STORMWATER MANAGEMENT, STORMDRAIN, AND EROSION AND SEDIMENT CONTROL CALCULATIONS

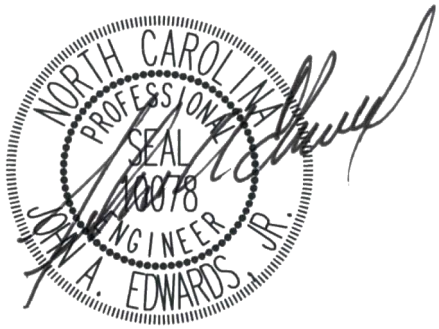
A Master Team Townhomes

151 Grand Rock Way
Rolesville, NC 27571

June 22, 2020

Prepared for:
A Master Team, LLC
6200 Falls of Neuse Road; Suite 10
Raleigh, NC 27609

Prepared by:
JAECO
333 Wade Avenue
Raleigh, NC 27605
(919) 828-4428



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DEVELOPMENT SUMMARY AND STORMWATER NARRATIVE

Project Description

The project site is located at 151 Grand Rock Way in Rolesville, North Carolina. A petition to rezone 4.38 acres of a 7.44 acre parcel from Residential and Planned Unit Development (R&PUD) to Commercial Outlying Special Use District (CO-SUD) is being processed under MA 19-03. This will permit commercial development and residential uses on the property. A special use permit for approval of a mixed-use master plan in the CO-SUP district is being processed under SUP 19-02.

The proposed development consists of eight (8) townhome buildings consisting of forty-seven individual units, associated private road construction, driveway installation, visitor parking areas, and other related site improvements. The total study area ("effective area") for this project is defined mainly by the outer property boundaries and the projections thereof to the existing back of curb or existing edge of pavement. Minor extensions of the effective area are included to account for impervious construction not otherwise captured. The effective area amounts to 6.01 ac. Streetscape improvements along Grand Rock Way are proposed as part of the development; however, no street widening is required.

Site Conditions

The subject property is currently an undeveloped wooded parcel. No buffered features, FEMA floodplain limits, or jurisdiction wetlands exist on the site or in the immediate vicinity.

There is an existing high point on the ridge adjacent to Grand Rock Way on site which results in three (3) points of interest (POI) within the effective area.

POI #1 consists of the majority of the site and drains from the ridge south, turning east and ultimately discharging at the proposed eastern property line and outfalling to an existing yard inlet located on the adjacent site. Area from the ridge north drains into the Grand Rock Way right-of-way into the existing storm drain collection system. These two (2) outfalls for POI #1 achieve confluence in the existing stormdrain system at the intersection of Grand Rock Way and Rogers Road.

POI #2 consists of area at the southeast corner of the site draining from another ridge connecting two apparent spoil piles ultimately discharging at an existing inlet located on the Carolinaz, LLC parcel.

POI #3 consists of runoff west of another ridge that runs the length of the western property line and the remainder of the area draining to Grand Rock Way.

The proposed condition maintains this overall drainage pattern with minor adjustments to the internal boundaries. As treatment within POI #2 and POI #3 is infeasible due to the size of those POIs, area from both is re-routed to POI #1 via grading updates as the additional impervious area would otherwise increase runoff for POI #2 and POI #3.

In the proposed condition, onsite flow is collected in a proposed stormdrain network, treated, and detained to match the existing 1-year flow rate before discharging to a new "build over" manhole at the existing 30" stormdrain system located on the adjacent parcel to the east. See included Pre-Development and Post-Development Drainage Area maps for additional information.

Spacing calculations for the proposed on site catch basins are provided in this report and are sized utilizing NCDOT standards, including 50% blockage of the sag inlet.

Stormwater Management Measures

Stormwater will be collected throughout the site in a proposed stormdrain network and directed to a proposed stormwater wet pond. All remaining drainage not captured in the proposed storm network maintains the existing drainage patterns, safely discharging offsite.

Please refer to the "Flow Summary and Hydrographs" section of this report for summary of flow results. In all 1-yr instances, the post development discharge rates are less than the existing conditions discharge rates. The 100-yr storm is fully detained within the wet pond.

Nutrient reduction is provided by the proposed wet pond below the required treatment threshold of 10 lb/ac/yr. The developer will buy down to 3.6 lb/ac/yr.

Methodology Discussion

The Wake County Municipal Nitrogen Tool utilizes the SCS method to size the required facilities and evaluate runoff rates. It is the Engineer's opinion, in keeping with generally accepted engineering practice as well as NCDOT guidance ("Guidelines for Drainage Studies and Hydraulic Design" November 21, 2016, Section 7.4.3), that the Rational Method be utilized for drainage areas less than 20 acres. As such, in this report the rational method is utilized to size all stormdrain infrastructure, excepting the wet pond outflow pipe. As the outflow pipe is an integral part of the wet pond design, the pipe in the hydrograph model is sized such that water will not back up into the facility and have an adverse impact on the design. However, with the size established via SCS, all further calculations that involve the outlet pipe utilize the rational method.

Downstream Impact Analysis

The existing 30" pipe located on the adjacent site is assumed to be half full. The flow rate that results in a half full pipe was then added to the rational runoff exiting the proposed wet pond in order to demonstrate that the development does not negatively impact the infrastructure downstream of POI #1.

The post development flow rates for POI #2 and POI #3 are reduced, and as such no negative downstream effects are anticipated.

Calculation Methodology

- See "methodology discussion" section for guidance on the establishment of runoff rates.
- Hydraflow Hydrographs 2019.2 was utilized for the hydrograph analysis and wet pond sizing calculations.
- Hydraflow Express Extension was utilized for inlet spacing and pipe capacity calculations.
- Bentley StormCAD V8i (SELECTseries 2) was utilized in preparing the storm drain calculations, including hydraulic grade lines. Note that the 25-yr event was utilized in all storm drain calculations.
- In an effort to obtain a conservative analysis, the time of concentration was assumed for all drainage areas at 5 minutes.
- Rainfall intensity is site specific per NOAA Atlas 14.
- An intensity of 4 in/hr is utilized in the inlet spacing calculations per NCDOT Table 10-1.
- Topographic, location, and boundary survey information was provided by JAECO.

Conclusion

The proposed development complies with the Town of Rolesville UDO Chapter 7.5 stormwater control requirements and Wake County design criteria. The project will provide attenuation using a proposed stormwater wet pond to reduce the post development 1-year storm to existing conditions discharge rates and provide 25% nitrogen removal which will reduce the total nitrogen export from the site below the required treatment threshold of 10 lb/ac/yr. The developer will buy down to 3.6 lb/ac/yr. Please see enclosed calculations for additional information.

NOAA Atlas 14, Volume 2, Version 3
Location name: Rolesville, North Carolina, USA*
Latitude: 35.9195°, Longitude: -78.4672°
Elevation: 421.28 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.403** (0.369-0.441)	**0.468** (0.429-0.512)	**0.534** (0.489-0.583)	**0.599** (0.548-0.654)	**0.665** (0.606-0.725)	**0.717** (0.650-0.781)	**0.763** (0.688-0.831)	**0.804** (0.721-0.878)	**0.850** (0.755-0.928)	**0.890** (0.785-0.974)
10-min	**0.644** (0.590-0.704)	**0.749** (0.687-0.818)	**0.855** (0.784-0.933)	**0.959** (0.877-1.05)	**1.06** (0.965-1.16)	**1.14** (1.03-1.25)	**1.21** (1.09-1.32)	**1.27** (1.14-1.39)	**1.34** (1.19-1.47)	**1.40** (1.24-1.53)
15-min	**0.805** (0.738-0.880)	**0.942** (0.863-1.03)	**1.08** (0.991-1.18)	**1.21** (1.11-1.32)	**1.34** (1.22-1.46)	**1.45** (1.31-1.58)	**1.53** (1.38-1.67)	**1.61** (1.44-1.76)	**1.69** (1.50-1.85)	**1.76** (1.55-1.93)
30-min	**1.10** (1.01-1.21)	**1.30** (1.19-1.42)	**1.54** (1.41-1.68)	**1.76** (1.61-1.92)	**1.99** (1.81-2.17)	**2.18** (1.97-2.37)	**2.35** (2.12-2.56)	**2.50** (2.24-2.73)	**2.69** (2.39-2.94)	**2.85** (2.51-3.12)
60-min	**1.38** (1.26-1.51)	**1.63** (1.50-1.78)	**1.97** (1.81-2.15)	**2.29** (2.09-2.50)	**2.65** (2.41-2.89)	**2.95** (2.68-3.22)	**3.23** (2.92-3.52)	**3.51** (3.15-3.83)	**3.86** (3.43-4.22)	**4.16** (3.67-4.55)
2-hr	**1.61** (1.46-1.77)	**1.91** (1.75-2.10)	**2.34** (2.13-2.56)	**2.74** (2.49-3.01)	**3.22** (2.91-3.53)	**3.65** (3.27-3.99)	**4.05** (3.61-4.43)	**4.46** (3.96-4.88)	**5.00** (4.39-5.47)	**5.47** (4.76-6.00)
3-hr	**1.70** (1.55-1.89)	**2.03** (1.85-2.24)	**2.49** (2.26-2.74)	**2.94** (2.67-3.23)	**3.49** (3.15-3.83)	**3.98** (3.57-4.37)	**4.47** (3.97-4.90)	**4.97** (4.39-5.45)	**5.65** (4.93-6.19)	**6.27** (5.41-6.89)
6-hr	**2.05** (1.87-2.26)	**2.44** (2.23-2.68)	**2.99** (2.72-3.28)	**3.54** (3.22-3.88)	**4.22** (3.81-4.61)	**4.83** (4.34-5.28)	**5.44** (4.84-5.94)	**6.09** (5.36-6.63)	**6.96** (6.06-7.59)	**7.76** (6.66-8.48)
12-hr	**2.41** (2.21-2.66)	**2.87** (2.64-3.15)	**3.54** (3.24-3.88)	**4.21** (3.84-4.61)	**5.06** (4.59-5.52)	**5.83** (5.24-6.34)	**6.62** (5.89-7.19)	**7.46** (6.56-8.09)	**8.61** (7.46-9.35)	**9.69** (8.26-10.5)
24-hr	**2.86** (2.66-3.08)	**3.45** (3.22-3.72)	**4.34** (4.04-4.68)	**5.04** (4.68-5.42)	**6.00** (5.55-6.45)	**6.76** (6.24-7.27)	**7.54** (6.94-8.12)	**8.35** (7.66-9.00)	**9.47** (8.64-10.2)	**10.4** (9.40-11.2)
2-day	**3.32** (3.09-3.57)	**3.99** (3.72-4.30)	**4.98** (4.63-5.36)	**5.75** (5.35-6.19)	**6.81** (6.30-7.33)	**7.64** (7.06-8.23)	**8.50** (7.83-9.15)	**9.38** (8.61-10.1)	**10.6** (9.66-11.5)	**11.6** (10.5-12.5)
3-day	**3.52** (3.28-3.77)	**4.23** (3.95-4.53)	**5.24** (4.89-5.62)	**6.05** (5.63-6.48)	**7.14** (6.62-7.66)	**8.01** (7.41-8.59)	**8.90** (8.21-9.56)	**9.82** (9.02-10.6)	**11.1** (10.1-11.9)	**12.1** (11.0-13.0)
4-day	**3.72** (3.48-3.97)	**4.46** (4.17-4.77)	**5.51** (5.15-5.88)	**6.34** (5.91-6.77)	**7.47** (6.94-7.99)	**8.38** (7.76-8.96)	**9.31** (8.59-9.96)	**10.3** (9.44-11.0)	**11.6** (10.6-12.4)	**12.6** (11.5-13.6)
7-day	**4.31** (4.04-4.60)	**5.15** (4.82-5.49)	**6.28** (5.87-6.70)	**7.17** (6.70-7.65)	**8.40** (7.83-8.97)	**9.38** (8.72-10.0)	**10.4** (9.62-11.1)	**11.4** (10.5-12.2)	**12.8** (11.8-13.8)	**14.0** (12.7-15.0)
10-day	**4.91** (4.60-5.23)	**5.84** (5.48-6.22)	**7.03** (6.59-7.49)	**7.97** (7.45-8.48)	**9.23** (8.61-9.83)	**10.2** (9.52-10.9)	**11.2** (10.4-12.0)	**12.2** (11.3-13.1)	**13.6** (12.6-14.6)	**14.7** (13.5-15.8)
20-day	**6.58** (6.20-7.01)	**7.78** (7.32-8.28)	**9.21** (8.65-9.79)	**10.3** (9.70-11.0)	**11.9** (11.1-12.6)	**13.1** (12.2-13.9)	**14.3** (13.3-15.2)	**15.5** (14.4-16.5)	**17.2** (15.9-18.4)	**18.5** (17.0-19.8)
30-day	**8.18** (7.72-8.68)	**9.62** (9.07-10.2)	**11.2** (10.6-11.9)	**12.4** (11.7-13.2)	**14.1** (13.2-14.9)	**15.3** (14.3-16.3)	**16.5** (15.5-17.6)	**17.8** (16.6-19.0)	**19.4** (18.0-20.8)	**20.7** (19.2-22.1)
45-day	**10.4** (9.89-11.0)	**12.2** (11.6-12.9)	**14.0** (13.3-14.7)	**15.4** (14.6-16.2)	**17.2** (16.2-18.1)	**18.5** (17.5-19.5)	**19.8** (18.7-20.9)	**21.2** (19.9-22.4)	**22.9** (21.4-24.2)	**24.2** (22.6-25.6)
60-day	**12.5** (11.9-13.1)	**14.6** (13.9-15.3)	**16.5** (15.7-17.4)	**18.0** (17.1-18.9)	**19.9** (18.9-21.0)	**21.4** (20.2-22.5)	**22.8** (21.5-24.0)	**24.1** (22.7-25.5)	**25.9** (24.3-27.4)	**27.2** (25.5-28.8)

[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.

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PF graphical

NOAA Atlas 14, Volume 2, Version 3
Location name: Rolesville, North Carolina, USA*
Latitude: 35.9195°, Longitude: -78.4672°
Elevation: m/ft**
* source: ESRI Maps
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POINT PRECIPITATION FREQUENCY ESTIMATES

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PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.84 (4.43-5.29)	5.62 (5.15-6.14)	6.41 (5.87-7.00)	7.19 (6.58-7.85)	7.98 (7.27-8.70)	8.60 (7.80-9.37)	9.16 (8.26-9.97)	9.65 (8.65-10.5)	10.2 (9.06-11.1)	10.7 (9.42-11.7)
10-min	3.86 (3.54-4.22)	4.49 (4.12-4.91)	5.13 (4.70-5.60)	5.75 (5.26-6.27)	6.36 (5.79-6.93)	6.85 (6.21-7.47)	7.28 (6.56-7.93)	7.64 (6.85-8.35)	8.06 (7.16-8.81)	8.41 (7.41-9.20)
15-min	3.22 (2.95-3.52)	3.77 (3.45-4.12)	4.33 (3.96-4.72)	4.85 (4.44-5.29)	5.37 (4.89-5.86)	5.78 (5.24-6.30)	6.13 (5.53-6.68)	6.43 (5.76-7.02)	6.77 (6.01-7.39)	7.04 (6.20-7.70)
30-min	2.21 (2.02-2.41)	2.60 (2.38-2.84)	3.07 (2.82-3.35)	3.51 (3.21-3.83)	3.98 (3.62-4.34)	4.36 (3.95-4.75)	4.70 (4.23-5.12)	5.01 (4.49-5.46)	5.38 (4.78-5.88)	5.70 (5.02-6.23)
60-min	1.38 (1.26-1.51)	1.63 (1.50-1.78)	1.97 (1.81-2.15)	2.29 (2.09-2.50)	2.65 (2.41-2.89)	2.95 (2.68-3.22)	3.23 (2.92-3.52)	3.51 (3.15-3.83)	3.86 (3.43-4.22)	4.16 (3.67-4.55)
2-hr	0.804 (0.732-0.887)	0.957 (0.874-1.05)	1.17 (1.06-1.28)	1.37 (1.24-1.50)	1.61 (1.45-1.76)	1.82 (1.64-1.99)	2.02 (1.81-2.21)	2.23 (1.98-2.44)	2.50 (2.19-2.73)	2.74 (2.38-3.00)
3-hr	0.567 (0.516-0.629)	0.676 (0.617-0.746)	0.828 (0.754-0.913)	0.979 (0.888-1.08)	1.16 (1.05-1.28)	1.33 (1.19-1.46)	1.49 (1.32-1.63)	1.66 (1.46-1.82)	1.88 (1.64-2.06)	2.09 (1.80-2.29)
6-hr	0.342 (0.312-0.377)	0.407 (0.372-0.448)	0.499 (0.455-0.548)	0.591 (0.537-0.648)	0.704 (0.636-0.770)	0.806 (0.724-0.881)	0.909 (0.809-0.992)	1.02 (0.896-1.11)	1.16 (1.01-1.27)	1.30 (1.11-1.42)
12-hr	0.200 (0.183-0.220)	0.239 (0.219-0.262)	0.294 (0.269-0.322)	0.350 (0.319-0.383)	0.420 (0.381-0.458)	0.484 (0.435-0.526)	0.549 (0.489-0.597)	0.619 (0.545-0.672)	0.715 (0.619-0.776)	0.804 (0.686-0.873)
24-hr	0.119 (0.111-0.128)	0.144 (0.134-0.155)	0.181 (0.168-0.195)	0.210 (0.195-0.226)	0.250 (0.231-0.269)	0.282 (0.260-0.303)	0.314 (0.289-0.338)	0.348 (0.319-0.375)	0.395 (0.360-0.425)	0.431 (0.392-0.466)
2-day	0.069 (0.064-0.074)	0.083 (0.078-0.090)	0.104 (0.097-0.112)	0.120 (0.111-0.129)	0.142 (0.131-0.153)	0.159 (0.147-0.171)	0.177 (0.163-0.191)	0.195 (0.179-0.211)	0.221 (0.201-0.239)	0.241 (0.218-0.261)
3-day	0.049 (0.046-0.052)	0.059 (0.055-0.063)	0.073 (0.068-0.078)	0.084 (0.078-0.090)	0.099 (0.092-0.106)	0.111 (0.103-0.119)	0.124 (0.114-0.133)	0.136 (0.125-0.147)	0.154 (0.141-0.166)	0.168 (0.153-0.181)
4-day	0.039 (0.036-0.041)	0.046 (0.043-0.050)	0.057 (0.054-0.061)	0.066 (0.062-0.071)	0.078 (0.072-0.083)	0.087 (0.081-0.093)	0.097 (0.089-0.104)	0.107 (0.098-0.115)	0.121 (0.110-0.129)	0.131 (0.120-0.141)
7-day	0.026 (0.024-0.027)	0.031 (0.029-0.033)	0.037 (0.035-0.040)	0.043 (0.040-0.046)	0.050 (0.047-0.053)	0.056 (0.052-0.060)	0.062 (0.057-0.066)	0.068 (0.063-0.073)	0.076 (0.070-0.082)	0.083 (0.076-0.089)
10-day	0.020 (0.019-0.022)	0.024 (0.023-0.026)	0.029 (0.027-0.031)	0.033 (0.031-0.035)	0.038 (0.036-0.041)	0.043 (0.040-0.045)	0.047 (0.043-0.050)	0.051 (0.047-0.055)	0.057 (0.052-0.061)	0.061 (0.056-0.066)
20-day	0.014 (0.013-0.015)	0.016 (0.015-0.017)	0.019 (0.018-0.020)	0.022 (0.020-0.023)	0.025 (0.023-0.026)	0.027 (0.025-0.029)	0.030 (0.028-0.032)	0.032 (0.030-0.034)	0.036 (0.033-0.038)	0.039 (0.035-0.041)
30-day	0.011 (0.011-0.012)	0.013 (0.013-0.014)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.020 (0.018-0.021)	0.021 (0.020-0.023)	0.023 (0.021-0.024)	0.025 (0.023-0.026)	0.027 (0.025-0.029)	0.029 (0.027-0.031)
45-day	0.010 (0.009-0.010)	0.011 (0.011-0.012)	0.013 (0.012-0.014)	0.014 (0.013-0.015)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.019)	0.020 (0.018-0.021)	0.021 (0.020-0.022)	0.022 (0.021-0.024)
60-day	0.009 (0.008-0.009)	0.010 (0.010-0.011)	0.011 (0.011-0.012)	0.013 (0.012-0.013)	0.014 (0.013-0.015)	0.015 (0.014-0.016)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.019)	0.019 (0.018-0.020)

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

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

Please refer to NOAA Atlas 14 document for more information.

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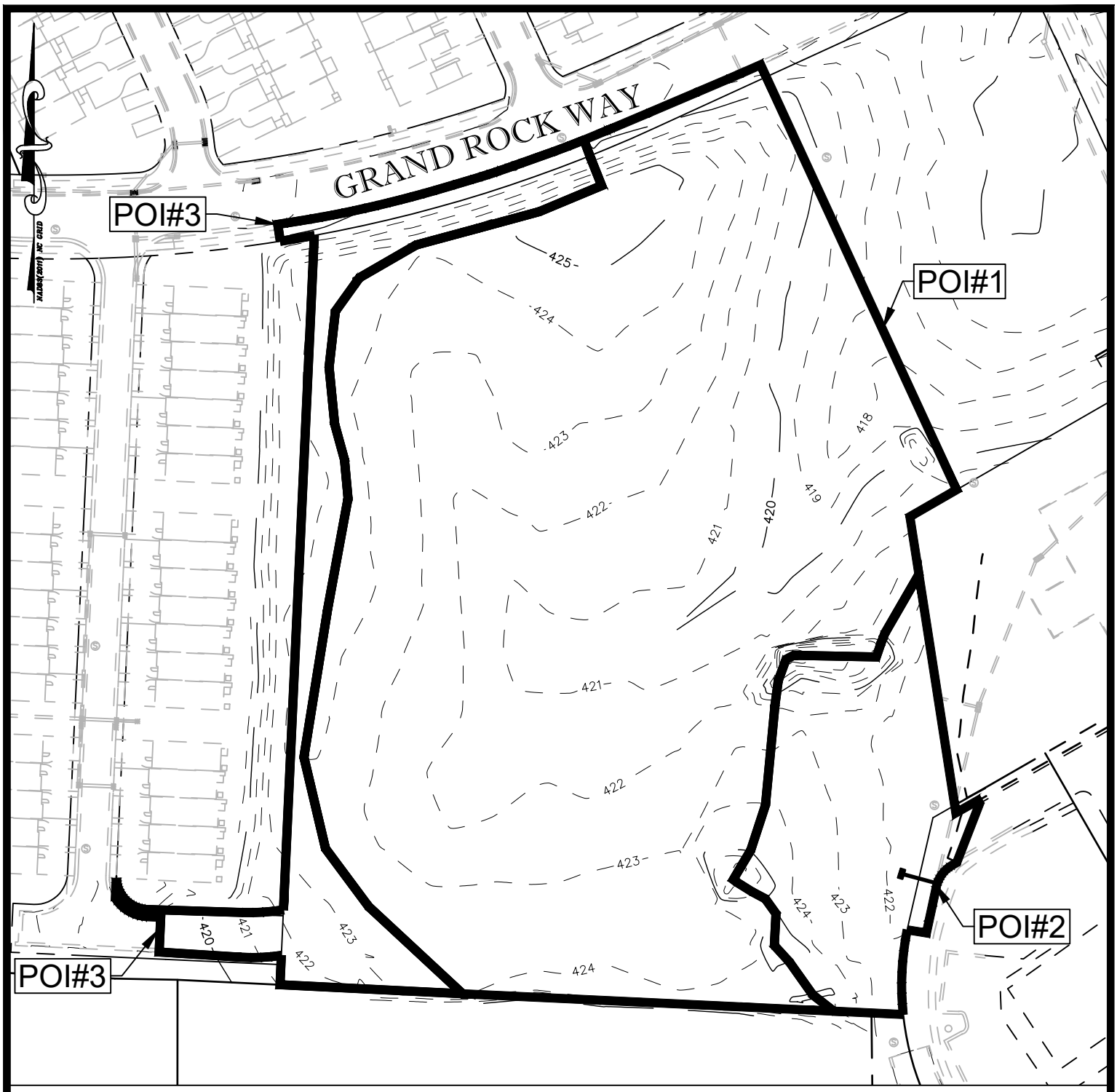
PF graphical

PRE-, POST-, AND INLET DRAINAGE AREA MAPS

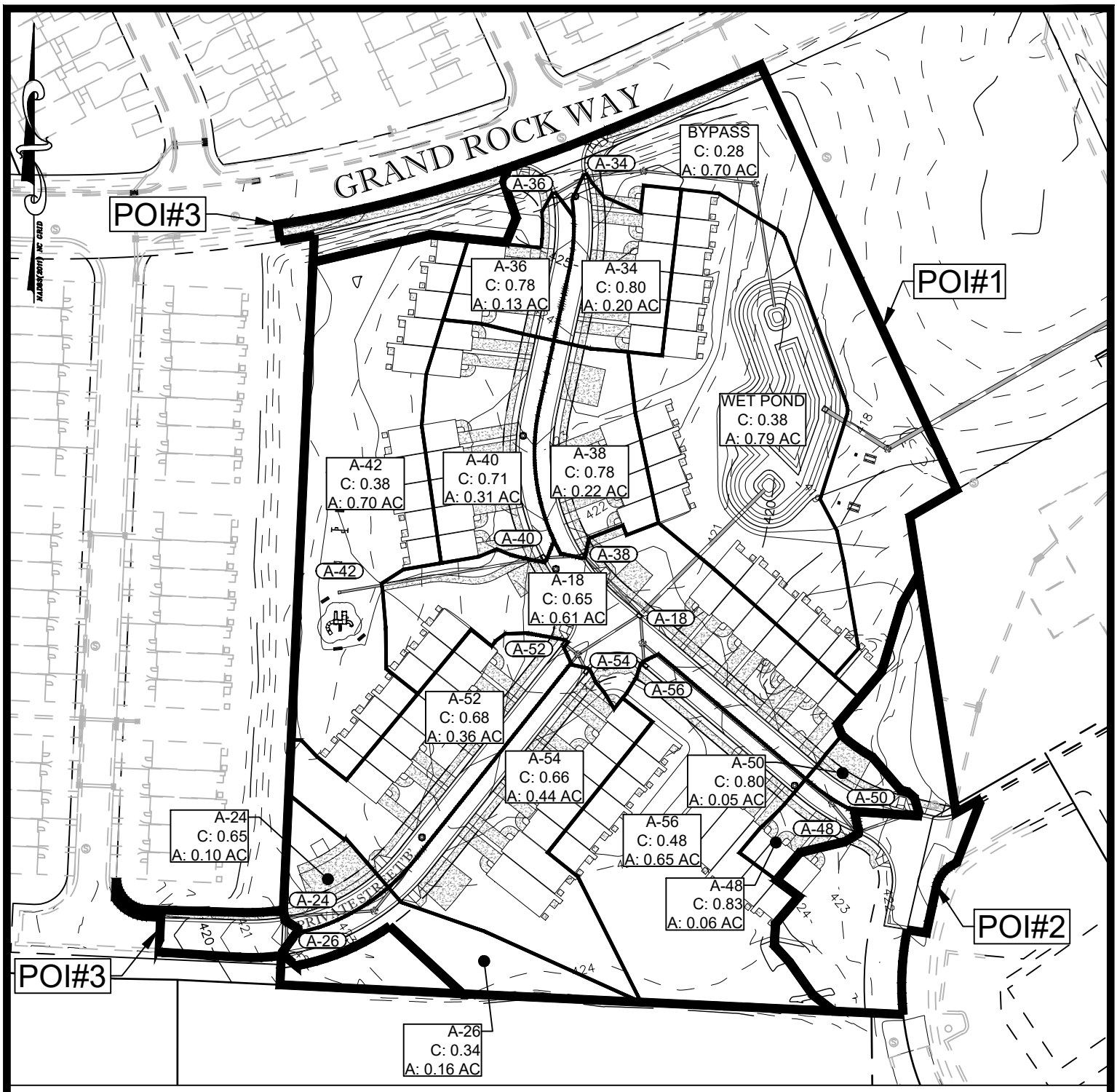


JAECO
Consulting Engineers and Land Surveyors
NC License F-0289
333 Wade Ave., Raleigh, N.C. 27605
Phone: (919) 828-4428
Fax: (919) 828-4711
E-mail: info@jaeco.com
www.jaeco.com

PRE-DEVELOPMENT DRAINAGE AREA MAP

A MASTER TEAM

SCALE:	1" = 100'
DRAWN BY:	TT
CHECKED BY:	JAE, Jr.
DATE ISSUED:	06/22/2020



LEGEND

INLET DRAINAGE AREA

POI DRAINAGE AREA

100 50 25 0 100

1" = 100'

JAECO
Consulting Engineers and Land Surveyors
NC License F-0289
333 Wade Ave., Raleigh, N.C. 27605
Phone: (919) 828-4428
Fax: (919) 828-4711
E-mail: info@jaeco.com
www.jaeco.com

POST-DEVELOPMENT DRAINAGE AREA MAP

A MASTER TEAM

SCALE:	1" = 100'
DRAWN BY:	TT
CHECKED BY:	JAE, Jr.
DATE ISSUED:	06/22/2020

STORMWATER FACILITY DESIGN

JAECO
Consulting Engineers
NC License F-0289
333 Wade Ave., Raleigh, N.C. 27605
Phone: (919) 828-4428
Fax: (919) 828-4711
E-mail: info@jaeco.com

Project Name: A Master Team Townhomes
JAECO Project #: 362-09
Designed by: TT Date: 20/06/22
Checked by: JAE, Jr. Date: 20/06/22

Wet Detention Pond Water Quality Calculations

Design Resource: NCDENR - Stormwater Design Manual

Site Information

Sub Area Location:	BMP		
Drainage Area (DA) =	4.78	ac	
Impervious Area (IA) =	2.28	ac	
Percent Impervious (I) =	47.7	%	

Average Permanent Pool Depth (d_{av}):

d_{av} (Option 1) =	1.94	ft	$d_{av} = V_{PP} / A_{PP}$
d_{av} (Option 2) =	2.41	ft	$d_{av} = (V_{PP} - V_{shelf}) / A_{shelf\ bottom}$
	215.25	cf	$V_{shelf} = 0.5 * Depth_{max\ over\ shelf} * Perimeter_{PP} * Width_{submerged\ shelf}$
	0.5	ft	$Depth_{max\ over\ shelf}$
	287	ft	$Perimeter_{PP}$
	3	ft	$Width_{submerged\ shelf}$

Required Surface Area:

SA/DA for dav = 3 and 40% Impervious =	1.51		(Taken from C-3 Table 1)
SA/DA for dav = 3 and 50% Impervious =	1.79		(Taken from C-3 Table 1)
Surface Area to DA Ratio (SA/DA) =	1.73		
Required Surface Area at Perm. Pool =	3,593	sf	

Required Storage Volume (Water Quality):

Design Storm =	1.0	in	
Determine Rv Value =	0.05 + .009 (I) =	0.48	in/in
Design Storm Storage Volume =	8,316	cf	
Storage Volume Required =	8,316	cf	

Summary of Proposed BMP

Bottom of Pond Elevation =	411.50	ft	
Sediment Cleanout Elevation =	412.00	ft	
Permanent Pool Elevation =	416.00	ft	
Temporary Pool Elevation =	417.34	ft	
Top of Berm Elevation =	419.00	ft	
Surface Area at Permanent Pool =	3,603	sf	(Required Surface Area = 3593 sf)
Forebay Volume (FV) =	1,615	cf	23.1%
Permanent Pool Volume (PPV) =	6,986	cf	
Temporary Pool Volume (TPV) =	8,316	cf	(Required Volume = 8316 cf)
Total Storage Volume (TSV) =	22,059	cf	
Total Pond Volume (PV=PPV+TSV) =	29,044	cf	

Wet Detention Basin
PROPOSED WATER QUALITY VOLUMES

Water Quality Volume Required =	**8,316**

POND					
Elevation	Contour Area	Incremental Volume	Accumulated Volume, S	Stage, Z	
	sq ft	cu ft	cu ft	ft	
412.50	886	0	0	0.00	(Bottom of Pond)
413.00	1,158	511	511	0.50	
414.00	1,761	1,460	1,971	1.50	
415.00	2,440	2,101	4,071	2.50	
415.50	2,808	1,312	5,383	3.00	(Bottom of Shelf)
416.00	**3,603**	**1,603**	**6,986**	**3.50**	**(Permanent Pool Elevation)**
416.00	3,603	0	0	0.00	(Top of Shelf)
416.50	6,308	2,478	2,478	0.50	
417.00	6,901	3,302	5,780	1.00	
417.34	7,314	2,399	**8,316**	1.34	**(Water quality elevation)**
418.00	8,126	7,514	13,294	2.00	
419.00	9,404	8,765	22,059	3.00	
419.50	10,063	4,867	26,925	3.50	(Berm Elevation)

FOREBAY (A-16)				
Elevation	Contour Area	Incremental Volume	Accumulated Volume, S	Stage, Z
	sq ft	cu ft	cu ft	ft
413.00	49	0	0	0.00
413.50	98	37	37	0.50
414.00	161	65	102	1.00
415.00	330	246	347	2.00
415.50	555	221	568	2.50
416.00	838	348	917	3.00

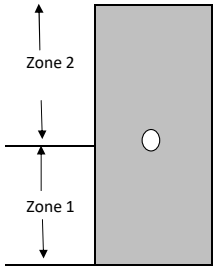
FOREBAY (A-28)				
Elevation	Contour Area	Incremental Volume	Accumulated Volume, S	Stage, Z
	sq ft	cu ft	cu ft	ft
413.00	32	0	0	0.00
413.50	74	27	27	0.50
414.00	129	51	77	1.00
415.00	283	206	283	2.00
415.50	380	166	449	2.50
416.00	619	250	699	3.00

