DOULGERAKIS
CONSULTING
ENGINEERS, INC.

June 8, 2017

To: R. Clai Brown
City Manager
City of Avondale Estates
21 North Avondale Plaza
Avondale Estates, GA 30002
404-294-5400

RE: Conceptual Hydrological Study for 4.059 Acres on N. Avondale Rd. and Oak St.

Mr. Brown,

Per our Agreement for Engineering Services, the City of Avondale Estates has commissioned DCE to prepare this Conceptual Hydrological Study for the purpose of determining what modifications would be necessary to the proposed future stormwater pond on the adjacent property to the north (owned by Avila Development) in order to receive and treat the redeveloped stormwater runoff from the City's property in accordance with the Stormwater Management Code of Avondale Estates. Additionally the City has requested recommendations for reducing the required stormwater runoff from its redevelopment and an engineer's estimate of what the additional cost would be to modify Avila's proposed pond.

Attached to this letter is the Conceptual Hydrological Study for the City of Avondale Estates development located in Land Lot 249 15th District of Avondale Estates, DeKalb County, Georgia. The site is located at the northeast corner of the intersection of N. Avondale Road and Oak Street. The project site consists of 4.059 acres, all of which has been previously developed. The property is not contiguous and is divided into 3 separate tracts of land by existing public streets. The City of Avondale Estates desires to redevelop this property to benefit the City's downtown. At the time of this study the proposed uses of the City's property were not yet determined.

The analysis herein is performed using the SCS method to generate hydrographs based on a 24 hour, type II distribution storm event. The study is based on the methodology outlined in the Georgia Stormwater Management Manual Volume 2.

Please let us know if you should have any questions regarding this study.

Sincerely,

Emmanuel Doulgerakis, P.E. & MSCE



400 Abbey Court, Alpharetta, GA 30004 · (770) 753-9800 · Fax (770) 753-9810

Conceptual Hydrological Study

FOR

# 4.059 acres on N. Avondale Rd. and Oak St.

LOCATED IN

Land Lot No. 249,
15th District of Avondale Estates,
DeKalb County, Georgia

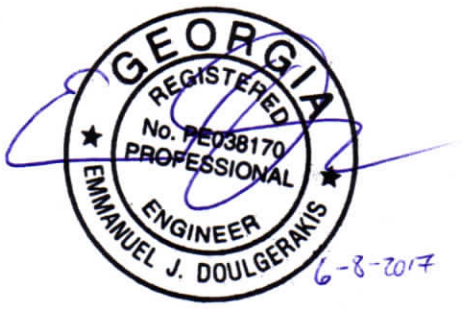
BY DEVELOPER/OWNER

## City of Avondale Estates

95 Cole Street
Marietta, GA 30060

PREPARED BY
***DOULGERAKIS CONSULTING ENGINEERS, INC.***
400 Abbey Court
Alpharetta, GA 30004
(770) 753 - 9800

**June 8, 2017**



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# Appendices:

# Project Narrative

The purpose of this report is to identify the required modifications to the future Avila stormwater management pond for the proposed City of Avondale Estates 4.059 acres development. The City property is not contiguous and is divided into 3 separate tracts of land by existing public streets. At the time of this study the proposed uses of the City's property were not yet determined.

The City Site is currently developed with several parking lots, building foundations, buildings and some grassed open space. For the purpose of this analysis we assume that approximately 0.27 acres of the existing City Street Right of Way will also be redeveloped for frontage improvements such as sidewalk enhancements and parallel parking additions. Therefore, the total "on-site" project area for the City Site will be defined as 4.33 acres. The portion of the City Site south of Franklin St currently drains to an existing storm sewer system located in the Lake St Right of Way which drains north into the Avila Site. The remainder of the City property drains to the north as overland flow into the Avila Site. The proposed use of the City Site is unknown at this time, therefore we assume that the proposed development will have an impervious area of approximately 80% of the total site or 3.46 acres.

The Avila Site consists of 13.28 acres that is currently developed with an expanse of parking lots and building foundations along with a very small amount of vegetated open space. Avila's Site drains via an existing storm sewer system to the northwest corner of the property where it daylights into an existing stream. This stream flows a approximately 100 ft before entering an existing 42" CMP culvert in the CSX Right of Way. The proposed uses of the Avila Site are also not finalized at this time, therefore we assume that the proposed development will have an impervious area of approximately 80% of the total site or 10.60 acres.

The existing developed downtown area generally bounded by Lake St to the west, N. Avondale Rd to the south, N. Clarendon Ave to the east, and Parry St/ Franklin St to the north also drains into the Avila Site via the existing storm sewer system. This area called the "Offsite Pass-Thru Area" consists of approximately 7.52 acres. Since the City Site and the Pass Thru Area both drain to the existing storm sewer system it is not reasonably feasible to treat the stormwater from the City Site on the Avila Site without also receiving the Offsite Pass-Thru Area. Therefore, although Water Quality is not required for offsite areas, the analysis of the required Avila Pond modifications must also account for this offsite area for Channel Protection if the City Site is to be accommodated, as is required by the Georgia Stormwater Management Manual.

The project drainage maps located in Appendix C show the defined project areas for this study.

Study Point A for this report is located at the northwestern property line of the Avila Site prior to entering the existing stream. The 10% Study Point for this report is located in Tributary C of South Fork Peachtree Creek near the intersection of DeKalb Industrial Way and N. Arcadia Ave. An additional analysis point is located in the existing culvert just north of the Avila Site, which flows beneath the CSX Right of Way.

Stormwater management for this study will be assessed by analyzing two pond routing scenarios. Scenario 1 assessed the stormwater management requirements for the Avila Site only while the City Site remains undeveloped. This scenario assumes that both the City Site and the Offsite Pass-Thru Site bypass the Avila Pond directly to Study Point A. This represents the control scenario as a basis for the minimum requirements of the Avila Pond so that the required modifications for the inclusion of treatment of the City Site can be quantified.

Scenario 2 assessed the stormwater management requirements to treat the combined Avila Site and City Site runoff. This scenario assumes that the Offsite Pass-Thru Site is taken into the combined Avila/City Pond due to the difficulties of effectively separating the stormwater from the City Site and the Offsite Pass-Thru Site as it enters the Avila Site.

According to FIRM Panel 13089C0069J this site is not located within a FEMA studied 100-year flood plain.

# Pre Development Conditions

The onsite area is composed of previously developed areas. The soil types located in this area are hydrological Type B. The offsite areas are also developed areas with hydrological Type B soils. Therefore, a Curve Number of 62 will be used for the onsite pervious/vegetated areas (Reference Table 3.1.5-1 GSWMM). Curve Number of 98 will be used for impervious areas such as roads, buildings, and parking lots. Time of concentration is calculated using the TR-55 method and calculations can be found in the Hydraflow Hydrographs Report Appendix B. For developed site the minimum permitted time of concentration of 6 minutes is used. Reference Appendix C for Pre and Post Development Maps.

**Pre Development Table**

| Area # | Total Area (AC) | Curve Number CN | Time of Conc. Tc (min) | Impervious Area (AC) (CN=98) | Grassed Area (AC) Soil Type B (CN=62) |
|---|---|---|---|---|---|
| City Site (to S.P. A) | 4.33 | 86 | 6 | 2.92 | 1.41 |
| Avila Site (to S.P. A) | 13.28 | 95 | 6 | 12.31 | 0.97 |
| Offsite Pass-Thru Area (to S.P. A) | 7.52 | 89 | 6 | 5.65 | 1.87 |
| Offsite to CSX Culvert | 21.3 | 83 | 12.9 | 12.7 | 8.6 |
| Overall Basin to 10% Study Point Less On and Offsite Areas | 194 | 91 | 34.4 | 156 | 38 |

| | |
|---|---|
| Total On and Off Site Areas (AC) = | 46.43 |
| Total Area to S.P. A (AC) = | 25.13 |
| Total Area to CSX Culvert (AC) = | 46.43 |
| Total Area to 10% S.P. (AC) = | 240 |

# Post Development Conditions

Post development conditions for areas within the Avila Site and the City Site will include a combination of pervious landscaped areas, impervious structures, and parking lots. It is assumed that 80% of the project site areas will be have impervious cover during post development conditions. The minimum permitted time of concentration of 6 minutes is used for both post developed areas as is typical for developed sites with onsite storm sewer systems. Reference Appendix C for Pre and Post Development Maps.

| Post Development Table | | | | | |
|---|---|---|---|---|---|
| Area # | Total Area (AC) | Curve Number CN | Time of Conc. Tc (min) | Impervious Area (AC) (CN=98) | Grassed Area (AC) Soil Type B (CN=62) |
| City Site (to S.P. A) | 4.33 | 91 | 6 | 3.46 | 0.87 |
| Avila Site (to S.P. A) | 13.28 | 91 | 6 | 10.60 | 2.68 |

# Sizing Criteria for Detention Ponds

The City of Avondale Estates requires the following Post-Development Stormwater Management Performance Criteria:

- Water Quality: Retain or treat the runoff resulting from the first 1.2" of rainfall such that the average annual post development total suspended solids are reduced by 80%. Utilizes the equations 3.1.19 & 3.1.20 from GSWMM Volume 2 Section 3.1.7 (page 88).

- Stream Channel Protection: Utilizes the equations and methodology from GSWMM Volume 2 Section 3.3.5 (page 108) to provide extended detention for the 1-year, 24-hour storm event or to reduce the 1-year, 24-hour pond outflow to less than 2 cfs.

- Over-bank Flood Protection: Ensures that the post development peak discharge rate does not exceed the pre development peak discharge rate leaving the site for the 25-year frequency storm event thru proper detention pond sizing.

- Extreme Flood Protection: Safely control and convey the 100-year frequency storm event such that flooding is not exacerbated.

# Pond Design

Two pond routing scenarios were analyzed for this study.

Scenario 1 assessed the stormwater management requirements for the Avila Site only. This scenario assumes that both the City Site and the Offsite Pass-Thru Site bypass the Avila Pond directly to Study Point A. This represents the control scenario as a basis for the minimum requirements of the Avila Pond so that the required modifications for the inclusion of treatment of the City Site can be quantified.

Scenario 2 assessed the stormwater management requirements for the Avila Site and the City Site. This scenario assumes that the Offsite Pass-Thru Site must be taken into the combined Avila/City Pond due to the physical limitations of not being able to effectively separate the stormwater from the City Site and the Offsite Pass-Thru Site as it enters the Avila Site.

## Scenario 1: Avila Pond Design

The Avila Pond for Scenario 1 is a proposed extended detention pond with micropool. The total area draining to the pond is 13.28 AC which includes the runoff from only the Avila Site. Reference Appendix D for Pond Details.

***The following table shows the stage/storage data for Scenario 1: Avila Pond.***

| Elevation | Contour Area (sf) | Pond Volume (cf) | Available Pond Storage* (cf) |
|---|---|---|---|
| 1010 | 500 | 0* | 0* |
| 1012 | 920 | 1,399* | 0* |
| 1014 | 6,270 | 7,793* | 0* |
| 1014.60 | *Micropool* | 12,080* | 0* |
| 1016 | 8,060 | 22,084 | 10,004 |
| 1018 | 9,980 | 40,088 | 28,008 |
| 1020 | 12,030 | 62,064 | 49,984 |
| 1022 | 14,190 | 88,251 | 76,171 |
| 1024 | 16,480 | 118,890 | 106,810 |
| 1026 | 18,900 | 154,239 | 142,159 |
| 1028 | 21,440 | 194,548 | 182,468 |

*Pond routing begins at the top of the permanent water quality pool elevation: therefore, volumes below elevation 1014.60 are not routed and are not included in the "Available Pond Storage" column.

***The outlet works consists of:***
One 3.0 in orifice at invert elevation 1014.60 (for WQ)
One 5.0 in orifice at invert elevation 1018.40 (for CPV)
A sharp crested rectangular weir of length 5 ft at elevation 1025.00
A broad crested weir of length 10 ft at elevation 1026.00 (emergency spillway)
A 42" RCP outlet pipe at invert elevation 1014.00 at 1.0% slope

***The 100-year ponding elevation for Pond 1 is 1026.56.***
***The top of pond at the outlet structure is 1028.00.***

***Check capacity of 5ft rectangular weir: $Q = C_d L h^{1.5}$***
The capacity of the weir is Q=3.33*5*3^1.5 = 86.52 cfs > $Q_{100yr\ unrouted\ flow}$= 129.19 cfs **NOT OK.**
Therefore, add emergency spillway

***Check capacity of emergency spillway: $Q = C_d L h^{1.5}$***
The capacity of the weir is Q=2.60*10*2^1.5 = 73.54 cfs

Combined capacity = 86.52 cfs + 73.54 cfs = 160.06 cfs > $Q_{100yr\ unrouted\ flow}$= 129.19 cfs **OK**.

***Check capacity of 42" outlet pipe: $Q_{full} = (0.464/n)D^{8/3}S^{1/2}$***
At 1.0% slope flowing full the capacity is Q=100.79 cfs > $Q_{max\ flow\ thru\ rectangular\ weir}$= 86.52 cfs **OK.**

**Water Quality Design Avila Pond:**
The volume in the proposed basin below elevation 1018.40 to elevation 1010.00 will be utilized to provide water quality. Per the GSWMM only onsite drainage areas are required to be accounted for when computing the required water quality volume. In order to determine the required volume, the following equations were used per the GSWMM Volume 2 page 88:

$WQ_V$=1.2"($R_V$)(A)/12 * 43560
$R_V$=0.05+ (I)*0.009
A = Total Drainage Area in acres
I = Percent Impervious = Impervious Area / Total Area x 100

| *Drainage Area* | *$WQ_V$ (cf)* | *I %* | *Area (acres)* | *IMPERVIOUS Area(acres)* |
|---|---|---|---|---|
| **Avila Site** | 44,449 | 79.82 | 13.28 | 10.60 |

Total Water Quality Volume Required = 44,449 cf
Total Water Quality Volume Provided = 44,483 cf @ elevation 1018.40
Micropool Volume Required = 25% ($WQ_V$) = 11,112 cf
Micropool Volume Provided = 12,080 cf at elevation 1014.60

**WQ Orifice Sizing:**
The following is the computation for the size of the WQ orifice that will drain water quality volume above the permanent pool in a minimum time of 24 hours. (Using the equation A= (V/t)/ $(64.4*(H/2)^{0.5})$

dt=V/C*a*(2*g*h/2)^0.5 $a=\pi*d^2/4$

| | | |
|---|---|---|
| VOLUME ABOVE PERM. POOL (cuft) | V= | 32403 |
| DEPTH (from centroid of orifice, ft) | h= | 3.67 |
| MIN TIME TO DRAIN (HRS) | dt= | 24.0 |
| ORIFICE FLOW COEFFICIENT | C= | 0.60 |
| REQUIRED AREA OF ORIFICE (sqin) | a= | 8.27 |
| REQUIRED DIAMETER OF ORIFICE (in) | d= | 3.25 |
| ACTUAL DIAMETER OF ORIFICE (in) | d= | 3.00 |
| ***ACTUAL TIME TO DRAIN (hrs)*** | ***T=*** | ***28.09*** |

**Channel Protection Design Avila Pond:**
The Channel Protection Volume in the proposed basin will be between elevations 1018.40 and 1025.00. The required volume is determined using rainfall data of 3.27 inches of rain in 24 hours and the entire area draining to the pond (including offsite areas). The volume for the 1 year 24 hour storm event is calculated using the following equation:
Q = [(P-0.2 x S)/ (P+0.8 x S] x A /12
S = 1000/CN – 10

***AVILA PROPERTY***

| | | |
|---|---|---|
| *1 YEAR STORM: P=* | 3.27 | inches |
| *DRAINAGE AREA: A =* | *13.28* | acres |
| *UNDISTURBED AREA (CN=55)=* | *0.00* | acres |
| *DISTURBED AREA (CN=62)=* | *2.68* | acres |
| *IMPERVIOUS AREA (CN=98)=* | *10.60* | acres |
| *COMPOSITE CURVE NUMBER: CN =* | *90.7* | |
| ***S=1000/CN-10 =*** | 1.0211 | |
| ***Q=(P-0.2*S)^2/(P+0.8*S)=*** | 2.300 | inches |
| VOLUME REQUIRED: CPv=A*43560*Q/12= | 110864.6 | cubic ft |

CPv Total Required = 110,865 cf
Per the GSWMM, Extended Detention Basins can utilize up to ½ of the required WQv to meet the CPv requirements. Therefore, the minimum pond volume for channel protection = ½ WQv + $CPv_{required}$ = 22,224 cf + 110865 cf = 133,089 cf

At elevation **1025.00** the available pond volume is **136,564 cf** *(Reference stage storage data Appendix B)* **therefore the channel protection volume requirement has been met.**

The following is the computation for the size of the CP orifice that will drain Channel Protection volume in a minimum time of 24 hours. (Using the equation $A= (V/t)/ (64.4*(H/2)^{0.5})$

$dt=V/C*a*(2*g*h/2)^{0.5}$ $a=\pi*d^2/4$

| | | |
|---|---|---|
| VOLUME ABOVE WQv (cf) | V= | 133088.9 |
| DEPTH (from centroid of orifice, ft) | h= | 6.19 |
| MIN TIME TO DRAIN (HRS) | dt= | 24.0 |
| ORIFICE FLOW COEFFICIENT | C= | 0.60 |
| REQUIRED AREA OF ORIFICE (sq in) | a= | 26.18 |
| REQUIRED DIAMETER OF ORIFICE (in) | d= | 5.77 |
| ACTUAL DIAMETER OF ORIFICE (in) | d= | 5.00 |
| ***ACTUAL TIME TO DRAIN (hrs)*** | ***T=*** | ***32.00*** |

## Scenario 2: Avila/City Shared Pond Design

The Avila/City Shared Pond for Scenario 2 is a proposed extended detention pond with micropool. The total area draining to the pond is 25.13 AC consisting of 13.28 AC from the Avila Site, 4.33 AC from the City Site and 7.52 AC from the Offsite Pass Thru Area. Reference Appendix D for Pond Details.

***The following table shows the stage/storage data for Scenario 2: Avila/City Shared Pond.***

| Elevation | Contour Area (sf) | Pond Volume (cf) | Available Pond Storage* (cf) |
|---|---|---|---|
| 1002 | 1,130 | 0* | 0* |
| 1004 | 1,880 | 2,978* | 0* |
| 1006 | 2,770 | 7,599* | 0* |
| 1008 | 3,780 | 14,122* | 0* |
| 1010 | 4,920 | 22,796* | 0* |
| 1012 | 6,180 | 33,871* | 0* |
| 1013 *Micropool* | 6,970 | 40,442* | 0* |
| 1014 | 14,150 | 50,791 | 10,349 |
| 1016 | 17,810 | 82,678 | 42,236 |
| 1018 | 21,410 | 121,839 | 81,397 |
| 1020 | 24,740 | 167,944 | 127,502 |
| 1022 | 28,230 | 220,870 | 180,428 |
| 1024 | 31,900 | 280,957 | 240,515 |
| 1026 | 35,720 | 348,534 | 308,092 |
| 1027 | 38,240 | 385,503 | 345,061 |

*Pond routing begins at the top of the permanent water quality pool elevation: therefore, volumes below elevation 1013.00 are not routed and are not included in the "Available Pond Storage" column.

***The outlet works consists of:***
One 3.0 in orifice at invert elevation 1013.00 (for WQ)
One 6.0 in orifice at invert elevation 1014.60 (for CPV)
A sharp crested rectangular weir of length 12 ft at elevation 1023.60
A broad crested weir of length 20 ft at elevation 1024.00 (emergency spillway)
A 48" RCP outlet pipe at invert elevation 1012.90 at 0.5% slope

***The 100-year ponding elevation for the Avila/City Shared Pond is 1024.96.***
***The top of pond at the outlet structure is 1027.00.***

***Check capacity of emergency spillway: $Q = C_d L h^{1.5}$***
The capacity of the weir is Q=2.60*20*3^1.5 = 270.20 cfs > $Q_{100yr\ unrouted\ flow}$= 242.99 cfs **OK**.

**Water Quality Design Avila/City Shared Pond:**
The volume in the proposed basin below elevation 1014.60 to elevation 1002.00 will be utilized to provide water quality. Per the GSWMM only onsite drainage areas are required to be accounted for when computing the required water quality volume. In order to determine the required volume, the following equations were used per the GSWMM Volume 2 page 88:

$WQ_V$=1.2"($R_V$)(A)/12 * 43560
$R_V$=0.05+ (I)*0.009

A = Total Drainage Area in acres
I = Percent Impervious = Impervious Area / Total Area x 100

| *Drainage Area* | *$WQ_V$ (cf)* | *I %* | *Area (acres)* | *IMPERVIOUS Area(acres)* |
|---|---|---|---|---|
| **Avila Site** | 44,449 | 79.82 | 13.28 | 10.60 |
| **City Site** | 14,508 | 79.91 | 4.33 | 3.46 |

Total Water Quality Volume Required = 44,449 cf + 14,508 cf = 58,956
Total Water Quality Volume Provided = 60,357 cf @ elevation 1014.60
Micropool Volume Required = 25% ($WQ_V$) = 15,089 cf
Micropool Volume Provided = 40,442 cf @ elevation 1013.00

**WQ Orifice Sizing:**
The following is the computation for the size of the WQ orifice that will drain water quality volume above the permanent pool in a minimum time of 24 hours. (Using the equation $A= (V/t)/ (64.4*(H/2)^{0.5})$

dt=V/C*a*(2*g*h/2)^0.5 $a=\pi*d^2/4$

| | | |
|---|---|---|
| VOLUME ABOVE PERM. POOL (cuft) | V= | 19915 |
| DEPTH (from centroid of orifice, ft) | h= | 1.48 |
| MIN TIME TO DRAIN (HRS) | dt= | 24.0 |
| ORIFICE FLOW COEFFICIENT | C= | 0.60 |
| REQUIRED AREA OF ORIFICE (sqin) | a= | 8.03 |
| REQUIRED DIAMETER OF ORIFICE (in) | d= | 3.20 |
| ACTUAL DIAMETER OF ORIFICE (in) | d= | 3.00 |
| ***ACTUAL TIME TO DRAIN (hrs)*** | ***T=*** | ***27.25*** |

**Channel Protection Design Avila Pond:**
The Channel Protection Volume in the proposed basin will be between elevations 1014.60 and 1023.60. The required volume is determined using rainfall data of 3.27 inches of rain in 24 hours and the entire area draining to the pond (including offsite areas). The volume for the 1 year 24 hour storm event is calculated using the following equation:
Q = [(P-0.2 x S)/ (P+0.8 x S] x A /12
S = 1000/CN – 10

***AVILA PROPERTY***

| | | |
|---|---|---|
| *1 YEAR STORM: P=* | 3.27 | inches |
| *DRAINAGE AREA: A =* | *13.28* | acres |
| *UNDISTURBED AREA (CN=55)=* | *0.00* | acres |
| *DISTURBED AREA (CN=62)=* | *2.68* | acres |
| *IMPERVIOUS AREA (CN=98)=* | *10.60* | acres |
| *COMPOSITE CURVE NUMBER: CN =* | *90.7* | |
| ***S=1000/CN-10 =*** | 1.0211 | |
| ***Q=(P-0.2*S)^2/(P+0.8*S)=*** | 2.300 | inches |
| VOLUME REQUIRED: CPv=A*43560*Q/12= | 110864.6 | cubic ft |

***CITY PROPERTY***

| | | |
|---|---|---|
| *1 YEAR STORM: P=* | 3.27 | |
| *DRAINAGE AREA: A =* | *4.33* | acres |
| *UNDISTURBED AREA (CN=55)=* | *0.00* | acres |
| *DISTURBED AREA (CN=62)=* | *0.87* | acres |
| *IMPERVIOUS AREA (CN=98)=* | *3.46* | acres |
| *COMPOSITE CURVE NUMBER: CN =* | *90.8* | |
| ***S=1000/CN-10 =*** | 1.0173 | |
| ***Q=(P-0.2*S)^2/(P+0.8*S)=*** | 2.303 | inches |
| VOLUME REQUIRED: CPv=A*43560*Q/12= | 36193.5 | cubic ft |

***OFFSITE PASSTHRU PROPERTY***

| | | |
|---|---|---|
| *1 YEAR STORM: P=* | 3.27 | |
| *DRAINAGE AREA: A =* | *7.52* | acres |
| *UNDISTURBED AREA (CN=55)=* | *0.00* | acres |
| *DISTURBED AREA (CN=62)=* | *1.87* | acres |
| *IMPERVIOUS AREA (CN=98)=* | *5.65* | acres |
| *COMPOSITE CURVE NUMBER: CN =* | *89.0* | |
| ***S=1000/CN-10 =*** | 1.2299 | |
| ***Q=(P-0.2*S)^2/(P+0.8*S)=*** | 2.150 | inches |
| VOLUME REQUIRED: CPv=A*43560*Q/12= | 58681.7 | cubic ft |

CPv Total Required = 110,865 cf + 36,194 cf + 58,682 cf = 205,740 cf
Per the GSWMM, Extended Detention Basins can utilize up to ½ of the required WQv to meet the CPv requirements. Since the micropool volume is greater than ½ of the WQv the CPv will begin at the top of the micropool. Therefore, the minimum pond volume for channel protection = Micropool Volume + $CPv_{required}$ = 40,442 cf + 205,740 cf = 246,182 cf

At elevation **1023.60** the available pond volume is **268,939 cf** *(Reference stage storage data Appendix B)* **therefore the channel protection volume requirement has been met.**

The following is the computation for the size of the CP orifice that will drain Channel Protection volume in a minimum time of 24 hours. (Using the equation $A= (V/t)/ (64.4*(H/2)^{0.5})$

$dt=V/C*a*(2*g*h/2)^{0.5}$ $a=\pi*d^2/4$

| | | |
|---|---|---|
| VOLUME ABOVE WQv (cf) | V= | 205739.7 |
| DEPTH (from centroid of orifice, ft) | h= | 8.75 |
| MIN TIME TO DRAIN (HRS) | dt= | 24.0 |
| ORIFICE FLOW COEFFICIENT | C= | 0.60 |
| REQUIRED AREA OF ORIFICE (sq in) | a= | 34.05 |
| REQUIRED DIAMETER OF ORIFICE (in) | d= | 6.58 |
| ACTUAL DIAMETER OF ORIFICE (in) | d= | 6.00 |
| ***ACTUAL TIME TO DRAIN (hrs)*** | ***T=*** | ***28.90*** |

# Summary of Peak Flows

Reference Appendix B for the complete hydrograph report.

