1	751	498,780	9, 10	-----	-----	DP EX-7
SCS ROUTING - Existing Downstream Analysis Report					Return Period: 5 Year			Thursday, 01 / 5 / 2023	

# Hydrograph Report

## Hyd. No. 1

EC10

Hydrograph type	= SCS Runoff	Peak discharge	= 18.43 cfs
Storm frequency	= 5 yrs	Time to peak	= 772 min
Time interval	= 1 min	Hyd. volume	= 262,007 cuft
Drainage area	= 320.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 63.00 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484





# TR55 Tc Worksheet

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

## Hyd. No. 1

EC10

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>				
Manning's n-value	= 0.030	0.011	0.011	
Flow length (ft)	= 300.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.20	0.00	0.00	
Land slope (%)	= 2.00	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 7.85</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 7.85</b>
<b>Shallow Concentrated Flow</b>				
Flow length (ft)	= 6086.00	0.00	0.00	
Watercourse slope (%)	= 1.30	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=1.84	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 55.14</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 55.14</b>
<b>Channel Flow</b>				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	{{0}}0.0	0.0	0.0	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>				<b>63.00 min</b>

# Hydrograph Report

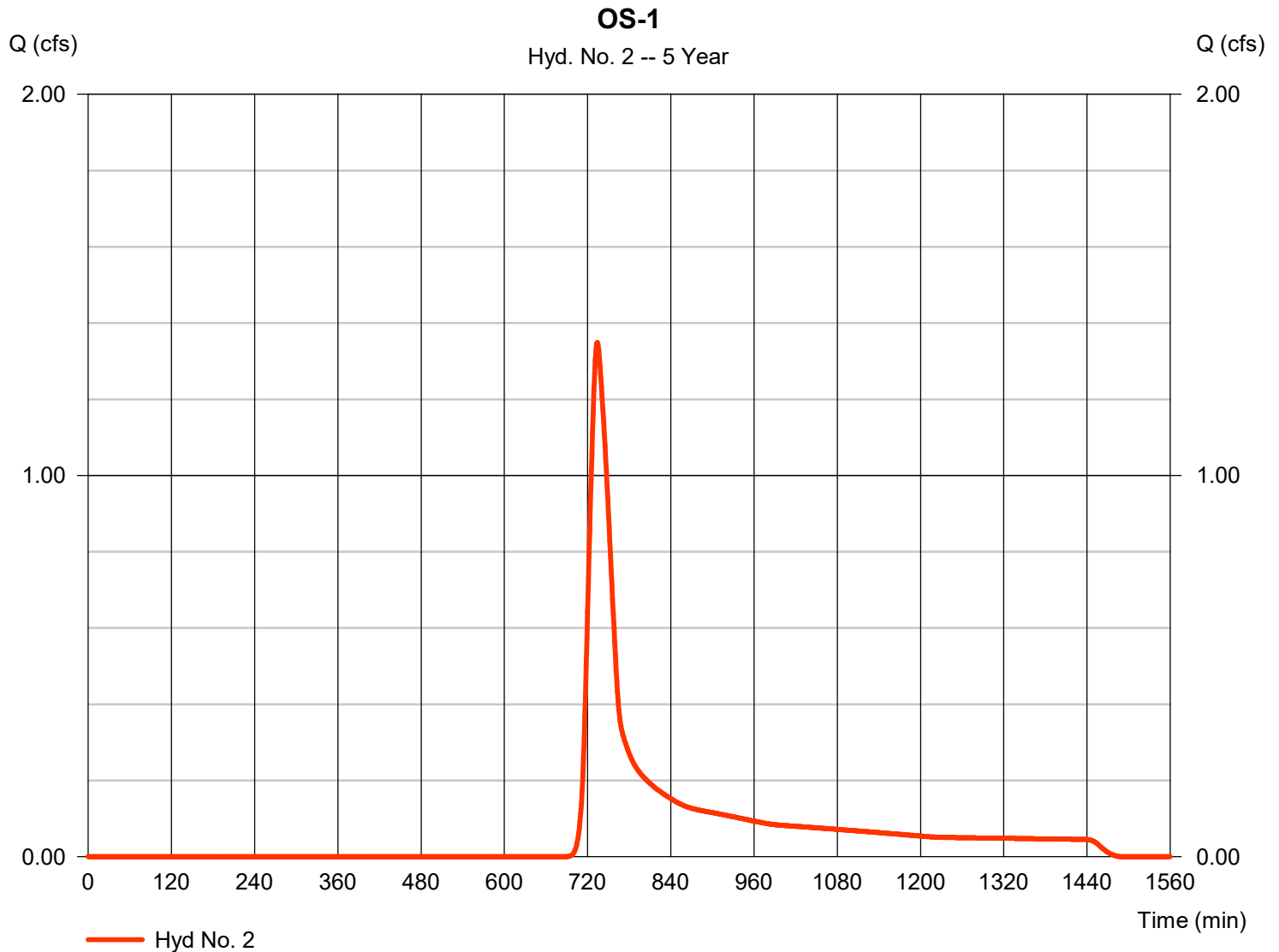
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 2

OS-1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.349 cfs
Storm frequency	= 5 yrs	Time to peak	= 734 min
Time interval	= 1 min	Hyd. volume	= 6,442 cuft
Drainage area	= 2.650 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 2

OS-1

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>						
Manning's n-value	= 0.013		0.011		0.011	
Flow length (ft)	= 50.0		0.0		0.0	
Two-year 24-hr precip. (in)	= 2.20		0.00		0.00	
Land slope (%)	= 2.00		0.00		0.00	
<b>Travel Time (min)</b>	<b>= 0.96</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 0.96</b>
<b>Shallow Concentrated Flow</b>						
Flow length (ft)	= 2525.00		0.00		0.00	
Watercourse slope (%)	= 0.70		0.00		0.00	
Surface description	= Unpaved		Paved		Paved	
Average velocity (ft/s)	=1.35		0.00		0.00	
<b>Travel Time (min)</b>	<b>= 31.17</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 31.17</b>
<b>Channel Flow</b>						
X sectional flow area (sqft)	= 0.00		0.00		0.00	
Wetted perimeter (ft)	= 0.00		0.00		0.00	
Channel slope (%)	= 0.00		0.00		0.00	
Manning's n-value	= 0.015		0.015		0.015	
Velocity (ft/s)	=0.00		0.00		0.00	
Flow length (ft)	{{0}}0.0		0.0		0.0	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>						<b>32.10 min</b>

# Hydrograph Report

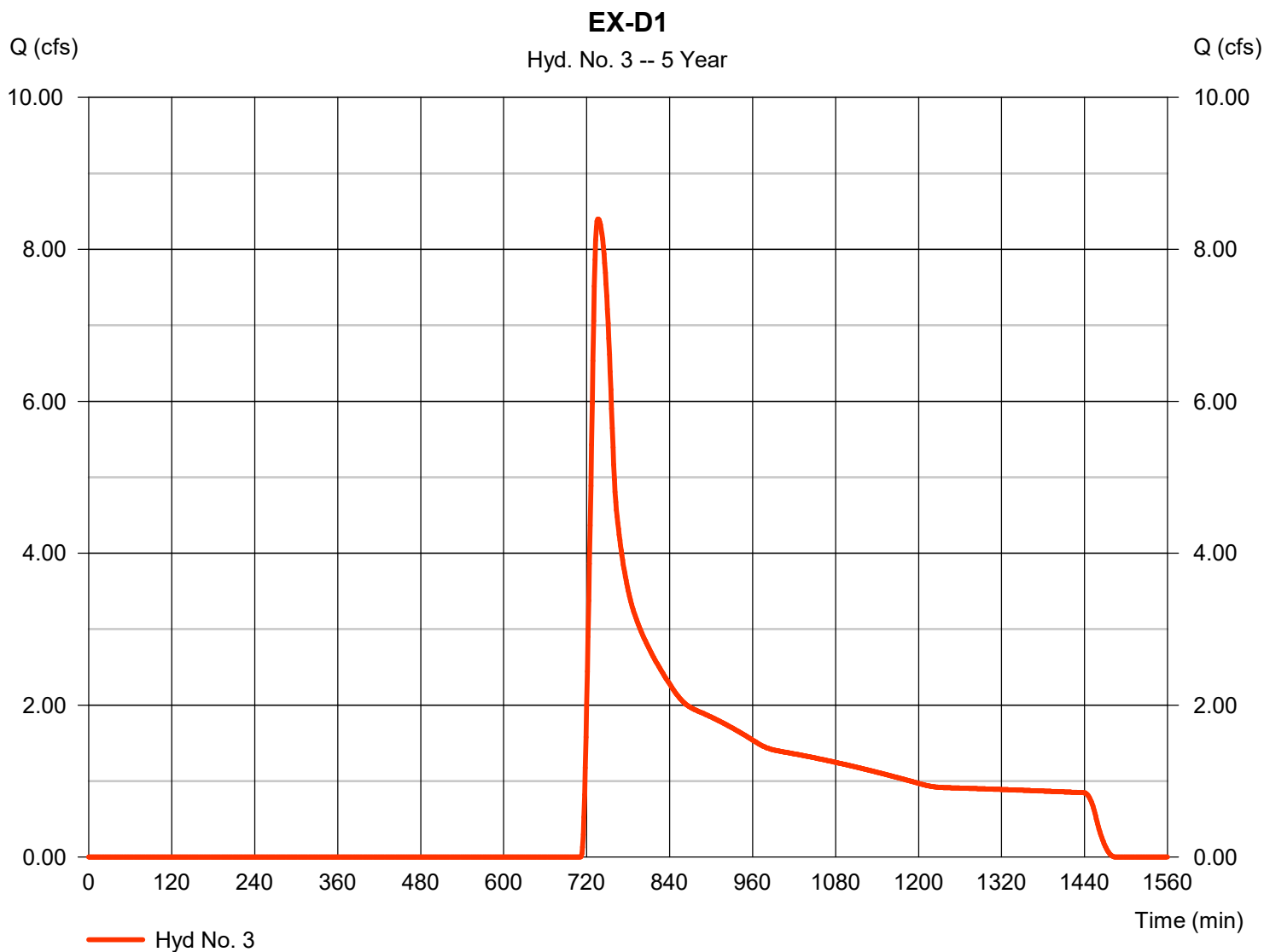
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 3

EX-D1

Hydrograph type	= SCS Runoff	Peak discharge	= 8.399 cfs
Storm frequency	= 5 yrs	Time to peak	= 737 min
Time interval	= 1 min	Hyd. volume	= 76,243 cuft
Drainage area	= 93.500 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 28.60 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 3

EX-D1

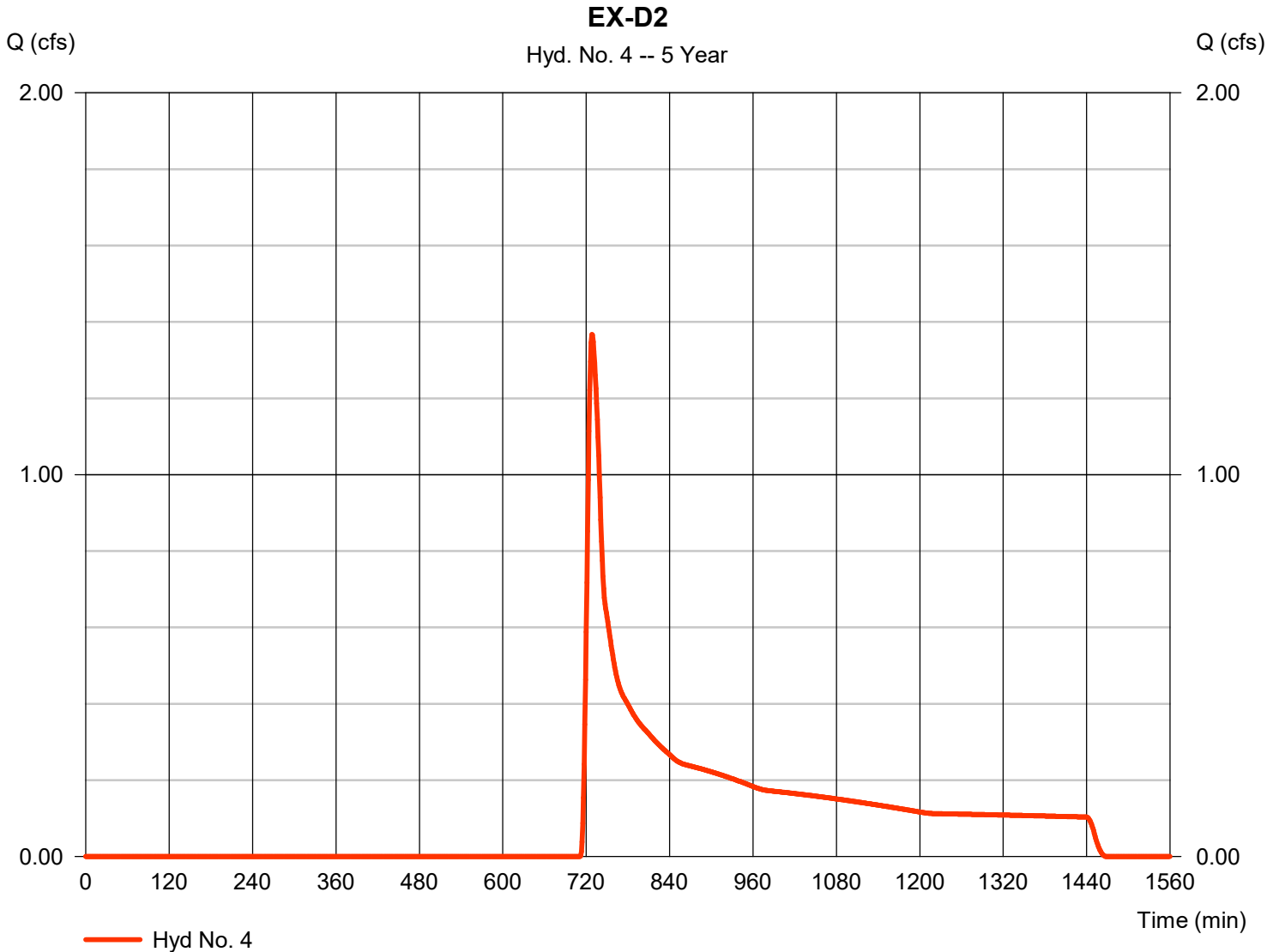
<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>						
Manning's n-value	= 0.030		0.011		0.011	
Flow length (ft)	= 300.0		0.0		0.0	
Two-year 24-hr precip. (in)	= 2.20		0.00		0.00	
Land slope (%)	= 2.00		0.00		0.00	
<b>Travel Time (min)</b>	<b>= 7.85</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 7.85</b>
<b>Shallow Concentrated Flow</b>						
Flow length (ft)	= 2845.00		0.00		0.00	
Watercourse slope (%)	= 2.00		0.00		0.00	
Surface description	= Unpaved		Paved		Paved	
Average velocity (ft/s)	=2.28		0.00		0.00	
<b>Travel Time (min)</b>	<b>= 20.78</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 20.78</b>
<b>Channel Flow</b>						
X sectional flow area (sqft)	= 0.00		0.00		0.00	
Wetted perimeter (ft)	= 0.00		0.00		0.00	
Channel slope (%)	= 0.00		0.00		0.00	
Manning's n-value	= 0.015		0.015		0.015	
Velocity (ft/s)	=0.00		0.00		0.00	
Flow length (ft)	{{0}}0.0		0.0		0.0	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>						<b>28.60 min</b>

# Hydrograph Report

## Hyd. No. 4

EX-D2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.367 cfs
Storm frequency	= 5 yrs	Time to peak	= 728 min
Time interval	= 1 min	Hyd. volume	= 9,340 cuft
Drainage area	= 11.500 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.00 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 4

EX-D2

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>				
Manning's n-value	= 0.030	0.011	0.011	
Flow length (ft)	= 300.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.20	0.00	0.00	
Land slope (%)	= 2.00	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 7.85</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 7.85</b>
<b>Shallow Concentrated Flow</b>				
Flow length (ft)	= 1395.00	0.00	0.00	
Watercourse slope (%)	= 2.00	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=2.28	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 10.19</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 10.19</b>
<b>Channel Flow</b>				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	{{0}}0.0	0.0	0.0	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>				<b>18.00 min</b>

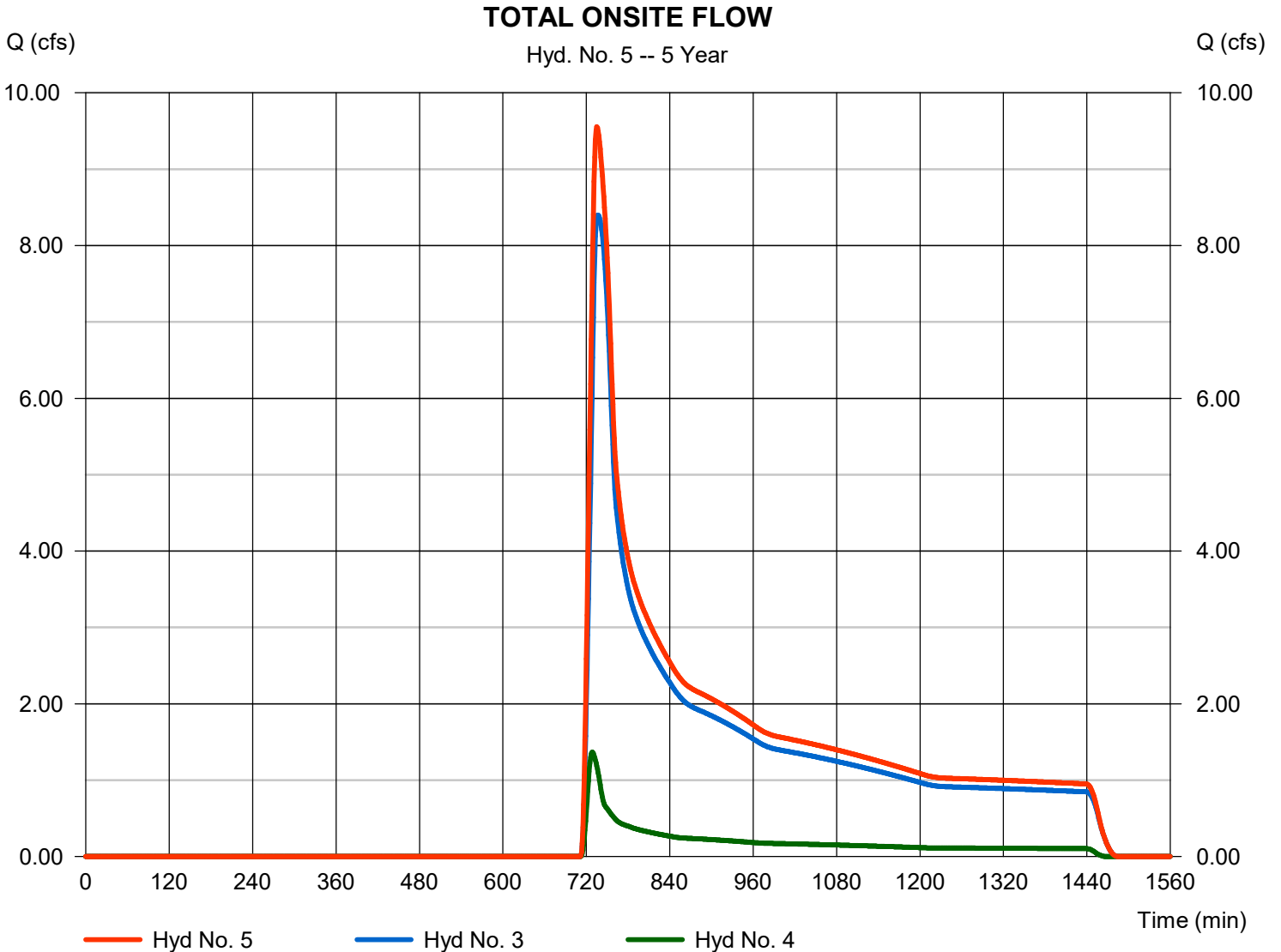
# Hydrograph Report

## Hyd. No. 5

### TOTAL ONSITE FLOW

Hydrograph type = Combine  
Storm frequency = 5 yrs  
Time interval = 1 min  
Inflow hyds. = 3, 4

Peak discharge = 9.557 cfs  
Time to peak = 735 min  
Hyd. volume = 85,583 cuft  
Contrib. drain. area = 105.000 ac





# Hydrograph Report

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

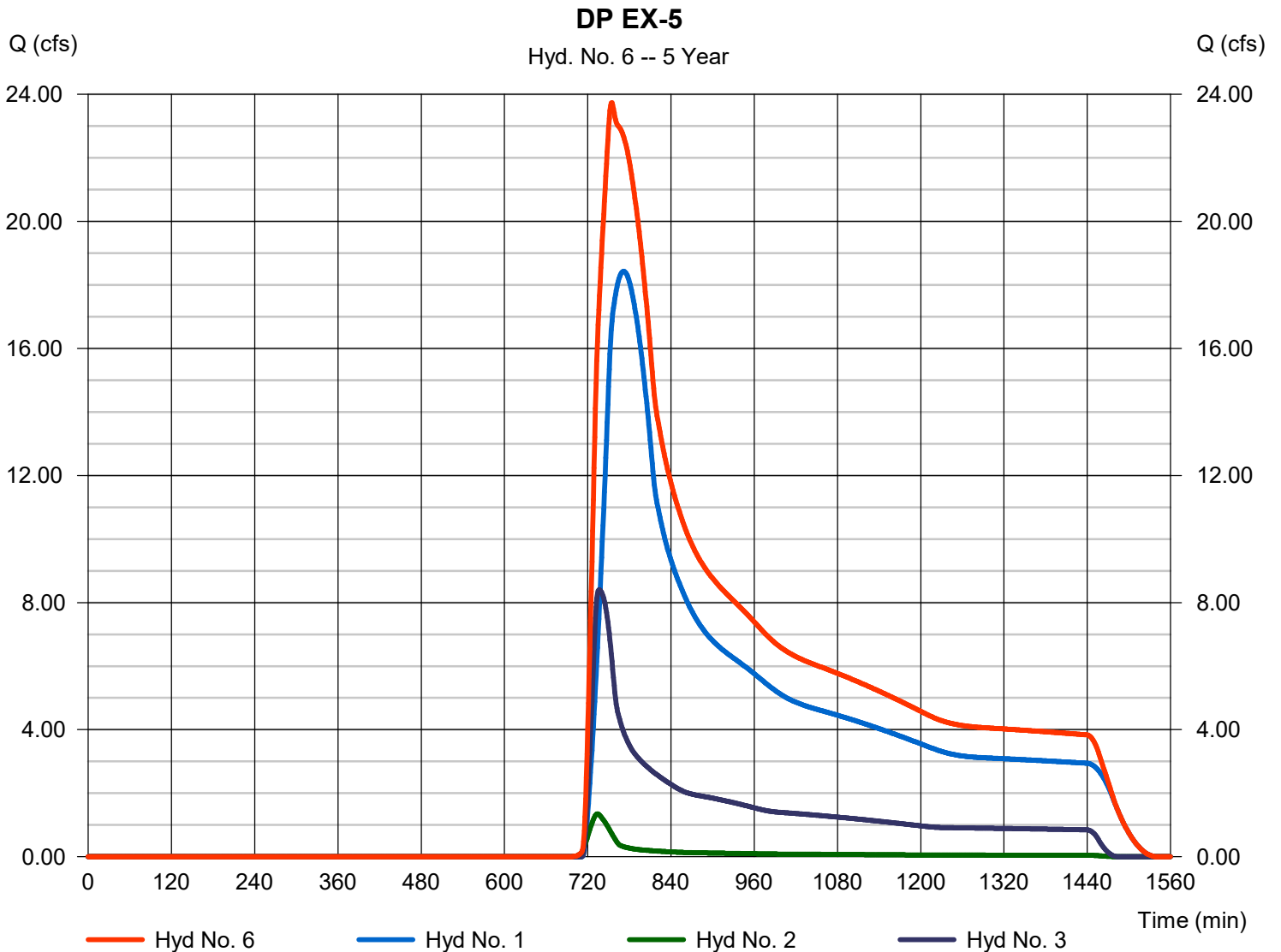
Thursday, 01 / 5 / 2023

## Hyd. No. 6

DP EX-5

Hydrograph type = Combine  
Storm frequency = 5 yrs  
Time interval = 1 min  
Inflow hyds. = 1, 2, 3

Peak discharge = 23.73 cfs  
Time to peak = 755 min  
Hyd. volume = 344,692 cuft  
Contrib. drain. area = 416.150 ac



# Hydrograph Report

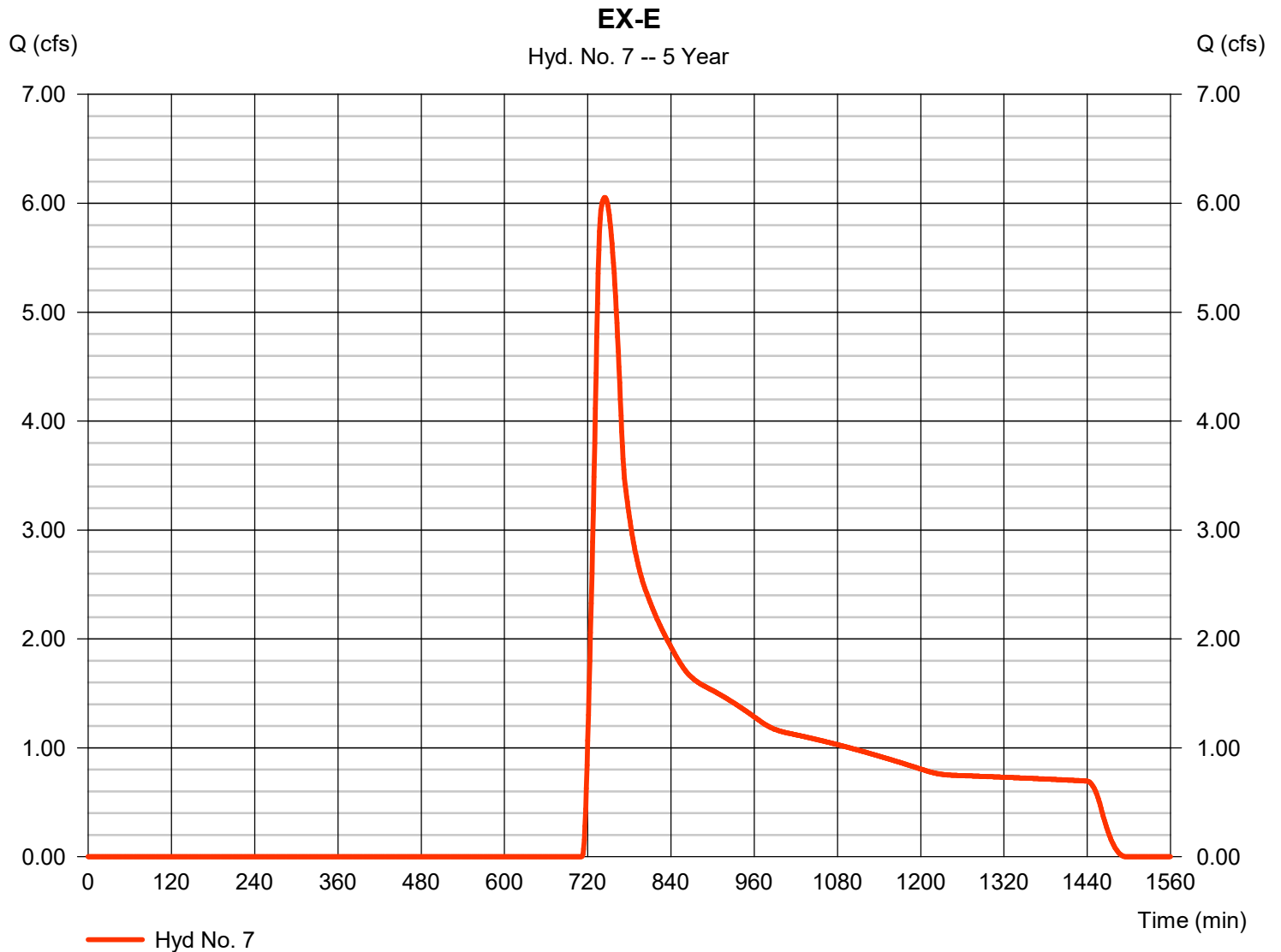
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 7

EX-E

Hydrograph type	= SCS Runoff	Peak discharge	= 6.054 cfs
Storm frequency	= 5 yrs	Time to peak	= 745 min
Time interval	= 1 min	Hyd. volume	= 62,432 cuft
Drainage area	= 76.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 34.20 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 7

EX-E

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>		<u>Totals</u>
<b>Sheet Flow</b>							
Manning's n-value	= 0.030		0.011		0.011		
Flow length (ft)	= 300.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.20		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
<b>Travel Time (min)</b>	<b>= 7.85</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>7.85</b>
<b>Shallow Concentrated Flow</b>							
Flow length (ft)	= 2546.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.61		0.00		0.00		
<b>Travel Time (min)</b>	<b>= 26.30</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>26.30</b>
<b>Channel Flow</b>							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00		0.00		0.00		
Flow length (ft)	{{0}}0.0		0.0		0.0		
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>0.00</b>
<b>Total Travel Time, Tc .....</b>							<b>34.20 min</b>

# Hydrograph Report

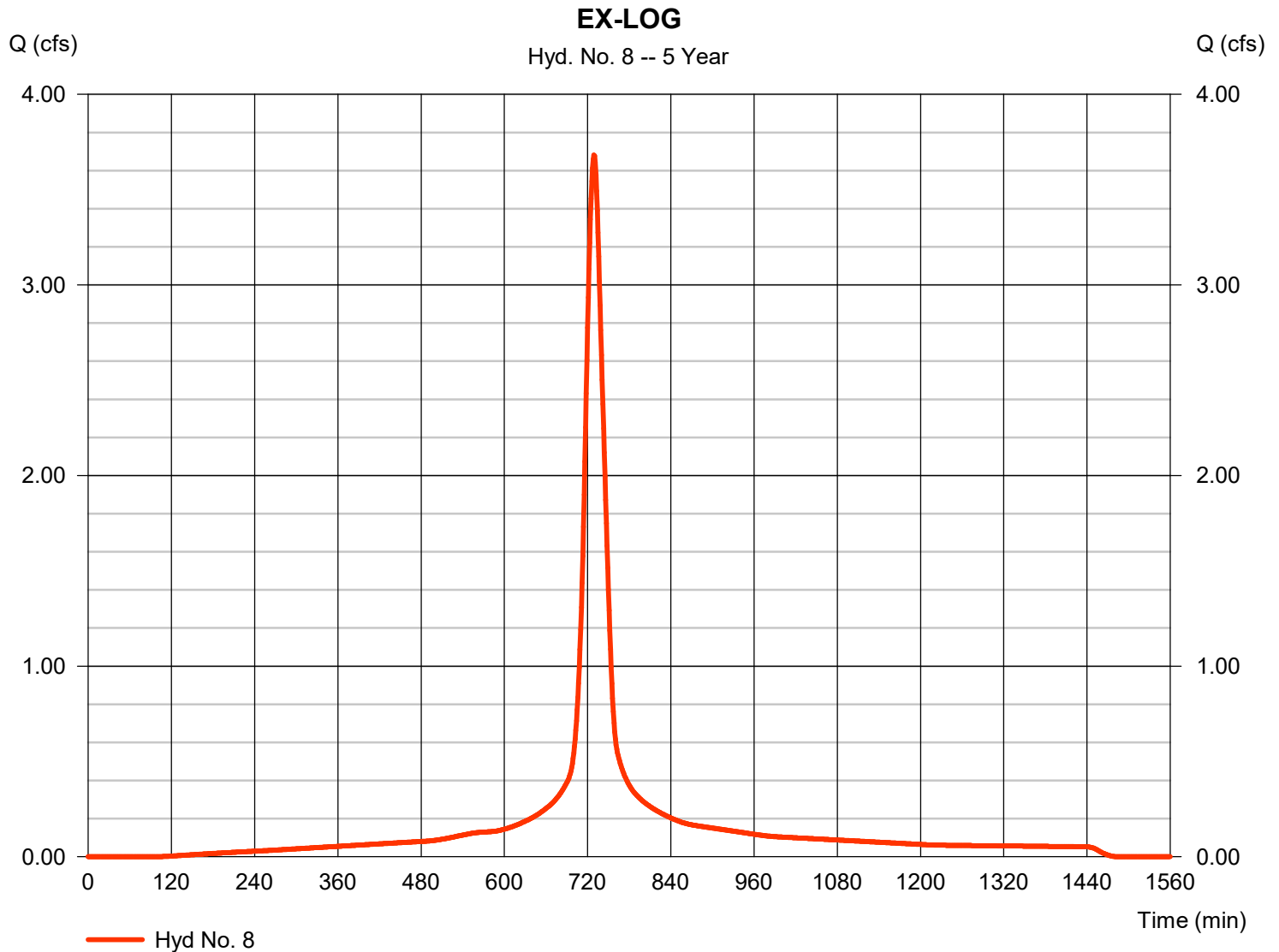
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 8

### EX-LOG

Hydrograph type	= SCS Runoff	Peak discharge	= 3.682 cfs
Storm frequency	= 5 yrs	Time to peak	= 729 min
Time interval	= 1 min	Hyd. volume	= 15,373 cuft
Drainage area	= 1.800 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.06 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 8

EX-LOG

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>						
Manning's n-value	= 0.013		0.011		0.011	
Flow length (ft)	= 11.0		0.0		0.0	
Two-year 24-hr precip. (in)	= 2.20		0.00		0.00	
Land slope (%)	= 2.00		0.00		0.00	
<b>Travel Time (min)</b>	<b>= 0.29</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 0.29</b>
<b>Shallow Concentrated Flow</b>						
Flow length (ft)	= 2592.00		0.00		0.00	
Watercourse slope (%)	= 1.00		0.00		0.00	
Surface description	= Unpaved		Paved		Paved	
Average velocity (ft/s)	=1.61		0.00		0.00	
<b>Travel Time (min)</b>	<b>= 26.77</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 26.77</b>
<b>Channel Flow</b>						
X sectional flow area (sqft)	= 0.00		0.00		0.00	
Wetted perimeter (ft)	= 0.00		0.00		0.00	
Channel slope (%)	= 0.00		0.00		0.00	
Manning's n-value	= 0.015		0.015		0.015	
Velocity (ft/s)	=0.00		0.00		0.00	
Flow length (ft)	{{0}}0.0		0.0		0.0	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>						<b>27.06 min</b>

# Hydrograph Report

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

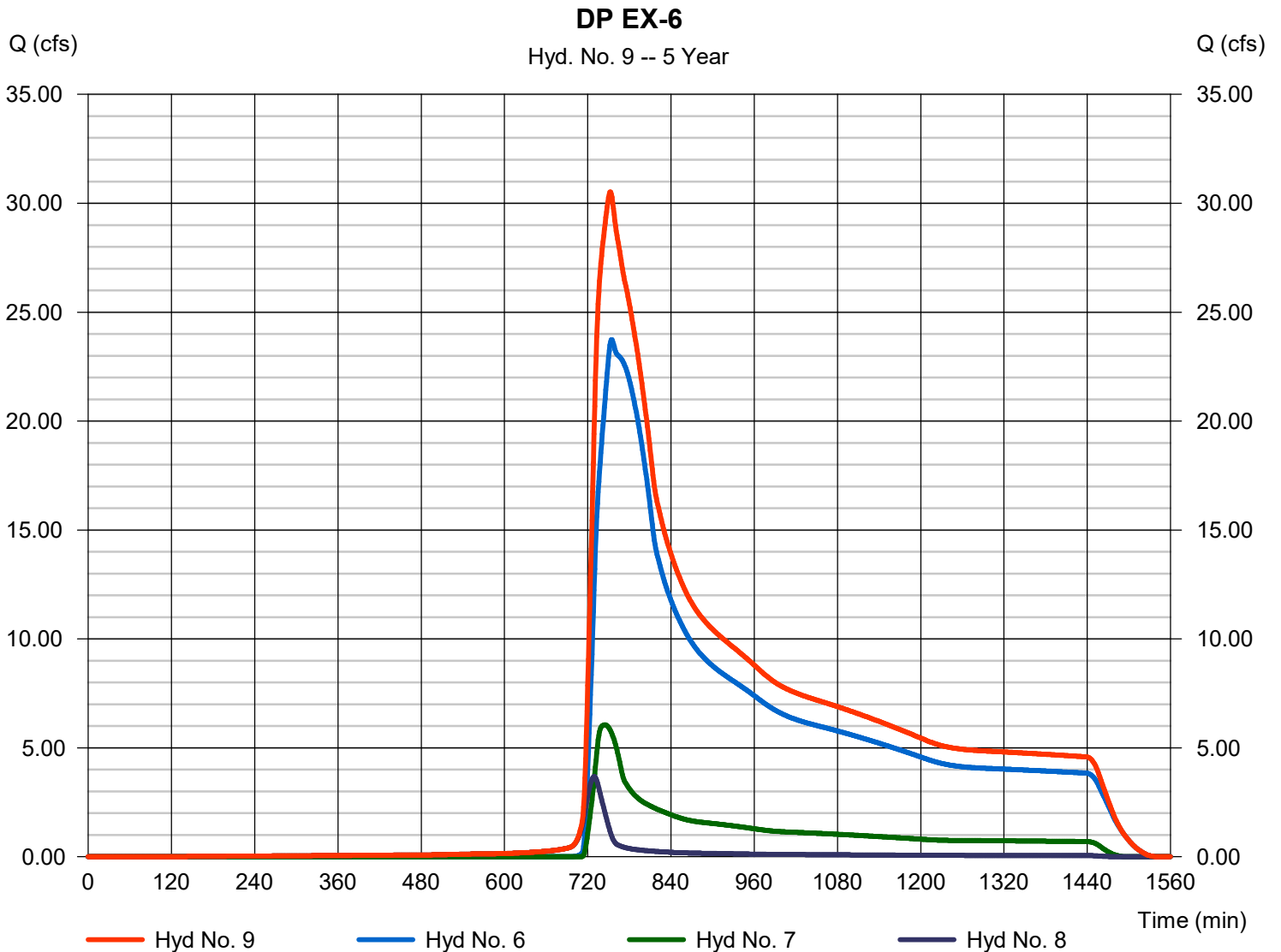
Thursday, 01 / 5 / 2023

## Hyd. No. 9

DP EX-6

Hydrograph type = Combine  
Storm frequency = 5 yrs  
Time interval = 1 min  
Inflow hyds. = 6, 7, 8

Peak discharge = 30.51 cfs  
Time to peak = 752 min  
Hyd. volume = 422,497 cuft  
Contrib. drain. area = 77.800 ac

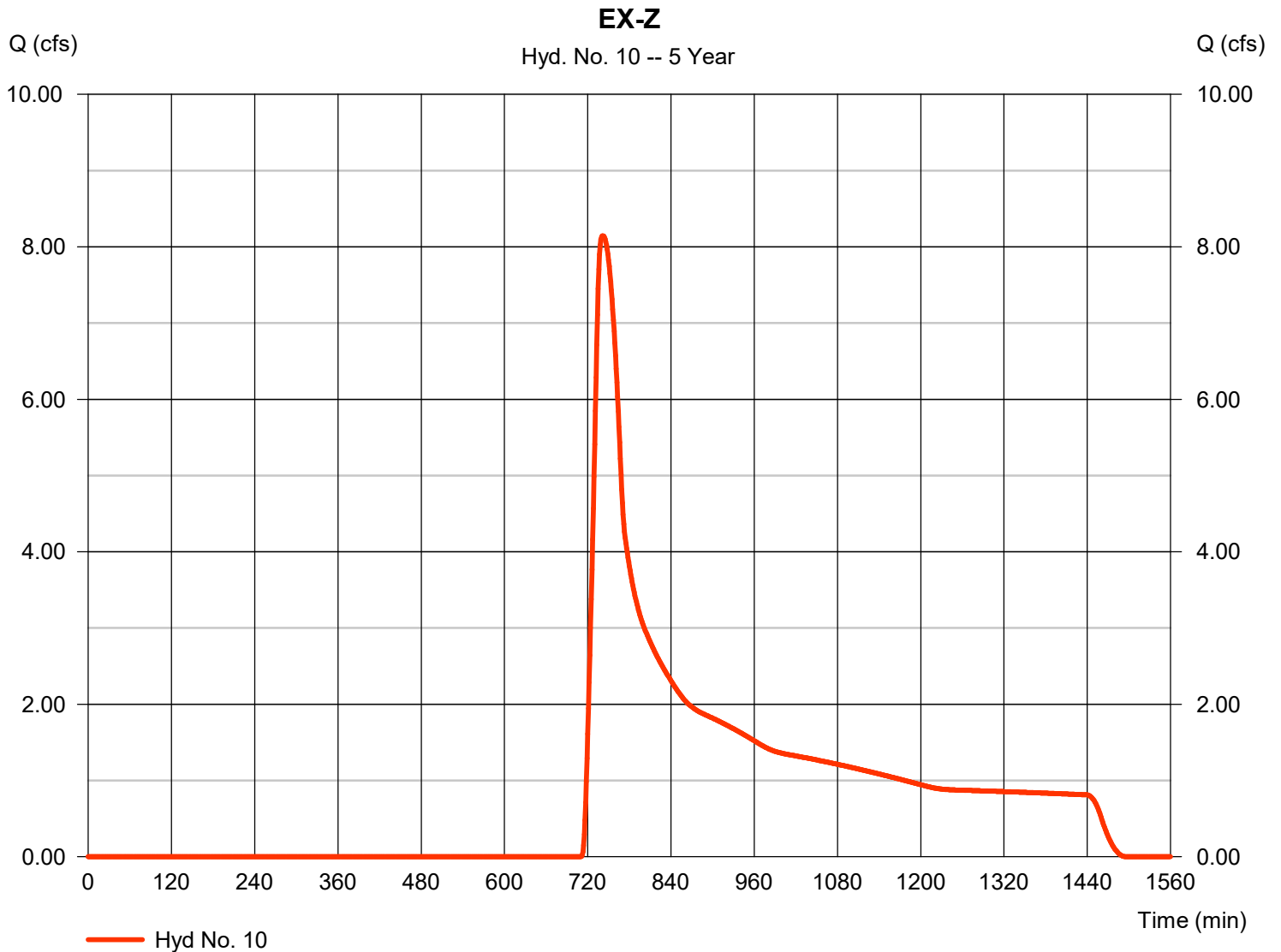


# Hydrograph Report

## Hyd. No. 10

EX-Z

Hydrograph type	= SCS Runoff	Peak discharge	= 8.146 cfs
Storm frequency	= 5 yrs	Time to peak	= 742 min
Time interval	= 1 min	Hyd. volume	= 76,284 cuft
Drainage area	= 83.500 ac	Curve number	= 62
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.00 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 10

EX-Z

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>		<u>Totals</u>	
<b>Sheet Flow</b>								
Manning's n-value	= 0.030		0.011		0.011			
Flow length (ft)	= 300.0		0.0		0.0			
Two-year 24-hr precip. (in)	= 2.20		0.00		0.00			
Land slope (%)	= 2.00		0.00		0.00			
<b>Travel Time (min)</b>	<b>= 7.85</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>7.85</b>	
<b>Shallow Concentrated Flow</b>								
Flow length (ft)	= 2627.00		0.00		0.00			
Watercourse slope (%)	= 1.00		0.00		0.00			
Surface description	= Unpaved		Paved		Paved			
Average velocity (ft/s)	=1.61		0.00		0.00			
<b>Travel Time (min)</b>	<b>= 27.14</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>27.14</b>	
<b>Channel Flow</b>								
X sectional flow area (sqft)	= 0.00		0.00		0.00			
Wetted perimeter (ft)	= 0.00		0.00		0.00			
Channel slope (%)	= 0.00		0.00		0.00			
Manning's n-value	= 0.015		0.015		0.015			
Velocity (ft/s)	=0.00		0.00		0.00			
Flow length (ft)	{{0}}0.0		0.0		0.0			
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>0.00</b>	
<b>Total Travel Time, Tc .....</b>							<b>=</b>	<b>35.00 min</b>



# Hydrograph Report

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

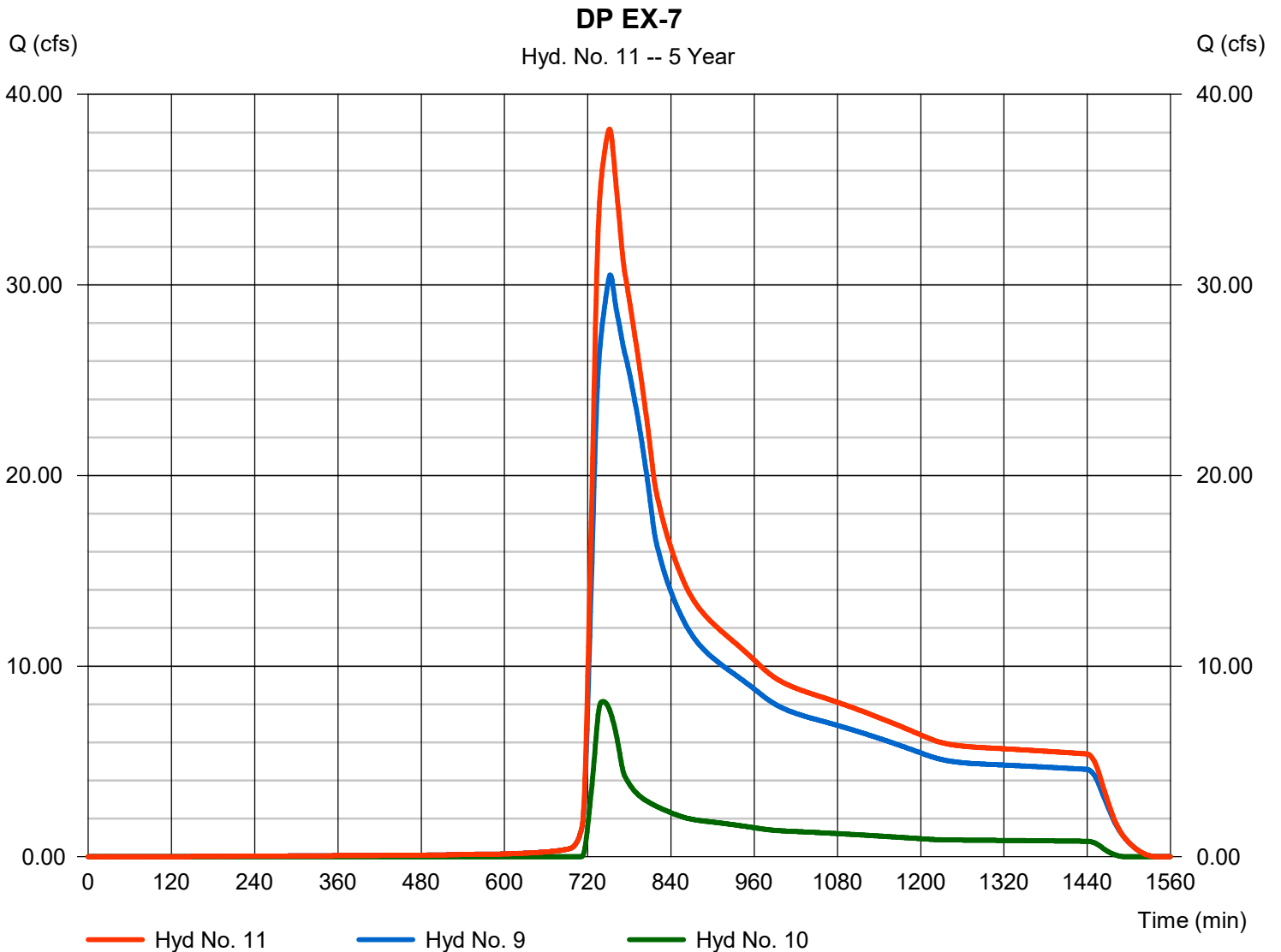
Thursday, 01 / 5 / 2023

## Hyd. No. 11

DP EX-7

Hydrograph type = Combine  
Storm frequency = 5 yrs  
Time interval = 1 min  
Inflow hyds. = 9, 10

Peak discharge = 38.16 cfs  
Time to peak = 751 min  
Hyd. volume = 498,780 cuft  
Contrib. drain. area = 83.500 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	144.67	1	755	1,185,497	-----	-----	-----	EC10
2	SCS Runoff	4.333	1	733	18,356	-----	-----	-----	OS-1
3	SCS Runoff	76.23	1	732	344,975	-----	-----	-----	EX-D1
4	SCS Runoff	12.54	1	725	42,259	-----	-----	-----	EX-D2
5	Combine	86.19	1	731	387,234	3, 4	-----	-----	TOTAL ONSITE FLOW
6	Combine	183.85	1	749	1,548,829	1, 2, 3,	-----	-----	DP EX-5
7	SCS Runoff	53.32	1	736	282,485	-----	-----	-----	EX-E
8	SCS Runoff	6.317	1	729	27,009	-----	-----	-----	EX-LOG
9	Combine	231.35	1	745	1,858,321	6, 7, 8	-----	-----	DP EX-6
10	SCS Runoff	63.40	1	736	328,266	-----	-----	-----	EX-Z
11	Combine	289.85	1	740	2,186,588	9, 10	-----	-----	DP EX-7
SCS ROUTING - Existing Downstream Analysis Report					Return Period: 100 Year			Thursday, 01 / 5 / 2023	

# Hydrograph Report

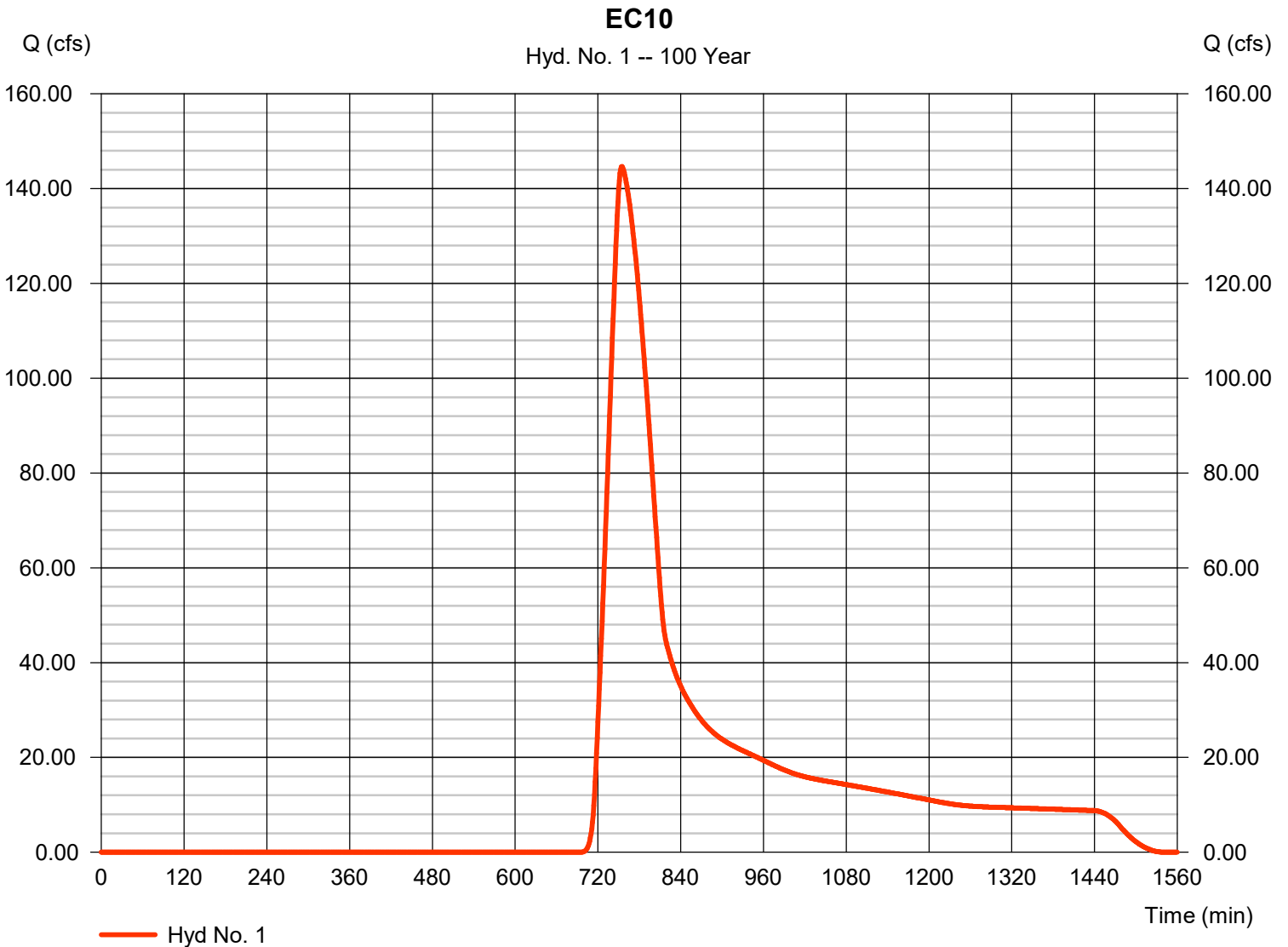
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 1

EC10

Hydrograph type	= SCS Runoff	Peak discharge	= 144.67 cfs
Storm frequency	= 100 yrs	Time to peak	= 755 min
Time interval	= 1 min	Hyd. volume	= 1,185,497 cuft
Drainage area	= 320.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 63.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

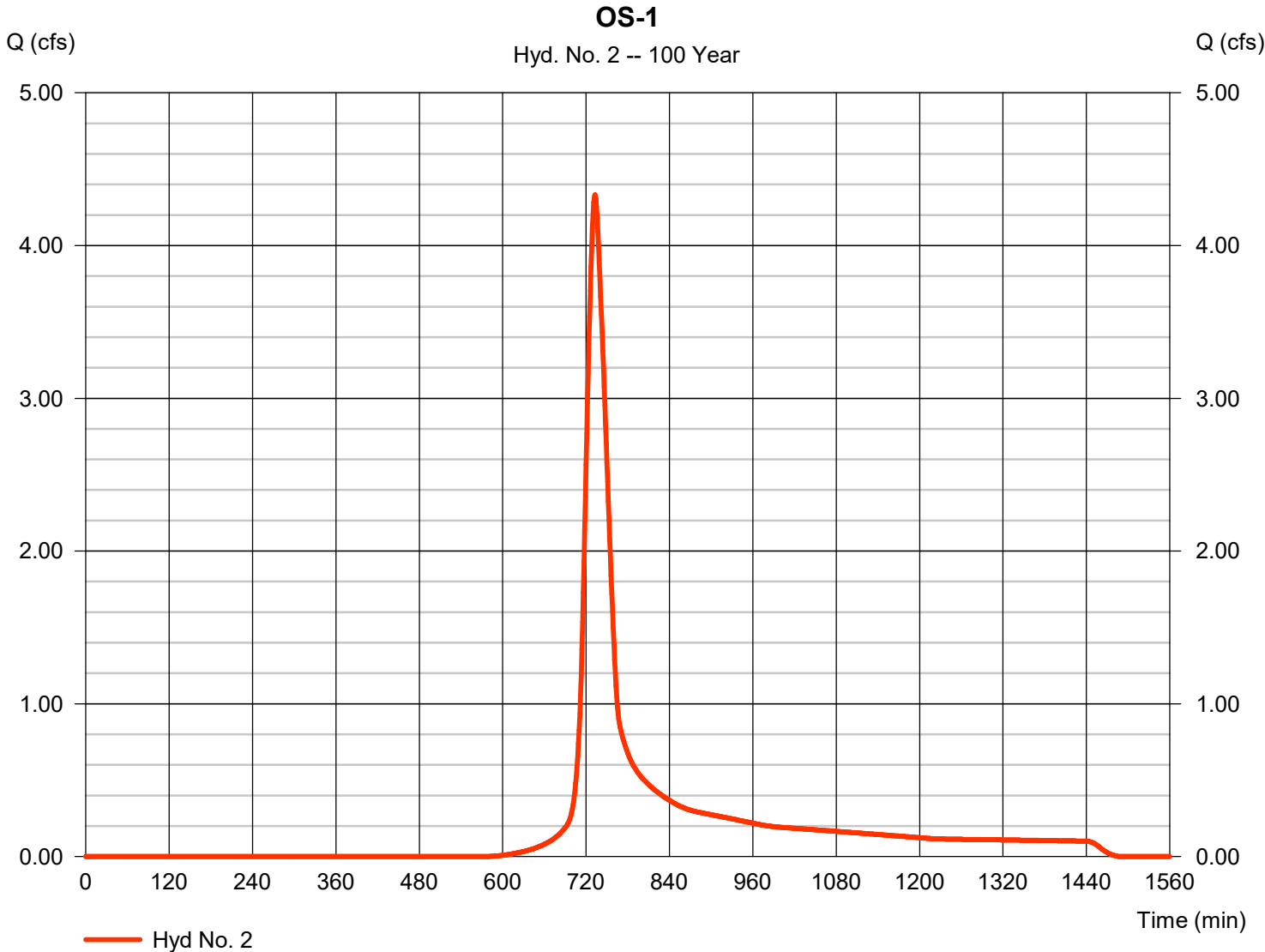


# Hydrograph Report

## Hyd. No. 2

OS-1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.333 cfs
Storm frequency	= 100 yrs	Time to peak	= 733 min
Time interval	= 1 min	Hyd. volume	= 18,356 cuft
Drainage area	= 2.650 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

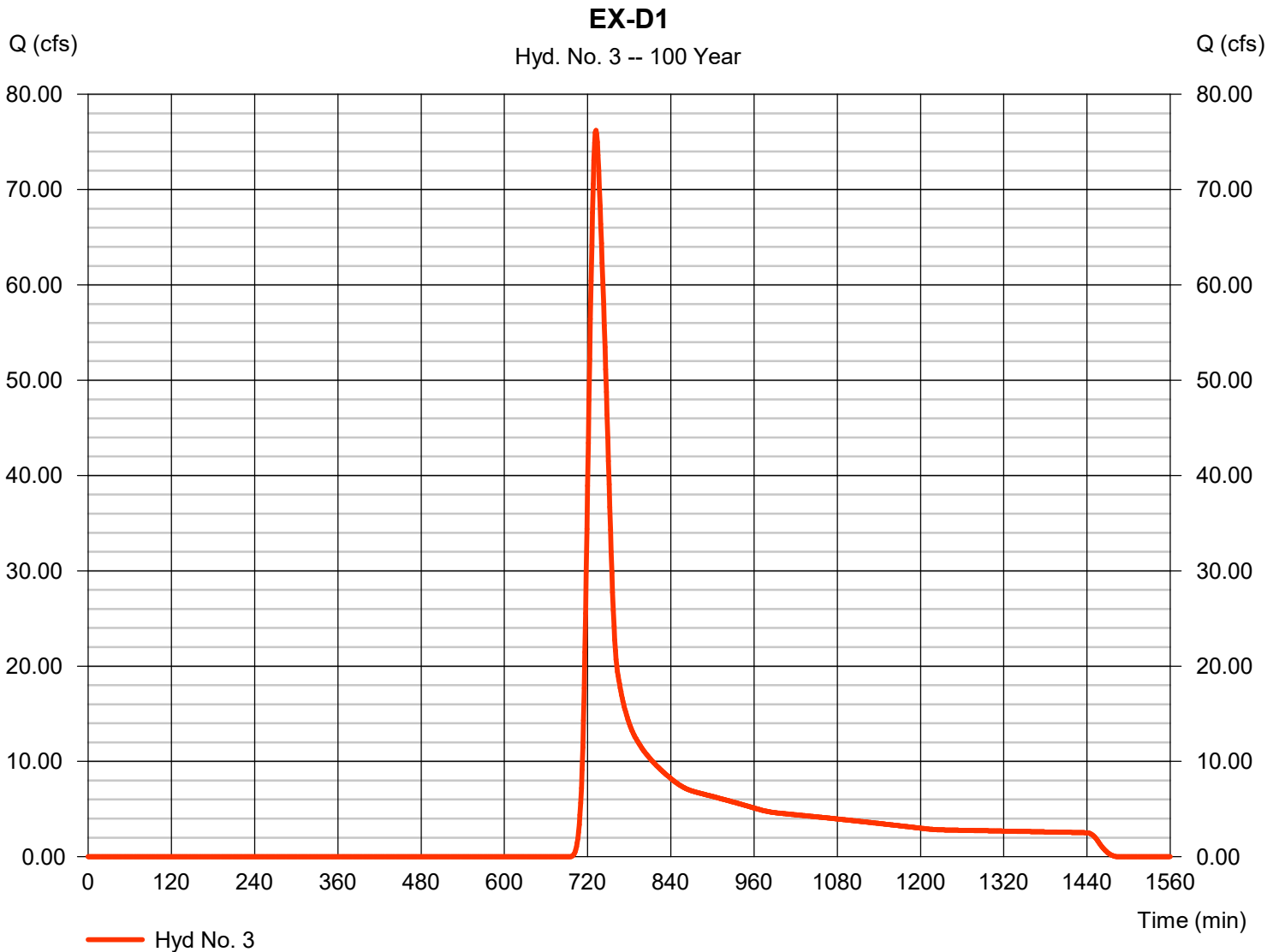
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 3

EX-D1

Hydrograph type	= SCS Runoff	Peak discharge	= 76.23 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 1 min	Hyd. volume	= 344,975 cuft
Drainage area	= 93.500 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 28.60 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

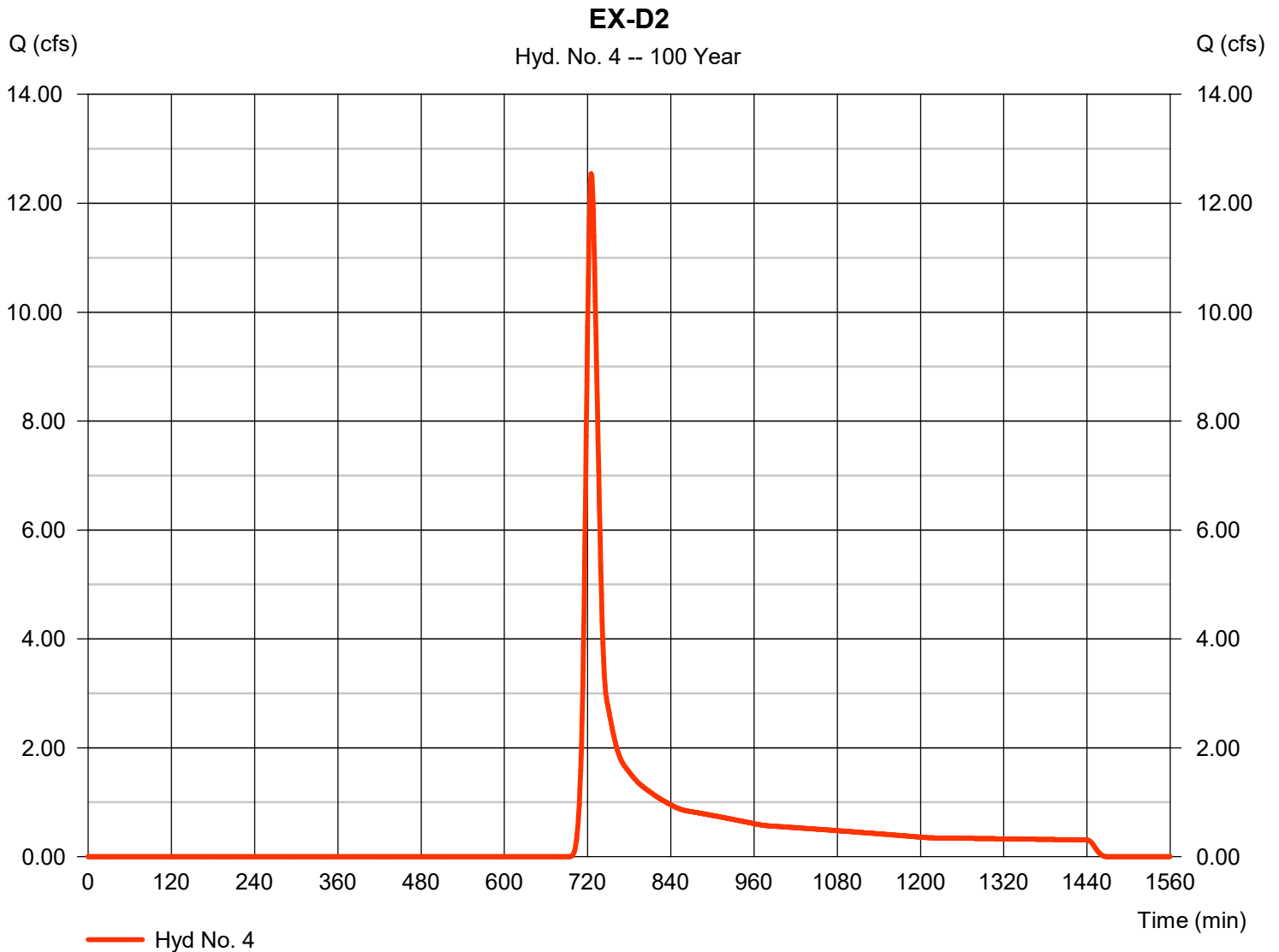


# Hydrograph Report

## Hyd. No. 4

EX-D2

Hydrograph type	= SCS Runoff	Peak discharge	= 12.54 cfs
Storm frequency	= 100 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 42,259 cuft
Drainage area	= 11.500 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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

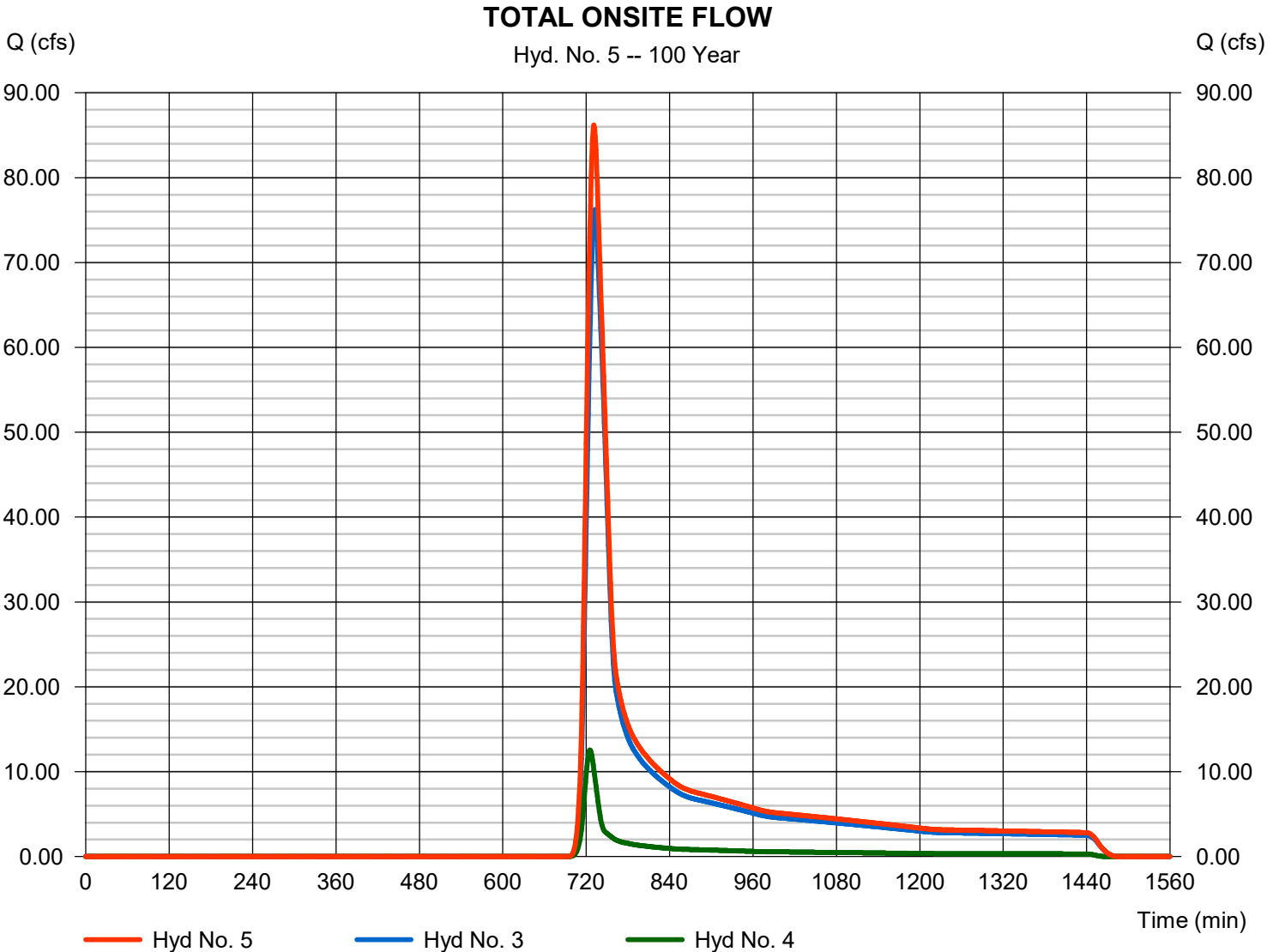
Thursday, 01 / 5 / 2023

## Hyd. No. 5

### TOTAL ONSITE FLOW

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 3, 4

Peak discharge = 86.19 cfs  
Time to peak = 731 min  
Hyd. volume = 387,234 cuft  
Contrib. drain. area = 105.000 ac



# Hydrograph Report

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

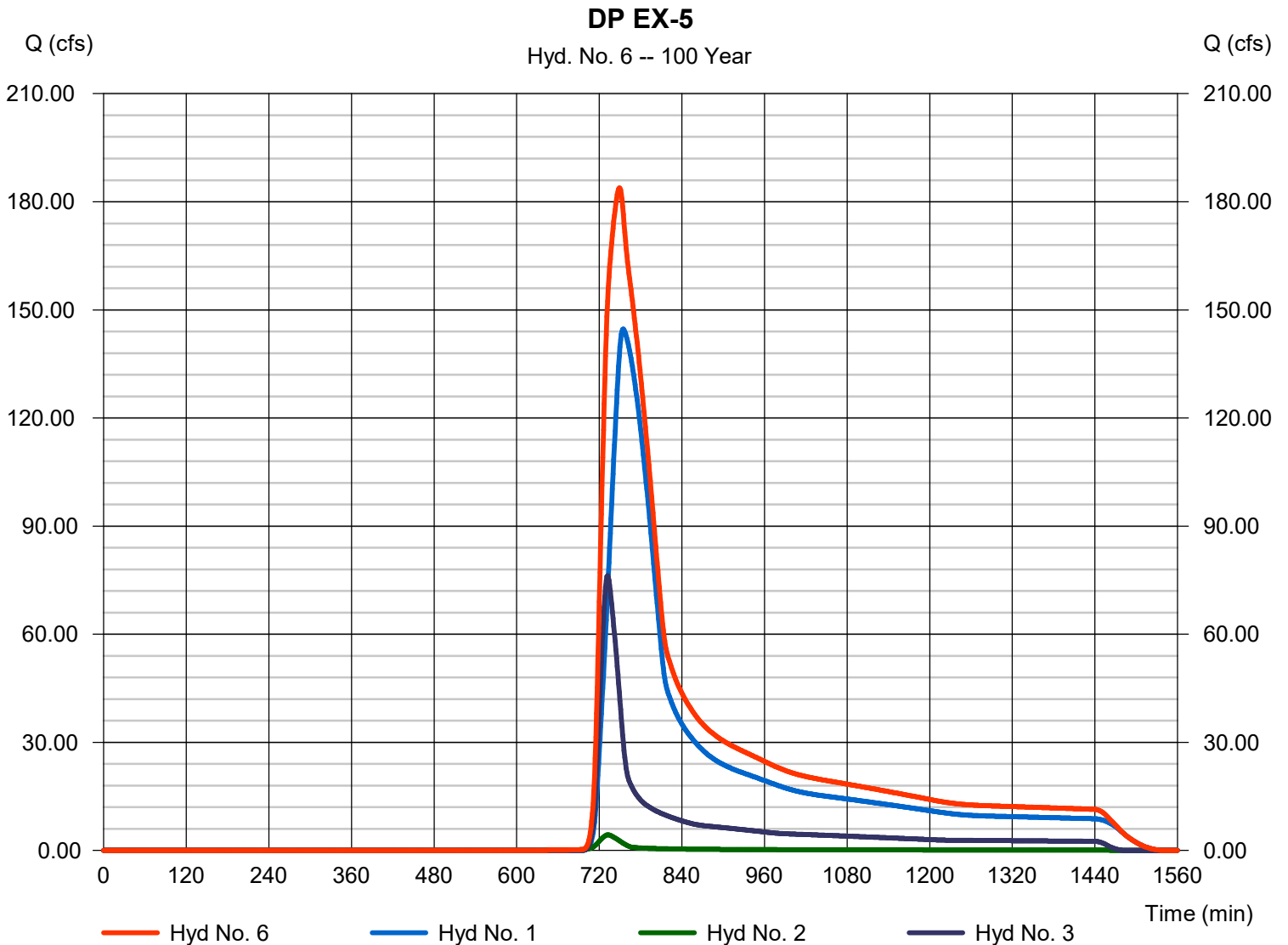
Thursday, 01 / 5 / 2023

## Hyd. No. 6

DP EX-5

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 1, 2, 3

Peak discharge = 183.85 cfs  
Time to peak = 749 min  
Hyd. volume = 1,548,829 cuft  
Contrib. drain. area = 416.150 ac



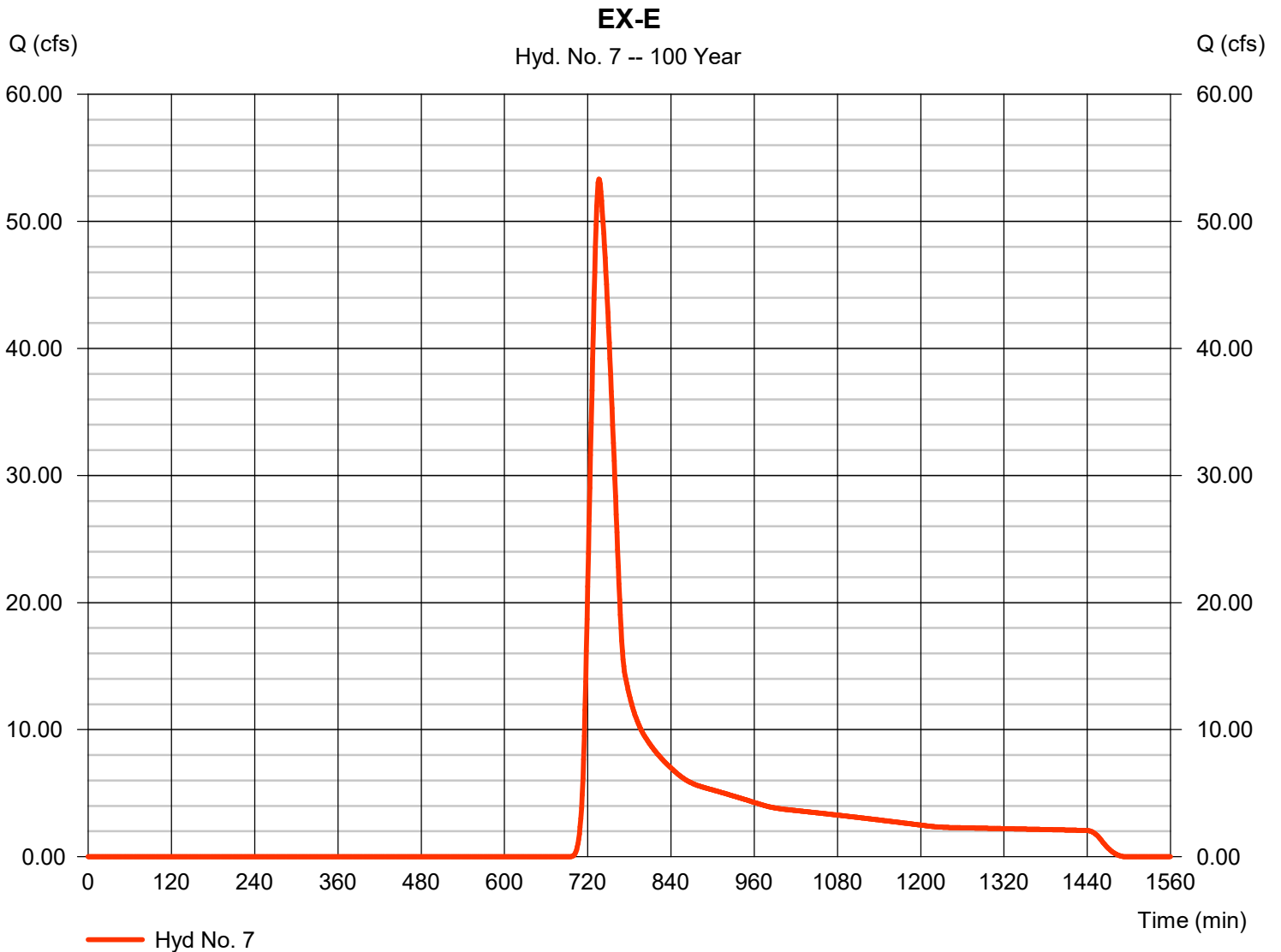


# Hydrograph Report

## Hyd. No. 7

EX-E

Hydrograph type	= SCS Runoff	Peak discharge	= 53.32 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 282,485 cuft
Drainage area	= 76.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 34.20 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