Wet Detention Basin
INCREMENTAL DRAWDOWN METHOD

Design Resource: NCDENR - Stormwater Design Manual

Water Quality Orifice

Incremental Determination of Water Quality Volume Drawdown Time



$Q_2 = C_D * A * (2gH_0)^{(1/2)}$

$Q_1 = 0$

Orifice Diameter (D) =	1.500 in		
Cd =	0.6		
Area =	0.01227 sf		
Ei =	416.00	Orifice Inv.	
Zone 1 Range =	411.50	to	416.0625
Zone 2 Range =	416.0625	to	417.34

	Incremental Drawdown Method						
	Countour	Contour Area	Incremental Volume	Stage, Z	Zone	Q	Drawdown Time
		sq ft	cu ft	ft		cfs	min
(Permanent Pool Elevation)	**416.000**	**3,603**	0	0.00	1	0.0000	--
	416.050	3,874	187	0.05	1	0.0000	--
(Orifice Centroid Elevation)	416.063	3,941	49	0.06	1	0.0000	--
	416.10	4,144	152	0.10	2	0.0114	221
	416.15	4,415	214	0.15	2	0.0175	204
	416.20	4,685	227	0.20	2	0.0219	173
	416.25	4,956	241	0.25	2	0.0256	157
	416.30	5,226	255	0.30	2	0.0288	147
	416.35	5,497	268	0.35	2	0.0317	141
	416.40	5,767	282	0.40	2	0.0343	137
	416.45	6,038	295	0.45	2	0.0368	134
	416.50	**6,308**	309	0.50	2	0.0391	132
	416.55	6,367	317	0.55	2	0.0413	128
	416.60	6,427	320	0.60	2	0.0433	123
	416.65	6,486	323	0.65	2	0.0453	119
	416.70	6,545	326	0.70	2	0.0472	115
	416.75	6,605	329	0.75	2	0.0490	112
	416.80	6,664	332	0.80	2	0.0507	109
	416.85	6,723	335	0.85	2	0.0524	106
	416.90	6,782	338	0.90	2	0.0541	104
	416.95	6,842	341	0.95	2	0.0557	102
	417.00	**6,901**	344	1.00	2	0.0572	100
	417.05	6,962	347	1.05	2	0.0587	98
	417.10	7,024	350	1.10	2	0.0602	97
	417.15	7,085	353	1.15	2	0.0616	95
	417.20	7,146	356	1.20	2	0.0630	94
	417.25	7,207	359	1.25	2	0.0644	93
	417.30	7,269	362	1.30	2	0.0657	92
(Water Quality Elevation)	**417.34**	**7,314**	411	1.34	2	0.0667	103
	418.00	**8,126**	-	2.00	-	0.0000	--
	TOTALS	**--**	**8,316**	**--**	**--**	**--**	**3,235**

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

Summary

Total Volume =	**8,316 cf**
Total Time =	**3,235 min**
Total Time =	**2.25 days***

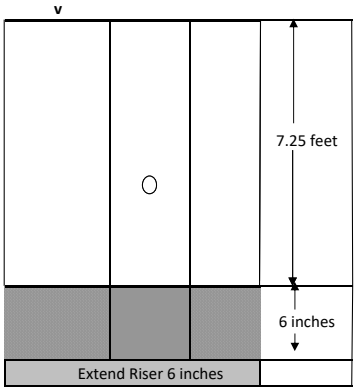
*Drawdown time calculated based on minimum required treatment volume and corresponding elevation

Wet Detention Basin
ANTI-FLOTATION DEVICE SIZING

Project Information

Project Name: A Master Team Townhomes
Project #: 362-09
Designed by: TT Date: 20/06/22
Revised by: Date:
Checked by: Date:

Anti-Flotation Device



Riser Width =	4	ft
Riser Length (L) =	4	ft
Wall Thickness (WT) =	6	in
Top Riser Elev. (Top) =	418.50	ft
Bottom Riser Elev. (Bot) =	411.25	ft
Height of Riser (H) =	7.25	ft = Top - Bot
Area of Riser (A) =	25.0	sf (Water Displaced) = (Width+WT*2) * (L+WT*2)
Volume of Riser (V) =	181.3	cf (Water Displaced) = A * H
Volume of Riser Wall (V_{rw}) =	65.3	cf = [(Width*WT/12*2)*(L*WT/12*2)-(Width*L)]*H
Factor of Safety (SF) =	1.10	
Weight (W) =	11310.0	lbs = V*62.4
Weight Req'd from Anti-Flotation Device (W_{req}) =	12441.0	lbs = W*SF
*Weight of Riser (W_R) =	11662.5	lbs (V_{rw} * Buoyant Wt. + Weight of 6" Base)
Additional Volume of Concrete Req'd (V_{req}) =	5.2	cf = (W_{req}-W_R)/150
Extend Riser (RE) =	6.00	in
Volume of Riser Extension (V_{RE})=	12.5	cf = [(Width*WT/12*2)*(L*WT/12*2)]*RE/12
Volume of Anti-flotation 6'x6' Concrete Slab (V_{cs})=	0.0	cf = $Length_{cs}$*$Width_{cs}$*$Depth_{cs}$
Volume Provided (V_{tot})=	12.5	cf = V_{RE}+V_{cs}
Is the Anti-flotation Device Sufficient (yes/no)?	Yes	12.5 > 5.2

*Assume buoyant weight of concrete = (150-62.4) pcf

Permit No._____
(to be provided by DWQ)

STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM

WET DETENTION BASIN SUPPLEMENT

This form must be filled out, printed and submitted.
The Required Items Checklist (Part III) must be printed, filled out and submitted along with all of the required information.

I. PROJECT INFORMATION

Project name	A Master Team Townhomes
Contact person	Johnny Edwards, P.E.
Phone number	(919) 828-4428
Date	06/22/2020
Drainage area number	BMP

II. DESIGN INFORMATION

Site Characteristics

Drainage area	208,217	ft^2	
Impervious area, post-development	99,317	ft^2	
% impervious	47.70	%	
Design rainfall depth	1.0	in	

Storage Volume: Non-SA Waters

Minimum volume required	8,316	ft^3	
Volume provided	8,316	ft^3	OK, volume provided is equal to or in excess of volume required.

Storage Volume: SA Waters

1.5" runoff volume		ft^3	
Pre-development 1-yr, 24-hr runoff		ft^3	
Post-development 1-yr, 24-hr runoff		ft^3	
Minimum volume required		ft^3	
Volume provided		ft^3	

Peak Flow Calculations

Is the pre/post control of the 1yr 24hr storm peak flow required?	y	(Y or N)	
1-yr, 24-hr rainfall depth	2.9	in	
Rational C, pre-development		(unitless)	
Rational C, post-development		(unitless)	
Rainfall intensity: 1-yr, 24-hr storm		in/hr	
Pre-development 1-yr, 24-hr peak flow	5.63	ft^3/sec	
Post-development 1-yr, 24-hr peak flow	2.95	ft^3/sec	
Pre/Post 1-yr, 24-hr peak flow control	-2.67	ft^3/sec	

Elevations

Temporary pool elevation	417.34	fmsl	
Permanent pool elevation	416.00	fmsl	
SHWT elevation (approx. at the perm. pool elevation)		fmsl	
Top of 10ft vegetated shelf elevation	416.50	fmsl	
Bottom of 10ft vegetated shelf elevation	415.50	fmsl	
Sediment cleanout, top elevation (bottom of pond)	412.00	fmsl	
Sediment cleanout, bottom elevation	411.50	fmsl	
Sediment storage provided	0.50	ft	Insufficient sediment storage provided
Is there additional volume stored above the state-required temp. pool?	y	(Y or N)	
Elevation of the top of the additional volume	419.5	fmsl	Insufficient. Must equal the temp. pool elev. previously entered.

Permit No._____
(to be provided by DWQ)

II. DESIGN INFORMATION

Surface Areas			
Area, temporary pool	7,314	ft^2	
Area REQUIRED, permanent pool	3,602	ft^2	
SA/DA ratio	1.73	(unitless)	
Area PROVIDED, permanent pool, A_{perm_pool}	3,603	ft^2	OK
Area, bottom of 10ft vegetated shelf, A_{bot_shelf}	2,808	ft^2	
Area, sediment cleanout, top elevation (bottom of pond), A_{bot_pond}	1,158	ft^2	
Volumes			
Volume, temporary pool	8,316	ft^3	OK
Volume, permanent pool, V_{perm_pool}	6,986	ft^3	
Volume, forebay (sum of forebays if more than one forebay)	1,615	ft^3	
Forebay % of permanent pool volume	23.1%	%	Insufficient forebay volume.
SA/DA Table Data			
Design TSS removal	90	%	
Coastal SA/DA Table Used?	n	(Y or N)	
Mountain/Piedmont SA/DA Table Used?	y	(Y or N)	
SA/DA ratio	1.73	(unitless)	
Average depth (used in SA/DA table):			
Calculation option 1 used? (See Figure 10-2b)	n	(Y or N)	
Volume, permanent pool, V_{perm_pool}	6,986	ft^3	
Area provided, permanent pool, A_{perm_pool}	3,603	ft^2	
Average depth calculated		ft	Need 3 ft min.
Average depth used in SA/DA, d_{av}, (Round to nearest 0.5ft)		ft	
Calculation option 2 used? (See Figure 10-2b)	y	(Y or N)	
Area provided, permanent pool, A_{perm_pool}	3,603	ft^2	
Area, bottom of 10ft vegetated shelf, A_{bot_shelf}	2,808	ft^2	
Area, sediment cleanout, top elevation (bottom of pond), A_{bot_pond}	1,158	ft^2	
"Depth" (distance b/w bottom of 10ft shelf and top of sediment)	3.50	ft	
Average depth calculated	2.41	ft	Need 3 ft min.
Average depth used in SA/DA, d_{av}, (Round to down to nearest 0.5ft)	3.0	ft	Insufficient. Check calculation.
Drawdown Calculations			
Drawdown through orifice?	y	(Y or N)	
Diameter of orifice (if circular)	1.50	in	
Area of orifice (if-non-circular)		in^2	
Coefficient of discharge (C_D)	0.60	(unitless)	
Driving head (H_o)	1.34	ft	
Drawdown through weir?	n	(Y or N)	
Weir type		(unitless)	
Coefficient of discharge (C_w)		(unitless)	
Length of weir (L)		ft	
Driving head (H)		ft	
Pre-development 1-yr, 24-hr peak flow	5.63	ft^3/sec	
Post-development 1-yr, 24-hr peak flow	2.95	ft^3/sec	
Storage volume discharge rate (through discharge orifice or weir)	0.07	ft^3/sec	
Storage volume drawdown time	2.25	days	OK, draws down in 2-5 days.
Additional Information			
Vegetated side slopes	3	:1	OK
Vegetated shelf slope	6	:1	Insufficient shelf slope.
Vegetated shelf width	6.0	ft	Insufficient shelf length.
Length of flowpath to width ratio		:1	
Length to width ratio		:1	
Trash rack for overflow & orifice?	y	(Y or N)	OK
Freeboard provided	1.0	ft	OK
Vegetated filter provided?	n	(Y or N)	OK
Recorded drainage easement provided?	y	(Y or N)	OK
Capures all runoff at ultimate build-out?	n	(Y or N)	Required to capture all runoff from the ultimate build-out
Drain mechanism for maintenance or emergencies is:	facility detains 100-yr storm. Greater events discharge overland away from development.		

Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Pond No. 3 - Wet Pond

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 416.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	416.00	3,606	0	0
0.50	416.50	6,308	2,479	2,479
1.00	417.00	6,901	3,302	5,781
1.34	417.34	7,314	2,417	8,197
2.00	418.00	8,126	5,095	13,293
3.00	419.00	9,404	8,765	22,058
3.50	419.50	10,063	4,867	26,924

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	1.50	3.00	0.00
Span (in)	= 24.00	1.50	36.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 411.50	416.00	417.50	0.00
Length (ft)	= 53.00	0.10	0.10	0.00
Slope (%)	= 0.57	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)	= 25.00	0.00	0.00	0.00
Crest El. (ft)	= 418.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= Yes	No	No	No

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

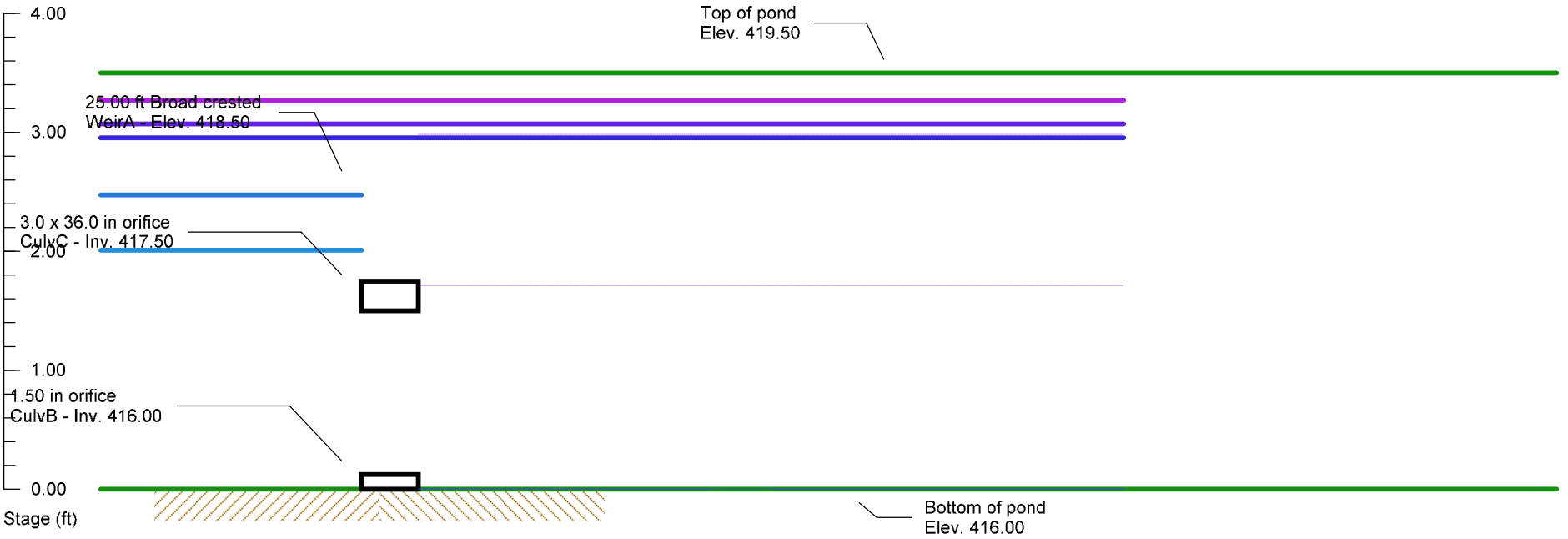
TW Elev. (ft) = 0.00

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

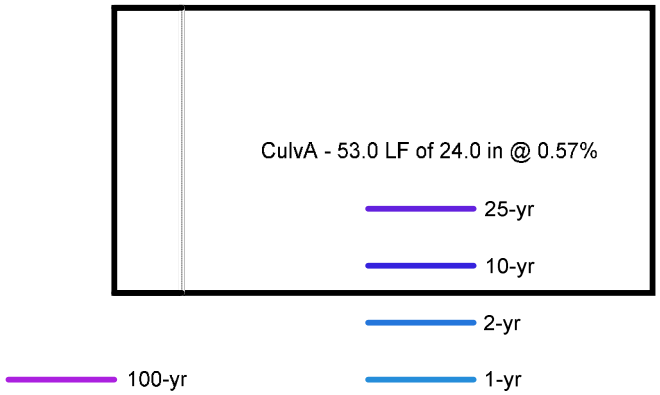
Stage / Storage / Discharge Table

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	416.00	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.50	2,479	416.50	28.30 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.039
1.00	5,781	417.00	28.30 ic	0.06 ic	0.00	---	0.00	---	---	---	---	---	0.057
1.34	8,197	417.34	28.30 ic	0.07 ic	0.00	---	0.00	---	---	---	---	---	0.067
2.00	13,293	418.00	28.30 ic	0.08 ic	2.21 ic	---	0.00	---	---	---	---	---	2.294
3.00	22,058	419.00	28.30 ic	0.10 ic	4.23 ic	---	22.98	---	---	---	---	---	27.32
3.50	26,924	419.50	39.52 ic	0.02 ic	1.50 ic	---	37.99 s	---	---	---	---	---	39.51

Pond No. 3 - Wet Pond



Section
NTS



Inflow hydrograph = 2. SCS Runoff - BMP

WAKE COUNTY MUNICIPAL STORMWATER TOOL

WAKE COUNTY
NORTH CAROLINA

SITE DATA

Project Information	
Project Name:	**A Master Team Townhomes**
Applicant:	John A Edwards and Company
Applicant Contact Name:	Johnny Edwards
Applicant Contact Number:	919-828-4428
Contact Email:	johnny@jaeco.com
Municipal Jurisdiction (Select from dropdown menu):	Rolesville
Last Updated:	Thursday, June 18, 2020
Site Data:	
Total Site Area (Ac):	5.96
Existing Lake/Pond Area (Ac):	0.00
Proposed Disturbed Area (Ac):	6.00
Impervious Surface Area (acre):	2.55
Type of Development (Select from Dropdown menu):	Non-Residential
Percent Built Upon Area (BUA):	43%
Project Density:	High
Is the proposed project a site expansion?	No
Number of Drainage Areas on Site:	3
NOAA — **1-Year, 24-Hour Storm (inches) (See NOAA Website):**	2.86
2-Year, 24-Hour Storm (inches) (See NOAA Website):	3.45
10-Year, 24-Hour Storm (inches) (See NOAA Website):	5.04
Lot Data (if applicable):	
Total Acreage in Lots:	
Number of Lots:	
Average Lot Size (SF):	
Total Impervious Surface Area on Lots (SF):	
Average Impervious Surface Area Per Lot (SF):	

Stormwater Narrative (limit to 1,200 characters - attach additional pages with submittal if necessary):

SEE ATTACHED REPORT

Project Name: A Master Team Townhomes

DRAINAGE AREA 1
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	4.87				5.48			
Site Acreage within Drainage=	4.83				5.44			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.45							
Ten-year, 24-hour storm (in)=	5.04							
Total Lake/Pond Area (Acres)=	0.00				0.00			
Lake/Pond Area not in the Tc flow path (Acres)=	0.00				0.00			
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition			4.54					
Woods, Good Condition								
Open Space, Poor Condition								
Open Space, Fair condition			0.29				3.12	
Open Space, Good Condition								
Reforestation (in dedicated OS)								
Connected Impervious								
Disconnected Impervious							2.32	
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft^2)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

Project Name: A Master Team Townhomes

DRAINAGE AREA 1
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.10	0.10
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	73	87
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =	2.32	
$CN_{adjusted\ (1\text{-}year)}$=	**87**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	9,228	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	0.79	1.62
Volume of runoff (ft^3) =	13,846	32,075
Volume change (ft^3) =	18,229	
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	5.625	14.047
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	1.17	2.15
Volume of runoff (ft^3) =	20,467	42,361
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	8.315	18.552
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	2.34	3.61
Volume of runoff (ft^3) =	41,064	63,366
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	16.683	31.255

Project Name: A Master Team Townhomes

DRAINAGE AREA 2
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	0.71				0.46			
Site Acreage within Drainage=	0.67				0.42			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.45							
Ten-year, 24-hour storm (in)=	5.04							
Total Lake/Pond Area (Acres)=	0.00				0.00			
Lake/Pond Area not in the Tc flow path (Acres)=	0.00				0.00			
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition			0.06					
Woods, Good Condition								
Open Space, Poor Condition								
Open Space, Fair condition			0.61				0.29	
Open Space, Good Condition								
Reforestation (in dedicated OS)								
Connected Impervious								
Disconnected Impervious			0.00				0.13	
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft^2)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

Project Name: A Master Team Townhomes

DRAINAGE AREA 2
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.10	0.10
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	78	85
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =	0.13	
$CN_{adjusted\ (1\text{-}year)}$=	**85**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	553	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	1.06	1.46
Volume of runoff (ft^3) =	2,569	2,228
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	1.183	1.061
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	1.49	1.96
Volume of runoff (ft^3) =	3,625	2,991
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	1.670	1.424
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	2.79	3.39
Volume of runoff (ft^3) =	6,779	8,248
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	3.123	2.462

Project Name: A Master Team Townhomes

DRAINAGE AREA 3
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	0.62				0.26			
Site Acreage within Drainage=	0.49				0.15			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.45							
Ten-year, 24-hour storm (in)=	5.04							
Total Lake/Pond Area (Acres)=	0.00				0.00			
Lake/Pond Area not in the Tc flow path (Acres)=	0.00				0.00			
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition			0.33					
Woods, Good Condition								
Open Space, Poor Condition								
Open Space, Fair condition			0.16				0.15	
Open Space, Good Condition								
Reforestation (in dedicated OS)								
Connected Impervious								
Disconnected Impervious							0.00	
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft^2)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

Project Name: A Master Team Townhomes

DRAINAGE AREA 3
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.10	0.10
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	75	79
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**79**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	47	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	0.87	1.09
Volume of runoff (ft^3) =	1,545	592
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	0.788	0.446
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	1.26	1.53
Volume of runoff (ft^3) =	2,248	832
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	1.146	0.627
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	2.48	2.84
Volume of runoff (ft^3) =	4,408	5,045
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	2.247	1.164

Project Name: A Master Team Townhomes

DA SITE SUMMARY
STORMWATER PRE-POST CALCULATIONS

SITE SUMMARY

DRAINAGE AREA SUMMARIES

DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development (1-year, 24-hour storm)										
Runoff (in) = $Q_{pre,1\text{-}year}$ =	0.79	1.06	0.87							
Peak Flow (cfs)=$Q_{1\text{-}year}$ =	5.625	1.183	0.788							
Post-Development (1-year, 24-hour storm)										
Proposed Impervious Surface (acre) =	2.32	0.13	0.00							
Runoff (in)=$Q_{1\text{-}year}$ =	1.62	1.46	1.09							
Peak Flow (cfs)=$Q_{1\text{-}year}$ =	14.047	1.061	0.446							
Increase in volume per DA (ft^3)_1-yr storm=	18,229									
Minimum Volume to be Managed for DA HIGH DENSITY REQUIREMENT = (ft^3) =	9,228	553	47							

TARGET CURVE NUMBER (TCN)

Site Data

SITE \SOIL COMPOSITION

HYDROLOGIC SOIL GROUP	Site Area	%	Target CN
A	0.00	0%	N/A
B	0.00	0%	N/A
C	6.01	100%	N/A
D	0.00	0%	N/A

Total Site Area (acres) =	6.01
Percent BUA (Includes Existing Lakes/Pond Areas) =	41%
Project Density =	High
Target Curve Number (TCN) =	N/A
$CN_{adjusted\ (1\text{-}year)}$=	87
Minimum Volume to be Managed (Total Site) Per TCN Requirement= ft^3 =	N/A

Site Nitrogen Loading Data

HSG	TN export coefficient (lbs/ac/yr)	Site Acreage	N Export
Pasture	1.2	0.00	0.00
Woods, Poor Condition	1.6	0.00	0.00
Woods, Fair Condition	1.2	0.00	0.00
Woods, Good Condition	0.8	0.00	0.00
Open Space, Poor Condition	1.0	0.00	0.00
Open Space, Fair Condition	0.8	3.56	2.85
Open Space, Good Condition	0.6	0.00	0.00
Reforestation (in dedicated OS)	0.6	0.00	0.00
Impervious	21.2	2.45	51.94

SITE NITROGEN LOADING RATE (lbs/ac/yr)=	9.12
Nitrogen Load (lbs/yr)=	54.79
TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)_Wendell Only=	33.15

Site Nitrogen Loading Data For Expansions Only

	Existing	New
Impervious(acres)=	NA	NA
"Expansion Area" (acres=)		
Nitrogen Load (lbs/yr)=	NA	NA
SITE NITROGEN LOADING RATE (lbs/ac/yr)=	NA	NA
Total Site loading rate (lbs/ac/yr)		
TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)=	NA	

WAKE COUNTY
NORTH CAROLINA

Project Name: A Master Team Townhomes

DRAINAGE AREA 1
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA1 Site Acreage=	5.44			
DA1 Off-Site Acreage=	0.04			
Total Required Storage Volume for Site TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA1 1" Rainfall for High Density (ft^3)=	9,228			
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=		Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA1(a) (Ac)		Sub-DA1(b) (Ac)		Sub-DA1(c) (Ac)		Sub-DA1(d) (Ac)		Sub-DA1(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition										
Open Space, Poor Condition										
Open Space, Fair Condition	2.50	0.00	0.62	0.01						
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious	2.28	0.00	0.04	0.03						

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
	Wet Detention Basin	7,365	8,316	25%	50.34	12.58	53.9
				0%	37.75	0.00	
				0%	37.75	0.00	
				0%	37.75	0.00	
				0%	37.75	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**37.75**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
		156		0%	1.99	0.00	
				0%	1.99	0.00	
				0%	1.99	0.00	
				0%	1.99	0.00	
				0%	1.99	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**1.99**					

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

WAKE COUNTY
NORTH CAROLINA

Project Name: A Master Team Townhomes

DRAINAGE AREA 1
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							
Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA1 BMP SUMMARY	
Total Volume Treated (ft^3)=	8,316
Nitrogen Mitigated(lbs)=	12.58
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-}year)}$=	23,759
Post BMP Runoff (inches) = $Q^*_{(1\text{-}year)}$=	1.20
Post BMP $CN_{(1\text{-}year)}$=	80
Post BMP Peak Discharge (cfs)= $Q_{1\text{-}year}$=	2.951
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-}year)}$=	34,045
Post BMP Runoff (inches) = $Q^*_{(2\text{-}year)}$=	1.72
Post BMP $CN_{(2\text{-}year)}$=	81
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-}year)}$=	4.668
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-}year)}$=	55,050
Post BMP Runoff (inches) = $Q^*_{(10\text{-}year)}$=	2.79
Post BMP $CN_{(10\text{-}year)}$=	94
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-}year)}$=	27.130

Project Name: A Master Team Townhomes

DRAINAGE AREA 2
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA2 Site Acreage=	0.42			
DA2 Off-Site Acreage=	0.04			
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA2 1" Rainfall for High Density (ft3)=	553			
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=		Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA2(a) (Ac)		Sub-DA2(b) (Ac)		Sub-DA2(c) (Ac)		Sub-DA2(d) (Ac)		Sub-DA2(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition										
Open Space, Poor Condition										
Open Space, Fair Condition	0.29	0.03								
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious	0.13	0.01								

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
		541		0%	3.22	0.00	
				0%	3.22	0.00	
				0%	3.22	0.00	
				0%	3.22	0.00	
				0%	3.22	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**3.22**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Project Name: A Master Team Townhomes

DRAINAGE AREA 2
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA2 BMP SUMMARY	
Total Volume Treated (ft^3)=	
Nitrogen Mitigated(lbs)=	
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	2,228
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	1.46
Post BMP $CN_{(1\text{-year})}$=	84
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	1.140
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	2,991
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	1.96
Post BMP $CN_{(2\text{-year})}$=	84
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	1.520
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	8,248
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	5.41
Post BMP $CN_{(10\text{-year})}$=	98
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	2.569

Project Name: A Master Team Townhomes

DRAINAGE AREA 3
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA3 Site Acreage=	0.15			
DA3 Off-Site Acreage=	0.11			
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA3 1" Rainfall for High Density (ft3)=	47			
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=		Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA3(a) (Ac)		Sub-DA3(b) (Ac)		Sub-DA3(c) (Ac)		Sub-DA3(d) (Ac)		Sub-DA3(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition										
Open Space, Poor Condition										
Open Space, Fair Condition	0.15	0.02								
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious	0.00	0.09								

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
		341		0%	2.04	0.00	
				0%	2.04	0.00	
				0%	2.04	0.00	
				0%	2.04	0.00	
				0%	2.04	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**2.04**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Project Name: A Master Team Townhomes

DRAINAGE AREA 3
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA3 BMP SUMMARY	
Total Volume Treated (ft^3)=	
Nitrogen Mitigated(lbs)=	
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	592
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	1.09
Post BMP $CN_{(1\text{-year})}$=	79
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	0.674
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	832
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	1.53
Post BMP $CN_{(2\text{-year})}$=	79
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	0.891
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	5,045
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	9.26
Post BMP $CN_{(10\text{-year})}$=	98
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	1.486

Project Name: A Master Team Townhomes

DA SITE SUMMARY
BMP CALCULATIONS

BMP SUMMARY										
DRAINAGE AREA SUMMARIES										
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development (1-year, 24-hour storm)										
Runoff (in)=$Q^*_{1\text{-year}}$ =	0.79	1.06	0.87							
Peak Flow (cfs)=$Q_{1\text{-year}}$ =	5.625	1.183	0.788							
Post-Development (1-year, 24-hour storm)										
Target Curve Number (TCN) =	NA									
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	1.20	1.46	1.09							
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	2.951	1.140	0.674							
Post BMP $CN_{(1\text{-year})}$=	80									
Post-BMP Nitrogen Loading										
TOTAL SITE NITROGEN MITIGATED (lbs)=	12.58									
SITE NITROGEN LOADING RATE (lbs/ac/yr)=	7.02									
TOTAL SITE NITROGEN LEFT TO MITIGATE_Wendell Only (lbs)=	**20.57**									

FLOW SUMMARY AND HYDROGRAPHS

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	
1	SCS Runoff	------	1.434	1.968	-------	-------	3.526	4.491	-------	6.047	Bypass
2	SCS Runoff	------	13.52	17.57	-------	-------	28.54	35.14	-------	45.65	BMP
3	Reservoir	2	2.321	3.419	-------	-------	24.28	32.35	-------	38.30	Wet Pond
4	Combine	1, 3	2.951	4.668	-------	-------	27.13	36.79	-------	48.89	DA-1
5	SCS Runoff	------	1.140	1.520	-------	-------	2.569	3.207	-------	4.227	DA-2
6	SCS Runoff	------	0.674	0.891	-------	-------	1.486	1.847	-------	2.422	DA-3
7	Mod. Rational	------	4.095	4.833	-------	-------	5.639	6.434	-------	7.595	Rational
8	Reservoir	7	1.623	2.257	-------	-------	3.352	5.745	-------	7.588	Rational

Hydrograph Report

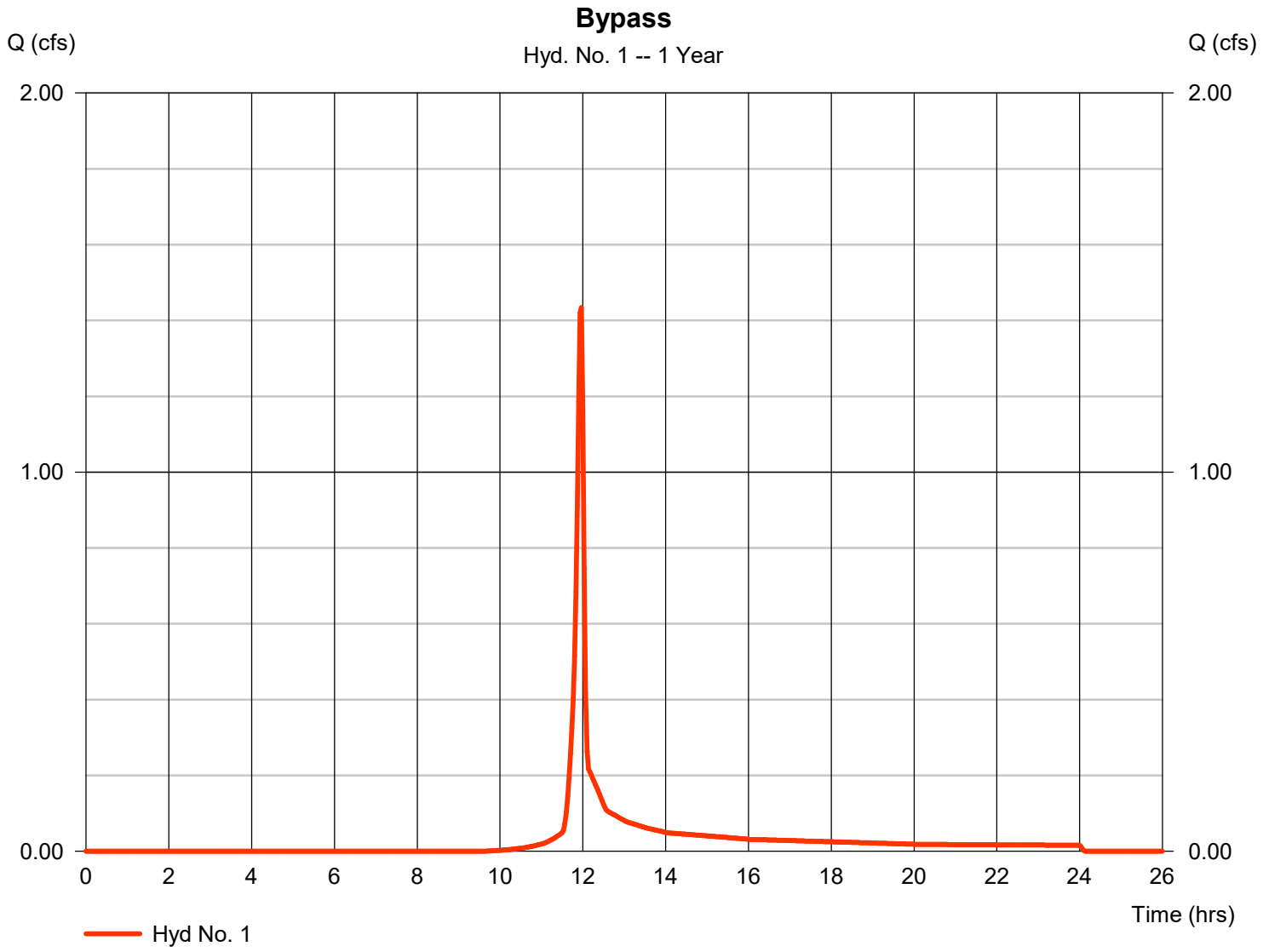
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 1

