

STORMWATER MANAGMENT SUMMARY

FOR

PROPOSED TAKE 5 OIL CHANGE

Missouri Hwy 291
Lee's Summit, Missouri

January 17, 2024

PREPARED FOR

DRIVEN ASSESTS, L.L.C.

**1601 High Street
Boulder, CO 80302**



A handwritten signature in black ink, appearing to read "B. Guin", written over a horizontal line.

SIGNATURE:

JANUARY 17, 2025

DATE:



PREPARED BY:

**HIGH TIDE
CONSULTANTS LLC**

409 W 21ST AVENUE - SUITE B
COVINGTON, LA 70433

www.hightidela.com

Stormwater Management Summary

Introduction:

The purpose of this document is to provide a summary of the pre and post development drainage conditions for the +/- 0.49-acre site located along the west side of Highway 291, and just north of the Meineke Car Care, which is located at 320 NE 291 Hwy, Lee's Summit, MO 64086. The site is made up of a vacant grass lot which will be developed into a Take 5 Oil Change facility. This analysis will demonstrate that the proposed developments drainage system will meet the requirements set forth by the City of Lee's Summit.

Methodology:

The hydraulic calculations, for this site, were performed using the SCS Method (TR-55), in accordance with the City of Lee's Summit and APWA Sections 5602 and 5608 requirements. The proposed detention basin, and the associated water quality elements will be required to meet the standards of Comprehensive Control Strategy described in the City of Lee's Summit Design & Constuction Manual (i.e., KCAPWA Section 5600 and Lee's Summit Addendum). Hydraflow Hydrographs Extension for Autodesk Civil 3D was utilized for the detention calculations. Detention storage data can be found in the appendix of the report, under the Post Development Calculations. Points of Interest were used to determine the allowable release rate for the developed site. The site has been analyzed for the 2-year, 10-year and 100-year storm events.

Per the Kansas City Metropolitan Chapter American Public Works Association Standard Specifications & Design Criteria – Section 5600 Storm Drainage Systems & Facilities, the maximum release rate from any development under the runoff control strategies shall be as follows:

- 50% storm peak rate less than or equal to 0.5 CFS per site acre.
- 10% storm peak rate less than or equal to 2.0 CFS per site acre.
- 1% storm peak rate less than or equal to 3.0 CFS per site acre.

The site-specific allowable release rates are shown in the table below.

Allowable Release Rate (CFS):	0.5 CFS/AC X 0.49AC = 0.245 CFS	2.0 CFS/AC X 0.49AC = 0.98 CFS	3.0 CFS/AC X 0.49AC = 1.47 CFS
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Existing Conditions:

The proposed site is located along the west side of Highway 291, and just north of the Meineke Car Care, which is located at 320 NE 291 Hwy, Lee's Summit, MO 64086. The site is located on the northwest side of the intersection of SE Langsford Rd. & NE Hwy 291. The site is currently occupied by a vacant grass lot that sits on approximately 0.49 acres of pervious cover. There has not been any wetlands identified in the area where the proposed improvements will take place, and therefore, no mitigation is proposed.

The site is contained within an existing retaining wall, and it is bordered by overgrown vegetation to the north and west. There is an existing stream located to the west of the site and the approximate location of the stream buffer can be seen on the Stream Exhibit, which is included in Appendix A. Per an email from Mike Weisenborn, dated 9/12/22, "I spoke with the engineers and based on a rough estimate of the upstream drainage area the stream buffer is 100 feet on each side of the stream. This is measured from the normal high-water mark. They also indicated that the stream buffer would not apply to the area that already has a

retaining wall in place.” Therefore, since no disturbance shall take place beyond the retaining wall that is currently in place, it has been determined that the developed portion of the site, within the retaining wall, can encroach into the 100’ stream buffer.

The site receives off-site run-on from the existing strip mall to the south. This area is +/-0.1 acres, with a CN of 86. The point at which most of the off-site impervious area enters the proposed site, through a concrete flume, has been labeled as point of interest “A”.

The site has high points on the south property line and slopes northeast towards Highway 291 with a slope of approximately 5.0%. The site drains via sheet flow to an existing roadside ditch located on the eastern side of the property, along Hwy. 291. The point at which this flow exits the property is considered the point of interest “B” for the existing condition. The points of interest can be seen on the Pre-Development Drainage Plan, which is included in Appendix A.

Per the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel Number 29095C0436G, which is dated 1/20/2017, the majority of the site is located in Flood Zone X (unshaded), while a portion bordering Hwy. 291 is located in Flood Zone x (shaded).

The time of concentration for the existing condition of the Take-5 site is 13.50 minutes and the SCS Curve Number (CN) value has been determined to be 74.

The time of concentration for the off-site area is 5 minutes and the SCS Curve Number (CN) value has been determined to be 86.

The total pre-development runoff values for the site are as follows:

Storm Event/Rainfall Return Period	50% / 2 YR	10% / 10 YR	1% / 100 YR
Off-Site Runoff (Pre DA 1) (CFS):	0.380 CFS	0.663 CFS	1.177 CFS
Take-5 Site Runoff (DA 2) (CFS):	0.836 CFS	1.799 CFS	3.719 CFS
Combined Runoff (CFS):	1.074 CFS	2.213 CFS	4.461 CFS
Allowable Release Rate (CFS):	0.5 CFS/AC X 0.49AC = 0.245 CFS	2.0 CFS/AC X 0.49AC = 0.98 CFS	3.0 CFS/AC X 0.49AC = 1.47 CFS

A pre-development drainage area exhibit has been provided in Appendix A.

Proposed Development:

For the purposes of this analysis, the proposed development will consist of a 1,415 SF Take 5 Oil Change Facility along with associated parking and access drives.

The redevelopment of the site will increase the impervious area which will require the excess
Stormwater Management Study

Proposed Take 5 (1/17/2025)

runoff to be stored on site. Green space areas will be provided internally to the parking areas as well as around the entire perimeter of the site.

The Take 5 site receives off-site flow from the adjacent strip mall to the south and this will be rerouted so that it bypasses the Take 5 drainage system. Approximately 0.05 Acres, from the adjacent strip mall, flows through a flume or sheet flows onto the Take-5 site. A swale will pick up the off-site flow and route it through a trench drain which will be located under the driveway. This off-site flow will ultimately outfall into the existing roadside ditch. This will be considered point of interest "A" for the post-developed condition.

The post-developed site will be broken into two drainage areas. Drainage Area 2 is shown in green on the Post-Development Drainage Plan and is generally the west side of the site. The time of concentration for Drainage Area 2 is 7.4 minutes and the SCS Curve Number (CN) value has been determined to be 86. Drainage area 2 will be routed into an underground detention basin which is located to the east of the Take 5 building. The underground detention basin will then discharge into the roadside ditch. This will be considered point of interest "B" for the post developed condition.

Drainage Area 3 is shown in pink on the Post-Development Drainage Plan and is generally the east side of the site. The time of concentration for Drainage Area 3 is 5 minutes and the SCS Curve Number (CN) value has been determined to be 74. Drainage area 3 will freely flow offsite, and into the right of way, without being detained. This will be considered point of interest "C" for the post developed condition.

The total post-development runoff values, into the pond/underground storage, are as follows:

Storm Event/Rainfall Return Period	50% / 2 YR	10% / 10 YR	1% / 100 YR
Off-Site Runoff (Pre DA 1) (CFS):	0.248 CFS	0.384 CFS	0.630 CFS
Take-5 Site Runoff (DA 2) (CFS):	1.726 CFS	3.022 CFS	5.382 CFS
Take-5 Site Runoff (DA 3) (CFS):	0.094 CFS	0.196 CFS	0.400 CFS
Combined Detained Runoff (CFS):	0.245 CFS	0.408 CFS	1.395 CFS
Allowable Release Rate (CFS):	0.5 CFS/AC X 0.49AC = 0.245 CFS	2.0 CFS/AC X 0.49AC = 0.98 CFS	3.0 CFS/AC X 0.49AC = 1.47 CFS

A post-development drainage area exhibit has been provided in Appendix B.

Stormwater Requirements:

Drainage calculations will conform to the requirements of the City of Lee's Summit Storm Drainage Design Criteria, as well as section 5600 of the *Kansas City Metropolitan Chapter American Public Works Association Standard Specifications & Design Criteria*.

Runoff for a portion of the site shall be routed to an underground detention basin, which has been appropriately sized to reduce the post-developed runoff exiting the site. Discharge from the underground detention basin will be via an outlet structure utilizing a 2.5" orifice, and a 5.75" orifice, followed by a 15" discharge pipe.

Summary of On-Site Runoff Calculations:

Storm Event	Pre-Developed	Post-Developed	Allowable Release Rate	Calculated Underground Storage Volume	Underground Storage WSE
2-year	1.074 cfs	0.245 cfs	0.5CFS X 0.49AC = 0.245 CFS	1,727 cuft	983.41 ft
10-year	2.213 cfs	0.408 cfs	2.0CFS X 0.49AC = 0.98 CFS	3,198 cuft	984.24 ft
100-year	4.461 cfs	1.395 cfs	3.0CFS X 0.49AC = 1.47 CFS	5,488 cuft	985.69 ft

Stormwater Quality:

A stormwater treatment facility has been designed for this site. Even though there are no "Hot Spots" located within the project area, there are large amounts of impervious area. Due to the large amounts of impervious area that could contaminate the stormwater, a treatment facility is necessary. An Underground Detention facility has been utilized for detention on this site. This underground detention system contains an isolator row, which will treat the stormwater runoff. Catch basin inserts have also been added to supplement the underground detention.

The Underground Detention Basin, that has been provided for this Take 5, will be a privately maintained and operated facility. Maintenance and inspections shall follow the activities and frequencies listed in Appendix B.

Storm Water Pollution Prevention Plan (SWPPP):

Since the total disturbed area is only +/-0.66 acres, and since it does not exceed 1 acre, a SWPPP will not be required. However, erosion control plans and details have been provided for the contractor to implement during construction.

Downstream Analysis:

Per the attached Watershed Report, which can be viewed in Appendix A, the size of the overall catchment area is 2.16km² (+/-533.74 acres). The area where improvements are being

Stormwater Management Study

Proposed Take 5 (1/17/2025)

made is +/-0.49 acres (0.09% of the overall catchment area). Therefore, since our site is significantly less than 10% of the overall catchment area, our site will not increase the flooding potential downstream of the site where the runoff from our site meets the existing stream.

Conclusion:

All the referenced material and supporting documentation can be found below. The proposed detention basin, and the associated water quality elements meets the standards of Comprehensive Control Strategy described in the City of Lee's Summit Design & Construction Manual (i.e., KCAPWA Section 5600 and Lee's Summit Addendum).

Appendix A

TOPOGRAPHIC SURVEY

SURVEY PREPARED FOR
DRIVEN ASSETS, LLC
2101 PEARL STREET
BOULDER, CO. 80302
TODD MINIS, MANAGING PARNTER
todd@drivenassets.com

SURVEY NOTES

1. INFORMATION AS SHOWN FOR UNDERGROUND UTILITIES HAS BEEN COMPILED FROM THE RECORDS OF VARIOUS UTILITY COMPANIES CONCERNED, AND AS MARKED IN THE FIELD BY THE MISSOURI ONE CALL SYSTEM, 1 (800) 344-7483. WHEN PRECISE LOCATIONS OF UNDERGROUND UTILITIES ARE NEEDED PRIOR TO EXCAVATION OR CONNECTIONS, THE VARIOUS UTILITY COMPANIES CONCERNED ARE TO FURNISH A CREW TO POINT OUT THE LOCATIONS AT THE JOB SITE. Missouri One Call Ticket #232351453.
3. CONTOURS SHOWN HEREON ARE 1 FOOT INTERVALS AND BASED NAVD88.
4. BASIS OF BEARINGS: MISSOURI STATE PLANE, WEST ZONE.
5. CLASS OF SURVEY: URBAN
6. WE HAVE REVIEWED THE "FLOOD INSURANCE RATE MAP", COMMUNITY PANEL NO. 29095C0436G HAVING AN EFFECTIVE JANUARY 20, 2017 AS PUBLISHED BY FEDERAL EMERGENCY MANAGEMENT AGENCY. OUR REVIEW OF THIS MAP INDICATES THAT THIS PARCEL OF LAND LIES WITHIN ZONE X OTHER FLOOD AREAS, WHICH IS "AREAS OF 0.2%; 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 FORM 1% ANNUAL CHANCE FLOOD."

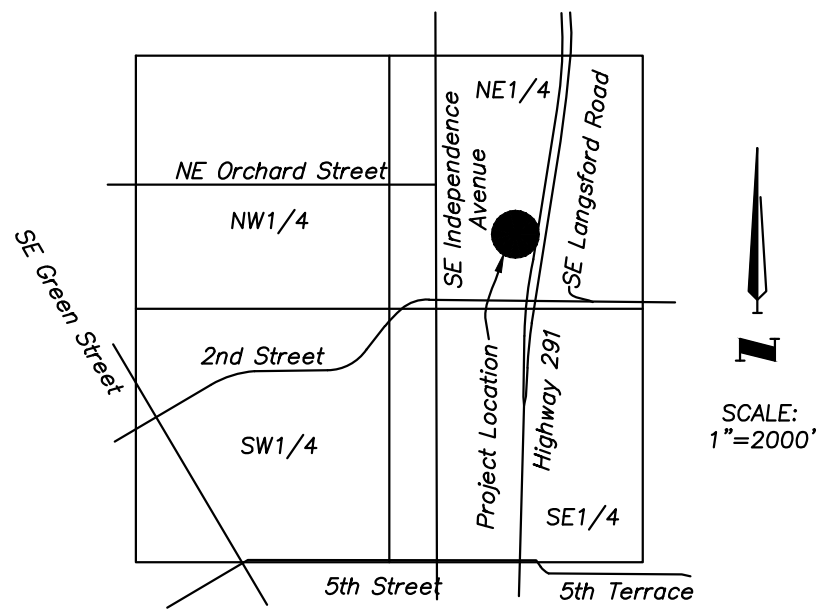
LEGAL DESCRIPTION PER TITLE COMMITMENT

TRACT I:

THE SOUTH 150 FEET OF THE EAST 150 FEET OF THE NORTH 300 FEET OF THE SOUTH 802 FEET OF THE EAST 880 FEET OF THE WEST ONE HALF OF THE NORTHEAST QUARTER OF SECTION 5, TOWNSHIP 47, RANGE 31, IN LEE'S SUMMIT, JACKSON COUNTY, MISSOURI, MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE SOUTHWEST CORNER OF THE NORTHEAST QUARTER OF SAID SECTION 5, TOWNSHIP 47, RANGE 31; THENCE SOUTH 89 DEGREES, 22 MINUTES, 09 SECONDS EAST ALONG THE SOUTH LINE OF THE WEST ONE HALF OF SAID QUARTER SECTION, A DISTANCE OF 1321.26 FEET TO THE SOUTHEAST CORNER OF SAID WEST ONE HALF; THENCE NORTH 00 DEGREES, 40 MINUTES, 00 SECONDS EAST ALONG THE EAST LINE OF SAID WEST ONE HALF, A DISTANCE OF 602.00 FEET TO THE POINT OF BEGINNING; THENCE NORTH 89 DEGREES, 22 MINUTES, 09 SECONDS EAST, PARALLEL WITH THE SOUTH LINE OF SAID WEST ONE HALF, A DISTANCE OF 150.00 FEET; THENCE NORTH 00 DEGREES, 40 MINUTES, 00 SECONDS EAST, PARALLEL WITH THE EAST LINE OF SAID WEST ONE HALF, A DISTANCE OF 150.00 FEET; THENCE SOUTH 89 DEGREES, 22 MINUTES, 09 SECONDS EAST, PARALLEL WITH THE SOUTH LINE OF SAID WEST ONE HALF, A DISTANCE OF 150.00 FEET TO A POINT ON THE EAST LINE OF SAID WEST ONE HALF, THENCE SOUTH 00 DEGREES, 40 MINUTES, 00 SECONDS WEST ALONG SAID EAST LINE, A DISTANCE OF 150.00 FEET TO THE POINT OF BEGINNING.

TRACT II:

COMMENCING AT THE SOUTHWEST CORNER OF THE EAST 1/2 OF THE NORTHEAST 1/4 OF SECTION 5, TOWNSHIP 47, RANGE 31, LEE'S SUMMIT, JACKSON COUNTY, MISSOURI; THENCE ALONG THE WEST LINE OF SAID 1/2 OF 1/4 SECTION NORTH 2 DEGREES, 33 MINUTES, 49 SECONDS EAST 602 FEET TO THE TRUE POINT OF BEGINNING OF THIS TRACT; THENCE ALONG SAID WEST LINE NORTH 2 DEGREES, 33 MINUTES, 49 SECONDS EAST 478.79 FEET; THENCE SOUTH 88 DEGREES, 27 MINUTES, 48 SECONDS EAST 152.53 FEET TO A POINT ON THE WEST LINE OF THE RIGHT-OF-WAY OF M-291; THENCE ALONG SAID RIGHT-OF-WAY LINE AS FOLLOWS: SOUTH 15 DEGREES, 32 MINUTES, 36 SECONDS WEST 73.03 FEET TO A POINT 135 FEET OPPOSITE CENTER LINE STATION 117+00; THENCE SOUTH 11 DEGREES, 23 MINUTES, 57 SECONDS WEST 200 FEET TO A POINT 135 FEET OPPOSITE CENTER LINE STATION 119+00; THENCE SOUTH 1 DEGREE, 11 MINUTES, 44 SECONDS WEST 101.61 FEET TO A POINT 117 FEET OPPOSITE CENTER LINE STATION 120+00; THENCE PARALLEL TO SAID CENTER LINE SOUTH 11 DEGREES, 23 MINUTES, 57 SECONDS WEST 50 FEET; THENCE SOUTH 64 DEGREES, 21 MINUTES, 40 SECONDS WEST 66.40 FEET TO A POINT 170 FEET OPPOSITE CENTER LINE STATION 120+90; THENCE PARALLEL TO SAID CENTER LINE SOUTH 11 DEGREES, 23 MINUTES, 57 SECONDS WEST 31.03 FEET; THENCE LEAVING SAID RIGHT-OF-WAY NORTH 87 DEGREES, 26 MINUTES, 43 SECONDS WEST 35.61 FEET TO THE TRUE POINT OF BEGINNING



VICINITY MAP
5-47-31

LEGEND

- GA = GUY ANCHOR
- MS = METAL SIGN
- PP = POWER POLE
- SSMH = SANITARY SEWER MANHOLE
- SC = SECTION CORNER
- SCO = SEWER CLEAN OUT
- W = WATER MARKER
- WV = WATER VALVE
- WS = WOOD SIGN
- B = BOLLARD
- PM = GAS METER
- LP = LIGHT POLE w/CONC. BASE

- CP 50
1/2" IRON BAR WITH SKW TRAVERSE CAP
1. NORTH 3.0 FEET TO THE SOUTH EDGE OF AN ASPHALT ENTRANCE.
2. SOUTHWEST 8.5 FEET TO THE WEST CURB RETURN.
3. SOUTHEAST 24.0 FEET TO THE SOUTH END OF AN 18" CMP.

- CP 51
1/2" IRON BAR WITH SKW CAP
1. EAST 10.50 FEET TO THE WEST EDGE OF HIGHWAY 291.
2. WEST 15.5 FEET TO THE EAST EDGE OF A CONCRETE FLUME.

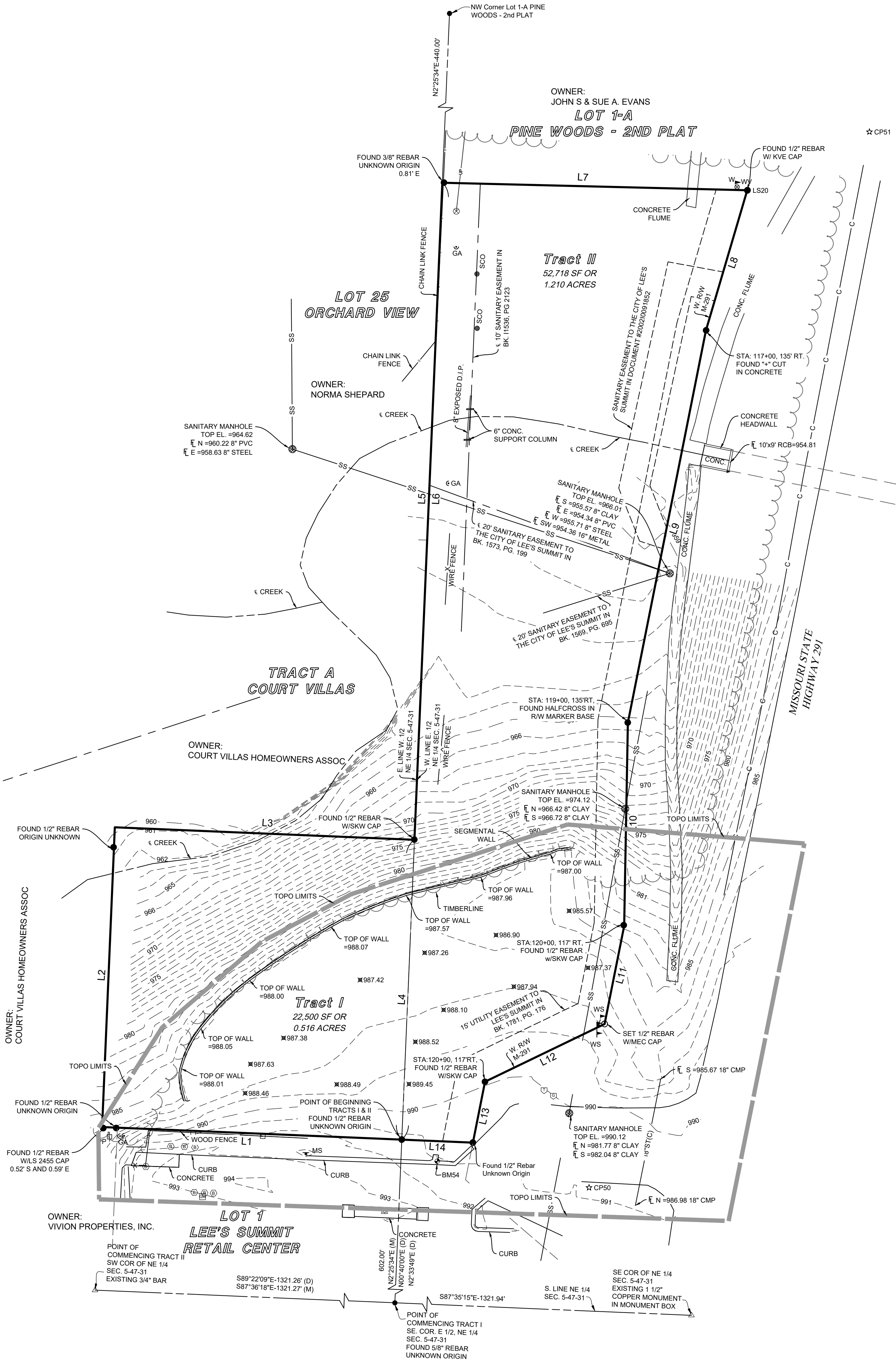
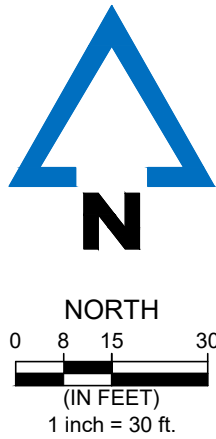
- CP 52
MAG & SHINER IN THE TOP OF A CURB AT THE NORTH END OF YELLOW NO PARKING.
1. WEST 28.0 FEET TO THE EAST END OF AN ISLAND.
2. EAST 41.8 FEET TO THE WEST EDGE OF HIGHWAY 291.
3. SOUTH 36.8 FEET TO A FIRE HYDRANT.

- BENCHMARK 53
ELEV.: 994.99
SET + CUT THE NORTH BOLT TOP FLANGE OF A FIRE HYDRANT ±150' SOUTHEAST OF THE SOUTHEAST CORNER OF THIS SURVEY.

- BENCHMARK 54
ELEV.: 991.62
EXISTING SQUARE CUT ON BACK OF CURB 50'± EAST NORTHEAST OF THE NORTHEAST CORNER OF MEINEKE ON THE NORTH SIDE DRIVE AT THE FLUME.

