APPLICATION OF THE LOFTS AT BLACK BIRCH LLC FOR SITE PLAN APPROVAL FOR 20 RENTAL APARTMENTS IN THE FORMER BANNER LODGE COMMUNITY CENTER AT 1 BANNER ROAD, EAST HADDAM, CT, "THE LOFTS AT BLACK BIRCH"

June 24, 2021



Timothy S. Hollister, Esq.
thollister@hinckleyallen.com
Andrea L. Gomes, Esq.
agomes@hinckleyallen.com
Hinckley Allen
20 Church Street
Hartford, CT 06103
PHONE: (860) 725-6200

Anthony Longhitano
ldgproperties@hotmail.com
The Lofts at Black Birch, LLC
c/o LDG Properties LLC
P.O. Box 8214
White Plains, NY 10602
PHONE: (860) 725-6200

Steven R. McDonnell, P.E.
SMcdonnell@WMCEngineers.com
Robert E. Barneschi
RBarneschi@WMCEngineers.com
WMC Consulting Engineers
87 Holmes Road
Newington, CT 06111
PHONE: (860) 667-9624

Mark G. Vertucci, P.E.
MVertucci@fando.com
Gina DePasquale
GDePasquale@fando.com
Fuss & O'Neill
146 Hartford Road
Manchester, CT 06040
PHONE: (860) 646-2469

Gary W. Hendren, AIA
architect@hendrenassociates.com
Hendren Associates
119 Braintree Street, Suite 209
Boston, MA 02134
PHONE: (617) 782-6003

TABLE OF CONTENTS
June 24, 2021

1. Transmittal letter from Hinckley, Allen & Snyder LLP

2. Overview letter from Hinckley, Allen & Snyder LLP

3. Site Plan application form

4. Storm Drainage Analysis Report Summary, June 20, 2021, prepared by WMC Consulting Engineers

5. Traffic Impact Statement, May 19, 2021, prepared by Fuss & O'Neill

6. Affordability Plan, Submission Draft, June 2021, prepared by Hinckley, Allen & Snyder LLP

7. Architectural Elevations, March 12, 2020, prepared by Hendren Associates

8. Letter from WMC Consulting Engineers, March 10, 2021, regarding Wastewater Disposal for Proposed New Housing Units, and accompanying concept plan

9. Email from Connecticut Water confirming water service to proposed community, June 8, 2021

10. Planning & Zoning Commission Letter Regarding Phase I Approval, dated September 14, 2005, and accompanying as-built site plan

11. Planning & Zoning Commission Letter Regarding Phase II Approval, dated December 12, 2006, and accompanying approved site plan

12. Planning & Zoning Commission Letter Regarding Phase III Approval, dated December 22, 2016, and accompanying approved site plan

13. Authorization letter from The Lofts At Black Birch LLC

14. Consultant Resumes

SUBMITTED SEPARATELY

Plan Set for “The Lofts At Black Birch Country Club, Community Center Redevelopment” prepared by WMC Consulting Engineers (full-size and reduced to 11x17); Architectural Plans for “The Lofts At Black Birch, Community Center Redevelopment,” prepared by Hendren Associates (full size and reduced to 11x17); Affordable Housing Need Memorandum, with exhibits; Storm Drainage Analysis Report, June 20, 2021, prepared by WMC Consulting Engineers; and Application Fee.

USB with all application materials.

HINCKLEY ALLEN

20 Church Street
Hartford, CT 06103-1221
p: 860-725-6200 f: 860-278-3802
hinckleyallen.com

Andrea L. Gomes
Phone: (860) 331-2603
agomes@hinckleyallen.com

June 24, 2021

HAND DELIVERY

Mr. Crary H. Brownell, Chair,
and Commission Members
Planning and Zoning Commission
Town of East Haddam
Town Hall, Land Use Office
1 Plains Road
Moodus, CT 06469

Mr. James F. Ventres, Land Use
Administrator / Zoning Enforcement
Officer
Town of East Haddam
Town Hall, Land Use Office
1 Plains Road
Moodus, CT 06469

Re: Application of The Lofts at Black Birch LLC for Site Plan Approval for 20 Rental Apartments in the former Banner Lodge Community Center at 1 Banner Road, East Haddam, CT, "The Lofts at Black Birch"

Dear Chair Brownell, Commission Members, and Mr. Ventres:

On behalf of our client, The Lofts at Black Birch, LLC ("The Lofts"), this package is a request for site plan approval for the redevelopment of the former Banner Lodge Community Center at 1 Banner Road (Map 73 / Lot 032) in East Haddam, Connecticut, into 20 rental apartment homes to be known as "The Lofts at Black Birch." The Lofts at Black Birch community will qualify as a "set-aside development" pursuant to General Statutes § 8-30g.

This package contains the following:

1. Transmittal letter from Hinckley, Allen & Snyder LLP
2. Overview letter from Hinckley, Allen & Snyder LLP
3. Site Plan application form
4. Storm Drainage Analysis Report Summary, June 20, 2021, prepared by WMC Consulting Engineers
5. Traffic Impact Statement, May 19, 2021, prepared by Fuss & O'Neill

6. Affordability Plan, Submission Draft, June 2021, prepared by Hinckley, Allen & Snyder LLP

7. Architectural Elevations, March 12, 2020, prepared by Hendren Associates

8. Letter from WMC Consulting Engineers, March 10, 2021, regarding Wastewater Disposal for Proposed New Housing Units, and accompanying concept plan

9. Email from Connecticut Water confirming water service to proposed community, June 8, 2021

10. Planning & Zoning Commission Letter Regarding Phase I Approval, dated September 14, 2005, and accompanying as-built site plan

11. Planning & Zoning Commission Letter Regarding Phase II Approval, dated December 12, 2006, and accompanying approved site plan

12. Planning & Zoning Commission Letter Regarding Phase III Approval, dated December 22, 2016, and accompanying approved site plan

13. Authorization letter from The Lofts At Black Birch LLC

14. Consultant Resumes

As requested by town staff, one original and fifteen (15) sets of this bound application package are being filed. In addition, we are filing five (5) full-sized and fifteen (15) 11x17 plans for "The Lofts At Black Birch Country Club," prepared by WMC Consulting Engineers (13 Sheets); five (5) full-sized and fifteen (15) 11x17 Architectural Plans for "The Lofts At Black Birch, Community Center Redevelopment," prepared by Hendren Associates (16 sheets); fifteen (15) sets of a bound Affordable Housing Need Memorandum with accompanying exhibits, June 2021, prepared by Hinckley, Allen & Snyder LLP; and three (3) copies of a Stormwater Management Report, prepared by WMC Consulting Engineers. A USB of all application materials also has been provided.

Application fees submitted herewith include a check, made out to "Town of East Haddam" for $260 for the Site Plan application, which includes the requisite state fee.

Very truly yours,

Andrea L. Gomes

Attachments
c: The Lofts at Black Birch, LLC (w/ att.)
WMC Consulting Engineers (w/ att.)
Hendren Associates (w/ att.)
Fuss & O'Neill (w/ att.)
Timothy S. Hollister, Esq. (w/ att.)

HINCKLEY ALLEN

20 Church Street
Hartford, CT 06103-1221

p: 860-725-6200 f: 860-278-3802
hinckleyallen.com

Andrea L. Gomes
Phone: (860) 331-2603
agomes@hinckleyallen.com

June 24, 2021

HAND DELIVERY

Mr. Crary H. Brownell, Chair,
and Commission Members
Planning and Zoning Commission
Town of East Haddam
Town Hall, Land Use Office
1 Plains Road
Moodus, CT 06469

Mr. James F. Ventres, Land Use
Administrator / Zoning Enforcement
Officer
Town of East Haddam
Town Hall, Land Use Office
1 Plains Road
Moodus, CT 06469

Re: Application of The Lofts at Black Birch LLC for Site Plan Approval for 20 Rental Apartments in the former Banner Lodge Community Center at 1 Banner Road, East Haddam, CT, "The Lofts at Black Birch"

Dear Chair Brownell, Commission Members, and Mr. Ventres:

On behalf of our client, The Lofts at Black Birch, LLC ("The Lofts"), we hereby apply for site plan approval to redevelop the existing Community Center building of the former Banner Lodge into a multi-family community consisting of 20 one-bedroom rental apartments, to be known as "The Lofts at Black Birch." The building is located at 1 Banner Road in East Haddam, Connecticut. As detailed further below, the proposed community will qualify as a "set-aside development" pursuant to General Statutes § 8-30g. **All notices should refer to General Statutes § 8-30g**.

1 Banner Road; Prior Development Approvals

The property at 1 Banner Road, East Haddam, is located in the Resort ("R") District and totals approximately 405.57 acres. The property formerly housed The Banner Lodge, which opened in the 1930s, and became a destination for vacationers in the New England region and beyond. After The Banner Lodge closed, various unrelated parties attempted to redevelop the property without long-term success.

In 2004, Banner Lodge Enterprises LLC, an affiliate of The Lofts, purchased the 1 Banner Road parcel. In September 2005, the Commission approved Banner Lodge

Enterprises' application for site plan, special exception, and floating zone approval to land the Planned Recreational Development-Resort Zones (PRD-R) on a portion of the 1 Banner Lodge property for the construction of 33 residential units to the south of the Community Center building ("Phase I"). The Commission was aware, and notes in its approval letter (Tab 10), that Banner Lodge Enterprises contemplated and would return for additional, phased approvals. Phase I became part of a Common Interest Community known as Banner Country Club Estates, pursuant to a Declaration of Banner Country Club Estates ("Banner Estates"), dated and recorded in the East Haddam Land Records on July 12, 2006. A copy of the as-built plan for Phase I is also at Tab 10.

In December 2006, the Commission approved Banner Lodge Enterprise's application for site plan, special exception, and floating zone approval to land the PRD-R on a portion of the 1 Banner Lodge property for Phase II of the redevelopment, consisting of 53 additional residential units, for a total of 86 residential units to be constructed on-site, consisting mostly of two-bedroom units, some of which contained additional lofted bedroom areas. *See* approval letter and approved site plan at Tab 11. Of the 86 residential units approved by the Commission by December 2006, 48 units have been constructed to-date. Those 48 units also became part of the Banner Country Club Estates Community.

In December 2016, the Commission approved Banner Lodge Enterprise's application for special exception approval to construct Phase III, consisting of an additional 247 residential units, to be constructed in phases, for a total of 333 approved residential units. *See* approval letter at Tab 12.

The subject of the present application is the former Banner Lodge Community Center, an approximately 13,915 square foot building located in the center of the 1 Banner Road parcel. The Community Center building is presently vacant and in need of renovation. Photos of the Community Center building are attached as Exhibit A.

The residential units previously developed by Banner Lodge Enterprises are located to the north and south of the Community Center building; the Black Birch Golf Course is located to the south and southeast. While Corvo Bar and Grill restaurant is located to the east, the areas surrounding the subject property are primarily wooded, or part of the same golf course property. An aerial of the subject property is at Exhibit B.

The subject property is not located in a water company watershed, and is not subject to any conservation or preservation restriction.

2020 Zoning Applications

In late 2019, and to facilitate the redevelopment of The Banner Lodge Community Center building, Banner Associates, L.L.C., an affiliate of The Lofts, submitted an application to the Commission to amend the PRD-R to allow more than four units in a building that existed prior to the enactment of the floating zone regulations. The Commission heard the application in January

and February 2020. At each night of public hearing, the application was met with opposition by members of the public. Banner Associates withdrew that application on February 21, 2020.

In June 2020, Banner Associates submitted a second application to the Commission to amend the PDR-R to allow more than four units in a building that existed prior to the floating zone regulations. The Commission requested that the applicant attempt to resolve its differences with the residents of Banner Estates before proceeding with the text amendment. The applicant attempted to do so without success over several months, and eventually withdrew that application in November 2020.

Current Development Proposal

With this application, The Lofts proposes to redevelop the Community Center building into a residential community to be known as "The Lofts at Black Birch." The proposed community will consist of 20 one-bedroom rental apartment homes, ranging between approximately 924 square feet and 1,653 square feet, and associated amenities, including a gym and accompanying locker room area. The proposed renovation will put a historic, but presently vacant and under-utilized building to a productive use, ensuring its long-term survival in an economically-viable way.

As shown on the accompanying plans, roadway access to the community will be extended from the existing roundabout at Banner Road and Banner Lane. Parking for community residents will be provided directly to the east and south of the building. The parking lot to the west of the southerly parking lot for the proposed community can be utilized for additional parking, if needed. To ensure efficient site circulation and pedestrian safety, vehicle circulation will be controlled with appropriate signage and pavement markings, and access to the drop-off area at the entrance to the building will be one-way (from north to south).

In an effort to preserve the history of the building, The Lofts will maintain the integrity of the existing architecture by working with the existing footprint of the building. The redevelopment also will improve the existing Community Center building's energy performance and safety by incorporating fire protection sprinklers. Rendered architectural elevations are at Tab 7; architectural details, including the proposed floor plans for the community, have been submitted separately.

In accordance with General Statutes § 8-30g, 30 percent of the 20 proposed rental apartments, or 6 apartments, will be formally rent-restricted. The Affordability Plan at Tab 6 includes administrative rules for the apartment homes that will be subject to long-term household income and monthly rental restrictions. As noted therein, rental prices for an affordable unit will be between $966 to $1,184 per month. However, all of the apartment units will be rented at monthly payment levels that are within the reach of moderate income households. As such, the proposed community will address East Haddam's need for this type of affordable housing, as detailed in the Affordable Housing Need Memorandum, submitted separately to staff as part of this application.

Compliance With Underlying Zone

Section 8-30g of the General Statutes, the Affordable Housing Land Use Appeals Act, has been in place for more than 30 years. Although the current proposal for the Community Center does not comply with bulk dimensions of the underlying Resort District, The Lofts' site plan is legally permissible because Connecticut court cases interpreting General Statutes § 8-30g have held that a § 8-30g proposal may not be denied on the ground that it does not comply with underlying zoning of an area. *See Wisniowski v. Planning Comm'n,* 37 Conn. App. 303, *cert. denied,* 233 Conn. 909 (1995). Accordingly, the Commission here may not deny The Lofts' site plan application because it does not comply with the underlying zoning of the subject property.

Stormwater Management

The redevelopment of the existing community and associated parking areas will be constructed with best management practices for stormwater and erosion, and in accordance with the DEEP Stormwater Manual. Specifically, the redevelopment will incorporate new drainage structures that will be connected to the existing subsurface stormwater collection system directed down Pinehurst Lane, thereby achieving a zero net increase in peak stormwater discharges. Accordingly, there are no adverse impacts downgradient of the proposed community or to offsite properties. A complete Storm Drainage Analysis Report, meeting the State's Guidelines, has been prepared and submitted separately to staff; a summary is at Tab 4.

Utilities

The subject property is currently, and will continue to be, serviced by Connecticut Water. Connecticut Water previously had confirmed that the existing infrastructure and water supply-on site would be sufficient for the 86 residential units approved by the Commission in 2005 and 2006 for Phases I and II of the 1 Banner Lodge parcel redevelopment, consisting mostly of two-bedroom units, some of which contained additional lofted bedroom areas. As noted above, 48 of the 86 approved residential units have been constructed to-date. Thus, and as confirmed by the email from Keith Nadeau at Connecticut Water (Tab 9), the existing infrastructure and water supply on-site is sufficient to serve the 20 one-bedroom units proposed for the Community Center renovation.

As reflected on the site plan, The Lofts also is proposing a 20,000 gallon fire suppression tank for water use during emergencies. The Lofts has engaged a consultant to review the proposed tank and to confirm that it is appropriately sized for the 20-unit community. The Lofts will provide the Commission with an update as soon as possible.

The subject property will be served by community septic. As noted in the feasibility letter and accompanying concept plan at Tab 8, the proposed septic system, which has been preliminarily designed by WMC Consulting Engineers, will be adequate to service the proposed community. An application for final approval will be submitted to the Connecticut Department of Energy and Environmental Protection after The Lofts obtains zoning approval for the

community. The Commission may impose final approval of the proposed septic system as a condition of its zoning approval.

Traffic

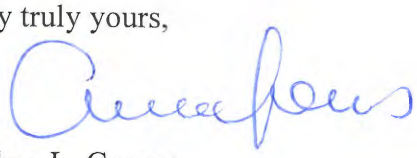
A traffic impact statement is contained in this application package at Tab 5. As noted therein, the total anticipated traffic from the proposed community totals 10 new vehicle trips during the weekday morning peak hour and 14 new vehicle trips during the weekday afternoon peak hour. These traffic estimates are very conservative. Based on as-built conditions, all intersections analyzed as part of the traffic impact study will continue to operate at an LOS A, which entails a very low delay of less than 10 seconds per vehicle. Accordingly, the proposed community will not impede or adversely affect traffic operations on the adjacent roadway network.

Pending Litigation

The Lofts is aware of ongoing pending litigation between Banner Lodge Enterprises and the Banner Estates homeowners' association, among others. Connecticut case law is clear that municipal land use commissions can only act within the scope of the powers and duties prescribed by statute. 9 Conn. Prac., Land Use Law & Prac. § 22:5 (4th ed.). "While land use agencies can regulate use of land, *they cannot decide title, ownership, or rights to real property.*" (Emphasis added.) *Id.*, *citing Cybulski v. Plan. & Zoning Comm'n*, 43 Conn. App. 105, 110 (noting that a planning and zoning commission does not have the authority to decide issues of title or ownership of real property). Accordingly, the subject of the pending lawsuits are not relevant to this site plan application and, thus, cannot be considered by the Commission in rendering its decision.

We look forward to presenting this application to the Commission.

Very truly yours,



Andrea L. Gomes

Attachments
c: The Lofts at Black Birch, LLC (w/ att.)
WMC Consulting Engineers (w/ att.)
Hendren Associates (w/ att.)
Fuss & O'Neill (w/ att.)
Timothy S. Hollister, Esq. (w/ att.)

EXHIBIT A










WARNING
NO LIFEGUARD
ON DUTY
SWIM AT YOUR
OWN RISK

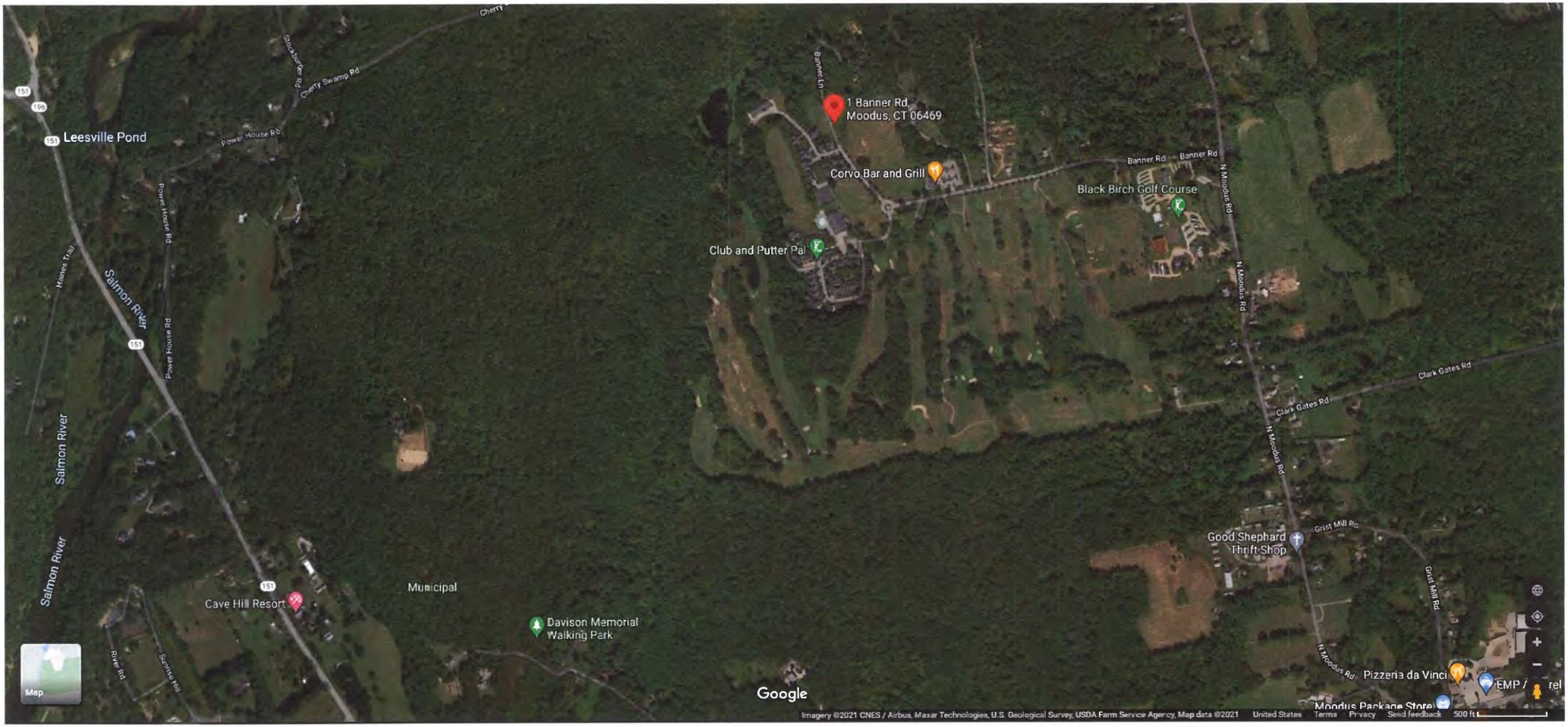








EXHIBIT B


1 Banner Rd
Moodus, CT 06469
Corvo Bar and Grill
Black Birch Golf Course
Club and Putter Pal
Banner Rd
Banner Ln
N Moodus Rd
Clark Gates Rd
Grist Mill Rd
Good Shephard Thrift Shop
Leesville Pond
Power House Rd
Cherry Swamp Rd
Stockbridge Rd
Haines Trail
Salmon River
Municipal
Cave Hill Resort
Davison Memorial Walking Park
River Rd
Sunrise Hill
Pizzeria da Vinci
Moodus Package Store
Map
Google
Imagery ©2021 CNES / Airbus, Maxar Technologies, U.S. Geological Survey, USDA Farm Service Agency, Map data ©2021
United States
Terms
Privacy
Send feedback
500 ft

TOWN OF EAST HADDAM
PLANNING AND ZONING COMMISSION
APPLICATION FOR SITE PLAN/SPECIAL EXCEPTION REVIEW
(Section 14A and Section 14 B)

Applicant's Name The Lofts at Black Birch LLC c/o Timothy S. Hollister, Esq. Phone (860) 331-2823
c/o LDG Properties LLC, P.O. Box 8214, White Plains, NY 10602
Address: _____ Zone/District Resort

Record Owner: The Lofts at Black Birch LLC

Property Location: 1 Banner Road

Assessor's Map # 73 Lot # 032

Deed Reference: Volume 1075 Page # 320

Description of proposed uses and structures: Redevelopment of existing community center building into multifamily community

Section under which application is made: C.G.S. § 8-30g; Zoning Regulations § 14A (Site Plan Review)

APPLICATION, FEE AND SUPPORTING DOCUMENTATION, INCLUDING LETTER(S) FROM THE SANITARIAN, BUILDING OFFICIAL, ZONING OFFICIAL, AND OTHER NESSECARY DOCUMENTS MUST BE IN THE PLANNING AND ZONING OFFICE THE WEDNESDAY PRIOR TO THE MEETING TO BE PLACED ON THE AGENDA.

_____ Attached checklist is completed

X Site Plan (Section 14A) and supporting documentation

_____ Letter from the Building Official

_____ Letter from the Chatham Health District

_____ Letter from the Zoning Board of Appeals

_____ Letter from the Zoning Enforcement Officer

X Narrative submitted

Section under which application is made:

Section 14A Site Plan Review X

Fee: $260 minimum. See fee schedule Site Plan Review includes $60.00 fee for DEP Fund - PA-235

Section 14B Special Exception Review _____

Fee: $360 minimum. See fee schedule Special Exception includes $60.00 fee for DEP Fund - PA-235

Chatham Health District Review - Variable fee

Section 14B.1 Special Exception Review - Waiver Request _____ **N/A**

14B.1 Special Exception Requirement: In any instance involving a use or uses requiring a Special Exception as set forth in these Regulations, no land or water areas shall be used, nor uses altered or expanded in space, time, or intensity, nor buildings or structures erected, altered, enlarged, the use substantially changed, or used until the Commission grants a Special Exception as defined in this Section 14B, or amend a previously granted Special Exception.

The Commission may waive the requirement for a Special Exception public hearing and other application requirements where it finds that:

a) One Special Exception use is being substituted for another similar use on the same lot.

b) The new use will require no greater parking or loading requirements than the original, as set forth in Section 11 of these Regulations.

c) The new use shall entail no exterior change to the building or site, and

d) The new use shall have no impact on the site, the neighborhood, or the Town which is different from the original, such impact to be measured by the standards set forth in Section 14B.4 of these Regulations.

Substantial changes are considered changes that involve (a) alterations in use from that set forth in an approved statement of use and site plan; or (b) alteration in an existing use, including such alterations that would:

1. Increased the parking demand of the use; or
2. Increase or change the hours of operation of the use; or
3. Increase the noise generation of the use or change the octave band frequency of such noise; or
4. Increase or change the emission of smoke, dust or other contaminants into the air, including both point sources and fugitive emissions; or
5. Increase or change the demand for outdoor storage, truck or equipment traffic (type or volume), water consumption, or effluent disposals; or
6. Involve the use of different equipment, processes, chemicals, or materials; or
7. Increase the amount of lighting.

The owner and the applicant hereby grant the East Haddam Planning and Zoning Commission and/or its agents permission to enter upon the property for which Site Plan or Special Exception Review is requested for the purpose of inspection and enforcement of the Zoning Regulations of the Town of East Haddam.

Date: 6/23/21 _____
Applicant's/Owner's Signature(s)

By: Andrea L. Gomes, Esq., Applicant's Agent
(See attached authorization letter)

_____ 6/23/21 Date received _____
PLAN PREPARER PE/LS Signature DATE

N/A

East Haddam Village District Regulations – Special Requirements and Provisions

9.5.6 Site Design and Compatibility Objectives

Applications shall provide a narrative, site plans, and design that demonstrate that the application is in compliance with subsections 9.5.5 and 9.5.6, including the approval of the East Haddam Historic District Commission where applicable, per Section 9.5.5. All development in the village district shall be designed to achieve the following compatibility objectives to the greatest extent possible. It is recognized that not all applications may be able to achieve each and every objective or in some cases a particular objective may not be applicable to the project. In cases where there is no change in the exterior appearance to the building or landscape the application shall still include a narrative and site plan of the existing conditions. These objectives are further defined in Appendix VI "Site Design and Compatibility Objectives and Guidelines"

_____ **1.** that proposed buildings or modifications to existing buildings be harmoniously related to their surroundings and to the terrain in the district and to the use, scale and architecture of existing buildings in the district that have a functional or visual relationship to a proposed building or modification,

_____ **2.** that all spaces, structures and related site improvements visible from public roadways be designed to be compatible with the elements of the area of the village district in and around the proposed building or modification,

_____ **3.** that the color, size, height, location, proportion of openings, roof treatments, building materials and landscaping of commercial or residential property and any proposed signs and lighting be evaluated for compatibility with the local architectural motif and the maintenance of views, historic buildings, monuments and landscaping, and

_____ **4.** that the removal or disruption of historic traditional or significant structures or architectural elements shall be minimized.

_____ **5.** The building and layout of buildings and included site improvements shall reinforce existing buildings and streetscape patterns and the placement of buildings and included site improvements shall assure there is no adverse impact on the district;

_____ **6.** proposed streets shall be connected to the existing district road network, wherever possible;

_____ **7.** open spaces within the proposed development shall reinforce open space patterns of the district, in form and siting;

_____ **8.** locally significant features of the site such as distinctive buildings or site lines of vistas from within the district, shall be integrated into the site design;

_____ **9.** the landscape design shall complement the district's landscape patterns;

_____ **10.** the exterior signs, site lighting and accessory structures shall support a uniform architectural theme if such a theme exists and be compatible with their surroundings; and

_____ **11.** the scale, proportions, massing and detailing of any proposed building shall be in proportion to the scale, proportion, massing and detailing in the district.

N/A

9.5.5 HISTORIC PRESERVATION

These regulations shall encourage the conversion, conservation, and preservation of existing buildings in a manner that maintains the historic or distinctive character of the district. New construction shall also incorporate in the design elements that will maintain the historic or distinctive character of the district.

The conversion, conservation, and preservation of existing buildings and sites shall be consistent with:

(A) The "Connecticut Historical Commission - The Secretary of the Interior's Standards

for Rehabilitation and Guidelines for Rehabilitating Historic Buildings", revised through 1990, as amended:

Available at http://www2.cr.nps.gov/tps/tax/rhb/stand.htm , the Historic District Commission, or the East Haddam Land Use Office

Please note: For those Buildings, Structures, or Lots located within the Village District which are also within the boundaries of the East Haddam Historic District, the Planning and Zoning Commission hereby delegates to the East Haddam Historic District Commission the review and approval of all aspects of a development which are within the legal jurisdiction of that Commission. Evidence of approval by the East Haddam Historic District Commission shall be provided at the time of application to the Planning and Zoning Commission, which shall not over rule or modify any aspect of a development plan which has been approved by the Historic District Commission and is within the jurisdiction of that Commission.

Fill out completely as possible. Applicant / Surveyor / Engineer / Agent is to check off items completed for site plan review. Place a "W" for item the applicant requests a waiver of, place a "N/A" when not applicable:

A. Site Plan A site plan, which shall conform to the following requirements, and contain the following information:

X 1. Property/Boundary Survey. A boundary survey prepared and sealed by a Connecticut Registered Land Surveyor, which survey shall be as required for the State of Connecticut minimum standards for Surveys and Maps. Said survey shall include the dimensions of the subject property, and its acreage or square footage.

X 2. Location Map. A location map, at a scale of one inch equals 1,000 feet, showing the location of the site in relation to existing roads which would assist the Commission and the public to orient themselves to the site and its boundaries.

3. General Information:

X a) The name and address of the applicant, property owner of record, the name of the development, and the names of the owners of record of all adjacent properties;

___b) The name, address and professional seal of each design professional responsible for, or participating in, the design of the site; Per past practice in East Haddam, mylars will be stamped/sealed.

X c) The assessor's map and lot numbers for the subject property and the properties within one hundred (100) feet of the perimeter of the site;

X d) The date of the site plan, a north arrow, and the scale of the plan;

X e) A description of any existing deed restrictions, covenants, easements, rights of way, or similar encumbrances which run with the land, including the identity of the dominant and servant estates, the volume and page of the East Haddam Land Records where the same are recorded, and the date upon which they will expire, if any;

X f) The words, "Approved by the East Haddam Planning and Zoning Commission/Zoning Board of Appeals" with a designated place for the signature of the chairman or secretary of the Commission or the Board, as the case may be, and the date of signing.

4. Site Features, Existing. On the site, and within one hundred (100') feet of the perimeter of the site:

X a) All existing uses of land including uses not requiring buildings or structures, such as outside storage; property lines, streets, utility lines, ledge outcrops, specimen trees, major tree or shrub areas, and other significant

features of the site, both natural and manmade;

__X__ b) Wetlands and watercourses as defined by the Regulations of the East Haddam Inland Wetlands and Watercourses Commission; the high water level of areas covered by water (such as lakes, rivers, streams, ponds, swamps, and the like);

__X__ c) Areas having slopes in excess of twenty (20%) percent;

__X__ d) Flood hazard areas as designated on the most current Federal Flood Insurance Rate Map for the Town of East Haddam, and the rate map designation for such areas;

__X__ e) Existing structures and their uses, general type of construction, height, and the like;

__X__ f) The location of all existing wells, existing septic systems, public water supply watersheds, and other public or private water supplies;

__X__ g) Existing monuments, iron pins, and other boundary indicators;

__X__ h) The soil classifications, as per the US Soil Conservation Service/Middlesex County Coding of Soil Types;

__X__ i) Existing contours of the land at intervals of two (2) feet, or less where the topography of the site and the area around it cannot be otherwise accurately and fairly represented.

__X__ j) Existing roads, paths, sidewalks, light features, major and unique natural, scenic, historic, and open space features.

5. Site Features, Proposed. On the site, and for any area off the site where any alteration whatsoever is proposed:

__X__ a) Any change whatsoever to any of the existing features depicted on the site plan in accordance with the preceding paragraph, including, but not limited to: proposed uses of land, including uses not requiring a structure or building;

__X__ b) The location, dimensions, square footage (both ground floor and total), height, and type of construction of all buildings or structures, including fences, walls, signs, lighting fixtures, flagpoles, and the like;

__X__ c) The location of any proposed well, septic system, and the location of, and test results for, any and all percolation and deep test holes, as verified by the Town Sanitarian and/or Health Official;

__X__ d) Any regrading, excavation, filling, and the volumes of material to be brought onto or removed from the site;

__X__ e) The percentage of Lot Coverage and percentage of Lot Impervious Coverage

__X__ f) Alterations in property boundaries, easements, utilities, and the like;

__X__ g) The location of any roads, curbs, sidewalk, driveway, parking and loading area(s) paths, and similar improvements;

__X__ h) Phase lines, proposed future division of the property, long-term lease boundaries, and the like.

__X__ i) In any site plan requiring the erection of any structure, grading, drainage work, paving or other improvement, those aspects of the plan shall be prepared, signed, and sealed by a Connecticut Registered Professional Engineer.

X
_____j) The areas of wooded portions of the site, or specimen trees, to be removed or retained, and the location, design, and content of landscaping to be created, including the size, number, and type of all landscaping material to be planted, and the proposed treatment of all buffer strips, screens, and islands.

X
____k) The expected intensity and frequency of noise, which may be emitted from the site or use, and the methods to be used to control the same.

X
____l) The height, bulk, use and location of all buildings; typical floor plans or other plans for the use of interior spaces of proposed buildings; the exterior appearance of proposed buildings, including a minimum of two exterior elevations, designation of materials, colors, and textures of exterior finishes, roofing, trim, and the like; location of heating, air conditioning, ventilation, and similar equipment; and special exterior features, such as building mounted signs, drive-in windows, building or roof lighting, roof drainage/gutters, and features of the interior of the building designed to be capable of being seen from the exterior. A rendering consisting of a minimum of two exterior elevations shall be submitted.

6. 14A.2.A Parking and Drainage:

X
____a) The site plan shall include all information necessary to establish conformance with the requirements of Section 11 of these Regulations, Off-Street Parking and Loading Requirements, and shall also include the calculations utilized to determine the parking and loading areas as depicted on the site plan.

X
____b) The site plan shall depict the dimensions of all parking and loading spaces, the total number of such spaces, and any proposed future or expansion parking or loading spaces. In addition, the site plan shall include the location, invert elevations, pipe sizes, flow calculations, and all other similar information as may be required by the Commission's engineering consultant to properly evaluate the storm water management plan for the site.

X
____c) For any site plan which depicts more than five thousand (5,000) square feet of impervious surface, be it building areas or paved areas, the site plan shall include provisions to retain stormwater runoff so as to produce no increase in peak runoff when such provisions is determined to be needed by the Town's Engineer. The methods used to meet this requirement shall be as prescribed by the Commission's engineering consultant.

X
____d) For any site plan, the proposed design, location, and illumination level of all outdoor lighting, which shall be used particularly in pedestrian and vehicular areas.

B. Sanitary Waste Disposal Plan.
For any site which is to be served, and is capable of being served, by an operational public sanitary sewer line prior to occupancy, the site plan shall depict the sewer lateral and other engineering information suitable to determine that connection to an operational sanitary sewer line is feasible. In addition, the applicant shall provide an approval letter from the East Haddam Water Pollution Control Authority stating the site if approved by the Planning and Zoning Commission is authorized to connect to the Town's system.

For any site, which is not to be served by public sanitary sewers, the applicant shall submit a sanitary waste disposal plan, which shall include, at a minimum, the following:

N/A

1. Report of Soil Test and Percolation Data. A Report of Soil Test Data signed by the Town Sanitarian or his representative which shall be in conformance with the Connecticut Public Health Code, as the same may be amended from time to time. All percolation tests and observation test pits for groundwater and ledge shall be dug and, tests performed, in accordance with the Technical Standards of the Connecticut Public Health Code, as the same may be amended from time to time, and shall be supervised and certified by the Town Sanitarian or his designee, who shall provide to the applicant, for inclusion with his Site Plan Approval Application, a verified approval of the application for subsurface disposal in accordance with the Connecticut Public Health Code, as the same may be amended from time to time.

2. Soils with Severe Limitations. If any existing soils in the immediate area of the site designated for sanitary waste

disposal are classified as having "severe" limitations for on-site sewerage treatment (as set forth in Section 4.3(1)(a) the East Haddam Subdivision Regulations), in accordance with the current soils map of the US Department of Agriculture, Soil Conservation Service, then a subsurface sewerage disposal plan shall be presented to the Commission. Said plan shall specifically address the methods utilized to overcome the limitations identified in the soils of the site; shall be prepared by a licensed Connecticut Professional Engineer, and shall be accompanied by a written report of the Town Sanitarian or his representative certifying that the plan will resolve the limitations of the soils, and will pose no significant risk to the public health or safety. All sanitary waste disposal systems to be located in the immediate area of soils with "severe" limitations, as set forth above, shall have 100% replacement leaching fields at least equal in size to the original leaching fields, and the location of both the original and replacement leaching fields shall be designated on the site plan. Both the original and replacement fields shall be located so as to contain the percolation and deep test pits.

_____C. Soil Erosion and Sediment Control for Land Development:
Refer to Section 14AC of the East Haddam Zoning Regulations.

_____D. Protection of Surface and Ground Water Supply.
Refer to Section 14AD of the East Haddam Zoning Regulations.

_____E. Certificate for Community Wells.
Refer to Section 14AE of the East Haddam Zoning Regulations.

_____F. Inland/Wetlands and Watercourses.
Refer to Section 14AF of the East Haddam Zoning Regulations.

_____G. General Provisions.
Refer to Section 14AG of the East Haddam Zoning Regulations.

SECTION 14A - SITE PLAN REVIEW
SECTION 14A.3-G

G. In the case of a Site Plan Approval not requiring a Special Exception, the applicant shall submit three (3) complete sets of plans, as the same may have been modified by the Commission, at least one (1) of which shall be printed on mylar. **Final copies, including the mylar, shall have the approval letters of the Planning and Zoning Commission and Inland/Wetlands and Watercourses Commission printed on them.** Said sets shall be signed by the Chairman or Secretary of the Commission, and the mylar set retained by the Clerk of the Commission; the remaining sets shall be distributed to other officials of the Town who may require them.

SECTION 14B SPECIAL EXCEPTION
C. SUBMISSION OF APPLICATION

5.Endorsement and Filing. Within sixty-five (65) days of the Commission/Board approval, the applicant shall submit one (1) set of final plans on mylar, and two (2) printed sets reflecting all conditions or **letters of the Planning and Zoning Commission and Inland/Wetland and Watercourse Commission printed on them** and accompanied by signed, sworn statements of the applicant's land surveyor, engineer, architect, and any other professional who has participated in the preparation of the application materials, to the effect that the plans submitted are the same as those approved by the Commission, except for the depiction of modifications and conditions required by the Commission in approval vote.

STORM DRAINAGE ANALYSIS

FOR

THE LOFTS AT BLACK BIRCH
COMMUNITY CENTER REDEVELOPMENT

BANNER ROAD

IN

EAST HADDAM, CONNECTICUT

JUNE 20, 2021

Prepared by:

WMC
CONSULTING ENGINEERS
87 Holmes Road, Newington Connecticut 06111
(860) 667-9624



TABLE OF CONTENTS

Section	Page Number
Background……	1
Watershed Description……	1
Soil Conditions……	1
Existing Conditions……	1
Proposed Conditions……..	2
Computer Modeling (Hydraflow Hydrographs)……	3
Model Construction/Assumptions……..	3
Results……	4
Computer Modeling (HYDRAFLOW)……	5
Model Construction/Assumptions……..	5
Results…….	5
Stormwater Treatment……	6
Stormwater Management System Maintenance Program……...	6

LIST OF TABLES

Table 1. Existing Drainage Area Summary
Table 2. Proposed Drainage Area Summary
Table 3. Existing Points of Analysis Summary
Table 4. Proposed Points of Analysis Summary
Table 5. Proposed Catch Basin Drainage Area Summary

LIST OF FIGURES

Figure 1. Site Location Map

Figure 2. Flood Insurance Rate Map

Figure 3. Site Soils Classification Map

Figure 4. Existing Watershed Map - Hydrograph Analysis

Figure 5. Proposed Watershed Map - Hydrograph Analysis

Figure 6. Existing Watershed Map - Hydraflow Analysis

Figure 7. Proposed Watershed Map - Hydraflow Analysis

APPENDICES

Reference Tables, Charts, & Graphs……. Appendix A

Project Calculations / Assumptions……...…… Appendix B

Soils Survey.....……..…… Appendix B

Water Quality Flow.....……..……Appendix B

Time of Concentration……...…… Appendix B

Curve Number.....Appendix B

Hydrograph Model Results …….…….……Appendix C

Hydraflow Model Results ……Appendix D

BACKGROUND

The Banner Development and Black Birch Country Club are located on a 405.57 acre parcel of land that abuts Cherry Swamp Road to the north and intercepts Banner Road in East Haddam, Connecticut. (See Figure-1) The site is bordered by Cherry Swamp Road to the north, residential properties from the northeast to southeast, and woods to the south and west. The site is composed of a golf course, a core area of development, and wooded land. There are approximately 20.77 acres of wetlands scattered throughout the site and golf course.

Watershed: The subject site is located within the Moodus River (4710) sub-regional watershed, which is approximately 17.6 square miles in area. This sub-watershed is associated with the Salmon Regional Basin (47), which is approximately 148.7 square miles in area. The runoff from the subject area occurs via overland flow and channel flow through a pond (dammed) and into an intermittent watercourse, located west of the proposed core development area. According to the Flood Insurance Rate Map (FIRM), panel 09007C0164G, effective 08/28/08; the subject development area is not located within any area of potential flooding. (See Figure-2)

Soil Conditions: In review of the site soil types, identified in the Soil Survey of Middlesex County, the site development area is mostly composed of Udorthents – Urban Land Complex. These soils have been disturbed over the years due to the development and grading operations. Figure-3 shows the Soils Map of the site with the various soils classifications.

Existing Conditions: The Banner condominium complex is constructed adjacent to an 18-hole golf course centrally situated on a 405.57 acre parcel in East Haddam, Connecticut. The condominium complex is divided into four previously approved sections; Section A through Section D totaling 86 approved units. There are 48 units that currently occupy Sections A, B and C with access roads, parking areas, sidewalks and associated utility connections. Section D currently remains in disrepair but has been previously approved for renovation and infrastructure improvements and permitted by both Planning and Zoning and Inland Wetlands (Phase II Development Approved for 86 units in 2006). Subsequently in 2016, a Phase III Development proposal was approved for the maximum parcel build out for an additional 247 units (333 Total).

In order to analyze existing site conditions, two (2) points of analysis were considered in order to protect areas down gradient of the proposed development and to evaluate any increase in stormwater runoff offsite. For this analysis, the impervious surfaces and buildings from the development prior to their removal circa 2004 are shown as the 'existing condition'. As shown on Figure-4, the site was broken down into two sub-watersheds that are identified as sub-watersheds EXWS-30 and EXWS-40 which are described below:

- Sub-watershed EXWS-30 is an area which encompasses a large wooded portion of north-east corner of the property and adjacent property north of the Cherry Swamp Road. This area directs stormwater runoff via overland flow to a pond located at the central portion of the property.
- Sub-watershed EXWS-40 is an area which encompasses a majority of the infrastructure development associated with the pro shop, Sections A & B, the

community center, associated roadways and parking areas along with about a third of the golf course. The remaining area consists of a large wooded portion west of the golf course that directs runoff via overland flow to a wetland system and well defined channel directing flow offsite to the south identified as POA 1.

- Existing Pinehurst Lane is the site specific watershed area surrounding the community center that directs runoff to an existing drainage oufall (POA B) via subsurface stormwater collection system.

Proposed Conditions: The proposed development consists of the renovation of the existing community center into 20 individual one bedroom rental apartments along with reconstructing the parking lots south and east of the building. New drainage structures are proposed and will be connected to the existing subsurface stormwater collection system directed through Section B down Pinehurst Lane. The proposal will also include the construction of a new subsurface wastewater disposal system that will require permitting through the Department of Energy and Environmental Protection (DEEP), a new fire protection system, utility connections, landscaping, lighting and associated appurtenances. There is adequate water supply provide by CT Water. The parcel is approved for the maximum density permitted by the zoning regulations and the proposed 20 individual units will not adversely impact the maximum Phase III build out.

The same two (2) points of analysis were considered in order to protect areas down gradient of the proposed development and to evaluate any increase in stormwater runoff offsite. For this analysis, the net change in impervious surfaces and buildings from 2004 development were taken into consideration. As shown on Figure-5, the two sub-watersheds identified as sub-watersheds PRWS-30 and PRWS-40 are described below:

- Sub-watershed PRWS-30 is an area which encompasses a large wooded portion of north-east corner of the property and adjacent property north of the Cherry Swamp Road. This area directs stormwater runoff via overland flow to a pond located at the central portion of the property. This watershed remains unchanged
- Sub-watershed PRWS-40 is an area which encompasses a majority of the infrastructure development associated with the pro shop, Sections A & B, the community center renovation area, associated roadways and parking areas along with about a third of the golf course. The remaining area consists of a large wooded portion west of the golf course that directs runoff via overland flow to a wetland system and well defined channel directing flow offsite to the south identified as POA 1.
- Proposed Pinehurst Lane is the site specific watershed area surrounding the community center that directs runoff to POA B via subsurface stormwater collection system. The overall watershed has been slightly reduced along with an overall reduction in impervious surfaces due to the removal of the old buildings and parking lot.

COMPUTER MODELING (HYDRAFLOW HYDROGRAPHS)

A major element of this study was the watershed analysis utilizing the Computer Program Hydraflow Hydrographs, Version 2020. The Hydraflow Hydrograph model develops flood hydrographs from runoff and routes the flow through stream channels and reservoirs. Routed hydrographs are combined with those from tributaries to compute peak discharges, their times of occurrence and water surface elevations at any desired cross-section or structure.

Curve Numbers, Runoff coefficients, times of concentration and areas for each the sub-areas were input into the Computer Program Hydraflow Hydrographs, Version 2020. An Intensity-Duration-Frequency (IDF) curve was developed for (Moodus) Middlesex County using rainfall values from the National Oceanic and Atmospheric Administration NOAA Atlas 14; and used in this analysis. Five rainfall events (2-yr., 10-yr., 25-yr., 50-yr. and 100-yr.) using the IDF curve, were modeled for both existing and proposed conditions.

Model Construction/Assumptions:

The runoff to sub-watersheds was calculated using the SCS and Rational Method in which drainage areas, runoff coefficients, and time of concentrations are calculated as explained below.

Drainage Areas: The drainage areas were delineated based on a supplied site-specific topographical map.

Runoff Coefficients and Time of Concentration: The SCS unit hydrograph method uses the runoff curve number (CN) estimated based on land use and soil type. The Rational Method uses runoff coefficients (C-Values) based on land use. Land uses for the watersheds were classified as woods, grass, gravel and impervious based on survey, aerial map and field inspection. Soil types in the watershed were determined from the Connecticut Department of Environmental Protection GIS database of the NRCS soil survey for Middlesex County, Connecticut. The NRCS divides soils into four hydrologic groups: A, B, C, or D, depending on their infiltration capacity and ability to absorb water. Based on the soil types and land use, weighted curve number was developed for the watershed.

Times of concentration (Tc) were calculated based on procedure given in the ConnDOT Drainage Manual. Intensity-Duration-Frequency (IDF) curves were developed for Middlesex County for the design storm events and then were applied to the sub watersheds. Included in Appendix A is the IDF curve data. The runoff coefficients, times of concentration and travel times for each sub-area were determined and summarized on Table 1 and Table 2 as shown below:

Table 1 – Existing Drainage Area Summary

Sub Watershed	Area (acres)	CN / C-Value	Tc (min)
30	119.80	55	37
40	125.10	60	32
E Pinehurst	7.23	0.56	23

Table 2 – Proposed Drainage Area Summary

Sub Watershed	Area (acres)	CN / C-Value	Tc (min)
30	119.80	55	37
40	125.10	60	32
P Pinehurst	6.79	0.56	23

Results: The site has been designed with the intent to achieve a zero net increase in peak stormwater discharges. While there is a net increase in impervious surfaces to PRWS-40 from the 2004 'existing condition', there is no change in the resultant Curve Number to produce any measurable peak flow increase due to the large contributing watershed. To focus on the impact in the immediate vicinity of the proposed community center renovation, the related infrastructure improvements resulted in a net loss of impervious surface and overall contributing watershed directed to Pinehurst Lane drainage system, which in return resulted in a decrease in flow to the existing outfall location (POA B). Therefore, there are no adverse impacts downgradient of the development or to offsite properties. The results of the existing and proposed conditions hydrograph models are included in Appendix C and summarized in Tables 3 and 4 below, which indicate that the design goal was met for all storm events.