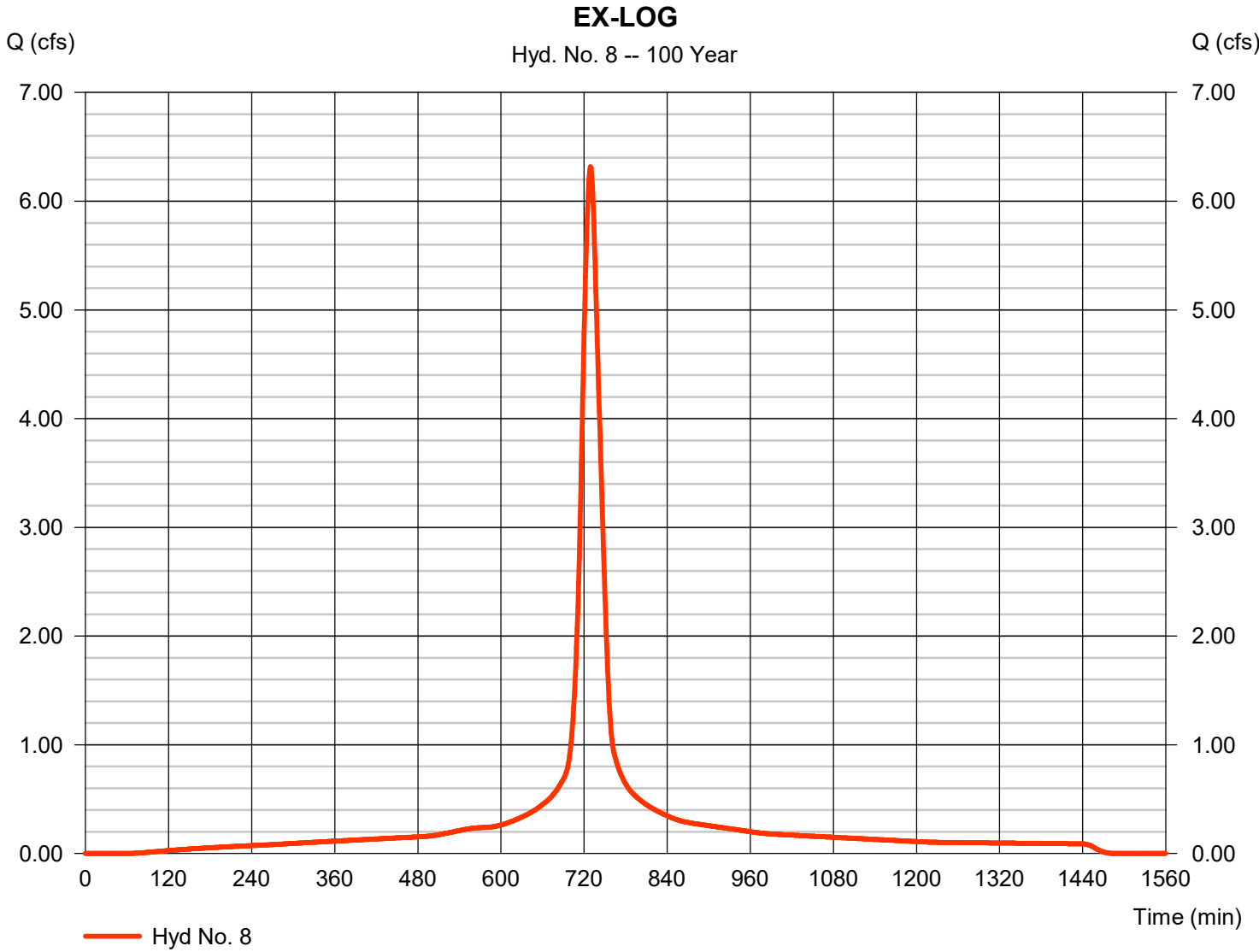
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 8

### EX-LOG

Hydrograph type	= SCS Runoff	Peak discharge	= 6.317 cfs
Storm frequency	= 100 yrs	Time to peak	= 729 min
Time interval	= 1 min	Hyd. volume	= 27,009 cuft
Drainage area	= 1.800 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.06 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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

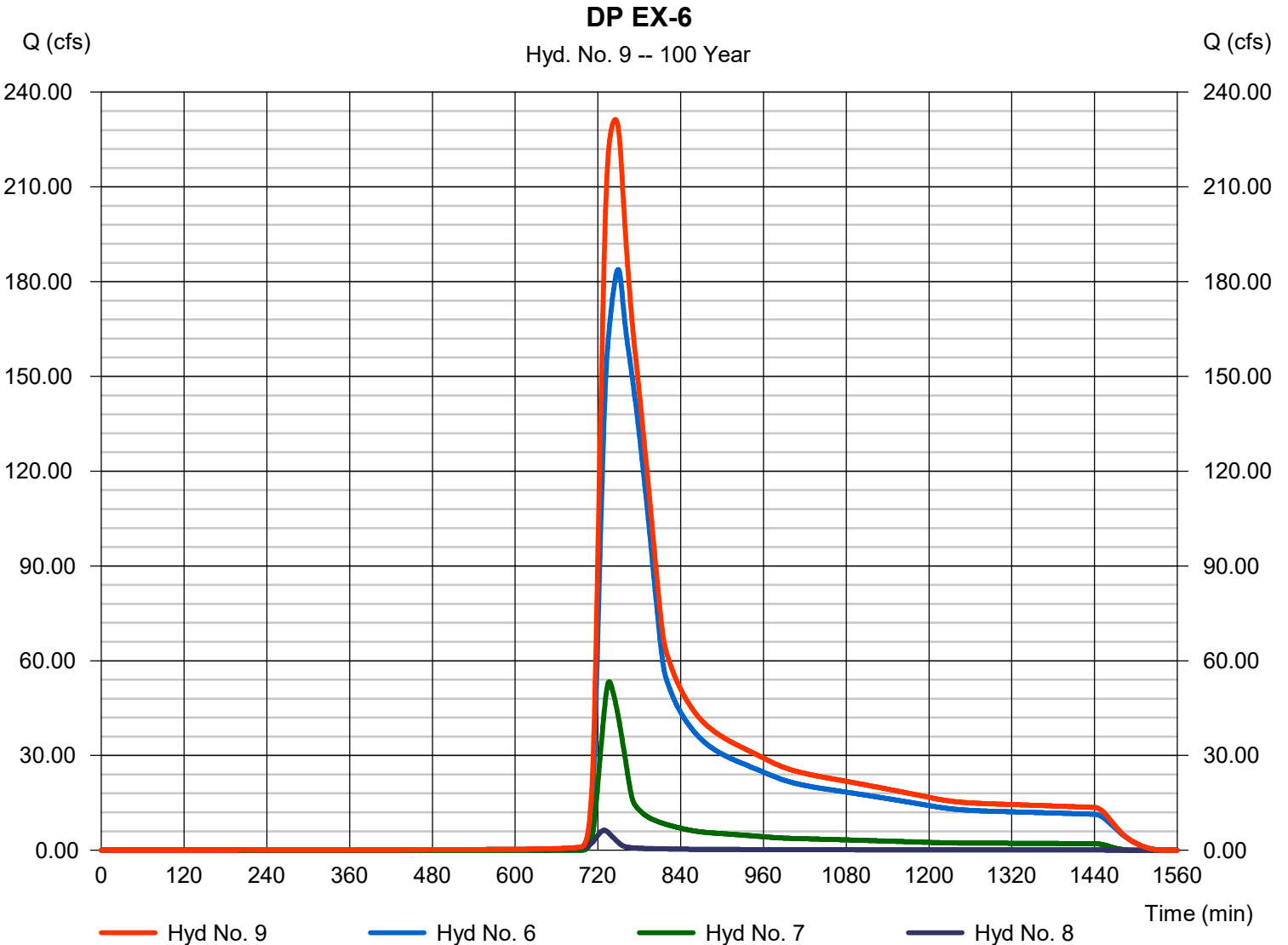
Thursday, 01 / 5 / 2023

## Hyd. No. 9

DP EX-6

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 6, 7, 8

Peak discharge = 231.35 cfs  
Time to peak = 745 min  
Hyd. volume = 1,858,321 cuft  
Contrib. drain. area = 77.800 ac

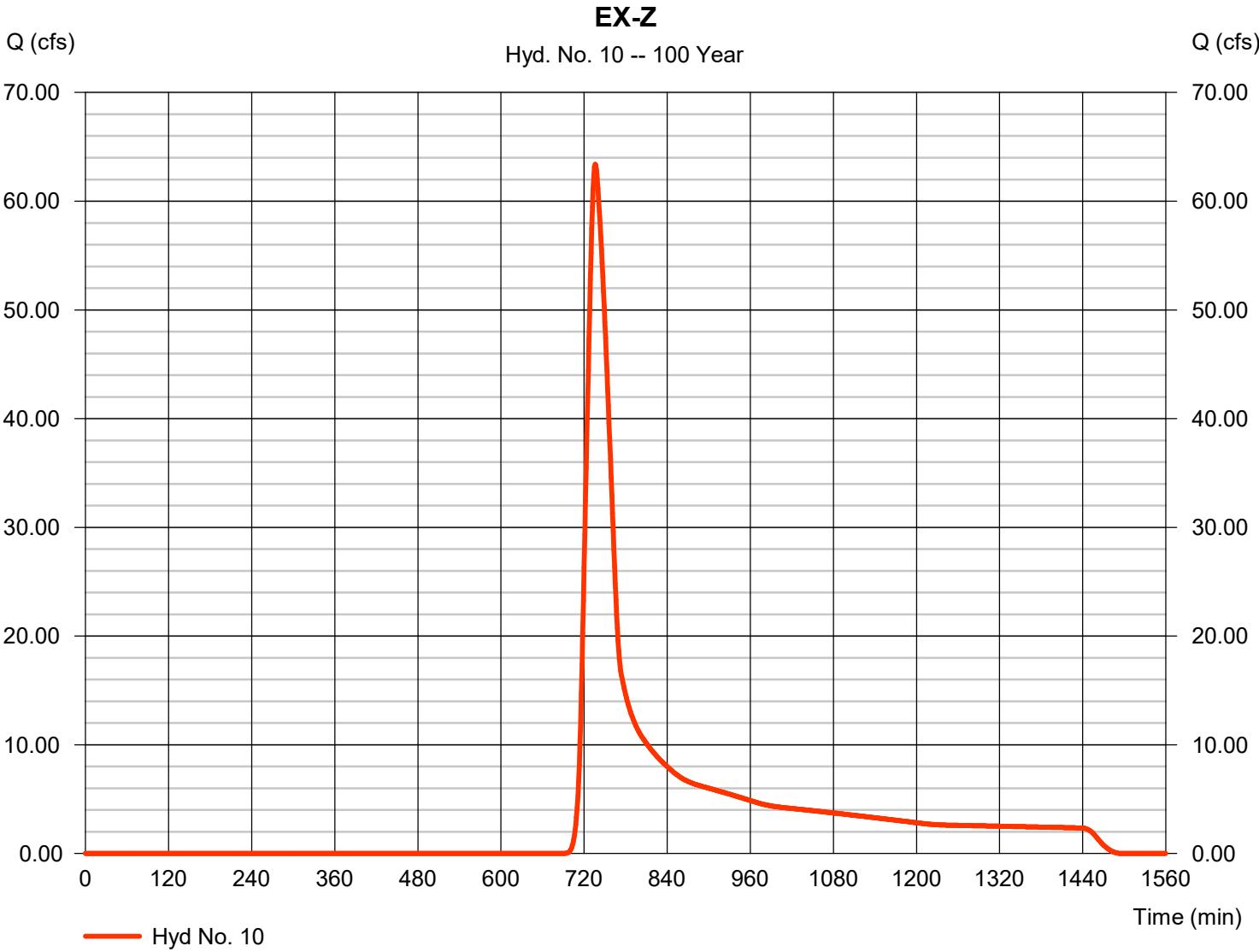


# Hydrograph Report

## Hyd. No. 10

EX-Z

Hydrograph type	= SCS Runoff	Peak discharge	= 63.40 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 328,266 cuft
Drainage area	= 83.500 ac	Curve number	= 62
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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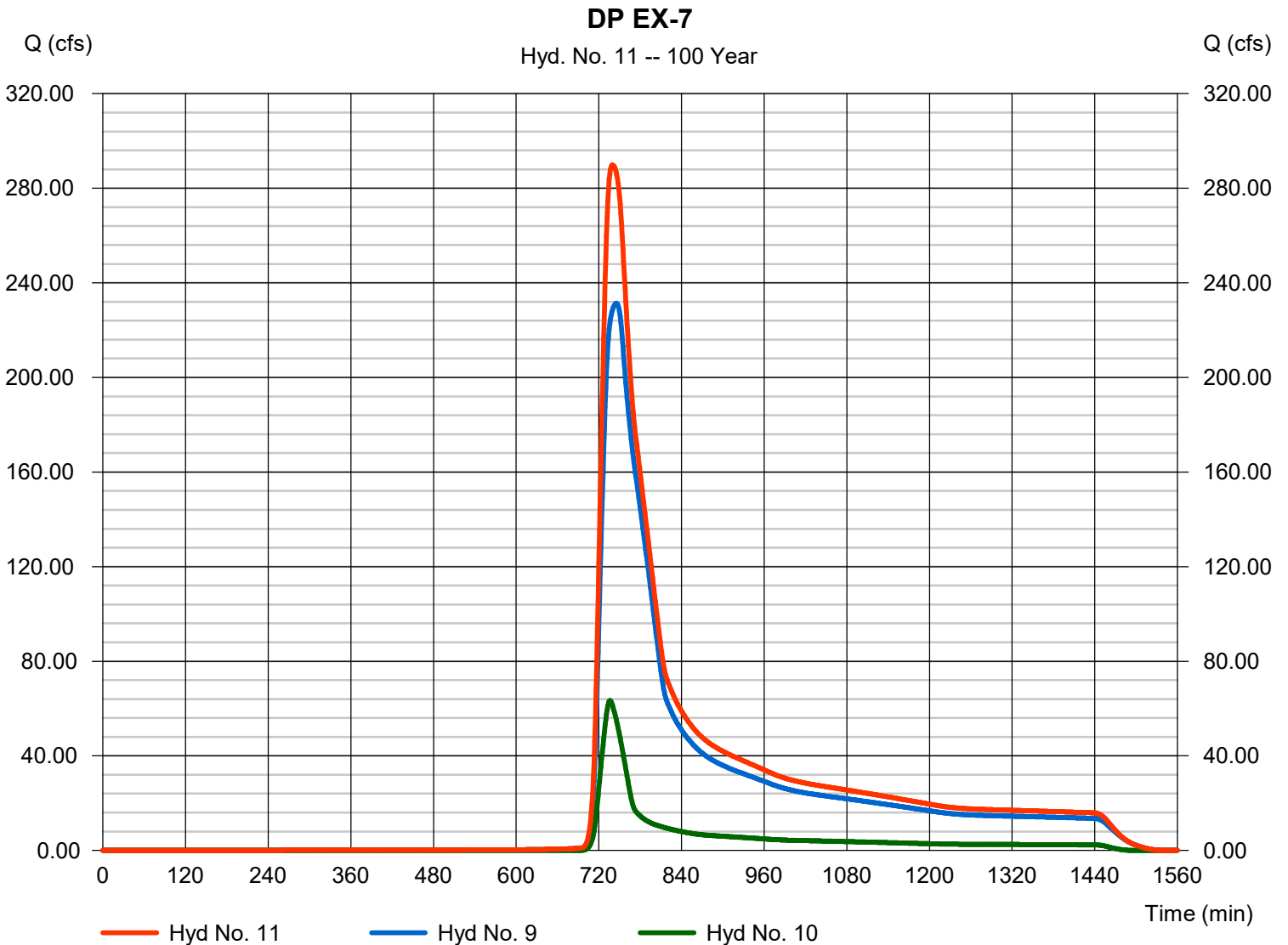
Thursday, 01 / 5 / 2023

## Hyd. No. 11

DP EX-7

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 9, 10

Peak discharge = 289.85 cfs  
Time to peak = 740 min  
Hyd. volume = 2,186,588 cuft  
Contrib. drain. area = 83.500 ac



# Hydraflow Rainfall Report

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

Thursday, 01 / 5 / 2023

Precip. file name: Sample.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		2.20		2.60				4.40

POST-DEVELOPMENT C VALUES

Designer: ESJ  
 Company: R&R Engineers-Surveyors  
 Date: 1/5/2023  
 Project: Mayberry Filing 3  
 Location: El Paso County



Global Parameters <sup>1</sup>			
Land Use	% Imp.	C <sub>5</sub>	C <sub>100</sub>
SF LOTS (1/6 AC)	47.5	0.375	0.545
Hardscape	100	0.9	0.96
Commercial	95	0.81	0.88
Landscape/Park	2	0.08	0.35

Summary	
Total Area (ac)	561.92
Composite Impervious	33.1%
Cells of this color are for required user-input	
Cells of this color are for optional user-input	

<sup>1</sup> From Table 6-6 in El Paso County DCM

<sup>2</sup> From Table 6-6 in El Paso County DCM

Basin Name	Area (ac)	NRCS Hydrologic Soil Group	SF LOTS (1/6 AC)		Hardscape		Commercial		Landscape/Park		% Check	Percent Imperviousness	Runoff Coefficient, C <sup>2</sup>						
			Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%			2-yr	5-yr	10-yr	25-yr	100-yr		
C2.1	0.77	A	0.77	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%				0.38			0.55
C2.2	0.33	A	0.33	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%				0.38			0.55
C2.3	1.81	A	1.81	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%				0.38			0.55
C2.4	1.16	A	0.00	0.0%	0.93	80.0%	0.00	0.0%	0.23	20.0%	100.00%	80%				0.74			0.84
C2.5	9.61	A	9.61	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%				0.38			0.55
C3.0	35.40	A	17.70	50.0%	0.00	0.0%	0.00	0.0%	17.70	50.0%	100.00%	25%				0.23			0.45
D1.1	1.73	A	0.00	0.0%	0.00	0.0%	1.73	100.0%	0.00	0.0%	100.00%	95%				0.81			0.88
D1.2	2.56	A	2.56	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%				0.38			0.55
D1.3	2.02	A	2.02	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%				0.38			0.55
D1.4	3.75	A	3.52	93.9%	0.00	0.0%	0.23	6.1%	0.00	0.0%	100.00%	50%				0.40			0.57
D1.5	9.88	A	0.00	0.0%	0.00	0.0%	9.88	100.0%	0.00	0.0%	100.00%	95%				0.81			0.88
D1.6	1.96	A	1.96	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%				0.38			0.55
D1.7	1.56	A	1.56	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%				0.38			0.55
D1.8	1.27	A	1.27	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%				0.38			0.55
D1.9	0.54	A	0.54	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%				0.38			0.55
D1.10	2.13	A	2.13	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%				0.38			0.55
D1.11	1.23	A	0.00	0.0%	0.98	80.0%	0.00	0.0%	0.25	20.0%	100.00%	80%				0.74			0.84
D1.12	3.42	A	3.42	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%				0.38			0.55
D1.13	3.07	A	0.00	0.0%	0.00	0.0%	3.07	100.0%	0.00	0.0%	100.00%	95%				0.81			0.88
D1.14	0.91	A	0.60	65.9%	0.00	0.0%	0.31	34.1%	0.00	0.0%	100.00%	64%				0.52			0.66
D2.0	11.90	A	9.50	79.8%	0.00	0.0%	0.00	0.0%	2.40	20.2%	100.00%	38%				0.32			0.51
E1	3.92	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	3.92	100.0%	100.00%	2%				0.08			0.35
D2.1	3.15	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	3.15	100.0%	100.00%	2%				0.08			0.35
OS-1	2.65	A	0.00	0.0%	0.91	34.3%	0.00	0.0%	1.74	65.7%	100.00%	36%				0.36			0.56
C Basins	49.08	A	30.22	61.6%	0.93	1.9%	0.00	0.0%	17.93	36.5%	100.00%	32%				0.28			0.48
D Basins	51.08	A	29.08	56.9%	0.98	1.9%	15.22	29.8%	2.65	5.2%	93.83%	57%				0.48			0.61
Pond - Developed	100.16	A	59.30	59.2%	1.91	1.9%	15.22	15.2%	20.58	20.5%	96.86%	45%				0.38			0.55
D1.5 (pre-dev)	9.88	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	9.88	100.0%	100.00%	2%				0.08			0.35
D2.0 (pre-dev)	11.90	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	11.90	100.0%	100.00%	2%				0.08			0.35
C3.0 (pre-dev)	35.40	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	35.40	100.0%	100.00%	2%				0.08			0.35
Pond - F2 & F3 Dev only	100.16	A	32.10	32.0%	1.91	1.9%	5.34	5.3%	60.81	60.7%	100.00%	23%							
*highlighted basins are tributary to Pond D in Interim condition																			
GALV	4.44	A	4.44	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%				0.38			0.55
C Basins - Pre Dev	49.08	A	12.52	25.5%	0.93	1.9%	0.00	0.0%	35.63	72.6%	100.00%	15.5%				0.17			0.41
D Basins - Pre Dev	47.93	A	19.58	40.9%	0.98	2.1%	5.34	11.1%	22.03	46.0%	100.00%	33.0%				0.30			0.50

**POST-DEVELOPMENT CN VALUES**

**Designer:** ESJ  
**Company:** R&R Engineers-Surveyors  
**Date:** 1/5/2023  
**Project:** Mayberry Filing 3  
**Location:** El Paso County



Global Parameters <sup>1</sup>	
Land Use	CN
SF LOTS (1/6 AC)	80
PASTURE - GOOD	61
COMMERCIAL	92
OPEN SPACE - GOOD	61
PAVED STREETS	98

Basin Name	Area (ac)	NRCS Hydrologic Soil Group	SF LOTS (1/6 AC)		PASTURE - GOOD		COMMERCIAL		OPEN SPACE - GOOD		PAVED STREETS		% Check	SCS CN
			Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%		CN
E1	3.92	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	3.92	100.0%	0.00	0.0%	100.00%	61
EC10	320.00	A	0.00	0.0%	320.00	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	61
D1.5 (pre-dev)	9.88	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	9.88	100.0%	0.00	0.0%	100.00%	61
OS-1	2.65	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	1.74	65.7%	0.91	34.3%	100.00%	74



## TIME OF CONCENTRATION

Designer: ESJ
Company: R&R Engineers-Surveyors
Date: 1/5/2023
Project: Mayberry Filing 3
Location: El Paso County

$$t_i = \frac{0.395(1.1 - C_s)\sqrt{L_i}}{S_i^{0.33}}$$

$$\text{Computed } t_c = t_i + t_t$$

$$t_{\text{minimum}} = 5 \text{ (urban)}$$

$$t_{\text{minimum}} = 10 \text{ (non-urban)}$$

Non Urban Li max = 300'  
Urban Li Max = 100'

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

$$\text{Selected } t_c = \max\{t_{\text{minimum}}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$$

$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Cells of this color are for required user-input



Subbasin Data				Overland (Initial) Flow Time			Channelized (Travel) Flow Time					Time of Concentration			Remarks
Basin	Area	% Impervious	C5	Overland Flow Length L <sub>i</sub> (ft)	Overland Flow Slope S <sub>i</sub> (ft/ft)	Overland Flow Time t <sub>i</sub> (min)	Channelized Flow Length L <sub>t</sub> (ft)	Channelized Flow Slope S <sub>t</sub> (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V <sub>t</sub> (ft/sec)	Channelized Flow Time t <sub>t</sub> (min)	Computed t <sub>c</sub> (min)	Regional t <sub>c</sub> (min)	Selected t <sub>c</sub> (min)	
C2.1	0.77	47.5%	0.38	100.00	0.020	10.41	242.00	0.020	20	2.83	1.43	11.84	19.75	11.84	
C2.2	0.33	47.5%	0.38	36.00	0.020	6.25	152.00	0.020	20	2.83	0.90	7.14	19.07	7.14	
C2.3	1.81	47.5%	0.38	100.00	0.020	10.41	1033.00	0.010	20	2.00	8.61	19.02	28.93	19.02	
C2.4	1.16	80.4%	0.74	12.00	0.020	1.81	534.00	0.009	20	1.90	4.69	6.50	16.96	6.50	
C2.5	9.61	47.5%	0.38	36.00	0.020	6.25	513.00	0.007	20	1.67	5.11	11.36	24.45	11.36	
C3.0	35.40	24.8%	0.23	100.00	0.020	12.53	1536.00	0.010	20	2.00	12.80	25.33	42.33	25.33	
D1.1	1.73	95.0%	0.81	100.00	0.020	4.17	405.00	0.020	20	2.83	2.39	6.55	11.99	6.55	
D1.2	2.56	47.5%	0.38	100.00	0.020	10.41	533.00	0.010	20	2.00	4.44	14.86	23.60	14.86	
D1.3	2.02	47.5%	0.38	36.00	0.020	6.25	495.00	0.010	20	2.00	4.13	10.37	23.20	10.37	
D1.4	3.75	50.4%	0.40	100.00	0.020	10.03	634.00	0.014	20	2.37	4.47	14.50	22.99	14.50	
D1.5	9.88	95.0%	0.81	100.00	0.020	4.17	856.00	0.010	20	2.00	7.13	11.30	16.25	11.30	
D1.6	1.96	47.5%	0.38	100.00	0.020	10.41	534.00	0.010	20	2.00	4.45	14.86	23.61	14.86	
D1.7	1.56	47.5%	0.38	100.00	0.020	10.41	530.00	0.010	20	2.00	4.42	14.83	23.57	14.83	
D1.8	1.27	47.5%	0.38	100.00	0.020	10.41	325.00	0.010	20	2.00	2.71	13.12	21.39	13.12	
D1.9	0.54	47.5%	0.38	36.00	0.020	6.25	389.00	0.010	20	2.00	3.24	9.49	22.07	9.49	
D1.10	2.13	47.5%	0.38	36.00	0.020	6.25	465.00	0.010	20	2.00	3.88	10.12	22.88	10.12	
D1.11	1.23	80.4%	0.74	12.00	0.020	1.81	962.00	0.017	20	2.61	6.15	7.96	18.40	7.96	
D1.12	3.42	47.5%	0.38	100.00	0.020	10.41	1356.00	0.010	20	2.00	11.30	21.71	32.37	21.71	
D1.13	3.07	95.0%	0.81	100.00	0.020	4.17	456.00	0.008	20	1.79	4.25	8.41	13.66	8.41	
D1.14	0.91	63.7%	0.52	100.00	0.020	8.28	400.00	0.008	20	1.79	3.73	12.01	19.33	12.01	
D2.0	11.90	38.3%	0.32	100.00	0.020	11.27	1750.00	0.011	20	2.10	13.90	25.17	38.84	25.17	
D2.1	3.15	2.0%	0.08	100.00	0.021	14.42						14.42		14.42	
E1	3.92	2.0%	0.08				2811.00	0.008							Tc calculated using TR55 - see Hydraflow Hydrographs Model
EC10	320.00		0.08	300.00	0.020		5250.00	0.013							Tc calculated using TR55 - see Hydraflow Hydrographs Model
OS-1	2.65	35.7%	0.36	50.00	0.020		2525.00	0.007							Tc calculated using TR55 - see Hydraflow Hydrographs Model
GALV	4.44	47.5%	0.38	36.00	0.020	6.25	1007.00	0.010	20	2.00	8.39	14.64	28.65	14.64	
D2.0 (pre-dev)	11.90	2.0%	0.08	100.00	0.020	14.65	1750.00	0.011	20	2.10	13.90	28.56	55.63	28.56	
C3.0 (pre-dev)	35.40	2.0%	0.08	100.00	0.020	14.65	1536.00	0.010	20	2.00	12.80	27.45	53.25	27.45	

**PROPOSED STORM DRAINAGE SYSTEM DESIGN - 5-YEAR DESIGN STORM**



Designer: ESJ
Company: R&R Engineers-Surveyors
Date: 1/5/2023
Project: Mayberry Filing 3
Location: El Paso County

Cells of this color are for required user-input  
 Cells of this color are for optional user-input

$$I_s = -1.50 \ln(D) + 7.583$$

DESIGN POINT	STREET/ CONTRIBUTING BASINS	DIRECT RUNOFF							TOTAL RUNOFF					STREET BYPASS		PIPE			TRAVEL TIME				Remarks			
		Basin Name	Area (ac)	Coeff C	Tc (min)	C*A (ac)	I	Q (cfs)	Tc (min)	Sum Area (ac)	Sum C*A (ac)	I in/hr	Q cfs	Slope %	Street Q cfs	Design Q cfs	Slope %	PIPE SIZE	L ft	VEL ft/sec	Tt min	Q add'l				
		C2.1	0.77	0.38	11.8	0.29	3.88	1.12																		
1	C2.1								11.8	0.77	0.29	3.88	1.12							33	4	0.10				
		C2.2	0.33	0.38	7.1	0.12	4.63	0.57																		
2	DP1, C2.2								11.9	1.10	0.41	3.86	1.59							450	4	1.90				
		C2.5	9.61	0.38	11.4	3.60	3.94	14.19												10	4	0.00				
3A	C2.5								11.4	9.61	3.60	3.94	14.19							196	4	0.80				
		C2.3	1.81	0.38	19.0	0.68	3.16	2.15																		
3B	C2.3, DP3A								19.0	12.52	4.70	3.16	14.86							70	4	0.30				
		C2.4	1.16	0.74	6.5	0.85	4.77	4.08																		
4	C2.4, DP3B								19.3	13.68	5.55	3.14	17.43							1590	4	6.60				
		D1.12	3.42	0.38	21.7	1.28	2.97	3.80																		
5A	D1.12								21.7	3.42	1.28	2.97	3.80							72	4	0.30				
		D1.14	0.91	0.52	12.0	0.48	3.85	1.83																		
5B	D1.14, DP5A								22.0	4.33	1.76	2.95	5.18							28	4	0.10				
		D1.2	2.56	0.38	14.9	0.96	3.54	3.39																		
6	D1.2								14.9	2.56	0.96	3.54	3.39							10	4	0.00				
7A	DP5B, DP6								22.1	6.89	2.72	2.94	7.99													
		D1.13	3.07	0.81	8.4	2.49	4.39	10.91																		
7B	D1.13								8.4	3.07	2.49	4.39	10.91							150	4	0.60				
		D1.1	1.73	0.81	6.6	1.40	4.76	6.67																		
7C	D1.1								6.6	1.73	1.40	4.76	6.67							63	4	0.30				
7D	DP7B, DP7C								9.0	4.80	3.89	4.28	16.66													
7E	DP7D, DP7A								22.3	11.69	6.61	2.93	19.33													
		D1.3	2.02	0.38	10.4	0.76	4.07	3.09																		
8	D1.3								10.4	2.02	0.76	4.07	3.09							27	4	0.10				
9	DP7, DP8								24.41	13.71	7.36	2.79	20.55													
		D1.4	3.75	0.40	14.5	1.51	3.57	5.38																		
10	DP9, D1.4								24.41	17.5	8.9	2.79	24.75							827	4	3.40				
		EC10	320.00		0.0								18.43												Offsite flow, Input from Hydraflow Hydrographs, Calculated via SCS Method	
		OS-1	2.65		0.0								1.40												Offsite flow, Input from Hydraflow Hydrographs, Calculated via SCS Method	
		E1	3.92		0.0								0.30												Input from Hydraflow Hydrographs, Calculated via SCS Method	
11	EC10, OS-1, E1												18.90							2811.6	4	11.70			Input from Hydraflow Hydrographs, Calculated via SCS Method	



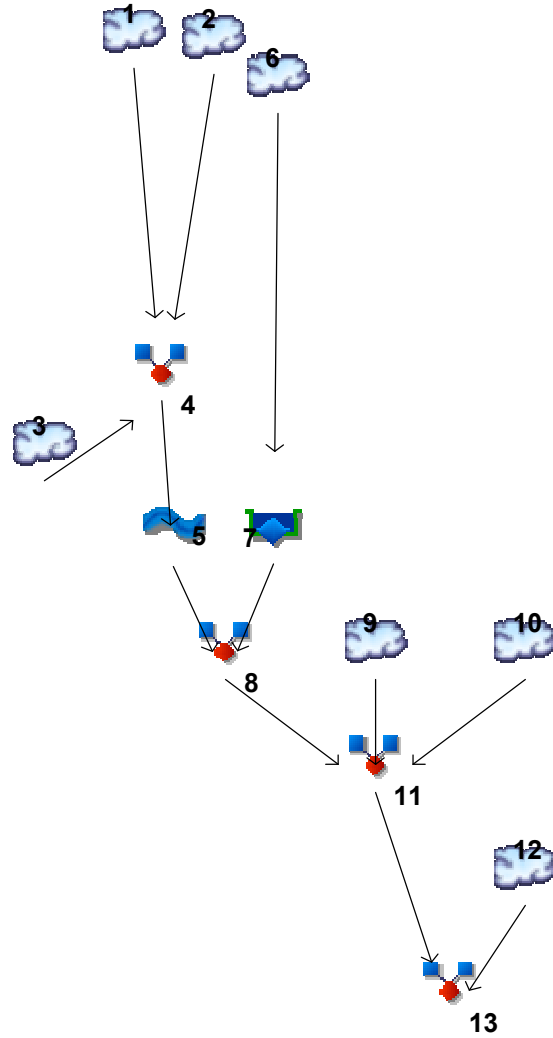


DESIGN POINT	STREET/ CONTRIBUTING BASINS	DIRECT RUNOFF							TOTAL RUNOFF					STREET BYPASS		PIPE			TRAVEL TIME				Remarks	
		Basin Name	Area (ac)	Coeff C	Tc (min)	C*A (ac)	I	Q (cfs)	Tc (min)	Sum Area (ac)	Sum C*A (ac)	I in/hr	Q cfs	Slope %	Street Q cfs	Design Q cfs	Slope %	PIPE SIZE	L ft	VEL ft/sec	Tt min	Q add'l		
12	D1.5							11.3	9.88	8.69	6.62	57.60						135	4	0.60				
		D1.6	1.96	0.55	14.9	1.07	5.93	6.3																
13	DP12, D1.6							14.86	11.8	9.8	5.93	57.93						35	4	0.10				
		D1.7	1.56	0.55	14.8	0.85	5.94	5.0																
14	DP13, D1.7							14.96	13.4	10.6	5.92	62.79						232	4	1.10				
		D1.8	1.27	0.55	13.1	0.69	6.25	4.3																
15	DP14, D1.8							16.06	14.7	11.3	5.74	64.87						35	4	0.10				
		D1.9	0.54	0.55	9.5	0.29	7.06	2.1																
16	DP15, D1.9							16.16	15.2	11.6	5.72	66.38						137	4	0.60				
		D1.10	2.13	0.55	10.1	1.16	6.90	8.0																
17	D1.10							10.12	2.1	1.2	6.90	8.01						20	4	0.10				
		D1.11	1.23	0.84	8.0	1.03	7.51	7.7										10	4	0.00				
18	D1.11, DP17, DP10							28.6	20.8	13.5	4.28	57.81						63	4	0.30				
19	DP16, DP18							28.9	36.0	25.1	4.26	106.83						1024	4	4.30			Total into upper Channel D	
		D2.0	11.9	0.51	25.2	6.02	4.61	27.7																
20	DP19, D2.0							33.21	47.9	31.1	3.91	121.58												
		C3.0	35.4	0.45	25.3	15.84	4.59	72.7																
21	DP4, C3.0							26.9	49.1	23.6	4.44	104.87												To channel C2
		D2.1	3.15	0.35	14.4	1.10	6.01	6.6																
22	D2.1, DP20, DP21							28.9	100.2	55.9	4.26	237.76			237.8									
23	POND D OUTFLOW											39.60												100 YEAR RELEASE RATE FOR POND D
24	CHANNEL E OUTFLOW											138.50												Input from Hydraflow Hydrographs, Calculated via SCS Method
EX5	DP23, DP24											177.50												Input from Hydraflow Hydrographs, Calculated via SCS Method
		GALV	4.44	0.55	14.6	2.42	5.97	14.5							14.5									
		D2.0 (pre-dev)	11.9	0.35	28.6	4.17	4.29	17.9																
		C3.0 (pre-dev)	35.4	0.35	27.5	12.39	4.39	54.4																
		D1.5 (pre-dev)	9.88	0.35	21.8	3.46	4.97	17.2																
20 - Pre Dev	DP4, C3.0 (pre-dev)							27.5	49.1	20.19	4.39	88.57			88.6									Used for sizing for interim forebay release rate
21 - Pre Dev	DP19, D2.0 Pre-Dev, D1.5 (pre-dev)							33.2	47.9	24.0	3.91	93.88			93.9									Used for sizing for interim forebay release rate

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# Watershed Model Schematic

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



## Legend

Hyd. Origin	Description
1	SCS Runoff EC10 - PRESENT
2	SCS Runoff E1
3	SCS Runoff OS-1
4	Combine DP11
5	Reach CHANNEL TO DP24
6	SCS Runoff BASIN D
7	Reservoir POND D
8	Combine EX-5
9	SCS Runoff EX-E
10	SCS Runoff EX-LOG
11	Combine EX-6
12	SCS Runoff EX-Z
13	Combine EX-7

# 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	18.43	1	772	262,007	-----	-----	-----	EC10 - PRESENT
2	SCS Runoff	0.320	1	742	3,200	-----	-----	-----	E1
3	SCS Runoff	1.349	1	734	6,442	-----	-----	-----	OS-1
4	Combine	18.93	1	771	271,649	1, 2, 3	-----	-----	DP11
5	Reach	17.61	1	789	271,640	4	-----	-----	CHANNEL TO DP24
6	SCS Runoff	61.50	1	730	256,733	-----	-----	-----	BASIN D
7	Reservoir	1.722	1	1443	150,906	6	6031.02	201,385	POND D
8	Combine	18.66	1	789	422,546	5, 7	-----	-----	EX-5
9	SCS Runoff	6.054	1	745	62,432	-----	-----	-----	EX-E
10	SCS Runoff	3.682	1	729	15,373	-----	-----	-----	EX-LOG
11	Combine	21.86	1	784	500,351	8, 9, 10	-----	-----	EX-6
12	SCS Runoff	8.146	1	742	76,284	-----	-----	-----	EX-Z
13	Combine	26.53	1	761	576,634	11, 12	-----	-----	EX-7

Basin D and Pond D (Hyd. #6 and #7) is included only to ensure Pond Release Rates are incorporated into the SCS model to accurately model downstream flows.

Please see the UD Detention printout in Appendix B for all release rate and volume analysis and the Rational Method printouts in this section for peak flow generations in areas tributary to Pond D

SCS ROUTING POST DEV.gpw	Return Period: 5 Year	Thursday, 01 / 5 / 2023
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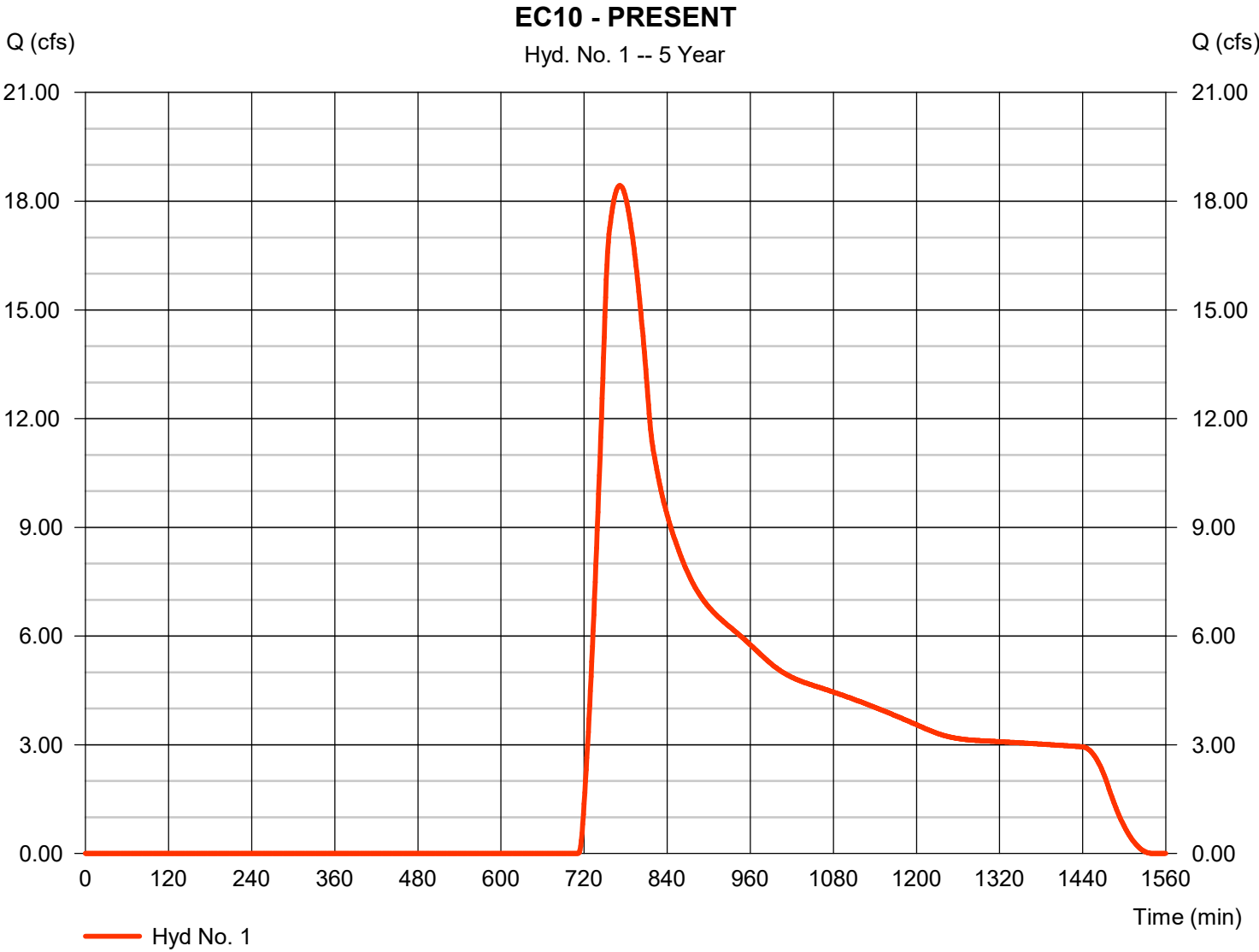
# Hydrograph Report

## Hyd. No. 1

EC10 - PRESENT

Hydrograph type = SCS Runoff  
Storm frequency = 5 yrs  
Time interval = 1 min  
Drainage area = 320.000 ac  
Basin Slope = 0.0 %  
Tc method = TR55  
Total precip. = 2.60 in  
Storm duration = 24 hrs

Peak discharge = 18.43 cfs  
Time to peak = 772 min  
Hyd. volume = 262,007 cuft  
Curve number = 61  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 63.00 min  
Distribution = Type II  
Shape factor = 484



# TR55 Tc Worksheet

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

## Hyd. No. 1

EC10 - PRESENT

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>				
Manning's n-value	= 0.030	0.011	0.011	
Flow length (ft)	= 300.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.20	0.00	0.00	
Land slope (%)	= 2.00	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 7.85</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 7.85</b>
<b>Shallow Concentrated Flow</b>				
Flow length (ft)	= 6086.00	0.00	0.00	
Watercourse slope (%)	= 1.30	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=1.84	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 55.14</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 55.14</b>
<b>Channel Flow</b>				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	{{0}}0.0	0.0	0.0	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>				<b>63.00 min</b>

# Hydrograph Report

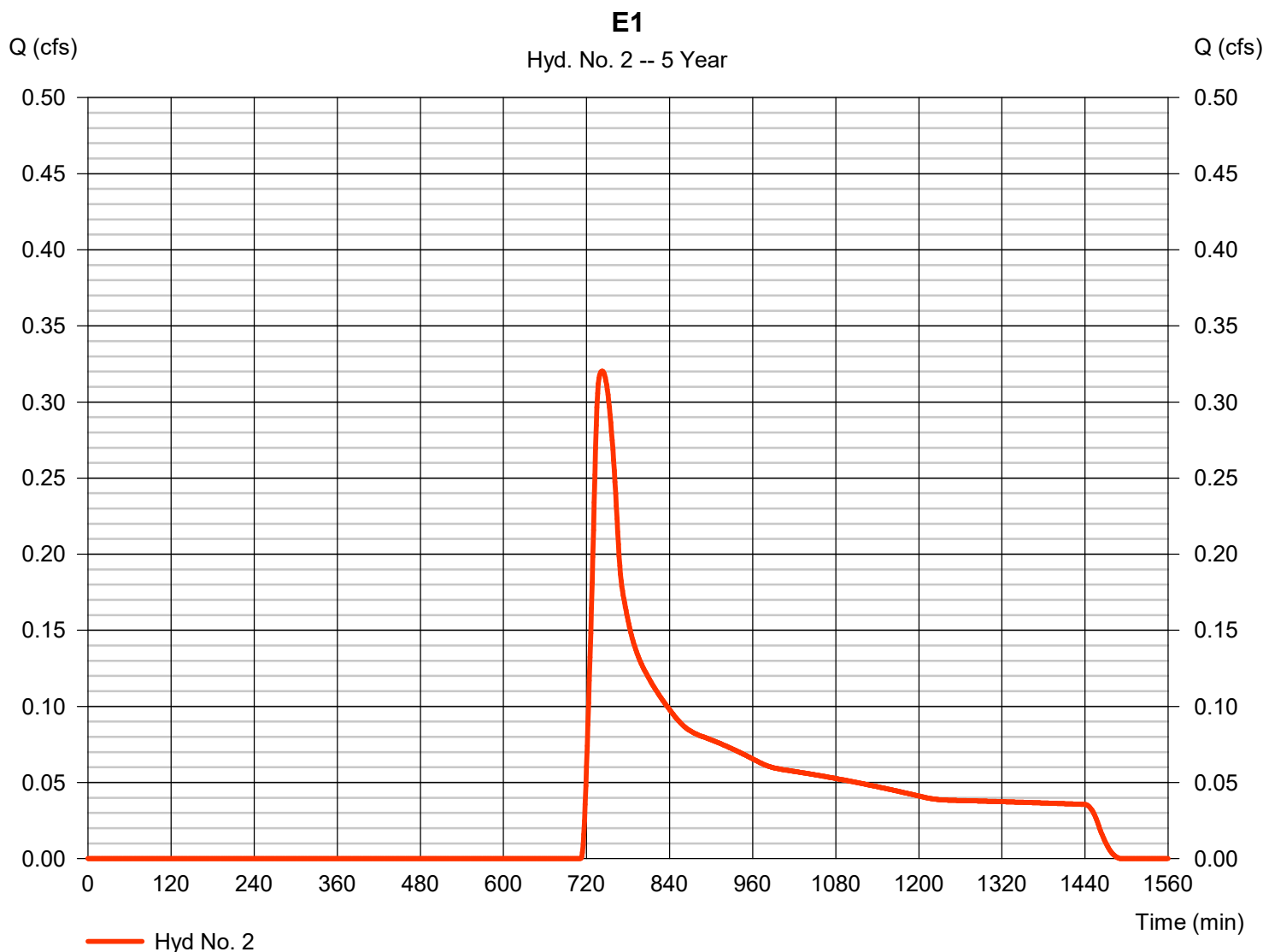
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 2

E1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.320 cfs
Storm frequency	= 5 yrs	Time to peak	= 742 min
Time interval	= 1 min	Hyd. volume	= 3,200 cuft
Drainage area	= 3.920 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.50 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 2

E1

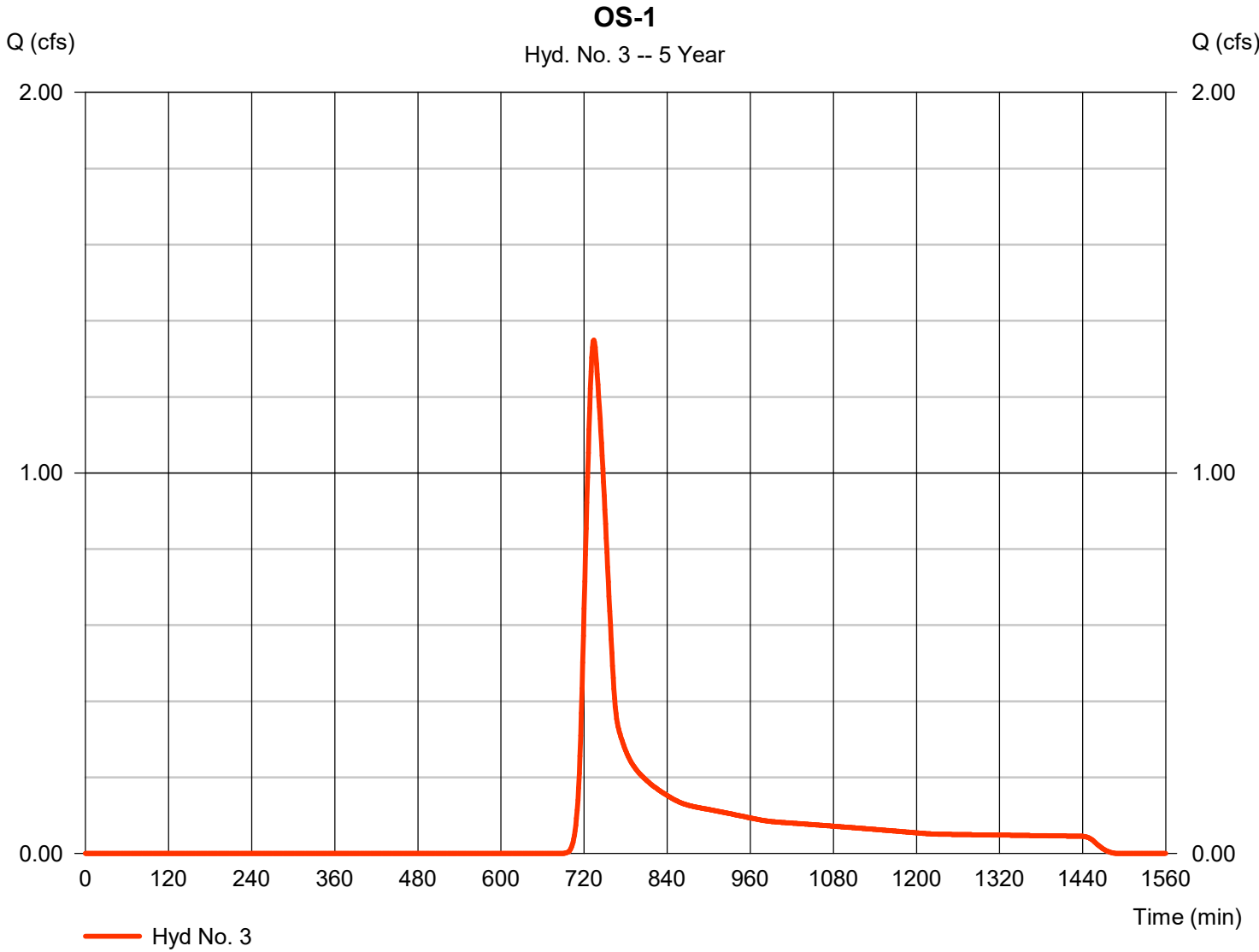
<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>				
Manning's n-value	= 0.011	0.011	0.011	
Flow length (ft)	= 0.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 0.00	0.00	0.00	
Land slope (%)	= 0.00	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.00</b>
<b>Shallow Concentrated Flow</b>				
Flow length (ft)	= 2811.00	0.00	0.00	
Watercourse slope (%)	= 0.80	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=1.44	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 32.46</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 32.46</b>
<b>Channel Flow</b>				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	{{0}}0.0	0.0	0.0	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc</b> .....				<b>32.50 min</b>

# Hydrograph Report

## Hyd. No. 3

OS-1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.349 cfs
Storm frequency	= 5 yrs	Time to peak	= 734 min
Time interval	= 1 min	Hyd. volume	= 6,442 cuft
Drainage area	= 2.650 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 3

OS-1

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>						
Manning's n-value	= 0.013		0.011		0.011	
Flow length (ft)	= 50.0		0.0		0.0	
Two-year 24-hr precip. (in)	= 2.20		0.00		0.00	
Land slope (%)	= 2.00		0.00		0.00	
<b>Travel Time (min)</b>	<b>= 0.96</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 0.96</b>
<b>Shallow Concentrated Flow</b>						
Flow length (ft)	= 2525.00		0.00		0.00	
Watercourse slope (%)	= 0.70		0.00		0.00	
Surface description	= Unpaved		Paved		Paved	
Average velocity (ft/s)	=1.35		0.00		0.00	
<b>Travel Time (min)</b>	<b>= 31.17</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 31.17</b>
<b>Channel Flow</b>						
X sectional flow area (sqft)	= 0.00		0.00		0.00	
Wetted perimeter (ft)	= 0.00		0.00		0.00	
Channel slope (%)	= 0.00		0.00		0.00	
Manning's n-value	= 0.015		0.015		0.015	
Velocity (ft/s)	=0.00		0.00		0.00	
Flow length (ft)	{{0}}0.0		0.0		0.0	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>						<b>32.10 min</b>

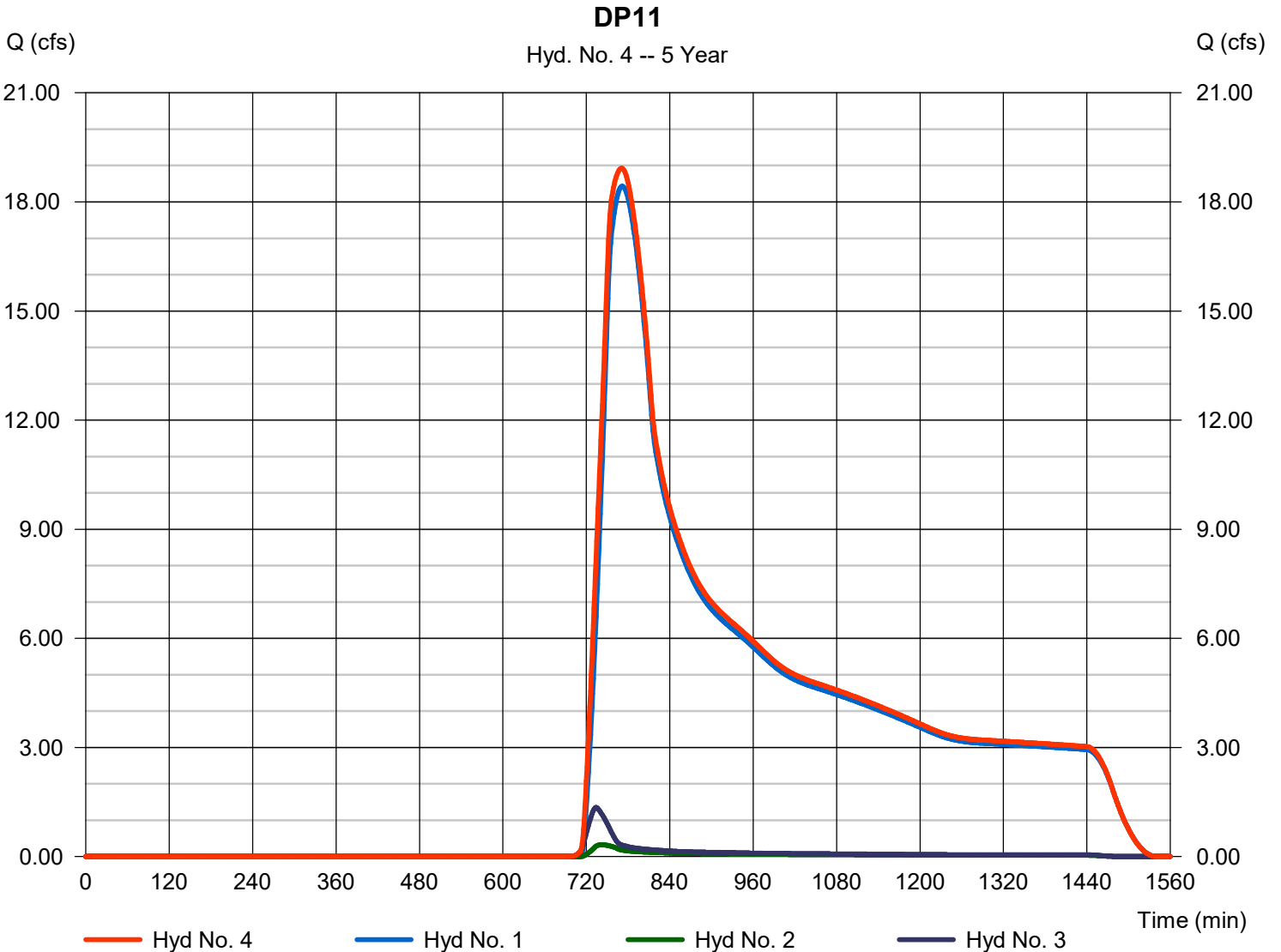
# Hydrograph Report

## Hyd. No. 4

DP11

Hydrograph type = Combine  
Storm frequency = 5 yrs  
Time interval = 1 min  
Inflow hyds. = 1, 2, 3

Peak discharge = 18.93 cfs  
Time to peak = 771 min  
Hyd. volume = 271,649 cuft  
Contrib. drain. area = 326.570 ac



# Hydrograph Report

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

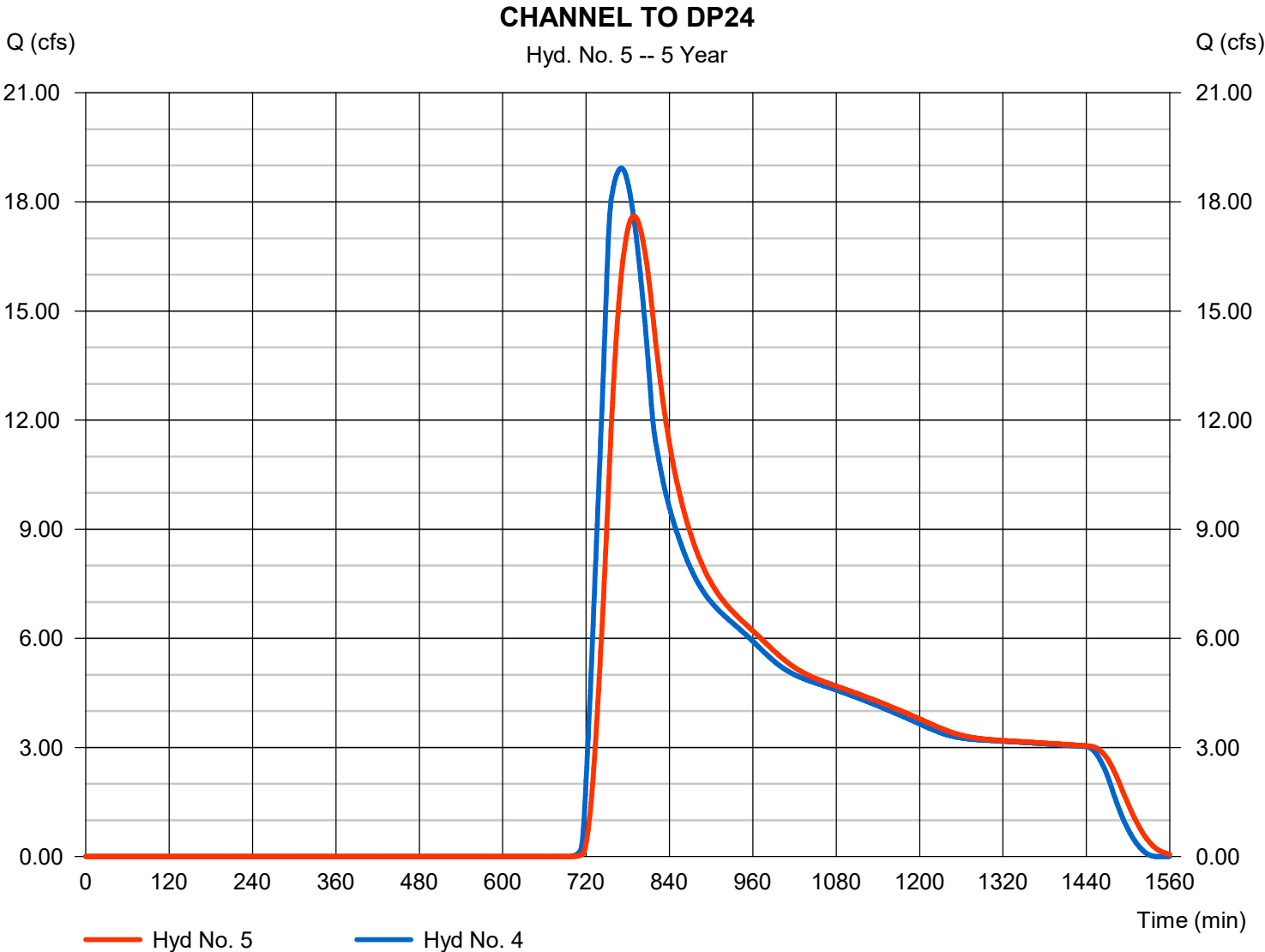
Thursday, 01 / 5 / 2023

## Hyd. No. 5

### CHANNEL TO DP24

Hydrograph type	= Reach	Peak discharge	= 17.61 cfs
Storm frequency	= 5 yrs	Time to peak	= 789 min
Time interval	= 1 min	Hyd. volume	= 271,640 cuft
Inflow hyd. No.	= 4 - DP11	Section type	= Trapezoidal
Reach length	= 2902.0 ft	Channel slope	= 0.8 %
Manning's n	= 0.030	Bottom width	= 8.0 ft
Side slope	= 4.0:1	Max. depth	= 3.3 ft
Rating curve x	= 1.110	Rating curve m	= 1.349
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0625

Modified Att-Kin routing method used.





# Hydrograph Report

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

Thursday, 01 / 5 / 2023

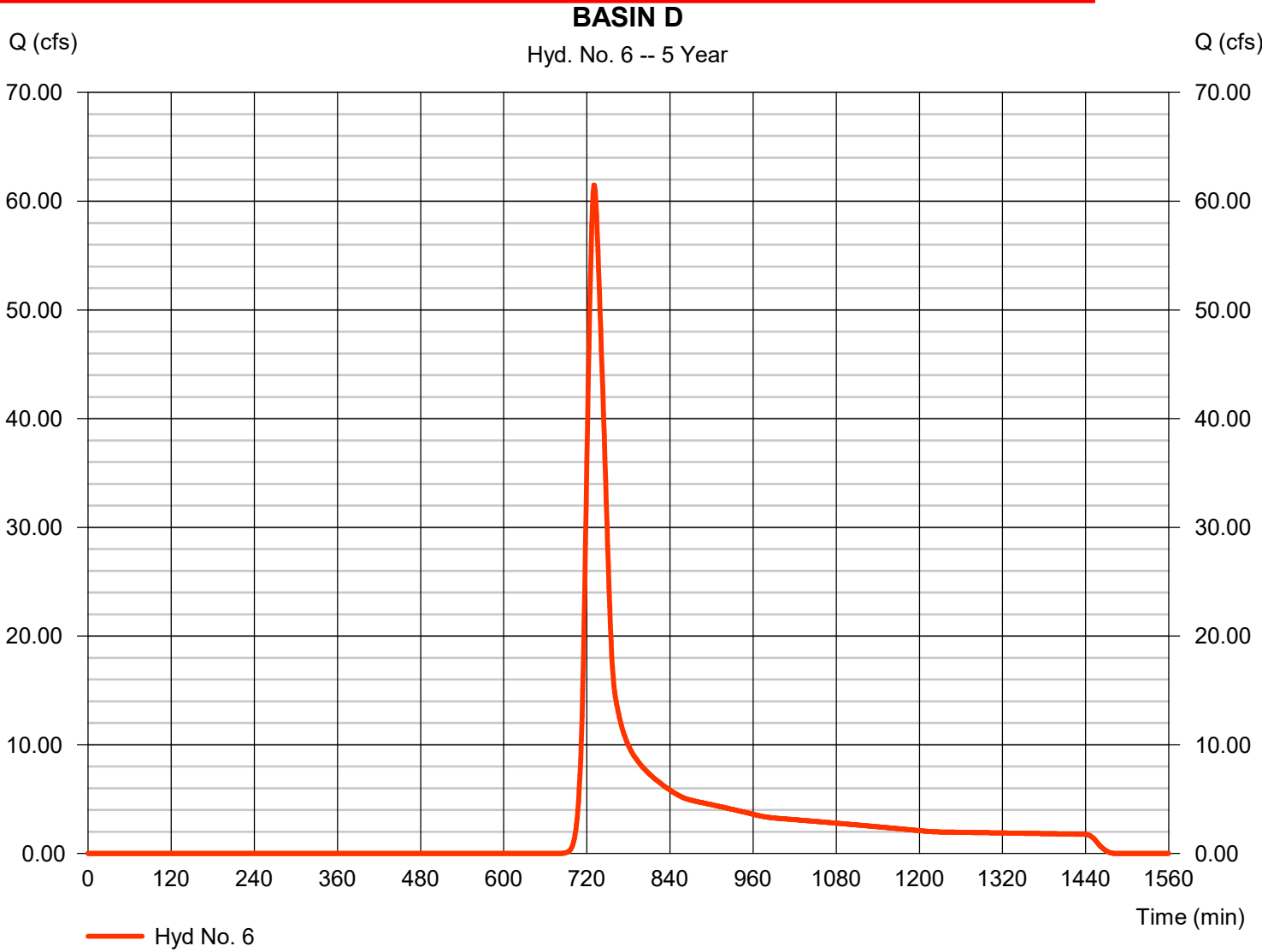
## Hyd. No. 6

### BASIN D

Hydrograph type	= SCS Runoff	Peak discharge	= 61.50 cfs
Storm frequency	= 5 yrs	Time to peak	= 730 min
Time interval	= 1 min	Hyd. volume	= 256,733 cuft
Drainage area	= 100.800 ac	Curve number	= 74.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 27.00 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Basin D and Pond D (Hyd. #6 and #7) is included only to ensure Pond Release Rates are incorporated into the SCS model to accurately model downstream flows.

Please see the UD Detention printout in Appendix B for all release rate and volume analysis and the Rational Method printouts in this section for peak flow generations in areas tributary to Pond D



# Hydrograph Report

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

Thursday, 01 / 5 / 2023

## Hyd. No. 7

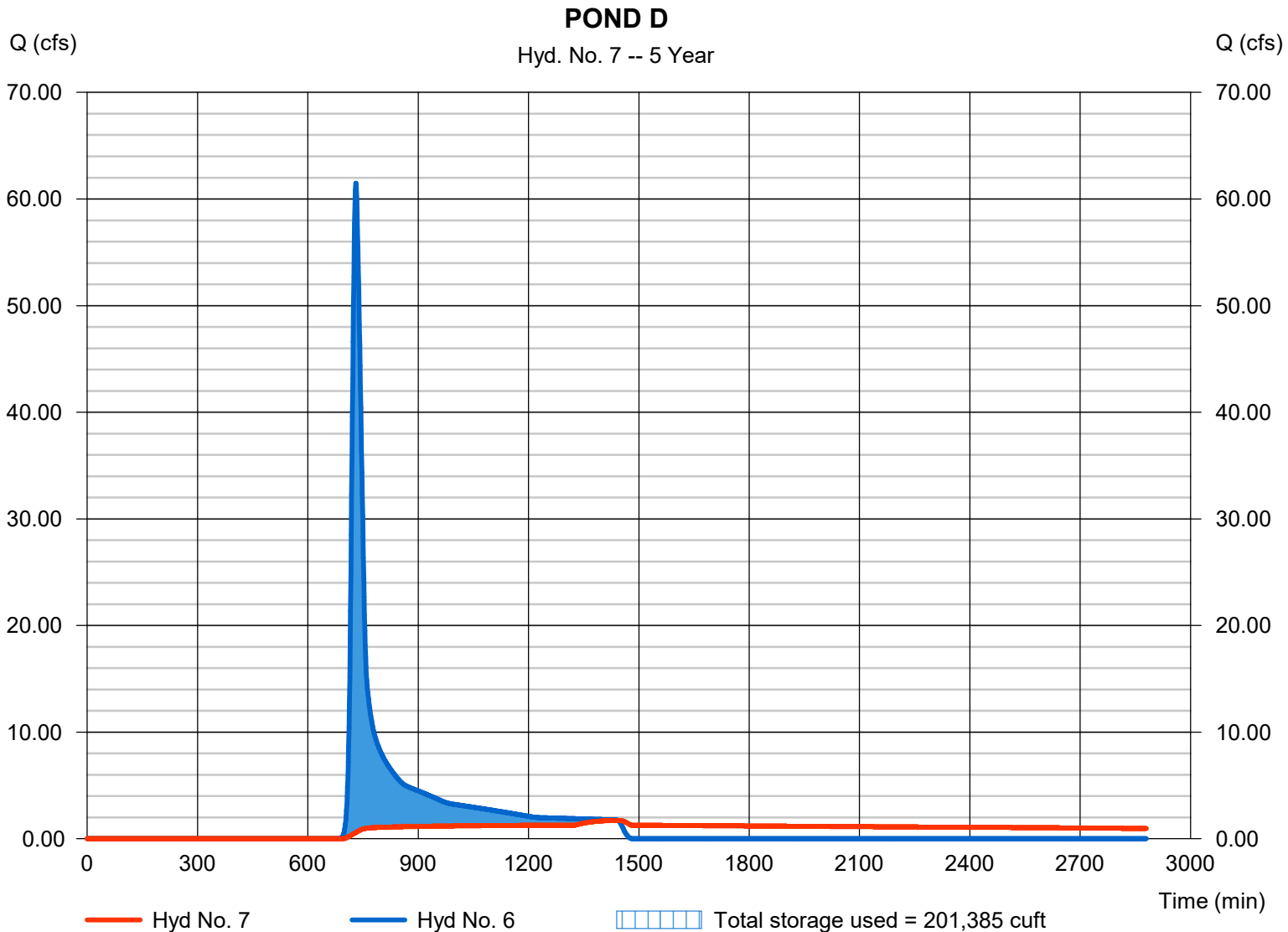
### POND D

Hydrograph type	= Reservoir	Peak discharge	= 1.722 cfs
Storm frequency	= 5 yrs	Time to peak	= 1443 min
Time interval	= 1 min	Hyd. volume	= 150,906 cuft
Inflow hyd. No.	= 6 - BASIN D	Max. Elevation	= 6031.02 ft
Reservoir name	= D	Max. Storage	= 201,385 cuft

Storage Indication method used.

Basin D and Pond D (Hyd. #6 and #7) is included only to ensure Pond Release Rates are incorporated into the SCS model to accurately model downstream flows.

