CALN TOWNSHIP - CONDITIONAL USE HEARING

AUGUST 27, 2020

THE WILLOWS AT VALLEY RUN – MBID OF DELAWARE LLC

APPLICANT'S EXHIBITS:

A-1	Agreement of Sale dated 12/31/2019 between 2131 Lincoln Highway LLC and MBID of Delaware, LLC *[first and last pages redacted]*
A-2	Civil Plan Set dated 6/23/2020 prepared by D.L. Howell & Associates, Inc.
A-3	Architectural Renderings/Elevations prepared by Haley Donovan
A-4	Environmental Impact Study Report dated June 23, 2020 prepared by D.L. Howell & Associates, Inc.
A-5	Existing Aerial dated 6/4/2020 prepared by D.L. Howell & Associates, Inc.
A-6	Fire Dept Adequacy Letter dated 6/9/2020
A-7	Geotechnical Report dated 6/12/2020 prepared by Ingram Engineering Services, Inc.
A-8	Hydrant Flow Test Data dated 6/23/2020 from Pennsylvania American Water
A-9	Preliminary Stormwater Management Report dated 6/23/2020 prepared by D.L. Howell & Associates, Inc.
A-10	Sanitary Sewer Adequacy Letter (e-mail) dated 6/16/2020 from Scot Gill, Director of Caln Township’s Department of Wastewater Operations
A-11	Site Rendering dated 6/23/2020 prepared by D.L. Howell & Associates, Inc.
A-12	Stormwater Infiltration Report dated June of 2020 prepared by D.L. Howell & Associates, Inc.
A-13	Traffic Engineering Investigation dated 6/22/2020 prepared by F. Tavani and Associates, Inc.
A-14	Water Adequacy Letter dated 6/16/2020 from Pennsylvania American Water
A-15	CV of Frank Tavani from F. Tavani and Associates, Inc.
A-16	CV of Amanda Schneider from D.L. Howell & Associates, Inc.
A-17	Response Letter of D.L. Howell & Associates, Inc. to Review Letter of ARRO
A-18	CV of Daniel Magno from Haley Donovan
A-19	Notification Letter with Property Owner Information within 500 ft

AGREEMENT OF SALE

THIS AGREEMENT OF SALE (as it may be from time to time amended, modified, extended, renewed, substituted, and/or supplemented, this "Agreement") is made as of December 31, 2019 by and between **2131 LINCOLN HIGHWAY LLC** ("Seller"), with an address of P.O. Box 2006, Media, Pennsylvania 19063 and **MBID OF DELAWARE, LLC** ("Buyer"), with an address of 5 Powell Lane, Collingswood, NJ 08108.

1. Seller is the owner of the 3 parcels of real estate, consisting of approximately 15.05± acres in the aggregate, located at 2081, 2131, and 2213 Lincoln Highway East, Caln Township, Pennsylvania 19320, also known as Tax Parcel Numbers 39-4-57, 39-4-56, and 39-4J-40, respectively, and described on Exhibit "A" attached hereto and made a part hereof, together with the improvements thereon ("Improvements") and all rights and interests associated therewith (collectively, the "Property"). Buyer intends to develop the Property to include an aggregate minimum of 120 general occupancy multifamily apartment units, in two separate phases, as follows: (i) phase 1, currently expected to be comprised of 60-72 multifamily apartment units and related site improvements (the "Phase 1 Project"), and (ii) phase 2, currently expected to be comprised of at least 48 multifamily apartment units and related site improvements (the "Phase 2 Project" and hereinafter the Phase 1 Project and the Phase 2 Project shall be sometimes individually and/or collectively referred to as the "Project" and/or the "Projects"). It is expected that Phase 1 Project will include all or most of the land east of the stream and floodplain and the Phase 2 Project will include the land west of the stream and floodplain. The specific property lines for each phase will be formally finalized upon completion and approval of the preliminary plan for the Property. The portion of the Property to be acquired in connection with the Phase 1 Project shall be referred to as the "Phase 1 Property" and the portion of the Property to be acquired in connection with the Phase 2 Project shall be referred to as the "Phase 2 Property".

2. Subject to the terms of this Agreement, Buyer will purchase the Property from Seller, and Seller will convey the Property to Buyer, in two (2) separate phases (each phase consisting of that portion of the Property as deemed necessary by Buyer for its respective Project), for the following respective purchase prices: (i) the sum of

hereinafter the Phase 1 Purchase Price and the Phase 2 Purchase Price shall be sometimes individually and/or collectively referred to as the "Purchase Price"). The closing for the Phase 1 Property, and the payment of the Phase 1 Purchase Price, shall occur on or before

(the "Phase 1 Settlement Date"); provided, however, Buyer may (in addition to the additional extension option granted under Section 4(b) below) extend the Phase 1 Settlement Date for two periods of ninety (90) days each by making a non-refundable extension payment of

(each, an "Extension Payment"). The closing for the Phase 2 Property, and the payment of the Phase 2 Purchase Price, shall occur on or before the date which is

on the Phase 1 Property (the "Phase 2 Settlement Date" and hereinafter the Phase 1 Settlement Date and the Phase 2 Settlement Date shall be sometimes individually and/or collectively referred to as the "Settlement Date). In addition to the foregoing extension options, Buyer shall have the additional right to extend any Settlement shall be entitled to recover from the non-prevailing party all reasonable costs incurred, including, without limitation, staff time, court costs, attorneys' fees, and all other related expenses incurred in such litigation or dispute or any appeals to such litigation or dispute.

22. The parties hereto acknowledge that no provision of this Agreement will be interpreted in favor of, or against, any of the parties hereto because any such party or its counsel performed or participated in the drafting thereof. Each party acknowledges such party has participated in the negotiation of this Agreement and the drafting and preparation of this Agreement, and the parties represent and warrant that they have not been coerced into entering into this Agreement, nor has any person or entity exercised any pressure or undue influence on such party to enter into this Agreement. As a result of the foregoing, should any provision of this Agreement require judicial interpretation, the governmental entity interpreting or construing such provision shall not apply the rule of construction that a document is to be construed more strictly against one party.

23. Seller is aware that Buyer may perform one or more IRC Section 1031 tax-deferred exchanges involving the Property. Buyer requests Seller's cooperation in such an exchange and agrees to hold Seller harmless from any and all claims, costs, liabilities, or delays in time resulting from such an exchange. In that regard, Seller agrees to an assignment of this purchase and sale agreement to a qualified intermediary by the Buyer.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

IN WITNESS WHEREOF, the parties have signed, sealed and delivered this Agreement.

MBID OF DELAWARE, LLC

By: ______________________________ (SEAL)
M. Brad Ingerman
Manager

2131 LINCOLN HIGHWAY LLC

DocuSigned by:
By: ______________________________ (SEAL) 1/23/2020
3E892C39E8164E9...
Name: John McMahon
Title: Manager

DocuSigned by:
Thomas J McMahon
By: ______________________________ (SEAL) 1/24/2020
9F2F473B29964E1...
Name: Tom McMahon
Title: Manager

DocuSigned by:
By: ______________________________ (SEAL) 1/24/2020
67665A8BE42043E...
Name: Chris Yangello
Title: Manager

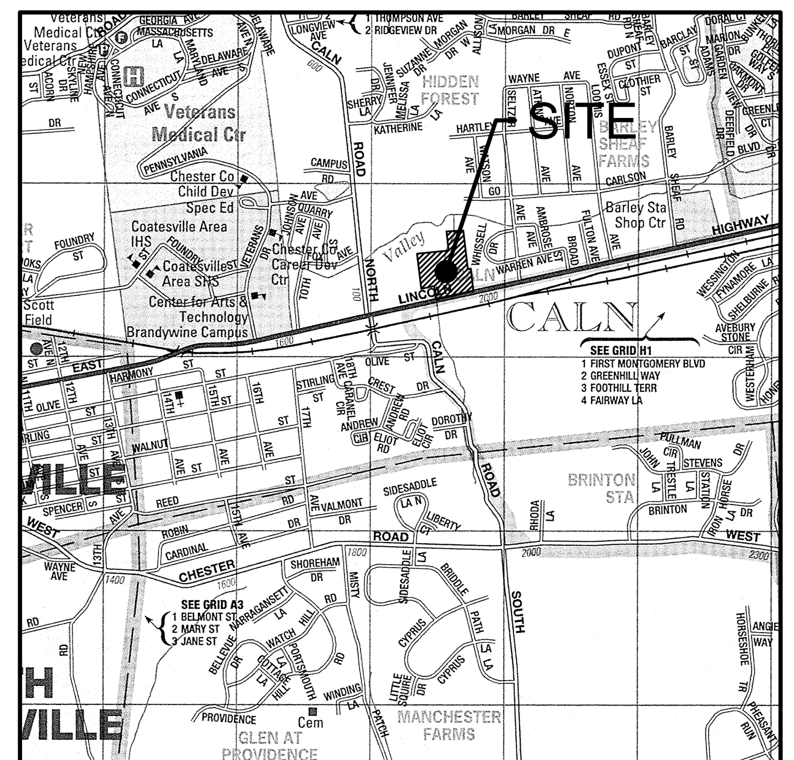
CONDITIONAL USE PLAN

FOR

THE WILLOWS AT VALLEY RUN

SITUATED IN

CALN TOWNSHIP, CHESTER COUNTY
PENNSYLVANIA



LOCATION MAP

SCALE: 1" = 2,000'

Copyright ADC The Map People ®
Permitted Use Number 20910184

GENERAL NOTES:

1. RECORD OWNER/MAILING ADDRESS:

   2131 LINCOLN HIGHWAY, LLC.
   PO BOX 2006
   MEDIA, PA 19063

2. SITE ADDRESS: 2081, 2131 AND 2213 LINCOLN HIGHWAY EAST, COATESVILLE, PA 19320

   TAX PARCELS: 39-4-57, 39-4-56, 39-4J-40

3. SOURCE OF TITLE: RECORD BOOK S43, PAGE 231 (TAX PARCEL 39-4-57)
   RECORD BOOK 6676, PAGE 2133 (TAX PARCEL 39-4-56)
   RECORD BOOK 5337, PAGE 1676 (TAX PARCEL 39-4J-40)

4. TOTAL LOT AREA: 15.175 ACRES

5. ALL TAX PARCELS ARE CONTAINED WITHIN THE C1 – HIGHWAY COMMERCIAL ZONING DISTRICT.

6. THE CONTRACTOR SHALL VERIFY THE LOCATION AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO THE START OF ANY CONSTRUCTION. THE CONTRACTOR SHALL PERFORM A PENNSYLVANIA ONE CALL IN ACCORDANCE WITH PA ACT 199.

7. D.L. HOWELL & ASSOCIATES, INC. DOES NOT GUARANTEE THE ACCURACY OF THE LOCATIONS OF THE EXISTING SUBSURFACE UTILITY STRUCTURES SHOWN ON THE PLANS. NOR DOES D.L. HOWELL & ASSOCIATES, INC. GUARANTEE THAT ALL SUBSURFACE STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL VERIFY THE LOCATION AND ELEVATION OF ALL UNDERGROUND UTILITIES PRIOR TO THE START OF THE WORK.

8. LOCATION OF ALL EXISTING AND PROPOSED SERVICES ARE APPROXIMATE AND MUST BE CONFIRMED INDEPENDENTLY WITH LOCAL UTILITY COMPANIES PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION OR EXCAVATION. IT SHALL BE THE CONTRACTOR'S FULL RESPONSIBILITY TO CONTACT THE VARIOUS UTILITY COMPANIES TO LOCATE THEIR FACILITIES PRIOR TO STARTING CONSTRUCTION IN ACCORDANCE WITH PENNSYLVANIA ACT 287 OF 1974 AS AMENDED BY PENNSYLVANIA ACT 187 OF 1996, "ONE CALL" SYSTEM. NO EXTRA COMPENSATION SHALL BE PAID TO THE CONTRACTOR FOR DAMAGE AND REPAIR TO THESE FACILITIES CAUSED BY HIS WORK FORCE. SANITARY SEWER, WATER, ELECTRIC, GAS AND ALL OTHER UTILITY SERVICES CONNECTION POINTS SHALL BE CONFIRMED INDEPENDENTLY BY THE CONTRACTOR IN THE FIELD PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, ALL DISCREPANCIES SHALL BE REPORTED IMMEDIATELY IN WRITING TO THE ENGINEER. CROSSINGS WITH EXISTING UNDERGROUND INSTALLATIONS SHALL BE FIELD VERIFIED BY TEST PIT PRIOR TO COMMENCEMENT OF CONSTRUCTION.

9. IF THE CONTRACTOR DEVIATES FROM THE PLANS AND SPECIFICATIONS, INCLUDING THE NOTES CONTAINED THEREON, WITHOUT FIRST OBTAINING PRIOR WRITTEN AUTHORIZATION FOR SUCH DEVIATIONS FROM THE OWNER AND ENGINEER, IT SHALL BE RESPONSIBLE FOR THE PAYMENT OF ALL COSTS TO CORRECT ANY WORK DONE. ALL FINES OR PENALTIES ASSESSED WITH RESPECT THERETO AND ALL COMPENSATORY OR PUNITIVE DAMAGES RESULTING FROM IT SHALL INDEMNIFY AND HOLD THE OWNER AND ENGINEER HARMLESS FROM ALL SUCH COSTS TO CORRECT ANY SUCH WORK AND FROM ALL SUCH FINES AND PENALTIES, COMPENSATIONS AND PUNITIVE DAMAGES AND COSTS OF ANY NATURE RESULTING THEREFROM.

REFERENCE PLAN(S)

1. BOUNDARY AND TOPOGRAPHICAL INFORMATION TAKEN FROM ALTA/ACSM LAND TITLE SURVEY PLAN PREPARED BY CONTROL POINT ASSOCIATES, INC., DATED 7/13/2010, PREPARED FOR ZOMMICK MCMAHON COMMERCIAL REAL ESTATE, INC.. WETLANDS BOUNDARIES AND OTHER EXISTING FEATURES TAKEN FROM THE ABOVE MENTIONED PLAN.

RECORD OWNER

2131 LINCOLN HIGHWAY, LLC.
PO BOX 2006
MEDIA, PA 19063

APPLICANT/EQUITABLE OWNER

MBID OF DELAWARE, LLC.
5 POWELL LANE
COLLINGSWOOD, NJ 08108

UPI# 39-4-57	D.B. S43 PAGE 231
UPI# 39-4-56	D.B. 6676 PAGE 2133
UPI# 39-4J-40	D.B. 5337 PAGE 1676

SHEET INDEX

SHEET TITLE	SHEET NUMBER	DRAWING NUMBER
COVER SHEET	01	C01.1
TITLE PLAN	02	C02.1
EXISTING CONDITIONS & DEMOLITION PLAN	03	C03.1
GRADING & UTILITIES PLAN	04	C04.1
TRUCK TURNING PLAN	05	C05.1
LIGHTING PLAN	06	C06.1
LANDSCAPE PLAN	07	C07.1
LANDSCAPE PLAN	08	C07.2

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES
3 WORKING DAYS NOTICE FOR
CONSTRUCTION PHASE AND 10 WORKING
DAYS IN DESIGN STAGE–STOP CALL

Pennsylvania One Call System, Inc

1–800–242–1776

ONE CALL NOTE
SCALE: NOT TO SCALE

PA ONE CALL
ACT 287 AS AMENDED BY ACT 181 OF 2006
SERIAL NUMBER 20201262504

D. L. HOWELL & ASSOCIATES, INC. DOES NOT GUARANTEE THE ACCURACY OF THE LOCATIONS FOR EXISTING SUBSURFACE UTILITY LINES, STRUCTURES, ETC. SHOWN ON THE PLANS, NOR DOES D. L. HOWELL & ASSOC., INC. GUARANTEE THAT ALL SUBSURFACE UTILITY LINES, STRUCTURES, ETC. ARE SHOWN.

CONTRACTOR SHALL VERIFY THE LOCATION AND ELEVATIONS OF ALL SUBSURFACE UTILITY LINES, STRUCTURES, ETC. BEFORE THE START OF WORK, BY CALLING THE PENNSYLVANIA ONE CALL SYSTEM AT 1–800–242–1776.

UTILITIES NOTIFIED

COMPANY: CALN TOWNSHIP
ADDRESS: 253 MUNICIPAL DR
THORNDALE, PA. 19372
CONTACT: SCOT GILL
EMAIL: sgill@calntownship.org

COMPANY: COMCAST
ADDRESS: 1004 CORNERSTONE BLVD
DOWNINGTOWN, PA. 19335
CONTACT: TOM RUSSO
EMAIL: tom_russo@cable.comcast.com

COMPANY: COMCAST
ADDRESS: 1004 CORNERSTONE BLVD
DOWNINGTOWN, PA. 19335
CONTACT: TOM RUSSO
EMAIL: tom_russo@cable.comcast.com

COMPANY: PECO ENERGY C/O USIC
ADDRESS: 450 S HENDERSON RD SUITE B
KING OF PRUSSIA, PA. 19406
CONTACT: NIKKIA SIMPKINS
EMAIL: NIKKIASIMPKINS@USICLLC.COM

COMPANY: PENNSYLVANIA AMERICAN WATER
ADDRESS: 100 CHESHIRE CT STE 104
COATESVILLE, PA. 19320
CONTACT: GEORGE THOMAS
EMAIL: george.thomas@amwater.com

COMPANY: VERIZON PENNSYLVANIA LLC
ADDRESS: 1050 VIRGINIA DR
FORT WASHINGTON, PA. 19034
CONTACT: DARLINE LEPPERD JOHNSON

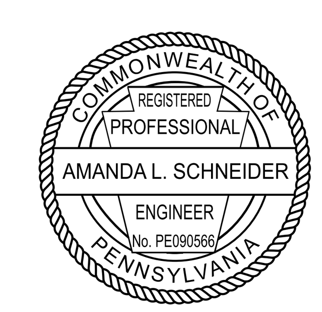


EXHIBIT A-2(a)

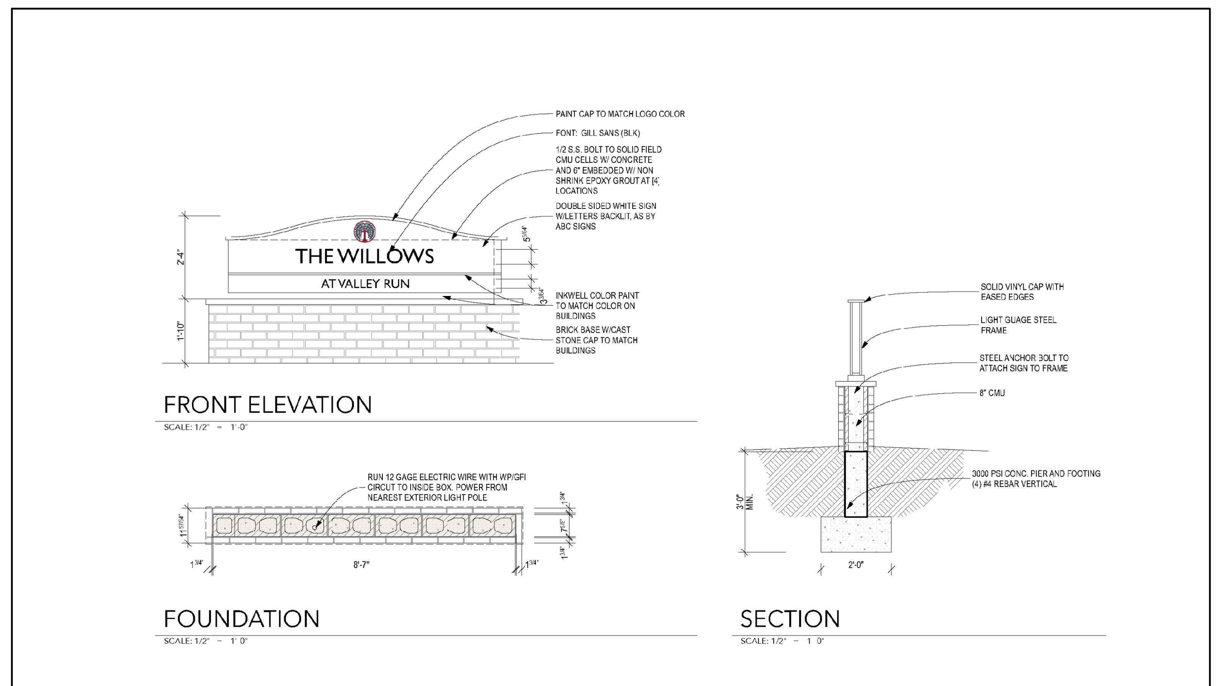
REV.	DATE	DESCRIPTION
8		
7		
6		
5		
4		
3		
2		
1	8/18/2020	REVISED PER TOWNSHIP REVIEW 8-12-2020

PREPARED BY:

DLHowell
Civil Engineering
Land Planning
Environmental
D.L. Howell & Assoc., Inc.

1250 Wrights Lane
West Chester, PA 19380
Phone: (610) 918-9002
Fax: (610) 918-9003
www.DLHowell.com

DATE:	6/23/2020
SCALE:	1"=50'
DRAWN BY:	PJK
CHECKED BY:	ALS
PROJECT NO.:	3705
CAD FILE:	q:\civil 3d jobs\3705\3705 production plans\sheet set\conditional use & special exception
PLOTTED:	6/23/2020
DRAWING NO.:	C01.1
SHEET	01 OF 08



THE WILLOWS AT VALLEY RUN | MONUMENTAL SIGN
2131 LINCOLN HIGHWAY
CALN TOWNSHIP, CHESTER COUNTY, PA

Ingerman | Haley Donovan

PENNSYLVANIA STATE HIGHWAY U.S. ROUTE 30
(A.K.A. LINCOLN HIGHWAY) - (A.K.A. BUSINESS ROUTE 30) - (A.K.A. S.R. 3070)

LEGEND

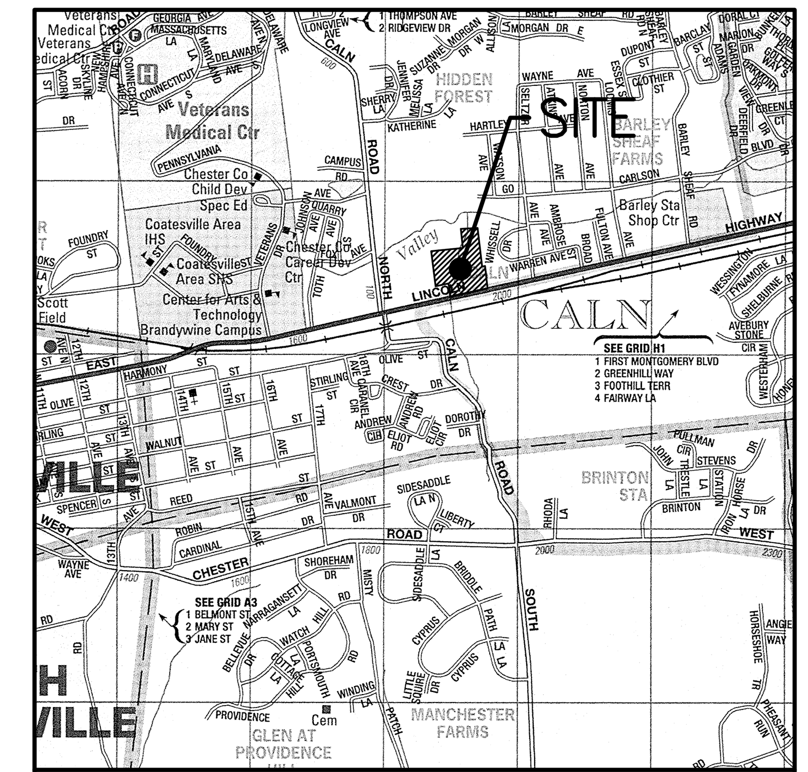
- EX. PROPERTY LINE
- PROP. PROPERTY LINE
- EX. RIGHT-OF-WAY
- PROP. RIGHT-OF-WAY
- EX. MONUMENT
- PROP. MONUMENT
- EX. IRON PIPE
- PROP. IRON PIPE
- EX. EASEMENT
- PROP. EASEMENT
- EX. WETLANDS
- 242 EXISTING CONTOUR
- 242 PROPOSED CONTOUR
- X 123.00 EXISTING SPOT ELEV.
- X 123.00 NEW SPOT ELEV.
- GEB2 SOILS TYPE
- SOILS LINE
- EX. CONC. CURB
- PROP. CONC. CURB
- EX. EDGE OF PAVING
- PROP. EDGE OF PAVING
- EX. LIGHT POLE
- PROP. LIGHT POLE
- EX. FENCE
- EX. MAIL BOX
- EX. SIGN
- PROP. SIGN
- EXIST. PARKING SPACES
- PROP. PARKING SPACES
- (TBR) TO BE REMOVED
- EX. TELE. LINE
- PROP. TELE. LINE
- EX. ELEC. LINE
- PROP. ELEC. LINE
- EX. UTILITY POLE
- PROP. UTILITY POLE
- EX. GUY ANCHOR
- EX. GAS LINE
- PROP. GAS LINE
- EX. GAS VALVE
- G.V. PROP. GAS VALVE
- EX. STORM SEWER LINE
- PROP. STORM SEWER LINE
- EX. STORM INLET
- PROP. STORM INLET
- PROP. STORM INLET ID
- PROP. SEEPAGE BED
- EX. SANITARY SEWER LINE
- PROP. SAN. SEWER LINE
- PROP. SAN. SEWER LATERAL
- MH 1 PROP. SANITARY MH. ID
- EX. WATER LINE
- PROP. WATER LINE
- PROP. WATER LATERAL
- PROP. FIRE WATER LINE
- EX. WATER VALVE
- W.V. PROP. WATER VALVE
- EX. HYDRANT
- F.H. PROP. HYDRANT
- EX. MANHOLE
- PROP. MANHOLE

TITLE PLAN

SCALE: 1" = 60'

GRAPHIC SCALE
1 inch = 60 feet

EXHIBIT A-2(b)



LOCATION MAP

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Copyright ADC The Map People ®
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ZONING DATA TABULATION

ARTICLE IV ZONING DISTRICT REGULATIONS

SECTION 155-27 C-1 HIGHWAY COMMERCIAL DISTRICT
(UNDERLYING ZONING DISTRICT)

ARTICLE VII RESIDENTIAL LAND USE & DEVELOPMENT REQUIREMENTS

SECTION 155-55 MULTIFAMILY APARTMENT USES & DEVELOPMENTS

SECTION 155-55.C. AREA & BULK REGULATIONS

	REQUIRED	PROPOSED
MIN. CONTIGUOUS LOT AREA	15 ACRES	15.175 ACRES
MAX. DENSITY	13 D.U./GROSS ACRE	7.91 D.U./GROSS ACRE
MIN. REQUIRED OPEN SPACE	40% OF GROSS LOT AREA	56.5%
MAX. D.U. / BUILDING	32 UNITS	24 UNITS
SETBACK FROM R/W LINE	30 FT.	41 FT.
MIN. BLDG SEPARATION	60 FT. SIDE TO SIDE	75 FT. SIDE TO SIDE
MIN. BLDG SEPARATION	70 FT. SIDE TO REAR	N/A
MIN. BLDG SEPARATION	80 FT. REAR TO REAR	N/A
MAX. BLDG LENGTH	160 FT.	160 FT.
MAX. BLDG DEPTH	80 FT.	67 FT.
MIN. BLDG SETBACK	30 FT. ANY SIDE/REAR PROP. LINE	31 FT. ANY PROP. LINE
MAX. BLDG COVER	25 %	7.22 % (47,716 S.F.)
MAX. IMPERVIOUS COVER	40 %	23.42 % (154,846 S.F.)
MAX. BUILDING HEIGHT	60 FT.	<60 FT.
MIN. BUFFER YARD	10 FT. ABUTTING NONRESIDENTIAL USE	20 FT.
MIN. BUFFER YARD	25 FT. ABUTTING RESIDENTIAL USE	N/A

AS REQUIRED PER §155-55.C(2) AND §155-55.C(3), THE PROPOSED DEVELOPMENT SHALL BE CONNECTED TO PUBLIC WATER SUPPLY THROUGH PENNSYLVANIA AMERICAN WATER AND TO PUBLIC SANITARY SEWER DISPOSAL THROUGH THE CALN TOWNSHIP MUNICIPAL AUTHORITY.

PARKING TABULATION:

USE:	REQUIRED	PROPOSED
MULTI-FAMILY DWELLING (APARTMENT)	240 PARKING SPACES (13 ADA) (2 SPACES/DWELLING UNIT)	210 PARKING SPACES (1.75 SPACES/DWELLING UNIT)

REQUIRED PARKING SPACE CALCULATIONS WERE BASED OFF OF 120 DWELLING UNITS.

PER §155-43(G)(3), THE APPLICANT IS PROPOSING A REDUCTION IN THE PARKING REQUIREMENT FOR THE PROPOSED DEVELOPMENT.

OPEN SPACE CALCULATIONS

ZONING SECTIONS 155-55.C(5) AND 155-118

GROSS LOT AREA = 15.175 ACRES
TOTAL PROPOSED OPEN SPACE PER ZONING DEFINITION = 373,423 SF (8.57 ACRES, 56.5%)
OPEN SPACE WITHIN WETLANDS OR FLOODPLAIN = 191,035 SF (4.39 ACRES, 51.2% OF TOTAL OPEN SPACE)

SALDO SECTION 137-31.C

SALDO REQUIREMENT = 0.076 AC/UNIT X 120 UNITS = 9.12 ACRES PUBLIC FACILITIES AND OPEN SPACE
PROPOSED PUBLIC FACILITIES = 6,447 SF (0.15 ACRES)
PROPOSED OPEN SPACE = 506,177 SF (11.6 ACRES ACRES)
TOTAL AREA = 512,624 SF (11.8 ACRES ACRES)

SIGHT DISTANCE REQUIREMENTS

LINCOLN HIGHWAY SPEED LIMIT = 40 MPH

	REQUIRED	EXISTING
EXITING TO THE RIGHT (WEST)	460'	600'+*
EXITING TO THE LEFT (EAST)	538'	600'+

*EXISTING OVERGROWN VEGETATION FROM THE SITE DID NOT ALLOW A COMPLETE SIGHT DISTANCE MEASURMENT TO BE TAKEN. HOWEVER, THIS OVERGROWN VEGETATION WILL BE REMOVED AS PART OF THE DEVELOPMENT AND BASED ON THE EXISTING GRADES OF LINCOLN HIGHWAY AND DLH'S REVIEW OF THE SITE AND LINCOLN HIGHWAY, THERE APPEARS TO BE ADEQUATE SIGHT DISTANCE.

DLHowell
Civil Engineering
Land Planning
Environmental
www.DLHowell.com

1250 Wrights Lane
West Chester, PA 19380
Phone: (610) 918-9002
Fax: (610) 918-9003

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
AMANDA L. SCHNEIDER

REV.	DATE	DESCRIPTION
1	8/18/2020	REVISED PER TOWNSHIP REVIEW 8-12-2020
2		
3		
4		
5		
6		
7		
8		

CONDITIONAL USE/SPECIAL EXCEPTION
TITLE PLAN

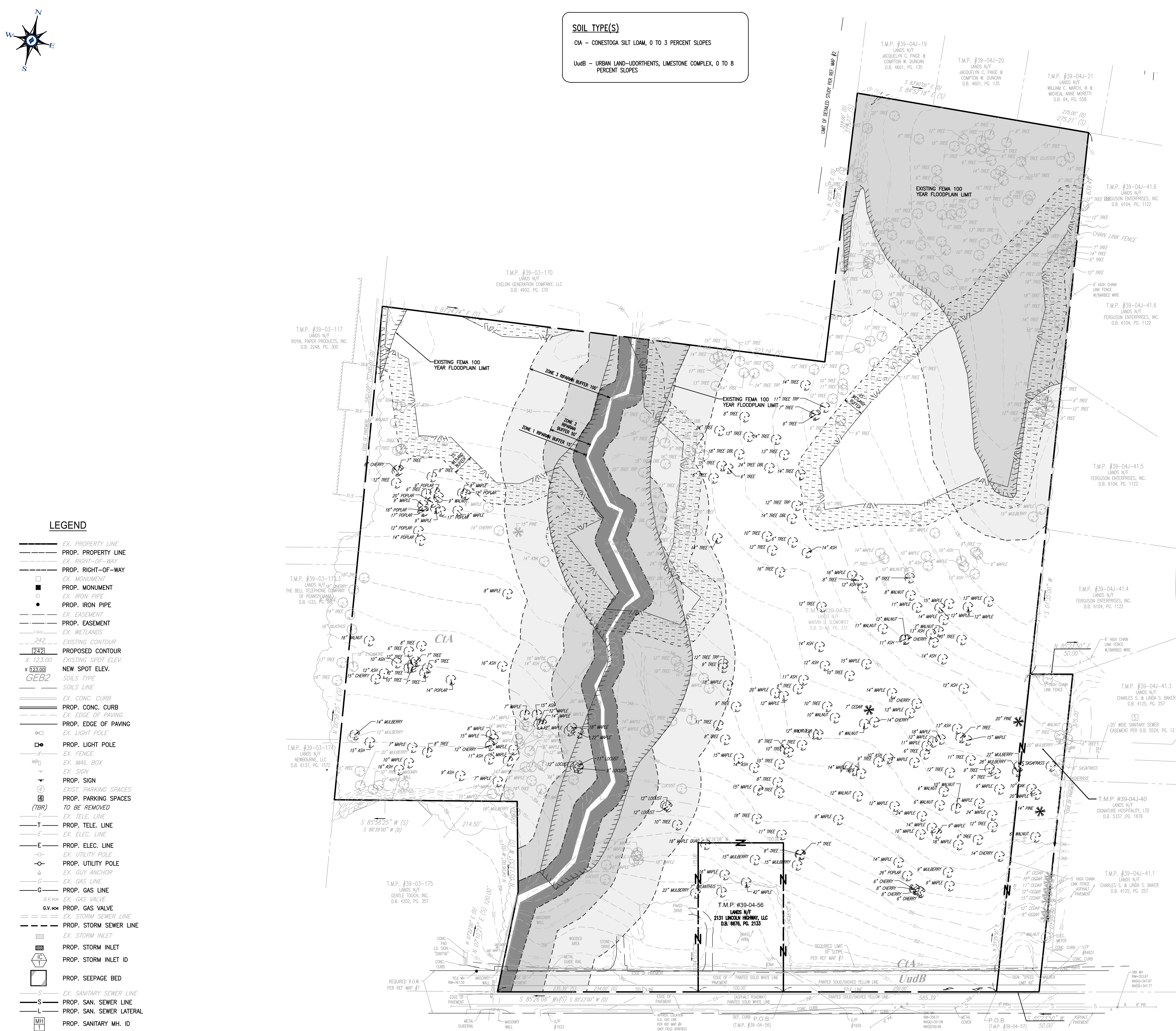
CLIENT: MBID OF DELAWARE, LLC.
PROJECT: THE WILLOWS AT VALLEY RUN
LOCATION: 2131 LINCOLN HIGHWAY EAST
CALN TOWNSHIP, CHESTER COUNTY, PA

DATE:	06/23/2020
SCALE:	1"=50'
DRAWN BY:	PJK
CHECKED BY:	ALS
PROJECT NO.:	3705
CAD FILE:	Overall Title Plan.dwg
PLOTTED:	06/23/2020
DRAWING NO.:	C02.1
SHEET	02 OF 08

SOIL TYPE(S)

CtA – CONESTOGA SILT LOAM, 0 TO 3 PERCENT SLOPES

UudB – URBAN LAND–UDORTHENTS, LIMESTONE COMPLEX, 0 TO 8 PERCENT SLOPES



PENNSYLVANIA STATE HIGHWAY U.S. ROUTE 30

(A.K.A. LINCOLN HIGHWAY) - (A.K.A. BUSINESS ROUTE 30) - (A.K.A. S.R. 3070)

EXISTING CONDITIONS & DEMOLITION PLAN

SCALE: 1" = 60'

60 0 30 60 120

GRAPHIC SCALE

1 inch = 60 feet

EXHIBIT A-2(c)

LEGEND

- EX. PROPERTY LINE
- PROP. PROPERTY LINE
- EX. RIGHT-OF-WAY
- PROP. RIGHT-OF-WAY
- EX. MONUMENT
- PROP. MONUMENT
- EX. IRON PIPE
- PROP. IRON PIPE
- EX. EASEMENT
- PROP. EASEMENT
- EX. WETLANDS
- 242 EXISTING CONTOUR
- 242 PROPOSED CONTOUR
- x 123.00 EXISTING SPOT ELEV.
- x 123.00 NEW SPOT ELEV.
- GEB2 SOILS TYPE
- SOILS LINE
- EX. CONC. CURB
- PROP. CONC. CURB
- EX. EDGE OF PAVING
- PROP. EDGE OF PAVING
- EX. LIGHT POLE
- PROP. LIGHT POLE
- EX. FENCE
- EX. MAIL BOX
- EX. SIGN
- PROP. SIGN
- EXIST. PARKING SPACES
- PROP. PARKING SPACES
- (TBR) TO BE REMOVED
- EX. TELE. LINE
- PROP. TELE. LINE
- EX. ELEC. LINE
- PROP. ELEC. LINE
- EX. UTILITY POLE
- PROP. UTILITY POLE
- EX. GUY ANCHOR
- EX. GAS LINE
- PROP. GAS LINE
- EX. GAS VALVE
- G.V. PROP. GAS VALVE
- EX. STORM SEWER LINE
- PROP. STORM SEWER LINE
- EX. STORM INLET
- PROP. STORM INLET
- PROP. STORM INLET ID
- PROP. SEEPAGE BED
- EX. SANITARY SEWER LINE
- PROP. SAN. SEWER LINE
- PROP. SAN. SEWER LATERAL
- MH 1 PROP. SANITARY MH. ID
- EX. WATER LINE
- PROP. WATER LINE
- WL PROP. WATER LATERAL
- FW PROP. FIRE WATER LINE
- EX. WATER VALVE
- W.V. PROP. WATER VALVE
- EX. HYDRANT
- F.H. PROP. HYDRANT
- EX. MANHOLE
- PROP. MANHOLE
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED

CALL BEFORE YOU DIG!

PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS IN DESIGN STAGE–STOP CALL

Pennsylvania One Call System, Inc

1–800–242–1776

ONE CALL NOTE

SCALE: NOT TO SCALE

PA ONE CALL

ACT 287 AS AMENDED BY ACT 181 OF 2006
SERIAL NUMBER 20201262504

D. L. HOWELL & ASSOCIATES, INC. DOES NOT GUARANTEE THE ACCURACY OF THE LOCATIONS FOR EXISTING SUBSURFACE UTILITY LINES, STRUCTURES, ETC. SHOWN ON THE PLANS, NOR DOES D. L. HOWELL & ASSOC., INC. GUARANTEE THAT ALL SUBSURFACE UTILITY LINES, STRUCTURES, ETC. ARE SHOWN.

CONTRACTOR SHALL VERIFY THE LOCATION AND ELEVATIONS OF ALL SUBSURFACE UTILITY LINES, STRUCTURES, ETC. BEFORE THE START OF WORK, BY CALLING THE PENNSYLVANIA ONE CALL SYSTEM AT 1–800–242–1776.

UTILITIES NOTIFIED

COMPANY: CALN TOWNSHIP
ADDRESS: 253 MUNICIPAL DR
THORNDALE, PA. 19372
CONTACT: SCOT GILL
EMAIL: sgill@calntownship.org

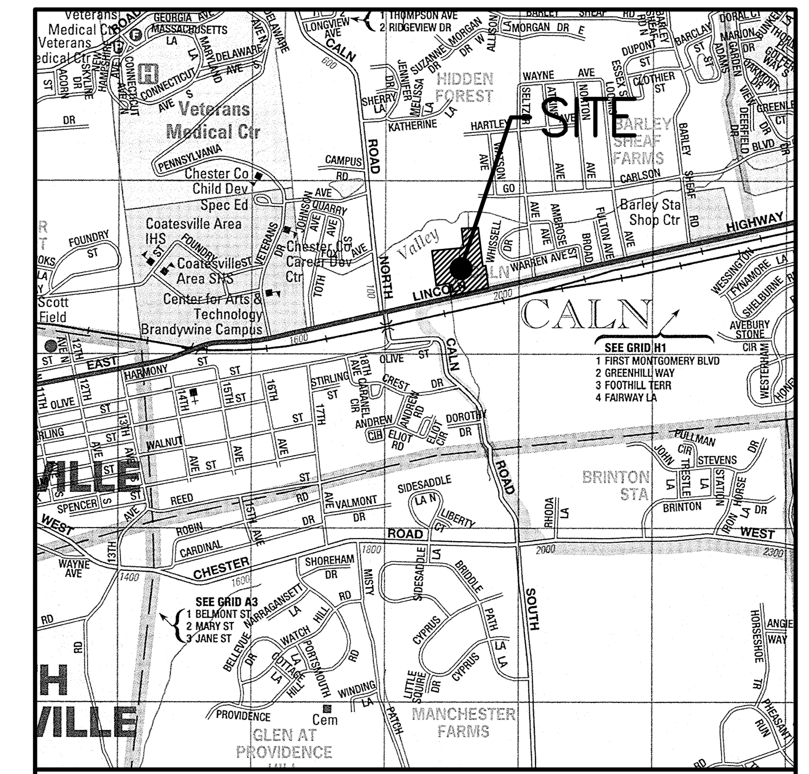
COMPANY: COMCAST
ADDRESS: 1004 CORNERSTONE BLVD
DOWNINGTOWN, PA. 19335
CONTACT: TOM RUSSO
EMAIL: tom_russo@cable.comcast.com

COMPANY: COMCAST
ADDRESS: 1004 CORNERSTONE BLVD
DOWNINGTOWN, PA. 19335
CONTACT: TOM RUSSO
EMAIL: tom_russo@cable.comcast.com

COMPANY: PECO ENERGY C/O USIC
ADDRESS: 450 S HENDERSON RD SUITE B
KING OF PRUSSIA, PA. 19406
CONTACT: NIKKIA SIMPKINS
EMAIL: NIKKIASIMPKINS@USICLLC.COM

COMPANY: PENNSYLVANIA AMERICAN WATER
ADDRESS: 100 CHESHIRE CT STE 104
COATESVILLE, PA. 19320
CONTACT: GEORGE THOMAS
EMAIL: george.thomas@amwater.com

COMPANY: VERIZON PENNSYLVANIA LLC
ADDRESS: 1050 VIRGINIA DR
FORT WASHINGTON, PA. 19034
CONTACT: DARLINE LEPPERD JOHNSON



LOCATION MAP

SCALE: 1" = 2,000'

DLHowell
Civil Engineering
Land Planning
Environmental
www.DLHowell.com

1250 Wrights Lane
West Chester, PA 19380
Phone: (610) 918-9002
Fax: (610) 918-9003

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
AMANDA L. SCHNEIDER

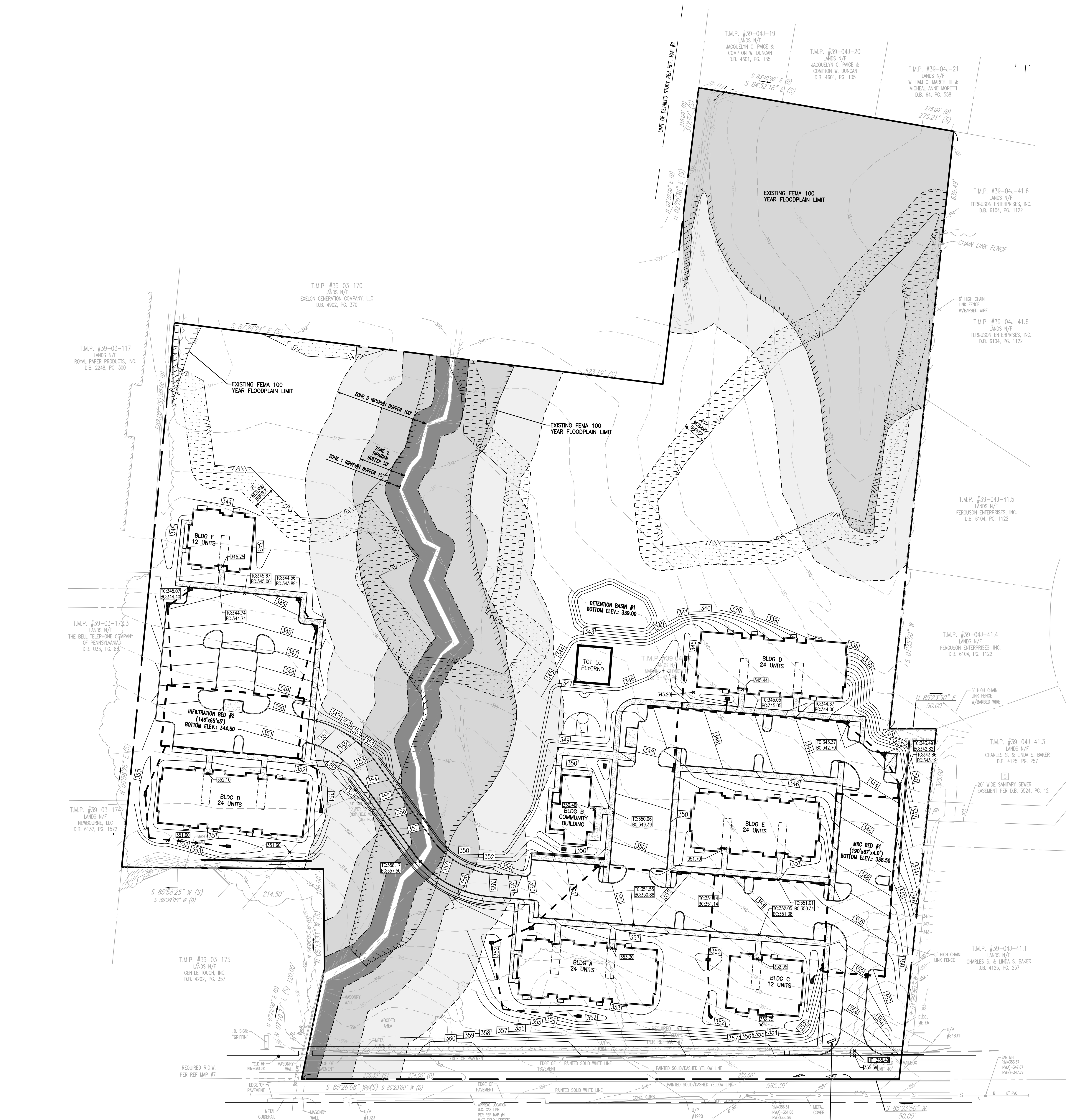
REV.	DATE	DESCRIPTION
8		
7		
6		
5		
4		
3		
2		
1	8/18/2020	REVISED PER TOWNSHIP REVIEW 8–12–2020

CONDITIONAL USE/SPECIAL EXCEPTION

EXISTING CONDITIONS & DEMOLITION PLAN

CLIENT: MBID OF DELAWARE, LLC.
PROJECT: THE WILLOWS AT VALLEY RUN
LOCATION: 2131 LINCOLN HIGHWAY EAST
CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06/23/2020
SCALE: 1" = 60'
DRAWN BY: PJK
CHECKED BY: ALS
PROJECT NO.: 3705
CAD FILE: Overall Existing Conditions Plan.dwg
PLOTTED: 06/23/2020
DRAWING NO.: C03.1
SHEET 03 OF 08



PENNSYLVANIA STATE HIGHWAY U.S. ROUTE 30

(A.K.A. LINCOLN HIGHWAY) - (A.K.A. BUSINESS ROUTE 30) - (A.K.A. S.R. 3070)

GRADING & UTILITIES PLAN

SCALE: 1" = 60'

60 0 30 60 120

GRAPHIC SCALE
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EXHIBIT A-2(d)

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SERIAL NUMBER 20201262504

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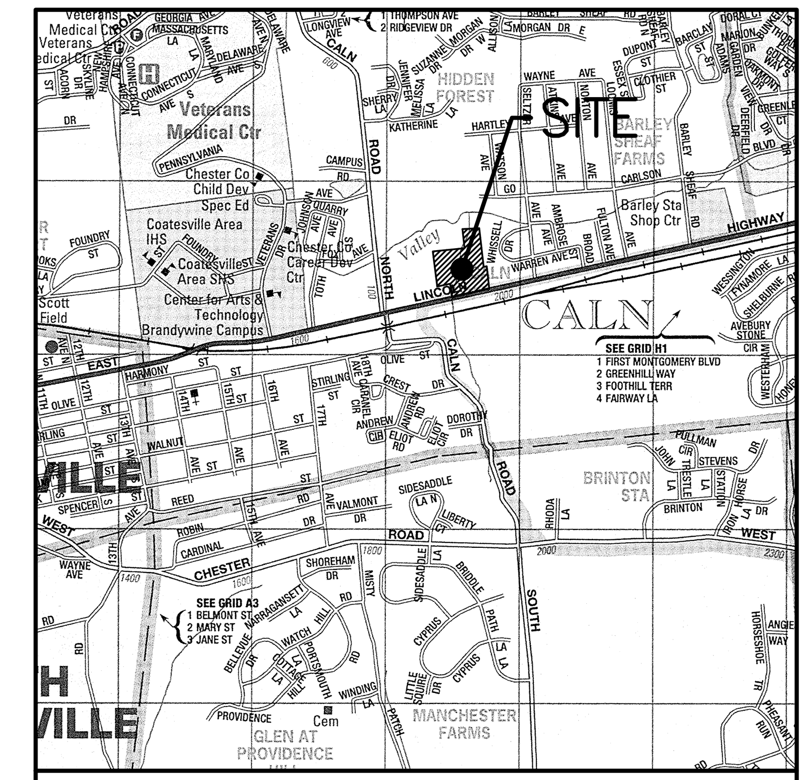

LOCATION MAP

SCALE: 1" = 2,000'

GRADING & UTILITY GENERAL NOTES:

1. PRIOR TO STARTING CONSTRUCTION, ALL UTILITY SERVICES IN THE AREA SHALL BE LOCATED AND MEASURES TAKEN TO PROTECT THE EXISTING FACILITIES. ANY DAMAGE TO EXISTING FACILITIES SHALL BE IMMEDIATELY AND COMPLETELY REPAIRED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE.
2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE UTILITY "ONE-CALL" NUMBER 72 HOURS PRIOR TO COMMENCING ANY CONSTRUCTION ACTIVITIES ON THIS SITE. CONTRACTOR SHALL ALSO NOTIFY LOCAL WATER AND SEWER DEPARTMENTS TO MARK OUT THEIR UTILITIES IF NECESSARY.
3. LOCATIONS OF EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM FIELD SURVEY AND EXISTING RECORDS. COMPLETENESS AND ACCURACY OF EXISTING UTILITY INFORMATION IS NOT GUARANTEED. PRIOR TO THE START OF ANY CONSTRUCTION, THE CONTRACTOR SHALL ACCURATELY FIELD MEASURE LOCATION AND ELEVATION OF EXISTING UTILITIES AT POINTS OF CONNECTION AND POTENTIAL CONFLICT. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER AND ENGINEER IN WRITING OF ANY DEVIATION FROM INFORMATION SHOWN ON THESE PLANS. CONSTRUCTION SHALL COMMENCE BEGINNING AT THE LOWEST INVERT (POINT OF CONNECTION) AND PROGRESS UP GRADIENT. INTERFACE POINTS (CROSSINGS) WITH EXISTING UNDERGROUND INSTALLATIONS SHALL BE FIELD VERIFIED BY TEST PIT PRIOR TO COMMENCEMENT OF CONSTRUCTION.
4. CONSTRUCTION SHALL BE LOCATED, AND MEASURES TAKEN TO PROTECT THE EXISTING FACILITIES IN ACCORDANCE WITH PENNSYLVANIA ACT 187. ANY DAMAGE TO EXISTING FACULTIES RESULTING FROM THE NEGLIGENCE OF THE CONTRACTOR SHALL BE IMMEDIATELY AND COMPLETELY REPAIRED AT THE CONTRACTOR'S EXPENSE.
5. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROTECT ALL PERSONS, VEHICLES AND BUILDINGS WITHIN THE CONSTRUCTION AREAS FROM INJURY AND DAMAGE DURING THE COURSE OF WORK.
6. SITE GRADING SHALL BE PERFORMED IN ACCORDANCE WITH THESE PLANS AND SPECIFICATIONS.
7. CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF EXISTING TOPOGRAPHIC INFORMATION PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION. CONTRACTOR TO ENSURE 1.0% MIN. SLOPE ON ASPHALT AND 2.0% MIN. ON GRASS, TO PREVENT PONDING. ANY DISCREPANCIES THAT MAY AFFECT THE PUBLIC SAFETY OR PROJECT COST, MUST BE IDENTIFIED TO THE ENGINEER IN WRITING IMMEDIATELY. PROCEEDING WITH CONSTRUCTION WITH DESIGN DISCREPANCIES IS DONE SO AT THE CONTRACTOR'S OWN RISK.
8. ALL SITE IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE APPLICABLE LOCAL, COUNTY, STATE AND FEDERAL STATUTES AND REGULATIONS.
9. ALL TRENCHING, SHORING AND EXCAVATING OPERATIONS SHALL BE PERFORMED IN COMPLIANCE WITH THE REQUIREMENTS OF THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).
10. SCALED DIMENSIONS FROM THIS PLAN SHALL NOT BE USED FOR CONSTRUCTION WITHOUT CONFIRMATION FROM D.L. HOWELL & ASSOC., INC.
11. SUBBASE MATERIAL FOR SIDEWALKS, CURB, OR ASPHALT SHALL BE FREE OF ORGANICS AND OTHER UNSUITABLE MATERIALS. IF ANY UNSUITABLE SOIL IS ENCOUNTERED DURING EXCAVATION, THE CONTRACTOR SHALL REMOVE IT AND REPLACE TO THE RECOMMENDATIONS OUTLINED IN A GEOTECHNICAL EVALUATION PREPARED SPECIFICALLY FOR THIS SITE.
12. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE LOCAL AUTHORITY OR GOVERNING AGENCY OF THE BEGINNING DATE OF CONSTRUCTION AND TO ENSURE THAT NO WORK IS PERFORMED WITHOUT THE REQUIRED PERMITS AND INSPECTIONS BY THE LOCAL AUTHORITY OR GOVERNING AGENCY.
13. IF CONDITIONS ON THE GROUND DIFFER FROM THOSE SHOWN ON THE PLAN, THE CONTRACTOR SHALL NOTIFY IMMEDIATELY IN WRITING THE ENGINEER OF RECORD.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REQUIRED TRAFFIC CONTROL, SHEETING, SHORING AND BARRICADING OF OPEN EXCAVATIONS.
15. ALL INLETS, MANHOLES AND ASSEMBLIES SHALL BE PRECAST CONCRETE.
16. ALL INLETS SHALL BE PROVIDED WITH FLOW CHANNELS.
17. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND BE SOLELY RESPONSIBLE FOR AND HAVE CONTROL OVER CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES, SAFETY PRECAUTIONS, AND PROGRAMS IN CONNECTION WITH THE WORK AND FOR COORDINATION OF ALL PORTIONS OF THE WORK UNDER CONTRACT.
18. CONTRACTOR SHALL REVIEW VARIOUS PHASES OF WORK WITH THE OWNER TO DETERMINE WHETHER ANY PHASE WILL CONFLICT WITH THE OWNERS DAILY OPERATIONS. WHERE CONFLICT IS APPARENT THE CONTRACTOR SHALL COORDINATE WITH THE OWNER THE WORK TO BE PERFORMED SO AS TO BE THE LEASE DISRUPTIVE.
19. ALL INLETS SHALL BE CONSTRUCTED FLUSH WITH THE BINDER COURSE.
20. ALL CURBING, CONCRETE OR PAVING TO BE REMOVED SHALL BE SAW CUT FIRST TO ENSURE A CLEAN SEPARATION FROM EXISTING.
21. ANY PAVING DAMAGED DURING CONSTRUCTION ACTIVITIES SHALL BE REMOVED TO SUBGRADE AND REPLACED WITH THE PAVING SECTION AT THE CONTRACTOR'S EXPENSE.
22. IN ANY AREA SUBJECT TO VEHICULAR ACTIVITY DURING CONSTRUCTION, A MINIMUM OF 18 INCHES OF COVER SHALL BE MAINTAINED FOR ALL UNDERGROUND UTILITIES (STORMWATER, SANITARY SEWER, WATER, ELECTRIC, GAS, ETC.)
23. ALL FILL SHALL BE COMPACTED TO PROVIDE STABILITY OF MATERIAL AND TO PREVENT UNDESIRABLE SETTLEMENTS. THE FILL SHALL BE SPREAD IN A SERIES OF LAYERS, NOT EXCEEDING EIGHT INCHES IN THICKNESS, AND BE COMPACTED BY A SHEEPS FOOT ROLLER OR OTHER APPROVED METHOD AFTER EACH LAYER IS SPREAD. THE BOROUGH ENGINEER MAY REQUIRE COMPACTION TESTS AND REPORTS.

DLHowell
Civil Engineering
Land Planning
Environmental
www.DLHowell.com

1250 Wrights Lane
West Chester, PA 19380
Phone: (610) 918-9002
Fax: (610) 918-9003

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
AMANDA L. SCHNEIDER
No. PE090566

REV.	DATE	DESCRIPTION
1	8/18/2020	REVISED PER TOWNSHIP REVIEW 8-12-2020
2		
3		
4		
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CONDITIONAL USE/SPECIAL EXCEPTION
GRADING & UTILITIES PLAN

CLIENT: MBID OF DELAWARE, LLC.
PROJECT: THE WILLOWS AT VALLEY RUN
LOCATION: 2131 LINCOLN HIGHWAY EAST
CALN TOWNSHIP, CHESTER COUNTY, PA

DATE:	06/23/2020
SCALE:	1" = 60'
DRAWN BY:	PJK
CHECKED BY:	ALS
PROJECT NO.:	3705
CAD FILE:	Overall Grading & Utility Plan.dwg
PLOTTED:	06/23/2020
DRAWING NO.:	C04.1
SHEET	04 OF 08

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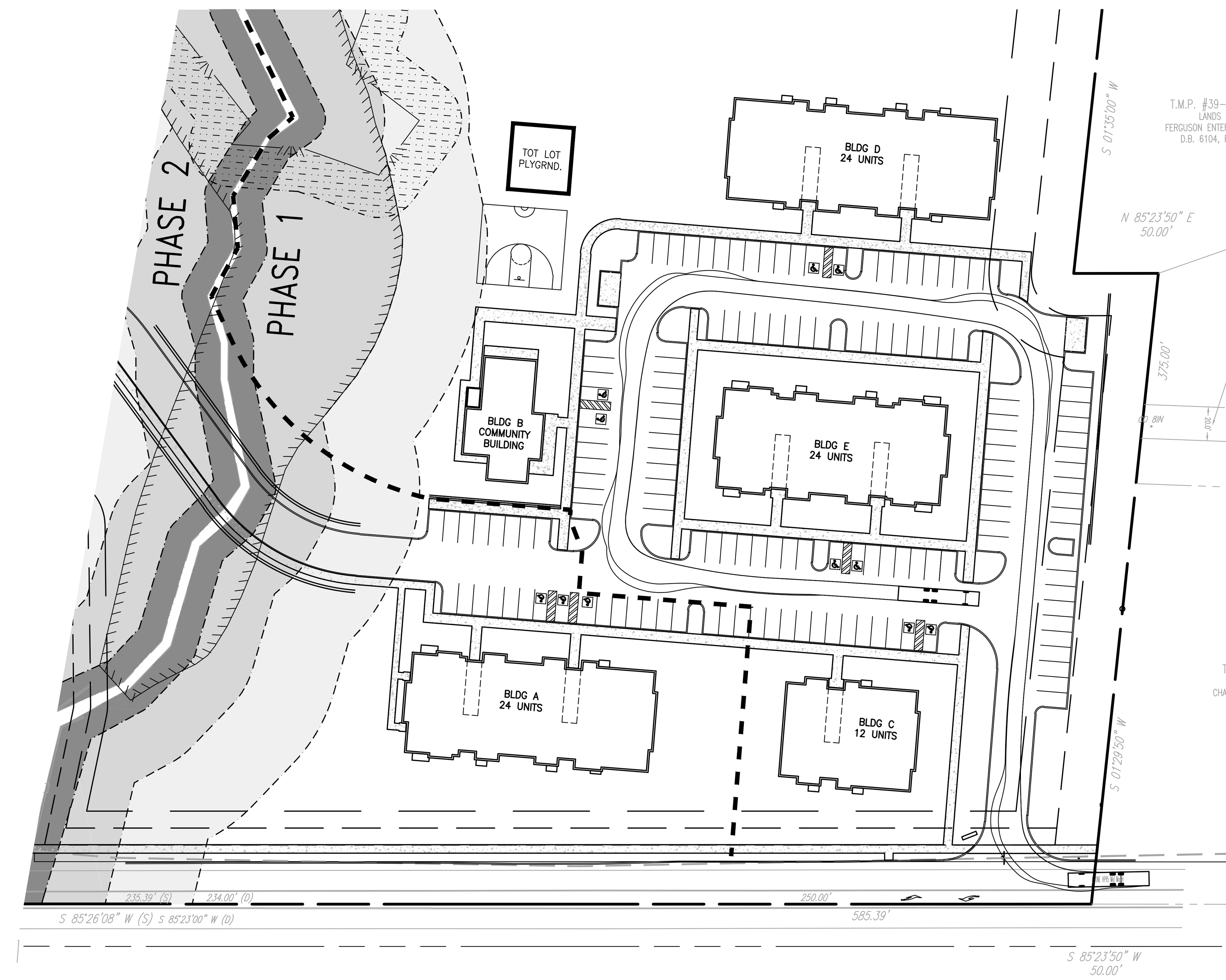

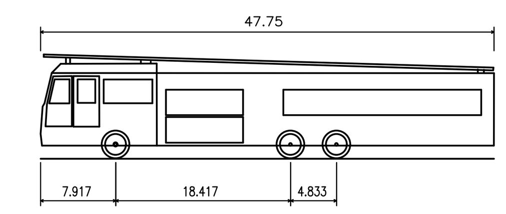

E-ONE HP95 Mid Mount

Overall Length	47.750ft
Overall Width	8.333ft
Overall Body Height	11.000ft
Min Body Ground Clearance	1.393ft
Track Width	8.333ft
Lock-to-lock time	6.00s
Max Wheel Angle	45.00°

PHASE 1 TRUCK TURNING PLAN

SCALE: 1" = 60'

60 0 30 60 120

GRAPHIC SCALE
1 inch = 60 feet

LEGEND

- EX. PROPERTY LINE
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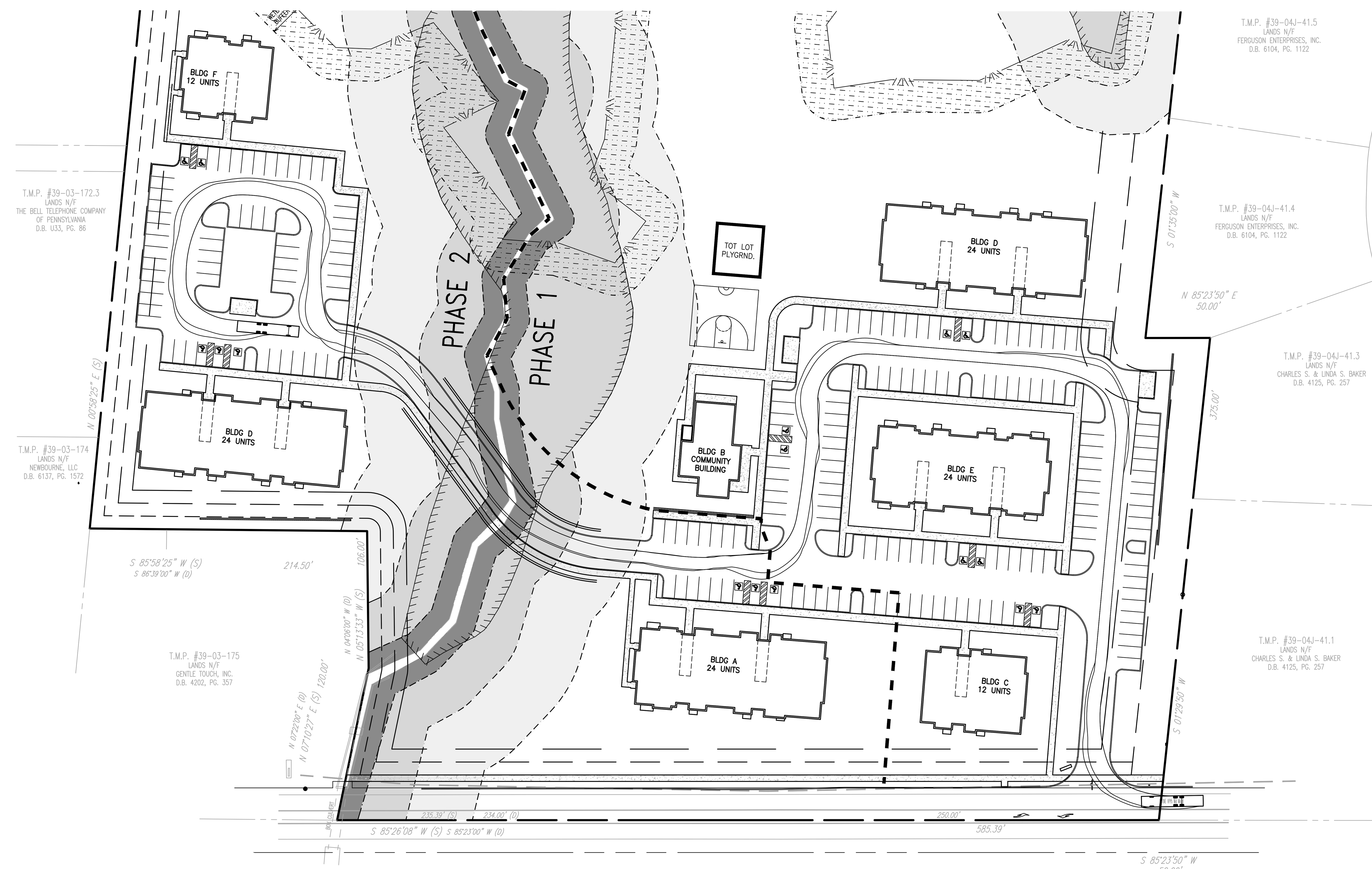

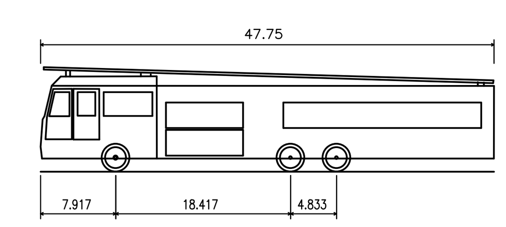

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OVERALL TRUCK TURNING PLAN

SCALE: 1" = 60'

60 0 30 60 120

GRAPHIC SCALE
1 inch = 60 feet

EXHIBIT A-2(e)

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COMMONWEALTH OF PENNSYLVANIA
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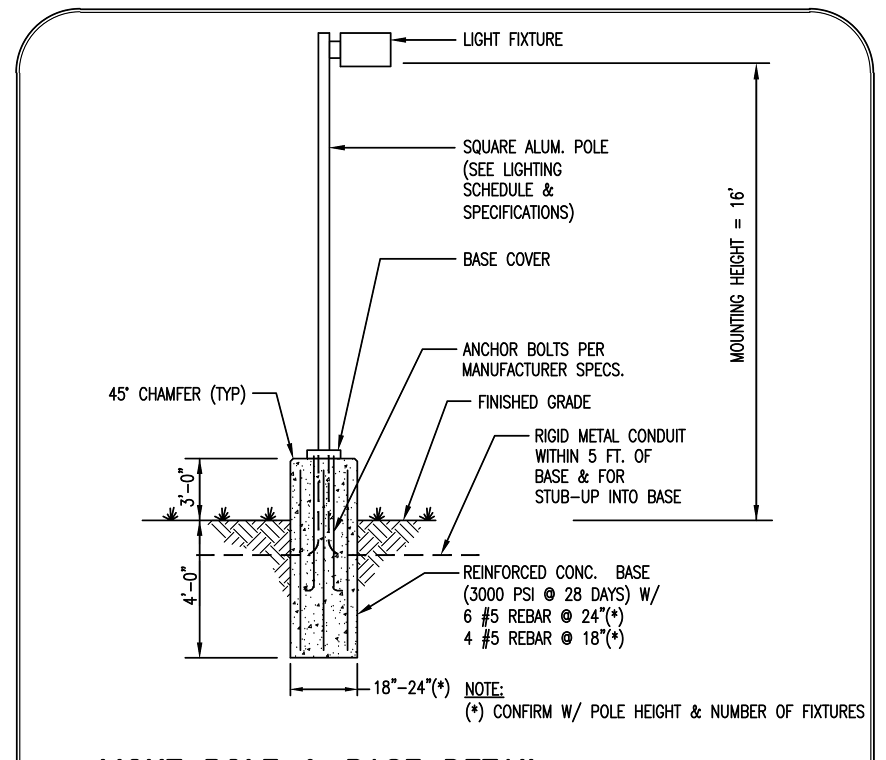
CONDITIONAL USE/SPECIAL EXCEPTION
TRUCK TURNING PLAN

CLIENT: MBID OF DELAWARE, LLC.
PROJECT: THE WILLOWS AT VALLEY RUN
LOCATION: 2131 LINCOLN HIGHWAY EAST
CALN TOWNSHIP, CHESTER COUNTY, PA

DATE:	06/23/2020
SCALE:	1" = 60'
DRAWN BY:	PJK
CHECKED BY:	ALS
PROJECT NO.:	3705
CAD FILE:	Truck Turning Plan.dwg
PLOTTED:	06/23/2020
DRAWING NO.:	C05.1
SHEET	05 OF 08



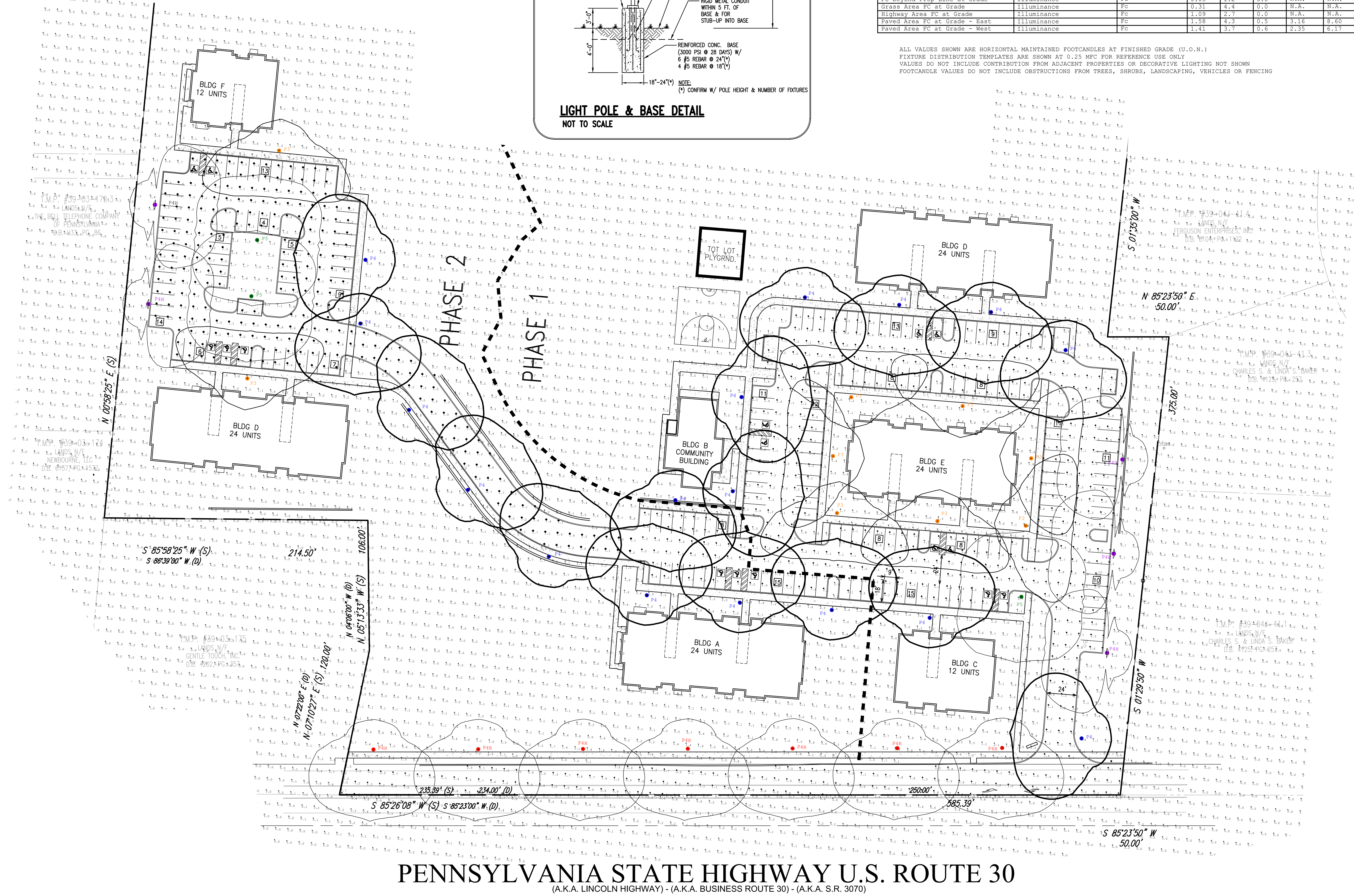
LIGHT POLE & BASE DETAIL
NOT TO SCALE

Luminaire Schedule										
Project: 2131 Lincoln Highway										
Symbol	Qty	Label	Arrangement	Lum. Lumens	LLF	Description	Lum. Watts	Total Watts	BUG Rating	LER
⊙	17	P4	SINGLE	7691	0.850	MPTC-80W48LED4K-G2-LE4	80	1360	B1-U0-G2	96
⊙	9	P3	SINGLE	7673	0.850	MPTC-80W48LED4K-G2-LE3	80	720	B1-U0-G2	96
⊙	3	P5	SINGLE	8117	0.850	MPTC-80W48LED4K-G2-LE5	80	240	B3-U0-G2	101
⊙	5	P4H	SINGLE	6598	0.850	MPTC-80W48LED4K-G2-LE4-HS	80	400	B1-U0-G2	82
⊙	7	P4R	SINGLE	7691	0.850	MPTC-80W48LED4K-G2-LE4 (for Roadway)	80	560	B1-U0-G2	96

ALL FIXTURES ARE SHOWN MOUNTED ON 16 FOOT POLES

Calculation Summary							
Project: 2131 Lincoln Highway							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
FC at Property Lines at Grade	Illuminance	Fc	0.14	1.5	0.0	N.A.	N.A.
FC Beyond Prop Line at Grade	Illuminance	Fc	0.03	1.2	0.0	N.A.	N.A.
Grass Area FC at Grade	Illuminance	Fc	0.31	4.4	0.0	N.A.	N.A.
Highway Area FC at Grade	Illuminance	Fc	1.09	2.7	0.0	N.A.	N.A.
Paved Area FC at Grade - East	Illuminance	Fc	1.58	4.3	0.5	3.16	8.60
Paved Area FC at Grade - West	Illuminance	Fc	1.41	3.7	0.6	2.35	6.17

ALL VALUES SHOWN ARE HORIZONTAL MAINTAINED FOOTCANDLES AT FINISHED GRADE (U.O.N.)
FIXTURE DISTRIBUTION TEMPLATES ARE SHOWN AT 0.25 MFC FOR REFERENCE USE ONLY
VALUES DO NOT INCLUDE CONTRIBUTION FROM ADJACENT PROPERTIES OR DECORATIVE LIGHTING NOT SHOWN
FOOTCANDLE VALUES DO NOT INCLUDE OBSTRUCTIONS FROM TREES, SHRUBS, LANDSCAPING, VEHICLES OR FENCING



LEGEND

- EX. PROPERTY LINE
- PROP. PROPERTY LINE
- EX. RIGHT-OF-WAY
- PROP. RIGHT-OF-WAY
- EX. MONUMENT
- PROP. MONUMENT
- EX. IRON PIPE
- PROP. IRON PIPE
- EX. EASEMENT
- PROP. EASEMENT
- EX. WETLANDS
- EXISTING CONTOUR
- PROPOSED CONTOUR
- EXISTING SPOT ELEV.
- NEW SPOT ELEV.
- SOILS TYPE
- SOILS LINE
- EX. CONC. CURB
- PROP. CONC. CURB
- EX. EDGE OF PAVING
- PROP. EDGE OF PAVING
- EX. LIGHT POLE
- PROP. LIGHT POLE
- EX. FENCE
- EX. MAIL BOX
- EX. SIGN
- PROP. SIGN
- EXIST. PARKING SPACES
- PROP. PARKING SPACES
- TO BE REMOVED
- EX. TELE. LINE
- PROP. TELE. LINE
- EX. ELEC. LINE
- PROP. ELEC. LINE
- EX. UTILITY POLE
- PROP. UTILITY POLE
- EX. GUY ANCHOR
- EX. GAS LINE
- PROP. GAS LINE
- EX. GAS VALVE
- PROP. GAS VALVE
- EX. STORM SEWER LINE
- PROP. STORM SEWER LINE
- EX. STORM INLET
- PROP. STORM INLET
- PROP. STORM INLET ID
- PROP. SEEPAGE BED
- EX. SANITARY SEWER LINE
- PROP. SAN. SEWER LINE
- PROP. SAN. SEWER LATERAL
- PROP. SANITARY MH. ID
- EX. WATER LINE
- PROP. WATER LINE
- PROP. WATER LATERAL
- PROP. FIRE WATER LINE
- EX. WATER VALVE
- PROP. WATER VALVE
- EX. HYDRANT
- PROP. HYDRANT
- EX. MANHOLE
- PROP. MANHOLE

LIGHTING PLAN
SCALE: 1" = 40'

40 0 20 40 80
GRAPHIC SCALE
1 inch = 40 feet

DLHowell
Civil Engineering
Land Planning
Environmental
www.DLHowell.com

1250 Wrights Lane
West Chester, PA 19380
Phone: (610) 918-9002
Fax: (610) 918-9003

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
AMANDA L. SCHNEIDER

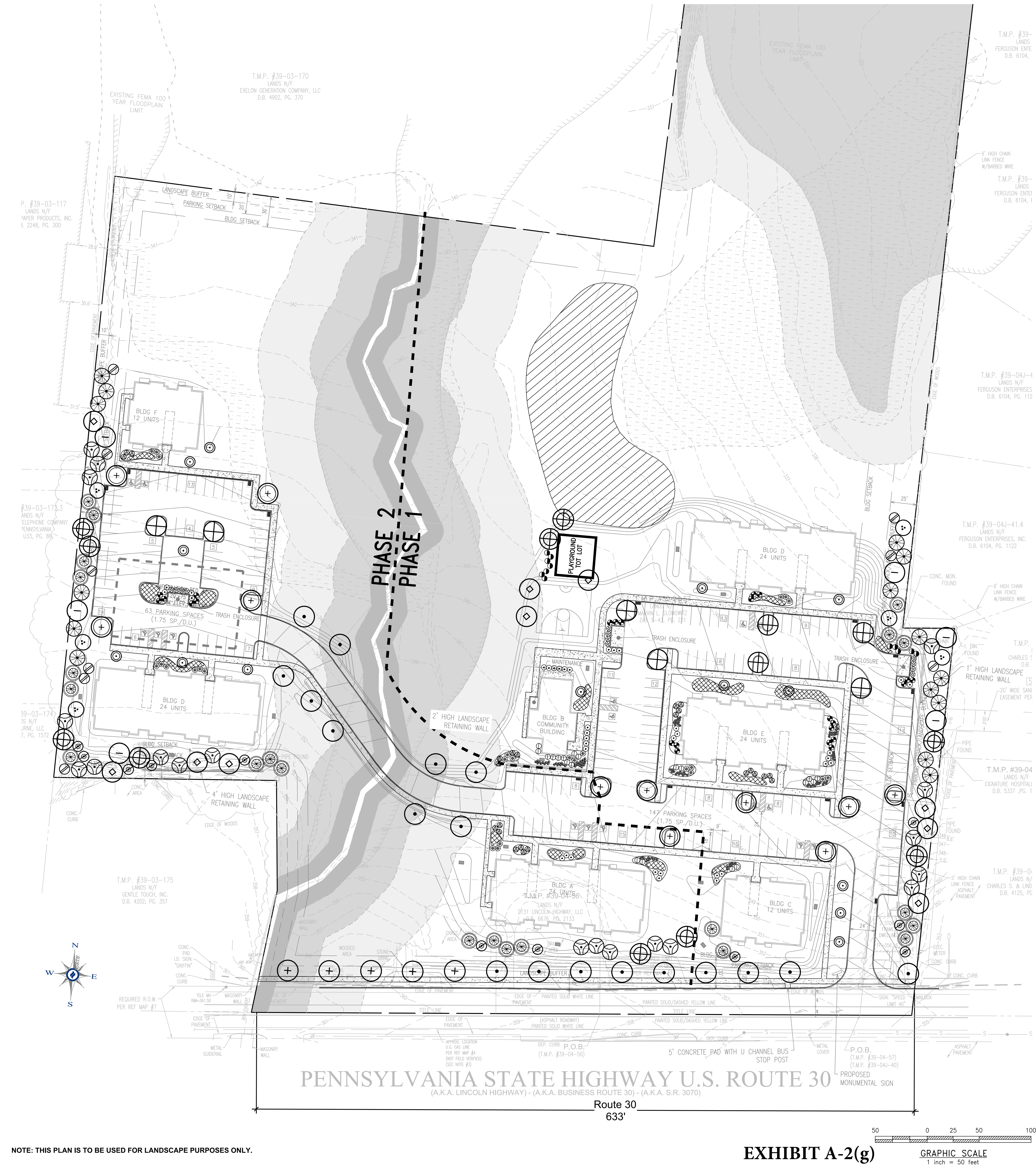
REV.	DATE	DESCRIPTION
1	8/18/2020	REVISED PER TOWNSHIP REVIEW 8-12-2020
2		
3		
4		
5		
6		
7		
8		

CONDITIONAL USE/SPECIAL EXCEPTION
LIGHTING PLAN

CLIENT: MBID OF DELAWARE, LLC.
PROJECT: THE WILLOWS AT VALLEY RUN
LOCATION: 2131 LINCOLN HIGHWAY EAST CALN TOWNSHIP, CHESTER COUNTY, PA

DATE:	06/23/2020
SCALE:	1" = 40'
DRAWN BY:	PJK
CHECKED BY:	ALS
PROJECT NO.:	3705
CAD FILE:	Lighting Plan.dwg
PLOTTED:	06/23/2020
DRAWING NO.:	C06.1
SHEET	06 OF 08

EXHIBIT A-2(f)



NOTE: THIS PLAN IS TO BE USED FOR LANDSCAPE PURPOSES ONLY.

EXHIBIT A-2(g)

DLHowell
Civil Engineering & Land Planning
www.DLHowell.com

D.L. Howell & Assoc., Inc.
1250 Wrights Lane
West Chester, PA 19380
Phone: (610) 918-9002
Fax: (610) 918-9003

PENNSYLVANIA — PATRICK J. STUART — REGISTERED LANDSCAPE ARCHITECT

REV.	DATE	DESCRIPTION
1	08/18/20	Revisions per review letter dated 08/11/20.
2		
3		
4		
5		
6		
7		
8		

LANDSCAPE PLAN

CLIENT: INGERMAN
PROJECT: APARTMENT COMPLEX
LOCATION: 2131 LINCOLN HIGHWAY EAST, CALN TOWNSHIP, CHESTER COUNTY, PA

DATE:	06/23/20
SCALE:	1" = 50'
DRAWN BY:	KTD
CHECKED BY:	PJS
PROJECT NO.:	3705
CAD FILE:	08-17-20_2131 Lincoln TLP.dwg
PLOTTED:	08/18/20
DRAWING NO.:	C07.1
SHEET	07 of 08

ORSATTI & STUART ASSOCIATES, INC.
PLANNERS ■ LANDSCAPE ARCHITECTS

CALN TOWNSHIP - LANDSCAPE COMPLIANCE CHART	REQUIRED	PROPOSED
C-1 Highway Commercial District		
SALDO		
§137-50. Shade Trees B. Where required by this chapter or chapter 55, shade trees shall be planted with a minimum caliper of 3" at 40' intervals. 925' / 40' = 23.13 trees	23 Trees	23 Proposed Trees
Zoning		
§155-55.C. Apartment Complexes (15) b. The apartment development shall provide a buffer yard and planting screen along the property lines at the perimeter of the development tract. The buffer yard shall be no less than 10' in width when it abuts as existing nonresidential use.	Buffer Yard Required	32 Shade Trees 49 Evergreen Trees 20 Flowering Trees
(17) d. All common parking areas shall be sufficiently screened and landscaped. (18) Areas for trash shall be completely screened from view on 3 sides by fencing and landscaping.	Screen Required	38 Shrubs
§155-119.C. Landscaping (4) Apartment buildings shall provide a minimum of one selected canopy, flowering and/or evergreen trees per dwelling unit which may be planted as either street trees, buffer yard, or within designated open space. Dwelling Units = 120	120 Trees	120 Trees in Buffer
§155-139.W. Off Street Parking (2) Raised planter islands shall be at least 180 sq. ft. in size and planted with suitable landscaping materials. (3) Off-street parking areas shall be suitably landscaped to provide a visual buffer or to enhance the aesthetics of the surrounding area.	Applicable	19 Trees

ERNST - Rain Garden Mix (ERNMX-180)

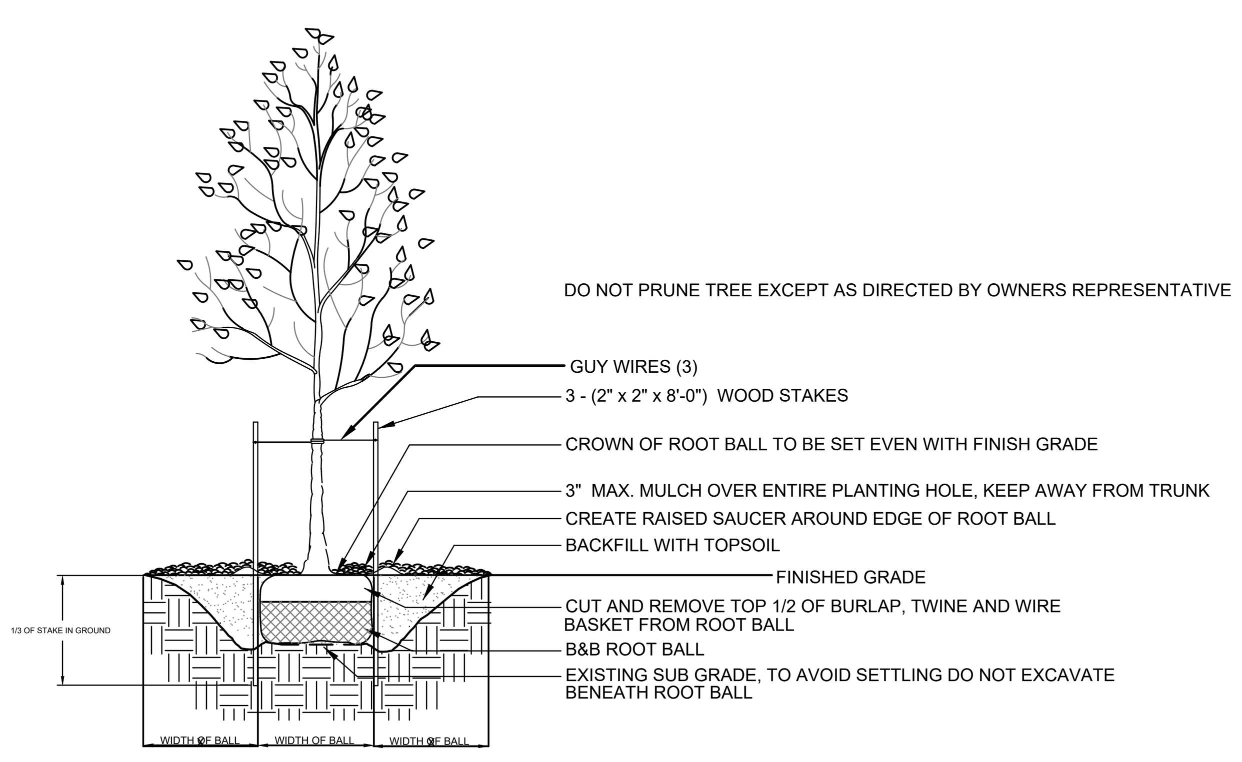
Mix Composition:
39.0% Schizachyrium scoparium, 'Camper' (Little Bluestem, 'Camper')
15.0% Elymus virginicus, PA Ecotype (Virginia Wildrye, PA Ecotype)
8.0% Chasmanthium latifolium, WV Ecotype (River Oats, WV Ecotype)
6.4% Panicum rigidulum, PA Ecotype (Redtop Panicgrass, PA Ecotype)
4.0% Chamaecrista fasciculata, PA Ecotype (Partridge Pea, PA Ecotype)
4.0% Echinacea purpurea (Purple Coneflower)
3.0% Coreopsis lanceolata (Lanceleaf Coreopsis)
3.0% Rudbeckia hirta, Coastal Plain NC Ecotype (Blackeyed Susan, Coastal Plain NC Ecotype)
2.0% Carex vulpinoidea, PA Ecotype (Fox Sedge, PA Ecotype)
2.0% Heliopsis helianthoides, PA Ecotype (Oxeye Sunflower, PA Ecotype)
2.0% Verbena hastata, PA Ecotype (Blue Vervain, PA Ecotype)
1.5% Asclepias incarnata, PA Ecotype (Swamp Milkweed, PA Ecotype)
1.0% Juncus effusus (Soft Rush)
1.0% Liatris spicata, PA Ecotype (Marsh Blazing Star, PA Ecotype)
1.0% Panicum sphaeroncarpon (Round Seed Panicgrass)
1.0% Penstemon digitalis, PA Ecotype (Tall White Beardtongue, PA Ecotype)

Plant Schedule

Quantity	Symbol	Scientific Name	Common Name	Size
Section 137-50 Shade Trees				
Trees				
18		Liquidambar styraciflua 'Happidaze'	'Happidaze' Sweetgum	3-3.5" cal. min., B&B
5		Quercus alba	White Oak	3-3.5" cal. min., B&B
Section 155-55 Apartment Complexes (Buffer and Screening)				
Trees				
10		Nyssa sylvatica 'Wildfire'	'Wildfire' Black Gum	3-3.5" cal. min., B&B
6		Liriodendron tulipifera	Tulip Tree	3-3.5" cal. min., B&B
10		Acer saccharum 'Legacy'	'Legacy' Sugar Maple	3-3.5" cal. min., B&B
6		Betula nigra	River Birch	2.5-3" cal. (10' ht.), B&B
15		Picea abies	Norway Spruce	6-8' ht. minimum
22		Picea omorika	Serbian Spruce	6-8' ht. minimum
19		Thuja standishii x plicata 'Green Giant'	Green Giant Arborvitae	6-8' ht. minimum
9		Amelanchier canadensis	Serviceberry	2.5-3" cal. (10' ht.), B&B
11		Cornus florida 'Cherokee Princess'	Cherokee Princess Dogwood	2.5-3" cal. (10' ht.), B&B
12		Thuja occidentalis 'Emerald'	Emerald Arborvitae	6-8' ht. minimum
Shrubs				
12		Viburnum trilobum 'Bailey Compactum'	Bailey Compact Cranberrybush Viburnum	30-36" ht., 30-36" spacing
12		Viburnum lantana 'Mohican'	'Mohican' Wayfaringtree Viburnum	30-36" ht., 30-36" spacing
9		Ilex glabra 'Densa'	Densa Inkberry	30-36" ht., 30-36" spacing
Section 155-139 Off Street Parking Areas				
8		Platanus x acerifolia 'Bloodgood'	'Bloodgood' London Planetree	3-3.5" cal. min., B&B
11		Gleditsia tricanthos inermis	Thornless Honey Locust	3-3.5" cal. min., B&B
Other Landscaping				
Trees				
14		Prunus yedoensis	Yoshino Cherry	2.5-3" cal. (10' ht.), B&B
Shrubs				
12		Viburnum trilobum 'Bailey Compactum'	Bailey Compact Cranberrybush Viburnum	30-36" ht., 30-36" spacing
27		Ilex glabra 'Densa'	Densa Inkberry	30-36" ht., 30-36" spacing
26		Hydrangea quercifolia 'Snow Queen'	Snow Queen Hydrangea	30-36" ht., 30-36" spacing
24		Clethra alnifolia 'Ruby Spice'	Ruby Spice Summersweet	30-36" ht., 30-36" spacing
20		Prunus laurocerasus 'Otto Luyken'	Otto Luyken Cherry Laurel	30-36" ht., 30-36" spacing
Perennials, Grasses, and Groundcovers				
109		Rhus aromatica 'Gro-Low'	Gro-Low Fragrant Sumac	Spacing as shown, #3 container
160		Pennisetum alopecuroides 'Cassian'	Cassian Dwarf Fountain Grass	24" O.C., 1 gal.
140		Achillea millefolium 'Strawberry Seduction'	Strawberry Seduction Yarrow	24" O.C., 1 gal.
85		Muhlenbergia capillaris	Pink Muhly Grass	24" O.C., 1 gal.
155		Schizachyrium scoparium 'Standing Ovation'	Standing Ovation Little Bluestem	24" O.C., 1 gal.
130		Leucanthemum x superbum 'Becky'	Shasta Daisy	24" O.C., 1 gal.
130		Rudbeckia fulgida 'Goldstrum'	Black Eyed Susan	24" O.C., 1 gal.
Infiltration Basin				
20,650 SF		Ernst Seed Mix 180 (Rain Garden Mix)		Seed at a rate of 20 lbs / acre

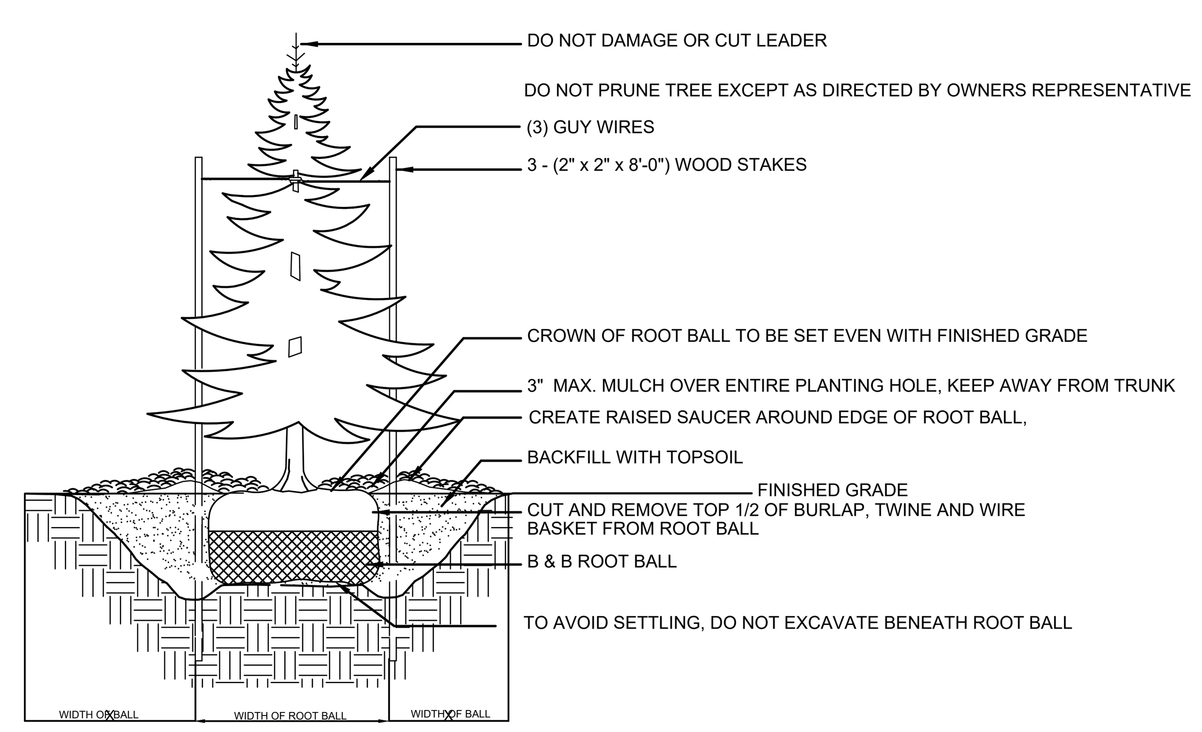
GENERAL NOTES:

1. Contractor shall be responsible for contacting PA ONE CALL and locating all underground utilities before any digging or plant removal occurs.
2. Contractor shall be responsible for removing existing trees and plant material within the area of proposed improvements.
3. Contractor shall be responsible for disposing of all debris off-site; clean-up of all paved areas (roadways, sidewalks, etc.); and restoration of all disturbed lawn areas.
4. Contractor shall be required to repair any damage to underground utilities damaged.
5. Contractor shall install silt fence in any areas where soil may runoff into parking areas or into existing inlets.
6. All plant material shall be of specimen quality.
7. All plant material shall conform with the most current version of the "American Standard for Nursery Stock".
8. Contractor shall provide Landscape Architect with nursery source of all plant material. Landscape Architect shall perform a site visit to inspect nursery source prior to delivery of any plant material.
9. All trees and shrubs delivered to the site shall be inspected and approved by the Landscape Architect prior to planting. All trees and shrubs shall have waterproof tag bearing legible designation of botanical and common name.
10. All plant substitutions must be approved by the Caln Township Landscape Architect.
11. Any plant material exhibiting signs of disease, insects, eggs, larvae and defects such as knots, sun-scald, injuries, abrasions or disfigurement shall be rejected.
12. All plant material shall be laid out in field by Landscape Architect. (Note: No shrubs shall be planted until all tree planting is completed.)
13. All proposed shrubs shall be planted in continuous mulched beds, consisting of 3" of Oak bark mulch.
14. All trees shall be provided with a 3" deep saucer, consisting of shredded Oak bark mulch.
15. All plant material shall be thoroughly watered during installation and throughout the guarantee period.
16. All plant material shall be watered by Contractor at least three (3) times in absence of natural rainfall or until the end of the guarantee period.
17. Following completion of all planting installation work, the Contractor shall be required to restore all disturbed lawn areas.
18. Following the completion, the existing vegetation will be inspected for health and quality, and if not deemed in good condition, replaced with the equivalent compensatory plantings.
19. All plant material shall be guaranteed for (18) eighteen months.
20. Client did not retain Orsatti & Stuart, inc. to provide long term maintenance specifications for the landscape material.



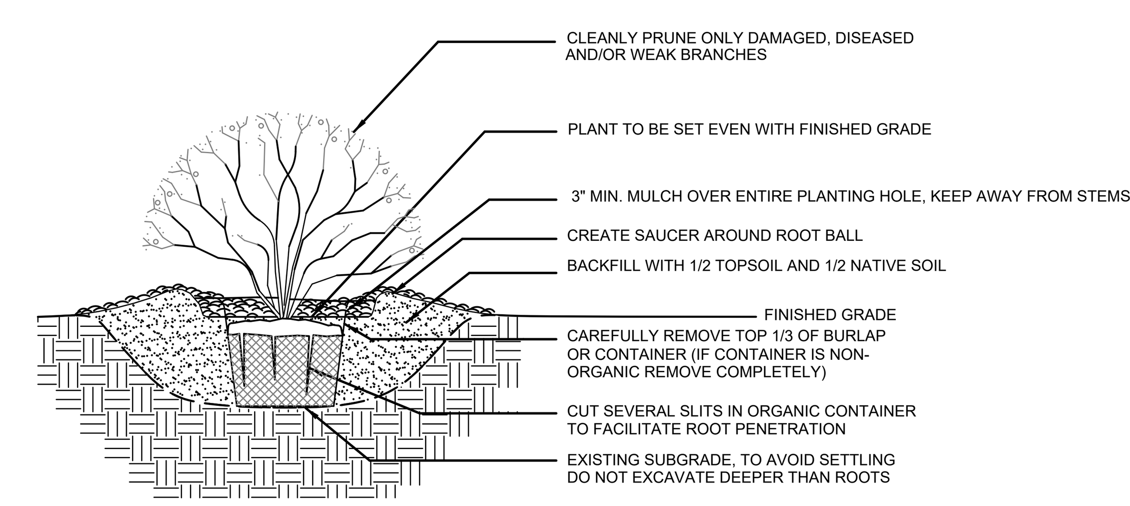
NOTES:
1. DO NOT DAMAGE MAIN ROOTS OR ROOT BALL WHEN INSTALLING TREE STAKE.
2. WATER THOROUGHLY AFTER INSTALLATION.
3. REMOVE STAKES TWO YEARS OR LESS AFTER INSTALLATION.
4. CONTRACTOR IS NOT TO USE TREE WRAP.

TYPICAL DECIDUOUS TREE PLANTING DETAIL
NOT TO SCALE



SPECIFICATIONS:
1. DO NOT DAMAGE MAIN ROOTS OR DESTROY ROOT BALL WHEN INSTALLING TREE STAKE.
2. WATER THOROUGHLY AFTER INSTALLATION.
3. REMOVE STAKES TWO YEARS OR LESS AFTER INSTALLATION.

TYPICAL EVERGREEN TREE PLANTING DETAIL
NOT TO SCALE



NOTES:
1. WATER THOROUGHLY AFTER INSTALLATION.
2. FOR PLANTING BED INSTALLATION EXCAVATE ENTIRE SHRUB BED AS SHOWN ON PROJECT DRAWINGS.

TYPICAL SHRUB PLANTING DETAIL
NOT TO SCALE

NOTE: THIS PLAN IS TO BE USED FOR LANDSCAPE PURPOSES ONLY.

EXHIBIT A-2(h)

DLHowell
Civil Engineering & Land Planning
www.DLHowell.com

D.L. Howell & Assoc., Inc.
1250 Wrights Lane
West Chester, PA 19380
Phone: (610) 918-9002
Fax: (610) 918-9003

REV.	DATE	DESCRIPTION
1	08/18/20	Revisions per review letter dated 08/11/20.
2		
3		
4		
5		
6		
7		
8		

LANDSCAPE PLAN

CLIENT: INGERMAN
PROJECT: APARTMENT COMPLEX
LOCATION: 2131 LINCOLN HIGHWAY EAST
CALN TOWNSHIP, CHESTER COUNTY, PA

DATE:	06/23/20
SCALE:	1" = 50'
DRAWN BY:	KTD
CHECKED BY:	PJS
PROJECT NO.:	3705
CAD FILE:	08-17-20_2131 Lincoln TLP.dwg
PLOTTED:	08/18/20
DRAWING NO.:	C07.2
SHEET	08 OF 08

ORSATTI & STUART
ASSOCIATES, INC.
PLANNERS ■ LANDSCAPE ARCHITECTS
860 First Avenue ■ Suite 9B ■ King of Prussia ■ PA ■ 19406
P:610 337 2100 ■ F:610 337 3639 ■ www.orsattiassociates.com

THE WILLOWS AT VALLEY RUN | Entrance Perspective
2131 LINCOLN HIGHWAY
CALN TOWNSHIP, CHESTER COUNTY, PA
DATE: 08-11-2020

EXHIBIT A-3(a)

Ingerman

HaleyDonovan

THE WILLOWS AT VALLEY RUN | PERSPECTIVE

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

EXHIBIT A-3(b)

Ingerman

HaleyDonovan

THE WILLOWS AT VALLEY RUN | REAR PERSPECTIVE

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

EXHIBIT A-3(c)

Ingerman

HaleyDonovan

THE WILLOWS AT VALLEY RUN
2131 LINCOLN HIGHWAY
CALN TOWNSHIP, CHESTER COUNTY, PA
DATE: 06-01-2020

FRONT PERSPECTIVE

EXHIBIT A-3(d)

Ingerman

HaleyDonovan

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-22-2020

FRONT ELEVATION

EXHIBIT A-3(e)

Ingerman

HaleyDonovan

BUILDING SQUARE FOOTAGE TABLE

			AREA (SF)				
CONSTRUCTION PHASE	BUILDING TYPE	# UNITS	1ST FLOOR	2ND FLOOR	3RD FLOOR	TOTAL	TOTAL AREA PER PHASE
PHASE 1	BUILDING TYPE B COMMUNITY BUILDING		2,583			2,583	68,427
	BUILDING TYPE D	24	9,307	9,381	9,381	28,069	
	BUILDING TYPE E	24	7,934	8,009	7,776	23,719	
	BUILDING TYPE C	12	4,660	4,698	4,698	14,056	
PHASE 2	BUILDING TYPE A	24	8,620	8,695	8,579	25,894	65,844
	BUILDING TYPE D	24	9,307	9,381	9,381	28,069	
	BUILDING TYPE F	12	3,974	4,012	3,895	11,881	
						TOTAL AREA	134,271

UNIT COUNT TABLE

	BUILDING A:			
UNIT TYPE	1ST FLOOR	2ND FLOOR	3RD FLOOR	TOTAL NUMBER OF UNIT TYPE
1BR- TYPE A	2			2
1BR- TYPE B		2	2	4
2BR- TYPE A	2	2	2	6
2BR- TYPE B	2			2
2BR- TYPE C			2	2
2BR- TYPE D		2		2
3BR- TYPE A	1			1
3BR- TYPE B		2	2	4
3BR- TYPE C	1			1
TOTAL UNITS PER FLOOR	8	8	8	**24**

	BUILDING C:			
UNIT TYPE	1ST FLOOR	2ND FLOOR	3RD FLOOR	TOTAL NUMBER OF UNIT TYPE
1BR- TYPE A	1			1
1BR- TYPE B		1	1	2
2BR- TYPE A	1	1	1	3
2BR- TYPE B				
2BR- TYPE C				
2BR- TYPE D				
3BR- TYPE A	2			2
3BR- TYPE B		2	2	4
3BR- TYPE C				
TOTAL UNITS PER FLOOR	4	4	4	**12**

(2x BUILDING TYPE D ON SITE)

	BUILDING D:			
UNIT TYPE	1ST FLOOR	2ND FLOOR	3RD FLOOR	TOTAL NUMBER OF UNIT TYPE
1BR- TYPE A	2			2
1BR- TYPE B		2	2	4
2BR- TYPE A	2	2	2	6
2BR- TYPE B				
2BR- TYPE C				
2BR- TYPE D				
3BR- TYPE A	2			2
3BR- TYPE B		4	4	8
3BR- TYPE C	2			2
TOTAL UNITS PER FLOOR	8	8	8	**24**

	BUILDING E:			
UNIT TYPE	1ST FLOOR	2ND FLOOR	3RD FLOOR	TOTAL NUMBER OF UNIT TYPE
1BR- TYPE A	2			2
1BR- TYPE B		2	2	4
2BR- TYPE A	2	2	2	6
2BR- TYPE B	4			4
2BR- TYPE C			4	4
2BR- TYPE D		4		4
3BR- TYPE A				
3BR- TYPE B				
3BR- TYPE C				
TOTAL UNITS PER FLOOR	8	8	8	**24**

	BUILDING F:			
UNIT TYPE	1ST FLOOR	2ND FLOOR	3RD FLOOR	TOTAL NUMBER OF UNIT TYPE
1BR- TYPE A	1			1
1BR- TYPE B		1	1	2
2BR- TYPE A	1	1	1	3
2BR- TYPE B	2			2
2BR- TYPE C			2	2
2BR- TYPE D		2		2
3BR- TYPE A				
3BR- TYPE B				
3BR- TYPE C				
TOTAL UNITS PER FLOOR	4	4	4	**12**

FIRST FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

BUILDING A - FLOOR PLANS

EXHIBIT A-3(f)

Ingerman

HaleyDonovan

THIRD FLOOR

SCALE: 1/8" = 1'-0"

SECOND FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

BUILDING A - FLOOR PLANS

EXHIBIT A-3(g)

Ingerman

HaleyDonovan

FLOOR PLAN

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN
2131 LINCOLN HIGHWAY
CALN TOWNSHIP, CHESTER COUNTY, PA
DATE: 06-01-2020

COMMUNITY BUILDING - B

EXHIBIT A-3(h)

Ingerman

HaleyDonovan

SECOND FLOOR

SCALE: 1/8" = 1'-0"

THIRD FLOOR

SCALE: 1/8" = 1'-0"

FIRST FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN
2131 LINCOLN HIGHWAY
CALN TOWNSHIP, CHESTER COUNTY, PA
DATE: 06-01-2020

BUILDING C - FLOOR PLANS

EXHIBIT A-3(i)

Ingerman

HaleyDonovan

SECOND FLOOR

SCALE: 1/8" = 1'-0"

FIRST FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

BUILDING D - FLOOR PLANS

EXHIBIT A-3(j)

Ingerman

HaleyDonovan

THIRD FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN
2131 LINCOLN HIGHWAY
CALN TOWNSHIP, CHESTER COUNTY, PA
DATE: 06-01-2020

BUILDING D - FLOOR PLANS

Ingerman

HaleyDonovan

EXHIBIT A-3(k)

SECOND FLOOR

SCALE: 1/8" = 1'-0"

FIRST FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-22-2020

BUILDING E - FLOOR PLANS

EXHIBIT A-3(l)

Ingerman

HaleyDonovan

THIRD FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

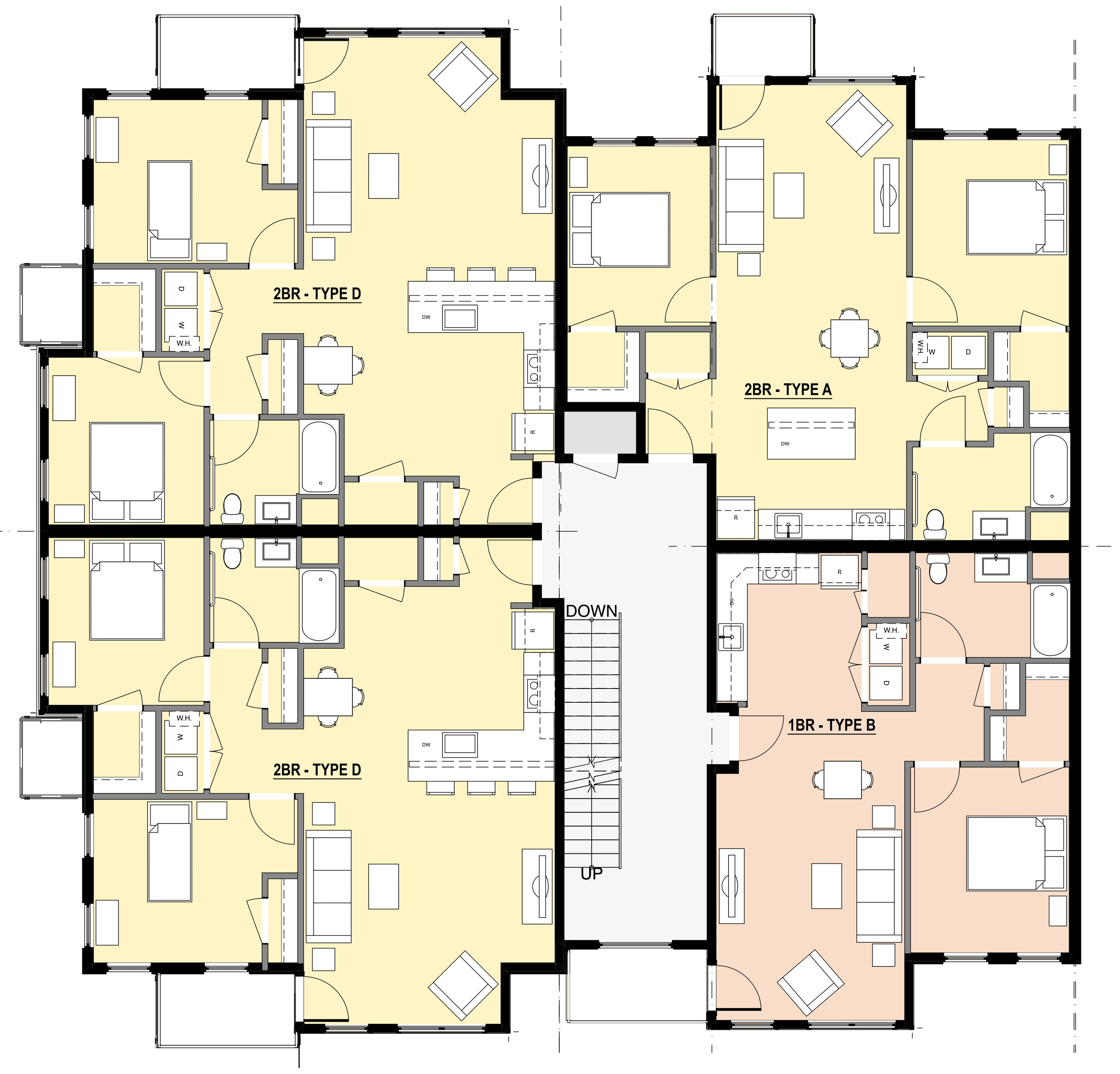
DATE: 06-01-2020

BULDING E - FLOOR PLANS

EXHIBIT A-3(m)

Ingerman

HaleyDonovan



SECOND FLOOR

SCALE: 1/8" = 1'-0"

THIRD FLOOR

SCALE: 1/8" = 1'-0"

FIRST FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN | BUILDING F

2131 LINCOLN HIGHWAY

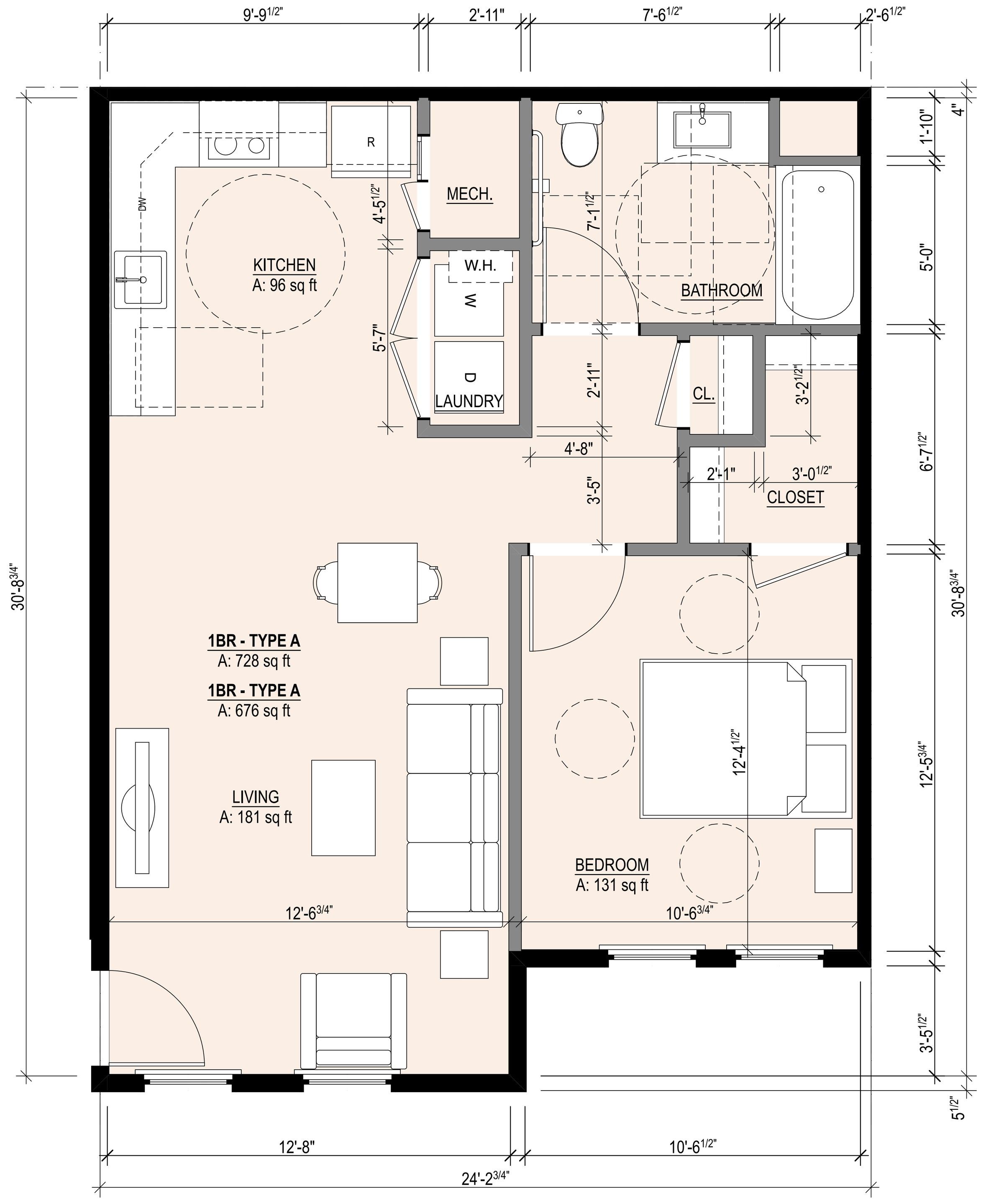
CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

EXHIBIT A-3(n)

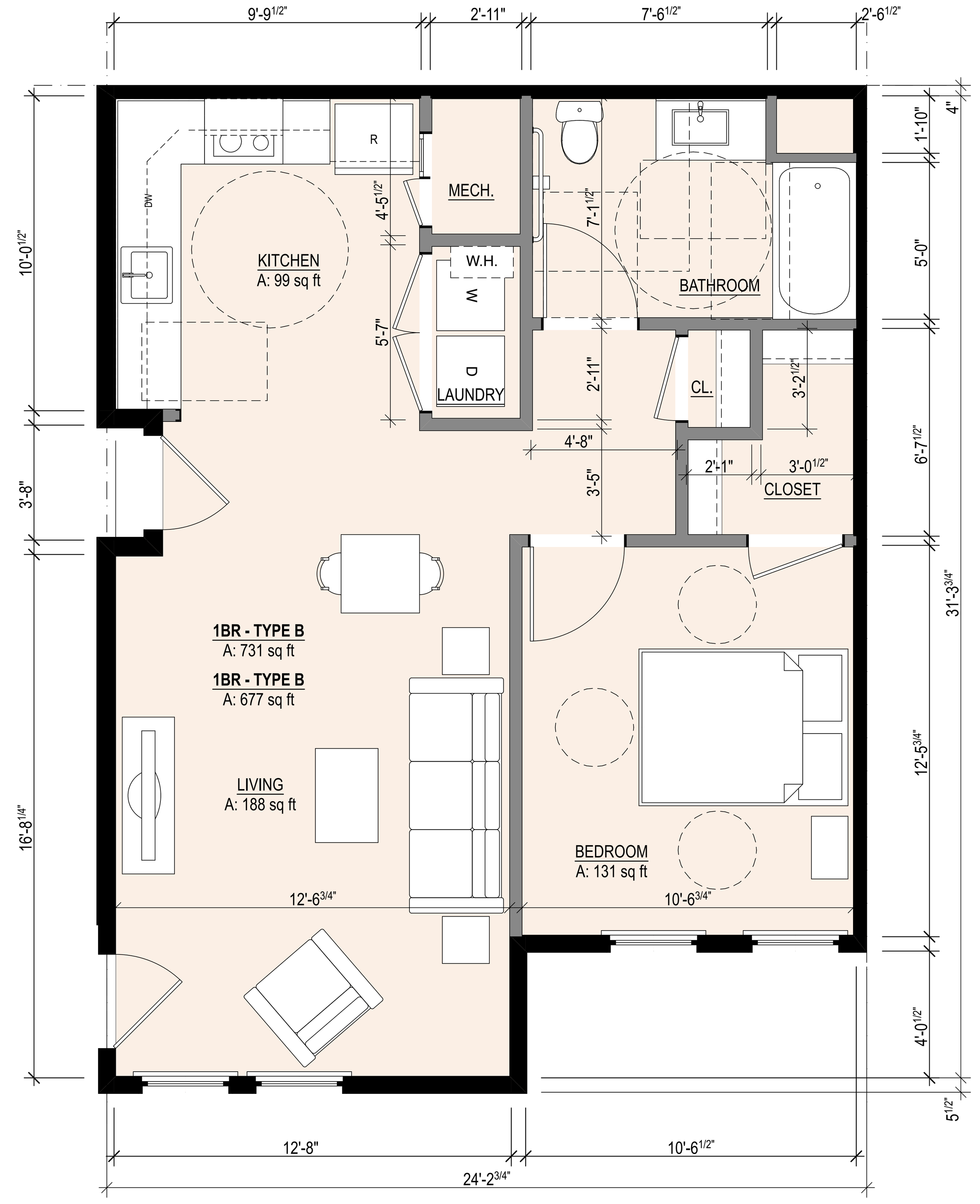
Ingerman

HaleyDonovan



1BR - A UNIT

SCALE: 1/4" = 1'-0"

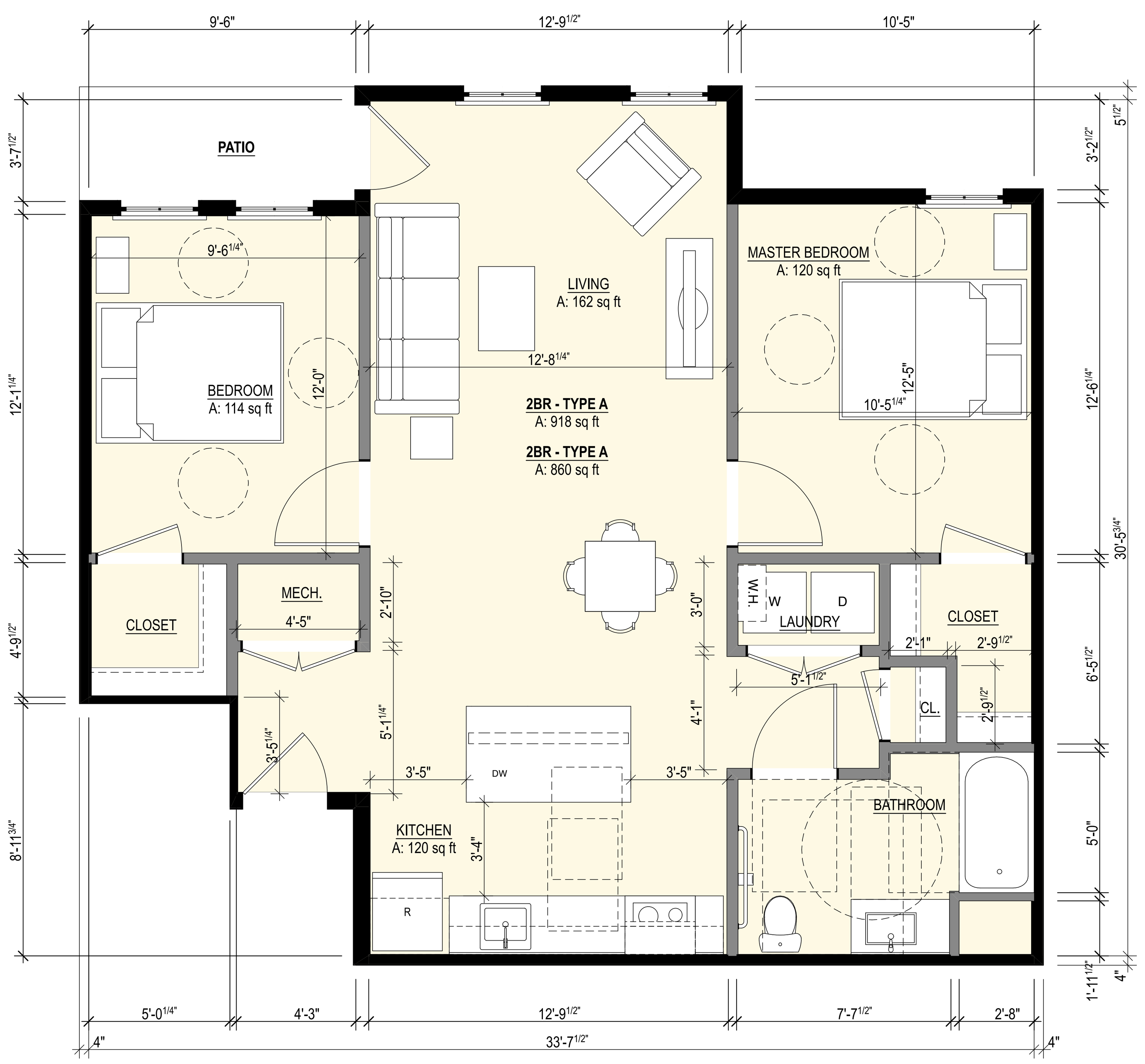


1BR - B UNIT

SCALE: 1/4" = 1'-0"

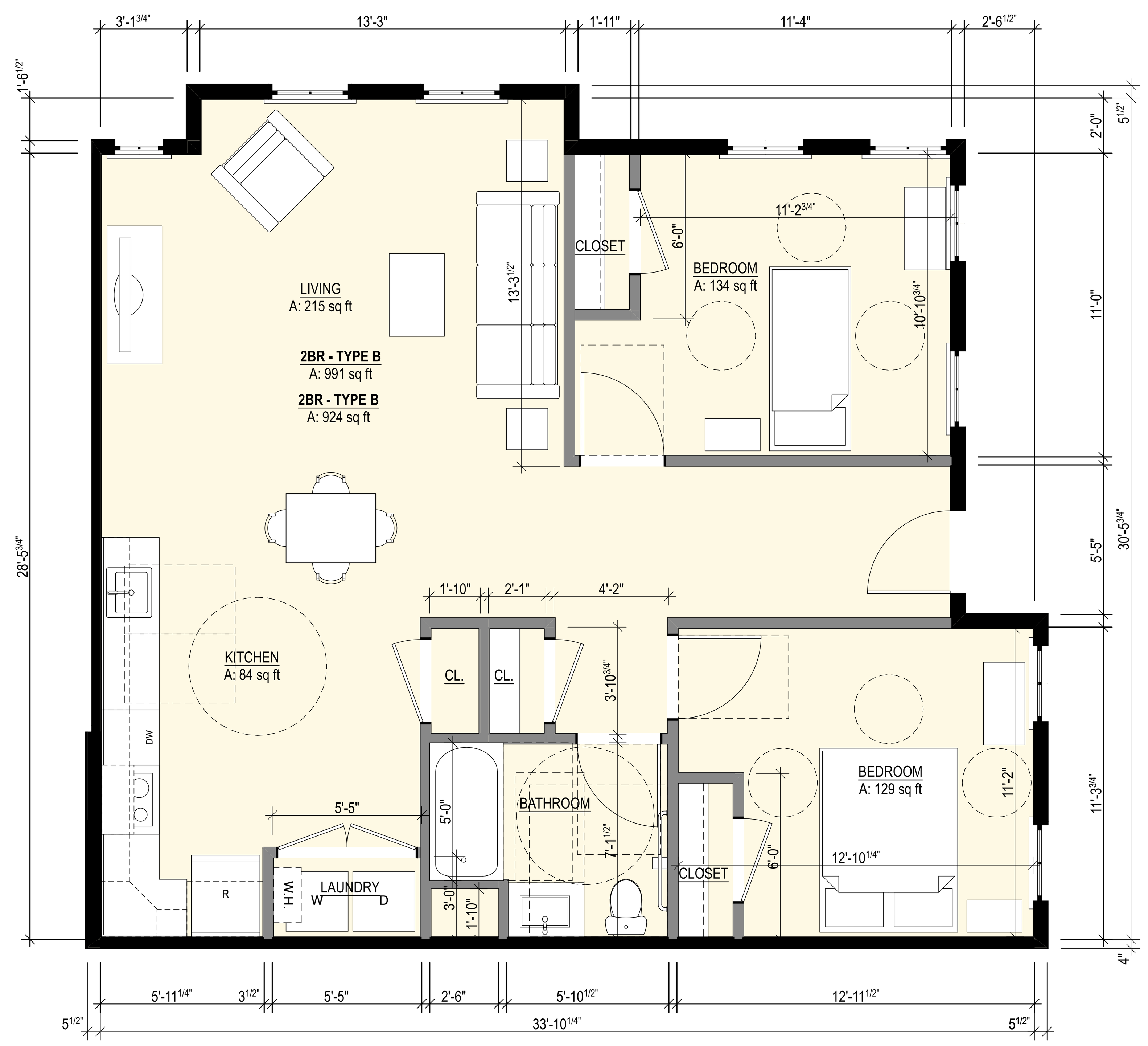
UNIT SQARE FOOTAGE TABLE

	GROSS (SF)		NET (SF)	
UNIT TYPE	**UNIT**	**AVERAGE GROSS (SF)**	**UNIT**	**AVERAGE NET (SF)**
1BR- TYPE A	728	730	676	677
1BR- TYPE B	731		677	
2BR- TYPE A	918	970	860	909
2BR- TYPE B	991		924	
2BR- TYPE C	956		898	
2BR- TYPE D	1,015		952	
3BR- TYPE A	1,329	1,337	1,261	1,265
3BR- TYPE B	1,368		1,291	
3BR- TYPE C	1,344		1,269	