Table 3 – Existing Points of Analysis Summary (cfs)

Location	2-yr Storm	10-yr Storm	25-yr Storm	50-yr Storm	100-yr Storm
POA 1	29.50	109.62	173.02	231.07	347.29
POA B	8.79	13.57	16.03	17.96	19.85

Table 4 – Proposed Points of Analysis Summary (cfs)

Location	2-yr Storm	10-yr Storm	25-yr Storm	50-yr Storm	100-yr Storm
POA 1	29.50	109.62	173.02	231.07	347.29
POA B	8.25	12.74	15.06	16.87	18.64

COMPUTER MODELING (HYDRAFLOW MODEL)

The proposed drainage systems were analyzed in accordance with procedures outlined in the U.S. Department of Transportation USDOT, Hydraulic Engineering Circular No. 22.

The runoff to catch basins was calculated using the Rational Method in which drainage areas, runoff coefficients, and time of concentrations are calculated as explained below.

Drainage Areas: The drainage areas were delineated based on a supplied site-specific topographical map. A summary of the drainage areas for the storm drainage structures is included in Table 6 in Appendix D.

Runoff Coefficient and Time of Concentration: The runoff coefficient (C) was based on land use and times of concentrations (Tc) were calculated based on runoff length and slope using the Seelye Chart. Intensity-Duration-Frequency (IDF) curves were developed for Middlesex County for the 10- and 25-year storm events and then were applied to the sub watersheds. Included in Appendix A is the IDF curve data. A table showing the proposed catch basin summary is included in Appendix B.

Model Construction/Assumptions:

The catch basins were evaluated using Hydraflow Storm Sewers version 2020, approved by the Connecticut Department of Transportation. Flows into the catch basins were obtained from the rational method, as previously discussed, which were then used to determine and evaluate the adequate size of the pipes connecting the catch basins from one to the other.

In order to successfully run Hydraflow, a starting hydraulic grade line (HGL), or tailwater elevation must be computed and entered into the model. The tailwater elevation is determined by: the average summation of the (critical depth of the pipe + the pipe diameter) + the downstream invert of the outlet to the drainage system. In the proposed model, the critical elevation of the discharge pipe was used, as computed by the Hydraflow software. Included in Appendix D is the output and Hydraulic Grade Line analysis from Hydraflow for the proposed systems.

Results: The results of the analysis indicate that the pipes are adequate to convey a 10-year design storm. All proposed manholes and catch basins are to be ConnDOT approved. Reinforced Concrete Pipe (RCP) or High Density Polyethylene Pipe (HDPE) was used throughout the site. The minimum cover (30 inches) is provided over all drainage pipes within a traffic bound surface and 18 inches in all grassed areas.

STORMWATER TREATMENT

Stormwater quality has plagued our rivers and streams for a number of years. New state and federal regulations are requiring towns to implement town-wide regulations for the removal of total suspended solids (TSS); typically this removal efficiency is 80 percent. As part of this project, Stormwater treatment practices include deep sump catch basins and a Hydrodynamic Stormwater Separator designed to treat the proposed parking lot surfaces. These Stormwater treatment devices are also known as Best Management Practices (BMPs).

STORMWATER MANAGEMENT SYSTEM MAINTENANCE PROGRAM

- **Pollution Prevention Team -** The owner and/or operator must designate a pollution prevention team consisting of personnel, at least one of whom must be available to work at the site on an 'as needed' basis along with regularly scheduled maintenance. This team will carry out all aspects of the stormwater management measures.

- **Sweeping** - All parking areas, sidewalks, driveways and other impervious surfaces (except roofs) shall be swept clean of sand, litter and any other possible pollutants at least twice a year, once between November 15 and December 15 (after leaf fall) and once during the month of April (after snow melt) and at other times as may be necessary.

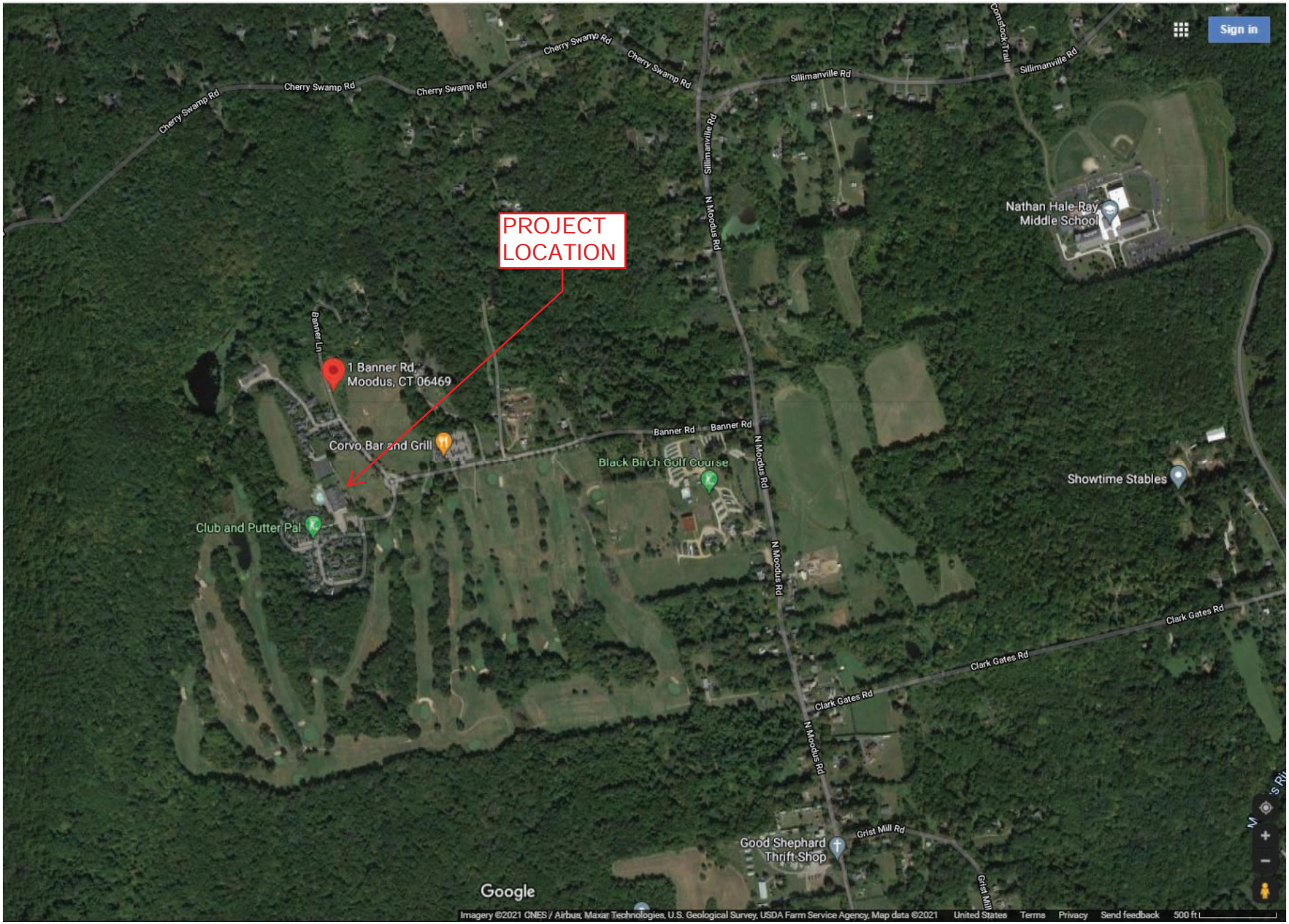
- **Drainage Systems -** All catch basins, manholes, stormwater treatment devices and detention structures shall be inspected and cleaned at least twice a year, once between November 15 and December 15 (after leaf fall) and once during the month of April (after snow melt) and at other times as may be necessary.

    - **Comprehensive Annual Stormwater Evaluation and Inspection-** once a year, a member of the Pollution Prevention Team will conduct a Comprehensive Annual Stormwater Evaluation and Inspection. All aspects of the stormwater collection and/or treatment system will be inspected for consistency with the Stormwater Management Plan. A report of the results of this inspection shall be prepared and a copy maintained on site.

CONCLUSION

Based on the foregoing drainage analysis, no health or safety impacts will result from the proposed redevelopment of the Community Center building.

FIGURES



LOFTS AT BLACK BIRCH COUNTRY CLUB
BANNER COMMUNITY CENTER REDEVELOPMENT
FIGURE-1

National Flood Hazard Layer FIRMette

FEMA

72°28'2"W 41°31'9"N



72°27'25"W 41°30'42"N

Feet 1:6,000

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

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

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
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 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 5/11/2021 at 3:16 PM 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.

FIGURE-2

Soil Map—State of Connecticut
(THE LOFTS AT BLACK BIRCH)



Map Scale: 1:3,660 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

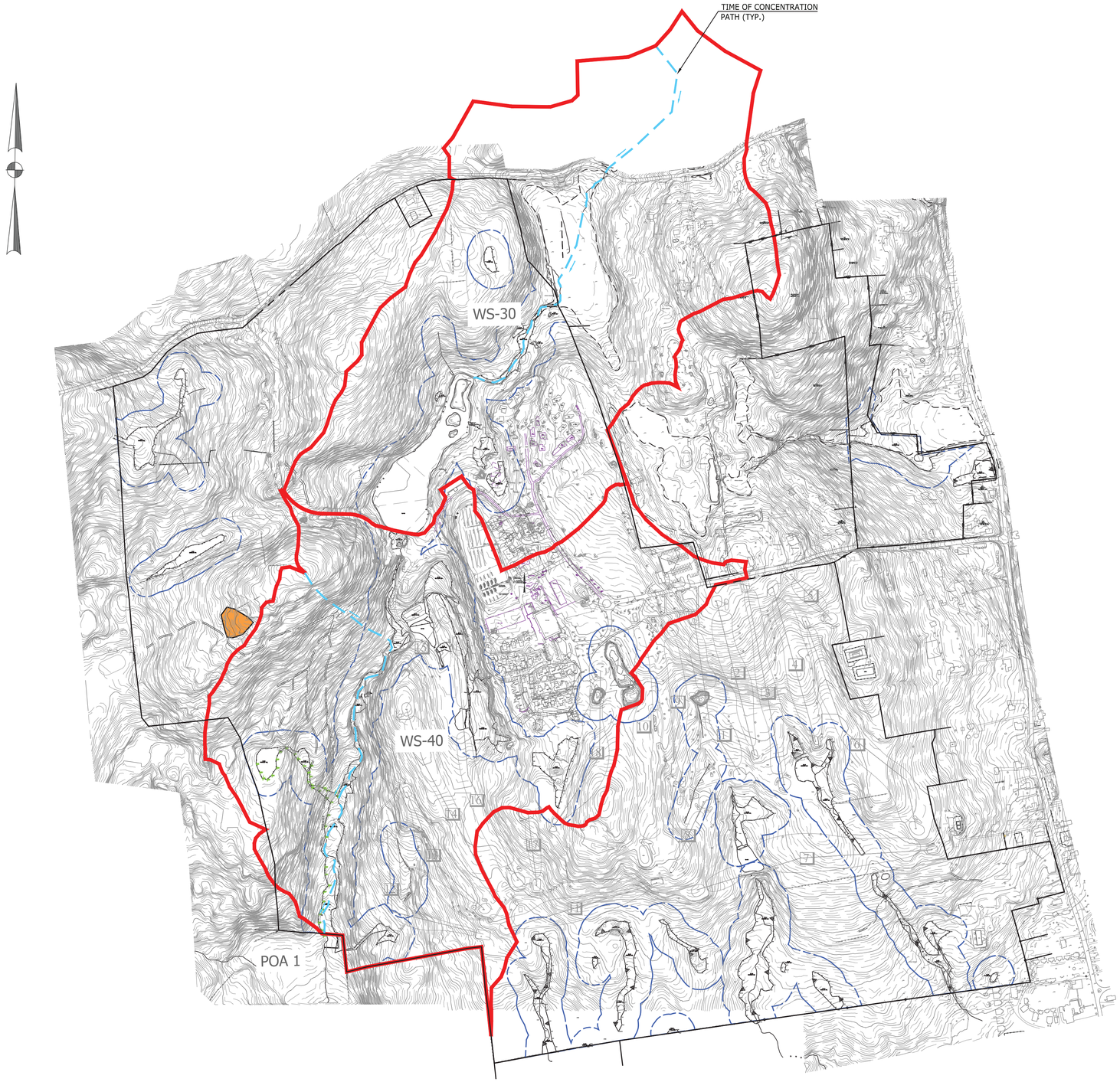
Feet
0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

USDA **Natural Resources Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

5/11/2021
FIGURE-3



GRAPHIC SCALE

350 0 175 350 700 1400

(IN FEET)
1 inch = 350 ft.

EXISTING WATERSHED BOUNDARY

WS EXISTING WATERSHED

POA POINT OF ANALYSIS

TIME OF CONCENTRATION

NO.	DATE	DESCRIPTION

REVISIONS

SUPV.	S.R.M.
DESIGN	R.E.B.
DRAWN	R.E.B.
CHECKED	S.R.M.
DATE	06/03/21

SCALE
1" = 350'

WMC
CONSULTING ENGINEERS
• WENGELL, McDONNELL & COSTELLO •
87 HOLMES ROAD
NEWINGTON, CT 06111
(860) 667-9624

PREPARED FOR
LOFTS AT BLACK BIRCH LLC.
1 BANNER ROAD
EAST HADDAM, CT 06423

EXISTING WATERSHED MAP HYDROGRAPHS
COMMUNITY CENTER REDEVELOPMENT
BANNER LANE - EAST HADDAM, CONNECTICUT

SIZE	PROJECT	FILE NAME	NUMBER	REV.	SHEET OF	
D	BLACK BIRCH APTS	07056.3 PD	07056.30			FIGURE-4



GRAPHIC SCALE

350 0 175 350 700 1400

(IN FEET)
1 inch = 350 ft.

EXISTING WATERSHED BOUNDARY

WS EXISTING WATERSHED

POA POINT OF ANALYSIS

TIME OF CONCENTRATION

NO.	DATE	DESCRIPTION

REVISIONS

SUPV.	S.R.M.
DESIGN	R.E.B.
DRAWN	R.E.B.
CHECKED	S.R.M.
DATE	06/03/21

SCALE
1" = 350'

WMC
CONSULTING ENGINEERS

• WENGELL, McDONNELL & COSTELLO •
87 HOLMES ROAD
NEWINGTON, CT 06111
(860) 667-9624

PREPARED FOR
LOFTS AT BLACK BIRCH LLC.
1 BANNER ROAD
EAST HADDAM, CT 06423

PROPOSED WATERSHED MAP - HYDROGRAPHS
COMMUNITY CENTER REDEVELOPMENT
BANNER LANE - EAST HADDAM, CONNECTICUT

SIZE	PROJECT	FILE NAME	NUMBER	REV.	SHEET
D	BLACK BIRCH APTS	07056.3 PD	07056.30		OF FIGURE-5

COUNTRY CLUB LANE

BANNER LANE

BANNER ROAD

Pinehurst Lane

Augusta D

OVERALL CONTRIBUTING WATERSHED TO EXISTING OUTFALL (CIRCA 2004) BEFORE THE FUNCTION HALL UPDATES AND REMOVAL OF ADJACENT BUILDINGS/PARKING LOT

TIME OF CONCENTRATION Tc PATH (TYP.)

IMPERVIOUS SURFACES (CIRCA 2004) SINCE REMOVED (TYP.)

POOL/PATIO

PATIO

FUNCTION HALL

PUMP HOUSE

PRO SHOP

SECTION A

SECTION B

POINT OF ANALYSIS "B"

GRAPHIC SCALE

(IN FEET)
1 inch = 40 ft.

NO.	DATE	DESCRIPTION
		REVISIONS

SUPV.	S.R.M.
DESIGN	R.E.B.
DRAWN	R.E.B.
CHECKED	S.R.M.
DATE	06/03/21

SCALE
1" = 40'

WMC
CONSULTING ENGINEERS
• WENGELL, McDONNELL & COSTELLO •
87 HOLMES ROAD
NEWINGTON, CT 06111
(860) 667-9624

PREPARED FOR
LOFTS AT BLACK BIRCH LLC.
1 BANNER ROAD
EAST HADDAM, CT 06423

EXISTING WATERSHED MAP HYDRAFLOW
COMMUNITY CENTER REDEVELOPMENT
BANNER LANE - EAST HADDAM, CONNECTICUT

SIZE	PROJECT	FILE NAME	NUMBER	REV.	SHEET OF	FIGURE-6
D	BLACK BIRCH APTS	07056.3 PD	07056.30			

COUNTRY CLUB LANE

TIME OF CONCENTRATION
Tc PATH (TYP.)

EXCB7

PCB3

BANNER LANE

PCB5

PCB4

POOL

EX6A

EX6R

PCB2R

PCB2

EXCB8

PRO SHOP

BANNER ROAD

EXCB1

EXCB2

SECTION B

PCB1

EXCB6

POINT OF ANALYSIS
"B"

Pinehurst Lane

EXCB3

EXCB5

SECTION A

EXCB4

Augusta D

GRAPHIC SCALE
40 0 20 40 80 160
(IN FEET)
1 inch = 40 ft.

NO.	DATE	DESCRIPTION
		REVISIONS

SUPV.	S.R.M.
DESIGN	R.E.B.
DRAWN	R.E.B.
CHECKED	S.R.M.
DATE	06/03/21

SCALE
1" = 40'

WMC
CONSULTING ENGINEERS
• WENGELL, McDONNELL & COSTELLO •
87 HOLMES ROAD
NEWINGTON, CT 06111
(860) 667-9624

PREPARED FOR
LOFTS AT BLACK BIRCH LLC.
1 BANNER ROAD
EAST HADDAM, CT 06423

EXISTING WATERSHED MAP HYDRAFLOW
COMMUNITY CENTER REDEVELOPMENT
BANNER LANE - EAST HADDAM, CONNECTICUT

SIZE	PROJECT	FILE NAME	NUMBER	REV.	SHEET OF
D	BLACK BIRCH APTS	07056.3 PD	07056.30		FIGURE-7

APPENDIX A

REFERENCE TABLES, CHARTS, & GRAPHS

Soil Map—State of Connecticut
(THE LOFTS AT BLACK BIRCH)



Map Scale: 1:3,660 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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 1:12,000.

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: State of Connecticut
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Sep 3, 2019—Oct 22, 2019

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
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	1.8	2.7%
4	Leicester fine sandy loam	5.9	8.7%
13	Walpole sandy loam, 0 to 3 percent slopes	0.0	0.0%
50B	Sutton fine sandy loam, 3 to 8 percent slopes	10.4	15.4%
57B	Gloucester gravelly sandy loam, 3 to 8 percent slopes	5.1	7.5%
57C	Gloucester gravelly sandy loam, 8 to 15 percent slopes	4.2	6.2%
57D	Gloucester gravelly sandy loam, 15 to 25 percent slopes	1.1	1.6%
59D	Gloucester gravelly sandy loam, 15 to 35 percent slopes, extremely stony	2.2	3.2%
62D	Canton and Charlton fine sandy loams, 15 to 35 percent slopes, extremely stony	3.3	4.8%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	6.6	9.7%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	0.6	0.8%
306	Udorthents-Urban land complex	26.6	39.3%
Totals for Area of Interest		**67.7**	**100.0%**

NOAA Atlas 14, Volume 10, Version 3
Location name: Moodus, Connecticut, USA*
Latitude: 41.5154°, Longitude: -72.462°
Elevation: 357.62 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.333 (0.258-0.417)	0.403 (0.311-0.505)	0.517 (0.399-0.650)	0.611 (0.468-0.772)	0.741 (0.550-0.975)	0.839 (0.611-1.13)	0.941 (0.666-1.31)	1.06 (0.709-1.49)	1.22 (0.790-1.78)	1.36 (0.858-2.02)
10-min	0.472 (0.365-0.591)	0.571 (0.441-0.715)	0.732 (0.563-0.920)	0.865 (0.663-1.09)	1.05 (0.779-1.38)	1.19 (0.865-1.59)	1.33 (0.944-1.85)	1.50 (1.00-2.12)	1.73 (1.12-2.53)	1.92 (1.22-2.86)
15-min	0.555 (0.429-0.695)	0.671 (0.518-0.841)	0.860 (0.663-1.08)	1.02 (0.779-1.29)	1.23 (0.916-1.62)	1.40 (1.02-1.88)	1.57 (1.11-2.18)	1.76 (1.18-2.49)	2.03 (1.32-2.97)	2.26 (1.43-3.36)
30-min	0.761 (0.589-0.953)	0.920 (0.711-1.15)	1.18 (0.908-1.48)	1.40 (1.07-1.76)	1.69 (1.26-2.23)	1.91 (1.39-2.57)	2.15 (1.52-2.98)	2.41 (1.62-3.41)	2.79 (1.80-4.07)	3.09 (1.96-4.60)
60-min	0.967 (0.748-1.21)	1.17 (0.903-1.47)	1.50 (1.15-1.88)	1.77 (1.36-2.24)	2.15 (1.60-2.83)	2.43 (1.77-3.26)	2.73 (1.93-3.79)	3.06 (2.06-4.33)	3.54 (2.29-5.17)	3.93 (2.48-5.84)
2-hr	1.29 (1.00-1.60)	1.54 (1.20-1.92)	1.96 (1.52-2.44)	2.30 (1.78-2.89)	2.78 (2.08-3.64)	3.14 (2.30-4.18)	3.52 (2.51-4.86)	3.95 (2.67-5.55)	4.59 (2.99-6.65)	5.13 (3.25-7.56)
3-hr	1.50 (1.18-1.86)	1.80 (1.41-2.23)	2.28 (1.78-2.83)	2.68 (2.08-3.34)	3.22 (2.43-4.20)	3.63 (2.68-4.83)	4.07 (2.92-5.60)	4.58 (3.10-6.39)	5.33 (3.47-7.68)	5.97 (3.80-8.75)
6-hr	1.93 (1.53-2.38)	2.31 (1.82-2.84)	2.92 (2.30-3.60)	3.43 (2.69-4.25)	4.13 (3.13-5.34)	4.65 (3.46-6.14)	5.21 (3.77-7.12)	5.87 (3.99-8.12)	6.85 (4.48-9.78)	7.68 (4.90-11.2)
12-hr	2.41 (1.92-2.94)	2.89 (2.30-3.52)	3.67 (2.92-4.49)	4.32 (3.41-5.32)	5.21 (3.99-6.69)	5.88 (4.40-7.69)	6.59 (4.80-8.94)	7.43 (5.08-10.2)	8.69 (5.70-12.3)	9.76 (6.24-14.0)
24-hr	2.83 (2.28-3.42)	3.42 (2.76-4.15)	4.40 (3.53-5.34)	5.21 (4.15-6.36)	6.32 (4.88-8.05)	7.14 (5.40-9.29)	8.03 (5.90-10.8)	9.11 (6.25-12.4)	10.7 (7.06-15.0)	12.1 (7.78-17.3)
2-day	3.15 (2.57-3.79)	3.87 (3.14-4.65)	5.04 (4.08-6.08)	6.01 (4.83-7.28)	7.34 (5.72-9.31)	8.32 (6.35-10.8)	9.40 (6.98-12.7)	10.7 (7.40-14.5)	12.8 (8.46-17.8)	14.6 (9.41-20.6)
3-day	3.42 (2.80-4.09)	4.20 (3.43-5.03)	5.47 (4.46-6.57)	6.53 (5.28-7.88)	7.99 (6.25-10.1)	9.06 (6.95-11.7)	10.2 (7.63-13.7)	11.7 (8.09-15.7)	14.0 (9.26-19.3)	16.0 (10.3-22.4)
4-day	3.66 (3.01-4.37)	4.49 (3.69-5.36)	5.85 (4.78-7.00)	6.97 (5.66-8.38)	8.51 (6.68-10.7)	9.65 (7.42-12.4)	10.9 (8.15-14.6)	12.4 (8.62-16.6)	14.9 (9.86-20.5)	17.0 (11.0-23.8)
7-day	4.37 (3.62-5.18)	5.29 (4.38-6.28)	6.80 (5.60-8.09)	8.05 (6.59-9.63)	9.78 (7.72-12.2)	11.0 (8.54-14.1)	12.4 (9.32-16.4)	14.1 (9.83-18.8)	16.8 (11.2-22.9)	19.1 (12.3-26.4)
10-day	5.07 (4.22-5.99)	6.05 (5.03-7.16)	7.65 (6.33-9.07)	8.98 (7.38-10.7)	10.8 (8.56-13.4)	12.2 (9.42-15.4)	13.6 (10.2-17.8)	15.4 (10.7-20.3)	18.1 (12.0-24.5)	20.3 (13.2-28.1)
20-day	7.29 (6.12-8.54)	8.34 (7.00-9.79)	10.1 (8.42-11.9)	11.5 (9.55-13.6)	13.5 (10.8-16.5)	15.0 (11.6-18.6)	16.5 (12.4-21.2)	18.3 (12.8-23.8)	20.7 (13.9-27.9)	22.7 (14.8-31.1)
30-day	9.15 (7.74-10.7)	10.3 (8.65-12.0)	12.1 (10.1-14.1)	13.5 (11.3-15.9)	15.6 (12.5-18.9)	17.2 (13.4-21.1)	18.8 (14.0-23.7)	20.4 (14.4-26.5)	22.7 (15.2-30.2)	24.4 (15.9-33.1)
45-day	11.5 (9.76-13.3)	12.6 (10.7-14.7)	14.5 (12.3-16.9)	16.1 (13.5-18.8)	18.2 (14.6-21.9)	19.9 (15.5-24.3)	21.5 (16.0-26.9)	23.1 (16.4-29.7)	25.1 (16.9-33.2)	26.5 (17.3-35.8)
60-day	13.4 (11.5-15.6)	14.6 (12.5-17.0)	16.6 (14.1-19.3)	18.2 (15.3-21.2)	20.4 (16.4-24.4)	22.2 (17.3-26.9)	23.8 (17.8-29.5)	25.3 (18.0-32.5)	27.1 (18.4-35.8)	28.4 (18.6-38.1)

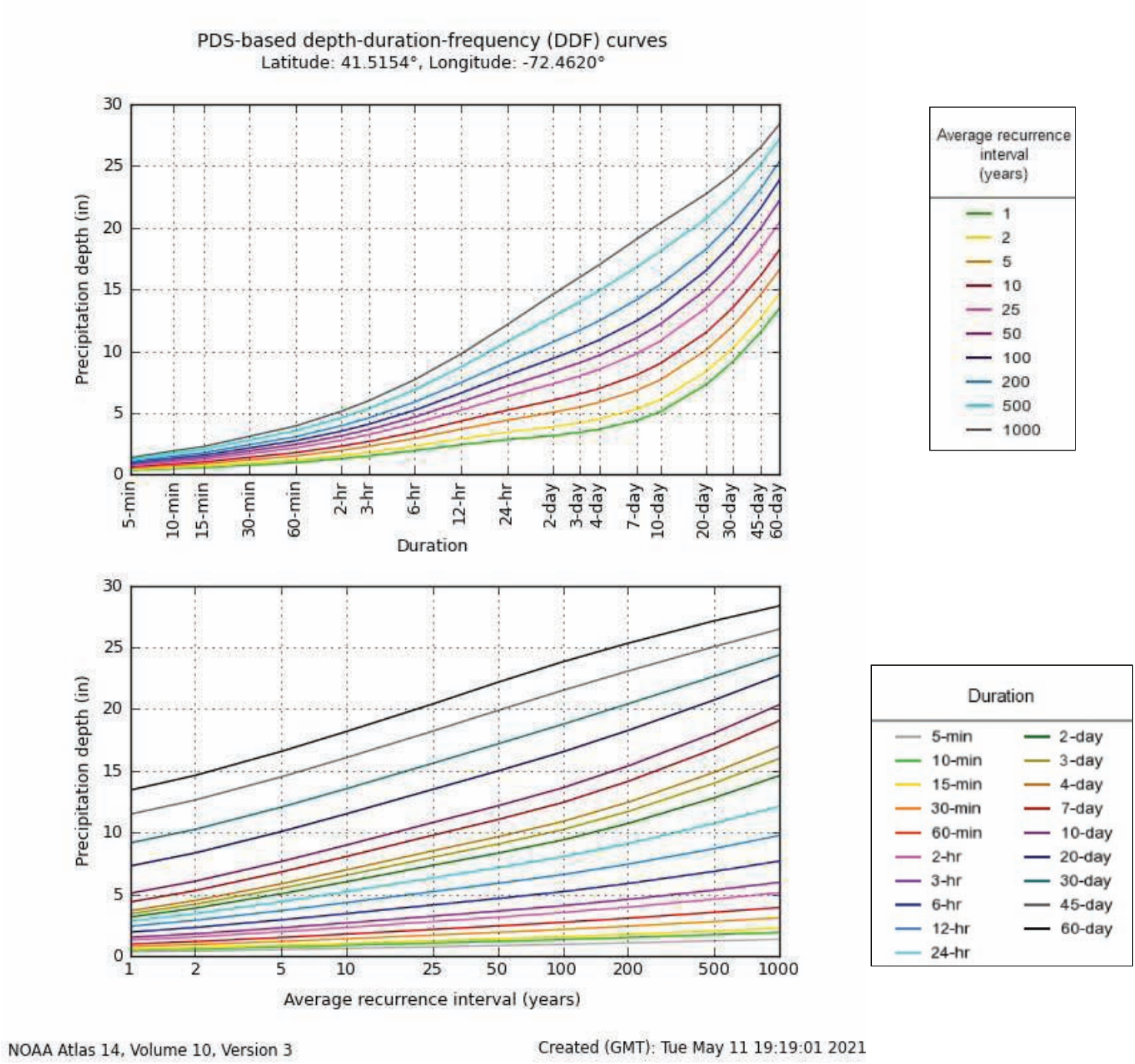
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



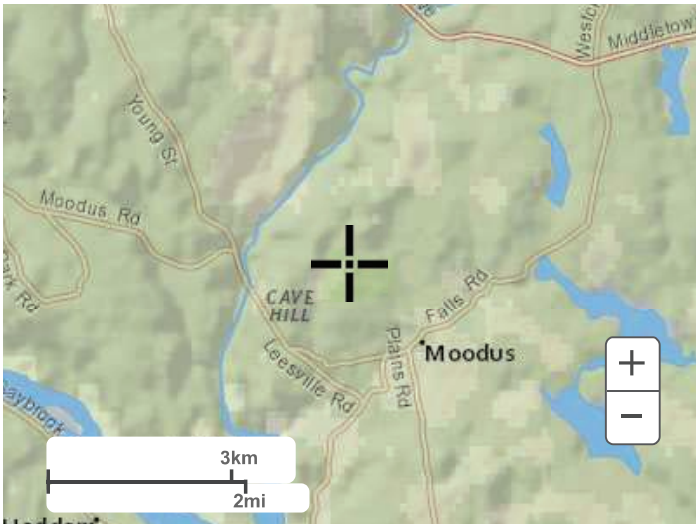
NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Tue May 11 19:19:01 2021

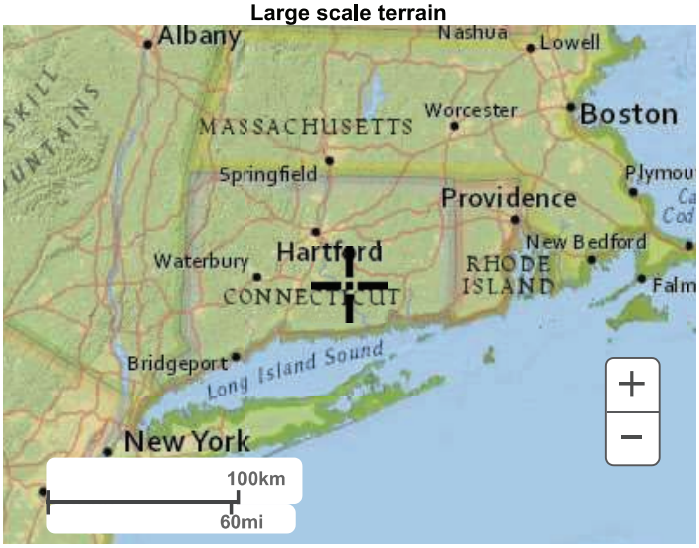
Back to Top

Maps & aerials

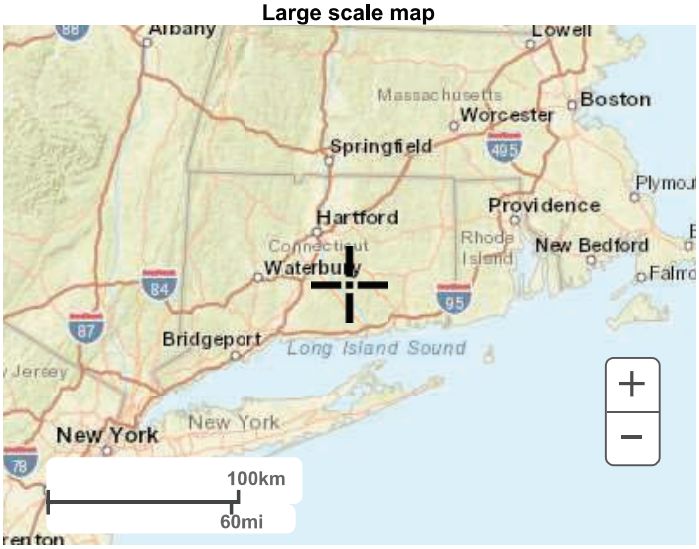
Small scale terrain



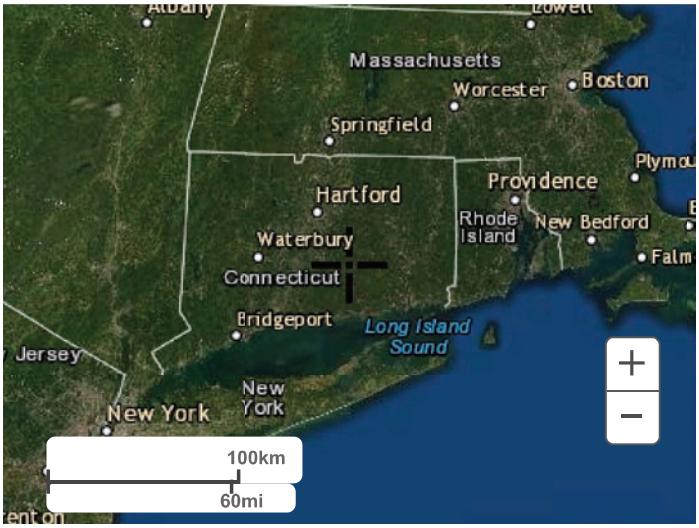
Large scale terrain



Large scale map



Large scale aerial



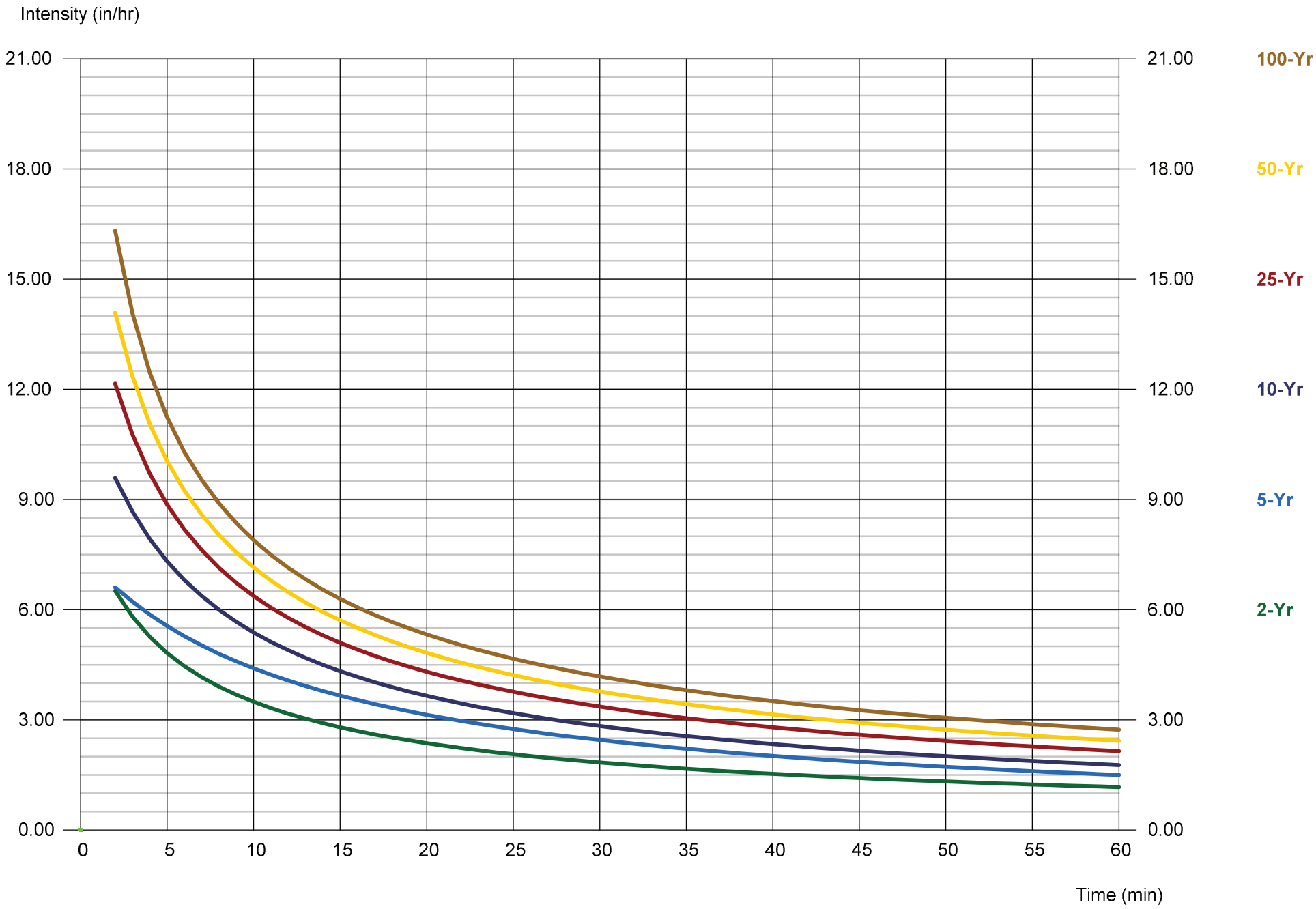
Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Hydraflow IDF Curves

IDF file: Middlesex.idf



APPENDIX B

PROJECT CALCULATIONS / ASSUMPTIONS

Banner Commnunity Center Renovation Drainage Analysis
East Haddam, Connecticut
WMC Job Number: 07056.10

Date: 6/20/2021
Calculated By: REB
Checked By:

TABLE 5
Proposed Summary of Catchment System (Pinehurst Lane)

SUBAREA	TOTAL AREA (S.F.)	TOTAL AREA AC.	PAVED AREA (S.F.)	GRASS AREA (S.F.)	COMPOSITE C-VALUE	ESTIMATED Tc (MIN)
EXCB1	22550	0.52	9000	13550	0.54	15
EXCB2	69330	1.59	23000	46330	0.50	20
EXCB3	16060	0.37	8500	7560	0.62	10
EXCB4	34165	0.78	18000	16165	0.62	15
EXCB5	2430	0.06	1500	930	0.67	5
EXCB6	15140	0.35	9100	6040	0.66	10
EX6A	14665	0.34	14665	0	0.70	5
EX6R	6650	0.15	6650	0	0.90	5
EXCB7	25360	0.58	0	25360	0.30	20
EXCB8	2000	0.05	0	2000	0.30	10
PCB1	17350	0.40	7900	9450	0.57	10
PCB2	6980	0.16	4000	2980	0.64	5
PCB2R	6650	0.15	6650	0	0.90	5
PCB3	19400	0.45	1285	18115	0.34	20
PCB4	17600	0.40	7000	10600	0.54	10
PCB5	19460	0.45	11450	8010	0.65	10

Assumed Impervious C-value = 0.9
Assumed Paver C-value = 0.7
Assumed Non-Impervious C-value = 0.3
Time of Concentration estimated using Seelye Chart for overland flow.
Catchment systems coordinate with Hydraflow Models.

WMC
CONSULTING ENGINEERS

Project: Banner Community Center Redvelopment Project No.: 07056.10
Location: East Haddam, CT
Calc By: REB Date: 6/20/2021

STORMWATER CALCULATIONS

Purpose: To calculate the first flush runoff flow rate (WQF) over a given site area. In this situation the Water Quality Volume (WQV) to be analyzed is the runoff produced by the first 1" of rainfall.

Reference: United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual
2004 Connecticut Stormwater Quality Manual

Given:

Structure Name	A (acres)	Runoff Coefficient	Area Imp (ac)	Area Perv (ac)	Tc (min)	Tc (hr)
SWQU-1	2.64	0.50	0.88	1.76	23	0.38

*Assumes pervious runoff coefficent of 0.3 and 0.90 for impervious areas.

Procedure: The Water Quality Flow (WQF) is calculated using the Water Quality Volume (WQV) as described in the 2004 Connecticut Stormwater Quality Manual.

1) Compute WQV in watershed inches using the following equation:

WQV = (P * R * A) / 12

where: WQV = water quality volume (ac-ft)
P = design precipitation (inches) = (1" for water quality storm)
R = volumetric runoff coefficient = 0.05 + 0.009(I)
I = percent impervious cover

Structure Name	Percent Imp (%)	R	P (in)	WQV (ac-ft)
SWQU-1	33	0.350	1.00	0.077

2) Compute the NRCS Runoff Curve Number (CN) using the following equation, or graphically using Figure 2-1 from TR-55 (USDA, 1986)

$$CN = \frac{1000}{[10+5P+10Q - 10(Q^2+1.25QP)^{.5}]}$$

where: CN = Runoff Curve Number
P = design precipitation (inches) = (1" for water quality storm)
Q = runoff depth (watershed inches) = [WQV x 12(in/ft)] / area(ac)

Structure Name	Q (in)	CN
SWQU-1	0.35	91

3) Using computed CN, read initial abstraction (Ia) from Table 4-1 in Chapter 4 of TR-55: compute Ia/P, interpolating when appropriate

Structure Name	Ia (in)	Ia/P
SWQU-1	0.198	0.198

4) Read the unit peak discharge (qu) from Exhibit 4-III in Chapter 4 of TR-55 for appropriate tc for Type III rainfall distribution.

Structure Name	Tc (hr)	Ia/P	qu (csm/in)
SWQU-1	0.38333333	0.198	420

5) Substituting WQV (watershed inches) for runoff depth (Q), compute the water quality flow (WQF) from the following equation:

WQF = (qu) * (A) * (Q)

where: WQF = water quality flow (cfs)
qu = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)

Structure Name	qu (csm/in)	A (mi^2)	Q (in)	WQF (cfs)
SWQU-1	420	0.004118	0.35	0.61

2. Compute the time of concentration (t_c) based on the methods described in Chapter 3 of TR-55. A minimum value of 0.167 hours (10 minutes) should be used. For sheet flow, the flow path should not be longer than 300 feet.

3. Using the computed CN, t_c, and drainage area (A) in acres, compute the peak discharge for the water quality storm (i.e., the water quality flow [WQF]), based on the procedures described in Chapter 4 of TR-55.