Please see the UD Detention printout in Appendix B for all release rate and volume analysis and the Rational Method printouts in this section for peak flow generations in areas tributary to Pond D



# Hydrograph Report

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

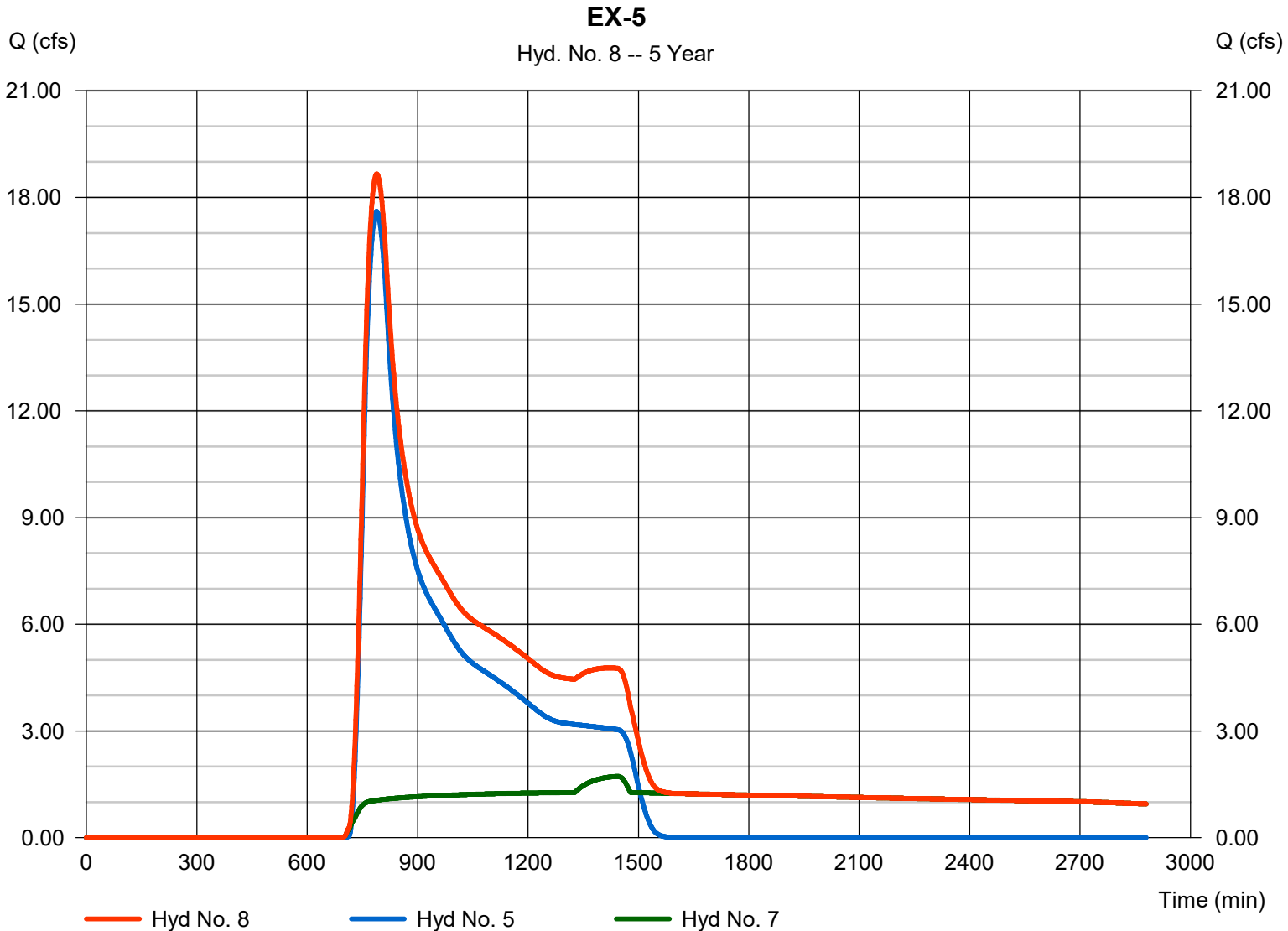
Thursday, 01 / 5 / 2023

## Hyd. No. 8

EX-5

Hydrograph type = Combine  
Storm frequency = 5 yrs  
Time interval = 1 min  
Inflow hyds. = 5, 7

Peak discharge = 18.66 cfs  
Time to peak = 789 min  
Hyd. volume = 422,546 cuft  
Contrib. drain. area = 0.000 ac

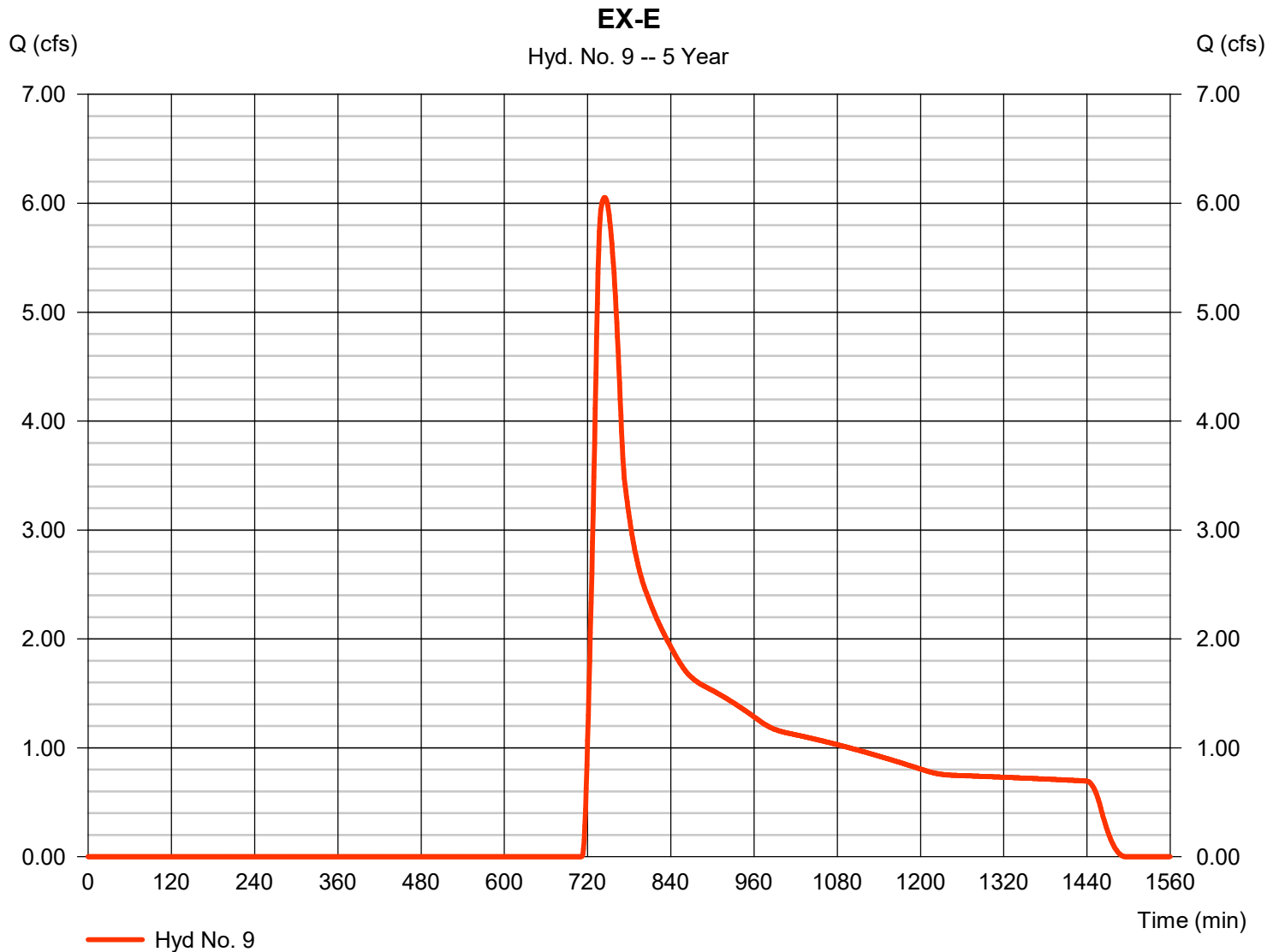


# Hydrograph Report

## Hyd. No. 9

EX-E

Hydrograph type	= SCS Runoff	Peak discharge	= 6.054 cfs
Storm frequency	= 5 yrs	Time to peak	= 745 min
Time interval	= 1 min	Hyd. volume	= 62,432 cuft
Drainage area	= 76.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 34.20 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 9

EX-E

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>		<u>Totals</u>
<b>Sheet Flow</b>							
Manning's n-value	= 0.030		0.011		0.011		
Flow length (ft)	= 300.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.20		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
<b>Travel Time (min)</b>	<b>= 7.85</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>7.85</b>
<b>Shallow Concentrated Flow</b>							
Flow length (ft)	= 2546.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.61		0.00		0.00		
<b>Travel Time (min)</b>	<b>= 26.30</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>26.30</b>
<b>Channel Flow</b>							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00		0.00		0.00		
Flow length (ft)	{{0}}0.0		0.0		0.0		
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>0.00</b>
<b>Total Travel Time, Tc .....</b>							<b>34.20 min</b>

# Hydrograph Report

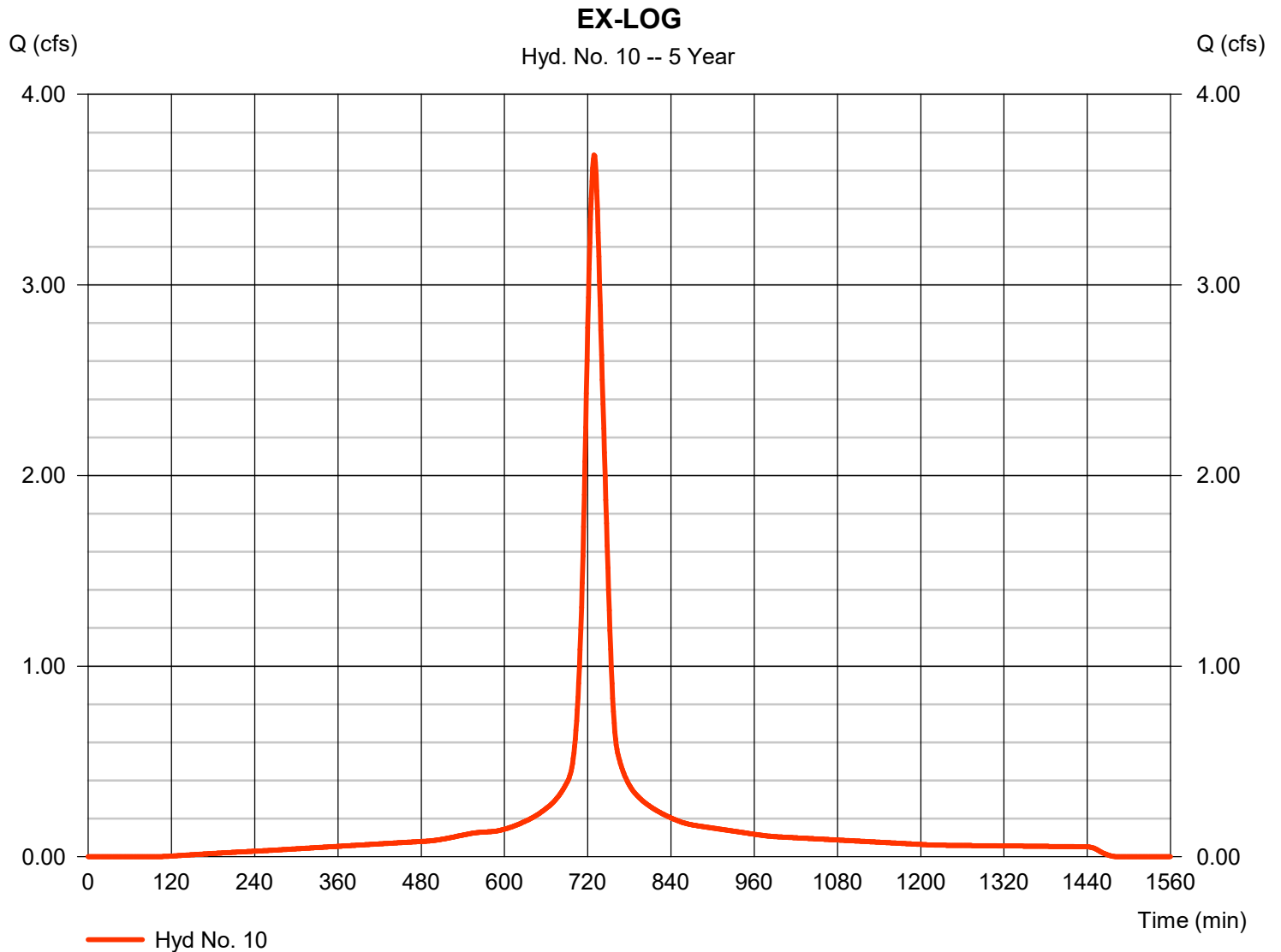
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 10

### EX-LOG

Hydrograph type	= SCS Runoff	Peak discharge	= 3.682 cfs
Storm frequency	= 5 yrs	Time to peak	= 729 min
Time interval	= 1 min	Hyd. volume	= 15,373 cuft
Drainage area	= 1.800 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.10 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 10

EX-LOG

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>		<u>Totals</u>
<b>Sheet Flow</b>							
Manning's n-value	= 0.013		0.011		0.011		
Flow length (ft)	= 11.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.20		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
<b>Travel Time (min)</b>	<b>= 0.29</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>0.29</b>
<b>Shallow Concentrated Flow</b>							
Flow length (ft)	= 2592.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.61		0.00		0.00		
<b>Travel Time (min)</b>	<b>= 26.77</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>26.77</b>
<b>Channel Flow</b>							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00		0.00		0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>0.00</b>
<b>Total Travel Time, Tc .....</b>							<b>27.10 min</b>

# Hydrograph Report

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

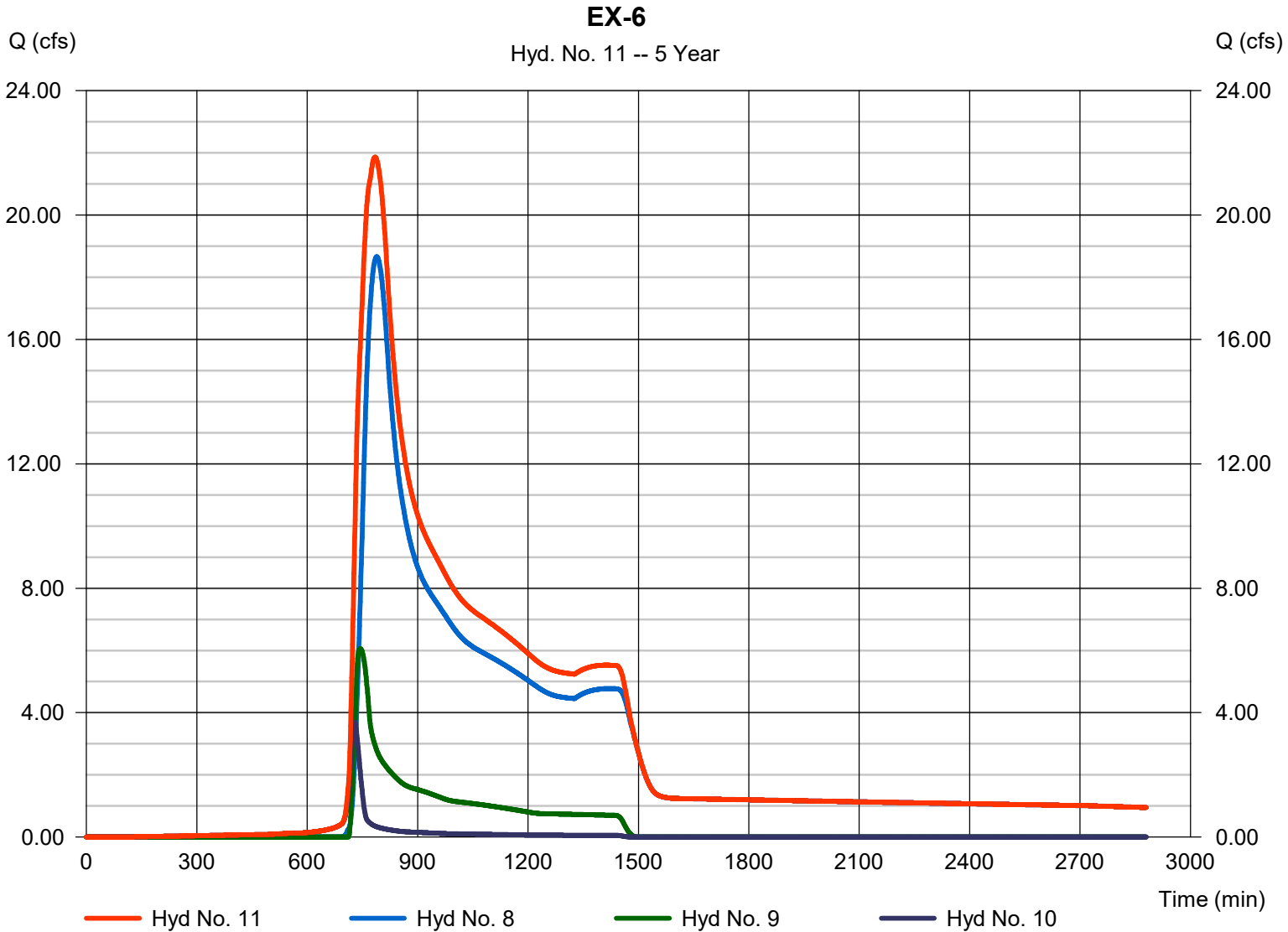
Thursday, 01 / 5 / 2023

## Hyd. No. 11

EX-6

Hydrograph type = Combine  
 Storm frequency = 5 yrs  
 Time interval = 1 min  
 Inflow hyds. = 8, 9, 10

Peak discharge = 21.86 cfs  
 Time to peak = 784 min  
 Hyd. volume = 500,351 cuft  
 Contrib. drain. area = 77.800 ac





# Hydrograph Report

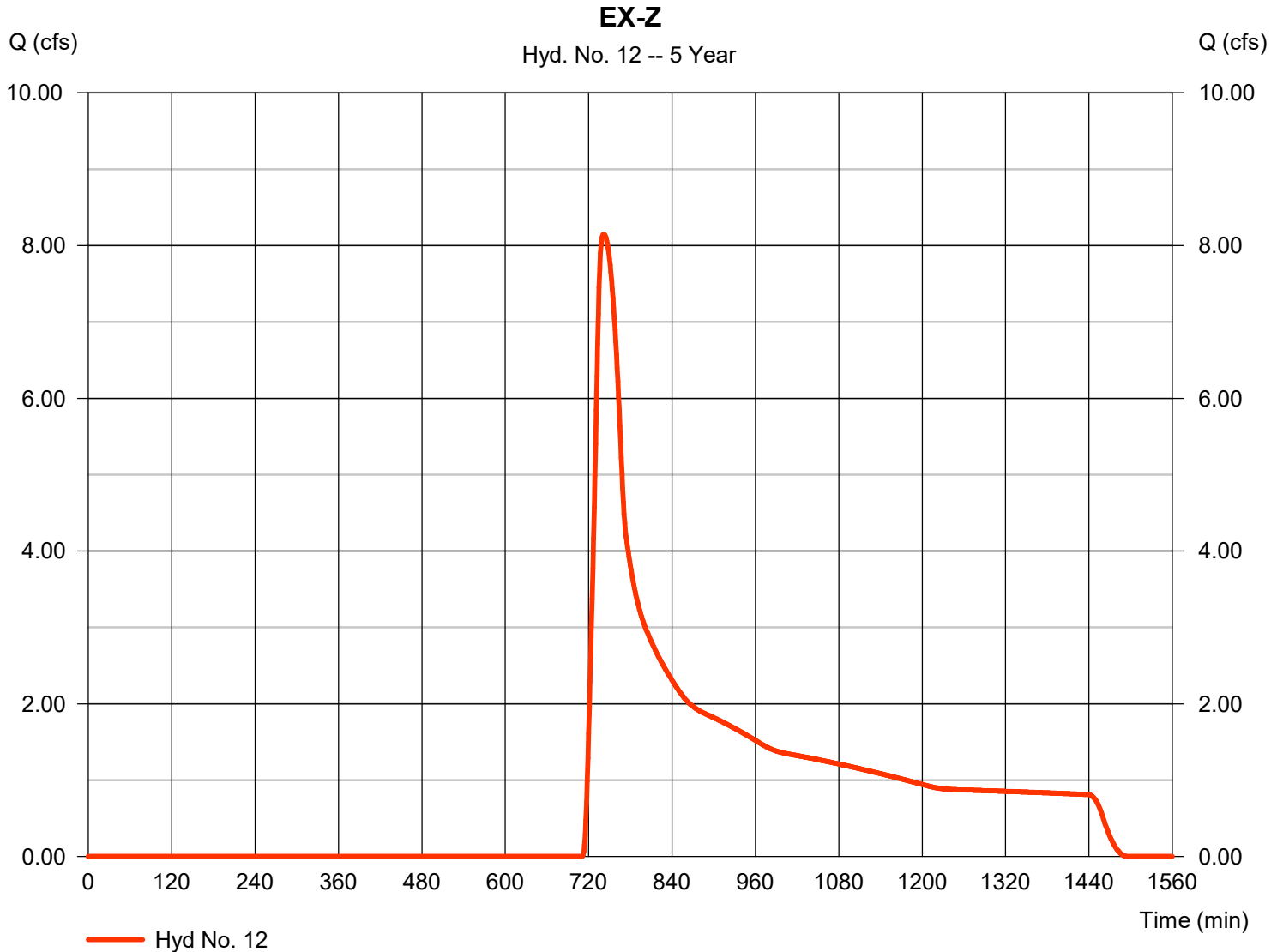
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 12

EX-Z

Hydrograph type	= SCS Runoff	Peak discharge	= 8.146 cfs
Storm frequency	= 5 yrs	Time to peak	= 742 min
Time interval	= 1 min	Hyd. volume	= 76,284 cuft
Drainage area	= 83.500 ac	Curve number	= 62
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.00 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 12

EX-Z

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>				
Manning's n-value	= 0.030	0.011	0.011	
Flow length (ft)	= 300.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.20	0.00	0.00	
Land slope (%)	= 2.00	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 7.85</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 7.85</b>
<b>Shallow Concentrated Flow</b>				
Flow length (ft)	= 2627.00	0.00	0.00	
Watercourse slope (%)	= 1.00	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=1.61	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 27.14</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 27.14</b>
<b>Channel Flow</b>				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	{{0}}0.0	0.0	0.0	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc</b> .....				<b>35.00 min</b>

# Hydrograph Report

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

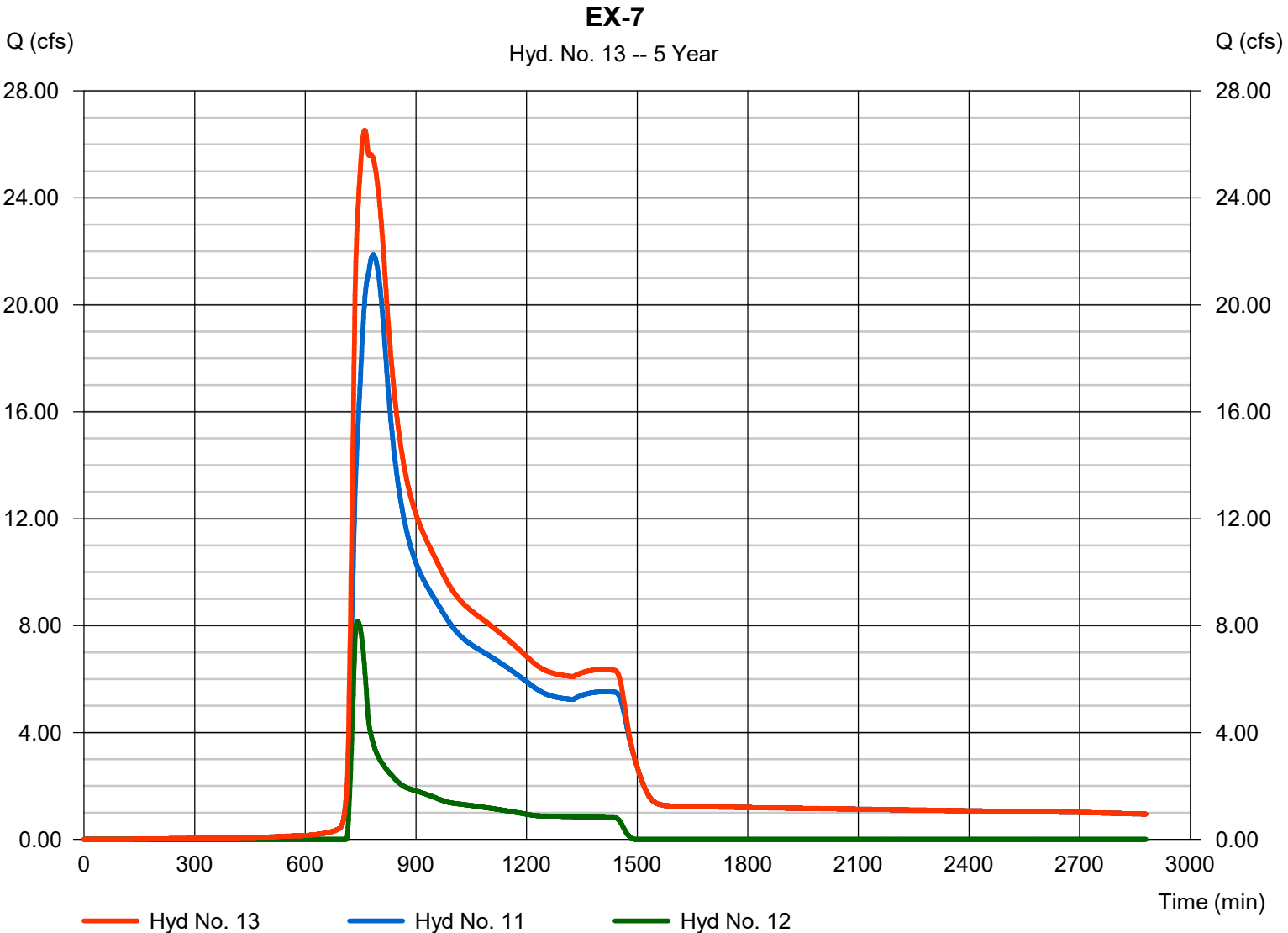
Thursday, 01 / 5 / 2023

## Hyd. No. 13

EX-7

Hydrograph type = Combine  
Storm frequency = 5 yrs  
Time interval = 1 min  
Inflow hyds. = 11, 12

Peak discharge = 26.53 cfs  
Time to peak = 761 min  
Hyd. volume = 576,634 cuft  
Contrib. drain. area = 83.500 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	144.67	1	755	1,185,497	-----	-----	-----	EC10 - PRESENT
2	SCS Runoff	2.846	1	735	14,479	-----	-----	-----	E1
3	SCS Runoff	4.333	1	733	18,356	-----	-----	-----	OS-1
4	Combine	148.45	1	754	1,218,333	1, 2, 3	-----	-----	DP11
5	Reach	138.52	1	766	1,218,326	4	-----	-----	CHANNEL TO DP24
6	SCS Runoff	190.38	1	730	718,796	-----	-----	-----	BASIN D
7	Reservoir	39.58	1	759	610,089	6	6032.21	333,480	POND D
8	Combine	177.50	1	765	1,828,414	5, 7	-----	-----	EX-5
9	SCS Runoff	53.32	1	736	282,485	-----	-----	-----	EX-E
10	SCS Runoff	6.317	1	729	27,009	-----	-----	-----	EX-LOG
11	Combine	204.65	1	758	2,137,908	8, 9, 10	-----	-----	EX-6
12	SCS Runoff	63.40	1	736	328,266	-----	-----	-----	EX-Z
13	Combine	244.45	1	754	2,466,175	11, 12	-----	-----	EX-7

Basin D and Pond D (Hyd. #6 and #7) is included only to ensure Pond Release Rates are incorporated into the SCS model to accurately model downstream flows.

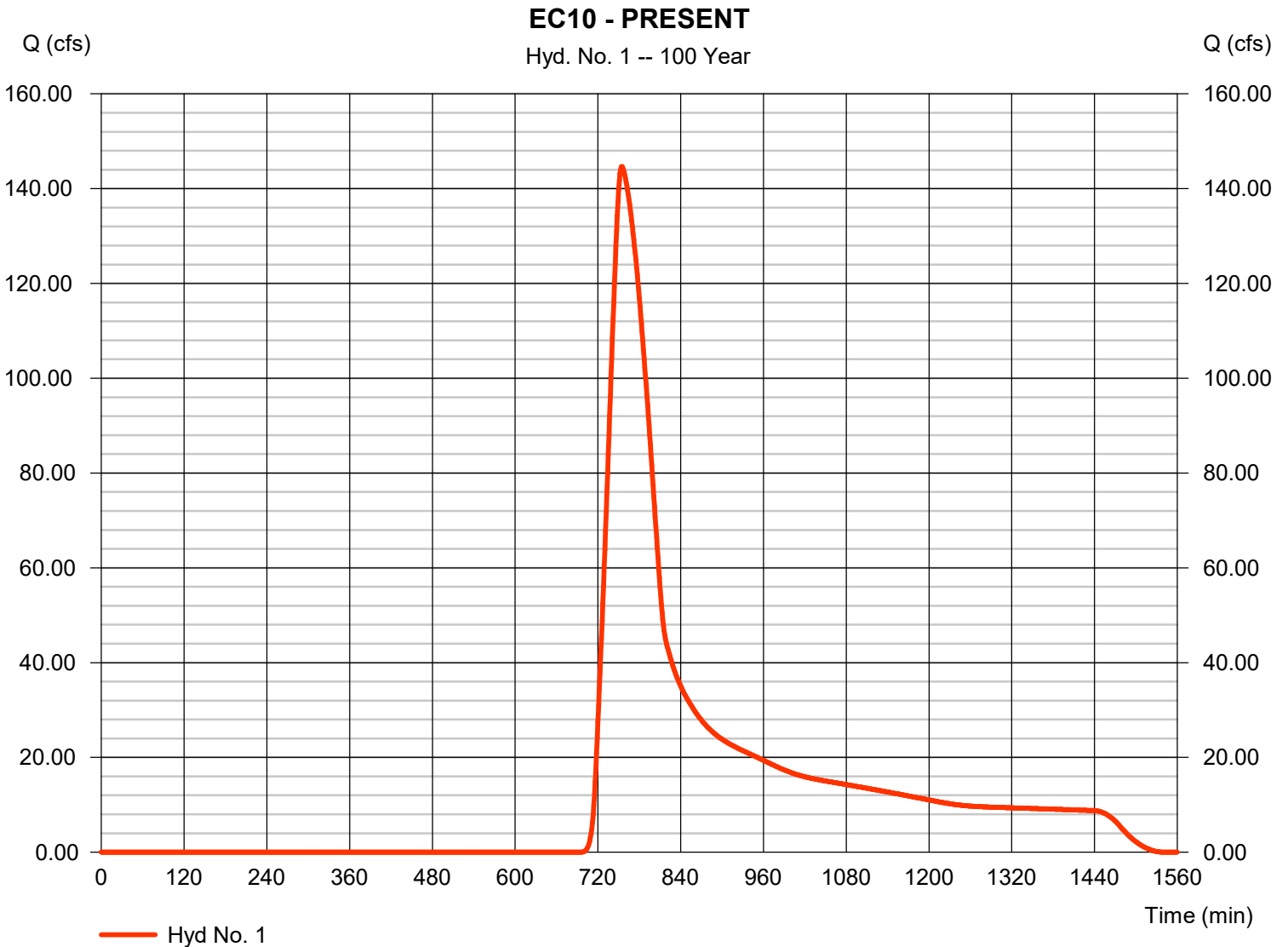
Please see the UD Detention printout in Appendix B for all release rate and volume analysis and the Rational Method printouts in this section for peak flow generations in areas tributary to Pond D

# Hydrograph Report

## Hyd. No. 1

### EC10 - PRESENT

Hydrograph type	= SCS Runoff	Peak discharge	= 144.67 cfs
Storm frequency	= 100 yrs	Time to peak	= 755 min
Time interval	= 1 min	Hyd. volume	= 1,185,497 cuft
Drainage area	= 320.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 63.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

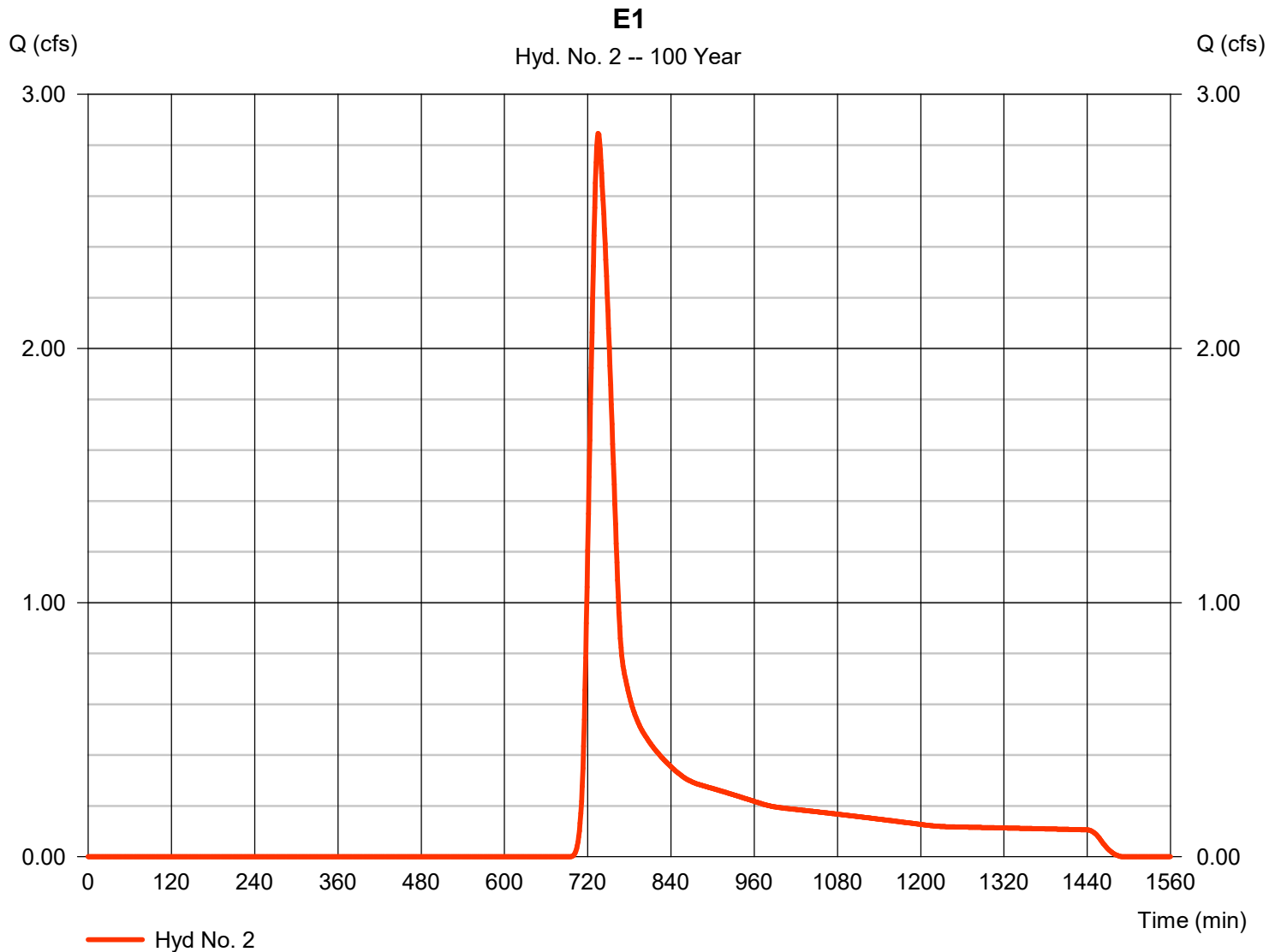


# Hydrograph Report

## Hyd. No. 2

E1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.846 cfs
Storm frequency	= 100 yrs	Time to peak	= 735 min
Time interval	= 1 min	Hyd. volume	= 14,479 cuft
Drainage area	= 3.920 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.50 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

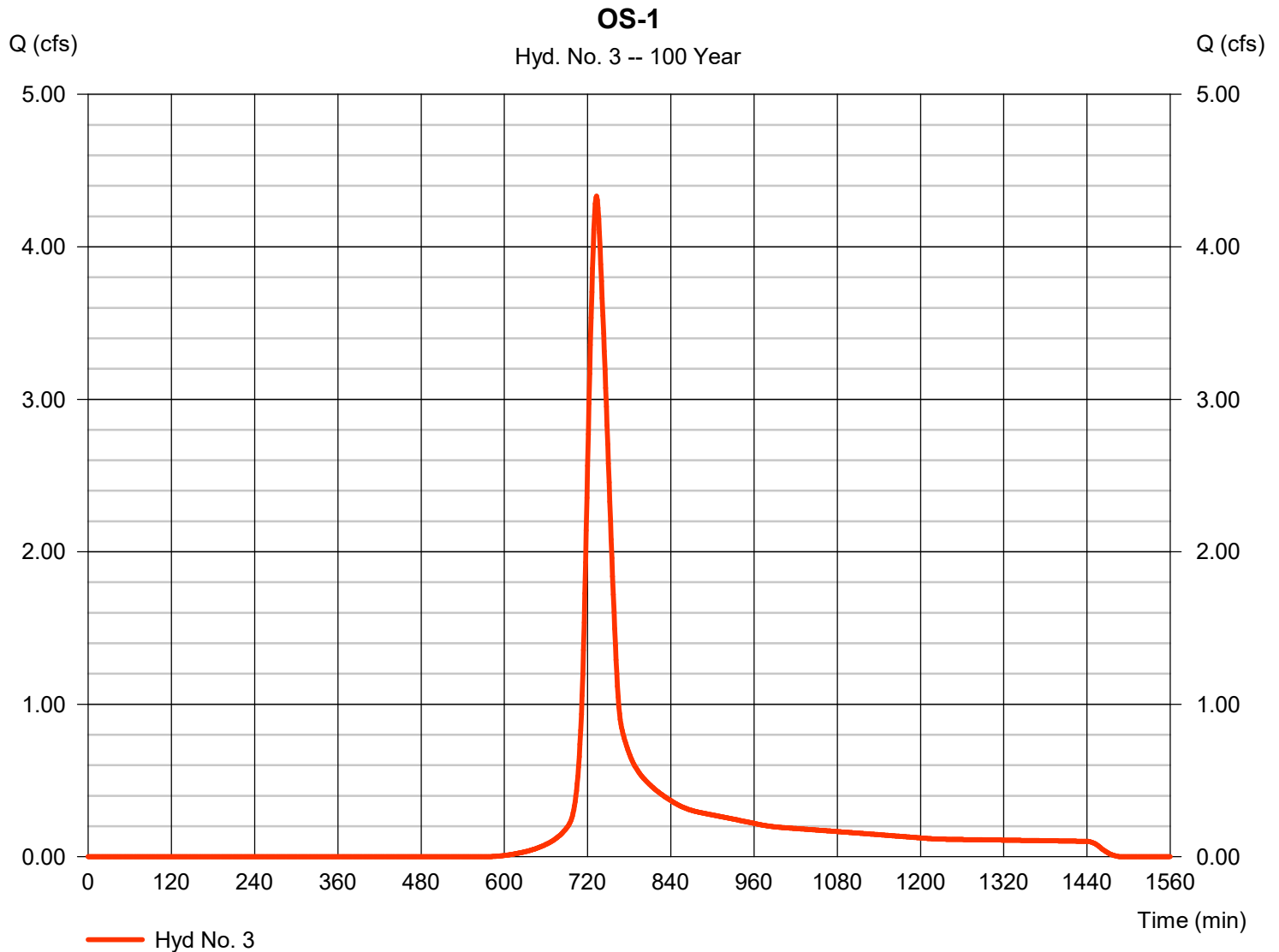
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 3

OS-1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.333 cfs
Storm frequency	= 100 yrs	Time to peak	= 733 min
Time interval	= 1 min	Hyd. volume	= 18,356 cuft
Drainage area	= 2.650 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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

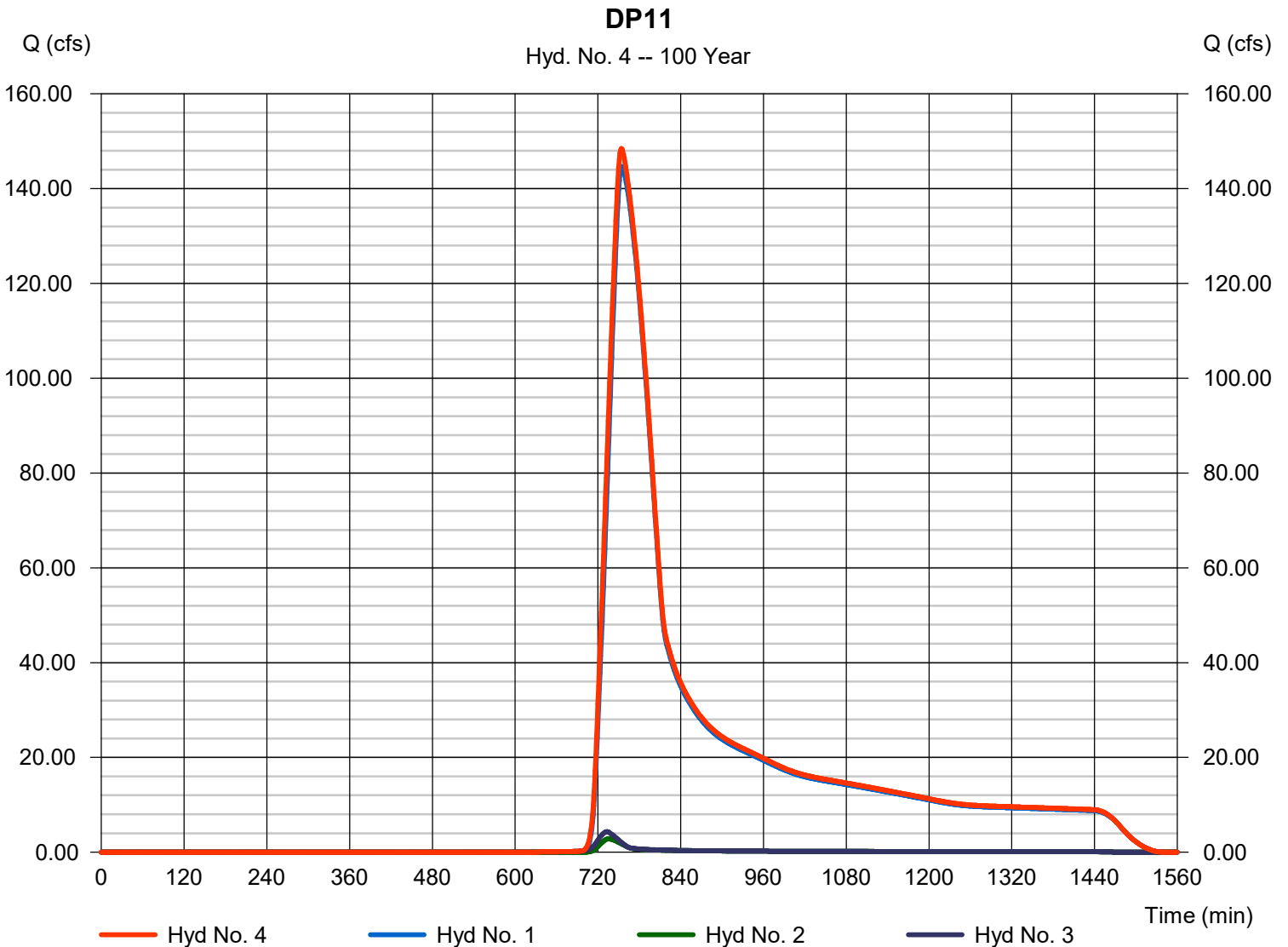
Thursday, 01 / 5 / 2023

## Hyd. No. 4

DP11

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 1, 2, 3

Peak discharge = 148.45 cfs  
Time to peak = 754 min  
Hyd. volume = 1,218,333 cuft  
Contrib. drain. area = 326.570 ac





# Hydrograph Report

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

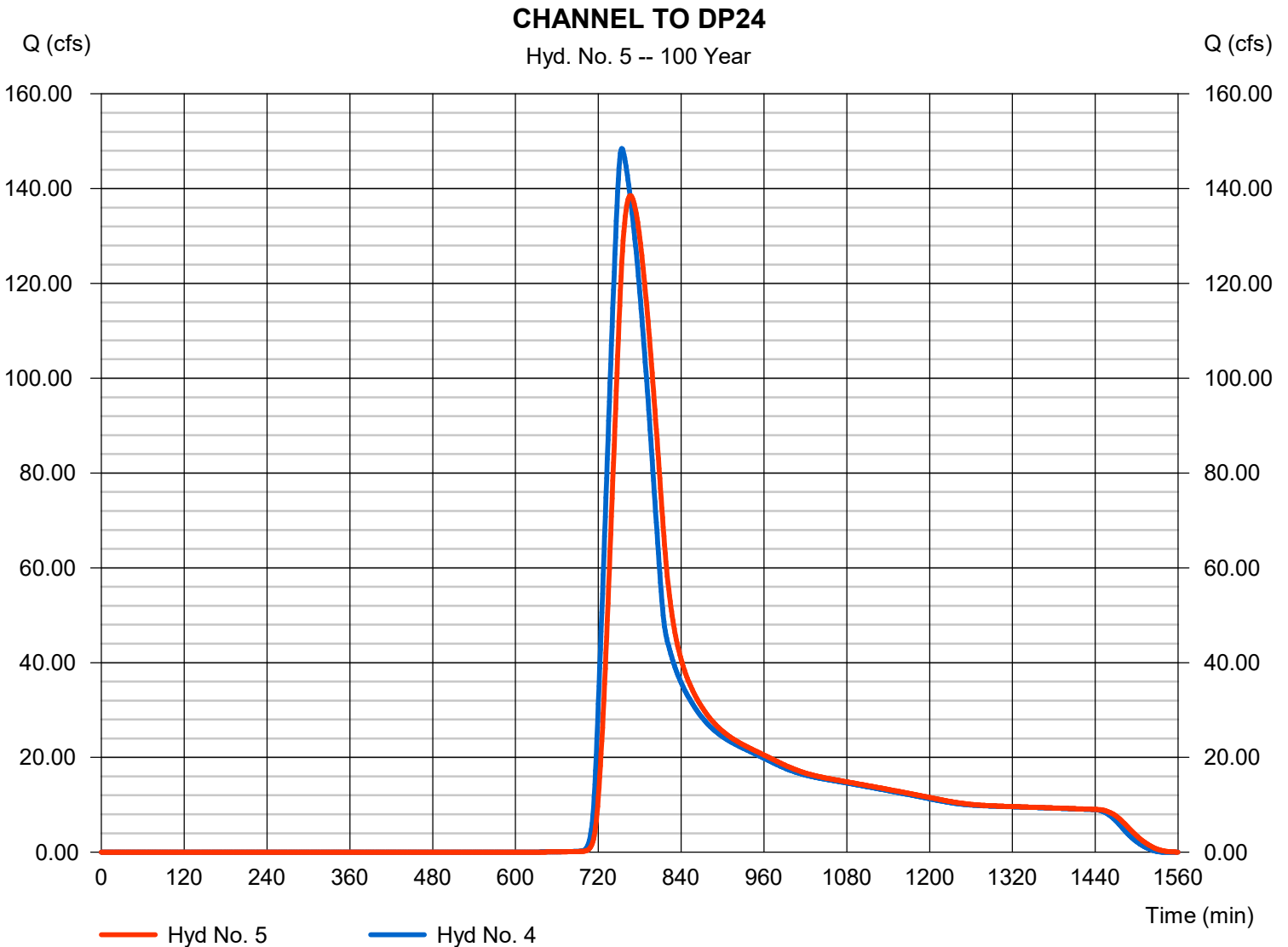
Thursday, 01 / 5 / 2023

## Hyd. No. 5

### CHANNEL TO DP24

Hydrograph type	= Reach	Peak discharge	= 138.52 cfs
Storm frequency	= 100 yrs	Time to peak	= 766 min
Time interval	= 1 min	Hyd. volume	= 1,218,326 cuft
Inflow hyd. No.	= 4 - DP11	Section type	= Trapezoidal
Reach length	= 2902.0 ft	Channel slope	= 0.8 %
Manning's n	= 0.030	Bottom width	= 8.0 ft
Side slope	= 4.0:1	Max. depth	= 3.3 ft
Rating curve x	= 1.110	Rating curve m	= 1.349
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.1042

Modified Att-Kin routing method used.



# Hydrograph Report

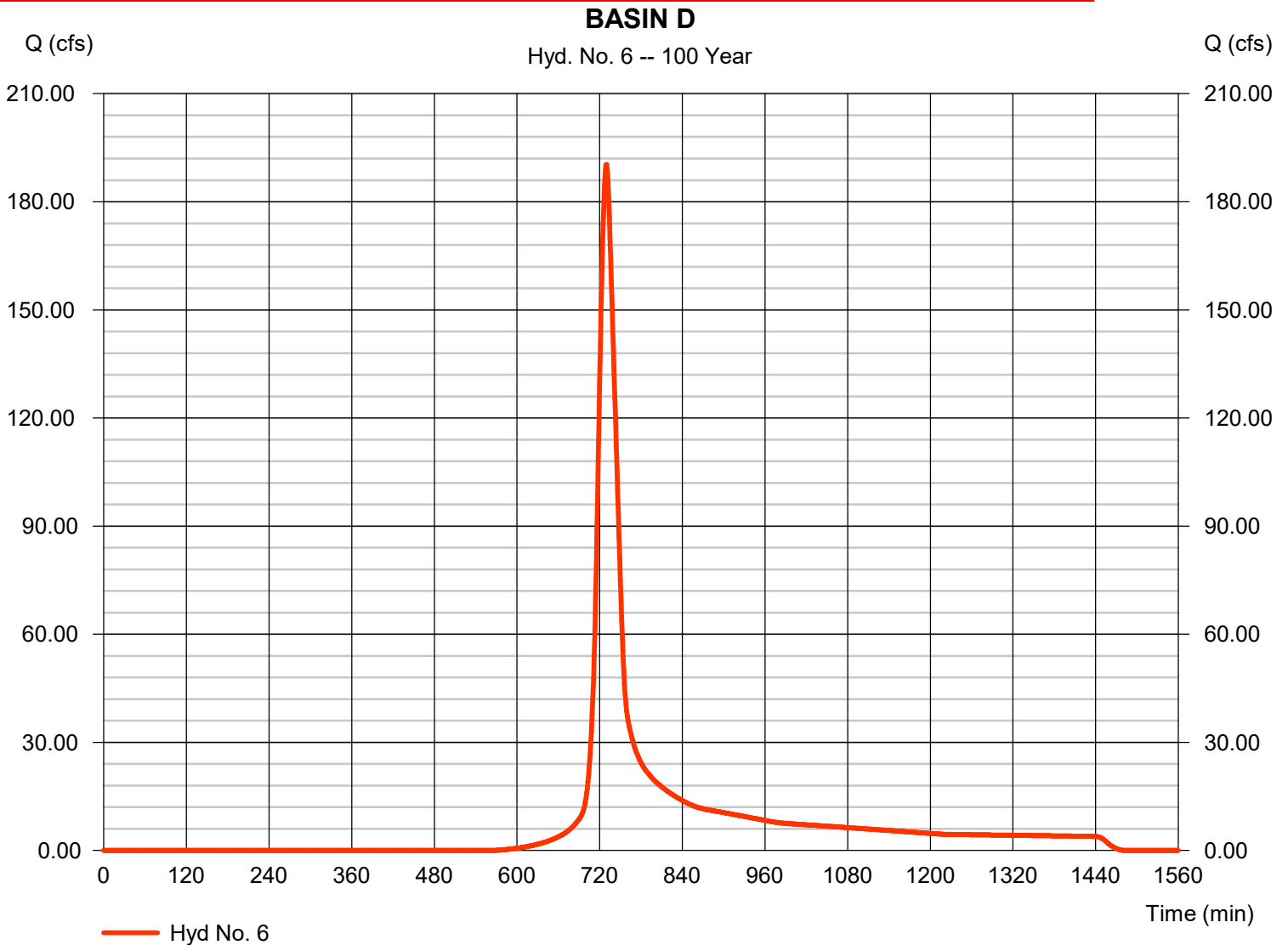
## Hyd. No. 6

### BASIN D

Hydrograph type	= SCS Runoff	Peak discharge	= 190.38 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 1 min	Hyd. volume	= 718,796 cuft
Drainage area	= 100.800 ac	Curve number	= 74.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 27.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Basin D and Pond D (Hyd. #6 and #7) is included only to ensure Pond Release Rates are incorporated into the SCS model to accurately model downstream flows.

Please see the UD Detention printout in Appendix B for all release rate and volume analysis and the Rational Method printouts in this section for peak flow generations in areas tributary to Pond D



# Hydrograph Report

## Hyd. No. 7

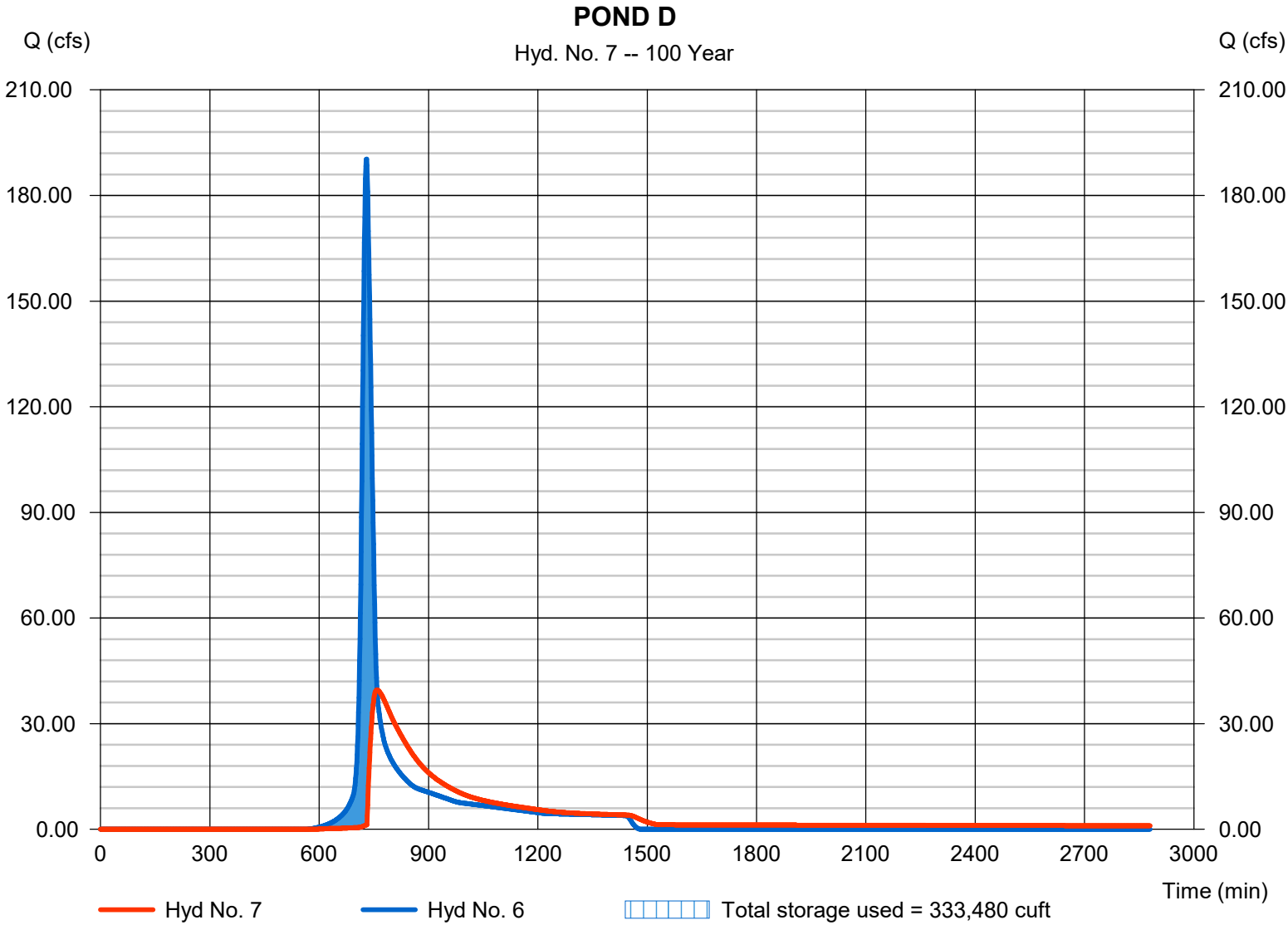
### POND D

Hydrograph type	= Reservoir	Peak discharge	= 39.58 cfs
Storm frequency	= 100 yrs	Time to peak	= 759 min
Time interval	= 1 min	Hyd. volume	= 610,089 cuft
Inflow hyd. No.	= 6 - BASIN D	Max. Elevation	= 6032.21 ft
Reservoir name	= D	Max. Storage	= 333,480 cuft

Storage Indication method used.

Basin D and Pond D (Hyd. #6 and #7) is included only to ensure Pond Release Rates are incorporated into the SCS model to accurately model downstream flows.

Please see the UD Detention printout in Appendix B for all release rate and volume analysis and the Rational Method printouts in this section for peak flow generations in areas tributary to Pond D



# Hydrograph Report

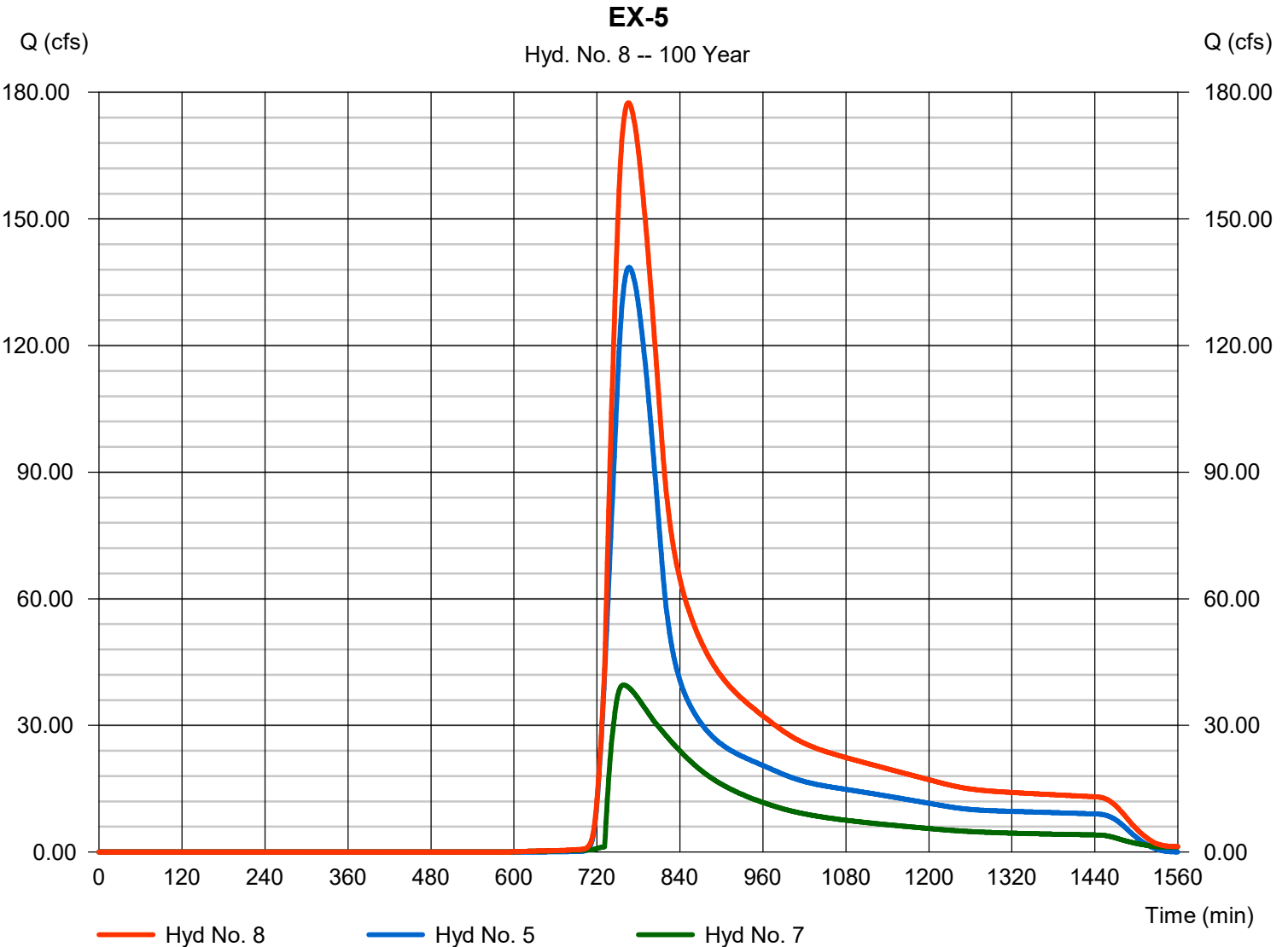
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Thursday, 01 / 5 / 2023

## Hyd. No. 8

EX-5

Hydrograph type	= Combine	Peak discharge	= 177.50 cfs
Storm frequency	= 100 yrs	Time to peak	= 765 min
Time interval	= 1 min	Hyd. volume	= 1,828,414 cuft
Inflow hyds.	= 5, 7	Contrib. drain. area	= 0.000 ac

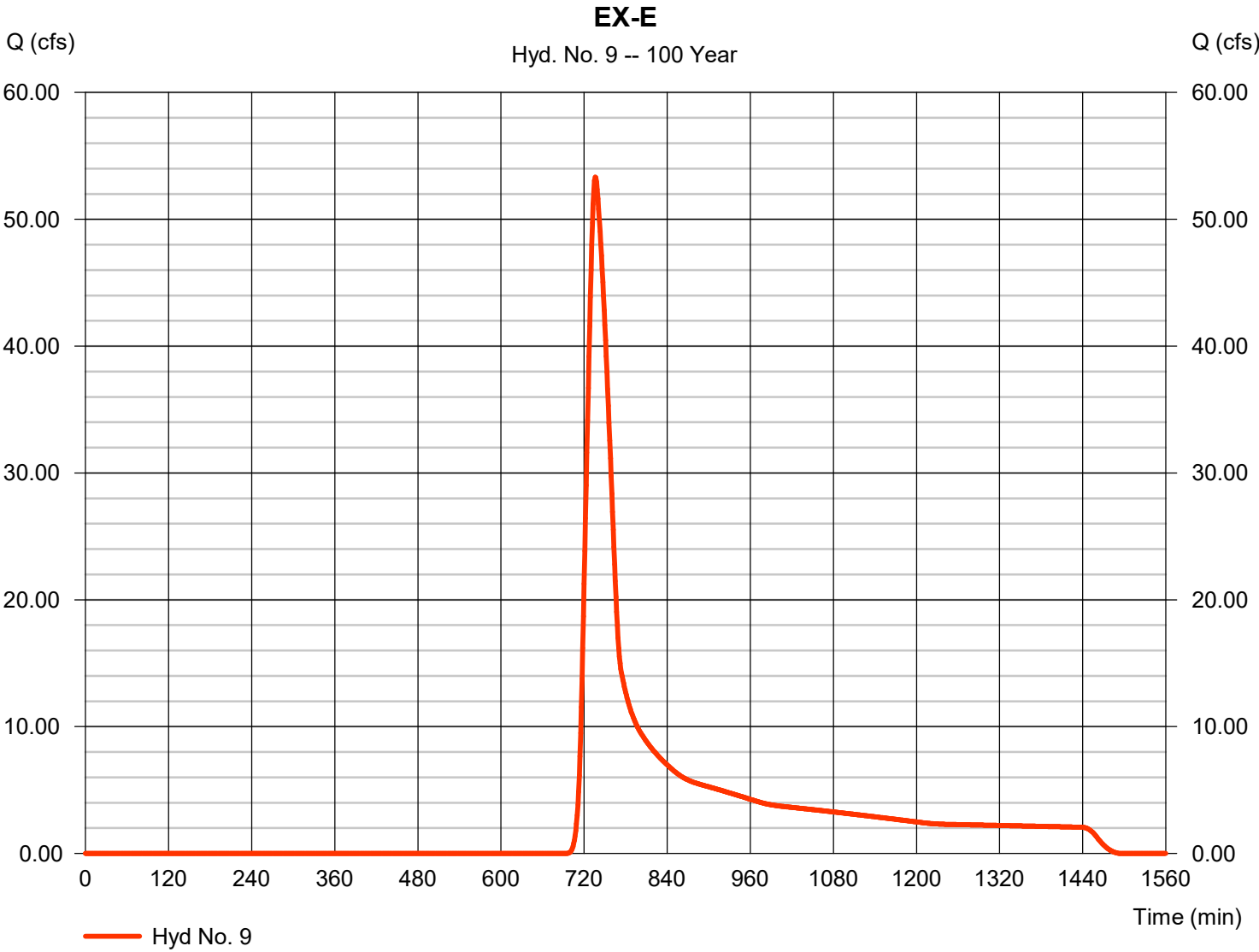


# Hydrograph Report

## Hyd. No. 9

EX-E

Hydrograph type	= SCS Runoff	Peak discharge	= 53.32 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 282,485 cuft
Drainage area	= 76.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 34.20 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

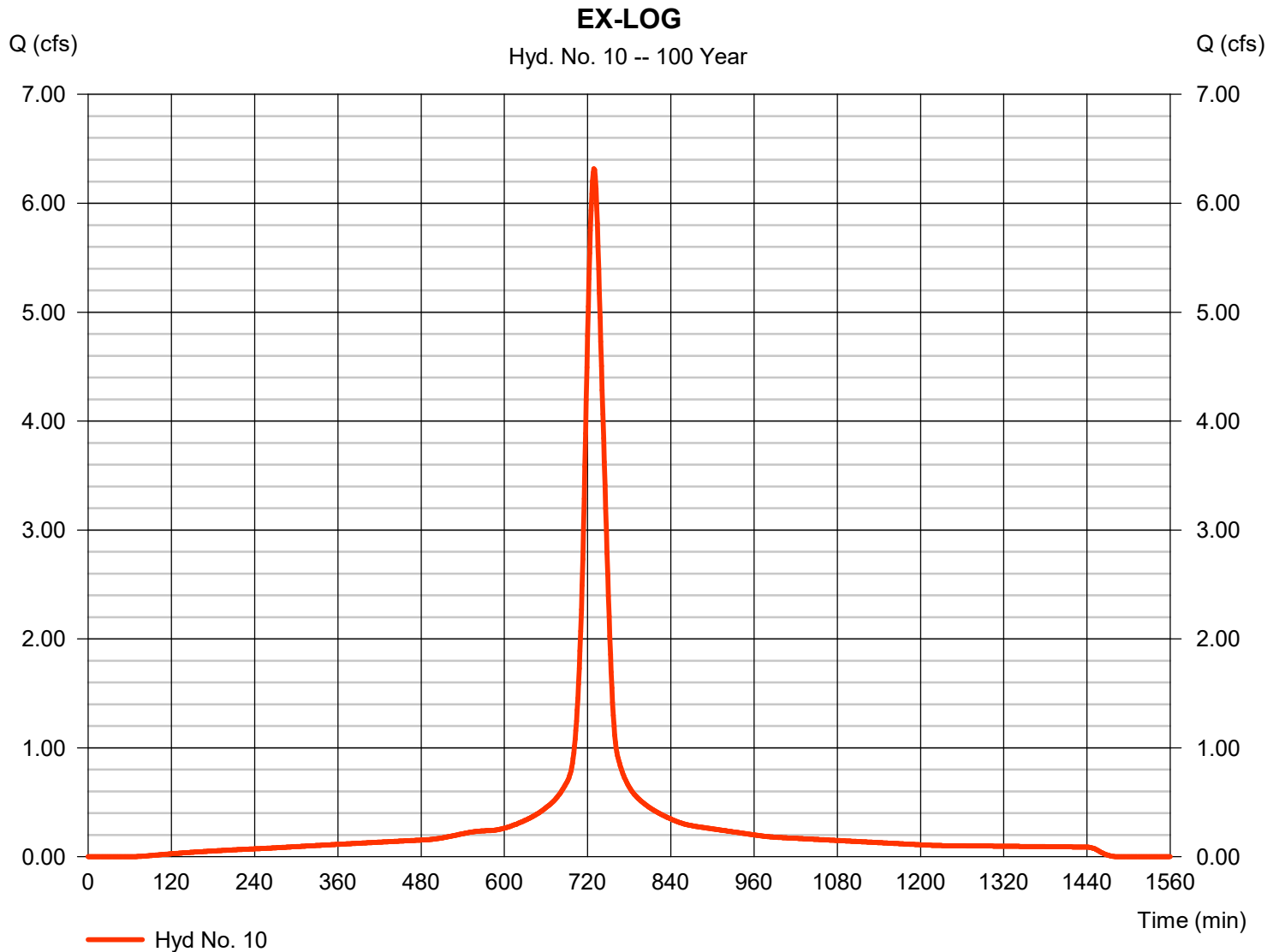
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 10

### EX-LOG

Hydrograph type	= SCS Runoff	Peak discharge	= 6.317 cfs
Storm frequency	= 100 yrs	Time to peak	= 729 min
Time interval	= 1 min	Hyd. volume	= 27,009 cuft
Drainage area	= 1.800 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.10 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

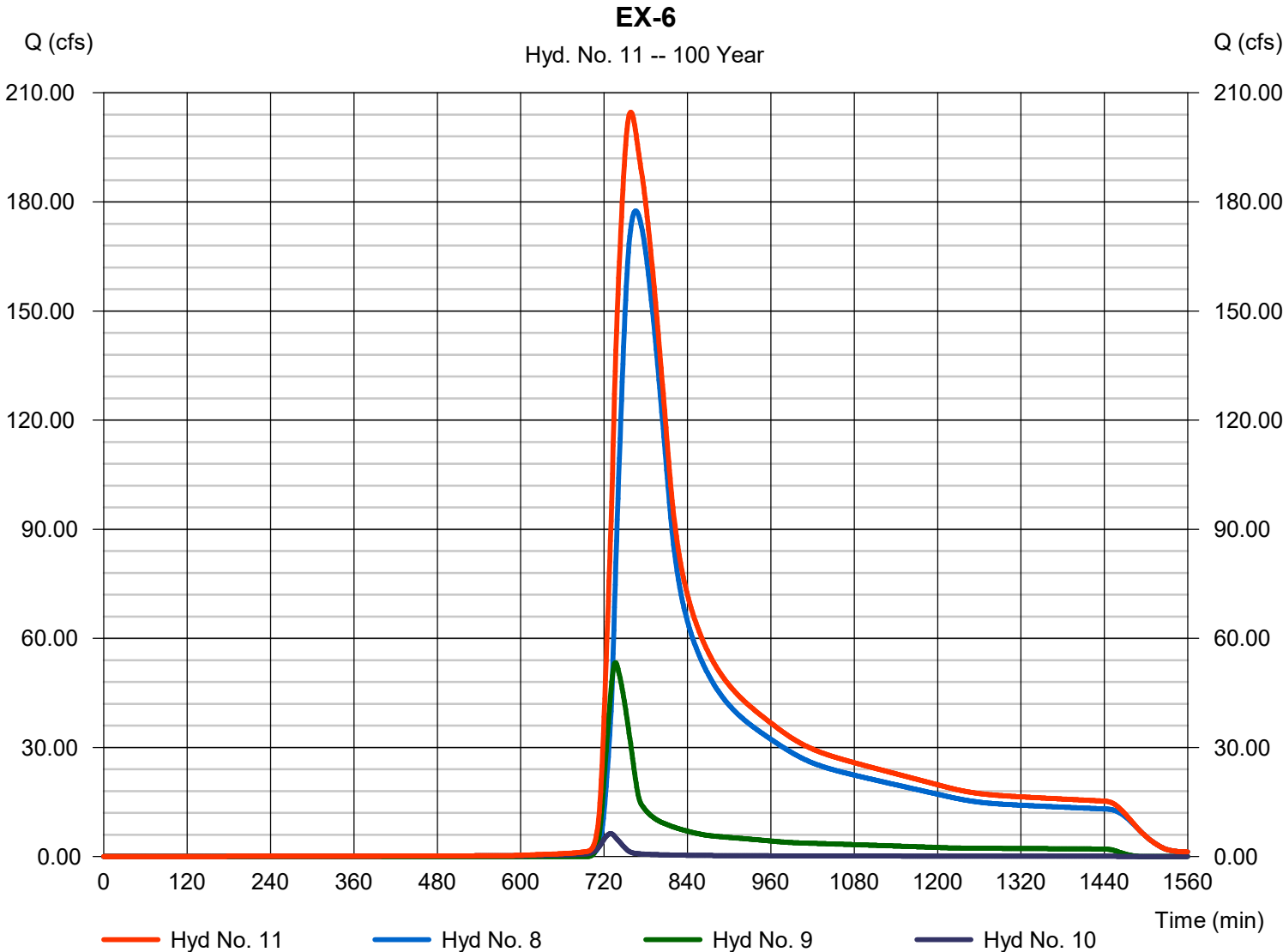
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 11

EX-6

Hydrograph type	= Combine	Peak discharge	= 204.65 cfs
Storm frequency	= 100 yrs	Time to peak	= 758 min
Time interval	= 1 min	Hyd. volume	= 2,137,908 cuft
Inflow hyds.	= 8, 9, 10	Contrib. drain. area	= 77.800 ac



# Hydrograph Report

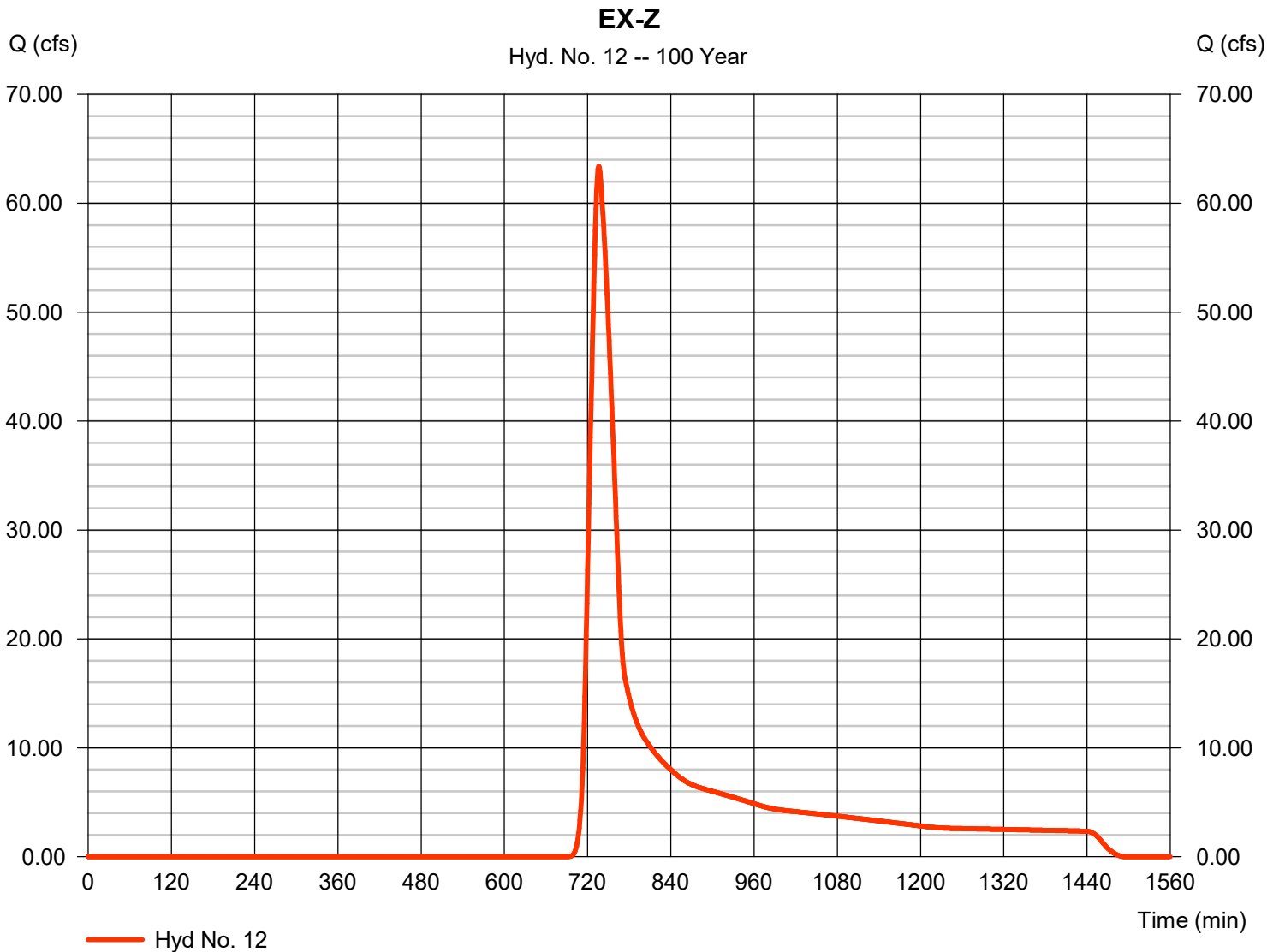
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 12

EX-Z

Hydrograph type	= SCS Runoff	Peak discharge	= 63.40 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 328,266 cuft
Drainage area	= 83.500 ac	Curve number	= 62
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484





# Hydrograph Report

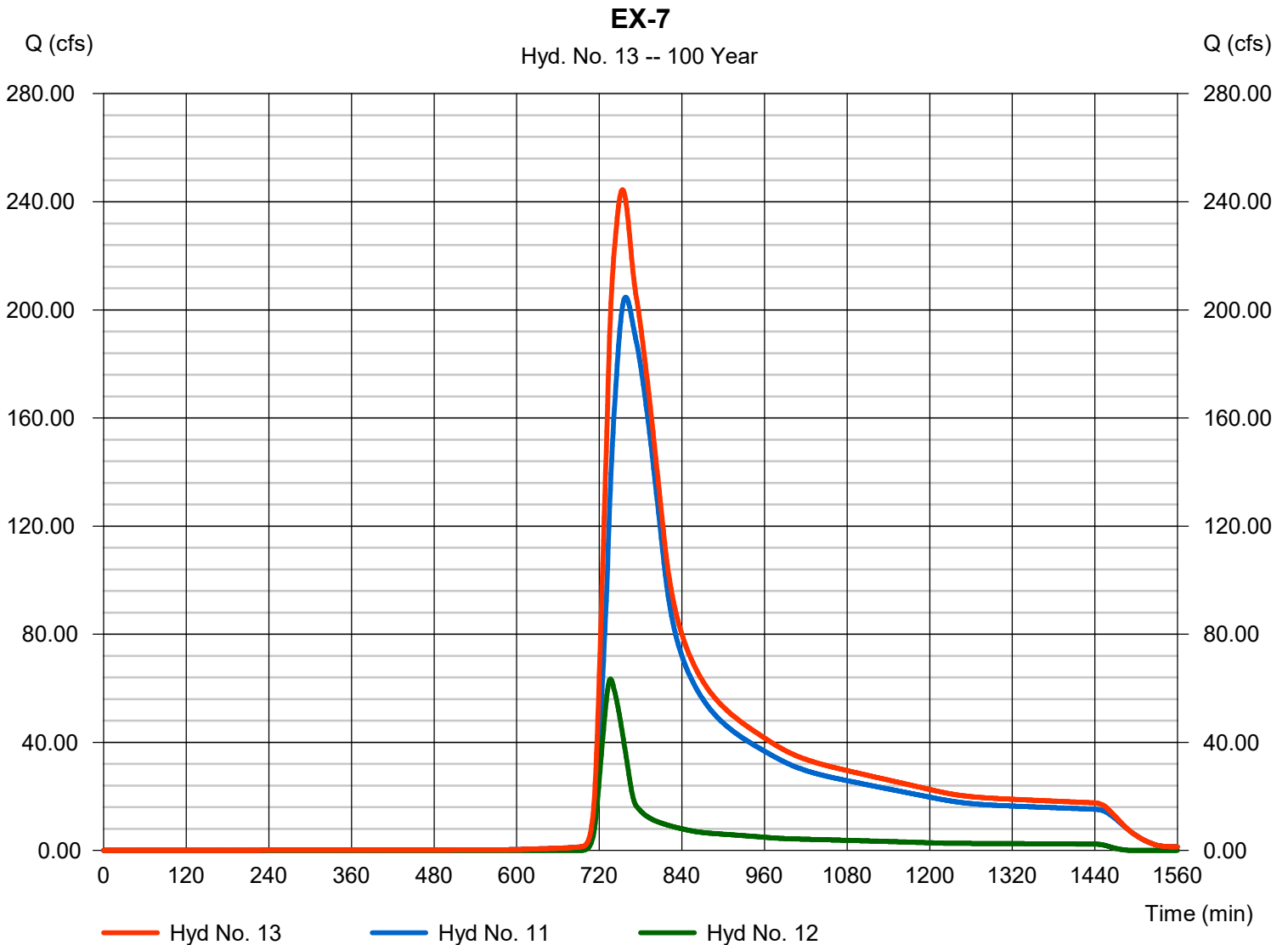
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 13

EX-7

Hydrograph type	= Combine	Peak discharge	= 244.45 cfs
Storm frequency	= 100 yrs	Time to peak	= 754 min
Time interval	= 1 min	Hyd. volume	= 2,466,175 cuft
Inflow hyds.	= 11, 12	Contrib. drain. area	= 83.500 ac



# Hydraflow Rainfall Report

Precip. file name: Sample.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		2.20		2.60				4.40