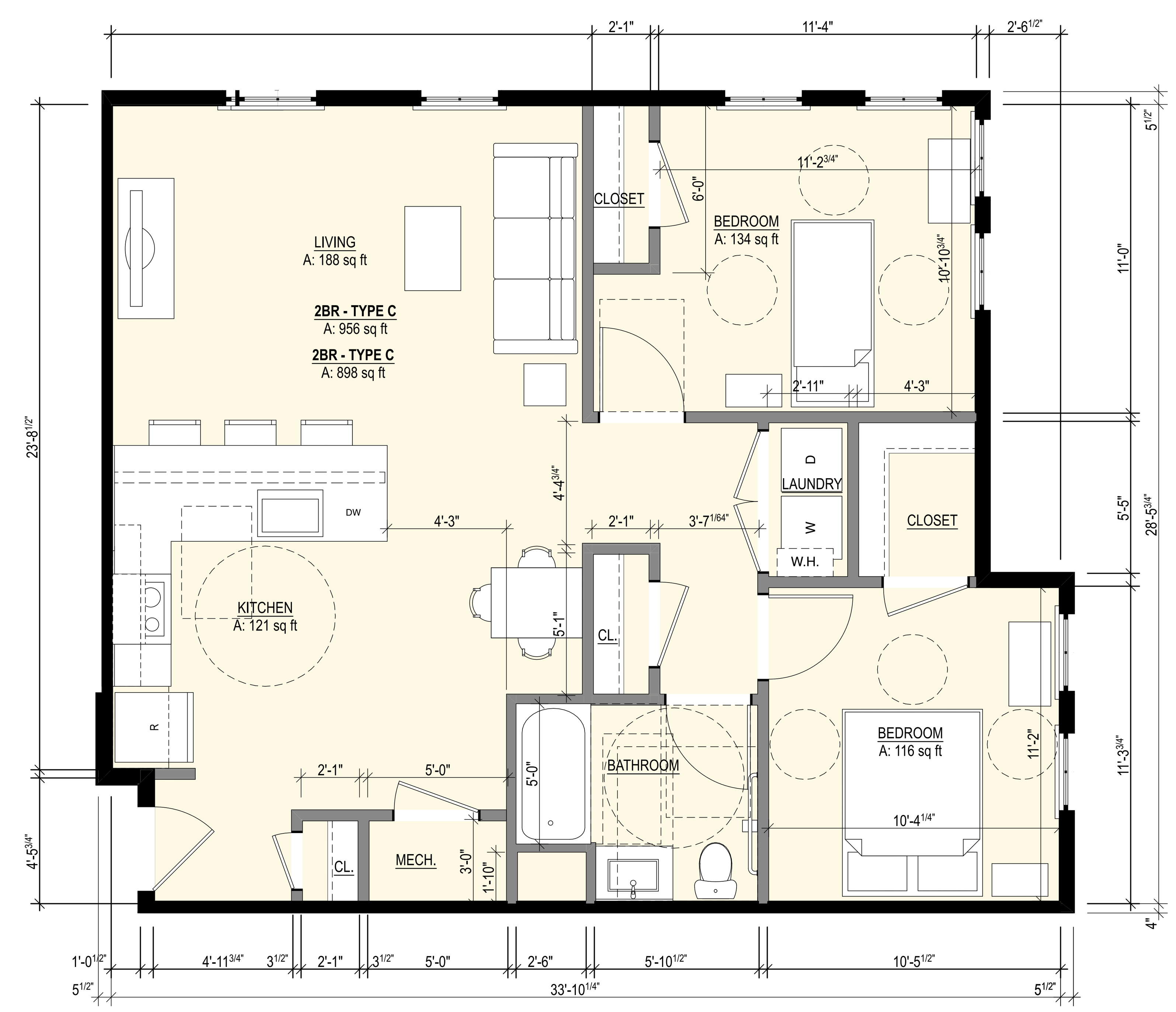
2BR - A UNIT

SCALE: 1/4" = 1'-0"



2BR - B UNIT

SCALE: 1/4" = 1'-0"



2BR - C UNIT

SCALE: 1/4" = 1'-0"

THE WILLOWS AT VALLEY RUN

UNIT TYPES

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

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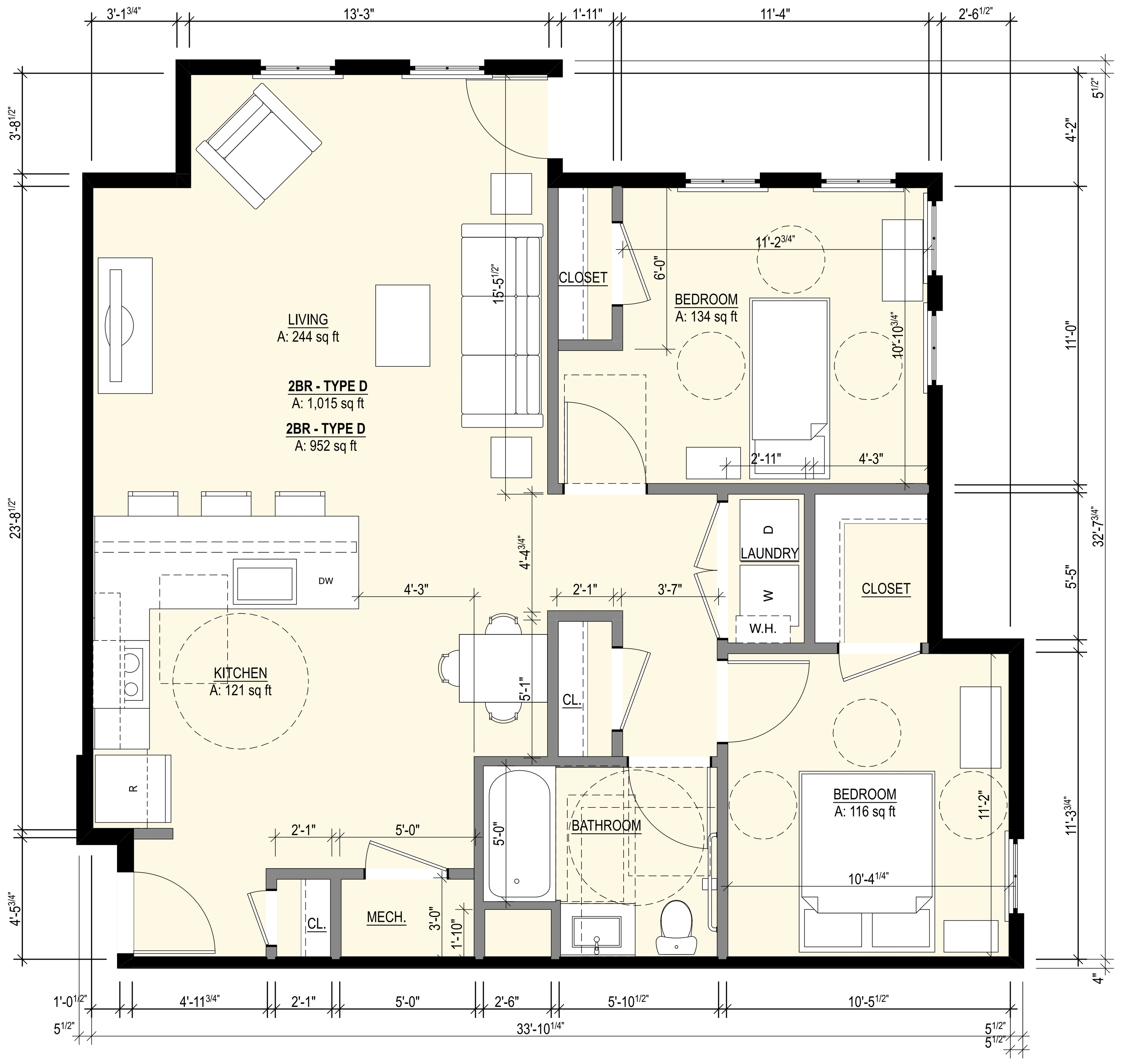
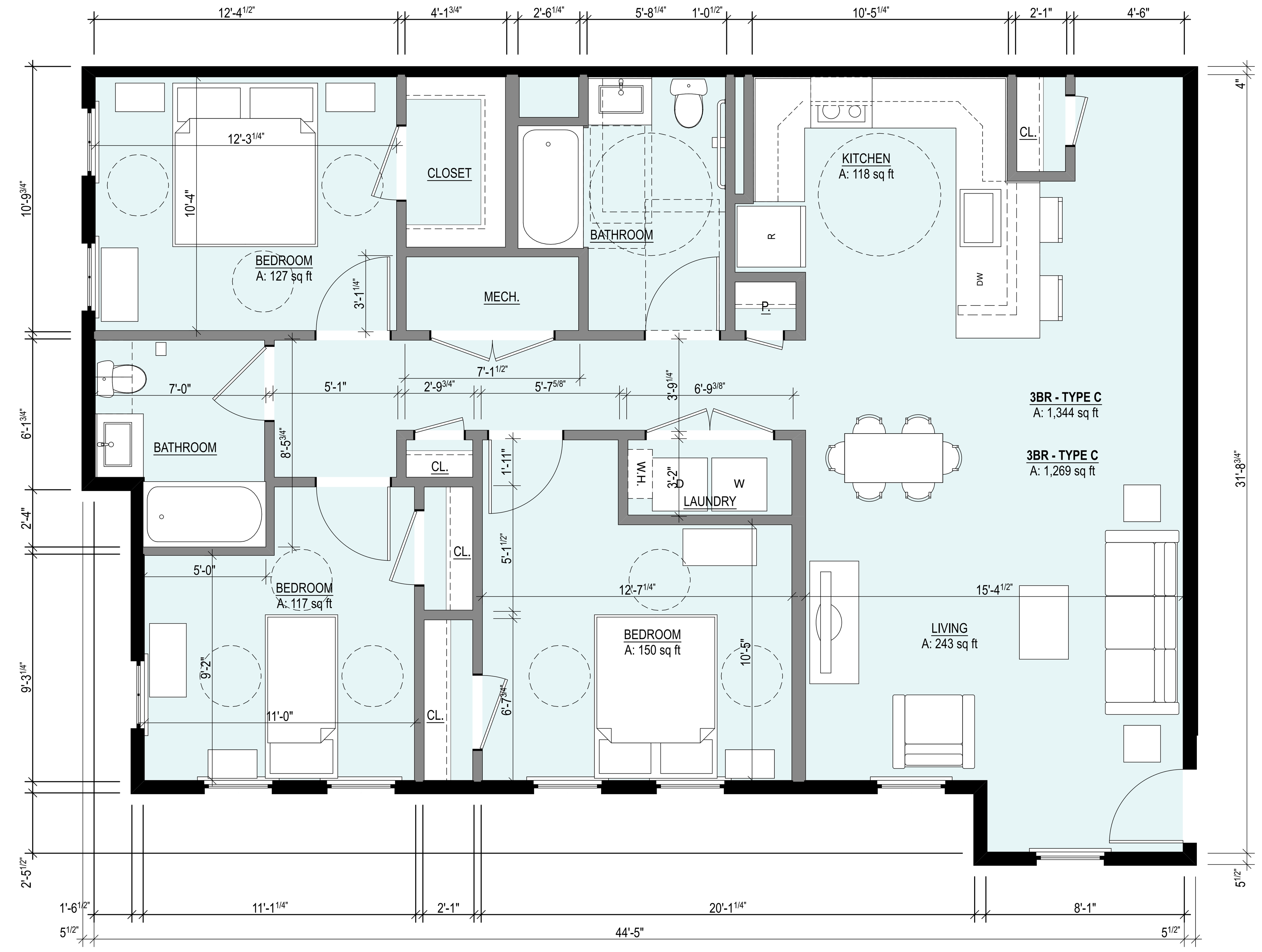


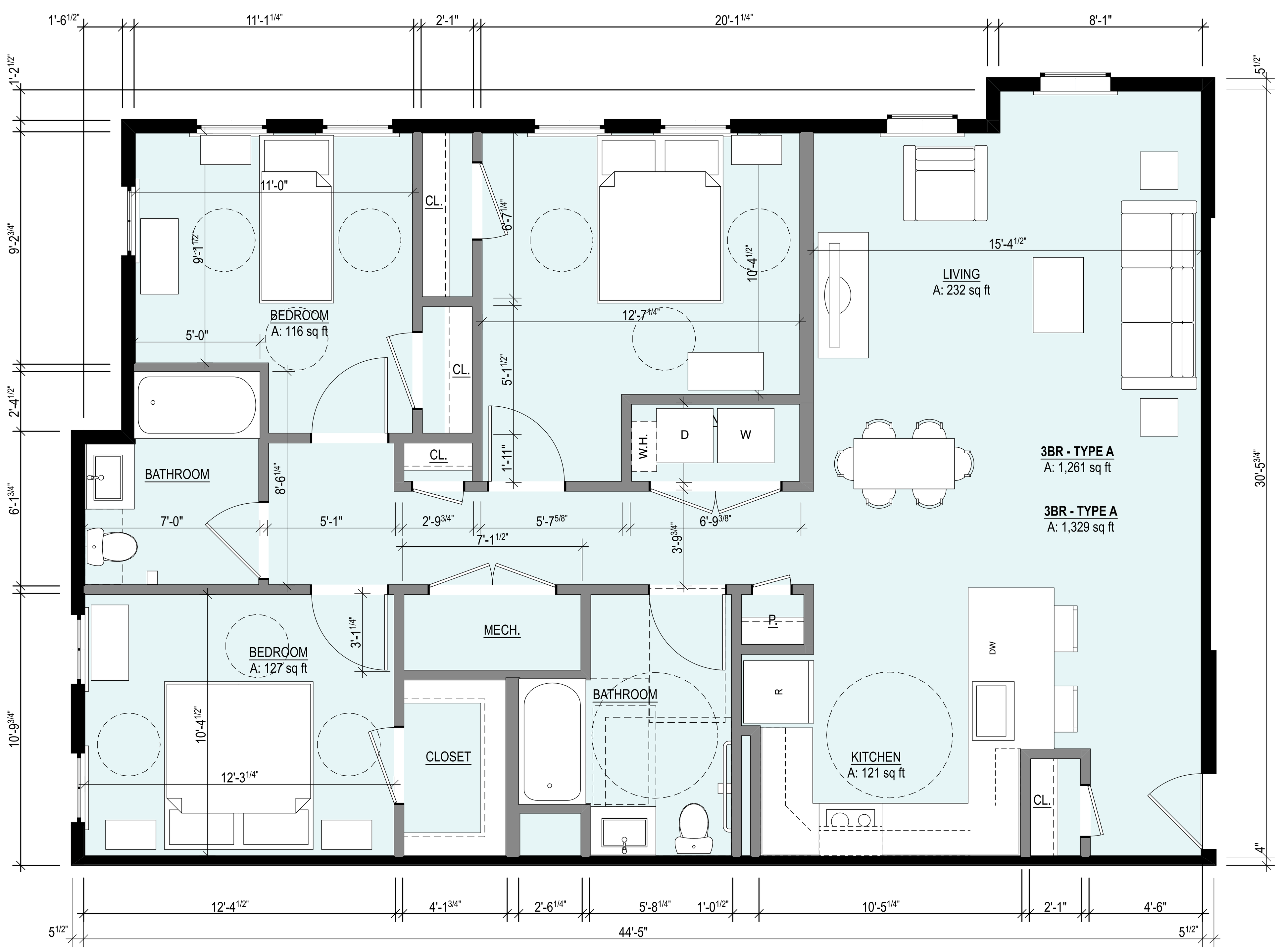
2 BR - D UNIT

SCALE: 1/4" = 1'-0"



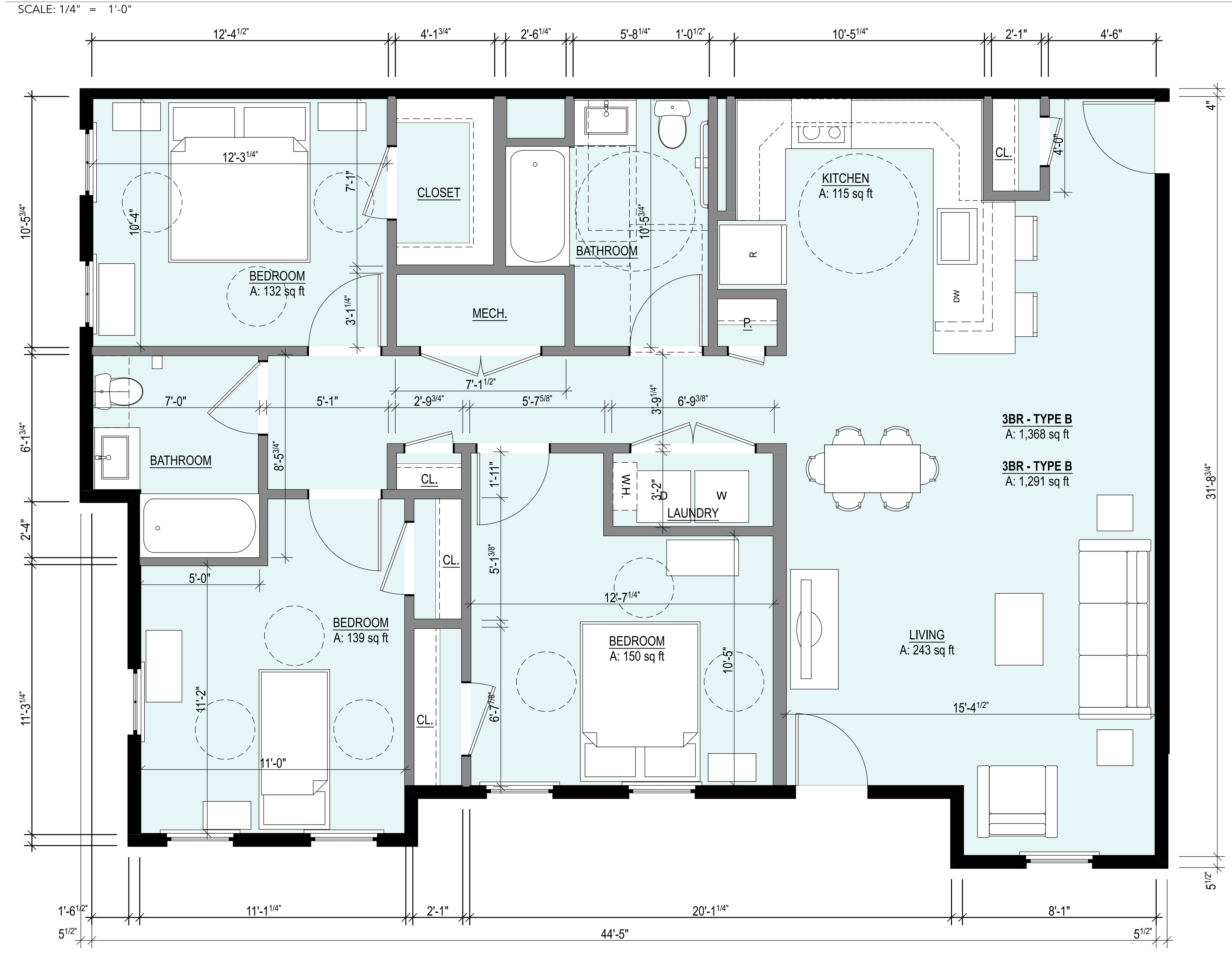
3 BR - C UNIT

SCALE: 1/4" = 1'-0"



3BR - A UNIT

SCALE: 1/4" = 1'-0"



3 BR - B UNIT

SCALE: 1/4" = 1'-0"

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

UNIT TYPES

EXHIBIT A-3(p)

Ingerman

HaleyDonovan

ENVIRONMENTAL IMPACT STUDY REPORT

FOR

The Willows at Valley Run
2131 Lincoln Highway
Caln Township
Chester County, Pennsylvania

June 23th, 2020

D.L. Howell Job# 3705

Prepared for:

Ingerman
5 Powell Lane
Collingswood, NJ

Prepared by:
D.L. HOWELL & ASSOCIATES, INC.
1250 Wrights Lane, West Chester, PA 19380
Phone: 610-918-9002 Fax: 610-918-9003

EXHIBIT A-4

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Appendix A – Site Location Map
Appendix B – Caln Township Zoning Map
Appendix C – Site Photographs
Appendix D – Site Development Plan
Appendix E – Architectural Plans
Appendix F – USDA NRCS Soil Resource Report
Appendix G – FEMA FIRMette Map
Appendix H – Bog Turtle Phase 1 Habitat Suitability Assessment

I. INTRODUCTION

The proposed project, The Willows at Valley Run, is a 120-unit apartment complex located at 2131 Lincoln Highway in Caln Township, Chester County, PA. This Environmental Impact Assessment Report summarizes the natural conditions at the site, the characteristics of the surrounding communities, and potential impacts that the proposed construction may have.

II. SITE LOCATION

A Site Location Map depicting the proposed development site and surrounding area can be found in Appendix A. The site is currently zoned C-1 Highway Commercial, which can be seen on the Caln Township Zoning Map, see Appendix B.

III. SITE CHARACTER AND APPEARANCE

The site is currently undeveloped and covered primarily with a mixture of wooded areas and dense vegetation. Photographs of the site can be found in Appendix C. All photographs were taken from Lincoln Highway.

IV. PROPOSED IMPROVMENTS

SITE DEVELOPMENT PLAN

The proposed improvements on the site consists of an apartment complex with four (4) 24-unit buildings, two (2) 12-unit buildings, one (1) community building, and associated parking, sidewalks, amenities, and stormwater management. The Site Development Plans can be found in Appendix D.

FLOOR PLANS

Floor plans of the proposed buildings can be found in Appendix E.

OWNERSHIP

The project consists of three parcels (39-4-57, 39-4-56, and 39-4J-40), all of which are currently owned by 2131 Lincoln Highway LLC. These parcels are to be consolidated and owned by MBID of Delaware, LLC. The operation and maintenance of all common areas (open space, stormwater management facilities, etc.) will be done by the property owner, MBID of Delaware, LLC.

PHASING

The project will be separated into two phases, see the Site Development Plans (Appendix D) for the phasing line. Phase 1 of the project will consist of the construction of the three (3) most eastern buildings, the community building, tot lot and basketball court amenities, and associated parking, sidewalks, and stormwater management. Phase 2 of the project will include the remaining improvements consisting of the remaining 24-unit building on the east side of the stream, the stream crossing, the two remaining buildings on the west side of the stream, and associated parking, sidewalks, and stormwater management.

V. PHYSICAL RESOURCES

GEOGRAPHICAL CHARACTERISTICS

Per the Pennsylvania DCNR PaGEODE mapping, the site is in an area underlain by the Ledger Formation (main rock type is Dolomite).

TOPOGRAPHICAL CHARACTERISTICS

The topography of the site is shown on the Existing Conditions and Demolition Plan in the development plan set. A stream flows from south to north across the property. The property slopes away from Lincoln Highway towards the North and generally towards the stream in the middle.

SOIL CHARACTERISTICS

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey was used to identify soil types at the site. The USDA NRCS Soil Resource Report can be found in Appendix F. The soil types are shown on the Existing Conditions and Demolition Plan in the development plan set. The following summarizes the soil types found on the site based on the USDA NRCS Web Soil Survey.

- CtA – Conestoga Silt Loam, 0 to 3 Percent Slopes
- UudB – Urban Land Udorthents, Limestone Complex, 0 to 8 Percent Slopes

HYDROLOGICAL CHARACTERISTICS

The hydrologic characteristics of the site, including surface water, topography/drainage characteristics, and floodplains are shown on the Existing Conditions and Demolition Plan in the development plan set. There is no evidence of existing wells or groundwater resources on the property. Per the Pennsylvania DEP eMapPA online mapping service, there are no groundwater resources on or within 500 feet of the site. The property lies within the Brandywine Creek East Branch Watershed. The existing stream on the site flows to an unnamed tributary to Beaver Creek, which is classified as a Cold Water Fishes (CWF) and Migratory Fishes (MF) watercourse based on the Pennsylvania Title 25, Chapter 93 Classification. Portions of the site are within the 100-Year Floodplain and areas of wetlands are present on the site, which are mapped on the Existing Conditions and Demolition Plan. The FEMA National Flood Hazard Layer FIRMette of the site can be found in Appendix G.

VI. BIOLOGICAL RESOURCES

Existing vegetated areas, wetlands, and watercourses located on the site are shown on the Existing Conditions and Demolition Plan. The site is heavily vegetated with a mixture of young and mature trees and areas of dense undergrowth. Trees greater than 6” outside of wetland areas were surveyed and are shown on the Existing Conditions and Demolition Plan.

The amount of vegetation on the site suggests there is a suitable habitat for terrestrial wildlife typical to this area of Pennsylvania. Additionally, because of the existing stream and wetlands located on the site, there is likely a suitable habitat for aquatic wildlife. A PNDI search was performed and identified a potential impact. A Bog Turtle Habitat (Phase 1) Survey was performed by DuBois & Associates on April 24th, 2020 and the results indicated that no suitable bog turtle habitat was located within the wetlands delineated on the property. See Appendix H for the full Bog Turtle Phase 1 Habitat Suitability Assessment.

VII. LAND USE

The Existing Conditions and Demolition Plan depicts the existing land cover, encumbrances, and adjacent land uses. The lot is currently vacant and is primarily covered by dense vegetation with surface water resources (as described above in Section V.a. Hydrologic Resources), and paving at the southeast corner of the site associated with a single-family dwelling that was previously demolished.

The property is bordered to the East, South (across Lincoln Highway), and West by C-1 Highway Commercial Zoned properties. The property is bordered to the north by I-1 Industrial and R-4 Medium to High Density Residential Zoning properties. Towards the East, there is a childcare center (Little Flock Learning Center) and wholesale distributor (Ferguson Waterworks). Towards the South, there is an automobile sales business (Caln Auto Sales), car rental facility (Avis Car Rental), and automobile service center (A & G's Automotive & Transmission). Towards the West, there is a storage warehouse (Extra Space Storage), office/contractor building (Verizon), and car wash (Gentle Touch Car Wash). Towards the North, the property is bordered by an industrial laboratory (Exelon PowerLabs) and a residential development. See the Existing Conditions and Demolition Plan for a map showing the adjacent land uses.

VIII. HISTORIC RESOURCES

There are no historic resources known to be associated with, or adjacent to, the property.

IX. VISUAL RESOURCES

There are no significant visual resources associated with the property.

X. COMMUNITY FACILITY NEEDS

The project proposes 120 residential apartment units. Community facilities will be constructed as part of the project and include a tot-lot, half-court basketball court, and a community building with a fitness center. Additionally, the applicant is conserving a large portion of the site as open space. By providing a combination of community facilities and preserved open space, the applicant will help meet the increase in demand for recreational areas. It is expected that the development of this lot will increase the population of school aged children in Coatesville School District. Nearby schools include Reeceville Elementary School (2.1 Miles), Scott Middle School (1.5 Miles) or Coatesville Area Senior High School (0.9 Miles). Caln Municipal Park is located approximately 1.6 miles from the proposed development for residents to use. The Coatesville Area Public Library is located approximately 1.75 miles from the site for use by the future residents. The Brandywine Hospital is located approximately 1.9 Miles from the project site. Various doctors are located within 2 miles of the site. There will be an increased demand for services such as postal, trash/recycling, and police/emergency. The project will be serviced by public transportation (summarized in Section XII. Below) which will allow the future residents to access other community resources not mentioned above if personal transportation is unavailable.

XI. UTILITY NEEDS

The proposed project will require sewer disposal, water service, and storm drainage. Sewage disposal will be provided by the Caln Township Municipal Authority and the proposed buildings will connect to an existing public sanitary sewer line. Water service will be provided by Pennsylvania American Water and the proposed buildings will connect to an existing water main. Stormwater management will be provided on the site and will consist of storm sewer lines throughout the site. Refuse disposal will likely be done by a private waste management company. It is expected that electric and communication connections will be made with the existing lines in Lincoln Highway.

XII. TRANSPORTATION NEEDS

There will be a single ingress/egress point on the site that connects to Lincoln Highway. The project site will provide adequate parking for residents who choose to use their personal vehicles for transportation. The SEPTA – Thorndale Train Station located at 201 S. Bailey Road is approximately 1.1 Miles from the project site, and the Rover/Krapf Transit Bus Route A – Seltzer Avenue, North Caln Road and Veterans Drive are all located within 0.5 Miles of the project site for residents who choose to use public transportation. The project also proposes a bus stop at the entrance to the site.

See the Traffic Impact Study for more detail on the transportation needs.

XIII. SOCIAL AND DEMOGRAPHIC CHARACTERISTICS

There are one-hundred and twenty (120) dwelling units proposed as a part of this project. Thirty-six (36) of the dwelling units contain three (3) bedrooms, fifty-four (54) of the dwelling units contain two (2) bedrooms and thirty (30) of the dwelling units contain one (1) bedroom.

The project will be funded in part by the Pennsylvania Housing Finance Agency (PHFA) and the Chester County Department of Community Development. This will be a mixed-income rental community offering units to individuals and families with a broad spectrum of incomes. Some units will target those with low-moderate incomes, while other units will be market-rate with no income or rent restrictions. In addition, 10% of the units (12) will target those with disabilities.

XIV. ECONOMIC AND FISCAL CHARACTERISTICS

The proposed development will provide 120 residential dwellings to the surrounding area. The expected demographics of the residents is expected to be diverse, as described above.

The anticipated population of the development will likely include school-aged children, which will affect revenue/costs for the local school district. A portion of the residents will likely use public transportation in lieu of personal vehicles, which will limit the effects on streets compared to other apartment complex developments. Utilities including sewer and water are needed for this development. Storm drainage will be provided throughout the site and drain directly to an existing stream. Emergency services will need to have adequate capacity for this development as well as refuse/recycling collection.

A more detailed analysis of the economic and fiscal characteristics can be provided if needed.

XV. EXISTING/POTENTIAL ENVIRONMENTAL IMPACTS

The existing property is currently vacant and heavily vegetated with a stream and wetlands. There are no existing features on the site that suggest negative impacts to air and water quality, or noise levels. There are no known toxic or radioactive materials located on the site.

During construction, the site will be cleared in the area within the limit of disturbance. Any negative impacts to air and water quality during construction will be mitigated through appropriate environmental controls (dust, erosion, and sediment controls, etc.). Construction will occur during appropriate hours per Caln Township procedures to minimize increased noise and vibration that may affect adjacent property owners.

When construction is complete and the development is operational, there are not expected to be any significant environmental impacts. Because this is a residential development, there is not expected to be any significant form of air pollution, vibration, toxic materials, electrical interference, odors, heat, fire, smoke, dust, fumes, vapors, gases or radioactive materials released from the site. Water quality of the existing stream will be maintained using the proposed stormwater management systems. Landscaping buffers will be provided to buffer the site from Lincoln Highway and adjacent properties and help minimize air and water quality impacts. Outdoor lighting will be provided on the site and will include shields as necessary to minimize backlight/glare onto Lincoln Highway and adjoining properties.

XVI. ALTERNATIVES

Several alternative designs were considered, however the layout chosen was the least disruptive to the sensitive areas of the site, which include wetlands, floodplain, a stream, and riparian buffer areas.

XVII. PROBABLE ADVERSE EFFECTS

The project proposes a stream crossing on the site. In this area, the riparian buffer and floodplain will be disturbed. Any negative impacts in this area will be minimized using appropriate erosion and sediment controls and minimizing the disturbed area.

XVIII. IRREVERSIBLE ENVIRONMENTAL CHANGES

The project proposes approximately 7 acres of disturbance, the majority of which will be removal of dense vegetation and disturbance within the floodplain/riparian buffer for the stream crossing. However, approximately 8 acres of open space (including wetlands and floodplains) will remain undisturbed, stormwater management facilities will be implemented to preserve the water quality on site and downstream, and additional plantings will be provided in accordance with the Caln Township landscape requirements.

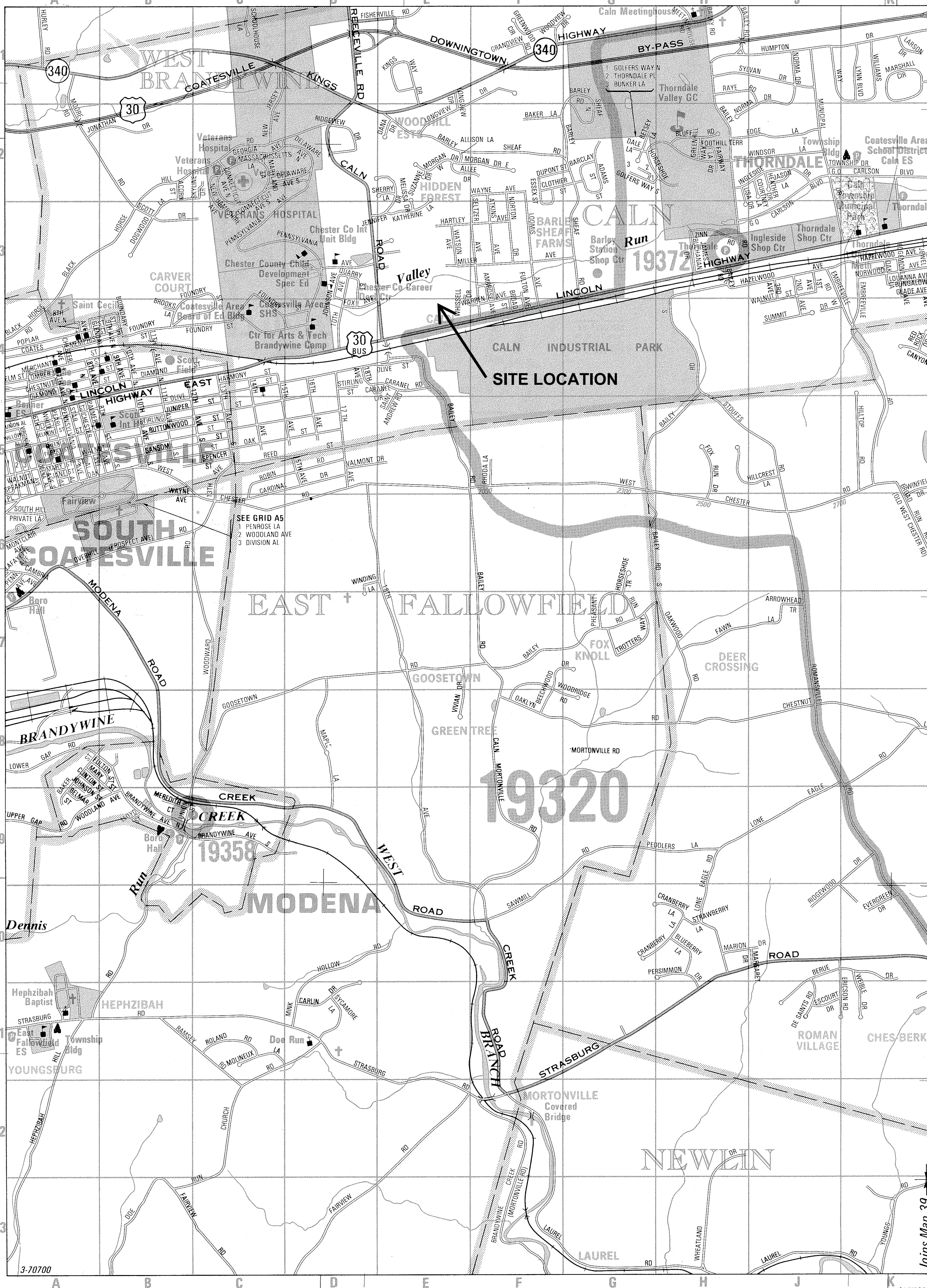
XIX. CONCLUSION

D.L. Howell & Associates, Inc. has completed an Environmental Impact Assessment for The Willows at Valley Run, the proposed construction at 2131 Lincoln Highway in Caln Township, Chester County, PA. The project proposes minimal environmental impacts and includes several measures to mitigate environmental impact from construction of the project, as well as including stormwater management solutions and erosion and sedimentation control measures.

APPENDIX A

SITE LOCATION MAP

75°47'30" 2,550,000 FT *Joins Map 19* 2,560,000 FT 75°45'00"



Joins Map 28 *Joins Map 39*

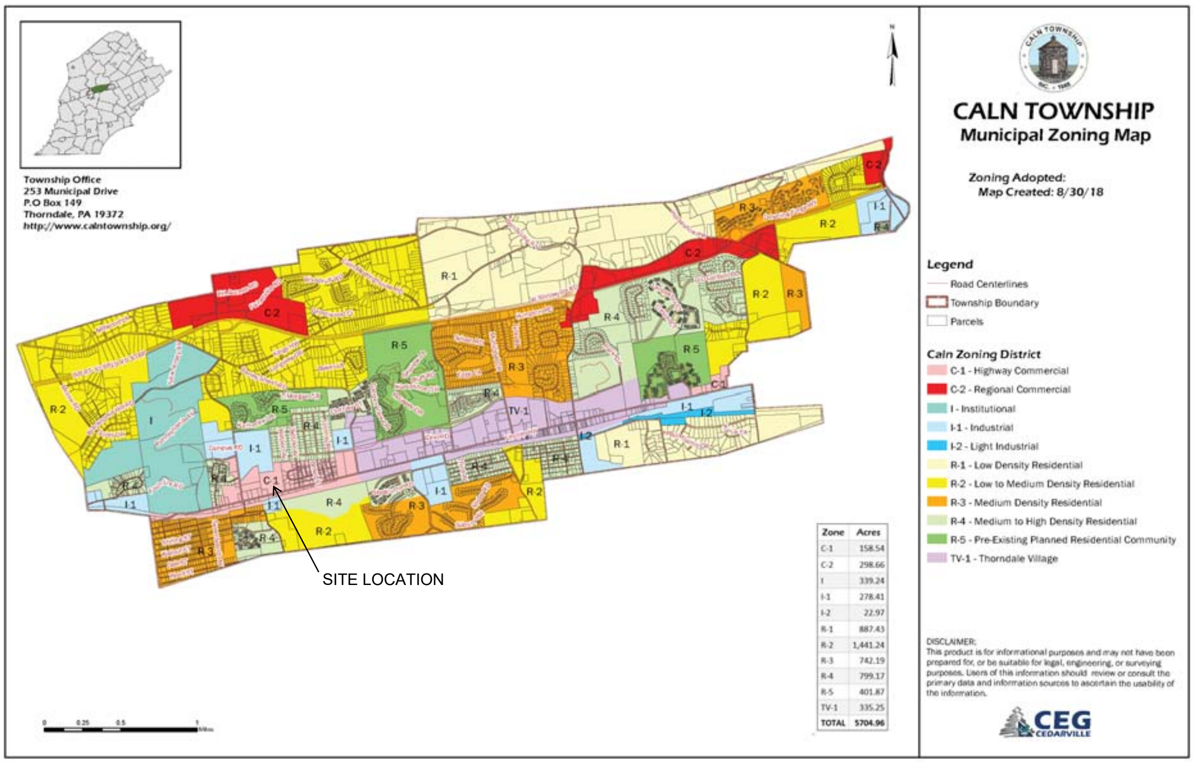
250,000 FT 40°00'00" 240,000 FT 39°57'30" PA GRID 230,000 FT

75°47'30" PA GRID 2,550,000 FT *Joins Map 38* 2,560,000 FT 75°45'00"

APPENDIX B

CALN TOWNSHIP ZONING MAP

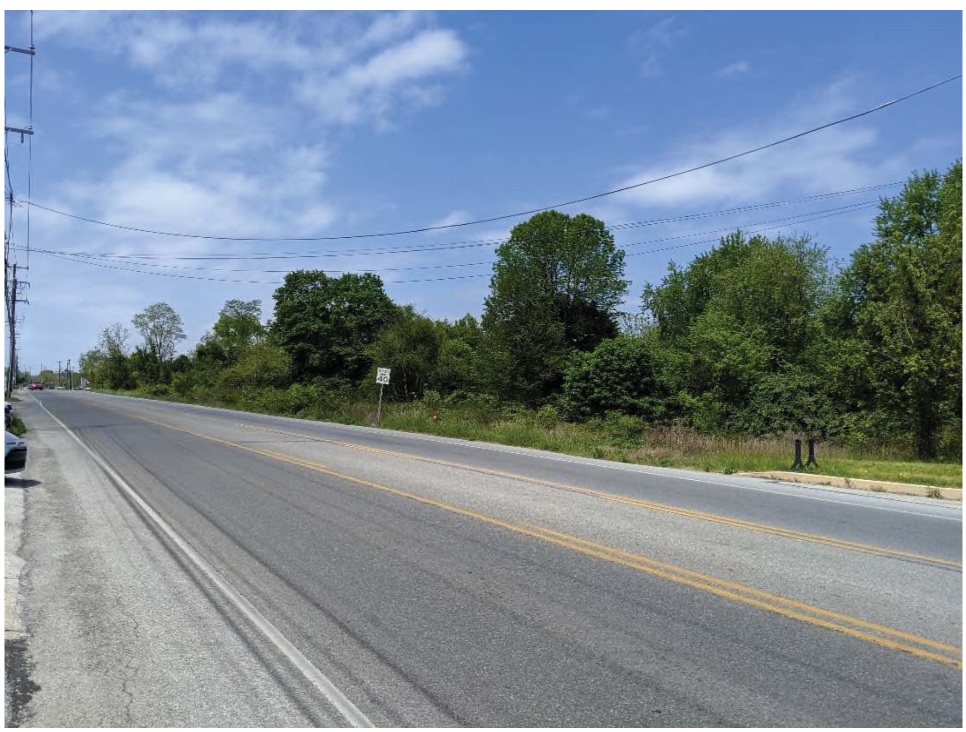
Appendix A, Township Maps



APPENDIX C

SITE PHOTOGRAPHS

Looking East along the edge of the proposed development site. Lincoln Highway and the for sale sign can be seen for location reference.



Looking West along the edge of the proposed development site. Lincoln Highway can be seen for location reference.

Looking South directly into the proposed development site. Lincoln Highway can be seen for location reference.

Interior view of the proposed development site.

APPENDIX D

SITE DEVELOPMENT PLAN

SEE CONDITIONAL USE PLAN SET INCLUDED WITH THIS APPLICATION

APPENDIX E

BUILDING PLANS

THE WILLOWS AT VALLEY RUN | PERSPECTIVE

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

Ingerman

HaleyDonovan

THE WILLOWS AT VALLEY RUN | REAR PERSPECTIVE

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

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THE WILLOWS AT VALLEY RUN | FRONT PERSPECTIVE
2131 LINCOLN HIGHWAY
CALN TOWNSHIP, CHESTER COUNTY, PA
DATE: 06-01-2020

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THE WILLOWS AT VALLEY RUN | FRONT ELEVATION

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-22-2020

Ingerman

HaleyDonovan

BUILDING SQUARE FOOTAGE TABLE

COSNTRUCTION PHASE	BUILDING TYPE	# UNITS	AREA (SF) 1ST FLOOR	2ND FLOOR	3RD FLOOR	TOTAL	TOTAL AREA PER PHASE
PHASE 1	BUILDING TYPE B COMMUNITY BUILDING		2,583			2,583	68,427
	BUILDING TYPE D	24	9,307	9,381	9,381	28,069	
	BUILDING TYPE E	24	7,934	8,009	7,776	23,719	
	BUILDING TYPE C	12	4,660	4,698	4,698	14,056	
PHASE 2	BUILDING TYPE A	24	8,620	8,695	8,579	25,894	65,844
	BUILDING TYPE D	24	9,307	9,381	9,381	28,069	
	BUILDING TYPE F	12	3,974	4,012	3,895	11,881	
						TOTAL AREA	134,271

UNIT COUNT TABLE

UNIT TYPE	BUILDING A: 1ST FLOOR	2ND FLOOR	3RD FLOOR	TOTAL NUMBER OF UNIT TYPE
1BR- TYPE A	2			2
1BR- TYPE B		2	2	4
2BR- TYPE A	2	2	2	6
2BR- TYPE B	2			2
2BR- TYPE C			2	2
2BR- TYPE D		2		2
3BR- TYPE A	1			1
3BR- TYPE B		2	2	4
3BR- TYPE C	1			1
TOTAL UNITS PER FLOOR	8	8	8	24

UNIT TYPE	BUILDING C: 1ST FLOOR	2ND FLOOR	3RD FLOOR	TOTAL NUMBER OF UNIT TYPE
1BR- TYPE A	1			1
1BR- TYPE B		1	1	2
2BR- TYPE A	1	1	1	3
2BR- TYPE B				
2BR- TYPE C				
2BR- TYPE D				
3BR- TYPE A	2			2
3BR- TYPE B		2	2	4
3BR- TYPE C				
TOTAL UNITS PER FLOOR	4	4	4	**12**

(2x BUILDING TYPE D ON SITE)

UNIT TYPE	BUILDING D: 1ST FLOOR	2ND FLOOR	3RD FLOOR	TOTAL NUMBER OF UNIT TYPE
1BR- TYPE A	2			2
1BR- TYPE B		2	2	4
2BR- TYPE A	2	2	2	6
2BR- TYPE B				
2BR- TYPE C				
2BR- TYPE D				
3BR- TYPE A	2			2
3BR- TYPE B		4	4	8
3BR- TYPE C	2			2
TOTAL UNITS PER FLOOR	8	8	8	24

UNIT TYPE	BUILDING E: 1ST FLOOR	2ND FLOOR	3RD FLOOR	TOTAL NUMBER OF UNIT TYPE
1BR- TYPE A	2			2
1BR- TYPE B		2	2	4
2BR- TYPE A	2	2	2	6
2BR- TYPE B	4			4
2BR- TYPE C			4	4
2BR- TYPE D		4		4
3BR- TYPE A				
3BR- TYPE B				
3BR- TYPE C				
TOTAL UNITS PER FLOOR	8	8	8	24

UNIT TYPE	BUILDING F: 1ST FLOOR	2ND FLOOR	3RD FLOOR	TOTAL NUMBER OF UNIT TYPE
1BR- TYPE A	1			1
1BR- TYPE B		1	1	2
2BR- TYPE A	1	1	1	3
2BR- TYPE B	2			2
2BR- TYPE C			2	2
2BR- TYPE D		2		2
3BR- TYPE A				
3BR- TYPE B				
3BR- TYPE C				
TOTAL UNITS PER FLOOR	4	4	4	12

FIRST FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

BUILDING A - FLOOR PLANS

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THIRD FLOOR

SCALE: 1/8" = 1'-0"

SECOND FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

BUILDING A - FLOOR PLANS

Ingerman

HaleyDonovan

FLOOR PLAN

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

COMMUNITY BUILDING - B

Ingerman

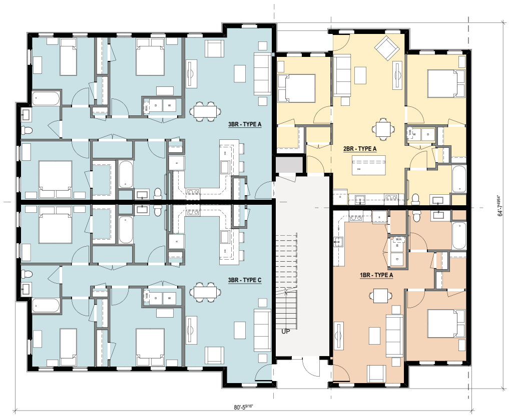
HaleyDonovan

SECOND FLOOR

SCALE: 1/8" = 1'-0"

THIRD FLOOR

SCALE: 1/8" = 1'-0"



FIRST FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

BUILDING C - FLOOR PLANS

Ingerman

HaleyDonovan

SECOND FLOOR

SCALE: 1/8" = 1'-0"

FIRST FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

BUILDING D - FLOOR PLANS

Ingerman

HaleyDonovan

THIRD FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN
2131 LINCOLN HIGHWAY
CALN TOWNSHIP, CHESTER COUNTY, PA
DATE: 06-01-2020

BUILDING D - FLOOR PLANS

Ingerman

HaleyDonovan

SECOND FLOOR

SCALE: 1/8" = 1'-0"

FIRST FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-22-2020

BUILDING E - FLOOR PLANS

Ingerman

HaleyDonovan

THIRD FLOOR

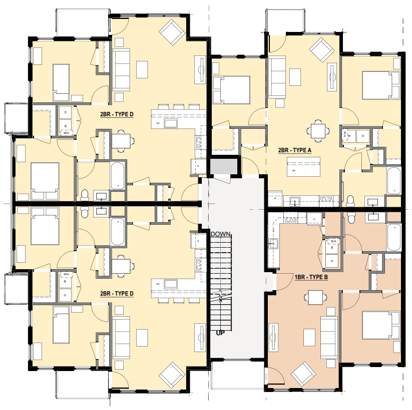
SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN
2131 LINCOLN HIGHWAY
CALN TOWNSHIP, CHESTER COUNTY, PA
DATE: 06-01-2020

BULDING E - FLOOR PLANS

Ingerman

HaleyDonovan



SECOND FLOOR

SCALE: 1/8" = 1'-0"

THIRD FLOOR

SCALE: 1/8" = 1'-0"

FIRST FLOOR

SCALE: 1/8" = 1'-0"

THE WILLOWS AT VALLEY RUN | BUILDING F

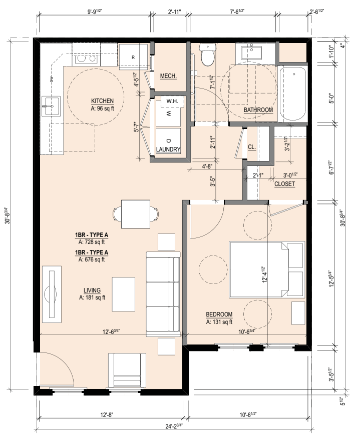
2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

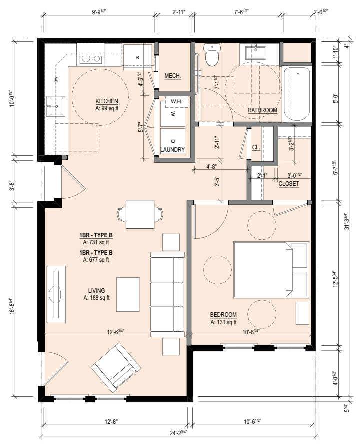
Ingerman

HaleyDonovan



1BR - A UNIT

SCALE: 1/4" = 1'-0"

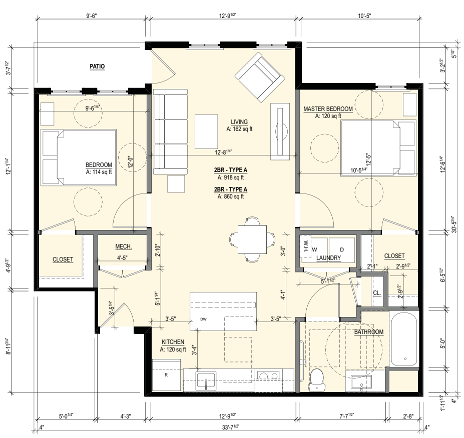


1BR - B UNIT

SCALE: 1/4" = 1'-0"

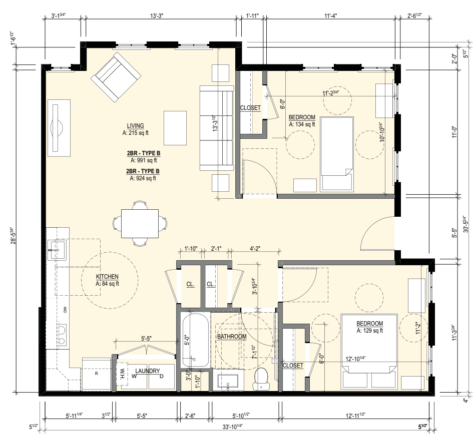
UNIT SQARE FOOTAGE TABLE

	GROSS (SF)		NET (SF)	
UNIT TYPE	UNIT	AVERAGE GROSS (SF)	UNIT	AVERAGE NET (SF)
1BR- TYPE A	728	730	676	677
1BR- TYPE B	731		677	
2BR- TYPE A	918	970	860	909
2BR- TYPE B	991		924	
2BR- TYPE C	956		898	
2BR- TYPE D	1,015		952	
3BR- TYPE A	1,329	1,337	1,261	1,265
3BR- TYPE B	1,368		1,291	
3BR- TYPE C	1,344		1,269	



2BR - A UNIT

SCALE: 1/4" = 1'-0"



2BR - B UNIT

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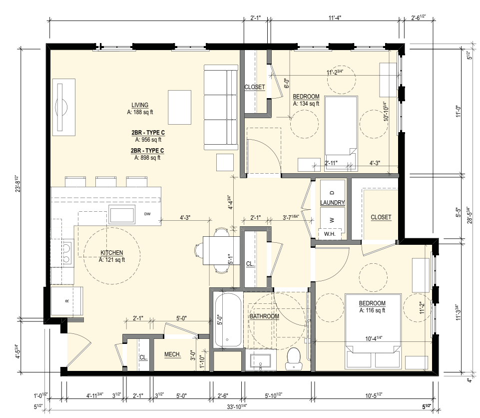


2BR - C UNIT

SCALE: 1/4" = 1'-0"

THE WILLOWS AT VALLEY RUN

2131 LINCOLN HIGHWAY

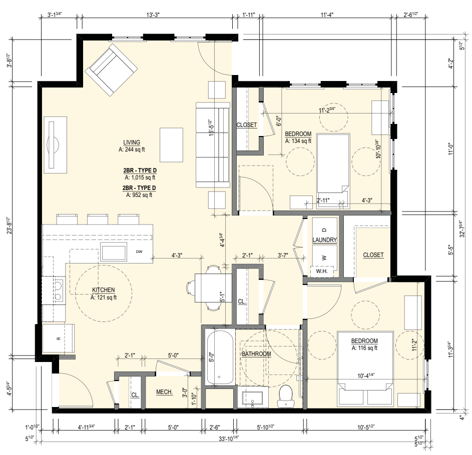
CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

UNIT TYPES

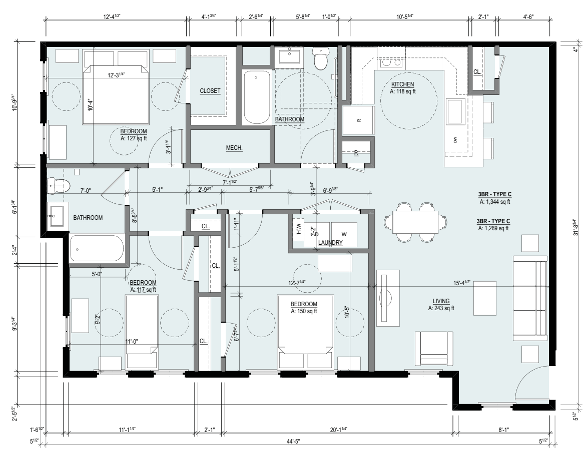
Ingerman

HaleyDonovan



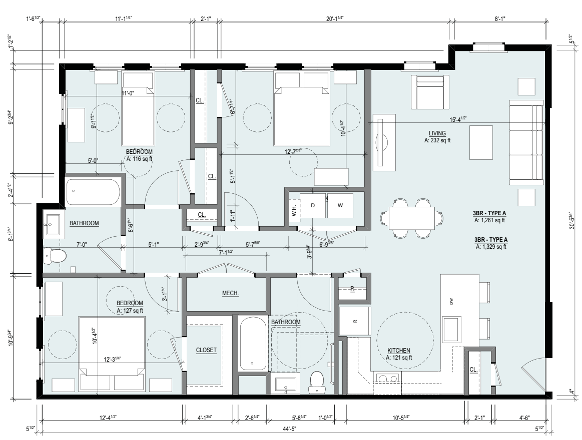
2 BR - D UNIT

SCALE: 1/4" = 1'-0"



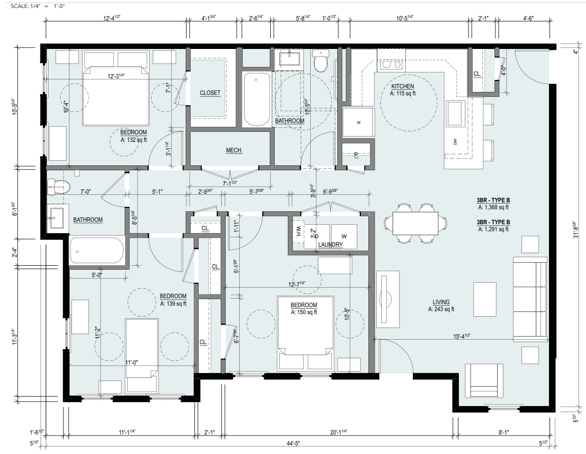
3 BR - C UNIT

SCALE: 1/4" = 1'-0"



3BR - A UNIT

SCALE: 1/4" = 1'-0"



3 BR - B UNIT

SCALE: 1/4" = 1'-0"

THE WILLOWS AT VALLEY RUN | UNIT TYPES

2131 LINCOLN HIGHWAY

CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: 06-01-2020

Ingerman

HaleyDonovan

APPENDIX F

USDA NRCS SOIL RESOURCE REPORT

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for

Chester County, Pennsylvania

May 5, 2020

Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Soil Map


75° 47' 7" W
75° 46' 53" W
432960
433010
433060
433110
433160
433210
433260
39° 59' 35" N
39° 59' 21" N
4427290
4427240
4427190
4427140
4427090
4427040
4426990
4426940
4426890
UudB
CtA
30 Business
30
Soil Map may not be valid at this scale.
Map Scale: 1:2,110 if printed on A portrait (8.5" x 11") sheet.
Meters
0 30 60 120 180
Feet
0 100 200 400 600
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 12, Sep 17, 2019

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

Date(s) aerial images were photographed: Apr 4, 2012—Oct 19, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CtA	Conestoga silt loam, 0 to 3 percent slopes	14.6	98.0%
UudB	Urban land-Udorthents, limestone complex, 0 to 8 percent slopes	0.3	2.0%
Totals for Area of Interest		**14.9**	**100.0%**

Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

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

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

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

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

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

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

Chester County, Pennsylvania

CtA—Conestoga silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: pjhy
Elevation: 300 to 1,600 feet
Mean annual precipitation: 34 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 140 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Conestoga and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Conestoga

Setting

Landform: Hillsides
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from schist and/or residuum weathered from limestone

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 38 inches: silty clay loam
C - 38 to 75 inches: channery loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 60 to 99 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Clarksburg

Percent of map unit: 5 percent
Landform: Valley flats

Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Hollinger

Percent of map unit: 1 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Penlaw

Percent of map unit: 1 percent
Landform: Swales
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Letort

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Duffield

Percent of map unit: 1 percent
Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Pequea

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

UudB—Urban land-Udorthents, limestone complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: pjnt
Elevation: 300 to 1,000 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 80 percent
Udorthents, limestone, and similar soils: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Hills, valleys
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Interfluve, side slope, nose slope, head slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Pavement, buildings and other artifically covered areas

Typical profile

H1 - 0 to 6 inches: variable

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 to 99 inches to lithic bedrock
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

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

Description of Udorthents, Limestone

Setting

Landform: Hills, valleys
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Interfluve, side slope, nose slope, head slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear

Parent material: Graded areas of argillaceous limestone

Typical profile

H1 - 0 to 6 inches: clay loam
H2 - 6 to 60 inches: clay

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 99 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Duffield

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

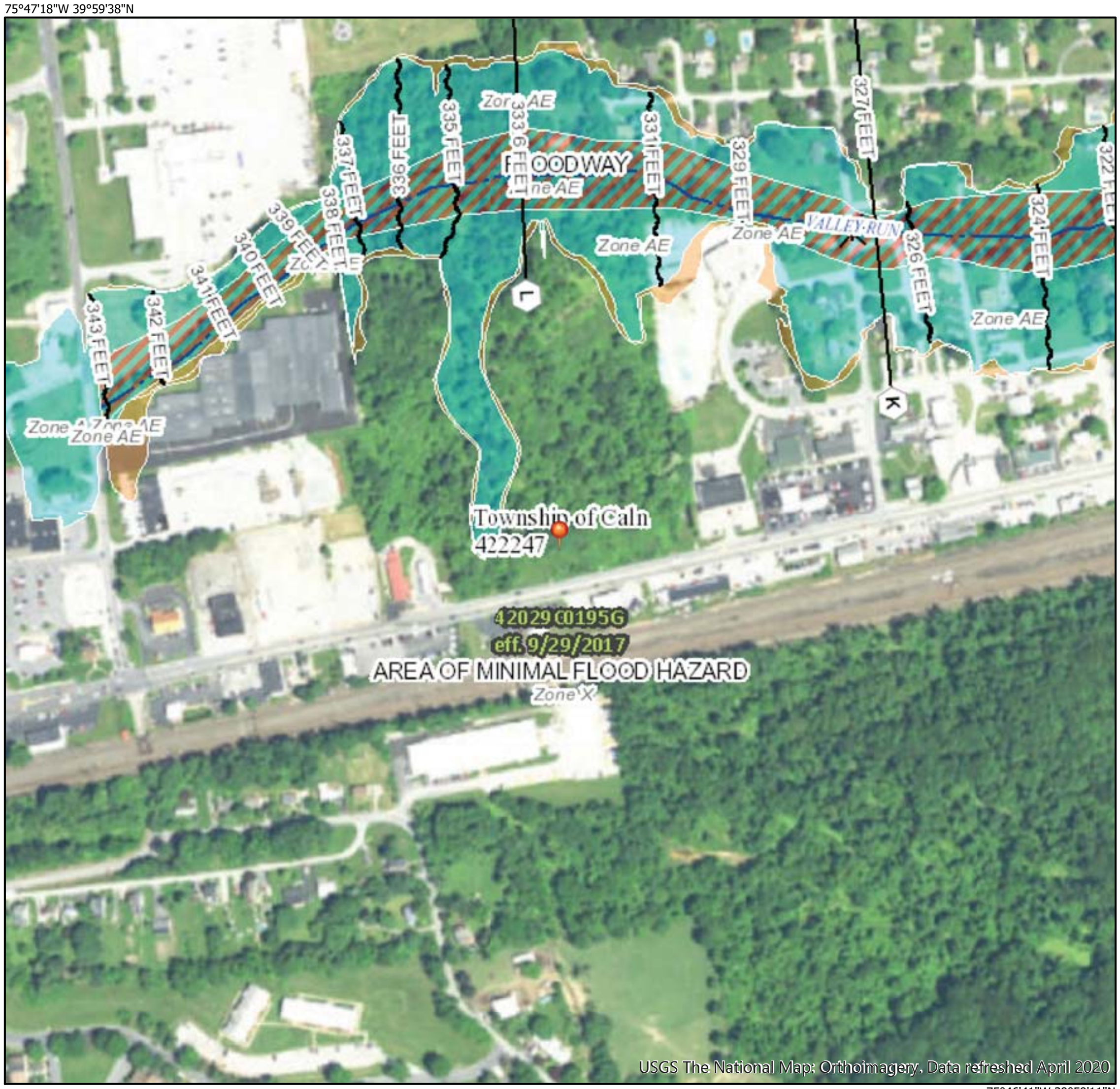
APPENDIX G

FEMA FIRMETTE MAP

National Flood Hazard Layer FIRMette

FEMA

75°47'18"W 39°59'38"N



75°46'41"W 39°59'11"N

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

1:6,000

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/18/2020 at 8:45 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX H

BOG TURTLE PHASE 1 HABITAT SUITABILITY ASSESSMENT

D1850.002
April 24, 2020

BOG TURTLE
(*Glyptemys muhlenbergii*)
PHASE 1 HABITAT SUITABILITY ASSESSMENT

FOR

2131 LINCOLN HIGHWAY PROJECT

CALN TOWNSHIP,
CHESTER COUNTY, PENNSYLVANIA

PREPARED FOR:

DL HOWELL & ASSOCIATES
1250 WRIGHTS LANE
WEST CHESTER, PA 19380

PREPARED BY:

DuBois & ASSOCIATES

190 NORTH MAIN STREET
MANAHAWKIN, NJ 08050

BRYON DUBOIS
SENIOR BIOLOGIST

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1.0 Introduction

This report documents the results and conclusions of a Phase 1 Bog Turtle (*Glyptemys muhlenbergii*) Habitat Suitability Assessment conducted for the 2131 Lincoln Highway Project performed by DuBois & Associates, LLC (DuBois) for DL Howell Associates. The project is located within Caln Township, Chester County, PA.

DL Howell requested a PNDI review from the Pennsylvania Department of Conservation of Natural Resources. The review letter, dated April 7, 2020 (PNDI-707690) indicates U.S. Fish and Wildlife (USFWS) concerns for potential impacts to the bog turtle. The PNDI requests that a Bog Turtle Habitat (Phase 1) Survey be performed for all wetlands on and within 300-feet of the project area. DuBois was retained by DL Howell to conduct the Phase 1 survey in April 2020. The Phase 1 survey was performed on April 23, 2020 by Mr. Bryon DuBois who is a USFWS Recognized Qualified Bog Turtle Surveyor in Pennsylvania. The Phase 1 Survey followed the USFWS Guidelines for Bog Turtle Surveys, Bog Turtle Northern Population Recovery Plan, dated May 15, 2001 and revised October 23, 2018. Three criteria were assessed within 300-feet of the project area to determine habitat suitability: hydrology, soils, and vegetation.

2.0 Project Description

The applicant is proposing a townhouse subdivision on the 15.17-acre site. The subdivision includes an access road from Lincoln Highway (PA Highway 30).

3.0 Location

The site is located at 2131 Lincoln Highway in Caln Township, Chester County, PA. The project site is located on the Coatesville 7.5' USGS Quadrangle with state plane coordinates (feet) of E(x) 132,543 N(y) 424,261 at the approximate center of the site (*refer figure 2: Coatesville USGS Quadrangle Map*). The project area is located within the Brandywine – Christina HUC 8 watershed, and within the Beaver Creek HUC 12 watershed. The surrounding land use of the project area includes residential subdivisions to the north, east, and southwest, commercial buildings to the west, and forested land to the southeast.

Two (2) wetland areas, further designated as wetland area A and B, were observed southern portion of the site (refer to *Figure 3: Habitat Suitability Assessment Map*).

Figure 1: Aerial view of the site located in Caln Township, Chester County.

4.0 Species Description and Life History

Bog Turtle (*Glyptemys muhlenbergii*), Federally Threatened, State Endangered

Bog turtles are one of the smallest turtles native to the United States. The bog turtle has an average adult size of approximately 3.5 inches (8.9 cm) and a record length of 4.5 inches (11.4 cm). The carapace (i.e., top shell) is light brown to mahogany to black with a lighter center or, often, a yellowish or reddish sunburst pattern on each scute. The midline of the carapace is weakly keeled. Carapacial growth annuli may or may not be present, on account of the turtle's burrowing habits which may cause the shell to have a smooth appearance. The carapace of a bog turtle is flat at hatching, and becomes more domed with age. The plastron (i.e., bottom shell) is brown to black with small areas of a lighter hue. The bog turtle's main identification is a large patch of orange, red or yellow on the temporal region of the head often extending onto the neck. Occasionally, the patch is split into two parts. The dark limbs are usually suffused with red, orange, or yellow mottling. The male bog turtle has a concave plastron while that of the female is flat or convex. The male also has a thicker tail than the female (USFWS 2001; Schwartz and Golden 2002; Natureserve 2011).

The bog turtle has been reported from twelve (12) eastern states, with a discontinuous and localized distribution from western Massachusetts and Connecticut, southward through New York, New Jersey, Pennsylvania, Delaware and Maryland, and then southward in the Appalachian Mountains from southwestern Virginia, North Carolina, Tennessee and South Carolina to northern Georgia (USFWS 2001). Eastern Pennsylvania has long been considered a stronghold for the bog turtle, particularly within the Delaware and Susquehanna watersheds. In Pennsylvania, the bog turtle is known to currently occur within

Adams, Berks, Bucks, Chester, Cumberland, Delaware, Franklin, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, and York counties (USFWS 2001).

Bog turtles inhabit a variety of wetland types throughout their range, but generally these are small, open-canopy, herbaceous sedge meadows and fens bordered by more thickly vegetated and wooded areas. The habitat is best described as open wet meadows, shallow water marshes, spring seeps, open floodplain wetlands, bogs and fens. Most of these habitats are in flat or gently rolling hills and valleys. Throughout the bog turtle's northern range, seepage or spring-fed emergent wetlands associated with streams are the primary habitat. These are often at or near the headwaters of streams or small tributaries. The habitats are often elongated or strip-like transitional zones between drier upland areas and more thickly vegetated, wetter, wooded swamp or marsh. Although bog turtles are dependent upon suitable open-canopy sedge meadows and fens for many of their ecological requirements such as foraging, reproduction, and thermoregulation, they also utilize more densely vegetated areas for hibernation.

Wetland plants that are known bog turtle habitat indicators include tussock sedge (*Carex stricta*), rushes (*Juncus* spp.), jewelweed (*Impatiens pallida*), skunk cabbage (*Symplocarpus foetides*), sphagnum (*Sphagnum* spp.) and various mature grasses such as rice-cut grass (*Leersia oryzoides*) and panic grass (*Panicum* spp.). More recently, bog turtles have been found in early to mid-successional maple forests, common reed grass (*Phragmites australis*) stands and groves of narrow-leaved cattail (*Typha angustifolia*). An essential component is an open or semi-open canopy that allows sunlight to reach the herbaceous vegetation. Bog turtles spend a significant amount of time in the spring, summer and fall basking in the sun. Bog turtle habitat typically contains a bottom substrate of soft muck or mucky-like soils which are soft enough for burrowing.

The single unifying characteristic of pure bog turtle habitat is often described as "early successional." Factors that can create such an early successional bog or emergent wetland habitat are somewhat limited. Mutualists (beneficial relationships) to a colony of bog turtles may include beavers, cows and other livestock that graze on herbaceous vegetation. Disturbance factors such as fire and large wind storms can also clear out older vegetation and allow for successional growth. Without these types of disturbances, bog turtle habitat typically continues through natural succession resulting in a wooded wetland with an overstory that no longer provides adequate solar radiation for thermo-regulation; egg incubation; etc (USFWS 2001).

Cold temperatures for one to two consecutive weeks during late October to late November compel bog turtles to retreat to their wintering sites. They will hibernate within subterranean burrows, where springs ensure that water will flow during the winter, preventing the turtles from freezing. Cavities underneath vegetated hummocks are characteristic hibernation areas, however muskrat and meadow vole burrows, sedge clumps and rivulets under soft mud have also been reported (Ernst et al. 1989). Alder (*Alnus* spp.), red maple (*Acer rubrum*), gray birch (*Betula populifolia*) and tamarack (*Larix laricina*) hummocks supporting bog turtle hibernacula have been reported (Klemens 1993a). Hibernating turtles may be found under water in soft mud, in crevices between rocks or between tangled roots.

As daytime air temperatures warm during March or April, bog turtles emerge from hibernation and bask atop sedge tussocks and sphagnum hummocks. Basking increases their body temperature and stimulates the urges for foraging and mating. Bog turtles will forage upon invertebrates, including insects and their larvae, crayfish, mollusks, worms, snails and slugs. Seeds, berries, amphibians and carrion are also eaten. Mating activity typically occurs in May and early June. From mid-June to early July, females seek open areas with raised hummocks to deposit their eggs, which is typically a clutch of three to four tiny, white oblong eggs. The elevated sites offer a drier microhabitat for the developing embryos and the eggs will hatch within 48 to 58 days (Liguori and Tesauro 2003).

5.0 Habitat Assessment Methodology

This section discusses the methods used to conduct the Phase 1 Bog Turtle Habitat Suitability Assessment described in this report.

Preliminary Assessment

Prior to conducting the Phase 1 Bog Turtle Survey, DuBois biologists reviewed Project Area information, USGS topographical and aerial mapping, National Wetlands Inventory (NWI) mappings, Pennsylvania Fish and Boat Commission Species Action Plan – Natural Diversity Section (June 2011), and Pennsylvania Spatial Data Access (PASDA) GIS layers to identify wetlands, network streams, and other surrounding area land-coverage information, respectively. Field maps were created that showed wetland or waterway areas along the project area which may provide potential habitat for bog turtle and/or known occurrences for bog turtle. This information was used to guide habitat survey efforts conducted in the field by DuBois qualified bog turtle biologists (Bryon DuBois - see *Appendix D* for resumes).

Habitat Assessment – Field Evaluation

Phase 1 bog turtle surveys are conducted to determine whether or not wetland areas contain potential bog turtle habitat. Three criteria were assessed within the project area to determine habitat suitability: hydrology, soils, and vegetation. Bog turtle wetlands are typically spring-fed with shallow surface water or saturated soils present year-round. Wetlands are typically interspersed with dry and wet pockets and there is often subsurface flow. Shallow rivulets (less than 4 inches deep) or pseudo-rivulets are often present. Bottom substrates may be mineral or organic, however permanently saturated soils are needed to support soft, mucky conditions. Suitable soils are those in which one will typically sink past their ankles. Emergent wetlands containing low grasses and sedges, often with a scrub-shrub wetland component are characteristic vegetation community types. Some forested wetland habitats are suitable given hydrology, soils and/or historic land use.

6.0 Phase 1 Habitat Evaluation Results

DuBois evaluated the hydrology, soils and vegetation composition within 300-feet of the project area boundary. Below are results of the Phase I bog turtle habitat suitability assessment for the survey location. Wetland locations were not delineated in the field prior to the survey. Results do not address or reflect any additional wetlands that may be present outside of the requested 300' survey location. As mentioned above, refer to *Figure 3: Habitat Suitability Assessment Map* for a depiction of the targeted survey areas described below, *Appendix B: Site Photographs* for a photographic depiction of surveyed locations and their suitability to potentially contain bog turtle habitat, and *Appendix C: Bog Turtle Habitat Evaluation Field Forms* for the habitat evaluation results.

6.1 Wetland A

Wetland A is approximately 1.0 acre and consists of 60% palustrine emergent (PEM) wetlands and 40% palustrine scrub/shrub (PSS) wetlands (refer to *Figure 3: Habitat Suitability Assessment Map*). The hydrologic features within this wetland include the surface water associated with several seeps, tire ruts in and surrounding the wetlands that are up to two inches deep, and saturated soils. Vegetation within this wetland includes sphagnum moss (*Sphagnum spp.)*, multiflora rose (*Rosa multiflora)*, red maple (*Acer rubrum)*, jewelweed (*Impatiens capensis*), sedges (*Carex spp.*), and dogwood species (*Cornus spp.*). The majority of the soils within this wetland were primarily non-mucky, containing mostly mineral soils. The soil and vegetation parameters of this wetland are not considered suitable habitat for the bog turtle.

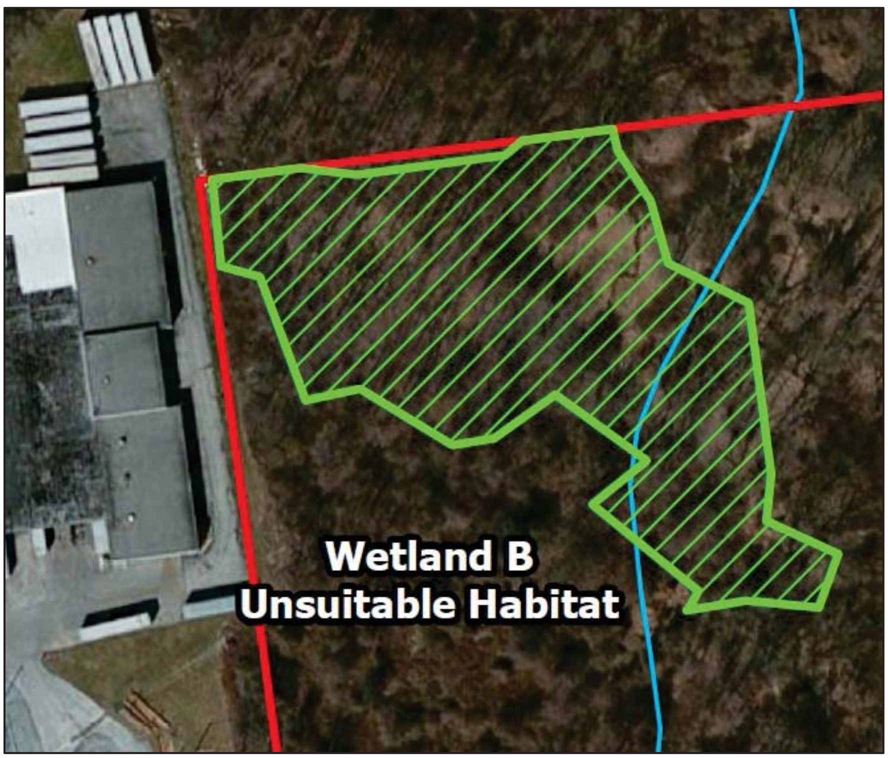
It is the opinion of DuBois that Wetland A does not contain suitable bog turtle habitat.

Wetland A: Representative view of Wetland A.

Wetland A: Additional view of Wetland A.

6.2 Wetland B

Wetland B is approximately 2.0 acres and consists of 50% palustrine forested wetlands (PFO) and 50% PEM wetlands (refer to *Figure 3: Habitat Suitability Assessment Map*). This wetland is associated with a tributary to Valley Run. The hydrologic features within this wetland include the surface water, tire ruts in and surrounding the wetlands that are up to two inches deep, and saturated soils. Vegetation within this wetland includes jewelweed (*Impatiens capensis*), multiflora rose (*Rosa multiflora)*, red maple (*Acer rubrum)*, tearthumb (*Polygonum spp*), viburnums (*Viburnum spp.*), dogwood species (*Cornus spp.*), and sedges (*Carex spp*). The majority of the soils within this wetland were primarily non-mucky, containing mostly mineral soils. The soil and hydrology parameters of this wetland are not considered suitable habitat for the bog turtle. It is the opinion of DuBois that Wetland B <u>does not</u> contain suitable bog turtle habitat.



Wetland B: Representative view of Wetland B.

Wetland B: Additional view of Wetland B.

7.0 Conclusion

DuBois evaluated all wetlands in and within 300 feet of the survey location area in Caln Township, Chester County, PA. The Phase I bog turtle habitat assessment applies to the identified wetland areas in the vicinity of the project area and does not apply to wetlands outside of the survey location. The habitat assessment was conducted using the USFWS Guidelines for Bog Turtle Surveys, Bog Turtle Northern Population Recovery Plan, dated May 15, 2001 and revised October, 23 2018.

It is this firm's opinion that both wetlands do not support the habitat characteristics to be considered bog turtle habitat.

8.0 References

Klemens, M.W. 1990. The herpetofauna of southwestern New England. Ph.D. dissertation, University of Kent, Canterbury, United Kingdom, 443 pp.

Klemens, M.W. 1993a. The amphibians and reptiles of Connecticut and adjacent regions. State Geological and Natural History Survey of Connecticut, Bull. I 12: l-3 18.

Liguori, Sherry and Tesauro, Jason. 2003. Bog Turtle, Clemmys muhlenbergii. In Endangered and Threatened Wildlife of New Jersey, eds. Beans, B. and Niles, L. Rutgers University Press, New Brunswick, NJ.

Natureserve Explorer. 2011. Glyptemys muhlenbergii. Available Online at http://www.natureserve.org/

Schwartz, V., & Golden, D. M. (2002). Field Guide to Reptiles and Amphibians of New Jersey. New Jersey Division of Fish and Wildlife

United States Fish and Wildlife Service. 2001. Bog Turtle (Clemmys muhlenbergii), Northern Population, Recovery Plan. Hadley, Massachusetts. 103 pp.

United States Fish and Wildlife Service. 2006. Guidelines for Bog Turtle Surveys. Revision to Bog Turtle (Clemmys muhlenbergii), Northern Population, Recovery Plan. Hadley, Massachusetts. 103 pp.

FIGURES

DuBois & ASSOCIATES

Aerial Map

2131 Lincoln Highway
Caln Township, Chester County, PA

NORTH

Sheet No. 1 of 1

Job No.: D1850.002	
Scale: 1 in = 250 ft	
Date: 4/22/2020	
Drawn By: AG	

This map was developed using Geographic Information Systems Digital Data. This map is for visual display purposes only and all locations are approximate.

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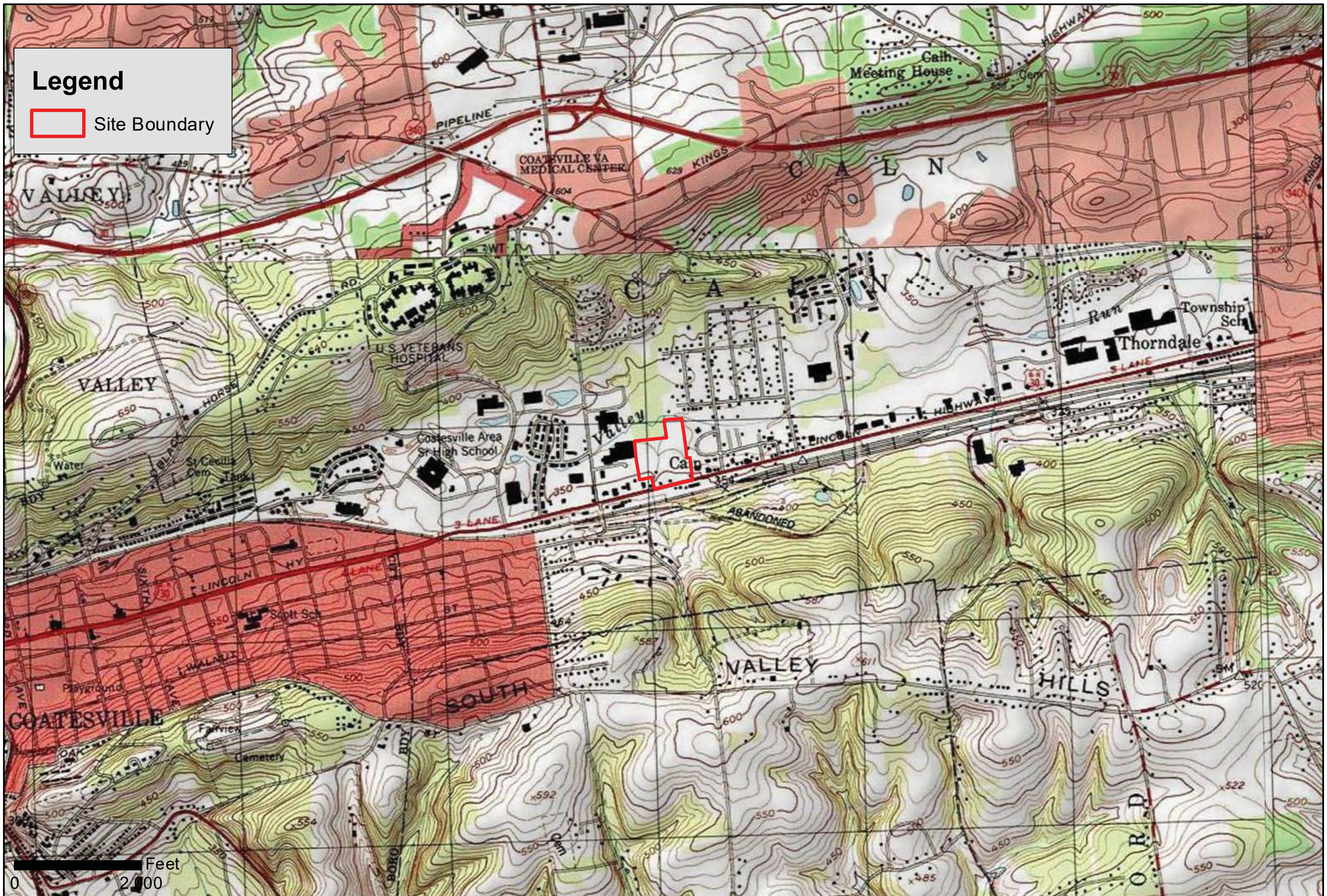


Coatesville USGS Quadrangle Map

Caln Township, Chester County, PA

DuBois Environmental Consultants

Sheet No. 1 of 1

Job No.: D1850.002

Scale: 1 in = 2,000 ft

Date: 4/22/2020

Drawn By: CP

Document Path: S:\JOBS NUMBERS\D1850.002\Quad.mxd

This map was developed using Geographic Information Systems Digital Data. This map is for visual display purposes only and all locations are approximate.

DuBois & ASSOCIATES

Habitat Suitability Assessment Map

2131 Lincoln Highway
Caln Township, Chester County, PA

NORTH
Sheet No. 1 of 1

Job No.: D1850.002	
Scale: 1 in = 200 ft	
Date: 6/23/2020	
Drawn By: AG	

Document Path: S:\JOBS NUMBERS\D1850.002\hab.mxd

This map was developed using Geographic Information Systems Digital Data. This map is for visual display purposes only and all locations are approximate.

APPENDIX A

Pennsylvania Natural Diversity Inventory

1. PROJECT INFORMATION

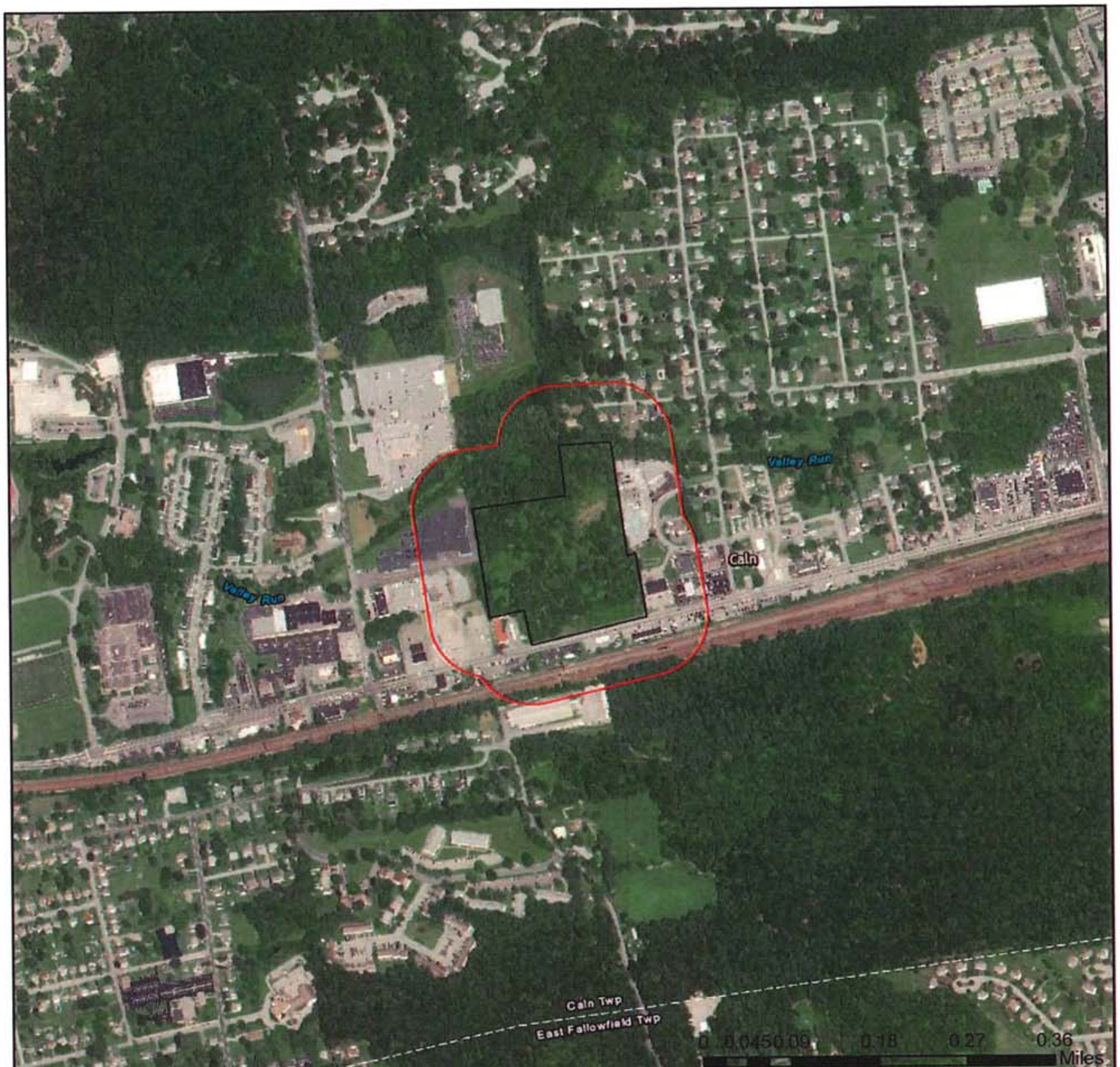
Project Name: **2131 Lincoln Hwy**
Date of Review: **4/7/2020 12:35:32 PM**
Project Category: **Development, Residential, Subdivision containing more than 2 lots and/or 2 single-family units**
Project Area: **15.22 acres**
County(s): **Chester**
Township/Municipality(s): **CALN**
ZIP Code: **19320**
Quadrangle Name(s): **COATESVILLE**
Watersheds HUC 8: **Brandywine-Christina**
Watersheds HUC 12: **Beaver Creek**
Decimal Degrees: **39.991099, -75.783415**
Degrees Minutes Seconds: **39° 59' 27.9553" N, 75° 47' 0.2938" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	**Potential Impact**	**MORE INFORMATION REQUIRED, See Agency Response**

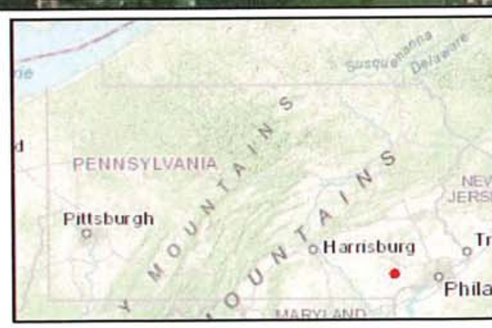
As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

2131 Lincoln Hwy



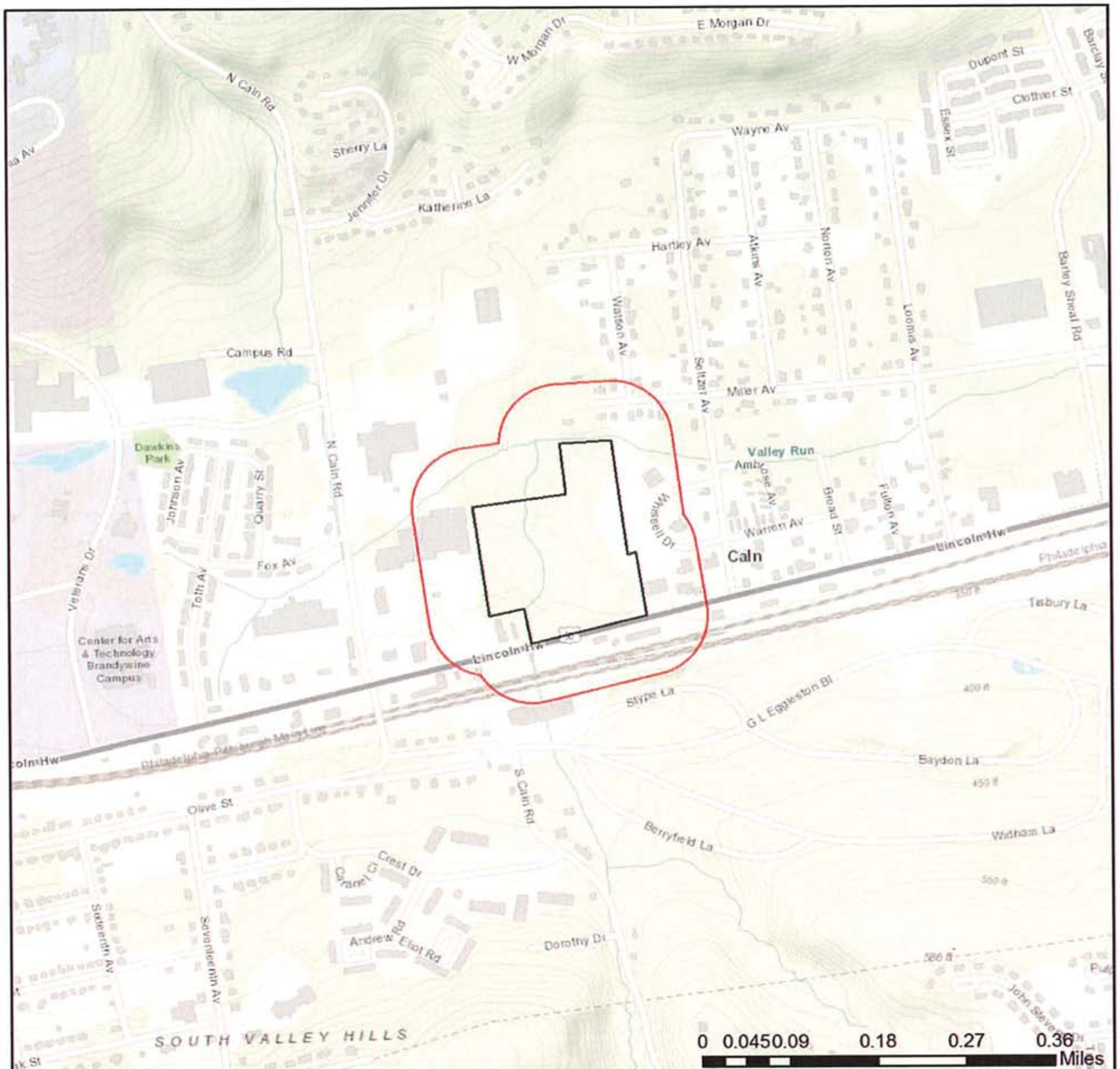
Project Boundary

Buffered Project Boundary



Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

2131 Lincoln Hwy



Project Boundary

Buffered Project Boundary

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS,

RESPONSE TO QUESTION(S) ASKED

Q1: Accurately describe what is known about wetland presence in the project area or on the land parcel by selecting ONE of the following. "Project" includes all features of the project (including buildings, roads, utility lines, outfall and intake structures, wells, stormwater retention/detention basins, parking lots, driveways, lawns, etc.), as well as all associated impacts (e.g., temporary staging areas, work areas, temporary road crossings, areas subject to grading or clearing, etc.). Include all areas that will be permanently or temporarily affected -- either directly or indirectly -- by any type of disturbance (e.g., land clearing, grading, tree removal, flooding, etc.). Land parcel = the lot(s) on which some type of project(s) or activity(s) are proposed to occur.
Your answer is: Someone qualified to identify and delineate wetlands has investigated the site, and determined that wetlands ARE located in or within 300 feet of the project area. (A written report from the wetland specialist, and detailed project maps should document this.)

Q2: The proposed project is in the range of the Indiana bat. Describe how the project will affect bat habitat (forests, woodlots and trees) and indicate what measures will be taken in consideration of this. Round acreages up to the nearest acre (e.g., 0.2 acres = 1 acre).
Your answer is: The project will affect 1 to 39 acres of forests, woodlots and trees.

Q3: Is tree removal, tree cutting or forest clearing of 40 acres or more necessary to implement all aspects of this project?
Your answer is: No

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission
RESPONSE:

No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources
RESPONSE:

No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission
RESPONSE:

No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service
RESPONSE:

Information Request: Conduct a Bog Turtle Habitat (Phase 1) Survey in accordance with USFWS Guidelines for Bog Turtle Surveys (April 2006). Evaluate all wetlands within 300 feet of the project area, which includes all areas that will be impacted by earth disturbance or project features (e.g., roads, structures, utility lines, lawns, detention basins, staging areas, etc.). IF THE PHASE 1 SURVEY IS DONE BY A QUALIFIED BOG TURTLE SURVEYOR (see https://www.fws.gov/northeast/pafo/endangered/surveys.html): 1) Send positive results to USFWS for concurrence, along with a project description documenting how impacts will be avoided. OR, conduct a Phase 2 survey and send Phase 1 and 2 results to USFWS for concurrence. 2) Send a courtesy copy of negative results to USFWS (label as "Negative Phase 1 Survey Results by Qualified Bog Turtle Surveyor: USFWS Courtesy Copy"). USFWS approval of negative results is not necessary when a qualified surveyor does the survey in full accordance with USFWS guidelines. IF THE PHASE 1 SURVEY IS NOT DONE BY A QUALIFIED SURVEYOR: Send ALL Phase 1 results to USFWS for concurrence, and if potential habitat is found, also send a project description documenting how impacts will be avoided. As a qualified bog turtle surveyor, I Byron DuBois (name) certify that I conducted a Phase 1 survey of all wetlands in and within 300 feet of the project area on 4/23/20 (date) and determined that bog turtle habitat is absent.

[signature] (Signature)

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, upload* or email* the following information to the agency(s). Instructions for uploading project materials can be found here. This option provides the applicant with the convenience of sending project materials to a single location accessible to all three state agencies. Alternatively, applicants may email or mail their project materials (see AGENCY CONTACT INFORMATION).

Check-list of Minimum Materials to be submitted:

____Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.

____A map with the project boundary and/or a basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)

In addition to the materials listed above, USFWS REQUIRES the following

____**SIGNED** copy of a Final Project Environmental Review Receipt

The inclusion of the following information may expedite the review process.

____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)

____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. Two review options are available to permit applicants for handling PNDI coordination in conjunction with DEP's permit review process involving either T&E Species or species of special concern. Under sequential review, the permit applicant performs a PNDI screening and completes all coordination with the appropriate jurisdictional agencies prior to submitting the permit application. The applicant will include with its application, both a PNDI receipt and/or a clearance letter from the jurisdictional agency if the PNDI Receipt shows a Potential Impact to a species or the applicant chooses to obtain letters directly from the jurisdictional agencies. Under concurrent review, DEP, where feasible, will allow technical review of the permit to occur concurrently with the T&E species consultation with the jurisdictional agency. The applicant must still supply a copy of the PNDI Receipt with its permit application. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. The applicant and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at https://conservationexplorer.dcnr.pa.gov/content/resources.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a preliminary screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552
Harrisburg, PA 17105-8552
Email: RA-HeritageReview@pa.gov

PA Fish and Boat Commission
Division of Environmental Services
595 E. Rolling Ridge Dr., Bellefonte, PA 16823
Email: RA-FBPACENOTIFY@pa.gov

U.S. Fish and Wildlife Service
Pennsylvania Field Office
Endangered Species Section
110 Radnor Rd; Suite 101
State College, PA 16801
Email: IR1_ESPenn@fws.gov
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
Email: RA-PGC_PNDI@pa.gov
NO Faxes Please

7. PROJECT CONTACT INFORMATION

Name:______________________________
Company/Business Name:______________________________
Address:______________________________
City, State, Zip:______________________________
Phone:(_____)______________________ Fax:(______)__________________
Email:______________________________

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

______________________________ ______________________
applicant/project proponent signature date

APPENDIX B

SITE PHOTOGRAPHS

Photo 1: Representative view of the site along Lincoln Highway.

Photo 2: Representative view of the upland portion of the site.

Photo 3: Additional view of the upland portion of the site.

Photo 4: Representative view of access road through the site.

Photo 5: Representative view of Wetland A.

Photo 6: Additional view of Wetland A.

Photo 7: Representative view of surface water in Wetland A.

Photo 68: Representative view of mineral soils in Wetland A.

Photo 9: Representative view of Wetland B.

Photo 10: Additional view of Wetland B.

Photo 11: Additional view of Wetland B.

Photo 12: Representative view of mineral soils in Wetland B.

APPENDIX C

Bog Turtle Habitat Evaluation
Field Forms

General Info

Phase 1 Bog Turtle Habitat Survey Data Form
For the Northern Population Range
(Revised October 23, 2018)

Wetland ID: A

Property/Project Name 2313 Lincoln Highway **County** Chester

Entity Requesting Phase 1 Survey (landowner, developer, agency): USFWS

Township/Municipality: Caln Township

Lead Surveyor: Bryon DuBois **Affiliation:** DuBois

Other Assistants Present: Abigail Gormley

Date/Condition

Date of Survey: 4/23/2020 **Time In:** 10:30am **Time Out:** 10:50am **Air Temp.** 49 F° C°

Last Precipitation: x < 24 hours __ 1-7 days __ > 1 week __ unknown **Drought conditions?** __ YES x NO __ Unknown

Drought Index*[1] (Circle): D0 D1 D2 D3 D4 **Notes** (*e.g.*, details about drought, flood, abnormally dry, seasonal conditions):

Wetland Info

Wetland ID: A **Wetland Size:** 1 acres, if known **# Wetlands w/in Project Area[2]:** ________

If estimating wetland size: __ < 0.1 acre __ 0.1-0.5 acre X 1-2 acres __ 2-4 acres __ 5+ acres __ 10+ acres

% Canopy Cover*[3] __ 0% __ ≤ 5 X 6-20 __21-40 __41-60 __ > 60

Hydrology and Soils (check all that apply):

X Springs/Seeps __ Springhouse __ Trib/Stream __ Pond __ Stormwater __ Iron Bacteria

__ Rivulets (how many_______) (_______inches deep) __ Subsurface Tunnel/Rivulets x Tire Ruts (2-3 inches deep)

X Saturated soils present? If yes, year-round? X Likely __ Unlikely __ Unknown

X Yes __ No water visible on surface? X Small Puddles/Depressions (___ inches deep)

x Yes __ No Are there any signs of disturbance to *hydrology* (*e.g.*, drainage ditches, tile drainages, berms, culverts, fill material, ponds, roads, beaver impoundment, evidence of flooding)? If yes, describe (if possible, include how recent disturbance is*):

ditching, access roads throughout the site

For ditches that may be present, is there bog turtle habitat? If yes, describe:

No

__ Yes x No Are there any signs of disturbance to *vegetation* (*e.g.*, mowing, pasturing, burning)? If yes, describe (if possible, include level of disturbance*):

Soil types present*:

---

[1] (*) Denotes reference to the **Supplemental Information** document that provides more details on this particular question.
[2] Each wetland must have a separate Phase 1 habitat assessment data form completed.
[3] Determine percent cover of abundant species for the wetland, not by wetland type. Abundant species are those that are

Wetland Type/Vegetation

PEM Portion of Wetland: Approx. Acre(s) 0.6 Mucky soils depth (inches) N/A

PSS Portion of Wetland: Approx. Acre(s) 0.4 Mucky soils depth (inches) N/A

PFO Portion of Wetland: Approx. Acre(s) _____ Mucky soils depth (inches) ______

PO Portion of Wetland: Approx. Acre(s) _____

CIRCLE all vegetation* from list below that is dominant ≥ 20% for each wetland type listed above. Also, CIRCLE calciphiles[4] present even if not a dominant species.

Sphagnum Moss	Grass-of-Parnassus	Rice Cutgrass	Tussock Sedge	Shrubby Cinquefoil	Red Maple
Arrowhead	Japanese Stiltgrass	Rough-leaved Goldenrod	White Turtlehead	Spicebush	Viburnum Spp.
Carpetgrass	Jewelweed	Sensitive Fern	Woolly-fruited Sedge	Swamp Rose	Carex spp.
Cattail	Mile-A-Minute	Skunk Cabbage	Yellow Sedge	Alder Spp.	
Cinnamon Fern	Porcupine Sedge	Smooth Sawgrass	Alder-leaved Buckthorn	American Elm	
Common Boneset	Purple Loosestrife	Sweetflag	Dogwood Spp.	Eastern Red Cedar	
Common Reed	Reed Canary Grass	Tearthumb Spp.	Multiflora Rose	Poison Sumac	

Notes on additional plant species (Are there other sedges/rushes/other species dominant that are not on the list above?):

Landscape Info

Describe surrounding landscape (*e.g.*, wetlands, forest, subdivision, agricultural field, fallow field, etc.):

How much of this wetland is located **off-site** (*i.e.*, outside the property boundaries or right-of-way)?

__ None of it – the entire wetland is within the property boundaries

X Some of it – _____ Acres or _____% of the wetland appears to be located off-site

If part of this wetland continues off-site, how much of the **off-site portion** was surveyed (on foot)?

X None of it __ All of it __ Part of it (____ acres or ____% of the off-site portion)

Is there potential bog turtle habitat **off-site**? __ Yes __ No X Unknown If yes, how did you conclude this?

Species

Were any bog turtles observed? __ Yes X No If yes, how many?________

Other herps observed? __ Yes X No If yes, which ones?

*Note that you must be permitted by the state you are conducting the survey in to handle bog turtles.

*Report bog turtle observations to your local FWS Field Office and state wildlife office within 48 hrs.

Lead Surveyor Opinion

__ Yes X No __ Unsure The **hydrology** criterion for bog turtle habitat is met.
__ Yes X No __ Unsure The **soils** criterion for bog turtle habitat is met.
__ Yes X No __ Unsure The **vegetation** criterion for bog turtle habitat is met.
__ Yes X No __ Unsure This wetland has potential bog turtle habitat (fair to good quality).
__ Yes X No __ Unsure This wetland has potential bog turtle habitat (low to very low quality).
X Yes __ No __ Unsure This wetland does **NOT** have potential bog turtle habitat.

Notes (How did you reach this opinion?):

Lead Surveyor – **please sign** below certifying to the best of your knowledge that all of the information provided herein is accurate and complete.

Signature ______________________ **Date** 4/23/2020

most prominent in the wetland and have the highest percent of coverage compared to other species.

[4] Pertinent to bog turtle sites found in Connecticut, Massachusetts, New Jersey, New York, and Pennsylvania. See Supplemental Information – Suitable Vegetation section.

Phase 1 Bog Turtle Habitat Survey Data Form
For the Northern Population Range
(Revised October 23, 2018)

Wetland ID: B

General Info

Property/Project Name 2313 Lincoln Highway **County** Chester

Entity Requesting Phase 1 Survey (landowner, developer, agency): USFWS

Township/Municipality: Caln Township

Lead Surveyor: Bryon DuBois **Affiliation:** DuBois

Other Assistants Present: Abigail Gormley

Date/Condition

Date of Survey: 4/23/2020 **Time In:** 11:15am **Time Out:** 11:40am **Air Temp.** 49 F° C°

Last Precipitation: x < 24 hours __ 1-7 days __ > 1 week __ unknown **Drought conditions?** __ YES x NO __ Unknown

Drought Index*[1] (Circle): D0 D1 D2 D3 D4 **Notes** (*e.g.*, details about drought, flood, abnormally dry, seasonal conditions):

Wetland Info

Wetland ID: B **Wetland Size:** 2 acres, if known **# Wetlands w/in Project Area[2]:** ________

If estimating wetland size: __ < 0.1 acre __ 0.1-0.5 acre X 1-2 acres __ 2-4 acres __ 5+ acres __ 10+ acres

% Canopy Cover*[3] __ 0% __ ≤ 5 __ 6-20 __21-40 X 41-60 __ > 60

Hydrology and Soils (check all that apply):

X Springs/Seeps __ Springhouse X Trib/Stream __ Pond __ Stormwater __ Iron Bacteria

__ Rivulets (how many_______) (_______inches deep) __ Subsurface Tunnel/Rivulets x Tire Ruts (2-3 inches deep)

X Saturated soils present? If yes, year-round? X Likely __ Unlikely __ Unknown

X Yes __ No water visible on surface? X Small Puddles/Depressions (___ inches deep)

x Yes __ No Are there any signs of disturbance to *hydrology* (*e.g.*, drainage ditches, tile drainages, berms, culverts, fill material, ponds, roads, beaver impoundment, evidence of flooding)? If yes, describe (if possible, include how recent disturbance is*):

access roads throughout the site

For ditches that may be present, is there bog turtle habitat? If yes, describe:

__ Yes x No Are there any signs of disturbance to *vegetation* (*e.g.*, mowing, pasturing, burning)? If yes, describe (if possible, include level of disturbance*):

Soil types present*:

[1] (*) Denotes reference to the **Supplemental Information** document that provides more details on this particular question.
[2] Each wetland must have a separate Phase 1 habitat assessment data form completed.
[3] Determine percent cover of abundant species for the wetland, not by wetland type. Abundant species are those that are

Wetland Type/Vegetation

PEM Portion of Wetland: Approx. Acre(s) 1.0 Mucky soils depth (inches) N/A

PSS Portion of Wetland: Approx. Acre(s) _____ Mucky soils depth (inches) ______

PFO Portion of Wetland: Approx. Acre(s) 1.0 Mucky soils depth (inches) N/A

PO Portion of Wetland: Approx. Acre(s) _____

CIRCLE all vegetation* from list below that is dominant ≥ 20% for each wetland type listed above. Also, CIRCLE calciphiles[4] present even if not a dominant species.

Sphagnum Moss	Grass-of-Parnassus	Rice Cutgrass	Tussock Sedge	Shrubby Cinquefoil	Red Maple
Arrowhead	Japanese Stiltgrass	Rough-leaved Goldenrod	White Turtlehead	Spicebush	Viburnum Spp.
Carpetgrass	Jewelweed	Sensitive Fern	Woolly-fruited Sedge	Swamp Rose	Carex spp.
Cattail	Mile-A-Minute	Skunk Cabbage	Yellow Sedge	Alder Spp.	
Cinnamon Fern	Porcupine Sedge	Smooth Sawgrass	Alder-leaved Buckthorn	American Elm	
Common Boneset	Purple Loosestrife	Sweetflag	Dogwood Spp.	Eastern Red Cedar	
Common Reed	Reed Canary Grass	Tearthumb Spp.	Multiflora Rose	Poison Sumac	

Notes on additional plant species (Are there other sedges/rushes/other species dominant that are not on the list above?):

Landscape Info

Describe surrounding landscape (*e.g.*, wetlands, forest, subdivision, agricultural field, fallow field, etc.):

How much of this wetland is located **off-site** (*i.e.*, outside the property boundaries or right-of-way)?

__ None of it – the entire wetland is within the property boundaries

X Some of it – _____ Acres or _____% of the wetland appears to be located off-site

If part of this wetland continues off-site, how much of the **off-site portion** was surveyed (on foot)?

X None of it __ All of it __ Part of it (____ acres or ____% of the off-site portion)

Is there potential bog turtle habitat **off-site**? __ Yes __ No X Unknown If yes, how did you conclude this?

Species

Were any bog turtles observed? __ Yes X No If yes, how many?________

Other herps observed? __ Yes X No If yes, which ones?

*Note that you must be permitted by the state you are conducting the survey in to handle bog turtles.

*Report bog turtle observations to your local FWS Field Office and state wildlife office within 48 hrs.

Lead Surveyor Opinion

__ Yes X No __ Unsure The **hydrology** criterion for bog turtle habitat is met.
__ Yes X No __ Unsure The **soils** criterion for bog turtle habitat is met.
__ Yes X No __ Unsure The **vegetation** criterion for bog turtle habitat is met.
__ Yes X No __ Unsure This wetland has potential bog turtle habitat (fair to good quality).
__ Yes X No __ Unsure This wetland has potential bog turtle habitat (low to very low quality).
X Yes __ No __ Unsure This wetland does **NOT** have potential bog turtle habitat.

Notes (How did you reach this opinion?):

Lead Surveyor – **please sign** below certifying to the best of your knowledge that all of the information provided herein is accurate and complete.

Signature ______________________________ **Date** 4/23/2020

most prominent in the wetland and have the highest percent of coverage compared to other species.

[4] Pertinent to bog turtle sites found in Connecticut, Massachusetts, New Jersey, New York, and Pennsylvania. See Supplemental Information – Suitable Vegetation section.

APPENDIX D

STATEMENT OF QUALIFICATIONS

Bryon DuBois
Principal Senior Biologist
bdubois@denviro.com

190 North Main Street
Manahawkin, NJ 08050
609-488-2857

Education:

B.S. Biology & Ecology,
West Chester University, 1993

Professional Affiliations:

NJ Department of Environmental Protection Wetland Mitigation Council 2003 – 2013; 2016 - Present

New Jersey Builders Association 1999 – Present

Shore Builders Association 2001 – 2013

Builders League of South Jersey 2013 - Present

Member: Society of Wetland Scientists 1997 – Present

Member: The Ecological Society of America 1998 – Present

Member: New Jersey Division of Fish, Game and Wildlife Conservation Corps. 2000 – Present

Member: Pine Beach Environmental Commission 1995 – 2003

Association of N.J. Environmental Commission (ANJEC) 1995 – 2010

N.J. Concrete & Aggregate Society 2003 – 2013

Southern Ocean County Chamber of Commerce 2014 - Present

Fields of Competence:

Mr. Bryon DuBois has over 25 years' experience in the fields of regulatory compliance, ecology, biology, wetland science, wildlife management, hydrology and habitat restoration. He has managed numerous large scale projects through the approval process in New Jersey, Pennsylvania, Maryland and Delaware. Mr. DuBois is highly respected by the regulatory agencies in N.J. and surrounding states. He has made positive contributions to policies effecting protected species (both state and federal), wetland mitigation, regulation and coastal zone policies through NJDEP, PADEP, MDDNR, DEDNR and ACOE. These contributions have also been through invited participation and professional guidance provided in regulatory agency stakeholder processes.

Professional Experience:

After seven (7) early years in the consulting business Mr. Bryon DuBois created an environmental consulting firm in 2000 that focused on ecological and environmental issues that the regulated community was facing. Mr. DuBois has applied logical and objective solutions to some of the most difficult environmental projects and has constantly found a balance between environmentalists and developers alike. Mr. DuBois operates the firm and ensures successful completion of projects through management and coordination of numerous employees. Mr. DuBois operates the firm to promote the client's interest while providing the regulatory agencies with the documentation they require for approvals. The end result is typically a project or product that is both environmentally sound and in the best interest of the client.

Mr. DuBois has been requested to present topics related to environmental regulations at the Atlantic City Builders Convention, the Eastern Region Airports Conference in Hershey, Pennsylvania, the U.S. Fish and Wildlife Bog Turtle Convention, the N.J. Pinelands Commission, the Louisiana Fish and Game and dozens of planning boards in towns across N.J. and P.A. His diverse experience has made him a respectable candidate to speak publicly on projects that require many different issues from ecology to water quality.

Mr. DuBois began designing and managing the construction of wetland mitigation projects tailored to a specific habitat type or land use in 1998. Over the years his projects were approved and exceeded the standard requirements without increasing costs for the client. These mitigation projects helped Mr. DuBois become nominated to the State of New Jersey's Wetland Mitigation Council in 2003 by the Governor of New Jersey. Mr. DuBois has reviewed and received approval for numerous mitigation related projects and banks in New Jersey, Pennsylvania and Maryland.

From 2003 to the present-day Mr. DuBois has successfully managed, designed and received approval for projects ranging from airports to industrial centers, wastewater management facilities and large commercial areas along with thousands of residential dwellings. This has involved performing numerous long term studies on several influential species such as Bog Turtles, Pine Snakes, and Indiana Bats along with assessments of habitat and creation of mitigation measures. Mr. DuBois has held over 320 scientific collecting permits for surveys performed within the Mid-Atlantic States, many of which involve a telemetry component.

Mr. DuBois also has extensive experience coordinating with various utility companies to provide wetland, ecological surveys and monitoring services necessary to support utility line improvement and upgrade projects, which also involves regulatory agency coordination through implementation of both Pennsylvania Fish and Boat Commission and New Jersey Department of Environmental Protection standards

Bryon DuBois Principal Senior Biologist bdubois@denviro.com	190 North Main Street Manahawkin, NJ 08050 609-488-2857

Certifications:

Professional Wetland Scientist Society of Wetland Scientist

Certified Sr. Ecologist, The Ecological Society of America

Recognized Qualified Bog Turtle Surveyor – N.J., N.Y., P.A., D.E., M.D.

Recognized Qualified Indiana and Northern Long Eared Bat Surveyor – N.J., N.Y., P.A.

Certified Subsurface Evaluator NJDEP# 0001940

Recognized Qualified Delmarva Fox Squirrel Surveyor – M.D., D.E.

Pennsylvania Qualified Herpetologist for Various Species

The projects of relevance presented below have been successfully completed through the management and coordination of Mr. DuBois with the client and regulatory agencies.

Projects of Relevance:

NEW JERSEY:

- *NJ DOT Permitting and Threatened and Endangered Species*
  - Route 206 – Taylor, Wiseman, Taylor and NJDOT, Atlantic County, NJ
  - Route 46 - Taylor, Wiseman & Taylor and NJDOT, Warren County, NJ
- *Ecological Monitoring, Threatened/Endangered Species Studies & Wetlands Assessments*
  - A.C. Electric Co. South Jersey Multiple Transmission Line Upgrades
    - BL England Transmission Line Upgrade, Atlantic, Burlington & Salem Counties
    - Cove Road Transmission Line Upgrade, Cape May County
    - Orchard to Lewis Transmission Line Upgrades, Atlantic County
    - Oyster-Creek Cardiff Transmission Line Wetland Mitigation, Ocean County
- *Threatened/Endangered Species Studies & Permitting- Pinelands*
  - NJNG Southern Reliability Line – Townships of Manchester, Jackson, Lakehurst, Plumsted, Chesterfield, and North Hanover, Ocean and Burlington Counties, NJ
  - Clayton Companies - Shulton Property, Glidden Sand Mine & Woodmansie Sand Mine – Ocean and Burlington Counties, NJ
  - Cutt Brothers Farm Service Restoration project- Burlington County
- *Federal Involvement/Federal Oversight*
  - Swamp Pink Monitoring at Various Sites – Atlantic, Warren Counties, NJ
  - Various Distribution Center Applications; Bat Studies – Warran Township, Montville Township, Morris Co, NJ, Mt. Pocono, Northampton Co, PA.
  - Bear Creek Construction Monitoring- Burlington County, NJ.
- *Wetland Mitigation Approvals/Monitoring*
  - GEHR Mitigation Bank - Evergreen Environmental, Gloucester County, NJ
  - MBB Mitigation Bank - Evergreen Environmental
  - Bell Labs –Riparian Mitigation - Toll Brothers, Inc. Monmouth County, NJ
  - Bamm Hollow – Wetland Mitigation - Toll Brothers, Inc., Monmouth County, NJ

PENNSYLVANIA:

- *Threatened/Endangered Species Studies*
  - Westtown Lake Turtle Relocation, Westtown School, Chester County, PA
  - Haverford College Red Bellied Turtle Relocation, Delaware County, PA
- *Threatened/Endangered Species Studies & ACOE Permitting*
  - Scudder Falls Bridge Replacement, Michael Baker Inc., Yardley, PA
- *Permitting and Jurisdictional Determinations*
  - Brookdale – 1200 Acre wetland delineation, SK Design Group, Monroe County PA
  - Shartlesville – 520-acre wetland delineation in Burkes County, PA
  - 2016 PPL Reliability Project – Surveyed approximately 100 Miles of PPL Right of way throughout Lancaster, Lebanon and Berks County.

DELAWARE:

- *Threatened/Endangered Species Studies, Permitting & Wetlands*
  - DPL - Church to Wye Mills Transmission Line Upgrade, Kent County, DE
  - DPL - MD Transmission Line Upgrades from 2009-2014 Kent County to Sussex County DE

MARYLAND:

- *Threatened/Endangered Species Studies, Permitting & Wetlands*
  - Pepco – Bald Eagle Hazing and Nest Construction, Brandywine MD.
  - Kent County Wetland Mitigation Project, Delineation and Assessment

Abigail Gormley
Environmental Scientist
agormley@denviro.com

190 North Main Street
Manahawkin, NJ 08050
609-488-2857

Education:

B.S. in Environmental Science
Stockton University -- 2019

P.S.M in Environmental Science with a Concentration in Ecology
Stockton University
2020

Certifications:

Delaware DNREC Sediment & Stormwater Program Blue Card Certification B 2019/12/12 000

Career Positions:

DuBois Environmental Consultants, Manahawkin, NJ – Environmental Scientist, 2019 – Present

Professional Experience:

Ms. Abigail Gormley is an Environmental Scientist with the firm of DuBois Environmental Consultants. She is responsible for faunal and floral sampling investigations, environmental site assessments and on-site soil analysis. She also handles any technical support needed in various rare, threatened and endangered species studies. Since starting at DuBois Environmental Consultants, Ms. Gormley has assisted with studies on several species such as Eastern Redbelly Turtle, Red Shouldered Hawks, Pine Snakes, Corn Snakes, Barred Owls, Indiana Bats, Northern Long Eared Bats, and Bald Eagles. These activities include helping with directed visual surveys, implementation of data collection and habitat analysis. Ms. Gormley has assisted in habitat and visual surveys for Bog Turtles in New Jersey and Pennsylvania. She has also assisted with the maintenance and operation of multiple ecological trapping arrays, including drift fence-box funnel traps designed to capture threatened and endangered snake species.

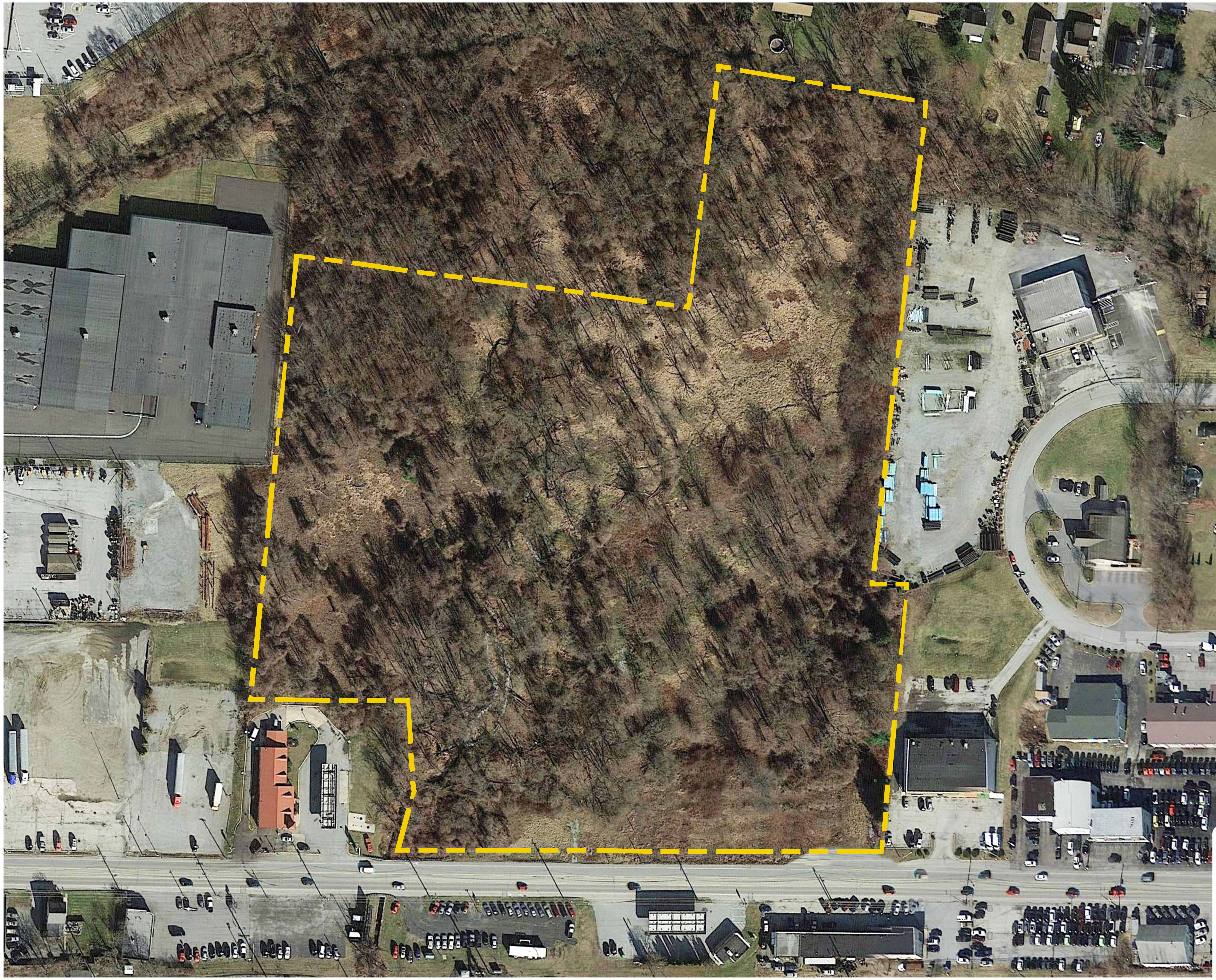
Ms. Gormley is also responsible for the organization and execution of various environmental reports including Letter of Interpretation (LOIs), feasibility studies, site assessments, CAFRA permits, and various State General Permits for submittal to the New Jersey Department of Environmental Protection (NJDEP).

In conjunction with performing surveys for a variety of environmental/ecological assessments, Ms. Gormley has gained extensive experience using ESRI Arc Map Geographic Information Systems (GIS) software and global positioning systems (GPS). Maps are created to depict a visual representation for clients of site-specific characteristics in relation to various projects. These tools are also used in mapping species such as turtles, bats and snakes.

Ms. Gormley also performs biological/environmental construction monitoring associated with utility right-of-way's throughout New Jersey. Environmental oversight ensures the project is conducted in an environmentally responsible manner and in accordance with all applicable SESC standards and best management practices. Biological oversight in and around sensitive habitats ensures that the project does not have any adverse impacts to sensitive habitats or rare faunal and floral species.

Education:

Ms. Gormley received a Bachelor of Science degree from Stockton University in Environmental Science in May of 2019. While attending Stockton University, Ms. Gormley selected upper-level classes including freshwater ecology, wildlife management, soil science, ecological forest management, and geographic information systems. All classes were supplemented with hands-on laboratory experience using professional techniques, as well as site-specific trips for fieldwork. Ms. Gormley will be receiving a Professional Science Master degree from Stockton University in Environmental Science in May of 2020. Ms. Gormley conducted research on the federally endangered bog turtle during her Masters' program.



2131 Lincoln Highway
Existing Conditions

PREPARED BY:

DLHowell
Civil Engineering, Land Planning, Environmental
1250 Wrights Lane, West Chester, PA 19380
Phone: (610) 918-9002 Fax: (610) 918-9003
(610) 918-9002 www.dlhowell.com

The Willows at Valley Run

Caln Township, Chester County, PA

EXHIBIT A-5

June 9, 2020

Re: 2131 Lincoln Highway Proposed Apartment Building Development

As requested by applicant, and required by Chapter 155-172, section F. (9), this shall serve as preliminary acknowledgment that the proposed development can be adequately serviced by Caln Township emergency service providers, provided all requirements set forth in Chapter 137 and applicable local ordinances are complied with.

Respectfully,

Raymond Stackhouse

Raymond Stackhouse, Director

DEPARTMENT OF BUILDING & LIFE SAFETY
Raymond Stackhouse, Director
253 Municipal Dr, Thorndale, PA 19372 | Phone: 610-384-0600 | Fax: 610-384-0689
codes@calntownship.org | www.calntownship.org

Ingram Engineering Services, Inc.
16 Hagerty Blvd., Suite 400
West Chester, PA 19382
Office 484-947-5549 Fax 610-431-7015

PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT

2131 LINCOLN HIGHWAY EAST
APARTMENT COMPLEX
TAX ID #39-4-57, 39-4-56, 39-4J-40
CALN TOWNSHIP
CHESTER COUNTY, PENNSYLVANIA 19320

PREPARED FOR

D.L. HOWELL & ASSOCIATES, INC.
1250 WRIGHTS LANE
WEST CHESTER, PA 19380

JUNE 12TH, 2020

Chadd W. Ingram, P.E.
President
NO 054439 E

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
CHADD W. INGRAM
ENGINEER
NO 054439 E

Ingram Engineering Services, Inc.
16 Hagerty Blvd., Suite 400
West Chester, PA 19382
Office 484-947-5549 Fax 610-431-7015

Executive Summary:

IES has been retained by the Client to perform a preliminary Due Diligence geotechnical investigation. Given the proposed land development plans and coordination with the Client, IES understands that the proposed residential development will consist of six (6) apartment buildings, one (1) community building, two (2) stormwater management facilities, and roadways, drive aisles, parking lots within a 15.175 acre property.