Scenario 1: Summary Table of Peak Flows (cfs)

| Study Point: | Study Point A | | CSX CULVERT | | 10% Study Point | |
|---|---|---|---|---|---|---|
| Storm Event | Pre | Post | Pre | Post | Pre | Post |
| 1 YR | 96.06 | 41.24 | 76.25 | 66.04 | 424.85 | 402.05 |
| 25 YR | 190.92 | 87.77 | 88.21 | 84.15 | 812.10 | 807.50 |
| 100 YR | 244.63 | 119.30 | 91.87 | 91.75 | 1024.81 | 1024.71 |

Scenario 1: Avila Pond Elevation/Discharge Table

| Storm Event | Elevation (ft) | Discharge (cfs) |
|---|---|---|
| 1 YR | 1021.19 | 1.656 |
| 25 YR | 1025.46 | 7.774 |
| 100 YR | 1026.56 | 44.16 |

Scenario 2: Summary Table of Peak Flows (cfs)

| Study Point: | Study Point A | | CSX CULVERT | | 10% Study Point | |
|---|---|---|---|---|---|---|
| Storm Event | Pre | Post | Pre | Post | Pre | Post |
| 1 YR | 96.06 | 2.708 | 76.25 | 53.44 | 424.85 | 371.95 |
| 25 YR | 190.92 | 17.12 | 88.21 | 76.45 | 812.10 | 799.39 |
| 100 YR | 244.63 | 115.84 | 91.87 | 90.54 | 1024.81 | 1023.55 |

Scenario 2: Avila/City Shared Pond Elevation/Discharge Table

| Storm Event | Elevation (ft) | Discharge (cfs) |
|---|---|---|
| 1 YR | 1019.84 | 2.708 |
| 25 YR | 1024.05 | 17.12 |
| 100 YR | 1024.96 | 115.84 |

# Downstream Analysis

Stormwater runoff from the proposed scenarios exit the Avila Site to the north where Oak St. dead-ends into the CSX Right of Way. After leaving the site the runoff flows into an open channel stream for several hundred feet prior to entering an existing 42" CMP culvert which travels beneath the CSX and MARTA railyards. Although we made diligent attempts to trace the storm system (including running a camera through over 900 linear feet beneath the CSX Right of Way) we were unable to determine the exact outlet location. Therefore, we assume based on GIS topography and visible storm structures that the pipe connects to the storm system along DeKalb Industrial Way and remains underground until it nears the intersection of N. Arcadia Ave and DeKalb Industrial Way. At that location, it again becomes an open channel stream known as Tributary C of South Fork Peachtree Creek. The 10% Study Point is located in Tributary C of South Fork Peachtree Creek just north of the intersection of N. Arcadia Ave and DeKalb Industrial Way.

The existing 42" CMP culvert acts as a constriction point and in accordance with the Extreme Flood Protection Performance Criteria of the Avondale Estates Stormwater Management Code flooding at this point cannot be exacerbated.

CSX Culvert 100 year Storm Event Elevation/Discharge Table:

| Scenario | Elevation (ft) | Discharge (cfs) |
|---|---|---|
| Pre-Development | 1025.38 | 91.87 |
| Post Development Scenario 1 | 1025.34 | 91.75 |
| Post Development Scenario 2 | 1024.74 | 90.03 |

Additionally post development flows at the 10% Study Point cannot be increased from predevelopment rates.

Summary of Flows at the 10% Study Point
Scenario 1:

| Storm Event | Pre-Development | Scenario 1: 10% Flow | Scenario 2: 10% Flows |
|---|---|---|---|
| 1 YR | 424.85 | 402.05 | 371.95 |
| 25 YR | 812.10 | 807.50 | 799.39 |
| 100 YR | 1024.81 | 1024.71 | 1023.55 |

Since post development peak flows are less than pre-development peak flows at the Study Point and the 10% Study Point; the geometry of the channels at the study points and offsite areas are not being changed by this project; and the flooding at the existing CSX culvert is not exacerbated, there will be no adverse downstream impacts caused by this either scenarios post development discharges.

## Cost Comparison for Scenarios 1 and 2

| Cost Item | Unit Rate | Scenario 1 | | Scenario 2 | | Estimated Cost Increase |
|---|---|---|---|---|---|---|
| | | Avila Pond | Cost | Avila/City Shared Pond | Cost | |
| Pond Area including dam (sf) | Market | 32154 | Market | 50039 | Market | Market |
| Pond Volume (CY) | $5/CY | 6758.0741 | $ 33,790.37 | 14277.89 | $ 71,389.44 | $ 37,599.07 |
| 42"RCP Outlet Length (ft) | $86/lf | 80 | $ 6,880.00 | 0 | $ - | $ (6,880.00) |
| 48"RCP Outlet Length (ft) | $125/lf | 0 | $ - | 110 | $ 13,750.00 | $ 13,750.00 |
| Outlet Structure Size (LxWxH) (ft) | N/A | 5x5x14 | $ 15,000.00 | 6x6x15 | $ 17,000.00 | $ 2,000.00 |
| | | Total Estimated Cost Increase Less Land Value | | | | $ 46,469.07 |

The market value and lost income potential associated with the actual land area is a subjective number which is beyond the expertise of DCE to estimate. We recommend you employ the services of a property appraiser and market analyst during negotiation of this value. In addition to the land costs, we estimate the increase in cost to construct the larger combined detention pond is as shown in the table above. These estimates are approximate and are based on unit rates from past projects in this geographical region. We make no guarantees as to the actual costs which will be quoted in the future by the general contractors engaged to perform the construction. Many factors exist which may increase costs associated with this scope of work such as encountering unsuitable soils, rock, high groundwater, and inclement weather during construction.

## Recommendations to Reduce the Required Stormwater Runoff

Below is a list of several ways that may be used to reduce the required stormwater runoff from the proposed City Redevelopment:

1. **Reduce the percentage of proposed impervious cover**. This is an effective way of reducing the stormwater management requirements. This study has assumed that 80% of the proposed development will have impervious cover, which is reasonable for most commercial developments.
2. **Use pervious pavements**. Although more expensive to install and maintain, these types of pavements have the benefit of reducing the amount of stormwater runoff from the site which can save on detention and pipe costs. Additionally, if pavers are selected there is an added aesthetic benefit gained by the project.
3. **Use onsite green infrastructure practices such as bioretention basins and tree planter boxes to reduce runoff potential from the site**. These practices come at higher installation and maintenance costs than the traditional detention methods employed in this report, however they can be incorporated into planned landscaping and streetscapes to help meet some of the stormwater requirements on the site thus reducing runoff potential.

Appendix A



General Info
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Current Projects
FAQ
Glossary

Precipitation Frequency (PF)
PF Data Server
PF in GIS Format
PF Maps
Temporal Distr.
Time Series Data
PFDS Perform.
PF Documents

Probable Maximum Precipitation (PMP)
PMP Documents

Miscellaneous
Publications
AEP Storm Analysis
Record Precipitation

Contact Us
Inquiries
List-server

# NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: GA

## Data description

**Data type:** Precipitation intensity **Units:** English **Time series type:** Partial duration

## Select location

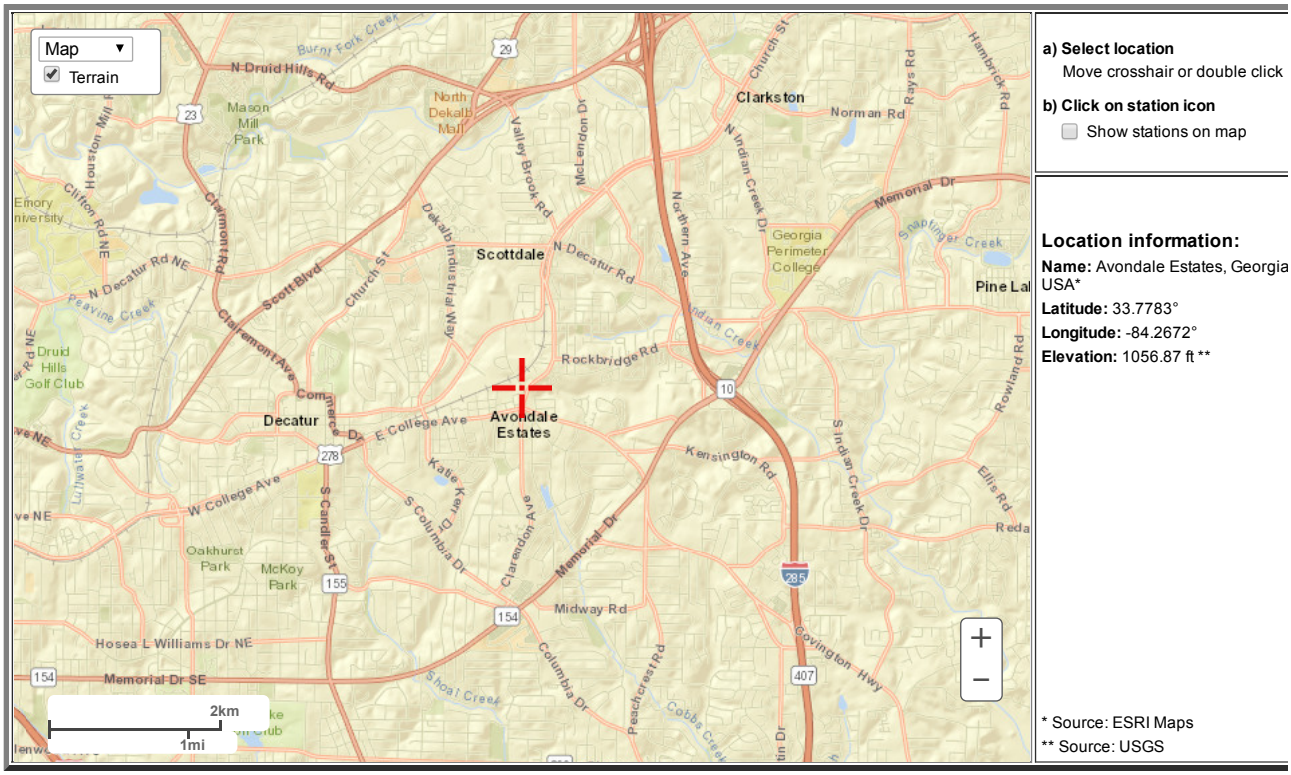
**1) Manually:**

**a) By location** (decimal degrees, use "-" for S and W): Latitude: Longitude: Submit

**b) By station** (list of GA stations): Select station

**c) By address** 115 Laredo Dr, Avondale Estates, GA

**2) Use map:**




**a) Select location**
Move crosshair or double click

**b) Click on station icon**
Show stations on map

**Location information:**

**Name:** Avondale Estates, Georgia USA*
**Latitude:** 33.7783°
**Longitude:** -84.2672°
**Elevation:** 1056.87 ft **

* Source: ESRI Maps
** Source: USGS

## POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

**WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION**
**NOAA Atlas 14, Volume 9, Version 2**

PF tabular | PF graphical | Supplementary information | Print page

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

| Duration | Average recurrence interval (years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | **4.81** (3.80-6.08) | **5.54** (4.38-7.01) | **6.77** (5.33-8.57) | **7.81** (6.12-9.90) | **9.29** (7.10-12.0) | **10.5** (7.86-13.6) | **11.6** (8.53-15.3) | **12.9** (9.16-17.1) | **14.5** (10.1-19.6) | **15.8** (10.7-21.5) |
| 10-min | **3.53** (2.78-4.45) | **4.06** (3.20-5.13) | **4.96** (3.90-6.27) | **5.72** (4.48-7.25) | **6.80** (5.20-8.78) | **7.65** (5.75-9.93) | **8.52** (6.25-11.2) | **9.42** (6.71-12.5) | **10.6** (7.36-14.4) | **11.6** (7.85-15.7) |
| 15-min | **2.87** (2.26-3.62) | **3.30** (2.60-4.17) | **4.03** (3.17-5.10) | **4.65** (3.64-5.90) | **5.53** (4.23-7.14) | **6.22** (4.68-8.07) | **6.92** (5.08-9.10) | **7.66** (5.45-10.2) | **8.65** (5.98-11.7) | **9.42** (6.38-12.8) |
| 30-min | **2.05** (1.62-2.59) | **2.37** (1.86-2.99) | **2.89** (2.27-3.66) | **3.34** (2.61-4.23) | **3.96** (3.03-5.11) | **4.46** (3.35-5.78) | **4.96** (3.64-6.52) | **5.48** (3.90-7.30) | **6.19** (4.28-8.35) | **6.73** (4.56-9.14) |
| 60-min | **1.32** (1.04-1.66) | **1.51** (1.19-1.91) | **1.85** (1.45-2.34) | **2.14** (1.67-2.71) | **2.55** (1.96-3.30) | **2.88** (2.17-3.75) | **3.23** (2.37-4.25) | **3.59** (2.56-4.79) | **4.09** (2.83-5.53) | **4.48** (3.04-6.09) |
| 2-hr | **0.806** (0.644-1.00) | **0.923** (0.737-1.15) | **1.13** (0.896-1.40) | **1.30** (1.03-1.63) | **1.56** (1.21-2.00) | **1.77** (1.35-2.28) | **1.99** (1.48-2.59) | **2.22** (1.61-2.93) | **2.54** (1.79-3.40) | **2.80** (1.92-3.76) |
| | **0.599** | **0.682** | **0.827** | **0.957** | **1.15** | **1.31** | **1.48** | **1.66** | **1.91** | **2.11** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3-hr | (0.482-0.741) | (0.548-0.843) | (0.664-1.02) | (0.765-1.19) | (0.904-1.46) | (1.01-1.67) | (1.11-1.91) | (1.21-2.17) | (1.35-2.54) | (1.46-2.81) |
| 6-hr | **0.368** (0.300-0.448) | **0.414** (0.337-0.505) | **0.496** (0.403-0.606) | **0.570** (0.462-0.699) | **0.683** (0.545-0.861) | **0.777** (0.609-0.983) | **0.878** (0.671-1.13) | **0.987** (0.732-1.28) | **1.14** (0.822-1.50) | **1.27** (0.891-1.67) |
| 12-hr | **0.226** (0.187-0.272) | **0.253** (0.209-0.304) | **0.299** (0.247-0.361) | **0.342** (0.281-0.413) | **0.405** (0.328-0.503) | **0.458** (0.364-0.572) | **0.515** (0.399-0.651) | **0.576** (0.433-0.738) | **0.662** (0.484-0.861) | **0.732** (0.523-0.954) |
| 24-hr | **0.136** (0.114-0.162) | **0.154** (0.129-0.182) | **0.183** (0.153-0.218) | **0.209** (0.174-0.250) | **0.247** (0.202-0.302) | **0.278** (0.223-0.341) | **0.310** (0.243-0.386) | **0.344** (0.262-0.435) | **0.392** (0.290-0.502) | **0.429** (0.311-0.553) |
| 2-day | **0.079** (0.067-0.092) | **0.090** (0.077-0.106) | **0.109** (0.093-0.128) | **0.126** (0.106-0.148) | **0.149** (0.123-0.179) | **0.168** (0.136-0.203) | **0.187** (0.148-0.229) | **0.207** (0.160-0.257) | **0.234** (0.176-0.295) | **0.255** (0.188-0.324) |
| 3-day | **0.058** (0.050-0.067) | **0.066** (0.056-0.076) | **0.079** (0.067-0.092) | **0.091** (0.077-0.106) | **0.107** (0.090-0.128) | **0.121** (0.099-0.146) | **0.135** (0.109-0.165) | **0.150** (0.117-0.186) | **0.171** (0.130-0.215) | **0.187** (0.139-0.237) |
| 4-day | **0.047** (0.040-0.054) | **0.053** (0.045-0.061) | **0.063** (0.054-0.073) | **0.072** (0.062-0.083) | **0.085** (0.072-0.102) | **0.096** (0.080-0.115) | **0.108** (0.087-0.131) | **0.120** (0.095-0.148) | **0.138** (0.105-0.172) | **0.152** (0.113-0.191) |
| 7-day | **0.032** (0.028-0.036) | **0.036** (0.031-0.041) | **0.042** (0.037-0.048) | **0.048** (0.042-0.055) | **0.057** (0.049-0.067) | **0.064** (0.054-0.076) | **0.072** (0.059-0.087) | **0.081** (0.064-0.099) | **0.093** (0.072-0.115) | **0.103** (0.078-0.128) |
| 10-day | **0.025** (0.022-0.029) | **0.028** (0.025-0.032) | **0.033** (0.029-0.038) | **0.038** (0.033-0.043) | **0.045** (0.038-0.052) | **0.050** (0.042-0.059) | **0.056** (0.047-0.067) | **0.063** (0.051-0.076) | **0.072** (0.056-0.089) | **0.080** (0.061-0.099) |
| 20-day | **0.017** (0.015-0.019) | **0.019** (0.017-0.021) | **0.022** (0.019-0.024) | **0.024** (0.022-0.027) | **0.028** (0.025-0.033) | **0.032** (0.027-0.037) | **0.035** (0.029-0.041) | **0.039** (0.031-0.046) | **0.044** (0.035-0.053) | **0.047** (0.037-0.058) |
| 30-day | **0.014** (0.012-0.015) | **0.015** (0.014-0.017) | **0.018** (0.016-0.020) | **0.020** (0.017-0.022) | **0.022** (0.020-0.025) | **0.025** (0.021-0.028) | **0.027** (0.023-0.031) | **0.029** (0.024-0.035) | **0.033** (0.026-0.039) | **0.035** (0.028-0.043) |
| 45-day | **0.012** (0.010-0.013) | **0.013** (0.012-0.014) | **0.015** (0.013-0.016) | **0.016** (0.015-0.018) | **0.018** (0.016-0.020) | **0.020** (0.017-0.022) | **0.021** (0.018-0.024) | **0.023** (0.019-0.027) | **0.025** (0.020-0.029) | **0.026** (0.021-0.032) |
| 60-day | **0.010** (0.009-0.011) | **0.011** (0.010-0.012) | **0.013** (0.012-0.014) | **0.014** (0.013-0.016) | **0.016** (0.014-0.018) | **0.017** (0.015-0.019) | **0.018** (0.016-0.021) | **0.019** (0.016-0.022) | **0.021** (0.017-0.024) | **0.022** (0.017-0.026) |

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

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

Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format: Precipitation frequency estimates ▾ Submit

Main Link Categories:
Home | OWP(OHD)

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
Office of Water Prediction (OWP)
1325 East West Highway
Silver Spring, MD 20910
Page Author: HDSC webmaster
Page last modified: August 27, 2014

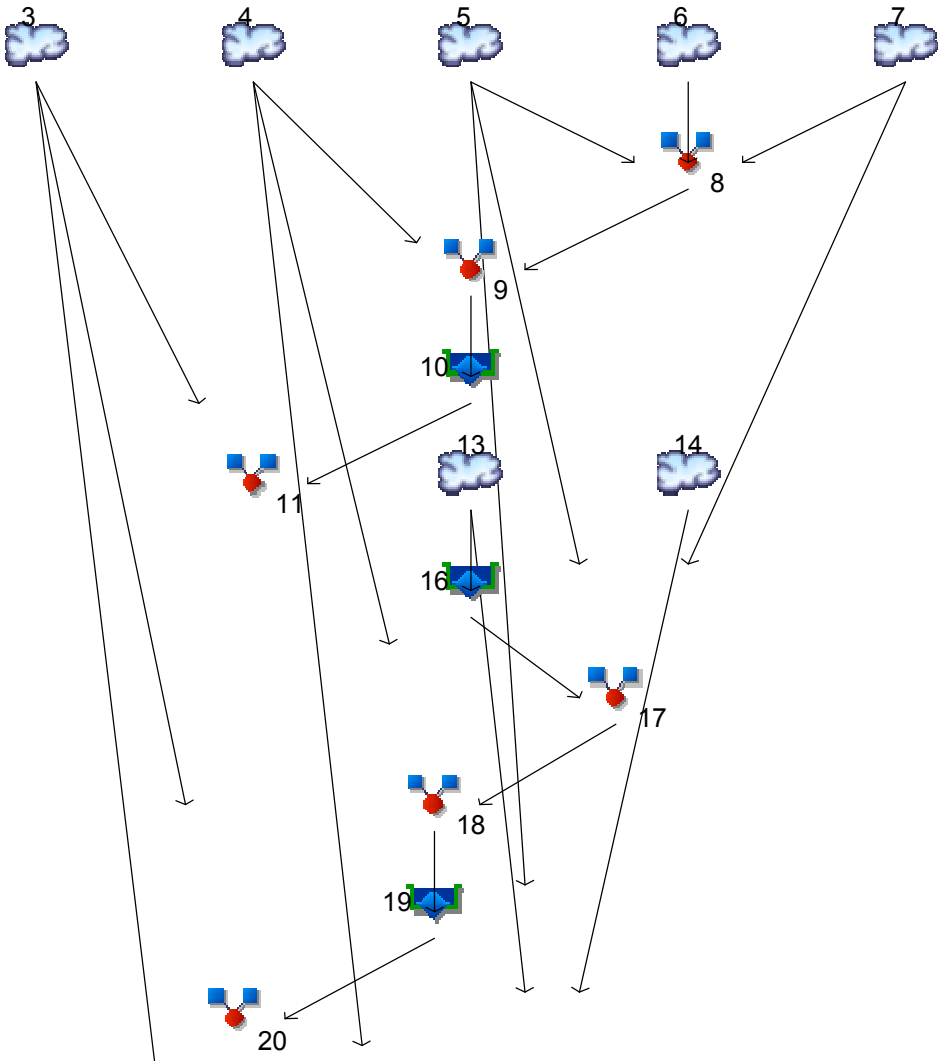
Map Disclaimer
Disclaimer
Credits
Glossary

Privacy P
Abou
Career Opportu

# Watershed Model Schematic

Appendix B






## Legend

| Hyd. | Origin | Description |
|---|---|---|
| 3 | SCS Runoff | PRE-AREA DIRECT 10% SP |
| 4 | SCS Runoff | PRE-OFFSITE TO CSX CULVERT |
| 5 | SCS Runoff | PRE-OFFSITE PASSTHRU |
| 6 | SCS Runoff | PRE-AVILA SITE |
| 7 | SCS Runoff | PRE-CITY SITE |
| 8 | Combine | PRE-COMBINE TO STUDY POINT A |
| 9 | Combine | PRE-COMBINE TO CSX CULVERT |
| 10 | Reservoir | PRE-CSX CULVERT |
| 11 | Combine | PRE-10% SP |
| 13 | SCS Runoff | POST-AVILA SITE |
| 14 | SCS Runoff | POST-CITY SITE |
| 16 | Reservoir | AVILA POND Scn1 |
| 17 | Combine | POST-COMBINE TO STUDY POINT A Scn1 |
| 18 | Combine | POST-COMBINE TO CSX CULVERT Scn1 |
| 19 | Reservoir | POST-CSX CULVERT Scn1 |
| 20 | Combine | POST-10% SP Scn1 |
| 22 | Combine | POST-COMBINE TO AVILA POND Scn2 |
| 23 | Reservoir | AVILA POND - SP A Scn2 |
| 24 | Combine | POST-COMBINE TO CSX CULVERT Scn2 |
| 25 | Reservoir | POST-CSX CULVERT Scn2 |
| 26 | Combine | POST-10% SP Scn2 |