   - *Read initial abstraction (I_a) from Table 4-1 in Chapter 4 of TR-55 (reproduced below); compute I_a/P*

Table 4-1 I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)	Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	55	1.636	70	0.857	85	0.353
41	2.878	56	1.571	71	0.817	86	0.326
42	2.762	57	1.509	72	0.778	87	0.299
43	2.651	58	1.448	73	0.740	88	0.273
44	2.545	59	1.390	74	0.703	89	0.247
45	2.444	60	1.333	75	0.667	90	0.222
46	2.348	61	1.279	76	0.632	91	0.198
47	2.255	62	1.226	77	0.597	92	0.174
48	2.167	63	1.175	78	0.564	93	0.151
49	2.082	64	1.125	79	0.532	94	0.128
50	2.000	65	1.077	80	0.500	95	0.105
51	1.922	66	1.030	81	0.469	96	0.083
52	1.846	67	0.985	82	0.439	97	0.062
53	1.774	68	0.941	83	0.410	98	0.041
54	1.704	69	0.899	84	0.381		

   - *Read the unit peak discharge (q_u) from Exhibit 4-III in Chapter 4 of TR-55 (reproduced below) for appropriate t_c*

Exhibit 4-111 Unit peak discharge (q_u) for NRCS (SCS) type III rainfall distribution

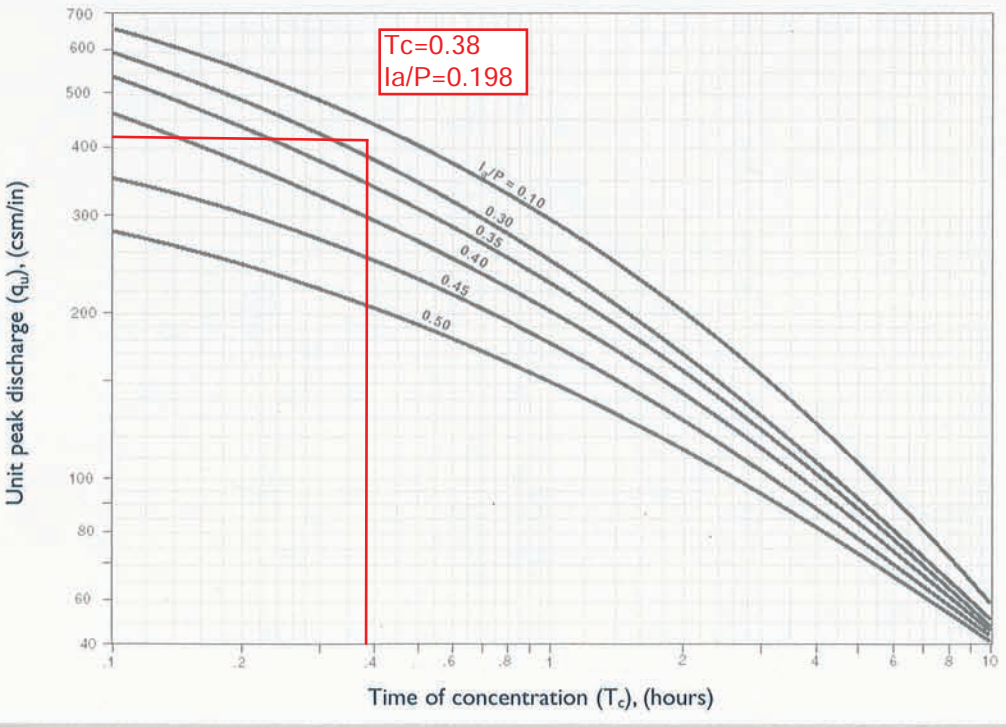


TABLE 2 - PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS

Maximum WQF (cfs)	Product Model								
	Downstream Defender	***Flogard***	***High Eff. CDS***	***Hydroguard***	***Stormceptor OSR***	***Stormceptor STC***	***Vortechs***	***Vortsentry***	***V2B1***
0.4	4-ft	DVS-36	2015-4G; 2015-4	HG 4	065	450	1000	VS30	2
0.5	4-ft	DVS-36	2015-4G; 2015-4	HG 4	065	900	1000	VS30	2
0.6	4-ft	DVS-36	2015-4G; 2015-4	HG 4	065	900	1000	VS40	2
0.7	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	900	1000	VS40	2
0.8	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	900	1000	VS40	2
0.9	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	1200	1000	VS40	3
1.0	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	1800	1000	VS40	3
1.1	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	1800	1000	VS40	4
1.2	6-ft	DVS-48	2015	HG 5	140	2400	1000	VS50	4
1.3	6-ft	DVS-60	2015	HG 5	140	2400	1000	VS50	4
1.4	6-ft	DVS-60	2015	HG 5	140	2400	2000	VS50	4
1.5	6-ft	DVS-60	2020	HG 5	140	2400	2000	VS50	6
1.6	6-ft	DVS-60	2020	HG 5	140	2400	2000	VS50	6
1.7	6-ft	DVS-60	2020	HG 5	250	2400	2000	VS50	6
1.8	6-ft	DVS-60	2020	HG 6	250	2400	2000	VS50	7
1.9	6-ft	DVS-60	2020	HG 6	250	3600	2000	VS60	7
2.0	6-ft	DVS-60	2020	HG 6	250	3600	2000	VS60	7
2.1	6-ft	DVS-60	2020	HG 6	250	3600	2000	VS60	9
2.2	6-ft	DVS-72	2025	HG 6	250	3600	2000	VS60	8
2.3	6-ft	DVS-72	3020, 3020-D	HG 6	250	3600	2000	VS60	8
2.4	6-ft	DVS-72	3035; 3035-D	HG 6	250	4800	2000	VS60	8
2.5	6-ft	DVS-72	3035; 3035-D	HG 6	250	4800	3000	VS60	10
2.6	6-ft	DVS-72	3035; 3035-D	HG 6	250	4800	3000	VS60	11
2.7	6-ft	DVS-72	3035; 3035-D	HG 7	250	4800	3000	VS60	11
2.8	6-ft	DVS-72	3035; 3035-D	HG 7	250	4800	3000	VS70	11
2.9	6-ft	DVS-72	3035; 3035-D	HG 7	250	4800	3000	VS70	12
3.0	6-ft	DVS-72	3035; 3035-D	HG 7	390	4800	3000	VS70	12

TIME OF CONCENTRATION COMPUTATIONS

Time of Concentration Worksheet

Project:	Community Center Renovation	By:	REB	Date:	6/20/2021
Location:	EXWS30	Checked:		Date:	

Check one: ☑ Present ☐ Developed
Check one: ☑ English Units ☐ Metric Units

Sheet flow (Applicable to T_c only)

			Segment ID				
			1				
1	Surface description (Table 6.C.1)		light underbrush				
2	Manning's roughness coeff., n (Table 6.C.1)		0.400		0.000		
3	Flow length, L (See Section 6.C.4)	ft	150				
4	Two-yr 24-hr rainfall, P_2 (Table B-1)	in	3.4		3.4		
5	Land slope, s	ft/ft	0.040				
6	Travel Time, T_t (Equation 6.C.2)	hr	0.36	+	0.00	=	0.36

Shallow concentrated flow

			Segment ID				
			2				
7	Surface description (paved or unpaved)		unpaved				
8	Flow length, L	ft	1175				
9	Watercourse slope, s	ft/ft	0.070				
10	Average velocity, V (Equation 6.C.4 or 6.C.5)	ft/s	4.3		0.0		
11	Travel Time, T_t (Equation 6.C.3)	hr	0.08	+	0.00	=	0.08

Channel flow

			Segment ID				
			3		4		
12	Cross sectional flow area, a	ft^2	604.00		6.25		
13	Wetted perimeter, p_w	ft	305.66		15.10		
14	Hydraulic radius, $r=a/p_w$	ft	1.98		0.41		
15	Channel slope, s	ft/ft	0.004		0.013		
16	Manning's roughness coeff., n (Table 7-1 & Append. A, Ch. 8)		0.050		0.050		
17	Average velocity, v (Equation 6.C.6)	ft/s	3.0		1.9		
18	Flow length, L	ft	560		800		
19	Travel Time, T_t (Equation 6.C.3)	hr	0.06	+	0.12	=	0.18

Time of Concentration = 0.62 hours
= 37 minutes

WMC Consulting Engineers
Newington, CT
(860)667-9624

Time of Concentration Worksheet

Project:	Community Center Renovation	By:	REB	Date:	6/20/2021
Location:	EXWS40	Checked:		Date:	

Check one: ☑ Present ☐ Developed
Check one: ☑ English Units ☐ Metric Units

Sheet flow (Applicable to T_c only)

		Segment ID	1					
1	Surface description (Table 6.C.1)	Dense Woods						
2	Manning's roughness coeff., n (Table 6.C.1)		0.800		0.000			
3	Flow length, L (See Section 6.C.4)	ft	100					
4	Two-yr 24-hr rainfall, P_2 (Table B-1)	in	3.4		3.4			
5	Land slope, s	ft/ft	0.050					
6	Travel Time, T_t (Equation 6.C.2)	hr	0.42	+	0.00	=	0.42	

Shallow concentrated flow

		Segment ID	2					
7	Surface description (paved or unpaved)		unpaved					
8	Flow length, L	ft	890					
9	Watercourse slope, s	ft/ft	0.180					
10	Average velocity, V (Equation 6.C.4 or 6.C.5)	ft/s	6.8		0.0			
11	Travel Time, T_t (Equation 6.C.3)	hr	0.04	+	0.00	=	0.04	

Channel flow

		Segment ID	3					
12	Cross sectional flow area, a	ft^2	110.00					
13	Wetted perimeter, p_w	ft	120.10					
14	Hydraulic radius, $r=a/p_w$	ft	0.92					
15	Channel slope, s	ft/ft	0.045					
16	Manning's roughness coeff., n (Table 7-1 & Append. A, Ch. 8)		0.050					
17	Average velocity, v (Equation 6.C.6)	ft/s	6.0					
18	Flow length, L	ft	1625					
19	Travel Time, T_t (Equation 6.C.3)	hr	0.08	+	0.00	=	0.08	

Time of Concentration = 0.54 hours
= 32 minutes

WMC Consulting Engineers
Newington, CT
(860)667-9624

Time of Concentration Worksheet

Project:	Community Center Renovation	By:	REB	Date:	6/20/2021
Location:	PRWS30	Checked:		Date:	

Check one: ☐ Present ☑ Developed
Check one: ☑ English Units ☐ Metric Units

Sheet flow (Applicable to T_c only)

			Segment ID				
			1				
1	Surface description (Table 6.C.1)		light underbrush				
2	Manning's roughness coeff., n (Table 6.C.1)		0.400		0.000		
3	Flow length, L (See Section 6.C.4)	ft	150				
4	Two-yr 24-hr rainfall, P_2 (Table B-1)	in	3.4		3.4		
5	Land slope, s	ft/ft	0.040				
6	Travel Time, T_t (Equation 6.C.2)	hr	0.36	+	0.00	=	0.36

Shallow concentrated flow

			Segment ID				
			2				
7	Surface description (paved or unpaved)		unpaved				
8	Flow length, L	ft	1175				
9	Watercourse slope, s	ft/ft	0.070				
10	Average velocity, V (Equation 6.C.4 or 6.C.5)	ft/s	4.3		0.0		
11	Travel Time, T_t (Equation 6.C.3)	hr	0.08	+	0.00	=	0.08

Channel flow

			Segment ID				
			3		4		
12	Cross sectional flow area, a	ft^2	604.00		6.25		
13	Wetted perimeter, p_w	ft	305.66		15.10		
14	Hydraulic radius, $r=a/p_w$	ft	1.98		0.41		
15	Channel slope, s	ft/ft	0.004		0.013		
16	Manning's roughness coeff., n (Table 7-1 & Append. A, Ch. 8)		0.050		0.050		
17	Average velocity, v (Equation 6.C.6)	ft/s	3.0		1.9		
18	Flow length, L	ft	560		800		
19	Travel Time, T_t (Equation 6.C.3)	hr	0.06	+	0.12	=	0.18

Time of Concentration = 0.62 hours
= 37 minutes

WMC Consulting Engineers
Newington, CT
(860)667-9624

Time of Concentration Worksheet

Project:	Community Center Renovation	By:	REB	Date:	6/20/2021
Location:	PRWS40	Checked:		Date:	

Check one: ☐ Present ☑ Developed
Check one: ☑ English Units ☐ Metric Units

Sheet flow (Applicable to T_c only)

		Segment ID	1					
1	Surface description (Table 6.C.1)	Dense Woods						
2	Manning's roughness coeff., n (Table 6.C.1)		0.800		0.000			
3	Flow length, L (See Section 6.C.4)	ft	100					
4	Two-yr 24-hr rainfall, P_2 (Table B-1)	in	3.4		3.4			
5	Land slope, s	ft/ft	0.050					
6	Travel Time, T_t (Equation 6.C.2)	hr	0.42	+	0.00	=	0.42	

Shallow concentrated flow

		Segment ID	2					
7	Surface description (paved or unpaved)		unpaved					
8	Flow length, L	ft	890					
9	Watercourse slope, s	ft/ft	0.180					
10	Average velocity, V (Equation 6.C.4 or 6.C.5)	ft/s	6.8		0.0			
11	Travel Time, T_t (Equation 6.C.3)	hr	0.04	+	0.00	=	0.04	

Channel flow

		Segment ID	3					
12	Cross sectional flow area, a	ft^2	110.00					
13	Wetted perimeter, p_w	ft	120.10					
14	Hydraulic radius, $r=a/p_w$	ft	0.92					
15	Channel slope, s	ft/ft	0.045					
16	Manning's roughness coeff., n (Table 7-1 & Append. A, Ch. 8)		0.050					
17	Average velocity, v (Equation 6.C.6)	ft/s	6.0					
18	Flow length, L	ft	1625					
19	Travel Time, T_t (Equation 6.C.3)	hr	0.08	+	0.00	=	0.08	

Time of Concentration = 0.54 hours
= 32 minutes

WMC Consulting Engineers
Newington, CT
(860)667-9624

CURVE NUMBER COMPUTATIONS

Worksheet 2: Runoff curve number and runoff

Project Banner Community Center Renovation By REB Date 6/20/2021

Location East Haddam Checked _____ Date _____

Existing EXWS30

1. Runoff curve number (CN)

Hydrologic group (appendix A)	Cover description	CN 1/ Table 2-2	CN 1/ Figure 2-3	CN 1/ Figure 2-4	Area X acres / mi^2 / %	Product of CN x area
Group A	Woods	30			20.80	624.00
Group A	Grass	39			11.50	448.50
Group B	Woods	55			55.90	3074.50
Group B	Grass	61			9.90	603.90
Group D	Woods	77			8.75	673.75
Group D	Grass	80			5.50	440.00
Group W	Water (Pond)	98			3.45	338.10
N/A	Impervious (Roadways & Houses)	98			4.00	392.00
1/ Use only one CN source per line.				Totals =	119.80	6594.75

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{\quad}{\quad} = _____$; Use CN = **55**

Worksheet 2: Runoff curve number and runoff

Project Banner Community Center Renovation By REB Date 6/20/2021

Location East Haddam Checked _____ Date _____

Existing EXWS40

1. Runoff curve number (CN)

Hydrologic group (appendix A)	Cover description	CN 1/ Table 2-2	CN 1/ Figure 2-3	CN 1/ Figure 2-4	Area [X] acres [ ] mi^2 [ ] %	Product of CN x area
Group A	Woods	30			12.40	372.00
Group A	Grass	39			0.20	7.80
Group A	Gravel	76			0.10	7.60
Group B	Woods	55			52.40	2882.00
Group B	Grass	61			37.00	2257.00
Group B	Gravel	85			1.25	106.25
Group D	Woods	77			9.00	693.00
Group D	Grass	80			5.00	400.00
Group D	Gravel	91			0.10	9.10
N/A	Water (Pond)	98			1.25	122.50
N/A	Impervious (Roof Area)	98			2.50	245.00
N/A	Impervious (Roadway & Parking)	98			3.90	382.20
				Totals =	125.10	7484.45

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{\quad}{\quad} = _____$; Use CN = **60**

Worksheet 2: Runoff curve number and runoff

Project Banner Community Center Renovation By REB Date 6/20/2021

Location East Haddam Checked _____ Date _____

Proposed PRWS30

1. Runoff curve number (CN)

Hydrologic group (appendix A)	Cover description	CN 1/ Table 2-2	CN 1/ Figure 2-3	CN 1/ Figure 2-4	Area (X acres / mi^2 / %)	Product of CN x area
Group A	Woods	30			20.80	624.00
Group A	Grass	39			11.50	448.50
Group B	Woods	55			55.90	3074.50
Group B	Grass	61			9.90	603.90
Group D	Woods	77			8.75	673.75
Group D	Grass	80			5.50	440.00
Group W	Water (Pond)	98			3.45	338.10
N/A	Impervious (Roadways & Houses)	98			4.00	392.00
1/ Use only one CN source per line.				Totals =	119.80	6594.75

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{\quad}{\quad} = _____$; Use CN = **55**

Worksheet 2: Runoff curve number and runoff

Project Banner Community Center Renovation By REB Date 6/20/2021

Location East Haddam Checked _____ Date _____

Proposed PRWS40

1. Runoff curve number (CN)

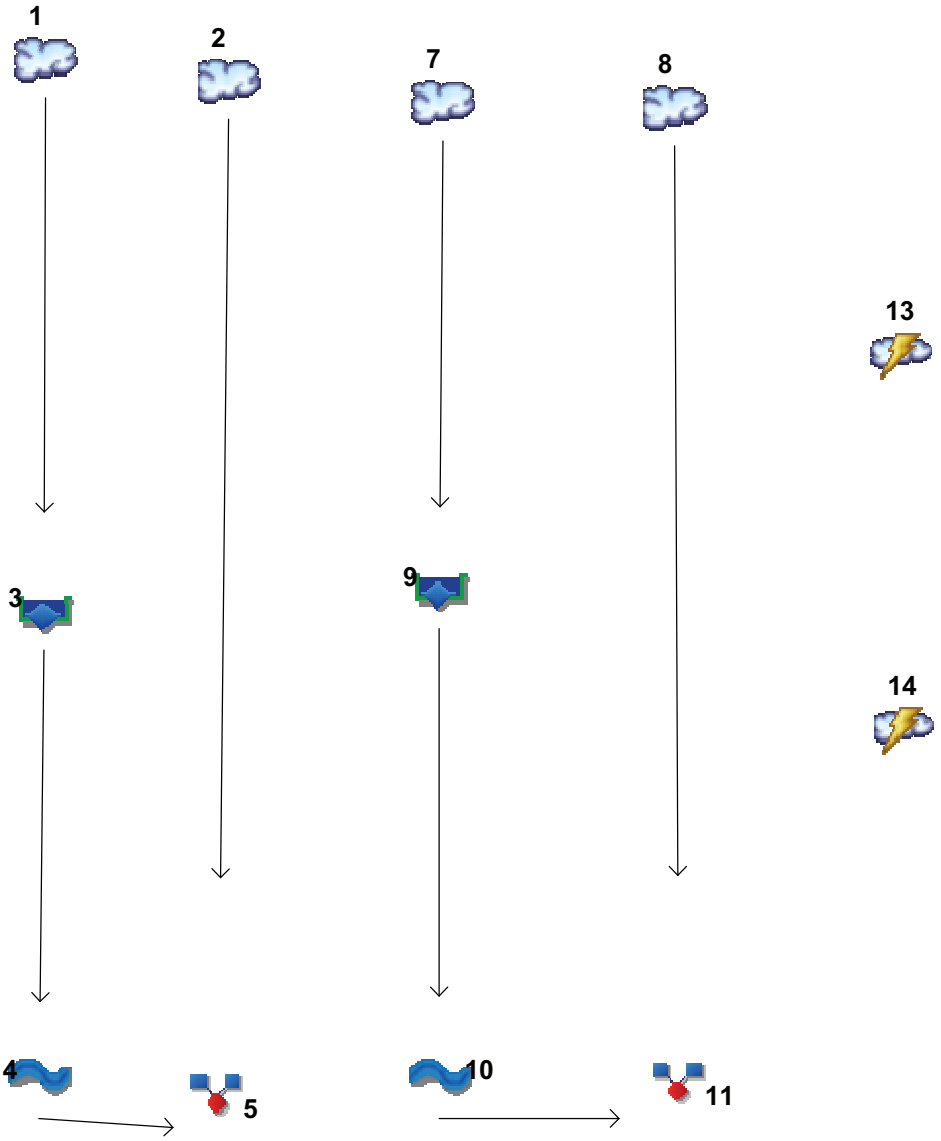
Hydrologic group (appendix A)	Cover description	CN 1/ Table 2-2	CN 1/ Figure 2-3	CN 1/ Figure 2-4	Area [X] acres [ ] mi^2 [ ] %	Product of CN x area
Group A	Woods	30			12.40	372.00
Group A	Grass	39			0.20	7.80
Group A	Gravel	76			0.10	7.60
Group B	Woods	55			52.40	2882.00
Group B	Grass	61			36.40	2220.40
Group B	Gravel	85			1.25	106.25
Group D	Woods	77			9.00	693.00
Group D	Grass	80			5.00	400.00
Group D	Gravel	91			0.10	9.10
N/A	Water (Pond)	98			1.25	122.50
N/A	Impervious (Roof Area)	98			2.25	220.50
N/A	Impervious (Roadway & Parking)	98			4.75	465.50
1/ Use only one CN source per line.				Totals =	125.10	7506.65

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{\quad}{\quad} = _____$; Use CN = **60**

APPENDIX C

HYDROGRAPH MODEL RESULTS

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	EXWS-30
2	SCS Runoff	EXWS-40
3	Reservoir	North Pond
4	Reach	EX-North Reach
5	Combine	EX POA OFFSITE
7	SCS Runoff	PRWS-30
8	SCS Runoff	PRWS-40
9	Reservoir	North Pond
10	Reach	PR-North Reach
11	Combine	PR POA OFFSITE
13	Rational	Existing Section B Outfall
14	Rational	Proposed Section B Outfall

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	11.88	-------	36.03	63.40	108.35	145.42	188.26	EXWS-30
2	SCS Runoff	------	-------	29.48	-------	68.75	108.97	170.48	219.43	275.10	EXWS-40
3	Reservoir	1	-------	2.568	-------	7.160	18.07	73.79	121.40	172.24	North Pond
4	Reach	3	-------	2.564	-------	7.149	17.44	68.06	113.76	163.74	EX-North Reach
5	Combine	2, 4	-------	29.50	-------	69.06	109.62	173.02	231.07	347.29	EX POA OFFSITE
7	SCS Runoff	------	-------	11.88	-------	36.03	63.40	108.35	145.42	188.26	PRWS-30
8	SCS Runoff	------	-------	29.48	-------	68.75	108.97	170.48	219.43	275.10	PRWS-40
9	Reservoir	7	-------	2.568	-------	7.160	18.07	73.79	121.40	172.24	North Pond
10	Reach	9	-------	2.564	-------	7.149	17.44	68.06	113.76	163.74	PR-North Reach
11	Combine	8, 10	-------	29.50	-------	69.06	109.62	173.02	231.07	347.29	PR POA OFFSITE
13	Rational	------	-------	8.791	-------	11.71	13.57	16.03	17.96	19.85	Existing Section B Outfall
14	Rational	------	-------	8.256	-------	10.99	12.74	15.06	16.87	18.64	Proposed Section B Outfall

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	11.88	5	765	135,077	------	------	------	EXWS-30
2	SCS Runoff	29.48	5	750	232,940	------	------	------	EXWS-40
3	Reservoir	2.568	5	1025	135,002	1	324.47	88,647	North Pond
4	Reach	2.564	5	1045	134,325	3	------	------	EX-North Reach
5	Combine	29.50	5	750	367,265	2, 4	------	------	EX POA OFFSITE
7	SCS Runoff	11.88	5	765	135,077	------	------	------	PRWS-30
8	SCS Runoff	29.48	5	750	232,940	------	------	------	PRWS-40
9	Reservoir	2.568	5	1025	135,002	7	324.47	88,647	North Pond
10	Reach	2.564	5	1045	134,325	9	------	------	PR-North Reach
11	Combine	29.50	5	750	367,265	8, 10	------	------	PR POA OFFSITE
13	Rational	8.791	1	23	12,132	------	------	------	Existing Section B Outfall
14	Rational	8.256	1	23	11,394	------	------	------	Proposed Section B Outfall

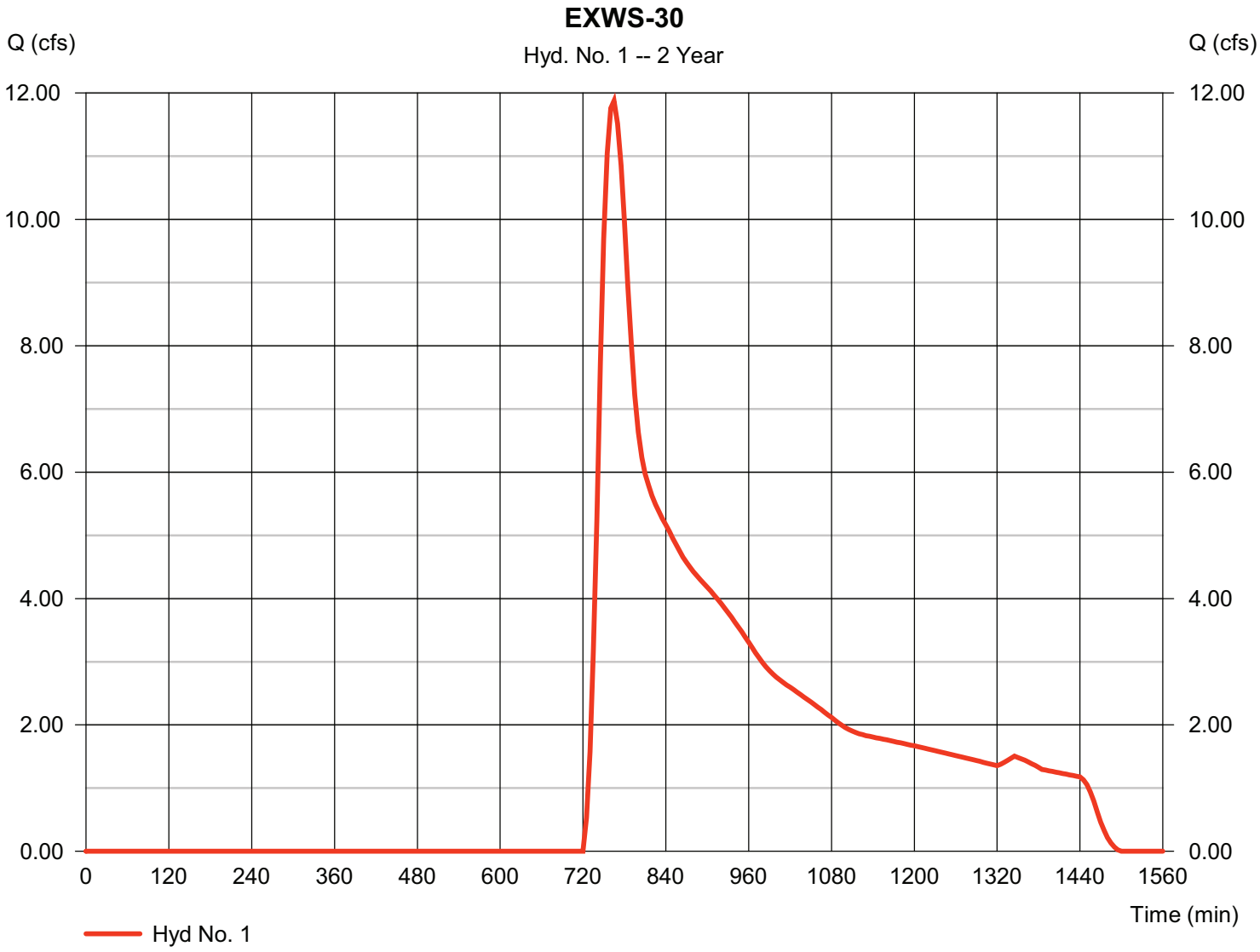
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 1

EXWS-30

Hydrograph type	= SCS Runoff	Peak discharge	= 11.88 cfs
Storm frequency	= 2 yrs	Time to peak	= 765 min
Time interval	= 5 min	Hyd. volume	= 135,077 cuft
Drainage area	= 119.800 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 37.00 min
Total precip.	= 3.42 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



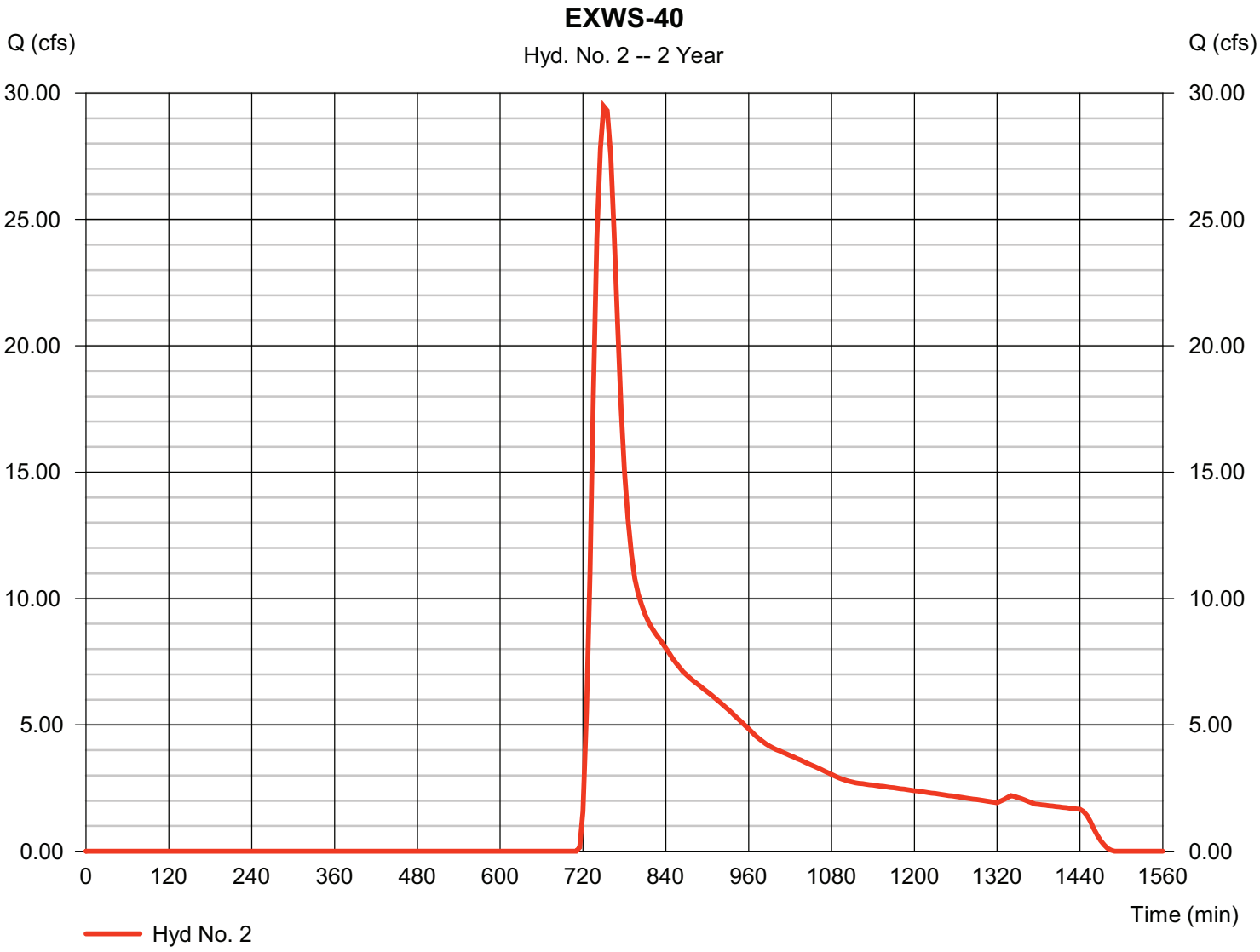
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 2

EXWS-40

Hydrograph type	= SCS Runoff	Peak discharge	= 29.48 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 5 min	Hyd. volume	= 232,940 cuft
Drainage area	= 125.100 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 32.00 min
Total precip.	= 3.42 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

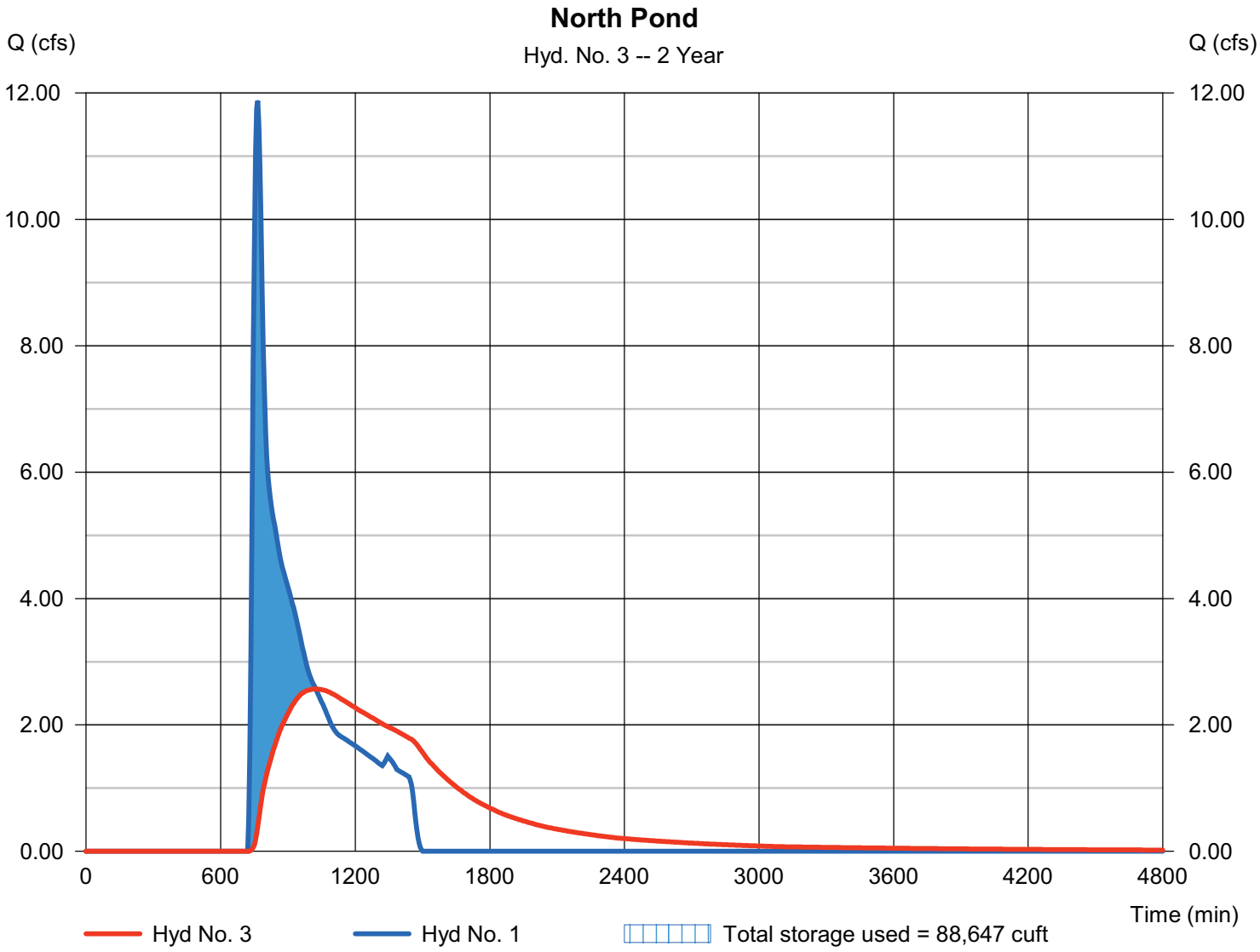
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 3

North Pond

Hydrograph type	= Reservoir	Peak discharge	= 2.568 cfs
Storm frequency	= 2 yrs	Time to peak	= 1025 min
Time interval	= 5 min	Hyd. volume	= 135,002 cuft
Inflow hyd. No.	= 1 - EXWS-30	Max. Elevation	= 324.47 ft
Reservoir name	= North Pond	Max. Storage	= 88,647 cuft

Storage Indication method used. Wet pond routing start elevation = 324.15 ft.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Pond No. 1 - North Pond

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 324.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	324.00	180,000	0	0
0.30	324.30	188,471	55,271	55,271
1.00	325.00	205,222	137,793	193,063
2.00	326.00	213,579	209,400	402,464
3.00	327.00	227,525	220,552	623,016

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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)	= 4.25	257.00	0.00	0.00
Crest El. (ft)	= 324.15	325.00	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= Rect	Broad	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	324.00	---	---	---	---	0.00	0.00	---	---	---	---	0.000
0.30	55,271	324.30	---	---	---	---	0.82	0.00	---	---	---	---	0.822
1.00	193,063	325.00	---	---	---	---	11.09	0.00	---	---	---	---	11.09
2.00	402,464	326.00	---	---	---	---	35.61	668.20	---	---	---	---	703.81
3.00	623,016	327.00	---	---	---	---	68.09	1889.95	---	---	---	---	1958.05

Hydrograph Report

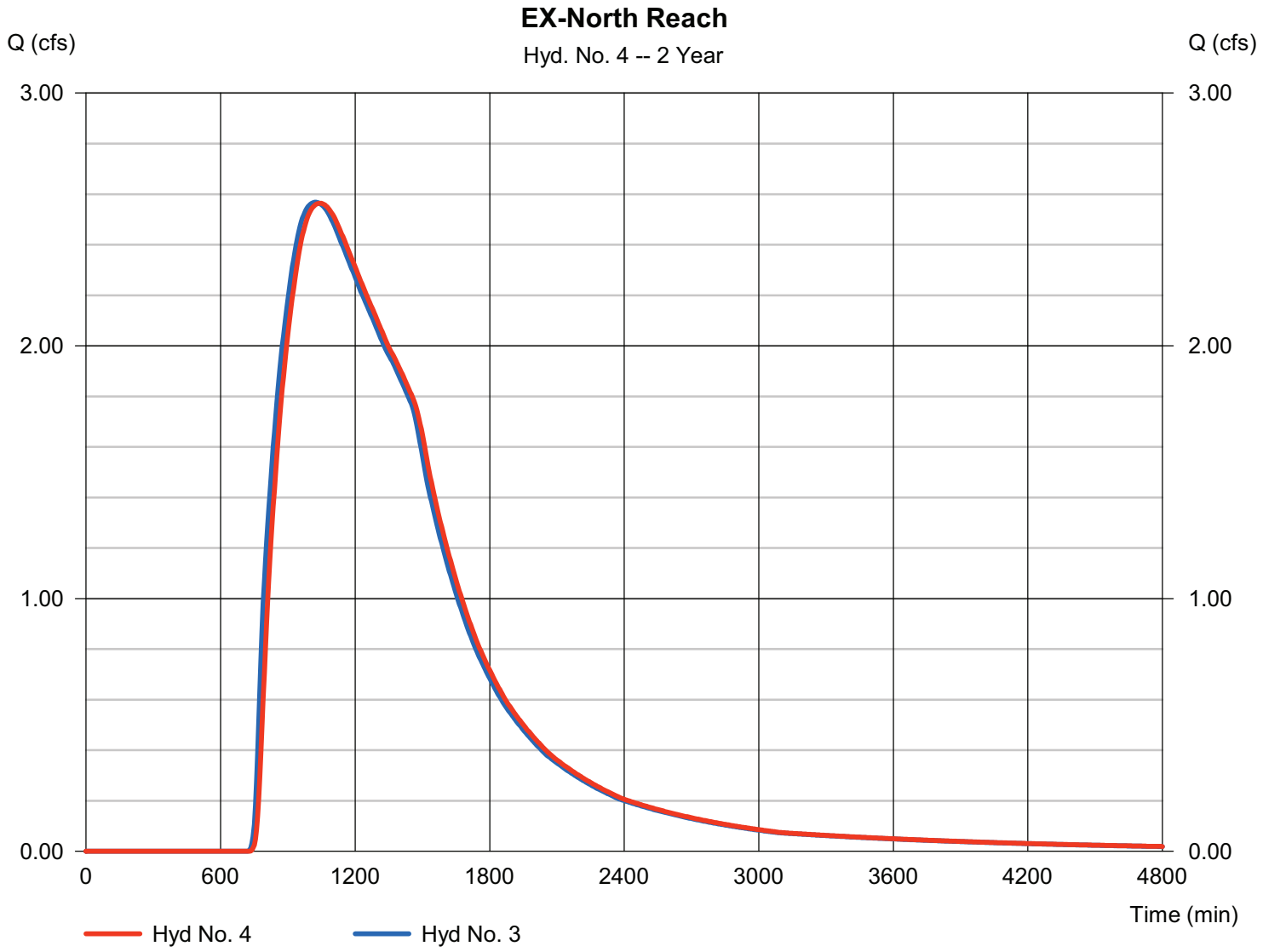
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 4

EX-North Reach

Hydrograph type	=	Reach	Peak discharge	=	2.564 cfs
Storm frequency	=	2 yrs	Time to peak	=	1045 min
Time interval	=	5 min	Hyd. volume	=	134,325 cuft
Inflow hyd. No.	=	3 - North Pond	Section type	=	Trapezoidal
Reach length	=	2800.0 ft	Channel slope	=	4.8 %
Manning's n	=	0.050	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	2.232	Rating curve m	=	1.321
Ave. velocity	=	2.31 ft/s	Routing coeff.	=	0.2809

Modified Att-Kin routing method used.



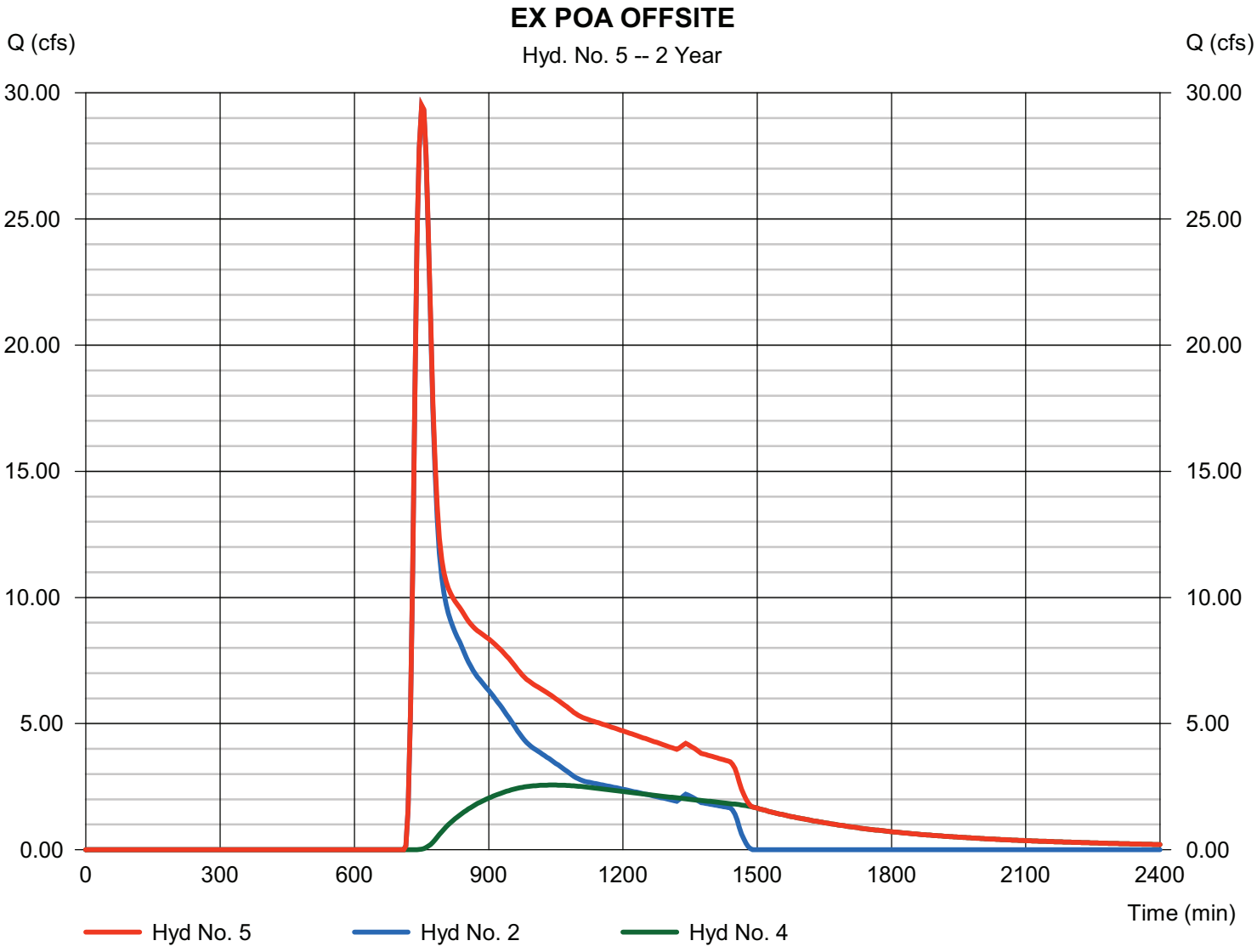
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 5

EX POA OFFSITE

Hydrograph type	= Combine	Peak discharge	= 29.50 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 5 min	Hyd. volume	= 367,265 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 125.100 ac



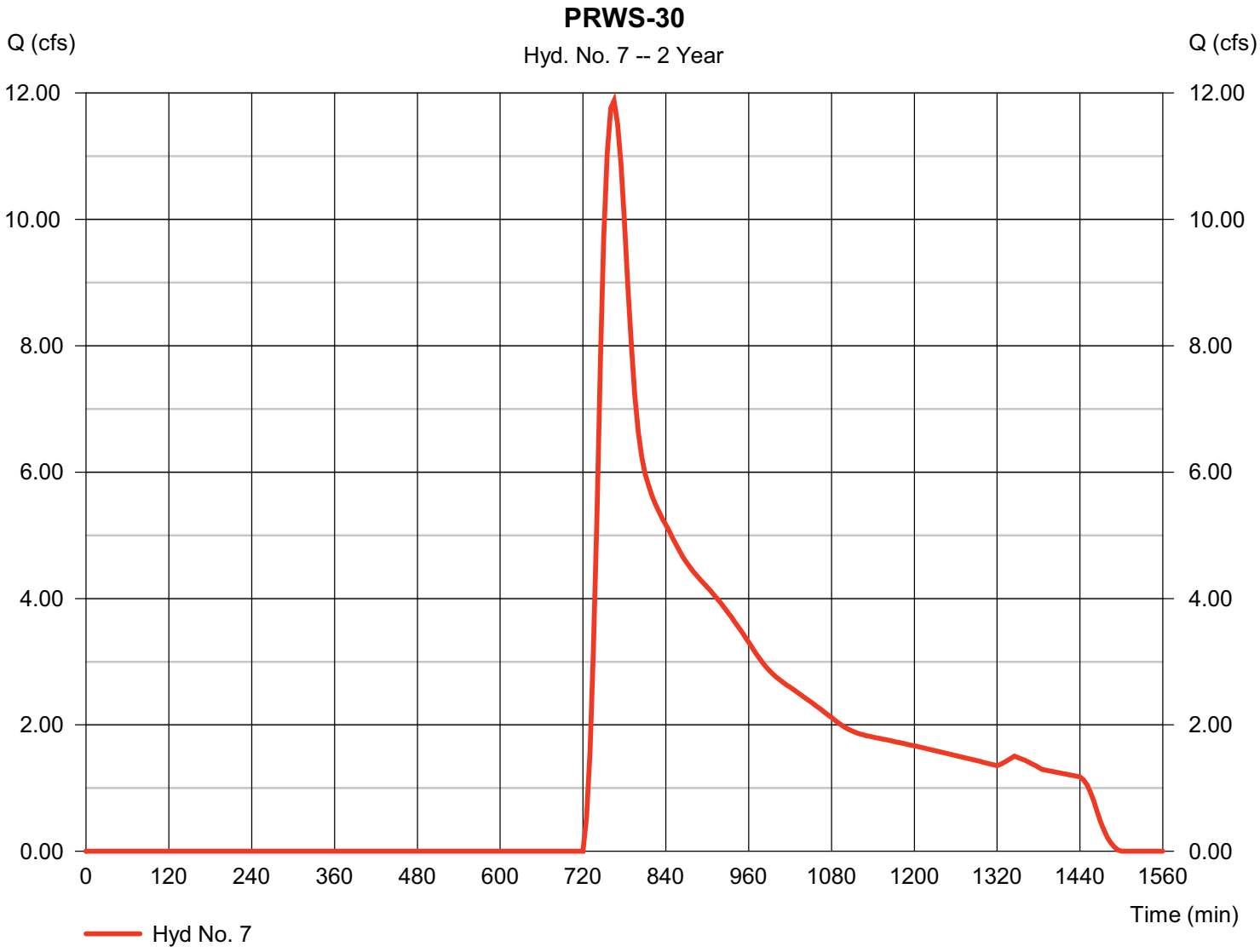
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 7

PRWS-30

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.88 cfs
Storm frequency	=	2 yrs	Time to peak	=	765 min
Time interval	=	5 min	Hyd. volume	=	135,077 cuft
Drainage area	=	119.800 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	37.00 min
Total precip.	=	3.42 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



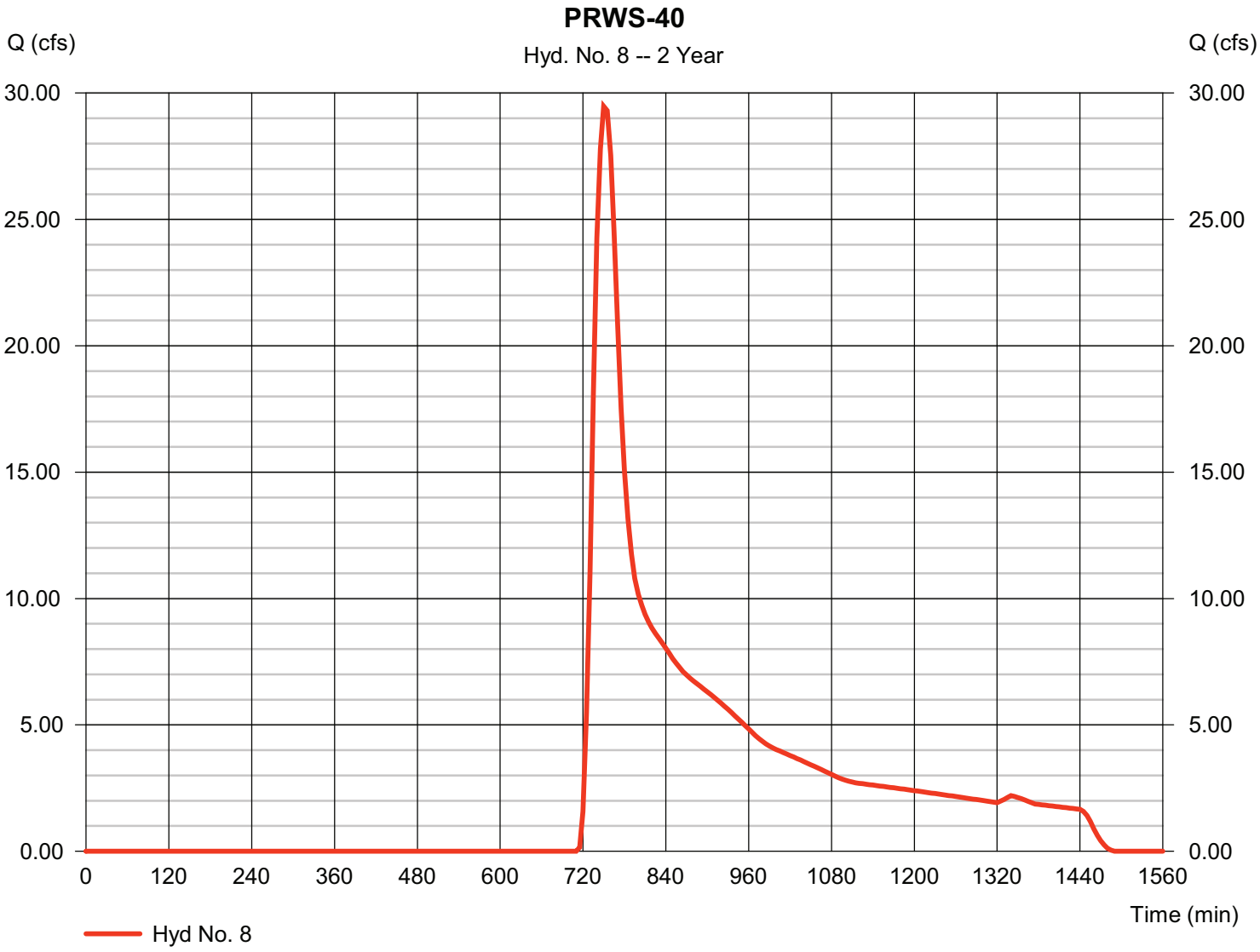
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 8

PRWS-40

Hydrograph type	=	SCS Runoff	Peak discharge	=	29.48 cfs
Storm frequency	=	2 yrs	Time to peak	=	750 min
Time interval	=	5 min	Hyd. volume	=	232,940 cuft
Drainage area	=	125.100 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	32.00 min
Total precip.	=	3.42 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

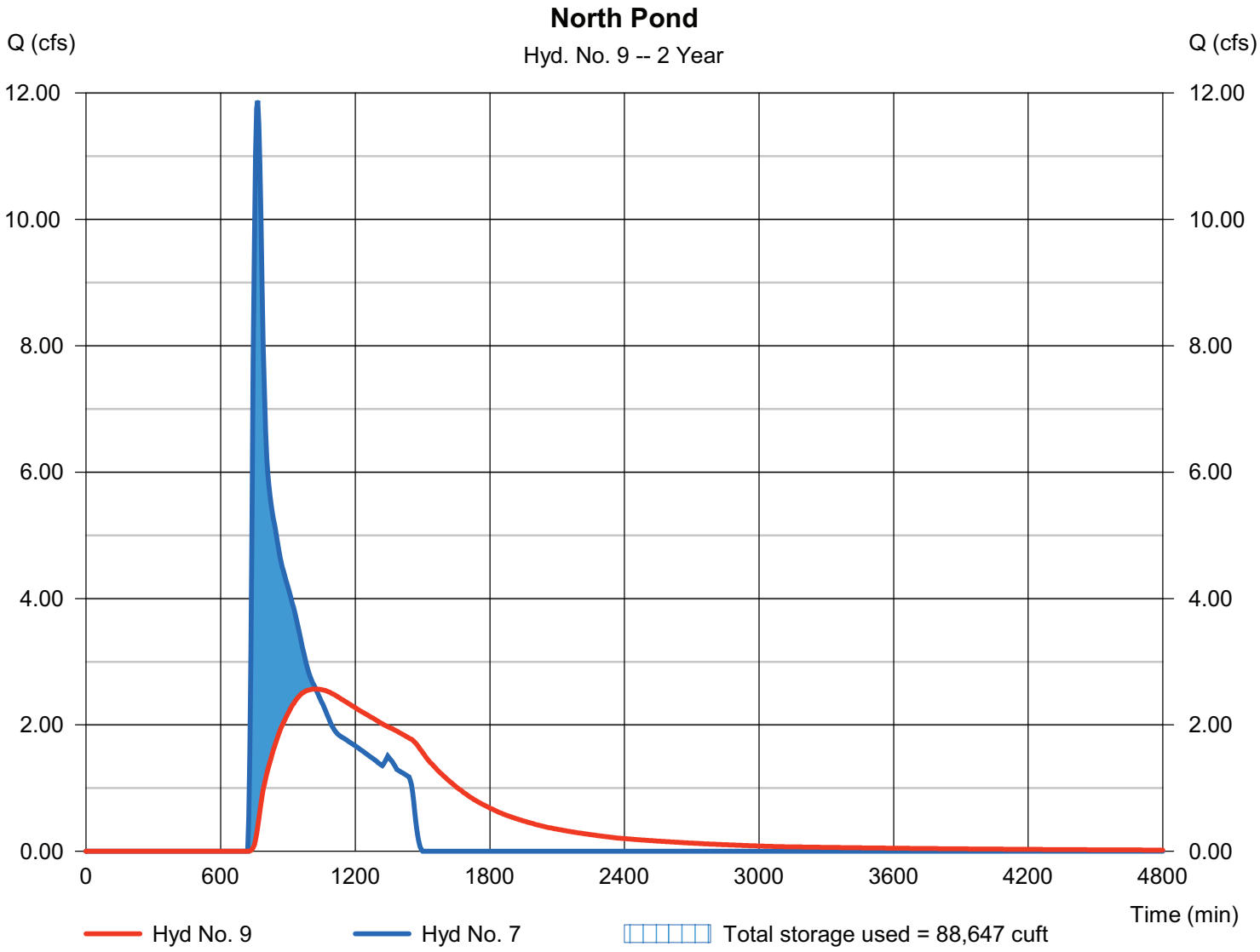
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 9

North Pond

Hydrograph type	= Reservoir	Peak discharge	= 2.568 cfs
Storm frequency	= 2 yrs	Time to peak	= 1025 min
Time interval	= 5 min	Hyd. volume	= 135,002 cuft
Inflow hyd. No.	= 7 - PRWS-30	Max. Elevation	= 324.47 ft
Reservoir name	= North Pond	Max. Storage	= 88,647 cuft

Storage Indication method used. Wet pond routing start elevation = 324.15 ft.