PROJECT CONTROL POINTS TABLE				
CP#	NORTHING	EASTING	ELEV.	DESCRIPTION
50	1002321.14'	2828279.79'	990.78'	CP 50
51	1002848.95'	2828419.99'	979.14'	CP 51
52	1001994.38'	2828211.00'	997.15'	CP 52
53	1002195.40'	2828248.41'	994.99'	BM 53
54	1002334.35'	2828203.90'	991.68'	BM 54

LINE TABLE		
LINE NO.	BEARING	DISTANCE
L1	N87°36'18"W (M) N89°22'09"E (D)	150.00'
L2	N2°25'34"E (M) N00°40'00"E (D)	150.00'
L3	S89°22'09"E (D) S87°36'18"E (M)	150.00'
L4	N00°40'00"E (D) N2°25'34"E (M)	150.00'
L5	N2°33'48"E (D) N2°25'34"E (M)	328.79'
L6	N2°33'48"E (D) N2°25'34"E (M)	478.79'
L7	S88°27'48"E (D) S89°38'03"E (M)	152.53'
L8	S16°24'21"W (M) S16°32'38"W (D)	73.03'
L9	N11°15'42"W (M) S11°23'57"W (D)	200.00'
L10	S11°11'44"W (D) S1°03'29"W (D)	101.61'
L11	S11°15'42"W (M) S11°23'57"W (D)	50.00'
L12	S64°13'25"W (M) S64°21'40"W (D)	66.40'
L13	S11°15'42"W (M) S11°23'57"W (D)	31.03'
L14	N87°34'58"W (M) N87°26'43"W (D)	35.61'



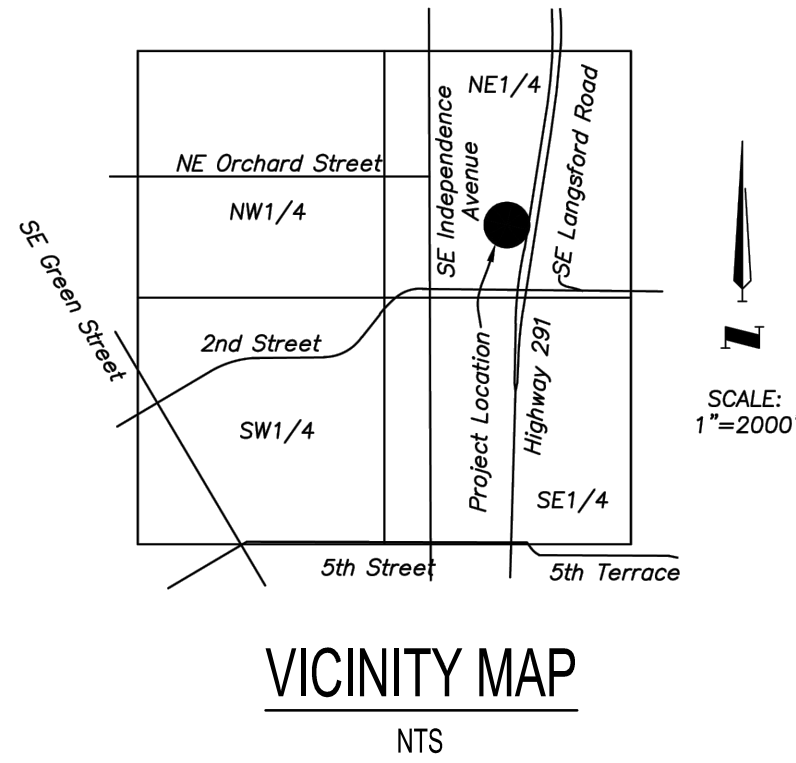
UTILITY WARNING

THE UTILITIES DEPICTED ON THIS DOCUMENT HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND/OR RECORDS OBTAINED. THE SURVEYOR MAKES NO GUARANTEE THAT THE UTILITIES OR SUBSURFACE FEATURES SHOWN COMPRISE ALL SUCH ITEMS IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UTILITIES OR SUBSURFACE FEATURES SHOWN ARE IN THE EXACT LOCATION INDICATED EXCEPT WHERE NOTED AS QUALITY LEVEL A.

TOPOGRAPHIC SURVEY

ENGINEER		DRAWN BY		REVISIONS	
J. BURNETTE		J. BURNETTE		LEE'S SUMMIT, JACKSON CO. MISSOURI	
S. WHITAKER		CREW CHIEF		SEC. 5-747-R31	
SHEET NO.		2023001249-000		9/13/2023	
01/01					





Not For Construction
STREAM EXHIBIT

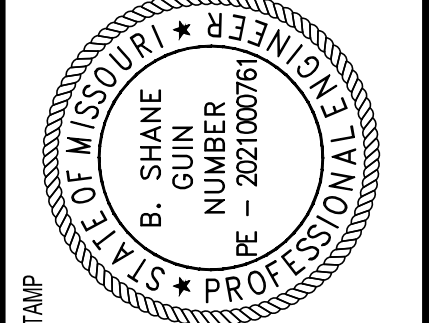
SCALE IN FEET
40 20 0 40 80 120

REVISION	BY

HIGH TIDE
CONSULTANTS LLC
434 N. COLUMBIA ST, SUITE 200A
COVINGTON, LA 70433
www.hightidelc.com




SIGNATURE
DATE: SEPTEMBER 8, 2023


STAMP
B. SHANE
GUIN
NUMBER
PE - 202100076
STATE OF MISSOURI
PROFESSIONAL ENGINEER

PROPOSED TAKE 5
LEE'S SUMMIT, MISSOURI

FOR DRIVEN ASSETS, LLC
2101 PEARL STREET
BOULDER, CO 80302

DRAWN KRG
CHECKED RCG
ISSUED DATE 09/08/23
ISSUED FOR REVIEW
PROJECT NO. 22-218
FILE 22-218 EX Stream Buffer Exhibit
SHEET
ZONE-EX

National Flood Hazard Layer FIRMMette



94°22'3"W 38°55'24"N



Legend

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

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
OTHER FEATURES		Levee, Dike, or Floodwall
		Cross Sections with 1% Annual Chance Water Surface Elevation
MAP PANELS		Digital Data Available
		No Digital Data Available
MAP PANELS		Unmapped
		The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.



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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/29/2022 at 11:09 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

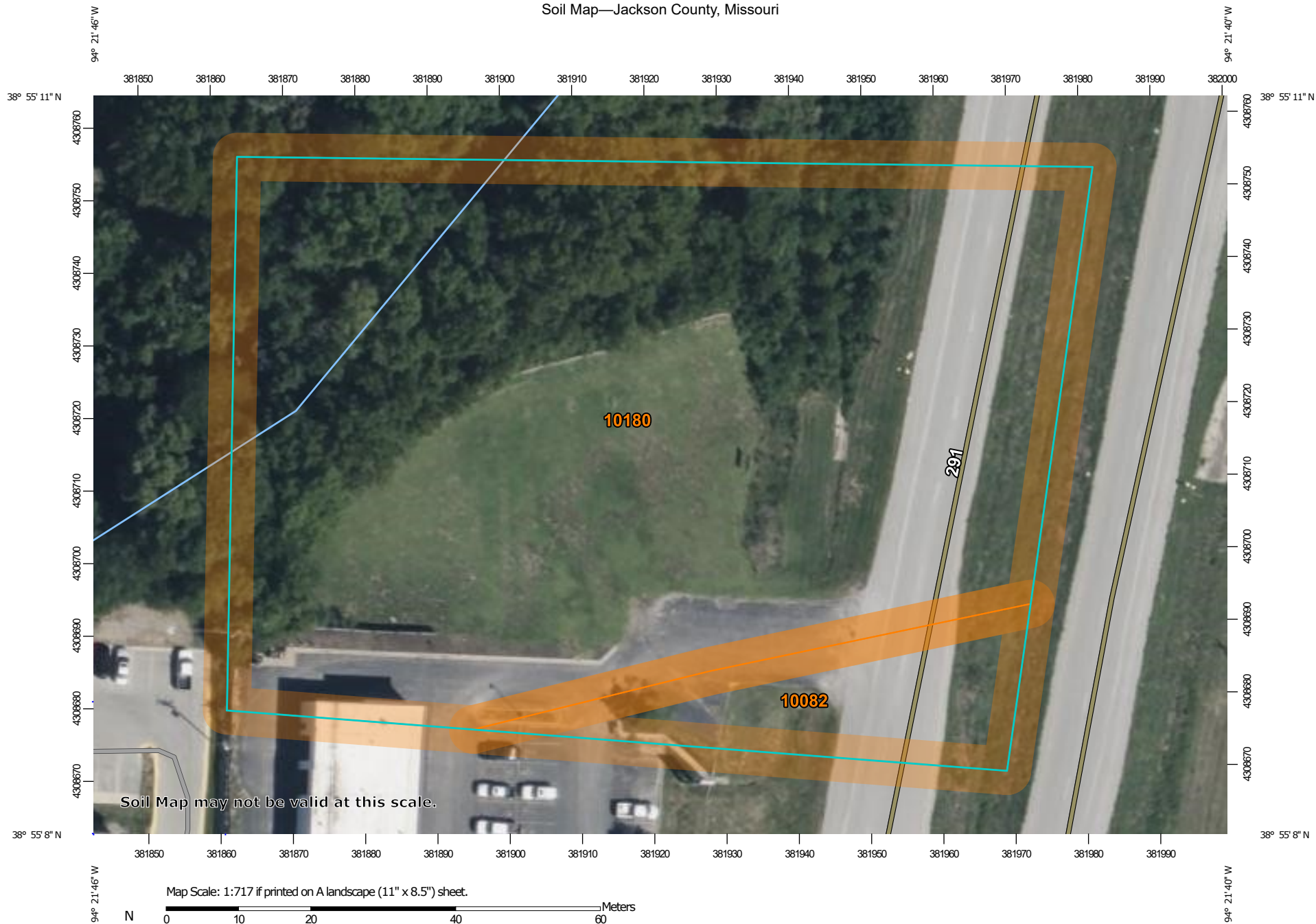
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory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

0 250 500 1,000 1,500 2,000 Feet 1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

94°21'25"W 38°54'56"N

Soil Map—Jackson County, Missouri



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

5/21/2024
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Jackson County, Missouri

Survey Area Data: Version 25, Aug 22, 2023

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

Date(s) aerial images were photographed: Aug 30, 2022—Sep 8, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	0.2	9.8%
10180	Udarents-Urban land-Sampsel complex, 2 to 5 percent slopes	2.0	90.2%
Totals for Area of Interest		2.2	100.0%

Jackson County, Missouri

10082—Arisburg-Urban land complex, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2w7ld

Elevation: 750 to 1,130 feet

Mean annual precipitation: 39 to 45 inches

Mean annual air temperature: 50 to 55 degrees F

Frost-free period: 177 to 220 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Arisburg and similar soils: 61 percent

Urban land: 30 percent

Minor components: 9 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arisburg

Setting

Landform: Interfluves

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Loess

Typical profile

Ap - 0 to 6 inches: silt loam

A - 6 to 13 inches: silt loam

Bt - 13 to 19 inches: silty clay loam

Btg - 19 to 56 inches: silty clay loam

BCg - 56 to 79 inches: silty clay loam

Properties and qualities

Slope: 1 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: About 18 to 30 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: C
Ecological site: R107XB007MO - Loess Upland Prairie
Hydric soil rating: No

Description of Urban Land

Interpretive groups

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

Minor Components

Sampsel

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Concave
Ecological site: R109XY010MO - Interbedded Sedimentary Upland
Savanna
Hydric soil rating: Yes

Greenton

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R109XY002MO - Loess Upland Prairie
Hydric soil rating: No

Sharpsburg

Percent of map unit: 3 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R109XY002MO - Loess Upland Prairie
Hydric soil rating: No

Data Source Information

Soil Survey Area: Jackson County, Missouri
Survey Area Data: Version 25, Aug 22, 2023

Jackson County, Missouri

10180—Udarents-Urban land-Sampsel complex, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1n85h

Elevation: 600 to 900 feet

Mean annual precipitation: 33 to 43 inches

Mean annual air temperature: 50 to 57 degrees F

Frost-free period: 175 to 220 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Udarents and similar soils: 46 percent

Urban land: 39 percent

Sampsel and similar soils: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udarents

Setting

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Crest

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Mine spoil or earthy fill

Typical profile

C1 - 0 to 5 inches: silt loam

C2 - 5 to 80 inches: silty clay loam

Properties and qualities

Slope: 2 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat poorly drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water

(Ksat): Moderately low to moderately high (0.14 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Ecological site: R107XB002MO - Deep Loess Upland Prairie
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: No

Description of Urban Land

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Across-slope shape: Convex

Interpretive groups

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

Description of Sampsel

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from shale

Typical profile

Ap - 0 to 13 inches: silty clay loam
Bt - 13 to 80 inches: silty clay

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Ecological site: R109XY010MO - Interbedded Sedimentary Upland Savanna

Other vegetative classification: Grass/Prairie (Herbaceous
Vegetation)

Hydric soil rating: No

Data Source Information

Soil Survey Area: Jackson County, Missouri

Survey Area Data: Version 25, Aug 22, 2023

Watershed Report

The Watershed Report provides a variety of stream, catchment and watershed related information from the [National Hydrography Dataset Plus](#) (NHDPlus Version 2) and other sources including the extensive collection of [StreamCat](#) landscape layers. A catchment is the local area draining directly to the selected stream segment. A watershed is the drainage area extending from the downstream end of the stream segment (outlet) upstream to the headwaters. The map displays the stream segment and catchment.



For the stream segment	Value
Stream Name	Not Available
Stream Order	1
Stream Level	6
Mean annual flow volume (estimate)	1.46 cfs
Mean annual flow velocity (estimate)	0.75 fps
Stream Length	1.68 km
Stream Time of Travel (estimate)	0.08 days

View catchment and watershed data from either the NHDPlus or StreamCat datasets by clicking on the appropriate tab below:

[NHDPlus Catchment and Watershed Data](#)

[StreamCat Catchment and Watershed Data](#)

For the catchment (local area draining directly to the selected stream segment)

Metrics	Catchment Total
Catchment area measurement	2.16 km ²
Mean annual temperature	12.38 °C
Mean annual precipitation	1,065.53 mm

2011 National Land Cover Dataset	Catchment Total
Open Water (11)	0.46%
Low Intensity Residential (21)	17.25%
Commercial (23)	19.66%
Deciduous Forest (41)	0%
Evergreen Forest (42)	0%
Mixed Forest (43)	0%
Other	62.64%

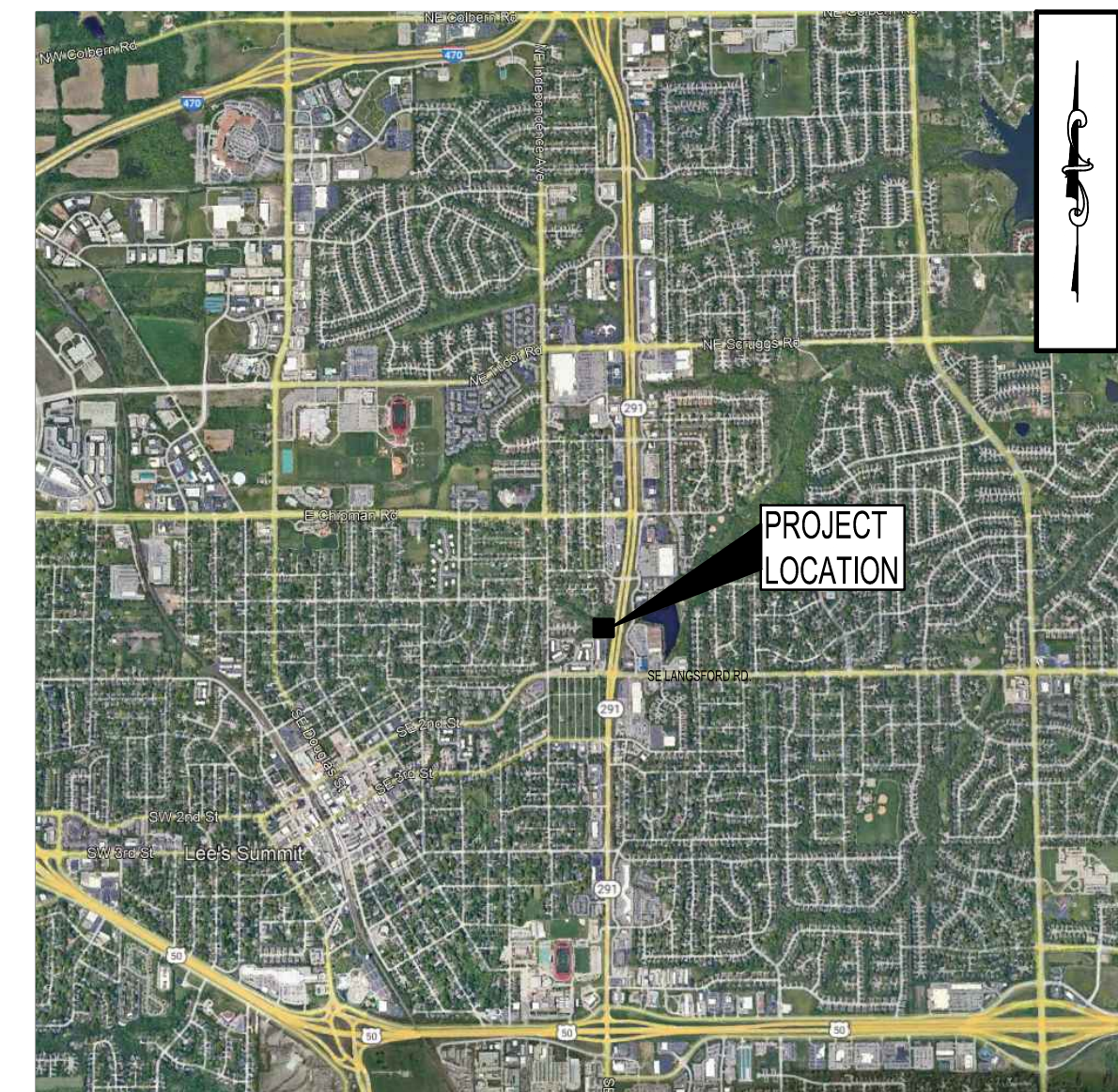
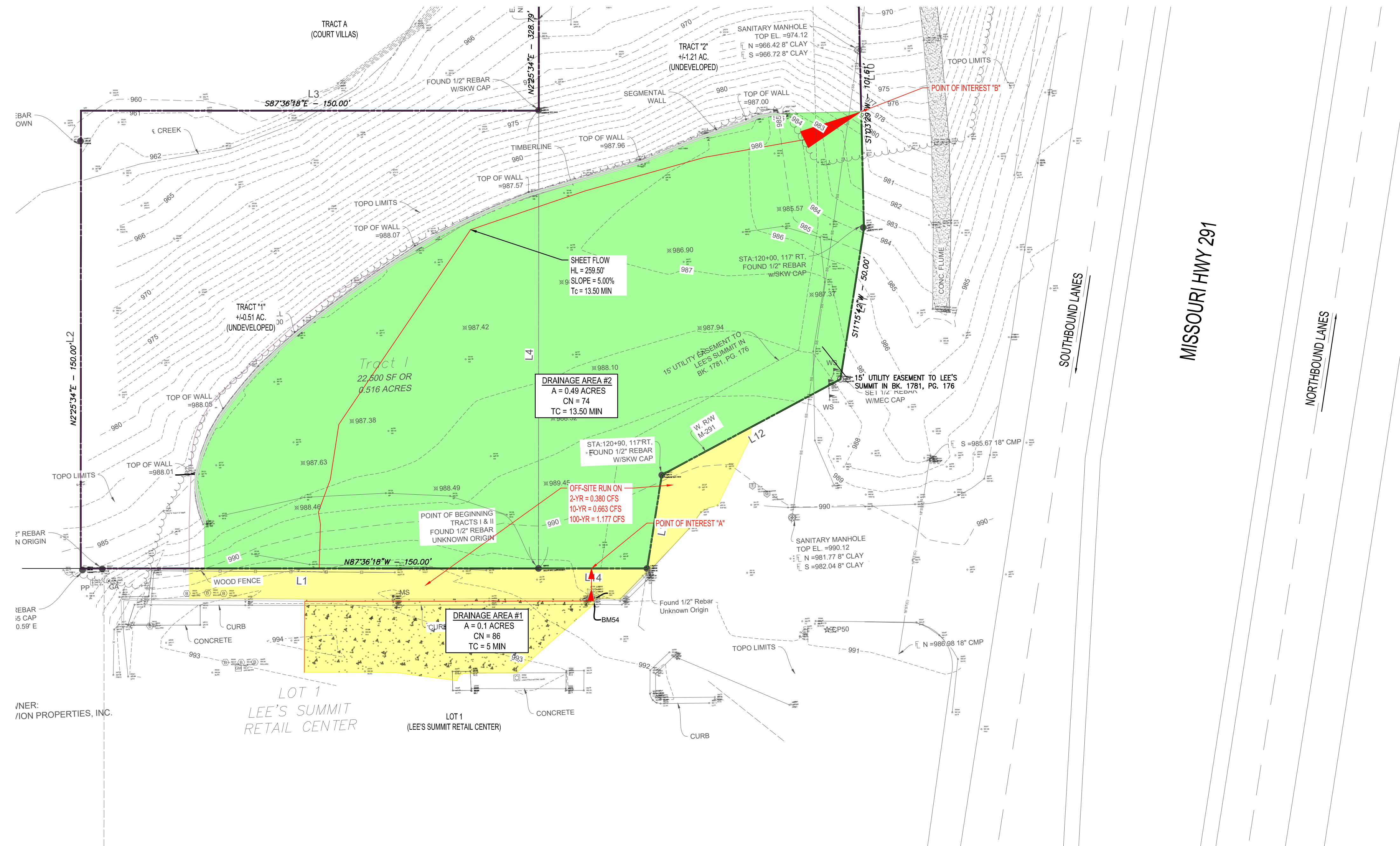
For the watershed (drainage area extending from the outlet upstream to the headwaters)

Since this is a headwater stream segment, its catchment and watershed are the same.

[Download Full Report \(.json\)](#)

NHDPlus data extracted as of March 2019.
More information on the [NHDPlus dataset](#).