- The site is relatively gently to moderately sloping south to north/northeast and is primarily consisting of wooded forest with a creek/wetland area that bisects the proposed site
- No grading plan was provided to IES, and for the intents of this investigation, IES is under the assumption that typical earthwork operations are anticipated for this project and maximum cuts/fills will typically be within the 3 to 5 foot range

IES was also requested to evaluate the site at a carbonate geology/karst formation standpoint as per Caln Township's requirements due to the proposed site being situated within the Ledger Formation. However, IES did not encounter any carbonate rock/karst formations and it is IES' professional opinion that the site is not currently subject to sinkhole conditions

The preliminary geotechnical investigation was performed throughout the site via exploratory test pit investigations, ABV testing via Weighted Drop-hammer Tests (Kneas Bar), visual field testing and log records, and a laboratory analysis. In general, the soil profile encountered was consistent throughout the site and consisted of two (2) strata:

- **0" to 9": TOPSOIL**
  Dark brown TOPSOIL was encountered in the majority of the test pits to an average depth of approximately nine (9") inches BGS.

- **9" to 12'-16': ML/CL (CLAYEY SANDY SILT to SILTY CLAY)**
  Medium stiff to stiff reddish brown to light bright/tan clayey SILT and sandy SILT and SILTY CLAY w/ little to some gravel, sl. plastic. ABV for the above-mentioned soils are calculated to 3,000 psf.
  Groundwater was present throughout the majority of the site. To the west of the creek, GW elevations ranged from 339.25 to 342.17. To the east of the creek, GW elevations ranged from 322.5 to 338.67 with elevation lowering as you move further east from creek, in general

Given the soil classifications, ABV test results, and the results from laboratory analysis IES has drawn the following conclusions/provides the following recommendations:

- Stratum II soils provide a minimum allowable bearing value of 3,000 PSF for the proposed residential apartment buildings.
- The concrete footings may be designed as spread footings.
- In general, the subgrade soils consist of a very fine-grained, cohesive nature with natural moisture contents ranging from 21.1% to 28.3%- thus, general earthwork/recompaction of excavated soils may be difficult.
- IES recommends that the Client/Developer allot for soil remediation measures (such as soil cement or similar) to be implemented in their budgetary estimates.

Ingram Engineering Services, Inc.
16 Hagerty Blvd., Suite 400
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June 12th, 2020

Denny L. Howell, II, P.E.
President
D.L. Howell & Associates, Inc.
1250 Wrights Lane
West Chester, PA 19380

Re: Preliminary Geotechnical Engineering Report
2131 Lincoln Highway East-Apartment Complex
Caln Township, Chester County, PA

Mr. Howell:

Submitted herewith is the *Geotechnical Engineering Report* for the above referenced project. D.L. Howell & Associates, Inc. (Client) has retained Ingram Engineering Services, Inc. (IES) to perform <u>due diligence via a preliminary geotechnical investigation</u> and analysis in order to make recommendations for foundation designs, soil remediation (if required), earthwork/compaction requirements, and similar recommendations for the existing soils beneath the proposed apartment complex development. IES was also requested to perform a carbonate district area assessment/karst evaluation in accordance with Caln Township requirements. Any environmentally related services are beyond this investigation's scope of work. Presented herewith is the required information. IES appreciates the opportunity to be of service with you on this project. If we may be of further assistance, please do not hesitate to contact our office.

<u>Purpose and Scope of Work:</u>

The purpose of this investigation was to assess the general subsurface soil profiles and groundwater conditions to determine the existing subsurface characteristics and the engineering properties for proposed load-bearing structures and related infrastructure, and provide soil recommendations and carbonate geology concerns (if applicable) for the proposed SWM design. Upon evaluation of these subsurface conditions, this report is to provide general construction recommendations regarding the foundation system for the proposed structures as well as general earthwork and construction guidelines.

The scope of the investigation and evaluation entailed subsurface exploration via test pit investigations and sampling, visual field testing and log records, laboratory analysis, to conclude with a geotechnical evaluation and all recommendations warranted. This report and its evaluation is limited to the data reviewed, collected and analyzed by IES and addresses the current site conditions investigated as they relate to ground support for the proposed structure and related construction. The scope of services performed included twenty-eight (28) exploratory test pit investigations, weighted drop-hammer/Kneas Bar Testing, a laboratory soil analysis, a geotechnical analysis of the field findings and field logs, carbonate evaluation and review of published data from nearby reported carbonate activity, and the preparation of a written engineering report. A plan entitled "Site Layout Plan" (Project No.

3705) dated 05/13/20, and prepared by the Client (hereafter referred to as the "Plans") was provided to IES and showed locations of the proposed apartment complex, including six (6) separate buildings, a community building, associated parking lot/drive aisles, and two (2) proposed stormwater management (SWM) facilities.

Site and Project Description:

The proposed construction site currently is situated within a heavily wooded area. IES has not been provided with any grading/utility plans at this time, but is under the assumption that typical earthwork operations are anticipated for this project and maximum cuts/fills will typically be within the 3 to 5 foot range. In the event that changes, and more substantial earthwork operations are required, IES should be contacted to reevaluate the findings, conclusions, and recommendations offered in this report. IES has been informed by the Client that the proposed apartment buildings are to be 3-story structures with timber framing on a slab-on-grade (no basements proposed). Typical loads are anticipated for this type of construction.

Historical aerial photography available for review back until the early 1950's shows the proposed construction site was originally of agricultural use with several farmhouses and structures existing at the southern end of the site along Lincoln Highway. By 1981, the southwestern structure had been demolished it appears as though the land was no longer being used for agricultural purposes. By 2008, the southern and southeastern structures were demolished, and the area was heavily wooded as it has remained up until the time of this investigation. Please see the attached historical aerial imagery in **Appendix D**.

Please note, that IES did not encounter any existing foundations, infilled basements, significant buried urban fill/debris, or similar within the areas of the demolished farmhouse and/or structures. Based on the proposed site development, the area of the demolished structures appears to be near the vicinity of the proposed Building A. In the event that remnants of the demolished structures are encountered, IES should be notified and permitted to evaluate conditions relative to the proposed development and adjust the conclusions/recommendations in this report if necessary.

Introduction:

On May 27th, 28th, and 29th, 2020, IES performed exploratory test pits at twenty-eight (28) locations within the proposed apartment complex. The field study consisted of test pit excavations and soil sampling at the proposed site utilizing a trackhoe excavator. Test Pits were excavated to average depths of 10 to 15 feet BGS. The test pit locations were rudimentary surveyed and field located via a handheld GPS device (accurate to approximately 10-20 feet). IES approximated surface elevations of the test pits based on the existing contours provided on the Plans. In addition to the test pit excavations, IES performed Weighted Drop Hammer/Kneas Bar Penetration Testing at various locations in order to ascertain the stability of the local soils and ascertain the allowable bearing capacity of the subgrade soils. Kneas Bar Testing entails utilizing a twenty-five (25) pound hammer to drive a four (4') foot long steel rod into the subgrade to correlate blow counts and penetration depths with a general understanding of subsurface soil load-bearing properties.

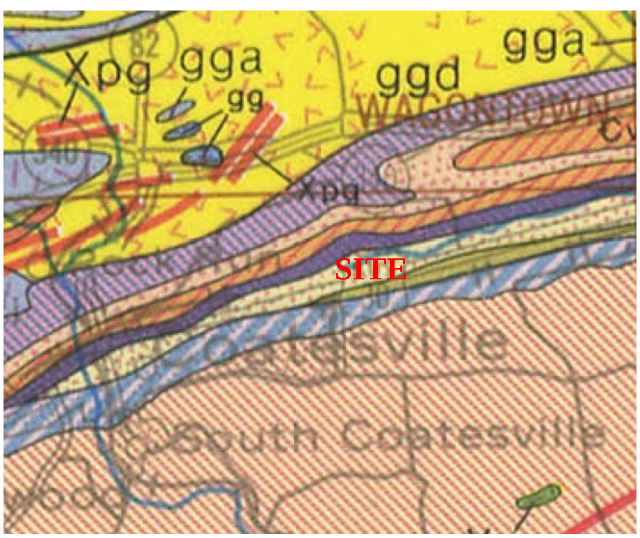
A Geotechnical Engineer from IES was present and inspected the test pit investigations on a full-time basis. The findings and locations are shown in **Appendices A and B** to include the Test Pit Location Plan and Test Pit Profiles, respectively. This report describes the site conditions, documents the work performed, and presents the data, conclusions and recommendations of the field investigations performed on May 27th, 28th, and 29th, 2020.

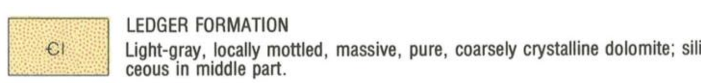
<u>Field Investigations and Subsurface Conditions:</u>

The soil stratification within each test pit excavation was examined and visually classified in the field on the attached test pit logs. Laboratory samples were also collected and analyzed via Full USCS (Unified Soil Classification System) classifications (ASTM D2487) via Particle Size Gradation, Hydrometer, and Atterberg Limits analyses. Laboratory testing was performed in accordance with applicable ASTM standard test methods. The laboratory results can be found in **Appendix C** and are incorporated into the findings, recommendations and conclusions discussed throughout the *Geotechnical Engineering Report.*

Within the depths explored, the subsurface soil profiles within all test investigation locations were, in general, similar and consisted primarily of the following soil profile:

- **0" to 9": TOPSOIL**
  Dark brown TOPSOIL was encountered in the majority of the test pits to an average depth of approximately nine (9") inches BGS.
- **9" to 12'-16': ML/CL (CLAYEY SANDY SILT to SILTY CLAY)**
  Medium stiff to stiff reddish brown to light bright/tan clayey SILT and sandy SILT and SILTY CLAY w/ little to some gravel, sl. plastic. These soils were encountered in the majority of the test pits to an average depth of twelve (12') feet to sixteen (16') feet below the existing ground surface. Allowable bearing values for the above-mentioned soils are calculated to 3,000 psf. It should be noted that isolated locations at the southwestern corner of the site encountered medium dense to dense gravelly silty SAND within this stratum.





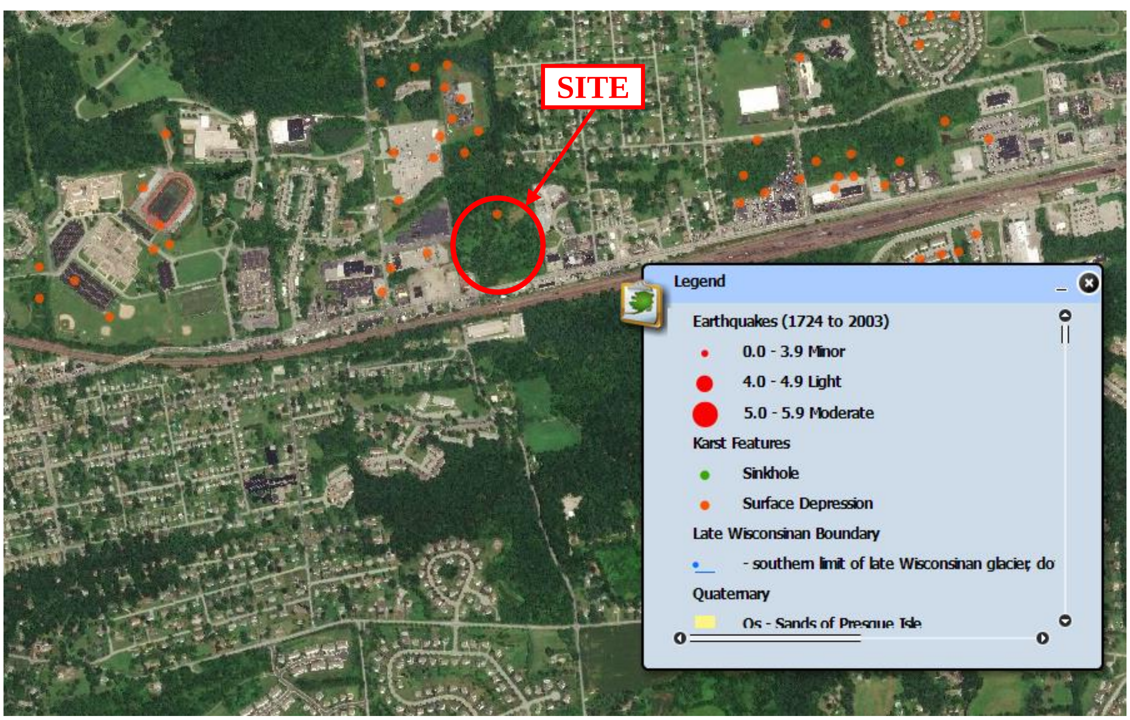
According to the Geologic Map of Pennsylvania, the site Geology belongs to the Ledger Formation. Characterized by the PA Department of Environmental Resources, "Engineering Characteristics of the Rocks of Pennsylvania", the formation is described as "Light-gray, locally mottled, massive, pure, coarsely crystalline dolomite; siliceous in middle part; beds weather to rust stained, granular, cherty layers; approximately 2,000 feet thick; type section is at Ledger, Lancaster

County." Weathering is described as "Moderately resistant; slightly to moderately weathered to a shallow depth; breakup results in large blocks; overlying mantle is thin; pinnacles characterize the interface between mantle and bedrock." Drainage is described as "Good surface and subsurface drainage." Ease of excavation is described as "Difficult; bedrock pinnacles are a special problem; fast drilling rate." Foundation stability is described as "Good; solution openings and bedrock pinnacles should be thoroughly investigated."

The ground water table was encountered in the majority of the test pit investigations, particularly those within closer proximity to the creek/wetlands at approximate depths ranging from three (3') feet to thirteen and a half (13.5') feet below ground surface as evidenced by direct observation of test pit excavations. Groundwater on the western side of the creek that bisects the site was encountered at approximate elevations ranging from Elev. 339.25 to 342.17. On the eastern side of the creek, the groundwater was encountered at approximate elevations ranging from Elev. 322.5 to 338.67 (with elevation lowering as you move further east from creek, in general). It should be noted that the ground water data presented on the individual test pit logs may not be representative of daily or seasonal variations in the ground water level. See the attached plan markup showing GW elevations in **Appendix E**.

Carbonate Assessment- Site Reconnaissance

IES reviewed historical aerial photographs of the proposed site from both www.historicalaerials.com as well as www.pennpilot.psu.edu dating back to 1937. IES also reviewed the interactive Pennsylvania Sinkhole Map provided by the Pennsylvania Department of Conservation & Natural Resources. As seen below, no sinkholes have been reported within approximately half of a mile from the proposed site, however one surface depression within the proposed site and several surface depressions have been reported in the adjacent area located immediately to the east of the proposed site.



Although the site is located within the Ledger Formation and the PA sinkhole maps show that the site is situated near karst features (surface depressions), IES did not identify that the carbonate rock is situated within the site at the extents and depths investigated. Due to the elevated groundwater table, sinkhole activity and depressions are typically minimal due to the saturation of subsurface carbonate stratum (if present), as any existing underlying karst features are situated within water and in a non-fluctuating groundwater table at deeper depths. This minimizes the potential significant dissolution of the carbonate bedrock (if present) and allows some stability of the underlying bedrock. However, carbonate geology is unpredictable in nature and there is always a potential for varying subsurface conditions to exist that would require modifications to our recommendations.

Based on the above field-gathered investigation and findings, it can be concluded that the subgrade soils for these areas are not currently subject to sinkhole conditions. IES does not anticipate the carbonate geology to have any adverse effect on the proposed project site development. However, karst pinnacles/formations are not very readily predictable, and in the event carbonate geology is encountered in localized areas during construction activities, sinkhole mitigation guidance may be necessary. In this event, all unconsolidated soils should be removed to bedrock and probed for voids and potential throat openings. Any carbonate rock interface encountered should be cleared to expose all potential throat openings. The area should then be flushed and capped with flowable concrete fill, with the intent of encapsulating any exposed pinnacles and/or any throat openings, preventing any future draining and/or removal of the overlying soils and creating sinkhole and/or karst formations. The amount of flowable fill needed to encapsulate any potential karst formations should be determined by the geotechnical engineer in the field.

Representative laboratory samples were collected and analyzed via Particle Size Gradation and Falling Head Permeability (if applicable) analyses at the locations of the two (2) proposed stormwater management (SWM) facilities. Laboratory testing was performed in accordance with all applicable ASTM standard test methods. Full soil laboratory testing results can be seen in **Appendix C**. Where Falling Head Permeability testing was not feasible, IES utilized the USDA Soil Permeability Textural Triangle to assign a K-rating permeability class to the sample analyzed. Results of the falling head permeability laboratory testing identified that the native soils encountered are conducive to infiltration within the vicinity of Test Pit 26. Results are summarized in the table below.

Table 1: Calculated Infiltration Rates

Location	**Sample Depth/ Elevation**	**Depth/Elevation to Limiting Zone**	**Approx. Infiltration Rate** (in/hr)
TP-17	16" / 338.67	40" / 336.67	K0- <0.2 in/hr
TP-23	60" / 344.25	100" / 340.92	0.36
TP-26	48" / 342.25	84" / 339.25	K3- 2-6 in/hr

<u>Allowable Bearing Value:</u>

A net allowable bearing value (ABV) for the proposed structure is designated at 3,000 PSF within areas of the building pad that are not subject to the placement of compacted fill based upon in-situ testing assuming minimal cuts/fill less than three (3') feet. The allowable bearing value of the aforementioned fill material should meet the above recommended PSF to arrest any potential of differential settlement. This designation is based upon field-testing performed by IES and must be confirmed for all infrastructure via direct oversight/subgrade verifications/inspection by the

Geotechnical/Soil Engineer via geostick probing in all footing and column subgrades for all structures. It is imperative to have footing subgrades for all structures and storm/sanitary sewer fills inspected on a full-time basis by the Soil Engineer or a representative therein to insure soil and geological consistency to field testing and geotechnical report determinations herein as previously mentioned.

Recommendations:

The following recommendations are based on the data collected during this investigation, our understanding of the proposed construction, our experience with similar site and subsurface conditions and generally accepted principles and practices of geotechnical engineering. Should the proposed construction change significantly from that described in this report, we request that we be advised so that we may amend these recommendations accordingly. This report, and the conclusions and recommendations provided herein, are provided exclusively for the use of the Client and is intended solely for the design of the referenced project. Based on the information obtained at the test pit locations and design details provided to IES, recommendations related to important aspects of design and construction are provided below.

- ***General Site Preparation and Fill Placement***

  Initially, prior to construction, the project site should be cleared of vegetation, stripped of topsoil and organics. Any topsoil, deleterious materials, vegetation, asphalt, concrete, fill and/or unforeseen demolition encountered are to be removed from the proposed construction area to stable natural ground in order to properly address any loose condition encountered within the test pit investigations. The exact depth of excavations for load-bearing infrastructure is to be determined by the Geotechnical Engineer of Record or a representative thereof at the time that the proposed area is excavated, i.e. - full-time Geotechnical oversight is required.

  Depending on the weather and moisture conditions at the time of construction, it may be difficult to achieve adequate compaction. If conditions are wet at the time of construction, proper dewatering and drying measures should be implemented for the soils to dry within optimum moisture content ranges. This is extremely important in order to properly compact the soils as specified herein. Note: on-site soils are moisture sensitive, silty cohesive soils. Utilization of these silty cohesive soils must be performed with strict moisture control measurements. The subgrade soils encountered during IES' investigation were that of a very fine-grained, cohesive nature with natural moisture contents ranging from 21.1% to 28.3%, and thus, general earthwork and recompaction of excavated soils may prove difficult at time of construction.

  It is likely that earthwork procedures of these existing in-situ soils will be difficult and soil amendment/remediation will be required in order to provide subgrade stability, especially for structural fill areas, heavily trafficked roadways, and similar. IES recommends that the Client/Developer allot for soil remediation measures to be implemented in their budgetary estimates. In IES' professional opinion, the soils are a good candidate for soil cement remediation. Soil-cementing is a densification process performed by mixing the in-situ soils with Type I Portland cement. The moisture within the proposed soils to be treated will react with the Type I Portland cement (similar to the exothermic reaction between water and cement curing to produce concrete) to create a dense soil stratum. Soil cement remediation is advantageous as no import/exporting of soils is required and thus, no clean fill testing will be needed. Soil cement remediation often provides a level of "waterproofing" of the building pads and/or roadways, providing a more stable working pad that minimizes the need for costly subgrade repairs, especially following precipitation events If requested, IES can perform a soil cement laboratory analysis to estimate the required Portland Cement percentage requirement.

The exposed subgrade is to be densified with a vibratory compactor or similar equipment in the presence of the Geotechnical/Soil Engineer to detect and repair unsuitable soil conditions and to attain a uniform firm & stable subgrade throughout. Proofroll evaluations utilizing a fully loaded tandem axle dump truck (20 tons) should be performed by the Geotechnical/Soil Engineer during a period of dry weather. Any loose/soft soils encountered are to be densified by proofrolling and further compaction by additional passes if necessary. Areas identified with excessive pumping or heaving are to be excavated and replaced with compacted structural fill materials imported or suitable site materials at the direction of the Geotechnical/Soil Engineer. Climatic conditions and site drainage will have an effect on the amount of reworking and undercutting required at the site. Areas to receive structural fill are to be stripped of all unsuitable and/or organic material prior to the placement of structural fill.

Subgrades may be brought up to desired elevation with approved on-site soils or approved structural fill * in lifts no greater than eight to ten inches (8"-10") loose thickness and compacted to 95% of the material's maximum dry density per ASTM D-698. Recommended frequency of in-field compaction testing is 1 test per 1,000 SF. The upper foot of fill which will support structures should be compacted to at least 98% of the soil's standard Proctor maximum dry density for improved support. Structural fill lifts must be at or near its optimum moisture content. Structural fill should be free of organic material, have a plasticity index (PI) less than 30, and contain particle sizes no larger than four inches (4"). Approved structural fill soils qualify under the following criteria:

- Free of demolition debris, organic matter, ash, cinders, slag, and frost.
- At or near optimum moisture content
- Plasticity Index (PI) less than 30
- Unsuitable soils for import are those classified as SC, CL, CL-ML, ML, MH, CH, OH, OL, and PT.
- Particle size distribution that is well-graded (for import soils)

100%	passing the two-inch (2") sieve
100% - 70%	passing the two-inch (3/4") sieve
80% - 30%	passing the two-inch (#4) sieve
35% - 10%	passing the two-inch (#50) sieve
35% - 5%	passing the two-inch (#200) sieve

* Structural fill criteria may be field adjusted by the Geotechnical Engineer of Record

Any bulk samples of all materials to be used as structural load-bearing fill must be taken and tested prior to the commencement of work and placement of select fill so that moisture/density relationships (compaction) can be determined. Approved on site soils may be used for backfilling under the strict fulltime control of the Soils Engineer. Organic and miscellaneous uncontrolled fill materials are considered to have no bearing value. All exposed footing subgrades are to be compacted by two passes with a jumping jack compactor immediately prior to the placement of the footing concrete.

Excavations of the in-place soils at this site can be accomplished using conventional heavy earthmoving equipment such as large track-mounted excavators. If conditions are wet at the time of construction, proper dewatering and drying measures should be implemented for the soils to dry within optimum moisture content ranges. This is extremely important in order to properly compact the soils as specified herein.

Frost: No fill or infrastructure shall be placed on frost. Removal of the frost is mandatory in all load-bearing areas. Depth of excavation and confirmation of sufficient soil removal is to be performed under the oversight of the Geotechnical/Soil Engineer or a representative thereof.

A capillary water barrier is required for all interior slabs on grade, including garages, carports, and storage rooms. The subbase requirements for all structures should be strictly adhered to as prescribed in the Sub-Slab Vapor Mitigation System Design provided by Brickhouse Environmental on Sheet 6 of the Plans.

- ***Foundation Design Criteria***

The proposed structures are to be placed on strip footing foundation systems. All footing bottoms are to be founded at least three feet beneath or away from atmospherically exposed final soil subgrade. The majority of the footing subgrades are anticipated to be situated in compacted native or structural fill. The soil characteristics were similar consisting of medium stiff to stiff clayey SILT and sandy clayey SILT. Depending on the final grading elevations, some localized pockets of soft, slightly plastic SILTS and CLAYS may be encountered at various locations. If these plastic soils are encountered during construction of the footings or building pad subgrades near these locations, it is recommended to replace the soils with approved structural fill or an imported modified stone blend or similar, prior to construction of the foundation. Deeper excavations may be necessary where loose soils are encountered to ensure adequate earth support. If soft soils and/or unsuitable fill material are encountered, they should be removed and replaced with engineered fill consisting of granular soils. Localized remediation typically entails:

- One to three feet (1' - 3') of removal of loose soils. Elevations may vary depending on surface topography and cut/fill quantities at specific locations. This shall be field determined during earthwork operations under the supervision and direction of the on-site soils engineer/technician.
- A 20-ton roller shall then compact the underlain soil until 98% compaction (ASTM D-698) is achieved.
- The loose sands may be redensified in eight to ten (8"-10") inches loose thickness and compacted to 95% of the material's maximum dry density per ASTM D-698 under the supervision of the certified geotechnical representative.

It is strongly recommended and industry practice that the Geotechnical/Soil Engineer representative is present during the foundation excavation activities to observe the subgrade preparation and/or identify a suitable bearing stratum in an effort to minimize potential differential settlement for the proposed apartment buildings. The footings may be placed at any elevation provided the minimum depth criteria are met and the recommendations listed herein are performed. Based on these recommendations, the soils are capable of supporting a spread footing system designed for a maximum allowable bearing capacity of 3,000 Pounds per Square Foot provided that the requirements under Recommendations are adhered to strictly. Using the allowable bearing value and following the recommendations will keep total and differential settlements negligible for the proposed infrastructure. (i.e. - less than ½").

- ***Pavement Design Considerations***

The pavement soil subgrade should be compacted to 95% of the material's Maximum Dry Density (ASTM D-698). IES recommends that a California Bearing Ratio (CBR) of 5 be used for pavement design purposes. This CBR values is estimated based on available data compared to the standard penetration test resistance values in conjunction with our experience with similar projects with similar soil conditions. In the event that a more precise CBR value is required, then IES recommends completing a field investigation of the existing subgrades to obtain CBR values via Dual Mass Cone Penetrometer testing and laboratory CBR analysis. Pavement areas are to be provided with at least a six (6") inch thick crushed stone or coarse gravel base course. A geotechnical reinforcing fabric (Mirafi 500X or equal) should be placed under any heavy traffic areas. A final proof roll of the proposed access road is to be performed utilizing a loaded ten-wheel dump truck in the presence of the Geotechnical/Soil engineer. Proof Rolls are also to be performed in between lifts and after periods of precipitation as much of the site does contain moisture-sensitive soils. Any loose/soft areas are to be repaired prior to the placement of the stone base course and asphalt.

- ***Inspections***

It is imperative that all earthwork operations, within load-bearing areas, be inspected full time by the Geotechnical/Soil Engineer or a qualified representative thereof, especially the proofrolling operations and footing subgrades immediately prior to placing the footing concrete. Foundation excavation evaluations/inspections should be performed to confirm that the design allowable bearing pressure is adhered to (consistent to this report of findings and test logs) and that subgrades are stable and free of deleterious material. Footing subgrade evaluations should be performed through a combination of visual observation, geoprobing, and field compaction density tests with comparison to the test pits. Concrete testing is recommended at 50-cubic yard intervals for 7, 14, and 28-day break cylinders or as required by the Building Code Official for non-single-family detached dwellings. This is recommended for all footings, slabs, elevated decking and foundation walls poured. Concrete placement should be performed immediately after footing subgrade evaluations are made to prevent exposure and potential weakening of foundation subgrades. The Structural Engineer of Record will provide testing requirements of the approved building plans per Code and Industry Standard.

- ***Seismic Site Class***

Seismic Site Class: D (Stiff Soil Profile)
Soil shear wave velocity - v_s (ft/s)
$600 < v_s \leq 1,200$

Standard penetration resistance - N
$15 \leq N \leq 50$

Soil undrained shear strength - s_u (psf)
$1,000 \leq s_u \leq 2,000$

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Limitations and Qualifications:

This is a "due diligence" report requested by the Client. The conclusions and recommendations included in this report are based on the subsurface data and conditions collected during the field investigations in conjunction with the site plans, data and history provided. This report is for geotechnical study only. This report does not include any geoenvironmental findings such as buried underground storage tanks or regulated contaminants. The general subsurface conditions used in our evaluation were based on interpolation of the subsurface data at the test pit locations.

It should be noted that soil conditions between test pits can vary significantly from the conditions found at the individual test pits. This is particularly true in areas that have been disturbed by prior construction and it is not uncommon to find buried construction debris in these areas. IES will not be responsible for the presence of buried fill materials or unexpected conditions that may be delineated or encountered at the site. IES should be informed immediately of such conditions so that we may modify our conclusions and recommendations.

The recommendations outlined in this geotechnical report are based on the assumption that the provisions for strict field inspection will be followed as specified and directed, either by a representative of IES or other qualified personnel, to include oversight and inspection of compaction, backfill placement, and/or other significant earthwork or structural fill construction activities.

These professional services have been performed, the findings derived, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all warranties either expressed or implied. This company is not responsible for the conclusions, opinions or recommendations of others based on this data.

Should you have any questions, kindly contact the undersigned.

Very Truly Yours,

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Appendix A:
Test Pit Location Plan

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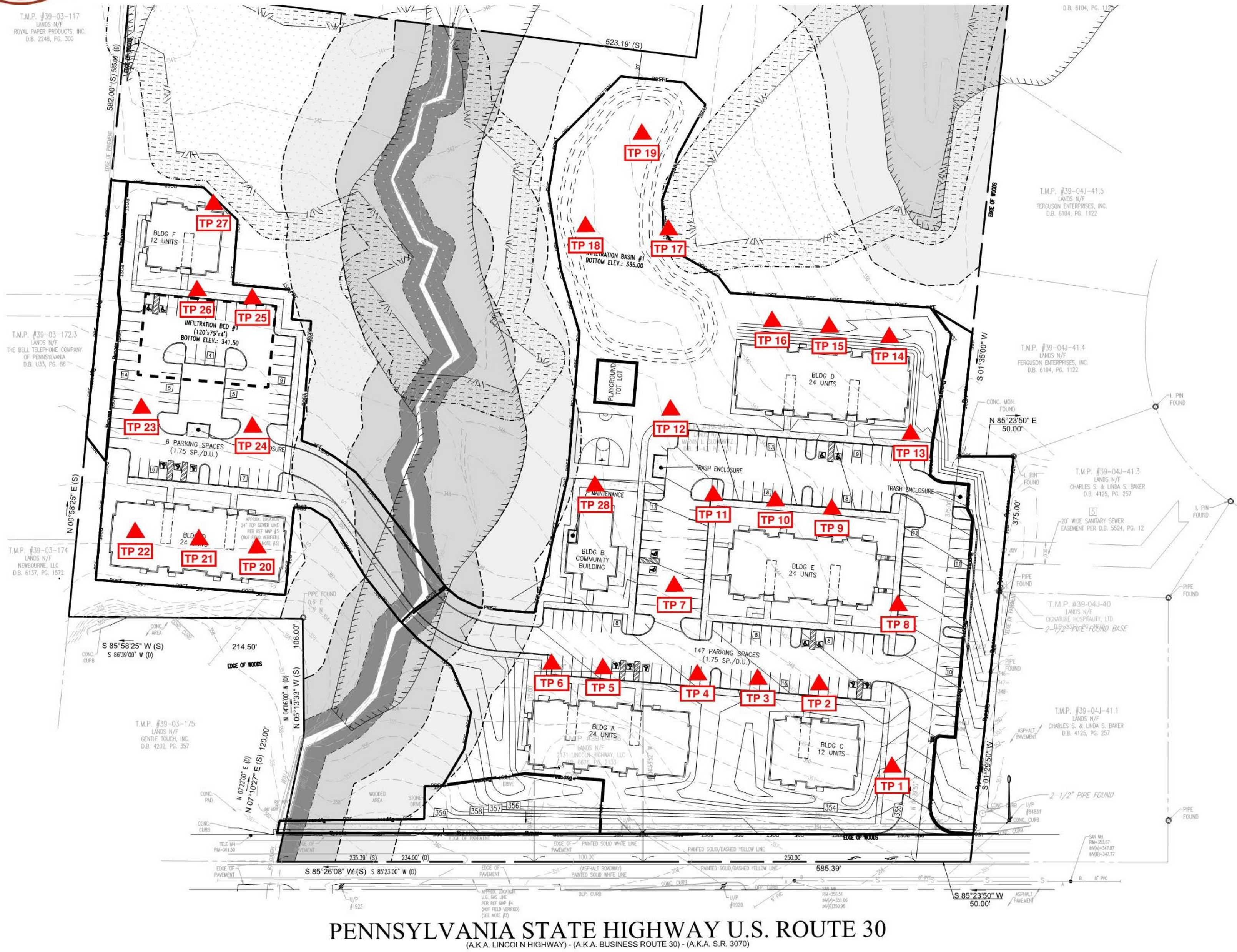

SITE LAYOUT PLAN

Appendix B:
Test Pit Logs

Ingram Engineering Services, Inc.

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TP #1

Test @ 20'' BGS (Elev. 347.58) & @ 68" BGS (Elev. 343.58) & @ 110" BGS (Elev. 340.08)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 9"	349.25 to 348.50	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
9" to 62"	348.50 to 344.08	Brn f sandy SILT w/ tr clay, sl. plastic, stiff	20"	13	17	28	50+
62" to 100"	344.08 to 340.92	Reddish brn clayey SILT, sl. plastic, stiff	68"	12	29	50+	
100" to 184"	340.92 to 333.92	Lt. brn/tan/gray SILT w/ tr clay, stiff, moist	110"	8	22	34	50+

No GW or LZ Encountered

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TP #2

Test @ 20'' BGS (Elev. 344.33) & @ 64'' BGS (Elev. 340.67)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
			Depth	*1'*	*2'*	*3'*	*4'*
0" to 8"	346.00 to 345.33	Dk brn TOPSOIL					
8" to 60"	345.33 to 341.00	Brn f sandy SILT w/ tr clay, sl. plastic, stiff	20"	6	25	50+	
60" to 161"	341.00 to 332.58	Lt. brn/tan/gray SILT w/ tr clay, stiff, moist	64"	7	19	28	34
161" to 183"	332.58 to 330.08	Lt. brn/tan/gray sandy SILT w/ tr clay and some gravel, stiff, moist					

No GW or LZ Encountered

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TP #3

Test @ 12'' BGS (Elev. 346.50) & @ 48'' BGS (Elev. 343.50)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 8"	347.50 to 346.83	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
8" to 96"	346.83 to 339.50	Brn f sandy SILT w/ tr clay and some gravel/cobbles, sl. plastic, stiff	12"	5	8	39	41
96" to 182"	339.50 to 332.33	Lt. brn clayey SILT w/ some gravel/cobbles, sl. plastic, stiff, moist	48"	17	39	50+	

135'' BGS (Elev. 336.25) = Ground Water LZ Encountered

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TP #4

Test @ 12'' BGS (Elev. 347.75) & @ 56'' BGS (Elev. 344.08)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 11"	348.75 to 347.83	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
11" to 108"	347.83 to 339.75	Brn f sandy SILT w/ tr clay and some gravel/cobbles, sl. plastic, stiff	12"	9	25	31	38
108" to 140"	339.75 to 337.08	Lt. brn/yellowish brn clayey SILT w/ some f-m gravel, stiff	56"	11	22	41	50+
140" to 186"	337.08 to 333.25	Reddish brn SILT w/ tr clay and some f-m gravel, moist, stiff					

No GW or LZ Encountered

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TP #5

Test @ 12'' BGS (Elev. 348.75) & @ 54'' BGS (Elev. 345.25)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 9"	349.75 to 349.00	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
9" to 52"	349.00 to 345.42	Brn/reddish brn SILT w/ tr clay and some f-m gravel, moist, stiff	12"	7	10	31	37
52" to 176"	345.42 to 335.08	Lt. brn/tan brn SILT w/ tr clay and some f-m gravel, moist, stiff	54"	14	41	50+	

150'' BGS (Elev. 337.25) = Ground Water LZ Encountered

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TP #6

Test @ 16'' BGS (Elev. 350.42) & @ 52'' BGS (Elev. 347.42)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 4"	351.75 to 351.42	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
4" to 15"	351.42 to 350.50	Dk brn/black gravelly silty SAND, FILL (urban debris, brick, etc.), loose to med dense	16"	11	30	37	43
15" to 140"	350.50 to 340.08	Lt. brn f sandy SILT w/ some f-m gravel, stiff	52"	20	36	47	50+
140" to 172"	340.08 to 337.42	Reddish brn SILT w/ tr clay and some f-m gravel, moist, stiff					

158'' BGS (Elev. 338.58) = Ground Water LZ Encountered

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TP #7

Test @ 16'' BGS (Elev. 344.17)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 7"	345.50 to 344.92	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
7" to 46"	344.92 to 341.67	Lt. brn clayey SILT w/ tr f gravel, sl. plastic, med stiff to stiff	16"	5	13	26	33
46" to 108"	341.67 to 336.50	Lt. brn/yellowish brn gravelly f-m SAND, dense					
108" to 120"	336.50 to 335.50	Dark reddish brn f sandy SILT w/ f-m gravel, stiff					

116'' BGS (Elev. 335.83) = Ground Water LZ Encountered

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TP #8

Test @ 20'' BGS (Elev. 341.08) & @ 60'' BGS (Elev. 337.75)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 15"	342.75 to 341.50	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
15" to 48"	341.50 to 338.75	Lt. brn silty CLAY, med stiff	20"	3	12	14	22
48" to 122"	338.75 to 332.58	Lt. brn silty CLAY w/ some gravel and cobbles, stiff	60"	22	27	33	41

No GW or LZ Encountered

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TP #9

Test @ 16'' BGS (Elev. 340.67) & @ 56'' BGS (Elev. 337.33)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 9"	342.00 to 341.25	Dk brn TOPSOIL w/ heavy root mat	*Depth*	*1'*	*2'*	*3'*	*4'*
9" to 47"	341.25 to 338.08	Lt. brn silty CLAY, med stiff to stiff	16"	6	9	22	36
47" to 168"	338.08 to 328.00	Lt. brn silty CLAY w/ some gravel and cobbles, stiff	56"	15	43	50+	

No GW or LZ Encountered

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TP #10

Test @ 12'' BGS (Elev. 342.00) & @ 48'' BGS (Elev. 339.00)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
			Depth	*1'*	*2'*	*3'*	*4'*
0" to 8"	343.00 to 342.33	Dk brn TOPSOIL					
8" to 48"	342.33 to 339.00	Lt. brn silty CLAY, med stiff to stiff	12"	6	19	35	41
48" to 173"	339.00 to 328.58	Lt. brn silty CLAY w/ some gravel and cobbles, stiff	48"	14	35	43	50

148'' BGS (Elev. 330.67) = Ground Water LZ Encountered

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TP #11

Test @ 16'' BGS (Elev. 341.92) & @ 53'' BGS (Elev. 338.83)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
			Depth	*1'*	*2'*	*3'*	*4'*
0" to 8"	343.25 to 342.58	Dk brn TOPSOIL					
8" to 39"	342.58 to 340.00	Lt brn/grayish brn f sandy SILT, stiff	16"	11	14	21	33
39" to 88"	340.00 to 335.92	Org brn/grey SILT, stiff, distinct and prominent mottling	53"	11	29	37	45
88" to 148"	335.92 to 330.92	Org brn/brn f sandy SILT w/ some f-m gravel, stiff to v. stiff					

104'' BGS (Elev. 334.58) = Ground Water LZ Encountered

28'' BGS (Elev. 340.92) = Perched Water Encountered

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TP #12

Test @ 12'' BGS (Elev. 341.75)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 6"	342.75 to 342.25	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
6" to 27"	342.25 to 340.50	Lt. brn/brn clayey SILT, stiff	12"	3	9	32	42
27" to 48"	340.50 to 338.75	Brn/org brn gravelly silty SAND, dense, few and faint mottling					
48" to 80"	338.75 to 336.08	Brn/org brn gravelly sandy SILT, stiff to v. stiff, distinct and prominent mottling					
80" to 124"	336.08 to 332.42	Brn gravelly silty f SAND, dense to v. dense					

118'' BGS (Elev. 332.92) = Ground Water LZ Encountered

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TP #13

Test @ 12'' BGS (Elev. 337.25)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 9"	338.25 to 337.50	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
9" to 70"	337.50 to 332.42	Lt. brn f sandy SILT, med stiff to stiff	12"	10	16	31	39
70" to 120"	332.42 to 328.25	Org brn f sandy SILT w/ some f-m gravel, few and faint mottling, stiff					

No GW or LZ Encountered

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TP #14

Test @ 20'' BGS (Elev. 334.33) & @ 58'' BGS (Elev. 331.17)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
			Depth	*1'*	*2'*	*3'*	*4'*
0" to 10"	336.00 to 335.17	Dk brn TOPSOIL					
10" to 26"	335.17 to 333.83	Lt. brn/grayish brn clayey SILT, med stiff	20"	4	10	17	23
26" to 114"	333.83 to 326.50	Org brn clayey SILT w/ distinct and prominent mottling, stiff	58"	11	33	41	50+
114" to 150"	326.50 to 323.50	Lt. greyish brn gleyed clayey SILT, stiff, moist, sl. plastic					
150" to 192"	323.50 to 320.00	Org brn CLAY w/ some silt, plastic, med stiff to stiff, wet					

162'' BGS (Elev. 322.50) = Ground Water LZ Encountered
26'' BGS (Elev. 333.83) = Perched Water Encountered

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TP #15

Test @ 12'' BGS (Elev. 336.50) & @ 59'' BGS (Elev. 332.58)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 8"	337.50 to 336.83	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
8" to 28"	336.83 to 335.17	Lt. brn/grayish brn clayey SILT, med stiff	12"	4	11	22	33
28" to 88"	335.17 to 330.17	Org brn clayey SILT w/ distinct and prominent mottling, stiff	59"	15	22	31	40
88" to 192"	330.17 to 321.50	Org brn clayey SILT w/ some f sand and gravel, moist					

132'' BGS (Elev. 326.50) = Ground Water LZ Encountered

60'' BGS (Elev. 332.50) = Perched Water Encountered

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TP #16

Test @ 12'' BGS (Elev. 337.75) & @ 58'' BGS (Elev. 333.92)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 8"	338.75 to 338.08	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
8" to 71"	338.08 to 332.83	Lt. brn silty CLAY, sl. plastic, med stiff to stiff	12"	4	6	10	23
71" to 132"	332.83 to 327.08	Lt. brn f sandy SILT w/ some f-m gravel, stiff, moist to wet	58"	18	18	39	43

98'' BGS (Elev. 330.58) = Ground Water LZ Encountered

TP #17

Depth BGS	Elevation	Soil Description
0" to 11"	340.00 to 339.08	Dk brn TOPSOIL
11" to 40"	339.08 to 336.67	Brn silty CLAY w/ some f-m gravel, stiff
40" to 94"	336.67 to 332.17	Brn silty sandy GRAVEL, wet

40'' BGS (Elev. 336.67) = Ground Water LZ Encountered

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TP #18

Depth BGS	Elevation	Soil Description
0" to 15"	341.25 to 340.00	Dk brn TOPSOIL
15" to 38"	340.00 to 338.08	Lt. greyish brn gleyed clayey SILT, wet, stiff
38" to 116"	338.08 to 331.58	Org brn/grey clayey SILT w/ some f sand and gravel, stiff, moist, distinct and prominent mottling

58'' BGS (Elev. 336.42) = Ground Water LZ Encountered
35'' BGS (Elev. 338.33) = Perched Water Encountered

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TP #19

Depth BGS	Elevation	Soil Description
0" to 7"	339.75 to 339.17	Dk brn TOPSOIL w/ some root mat
7" to 32"	339.17 to 337.08	Brn CLAY, plastic, med stiff, moist
32" to 110"	337.08 to 330.58	Dk greyish brn to org brn gravelly silty SAND,

35'' BGS (Elev. 336.83) = Ground Water LZ Encountered

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TP #20

Test @ 12'' BGS (Elev. 351.00) & @ 60'' BGS (Elev. 347.00)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 9"	352.00 to 351.25	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
9" to 34"	351.25 to 349.17	Lt. brn clayey SILT w/ some f-m gravel, stiff	12"	4	24	33	38
34" to 160"	349.17 to 338.67	Lt. brn/tan gravelly f-m SAND, med dense	60"	19	48	50+	

118'' BGS (Elev. 342.17) = Ground Water LZ Encountered

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TP #21

Test @ 12'' BGS (Elev. 350.75) & @ 54'' BGS (Elev. 347.25)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 7"	351.75 to 351.17	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
7" to 24"	351.17 to 349.75	Lt. brn f sandy SILT, stiff to v. stiff	12"	4	41	50+	
24" to 86"	349.75 to 344.58	Dk brn gravelly silty f SAND, dense to v. dense	54"	39	50+		
86" to 186"	344.58 to 336.25	Reddish brn gravelly f sandy SILT, stiff to v. stiff, moist					

143'' BGS (Elev. 339.83) = Ground Water LZ Encountered

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TP #22

Test @ 12'' BGS (Elev. 350.75) & @ 60'' BGS (Elev. 346.75)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
			Depth	*1'*	*2'*	*3'*	*4'*
0" to 6"	351.75 to 351.25	Dk brn TOPSOIL					
6" to 25"	351.25 to 349.67	Lt. brn f sandy SILT, stiff to v. stiff	12"	9	45	50+	
25" to 128"	349.67 to 341.08	Dk brn gravelly silty f SAND, dense to v. dense	60"	19	50+		
128" to 184"	341.08 to 336.42	Org brn f sandy SILT w/ some f-m gravel, stiff, moist					

133'' BGS (Elev. 340.67) = Ground Water LZ Encountered

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TP #23

Test @ 12'' BGS (Elev. 348.25)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 7"	349.25 to 348.67	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
7" to 24"	348.67 to 347.25	Lt. brn sandy SILT, stiff	12"	10	28	33	40
24" to 134"	347.25 to 338.08	Lt. brn/greyish brn gravelly sandy SILT, stiff					

100'' BGS (Elev. 340.92) = Ground Water LZ Encountered

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TP #24

Test @ 12'' BGS (Elev. 348.25)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 6"	349.25 to 348.75	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
6" to 28"	348.75 to 346.92	Lt. brn sandy SILT, stiff	12"	11	31	47	50+
28" to 102"	346.92 to 340.75	Lt. brn/greyish brn gravelly sandy SILT, stiff					

92'' BGS (Elev. 341.58) = Ground Water LZ Encountered

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TP #25

Test @ 12'' BGS (Elev. 345.25) & @ 48'' BGS (Elev. 342.25)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 9"	346.25 to 345.50	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
9" to 28"	345.50 to 343.92	Lt. brn f sandy SILT, sl. plastic, med stiff to stiff	12"	4	18	44	50+
28" to 64"	343.92 to 340.92	Org brn/grey f sandy SILT w/ some f-m gravel, stiff to v. stiff, distinct and prominent mottling	48"	15	50+		
64" to 86"	340.92 to 339.08	Dk greyish brn gravelly silty f-m SAND, wet					
86" to 115"	339.08 to 336.67	Org brn to lt. brn SILT, wet					

72'' BGS (Elev. 340.25) = Ground Water LZ Encountered

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TP #26

Test @ 12'' BGS (Elev. 345.25)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 10"	346.25 to 345.42	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
10" to 32"	345.42 to 343.58	Lt. brn f sandy SILT, sl. plastic, med stiff to stiff	12"	3	19	35	44
32" to 96"	343.58 to 338.25	Dk greyish brn gravelly silty f-m SAND, moist to w					

84'' BGS (Elev. 339.25) = Ground Water LZ Encountered

TP #27

Test @ 12'' BGS (Elev. 343.00)

Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 8"	344.00 to 343.33	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
8" to 28"	343.33 to 341.67	Lt. brn silty CLAY, med stiff to stiff	12"	4	10	19	39
28" to 56"	341.67 to 339.33	Grey gleyed clayey SILT, stiff					
56" to 90"	339.33 to 336.50	Dk brn gravelly f SAND, med dense to dense, wet					

50'' BGS (Elev. 339.83) = Ground Water LZ Encountered

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TP #28

Test @ 16'' BGS (Elev. 343.92) & @ 53'' BGS (Elev. 340.83)

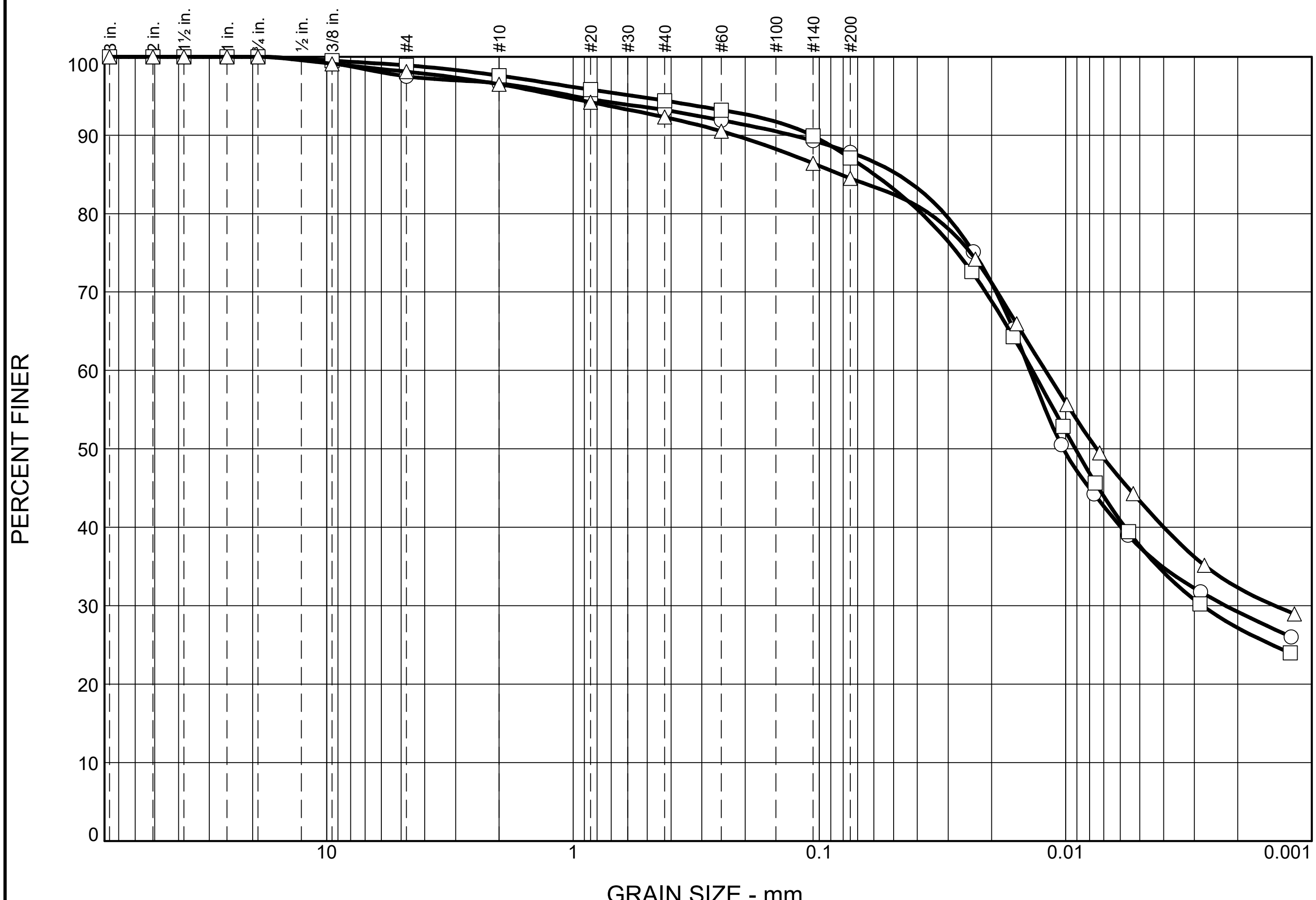
Depth BGS	Elevation	Soil Description	Kneas Bar Testing Results (blows/foot)				
0" to 10"	345.25 to 344.42	Dk brn TOPSOIL	*Depth*	*1'*	*2'*	*3'*	*4'*
10" to 43"	344.42 to 341.67	Org brn/grey f sandy SILT, stiff, few and faint mottling	16"	10	41	50+	
43" to 138"	341.67 to 333.75	Org brn f sandy SILT w/ some f-m gravel	53"	16	27	39	48

79'' BGS (Elev. 338.67) = Ground Water LZ Encountered

Appendix C:

Soil Laboratory Results

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.5	0.9	3.4	5.4	50.3	37.5
□	0.0	0.0	1.1	1.3	3.2	7.3	49.5	37.6
△	0.0	0.0	1.9	1.6	4.2	7.8	41.1	43.4

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	33	20	0.0481	0.0140	0.0102	0.0022				
□	34	22	0.0599	0.0137	0.0091	0.0028				
△	38	22	0.0824	0.0121	0.0075	0.0014				

Material Description	USCS	AASHTO
○ lean clay	CL	A-6(11)
□ lean clay	CL	A-6(10)
△ lean clay with sand	CL	A-6(13)

Project No. **Client:** D.L. Howell & Associates, Inc.

Project: 2131 Lincoln Highway East - Apartment Complex - Caln Township

○ **Location:** TP-2 **Depth:** 2-3'

□ **Location:** TP-10 **Depth:** 4-5'

△ **Location:** TP-16 **Depth:** 3-4'

Remarks:

○ Natural Moisture = 21.1%

□ Natural Moisture = 22.8%

△ Natural Moisture = 26.1%

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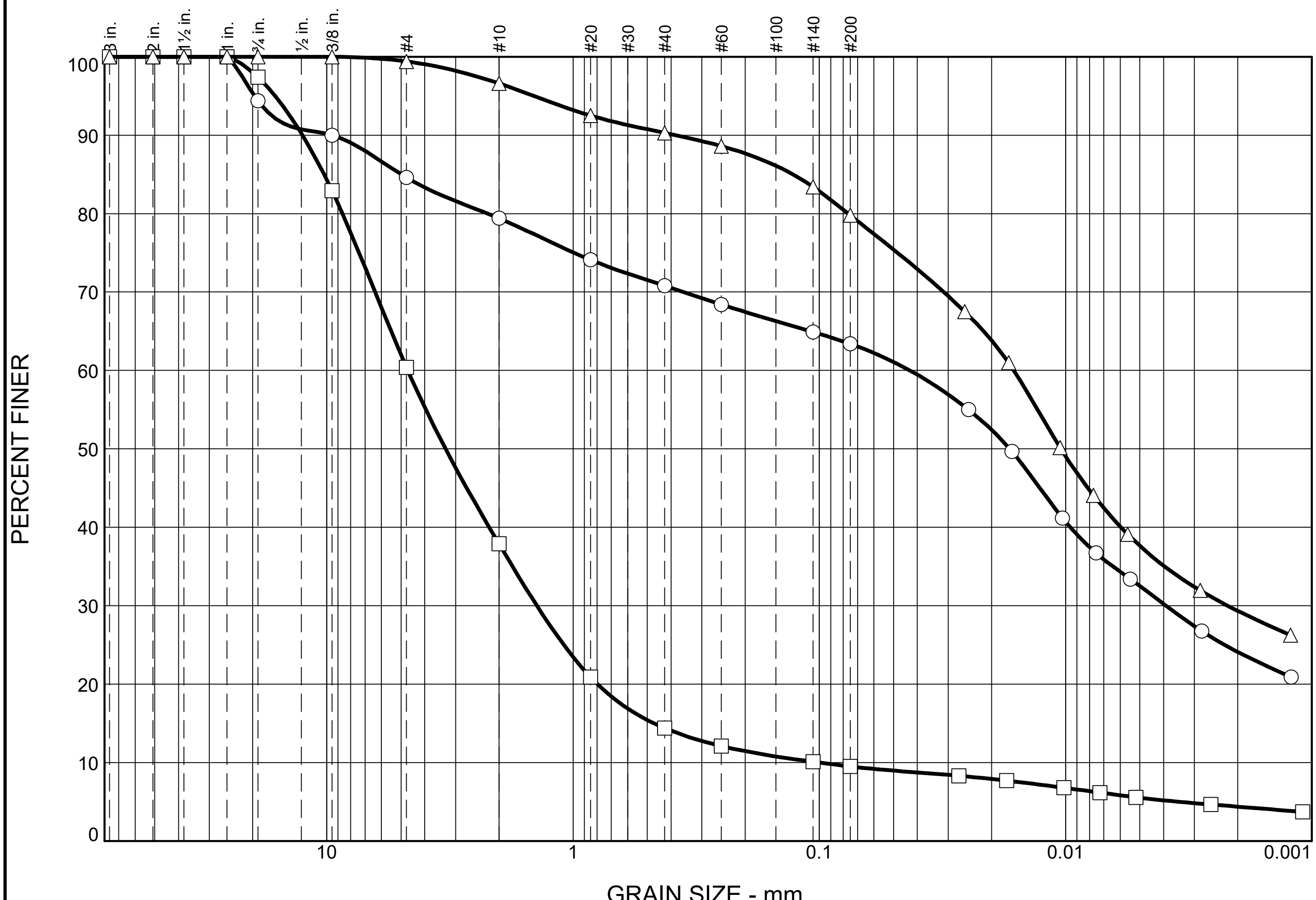
Figure

Tested By: G. Urich **Checked By:** S. Joran

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	5.6	9.8	5.2	8.6	7.4	30.9	32.5
□	0.0	2.6	37.0	22.5	23.5	4.9	4.0	5.5
△	0.0	0.0	0.6	2.8	6.3	10.5	42.2	37.6

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	30	20	4.9843	0.0429	0.0169	0.0039				
□	34	25	10.2661	4.6892	3.2955	1.4031	0.4689	0.1004	4.18	46.71
△	38	24	0.1282	0.0162	0.0105	0.0022				

Material Description	USCS	AASHTO
○ sandy lean clay with gravel	CL	A-4(4)
□ poorly graded sand with silt and gravel	SP-SM	A-2-4(0)
△ lean clay with sand	CL	A-6(11)

Project No. **Client:** D.L. Howell & Associates, Inc.

Project: 2131 Lincoln Highway East - Apartment Complex - Caln Township

○ **Location:** TP-17 **Depth:** 16"

□ **Location:** TP-21 **Depth:** 4-5'

△ **Location:** TP-27 **Depth:** 16"

Remarks:

○ Natural Moisture = 21.3%

□ Natural Moisture = 7.5%

△ Natural Moisture = 28.3%

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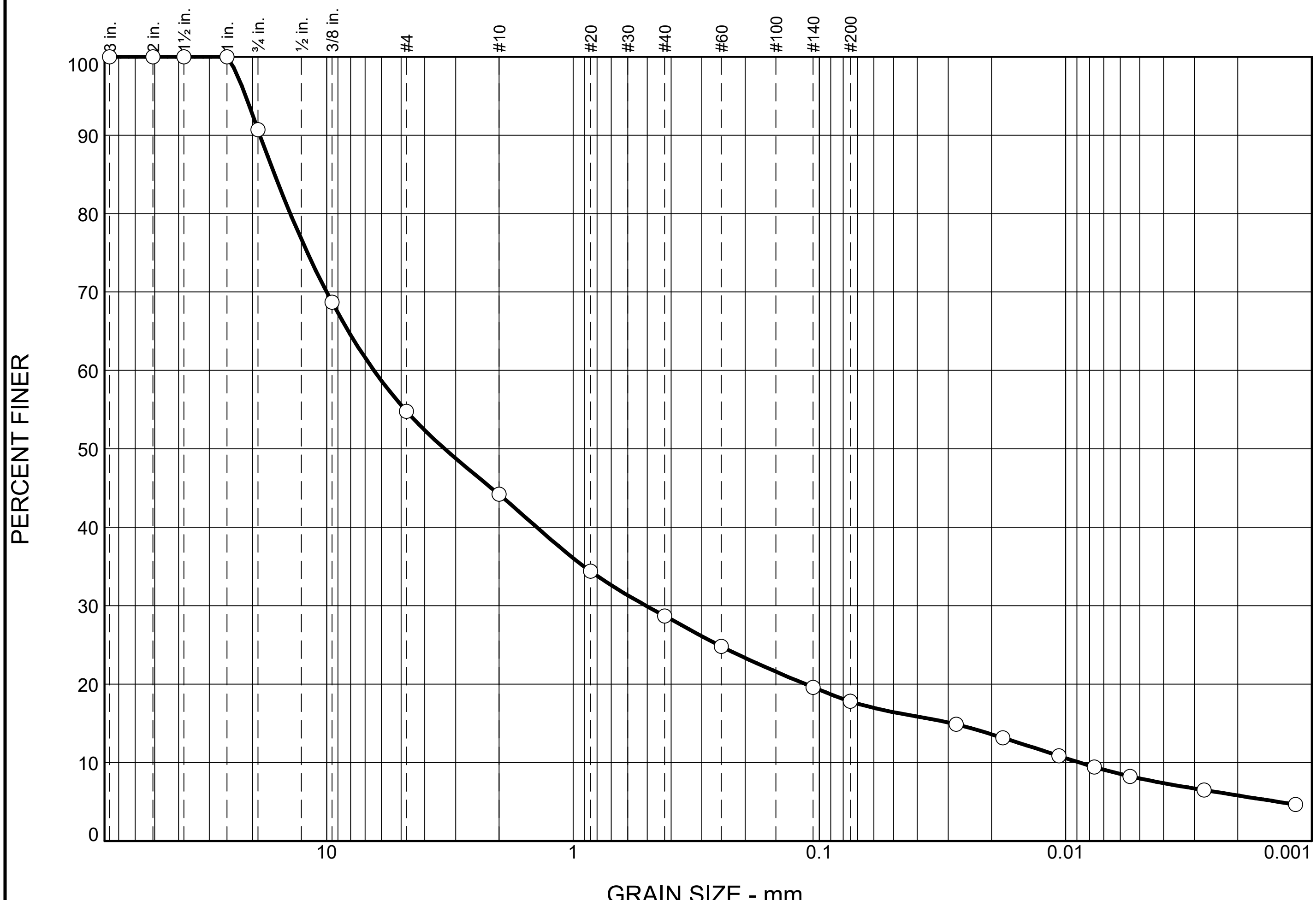
Figure

Tested By: G. Urich **Checked By:** S. Joran

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	9.3	35.9	10.6	15.5	10.9	9.8	8.0

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			16.3069	6.4378	3.3231	0.5053	0.0290	0.0088	4.52	733.39

Material Description	USCS	AASHTO
○ sandy loam		

Project No. **Client:** D.L. Howell & Associates, Inc.

Project: 2131 Lincoln Highway East - Apartment Complex - Caln Township

○ **Location:** TP-26 **Depth:** 48"

Remarks:

○ Natural Moisture = 24.3%

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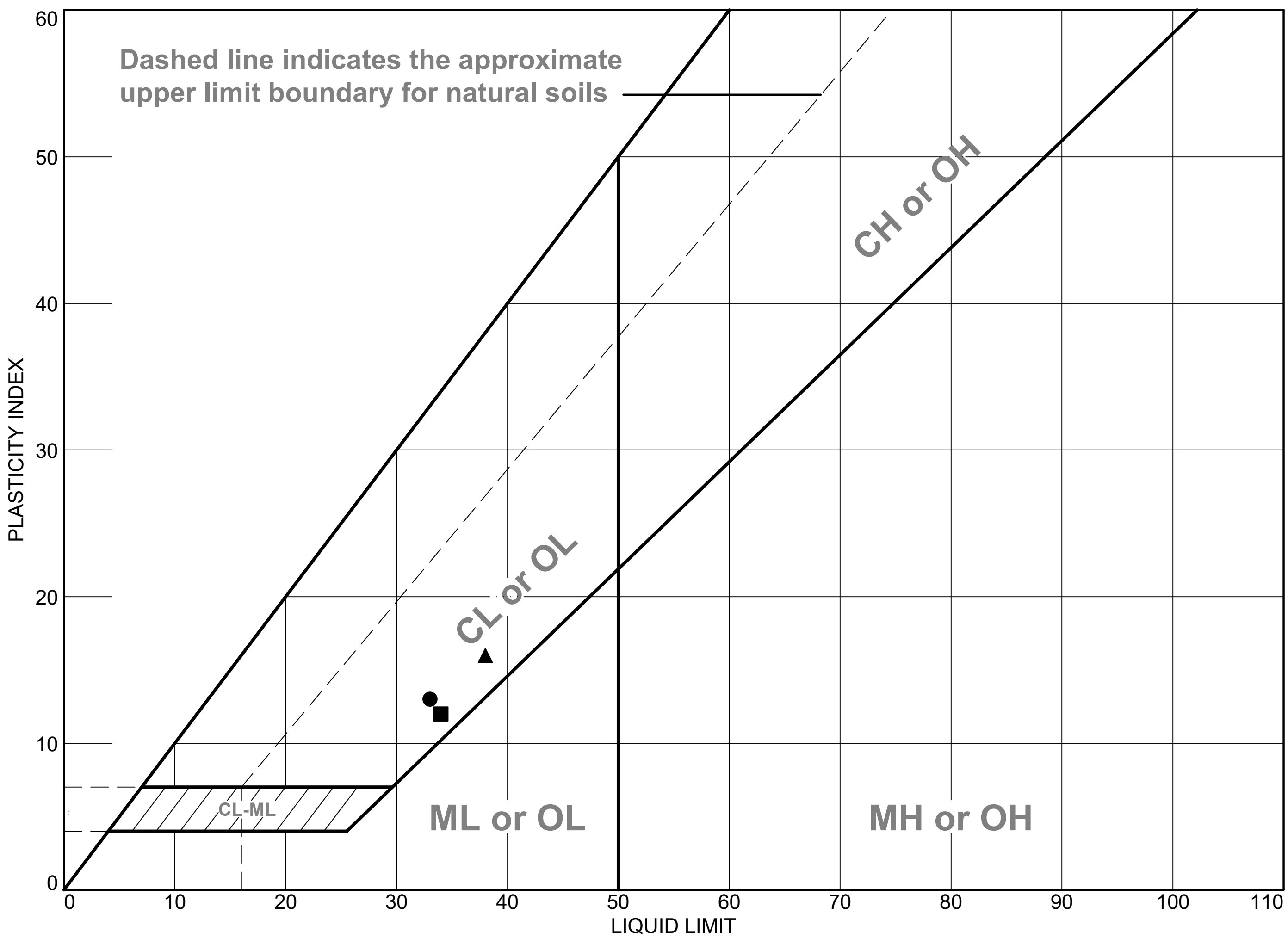
Figure

Tested By: G. Urich **Checked By:** S. Joran

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	lean clay	33	20	13	93.2	87.8	CL
■	lean clay	34	22	12	94.4	87.1	CL
▲	lean clay with sand	38	22	16	92.3	84.5	CL

Project No. **Client:** D.L. Howell & Associates, Inc.

Project: 2131 Lincoln Highway East - Apartment Complex - Caln Township

● **Location:** TP-2 **Depth:** 2-3'

■ **Location:** TP-10 **Depth:** 4-5'

▲ **Location:** TP-16 **Depth:** 3-4'

Remarks:

● Natural Moisture = 21.1%

■ Natural Moisture = 22.8%

▲ Natural Moisture = 26.1%

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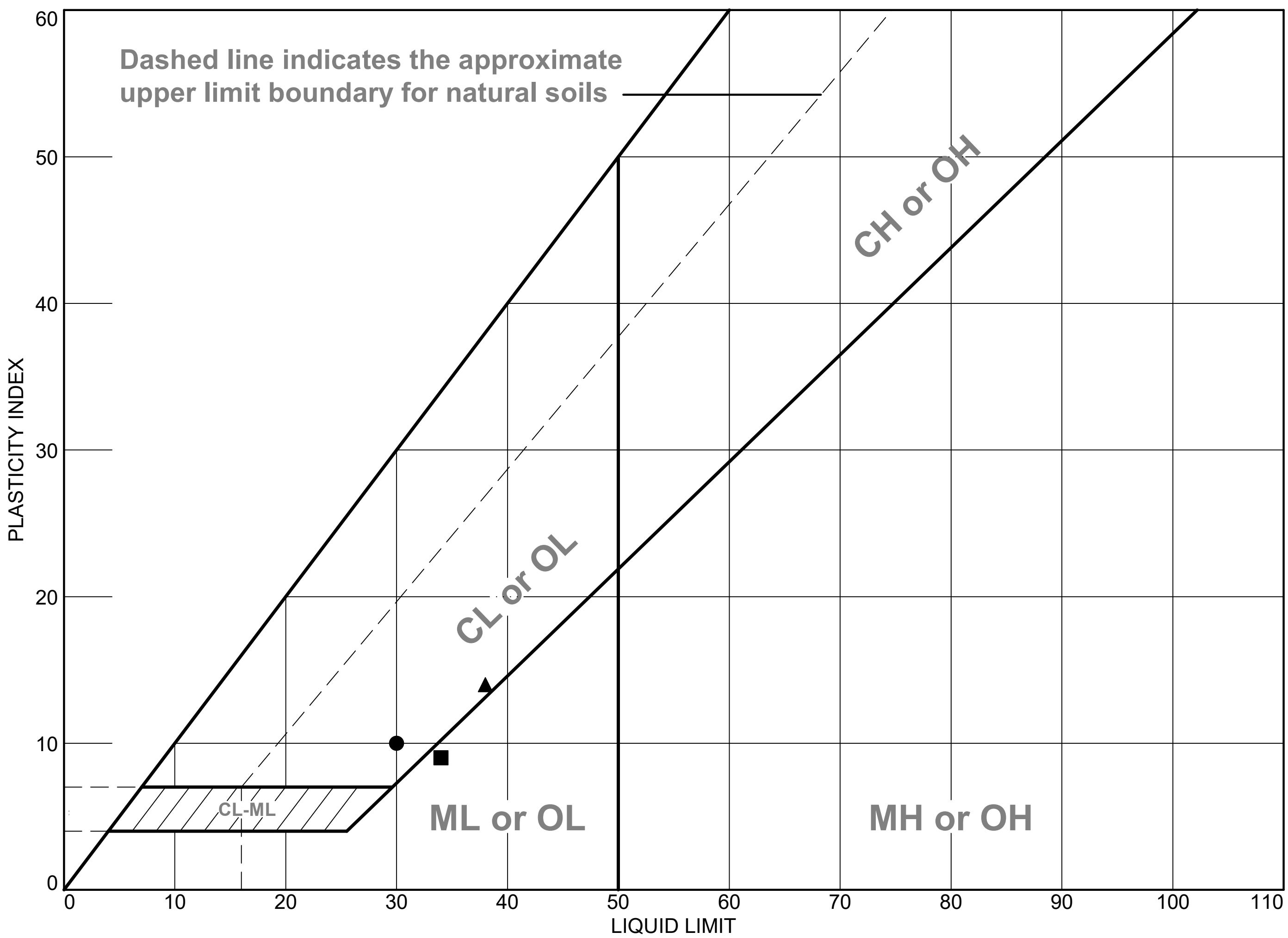
West Chester PA 19382
Office 484-947-5549 Fax 610-431-7015

Figure

Tested By: G. Urich **Checked By:** S. Joran

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	sandy lean clay with gravel	30	20	10	70.8	63.4	CL
■	poorly graded sand with silt and gravel	34	25	9	14.4	9.5	SP-SM
▲	lean clay with sand	38	24	14	90.3	79.8	CL

Project No. **Client:** D.L. Howell & Associates, Inc.

Project: 2131 Lincoln Highway East - Apartment Complex - Caln Township

● **Location:** TP-17 **Depth:** 16"

■ **Location:** TP-21 **Depth:** 4-5'

▲ **Location:** TP-27 **Depth:** 16"

Remarks:

● Natural Moisture = 21.3%

■ Natural Moisture = 7.5%

▲ Natural Moisture = 28.3%

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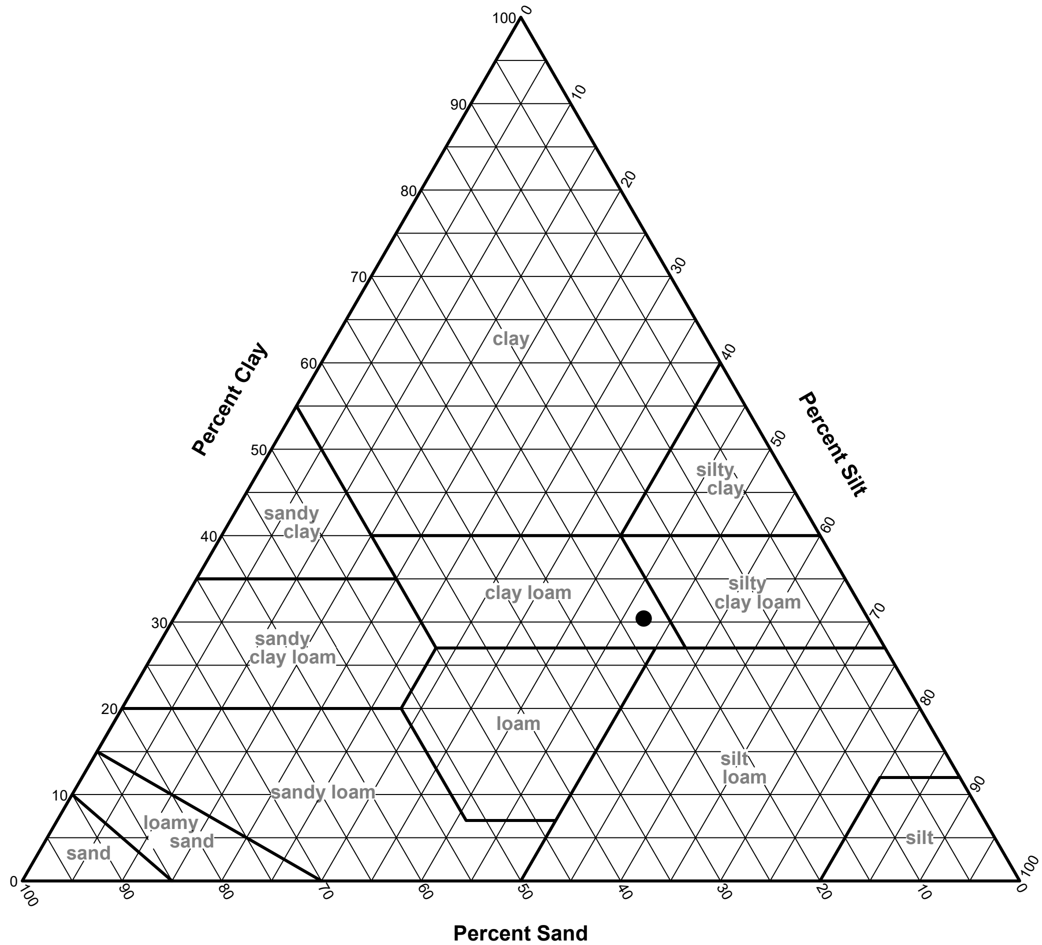
Figure

Tested By: G. Urich **Checked By:** S. Joran

USDA Soil Classification



SOIL DATA							
	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve: Sand	Silt	Clay	Classification
●		TP-17 16"	16"	22.5	47.1	30.4	Clay loam

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Client: D.L. Howell & Associates, Inc.

Project: 2131 Lincoln Highway East - Apartment Complex - Caln Township

Project No.:

Figure

Checked By: S. Joran

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Office 484-947-5549

Falling Head Permeability Test Laboratory Report

Client:	D.L. Howell & Associates, Inc.	**Tested By:**	G. Urich
Project:	2131 Lincoln Highway East-Apartment Complex	**Checked By:**	S. Joran
Location:	Caln Township, Pennsylvania	**Report Date:**	6/4/20

Sample ID: **TP-23 60"**

Sample Data		
Diameter of Sample Tube:	7.30	cm
Cross-Sectional Area of Sample Tube (**a**) =	41.85	cm^2
Diameter of Sample:	7.30	cm
Cross-Sectional Area of Sample (**A**) =	41.85	cm^2
Length of Sample (**L**):	14.92	cm

Permeability Testing Data

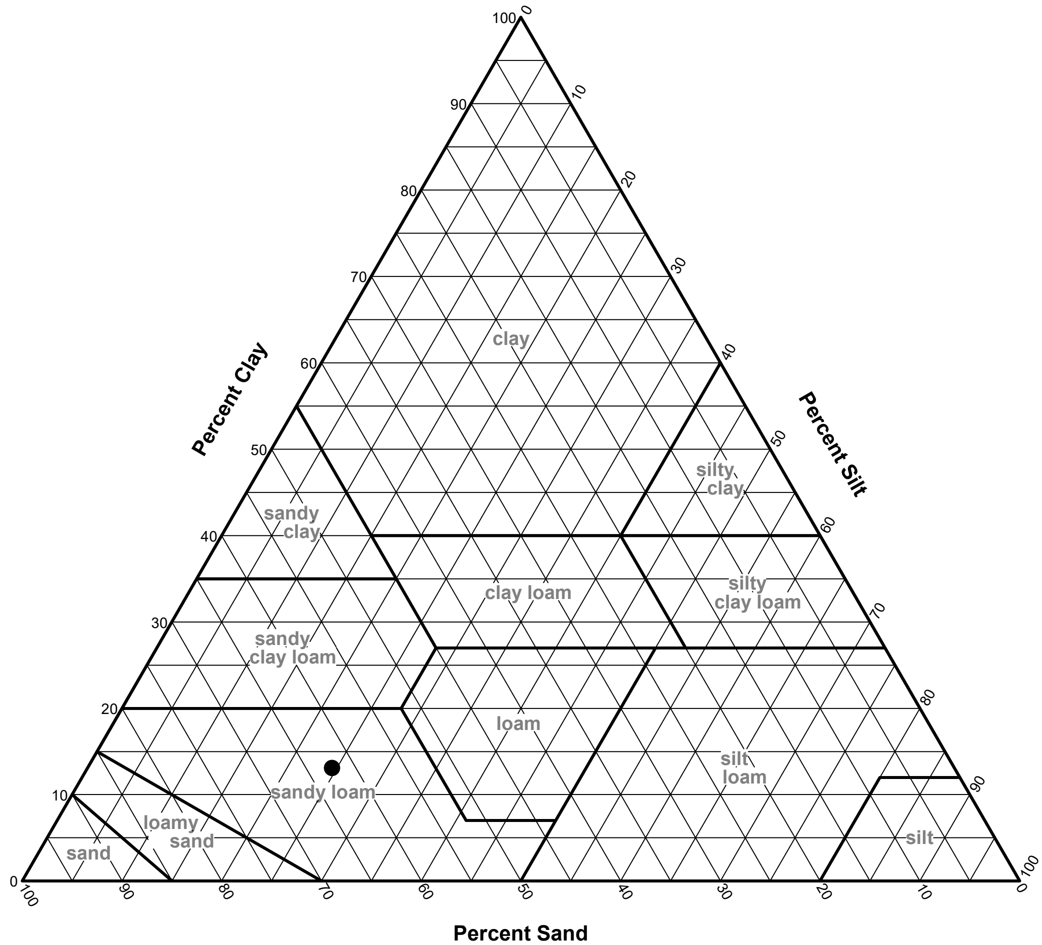
Trial #	Initial Head (cm) (h_1)	Final Head (cm) (h_2)	Elapsed Time (s) (t)	Hydraulic Conductivity (cm/s) (K)
1	12.38	12.03	1,800	**0.00024**
2	12.38	11.98	1,800	**0.00027**
3	12.38	12.01	1,800	**0.00025**

$$K = 2.303 \left(\frac{a * L}{A * t} \right) \text{Log} \left(\frac{h_1}{h_2} \right)$$

Average K Value = 0.00025 cm/s

Average K Value = 0.360 Inches Per Hour

USDA Soil Classification



SOIL DATA

	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve: Sand	Silt	Clay	Classification
●		TP-26 48"	48"	62.4	24.4	13.1	Sandy loam

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Office 484-947-5549 Fax 610-431-7015

Client: D.L. Howell & Associates, Inc.
Project: 2131 Lincoln Highway East - Apartment Complex - Caln Township
Project No.:
Figure

Checked By: S. Joran

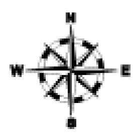
<u>Appendix D:</u>

Historical Aerial Imagery

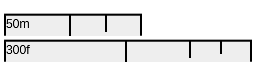
50m
300f

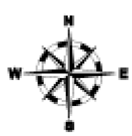
2015 aerial photograph
USDA (2015-05-03 - 2015-10-11)

50m
300f

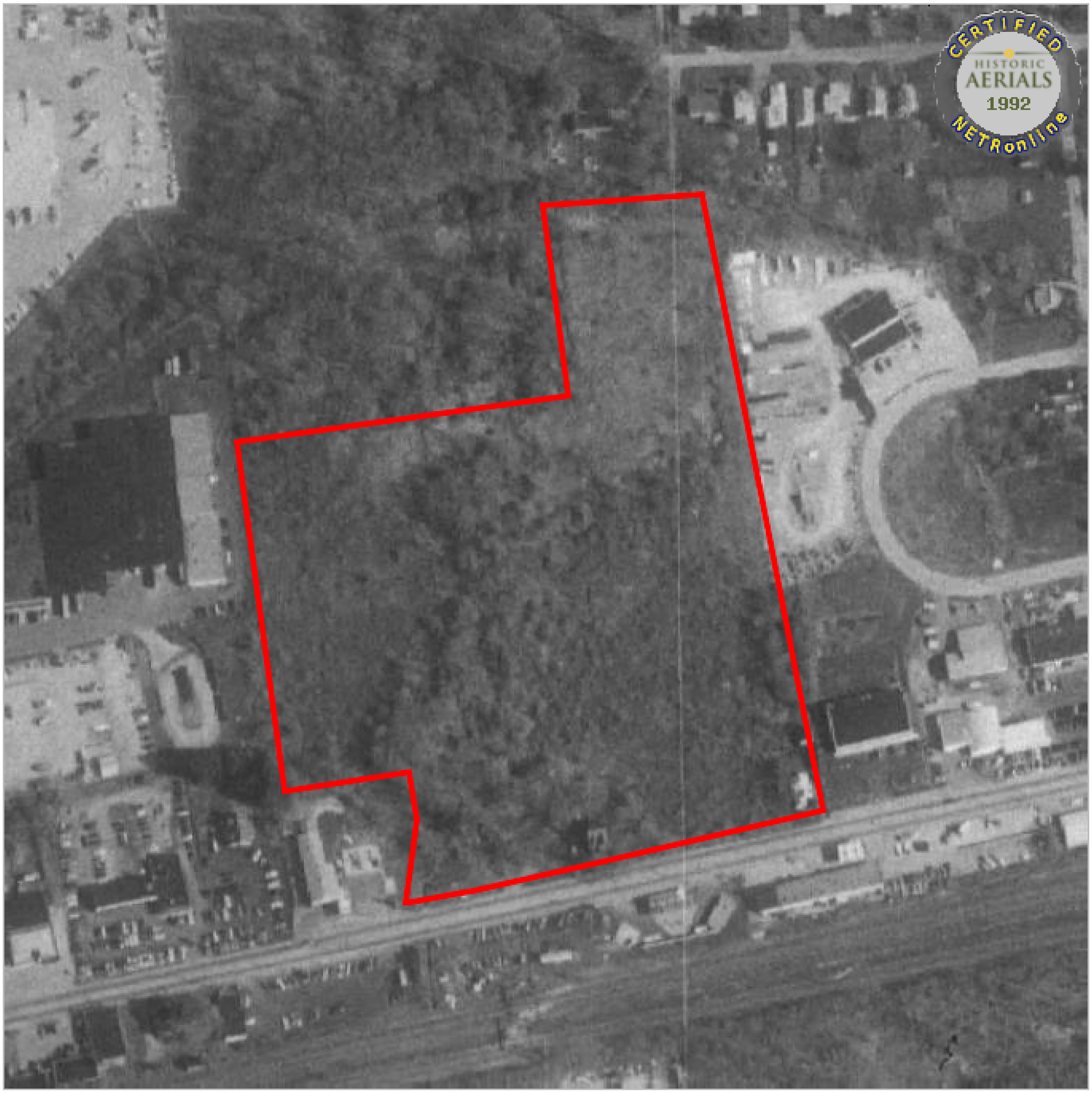


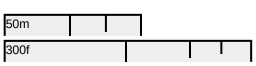
2008 aerial photograph
USDA (2008-05-28 - 2008-10-17)
PAMAP (2008-06-24 - 2008-08-28)

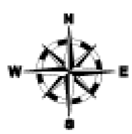




2004 aerial photograph
USDA (2004-06-12 - 2004-12-08)

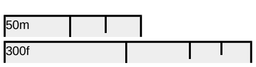


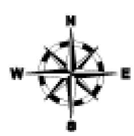




1992 aerial photograph

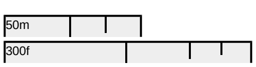
USGS DOQQ (1992-03-29 - 1992-04-29)

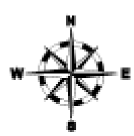




1981 aerial photograph

USDA NHAP81 (1981-04-21 - 1981-05-08)





1950 aerial photograph
USGS (1950-04-07 - 1950-04-07)

Appendix E:

GW Elevations

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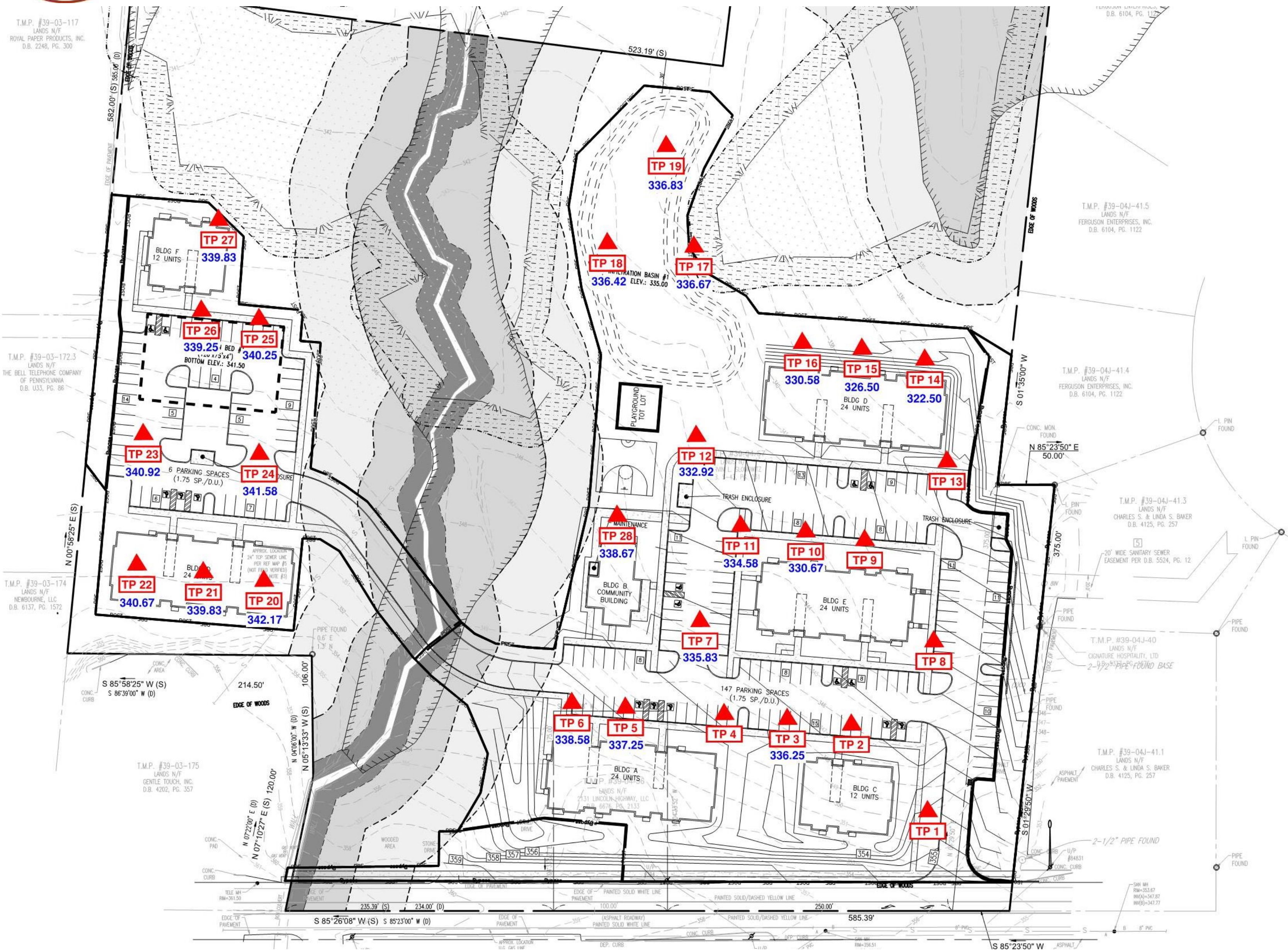

Appendix F:

General Soil Terms

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West Chester PA 19382
Office 484-947-5549 Fax 610-431-7015

Unified Soil Classification System

Primary Divisions for Field and Laboratory Identification			Group Symbol	Typical Names	Laboratory Classification Criteria	Supplementary Criteria for Visual Identification
Coarse grained soils (More than half of material finer than 3-inch sieve is larger than No. 200 sieve size)	Gravel (More than half of the coarse fraction is larger than No. 4 sieve size about ¼ inch)	Clean gravels (Less than 5% of material smaller than No. 200 sieve size)	GW	Well graded gravels, gravel-sand mixtures, little of no fines*	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_Z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	Wide range in grain size and substantial amounts of all intermediate particle size
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines*	Not meeting both criteria for GW	Predominantly one size (uniformly graded) or a range of sizes with some intermediate sizes missing (gap graded)

*Materials with 5 to 12 percent smaller than No. 200 sieve are borderline cases, designated: GW-GM, SW-SC, etc.

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Unified Soil Classification System

Primary Divisions for Field and Laboratory Identification			Group Symbol	Typical Names	Laboratory Classification Criteria		Supplementary Criteria for Visual Identification
…do…	…do…	Gravels with fines (More than 12% of material smaller than No. 200 sieve size)*	GM	Silty gravels, and gravel-sand-silt mixtures	Atterberg limits below "A" line, or PI less than 4	Atterberg limits above "A" line with PI between 4 & 7 is borderline case GM-GC	Nonplastic fines or fines of low plasticity
			GC	Clayey gravels, and gravel-sand-clay mixtures	Atterberg limits above "A" line, and PI greater than 7		Plastic fines
…do…	Sands (More than half of the coarse fraction is smaller than No. 4 sieve size)	Clean sands (Less than 5% of material smaller than No. 200 sieve size)	SW	Well graded sands, gravelly sands, little or no fines*	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_Z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3		Wide range in grain sizes and substantial amounts of all intermediate particle sizes
			SP	Poorly graded sands and gravely sands, little or no fines*	Not meeting both criteria for SW		Predominately one size (uniformly graded) or a range of sizes with some intermediate sizes missing (gap graded)

*Materials with 5 to 12 percent smaller than No. 200 sieve are borderline cases, designated: GW-GM, SW-SC, etc.

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Unified Soil Classification System

Primary Divisions for Field and Laboratory Identification			Group Symbol	Typical Names	Laboratory Classification Criteria		Supplementary Criteria for Visual Identification
…do…	…do…	Sands with fines (More than 12% of material smaller than No. 200 sieve size.)*	SM	Silty sands, sand-silt mixtures	Atterberg limits below "A" line, or PI less than 4	Atterberg limits about "A" line with PI between 4 and 7 is border line case SM-SC	Nonplastic fines or fines of low plasticity
			SM	Clayey sands, sand-clay mixures	Atterberg limits aboe "A" line with PI greater than 7		Plastic fines

*Materials with 5 to 12 percent smaller then No. 200 sieve are borderline cases, designated: GW-GM, SW-SC, etc.

Unified Soil Classification System

Primary Divisions for Field and Laboratory Identification		Group Symbol	Typical Names	Laboratory Classification Criteria		Supplementary Criteria for Visual Identification		
						Dry strength	Reaction to shaking	Toughness near Plastic Limit
Fine-grained soils (More than half of material is smaller than No. 200 sieve size)(Visual: more than half of particles are so fine that they can not be seen by the naked eye)	Silts and clays (Liquid limit less than 50)	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	Atterberg limits below "A" line, or PI less than 4	Atterberg limits above "A" line with PI between 4 and 7 is borderline case ML-CL	None to slight	Quick to slow	None
	…do…	CL	Inorganic clays of low to medium plasticity; gravelly clays, silty clays, sandy clays, lean clays	Atterberg limits above "A" line with PI greater than 7		Medium to high	None to very slow	Medium
	…do…	OL	Organic silts and organic silt-clays of low plasticity	Atterberg limits below "A" line		Slight to medium	Slow	Slight

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Unified Soil Classification System

Primary Divisions for Field and Laboratory Identification		Group Symbol	Typical Names	Laboratory Classification Criteria	Supplementary Criteria for Visual Identification		
					Dry Strength	Reaction to Shaking	Toughness Near Plastic Limit
…do…	Silts and clays (Liquid limit greater than 50)	MH	Inorganic silts, micaceous of diatomaceous fine sands or silt, elastic silts	Atterberg limits below "A" line	Slight to medium	Slow to none	Slight to medium
	…do…	CH	Inorganic clays of high plasticity, fat clays	Atterberg limits above "A" line	High to very high	None	High
	…do…	OH	Organic clays of medium plasticity	Atterberg limits below "A" line	Medium to high	None to very high	Slight to medium
…do…	Highly organic soils…..	Pt	Peat, muck and other highly organic soils	High ignition loss, LL and PI decrease after drying	Organic color and odor, spongy feel, frequently fibrous texture		

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June 23, 2020

Caln Township
253 Municipal Dr.
Thorndale, PA 19372

Re: Hydrant Flow Test Data
The Willows at Valley Run
2131 Lincoln Hwy
Caln Township, Chester County

To whom it may concern,

The following hydrant flow test data was provided by Pennsylvania American Water. We believe the following information is sufficient to satisfy Caln Township Zoning Code Section 155-172.F(10). If further information is required, please do not hesitate to contact us.

Sincerely,

D.L. HOWELL & ASSOCIATES, INC.

Amanda Schneider

Amanda L. Schneider, P.E.
Project Engineer

EXHIBIT A-8

1250 Wright's Lane, West Chester, PA 19380
Phone: (610) 918-9002 Fax: (610) 918-9003
www.dlhowell.com

HYDRANT FLOW TEST DATA

HYDRANT ID HCT-222 MUNICIPALITY Caln Township DATE OF TEST 5/12/20

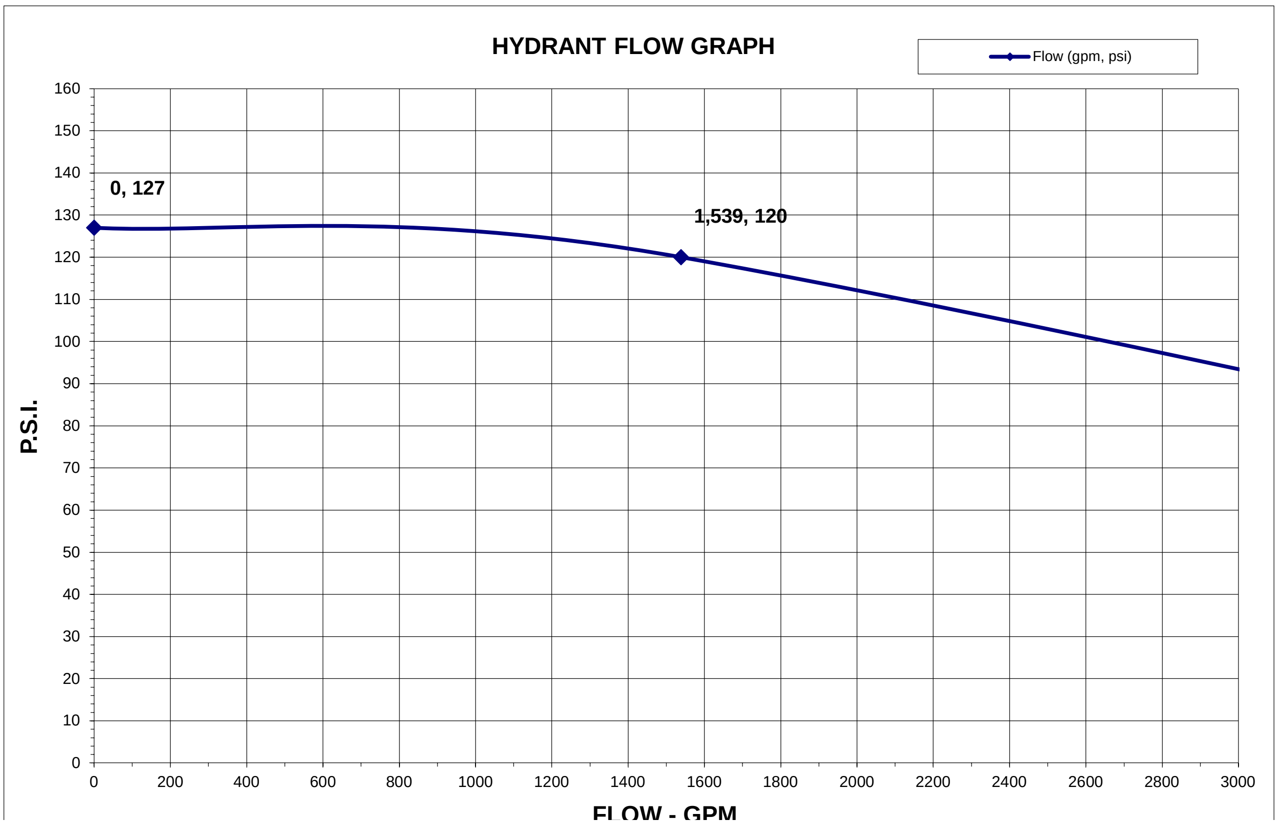
LOCATION DESCRIPTION Flowed on Whissel Dr. : Monatored HCT-222 @ 2221 Lincoln Hwy

STATIC **127** PSI RESIDUAL **120** PSI FLOW **1,539** GPM

CALCULATED AT RESIDUAL 20 PSI FLOW 6,710 GPM

TEST BY L. DiSciullo/N. Rose

The test is based on system conditions at the time of the test. PAWC does not guarantee identical results under all future operating conditio



CREATED BY: ICC

LAST REV.: 11-20-03

PRELIMINARY POST CONSTRUCTION STORMWATER MANAGEMENT REPORT

for

The Willows at Valley Run

Proposed Land Development
2131 Lincoln Highway,
Caln Township,
Chester County, Pennsylvania

D.L. Howell Job #3705

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
AMANDA L. SCHNEIDER
ENGINEER
No. PE090566

Prepared by:

D.L. HOWELL & ASSOCIATES, INC.

1250 Wrights Lane, West Chester, PA 19380
Phone: 610-918-9002 Fax: 610-918-9003
www.dlhowell.com

EXHIBIT A-9

TABLE OF CONTENTS

Section Page

1.0 INTRODUCTION 1
1.1 Land Use 1
1.2 Site Soils 1
1.3 Soils Limitations 2

2.0 RUNOFF MANAGEMENT 4
2.1 Infiltration Compliance 5

3.0 PERMANENT BMPs 5

4.0 CONCLUSIONS 6

APPENDICES

Appendix A SCS Runoff Coefficients Calculations
Appendix B Peak Flow Summary
Appendix C SCS Hydrograph Reports & Basin Routings
Appendix D Volume Calculations
Appendix E NRCS Soil Report

1.0 INTRODUCTION

This Stormwater Management Report presents the permanent control measures/facilities required to support construction of a 120-unit apartment complex and associated improvements on a property located at 2131 Lincoln Highway in Caln Township, Chester County, Pennsylvania.

The proposed land development consists of the construction of six (6) proposed apartment buildings, one (1) proposed community building, parking areas, sidewalks, landscaping, site lighting, one underground infiltration facility, one underground MRC bed, one aboveground detention basin, and other associated improvements.

1.1 LAND USE

The site is currently vacant and primarily densely vegetated area with wooded areas and underbrush. The site is bisected by an Unnamed Tributary (UNT) of Beaver Creek. Topography of the site generally flows towards the stream in the center of the site and to the north.

Stormwater runoff from each parcel ultimately flows to an Unnamed Tributary (UNT) of Beaver Creek. Per Pennsylvania Department of Environmental Protection, 25 Pa. Code, 93.9 "Water Quality Standards" Beaver Creek is classified as a Cold Water Fishes (CWF) and Migratory Fished (MF) Watercourse.

1.2 SITE SOILS

Soils information is provided by the Natural Resources Conservation Service, United States Department of Agriculture and their Web Soil Survey. Soils attribute data is served from the websoilsurvey.nrcs.usda.gov. All the below mentioned soils are further evaluated in Appendix E and are shown on the Existing Conditions and Demolition Plan of the Conditional Use plan set.

Conestoga silt loam (CtA), 0 to 3 percent slopes
Urban land-Udorthents (UudB), limestone complex, 0 to 8 percent slopes

2.1 RUNOFF MANAGEMENT

The stormwater management design proposes to control the 2-year increase in stormwater runoff volume and peak flow rate requirements for each storm through infiltration, detention, and a Managed Release Concept (MRC) stormwater management system. Site soils were evaluated during a geotechnical evaluation and infiltration feasibility evaluation. There are significant areas of clay soils, shallow groundwater, and redoximorphic features throughout the site. Infiltration testing was performed at a location on the west side of the site and it was determined that infiltration was feasible in this location. All other areas investigated for infiltration were unable to be tested due to shallow groundwater and/or shall redoximorphic features. Therefore, it is anticipated that to manage stormwater runoff from this site, a combination of infiltration, detention, and MRC systems will be used. The Applicant intends to fully design the MRC system per DEP guidelines.

The project will be constructed in two phases. A phasing line is shown on the Conditional Use Plan set. There is one discharge point on the site located at the downstream end of the existing stream where it intersects the northern property line. Both phases of this project will drain to this discharge point, but Phase 1 is designed to meet Township and DEP requirements on its own since it will be constructed prior to Phase 2.

Phase 1 stormwater will be managed using 1 subsurface MRC system and a detention basin in series. Phase 2 stormwater will be managed using 1 subsurface infiltration bed, while some areas of Phase 2 will drain to the MRC system in Phase 1. The MRC system has been preliminarily designed for the conditional use application to show that it is sized to hold the required volume and can achieve the required peak flow rates per Caln Township's Code.

Calculations summarizing the overall stormwater management design can be found in the Appendices of this report.

4.0 CONCLUSIONS

D.L. Howell & Associates, Inc. has completed a detailed stormwater engineering design of the proposed development of The Willows at Valley Run. Using site-specific topography, soils, land cover, and Township Ordinances, D.L. Howell & Associates, Inc. designed the stormwater management systems for the proposed development. The objective of the stormwater design was to develop site-specific stormwater management structures that reduce post-development runoff to below pre-development runoff rates and provided volumetric storage per Township/DEP requirements. Post-development stormwater management is achieved through an MRC system, detention basin, and infiltration bed.

APPENDIX A

SCS RUNOFF COEFFICIENTS CALCULATIONS

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SOIL CONSERVATION SERVICE
HYDROLOGIC DATA FOR WATERSHED
RUNOFF COMPUTATIONS

DATE: 6/22/2020
REV:
BY: PJK

JOB NO.: 3705 **PROJECT:** The Willows at Valley Run **TOWNSHIP:** CALN
DESCRIPTION: PRE-DEVELOPMENT PHASE 1

Total Area: 3.77 acres

Symbol	Soil Name	Hydrological Soil Group	Land Use	Hydrologic Condition	Soil Runoff Curve Number	Area acres	Complex Number acres	Comment
CtA	Conestoga Silt Loam	B	MEADOW	Good	58	3.10	179.68	
CtA	Conestoga Silt Loam	B	WOODS	Good	55	0.58	31.96	
N/A	N/A	N/A	MEADOW (20% IMPERVIOUS)	Good	98	0.02	1.75	
N/A	N/A	N/A	IMPERVIOUS (80%)	Good	98	0.07	7.00	

Total Area 3.77 220.39

Weighted Soil Complex Number $\frac{220.39}{3.77}$ = **58.5**

TIME OF CONCENTRATION - SEE HYDRAFLOW REPORT

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SOIL CONSERVATION SERVICE
HYDROLOGIC DATA FOR WATERSHED
RUNOFF COMPUTATIONS

DATE: 6/22/2020
REV:
BY: PJK

JOB NO.: 3705 **PROJECT:** The Willows at Valley Run **TOWNSHIP:** CALN
DESCRIPTION: PRE-DEVELOPMENT PHASE 2

Total Area: 3.15 acres

Symbol	Soil Name	Hydrological Soil Group	Land Use	Hydrologic Condition	Soil Runoff Curve Number	Area acres	Complex Number acres	Comment
CtA	Conestoga Silt Loam	B	MEADOW	Good	58	2.66	154.11	
CtA	Conestoga Silt Loam	B	WOODS	Good	55	0.47	25.98	
N/A	N/A	N/A	MEADOW (20% IMPERVIOUS)	Good	98	0.01	0.50	
N/A	N/A	N/A	IMPERVIOUS (80%)	Good	98	0.02	1.99	
					Total Area	3.15	182.58	

Weighted Soil Complex Number $\frac{182.58}{3.15}$ = **57.9**

TIME OF CONCENTRATION - SEE HYDRAFLOW REPORT

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SOIL CONSERVATION SERVICE
HYDROLOGIC DATA FOR WATERSHED
RUNOFF COMPUTATIONS

DATE: 6/22/2020
REV:
BY: PJK

JOB NO.: 3705 **PROJECT:** The Willows at Valley Run **TOWNSHIP:** CALN
DESCRIPTION: POST TO BED #1 - PHASE 1

Total Area: 2.63 acres

Symbol	Soil Name	Hydrological Soil Group	Land Use	Hydrologic Condition	Soil Runoff Curve Number	Area acres	Complex Number acres	Comment
CtA	Conestoga Silt Loam	B	LAWN	Good	61	0.73	44.28	
N/A	N/A	N/A	IMPERVIOUS	Good	98	1.91	186.99	
					Total Area	2.63	231.27	

Weighted Soil Complex Number $\frac{231.27}{2.63}$ = **87.8**

TIME OF CONCENTRATION - SEE HYDRAFLOW REPORT

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HYDROLOGIC DATA FOR WATERSHED
RUNOFF COMPUTATIONS

DATE: 6/22/2020
REV:
BY: PJK

JOB NO.: 3705 **PROJECT:** The Willows at Valley Run **TOWNSHIP:** CALN
DESCRIPTION: POST TO BASIN #1 - PHASE 1

Total Area: 0.48 acres

Symbol	Soil Name	Hydrological Soil Group	Land Use	Hydrologic Condition	Soil Runoff Curve Number	Area acres	Complex Number acres	Comment
CtA	Conestoga Silt Loam	B	LAWN	Good	61	0.42	25.90	
N/A	N/A	N/A	IMPERVIOUS	Good	98	0.05	5.29	
					Total Area	0.48	31.18	

Weighted Soil Complex Number $\frac{31.18}{0.48}$ = $\boxed{65.2}$

TIME OF CONCENTRATION - SEE HYDRAFLOW REPORT

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SOIL CONSERVATION SERVICE
HYDROLOGIC DATA FOR WATERSHED
RUNOFF COMPUTATIONS

DATE: 6/22/2020
REV:
BY: PJK

JOB NO.: 3705 **PROJECT:** The Willows at Valley Run **TOWNSHIP:** CALN
DESCRIPTION: POST BYPASS - PHASE 1

Total Area: 0.66 acres

Symbol	Soil Name	Hydrological Soil Group	Land Use	Hydrologic Condition	Soil Runoff Curve Number	Area acres	Complex Number acres	Comment
CtA	Conestoga Silt Loam	B	LAWN	Good	61	0.66	40.36	
N/A	N/A	N/A	IMPERVIOUS	Good	98	0.00	0.00	
					Total Area	0.66	40.36	

Weighted Soil Complex Number $\frac{40.36}{0.66}$ = **61.0**

TIME OF CONCENTRATION - SEE HYDRAFLOW REPORT

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SOIL CONSERVATION SERVICE
HYDROLOGIC DATA FOR WATERSHED
RUNOFF COMPUTATIONS

DATE: 6/22/2020
REV:
BY: PJK

JOB NO.: 3705 **PROJECT:** The Willows at Valley Run **TOWNSHIP:** CALN
DESCRIPTION: POST TO BED #1 - PHASE 2

Total Area: 1.11 acres

Symbol	Soil Name	Hydrological Soil Group	Land Use	Hydrologic Condition	Soil Runoff Curve Number	Area acres	Complex Number acres	Comment
CtA	Conestoga Silt Loam	B	LAWN	Good	61	0.57	34.49	
N/A	N/A	N/A	IMPERVIOUS	Good	98	0.54	52.92	

Total Area 1.11 87.41

Weighted Soil Complex Number $\frac{87.41}{1.11}$ = **79.1**

TIME OF CONCENTRATION - SEE HYDRAFLOW REPORT

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SOIL CONSERVATION SERVICE
HYDROLOGIC DATA FOR WATERSHED
RUNOFF COMPUTATIONS

DATE: 6/22/2020
REV:
BY: PJK

JOB NO.: 3705 **PROJECT:** The Willows at Valley Run **TOWNSHIP:** CALN
DESCRIPTION: POST TO BED #2 - PHASE

Total Area: 1.46 acres

Symbol	Soil Name	Hydrological Soil Group	Land Use	Hydrologic Condition	Soil Runoff Curve Number	Area acres	Complex Number acres	Comment
CtA	Conestoga Silt Loam	B	LAWN	Good	61	0.43	26.24	
N/A	N/A	N/A	IMPERVIOUS	Good	98	1.03	100.81	
					Total Area	1.46	127.06	

Weighted Soil Complex Number $\frac{127.06}{1.46}$ = **87.1**

TIME OF CONCENTRATION - SEE HYDRAFLOW REPORT

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SOIL CONSERVATION SERVICE
HYDROLOGIC DATA FOR WATERSHED
RUNOFF COMPUTATIONS

DATE: 6/22/2020
REV:
BY: PJK

JOB NO.: 3705 **PROJECT:** The Willows at Valley Run **TOWNSHIP:** CALN
DESCRIPTION: POST BYPASS - PHASE 2

Total Area: 0.58 acres

Symbol	Soil Name	Hydrological Soil Group	Land Use	Hydrologic Condition	Soil Runoff Curve Number	Area acres	Complex Number acres	Comment
CtA	Conestoga Silt Loam	B	LAWN	Good	61	0.56	34.20	
N/A	N/A	N/A	IMPERVIOUS	Good	98	0.02	1.98	

Total Area 0.58 36.17

Weighted Soil Complex Number $\frac{36.17}{0.58}$ = $\boxed{62.3}$

TIME OF CONCENTRATION - SEE HYDRAFLOW REPORT

APPENDIX B

PEAK FLOW SUMMARY

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Stormwater Summary
Peak Flow Reduction Requirements

DATE: 6/19/2020
BY: ALS

JOB NO.: 3705 **PROJECT:** The Willows at Valley Run **TOWNSHIP:** Caln
DESCRIPTION: Stormwater Summary - POI-1 - Phase 1

1-year	Pre-Developed	0.75 cfs	*Hydrograph 1*
2-year	Pre-Developed	1.62 cfs	*Hydrograph 1*
2-year	Post-Developed	0.75 cfs	*Hydrograph 12*
5-year	Pre-Developed	4.64 cfs	*Hydrograph 1*
5-year	Post-Developed	1.46 cfs	*Hydrograph 12*
10-year	Pre-Developed	7.49 cfs	*Hydrograph 1*
10-year	Post-Developed	2.11 cfs	*Hydrograph 12*
25-year	Pre-Developed	10.23 cfs	*Hydrograph 1*
25-year	Post-Developed	2.71 cfs	*Hydrograph 12*
50-year	Pre-Developed	13.15 cfs	*Hydrograph 1*
50-year	Post-Developed	3.42 cfs	*Hydrograph 12*
100-year	Pre-Developed	16.65 cfs	*Hydrograph 1*
100-year	Post-Developed	6.99 cfs	*Hydrograph 12*

	Post Developed 2 Year Flow = **Pre Developed 1 Year Flow =**	**0.75** **0.75**	**cfs** **cfs**	OK
	Post Developed 5 Year Flow = **Pre Developed 5 Year Flow =**	**0.75** **1.62**	**cfs** **cfs**	OK
	Post Developed 10 Year Flow = **Pre Developed 10 Year Flow =**	**2.11** **7.49**	**cfs** **cfs**	OK
	Post Developed 25 Year Flow = **Pre Developed 25 Year Flow =**	**2.71** **10.23**	**cfs** **cfs**	OK
	Post Developed 50 Year Flow = **Pre Developed 50 Year Flow =**	**3.42** **13.15**	**cfs** **cfs**	OK
	Post Developed 100 Year Flow = **Pre Developed 100 Year Flow =**	**6.99** **16.65**	**cfs** **cfs**	OK

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Stormwater Summary
Peak Flow Reduction Requirements

DATE: 6/19/2020
BY: ALS

JOB NO.: 3705 **PROJECT:** The Willows at Valley Run **TOWNSHIP:** Caln
DESCRIPTION: Stormwater Summary - POI-1 - Phase 1 & 2

1-year	Pre-Developed	1.28 cfs	*Hydrograph 4*
2-year	Pre-Developed	2.84 cfs	*Hydrograph 4*
2-year	Post-Developed	1.26 cfs	*Hydrograph 20*
5-year	Pre-Developed	8.32 cfs	*Hydrograph 4*
5-year	Post-Developed	1.98 cfs	*Hydrograph 20*
10-year	Pre-Developed	13.52 cfs	*Hydrograph 4*
10-year	Post-Developed	2.80 cfs	*Hydrograph 20*
25-year	Pre-Developed	18.51 cfs	*Hydrograph 4*
25-year	Post-Developed	7.36 cfs	*Hydrograph 20*
50-year	Pre-Developed	23.84 cfs	*Hydrograph 4*
50-year	Post-Developed	12.46 cfs	*Hydrograph 20*
100-year	Pre-Developed	30.25 cfs	*Hydrograph 4*
100-year	Post-Developed	14.65 cfs	*Hydrograph 20*

	Post Developed 2 Year Flow =	**1.26**	**cfs**	OK
	Pre Developed 1 Year Flow =	**1.28**	**cfs**	
	Post Developed 5 Year Flow =	**1.26**	**cfs**	OK
	Pre Developed 5 Year Flow =	**2.84**	**cfs**	
	Post Developed 10 Year Flow =	**2.80**	**cfs**	OK
	Pre Developed 10 Year Flow =	**13.52**	**cfs**	
	Post Developed 25 Year Flow =	**7.36**	**cfs**	OK
	Pre Developed 25 Year Flow =	**18.51**	**cfs**	
	Post Developed 50 Year Flow =	**12.46**	**cfs**	OK
	Pre Developed 50 Year Flow =	**23.84**	**cfs**	
	Post Developed 100 Year Flow =	**14.65**	**cfs**	OK
	Pre Developed 100 Year Flow =	**30.25**	**cfs**	

APPENDIX C

SCS HYDROGRAPH REPORTS & BASIN ROUTINGS

1 - Year

Summary Report **1**
Hydrograph Reports **2**
Hydrograph No. 1, SCS Runoff, PRE-DEV PHASE 1 2
Hydrograph No. 2, SCS Runoff, PRE-DEV PHASE 2 3
Hydrograph No. 4, Combine, TOTAL PRE-DEV 4
Hydrograph No. 6, SCS Runoff, POST TO BED 1 - PHASE 1 5
Hydrograph No. 7, Reservoir, BED 1 ROUTED - PHASE 1 6
Pond Report - MRC BED 1 7
Hydrograph No. 8, SCS Runoff, POST TO BASIN 1 - PHASE 1 8
Hydrograph No. 9, Combine, TOTAL TO BASIN 1 9
Hydrograph No. 10, Reservoir, BASIN 1 ROUTED 10
Pond Report - DETENTION BASIN 1 11
Hydrograph No. 11, SCS Runoff, POST BYPASS - PHASE 1 12
Hydrograph No. 12, Combine, TOTAL PHASE 1 13
Hydrograph No. 14, SCS Runoff, POST TO BED 1 - PHASE 2 14
Hydrograph No. 15, Combine, POST TO BED 1 TOTAL - PHASE 2 15
Hydrograph No. 16, Reservoir, BED 1 ROUTED - PHASE 2 16
Pond Report - MRC BED 1 17
Hydrograph No. 17, SCS Runoff, POST TO BED 2 - PHASE 2 18
Hydrograph No. 18, Reservoir, BED 2 ROUTED - PHASE 2 19
Pond Report - INFILTRATION BED 2 20
Hydrograph No. 19, SCS Runoff, POST BYPASS - PHASE 2 21
Hydrograph No. 20, Combine, TOTAL PHASE 1 & 2 22

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Hydrograph Reports **24**
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Hydrograph No. 2, SCS Runoff, PRE-DEV PHASE 2 25
Hydrograph No. 4, Combine, TOTAL PRE-DEV 26
Hydrograph No. 6, SCS Runoff, POST TO BED 1 - PHASE 1 27
Hydrograph No. 7, Reservoir, BED 1 ROUTED - PHASE 1 28
Hydrograph No. 8, SCS Runoff, POST TO BASIN 1 - PHASE 1 29
Hydrograph No. 9, Combine, TOTAL TO BASIN 1 30
Hydrograph No. 10, Reservoir, BASIN 1 ROUTED 31
Hydrograph No. 11, SCS Runoff, POST BYPASS - PHASE 1 32
Hydrograph No. 12, Combine, TOTAL PHASE 1 33
Hydrograph No. 14, SCS Runoff, POST TO BED 1 - PHASE 2 34
Hydrograph No. 15, Combine, POST TO BED 1 TOTAL - PHASE 2 35
Hydrograph No. 16, Reservoir, BED 1 ROUTED - PHASE 2 36
Hydrograph No. 17, SCS Runoff, POST TO BED 2 - PHASE 2 37
Hydrograph No. 18, Reservoir, BED 2 ROUTED - PHASE 2 38
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Hydrograph No. 4, Combine, TOTAL PRE-DEV 44
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Hydrograph No. 7, Reservoir, BED 1 ROUTED - PHASE 1 46
Hydrograph No. 8, SCS Runoff, POST TO BASIN 1 - PHASE 1 47
Hydrograph No. 9, Combine, TOTAL TO BASIN 1 48
Hydrograph No. 10, Reservoir, BASIN 1 ROUTED 49
Hydrograph No. 11, SCS Runoff, POST BYPASS - PHASE 1 50
Hydrograph No. 12, Combine, TOTAL PHASE 1 51
Hydrograph No. 14, SCS Runoff, POST TO BED 1 - PHASE 2 52
Hydrograph No. 15, Combine, POST TO BED 1 TOTAL - PHASE 2 53
Hydrograph No. 16, Reservoir, BED 1 ROUTED - PHASE 2 54
Hydrograph No. 17, SCS Runoff, POST TO BED 2 - PHASE 2 55
Hydrograph No. 18, Reservoir, BED 2 ROUTED - PHASE 2 56
Hydrograph No. 19, SCS Runoff, POST BYPASS - PHASE 2 57
Hydrograph No. 20, Combine, TOTAL PHASE 1 & 2 58

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Hydrograph No. 8, SCS Runoff, POST TO BASIN 1 - PHASE 1 65
Hydrograph No. 9, Combine, TOTAL TO BASIN 1 66
Hydrograph No. 10, Reservoir, BASIN 1 ROUTED 67
Hydrograph No. 11, SCS Runoff, POST BYPASS - PHASE 1 68
Hydrograph No. 12, Combine, TOTAL PHASE 1 69
Hydrograph No. 14, SCS Runoff, POST TO BED 1 - PHASE 2 70
Hydrograph No. 15, Combine, POST TO BED 1 TOTAL - PHASE 2 71
Hydrograph No. 16, Reservoir, BED 1 ROUTED - PHASE 2 72
Hydrograph No. 17, SCS Runoff, POST TO BED 2 - PHASE 2 73
Hydrograph No. 18, Reservoir, BED 2 ROUTED - PHASE 2 74
Hydrograph No. 19, SCS Runoff, POST BYPASS - PHASE 2 75
Hydrograph No. 20, Combine, TOTAL PHASE 1 & 2 76

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Hydrograph No. 1, SCS Runoff, PRE-DEV PHASE 1 78
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Hydrograph No. 7, Reservoir, BED 1 ROUTED - PHASE 1 82
Hydrograph No. 8, SCS Runoff, POST TO BASIN 1 - PHASE 1 83
Hydrograph No. 9, Combine, TOTAL TO BASIN 1 84
Hydrograph No. 10, Reservoir, BASIN 1 ROUTED 85

Hydrograph No. 11, SCS Runoff, POST BYPASS - PHASE 1 86
Hydrograph No. 12, Combine, TOTAL PHASE 1 87
Hydrograph No. 14, SCS Runoff, POST TO BED 1 - PHASE 2 88
Hydrograph No. 15, Combine, POST TO BED 1 TOTAL - PHASE 2 89
Hydrograph No. 16, Reservoir, BED 1 ROUTED - PHASE 2 90
Hydrograph No. 17, SCS Runoff, POST TO BED 2 - PHASE 2 91
Hydrograph No. 18, Reservoir, BED 2 ROUTED - PHASE 2 92
Hydrograph No. 19, SCS Runoff, POST BYPASS - PHASE 2 93
Hydrograph No. 20, Combine, TOTAL PHASE 1 & 2 94

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Hydrograph No. 2, SCS Runoff, PRE-DEV PHASE 2 97
Hydrograph No. 4, Combine, TOTAL PRE-DEV 98
Hydrograph No. 6, SCS Runoff, POST TO BED 1 - PHASE 1 99
Hydrograph No. 7, Reservoir, BED 1 ROUTED - PHASE 1 100
Hydrograph No. 8, SCS Runoff, POST TO BASIN 1 - PHASE 1 101
Hydrograph No. 9, Combine, TOTAL TO BASIN 1 102
Hydrograph No. 10, Reservoir, BASIN 1 ROUTED 103
Hydrograph No. 11, SCS Runoff, POST BYPASS - PHASE 1 104
Hydrograph No. 12, Combine, TOTAL PHASE 1 105
Hydrograph No. 14, SCS Runoff, POST TO BED 1 - PHASE 2 106
Hydrograph No. 15, Combine, POST TO BED 1 TOTAL - PHASE 2 107
Hydrograph No. 16, Reservoir, BED 1 ROUTED - PHASE 2 108
Hydrograph No. 17, SCS Runoff, POST TO BED 2 - PHASE 2 109
Hydrograph No. 18, Reservoir, BED 2 ROUTED - PHASE 2 110
Hydrograph No. 19, SCS Runoff, POST BYPASS - PHASE 2 111
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Hydrograph No. 4, Combine, TOTAL PRE-DEV 116
Hydrograph No. 6, SCS Runoff, POST TO BED 1 - PHASE 1 117
Hydrograph No. 7, Reservoir, BED 1 ROUTED - PHASE 1 118
Hydrograph No. 8, SCS Runoff, POST TO BASIN 1 - PHASE 1 119
Hydrograph No. 9, Combine, TOTAL TO BASIN 1 120
Hydrograph No. 10, Reservoir, BASIN 1 ROUTED 121
Hydrograph No. 11, SCS Runoff, POST BYPASS - PHASE 1 122
Hydrograph No. 12, Combine, TOTAL PHASE 1 123
Hydrograph No. 14, SCS Runoff, POST TO BED 1 - PHASE 2 124
Hydrograph No. 15, Combine, POST TO BED 1 TOTAL - PHASE 2 125
Hydrograph No. 16, Reservoir, BED 1 ROUTED - PHASE 2 126
Hydrograph No. 17, SCS Runoff, POST TO BED 2 - PHASE 2 127
Hydrograph No. 18, Reservoir, BED 2 ROUTED - PHASE 2 128
Hydrograph No. 19, SCS Runoff, POST BYPASS - PHASE 2 129

Hydrograph No. 20, Combine, TOTAL PHASE 1 & 2.. 130

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.750	2	720	2,887	------	------	------	PRE-DEV PHASE 1
2	SCS Runoff	0.534	2	720	2,253	------	------	------	PRE-DEV PHASE 2
4	Combine	1.284	2	720	5,140	1, 2,	------	------	TOTAL PRE-DEV
6	SCS Runoff	7.153	2	716	14,555	------	------	------	POST TO BED 1 - PHASE 1
7	Reservoir	0.767	2	740	14,505	6	339.54	6,777	BED 1 ROUTED - PHASE 1
8	SCS Runoff	0.297	2	718	693	------	------	------	POST TO BASIN 1 - PHASE 1
9	Combine	0.974	2	720	15,199	7, 8	------	------	TOTAL TO BASIN 1
10	Reservoir	0.638	2	846	15,187	9	339.81	2,404	BASIN 1 ROUTED
11	SCS Runoff	0.218	2	718	656	------	------	------	POST BYPASS - PHASE 1
12	Combine	0.655	2	842	15,844	10, 11	------	------	TOTAL PHASE 1
14	SCS Runoff	1.984	2	718	3,967	------	------	------	POST TO BED 1 - PHASE 2
15	Combine	9.098	2	716	18,521	6, 14	------	------	POST TO BED 1 TOTAL - PHASE 2
16	Reservoir	0.866	2	746	18,472	15	339.75	8,559	BED 1 ROUTED - PHASE 2
17	SCS Runoff	3.851	2	716	7,817	------	------	------	POST TO BED 2 - PHASE 2
18	Reservoir	0.000	2	n/a	0	17	345.80	7,817	BED 2 ROUTED - PHASE 2
19	SCS Runoff	0.242	2	718	653	------	------	------	POST BYPASS - PHASE 2
20	Combine	1.018	2	720	19,125	16, 18, 19	------	------	TOTAL PHASE 1 & 2

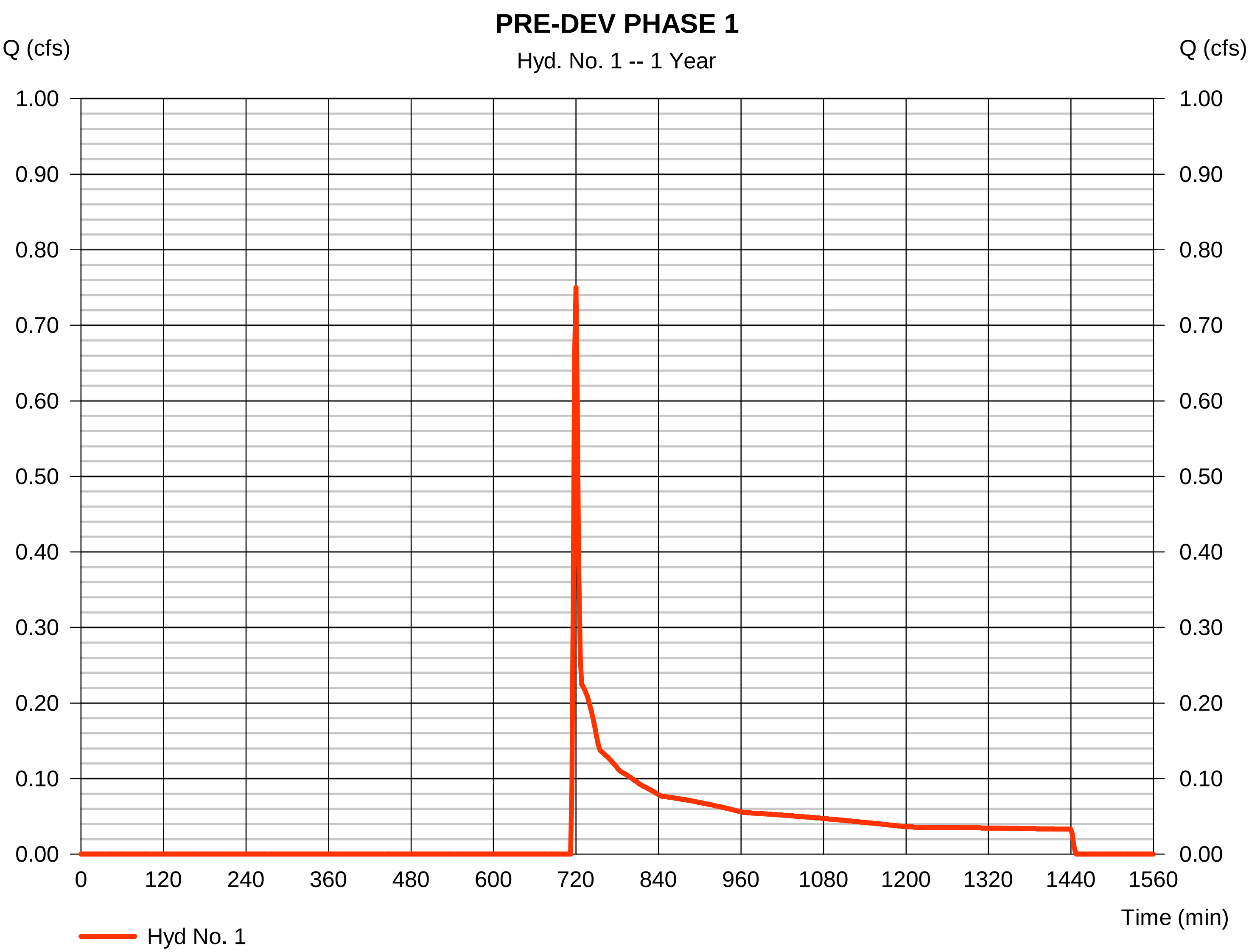
3705 Hydraflow.gpw	Return Period: 1 Year	Monday, 06 / 22 / 2020