# Hydrograph Return Period Recap



| 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 | |
| 3 | SCS Runoff | ------ | 354.39 | ------- | ------- | ------- | ------- | 724.11 | ------- | 933.01 | PRE-AREA DIRECT 10% SP |
| 4 | SCS Runoff | ------ | 51.25 | ------- | ------- | ------- | ------- | 122.02 | ------- | 163.17 | PRE-OFFSITE TO CSX CULVERT |
| 5 | SCS Runoff | ------ | 26.60 | ------- | ------- | ------- | ------- | 55.40 | ------- | 71.67 | PRE-OFFSITE PASSTHRU |
| 6 | SCS Runoff | ------ | 55.73 | ------- | ------- | ------- | ------- | 105.21 | ------- | 133.18 | PRE-AVILA SITE |
| 7 | SCS Runoff | ------ | 13.73 | ------- | ------- | ------- | ------- | 30.32 | ------- | 39.78 | PRE-CITY SITE |
| 8 | Combine | 5, 6, 7 | 96.06 | ------- | ------- | ------- | ------- | 190.92 | ------- | 244.63 | PRE-COMBINE TO STUDY POINT A |
| 9 | Combine | 4, 8 | 140.28 | ------- | ------- | ------- | ------- | 297.94 | ------- | 388.39 | PRE-COMBINE TO CSX CULVERT |
| 10 | Reservoir | 9 | 76.25 | ------- | ------- | ------- | ------- | 88.21 | ------- | 91.87 | PRE-CSX CULVERT |
| 11 | Combine | 3, 10 | 424.85 | ------- | ------- | ------- | ------- | 812.10 | ------- | 1024.81 | PRE-10% SP |
| 13 | SCS Runoff | ------ | 50.11 | ------- | ------- | ------- | ------- | 100.69 | ------- | 129.19 | POST-AVILA SITE |
| 14 | SCS Runoff | ------ | 16.34 | ------- | ------- | ------- | ------- | 32.83 | ------- | 42.12 | POST-CITY SITE |
| 16 | Reservoir | 13 | 1.656 | ------- | ------- | ------- | ------- | 7.774 | ------- | 44.16 | AVILA POND Scn1 |
| 17 | Combine | 5, 7, 16 | 41.24 | ------- | ------- | ------- | ------- | 87.77 | ------- | 119.30 | POST-COMBINE TO STUDY POINT |
| 18 | Combine | 4, 17 | 87.92 | ------- | ------- | ------- | ------- | 199.56 | ------- | 276.66 | POST-COMBINE TO CSX CULVERT |
| 19 | Reservoir | 18 | 66.04 | ------- | ------- | ------- | ------- | 84.15 | ------- | 91.75 | POST-CSX CULVERT Scn1 |
| 20 | Combine | 3, 19 | 402.05 | ------- | ------- | ------- | ------- | 807.50 | ------- | 1024.71 | POST-10% SP Scn1 |
| 22 | Combine | 5, 13, 14, | 93.05 | ------- | ------- | ------- | ------- | 188.92 | ------- | 242.99 | POST-COMBINE TO AVILA POND S |
| 23 | Reservoir | 22 | 2.708 | ------- | ------- | ------- | ------- | 17.12 | ------- | 115.84 | AVILA POND - SP A Scn2 |
| 24 | Combine | 4, 23 | 53.58 | ------- | ------- | ------- | ------- | 125.43 | ------- | 274.76 | POST-COMBINE TO CSX CULVERT |
| 25 | Reservoir | 24 | 53.44 | ------- | ------- | ------- | ------- | 76.45 | ------- | 90.54 | POST-CSX CULVERT Scn2 |
| 26 | Combine | 3, 25 | 371.95 | ------- | ------- | ------- | ------- | 799.39 | ------- | 1023.55 | POST-10% SP Scn2 |

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 3 | SCS Runoff | 354.39 | 2 | 734 | 1,618,035 | ------ | ------ | ------ | PRE-AREA DIRECT 10% SP |
| 4 | SCS Runoff | 51.25 | 2 | 720 | 132,904 | ------ | ------ | ------ | PRE-OFFSITE TO CSX CULVERT |
| 5 | SCS Runoff | 26.60 | 2 | 716 | 54,908 | ------ | ------ | ------ | PRE-OFFSITE PASSTHRU |
| 6 | SCS Runoff | 55.73 | 2 | 716 | 122,631 | ------ | ------ | ------ | PRE-AVILA SITE |
| 7 | SCS Runoff | 13.73 | 2 | 716 | 27,940 | ------ | ------ | ------ | PRE-CITY SITE |
| 8 | Combine | 96.06 | 2 | 716 | 205,479 | 5, 6, 7 | ------ | ------ | PRE-COMBINE TO STUDY POINT A |
| 9 | Combine | 140.28 | 2 | 718 | 338,383 | 4, 8 | ------ | ------ | PRE-COMBINE TO CSX CULVERT |
| 10 | Reservoir | 76.25 | 2 | 724 | 338,383 | 9 | 1020.33 | 38,753 | PRE-CSX CULVERT |
| 11 | Combine | 424.85 | 2 | 734 | 1,956,419 | 3, 10 | ------ | ------ | PRE-10% SP |
| 13 | SCS Runoff | 50.11 | 2 | 716 | 105,031 | ------ | ------ | ------ | POST-AVILA SITE |
| 14 | SCS Runoff | 16.34 | 2 | 716 | 34,246 | ------ | ------ | ------ | POST-CITY SITE |
| 16 | Reservoir | 1.656 | 2 | 822 | 105,009 | 13 | 1021.19 | 77,646 | AVILA POND Scn1 |
| 17 | Combine | 41.24 | 2 | 716 | 187,857 | 5, 7, 16 | ------ | ------ | POST-COMBINE TO STUDY POINT |
| 18 | Combine | 87.92 | 2 | 718 | 320,761 | 4, 17 | ------ | ------ | POST-COMBINE TO CSX CULVERT |
| 19 | Reservoir | 66.04 | 2 | 722 | 320,760 | 18 | 1017.60 | 11,806 | POST-CSX CULVERT Scn1 |
| 20 | Combine | 402.05 | 2 | 732 | 1,938,796 | 3, 19 | ------ | ------ | POST-10% SP Scn1 |
| 22 | Combine | 93.05 | 2 | 716 | 194,185 | 5, 13, 14, | ------ | ------ | POST-COMBINE TO AVILA POND S |
| 23 | Reservoir | 2.708 | 2 | 840 | 193,984 | 22 | 1019.84 | 164,152 | AVILA POND - SP A Scn2 |
| 24 | Combine | 53.58 | 2 | 720 | 326,888 | 4, 23 | ------ | ------ | POST-COMBINE TO CSX CULVERT |
| 25 | Reservoir | 53.44 | 2 | 722 | 326,888 | 24 | 1013.81 | 1,278 | POST-CSX CULVERT Scn2 |
| 26 | Combine | 371.95 | 2 | 734 | 1,944,922 | 3, 25 | ------ | ------ | POST-10% SP Scn2 |

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 3 | SCS Runoff | 724.11 | 2 | 734 | 3,403,610 | ------ | ------ | ------ | PRE-AREA DIRECT 10% SP |
| 4 | SCS Runoff | 122.02 | 2 | 720 | 321,050 | ------ | ------ | ------ | PRE-OFFSITE TO CSX CULVERT |
| 5 | SCS Runoff | 55.40 | 2 | 716 | 119,452 | ------ | ------ | ------ | PRE-OFFSITE PASSTHRU |
| 6 | SCS Runoff | 105.21 | 2 | 716 | 241,425 | ------ | ------ | ------ | PRE-AVILA SITE |
| 7 | SCS Runoff | 30.32 | 2 | 716 | 63,995 | ------ | ------ | ------ | PRE-CITY SITE |
| 8 | Combine | 190.92 | 2 | 716 | 424,873 | 5, 6, 7 | ------ | ------ | PRE-COMBINE TO STUDY POINT A |
| 9 | Combine | 297.94 | 2 | 718 | 745,922 | 4, 8 | ------ | ------ | PRE-COMBINE TO CSX CULVERT |
| 10 | Reservoir | 88.21 | 2 | 730 | 745,952 | 9 | 1024.11 | 169,730 | PRE-CSX CULVERT |
| 11 | Combine | 812.10 | 2 | 734 | 4,149,562 | 3, 10 | ------ | ------ | PRE-10% SP |
| 13 | SCS Runoff | 100.69 | 2 | 716 | 220,938 | ------ | ------ | ------ | POST-AVILA SITE |
| 14 | SCS Runoff | 32.83 | 2 | 716 | 72,038 | ------ | ------ | ------ | POST-CITY SITE |
| 16 | Reservoir | 7.774 | 2 | 748 | 220,916 | 13 | 1025.46 | 144,721 | AVILA POND Scn1 |
| 17 | Combine | 87.77 | 2 | 716 | 404,363 | 5, 7, 16 | ------ | ------ | POST-COMBINE TO STUDY POINT |
| 18 | Combine | 199.56 | 2 | 718 | 725,414 | 4, 17 | ------ | ------ | POST-COMBINE TO CSX CULVERT |
| 19 | Reservoir | 84.15 | 2 | 728 | 725,413 | 18 | 1022.76 | 89,171 | POST-CSX CULVERT Scn1 |
| 20 | Combine | 807.50 | 2 | 734 | 4,129,030 | 3, 19 | ------ | ------ | POST-10% SP Scn1 |
| 22 | Combine | 188.92 | 2 | 716 | 412,428 | 5, 13, 14, | ------ | ------ | POST-COMBINE TO AVILA POND S |
| 23 | Reservoir | 17.12 | 2 | 744 | 411,996 | 22 | 1024.05 | 282,710 | AVILA POND - SP A Scn2 |
| 24 | Combine | 125.43 | 2 | 720 | 733,044 | 4, 23 | ------ | ------ | POST-COMBINE TO CSX CULVERT |
| 25 | Reservoir | 76.45 | 2 | 728 | 733,043 | 24 | 1020.39 | 37,066 | POST-CSX CULVERT Scn2 |
| 26 | Combine | 799.39 | 2 | 734 | 4,136,652 | 3, 25 | ------ | ------ | POST-10% SP Scn2 |

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 3 | SCS Runoff | 933.01 | 2 | 734 | 4,443,174 | ------ | ------ | ------ | PRE-AREA DIRECT 10% SP |
| 4 | SCS Runoff | 163.17 | 2 | 720 | 434,856 | ------ | ------ | ------ | PRE-OFFSITE TO CSX CULVERT |
| 5 | SCS Runoff | 71.67 | 2 | 716 | 157,333 | ------ | ------ | ------ | PRE-OFFSITE PASSTHRU |
| 6 | SCS Runoff | 133.18 | 2 | 716 | 309,738 | ------ | ------ | ------ | PRE-AVILA SITE |
| 7 | SCS Runoff | 39.78 | 2 | 716 | 85,456 | ------ | ------ | ------ | PRE-CITY SITE |
| 8 | Combine | 244.63 | 2 | 716 | 552,528 | 5, 6, 7 | ------ | ------ | PRE-COMBINE TO STUDY POINT A |
| 9 | Combine | 388.39 | 2 | 718 | 987,383 | 4, 8 | ------ | ------ | PRE-COMBINE TO CSX CULVERT |
| 10 | Reservoir | 91.87 | 2 | 732 | 987,383 | 9 | 1025.38 | 260,730 | PRE-CSX CULVERT |
| 11 | Combine | 1024.81 | 2 | 734 | 5,430,557 | 3, 10 | ------ | ------ | PRE-10% SP |
| 13 | SCS Runoff | 129.19 | 2 | 716 | 288,419 | ------ | ------ | ------ | POST-AVILA SITE |
| 14 | SCS Runoff | 42.12 | 2 | 716 | 94,040 | ------ | ------ | ------ | POST-CITY SITE |
| 16 | Reservoir | 44.16 | 2 | 724 | 288,397 | 13 | 1026.56 | 164,869 | AVILA POND Scn1 |
| 17 | Combine | 119.30 | 2 | 718 | 531,186 | 5, 7, 16 | ------ | ------ | POST-COMBINE TO STUDY POINT |
| 18 | Combine | 276.66 | 2 | 720 | 966,041 | 4, 17 | ------ | ------ | POST-COMBINE TO CSX CULVERT |
| 19 | Reservoir | 91.75 | 2 | 732 | 966,040 | 18 | 1025.34 | 173,206 | POST-CSX CULVERT Scn1 |
| 20 | Combine | 1024.71 | 2 | 734 | 5,409,207 | 3, 19 | ------ | ------ | POST-10% SP Scn1 |
| 22 | Combine | 242.99 | 2 | 716 | 539,793 | 5, 13, 14, | ------ | ------ | POST-COMBINE TO AVILA POND S |
| 23 | Reservoir | 115.84 | 2 | 722 | 539,325 | 22 | 1024.96 | 313,415 | AVILA POND - SP A Scn2 |
| 24 | Combine | 274.76 | 2 | 722 | 974,181 | 4, 23 | ------ | ------ | POST-COMBINE TO CSX CULVERT |
| 25 | Reservoir | 90.54 | 2 | 734 | 974,180 | 24 | 1024.93 | 128,830 | POST-CSX CULVERT Scn2 |
| 26 | Combine | 1023.55 | 2 | 734 | 5,417,343 | 3, 25 | ------ | ------ | POST-10% SP Scn2 |

# Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Thursday, 06 / 8 / 2017

| Return Period (Yrs) | Intensity-Duration-Frequency Equation Coefficients (FHA) | | | |
|---|---|---|---|---|
| | B | D | E | (N/A) |
| 1 | 0.0000 | 0.0000 | 0.0000 | -------- |
| 2 | 29.6471 | 7.7000 | 0.6926 | -------- |
| 3 | 0.0000 | 0.0000 | 0.0000 | -------- |
| 5 | 29.2182 | 5.1000 | 0.6305 | -------- |
| 10 | 40.3921 | 6.3000 | 0.6731 | -------- |
| 25 | 49.1053 | 6.9000 | 0.6815 | -------- |
| 50 | 66.1182 | 8.6000 | 0.7237 | -------- |
| 100 | 62.1387 | 7.5000 | 0.6898 | -------- |

File name: atlanta.IDF

### Intensity = B / (Tc + D)^E

| Return Period (Yrs) | Intensity Values (in/hr) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 min | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | 5.10 | 4.05 | 3.41 | 2.97 | 2.65 | 2.40 | 2.20 | 2.04 | 1.90 | 1.79 | 1.69 | 1.60 |
| 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 | 6.80 | 5.28 | 4.41 | 3.83 | 3.42 | 3.10 | 2.85 | 2.65 | 2.48 | 2.33 | 2.21 | 2.10 |
| 10 | 7.90 | 6.17 | 5.15 | 4.47 | 3.98 | 3.60 | 3.30 | 3.06 | 2.85 | 2.68 | 2.53 | 2.40 |
| 25 | 9.08 | 7.15 | 5.99 | 5.21 | 4.64 | 4.20 | 3.85 | 3.57 | 3.33 | 3.13 | 2.95 | 2.80 |
| 50 | 10.00 | 7.97 | 6.71 | 5.84 | 5.20 | 4.70 | 4.30 | 3.98 | 3.71 | 3.47 | 3.27 | 3.10 |
| 100 | 10.88 | 8.63 | 7.25 | 6.32 | 5.63 | 5.10 | 4.68 | 4.33 | 4.04 | 3.80 | 3.59 | 3.40 |

Tc = time in minutes. Values may exceed 60.

Precip. file name: Z:\2015\1521 Euramex Avondale\STORMWATER MANAGEMENT\AVONDALE.pcp

| Storm Distribution | Rainfall Precipitation Table (in) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1-yr | 2-yr | 3-yr | 5-yr | 10-yr | 25-yr | 50-yr | 100-yr |
| SCS 24-hour | 3.27 | 3.69 | 0.00 | 4.40 | 5.02 | 5.93 | 6.67 | 7.45 |
| SCS 6-Hr | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Huff-1st | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Huff-2nd | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Huff-3rd | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Huff-4th | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Huff-Indy | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Custom | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

# TR55 Tc Worksheet



## Hyd. No. 3

PRE-AREA DIRECT 10% SP

| Description | A | | B | | C | | Totals |
|---|---|---|---|---|---|---|---|
| **Sheet Flow** | | | | | | | |
| Manning's n-value | = 0.400 | | 0.011 | | 0.011 | | |
| Flow length (ft) | = 100.0 | | 0.0 | | 0.0 | | |
| Two-year 24-hr precip. (in) | = 3.69 | | 0.00 | | 0.00 | | |
| Land slope (%) | = 2.00 | | 0.00 | | 0.00 | | |
| **Travel Time (min)** | **= 20.00** | **+** | **0.00** | **+** | **0.00** | **=** | **20.00** |
| **Shallow Concentrated Flow** | | | | | | | |
| Flow length (ft) | = 500.00 | | 0.00 | | 0.00 | | |
| Watercourse slope (%) | = 3.00 | | 0.00 | | 0.00 | | |
| Surface description | = Unpaved | | Paved | | Unpaved | | |
| Average velocity (ft/s) | =2.79 | | 0.00 | | 0.00 | | |
| **Travel Time (min)** | **= 2.98** | **+** | **0.00** | **+** | **0.00** | **=** | **2.98** |
| **Channel Flow** | | | | | | | |
| X sectional flow area (sqft) | = 7.10 | | 45.00 | | 0.00 | | |
| Wetted perimeter (ft) | = 9.40 | | 20.00 | | 0.00 | | |
| Channel slope (%) | = 1.00 | | 0.05 | | 0.00 | | |
| Manning's n-value | = 0.015 | | 0.030 | | 0.015 | | |
| Velocity (ft/s) | =8.23 | | | | | | |
| | | | 1.91 | | | | |
| | | | | | 0.00 | | |
| Flow length (ft) | ({0})3500.0 | | 500.0 | | 0.0 | | |
| **Travel Time (min)** | **= 7.09** | **+** | **4.36** | **+** | **0.00** | **=** | **11.45** |

**Total Travel Time, Tc ..... 34.40 min**

# TR55 Tc Worksheet



## Hyd. No. 4

PRE-OFFSITE TO CSX CULVERT

| Description | A | | B | | C | | Totals |
|---|---|---|---|---|---|---|---|
| **Sheet Flow** | | | | | | | |
| Manning's n-value | = 0.240 | | 0.011 | | 0.011 | | |
| Flow length (ft) | = 50.0 | | 0.0 | | 0.0 | | |
| Two-year 24-hr precip. (in) | = 3.69 | | 0.00 | | 0.00 | | |
| Land slope (%) | = 4.00 | | 0.00 | | 0.00 | | |
| **Travel Time (min)** | **= 5.78** | **+** | **0.00** | **+** | **0.00** | **=** | **5.78** |
| **Shallow Concentrated Flow** | | | | | | | |
| Flow length (ft) | = 841.00 | | 300.00 | | 0.00 | | |
| Watercourse slope (%) | = 3.00 | | 1.00 | | 0.00 | | |
| Surface description | = Paved | | Unpaved | | Unpaved | | |
| Average velocity (ft/s) | =3.52 | | 1.61 | | 0.00 | | |
| **Travel Time (min)** | **= 3.98** | **+** | **3.10** | **+** | **0.00** | **=** | **7.08** |
| **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 ..... 12.90 min**

# Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 — Thursday, 06 / 8 / 2017

## Pond No. 1 - EXISTING LOW AREA

### Pond Data

**Contours -**User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1010.62 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 1010.62 | 10 | 0 | 0 |
| 1.38 | 1012.00 | 330 | 183 | 183 |
| 3.38 | 1014.00 | 950 | 1,226 | 1,409 |
| 5.38 | 1016.00 | 3,270 | 3,988 | 5,397 |
| 7.38 | 1018.00 | 5,250 | 8,441 | 13,839 |
| 9.38 | 1020.00 | 13,470 | 18,084 | 31,923 |
| 11.38 | 1022.00 | 31,060 | 43,319 | 75,242 |
| 13.38 | 1024.00 | 57,330 | 87,050 | 162,292 |
| 15.38 | 1026.00 | 87,040 | 143,326 | 305,617 |
| 17.38 | 1028.00 | 181,010 | 262,353 | 567,970 |
| 19.38 | 1030.00 | 199,960 | 380,775 | 948,745 |
| 21.38 | 1032.00 | 234,390 | 433,851 | 1,382,596 |
| 23.38 | 1034.00 | 287,520 | 520,954 | 1,903,550 |
| 25.38 | 1036.00 | 326,240 | 613,292 | 2,516,842 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 42.00 | 0.00 | 0.00 | 0.00 |
| **Span (in)** | = 42.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 1010.62 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 500.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 1.00 | 0.00 | 0.00 | n/a |
| **N-Value** | = .024 | .013 | .013 | n/a |
| **Orifice Coeff.** | = 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = n/a | No | No | No |

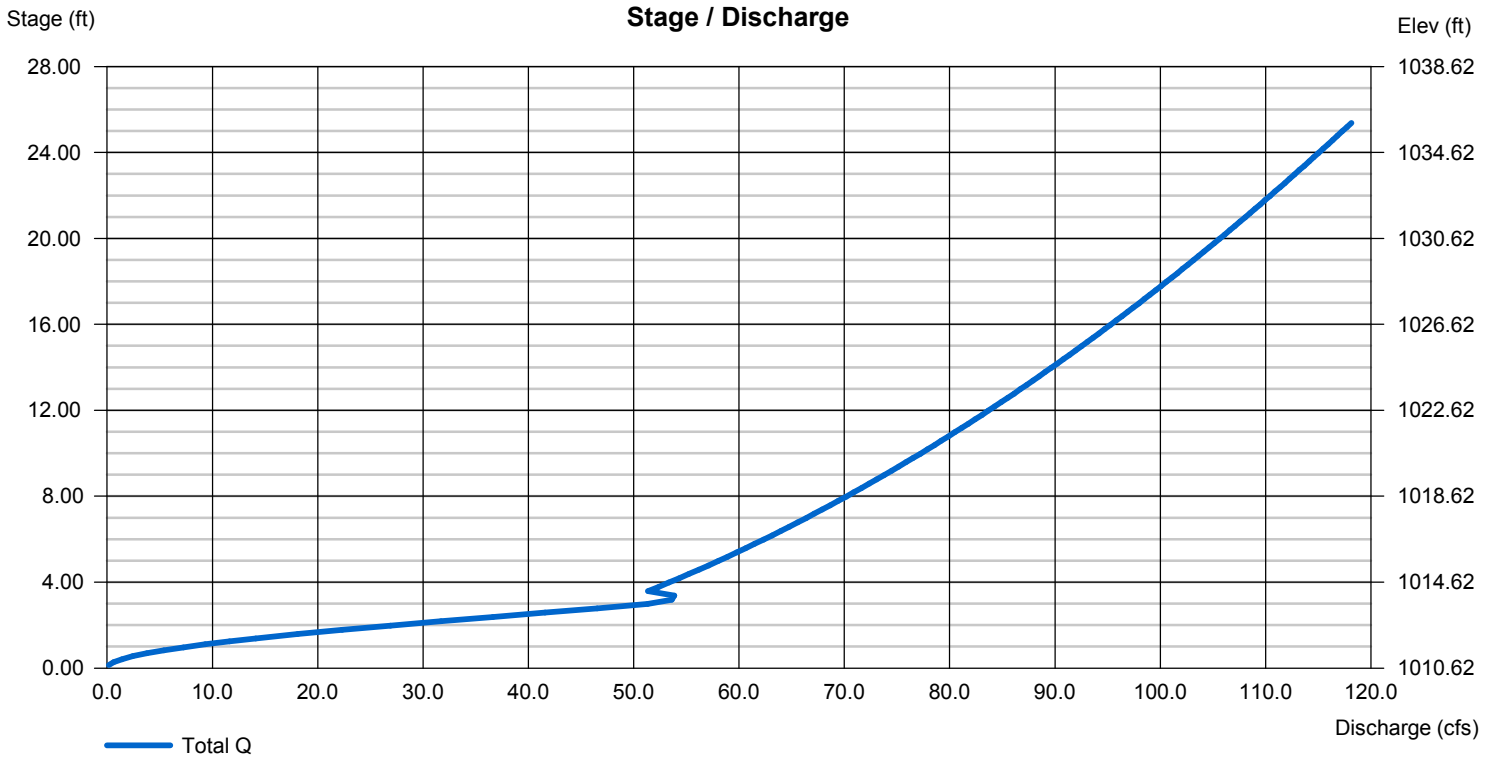
### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = --- | --- | --- | --- |
| **Multi-Stage** | = No | No | No | No |