LAST UPDATED ON FEBRUARY 15, 2017



VICINITY MAP
NTS

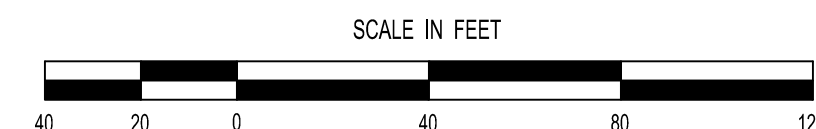
THE PROJECT SITE IS INCLUDED WITHIN
THE WEST PRAIRIE LEE WATERSHED
AREA AS SHOWN ON THE CITY OF LEE'S
SUMMIT WATERSHED & OUTFALL MAP

OFF-SITE DRAINAGE AREA 1 TOTAL RUNOFF:		ON-SITE DRAINAGE AREA 2 TOTAL RUNOFF:		COMBINED PRE-DEVELOPED TOTAL RUNOFF:	
RETURN PERIOD	Q (CFS)	RETURN PERIOD	Q (CFS)	RETURN PERIOD	Q (CFS)
2 - YEAR	0.380	2 - YEAR	0.836	2 - YEAR	1.074
10 - YEAR	0.663	10 - YEAR	1.799	10 - YEAR	2.213
100 - YEAR	1.177	100 - YEAR	3.719	100 - YEAR	4.461



Not For Construction

PRE-DEVELOPMENT DRAINAGE PLAN



REVISION	BY

HIGH TIDE
CONSULTANTS LLC
434 N. COLUMBIA ST, SUITE 200A
COVINGTON, LA 70433
www.hightidela.com

STAMP

SIGNATURE

JANUARY 17, 2025
DATE

PROPOSED TAKE 5
LEE'S SUMMIT, MISSOURI

FOR DRIVEN ASSETS, LLC
2101 PEARL STREET
BOULDER, CO 80302

DRAWN KRG
CHECKED RCG
ISSUED DATE 07/30/2024
ISSUED FOR PERMITTING
PROJECT NO. 22-218
FILE 22-218 PRE PreDevelopment Plan
SHEET PRE

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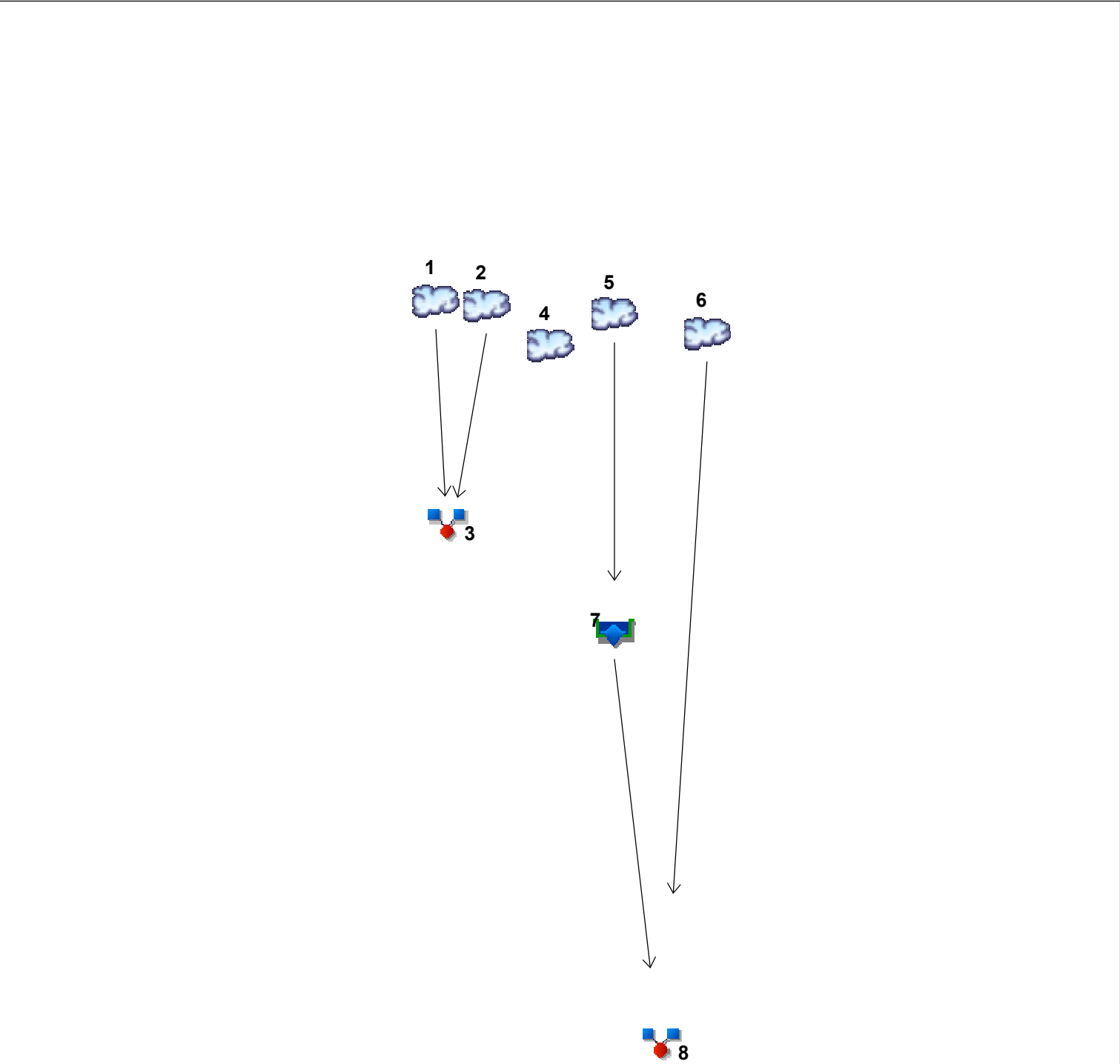
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Watershed Model Schematic

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



Legend

Hyd.	Origin	Description
1	SCS Runoff	Pre Off-Site Area (Pre DA 1)(Bypass Site)
2	SCS Runoff	Pre On-Site Area (DA 2)
3	Combine	Combined Pre-Developed Flow
4	SCS Runoff	Post Off-Site Area (Post DA 1)(Diverted)
5	SCS Runoff	Post On-Site Area (DA2)
6	SCS Runoff	Post-On Site Area (DA3) Undetained
7	Reservoir	Underground Detention
8	Combine	Detention + DA 3

Hydrograph Return Period Recap

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

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	-----	-----	0.380	-----	-----	0.663	-----	-----	1.177	Pre Off-Site Area (Pre DA 1)(Bypass
2	SCS Runoff	-----	-----	0.836	-----	-----	1.799	-----	-----	3.719	Pre On-Site Area (DA 2)
3	Combine	1, 2	-----	1.074	-----	-----	2.213	-----	-----	4.461	Combined Pre-Developed Flow
4	SCS Runoff	-----	-----	0.248	-----	-----	0.384	-----	-----	0.630	Post Off-Site Area (Post DA 1)(Divert
5	SCS Runoff	-----	-----	1.726	-----	-----	3.022	-----	-----	5.382	Post On-Site Area (DA2)
6	SCS Runoff	-----	-----	0.094	-----	-----	0.196	-----	-----	0.400	Post-On Site Area (DA3) Undetained
7	Reservoir	5	-----	0.185	-----	-----	0.385	-----	-----	1.340	Underground Detention
8	Combine	6, 7	-----	0.245	-----	-----	0.408	-----	-----	1.395	Detention + DA 3
Proj. file: Lees Summit Hydrographs_2025-01-06_Underground.gpw										Friday, 01 / 17 / 2025	

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	0.380	2	716	778	-----	-----	-----	Pre Off-Site Area (Pre DA 1)(Bypass
2	SCS Runoff	0.836	2	722	2,405	-----	-----	-----	Pre On-Site Area (DA 2)
3	Combine	1.074	2	720	3,183	1, 2	-----	-----	Combined Pre-Developed Flow
4	SCS Runoff	0.248	2	716	572	-----	-----	-----	Post Off-Site Area (Post DA 1)(Divert
5	SCS Runoff	1.726	2	718	3,982	-----	-----	-----	Post On-Site Area (DA2)
6	SCS Runoff	0.094	2	718	189	-----	-----	-----	Post-On Site Area (DA3) Undetained
7	Reservoir	0.185	2	746	3,979	5	983.41	1,727	Underground Detention
8	Combine	0.245	2	718	4,168	6, 7	-----	-----	Detention + DA 3
Lees Summit Hydrographs_2025-01-06_Underground					Return Period: 2 Year			Friday, 01 / 17 / 2025	

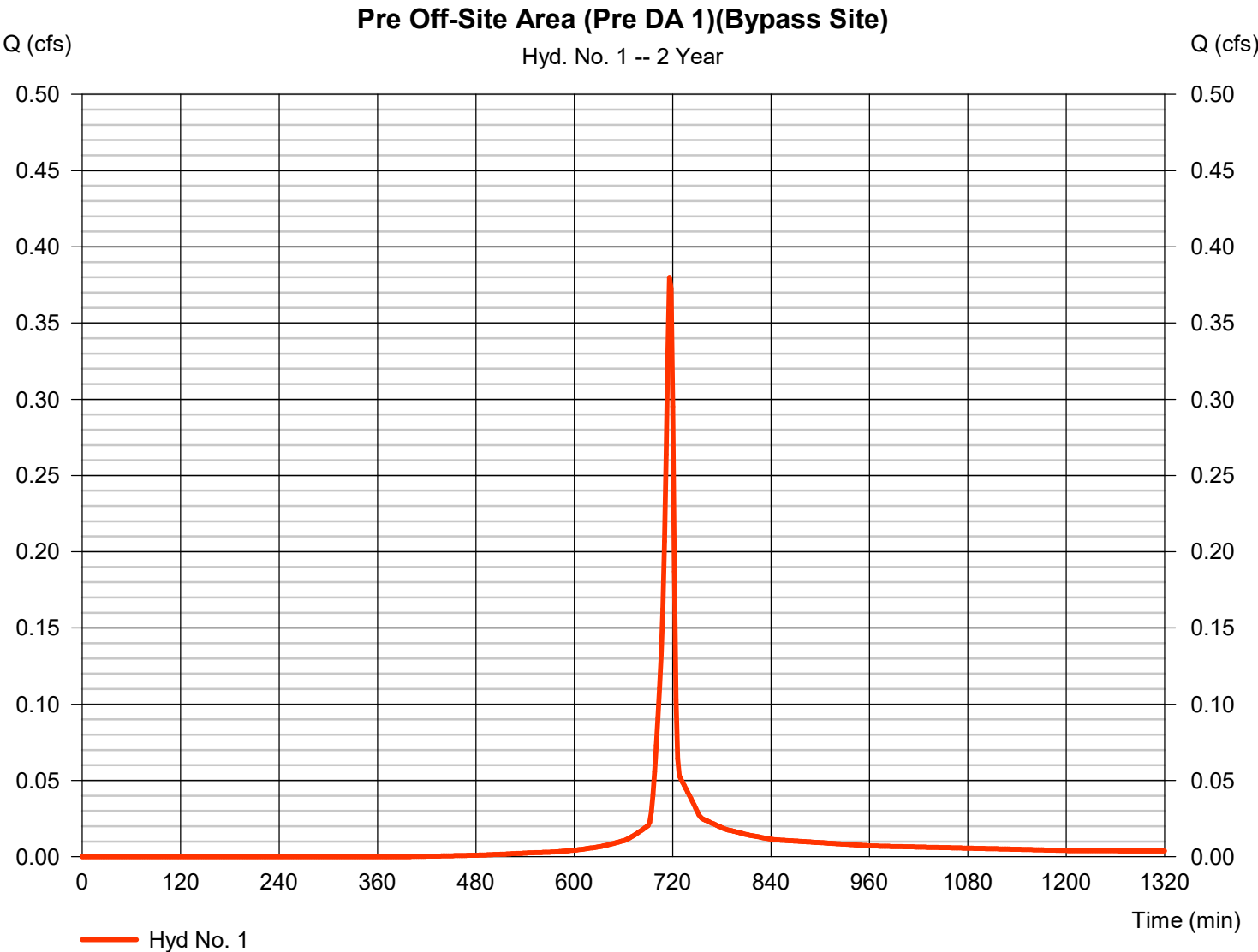
Hydrograph Report

Hyd. No. 1

Pre Off-Site Area (Pre DA 1)(Bypass Site)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.380 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	778 cuft
Drainage area	=	0.100 ac	Curve number	=	86*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.71 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.050 x 98) + (0.050 x 74)] / 0.100



Hydrograph Report

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

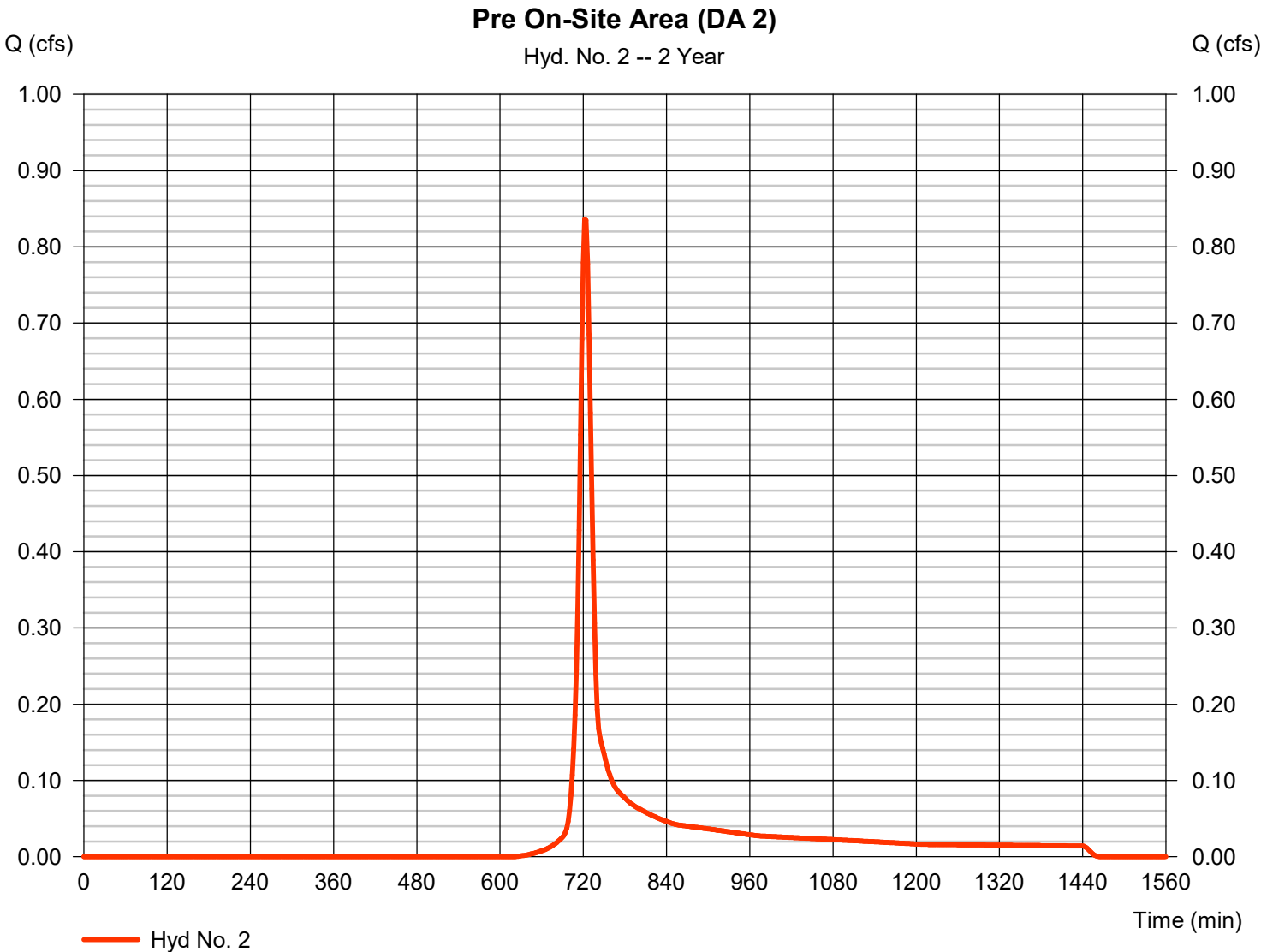
Friday, 01 / 17 / 2025

Hyd. No. 2

Pre On-Site Area (DA 2)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.836 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	2,405 cuft
Drainage area	=	0.490 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.50 min
Total precip.	=	3.71 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.493 x 74)] / 0.490



TR55 Tc Worksheet

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

Hyd. No. 2

Pre On-Site Area (DA 2)

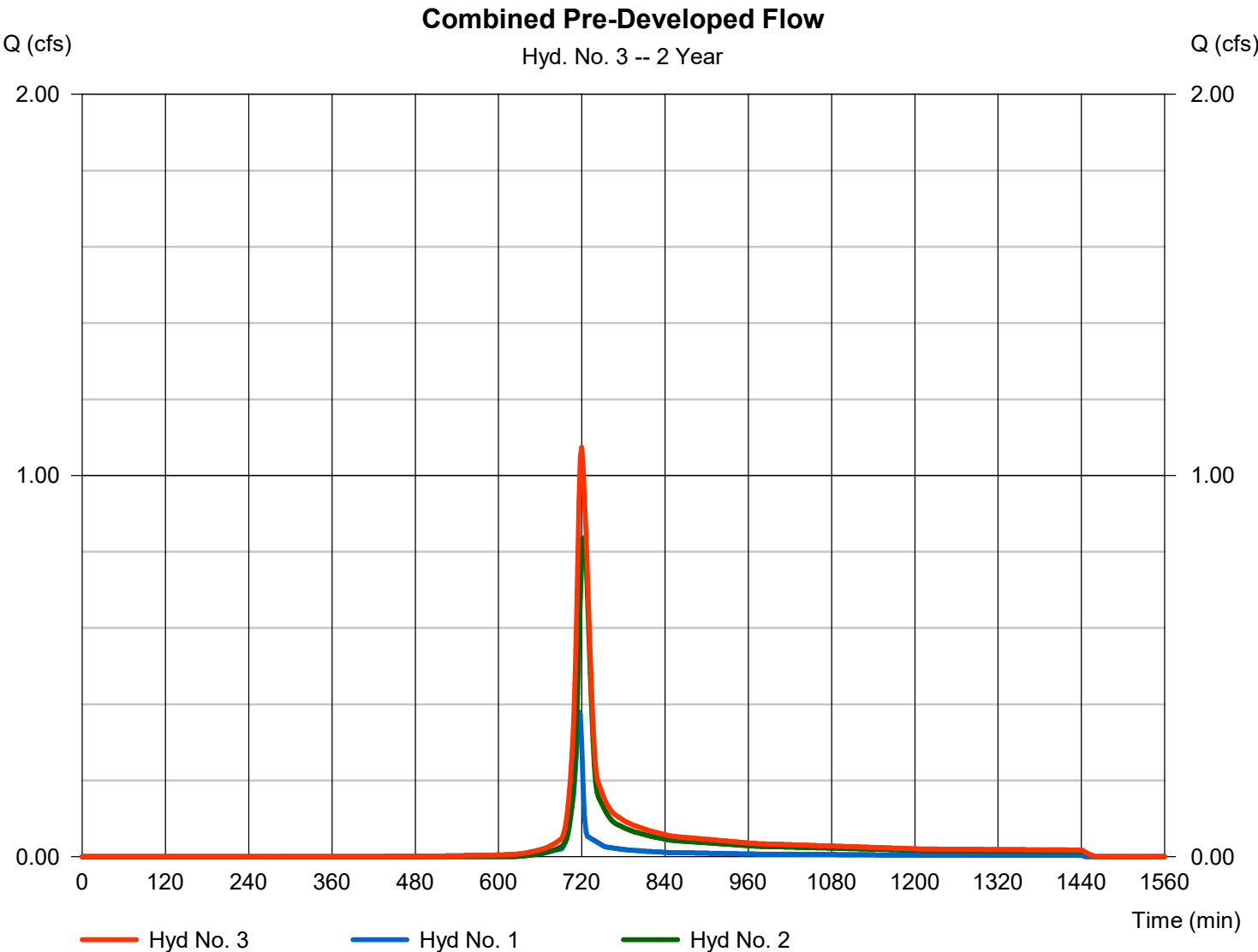
<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.150	0.011	0.011				
Flow length (ft)	= 259.5	0.0	0.0				
Two-year 24-hr precip. (in)	= 3.71	0.00	0.00				
Land slope (%)	= 5.00	0.00	0.00				
Travel Time (min)	= 13.53	+	0.00	+	0.00	=	13.53
Shallow Concentrated Flow							
Flow length (ft)	= 0.00	0.00	0.00				
Watercourse slope (%)	= 0.00	0.00	0.00				
Surface description	= Paved	Paved	Paved				
Average velocity (ft/s)	=0.00	0.00	0.00				
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Channel Flow							
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				
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Total Travel Time, Tc				13.50 min			

Hydrograph Report

Hyd. No. 3

Combined Pre-Developed Flow

Hydrograph type	= Combine	Peak discharge	= 1.074 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 3,183 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 0.590 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	0.663	2	716	1,394	-----	-----	-----	Pre Off-Site Area (Pre DA 1)(Bypass
2	SCS Runoff	1.799	2	722	5,046	-----	-----	-----	Pre On-Site Area (DA 2)
3	Combine	2.213	2	720	6,440	1, 2	-----	-----	Combined Pre-Developed Flow
4	SCS Runoff	0.384	2	716	904	-----	-----	-----	Post Off-Site Area (Post DA 1)(Divert
5	SCS Runoff	3.022	2	718	7,138	-----	-----	-----	Post On-Site Area (DA2)
6	SCS Runoff	0.196	2	716	396	-----	-----	-----	Post-On Site Area (DA3) Undetained
7	Reservoir	0.385	2	738	7,136	5	984.24	3,198	Underground Detention
8	Combine	0.408	2	736	7,532	6, 7	-----	-----	Detention + DA 3
Lees Summit Hydrographs_2025-01-06_Underground					Return Period: 10 Year			Friday, 01 / 17 / 2025	

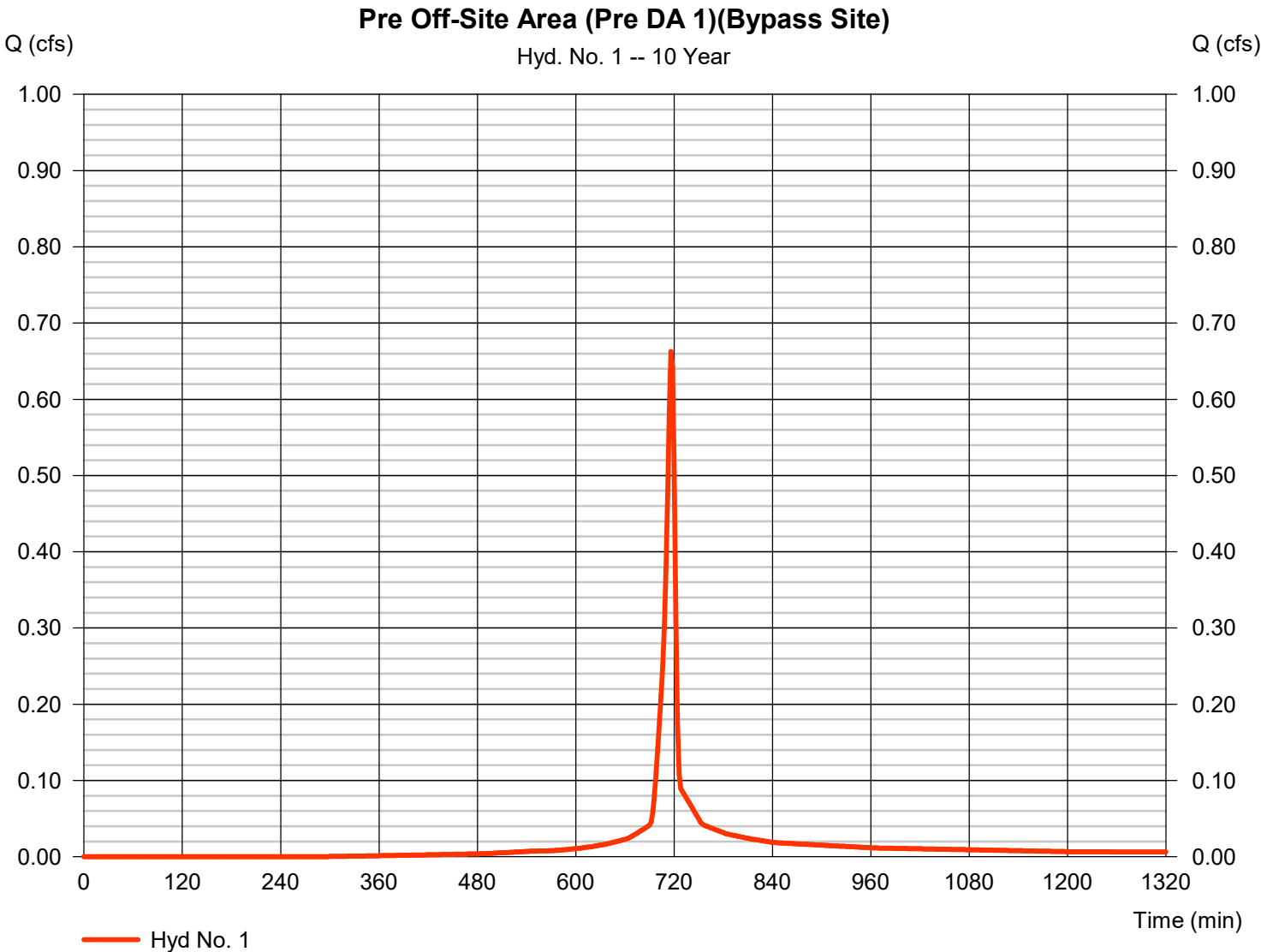
Hydrograph Report

Hyd. No. 1

Pre Off-Site Area (Pre DA 1)(Bypass Site)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.663 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	1,394 cuft
Drainage area	=	0.100 ac	Curve number	=	86*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.050 x 98) + (0.050 x 74)] / 0.100