Hydrograph Report

Hyd. No. 1

PRE-DEV PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.750 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 2,887 cuft
Drainage area	= 3.770 ac	Curve number	= 58.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



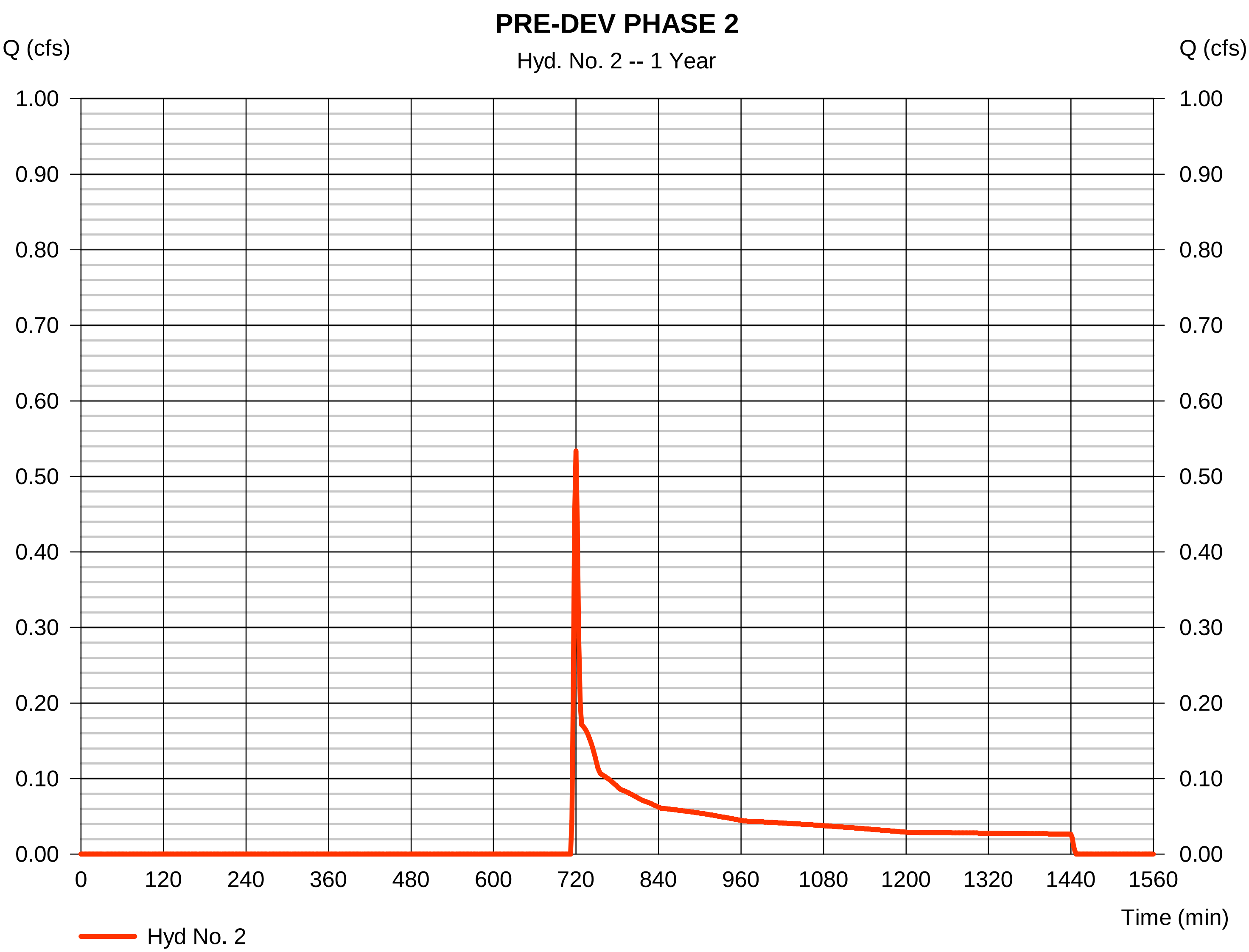
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 2

PRE-DEV PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.534 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 2,253 cuft
Drainage area	= 3.150 ac	Curve number	= 57.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



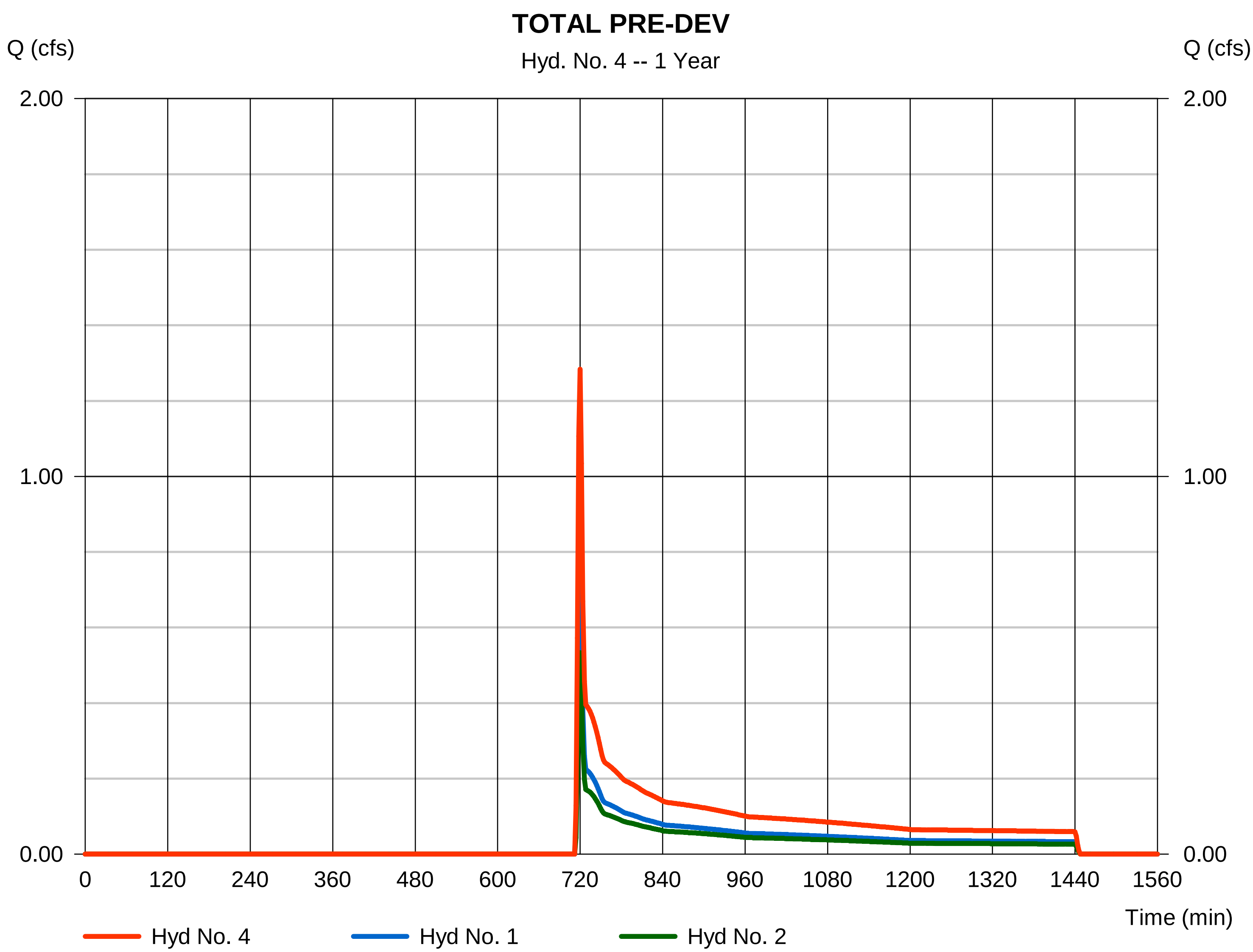
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 4

TOTAL PRE-DEV

Hydrograph type	= Combine	Peak discharge	= 1.284 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 5,140 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 6.920 ac



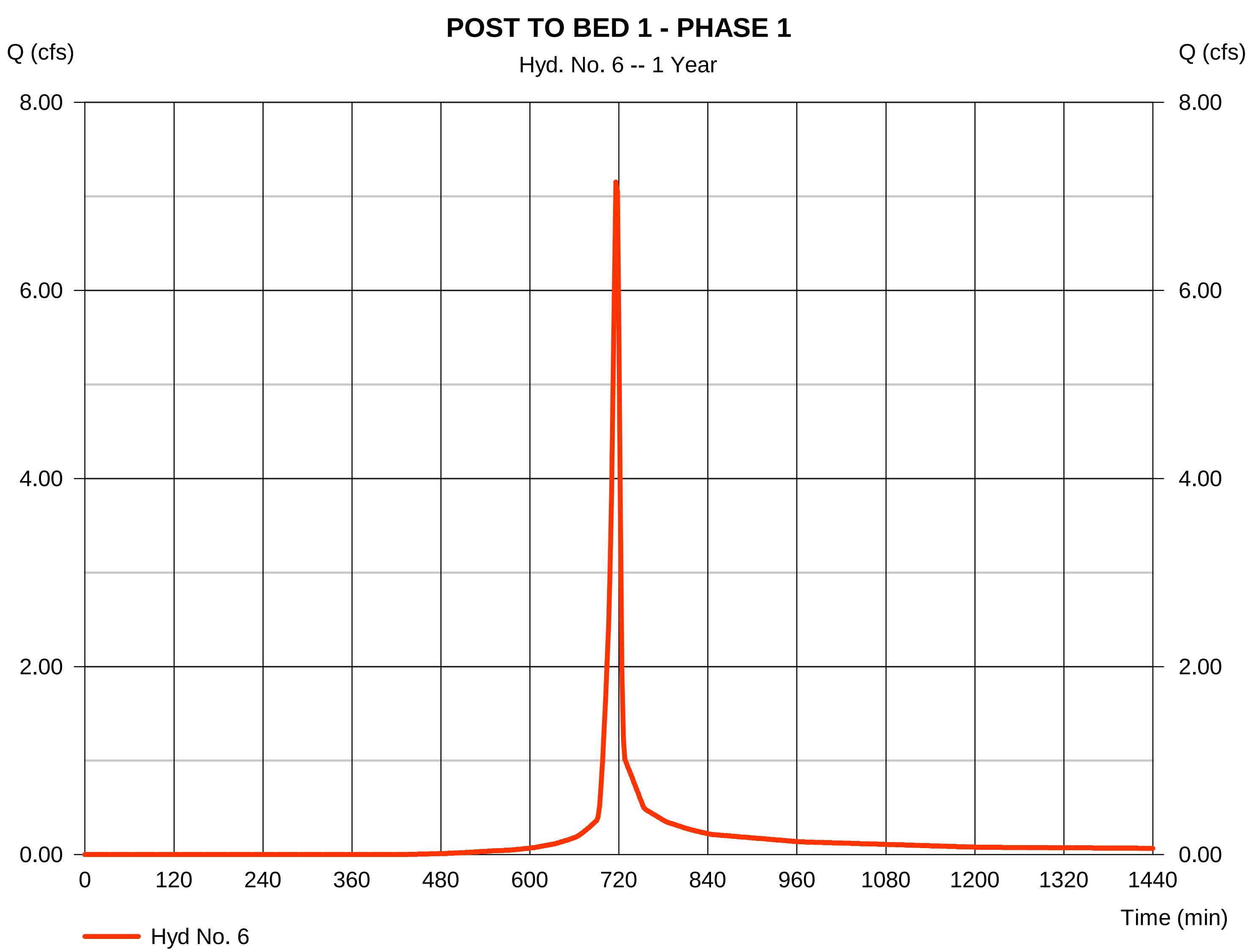
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 6

POST TO BED 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 7.153 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 14,555 cuft
Drainage area	= 2.630 ac	Curve number	= 87.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

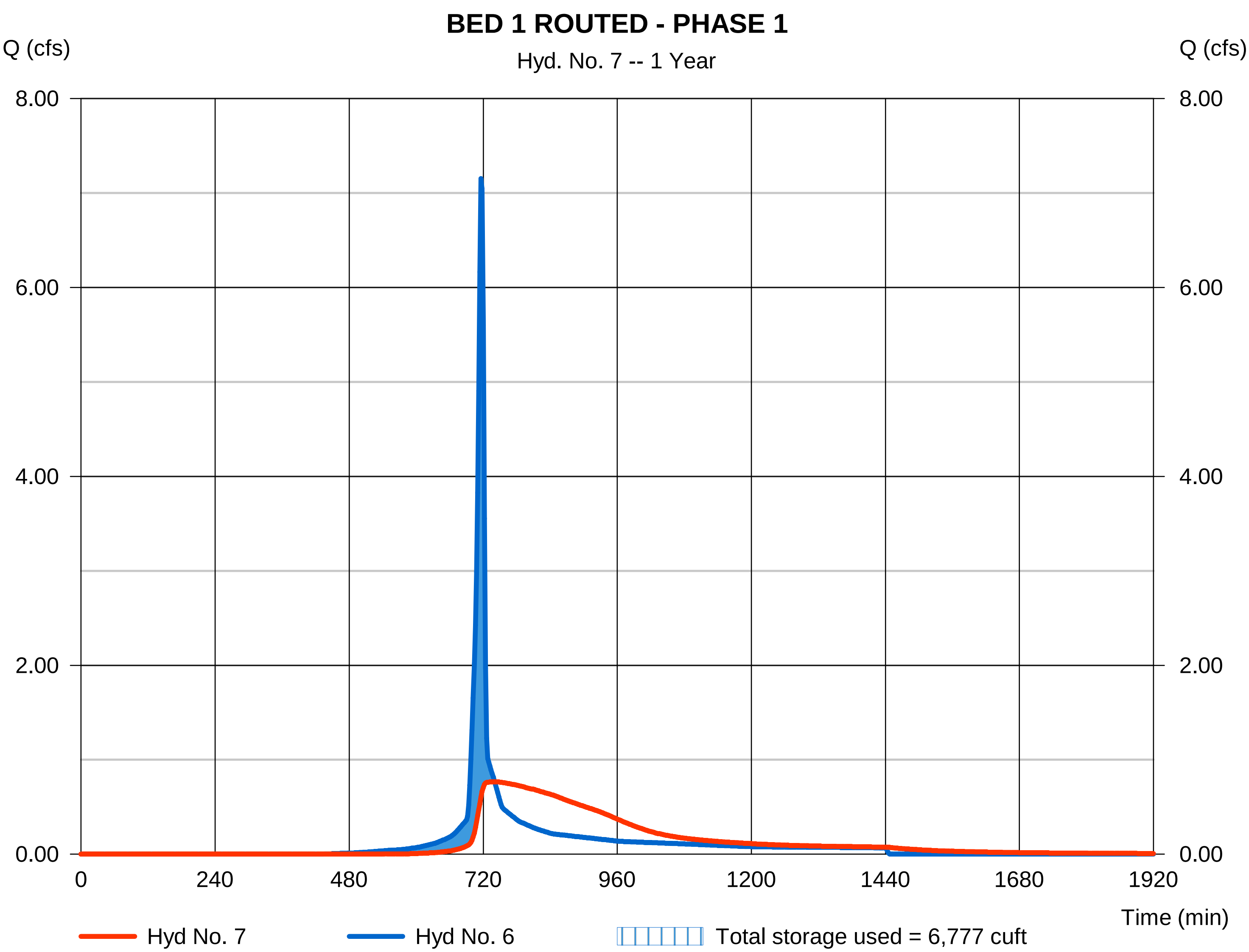
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 7

BED 1 ROUTED - PHASE 1

Hydrograph type	= Reservoir	Peak discharge	= 0.767 cfs
Storm frequency	= 1 yrs	Time to peak	= 740 min
Time interval	= 2 min	Hyd. volume	= 14,505 cuft
Inflow hyd. No.	= 6 - POST TO BED 1 - PHASE 1	Max. Elevation	= 339.54 ft
Reservoir name	= MRC BED 1	Max. Storage	= 6,777 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Pond No. 1 - MRC BED 1

Pond Data

UG Chambers -Invert elev. = 339.00 ft, Rise x Span = 2.50 x 2.50 ft, Barrel Len = 185.00 ft, No. Barrels = 14, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 338.50 ft, Width = 4.80 ft, Height = 4.00 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	338.50	n/a	0	0
0.40	338.90	n/a	2,093	2,093
0.80	339.30	n/a	2,638	4,731
1.20	339.70	n/a	3,388	8,119
1.60	340.10	n/a	3,655	11,775
2.00	340.50	n/a	3,718	15,493
2.40	340.90	n/a	3,609	19,102
2.80	341.30	n/a	3,272	22,374
3.20	341.70	n/a	2,393	24,767
3.60	342.10	n/a	2,093	26,860
4.00	342.50	n/a	2,093	28,953

Culvert / Orifice Structures

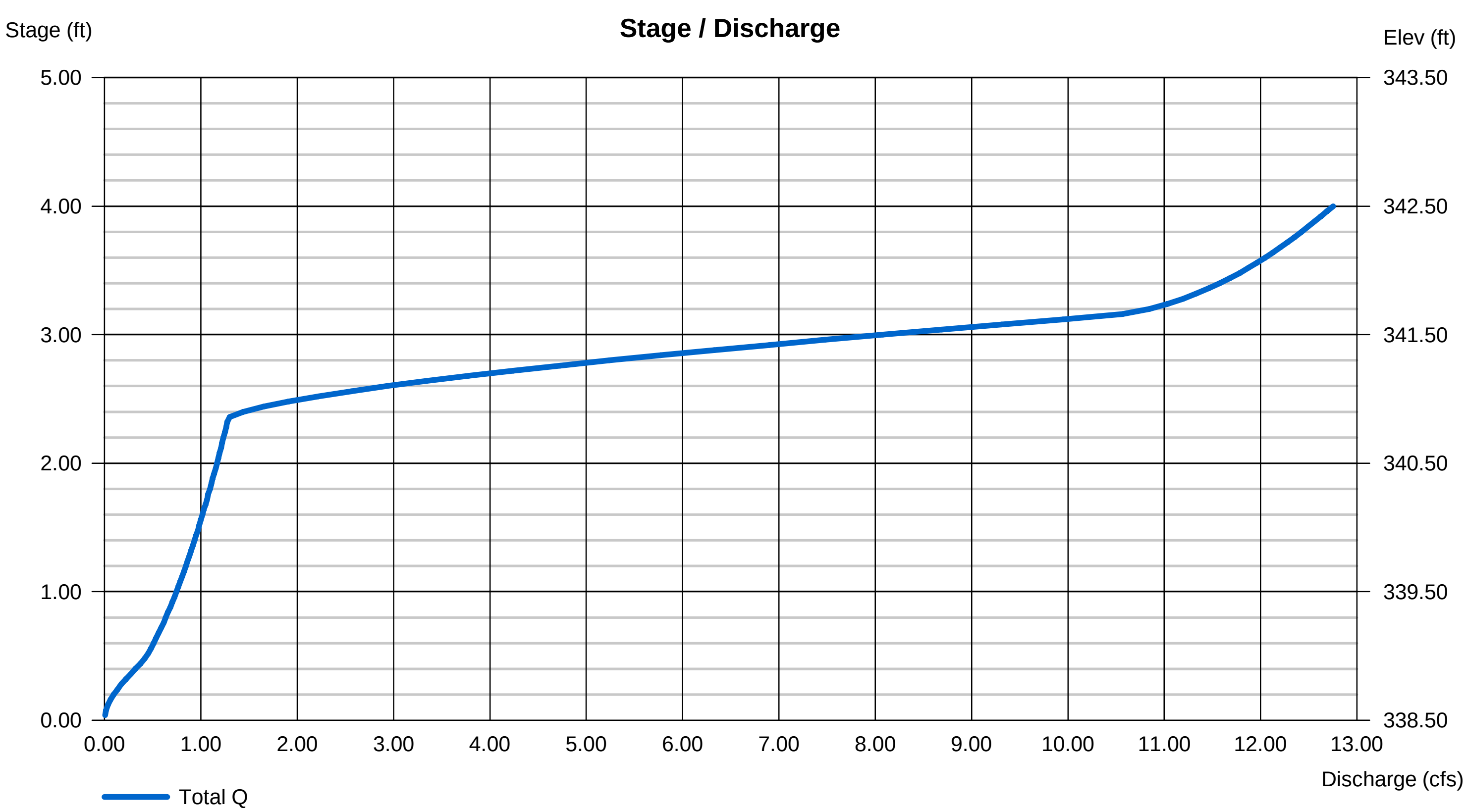
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	6.00	0.00	0.00
Span (in)	= 18.00	6.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 338.50	338.50	0.00	0.00
Length (ft)	= 250.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 340.85	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

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



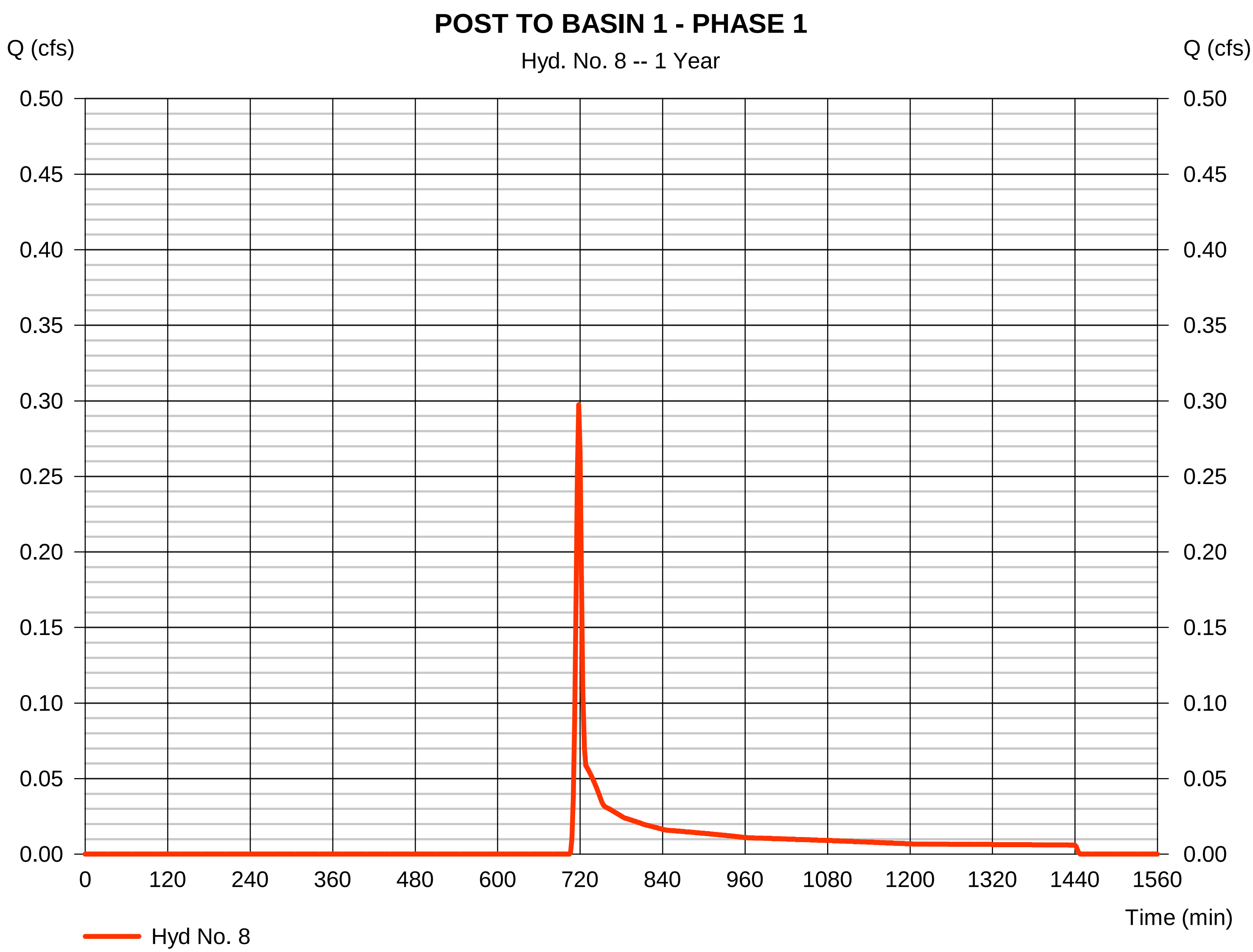
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 8

POST TO BASIN 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.297 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 693 cuft
Drainage area	= 0.480 ac	Curve number	= 65.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



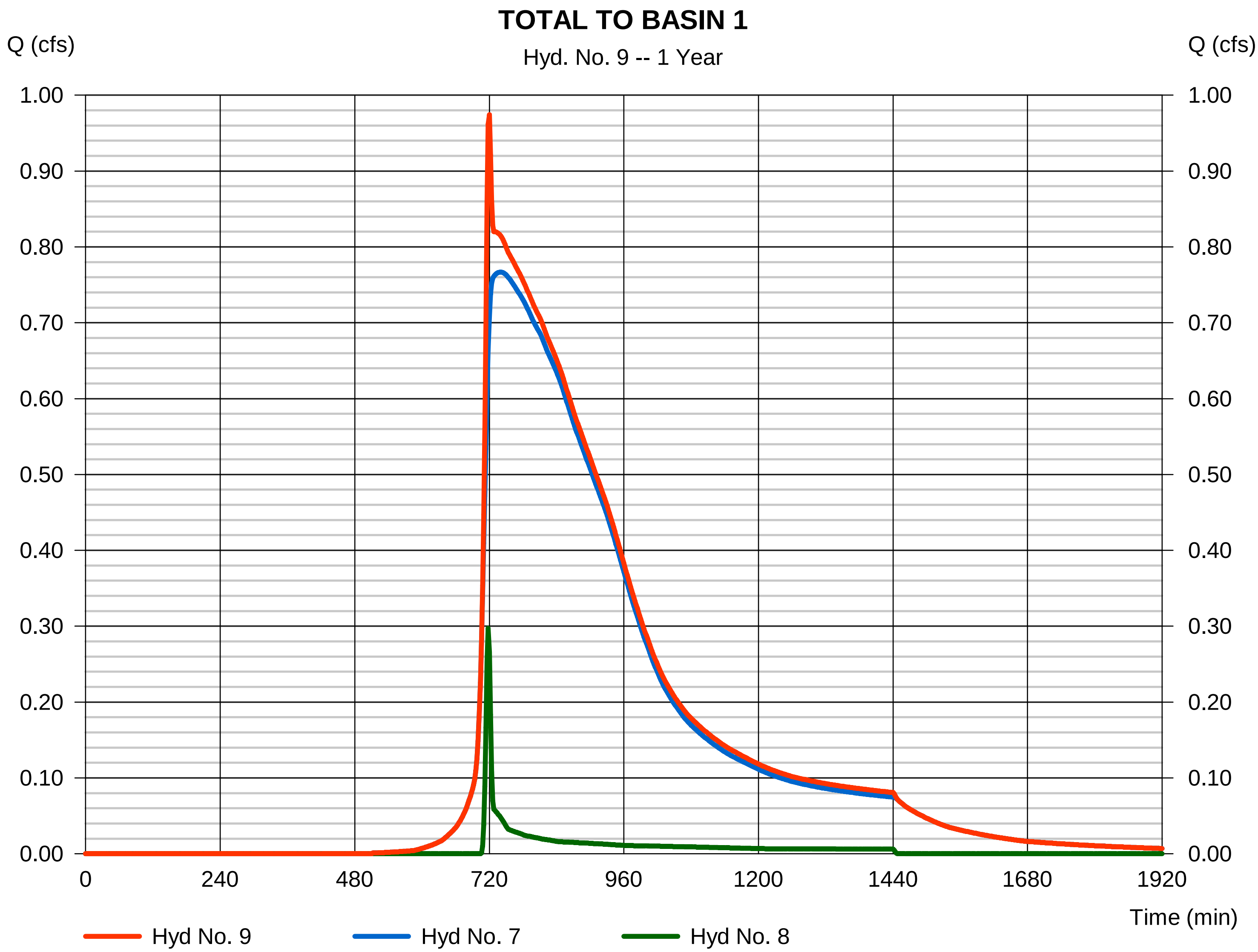
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 9

TOTAL TO BASIN 1

Hydrograph type	= Combine	Peak discharge	= 0.974 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 15,199 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 0.480 ac



Hydrograph Report

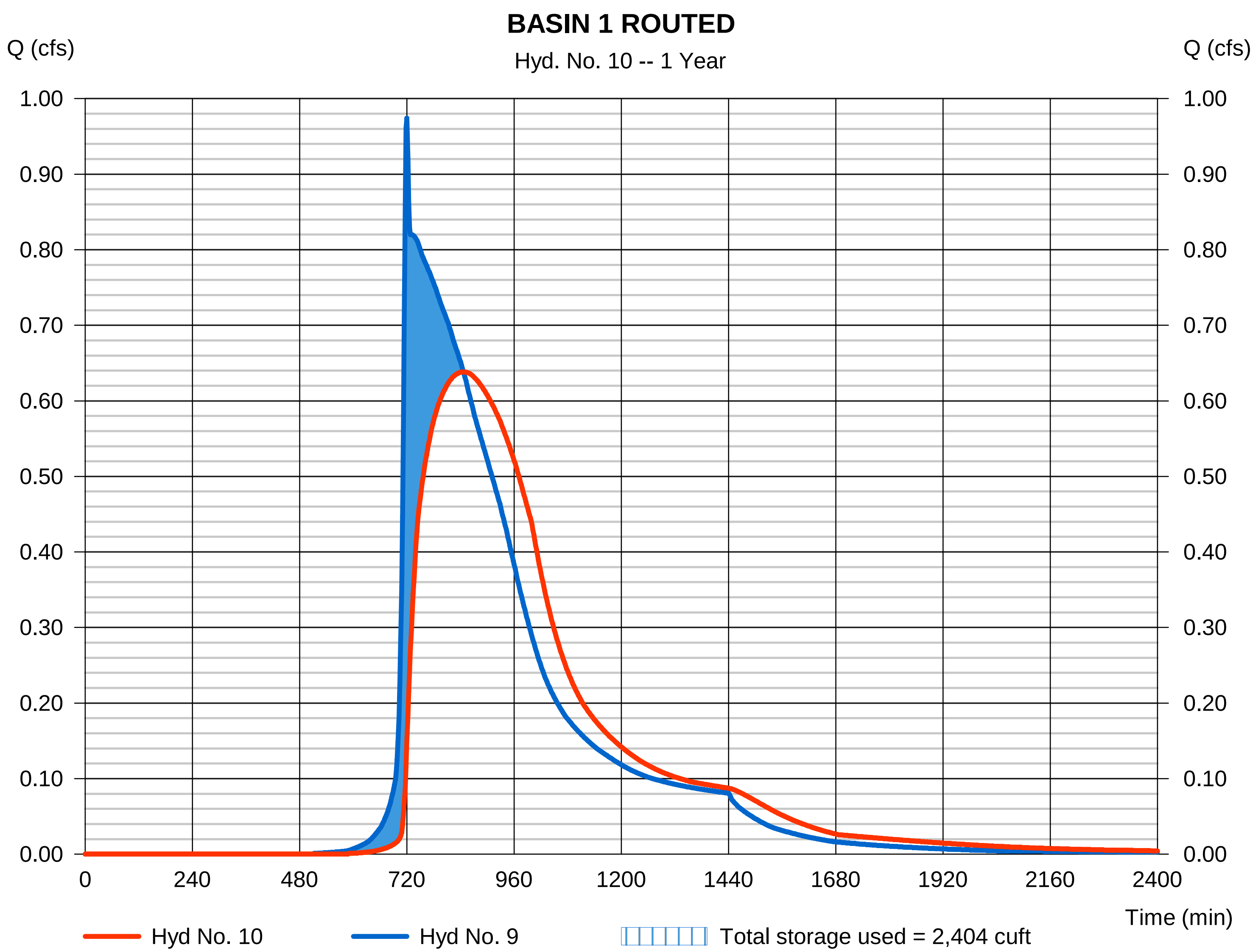
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 10

BASIN 1 ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 0.638 cfs
Storm frequency	= 1 yrs	Time to peak	= 846 min
Time interval	= 2 min	Hyd. volume	= 15,187 cuft
Inflow hyd. No.	= 9 - TOTAL TO BASIN 1	Max. Elevation	= 339.81 ft
Reservoir name	= DETENTION BASIN 1	Max. Storage	= 2,404 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Pond No. 3 - DETENTION BASIN 1

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 339.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	339.00	2,667	0	0
1.00	340.00	3,306	2,987	2,987
2.00	341.00	4,002	3,654	6,641

Culvert / Orifice Structures

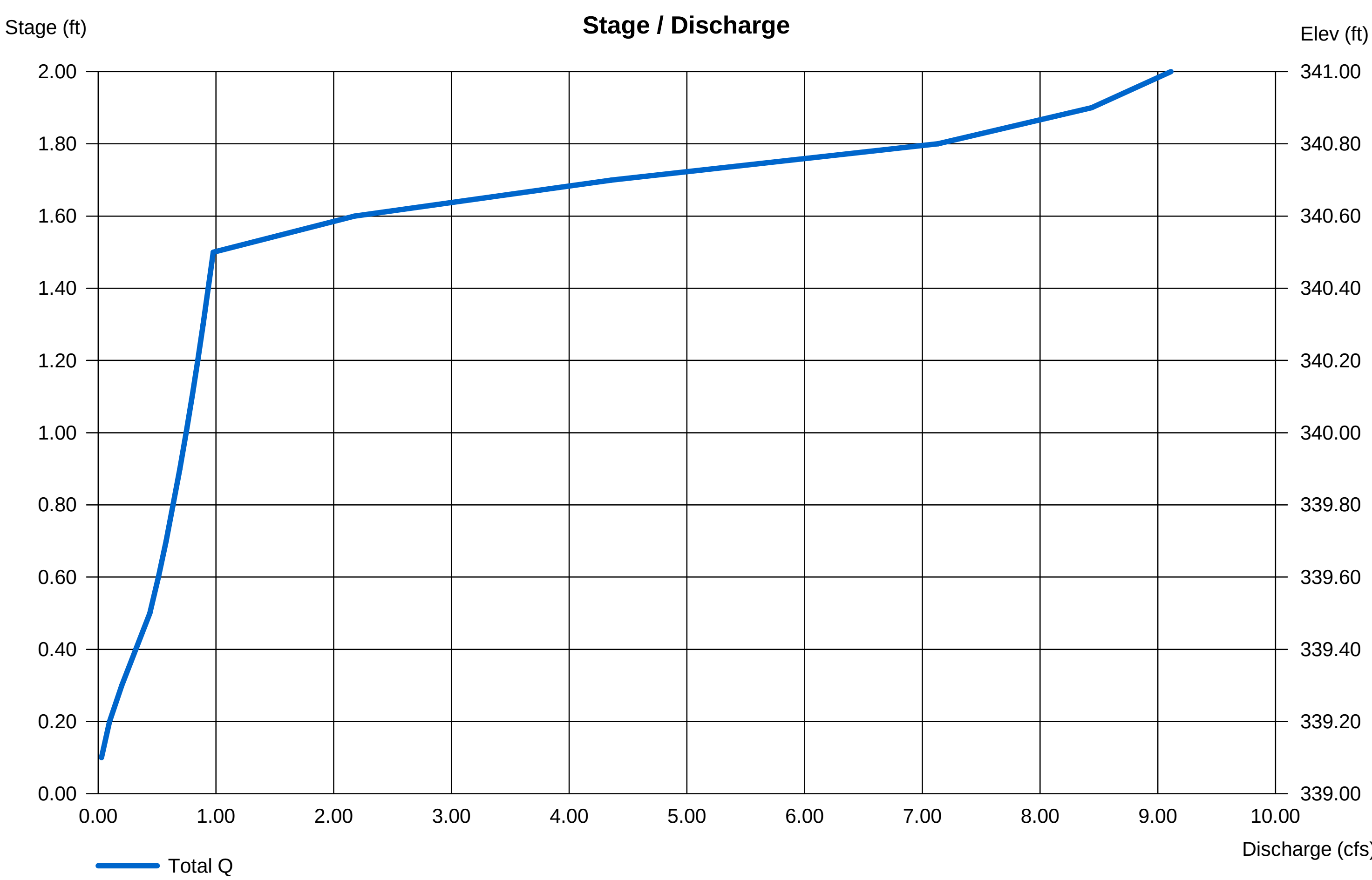
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	6.00	0.00	0.00
Span (in)	= 18.00	6.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 339.00	339.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	0.00	0.00	0.00
Crest El. (ft)	= 340.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
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).



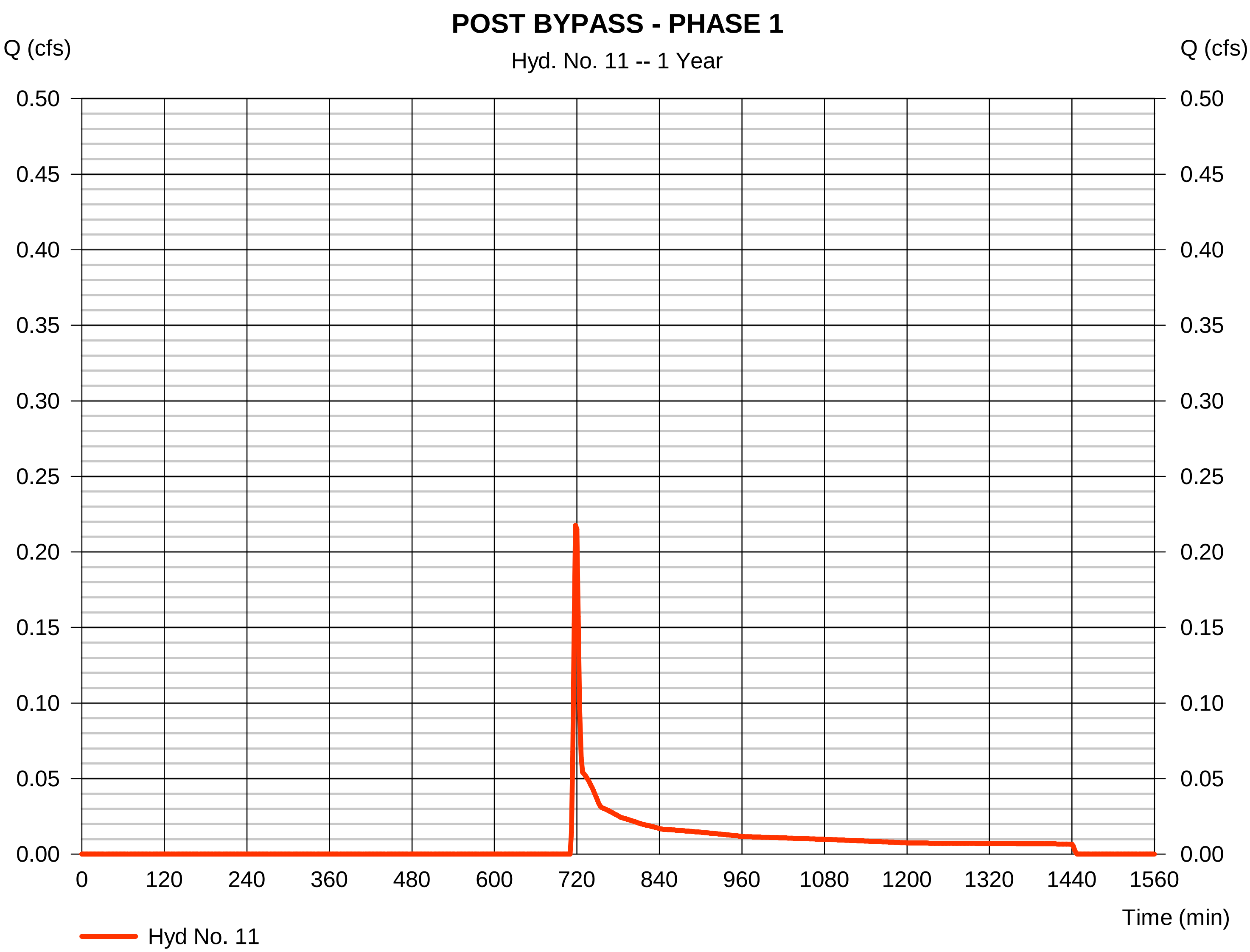
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 11

POST BYPASS - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.218 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 656 cuft
Drainage area	= 0.660 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



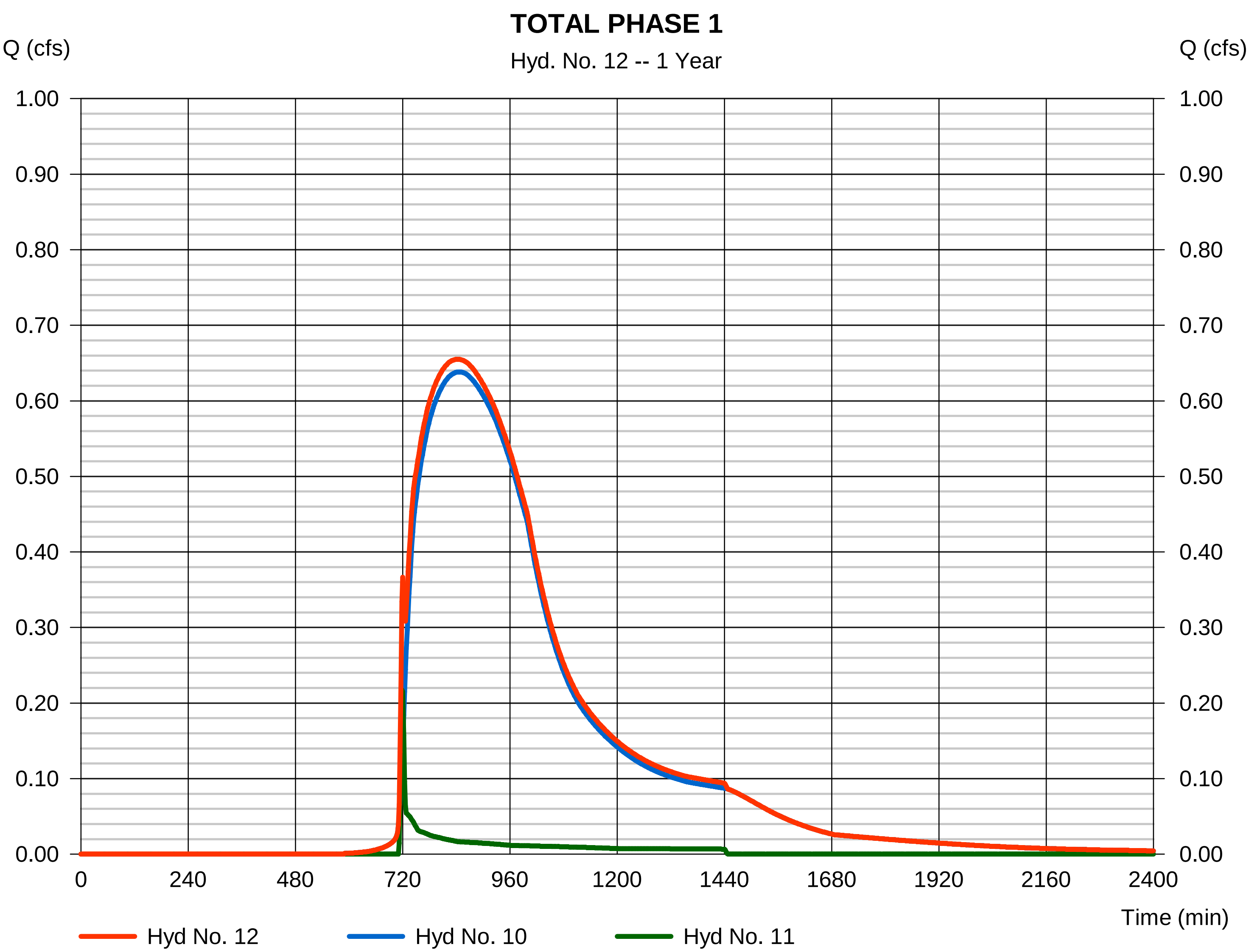
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 12

TOTAL PHASE 1

Hydrograph type	= Combine	Peak discharge	= 0.655 cfs
Storm frequency	= 1 yrs	Time to peak	= 842 min
Time interval	= 2 min	Hyd. volume	= 15,844 cuft
Inflow hyds.	= 10, 11	Contrib. drain. area	= 0.660 ac



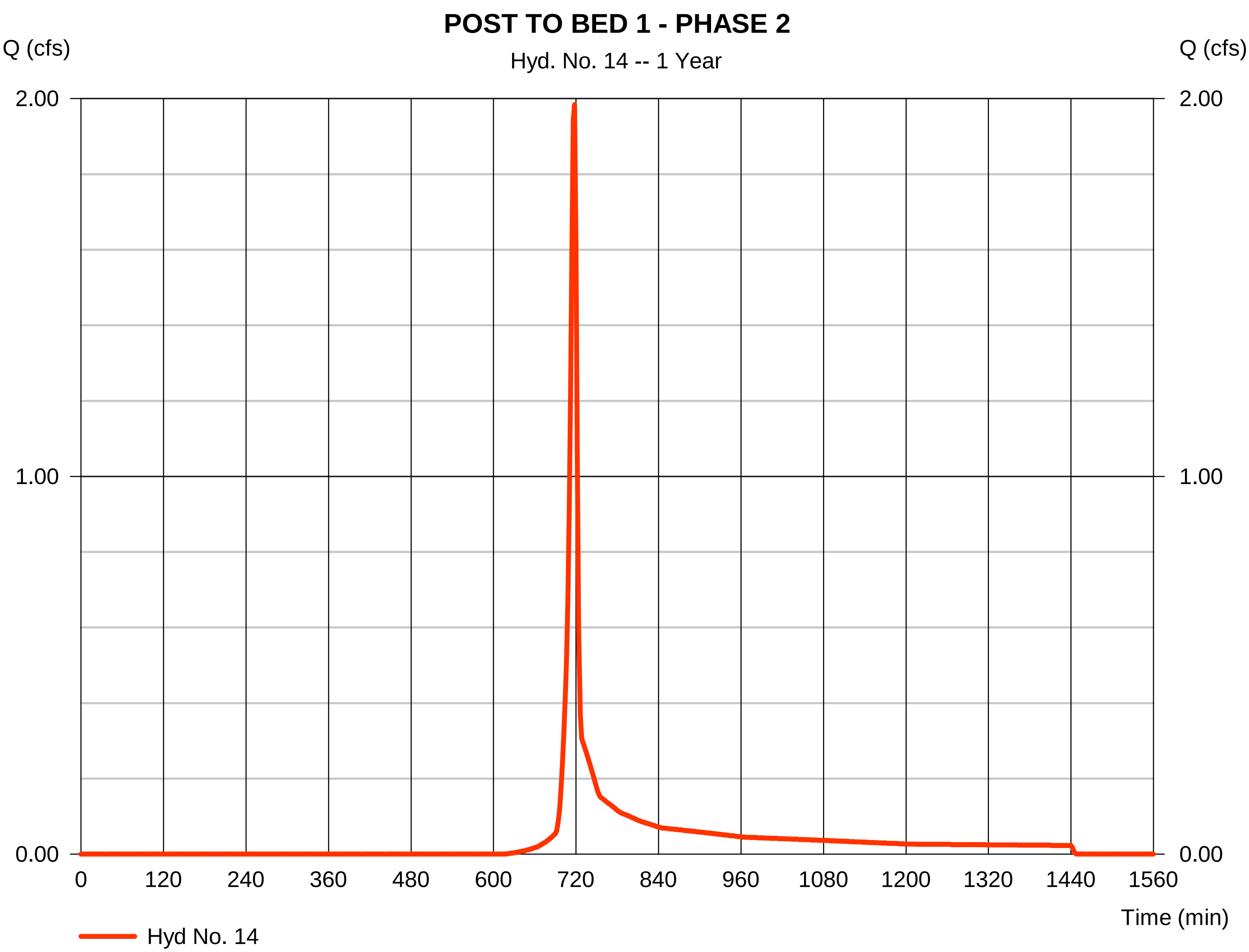
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 14

POST TO BED 1 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.984 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 3,967 cuft
Drainage area	= 1.110 ac	Curve number	= 79.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



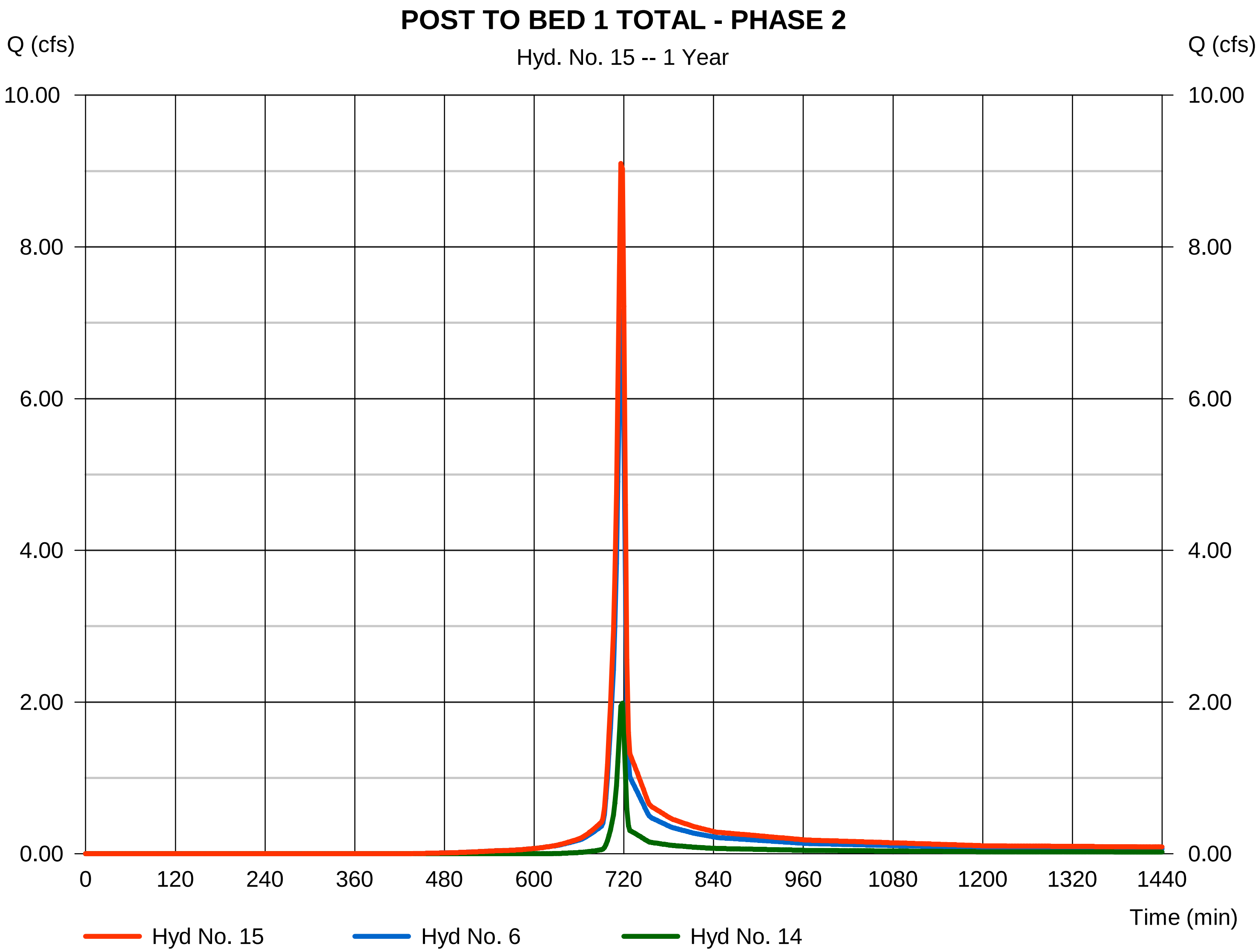
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 15

POST TO BED 1 TOTAL - PHASE 2

Hydrograph type	= Combine	Peak discharge	= 9.098 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 18,521 cuft
Inflow hyds.	= 6, 14	Contrib. drain. area	= 3.740 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 16

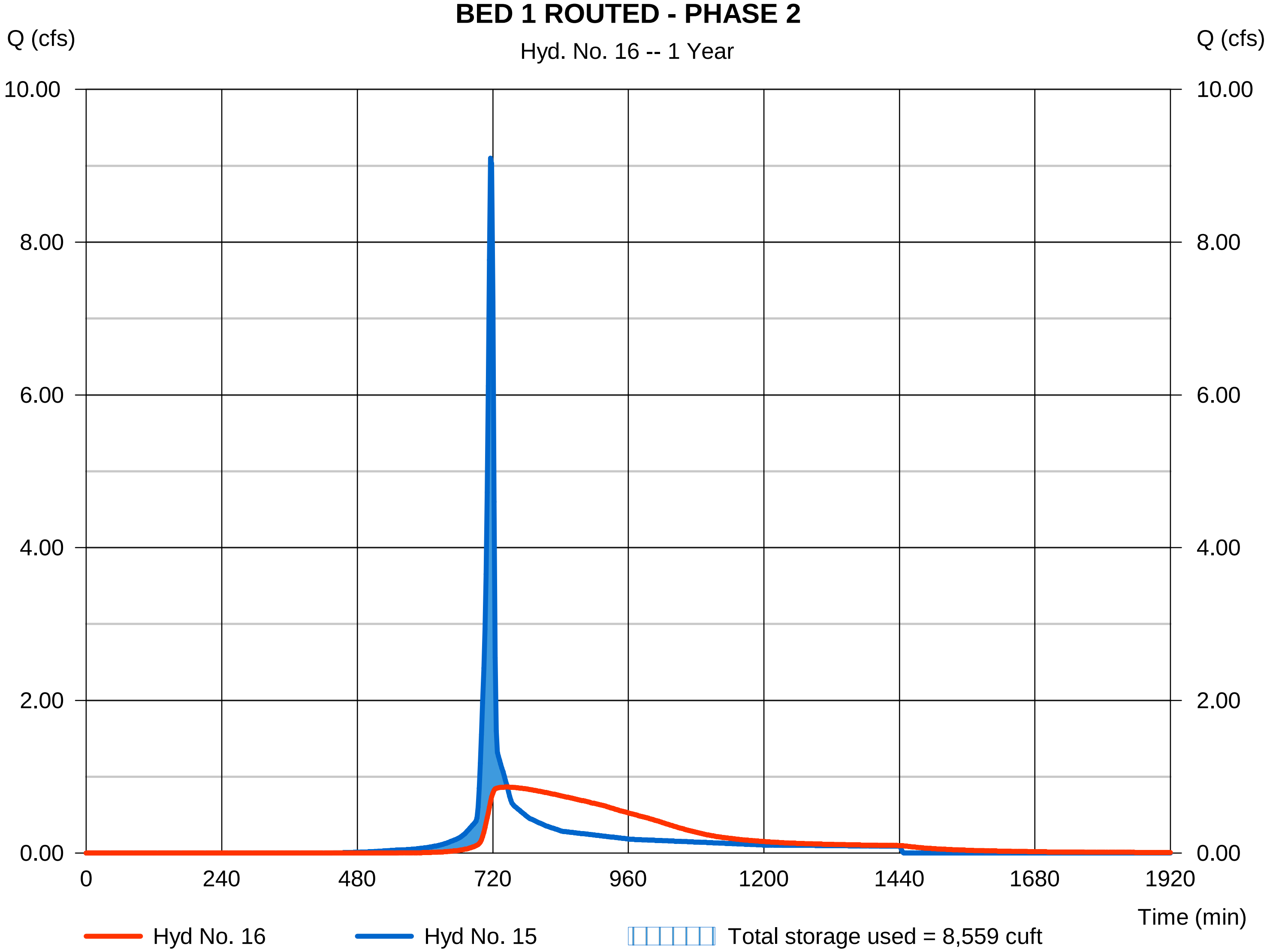
BED 1 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 0.866 cfs
Storm frequency	= 1 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 18,472 cuft
Inflow hyd. No.	= 15 - POST TO BED 1 TOTAL - PHASE 2	Max. Elevation	= 339.75 ft
Reservoir name	= MRC BED 1	Max. Storage	= 8,559 cuft

Storage Indication method used.

BED 1 ROUTED - PHASE 2

Hyd. No. 16 -- 1 Year



Pond Report

Pond No. 1 - MRC BED 1

Pond Data

UG Chambers -Invert elev. = 339.00 ft, Rise x Span = 2.50 x 2.50 ft, Barrel Len = 185.00 ft, No. Barrels = 14, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 338.50 ft, Width = 4.80 ft, Height = 4.00 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	338.50	n/a	0	0
0.40	338.90	n/a	2,093	2,093
0.80	339.30	n/a	2,638	4,731
1.20	339.70	n/a	3,388	8,119
1.60	340.10	n/a	3,655	11,775
2.00	340.50	n/a	3,718	15,493
2.40	340.90	n/a	3,609	19,102
2.80	341.30	n/a	3,272	22,374
3.20	341.70	n/a	2,393	24,767
3.60	342.10	n/a	2,093	26,860
4.00	342.50	n/a	2,093	28,953

Culvert / Orifice Structures

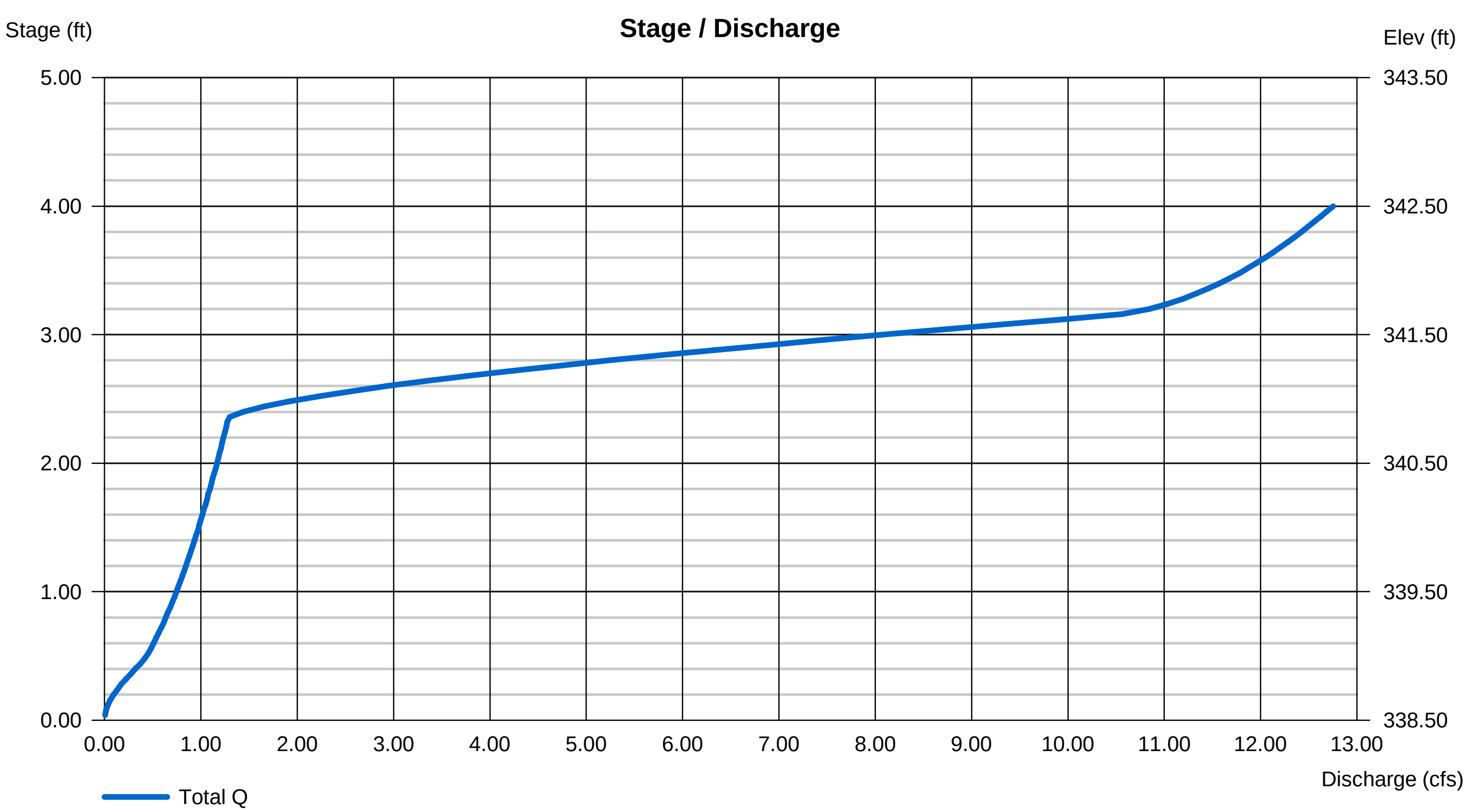
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	6.00	0.00	0.00
Span (in)	= 18.00	6.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 338.50	338.50	0.00	0.00
Length (ft)	= 250.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 340.85	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

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



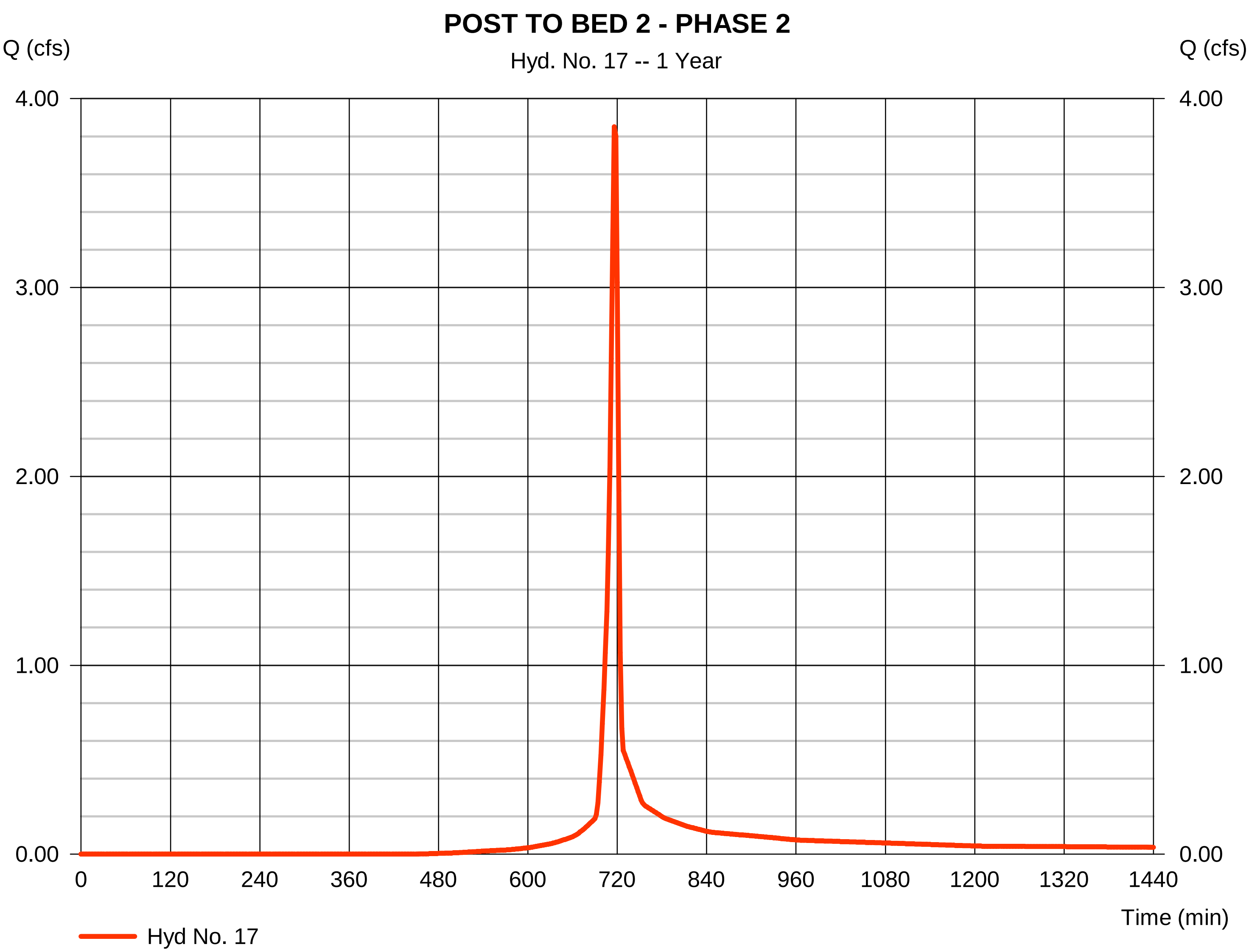
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 17

POST TO BED 2 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 3.851 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 7,817 cuft
Drainage area	= 1.460 ac	Curve number	= 87.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

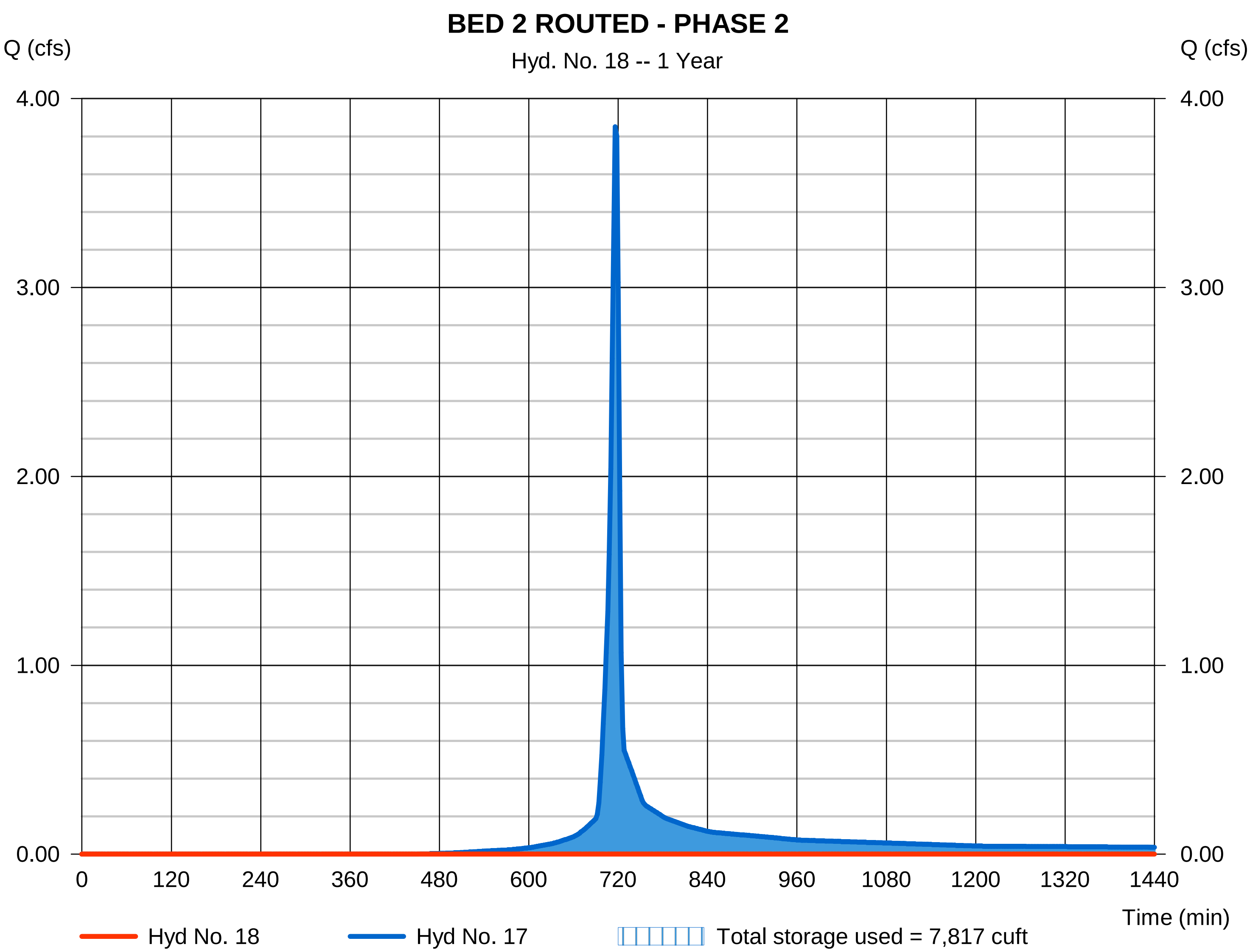
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 18

BED 2 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 17 - POST TO BED 2 - PHASE 2	Max. Elevation	= 345.80 ft
Reservoir name	= INFILTRATION BED 2	Max. Storage	= 7,817 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Pond No. 2 - INFILTRATION BED 2

Pond Data

UG Chambers -Invert elev. = 345.00 ft, Rise x Span = 2.00 x 2.00 ft, Barrel Len = 141.00 ft, No. Barrels = 19, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 344.50 ft, Width = 3.94 ft, Height = 3.00 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	344.50	n/a	0	0
0.30	344.80	n/a	1,338	1,338
0.60	345.10	n/a	1,438	2,775
0.90	345.40	n/a	1,997	4,773
1.20	345.70	n/a	2,243	7,015
1.50	346.00	n/a	2,340	9,355
1.80	346.30	n/a	2,342	11,697
2.10	346.60	n/a	2,241	13,938
2.40	346.90	n/a	1,997	15,935
2.70	347.20	n/a	1,437	17,372
3.00	347.50	n/a	1,338	18,710

Culvert / Orifice Structures

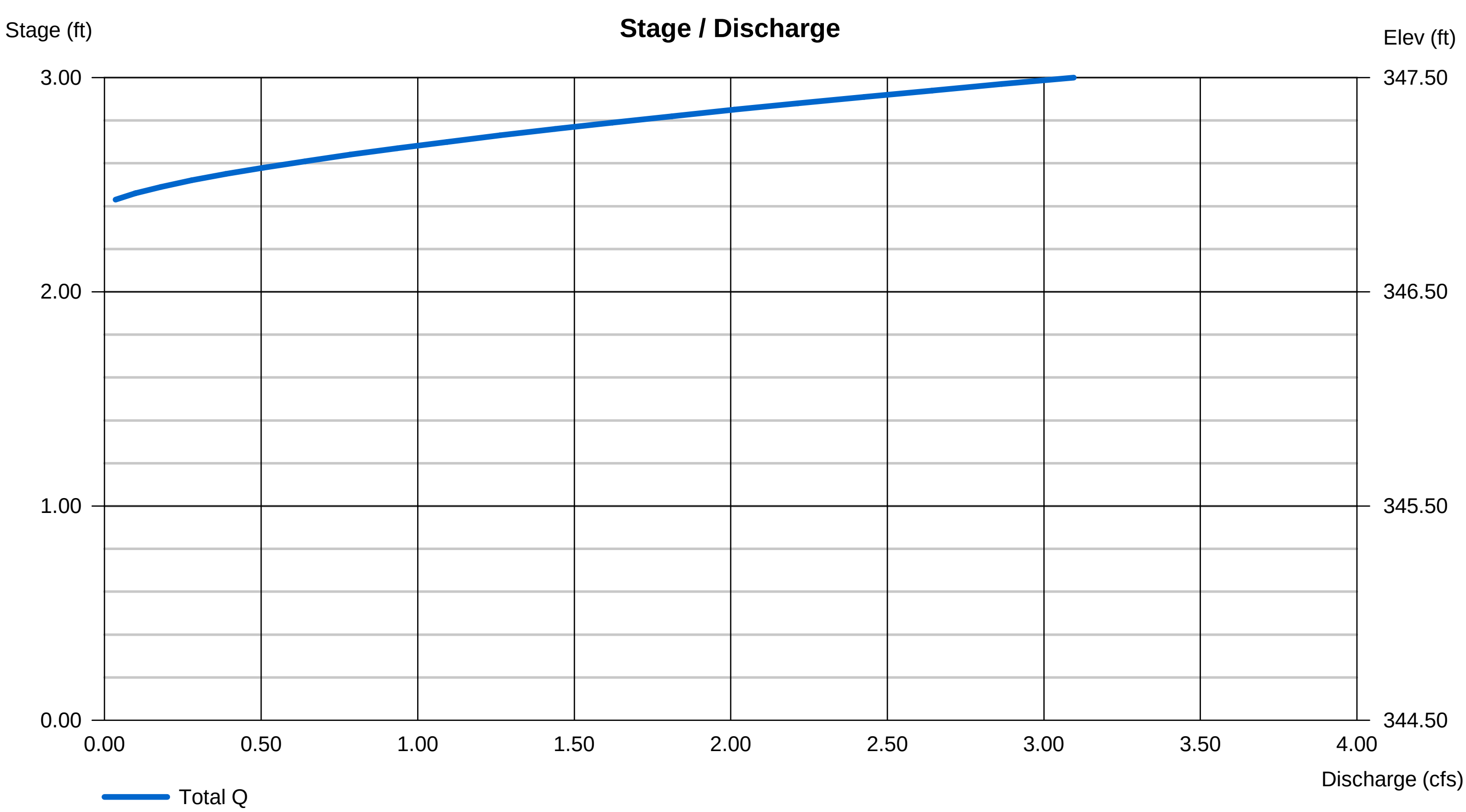
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 344.50	0.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 2.00	0.00	0.00	0.00
Crest El. (ft)	= 346.90	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

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

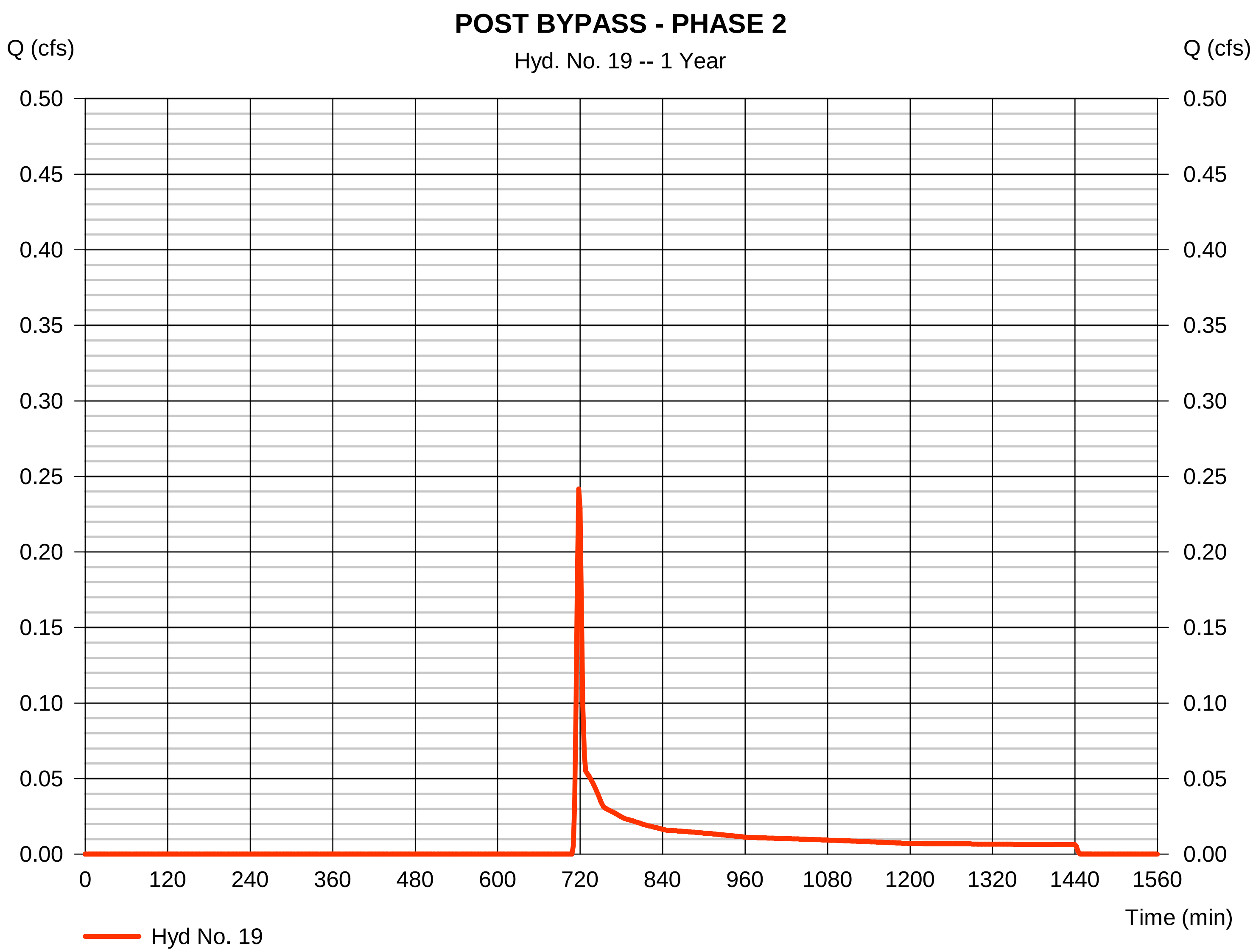


Hydrograph Report

Hyd. No. 19

POST BYPASS - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.242 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 653 cuft
Drainage area	= 0.580 ac	Curve number	= 62.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



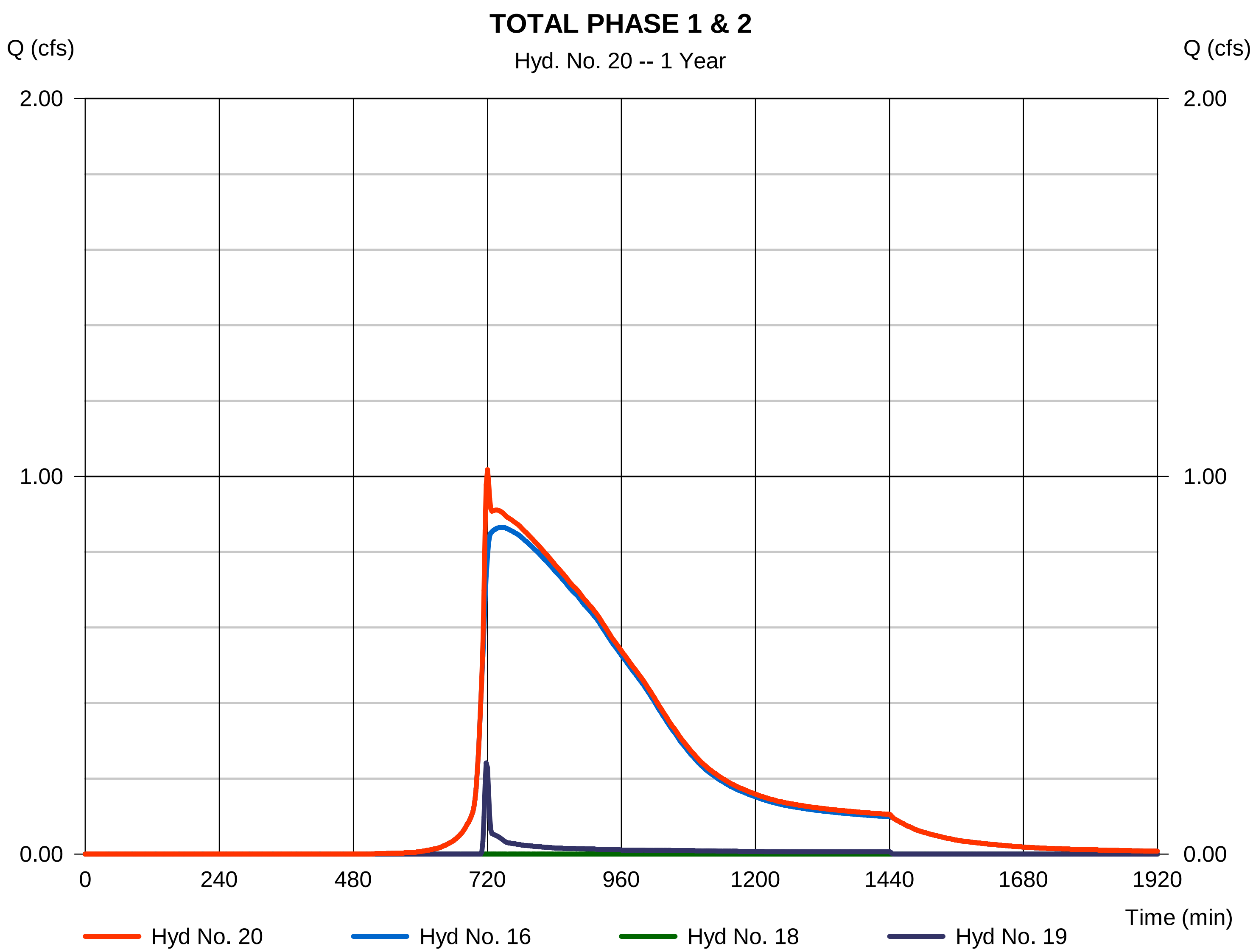
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 20

TOTAL PHASE 1 & 2

Hydrograph type	= Combine	Peak discharge	= 1.018 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 19,125 cuft
Inflow hyds.	= 16, 18, 19	Contrib. drain. area	= 0.580 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.621	2	718	4,583	------	------	------	PRE-DEV PHASE 1
2	SCS Runoff	1.214	2	718	3,620	------	------	------	PRE-DEV PHASE 2
4	Combine	2.835	2	718	8,203	1, 2,	------	------	TOTAL PRE-DEV
6	SCS Runoff	8.655	2	716	17,725	------	------	------	POST TO BED 1 - PHASE 1
7	Reservoir	0.859	2	742	17,676	6	339.73	8,428	BED 1 ROUTED - PHASE 1
8	SCS Runoff	0.461	2	718	994	------	------	------	POST TO BASIN 1 - PHASE 1
9	Combine	1.206	2	718	18,670	7, 8	------	------	TOTAL TO BASIN 1
10	Reservoir	0.727	2	854	18,659	9	339.97	2,883	BASIN 1 ROUTED
11	SCS Runoff	0.410	2	718	997	------	------	------	POST BYPASS - PHASE 1
12	Combine	0.750	2	852	19,656	10, 11	------	------	TOTAL PHASE 1
14	SCS Runoff	2.531	2	718	5,074	------	------	------	POST TO BED 1 - PHASE 2
15	Combine	11.16	2	716	22,799	6, 14	------	------	POST TO BED 1 TOTAL - PHASE 2
16	Reservoir	0.974	2	748	22,749	15	340.00	10,828	BED 1 ROUTED - PHASE 2
17	SCS Runoff	4.681	2	716	9,554	------	------	------	POST TO BED 2 - PHASE 2
18	Reservoir	0.000	2	n/a	0	17	346.03	9,554	BED 2 ROUTED - PHASE 2
19	SCS Runoff	0.419	2	718	972	------	------	------	POST BYPASS - PHASE 2
20	Combine	1.263	2	720	23,721	16, 18, 19	------	------	TOTAL PHASE 1 & 2

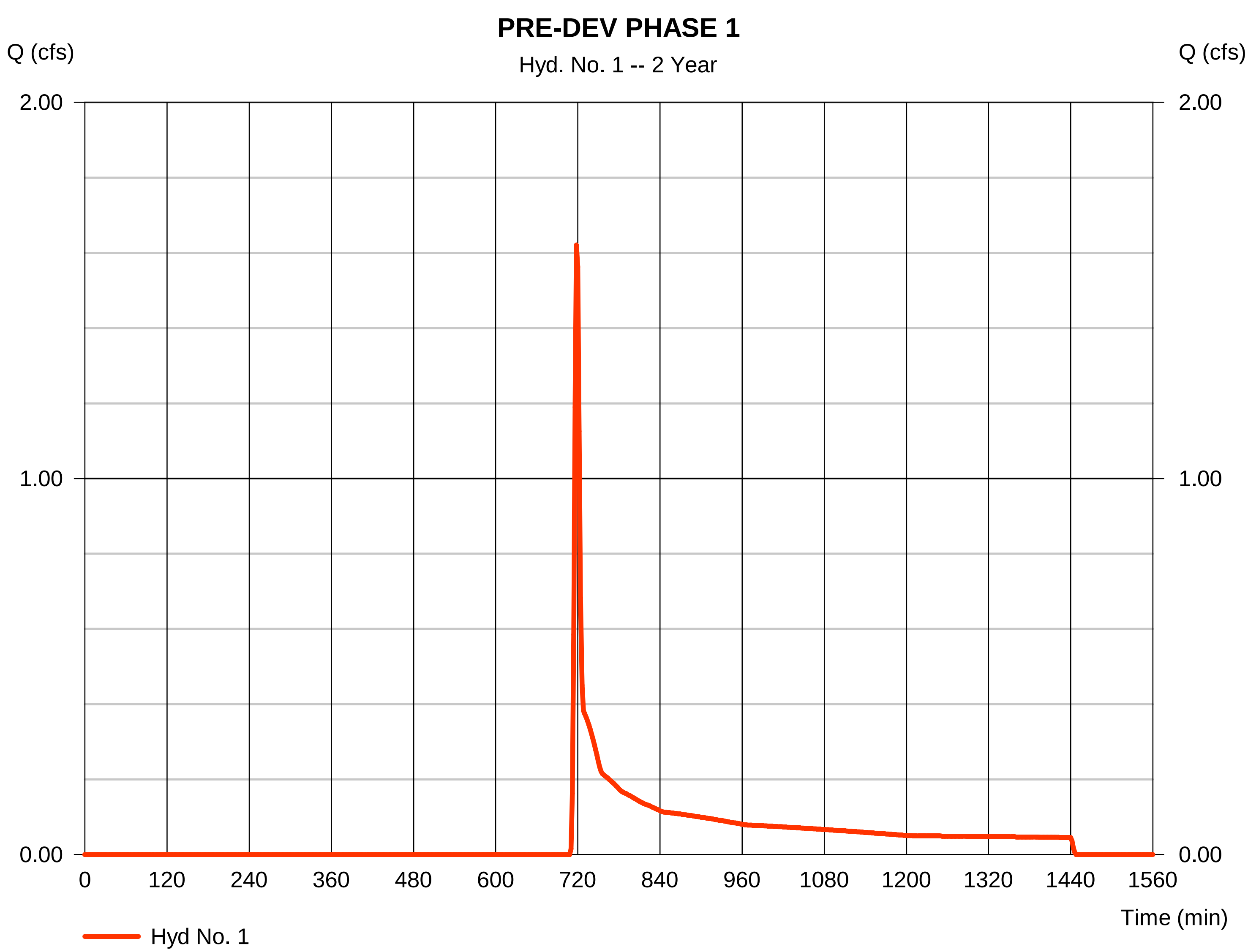
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 1

PRE-DEV PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.621 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 4,583 cuft
Drainage area	= 3.770 ac	Curve number	= 58.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



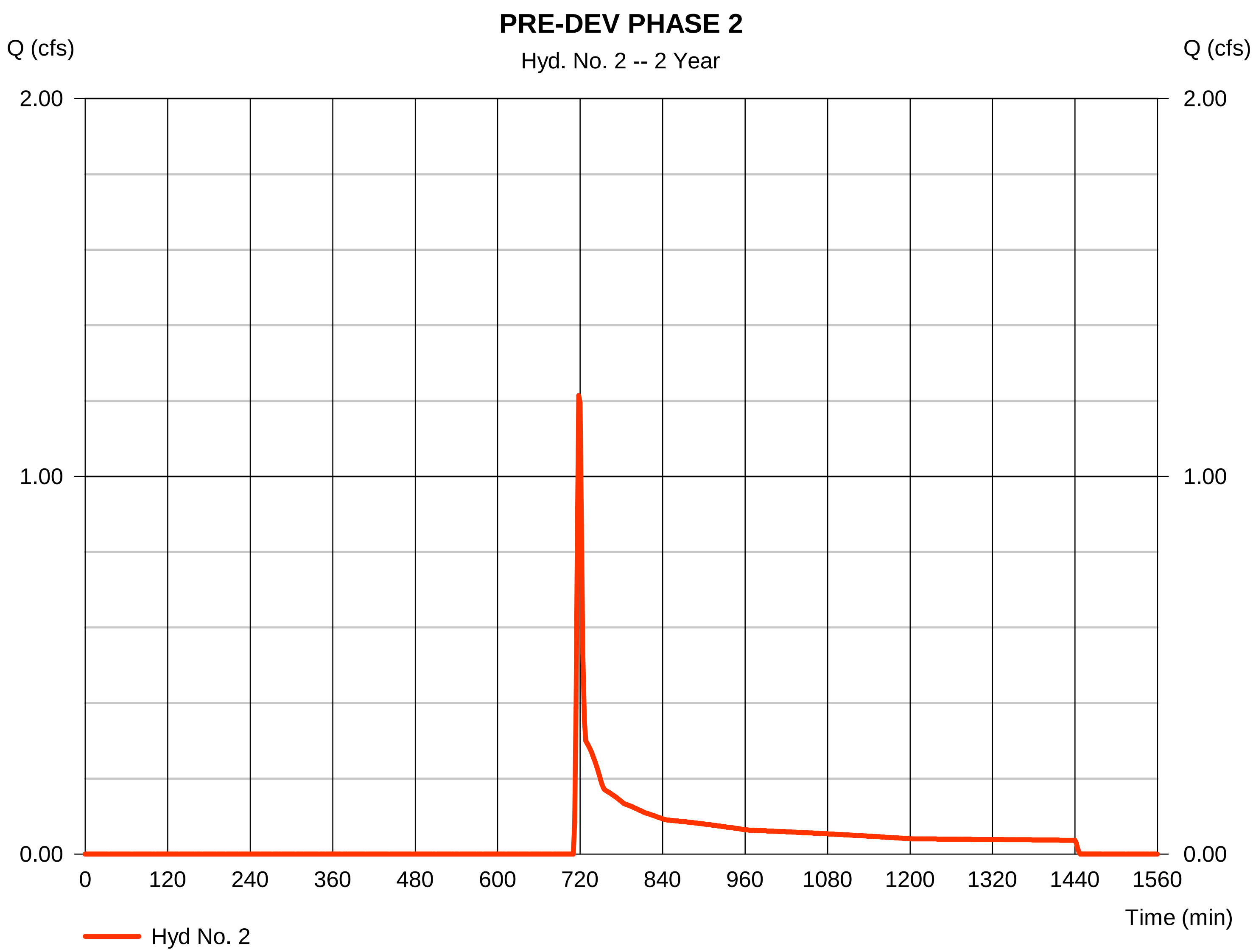
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 2

PRE-DEV PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.214 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 3,620 cuft
Drainage area	= 3.150 ac	Curve number	= 57.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



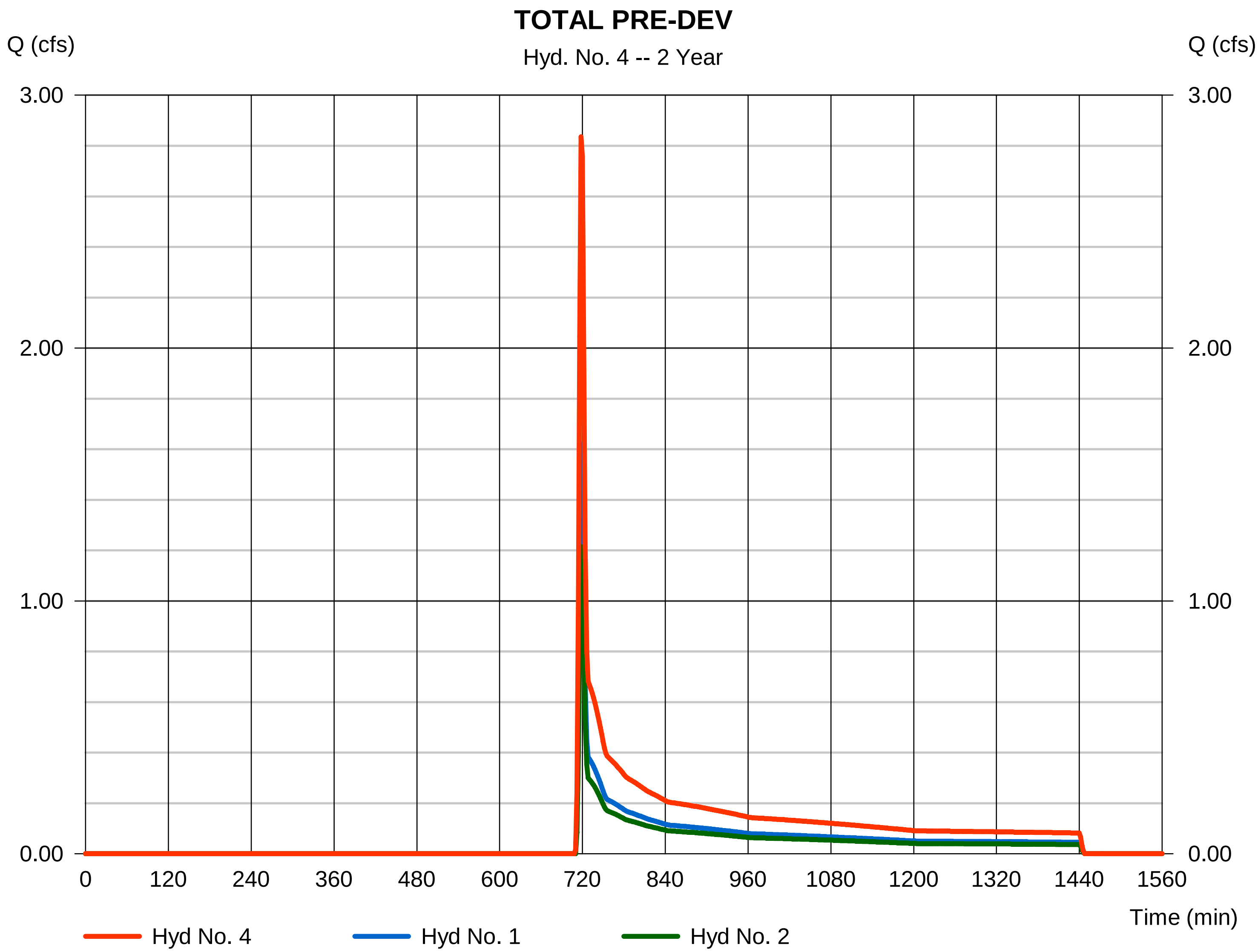
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 4

TOTAL PRE-DEV

Hydrograph type	= Combine	Peak discharge	= 2.835 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 8,203 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 6.920 ac



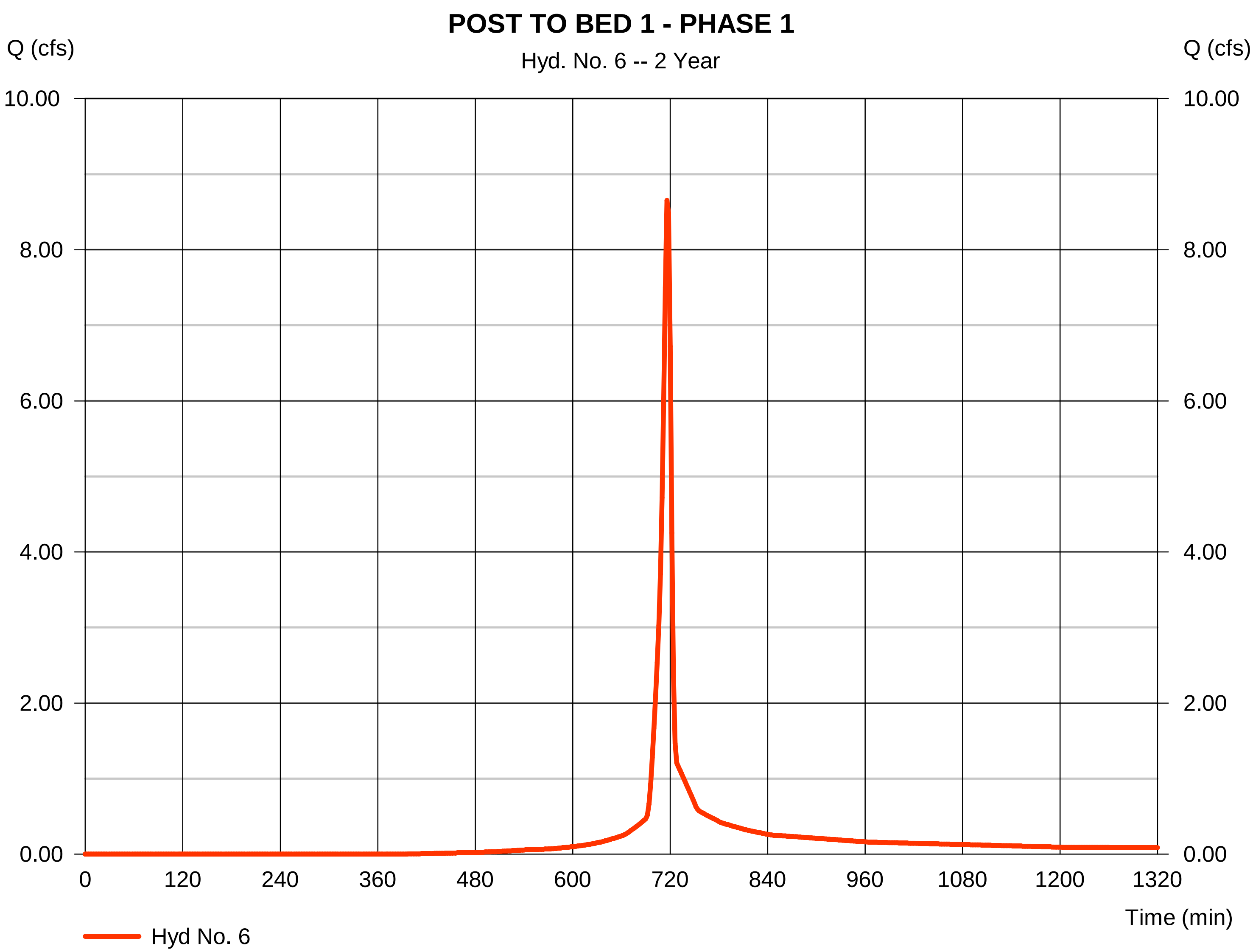
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 6

POST TO BED 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 8.655 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 17,725 cuft
Drainage area	= 2.630 ac	Curve number	= 87.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

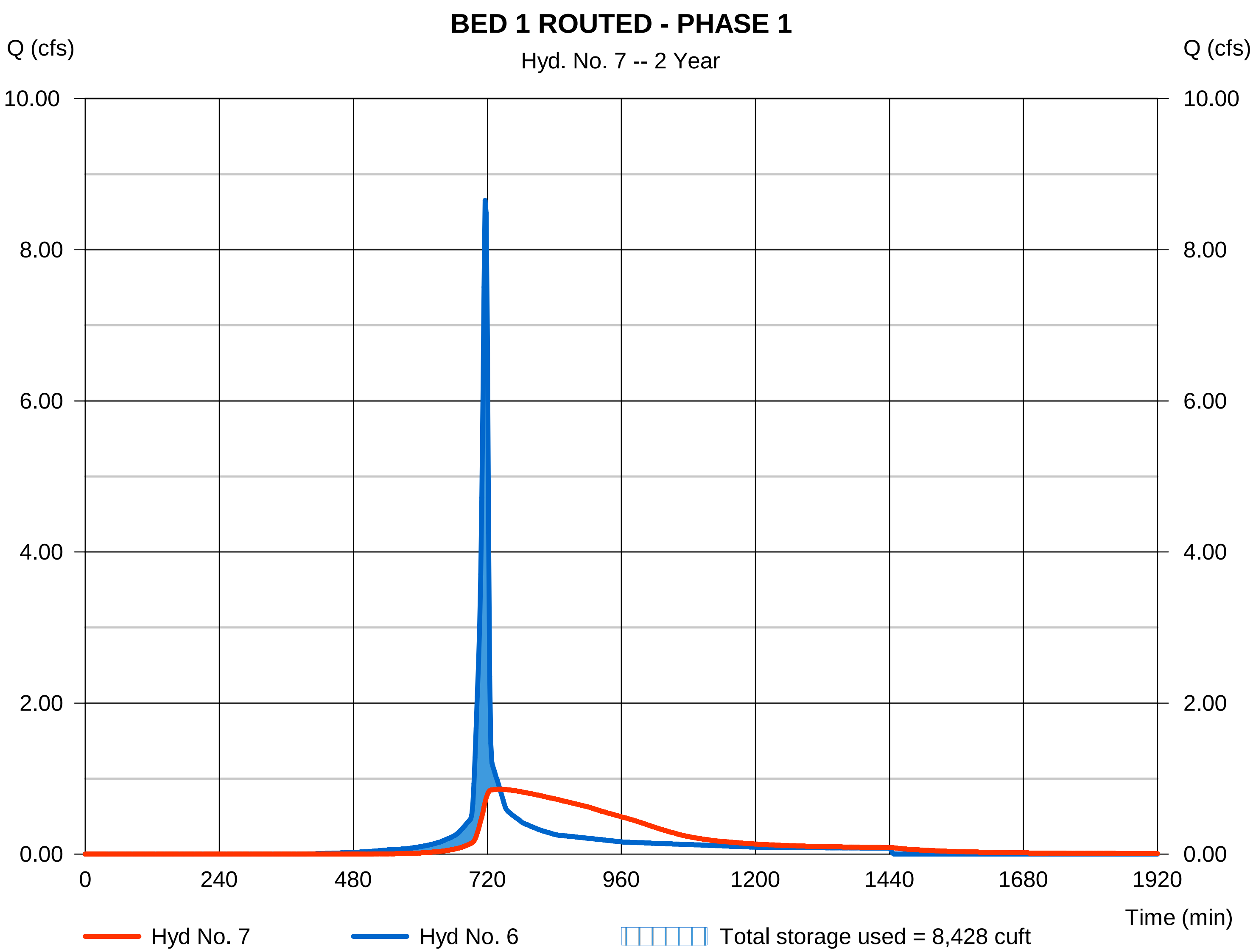
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 7

BED 1 ROUTED - PHASE 1

Hydrograph type	= Reservoir	Peak discharge	= 0.859 cfs
Storm frequency	= 2 yrs	Time to peak	= 742 min
Time interval	= 2 min	Hyd. volume	= 17,676 cuft
Inflow hyd. No.	= 6 - POST TO BED 1 - PHASE 1	Max. Elevation	= 339.73 ft
Reservoir name	= MRC BED 1	Max. Storage	= 8,428 cuft

Storage Indication method used.



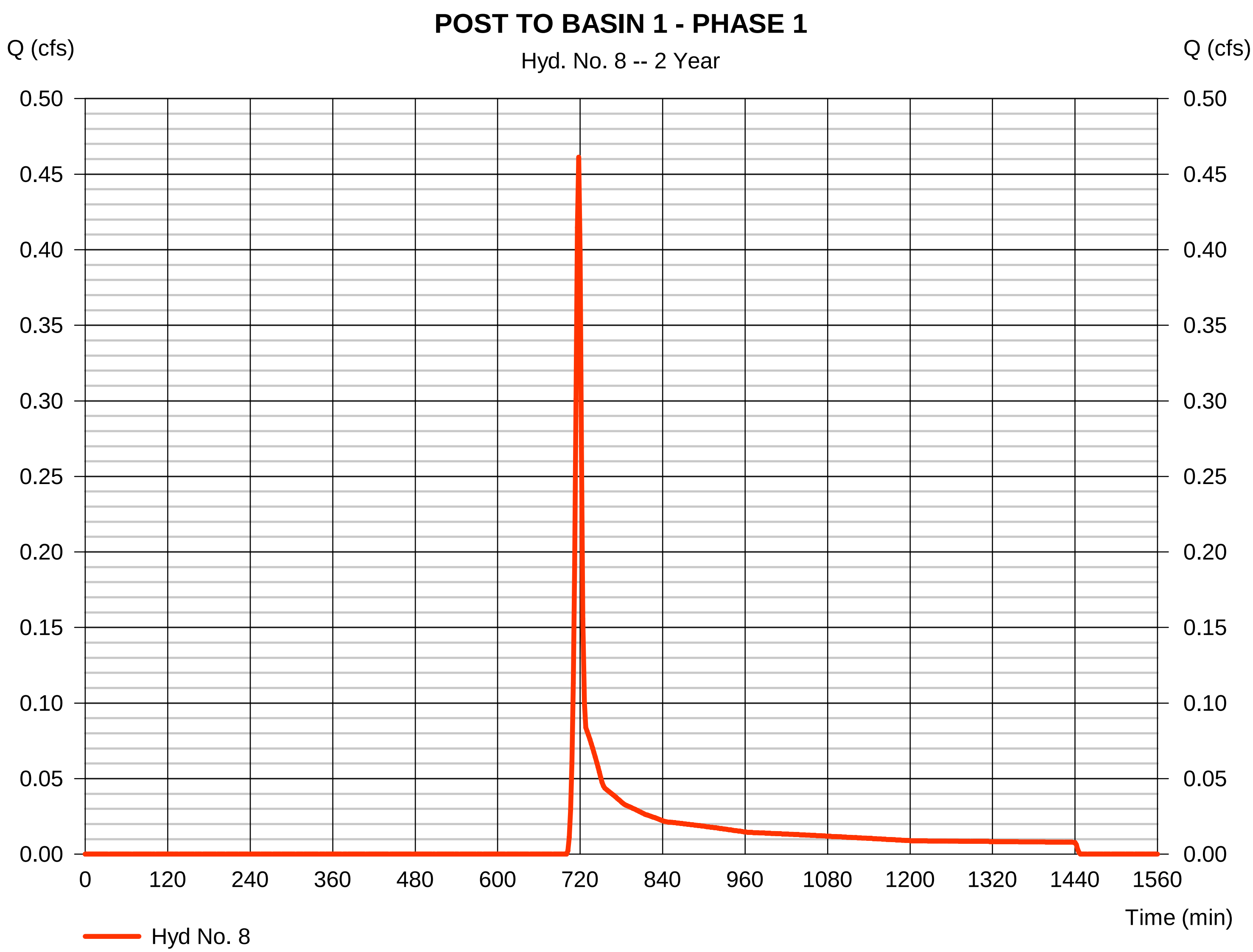
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 8

POST TO BASIN 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.461 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 994 cuft
Drainage area	= 0.480 ac	Curve number	= 65.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



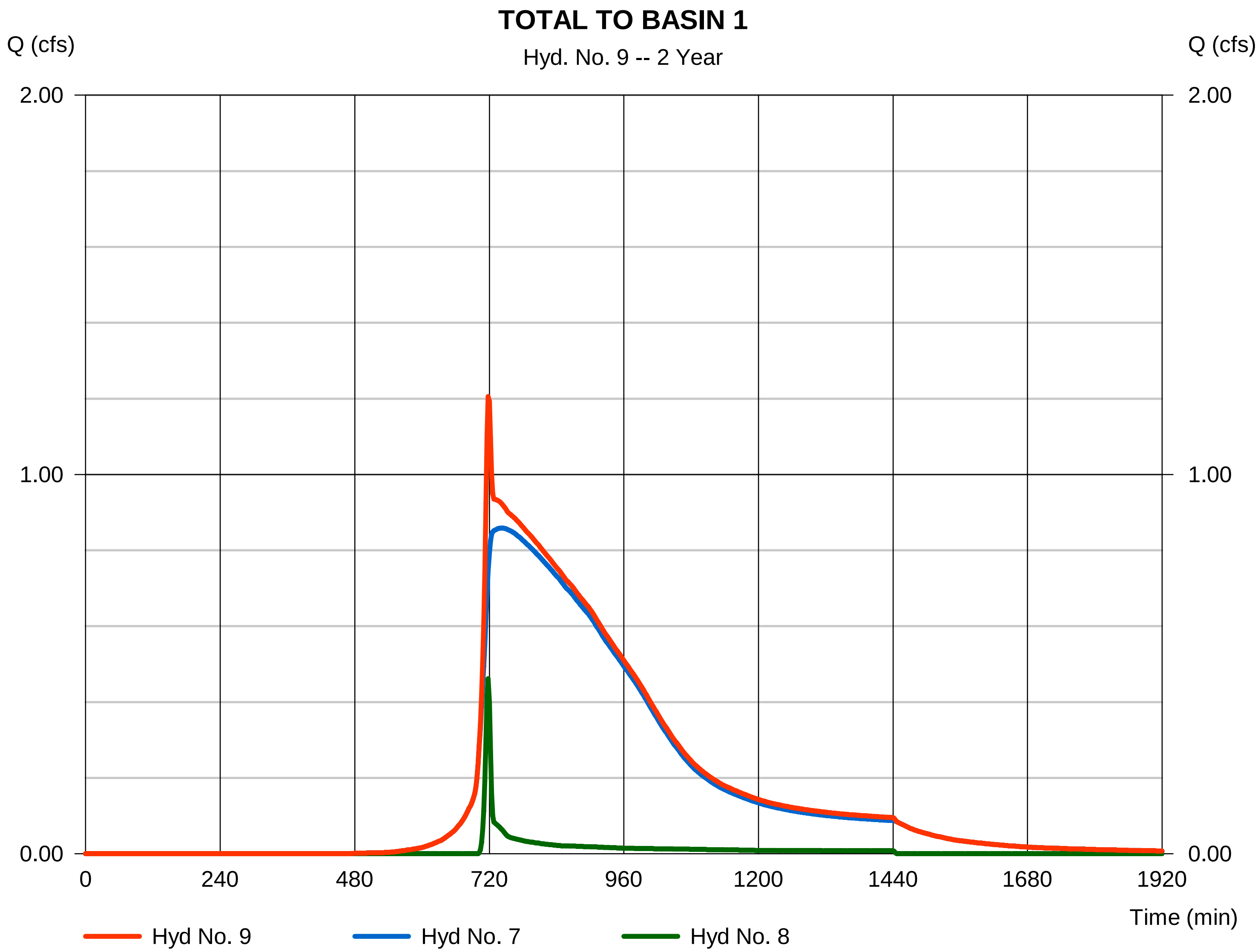
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 9

TOTAL TO BASIN 1

Hydrograph type	= Combine	Peak discharge	= 1.206 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 18,670 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 0.480 ac



Hydrograph Report

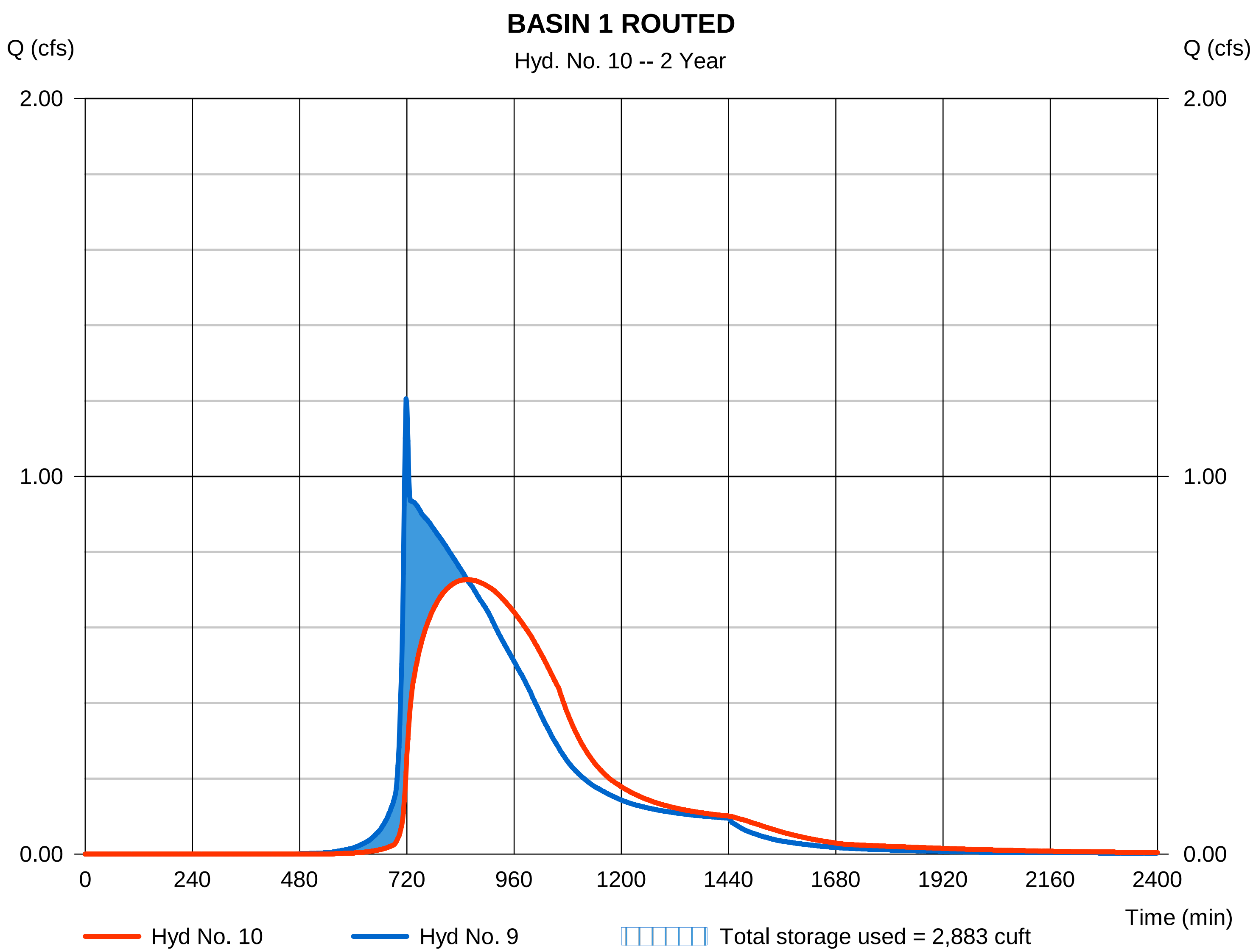
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 10

BASIN 1 ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 0.727 cfs
Storm frequency	= 2 yrs	Time to peak	= 854 min
Time interval	= 2 min	Hyd. volume	= 18,659 cuft
Inflow hyd. No.	= 9 - TOTAL TO BASIN 1	Max. Elevation	= 339.97 ft
Reservoir name	= DETENTION BASIN 1	Max. Storage	= 2,883 cuft

Storage Indication method used.



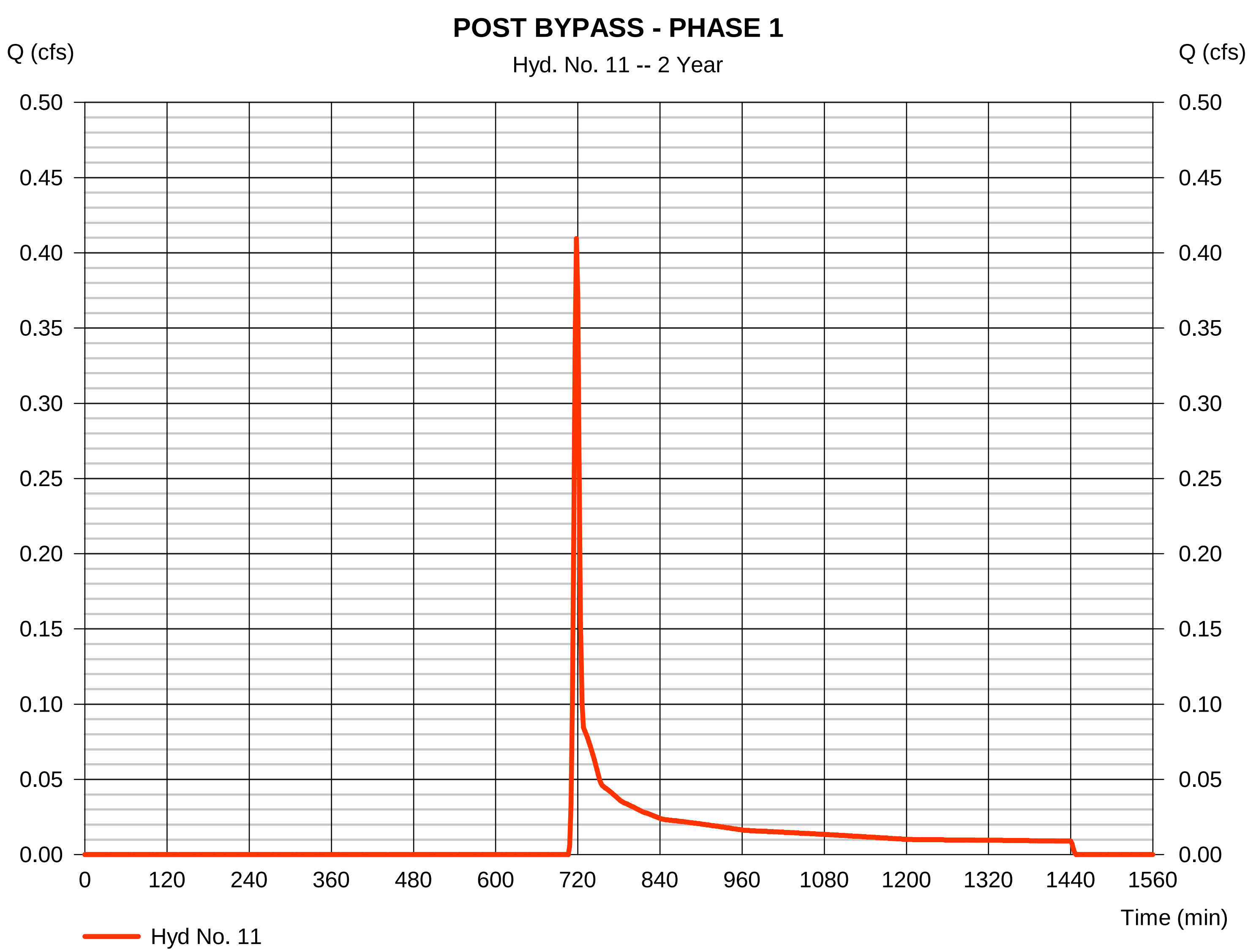
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 11

POST BYPASS - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.410 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 997 cuft
Drainage area	= 0.660 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



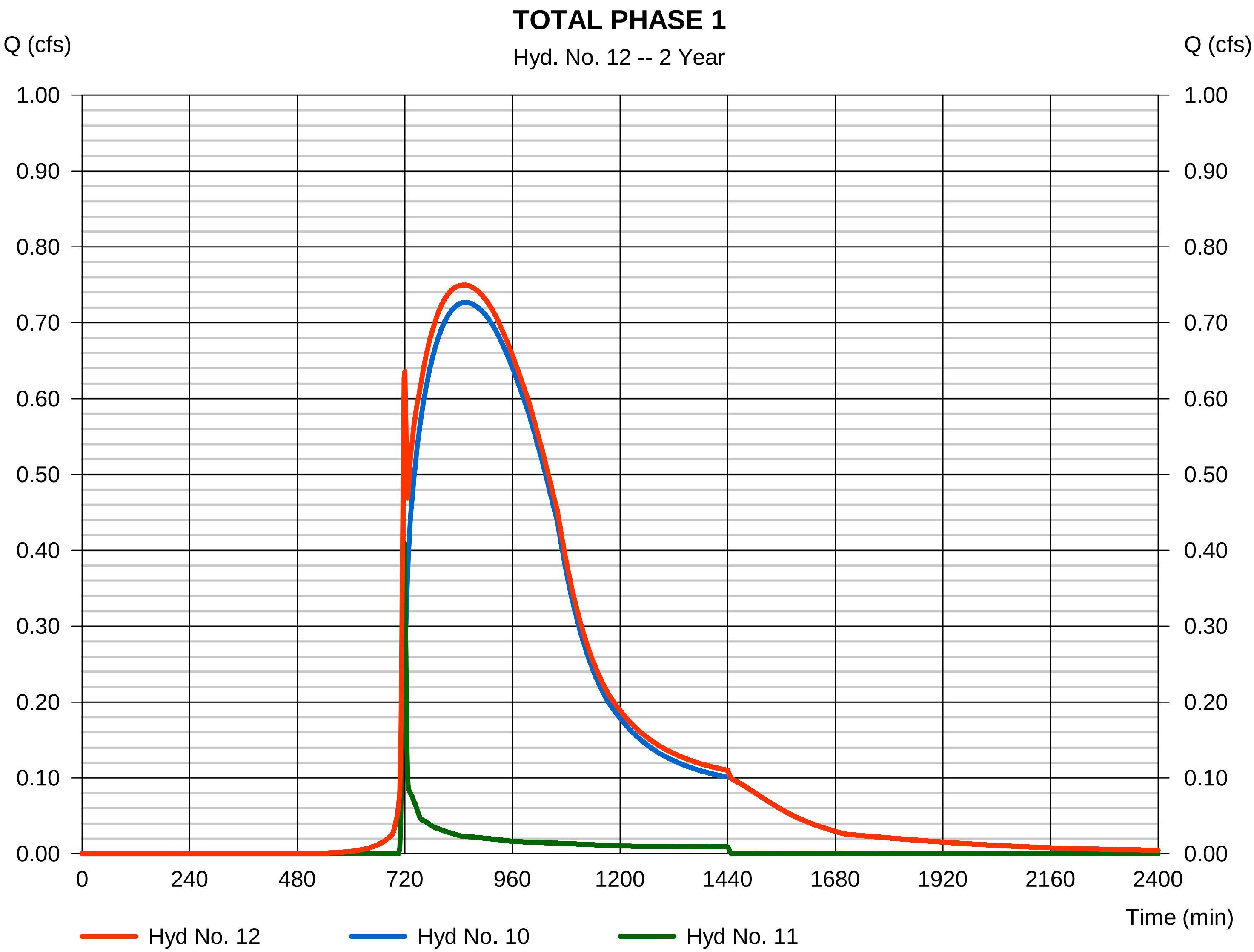
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 12

TOTAL PHASE 1

Hydrograph type	= Combine	Peak discharge	= 0.750 cfs
Storm frequency	= 2 yrs	Time to peak	= 852 min
Time interval	= 2 min	Hyd. volume	= 19,656 cuft
Inflow hyds.	= 10, 11	Contrib. drain. area	= 0.660 ac



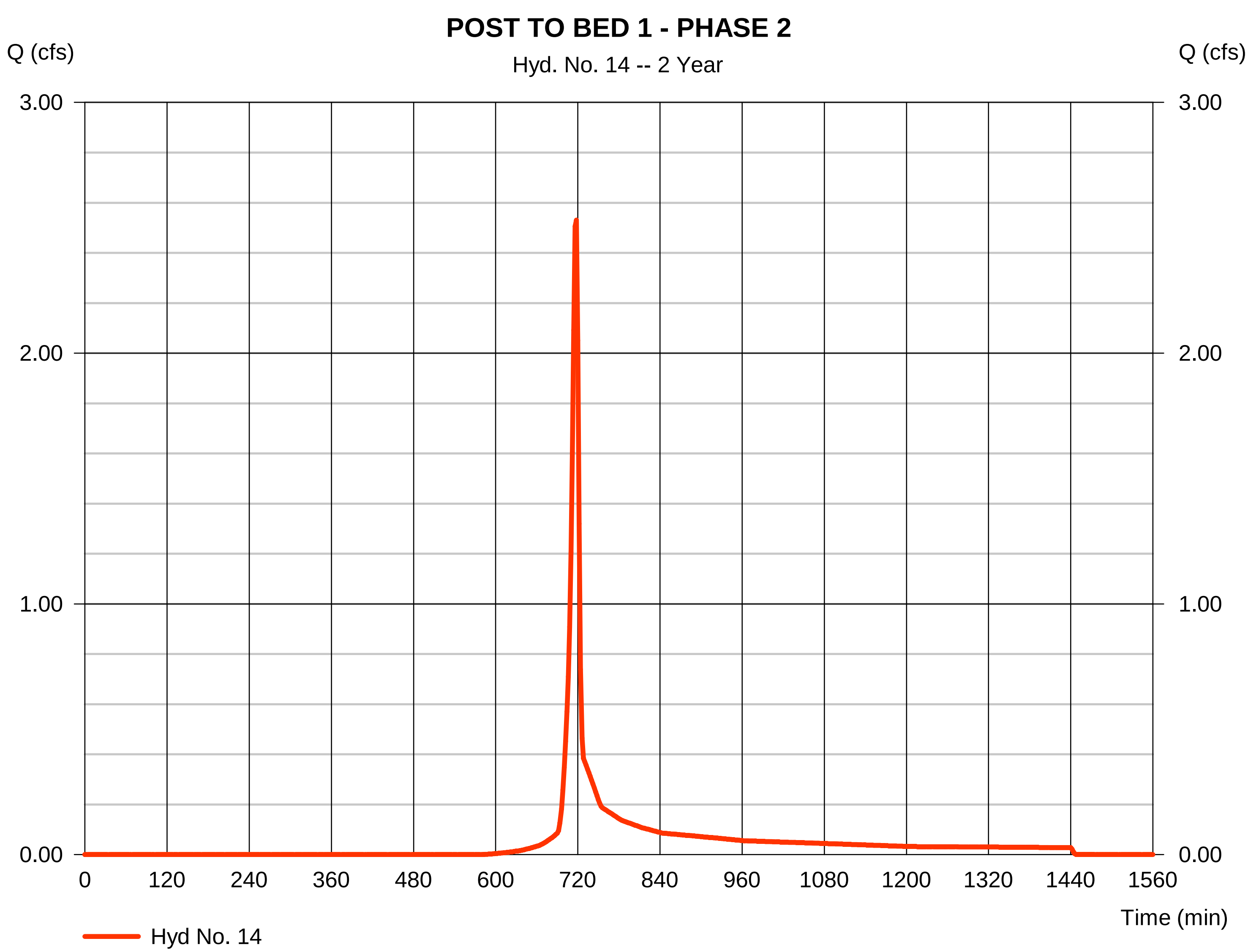
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 14

POST TO BED 1 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.531 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 5,074 cuft
Drainage area	= 1.110 ac	Curve number	= 79.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



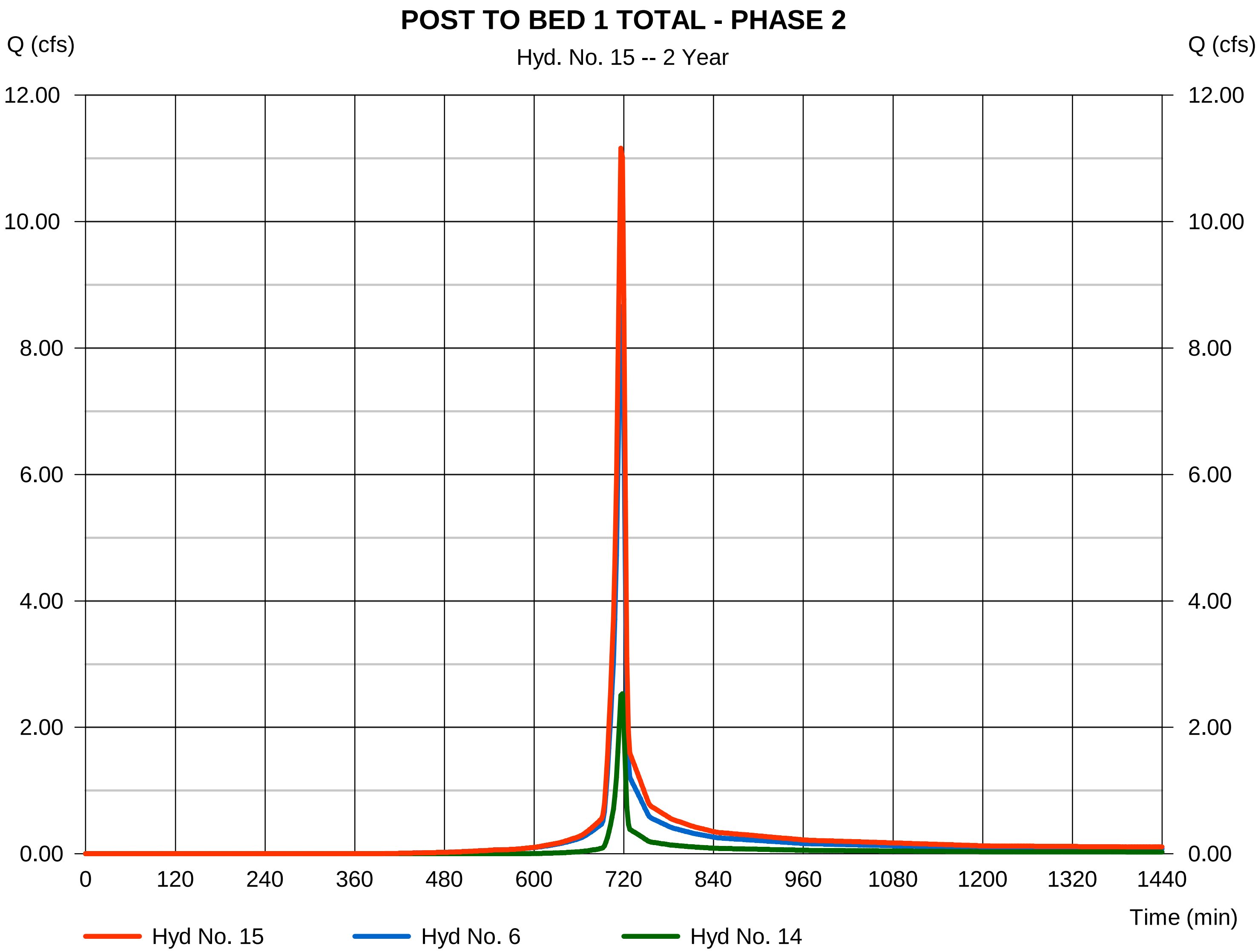
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 15

POST TO BED 1 TOTAL - PHASE 2

Hydrograph type	= Combine	Peak discharge	= 11.16 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 22,799 cuft
Inflow hyds.	= 6, 14	Contrib. drain. area	= 3.740 ac



Hydrograph Report

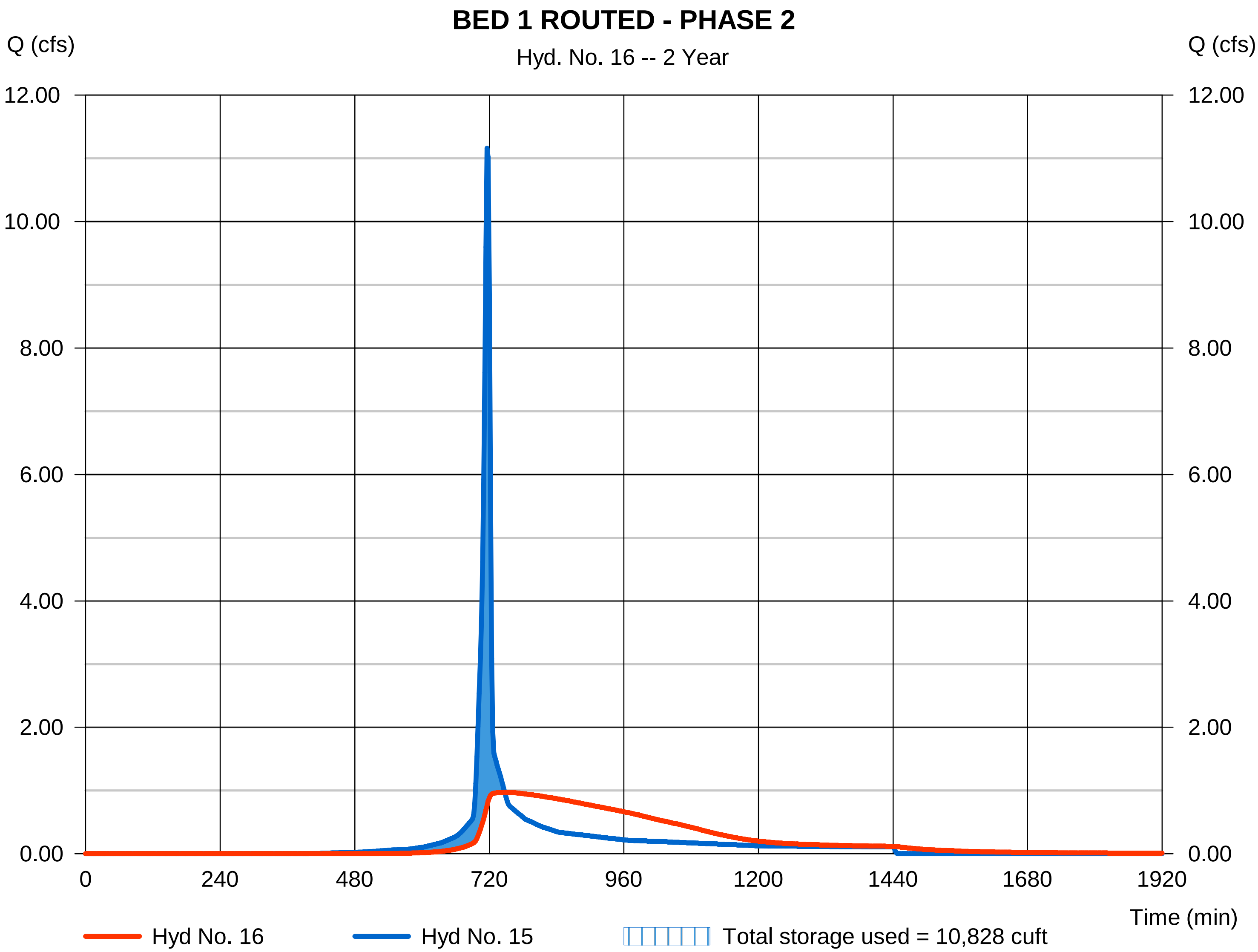
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 16

BED 1 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 0.974 cfs
Storm frequency	= 2 yrs	Time to peak	= 748 min
Time interval	= 2 min	Hyd. volume	= 22,749 cuft
Inflow hyd. No.	= 15 - POST TO BED 1 TOTAL - PHASE 2	Max. Elevation	= 340.00 ft
Reservoir name	= MRC BED 1	Max. Storage	= 10,828 cuft

Storage Indication method used.