Bypass

Hydrograph type	= SCS Runoff	Peak discharge	= 1.434 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 2,875 cuft
Drainage area	= 0.700 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.630 x 79) + (0.070 x 98)] / 0.700



Hydrograph Report

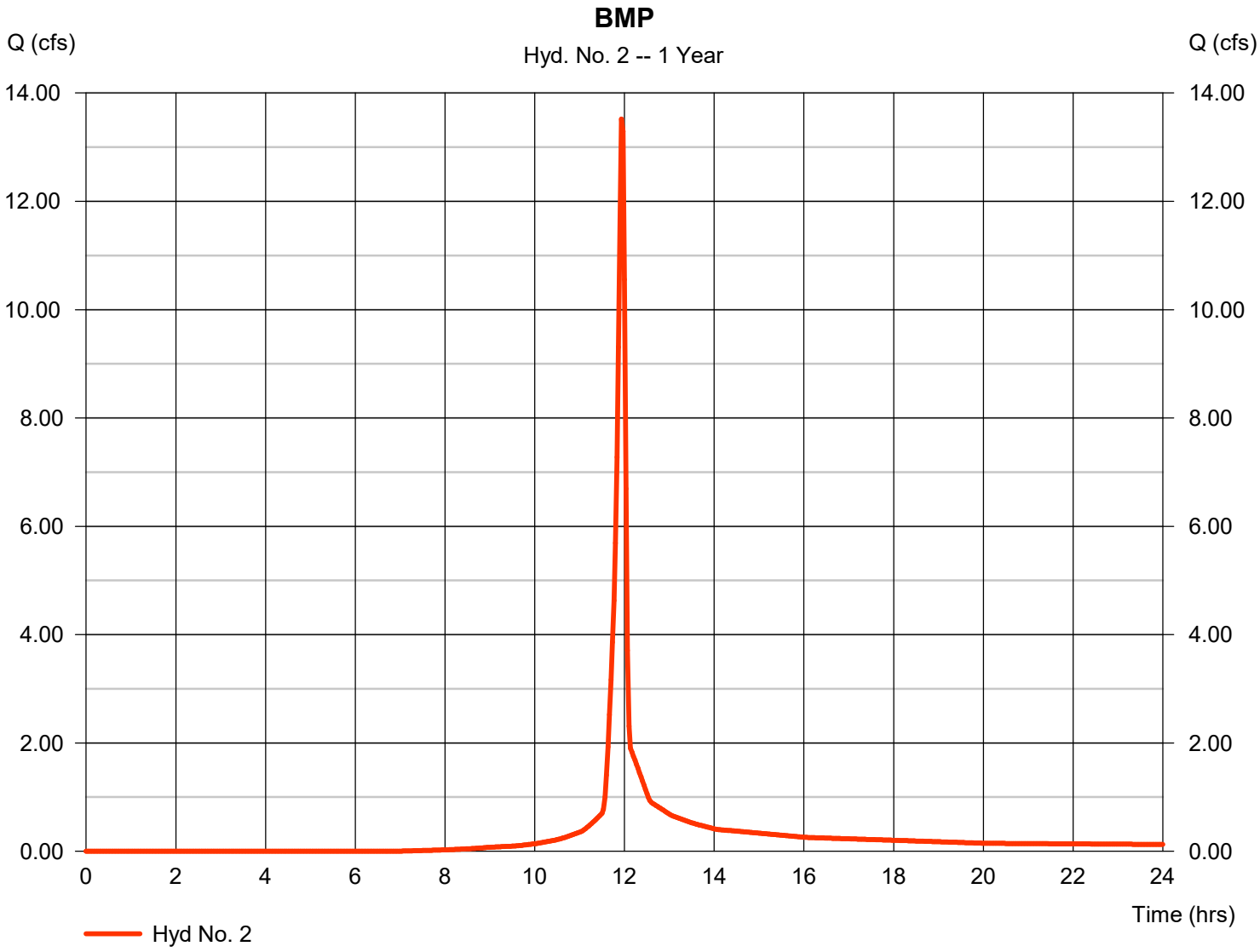
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 2

BMP

Hydrograph type	= SCS Runoff	Peak discharge	= 13.52 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 27,561 cuft
Drainage area	= 4.780 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.500 x 79) + (2.280 x 98)] / 4.780



Hydrograph Report

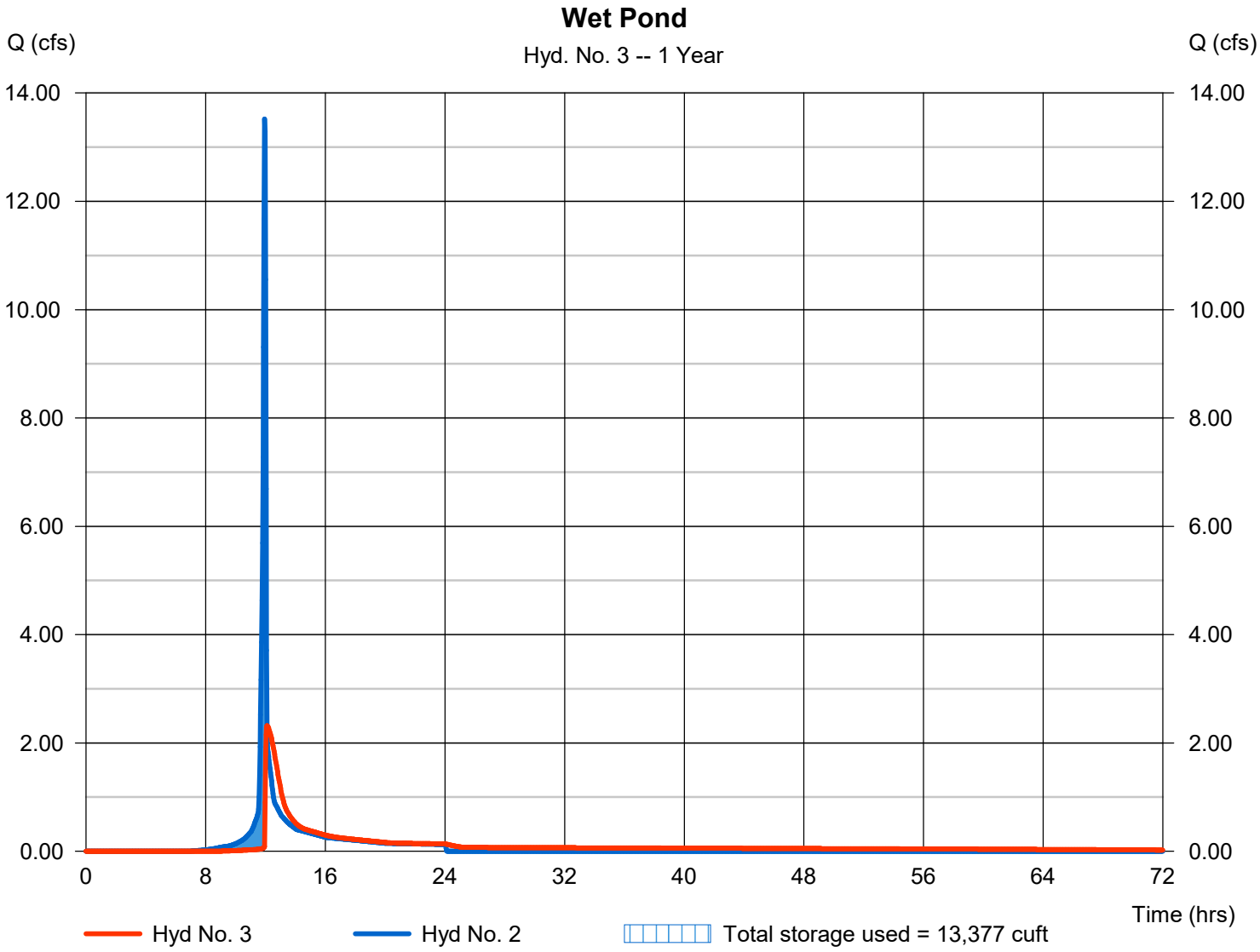
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 3

Wet Pond

Hydrograph type	= Reservoir	Peak discharge	= 2.321 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 27,365 cuft
Inflow hyd. No.	= 2 - BMP	Max. Elevation	= 418.01 ft
Reservoir name	= Wet Pond	Max. Storage	= 13,377 cuft

Storage Indication method used.



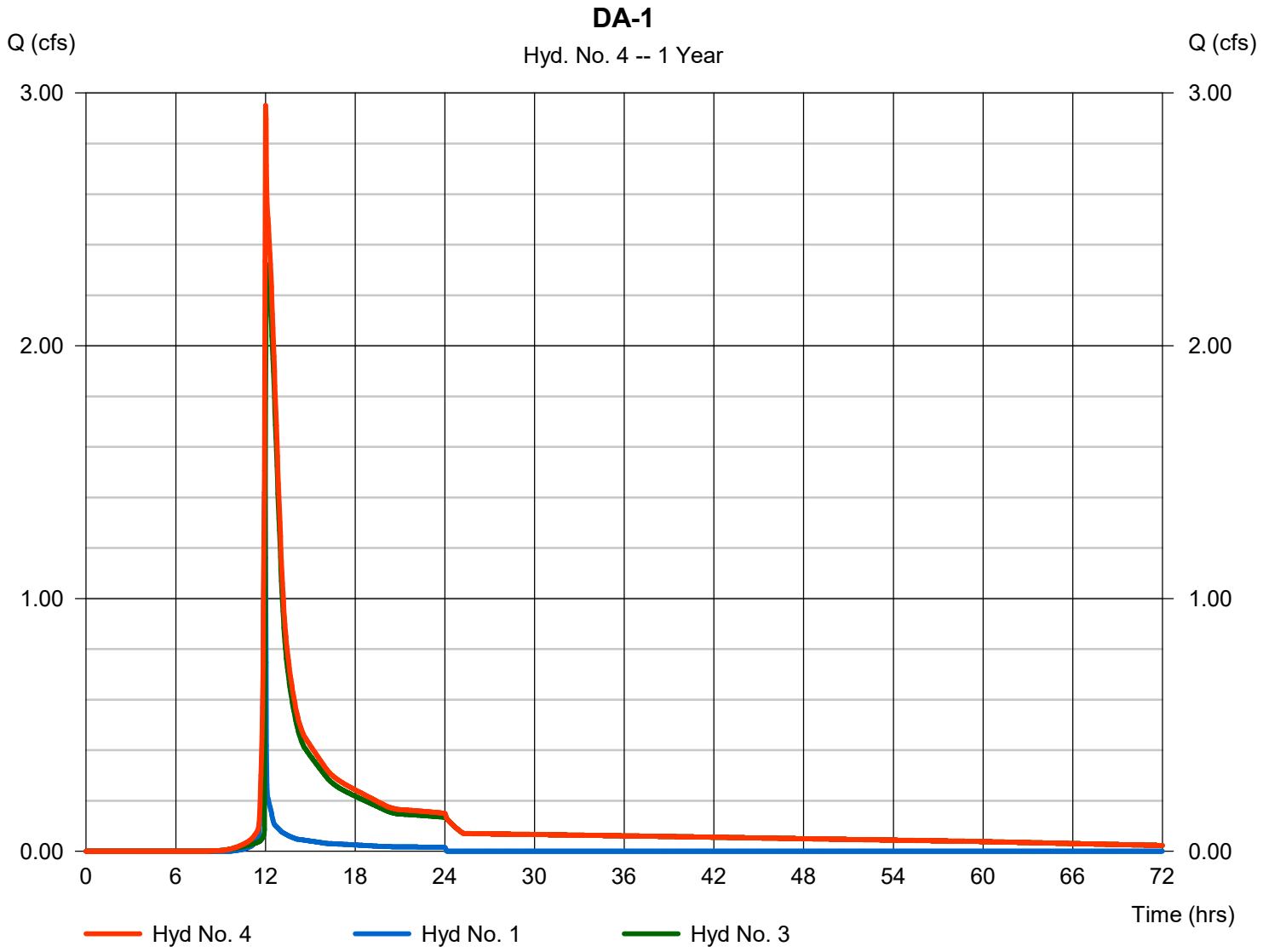
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 4

DA-1

Hydrograph type	= Combine	Peak discharge	= 2.951 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 30,240 cuft
Inflow hyds.	= 1, 3	Contrib. drain. area	= 0.700 ac



Hydrograph Report

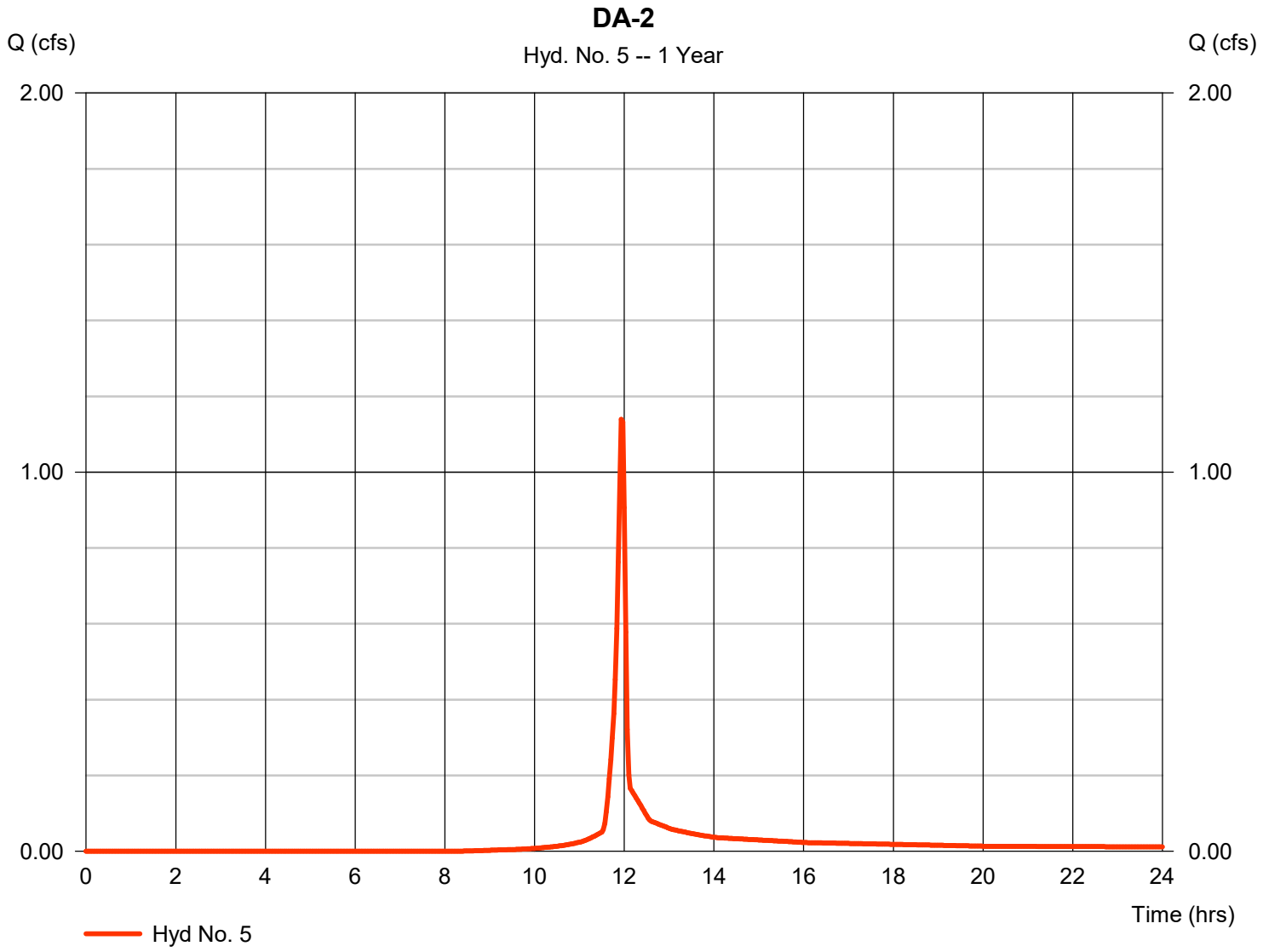
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 5

DA-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.140 cfs
Storm frequency	=	1 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	2,303 cuft
Drainage area	=	0.460 ac	Curve number	=	85*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	2.86 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.320 x 79) + (0.140 x 98)] / 0.460



Hydrograph Report

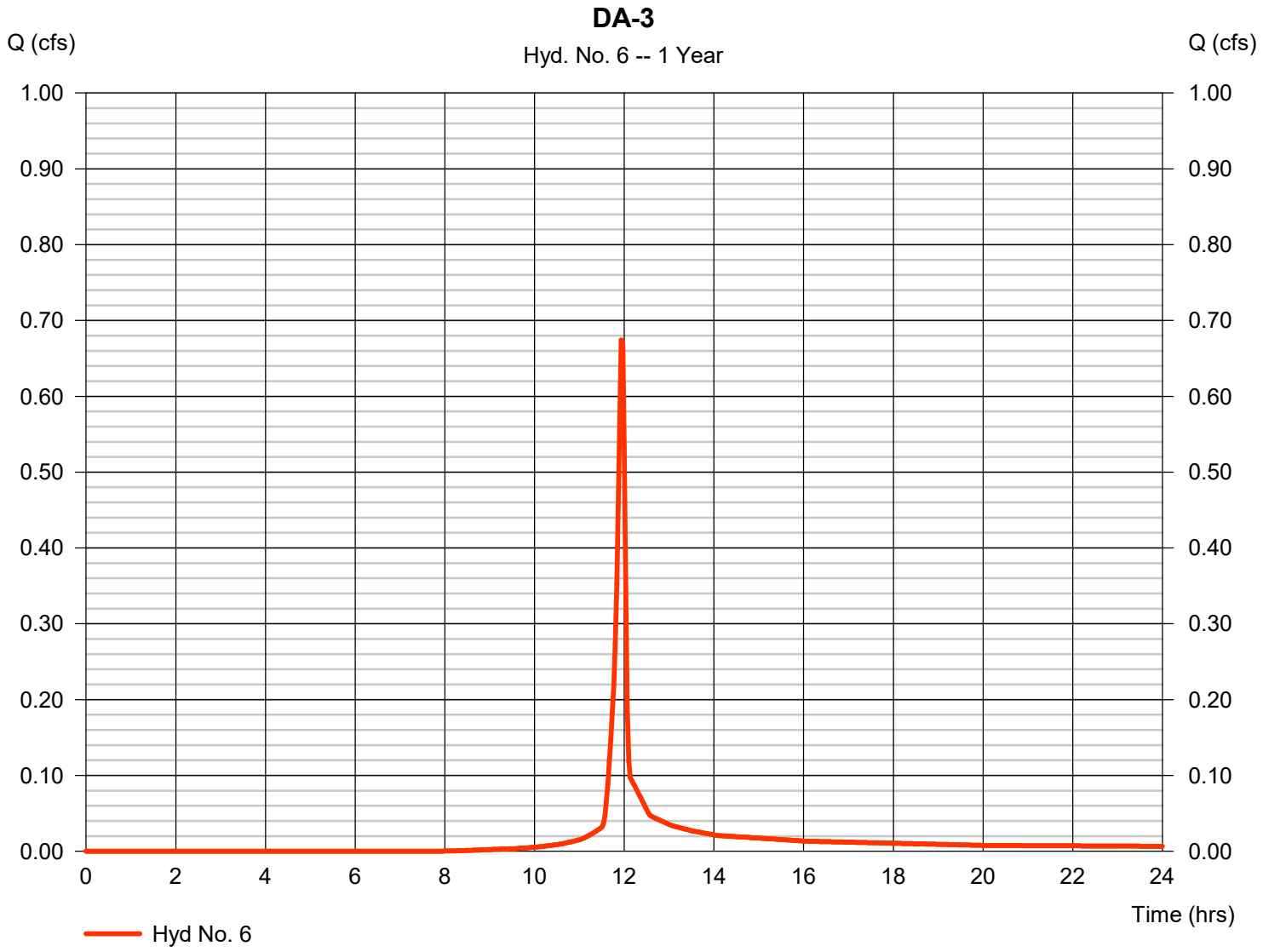
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 6

DA-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.674 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 1,365 cuft
Drainage area	= 0.260 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.170 x 79) + (0.090 x 98)] / 0.260



Hydrograph Report

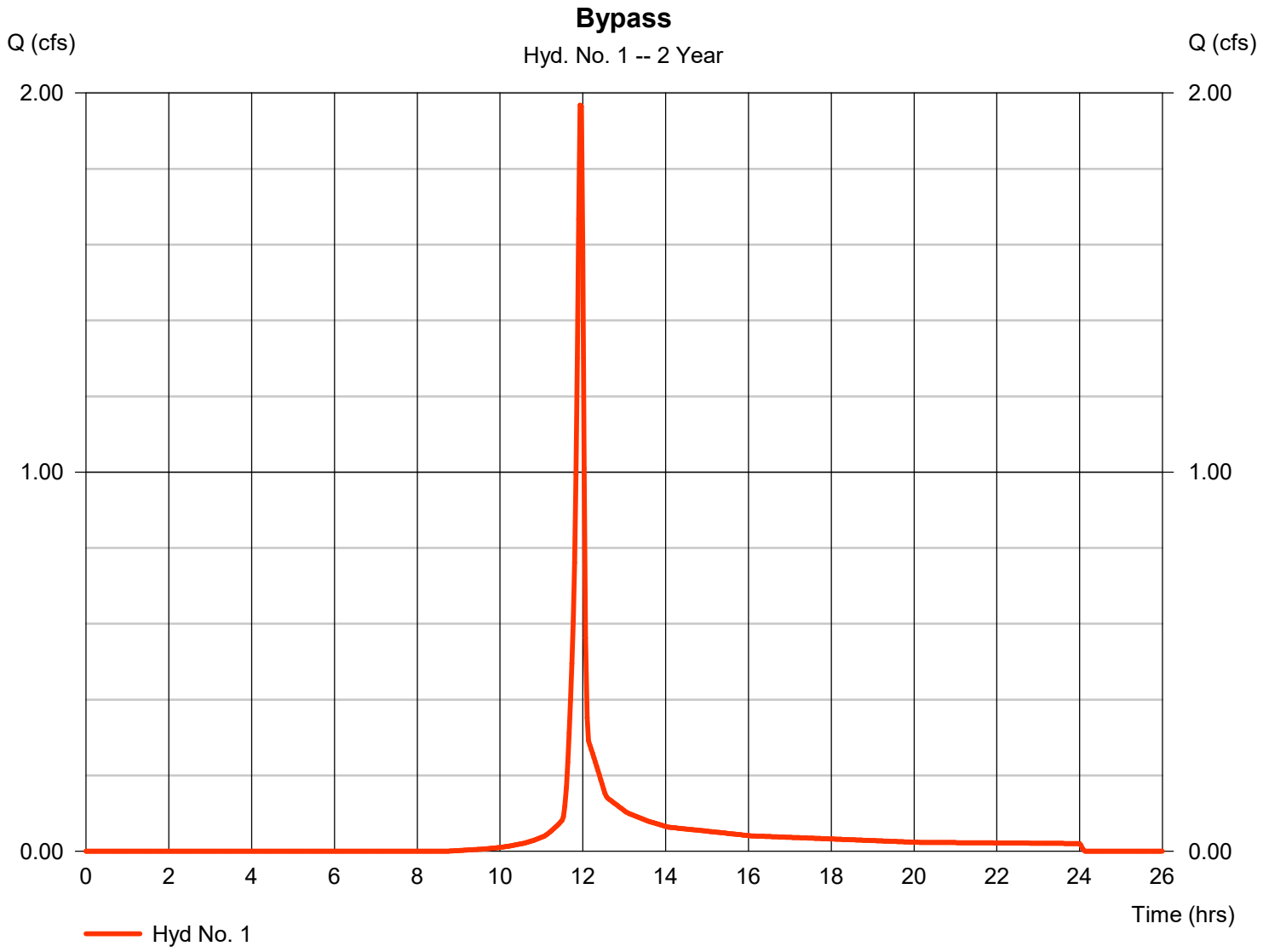
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 1

Bypass

Hydrograph type	= SCS Runoff	Peak discharge	= 1.968 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 3,974 cuft
Drainage area	= 0.700 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.630 x 79) + (0.070 x 98)] / 0.700



Hydrograph Report

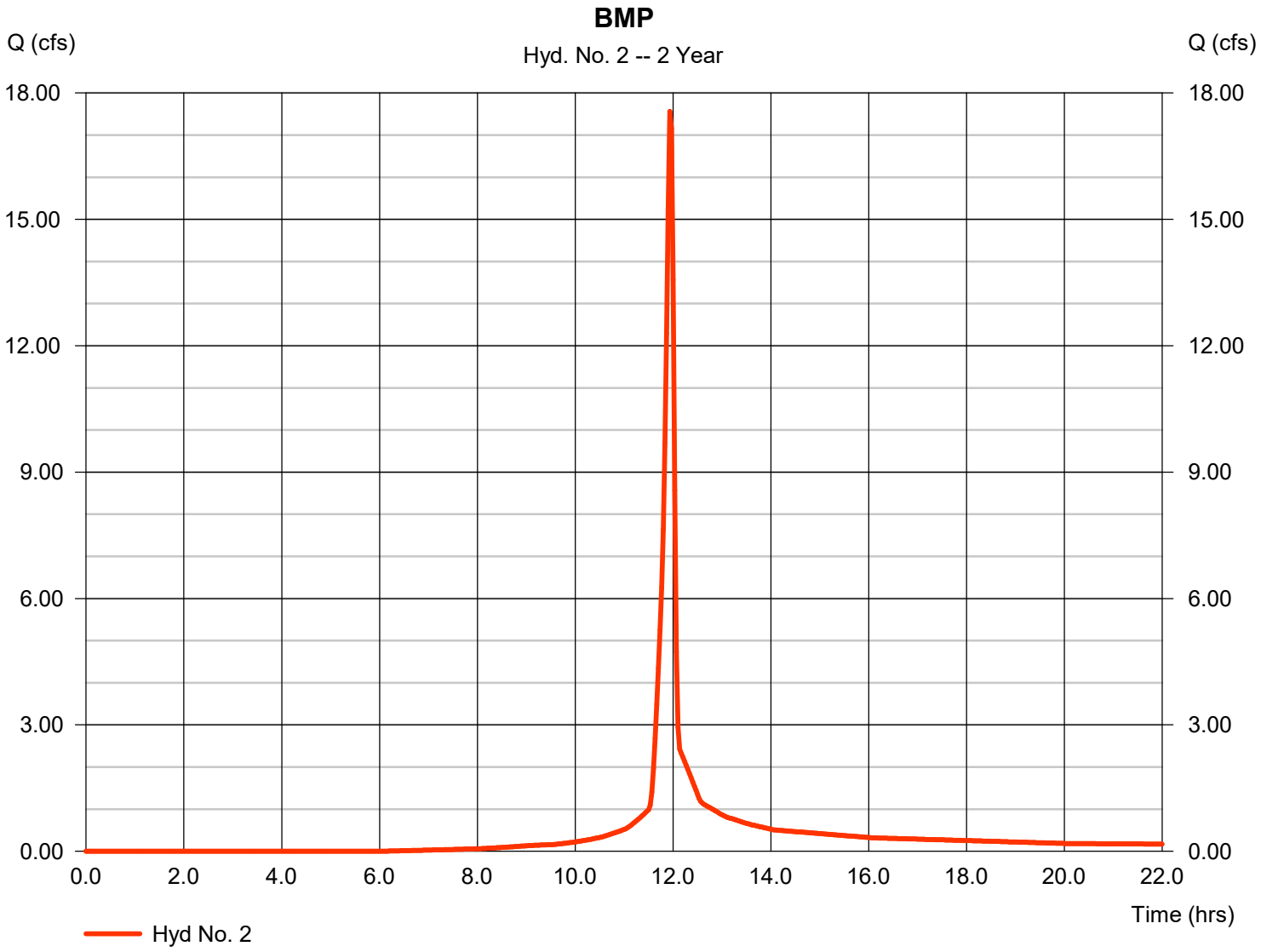
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 2

BMP

Hydrograph type	= SCS Runoff	Peak discharge	= 17.57 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 36,164 cuft
Drainage area	= 4.780 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.500 x 79) + (2.280 x 98)] / 4.780



Hydrograph Report

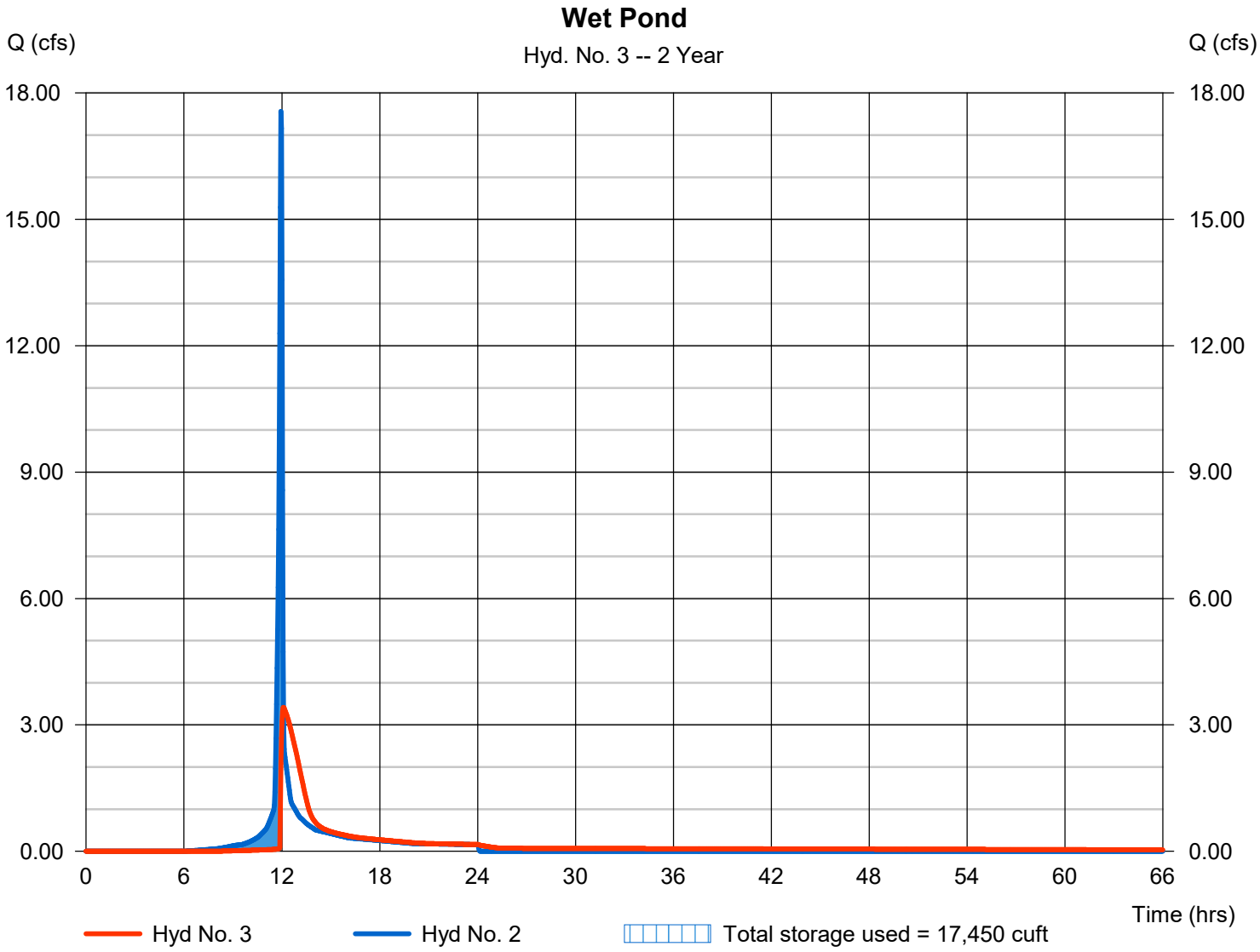
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 3

Wet Pond

Hydrograph type	= Reservoir	Peak discharge	= 3.419 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 35,966 cuft
Inflow hyd. No.	= 2 - BMP	Max. Elevation	= 418.48 ft
Reservoir name	= Wet Pond	Max. Storage	= 17,450 cuft

Storage Indication method used.