Hydrograph Report

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

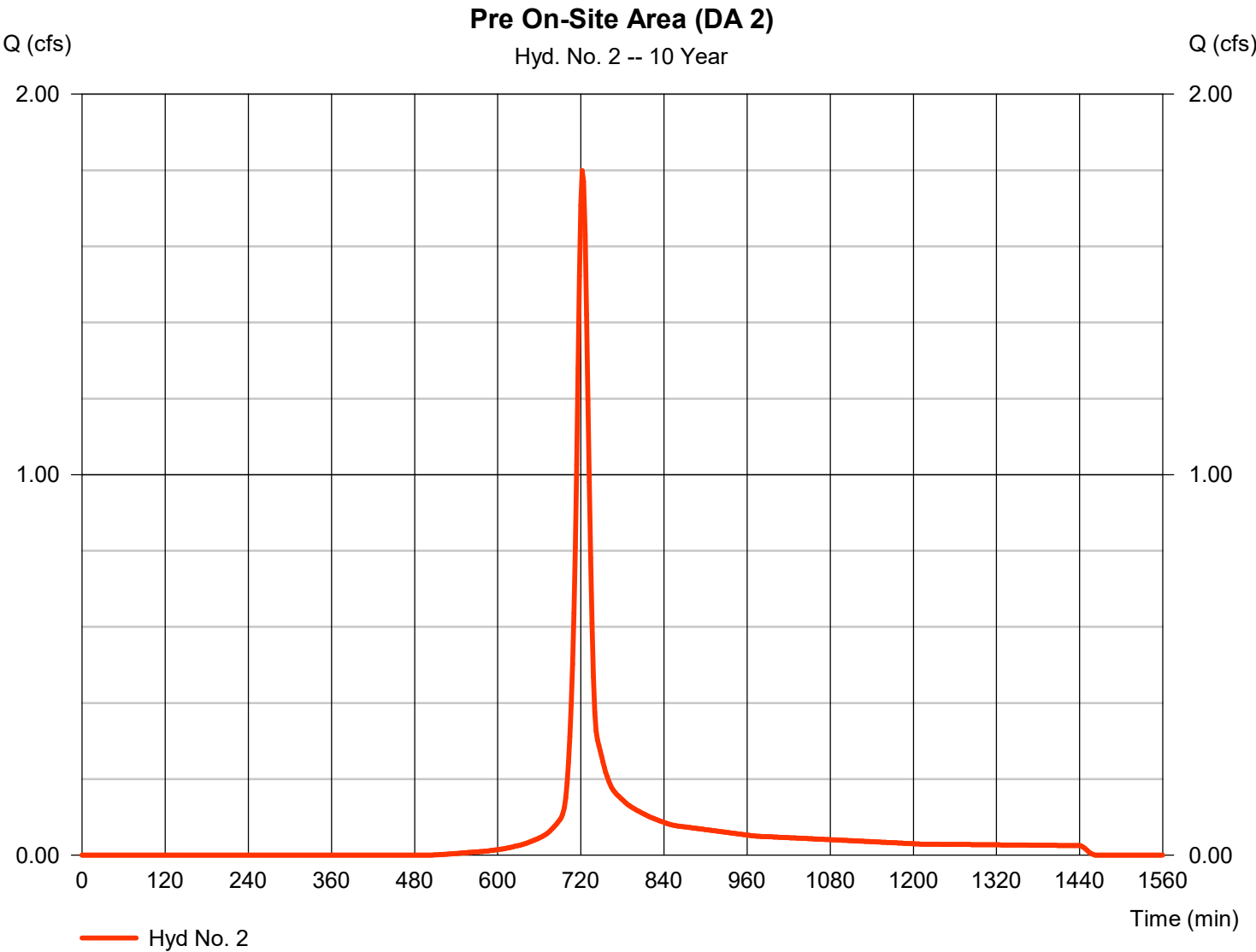
Friday, 01 / 17 / 2025

Hyd. No. 2

Pre On-Site Area (DA 2)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.799 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	5,046 cuft
Drainage area	=	0.490 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.50 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.493 x 74)] / 0.490

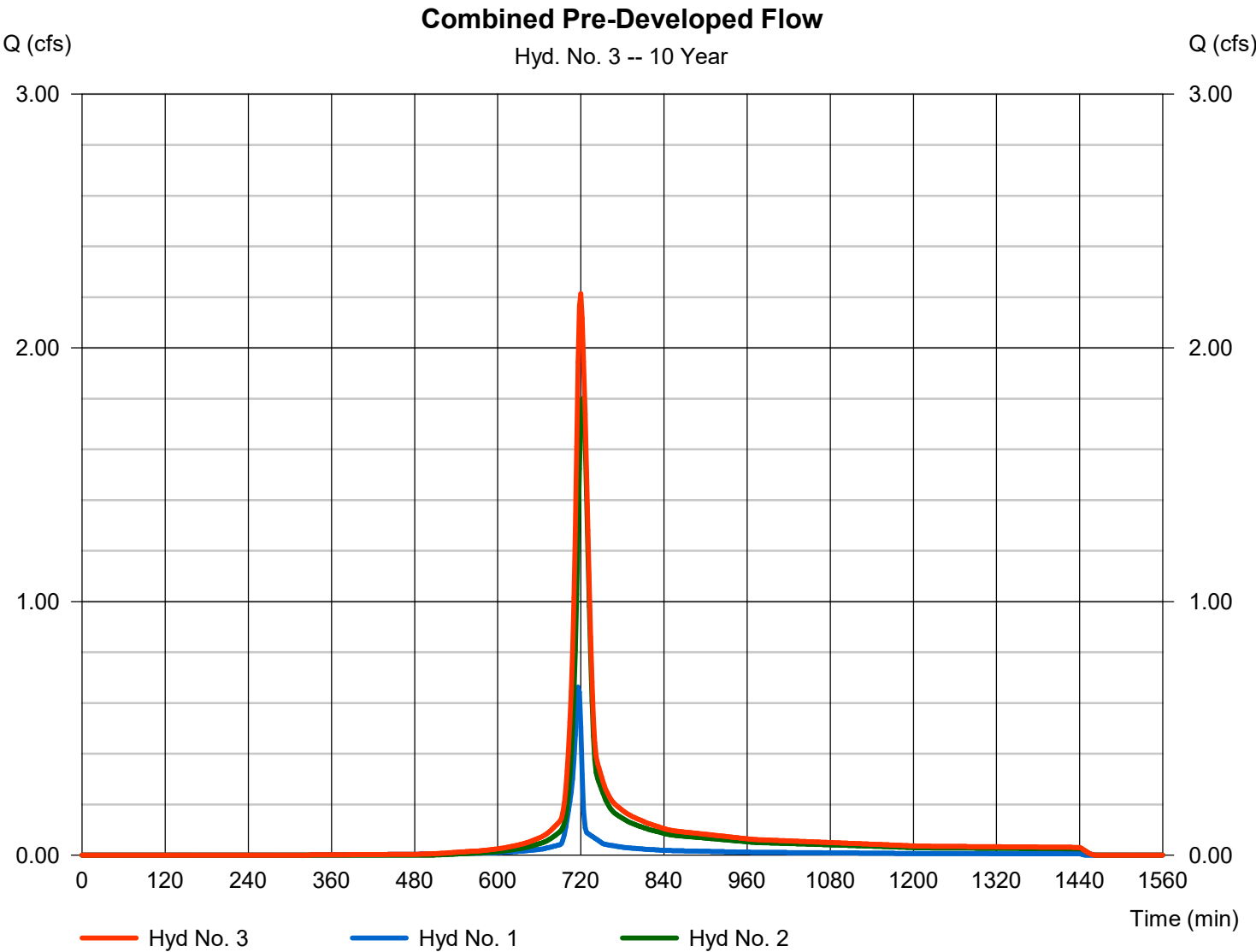


Hydrograph Report

Hyd. No. 3

Combined Pre-Developed Flow

Hydrograph type	= Combine	Peak discharge	= 2.213 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 6,440 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 0.590 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	1.177	2	716	2,572	-----	-----	-----	Pre Off-Site Area (Pre DA 1)(Bypass
2	SCS Runoff	3.719	2	722	10,521	-----	-----	-----	Pre On-Site Area (DA 2)
3	Combine	4.461	2	720	13,093	1, 2	-----	-----	Combined Pre-Developed Flow
4	SCS Runoff	0.630	2	716	1,514	-----	-----	-----	Post Off-Site Area (Post DA 1)(Divert
5	SCS Runoff	5.382	2	718	13,168	-----	-----	-----	Post On-Site Area (DA2)
6	SCS Runoff	0.400	2	716	826	-----	-----	-----	Post-On Site Area (DA3) Undetained
7	Reservoir	1.340	2	728	13,166	5	985.69	5,488	Underground Detention
8	Combine	1.395	2	728	13,991	6, 7	-----	-----	Detention + DA 3
Lees Summit Hydrographs_2025-01-06_Underground					Return Period: 100 Year			Friday, 01 / 17 / 2025	

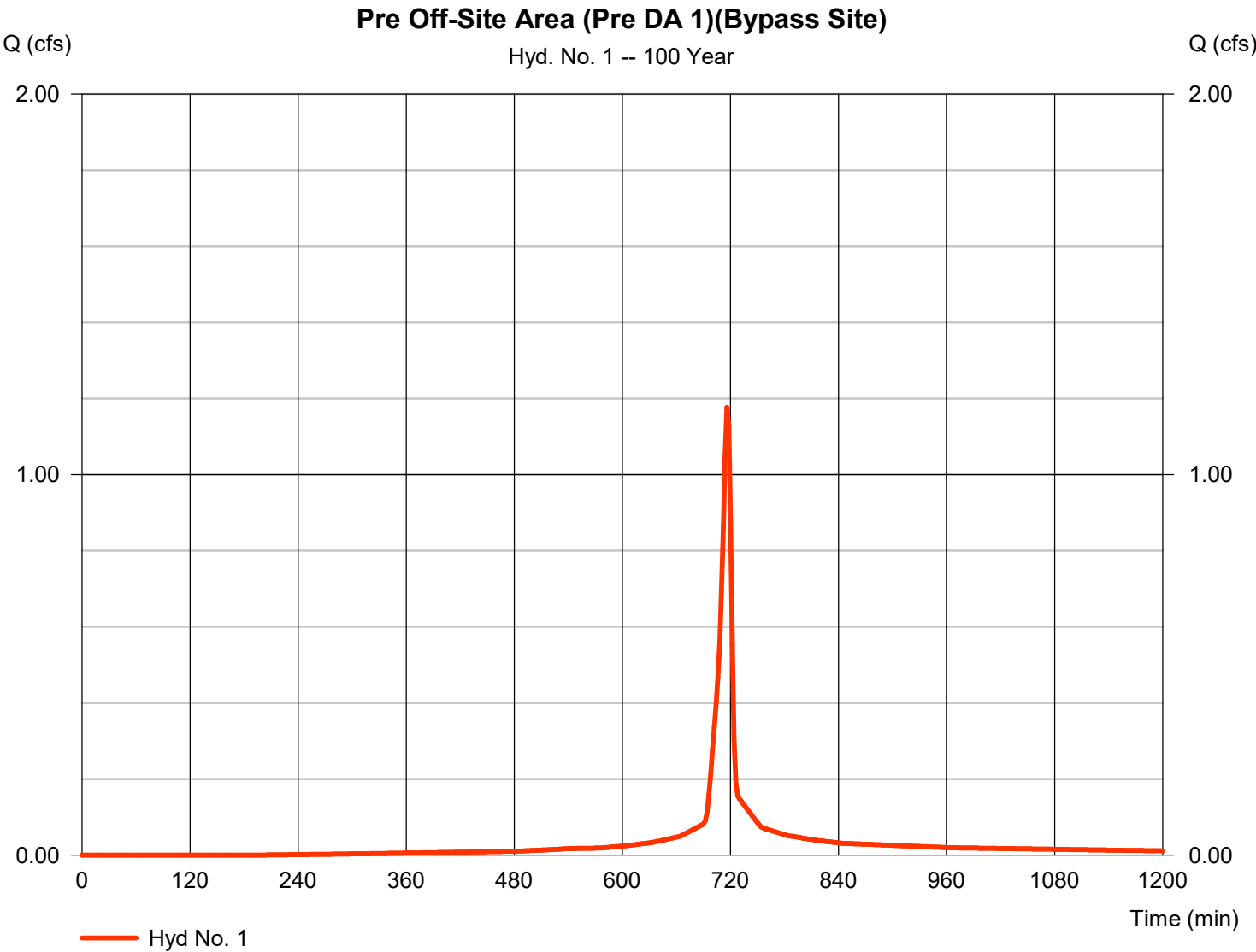
Hydrograph Report

Hyd. No. 1

Pre Off-Site Area (Pre DA 1)(Bypass Site)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.177 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	2,572 cuft
Drainage area	=	0.100 ac	Curve number	=	86*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	9.26 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.050 x 98) + (0.050 x 74)] / 0.100



Hydrograph Report

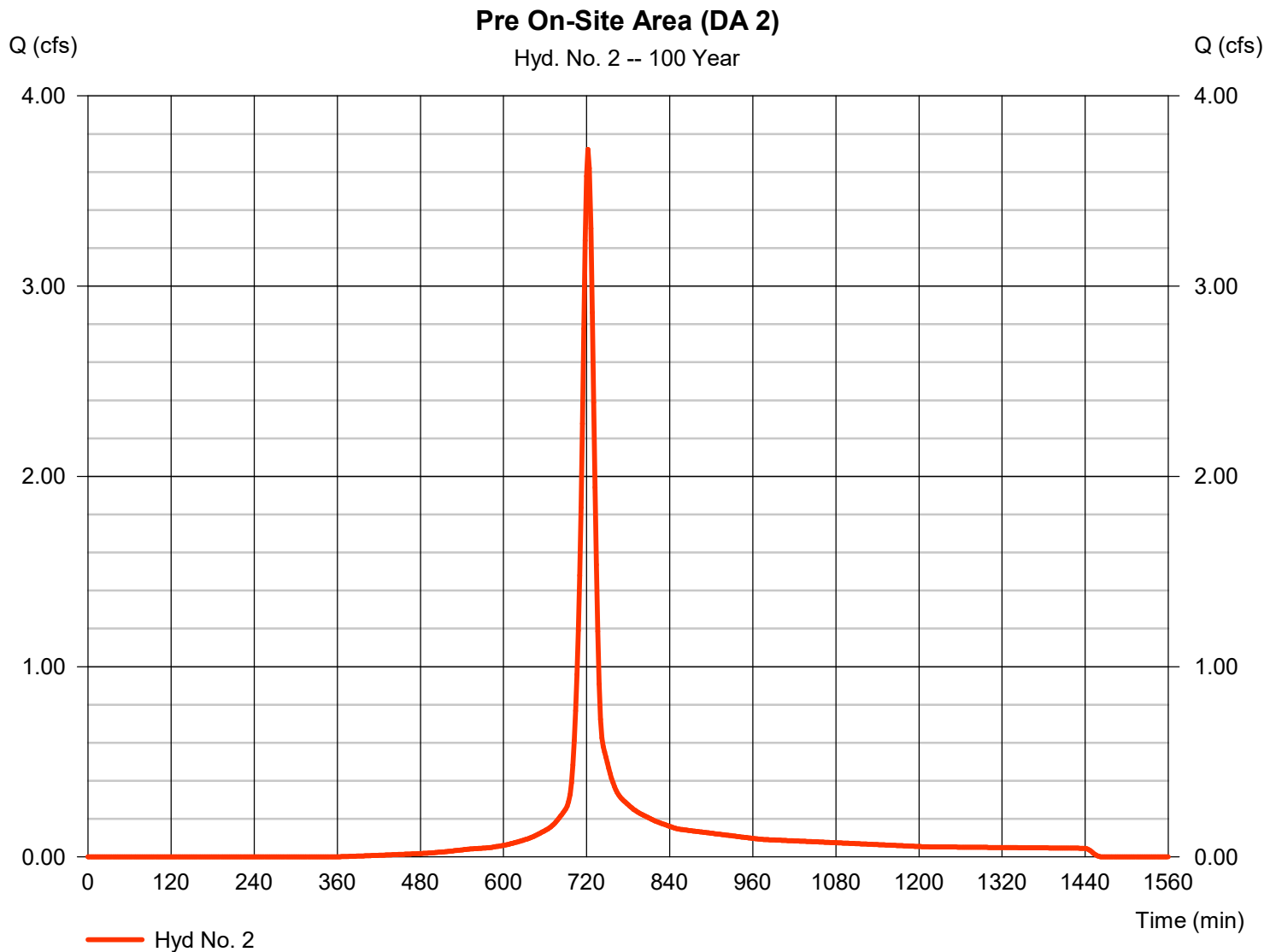
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Friday, 01 / 17 / 2025

Hyd. No. 2

Pre On-Site Area (DA 2)

Hydrograph type	= SCS Runoff	Peak discharge	= 3.719 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 10,521 cuft
Drainage area	= 0.490 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.50 min
Total precip.	= 9.26 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.493 \times 74)] / 0.490$ 

Hydrograph Report

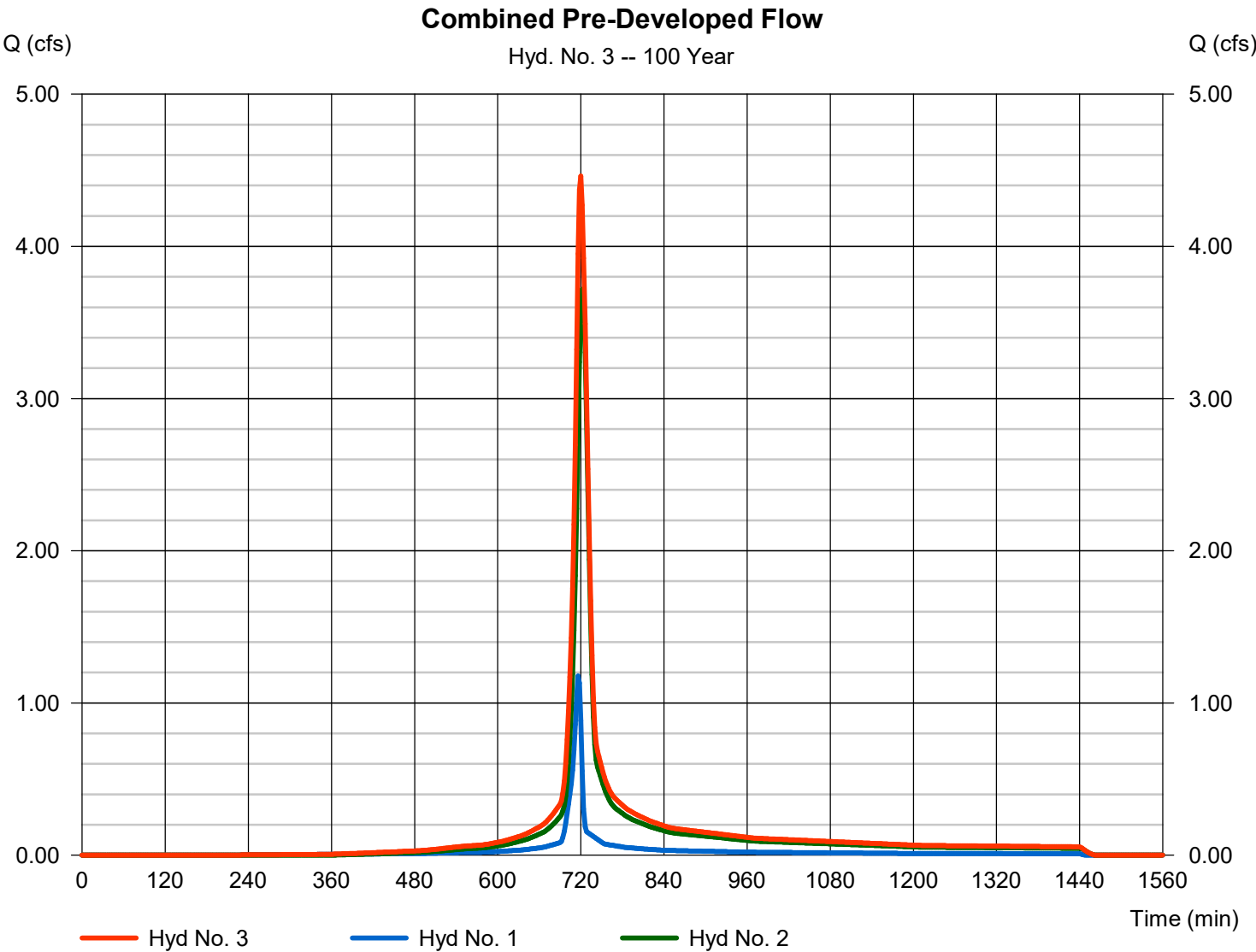
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Friday, 01 / 17 / 2025

Hyd. No. 3

Combined Pre-Developed Flow

Hydrograph type	= Combine	Peak discharge	= 4.461 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 13,093 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 0.590 ac



Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	80.1702	15.0000	0.9000	-----
3	0.0000	0.0000	0.0000	-----
5	0.0000	0.0000	0.0000	-----
10	183.3473	19.2000	1.0096	-----
25	197.2999	18.6000	0.9937	-----
50	235.4014	19.9000	1.0020	-----
100	252.3450	19.7000	0.9969	-----

File name: IDF Curve APWA5600.IDF

$$\text{Intensity} = B / (Tc + D)^E$$

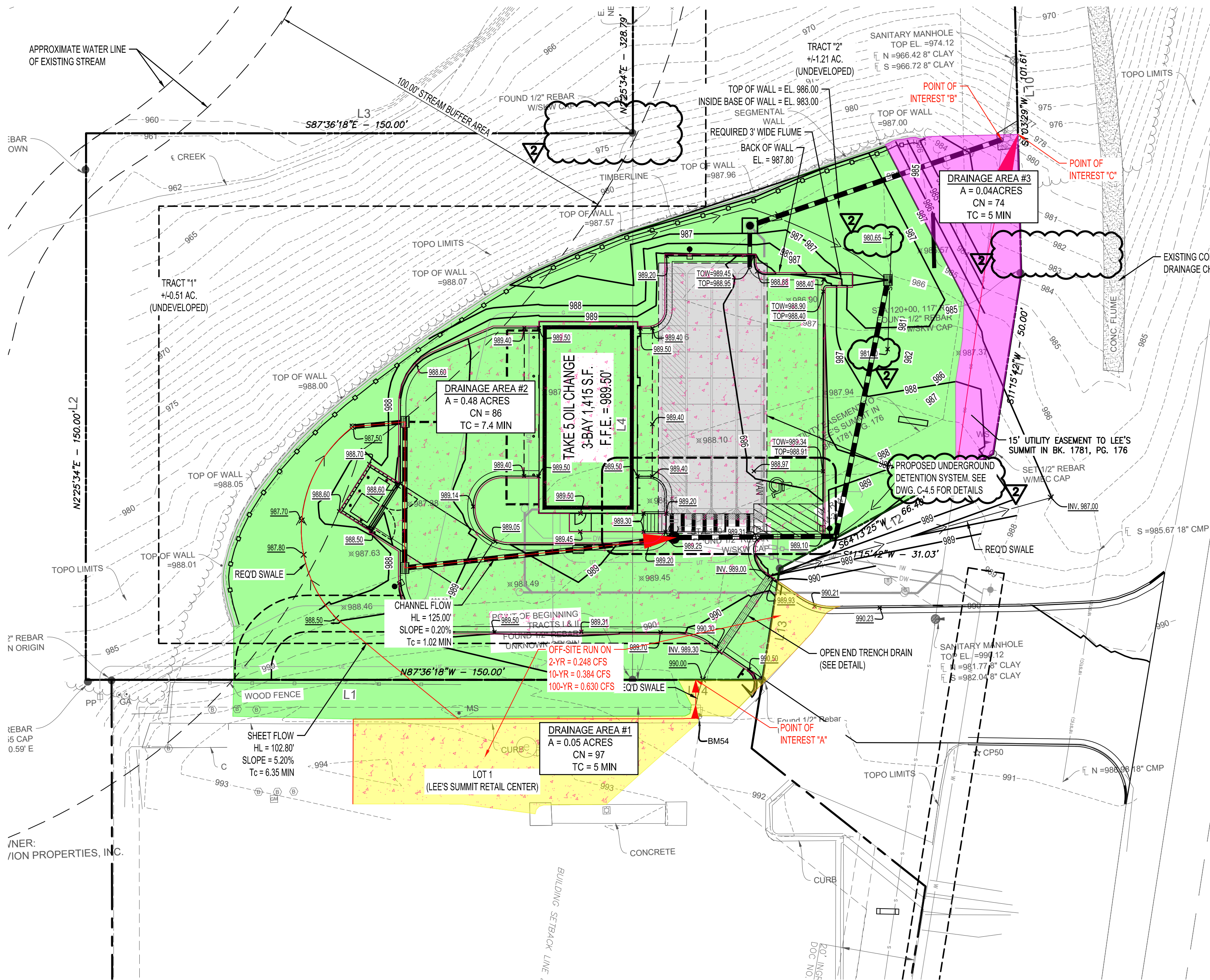
Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.41	4.42	3.76	3.27	2.90	2.61	2.37	2.18	2.01	1.87	1.75	1.65
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	7.35	6.08	5.18	4.52	4.00	3.59	3.26	2.98	2.74	2.54	2.37	2.22
25	8.53	7.05	6.00	5.23	4.63	4.16	3.77	3.45	3.18	2.95	2.75	2.58
50	9.39	7.82	6.70	5.86	5.20	4.68	4.25	3.90	3.60	3.34	3.12	2.92
100	10.32	8.59	7.35	6.43	5.71	5.14	4.67	4.28	3.95	3.67	3.42	3.21

Tc = time in minutes. Values may exceed 60.