**Exfil.(in/hr)** = 0.000 (by Wet area)

**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).



# Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 — Thursday, 06 / 8 / 2017

## Pond No. 12 - AVILA POND SCN1

### Pond Data

**Contours -**User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1010.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 1010.00 | 500 | 0 | 0 |
| 2.00 | 1012.00 | 920 | 1,399 | 1,399 |
| 4.00 | 1014.00 | 6,270 | 6,394 | 7,793 |
| 6.00 | 1016.00 | 8,060 | 14,291 | 22,084 |
| 8.00 | 1018.00 | 9,980 | 18,004 | 40,088 |
| 10.00 | 1020.00 | 12,030 | 21,976 | 62,064 |
| 12.00 | 1022.00 | 14,190 | 26,188 | 88,251 |
| 14.00 | 1024.00 | 16,480 | 30,638 | 118,890 |
| 16.00 | 1026.00 | 18,900 | 35,349 | 154,239 |
| 18.00 | 1028.00 | 21,440 | 40,309 | 194,548 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 42.00 | 3.00 | 5.00 | 0.00 |
| **Span (in)** | = 42.00 | 3.00 | 5.00 | 0.00 |
| **No. Barrels** | = 1 | 1 | 1 | 0 |
| **Invert El. (ft)** | = 1014.00 | 1014.60 | 1018.40 | 0.00 |
| **Length (ft)** | = 100.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 1.00 | 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 |

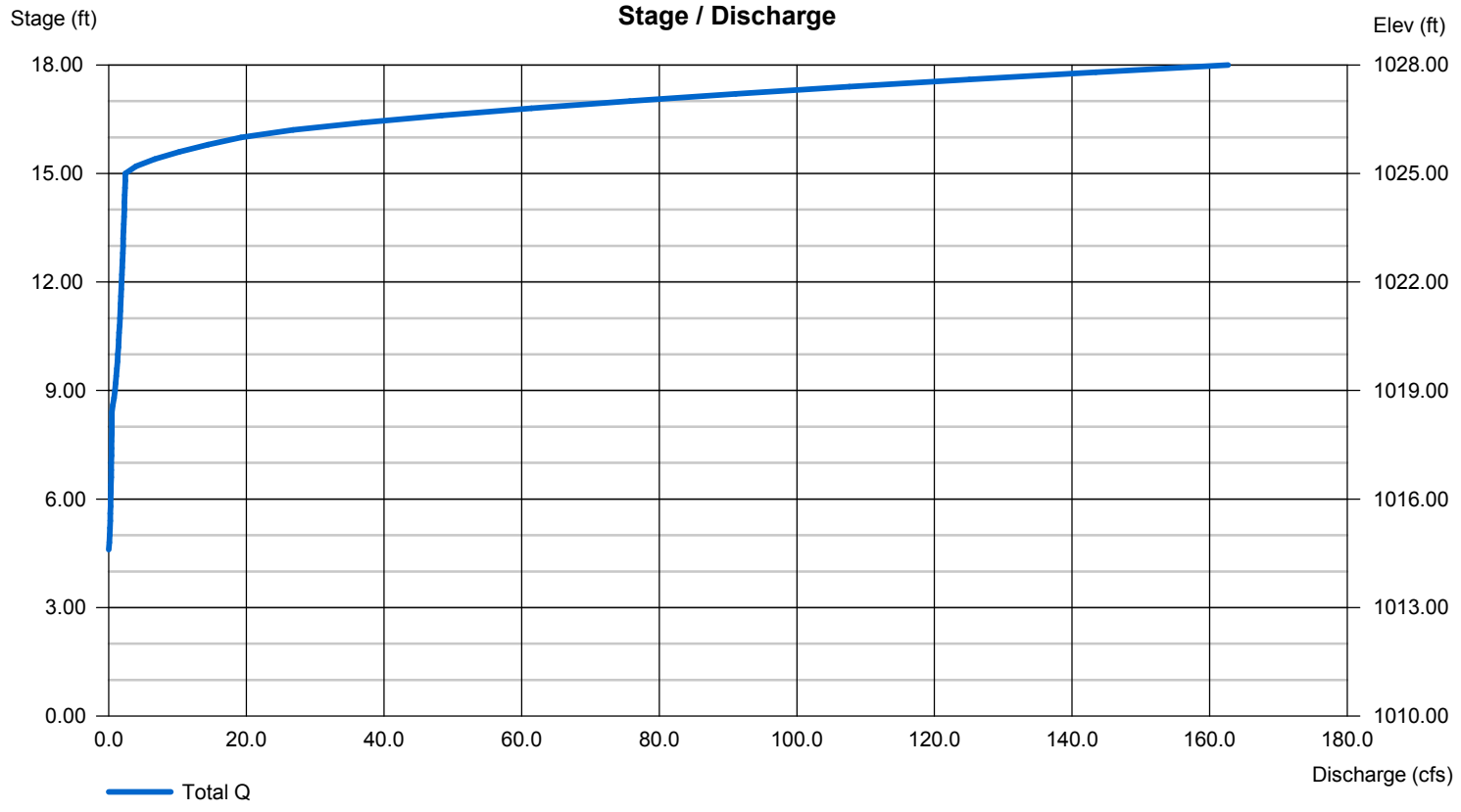
### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 5.00 | 10.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 1025.00 | 1026.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 2.60 | 3.33 | 3.33 |
| **Weir Type** | = Rect | Broad | --- | --- |
| **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).



# Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 — Thursday, 06 / 8 / 2017

## Pond No. 4 - PROPOSED LOW AREA SCN1

### Pond Data

**Contours -**User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1010.62 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 1010.62 | 10 | 0 | 0 |
| 1.38 | 1012.00 | 330 | 183 | 183 |
| 3.38 | 1014.00 | 950 | 1,226 | 1,409 |
| 5.38 | 1016.00 | 3,270 | 3,988 | 5,397 |
| 7.38 | 1018.00 | 5,250 | 8,441 | 13,839 |
| 9.38 | 1020.00 | 13,524 | 18,132 | 31,970 |
| 11.38 | 1022.00 | 23,500 | 36,564 | 68,534 |
| 13.38 | 1024.00 | 31,270 | 54,580 | 123,114 |
| 15.38 | 1026.00 | 44,298 | 75,183 | 198,297 |
| 17.38 | 1028.00 | 56,662 | 100,697 | 298,994 |
| 19.38 | 1030.00 | 93,000 | 148,154 | 447,148 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 42.00 | 0.00 | 0.00 | 0.00 |
| **Span (in)** | = 42.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 1010.62 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 500.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 1.00 | 0.00 | 0.00 | n/a |
| **N-Value** | = .024 | .013 | .013 | n/a |
| **Orifice Coeff.** | = 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = n/a | No | No | No |

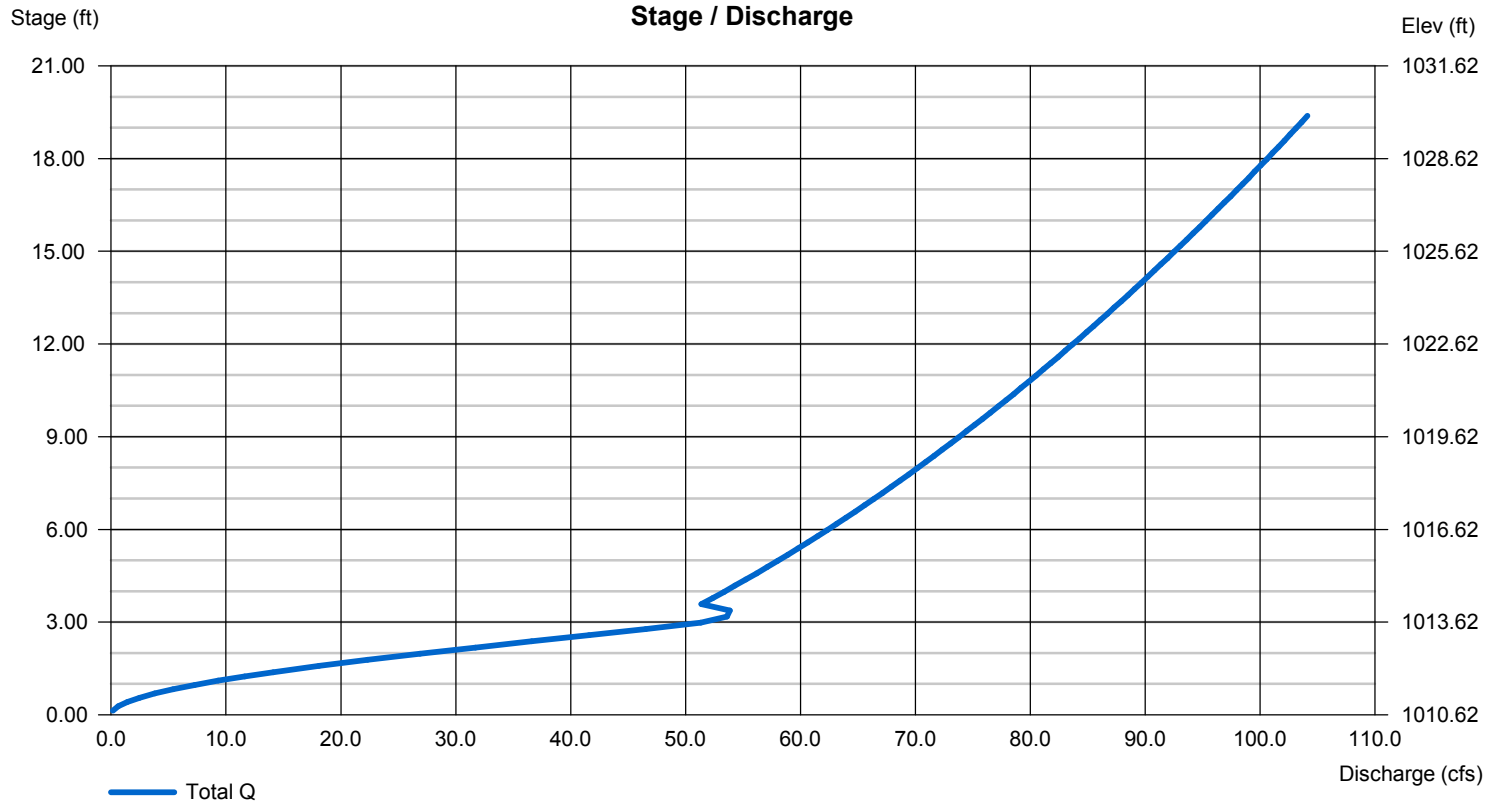
### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = --- | --- | --- | --- |
| **Multi-Stage** | = No | No | No | No |

**Exfil.(in/hr)** = 0.000 (by Wet area)

**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).



# Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 — Thursday, 06 / 8 / 2017

## Pond No. 15 - Avila Pond SCN2

### Pond Data

**Contours -**User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1002.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 1002.00 | 1,130 | 0 | 0 |
| 2.00 | 1004.00 | 1,880 | 2,978 | 2,978 |
| 4.00 | 1006.00 | 2,770 | 4,621 | 7,599 |
| 6.00 | 1008.00 | 3,780 | 6,523 | 14,122 |
| 8.00 | 1010.00 | 4,920 | 8,674 | 22,796 |
| 10.00 | 1012.00 | 6,180 | 11,075 | 33,871 |
| 11.00 | 1013.00 | 6,970 | 6,570 | 40,442 |
| 12.00 | 1014.00 | 14,150 | 10,349 | 50,791 |
| 14.00 | 1016.00 | 17,810 | 31,887 | 82,678 |
| 16.00 | 1018.00 | 21,410 | 39,161 | 121,839 |
| 18.00 | 1020.00 | 24,740 | 46,105 | 167,944 |
| 20.00 | 1022.00 | 28,230 | 52,926 | 220,870 |
| 22.00 | 1024.00 | 31,900 | 60,087 | 280,957 |
| 24.00 | 1026.00 | 35,720 | 67,577 | 348,534 |
| 25.00 | 1027.00 | 38,240 | 36,969 | 385,503 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 48.00 | 3.00 | 6.00 | 0.00 |
| **Span (in)** | = 48.00 | 3.00 | 6.00 | 0.00 |
| **No. Barrels** | = 1 | 1 | 1 | 0 |
| **Invert El. (ft)** | = 1012.90 | 1013.00 | 1014.60 | 0.00 |
| **Length (ft)** | = 109.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 0.50 | 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 |

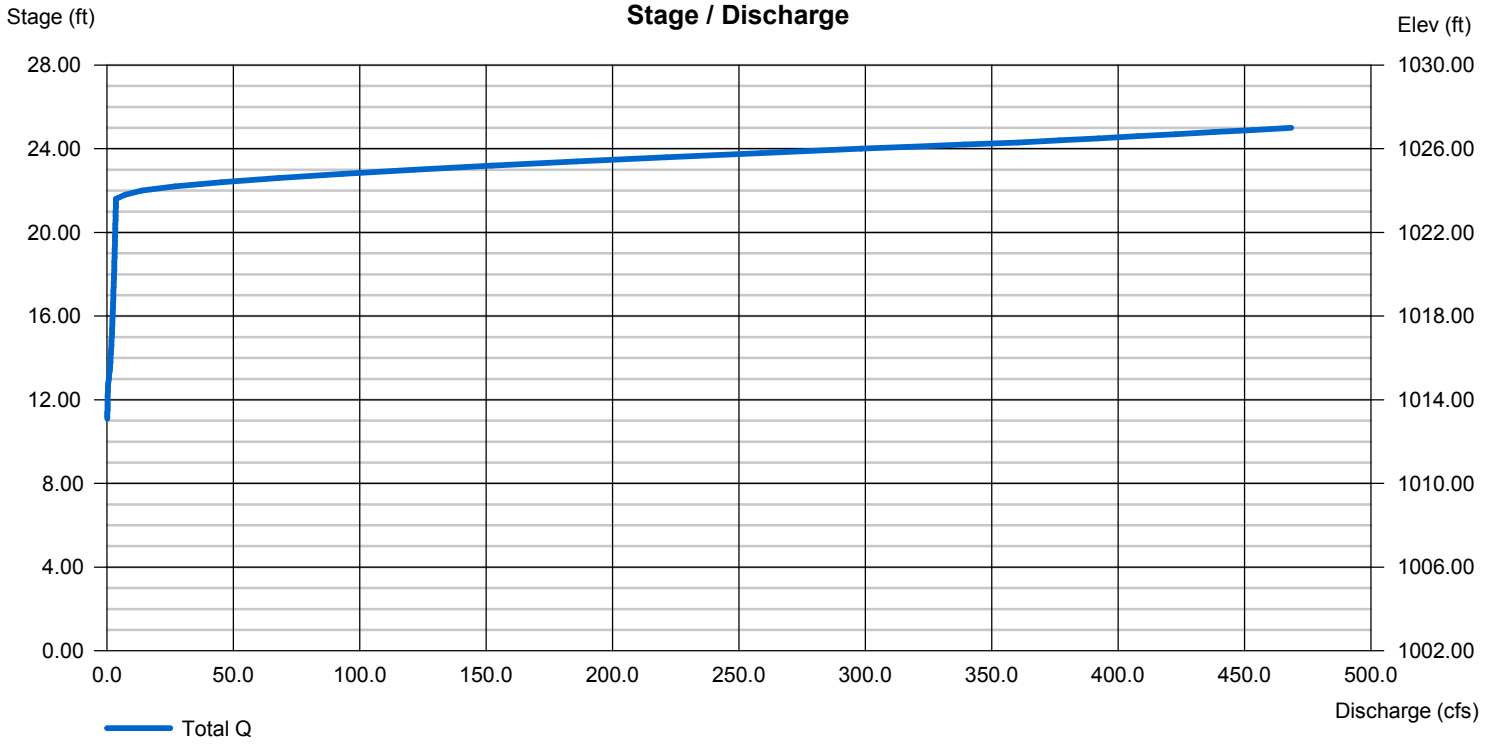
### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 12.00 | 20.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 1023.60 | 1024.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 2.60 | 3.33 | 3.33 |
| **Weir Type** | = Rect | Broad | --- | --- |
| **Multi-Stage** | = Yes | No | No | No |

**Exfil.(in/hr)** = 0.000 (by Wet area)

**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).



# Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 — Thursday, 06 / 8 / 2017

## Pond No. 6 - PROPOSED LOW AREA SCN2

### Pond Data

**Contours -**User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1010.62 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 1010.62 | 10 | 0 | 0 |
| 1.38 | 1012.00 | 330 | 183 | 183 |
| 3.38 | 1014.00 | 950 | 1,226 | 1,409 |
| 5.38 | 1016.00 | 3,270 | 3,988 | 5,397 |
| 7.38 | 1018.00 | 5,250 | 8,441 | 13,839 |
| 9.38 | 1020.00 | 12,700 | 17,409 | 31,247 |
| 11.38 | 1022.00 | 18,500 | 31,016 | 62,263 |
| 13.38 | 1024.00 | 23,160 | 41,569 | 103,832 |
| 15.38 | 1026.00 | 32,230 | 55,135 | 158,967 |
| 17.38 | 1028.00 | 41,930 | 73,940 | 232,907 |
| 19.38 | 1030.00 | 93,000 | 131,571 | 364,478 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 42.00 | 0.00 | 0.00 | 0.00 |
| **Span (in)** | = 42.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 1010.62 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 500.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 1.00 | 0.00 | 0.00 | n/a |
| **N-Value** | = .024 | .013 | .013 | n/a |
| **Orifice Coeff.** | = 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = n/a | No | No | No |

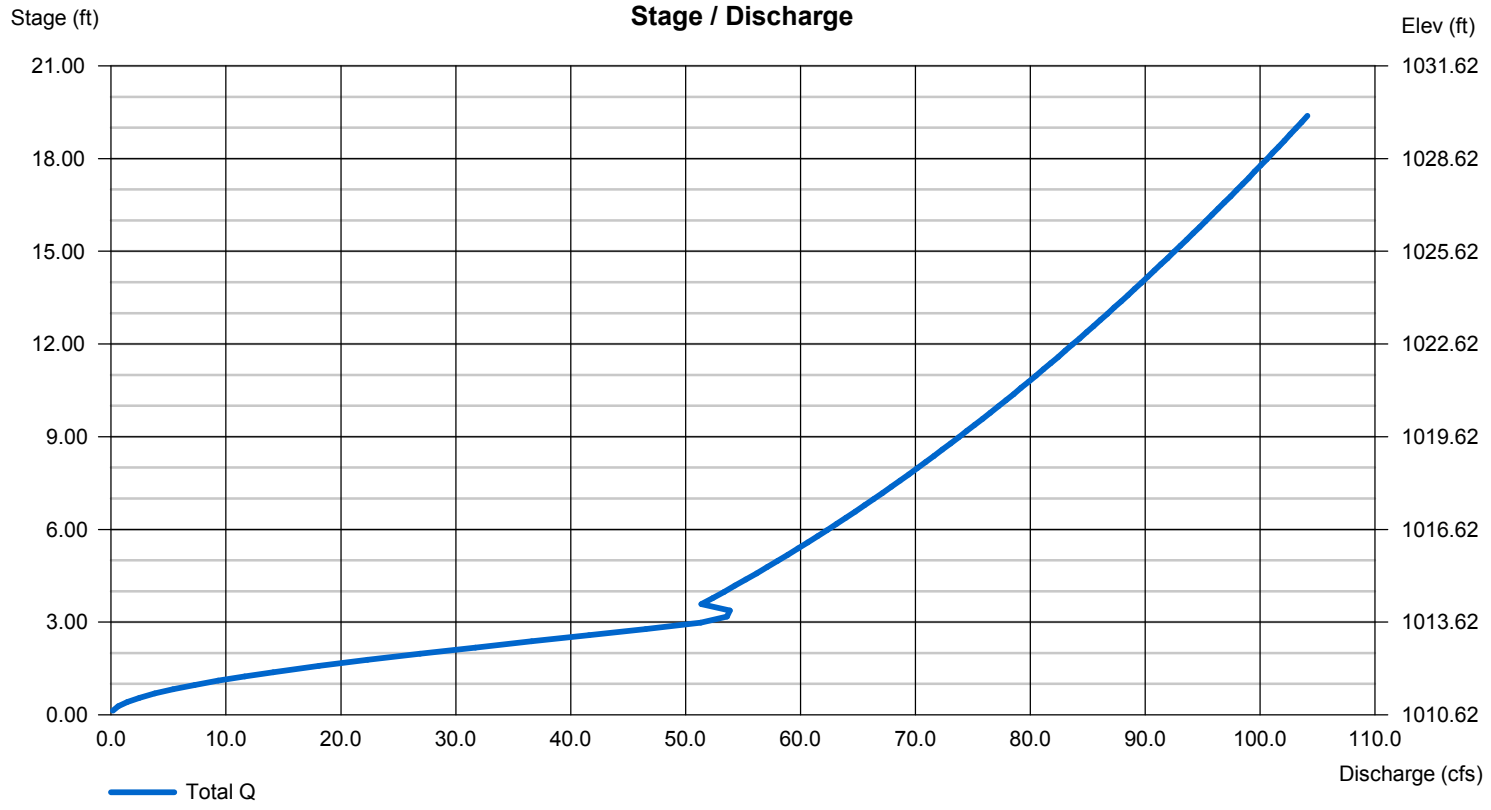
### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = --- | --- | --- | --- |
| **Multi-Stage** | = No | No | No | No |

**Exfil.(in/hr)** = 0.000 (by Wet area)

**TW Elev. (ft)** = 0.00

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



# Hydrograph Report

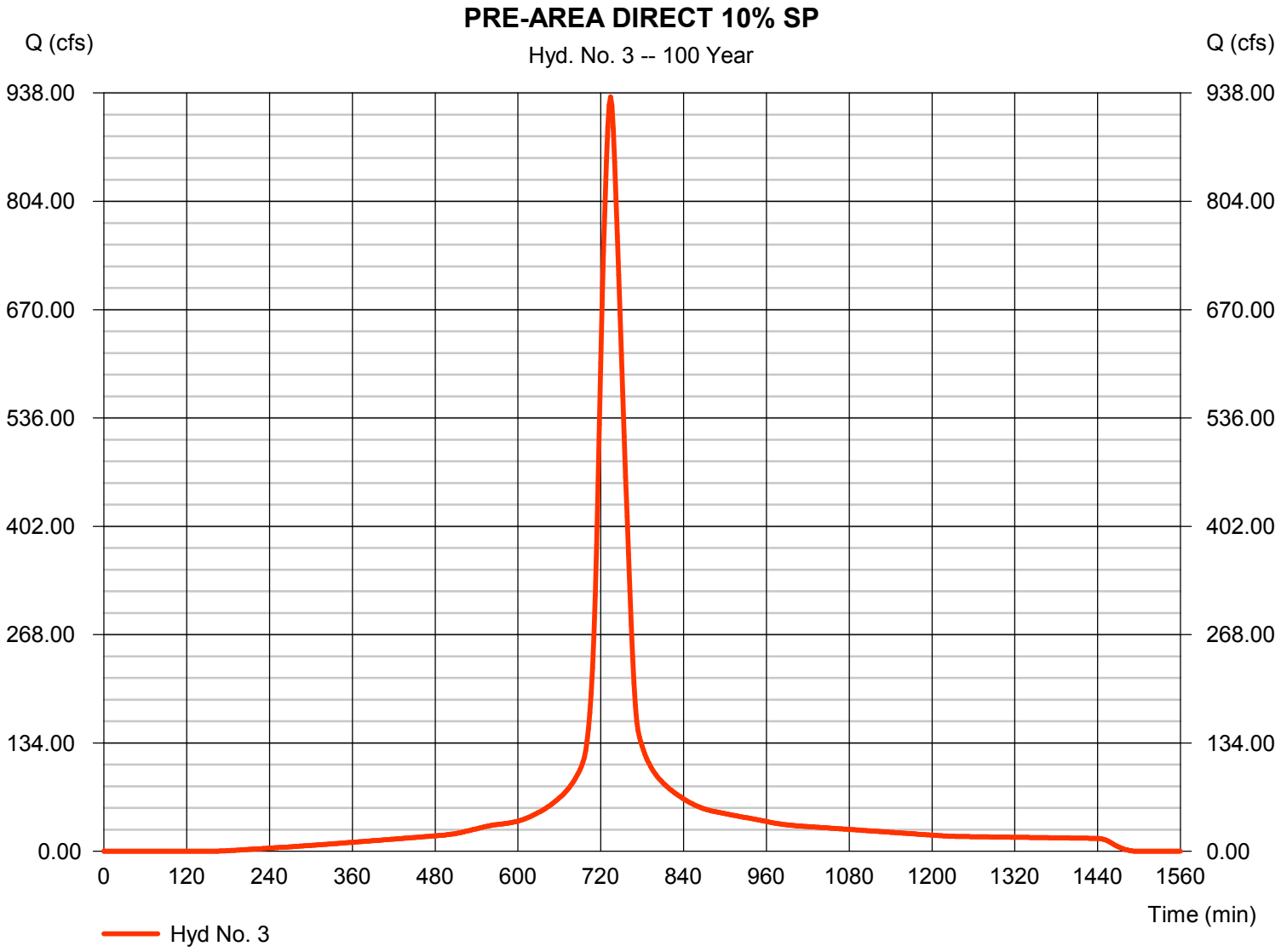
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 — Thursday, 06 / 8 / 2017