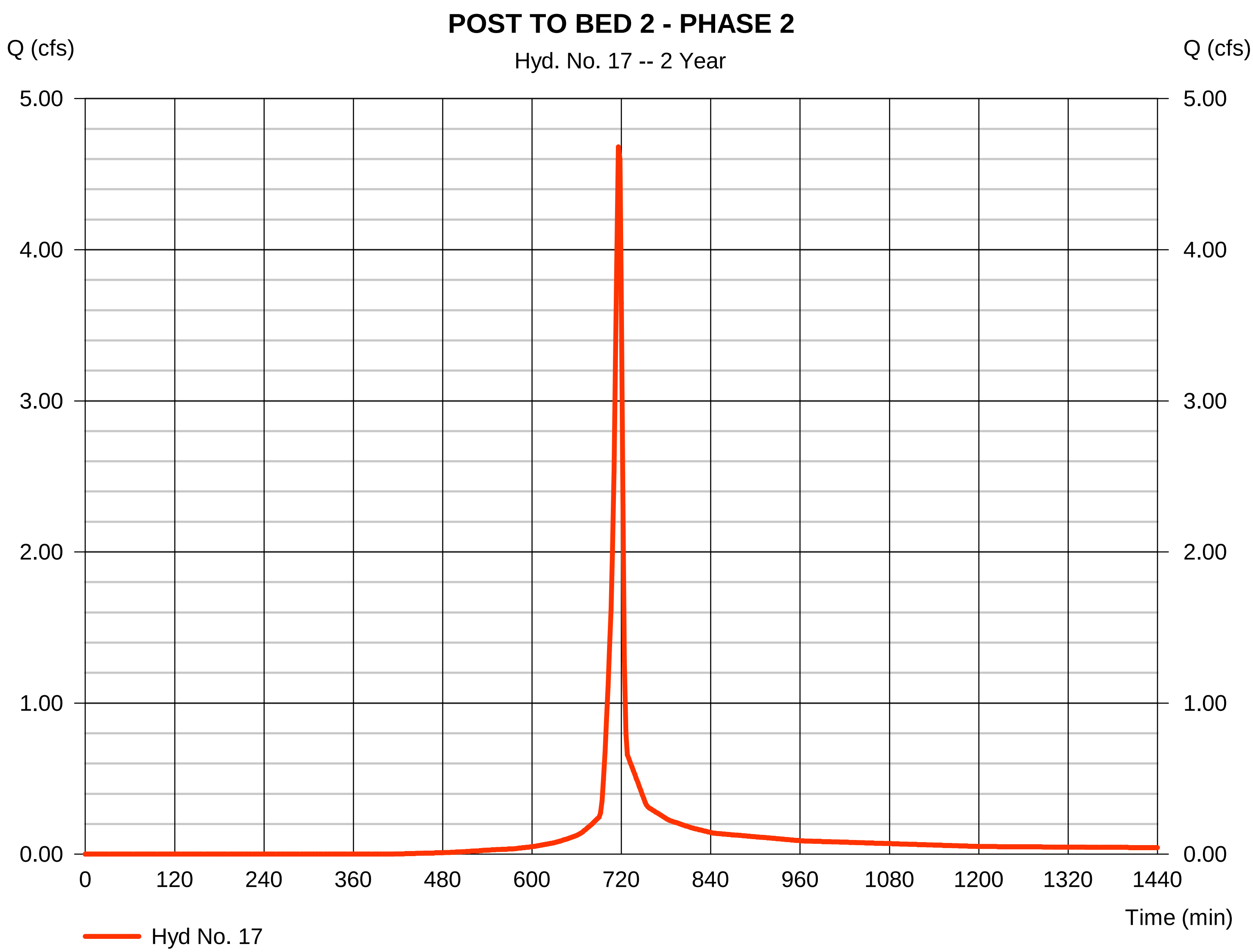
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 17

POST TO BED 2 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 4.681 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 9,554 cuft
Drainage area	= 1.460 ac	Curve number	= 87.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

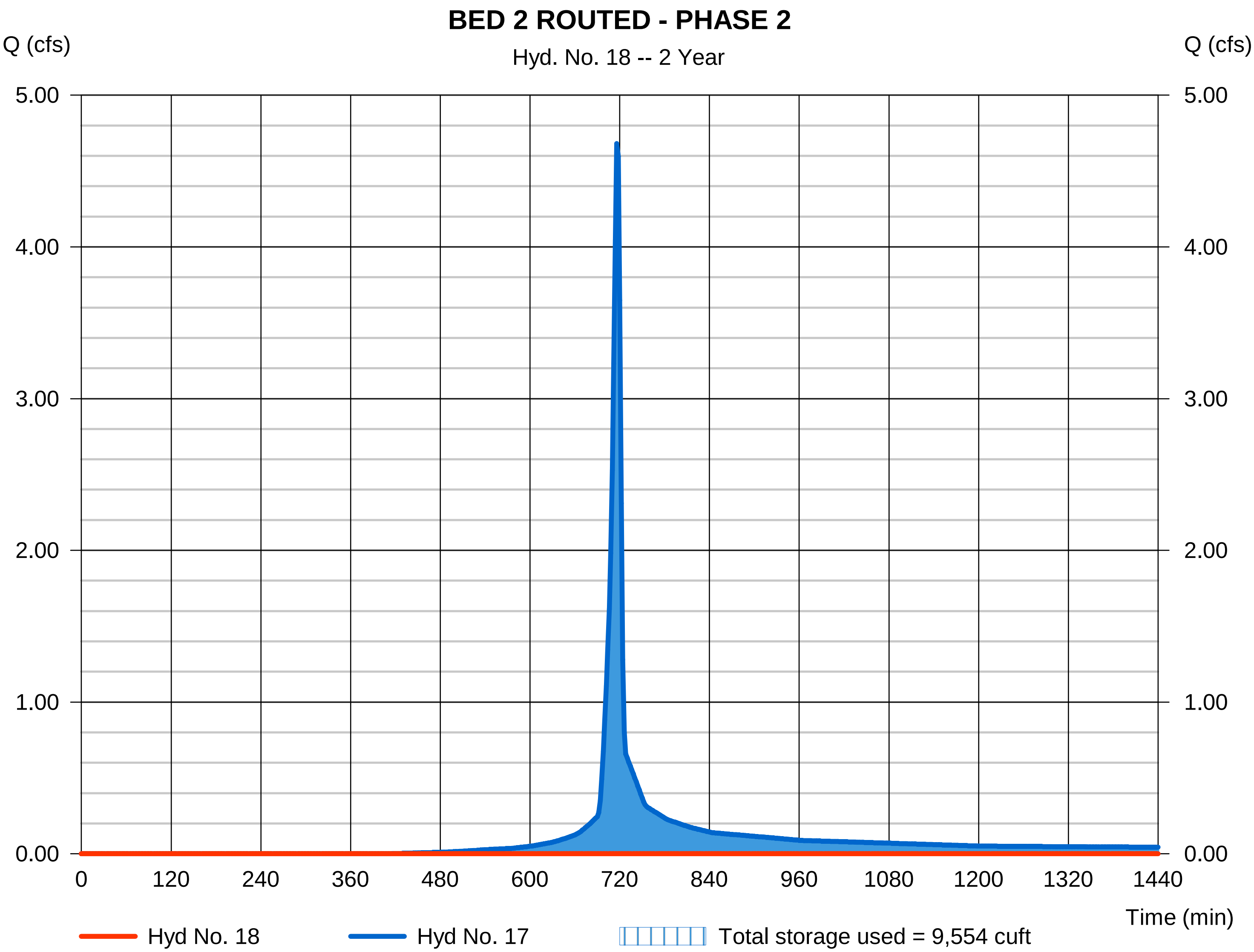
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 18

BED 2 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 17 - POST TO BED 2 - PHASE 2	Max. Elevation	= 346.03 ft
Reservoir name	= INFILTRATION BED 2	Max. Storage	= 9,554 cuft

Storage Indication method used.



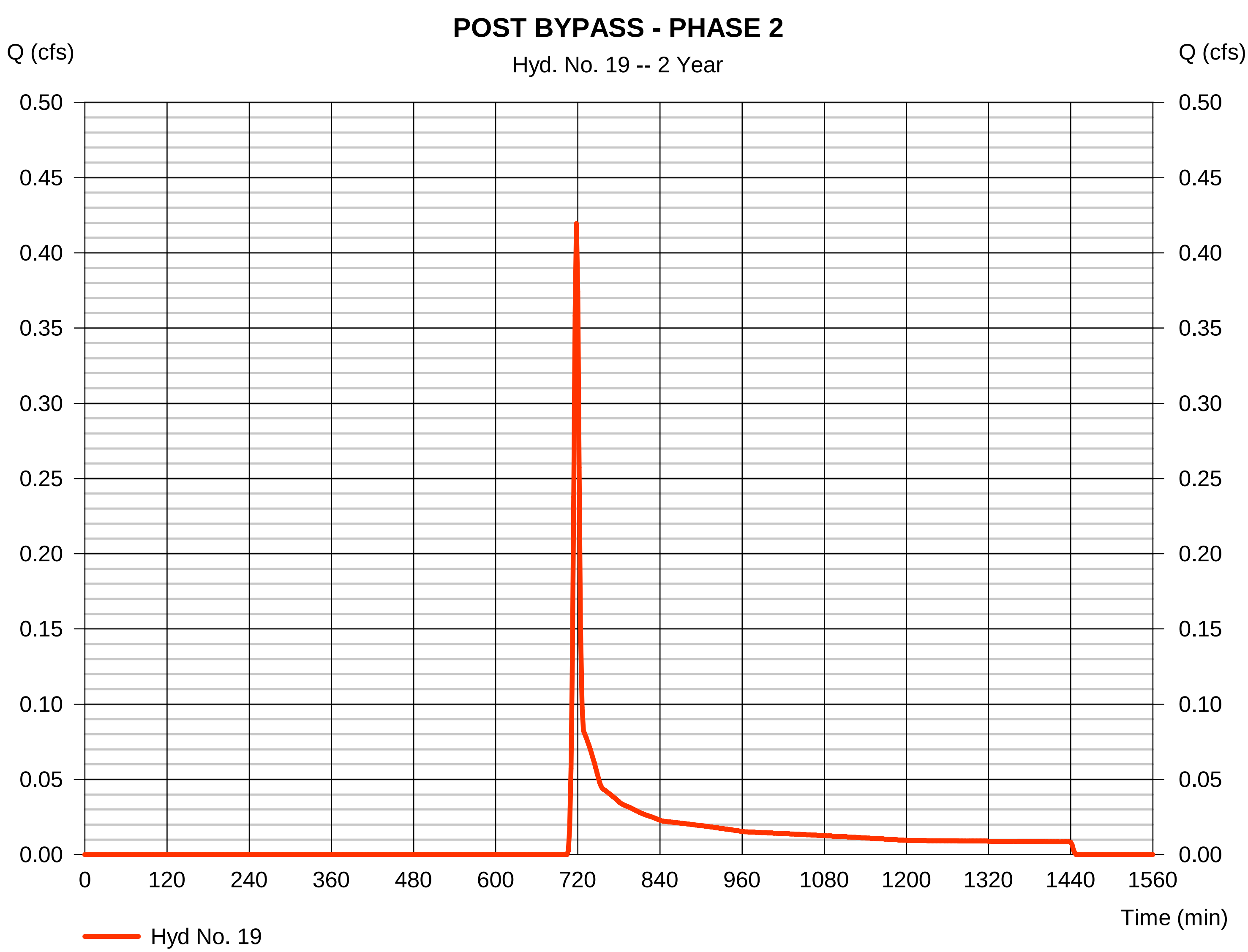
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 19

POST BYPASS - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.419 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 972 cuft
Drainage area	= 0.580 ac	Curve number	= 62.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



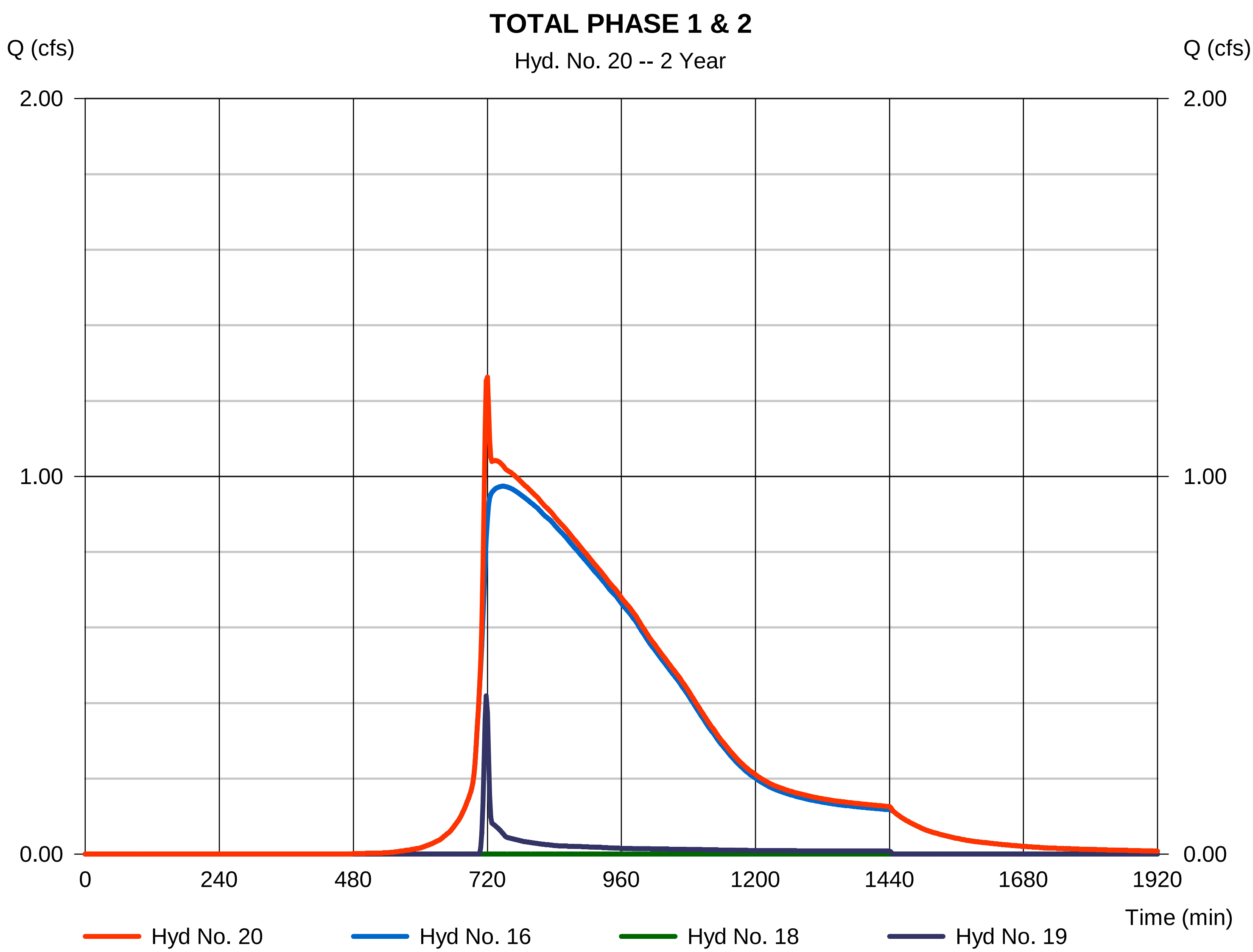
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 20

TOTAL PHASE 1 & 2

Hydrograph type	= Combine	Peak discharge	= 1.263 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 23,721 cuft
Inflow hyds.	= 16, 18, 19	Contrib. drain. area	= 0.580 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	4.636	2	718	10,049	------	------	------	PRE-DEV PHASE 1
2	SCS Runoff	3.679	2	718	8,067	------	------	------	PRE-DEV PHASE 2
4	Combine	8.315	2	718	18,116	1, 2,	------	------	TOTAL PRE-DEV
6	SCS Runoff	12.45	2	716	25,920	------	------	------	POST TO BED 1 - PHASE 1
7	Reservoir	1.056	2	746	25,871	6	340.20	12,718	BED 1 ROUTED - PHASE 1
8	SCS Runoff	0.935	2	718	1,892	------	------	------	POST TO BASIN 1 - PHASE 1
9	Combine	1.853	2	718	27,764	7, 8	------	------	TOTAL TO BASIN 1
10	Reservoir	0.907	2	884	27,752	9	340.34	4,236	BASIN 1 ROUTED
11	SCS Runoff	0.984	2	718	2,058	------	------	------	POST BYPASS - PHASE 1
12	Combine	1.458	2	718	29,810	10, 11	------	------	TOTAL PHASE 1
14	SCS Runoff	3.992	2	716	8,065	------	------	------	POST TO BED 1 - PHASE 2
15	Combine	16.44	2	716	33,986	6, 14	------	------	POST TO BED 1 TOTAL - PHASE 2
16	Reservoir	1.216	2	752	33,936	15	340.65	16,815	BED 1 ROUTED - PHASE 2
17	SCS Runoff	6.781	2	716	14,061	------	------	------	POST TO BED 2 - PHASE 2
18	Reservoir	0.000	2	n/a	0	17	346.62	14,061	BED 2 ROUTED - PHASE 2
19	SCS Runoff	0.945	2	718	1,951	------	------	------	POST BYPASS - PHASE 2
20	Combine	1.983	2	718	35,888	16, 18, 19	------	------	TOTAL PHASE 1 & 2

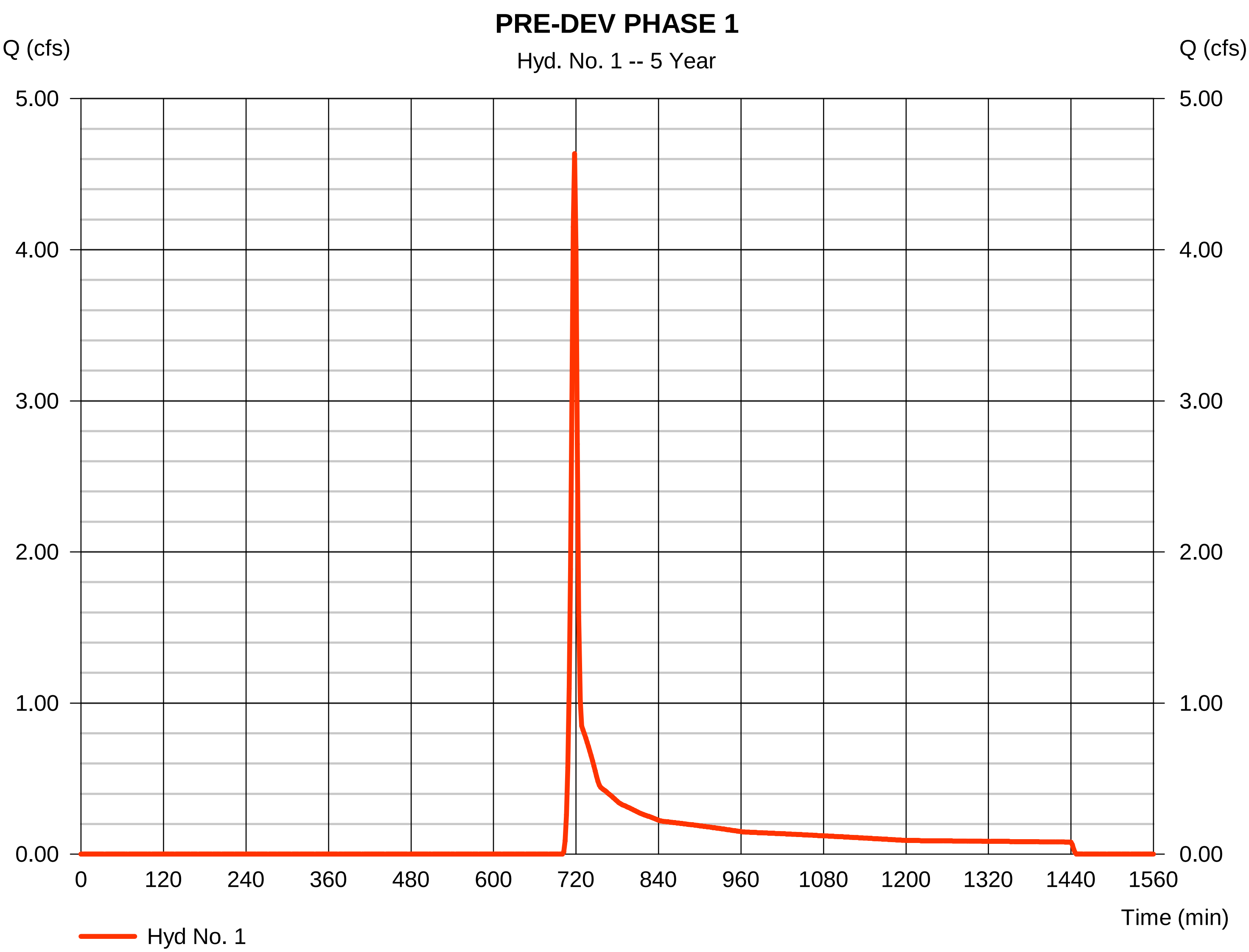
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 1

PRE-DEV PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.636 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 10,049 cuft
Drainage area	= 3.770 ac	Curve number	= 58.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



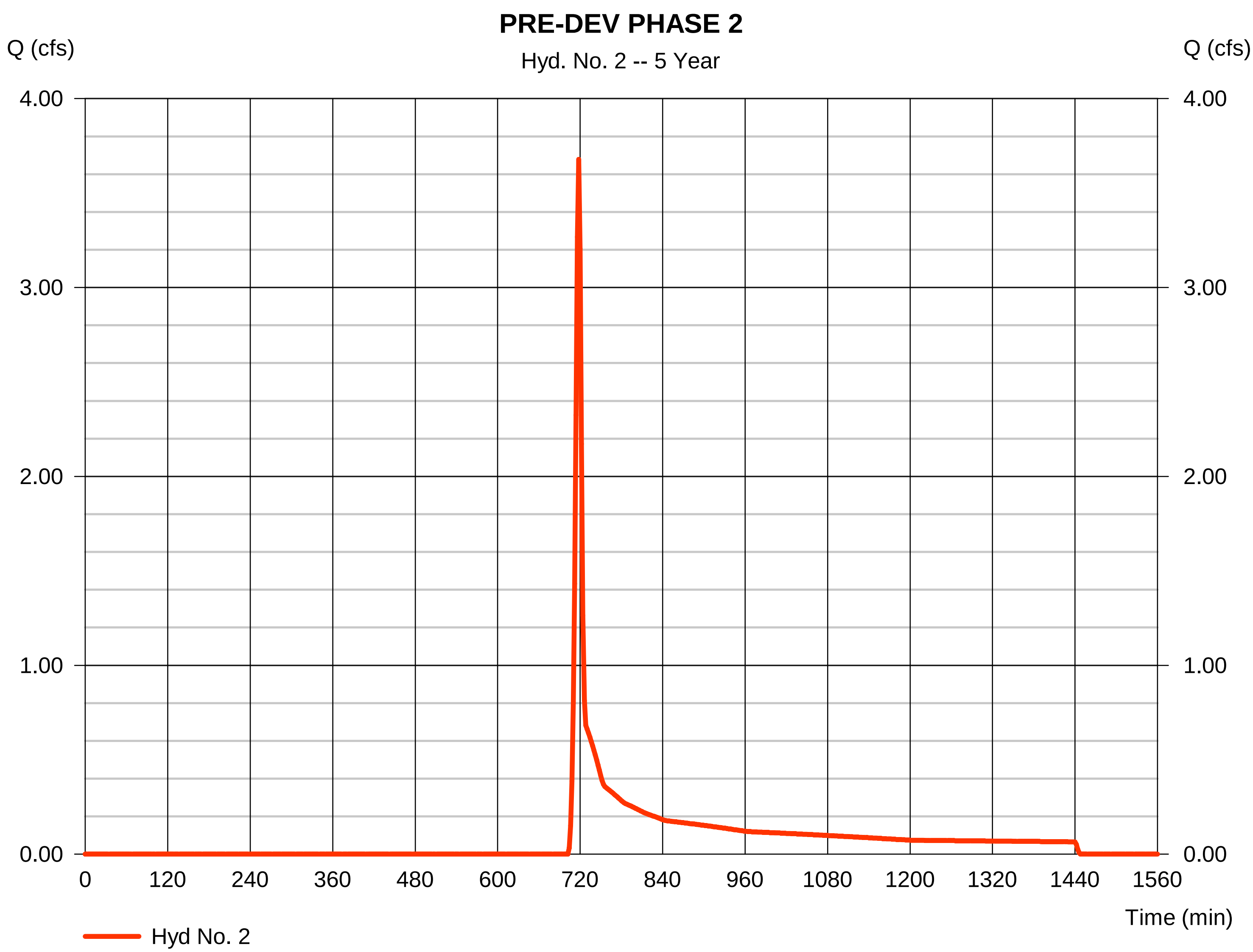
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 2

PRE-DEV PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 3.679 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 8,067 cuft
Drainage area	= 3.150 ac	Curve number	= 57.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



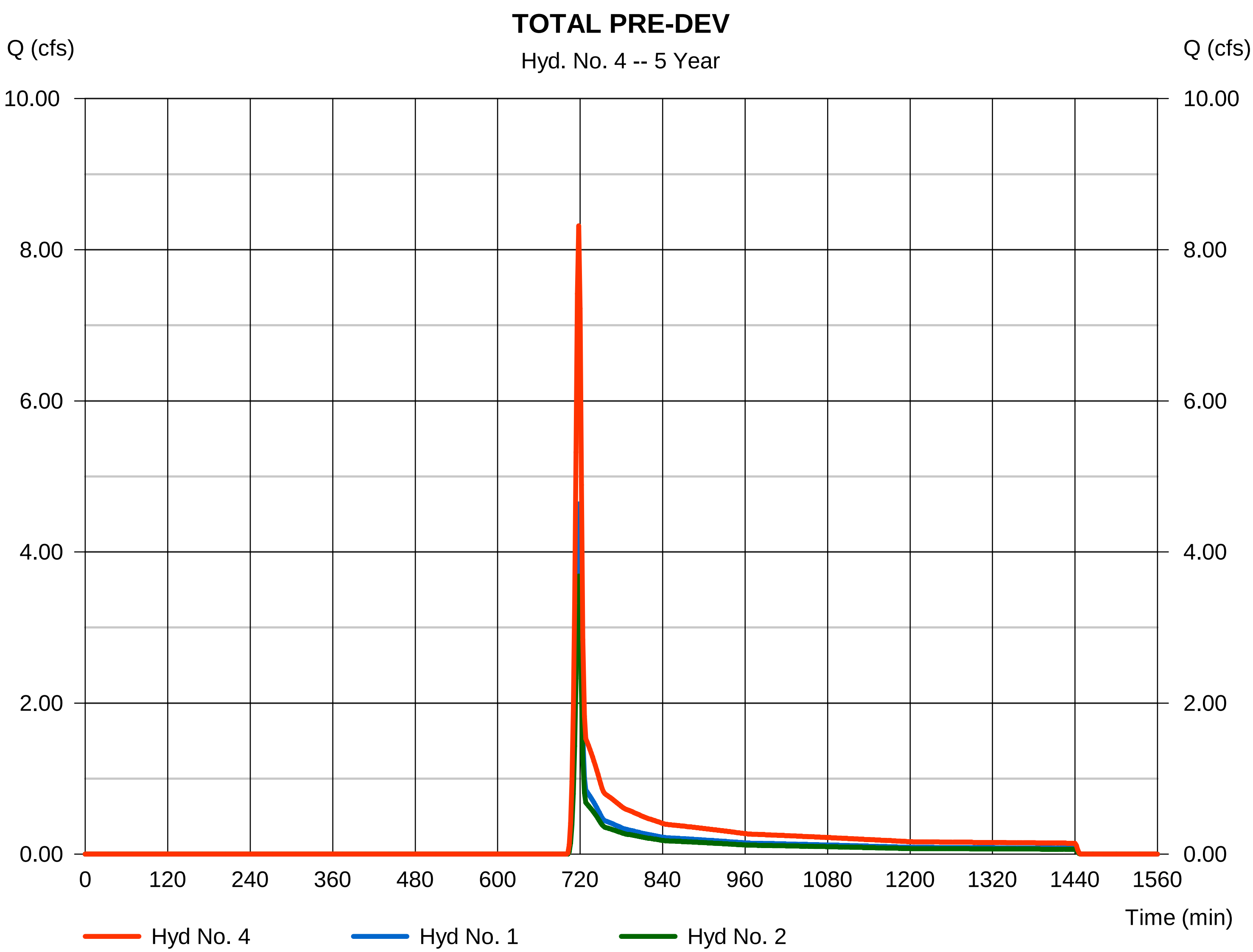
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 4

TOTAL PRE-DEV

Hydrograph type	= Combine	Peak discharge	= 8.315 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 18,116 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 6.920 ac



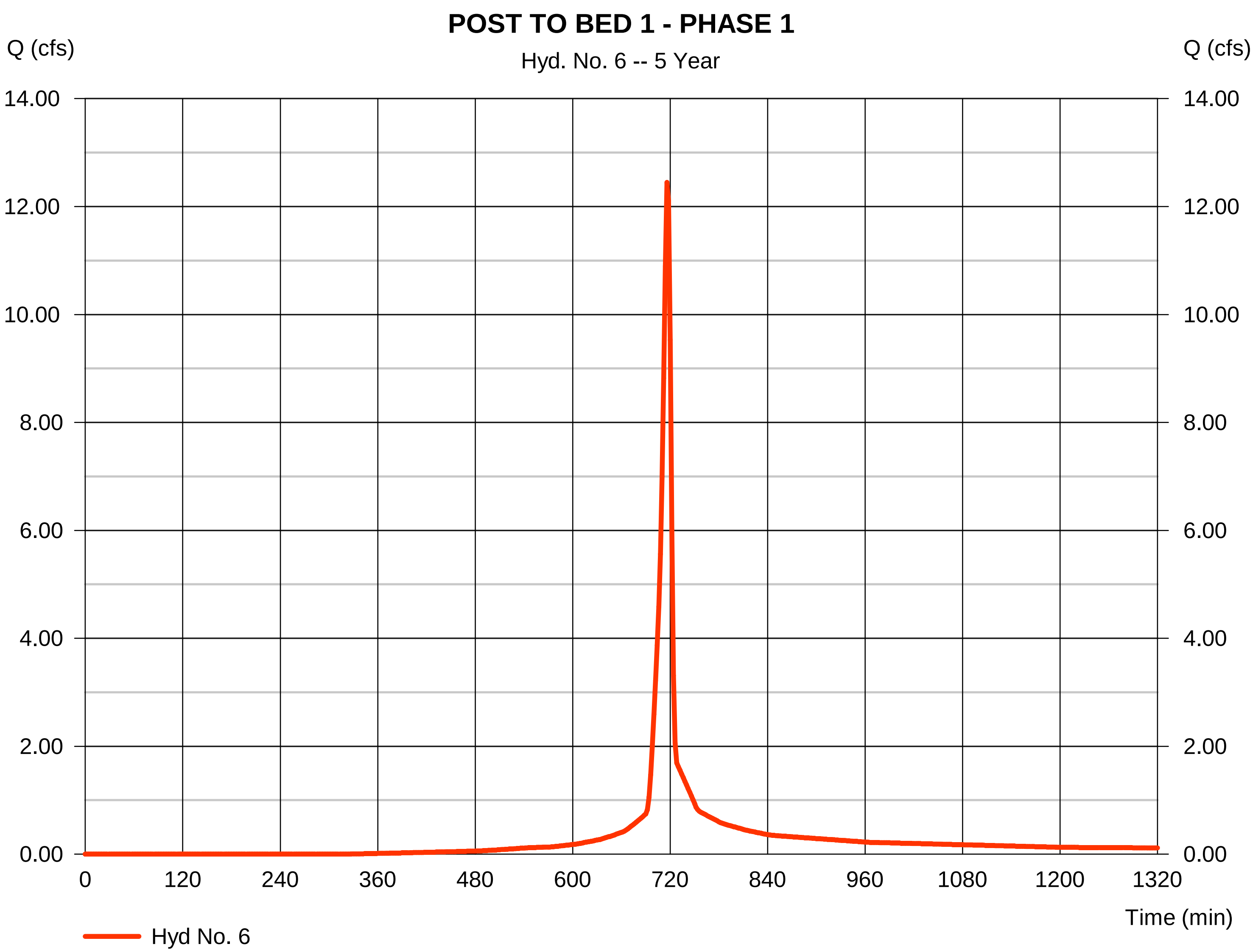
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 6

POST TO BED 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 12.45 cfs
Storm frequency	= 5 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 25,920 cuft
Drainage area	= 2.630 ac	Curve number	= 87.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

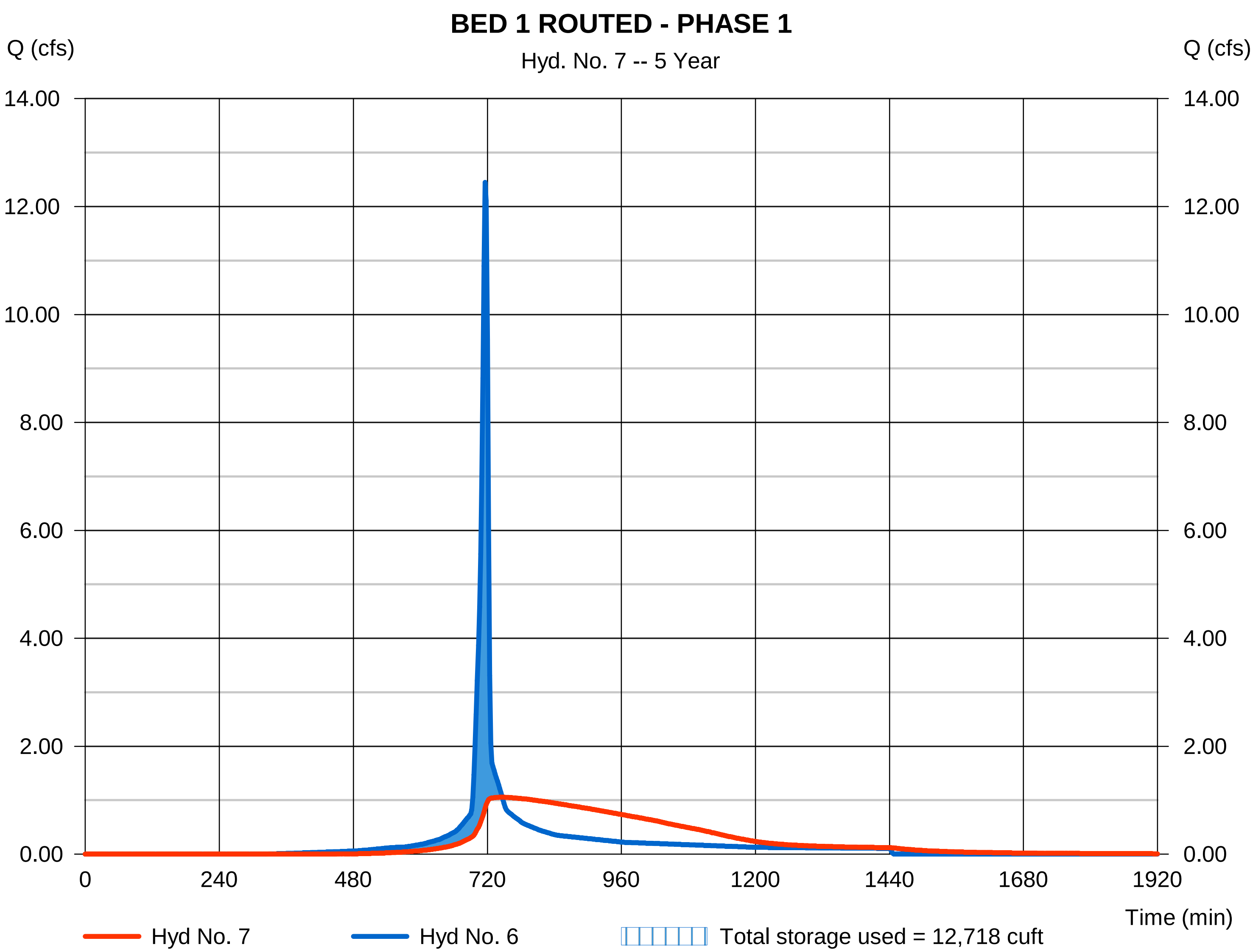
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 7

BED 1 ROUTED - PHASE 1

Hydrograph type	= Reservoir	Peak discharge	= 1.056 cfs
Storm frequency	= 5 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 25,871 cuft
Inflow hyd. No.	= 6 - POST TO BED 1 - PHASE 1	Max. Elevation	= 340.20 ft
Reservoir name	= MRC BED 1	Max. Storage	= 12,718 cuft

Storage Indication method used.



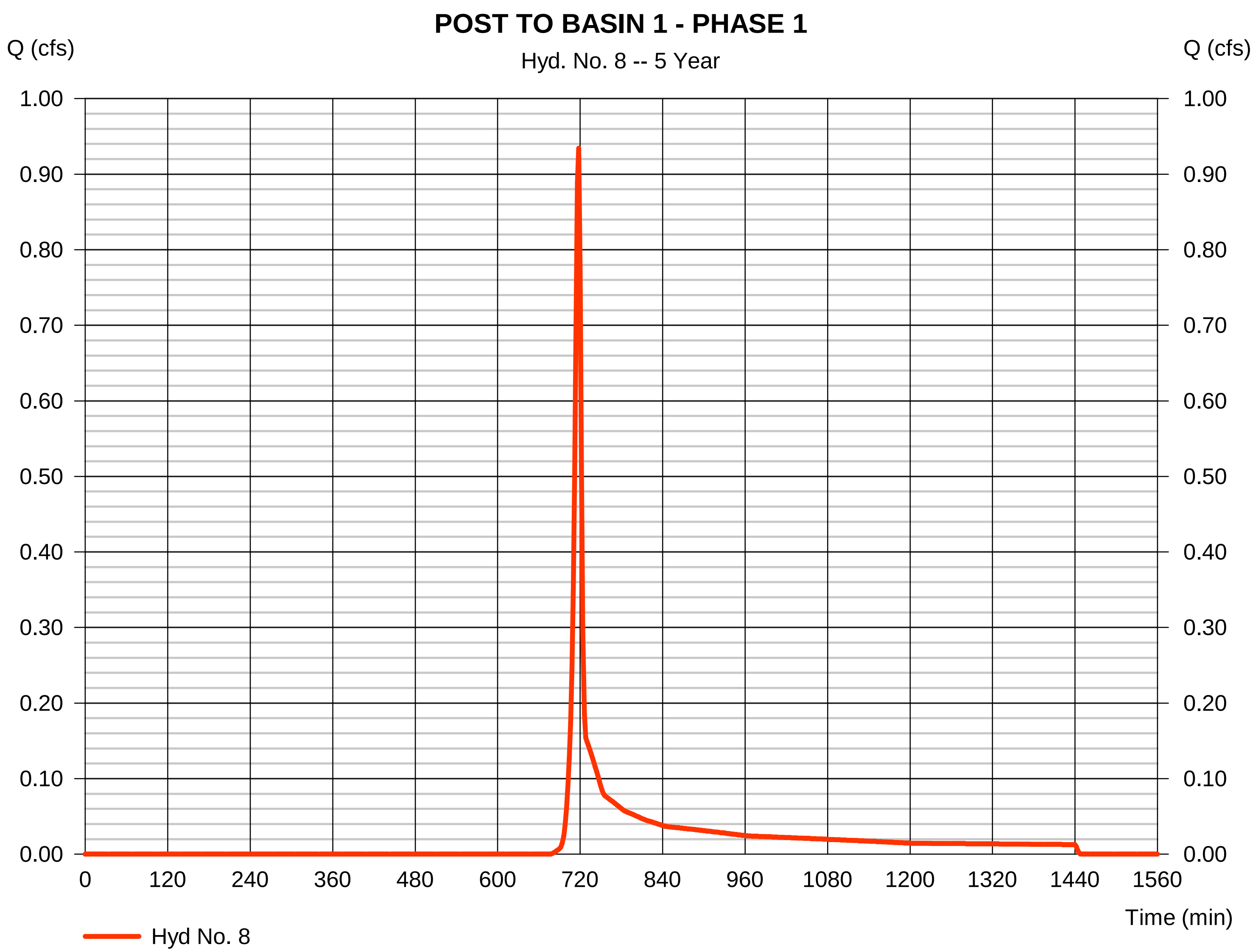
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 8

POST TO BASIN 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.935 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 1,892 cuft
Drainage area	= 0.480 ac	Curve number	= 65.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



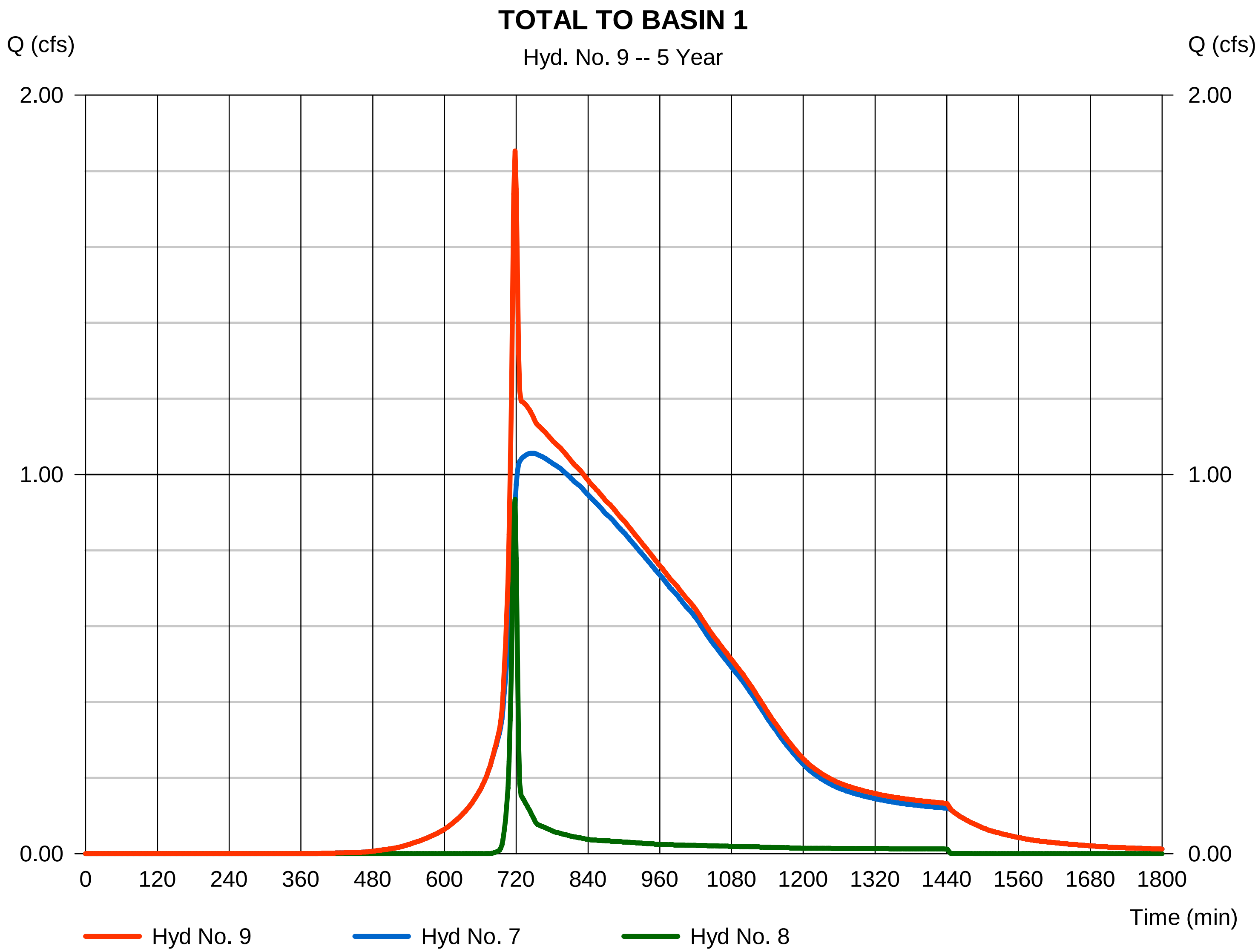
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 9

TOTAL TO BASIN 1

Hydrograph type	= Combine	Peak discharge	= 1.853 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 27,764 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 0.480 ac



Hydrograph Report

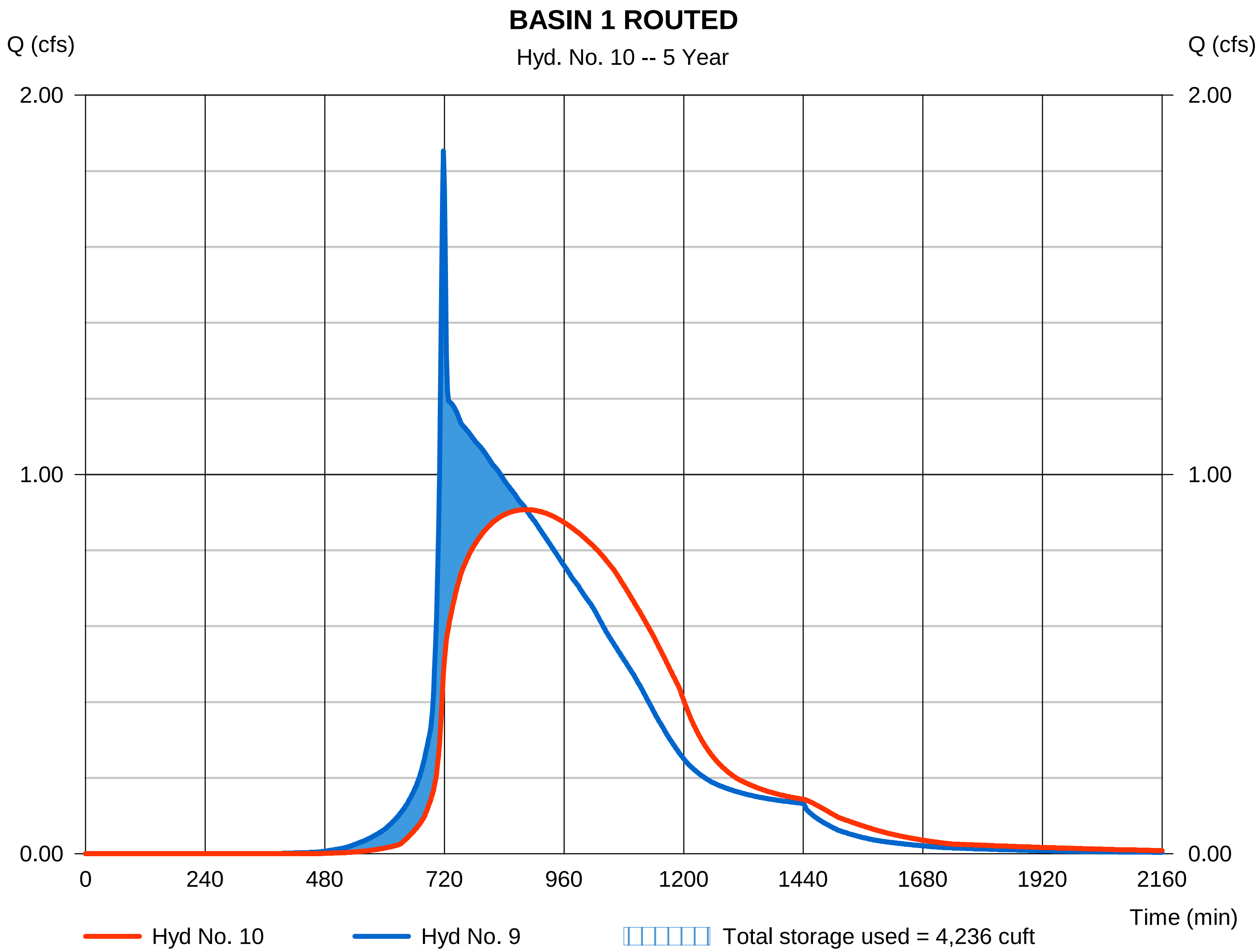
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 10

BASIN 1 ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 0.907 cfs
Storm frequency	= 5 yrs	Time to peak	= 884 min
Time interval	= 2 min	Hyd. volume	= 27,752 cuft
Inflow hyd. No.	= 9 - TOTAL TO BASIN 1	Max. Elevation	= 340.34 ft
Reservoir name	= DETENTION BASIN 1	Max. Storage	= 4,236 cuft

Storage Indication method used.



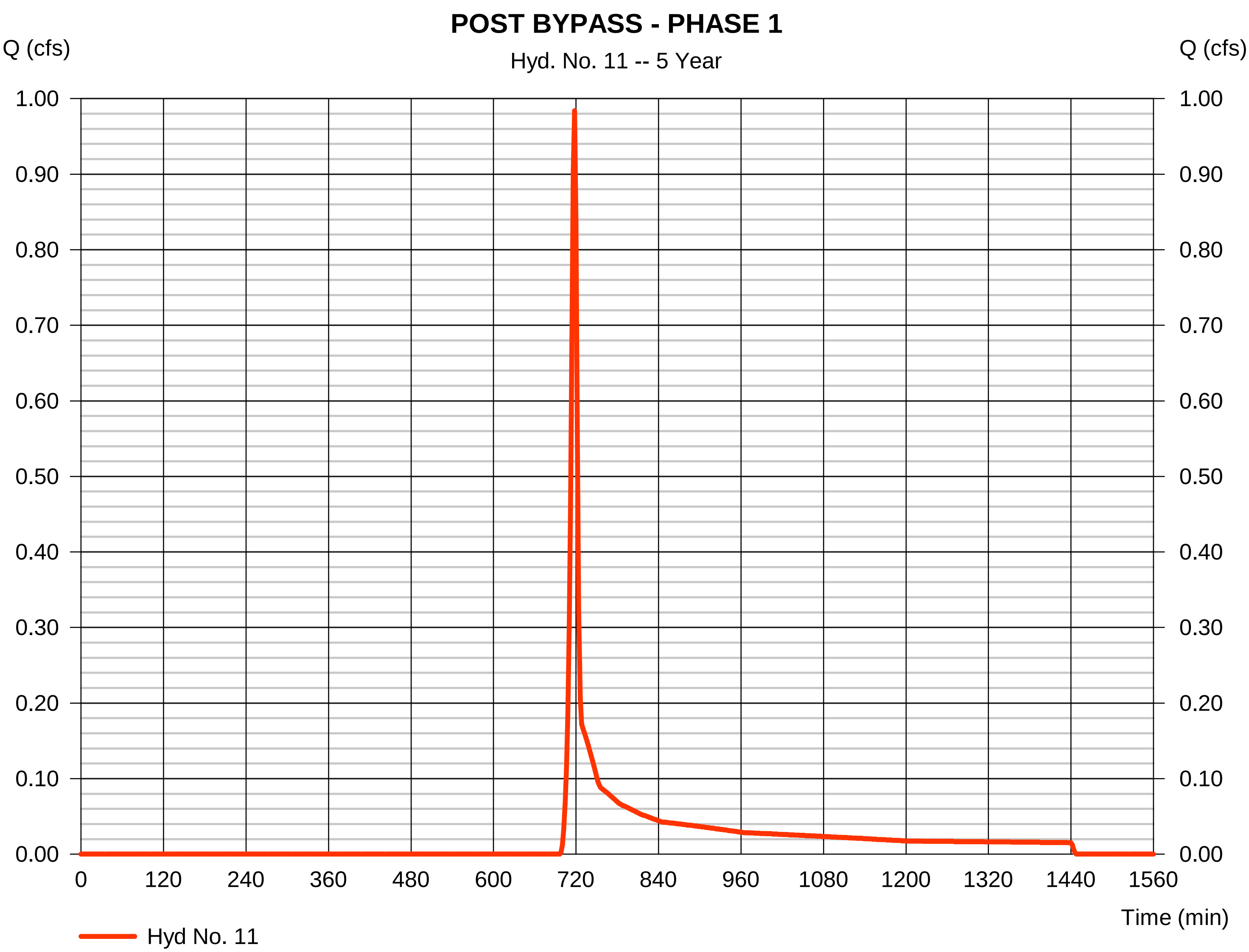
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 11

POST BYPASS - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.984 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 2,058 cuft
Drainage area	= 0.660 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



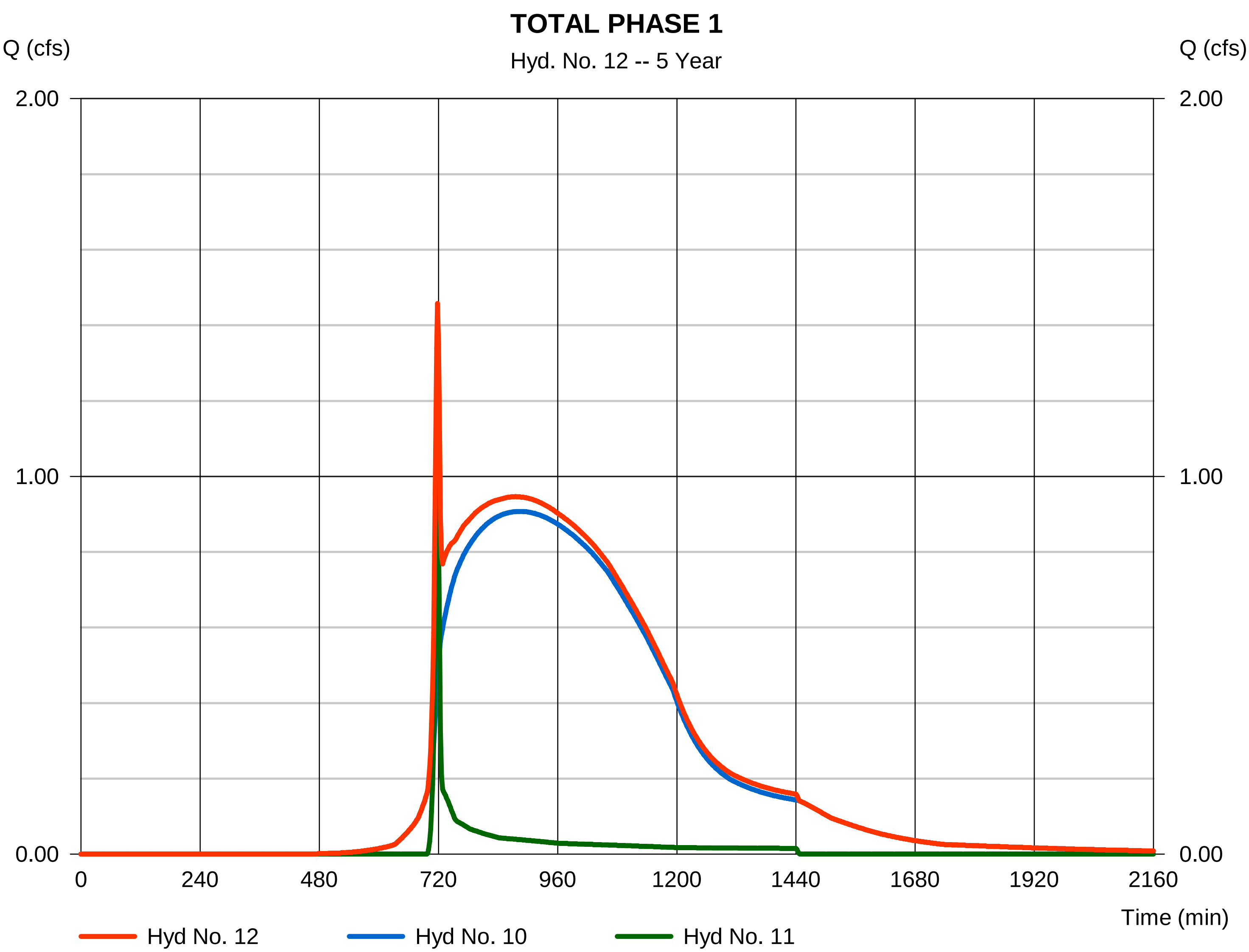
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 12

TOTAL PHASE 1

Hydrograph type	= Combine	Peak discharge	= 1.458 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 29,810 cuft
Inflow hyds.	= 10, 11	Contrib. drain. area	= 0.660 ac

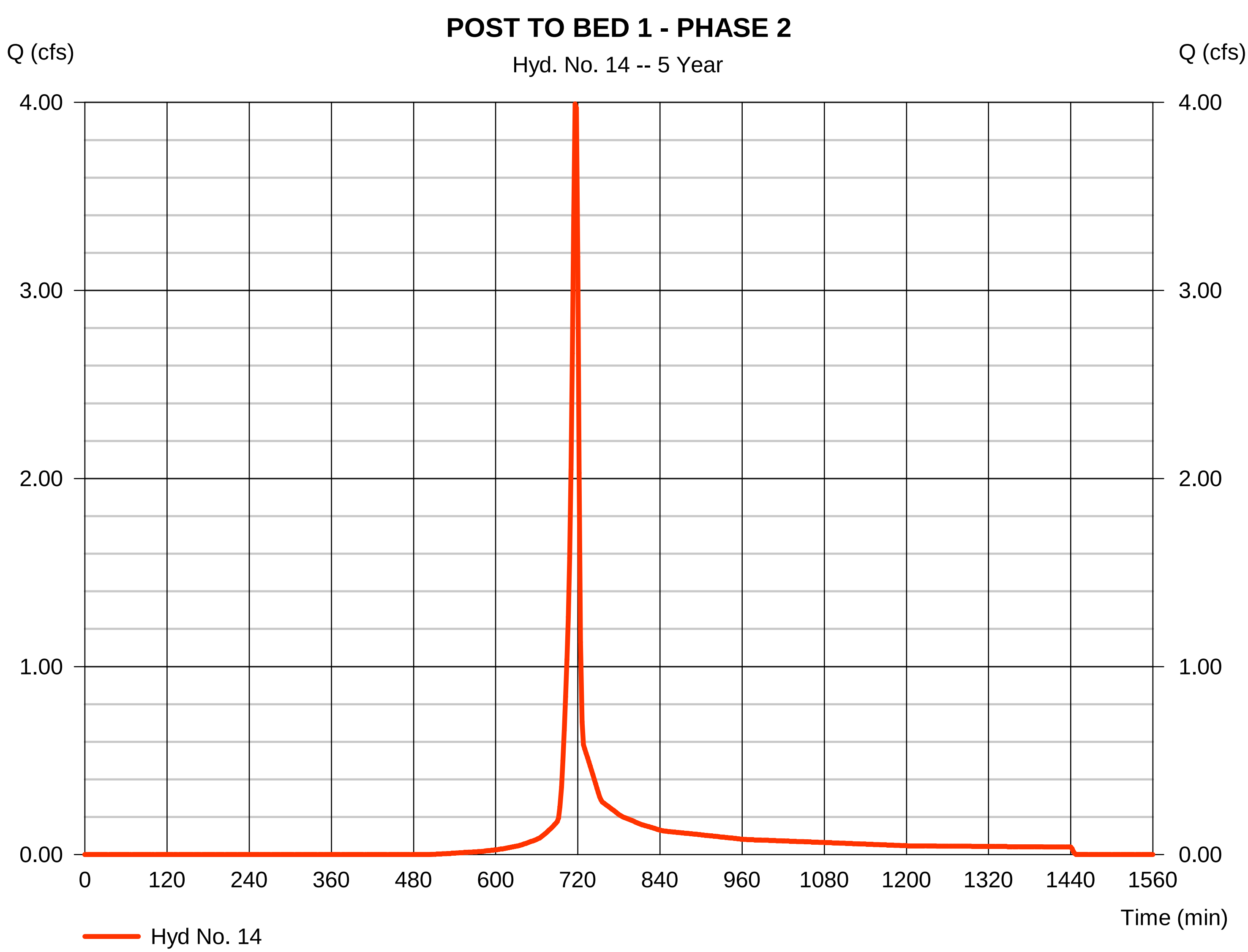


Hydrograph Report

Hyd. No. 14

POST TO BED 1 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 3.992 cfs
Storm frequency	= 5 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 8,065 cuft
Drainage area	= 1.110 ac	Curve number	= 79.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



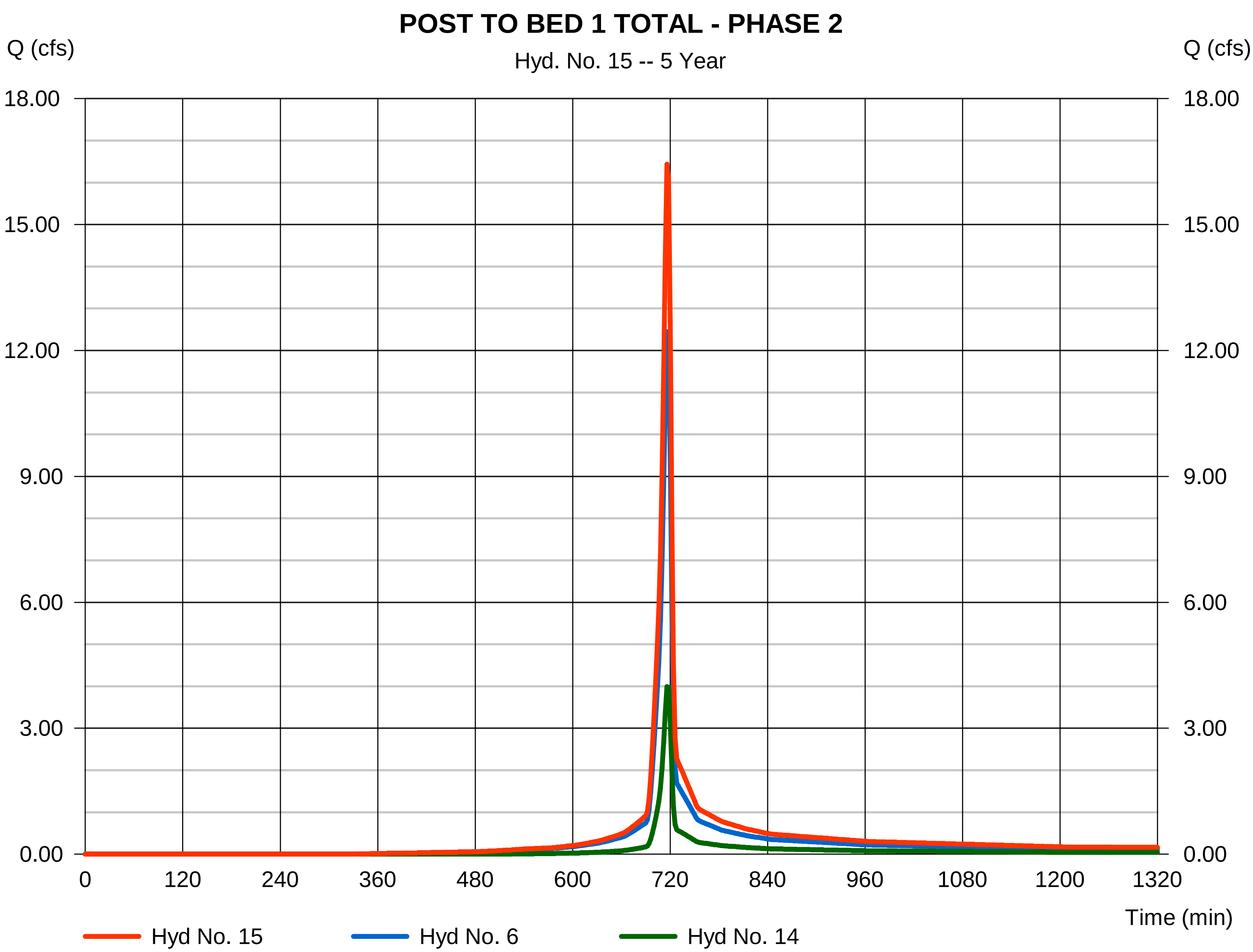
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 15

POST TO BED 1 TOTAL - PHASE 2

Hydrograph type	= Combine	Peak discharge	= 16.44 cfs
Storm frequency	= 5 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 33,986 cuft
Inflow hyds.	= 6, 14	Contrib. drain. area	= 3.740 ac



Hydrograph Report

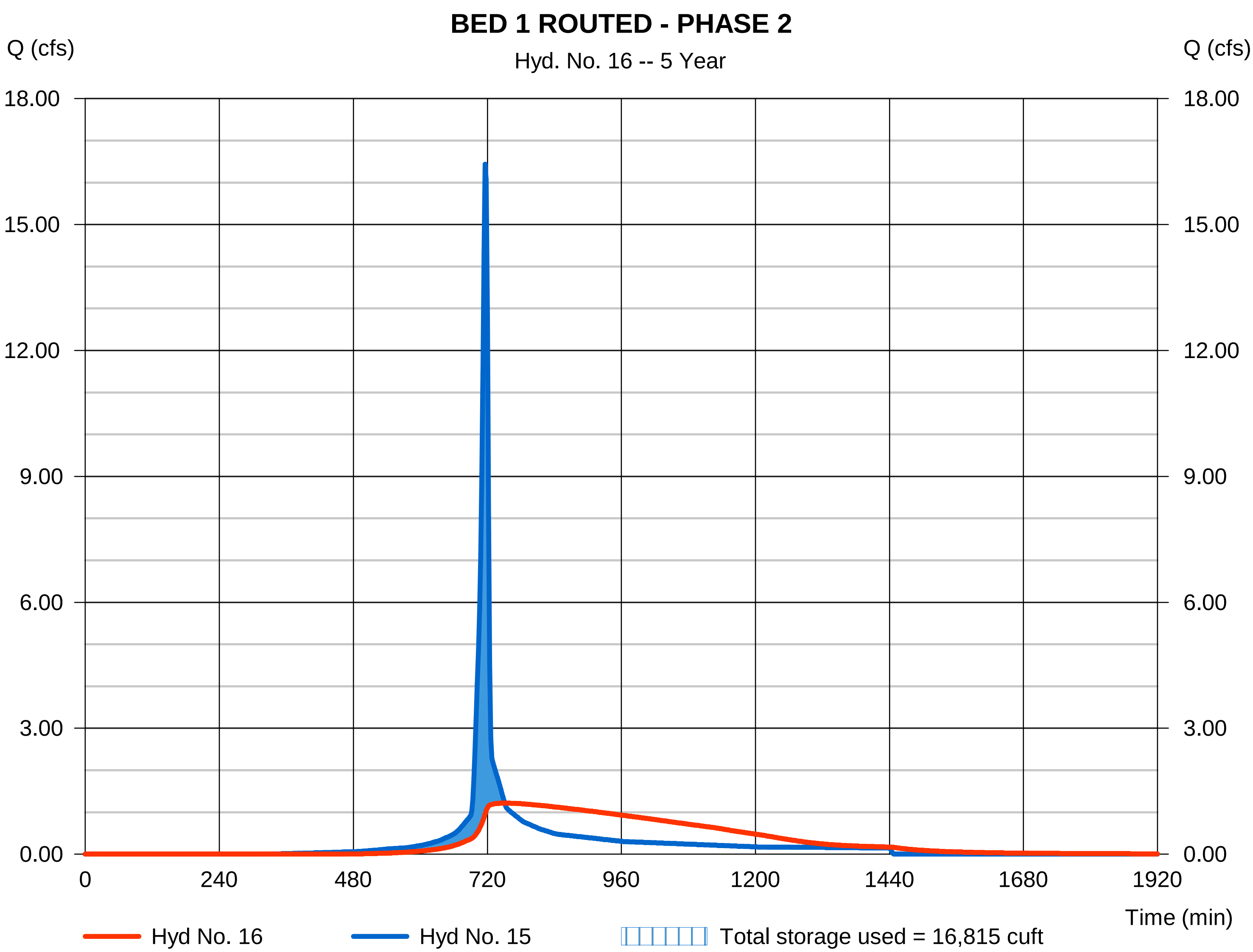
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 16

BED 1 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 1.216 cfs
Storm frequency	= 5 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 33,936 cuft
Inflow hyd. No.	= 15 - POST TO BED 1 TOTAL - PHASE 2	Max. Elevation	= 340.65 ft
Reservoir name	= MRC BED 1	Max. Storage	= 16,815 cuft

Storage Indication method used.



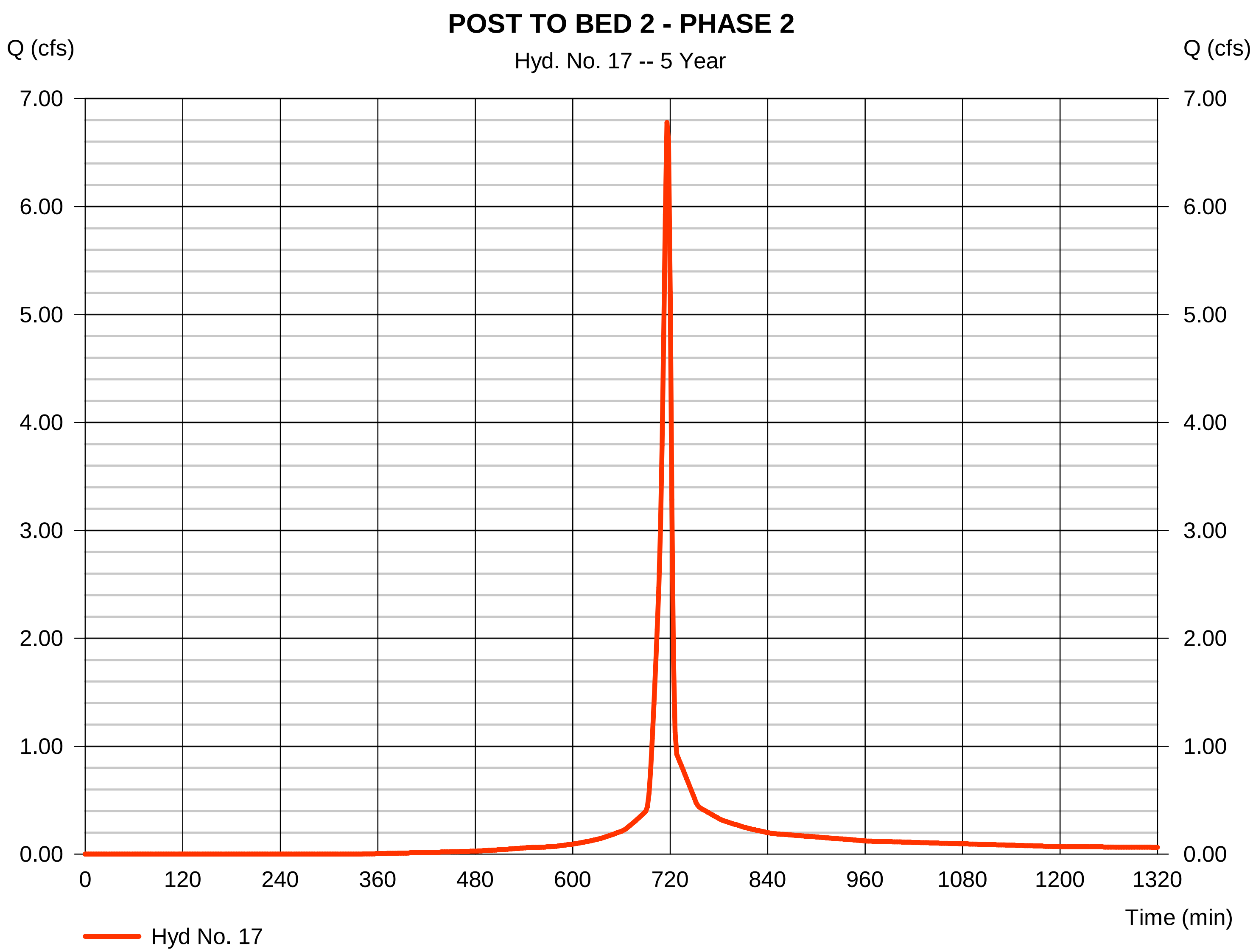
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 17

POST TO BED 2 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 6.781 cfs
Storm frequency	= 5 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 14,061 cuft
Drainage area	= 1.460 ac	Curve number	= 87.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

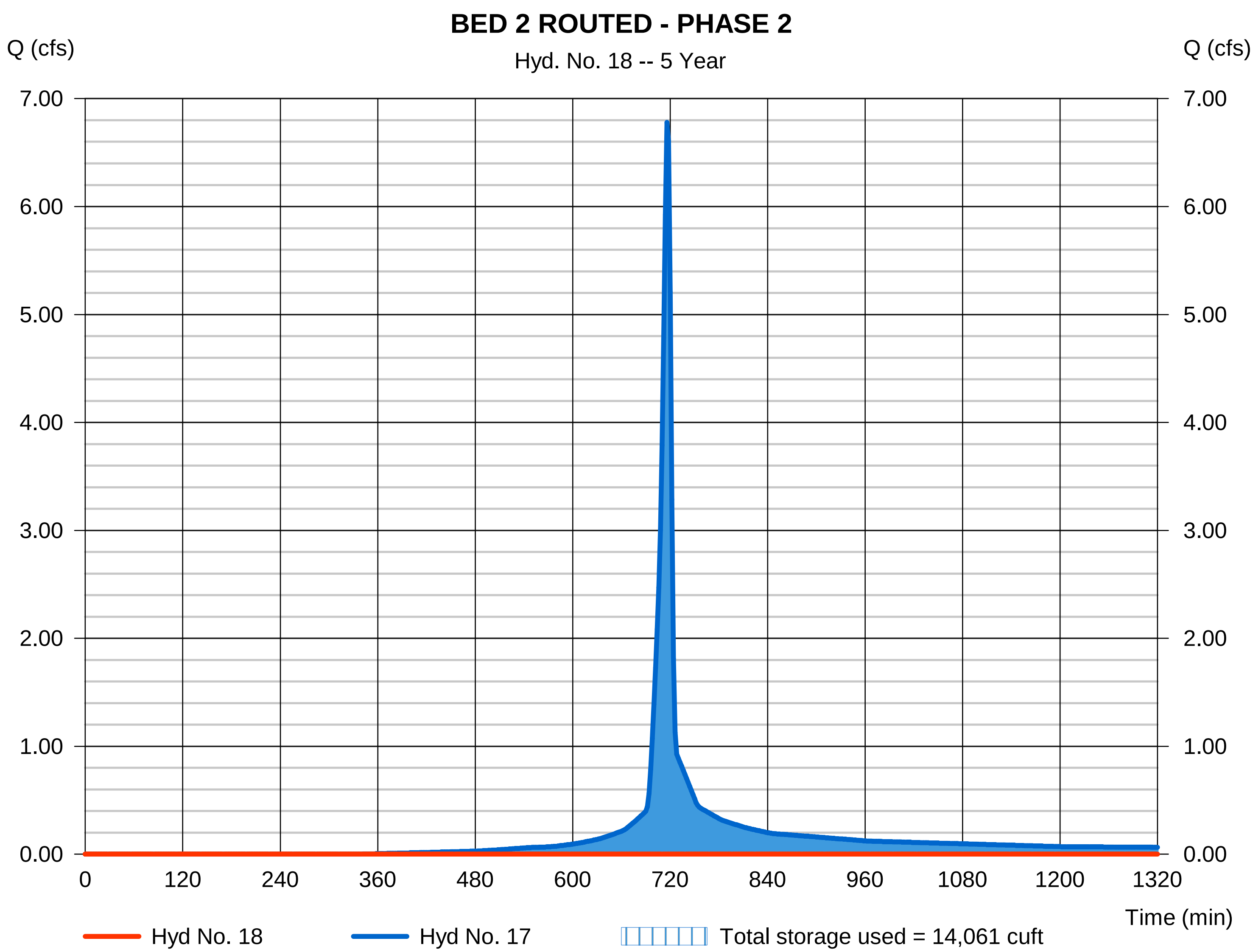
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 18

BED 2 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 5 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 17 - POST TO BED 2 - PHASE 2	Max. Elevation	= 346.62 ft
Reservoir name	= INFILTRATION BED 2	Max. Storage	= 14,061 cuft

Storage Indication method used.



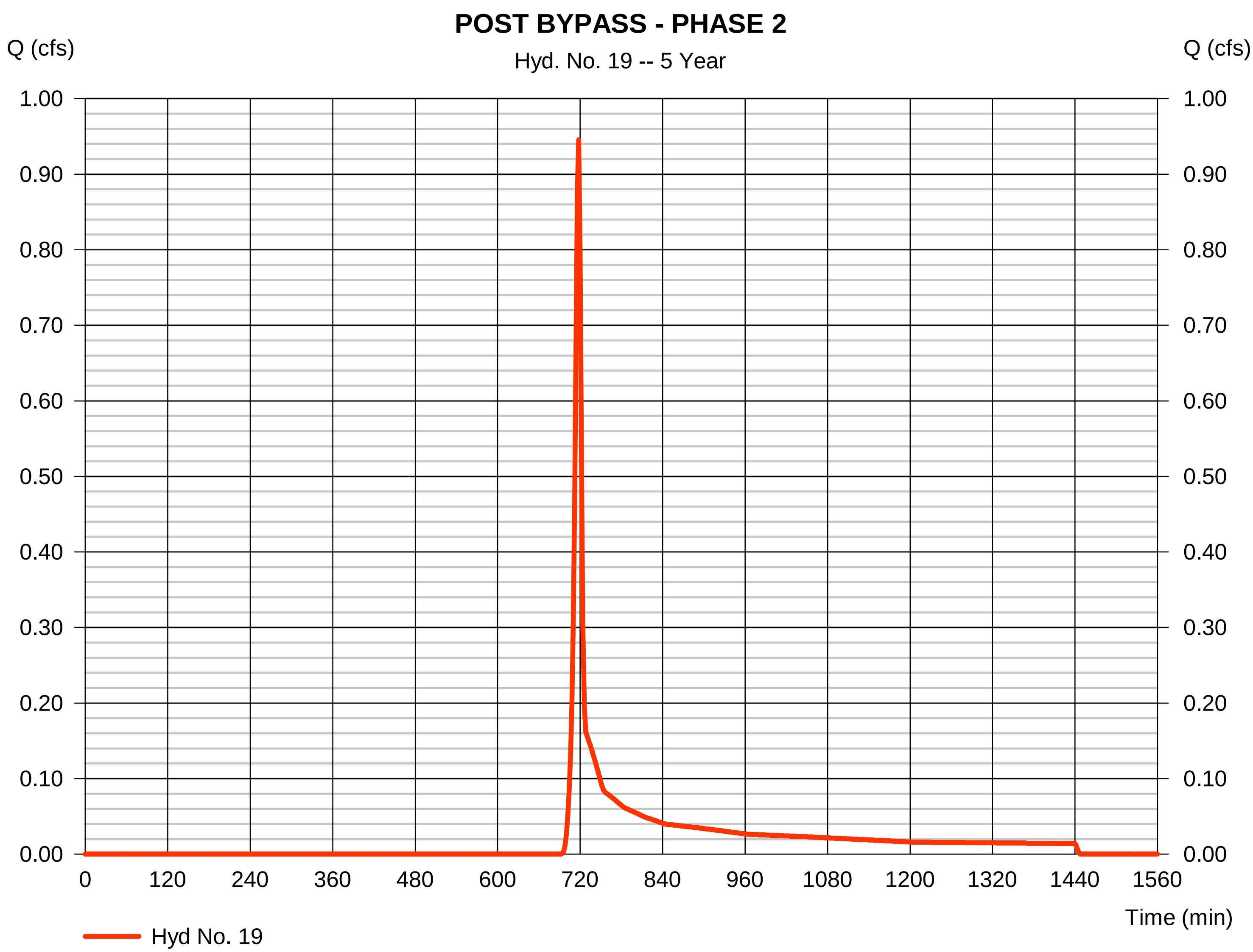
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 19

POST BYPASS - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.945 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 1,951 cuft
Drainage area	= 0.580 ac	Curve number	= 62.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



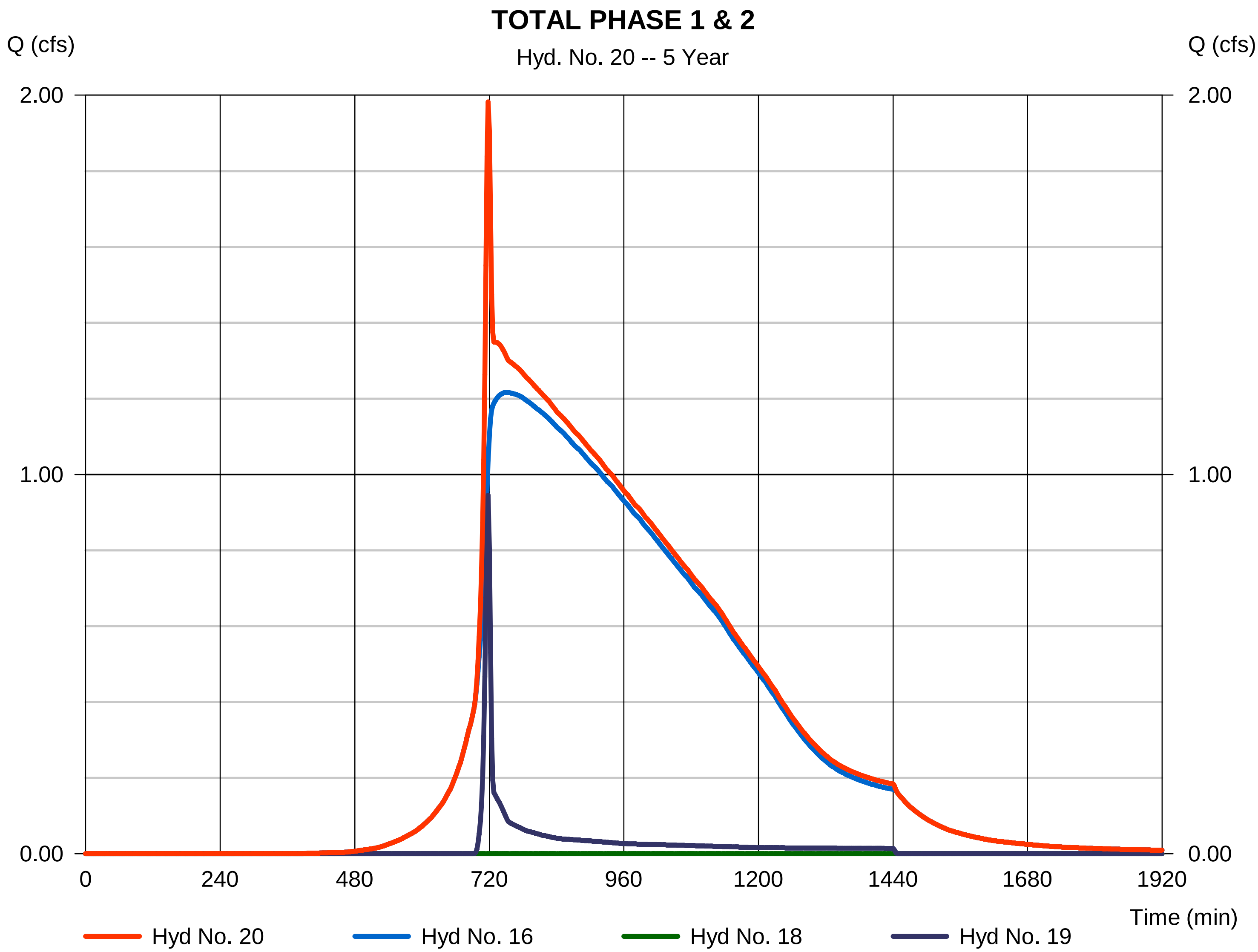
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 20

TOTAL PHASE 1 & 2

Hydrograph type	= Combine	Peak discharge	= 1.983 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 35,888 cuft
Inflow hyds.	= 16, 18, 19	Contrib. drain. area	= 0.580 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	7.490	2	718	15,413	------	------	------	PRE-DEV PHASE 1
2	SCS Runoff	6.025	2	718	12,459	------	------	------	PRE-DEV PHASE 2
4	Combine	13.52	2	718	27,873	1, 2,	------	------	TOTAL PRE-DEV
6	SCS Runoff	15.48	2	716	32,655	------	------	------	POST TO BED 1 - PHASE 1
7	Reservoir	1.196	2	748	32,606	6	340.58	16,260	BED 1 ROUTED - PHASE 1
8	SCS Runoff	1.361	2	718	2,725	------	------	------	POST TO BASIN 1 - PHASE 1
9	Combine	2.396	2	718	35,331	7, 8	------	------	TOTAL TO BASIN 1
10	Reservoir	1.177	2	824	35,319	9	340.52	4,875	BASIN 1 ROUTED
11	SCS Runoff	1.518	2	718	3,075	------	------	------	POST BYPASS - PHASE 1
12	Combine	2.112	2	718	38,394	10, 11	------	------	TOTAL PHASE 1
14	SCS Runoff	5.231	2	716	10,617	------	------	------	POST TO BED 1 - PHASE 2
15	Combine	20.72	2	716	43,272	6, 14	------	------	POST TO BED 1 TOTAL - PHASE 2
16	Reservoir	2.584	2	732	43,223	15	341.06	20,434	BED 1 ROUTED - PHASE 2
17	SCS Runoff	8.468	2	716	17,775	------	------	------	POST TO BED 2 - PHASE 2
18	Reservoir	0.088	2	1190	1,835	17	346.96	16,199	BED 2 ROUTED - PHASE 2
19	SCS Runoff	1.429	2	718	2,881	------	------	------	POST BYPASS - PHASE 2
20	Combine	2.801	2	732	47,939	16, 18, 19	------	------	TOTAL PHASE 1 & 2

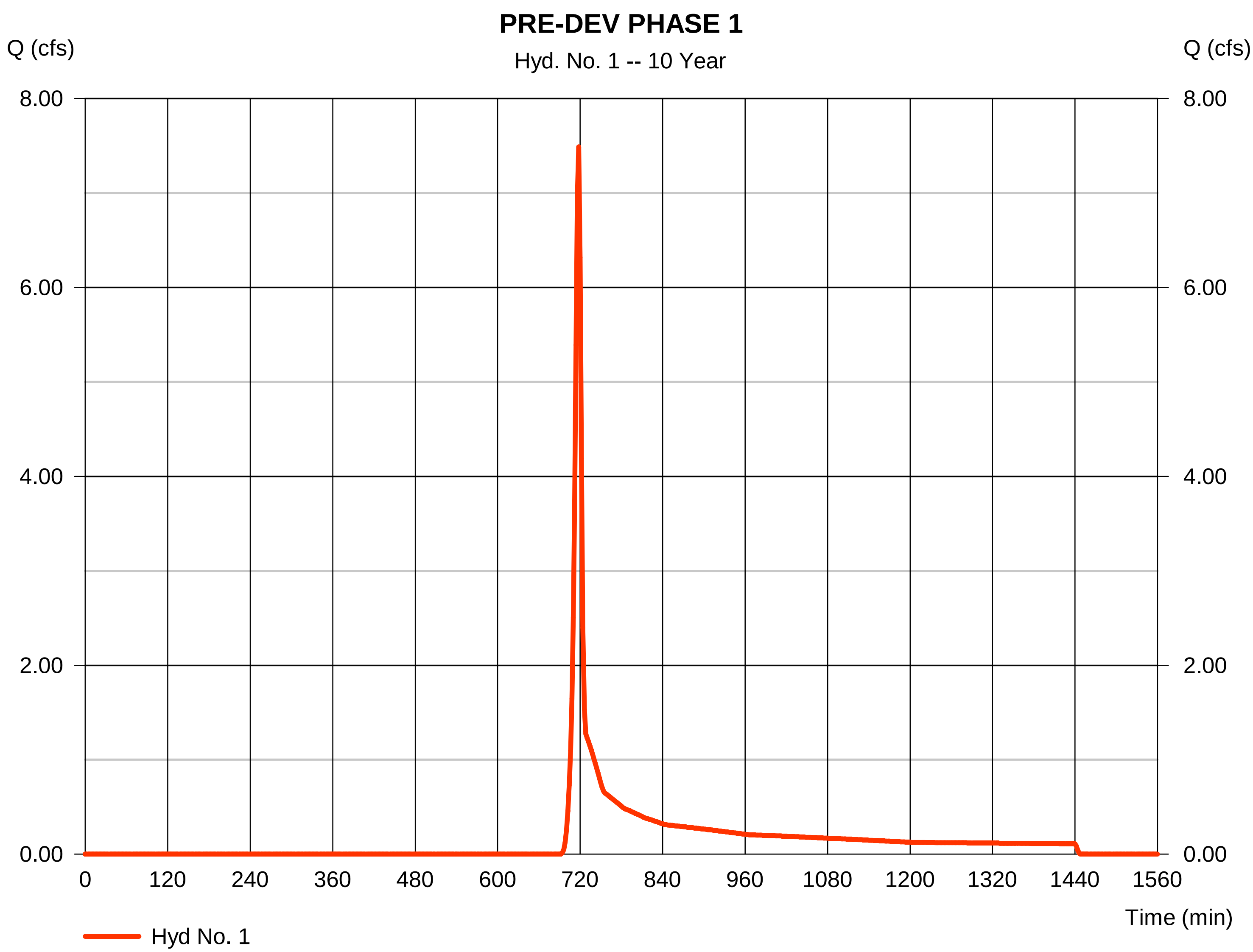
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 1

PRE-DEV PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 7.490 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 15,413 cuft
Drainage area	= 3.770 ac	Curve number	= 58.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

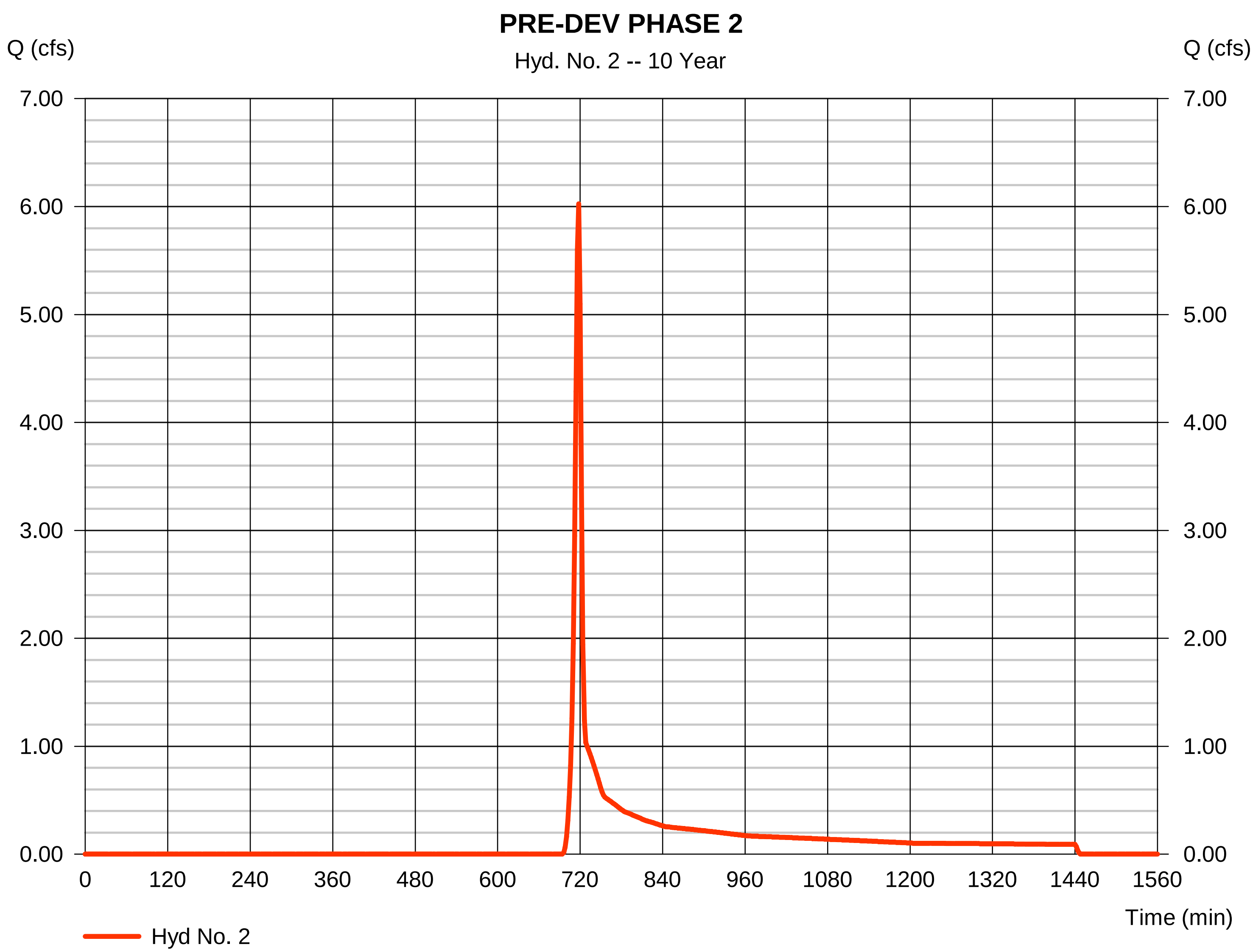


Hydrograph Report

Hyd. No. 2

PRE-DEV PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 6.025 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 12,459 cuft
Drainage area	= 3.150 ac	Curve number	= 57.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



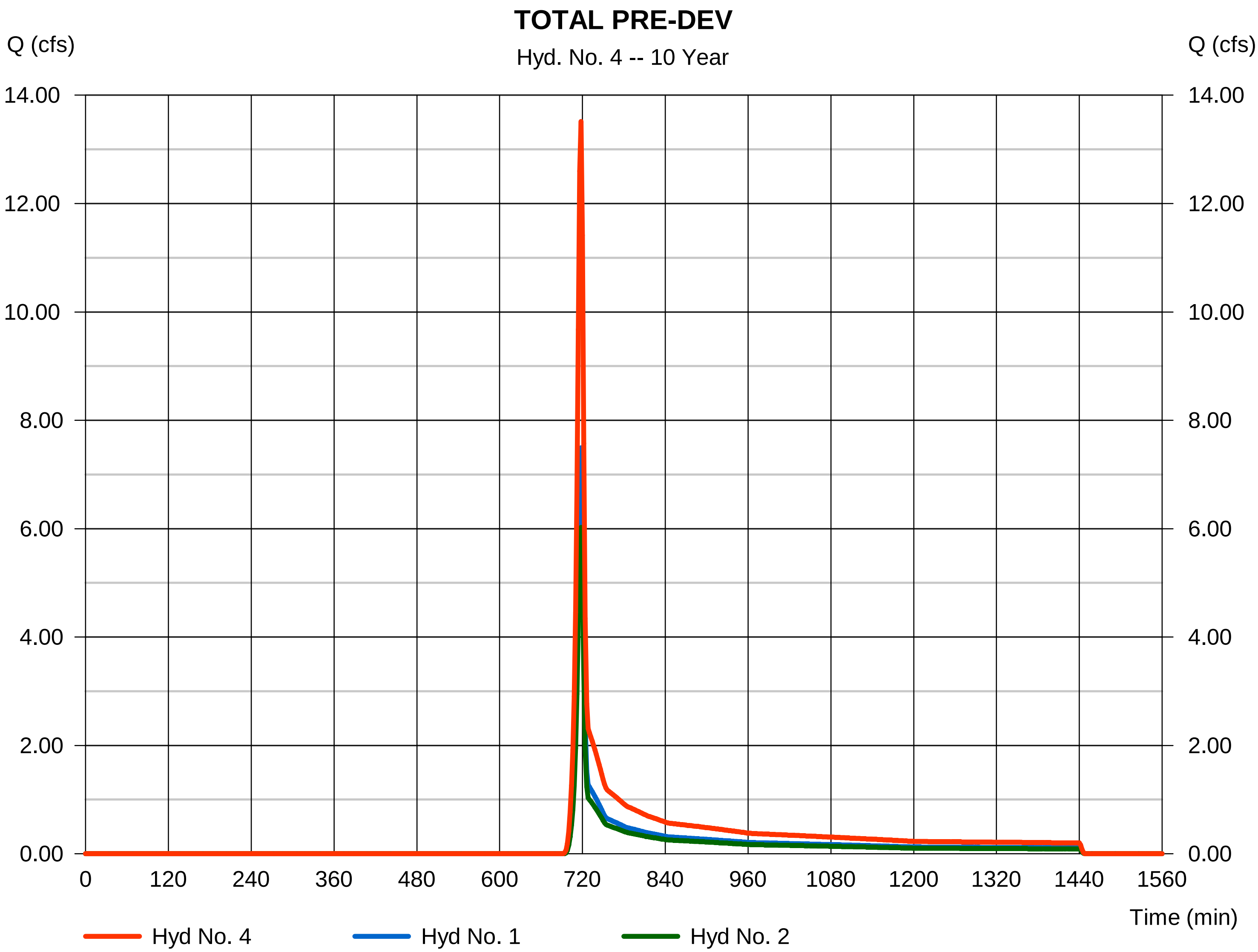
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 4

TOTAL PRE-DEV

Hydrograph type	= Combine	Peak discharge	= 13.52 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 27,873 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 6.920 ac



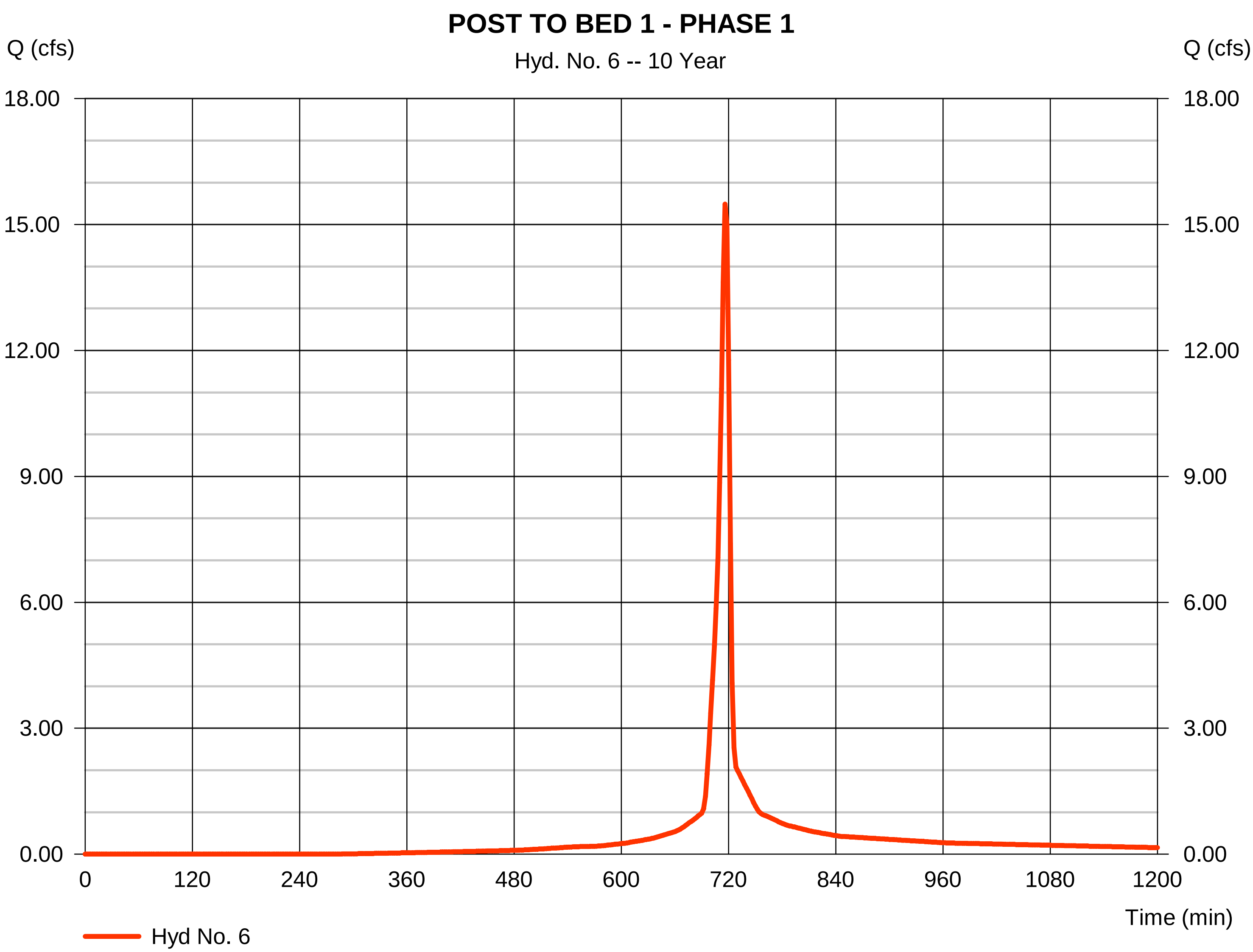
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 6

POST TO BED 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 15.48 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 32,655 cuft
Drainage area	= 2.630 ac	Curve number	= 87.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

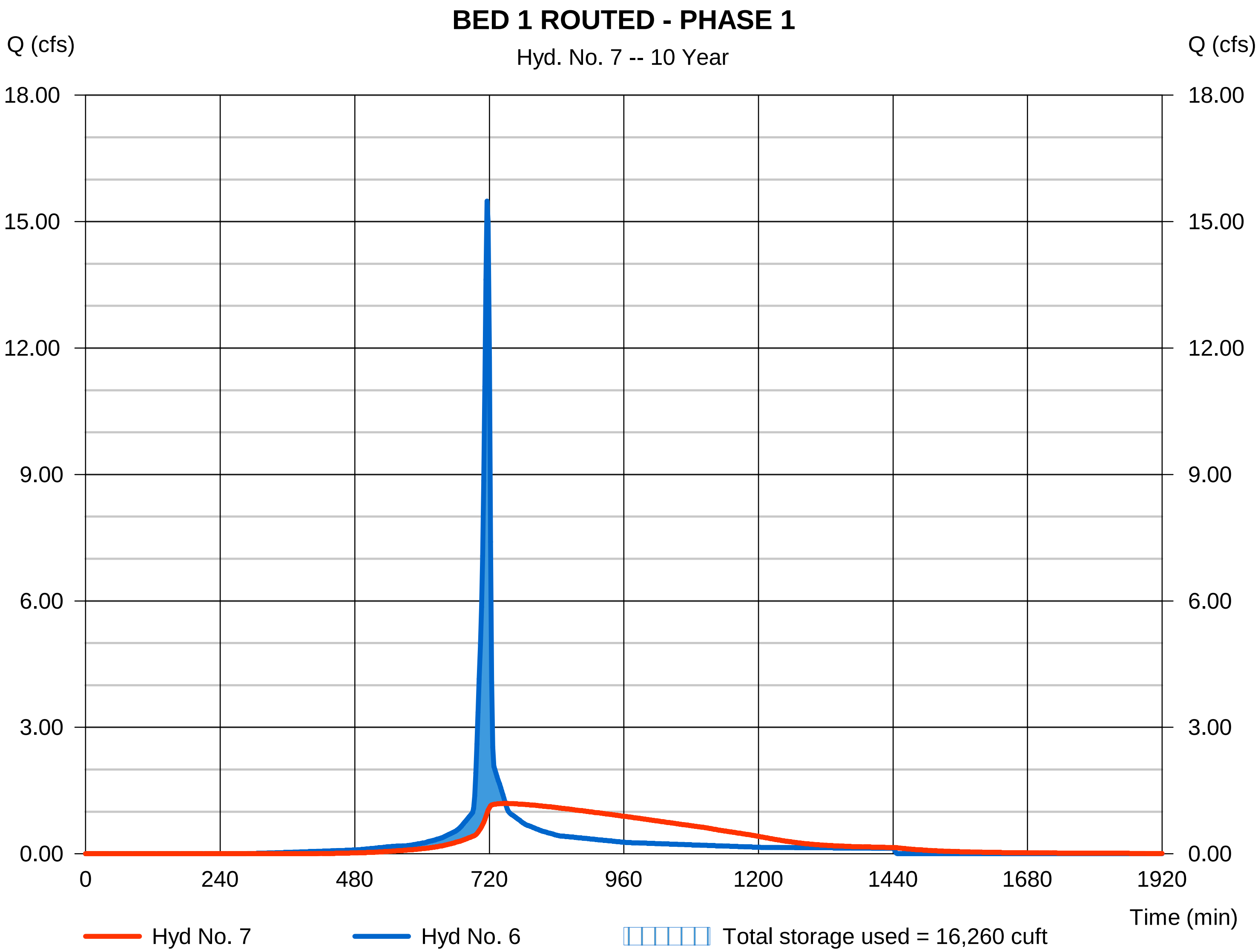
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 7

BED 1 ROUTED - PHASE 1

Hydrograph type	= Reservoir	Peak discharge	= 1.196 cfs
Storm frequency	= 10 yrs	Time to peak	= 748 min
Time interval	= 2 min	Hyd. volume	= 32,606 cuft
Inflow hyd. No.	= 6 - POST TO BED 1 - PHASE 1	Max. Elevation	= 340.58 ft
Reservoir name	= MRC BED 1	Max. Storage	= 16,260 cuft

Storage Indication method used.



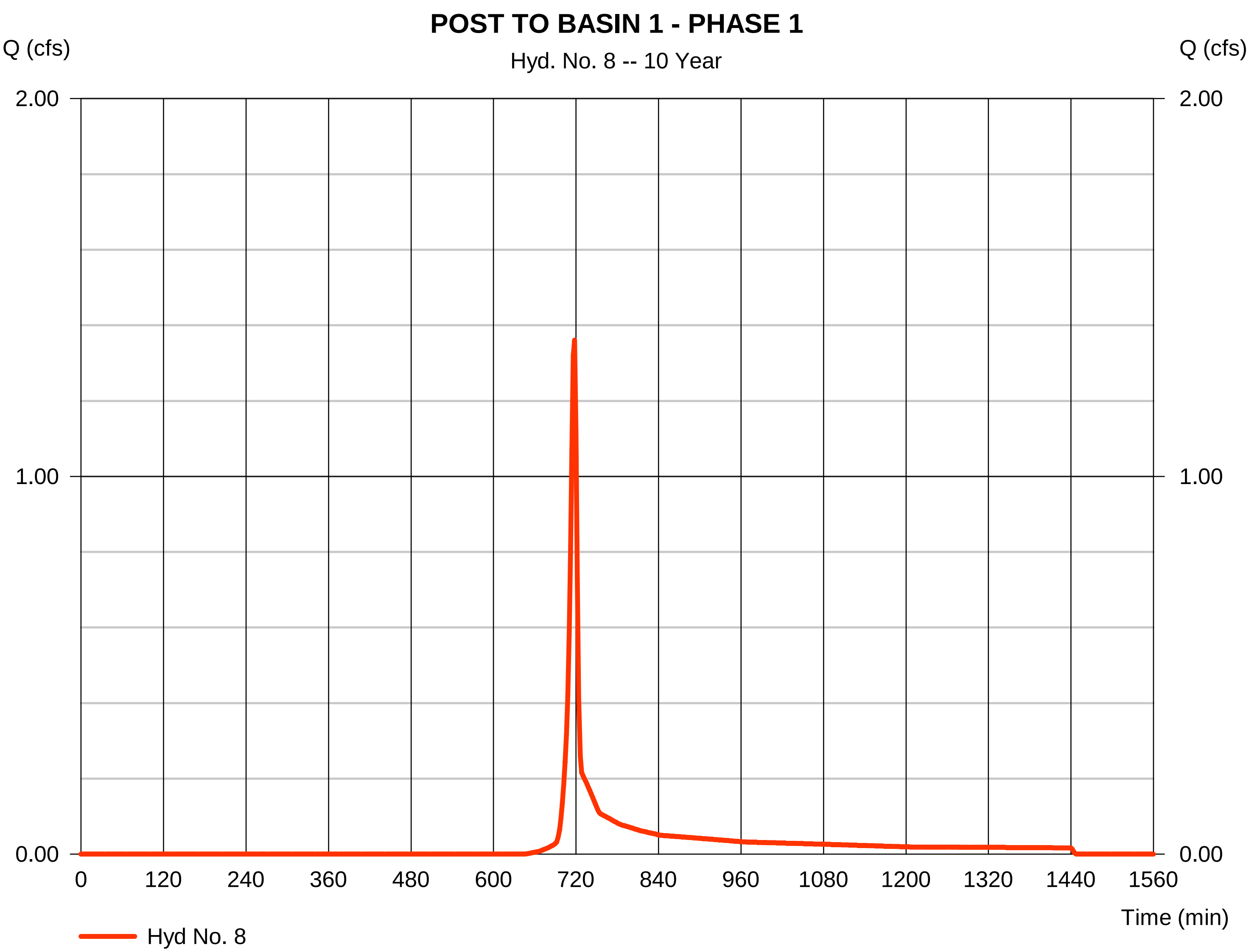
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 8

POST TO BASIN 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.361 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 2,725 cuft
Drainage area	= 0.480 ac	Curve number	= 65.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



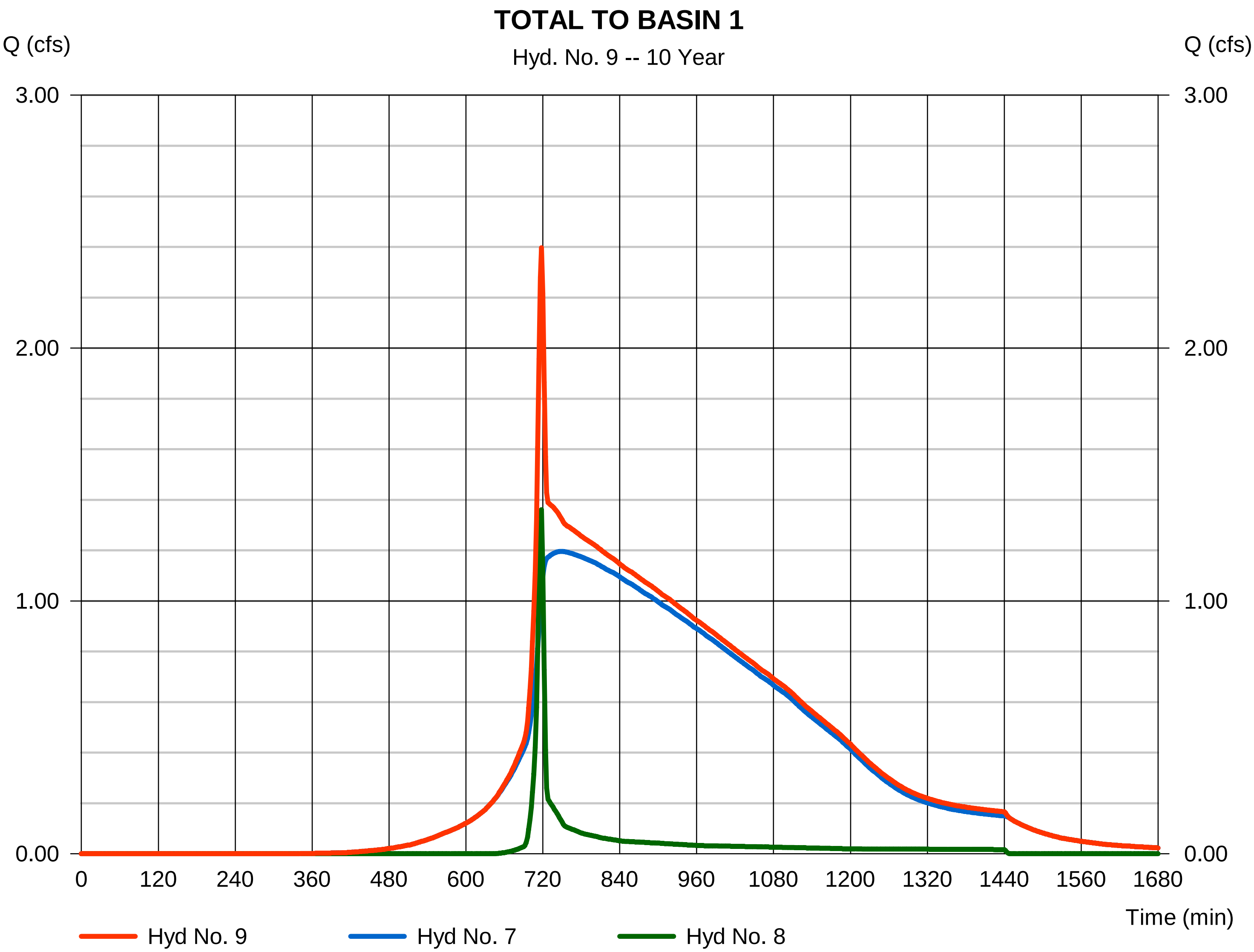
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 9

TOTAL TO BASIN 1

Hydrograph type	= Combine	Peak discharge	= 2.396 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 35,331 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 0.480 ac



Hydrograph Report

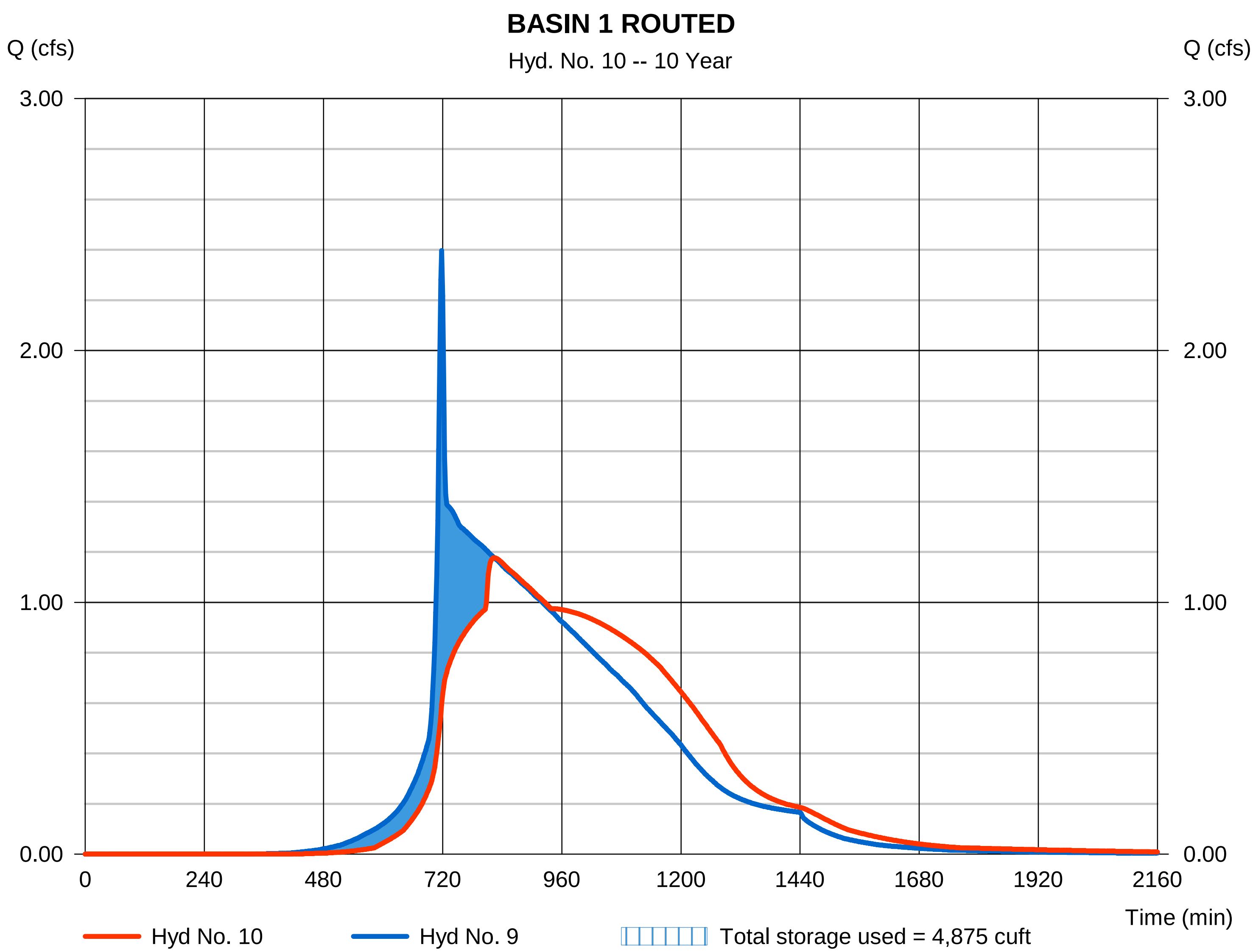
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 10

BASIN 1 ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 1.177 cfs
Storm frequency	= 10 yrs	Time to peak	= 824 min
Time interval	= 2 min	Hyd. volume	= 35,319 cuft
Inflow hyd. No.	= 9 - TOTAL TO BASIN 1	Max. Elevation	= 340.52 ft
Reservoir name	= DETENTION BASIN 1	Max. Storage	= 4,875 cuft

Storage Indication method used.