C:\Users\Scott Poirrier\High Tide Consultant Dropbox\Projects\Reference Material\LADOTD\New\LADOTD Region 1.pcp

[illegible]

Appendix B



OFF-SITE DRAINAGE AREA 1 TOTAL RUNOFF (DIVERTED):

RETURN PERIOD	Q (CFS)
2 - YEAR	0.248
10 - YEAR	0.384
100 - YEAR	0.630

ON-SITE DRAINAGE AREA 2 TOTAL RUNOFF:

RETURN PERIOD	Q (CFS)
2 - YEAR	1.726
10 - YEAR	3.022
100 - YEAR	5.382

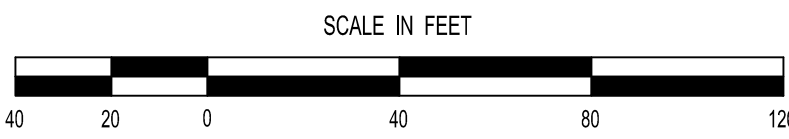
OFF-SITE DRAINAGE AREA 3 TOTAL RUNOFF:

RETURN PERIOD	Q (CFS)
2 - YEAR	0.094
10 - YEAR	0.196
100 - YEAR	0.400

MAXIMUM ALLOWABLE RELEASE RATE PER 0.5 ACRE: TOTAL COMBINED DETAINED RUNOFF:

RETURN PERIOD	Q (CFS)	RETURN PERIOD	Q (CFS)
2 - YEAR	0.245	2 - YEAR	0.245
10 - YEAR	0.98	10 - YEAR	0.408
100 - YEAR	1.47	100 - YEAR	1.395

Not For Construction
POST-DEVELOPMENT
DRAINAGE PLAN



REVISION		BY
1	10/24/2024 REVISED PER CITY	KRG
2	12/13/2024 REVISED PER CITY	KRG

HIGH TIDE
CONSULTANTS LLC
434 N. COLUMBIA ST, SUITE 200A
COVINGTON, LA 70433
www.hightidelc.com

SIGNATURE:

DATE: JANUARY 17, 2025

PROPOSED TAKE 5
LEE'S SUMMIT, MISSOURI

FOR DRIVEN ASSETS, LLC
2101 PEARL STREET
BOULDER, CO 80302

DRAWN KRG
CHECKED RCG
ISSUED DATE 07/30/2024
ISSUED FOR PERMITTING
PROJECT NO. 22-218
FILE 22-218 Post-Developed Plan_2025-01-08

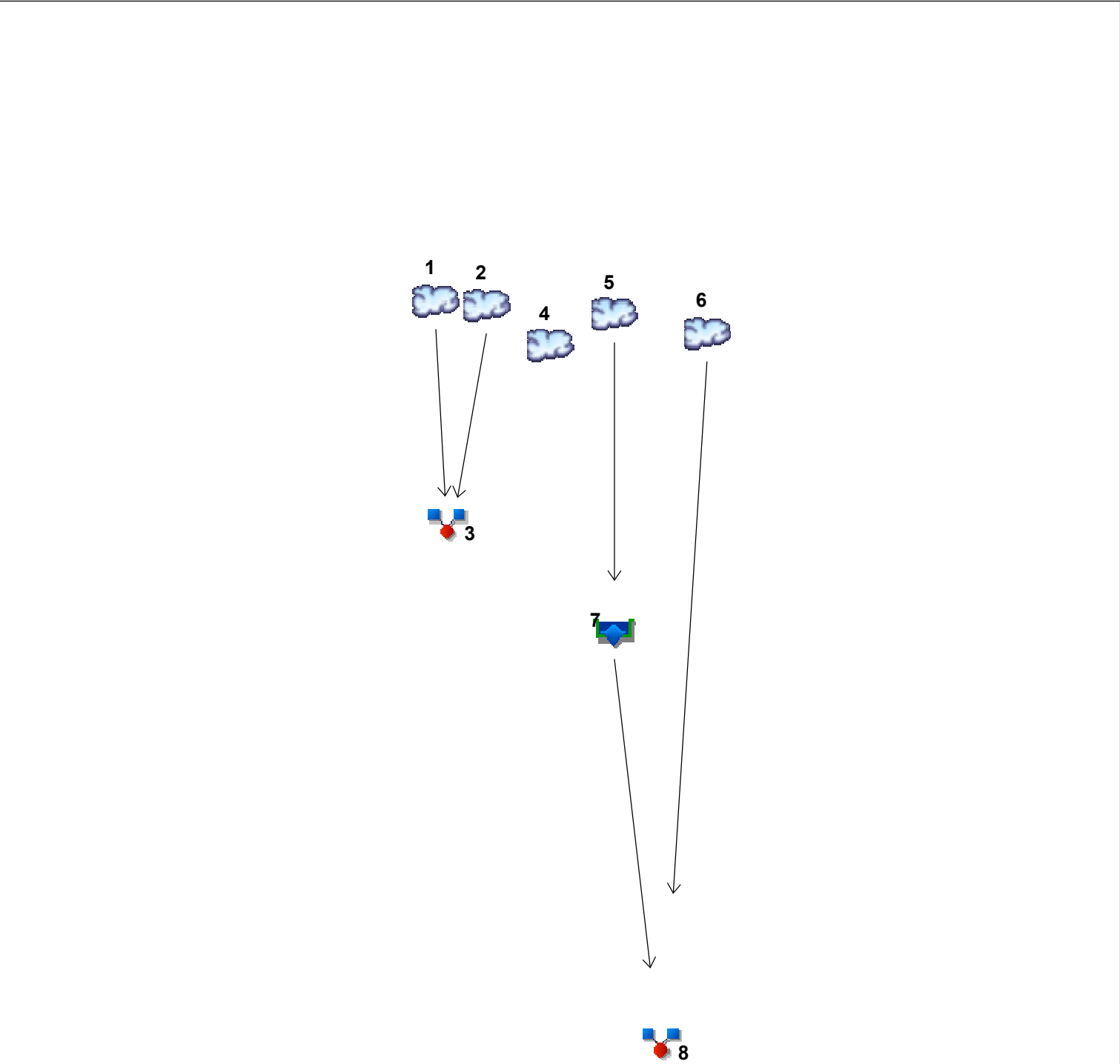
SHEET

C-2

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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	Pre Off-Site Area (Pre DA 1)(Bypass Site)
2	SCS Runoff	Pre On-Site Area (DA 2)
3	Combine	Combined Pre-Developed Flow
4	SCS Runoff	Post Off-Site Area (Post DA 1)(Diverted)
5	SCS Runoff	Post On-Site Area (DA2)
6	SCS Runoff	Post-On Site Area (DA3) Undetained
7	Reservoir	Underground Detention
8	Combine	Detention + DA 3

Hydrograph Return Period Recap

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

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	-----	-----	0.380	-----	-----	0.663	-----	-----	1.177	Pre Off-Site Area (Pre DA 1)(Bypass
2	SCS Runoff	-----	-----	0.836	-----	-----	1.799	-----	-----	3.719	Pre On-Site Area (DA 2)
3	Combine	1, 2	-----	1.074	-----	-----	2.213	-----	-----	4.461	Combined Pre-Developed Flow
4	SCS Runoff	-----	-----	0.248	-----	-----	0.384	-----	-----	0.630	Post Off-Site Area (Post DA 1)(Divert
5	SCS Runoff	-----	-----	1.726	-----	-----	3.022	-----	-----	5.382	Post On-Site Area (DA2)
6	SCS Runoff	-----	-----	0.094	-----	-----	0.196	-----	-----	0.400	Post-On Site Area (DA3) Undetained
7	Reservoir	5	-----	0.185	-----	-----	0.385	-----	-----	1.340	Underground Detention
8	Combine	6, 7	-----	0.245	-----	-----	0.408	-----	-----	1.395	Detention + DA 3
Proj. file: Lees Summit Hydrographs_2025-01-06_Underground.gpw										Friday, 01 / 17 / 2025	

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	0.380	2	716	778	-----	-----	-----	Pre Off-Site Area (Pre DA 1)(Bypass
2	SCS Runoff	0.836	2	722	2,405	-----	-----	-----	Pre On-Site Area (DA 2)
3	Combine	1.074	2	720	3,183	1, 2	-----	-----	Combined Pre-Developed Flow
4	SCS Runoff	0.248	2	716	572	-----	-----	-----	Post Off-Site Area (Post DA 1)(Divert
5	SCS Runoff	1.726	2	718	3,982	-----	-----	-----	Post On-Site Area (DA2)
6	SCS Runoff	0.094	2	718	189	-----	-----	-----	Post-On Site Area (DA3) Undetained
7	Reservoir	0.185	2	746	3,979	5	983.41	1,727	Underground Detention
8	Combine	0.245	2	718	4,168	6, 7	-----	-----	Detention + DA 3
Lees Summit Hydrographs_2025-01-06_Underground					Return Period: 2 Year			Friday, 01 / 17 / 2025	

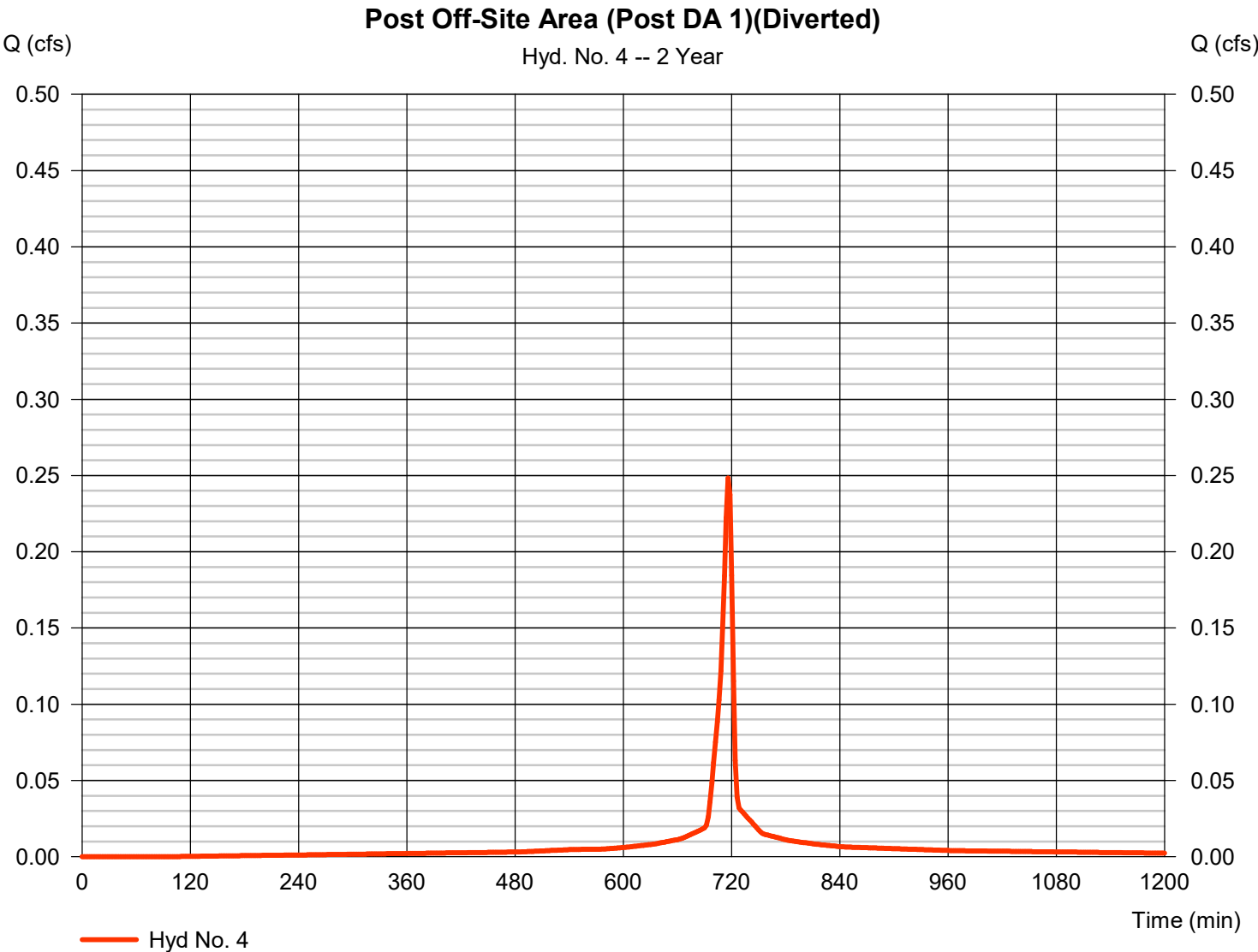
Hydrograph Report

Hyd. No. 4

Post Off-Site Area (Post DA 1)(Diverted)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.248 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	572 cuft
Drainage area	=	0.050 ac	Curve number	=	97*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.71 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.052 x 98) + (0.002 x 74)] / 0.050



Hydrograph Report

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

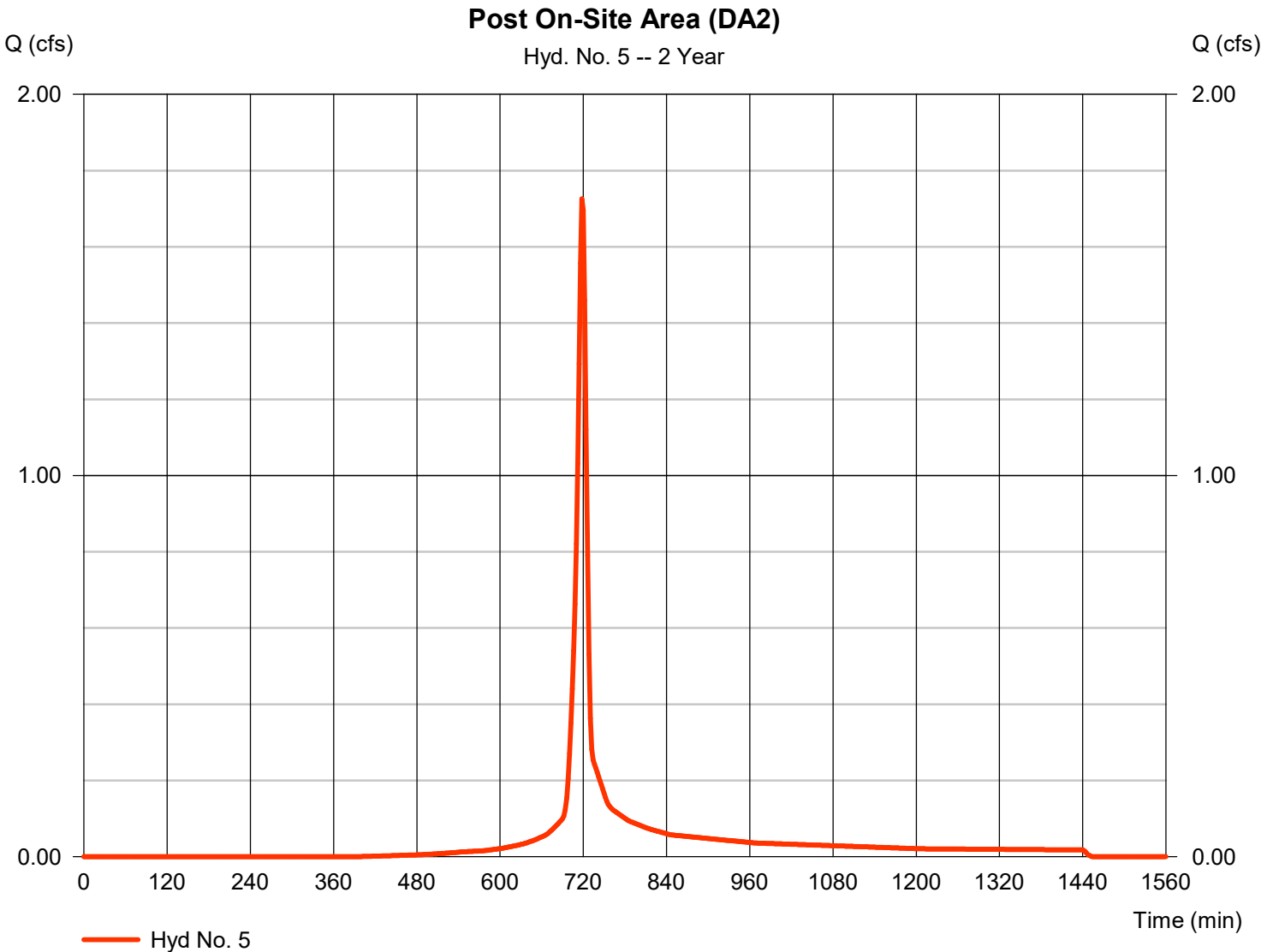
Friday, 01 / 17 / 2025

Hyd. No. 5

Post On-Site Area (DA2)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.726 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	3,982 cuft
Drainage area	=	0.480 ac	Curve number	=	86*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.40 min
Total precip.	=	3.71 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.230 x 98) + (0.250 x 74)] / 0.480



TR55 Tc Worksheet

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

Hyd. No. 5

Post On-Site Area (DA2)

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.150	0.011	0.011				
Flow length (ft)	= 102.8	0.0	0.0				
Two-year 24-hr precip. (in)	= 3.71	0.00	0.00				
Land slope (%)	= 5.20	0.00	0.00				
Travel Time (min)	= 6.35	+	0.00	+	0.00	=	6.35
Shallow Concentrated Flow							
Flow length (ft)	= 0.00	0.00	0.00				
Watercourse slope (%)	= 0.00	0.00	0.00				
Surface description	= Paved	Paved	Paved				
Average velocity (ft/s)	=0.00	0.00	0.00				
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Channel Flow							
X sectional flow area (sqft)	= 1.23	0.00	0.00				
Wetted perimeter (ft)	= 3.93	0.00	0.00				
Channel slope (%)	= 0.20	0.00	0.00				
Manning's n-value	= 0.015	0.015	0.015				
Velocity (ft/s)	=2.04	0.00	0.00				
Flow length (ft)	(0)125.0	0.0	0.0				
Travel Time (min)	= 1.02	+	0.00	+	0.00	=	1.02
Total Travel Time, Tc				7.40 min			

Hydrograph Report

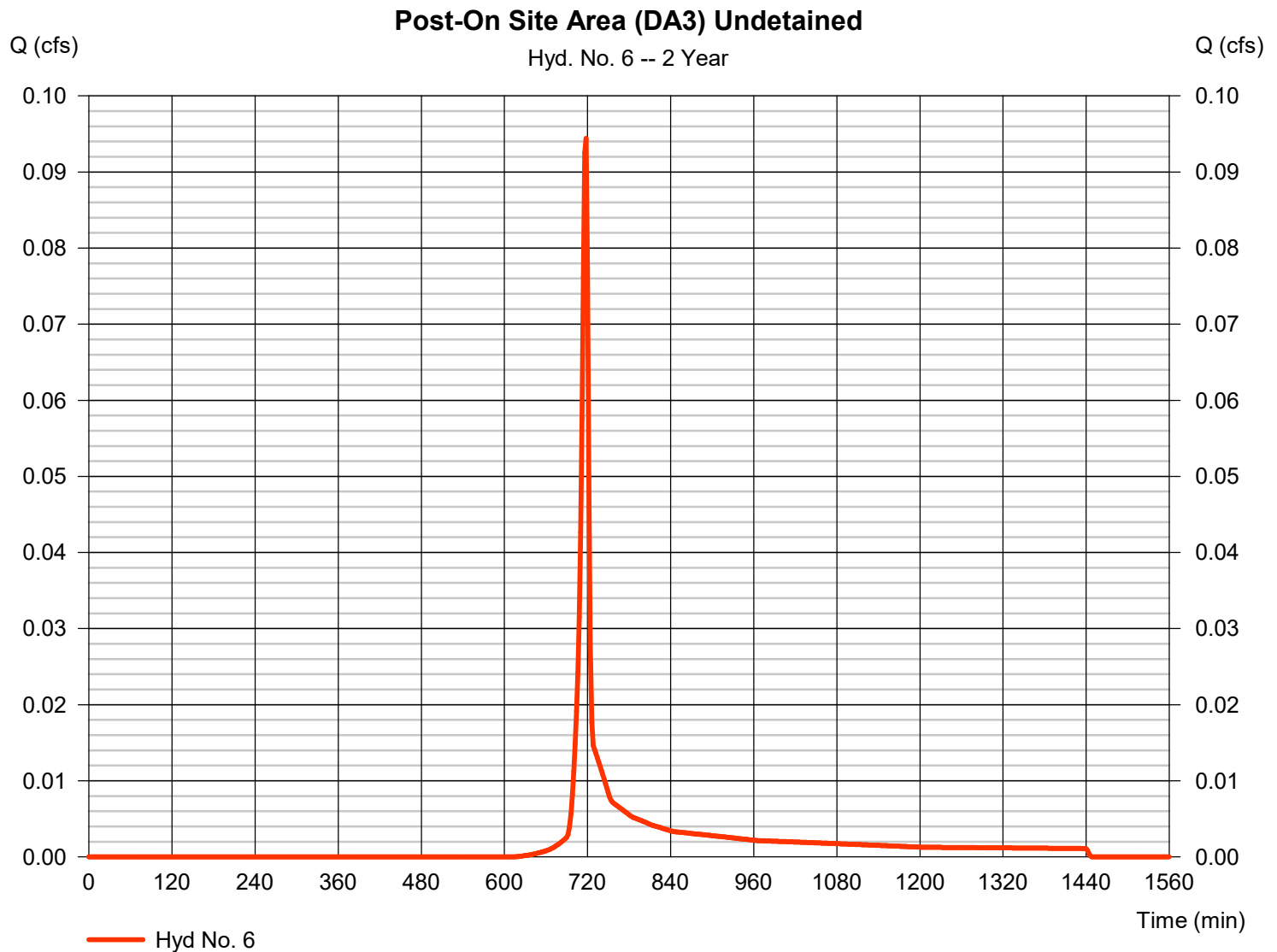
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Friday, 01 / 17 / 2025

Hyd. No. 6

Post-On Site Area (DA3) Undetained

Hydrograph type	= SCS Runoff	Peak discharge	= 0.094 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 189 cuft
Drainage area	= 0.040 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



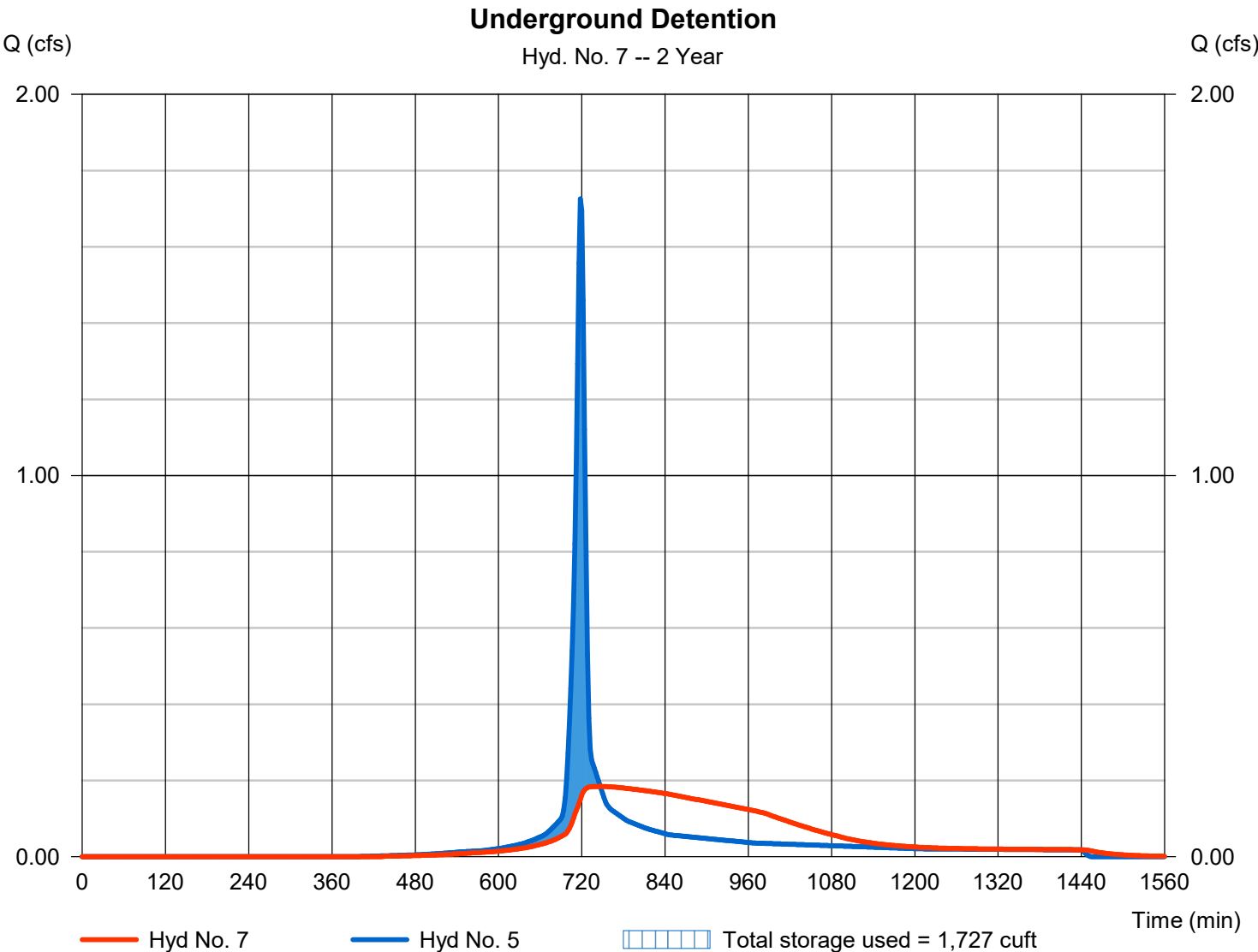
Hydrograph Report

Hyd. No. 7

Underground Detention

Hydrograph type	= Reservoir	Peak discharge	= 0.185 cfs
Storm frequency	= 2 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 3,979 cuft
Inflow hyd. No.	= 5 - Post On-Site Area (DA2)	Max. Elevation	= 983.41 ft
Reservoir name	= Underground Detention	Max. Storage	= 1,727 cuft

Storage Indication method used.