# TR55 Tc Worksheet

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

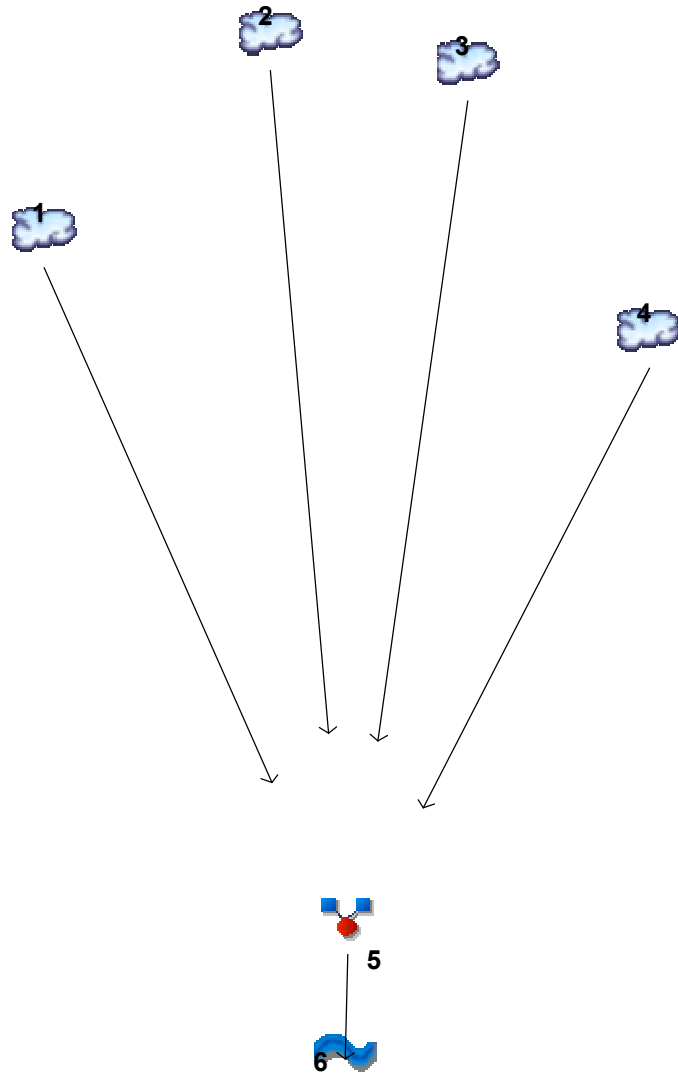
## Hyd. No. 1

EC10 - PRESENT

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>		<u>Totals</u>
<b>Sheet Flow</b>							
Manning's n-value	= 0.030		0.011		0.011		
Flow length (ft)	= 300.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.20		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
<b>Travel Time (min)</b>	<b>= 7.85</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>7.85</b>
<b>Shallow Concentrated Flow</b>							
Flow length (ft)	= 6086.00		0.00		0.00		
Watercourse slope (%)	= 1.30		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.84		0.00		0.00		
<b>Travel Time (min)</b>	<b>= 55.14</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>55.14</b>
<b>Channel Flow</b>							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00		0.00		0.00		
Flow length (ft)	{{0}}0.0		0.0		0.0		
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>0.00</b>
<b>Total Travel Time, Tc .....</b>							<b>63.00 min</b>

# Watershed Model Schematic

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



## Legend

Hyd. Origin	Description
1	SCS Runoff EC10 - PRESENT
2	SCS Runoff OS-1
3	SCS Runoff E1
4	SCS Runoff BASIN D1.5
5	Combine DP11
6	Reach Channel to DP24

# 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	18.43	1	772	262,007	-----	-----	-----	EC10 - PRESENT
2	SCS Runoff	1.349	1	734	6,442	-----	-----	-----	OS-1
3	SCS Runoff	0.320	1	742	3,200	-----	-----	-----	E1
4	SCS Runoff	1.348	1	726	8,116	-----	-----	-----	BASIN D1.5
5	Combine	19.29	1	770	279,765	1, 2, 3,	-----	-----	DP11
6	Reach	18.66	1	783	279,759	4 5	-----	-----	Channel to DP24
SCS ROUTING CHAN E Peak Flow - Pre Dev						Return Period: 5 Year		Thursday, 01 / 5 / 2023	

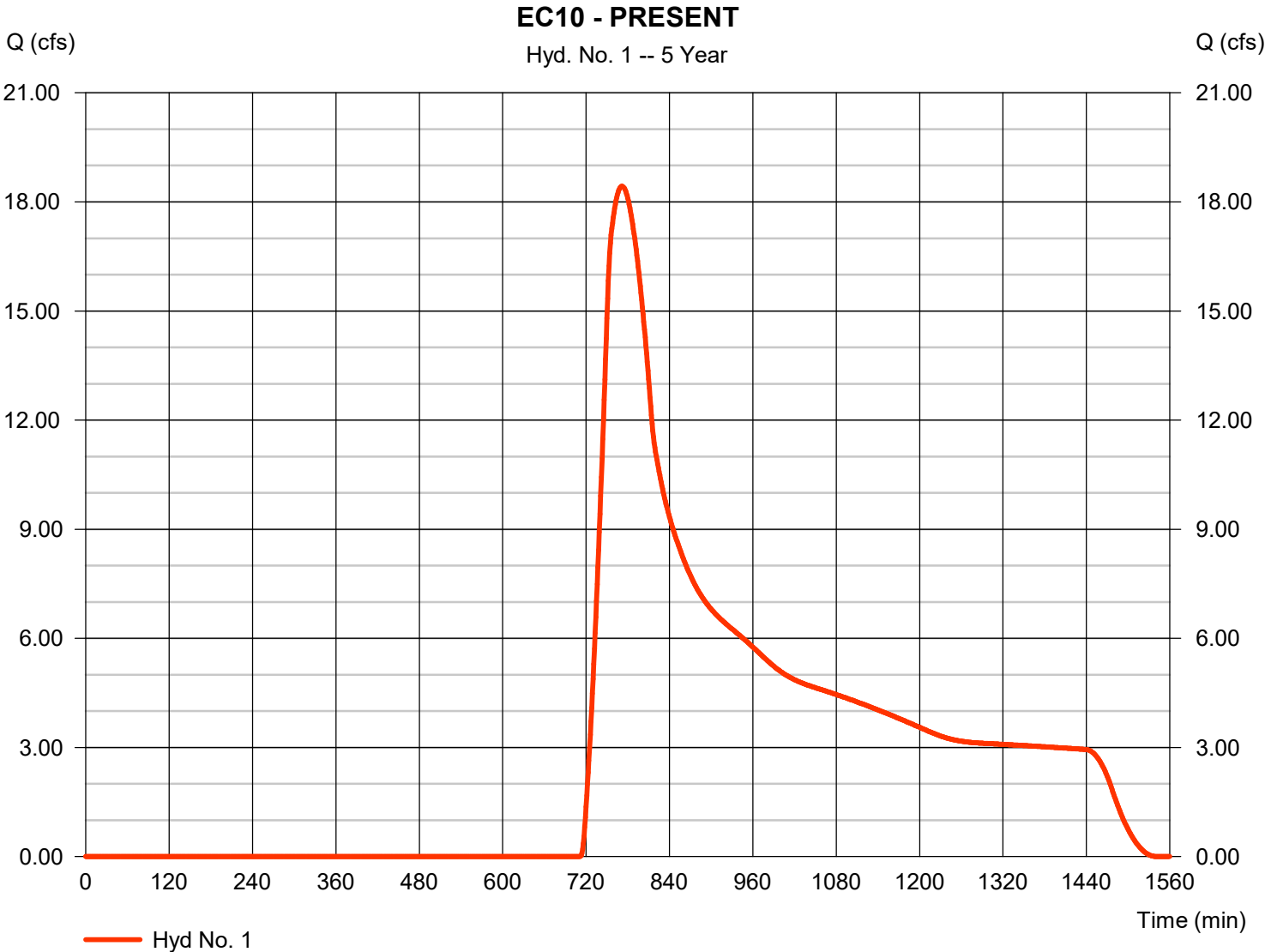
# Hydrograph Report

## Hyd. No. 1

### EC10 - PRESENT

Hydrograph type = SCS Runoff  
Storm frequency = 5 yrs  
Time interval = 1 min  
Drainage area = 320.000 ac  
Basin Slope = 0.0 %  
Tc method = TR55  
Total precip. = 2.60 in  
Storm duration = 24 hrs

Peak discharge = 18.43 cfs  
Time to peak = 772 min  
Hyd. volume = 262,007 cuft  
Curve number = 61  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 63.00 min  
Distribution = Type II  
Shape factor = 484



# TR55 Tc Worksheet

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

## Hyd. No. 1

EC10 - PRESENT

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>				
Manning's n-value	= 0.030	0.011	0.011	
Flow length (ft)	= 300.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.20	0.00	0.00	
Land slope (%)	= 2.00	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 7.85</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 7.85</b>
<b>Shallow Concentrated Flow</b>				
Flow length (ft)	= 6086.00	0.00	0.00	
Watercourse slope (%)	= 1.30	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=1.84	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 55.14</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 55.14</b>
<b>Channel Flow</b>				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	{{0}}0.0	0.0	0.0	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>				<b>63.00 min</b>

# Hydrograph Report

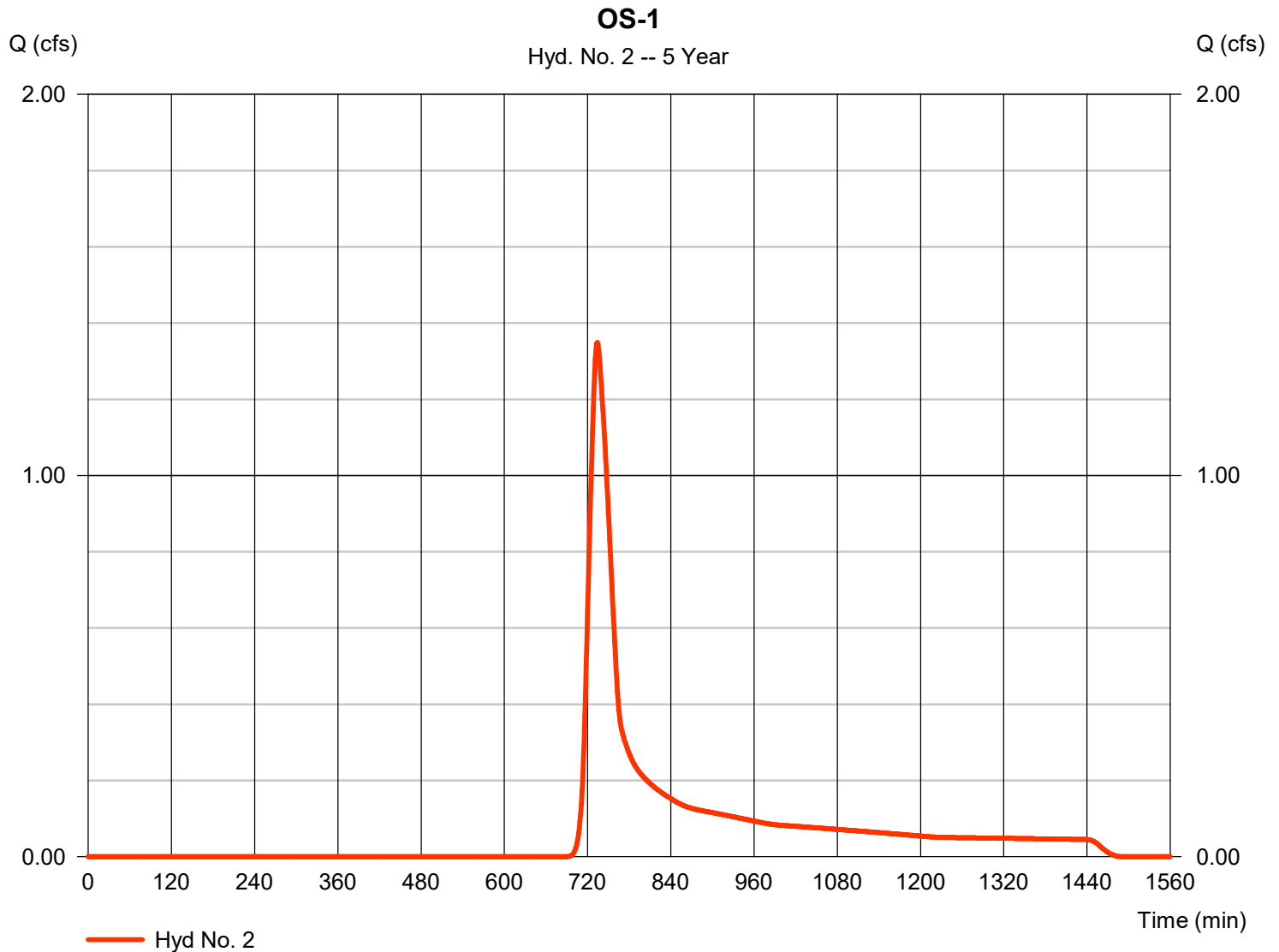
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 2

OS-1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.349 cfs
Storm frequency	= 5 yrs	Time to peak	= 734 min
Time interval	= 1 min	Hyd. volume	= 6,442 cuft
Drainage area	= 2.650 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484





# TR55 Tc Worksheet

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

## Hyd. No. 2

OS-1

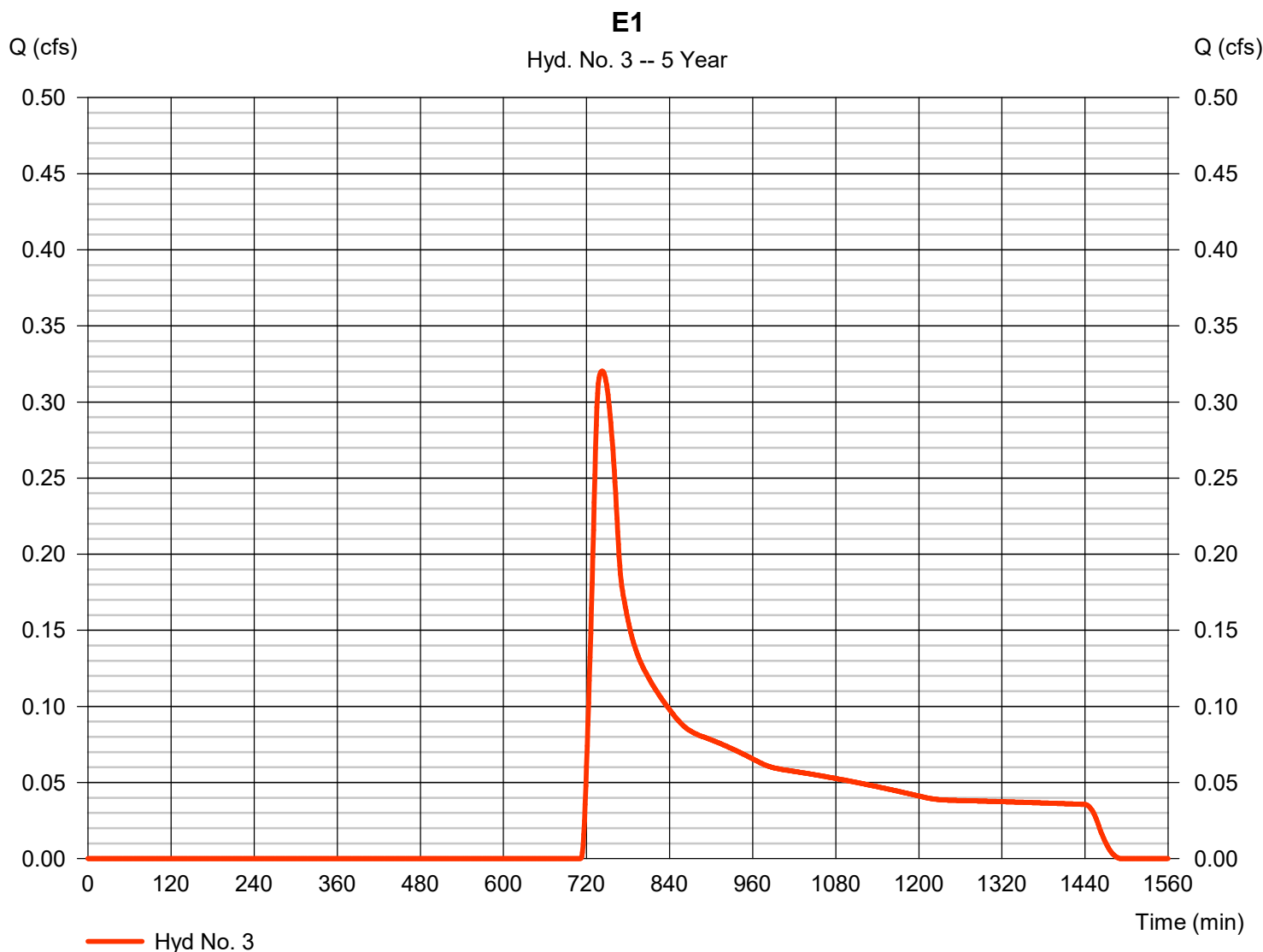
<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>						
Manning's n-value	= 0.013		0.011		0.011	
Flow length (ft)	= 50.0		0.0		0.0	
Two-year 24-hr precip. (in)	= 2.20		0.00		0.00	
Land slope (%)	= 2.00		0.00		0.00	
<b>Travel Time (min)</b>	<b>= 0.96</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 0.96</b>
<b>Shallow Concentrated Flow</b>						
Flow length (ft)	= 2525.00		0.00		0.00	
Watercourse slope (%)	= 0.70		0.00		0.00	
Surface description	= Unpaved		Paved		Paved	
Average velocity (ft/s)	=1.35		0.00		0.00	
<b>Travel Time (min)</b>	<b>= 31.17</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 31.17</b>
<b>Channel Flow</b>						
X sectional flow area (sqft)	= 0.00		0.00		0.00	
Wetted perimeter (ft)	= 0.00		0.00		0.00	
Channel slope (%)	= 0.00		0.00		0.00	
Manning's n-value	= 0.015		0.015		0.015	
Velocity (ft/s)	=0.00		0.00		0.00	
Flow length (ft)	{{0}}0.0		0.0		0.0	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>						<b>32.10 min</b>

# Hydrograph Report

## Hyd. No. 3

E1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.320 cfs
Storm frequency	= 5 yrs	Time to peak	= 742 min
Time interval	= 1 min	Hyd. volume	= 3,200 cuft
Drainage area	= 3.920 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.50 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 3

E1

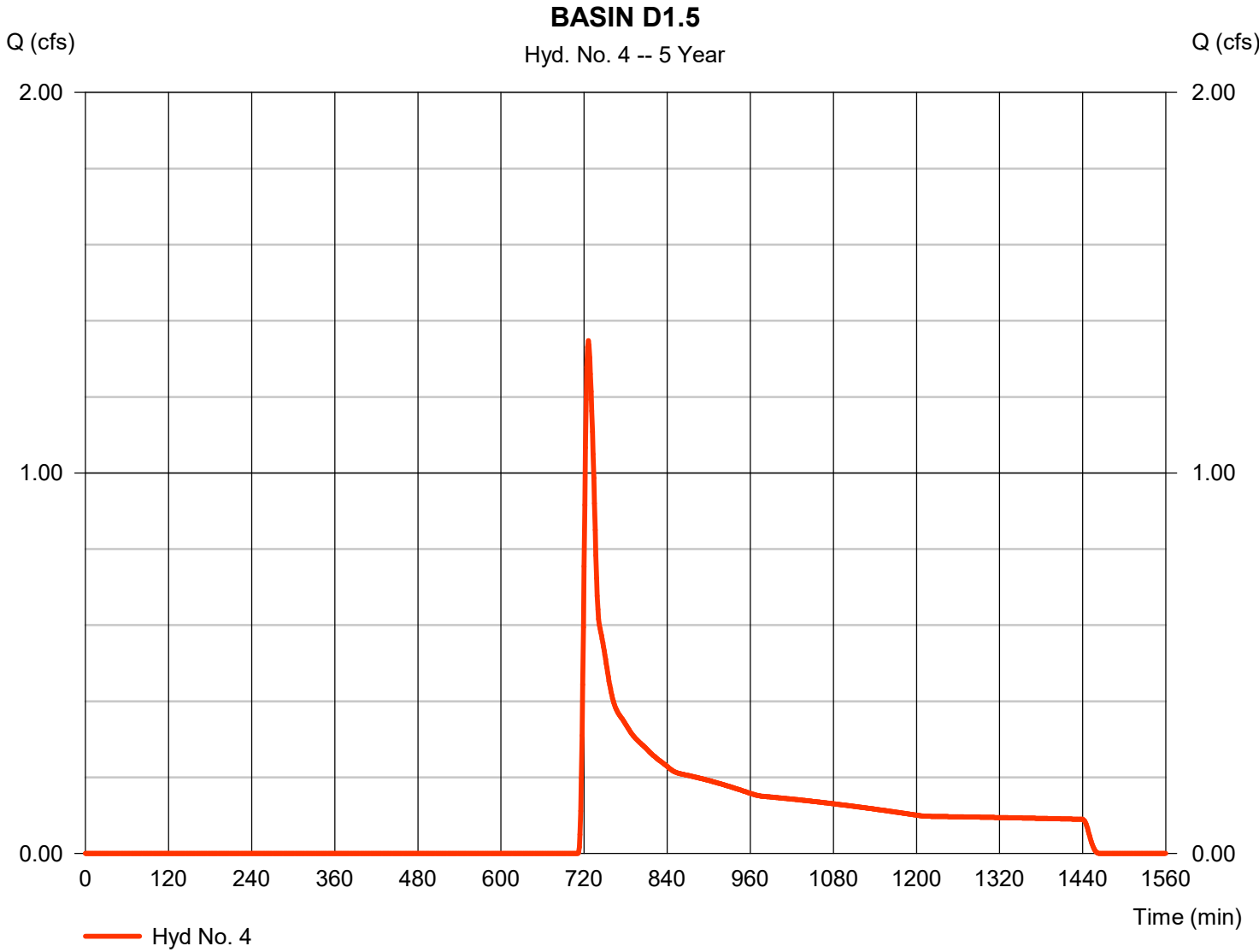
<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>				
Manning's n-value	= 0.011	0.011	0.011	
Flow length (ft)	= 0.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 0.00	0.00	0.00	
Land slope (%)	= 0.00	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.00</b>
<b>Shallow Concentrated Flow</b>				
Flow length (ft)	= 2811.00	0.00	0.00	
Watercourse slope (%)	= 0.80	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=1.44	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 32.46</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 32.46</b>
<b>Channel Flow</b>				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	{{0}}0.0	0.0	0.0	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>				<b>32.50 min</b>

# Hydrograph Report

## Hyd. No. 4

### BASIN D1.5

Hydrograph type	= SCS Runoff	Peak discharge	= 1.348 cfs
Storm frequency	= 5 yrs	Time to peak	= 726 min
Time interval	= 1 min	Hyd. volume	= 8,116 cuft
Drainage area	= 9.880 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.00 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 4

BASIN D1.5

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>		<u>Totals</u>
<b>Sheet Flow</b>							
Manning's n-value	= 0.030		0.011		0.011		
Flow length (ft)	= 300.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.20		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
<b>Travel Time (min)</b>	<b>= 7.85</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>7.85</b>
<b>Shallow Concentrated Flow</b>							
Flow length (ft)	= 840.00		0.00		0.00		
Watercourse slope (%)	= 2.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.28		0.00		0.00		
<b>Travel Time (min)</b>	<b>= 6.14</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>6.14</b>
<b>Channel Flow</b>							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00		0.00		0.00		
Flow length (ft)	{{0}}0.0		0.0		0.0		
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>0.00</b>
<b>Total Travel Time, Tc .....</b>							<b>14.00 min</b>

# Hydrograph Report

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

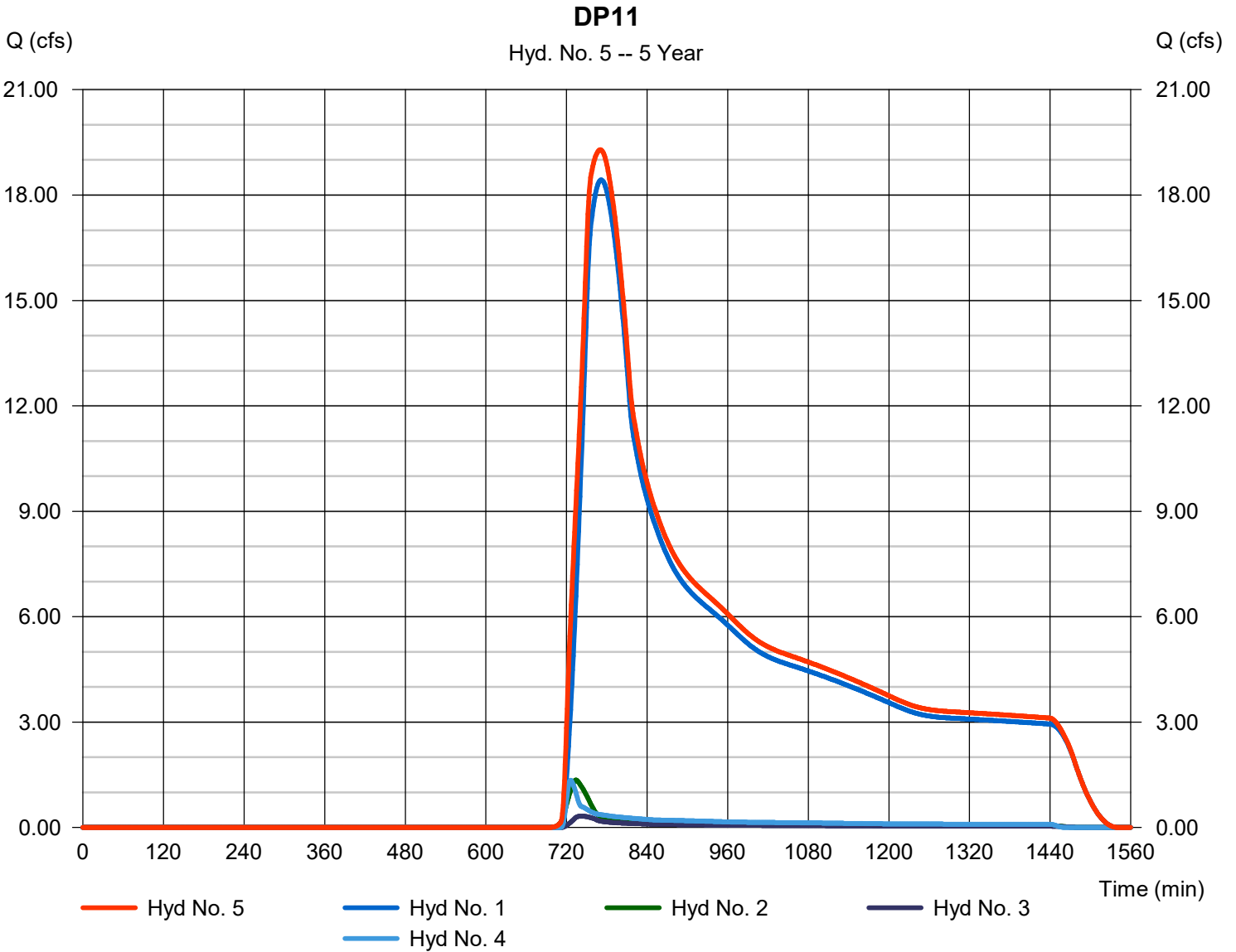
Thursday, 01 / 5 / 2023

## Hyd. No. 5

DP11

Hydrograph type = Combine  
Storm frequency = 5 yrs  
Time interval = 1 min  
Inflow hyds. = 1, 2, 3, 4

Peak discharge = 19.29 cfs  
Time to peak = 770 min  
Hyd. volume = 279,765 cuft  
Contrib. drain. area = 336.450 ac



# Hydrograph Report

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

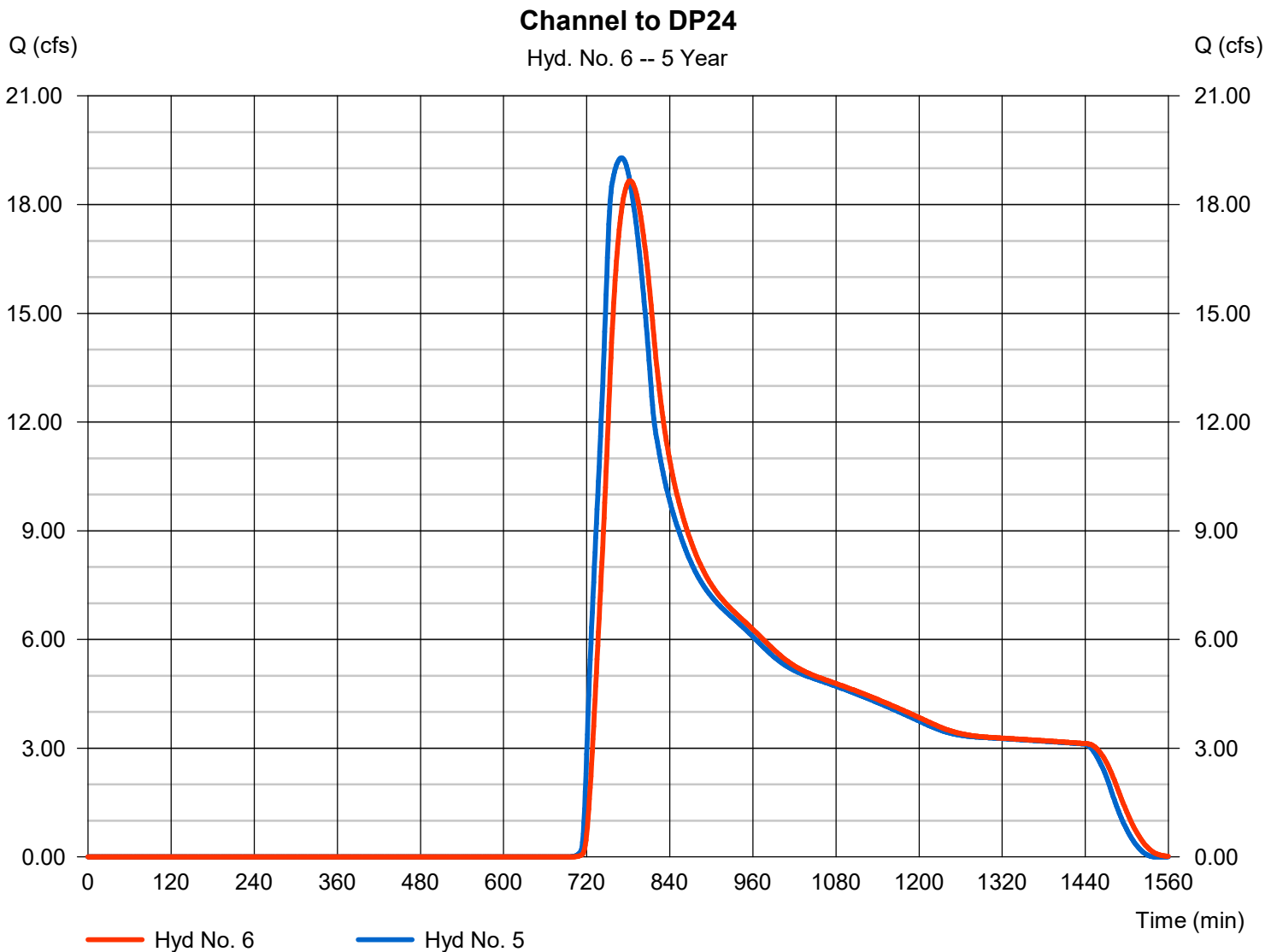
Thursday, 01 / 5 / 2023

## Hyd. No. 6

Channel to DP24

Hydrograph type	= Reach	Peak discharge	= 18.66 cfs
Storm frequency	= 5 yrs	Time to peak	= 783 min
Time interval	= 1 min	Hyd. volume	= 279,759 cuft
Inflow hyd. No.	= 5 - DP11	Section type	= Trapezoidal
Reach length	= 1976.0 ft	Channel slope	= 0.8 %
Manning's n	= 0.030	Bottom width	= 8.0 ft
Side slope	= 4.0:1	Max. depth	= 3.3 ft
Rating curve x	= 1.110	Rating curve m	= 1.349
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0909

Modified Att-Kin routing method used.



# 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	144.67	1	755	1,185,497	-----	-----	-----	EC10 - PRESENT
2	SCS Runoff	4.333	1	733	18,356	-----	-----	-----	OS-1
3	SCS Runoff	2.846	1	735	14,479	-----	-----	-----	E1
4	SCS Runoff	12.23	1	723	36,723	-----	-----	-----	BASIN D1.5
5	Combine	150.44	1	754	1,255,054	1, 2, 3,	-----	-----	DP11
6	Reach	144.76	1	762	1,255,052	4 5	-----	-----	Channel to DP24
SCS ROUTING CHAN E Peak Flow - Pre Dev Return Period: 100 Year						Thursday, 01 / 5 / 2023			



# Hydrograph Report

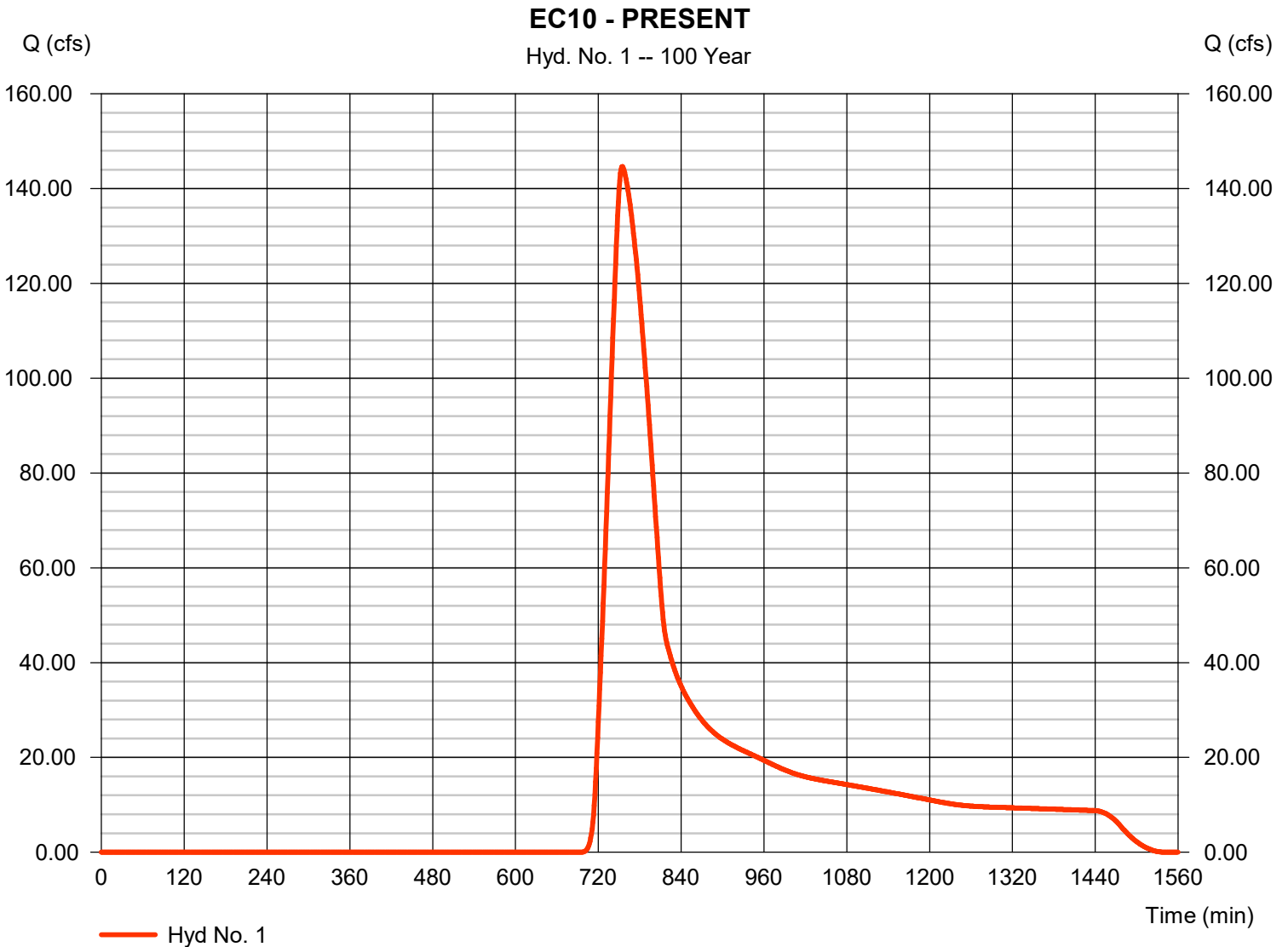
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 1

EC10 - PRESENT

Hydrograph type	= SCS Runoff	Peak discharge	= 144.67 cfs
Storm frequency	= 100 yrs	Time to peak	= 755 min
Time interval	= 1 min	Hyd. volume	= 1,185,497 cuft
Drainage area	= 320.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 63.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

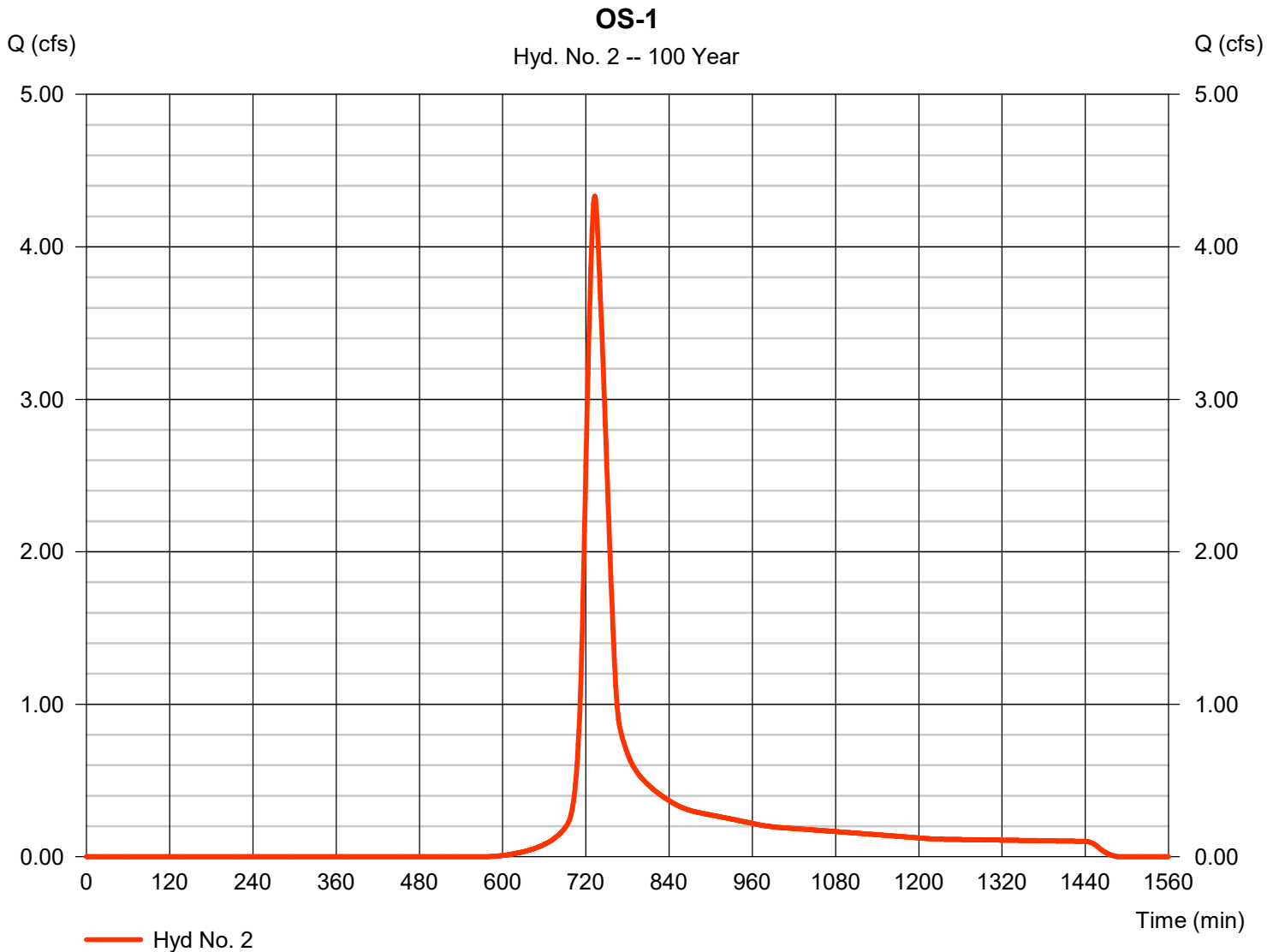
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 2

OS-1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.333 cfs
Storm frequency	= 100 yrs	Time to peak	= 733 min
Time interval	= 1 min	Hyd. volume	= 18,356 cuft
Drainage area	= 2.650 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

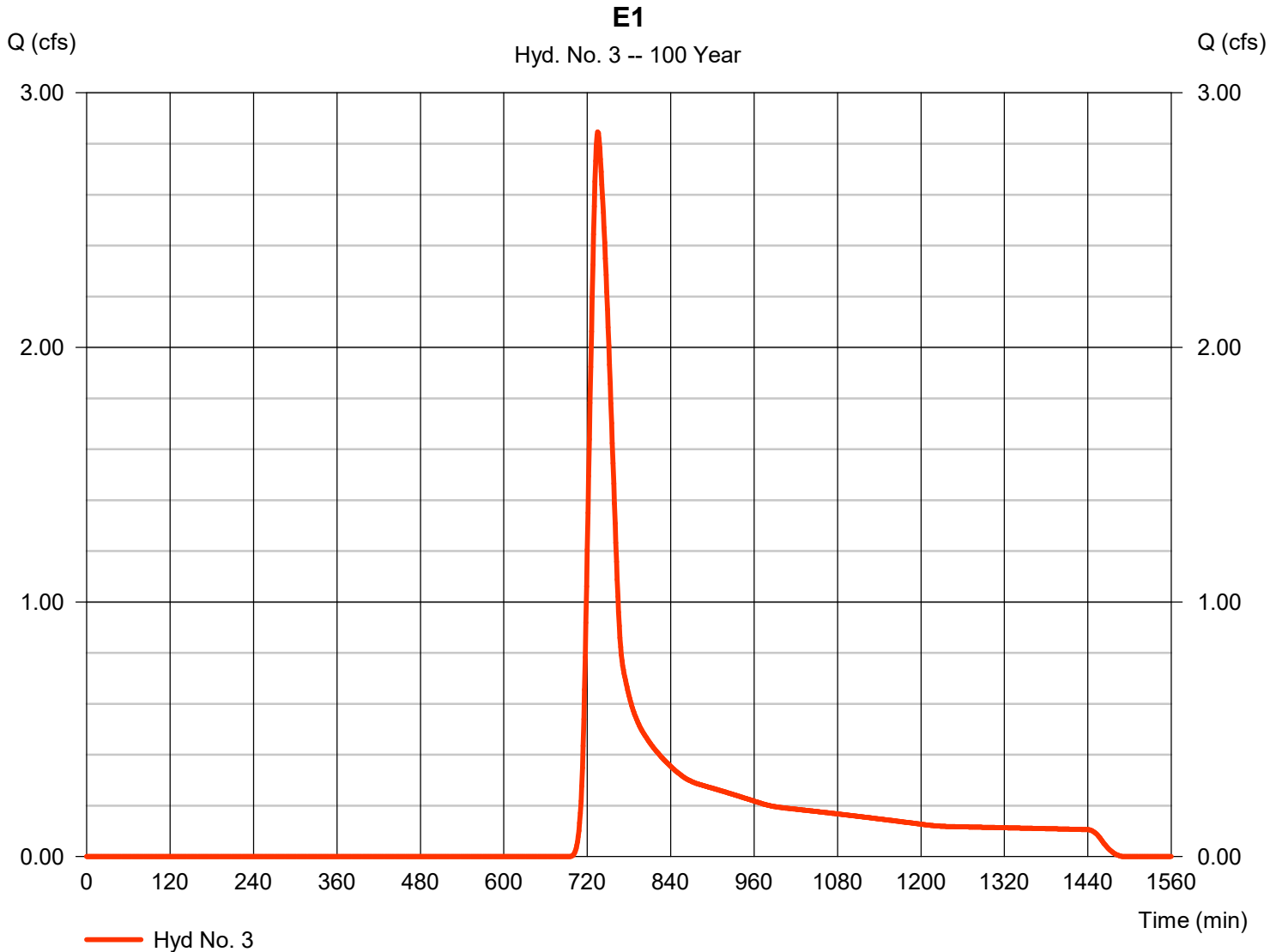
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 3

E1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.846 cfs
Storm frequency	= 100 yrs	Time to peak	= 735 min
Time interval	= 1 min	Hyd. volume	= 14,479 cuft
Drainage area	= 3.920 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.50 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

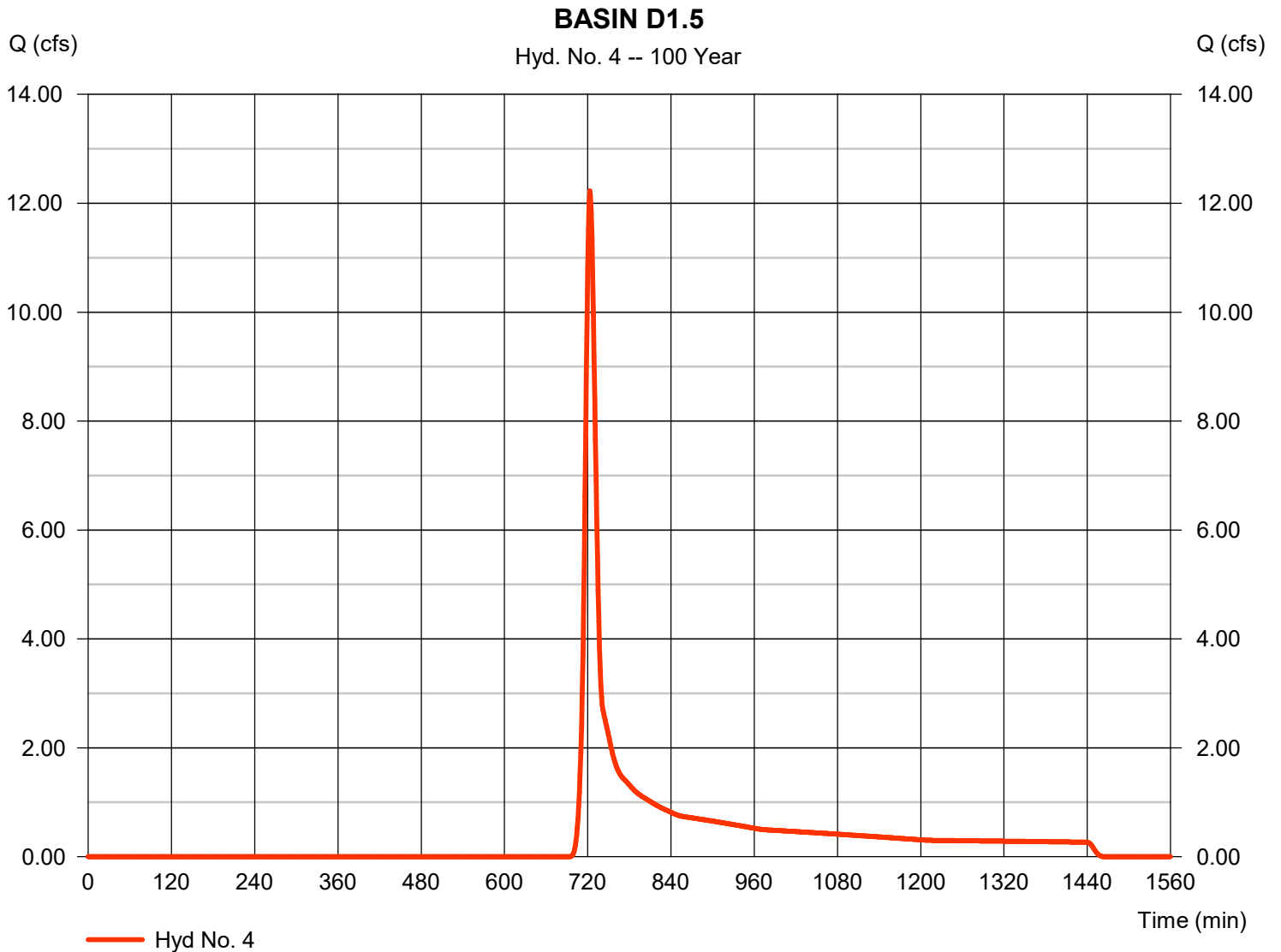
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 5 / 2023

## Hyd. No. 4

### BASIN D1.5

Hydrograph type	= SCS Runoff	Peak discharge	= 12.23 cfs
Storm frequency	= 100 yrs	Time to peak	= 723 min
Time interval	= 1 min	Hyd. volume	= 36,723 cuft
Drainage area	= 9.880 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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

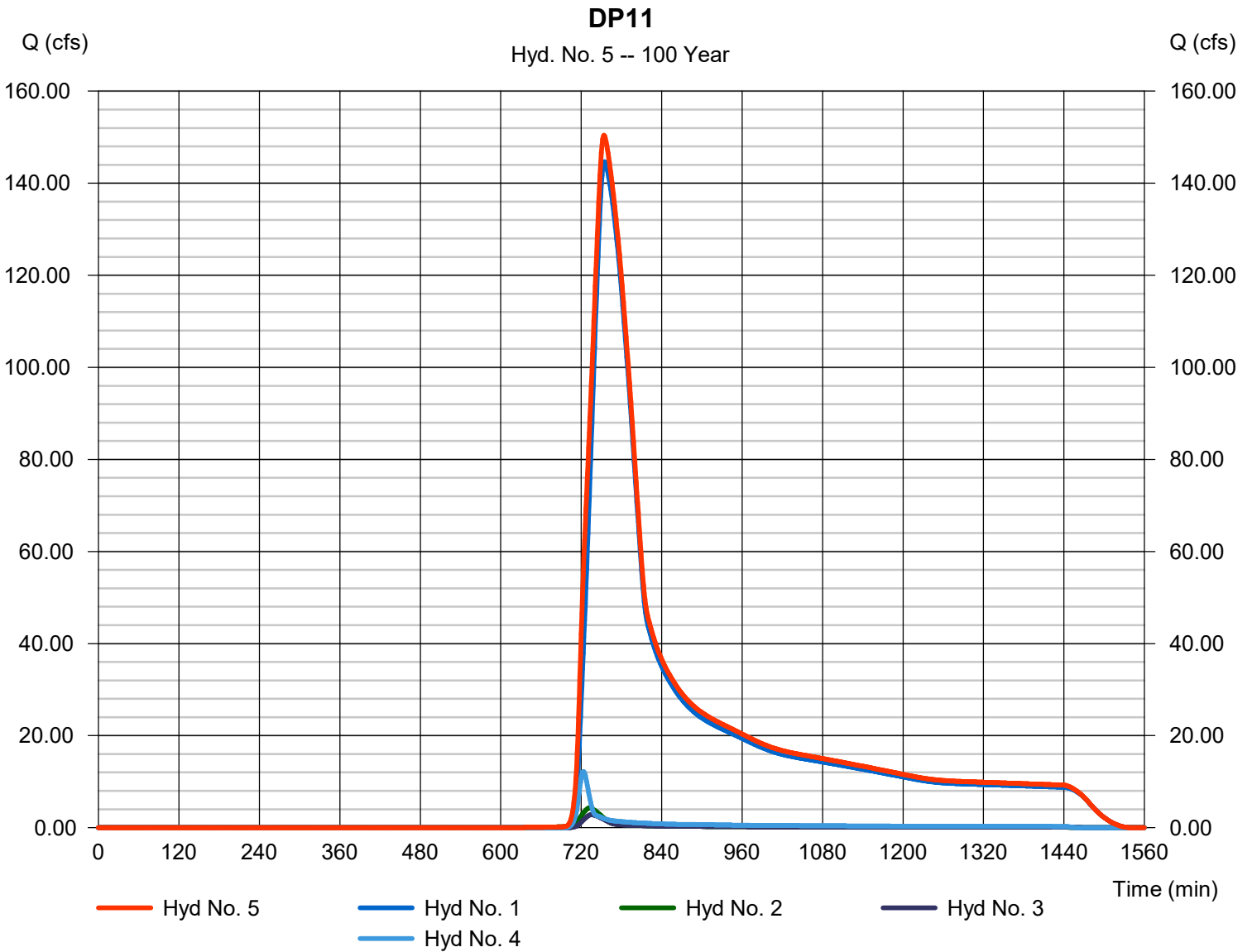
Thursday, 01 / 5 / 2023

## Hyd. No. 5

DP11

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 1, 2, 3, 4

Peak discharge = 150.44 cfs  
Time to peak = 754 min  
Hyd. volume = 1,255,054 cuft  
Contrib. drain. area = 336.450 ac



# Hydrograph Report

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

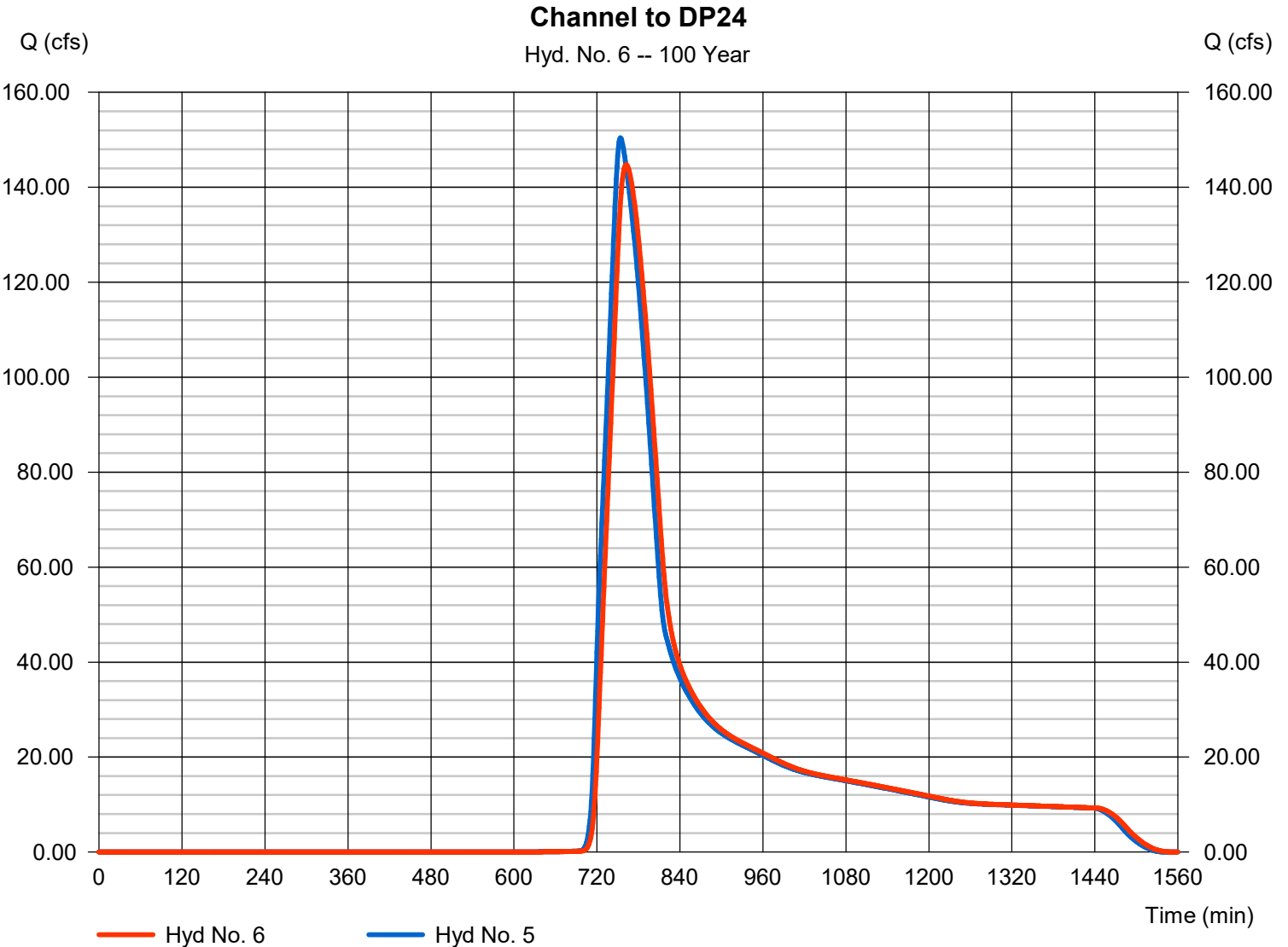
Thursday, 01 / 5 / 2023

## Hyd. No. 6

Channel to DP24

Hydrograph type	= Reach	Peak discharge	= 144.76 cfs
Storm frequency	= 100 yrs	Time to peak	= 762 min
Time interval	= 1 min	Hyd. volume	= 1,255,052 cuft
Inflow hyd. No.	= 5 - DP11	Section type	= Trapezoidal
Reach length	= 1976.0 ft	Channel slope	= 0.8 %
Manning's n	= 0.030	Bottom width	= 8.0 ft
Side slope	= 4.0:1	Max. depth	= 3.3 ft
Rating curve x	= 1.110	Rating curve m	= 1.349
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.1499

Modified Att-Kin routing method used.



# Hydraflow Rainfall Report

Precip. file name: Sample.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		2.20		2.60				4.40

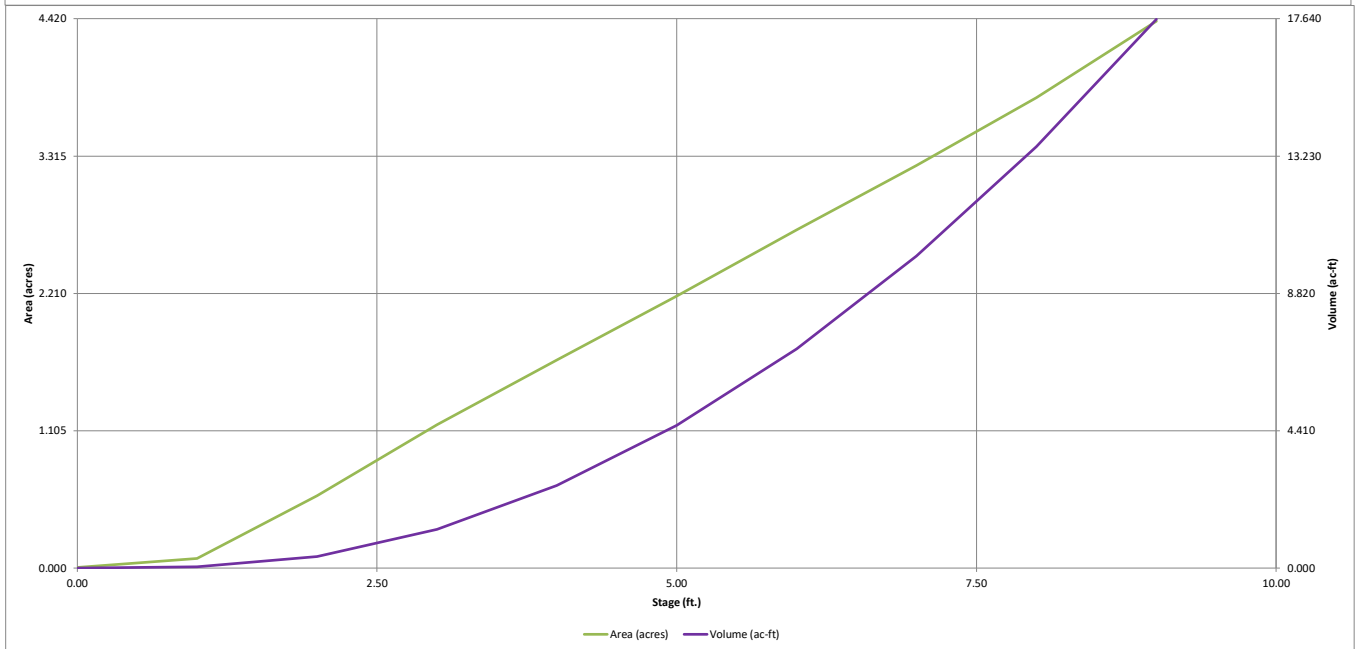
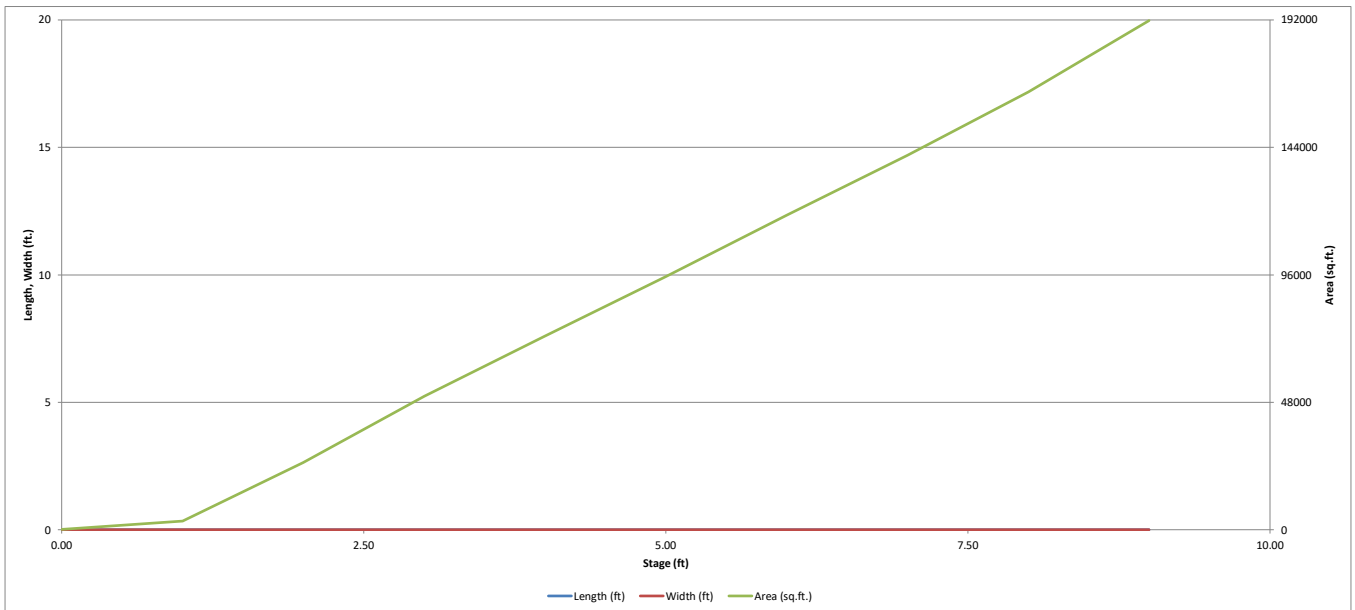
## **APPENDIX B - HYDRAULIC COMPUTATIONS**





# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

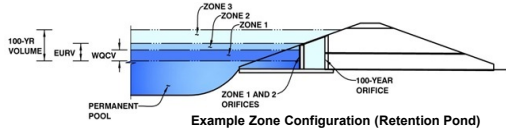
*MHFD-Detention, Version 4.06 (July 2022)*



## DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

**Project: MAYBERRY FILING 3**  
**Basin ID: INTERIM DETENTION POND D**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.85	1.065	Orifice Plate
Zone 2 (EURV)	3.68	1.073	Orifice Plate
Z3 (100+1/2WQCV)	5.17	2.823	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>4.961</b>	

**User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)**

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft <sup>2</sup>
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

**User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)**

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft <sup>2</sup>
Depth at top of Zone using Orifice Plate =	3.60	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft <sup>2</sup>

**User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)**

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.20	2.40					
Orifice Area (sq. inches)	4.00	4.00	4.00					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

**User Input: Vertical Orifice (Circular or Rectangular)**

	Not Selected	Not Selected		Not Selected	Not Selected
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A
Vertical Orifice Diameter =	N/A	N/A	inches		

**User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)**

	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	5.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H <sub>t</sub> =	5.50
Overflow Weir Front Edge Length =	7.00	N/A	feet	Overflow Weir Slope Length =	6.00
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.46
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	29.23
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	14.62
Debris Clogging % =	50%	N/A	%		

**User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)**

	Zone 3 Restrictor	Not Selected		Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.53
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	1.04
Restrictor Plate Height Above Pipe Invert =	22.00	N/A	inches	Half-Central Angle of Restrictor Plate on Pipe =	1.79

**User Input: Emergency Spillway (Rectangular or Trapezoidal)**

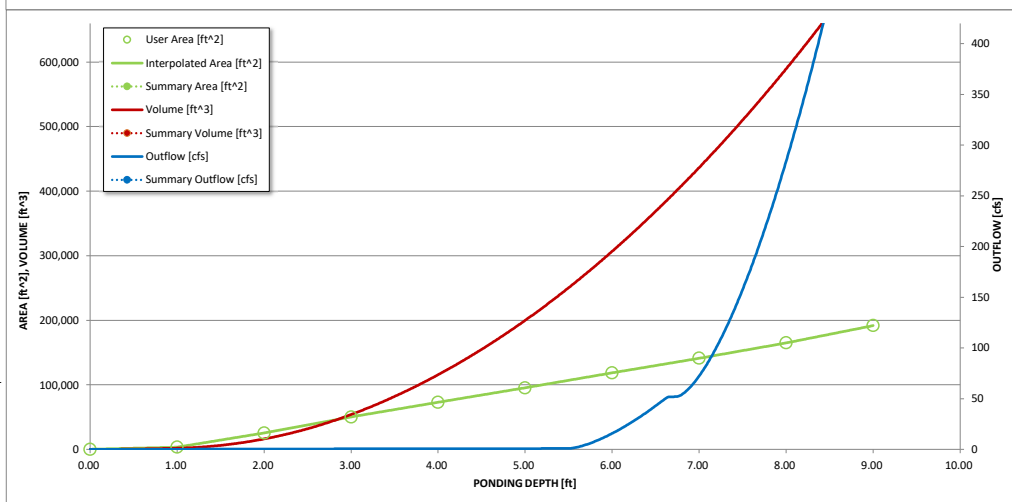
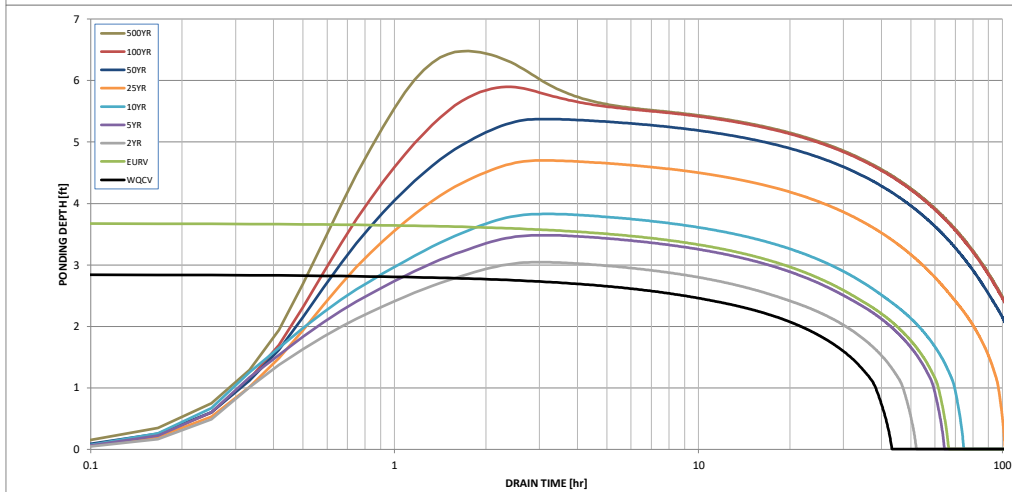
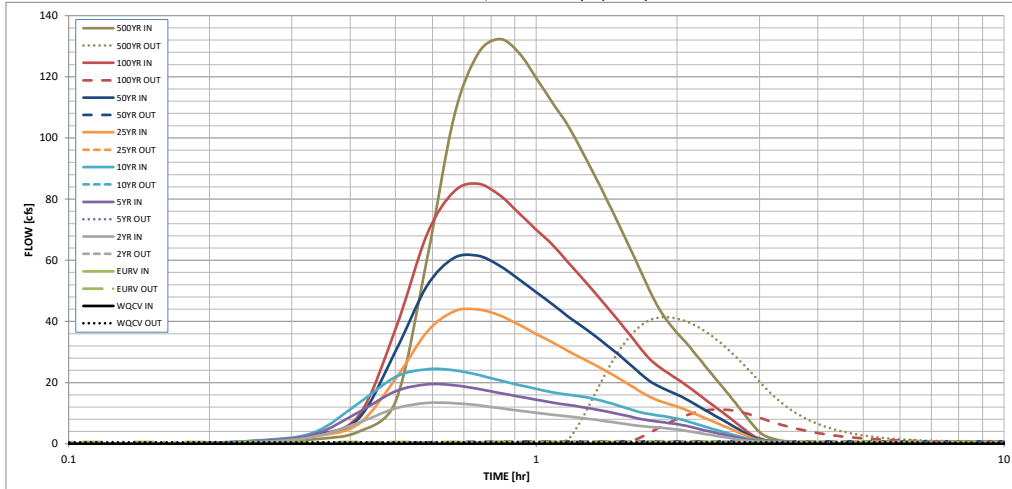
Spillway Invert Stage =	6.75	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	0.65	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	8.40	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	4.03	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	15.10	acre-ft

**Routed Hydrograph Results** *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in)	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft)	1.065	2.138	1.404	1.992	2.522	4.117	5.623	7.666	12.108
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	1.404	1.992	2.522	4.117	5.623	7.666	12.108
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	0.6	1.2	1.7	15.6	31.3	51.8	94.2
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.01	0.01	0.02	0.16	0.31	0.52	0.94
Peak Inflow Q (cfs)	N/A	N/A	13.3	19.4	24.4	43.9	61.4	85.0	132.3
Peak Outflow Q (cfs)	0.5	0.6	0.5	0.6	0.6	0.7	0.8	11.2	41.4
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	0.5	0.4	0.0	0.0	0.2	0.4
Structure Controlling Flow	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.3	1.4
Max Velocity through Grate 2 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours)	39	60	47	58	67	92	112	118	113
Time to Drain 99% of Inflow Volume (hours)	42	64	50	62	71	97	119	>120	>120
Maximum Ponding Depth (ft)	2.85	3.68	3.04	3.48	3.83	4.70	5.37	5.89	6.48
Area at Maximum Ponding Depth (acres)	1.07	1.51	1.18	1.40	1.58	2.03	2.39	2.66	2.96
Maximum Volume Stored (acre-ft)	1.072	2.144	1.286	1.853	2.361	3.932	5.433	6.745	8.377

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

## DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: \_\_\_\_\_

### Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

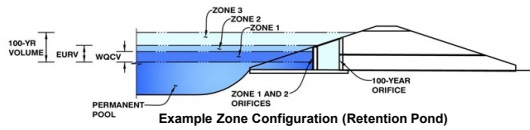
Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.01
	0:15:00	0.00	0.00	0.52	0.84	1.05	0.71	0.93	0.88	1.40
	0:20:00	0.00	0.00	2.21	3.02	3.61	2.32	2.77	2.90	3.93
	0:25:00	0.00	0.00	6.84	10.28	13.24	6.42	8.22	9.22	13.63
	0:30:00	0.00	0.00	11.56	17.17	21.81	21.20	30.19	37.45	60.06
	0:35:00	0.00	0.00	13.31	19.38	24.37	36.53	51.53	68.30	106.83
	0:40:00	0.00	0.00	13.29	19.14	24.06	43.28	60.70	82.43	127.49
	0:45:00	0.00	0.00	12.57	17.98	22.51	43.90	61.45	85.01	132.35
	0:50:00	0.00	0.00	11.64	16.64	20.75	42.00	58.29	81.36	127.98
	0:55:00	0.00	0.00	10.85	15.49	19.26	38.96	53.86	75.47	119.59
	1:00:00	0.00	0.00	10.15	14.42	17.93	35.90	49.52	70.00	111.45
	1:05:00	0.00	0.00	9.52	13.44	16.79	33.17	45.60	65.06	104.31
	1:10:00	0.00	0.00	8.96	12.71	16.05	30.40	41.73	59.52	95.89
	1:15:00	0.00	0.00	8.42	12.03	15.46	27.99	38.44	54.32	87.69
	1:20:00	0.00	0.00	7.88	11.28	14.65	25.79	35.33	49.47	79.73
	1:25:00	0.00	0.00	7.34	10.49	13.59	23.60	32.22	44.70	71.79
	1:30:00	0.00	0.00	6.79	9.69	12.44	21.40	29.10	40.13	64.24
	1:35:00	0.00	0.00	6.27	8.93	11.32	19.25	26.03	35.71	56.97
	1:40:00	0.00	0.00	5.80	8.15	10.32	17.16	23.07	31.46	50.01
	1:45:00	0.00	0.00	5.49	7.60	9.69	15.30	20.46	27.72	44.02
	1:50:00	0.00	0.00	5.29	7.19	9.21	14.00	18.67	25.06	39.74
	1:55:00	0.00	0.00	5.01	6.80	8.75	13.02	17.30	23.03	36.32
	2:00:00	0.00	0.00	4.69	6.41	8.24	12.16	16.09	21.24	33.29
	2:05:00	0.00	0.00	4.29	5.88	7.55	11.14	14.71	19.36	30.22
	2:10:00	0.00	0.00	3.84	5.28	6.76	10.04	13.25	17.41	27.12
	2:15:00	0.00	0.00	3.41	4.68	5.99	8.96	11.81	15.51	24.13
	2:20:00	0.00	0.00	3.00	4.12	5.25	7.92	10.42	13.70	21.28
	2:25:00	0.00	0.00	2.62	3.58	4.55	6.93	9.09	11.97	18.58
	2:30:00	0.00	0.00	2.26	3.08	3.90	5.98	7.81	10.28	15.92
	2:35:00	0.00	0.00	1.91	2.59	3.29	5.05	6.56	8.62	13.31
	2:40:00	0.00	0.00	1.58	2.13	2.70	4.14	5.34	6.99	10.74
	2:45:00	0.00	0.00	1.26	1.69	2.14	3.27	4.15	5.39	8.22
	2:50:00	0.00	0.00	0.98	1.30	1.64	2.43	3.01	3.85	5.80
	2:55:00	0.00	0.00	0.77	1.02	1.32	1.68	2.01	2.50	3.79
	3:00:00	0.00	0.00	0.64	0.85	1.10	1.21	1.44	1.70	2.62
	3:05:00	0.00	0.00	0.54	0.72	0.93	0.94	1.11	1.26	1.90
	3:10:00	0.00	0.00	0.46	0.61	0.79	0.75	0.88	0.95	1.40
	3:15:00	0.00	0.00	0.39	0.51	0.67	0.61	0.71	0.74	1.04
	3:20:00	0.00	0.00	0.33	0.43	0.56	0.50	0.58	0.57	0.78
	3:25:00	0.00	0.00	0.28	0.36	0.47	0.41	0.47	0.44	0.57
	3:30:00	0.00	0.00	0.23	0.30	0.38	0.33	0.38	0.34	0.43
	3:35:00	0.00	0.00	0.19	0.24	0.31	0.27	0.30	0.28	0.35
	3:40:00	0.00	0.00	0.15	0.20	0.24	0.22	0.24	0.23	0.28
	3:45:00	0.00	0.00	0.12	0.15	0.19	0.17	0.19	0.18	0.22
	3:50:00	0.00	0.00	0.09	0.12	0.15	0.13	0.15	0.14	0.17
	3:55:00	0.00	0.00	0.07	0.09	0.11	0.10	0.11	0.10	0.13
	4:00:00	0.00	0.00	0.05	0.06	0.08	0.07	0.08	0.07	0.09
	4:05:00	0.00	0.00	0.03	0.04	0.05	0.05	0.05	0.05	0.06
	4:10:00	0.00	0.00	0.02	0.03	0.03	0.03	0.03	0.03	0.03
	4:15:00	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.01	0.02
	4:20:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD- Detention, Version 4.06 (July 2022)

**Project: Mayberry Filing 3**

**Basin ID: Pond D ULTIMATE CONDITION**



ULTIMATE CONDITION IS INCLUDED TO PROJECT RELEASE RATES IN THE FULLY DEVELOPED CONDITION. DOWNSTREAM CHANNELS AND RIPRAP ARE SIZED FOR THESE RELEASE RATES

**Watershed Information**

Selected BMP Type =	<b>EDB</b>	
Watershed Area =	100.20	acres
Watershed Length =	2,867	ft
Watershed Length to Centroid =	1,433	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	45.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.611	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	5.048	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	3.827	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	5.115	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	6.145	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	7.908	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	9.626	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	11.845	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	16.637	acre-feet	3.14 inches
Approximate 2-yr Detention Volume =	3.231	acre-feet	
Approximate 5-yr Detention Volume =	4.265	acre-feet	
Approximate 10-yr Detention Volume =	5.231	acre-feet	
Approximate 25-yr Detention Volume =	6.442	acre-feet	
Approximate 50-yr Detention Volume =	7.233	acre-feet	
Approximate 100-yr Detention Volume =	8.260	acre-feet	