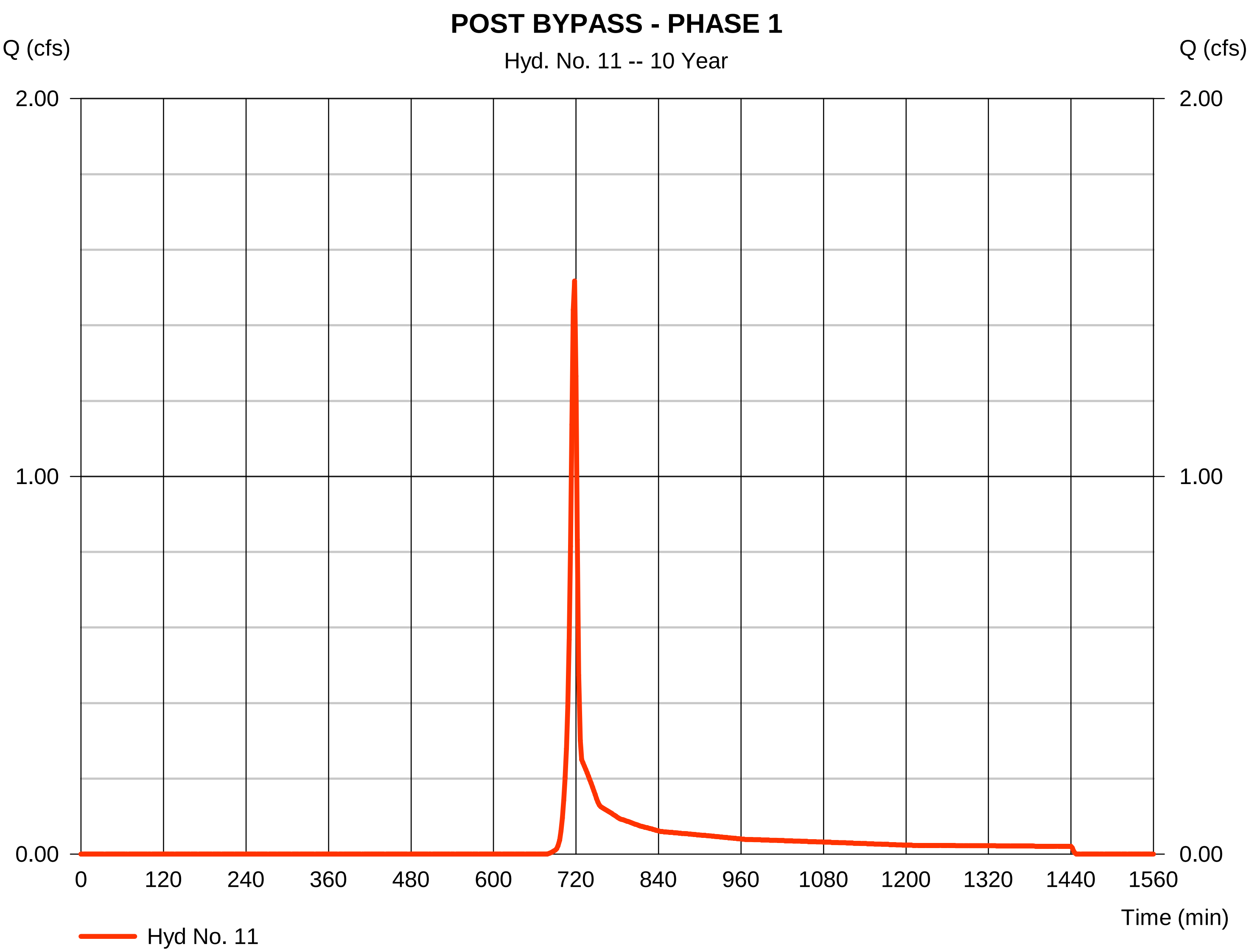
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 11

POST BYPASS - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.518 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 3,075 cuft
Drainage area	= 0.660 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



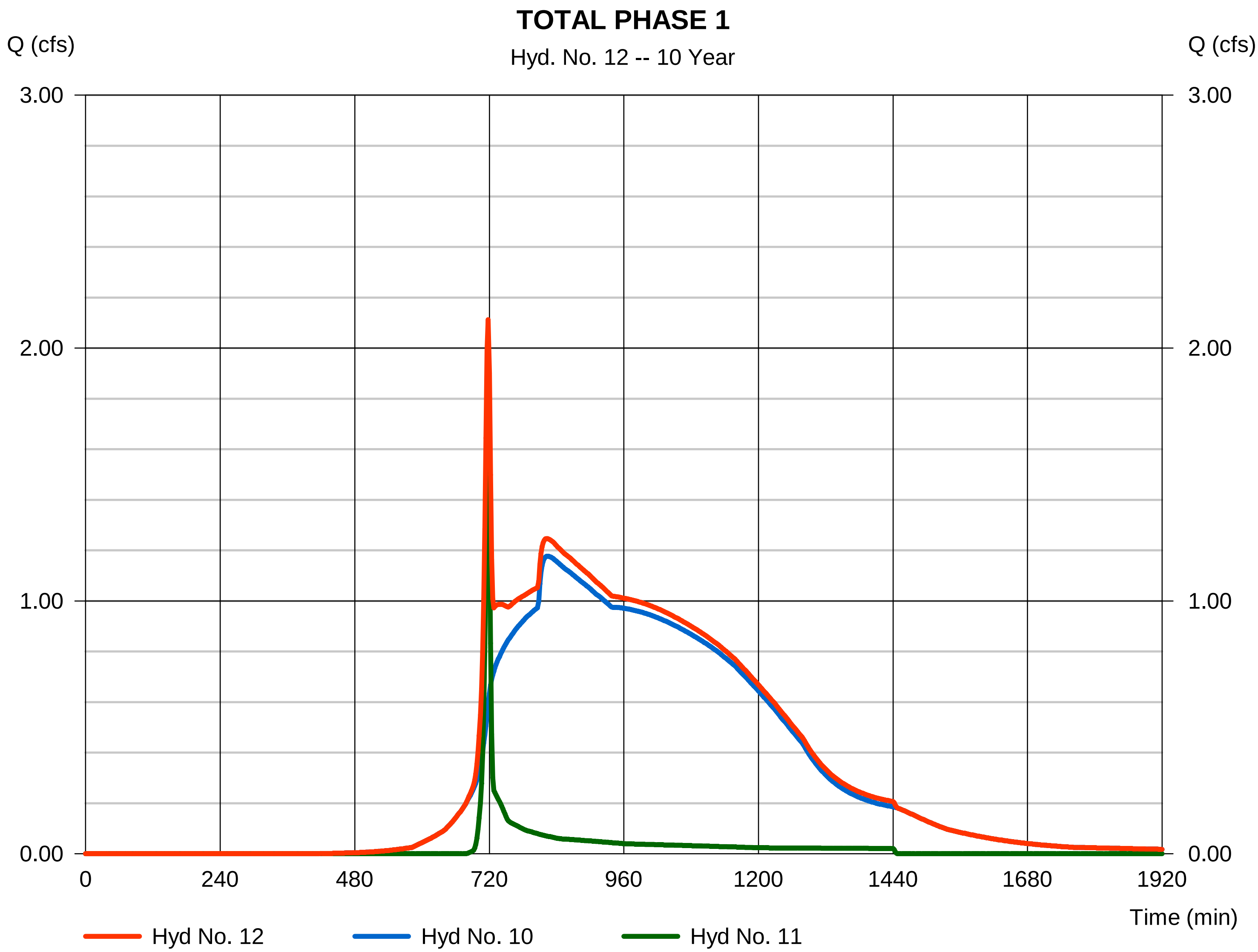
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 12

TOTAL PHASE 1

Hydrograph type	= Combine	Peak discharge	= 2.112 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 38,394 cuft
Inflow hyds.	= 10, 11	Contrib. drain. area	= 0.660 ac



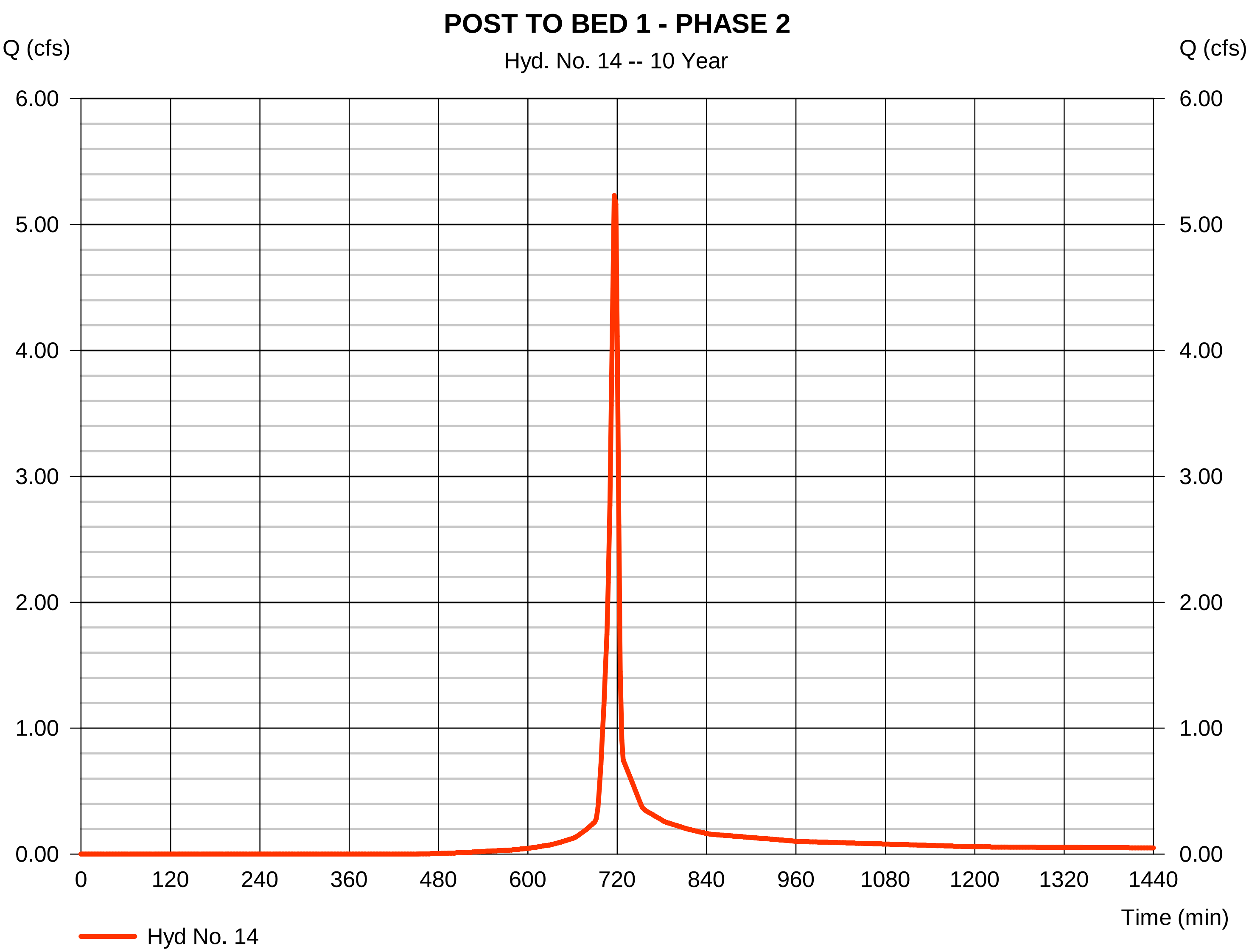
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 14

POST TO BED 1 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 5.231 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 10,617 cuft
Drainage area	= 1.110 ac	Curve number	= 79.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



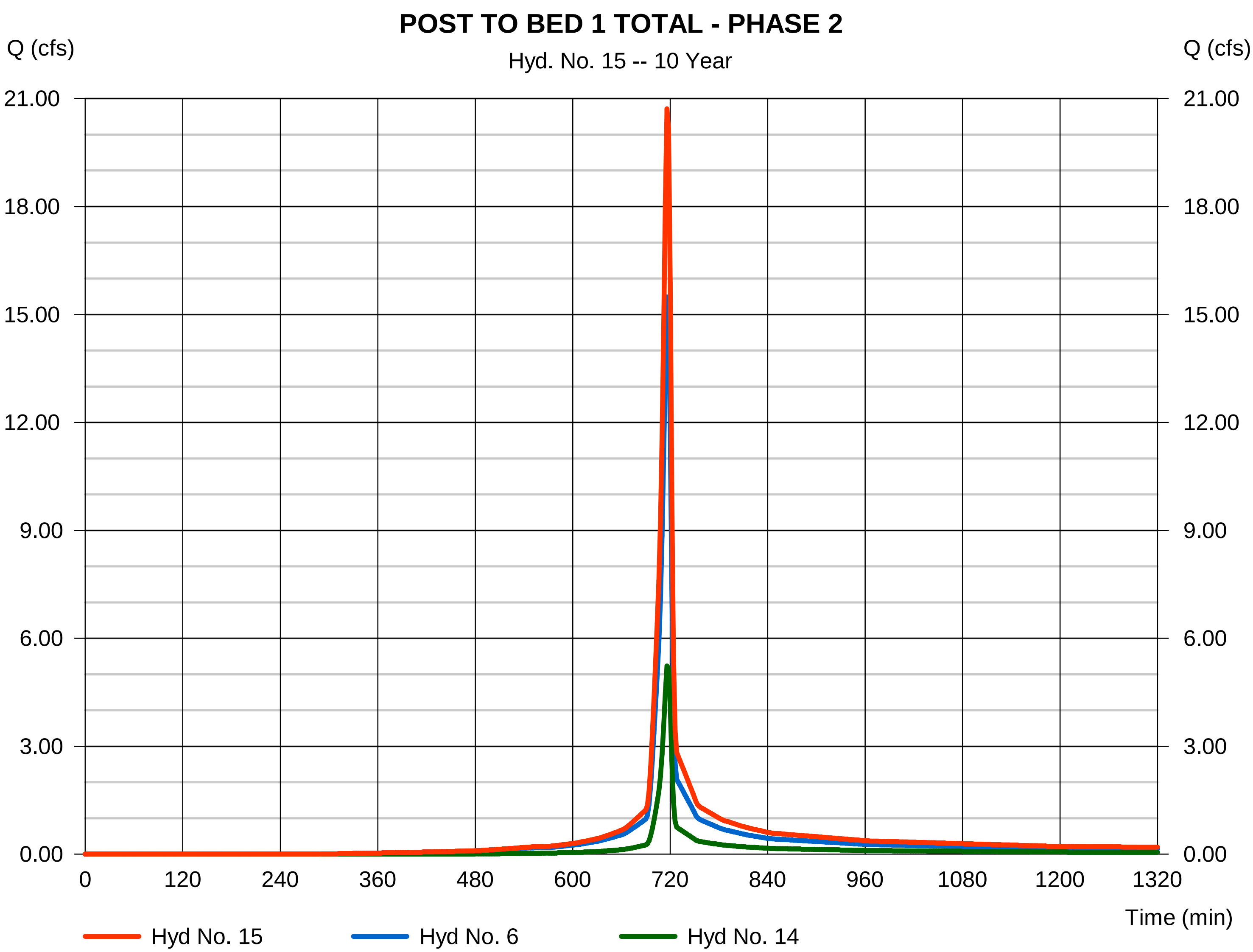
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 15

POST TO BED 1 TOTAL - PHASE 2

Hydrograph type	= Combine	Peak discharge	= 20.72 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 43,272 cuft
Inflow hyds.	= 6, 14	Contrib. drain. area	= 3.740 ac



Hydrograph Report

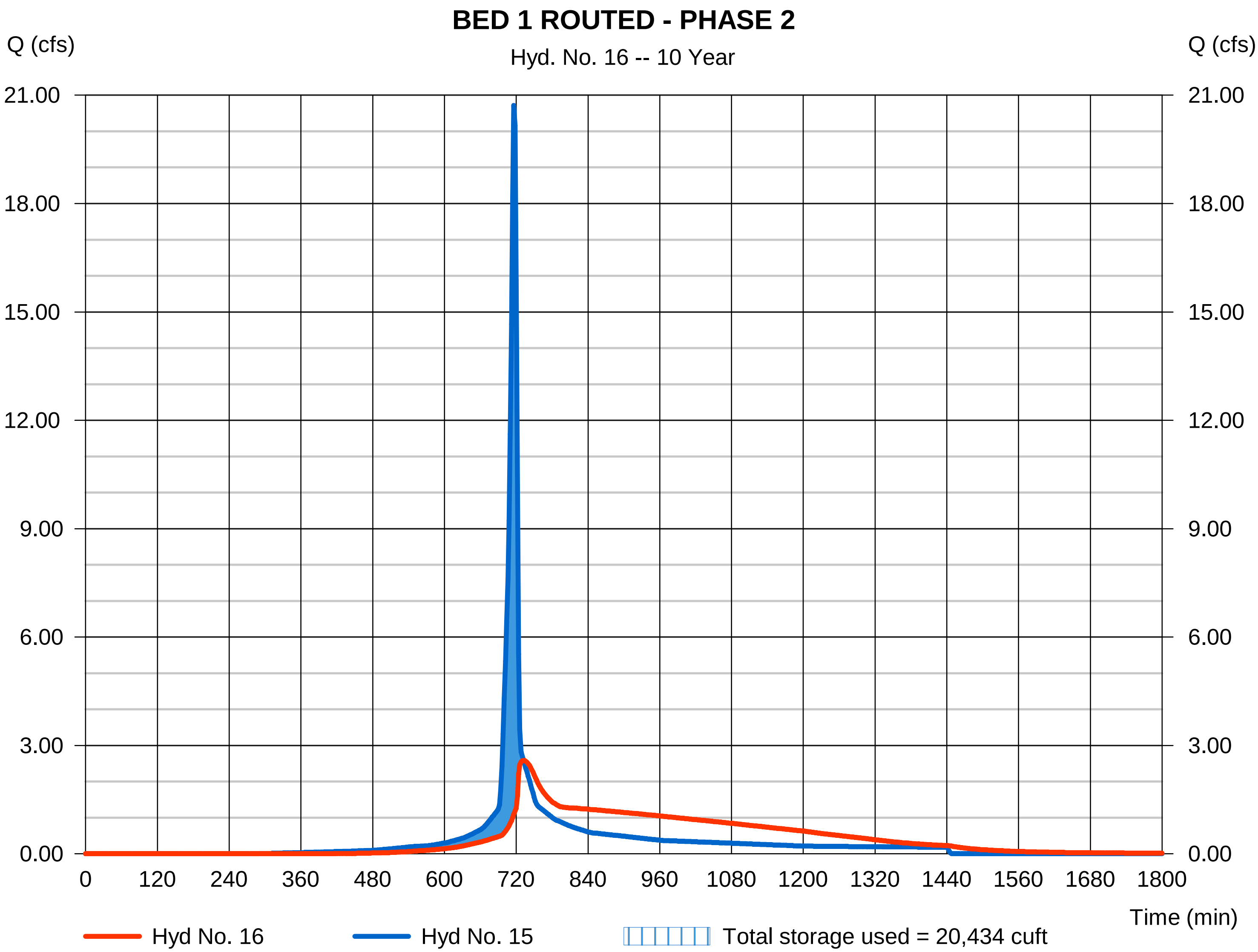
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 16

BED 1 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 2.584 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 43,223 cuft
Inflow hyd. No.	= 15 - POST TO BED 1 TOTAL - PHASE 2	Max. Elevation	= 341.06 ft
Reservoir name	= MRC BED 1	Max. Storage	= 20,434 cuft

Storage Indication method used.



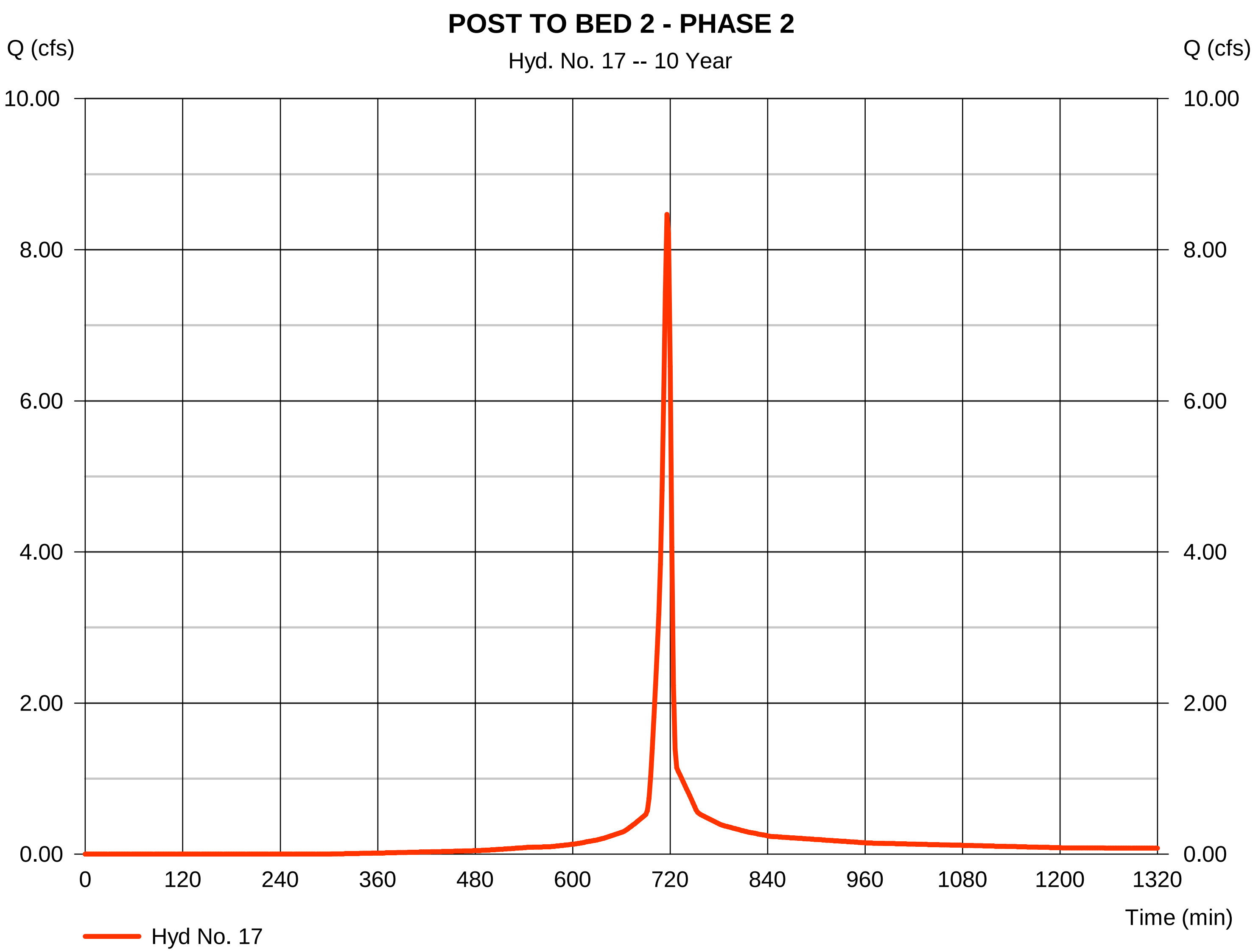
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 17

POST TO BED 2 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 8.468 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 17,775 cuft
Drainage area	= 1.460 ac	Curve number	= 87.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

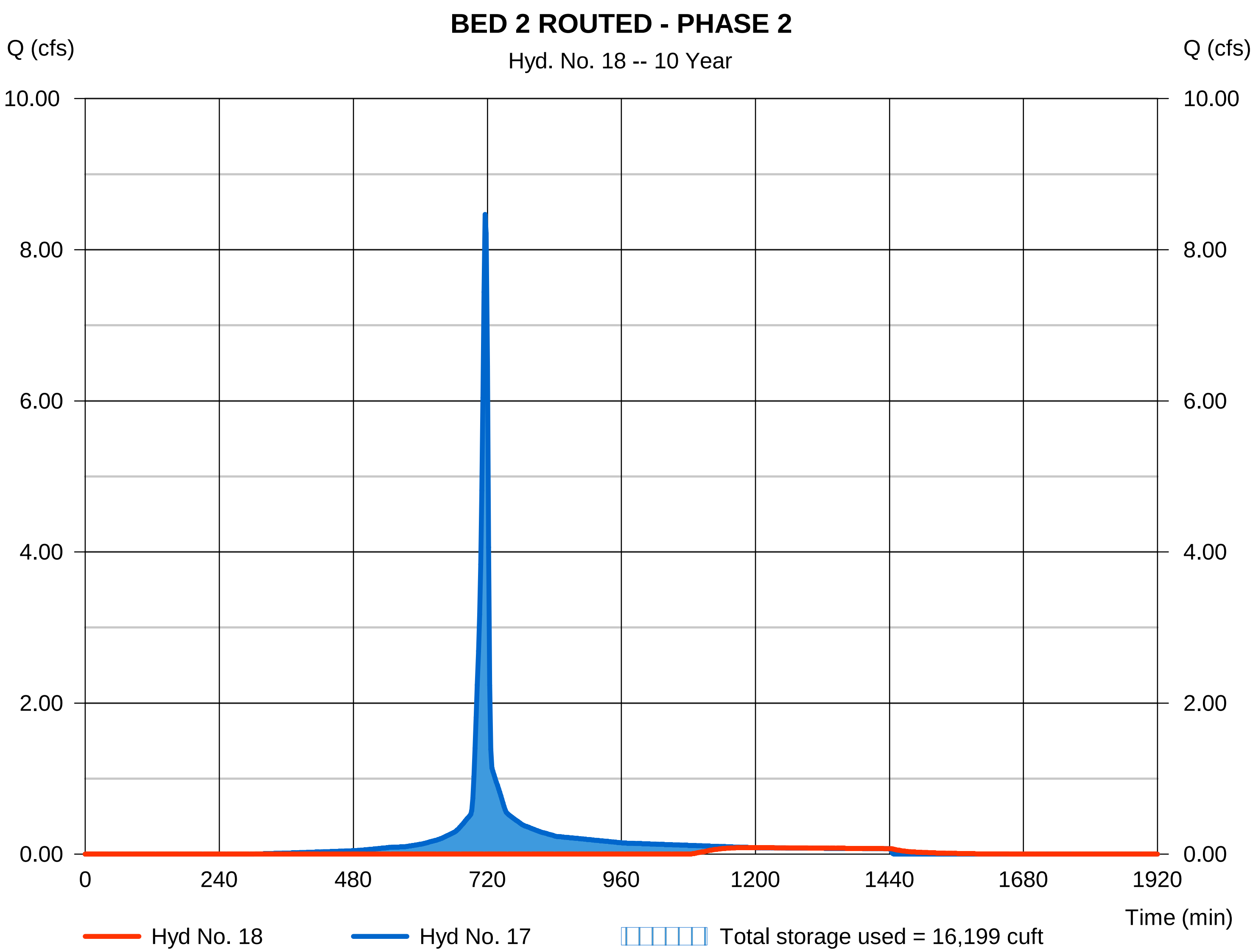
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 18

BED 2 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 0.088 cfs
Storm frequency	= 10 yrs	Time to peak	= 1190 min
Time interval	= 2 min	Hyd. volume	= 1,835 cuft
Inflow hyd. No.	= 17 - POST TO BED 2 - PHASE 2	Max. Elevation	= 346.96 ft
Reservoir name	= INFILTRATION BED 2	Max. Storage	= 16,199 cuft

Storage Indication method used.



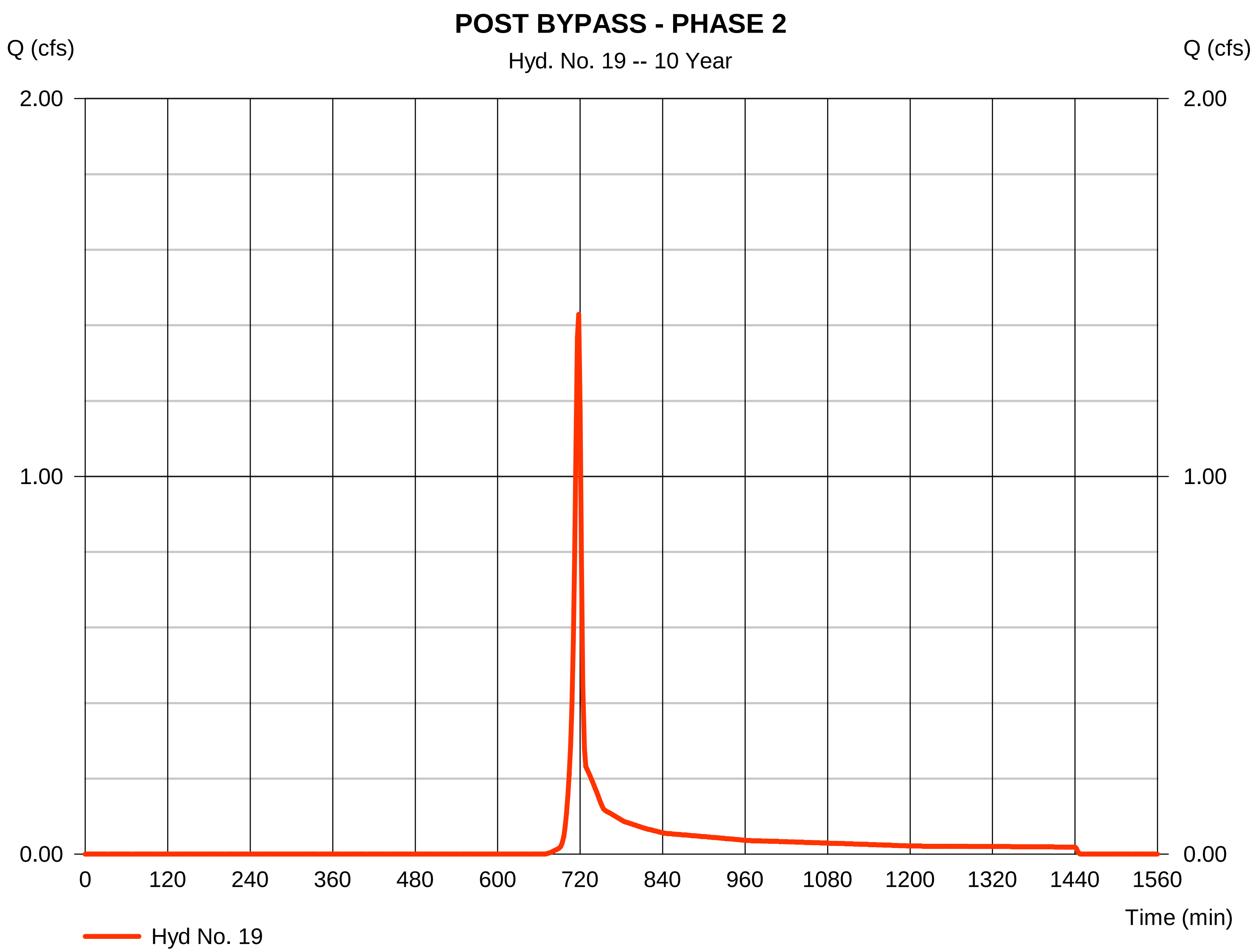
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 19

POST BYPASS - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.429 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 2,881 cuft
Drainage area	= 0.580 ac	Curve number	= 62.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



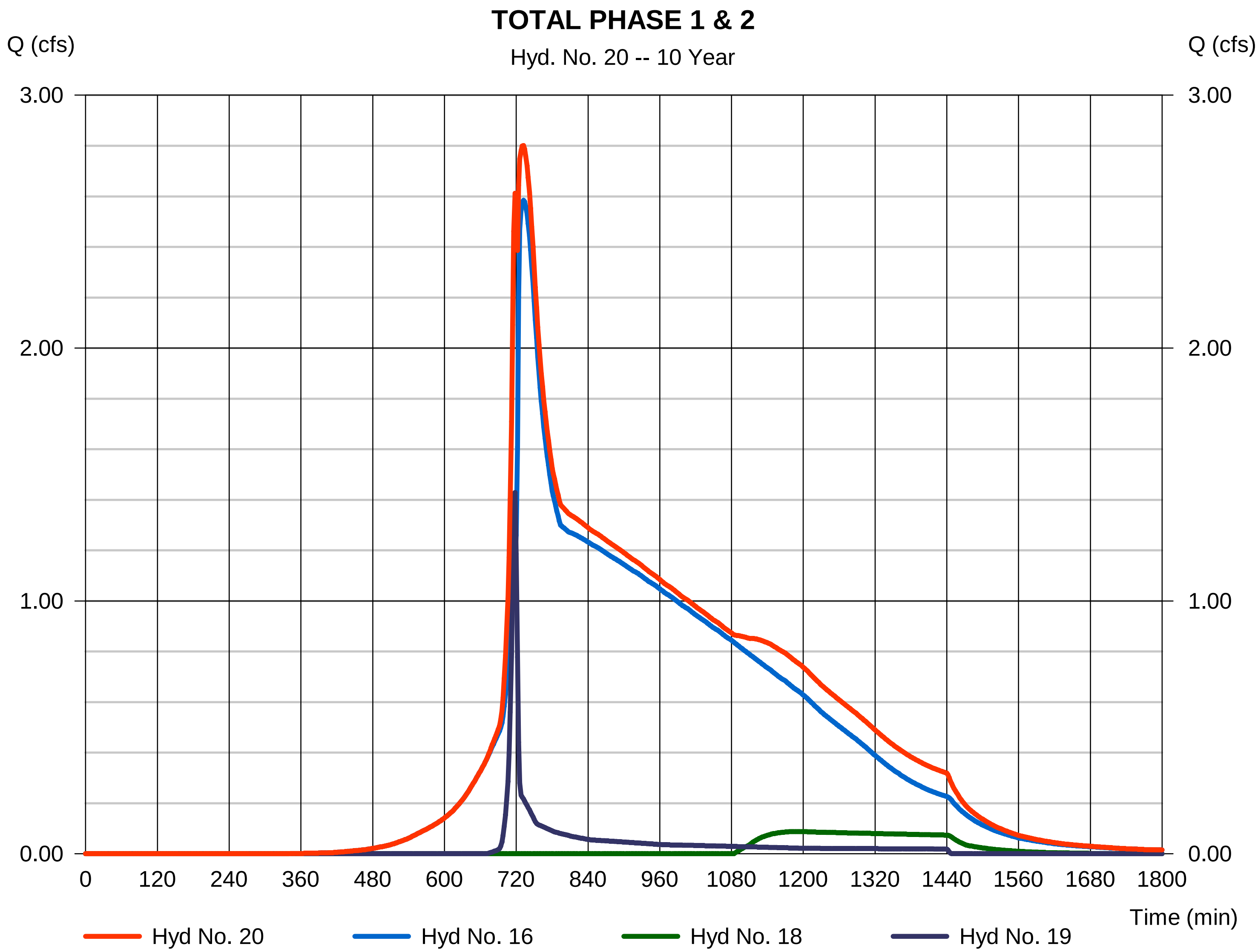
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 20

TOTAL PHASE 1 & 2

Hydrograph type	= Combine	Peak discharge	= 2.801 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 47,939 cuft
Inflow hyds.	= 16, 18, 19	Contrib. drain. area	= 0.580 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	10.23	2	718	20,672	------	------	------	PRE-DEV PHASE 1
2	SCS Runoff	8.283	2	718	16,779	------	------	------	PRE-DEV PHASE 2
4	Combine	18.51	2	718	37,451	1, 2,	------	------	TOTAL PRE-DEV
6	SCS Runoff	18.14	2	716	38,629	------	------	------	POST TO BED 1 - PHASE 1
7	Reservoir	1.532	2	746	38,580	6	340.92	19,247	BED 1 ROUTED - PHASE 1
8	SCS Runoff	1.758	2	718	3,516	------	------	------	POST TO BASIN 1 - PHASE 1
9	Combine	2.889	2	718	42,096	7, 8	------	------	TOTAL TO BASIN 1
10	Reservoir	1.439	2	772	42,085	9	340.54	4,955	BASIN 1 ROUTED
11	SCS Runoff	2.024	2	718	4,060	------	------	------	POST BYPASS - PHASE 1
12	Combine	2.708	2	718	46,145	10, 11	------	------	TOTAL PHASE 1
14	SCS Runoff	6.335	2	716	12,930	------	------	------	POST TO BED 1 - PHASE 2
15	Combine	24.47	2	716	51,559	6, 14	------	------	POST TO BED 1 TOTAL - PHASE 2
16	Reservoir	6.789	2	724	51,510	15	341.41	23,046	BED 1 ROUTED - PHASE 2
17	SCS Runoff	9.942	2	716	21,073	------	------	------	POST TO BED 2 - PHASE 2
18	Reservoir	0.223	2	902	5,134	17	347.00	16,429	BED 2 ROUTED - PHASE 2
19	SCS Runoff	1.885	2	718	3,774	------	------	------	POST BYPASS - PHASE 2
20	Combine	7.359	2	724	60,419	16, 18, 19	------	------	TOTAL PHASE 1 & 2

3705 Hydraflow.gpw	Return Period: 25 Year	Monday, 06 / 22 / 2020

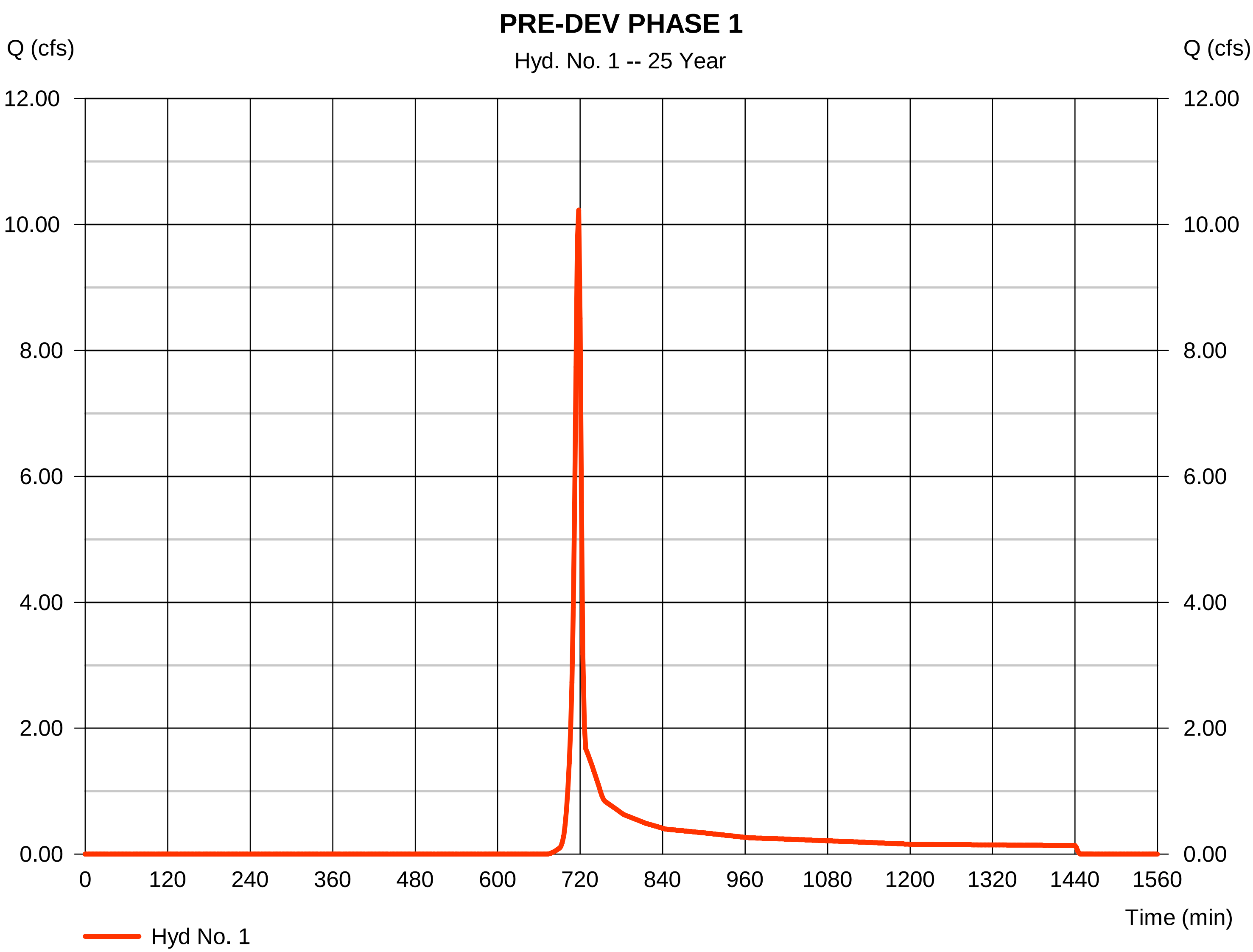
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 1

PRE-DEV PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 10.23 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 20,672 cuft
Drainage area	= 3.770 ac	Curve number	= 58.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



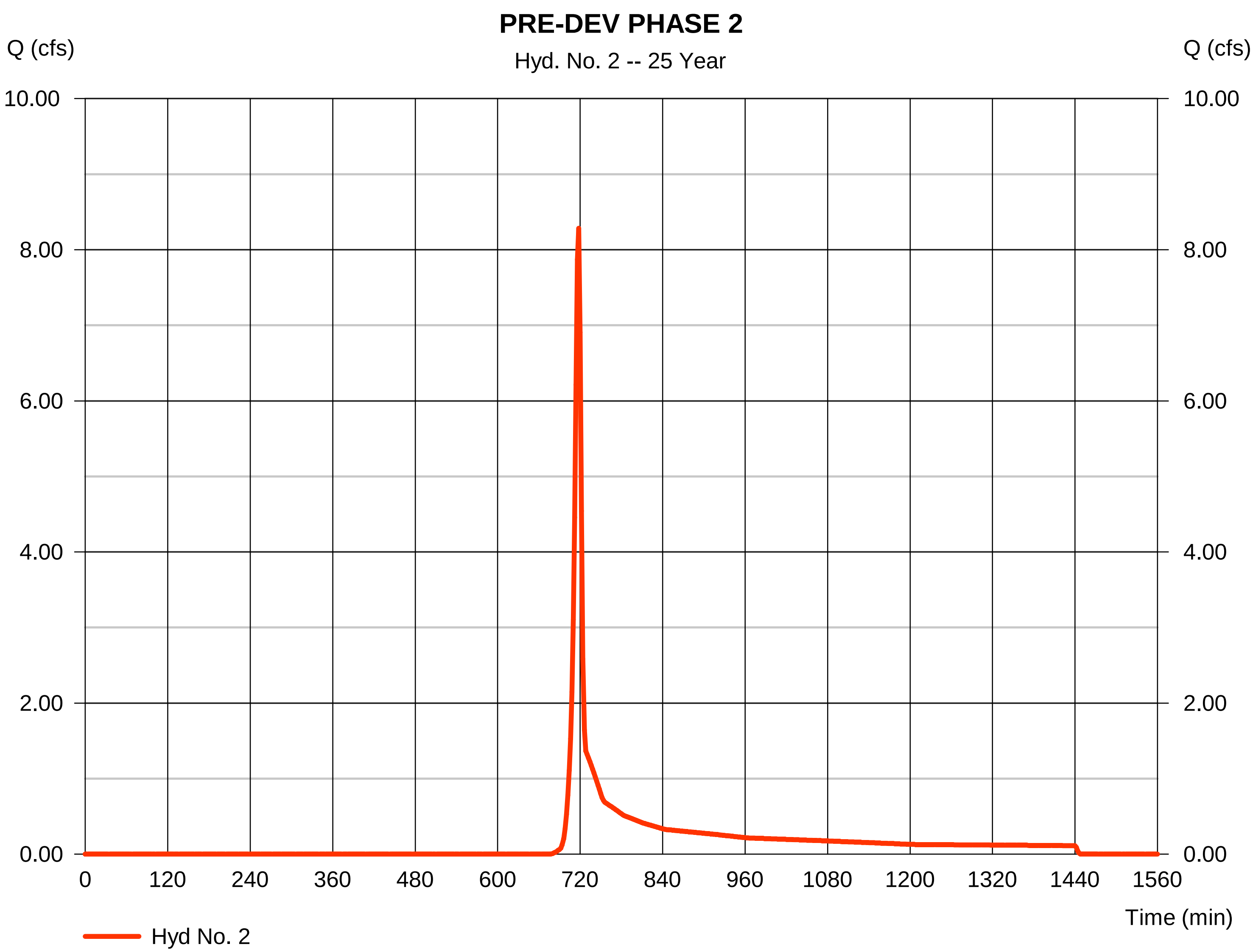
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 2

PRE-DEV PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 8.283 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 16,779 cuft
Drainage area	= 3.150 ac	Curve number	= 57.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



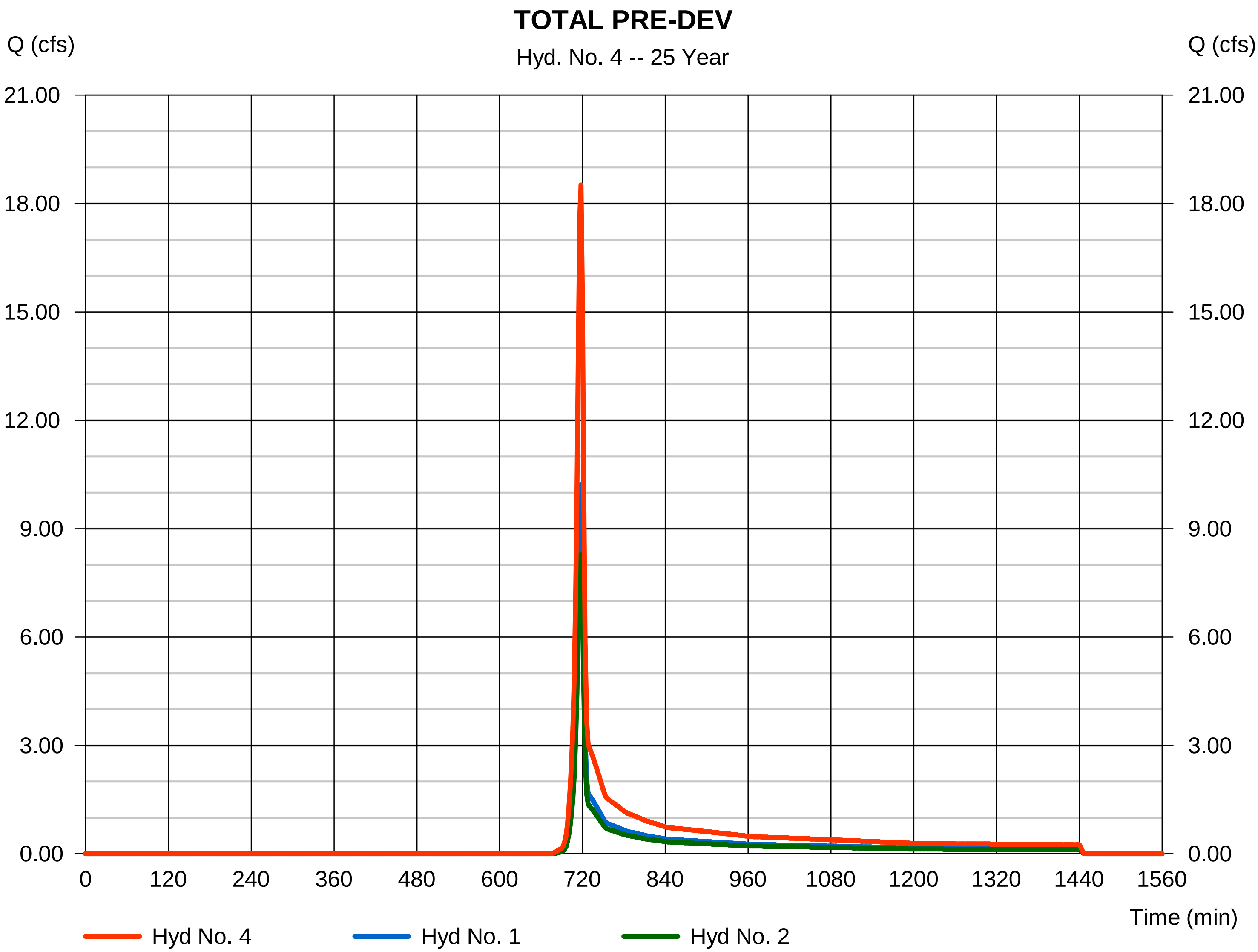
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 4

TOTAL PRE-DEV

Hydrograph type	= Combine	Peak discharge	= 18.51 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 37,451 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 6.920 ac



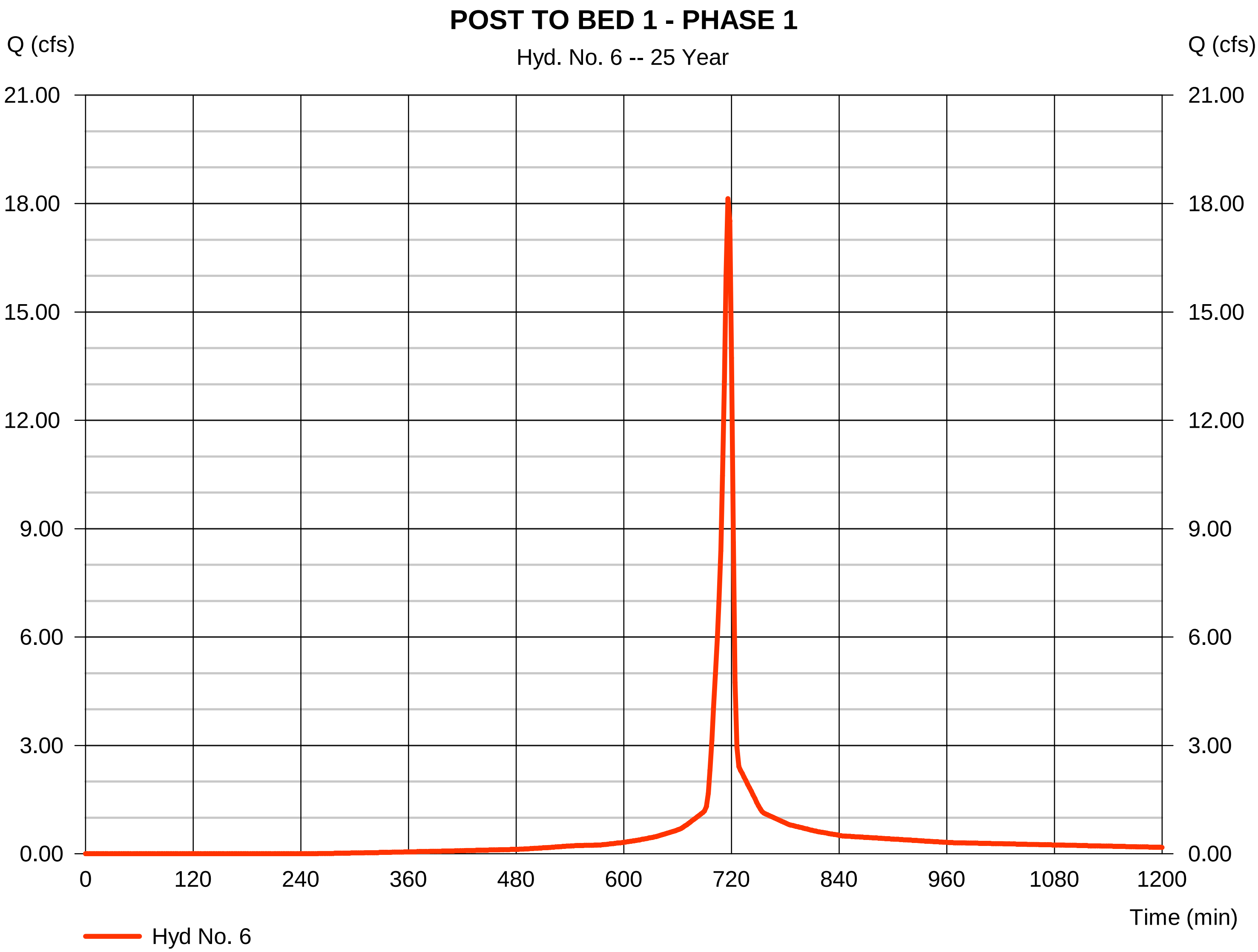
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 6

POST TO BED 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 18.14 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 38,629 cuft
Drainage area	= 2.630 ac	Curve number	= 87.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

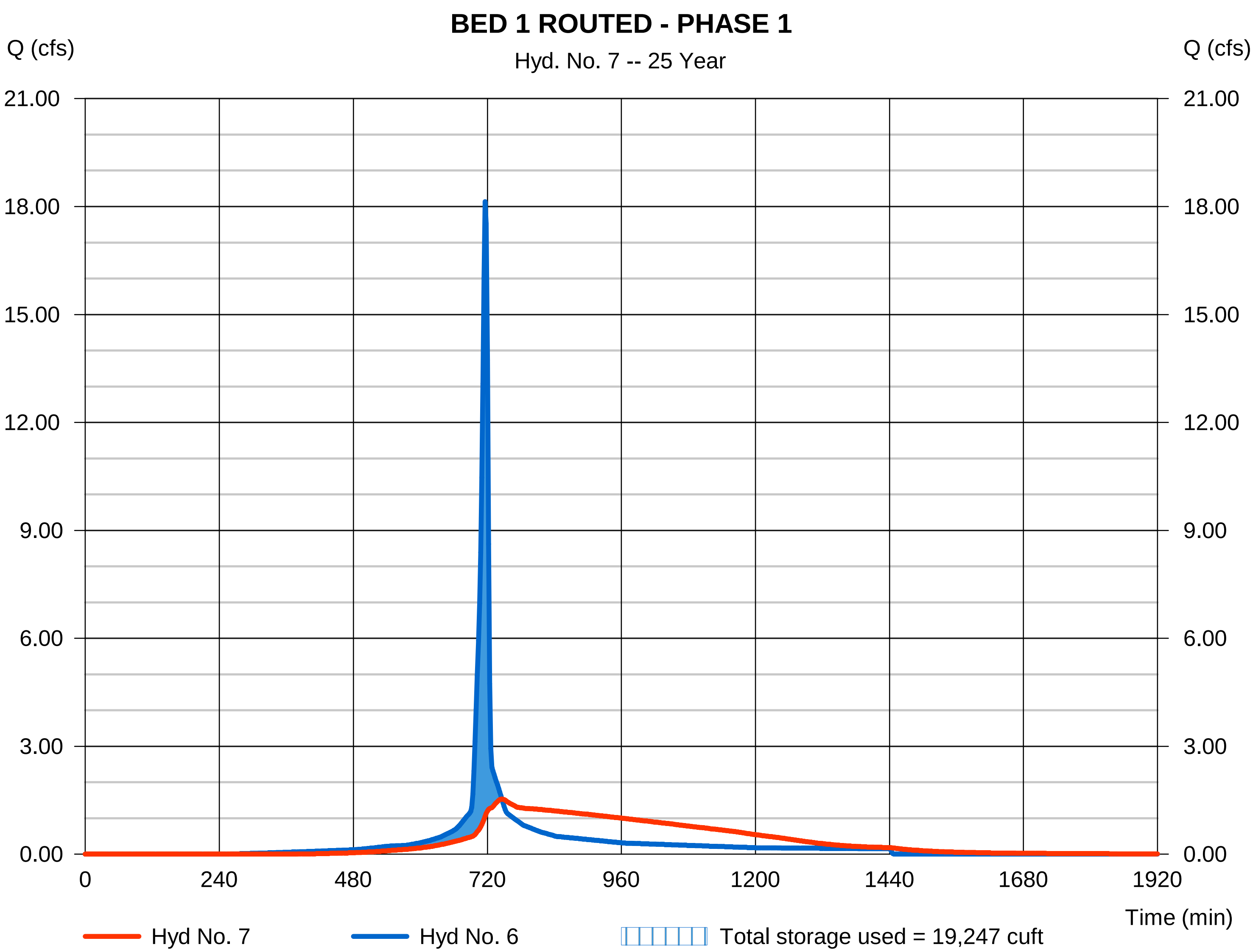
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 7

BED 1 ROUTED - PHASE 1

Hydrograph type	= Reservoir	Peak discharge	= 1.532 cfs
Storm frequency	= 25 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 38,580 cuft
Inflow hyd. No.	= 6 - POST TO BED 1 - PHASE 1	Max. Elevation	= 340.92 ft
Reservoir name	= MRC BED 1	Max. Storage	= 19,247 cuft

Storage Indication method used.



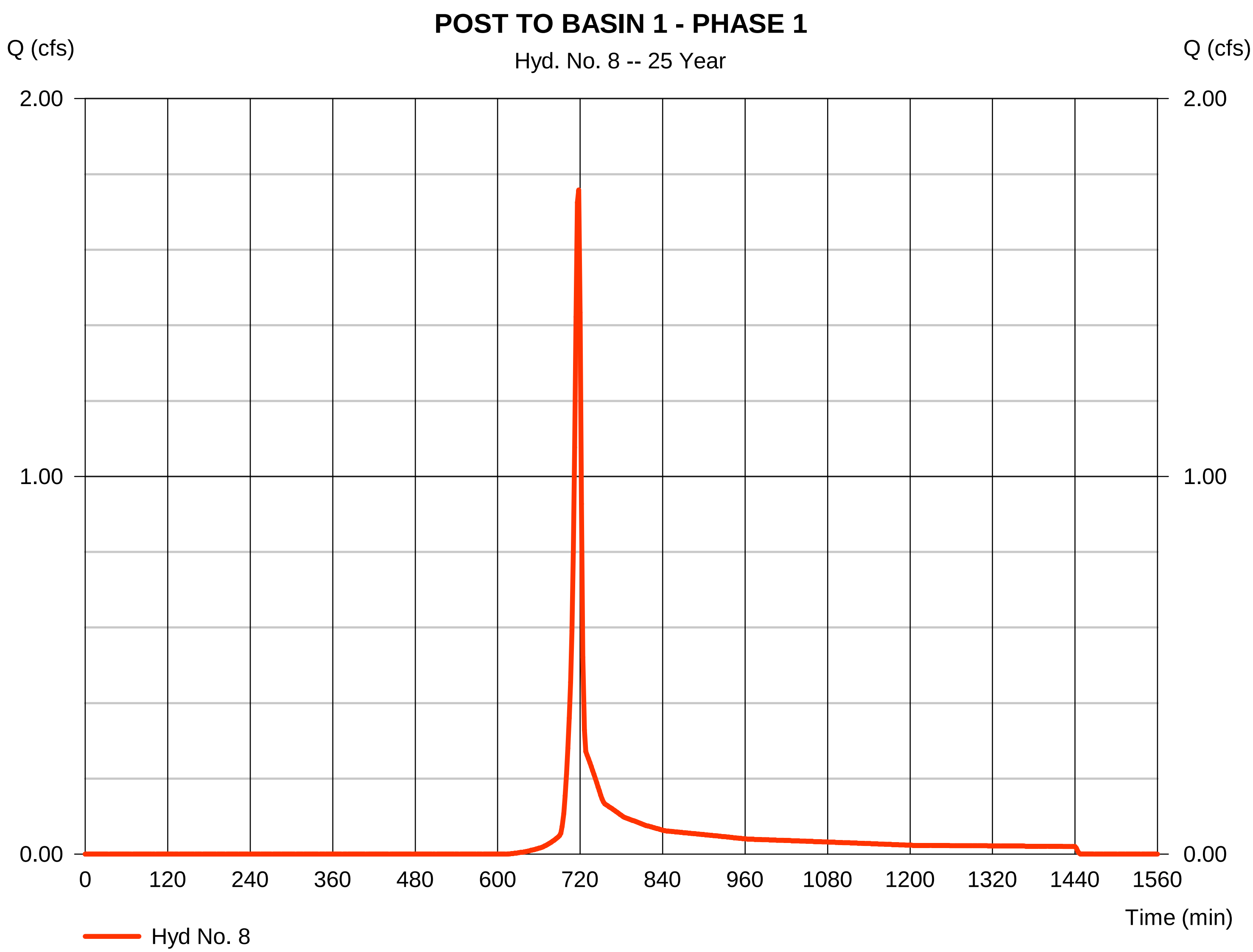
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 8

POST TO BASIN 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.758 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 3,516 cuft
Drainage area	= 0.480 ac	Curve number	= 65.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



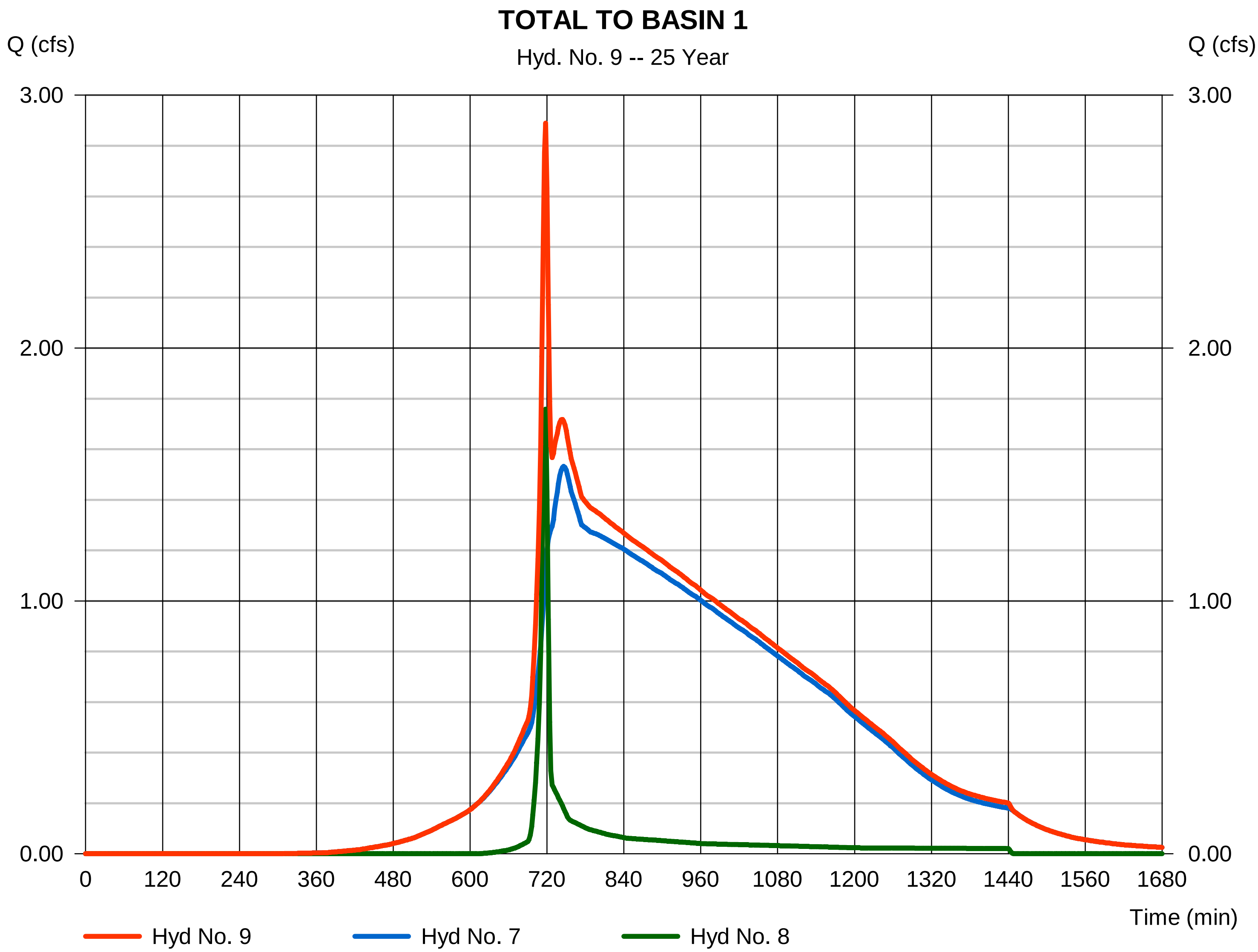
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 9

TOTAL TO BASIN 1

Hydrograph type	= Combine	Peak discharge	= 2.889 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 42,096 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 0.480 ac



Hydrograph Report

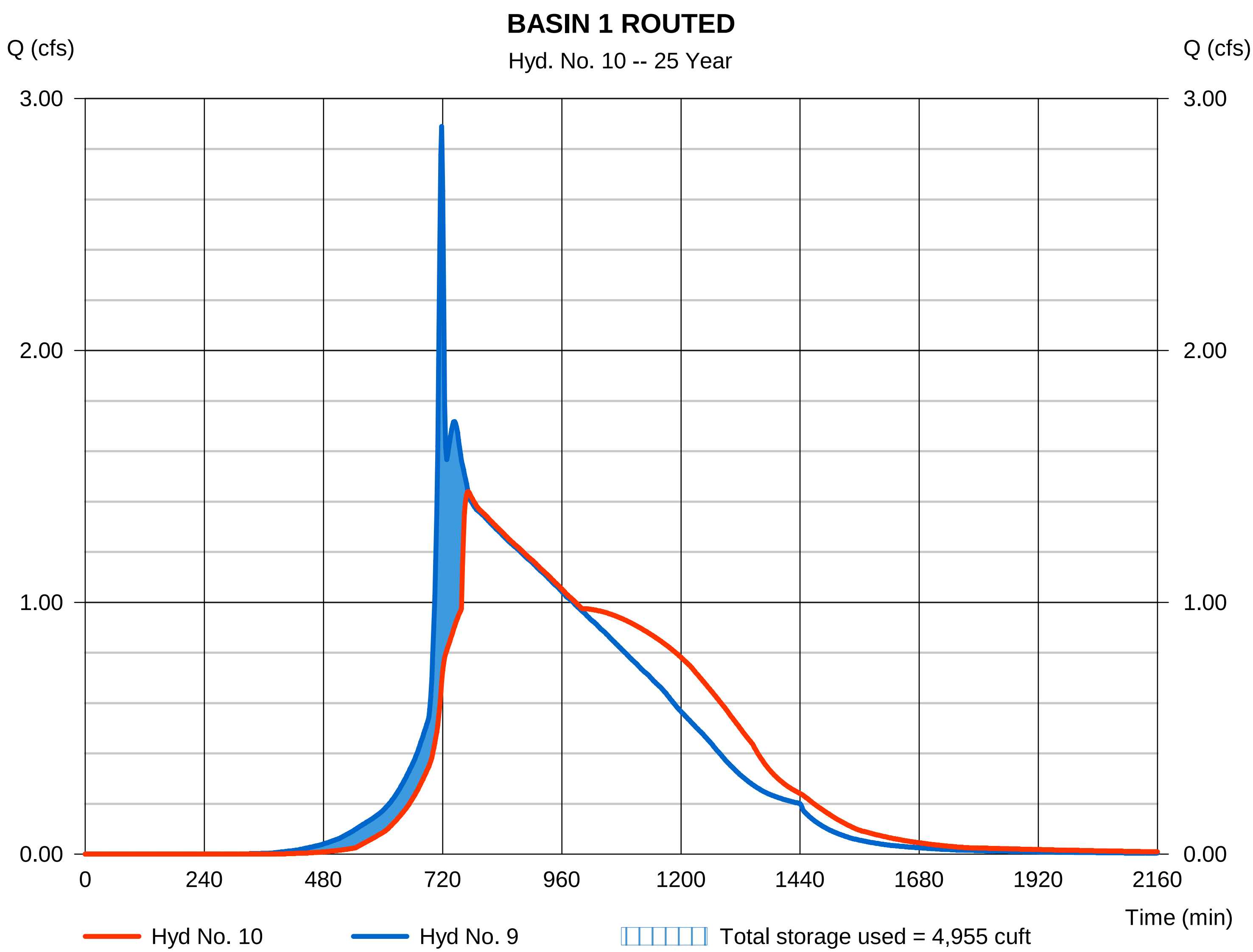
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 10

BASIN 1 ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 1.439 cfs
Storm frequency	= 25 yrs	Time to peak	= 772 min
Time interval	= 2 min	Hyd. volume	= 42,085 cuft
Inflow hyd. No.	= 9 - TOTAL TO BASIN 1	Max. Elevation	= 340.54 ft
Reservoir name	= DETENTION BASIN 1	Max. Storage	= 4,955 cuft

Storage Indication method used.



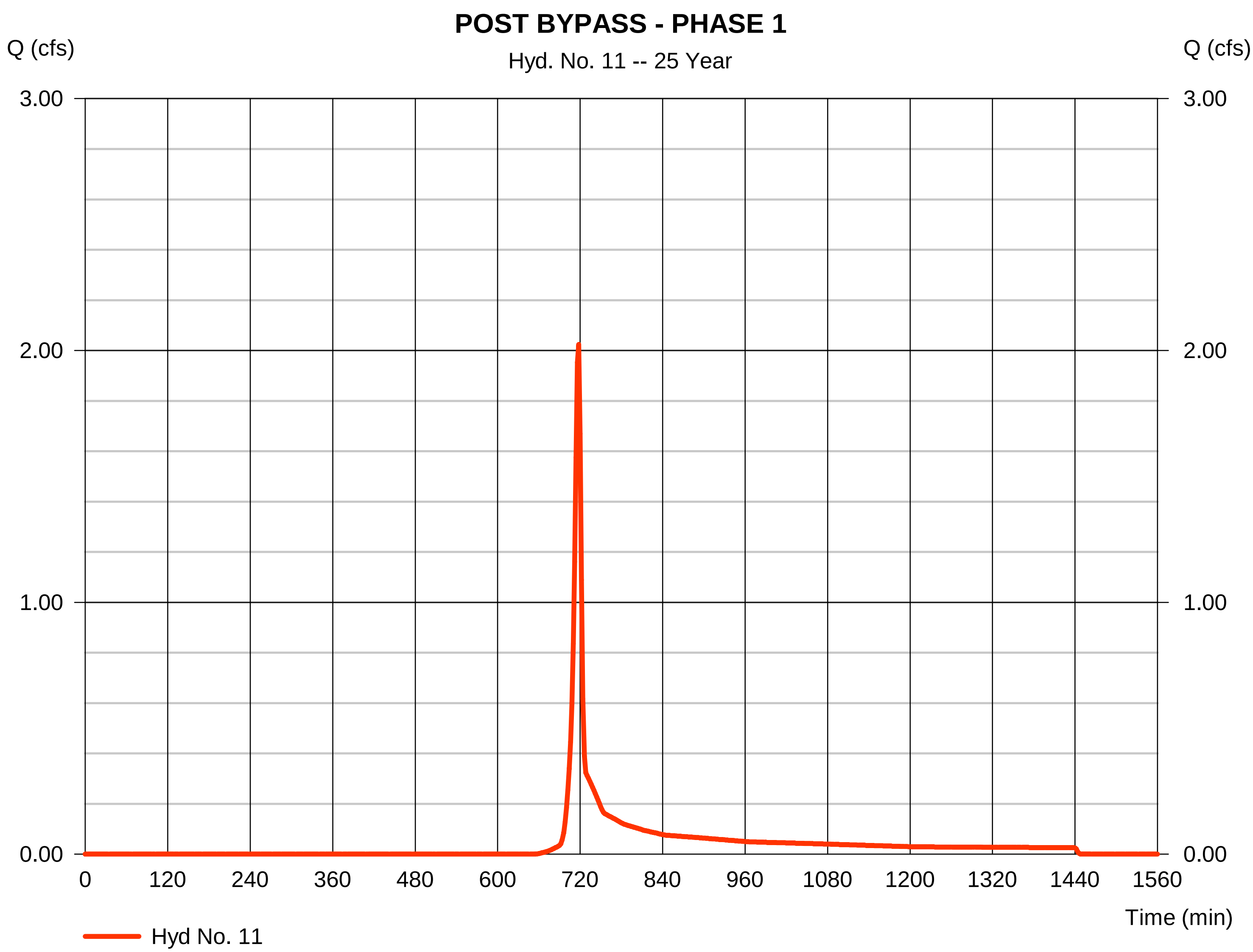
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 11

POST BYPASS - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.024 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 4,060 cuft
Drainage area	= 0.660 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



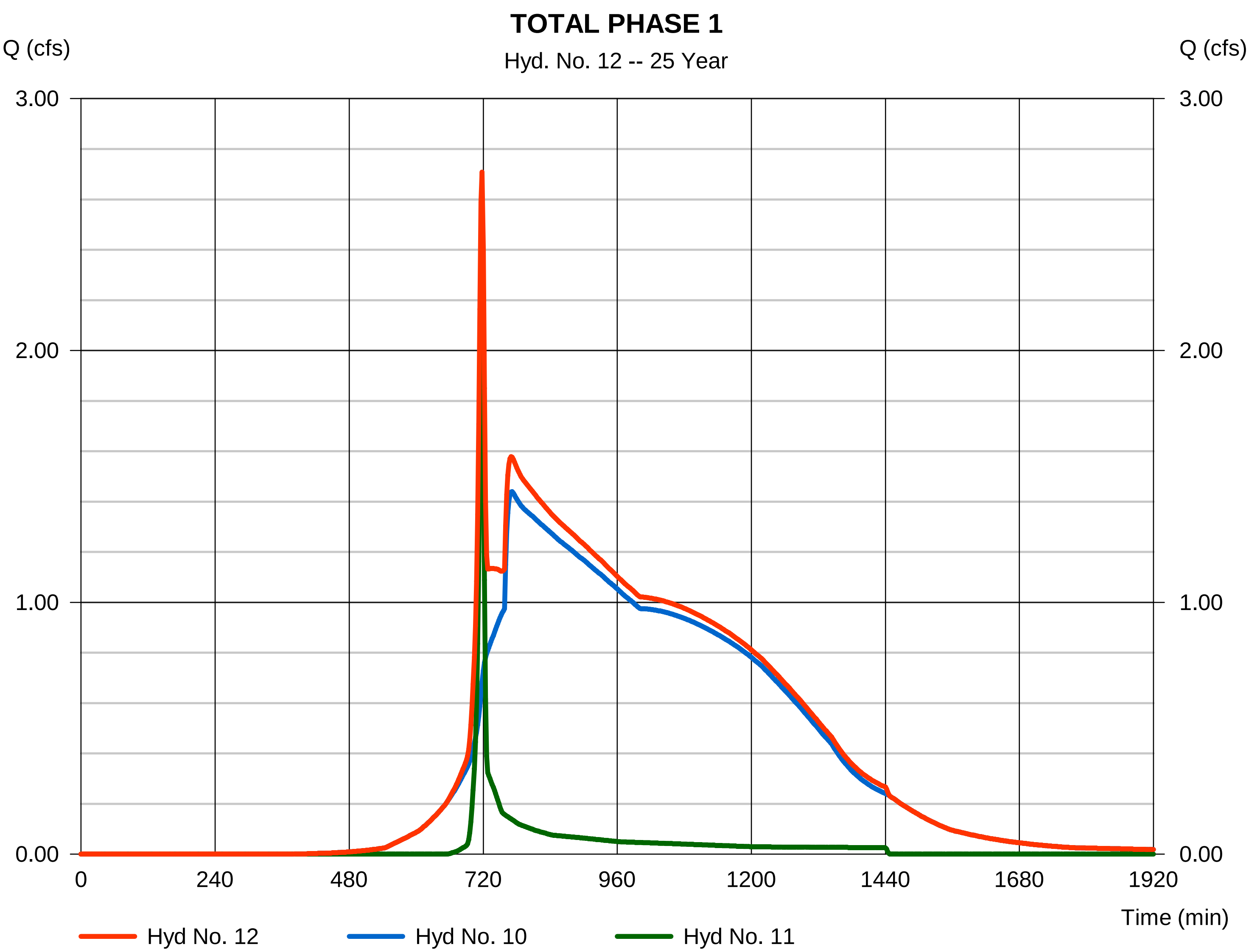
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 12

TOTAL PHASE 1

Hydrograph type	= Combine	Peak discharge	= 2.708 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 46,145 cuft
Inflow hyds.	= 10, 11	Contrib. drain. area	= 0.660 ac



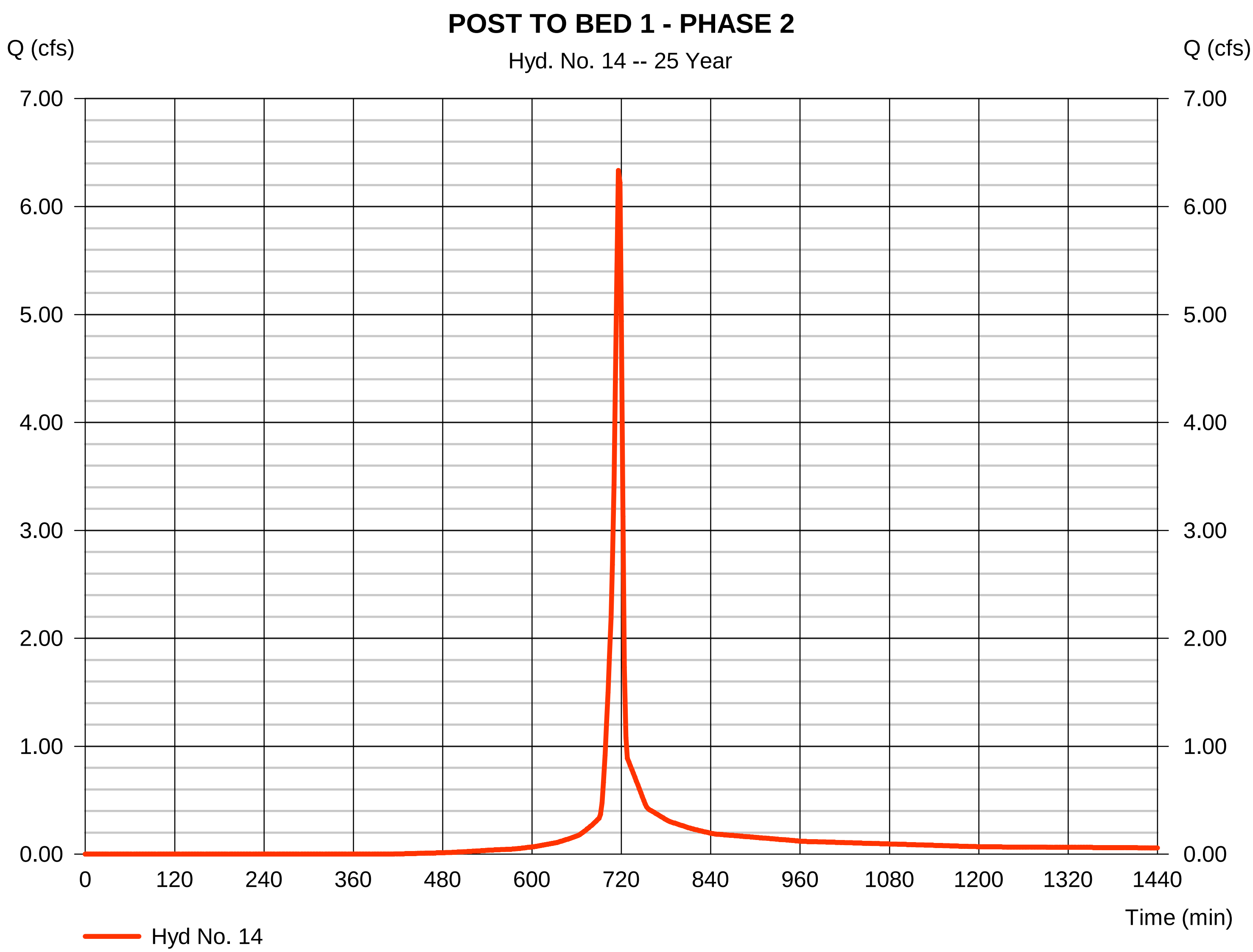
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 14

POST TO BED 1 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 6.335 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 12,930 cuft
Drainage area	= 1.110 ac	Curve number	= 79.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



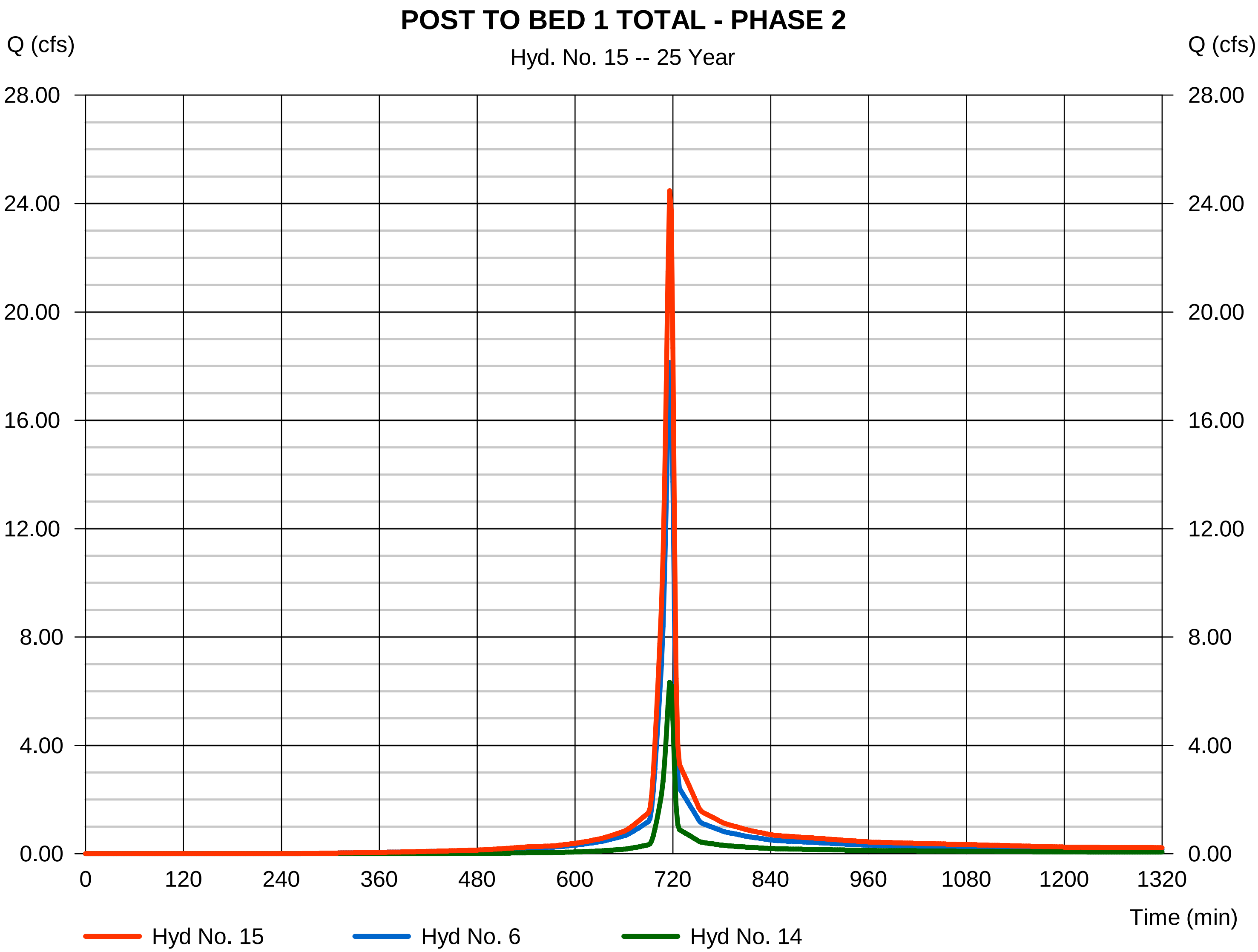
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 15

POST TO BED 1 TOTAL - PHASE 2

Hydrograph type	= Combine	Peak discharge	= 24.47 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 51,559 cuft
Inflow hyds.	= 6, 14	Contrib. drain. area	= 3.740 ac



Hydrograph Report

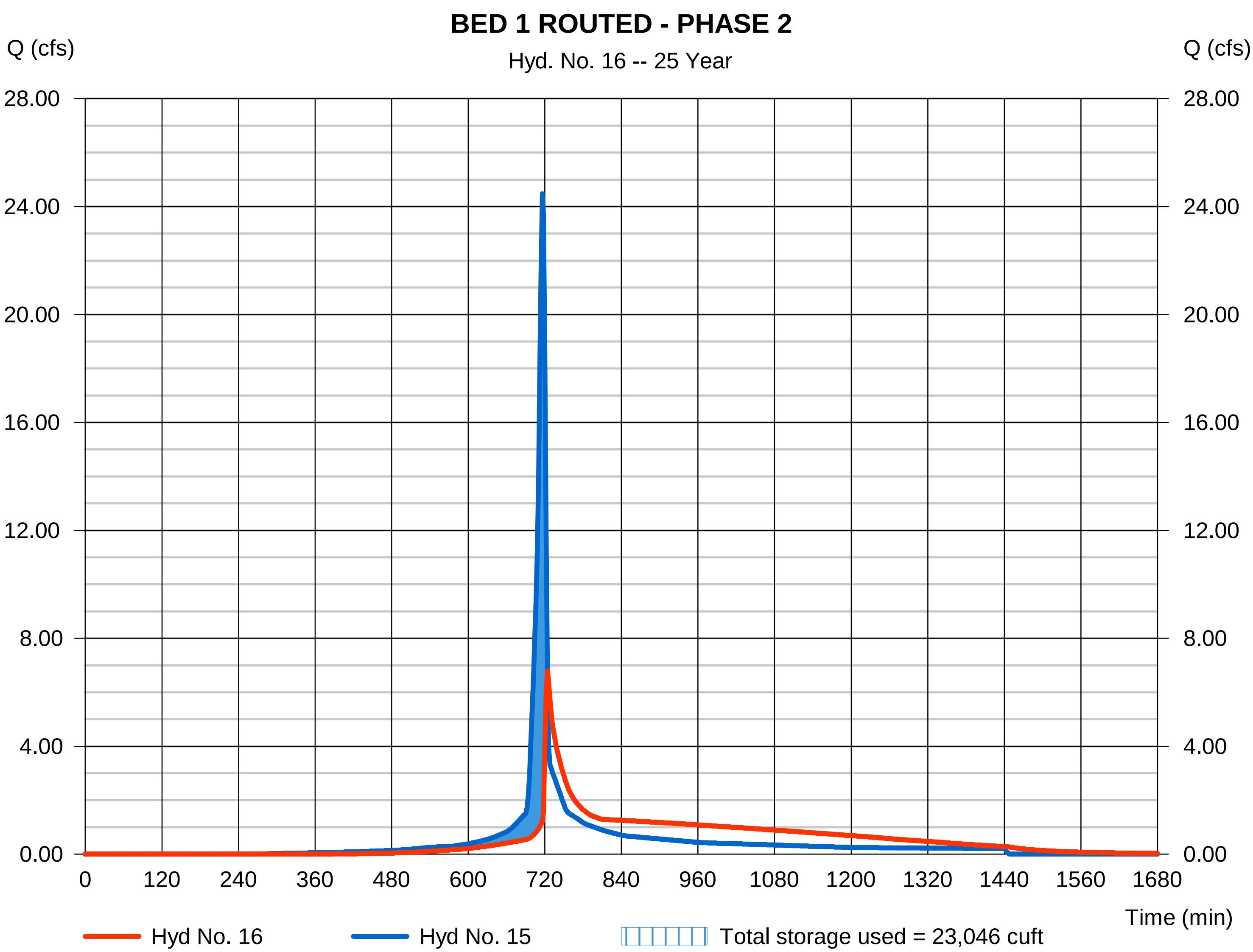
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 16

BED 1 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 6.789 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 51,510 cuft
Inflow hyd. No.	= 15 - POST TO BED 1 TOTAL - PHASE 2	Max. Elevation	= 341.41 ft
Reservoir name	= MRC BED 1	Max. Storage	= 23,046 cuft

Storage Indication method used.



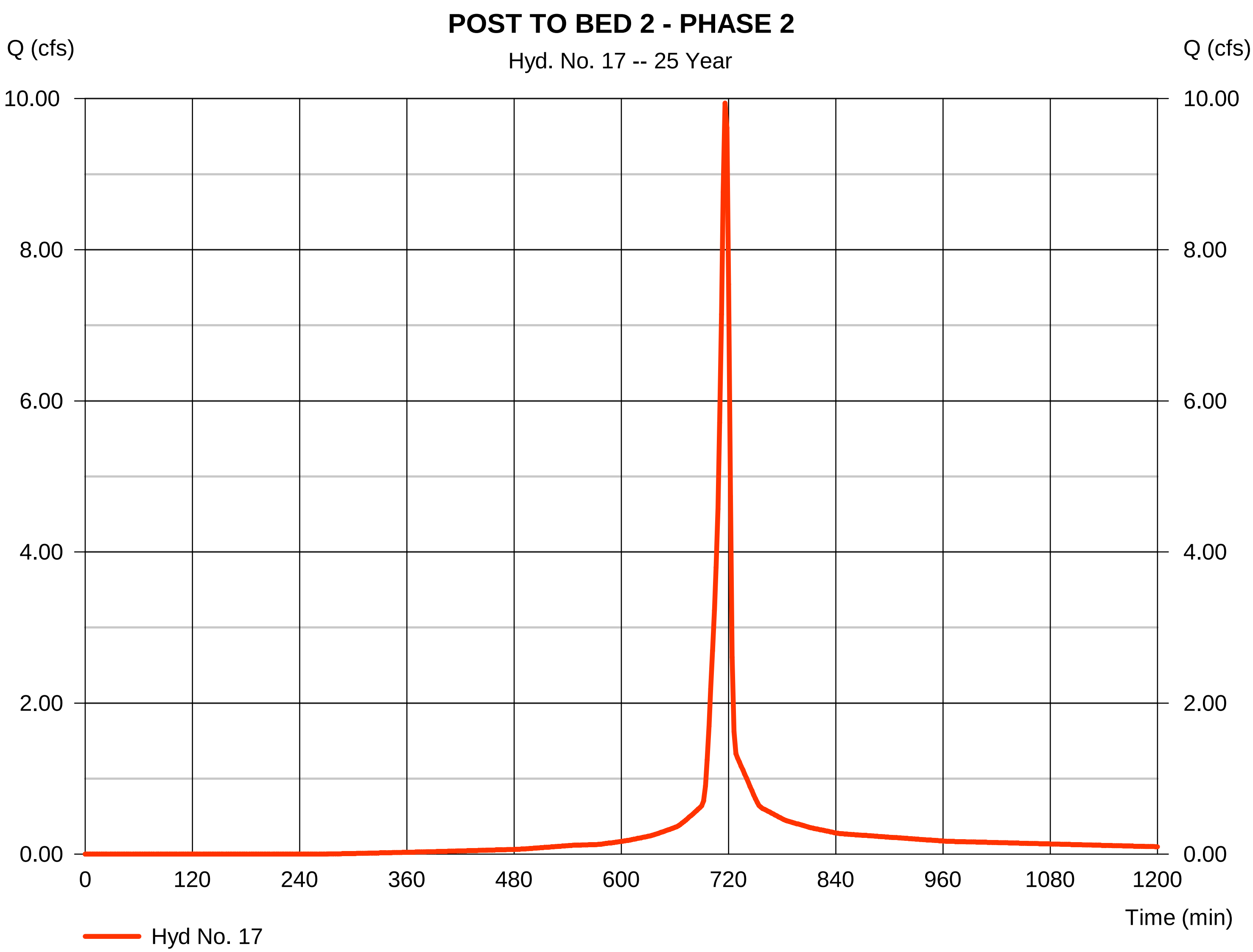
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 17

POST TO BED 2 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 9.942 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 21,073 cuft
Drainage area	= 1.460 ac	Curve number	= 87.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

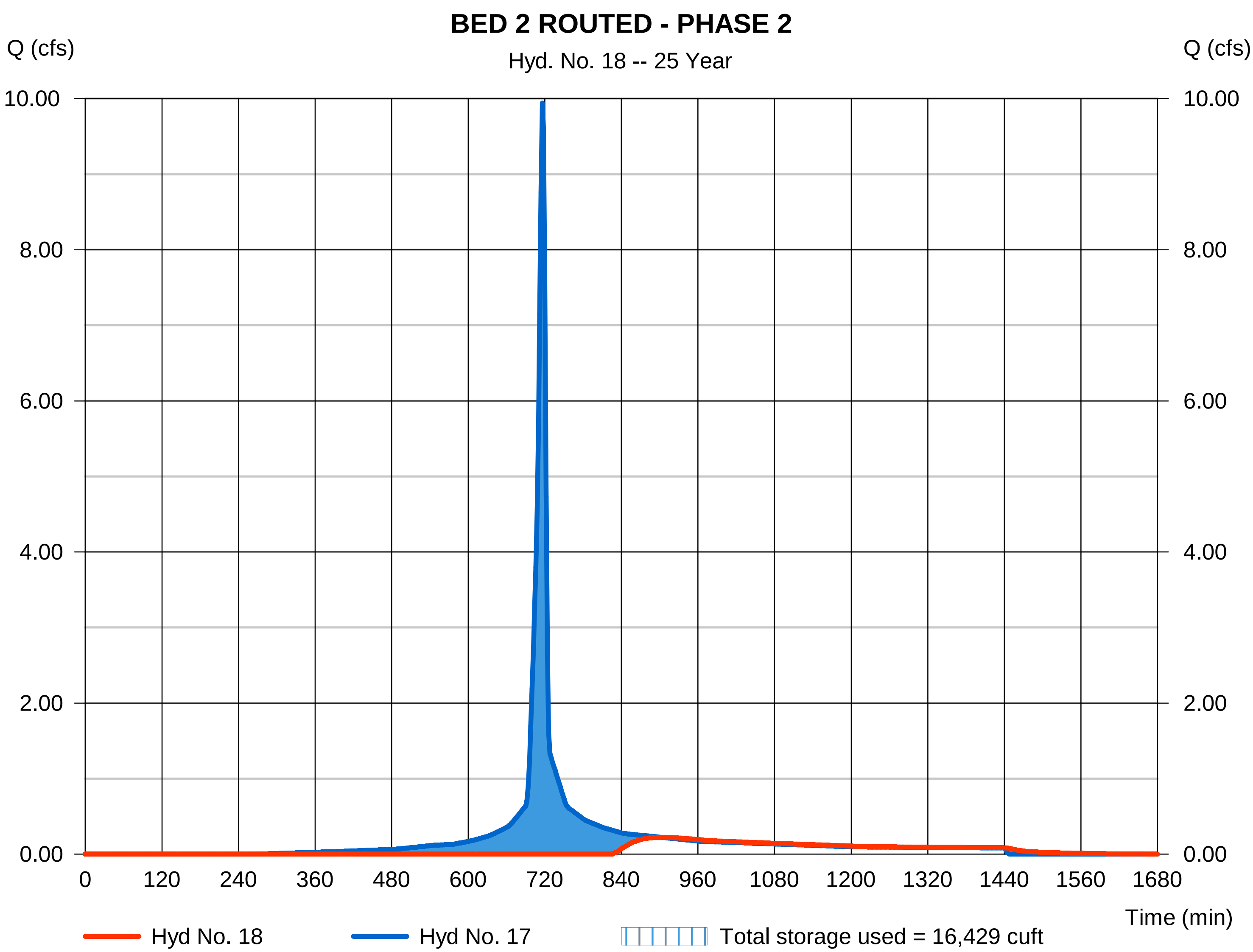
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 18

BED 2 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 0.223 cfs
Storm frequency	= 25 yrs	Time to peak	= 902 min
Time interval	= 2 min	Hyd. volume	= 5,134 cuft
Inflow hyd. No.	= 17 - POST TO BED 2 - PHASE 2	Max. Elevation	= 347.00 ft
Reservoir name	= INFILTRATION BED 2	Max. Storage	= 16,429 cuft

Storage Indication method used.



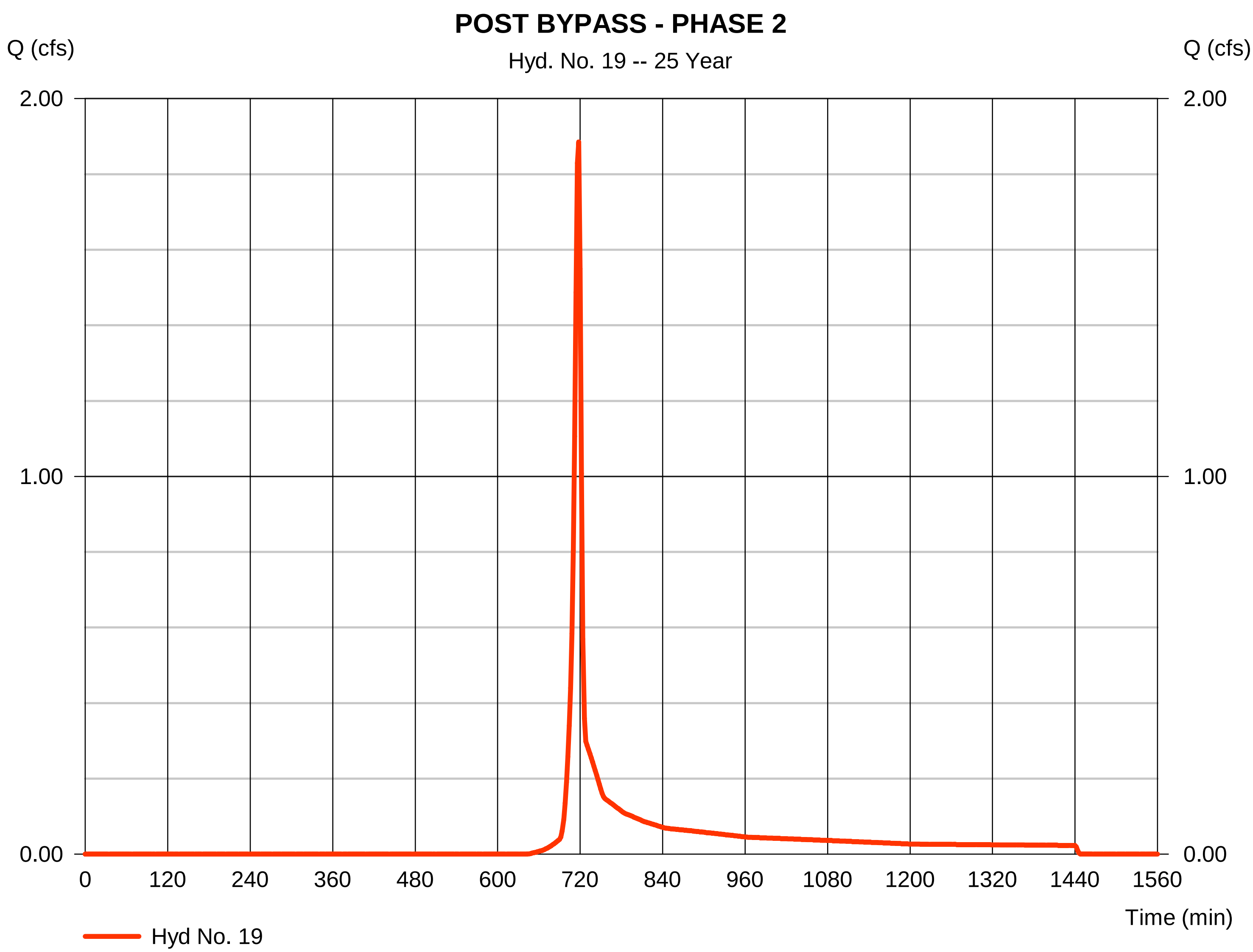
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 19

POST BYPASS - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.885 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 3,774 cuft
Drainage area	= 0.580 ac	Curve number	= 62.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



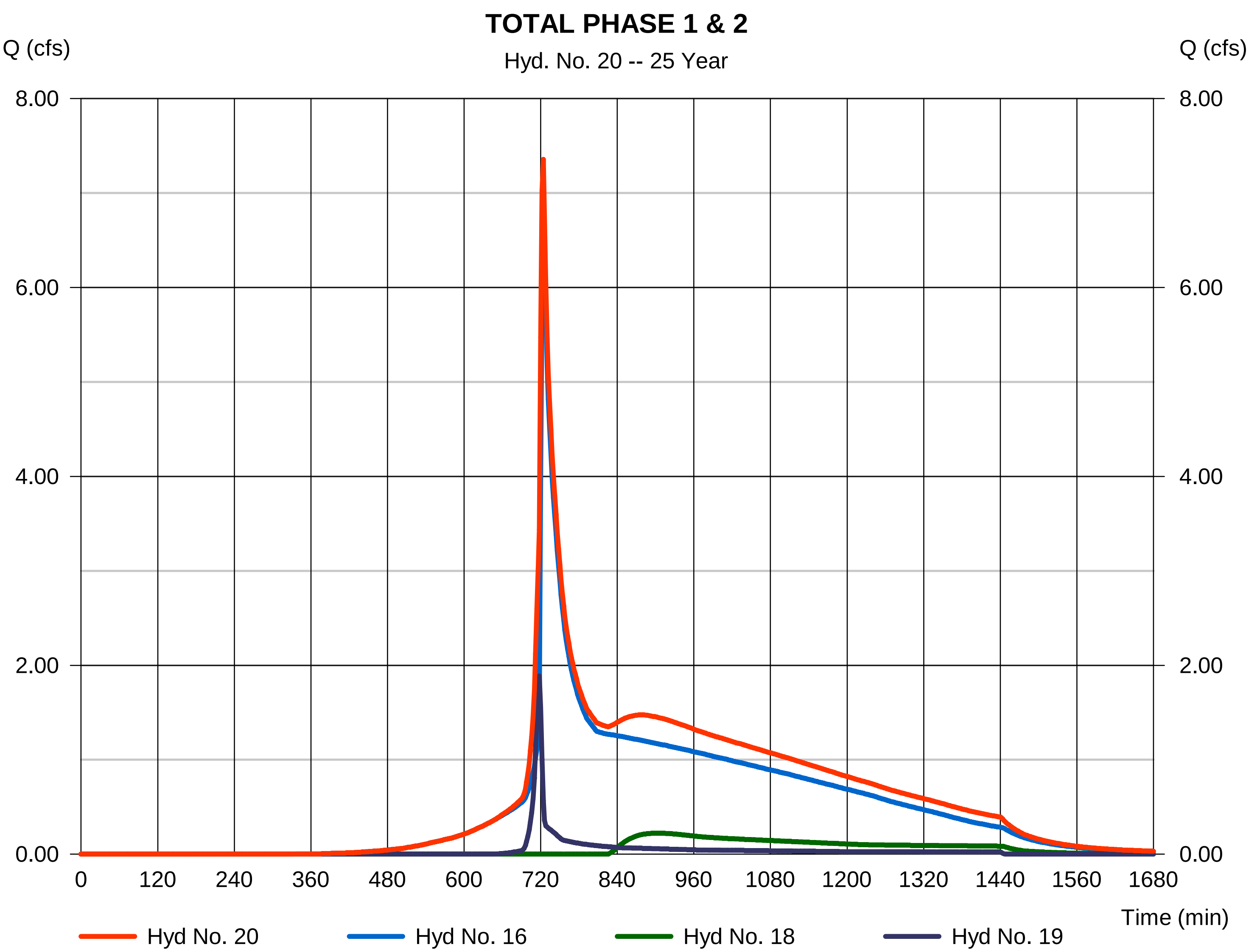
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 20

TOTAL PHASE 1 & 2

Hydrograph type	= Combine	Peak discharge	= 7.359 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 60,419 cuft
Inflow hyds.	= 16, 18, 19	Contrib. drain. area	= 0.580 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	13.15	2	718	26,363	------	------	------	PRE-DEV PHASE 1
2	SCS Runoff	10.69	2	718	21,463	------	------	------	PRE-DEV PHASE 2
4	Combine	23.84	2	718	47,826	1, 2,	------	------	TOTAL PRE-DEV
6	SCS Runoff	20.78	2	716	44,658	------	------	------	POST TO BED 1 - PHASE 1
7	Reservoir	3.286	2	726	44,609	6	341.13	21,020	BED 1 ROUTED - PHASE 1
8	SCS Runoff	2.172	2	718	4,353	------	------	------	POST TO BASIN 1 - PHASE 1
9	Combine	3.745	2	724	48,962	7, 8	------	------	TOTAL TO BASIN 1
10	Reservoir	3.095	2	738	48,951	9	340.64	5,333	BASIN 1 ROUTED
11	SCS Runoff	2.558	2	718	5,116	------	------	------	POST BYPASS - PHASE 1
12	Combine	3.422	2	738	54,067	10, 11	------	------	TOTAL PHASE 1
14	SCS Runoff	7.449	2	716	15,296	------	------	------	POST TO BED 1 - PHASE 2
15	Combine	28.23	2	716	59,954	6, 14	------	------	POST TO BED 1 TOTAL - PHASE 2
16	Reservoir	11.22	2	722	59,905	15	341.79	25,217	BED 1 ROUTED - PHASE 2
17	SCS Runoff	11.41	2	716	24,405	------	------	------	POST TO BED 2 - PHASE 2
18	Reservoir	0.489	2	788	8,466	17	347.08	16,774	BED 2 ROUTED - PHASE 2
19	SCS Runoff	2.365	2	718	4,729	------	------	------	POST BYPASS - PHASE 2
20	Combine	12.46	2	722	73,101	16, 18, 19	------	------	TOTAL PHASE 1 & 2

3705 Hydraflow.gpw	Return Period: 50 Year	Monday, 06 / 22 / 2020

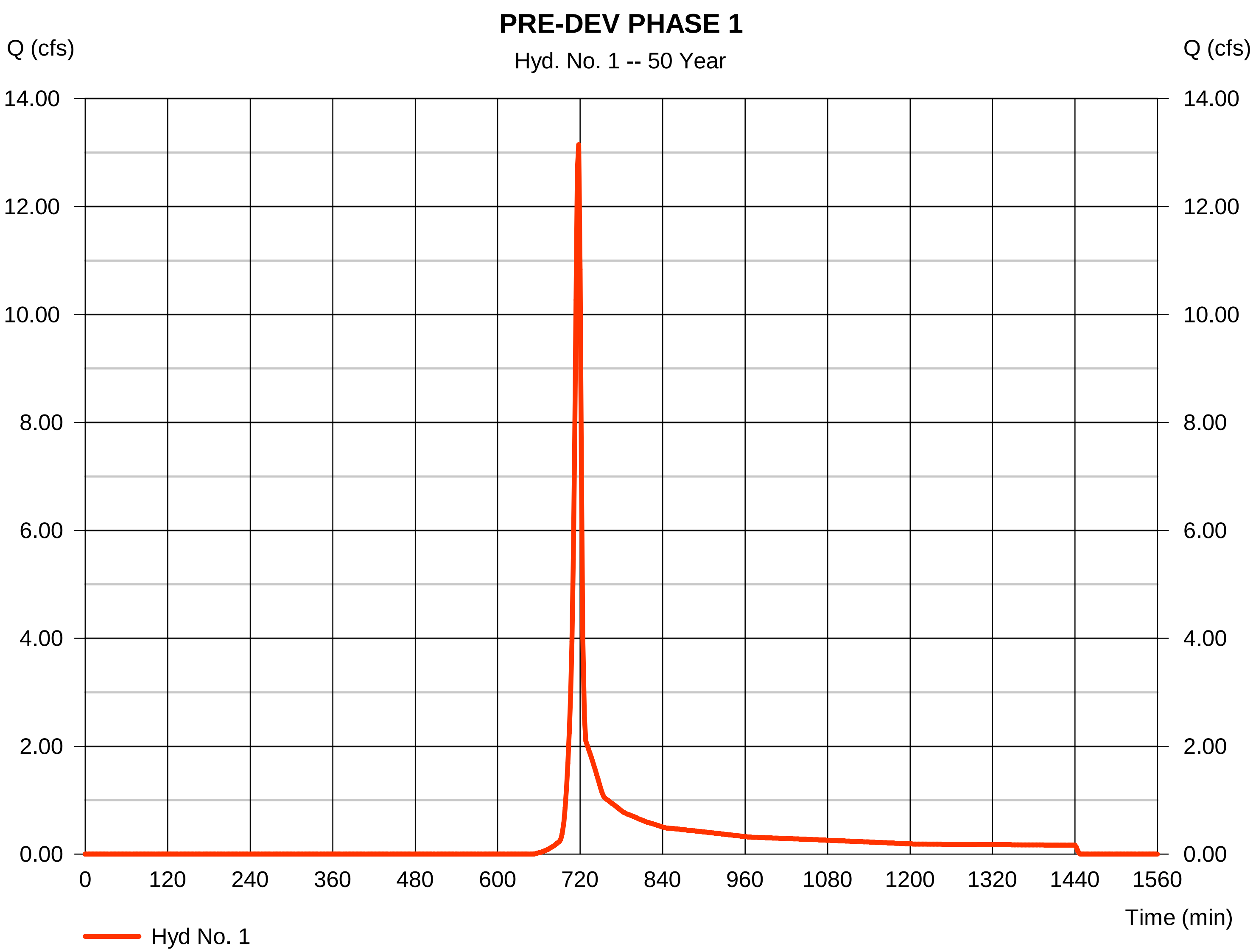
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 1

PRE-DEV PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 13.15 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 26,363 cuft
Drainage area	= 3.770 ac	Curve number	= 58.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



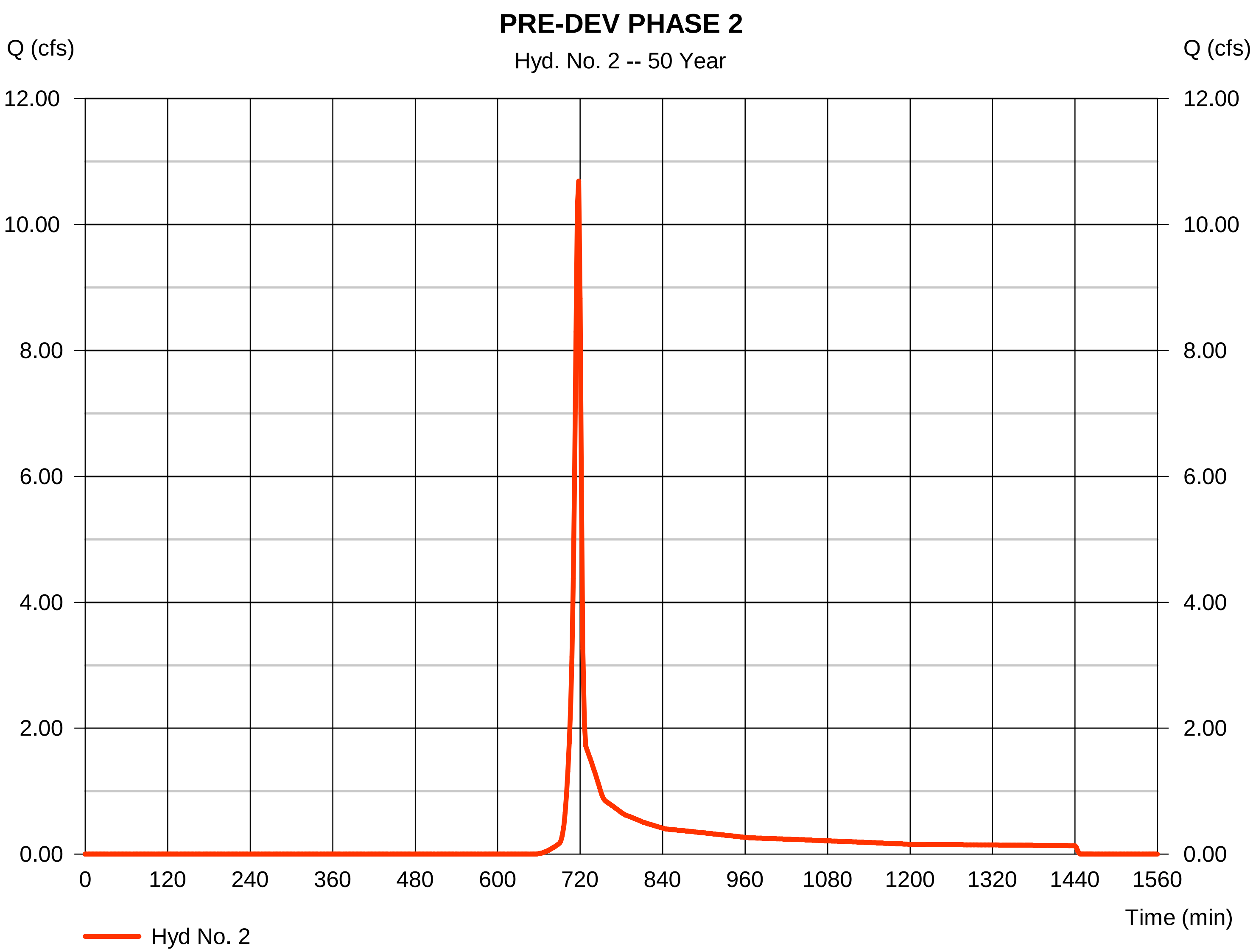
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 2

PRE-DEV PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 10.69 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 21,463 cuft
Drainage area	= 3.150 ac	Curve number	= 57.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



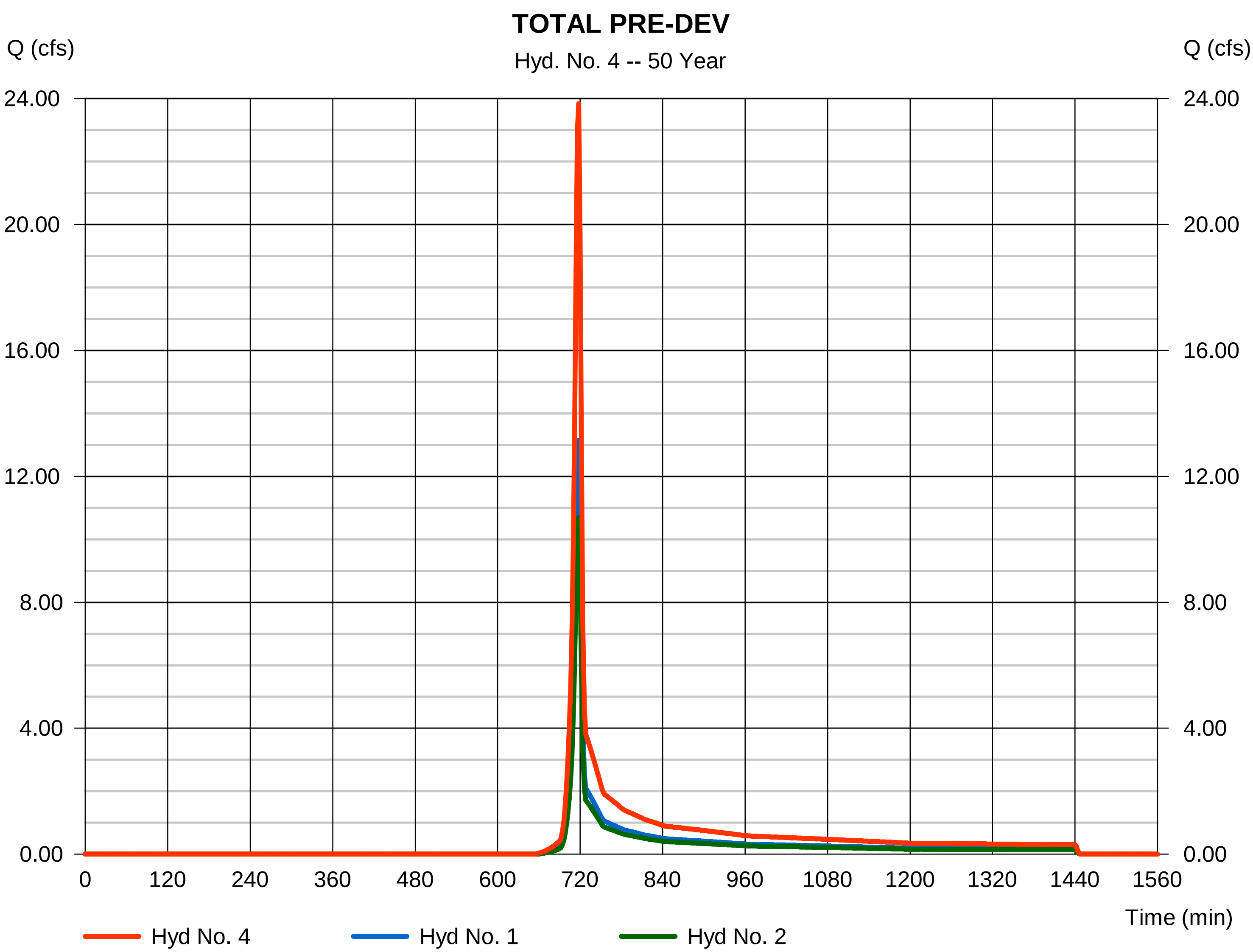
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 4

TOTAL PRE-DEV

Hydrograph type	= Combine	Peak discharge	= 23.84 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 47,826 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 6.920 ac



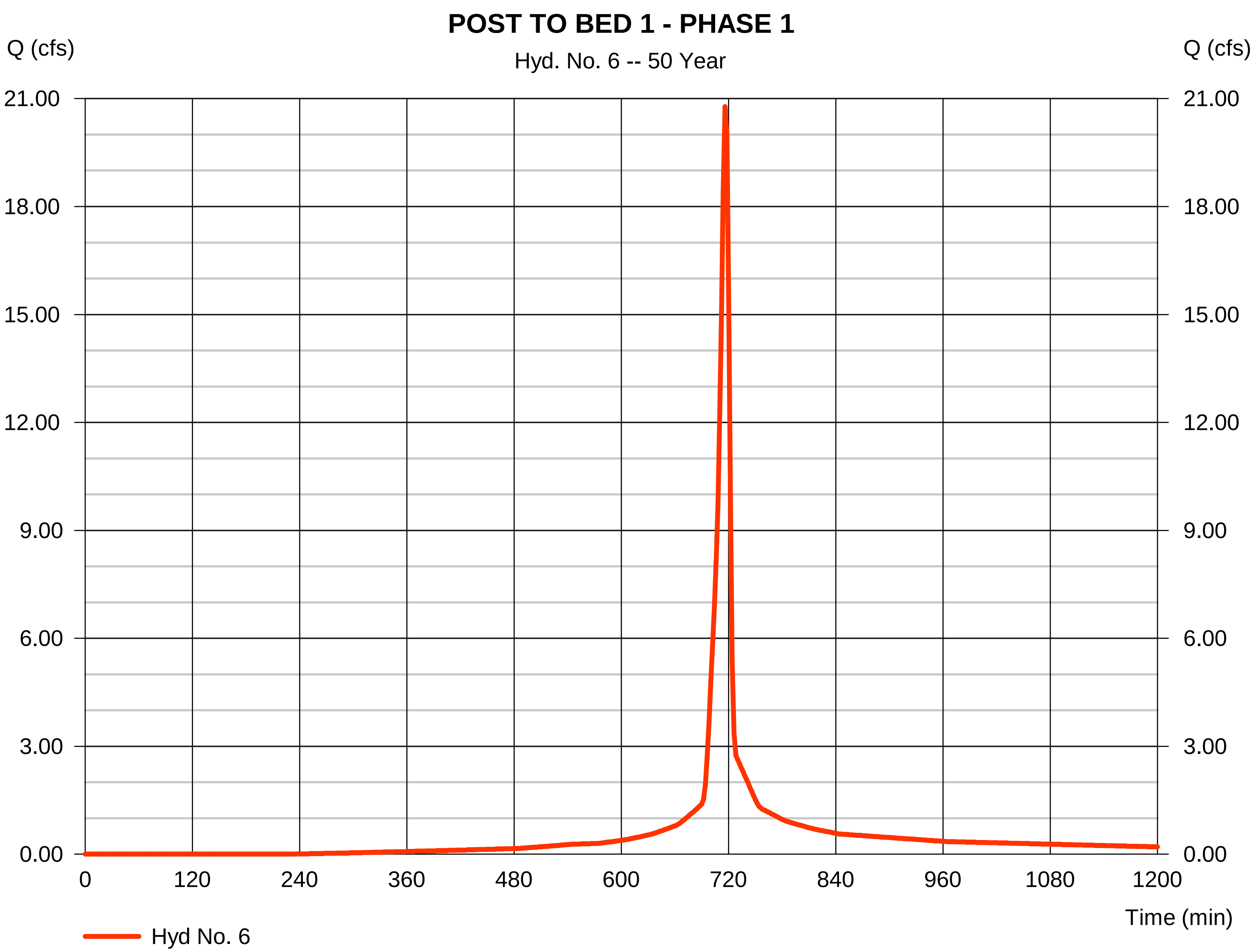
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 6

POST TO BED 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 20.78 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 44,658 cuft
Drainage area	= 2.630 ac	Curve number	= 87.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

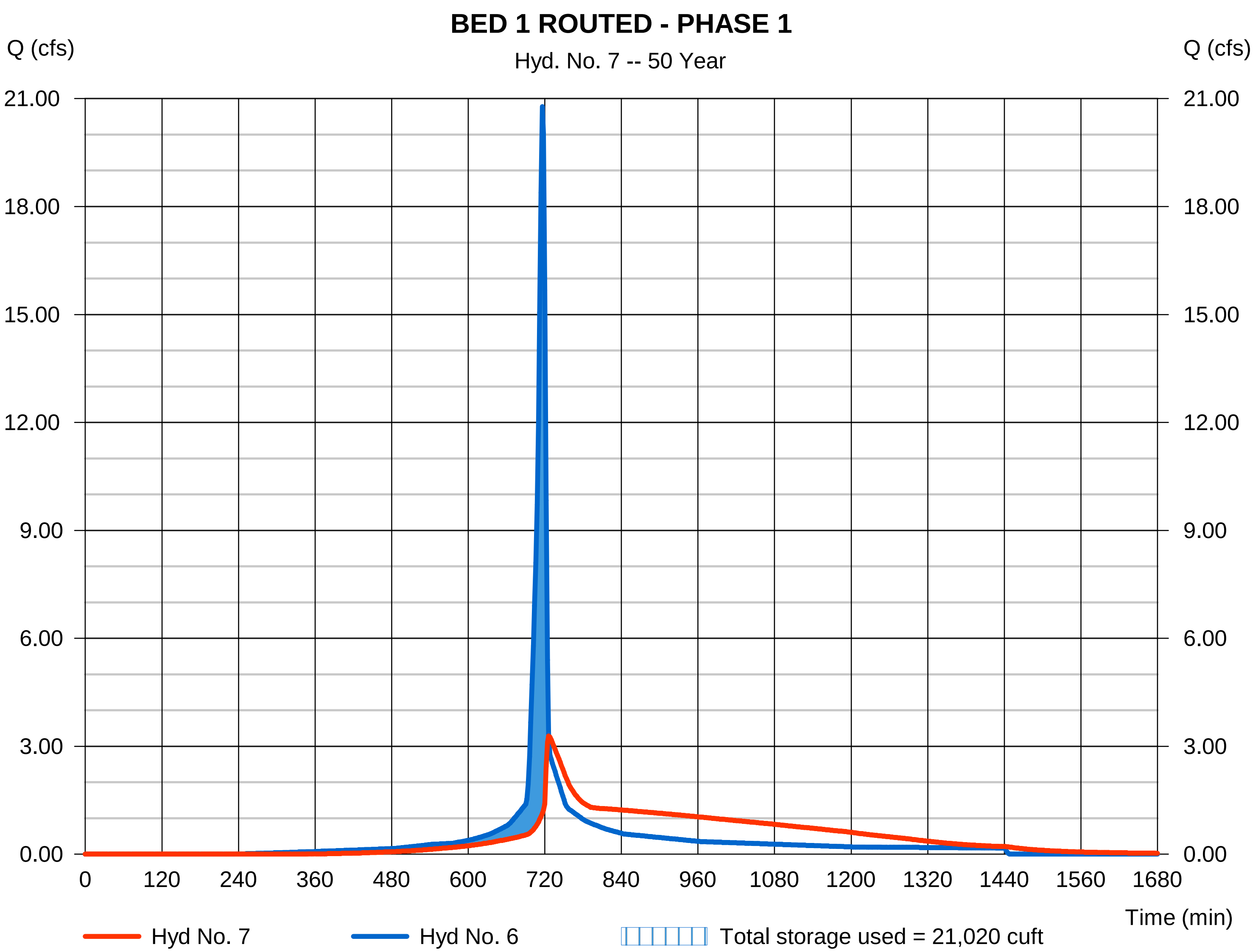
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 7

BED 1 ROUTED - PHASE 1

Hydrograph type	= Reservoir	Peak discharge	= 3.286 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 44,609 cuft
Inflow hyd. No.	= 6 - POST TO BED 1 - PHASE 1	Max. Elevation	= 341.13 ft
Reservoir name	= MRC BED 1	Max. Storage	= 21,020 cuft

Storage Indication method used.



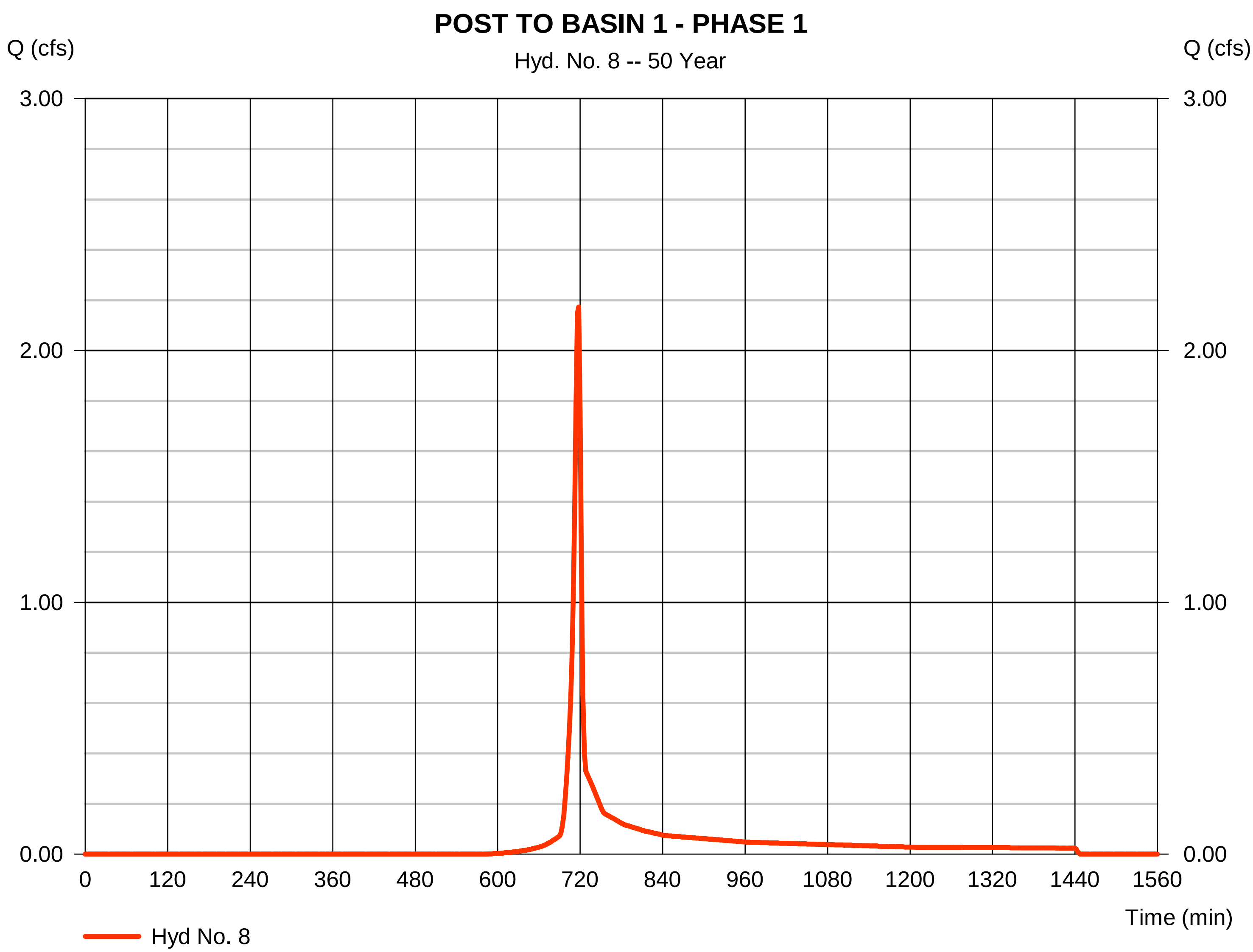
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 8

POST TO BASIN 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.172 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 4,353 cuft
Drainage area	= 0.480 ac	Curve number	= 65.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



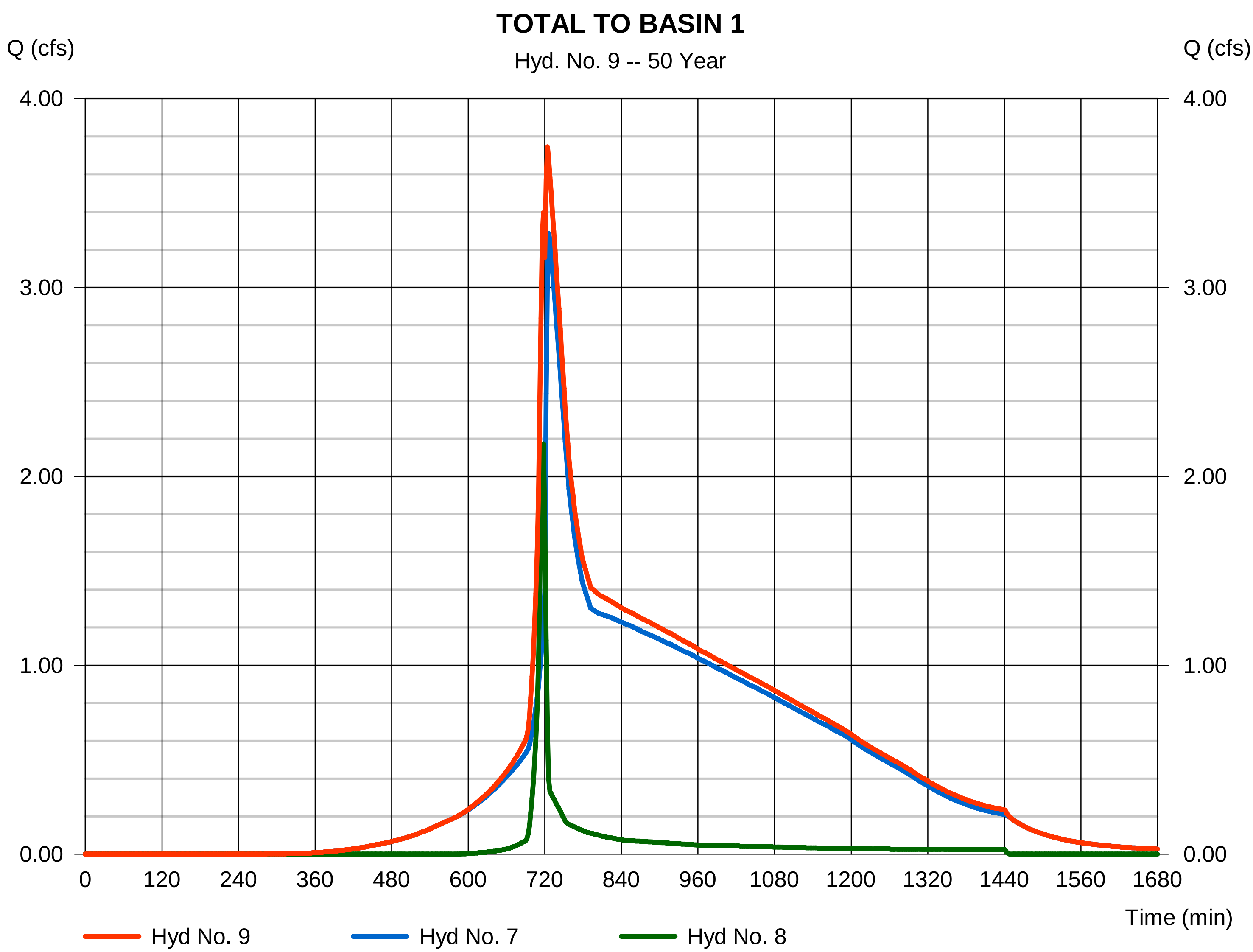
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 9

TOTAL TO BASIN 1

Hydrograph type	= Combine	Peak discharge	= 3.745 cfs
Storm frequency	= 50 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 48,962 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 0.480 ac



Hydrograph Report

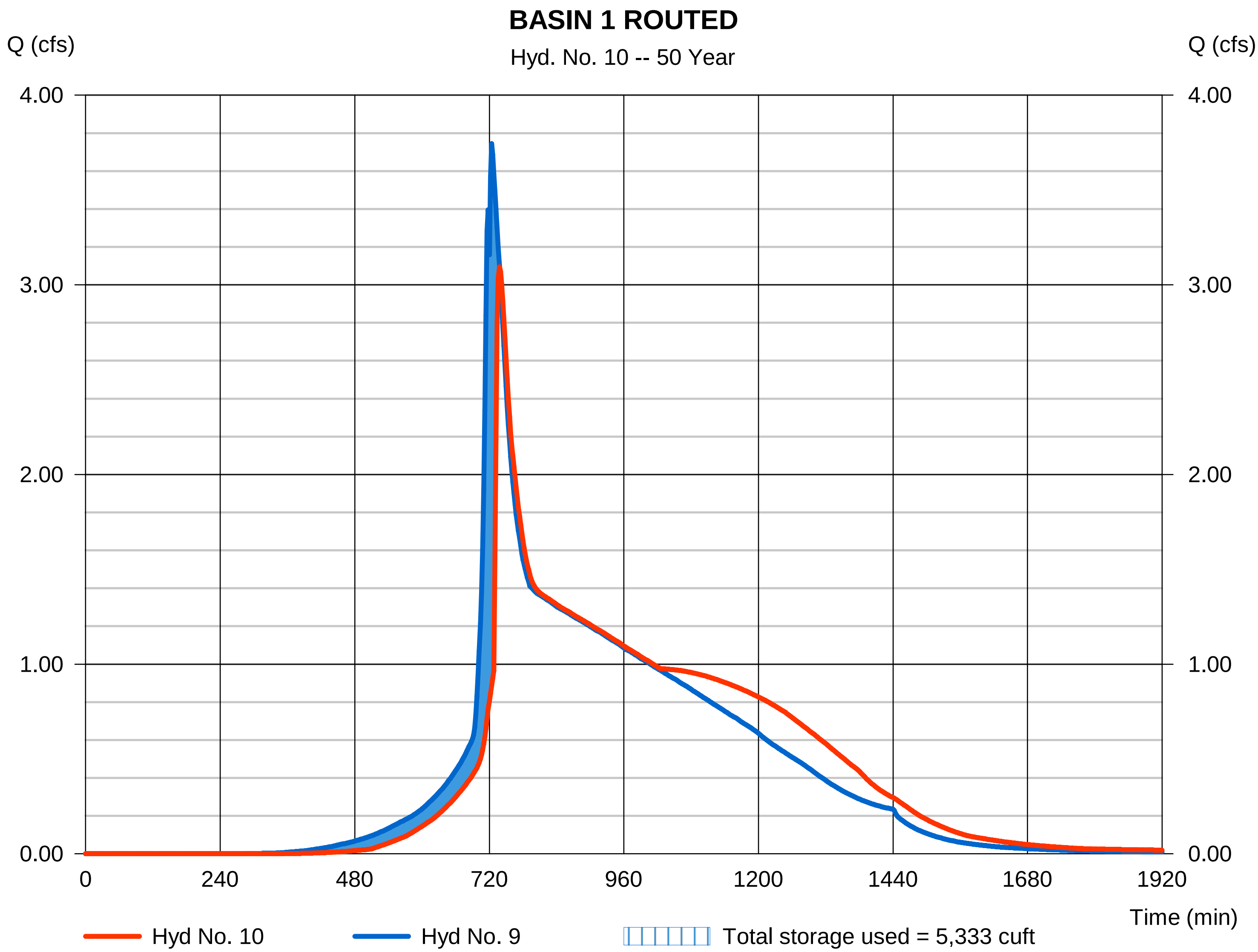
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 10

BASIN 1 ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 3.095 cfs
Storm frequency	= 50 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 48,951 cuft
Inflow hyd. No.	= 9 - TOTAL TO BASIN 1	Max. Elevation	= 340.64 ft
Reservoir name	= DETENTION BASIN 1	Max. Storage	= 5,333 cuft

Storage Indication method used.