Pond No. 2 - Underground Detention

Pond Data

UG Chambers -Invert elev. = 982.80 ft, Rise x Span = 3.50 x 5.60 ft, Barrel Len = 7.12 ft, No. Barrels = 40, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 982.05 ft, Width = 7.45 ft, Height = 5.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	982.05	n/a	0	0
0.55	982.60	n/a	467	467
1.10	983.15	n/a	801	1,268
1.65	983.70	n/a	984	2,252
2.20	984.25	n/a	962	3,215
2.75	984.80	n/a	924	4,139
3.30	985.35	n/a	866	5,004
3.85	985.90	n/a	775	5,779
4.40	986.45	n/a	587	6,366
4.95	987.00	n/a	467	6,833
5.50	987.55	n/a	467	7,300

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.50	5.75	0.00
Span (in)	= 15.00	2.50	5.75	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 981.95	982.00	984.00	0.00
Length (ft)	= 71.00	0.00	0.00	0.00
Slope (%)	= 1.40	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	Inactive	0.00	0.00	0.00
Crest El. (ft)	= 985.87	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	982.05	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.05	47	982.10	0.05 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.019
0.11	93	982.16	0.05 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.038
0.17	140	982.22	0.06 ic	0.05 ic	0.00	---	0.00	---	---	---	---	---	0.055
0.22	187	982.27	0.07 ic	0.07 ic	0.00	---	0.00	---	---	---	---	---	0.067
0.28	233	982.33	0.08 ic	0.08 ic	0.00	---	0.00	---	---	---	---	---	0.077
0.33	280	982.38	0.09 ic	0.09 ic	0.00	---	0.00	---	---	---	---	---	0.086
0.38	327	982.43	0.10 ic	0.09 ic	0.00	---	0.00	---	---	---	---	---	0.094
0.44	374	982.49	0.11 ic	0.10 ic	0.00	---	0.00	---	---	---	---	---	0.102
0.50	420	982.54	0.11 ic	0.11 ic	0.00	---	0.00	---	---	---	---	---	0.109
0.55	467	982.60	0.12 ic	0.12 ic	0.00	---	0.00	---	---	---	---	---	0.116
0.61	547	982.66	0.13 ic	0.12 ic	0.00	---	0.00	---	---	---	---	---	0.122
0.66	627	982.71	0.13 ic	0.13 ic	0.00	---	0.00	---	---	---	---	---	0.127
0.71	707	982.77	0.14 ic	0.13 ic	0.00	---	0.00	---	---	---	---	---	0.133
0.77	787	982.82	0.14 ic	0.14 ic	0.00	---	0.00	---	---	---	---	---	0.138
0.82	868	982.87	0.15 ic	0.14 ic	0.00	---	0.00	---	---	---	---	---	0.143
0.88	948	982.93	0.15 ic	0.15 ic	0.00	---	0.00	---	---	---	---	---	0.148
0.94	1,028	982.98	0.16 ic	0.15 ic	0.00	---	0.00	---	---	---	---	---	0.152
0.99	1,108	983.04	0.16 ic	0.16 ic	0.00	---	0.00	---	---	---	---	---	0.157
1.04	1,188	983.09	0.16 ic	0.16 ic	0.00	---	0.00	---	---	---	---	---	0.161
1.10	1,268	983.15	0.17 ic	0.17 ic	0.00	---	0.00	---	---	---	---	---	0.165
1.15	1,367	983.21	0.17 ic	0.17 ic	0.00	---	0.00	---	---	---	---	---	0.170
1.21	1,465	983.26	0.17 ic	0.17 ic	0.00	---	0.00	---	---	---	---	---	0.174
1.26	1,563	983.31	0.18 ic	0.18 ic	0.00	---	0.00	---	---	---	---	---	0.178
1.32	1,662	983.37	0.18 ic	0.18 ic	0.00	---	0.00	---	---	---	---	---	0.182
1.38	1,760	983.42	0.19 ic	0.19 ic	0.00	---	0.00	---	---	---	---	---	0.186
1.43	1,859	983.48	0.20 ic	0.19 ic	0.00	---	0.00	---	---	---	---	---	0.189
1.49	1,957	983.53	0.20 ic	0.19 ic	0.00	---	0.00	---	---	---	---	---	0.193
1.54	2,056	983.59	0.20 ic	0.20 ic	0.00	---	0.00	---	---	---	---	---	0.197
1.60	2,154	983.64	0.20 ic	0.20 ic	0.00	---	0.00	---	---	---	---	---	0.200
1.65	2,252	983.70	0.21 ic	0.20 ic	0.00	---	0.00	---	---	---	---	---	0.204
1.71	2,349	983.76	0.21 ic	0.21 ic	0.00	---	0.00	---	---	---	---	---	0.208

Continues on next page...

Underground Detention

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
1.76	2,445	983.81	0.21 ic	0.21 ic	0.00	---	0.00	---	---	---	---	---	0.211
1.82	2,541	983.86	0.21 ic	0.21 ic	0.00	---	0.00	---	---	---	---	---	0.214
1.87	2,637	983.92	0.23 ic	0.22 ic	0.00	---	0.00	---	---	---	---	---	0.218
1.92	2,734	983.97	0.23 ic	0.22 ic	0.00	---	0.00	---	---	---	---	---	0.221
1.98	2,830	984.03	0.23 ic	0.22 ic	0.00 ic	---	0.00	---	---	---	---	---	0.227
2.04	2,926	984.09	0.26 ic	0.23 ic	0.02 ic	---	0.00	---	---	---	---	---	0.249
2.09	3,022	984.14	0.29 ic	0.23 ic	0.06 ic	---	0.00	---	---	---	---	---	0.285
2.14	3,118	984.19	0.35 ic	0.23 ic	0.11 ic	---	0.00	---	---	---	---	---	0.337
2.20	3,215	984.25	0.40 ic	0.23 ic	0.16 ic	---	0.00	---	---	---	---	---	0.395
2.26	3,307	984.30	0.46 ic	0.23 ic	0.23 ic	---	0.00	---	---	---	---	---	0.463
2.31	3,399	984.36	0.53 ic	0.24 ic	0.30 ic	---	0.00	---	---	---	---	---	0.535
2.37	3,492	984.41	0.61 ic	0.24 ic	0.37 ic	---	0.00	---	---	---	---	---	0.603
2.42	3,584	984.47	0.67 ic	0.24 ic	0.42 ic	---	0.00	---	---	---	---	---	0.659
2.47	3,677	984.53	0.71 ic	0.24 ic	0.46 ic	---	0.00	---	---	---	---	---	0.706
2.53	3,769	984.58	0.77 ic	0.24 ic	0.51 ic	---	0.00	---	---	---	---	---	0.751
2.59	3,861	984.63	0.80 ic	0.25 ic	0.55 ic	---	0.00	---	---	---	---	---	0.793
2.64	3,954	984.69	0.83 ic	0.25 ic	0.58 ic	---	0.00	---	---	---	---	---	0.832
2.70	4,046	984.74	0.87 ic	0.25 ic	0.62 ic	---	0.00	---	---	---	---	---	0.869
2.75	4,139	984.80	0.90 ic	0.25 ic	0.65 ic	---	0.00	---	---	---	---	---	0.904
2.81	4,225	984.85	0.94 ic	0.26 ic	0.68 ic	---	0.00	---	---	---	---	---	0.938
2.86	4,312	984.91	0.97 ic	0.26 ic	0.71 ic	---	0.00	---	---	---	---	---	0.970
2.91	4,398	984.97	1.01 ic	0.26 ic	0.74 ic	---	0.00	---	---	---	---	---	1.001
2.97	4,485	985.02	1.05 ic	0.26 ic	0.77 ic	---	0.00	---	---	---	---	---	1.031
3.03	4,571	985.08	1.09 ic	0.27 ic	0.79 ic	---	0.00	---	---	---	---	---	1.060
3.08	4,658	985.13	1.09 ic	0.27 ic	0.82 ic	---	0.00	---	---	---	---	---	1.088
3.13	4,745	985.18	1.12 ic	0.27 ic	0.84 ic	---	0.00	---	---	---	---	---	1.116
3.19	4,831	985.24	1.16 ic	0.27 ic	0.87 ic	---	0.00	---	---	---	---	---	1.142
3.25	4,918	985.29	1.17 ic	0.28 ic	0.89 ic	---	0.00	---	---	---	---	---	1.168
3.30	5,004	985.35	1.20 ic	0.28 ic	0.91 ic	---	0.00	---	---	---	---	---	1.193
3.36	5,082	985.41	1.25 ic	0.28 ic	0.94 ic	---	0.00	---	---	---	---	---	1.218
3.41	5,159	985.46	1.25 ic	0.28 ic	0.96 ic	---	0.00	---	---	---	---	---	1.243
3.46	5,237	985.52	1.29 ic	0.29 ic	0.98 ic	---	0.00	---	---	---	---	---	1.266
3.52	5,314	985.57	1.29 ic	0.29 ic	1.00 ic	---	0.00	---	---	---	---	---	1.289
3.58	5,392	985.62	1.33 ic	0.29 ic	1.02 ic	---	0.00	---	---	---	---	---	1.312
3.63	5,469	985.68	1.33 ic	0.29 ic	1.04 ic	---	0.00	---	---	---	---	---	1.335
3.68	5,547	985.73	1.37 ic	0.29 ic	1.06 ic	---	0.00	---	---	---	---	---	1.357
3.74	5,624	985.79	1.38 ic	0.30 ic	1.08 ic	---	0.00	---	---	---	---	---	1.378
3.80	5,702	985.84	1.42 ic	0.30 ic	1.10 ic	---	0.00	---	---	---	---	---	1.399
3.85	5,779	985.90	1.42 ic	0.30 ic	1.12 ic	---	0.00	---	---	---	---	---	1.420
3.90	5,838	985.96	1.46 ic	0.30 ic	1.14 ic	---	0.00	---	---	---	---	---	1.441
3.96	5,897	986.01	1.46 ic	0.31 ic	1.16 ic	---	0.00	---	---	---	---	---	1.461
4.01	5,955	986.06	1.50 ic	0.31 ic	1.17 ic	---	0.00	---	---	---	---	---	1.481
4.07	6,014	986.12	1.50 ic	0.31 ic	1.19 ic	---	0.00	---	---	---	---	---	1.501
4.13	6,073	986.17	1.55 ic	0.31 ic	1.21 ic	---	0.00	---	---	---	---	---	1.520
4.18	6,131	986.23	1.55 ic	0.32 ic	1.22 ic	---	0.00	---	---	---	---	---	1.540
4.23	6,190	986.28	1.56 ic	0.32 ic	1.24 ic	---	0.00	---	---	---	---	---	1.559
4.29	6,249	986.34	1.59 ic	0.32 ic	1.26 ic	---	0.00	---	---	---	---	---	1.577
4.34	6,307	986.39	1.60 ic	0.32 ic	1.27 ic	---	0.00	---	---	---	---	---	1.596
4.40	6,366	986.45	1.64 ic	0.32 ic	1.29 ic	---	0.00	---	---	---	---	---	1.614
4.45	6,413	986.51	1.64 ic	0.33 ic	1.31 ic	---	0.00	---	---	---	---	---	1.632
4.51	6,459	986.56	1.65 ic	0.33 ic	1.32 ic	---	0.00	---	---	---	---	---	1.650
4.57	6,506	986.61	1.68 ic	0.33 ic	1.34 ic	---	0.00	---	---	---	---	---	1.668
4.62	6,553	986.67	1.69 ic	0.33 ic	1.35 ic	---	0.00	---	---	---	---	---	1.686
4.67	6,600	986.72	1.73 ic	0.33 ic	1.37 ic	---	0.00	---	---	---	---	---	1.703
4.73	6,646	986.78	1.73 ic	0.34 ic	1.38 ic	---	0.00	---	---	---	---	---	1.720
4.78	6,693	986.84	1.74 ic	0.34 ic	1.40 ic	---	0.00	---	---	---	---	---	1.737
4.84	6,740	986.89	1.78 ic	0.34 ic	1.41 ic	---	0.00	---	---	---	---	---	1.754
4.89	6,786	986.94	1.78 ic	0.34 ic	1.43 ic	---	0.00	---	---	---	---	---	1.770
4.95	6,833	987.00	1.79 ic	0.34 ic	1.44 ic	---	0.00	---	---	---	---	---	1.787
5.01	6,880	987.05	1.83 ic	0.35 ic	1.46 ic	---	0.00	---	---	---	---	---	1.803
5.06	6,926	987.11	1.83 ic	0.35 ic	1.47 ic	---	0.00	---	---	---	---	---	1.819
5.11	6,973	987.16	1.84 ic	0.35 ic	1.48 ic	---	0.00	---	---	---	---	---	1.835
5.17	7,020	987.22	1.87 ic	0.35 ic	1.50 ic	---	0.00	---	---	---	---	---	1.851
5.22	7,066	987.28	1.87 ic	0.35 ic	1.51 ic	---	0.00	---	---	---	---	---	1.867
5.28	7,113	987.33	1.88 ic	0.36 ic	1.53 ic	---	0.00	---	---	---	---	---	1.882
5.33	7,160	987.38	1.92 ic	0.36 ic	1.54 ic	---	0.00	---	---	---	---	---	1.898
5.39	7,206	987.44	1.92 ic	0.36 ic	1.55 ic	---	0.00	---	---	---	---	---	1.913
5.44	7,253	987.49	1.93 ic	0.36 ic	1.57 ic	---	0.00	---	---	---	---	---	1.928
5.50	7,300	987.55	1.97 ic	0.36 ic	1.58 ic	---	0.00	---	---	---	---	---	1.943

...End

Hydrograph Report

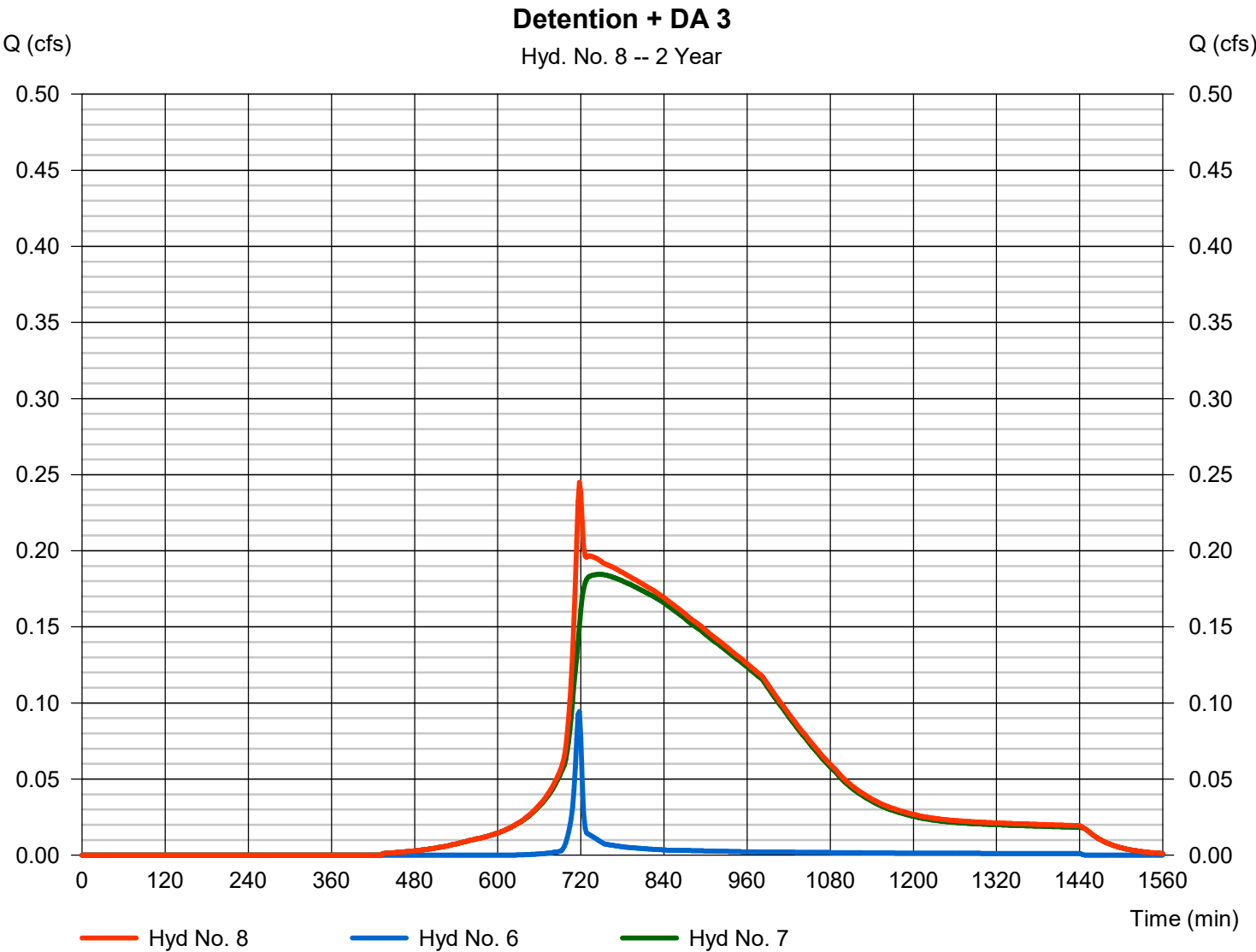
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Friday, 01 / 17 / 2025

Hyd. No. 8

Detention + DA 3

Hydrograph type	= Combine	Peak discharge	= 0.245 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 4,168 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 0.040 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	0.663	2	716	1,394	-----	-----	-----	Pre Off-Site Area (Pre DA 1)(Bypass
2	SCS Runoff	1.799	2	722	5,046	-----	-----	-----	Pre On-Site Area (DA 2)
3	Combine	2.213	2	720	6,440	1, 2	-----	-----	Combined Pre-Developed Flow
4	SCS Runoff	0.384	2	716	904	-----	-----	-----	Post Off-Site Area (Post DA 1)(Divert
5	SCS Runoff	3.022	2	718	7,138	-----	-----	-----	Post On-Site Area (DA2)
6	SCS Runoff	0.196	2	716	396	-----	-----	-----	Post-On Site Area (DA3) Undetained
7	Reservoir	0.385	2	738	7,136	5	984.24	3,198	Underground Detention
8	Combine	0.408	2	736	7,532	6, 7	-----	-----	Detention + DA 3
Lees Summit Hydrographs_2025-01-06_Underground					Return Period: 10 Year			Friday, 01 / 17 / 2025	

Hydrograph Report

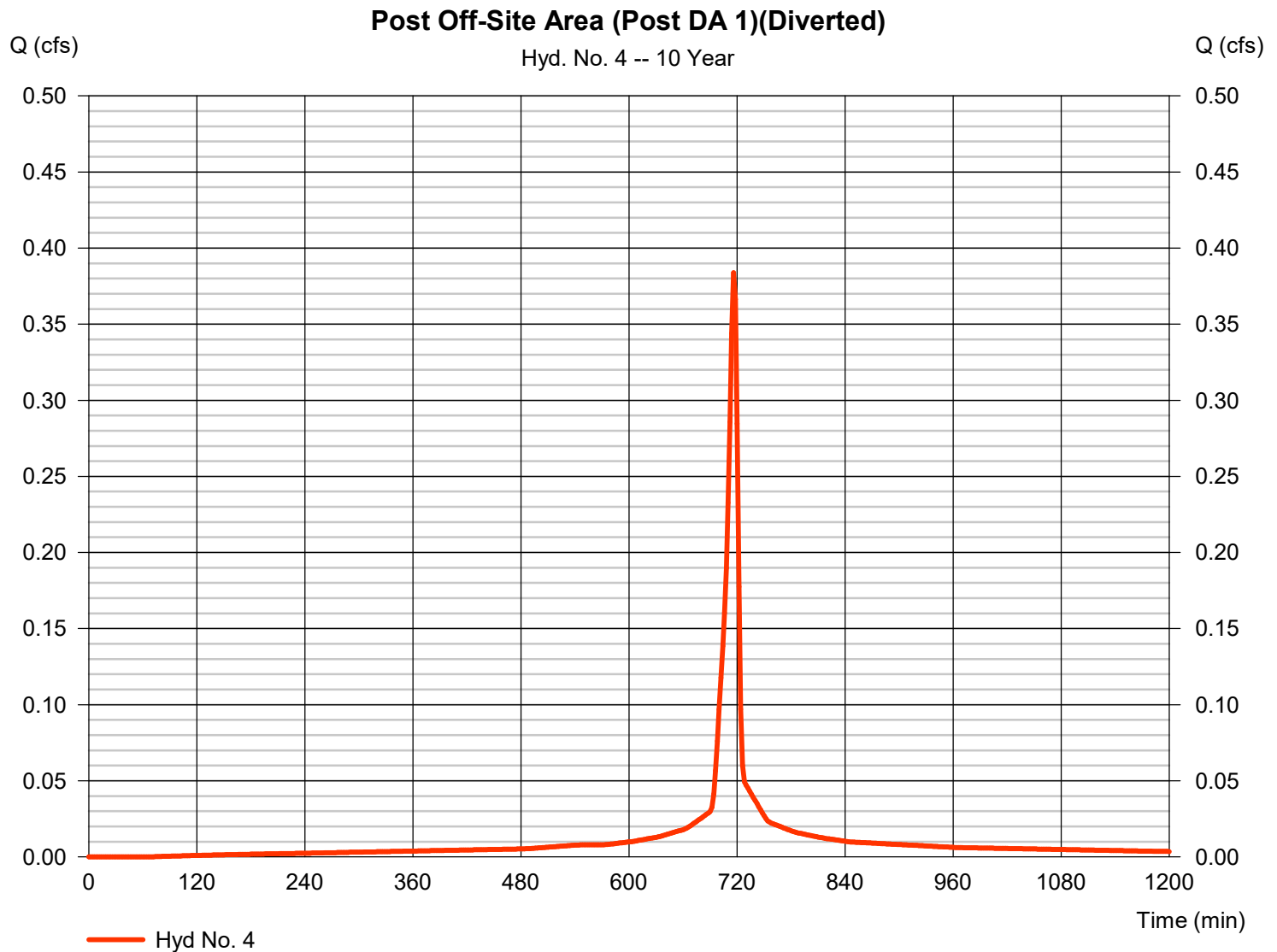
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Friday, 01 / 17 / 2025