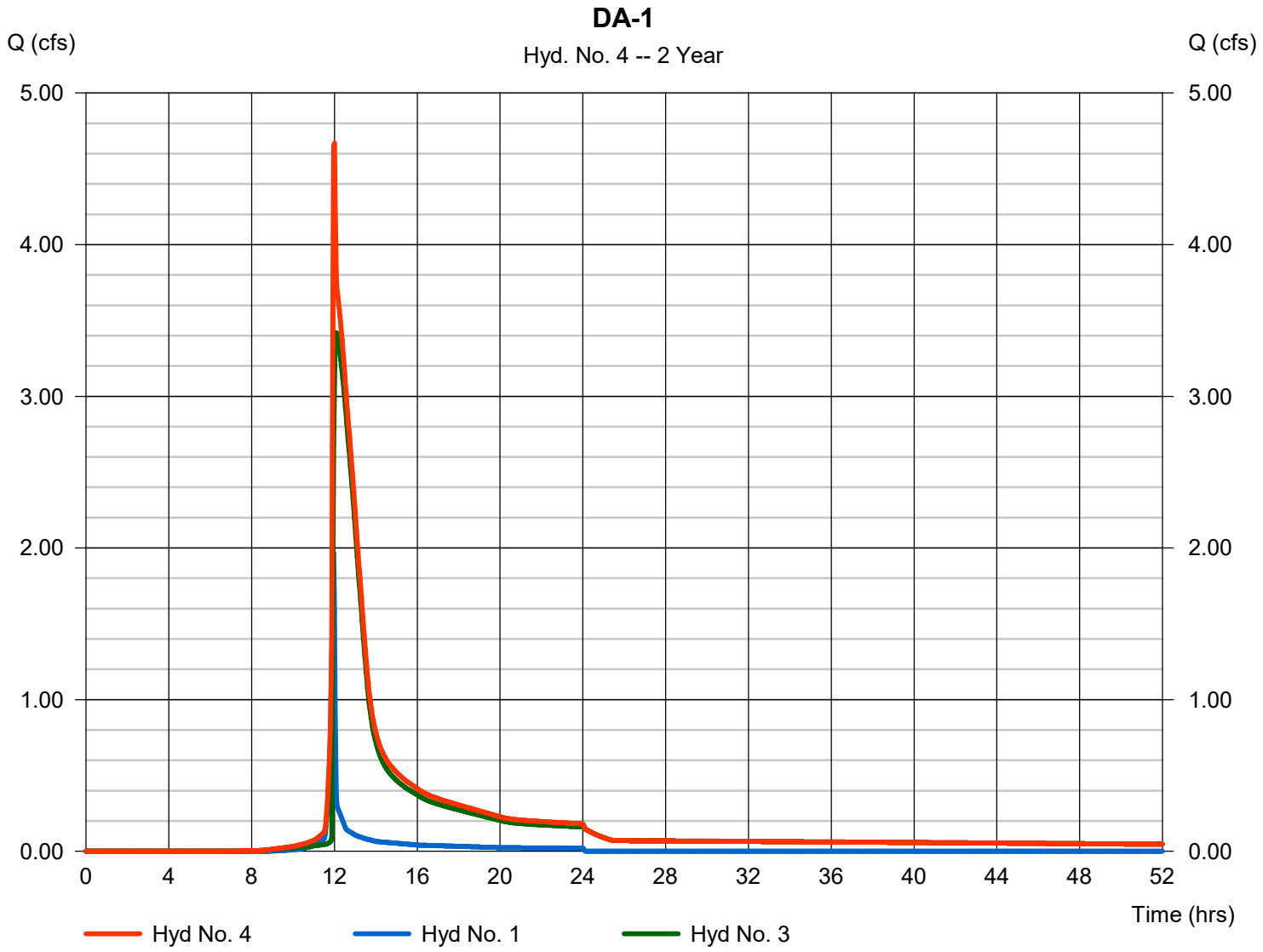
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 4

DA-1

Hydrograph type	= Combine	Peak discharge	= 4.668 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 39,940 cuft
Inflow hyds.	= 1, 3	Contrib. drain. area	= 0.700 ac



Hydrograph Report

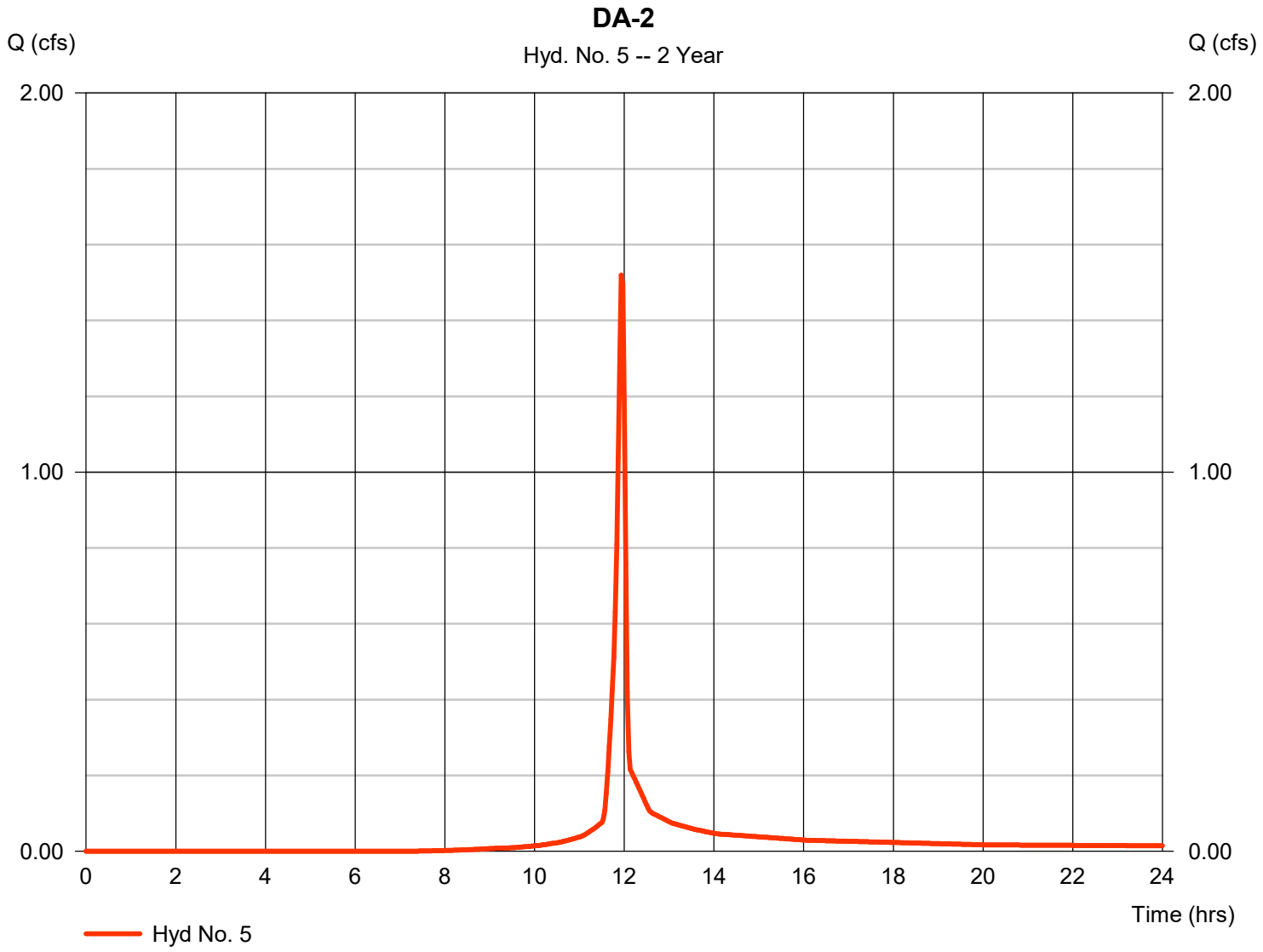
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 5

DA-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.520 cfs
Storm frequency	=	2 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	3,088 cuft
Drainage area	=	0.460 ac	Curve number	=	85*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.45 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.320 x 79) + (0.140 x 98)] / 0.460



Hydrograph Report

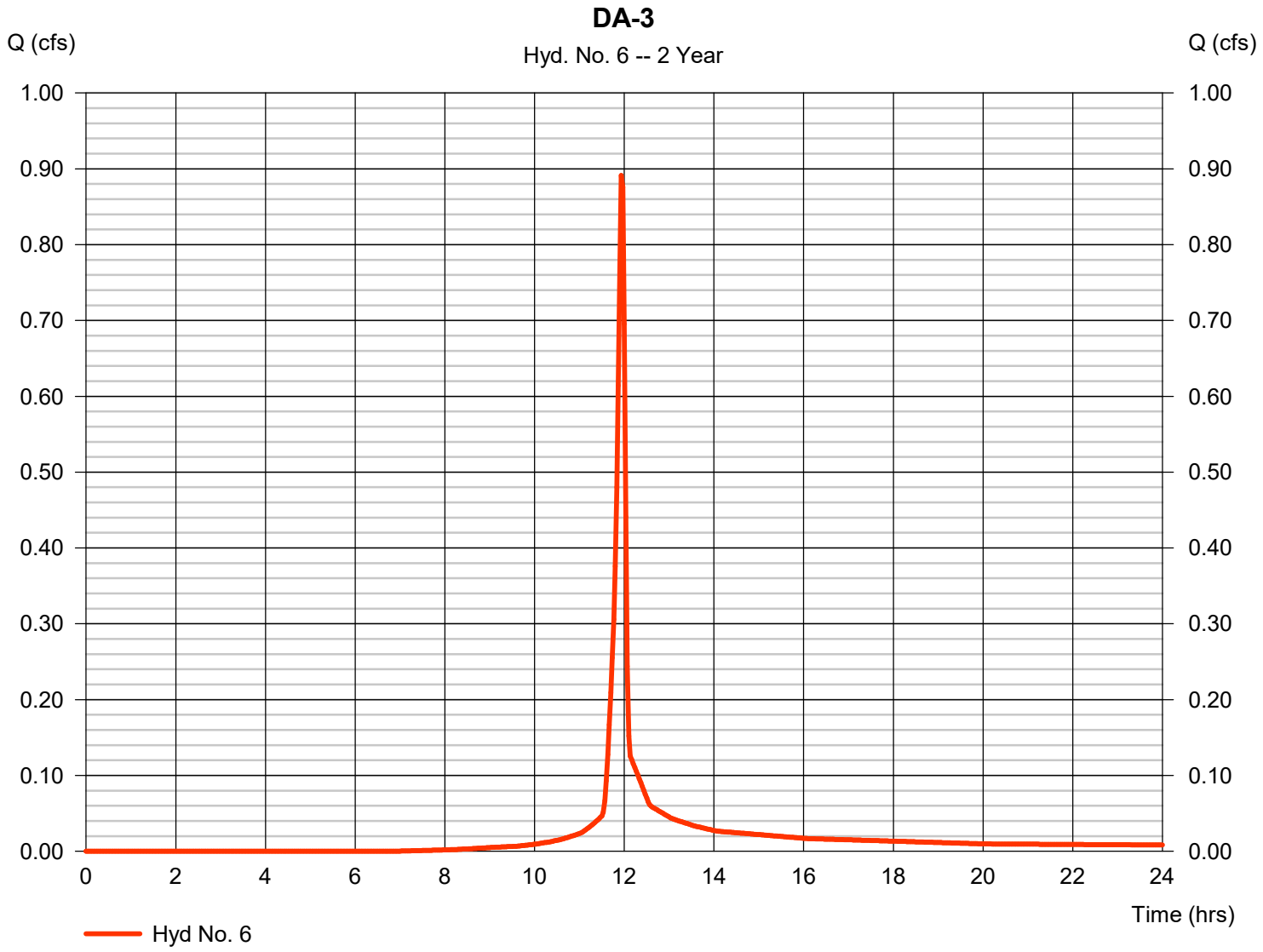
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 6

DA-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.891 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 1,818 cuft
Drainage area	= 0.260 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.170 x 79) + (0.090 x 98)] / 0.260



Hydrograph Report

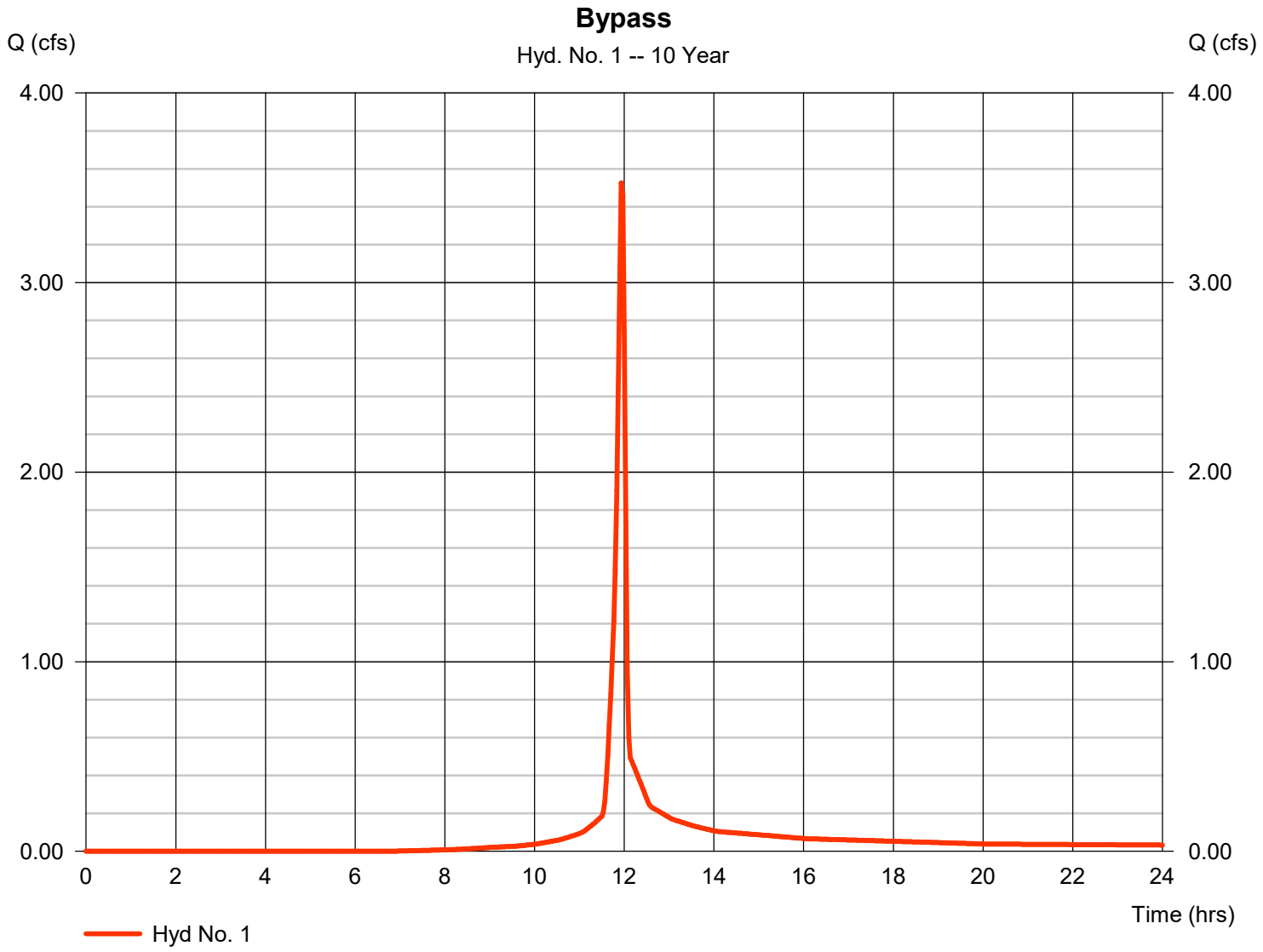
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 1

Bypass

Hydrograph type	= SCS Runoff	Peak discharge	= 3.526 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 7,196 cuft
Drainage area	= 0.700 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.630 x 79) + (0.070 x 98)] / 0.700



Hydrograph Report

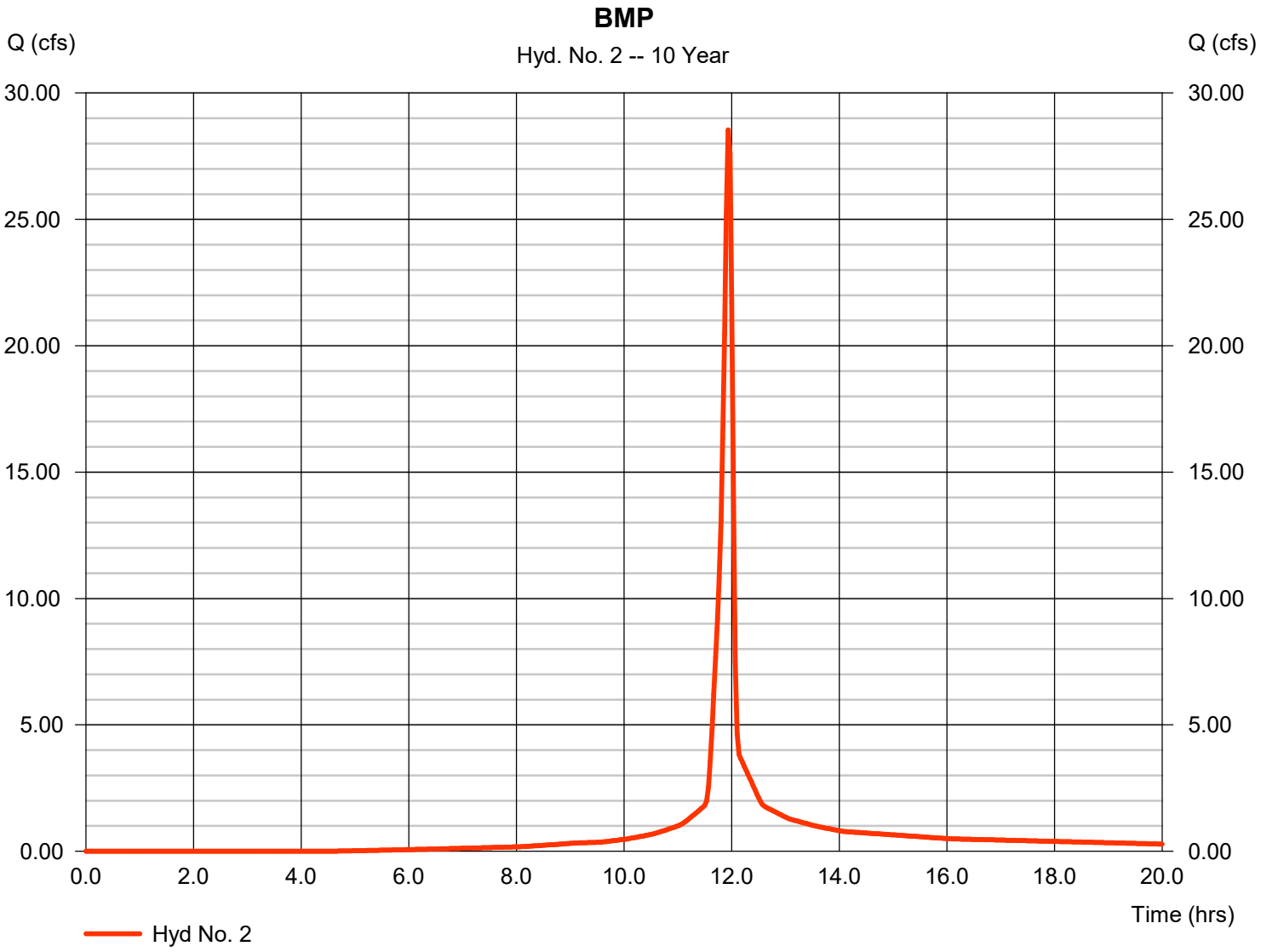
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 2

BMP

Hydrograph type	= SCS Runoff	Peak discharge	= 28.54 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 60,301 cuft
Drainage area	= 4.780 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.500 x 79) + (2.280 x 98)] / 4.780



Hydrograph Report

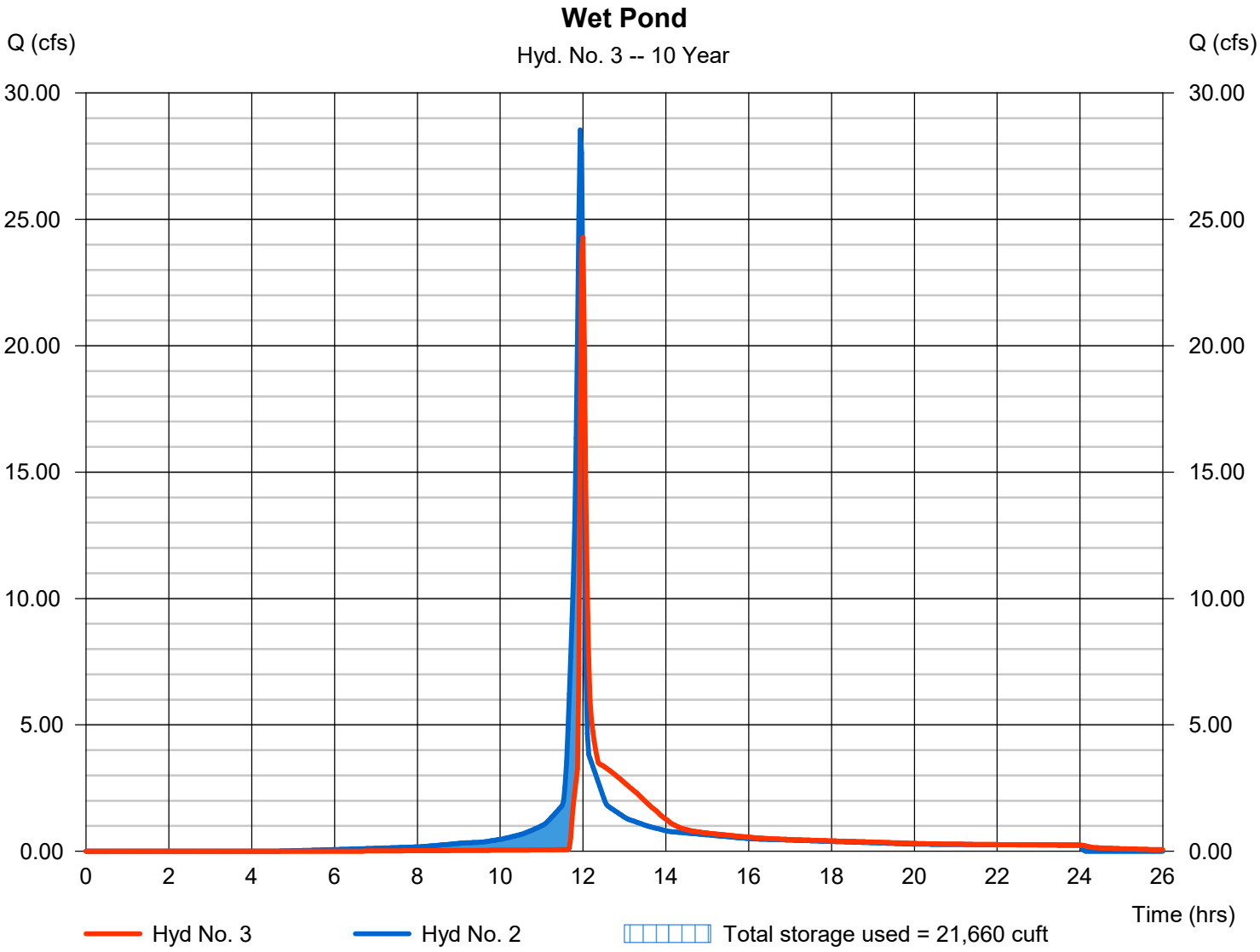
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 3

Wet Pond

Hydrograph type	= Reservoir	Peak discharge	= 24.28 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 60,100 cuft
Inflow hyd. No.	= 2 - BMP	Max. Elevation	= 418.97 ft
Reservoir name	= Wet Pond	Max. Storage	= 21,660 cuft

Storage Indication method used.



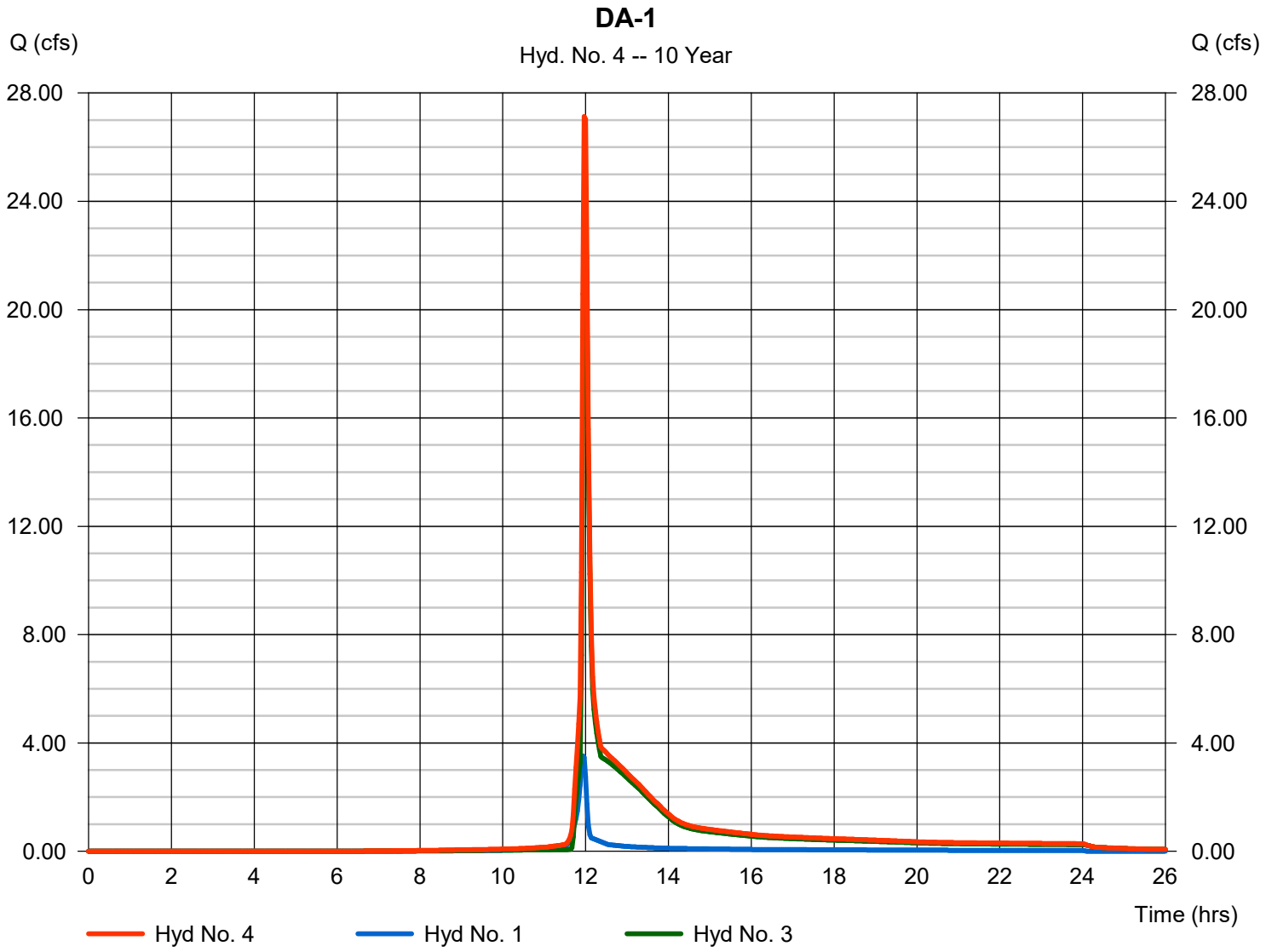
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 4

DA-1

Hydrograph type	= Combine	Peak discharge	= 27.13 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 67,296 cuft
Inflow hyds.	= 1, 3	Contrib. drain. area	= 0.700 ac



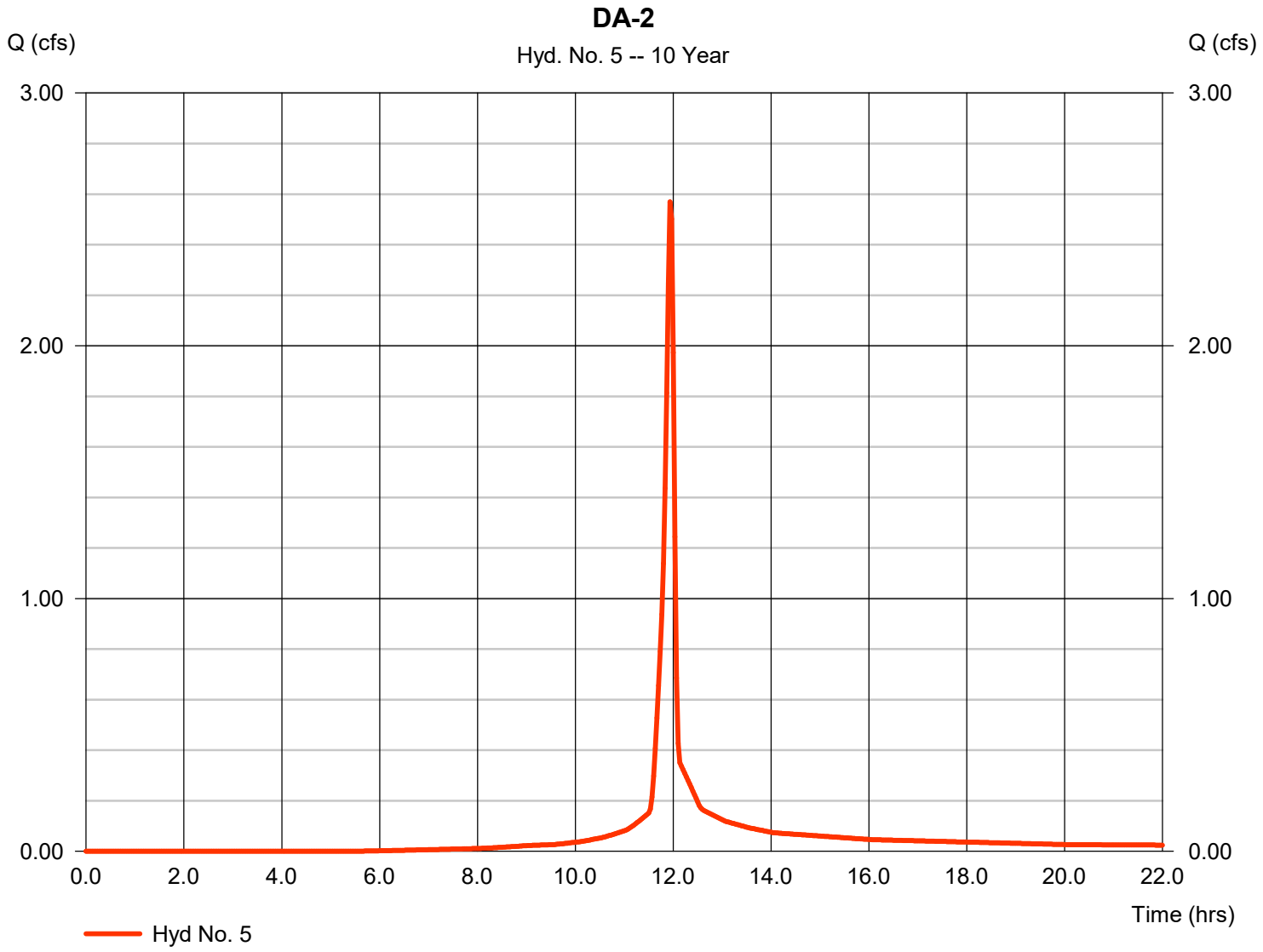
Hydrograph Report

Hyd. No. 5

DA-2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.569 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 5,330 cuft
Drainage area	= 0.460 ac	Curve number	= 85*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.320 x 79) + (0.140 x 98)] / 0.460



Hydrograph Report

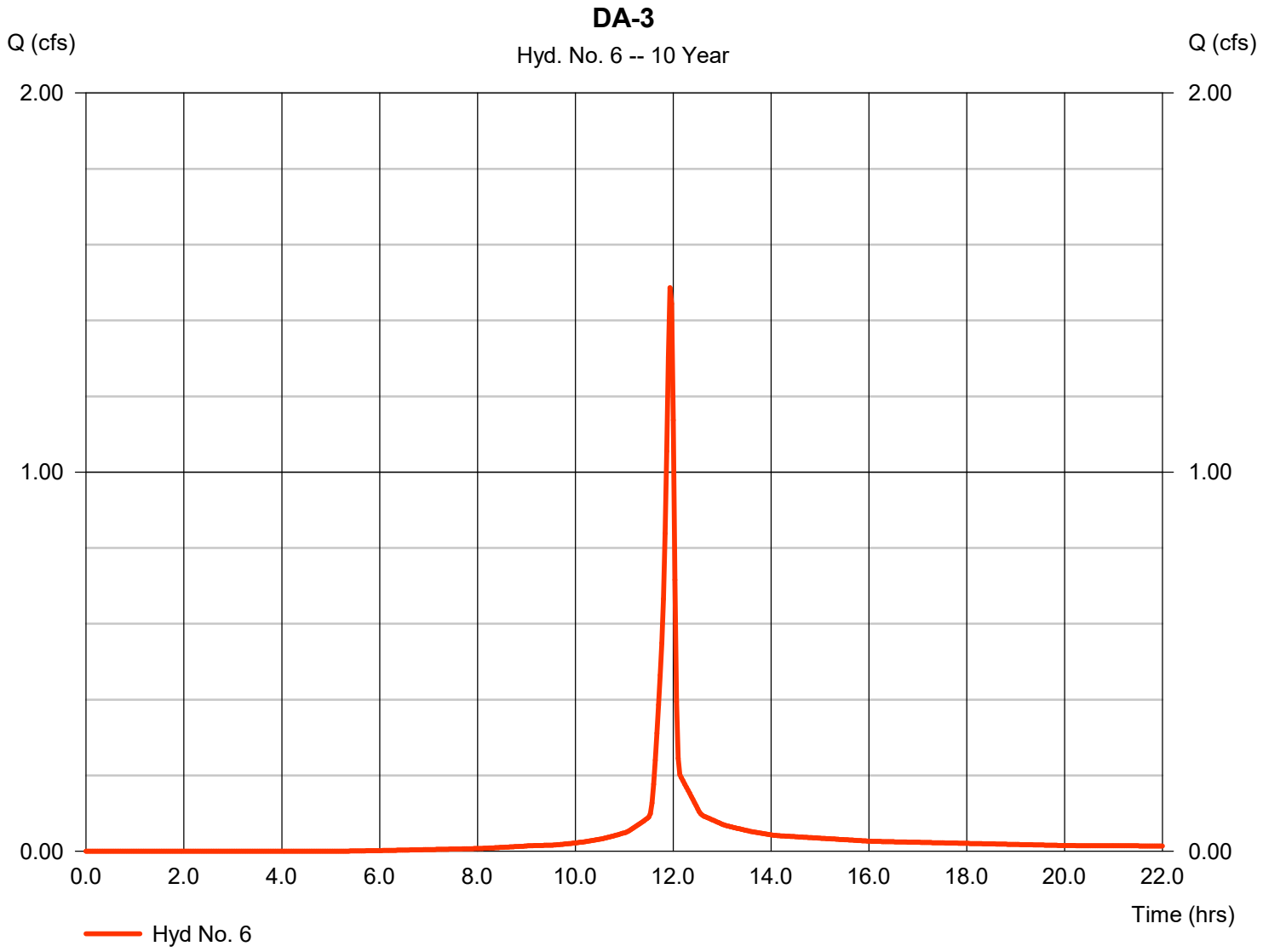
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 6