Pond Report

Pond No. 1 - North Pond

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 324.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	324.00	180,000	0	0
0.30	324.30	188,471	55,271	55,271
1.00	325.00	205,222	137,793	193,063
2.00	326.00	213,579	209,400	402,464
3.00	327.00	227,525	220,552	623,016

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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)	= 4.25	257.00	0.00	0.00
Crest El. (ft)	= 324.15	325.00	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= Rect	Broad	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	324.00	---	---	---	---	0.00	0.00	---	---	---	---	0.000
0.30	55,271	324.30	---	---	---	---	0.82	0.00	---	---	---	---	0.822
1.00	193,063	325.00	---	---	---	---	11.09	0.00	---	---	---	---	11.09
2.00	402,464	326.00	---	---	---	---	35.61	668.20	---	---	---	---	703.81
3.00	623,016	327.00	---	---	---	---	68.09	1889.95	---	---	---	---	1958.05

Hydrograph Report

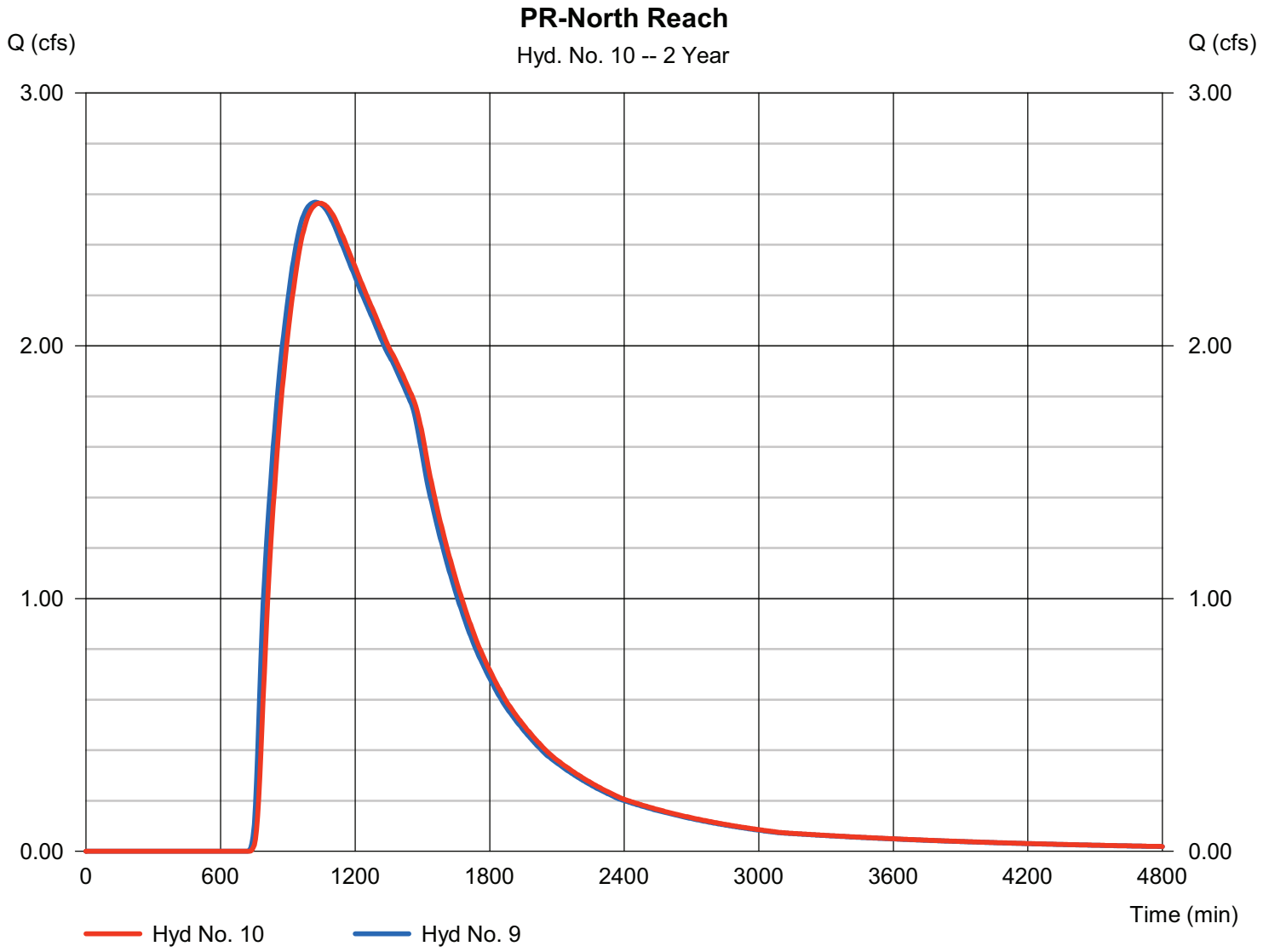
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 10

PR-North Reach

Hydrograph type	= Reach	Peak discharge	= 2.564 cfs
Storm frequency	= 2 yrs	Time to peak	= 1045 min
Time interval	= 5 min	Hyd. volume	= 134,325 cuft
Inflow hyd. No.	= 9 - North Pond	Section type	= Trapezoidal
Reach length	= 2800.0 ft	Channel slope	= 4.8 %
Manning's n	= 0.050	Bottom width	= 5.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 2.232	Rating curve m	= 1.321
Ave. velocity	= 2.31 ft/s	Routing coeff.	= 0.2809

Modified Att-Kin routing method used.

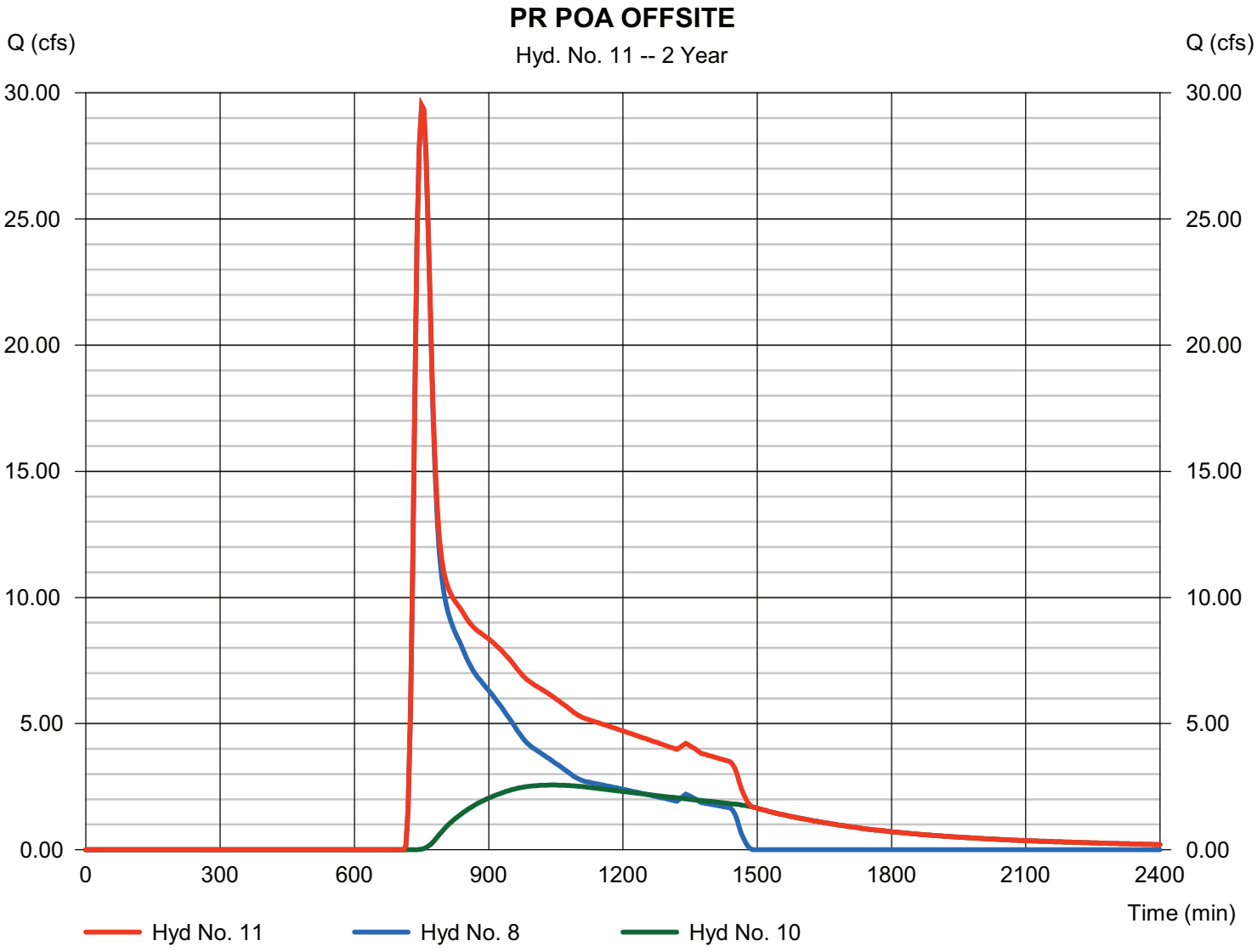


Hydrograph Report

Hyd. No. 11

PR POA OFFSITE

Hydrograph type	= Combine	Peak discharge	= 29.50 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 5 min	Hyd. volume	= 367,265 cuft
Inflow hyds.	= 8, 10	Contrib. drain. area	= 125.100 ac



Hydrograph Report

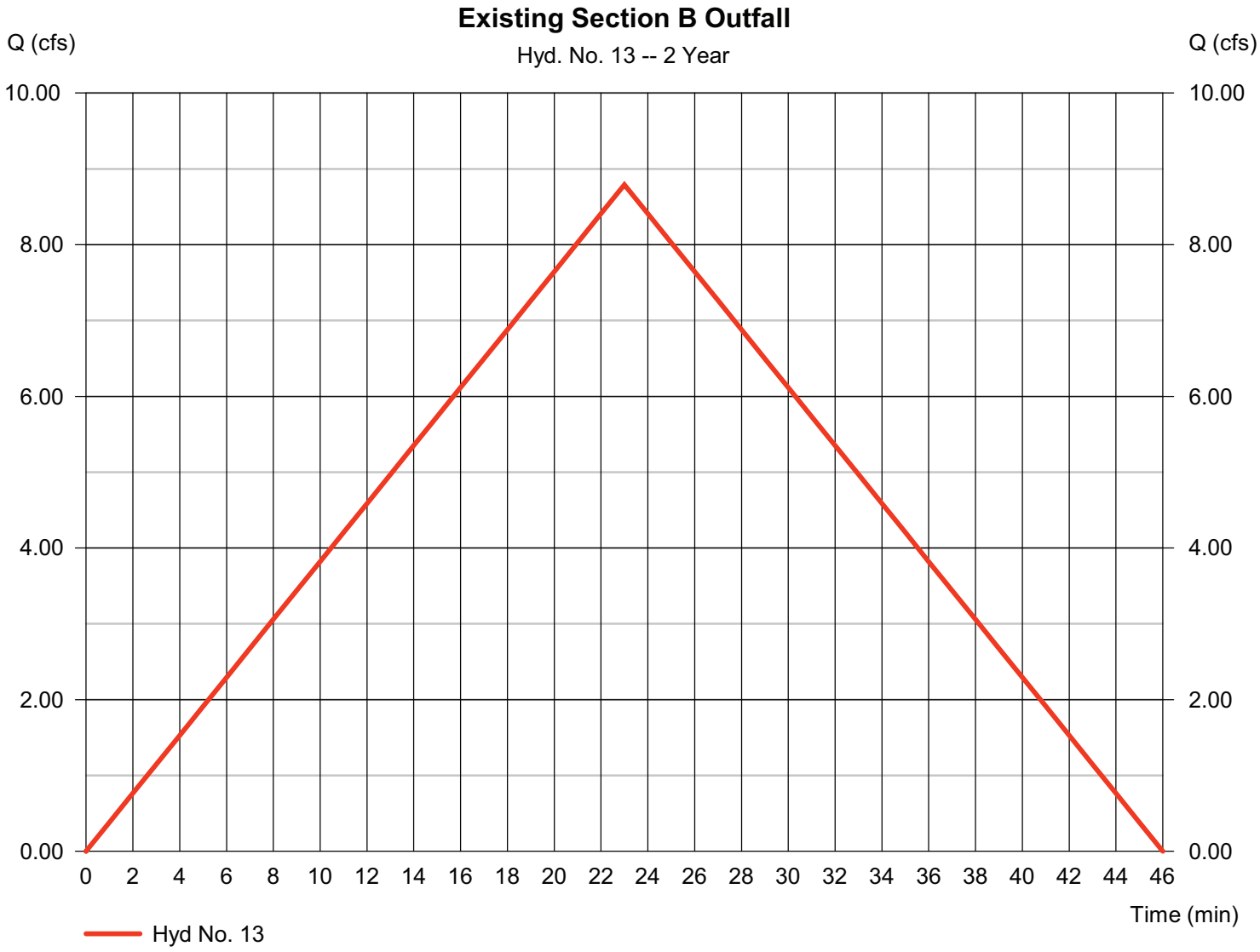
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 13

Existing Section B Outfall

Hydrograph type	= Rational	Peak discharge	= 8.791 cfs
Storm frequency	= 2 yrs	Time to peak	= 23 min
Time interval	= 1 min	Hyd. volume	= 12,132 cuft
Drainage area	= 7.230 ac	Runoff coeff.	= 0.56*
Intensity	= 2.171 in/hr	Tc by User	= 23.00 min
IDF Curve	= Middlesex.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(3.150 x 0.90) + (4.080 x 0.30)] / 7.230



Hydrograph Report

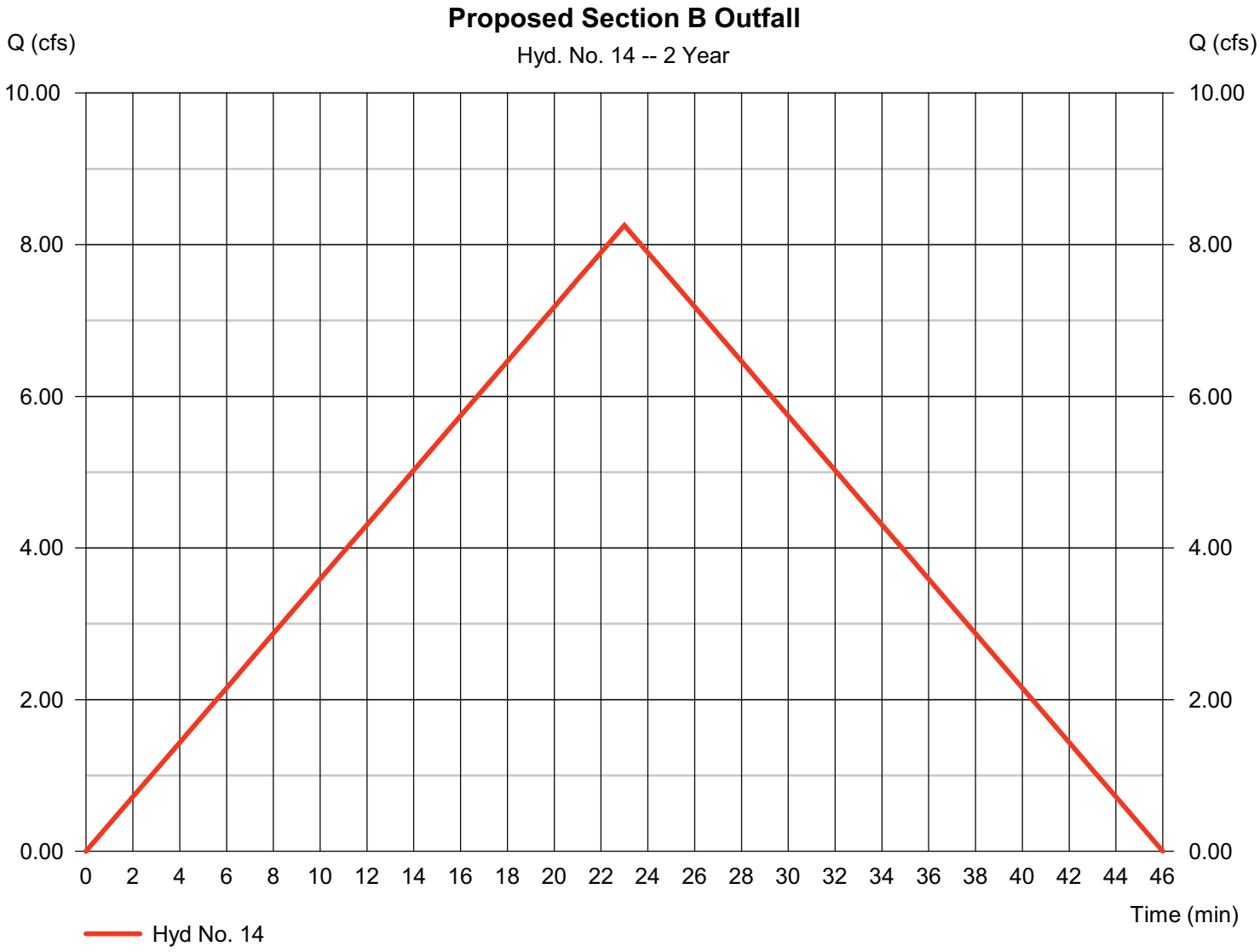
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 14

Proposed Section B Outfall

Hydrograph type	=	Rational	Peak discharge	=	8.256 cfs
Storm frequency	=	2 yrs	Time to peak	=	23 min
Time interval	=	1 min	Hyd. volume	=	11,394 cuft
Drainage area	=	6.790 ac	Runoff coeff.	=	0.56*
Intensity	=	2.171 in/hr	Tc by User	=	23.00 min
IDF Curve	=	Middlesex.idf	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(2.950 x 0.90) + (3.840 x 0.30)] / 6.790



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	63.40	5	755	460,613	------	------	------	EXWS-30
2	SCS Runoff	108.97	5	745	667,523	------	------	------	EXWS-40
3	Reservoir	18.07	5	810	460,538	1	325.03	199,376	North Pond
4	Reach	17.44	5	825	459,863	3	------	------	EX-North Reach
5	Combine	109.62	5	745	1,127,386	2, 4	------	------	EX POA OFFSITE
7	SCS Runoff	63.40	5	755	460,613	------	------	------	PRWS-30
8	SCS Runoff	108.97	5	745	667,523	------	------	------	PRWS-40
9	Reservoir	18.07	5	810	460,538	7	325.03	199,376	North Pond
10	Reach	17.44	5	825	459,863	9	------	------	PR-North Reach
11	Combine	109.62	5	745	1,127,386	8, 10	------	------	PR POA OFFSITE
13	Rational	13.57	1	23	18,727	------	------	------	Existing Section B Outfall
14	Rational	12.74	1	23	17,587	------	------	------	Proposed Section B Outfall

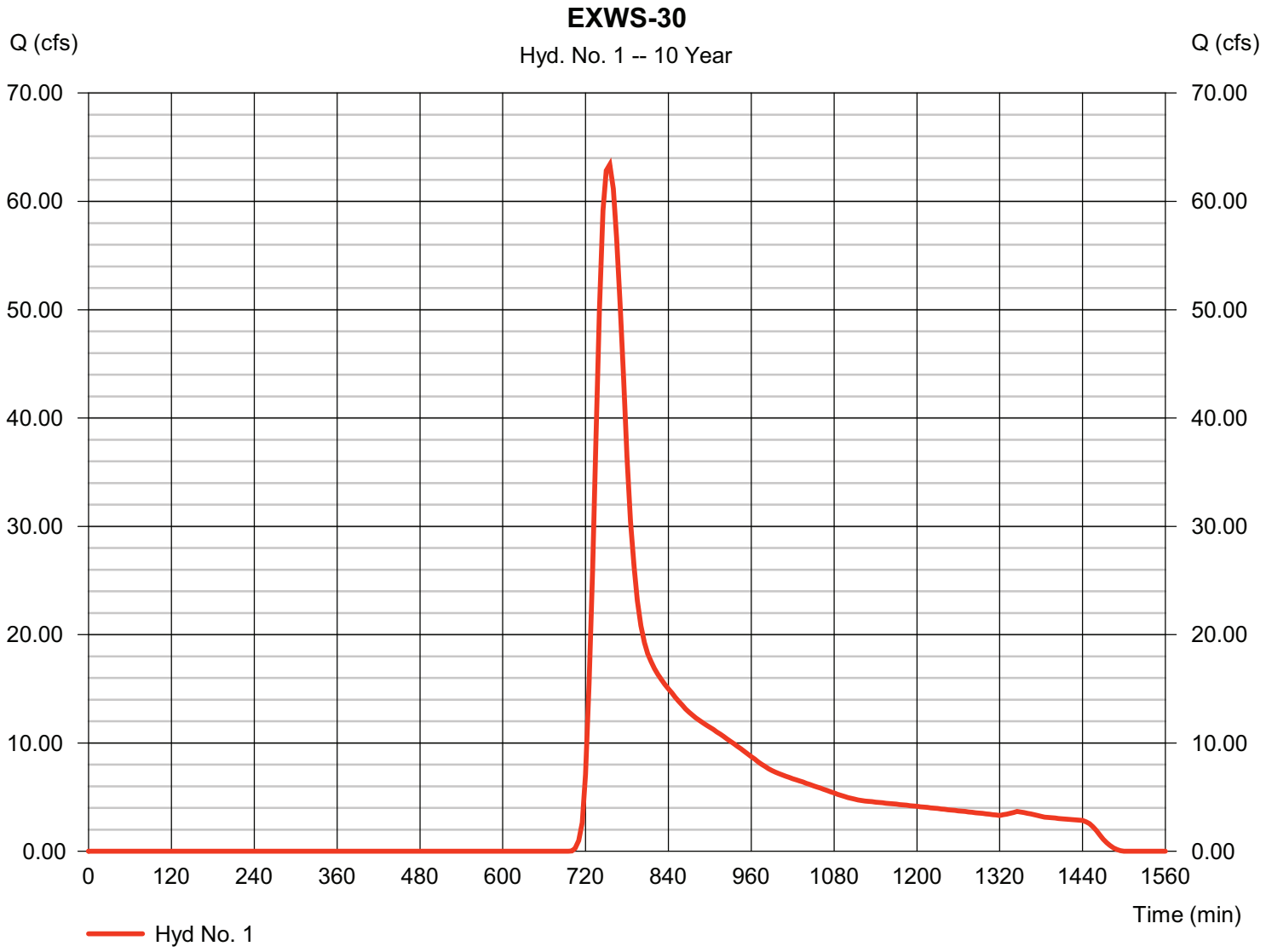
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 1

EXWS-30

Hydrograph type	= SCS Runoff	Peak discharge	= 63.40 cfs
Storm frequency	= 10 yrs	Time to peak	= 755 min
Time interval	= 5 min	Hyd. volume	= 460,613 cuft
Drainage area	= 119.800 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 37.00 min
Total precip.	= 5.21 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



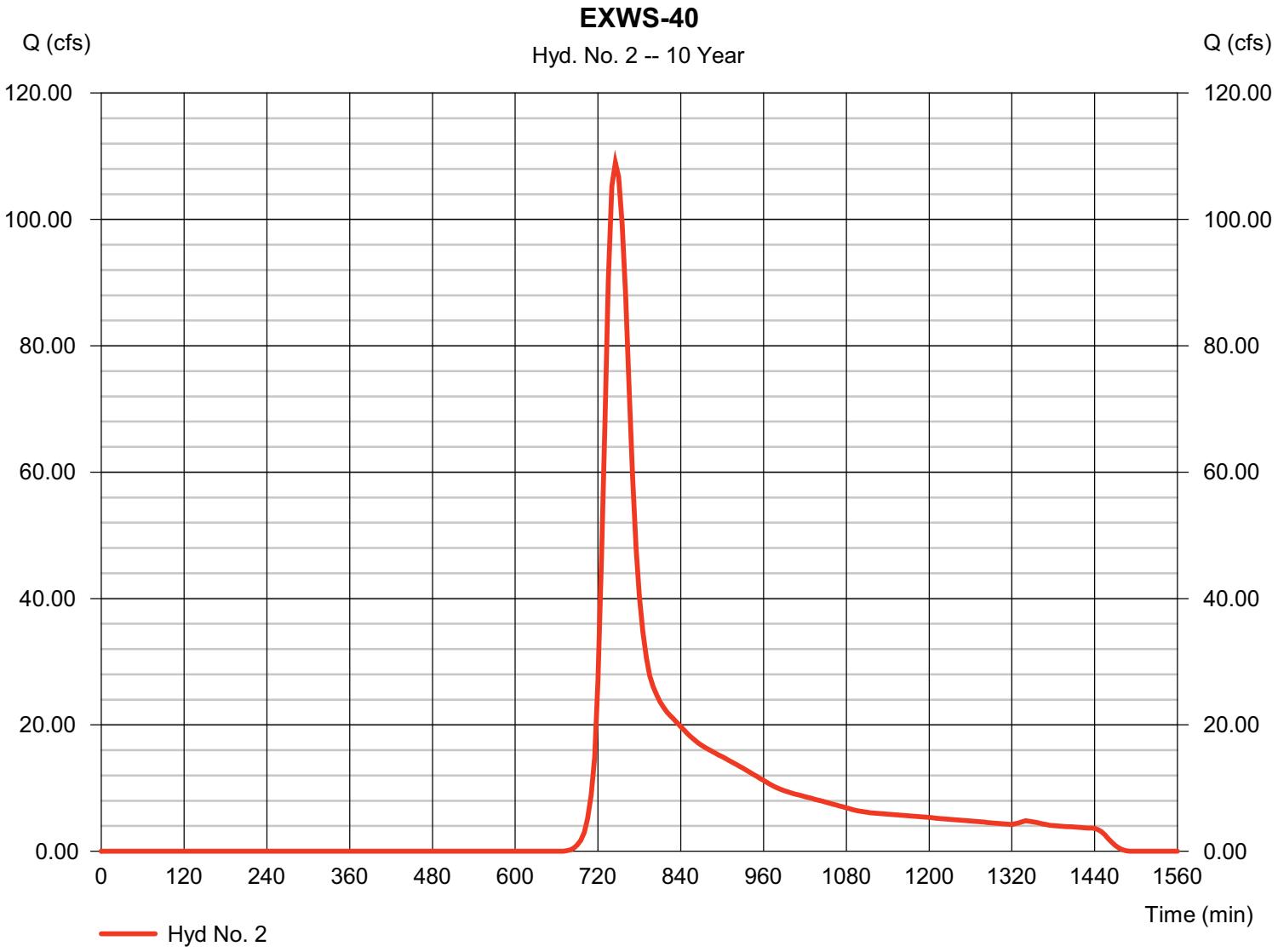
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 2

EXWS-40

Hydrograph type	= SCS Runoff	Peak discharge	= 108.97 cfs
Storm frequency	= 10 yrs	Time to peak	= 745 min
Time interval	= 5 min	Hyd. volume	= 667,523 cuft
Drainage area	= 125.100 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 32.00 min
Total precip.	= 5.21 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

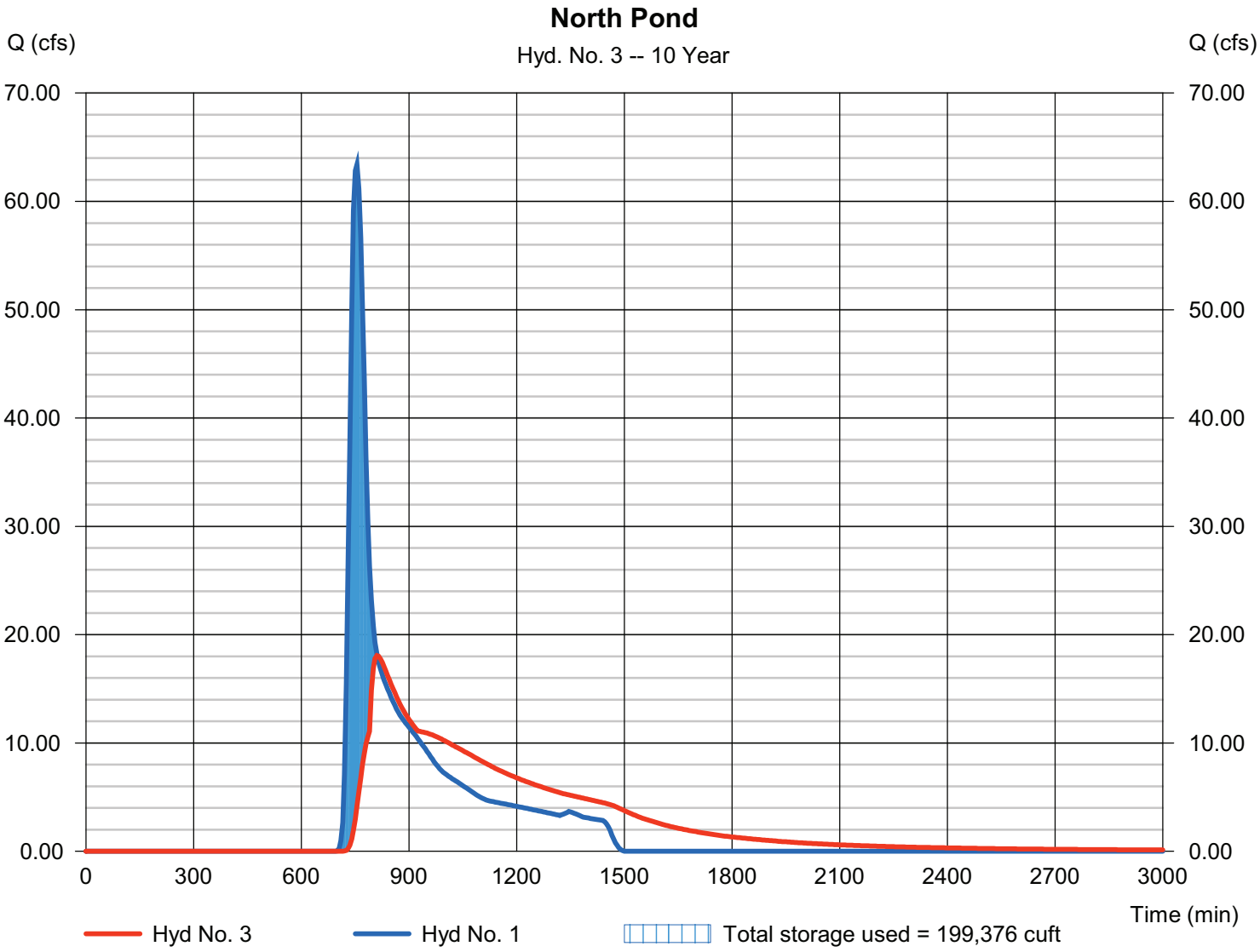
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 3

North Pond

Hydrograph type	= Reservoir	Peak discharge	= 18.07 cfs
Storm frequency	= 10 yrs	Time to peak	= 810 min
Time interval	= 5 min	Hyd. volume	= 460,538 cuft
Inflow hyd. No.	= 1 - EXWS-30	Max. Elevation	= 325.03 ft
Reservoir name	= North Pond	Max. Storage	= 199,376 cuft

Storage Indication method used. Wet pond routing start elevation = 324.15 ft.



Hydrograph Report

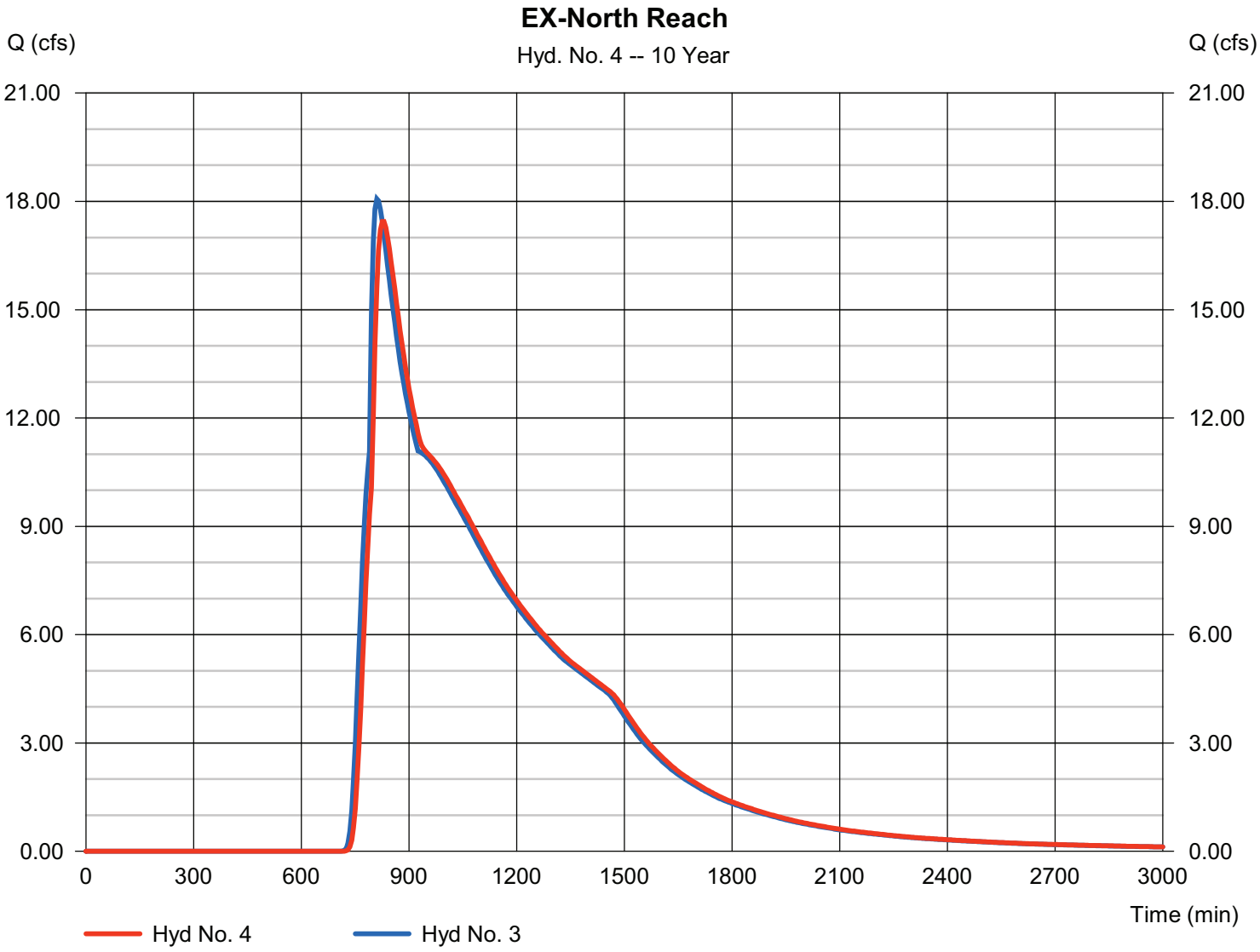
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 4

EX-North Reach

Hydrograph type	=	Reach	Peak discharge	=	17.44 cfs
Storm frequency	=	10 yrs	Time to peak	=	825 min
Time interval	=	5 min	Hyd. volume	=	459,863 cuft
Inflow hyd. No.	=	3 - North Pond	Section type	=	Trapezoidal
Reach length	=	2800.0 ft	Channel slope	=	4.8 %
Manning's n	=	0.050	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	2.232	Rating curve m	=	1.321
Ave. velocity	=	3.71 ft/s	Routing coeff.	=	0.4158

Modified Att-Kin routing method used.



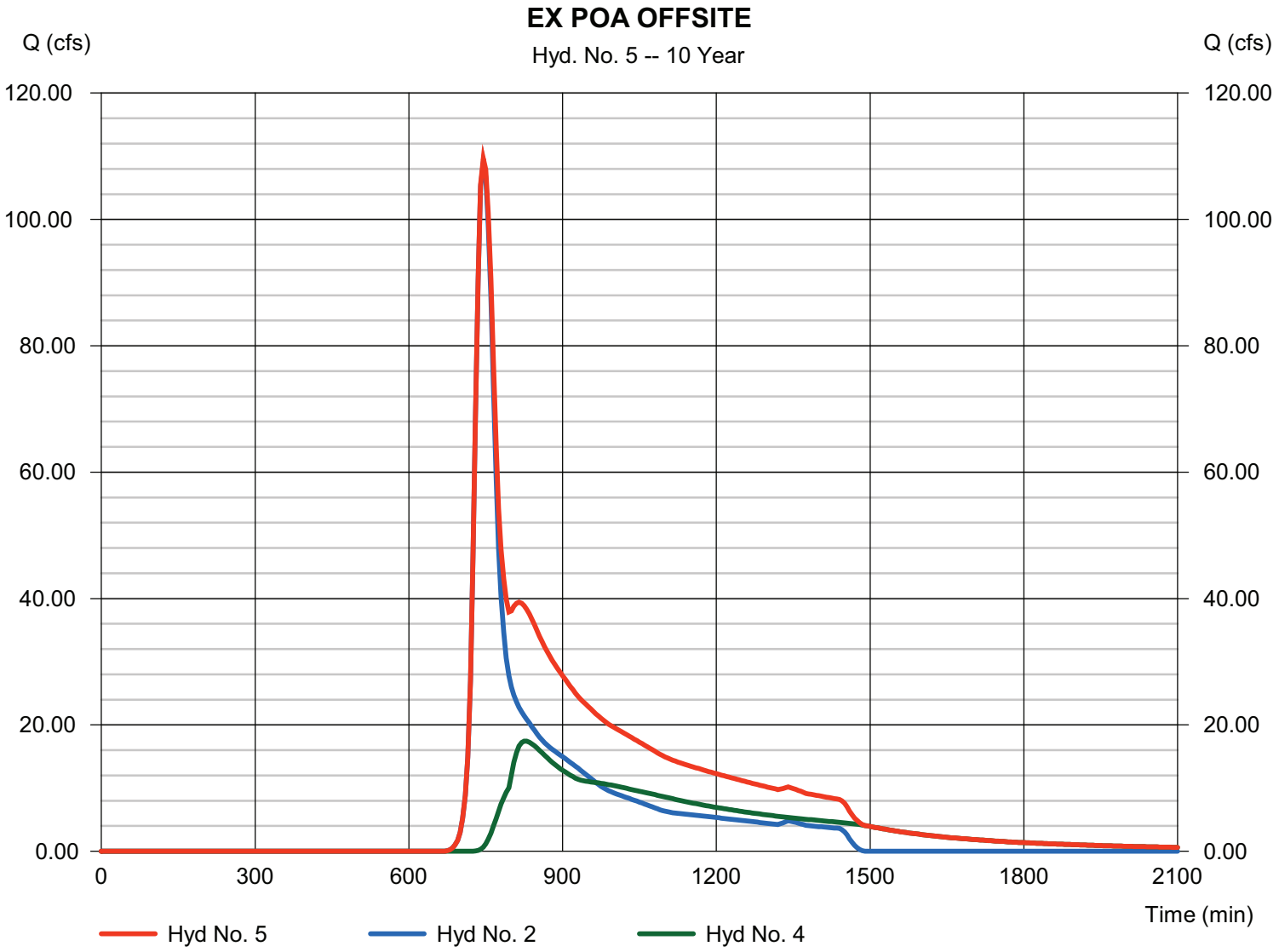
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 5

EX POA OFFSITE

Hydrograph type	=	Combine	Peak discharge	=	109.62 cfs
Storm frequency	=	10 yrs	Time to peak	=	745 min
Time interval	=	5 min	Hyd. volume	=	1,127,386 cuft
Inflow hyds.	=	2, 4	Contrib. drain. area	=	125.100 ac



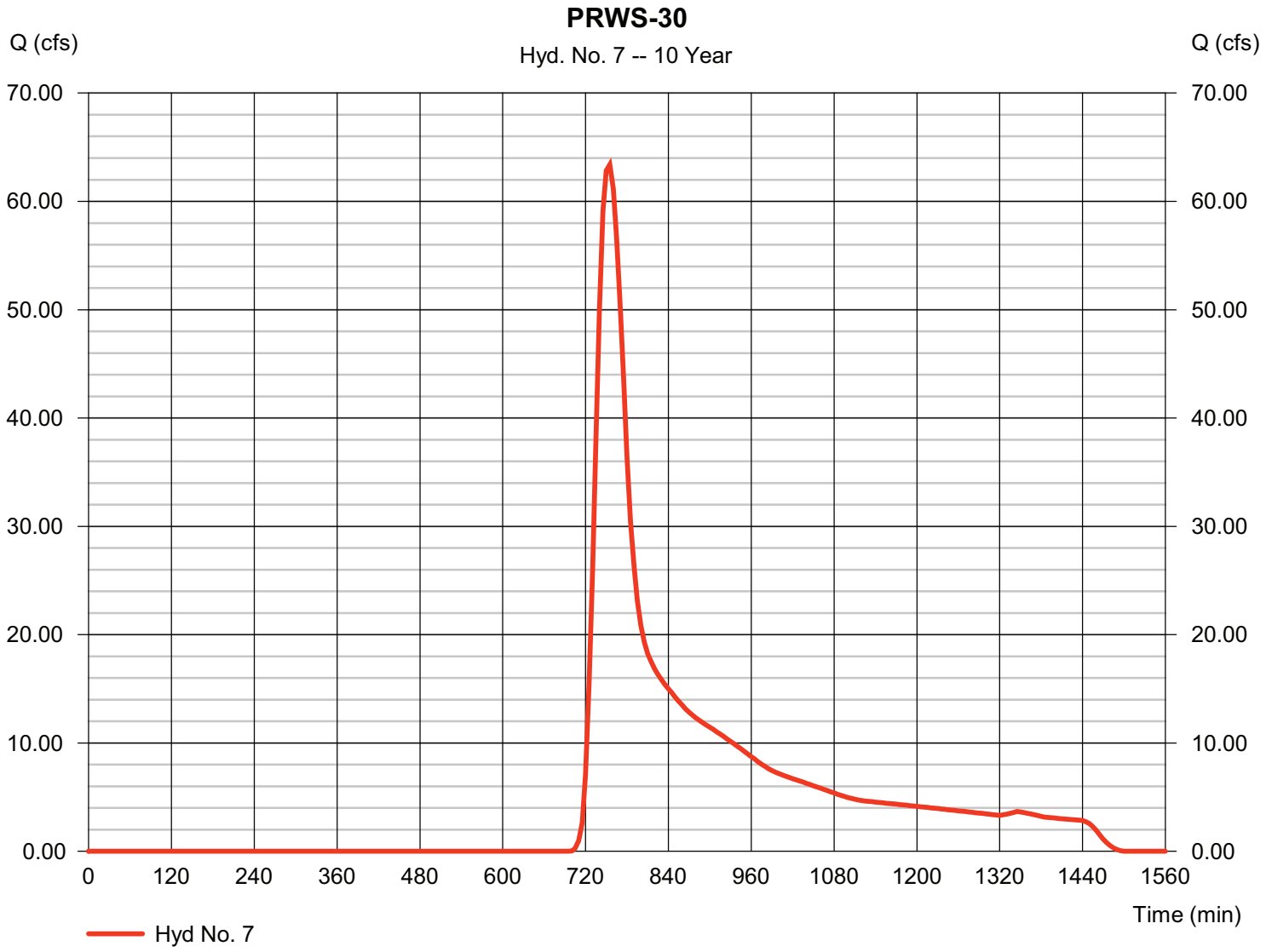
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 7

PRWS-30

Hydrograph type	= SCS Runoff	Peak discharge	= 63.40 cfs
Storm frequency	= 10 yrs	Time to peak	= 755 min
Time interval	= 5 min	Hyd. volume	= 460,613 cuft
Drainage area	= 119.800 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 37.00 min
Total precip.	= 5.21 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



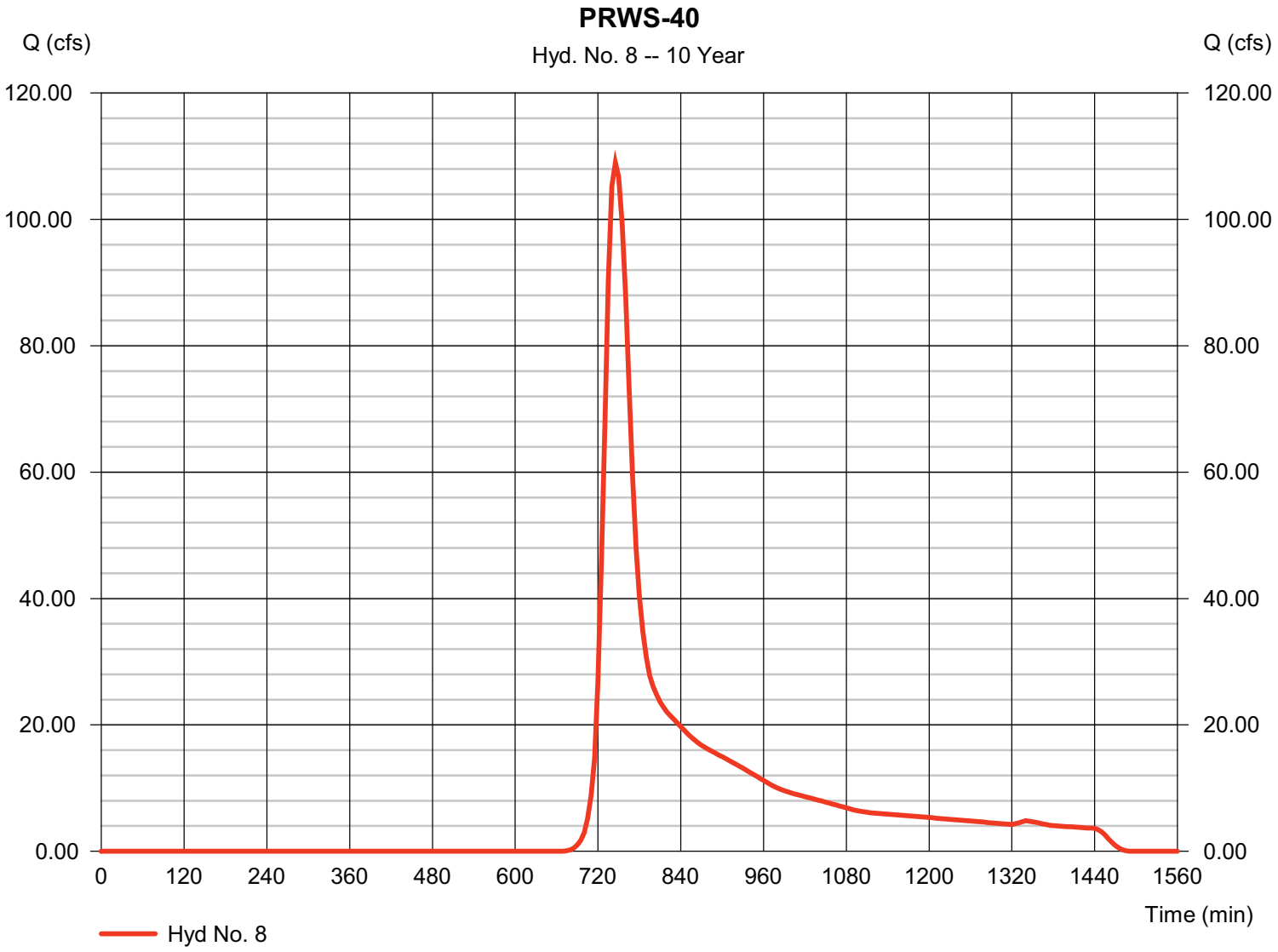
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 8

PRWS-40

Hydrograph type	= SCS Runoff	Peak discharge	= 108.97 cfs
Storm frequency	= 10 yrs	Time to peak	= 745 min
Time interval	= 5 min	Hyd. volume	= 667,523 cuft
Drainage area	= 125.100 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 32.00 min
Total precip.	= 5.21 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

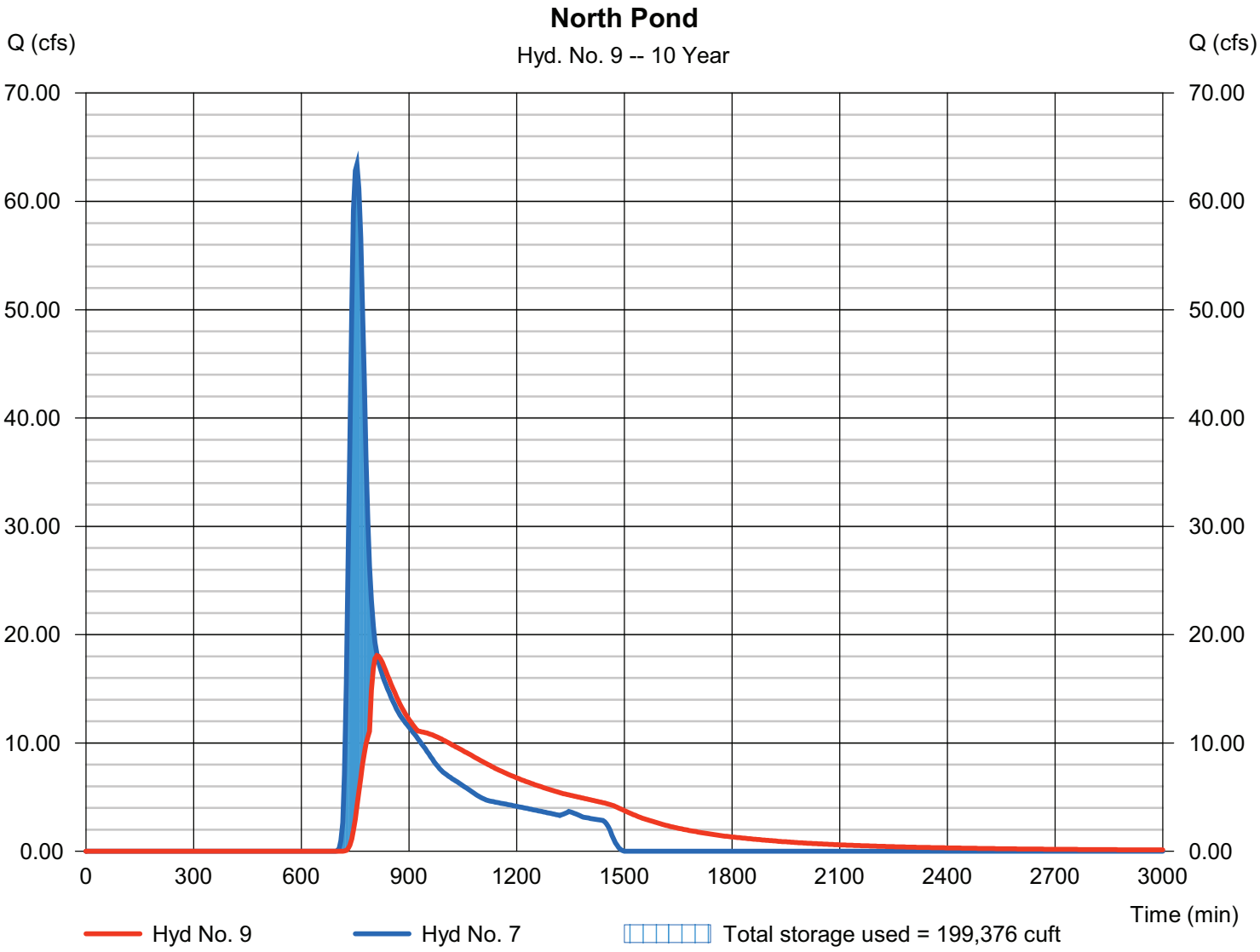
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 9

North Pond

Hydrograph type	= Reservoir	Peak discharge	= 18.07 cfs
Storm frequency	= 10 yrs	Time to peak	= 810 min
Time interval	= 5 min	Hyd. volume	= 460,538 cuft
Inflow hyd. No.	= 7 - PRWS-30	Max. Elevation	= 325.03 ft
Reservoir name	= North Pond	Max. Storage	= 199,376 cuft

Storage Indication method used. Wet pond routing start elevation = 324.15 ft.