Hyd. No. 4

Post Off-Site Area (Post DA 1)(Diverted)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.384 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	904 cuft
Drainage area	=	0.050 ac	Curve number	=	97*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = $[(0.052 \times 98) + (0.002 \times 74)] / 0.050$ 

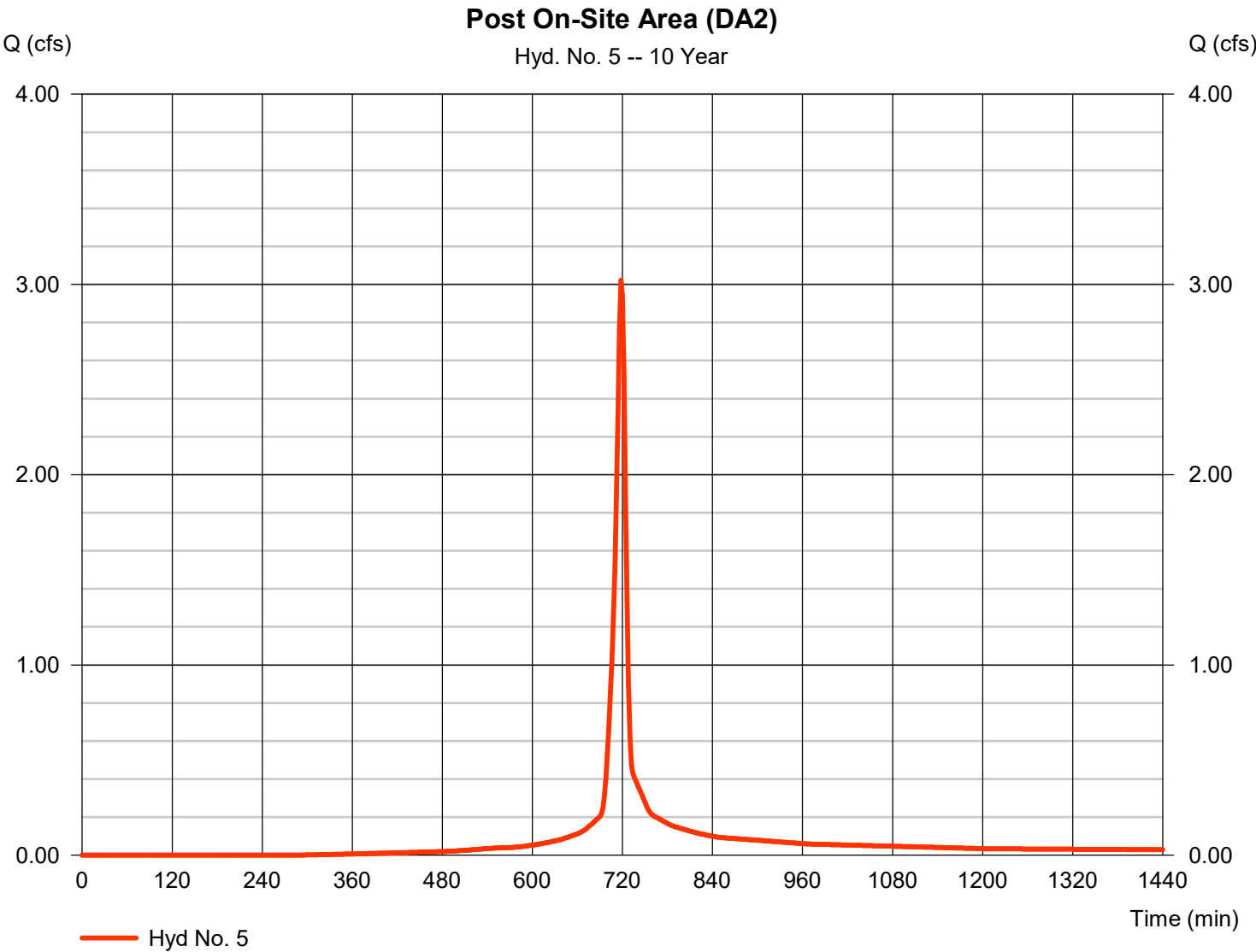
Hydrograph Report

Hyd. No. 5

Post On-Site Area (DA2)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.022 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	7,138 cuft
Drainage area	=	0.480 ac	Curve number	=	86*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.40 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.230 x 98) + (0.250 x 74)] / 0.480

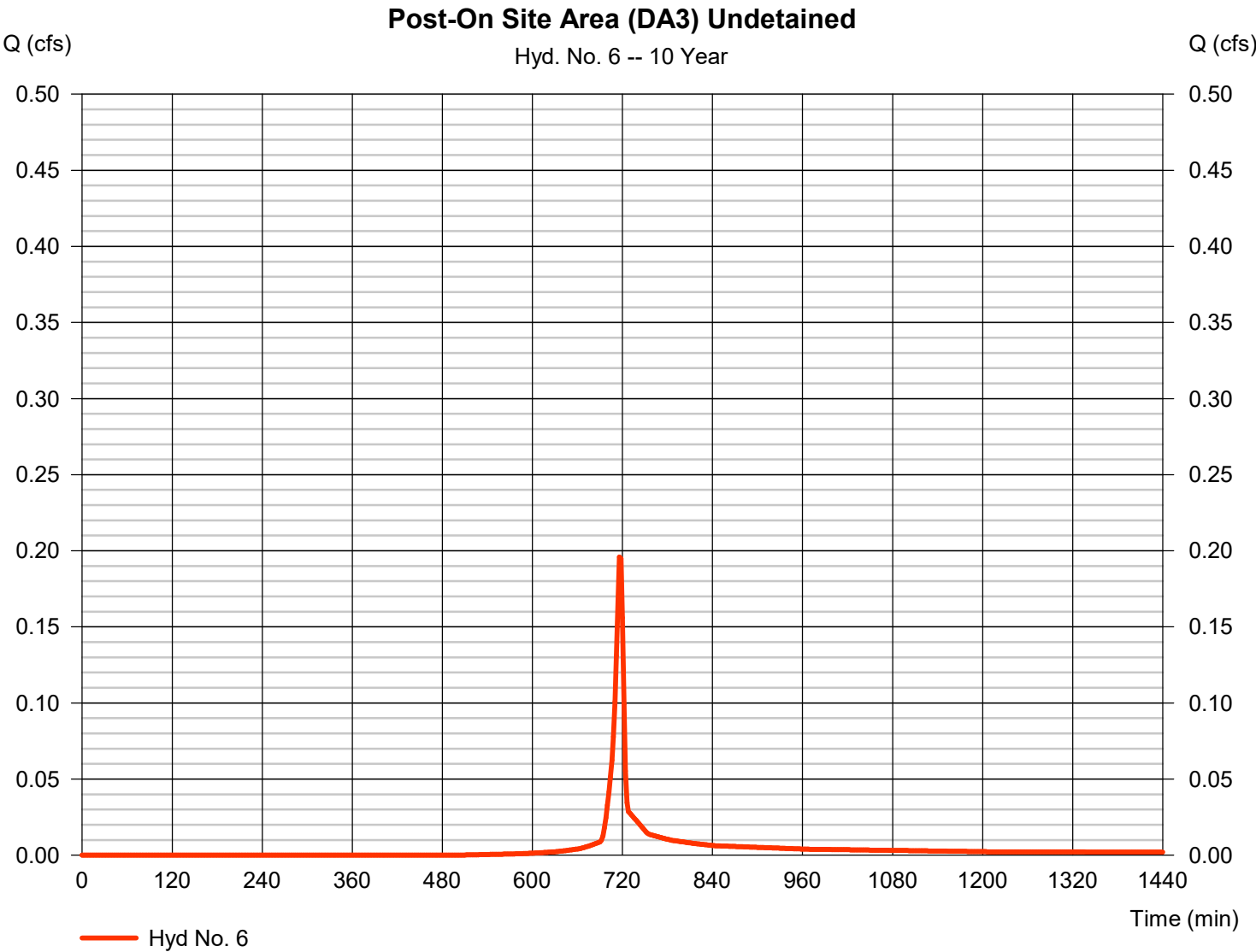


Hydrograph Report

Hyd. No. 6

Post-On Site Area (DA3) Undetained

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.196 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	396 cuft
Drainage area	=	0.040 ac	Curve number	=	74
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

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

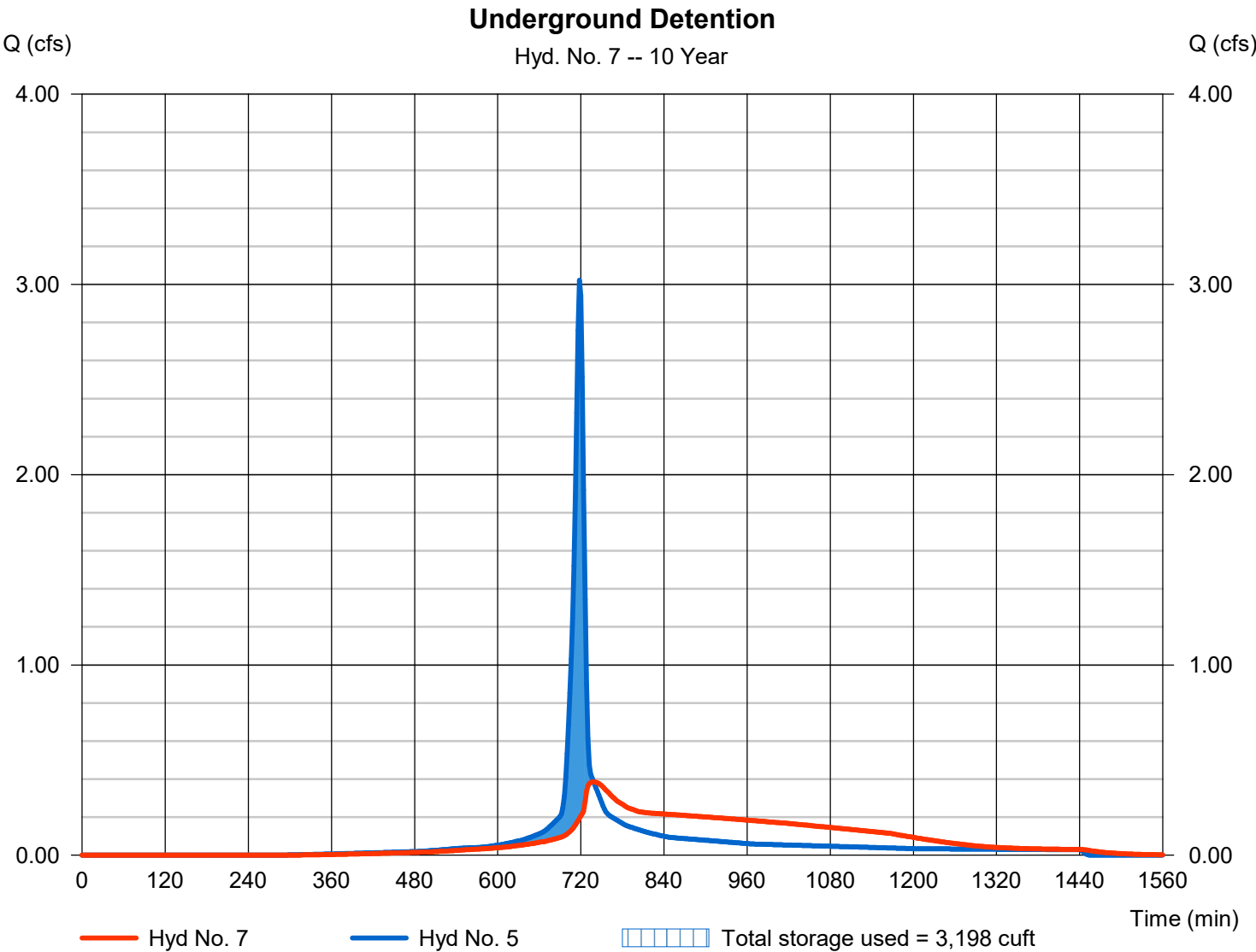
Friday, 01 / 17 / 2025

Hyd. No. 7

Underground Detention

Hydrograph type	= Reservoir	Peak discharge	= 0.385 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 7,136 cuft
Inflow hyd. No.	= 5 - Post On-Site Area (DA2)	Max. Elevation	= 984.24 ft
Reservoir name	= Underground Detention	Max. Storage	= 3,198 cuft

Storage Indication method used.

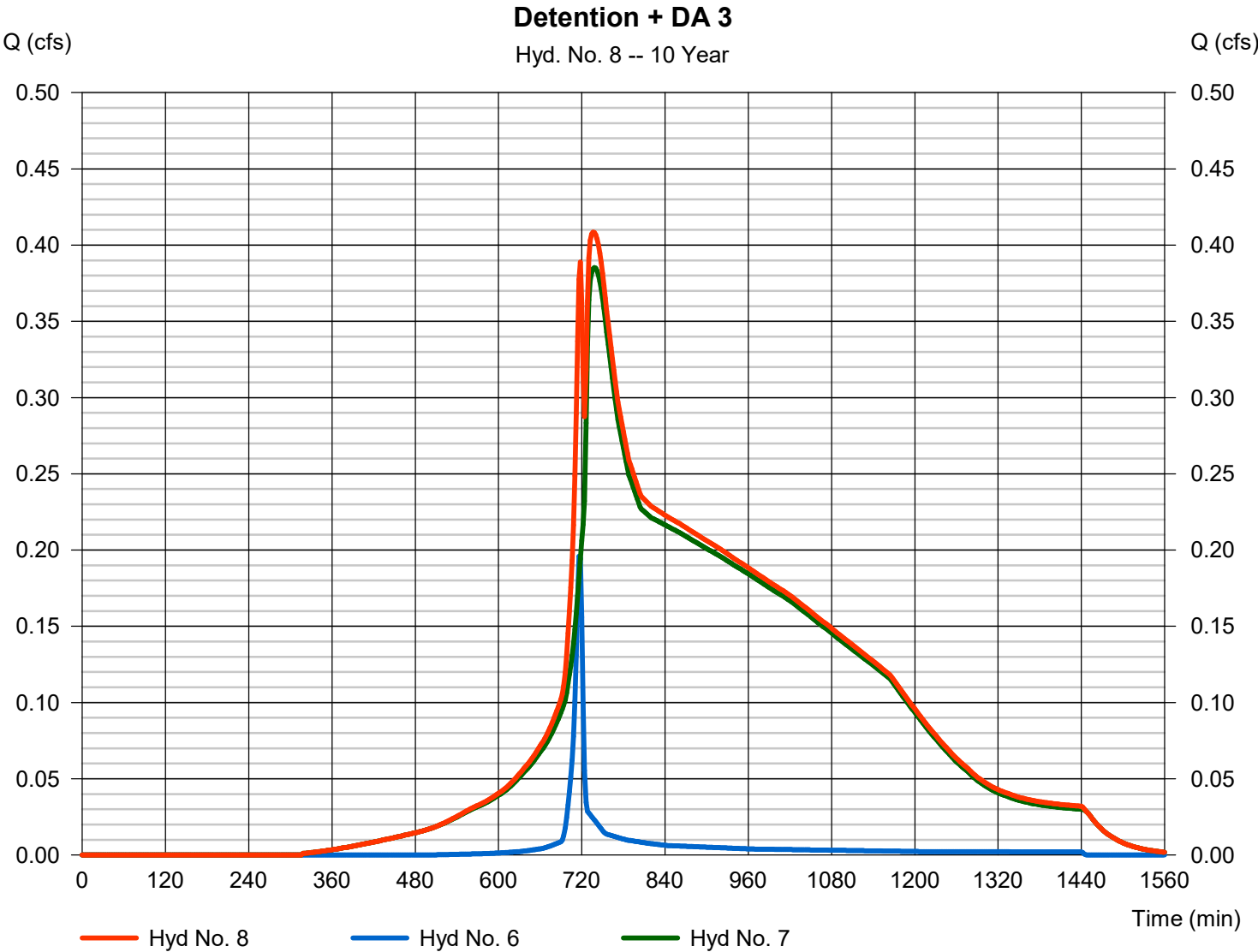


Hydrograph Report

Hyd. No. 8

Detention + DA 3

Hydrograph type	= Combine	Peak discharge	= 0.408 cfs
Storm frequency	= 10 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 7,532 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 0.040 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	1.177	2	716	2,572	-----	-----	-----	Pre Off-Site Area (Pre DA 1)(Bypass
2	SCS Runoff	3.719	2	722	10,521	-----	-----	-----	Pre On-Site Area (DA 2)
3	Combine	4.461	2	720	13,093	1, 2	-----	-----	Combined Pre-Developed Flow
4	SCS Runoff	0.630	2	716	1,514	-----	-----	-----	Post Off-Site Area (Post DA 1)(Divert
5	SCS Runoff	5.382	2	718	13,168	-----	-----	-----	Post On-Site Area (DA2)
6	SCS Runoff	0.400	2	716	826	-----	-----	-----	Post-On Site Area (DA3) Undetained
7	Reservoir	1.340	2	728	13,166	5	985.69	5,488	Underground Detention
8	Combine	1.395	2	728	13,991	6, 7	-----	-----	Detention + DA 3
Lees Summit Hydrographs_2025-01-06_Underground					Return Period: 100 Year			Friday, 01 / 17 / 2025	

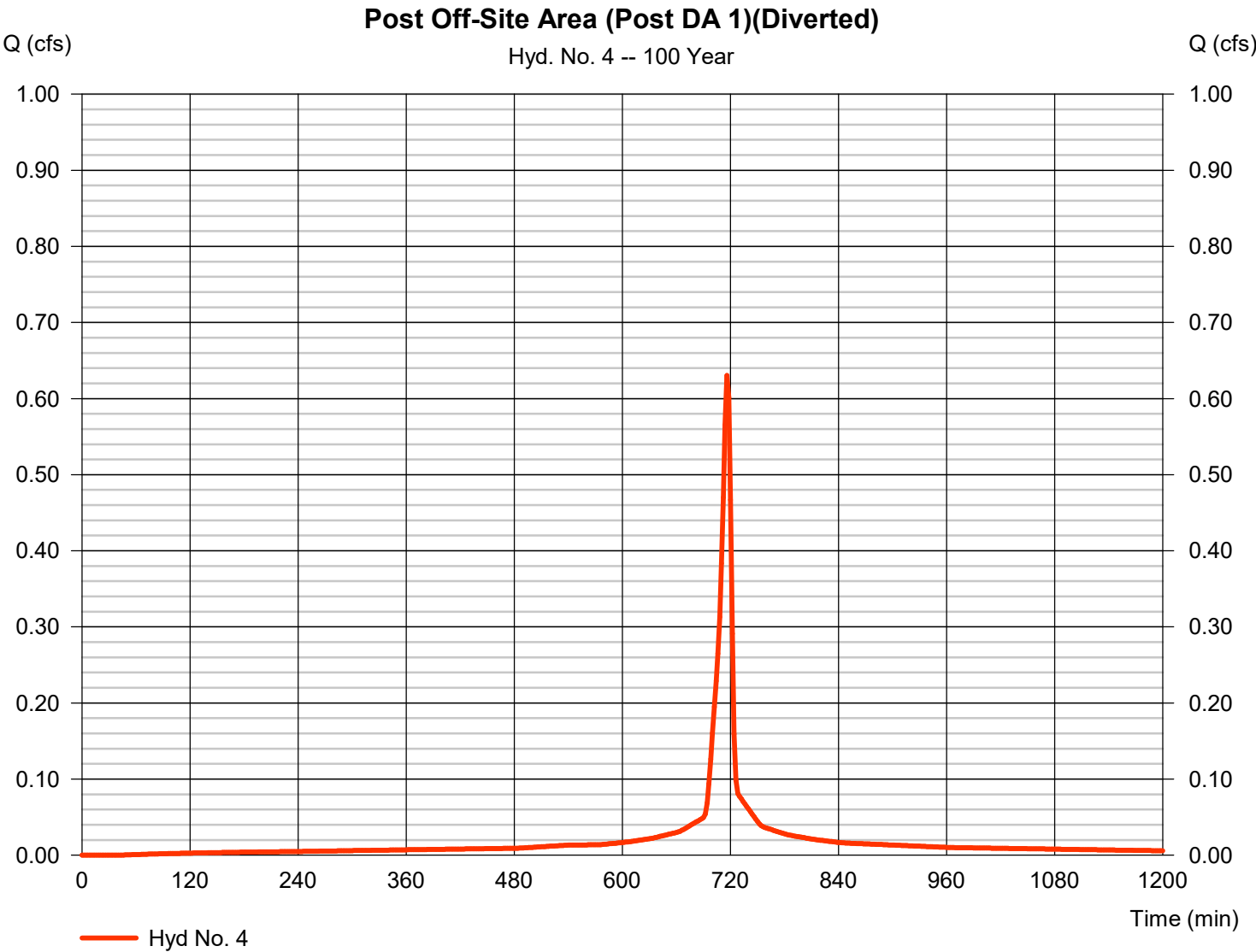
Hydrograph Report

Hyd. No. 4

Post Off-Site Area (Post DA 1)(Diverted)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.630 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	1,514 cuft
Drainage area	=	0.050 ac	Curve number	=	97*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	9.26 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.052 x 98) + (0.002 x 74)] / 0.050



Hydrograph Report

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

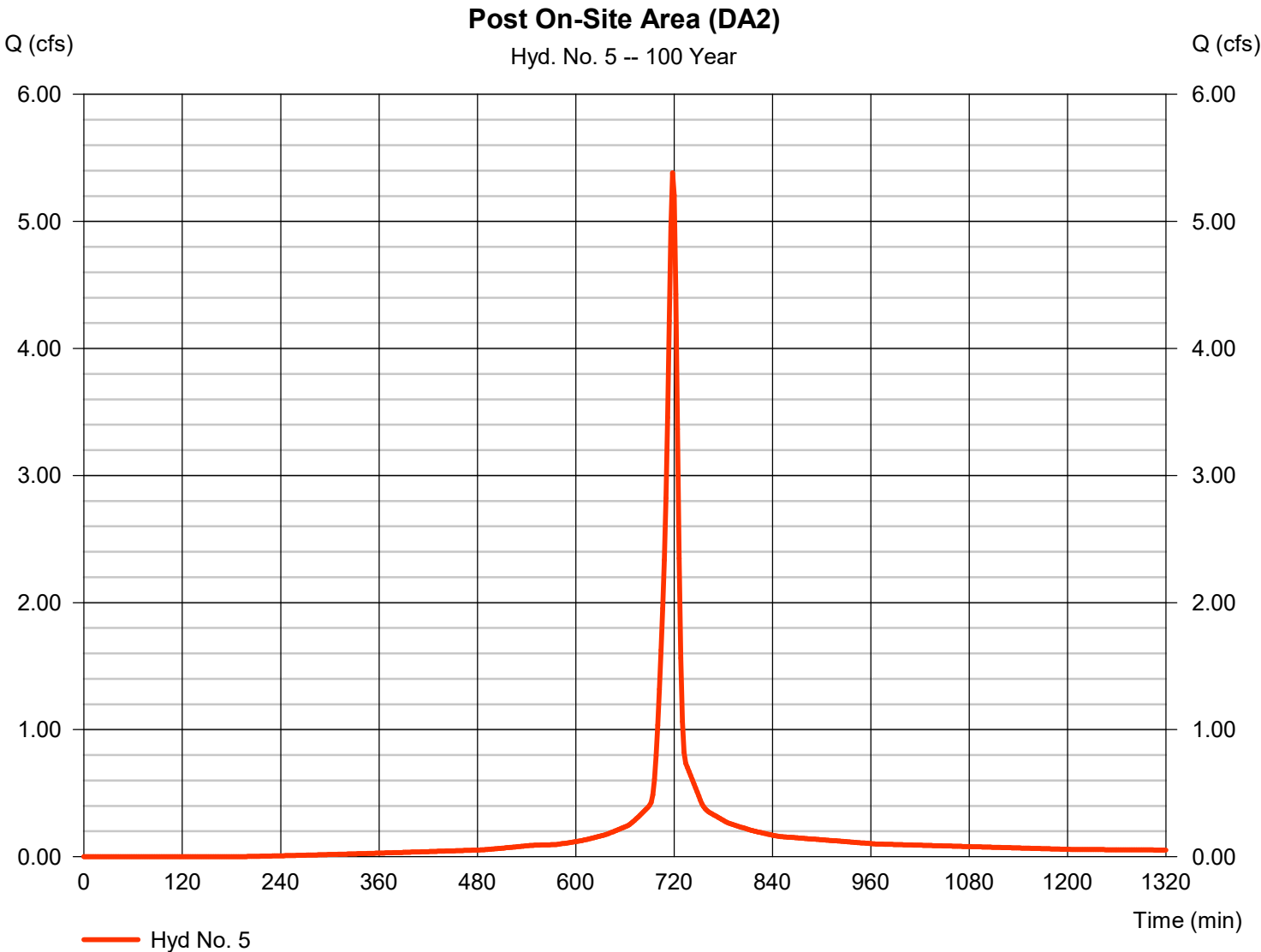
Friday, 01 / 17 / 2025

Hyd. No. 5

Post On-Site Area (DA2)