DA-3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.486 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 3,101 cuft
Drainage area	= 0.260 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.170 x 79) + (0.090 x 98)] / 0.260



Hydrograph Report

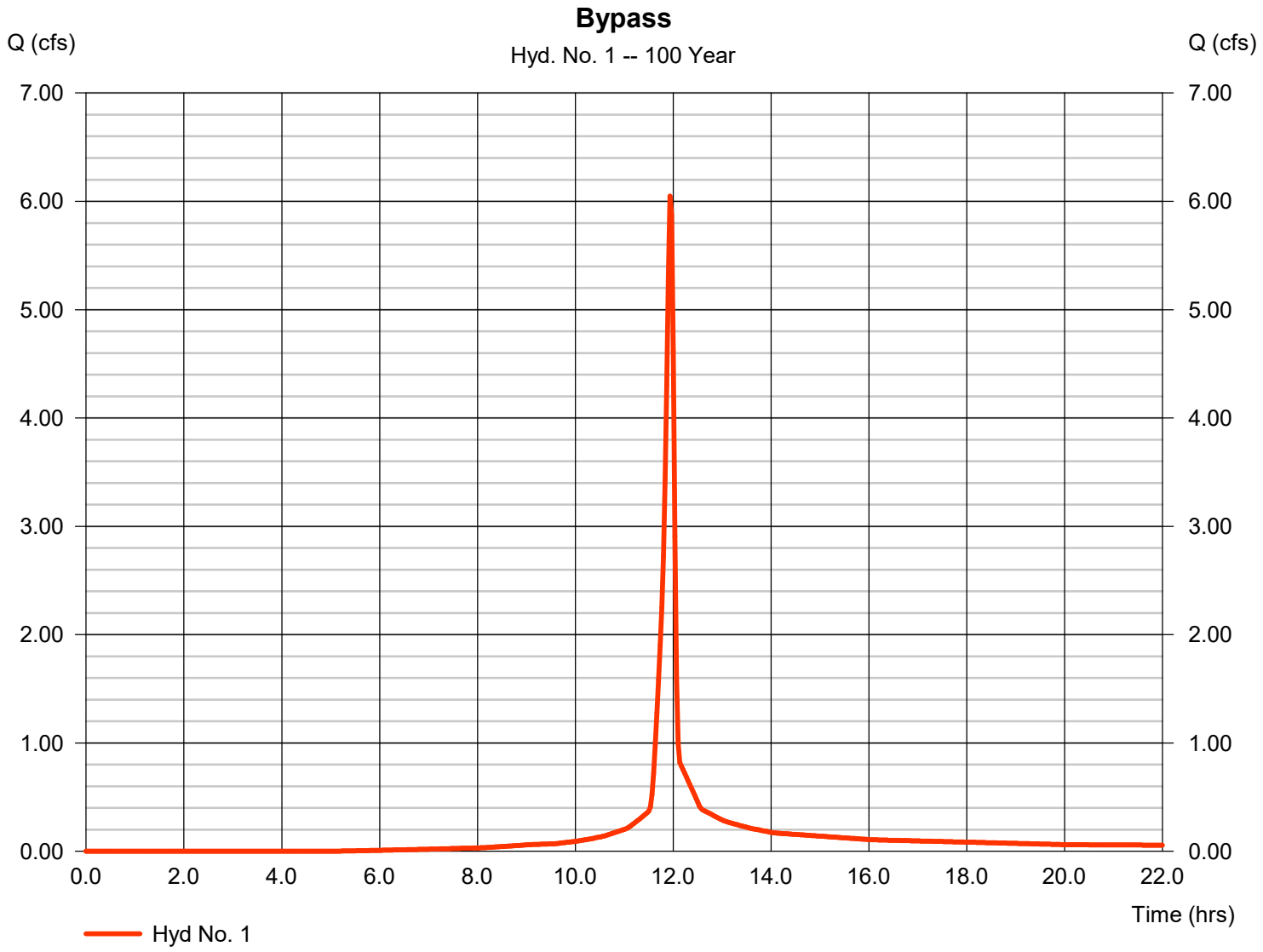
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 1

Bypass

Hydrograph type	= SCS Runoff	Peak discharge	= 6.047 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 12,648 cuft
Drainage area	= 0.700 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.54 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.630 x 79) + (0.070 x 98)] / 0.700



Hydrograph Report

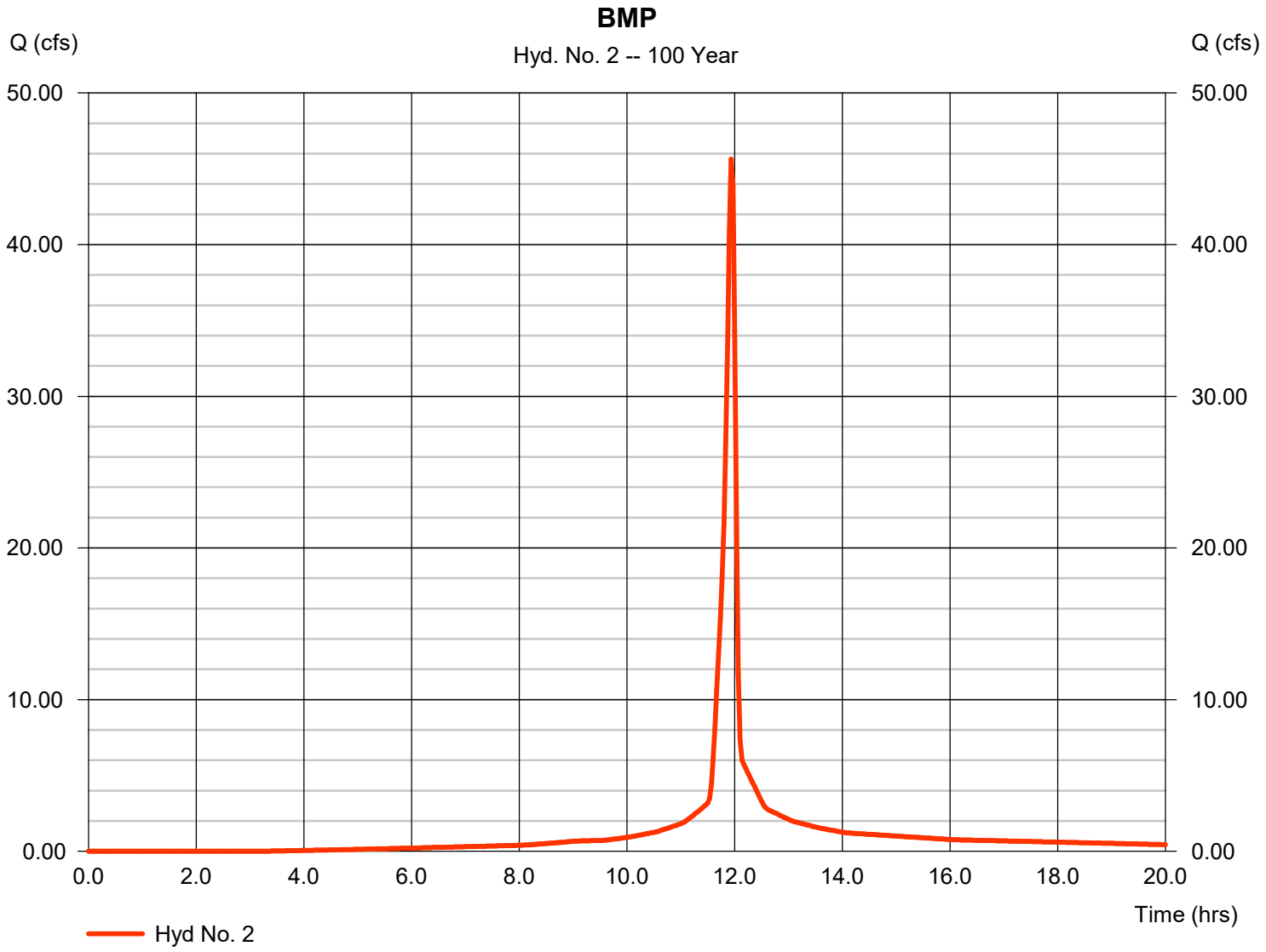
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 2

BMP

Hydrograph type	= SCS Runoff	Peak discharge	= 45.65 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 99,539 cuft
Drainage area	= 4.780 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.54 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.500 x 79) + (2.280 x 98)] / 4.780



Hydrograph Report

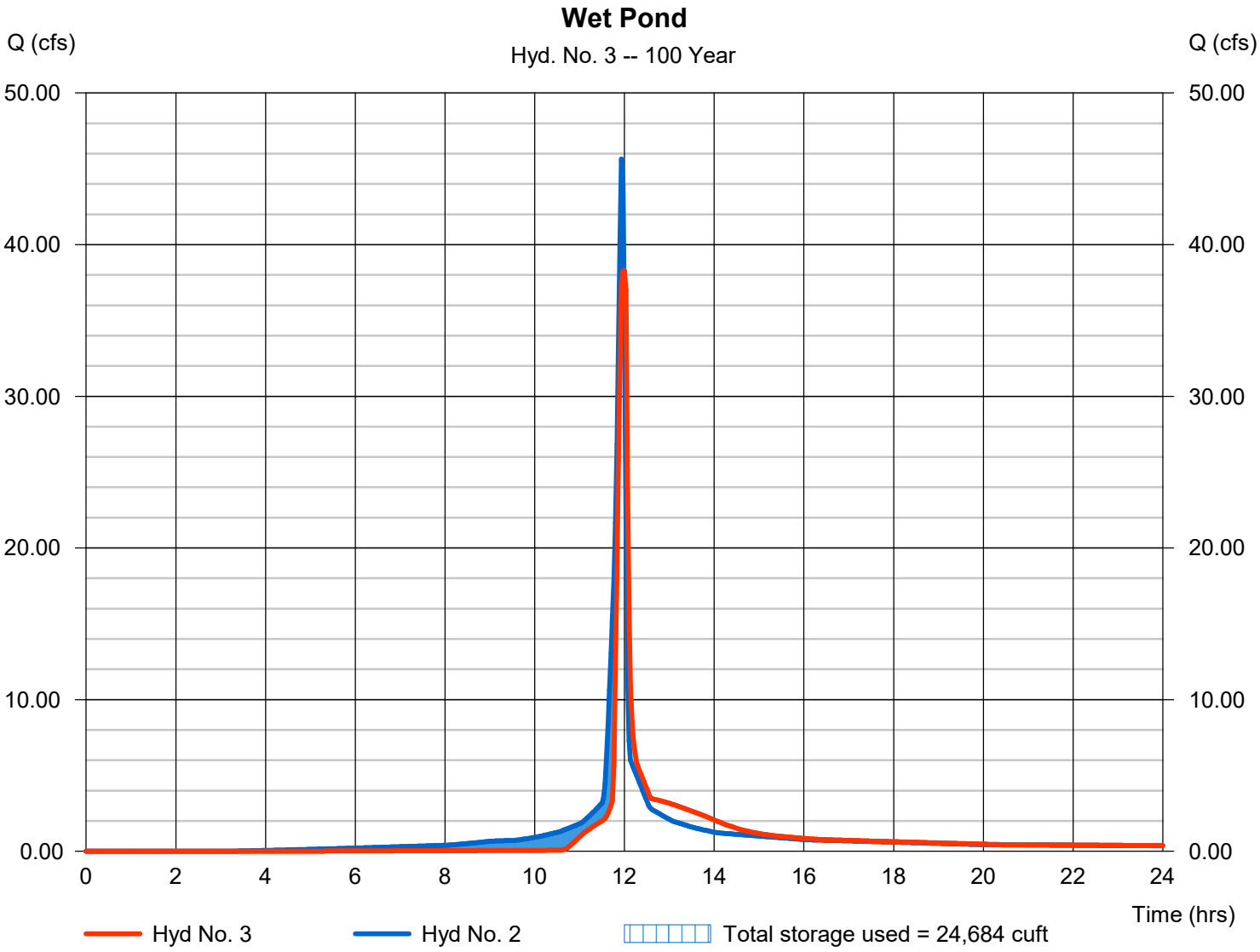
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 3

Wet Pond

Hydrograph type	= Reservoir	Peak discharge	= 38.30 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 99,336 cuft
Inflow hyd. No.	= 2 - BMP	Max. Elevation	= 419.29 ft
Reservoir name	= Wet Pond	Max. Storage	= 24,684 cuft

Storage Indication method used.



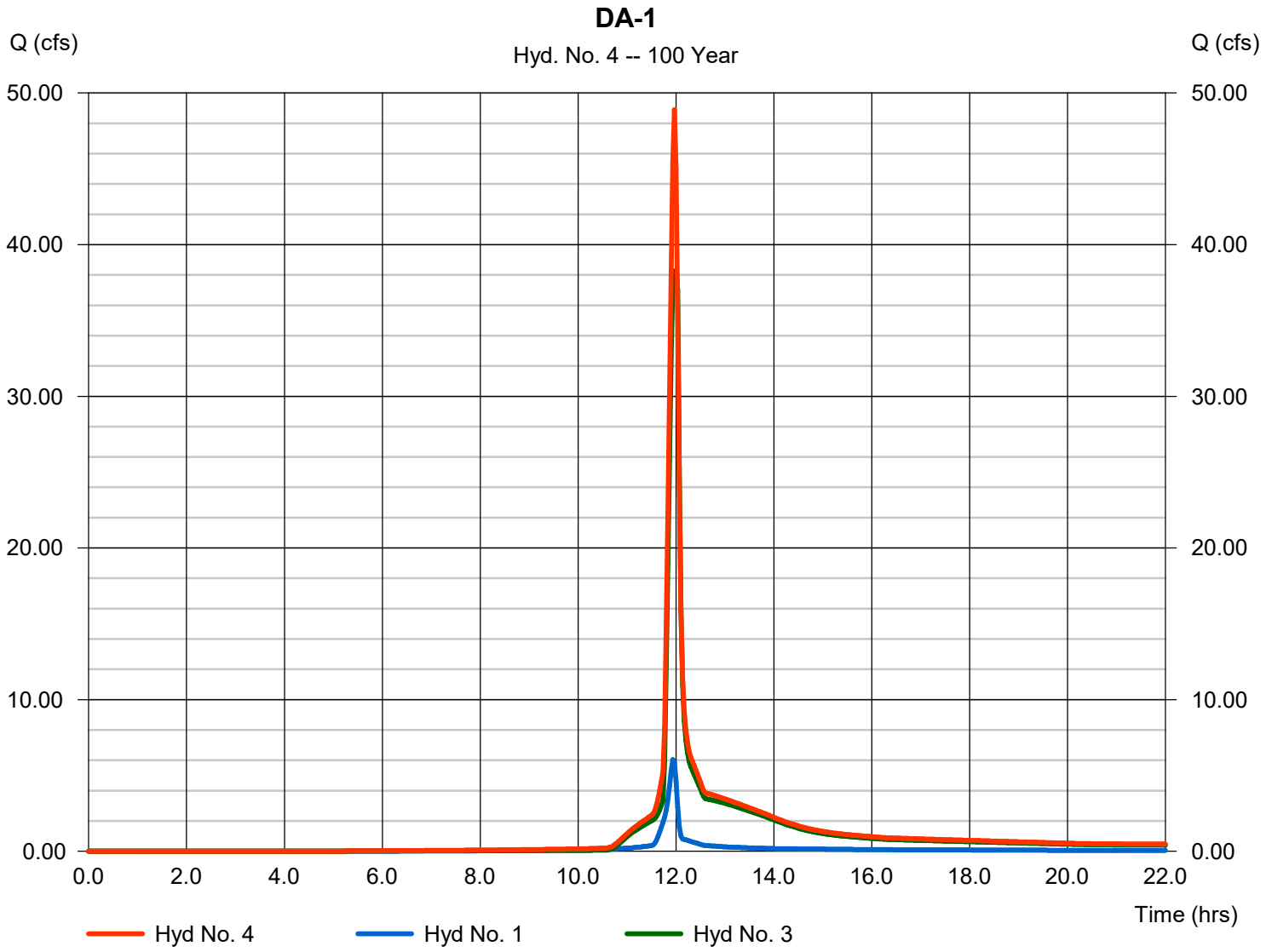
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 4

DA-1

Hydrograph type	= Combine	Peak discharge	= 48.89 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 111,984 cuft
Inflow hyds.	= 1, 3	Contrib. drain. area	= 0.700 ac



Hydrograph Report

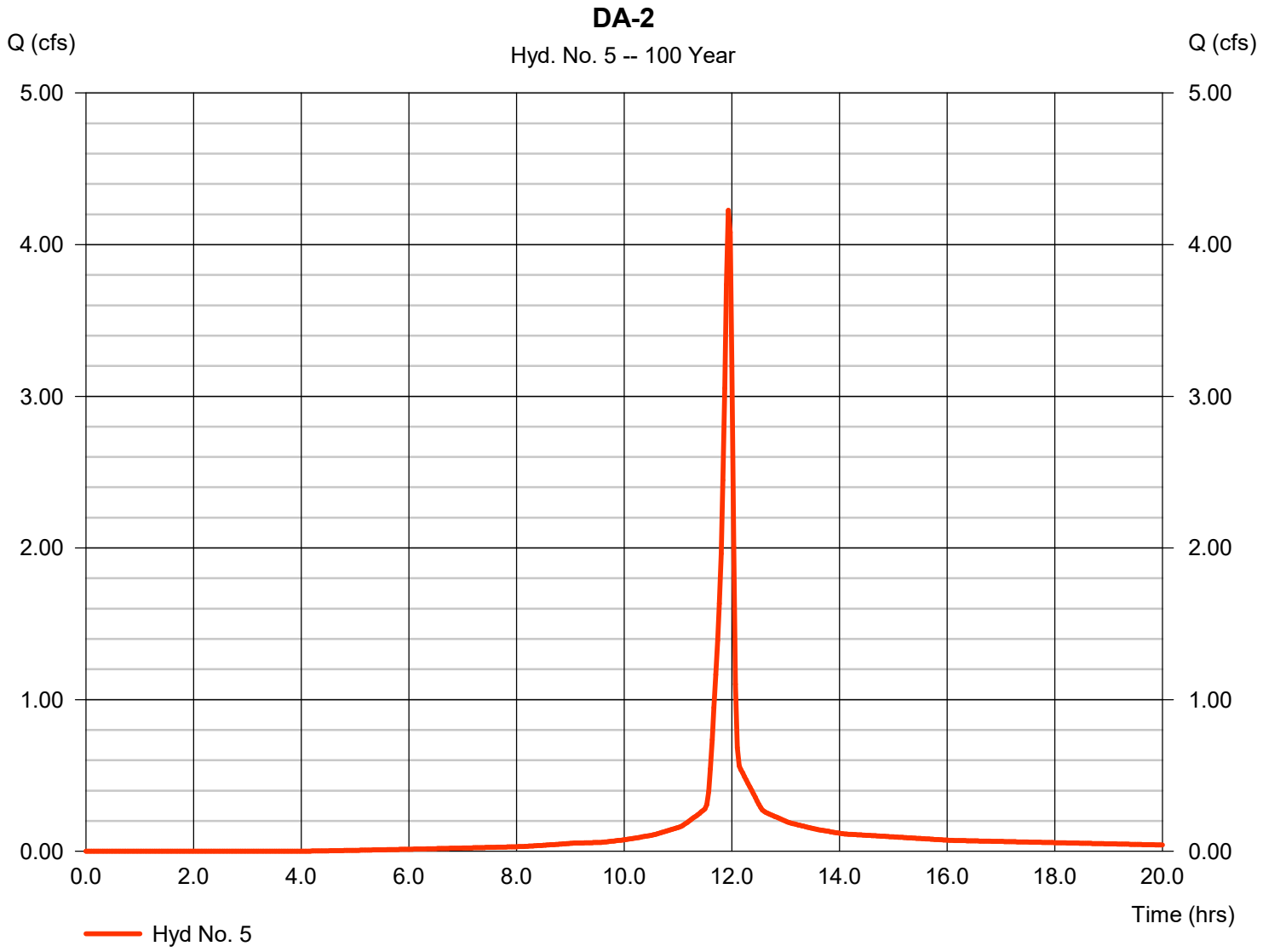
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 5

DA-2

Hydrograph type	= SCS Runoff	Peak discharge	= 4.227 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 9,033 cuft
Drainage area	= 0.460 ac	Curve number	= 85*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.54 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.320 x 79) + (0.140 x 98)] / 0.460



Hydrograph Report

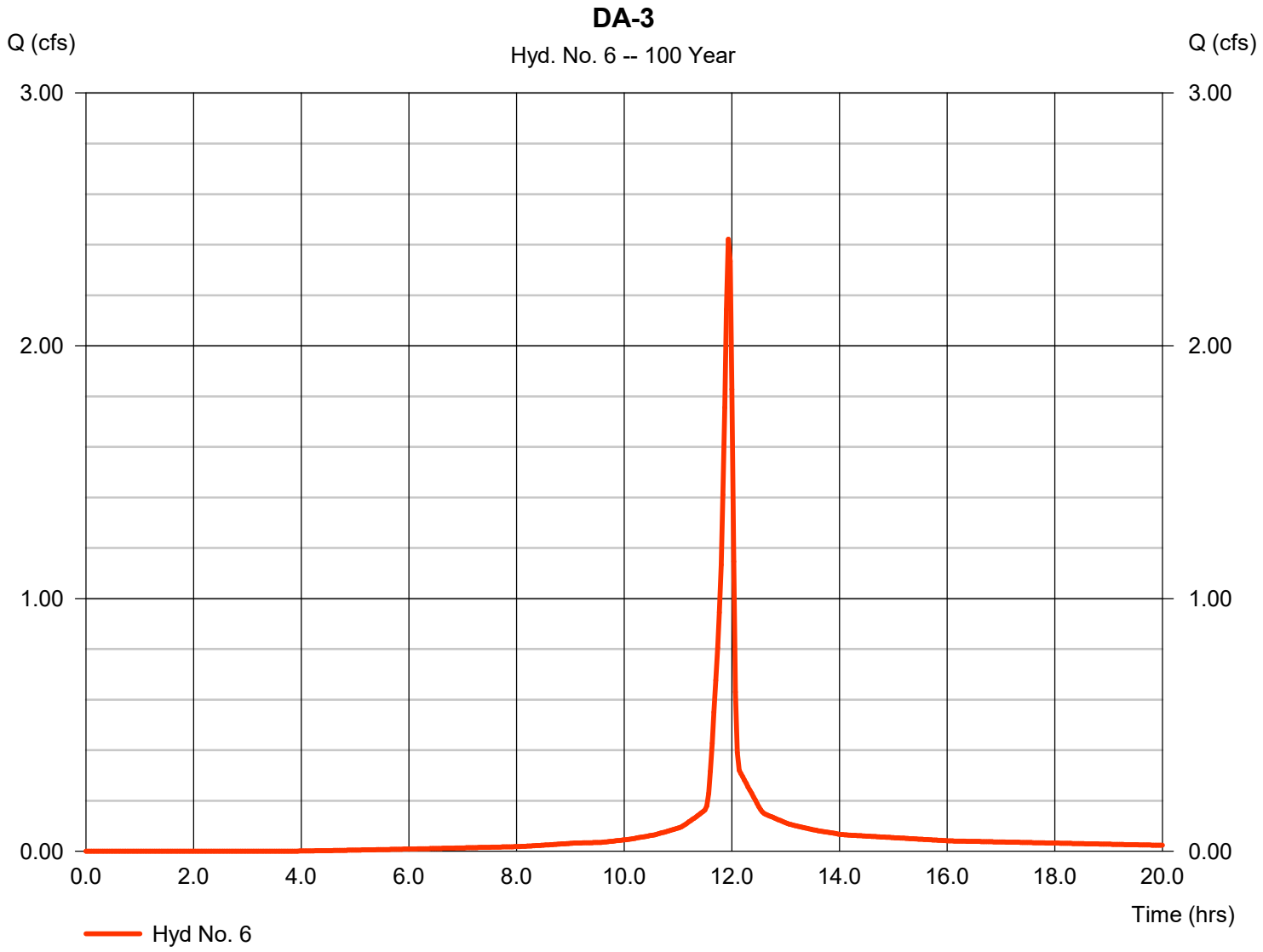
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 6

DA-3

Hydrograph type	= SCS Runoff	Peak discharge	= 2.422 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 5,208 cuft
Drainage area	= 0.260 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.54 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.170 x 79) + (0.090 x 98)] / 0.260



STORMDRAIN CALCULATIONS

Inlet Runoff Calculations

Rational Coefficients:	Grassed:	0.2
	Wooded:	0.15
	Impervious:	0.95
Rainfall Intensities:	I_{spread}=	4 in/hr
	I_{10}=	7.19 in/hr
	I_{25}=	7.98 in/hr

Rainfall Intensities are site specific from NOAA atlas 14. Intensity for 5 min Tc.

A-18 0.61 ac

Grassed:	0.24 ac
Wooded:	0 ac
Impervious:	0.37 ac
Composite C Factor:	0.65

Q_{spread}=	**1.59 cfs**
Q_{10}=	**2.85 cfs**
Q_{25}=	**3.16 cfs**

use 2.57 (includes bypass flows)

A-24 0.10 ac

Grassed:	0.04 ac
Wooded:	0 ac
Impervious:	0.06 ac
Composite C Factor:	0.65

Q_{spread}=	**0.26 cfs**
Q_{10}=	**0.47 cfs**
Q_{25}=	**0.52 cfs**

bypass offsite

A-26 0.16 ac

Grassed:	0.13 ac
Wooded:	0 ac
Impervious:	0.03 ac
Composite C Factor:	0.34

Q_{spread}=	**0.22 cfs**
Q_{10}=	**0.39 cfs**
Q_{25}=	**0.43 cfs**

bypass offsite

A-34 0.20 ac

Grassed:	0.04 ac
Wooded:	0 ac
Impervious:	0.16 ac
Composite C Factor:	0.80

Q_{spread}=	**0.64 cfs**
Q_{10}=	**1.15 cfs**
Q_{25}=	**1.28 cfs**

bypass offsite

A-36 0.13 ac

Grassed:	0.03 ac
Wooded:	0 ac
Impervious:	0.1 ac
Composite C Factor:	0.78

Q_{spread}=	**0.41 cfs**
Q_{10}=	**0.73 cfs**
Q_{25}=	**0.81 cfs**

bypass offsite

A-38 0.22 ac

Grassed:	0.07	ac
Wooded:	0	ac
Impervious:	0.15	ac
Composite C Factor:	0.71	

Q_{spread}=	0.62	cfs
Q_{10}=	1.12	cfs
Q_{25}=	1.25	cfs

bypass to A-18
0.06 cfs

A-40 0.31 ac

Grassed:	0.1	ac
Wooded:	0	ac
Impervious:	0.21	ac
Composite C Factor:	0.71	

Q_{spread}=	0.88	cfs
Q_{10}=	1.58	cfs
Q_{25}=	1.76	cfs

bypass to A-18
0.13 cfs

A-42 0.70 ac

Grassed:	0.53	ac
Wooded:	0	ac
Impervious:	0.17	ac
Composite C Factor:	0.38	

Q_{spread}=	1.06	cfs
Q_{10}=	1.91	cfs
Q_{25}=	2.12	cfs

sag yard inlet

A-48 0.06 ac

Grassed:	0.01	ac
Wooded:	0	ac
Impervious:	0.05	ac
Composite C Factor:	0.83	

Q_{spread}=	0.20	cfs
Q_{10}=	0.36	cfs
Q_{25}=	0.40	cfs

bypass offsite

A-50 0.05 ac

Grassed:	0.01	ac
Wooded:	0	ac
Impervious:	0.04	ac
Composite C Factor:	0.80	

Q_{spread}=	0.16	cfs
Q_{10}=	0.29	cfs
Q_{25}=	0.32	cfs

bypass offsite

A-52 0.36 ac

Grassed:	0.13	ac
Wooded:	0	ac
Impervious:	0.23	ac
Composite C Factor:	0.68	

Q_{spread}=	**0.98**	**cfs**
Q_{10}=	**1.76**	**cfs**
Q_{25}=	**1.95**	**cfs**

bypass to A-18
0.21 cfs

A-54 0.44 ac

Grassed:	0.17	ac
Wooded:	0	ac
Impervious:	0.27	ac
Composite C Factor:	0.66	

Q_{spread}=	**1.16**	**cfs**
Q_{10}=	**2.09**	**cfs**
Q_{25}=	**2.32**	**cfs**

bypass to A-18
0.28 cfs

A-56 0.65 ac

Grassed:	0.41	ac
Wooded:	0	ac
Impervious:	0.24	ac
Composite C Factor:	0.48	

Q_{spread}=	**1.25**	**cfs**
Q_{10}=	**2.24**	**cfs**
Q_{25}=	**2.49**	**cfs**

bypass to A-18
0.3 cfs

Hydrograph Report

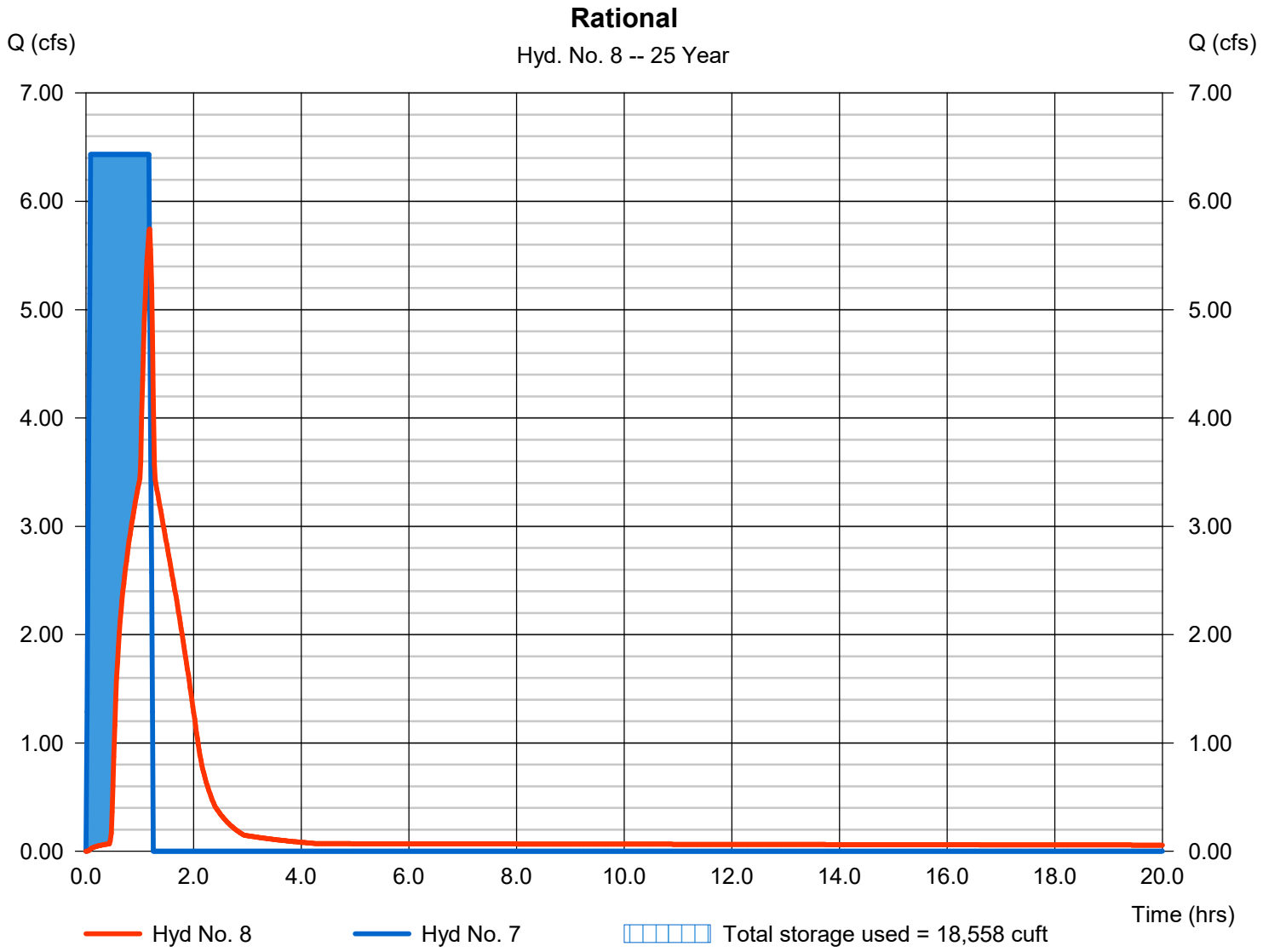
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 06 / 23 / 2020

Hyd. No. 8

Rational

Hydrograph type	= Reservoir	Peak discharge	= 5.745 cfs
Storm frequency	= 25 yrs	Time to peak	= 1.18 hrs
Time interval	= 1 min	Hyd. volume	= 25,690 cuft
Inflow hyd. No.	= 7 - Rational	Max. Elevation	= 418.60 ft
Reservoir name	= Wet Pond	Max. Storage	= 18,558 cuft

Storage Indication method used.