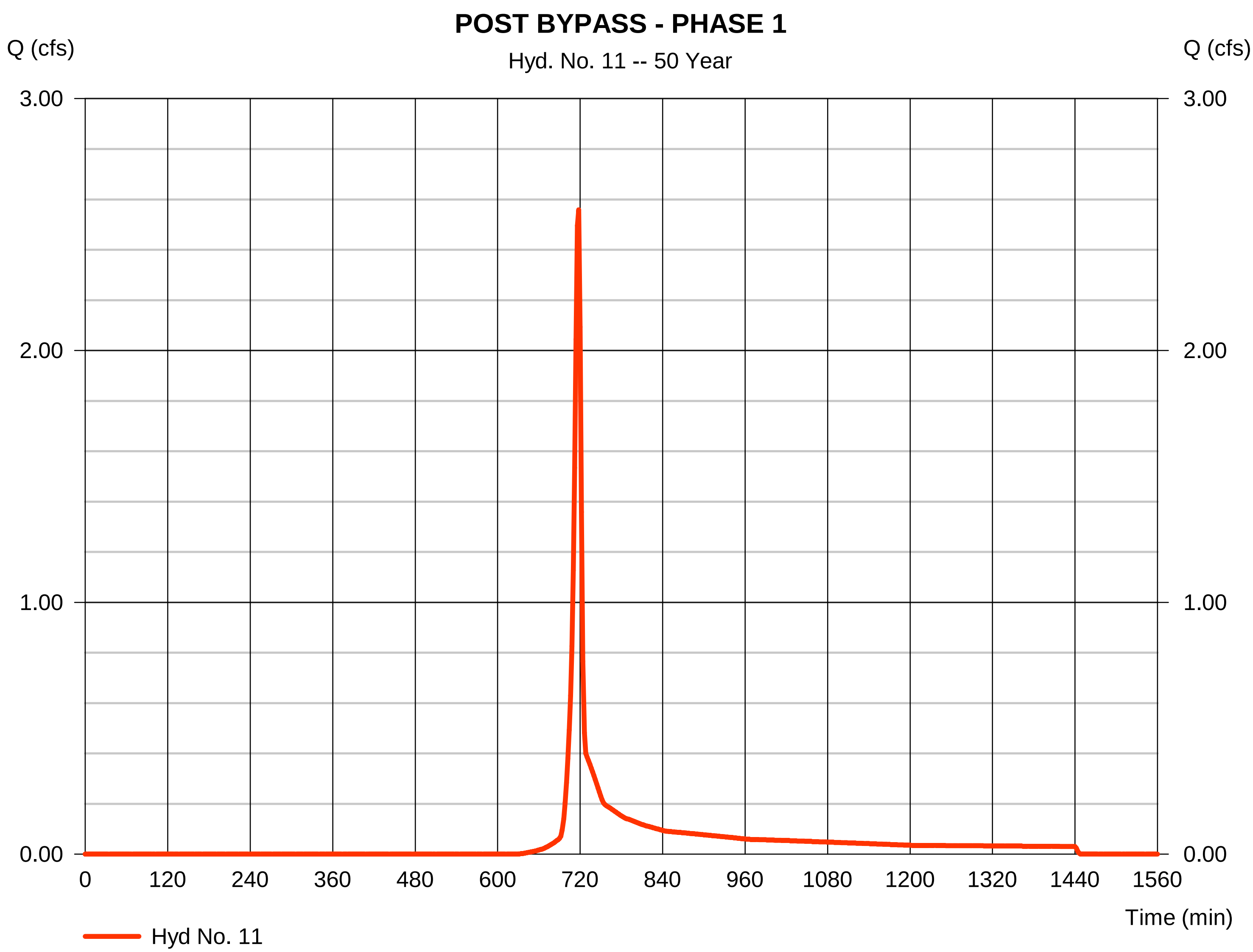
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 11

POST BYPASS - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.558 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 5,116 cuft
Drainage area	= 0.660 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



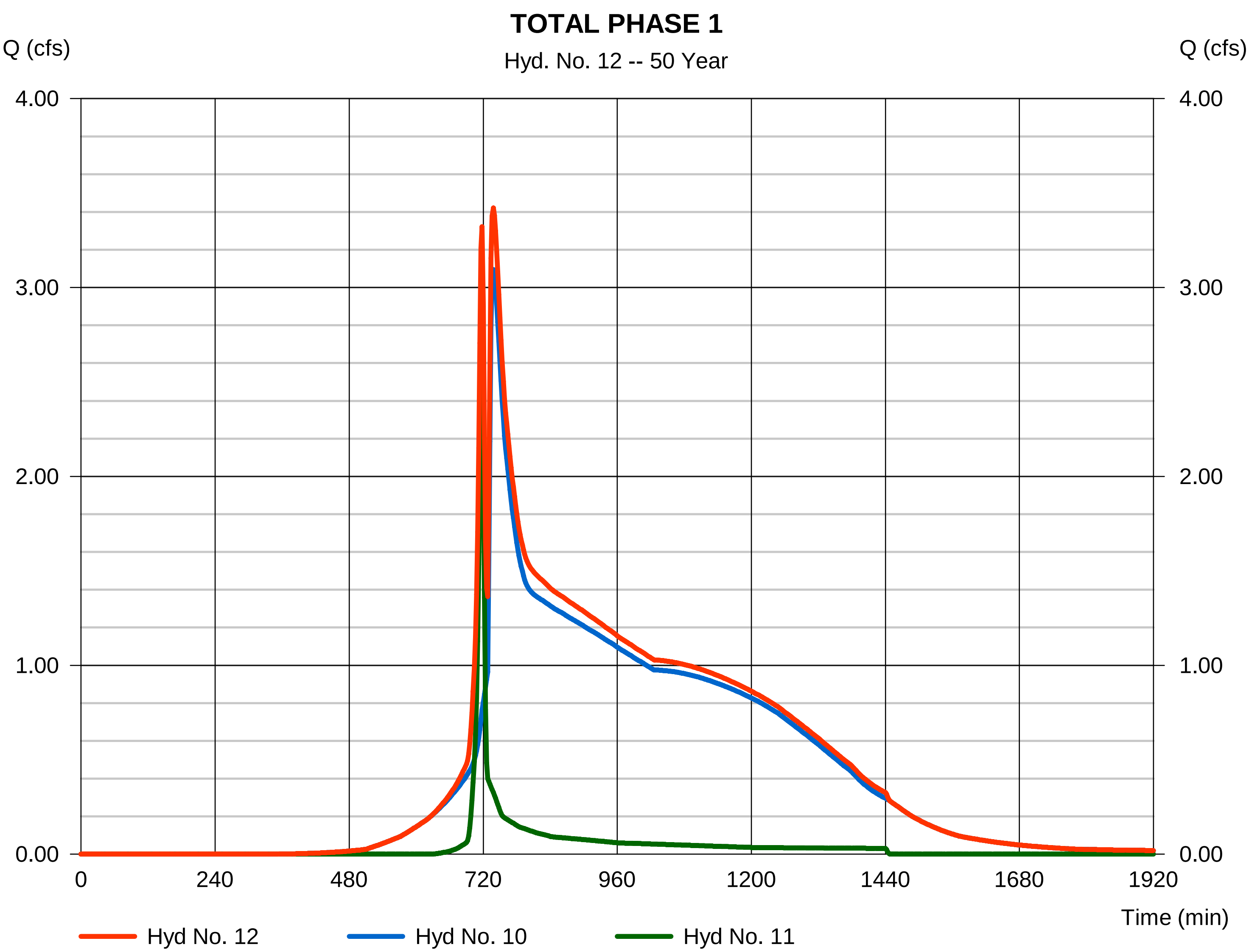
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 12

TOTAL PHASE 1

Hydrograph type	= Combine	Peak discharge	= 3.422 cfs
Storm frequency	= 50 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 54,067 cuft
Inflow hyds.	= 10, 11	Contrib. drain. area	= 0.660 ac



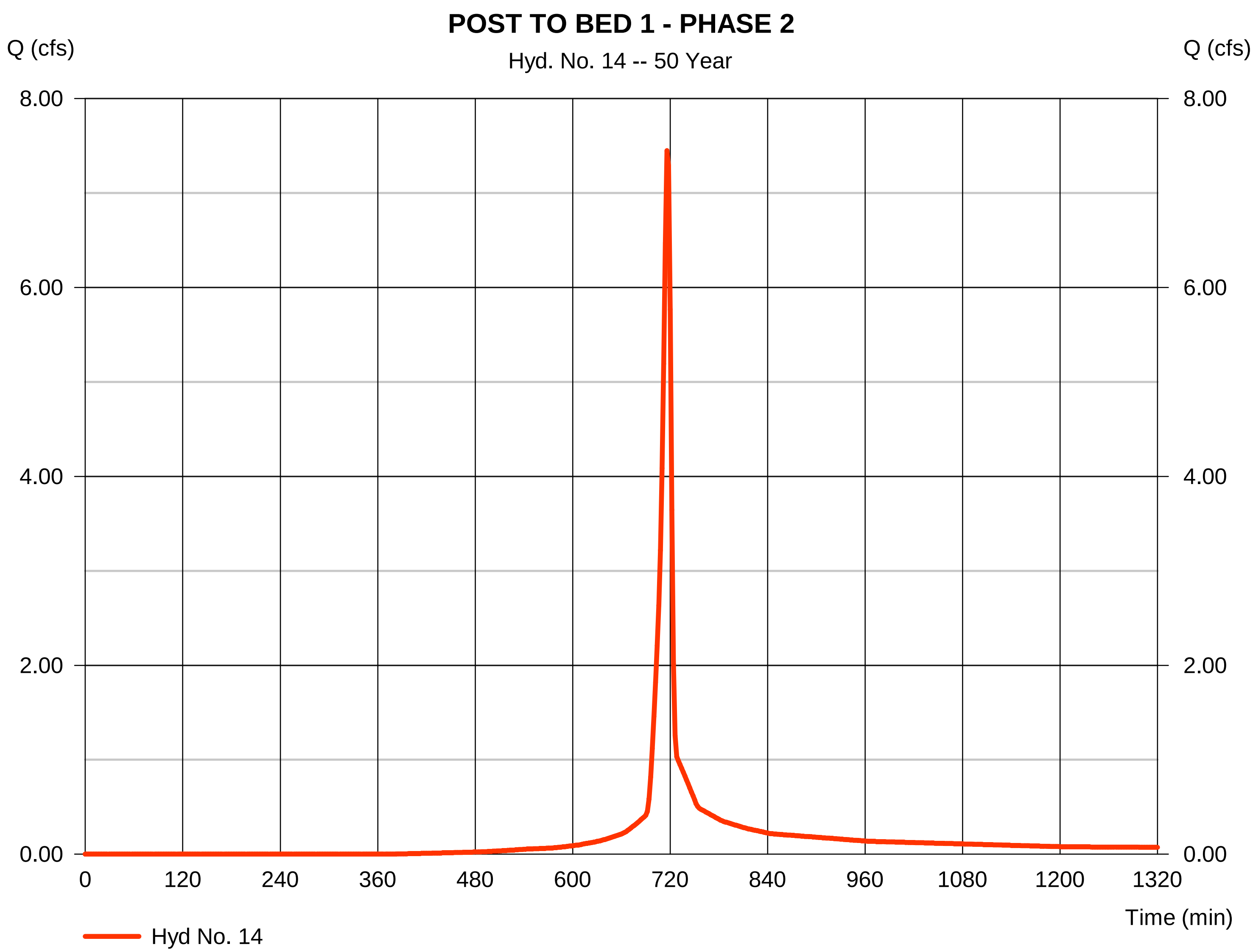
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 14

POST TO BED 1 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 7.449 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 15,296 cuft
Drainage area	= 1.110 ac	Curve number	= 79.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



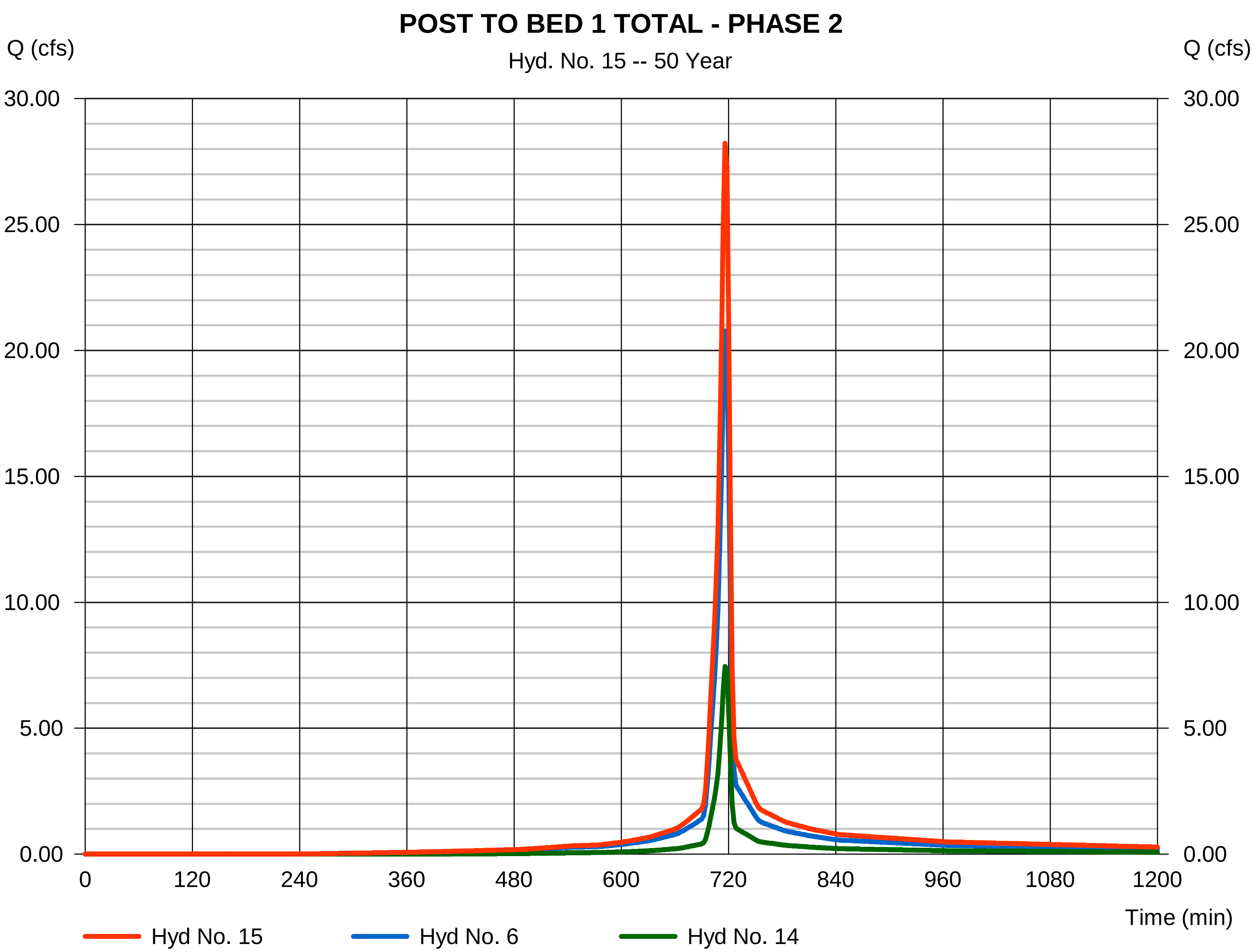
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 15

POST TO BED 1 TOTAL - PHASE 2

Hydrograph type	= Combine	Peak discharge	= 28.23 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 59,954 cuft
Inflow hyds.	= 6, 14	Contrib. drain. area	= 3.740 ac



Hydrograph Report

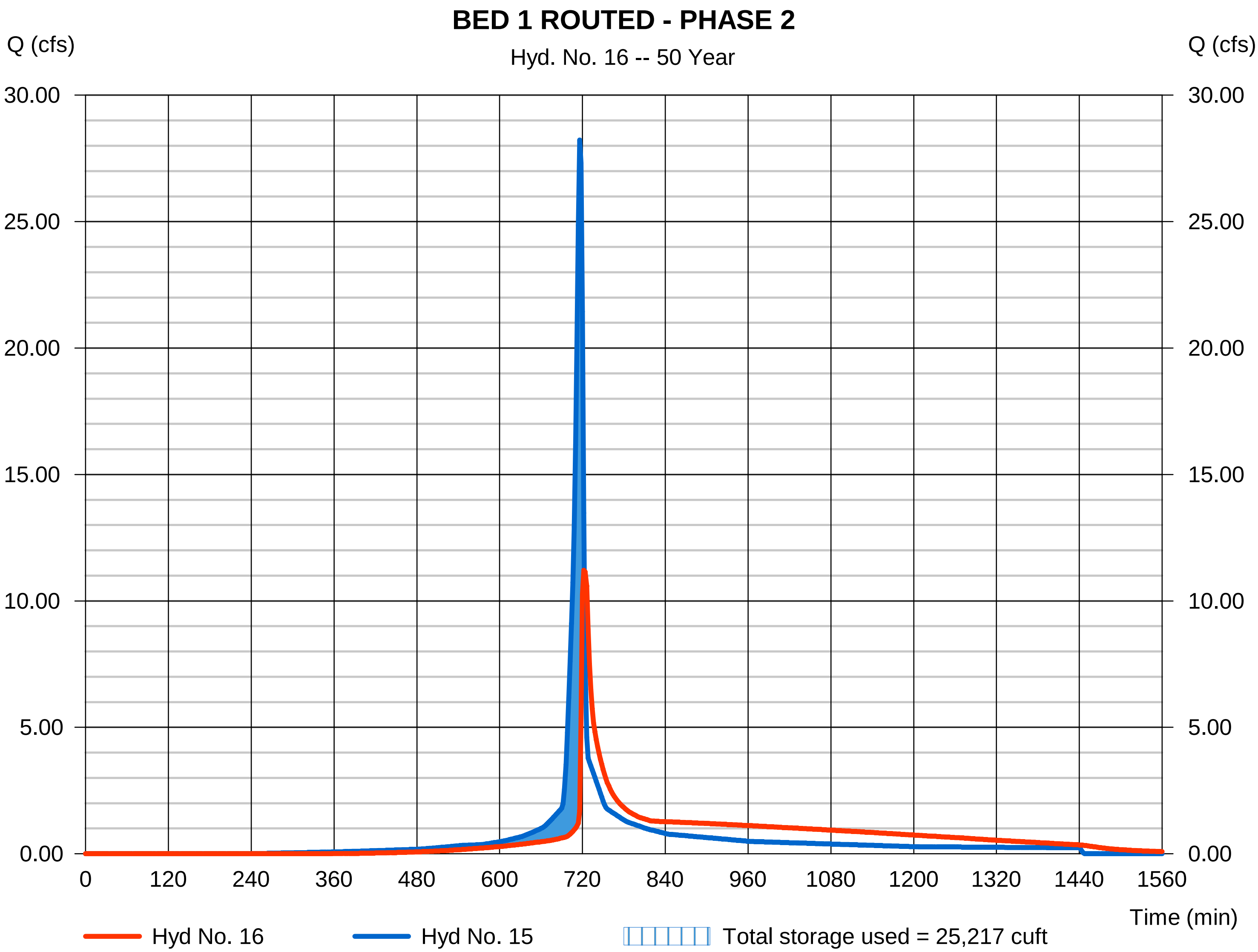
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 16

BED 1 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 11.22 cfs
Storm frequency	= 50 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 59,905 cuft
Inflow hyd. No.	= 15 - POST TO BED 1 TOTAL - PHASE 2	Max. Elevation	= 341.79 ft
Reservoir name	= MRC BED 1	Max. Storage	= 25,217 cuft

Storage Indication method used.



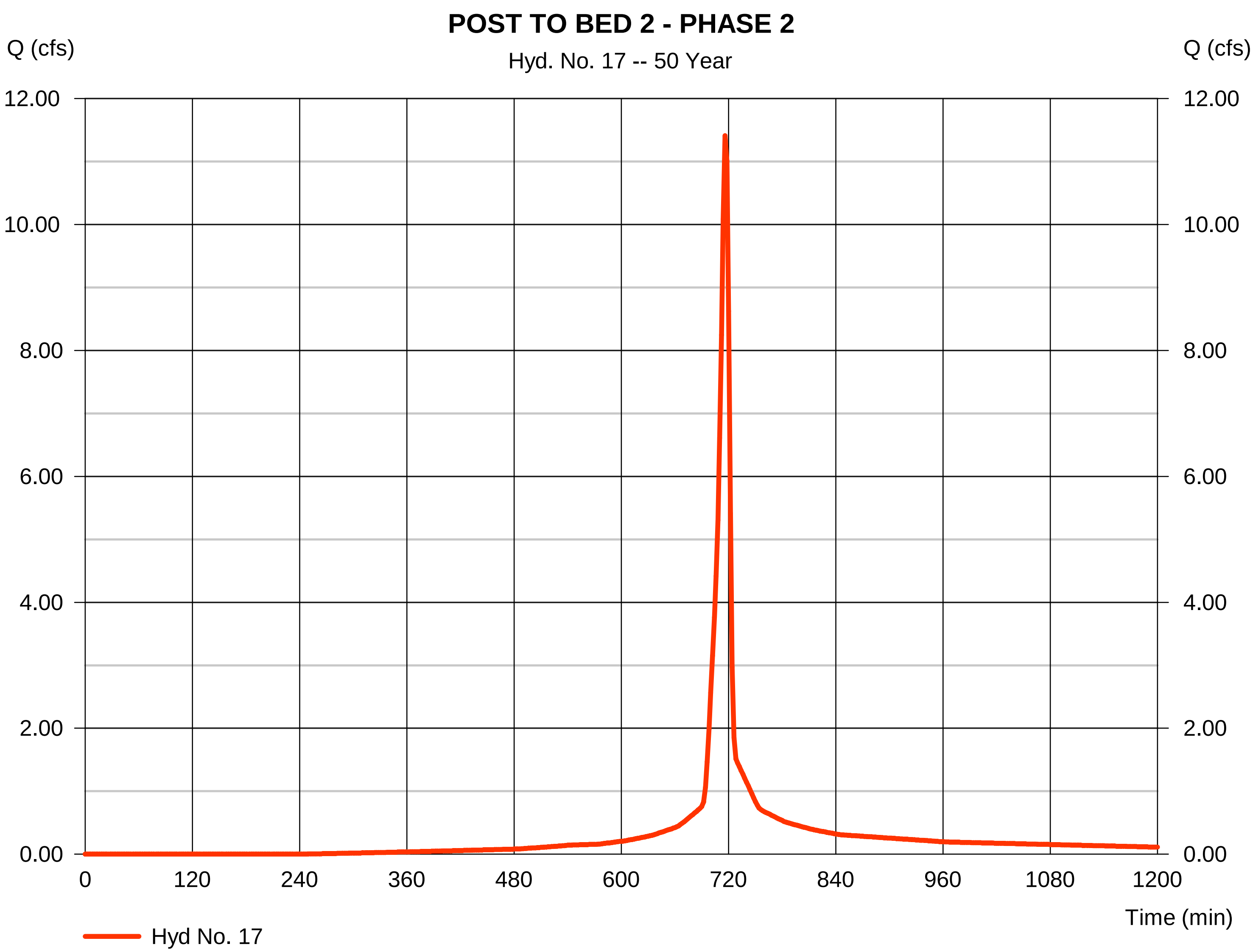
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 17

POST TO BED 2 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 11.41 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 24,405 cuft
Drainage area	= 1.460 ac	Curve number	= 87.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

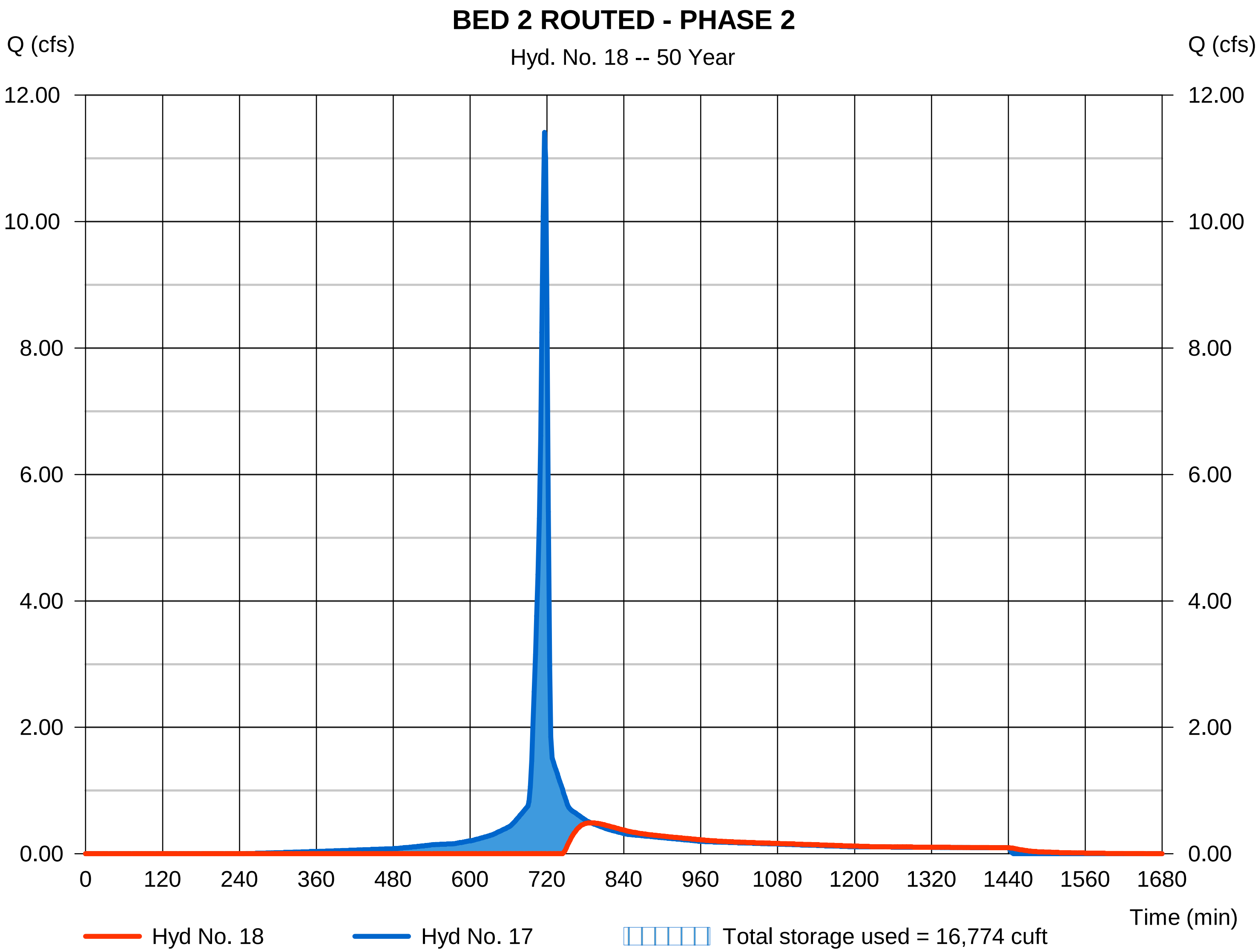
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 18

BED 2 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 0.489 cfs
Storm frequency	= 50 yrs	Time to peak	= 788 min
Time interval	= 2 min	Hyd. volume	= 8,466 cuft
Inflow hyd. No.	= 17 - POST TO BED 2 - PHASE 2	Max. Elevation	= 347.08 ft
Reservoir name	= INFILTRATION BED 2	Max. Storage	= 16,774 cuft

Storage Indication method used.



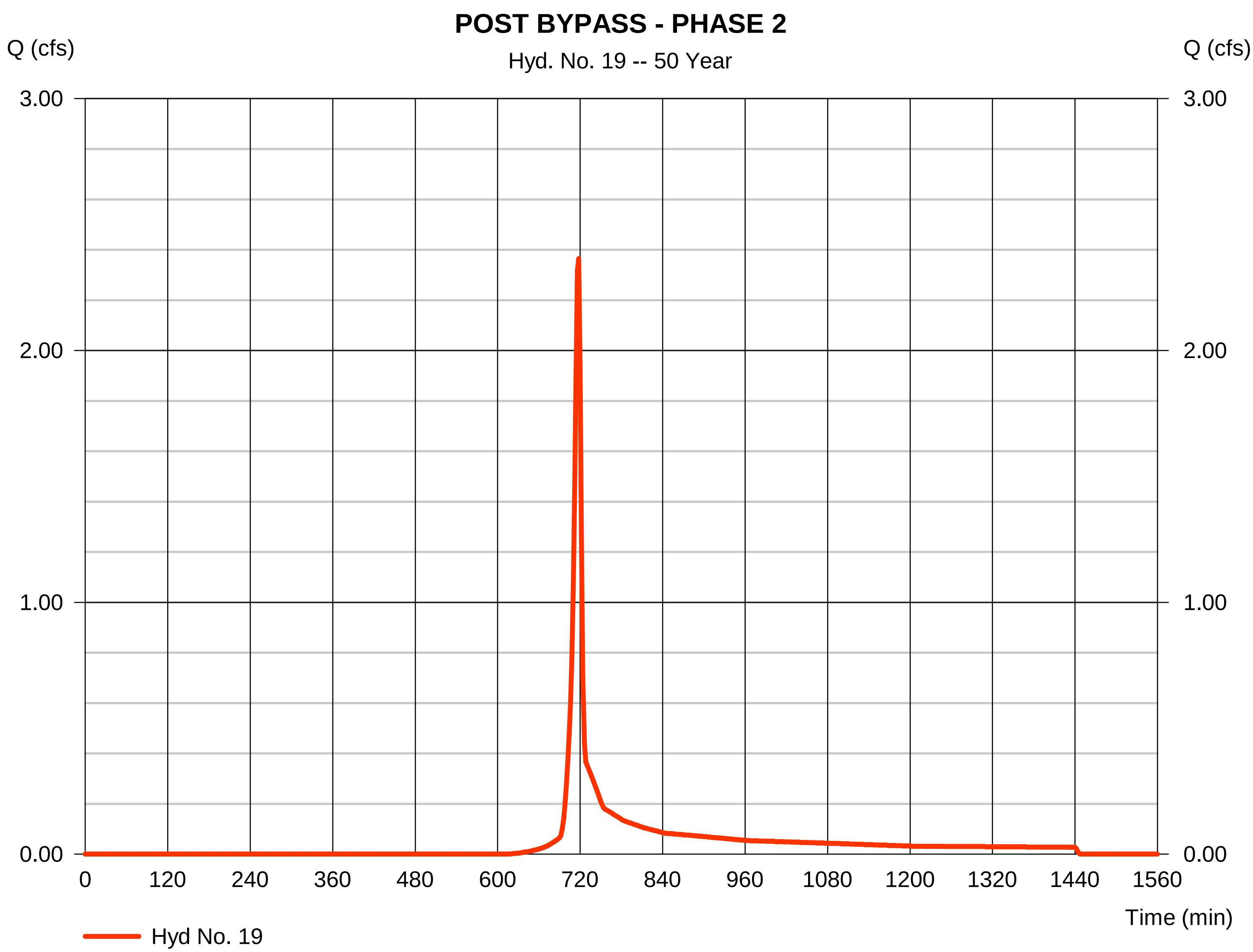
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 19

POST BYPASS - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.365 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 4,729 cuft
Drainage area	= 0.580 ac	Curve number	= 62.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



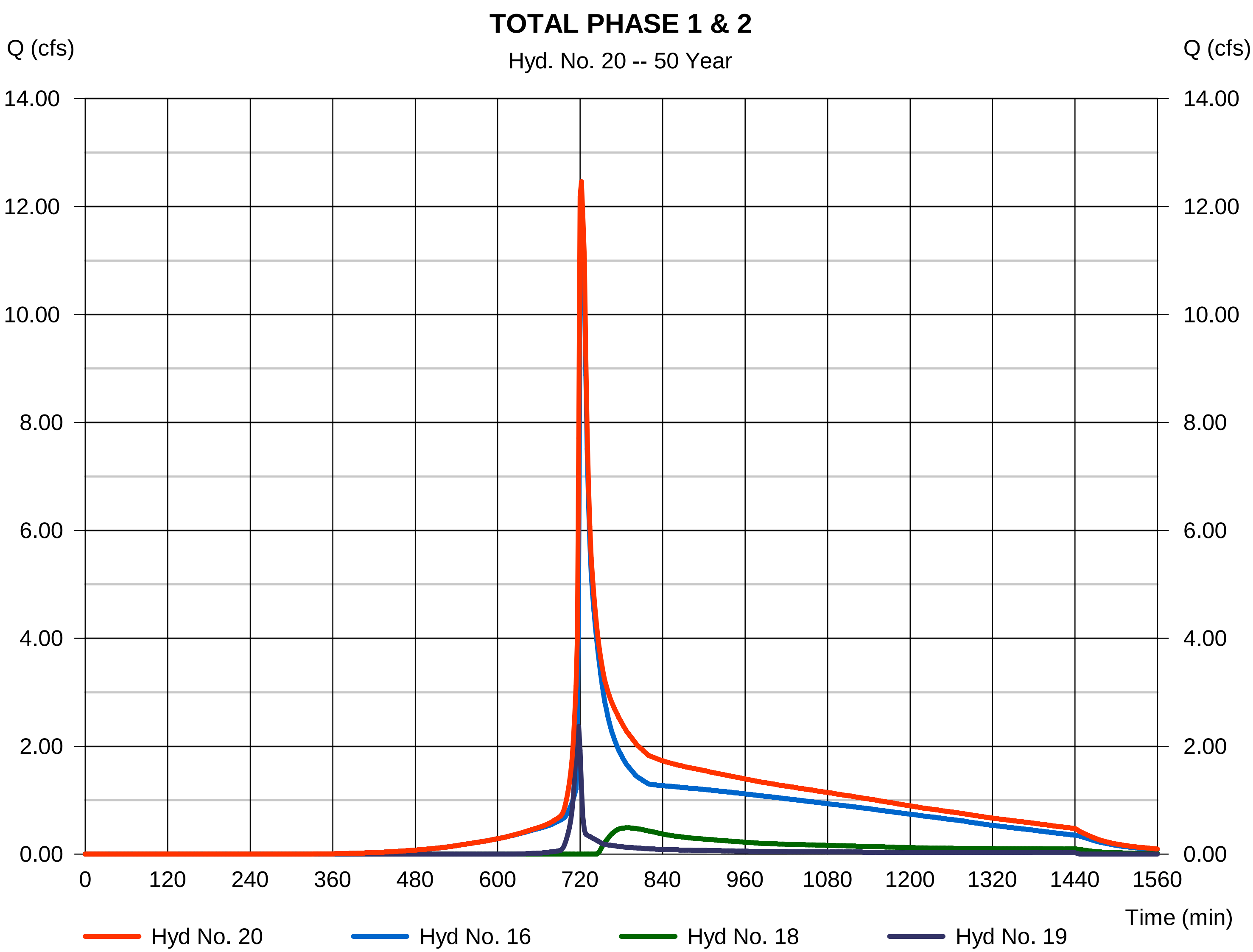
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 20

TOTAL PHASE 1 & 2

Hydrograph type	= Combine	Peak discharge	= 12.46 cfs
Storm frequency	= 50 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 73,101 cuft
Inflow hyds.	= 16, 18, 19	Contrib. drain. area	= 0.580 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	16.65	2	718	33,304	------	------	------	PRE-DEV PHASE 1
2	SCS Runoff	13.59	2	718	27,188	------	------	------	PRE-DEV PHASE 2
4	Combine	30.25	2	718	60,492	1, 2,	------	------	TOTAL PRE-DEV
6	SCS Runoff	23.78	2	716	51,597	------	------	------	POST TO BED 1 - PHASE 1
7	Reservoir	7.047	2	724	51,548	6	341.43	23,153	BED 1 ROUTED - PHASE 1
8	SCS Runoff	2.660	2	718	5,356	------	------	------	POST TO BASIN 1 - PHASE 1
9	Combine	7.873	2	722	56,904	7, 8	------	------	TOTAL TO BASIN 1
10	Reservoir	6.497	2	728	56,892	9	340.78	5,826	BASIN 1 ROUTED
11	SCS Runoff	3.196	2	718	6,395	------	------	------	POST BYPASS - PHASE 1
12	Combine	6.987	2	728	63,287	10, 11	------	------	TOTAL PHASE 1
14	SCS Runoff	8.728	2	716	18,052	------	------	------	POST TO BED 1 - PHASE 2
15	Combine	32.51	2	716	69,649	6, 14	------	------	POST TO BED 1 TOTAL - PHASE 2
16	Reservoir	12.57	2	722	69,600	15	342.39	28,364	BED 1 ROUTED - PHASE 2
17	SCS Runoff	13.08	2	716	28,243	------	------	------	POST TO BED 2 - PHASE 2
18	Reservoir	1.164	2	744	12,304	17	347.21	17,428	BED 2 ROUTED - PHASE 2
19	SCS Runoff	2.935	2	718	5,881	------	------	------	POST BYPASS - PHASE 2
20	Combine	14.65	2	720	87,785	16, 18, 19	------	------	TOTAL PHASE 1 & 2

3705 Hydraflow.gpw	Return Period: 100 Year	Monday, 06 / 22 / 2020

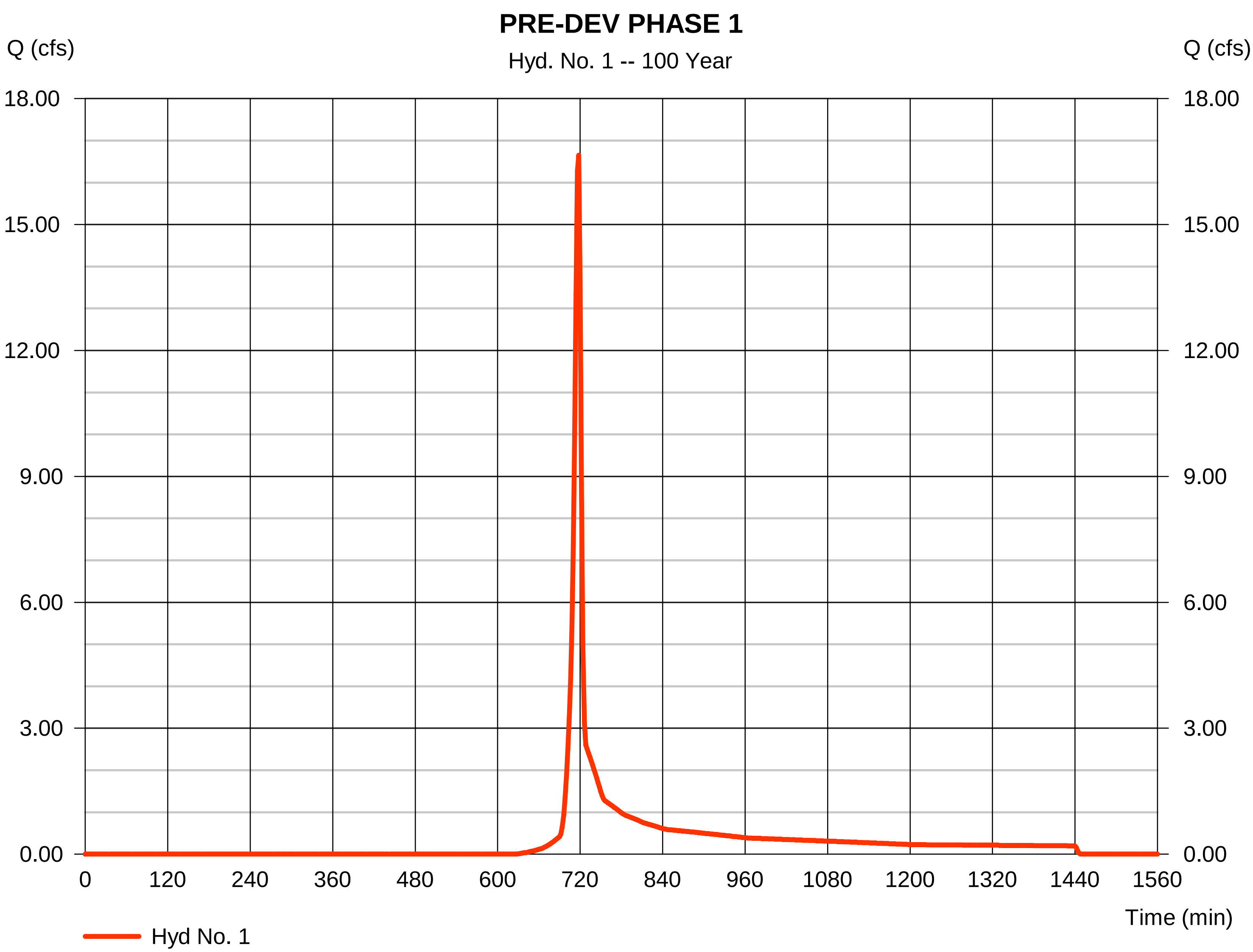
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 1

PRE-DEV PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 16.65 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 33,304 cuft
Drainage area	= 3.770 ac	Curve number	= 58.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



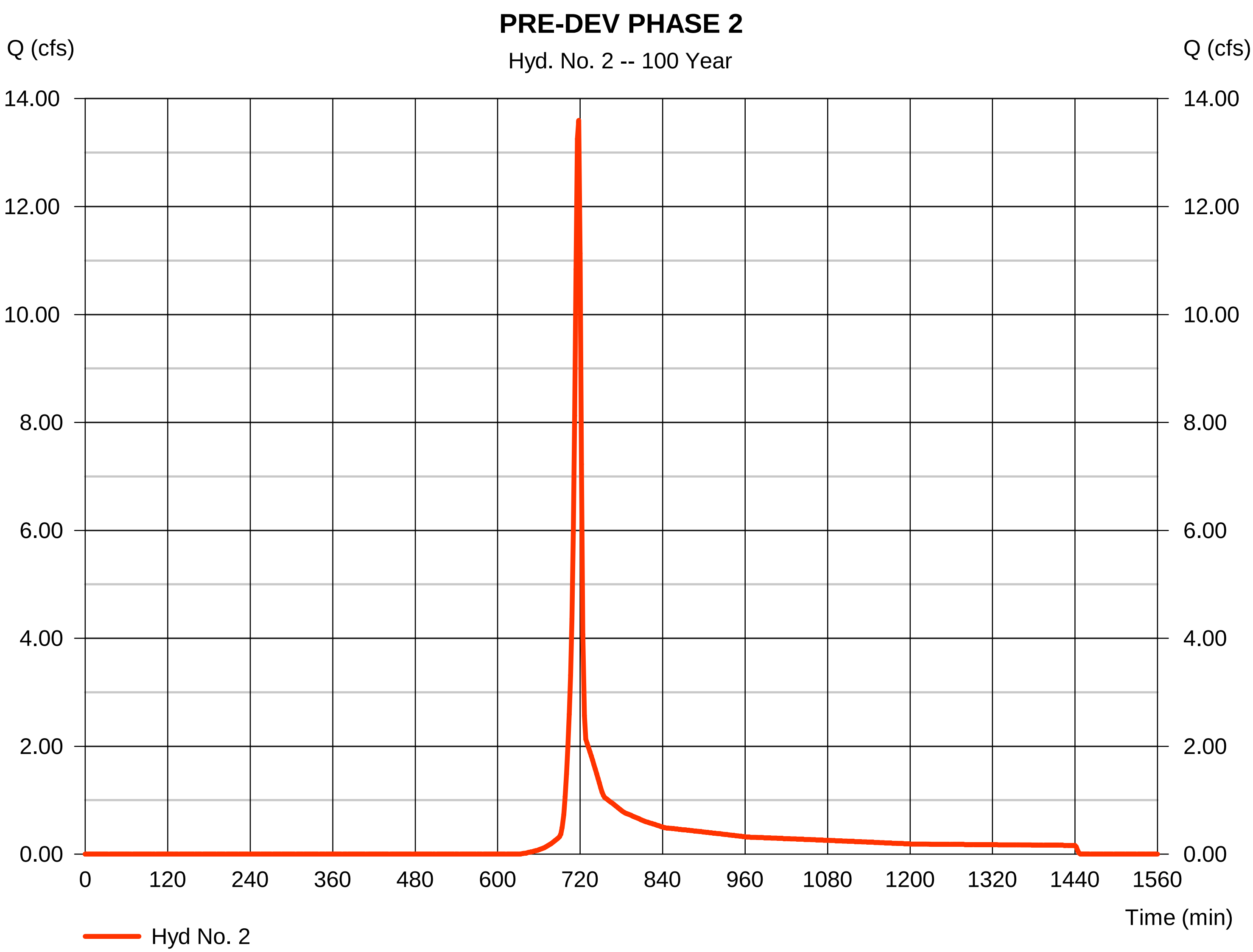
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 2

PRE-DEV PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 13.59 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 27,188 cuft
Drainage area	= 3.150 ac	Curve number	= 57.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



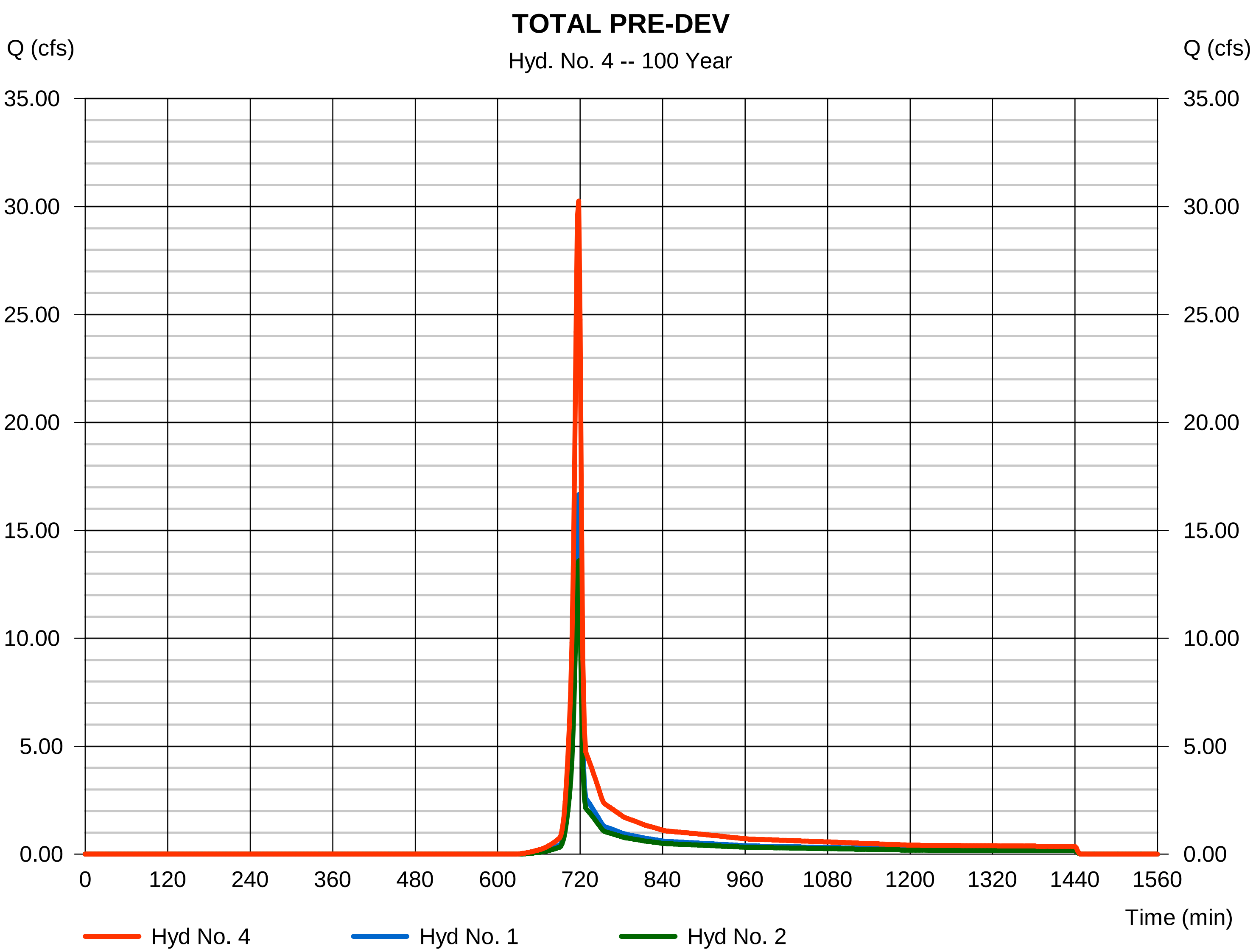
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 4

TOTAL PRE-DEV

Hydrograph type	= Combine	Peak discharge	= 30.25 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 60,492 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 6.920 ac



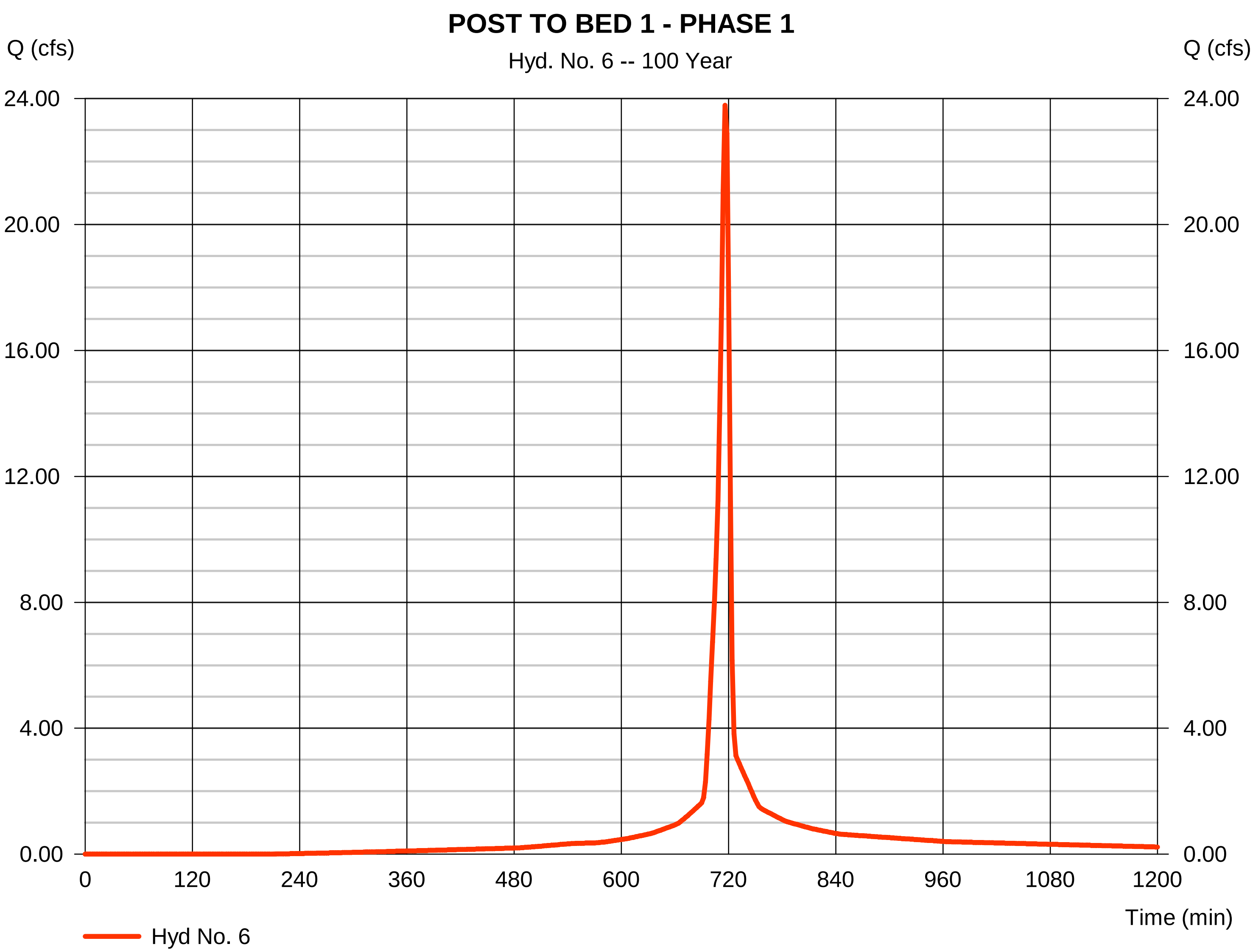
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 6

POST TO BED 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 23.78 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 51,597 cuft
Drainage area	= 2.630 ac	Curve number	= 87.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

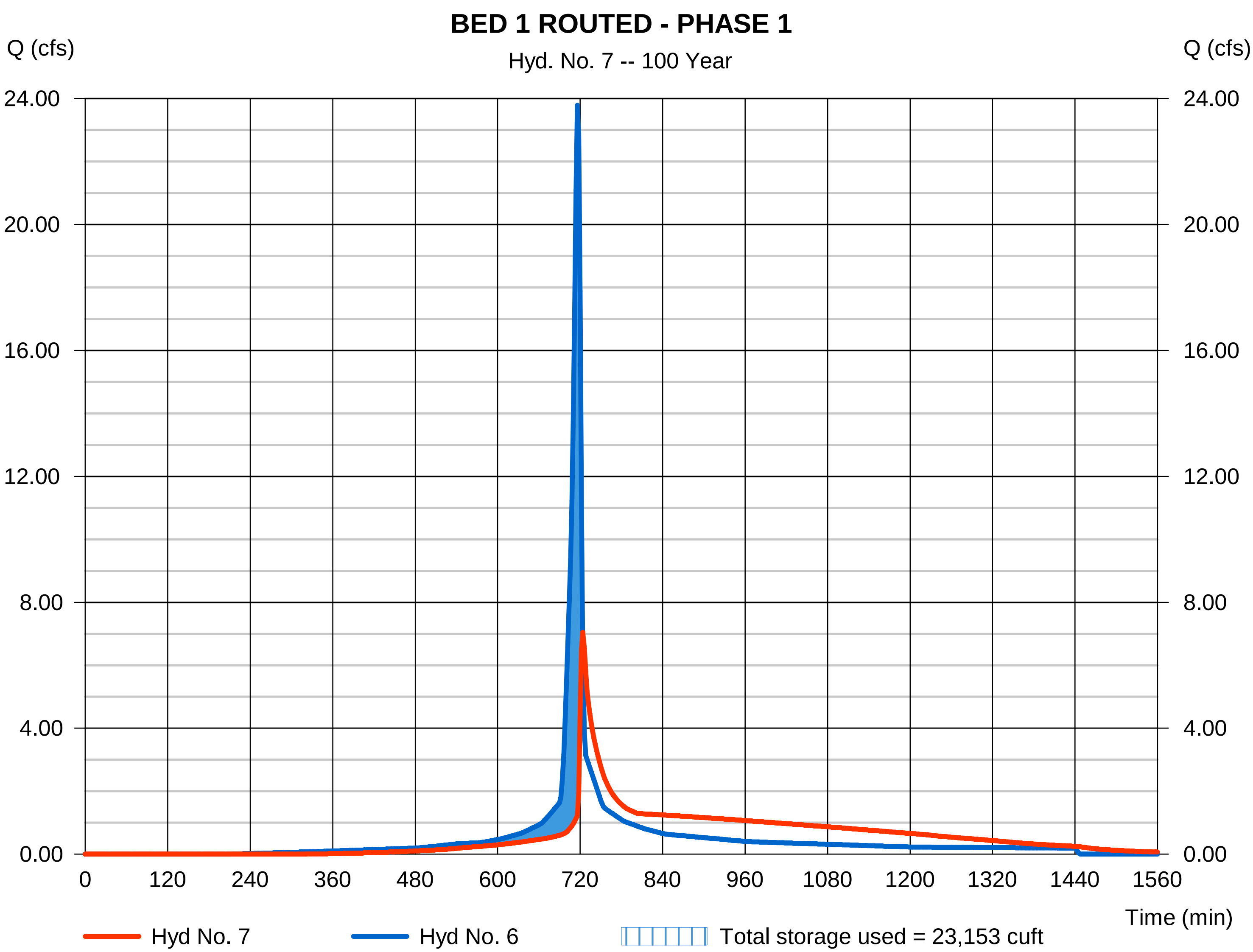
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 7

BED 1 ROUTED - PHASE 1

Hydrograph type	= Reservoir	Peak discharge	= 7.047 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 51,548 cuft
Inflow hyd. No.	= 6 - POST TO BED 1 - PHASE 1	Max. Elevation	= 341.43 ft
Reservoir name	= MRC BED 1	Max. Storage	= 23,153 cuft

Storage Indication method used.

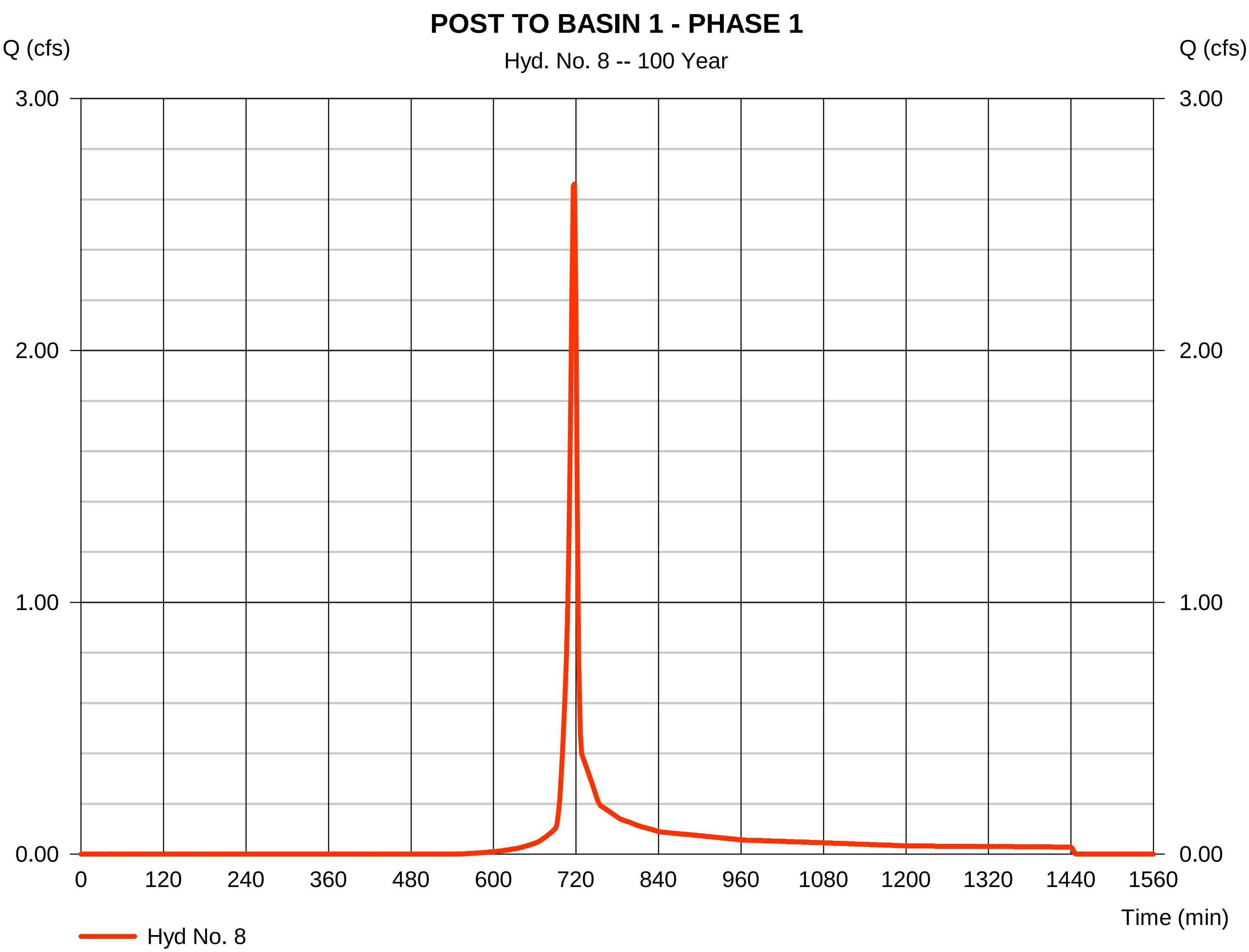


Hydrograph Report

Hyd. No. 8

POST TO BASIN 1 - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.660 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 5,356 cuft
Drainage area	= 0.480 ac	Curve number	= 65.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



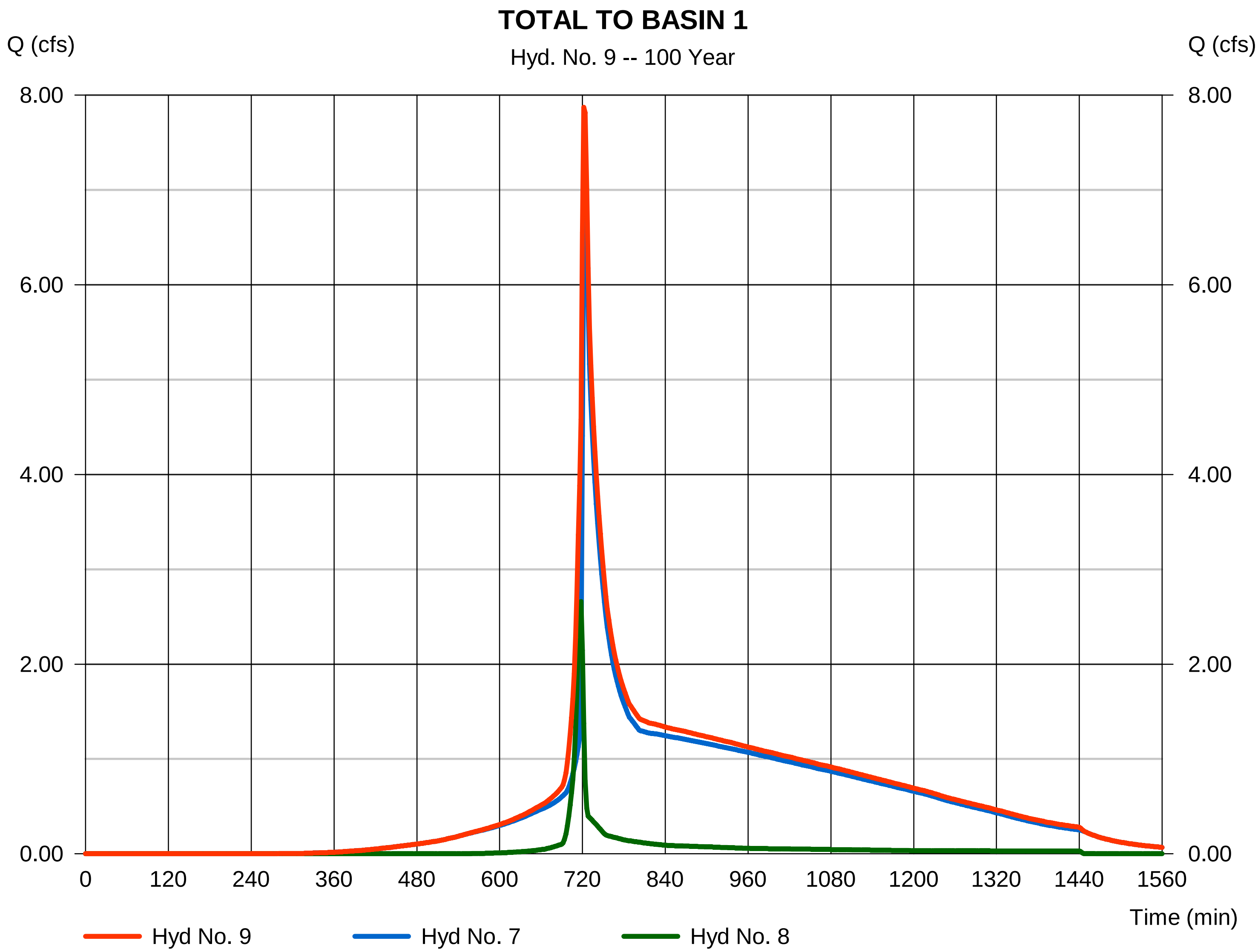
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 9

TOTAL TO BASIN 1

Hydrograph type	= Combine	Peak discharge	= 7.873 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 56,904 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 0.480 ac



Hydrograph Report

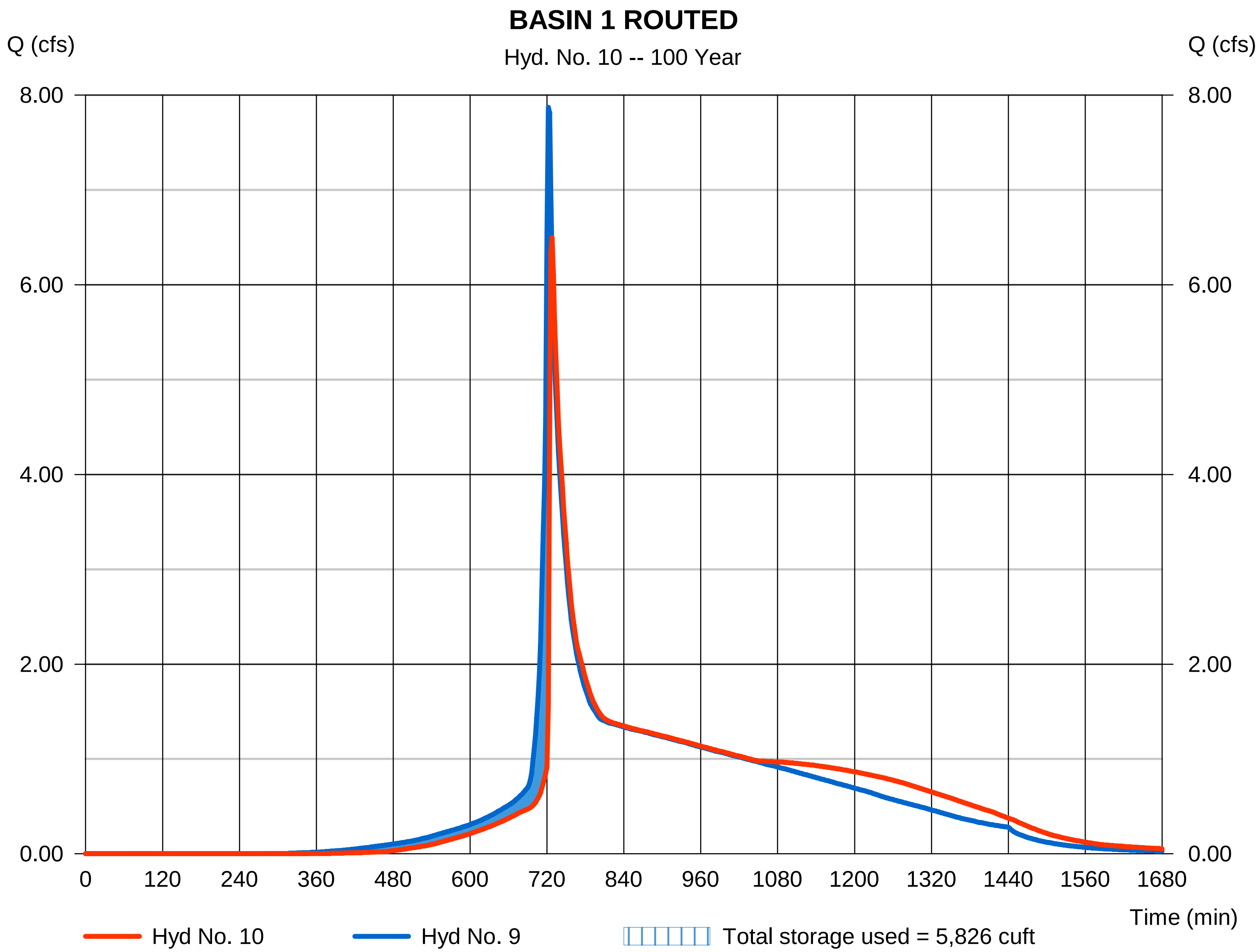
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 10

BASIN 1 ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 6.497 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 56,892 cuft
Inflow hyd. No.	= 9 - TOTAL TO BASIN 1	Max. Elevation	= 340.78 ft
Reservoir name	= DETENTION BASIN 1	Max. Storage	= 5,826 cuft

Storage Indication method used.

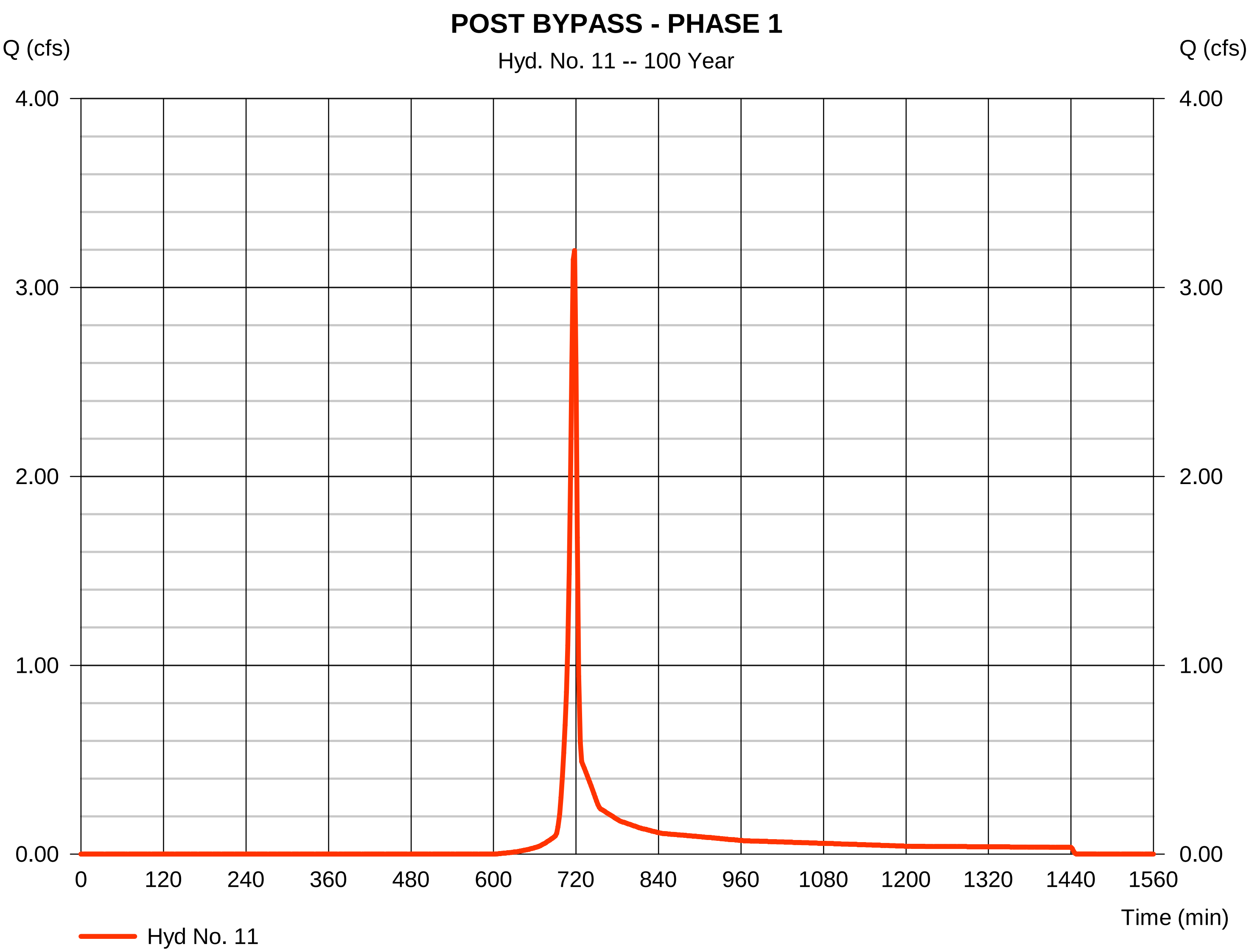


Hydrograph Report

Hyd. No. 11

POST BYPASS - PHASE 1

Hydrograph type	= SCS Runoff	Peak discharge	= 3.196 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 6,395 cuft
Drainage area	= 0.660 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



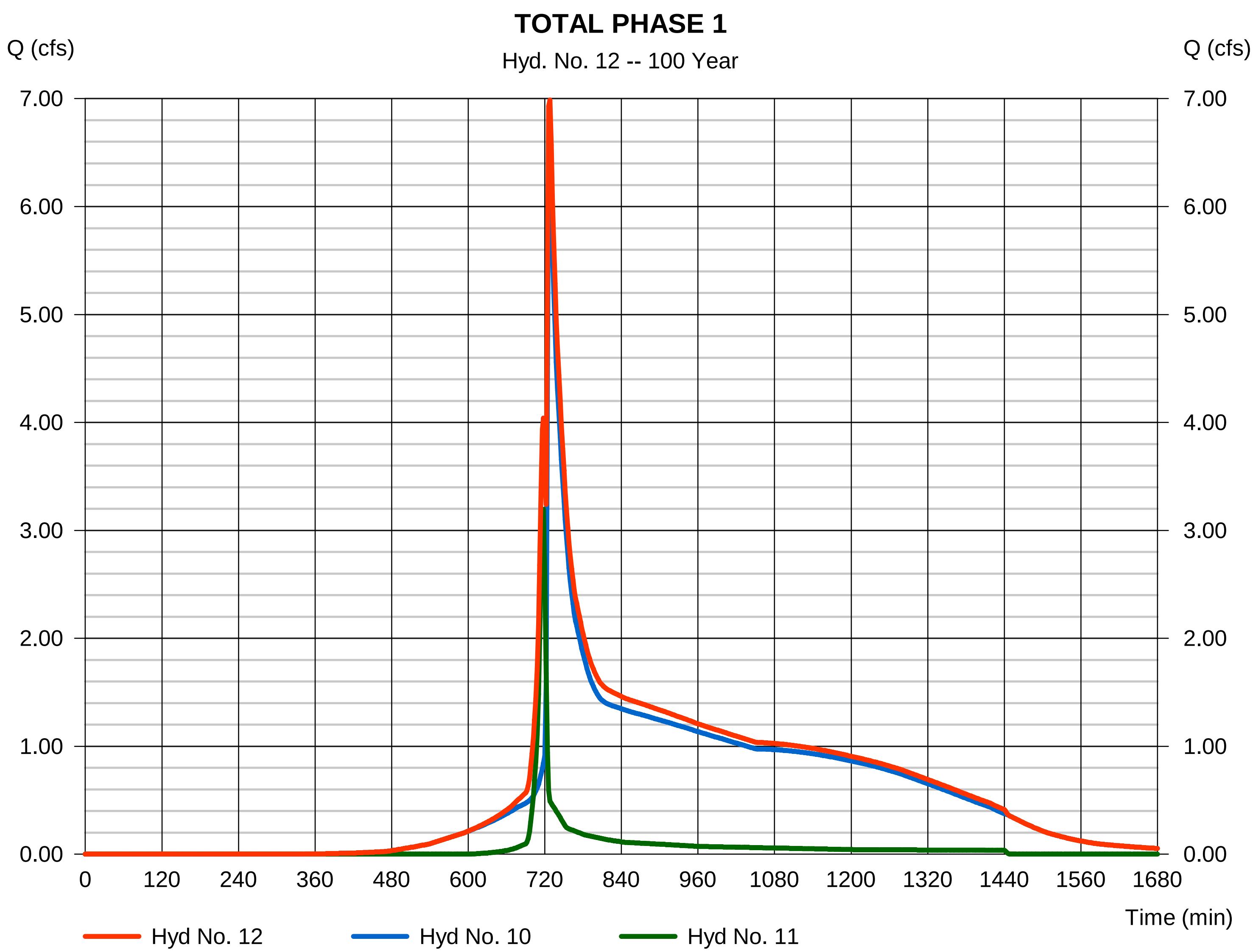
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 12

TOTAL PHASE 1

Hydrograph type	= Combine	Peak discharge	= 6.987 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 63,287 cuft
Inflow hyds.	= 10, 11	Contrib. drain. area	= 0.660 ac



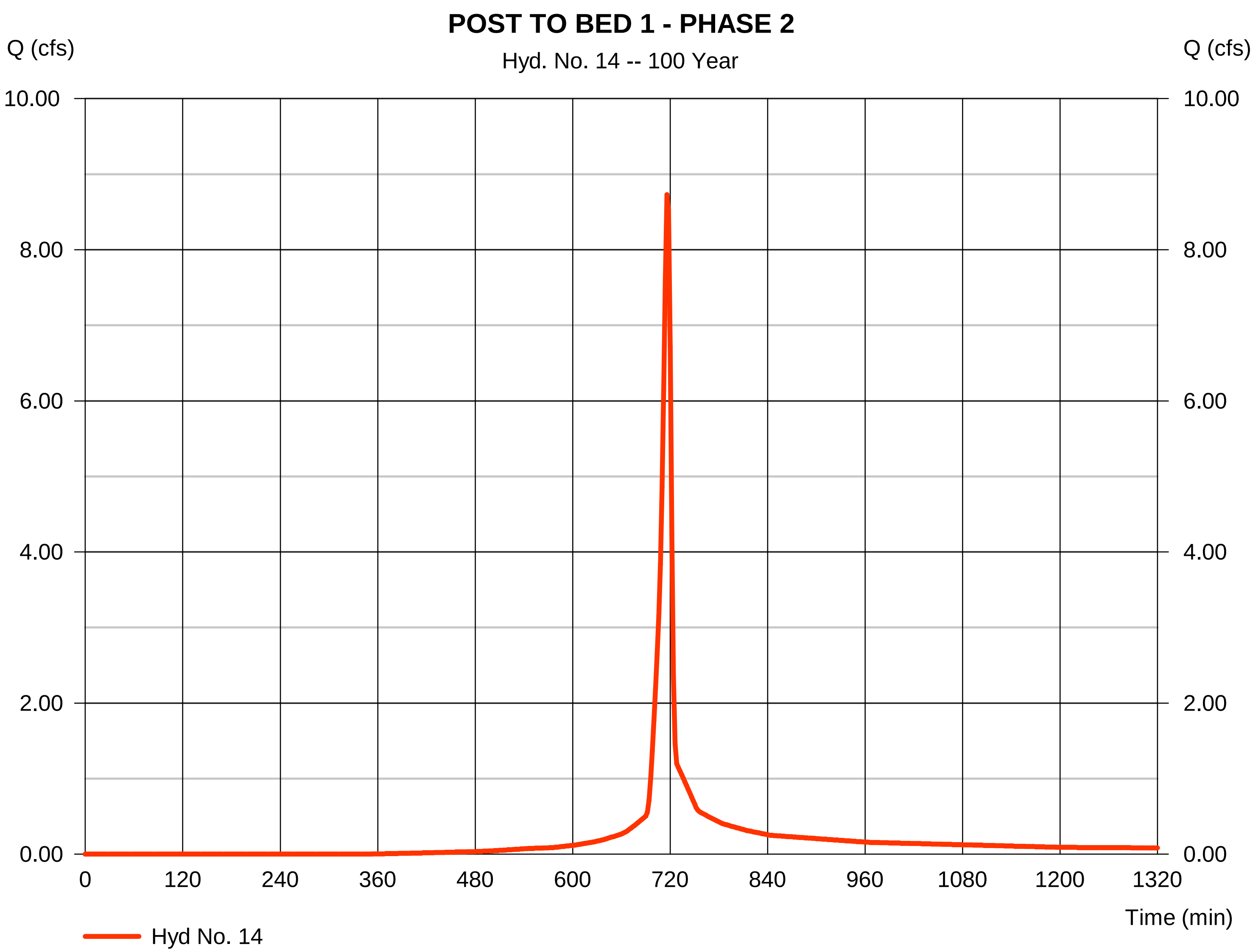
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 14

POST TO BED 1 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 8.728 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 18,052 cuft
Drainage area	= 1.110 ac	Curve number	= 79.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



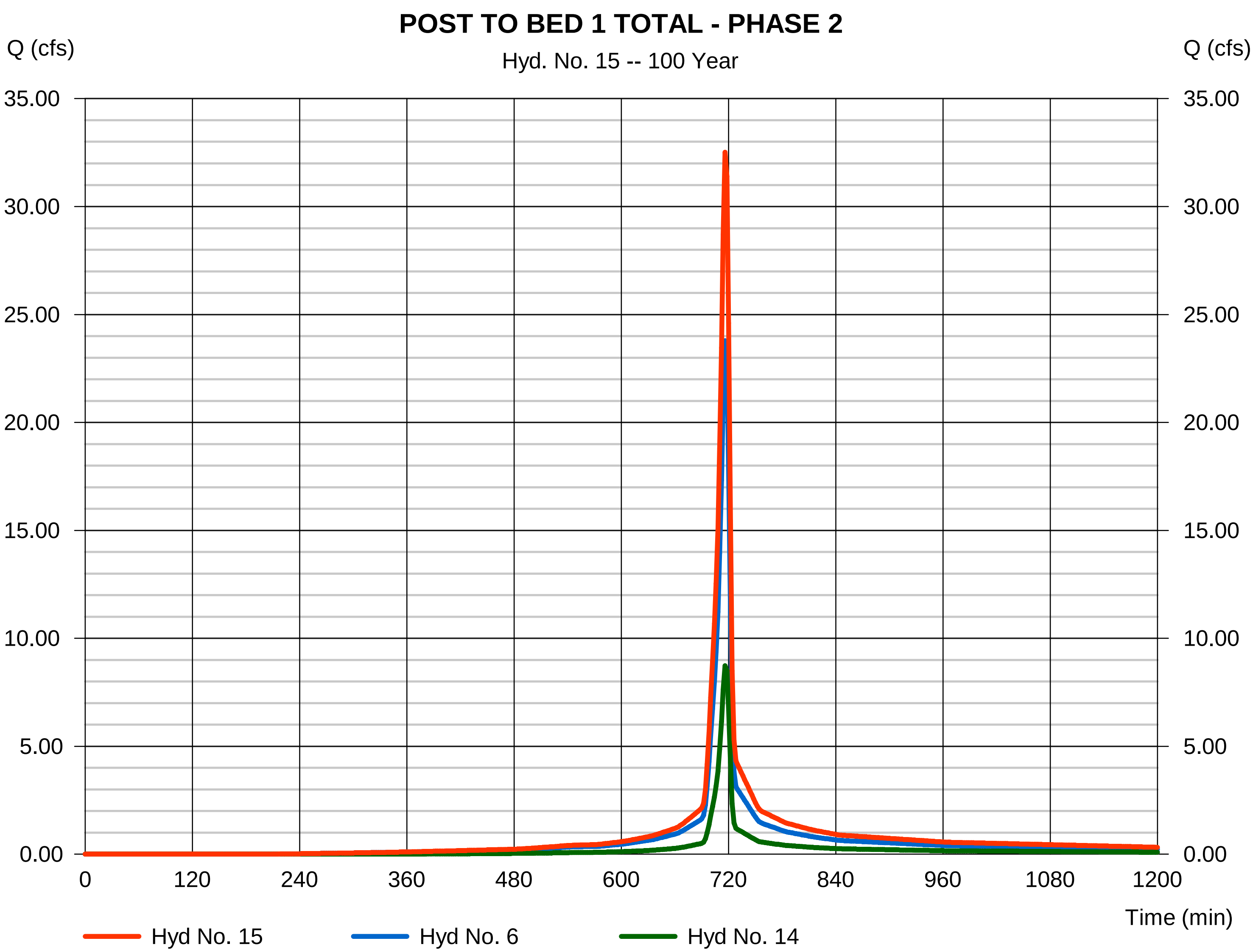
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Monday, 06 / 22 / 2020

Hyd. No. 15

POST TO BED 1 TOTAL - PHASE 2

Hydrograph type	= Combine	Peak discharge	= 32.51 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 69,649 cuft
Inflow hyds.	= 6, 14	Contrib. drain. area	= 3.740 ac



Hydrograph Report

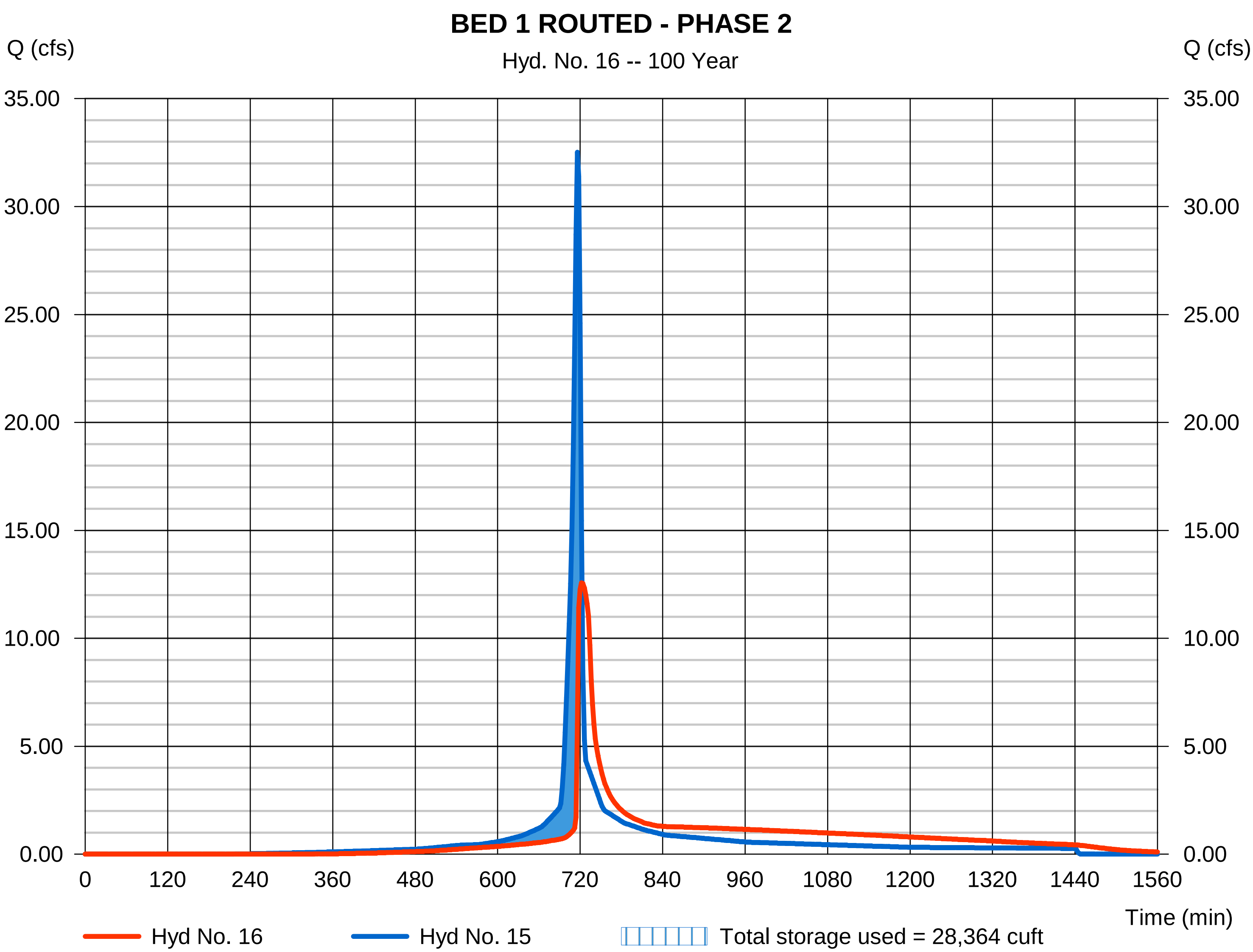
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Monday, 06 / 22 / 2020

Hyd. No. 16

BED 1 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 12.57 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 69,600 cuft
Inflow hyd. No.	= 15 - POST TO BED 1 TOTAL - PHASE 2	Max. Elevation	= 342.39 ft
Reservoir name	= MRC BED 1	Max. Storage	= 28,364 cuft

Storage Indication method used.



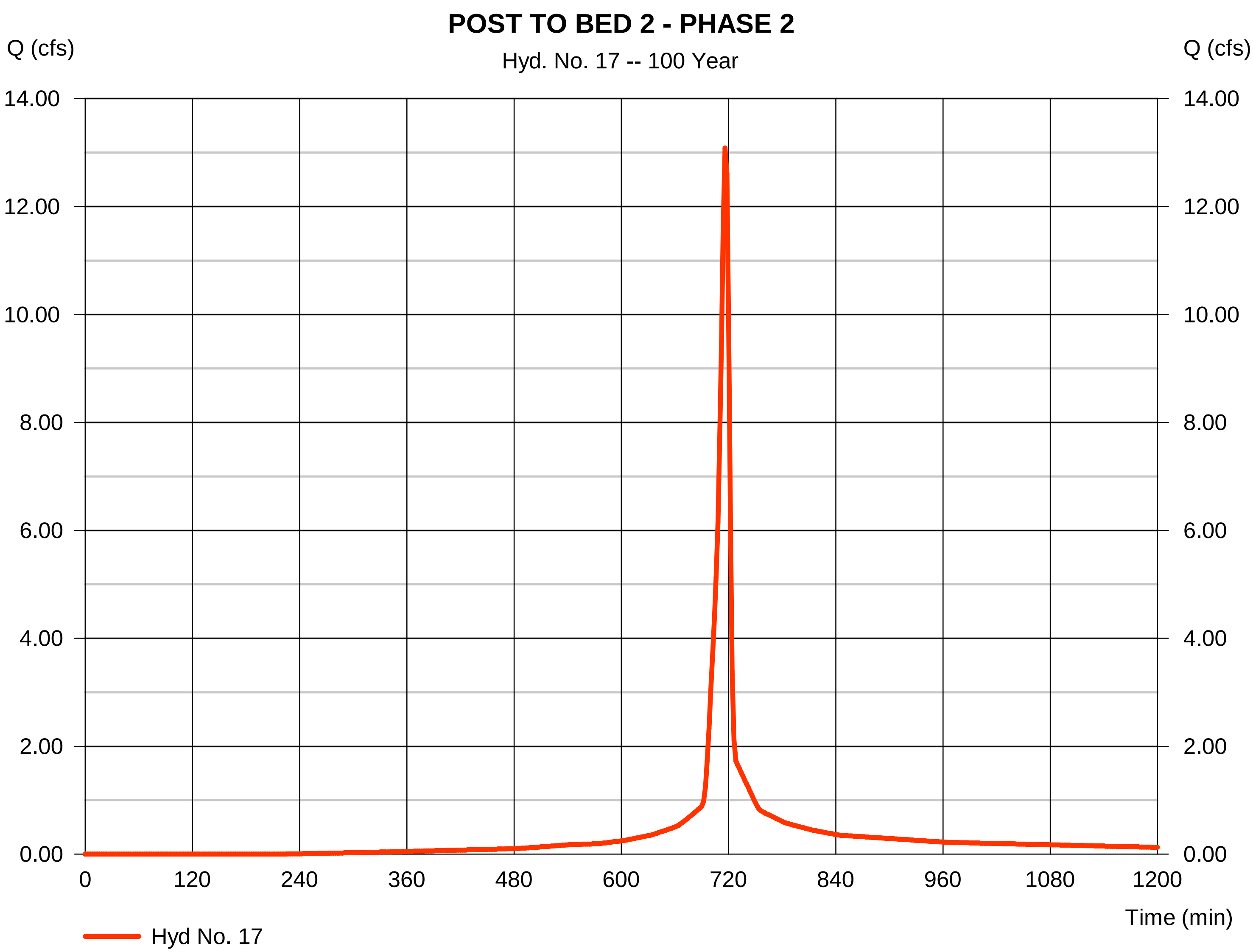
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 17

POST TO BED 2 - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 13.08 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 28,243 cuft
Drainage area	= 1.460 ac	Curve number	= 87.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

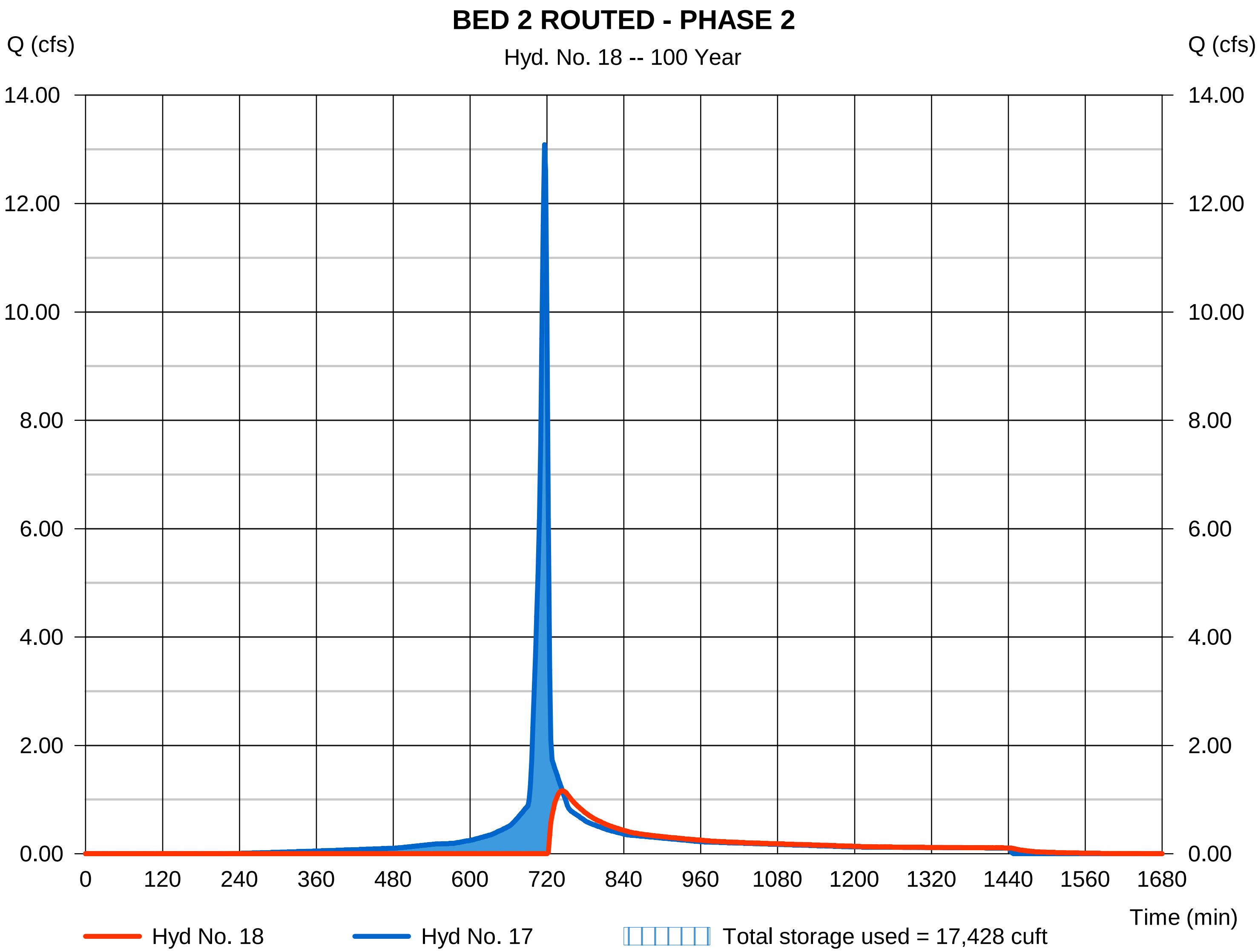
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 18

BED 2 ROUTED - PHASE 2

Hydrograph type	= Reservoir	Peak discharge	= 1.164 cfs
Storm frequency	= 100 yrs	Time to peak	= 744 min
Time interval	= 2 min	Hyd. volume	= 12,304 cuft
Inflow hyd. No.	= 17 - POST TO BED 2 - PHASE 2	Max. Elevation	= 347.21 ft
Reservoir name	= INFILTRATION BED 2	Max. Storage	= 17,428 cuft

Storage Indication method used.



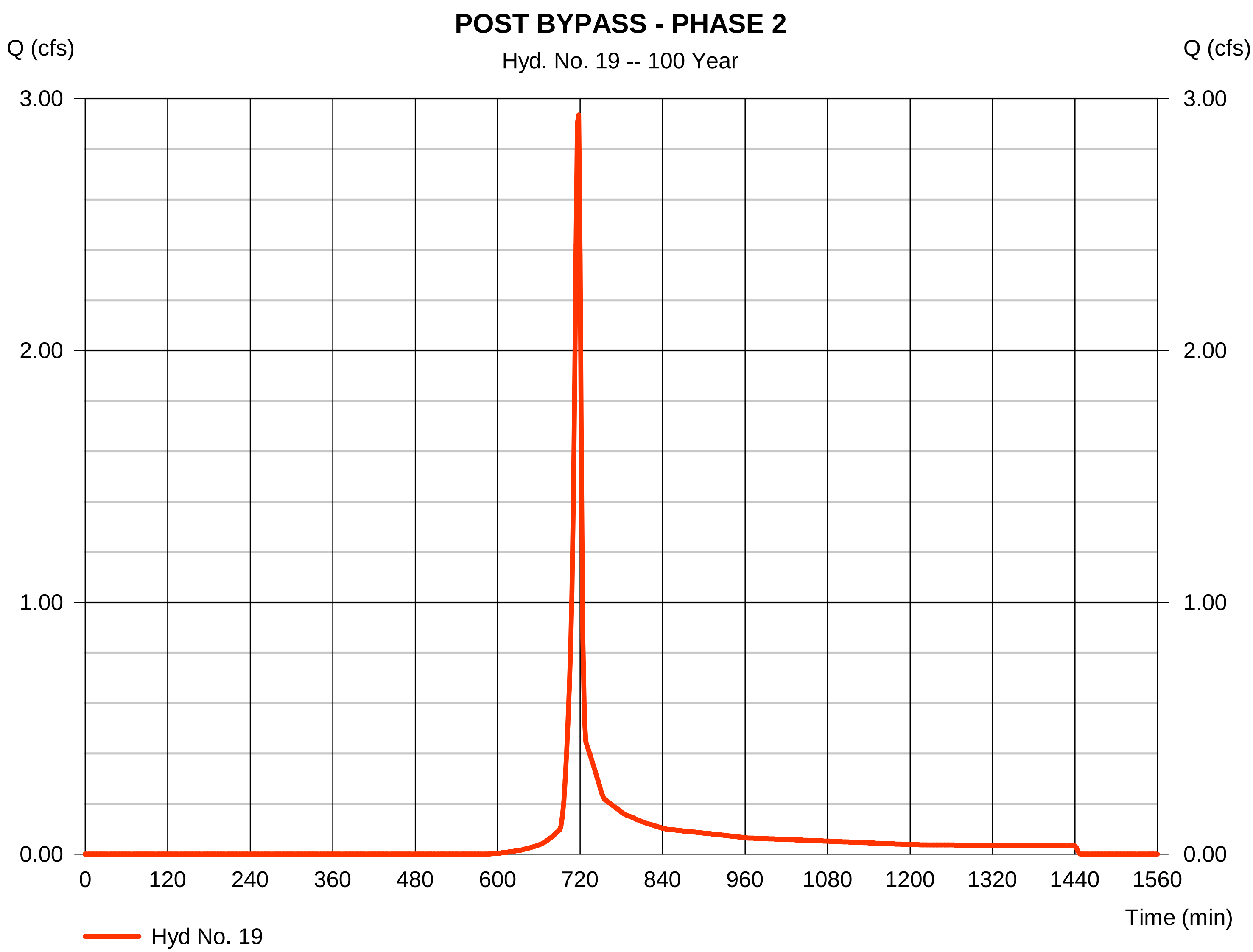
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 19

POST BYPASS - PHASE 2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.935 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 5,881 cuft
Drainage area	= 0.580 ac	Curve number	= 62.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



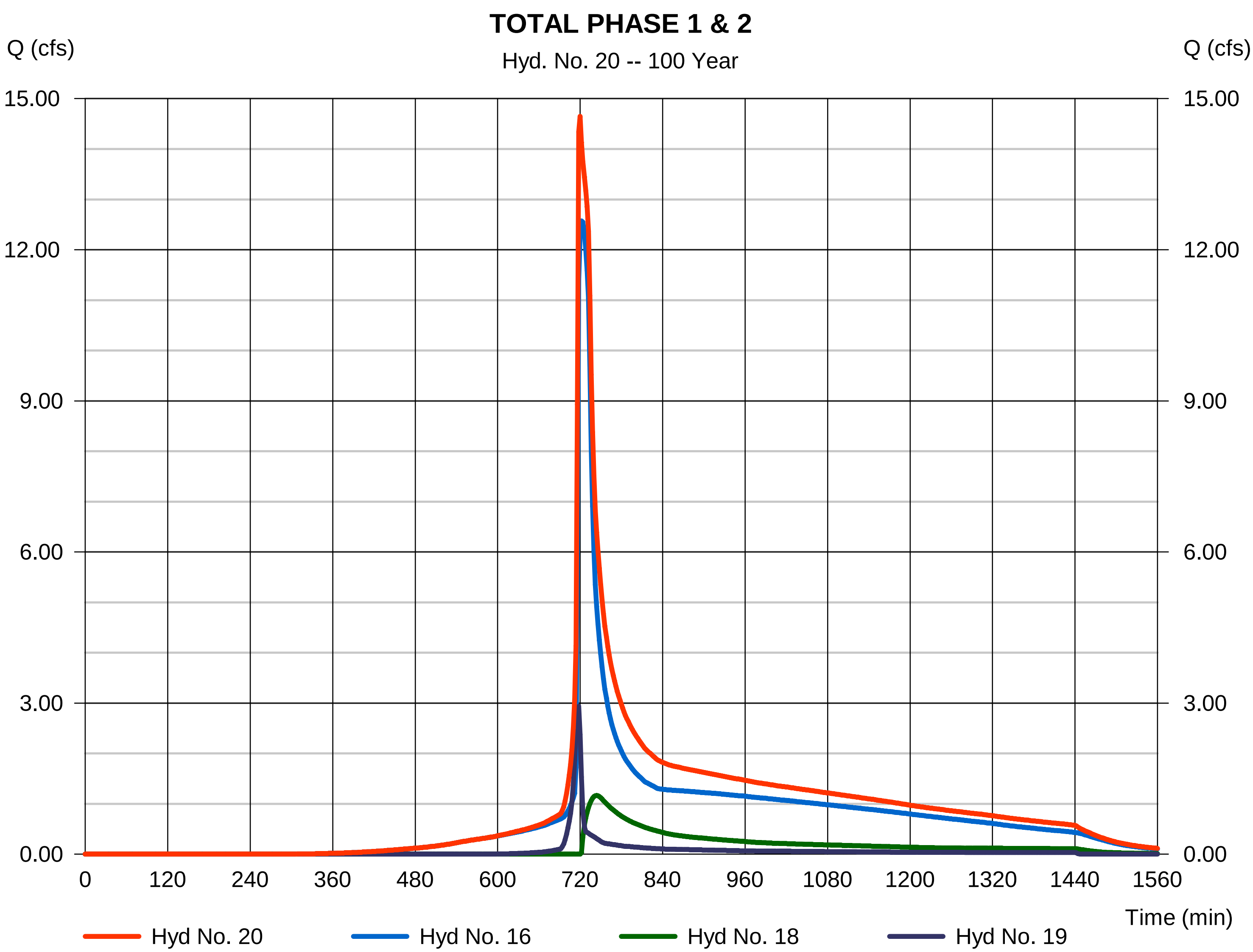
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 06 / 22 / 2020

Hyd. No. 20

TOTAL PHASE 1 & 2

Hydrograph type	= Combine	Peak discharge	= 14.65 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 87,785 cuft
Inflow hyds.	= 16, 18, 19	Contrib. drain. area	= 0.580 ac



APPENDIX D

VOLUME CALCULATIONS

DLHowell
Civil Engineering & Land Planning
www.DLHowell.com

CHANGE IN RUNOFF VOLUME FOR 2-YR STORM EVENT

Worksheet 4, Pennsylvania Stormwater Best Management Practices Manual — Chapter 8

PROJECT:	The Willows at Valley Run	
Drainage Area:	Overall LOD	
2-Year Rainfall:	3.2	inches
Total Site Area:	15.18	**acres**
Protected Site Area:	8.25	**acres**
Managed Area:	6.92	**acres**

Existing Conditions

Cover Type/Conditions	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Woods	**B**	45,895	1.054	55	8.1818	1.6364	0.25	960
Meadow	**B**	250,688	5.755	58	7.2414	1.4483	0.34	7,128
Meadow (20% Impervious)	**B**	999	0.023	58	7.2414	1.4483	0.34	28
Impervious (80%)	**N/A**	3,994	0.092	98	0.2041	0.0408	2.97	988
TOTAL:		**301,576**	**6.92**					**9,104**

Developed Conditions

Cover Type/Conditions	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Lawn	**B**	146,733	3.369	61	6.3934	1.2787	0.44	5,429
Impervious	**N/A**	154,843	3.55	98	0.2041	0.0408	2.97	38,291
TOTAL:		**301,576**	**6.92**					**43,720**

2-Year Volume Increase (ft^3):	**34,616**

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = Q = $(P - 0.2S)^2 / (P + 0.8S)$
   P = 2-Year Rainfall (in)
   S = (1000/CN) - 10

2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land Use Area (Sq. Ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI.
The use of a weighted CN value for volume calculations is not acceptable.

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CHANGE IN RUNOFF VOLUME FOR 2-YR STORM EVENT

Worksheet 4, Pennsylvania Stormwater Best Management Practices Manual — Chapter 8

PROJECT: The Willows at Valley Run
Drainage Area: Phase 1
2-Year Rainfall: 3.2 inches

Total Site Area: 15.18 **acres**
Protected Site Area: 11.41 **acres**
Managed Area: 3.77 **acres**

Existing Conditions

Cover Type/Conditions	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Woods	**B**	25,316	0.581	55	8.1818	1.6364	0.25	529
Meadow	**B**	134,945	3.098	58	7.2414	1.4483	0.34	3,837
Meadow (20% Impervious)	**B**	778	0.018	58	7.2414	1.4483	0.34	22
Impervious (80%)	**N/A**	3,110	0.071	98	0.2041	0.0408	2.97	769
TOTAL:		**164,149**	**3.77**					**5,158**

Developed Conditions

Cover Type/Conditions	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Lawn	**B**	78,522	1.803	61	6.3934	1.2787	0.44	2,905
Impervious	**N/A**	85,627	1.97	98	0.2041	0.0408	2.97	21,175
TOTAL:		**164,149**	**3.77**					**24,080**

2-Year Volume Increase (ft^3):	**18,922**

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = Q = $(P - 0.2S)^2 / (P + 0.8S)$
   P = 2-Year Rainfall (in)
   S = (1000/CN) - 10

2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land Use Area (Sq. Ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI.
The use of a weighted CN value for volume calculations is not acceptable.

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CHANGE IN RUNOFF VOLUME FOR 2-YR STORM EVENT

Worksheet 4, Pennsylvania Stormwater Best Management Practices Manual — Chapter 8

PROJECT: The Willows at Valley Run
Drainage Area: Phase 2
2-Year Rainfall: 3.2 inches

Total Site Area: 15.18 **acres**
Protected Site Area: 12.02 **acres**
Managed Area: 3.15 **acres**

Existing Conditions

Cover Type/Conditions	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Woods	**B**	20,579	0.472	55	8.1818	1.6364	0.25	430
Meadow	**B**	115,742	2.657	58	7.2414	1.4483	0.34	3,291
Meadow (20% Impervious)	**B**	221	0.005	58	7.2414	1.4483	0.34	6
Impervious (80%)	**N/A**	885	0.020	98	0.2041	0.0408	2.97	219
TOTAL:		**137,427**	**3.15**					**3,946**

Developed Conditions

Cover Type/Conditions	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Lawn	**B**	68,211	1.566	61	6.3934	1.2787	0.44	2,524
Impervious	**N/A**	69,216	1.59	98	0.2041	0.0408	2.97	17,116
TOTAL:		**137,427**	**3.15**					**19,640**

2-Year Volume Increase (ft^3):	**15,694**

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = Q = $(P - 0.2S)^2 / (P + 0.8S)$
   P = 2-Year Rainfall (in)
   S = (1000/CN) - 10

2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land Use Area (Sq. Ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI.
The use of a weighted CN value for volume calculations is not acceptable.

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VOLUME CALCULATION
MRC Bed 1

PROJECT NAME: ***The Willows at Valley Run***
LOCATION: ***Caln Township, Chester County, PA***
PREPARED BY: ***ALS*** DATE: ***6/22/2020***
CHECKED BY: DATE:

WATER SURFACE ELEVATION (FEET)	AREA AREA (SQ.FT.)	AVERAGE AREA (SQ.FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
338.80				**0**	
338.90				**2093**	**2,093**
339.30				**2638**	**4,731**
339.70				**3388**	**8,119**
340.10				**3655**	**11,774**
340.50				**3718**	**15,492**
340.90				**3609**	**19,101**
341.30				**3272**	**22,373**
341.70				**2393**	**24,766**
342.10				**2093**	**26,859**
342.50				**2093**	**28,952**
					28,952

2-Year Storm Proposed Infiltration/UG Retention Volume

Elevation	Storage Volume (CF)
340.50	15,492
340.85	***18,650***
340.90	19,101

Volume = 18,650 CF

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VOLUME CALCULATION
Infiltration Bed 1

PROJECT NAME: ***The Willows at Valley Run***
LOCATION: ***Caln Township, Chester County, PA***
PREPARED BY: ***ALS*** DATE: ***6/22/2020***
CHECKED BY: DATE:

WATER SURFACE ELEVATION (FEET)	AREA AREA (SQ.FT.)	AVERAGE AREA (SQ.FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
344.50				**0**	
344.80				**1338**	**1,338**
345.10				**1438**	**2,776**
345.40				**1997**	**4,773**
345.70				**2243**	**7,016**
346.00				**2340**	**9,356**
346.30				**2342**	**11,698**
346.60				**2241**	**13,939**
346.90				**1997**	**15,936**
347.20				**1437**	**17,373**
347.50				**1338**	**18,711**
					18,711

2-Year Storm Proposed Infiltration/UG Retention Volume

Elevation	Storage Volume (CF)
346.90	15,936
346.90	***15,936***
346.90	15,936

Volume = 15,936 CF

APPENDIX E

NRCS SOIL REPORT

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for

Chester County, Pennsylvania

May 5, 2020

Preface

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

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

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

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

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

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

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UudB—Urban land-Udorthents, limestone complex, 0 to 8 percent slopes...15
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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Soil Map

Map Scale: 1:2,110 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 30, 60, 120, 180

Feet: 0, 100, 200, 400, 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 12, Sep 17, 2019

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

Date(s) aerial images were photographed: Apr 4, 2012—Oct 19, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CtA	Conestoga silt loam, 0 to 3 percent slopes	14.6	98.0%
UudB	Urban land-Udorthents, limestone complex, 0 to 8 percent slopes	0.3	2.0%
Totals for Area of Interest		**14.9**	**100.0%**

Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

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

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

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

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

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

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

Chester County, Pennsylvania

CtA—Conestoga silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: pjhy
Elevation: 300 to 1,600 feet
Mean annual precipitation: 34 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 140 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Conestoga and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Conestoga

Setting

Landform: Hillsides
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from schist and/or residuum weathered from limestone

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 38 inches: silty clay loam
C - 38 to 75 inches: channery loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 60 to 99 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Clarksburg

Percent of map unit: 5 percent
Landform: Valley flats

Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Hollinger

Percent of map unit: 1 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Penlaw

Percent of map unit: 1 percent
Landform: Swales
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Letort

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Duffield

Percent of map unit: 1 percent
Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Pequea

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

UudB—Urban land-Udorthents, limestone complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: pjnt
Elevation: 300 to 1,000 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 80 percent
Udorthents, limestone, and similar soils: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Hills, valleys
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Interfluve, side slope, nose slope, head slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Pavement, buildings and other artifically covered areas

Typical profile

H1 - 0 to 6 inches: variable

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 to 99 inches to lithic bedrock
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

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

Description of Udorthents, Limestone

Setting

Landform: Hills, valleys
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Interfluve, side slope, nose slope, head slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear

Parent material: Graded areas of argillaceous limestone

Typical profile

H1 - 0 to 6 inches: clay loam
H2 - 6 to 60 inches: clay

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 99 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Duffield

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Amanda Schneider

From: Scott Gill <sgill@calntownship.org>
Sent: Tuesday, June 16, 2020 10:29 AM
To: Amanda Schneider
Subject: RE: 2131 Lincoln Highway - Will Serve Letters
Attachments: Resolution 2019-1 CTMA Establishing Reservation of SS Capacity Policy and Reservation Capacity Fee.pdf

Good morning Amanda,
Allocation/Reservation of capacity is in accordance with the attached resolution. The area you are proposing to develop is currently in the authority's existing service area.

Thanks,

Scot Gill, Director
Caln Township
Department of Wastewater Operations
253 Municipal Drive
Thorndale, Pa 19372
610-384-0600 ext 147
610-384-4043 fax

▯ Think Green! Please do not print this e-mail unless necessary

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From: Amanda Schneider [mailto:aschneider@dlhowell.com]
Sent: Tuesday, June 16, 2020 8:25 AM
To: Scott Gill <sgill@calntownship.org>
Subject: RE: 2131 Lincoln Highway - Will Serve Letters

Hi Scott,

Have you had a chance to look at this yet? Will you be able to provide us a will serve letter for this project? Let me know if you need any additional information.

Thank you,

Amanda Schneider, P.E.
Project Engineer

D.L. Howell & Associates, Inc.
Civil Engineering, Environmental, Land Planning
1250 Wright's Lane, West Chester, PA 19380
PH: (610) 918-9002

Direct: (484) 784-6736
Cell: (610) 755-1240
DLHowell.com | HowellKline.com
LinkedIN | FaceBook | Instagram | Newsletter Signup

From: Amanda Schneider
Sent: Monday, June 8, 2020 2:39 PM
To: Ray Stackhouse <rstackhouse@calntownship.org>; Scott Gill <sgill@calntownship.org>
Subject: 2131 Lincoln Highway - Will Serve Letters

Good afternoon Ray and Scott,

Attached is the layout plan for the 2131 Lincoln Highway development, there is a total of 120 apartment units proposed. We will need some documentation from you two to submit for Conditional Use.

Ray, could you please review and provide documentation that the fire/emergency services can service this site?

Scott, could you please review and provide a will serve letter for sanitary sewer service? We intend to connect through the sanitary sewer easement on parcel 39-04J-41.3 (east side of property).

Please let me know if you have any questions.

Thank you!

Amanda Schneider, P.E.
Civil Engineer
D.L. Howell and Associates, Inc.
Civil Engineering, Environmental, Land Planning
1250 Wrights Lane
West Chester, PA 19380
Phone: (610) 918-9002
Mobile: (610) 755-1240
Fax: (610) 918-9003
Email: aschneider@dlhowell.com
Web: https://www.dlhowell.com

CALN TOWNSHIP MUNICIPAL AUTHORITY
CHESTER COUNTY, PENNSYLVANIA
RESOLUTION NO. 2019-__1__-CTMA

A RESOLUTION OF THE CALN TOWNSHIP MUNICIPAL AUTHORITY ESTABLISHING A RESERVATION OF SANITARY SEWER CAPACITY POLICY AND A RESERVATION OF CAPACITY FEE.

WHEREAS, the Caln Township Municipal Authority (the "Authority") is empowered to enact and from time to time, to revise a schedule of certain fees to be charged against property owners connecting to the Authority's sanitary sewage collection and transmission lines (the "Sewer System") and where applicable, utilizing a portion of the Authority's sewage treatment capacity; and

WHEREAS, Caln Township (the "Township") is served by two wastewater treatment facilities, one owned by the Downingtown Area Regional Authority ("DARA") and the other owned by Pennsylvania American Water Company ("PAWC"); and

WHEREAS, the Township has entered into agreements with both PAWC and DARA for a fixed quantity of wastewater treatment capacity at each treatment facility; and

WHEREAS, Section 5 of the Act of January 24, 1966, P.L. 1535, No. 537, known as the Pennsylvania Sewage Facilities Act, 35 P.S. Section 750.1 et seq. ("Act 537") as amended, and the Rules and Regulations promulgated by the Pennsylvania Department of Environmental Protection ("PADEP") adopted thereunder, which are codified in Chapter 71 of Title 25 of the Pennsylvania Code, requires the Township to develop and implement a comprehensive official plan which provides for the resolution of existing sewage disposal problems, provides for future sewage disposal needs of new land development and provides for future sewage disposal needs of the Township, and

WHEREAS, the Township has prepared an Act 537 Official Sewage Facilities Plan which provides for a sewage facilities for the Township and adopted such plan by **Resolution No. 2005-27** as attached hereto as **Exhibit A**, and

WHEREAS, on March 26, 2010 the PADEP approved the Township's Official Plan, as prepared by EDM Consulting, Inc., a Bursich Company, dated October 2005, last revised by additional information dated June 26, 2007. Attached hereto is the PADEP letter dated March 26, 2010 as **Exhibit B**.

WHEREAS, the Authority, under the direction of the Township, is responsible for the implementation of the Township's Official Plan, and

WHEREAS, the Authority would like to establish a policy for the reservation of allocated sanitary sewer capacity and establish a reservation of capacity fee within the Sewer System.

NOW THEREFORE, BE IT HEREBY RESOLVED by the Board of Directors of the Caln Township Municipal Authority, Chester County, Pennsylvania, to adopt an allocation of sewage capacity policy and reservation of capacity fee, as follows:

SECTION 1

Purpose.

The Authority has determined that allocation to and reservation of sanitary sewer system capacity for future use creates an unreasonable and inequitable economic burden upon the Authority and the existing users of the Sewer System. Until such time as persons who have been granted reserve capacity choose to make use of such capacity, the Authority and ultimately the existing users of the system are required to amortize the costs of the fixed operation expenses and debt needed for such reservation. It is therefore, deemed to be in the interest of the Authority and the existing users of the sanitary sewer system to establish a policy on the payment of tapping fees and establish a reservation of capacity fee for the fixed operation expenses and debt in proportion to the existing users of the system for persons desiring or required to reserve sanitary sewer system capacity.

SECTION 2

Application for reservation of sewer capacity.

1) Any applicant whose project proposes to utilize more than one (1) residential equivalent dwelling unit ("EDU") shall prepare and submit to the Authority a development plan in accordance with Authority rules and regulations and a written request for the allocation to and reservation of sanitary sewer capacity.

2) The submission for the reservation of such sewer capacity shall contain a connection time schedule for the project and include such other information and supporting data as the Authority shall determine is reasonably necessary to estimate a five-year sewage flow from the project.

3) The Authority shall, in its sole discretion, based upon competent engineering advice and all other factors and conditions relating to the sanitary sewage system existing at the time of approval, determine the sewer capacity to be allocated to and reserved by the applicant for the project.

4) An escrow will need to be established so the Authority's Engineer can complete an evaluation of the existing system to determine that the project will not create a hydraulic overload in the Sewer System.

5) Flow data which shows all the proposed uses that will be needing public sewer along with the official request must be submitted, so the Authority's Engineer can proceed with the capacity evaluation once the escrow is established.

6) A plan that shows the proposed project along with any proposed locations of sewer extensions that will need to be installed to serve the project.

7) Once the flow data evaluation is complete and if it determines that improvements and/or upgrades are needed in the existing system, they will be addressed as part of a sewer capacity reservation agreement between the Authority, and the applicant.

8) Once the evaluation is done and the agreements are executed a complete PADEP sewage planning module, along with the executed agreements will need to be submitted to the PADEP by the applicant for review and approval. Once the applicant receives all governmental approvals, and meets all the conditions outlined in the executed agreements capacity will then be considered allocated for the project in accordance with the executed agreements.

9) In the event that the PADEP shall cancel, revoke or stay the effectiveness of any approval or permit for any reason, or should it for any reason impose a ban on connections or extensions to the Sewer System, or should a prohibition on connections or extensions to the Sewer System arise by operation of law or regulation, or if the Authority is unable to permit connection for any reason whatsoever, the Authority shall not as a result thereof incur any liability of any nature to an applicant for allocated capacity.

SECTION 3

Reserved Sewer Capacity.

1) The Authority shall require the payment of applicable tapping fees in no more than three equal installments. Upon receipt by the Authority of the first installment of the tapping in accordance with term outlined in the executed agreement, the applicant shall be deemed to have reserved 33% of the total EDUs requested (total EDUs rounded to lowest EDU) of sewer capacity reserved for the property.

2) Upon receipt by the Authority of the second installment of the tapping fee in accordance with term outlined in the executed agreement, the applicant shall be deemed to have reserved 66% of the total EDUs requested (total EDUs rounded to lowest EDU) of sewer capacity for the property.

3) Upon receipt by the Authority of the third and final installment of the tapping fee in accordance with term outlined in the executed agreement, the applicant shall be deemed to have reserved all of the sewer capacity for the property.

4) If for any reason, the applicant fails to make payment in accordance with SECTION 3 (2) and/or (3) above within 1 year of the date of the executed agreement, then the applicant shall pay a monthly charge of 60% of the average sanitary sewer bill for a residential customer in the same sewer service area for the same billing period for each EDU that is proposed to be connected and for which the tapping fees

having not been paid in order to maintain any reservation of capacity. For any EDU so reserved, the applicant shall pay the prevailing tapping fee in effect at the time of connection. The Authority shall have no monetary obligation to refund applicant for any tapping fees or sewer rentals paid by applicant for any unused EDU(s) if the unused EDU(s) is relinquished.

SECTION 4

Purchased Sewer Capacity

Upon receipt by the Authority of the total amount of the tapping fee in accordance with SECTION 3 (1), (2) and (3) above, Applicant shall be deemed to have purchased the sewer capacity for the property in the Sewer System.

SECTION 5

Reservation and Use Periods; Refunds

1) If sewer capacity in the Sewer System is reserved by the applicant under SECTION 3 (1) and (2), but applicant does not reserve all of the capacity under its agreement or the applicant does not obtain sewage planning module approval within five (5) years of the date of execution of the capacity reservation agreement, unless extended by the agreement of the applicant and the Authority, or if the Applicant fails to pay the sewer reservation fee under SECTION 3 (4), Applicant shall return the unused EDU(s) to the Authority, and the agreement with the Authority shall cancel and terminate. All payments by the applicant to the Authority under the capacity reservation agreement shall be nonrefundable.

2) If the sewer capacity in the Sewer System is reserved by the applicant under SECTION 3 (1) and (2) and purchased under SECTION 4, then SECTION 5 (1) shall not apply and if the capacity is not used within five years of the date of sewage planning module approval, the applicant may retain any unused EDU(s) by paying the sewer rentals then in effect for each EDU, and upon default of any such payment following reasonable written notice from the Authority with an opportunity to cure, the unused EDU(s) shall be deemed to be returned to the Authority and relinquished. Otherwise, the applicant may return the unused EDU(s) to the Authority. The Authority shall have no monetary obligation to refund the applicant for any tapping fees or sewer rentals paid by the applicant for any unused EDU(s) if the unused EDU(s) is relinquished.

3) The applicant will also be required to execute and submit to the Authority in recordable form satisfactory to the Authority a sewer capacity relinquishment agreement for the relinquished EDUs. However, the relinquishment agreement

will only be recorded in accordance with the sewer capacity reservation agreement.

SECTION 6

Miscellaneous provisions.

1) Sewer capacity allocated to and reserved by a person shall apply to and be valid only for such persons, or their successor in title, for the unimproved lot, parcel, tract or any part of a subdivision or land development made the subject of the application. Capacity that has been allocated cannot be transferred to another tract of land.

2) The reserve capacity applicable to such lot, parcel, tract or part of the subdivision or land development shall be transferred to the new owner thereof, with or without a formal assignment of such reserve capacity.

3) Reserved capacity shall not be sold, transferred or assigned to any other person or for the use of any other subdivision or land development, without the express written approval of the Authority. Capacity that has been allocated cannot be transferred to another tract of land.

4) In no event shall the Authority or any officer or agent thereof approve an assignment of sewer capacity unless there exists, at the time of such request for sewer capacity, demonstrable treatment and conveyance capacity in the Sewer System as determined by PADEP's approval of the required Act 537 sewage facility planning. The completion of the Chapter 94 consistency requirements of an Act 537 planning module or planning module exemption by the Authority is not an allocation of capacity.

SECTION 7

Resolution 2005-10-CTMA is hereby repealed. This Resolution shall supersede all resolutions or parts thereof inconsistent herewith.

SECTION 8

Unless otherwise provided herein, this Resolution shall be effective upon adoption.

RESOLVED, APPROVED AND ADOPTED by the Caln Township Municipal Authority this ____th day of ____________, 2019.