## Hyd. No. 3

PRE-AREA DIRECT 10% SP

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 933.01 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 734 min |
| Time interval | = 2 min | Hyd. volume | = 4,443,174 cuft |
| Drainage area | = 194.000 ac | Curve number | = 91* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = TR55 | Time of conc. (Tc) | = 34.40 min |
| Total precip. | = 7.45 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(38.000 x 62) + (156.000 x 98)] / 194.000



# Hydrograph Report

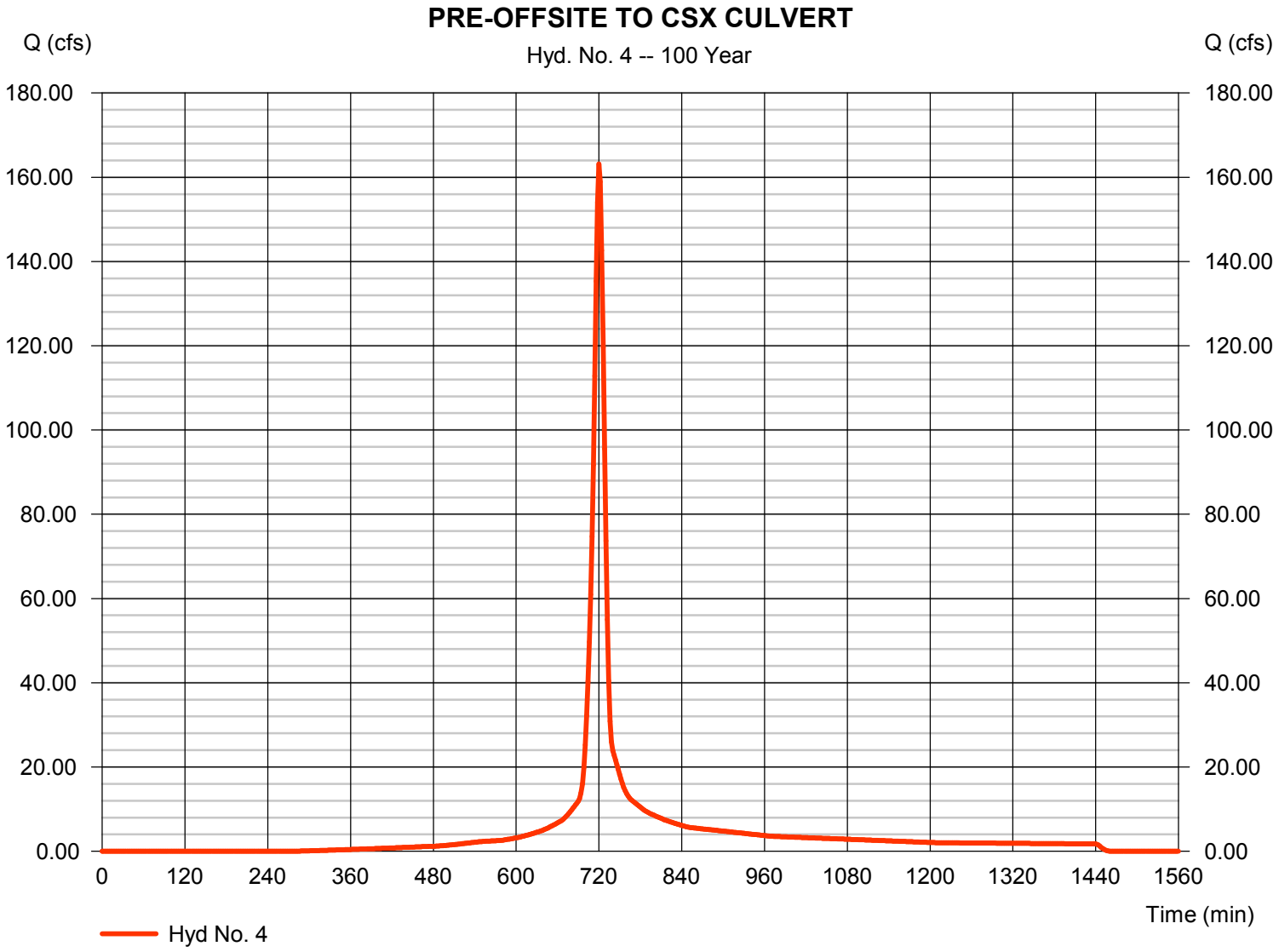
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Thursday, 06 / 8 / 2017

## Hyd. No. 4

PRE-OFFSITE TO CSX CULVERT

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 163.17 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 720 min |
| Time interval | = 2 min | Hyd. volume | = 434,856 cuft |
| Drainage area | = 21.300 ac | Curve number | = 83* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = TR55 | Time of conc. (Tc) | = 12.90 min |
| Total precip. | = 7.45 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(8.600 x 62) + (12.700 x 98)] / 21.300



# Hydrograph Report

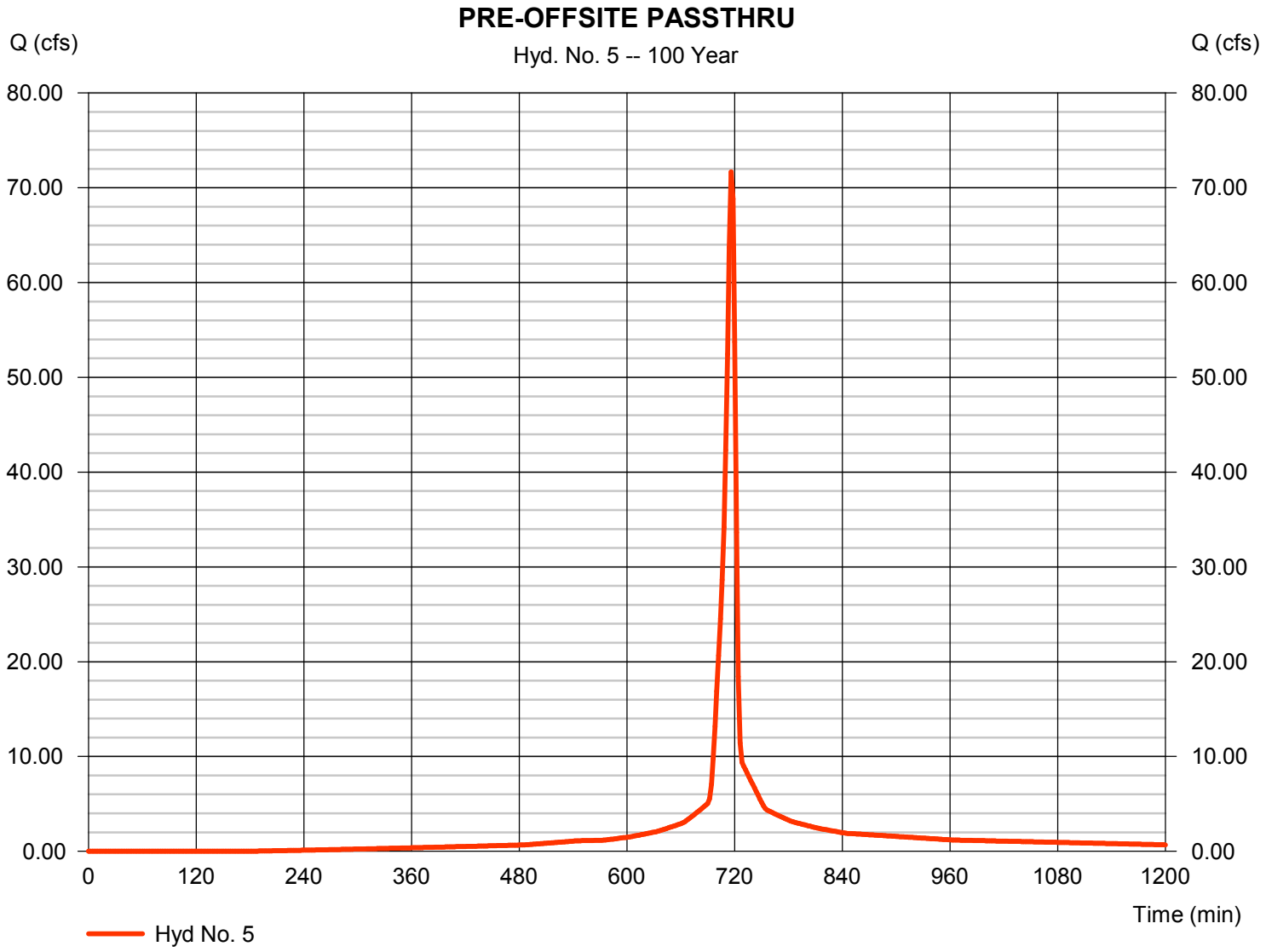
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Thursday, 06 / 8 / 2017

## Hyd. No. 5

PRE-OFFSITE PASSTHRU

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 71.67 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 157,333 cuft |
| Drainage area | = 7.520 ac | Curve number | = 89* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = User | Time of conc. (Tc) | = 6.00 min |
| Total precip. | = 7.45 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(1.870 x 62) + (5.650 x 98)] / 7.520



# Hydrograph Report

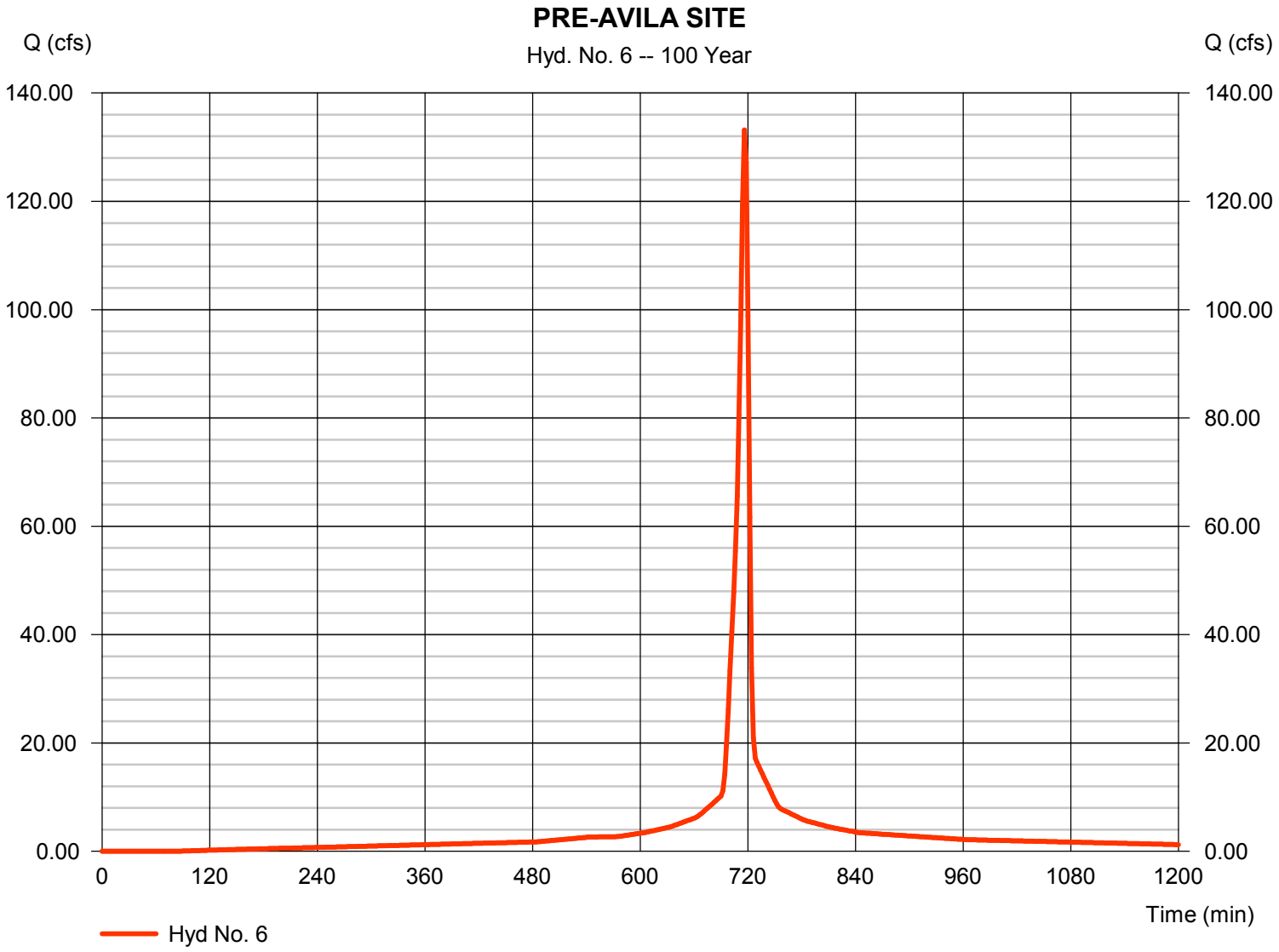
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 — Thursday, 06 / 8 / 2017

## Hyd. No. 6

PRE-AVILA SITE

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 133.18 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 309,738 cuft |
| Drainage area | = 13.280 ac | Curve number | = 95* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = User | Time of conc. (Tc) | = 6.00 min |
| Total precip. | = 7.45 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(0.970 x 62) + (12.310 x 98)] / 13.280



# Hydrograph Report

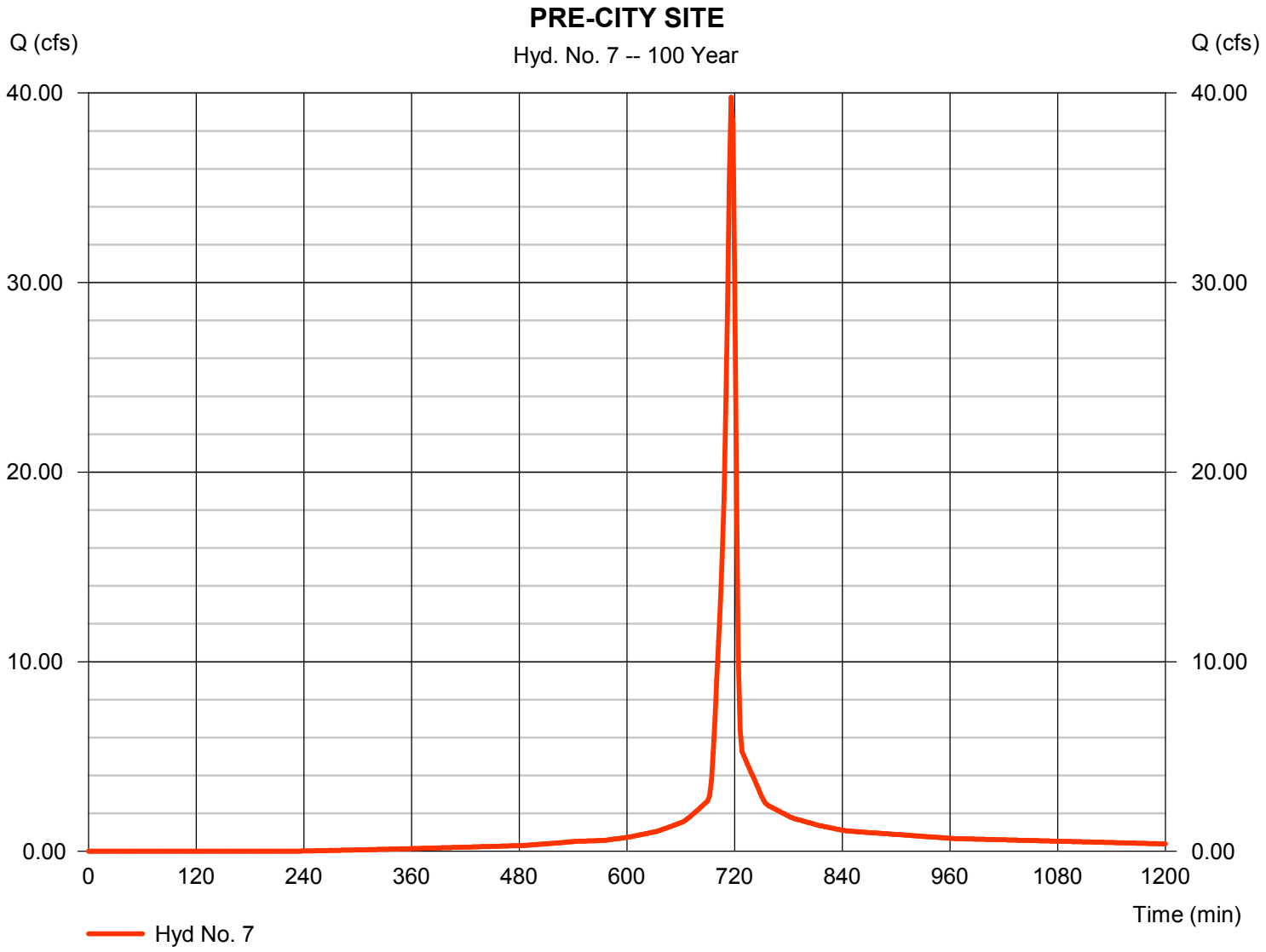
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Thursday, 06 / 8 / 2017

## Hyd. No. 7

PRE-CITY SITE

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 39.78 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 85,456 cuft |
| Drainage area | = 4.330 ac | Curve number | = 86* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = User | Time of conc. (Tc) | = 6.00 min |
| Total precip. | = 7.45 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(1.410 x 62) + (2.920 x 98)] / 4.330



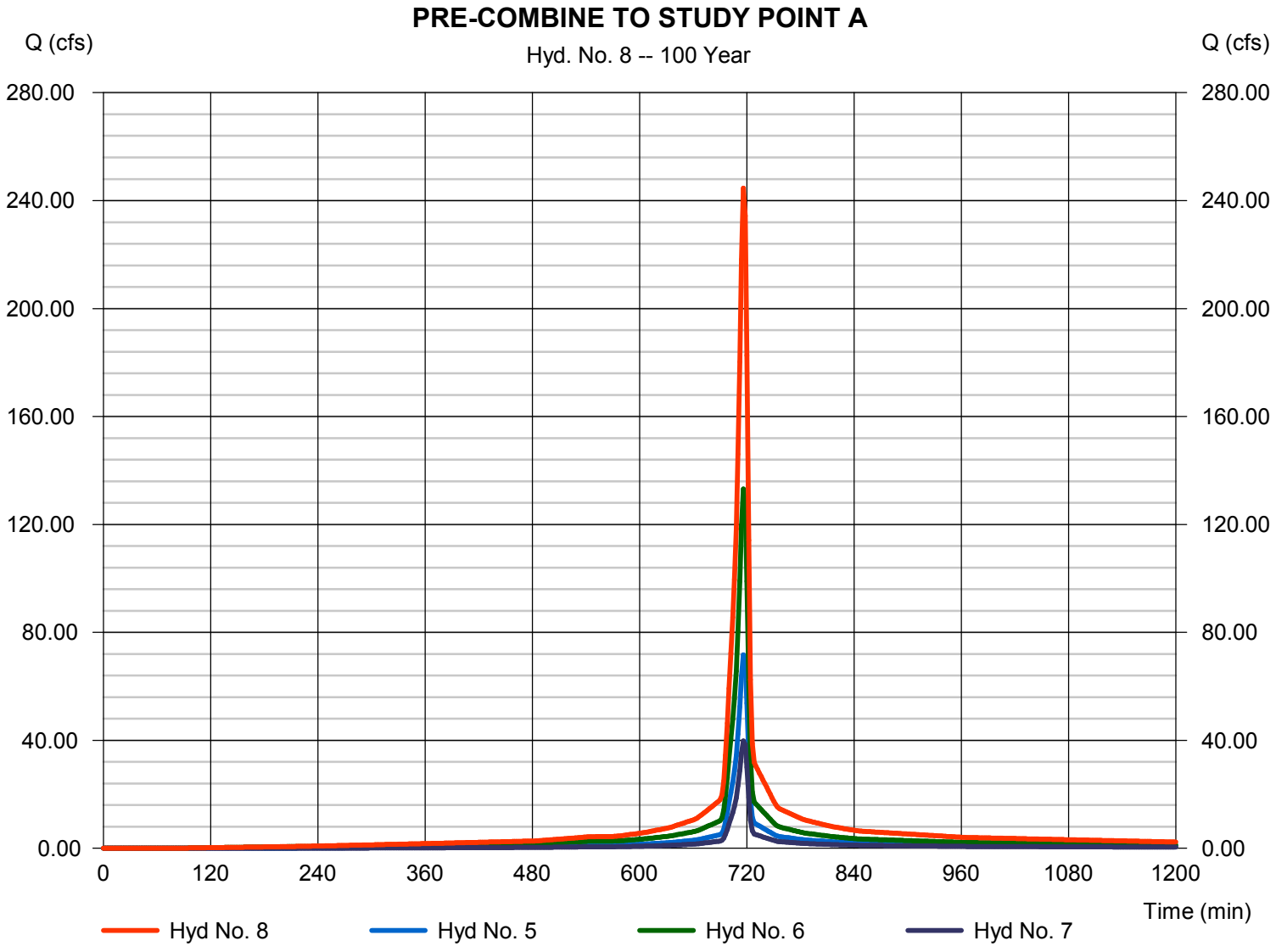
# Hydrograph Report



## Hyd. No. 8

PRE-COMBINE TO STUDY POINT A

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 244.63 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 552,528 cuft |
| Inflow hyds. | = 5, 6, 7 | Contrib. drain. area | = 25.130 ac |



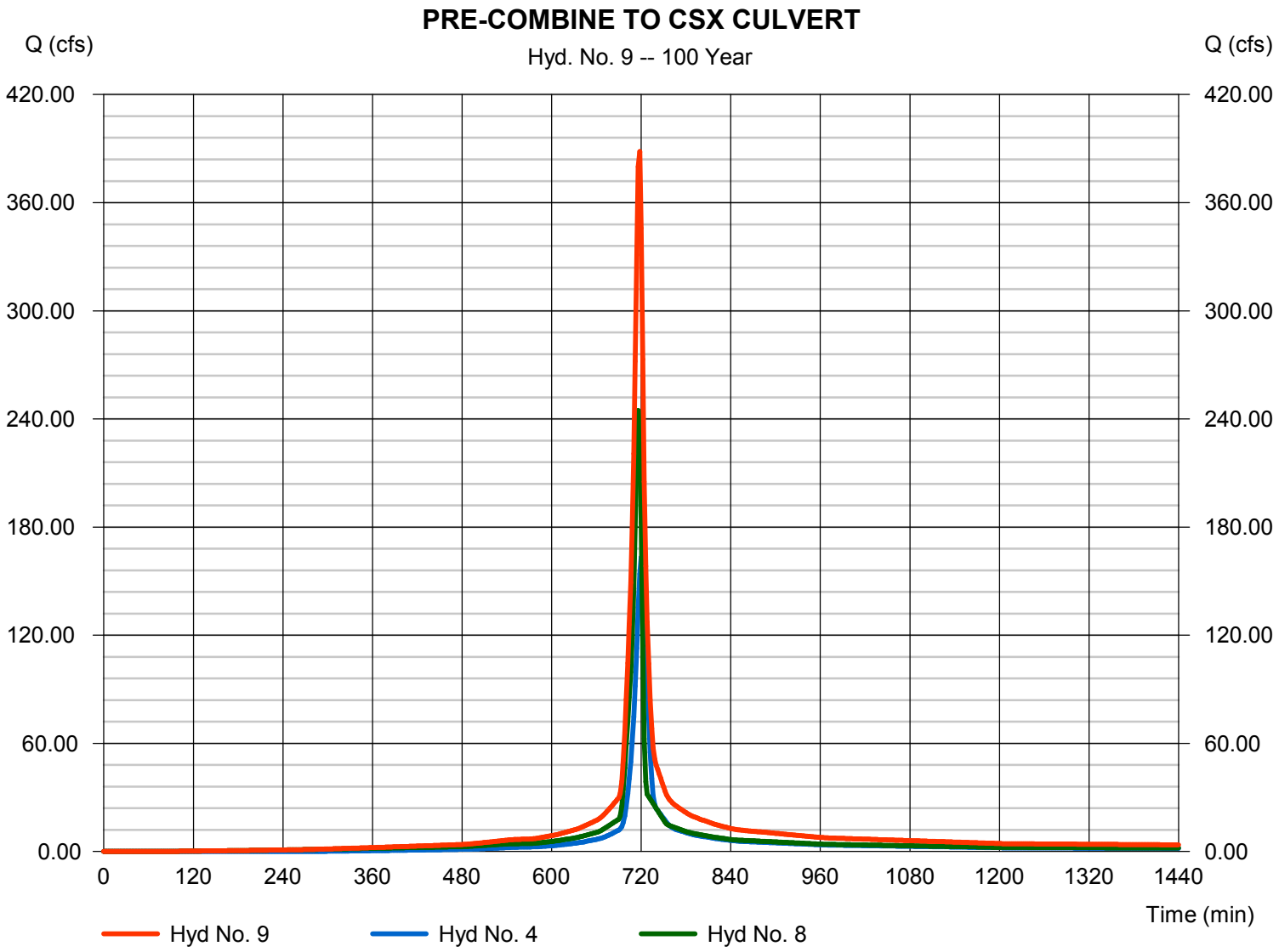
# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Thursday, 06 / 8 / 2017