Storm Event Group Detailed Report: User Defined IDF Table - 1

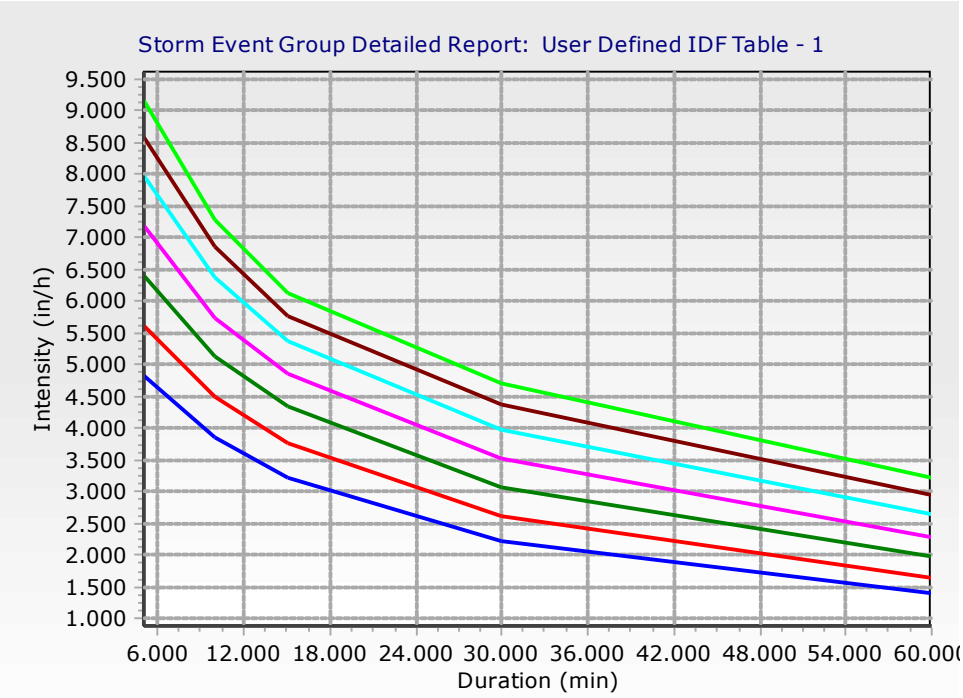
Element Details			
ID	61	Notes	
Label	User Defined IDF Table - 1		

Duration (min)	1 Year (in/h)	2 Year (in/h)	5 Year (in/h)	10 Year (in/h)	25 Year (in/h)	50 Year (in/h)	100 Year (in/h)
5.000	4.840	5.620	6.410	7.190	7.980	8.600	9.160
10.000	3.860	4.490	5.130	5.750	6.360	6.850	7.280
15.000	3.220	3.770	4.330	4.850	5.370	5.780	6.130
30.000	2.210	2.600	3.070	3.510	3.980	4.360	4.700
60.000	1.380	1.630	1.970	2.290	2.650	2.950	3.230

Utilized in pipe sizing (including HGLs)

Library Status Summary

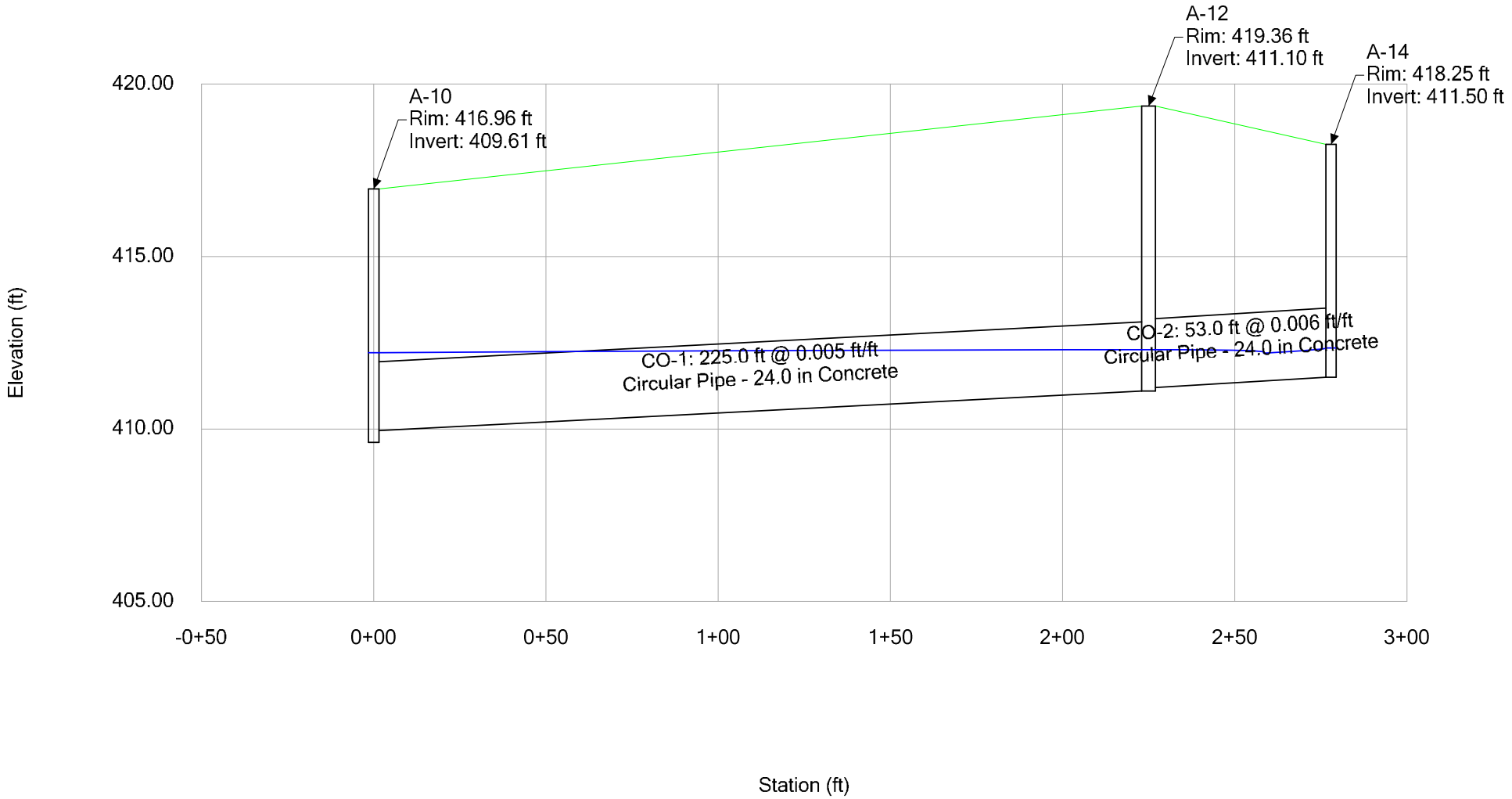
	Synchronization Details
ID	61
Label	User Defined IDF Table - 1
Modified Date	20/06/22 2:18:54 PM
Library Source	Orphan (local)
Library Modified Date	Orphan (local)
Synchronization Status	Orphan (local)
Engineering Reference Guid	Orphan (local)



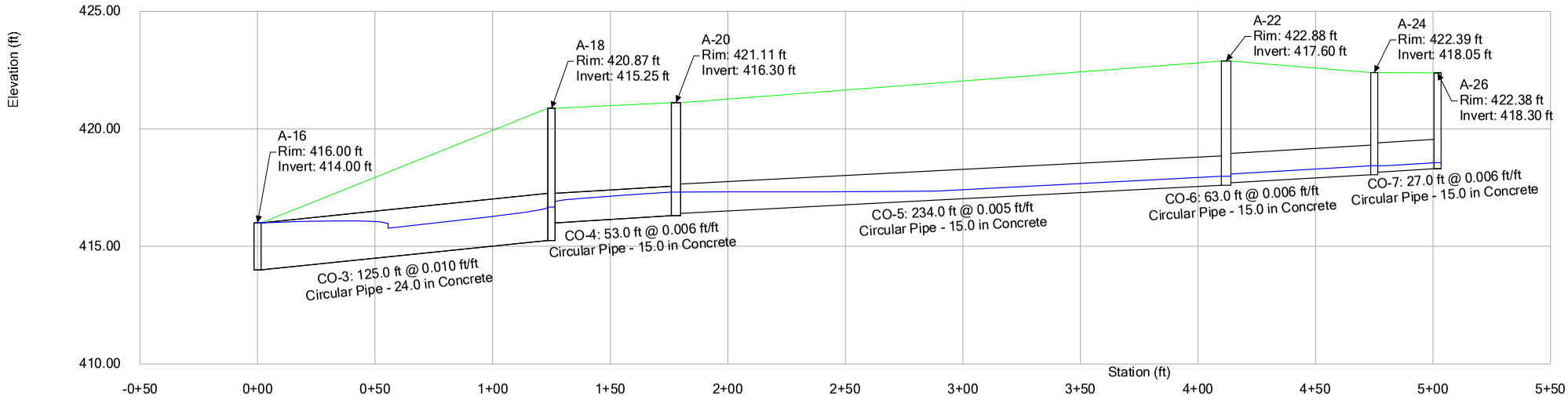
Conduit FlexTable: Combined Pipe/Node Report (Stm-A.stc)

Stop Node	Start Node	Invert (d/s) (ft)	Invert (u/s) (ft)	Diameter (in)	Material	Length (Scaled) (ft)	Slope (ft/ft)	Flow (ft^3/s)	Velocity (ft/s)	Friction Slope (ft/ft)
A-10	A-12	409.95	411.10	24.0	Concrete	224.8	0.005	5.75	4.71	0.001
A-12	A-14	411.20	411.50	24.0	Concrete	52.7	0.006	5.75	4.89	0.004
A-16	A-18	414.00	415.25	24.0	Concrete	125.2	0.010	15.46	7.75	0.008
A-18	A-20	416.00	416.30	15.0	Concrete	53.2	0.006	4.87	4.51	0.006
A-20	A-22	416.40	417.60	15.0	Concrete	234.2	0.005	0.94	2.96	0.003
A-22	A-24	417.70	418.05	15.0	Concrete	62.7	0.006	0.95	3.05	0.006
A-24	A-26	418.15	418.30	15.0	Concrete	27.4	0.006	0.44	2.44	0.005
A-28	A-30	414.75	415.70	15.0	Concrete	89.2	0.011	2.06	4.79	0.005
A-30	A-32	415.80	416.60	15.0	Concrete	80.3	0.010	2.08	4.69	0.010
A-32	A-34	416.70	417.15	15.0	Concrete	40.6	0.011	2.09	4.86	0.010
A-34	A-36	417.25	417.55	15.0	Concrete	28.3	0.011	0.82	3.69	0.009
A-18	A-38	416.00	416.30	15.0	Concrete	58.5	0.005	5.00	4.08	0.006
A-38	A-40	416.40	416.55	15.0	Concrete	30.1	0.005	3.80	4.16	0.004
A-40	A-42	416.65	417.40	15.0	Concrete	146.8	0.005	2.14	3.69	0.004
A-18	A-44	416.00	416.15	15.0	Concrete	20.7	0.007	3.02	4.56	0.007
A-44	A-46	416.25	417.15	15.0	Concrete	177.7	0.005	0.71	2.71	0.004
A-46	A-48	417.25	417.40	15.0	Concrete	27.1	0.006	0.71	2.81	0.006
A-48	A-50	417.50	417.75	15.0	Concrete	45.7	0.005	0.32	2.21	0.005
A-20	A-52	416.55	416.70	15.0	Concrete	13.4	0.012	1.97	4.87	0.005
A-20	A-54	416.40	416.60	15.0	Concrete	14.6	0.013	2.34	5.37	0.003
A-44	A-56	416.25	416.35	15.0	Concrete	17.1	0.006	2.51	4.05	0.006

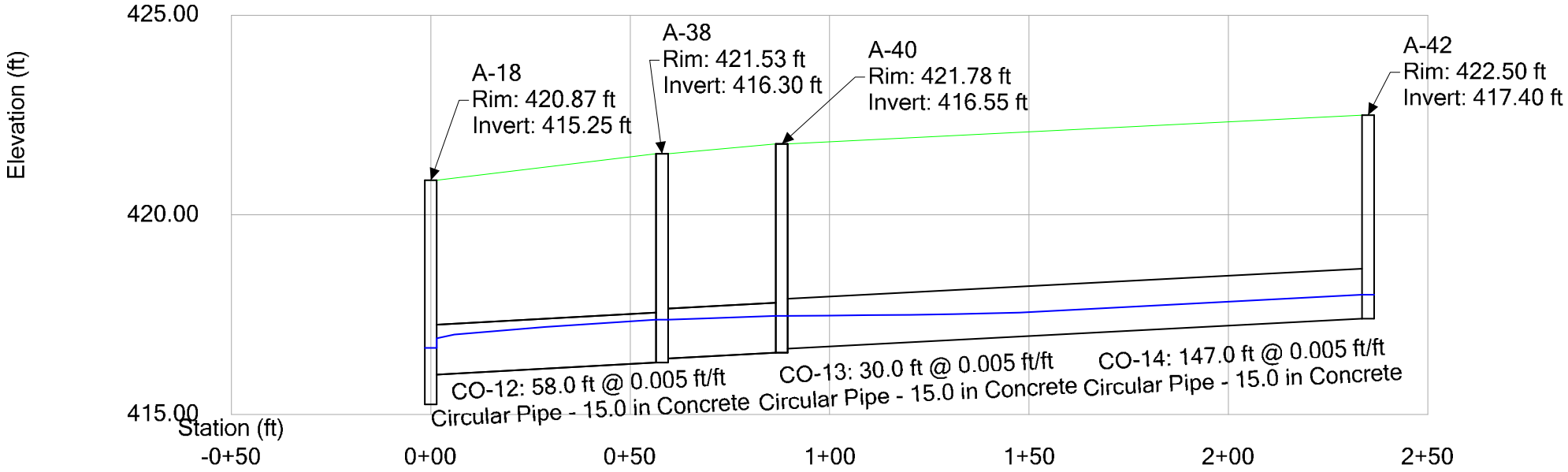
Profile Report
Engineering Profile - A-10 to A-14 (Stm-A.stc)



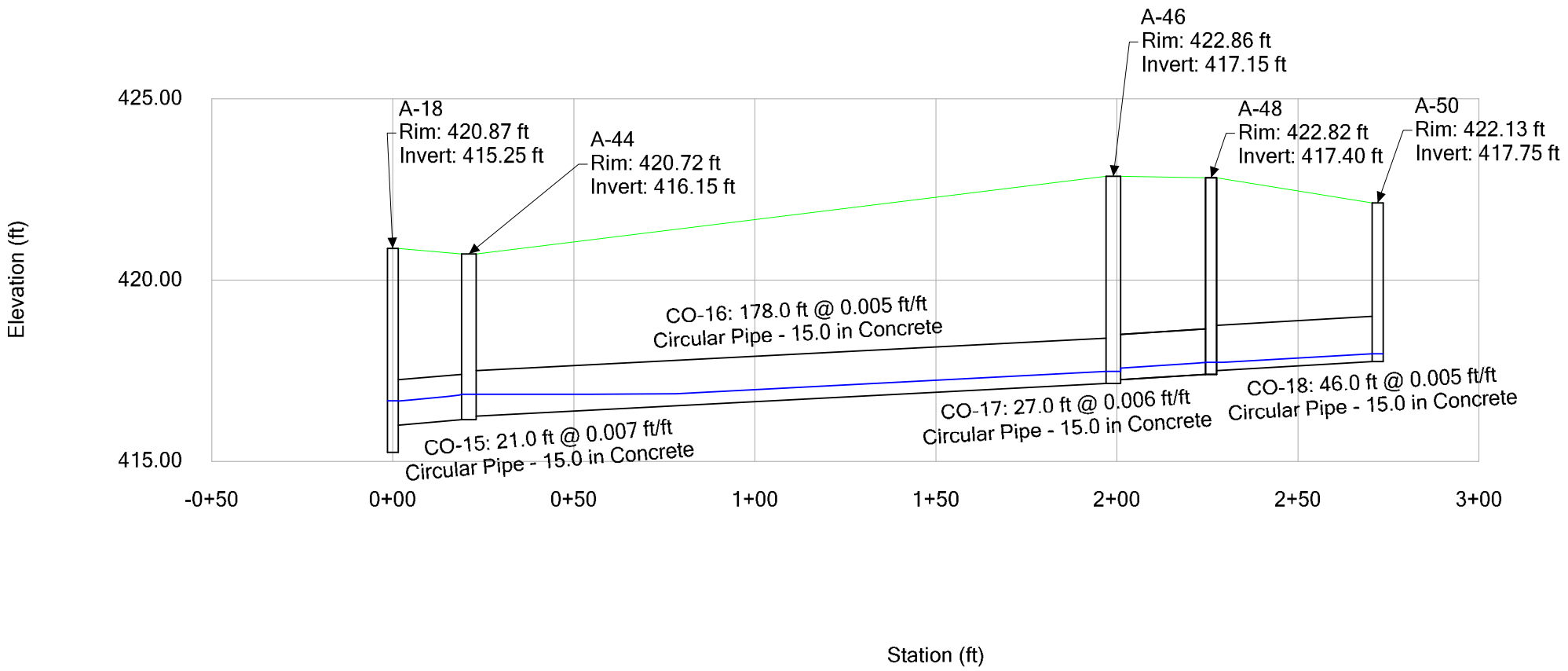
Profile Report
Engineering Profile - A-16 to A-26 (Stm-A.stc)



Profile Report
Engineering Profile - A-18 to A-42 (Stm-A.stc)

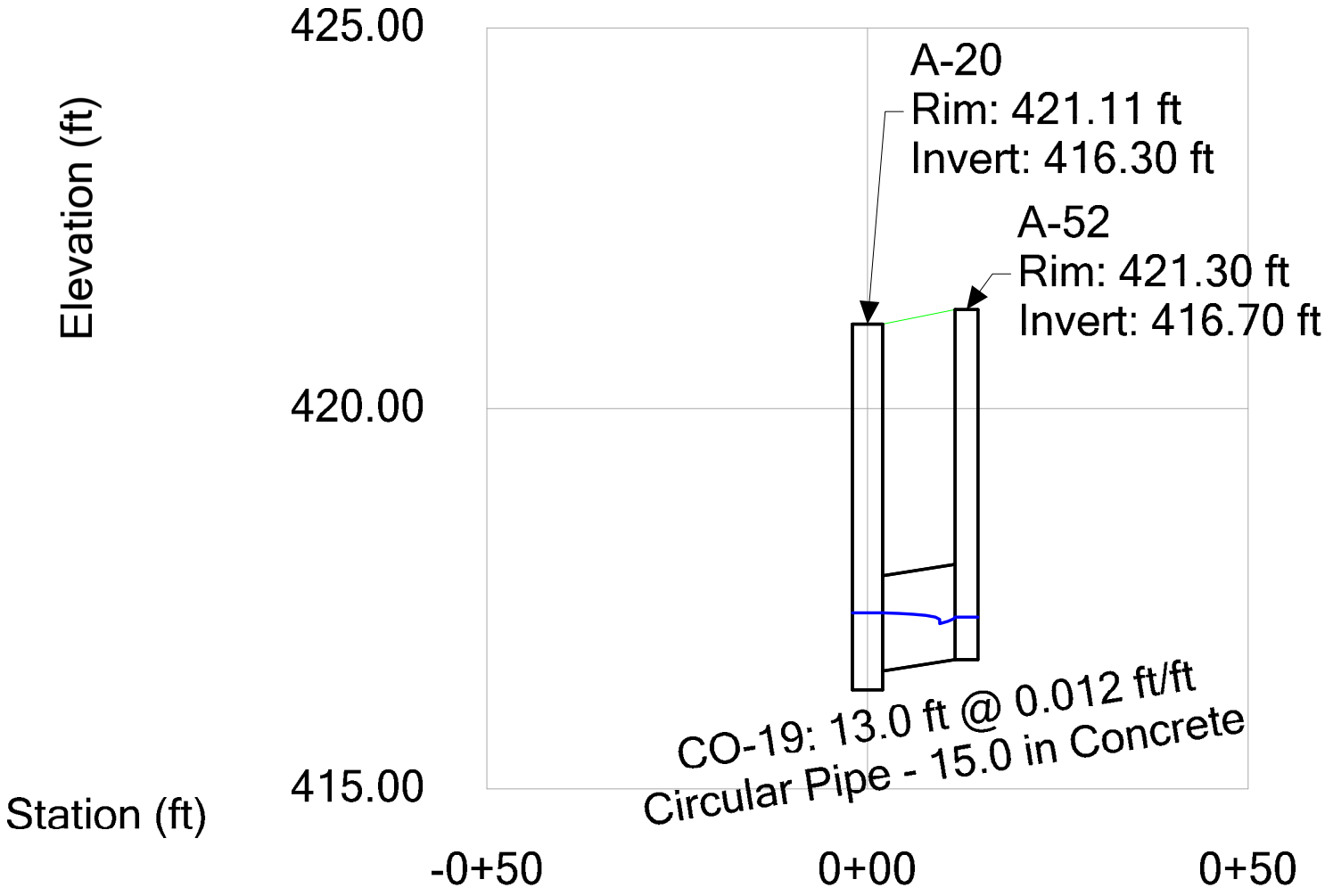


Profile Report
Engineering Profile - A-18 to A-50 (Stm-A.stc)

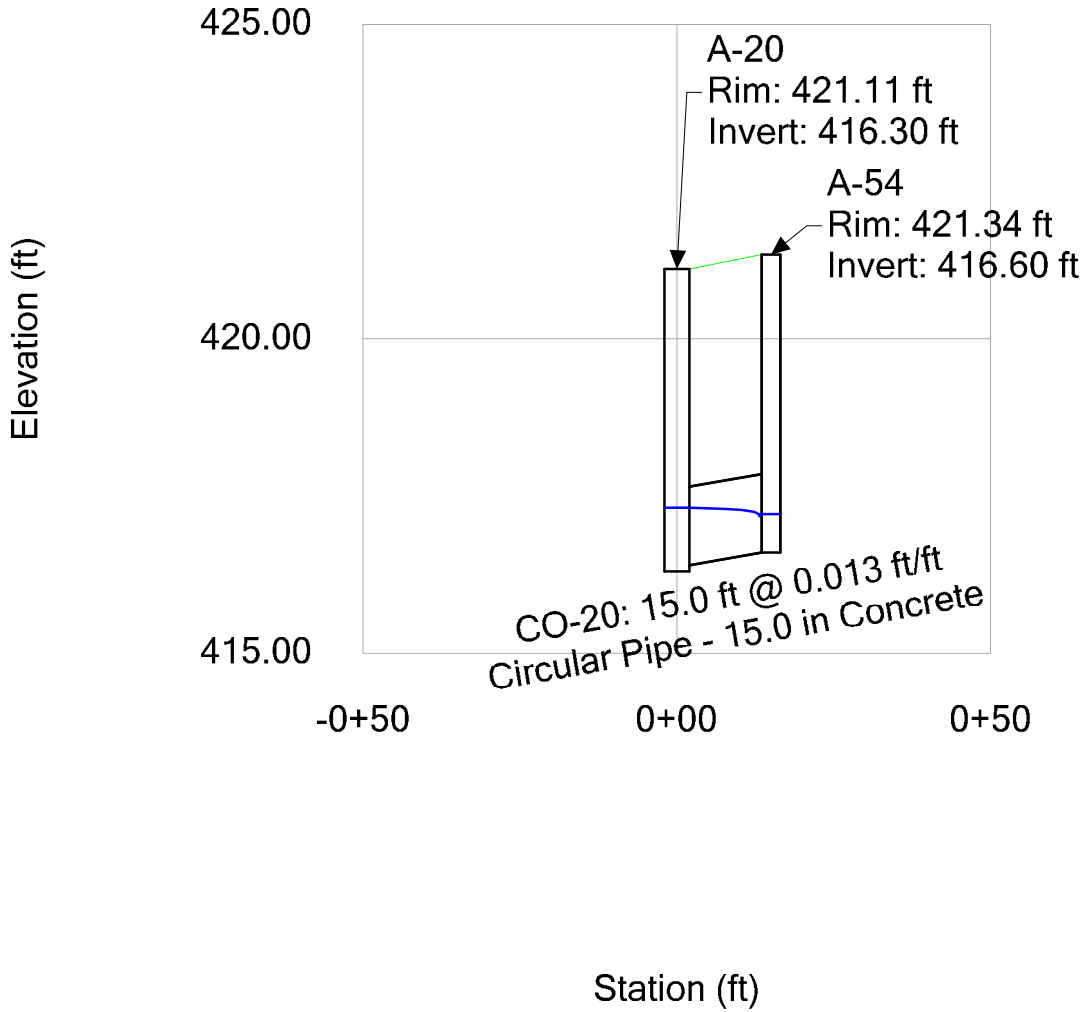


Profile Report

Engineering Profile - A-20 to A-52 (Stm-A.stc)

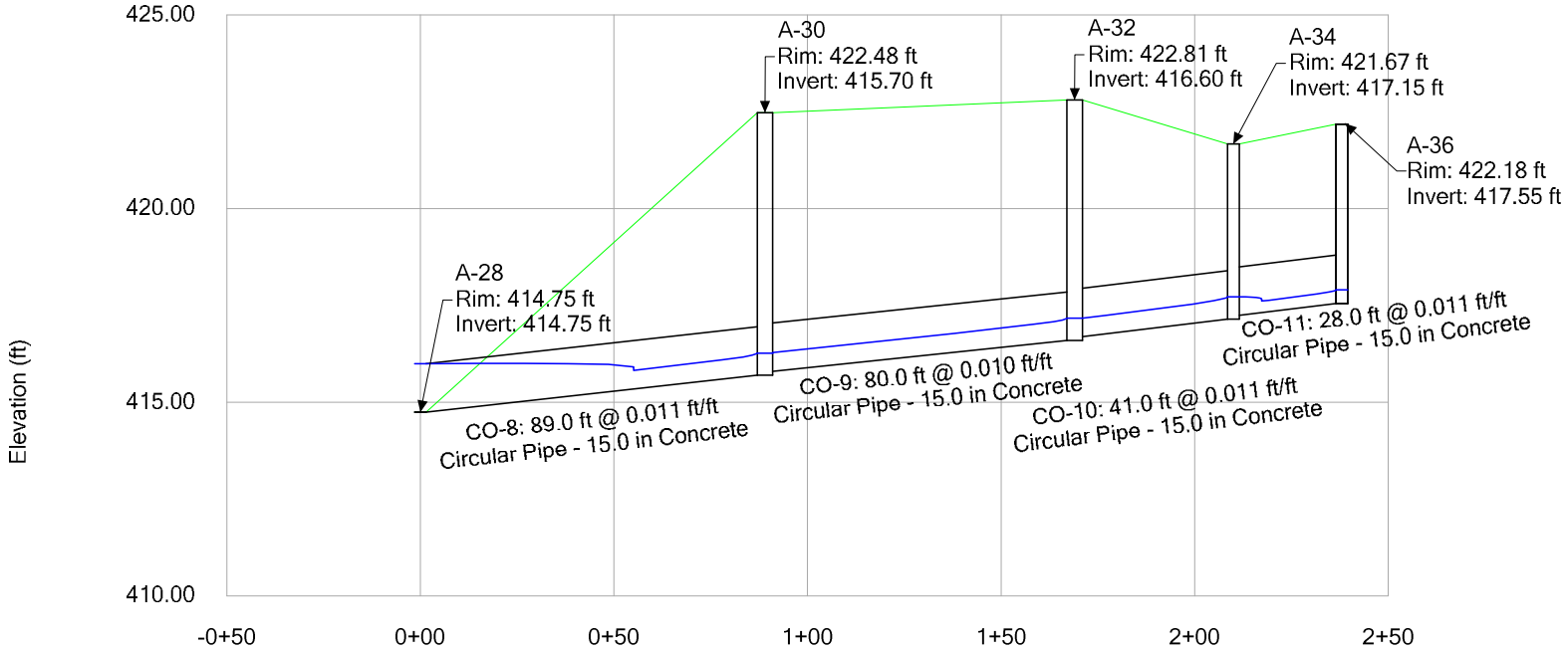


Profile Report
Engineering Profile - A-20 to A-54 (Stm-A.stc)



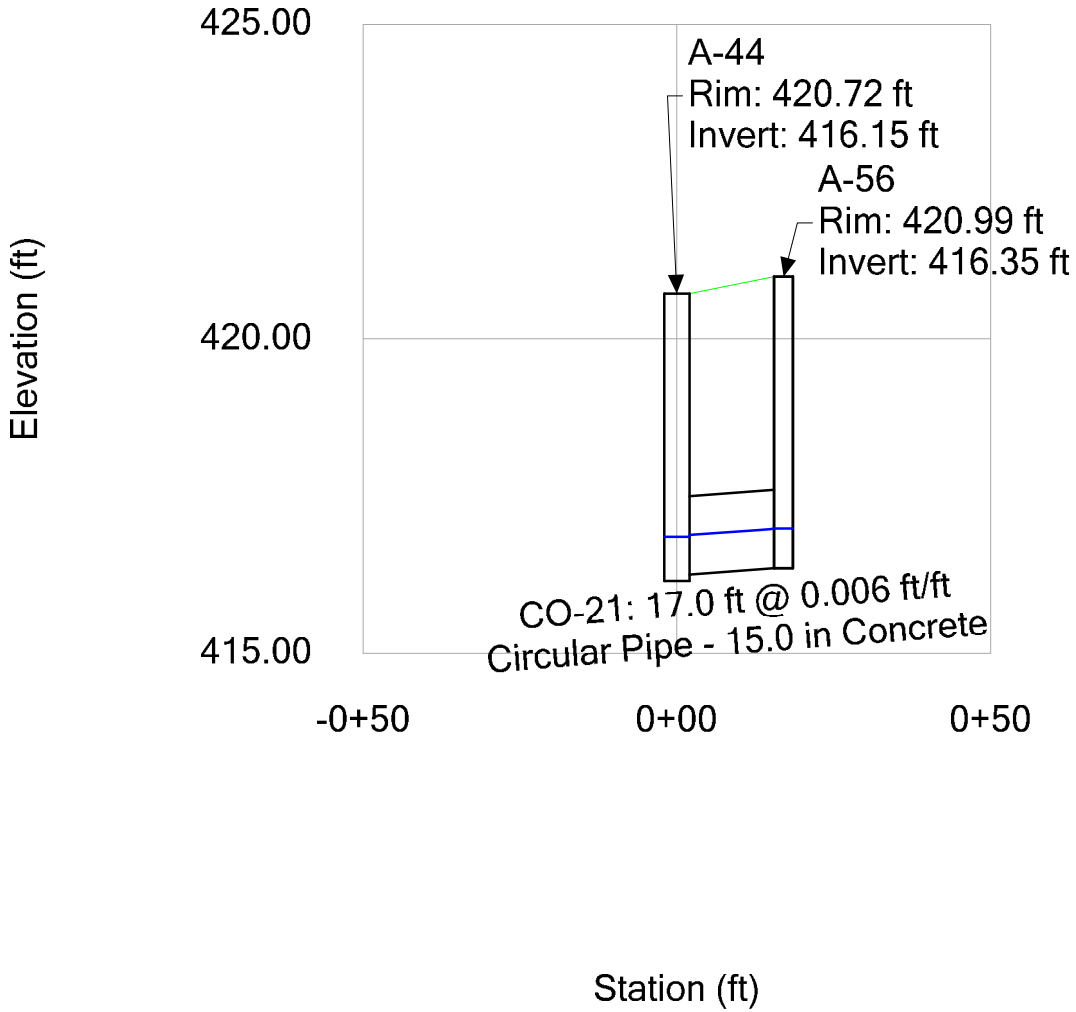
Profile Report

Engineering Profile - A-28 to A-36 (Stm-A.stc)



Profile Report

Engineering Profile - A-44 to A-56 (Stm-A.stc)



INLET SPACING CALCULATIONS

Inlet Report

A-18 (sag - double)

Combination Inlet

Location	= Sag
Curb Length (ft)	= 3.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= 6.00
Grate Width (ft)	= 2.00
Grate Length (ft)	= 3.00

Gutter

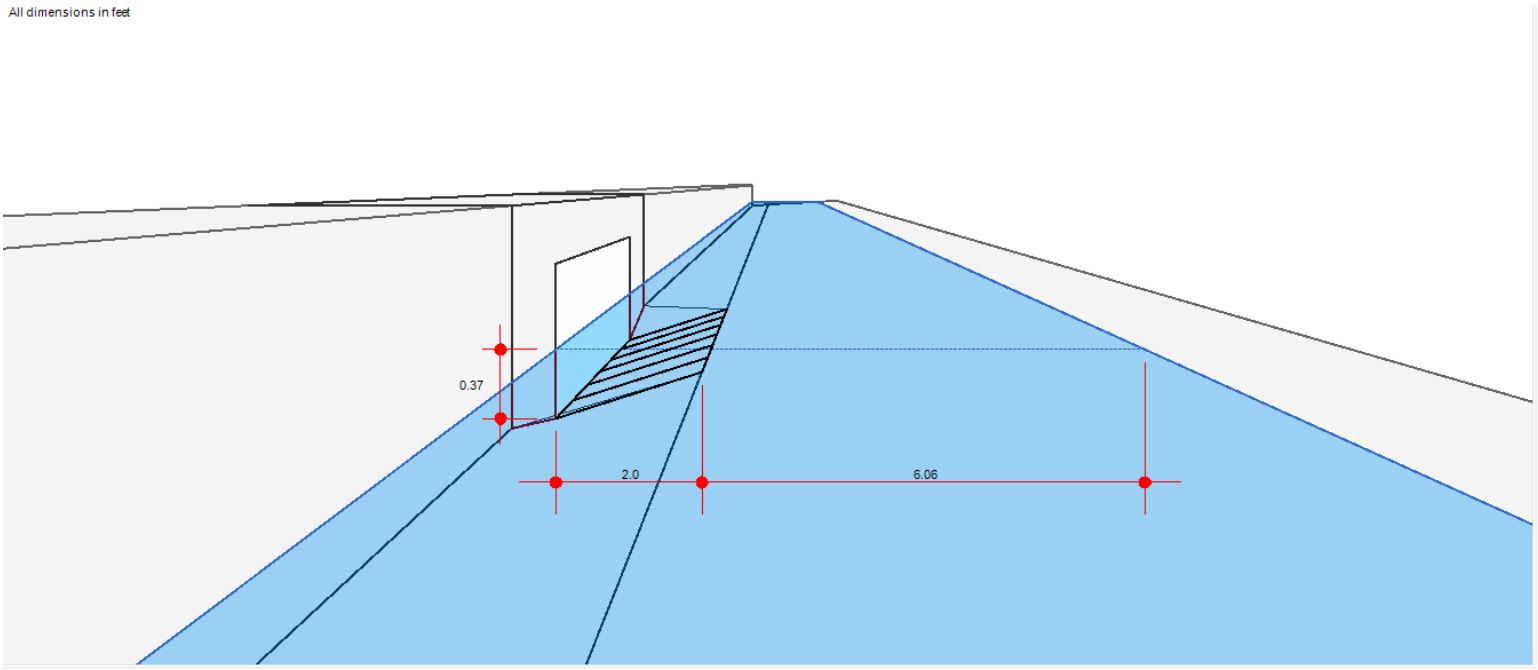
Slope, Sw (ft/ft)	= 0.042
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 2.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= -0-
Gutter n-value	= -0-