Hydrograph Report

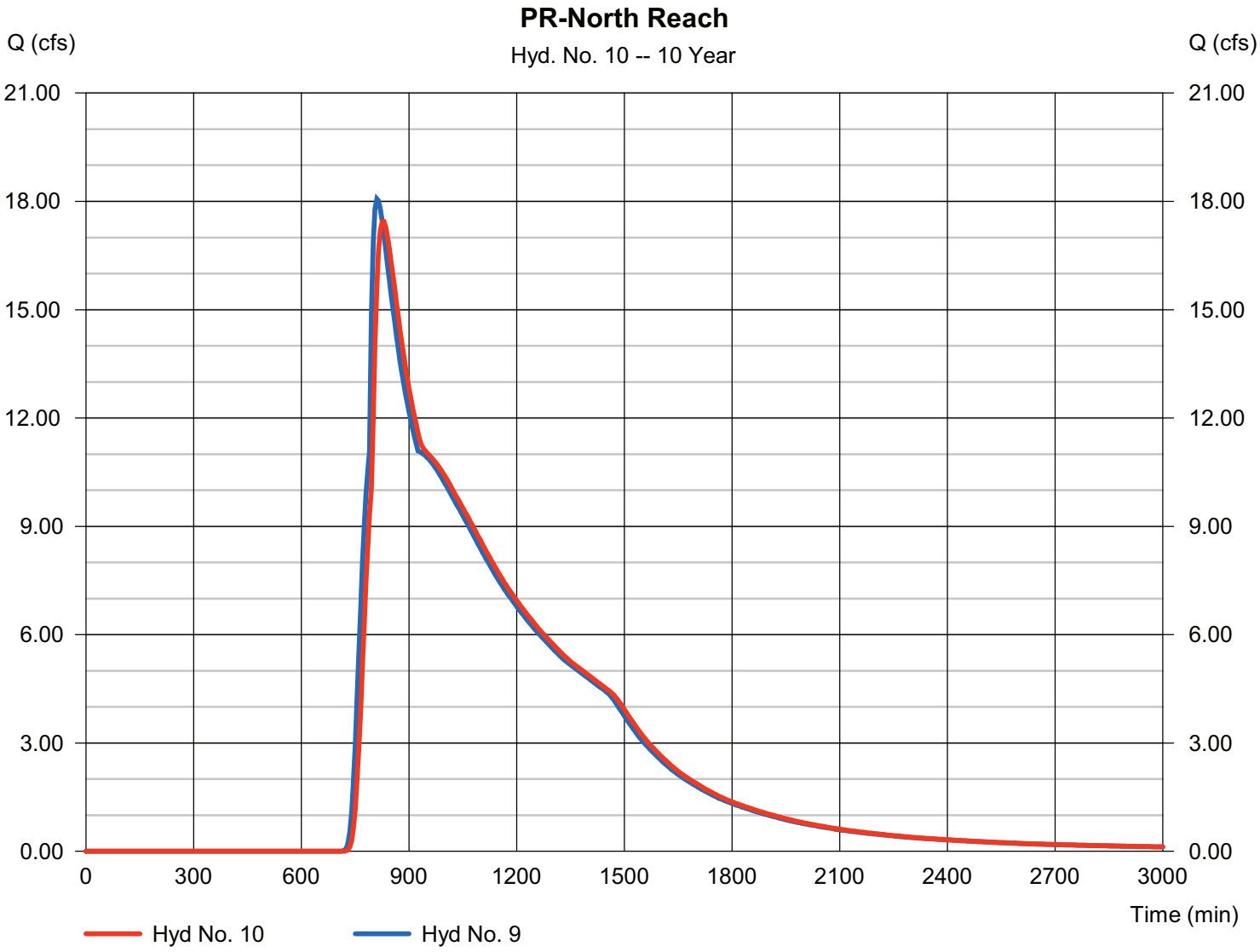
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 10

PR-North Reach

Hydrograph type	= Reach	Peak discharge	= 17.44 cfs
Storm frequency	= 10 yrs	Time to peak	= 825 min
Time interval	= 5 min	Hyd. volume	= 459,863 cuft
Inflow hyd. No.	= 9 - North Pond	Section type	= Trapezoidal
Reach length	= 2800.0 ft	Channel slope	= 4.8 %
Manning's n	= 0.050	Bottom width	= 5.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 2.232	Rating curve m	= 1.321
Ave. velocity	= 3.71 ft/s	Routing coeff.	= 0.4158

Modified Att-Kin routing method used.



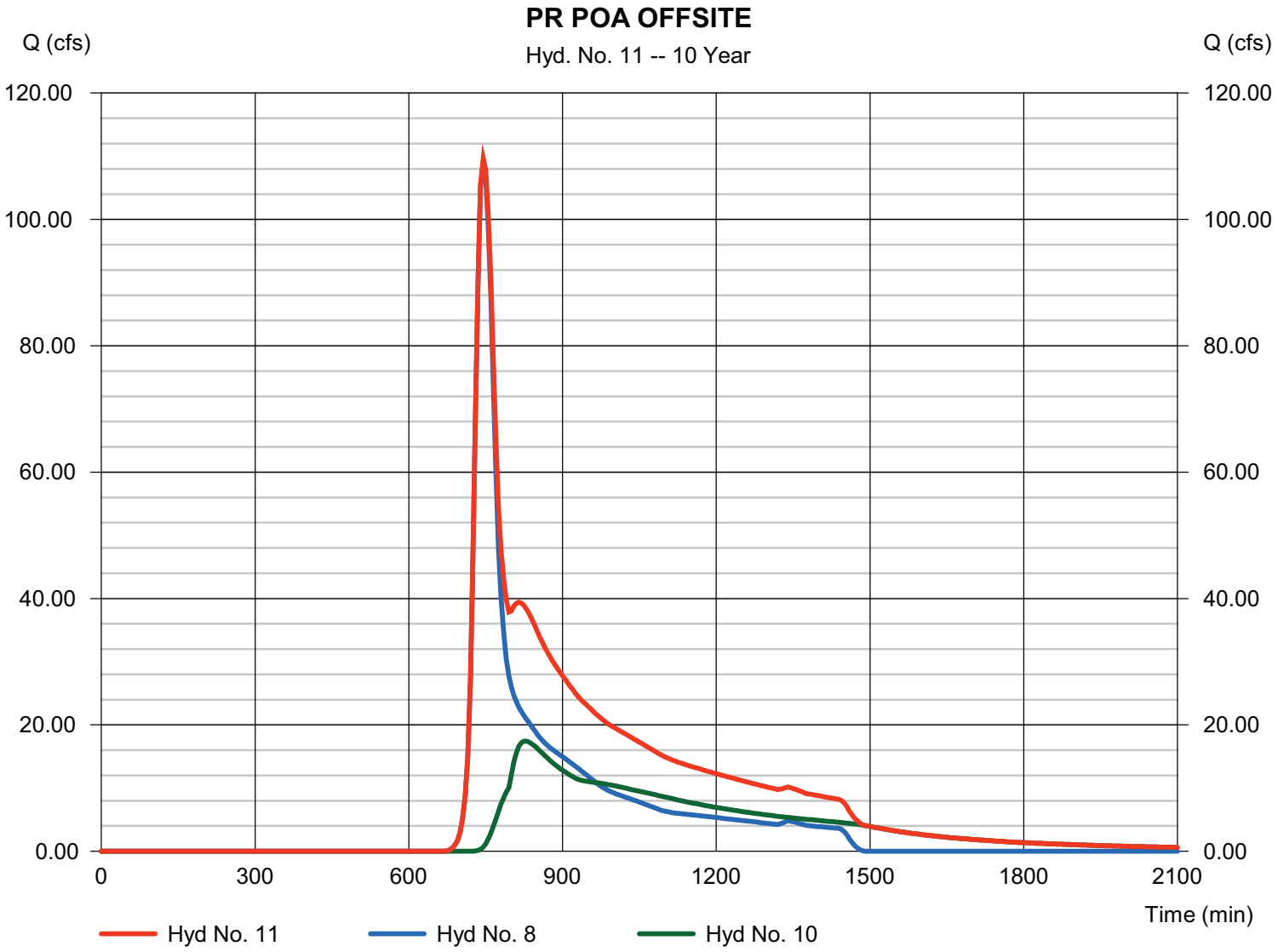
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 11

PR POA OFFSITE

Hydrograph type	=	Combine	Peak discharge	=	109.62 cfs
Storm frequency	=	10 yrs	Time to peak	=	745 min
Time interval	=	5 min	Hyd. volume	=	1,127,386 cuft
Inflow hyds.	=	8, 10	Contrib. drain. area	=	125.100 ac



Hydrograph Report

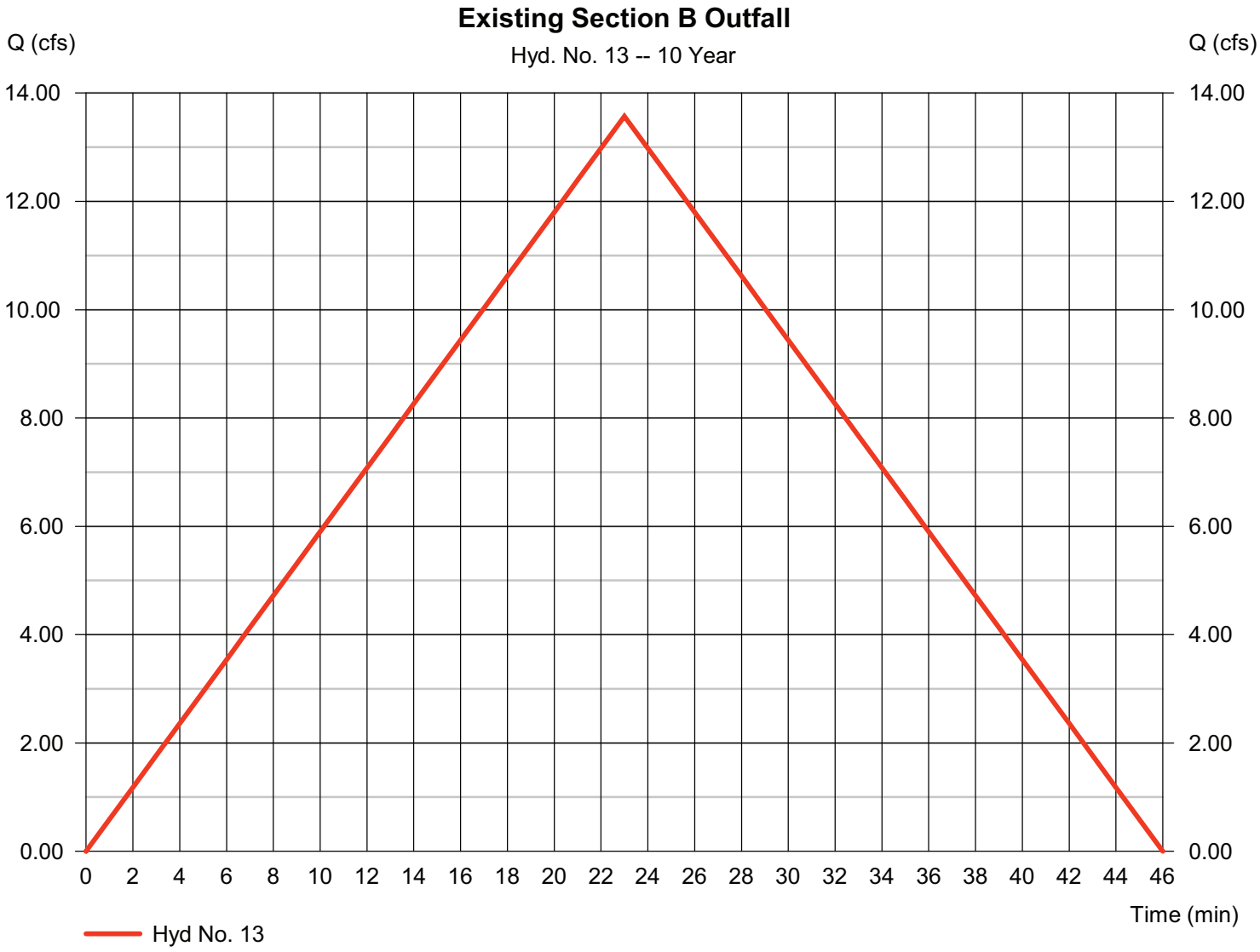
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 13

Existing Section B Outfall

Hydrograph type	=	Rational	Peak discharge	=	13.57 cfs
Storm frequency	=	10 yrs	Time to peak	=	23 min
Time interval	=	1 min	Hyd. volume	=	18,727 cuft
Drainage area	=	7.230 ac	Runoff coeff.	=	0.56*
Intensity	=	3.352 in/hr	Tc by User	=	23.00 min
IDF Curve	=	Middlesex.idf	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(3.150 x 0.90) + (4.080 x 0.30)] / 7.230



Hydrograph Report

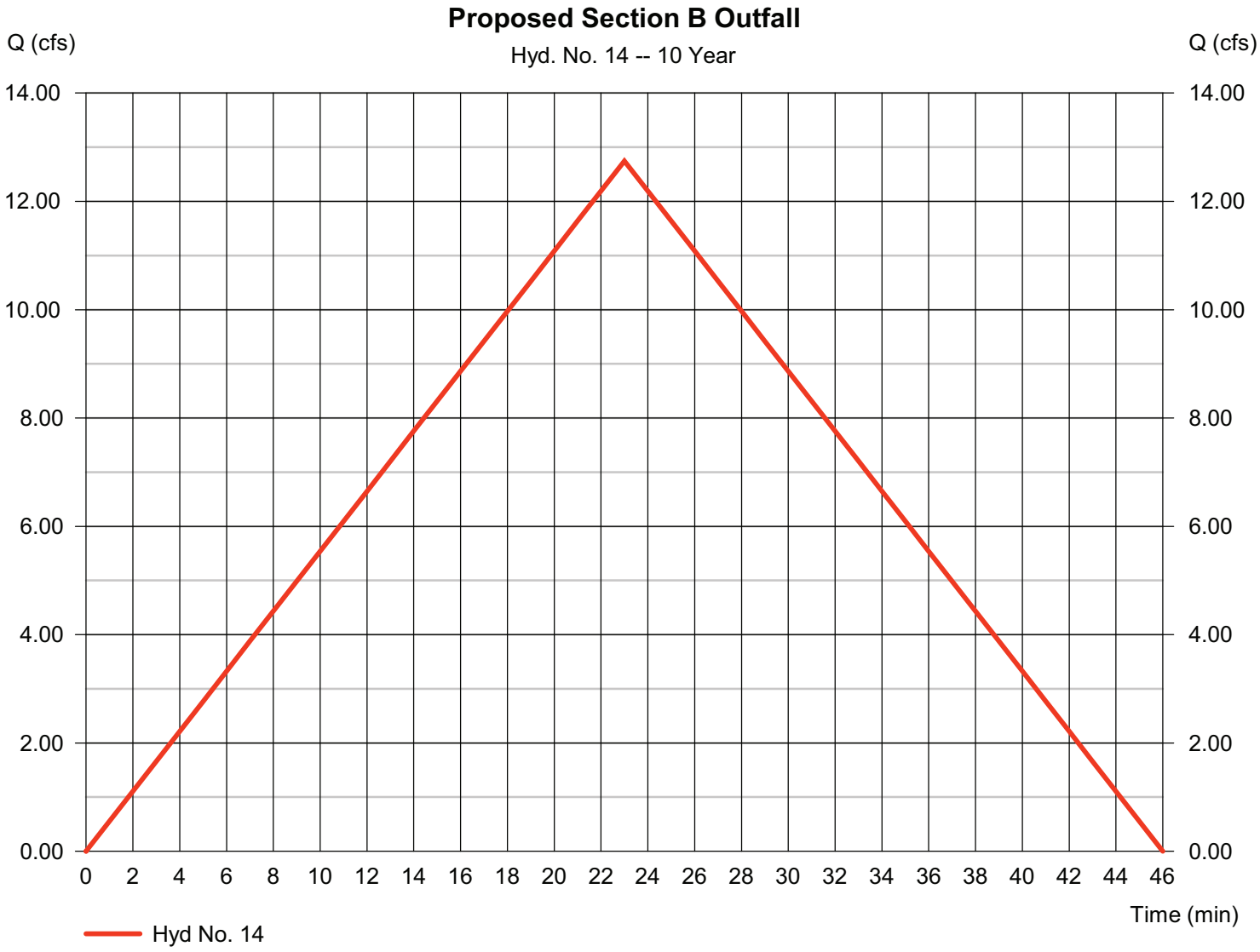
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 14

Proposed Section B Outfall

Hydrograph type	=	Rational	Peak discharge	=	12.74 cfs
Storm frequency	=	10 yrs	Time to peak	=	23 min
Time interval	=	1 min	Hyd. volume	=	17,587 cuft
Drainage area	=	6.790 ac	Runoff coeff.	=	0.56*
Intensity	=	3.352 in/hr	Tc by User	=	23.00 min
IDF Curve	=	Middlesex.idf	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(2.950 x 0.90) + (3.840 x 0.30)] / 6.790



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	108.35	5	750	722,939	------	------	------	EXWS-30
2	SCS Runoff	170.48	5	745	999,305	------	------	------	EXWS-40
3	Reservoir	73.79	5	775	722,863	1	325.20	234,321	North Pond
4	Reach	68.06	5	785	722,187	3	------	------	EX-North Reach
5	Combine	173.02	5	745	1,721,494	2, 4	------	------	EX POA OFFSITE
7	SCS Runoff	108.35	5	750	722,939	------	------	------	PRWS-30
8	SCS Runoff	170.48	5	745	999,305	------	------	------	PRWS-40
9	Reservoir	73.79	5	775	722,863	7	325.20	234,321	North Pond
10	Reach	68.06	5	785	722,187	9	------	------	PR-North Reach
11	Combine	173.02	5	745	1,721,494	8, 10	------	------	PR POA OFFSITE
13	Rational	16.03	1	23	22,124	------	------	------	Existing Section B Outfall
14	Rational	15.06	1	23	20,778	------	------	------	Proposed Section B Outfall

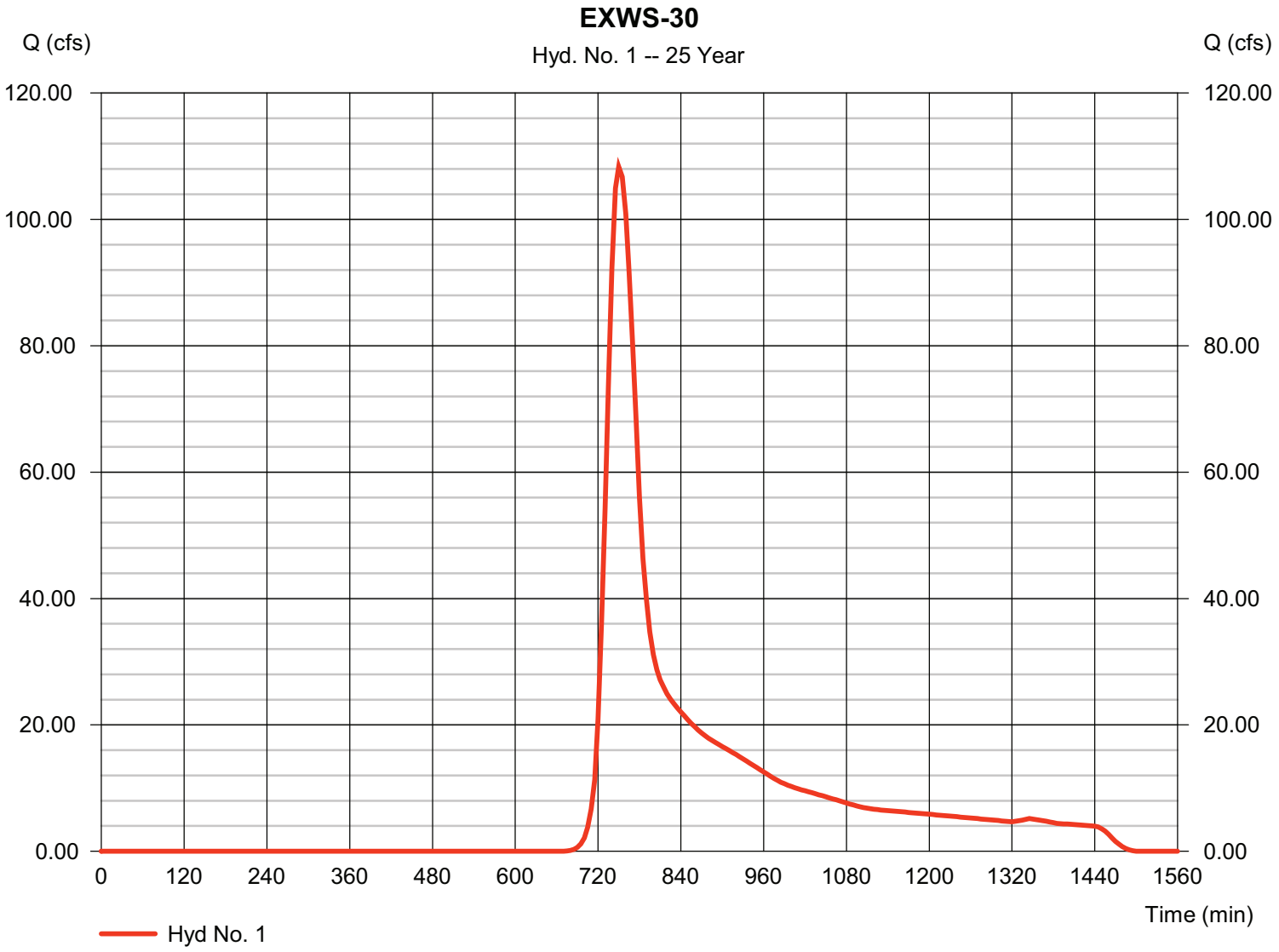
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 1

EXWS-30

Hydrograph type	= SCS Runoff	Peak discharge	= 108.35 cfs
Storm frequency	= 25 yrs	Time to peak	= 750 min
Time interval	= 5 min	Hyd. volume	= 722,939 cuft
Drainage area	= 119.800 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 37.00 min
Total precip.	= 6.32 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



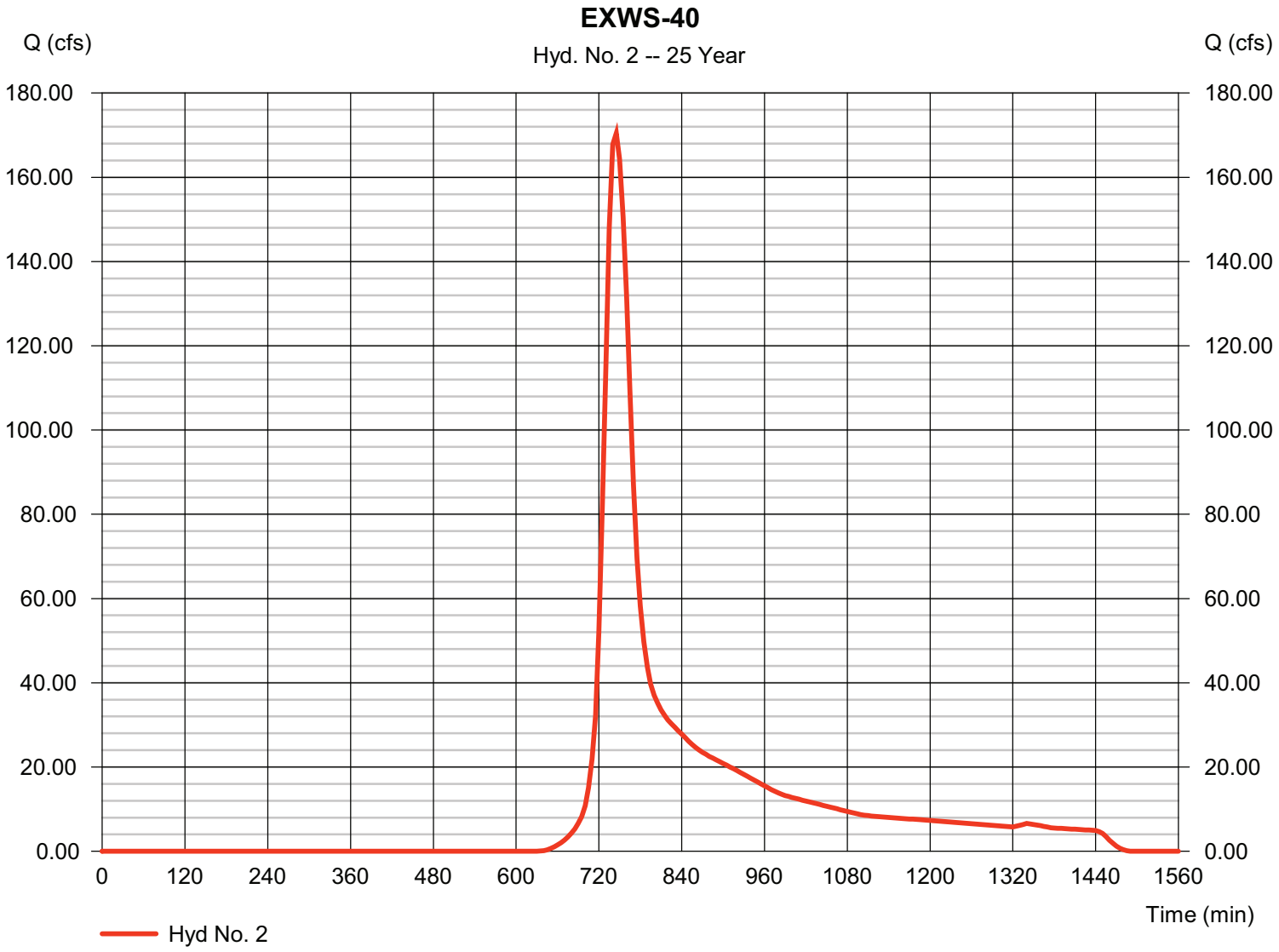
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 2

EXWS-40

Hydrograph type	= SCS Runoff	Peak discharge	= 170.48 cfs
Storm frequency	= 25 yrs	Time to peak	= 745 min
Time interval	= 5 min	Hyd. volume	= 999,305 cuft
Drainage area	= 125.100 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 32.00 min
Total precip.	= 6.32 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

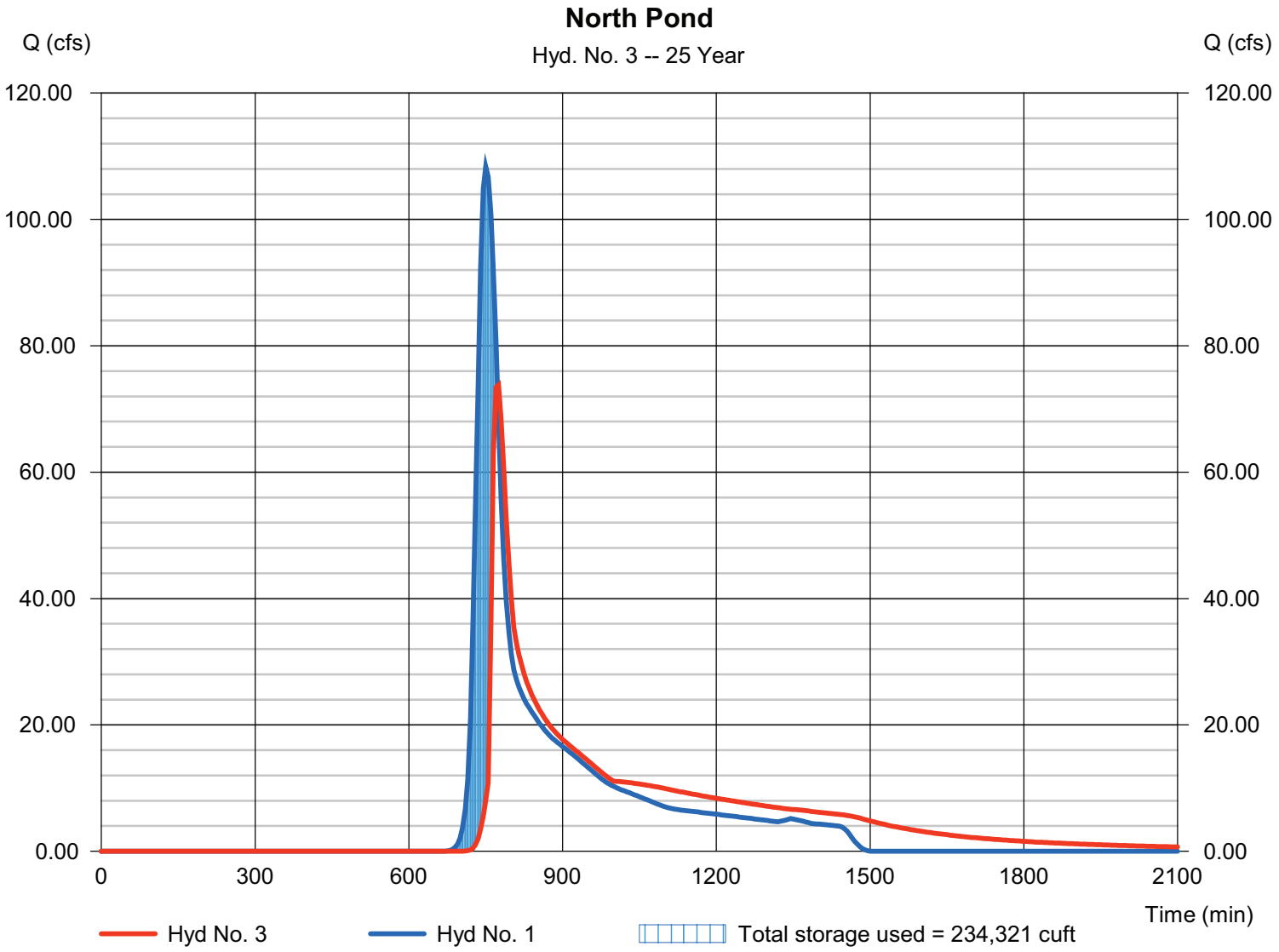
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 3

North Pond

Hydrograph type	=	Reservoir	Peak discharge	=	73.79 cfs
Storm frequency	=	25 yrs	Time to peak	=	775 min
Time interval	=	5 min	Hyd. volume	=	722,863 cuft
Inflow hyd. No.	=	1 - EXWS-30	Max. Elevation	=	325.20 ft
Reservoir name	=	North Pond	Max. Storage	=	234,321 cuft

Storage Indication method used. Wet pond routing start elevation = 324.15 ft.



Hydrograph Report

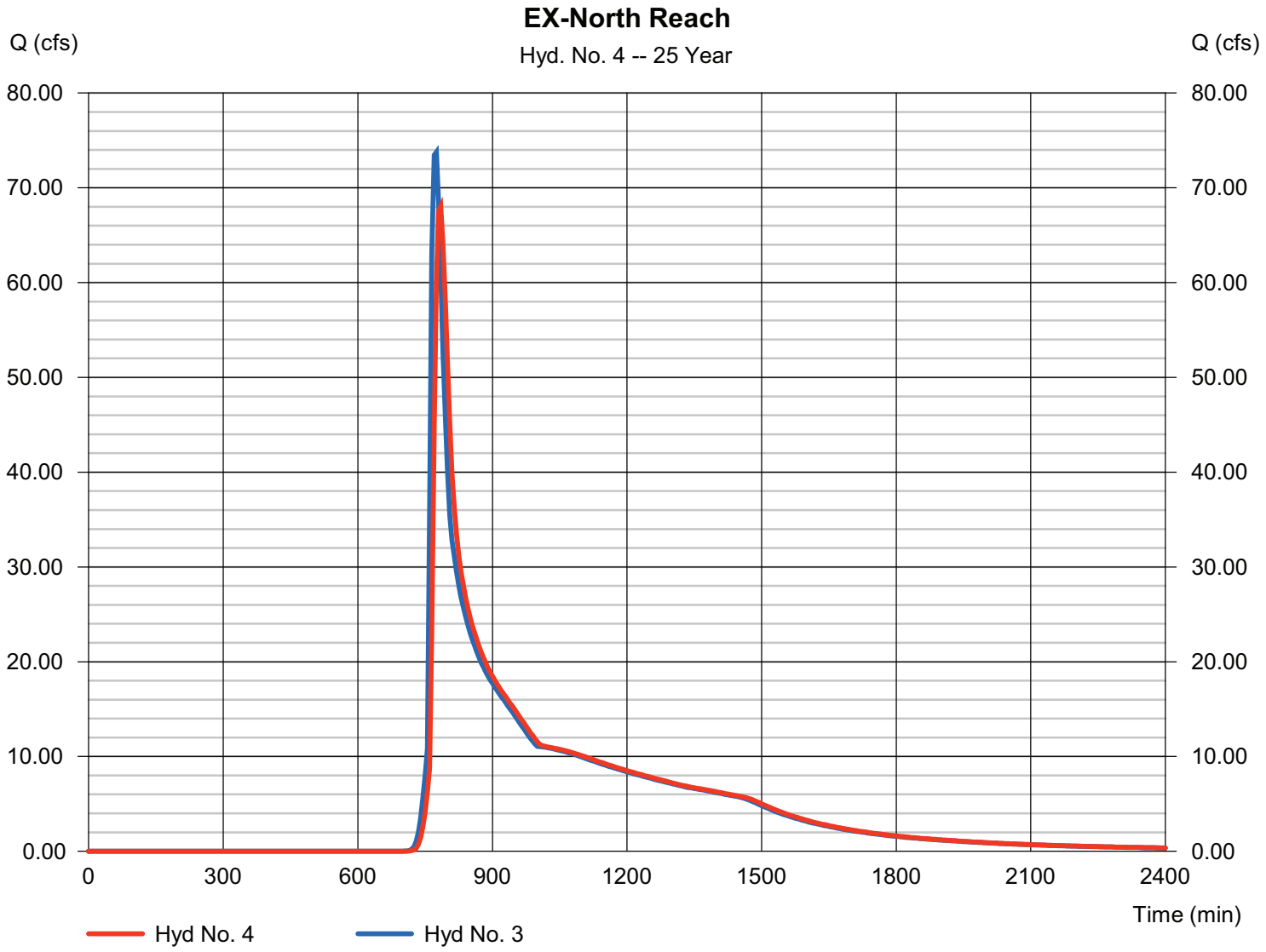
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 4

EX-North Reach

Hydrograph type	=	Reach	Peak discharge	=	68.06 cfs
Storm frequency	=	25 yrs	Time to peak	=	785 min
Time interval	=	5 min	Hyd. volume	=	722,187 cuft
Inflow hyd. No.	=	3 - North Pond	Section type	=	Trapezoidal
Reach length	=	2800.0 ft	Channel slope	=	4.8 %
Manning's n	=	0.050	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	2.232	Rating curve m	=	1.321
Ave. velocity	=	5.22 ft/s	Routing coeff.	=	0.5395

Modified Att-Kin routing method used.