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.382 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	13,168 cuft
Drainage area	=	0.480 ac	Curve number	=	86*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.40 min
Total precip.	=	9.26 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.230 x 98) + (0.250 x 74)] / 0.480



Hydrograph Report

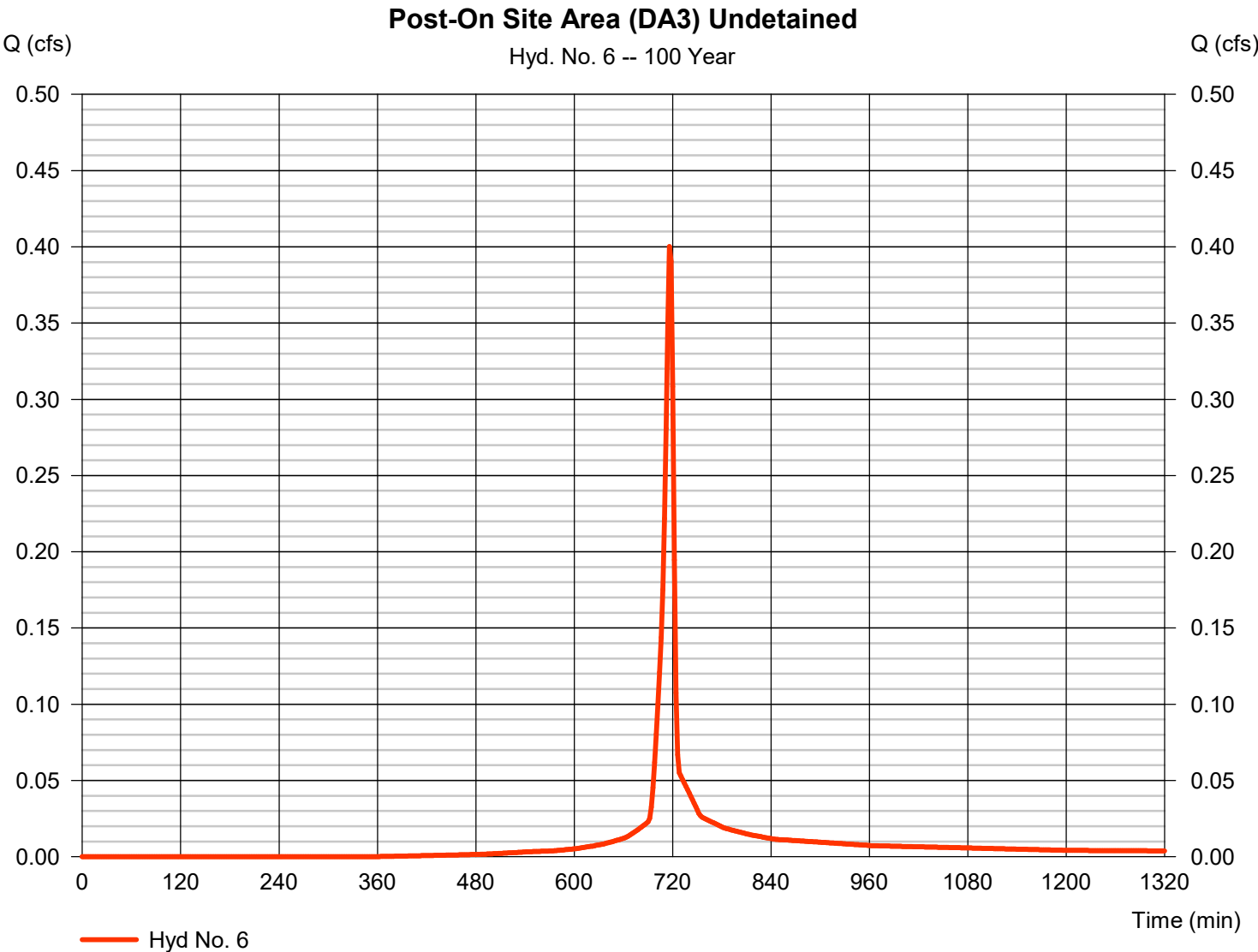
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Friday, 01 / 17 / 2025

Hyd. No. 6

Post-On Site Area (DA3) Undetained

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.400 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	826 cuft
Drainage area	=	0.040 ac	Curve number	=	74
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	9.26 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

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

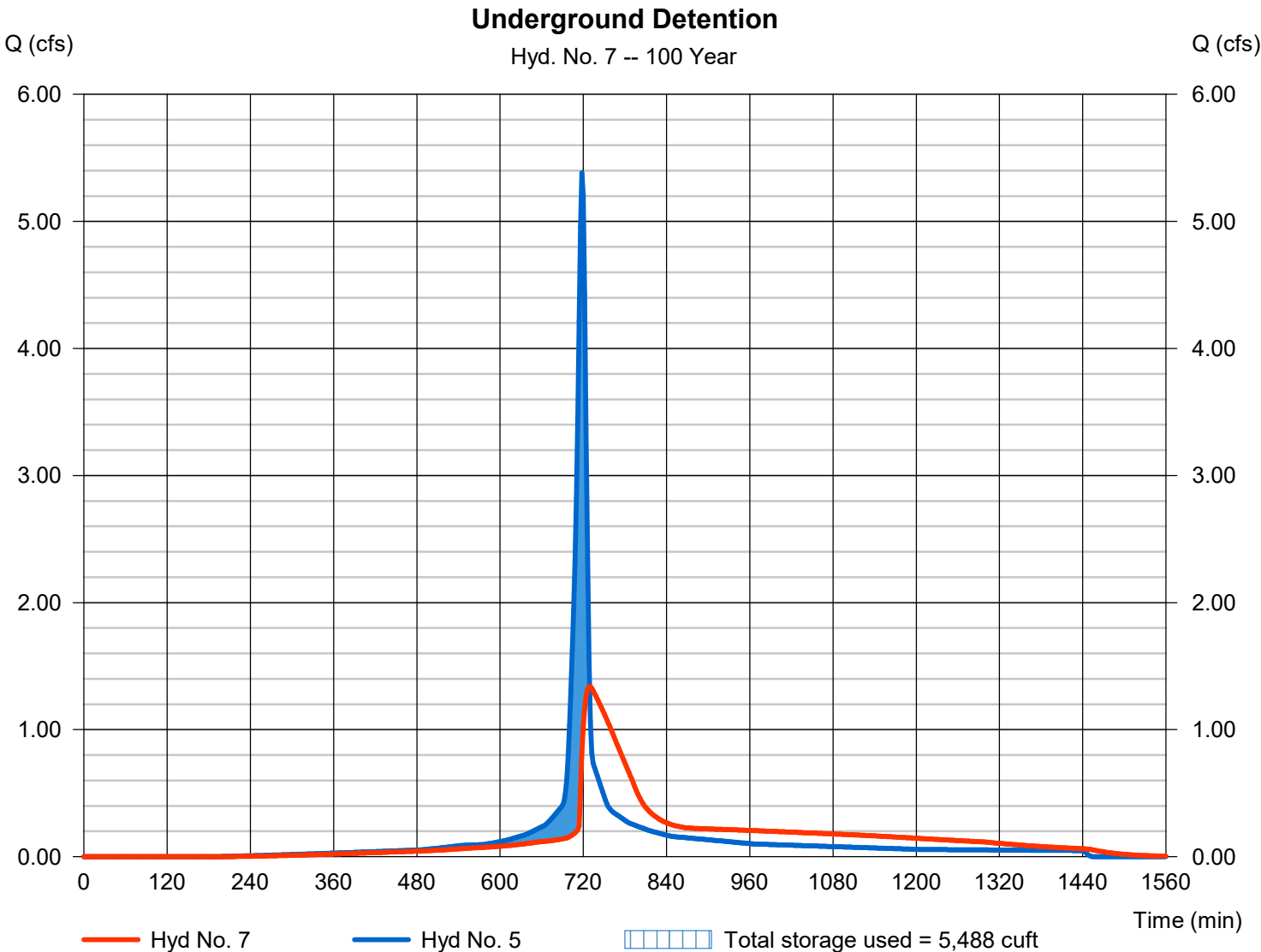
Friday, 01 / 17 / 2025

Hyd. No. 7

Underground Detention

Hydrograph type	= Reservoir	Peak discharge	= 1.340 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 13,166 cuft
Inflow hyd. No.	= 5 - Post On-Site Area (DA2)	Max. Elevation	= 985.69 ft
Reservoir name	= Underground Detention	Max. Storage	= 5,488 cuft

Storage Indication method used.

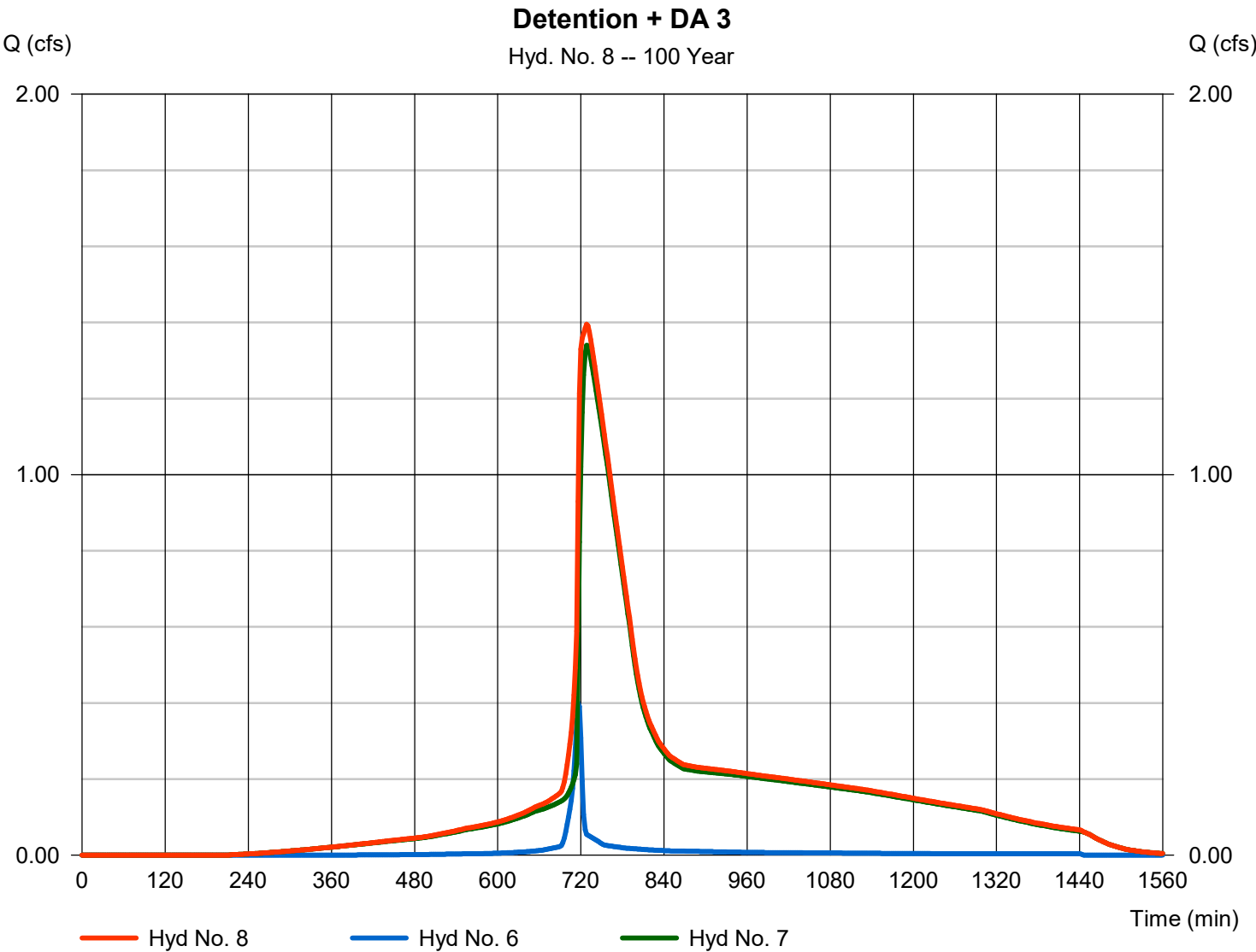


Hydrograph Report

Hyd. No. 8

Detention + DA 3

Hydrograph type	= Combine	Peak discharge	= 1.395 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 13,991 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 0.040 ac



Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	80.1702	15.0000	0.9000	-----
3	0.0000	0.0000	0.0000	-----
5	0.0000	0.0000	0.0000	-----
10	183.3473	19.2000	1.0096	-----
25	197.2999	18.6000	0.9937	-----
50	235.4014	19.9000	1.0020	-----
100	252.3450	19.7000	0.9969	-----

File name: IDF Curve APWA5600.IDF

$$\text{Intensity} = B / (Tc + D)^E$$

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.41	4.42	3.76	3.27	2.90	2.61	2.37	2.18	2.01	1.87	1.75	1.65
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	7.35	6.08	5.18	4.52	4.00	3.59	3.26	2.98	2.74	2.54	2.37	2.22
25	8.53	7.05	6.00	5.23	4.63	4.16	3.77	3.45	3.18	2.95	2.75	2.58
50	9.39	7.82	6.70	5.86	5.20	4.68	4.25	3.90	3.60	3.34	3.12	2.92
100	10.32	8.59	7.35	6.43	5.71	5.14	4.67	4.28	3.95	3.67	3.42	3.21

Tc = time in minutes. Values may exceed 60.

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[illegible]

-
- Do not locate EDDBs on fill sites or on or near steep slopes if it is expected that much of the water will exit through the bottom of the facility, unless the bottom of the facility is modified to prevent excessive infiltration (Metropolitan Nashville – Davidson County, 2000).
 - Energy dissipation shall be included in the inlet design to reduce resuspension of accumulated sediment (California Stormwater Quality Association, 2003).
 - Erosion protection shall be placed at the facility's outfall. Energy dissipation may be required to reduce flow velocities from the primary spillway to nonerosive values (California Stormwater Quality Association, 2003).
 - A maintenance ramp and perimeter access shall be included in the design to facilitate access to the basin for maintenance activities (California Stormwater Quality Association, 2003).
 - When desirable and feasible, EDDBs shall be incorporated within a larger flood control basin or as a part of a full-spectrum detention facility. See APWA 5600 for design specifications if flood control is to be incorporated into the design of the EDDB. Also, whenever possible, designers should try to accommodate within the basin other urban uses such as passive recreation and wildlife habitat (Urban Drainage and Flood Control District, Denver, Colorado, 2005).
 - EDDBs that do not provide flood storage for the 1 percent storm shall be designed so that runoff flows from the 1 percent event safely pass through the facility. At a minimum, all facility embankments shall be protected from failure during the 1 percent event. An emergency spillway, which conveys large flood flows safely past earth embankments, must be provided for each dam unless the principal spillway is large enough to pass the peak flow expected from the 1 percent design storm without overtopping the dam (Natural Resources Conservation Service – Maryland, 2000).
 - The EDDB bottom should be 1 to 2 feet above the wet season groundwater table, as groundwater may surface within the basin or contribute baseflow to the basin (Urban Drainage and Flood Control District, Denver, Colorado, 2005). This also allows for some infiltration.
 - Outflow structures shall be protected by well screen, trash racks, grates, stone filters, or other approved devices to ensure that the outlet works will remain functional (Kansas City Metropolitan Chapter of the American Public Works Administration, 2006). No single outlet orifice shall be less than 4 inches in diameter (smaller orifices are more susceptible to clogging). If the calculated orifice diameter necessary to achieve a 40-hour drawdown is less than 4 inches, a perforated riser, orifice plate, or v-notch weir shall be used instead of a single orifice outlet. Keep perforations larger than 1 inch when using orifice plates or perforated risers. Smaller orifice sizes may be used if the weir plate is placed in a riser manhole in a sump-like condition.
 - Public safety shall be considered in EDDB design. Fences and landscaping can be used to impede access to the facility. The facility shall be contoured so as to eliminate any dropoffs or other hazards. The primary spillway opening must not permit access by small children. Outfall pipes above 48 inches in diameter shall be fenced (California Stormwater Quality Association, 2003).
 - Facilities that receive stormwater from contributing areas that have potential for oil and grease contamination must include a baffle, skimmer, and grease trap to prevent these substances from being discharged from the facility (Metropolitan Nashville – Davidson County, 2000).

8.10.6 Maintenance and Inspections

Extended dry detention basins (EDDB) provide stormwater volume control and may integrate water quality treatment through the use of deep-rooted native plantings. Native vegetation installed at least to the water quality event (WQv) storage elevation provides optimal function for the basin. The use of native vegetation also greatly improves stormwater infiltration into the soil, removes nutrients and trash from the contributing drainage area, and does not require the fertilizer or herbicides of turf-type plantings. Native vegetation provides exceptional erosion control and stabilization for EDDBs, but also needs intensive initial establishment activities and routine long-term maintenance to

achieve optimal performance. Additionally, the flood control benefits of EDDBs are vulnerable to structural compromise by woody vegetation encroachment and animal burrowing that can cause leaks and dam failure.

Primary maintenance in EDDBs is related to maintaining dry conditions, repairing erosion, and managing vegetation. EDDB structures handle sporadic, intense runoff events, and are vulnerable to erosion on the side slopes and the flow line of the basin. Preserving design elevations through routine maintenance to forebays, swales, other pretreatment structures, and the contributing drainage area is critical to avoiding costly dredging. The side slopes shall conform as closely as possible to regraded or natural land contours, and shall not exceed 4:1 (H:V). Slopes showing excessive erosion may require erosion control and safety measures (Kansas City Metropolitan Chapter of the American Public Works Administration, 2006).

Routine inspection to ensure outlets are functioning properly prevents standing water issues. If a v-notch weir or orifice plate is used to control flow, weekly inspections may be required to ensure the opening is clear of vegetation, trash, or other debris. Blocked outlet structures create standing water that can kill desired vegetation, encourage undesirable weed growth, and damage trash racks or other outlet structures. Inspect for evidence of muskrats, beavers, and other animals that can severely degrade the function of the basin. Additionally, routine inspection of the outfall of the basin into a stream or subsequent stormwater facility to identify erosion and prevent any head-cutting will avoid degradation and costly repair to the basin.

Dense, well-established stands of desirable native vegetation in an EDDB can preclude weed infestation by occupying the root space and canopy sunlight. A combination of grasses and flowers reduces peak flows and provides year long visual interest, so maintenance activities must be targeted to foster continuity in this diversity over time. This can be established through regular flail-type mowing, removal of undesirable species, and spot treatment of noxious or woody vegetation. String trimming to prevent disturbance from mowing equipment on saturated soils is strongly recommended. Prescribed burning is an efficient and effective tool for managing native vegetation in EDDBs; however, if that option is not available, annual mowing may be followed up with tilling of small, select areas for overseeding with flowers, as grasses will come to dominate the seeding over time in the absence of prescribed burning. A diverse mix of native vegetation can provide valuable habitat for birds, and maintenance activities may be scheduled around primary nesting seasons.

TABLE 8.12 Extended Dry Detention Basin Typical Maintenance Activities		
Activity		Frequency
Establishment (1-3yrs)		
	Watering plants <i>(seeded areas up to 8 weeks, plugs in drought)</i>	1" per week as needed
	Weed control <i>(flail mow, string-trim, selective/preemerg herbicides)</i>	Monthly
	Remove litter and debris <i>(trash, leaves, sand, mower discharge)</i>	Monthly
	Monitor & repair erosion <i>(stabilize soil, replace plants, secure edging)</i>	Monthly
	Check for standing water <i>(longer than design, any puddles, saturated soil)</i>	Monthly
	Add mulch <i>(moisture & weed control with plugs/containers, 3" or less)</i>	Annually
	Inspect drainage area <i>(parking lot sweeping, open dumpsters, etc)</i>	Annually
	Replace dead plants <i>(use design species/size: overseed, install deep cell plugs)</i>	Annually, as needed
Maintenance (3+yrs, establishment activities may carry over, as needed)		
	Vegetation cleanup <i>(spot treat, prescribed burn, prune)</i>	Annually, spring or fall
	Evaluate plant composition <i>(woody invasion, grass/flower ratio, "right plant right place")</i>	Annually
	Sediment removal, erosion control <i>(pretreatment structures: forebay, check dams)</i>	Annually
	Address animal damage <i>(beaver dams, muskrat burrows, deer rubs)</i>	Annually
	Verify structural component function <i>(v-notch weir, check dams, outlet protection)</i>	Annually
Extended Dry Detention Basin		
	String trim vegetation to minimize disturbance	Annually
	Inspect for erosion in flow lines and slopes	Annually

Typical maintenance activities are outlined to provide a basis for scheduling and planning work but should not be considered wholly comprehensive or definitive. Activities and frequencies will vary depending on site conditions and expectations related to adjacent land use. Some activities shown may continue through the establishment and maintenance phases. It's important to use adaptive management based on the goals of the practice and to integrate evaluation and assessment into a long-term maintenance plan.

8.10.6.1 *Sediment Removal*

Some sediment may contain contaminants of which the Kansas Department of Health and Environment (KDHE) or Missouri Department of Natural Resources (MDNR) requires special disposal procedures. If there is any uncertainty about what the sediment contains or it is known to contain contaminants, then KDHE or MDNR should be consulted and their disposal recommendations followed. Sampling and testing shall be performed on sediments accumulated in facilities serving industrial, manufacturing or heavy commercial sites, fueling centers or automotive maintenance areas, large parking areas, or other areas where pollutants (other than “clean” soil) are suspected to accumulate and be conveyed via stormwater runoff (Metropolitan Nashville – Davidson County, 2000).

Some sediment collected may be innocuous (free of pollutants other than “clean” soil) and can be used as fill material, cover, or land spreading. It is important that this material not be placed in a way that will promote or allow resuspension in stormwater runoff. The sediment shall not be placed within the high water level area of the EDDB, other BMP, creek, waterway, buffer, runoff conveyance device, or other infrastructure. Some demolition or sanitary landfill operators will allow the sediment to be disposed at their facility for use as cover. This generally requires that the sediment be tested to ensure that it is innocuous (Metropolitan Nashville – Davidson County, 2000).

- Remove sediment when accumulation reaches 6 inches, or if resuspension is observed or probable. Sediment may be permitted to accumulate deeper than 6 inches if there is a permanent marker indicating the depth where sediment needs to be removed and that mark has not been met (Metropolitan Nashville – Davidson County, 2000).
- Remove sediments if they are within 18 inches of an orifice plate (Metropolitan Nashville – Davidson County, 2000).