Calculations

Compute by:	Known Q
Q (cfs)	= 2.57

Highlighted

Q Total (cfs)	= 2.57
Q Capt (cfs)	= 2.57
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 4.46
Efficiency (%)	= 100
Gutter Spread (ft)	= 8.06
Gutter Vel (ft/s)	= 1.81
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



Inlet Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 22 2020

A-24

Combination Inlet

Location	= On grade
Curb Length (ft)	= 3.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= 2.00
Grate Length (ft)	= 3.00

Gutter

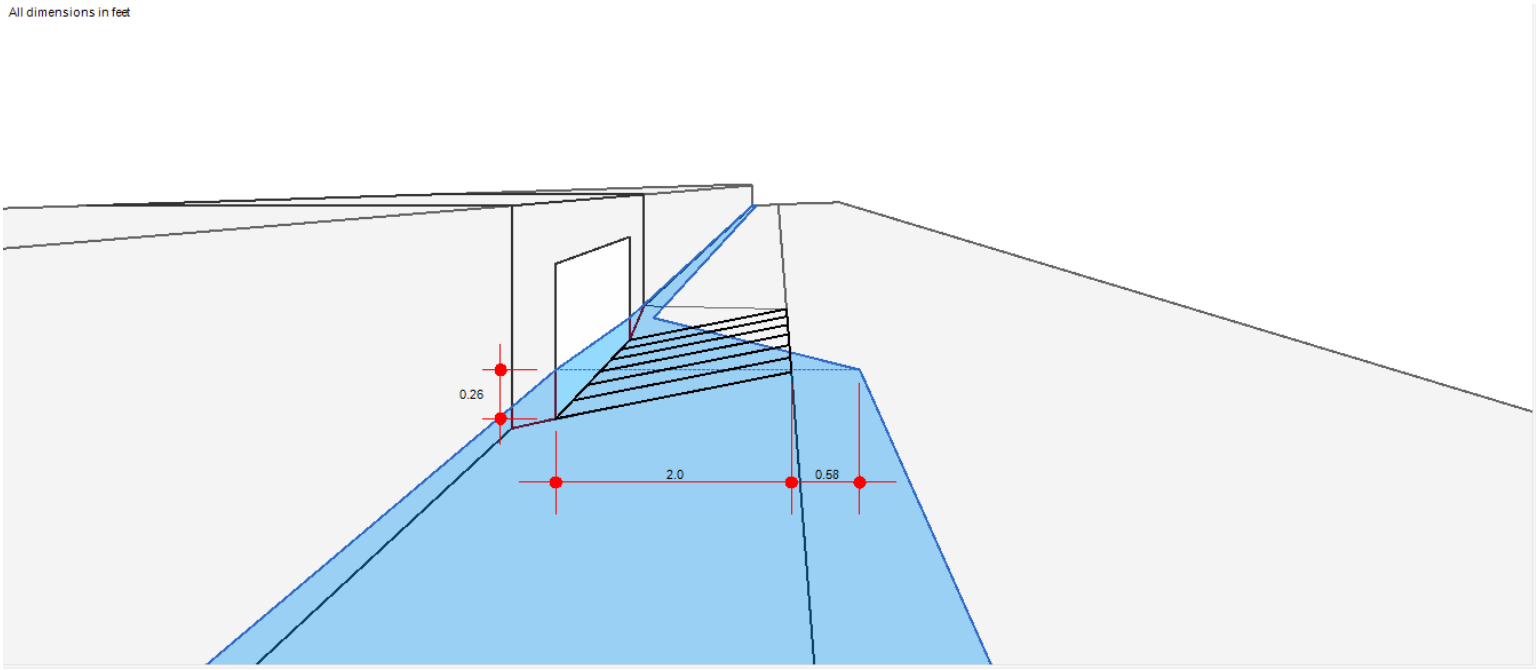
Slope, Sw (ft/ft)	= 0.042
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 2.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 1.75
Gutter n-value	= 0.013

Calculations

Compute by:	Known Q
Q (cfs)	= 0.26

Highlighted

Q Total (cfs)	= 0.26
Q Capt (cfs)	= 0.26
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 3.15
Efficiency (%)	= 100
Gutter Spread (ft)	= 2.58
Gutter Vel (ft/s)	= 2.35
Bypass Spread (ft)	= 0.31
Bypass Depth (in)	= 0.15



Inlet Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 22 2020

A-26

Combination Inlet

Location	= On grade
Curb Length (ft)	= 3.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= 2.00
Grate Length (ft)	= 3.00

Gutter

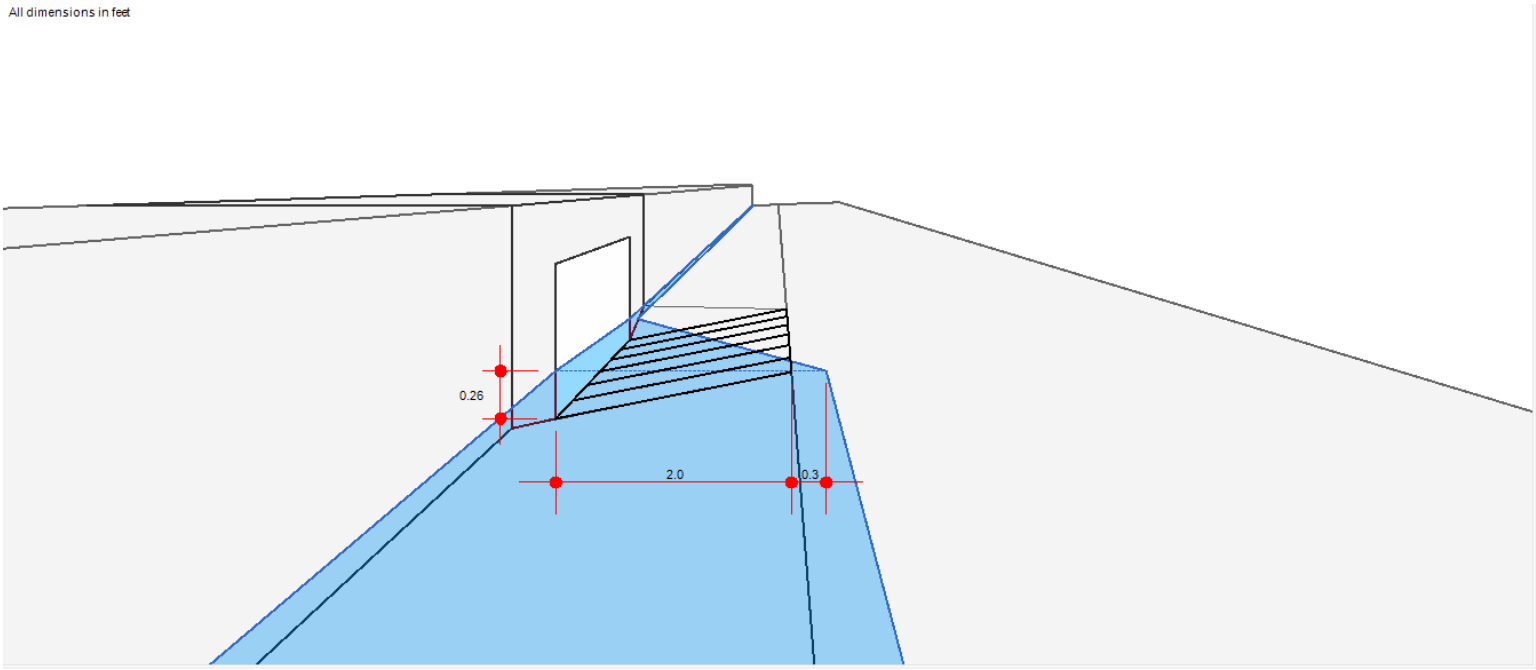
Slope, Sw (ft/ft)	= 0.042
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 2.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 1.75
Gutter n-value	= 0.013

Calculations

Compute by:	Known Q
Q (cfs)	= 0.22

Highlighted

Q Total (cfs)	= 0.22
Q Capt (cfs)	= 0.22
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 3.08
Efficiency (%)	= 100
Gutter Spread (ft)	= 2.30
Gutter Vel (ft/s)	= 2.28
Bypass Spread (ft)	= 0.10
Bypass Depth (in)	= 0.05



Inlet Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 22 2020

A-34

Combination Inlet

Location	= On grade
Curb Length (ft)	= 3.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= 2.00
Grate Length (ft)	= 3.00

Gutter

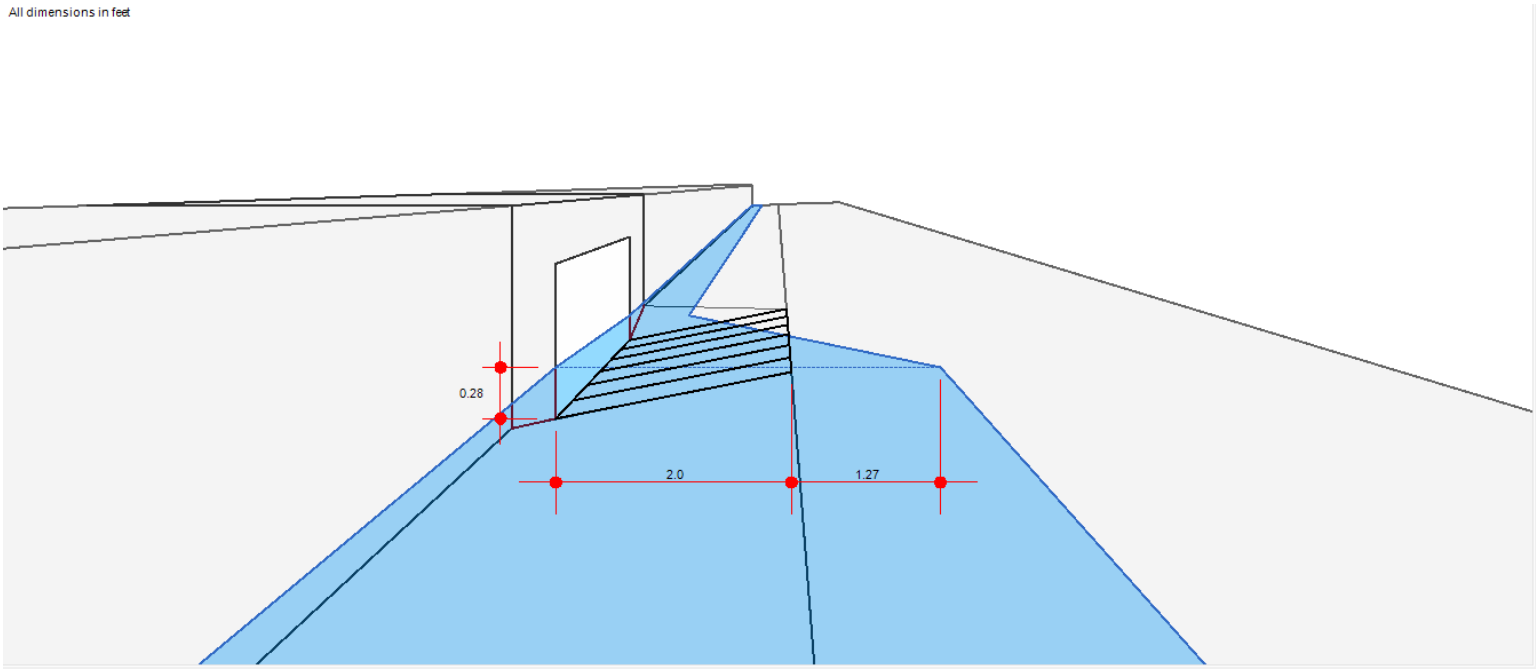
Slope, Sw (ft/ft)	= 0.042
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 2.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 5.00
Gutter n-value	= 0.013

Calculations

Compute by:	Known Q
Q (cfs)	= 0.64

Highlighted

Q Total (cfs)	= 0.64
Q Capt (cfs)	= 0.62
Q Bypass (cfs)	= 0.02
Depth at Inlet (in)	= 3.31
Efficiency (%)	= 96
Gutter Spread (ft)	= 3.27
Gutter Vel (ft/s)	= 4.25
Bypass Spread (ft)	= 0.76
Bypass Depth (in)	= 0.38



Inlet Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 22 2020

A-36

Combination Inlet

Location	= On grade
Curb Length (ft)	= 3.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= 2.00
Grate Length (ft)	= 3.00

Gutter

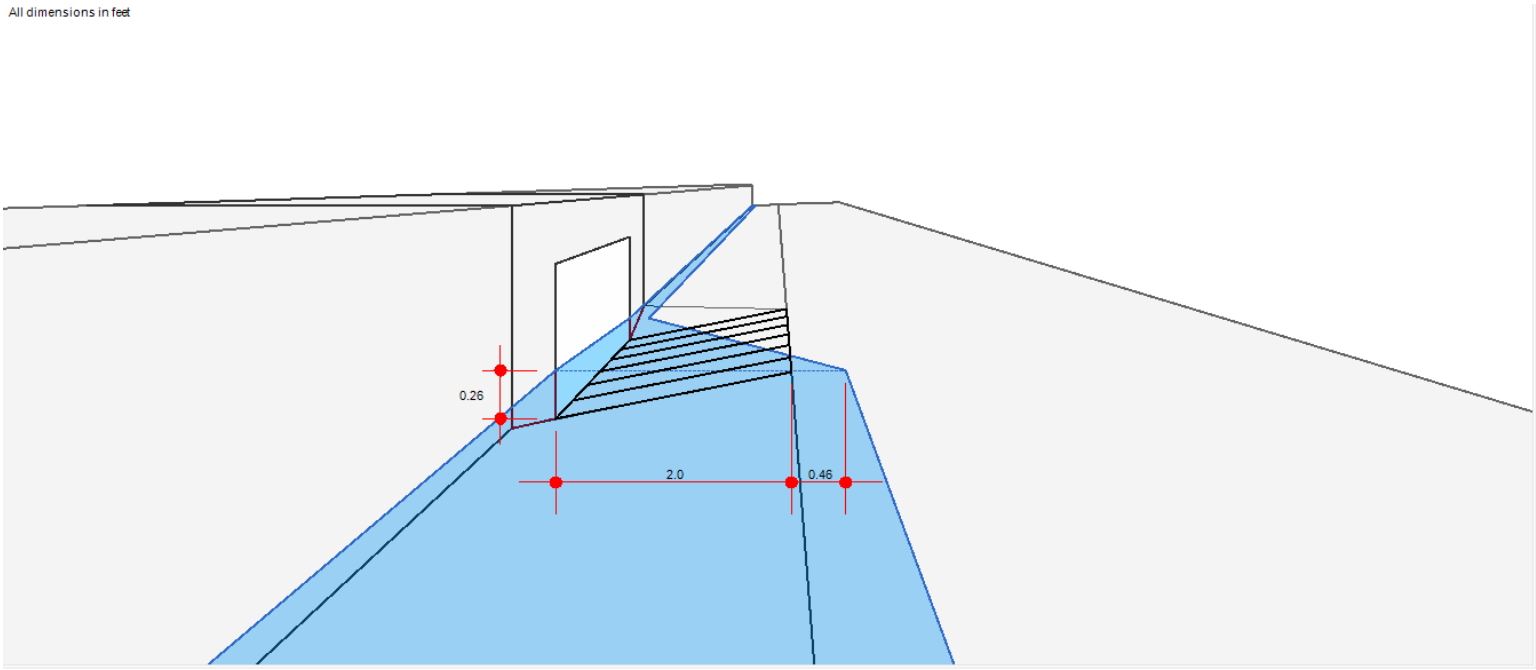
Slope, Sw (ft/ft)	= 0.042
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 2.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 5.00
Gutter n-value	= 0.013

Calculations

Compute by:	Known Q
Q (cfs)	= 0.41

Highlighted

Q Total (cfs)	= 0.41
Q Capt (cfs)	= 0.41
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 3.12
Efficiency (%)	= 100
Gutter Spread (ft)	= 2.46
Gutter Vel (ft/s)	= 3.92
Bypass Spread (ft)	= 0.25
Bypass Depth (in)	= 0.12



Inlet Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 22 2020

A-38

Combination Inlet

Location	= On grade
Curb Length (ft)	= 3.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= 2.00
Grate Length (ft)	= 3.00

Gutter

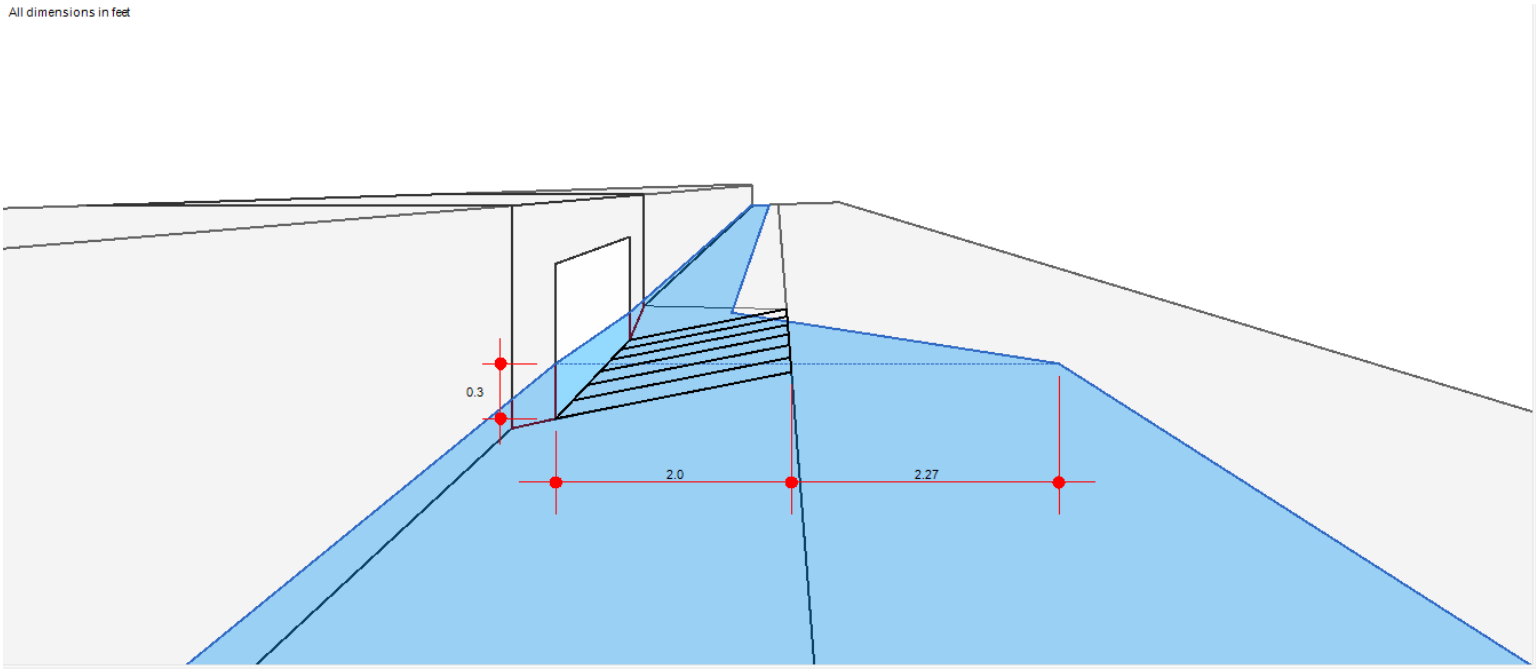
Slope, Sw (ft/ft)	= 0.042
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 2.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 1.75
Gutter n-value	= 0.013

Calculations

Compute by:	Known Q
Q (cfs)	= 0.62

Highlighted

Q Total (cfs)	= 0.62
Q Capt (cfs)	= 0.56
Q Bypass (cfs)	= 0.06
Depth at Inlet (in)	= 3.55
Efficiency (%)	= 91
Gutter Spread (ft)	= 4.27
Gutter Vel (ft/s)	= 2.74
Bypass Spread (ft)	= 1.30
Bypass Depth (in)	= 0.66



Inlet Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 22 2020

A-40

Combination Inlet

Location	= On grade
Curb Length (ft)	= 3.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= 2.00
Grate Length (ft)	= 3.00

Gutter

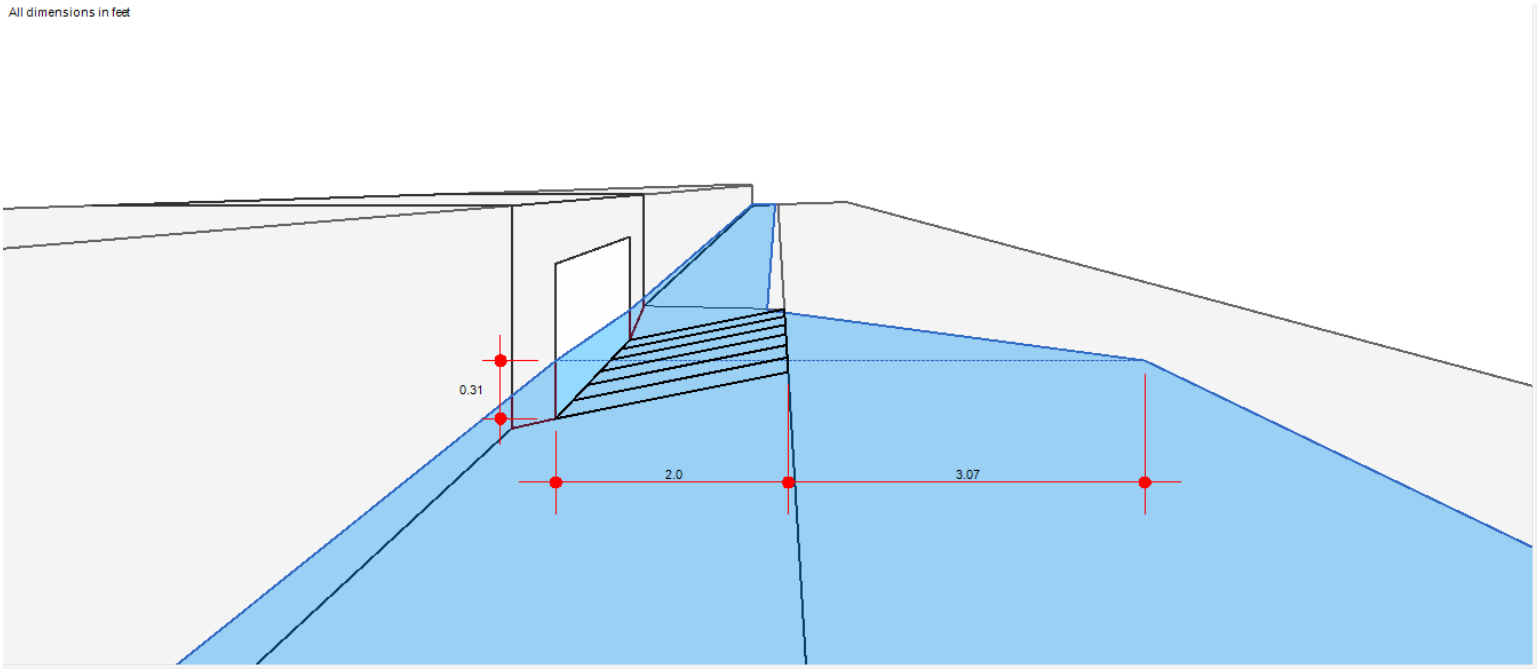
Slope, Sw (ft/ft)	= 0.042
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 2.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 1.75
Gutter n-value	= 0.013

Calculations

Compute by:	Known Q
Q (cfs)	= 0.88

Highlighted

Q Total (cfs)	= 0.88
Q Capt (cfs)	= 0.75
Q Bypass (cfs)	= 0.13
Depth at Inlet (in)	= 3.74
Efficiency (%)	= 85
Gutter Spread (ft)	= 5.07
Gutter Vel (ft/s)	= 2.92
Bypass Spread (ft)	= 1.78
Bypass Depth (in)	= 0.90



Inlet Report

A-42

Drop Grate Inlet

Location	= Sag
Curb Length (ft)	= -0-
Throat Height (in)	= -0-
Grate Area (sqft)	= 6.00
Grate Width (ft)	= 3.00
Grate Length (ft)	= 4.00

Gutter

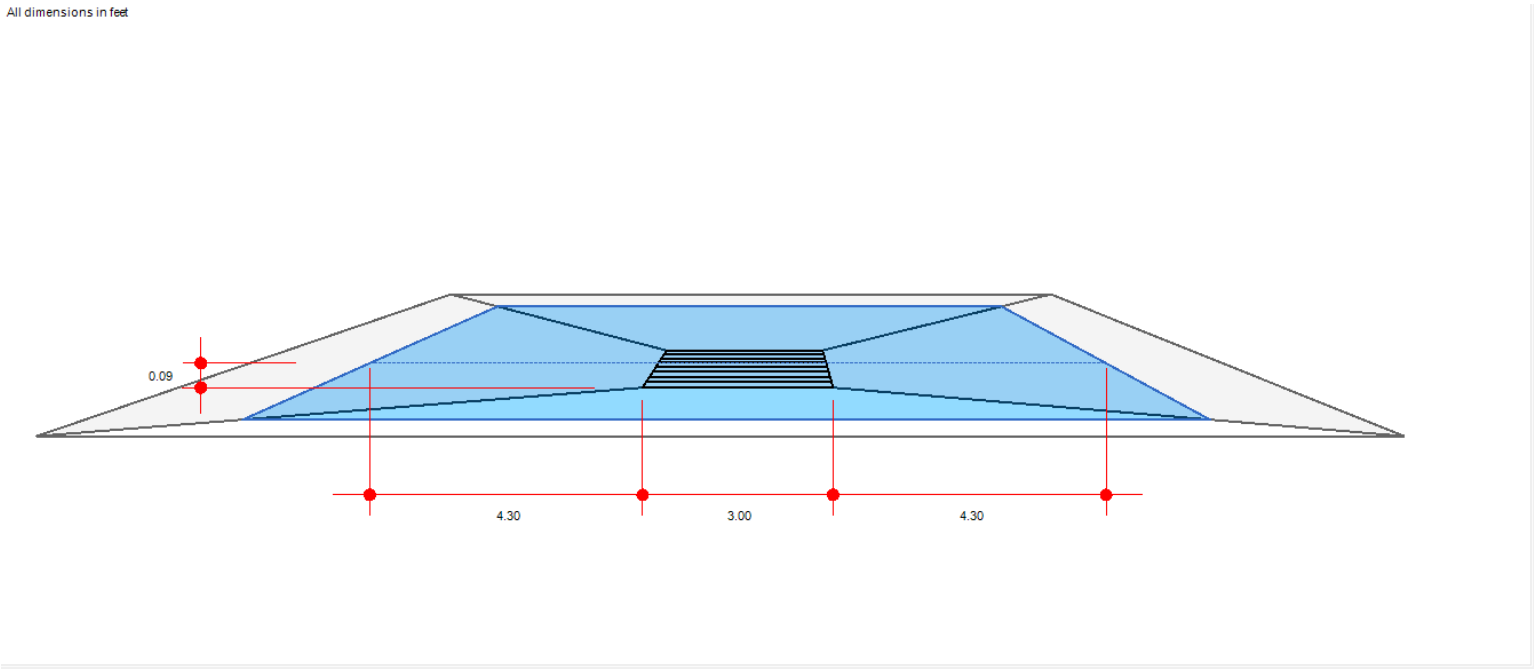
Slope, Sw (ft/ft)	= 0.020
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= -0-
Gutter Width (ft)	= 3.00
Gutter Slope (%)	= -0-
Gutter n-value	= -0-

Calculations

Compute by:	Known Q
Q (cfs)	= 1.06

Highlighted

Q Total (cfs)	= 1.06
Q Capt (cfs)	= 1.06
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 1.03
Efficiency (%)	= 100
Gutter Spread (ft)	= 11.59
Gutter Vel (ft/s)	= 2.11
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



Inlet Report

A-48

Combination Inlet

Location	= On grade
Curb Length (ft)	= 3.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= 2.00
Grate Length (ft)	= 3.00

Gutter

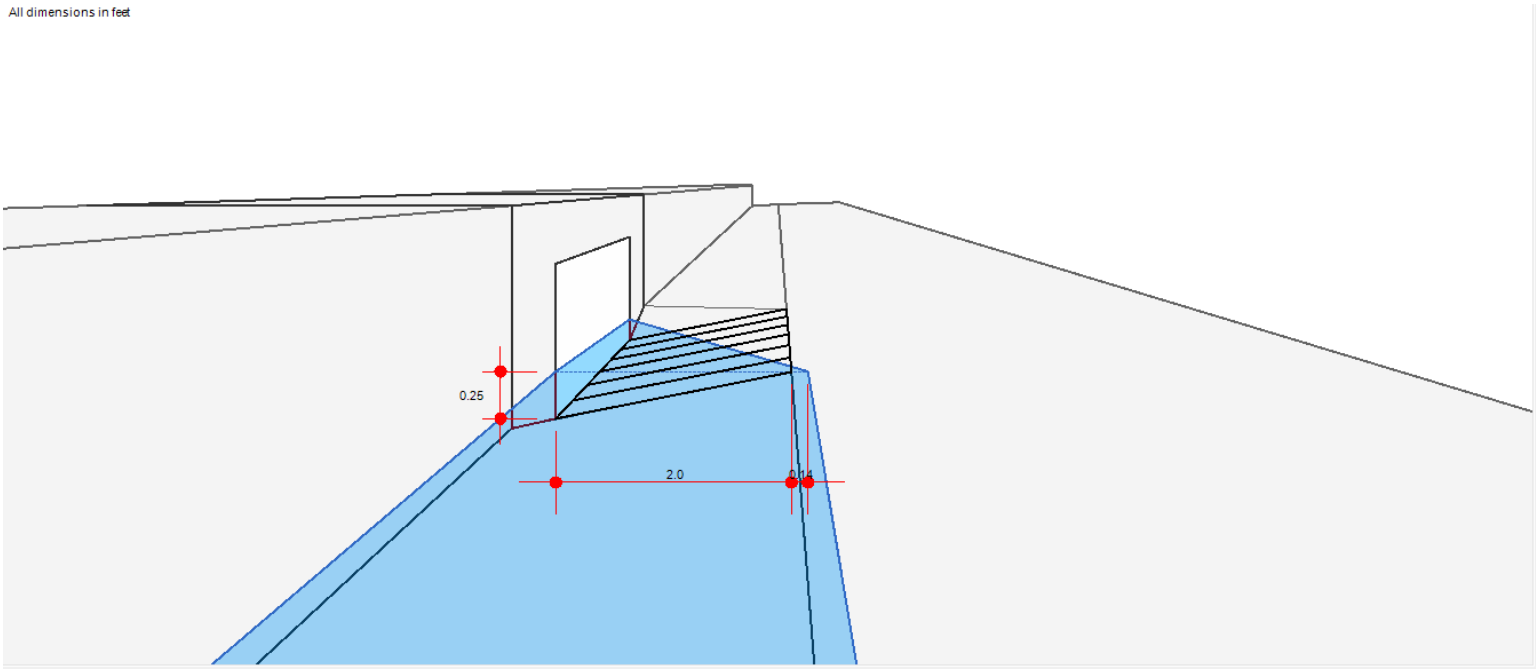
Slope, Sw (ft/ft)	= 0.042
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 2.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 1.75
Gutter n-value	= 0.013

Calculations

Compute by:	Known Q
Q (cfs)	= 0.20

Highlighted

Q Total (cfs)	= 0.20
Q Capt (cfs)	= 0.20
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 3.04
Efficiency (%)	= 100
Gutter Spread (ft)	= 2.14
Gutter Vel (ft/s)	= 2.23
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



Inlet Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 22 2020

A-50

Combination Inlet

Location	= On grade
Curb Length (ft)	= 3.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= 2.00
Grate Length (ft)	= 3.00

Gutter

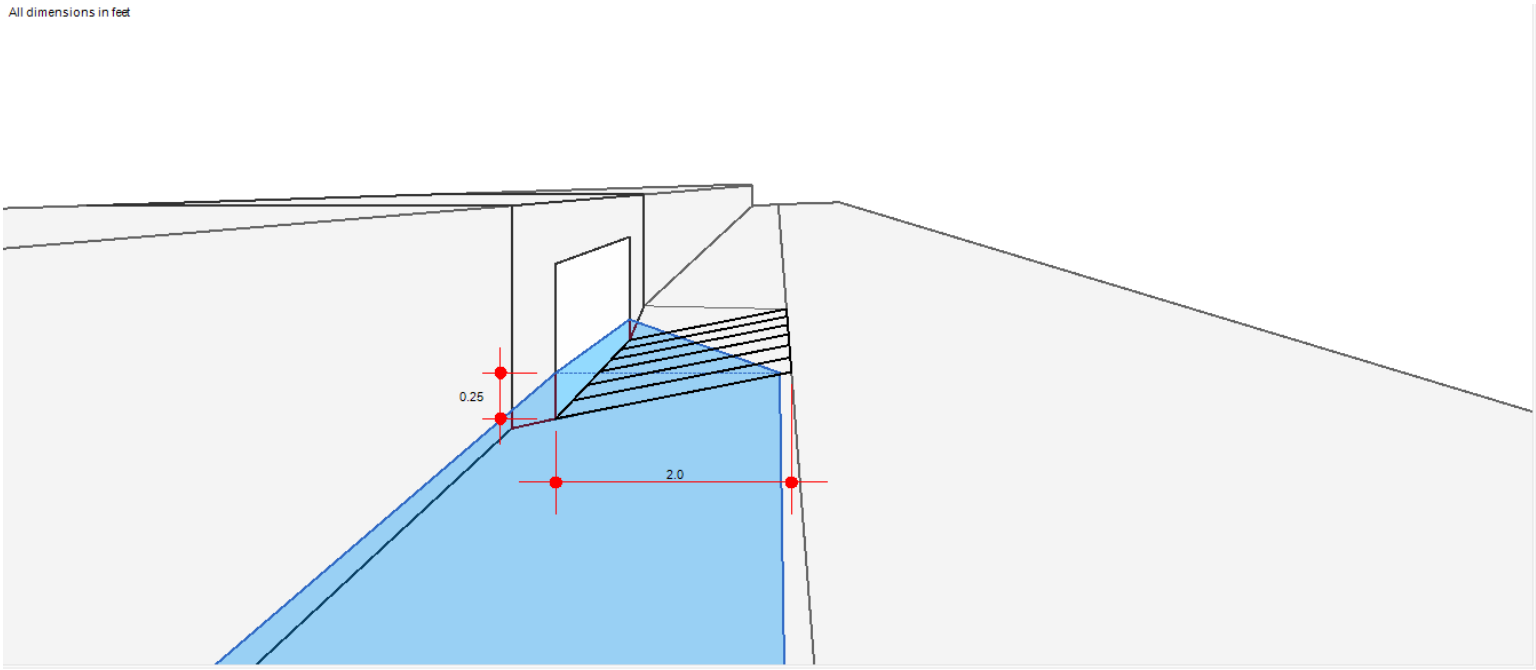
Slope, Sw (ft/ft)	= 0.042
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 2.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 1.75
Gutter n-value	= 0.013