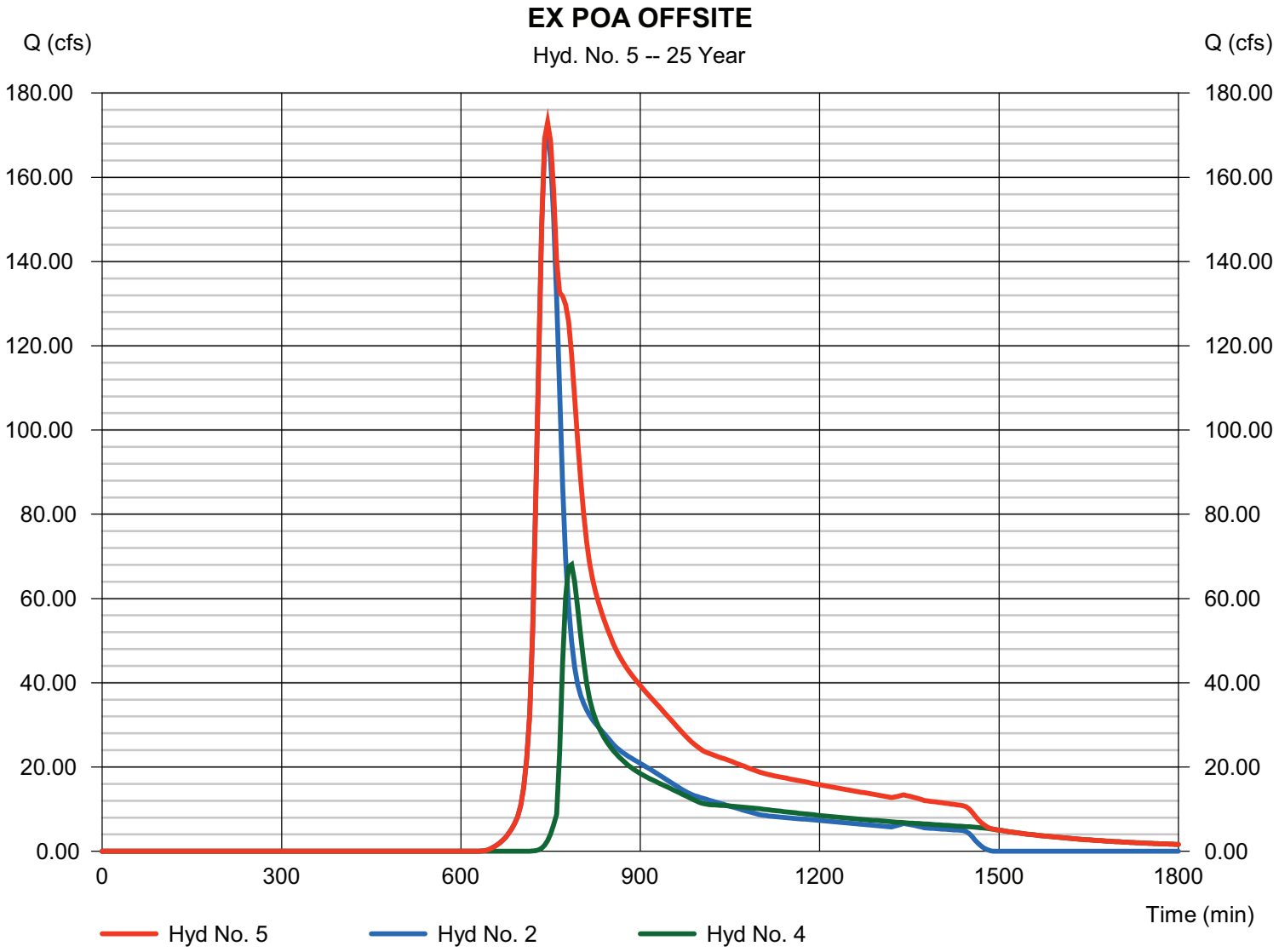


Hydrograph Report

Hyd. No. 5

EX POA OFFSITE

Hydrograph type	=	Combine	Peak discharge	=	173.02 cfs
Storm frequency	=	25 yrs	Time to peak	=	745 min
Time interval	=	5 min	Hyd. volume	=	1,721,494 cuft
Inflow hyds.	=	2, 4	Contrib. drain. area	=	125.100 ac



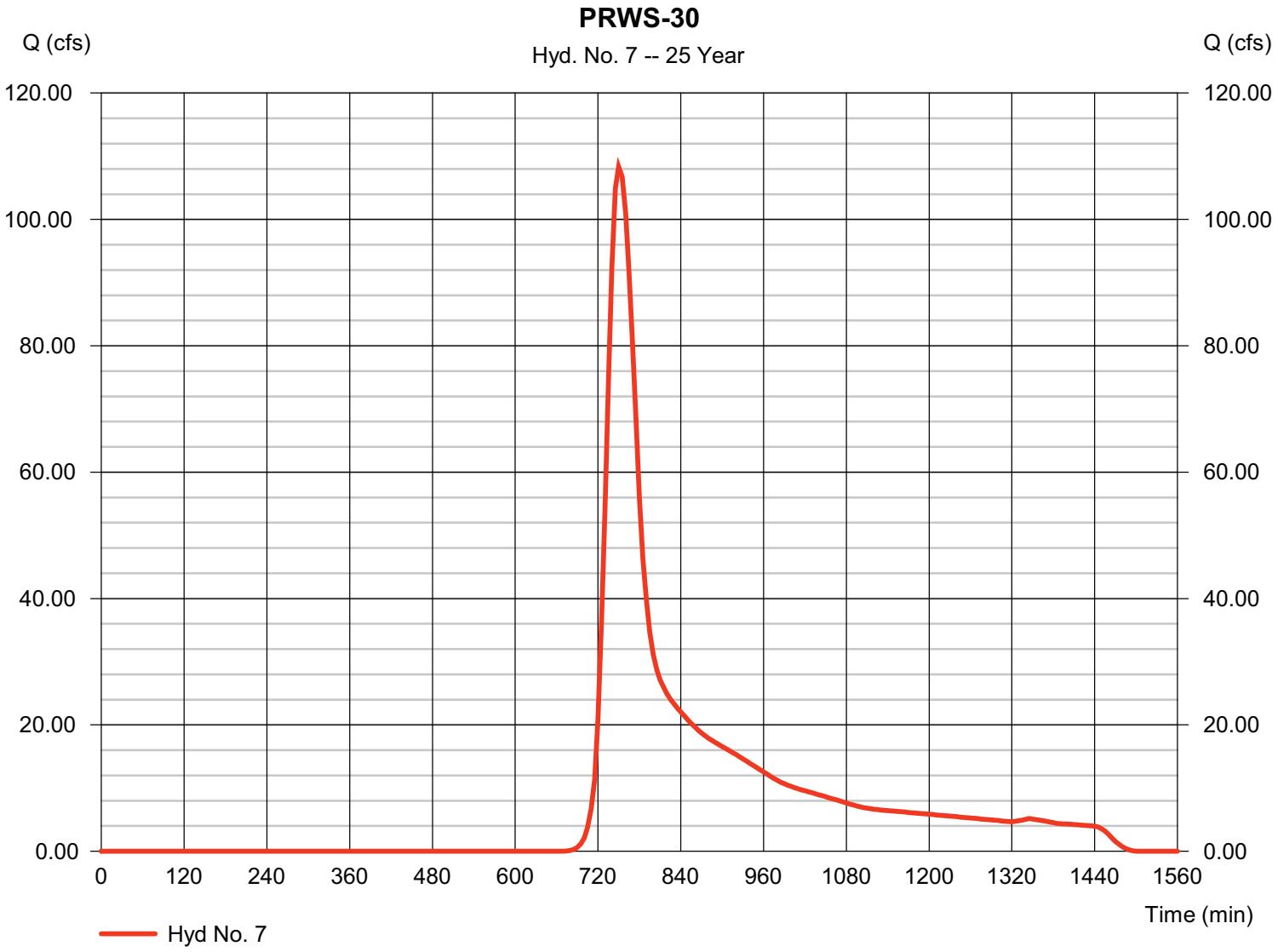
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 7

PRWS-30

Hydrograph type	= SCS Runoff	Peak discharge	= 108.35 cfs
Storm frequency	= 25 yrs	Time to peak	= 750 min
Time interval	= 5 min	Hyd. volume	= 722,939 cuft
Drainage area	= 119.800 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 37.00 min
Total precip.	= 6.32 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



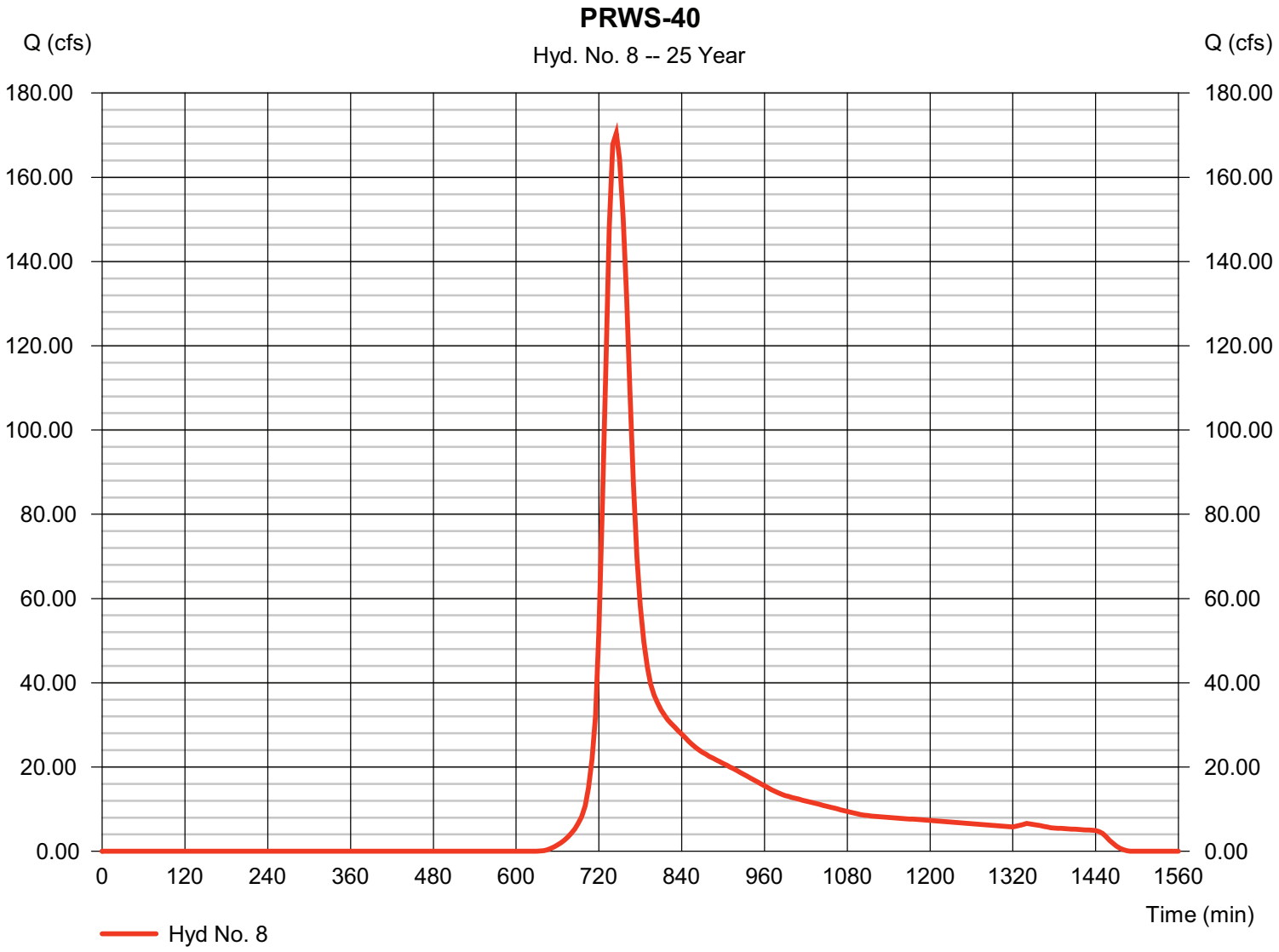
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 8

PRWS-40

Hydrograph type	= SCS Runoff	Peak discharge	= 170.48 cfs
Storm frequency	= 25 yrs	Time to peak	= 745 min
Time interval	= 5 min	Hyd. volume	= 999,305 cuft
Drainage area	= 125.100 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 32.00 min
Total precip.	= 6.32 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

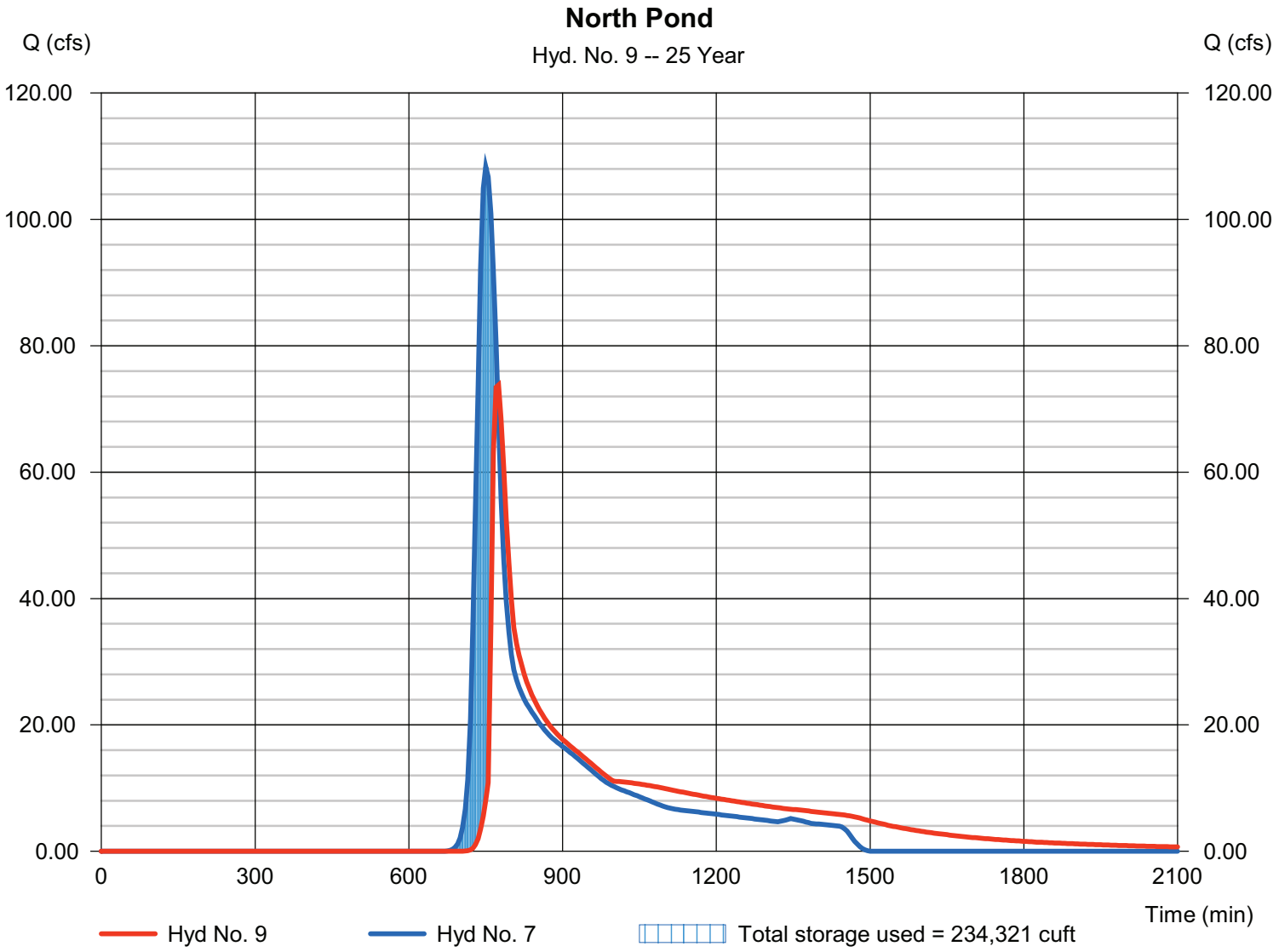
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 9

North Pond

Hydrograph type	=	Reservoir	Peak discharge	=	73.79 cfs
Storm frequency	=	25 yrs	Time to peak	=	775 min
Time interval	=	5 min	Hyd. volume	=	722,863 cuft
Inflow hyd. No.	=	7 - PRWS-30	Max. Elevation	=	325.20 ft
Reservoir name	=	North Pond	Max. Storage	=	234,321 cuft

Storage Indication method used. Wet pond routing start elevation = 324.15 ft.



Hydrograph Report

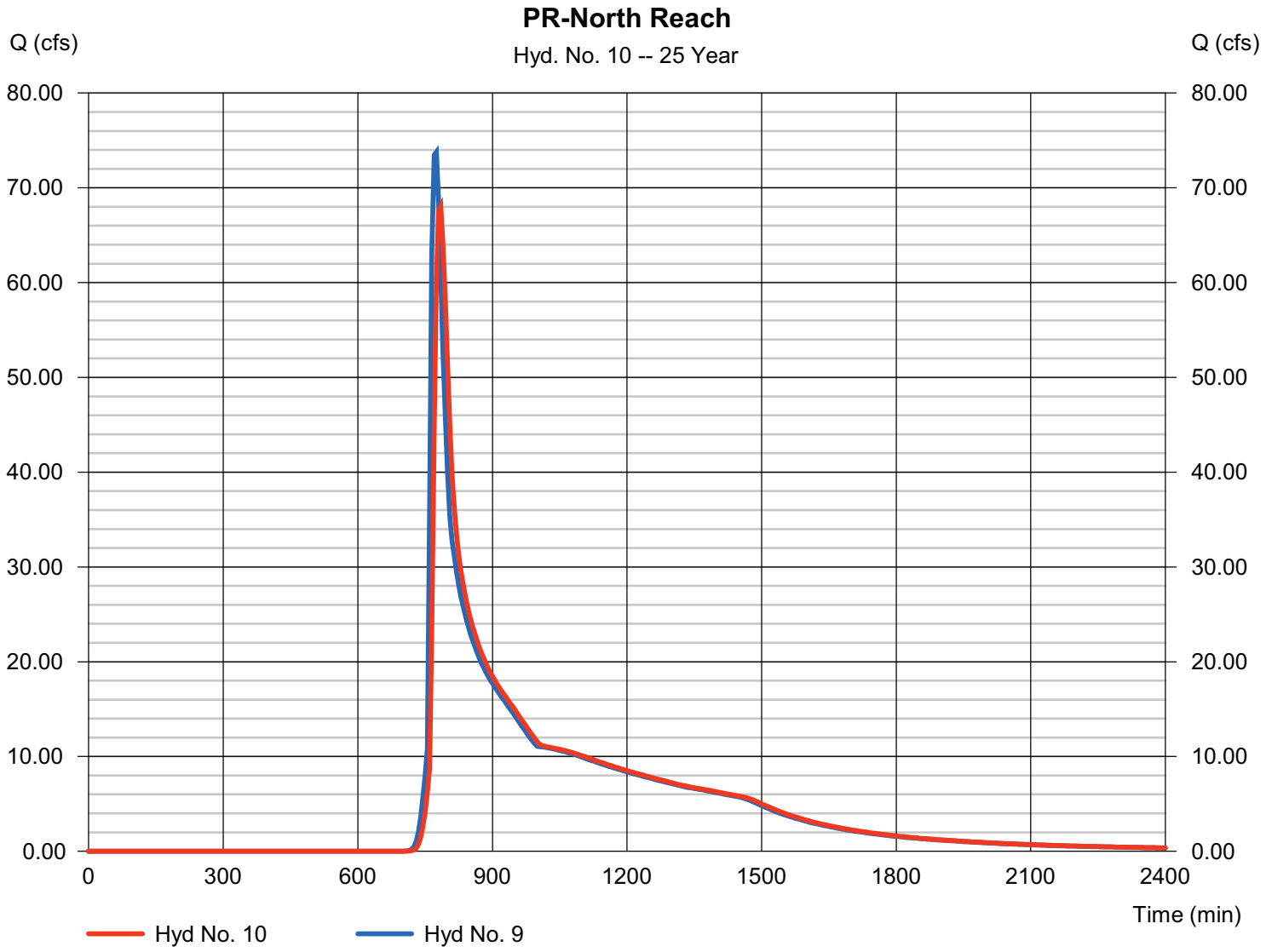
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 10

PR-North Reach

Hydrograph type	= Reach	Peak discharge	= 68.06 cfs
Storm frequency	= 25 yrs	Time to peak	= 785 min
Time interval	= 5 min	Hyd. volume	= 722,187 cuft
Inflow hyd. No.	= 9 - North Pond	Section type	= Trapezoidal
Reach length	= 2800.0 ft	Channel slope	= 4.8 %
Manning's n	= 0.050	Bottom width	= 5.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 2.232	Rating curve m	= 1.321
Ave. velocity	= 5.22 ft/s	Routing coeff.	= 0.5395

Modified Att-Kin routing method used.



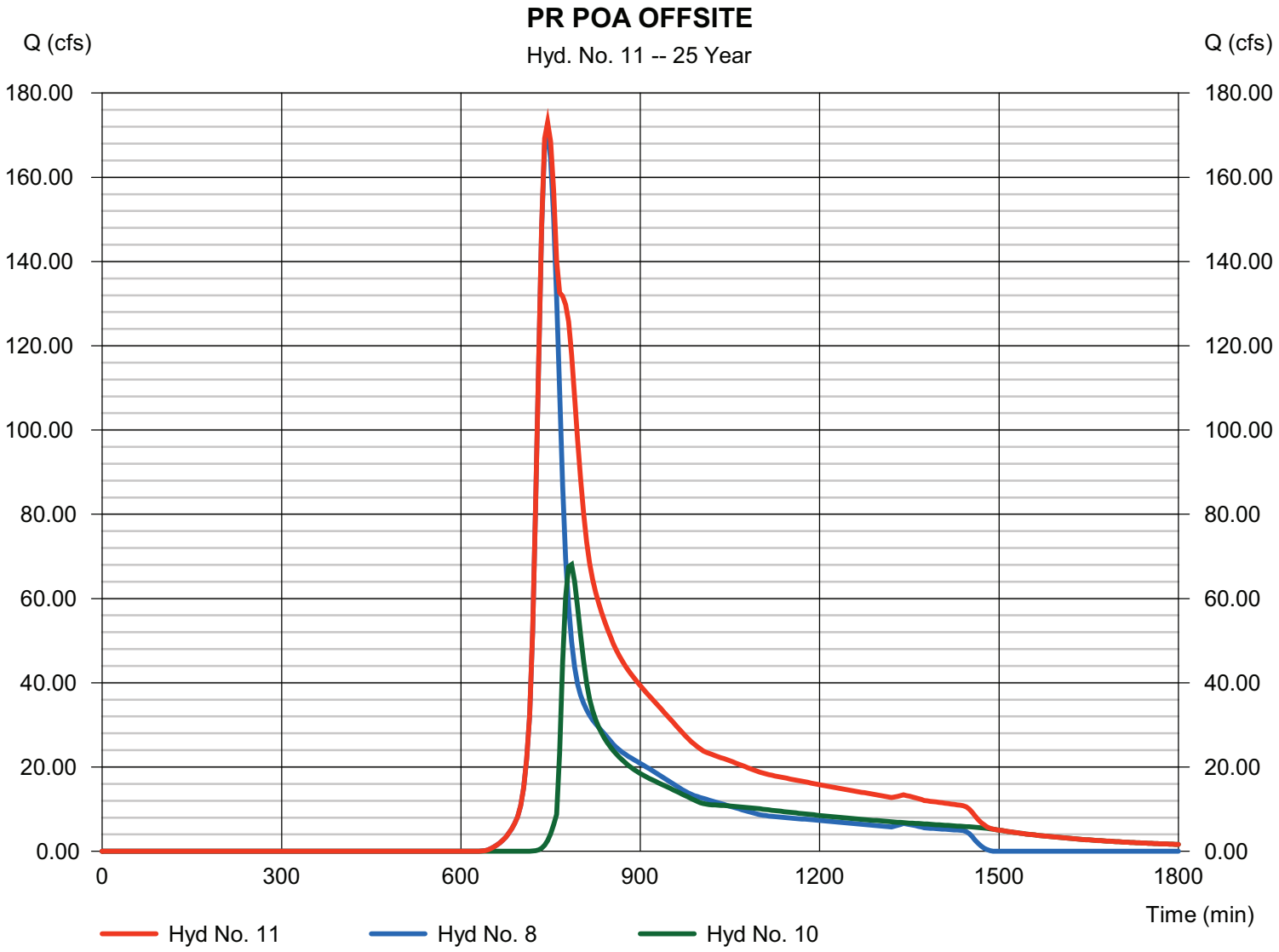
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 11

PR POA OFFSITE

Hydrograph type	= Combine	Peak discharge	= 173.02 cfs
Storm frequency	= 25 yrs	Time to peak	= 745 min
Time interval	= 5 min	Hyd. volume	= 1,721,494 cuft
Inflow hyds.	= 8, 10	Contrib. drain. area	= 125.100 ac



Hydrograph Report

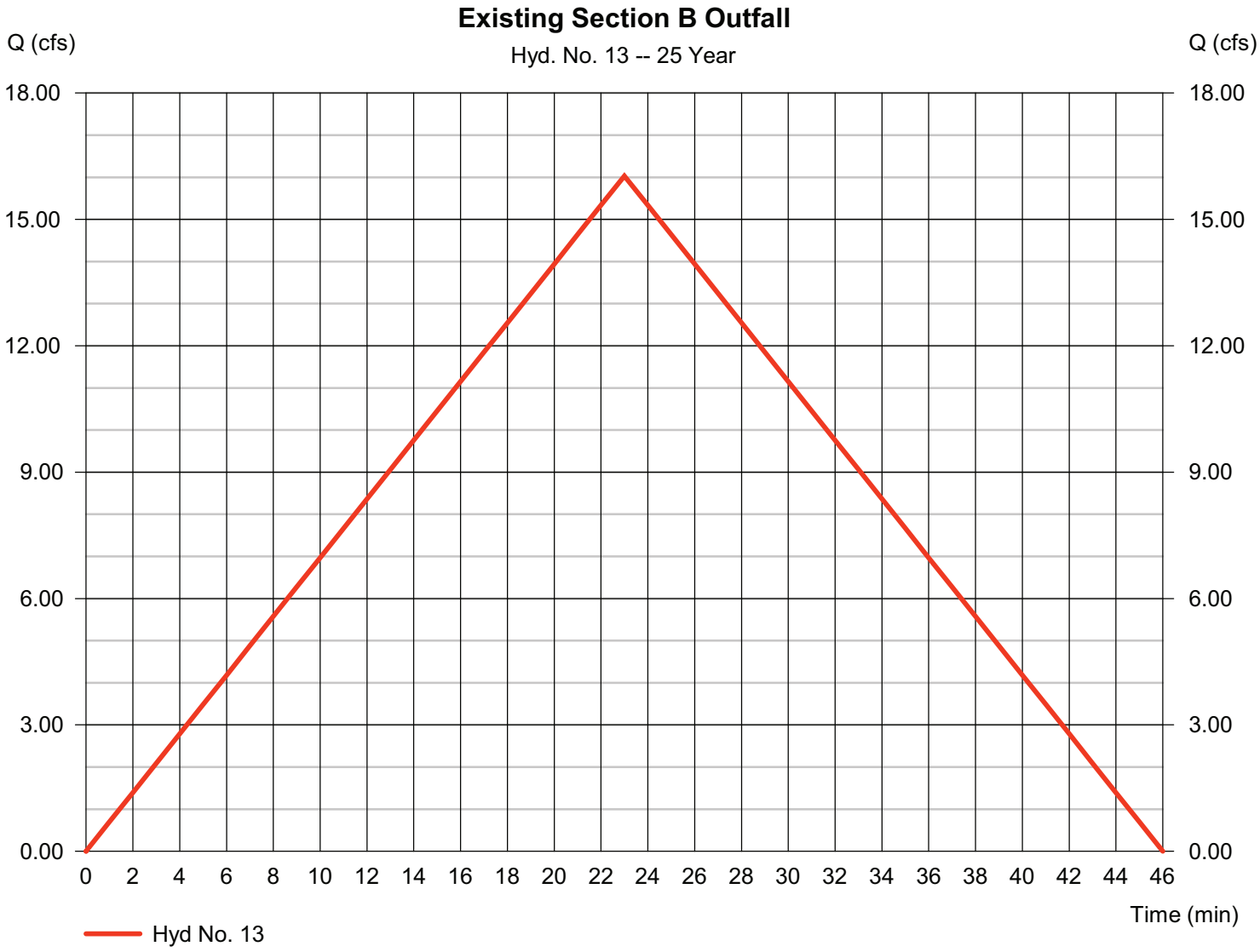
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 13

Existing Section B Outfall

Hydrograph type	=	Rational	Peak discharge	=	16.03 cfs
Storm frequency	=	25 yrs	Time to peak	=	23 min
Time interval	=	1 min	Hyd. volume	=	22,124 cuft
Drainage area	=	7.230 ac	Runoff coeff.	=	0.56*
Intensity	=	3.960 in/hr	Tc by User	=	23.00 min
IDF Curve	=	Middlesex.idf	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(3.150 x 0.90) + (4.080 x 0.30)] / 7.230



Hydrograph Report

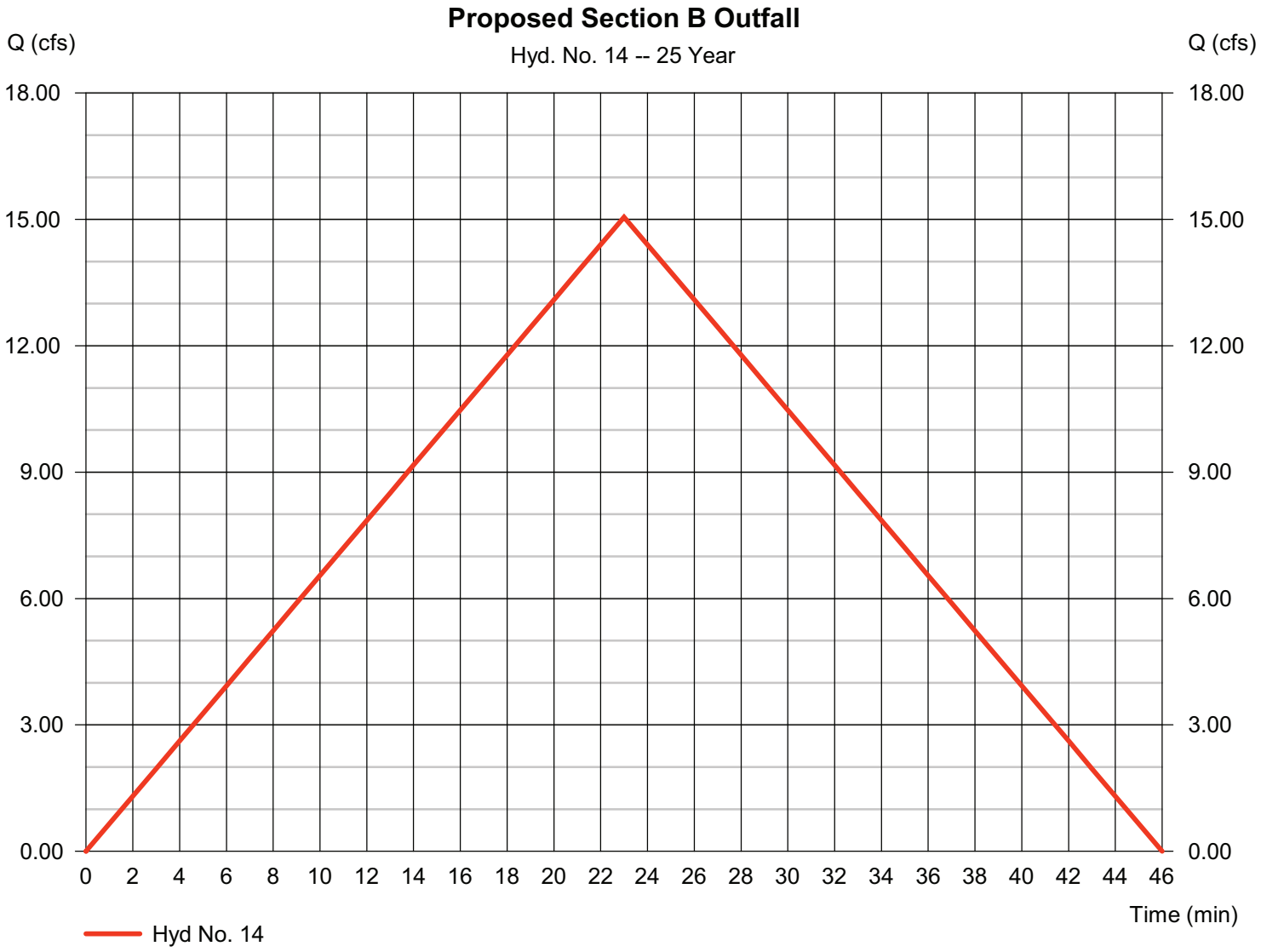
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 14

Proposed Section B Outfall

Hydrograph type	=	Rational	Peak discharge	=	15.06 cfs
Storm frequency	=	25 yrs	Time to peak	=	23 min
Time interval	=	1 min	Hyd. volume	=	20,778 cuft
Drainage area	=	6.790 ac	Runoff coeff.	=	0.56*
Intensity	=	3.960 in/hr	Tc by User	=	23.00 min
IDF Curve	=	Middlesex.idf	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(2.950 x 0.90) + (3.840 x 0.30)] / 6.790



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	145.42	5	750	938,431	------	------	------	EXWS-30
2	SCS Runoff	219.43	5	745	1,265,888	------	------	------	EXWS-40
3	Reservoir	121.40	5	765	938,357	1	325.29	253,536	North Pond
4	Reach	113.76	5	775	937,678	3	------	------	EX-North Reach
5	Combine	231.07	5	765	2,203,569	2, 4	------	------	EX POA OFFSITE
7	SCS Runoff	145.42	5	750	938,431	------	------	------	PRWS-30
8	SCS Runoff	219.43	5	745	1,265,888	------	------	------	PRWS-40
9	Reservoir	121.40	5	765	938,357	7	325.29	253,536	North Pond
10	Reach	113.76	5	775	937,678	9	------	------	PR-North Reach
11	Combine	231.07	5	765	2,203,569	8, 10	------	------	PR POA OFFSITE
13	Rational	17.96	1	23	24,786	------	------	------	Existing Section B Outfall
14	Rational	16.87	1	23	23,278	------	------	------	Proposed Section B Outfall

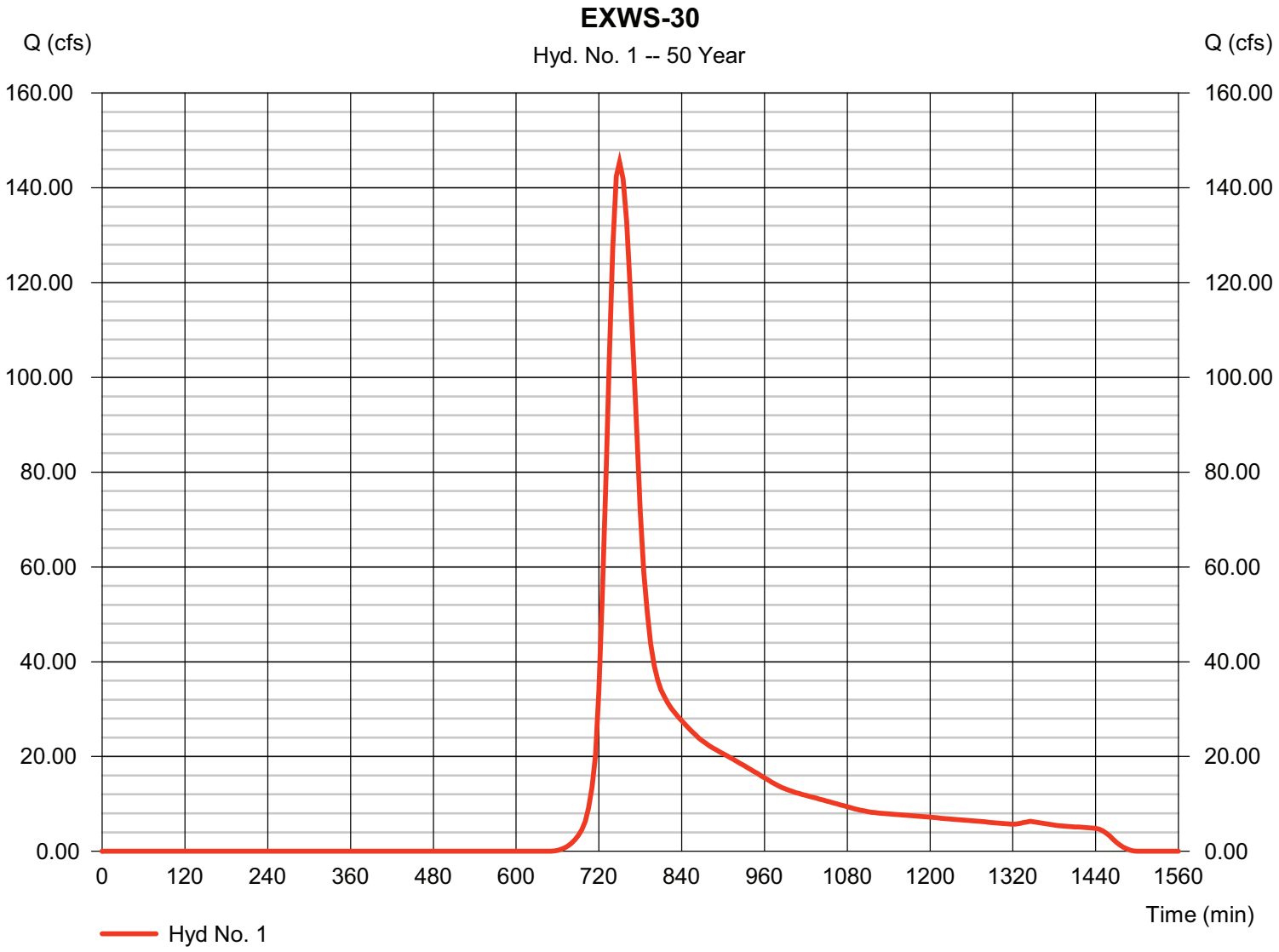
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 1

EXWS-30

Hydrograph type	= SCS Runoff	Peak discharge	= 145.42 cfs
Storm frequency	= 50 yrs	Time to peak	= 750 min
Time interval	= 5 min	Hyd. volume	= 938,431 cuft
Drainage area	= 119.800 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 37.00 min
Total precip.	= 7.14 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



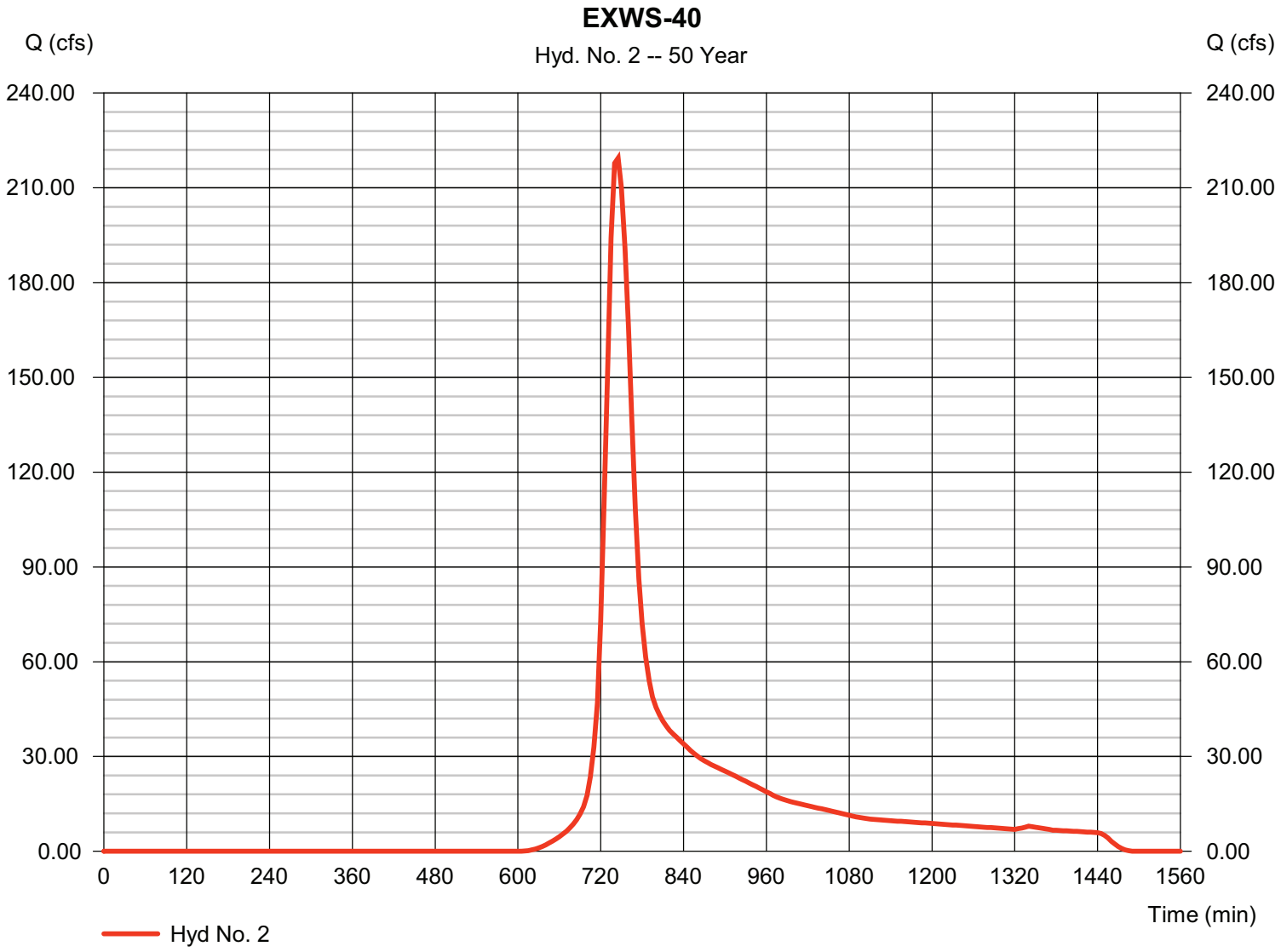
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 2

EXWS-40

Hydrograph type	= SCS Runoff	Peak discharge	= 219.43 cfs
Storm frequency	= 50 yrs	Time to peak	= 745 min
Time interval	= 5 min	Hyd. volume	= 1,265,888 cuft
Drainage area	= 125.100 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 32.00 min
Total precip.	= 7.14 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

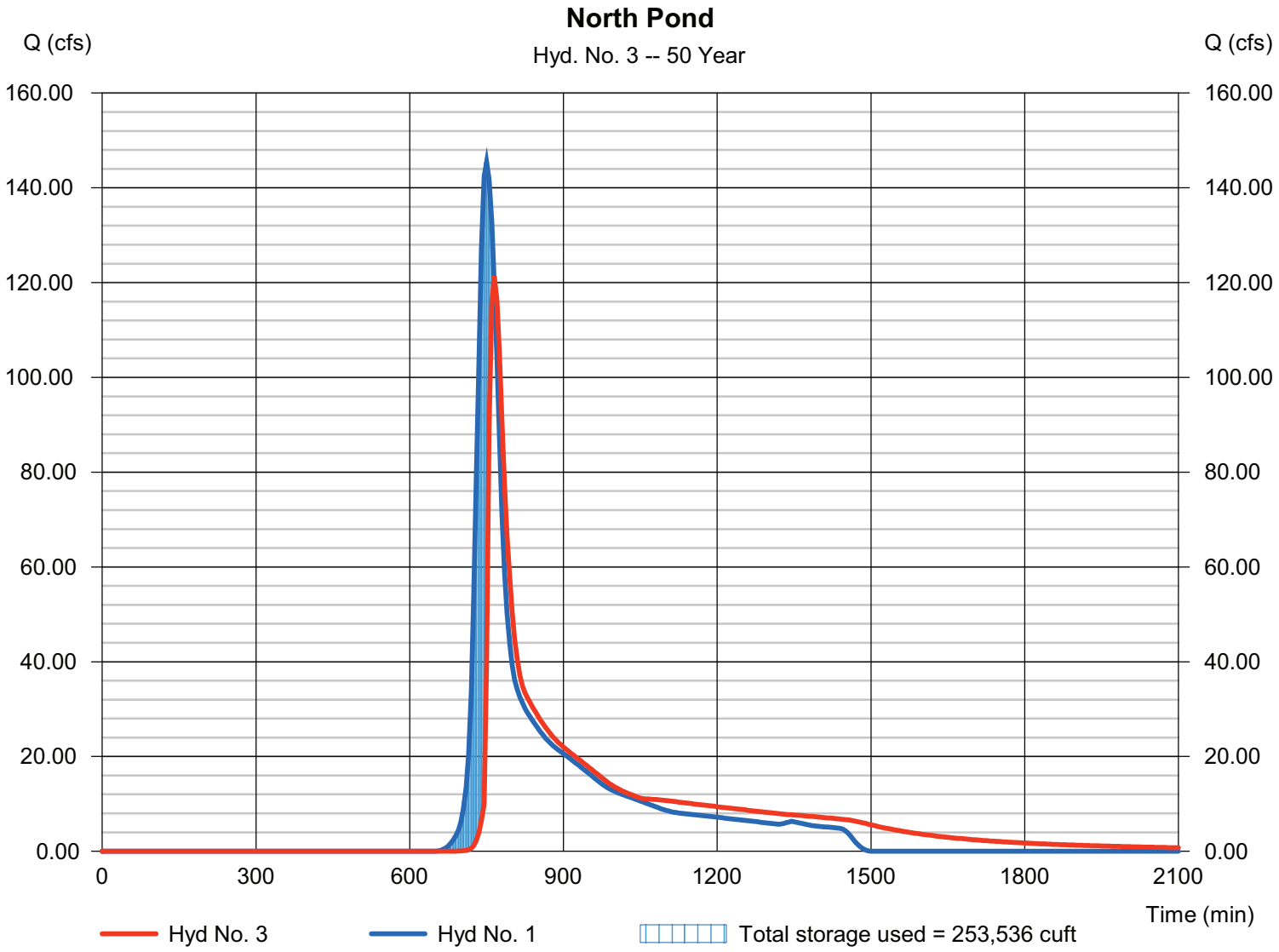
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 3

North Pond

Hydrograph type	=	Reservoir	Peak discharge	=	121.40 cfs
Storm frequency	=	50 yrs	Time to peak	=	765 min
Time interval	=	5 min	Hyd. volume	=	938,357 cuft
Inflow hyd. No.	=	1 - EXWS-30	Max. Elevation	=	325.29 ft
Reservoir name	=	North Pond	Max. Storage	=	253,536 cuft

Storage Indication method used. Wet pond routing start elevation = 324.15 ft.



Hydrograph Report

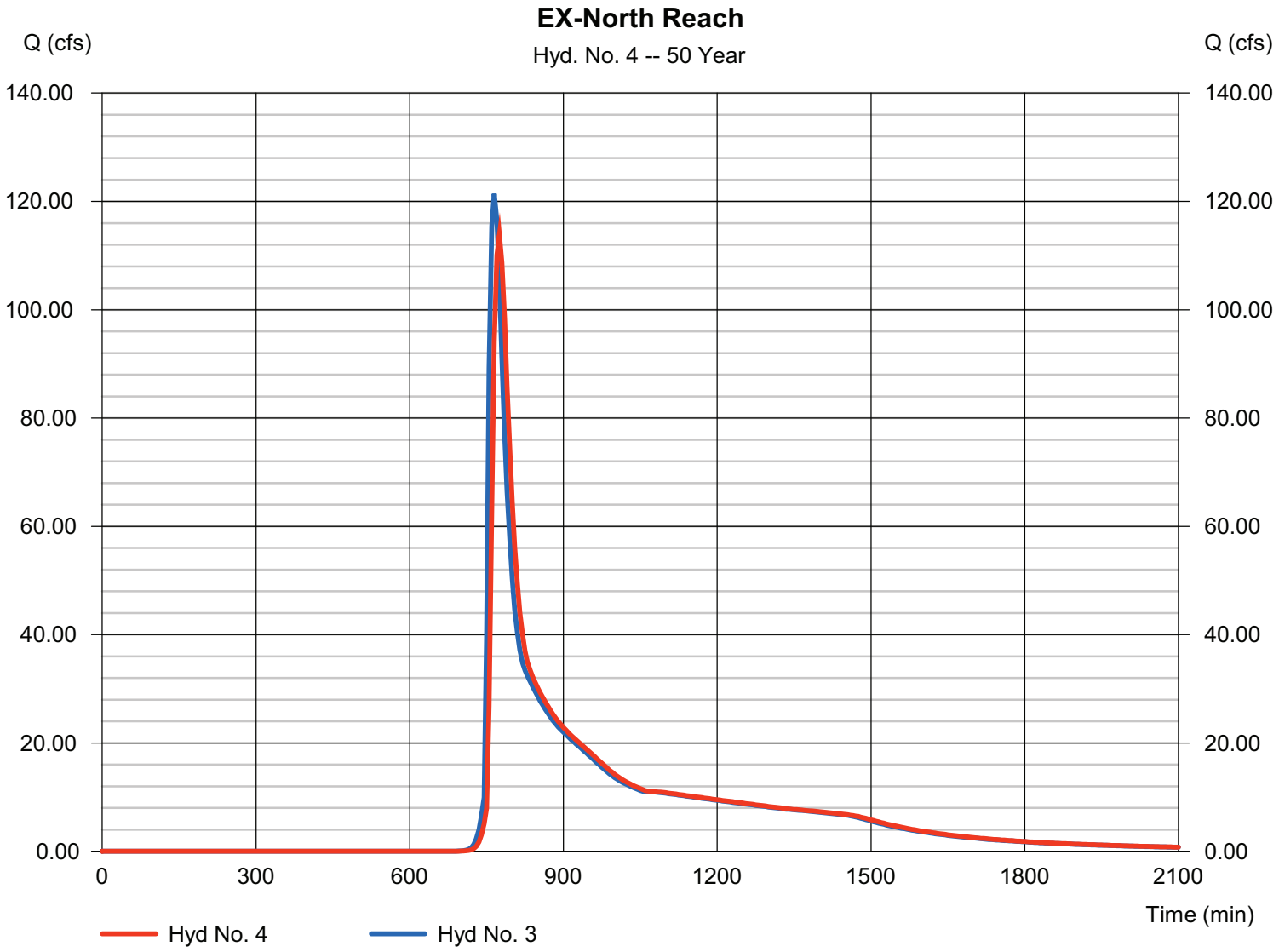
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 4

EX-North Reach

Hydrograph type	=	Reach	Peak discharge	=	113.76 cfs
Storm frequency	=	50 yrs	Time to peak	=	775 min
Time interval	=	5 min	Hyd. volume	=	937,678 cuft
Inflow hyd. No.	=	3 - North Pond	Section type	=	Trapezoidal
Reach length	=	2800.0 ft	Channel slope	=	4.8 %
Manning's n	=	0.050	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	2.232	Rating curve m	=	1.321
Ave. velocity	=	5.89 ft/s	Routing coeff.	=	0.5884

Modified Att-Kin routing method used.