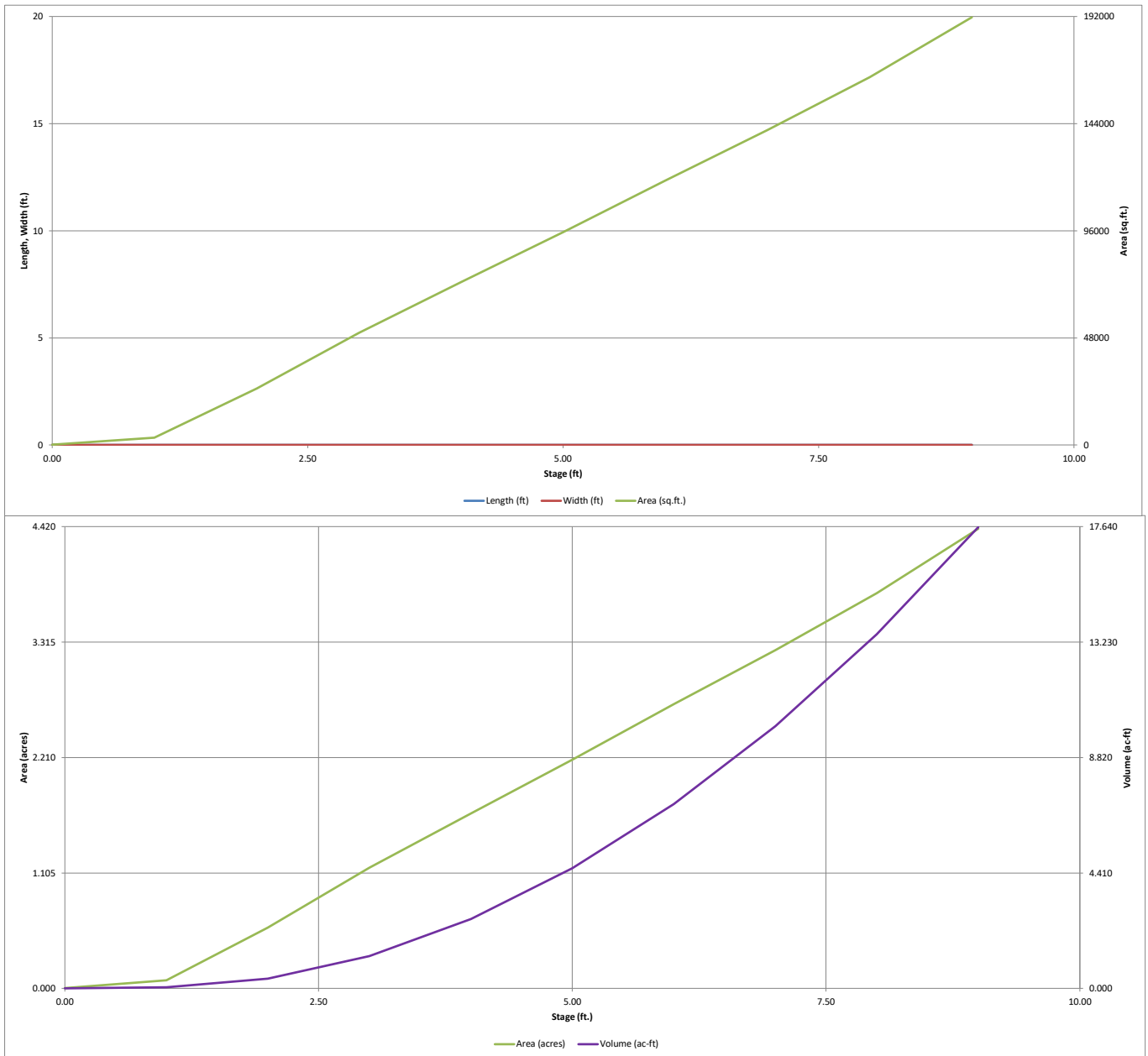
**Define Zones and Basin Geometry**

Zone 1 Volume (WQCV) =	1.611	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.437	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	4.018	acre-feet
Total Detention Basin Volume =	9.065	acre-feet
Initial Surcharge Volume (ISV) =	user	ft <sup>3</sup>
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H <sub>total</sub> ) =	user	ft
Depth of Trickle Channel (H <sub>TC</sub> ) =	user	ft
Slope of Trickle Channel (S <sub>TC</sub> ) =	user	ft/ft
Slopes of Main Basin Sides (S <sub>main</sub> ) =	user	H:V
Basin Length-to-Width Ratio (R <sub>L/W</sub> ) =	user	
Initial Surcharge Area (A <sub>ISV</sub> ) =	user	ft <sup>2</sup>
Surcharge Volume Length (L <sub>ISV</sub> ) =	user	ft
Surcharge Volume Width (W <sub>ISV</sub> ) =	user	ft
Depth of Basin Floor (H <sub>FLOOR</sub> ) =	user	ft
Length of Basin Floor (L <sub>FLOOR</sub> ) =	user	ft
Width of Basin Floor (W <sub>FLOOR</sub> ) =	user	ft
Area of Basin Floor (A <sub>FLOOR</sub> ) =	user	ft <sup>2</sup>
Volume of Basin Floor (V <sub>FLOOR</sub> ) =	user	ft <sup>3</sup>
Depth of Main Basin (H <sub>MAIN</sub> ) =	user	ft
Length of Main Basin (L <sub>MAIN</sub> ) =	user	ft
Width of Main Basin (W <sub>MAIN</sub> ) =	user	ft
Area of Main Basin (A <sub>MAIN</sub> ) =	user	ft <sup>2</sup>
Volume of Main Basin (V <sub>MAIN</sub> ) =	user	ft <sup>3</sup>
Calculated Total Basin Volume (V <sub>total</sub> ) =	<b>user</b>	acre-feet

Depth Increment =	ft								
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft <sup>2</sup> )	Optional Override Area (ft <sup>2</sup> )	Area (acre)	Volume (ft <sup>3</sup> )	Volume (ac-ft)
<b>Top of Micropool</b>	--	0.00	--	--	--	170	0.004		
<b>6027</b>	--	1.00	--	--	--	3,344	0.077	1,757	0.040
<b>6028</b>	--	2.00	--	--	--	25,396	0.583	16,127	0.370
<b>6029</b>	--	3.00	--	--	--	50,286	1.154	53,968	1.239
<b>6030</b>	--	4.00	--	--	--	72,956	1.675	115,589	2.654
<b>6031</b>	--	5.00	--	--	--	95,393	2.190	199,763	4.586
<b>6032</b>	--	6.00	--	--	--	118,525	2.721	306,722	7.041
<b>6033</b>	--	7.00	--	--	--	141,085	3.239	436,527	10.021
<b>6034</b>	--	8.00	--	--	--	164,866	3.785	589,503	13.533
<b>6035</b>	--	9.00	--	--	--	191,669	4.400	767,770	17.626

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.06 (July 2022)*

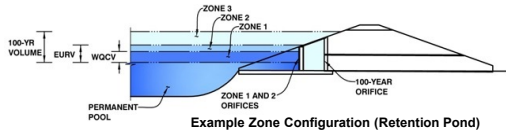


ULTIMATE CONDITION IS INCLUDED TO PROJECT RELEASE RATES IN THE FULLY DEVELOPED CONDITION. DOWNSTREAM CHANNELS AND RIPRAP ARE SIZED FOR THESE RELEASE RATES

## DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

**Project: Mayberry Filing 3**  
**Basin ID: Pond D**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.31	1.611	Orifice Plate
Zone 2 (EURV)	5.21	3.437	Orifice Plate
Z3 (100+1/2WQCV)	6.70	4.018	Weir&Pipe (Restrict)
Total (all zones)		9.065	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain	
Underdrain Orifice Area =	N/A ft <sup>2</sup>
Underdrain Orifice Centroid =	N/A feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	4.97	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	sq. inches

Calculated Parameters for Plate	
WQ Orifice Area per Row =	N/A ft <sup>2</sup>
Elliptical Half-Width =	N/A feet
Elliptical Slot Centroid =	N/A feet
Elliptical Slot Area =	N/A ft <sup>2</sup>

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.66	3.30					
Orifice Area (sq. inches)	6.00	8.30	8.30					

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice	
Vertical Orifice Area =	N/A ft <sup>2</sup>
Vertical Orifice Centroid =	N/A feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.50	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	7.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	6.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir	
Height of Grate Upper Edge, H <sub>t</sub> =	5.50 feet
Overflow Weir Slope Length =	6.00 feet
Grate Open Area / 100-yr Orifice Area =	8.51
Overflow Grate Open Area w/o Debris =	29.23 ft <sup>2</sup>
Overflow Grate Open Area w/ Debris =	14.62 ft <sup>2</sup>

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	36.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	17.60	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	
Outlet Orifice Area =	3.43 ft <sup>2</sup>
Outlet Orifice Centroid =	0.85 feet
Half-Central Angle of Restrictor Plate on Pipe =	1.55 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	6.75	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	50.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway	
Spillway Design Flow Depth =	0.97 feet
Stage at Top of Freeboard =	8.72 feet
Basin Area at Top of Freeboard =	4.22 acres
Basin Volume at Top of Freeboard =	16.38 acre-ft

### Routed Hydrograph Results

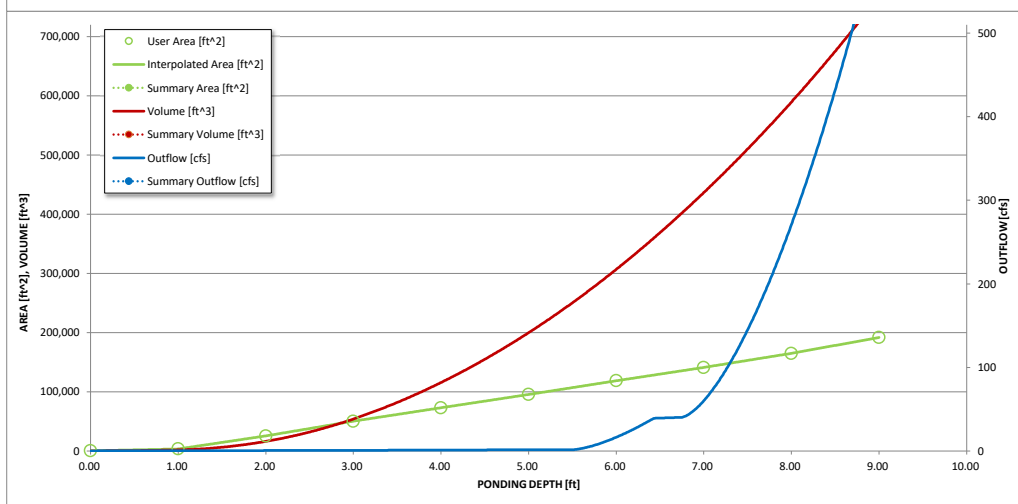
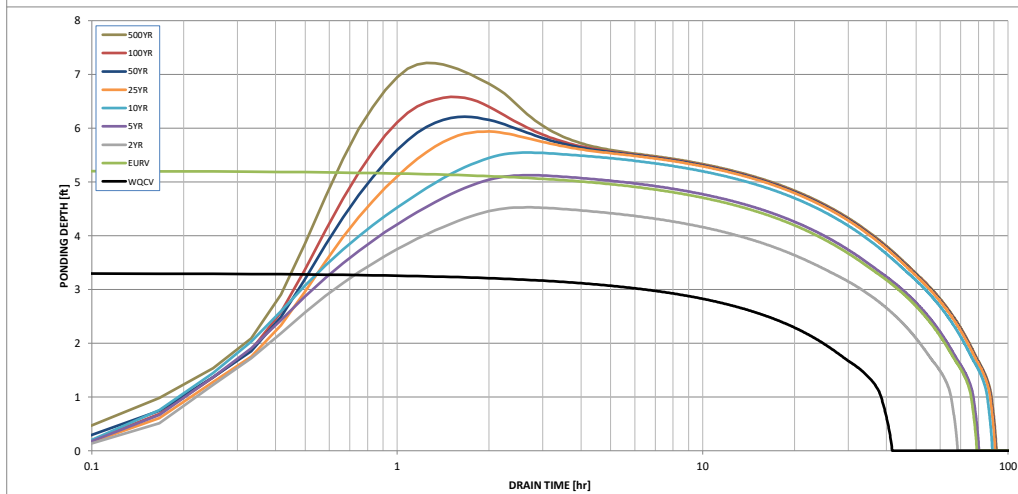
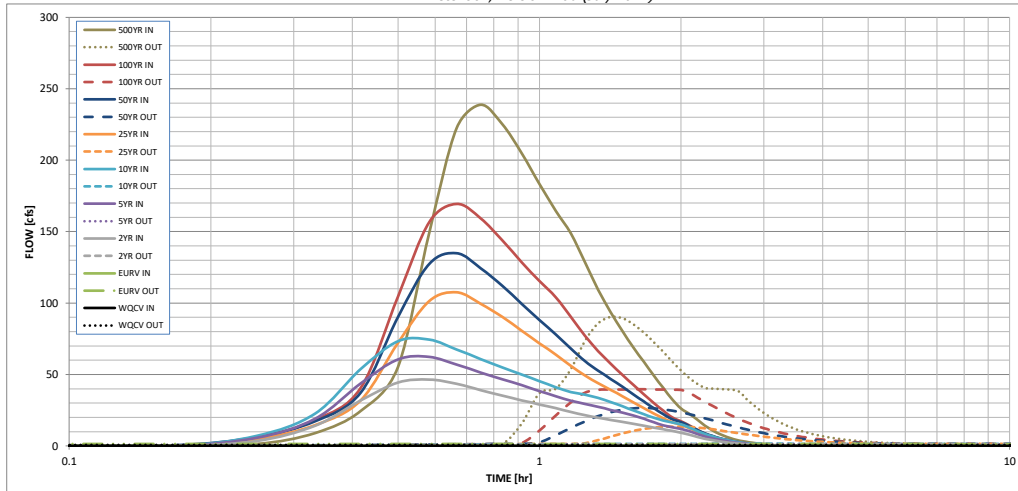
*The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in)	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft)	1.611	5.048	3.827	5.115	6.145	7.908	9.626	11.845	16.637
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	3.827	5.115	6.145	7.908	9.626	11.845	16.637
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	0.6	1.2	1.7	15.6	31.3	51.8	94.2
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.01	0.01	0.02	0.16	0.31	0.52	0.94
Peak Inflow Q (cfs)	N/A	N/A	46.5	62.3	74.4	107.5	134.9	169.4	238.9
Peak Outflow Q (cfs)	0.7	1.4	1.2	1.3	1.82	13.5	26.6	39.6	90.2
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	1.1	1.1	0.9	0.9	0.8	1.0
Structure Controlling Flow	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps)	N/A	N/A	N/A	N/A	0.0	0.4	0.9	1.3	1.4
Max Velocity through Grate 2 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours)	38	70	61	71	78	78	77	75	72
Time to Drain 99% of Inflow Volume (hours)	40	75	65	77	85	85	85	84	82
Maximum Ponding Depth (ft)	3.31	5.21	4.53	5.12	5.54	5.94	6.21	6.58	7.21
Area at Maximum Ponding Depth (acres)	1.32	2.30	1.94	2.25	2.48	2.68	2.82	3.02	3.35
Maximum Volume Stored (acre-ft)	1.622	5.058	3.594	4.853	5.846	6.852	7.596	8.676	10.713



# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.06 (July 2022)*



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

# R&R Engineers-Surveyors

## Mayberry Filing 3

MC22110

12/30/2022

### Extended Detention Basin Fully Developed - Forebay 1 Sizing Calculations

SEDIMENT FOREBAY SIZING		
Contributing Tributary Area	47.90	AC
Imperviousness	57.0%	
Contributing Area WQCV	0.226	watershed inches
Required WQCV	0.904	AC-ft
	39,382	ft <sup>3</sup>
Contributing Impervious Acres	> 20 Acres	
Req. % of WQCV	3%	
Minimum Forebay Volume	1,181	ft <sup>3</sup>
Maximum Forebay Depth	2.5	ft
Provided Forebay Depth	1.00	ft
Provided Forebay Volume	1,360	ft <sup>3</sup>
FOREBAY RELEASE RATE CALCULATIONS		
Notch Width	0.67	ft
Undetained 100-Year Peak Flow	121.6	cfs
Max Allowable Outlet Flow (q)	2.4	cfs
Provided Max Outlet Flow	2.1	cfs

$$Q = C_{BCW} L H^{1.5}$$

# R&R Engineers-Surveyors

Mayberry Filing 3

MC22110

12/30/2022

## Extended Detention Basin Fully Developed - Forebay 2 Sizing Calculations

### SEDIMENT FOREBAY SIZING

Contributing Tributary Area	49.10	AC
Imperviousness	32.0%	
Contributing Area WQCV	0.158	watershed inches
	0.645	AC-ft
Required WQCV	28,083	ft <sup>3</sup>
Contributing Impervious Acres	5-20	Acres
Req. % of WQCV	3%	
Minimum Forebay Volume	842	ft <sup>3</sup>
Maximum Forebay Depth	2.5	ft
Provided Forebay Depth	1.00	ft
Provided Forebay Volume	1,370	ft <sup>3</sup>

### FOREBAY RELEASE RATE CALCULATIONS

Notch Width	0.67	ft
Undetained 100-Year Peak Flow	105.0	cfs
Max Allowable Outlet Flow (q)	2.1	cfs
Provided Max Outlet Flow	2.1	cfs

$$Q = C_{BCW} L H^{1.5}$$

# R&R Engineers-Surveyors

## Mayberry Filing 3

MC22110

12/30/2022

### Extended Detention Basin Interim Condition - Forebay 1 Sizing Calculations (DP21)

#### SEDIMENT FOREBAY SIZING

Contributing Tributary Area	47.90	AC
Imperviousness	33.0%	
Contributing Area WQCV	0.161	watershed inches
Required WQCV	0.641	AC-ft
	27,909	ft <sup>3</sup>

Contributing Impervious Acres	> 20 Acres
Req. % of WQCV	3%

Minimum Forebay Volume	837	ft <sup>3</sup>
Maximum Forebay Depth	2.5	ft

Provided Forebay Depth	1.00	ft
------------------------	------	----

Provided Forebay Volume	1,360	ft <sup>3</sup>
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#### FOREBAY RELEASE RATE CALCULATIONS - Restrictor Plate

Depth from Notch Bottom to Top of Restrictor Plate	0.41	H (ft)
Notch Width	0.67	W (ft)
Undetained 100-Year Peak Flow	93.3	cfs
Max Allowable Outlet Flow (q)	1.9	cfs

Provided Max Outlet Flow	1.4	cfs	$Q = CA(2gH)^{0.5}$
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# R&R Engineers-Surveyors

## Mayberry Filing 3

MC22110

12/30/2022

### Extended Detention Basin Interim Condition - Forebay 2 Sizing Calculations (DP20)

SEDIMENT FOREBAY SIZING		
Contributing Tributary Area	49.10	AC
Imperviousness	16.0%	
Contributing Area WQCV	0.098	watershed inches
Required WQCV	0.401	AC-ft
	17,478	ft <sup>3</sup>
Contributing Impervious Acres	5-20	Acres
Req. % of WQCV	3%	
Minimum Forebay Volume	524	ft <sup>3</sup>
Maximum Forebay Depth	2.5	ft
Provided Forebay Depth	1.00	ft
Provided Forebay Volume	1,370	ft <sup>3</sup>

### FOREBAY RELEASE RATE CALCULATIONS - Restrictor Plate

Depth from Notch Bottom to Top of Restrictor Plate	0.41	H (ft)
Notch Width	0.67	W (ft)
Undetained 100-Year Peak Flow	88.6	cfs
Max Allowable Outlet Flow (q)	1.8	cfs
Provided Max Outlet Flow	1.4	cfs

$Q = CA(2gH)^{0.5}$ ,

# Weir Report

## Forebay 1 and 2 Weir Notch - Full Development

### Rectangular Weir

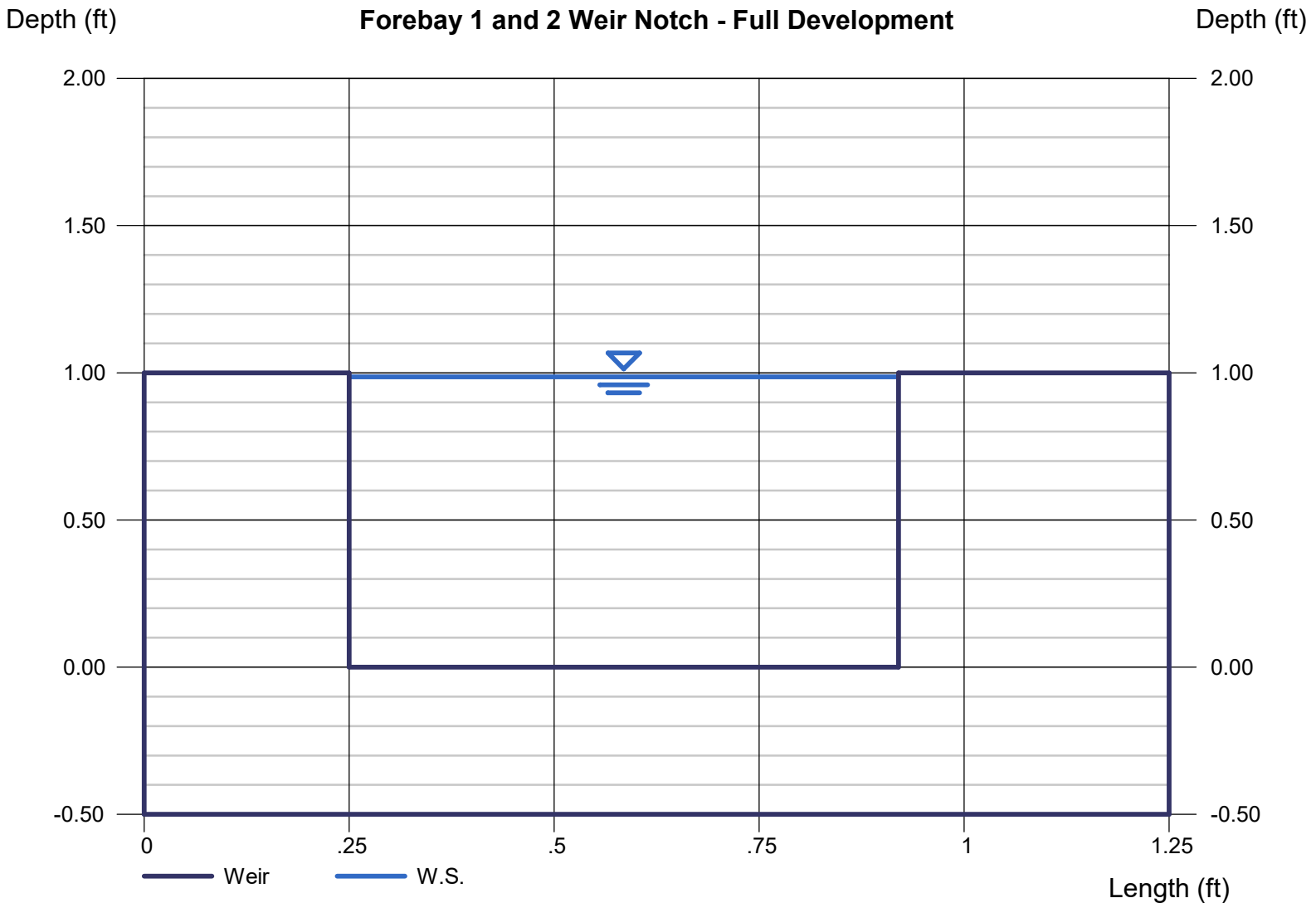
Crest = Sharp  
Bottom Length (ft) = 0.67  
Total Depth (ft) = 1.00

### Highlighted

Depth (ft) = 0.99  
Q (cfs) = 2.100  
Area (sqft) = 0.66  
Velocity (ft/s) = 3.18  
Top Width (ft) = 0.67

### Calculations

Weir Coeff. Cw = 3.20  
Compute by: Known Q  
Known Q (cfs) = 2.10



# Weir Report

## Forebay 1 and 2 Weir Notch - Full Development

### Rectangular Weir

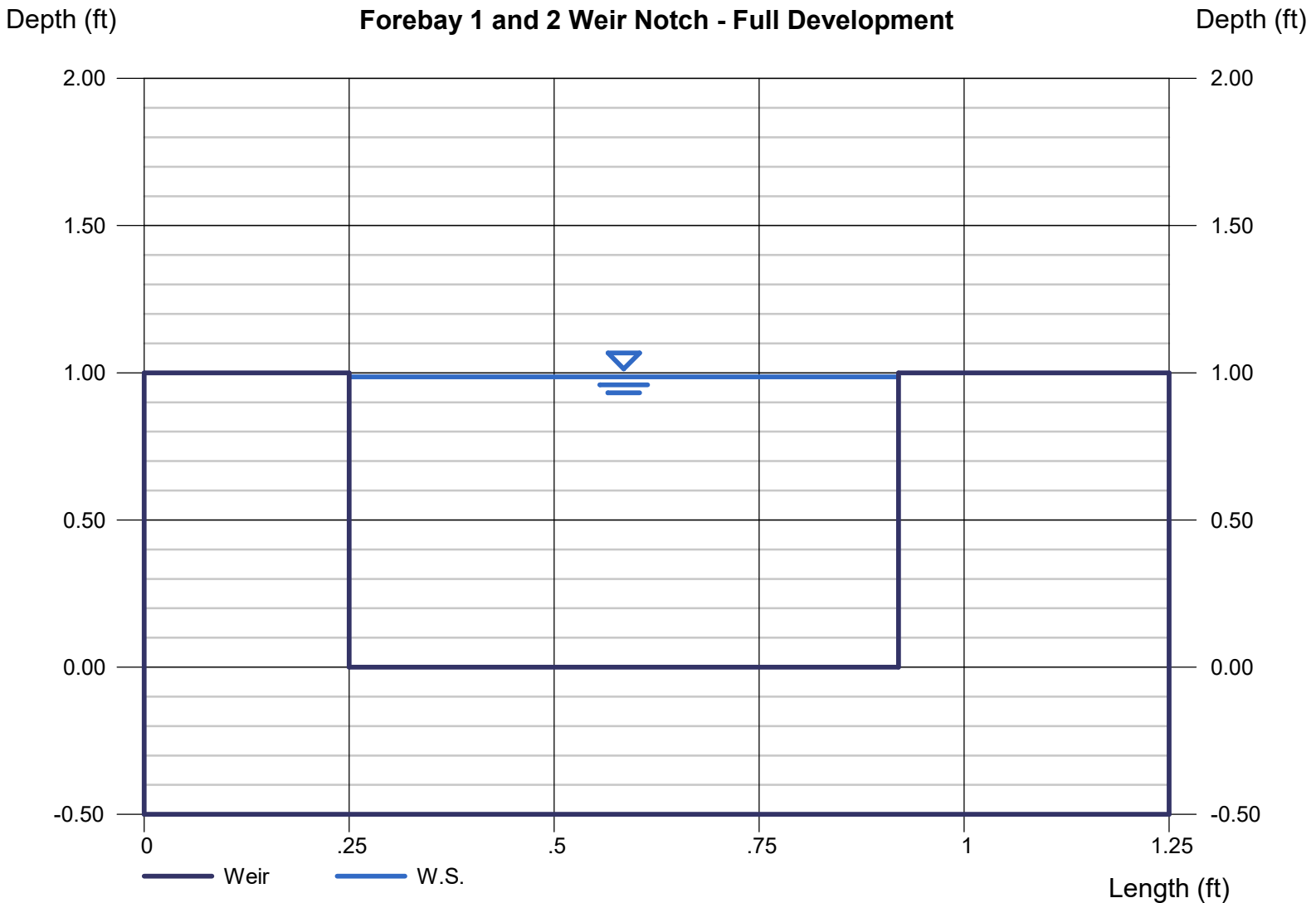
Crest = Sharp  
Bottom Length (ft) = 0.67  
Total Depth (ft) = 1.00

### Highlighted

Depth (ft) = 0.99  
Q (cfs) = 2.100  
Area (sqft) = 0.66  
Velocity (ft/s) = 3.18  
Top Width (ft) = 0.67

### Calculations

Weir Coeff. Cw = 3.20  
Compute by: Known Q  
Known Q (cfs) = 2.10



**Design Procedure Form: Extended Detention Basin (EDB)**

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

**Designer:** ESJ  
**Company:** R&R ENGINEERS  
**Date:** December 30, 2022  
**Project:** Mayberry, Colorado Springs  
**Location:** Detention Basin D - Interim

<p>1. Basin Storage Volume</p> <p>A) Effective Imperviousness of Tributary Area, <math>I_e</math></p> <p>B) Tributary Area's Imperviousness Ratio (<math>i = I_e / 100</math>)</p> <p>C) Contributing Watershed Area</p> <p>D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm</p> <p>E) Design Concept (Select EURV when also designing for flood control)</p> <p>F) Design Volume (WQCV) Based on 40-hour Drain Time (<math>V_{DESIGN} = (1.0 * (0.91 * i^2 - 1.19 * i^2 + 0.78 * i) / 12 * Area)</math>)</p> <p>G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume (<math>V_{WQCV\ OTHER} = (d_e * (V_{DESIGN} / 0.43))</math>)</p> <p>H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)</p> <p>I) NRCS Hydrologic Soil Groups of Tributary Watershed              i) Percentage of Watershed consisting of Type A Soils              ii) Percentage of Watershed consisting of Type B Soils              iii) Percentage of Watershed consisting of Type C/D Soils</p> <p>J) Excess Urban Runoff Volume (EURV) Design Volume              For HSG A: <math>EURV_A = 1.68 * i^{1.28}</math>              For HSG B: <math>EURV_B = 1.36 * i^{1.08}</math>              For HSG C/D: <math>EURV_{C/D} = 1.20 * i^{1.08}</math></p> <p>K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)</p>	<p><math>I_e =</math> <input type="text" value="23.0"/> %</p> <p><math>i =</math> <input type="text" value="0.230"/></p> <p>Area = <input type="text" value="100.200"/> ac</p> <p><math>d_e =</math> <input type="text" value=""/></p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;">             Choose One  <input type="radio"/> Water Quality Capture Volume (WQCV)  <input checked="" type="radio"/> Excess Urban Runoff Volume (EURV)         </div> <p><math>V_{DESIGN} =</math> <input type="text" value="1.065"/> ac-ft</p> <p><math>V_{DESIGN\ OTHER} =</math> <input type="text" value=""/></p> <p><math>V_{DESIGN\ USER} =</math> <input type="text" value=""/></p> <p>HSG <math>A =</math> <input type="text" value="100"/> %              HSG <math>B =</math> <input type="text" value="0"/> %              HSG <math>C/D =</math> <input type="text" value="0"/> %</p> <p>EURV<math>_{DESIGN} =</math> <input type="text" value="2.138"/> ac-ft</p> <p>EURV<math>_{DESIGN\ USER} =</math> <input type="text" value=""/></p>
<p>2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)</p>	<p>L : W = <input type="text" value="2.0"/> : 1</p>
<p>3. Basin Side Slopes</p> <p>A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>Z = <input type="text" value="4.00"/> ft / ft</p>
<p>4. Inlet</p> <p>A) Describe means of providing energy dissipation at concentrated inflow locations:</p>	<p><u>Concrete Forebay</u></p> <hr/> <hr/> <hr/>
<p>5. Forebay</p> <p>A) Minimum Forebay Volume (<math>V_{FMIN} =</math> <input type="text" value="3%"/> of the WQCV)</p> <p>B) Actual Forebay Volume</p> <p>C) Forebay Depth (<math>D_F =</math> <input type="text" value="30"/> inch maximum)</p> <p>D) Forebay Discharge</p> <p>i) Undetained 100-year Peak Discharge</p> <p>ii) Forebay Discharge Design Flow (<math>Q_F = 0.02 * Q_{100}</math>)</p> <p>E) Forebay Discharge Design</p> <p>F) Discharge Pipe Size (minimum 8-inches)</p> <p>G) Rectangular Notch Width</p>	<p><math>V_{FMIN} =</math> <input type="text" value="0.032"/> ac-ft</p> <p><math>V_F =</math> <input type="text" value="0.060"/> ac-ft</p> <p><math>D_F =</math> <input type="text" value="12.0"/> in</p> <p><math>Q_{100} =</math> <input type="text" value="181.90"/> cfs</p> <p><math>Q_F =</math> <input type="text" value="3.64"/> cfs</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;">             Choose One  <input type="radio"/> Berm With Pipe  <input checked="" type="radio"/> Wall with Rect. Notch  <input type="radio"/> Wall with V-Notch Weir         </div> <p>Calculated <math>D_p =</math> <input type="text" value=""/></p> <p>Calculated <math>W_N =</math> <input type="text" value="15.5"/> in</p>



**Design Procedure Form: Extended Detention Basin (EDB)**

Sheet 2 of 3

**Designer:** ESJ  
**Company:** R&R ENGINEERS  
**Date:** December 30, 2022  
**Project:** Mayberry, Colorado Springs  
**Location:** Detention Basin D - Interim

<p>6. Trickle Channel</p> <p>A) Type of Trickle Channel</p> <p>F) Slope of Trickle Channel</p>	<p>Choose One</p> <p><input checked="" type="radio"/> Concrete</p> <p><input type="radio"/> Soft Bottom</p> <p>S = <input type="text" value="0.0050"/> ft / ft</p>
<p>7. Micropool and Outlet Structure</p> <p>A) Depth of Micropool (2.5-feet minimum)</p> <p>B) Surface Area of Micropool (10 ft<sup>2</sup> minimum)</p> <p>C) Outlet Type</p> <p>D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)</p> <p>E) Total Outlet Area</p>	<p>D<sub>M</sub> = <input type="text" value="2.5"/> ft</p> <p>A<sub>M</sub> = <input type="text" value="170"/> sq ft</p> <p>Choose One</p> <p><input checked="" type="radio"/> Orifice Plate</p> <p><input type="radio"/> Other (Describe):</p> <hr/> <hr/> <p>D<sub>orifice</sub> = <input type="text" value="2.00"/> inches</p> <p>A<sub>or</sub> = <input type="text" value="16.50"/> square inches</p>
<p>8. Initial Surcharge Volume</p> <p>A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)</p> <p>B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)</p> <p>C) Initial Surcharge Provided Above Micropool</p>	<p>D<sub>IS</sub> = <input type="text" value="4"/> in</p> <p>V<sub>IS</sub> = <input type="text" value="139"/> cu ft</p> <p>V<sub>e</sub> = <input type="text" value="56.7"/> cu ft</p>
<p>9. Trash Rack</p> <p>A) Water Quality Screen Open Area: <math>A_s = A_{ot} * 38.5 * (e^{-0.095D})</math></p> <p>B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open area to the total screen area for the material specified.)</p> <p style="text-align: center;">Other (Y/N): <input type="text" value="N"/></p> <p>C) Ratio of Total Open Area to Total Area (only for type "Other")</p> <p>D) Total Water Quality Screen Area (based on screen type)</p> <p>E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)</p> <p>F) Height of Water Quality Screen (H<sub>TR</sub>)</p> <p>G) Width of Water Quality Screen Opening (W<sub>opening</sub>) (Minimum of 12 inches is recommended)</p>	<p>A<sub>s</sub> = <input type="text" value="525"/> square inches</p> <p><u>Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.</u></p> <hr/> <hr/> <p>User Ratio = <input type="text"/></p> <p>A<sub>total</sub> = <input type="text" value="740"/> sq. in.</p> <p>H = <input type="text" value="3.68"/> feet</p> <p>H<sub>TR</sub> = <input type="text" value="72.16"/> inches</p> <p>W<sub>opening</sub> = <input type="text" value="12.0"/> inches <span style="color: red; font-weight: bold;">VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.</span></p>

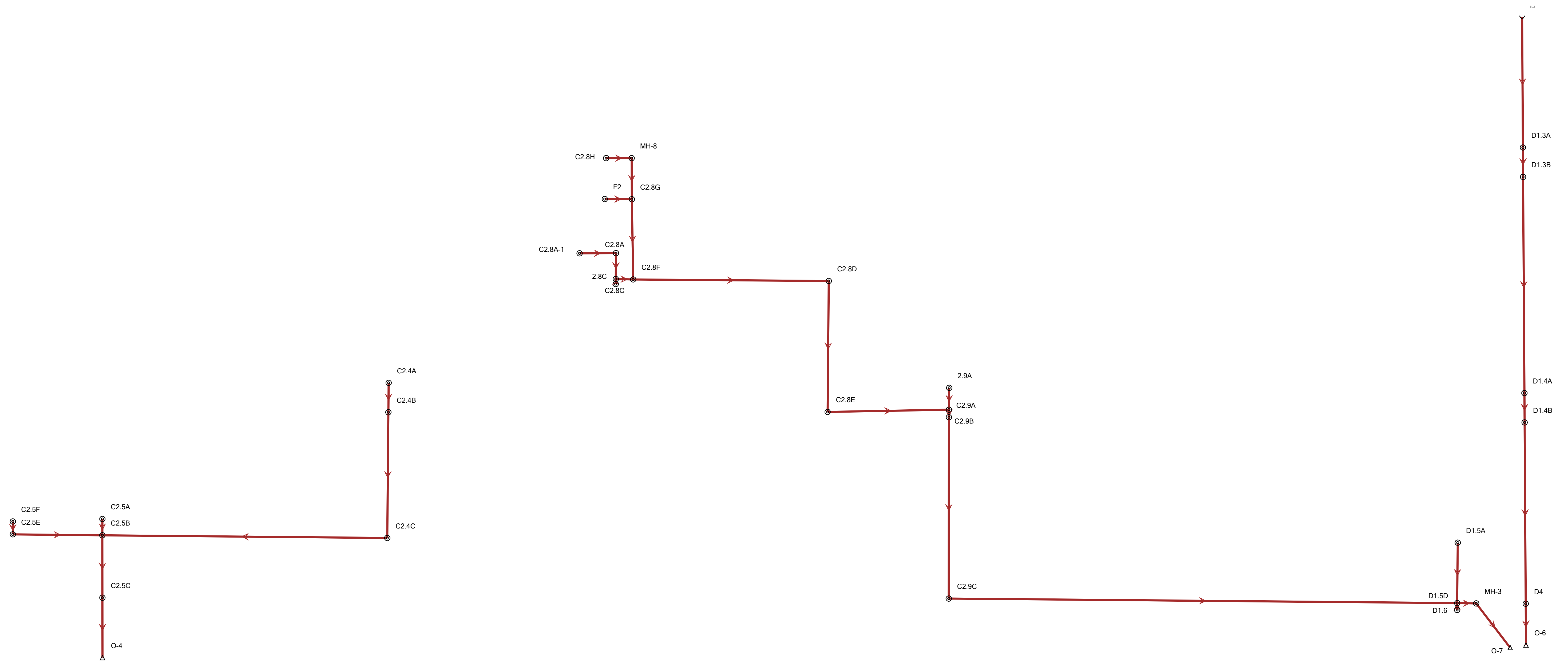
**Design Procedure Form: Extended Detention Basin (EDB)**

Sheet 3 of 3

**Designer:** ESJ  
**Company:** R&R ENGINEERS  
**Date:** December 30, 2022  
**Project:** Mayberry, Colorado Springs  
**Location:** Detention Basin D - Interim

<p>10. Overflow Embankment</p> <p>A) Describe embankment protection for 100-year and greater overtopping:</p> <p>B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p><u>Buried Riprap Spillway</u></p> <hr/> <p>Ze = <input type="text" value="4.00"/> ft / ft</p>
<p>11. Vegetation</p>	<p>Choose One</p> <p><input type="radio"/> Irrigated</p> <p><input checked="" type="radio"/> Not Irrigated</p>
<p>12. Access</p> <p>A) Describe Sediment Removal Procedures</p>	<p><u>Periodic inspection and sediment removal as required;</u>  <u>Access ramp provided to pond bottom</u></p> <hr/> <hr/> <hr/>
<p>Notes: _____</p> <hr/> <hr/> <hr/>	

Scenario: 100 Year



Scenario: 5 year  
 Current Time Step: 0.000 h  
 FlexTable: Conduit Table

Start Node	Stop Node	Section Type	Span (ft)	Rise (ft)	Diameter (in)	Manning's n	Length (User Defined) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
C2.4C	C2.5B	Circle	-	-	24.0	0.013	313.6	6,046.92	6,045.04	0.006	1.60	3.47	6,047.36	6,046.80
C2.4A	C2.4B	Circle	-	-	18.0	0.013	37.3	6,048.57	6,048.35	0.006	1.10	3.19	6,048.96	6,048.72
C2.4B	C2.4C	Circle	-	-	24.0	0.013	138.3	6,047.85	6,047.02	0.006	1.60	3.47	6,048.29	6,047.43
C2.5B	C2.5C	Circle	-	-	36.0	0.013	68.6	6,044.94	6,044.60	0.005	14.90	5.90	6,046.57	6,046.58
C2.5A	C2.5B	Circle	-	-	30.0	0.013	5.4	6,045.09	6,045.04	0.009	8.50	6.42	6,046.72	6,046.73
C2.5C	O-4	Circle	-	-	36.0	0.013	65.9	6,044.50	6,044.17	0.005	17.40	6.17	6,046.53	6,046.52
2.8C	C2.8F	Circle	-	-	36.0	0.013	44.2	6,042.53	6,042.31	0.005	8.00	4.96	6,044.18	6,044.18
C2.8C	2.8C	Circle	-	-	18.0	0.013	5.5	6,042.85	6,042.82	0.005	3.40	4.11	6,044.19	6,044.19
C2.8A	2.8C	Circle	-	-	30.0	0.013	27.5	6,043.21	6,043.03	0.007	9.70	5.87	6,044.25	6,043.97
C2.9C	D1.5D	Ellipse	3.8	2.4	-	0.013	559.5	6,037.56	6,034.76	0.005	24.80	6.65	6,038.91	6,036.29
C2.8D	C2.8E	Circle	-	-	36.0	0.013	144.0	6,041.07	6,039.92	0.008	19.30	7.53	6,042.48	6,041.76
C2.8E	C2.9A	Circle	-	-	36.0	0.013	133.6	6,039.82	6,038.89	0.007	19.30	7.16	6,041.23	6,040.11
C2.9A	C2.9B	Ellipse	3.8	2.4	-	0.013	5.7	6,038.79	6,038.76	0.005	20.50	6.39	6,040.01	6,040.01
C2.9B	C2.9C	Ellipse	3.8	2.4	-	0.013	199.3	6,038.66	6,037.66	0.005	24.80	6.66	6,040.01	6,039.48
2.9A	C2.9A	Circle	-	-	30.0	0.013	32.5	6,039.73	6,039.39	0.010	3.10	5.00	6,040.45	6,040.50
D1.3B	D1.4A	Ellipse	3.8	2.4	-	0.013	237.7	6,038.48	6,036.82	0.007	32.90	8.13	6,040.05	6,038.14
D1.3A	D1.3B	Ellipse	3.8	2.4	-	0.013	32.3	6,039.00	6,038.78	0.007	30.90	7.91	6,040.52	6,040.12
D1.4B	D4	Ellipse	3.8	2.4	-	0.013	199.4	6,036.42	6,034.71	0.009	34.20	8.84	6,038.02	6,035.99
D1.4A	D1.4B	Ellipse	3.8	2.4	-	0.013	32.3	6,036.72	6,036.52	0.006	33.60	7.84	6,038.30	6,037.95
D4	O-6	Ellipse	3.8	2.4	-	0.013	45.4	6,034.18	6,033.86	0.007	34.20	8.25	6,035.78	6,035.51
D1.5D	MH-3	Ellipse	3.8	2.4	-	0.013	34.5	6,034.66	6,034.48	0.005	27.40	6.95	6,036.09	6,035.79
D1.6	D1.5D	Circle	-	-	18.0	0.013	7.5	6,035.01	6,034.86	0.020	4.00	7.14	6,036.28	6,036.29
D1.5A	D1.5D	Circle	-	-	18.0	0.013	66.5	6,035.53	6,034.86	0.010	3.30	5.27	6,036.22	6,036.29
H-1	D1.3A	Ellipse	3.8	2.4	-	0.013	136.0	6,039.79	6,039.11	0.005	31.60	7.15	6,041.34	6,040.55
MH-3	O-7	Ellipse	4.4	2.8	-	0.013	63.3	6,034.38	6,034.06	0.005	27.40	6.72	6,035.74	6,035.51
C2.5E	C2.5B	Circle	-	-	24.0	0.013	189.3	6,046.32	6,045.37	0.005	7.80	5.07	6,047.31	6,046.63
C2.5F	C2.5E	Circle	-	-	24.0	0.013	5.5	6,046.45	6,046.42	0.005	7.80	5.23	6,047.69	6,047.69
C2.8A-1	C2.8A	Circle	-	-	24.0	0.013	74.4	6,044.05	6,043.31	0.010	3.80	5.34	6,044.73	6,044.81
C2.8F	C2.8D	Circle	-	-	36.0	0.013	189.3	6,042.21	6,041.27	0.005	19.30	6.32	6,043.62	6,042.93
MH-8	C2.8G	Circle	-	-	24.0	0.013	142.8	6,046.57	6,045.21	0.010	9.20	6.71	6,047.65	6,046.88
C2.8H	MH-8	Circle	-	-	24.0	0.013	7.5	6,046.74	6,046.67	0.009	9.20	6.66	6,048.09	6,048.10
C2.8G	C2.8F	Circle	-	-	30.0	0.013	279.8	6,045.11	6,042.31	0.010	15.90	7.83	6,046.46	6,044.07
F2	C2.8G	Circle	-	-	24.0	0.013	62.4	6,047.47	6,046.37	0.018	6.70	7.70	6,048.39	6,047.02

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Scenario: 100 Year  
 Current Time Step: 0.000 h  
 FlexTable: Conduit Table

Start Node	Stop Node	Section Type	Span (ft)	Rise (ft)	Diameter (in)	Manning's n	Length (User Defined) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
C2.4C	C2.5B	Circle	-	-	24.0	0.013	313.6	6,046.92	6,045.04	0.006	3.90	4.49	6,048.35	6,048.27
C2.4A	C2.4B	Circle	-	-	18.0	0.013	37.3	6,048.57	6,048.35	0.006	2.73	4.12	6,049.20	6,048.95
C2.4B	C2.4C	Circle	-	-	24.0	0.013	138.3	6,047.85	6,047.02	0.006	3.90	4.49	6,048.54	6,048.38
C2.5B	C2.5C	Circle	-	-	36.0	0.013	68.6	6,044.94	6,044.60	0.005	36.20	7.33	6,047.86	6,047.67
C2.5A	C2.5B	Circle	-	-	30.0	0.013	5.4	6,045.09	6,045.04	0.009	28.50	5.81	6,047.82	6,047.80
C2.5C	O-4	Circle	-	-	36.0	0.013	65.9	6,044.50	6,044.17	0.005	41.10	5.81	6,047.53	6,047.28
2.8C	C2.8F	Circle	-	-	36.0	0.013	44.2	6,042.53	6,042.31	0.005	19.00	2.69	6,046.48	6,046.45
C2.8C	2.8C	Circle	-	-	18.0	0.013	5.5	6,042.85	6,042.82	0.005	8.30	4.70	6,046.32	6,046.29
C2.8A	2.8C	Circle	-	-	30.0	0.013	27.5	6,043.21	6,043.03	0.007	12.20	2.49	6,046.58	6,046.56
C2.9C	D1.5D	Ellipse	3.8	2.4	-	0.013	559.5	6,037.56	6,034.76	0.005	52.60	7.34	6,040.79	6,037.20
C2.8D	C2.8E	Circle	-	-	36.0	0.013	144.0	6,041.07	6,039.92	0.008	39.70	5.62	6,044.86	6,044.35
C2.8E	C2.9A	Circle	-	-	36.0	0.013	133.6	6,039.82	6,038.89	0.007	39.70	5.62	6,043.89	6,043.42
C2.9A	C2.9B	Ellipse	3.8	2.4	-	0.013	5.7	6,038.79	6,038.76	0.005	42.70	5.96	6,042.85	6,042.83
C2.9B	C2.9C	Ellipse	3.8	2.4	-	0.013	199.3	6,038.66	6,037.66	0.005	52.60	7.34	6,042.83	6,041.55
2.9A	C2.9A	Circle	-	-	30.0	0.013	32.5	6,039.73	6,039.39	0.010	7.50	1.53	6,043.46	6,043.45
D1.3B	D1.4A	Ellipse	3.8	2.4	-	0.013	237.7	6,038.48	6,036.82	0.007	62.80	8.77	6,041.57	6,039.40
D1.3A	D1.3B	Ellipse	3.8	2.4	-	0.013	32.3	6,039.00	6,038.78	0.007	57.90	8.08	6,042.06	6,041.81
D1.4B	D4	Ellipse	3.8	2.4	-	0.013	199.4	6,036.42	6,034.71	0.009	66.40	9.27	6,038.82	6,036.87
D1.4A	D1.4B	Ellipse	3.8	2.4	-	0.013	32.3	6,036.72	6,036.52	0.006	64.90	9.06	6,039.26	6,038.94
D4	O-6	Ellipse	3.8	2.4	-	0.013	45.4	6,034.18	6,033.86	0.007	66.40	9.27	6,036.67	6,036.18
D1.5D	MH-3	Ellipse	3.8	2.4	-	0.013	34.5	6,034.66	6,034.48	0.005	57.75	8.06	6,037.00	6,036.74
D1.6	D1.5D	Circle	-	-	18.0	0.013	7.5	6,035.01	6,034.86	0.020	7.70	4.36	6,037.24	6,037.20
D1.5A	D1.5D	Circle	-	-	18.0	0.013	66.5	6,035.53	6,034.86	0.010	8.00	4.53	6,037.58	6,037.20
H-1	D1.3A	Ellipse	3.8	2.4	-	0.013	136.0	6,039.79	6,039.11	0.005	57.60	8.08	6,043.17	6,042.11
MH-3	O-7	Ellipse	4.4	2.8	-	0.013	63.3	6,034.38	6,034.06	0.005	57.75	8.34	6,036.39	6,036.18
C2.5E	C2.5B	Circle	-	-	24.0	0.013	189.3	6,046.32	6,045.37	0.005	11.30	3.60	6,048.62	6,048.15
C2.5F	C2.5E	Circle	-	-	24.0	0.013	5.5	6,046.45	6,046.42	0.005	11.30	3.60	6,048.81	6,048.79
C2.8A-1	C2.8A	Circle	-	-	24.0	0.013	74.4	6,044.05	6,043.31	0.010	8.40	2.67	6,046.75	6,046.65
C2.8F	C2.8D	Circle	-	-	36.0	0.013	189.3	6,042.21	6,041.27	0.005	39.70	5.62	6,045.97	6,045.30
MH-8	C2.8G	Circle	-	-	24.0	0.013	142.8	6,046.57	6,045.21	0.010	12.80	7.29	6,047.86	6,047.51
C2.8H	MH-8	Circle	-	-	24.0	0.013	7.5	6,046.74	6,046.67	0.009	12.80	7.23	6,048.48	6,048.47
C2.8G	C2.8F	Circle	-	-	30.0	0.013	279.8	6,045.11	6,042.31	0.010	25.00	8.77	6,047.22	6,046.29
F2	C2.8G	Circle	-	-	24.0	0.013	62.4	6,047.47	6,046.37	0.018	12.20	9.06	6,048.73	6,047.28

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# Culvert Report

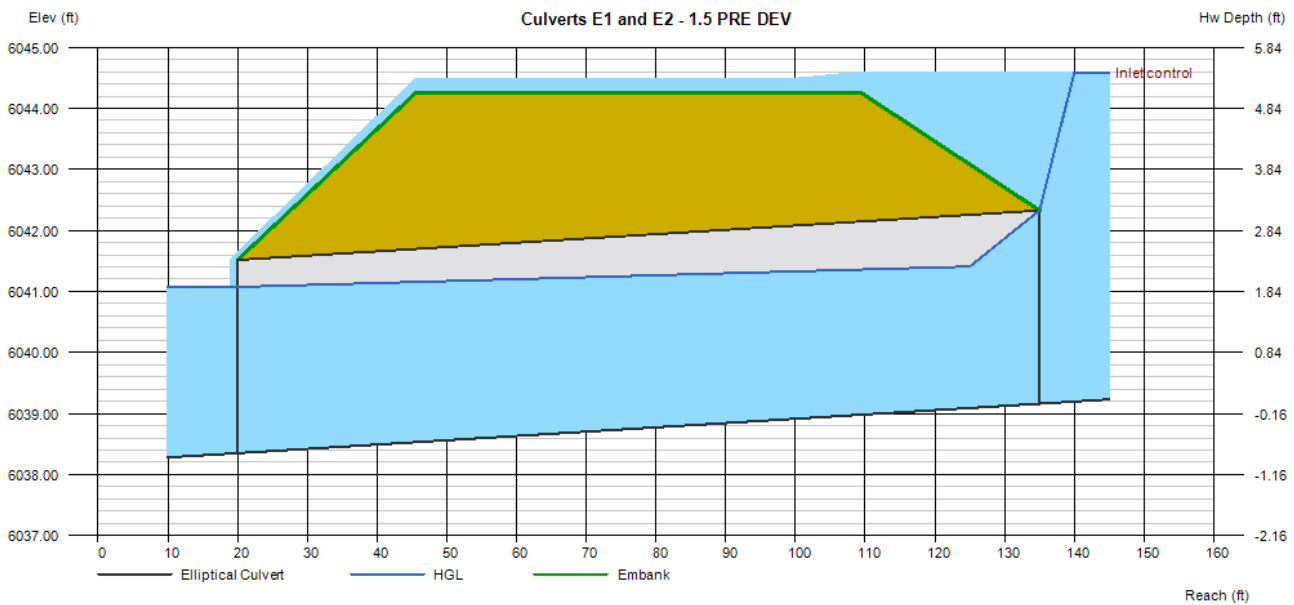
## Culverts E1 and E2 - 1.5 PRE DEV

Invert Elev Dn (ft)	= 6038.35
Pipe Length (ft)	= 115.00
Slope (%)	= 0.70
Invert Elev Up (ft)	= 6039.16
Rise (in)	= 38.0
Shape	= Elliptical
Span (in)	= 60.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Horizontal Ellipse Concrete
Culvert Entrance	= Square edge w/headwall (H)
Coeff. K,M,c,Y,k	= 0.01, 2, 0.0398, 0.67, 0.5

<b>Embankment</b>	
Top Elevation (ft)	= 6044.25
Top Width (ft)	= 64.00
Crest Width (ft)	= 60.80

<b>Calculations</b>	
Qmin (cfs)	= 50.44
Qmax (cfs)	= 150.44
Tailwater Elev (ft)	= (dc+D)/2

<b>Highlighted</b>	
Qtotal (cfs)	= 150.44
Qpipe (cfs)	= 113.52
Qovertop (cfs)	= 36.92
Veloc Dn (ft/s)	= 9.76
Veloc Up (ft/s)	= 11.48
HGL Dn (ft)	= 6041.07
HGL Up (ft)	= 6041.44
Hw Elev (ft)	= 6044.59
Hw/D (ft)	= 1.71
Flow Regime	= Inlet Control



# INLET MANAGEMENT

Worksheet Protected

<b>INLET NAME</b>	<a href="#">C2.3 - DP3</a>	<a href="#">C2.1 - DP1</a>	<a href="#">C2.2</a>	<a href="#">D1.12 - DP5</a>
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

## USER-DEFINED INPUT

<b>User-Defined Design Flows</b>				
Minor $Q_{known}$ (cfs)	2.1	1.1	0.6	3.8
Major $Q_{known}$ (cfs)	5.2	2.7	1.4	9.3
<b>Bypass (Carry-Over) Flow from Upstream</b>				
Receive Bypass Flow from:	User-Defined	No Bypass Flow Received	No Bypass Flow Received	User-Defined
Minor Bypass Flow Received, $Q_b$ (cfs)	6.4	0.0	0.0	0.0
Major Bypass Flow Received, $Q_b$ (cfs)	23.3	0.0	0.0	0.0
<b>Watershed Characteristics</b>				
Subcatchment Area (acres)				
Percent Impervious				
NRCS Soil Type				
<b>Watershed Profile</b>				
Overland Slope (ft/ft)				
Overland Length (ft)				
Channel Slope (ft/ft)				
Channel Length (ft)				
<b>Minor Storm Rainfall Input</b>				
Design Storm Return Period, $T_r$ (years)				
One-Hour Precipitation, $P_1$ (inches)				
<b>Major Storm Rainfall Input</b>				
Design Storm Return Period, $T_r$ (years)				
One-Hour Precipitation, $P_1$ (inches)				

## CALCULATED OUTPUT

<b>Minor Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>8.5</b>	<b>1.1</b>	<b>0.6</b>	<b>3.8</b>
<b>Major Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>28.5</b>	<b>2.7</b>	<b>1.4</b>	<b>9.3</b>
Minor Flow Bypassed Downstream, $Q_b$ (cfs)	N/A	N/A	N/A	0.0
Major Flow Bypassed Downstream, $Q_b$ (cfs)	N/A	N/A	N/A	0.9

## INLET MANAGEMENT

Worksheet Protected

INLET NAME	<a href="#">D1.2 - DP6</a>	<a href="#">D1.3 - DP8</a>	<a href="#">D1.4</a>	<a href="#">D1.6</a>	<a href="#">D1.7</a>
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

### USER-DEFINED INPUT

<b>User-Defined Design Flows</b>					
Minor $Q_{known}$ (cfs)	3.4	3.1	5.4	2.6	2.1
Major $Q_{known}$ (cfs)	8.3	7.5	12.7	6.3	5.0
<b>Bypass (Carry-Over) Flow from Upstream</b>					
Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, $Q_b$ (cfs)	0.0	0.0	0.0	0.0	0.0
Major Bypass Flow Received, $Q_b$ (cfs)	0.0	0.0	0.0	0.0	0.0
<b>Watershed Characteristics</b>					
Subcatchment Area (acres)					
Percent Impervious					
NRCS Soil Type					
<b>Watershed Profile</b>					
Overland Slope (ft/ft)					
Overland Length (ft)					
Channel Slope (ft/ft)					
Channel Length (ft)					
<b>Minor Storm Rainfall Input</b>					
Design Storm Return Period, $T_r$ (years)					
One-Hour Precipitation, $P_1$ (inches)					
<b>Major Storm Rainfall Input</b>					
Design Storm Return Period, $T_r$ (years)					
One-Hour Precipitation, $P_1$ (inches)					

### CALCULATED OUTPUT

<b>Minor Total Design Peak Flow, Q (cfs)</b>	<b>3.4</b>	<b>3.1</b>	<b>5.4</b>	<b>2.6</b>	<b>2.1</b>
<b>Major Total Design Peak Flow, Q (cfs)</b>	<b>8.3</b>	<b>7.5</b>	<b>12.7</b>	<b>6.3</b>	<b>5.0</b>
Minor Flow Bypassed Downstream, $Q_b$ (cfs)	N/A	N/A	N/A	N/A	N/A
Major Flow Bypassed Downstream, $Q_b$ (cfs)	N/A	N/A	N/A	N/A	N/A



## INLET MANAGEMENT

Worksheet Protected

<b>INLET NAME</b>	<a href="#">D1.8</a>	<a href="#">D1.9</a>	<a href="#">D1.10</a>	<a href="#">Mayberry Drive</a>	<a href="#">50' ROW - 6" Rollover Curb</a>
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening		

### USER-DEFINED INPUT

<b>User-Defined Design Flows</b>					
Minor $Q_{known}$ (cfs)	1.8	0.9	3.3	14.2	5.4
Major $Q_{known}$ (cfs)	4.3	2.1	8.0	34.6	12.7
<b>Bypass (Carry-Over) Flow from Upstream</b>					
Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, $Q_b$ (cfs)	0.0	0.0	0.0	0.0	0.0
Major Bypass Flow Received, $Q_b$ (cfs)	0.0	0.0	0.0	0.0	0.0
<b>Watershed Characteristics</b>					
Subcatchment Area (acres)					
Percent Impervious					
NRCS Soil Type					
<b>Watershed Profile</b>					
Overland Slope (ft/ft)					
Overland Length (ft)					
Channel Slope (ft/ft)					
Channel Length (ft)					
<b>Minor Storm Rainfall Input</b>					
Design Storm Return Period, $T_r$ (years)					
One-Hour Precipitation, $P_1$ (inches)					
<b>Major Storm Rainfall Input</b>					
Design Storm Return Period, $T_r$ (years)					
One-Hour Precipitation, $P_1$ (inches)					

### CALCULATED OUTPUT

<b>Minor Total Design Peak Flow, Q (cfs)</b>	<b>1.8</b>	<b>0.9</b>	<b>3.3</b>	<b>14.2</b>	<b>5.4</b>
<b>Major Total Design Peak Flow, Q (cfs)</b>	<b>4.3</b>	<b>2.1</b>	<b>8.0</b>	<b>34.6</b>	<b>12.7</b>
Minor Flow Bypassed Downstream, $Q_b$ (cfs)	N/A	N/A	N/A		
Major Flow Bypassed Downstream, $Q_b$ (cfs)	N/A	N/A	N/A		

# INLET MANAGEMENT

Worksheet Protected

<b>INLET NAME</b>	<a href="#">C2.4</a>	<a href="#">Galveston Ter.</a>	<a href="#">C2.5</a>	<a href="#">D1.13</a>	<a href="#">D1.14 - DP5B</a>
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	On Grade	On Grade	On Grade	In Sump
Inlet Type	CDOT Type R Curb Opening		CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

## USER-DEFINED INPUT

<b>User-Defined Design Flows</b>					
Minor $Q_{known}$ (cfs)	4.1	5.9	14.2	10.9	1.8
Major $Q_{known}$ (cfs)	7.8	14.5	34.6	19.9	3.9

### Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	User-Defined	User-Defined
Minor Bypass Flow Received, $Q_b$ (cfs)	0.0	0.0	0.0	0.0	1.7
Major Bypass Flow Received, $Q_b$ (cfs)	0.0	0.0	0.0	0.0	8.0

### Watershed Characteristics

Subcatchment Area (acres)					
Percent Impervious					
NRCS Soil Type					

### Watershed Profile

Overland Slope (ft/ft)					
Overland Length (ft)					
Channel Slope (ft/ft)					
Channel Length (ft)					

### Minor Storm Rainfall Input

Design Storm Return Period, $T_r$ (years)					
One-Hour Precipitation, $P_1$ (inches)					

### Major Storm Rainfall Input

Design Storm Return Period, $T_r$ (years)					
One-Hour Precipitation, $P_1$ (inches)					

## CALCULATED OUTPUT

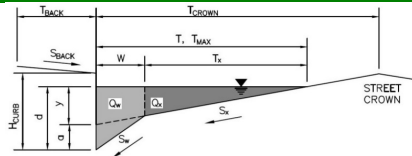
<b>Minor Total Design Peak Flow, Q (cfs)</b>	<b>4.1</b>	<b>5.9</b>	<b>14.2</b>	<b>10.9</b>	<b>3.5</b>
<b>Major Total Design Peak Flow, Q (cfs)</b>	<b>7.8</b>	<b>14.5</b>	<b>34.6</b>	<b>19.9</b>	<b>11.9</b>
Minor Flow Bypassed Downstream, $Q_b$ (cfs)	N/A		6.4	1.7	N/A
Major Flow Bypassed Downstream, $Q_b$ (cfs)	N/A		23.3	7.1	N/A

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **MAYBERRY FILING 3**

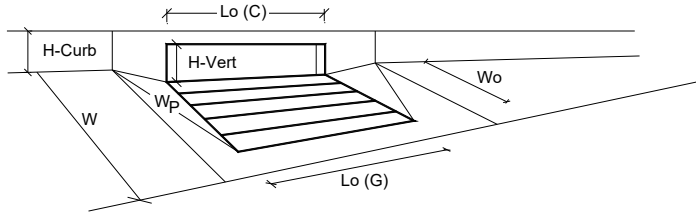
Inlet ID: **C2.3 - DP3**



<b>Gutter Geometry:</b>							
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="12.0"/> ft						
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft						
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.012"/>						
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches						
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="28.0"/> ft						
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft						
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft						
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft						
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft						
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.012"/>						
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Minor Storm</td> <td style="padding: 2px 5px;">Major Storm</td> <td style="padding: 2px 5px;">ft</td> </tr> <tr> <td style="padding: 2px 5px;"><math>T_{MAX} = </math> <input style="width: 50px;" type="text" value="28.0"/></td> <td style="padding: 2px 5px;"><input style="width: 50px;" type="text" value="28.0"/></td> <td></td> </tr> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = $ <input style="width: 50px;" type="text" value="28.0"/>	<input style="width: 50px;" type="text" value="28.0"/>	
Minor Storm	Major Storm	ft					
$T_{MAX} = $ <input style="width: 50px;" type="text" value="28.0"/>	<input style="width: 50px;" type="text" value="28.0"/>						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Minor Storm</td> <td style="padding: 2px 5px;">Major Storm</td> <td style="padding: 2px 5px;">inches</td> </tr> <tr> <td style="padding: 2px 5px;"><math>d_{MAX} = </math> <input style="width: 50px;" type="text" value="6.0"/></td> <td style="padding: 2px 5px;"><input style="width: 50px;" type="text" value="12.0"/></td> <td></td> </tr> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = $ <input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="12.0"/>	
Minor Storm	Major Storm	inches					
$d_{MAX} = $ <input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="12.0"/>						
Check boxes are not applicable in SUMP conditions	<table style="display: inline-table; border: none;"> <tr> <td style="padding: 0 10px;"><input type="checkbox"/></td> <td style="padding: 0 10px;"><input type="checkbox"/></td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>						
<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>							
<a href="#">MAJOR STORM Allowable Capacity is based on Depth Criterion</a>							
<b><math>Q_{allow} = </math></b>	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Minor Storm</td> <td style="padding: 2px 5px;">Major Storm</td> <td style="padding: 2px 5px;">cfs</td> </tr> <tr> <td style="padding: 2px 5px;"><b>SUMP</b></td> <td style="padding: 2px 5px;"><b>SUMP</b></td> <td></td> </tr> </table>	Minor Storm	Major Storm	cfs	<b>SUMP</b>	<b>SUMP</b>	
Minor Storm	Major Storm	cfs					
<b>SUMP</b>	<b>SUMP</b>						

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

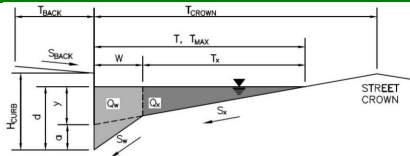


CDOT Type R Curb Opening		MINOR		MAJOR	
<b>Design Information (Input)</b>		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a <sub>local</sub> =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	12.0	<input checked="" type="checkbox"/> Override Depths
<b>Grate Information</b>		MINOR		MAJOR	
Length of a Unit Grate		L <sub>o</sub> (G) =	N/A	N/A	feet
Width of a Unit Grate		W <sub>o</sub> =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A <sub>ratio</sub> =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C <sub>f</sub> (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C <sub>w</sub> (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C <sub>o</sub> (G) =	N/A	N/A	
<b>Curb Opening Information</b>		MINOR		MAJOR	
Length of a Unit Curb Opening		L <sub>o</sub> (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches		H <sub>vert</sub> =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H <sub>throat</sub> =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W <sub>p</sub> =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C <sub>f</sub> (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C <sub>w</sub> (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C <sub>o</sub> (C) =	0.67	0.67	
<b>Resultant Street Conditions</b>		MINOR		MAJOR	
Total Inlet Length		L =	15.00	15.00	feet
Resultant Street Flow Spread (based on street geometry from above)		T =	18.7	43.7	ft. > T-Crown
Resultant Flow Depth at Street Crown		d <sub>CROWN</sub> =	0.0	3.8	inches
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q <sub>s</sub> =	9.7	39.1	cfs
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>		Q <sub>PEAK REQUIRED</sub> =	8.5	28.5	cfs

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

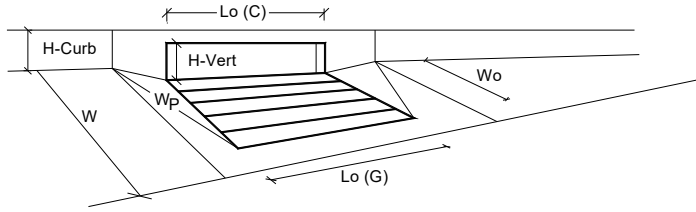
**Project:** MAYBERRY FILING 3  
**Inlet ID:** C2.1 - DP1



<b>Gutter Geometry:</b>									
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="7.5"/> ft								
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>								
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches								
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="16.7"/> ft								
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="1.17"/> ft								
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft								
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft								
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.013"/>								
Max. Allowable Spread for Minor & Major Storm	<table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 2px 10px;"></td> <td style="padding: 2px 10px; text-align: center;">Minor Storm</td> <td style="padding: 2px 10px; text-align: center;">Major Storm</td> <td style="padding: 2px 10px;"></td> </tr> <tr> <td style="padding: 2px 10px;"><math>T_{MAX} = </math></td> <td style="padding: 2px 10px; border: 1px solid black; text-align: center;">16.7</td> <td style="padding: 2px 10px; border: 1px solid black; text-align: center;">16.7</td> <td style="padding: 2px 10px;">ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} = $	16.7	16.7	ft
	Minor Storm	Major Storm							
$T_{MAX} = $	16.7	16.7	ft						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 2px 10px;"></td> <td style="padding: 2px 10px; text-align: center;">Minor Storm</td> <td style="padding: 2px 10px; text-align: center;">Major Storm</td> <td style="padding: 2px 10px;"></td> </tr> <tr> <td style="padding: 2px 10px;"><math>d_{MAX} = </math></td> <td style="padding: 2px 10px; border: 1px solid black; text-align: center;">6.0</td> <td style="padding: 2px 10px; border: 1px solid black; text-align: center;">12.0</td> <td style="padding: 2px 10px;">inches</td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX} = $	6.0	12.0	inches
	Minor Storm	Major Storm							
$d_{MAX} = $	6.0	12.0	inches						
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>								
<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>									
<a href="#">MAJOR STORM Allowable Capacity is based on Depth Criterion</a>									
<b><math>Q_{allow} = </math></b>	<table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 2px 10px;"></td> <td style="padding: 2px 10px; text-align: center;">Minor Storm</td> <td style="padding: 2px 10px; text-align: center;">Major Storm</td> <td style="padding: 2px 10px;"></td> </tr> <tr> <td style="padding: 2px 10px;"></td> <td style="padding: 2px 10px; border: 1px solid black; text-align: center;"><b>SUMP</b></td> <td style="padding: 2px 10px; border: 1px solid black; text-align: center;"><b>SUMP</b></td> <td style="padding: 2px 10px;">cfs</td> </tr> </table>		Minor Storm	Major Storm			<b>SUMP</b>	<b>SUMP</b>	cfs
	Minor Storm	Major Storm							
	<b>SUMP</b>	<b>SUMP</b>	cfs						

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



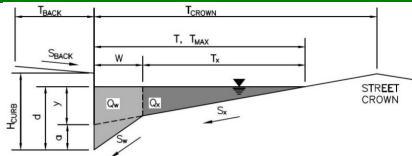
Design Information (Input)	MINOR      MAJOR	
Type of Inlet	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)	$a_{local} = 3.00$	3.00 inches
Number of Unit Inlets (Grate or Curb Opening)	$N_o = 1$	1
Water Depth at Flowline (outside of local depression)	Ponding Depth = 4.9	4.9 inches
<u>Grate Information</u>	MINOR	MAJOR
Length of a Unit Grate	$L_o (G) = N/A$	N/A feet
Width of a Unit Grate	$W_o = N/A$	N/A feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	$A_{ratio} = N/A$	N/A
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	$C_f (G) = N/A$	N/A
Grate Weir Coefficient (typical value 2.15 - 3.60)	$C_w (G) = N/A$	N/A
Grate Orifice Coefficient (typical value 0.60 - 0.80)	$C_o (G) = N/A$	N/A
<u>Curb Opening Information</u>	MINOR	MAJOR
Length of a Unit Curb Opening	$L_o (C) = 5.00$	5.00 feet
Height of Vertical Curb Opening in Inches	$H_{vert} = 6.00$	6.00 inches
Height of Curb Orifice Throat in Inches	$H_{throat} = 6.00$	6.00 inches
Angle of Throat (see USDCM Figure ST-5)	Theta = 63.40	63.40 degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	$W_p = 1.17$	1.17 feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_f (C) = 0.10$	0.10
Curb Opening Weir Coefficient (typical value 2.3-3.7)	$C_w (C) = 3.60$	3.60
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	$C_o (C) = 0.67$	0.67
<u>Low Head Performance Reduction (Calculated)</u>	MINOR	MAJOR
Depth for Grate Midwidth	$d_{Grate} = N/A$	N/A ft
Depth for Curb Opening Weir Equation	$d_{Curb} = 0.31$	0.31 ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination} = 0.63$	0.63
Curb Opening Performance Reduction Factor for Long Inlets	$RF_{Curb} = 1.00$	1.00
Grated Inlet Performance Reduction Factor for Long Inlets	$RF_{Grate} = N/A$	N/A
Total Inlet Interception Capacity (assumes clogged condition)	$Q_s = 4.0$	4.0 cfs
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	$Q_{PEAK REQUIRED} = 1.1$	2.7 cfs

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

**Project: MAYBERRY FILING 3**

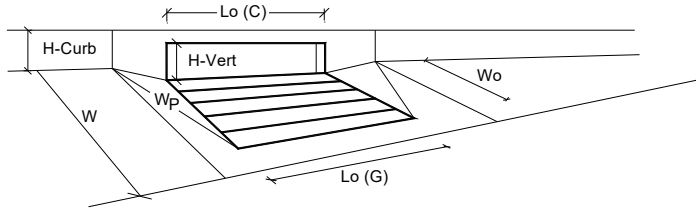
**Inlet ID: C2.2**



<b>Gutter Geometry:</b>										
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input type="text" value="7.5"/> ft									
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input type="text" value="0.020"/> ft/ft									
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input type="text" value="0.013"/>									
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input type="text" value="6.00"/> inches									
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input type="text" value="16.7"/> ft									
Gutter Width	$W = $ <input type="text" value="1.17"/> ft									
Street Transverse Slope	$S_X = $ <input type="text" value="0.020"/> ft/ft									
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = $ <input type="text" value="0.083"/> ft/ft									
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = $ <input type="text" value="0.000"/> ft/ft									
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input type="text" value="0.013"/>									
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center; border: 1px solid black;"><math>T_{MAX} = </math> <input type="text" value="16.7"/></td> <td style="text-align: center; border: 1px solid black;"><input type="text" value="16.7"/></td> <td style="text-align: right; padding: 2px;">ft</td> </tr> </table>	Minor Storm	Major Storm		$T_{MAX} = $ <input type="text" value="16.7"/>	<input type="text" value="16.7"/>	ft			
Minor Storm	Major Storm									
$T_{MAX} = $ <input type="text" value="16.7"/>	<input type="text" value="16.7"/>	ft								
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center; border: 1px solid black;"><math>d_{MAX} = </math> <input type="text" value="6.0"/></td> <td style="text-align: center; border: 1px solid black;"><input type="text" value="12.0"/></td> <td style="text-align: right; padding: 2px;">inches</td> </tr> <tr> <td style="text-align: center; padding: 2px;"><input type="checkbox"/></td> <td style="text-align: center; padding: 2px;"><input type="checkbox"/></td> <td></td> </tr> </table>	Minor Storm	Major Storm		$d_{MAX} = $ <input type="text" value="6.0"/>	<input type="text" value="12.0"/>	inches	<input type="checkbox"/>	<input type="checkbox"/>	
Minor Storm	Major Storm									
$d_{MAX} = $ <input type="text" value="6.0"/>	<input type="text" value="12.0"/>	inches								
<input type="checkbox"/>	<input type="checkbox"/>									
Check boxes are not applicable in SUMP conditions										
<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>										
<a href="#">MAJOR STORM Allowable Capacity is based on Depth Criterion</a>										
<b><math>Q_{allow} = </math></b>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center; border: 1px solid black;"><b>SUMP</b></td> <td style="text-align: center; border: 1px solid black;"><b>SUMP</b></td> <td style="text-align: right; padding: 2px;"><b>cfs</b></td> </tr> </table>	Minor Storm	Major Storm		<b>SUMP</b>	<b>SUMP</b>	<b>cfs</b>			
Minor Storm	Major Storm									
<b>SUMP</b>	<b>SUMP</b>	<b>cfs</b>								

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	MINOR      MAJOR	
Type of Inlet	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00
Number of Unit Inlets (Grate or Curb Opening)	1	1
Water Depth at Flowline (outside of local depression)	4.9	4.9
<b>Grate Information</b>	MINOR	MAJOR
Length of a Unit Grate	N/A	N/A
Width of a Unit Grate	N/A	N/A
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A
<b>Curb Opening Information</b>	MINOR	MAJOR
Length of a Unit Curb Opening	5.00	5.00
Height of Vertical Curb Opening in Inches	6.00	6.00
Height of Curb Orifice Throat in Inches	6.00	6.00
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40
Side Width for Depression Pan (typically the gutter width of 2 feet)	1.17	1.17
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67
<b>Low Head Performance Reduction (Calculated)</b>	MINOR	MAJOR
Depth for Grate Midwidth	N/A	N/A
Depth for Curb Opening Weir Equation	0.31	0.31
Combination Inlet Performance Reduction Factor for Long Inlets	0.63	0.63
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A
Total Inlet Interception Capacity (assumes clogged condition)	4.0	4.0
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	0.6	1.4