## Hyd. No. 9

PRE-COMBINE TO CSX CULVERT

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 388.39 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 718 min |
| Time interval | = 2 min | Hyd. volume | = 987,383 cuft |
| Inflow hyds. | = 4, 8 | Contrib. drain. area | = 21.300 ac |



# Hydrograph Report

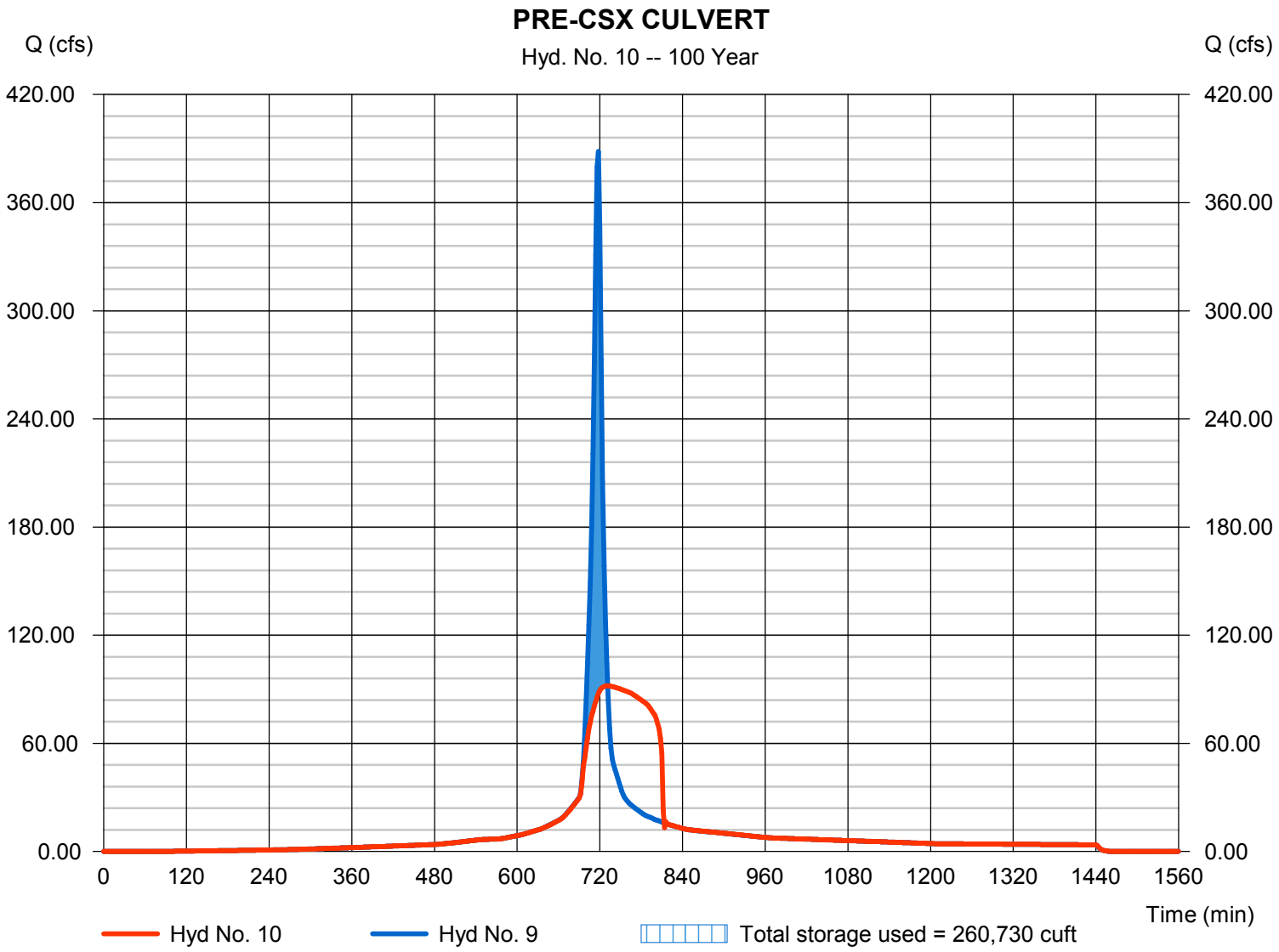
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Thursday, 06 / 8 / 2017

## Hyd. No. 10

PRE-CSX CULVERT

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 91.87 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 732 min |
| Time interval | = 2 min | Hyd. volume | = 987,383 cuft |
| Inflow hyd. No. | = 9 - PRE-COMBINE TO CSX CULVERT | Max. Elevation | = 1025.38 ft |
| Reservoir name | = EXISTING LOW AREA | Max. Storage | = 260,730 cuft |

Storage Indication method used.



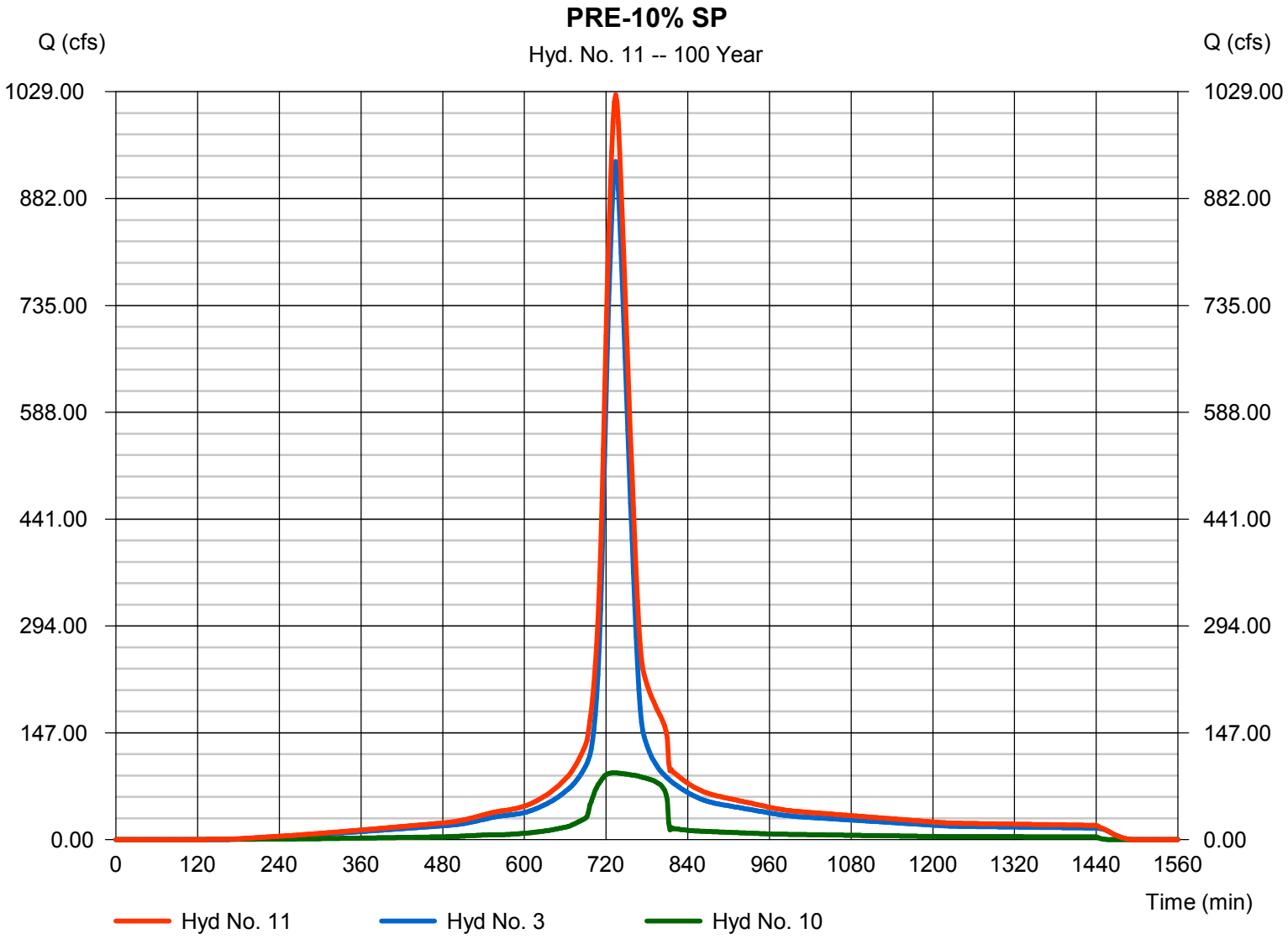
# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 — Thursday, 06 / 8 / 2017

## Hyd. No. 11

PRE-10% SP

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 1024.81 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 734 min |
| Time interval | = 2 min | Hyd. volume | = 5,430,557 cuft |
| Inflow hyds. | = 3, 10 | Contrib. drain. area | = 194.000 ac |



# Hydrograph Report

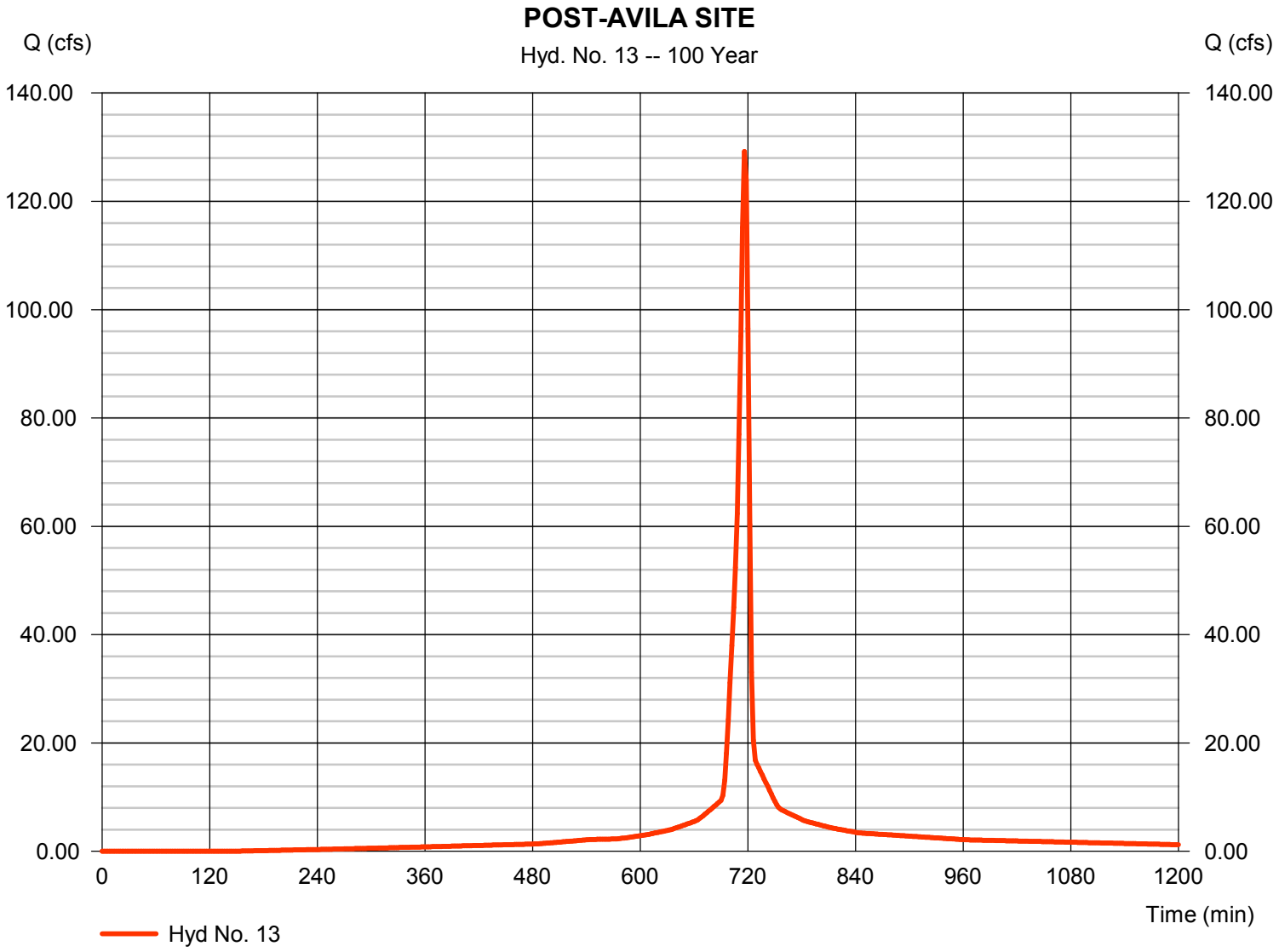
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 — Thursday, 06 / 8 / 2017

## Hyd. No. 13

POST-AVILA SITE

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 129.19 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 288,419 cuft |
| Drainage area | = 13.280 ac | Curve number | = 91* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = User | Time of conc. (Tc) | = 6.00 min |
| Total precip. | = 7.45 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(10.600 x 98) + (2.680 x 62)] / 13.280



# Hydrograph Report

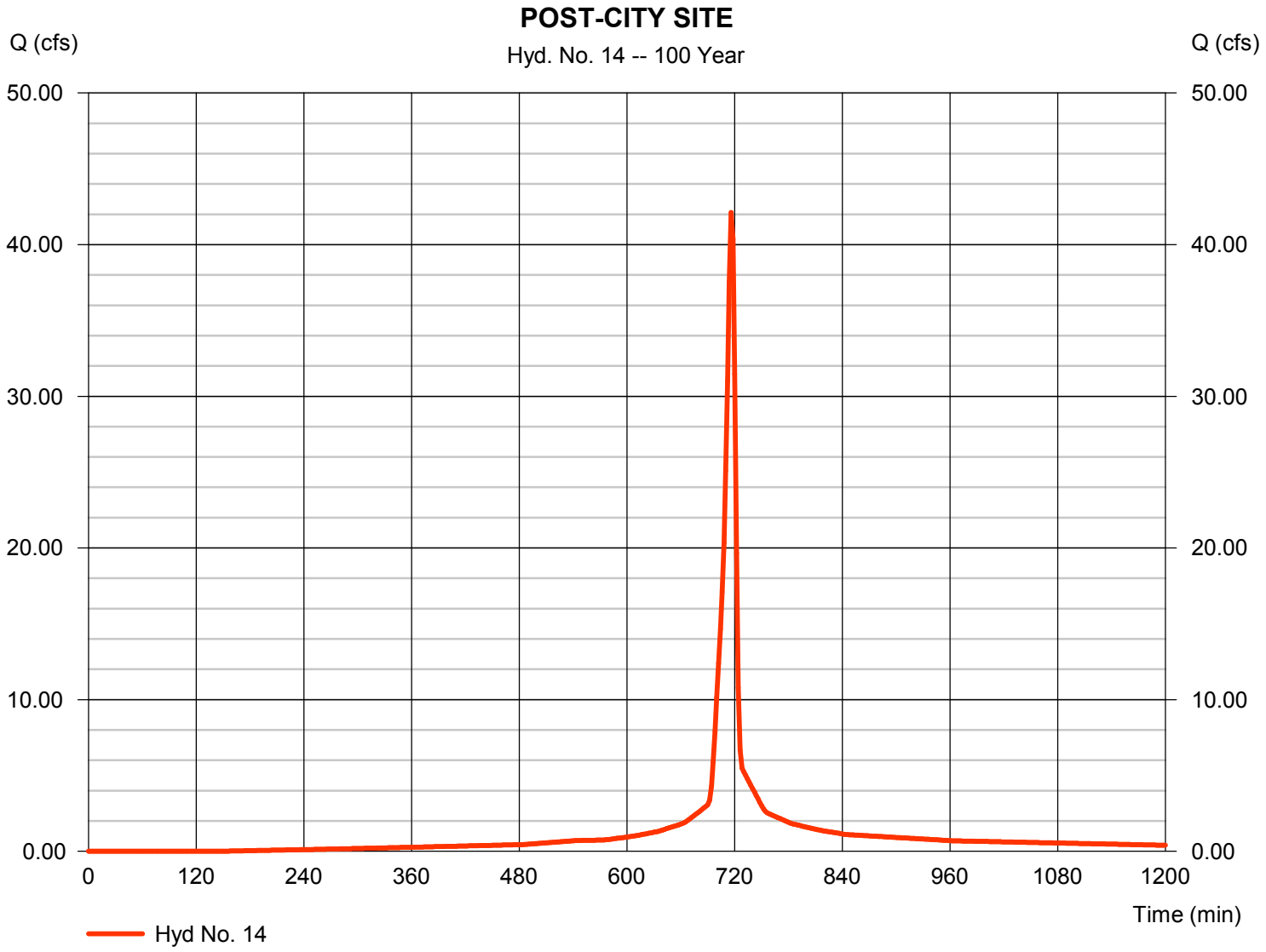
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Thursday, 06 / 8 / 2017

## Hyd. No. 14

POST-CITY SITE

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 42.12 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 94,040 cuft |
| Drainage area | = 4.330 ac | Curve number | = 91* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = User | Time of conc. (Tc) | = 6.00 min |
| Total precip. | = 7.45 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(0.870 x 62) + (3.460 x 98)] / 4.330



# Hydrograph Report

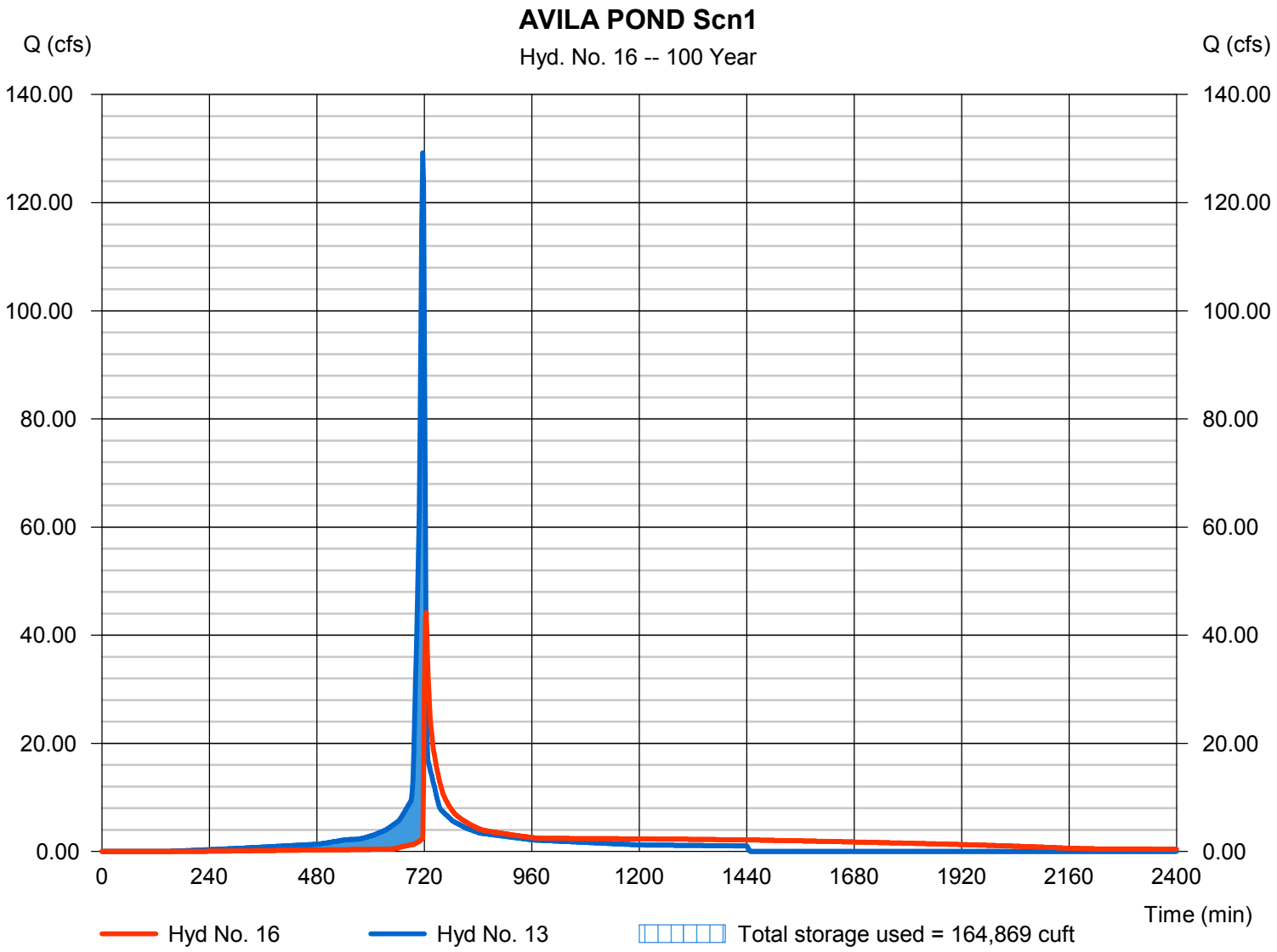
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Thursday, 06 / 8 / 2017

## Hyd. No. 16

AVILA POND Scn1

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 44.16 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 724 min |
| Time interval | = 2 min | Hyd. volume | = 288,397 cuft |
| Inflow hyd. No. | = 13 - POST-AVILA SITE | Max. Elevation | = 1026.56 ft |
| Reservoir name | = AVILA POND SCN1 | Max. Storage | = 164,869 cuft |

Storage Indication method used. Wet pond routing start elevation = 1014.60 ft.