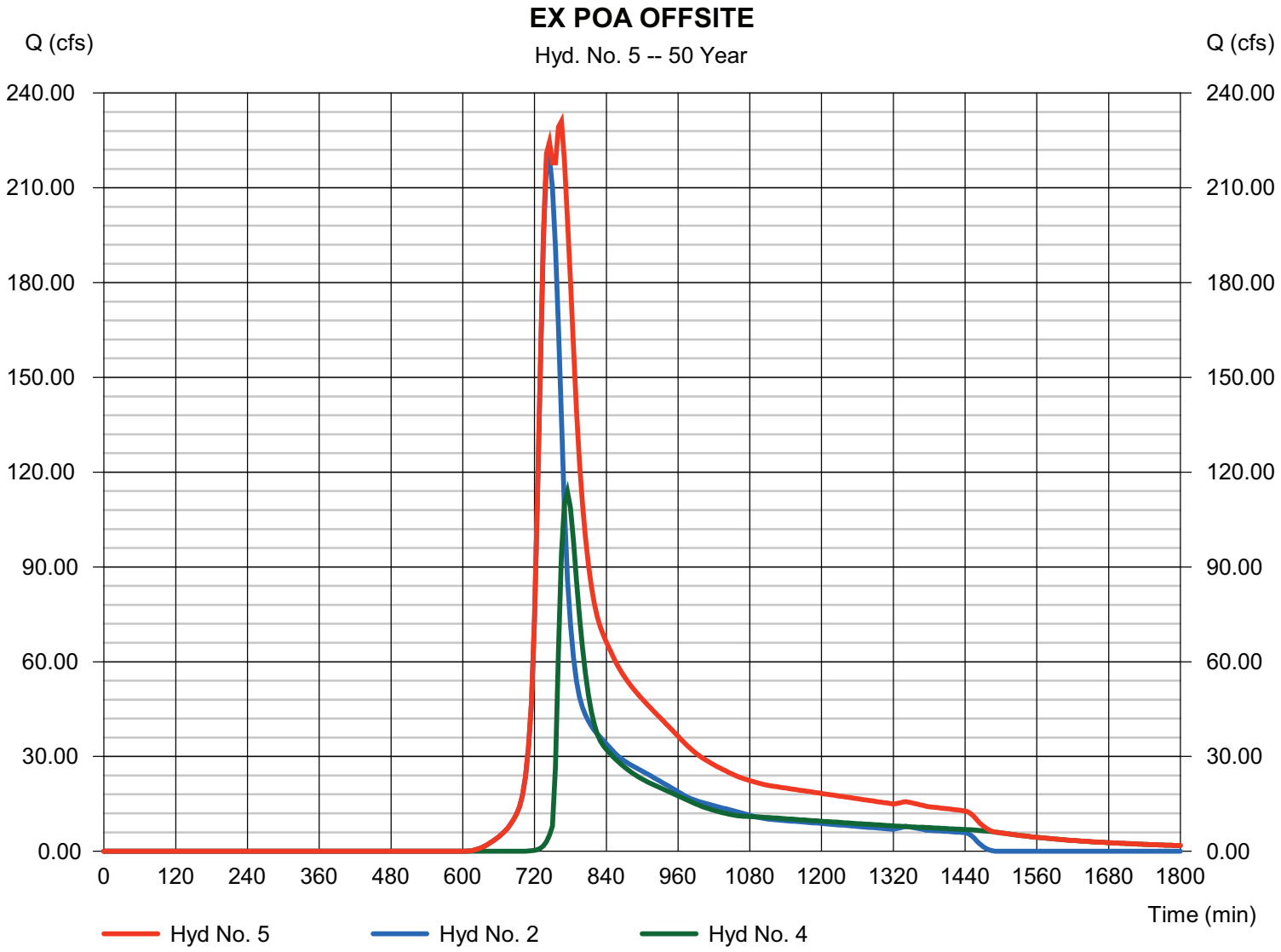
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 5

EX POA OFFSITE

Hydrograph type	=	Combine	Peak discharge	=	231.07 cfs
Storm frequency	=	50 yrs	Time to peak	=	765 min
Time interval	=	5 min	Hyd. volume	=	2,203,569 cuft
Inflow hyds.	=	2, 4	Contrib. drain. area	=	125.100 ac



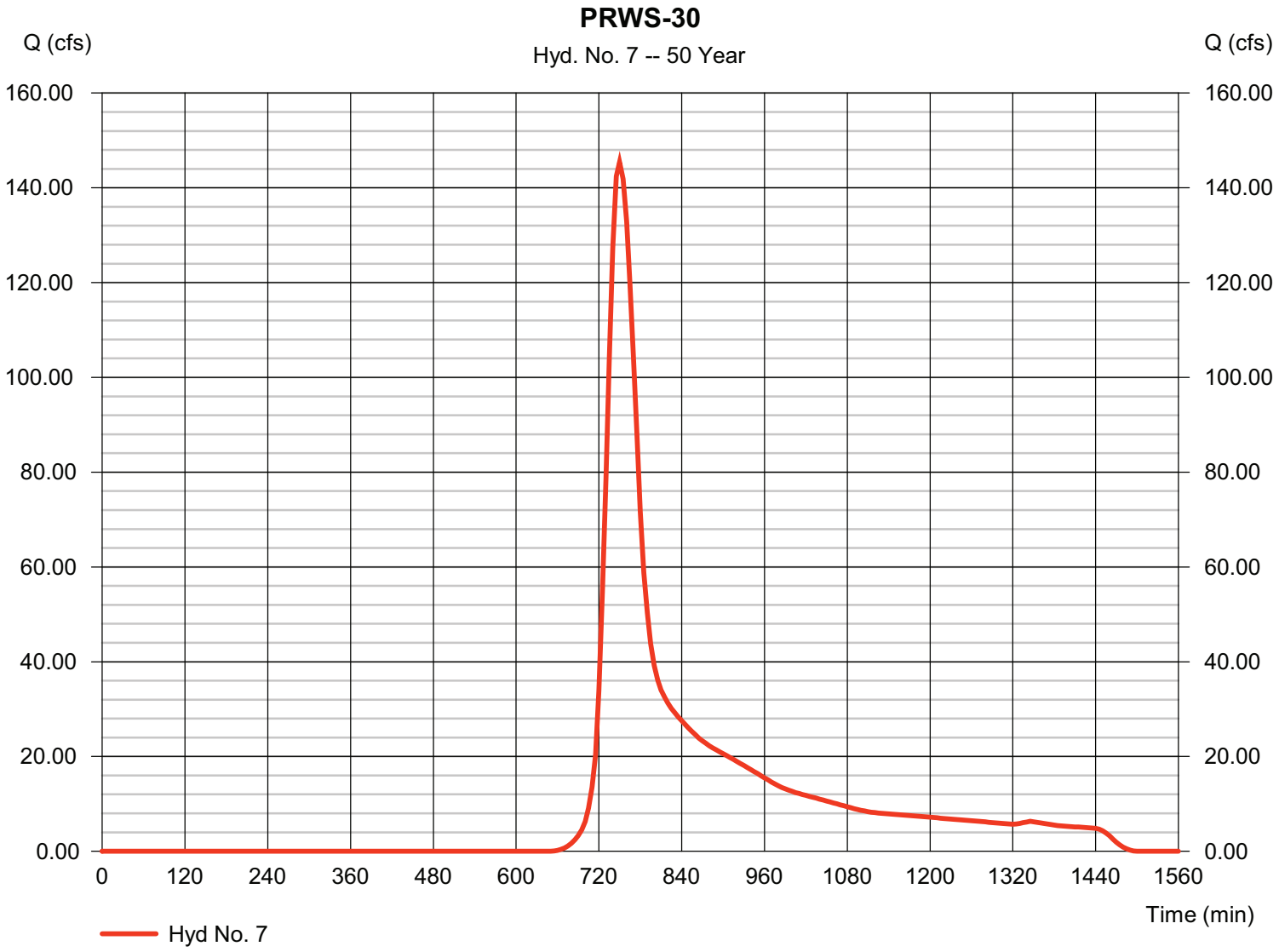
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 7

PRWS-30

Hydrograph type	= SCS Runoff	Peak discharge	= 145.42 cfs
Storm frequency	= 50 yrs	Time to peak	= 750 min
Time interval	= 5 min	Hyd. volume	= 938,431 cuft
Drainage area	= 119.800 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 37.00 min
Total precip.	= 7.14 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



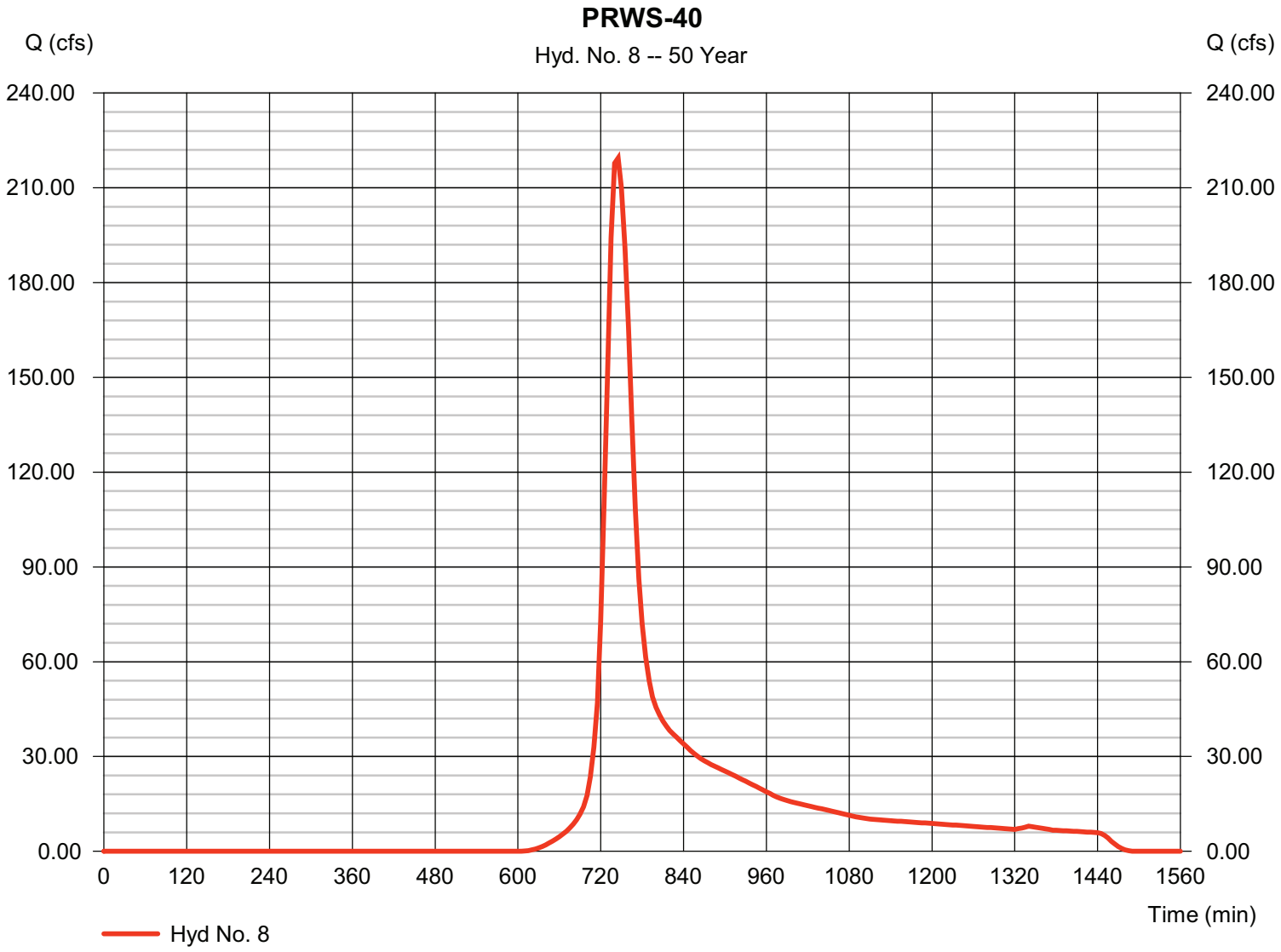
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 8

PRWS-40

Hydrograph type	= SCS Runoff	Peak discharge	= 219.43 cfs
Storm frequency	= 50 yrs	Time to peak	= 745 min
Time interval	= 5 min	Hyd. volume	= 1,265,888 cuft
Drainage area	= 125.100 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 32.00 min
Total precip.	= 7.14 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

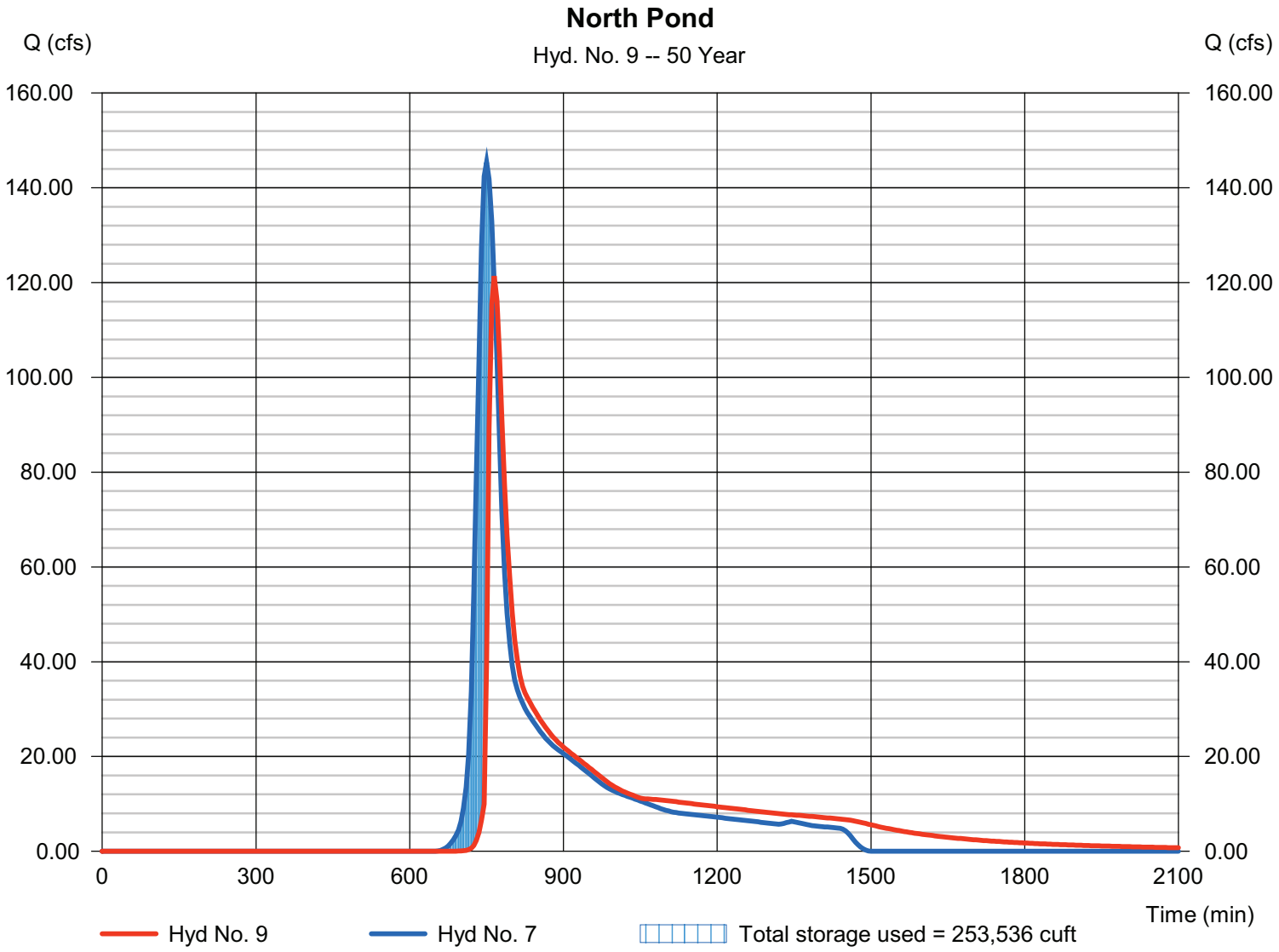
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 9

North Pond

Hydrograph type	=	Reservoir	Peak discharge	=	121.40 cfs
Storm frequency	=	50 yrs	Time to peak	=	765 min
Time interval	=	5 min	Hyd. volume	=	938,357 cuft
Inflow hyd. No.	=	7 - PRWS-30	Max. Elevation	=	325.29 ft
Reservoir name	=	North Pond	Max. Storage	=	253,536 cuft

Storage Indication method used. Wet pond routing start elevation = 324.15 ft.



Hydrograph Report

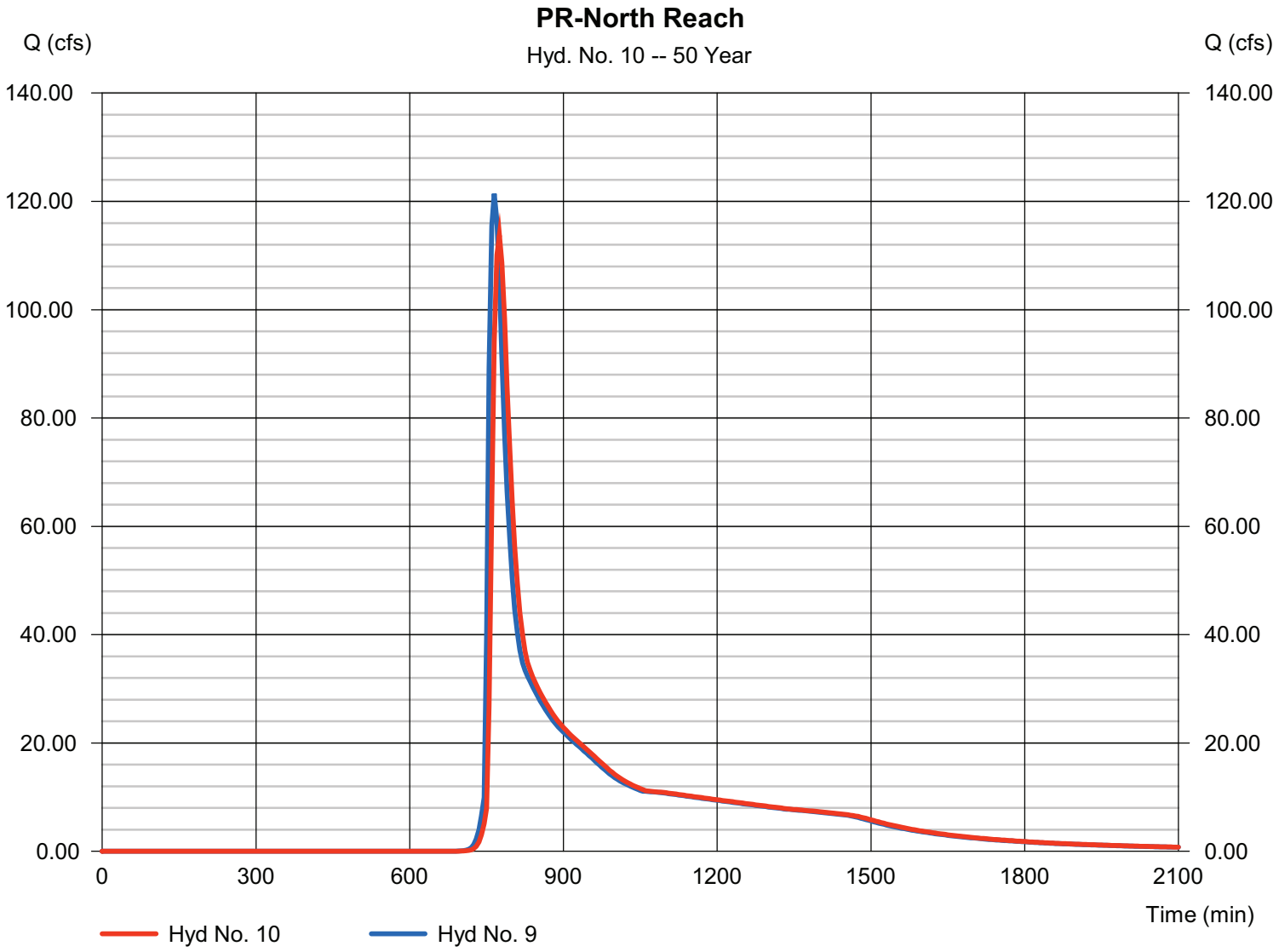
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 10

PR-North Reach

Hydrograph type	=	Reach	Peak discharge	=	113.76 cfs
Storm frequency	=	50 yrs	Time to peak	=	775 min
Time interval	=	5 min	Hyd. volume	=	937,678 cuft
Inflow hyd. No.	=	9 - North Pond	Section type	=	Trapezoidal
Reach length	=	2800.0 ft	Channel slope	=	4.8 %
Manning's n	=	0.050	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	2.232	Rating curve m	=	1.321
Ave. velocity	=	5.89 ft/s	Routing coeff.	=	0.5884

Modified Att-Kin routing method used.



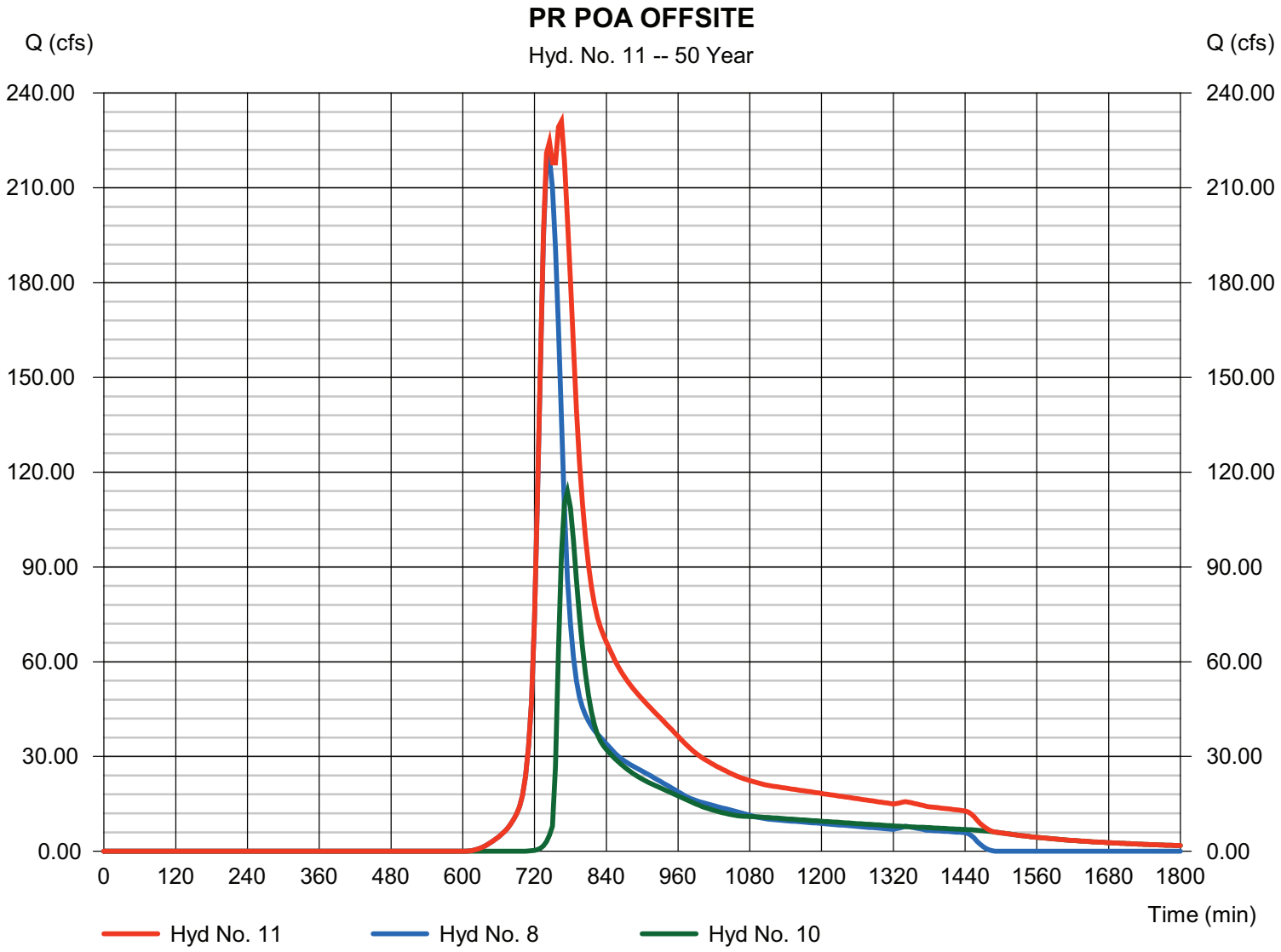
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 11

PR POA OFFSITE

Hydrograph type	=	Combine	Peak discharge	=	231.07 cfs
Storm frequency	=	50 yrs	Time to peak	=	765 min
Time interval	=	5 min	Hyd. volume	=	2,203,569 cuft
Inflow hyds.	=	8, 10	Contrib. drain. area	=	125.100 ac



Hydrograph Report

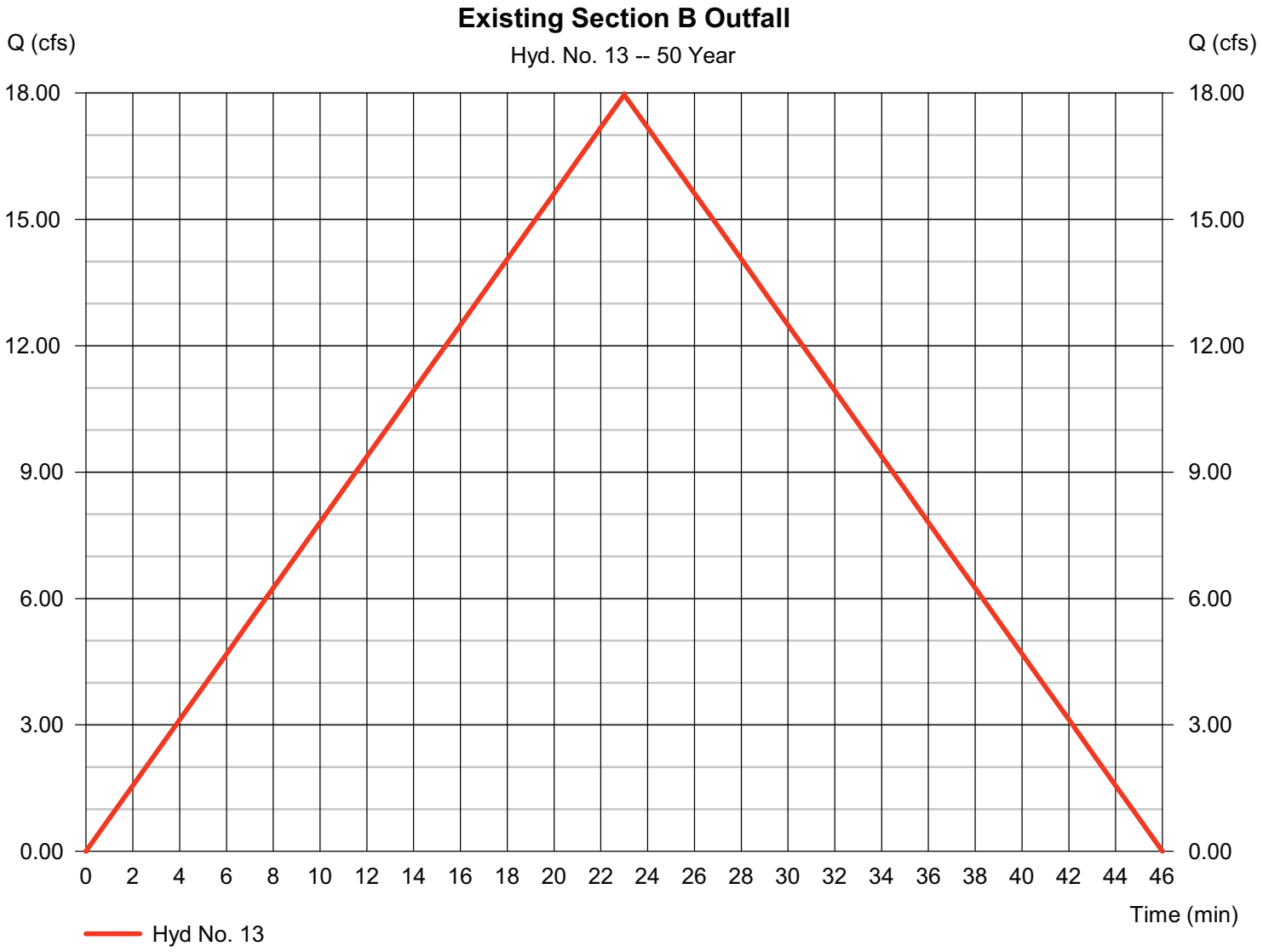
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 13

Existing Section B Outfall

Hydrograph type	=	Rational	Peak discharge	=	17.96 cfs
Storm frequency	=	50 yrs	Time to peak	=	23 min
Time interval	=	1 min	Hyd. volume	=	24,786 cuft
Drainage area	=	7.230 ac	Runoff coeff.	=	0.56*
Intensity	=	4.436 in/hr	Tc by User	=	23.00 min
IDF Curve	=	Middlesex.idf	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(3.150 x 0.90) + (4.080 x 0.30)] / 7.230



Hydrograph Report

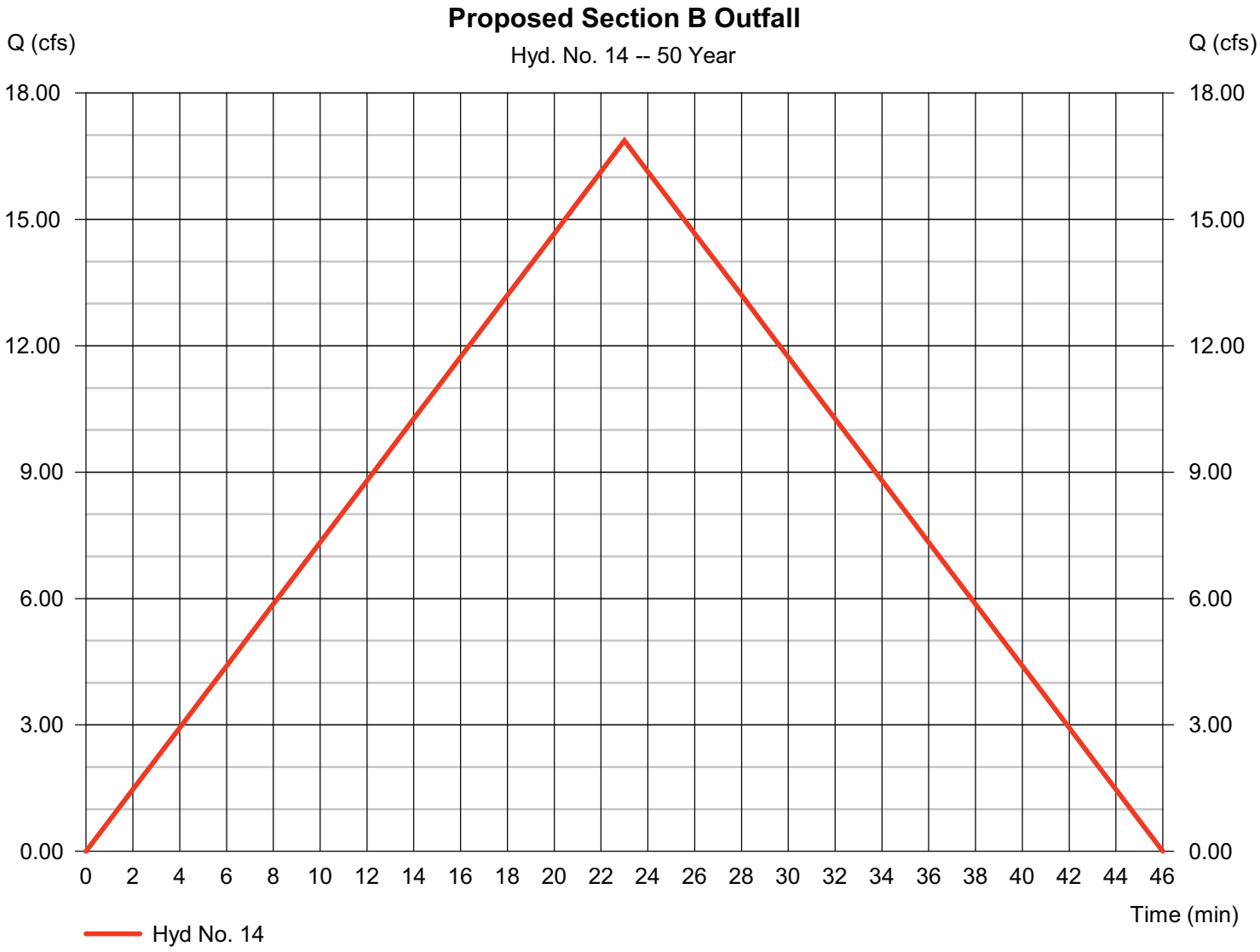
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 14

Proposed Section B Outfall

Hydrograph type	=	Rational	Peak discharge	=	16.87 cfs
Storm frequency	=	50 yrs	Time to peak	=	23 min
Time interval	=	1 min	Hyd. volume	=	23,278 cuft
Drainage area	=	6.790 ac	Runoff coeff.	=	0.56*
Intensity	=	4.436 in/hr	Tc by User	=	23.00 min
IDF Curve	=	Middlesex.idf	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(2.950 x 0.90) + (3.840 x 0.30)] / 6.790



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	188.26	5	750	1,189,153	------	------	------	EXWS-30
2	SCS Runoff	275.10	5	745	1,571,558	------	------	------	EXWS-40
3	Reservoir	172.24	5	760	1,189,078	1	325.37	271,178	North Pond
4	Reach	163.74	5	770	1,188,403	3	------	------	EX-North Reach
5	Combine	347.29	5	760	2,759,959	2, 4	------	------	EX POA OFFSITE
7	SCS Runoff	188.26	5	750	1,189,153	------	------	------	PRWS-30
8	SCS Runoff	275.10	5	745	1,571,558	------	------	------	PRWS-40
9	Reservoir	172.24	5	760	1,189,078	7	325.37	271,178	North Pond
10	Reach	163.74	5	770	1,188,403	9	------	------	PR-North Reach
11	Combine	347.29	5	760	2,759,959	8, 10	------	------	PR POA OFFSITE
13	Rational	19.85	1	23	27,391	------	------	------	Existing Section B Outfall
14	Rational	18.64	1	23	25,724	------	------	------	Proposed Section B Outfall

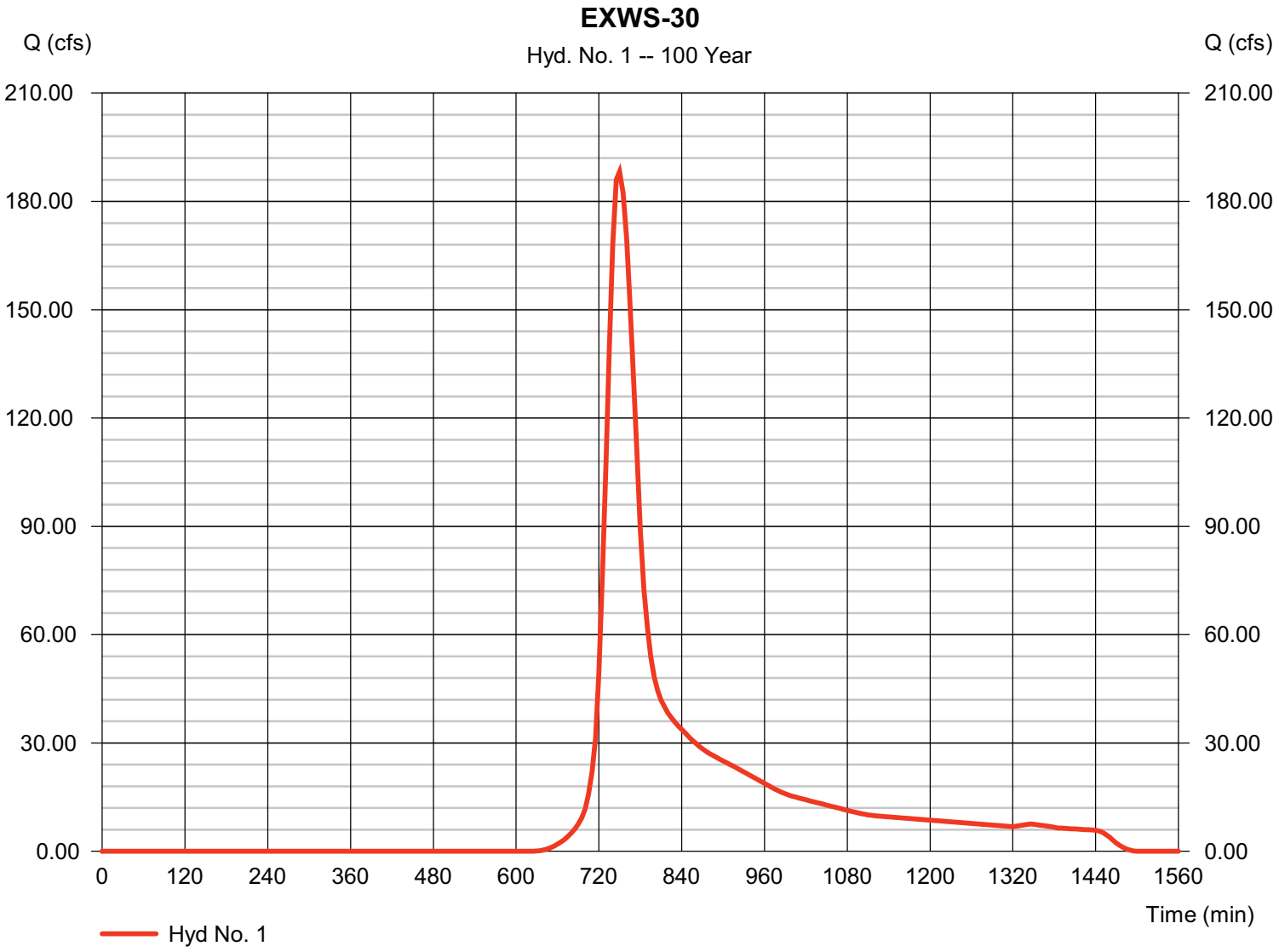
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 1

EXWS-30

Hydrograph type	=	SCS Runoff	Peak discharge	=	188.26 cfs
Storm frequency	=	100 yrs	Time to peak	=	750 min
Time interval	=	5 min	Hyd. volume	=	1,189,153 cuft
Drainage area	=	119.800 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	37.00 min
Total precip.	=	8.03 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



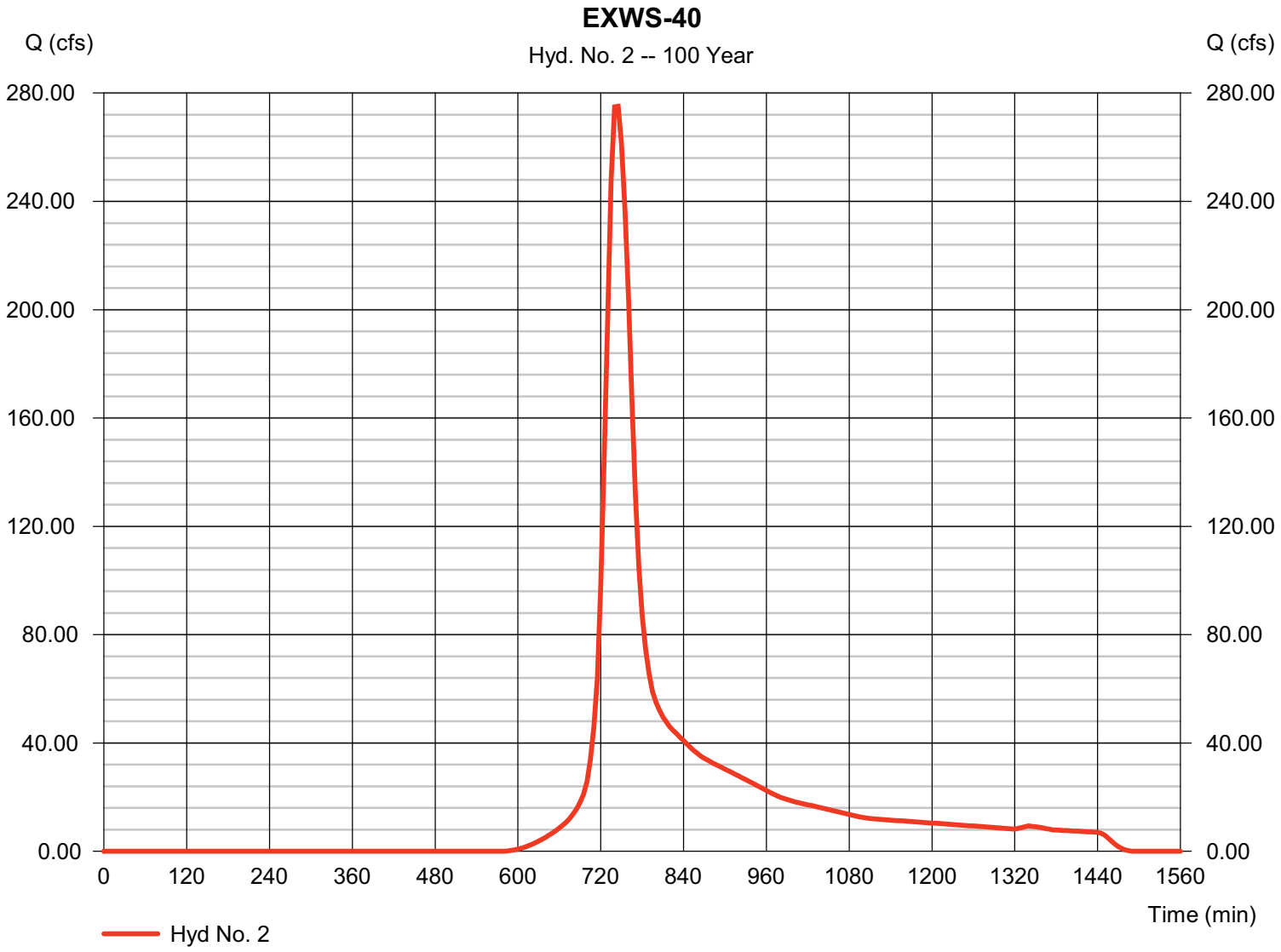
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 2

EXWS-40

Hydrograph type	= SCS Runoff	Peak discharge	= 275.10 cfs
Storm frequency	= 100 yrs	Time to peak	= 745 min
Time interval	= 5 min	Hyd. volume	= 1,571,558 cuft
Drainage area	= 125.100 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 32.00 min
Total precip.	= 8.03 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

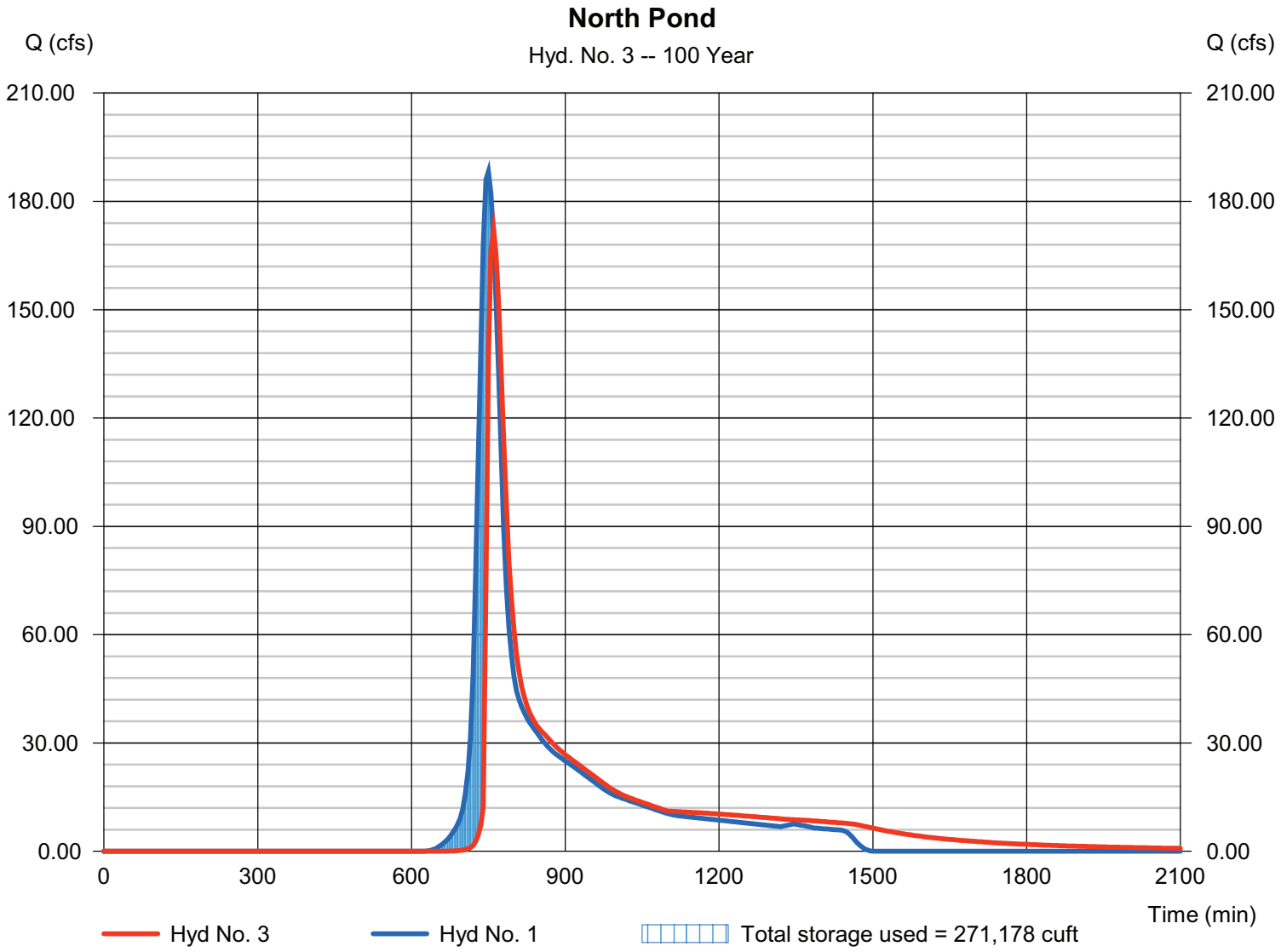
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 3

North Pond

Hydrograph type	=	Reservoir	Peak discharge	=	172.24 cfs
Storm frequency	=	100 yrs	Time to peak	=	760 min
Time interval	=	5 min	Hyd. volume	=	1,189,078 cuft
Inflow hyd. No.	=	1 - EXWS-30	Max. Elevation	=	325.37 ft
Reservoir name	=	North Pond	Max. Storage	=	271,178 cuft

Storage Indication method used. Wet pond routing start elevation = 324.15 ft.



Hydrograph Report

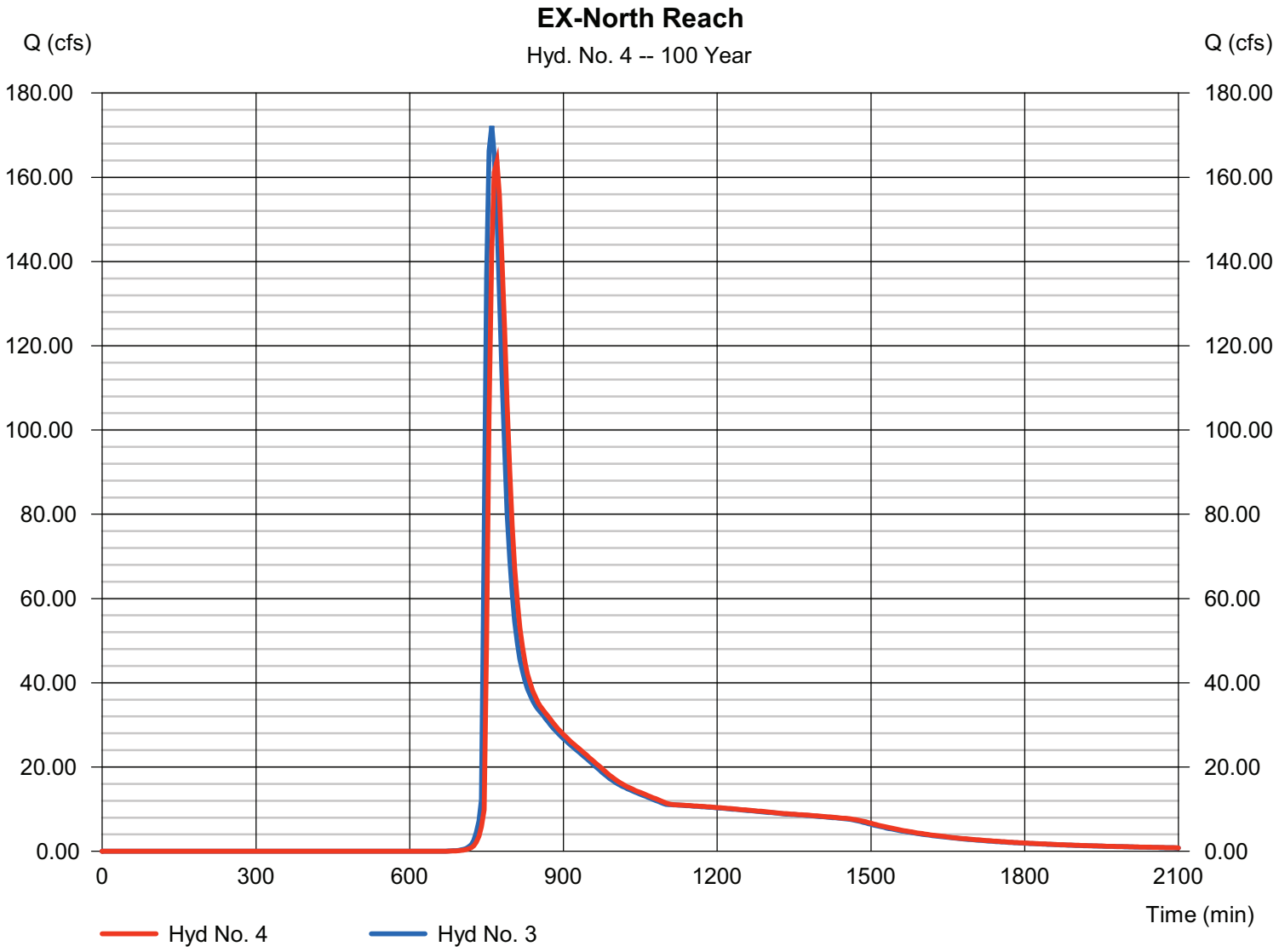
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 4

EX-North Reach

Hydrograph type	=	Reach	Peak discharge	=	163.74 cfs
Storm frequency	=	100 yrs	Time to peak	=	770 min
Time interval	=	5 min	Hyd. volume	=	1,188,403 cuft
Inflow hyd. No.	=	3 - North Pond	Section type	=	Trapezoidal
Reach length	=	2800.0 ft	Channel slope	=	4.8 %
Manning's n	=	0.050	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	2.232	Rating curve m	=	1.321
Ave. velocity	=	6.41 ft/s	Routing coeff.	=	0.6243

Modified Att-Kin routing method used.