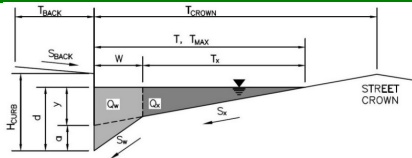


## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **MAYBERRY FILING 3**

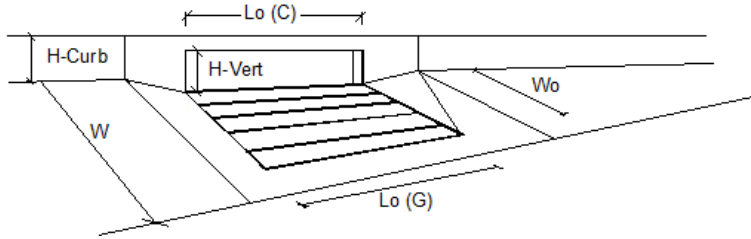
Inlet ID: **D1.12 - DP5**



<b>Gutter Geometry:</b>									
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="12.5"/> ft								
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.012"/>								
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches								
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="17.0"/> ft								
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft								
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft								
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.012"/>								
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><math>T_{MAX} = </math></td> <td style="border: 1px solid black; text-align: center;">17.0</td> <td style="border: 1px solid black; text-align: center;">17.0</td> <td style="border: 1px solid black;">ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} = $	17.0	17.0	ft
	Minor Storm	Major Storm							
$T_{MAX} = $	17.0	17.0	ft						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><math>d_{MAX} = </math></td> <td style="border: 1px solid black; text-align: center;">6.0</td> <td style="border: 1px solid black; text-align: center;">12.0</td> <td style="border: 1px solid black;">inches</td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX} = $	6.0	12.0	inches
	Minor Storm	Major Storm							
$d_{MAX} = $	6.0	12.0	inches						
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"></td> <td style="border: 1px solid black; text-align: center;"><input type="checkbox"/></td> <td style="border: 1px solid black; text-align: center;"><input type="checkbox"/></td> <td style="border: 1px solid black;"></td> </tr> </table>		Minor Storm	Major Storm			<input type="checkbox"/>	<input type="checkbox"/>	
	Minor Storm	Major Storm							
	<input type="checkbox"/>	<input type="checkbox"/>							
<a href="#">MINOR STORM Allowable Capacity is based on Spread Criterion</a>									
<a href="#">MAJOR STORM Allowable Capacity is based on Spread Criterion</a>									
<b>Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b>									
<b>Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b>									
$Q_{allow} = $	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><math>Q_{allow} = </math></td> <td style="border: 1px solid black; text-align: center;">20.5</td> <td style="border: 1px solid black; text-align: center;">20.5</td> <td style="border: 1px solid black;">cfs</td> </tr> </table>		Minor Storm	Major Storm		$Q_{allow} = $	20.5	20.5	cfs
	Minor Storm	Major Storm							
$Q_{allow} = $	20.5	20.5	cfs						

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



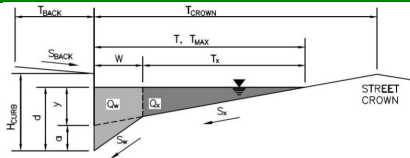
Design Information (Input)	MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a')	Type =	CDOT Type R Curb Opening		
Total Number of Units in the Inlet (Grate or Curb Opening)	$a_{LOCAL}$ =	3.0	3.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)	No =	1	1	
Width of a Unit Grate (cannot be greater than W, Gutter Width)	$L_o$ =	15.00	15.00	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$W_o$ =	N/A	N/A	ft
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	$C_r-G$ =	N/A	N/A	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity'</b>	$C_r-C$ =	0.10	0.10	
Total Inlet Interception Capacity		MINOR	MAJOR	
Total Inlet Carry-Over Flow (flow bypassing inlet)	$Q$ =	3.8	8.4	cfs
Capture Percentage = $Q_d/Q_s$ =	$Q_b$ =	0.0	0.9	cfs
	$C\%$ =	100	90	%

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **MAYBERRY FILING 3**

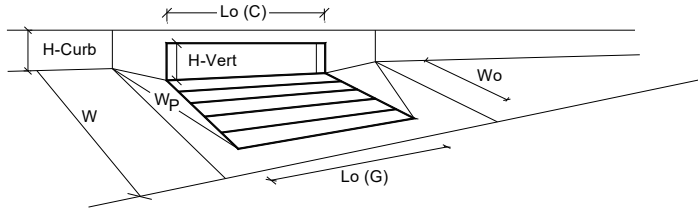
Inlet ID: **D1.2 - DP6**



<b>Gutter Geometry:</b>									
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="12.5"/> ft								
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>								
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches								
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="17.0"/> ft								
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft								
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft								
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft								
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.013"/>								
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><math>T_{MAX} = </math></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 40px;" type="text" value="17.0"/></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 40px;" type="text" value="17.0"/></td> <td style="border: 1px solid black;">ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} = $	<input style="width: 40px;" type="text" value="17.0"/>	<input style="width: 40px;" type="text" value="17.0"/>	ft
	Minor Storm	Major Storm							
$T_{MAX} = $	<input style="width: 40px;" type="text" value="17.0"/>	<input style="width: 40px;" type="text" value="17.0"/>	ft						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><math>d_{MAX} = </math></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 40px;" type="text" value="6.0"/></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 40px;" type="text" value="12.0"/></td> <td style="border: 1px solid black;">inches</td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX} = $	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="12.0"/>	inches
	Minor Storm	Major Storm							
$d_{MAX} = $	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="12.0"/>	inches						
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>								
<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>									
<a href="#">MAJOR STORM Allowable Capacity is based on Depth Criterion</a>									
<b><math>Q_{allow} = </math></b>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><b>SUMP</b></td> <td style="border: 1px solid black; text-align: center;"><b>SUMP</b></td> <td style="border: 1px solid black; text-align: center;"><b>SUMP</b></td> <td style="border: 1px solid black;"><b>cfs</b></td> </tr> </table>		Minor Storm	Major Storm		<b>SUMP</b>	<b>SUMP</b>	<b>SUMP</b>	<b>cfs</b>
	Minor Storm	Major Storm							
<b>SUMP</b>	<b>SUMP</b>	<b>SUMP</b>	<b>cfs</b>						

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



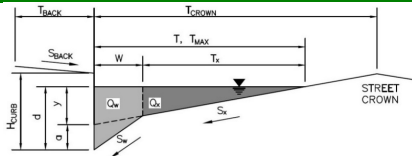
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.6	12.0	inches
<b>Grate Information</b>	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>	MINOR	MAJOR	
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.30	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.72	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	4.6	12.3	cfs
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	3.4	8.3	cfs

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **MAYBERRY FILING 3**

Inlet ID: **D1.3 - DP8**



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} =$   ft  
 $S_{BACK} =$   ft/ft  
 $n_{BACK} =$

Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} =$   inches  
 $T_{CROWN} =$   ft  
 $W =$   ft  
 $S_x =$   ft/ft  
 $S_w =$   ft/ft  
 $S_o =$   ft/ft  
 $n_{STREET} =$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	<input type="text" value="16.2"/>	<input type="text" value="16.2"/>	ft
$d_{MAX} =$	<input type="text" value="6.0"/>	<input type="text" value="12.0"/>	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)  
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

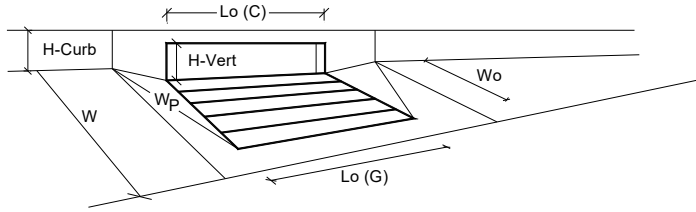
$Q_{allow} =$ 

Minor Storm	Major Storm
<b>SUMP</b>	<b>SUMP</b>

 cfs

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

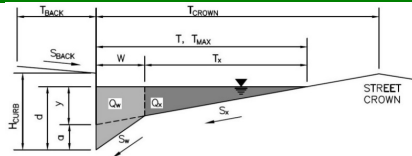


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	4.8	12.0	inches
<b>Grate Information</b>			
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>			
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>			
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.30	0.90	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.61	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>			
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	<b>3.8</b>	<b>12.3</b>	<b>cfs</b>
Q PEAK REQUIRED =	3.1	7.5	cfs

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

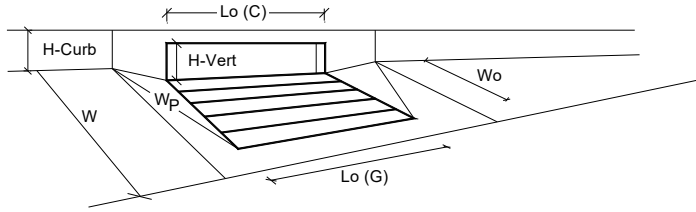
**Project:** MAYBERRY FILING 3  
**Inlet ID:** D1.4



<b>Gutter Geometry:</b>							
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="7.5"/> ft						
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft						
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>						
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches						
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="16.2"/> ft						
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="1.17"/> ft						
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft						
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft						
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft						
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.013"/>						
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center; padding: 2px;"><math>T_{MAX} = </math> <input style="width: 50px;" type="text" value="16.2"/></td> <td style="text-align: center; padding: 2px;"><input style="width: 50px;" type="text" value="16.2"/></td> <td style="text-align: right; padding: 2px;">ft</td> </tr> </table>	Minor Storm	Major Storm		$T_{MAX} = $ <input style="width: 50px;" type="text" value="16.2"/>	<input style="width: 50px;" type="text" value="16.2"/>	ft
Minor Storm	Major Storm						
$T_{MAX} = $ <input style="width: 50px;" type="text" value="16.2"/>	<input style="width: 50px;" type="text" value="16.2"/>	ft					
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center; padding: 2px;"><math>d_{MAX} = </math> <input style="width: 50px;" type="text" value="6.0"/></td> <td style="text-align: center; padding: 2px;"><input style="width: 50px;" type="text" value="12.0"/></td> <td style="text-align: right; padding: 2px;">inches</td> </tr> </table>	Minor Storm	Major Storm		$d_{MAX} = $ <input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="12.0"/>	inches
Minor Storm	Major Storm						
$d_{MAX} = $ <input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="12.0"/>	inches					
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>						
<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>							
<a href="#">MAJOR STORM Allowable Capacity is based on Depth Criterion</a>							
<b><math>Q_{allow} = </math></b>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center; padding: 2px;"><b><input style="width: 50px;" type="text" value="SUMP"/></b></td> <td style="text-align: center; padding: 2px;"><b><input style="width: 50px;" type="text" value="SUMP"/></b></td> <td style="text-align: right; padding: 2px;"><b>cfs</b></td> </tr> </table>	Minor Storm	Major Storm		<b><input style="width: 50px;" type="text" value="SUMP"/></b>	<b><input style="width: 50px;" type="text" value="SUMP"/></b>	<b>cfs</b>
Minor Storm	Major Storm						
<b><input style="width: 50px;" type="text" value="SUMP"/></b>	<b><input style="width: 50px;" type="text" value="SUMP"/></b>	<b>cfs</b>					

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



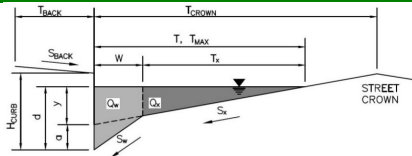
		MINOR	MAJOR	
<b>Design Information (Input)</b>	CDOT Type R Curb Opening	CDOT Type R Curb Opening		
Type of Inlet		CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		1	1	
Water Depth at Flowline (outside of local depression)		4.8	12.0	inches
<b>Grate Information</b>		MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate		N/A	N/A	
Width of a Unit Grate		N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		N/A	N/A	
<b>Curb Opening Information</b>		MINOR	MAJOR	
Length of a Unit Curb Opening		10.00	10.00	feet
Height of Vertical Curb Opening in Inches		6.00	6.00	inches
Height of Curb Orifice Throat in Inches		6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>		MINOR	MAJOR	
Depth for Grate Midwidth		N/A	N/A	ft
Depth for Curb Opening Weir Equation		0.30	0.90	ft
Combination Inlet Performance Reduction Factor for Long Inlets		0.45	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		0.85	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>		MINOR	MAJOR	
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>		5.8	25.5	cfs
$Q_{PEAK\ REQUIRED}$		5.4	12.7	cfs



## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

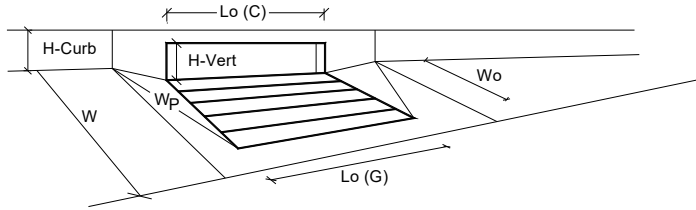
**Project:** MAYBERRY FILING 3  
**Inlet ID:** D1.6



<b>Gutter Geometry:</b>													
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="7.5"/> ft												
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft												
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>												
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches												
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="16.2"/> ft												
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="1.17"/> ft												
Street Transverse Slope	$S_X = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft												
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft												
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft												
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.013"/>												
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><math>T_{MAX} = </math></td> <td style="border: 1px solid black; text-align: center;">16.2</td> <td style="border: 1px solid black; text-align: center;">16.2</td> <td style="border: 1px solid black;">ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} = $	16.2	16.2	ft				
	Minor Storm	Major Storm											
$T_{MAX} = $	16.2	16.2	ft										
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><math>d_{MAX} = </math></td> <td style="border: 1px solid black; text-align: center;">6.0</td> <td style="border: 1px solid black; text-align: center;">12.0</td> <td style="border: 1px solid black;">inches</td> </tr> <tr> <td style="border-right: 1px solid black;"></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX} = $	6.0	12.0	inches		<input type="checkbox"/>	<input type="checkbox"/>	
	Minor Storm	Major Storm											
$d_{MAX} = $	6.0	12.0	inches										
	<input type="checkbox"/>	<input type="checkbox"/>											
Check boxes are not applicable in SUMP conditions													
<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>													
<a href="#">MAJOR STORM Allowable Capacity is based on Depth Criterion</a>													
<b><math>Q_{allow} = </math></b>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><b>SUMP</b></td> <td style="border: 1px solid black; text-align: center;"><b>SUMP</b></td> <td style="border: 1px solid black; text-align: center;"><b>SUMP</b></td> <td style="border: 1px solid black;"><b>cfs</b></td> </tr> </table>		Minor Storm	Major Storm		<b>SUMP</b>	<b>SUMP</b>	<b>SUMP</b>	<b>cfs</b>				
	Minor Storm	Major Storm											
<b>SUMP</b>	<b>SUMP</b>	<b>SUMP</b>	<b>cfs</b>										

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



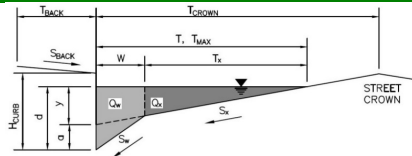
Design Information (Input)	MINOR      MAJOR	
Type of Inlet	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00
Number of Unit Inlets (Grate or Curb Opening)	1	1
Water Depth at Flowline (outside of local depression)	4.8	12.0
<b>Grate Information</b>	MINOR	MAJOR
Length of a Unit Grate	N/A	N/A
Width of a Unit Grate	N/A	N/A
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A
<b>Curb Opening Information</b>	MINOR	MAJOR
Length of a Unit Curb Opening	5.00	5.00
Height of Vertical Curb Opening in Inches	6.00	6.00
Height of Curb Orifice Throat in Inches	6.00	6.00
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40
Side Width for Depression Pan (typically the gutter width of 2 feet)	1.17	1.17
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67
<b>Low Head Performance Reduction (Calculated)</b>	MINOR	MAJOR
Depth for Grate Midwidth	N/A	N/A
Depth for Curb Opening Weir Equation	0.30	0.90
Combination Inlet Performance Reduction Factor for Long Inlets	0.61	1.00
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>	MINOR	MAJOR
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	3.8	12.3
$Q_{PEAK\ REQUIRED}$	2.6	6.3

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **MAYBERRY FILING 3**

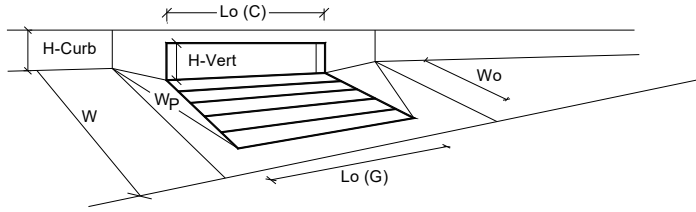
Inlet ID: **D1.7**



<b>Gutter Geometry:</b>													
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="7.5"/> ft												
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft												
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>												
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches												
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="16.2"/> ft												
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="1.17"/> ft												
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft												
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft												
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft												
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.013"/>												
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="padding: 5px;"><math>T_{MAX} = </math></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 50px;" type="text" value="16.2"/></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 50px;" type="text" value="16.2"/></td> <td style="text-align: right; padding: 5px;">ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} = $	<input style="width: 50px;" type="text" value="16.2"/>	<input style="width: 50px;" type="text" value="16.2"/>	ft				
	Minor Storm	Major Storm											
$T_{MAX} = $	<input style="width: 50px;" type="text" value="16.2"/>	<input style="width: 50px;" type="text" value="16.2"/>	ft										
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="padding: 5px;"><math>d_{MAX} = </math></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 50px;" type="text" value="6.0"/></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 50px;" type="text" value="12.0"/></td> <td style="text-align: right; padding: 5px;">inches</td> </tr> <tr> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX} = $	<input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="12.0"/>	inches		<input type="checkbox"/>	<input type="checkbox"/>	
	Minor Storm	Major Storm											
$d_{MAX} = $	<input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="12.0"/>	inches										
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<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>													
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$Q_{allow} = $	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 50px;" type="text" value="SUMP"/></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 50px;" type="text" value="SUMP"/></td> <td style="text-align: right; padding: 5px;">cfs</td> </tr> </table>		Minor Storm	Major Storm			<input style="width: 50px;" type="text" value="SUMP"/>	<input style="width: 50px;" type="text" value="SUMP"/>	cfs				
	Minor Storm	Major Storm											
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# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



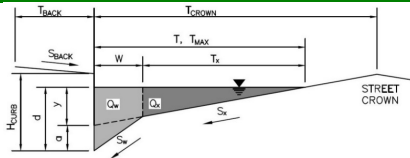
Design Information (Input)	MINOR      MAJOR	
Type of Inlet	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)	$a_{local} =$	3.00 inches
Number of Unit Inlets (Grate or Curb Opening)	$N_o =$	1
Water Depth at Flowline (outside of local depression)	Ponding Depth =	12.0 inches
<u>Grate Information</u>	MINOR	MAJOR
Length of a Unit Grate	$L_o (G) =$	N/A
Width of a Unit Grate	$W_o =$	N/A
Area Opening Ratio for a Grate (typical values 0.15-0.90)	$A_{ratio} =$	N/A
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	$C_f (G) =$	N/A
Grate Weir Coefficient (typical value 2.15 - 3.60)	$C_w (G) =$	N/A
Grate Orifice Coefficient (typical value 0.60 - 0.80)	$C_o (G) =$	N/A
<u>Curb Opening Information</u>	MINOR	MAJOR
Length of a Unit Curb Opening	$L_o (C) =$	5.00 feet
Height of Vertical Curb Opening in Inches	$H_{vert} =$	6.00 inches
Height of Curb Orifice Throat in Inches	$H_{throat} =$	6.00 inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40 degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	$W_p =$	1.17 feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_f (C) =$	0.10
Curb Opening Weir Coefficient (typical value 2.3-3.7)	$C_w (C) =$	3.60
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	$C_o (C) =$	0.67
<u>Low Head Performance Reduction (Calculated)</u>	MINOR	MAJOR
Depth for Grate Midwidth	$d_{Grate} =$	N/A
Depth for Curb Opening Weir Equation	$d_{Curb} =$	0.30
Combination Inlet Performance Reduction Factor for Long Inlets	RF <sub>Combination</sub> =	0.61
Curb Opening Performance Reduction Factor for Long Inlets	RF <sub>Curb</sub> =	1.00
Grated Inlet Performance Reduction Factor for Long Inlets	RF <sub>Grate</sub> =	N/A
Total Inlet Interception Capacity (assumes clogged condition)	$Q_s =$	3.8 cfs
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	$Q_{PEAK REQUIRED} =$	2.1 cfs

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **MAYBERRY FILING 3**

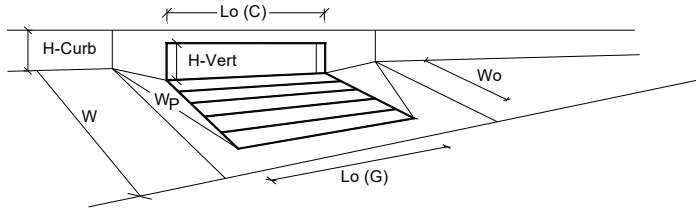
Inlet ID: **D1.8**



<u>Gutter Geometry:</u>									
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="7.5"/> ft								
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>								
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches								
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="16.2"/> ft								
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="1.17"/> ft								
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft								
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft								
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.013"/>								
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><math>T_{MAX} = </math></td> <td style="border: 1px solid black; text-align: center;">16.2</td> <td style="border: 1px solid black; text-align: center;">16.2</td> <td style="border: 1px solid black;">ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} = $	16.2	16.2	ft
	Minor Storm	Major Storm							
$T_{MAX} = $	16.2	16.2	ft						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><math>d_{MAX} = </math></td> <td style="border: 1px solid black; text-align: center;">6.0</td> <td style="border: 1px solid black; text-align: center;">12.0</td> <td style="border: 1px solid black;">inches</td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX} = $	6.0	12.0	inches
	Minor Storm	Major Storm							
$d_{MAX} = $	6.0	12.0	inches						
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>								
<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>									
<a href="#">MAJOR STORM Allowable Capacity is based on Depth Criterion</a>									
<b><math>Q_{allow} = </math></b>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><b>SUMP</b></td> <td style="border: 1px solid black; text-align: center;"><b>SUMP</b></td> <td style="border: 1px solid black; text-align: center;"><b>SUMP</b></td> <td style="border: 1px solid black;"><b>cfs</b></td> </tr> </table>		Minor Storm	Major Storm		<b>SUMP</b>	<b>SUMP</b>	<b>SUMP</b>	<b>cfs</b>
	Minor Storm	Major Storm							
<b>SUMP</b>	<b>SUMP</b>	<b>SUMP</b>	<b>cfs</b>						

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



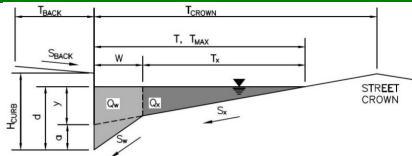
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	4.8	12.0	inches
<u>Grate Information</u>	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<u>Curb Opening Information</u>	MINOR	MAJOR	
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<u>Low Head Performance Reduction (Calculated)</u>	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.30	0.90	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.61	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	3.8	12.3	cfs
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	1.8	4.3	cfs

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **MAYBERRY FILING 3**

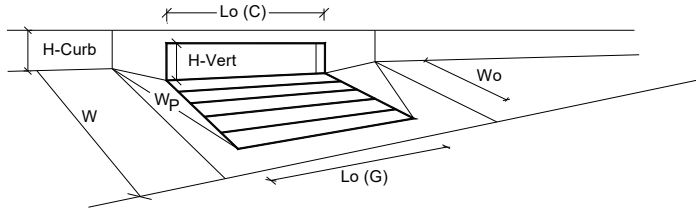
Inlet ID: **D1.9**



<b>Gutter Geometry:</b>									
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px; text-align: center;" type="text" value="7.5"/> ft								
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px; text-align: center;" type="text" value="0.020"/> ft/ft								
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px; text-align: center;" type="text" value="0.013"/>								
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px; text-align: center;" type="text" value="6.00"/> inches								
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px; text-align: center;" type="text" value="16.2"/> ft								
Gutter Width	$W = $ <input style="width: 50px; text-align: center;" type="text" value="1.17"/> ft								
Street Transverse Slope	$S_X = $ <input style="width: 50px; text-align: center;" type="text" value="0.020"/> ft/ft								
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = $ <input style="width: 50px; text-align: center;" type="text" value="0.083"/> ft/ft								
Street Longitudinal Slope - Enter 0 for sump condition	$S_O = $ <input style="width: 50px; text-align: center;" type="text" value="0.000"/> ft/ft								
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px; text-align: center;" type="text" value="0.013"/>								
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><math>T_{MAX} = </math></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px; text-align: center;" type="text" value="16.2"/></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px; text-align: center;" type="text" value="16.2"/></td> <td style="border-left: 1px solid black;">ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} = $	<input style="width: 40px; text-align: center;" type="text" value="16.2"/>	<input style="width: 40px; text-align: center;" type="text" value="16.2"/>	ft
	Minor Storm	Major Storm							
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Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><math>d_{MAX} = </math></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px; text-align: center;" type="text" value="6.0"/></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px; text-align: center;" type="text" value="12.0"/></td> <td style="border-left: 1px solid black;">inches</td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX} = $	<input style="width: 40px; text-align: center;" type="text" value="6.0"/>	<input style="width: 40px; text-align: center;" type="text" value="12.0"/>	inches
	Minor Storm	Major Storm							
$d_{MAX} = $	<input style="width: 40px; text-align: center;" type="text" value="6.0"/>	<input style="width: 40px; text-align: center;" type="text" value="12.0"/>	inches						
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>								
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	Minor Storm	Major Storm							
<b>SUMP</b>	<b>SUMP</b>	<b>SUMP</b>	<b>cfs</b>						

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



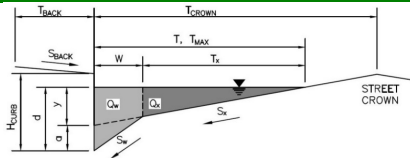
Design Information (Input)	MINOR      MAJOR	
Type of Inlet	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)	Type =	CDOT Type R Curb Opening
Number of Unit Inlets (Grate or Curb Opening)	$a_{local}$ =	3.00 inches
Water Depth at Flowline (outside of local depression)	No =	1
<b>Grate Information</b>	Ponding Depth =	4.8 inches
Length of a Unit Grate	$L_o$ (G) =	12.0 inches
Width of a Unit Grate	$W_o$ =	N/A feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	$A_{ratio}$ =	N/A feet
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	$C_f$ (G) =	N/A
Grate Weir Coefficient (typical value 2.15 - 3.60)	$C_w$ (G) =	N/A
Grate Orifice Coefficient (typical value 0.60 - 0.80)	$C_o$ (G) =	N/A
<b>Curb Opening Information</b>	<input checked="" type="checkbox"/> Override Depths	
Length of a Unit Curb Opening	$L_o$ (C) =	5.00 feet
Height of Vertical Curb Opening in Inches	$H_{vert}$ =	6.00 inches
Height of Curb Orifice Throat in Inches	$H_{throat}$ =	6.00 inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40 degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	$W_p$ =	1.17 feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_f$ (C) =	0.10
Curb Opening Weir Coefficient (typical value 2.3-3.7)	$C_w$ (C) =	3.60
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	$C_o$ (C) =	0.67
<b>Low Head Performance Reduction (Calculated)</b>	$d_{Grate}$ =	N/A ft
Depth for Grate Midwidth	$d_{Curb}$ =	0.30 ft
Depth for Curb Opening Weir Equation	RF <sub>Combination</sub> =	0.61
Combination Inlet Performance Reduction Factor for Long Inlets	RF <sub>Curb</sub> =	1.00
Curb Opening Performance Reduction Factor for Long Inlets	RF <sub>Grate</sub> =	N/A
Grated Inlet Performance Reduction Factor for Long Inlets	$Q_s$ =	3.8 cfs
Total Inlet Interception Capacity (assumes clogged condition)	$Q_{PEAK REQUIRED}$ =	0.9 cfs
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>		



## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

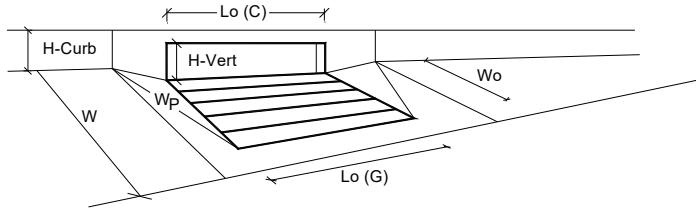
**Project:** MAYBERRY FILING 3  
**Inlet ID:** D1.10



<b>Gutter Geometry:</b>							
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="12.0"/> ft						
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft						
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>						
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches						
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="28.0"/> ft						
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft						
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft						
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft						
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft						
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.013"/>						
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Minor Storm</td> <td style="padding: 2px 5px;">Major Storm</td> <td style="padding: 2px 5px;">ft</td> </tr> <tr> <td style="padding: 2px 5px;"><math>T_{MAX} = </math> <input style="width: 50px;" type="text" value="28.0"/></td> <td style="padding: 2px 5px;"><input style="width: 50px;" type="text" value="28.0"/></td> <td></td> </tr> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = $ <input style="width: 50px;" type="text" value="28.0"/>	<input style="width: 50px;" type="text" value="28.0"/>	
Minor Storm	Major Storm	ft					
$T_{MAX} = $ <input style="width: 50px;" type="text" value="28.0"/>	<input style="width: 50px;" type="text" value="28.0"/>						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Minor Storm</td> <td style="padding: 2px 5px;">Major Storm</td> <td style="padding: 2px 5px;">inches</td> </tr> <tr> <td style="padding: 2px 5px;"><math>d_{MAX} = </math> <input style="width: 50px;" type="text" value="6.0"/></td> <td style="padding: 2px 5px;"><input style="width: 50px;" type="text" value="12.0"/></td> <td></td> </tr> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = $ <input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="12.0"/>	
Minor Storm	Major Storm	inches					
$d_{MAX} = $ <input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="12.0"/>						
Check boxes are not applicable in SUMP conditions	<table style="display: inline-table; border: none;"> <tr> <td style="padding: 0 10px;"><input type="checkbox"/></td> <td style="padding: 0 10px;"><input type="checkbox"/></td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>						
<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>							
<a href="#">MAJOR STORM Allowable Capacity is based on Depth Criterion</a>							
<b><math>Q_{allow} = </math></b>	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Minor Storm</td> <td style="padding: 2px 5px;">Major Storm</td> <td style="padding: 2px 5px;">cfs</td> </tr> <tr> <td style="padding: 2px 5px;"><b>SUMP</b></td> <td style="padding: 2px 5px;"><b>SUMP</b></td> <td></td> </tr> </table>	Minor Storm	Major Storm	cfs	<b>SUMP</b>	<b>SUMP</b>	
Minor Storm	Major Storm	cfs					
<b>SUMP</b>	<b>SUMP</b>						

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



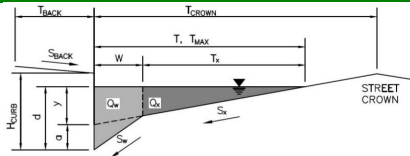
Design Information (Input)	MINOR      MAJOR	
Type of Inlet	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)	$a_{local} =$	3.00 inches
Number of Unit Inlets (Grate or Curb Opening)	$N_u =$	1
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0 inches
<u>Grate Information</u>	MINOR      MAJOR	<input type="checkbox"/> Override Depths
Length of a Unit Grate	$L_o (G) =$	N/A feet
Width of a Unit Grate	$W_o =$	N/A feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	$A_{ratio} =$	N/A
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	$C_f (G) =$	N/A
Grate Weir Coefficient (typical value 2.15 - 3.60)	$C_w (G) =$	N/A
Grate Orifice Coefficient (typical value 0.60 - 0.80)	$C_o (G) =$	N/A
<u>Curb Opening Information</u>	MINOR      MAJOR	
Length of a Unit Curb Opening	$L_o (C) =$	5.00 feet
Height of Vertical Curb Opening in Inches	$H_{vert} =$	6.00 inches
Height of Curb Orifice Throat in Inches	$H_{throat} =$	6.00 inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40 degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	$W_p =$	2.00 feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_f (C) =$	0.10
Curb Opening Weir Coefficient (typical value 2.3-3.7)	$C_w (C) =$	3.60
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	$C_o (C) =$	0.67
<u>Low Head Performance Reduction (Calculated)</u>	MINOR      MAJOR	
Depth for Grate Midwidth	$d_{Grate} =$	N/A ft
Depth for Curb Opening Weir Equation	$d_{Curb} =$	0.33 ft
Combination Inlet Performance Reduction Factor for Long Inlets	RF <sub>Combination</sub> =	0.77
Curb Opening Performance Reduction Factor for Long Inlets	RF <sub>Curb</sub> =	1.00
Grated Inlet Performance Reduction Factor for Long Inlets	RF <sub>Grate</sub> =	N/A
Total Inlet Interception Capacity (assumes clogged condition)	$Q_s =$	5.4 cfs
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	$Q_{PEAK REQUIRED} =$	3.3 cfs

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **MAYBERRY FILING 3**

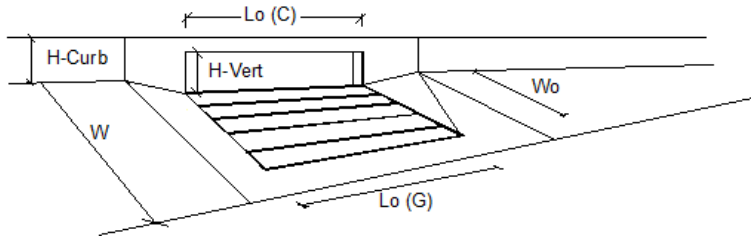
Inlet ID: **Mayberry Drive**



<b>Gutter Geometry:</b>					
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <table border="1" style="display: inline-table; width: 80px;"><tr><td style="text-align: center;">12.0</td></tr></table> ft	12.0			
12.0					
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <table border="1" style="display: inline-table; width: 80px;"><tr><td style="text-align: center;">0.020</td></tr></table> ft/ft	0.020			
0.020					
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <table border="1" style="display: inline-table; width: 80px;"><tr><td style="text-align: center;">0.012</td></tr></table>	0.012			
0.012					
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <table border="1" style="display: inline-table; width: 80px;"><tr><td style="text-align: center;">6.00</td></tr></table> inches	6.00			
6.00					
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <table border="1" style="display: inline-table; width: 80px;"><tr><td style="text-align: center;">28.0</td></tr></table> ft	28.0			
28.0					
Gutter Width	$W = $ <table border="1" style="display: inline-table; width: 80px;"><tr><td style="text-align: center;">2.00</td></tr></table> ft	2.00			
2.00					
Street Transverse Slope	$S_x = $ <table border="1" style="display: inline-table; width: 80px;"><tr><td style="text-align: center;">0.020</td></tr></table> ft/ft	0.020			
0.020					
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <table border="1" style="display: inline-table; width: 80px;"><tr><td style="text-align: center;">0.083</td></tr></table> ft/ft	0.083			
0.083					
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <table border="1" style="display: inline-table; width: 80px;"><tr><td style="text-align: center;">0.010</td></tr></table> ft/ft	0.010			
0.010					
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <table border="1" style="display: inline-table; width: 80px;"><tr><td style="text-align: center;">0.012</td></tr></table>	0.012			
0.012					
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="display: inline-table; width: 150px;"><tr><th style="width: 50%;">Minor Storm</th><th style="width: 50%;">Major Storm</th></tr><tr><td style="text-align: center;">28.0</td><td style="text-align: center;">28.0</td></tr></table> ft	Minor Storm	Major Storm	28.0	28.0
Minor Storm	Major Storm				
28.0	28.0				
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	$d_{MAX} = $ <table border="1" style="display: inline-table; width: 150px;"><tr><th style="width: 50%;">Minor Storm</th><th style="width: 50%;">Major Storm</th></tr><tr><td style="text-align: center;">6.0</td><td style="text-align: center;">12.0</td></tr></table> inches	Minor Storm	Major Storm	6.0	12.0
Minor Storm	Major Storm				
6.0	12.0				
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<table style="display: inline-table; width: 150px;"><tr><td style="text-align: center;"><input type="checkbox"/></td><td style="text-align: center;"><input type="checkbox"/></td></tr></table>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>				
<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>	$Q_{allow} = $ <table border="1" style="display: inline-table; width: 150px;"><tr><th style="width: 50%;">Minor Storm</th><th style="width: 50%;">Major Storm</th></tr><tr><td style="text-align: center;">18.4</td><td style="text-align: center;">54.2</td></tr></table> cfs	Minor Storm	Major Storm	18.4	54.2
Minor Storm	Major Storm				
18.4	54.2				
<a href="#">MAJOR STORM Allowable Capacity is based on Spread Criterion</a>					
<b>Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b>					
<b>Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b>					

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



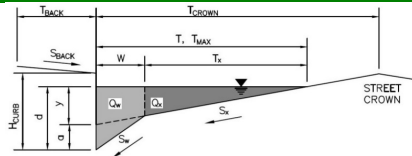
Design Information (Input)	MINOR      MAJOR		
Type of Inlet			
Local Depression (additional to continuous gutter depression 'a')	$a_{LOCAL} =$		inches
Total Number of Units in the Inlet (Grate or Curb Opening)	$N_o =$		
Length of a Single Unit Inlet (Grate or Curb Opening)	$L_o =$		ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	$W_o =$		ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$C_r-G =$		
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	$C_r-C =$		
Total Inlet Interception Capacity	$Q =$		cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	$Q_b =$		cfs
Capture Percentage = $Q_a/Q_o =$	$C\% =$		%

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **MAYBERRY FILING 3**

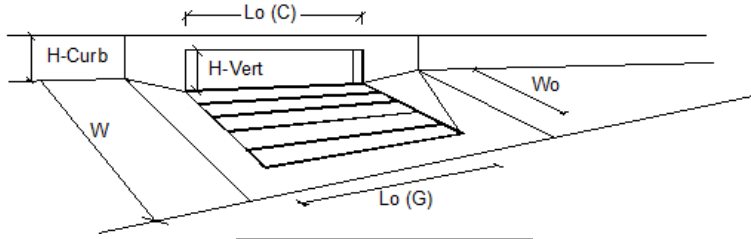
Inlet ID: **50' ROW - 6" Rollover Curb**



<b>Gutter Geometry:</b>									
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="7.5"/> ft								
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>								
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches								
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="16.7"/> ft								
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="1.17"/> ft								
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft								
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.008"/> ft/ft								
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.013"/>								
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><math>T_{MAX} = </math></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px;" type="text" value="16.7"/></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px;" type="text" value="16.7"/></td> <td style="border-left: 1px solid black;">ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} = $	<input style="width: 40px;" type="text" value="16.7"/>	<input style="width: 40px;" type="text" value="16.7"/>	ft
	Minor Storm	Major Storm							
$T_{MAX} = $	<input style="width: 40px;" type="text" value="16.7"/>	<input style="width: 40px;" type="text" value="16.7"/>	ft						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><math>d_{MAX} = </math></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px;" type="text" value="6.0"/></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px;" type="text" value="12.0"/></td> <td style="border-left: 1px solid black;">inches</td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX} = $	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="12.0"/>	inches
	Minor Storm	Major Storm							
$d_{MAX} = $	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="12.0"/>	inches						
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"></td> <td style="text-align: center; border: 1px solid black;"><input type="checkbox"/></td> <td style="text-align: center; border: 1px solid black;"><input checked="" type="checkbox"/></td> <td style="border-left: 1px solid black;"></td> </tr> </table>		Minor Storm	Major Storm			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	Minor Storm	Major Storm							
	<input type="checkbox"/>	<input checked="" type="checkbox"/>							
<a href="#">MINOR STORM Allowable Capacity is based on Spread Criterion</a>									
<a href="#">MAJOR STORM Allowable Capacity is based on Depth Criterion</a>									
<b>Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b>									
<b>Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b>									
<b><math>Q_{allow} = </math></b>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="border-right: 1px solid black;"><b><math>Q_{allow} = </math></b></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px;" type="text" value="10.7"/></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px;" type="text" value="128.7"/></td> <td style="border-left: 1px solid black;"><b>cfs</b></td> </tr> </table>		Minor Storm	Major Storm		<b><math>Q_{allow} = </math></b>	<input style="width: 40px;" type="text" value="10.7"/>	<input style="width: 40px;" type="text" value="128.7"/>	<b>cfs</b>
	Minor Storm	Major Storm							
<b><math>Q_{allow} = </math></b>	<input style="width: 40px;" type="text" value="10.7"/>	<input style="width: 40px;" type="text" value="128.7"/>	<b>cfs</b>						

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

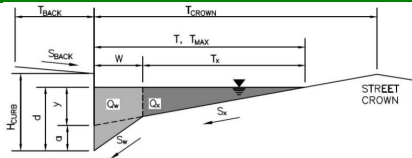


Design Information (Input)	MINOR      MAJOR		
Type of Inlet	Type =		
Local Depression (additional to continuous gutter depression 'a')	$a_{LOCAL}$ =		inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =		
Length of a Single Unit Inlet (Grate or Curb Opening)	$L_o$ =		ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	$W_o$ =		ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$C_r-G$ =		
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	$C_r-C$ =		
Total Inlet Interception Capacity	$Q$ =		cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	$Q_b$ =		cfs
Capture Percentage = $Q_a/Q_o$ =	$C\%$ =		%

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

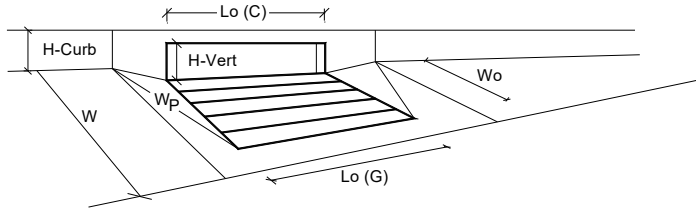
Project: **MAYBERRY FILING 3**  
 Inlet ID: **C2.4**



Gutter Geometry:					
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="12.5"/> ft				
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft				
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>				
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches				
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="28.0"/> ft				
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft				
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft				
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft				
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft				
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.013"/>				
Max. Allowable Spread for Minor & Major Storm	$T_{MAX} = $ <table border="1" style="display: inline-table; border-collapse: collapse;"><tr><td style="padding: 2px;">Minor Storm</td><td style="padding: 2px;">Major Storm</td></tr><tr><td style="text-align: center; padding: 2px;">28.0</td><td style="text-align: center; padding: 2px;">28.0</td></tr></table> ft	Minor Storm	Major Storm	28.0	28.0
Minor Storm	Major Storm				
28.0	28.0				
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	$d_{MAX} = $ <table border="1" style="display: inline-table; border-collapse: collapse;"><tr><td style="padding: 2px;">Minor Storm</td><td style="padding: 2px;">Major Storm</td></tr><tr><td style="text-align: center; padding: 2px;">6.0</td><td style="text-align: center; padding: 2px;">12.0</td></tr></table> inches	Minor Storm	Major Storm	6.0	12.0
Minor Storm	Major Storm				
6.0	12.0				
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>				
<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>					
<a href="#">MAJOR STORM Allowable Capacity is based on Depth Criterion</a>					
$Q_{allow} = $	<table border="1" style="display: inline-table; border-collapse: collapse;"><tr><td style="padding: 2px;">Minor Storm</td><td style="padding: 2px;">Major Storm</td></tr><tr><td style="text-align: center; padding: 2px;"><b>SUMP</b></td><td style="text-align: center; padding: 2px;"><b>SUMP</b></td></tr></table> cfs	Minor Storm	Major Storm	<b>SUMP</b>	<b>SUMP</b>
Minor Storm	Major Storm				
<b>SUMP</b>	<b>SUMP</b>				

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	MINOR      MAJOR	
Type of Inlet	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)	$a_{local} = 3.00$	3.00 inches
Number of Unit Inlets (Grate or Curb Opening)	$N_o = 1$	1
Water Depth at Flowline (outside of local depression)	Ponding Depth = 6.0	8.2 inches
<u>Grate Information</u>	MINOR	MAJOR
Length of a Unit Grate	$L_o (G) = N/A$	N/A feet
Width of a Unit Grate	$W_o = N/A$	N/A feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	$A_{ratio} = N/A$	N/A
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	$C_f (G) = N/A$	N/A
Grate Weir Coefficient (typical value 2.15 - 3.60)	$C_w (G) = N/A$	N/A
Grate Orifice Coefficient (typical value 0.60 - 0.80)	$C_o (G) = N/A$	N/A
<u>Curb Opening Information</u>	MINOR	MAJOR
Length of a Unit Curb Opening	$L_o (C) = 15.00$	15.00 feet
Height of Vertical Curb Opening in Inches	$H_{vert} = 6.00$	6.00 inches
Height of Curb Orifice Throat in Inches	$H_{throat} = 6.00$	6.00 inches
Angle of Throat (see USDCM Figure ST-5)	$\theta = 63.40$	63.40 degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	$W_p = 2.00$	2.00 feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_f (C) = 0.10$	0.10
Curb Opening Weir Coefficient (typical value 2.3-3.7)	$C_w (C) = 3.60$	3.60
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	$C_o (C) = 0.67$	0.67
<u>Low Head Performance Reduction (Calculated)</u>	MINOR	MAJOR
Depth for Grate Midwidth	$d_{Grate} = N/A$	N/A ft
Depth for Curb Opening Weir Equation	$d_{Curb} = 0.33$	0.52 ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination} = 0.57$	0.78
Curb Opening Performance Reduction Factor for Long Inlets	$RF_{Curb} = 0.79$	0.90
Grated Inlet Performance Reduction Factor for Long Inlets	$RF_{Grate} = N/A$	N/A
Total Inlet Interception Capacity (assumes clogged condition)	$Q_a = 9.7$	21.7 cfs
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	$Q_{PEAK REQUIRED} = 4.1$	7.8 cfs

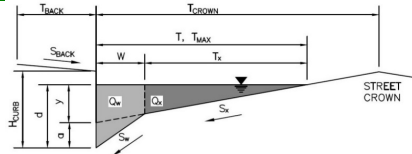


## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **MAYBERRY FILING 3**

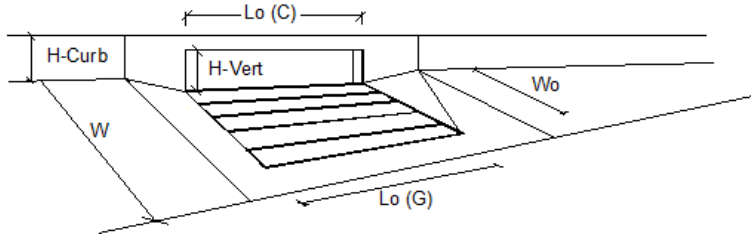
Inlet ID: **Galveston Ter.**



<b>Gutter Geometry:</b>									
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="12.5"/> ft								
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.012"/>								
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches								
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="17.0"/> ft								
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft								
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft								
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.010"/> ft/ft								
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.012"/>								
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;"><math>T_{MAX} = </math></td> <td style="padding: 2px 5px; text-align: center;">Minor Storm</td> <td style="padding: 2px 5px; text-align: center;">Major Storm</td> <td style="padding: 2px 5px;">ft</td> </tr> <tr> <td></td> <td style="padding: 2px 5px; text-align: center;"><input style="width: 40px;" type="text" value="17.0"/></td> <td style="padding: 2px 5px; text-align: center;"><input style="width: 40px;" type="text" value="17.0"/></td> <td></td> </tr> </table>	$T_{MAX} = $	Minor Storm	Major Storm	ft		<input style="width: 40px;" type="text" value="17.0"/>	<input style="width: 40px;" type="text" value="17.0"/>	
$T_{MAX} = $	Minor Storm	Major Storm	ft						
	<input style="width: 40px;" type="text" value="17.0"/>	<input style="width: 40px;" type="text" value="17.0"/>							
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;"><math>d_{MAX} = </math></td> <td style="padding: 2px 5px; text-align: center;">Minor Storm</td> <td style="padding: 2px 5px; text-align: center;">Major Storm</td> <td style="padding: 2px 5px;">inches</td> </tr> <tr> <td></td> <td style="padding: 2px 5px; text-align: center;"><input style="width: 40px;" type="text" value="6.0"/></td> <td style="padding: 2px 5px; text-align: center;"><input style="width: 40px;" type="text" value="6.0"/></td> <td></td> </tr> </table>	$d_{MAX} = $	Minor Storm	Major Storm	inches		<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="6.0"/>	
$d_{MAX} = $	Minor Storm	Major Storm	inches						
	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="6.0"/>							
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;"><math>Q_{allow} = </math></td> <td style="padding: 2px 5px; text-align: center;">Minor Storm</td> <td style="padding: 2px 5px; text-align: center;">Major Storm</td> <td style="padding: 2px 5px;">cfs</td> </tr> <tr> <td></td> <td style="padding: 2px 5px; text-align: center;"><input type="checkbox"/> <input style="width: 40px;" type="text" value="14.1"/></td> <td style="padding: 2px 5px; text-align: center;"><input checked="" type="checkbox"/> <input style="width: 40px;" type="text" value="17.9"/></td> <td></td> </tr> </table>	$Q_{allow} = $	Minor Storm	Major Storm	cfs		<input type="checkbox"/> <input style="width: 40px;" type="text" value="14.1"/>	<input checked="" type="checkbox"/> <input style="width: 40px;" type="text" value="17.9"/>	
$Q_{allow} = $	Minor Storm	Major Storm	cfs						
	<input type="checkbox"/> <input style="width: 40px;" type="text" value="14.1"/>	<input checked="" type="checkbox"/> <input style="width: 40px;" type="text" value="17.9"/>							
<a href="#">MINOR STORM Allowable Capacity is based on Spread Criterion</a>									
<a href="#">MAJOR STORM Allowable Capacity is based on Depth Criterion</a>									
<b>Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b>									
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# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

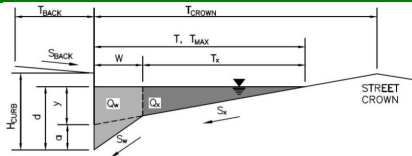


Design Information (Input)	MINOR	MAJOR	
Type of Inlet <input style="width: 150px;" type="text"/>	Type =		
Local Depression (additional to continuous gutter depression 'a')	$a_{LOCAL}$ =		inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =		
Length of a Single Unit Inlet (Grate or Curb Opening)	$L_o$ =		ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	$W_o$ =		ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$C_r-G$ =		
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	$C_r-C$ =		
Total Inlet Interception Capacity	$Q$ =		cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	$Q_b$ =		cfs
Capture Percentage = $Q_a/Q_o$ =	C% =		%

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

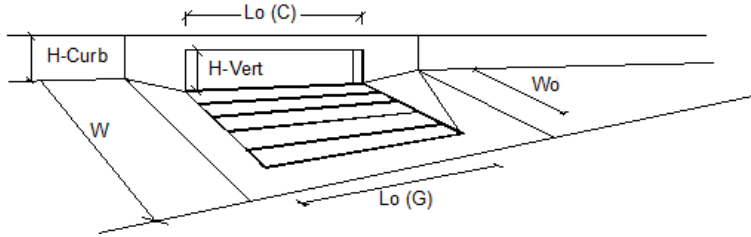
**Project: MAYBERRY FILING 3**  
**Inlet ID: C2.5**



<b>Gutter Geometry:</b>																	
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="12.0"/> ft																
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft																
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>																
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches																
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="28.0"/> ft																
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft																
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft																
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft																
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.007"/> ft/ft																
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.012"/>																
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">Minor Storm</th> <th style="width: 25%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> <tr> <td style="padding: 5px;"><math>T_{MAX} = </math></td> <td style="text-align: center;"><input style="width: 50px;" type="text" value="28.0"/></td> <td style="text-align: center;"><input style="width: 50px;" type="text" value="28.0"/></td> <td style="text-align: right;">ft</td> </tr> <tr> <td style="padding: 5px;"><math>d_{MAX} = </math></td> <td style="text-align: center;"><input style="width: 50px;" type="text" value="6.0"/></td> <td style="text-align: center;"><input style="width: 50px;" type="text" value="12.0"/></td> <td style="text-align: right;">inches</td> </tr> <tr> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} = $	<input style="width: 50px;" type="text" value="28.0"/>	<input style="width: 50px;" type="text" value="28.0"/>	ft	$d_{MAX} = $	<input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="12.0"/>	inches		<input type="checkbox"/>	<input type="checkbox"/>	
	Minor Storm	Major Storm															
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Allow Flow Depth at Street Crown (check box for yes, leave blank for no)																	
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	Minor Storm	Major Storm															
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# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

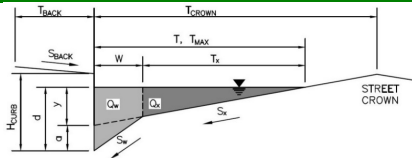


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>			
Total Inlet Interception Capacity	7.8	11.3	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	6.4	23.3	cfs
Capture Percentage = $Q_i/Q_o$ =	55	33	%

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

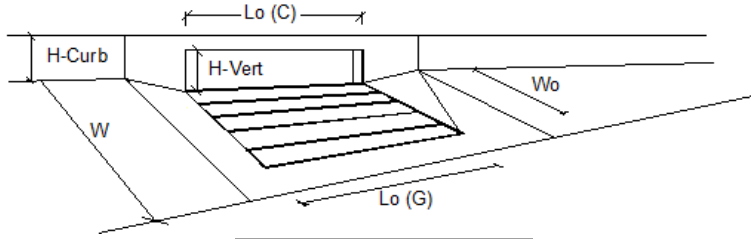
Project: **MAYBERRY FILING 3**  
 Inlet ID: **D1.1**



<b>Gutter Geometry:</b>									
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px; text-align: center;" type="text" value="12.0"/> ft								
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px; text-align: center;" type="text" value="0.020"/> ft/ft								
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px; text-align: center;" type="text" value="0.012"/>								
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px; text-align: center;" type="text" value="6.00"/> inches								
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px; text-align: center;" type="text" value="17.0"/> ft								
Gutter Width	$W = $ <input style="width: 50px; text-align: center;" type="text" value="2.00"/> ft								
Street Transverse Slope	$S_x = $ <input style="width: 50px; text-align: center;" type="text" value="0.020"/> ft/ft								
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px; text-align: center;" type="text" value="0.083"/> ft/ft								
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px; text-align: center;" type="text" value="0.020"/> ft/ft								
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px; text-align: center;" type="text" value="0.012"/>								
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">Minor Storm</th> <th style="width: 25%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> <tr> <td style="padding: 5px;"><math>T_{MAX} = </math></td> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="17.0"/></td> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="17.0"/></td> <td style="text-align: right;">ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} = $	<input style="width: 50px; text-align: center;" type="text" value="17.0"/>	<input style="width: 50px; text-align: center;" type="text" value="17.0"/>	ft
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	Minor Storm	Major Storm							
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	Minor Storm	Major Storm							
	<input style="width: 50px; text-align: center;" type="text" value="20.5"/>	<input style="width: 50px; text-align: center;" type="text" value="20.5"/>	cfs						

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



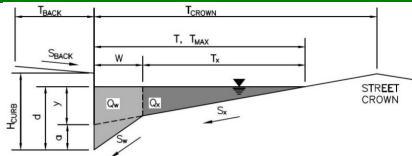
CDOT Type R Curb Opening		MINOR		MAJOR	
<b>Design Information (Input)</b>					
Type of Inlet		CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a')		3.0	3.0	inches	
Total Number of Units in the Inlet (Grate or Curb Opening)		1	1		
Length of a Single Unit Inlet (Grate or Curb Opening)		15.00	15.00	ft	
Width of a Unit Grate (cannot be greater than W, Gutter Width)		N/A	N/A	ft	
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		N/A	N/A		
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		0.10	0.10		
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>					
Total Inlet Interception Capacity		4.8	8.0	cfs	
Total Inlet Carry-Over Flow (flow bypassing inlet)		0.0	0.7	cfs	
Capture Percentage = $Q_i/Q_s$ =		100	92	%	

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **MAYBERRY FILING 3**

Inlet ID: **D1.13**



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK}$ =	12.0	ft
$S_{BACK}$ =	0.020	ft/ft
$n_{BACK}$ =	0.012	

Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB}$ =	6.00	inches
$T_{CROWN}$ =	20.0	ft
$W$ =	2.00	ft
$S_X$ =	0.020	ft/ft
$S_W$ =	0.083	ft/ft
$S_0$ =	0.006	ft/ft
$n_{STREET}$ =	0.012	

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX}$ =	20.0	20.0	ft
$d_{MAX}$ =	6.0	12.0	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

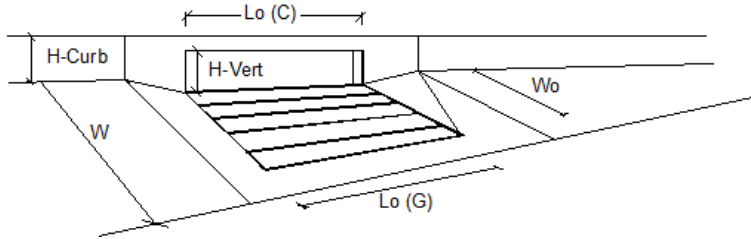
MINOR STORM Allowable Capacity is based on Depth Criterion  
 MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow}$ =	14.7	131.5	cfs

**Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**  
**Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



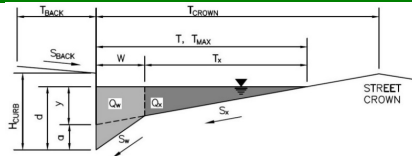
Design Information (Input)	MINOR      MAJOR	
Type of Inlet	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	Type =	CDOT Type R Curb Opening
Total Number of Units in the Inlet (Grate or Curb Opening)	$a_{LOCAL}$ =	3.0      3.0 inches
Length of a Single Unit Inlet (Grate or Curb Opening)	No =	1      1
Width of a Unit Grate (cannot be greater than W, Gutter Width)	$L_o$ =	15.00      15.00 ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$W_o$ =	N/A      N/A ft
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	$C_r-G$ =	N/A      N/A
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity'</b>	$C_r-C$ =	0.10      0.10
Total Inlet Interception Capacity	$Q$ =	9.2      12.8 cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	$Q_b$ =	1.7      7.1 cfs
Capture Percentage = $Q_a/Q_s$ =	$C\%$ =	84      64 %



## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

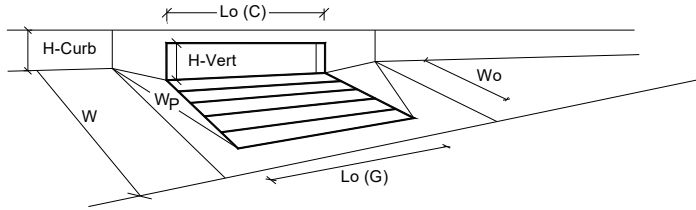
**Project:** MAYBERRY FILING 3  
**Inlet ID:** D1.14 - DP5B



<b>Gutter Geometry:</b>													
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="12.5"/> ft												
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft												
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.012"/>												
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches												
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="17.0"/> ft												
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft												
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft												
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft												
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft												
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.012"/>												
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="padding: 5px;"><math>T_{MAX} = </math></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px;" type="text" value="17.0"/></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px;" type="text" value="17.0"/></td> <td style="text-align: right; padding-right: 5px;">ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} = $	<input style="width: 40px;" type="text" value="17.0"/>	<input style="width: 40px;" type="text" value="17.0"/>	ft				
	Minor Storm	Major Storm											
$T_{MAX} = $	<input style="width: 40px;" type="text" value="17.0"/>	<input style="width: 40px;" type="text" value="17.0"/>	ft										
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td style="padding: 5px;"><math>d_{MAX} = </math></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px;" type="text" value="6.0"/></td> <td style="text-align: center; border: 1px solid black;"><input style="width: 40px;" type="text" value="12.0"/></td> <td style="text-align: right; padding-right: 5px;">inches</td> </tr> <tr> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX} = $	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="12.0"/>	inches		<input type="checkbox"/>	<input type="checkbox"/>	
	Minor Storm	Major Storm											
$d_{MAX} = $	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="12.0"/>	inches										
	<input type="checkbox"/>	<input type="checkbox"/>											
Check boxes are not applicable in SUMP conditions													
<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>													
<a href="#">MAJOR STORM Allowable Capacity is based on Depth Criterion</a>													
<b><math>Q_{allow} = </math></b>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Minor Storm</td> <td style="text-align: center; border-bottom: 1px solid black;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td></td> <td style="text-align: center; border: 1px solid black;"><b>SUMP</b></td> <td style="text-align: center; border: 1px solid black;"><b>SUMP</b></td> <td style="text-align: right; padding-right: 5px;"><b>cfs</b></td> </tr> </table>		Minor Storm	Major Storm			<b>SUMP</b>	<b>SUMP</b>	<b>cfs</b>				
	Minor Storm	Major Storm											
	<b>SUMP</b>	<b>SUMP</b>	<b>cfs</b>										

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	12.0	inches
<b>Grate Information</b>			
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>			
Length of a Unit Curb Opening	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>			
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	0.79	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>			
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	<b>9.7</b>	<b>39.1</b>	<b>cfs</b>
Q PEAK REQUIRED =	3.5	11.9	cfs

# Channel Report

## Channel C2 - 5 Year (DP21)

### Trapezoidal

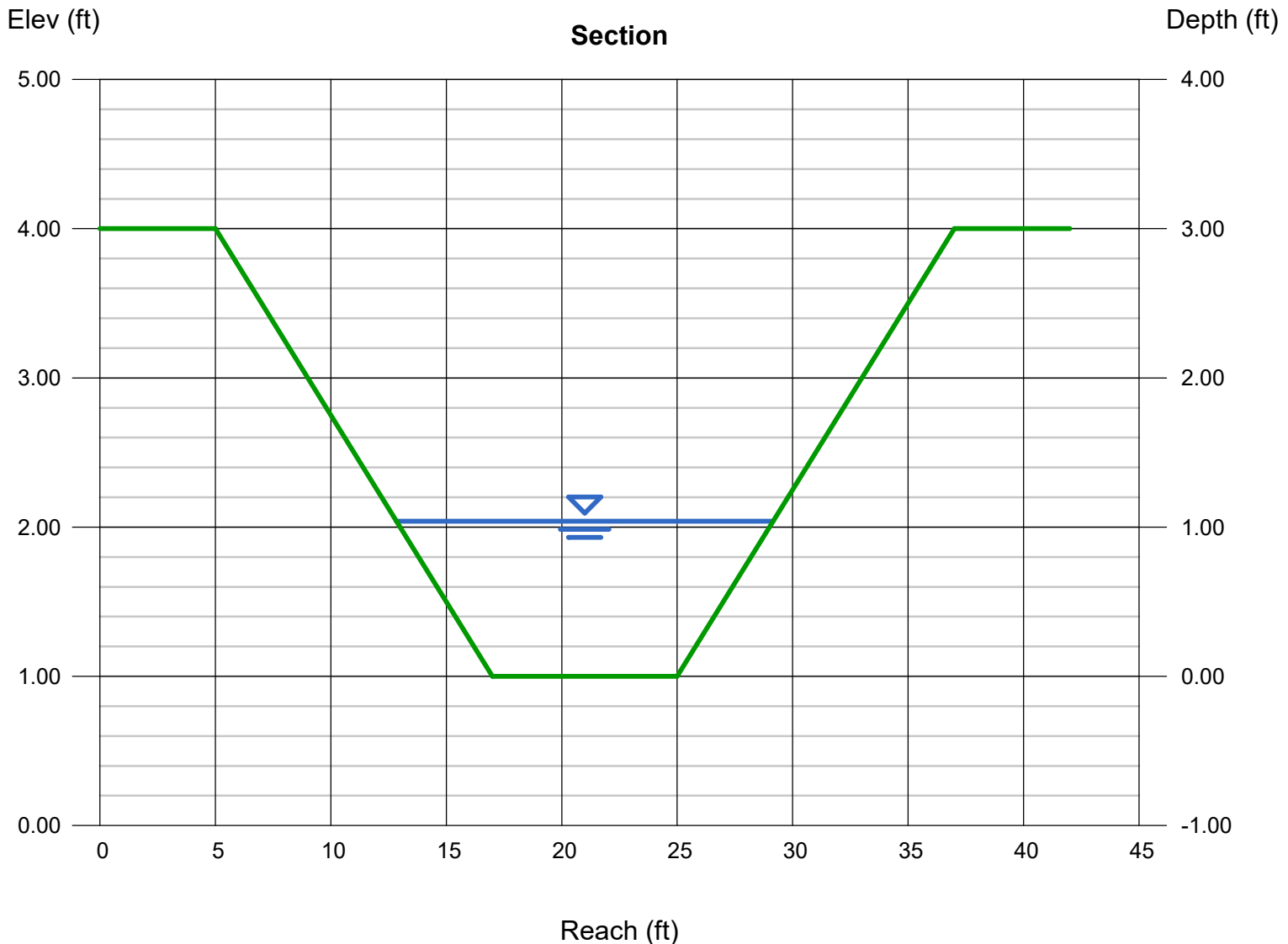
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 3.00  
Invert Elev (ft) = 1.00  
Slope (%) = 0.50  
N-Value = 0.030

### Highlighted

Depth (ft) = 1.04  
Q (cfs) = 36.70  
Area (sqft) = 12.65  
Velocity (ft/s) = 2.90  
Wetted Perim (ft) = 16.58  
Crit Depth,  $Y_c$  (ft) = 0.76  
Top Width (ft) = 16.32  
EGL (ft) = 1.17

### Calculations

Compute by: Known Q  
Known Q (cfs) = 36.70



# Channel Report

## Channel C2 - 100 Year (DP21)

### Trapezoidal

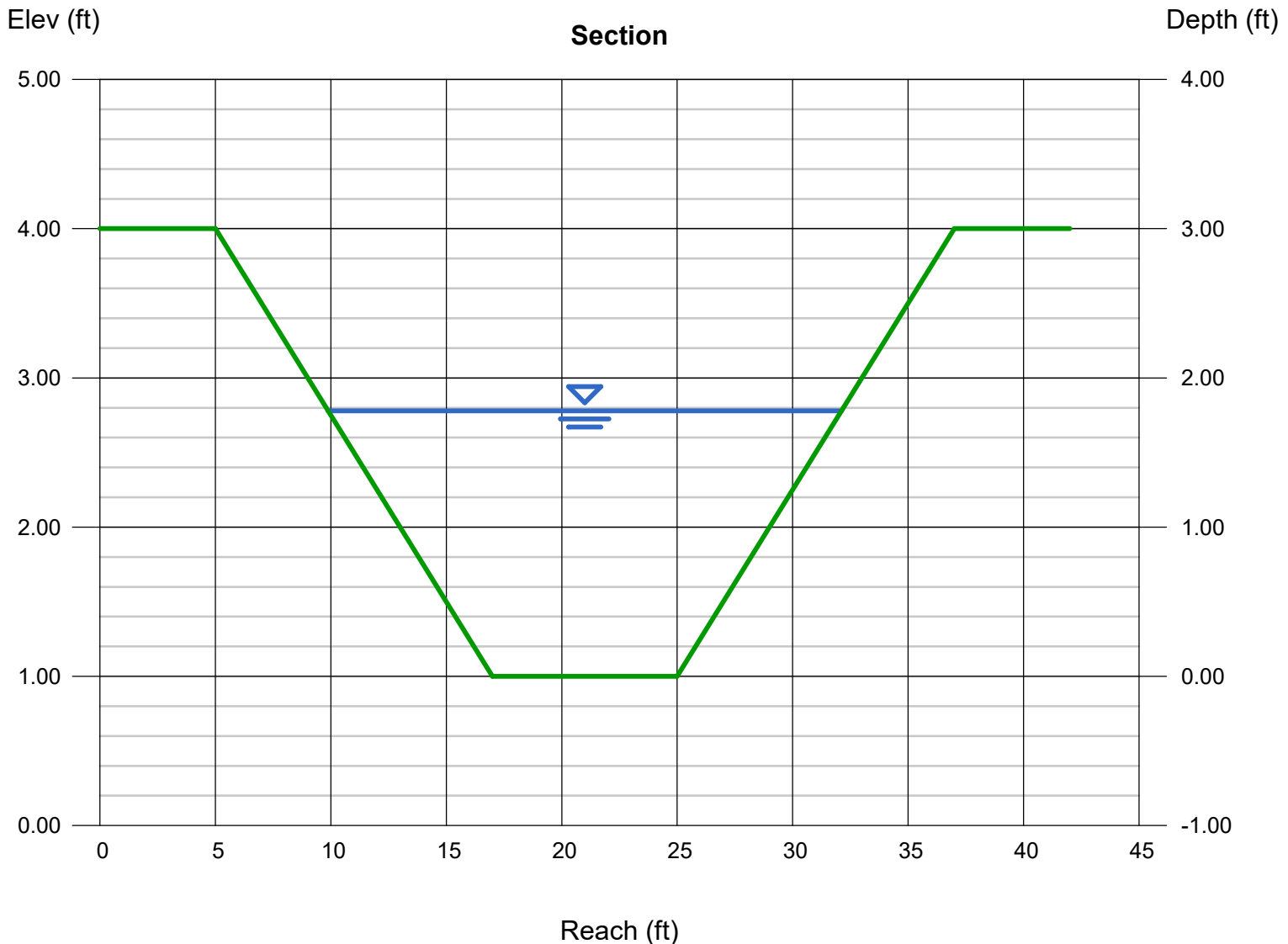
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 3.00  
Invert Elev (ft) = 1.00  
Slope (%) = 0.50  
N-Value = 0.030

### Highlighted

Depth (ft) = 1.78  
Q (cfs) = 104.90  
Area (sqft) = 26.91  
Velocity (ft/s) = 3.90  
Wetted Perim (ft) = 22.68  
Crit Depth,  $Y_c$  (ft) = 1.39  
Top Width (ft) = 22.24  
EGL (ft) = 2.02

### Calculations

Compute by: Known Q  
Known Q (cfs) = 104.90



# Channel Report

## Channel D - DP20 5 YEAR FLOW

### Trapezoidal

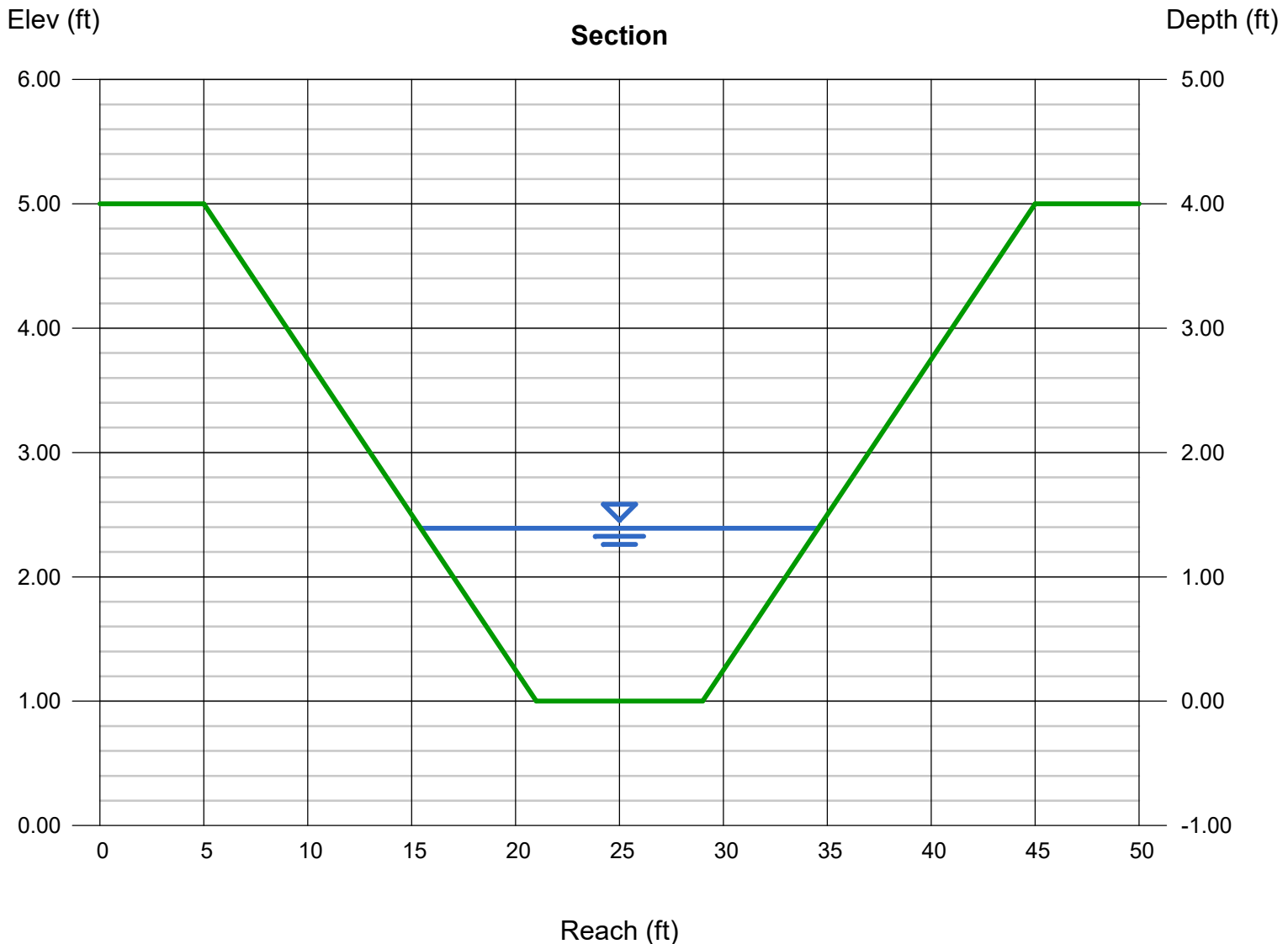
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 4.00  
Invert Elev (ft) = 1.00  
Slope (%) = 0.40  
N-Value = 0.030

### Highlighted

Depth (ft) = 1.39  
Q (cfs) = 57.50  
Area (sqft) = 18.85  
Velocity (ft/s) = 3.05  
Wetted Perim (ft) = 19.46  
Crit Depth, Yc (ft) = 0.99  
Top Width (ft) = 19.12  
EGL (ft) = 1.53

### Calculations

Compute by: Known Q  
Known Q (cfs) = 57.50



# Channel Report

## Channel D - DP20 100 YEAR

### Trapezoidal

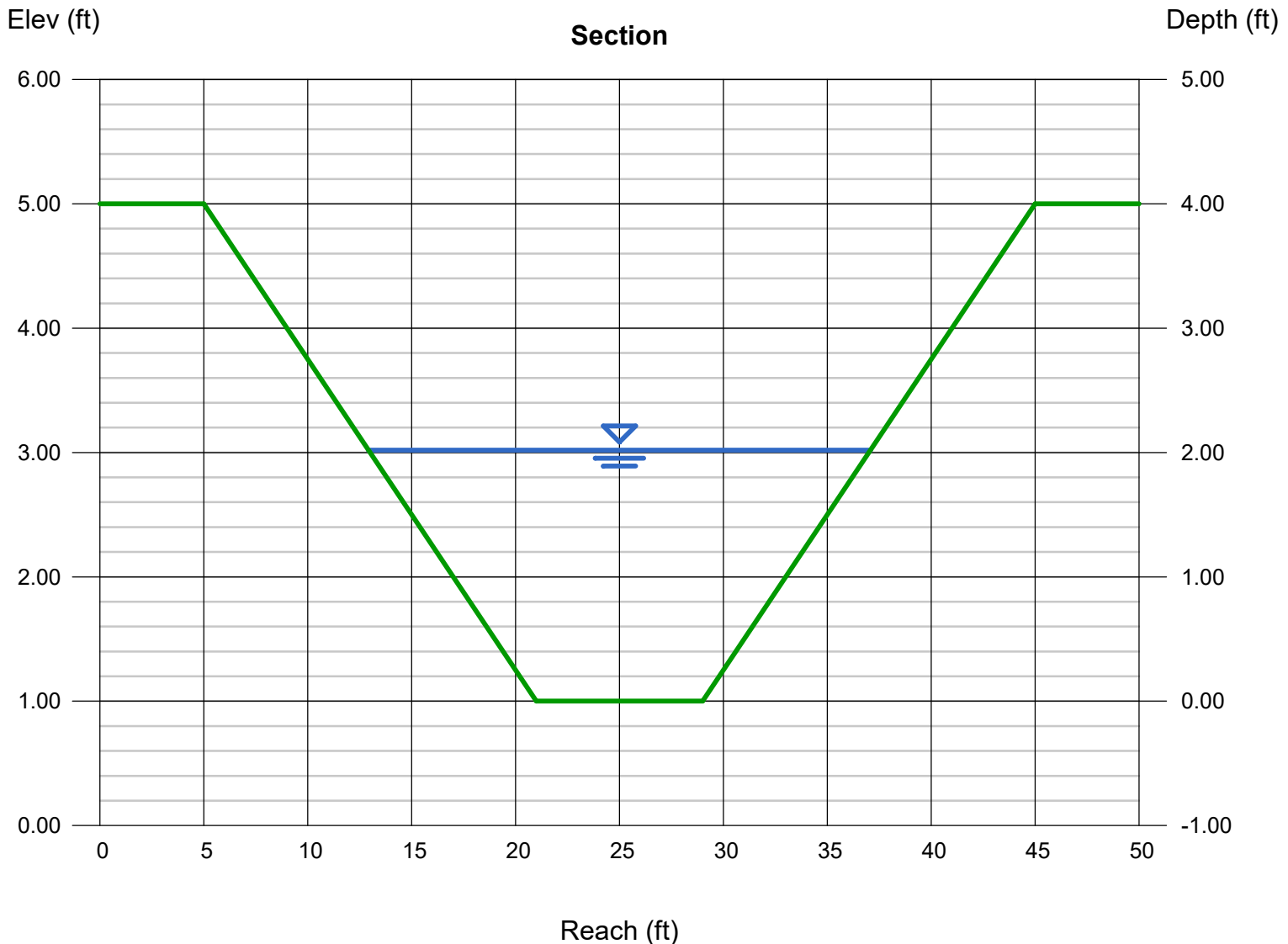
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 4.00  
Invert Elev (ft) = 1.00  
Slope (%) = 0.40  
N-Value = 0.030

### Highlighted

Depth (ft) = 2.02  
Q (cfs) = 121.60  
Area (sqft) = 32.48  
Velocity (ft/s) = 3.74  
Wetted Perim (ft) = 24.66  
Crit Depth, Yc (ft) = 1.50  
Top Width (ft) = 24.16  
EGL (ft) = 2.24

### Calculations

Compute by: Known Q  
Known Q (cfs) = 121.60



# Channel Report

## Channel E PRE DEV D1.5 -100 Year

### Trapezoidal

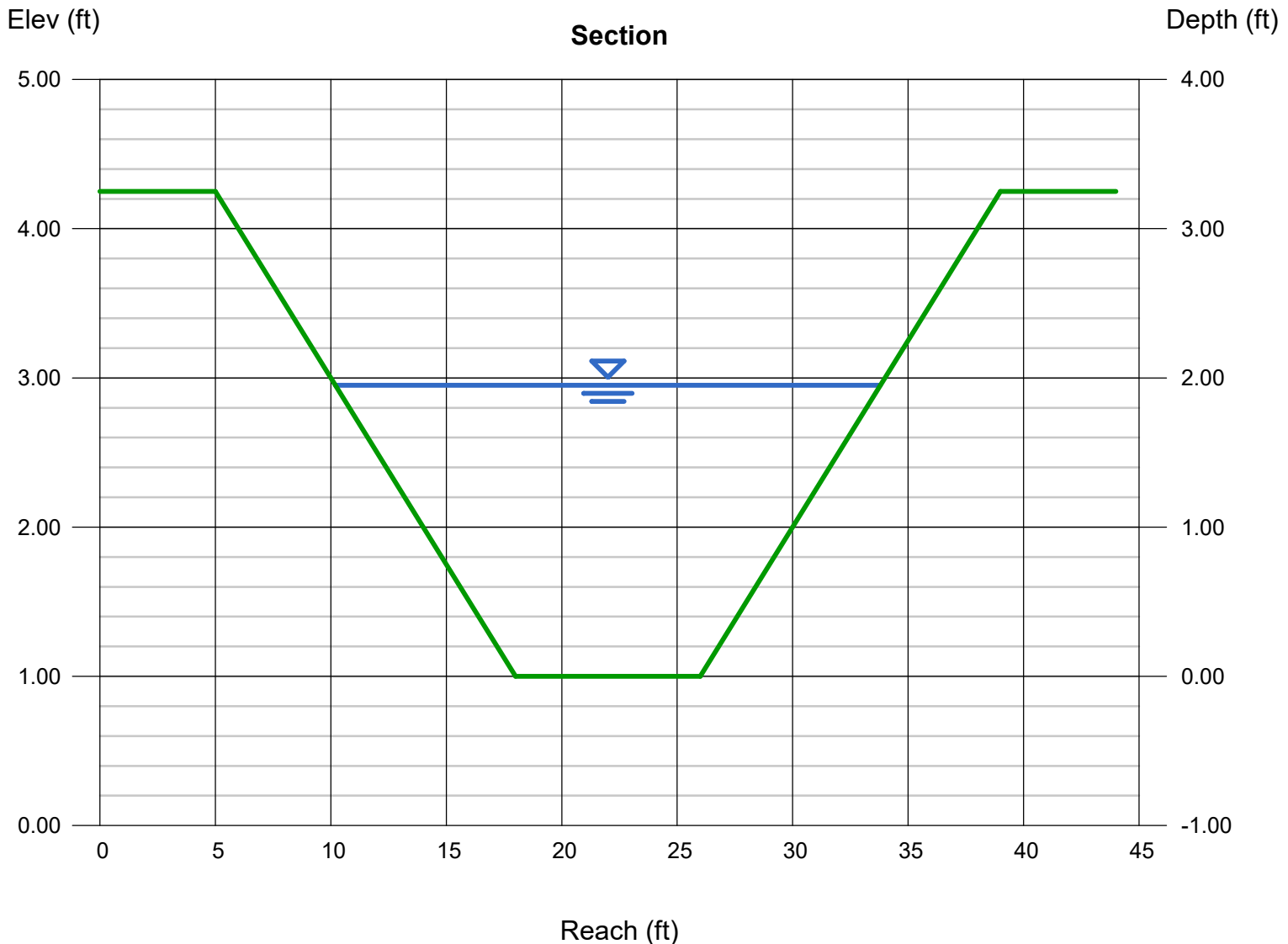
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 3.25  
Invert Elev (ft) = 1.00  
Slope (%) = 0.70  
N-Value = 0.030

### Highlighted

Depth (ft) = 1.95  
Q (cfs) = 150.44  
Area (sqft) = 30.81  
Velocity (ft/s) = 4.88  
Wetted Perim (ft) = 24.08  
Crit Depth, Yc (ft) = 1.68  
Top Width (ft) = 23.60  
EGL (ft) = 2.32

### Calculations

Compute by: Known Q  
Known Q (cfs) = 150.44



# Channel Report

## CHANNEL F - 100 YEAR FLOW

### Trapezoidal

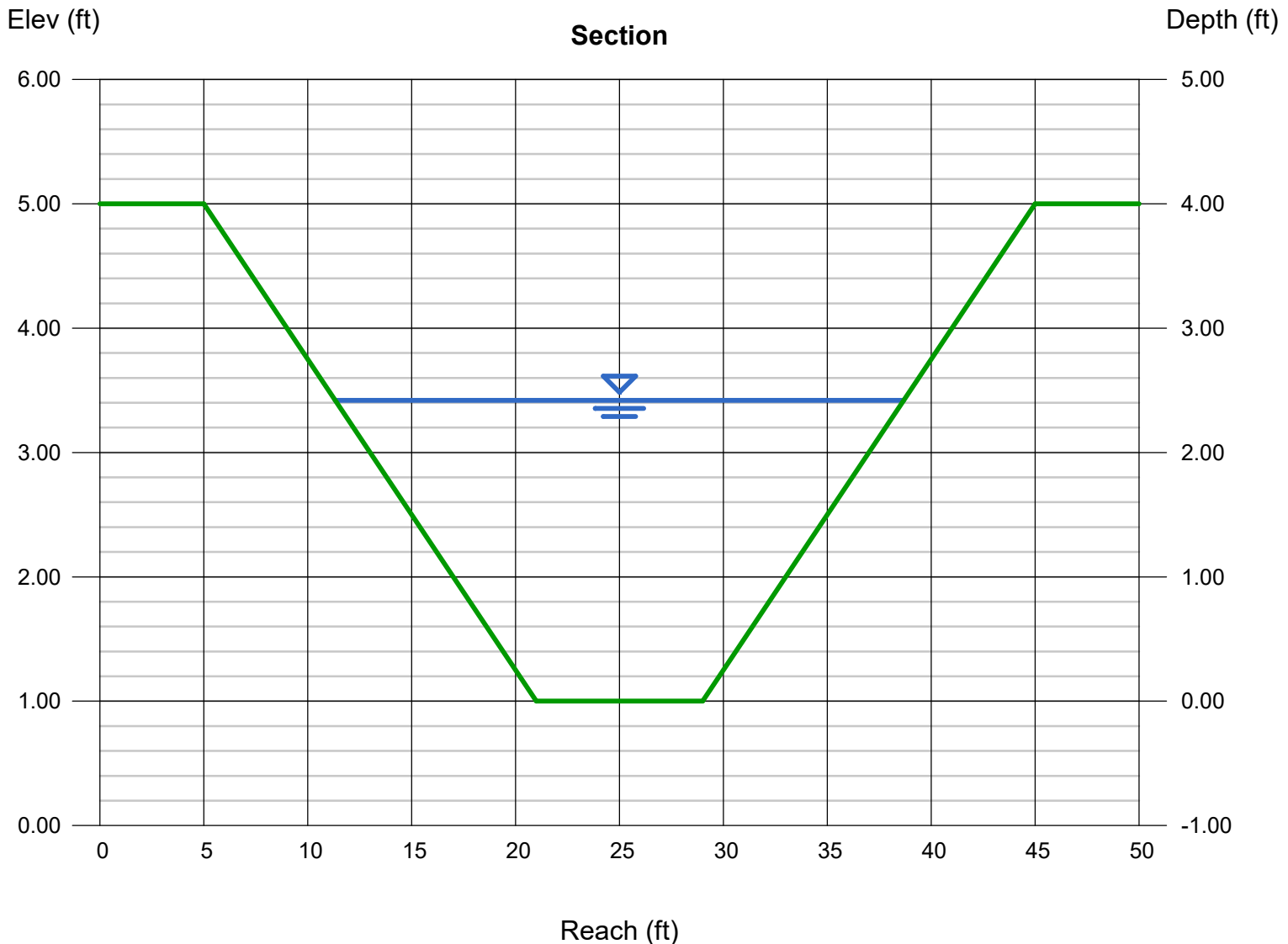
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 4.00  
Invert Elev (ft) = 1.00  
Slope (%) = 0.40  
N-Value = 0.030

### Highlighted

Depth (ft) = 2.42  
Q (cfs) = 177.50  
Area (sqft) = 42.79  
Velocity (ft/s) = 4.15  
Wetted Perim (ft) = 27.96  
Crit Depth, Yc (ft) = 1.84  
Top Width (ft) = 27.36  
EGL (ft) = 2.69

### Calculations

Compute by: Known Q  
Known Q (cfs) = 177.50





## Channel E - Superelevation Calculation

C	0.5	
Velocity (V - fps)	4.88	*From Hydraflow Express
Channel Width (W - ft)	23.6	*From Hydraflow Express
g - constant (ft/sec <sup>2</sup> )	32.2	
Channel /Bend Radius (ft)	50	
H - additional freeboard - (ft)	0.17	
Total Freeboard Required	1.17	1 foot + additional
Depth at 100 Year Flow (ft)	1.95	*From Hydraflow Express
Channel Depth Provided (ft)	3.25	
Total Freeboard Provided (ft)	1.30	

$$H = \frac{C v^2 W}{gR} \quad (10-4)$$

where:

C = coefficient;

= 0.5, subcritical flow, simple curve

= 1.0, supercritical flow, simple curve

v = average velocity of flow in channel, in fps;

W = channel width at level water surface

g = acceleration of gravity constant, 32.2 ft/sec<sup>2</sup>;

R = channel centerline radius of curvature, in ft; and

H = additional height of freeboard on outside edge of channel, in ft.