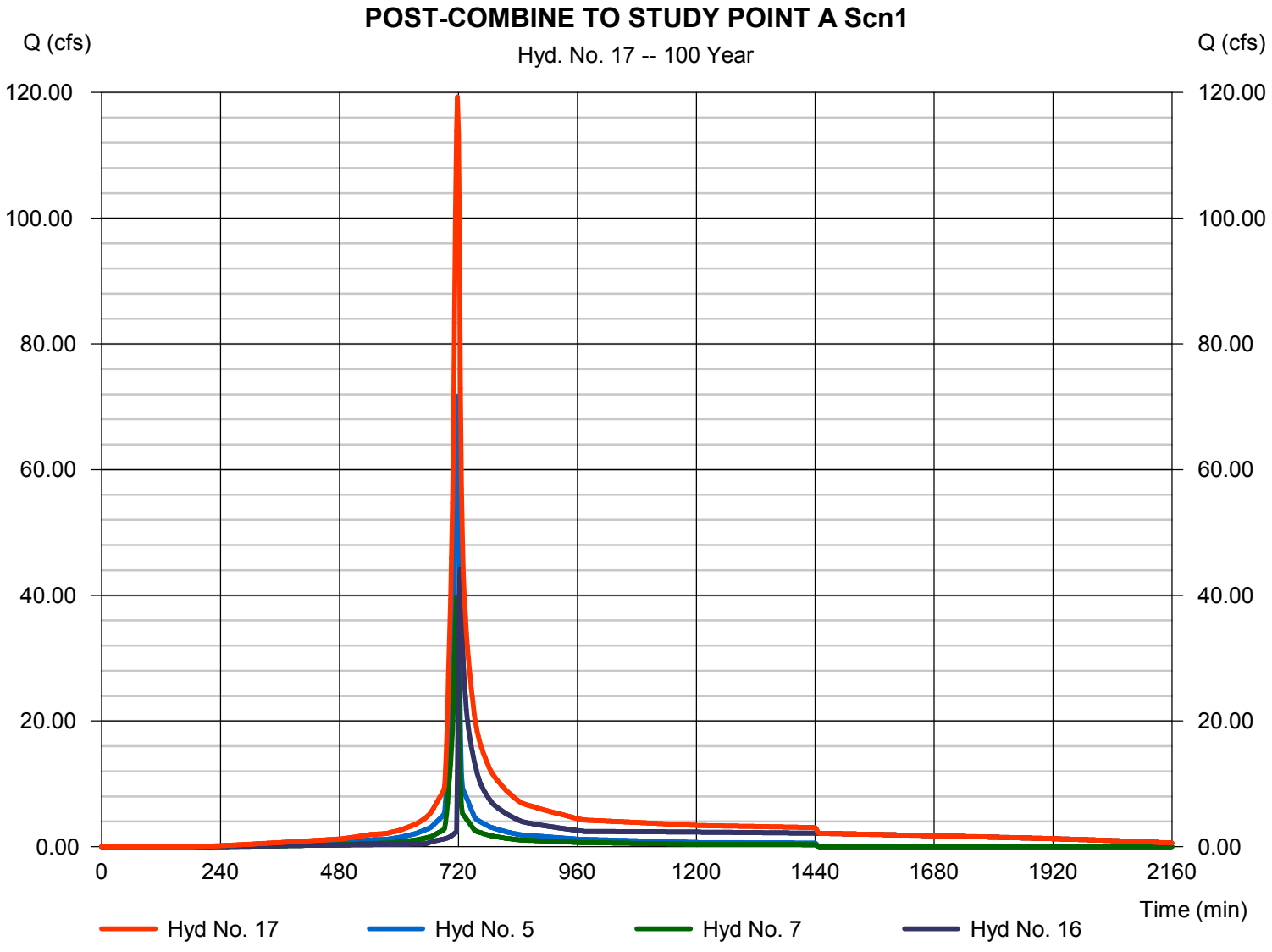
# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Thursday, 06 / 8 / 2017

## Hyd. No. 17

POST-COMBINE TO STUDY POINT A Scn1

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 119.30 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 718 min |
| Time interval | = 2 min | Hyd. volume | = 531,186 cuft |
| Inflow hyds. | = 5, 7, 16 | Contrib. drain. area | = 11.850 ac |



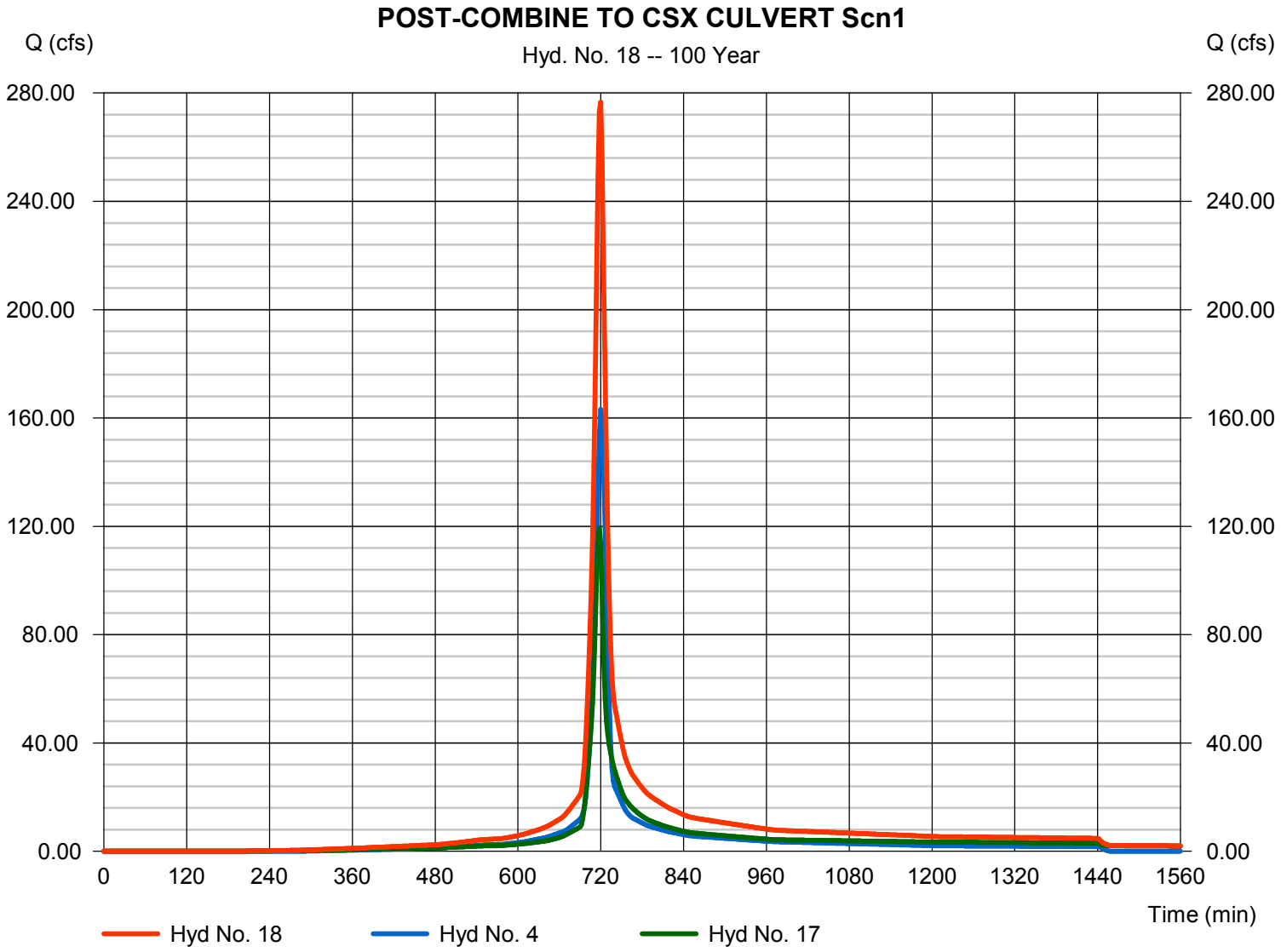
# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Thursday, 06 / 8 / 2017

## Hyd. No. 18

POST-COMBINE TO CSX CULVERT Scn1

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 276.66 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 720 min |
| Time interval | = 2 min | Hyd. volume | = 966,041 cuft |
| Inflow hyds. | = 4, 17 | Contrib. drain. area | = 21.300 ac |



# Hydrograph Report

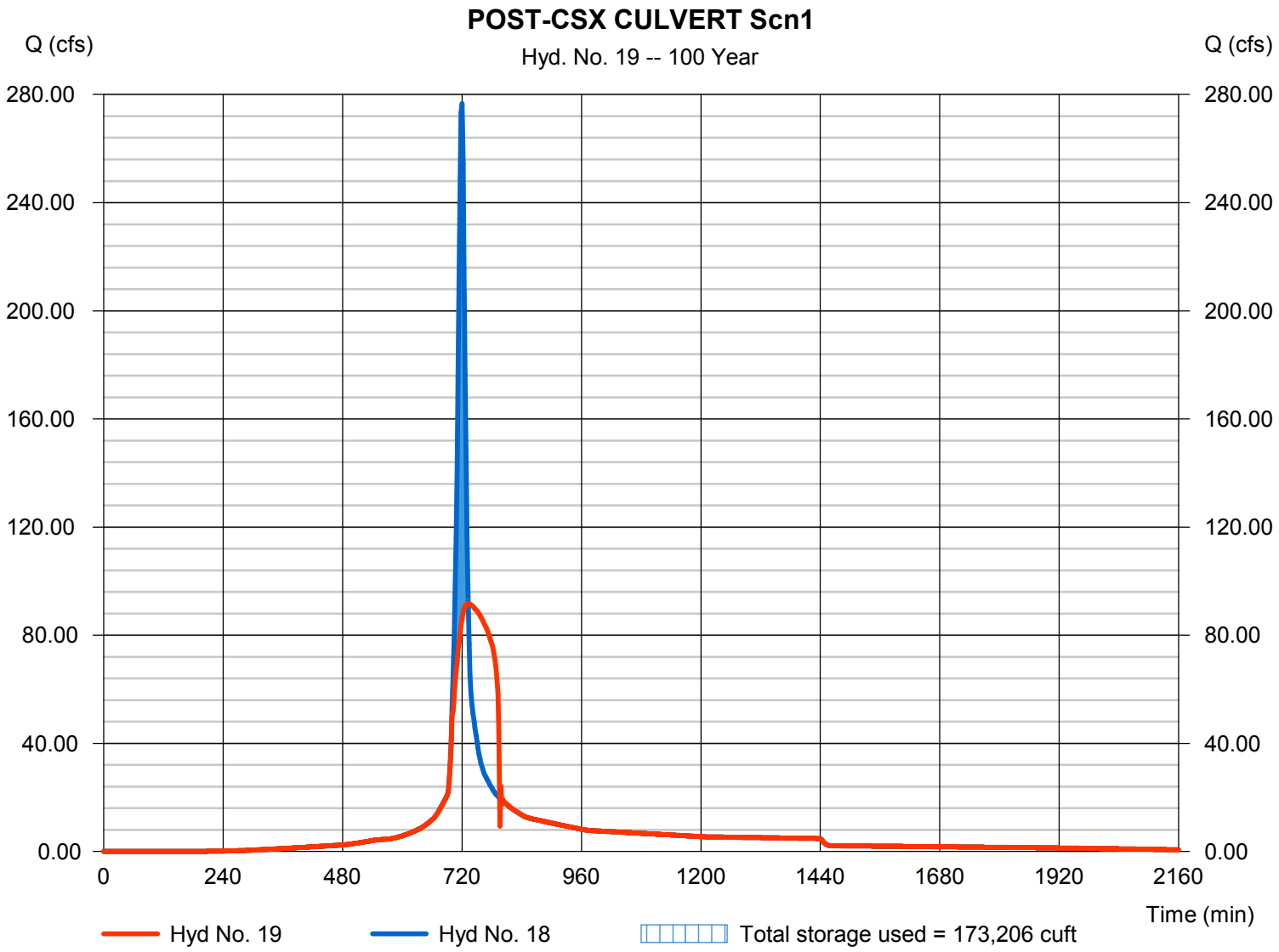
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 — Thursday, 06 / 8 / 2017

## Hyd. No. 19

POST-CSX CULVERT Scn1

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 91.75 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 732 min |
| Time interval | = 2 min | Hyd. volume | = 966,040 cuft |
| Inflow hyd. No. | = 18 - POST-COMBINE TO CSX CULVERT Scn1 | Max. Elevation | = 1025.34 ft |
| Reservoir name | = PROPOSED LOW AREA SCN1 | Max. Storage | = 173,206 cuft |

Storage Indication method used.



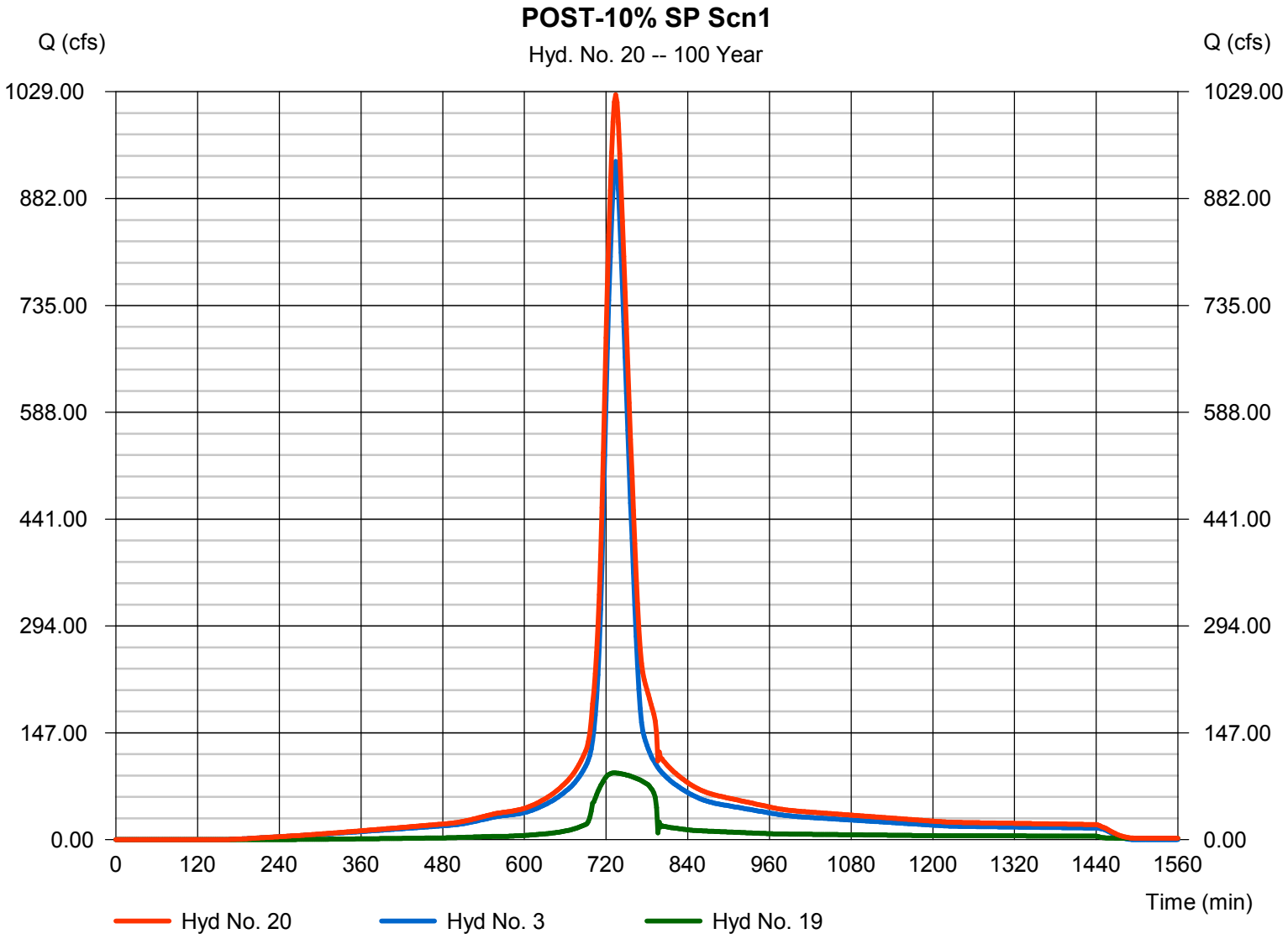
# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 — Thursday, 06 / 8 / 2017

## Hyd. No. 20

POST-10% SP Scn1

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 1024.71 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 734 min |
| Time interval | = 2 min | Hyd. volume | = 5,409,207 cuft |
| Inflow hyds. | = 3, 19 | Contrib. drain. area | = 194.000 ac |



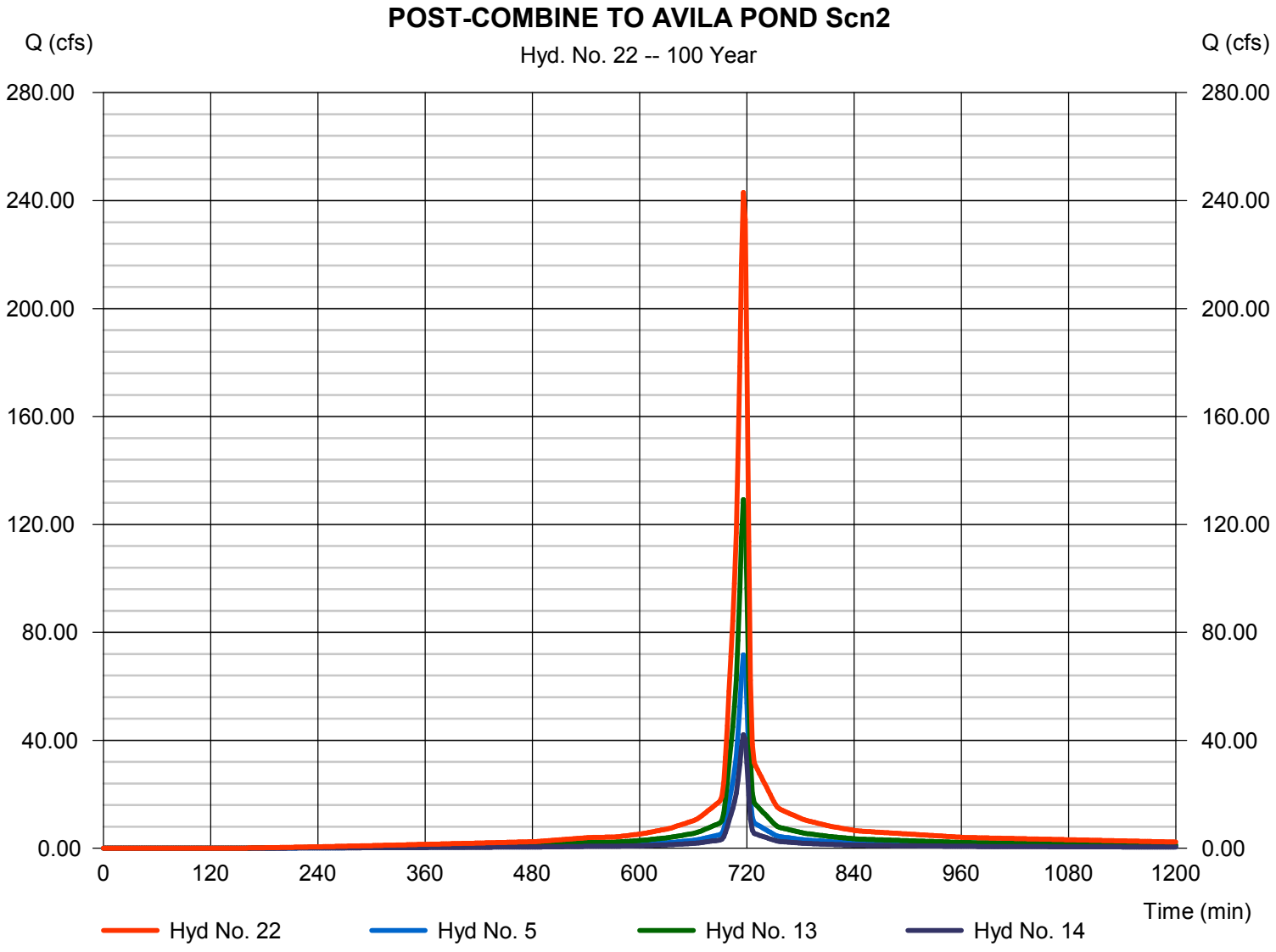
# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Thursday, 06 / 8 / 2017

## Hyd. No. 22

POST-COMBINE TO AVILA POND Scn2

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 242.99 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 539,793 cuft |
| Inflow hyds. | = 5, 13, 14 | Contrib. drain. area | = 25.130 ac |



# Hydrograph Report

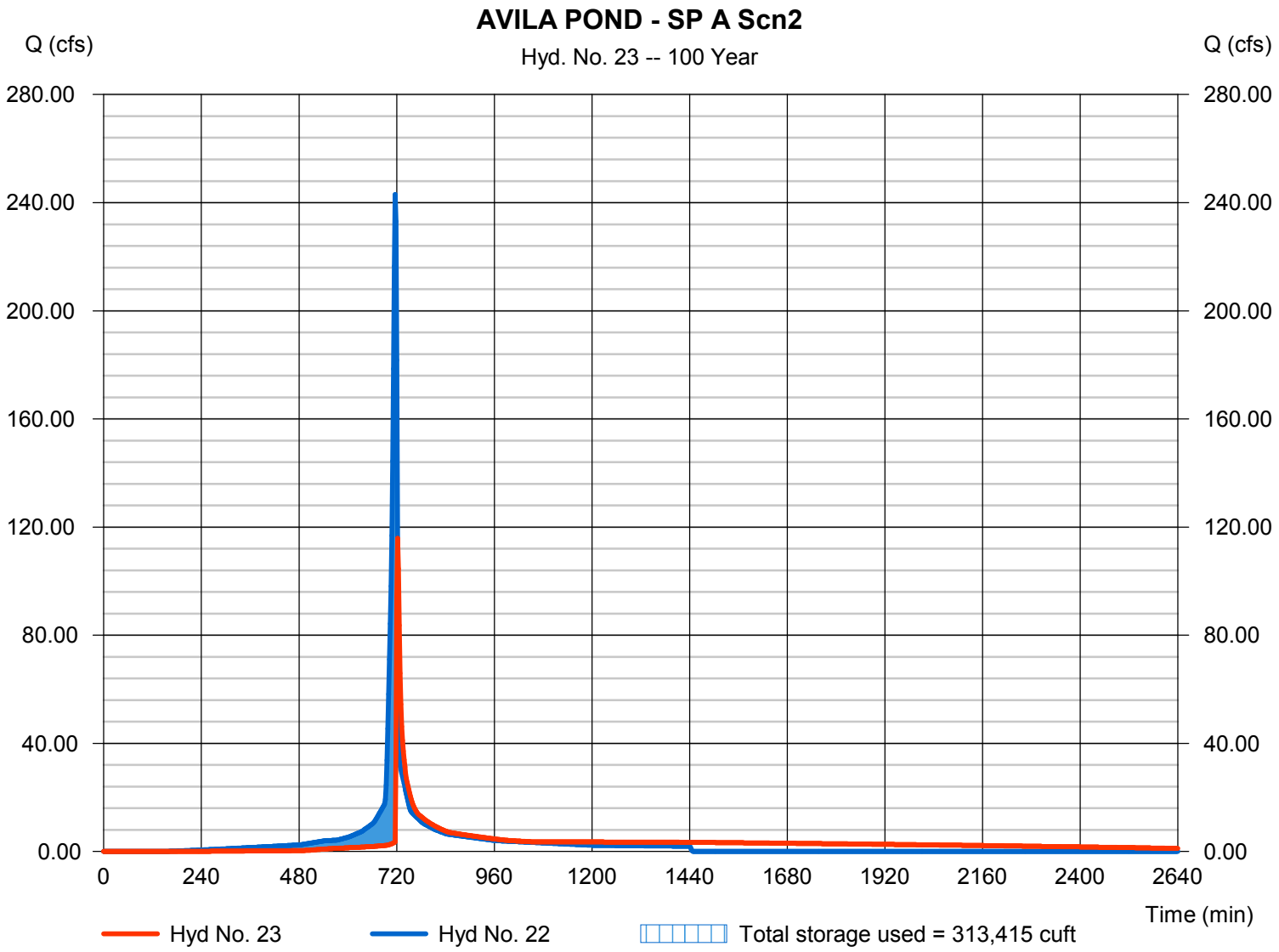
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Thursday, 06 / 8 / 2017

## Hyd. No. 23

AVILA POND - SP A Scn2

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph type | = | Reservoir | Peak discharge | = | 115.84 cfs |
| Storm frequency | = | 100 yrs | Time to peak | = | 722 min |
| Time interval | = | 2 min | Hyd. volume | = | 539,325 cuft |
| Inflow hyd. No. | = | 22 - POST-COMBINE TO AVILA POND Scn2 | Max. Elevation | = | 1024.96 ft |
| Reservoir name | = | Avila Pond SCN2 | Max. Storage | = | 313,415 cuft |

Storage Indication method used. Wet pond routing start elevation = 1013.00 ft.