Calculations

Compute by:	Known Q
Q (cfs)	= 0.16

Highlighted

Q Total (cfs)	= 0.16
Q Capt (cfs)	= 0.16
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 2.96
Efficiency (%)	= 100
Gutter Spread (ft)	= 1.90
Gutter Vel (ft/s)	= 2.11
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



Inlet Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 22 2020

A-52

Combination Inlet

Location	= On grade
Curb Length (ft)	= 3.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= 2.00
Grate Length (ft)	= 3.00

Gutter

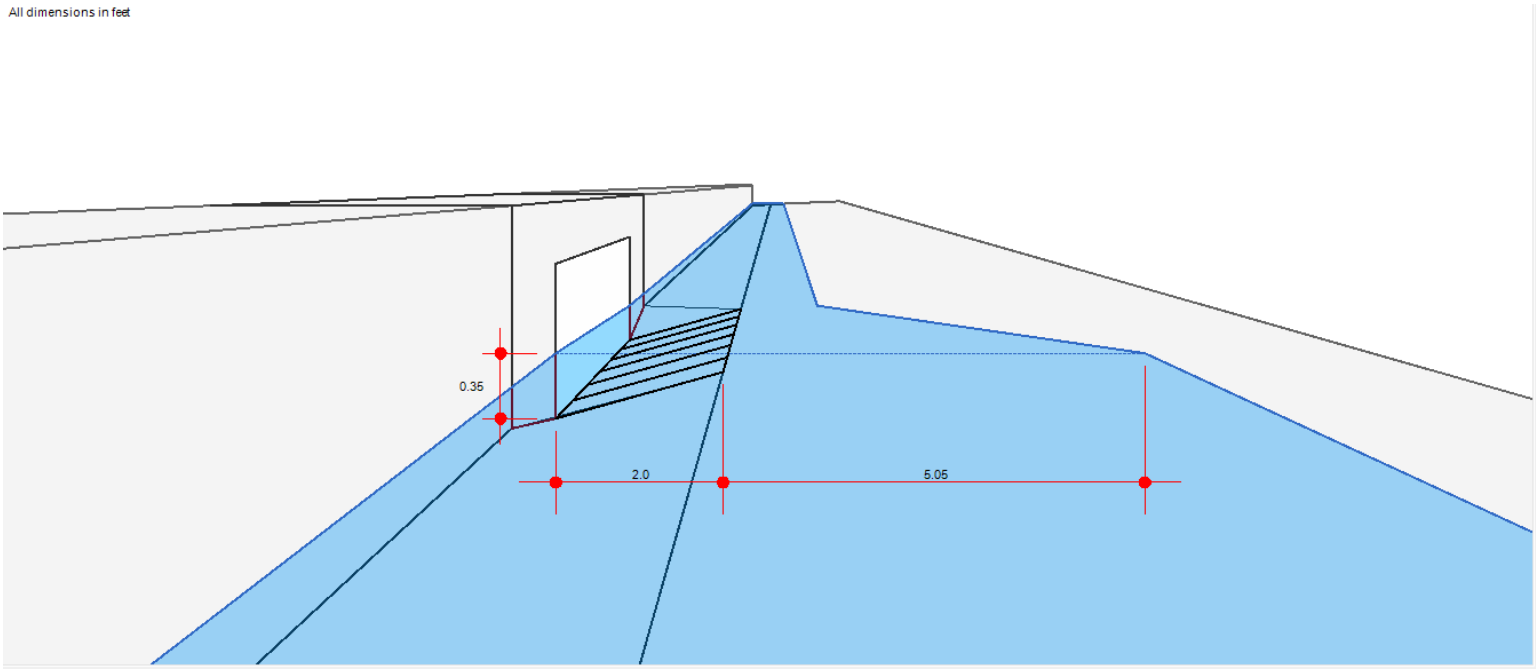
Slope, Sw (ft/ft)	= 0.042
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 2.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 0.50
Gutter n-value	= 0.013

Calculations

Compute by:	Known Q
Q (cfs)	= 0.98

Highlighted

Q Total (cfs)	= 0.98
Q Capt (cfs)	= 0.77
Q Bypass (cfs)	= 0.21
Depth at Inlet (in)	= 4.22
Efficiency (%)	= 78
Gutter Spread (ft)	= 7.05
Gutter Vel (ft/s)	= 1.81
Bypass Spread (ft)	= 3.37
Bypass Depth (in)	= 1.34



Inlet Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 22 2020

A-54

Combination Inlet

Location	= On grade
Curb Length (ft)	= 3.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= 2.00
Grate Length (ft)	= 3.00

Gutter

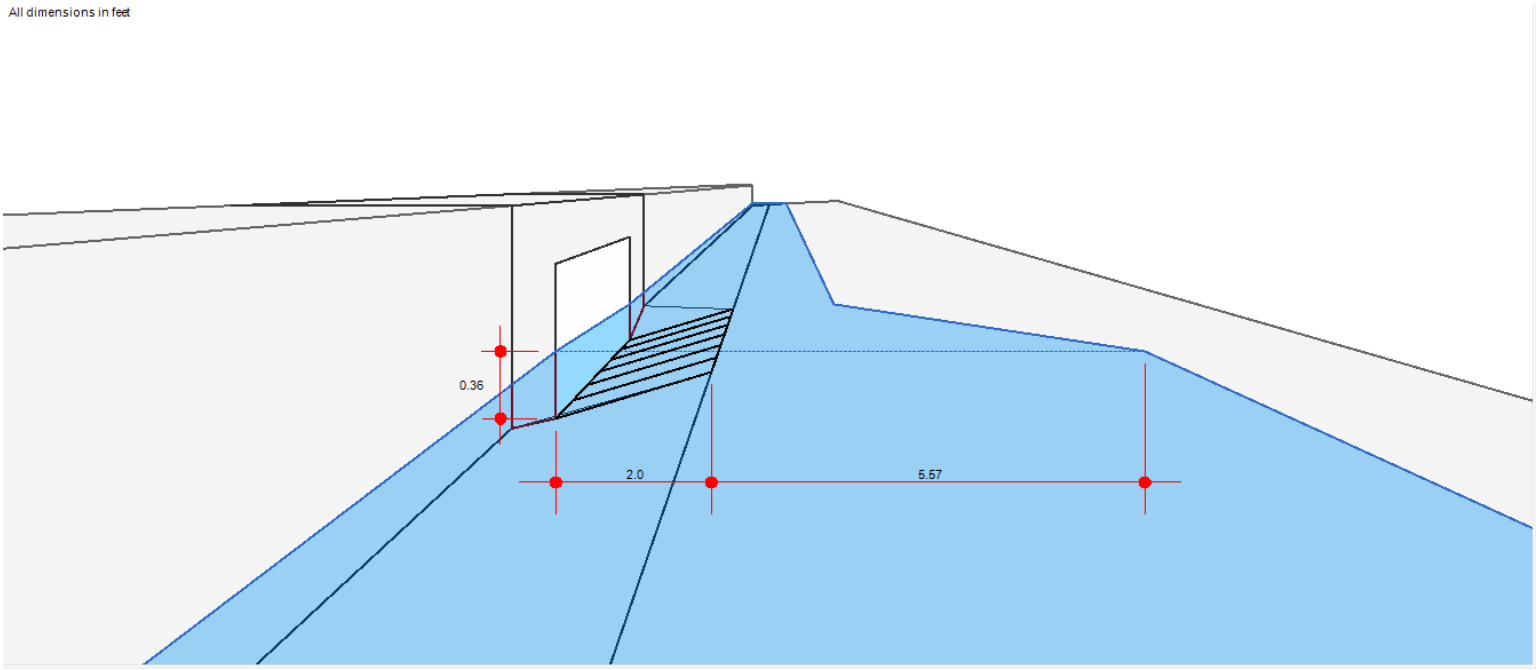
Slope, Sw (ft/ft)	= 0.042
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 2.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 0.50
Gutter n-value	= 0.013

Calculations

Compute by:	Known Q
Q (cfs)	= 1.16

Highlighted

Q Total (cfs)	= 1.16
Q Capt (cfs)	= 0.88
Q Bypass (cfs)	= 0.28
Depth at Inlet (in)	= 4.34
Efficiency (%)	= 76
Gutter Spread (ft)	= 7.57
Gutter Vel (ft/s)	= 1.88
Bypass Spread (ft)	= 3.94
Bypass Depth (in)	= 1.47



Inlet Report

A-56

Combination Inlet

Location	= On grade
Curb Length (ft)	= 3.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= 2.00
Grate Length (ft)	= 3.00

Gutter

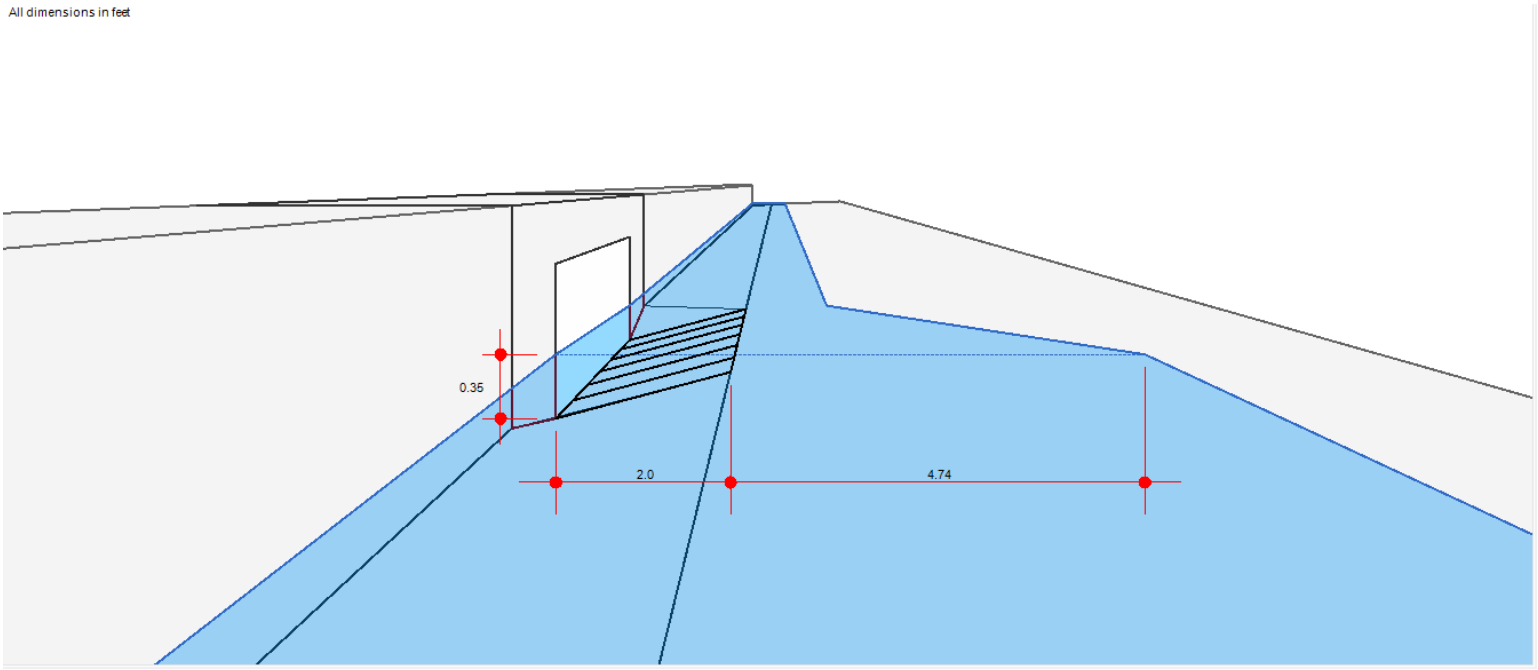
Slope, Sw (ft/ft)	= 0.042
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 2.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 1.00
Gutter n-value	= 0.013

Calculations

Compute by:	Known Q
Q (cfs)	= 1.25

Highlighted

Q Total (cfs)	= 1.25
Q Capt (cfs)	= 0.95
Q Bypass (cfs)	= 0.30
Depth at Inlet (in)	= 4.15
Efficiency (%)	= 76
Gutter Spread (ft)	= 6.74
Gutter Vel (ft/s)	= 2.51
Bypass Spread (ft)	= 3.39
Bypass Depth (in)	= 1.34



DOWNSTREAM IMPACT ANALYSIS

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 22 2020

Assumed Existing Flow

Circular

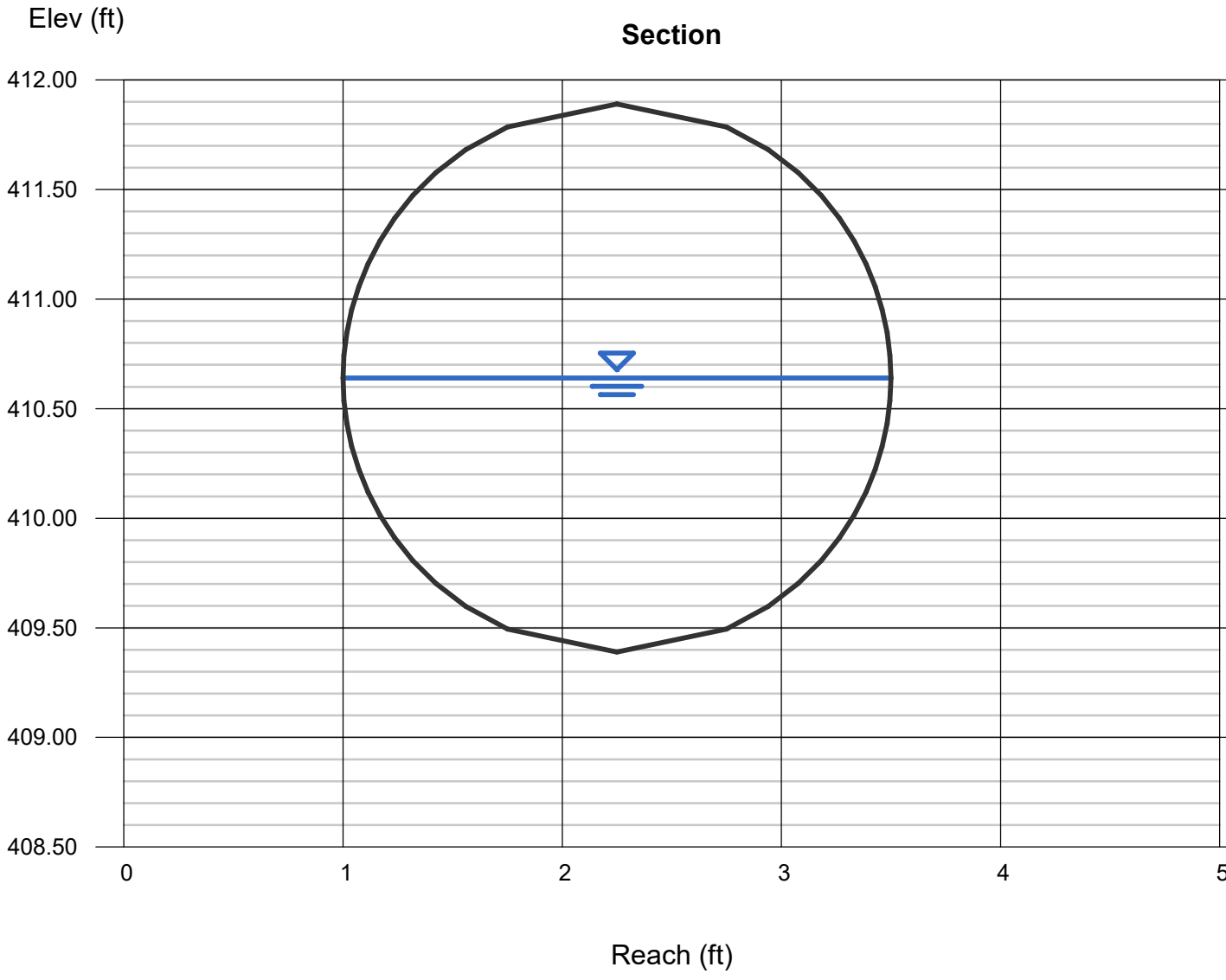
Diameter (ft)	= 2.50
Invert Elev (ft)	= 409.39
Slope (%)	= 0.68
N-Value	= 0.013

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 1.25

Highlighted

Depth (ft)	= 1.25
Q (cfs)	= 17.03
Area (sqft)	= 2.47
Velocity (ft/s)	= 6.90
Wetted Perim (ft)	= 3.94
Crit Depth, Yc (ft)	= 1.40
Top Width (ft)	= 2.50
EGL (ft)	= 1.99



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 22 2020

Existing pipe with site flow

Circular

Diameter (ft)	= 2.50
Invert Elev (ft)	= 409.39
Slope (%)	= 0.68
N-Value	= 0.013

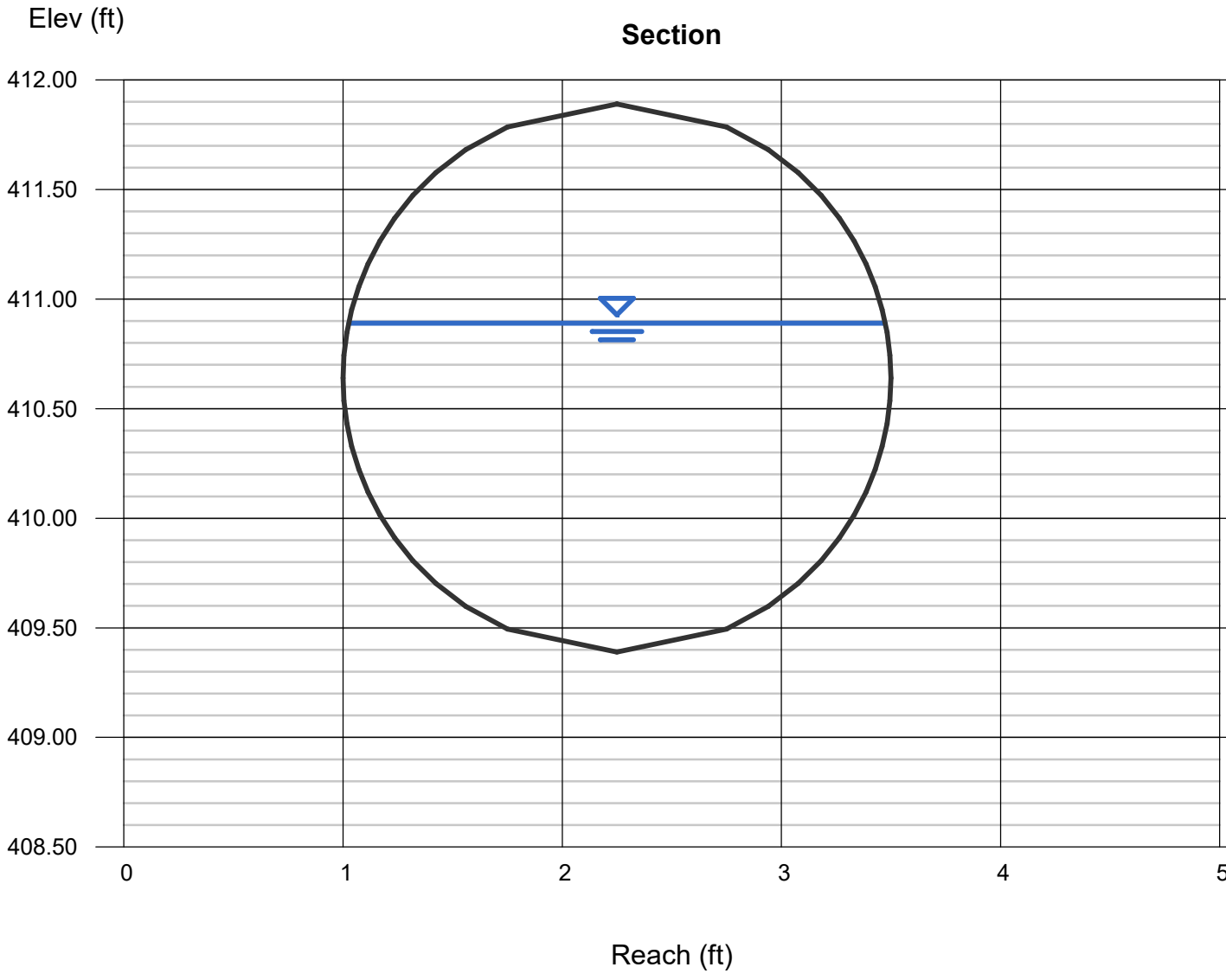
Calculations

Compute by:	Known Q
Known Q (cfs)	= 22.78

5.75 + 17.03 = **22.78**

Highlighted

Depth (ft)	= 1.50
Q (cfs)	= 22.78
Area (sqft)	= 3.08
Velocity (ft/s)	= 7.39
Wetted Perim (ft)	= 4.44
Crit Depth, Yc (ft)	= 1.63
Top Width (ft)	= 2.45
EGL (ft)	= 2.35



EROSION CONTROL CALCULATIONS

Skimmer Basin

Predevelopment

3.90 Total Drainage Area [Acres]
3.90 Disturbed Area [Acres] C = 0.50
14.02 Peak Flow from 10-year Storm [cfs] (0.5 * 7.19 * 3.9) I_{10} = 7.19 in/hr

Postdevelopment

4.75 Total Drainage Area [Acres]
4.75 Disturbed Area [Acres] C = 0.59
20.11 Peak Flow from 10-year Storm [cfs] (0.588947368421053 * 7.19 * 4.75) I_{10} = 7.19 in/hr

8,550.0 Required Volume [ft^3]
8,749.6 Required Surface Area [ft^2]

Contour	Contour Area	Incremental Volume	Accumulated Volume, S	Stage, Z	
	[ft^2]	[ft^3]	[ft^3]	[ft]	
414.00	4,071	0	0	0	Bottom
418.50	9,025	29,466	29,466	4.50	Riser top
420.25	11,306	17,790	47,256	6.25	Emergency spillway
421.75	13,402	36,444	65,910	7.75	Top of Berm

29,466.0 Actual Volume ft^3 **Okay**
9,025.0 Actual Surface Area ft^2 **Okay**

Weir Design

15 Trial Weir Length [ft] (10' min.)
6 Trial Depth of Flow [in] (6" max.)
15.9 Spillway Capacity [cfs] **Okay**
10.0 Embankment Width [ft]
1.00 Freeboard [ft]

Skimmer Design

3 Skimmer Size [in]
0.250 Head on Skimmer [ft]
3 t_d [days]
2850.00 $Q_d = V/t_d$ = 8550/3
1.57 Suggested orifice [in] = $\sqrt{[Q_d/(2310*\sqrt{H})]}$
1.5 Orifice Size [1/4 inch increments]
3.29 Dewatering Time (3-5 days) [days] **Okay**

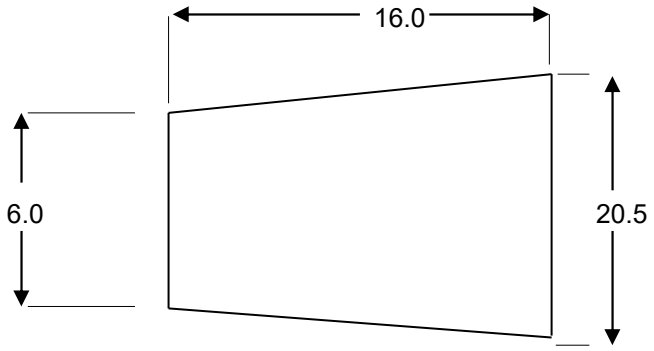
Skimmer Size	Head on Skimmer
[in]	[ft]
1.5	0.125
2	0.167
2.5	0.208
3	0.250
4	0.333
5	0.333
6	0.417
8	0.500

A-16

Sizing per "Bank and channel lining procedures" New York Department of Transportation, Division of Design and Construction, 1971

Pipe Diameter	d=	24	in	
Number of Pipes	#=	1	total	
Pipe Slope	s=	1.00	%	
Manning's number	n=	0.013		
10-year flow	Q_{10}=	13.91	cfs	
10-year velocity	V_{10}=	7.57	ft/s	
Full flow	Q_0=	22.68	cfs	
Full flow velocity	V_0=	7.22	ft/s	
Channel slope		33.33	%	**use next higher zone**

Dissipator Dimensions*				
	Zone =	3		
	Stone Filling Class =	1		
	D_0 =	2	ft	
	Entry Width ($3xD_0$) =	6.00	ft	**use 6 ft**
	Length (8xD0) =	16.00	ft	**use 16 ft**
	Width (D_0+2L*Tan(30)) =	20.48	ft	**use 20.5 ft**
	Min. Thickness =	24	in	
	d_{50} =	13	in	
	d_{MAX} (per figure 8.06e)=	9	in	**use 19.5 in**



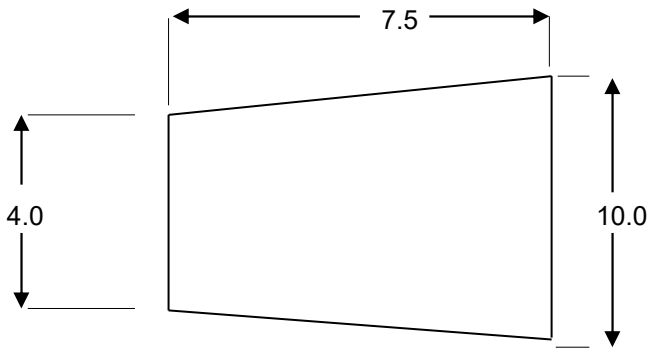
* All units are in feet

A-28

Sizing per "Bank and channel lining procedures" New York Department of Transportation, Division of Design and Construction, 1971

Pipe Diameter	d=	15	in	
Number of Pipes	#=	1	total	
Pipe Slope	s=	1.06	%	
Manning's number	n=	0.013		
10-year flow	Q_{10}=	1.85	cfs	
10-year velocity	V_{10}=	4.65	ft/s	
Full flow	Q_0=	6.67	cfs	
Full flow velocity	V_0=	5.43	ft/s	
Channel slope		33.33	%	**use next higher zone**

Dissipator Dimensions*				
	Zone =	2		
	Stone Filling Class =	B		
	D_0 =	1.25	ft	
	Entry Width ($3xD_0$) =	3.75	ft	**use 4 ft**
	Length (6xD0) =	7.50	ft	**use 7.5 ft**
	Width (D_0+2L*Tan(30)) =	9.91	ft	**use 10 ft**
	Min. Thickness =	18	in	
	d_{50} =	6	in	
	d_{MAX} (per figure 8.06e)=	1	in	**use 9 in**



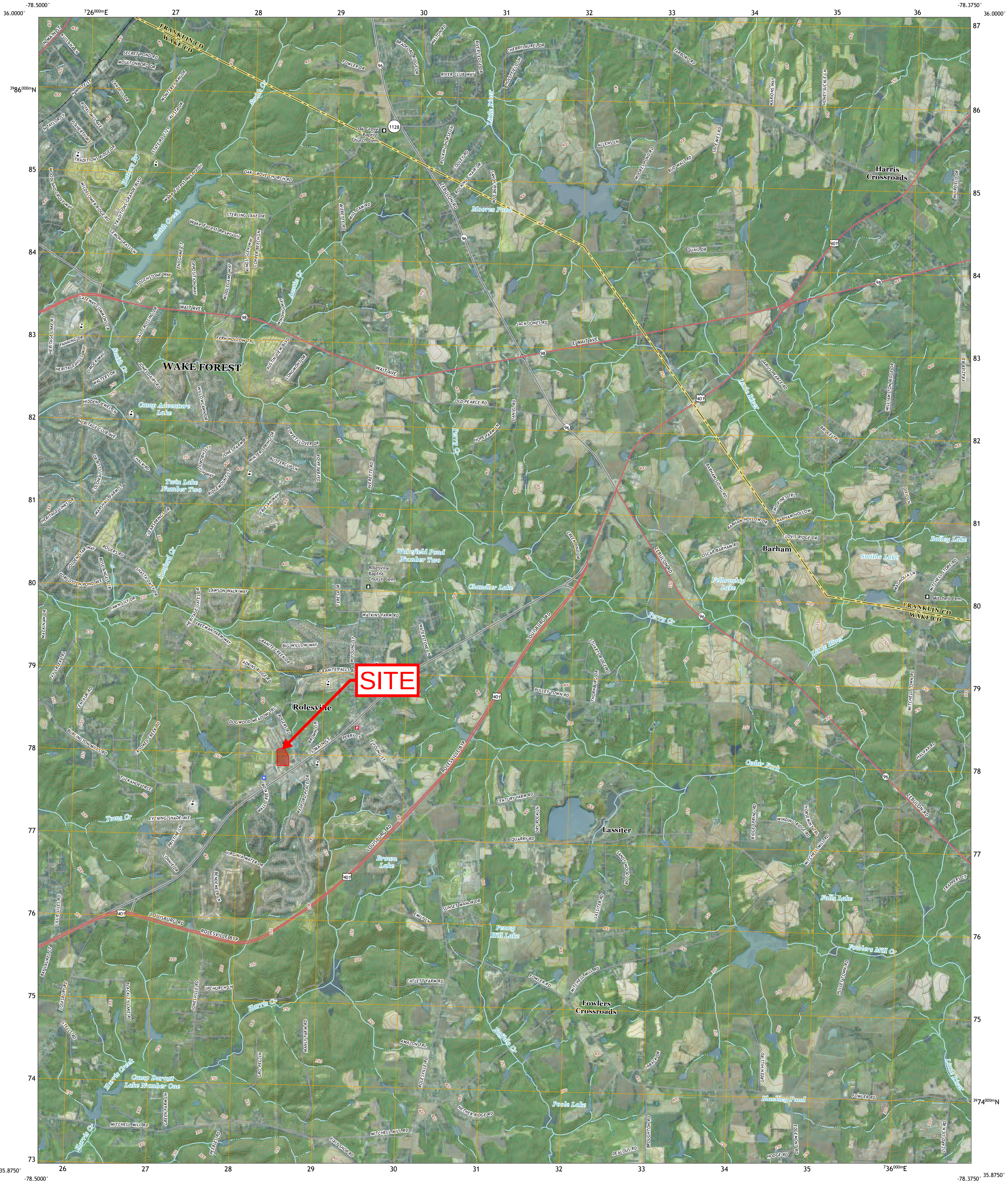
* All units are in feet

USGS QUAD MAP

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

The National Map US Topo

ROLESVILLE QUADRANGLE
NORTH CAROLINA
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid:Universal Transverse Mercator, Zone 17S
This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery....NAIP, May 2016 - November 2016
Roads....U.S. Census Bureau, 2016
Names....GNIS, 1980 - 2019
Hydrography....National Hydrography Dataset, 1899 - 2018
Contours....National Elevation Dataset, 2008
Boundaries....Multiple sources; see metadata file 2017 - 2018
Wetlands....FWS National Wetlands Inventory 1983

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
9°28´ 168 MILS; 1½° 27 MILS

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

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

QUADRANGLE LOCATION

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

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

ROLESVILLE, NC
2019

NSN. 7643016379170
NGA REF NO. USGSX24K38453


SITE
Rolesville
Rolesville Baptist Church Cem
Wakefield Pond Number Two
Chandler Lake
Brown Lake
Penny Hill Lake
Harris Cr
Sanford Cr
LOUISBURG RD
ROLESVILLE BYP
401
WATKINS FARM RD
GRANITE FALLS BL
S MAIN ST
PERRY ST
E YOUNG ST
W YOUNG ST
DOGWOOD MEADOW TRL
ROGERS RD
BROWN CIR
WALL CREEK DR
REDFORD PLACE DR
VIRGINIA WATER DR
BENDEMEER LN
LONNIE DR
PRISTINE LN
EVENING SHADE AVE
TUCKAHOE TRCE
CROOKED CREEK RD
ADKINS RIDGE RD
GRANITE CREEK DR
BIG WILLOW WAY
FREEMAN FARM WAY
HERITAGE GATES DR
LAWSON WALK WAY
TERESA DR
WATERSTONE LN
CENTURY FARM RD
QUARRY RD
DRY ROCK LN
SUNSET MANOR DR
EMILY LN
CATLETT FARM RD
UPCHURCH LN
JONESVILLE RD
BLACKLEY LAKE RD
FOWLER
FRIESAN WAY
CLEARSPRINGS DR
SHASTA DAISY DR

WAKE COUNTY SOIL SURVEY MAP


WAKE COUNTY, NORTH CAROLINA — SHEET NUMBER 22
22
N
(Joins sheet 15)
(Joins sheet 21)
(Joins sheet 23)
(Joins sheet 31)
Scale 1:15840
1 Mile
5000 Feet
Walkers Crossroads
Rolesville
Rolesville Church
SITE

E COUNTY, NORTH CAROLINA — SHEET NUMBER 22