## Channel E/F Confluence - Superelevation Calculation

C	0.5	
Velocity (V - fps)	3	*From Channel E RipRap Calculation
Channel Width (W - ft)	27.96	*From Hydraflow Express
g - constant (ft/sec <sup>2</sup> )	32.2	
Channel /Bend Radius (ft)	10	
H - additional freeboard - (ft)	0.39	
Total Freeboard Required	1.39	1 foot + additional
Depth at 100 Year Flow (ft)	2.40	*From Hydraflow Express
Channel Depth Provided (ft)	4	
Total Freeboard Provided (ft)	1.60	

$$H = \frac{C v^2 W}{gR} \quad (10-4)$$

where:

C = coefficient;

= 0.5, subcritical flow, simple curve

= 1.0, supercritical flow, simple curve

v = average velocity of flow in channel, in fps;

W = channel width at level water surface

g = acceleration of gravity constant, 32.2 ft/sec<sup>2</sup>;

R = channel centerline radius of curvature, in ft; and

H = additional height of freeboard on outside edge of channel, in ft.

Mayberry Filing 3  
 Flow into Channel C2 (DP4)

Per UDFCD Section 3.2.1 - Riprap Apron

Parameter	Unit	Value
Diameter of Conduit	ft	3
Design Discharge	ft <sup>3</sup> /s	41.1
Tailwater Depth	ft	1.78
Allowable Velocity	ft/s	5
Required Area of Flow	ft <sup>2</sup>	8.22
Froude Parameter		2.64
Tailwater Depth/Conduit Diameter		0.59
Expansion Factor		6.6
<b>Length of Protection</b>	<b>ft</b>	<b>11</b>
*Length will extend until tie out to existing grade		
Expansion Angle	degrees	4.332314
<b>Width of Protection</b>	<b>ft</b>	<b>5</b>
<b>RipRap Size (Figure 9-38)</b>		
Q/D <sup>1.5</sup>		7.91
Y <sub>t</sub> /D		0.59
<b>RipRap Size (Figure 9-38)</b>		TYPE L

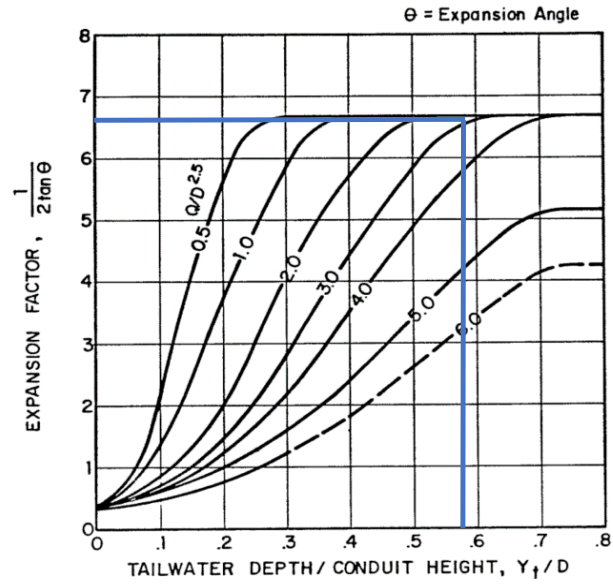
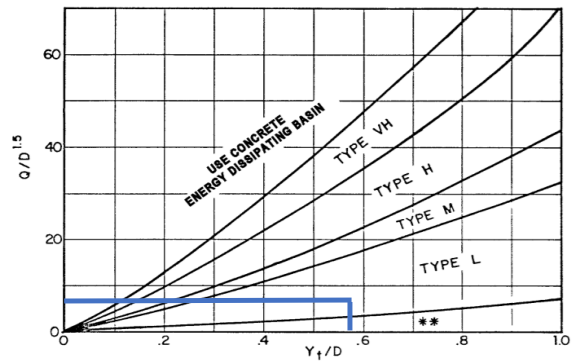


Figure 9-35. Expansion factor for circular conduits

RIPRAP DESIGNATION	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D <sub>50</sub> * (INCHES)
TYPE VL	70 - 100	12	6
	50 - 70	9	
	35 - 50	6	
TYPE L	70 - 100	15	9
	50 - 70	12	
	35 - 50	9	
TYPE M	70 - 100	21	12
	50 - 70	18	
	35 - 50	12	
TYPE H	70 - 100	30	18
	50 - 70	24	
	35 - 50	18	
	2 - 10	6	

\*D<sub>50</sub> = MEAN ROCK SIZE

Figure 8-34. Riprap and soil riprap placement and gradation (part 1 of 3)



Use D<sub>a</sub> instead of D whenever flow is supercritical in the barrel.  
 \*\*Use Type L for a distance of 3D downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D2.5 ≤ 6.0)

Mayberry Filing 3  
 Flow into Channel D (DP19)

Per UDFCD Section 3.2.1 - Riprap Apron

Parameter	Unit	Value
Diameter of Conduit	ft	3.75
Design Discharge	ft <sup>3</sup> /s	106.8
Tailwater Depth	ft	2
Allowable Velocity	ft/s	5
Required Area of Flow	ft <sup>2</sup>	21.36
Froude Parameter		3.92
Tailwater Depth/Conduit Diameter		0.53
Expansion Factor		5.8
<b>Length of Protection</b>	<b>ft</b>	<b>41</b>
*Length will extend until tie out to existing grade		
Expansion Angle	degrees	4.92711
<b>Width of Protection</b>	<b>ft</b>	<b>11</b>
<b>RipRap Size (Figure 9-38)</b>		
Q/D <sup>1.5</sup>		14.71
Y <sub>t</sub> /D		0.53
<b>RipRap Size (Figure 9-38)</b>		Type M

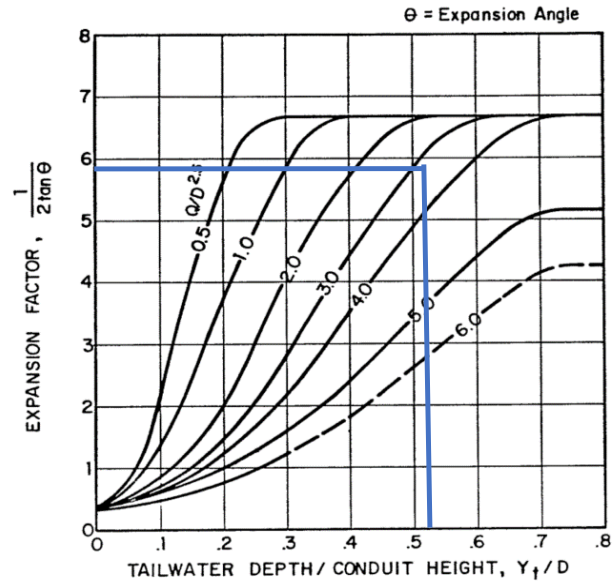
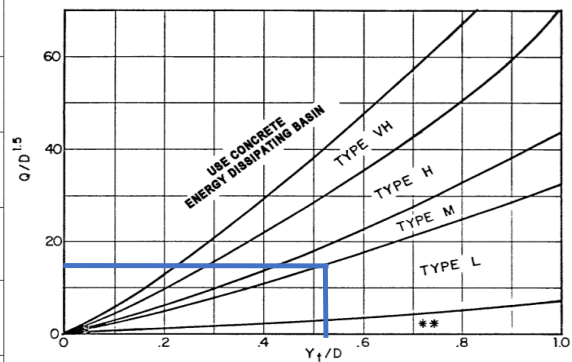


Figure 9-35. Expansion factor for circular conduits

RIPRAP DESIGNATION	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D <sub>50</sub> * (INCHES)
TYPE VL	70 - 100	12	6
	50 - 70	9	
	35 - 50	6	
	2 - 10	2	
TYPE L	70 - 100	15	9
	50 - 70	12	
	35 - 50	9	
	2 - 10	3	
TYPE M	70 - 100	21	12
	50 - 70	18	
	35 - 50	12	
	2 - 10	4	
TYPE H	70 - 100	30	18
	50 - 70	24	
	35 - 50	18	
	2 - 10	6	

\*D<sub>50</sub> = MEAN ROCK SIZE

Figure 8-34. Riprap and soil riprap placement and gradation (part 1 of 3)



Use D<sub>a</sub> instead of D whenever flow is supercritical in the barrel.  
 \*\*Use Type L for a distance of 3D downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D2.5 ≤ 6.0)

Per UDFCD Section 3.2.1 - Riprap Apron

Parameter	Unit	Value
Diameter of Conduit	ft	3
Design Discharge	ft <sup>3</sup> /s	39.6
Tailwater Depth	ft	2.42
Allowable Velocity	ft/s	1.3
Required Area of Flow	ft <sup>2</sup>	30.46154
Froude Parameter		2.54
Tailwater Depth/Conduit Diameter		0.81
Expansion Factor		6.8
<b>Length of Protection</b>	<b>ft</b>	<b>66</b>
*Length will extend until tie out to existing grade		
Expansion Angle	degrees	4.205357
<b>Width of Protection</b>	<b>ft</b>	<b>13</b>
<b>RipRap Size (Figure 9-38)</b>		
Q/D <sup>1.5</sup>		7.62
Y <sub>t</sub> /D		0.81
<b>RipRap Size (Figure 9-38)</b>		Type L

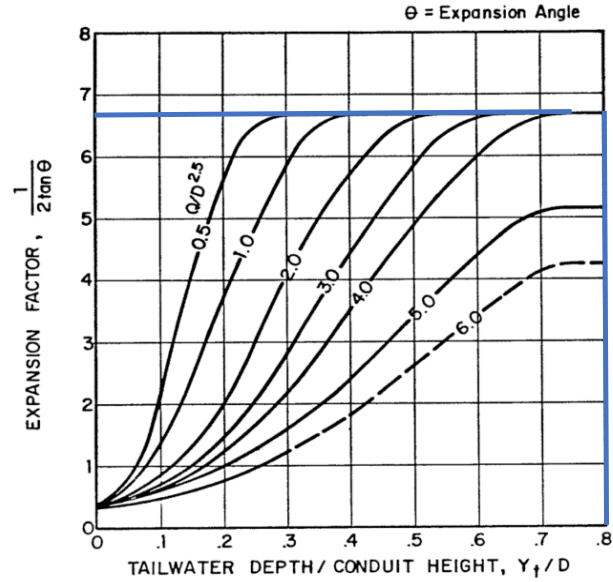
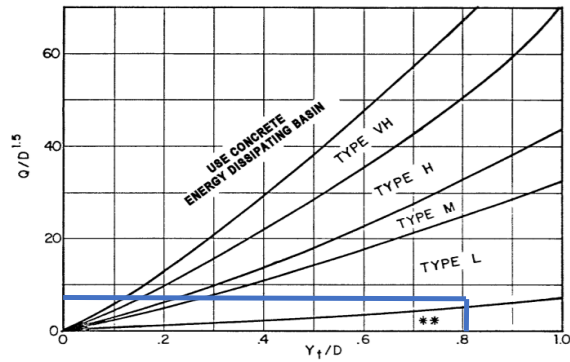


Figure 9-35. Expansion factor for circular conduits

RIPRAP DESIGNATION	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D <sub>50</sub> * (INCHES)
TYPE VL	70 - 100	12	6
	50 - 70	9	
	35 - 50	6	
	2 - 10	2	
TYPE L	70 - 100	15	9
	50 - 70	12	
	35 - 50	9	
	2 - 10	3	
TYPE M	70 - 100	21	12
	50 - 70	18	
	35 - 50	12	
	2 - 10	4	
TYPE H	70 - 100	30	18
	50 - 70	24	
	35 - 50	18	
	2 - 10	6	

\*D<sub>50</sub> = MEAN ROCK SIZE

Figure 8-34. Riprap and soil riprap placement and gradation (part 1 of 3)



Use D<sub>0</sub> instead of D whenever flow is supercritical in the barrel.  
 \*\*Use Type L for a distance of 3D downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D2.5 ≤ 6.0)

Per UDFCD Section 3.2.1 - Riprap Apron

Parameter	Unit	Value
Diameter of Conduit	ft	5
Design Discharge	ft <sup>3</sup> /s	144.7
Tailwater Depth	ft	1.96
Allowable Velocity	ft/s	5
Required Area of Flow	ft <sup>2</sup>	28.94
Froude Parameter		2.59
Tailwater Depth/Conduit Diameter		0.39
Expansion Factor		4.8
<b>Length of Protection</b>	<b>ft</b>	<b>47</b>
*Length will extend until tie out to existing grade		
Expansion Angle	degrees	5.946863
<b>Width of Protection</b>	<b>ft</b>	<b>15</b>
<b>RipRap Size (Figure 9-38)</b>		
Q/D <sup>1.5</sup>		12.94
Y <sub>t</sub> /D		0.39
<b>RipRap Size (Figure 9-38)</b>		Type M

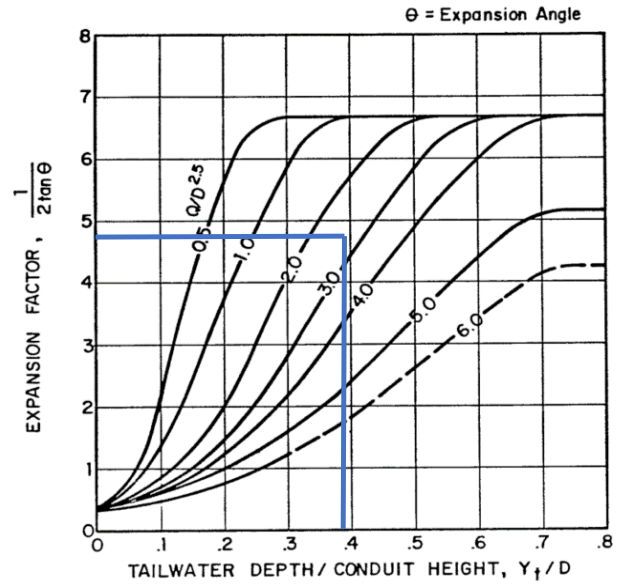
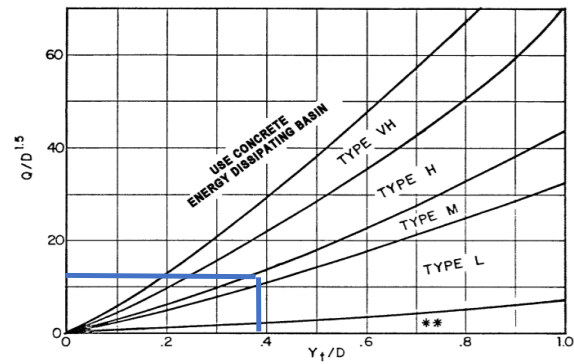


Figure 9-35. Expansion factor for circular conduits

RIPRAP DESIGNATION	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D <sub>50</sub> * (INCHES)
TYPE VL	70 - 100	12	6
	50 - 70	9	
	35 - 50	6	
	2 - 10	2	
TYPE L	70 - 100	15	9
	50 - 70	12	
	35 - 50	9	
	2 - 10	3	
TYPE M	70 - 100	21	12
	50 - 70	18	
	35 - 50	12	
	2 - 10	4	
TYPE H	70 - 100	30	18
	50 - 70	24	
	35 - 50	18	
	2 - 10	6	

\*D<sub>50</sub> = MEAN ROCK SIZE

Figure 8-34. Riprap and soil riprap placement and gradation (part 1 of 3)



Use D<sub>0</sub> instead of D whenever flow is supercritical in the barrel.  
 \*\*Use Type L for a distance of 3D downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D<sup>2.5</sup> ≤ 6.0)

Per UDFCD Section 3.2.1 - Riprap Apron

Parameter	Unit	Value
Diameter of Conduit	ft	5
Design Discharge	ft <sup>3</sup> /s	150.8
Tailwater Depth	ft	1.95
Allowable Velocity	ft/s	5
Required Area of Flow	ft <sup>2</sup>	30.16
Froude Parameter		2.70
Tailwater Depth/Conduit Diameter		0.39
Expansion Factor		4.4
<b>Length of Protection</b>	<b>ft</b>	<b>47</b>
*Length will extend until tie out to existing grade		
Expansion Angle	degrees	6.483074
<b>Width of Protection</b>	<b>ft</b>	<b>16</b>
<b>RipRap Size (Figure 9-38)</b>		
Q/D <sup>1.5</sup>		13.49
Y <sub>t</sub> /D		0.39
<b>RipRap Size (Figure 9-38)</b>		Type M

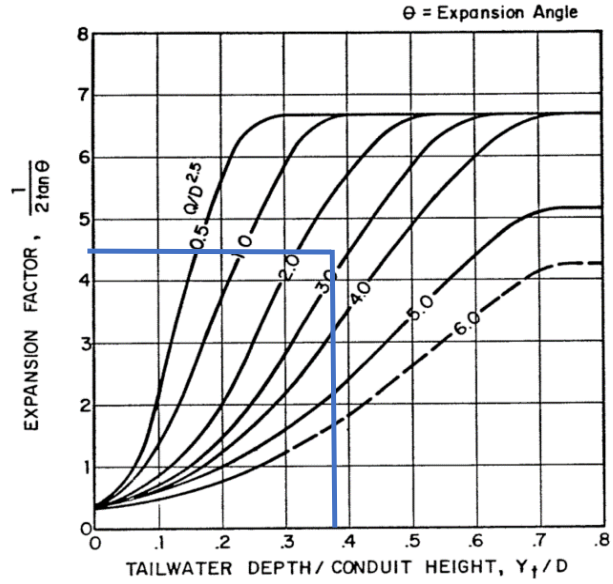
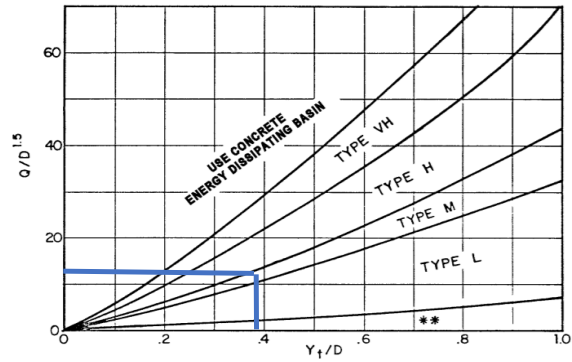


Figure 9-35. Expansion factor for circular conduits

RIPRAP DESIGNATION	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D <sub>50</sub> * (INCHES)
TYPE VL	70 - 100	12	6
	50 - 70	9	
	35 - 50	6	
	2 - 10	2	
TYPE L	70 - 100	15	9
	50 - 70	12	
	35 - 50	9	
	2 - 10	3	
TYPE M	70 - 100	21	12
	50 - 70	18	
	35 - 50	12	
	2 - 10	4	
TYPE H	70 - 100	30	18
	50 - 70	24	
	35 - 50	18	
	2 - 10	6	

\*D<sub>50</sub> = MEAN ROCK SIZE

Figure 8-34. Riprap and soil riprap placement and gradation (part 1 of 3)



Use D<sub>a</sub> instead of D whenever flow is supercritical in the barrel.  
 \*\*Use Type L for a distance of 3D downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D<sup>2.5</sup> ≤ 6.0)

Mayberry Filing 3  
 Channel E Confluence with channel F (EX-5)

Per UDFCD Section 3.2.1 - Riprap Apron

Parameter	Unit	Value
Diameter of Conduit	ft	8
Design Discharge	ft <sup>3</sup> /s	150.5
Tailwater Depth	ft	2.42
Allowable Velocity	ft/s	3
Required Area of Flow	ft <sup>2</sup>	50.16667
Froude Parameter		0.83
Tailwater Depth/Conduit Diameter		0.30
Expansion Factor		6.67
<b>Length of Protection</b>	<b>ft</b>	<b>85</b>
*Length will extend until tie out to existing grade		
Expansion Angle	degrees	4.287018
<b>Width of Protection</b>	<b>ft</b>	<b>21</b>
<b>RipRap Size (Figure 9-38)</b>		
Q/D <sup>1.5</sup>		6.65
Y <sub>t</sub> /D		0.30
<b>RipRap Size (Figure 9-38)</b>		Type L

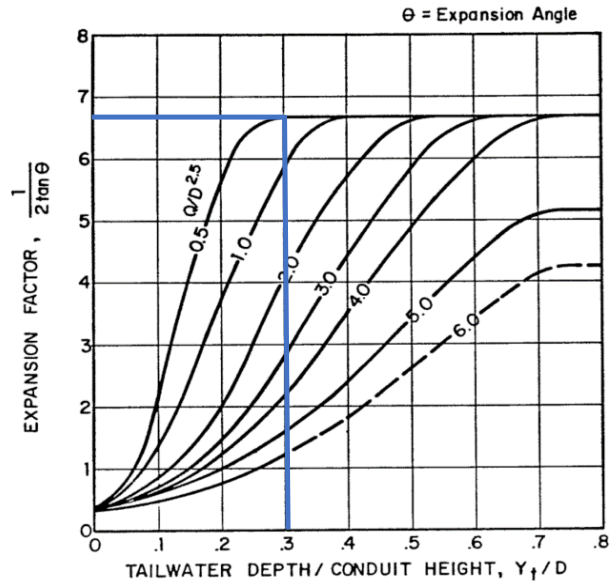
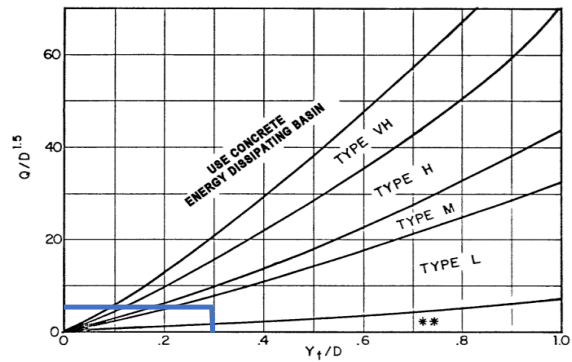


Figure 9-35. Expansion factor for circular conduits

RIPRAP DESIGNATION	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D <sub>50</sub> * (INCHES)
TYPE VL	70 - 100	12	6
	50 - 70	9	
	35 - 50	6	
	2 - 10	2	
TYPE L	70 - 100	15	9
	50 - 70	12	
	35 - 50	9	
	2 - 10	3	
TYPE M	70 - 100	21	12
	50 - 70	18	
	35 - 50	12	
	2 - 10	4	
TYPE H	70 - 100	30	18
	50 - 70	24	
	35 - 50	18	
	2 - 10	6	

\*D<sub>50</sub> = MEAN ROCK SIZE

Figure 8-34. Riprap and soil riprap placement and gradation (part 1 of 3)



Use D<sub>a</sub> instead of D whenever flow is supercritical in the barrel.  
 \*\*Use Type L for a distance of 3D downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D<sup>2.5</sup> ≤ 6.0)



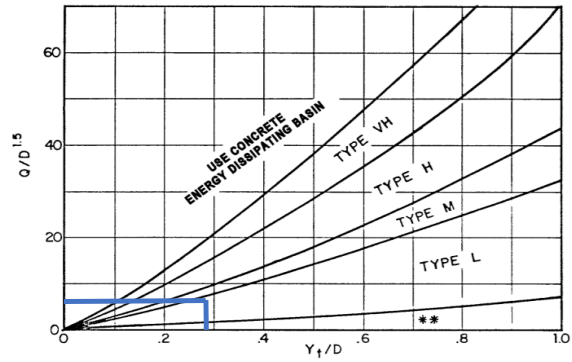
Per UDFCD Section 3.2.1 - Riprap Apron

Parameter	Unit	Value
Diameter of Conduit	ft	8
Design Discharge	ft <sup>3</sup> /s	177.5
Tailwater Depth	ft	3
Allowable Velocity	ft/s	1.3
<b>RipRap Size (Figure 9-38)</b>		
Q/D <sup>1.5</sup>		7.84
Yt/D		0.38
<b>RipRap Size (Figure 9-38)</b>		Type L

RIPRAP DESIGNATION	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D <sub>50</sub> * (INCHES)
TYPE VL	70 - 100	12	6
	50 - 70	9	
	35 - 50	6	
	2 - 10	2	
TYPE L	70 - 100	15	9
	50 - 70	12	
	35 - 50	9	
	2 - 10	3	
TYPE M	70 - 100	21	12
	50 - 70	18	
	35 - 50	12	
	2 - 10	4	
TYPE H	70 - 100	30	18
	50 - 70	24	
	35 - 50	18	
	2 - 10	6	

\*D<sub>50</sub> = MEAN ROCK SIZE

Figure 8-34. Riprap and soil riprap placement and gradation (part 1 of 3)



Use D<sub>0</sub> instead of D whenever flow is supercritical in the barrel.  
\*\*Use Type L for a distance of 3D downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D2.5 ≤ 6.0)

# DOWNSTREAM OUTFALL STUDY

## **DP EX-6 (EX. 100 YEAR FLOW)**

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

---

Input Data	
Channel Slope	0.010 ft/ft
Normal Depth	19.8 in

### **Section Definitions**

Station (ft)	Elevation (ft)
12+21	6,023.20
14+15	6,022.90
15+21	6,022.50
15+30	6,021.50
15+38	6,022.90
15+50	6,023.20

### **Roughness Segment Definitions**

Start Station	Ending Station	Roughness Coefficient
(12+21, 6,023.20)	(15+38, 6,022.90)	0.025
(15+38, 6,022.90)	(15+50, 6,023.20)	0.013

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Discharge	231.42 cfs
Roughness Coefficient	0.025
Elevation Range	6,021.5 to 6,023.2 ft
Flow Area	86.7 ft <sup>2</sup>
Wetted Perimeter	293.2 ft
Hydraulic Radius	3.5 in
Top Width	293.05 ft
Normal Depth	19.8 in
Critical Depth	19.3 in
Critical Slope	0.014 ft/ft
Velocity	2.67 ft/s
Velocity Head	0.11 ft
Specific Energy	1.76 ft
Froude Number	0.865

# DOWNSTREAM OUTFALL STUDY

## **DP EX-6 (EX. 100 YEAR FLOW)**

Results	
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	19.8 in
Critical Depth	19.3 in
Channel Slope	0.010 ft/ft
Critical Slope	0.014 ft/ft

# DOWNSTREAM OUTFALL STUDY

## **DP EX-7 (EX. 100 YEAR FLOW)**

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

---

Input Data	
Channel Slope	0.010 ft/ft
Normal Depth	17.1 in

### **Section Definitions**

Station (ft)	Elevation (ft)
13+06	6,001.10
13+22	6,000.72
15+41	6,000.72
15+51	5,999.65
15+59	6,001.10
15+71	6,001.39

### **Roughness Segment Definitions**

Start Station	Ending Station	Roughness Coefficient
(13+06, 6,001.10)	(15+59, 6,001.10)	0.025
(15+59, 6,001.10)	(15+71, 6,001.39)	0.013

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Discharge	289.90 cfs
Roughness Coefficient	0.025
Elevation Range	5,999.7 to 6,001.4 ft
Flow Area	94.0 ft <sup>2</sup>
Wetted Perimeter	251.7 ft
Hydraulic Radius	4.5 in
Top Width	251.48 ft
Normal Depth	17.1 in
Critical Depth	16.7 in
Critical Slope	0.013 ft/ft
Velocity	3.08 ft/s
Velocity Head	0.15 ft
Specific Energy	1.57 ft
Froude Number	0.889

# DOWNSTREAM OUTFALL STUDY

## **DP EX-7 (EX. 100 YEAR FLOW)**

Results	
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	17.1 in
Critical Depth	16.7 in
Channel Slope	0.010 ft/ft
Critical Slope	0.013 ft/ft

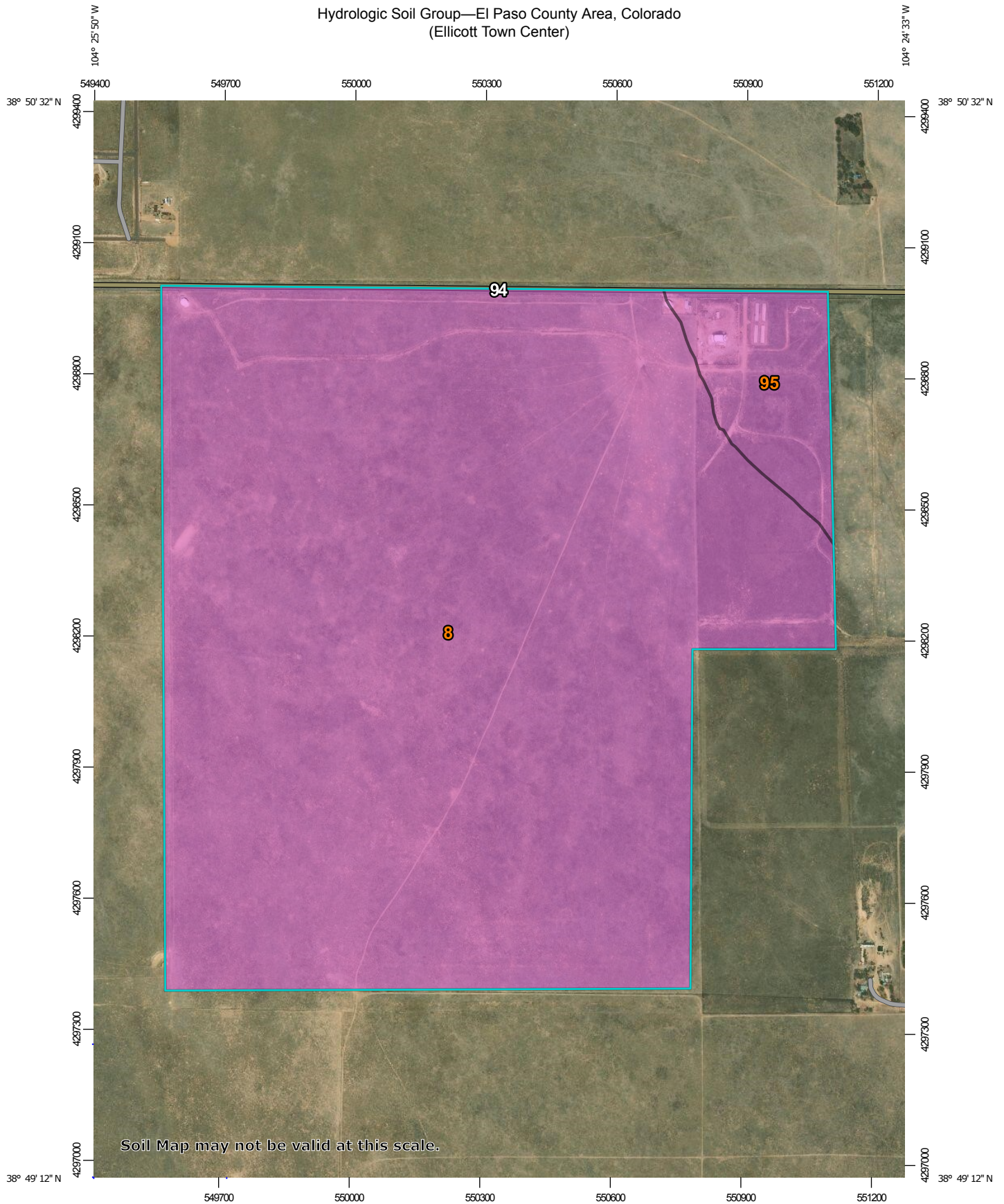
## **APPENDIX C – REFERENCE INFORMATION**



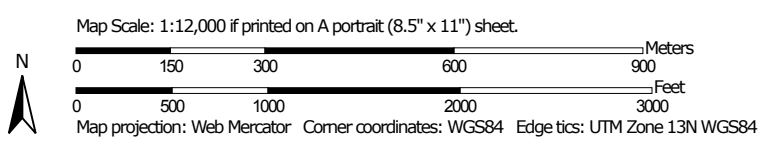
ENGINEER'S OPINION OF PROBABLE COSTS  
FOR  
Mayberry Filing 3 - Drainage Improvements

Item	Description	Total Work Units	Unit Price (\$)	Total Cost (\$)
Riprap		15 Ton	89.00 Ton	1,340.34
18" RCP		104 LF	\$ 70.00 LF	\$ 7,280.00
24" RCP		1,592 LF	\$ 83.00 LF	\$ 132,136.00
30" RCP		989 LF	\$ 104.00 LF	\$ 102,856.00
36" RCP		2,712 LF	\$ 128.00 LF	\$ 347,136.00
48" RCP		927 LF	\$ 209.00 LF	\$ 193,743.00
5' Type R		6 EA	\$ 6,138.00 EA	\$ 36,828.00
10' Type R		6 EA	\$ 8,447.00 EA	\$ 50,682.00
15' Type R		7 EA	\$ 10,984.00 EA	\$ 76,888.00
Storm Manhole		18 EA	\$ 7,082.00 EA	\$ 127,476.00
36" FES		1 EA	\$ 744.00 EA	\$ 744.00
60" FES		6 EA	\$ 1,788.00 EA	\$ 10,728.00
Pond Forebay		2 EA	\$ 12,000.00 EA	\$ 24,000.00
Pond Outlet Structure		1 EA	\$ 12,000.00 EA	\$ 12,000.00
Grass Channels		3 AC	\$ 1,520.00 EA	\$ 4,560.00
SUBTOTAL				\$ 1,123,837.34
Contingency (15%)				\$ 168,575.60
<b>TOTAL</b>				<b>\$ 1,292,412.94</b>

Hydrologic Soil Group—El Paso County Area, Colorado  
(Ellicott Town Center)



Soil Map may not be valid at this scale.





is severely eroded and blowouts have developed, the new seeding should be fertilized.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be necessary when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, the provision of undisturbed nesting cover is vital and should be included in plans for habitat development. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. Shallow excavation is severely limited because cut banks cave in. This sandy soil requires special management practices to reduce water erosion and soil blowing. Capability subclasses IIIe, irrigated, and IVe, nonirrigated.

**7—Bijou sandy loam, 3 to 8 percent slopes.** This deep, well drained soil is on flood plains, terraces, and uplands. It formed in sandy alluvium and eolian material derived from arkose deposits. Elevation ranges from 5,400 to 6,200 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown sandy loam about 4 inches thick. The subsoil is brown or grayish brown sandy loam about 24 inches thick. The substratum is pale brown loamy coarse sand.

Included with this soil in mapping are small areas of Olney sandy loam, 3 to 5 percent slopes; Valent sand, 1 to 9 percent slopes; Vona sandy loam, 3 to 9 percent slopes; and Wigton loamy sand, 1 to 8 percent slopes.

Permeability of this Bijou soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Organic matter content of the surface layer is low. Surface runoff is slow, and the hazards of erosion and soil blowing are moderate.

Almost all areas of this soil are used for range.

This soil is suited to the production of native vegetation suitable for grazing. Because of the hazards of water erosion and soil blowing, the soil is not suited to nonirrigated crops.

Native vegetation is dominantly blue grama, sand dropseed, needleandthread, side-oats grama, and buckwheat.

Seeding is a suitable practice if the range has deteriorated. Seeding the native grasses is a good practice. If the range is severely eroded and blowouts have developed, the new seeding should be fertilized. Brush control and grazing management may be needed to improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase infiltration of water, and to catch and hold snow.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, by properly managing livestock grazing, and by reseeding range where needed.

This soil has good potential for use as homesites. Shallow excavation is severely limited because cut banks cave in. This soil requires special management practices to reduce water erosion and soil blowing. Capability subclass VIe.

**8—Blakeland loamy sand, 1 to 9 percent slopes.** This deep, somewhat excessively drained soil formed in alluvial and eolian material derived from arkosic sedimentary rock on uplands. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is dark grayish brown loamy sand about 11 inches thick. The substratum, to a depth of 27 inches, is brown loamy sand; it grades to pale brown sand that extends to a depth of 60 inches.

Included with this soil in mapping are small areas of Bresser sandy loam, 0 to 3 percent slopes; Bresser sandy loam, 3 to 5 percent slopes; Truckton sandy loam, 0 to 3 percent slopes; Truckton sandy loam, 3 to 9 percent slopes; and Stapleton sandy loam, 3 to 8 percent slopes. In some areas, mainly north of Colorado Springs in the Cottonwood Creek area, arkosic beds of sandstone and shale are at a depth of 0 to 40 inches.

Permeability of this Blakeland soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Organic matter content of the surface layer is medium. Surface runoff is slow, the hazard of erosion is moderate, and the hazard of soil blowing is severe.

Most areas of this soil are used for range, homesites, and wildlife habitat.

Native vegetation is dominantly western wheatgrass, side-oats grama, and needleandthread. This soil is best suited to deep-rooted grasses.

Proper range management is necessary to prevent excessive removal of plant cover from the soil. Interseeding improves the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the main limitations for the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for urban development. Soil blowing is a hazard if protective vegetation is removed. Special erosion control practices must be provided to minimize soil losses. Capability subclass VIe.

**9—Blakeland complex, 1 to 9 percent slopes.** This complex is on uplands, mostly in the Falcon area. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the frost-free period is about 135 days.

This complex is about 60 percent Blakeland loamy sand, about 30 percent Fluvaquentic Haplaquolls, and 10 percent other soils.

Included with these soils in mapping are areas of Columbine gravelly sandy loam, 0 to 3 percent slopes, Ellicott loamy coarse sand, 0 to 5 percent slopes, and Ustic Torrifluvents, loamy.

The Blakeland soil is in the more sloping areas. It is deep and somewhat excessively drained. It formed in sandy alluvium and eolian material derived from arkosic sedimentary rock. Typically, the surface layer is dark grayish brown loamy sand about 11 inches thick. The substratum, to a depth of 27 inches, is brown loamy sand; it grades to pale brown sand that extends to a depth of 60 inches or more.

Permeability of the Blakeland soil is rapid. The effective rooting depth is more than 60 inches. The available water capacity is moderate to low. Surface runoff is slow, and the hazard of erosion is moderate.

The Fluvaquentic Haplaquolls are in swale areas. They are deep, poorly drained soils. They formed in alluvium derived from arkosic sedimentary rock. Typically, the surface layer is brown. The texture is variable throughout. The water table is at a depth of 0 to 3 feet.

The Blakeland soil is well suited to deep-rooted grasses. Native vegetation is dominantly western wheatgrass, side-oats grama, and needleandthread. Rangeland vegetation on the Fluvaquentic Haplaquolls is dominantly tall grasses, including sand bluestem, switchgrass, prairie cordgrass, little bluestem, and sand reedgrass. Cattails and bulrushes are common in the swampy areas.

Proper range management is needed to prevent excessive removal of plant cover from these soils. It is also needed to maintain the productive grasses. Interseeding improves the existing vegetation. Deferment of grazing during the growing season increases plant vigor and soil stability, and it helps to maintain and improve range condition. Proper location of livestock watering facilities helps to control grazing of animals.

Windbreaks and environmental plantings are fairly well suited to these soils. Blowing sand and low available water capacity are the main limitations to the establishment of trees and shrubs. The soils are so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

The Blakeland soil is well suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed. Wetland wildlife can be attracted to the Fluvaquentic Haplaquolls and the wetland habitat can be enhanced by several means. Shallow water developments can be created by digging or by blasting potholes to create open-water areas. Fencing to control livestock grazing is beneficial, and it allows wetland plants such as cattails, reed canarygrass, and rushes to grow. Control of unplanned burning and prevention of drainage that would remove water from the wetlands are good practices. Openland wildlife use the vegetation on these soils for nesting and escape cover. These shallow marsh areas are especially important for winter cover if natural vegetation is allowed to grow.

The Blakeland soil has good potential for homesites, roads, and streets. It needs to be protected from erosion when vegetation has been removed from building sites. The Fluvaquentic Haplaquolls have poor potential for homesites. Their main limitations for this use are the high water table and the hazard of flooding. Capability subclass VIe.

**10—Blendon sandy loam, 0 to 3 percent slopes.** This deep, well drained soil formed in sandy arkosic alluvium on alluvial fans and terraces. The average annual precipitation is about 15 inches, the mean annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Permeability of the Crowfoot soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies are present in some drainageways and along stock trails.

The soils in this complex are used as rangeland, for recreation and wildlife habitat, and as homesites.

Native vegetation is mainly mountain muhly, bluestem, mountain brome, needleandthread, and blue grama. These soils are subject to invasion by Kentucky bluegrass and Gambel oak. Noticeable forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Proper location of livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings are fairly well suited to these soils. Blowing sand and moderate available water capacity are the main limitations for the establishment of trees and shrubs. The soils are so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are best suited to habitat for openland wildlife species, such as pronghorn antelope and sharp-tailed grouse. Although sharp-tailed grouse are not plentiful, they could be encouraged on these soils, especially where brush species are interspersed with grasses and forbs. If these soils are used as rangeland, wildlife production can be increased by managing livestock grazing to preclude overuse of the more desirable grass species and depletion of the various brush species.

The main limitations for urban uses are frost-action potential and slope on the Crowfoot soil and slope on the Tomah soil. Buildings and roads must be designed to overcome these limitations. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff. Maintaining the existing vegetation on building sites during construction helps to control erosion. Capability subclass VIe.

**94—Travessilla-Rock outcrop complex, 8 to 90 percent slopes.** This moderately sloping to extremely steep complex is mostly on rocky uplands (fig. 5). Elevation ranges from 6,200 to 6,700 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 140 days.

The Travessilla soil makes up about 45 percent of the complex. Rock outcrop about 30 percent, and included areas about 25 percent.

Included with this complex in mapping are areas of Bresser sandy loam, 5 to 9 percent slopes, Elbeth sandy loam, 8 to 15 percent slopes, Kettle gravelly loamy sand, 8 to 40 percent slopes, and Louviers silty clay loam, 3 to 18 percent slopes. The Elbeth and Kettle soils commonly are on the north-facing slopes.

The Travessilla soil is shallow and well drained. It formed in residuum derived from sandstone. Typically, the surface layer is light brownish gray sandy loam about 3 inches thick. The underlying material is pale brown sandy loam about 8 inches thick. Hard arkosic sandstone that has some fractures is at a depth of about 11 inches.

Permeability of the Travessilla soil is moderately rapid. Effective rooting depth is 6 to 20 inches. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is high. Gullies are common along drainageways and trails.

Rock outcrop occurs mostly as ledges on cliffs.

This complex is used for urban development, as homesites, and for recreation and wildlife habitat.

This complex is suited to the production of ponderosa pine. The main limitations are the presence of stones and rock outcrop on the surface and a high hazard of erosion. Stones on the surface can hinder felling, yarding, and other operations involving the use of equipment. Practices must be used to minimize soil erosion when harvesting timber. The low available water capacity can influence seedling survival.

Wildlife on these soils is limited mostly to small animals such as cottontail, squirrel, and birds because of the extent of urban development. Ponderosa pine, mountain-mahogany, Gambel oak, and various grasses provide food, cover, and nesting areas.

This complex is extensively used for urban development and as homesites (fig. 6). The main limitations for these uses are depth to bedrock, rock outcrop, and steep slopes. Septic tank absorption fields do not function properly because of the depth to bedrock. Special designs for buildings and roads and streets are needed to overcome the limitations. Plans for homesite development should provide for the preservation of as many trees as possible because of their esthetic value. Capability subclass VIIe.

**95—Truckton loamy sand, 1 to 9 percent slopes.** This deep, well drained soil formed in alluvium and residuum derived from arkosic sedimentary rock on uplands. Elevation ranges from 6,000 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown loamy sand about 8 inches thick. The subsoil is brown sandy loam about 18 inches thick. The substratum is light yellowish brown coarse sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Blakeland loamy sand, 1 to 9 percent slopes; Bresser sandy loam, 3 to 5 percent slopes; Bresser sandy loam, 5 to 9 percent slopes; Truckton sandy loam, 0 to 3 percent slopes; and Truckton sandy loam, 3 to 9 percent slopes.

Permeability of this Truckton soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is moderate to high.

Almost all areas of this soil are used as rangeland. A few areas of crops such as alfalfa and corn are grown under sprinkler irrigation.

This soil is well suited to the production of native vegetation suitable for grazing. It is best suited to deep-rooted grasses. The native vegetation is mainly cool- and warm-season grasses such as western wheatgrass, side-oats grama, and needleandthread.

Proper range management is needed to prevent excessive removal of the plant cover. Interseeding is used to improve the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand is the main limitation for the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to openland and rangeland wildlife habitat. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. The main limitation of this soil for roads and streets is frost action potential. Special designs for roads are needed to minimize this limitation. Practices are needed to control soil blowing and water erosion on construction sites where the plant cover has been removed. Capability subclass VIe, nonirrigated.

**96—Truckton sandy loam, 0 to 3 percent slopes.** This deep, well drained soil formed in alluvium and residuum derived from arkosic sedimentary rock on uplands. Elevation ranges from 6,000 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The next layer is dark grayish brown sandy loam about 3 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum is light yellowish brown coarse sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Blakeland loamy sand, 1 to 9 percent slopes; Bresser sandy loam, 0 to 3 percent slopes; Ellicott loamy coarse sand, 0 to 5 percent slopes; and Ustic Torrifluvents, loamy.

Permeability of this Truckton soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazards of erosion and soil blowing are moderate.

This soil is used mainly for cultivated crops. It is also used for livestock grazing, for wildlife habitat, and as homesites.

Crops are commonly grown in combination with summer fallow because moisture is insufficient for annual cropping. Alfalfa can also be grown on this soil. When this soil is used as cropland, crop residue management and minimum tillage are necessary conservation practices.

This soil is well suited to the production of native vegetation suitable for grazing (fig. 7). It favors deep-rooted grasses. The native vegetation is mainly cool- and warm-season grasses such as western wheatgrass, side-oats grama, and needleandthread.

Proper range management is needed to prevent excessive removal of the plant cover. Interseeding is used to improve the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are suited to this soil. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. The main limitation of this soil for roads and streets is frost action potential. Special designs for roads are needed to overcome this limitation. Capability subclasses IIIe, nonirrigated, and IIe, irrigated.

**97—Truckton sandy loam, 3 to 9 percent slopes.** This deep, well drained soil formed in alluvium and residuum derived from arkosic sedimentary rock on uplands. Elevation ranges from 6,000 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The next layer is dark grayish brown sandy loam about 3 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum is light yellowish brown coarse sandy loam to a depth of 60 inches or more.

## EL PASO COUNTY AREA, COLORADO

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TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See "flooding" in Glossary for definition of terms as "rare," "brief," and "very brief." The symbol > means greater than]

Soil name and map symbol	Hydro-logic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
Alamosa: 1-----	C	Frequent-----	Brief-----	May-Jun	In >60	---	High.
Ascalon: 2, 3-----	B	None-----	---	---	>60	---	Moderate.
Badland: 4-----	D	---	---	---	---	---	---
Bijou: 5, 6, 7-----	B	None-----	---	---	>60	---	Low.
Blakeland: 8-----	A	None-----	---	---	>60	---	Low.
19: Blakeland part-	A	None-----	---	---	>60	---	Low.
Fluvaquentic Haplaquolls part-----	D	Common-----	Very brief----	Mar-Aug	>60	---	High.
Blendon: 10-----	B	None-----	---	---	>60	---	Moderate.
Bresser: 11, 12, 13-----	B	None-----	---	---	>60	---	Low.
Brussett: 14, 15-----	B	None-----	---	---	>60	---	Moderate.
Chaseville: 16, 17-----	A	None-----	---	---	>60	---	Low.
118: Chaseville part	A	None-----	---	---	>60	---	Low.
Midway part----	D	None-----	---	---	10-20	Rippable	Moderate.
Columbine: 19-----	A	None to rare	---	---	>60	---	Low.
Connerton: 120: Connerton part-	B	None-----	---	---	>60	---	High.
Rock outcrop part-----	D	---	---	---	---	---	---
Cruckton: 21-----	B	None-----	---	---	>60	---	Moderate.
Cushman: 22, 23-----	C	None-----	---	---	20-40	Rippable	Moderate.
124: Cushman part----	C	None-----	---	---	20-40	Rippable	Moderate.
Kutch part-----	C	None-----	---	---	20-40	Rippable	Moderate.
Elbeth: 25, 26-----	B	None-----	---	---	>60	---	Moderate.
127: Elbeth part----	B	None-----	---	---	>60	---	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
Tomah: 192, 193: Tomah part-----	B	None-----	---	---	In >60	---	Moderate.
Crowfoot part--	B	None-----	---	---	>60	---	Moderate.
Travessilla: 194: Travessilla part-----	D	None-----	---	---	6-20	Hard	Low.
Rock outcrop part-----	D	---	---	---	---	---	---
Truckton: 95, 96, 97-----	B	None-----	---	---	>60	---	Moderate.
198: Truckton part--	B	None-----	---	---	>60	---	Moderate.
Blakeland part-	A	None-----	---	---	>60	---	Low.
199, 1100: Truckton part--	B	None-----	---	---	>60	---	Moderate.
Bresser part---	B	None-----	---	---	>60	---	Low.
Ustic Torrifluvents: 101-----	B	Occasional---	Very brief---	Mar-Aug	>60	---	Moderate.
Valent: 102, 103-----	A	None-----	---	---	>60	---	Low.
Vona: 104, 105-----	B	None-----	---	---	>60	---	Moderate.
Wigton: 106-----	A	None-----	---	---	>60	---	Low.
Wiley: 107, 108-----	B	None-----	---	---	>60	---	Low.
Yoder: 109, 110-----	B	None-----	---	---	>60	---	Low.

<sup>1</sup>This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior characteristics of the map unit.

**NOTES TO USERS**

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

**Coastal Base Flood Elevations** shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

NGS Information Services  
NOAA, NINGS12  
National Geodetic Survey  
SSMC-3, #9202  
1315 East-West Highway  
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at <http://www.ngs.noaa.gov/>.

**Base Map** information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

**Corporate limits** shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

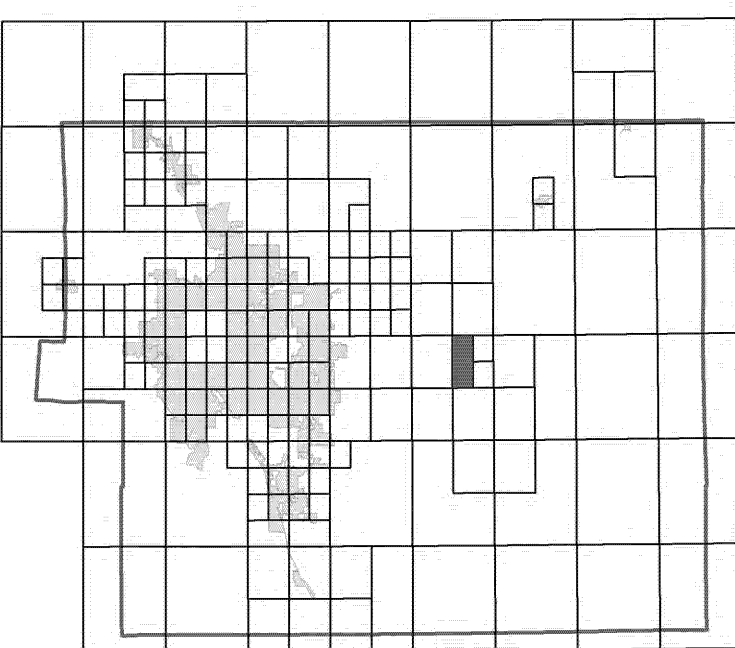
Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msc.fema.gov/>.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfip>.

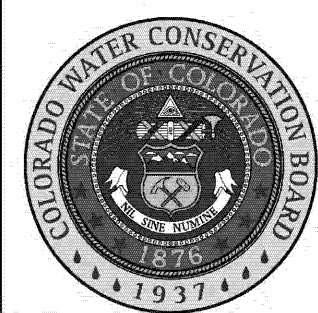
**El Paso County Vertical Datum Offset Table**

Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

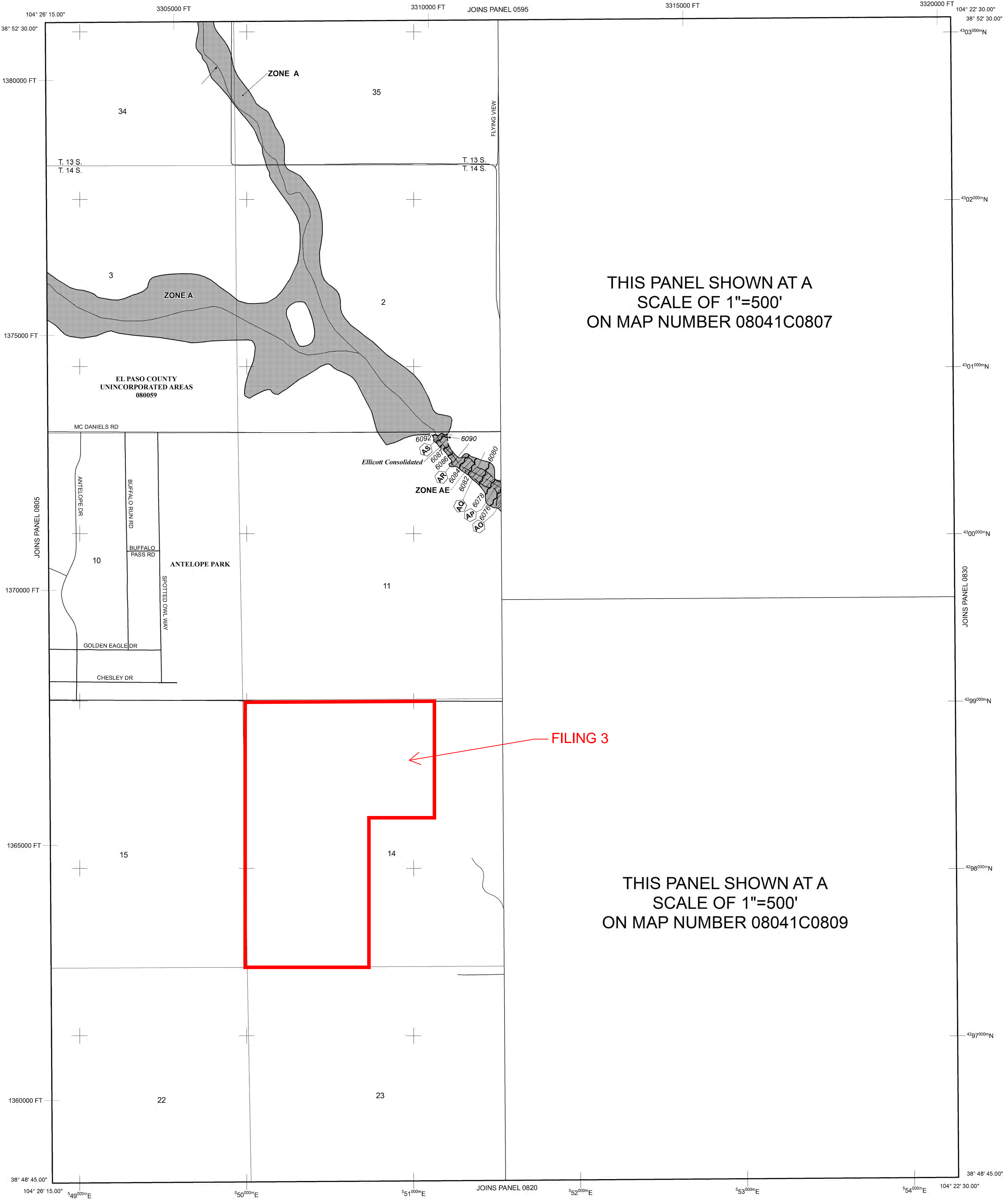
**Panel Location Map**



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).



Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



THIS PANEL SHOWN AT A SCALE OF 1"=500' ON MAP NUMBER 08041C0807

THIS PANEL SHOWN AT A SCALE OF 1"=500' ON MAP NUMBER 08041C0809

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 63 WEST, AND TOWNSHIP 14 SOUTH, RANGE 63 WEST.

**LEGEND**

**SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decreedified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**  
The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

**OTHER FLOOD AREAS**  
**ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot, with or without drainage areas less than 1 square mile, and areas protected by levees from 1% annual chance flood.

**OTHER AREAS**  
**ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.  
**ZONE D** Areas in which flood hazards are undetermined, but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**  
**OTHERWISE PROTECTED AREAS (OPAs)**

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D Boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Base Flood Elevation line and value; elevation in feet\* (EL 987)
- Base Flood Elevation value where uniform within zone; elevation in feet\*

\* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- Cross section line
- Transect line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

1000-meter Universal Transverse Mercator grid ticks, zone 13

5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0902), Lambert Conformal Conic Projection

Bench mark (see explanation in Notes to Users section of this FIRM panel)

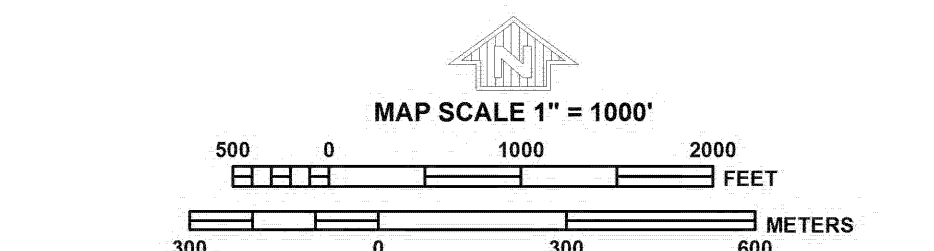
River Mile

**MAP REPOSITORIES**  
Refer to Map Repositories list on Map Index  
**EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP**  
MARCH 17, 1997

**EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**  
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

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



**NATIONAL FLOOD INSURANCE PROGRAM**

**PANEL 0810G**

**FIRM**  
FLOOD INSURANCE RATE MAP  
EL PASO COUNTY,  
COLORADO  
AND INCORPORATED AREAS

**PANEL 810 OF 1300**  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	08020	0810	G

Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER**  
08041C0810G

**MAP REVISED**  
DECEMBER 7, 2018  
Federal Emergency Management Agency

**NOTES TO USERS**

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

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The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The horizontal datum was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

NGS Information Services  
NOAA, NINGS12  
National Geodetic Survey  
SSMC-3, #9202  
1315 East-West Highway  
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at <http://www.ngs.noaa.gov/>.

**Base Map** information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

**Corporate limits** shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msc.fema.gov/>.

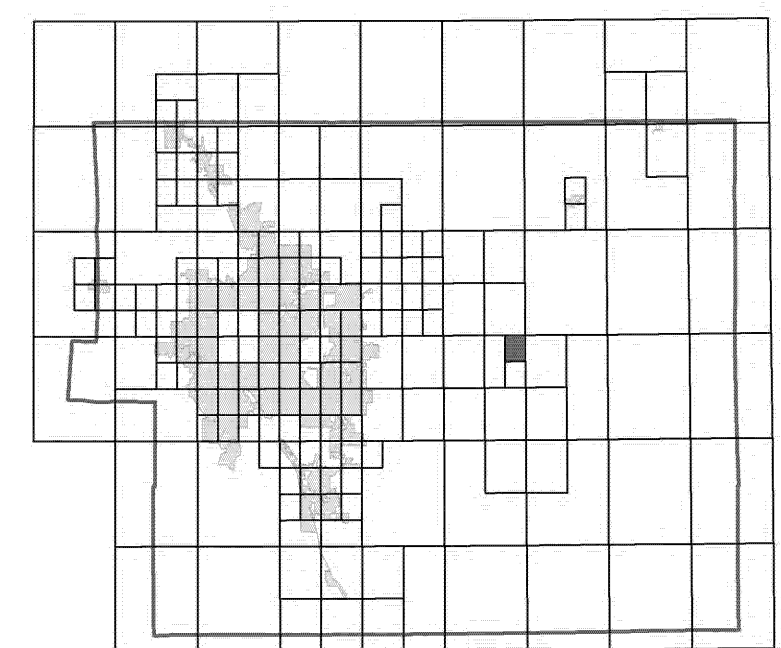
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfip>.

**El Paso County Vertical Datum Offset Table**

Flooding Source	Vertical Datum Offset (ft)

REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

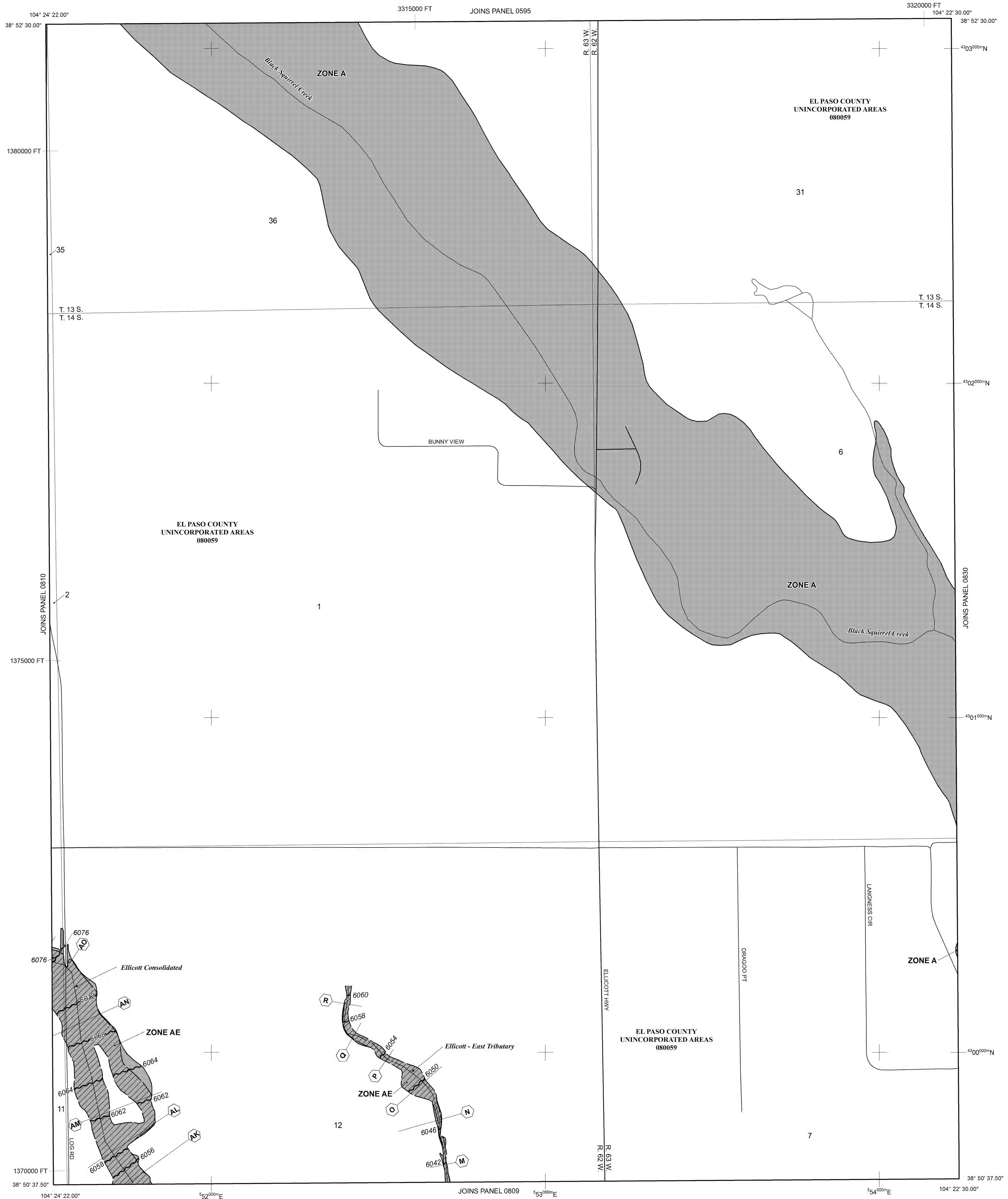
**Panel Location Map**



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).



Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



**LEGEND**

**SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decreedified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

**OTHER FLOOD AREAS**

**ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

**OTHER AREAS**

**ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.

**ZONE D** Areas in which flood hazards are undetermined, but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**

**OTHERWISE PROTECTED AREAS (OPAs)**

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Base Flood Elevation line and value; elevation in feet\* (EL 987)
- Base Flood Elevation value where uniform within zone; elevation in feet\*

\* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- Cross section line
- Transsect line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

1000-meter Universal Transverse Mercator grid ticks, zone 13

5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0902), Lambert Conformal Conic Projection

Bench mark (see explanation in Notes to Users section of this FIRM panel)

River Mile

MAP REPOSITORIES

Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

**NFP**

**PANEL 0807G**

**FIRM**

**FLOOD INSURANCE RATE MAP**

**EL PASO COUNTY, COLORADO AND INCORPORATED AREAS**

**PANEL 807 OF 1300**

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	08009	0807	G

Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER 08041C0807G**

**MAP REVISED DECEMBER 7, 2018**

**Federal Emergency Management Agency**



**NOTES TO USERS**

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

**Coastal Base Flood Elevations** shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

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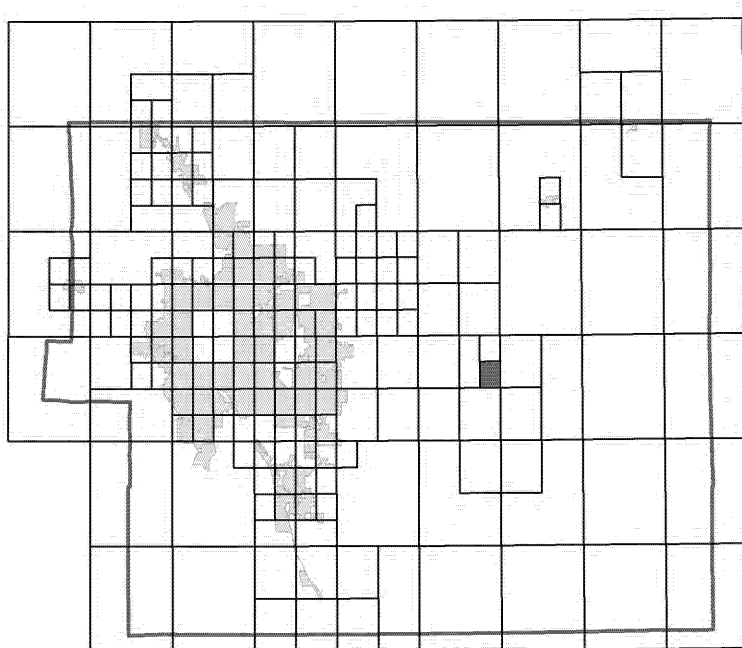
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**El Paso County Vertical Datum Offset Table**

Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

**Panel Location Map**



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).



Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 14 SOUTH, RANGE 82 WEST, AND TOWNSHIP 14 SOUTH, RANGE 63 WEST.

**LEGEND**

**SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**

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**OTHERWISE PROTECTED AREAS (OPAs)**  
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Floodplain boundary  
Floodway boundary  
Zone D Boundary  
CBRS and OPA boundary  
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.  
Base Flood Elevation line and value; elevation in feet\* (EL 987)  
\* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

Legend symbols:  
Cross section line  
Transsect line

Legend symbols:  
Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)  
1000-meter Universal Transverse Mercator grid ticks, zone 13  
5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0902), Lambert Conformal Conic Projection  
Bench mark (see explanation in Notes to Users section of this FIRM panel)  
River Mile

Legend symbols:  
MAP REPOSITORIES  
Refer to Map Repositories list on Map Index

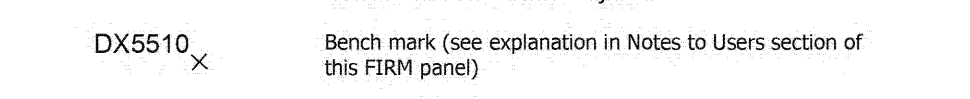
EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP  
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL  
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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MAP SCALE 1" = 500'



**NFP**  
**PANEL 0809G**

**FIRM**  
**FLOOD INSURANCE RATE MAP**  
**EL PASO COUNTY, COLORADO AND INCORPORATED AREAS**

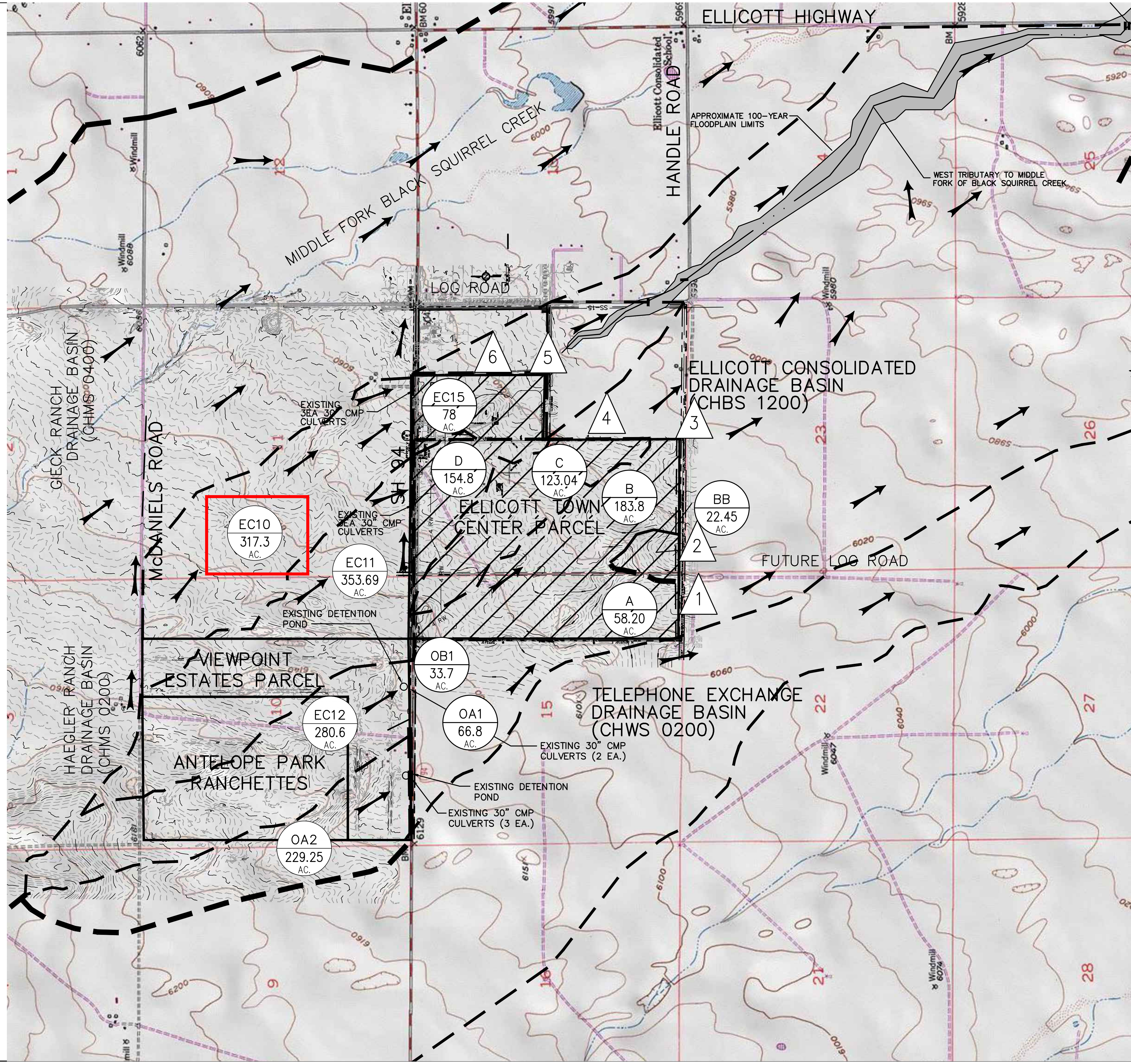
**PANEL 809 OF 1300**  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:  
COMMUNITY NUMBER PANEL SUFFIX  
EL PASO COUNTY 0809G 0809 G

Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER 08041C0809G**  
**MAP REVISED DECEMBER 7, 2018**  
Federal Emergency Management Agency

Z:\090001.Elliccott\TC.dwg\Civil\EX1 - F1.dwg Sep 16, 2019 - 8:26am

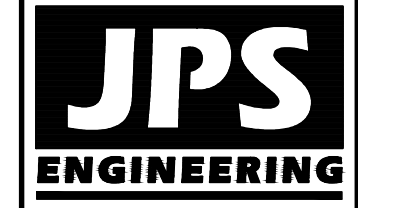
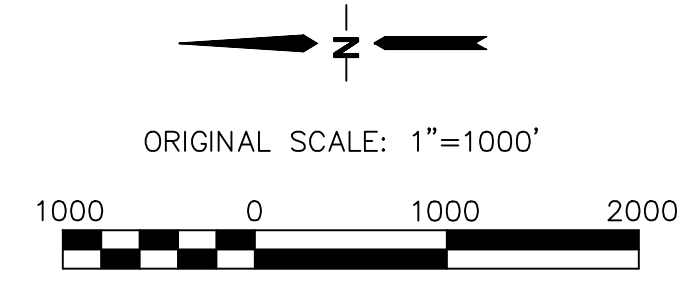


**SUMMARY HYDROLOGY TABLE**

DESIGN POINT	Q <sub>5</sub> (CFS)	Q <sub>100</sub> (CFS)
1	4.9	34.4
2	11.3	28.0
3	8.7	60.8
4	5.5	42.2
(REFER TO MDDP)		
5	30.6	174.9
6	19.1	111.4

**LEGEND**

- DRAINAGE BASIN AREA (AC)
- DESIGN POINT
- MAJOR BASIN LINE
- BASIN LINE



19 E. Willamette Ave.  
Colorado Springs, CO 80903  
PH: 719-477-9429  
FAX: 719-471-0766  
john@jpsengr.com



CALL UTILITY NOTIFICATION CENTER OF COLORADO 1-800-922-1987  
CALL BEFORE YOU DIG. IN ADVANCE OF ANY EXCAVATION BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

# ELLICOTT TOWN CENTER

## MAJOR BASIN / HISTORIC DRAINAGE PLAN

DATE	BY	REVISION	No.

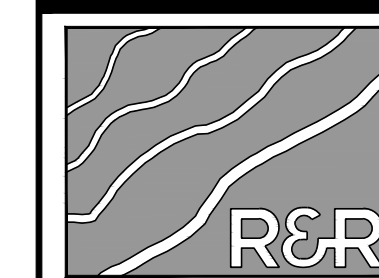
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VERT. SCALE: N/A  
SURVEYED: N/A  
CREATED: 12/3/00  
PROJECT NO: 090001  
SHEET: EX1

DRAWN: MJP  
DESIGNED: JPS  
CHECKED: JPS  
LAST MODIFIED: 9/12/19  
MODIFIED BY: BJJ



Know what's below.  
Call before you dig.

DATE	9/1/22
BY	01/09/23
REVISION	
NO.	
2ND SUBMISSION	
3RD SUBMISSION	



R&R ENGINEERS SURVEYORS

**R&R ENGINEERS-SURVEYORS, INC.**  
1635 WEST 13TH AVENUE, SUITE 310  
DENVER, COLORADO 80204  
PHONE: 303-753-6730

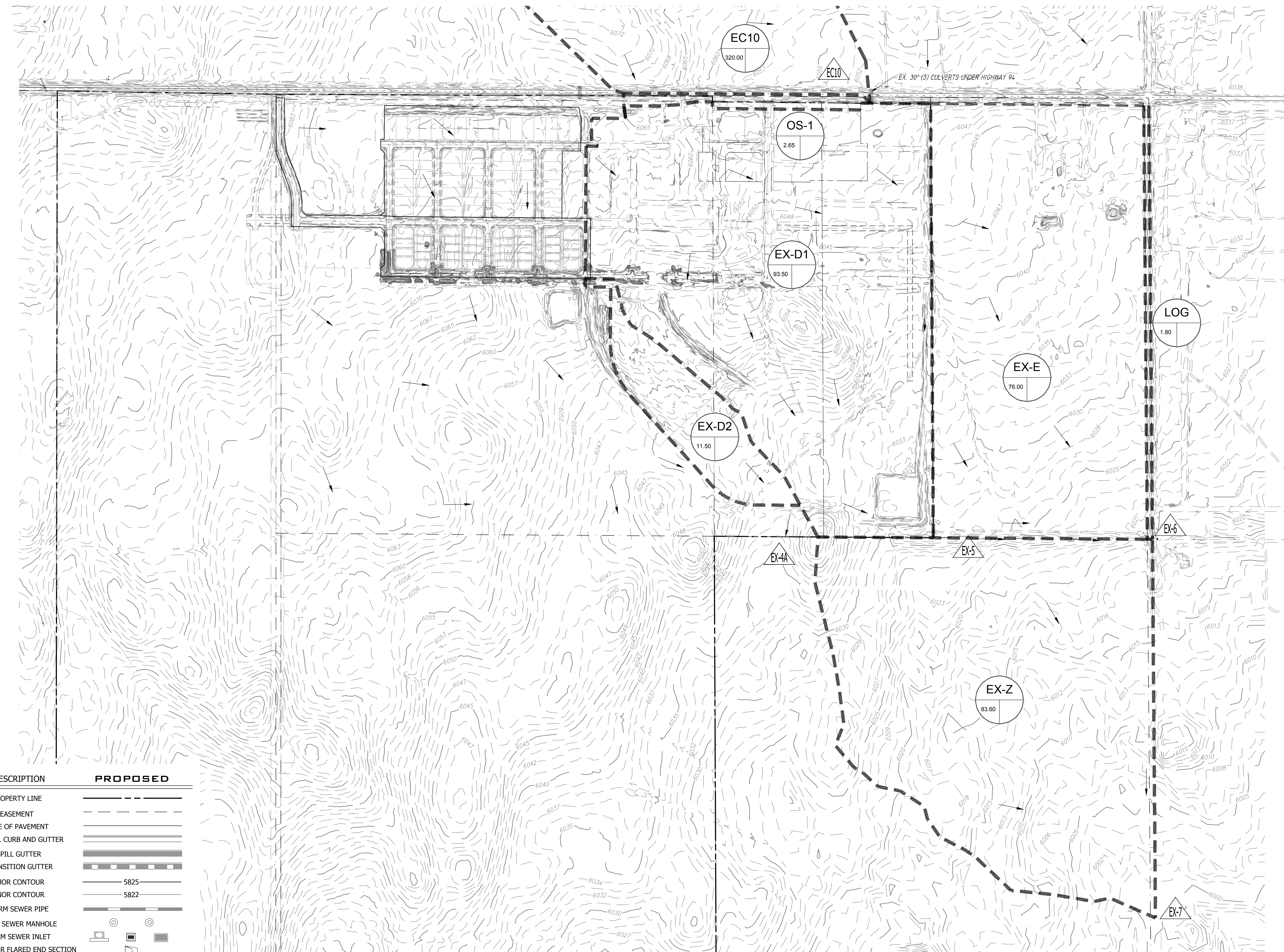
WWW.RRENGINEERS.COM

**MAYBERRY PUD PH 1 - FILING NO. 3**  
MAYBERRY, COLORADO SPRINGS  
EL PASO COUNTY  
PREPARED FOR:  
MAYBERRY COMMUNITIES, LLC  
3296 DEVINE HEIGHTS #208  
COLORADO SPRINGS, CO 80922

CONSTRUCTION DOCUMENTS  
JOB NO. MC22110  
ORG. SUBM. DATE 06/16/2022  
DWN: LAO CHKD: CJD  
NAME

FILING 3 HISTORIC  
DRAINAGE PLAN

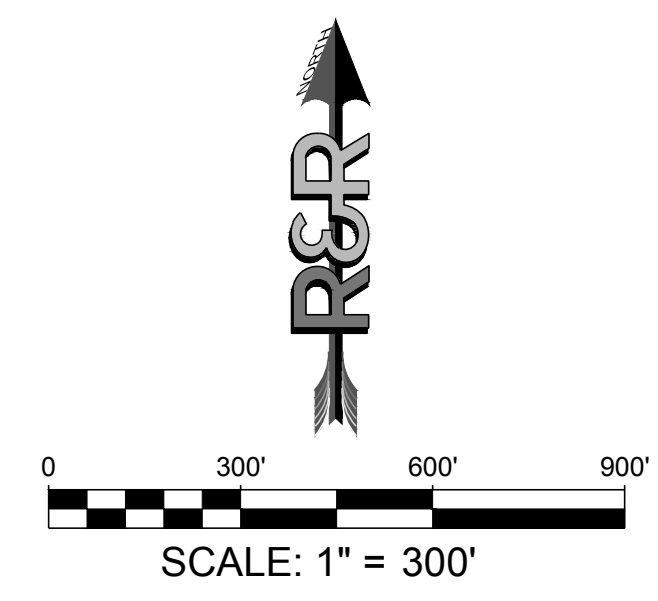
NO. **EX2**



EXISTING	DESCRIPTION	PROPOSED
---	PROPERTY LINE	---
---	EASEMENT	---
---	EDGE OF PAVEMENT	---
---	VERTICAL CURB AND GUTTER	---
---	SPILL GUTTER	---
---	TRANSITION GUTTER	---
---	MAJOR CONTOUR	5825
---	MINOR CONTOUR	5822
---	STORM SEWER PIPE	---
---	STORM SEWER MANHOLE	---
---	STORM SEWER INLET	---
---	STORM SEWER FLARED END SECTION	---
---	STORM SEWER HEADWALL	---
---	DRAINAGE BASIN LABEL	---
---	* BASIN LABEL	---
---	** TRIBUTARY AREA (AC)	---
---	FLOW ARROW	---
---	DESIGN POINT	---
---	DRAINAGE AREA BOUNDARY	---

BASIN	AREA (AC)	5-YR (CFS)	100-YR (CFS)
EC-10	320.00	18.40	144.70
OS-1	2.65	1.40	4.30
EX-D1	93.50	8.40	76.23
EX-D2	11.50	1.40	12.50
EX-E	76.00	6.10	53.30
LOG	1.80	3.70	6.30
EX-Z	83.60	8.20	63.40

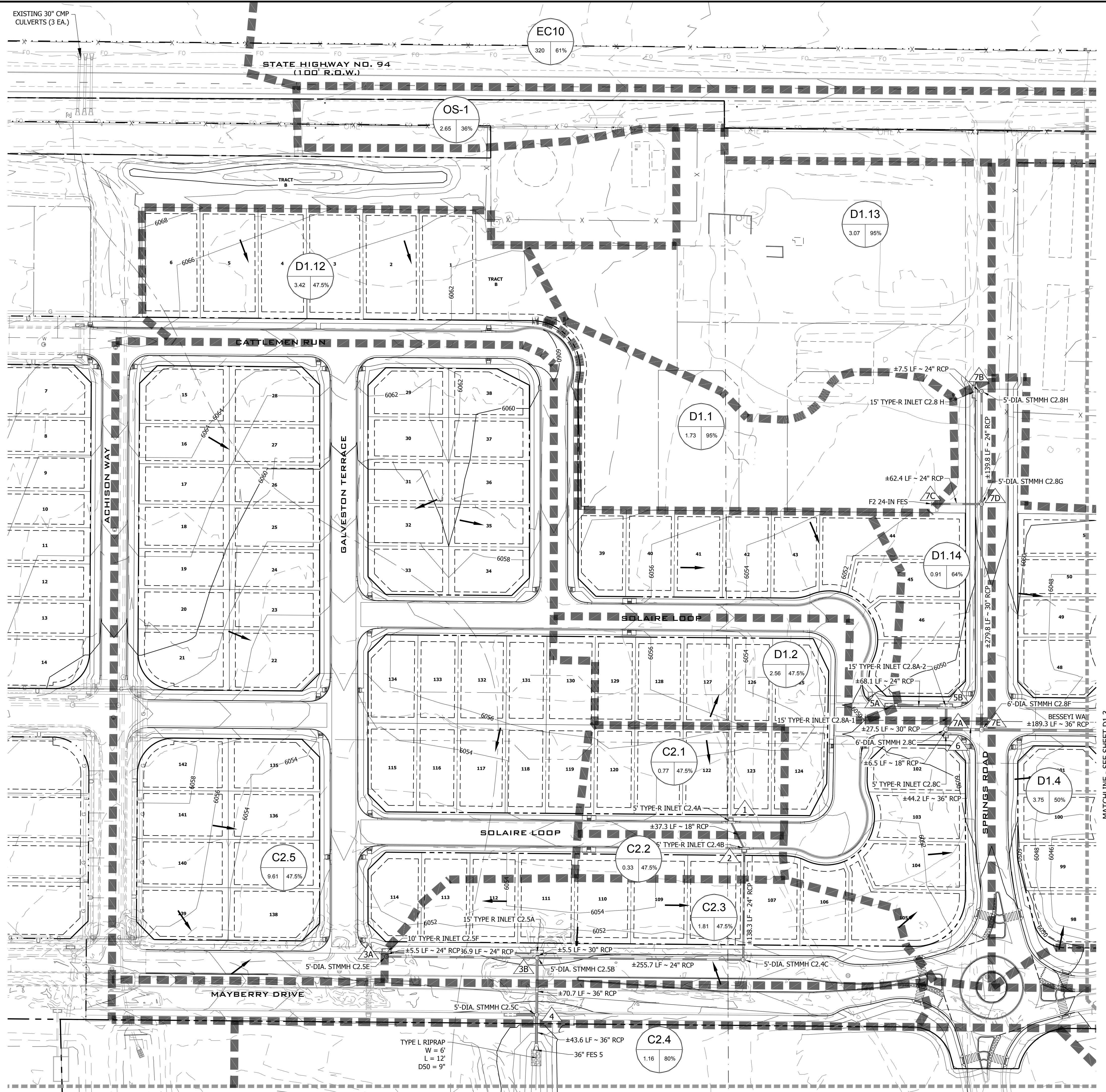
DESIGN POINT	CONTRIBUTING BASINS	5-YR (CFS)	100-YR (CFS)
EC-10	EC-10	18.40	144.70
EX-4A	EX-D2	1.40	12.50
EX-5	EC-10, EX-D1	23.70	183.90
EX-6	DP EX-5, EX-E, LOG	30.50	231.40
EX-7	DP EX-6, EX-Z	38.20	289.90



P:\11\102\_102\_102\_102\PROJECTS\MC22110\_MAYBERRY\_FILING\_NO\_3\ENGINEERING\DRAWINGS\PLAN\DRAINAGE\MAPS\MC22110-3E-DWG\_MAP -- DWG, PLOT DATE: 7/5/2023 2:13:58 PM, BKLUZ\_JONES



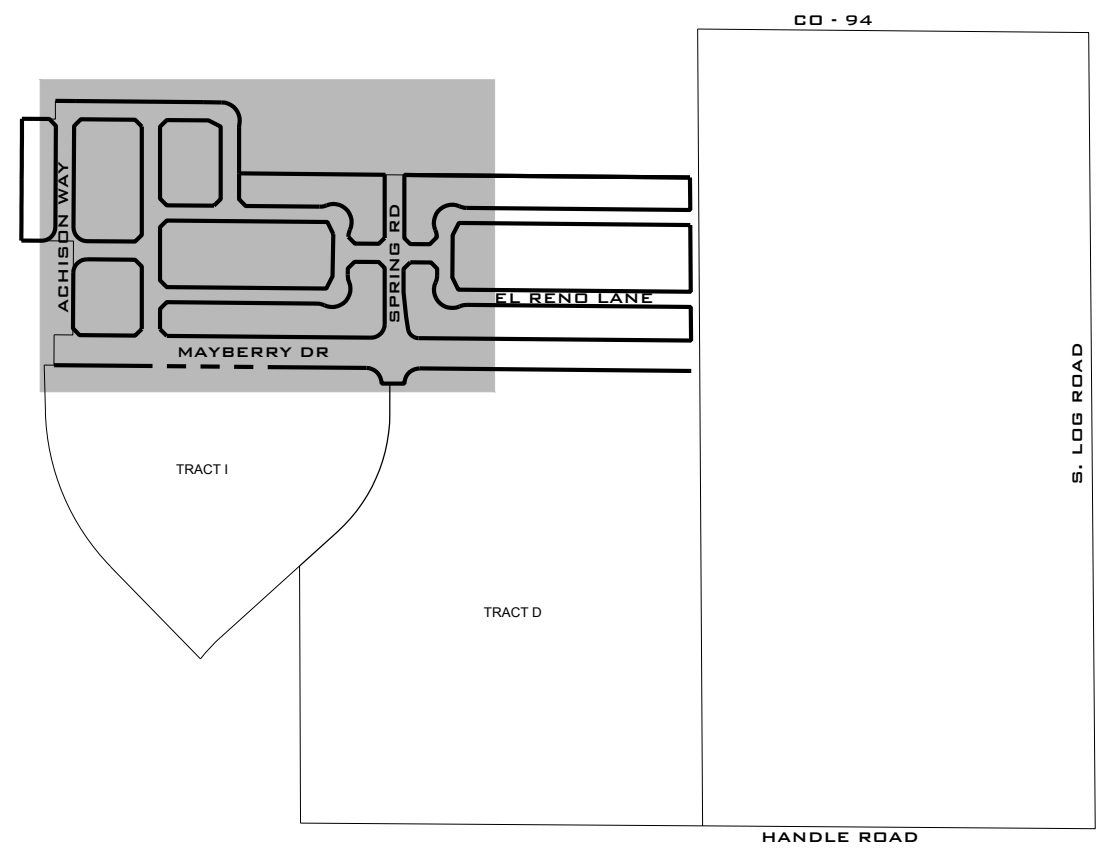
DATE: 11/22/22 10:23 AM PROJECT: MAYBERRY PUD PH1 - FILING NO. 3 ENGINEER: V. DRAMISOS CIVIL DRNG MAP DTL DWG. PLOT DATE: 11/22/22 2:50:12 PM BY: LIZ JONES



CDOT NOTE: MAINTAIN EXISTING ROADSIDE DITCH DRAINAGE PATTERNS & EXTEND EXISTING CULVERTS AS REQUIRED BASED ON SH94 IMPROVEMENTS; PROVIDE RIPRAP APRONS & EROSION CONTROL FOR ALL CULVERT EXTENSIONS  
NOTE: DETAILED BASIN MAPS REPRESENT THE FULL ANTICIPATED BUILD OUT OF ALL AREAS TRIBUTARY TO POND D

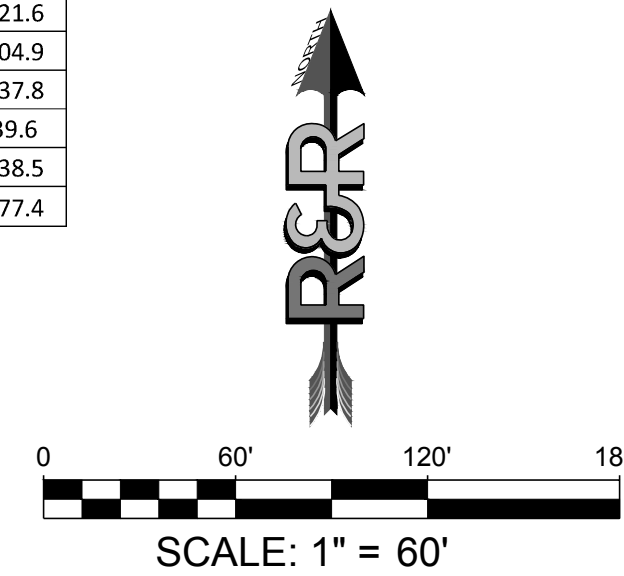


Know what's below.  
Call before you dig.



EXISTING	DESCRIPTION	PROPOSED
	PROPERTY LINE	---
	EASEMENT	---
	EDGE OF PAVEMENT	---
	VERTICAL CURB AND GUTTER	---
	SPILL GUTTER	---
	TRANSITION GUTTER	---
	MAJOR CONTOUR	5825
	MINOR CONTOUR	5822
	STORM SEWER PIPE	---
	STORM SEWER MANHOLE	⊙
	STORM SEWER INLET	⊠
	STORM SEWER FLARED END SECTION	⊠
	STORM SEWER HEADWALL	⊠
	DRAINAGE BASIN LABEL	C-1*
	* BASIN LABEL	
	** TRIBUTARY AREA (AC)	1** 50%***
	*** PERCENT IMPERVIOUS (%) (FULL BUILDOUT)	
	FLOW ARROW	→
	DESIGN POINT	△
	DRAINAGE AREA BOUNDARY	---

DESIGN POINT SUMMARY TABLE					BASIN SUMMARY TABLE				
Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)	Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)	
1	C2.1	0.8	1.1	2.7	C2.1	0.77	1.1	2.7	
2	DP1, C2.2	1.1	1.6	3.9	C2.2	0.33	0.6	1.4	
3A	C2.5	9.6	14.2	34.6	C2.3	1.81	2.1	5.2	
3B	C2.3, DP3A	12.5	14.9	36.2	C2.4	1.16	4.1	7.8	
4	C2.4, DP3B	13.7	17.4	41.1	C2.5	9.61	14.2	34.6	
5A	D1.12	3.4	3.8	9.3	C3.0	35.40	22.0	72.7	
5B	D1.14, DP5A	4.3	5.2	12.2	D1.1	1.73	6.7	12.2	
6	D1.2	2.6	3.4	8.3	D1.2	2.56	3.4	8.3	
7A	DP5B, DP6	6.9	8.0	19.0	D1.3	2.02	3.1	7.5	
7B	D1.13	3.1	10.9	19.9	D1.4	3.75	5.4	12.7	
7C	D1.1	1.7	6.7	12.2	D1.5	9.88	31.6	57.6	
7D	DP7B, DP7C	4.8	16.7	30.3	D1.6	1.96	2.6	6.3	
7E	DP7D, DP7A	11.7	19.3	39.7	D1.7	1.56	2.1	5.0	
8	D1.3	2.0	3.1	7.5	D1.8	1.27	1.8	4.3	
9	DP7, DP8	13.7	20.5	42.7	D1.9	0.54	0.9	2.1	
10	DP9, D1.4	17.5	24.8	52.6	D1.10	2.13	3.3	8.0	
11	EC10, OS-1, E1	0.0	18.9	148.3	D1.11	1.23	4.0	7.7	
12	D1.5	9.9	31.6	57.6	D1.12	3.42	3.8	9.3	
13	DP12, D1.6	11.8	30.9	57.9	D1.13	3.07	10.9	19.9	
14	DP13, D1.7	13.4	32.9	62.8	D1.14	0.91	1.8	3.9	
15	DP14, D1.8	14.7	33.6	64.9	D2.0	11.90	10.30	27.7	
16	DP15, D1.9	15.2	34.2	66.4	D2.1	3.15	0.90	6.6	
17	D1.10	2.1	3.3	8.0	E1	3.92	0.30	2.8	
18	D1.11, DP17, DP10	20.8	27.4	57.8	OS-1	2.65	0.40	2.6	
19	DP16, DP18	36.0	53.1	106.8	EC10	320.0	18.40	144.7	
20	DP19, D2.0	47.9	57.5	121.6					
21	DP4, C3.0	49.1	36.7	104.9					
22	D2.1, DP20, DP21	100.2	98.5	237.8					
23	POND D OUTFLOW		1.2	39.6					
24	CHANNEL E OUTFLOW		17.6	138.5					
EX5	DP23, DP24		18.7	177.4					



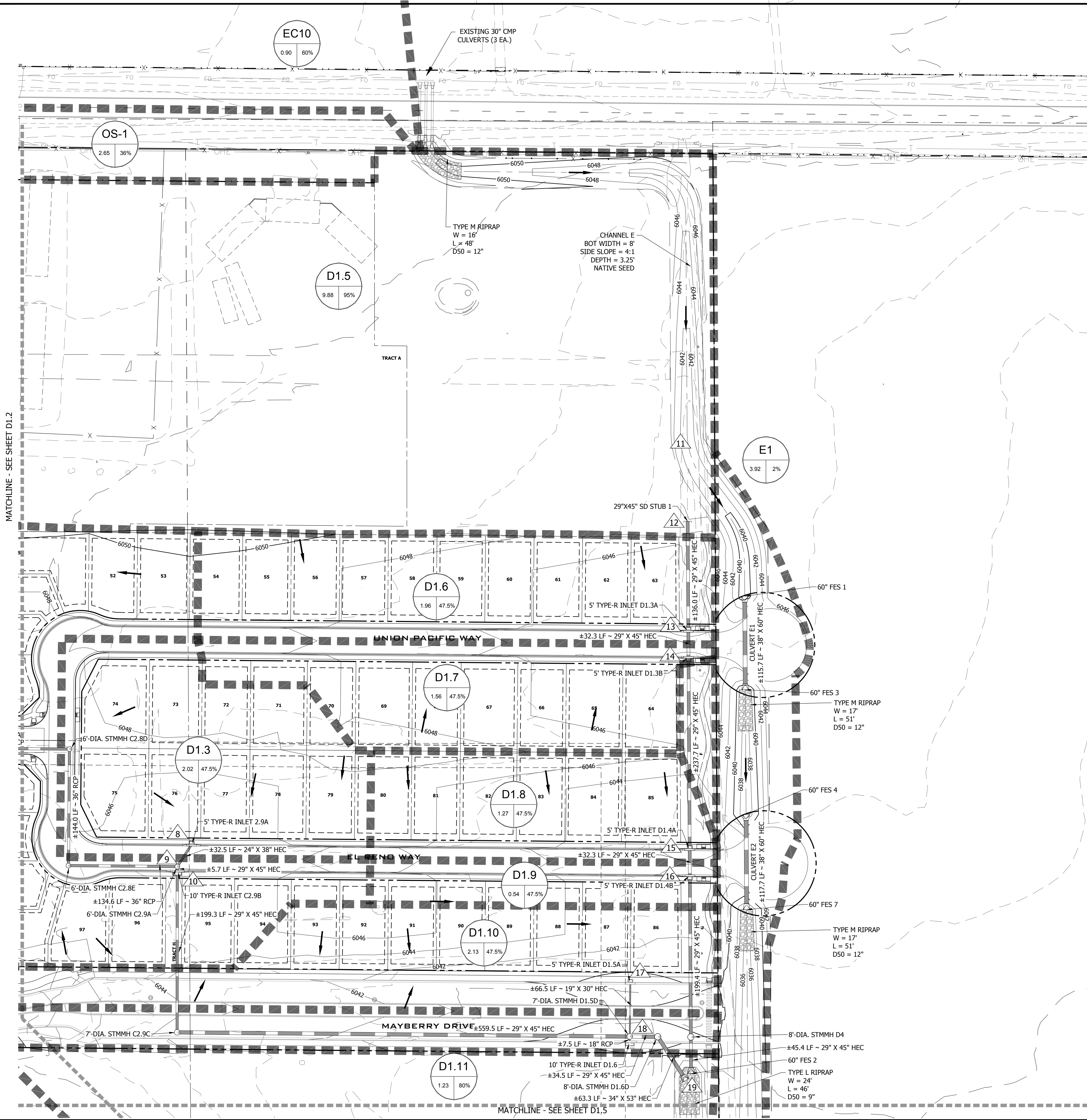
**R&R ENGINEERS-SURVEYORS, INC.**  
1635 WEST 13TH AVENUE, SUITE 310  
DENVER, COLORADO 80204  
PHONE: 303-753-6730

**MAYBERRY PUD PH1 - FILING NO. 3**  
ORG. ADDRESS: MAYBERRY, COLORADO SPRINGS, EL PASO COUNTY  
PREPARED FOR: MAYBERRY COMMUNITIES, LLC  
3296 DEVINE HEIGHTS #208  
COLORADO SPRINGS, CO 80922

CONSTRUCTION DOCUMENTS  
JOB NO. MC22110  
ORG. SUBM. DATE 06/16/2022  
DWN: LAO CHKD: CJD  
NAME: FILING 3  
DETAILED DRAINAGE PLAN - NORTH WEST  
NO. **D1.2**

REVISION  
NO. 2ND SUBMISSION  
NO. 3RD SUBMISSION  
DATE 9/1/22  
DATE 01/09/23

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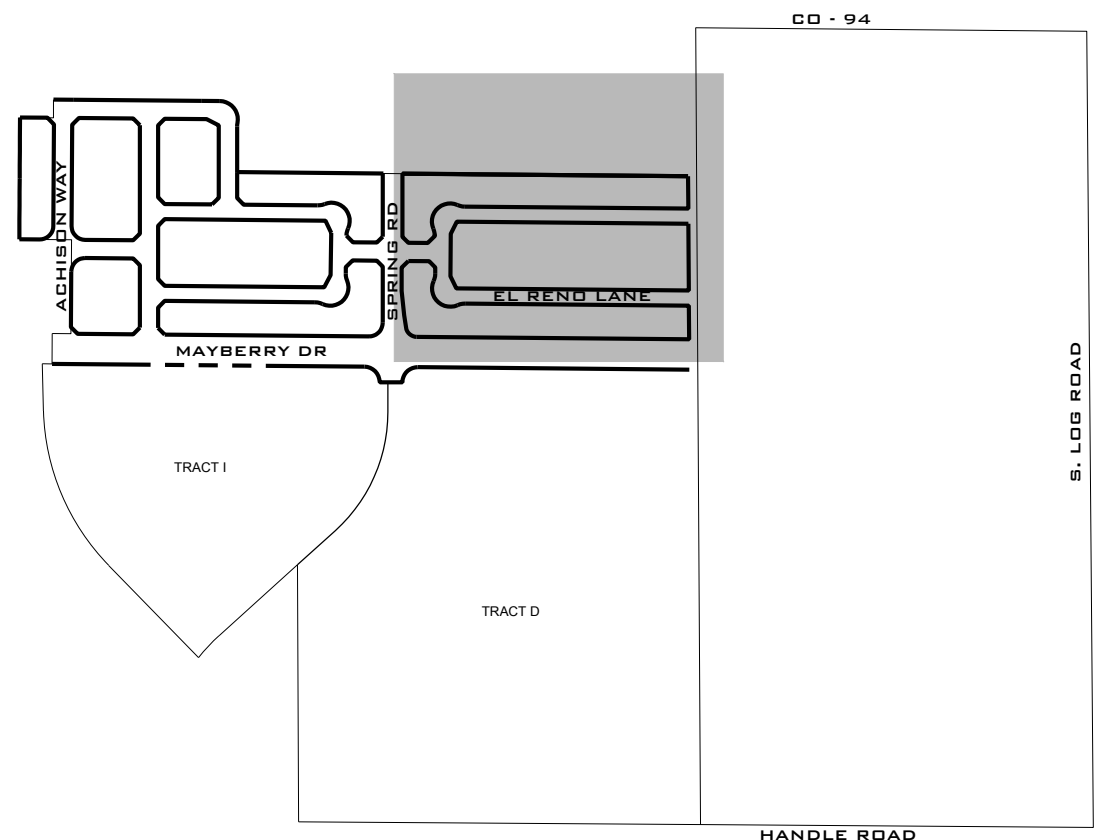


CDOT NOTE: MAINTAIN EXISTING ROADSIDE DITCH DRAINAGE PATTERNS & EXTEND EXISTING CULVERTS AS REQUIRED BASED ON SH94 IMPROVEMENTS; PROVIDE RIPRAP APRONS & EROSION CONTROL FOR ALL CULVERT EXTENSIONS

NOTE: DETAILED BASIN MAPS REPRESENT THE FULL ANTICIPATED BUILD OUT OF ALL AREAS TRIBUTARY TO POND D

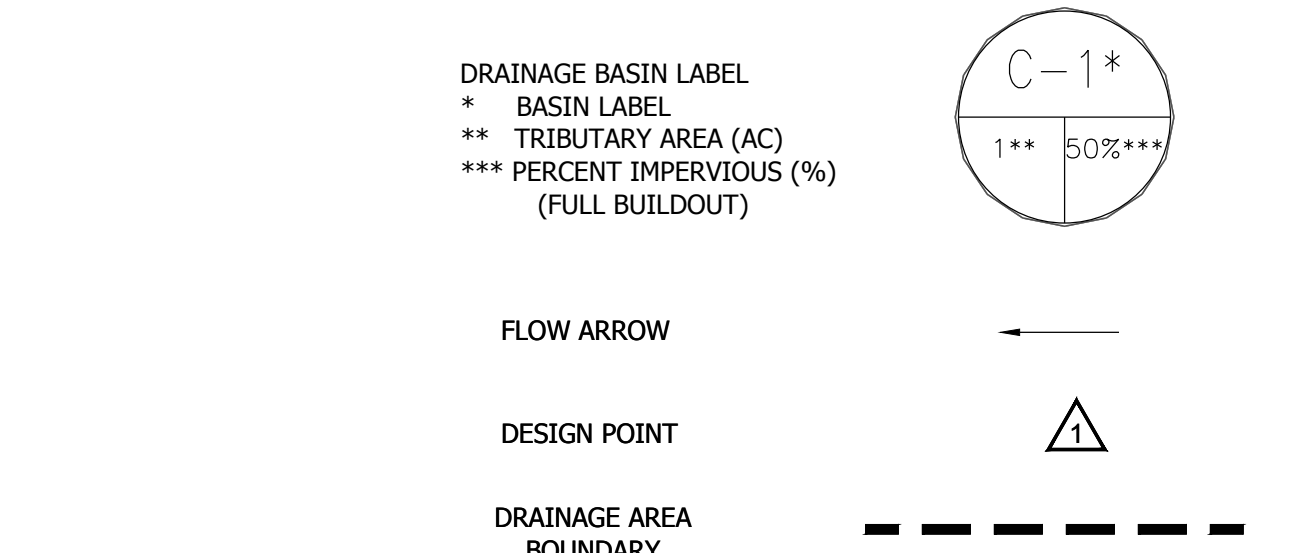


Know what's below.  
Call before you dig.



KEY MAP  
N.T.S.

EXISTING	DESCRIPTION	PROPOSED
---	PROPERTY LINE	---
---	EASEMENT	---
---	EDGE OF PAVEMENT	---
---	VERTICAL CURB AND GUTTER	---
---	SPILL GUTTER	---
---	TRANSITION GUTTER	---
---	MAJOR CONTOUR	---
---	MINOR CONTOUR	---
---	STORM SEWER PIPE	---
---	STORM SEWER MANHOLE	---
---	STORM SEWER INLET	---
---	STORM SEWER FLARED END SECTION	---
---	STORM SEWER HEADWALL	---

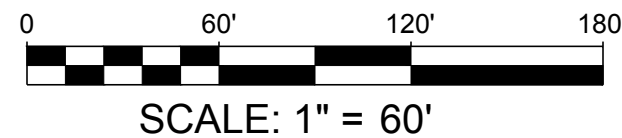


BASIN SUMMARY TABLE

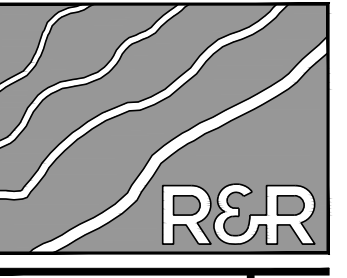
Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
C2.1	0.77	1.1	2.7
C2.2	0.33	0.6	1.4
C2.3	1.81	2.1	5.2
C2.4	1.16	4.1	7.8
C2.5	9.61	14.2	34.6
C3.0	35.40	22.0	72.7
D1.1	1.73	6.7	12.2
D1.2	2.56	3.4	8.3
D1.3	2.02	3.1	7.5
D1.4	3.75	5.4	12.7
D1.5	9.88	31.6	57.6
D1.6	1.96	2.6	6.3
D1.7	1.56	2.1	5.0
D1.8	1.27	1.8	4.3
D1.9	0.54	0.9	2.1
D1.10	2.13	3.3	8.0
D1.11	1.23	4.0	7.7
D1.12	3.42	3.8	9.3
D1.13	3.07	10.9	19.9
D1.14	0.91	1.8	3.9
D2.0	11.90	10.30	27.7
D2.1	3.15	0.90	6.6
E1	3.92	0.30	2.8
OS-1	2.65	0.40	2.6
EC10	320.0	18.40	144.7

DESIGN POINT SUMMARY TABLE

Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
1	C2.1	0.8	1.1	2.7
2	DP1, C2.2	1.1	1.6	3.9
3A	C2.5	9.6	14.2	34.6
3B	C2.3, DP3A	12.5	14.9	36.2
4	C2.4, DP3B	13.7	17.4	41.1
5A	D1.12	3.4	3.8	9.3
5B	D1.14, DP5A	4.3	5.2	12.2
6	D1.2	2.6	3.4	8.3
7A	DP5B, DP6	6.9	8.0	19.0
7B	D1.13	3.1	10.9	19.9
7C	D1.1	1.7	6.7	12.2
7D	DP7B, DP7C	4.8	16.7	30.3
7E	DP7D, DP7A	11.7	19.3	39.7
8	D1.3	2.0	3.1	7.5
9	DP7, DP8	13.7	20.5	42.7
10	DP9, D1.4	17.5	24.8	52.6
11	EC10, OS-1, E1	0.0	18.9	148.3
12	D1.5	9.9	31.6	57.6
13	DP12, D1.6	11.8	30.9	57.9
14	DP13, D1.7	13.4	32.9	62.8
15	DP14, D1.8	14.7	33.6	64.9
16	DP15, D1.9	15.2	34.2	66.4
17	D1.10	2.1	3.3	8.0
18	D1.11, DP17, DP10	20.8	27.4	57.8
19	DP16, DP18	36.0	53.1	106.8
20	DP19, D2.0	47.9	57.5	121.6
21	DP4, C3.0	49.1	36.7	104.9
22	D2.1, DP20, DP21	100.2	98.5	237.8
23	POND D OUTFLOW	1.2	1.2	39.6
24	CHANNEL E OUTFLOW	17.6	138.5	
EX5	DP23, DP24	18.7	177.4	



NO.	REVISION	DATE
2ND SUBMISSION		9/1/22
3RD SUBMISSION		01/09/23



ENGINEERS SURVEYORS

R&R ENGINEERS-SURVEYORS, INC.  
1635 WEST 13TH AVENUE, SUITE 310  
DENVER, COLORADO 80204  
PHONE: 303-753-6730

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MAYBERRY PUD PH1 - FILING NO. 3  
MAYBERRY, COLORADO SPRINGS  
EL PASO COUNTY  
MAYBERRY COMMUNITIES, LLC  
3296 DEVINE HEIGHTS #208  
COLORADO SPRINGS, CO 80922

CONSTRUCTION DOCUMENTS

JOB NO. MC22110  
ORG. SUBM. DATE 06/16/2022  
DWN: LAO CHKD: CJJD

FILING 3  
DETAILED  
DRAINAGE PLAN -  
NORTH EAST

D1.3

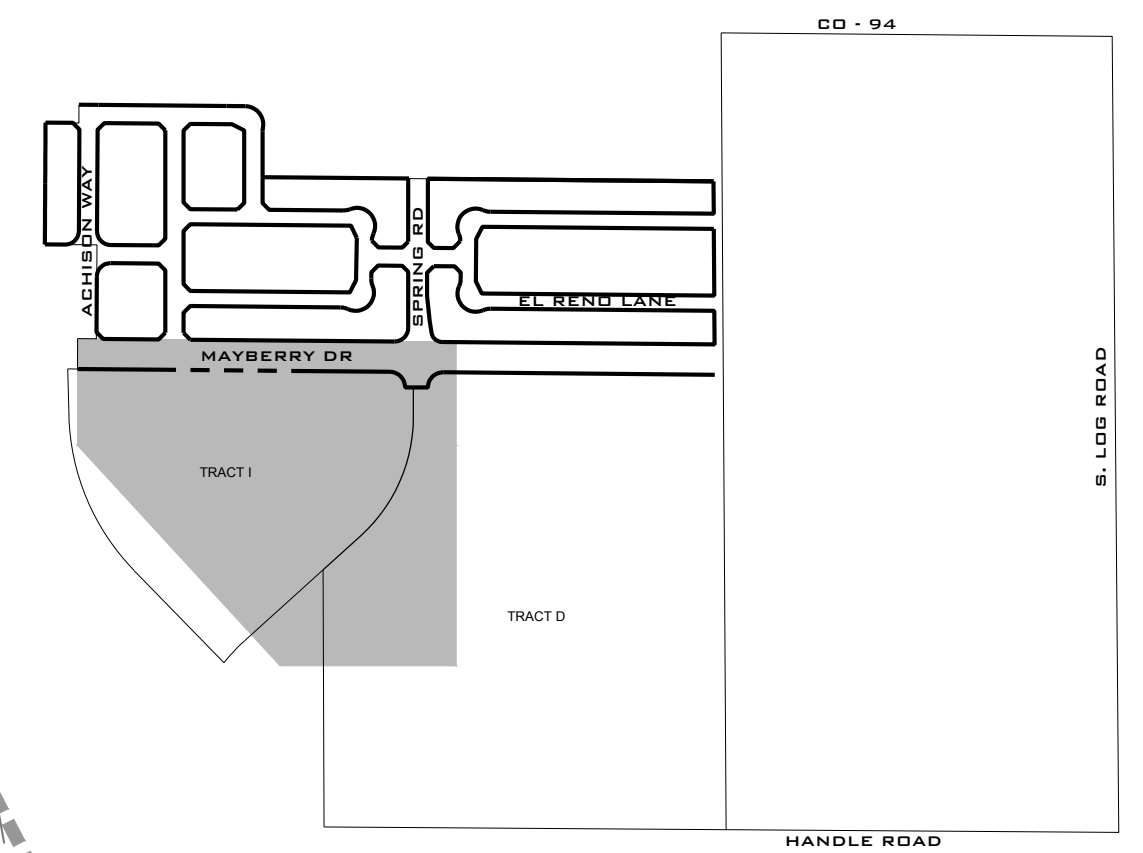
MAYBERRY DRIVE



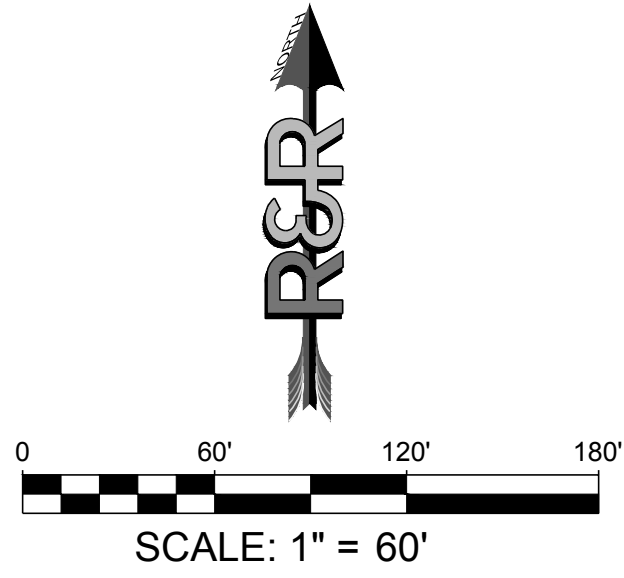
CDOT NOTE: MAINTAIN EXISTING ROADSIDE DITCH DRAINAGE PATTERNS & EXTEND EXISTING CULVERTS AS REQUIRED BASED ON SH94 IMPROVEMENTS; PROVIDE RIPRAP APRONS & EROSION CONTROL FOR ALL CULVERT EXTENSIONS

NOTE: DETAILED BASIN MAPS REPRESENT THE FULL ANTICIPATED BUILD OUT OF ALL AREAS TRIBUTARY TO POND D

Know what's below. Call before you dig.



KEY MAP N.T.S.



DESIGN POINT SUMMARY TABLE

Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
1	C2.1	0.8	1.1	2.7
2	DP1, C2.2	1.1	1.6	3.9
3A	C2.5	9.6	14.2	34.6
3B	C2.3, DP3A	12.5	14.9	36.2
4	C2.4, DP3B	13.7	17.4	41.1
5A	D1.12	3.4	3.8	9.3
5B	D1.14, DP5A	4.3	5.2	12.2
6	D1.2	2.6	3.4	8.3
7A	DP5B, DP6	6.9	8.0	19.0
7B	D1.13	3.1	10.9	19.9
7C	D1.1	1.7	6.7	12.2
7D	DP7B, DP7C	4.8	16.7	30.3
7E	DP7D, DP7A	11.7	19.3	39.7
8	D1.3	2.0	3.1	7.5
9	DP7, DP8	13.7	20.5	42.7
10	DP9, D1.4	17.5	24.8	52.6
11	EC10, OS-1, E1	0.0	18.9	148.3
12	D1.5	9.9	31.6	57.6
13	DP12, D1.6	11.8	30.9	57.9
14	DP13, D1.7	13.4	32.9	62.8
15	DP14, D1.8	14.7	33.6	64.9
16	DP15, D1.9	15.2	34.2	66.4
17	D1.10	2.1	3.3	8.0
18	D1.11, DP17, DP10	20.8	27.4	57.8
19	DP16, DP18	36.0	53.1	106.8
20	DP19, D2.0	47.9	57.5	121.6
21	DP4, C3.0	49.1	36.7	104.9
22	D2.1, DP20, DP21	100.2	98.5	237.8
23	POND D OUTFLOW		1.2	39.6
24	CHANNEL E OUTFLOW		17.6	138.5
EXS	DP23, DP24		18.7	177.4

EXISTING DESCRIPTION PROPOSED

- PROPERTY LINE
- EASEMENT
- EDGE OF PAVEMENT
- VERTICAL CURB AND GUTTER
- SPILL GUTTER
- TRANSITION GUTTER
- MAJOR CONTOUR
- MINOR CONTOUR
- STORM SEWER PIPE
- STORM SEWER MANHOLE
- STORM SEWER INLET
- STORM SEWER FLARED END SECTION
- STORM SEWER HEADWALL
- DRAINAGE BASIN LABEL
- FLOW ARROW
- DESIGN POINT
- DRAINAGE AREA BOUNDARY

BASIN SUMMARY TABLE

Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
C2.1	0.77	1.1	2.7
C2.2	0.33	0.6	1.4
C2.3	1.81	2.1	5.2
C2.4	1.16	4.1	7.8
C2.5	9.61	14.2	34.6
C3.0	35.40	22.0	72.7
D1.1	1.73	6.7	12.2
D1.2	2.56	3.4	8.3
D1.3	2.02	3.1	7.5
D1.4	3.75	5.4	12.7
D1.5	9.88	31.6	57.6
D1.6	1.96	2.6	6.3
D1.7	1.56	2.1	5.0
D1.8	1.27	1.8	4.3
D1.9	0.54	0.9	2.1
D1.10	2.13	3.3	8.0
D1.11	1.23	4.0	7.7
D1.12	3.42	3.8	9.3
D1.13	3.07	10.9	19.9
D1.14	0.91	1.8	3.9
D2.0	11.90	10.30	27.7
D2.1	3.15	0.90	6.6
E1	3.92	0.30	2.8
OS-1	2.65	0.40	2.6
EC10	320.0	18.40	144.7

CHANNEL C2  
BOT WIDTH = 8'  
SIDE SLOPE = 4:1  
DEPTH = 3'  
NATIVE SEED

P:\DATA\10248\_103\_23\PROJECTS\MC2210\_MAYBERRY\_FLANS.DWG, FILED DATE: 1/16/2023, 2:45:20 PM, BY: LIZ JONES

REVISION

NO.	REVISION	DATE
2ND SUBMISSION		9/1/22
3RD SUBMISSION		01/09/23

**R&R ENGINEERS-SURVEYORS, INC.**  
1635 WEST 13TH AVENUE, SUITE 310  
DENVER, COLORADO 80204  
PHONE: 303-753-6730

**MAYBERRY PUD PH1 - FILING NO. 3**  
SITE ADDRESS: MAYBERRY, COLORADO SPRINGS EL PASO COUNTY  
PREPARED FOR: MAYBERRY COMMUNITIES, LLC 3296 DEVINE HEIGHTS #208 COLORADO SPRINGS, CO 80922

CONSTRUCTION DOCUMENTS

JOB NO: MC22110  
ORG. SUBM. DATE: 06/16/2022  
DWN: LAO CHKD: CJD  
NAME: FILING 3  
DETAILED DRAINAGE PLAN - SOUTH WEST

D1.4





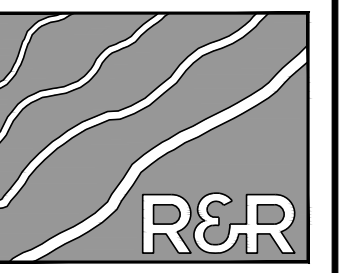
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CDOT NOTE: MAINTAIN EXISTING ROADSIDE DITCH DRAINAGE PATTERNS &  
 EXTEND EXISTING CULVERTS AS REQUIRED BASED ON SH94 IMPROVEMENTS;  
 PROVIDE RIPRAP APRONS & EROSION CONTROL FOR ALL CULVERT  
 EXTENSIONS



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NO.	REVISION	BY	DATE
2ND SUBMISSION			9/1/22
3RD SUBMISSION			01/09/23



**R&R ENGINEERS SURVEYORS**

**R&R ENGINEERS-SURVEYORS, INC.**  
 1635 WEST 13TH AVENUE, SUITE 310  
 DENVER, COLORADO 80204  
 PHONE: 303-753-6730

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MAYBERRY PUD PH1 - FILING NO. 3

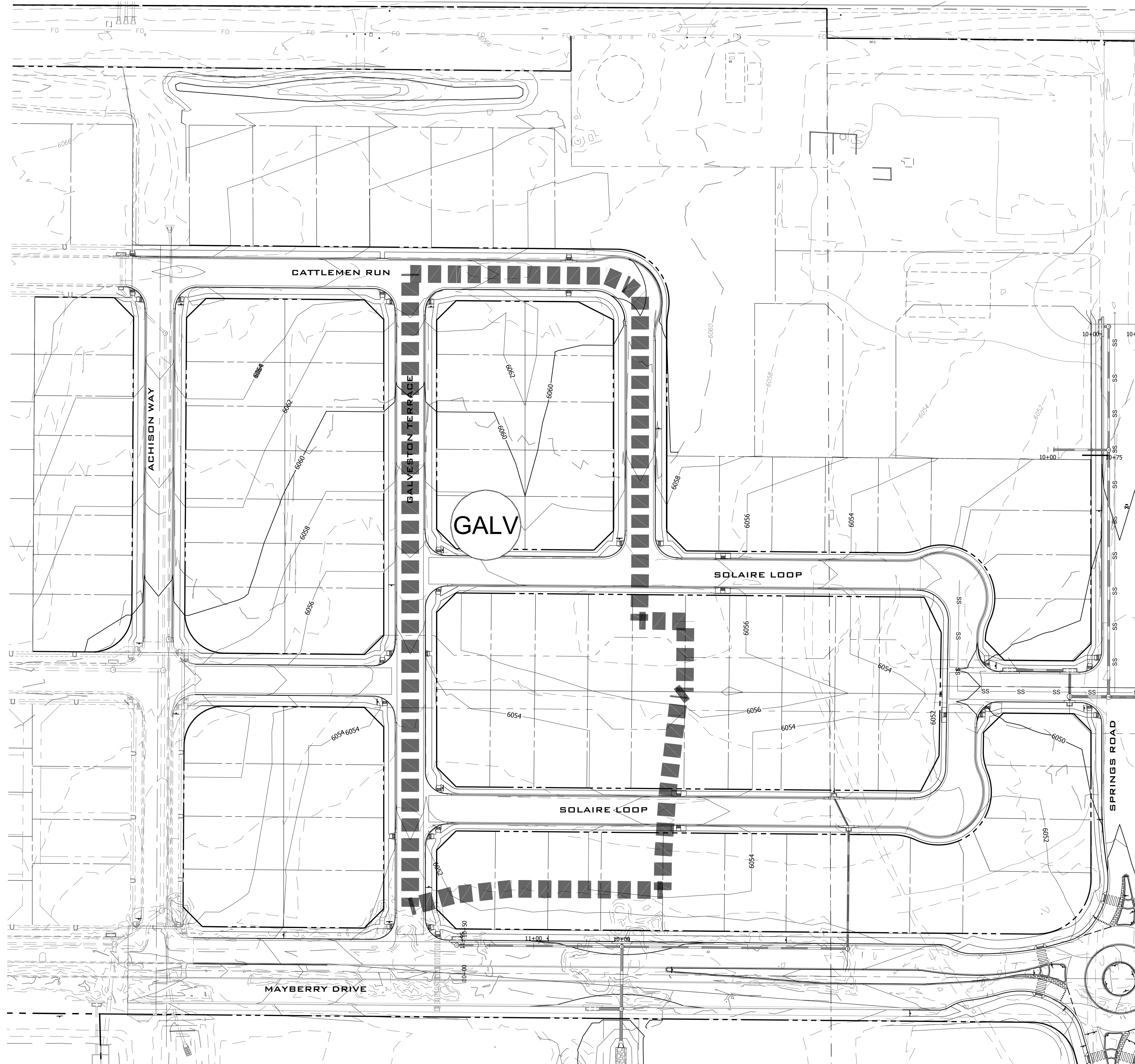
SITE ADDRESS: MAYBERRY, COLORADO SPRINGS  
 EL PASO COUNTY

PREPARED FOR: MAYBERRY COMMUNITIES, LLC  
 3296 DEVINE HEIGHTS #208  
 COLORADO SPRINGS, CO 80922

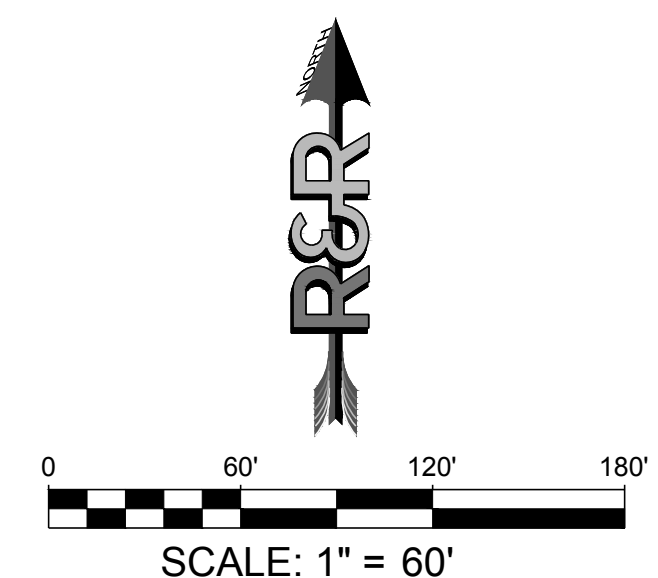
CONSTRUCTION DOCUMENTS  
 JOB NO. MC22110  
 ORG. SUBM. DATE 06/16/2022  
 DWN: LAO CHKD: CJJD  
 NAME: FILING 3

DETAILED  
 DRAINAGE PLAN -  
 GALVESTON TER.  
 NO.

D1.6



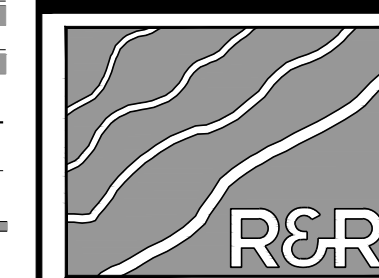
EXISTING	DESCRIPTION	PROPOSED
---	PROPERTY LINE	---
---	EASEMENT	---
---	EDGE OF PAVEMENT	---
---	VERTICAL CURB AND GUTTER	---
---	SPILL GUTTER	---
---	TRANSITION GUTTER	---
---	MAJOR CONTOUR	5825
---	MINOR CONTOUR	5822
---	STORM SEWER PIPE	---
---	STORM SEWER MANHOLE	---
---	STORM SEWER INLET	---
---	STORM SEWER FLARED END SECTION	---
---	STORM SEWER HEADWALL	---
---	DRAINAGE BASIN LABEL	---
---	* BASIN LABEL	---
---	** TRIBUTARY AREA (AC)	---
---	*** PERCENT IMPERVIOUS (%)	---
---	FLOW ARROW	---
---	DESIGN POINT	---
---	DRAINAGE AREA BOUNDARY	---





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NO.	REVISION	DATE
2ND SUBMISSION		9/1/22
3RD SUBMISSION		01/09/23



**R&R ENGINEERS-SURVEYORS, INC.**  
ENGINEERS SURVEYORS

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DENVER, COLORADO 80204  
PHONE: 303-753-6730

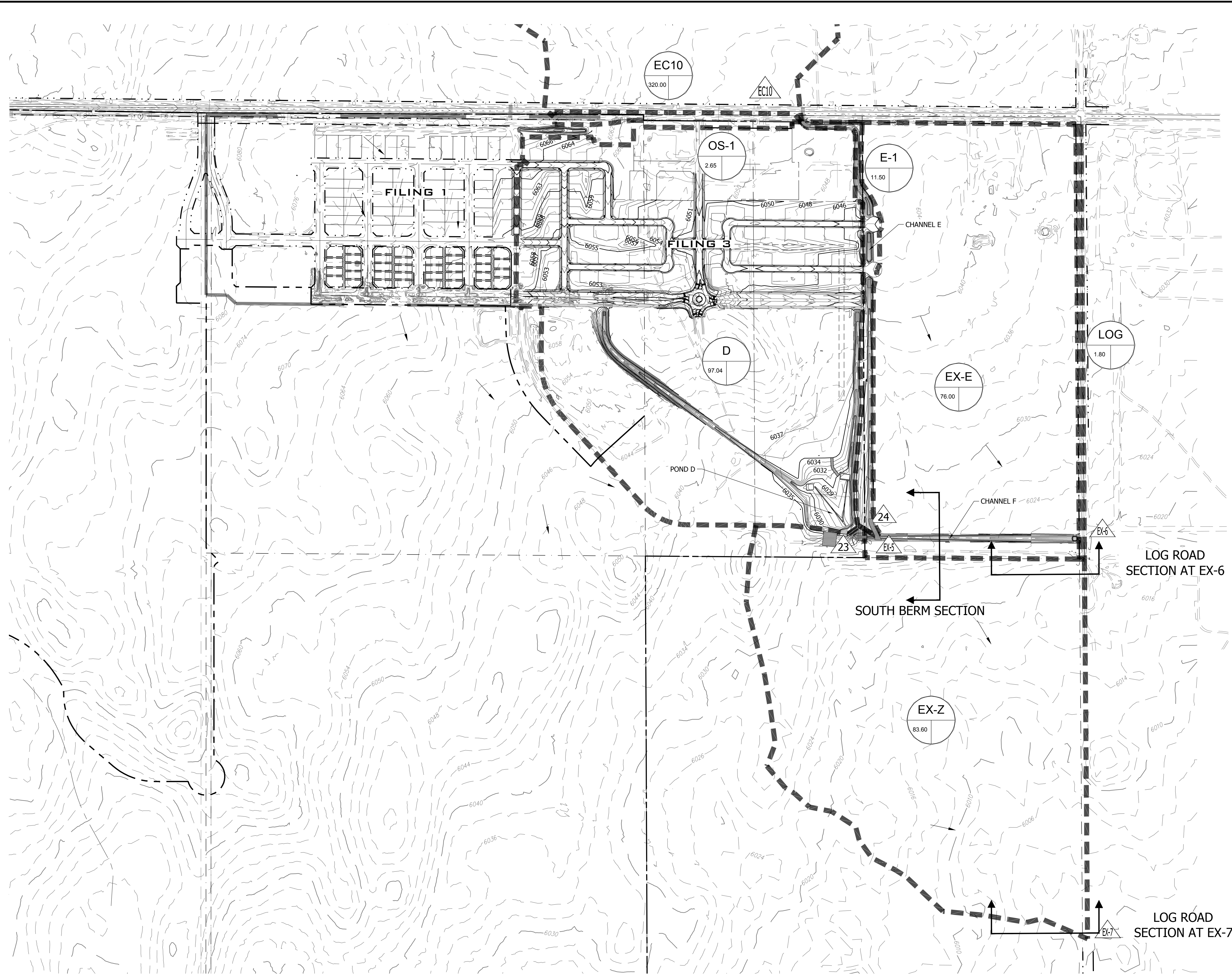
WWW.RRENGINEERS.COM

MAYBERRY PUD PH1 - FILING NO. 3  
SITE ADDRESS: MAYBERRY, COLORADO SPRINGS  
EL PASO COUNTY  
PREPARED FOR: MAYBERRY COMMUNITIES, LLC  
3296 DEVINE HEIGHTS #208  
COLORADO SPRINGS, CO 80922

CONSTRUCTION DOCUMENTS  
JOB NO. MC22110  
ORG. SUBM. DATE 06/16/2022  
DWN: LAO CHKD: CJD  
NAME

FILING 3 - LOG ROAD DRAINAGE PLAN

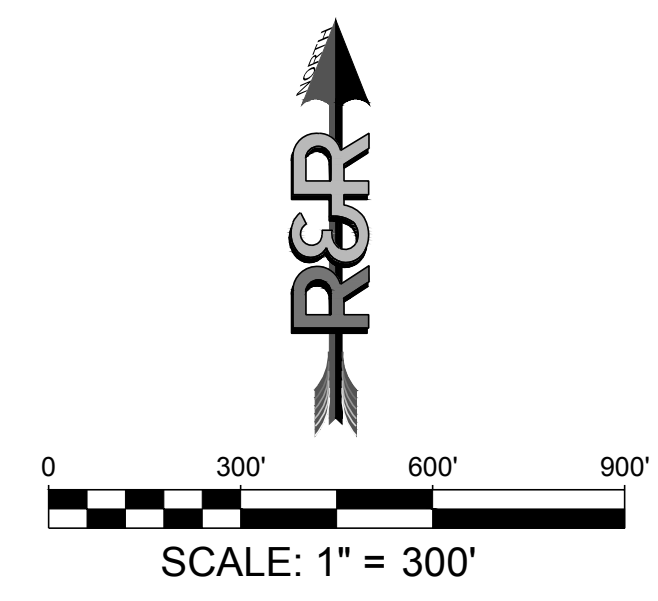
NO. D1.7



EXISTING	DESCRIPTION	PROPOSED
---	PROPERTY LINE	---
---	EASEMENT	---
---	EDGE OF PAVEMENT	---
---	VERTICAL CURB AND GUTTER	---
---	SPILL GUTTER	---
---	TRANSITION GUTTER	---
---	MAJOR CONTOUR	---
---	MINOR CONTOUR	---
---	STORM SEWER PIPE	---
---	STORM SEWER MANHOLE	---
---	STORM SEWER INLET	---
---	STORM SEWER FLARED END SECTION	---
---	STORM SEWER HEADWALL	---
---	DRAINAGE BASIN LABEL	---
---	* BASIN LABEL	---
---	** TRIBUTARY AREA (AC)	---
---	FLOW ARROW	---
---	DESIGN POINT	---
---	DRAINAGE AREA BOUNDARY	---

BASIN	AREA (AC)	5-YR (CFS)	100-YR (CFS)
EC-10	320.00	18.40	144.70
OS-1	2.65	1.40	4.30
D	93.50	98.50	237.80
E1	11.50	0.40	3.20
EX-E	76.00	5.80	51.10
LOG	1.80	3.70	6.30
EX-Z	83.60	8.20	63.40

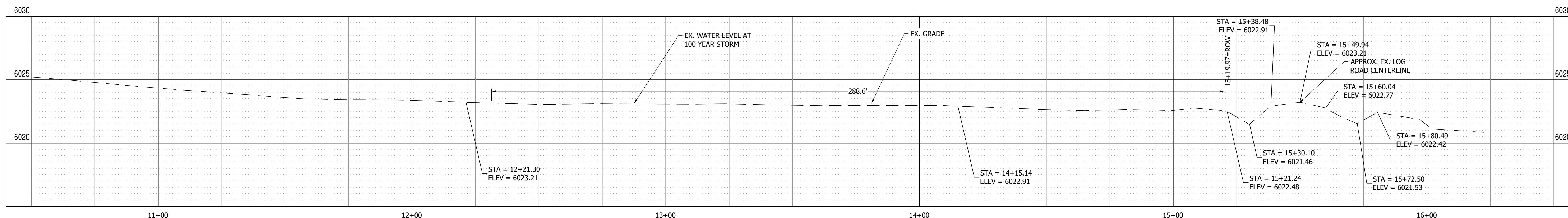
DESIGN POINT	CONTRIBUTING BASINS	5-YR (CFS)	100-YR (CFS)	100-YR (CFS) - HISTORIC
EC-10	EC-10	18.40	144.70	
23	POND D	1.20	39.60	
24	EC-10, E1	17.60	138.50	
EX-5	DP23, DP24	18.70	177.50	183.90
EX-6	DP EX-5, EX-E, LOG	21.90	204.70	231.40
EX-7	DP EX-6, EX-Z	26.50	244.50	289.90



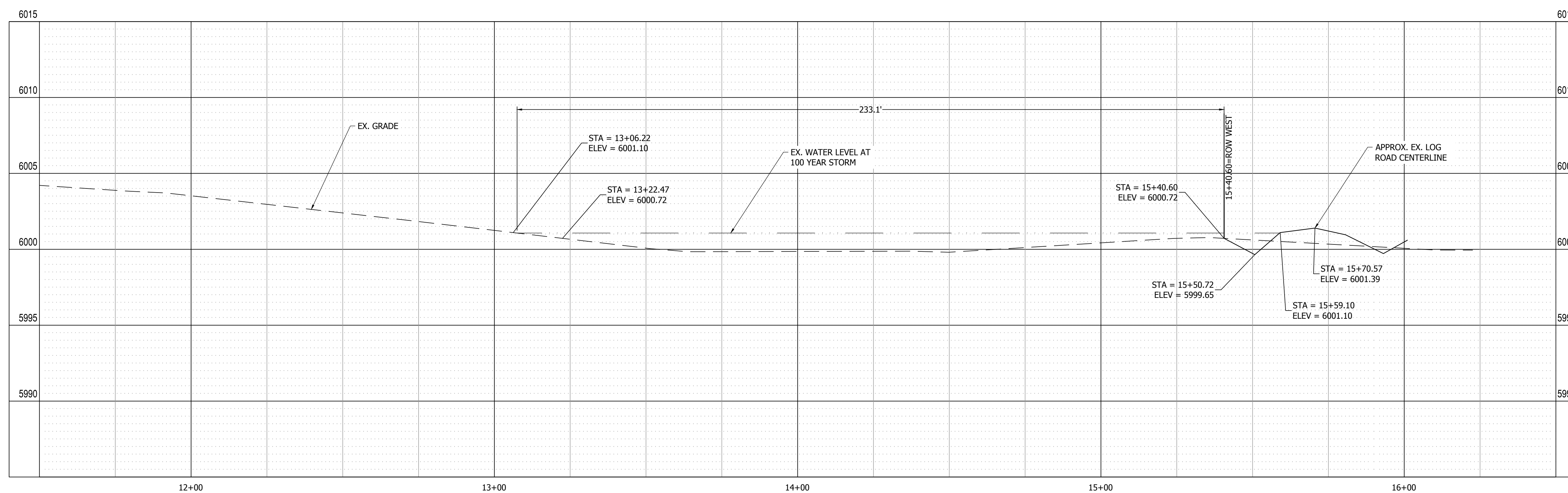
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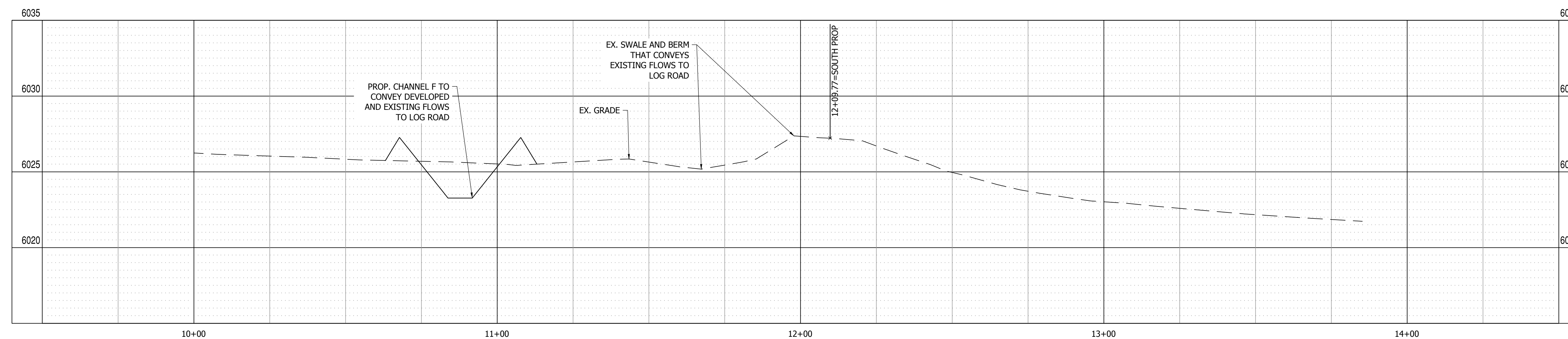
Know what's below.  
Call before you dig.



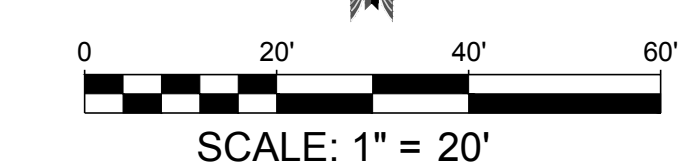
Log Road Section - EX6 PROFILE VIEW  
HORIZONTAL SCALE: 1"=20'  
VERTICAL SCALE: 1"=4'



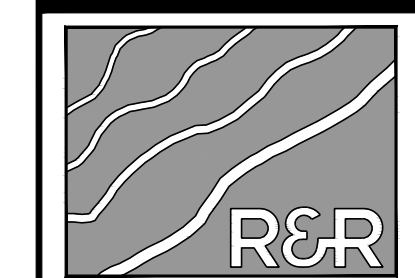
Log Road Section - EX7 PROFILE VIEW  
HORIZONTAL SCALE: 1"=20'  
VERTICAL SCALE: 1"=4'



SOUTH BERM SECTION PROFILE VIEW  
HORIZONTAL SCALE: 1"=20'  
VERTICAL SCALE: 1"=4'



NO.	REVISION	BY	DATE
	2ND SUBMISSION		9/1/22
	3RD SUBMISSION		01/09/23



ENGINEERS  
SURVEYORS

**R&R ENGINEERS-SURVEYORS, INC.**  
1635 WEST 13TH AVENUE, SUITE 310  
DENVER, COLORADO 80204  
PHONE: 303-753-6730

WWW.RRENINEERS.COM

MAYBERRY PUD PH1 - FILING NO. 3  
 SITE ADDRESS: MAYBERRY, COLORADO SPRINGS  
 EL PASO COUNTY  
 PREPARED FOR: MAYBERRY COMMUNITIES, LLC  
 3296 DEVINE HEIGHTS #208  
 COLORADO SPRINGS, CO 80922

CONSTRUCTION DOCUMENTS	
JOB NO.	MC22110
ORG. SUBM. DATE	06/16/2022
DWN.	LAO
CHKD.	CJD
NAME	

FILING 3 - LOG ROAD SECTIONS

NO. **D1.8**

PATH: \102\_108\_100\_231\_PROJECTS\MC22110\_MAYBERRY\_FLING\_NO\_3\ENGINEERING\DRAWINGS\PLAN\DRAINAGE\_MAPS\MC22110-PROP-DRN-SECT.DWG, PLOT DATE: 1/5/2023 10:56:33 AM BY: LIZ\_JONES