____
Noel Bernard, Secretary

____
Paul F. Mullin, Chairperson

____
George Chambers, Vice Chairperson

____
John D. Contento, Member

____
Noel Bernard, Member

____
Tony DiSario, Member

Exhibit A

Resolution No: 2005-27

CALN TOWNSHIP

CHESTER COUNTY, PENNSYLVANIA

RESOLUTION NO. 2005 - 27

A RESOLUTION ADOPTED PURSUANT TO THE PENNSYLVANIA SEWAGE FACILITIES ACT, 35 P.S. SECTION 750.1 ET SEQ. AND THE REGULATIONS PROMULGATED THEREUNDER, APPROVING THE TOWNSHIP'S OFFICIAL WASTEWATER FACILITIES PLAN.

WHEREAS, Section 5 of the Act of January 24, 1966, P.L. 1535, No. 537, known as the "Pennsylvania Sewage Facilities Act", 35 P.S. Section 750.1 et seq. (the "Act"), as amended, and the rules and regulations promulgated by the Pennsylvania Department of Environmental Protection (the "Department") adopted thereunder, which are codified in Chapter 71 of Title 25 of the Pennsylvania Code, requires the Township to develop and implement a comprehensive official plan which provides for the resolution of existing sewage disposal problems, provides for future sewage disposal needs of new land developments and provides for future sewage disposal needs of the Township (the "Official Plan"); and

WHEREAS, once adopted by the Township, the Official Plan must be submitted to the Department for approval; and

WHEREAS, the Township has retained EDM Consultants, Inc. to prepare the Official Plan which is attached hereto which is titled, "Act 537 Official Sewage Facilities Plan" and is dated May, 2005; and

WHEREAS, the Official Plan has been submitted to the Caln Township Planning Commission, the Chester County Planning Commission ("CCPC") and the Chester County Health Department ("CCHD") in accordance with the Act; and

WHEREAS, at its July 26, 2005 meeting, the Caln Township Planning Commission reviewed the Official Plan and offered no written comments or recommendations to the Board of Commissioners concerning the Official Plan; and

WHEREAS, the CCPC issued a review letter dated July 28, 2005 wherein it offered several comments and suggestions to the Township regarding possible revisions to the Official Plan; and

WHEREAS, the CCHD issued a review letter dated August 22, 2005 wherein it offered several comments and suggestions to the Township regarding possible revisions to the Official Plan; and

WHEREAS, the Township advertised its intention to adopt the Official Plan in the *Daily Local News* on September 7, 2005 consistent with the Act and provided a thirty (30) day review period for the public to comment; and

WHEREAS, the Township did not receive any public comment on the Official Plan; and

WHEREAS, the Official Plan contemplates the following alternatives to meet the sewage needs of the Township:

<u>Phase 1</u>

1. Provide sewer service for the twenty lots in the Parkside subdivision at an estimated cost of $172,000.

2. Purchase 75,000 gallons per day (gpd) of sewer treatment capacity at Downingtown Area Regional Authority ("DARA") from the Borough of Downingtown. Estimated cost $938,000.

<u>Phase 1A</u>

3. Develop and adopt an On-Lot Disposal System Management Ordinance for the areas of the Township not served by public sewers.

4. The Caln Township Municipal Authority ("CTMA") has been established to own, operate and maintain the sewage facilities in the Township. The CTMA, under the direction of the Township, is responsible for the implementation of the Township's Official Plan.

5. Participate in Pennsylvania American Water Company ("PAWC") East End Interceptor improvements to increase the conveyance capacity to allow for the discharge of up to 570,000 gpd of wastewater from Caln Township to the PAWC Coatesville Wastewater Treatment Plant ("WWTP"). Estimated Cost $1,140.000.

6. Design and construct a new 536 gallon per minute (gpm) pump station and eight inch diameter force main to pump wastewater from the Caln Interceptor near Municipal Drive to the PAWC East End Interceptor in Coatesville as shown on Plate 5. Estimated Cost $2,400,000.

<u>Phase 2</u>

7. Participate in PAWC East End Interceptor improvements to increase the conveyance capacity to allow for the discharge of up to 800,000 gpd of wastewater from Caln Township to the PAWC Coatesville WWTP. Estimated Cost $454,000.

The key implementation activities/dates include the following:

Item	Completion Days after PaDEP Plan Approval
Phase 1	
Construct Parkside Area Sewers	(-90 days)
DEP Approval of Plan	0 days
Purchase DARA Capacity (75,000 gpd)	60 days
Phase 1A	
PAWC Phase 1A Improvements	90 days
Adopt OLDS Ordinance	180 days
Design of Municipal Drive Pump Station and Force Main	300 days
Permit and Bid Municipal Drive Pump Station and Force Main	420 days
Construct Municipal Drive Pump Station and Force Main	700 days
Phase 2	
PAWC Phase 2 Improvements and WWTP Expansion	1,095 days

WHEREAS, the Board of Commissioners finds that the Official Plan attached hereto as Exhibit "A" and summarized above conforms to applicable zoning, subdivision, and other applicable municipal ordinances and provides a comprehensive program of pollution control and water quality management; and

WHEREAS, the Board has reviewed the Official Plan and finds that the alternatives set forth therein are adequate for the wastewater disposal and management needs of the entire Township, and as soon as it is approved by the Department intends to implement the Official Plan;

NOW, THEREFORE, BE IT AND IT IS RESOLVED that the Caln Township Board of Commissioners hereby adopts the Official Plan which is attached hereto as Exhibit "A" and which is more particularly defined and summarized above.

ADOPTED AND RESOLVED this 27th day of October 2005.

ATTEST:

CALN TOWNSHIP
BOARD OF COMMISSIONERS

Janet Bugar, Secretary

Arnold M. Kring, President

Thomas C. Hinkle, Vice President

Illaria Steele, Member

James Sacco, Member

David Mushrush, Member

I, Janet Bugar, Secretary, of the Board of Commissioners of Caln Township hereby certify that the foregoing is a true copy of the Township's Resolution No. 2005-27, adopted on October 27, 2005.

AUTHORIZED SIGNATURE

Janet Bugar, Secretary

Exhibit B

PADEP Letter Dated March 26, 2010

pennsylvania

DEPARTMENT OF ENVIRONMENTAL PROTECTION

SOUTHEAST REGIONAL OFFICE

MAR 26 2010

RECEIVED MAR 31 2010

Mr. Greg Prowant, Manager
Caln Township
253 Municipal Drive
Thorndale, PA 19372

Re: Act 537 Plan Update
Official Sewage Facilities Plan
APS ID 512869, AUTH ID 619116
Caln Township
Chester County

Dear Mr. Prowant:

This letter is a reissuance and revision of our December 21, 2009, approval of the above-referenced plan.

We have completed our review of your municipality's updated official sewage facilities plan titled Act 537 Official Sewage Facilities Plan, as prepared by EDM Consulting, Inc., a Bursich Company, dated October 2005, last revised by additional information dated June 26, 2007. The review was conducted in accordance with the provisions of the Pennsylvania Sewage Facilities Act.

Approval of the plan is hereby granted. The plan provides for the following:

1. Proposed sewer growth areas, existing sewer service areas, on-lot sewage disposal system areas, the sewer service area served by the Veteran's Administration Hospital, and the sewer service area served by West Brandywine Township are approved as shown in the plan in Appendix A, Plates 5 and 6.

2. Caln Township's (Township) bulk capacity allocation in the Pennsylvania American Water Company's (PAWC) Coatesville Wastewater Treatment Plant will be increased from 0.18 million gallons per day (MGD) to 0.8 MGD, consistent with the terms and conditions set forth in their capacity agreement with PAWC dated March 10, 2005, as provided in Appendix D of the plan.

SCANNED

MAR 31 2010

ELECTRONICALLY FILED

3. Under the approved plan and consistent with the Intermunicipal Agreement of December 27, 1985, as amended, on February 23, 2000 (Third Amendment), by and among Downingtown Area Regional Authority (DARA) and its tributary municipalities, sewage flows to DARA's Downingtown Regional Water Pollution Control Center (DRWPCC) from the Township are to remain consistent with prior years, until such time as the plan and Intermunicipal Agreement may be modified in the future.[1] The Intermunicipal Agreement with DARA provides for maximum annual average flows from the Township of 1.3875 MGD and a 12 consecutive week average daily flow not to exceed 150 percent of the lowest 12-week average daily flow to DARA's DRWPCC for any 12-week period during the previous 52 weeks, as adjusted by DARA to account for new connections and unusual weather conditions.

4. The plan provides for a flow diversion from a service area in the western and central portions of the Township. This service area is to be shared between the PAWC Wastewater Treatment Facility and the DARA DRWPCC.

5. Pretreatment requirements for facilities that discharge industrial waste to the public sewers throughout the shared service area will be enforced by the Township and Caln Township Municipal Authority in accordance with the most restrictive pretreatment requirements in effect from either the PAWC facility or the DARA facility. Both DARA and PAWC will be contacted as part of the emergency contact system for the shared service area.

6. Planning approval is granted through this revision for a sewage pumping station and an 8-inch force main that will divert sewage flows to PAWC from the shared PAWC/DARA service area. The Municipal Drive Pump Station will be located adjacent to the existing Caln Interceptor in the vicinity of Municipal Drive Park and will ultimately divert average daily flows of 0.702 MGD to the PAWC system at Manhole 54. The capacity agreement with PAWC for the pumping station provides for a maximum pumping rate from the flow diversion of 536 gallons per minute, or 0.772 MGD. The proposed facilities will be owned and operated by the Caln Township Municipal Authority and are shown on Plate 5, Service Area Alternative MD-1, found in Appendix A.

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[1] The Department acknowledge that the December 27, 1985, Intermunicipal Agreement with DARA has been amended by the parties to that agreement on May 1, 1996, January 18, 1999, February 23, 2000, May 18, 2006, and January 18, 2010.

Planning approval for the Municipal Drive Pump Station provides for metering of the total flows received at the pump station, metering the flows pumped to PAWC, and calculating the flows sent by gravity to DARA in order to determine a ratio of flows to each facility. Wet and dry weather flows will be conveyed to the PAWC Wastewater Treatment Facility and DARA's DRWPCC at ratios consistent with the flow rates allowed under the respective DARA Intermunicipal Agreement and the PAWC capacity agreement (referenced in Items 2 and 3, above) up to the maximum allowable flow rate. Flows to DARA will not exceed the maximum annual average flows of 1.3875 MGD and a 12 consecutive week average daily flow not to exceed 150 percent of the lowest 12-week average daily flow to DARA's DRWPCC for any 12-week period during the previous 52 weeks, as adjusted by DARA to account for new connections and unusual weather conditions, subject to the provisions in Item 3, above. Flows to PAWC tributary to the pump station in excess of the maximum allowable flow rate of 0.772 MGD will flow by gravity to DARA's DRWPCC.

7. Planning approval provides for Chapter 94 reporting by the Caln Township Municipal Authority to both PAWC and DARA. The Chapter 94 Report is to provide both total average flows and instantaneous or hourly total wet weather peak flows (1) received at the Municipal Drive Pump Station; (2) pumped to PAWC's Wastewater Treatment Facility; and (3) conveyed by gravity to DARA's DRWPC. The Chapter 94 Report must document that sewage flows from the shared sewer service area are being conveyed to PAWC Wastewater Treatment Facility and DARA's DRWPC consistent with the ratios indicated in Item 6, above, and as set forth in the respective DARA Intermuncipal Agreement and the PAWC capacity agreement, referenced in Items 2 and 3, above.

8. Water Quality Permit No. 1509401 was issued to the Caln Township Municipal Authority for the Municipal Drive Pump Station and associated force main on July 7, 2009. To assure implementation of the Township's plan to control wet weather sewage flows to be conveyed to PAWC's Wastewater Treatment Facility and DARA's DRWPCC through the diversion at the ratios as indicated in Item 6, above, the Caln Township Municipal Authority will install a flow metering and flow controller system necessary to assure that these ratios are maintained during wet weather/high-flow conditions.

9. The Township will develop and implement an On-Lot Sewage Disposal System (OLDS) Sewage Management Program within 5 years for the areas of the Township designated as on-lot sewage disposal system areas in Appendix A, Plates 5 and 6.

10. If future malfunctions are identified in existing on-lot sewage disposal areas, the Township will use the Department of Environmental Protection's (Department) Component 3m to evaluate and adopt sewage facilities planning for the connection of these areas to public sewers.

Please note that when future needs indicate additional or changed sewage facilities needs in the Township that require additional treatment capacity at PAWC or DARA, additional sewage facilities planning must be adopted by the Township and approved by the Department, along with any necessary changes to the inter-municipal agreements that are needed to serve the identified needs.

The Township Municipal Authority will need to submit to the Department a request for determination whether the Authority needs to amend Water Quality Management Permit No. 1509401 to reflect a proposed installation of flow metering devices and a flow controller system to assure that wet/dry weather ratios are maintained consistent with this Plan Approval.

Any person aggrieved by this action may appeal, pursuant to Section 4 of the Environmental Hearing Board Act, 35 P.S. Section 7514, and the Administrative Agency Law, 2 Pa.C.S. Chapter 5A, to the Environmental Hearing Board, Second Floor, Rachel Carson State Office Building, 400 Market Street, P.O. Box 8457, Harrisburg, PA 17105-8457, 717.787.3483. TDD users may contact the Board through the Pennsylvania Relay Service, 800.654.5984. Appeals must be filed with the Environmental Hearing Board within 30 days of receipt of written notice of this action unless the appropriate statute provides a different time period. Copies of the appeal form and the Board's rules of practice and procedure may be obtained from the Board. The appeal form and the Board's rules of practice and procedure are also available in braille or on audiotape from the Secretary to the Board at 717.787.3483. This paragraph does not, in and of itself, create any right of appeal beyond that permitted by applicable statutes and decisional law.

IF YOU WANT TO CHALLENGE THIS ACTION, YOUR APPEAL MUST REACH THE BOARD WITHIN 30 DAYS. YOU DO NOT NEED A LAWYER TO FILE AN APPEAL WITH THE BOARD.

IMPORTANT LEGAL RIGHTS ARE AT STAKE, HOWEVER, SO YOU SHOULD SHOW THIS DOCUMENT TO A LAWYER AT ONCE. IF YOU CANNOT AFFORD A LAWYER, YOU MAY QUALIFY FOR FREE PRO BONO REPRESENTATION. CALL THE SECRETARY TO THE BOARD (717.787.3483) FOR MORE INFORMATION.

If you have any questions, please feel free to contact Mr. John M. Veneziale of our office at 484.250.5175.

Sincerely,

Jenifer Fields, P.E.
Regional Manager
Water Management

cc: Chester County Planning Commission
Chester County Health Department
EDM Consulting, Inc.
Downingtown Area Regional Authority
Pennsylvania American Water Company
Mr. Veneziale
Ms. Moore
Ms. Grant
Mr. McHale - RCSOB
Planning Section
Re 30 (joh10wqm)075-10

2131 Lincoln Highway

PREPARED BY:

DLHowell
Civil Engineering, Land Planning, Environmental
1250 Wrights Lane, West Chester, PA 19380
Phone: (610) 918-9002 Fax: (610) 918-9003
(610) 918-9002 www.dlhowell.com

The Willows at Valley Run

Caln Township, Chester County, PA

EXHIBIT A-11

STORMWATER INFILTRATION REPORT

FOR

THE WILLOWS AT VALLEY RUN
2131 W. LINCOLN HIGHWAY
CALN TOWNSHIP
CHESTER COUNTY

PREPARED FOR:

Mr. John Randolph
MBID of Delaware, LLC
5 Powell Lane
Collingswood, NJ 08108

PREPARED BY:

D.L. Howell & Associates, Inc.
1250 Wrights Lane
West Chester, PA 19380

June 2020

DLHowell
Civil Engineering & Land Planning
www.DLHowell.com

EXHIBIT A-12

Stormwater Infiltration Test Report
2131 W. Lincoln Highway
Caln Township
Chester County

On Tuesday-Wednesday, June 16-17, 2020, D.L. Howell and Associates, Inc. preformed hydraulic conductivity tests for the proposed stormwater management areas for the property located at 2131 W. Lincoln Highway in Caln Township, Chester County. The purpose of the hydraulic conductivity testing was to determine site suitability for the proposed stormwater infiltration area associated with proposed improvements at the site (see development plan).

Testing was conducted in general accordance with the Pennsylvania Department of Environmental Protection (PADEP)'s Pennsylvania Stormwater Best Management Practices Manual specifications, in a cased, sealed, borehole utilizing the falling head method designed to measure the vertical hydraulic conductivity of the soil. An approximate five inch diameter borehole was dug to the depth of the proposed bottom elevation of the infiltration structure and a 3 inch diameter PVC casing was installed. A mixture of bentonite and soil was placed around the annulus of the casing and packed to seal the casing in place. The casing was presoaked immediately prior to the start of the test to simulate field saturated conditions. A measured amount of water was poured into the sealed casing to begin the 30 minute presoak. After the final 30 minute presoaking period, the water in the casing was adjusted to a known depth and consecutively re-adjusted after each reading and the drop of the water column is measured. The test continued until the readings became stabilized or for a maximum of eight readings. A stabilized rate of drop means a difference of ¼ inch or less of drop between the highest and lowest readings of four consecutive readings.

Within the proposed area for Infiltration Bed 1, a total of two hydraulic conductivity tests were conducted at the elevation associated with the proposed bottom of the infiltration structure. One deep test pit was excavated at each test location to identify limiting conditions such as mottling, depth of bedrock, and depth of groundwater. Testing was to be conducted within the footprint of each proposed infiltration structure.

- Infiltration Test 1 was conducted at approximately ± 7.0 feet below existing grade, which corresponds to an approximate infiltration elevation of 343.0. One deep test pit was excavated at this location to a depth of 9.0 feet below existing grade. No limiting conditions were identified at the time of excavation.

- Infiltration Test 2 was conducted at approximately ± 6.0 feet below existing grade, which corresponds to an approximate infiltration elevation of 343.0. One deep test pit was excavated at this location to a depth of 8.0 feet below existing grade. No limiting conditions were identified at the time of excavation.

Based on the hydraulic conductivity testing located within the footprint of the infiltration structure, D.L. Howell & Associates, Inc., recommends the following infiltration rate for the soils underlying Test 1 and 2: an infiltration rate of 5.7622 inches per hour shall be used.

Throughout the site, an additional ten test pits were excavated in an effort to locate suitable soils for infiltration. All ten of those test pits contained limiting conditions in the form of shallow groundwater or redoximorphic features. As a result, no additional testing was conducted on site. Soils descriptions were logged for Test Pits 5 through 9.

Please reference plan drawings for exact locations and visual representation of infiltration tests and test pits. Results of the hydraulic conductivity testing and soil horizon descriptions can be found in the enclosed attachments.

Hydraulic Conductivity Calculation

Coefficient of Permeability: K = [A/(F*D*t)] x ln (h1 / h2)

Where:
K = permeability (inches per hour)
A = cross sectional area of cased hole
F = shape factor (2.75 constant of flat bottom)
D = cased hole diameter
t = time for head change from h1 to h2
h1 = initial height of water column in casing
h2 = final height of water column in casing

*Reference *Soil Hydraulic Conductivity Analysis Form* for infiltration testing data and *Soil Morphology Form* for soil profile data.

Hydraulic Conductivity Testing Results

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Stormwater Infiltration Testing & Hydraulic Conductivity Calculations

JOB NO.: 3705
LOCATION: 2131 Lincoln Highway
MUNICIPALITY: Caln Township, Chester County, Pa.
DESCRIPTION: Stormwater Infiltration Testing
DATE: 6/16/2020
BY: DD

Field Test Results

WEATHER CONDITIONS: SUNNY TEMPERATURE: 73 °F
PRECIPITATION IN LAST 24 HOURS: None

Hole #	Depth (Inches)	Readings								
		Pre-Soak	1st	2nd	3rd	4th	5th	6th	7th	8th
Test 1	84									
Time(min.)		30	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**
Drop(inches)		18.00	12.25	11.50	11.25	11.25	11.25	n/a	n/a	n/a
Initial Water Level Depth (inches)		18	18	18	18	18	18	n/a	n/a	n/a

Hole #	Depth (Inches)	Readings								
		Pre-Soak	1st	2nd	3rd	4th	5th	6th	7th	8th
Test 2	72									
Time(min.)		30	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**
Drop(inches)		18.00	13.75	13.00	13.00	13.00	13.00	n/a	n/a	n/a
Initial Water Level Depth (inches)		18	18	18	18	18	18	n/a	n/a	n/a

Determination of Hydraulic Conductivity (Kv)

$$Kv = [A/(F*D*t)] * \ln(h1/h2)$$

		Test 1 Results		Test 2 Results	
Kv =	***Vertical Permeability***	**5.0422**	**(in/hour)**	**6.585**	**(in/hour)**
A =	***Cross-sectional area of cased hole***	7.0686	(Sq.in.)	7.0686	(Sq.in.)
F =	***shape factor (2.75 constant for flat bottom)***	2.75	(Units)	2.75	(Units)
D =	***cased hole diameter***	3	(Inches)	3	(Inches)
t =	***time for head to change from h1 to h2***	0.1667	(hrs.)	0.1667	(hrs.)
h1 =	***initial height of water column in casing***	18	(Inches)	18	(Inches)
h2 =	***final height of water column in casing***	6.75	(Inches)	5.00	(Inches)

Average Permeability	**5.814** (in./hr)
Geometric Mean	**5.762** (in./hr)

Soil Horizon Information

Soil Morphology Form

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PIT NUMBER: TP 1 DLH NUMBER: 3705 INVESTIGATOR: DWD

DATE: 6/16/2020 STATE: PA COUNTY: CHESTER

MUNICIPALITY: CALN TOWNSHIP CLIENT: JOHN RANDOLPH

SUBDIVISION: N/A SITE LOCATION: 2131 LINCOLN HIGHWAY

MORPHOLOGIC DETERMINATION: SEWAGE **STORMWATER** SHWT SOILS

Horizon	Depth		Boundary		Color	Texture	%CFs	REDOX			Structure	Consistence	NOTES	
	Upper	Lower	Distrnct	Topo				A	S	C				
	0	9	A	W	10 YR 3/1	SILT LOAM	0				GRAN	FRI		
	9	23	G	W	10 YR 5/4	SILT LOAM	0				MA	FRI		
	23	47	G	W	10 YR 5/3	CHANNERY SILT	<15				GRAN	LO		
	47	108			10 YR 4/2	CHANNERY SILT	<25				GRAN	LO		

COMMENTS: This Deep Test Pit was conducted at Test 1. No limiting conditions were identified at the time of excavation.

SOIL TYPE:	Soil Drainage Class:		Soil Scientist Signature:
LIMITING CONDITION: None	Excessively Drained	Somewhat Poorly Drained	
Type: Water Rock Mottling	**Well Drained**	Poorly Drained	
Depth: +108"	Moderately Well Drained	Very Poorly Drained	

WEATHER: 73° slight breeze METHOD: EXCAVATOR

SLOPE: EXCAVATION DEPTH: 108"

COVER: WOODLAND LANDSCAPE POSITION: W

REDOX – Redoxymorphic features (Drainage Mottling) A/S/C – Abundance/Size/Contrast
Roots/Pores – f – few, c – common, m – many / f – fine, m – medium, c – coarse

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West Chester, PA 19380

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F: (610) 918-9003

Soil Morphology Form

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PIT NUMBER: TP 2　DLH NUMBER: 3705　INVESTIGATOR: DWD
DATE: 6/16/2020　STATE: PA　COUNTY: CHESTER
MUNICIPALITY: CALN TOWNSHIP　CLIENT: JOHN RANDOLPH
SUBDIVISION: N/A　SITE LOCATION: 2131 LINCOLN HIGHWAY
MORPHOLOGIC DETERMINATION: SEWAGE **STORMWATER** SHWT SOILS

Horizon	Depth		Boundary		Color	Texture	%CFs	REDOX			Structure	Consistence	NOTES	
	Upper	Lower	Distrnct	Topo				A	S	C				
	0	9	A	W	10 YR 3/1	SILT LOAM	0				GRAN	FRI		
	9	42	A	IR	10 YR 5/6	SILT LOAM	0				MA	FRI		
	42	96			10 YR 4/2	CHANNERY SILT	<25				GRAN	LO		

COMMENTS: This Deep Test Pit was conducted at Test 2. No limiting conditions were identified at the time of excavation.

SOIL TYPE:	Soil Drainage Class:		Soil Scientist Signature:
LIMITING CONDITION: None	Excessively Drained	Somewhat Poorly Drained	
Type: Water Rock Mottling	**Well Drained**	Poorly Drained	
Depth: +96"	Moderately Well Drained	Very Poorly Drained	

WEATHER: 73° slight breeze　METHOD: EXCAVATOR
SLOPE: ______　EXCAVATION DEPTH: 96"
COVER: WOODLAND　LANDSCAPE POSITION: W

REDOX – Redoxymorphic features (Drainage Mottling) A/S/C – Abundance/Size/Contrast
Roots/Pores – f – few, c – common, m – many / f – fine, m – medium, c – coarse

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Soil Morphology Form

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PIT NUMBER: TP 5 DLH NUMBER: 3705 INVESTIGATOR: DWD

DATE: 6/17/2020 STATE: PA COUNTY: CHESTER

MUNICIPALITY: CALN TOWNSHIP CLIENT: JOHN RANDOLPH

SUBDIVISION: N/A SITE LOCATION: 2131 LINCOLN HIGHWAY

MORPHOLOGIC DETERMINATION: SEWAGE **STORMWATER** SHWT SOILS

Horizon	Depth		Boundary		Color	Texture	%CFs	REDOX			Structure	Consistence	NOTES	
	Upper	Lower	Distrnct	Topo				A	S	C				
	0	8	A	C	10 YR 4/1	SILT LOAM	0				SBK	FRI		
	8	32	G	W	2.5 YR 6/4	SILTY CLAY	0	c	c	d	MA	FIRM		
	32	84			10 YR 5/4	SILTY CLAY	0	c	c	d	MA	FIRM		

COMMENTS: This Deep Test Pit was conducted at Test Pit 5. During excavation, redoximorphic features were identified from approximately 8-84 inches below existing grade.

SOIL TYPE:

LIMITING CONDITION: Redox

Type: Water Rock **Mottling**

Depth: 8-84"

Soil Drainage Class:

Excessively Drained
Somewhat Poorly Drained
Well Drained
Poorly Drained
Moderately Well Drained
Very Poorly Drained

Soil Scientist Signature:

WEATHER: 73° slight breeze

SLOPE:

COVER: WOODLAND

METHOD: EXCAVATOR

EXCAVATION DEPTH: 84"

LANDSCAPE POSITION: E

REDOX – Redoxymorphic features (Drainage Mottling) A/S/C – Abundance/Size/Contrast
Roots/Pores – f – few, c – common, m – many / f – fine, m – medium, c – coarse

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F: (610) 918-9003

Soil Morphology Form

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PIT NUMBER: TP 6 DLH NUMBER: 3705 INVESTIGATOR: DWD
DATE: 6/17/2020 STATE: PA COUNTY: CHESTER
MUNICIPALITY: CALN TOWNSHIP CLIENT: JOHN RANDOLPH
SUBDIVISION: N/A SITE LOCATION: 2131 LINCOLN HIGHWAY
MORPHOLOGIC DETERMINATION: SEWAGE **STORMWATER** SHWT SOILS

Horizon	Depth		Boundary		Color	Texture	%CFs	REDOX			Structure	Consistence	NOTES	
	Upper	Lower	Distrnct	Topo				A	S	C				
	0	10	A	C	10 YR 3/1	SILT LOAM	0				SBK	FRI		
	10	26	G	W	2.5 Y 6/3	SILTY CLAY	0				MA	FRI		
	26	60	G	W	VAR	SILTY CLAY	0	c	c	d	MA	FIRM		
	60	84			10 YR 5/3	SILT LOAM	0				GRAN	FRI	GW @ 84"	

COMMENTS: This Deep Test Pit was conducted at Test Pit 6. During excavation, redoximorphic features were identified approximately 26-60 inches below existing grade and ground water was encountered at approximately 84 inches below existing grade.

SOIL TYPE:

LIMITING CONDITION: Redox/Groundwater

Type: **Water** Rock **Mottling**

Depth: 26-60" / 84"

Soil Drainage Class:

Excessively Drained — Somewhat Poorly Drained
Well Drained — **Poorly Drained**
Moderately Well Drained — Very Poorly Drained

Soil Scientist Signature:

WEATHER: 73° slight breeze METHOD: EXCAVATOR
SLOPE: EXCAVATION DEPTH: 84"
COVER: WOODLAND LANDSCAPE POSITION: SE

REDOX – Redoxymorphic features (Drainage Mottling) A/S/C – Abundance/Size/Contrast
Roots/Pores – f – few, c – common, m – many / f – fine, m – medium, c – coarse

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Soil Morphology Form

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PIT NUMBER: TP 7 DLH NUMBER: 3705 INVESTIGATOR: DWD
DATE: 6/17/2020 STATE: PA COUNTY: CHESTER
MUNICIPALITY: CALN TOWNSHIP CLIENT: JOHN RANDOLPH
SUBDIVISION: N/A SITE LOCATION: 2131 LINCOLN HIGHWAY
MORPHOLOGIC DETERMINATION: SEWAGE **STORMWATER** SHWT SOILS

Horizon	Depth		Boundary		Color	Texture	%CFs	REDOX			Structure	Consistence	NOTES	
	Upper	Lower	Distrnct	Topo				A	S	C				
	0	14	A	W	10 YR 3/1	SILT LOAM	0				GRAN	FRI		
	14	45	G	W	2.5 YR 6/4	SILTY CLAY	0				MA	FRI		
	45	69	A	IR	10 YR 5/4	SILTY CLAY	0	c	c	d	MA	FRI		
	69	84			10 YR 4/6	SILTY CLAY	0	c	c	d	MA	FRI		

COMMENTS: This Deep Test Pit was conducted at Test Pit 7. During excavation, redoximorphic features were identified approximately 45-84 inches below existing grade.

SOIL TYPE:	Soil Drainage Class:		Soil Scientist Signature:
LIMITING CONDITION: Redox	Excessively Drained	Somewhat Poorly Drained	
Type: Water Rock **Mottling**	Well Drained	**Poorly Drained**	
Depth: 45-84"	Moderately Well Drained	Very Poorly Drained	

WEATHER: 73° slight breeze METHOD: EXCAVATOR
SLOPE: EXCAVATION DEPTH: 84"
COVER: WOODLAND LANDSCAPE POSITION: SE

REDOX – Redoxymorphic features (Drainage Mottling) A/S/C – Abundance/Size/Contrast
Roots/Pores – f – few, c – common, m – many / f – fine, m – medium, c – coarse

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P: (610) 918-9002
F: (610) 918-9003

Soil Morphology Form

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PIT NUMBER: TP 8 DLH NUMBER: 3705 INVESTIGATOR: DWD
DATE: 6/17/2020 STATE: PA COUNTY: CHESTER
MUNICIPALITY: CALN TOWNSHIP CLIENT: JOHN RANDOLPH
SUBDIVISION: N/A SITE LOCATION: 2131 LINCOLN HIGHWAY
MORPHOLOGIC DETERMINATION: SEWAGE **STORMWATER** SHWT SOILS

Horizon	Depth		Boundary		Color	Texture	%CFs	REDOX			Structure	Consistence	NOTES	
	Upper	Lower	Distrnct	Topo				A	S	C				
	0	8	A	C	10 YR 4/1	SILT LOAM	0				GRAN	FRI		
	8	22	G	W	10 YR 5/6	SILTY CLAY	0				MA	FRI		
	22	47	G	W	10 YR 6/2	SILTY CLAY	0	c	c	d	MA	FRI		
	47	84			2.5 Y 6/3	SILTY CLAY	0	c	c	d	MA	FIRM		

COMMENTS: This Deep Test Pit was conducted at Test Pit 8. During excavation, redoximorphic features were identified approximately 22-84 inches below existing grade.

SOIL TYPE:
LIMITING CONDITION: Redox
Type: Water Rock **Mottling**
Depth: 22-84"

Soil Drainage Class:
Excessively Drained Somewhat Poorly Drained
Well Drained **Poorly Drained**
Moderately Well Drained Very Poorly Drained

Soil Scientist Signature:

WEATHER: 73° slight breeze
SLOPE:
COVER: WOODLAND

METHOD: EXCAVATOR
EXCAVATION DEPTH: 84"
LANDSCAPE POSITION: SE

REDOX – Redoxymorphic features (Drainage Mottling) A/S/C – Abundance/Size/Contrast
Roots/Pores – f – few, c – common, m – many / f – fine, m – medium, c – coarse

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Soil Morphology Form

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PIT NUMBER: TP 9 DLH NUMBER: 3705 INVESTIGATOR: DWD
DATE: 6/17/2020 STATE: PA COUNTY: CHESTER
MUNICIPALITY: CALN TOWNSHIP CLIENT: JOHN RANDOLPH
SUBDIVISION: N/A SITE LOCATION: 2131 LINCOLN HIGHWAY
MORPHOLOGIC DETERMINATION: SEWAGE **STORMWATER** SHWT SOILS

Horizon	Depth		Boundary		Color	Texture	%CFs	REDOX			Structure	Consistence	NOTES	
	Upper	Lower	Distrnct	Topo				A	S	C				
	0	10	A	W	10 YR 4/1	SILT LOAM	0				GRAN	FRI		
	10	39	A	W	10 YR 5/6	SILTY CLAY	0	c	m	d	MA	FRI		
	39	70	G	W	5 Y 7/3	SILTY CLAY	0	c	c	d	MA	FIRM		
	70	84			7.5 YR 5/6	SILT LOAM	0				MA	FIRM		

COMMENTS: This Deep Test Pit was conducted at Test Pit 9. During excavation, redoximorphic features were identified approximately 10-70 inches below existing grade.

SOIL TYPE:	Soil Drainage Class:		Soil Scientist Signature:
LIMITING CONDITION: Redox	Excessively Drained	Somewhat Poorly Drained	
Type: Water Rock **Mottling**	Well Drained	**Poorly Drained**	
Depth: 10-70"	Moderately Well Drained	Very Poorly Drained	

WEATHER: 73° slight breeze METHOD: EXCAVATOR
SLOPE: EXCAVATION DEPTH: 84"
COVER: WOODLAND LANDSCAPE POSITION: S

REDOX – Redoxymorphic features (Drainage Mottling) A/S/C – Abundance/Size/Contrast
Roots/Pores – f – few, c – common, m – many / f – fine, m – medium, c – coarse

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P: (610) 918-9002
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F. Tavani and Associates, Inc.
Traffic Engineering and Planning

248 Beech Hill Road • Wynnewood • PA • 19096 • (215) 625-3821 Phone • (484) 792-9495 Fax
www.FTAVANIASSOCIATES.com

22 June 2020

John A. Jaros, Esq.
Riley Riper Hollin & Colagreco
717 Constitution Drive, SU 201
Exton, PA 19341-1265

VIA EMAIL ONLY

RE: Conditional Use Traffic Engineering Investigations of 2131 Lincoln Highway Multi-family Housing / 120 Apartment Units, Caln Township, Chester County

FTA Job #220-018

Dear Mr. Jaros:

F. Tavani and Associates, Inc. (FTA) has conducted traffic engineering investigations for the above-referenced project in Caln Township. Specifically investigations as to appropriateness of the proposed use – multifamily housing – were conducted relative to the conditional use standards as found in section 155-172(F) of the township code.

SITE DESCRIPTION

The site is presently undeveloped land. The site plan identifies 6 proposed three-story buildings, most of which contain 24 apartment units. The total proposed unit count is 120. The site is expected to be constructed in 2022 with leasing to capacity to occur sometime thereafter. The site is proposed to take access to Lincoln Highway via one driveway which will form an unsignalized T-intersection with Lincoln Highway approximately 550 feet west of the side-street stop-controlled intersection of Lincoln Highway and Seltzer Road, which is the closest existing public street intersection.

TRIP GENERATION

Trip generation for many land uses can be examined through consult with the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th edition. This edition includes Land Use Code (LUC) 221 (multifamily housing, mid rise), which is appropriate to use to investigate trip generation potential for the proposed site. Using 120 units as a variable, the typical weekday commuter peak hour trip generation potential of the site is:

TRIP GENERATION

AM Peak Hour			PM Peak Hour		
In	**Out**	**Total**	**In**	**Out**	**Total**
11	32	43	32	21	53

EXHIBIT A-13

The site as proposed is a modest trip generator. ITE information is attached to the end of this letter.

CONDITIONAL USE STANDARDS

Per the Caln Township code, 155-172(F) (5) & (6) read:

The applicant shall provide evidence with supporting documentation that the capacity of the road system providing access to the property or lot in question has sufficient capacity to accommodate the use and that when the incremental increase in traffic attributable to the proposed use is superimposed upon the existing use of the road shall not lower the level of service of the roads or any portions thereof or any street intersections below a level of service "C."

The applicant shall provide evidence with supporting documentation that the interior traffic circulation for the proposed use at the proposed location, including but not limited to acceleration and deceleration lanes where required at the proposed entrances to the location, shall be adequate to provide safe and convenient circulation for users of the facility, visitors to the facility, employees of the facility and all emergency vehicles that may require entrance thereon.

LEVELS OF SERVICE

Levels of service are calculated using existing traffic count data and other elements as key parameters. COVID-19 has affected travel patterns in the Delaware Valley since mid March 2020. Traffic counts conducted prior to mid March 2020 are therefore preferred data sources for studies and investigations being conducted presently. Traffic Planning and Design, Inc. (TPD) provided FTA with a recent traffic study which contained Lincoln Highway count data as gathered by them in November 2019 at a nearby intersection west of the site. FTA used this study data first to generate levels of service of the proposed site driveway assuming the site remains as it is today (undeveloped)[1]. Levels of service were next determined including the site trip generation estimates presented on the previous page, and further incorporating a trip distribution model of approximately 65% to / from the west and 35% to / from the east[2]. The pre-development levels of service were found to be LOS C or better during commuter peak hours. The post-development levels of service were found to be similar to the pre-development levels of service (both peak hours were found to be LOS C or better). Thus, 155-172(F)(5) is satisfied.

INTERIOR CIRCULATION / AUXILLIARY LANES

The site plan was reviewed to determine if the interior traffic circulation is adequate to provide safe and convenient circulation for users of the facility, visitors to the facility, employees of the facility, and all emergency vehicles that may require entrance thereon.

Lincoln Highway provides a three vehicular lane cross section along the site frontage: one travel lane per direction plus a continuous center left-turn lane. Bicycle lanes are also provided in each direction.

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[1] The TPD study was published in Dec 2019 and included a 2024 build year for a proposed Dunkin Donuts. FTA utilized TPD's Lincoln Highway traffic estimates for the 'Build' 2024 traffic condition to perform the level of service investigations described herein.

[2] The trip distribution model used here was mainly based on a trip distribution model presented in a recent traffic study of a nearby residential community published by Andreas Heinrich in October 2019. In that study, site traffic was distributed as follows:

- 42% to/from the west;
- 24% to/from the east;
- 19% to/from the north (Caln Road); and
- 15% to/from the south.

The continuous center left-turn lane will ensure safe and convenient circulation for entering motorists arriving from the west. Right-turn auxiliary turn lane investigations using PennDOT tools conclude that an entering right-turn lane is not warranted (see attached).

The site driveway intersects with Lincoln Highway at a right angle. The site driveway provides a throat approximately 80 feet deep before reaching the first on-site parking space, and approximately 120 deep before reaching the first internal site intersection. The projected 95th percentile queue is no greater than 1 vehicle (approximately 25 feet) during either commuter peak hour. The site driveway is thus appropriately designed to provide safe and convenient circulation. The remainder of the on-site parking and roadways / internal intersections also are appropriately designed to provide safe and convenient circulation.

PARKING GENERATION

Parking generation for many land uses can be examined through consult with the Institute of Transportation Engineers (ITE) Parking Generation Manual, 5th edition. Like Trip Generation, this publication also includes Land Use Code (LUC) 221. Using 120 units as a variable, the average peak weekday parking generation potential of the site is 1.31 spaces per unit, or 158 spaces. As shown on the plan, the applicant is proposing a parking supply of 1.75 spaces per unit, which is well above the expected peak parking demand per ITE's latest data. ITE information is attached to the end of this letter. The applicant has also gathered some parking data as local existing residential communities and this also concludes that the proposed parking supply is well in excess of recent experience. This information is also attached.

TRANSIT

The applicant anticipates that some residents will utilize nearby mass transit opportunities. SEPTA Regional Rail is available nearby, and in fact the Thorndale station is one mile east (five-minute bike ride) of the site. Krapf also operates a bus route along Lincoln Highway pass the site (the Route A bus). These available transit opportunities mean both trip generation and parking generation at this particular site will likely be even lower than the ITE estimates provided in this report.

CONCLUSIONS

The site as proposed meets the traffic-related conditional use standards provided in section 155-172(F) of the township code. Provide parking is well in excess of the expected peak parking demand, per the latest industry information as well as the local experience as gathered by the applicant.

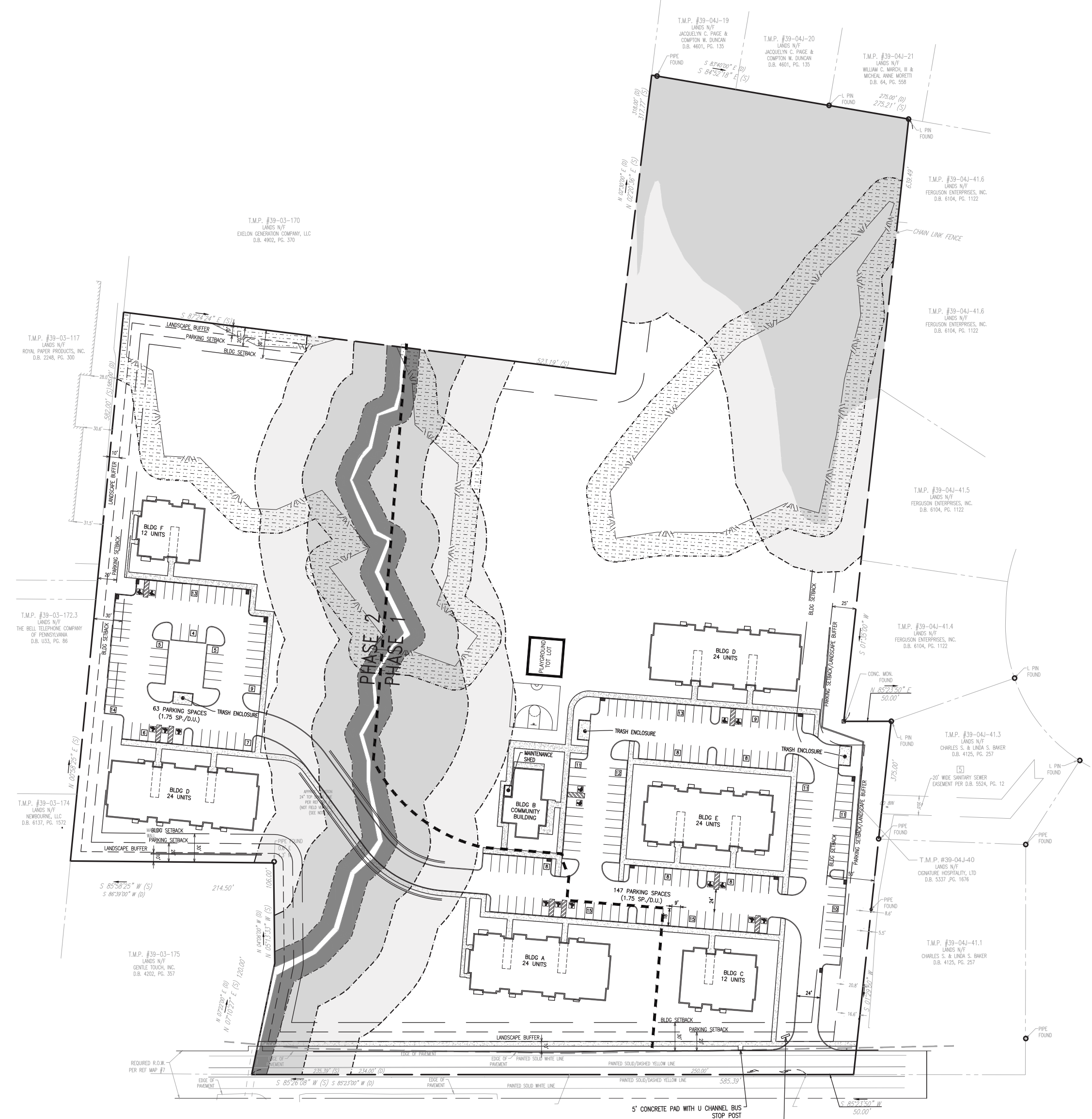
I hope this has been helpful. Please let me know if I can answer any questions.

Thank you,
F. TAVANI AND ASSOCIATES, INC.

FRANK TAVANI, P.E., PTOE
Principal

attachments

cc: John Randolph
Amanda Schneider, P.E.



PENNSYLVANIA STATE HIGHWAY U.S. ROUTE 30
(A.K.A. LINCOLN HIGHWAY) - (A.K.A. BUSINESS ROUTE 30) - (A.K.A. S.R. 3070)

TITLE PLAN

SCALE: 1" = 60'

60 0 30 60 120

GRAPHIC SCALE
1 inch = 60 feet

LEGEND

- EX. PROPERTY LINE
- PROP. PROPERTY LINE
- EX. RIGHT-OF-WAY
- PROP. RIGHT-OF-WAY
- EX. MONUMENT
- PROP. MONUMENT
- EX. IRON PIPE
- PROP. IRON PIPE
- EX. EASEMENT
- PROP. EASEMENT
- EX. WETLANDS
- EXISTING CONTOUR
- PROPOSED CONTOUR
- EXISTING SPOT ELEV.
- NEW SPOT ELEV.
- SOILS TYPE
- SOILS LINE
- EX. CONC. CURB
- PROP. CONC. CURB
- EX. EDGE OF PAVING
- PROP. EDGE OF PAVING
- EX. LIGHT POLE
- PROP. LIGHT POLE
- EX. FENCE
- EX. MAIL BOX
- EX. SIGN
- PROP. SIGN
- EXIST. PARKING SPACES
- PROP. PARKING SPACES
- (TBR) TO BE REMOVED
- EX. TELE. LINE
- PROP. TELE. LINE
- EX. ELEC. LINE
- PROP. ELEC. LINE
- EX. UTILITY POLE
- PROP. UTILITY POLE
- EX. GUY ANCHOR
- EX. GAS LINE
- PROP. GAS LINE
- EX. GAS VALVE
- PROP. GAS VALVE
- EX. STORM SEWER LINE
- PROP. STORM SEWER LINE
- EX. STORM INLET
- PROP. STORM INLET
- PROP. STORM INLET ID
- PROP. SEEPAGE BED
- EX. SANITARY SEWER LINE
- PROP. SAN. SEWER LINE
- PROP. SAN. SEWER LATERAL
- PROP. SANITARY MH. ID
- EX. WATER LINE
- PROP. WATER LINE
- PROP. WATER LATERAL
- PROP. FIRE WATER LINE
- EX. WATER VALVE
- PROP. WATER VALVE
- EX. HYDRANT
- PROP. HYDRANT
- EX. MANHOLE
- PROP. MANHOLE

LOCATION MAP
SCALE: 1" = 2,000'

GENERAL NOTES:

1. RECORD OWNER/MAILING ADDRESS:

   2131 LINCOLN HIGHWAY, LLC
   PO BOX 2006
   MEDIA, PA 19063

2. SITE ADDRESS: 2081, 2131 AND 2213 LINCOLN HIGHWAY EAST, COATESVILLE, PA 19320

   TAX PARCELS: 39-4-57, 39-4-56, 39-4J-40

3. SOURCE OF TITLE: RECORD BOOK S43, PAGE 231 (TAX PARCEL 39-4-57)
   RECORD BOOK 6676, PAGE 2133 (TAX PARCEL 39-4-56)
   RECORD BOOK 5337, PAGE 1676 (TAX PARCEL 39-4J-40)

4. TOTAL LOT AREA: 15.175 ACRES

5. ALL TAX PARCELS ARE CONTAINED WITHIN THE C1 – HIGHWAY COMMERCIAL ZONING DISTRICT.

6. THE CONTRACTOR SHALL VERIFY THE LOCATION AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO THE START OF ANY CONSTRUCTION. THE CONTRACTOR SHALL PERFORM A PENNSYLVANIA ONE CALL IN ACCORDANCE WITH PA ACT 199.

7. D.L. HOWELL & ASSOCIATES, INC. DOES NOT GUARANTEE THE ACCURACY OF THE LOCATIONS OF THE EXISTING SUBSURFACE UTILITY STRUCTURES SHOWN ON THE PLANS. NOR DOES D.L. HOWELL & ASSOCIATES, INC. GUARANTEE THAT ALL SUBSURFACE STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL VERIFY THE LOCATION AND ELEVATION OF ALL UNDERGROUND UTILITIES PRIOR TO THE START OF THE WORK.

8. LOCATION OF ALL EXISTING AND PROPOSED SERVICES ARE APPROXIMATE AND MUST BE CONFIRMED INDEPENDENTLY WITH LOCAL UTILITY COMPANIES PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION OR EXCAVATION. IT SHALL BE THE CONTRACTOR'S FULL RESPONSIBILITY TO CONTACT THE VARIOUS UTILITY COMPANIES TO LOCATE THEIR FACILITIES PRIOR TO STARTING CONSTRUCTION IN ACCORDANCE WITH PENNSYLVANIA ACT 287 OF 1974 AS AMENDED BY PENNSYLVANIA ACT 187 OF 1996, "ONE CALL" SYSTEM. NO EXTRA COMPENSATION SHALL BE PAID TO THE CONTRACTOR FOR DAMAGE AND REPAIR TO THESE FACILITIES CAUSED BY HIS WORK FORCE. SANITARY SEWER, WATER, ELECTRIC, GAS AND ALL OTHER UTILITY SERVICES CONNECTION POINTS SHALL BE CONFIRMED INDEPENDENTLY BY THE CONTRACTOR IN THE FIELD PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. ALL DISCREPANCIES SHALL BE REPORTED IMMEDIATELY IN WRITING TO THE ENGINEER. CROSSINGS WITH EXISTING UNDERGROUND INSTALLATIONS SHALL BE FIELD VERIFIED BY TEST PIT PRIOR TO COMMENCEMENT OF CONSTRUCTION.

9. IF THE CONTRACTOR DEVIATES FROM THE PLANS AND SPECIFICATIONS, INCLUDING THE NOTES CONTAINED THEREON, WITHOUT FIRST OBTAINING PRIOR WRITTEN AUTHORIZATION FOR SUCH DEVIATIONS FROM THE OWNER AND ENGINEER, IT SHALL BE RESPONSIBLE FOR THE PAYMENT OF ALL COSTS TO CORRECT ANY WORK DONE. ALL FINES OR PENALTIES ASSESSED WITH RESPECT THERETO AND ALL COMPENSATORY OR PUNITIVE DAMAGES RESULTING FROM IT SHALL INDEMNIFY AND HOLD THE OWNER AND ENGINEER HARMLESS FROM ALL SUCH COSTS TO CORRECT ANY SUCH WORK AND FROM ALL SUCH FINES AND PENALTIES, COMPENSATIONS AND PUNITIVE DAMAGES AND COSTS OF ANY NATURE RESULTING THEREFROM.

REFERENCE PLAN(S)

1. BOUNDARY AND TOPOGRAPHICAL INFORMATION TAKEN FROM ALTA/ACSM LAND TITLE SURVEY PLAN PREPARED BY CONTROL POINT ASSOCIATES, INC., DATED 7/13/2010, PREPARED FOR ZOMMICK MCMAHON COMMERCIAL REAL ESTATE, INC.. WETLANDS BOUNDARIES AND OTHER EXISTING FEATURES TAKEN FROM THE ABOVE MENTIONED PLAN.

ZONING DATA TABULATION

ARTICLE IV ZONING DISTRICT REGULATIONS

SECTION 155–27 C–1 HIGHWAY COMMERCIAL DISTRICT
(UNDERLYING ZONING DISTRICT)

ARTICLE VII RESIDENTIAL LAND USE & DEVELOPMENT REQUIREMENTS

SECTION 155–55 MULTIFAMILY APARTMENT USES & DEVELOPMENTS

SECTION 155–55.C. AREA & BULK REGULATIONS

	REQUIRED	PROPOSED
MIN. CONTIGUOUS LOT AREA	15 ACRES	15.175 ACRES
MAX. DENSITY	13 D.U./GROSS ACRE	7.91 D.U./GROSS ACRE
MIN. REQUIRED OPEN SPACE	40% OF GROSS LOT AREA	**74.2%**
MAX. D.U. / BUILDING	32 UNITS	24 UNITS
SETBACK FROM R/W LINE	30 FT.	41 FT.
MIN. BLDG SEPARATION	60 FT. SIDE TO SIDE	75 FT. SIDE TO SIDE
MIN. BLDG SEPARATION	70 FT. SIDE TO REAR	N/A
MIN. BLDG SEPARATION	80 FT. REAR TO REAR	N/A
MAX. BLDG LENGTH	160 FT.	160 FT.
MAX. BLDG DEPTH	80 FT.	67 FT.
MIN. BLDG SETBACK	30 FT. ANY SIDE/REAR PROP. LINE	31 FT. ANY PROP. LINE
MAX. BLDG COVER	25 %	7.22 % (47,716 S.F.)
MAX. IMPERVIOUS COVER	40 %	23.42 % (154,846 S.F.)
MAX. BUILDING HEIGHT	60 FT.	<60 FT.
MIN. BUFFER YARD	10 FT. ABUTTING NONRESIDENTIAL USE	20 FT.
MIN. BUFFER YARD	25 FT. ABUTTING RESIDENTIAL USE	N/A

AS REQUIRED PER §155–55.C(2) AND §155–55.C(3), THE PROPOSED DEVELOPMENT SHALL BE CONNECTED TO PUBLIC WATER SUPPLY THROUGH PENNSYLVANIA AMERICAN WATER AND TO PUBLIC SANITARY SEWER DISPOSAL THROUGH THE CALN TOWNSHIP MUNICIPAL AUTHORITY.

PARKING TABULATION:

USE:	REQUIRED	PROPOSED
MULTI–FAMILY DWELLING (APARTMENT)	240 PARKING SPACES (13 ADA) (2 SPACES/DWELLING UNIT)	210 PARKING SPACES (1.75 SPACES/DWELLING UNIT)

*NOTE: REQUIRED PARKING SPACE CALCULATIONS WERE BASED OFF OF 120 DWELLING UNITS.

DLHowell
Civil Engineering
Land Planning
Environmental
www.DLHowell.com
1250 Wrights Lane
West Chester, PA 19380
Phone: (610) 918-9002
Fax: (610) 918-9003

REV.	DATE	DESCRIPTION
1		
2		
3		
4		
5		
6		
7		
8		

CONDITIONAL USE/SPECIAL EXCEPTION
TITLE PLAN

CLIENT: MBID OF DELAWARE, LLC.
PROJECT: THE WILLOWS AT VALLEY RUN
LOCATION: 2131 LINCOLN HIGHWAY EAST
CALN TOWNSHIP, CHESTER COUNTY, PA

DATE: ----
SCALE: 1"=50'
DRAWN BY: ----
CHECKED BY: ----
PROJECT NO.: 3705
CAD FILE: Overall Title Plan.dwg
PLOTTED: _-_
DRAWING NO.: C02.1
SHEET 02 OF 12

Land Use: 221
Multifamily Housing (Mid-Rise)

Description

Mid-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have between three and 10 levels (floors). Multifamily housing (low-rise) (Land Use 220), multifamily housing (high-rise) (Land Use 222), off-campus student apartment (Land Use 225), and mid-rise residential with 1st-floor commercial (Land Use 231) are related land uses.

Additional Data

In prior editions of *Trip Generation Manual*, the mid-rise multifamily housing sites were further divided into rental and condominium categories. An investigation of vehicle trip data found no clear differences in trip making patterns between the rental and condominium sites within the ITE database. As more data are compiled for future editions, this land use classification can be reinvestigated.

For the six sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.46 residents per occupied dwelling unit.

For the five sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 95.7 percent of the total dwelling units were occupied.

Time-of-day distribution data for this land use are presented in Appendix A. For the eight general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:00 and 8:00 a.m. and 4:45 and 5:45 p.m., respectively.

For the four dense multi-use urban sites with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:15 and 8:15 a.m. and 4:15 and 5:15 p.m., respectively. For the three center city core sites with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 6:45 and 7:45 a.m. and 5:00 and 6:00 p.m., respectively.

For the six sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.46 residents per occupied dwelling unit.

For the five sites for which data were provided for both occupied dwelling units and total dwelling units, an average of 95.7 percent of the units were occupied.

The average numbers of person trips per vehicle trip at the five center city core sites at which both person trip and vehicle trip data were collected were as follows:

- 1.84 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.94 during Weekday, AM Peak Hour of Generator
- 2.07 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.59 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the 32 dense multi-use urban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.90 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.90 during Weekday, AM Peak Hour of Generator
- 2.00 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.08 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the 13 general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.56 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.88 during Weekday, AM Peak Hour of Generator
- 1.70 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.07 during Weekday, PM Peak Hour of Generator

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), British Columbia (CAN), California, Delaware, District of Columbia, Florida, Georgia, Illinois, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, Ontario, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Utah, Virginia, and Wisconsin.

Source Numbers

168, 188, 204, 305, 306, 321, 357, 390, 436, 525, 530, 579, 638, 818, 857, 866, 901, 904, 910, 912, 918, 934, 936, 939, 944, 947, 948, 949, 959, 963, 964, 966, 967, 969, 970

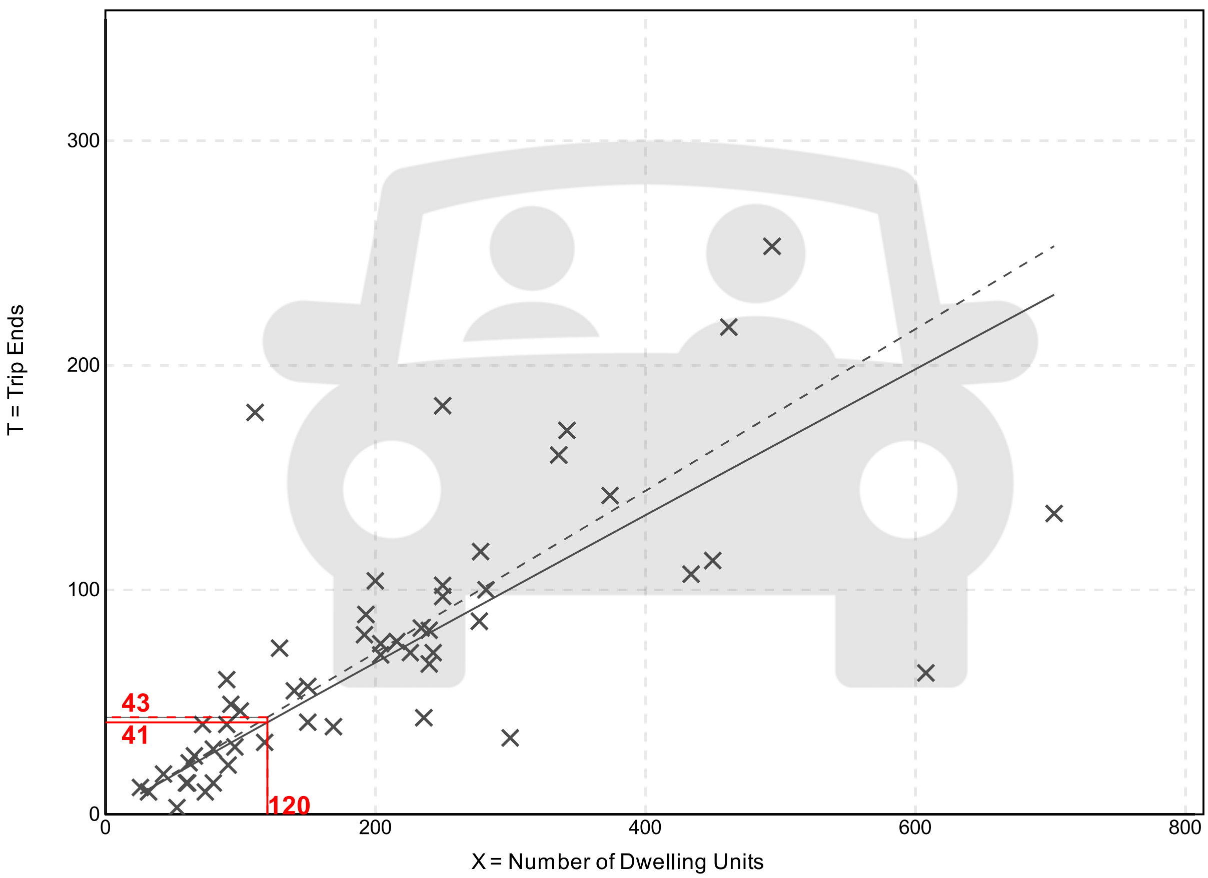
Multifamily Housing (Mid-Rise)
(221)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	53
Avg. Num. of Dwelling Units:	207
Directional Distribution:	26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.36	0.06 - 1.61	0.19

Data Plot and Equation



Fitted Curve Equation: $Ln(T) = 0.98\ Ln(X) - 0.98$

$R^2 = 0.67$

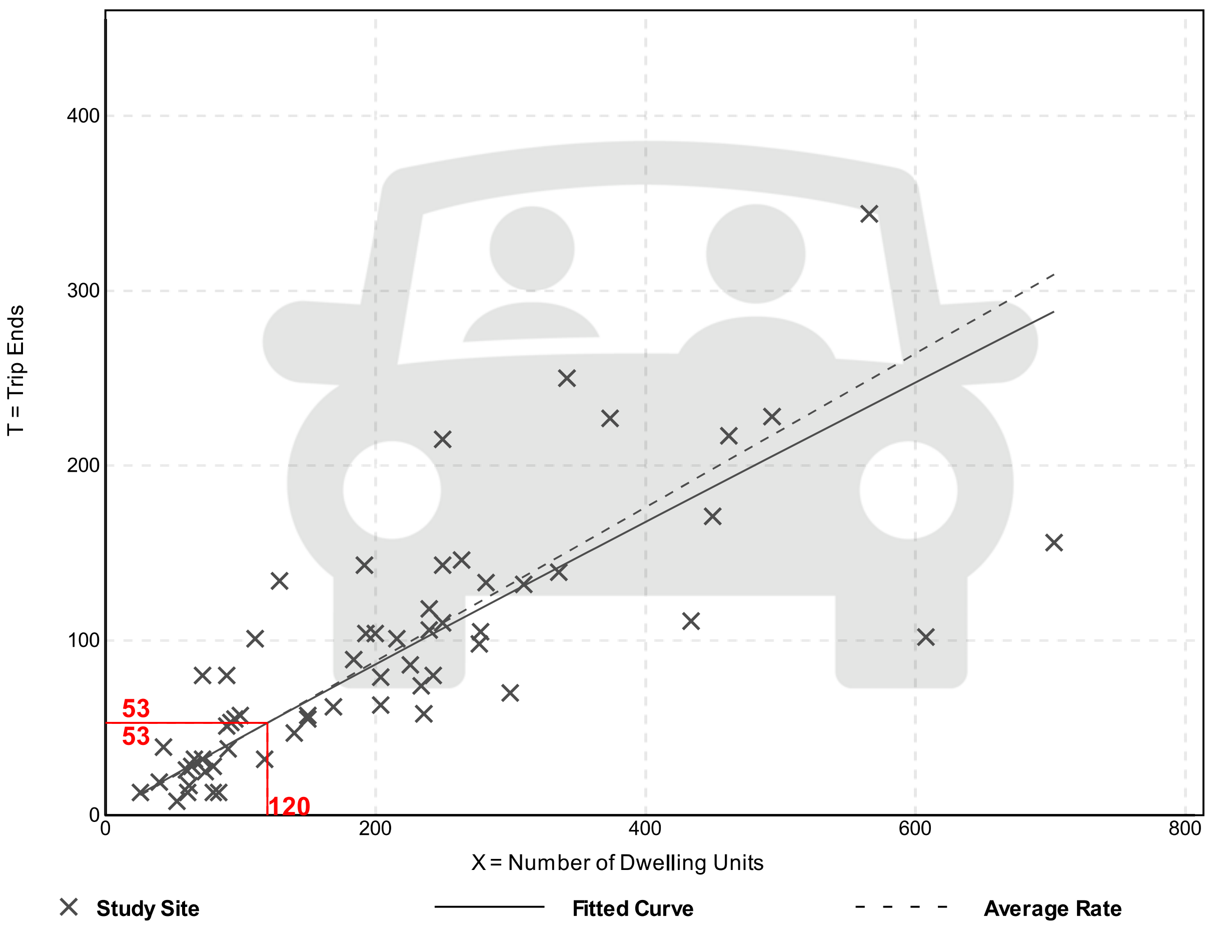
Multifamily Housing (Mid-Rise)
(221)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	60
Avg. Num. of Dwelling Units:	208
Directional Distribution:	61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.44	0.15 - 1.11	0.19

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.96 Ln(X) - 0.63 **R^2= 0.72**

DUNKIN DONUTS – LINCOLN HIGHWAY & NORTH CALN ROAD TRANSPORTATION IMPACT STUDY

FOR SUBMISSION TO:

Caln Township, Chester County, PA

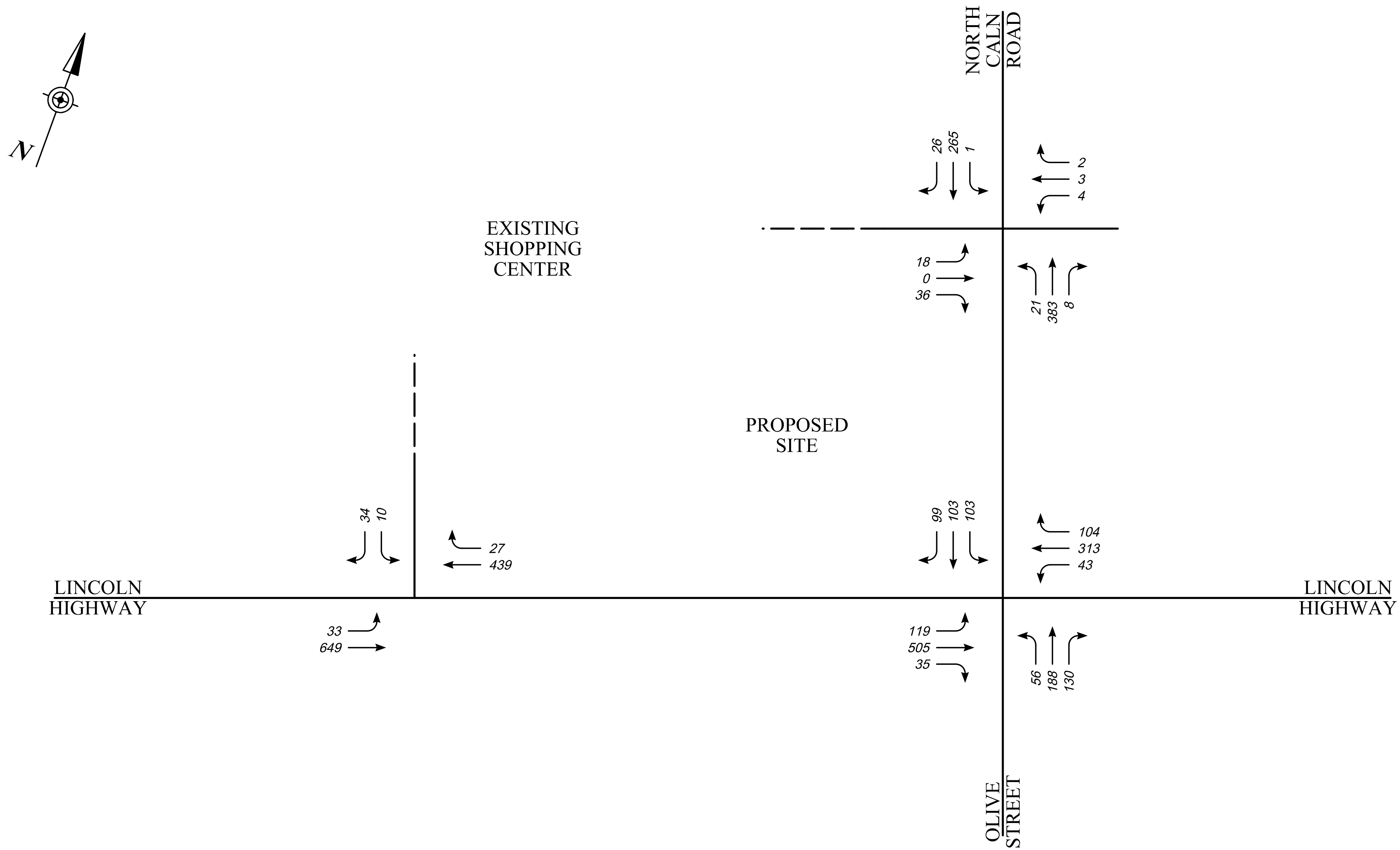
Prepared For:
PINTZUK BROWN REALTY GROUP, INC.
Mr. Scott G. Homel
491 Old York Road
Suite 200
Jenkintown, PA 19046

December 5, 2019
TPD # PBRG.00017

Prepared By:
Traffic Planning and Design, Inc.
Sanatoga Commons
2500 East High Street, Suite 650
Pottstown, Pennsylvania 19464

Phone: (610) 326-3100
Fax: (610) 326-9410
E-mail: TPD@TrafficPD.com
Web Site: www.trafficpd.com

Matthew I. Hammond, P.E.
Executive Vice President
Pennsylvania License Number 071037



KEY:

– – – – – · **PROPOSED DRIVEWAY**

SCHEMATIC DRAWING:NOT TO SCALE

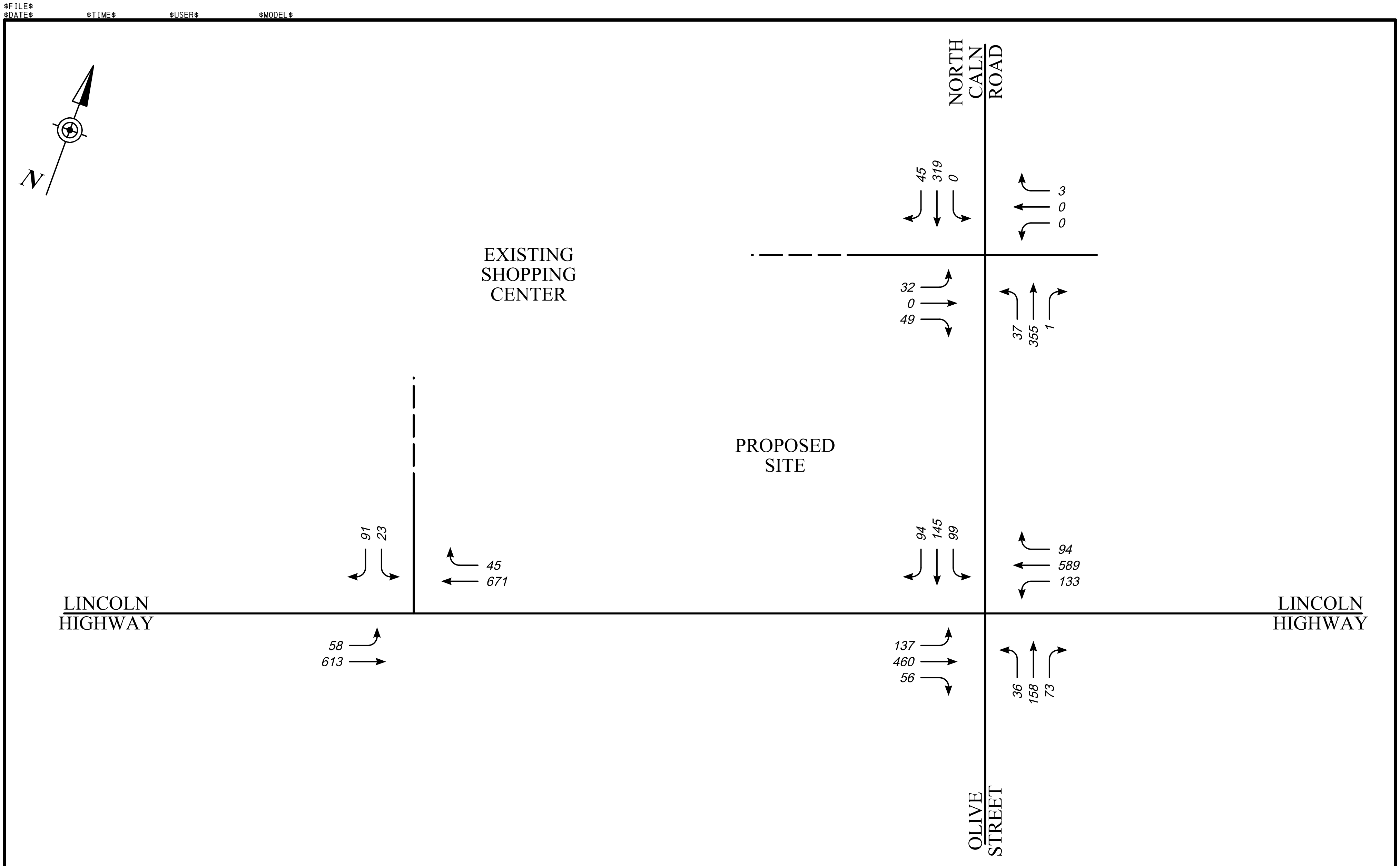
Est. 1989 TPD

TRAFFIC PLANNING AND DESIGN, INC.

www.TrafficPD.com | 610.326.3100 | TPD@TrafficPD.com

FIGURE 12

2024 PROJECTED CONDITIONS
WEEKDAY AM PEAK HOUR
TRAFFIC VOLUMES



KEY:
– – – – – · PROPOSED DRIVEWAY
SCHEMATIC DRAWING:NOT TO SCALE

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www.TrafficPD.com | 610.326.3100 | TPD@TrafficPD.com

FIGURE 13

2024 PROJECTED CONDITIONS
WEEKDAY PM PEAK HOUR
TRAFFIC VOLUMES

HEINRICH & KLEIN
ASSOCIATES, INC.

TRAFFIC ENGINEERING & PLANNING
1134 Heinrich Lane • Ambler, Pennsylvania 19002
215-793-4177 • FAX 215-793-4179

MEMORANDUM

TO: Timberlake M. Townes
Southdown Properties, Inc.

FROM: Andreas Heinrich, P.E., P.T.O.E.

DATE: October 29, 2019

RE: Traffic Impact Assessment
Hills At Thorndale Woods Residential Development
Caln Township, Chester County, PA

As requested, please accept the results of this Traffic Impact Assessment for the Hills At Thorndale Woods Residential Development proposed along the east side of South Caln Road in Caln Township, Chester County, Pennsylvania. It is proposed to develop the property for 87 single family detached houses and 175 townhouses (Sketch attached). Access to the Hills At Thorndale Woods Residential Development will be provided via a roadway that intersect South Caln Road at a point east of Olive Street and via an extension of G.L. Eggleston Boulevard through the adjacent Bailey Station Residential Development to South Bailey Road.

The purpose of this Traffic Impact Assessment is to assess the potential traffic impact of the proposed development of the site on the immediately adjacent roadways, and to comment on site access from the viewpoint of both traffic efficiency and safety. As such, our study has included:

- visits to the site to observe current traffic conditions and to note existing physical characteristics of the adjacent highways;

- completion of Turning Movement Traffic Counts on a typical weekday from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM at the intersections listed below:

  - Lincoln Highway (Bus. Route 30) & North Caln Road/Olive Street
  - Lincoln Highway (Bus. Route 30) & South Bailey Road
  - South Caln Road & Olive Street
  - North Caln Road & Black Horse Hill Road
  - South Bailey Road & Hazelwood Avenue
  - South Bailey Road & G.L. Eggleston Boulevard

Planned Roadway Improvements

There are no known roadway improvements proposed for the roadways and intersections in the study area.

Traffic Generation Characteristics

As described previously, it is proposed to develop the property for 87 single family detached houses and 175 townhouses. Development of the site will obviously generate some new traffic -- as might any development of the property.

Based on the size of the proposed residential development, estimates of new traffic demand can be calculated for the proposed development of the site. The anticipated traffic generation of the proposed new development is estimated from trip generation data compiled by the Institute of Transportation Engineers and documented in the publication entitled Trip Generation Manual[(1)]. Table 1 presents the calculated vehicular trip generation rates for the proposed new development. Application of these rates to the size of the proposed development produces the daily and peak hourly traffic volumes presented in the bottom of Table 1.

As shown in Table 1, it is anticipated that the proposed residential development will generate a total of about 2,200 trips per day (total inbound and outbound) with 148 trips per hour (36 inbound trips and 112 outbound trips) during the weekday morning peak hour and 186 trips per hour (117 inbound trips and 69 outbound trips) during the weekday afternoon peak hour.

It is anticipated that traffic generated by and attracted to the proposed residential development will approach and depart the site according to existing traffic patterns at the driveways and along the roads in the vicinity of the site. The assignment of new trip generation for the proposed development, based on the distribution percentages listed below, is presented in Figure 3.

- 23% to/from the east on Lincoln Highway (Bus. Route 30)
- 19% to/from the north on North Caln Road
- 16% to/from the west on Lincoln Highway (Bus. Route 30)
- 8% to/from the south on South Caln Road
- 8% to/from the east on Hazelwood Avenue
- 8% to/from the west on Black Horse Hill Road
- 7% to/from the west on Olive Street
- 5% to/from the south on Stouffs Road
- 4% to/from the west on South Bailey Road
- 2% to/from the south on Embreeville Road

(1) *Trip Generation Manual, 10th Ed., Institute of Transportation Engineers, Washington DC, 2017.*

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	738	460	0	0	1
Future Vol, veh/h	1	738	460	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	0	6	4	0	0	0
Mvmt Flow	1	811	505	0	0	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	505	0	-	0	1318	505
Stage 1	-	-	-	-	505	-
Stage 2	-	-	-	-	813	-
Critical Hdwy	4.3	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	3	-	-	-	3	3.1
Pot Cap-1 Maneuver	804	-	-	-	190	600
Stage 1	-	-	-	-	689	-
Stage 2	-	-	-	-	488	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	804	-	-	-	190	600
Mov Cap-2 Maneuver	-	-	-	-	190	-
Stage 1	-	-	-	-	688	-
Stage 2	-	-	-	-	488	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	804	-	-	-	600
HCM Lane V/C Ratio	0.001	-	-	-	0.002
HCM Control Delay (s)	9.5	-	-	-	11
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	7	738	460	4	11	21
Future Vol, veh/h	7	738	460	4	11	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	0	6	4	0	0	0
Mvmt Flow	8	811	505	4	12	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	509	0	-	0	1334	507
Stage 1	-	-	-	-	507	-
Stage 2	-	-	-	-	827	-
Critical Hdwy	4.3	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	3	-	-	-	3	3.1
Pot Cap-1 Maneuver	802	-	-	-	186	599
Stage 1	-	-	-	-	688	-
Stage 2	-	-	-	-	480	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	802	-	-	-	184	599
Mov Cap-2 Maneuver	-	-	-	-	184	-
Stage 1	-	-	-	-	681	-
Stage 2	-	-	-	-	480	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	16.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	802	-	-	-	337
HCM Lane V/C Ratio	0.01	-	-	-	0.104
HCM Control Delay (s)	9.5	-	-	-	16.9
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	632	816	0	0	1
Future Vol, veh/h	1	632	816	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	0	2	1	0	0	0
Mvmt Flow	1	652	841	0	0	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	841	0	-	0	1495	841
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	654	-
Critical Hdwy	4.3	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	3	-	-	-	3	3.1
Pot Cap-1 Maneuver	611	-	-	-	147	383
Stage 1	-	-	-	-	473	-
Stage 2	-	-	-	-	584	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	611	-	-	-	147	383
Mov Cap-2 Maneuver	-	-	-	-	147	-
Stage 1	-	-	-	-	472	-
Stage 2	-	-	-	-	584	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	14.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	611	-	-	-	383
HCM Lane V/C Ratio	0.002	-	-	-	0.003
HCM Control Delay (s)	10.9	-	-	-	14.4
HCM Lane LOS	B	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	21	632	816	11	7	14
Future Vol, veh/h	21	632	816	11	7	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	0	2	1	0	0	0
Mvmt Flow	22	652	841	11	7	14

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	852	0	-	0	1543	847
Stage 1	-	-	-	-	847	-
Stage 2	-	-	-	-	696	-
Critical Hdwy	4.3	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	3	-	-	-	3	3.1
Pot Cap-1 Maneuver	606	-	-	-	137	380
Stage 1	-	-	-	-	470	-
Stage 2	-	-	-	-	557	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	606	-	-	-	132	380
Mov Cap-2 Maneuver	-	-	-	-	132	-
Stage 1	-	-	-	-	453	-
Stage 2	-	-	-	-	557	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	21.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	606	-	-	-	234
HCM Lane V/C Ratio	0.036	-	-	-	0.093
HCM Control Delay (s)	11.2	-	-	-	21.9
HCM Lane LOS	B	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Turn Lane Warrant and Length Analysis
Workbook

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	Caln	**Analysis Date:**	6/22/2020
County:	Chester County	**Conducted By:**	FT
PennDOT Engineering District:	6	**Checked By:**	EB
		Agency/Company Name:	FTA

Intersection & Approach Description: Lincoln Hwy & Site Driveway

Analysis Period:	2024	**Number of Approach Lanes:**	1
Design Hour:	AM Peak Hour	**Undivided or Divided Highway:**	Undivided
Intersection Control:	Unsignalized		
Posted Speed Limit (MPH):	40		Type of Analysis
Type of Terrain:	Level	**Left or Right-Turn Lane Analysis?:**	Right Turn Lane

VOLUME CALCULATIONS

Left Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	Yes	0	0.0%	N/A
	Through	-	0	0.0%	N/A
	Right	No	0	0.0%	N/A
Opposing	Left	No	0	0.0%	N/A
	Through	-	0	0.0%	N/A
	Right	Yes	0	0.0%	N/A

Advancing Volume: N/A
Opposing Volume: N/A
Left Turn Volume: N/A
% Left Turns in Advancing Volume: N/A

Right Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No	0	0.0%	N/A
	Through	-	460	4.0%	470
	Right	-	4	0.0%	4

Advancing Volume: 474
Right Turn Volume: 4

TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings

Applicable Warrant Figure: N/A

Warrant Met?: N/A

Right Turn Lane Warrant Findings

Applicable Warrant Figure: Figure 9

Warrant Met?: No

TURN LANE LENGTH CALCULATIONS

Intersection Control:	Unsignalized
Design Hour Volume of Turning Lane:	4
Cycles Per Hour (Assumed):	60
Cycles Per Hour (If Known):	

Average # of Vehicles/Cycle: N/A

PennDOT Publication 46, Exhibit 11-6

Type of Traffic Control	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B

Right Turn Lane Storage Length, Condition A:	N/A	Feet
Condition B:	N/A	Feet
Condition C:	N/A	Feet
Required Right Turn Lane Storage Length:	N/A	Feet

Additional Findings:
N/A

Additional Comments / Justifications:

Turn Lane Warrant and Length Analysis
Workbook

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	Caln	**Analysis Date:**	6/22/2020
County:	Chester County	**Conducted By:**	FT
PennDOT Engineering District:	6	**Checked By:**	EB
		Agency/Company Name:	FTA

Intersection & Approach Description: Lincoln Hwy & Site Driveway

Analysis Period:	2024	**Number of Approach Lanes:**	1
Design Hour:	PM Peak Hour	**Undivided or Divided Highway:**	Undivided
Intersection Control:	Unsignalized		
Posted Speed Limit (MPH):	40		Type of Analysis
Type of Terrain:	Level	**Left or Right-Turn Lane Analysis?:**	Right Turn Lane

VOLUME CALCULATIONS

Left Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	Yes	0	0.0%	N/A
	Through	-	0	0.0%	N/A
	Right	No	0	0.0%	N/A
Opposing	Left	No	0	0.0%	N/A
	Through	-	0	0.0%	N/A
	Right	Yes	0	0.0%	N/A

Advancing Volume: N/A
Opposing Volume: N/A
Left Turn Volume: N/A
% Left Turns in Advancing Volume: N/A

Right Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No	0	0.0%	N/A
	Through	-	816	1.0%	821
	Right	-	11	0.0%	11

Advancing Volume: 832
Right Turn Volume: 11

TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings

Applicable Warrant Figure: N/A
Warrant Met?: N/A

Right Turn Lane Warrant Findings

Applicable Warrant Figure: Figure 9
Warrant Met?: No

TURN LANE LENGTH CALCULATIONS

Intersection Control: Unsignalized
Design Hour Volume of Turning Lane: 11
Cycles Per Hour (Assumed): 60
Cycles Per Hour (If Known):
Average # of Vehicles/Cycle: N/A

PennDOT Publication 46, Exhibit 11-6

Type of Traffic Control	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B

Right Turn Lane Storage Length, Condition A: N/A Feet
Condition B: N/A Feet
Condition C: N/A Feet
Required Right Turn Lane Storage Length: N/A Feet

Additional Findings:
N/A

Additional Comments / Justifications:

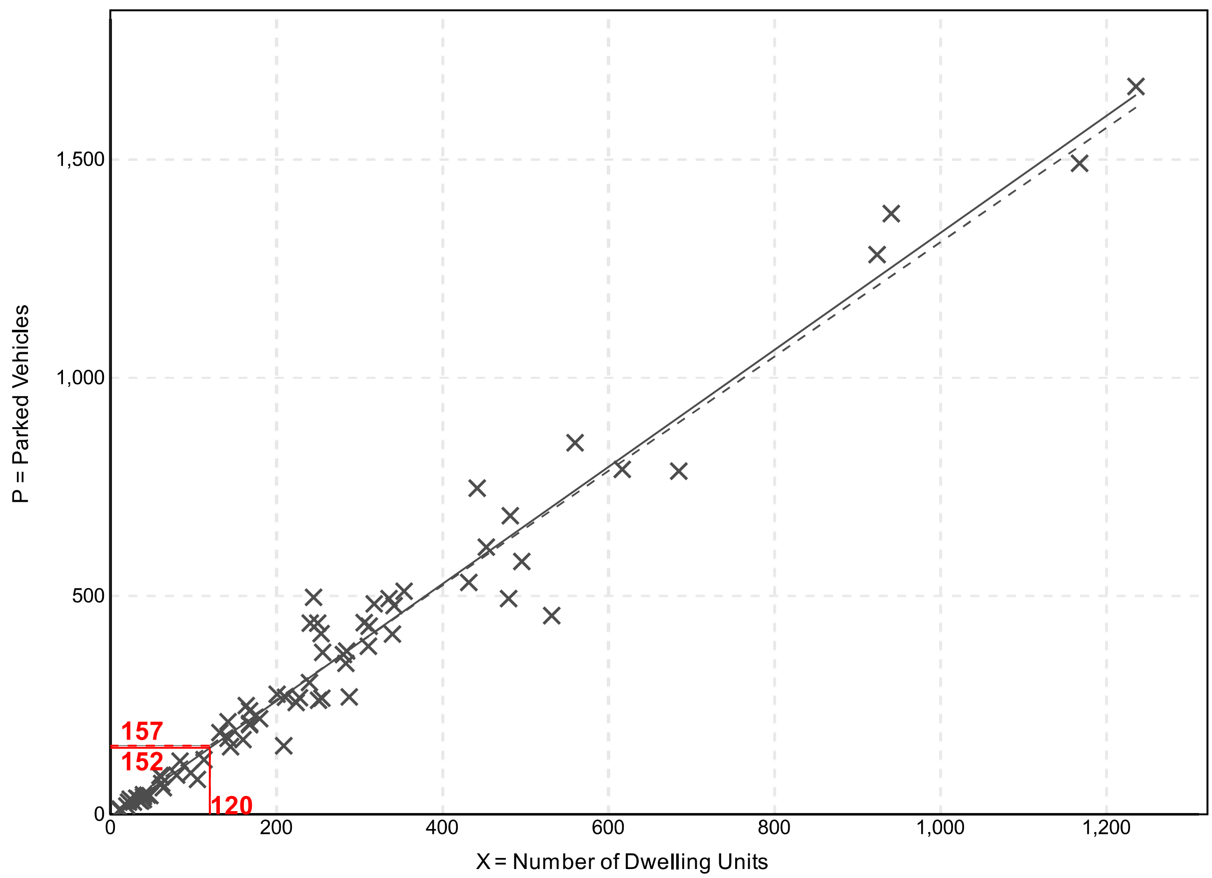
Multifamily Housing (Mid-Rise)
(221)

Peak Period Parking Demand vs:	**Dwelling Units**
On a:	**Weekday (Monday - Friday)**
Setting/Location:	**General Urban/Suburban (no nearby rail transit)**
Peak Period of Parking Demand:	**10:00 p.m. - 5:00 a.m.**
Number of Studies:	73
Avg. Num. of Dwelling Units:	261

Peak Period Parking Demand per Dwelling Unit

Average Rate	Range of Rates	33rd / 85th Percentile	95% Confidence Interval	Standard Deviation (Coeff. of Variation)
1.31	0.75 - 2.03	1.13 / 1.47	1.26 - 1.36	0.22 (17%)

Data Plot and Equation



Fitted Curve Equation: $P = 1.34(X) - 8.73$

$R^2 = 0.97$

Parking Needs Analysis

Ingerman Portfolio - Similar General Occupancy Properties

April 2020

Community	Location	Units	Spaces			Spaces/Unit Built (Residential)	Usage %	Spaces Used/Unit
			Total Project	Dedicated to Shared Use	Dedicated to Residential			
Landisville	East Hempfield, PA	60	131	43	88	1.47	68%	1.00
Wesmont Station	Wood-Ridge, NJ	104	166	0	166	1.60	78%	1.25
Carriage Works	York, PA	80	184	61	123	1.54	65%	1.00
Reliance Crossing	Souderton, PA	56	96	0	96	1.71	76%	1.30
Flemington Junction	Raritan, NJ	84	136	0	136	1.62	76%	1.24
Manor Heights	Manor Township, PA	70	144	0	144	2.06	49%	1.00

Usage % based on # tenant vehicles registered, except for Manor Heights and Landisville where date is unavailable

For Manor Heights and Landisville, Usage % based on # of resident-owned cars counted by manager or regional manager

Landisville and Carriage Works include shared uses in total parking count, so the spaces dedicated to the shared uses have been noted

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AMERICAN WATER

Pennsylvania American Water
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June 16, 2020

Amanda Schneider, P.E.
D.L. Howell and Associates, Inc.
1250 Wrights Lane
West Chester, PA 19380

RE: Letter of Water Serviceability
2131 Lincoln Highway – 120 units
Caln Township, Chester County

Dear Ms. Schneider:

Thank you for your request for water service to the above referenced site. The proposed development is located within the certificated franchise area of Pennsylvania-American Water Company (PAWC), Coatesville Service District. Domestic water service can be provided in accordance with the provisions of our tariff as approved by the Pennsylvania Public Utility Commission.

The cost of the water main extension necessary to provide service to the project is the responsibility of the developer, as would be any improvements to existing water facilities or supplies, or construction of new facilities such as pumping stations, tanks, wells or other water sources. Please note that all services now require meter pits located at the edge of the road right of way. The meter pits shall be owned and maintained by the customer. PAWC will provide the meter for each pit.

If fire suppression systems have been planned as a part of this project, please provide us with the design point (required flow rate and residual pressure) of the proposed systems so that we may evaluate our existing facilities to determine if the requirements can be met. We will advise you of any improvements that must be made to our water facilities to meet the requested fire service parameters.

This Letter of Serviceability is not an approval of the design of the facilities necessary to service the project, nor does it constitute permission to construct said facilities. Please provide us with two sets of plans and fire suppression requirements for our review and approval. The evaluation will be based on system conditions at the time of the evaluation and PAW can not guarantee this under all future operating conditions. If construction of the water facilities necessary to service this project has not begun within two years of the date of this letter, the letter of service shall become null and void, and a new request for water service must be made.

Should you have any questions, or require any additional information, please contact me.

Sincerely,

Gerald A. DeBalko

Gerald A. DeBalko, P.E.
Senior Project Manager

cc: George Thomas

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FRANK TAVANI, P.E., PTOE
Principal

EDUCATION

Bachelor of Civil Engineering, Rensselaer Polytechnic Institute, 1993

PROFESSIONAL REGISTRATIONS AND CERTIFICATIONS

Registered Professional Engineer (PE) in Pennsylvania
Registered Professional Traffic Operations Engineer (PTOE)

MEMBERSHIPS

Institute of Transportation Engineers
Urban Land Institute
Greater Valley Forge Transportation Management Association
Delaware Valley Engineers Week Council
Engineers' Club of Philadelphia
The Order of the Engineer

DETAILED EXPERIENCE

Mr. Tavani is the Founding Principal of F. Tavani and Associates, Inc. (FTA). His experience spans over 25 years during which he has participated in a wide range of projects including: traffic impact studies, circulation studies, corridor improvement studies, parking studies, and master planning studies. He has served the needs of developers, townships, municipalities, and states. Highlights of Mr. Tavani's experience include:

- **Villanova University, Radnor Township, Pennsylvania**
  FTA has been Villanova University's traffic consultant since 2004 and has prepared traffic and parking studies for Schools of Law and Nursing, a proposed new Athletic Facility for its Varsity Basketball Team, and is currently investigating its proposed 1159-bed student living complex which involves new structured parking and student-centric commercial space.

- **Lower Merion School District High Schools, Lower Merion Township, Pennsylvania**
  FTA has been Lower Merion School District's traffic consultant since 2004 and has prepared traffic and parking studies for both its high schools, two middle schools, and several elementary schools. The District has also consulted with Mr. Tavani regarding other capital projects including new bus storage and maintenance facilities.

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- **Worthington, East Whiteland Township, Pennsylvania**
  Mr. Tavani served as the Principal-in-Charge for a traffic impact study of an ambitious redevelopment project in Chester County. A former steel mill located along the Route 29 corridor was examined as a potential rezoning project featuring a premier "live-work-play" community featuring hundreds of residential-over-retail units, over one half million SF of retail space, and several office buildings. Working with several consultants, Mr. Tavani assisted in moving the project through PENNDOT and played a key role in developing the project's offsite road improvements, which included changes to Routes 202 and 29.

- **Novartis Pharmaceuticals, East Hanover, New Jersey**
  FTA reviewed the vehicular and pedestrian circulation of the USA headquarters of this major pharmaceutical company. The campus serves thousands of employees and has evolved over a period of many years and as a result of evolution of the campus, some areas have aspects of design which are inconsistent with other areas. This lack of consistency creates an environment which is consciously and subconsciously unsettling to motorists and pedestrians alike. FTA prepared a study and design documents addressing inconsistent pavement markings, signage placement and types, and other unexpected or unpredictable conditions throughout the campus in its Roadway and Walkway Study. The study also addressed speeding issues by evaluating existing speed bumps for "spot" control of speeds and suggesting new ways to retrofit the existing roadway network to encourage motorists to drive at speeds which are reasonable for the surroundings.

- **Hill View Retirement Community, Valley Township, Pennsylvania**
  Construction of this retirement community began in 2004 and is located near Coatesville on a parcel of approximately 200 acres. The proposed community will be home to approximately 1,500 retirees aged 55 and over. An unusual aspect of this land development application was the parcel itself – about two thirds of which is in Caln Township and one third of which is in Valley Township. This required extensive additional hearings, testimony, coordination, and interdependency among the two municipalities, all of which is an uncommon challenge.

- **USPS Distribution Hub, Philadelphia, Pennsylvania**
  Mr. Tavani assisted the United States Postal Service (USPS) through the conduct of traffic engineering services for the proposed USPS Philadelphia Processing and Distribution Center and Vehicle Maintenance Facility. The former distribution facility was located at 30^{th} and Market Streets in downtown Philadelphia and the new site is located in Southwest Philadelphia, minutes from I-95 and the Philadelphia International Airport. The new facility is expansive in all senses of the word. The facility is the largest building under one roof in Philadelphia and employs over 4,000 people, features 150 truck loading docks, and generates about 5,000 truck trips per day. The facility is expected to process over 3,000,000,000 pieces of mail annually. Any operation of this scale has considerable traffic impacts. Mr. Tavani identified ways to resolve critical traffic concerns of both the client and neighborhood residents. After several meetings with City officials, a traffic plan evolved that included the construction of several new intersections, driveways, and thoroughfares.

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OTHER EXPERIENCE

In addition to the detailed experience listed above, Mr. Tavani's has also represented many other clients which span several industries and types of development, including retail, residential, pharmaceutical, manufacturing, finance, and hospitality industries. In additional to those listed above, some other clients for whom Mr. Tavani has worked include:

Wolfington Properties	Arby's	Infiniti of Ardmore
Aqua America	Play & Learn	Honda of Ardmore
Merck	Eastern University	Sports Authority
Qdoba	Princeton University	Stonebridge Associates
Ninety-Nine Restaurant & Pub	Saunders House	SAP America
St. Joseph's University	Heritage Building Group	Giant Supermarkets
Fresh Fields	IKEA	Pennsylvania National Bank
Peter Batchelor Architects	Main Line Health	and various local churches
Starbucks	SEPTA	as well as synagogues

In addition to working on behalf of developers, businesses, and institutions, Mr. Tavani and FTA have also had experience in reviewing traffic studies and submittals on behalf of townships and municipalities, including Cheltenham Township, Montgomery County, Pennsylvania and Caln Township, Chester County, Pennsylvania.

TEACHING AND LECTURING

Mr. Tavani occasionally is a guest lector at local universities covering topics of traffic engineering and roadway design as both apply to land development and expert witness questioning and preparation.

VOLUNTEERING AND ACTIVISM

Mr. Tavani joined the Delaware Valley Engineers Week Council in 2003 and has participated in assisting in the oversight of the celebration of "Engineers Week" which is held every February. This group also participates with local schools and fosters interest in engineering through many programs and activities, including Future City competitions in southeastern Pennsylvania, southern New Jersey, and Delaware.

DLHowell
Civil Engineering & Land Planning
www.DLHowell.com

CURRICULUM VITAE

NAME: Amanda L. Schneider, P.E.

EDUCATION: Messiah College, Grantham, Pennsylvania
Bachelor of Science in Engineering
May 2014

REGISTRATION: Registered Professional Engineer, Pennsylvania (License No: PE090566)
Registered Professional Engineer, Delaware (License No: 22620)

EXPERIENCE & RESPONSIBILITIES

D.L. Howell & Associates, Inc.
West Chester, PA – May 2018 to present

Project Engineer – June 2019 to present
Civil Designer – May 2018 to June 2019
Responsible for complete engineering design and preparation of subdivision and land development plans. Designs include the following: sanitary sewer, storm sewer, stormwater management, roadway design, erosion & sedimentation control plans, drainage reports, construction specifications and representation at public meetings and hearings.

Duffield Associates
Philadelphia, PA – June 2016 – May 2018
Wilmington, DE – September 2014 – June 2016

Engineer-in-Training
June 2016 – May 2018
Responsible for preparation and civil design of land development plans. Experience also includes the preparation of stormwater management designs, hydraulic calculations, and erosion and sedimentation design.

Engineer-in-Training
September 2014 – June 2016
Responsible for performing environmental investigations on potentially impacted land development sites. Experience also includes performing Phase I and II Environmental Site Assessments, conducting environmental sampling, and analyzing environmental data.

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West Chester, PA 19380
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Fax: (610) 918-9003

EXHIBIT A-16

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August 20, 2020

Mr. Raymond Stackhouse, BCO
Caln Township
253 Municipal Drive
P.O. Box 72149
Thorndale, PA 19372

RE: The Willows at Valley Run
Conditional Use Review
Caln Township
ARRO No.: 11092.60
DLH No.: 3705

Dear Mr. Stackhouse,

D.L. Howell and Associates, Inc. (DLH) has reviewed the Conditional Use Application review letter from ARRO Consulting, Inc. dated August 11, 2020. The following explains how each comment has been addressed.

A. Chapter 155 – Zoning

1. *§155-43.E2: Streetlighting. Properties in Zone 1 may install lights on the building in lieu of streetlights, subject to approval of the Board of Commissioners. Properties in Zone 2 of the overlay district shall install streetlights at consistent intervals as approved by the Board of Commissioners.*

   The applicant shall install street lights in accordance with this section and subject to approval of the Board of Commissioners. The proposed streetlights shall be shown on the lighting plan.

   Response: Streetlights have been added along Route 30 and are shown on the updated Lighting Plan (Drawing C06.1, Sheet 06 of 08).

2. *§155-43.G.3: The Board of Commissioners may agree to reduce the total number of off-street parking spaces that would otherwise be required pursuant to Article X of this chapter for the proposed use(s), provided that the applicant demonstrates that it has provided sufficient parking for its use(s) and the proposed use(s) will utilize public transportation services or other modes of transportation for its customers and/or employees. Applicants are also encouraged to use joint parking arrangements. Off-premises parking on other lots may also be permitted to satisfy the off-street parking requirements in*

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West Chester, PA 19380
Phone: (610) 918-9002
Fax: (610) 918-9003

EXHIBIT A-17

Article X provided that the applicant secures an agreement with the property owner where the parking is to occur and the off-premises parking area is within 200 feet of the use(s).

The Applicant must demonstrate that sufficient parking is provided for the use described.

Response: The Applicant has included a Parking Needs Analysis in the Conditional Use Traffic Engineering Investigations report done by F. Tavani Associates, Inc. (FTA) dated June 22, 2020. This analysis summarizes the parking demand at similar apartment complexes owned by the Applicant. This analysis demonstrates that the spaces used per unit at these similar complexes range from 1.00 to 1.30. As noted on page 3 of FTA's report, using the Institute of Transportation Engineers (ITE) Parking Generation Manual, 5th edition, the average peak weekday parking generation potential of the site is 1.31 spaces per unit, which results in 158 spaces for 120 units. The proposed parking count of 210 (1.75 spaces/unit) is well over the expected peak parking demand for this site.

3. *§155-55.C.17.e: The minimum number of required off-street parking spaces for the development shall be two spaces per dwelling unit.*

   The minimum number of parking spaces required is 240 parking spaces. The Applicant is requesting a reduction in parking per §155-43.G.3.

   Response: Comment acknowledged; the parking reduction request will be discussed with the Board of Commissioners during the Conditional Use hearing.

4. *§155-119.D: The following is an approved list of selected trees, hedges and/or shrubs, which may be utilized to meet the standards and specifications for buffer yards and landscaping. Species selection shall be based upon the existing physical and natural conditions of the site:*

   The plant list on sheet 6 must be revised to meet the approved plant/tree species of this section.

   Response: The Landscape Plans have been updated accordingly, see Drawings C07.1 and C07.2, Sheets 07 and 08 of 08.

5. *§155-124.E.5: Light fixtures, including mounting base, shall not exceed 25 feet in height above finished grade.*

   Light pole details including their foundations must be shown on the Lighting Plan to demonstrate compliance with this section.

   Response: The Lighting Plan has been updated to show the light pole base detail, see Drawing C06.1, Sheet 06 of 08.

6. *§155-140.13: Where required by the Caln Township Fire Chief, Police Chief, Emergency Management Coordinator or Zoning Officer, a fire apparatus access road shall be located, designed and constructed in accordance with the provisions of Chapters 82 and 137 of the Caln Township Code.*

   A fire lane meeting all requirements and provisions of Chapter 82 of Cain Township Code shall be added to the Plan.

   Response: The proposed access drives throughout the site are intended to be used as a fire lane as well and will be designed as such. The Applicant will work with the Township to ensure these requirements are met during the Land Development permitting process.

7. *§155-131.C.2: Permits required. A permit shall be required before any construction or development is undertaken within any identified floodplain area of Caln Township.*

   Permit(s) will be required for construction in the floodplain.

   Response: Per correspondence with Township Engineer Bryan Kulakowsky, the permitting for construction in the floodplain will be encompassed in the Land Development Approval.

8. *§155-138.C: The total number of off-street loading spaces shall be determined by the requirements specified within Matrix Chart 10. The required off-street loading spaces shall be located exclusive of any public right-of-way or required parking area.*

   A total of two (2) off-street loading areas must be shown on the Plan.

   Response: The Applicant intends to comply with this comment and will provide 2 off-street loading areas as required.

9. *§155-146.A.1: Two complete permit applications shall be submitted to erect, install, replace, remove and alter signs, as required by the provisions of this article. The application shall include the required permit fee.*

   A permit application must be submitted for the proposed monumental sign at the entrance to the apartment complex in accordance with Article XI Signs.

   Response: Comment acknowledged; the Applicant will obtain a permit for the proposed monumental sign prior to installation.

10. *§155-172.F.10: The applicant shall provide evidence with supporting documentation that adequate water storage is available within the region for fire-fighting purposes, which shall include but not be limited to pumping at all hours, at a minimum of 25 pounds per square inch (psi) pressure, without impairing the uses of the water supply for ordinary purposes on the premises and shall be in compliance with all applicable governmental regulations.*

The availability of adequate water for firefighting shall comply with Chapter 137, Subdivision and Land Development. All required evidence and documentation shall be provided for review with the application for subdivision and land development.

Response: Information has been provided to the Township/CTMA. Per correspondence with Township Engineer Bryan Kulakowsky, this will be reviewed by CTMA during Land Development.

11. *§155-172.F.13: The applicant shall provide evidence with supporting documentation that the existing or proposed municipal water supply facilities have sufficient capacity for the proposed use. Where water supply methods are permitted, the applicant shall consult with a qualified hydrogeologist to determine if on-lot water supply is a viable option considering the proposed use, groundwater supply and site characteristics.*

    The availability of municipal water supply shall comply with Chapter 137, Subdivision and Land Development. All required evidence and documentation shall be provided for review with the application for subdivision and land development.

    Response: Information has been provided to the Township/CTMA. Per correspondence with Township Engineer Bryan Kulakowsky, this will be reviewed by CTMA during Land Development.

12. *§155-172.F.14: The applicant shall provide evidence with supporting documentation that there will be no increase in surface water runoff and erosion within the property or at the boundaries of the facility as a result of the site improvements, as specified under Chapter 128 of the Code.*

    Surface water runoff shall comply with Chapter 135, Stormwater Management, and erosion and sediment control shall comply with Chapter 88, Grading, Erosion and Sediment Control. All required evidence and documentation shall be provided for review with the application for subdivision and land development.

    Response: The Applicant intends to comply with the above-referenced code sections. Appropriate documentation/plans will be provided with the Subdivision and Land Development Application to demonstrate this.

B. Caln Township Municipal Authority Comments

13. Capacity will need to be obtained from the CTMA by executing a Capacity Reservation/Extension Agreement. All capacity is allocated in accordance with CTMA Resolution 2005-10-CTMA.

    Response: Information has been provided to the Township/CTMA. Per correspondence with Township Engineer Bryan Kulakowsky, this will be reviewed by CTMA during Land Development.

14. An escrow will need to be established so the Authority's Engineer can complete an evaluation of the existing system to determine if the project will not create a hydraulic overload in the Authority's System.

    Response: An escrow will be provided with the Subdivision and Land Development Application.

15. Flow Data which shows all the proposed uses that will be needing public sewer along with an official request must be submitted, so the Authority's Engineer can proceed with the capacity evaluation once the escrow is established.

    Response: Information has been provided to the Township/CTMA. Per correspondence with Township Engineer Bryan Kulakowsky, this will be reviewed by CTMA during Land Development.

16. Once the flow data evaluation is complete and if it determines that improvements and/or upgrades are needed in the existing system, they will be addressed as part of an extension/improvement and capacity reservation agreement between the Caln Township Municipal Authority ("CTMA"), and the Developer

    Response: Comment acknowledged; the Applicant will address this as needed during the Land Development Permit process.

17. Provide a plan that shows the proposed development along with any proposed locations of the sewer extensions and their connection points to the Authority's system, which will need to be installed to serve the development along with any necessary easements.

    Response: The Applicant will provide this information during the Land Development Permit process.

18. Once the evaluation is done and the agreements are executed, the developer will also need to submit a complete PADEP Sewer Planning Module or exemption request, along with the Executed Agreements, to the PADEP for review and approval. Once they receive all governmental approvals, and satisfied all conditions outlined in the Executed Agreements, the capacity will then be considered reserved.

    Response: Comment acknowledged; a PADEP Sewer Planning Module/exemption will be provided during the Land Development Permit process.

C. Township Traffic Engineer Comments

19. *§155-172.F. 5: The applicant shall provide evidence with supporting documentation that the capacity of the road system providing access to the property or lot in question has sufficient capacity to*

accommodate the use and that when the incremental increase in traffic attributable to the proposed use is superimposed upon the existing use of the road shall not lower the level of service of the roads or any portions thereof or any street intersections below a level of service "C."

a. The submitted materials conclude that the access and adjacent street will operate at Level of Service "C" or better during the peak periods. It is noted that the Assessment was completed consistent with the Pennsylvania Department of Transportation guidance for completing traffic studies during COVID-19 conditions.

Response: Comment acknowledged.

b. A detailed review of submitted traffic studies relative to the criteria for Subdivision and Land Development {§137-67} will be completed separately when submitted.

Response: Comment acknowledged; additional traffic study information will be provided as needed during the Land Development Permit process.

20. *§155-172F.6: The applicant shall provide evidence with supporting documentation that the interior traffic circulation for the proposed use at the proposed location, including but not limited to acceleration and deceleration lanes where required at the proposed entrances to the location, shall be adequate to provide safe and convenient circulation for users of the facility, visitors to the facility, employees of the facility and all emergency vehicles that may require entrance thereon.*

a. The submitted materials adequately address interior circulation, including emergency vehicles, and conclude that acceleration and deceleration lanes are not required.

Response: Comment acknowledged.

b. The submitted materials do not address sight distance at the proposed access. There do not appear to be any features that would prevent compliance with applicable requirements; however, this should be confirmed by the Applicant.

Response: Sight distance requirements have been added to the Title Plan, Drawing C02.1, Sheet 08 of 08.

21. *§155-172. F7: The applicant shall provide evidence with supporting documentation the facility or use provides safe and convenient pedestrian access and internal circulation within the grounds of the facility and particularly for points of access from the facility to the parking areas.*

a. The submitted materials show pedestrian facilities along the site frontage and within the site.

Response: Comment acknowledged.

b. Consideration should be given to coordinating with the adjacent to commercial development to determine if a supplemental direct access is feasible.

Response: This have been reviewed and the Applicant discussed this with the Township Staff. Emergency access is not feasible from the adjacent commercial development because of its use being self-storage and requiring fencing around the property.

c. It is anticipated that the detailed design of the bus stop along the site frontage will be completed during Land Development and will include coordination with PennDOT.

Response: The Applicant will coordinate with PennDOT regarding the proposed bus stop and a detailed design will be completed during the Land Development Permit process.

D. Building, Life and Safety Comments

In order to be compliant with Chapter 155, Section 155 —172 F. (4), (6), (9), (10), and (11) the applicant will need to provide proper plans and documentation during the Land Development phase that adheres to the requirements of:

22. Water modeling and fire flow information and data as per requirements of Section 137- 47 A, B, C, D, and G, Appendix B Section 8105.1 and B105.3 and Section 507 of the 2018 International Fire Code will be required.

    Response: Comment acknowledged; this information will be provided for review during the Land Development Permit process.

23. Fire hydrants as per Section 137- 47 E. and F., Section 507 and Appendix D of the 2018 International Fire Code may be required.

    Response: The Applicant will review the requirements for fire hydrants during the Land Development Permit process and will provide them as needed.

24. If a fire suppression system is required, it shall be installed as per Section 137 — 47 B.

    Response: The Applicant will provide information regarding the fire suppression system for review during the Land Development Permit process.

25. All connections for hydrants and fire suppression systems shall comply with Section 137- 47 F. if applicable

    Response: The Applicant intends to comply with these requirements.

26. Roads/Emergency Services access as per Section 137- 24 F., Section 503 and Appendix D of the 2018 International Fire Code will be required

    Response: The Applicant intends to comply with these requirements.

    Compliance with these Chapter 137 requirements will satisfy compliance with the Conditional Use requirements noted above.

    Response: Comment acknowledged.

Preliminary and Final plans will be required to demonstrate compliance with Chapter 88 — Grading and Erosion & Sediment Control, Chapter 135 — Stormwater Management, Chapter 137 — Subdivision and Land Development, and Chapter 155 — Zoning of the Caln Township Code.

Response: Comment acknowledged; the Applicant intends to comply with the above-referenced ordinance chapters. Evidence demonstrating compliance with these chapters will be provided in the Land Development Application submission.

We trust that the above information and the attached revised plans satisfactorily address the concerns as stated in the review letter. If you have any questions, or require additional information, please contact me directly in our West Chester office at 610-918-9002.

Sincerely,

D.L. HOWELL & ASSOCIATES, INC.

Amanda L. Schneider, P.E.

Daniel Magno, RA

215 Morris Lane, Washington Crossing, PA 18977

Overview

Project Architect for new residential and mixed-use projects, large scale renovations, historic preservation, and design-build projects.

Registration

Pennsylvania (active) 2006, New Jersey 2009, Delaware 2007, Maryland 2007

Education

Master of Architecture, Harvard Graduate School of Design *1992*
Bachelor of Architecture, Pennsylvania State University *1989*

Professional Experience

Haley Donovan / Project Architect *2015-Present*

Project architect at innovative firm committed to quality, sustainable multi-family housing communities. Involved in all project phases from schematic design through construction observation. Responsible for overseeing architects and interns in design, the production of construction documents, preparation of funding applications, and coordination with structural, MEP, and Passive House consultants.

- *The Willows at East Greenville* - 71 unit adaptive reuse of a historic manufacturing building, East Greenville PA - Design, construction documents and construction observation;
- *Cornerstone at Seaside* - new 91 unit senior apartment building, Seaside Heights NJ. The building is prominently located on the route 37 Causeway, the entry-point to the barrier Island. Responsible for design, construction documents and construction observation;
- *The Willows at Landisville* - Passive House certified 60 unit affordable housing development on a 9.8 acre site, East Hempfield PA - Project architect through construction documents and construction;
- *The Willows at Maple Mount Vernon* - Facade restoration and interior renovation of of 41 affordable apartments located on a block of 19th century buildings in Philadelphia's Fairmount Ave Historic District - Design, construction documents and construction observation; The project received a historic preservation award.

Plumbob LLC & Onion Flats / Project Architect *2012-2015*

Project architect at firm that produced award winning Passive House and net zero energy buildings. Involved in all project phases from schematic design through construction observation.

- *Mallard Flats* - new mixed use 14 unit condominium, Philadelphia PA - construction documents and construction observation;
- *Stables Homes* - new residential development of 26 homes designed for Passive House certification, Philadelphia PA - Combination of site-built and modular construction. Project architect throughout;
- *Ridge Flats* - new mixed use, Passive House, modular 147 unit apartment complex, Philadelphia PA- construction documents.

Cover LLC / Partner Design-build, real estate development company, Philadelphia PA *2003-2011*

Shared responsibility for site selection, design, cost estimates, securing of financing, management of subcontractors and labor. Responsible for code analysis, construction documents, production of shop drawings and condominium documents. Work also included hands-on construction.

- *Milk Depot* - architect, contractor and developer for adaptive reuse of 25,000 s.f. 19th century warehouse into loft apartments, Philadelphia PA
- *Frankford Ave. Apartments* - architect and contractor for conversion of existing storefront building into gallery and apartments, Philadelphia PA
- *Staircase Vignettes* - design and fabrication of steel staircases and other architectural metalwork

Trace Ltd / Partner, Principal Architectural firm, Philadelphia PA *2008-2011*

- *K Group Offices/ Retail Space* - Alterations, Philadelphia PA
- *Schank Residence* - additions and alterations, Gilbertsville PA
- *Maccess Offices* - barn conversion into office suite, Mullica Hill NJ
- *718 N Second St.* - renovation of 4-story mixed use building in collaboration with Plumbob LLC, Architects, Philadelphia, PA
- *Artisans Colony* - 55,000 s.f. warehouse conversion, schematic design, Philadelphia PA
- *811 N Market St.* - 11,000 s.f. condominium renovation, schematic design, Wilmington DE

Wesley Architects / Project Manager Philadelphia PA *1993-2004*

Designer/ Project Manager

- *Merchants' Court* - new 8-story condominium, design and construction documents, Philadelphia PA
- *Merchants' Row* - 29,000 s.f. adaptive reuse and exterior restoration of 4 loft buildings, Philadelphia PA
- *Harriton Farms* - restoration and adaptive reuse of 9,000 s.f. stable into private residence, Villanova PA
- *Riverbend Environmental Education Center* - 4,000 s.f. alterations and additions, Gladwyne PA
- *Gladwyne Montessori School* - Interior and exterior alterations
- *Episcopal Church of the Redeemer* - Choir room and chancel renovations, Bryn Mawr PA
- *Private Residence* - 7,000 s.f. new construction, Pocono Lake, PA

Wesley Wei Architects / Intern Architect Philadelphia PA *1992-1993*

- *Deerwood Guest House* - new construction, Easton, MD
- *Rittenhouse Square Private Residence* - condominium renovation

Yoshida Architect and Associates / Intern Architect Design-build Osaka, Japan 1990

- Design and construction of temporary steel pavilions at *Hana Haku* Exposition in Osaka and at *Imaike* Colors project in Nagoya Japan

Awards

- *Preservation Alliance, Grand Jury Award* - Maple Mount Vernon Apartments, Haley Donovan *2018*
- *Preservation Achievement Award* - Merchants' Row, Wesley Architects *2004*
- *HARB Historic Preservation Award* - Harriton Farms, Wesley architects *2004*
- *HARB Historic Preservation Award* - Riverbend Environmental Education Center, Wesley Architects *2000*
- *Award of Merit* - New Urban Housing Competition, Wesley Wei, Alice Chun and Timothy McDonald *1992*

Works Cited

- *Context, The Journal of the AIA Philadelphia* - Milk Depot, Cover LLC *Summer 2009*
- *Architectural Record* - Rag Flats [custom stair & metal work], Onion Flats, Cover LLC *Feb 2006*
- *Main Line Today* - Harriton Farms, Wesley Architects *Feb 2006*
- *Philadelphia Style* - Merchants' Row, Wesley Architects Sept 2003
- *The New American Apartment* - Private Residence, Wesley Wei Architects 1997
- *Progressive Architecture* - Private Residence Wesley Wei Architects Feb 1992
- *SD Review* - *Imaike* Colors Project, Yoshida Architect and Associates Jan 1990

DLHowell
Civil Engineering & Land Planning
www.DLHowell.com

August 20, 2020

Re: Conditional Use Application
The Willows at Valley Run
2131 Lincoln Hwy
Caln Township, Chester County

To Whom it May Concern:

On behalf of MBID of Delaware, LLC. (the 'Applicant'), DL Howell and Associates, Inc. is sending this notice to you regarding the Conditional Use Application submitted to Caln Township for The Willows at Valley Run, a proposed apartment complex located at 2131 Lincoln Highway, in Caln Township, Chester County, Pennsylvania. The Applicant is proposing a 6-building 120-unit apartment complex with a community building, recreational facilities, associated parking, and stormwater management.

The property is located in the C-1 Highway Commercial District and is applying for a conditional use to develop this site as a multi-family apartment complex. A conditional use hearing is scheduled for Thursday August 27, 2020 at 6:00 P.M. and will be held remotely via Zoom. Please visit Caln Township's website (www.calntownship.org) for more information on how to attend the upcoming hearing. You are not required to attend but may attend if you are interested.

Sincerely,

D.L. HOWELL & ASSOCIATES, INC.

Amanda Schneider

Amanda L. Schneider, P.E.
Project Engineer

1250 Wright's Lane, West Chester, PA 19380
Phone: (610) 918-9002 Fax: (610) 918-9003
www.dlhowell.com

EXHIBIT A-19(a)

UPI	Owner 1	Owner 2	Local Address	Municipality	Zip Code	Mailing Address 1	Mailing Address 2	Mailing Address 3
39-3-170	EXELON GENERATION CO LLC		175 N CALN RD	CALN	60181	ATTN FRED SCHWER	3 LINCOLN CNTR	OAKBROOK TERRACE IL
39-3-171	RPC COATESVILLE STORAGE LLC		99 N CALN RD	CALN	75201	2101 CEDAR SPRINGS RD	STE 1600	DALLAS TX
39-3-172.1	NEWBOURNE LLC		1951 LINCOLN HW	CALN	8053	8 NORRSKEN DR	MARLTON NJ	
39-3-172.3	BELL TELEPHONE CO OF PA		97 N CALN RD	CALN	75001	C/O VERIZON PENNSYLVANIA	PO BOX 2749	ADDISON TX
39-3-173	NEWBOURNE LLC		1961 LINCOLN HW	CALN	8053	8 NORRSKEN DR	MARLTON NJ	
39-3-174	NEWBOURNE LLC		2011 LINCOLN HW	CALN	8053	8 NORRSKEN DR	MARLTON NJ	
39-3-175	JMLE EXPRESS PROP LLC		2025 LINCOLN HW	CALN	19096	1328 MEDFORD RD	WYNNEWOOD PA	
39-3-178.1	KREMPA JOSEPH T	DEBORAH M S	2000 LINCOLN HW	CALN	19320	403 BAKER LA	COATESVILLE PA	
39-3M-54	EILETAL CORP		1960 LINCOLN HW	CALN	19335	139 ROBBINS RD	PO BOX 461	DOWNINGTOWN PA
39-3M-55	EILETAL CORP		1980 LINCOLN HW	CALN	19335	139 ROBINS RD	PO BOX 461	DOWNINGTOWN PA
39-3M-98	BROWN LONNIE D	MAYTHA E	17 S CALN RD	CALN	19320	17 S CALN RD	COATESVILLE PA	
39-3M-99	BROWN FREDERICK W JR	EILEEN M	19 S CALN RD	CALN	19335	1 BLACKHAWK CIR	UNIT N-10	DOWNINGTOWN PA
39-4-122	CALN HOLDING CO LLC		2140 LINCOLN HW	CALN	19320	2140 E LINCOLN HWY	COATESVILLE PA	
39-4-122.2	2220 EAST LINCOLN HIGHWAY LLC		2200 LINCOLN HW	CALN	19425	217 POTTSTOWN PK	CHESTER SPRINGS PA	
39-4-123	NATIONAL RAILROAD PASSENGER CORP		200 S BAILEY RD	CALN	19104	2955 MARKET ST 5TH FLOOR	SOUTHWEST BOX 25	PHILADELPHIA PA
39-4-123.1A	GUNNER PROPERTIES LTD		2236 LINCOLN HW	CALN	19425	217 POTTSTOWN PK	CHESTER SPRINGS PA	
39-4-123.1B	2240 E LINCOLN HIGHWAY LP		2240 LINCOLN HW	CALN	19320	2240 E LINCOLN HWY	COATESVILLE PA	
39-4-123.2	GUNNER PROPERTIES LTD		2216 LINCOLN HW	CALN	19425	217 POTTSTOWN PK	CHESTER SPRINGS PA	
39-4-123.3	SOUTHDOWN	PROPERTIES INC	201 S CALN RD	CALN	19335	55 COUNTRY CLUB DR	DOWNINGTOWN PA	
39-4-123.3A	STELLRECHT EWALD	EILEEN LONGO	21 S CALN RD	CALN	19380	580 GRUBBS MILL RD	WEST CHESTER PA	
39-4E-30.2	HARPLE JOHN W JR	HARPLE TAMMY L	260 WATSON AV	CALN	19320	260 WATSON AVE	COATESVILLE PA	
39-4E-30.3	HARPLE JOHN W JR		250 WATSON AV	CALN	19320	260 WATSON AVE	COATESVILLE PA	
39-4E-42	STECZAK JOANN K	MICHAEL J	241 WATSON AV	CALN	19320	241 WATSON AVE	COATESVILLE PA	
39-4J-2	KWASIZUR DANIEL J	KWASIZUR ROBIN M	2211 MILLER AV	CALN	19320	2211 MILLER AVE	COATESVILLE PA	
39-4J-3	HEACOCK JENNIFER		2215 MILLER AV	CALN	19320	2215 MILLER AVE	COATESVILLE PA	
39-4J-4	DENNY PAUL K	CARLIE J	200 WATSON AV	CALN	19320	200 WATSON AVE	COATESVILLE PA	
39-4J-5	CHOQUETTE JAMES		2275 MILLER AV	CALN	19320	2275 MILLER AVE	COATESVILLE PA	
39-4J-6	NARANJO HENRY FAVIAN RUILOVA		2281 MILLER AV	CALN	19320	2281 MILLER AVE	COATESVILLE PA	
39-4J-7	COLE GERALDINE		218 SELTZER AV	CALN	19320	218 SELTZER AVE	COATESVILLE PA	
39-4J-8	MONTER VERONICA TIBURCIO	ARROYO GERARDO MARTINEZ	200 SELTZER AV	CALN	19320	200 SELTZER AVE	COATESVILLE PA	
39-4J-19	PAIGE JACQUELYN C	DUNCAN COMPTON W	2220 MILLER AV	CALN	19320	2220 MILLER AVE	COATESVILLE PA	
39-4J-21	MARCH WILLIAM C III		2230 MILLER AV	CALN	19320	2230 MILLER AVE	COATESVILLE PA	
39-4J-22	ENEA PAUL J	ENEA DEBORAH	2240 MILLER AV	CALN	19320	2240 MILLER AVE	COATESVILLE PA	
39-4J-23	EMMONS WESLEY		2250 MILLER AV	CALN	19320	2260 MILLER AVE	COATESVILLE PA	
39-4J-24	EMMONS WESLEY		2260 MILLER AV	CALN	19320	2260 MILLER AVE	COATESVILLE PA	
39-4J-25	DAILEY DUAYNE E	MCCOMSEY CAROL J	2270 MILLER AV	CALN	19320	2270 MILLER AVE	COATESVILLE PA	
39-4J-26	LORDAN TIMOTHY S		2280 MILLER AV	CALN	19320	2280 MILLER AVE	COATESVILLE PA	
39-4J-27	CEDAR KNOLL PROPERTIES LLC		2290 MILLER AV	CALN	19320	22 MARTINS CORNER RD	COATESVILLE PA	

EXHIBIT A-19(b)

39-4J-28	BITTLE JEANNE		198 SELTZER AV	CALN	19320	198 SELTZER AVE	COATESVILLE PA
39-4J-29	GALLO CAROLE		182 SELTZER AV	CALN	19320	PO BOX 1277	COATESVILLE PA
39-4J-30	JOHNSON LORRIE		178 SELTZER AV	CALN	19320	31 MORRIS LA	COATESVILLE PA
39-4J-30.1	RODRIGUEZ MILTON		174 SELTZER AV	CALN	19335	1476 E STONINGTON DR	DOWNINGTOWN PA
39-4J-32	PIERSON HOWARD E SR	SUSAN R	150 SELTZER AV	CALN	19320	150 SELTZER AVE	COATESVILLE PA
39-4J-34	MELSON RACHEL N		140 SELTZER AV	CALN	19320	140 SELTZER AVE	COATESVILLE PA
39-4J-35	SINDORF TODD G		130 SELTZER AV	CALN	17519	PO BOX 173	EAST EARL PA
39-4J-36	SINDORF TODD G		120 SELTZER AV	CALN	17519	PO BOX 173	EAST EARL PA
39-4J-37	SINDORF TODD G		110 SELTZER AV	CALN	17519	PO BOX 173	EAST EARL PA
39-4J-39	COURTESY REAL ESTATE LP		2225 LINCOLN HW	CALN	19320	2225 E LINCOLN HWY	COATESVILLE PA
39-4J-41.2	LAMBERT THOMAS D		9 WHISSELL DR	CALN	19320	9 WHISSELL DR	COATESVILLE PA
39-4J-41.3	BAKER CHARLES S	LINDA S	13 WHISSELL DR	CALN	19365	PO BOX 736	PARKESBURG PA
39-4J-41.4	FERGUSON ENTERPRISES INC		17 WHISSELL DR	CALN	23602	12500 JEFFERSON AVE	NEWPORT NEWS VA
39-4J-41.5	FERGUSON ENTERPRISES INC		19 WHISSELL DR	CALN	23602	12500 JEFFERSON AVE	NEWPORT NEWS VA
39-4J-41.6	FERGUSON ENTERPRISES INC		23 WHISSELL DR	CALN	23602	12500 JEFFERSON AVE	NEWPORT NEWS VA
39-4J-41.8	CCP REALTY GROUP LLC		8 WHISSELL DR	CALN	19335	1344 PIEDMONT DR	DOWNINGTOWN PA