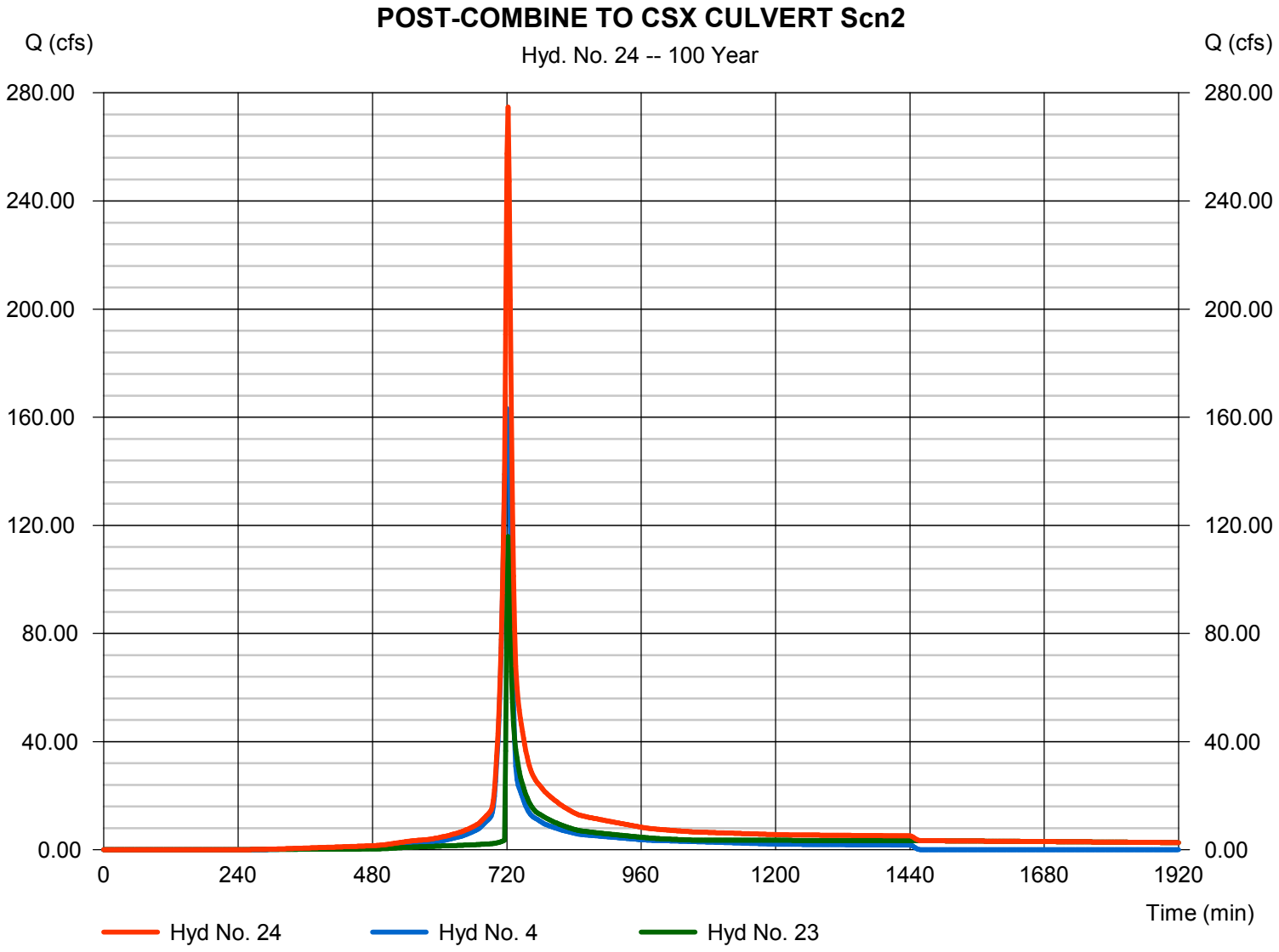
# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Thursday, 06 / 8 / 2017

## Hyd. No. 24

POST-COMBINE TO CSX CULVERT Scn2

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 274.76 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 722 min |
| Time interval | = 2 min | Hyd. volume | = 974,181 cuft |
| Inflow hyds. | = 4, 23 | Contrib. drain. area | = 21.300 ac |



# Hydrograph Report

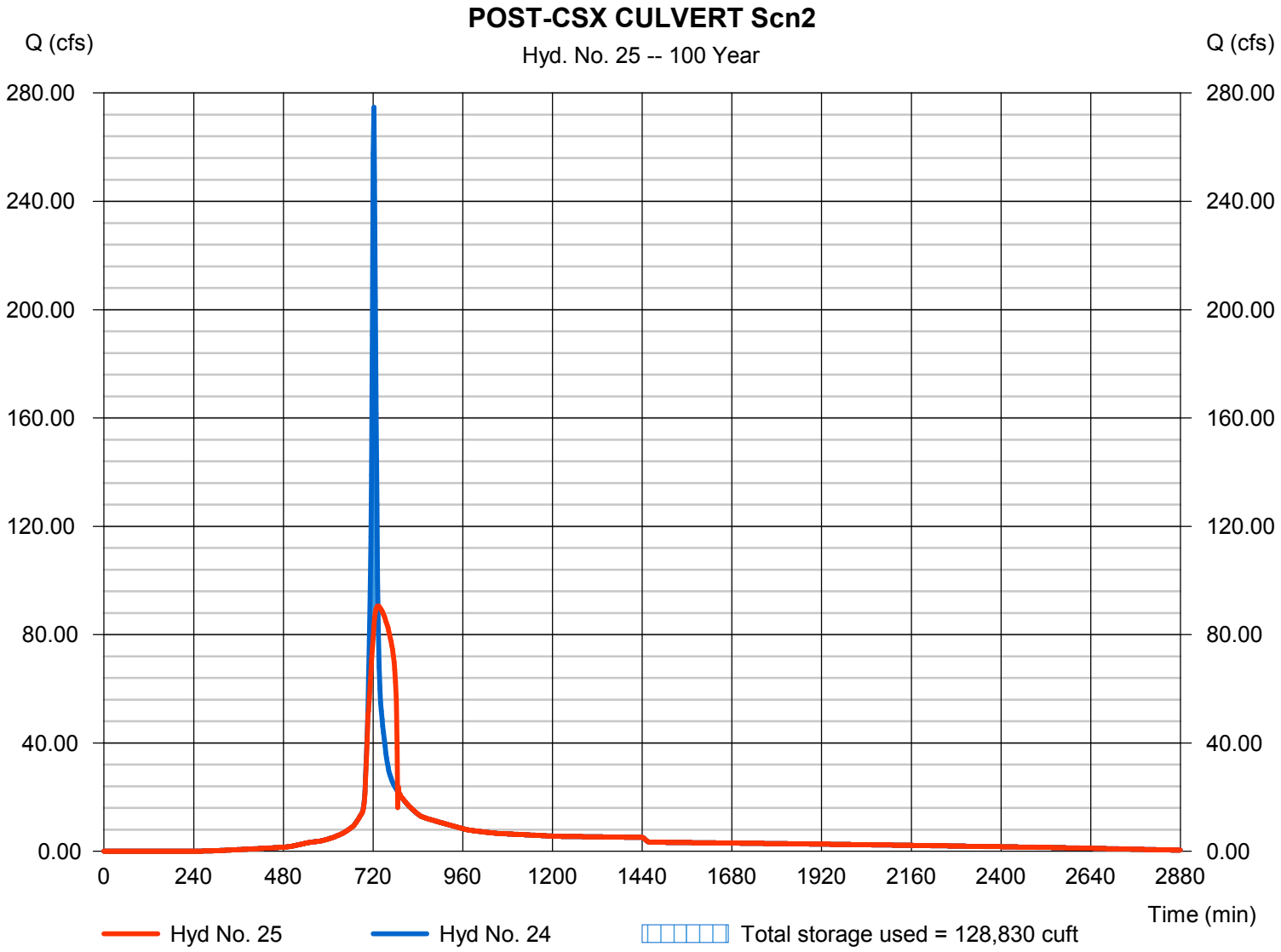
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 — Thursday, 06 / 8 / 2017

## Hyd. No. 25

POST-CSX CULVERT Scn2

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 90.54 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 734 min |
| Time interval | = 2 min | Hyd. volume | = 974,180 cuft |
| Inflow hyd. No. | = 24 - POST-COMBINE TO CSX CULVERT Scn2 | Max. Elevation | = 1024.93 ft |
| Reservoir name | = PROPOSED LOW AREA SCN2 | Max. Storage | = 128,830 cuft |

Storage Indication method used.



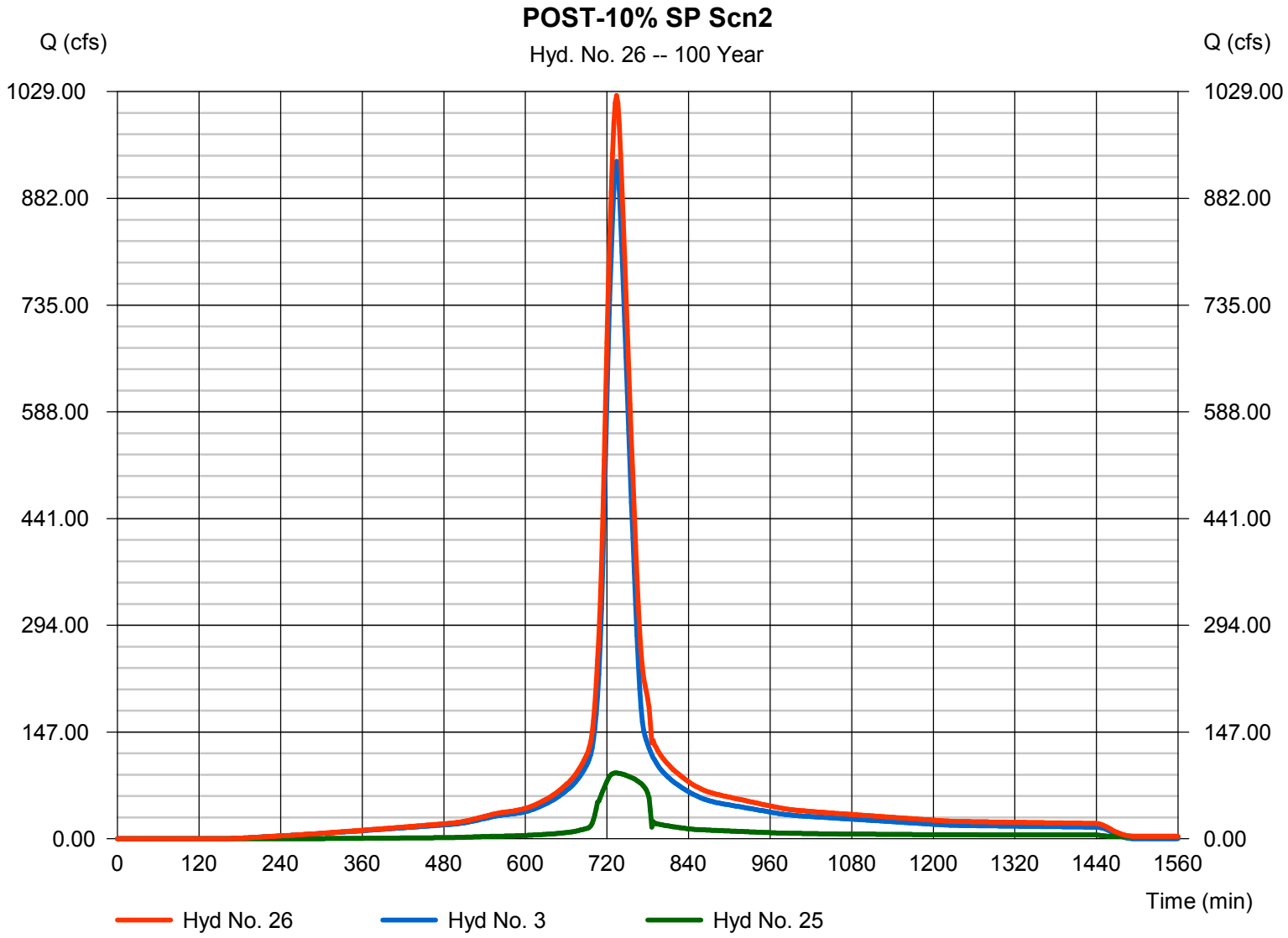
# Hydrograph Report

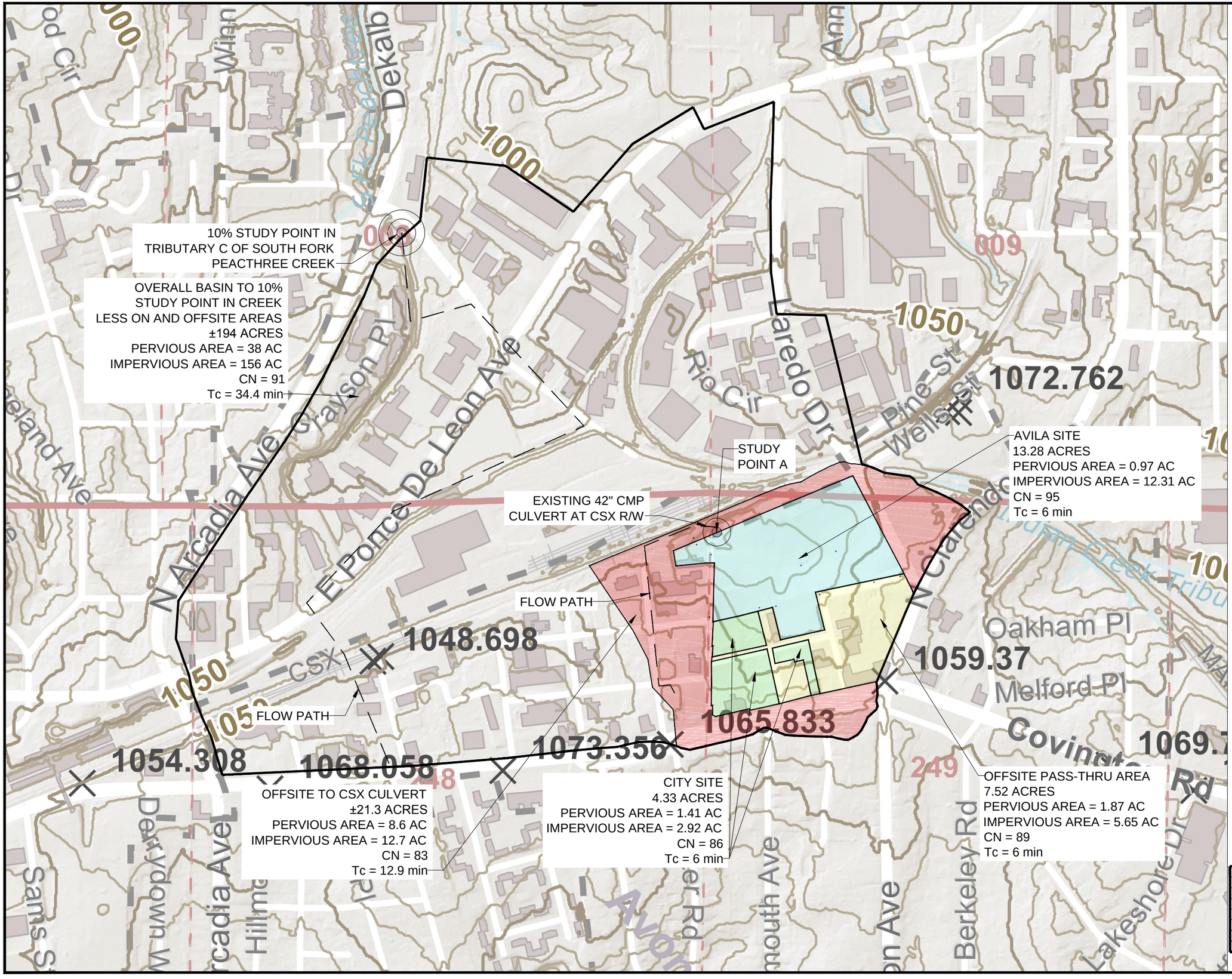
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 — Thursday, 06 / 8 / 2017

## Hyd. No. 26

POST-10% SP Scn2

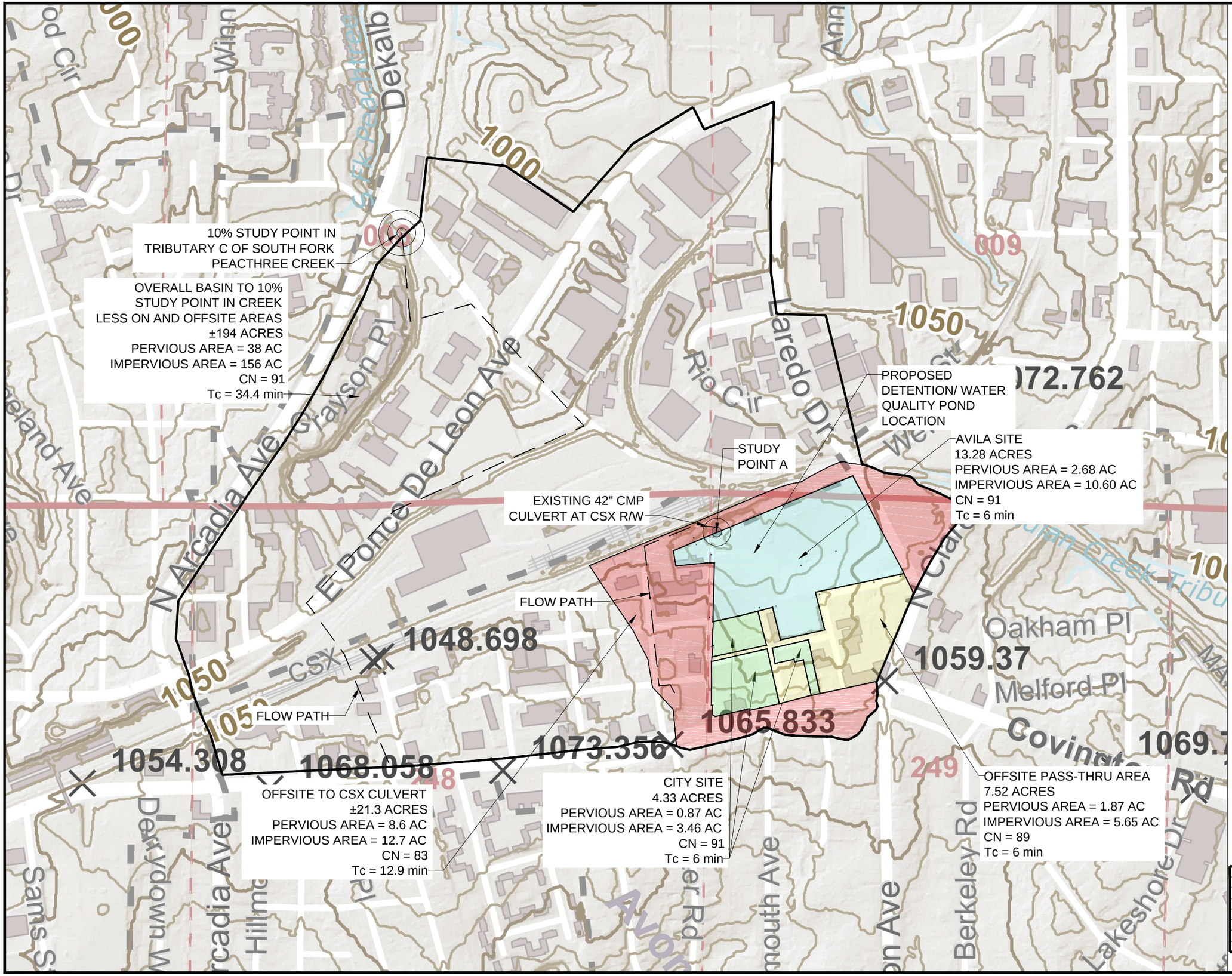
| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 1023.55 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 734 min |
| Time interval | = 2 min | Hyd. volume | = 5,417,343 cuft |
| Inflow hyds. | = 3, 25 | Contrib. drain. area | = 194.000 ac |






Appendix C:
Pre-Development
Drainage Map

| NO. | DATE | REVISION | SCALE: 1" = 500' |
|---|---|---|---|
| | | | DATE: 06-08-17 |
| | | | JOB. NO. 1713 |
| | | | SHEET. 1 OF 2 |




Appendix C:
Post-Development
Drainage Map

| NO. | DATE | REVISION | SCALE: 1" = 500' |
|---|---|---|---|
| | | | DATE: 06-08-17 |
| | | | JOB. NO. 1713 |
| | | | SHEET. 2 OF 2 |

OUTLET CONTROL STRUCTURE 5'X5'X14'

SCENARIO 1 POND:
AREA =32,154 SF (0.74 AC)
VOLUME = 182,468 CF

FUTURE DEVELOPMENT

FUTURE DEVELOPMENT

FUTURE DEVELOPMENT

50' STREAM BUFFER

75' IMPERVIOUS SETBACK

50' STREAM BUFFER

75' IMPERVIOUS SETBACK

42" RCP

36" CMP

18" CMP

24" CMP

15"RCP

FLUME

STREAM

INTERMITTENT STREAM

DITCH

GRAVEL

CONCRETE

WALL

OHP

GM

N 67°45'33" E 424.81'

N 67°45'33" E 43.43'

(TIE LINE)

N 67°45'33" E 9.64'

S 10°40'13" W 149.21'

S 24°36'38" W 174.76'

N 30°44'26" E 304.26'

INV 1017.86

INV 1014.15

INV 1010.62

42" STEEL PIPE

TOP 1025.53

TOP 1024.81
INV 1021.31±

TOP 1021.79
INV 1014.79

TOP 1019.29
INV 1015.43

TOP 1024.28

TOP 1030.12
INV IN 1021.37(A)
INV OUT 1021.37(B)

TOP 1026.23
INV IN 1020.83(A)
INV OUT 1020.73(B)

TOP 1029.57
INV 1026.87

TOP 1036.39
INV 1035.56

INV 1020.95
INV 1022.63
(C)

INV 1021.86

TOP 1032.19

SEALED

1030

1026

1020

1022

1024

1028

1014

1012

1010

1016

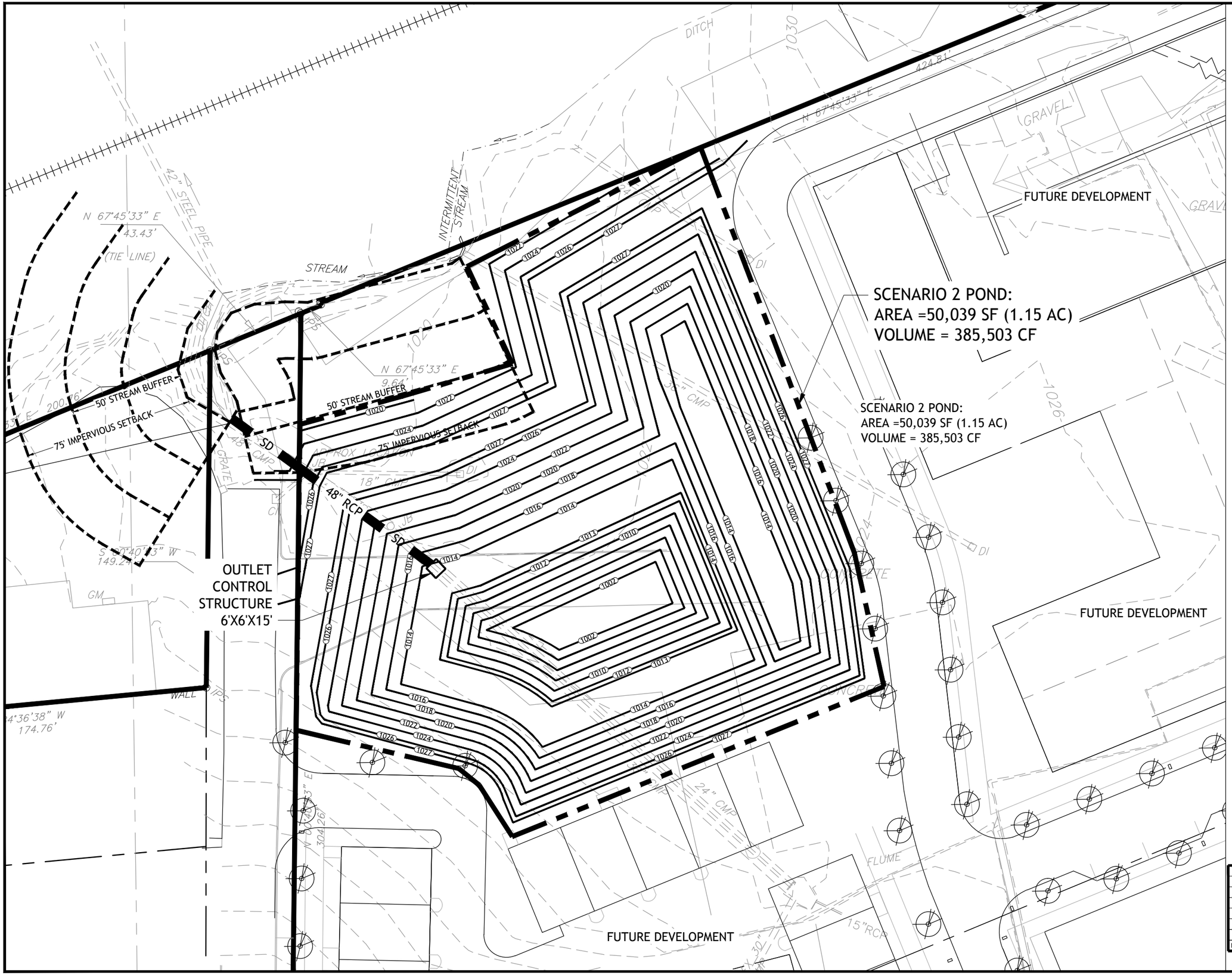
0 40' 80'

GRAPHIC SCALE : 1" = 40'

# Appendix D:
# Scenario 1
# Avila Pond

| NO. | DATE | REVISION |
|---|---|---|
| | | |

SCALE: 1" = 40'
DATE: 06-08-17
JOB. NO. 1713
SHEET. 1 OF 2




Appendix D:
Scenario 2
Avila/City Shared Pond

| NO. | DATE | REVISION | SCALE: 1" = 40' |
|---|---|---|---|
| | | | DATE: 06-08-17 |
| | | | JOB. NO. 1713 |
| | | | SHEET. 2 OF 2 |