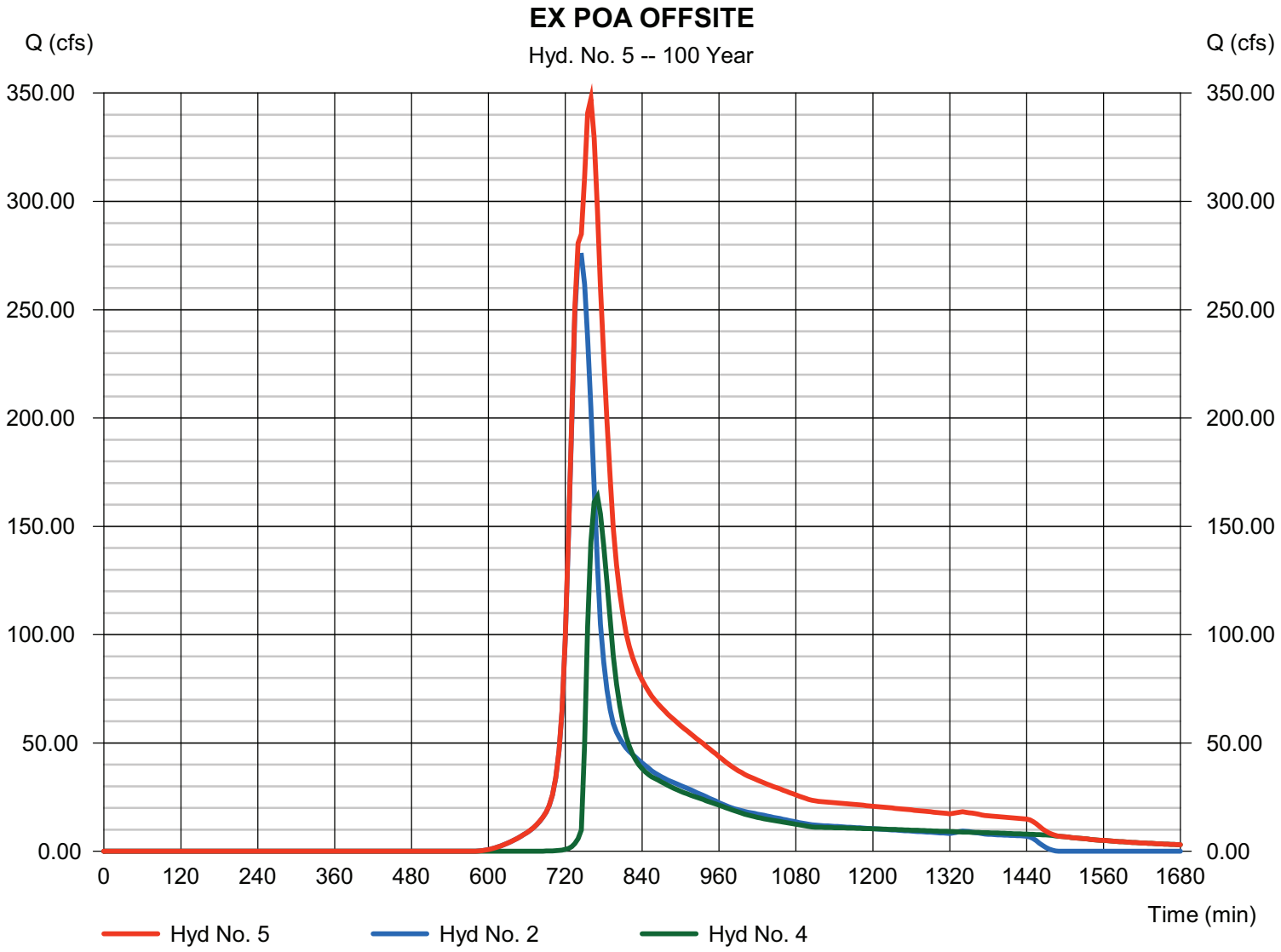
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 5

EX POA OFFSITE

Hydrograph type	= Combine	Peak discharge	= 347.29 cfs
Storm frequency	= 100 yrs	Time to peak	= 760 min
Time interval	= 5 min	Hyd. volume	= 2,759,959 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 125.100 ac



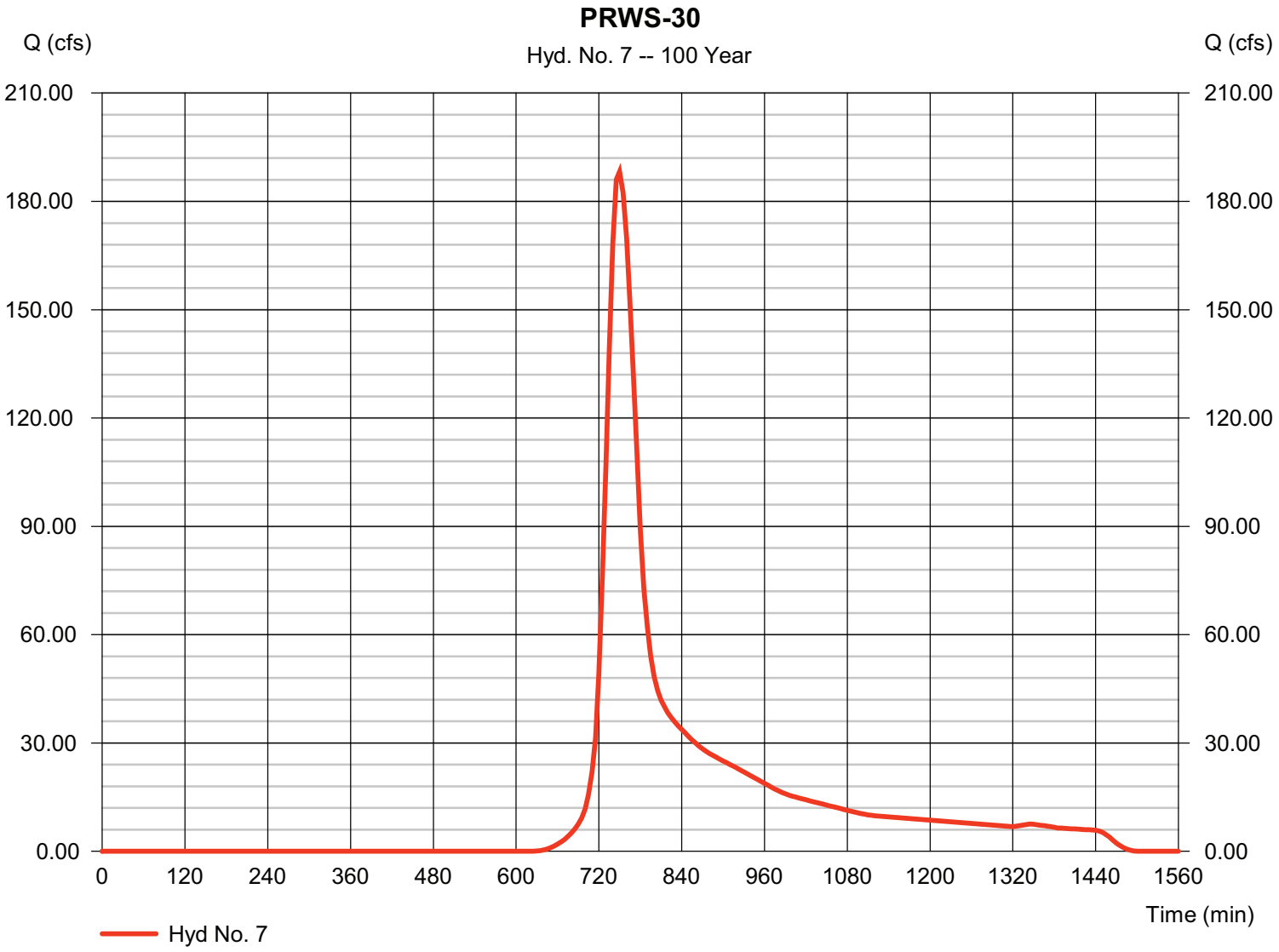
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 7

PRWS-30

Hydrograph type	=	SCS Runoff	Peak discharge	=	188.26 cfs
Storm frequency	=	100 yrs	Time to peak	=	750 min
Time interval	=	5 min	Hyd. volume	=	1,189,153 cuft
Drainage area	=	119.800 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	37.00 min
Total precip.	=	8.03 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



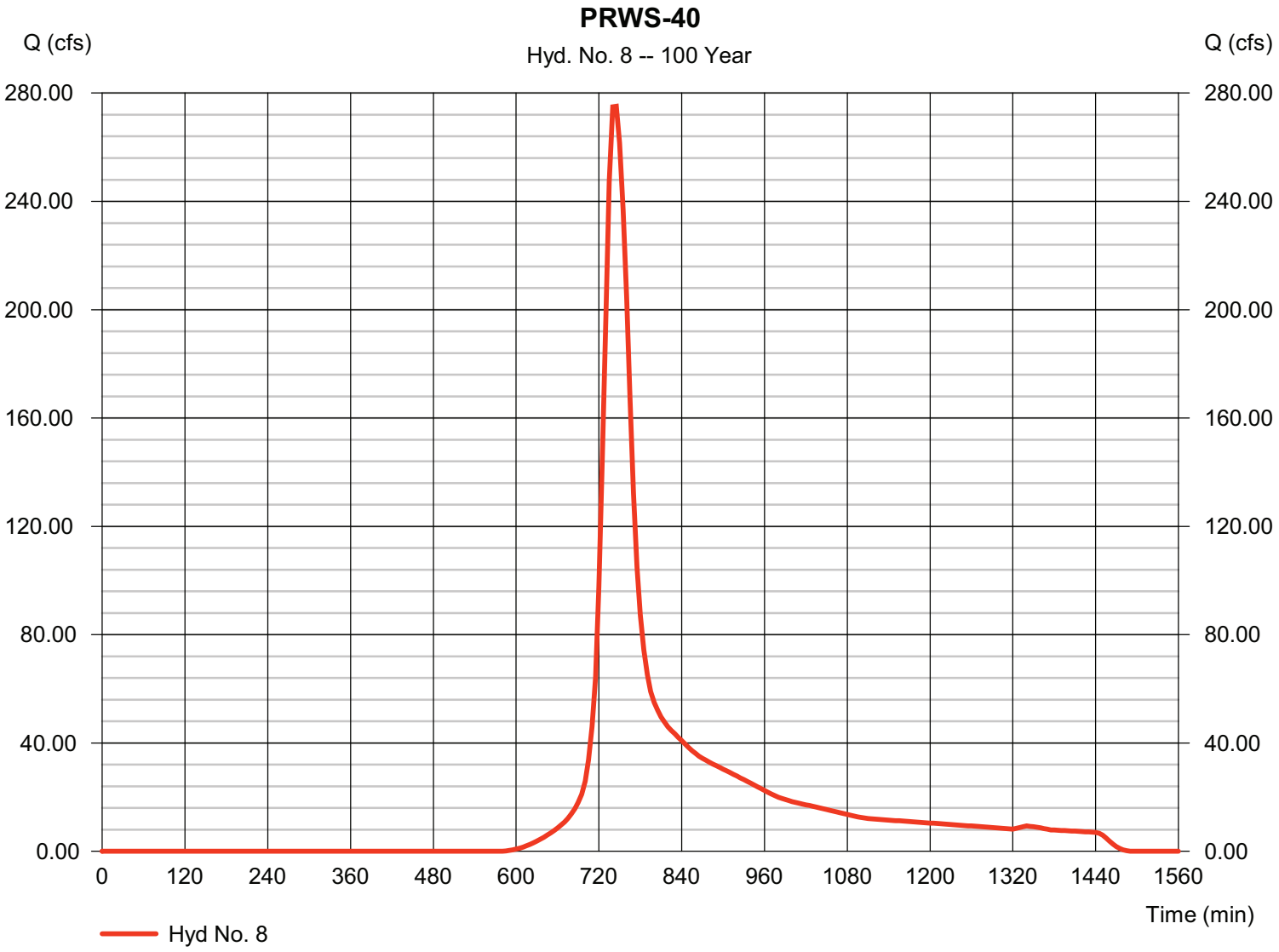
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 8

PRWS-40

Hydrograph type	=	SCS Runoff	Peak discharge	=	275.10 cfs
Storm frequency	=	100 yrs	Time to peak	=	745 min
Time interval	=	5 min	Hyd. volume	=	1,571,558 cuft
Drainage area	=	125.100 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	32.00 min
Total precip.	=	8.03 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

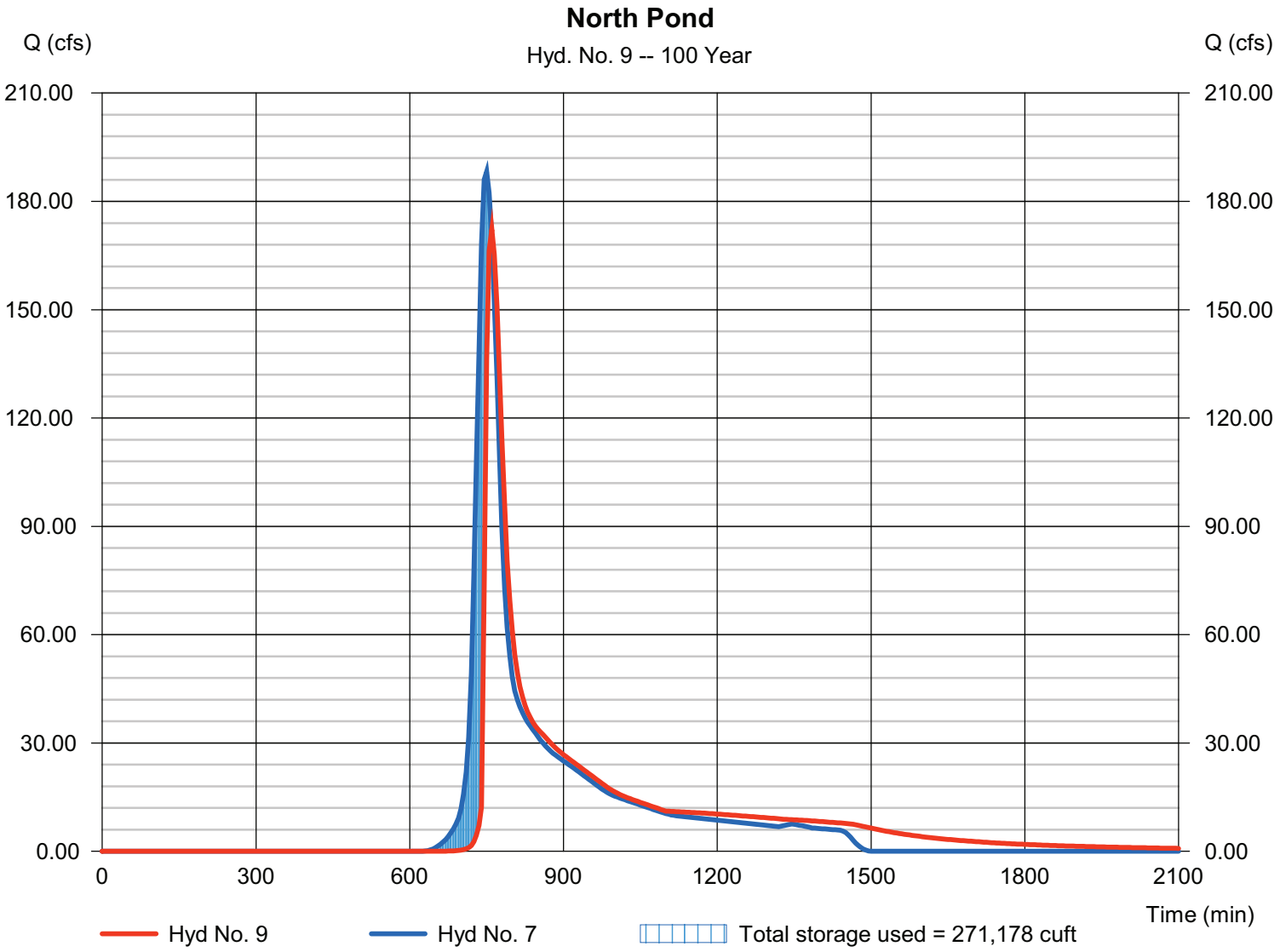
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 9

North Pond

Hydrograph type	=	Reservoir	Peak discharge	=	172.24 cfs
Storm frequency	=	100 yrs	Time to peak	=	760 min
Time interval	=	5 min	Hyd. volume	=	1,189,078 cuft
Inflow hyd. No.	=	7 - PRWS-30	Max. Elevation	=	325.37 ft
Reservoir name	=	North Pond	Max. Storage	=	271,178 cuft

Storage Indication method used. Wet pond routing start elevation = 324.15 ft.



Hydrograph Report

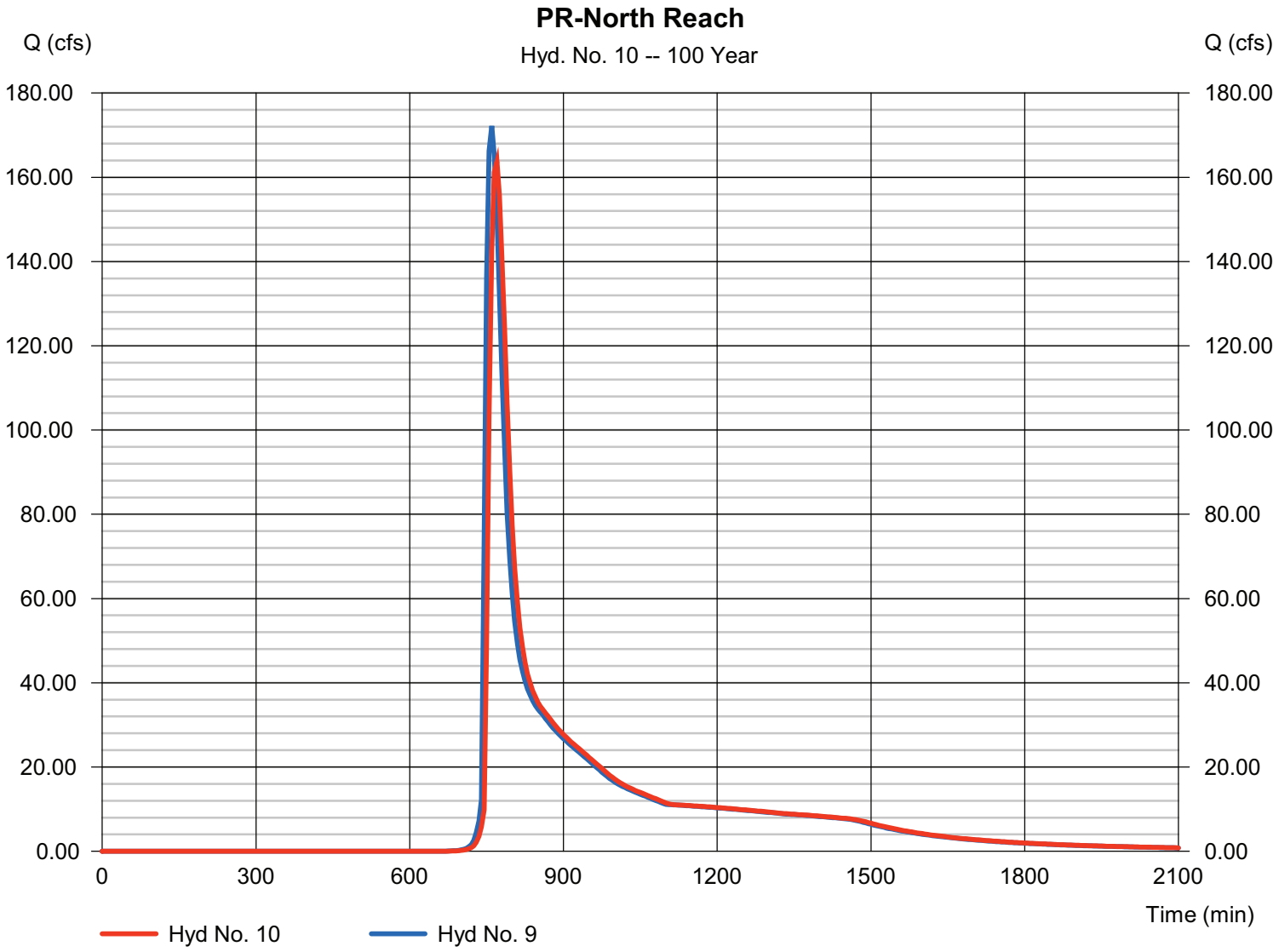
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 10

PR-North Reach

Hydrograph type	= Reach	Peak discharge	= 163.74 cfs
Storm frequency	= 100 yrs	Time to peak	= 770 min
Time interval	= 5 min	Hyd. volume	= 1,188,403 cuft
Inflow hyd. No.	= 9 - North Pond	Section type	= Trapezoidal
Reach length	= 2800.0 ft	Channel slope	= 4.8 %
Manning's n	= 0.050	Bottom width	= 5.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 2.232	Rating curve m	= 1.321
Ave. velocity	= 6.41 ft/s	Routing coeff.	= 0.6243

Modified Att-Kin routing method used.



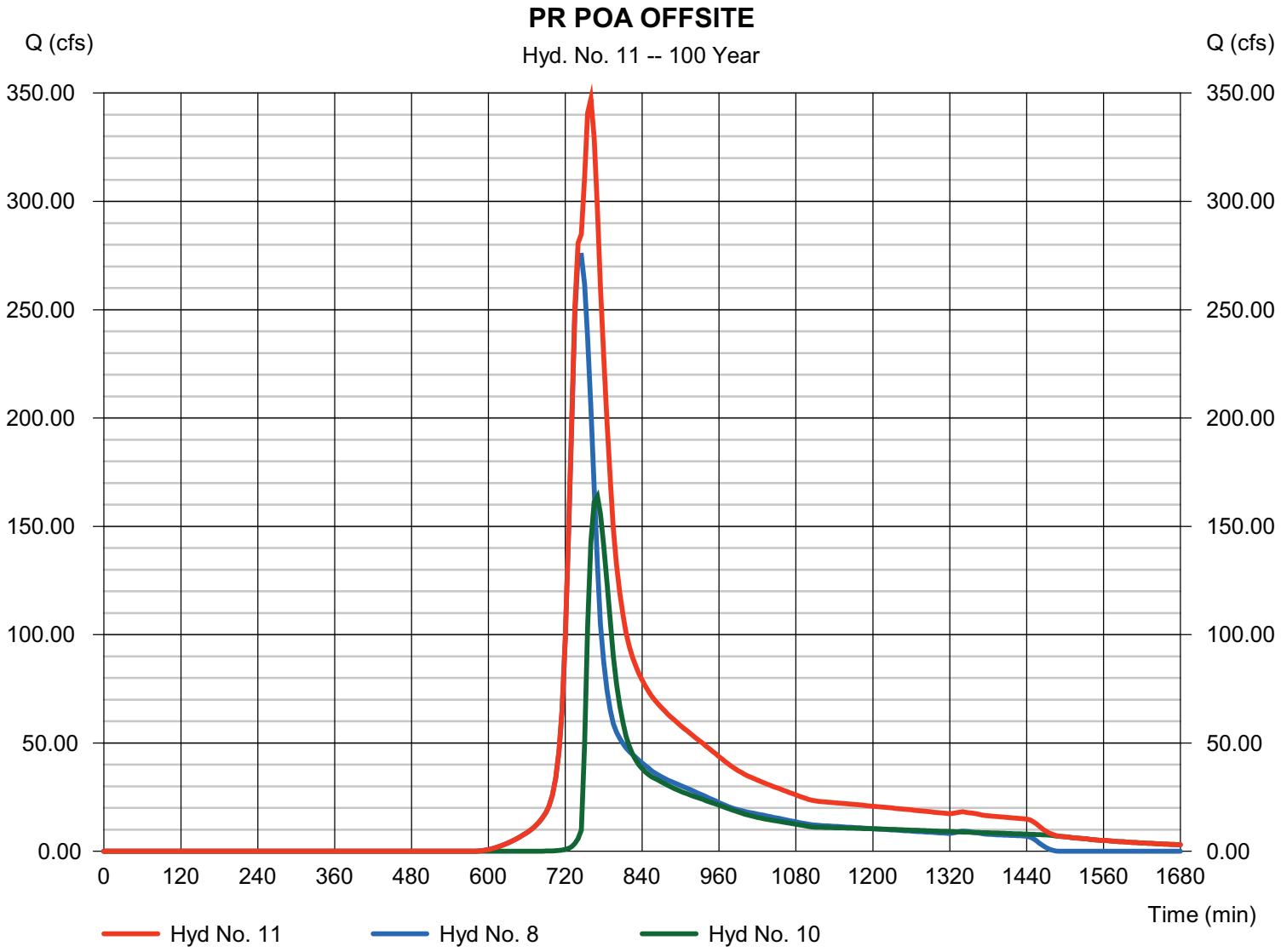
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 11

PR POA OFFSITE

Hydrograph type	=	Combine	Peak discharge	=	347.29 cfs
Storm frequency	=	100 yrs	Time to peak	=	760 min
Time interval	=	5 min	Hyd. volume	=	2,759,959 cuft
Inflow hyds.	=	8, 10	Contrib. drain. area	=	125.100 ac



Hydrograph Report

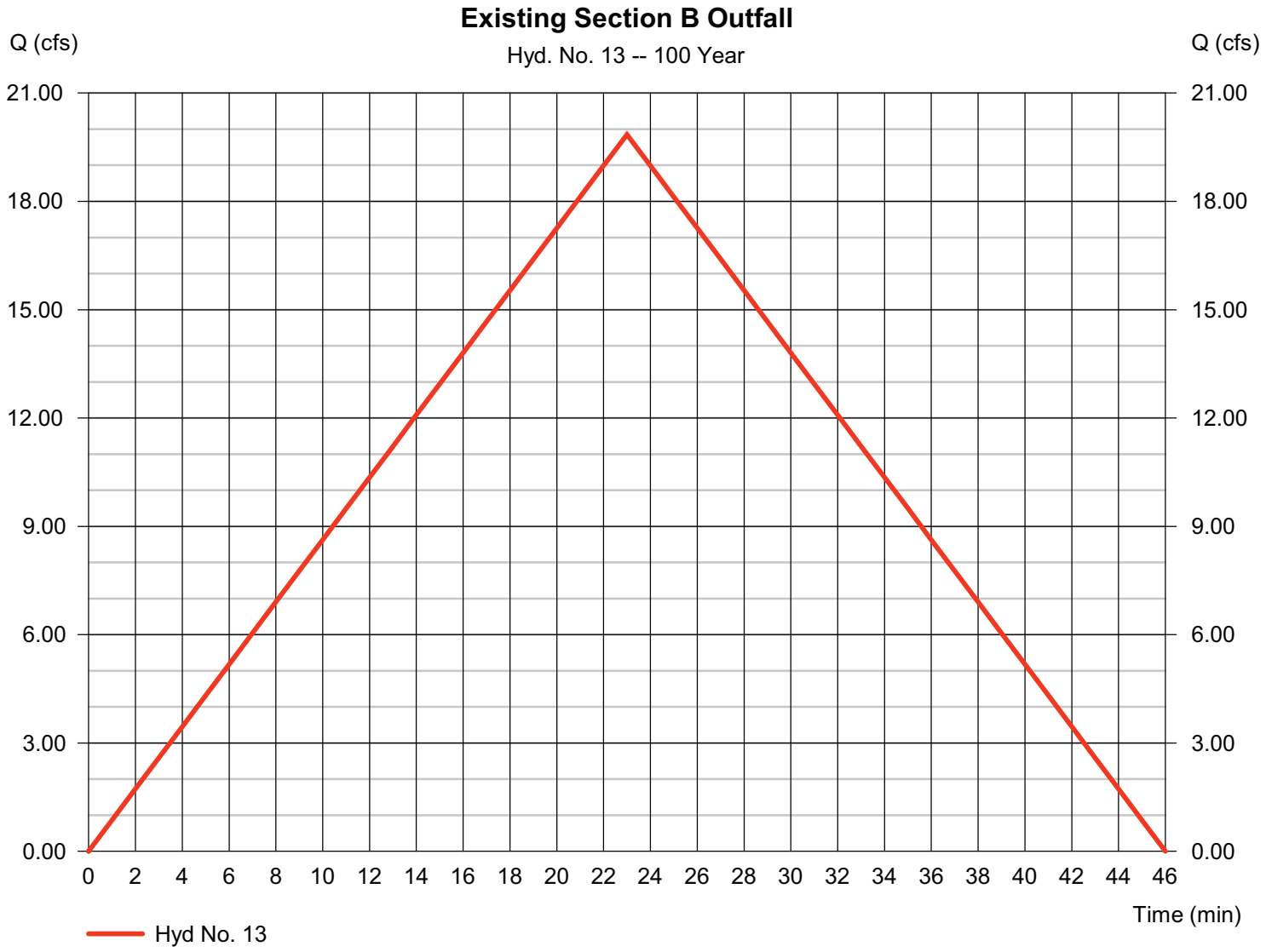
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 13

Existing Section B Outfall

Hydrograph type	= Rational	Peak discharge	= 19.85 cfs
Storm frequency	= 100 yrs	Time to peak	= 23 min
Time interval	= 1 min	Hyd. volume	= 27,391 cuft
Drainage area	= 7.230 ac	Runoff coeff.	= 0.56*
Intensity	= 4.902 in/hr	Tc by User	= 23.00 min
IDF Curve	= Middlesex.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(3.150 x 0.90) + (4.080 x 0.30)] / 7.230



Hydrograph Report

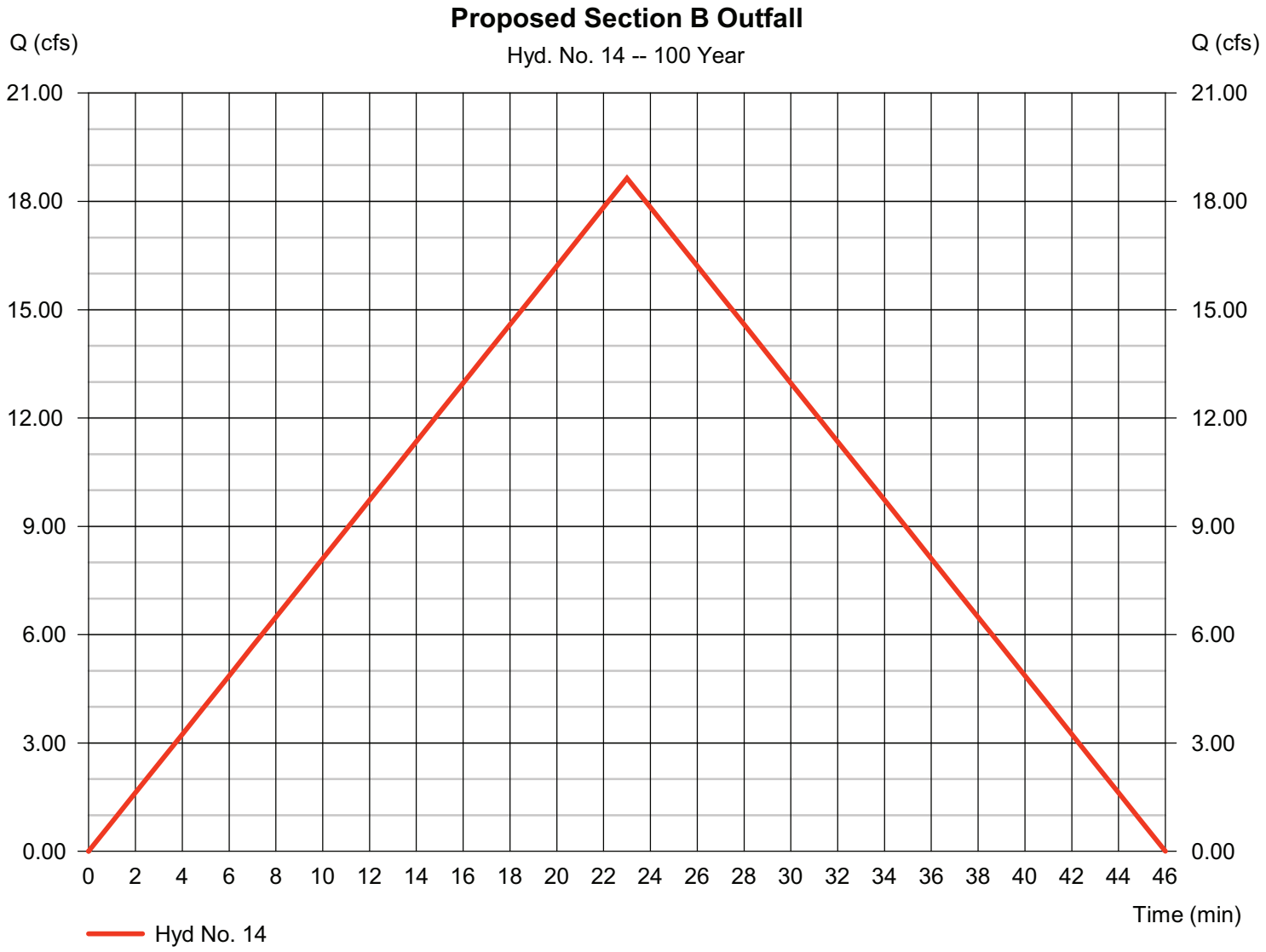
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 06 / 22 / 2021

Hyd. No. 14

Proposed Section B Outfall

Hydrograph type	=	Rational	Peak discharge	=	18.64 cfs
Storm frequency	=	100 yrs	Time to peak	=	23 min
Time interval	=	1 min	Hyd. volume	=	25,724 cuft
Drainage area	=	6.790 ac	Runoff coeff.	=	0.56*
Intensity	=	4.902 in/hr	Tc by User	=	23.00 min
IDF Curve	=	Middlesex.idf	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(2.950 x 0.90) + (3.840 x 0.30)] / 6.790



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	22.4465	3.7000	0.7111	--------
3	0.0000	0.0000	0.0000	--------
5	75.4607	12.3000	0.9153	--------
10	41.9134	5.0000	0.7581	--------
25	38.1345	3.2000	0.6935	--------
50	39.3485	2.6000	0.6731	--------
100	38.4123	1.8000	0.6412	--------

File name: Middlesex.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	4.82	3.49	2.80	2.36	2.06	1.84	1.67	1.53	1.42	1.32	1.24	1.17
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	5.55	4.40	3.66	3.14	2.75	2.45	2.21	2.02	1.86	1.72	1.60	1.50
10	7.32	5.38	4.33	3.65	3.18	2.83	2.56	2.34	2.16	2.01	1.88	1.77
25	8.86	6.37	5.10	4.31	3.76	3.36	3.05	2.80	2.59	2.42	2.28	2.15
50	10.05	7.15	5.71	4.82	4.22	3.77	3.42	3.15	2.92	2.73	2.57	2.43
100	11.24	7.89	6.29	5.32	4.66	4.18	3.81	3.51	3.26	3.06	2.88	2.73

Tc = time in minutes. Values may exceed 60.

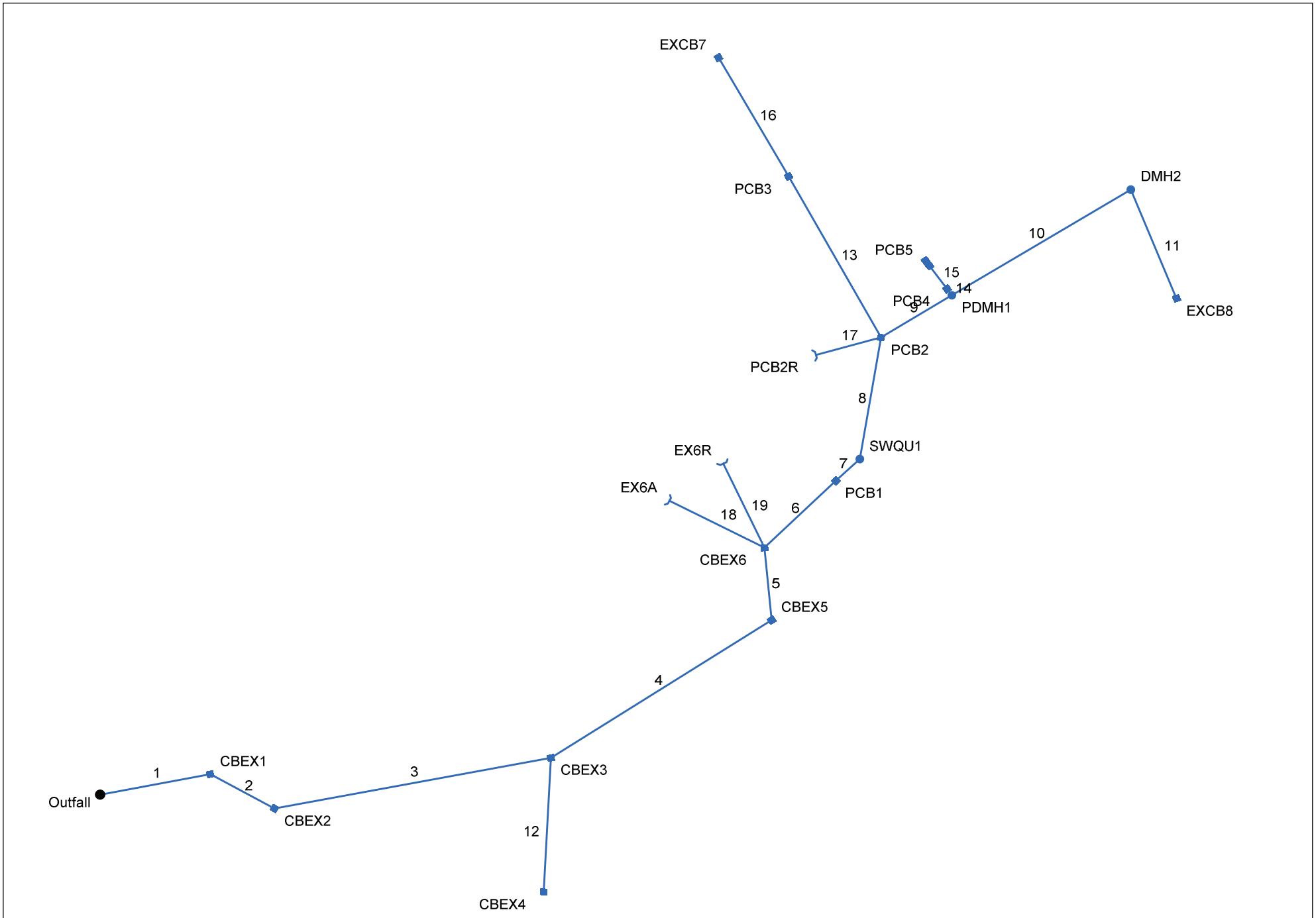
Precip. file name: Middlesex.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	3.42	0.00	4.40	5.21	6.32	7.14	8.03
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX D

HYDRAFLOW MODEL RESULTS

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Proposed Pinehurst Section B.stm	Number of lines: 19	Date: 6/22/2021 D-1

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	67.000	-11.183	Grate	0.00	0.52	0.54	15.0	309.70	18.78	322.28	18	Cir	0.013	1.05	331.18	CBEX1 TO OUTFALL
2	1	44.000	40.767	Grate	0.00	1.59	0.50	20.0	323.18	1.34	323.77	15	Cir	0.013	1.05	331.97	CBEX2 TO CBEX1
3	2	168.000	-40.592	Comb	0.00	0.37	0.62	10.0	328.37	2.08	331.87	15	Cir	0.013	1.50	336.07	CBEX3 TO CBEX2
4	3	158.000	-22.513	Comb	0.00	0.06	0.67	5.0	332.17	5.05	340.15	15	Cir	0.013	1.35	340.15	CBEX5 TO CBEX3
5	4	46.000	-61.894	Grate	0.00	0.35	0.66	10.0	336.05	1.41	336.70	15	Cir	0.013	1.30	339.70	CBEX6 TO CBEX5
6	5	60.000	50.593	Comb	0.00	0.40	0.57	10.0	337.00	2.50	338.50	15	Cir	0.013	0.50	343.70	PCB1 TO CBEX6
7	6	20.000	0.865	MH	0.00	0.00	0.00	0.0	338.50	3.35	339.17	15	Cir	0.012	0.65	344.50	SWQU1 TO PCB1
8	7	78.000	-36.733	Comb	0.00	0.16	0.64	5.0	339.17	5.81	343.70	15	Cir	0.013	1.50	347.50	PCB2 TO SWQU1
9	8	50.000	48.378	MH	0.00	0.00	0.00	0.0	343.80	1.20	344.40	15	Cir	0.013	1.00	349.50	PDMH1 TO PCB2
10	9	126.000	0.243	MH	0.00	0.00	0.00	0.0	344.40	1.32	346.06	15	Cir	0.013	1.00	352.50	DMH2 TO PDMH1
11	10	74.000	100.465	Grate	0.00	0.05	0.30	10.0	346.06	1.68	347.30	15	Cir	0.013	1.00	350.40	EXCB8 TO DMH2
12	3	85.000	103.858	Grate	0.00	0.78	0.62	15.0	332.07	0.86	332.80	15	Cir	0.013	1.00	336.80	CBEX4 TO CBEX3
13	8	116.000	-37.719	Comb	0.00	0.45	0.34	20.0	343.70	0.95	344.80	15	Cir	0.013	0.50	349.60	PCB3 TO PCB2
14	9	5.000	-93.379	Comb	0.00	0.40	0.54	10.0	344.40	2.00	344.50	15	Cir	0.011	0.50	349.00	PCB4 TO PDMH1
15	14	20.000	0.233	Comb	0.00	0.45	0.65	10.0	344.50	2.50	345.00	15	Cir	0.012	1.00	348.70	PCB5 TO PCB4
16	13	86.000	-0.630	Grate	0.00	0.58	0.30	20.0	344.80	0.81	345.50	15	Cir	0.013	1.00	350.00	EXCB7 TO PCB3
17	8	40.371	-115.203	Hdwl	0.00	0.15	0.90	5.0	343.70	2.01	344.51	6	Cir	0.011	1.00	348.00	PCB2R TO PCB2
18	5	63.974	-56.897	Hdwl	0.00	0.34	0.70	5.0	336.70	2.00	337.98	6	Cir	0.011	1.00	340.00	EX6A TO CBEX6
19	5	58.616	-19.285	Hdwl	0.00	0.15	0.90	5.0	336.70	2.00	337.87	6	Cir	0.011	1.00	340.00	EX6R TO CBEX6

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	CBEX1 TO OUTFALL	12.51	18	Cir	67.000	309.70	322.28	18.776	311.12	323.61	n/a	323.61 j	End	Grate
2	CBEX2 TO CBEX1	11.60	15	Cir	44.000	323.18	323.77	1.341	324.43*	325.85*	1.46	327.31	1	Grate
3	CBEX3 TO CBEX2	9.02	15	Cir	168.000	328.37	331.87	2.083	329.36	333.03	n/a	333.03	2	Combination
4	CBEX5 TO CBEX3	6.69	15	Cir	158.000	332.17	340.15	5.051	333.03	341.19	0.79	341.19	3	Combination
5	CBEX6 TO CBEX5	6.58	15	Cir	46.000	336.05	336.70	1.413	341.19*	341.67*	0.58	342.25	4	Grate
6	PCB1 TO CBEX6	4.54	15	Cir	60.000	337.00	338.50	2.500	342.25*	342.54*	0.11	342.65	5	Combination
7	SWQU1 TO PCB1	3.77	15	Cir	20.000	338.50	339.17	3.350	342.65*	342.71*	0.10	342.80	6	Manhole
8	PCB2 TO SWQU1	3.80	15	Cir	78.000	339.17	343.70	5.808	342.80	344.49	n/a	344.49 j	7	Combination
9	PDMH1 TO PCB2	2.42	15	Cir	50.000	343.80	344.40	1.200	344.49	345.02	n/a	345.02 j	8	Manhole
10	DMH2 TO PDMH1	0.08	15	Cir	126.000	344.40	346.06	1.317	345.02	346.17	n/a	346.17 j	9	Manhole
11	EXCB8 TO DMH2	0.08	15	Cir	74.000	346.06	347.30	1.676	346.17	347.41	n/a	347.41	10	Grate
12	CBEX4 TO CBEX3	2.09	15	Cir	85.000	332.07	332.80	0.859	333.03	333.38	n/a	333.38 j	3	Grate
13	PCB3 TO PCB2	1.17	15	Cir	116.000	343.70	344.80	0.948	344.49	345.23	n/a	345.23 j	8	Combination
14	PCB4 TO PDMH1	2.72	15	Cir	5.000	344.40	344.50	2.000	345.02	345.16	0.13	345.16	9	Combination
15	PCB5 TO PCB4	1.57	15	Cir	20.000	344.50	345.00	2.500	345.16	345.50	n/a	345.50 j	14	Combination
16	EXCB7 TO PCB3	0.64	15	Cir	86.000	344.80	345.50	0.814	345.23	345.81	n/a	345.81 j	13	Grate
17	PCB2R TO PCB2	0.99	6	Cir	40.371	343.70	344.51	2.006	344.49*	345.38*	0.39	345.78	8	OpenHeadwall
18	EX6A TO CBEX6	1.74	6	Cir	63.974	336.70	337.98	2.001	342.25*	346.66*	1.22	347.89	5	OpenHeadwall
19	EX6R TO CBEX6	0.99	6	Cir	58.616	336.70	337.87	1.996	342.25*	343.55*	0.39	343.94	5	OpenHeadwall

Project File: Proposed Pinehurst Section B.stm | Number of lines: 19 | Run Date: 6/22/2021

NOTES: Return period = 10 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	67.000	0.52	6.80	0.54	0.28	3.75	15.0	23.2	3.3	12.51	45.50	7.39	18	18.78	309.70	322.28	311.12	323.61	312.00	331.18	CBEX1 TO OUTF
2	1	44.000	1.59	6.28	0.50	0.80	3.47	20.0	23.1	3.3	11.60	7.48	9.45	15	1.34	323.18	323.77	324.43	325.85	331.18	331.97	CBEX2 TO CBEX
3	2	168.000	0.37	4.69	0.62	0.23	2.67	10.0	22.7	3.4	9.02	9.32	8.13	15	2.08	328.37	331.87	329.36	333.03	331.97	336.07	CBEX3 TO CBEX
4	3	158.000	0.06	3.54	0.67	0.04	1.96	5.0	22.3	3.4	6.69	14.51	6.80	15	5.05	332.17	340.15	333.03	341.19	336.07	340.15	CBEX5 TO CBEX
5	4	46.000	0.35	3.48	0.66	0.23	1.92	10.0	22.2	3.4	6.58	7.68	5.36	15	1.41	336.05	336.70	341.19	341.67	340.15	339.70	CBEX6 TO CBEX
6	5	60.000	0.40	2.64	0.57	0.23	1.32	10.0	21.9	3.5	4.54	10.21	3.70	15	2.50	337.00	338.50	342.25	342.54	339.70	343.70	PCB1 TO CBEX6
7	6	20.000	0.00	2.24	0.00	0.00	1.09	0.0	21.8	3.5	3.77	12.80	3.07	15	3.35	338.50	339.17	342.65	342.71	343.70	344.50	SWQU1 TO PCB1
8	7	78.000	0.16	2.24	0.64	0.10	1.09	5.0	21.5	3.5	3.80	15.56	3.88	15	5.81	339.17	343.70	342.80	344.49	344.50	347.50	PCB2 TO SWQU1
9	8	50.000	0.00	0.90	0.00	0.00	0.52	0.0	13.3	4.6	2.42	7.07	3.73	15	1.20	343.80	344.40	344.49	345.02	347.50	349.50	PDMH1 TO PCB2
10	9	126.000	0.00	0.05	0.00	0.00	0.02	0.0	10.8	5.2	0.08	7.41	0.83	15	1.32	344.40	346.06	345.02	346.17	349.50	352.50	DMH2 TO PDMH
11	10	74.000	0.05	0.05	0.30	0.02	0.02	10.0	10.0	5.4	0.08	8.36	1.57	15	1.68	346.06	347.30	346.17	347.41	352.50	350.40	EXCB8 TO DMH2
12	3	85.000	0.78	0.78	0.62	0.48	0.48	15.0	15.0	4.3	2.09	5.98	2.93	15	0.86	332.07	332.80	333.03	333.38	336.07	336.80	CBEX4 TO CBEX
13	8	116.000	0.45	1.03	0.34	0.15	0.33	20.0	20.7	3.6	1.17	6.29	2.30	15	0.95	343.70	344.80	344.49	345.23	347.50	349.60	PCB3 TO PCB2
14	9	5.000	0.40	0.85	0.54	0.22	0.51	10.0	10.1	5.3	2.72	10.79	4.29	15	2.00	344.40	344.50	345.02	345.16	349.50	349.00	PCB4 TO PDMH1
15	14	20.000	0.45	0.45	0.65	0.29	0.29	10.0	10.0	5.4	1.57	11.06	2.93	15	2.50	344.50	345.00	345.16	345.50	349.00	348.70	PCB5 TO PCB4
16	13	86.000	0.58	0.58	0.30	0.17	0.17	20.0	20.0	3.7	0.64	5.83	2.19	15	0.81	344.80	345.50	345.23	345.81	349.60	350.00	EXCB7 TO PCB3
17	8	40.371	0.15	0.15	0.90	0.14	0.14	5.0	5.0	7.3	0.99	0.94	5.03	6	2.01	343.70	344.51	344.49	345.38	347.50	348.00	PCB2R TO PCB2
18	5	63.974	0.34	0.34	0.70	0.24	0.24	5.0	5.0	7.3	1.74	0.94	8.87	6	2.00	336.70	337.98	342.25	346.66	339.70	340.00	EX6A TO CBEX6
19	5	58.616	0.15	0.15	0.90	0.14	0.14	5.0	5.0	7.3	0.99	0.94	5.03	6	2.00	336.70	337.87	342.25	343.55	339.70	340.00	EX6R TO CBEX6

Project File: Proposed Pinehurst Section B.stm | Number of lines: 19 | Run Date: 6/22/2021

NOTES:Intensity = 41.91 / (Inlet time + 5.00) ^ 0.76; Return period =Yrs. 10 ; c = cir e = ellip b = box

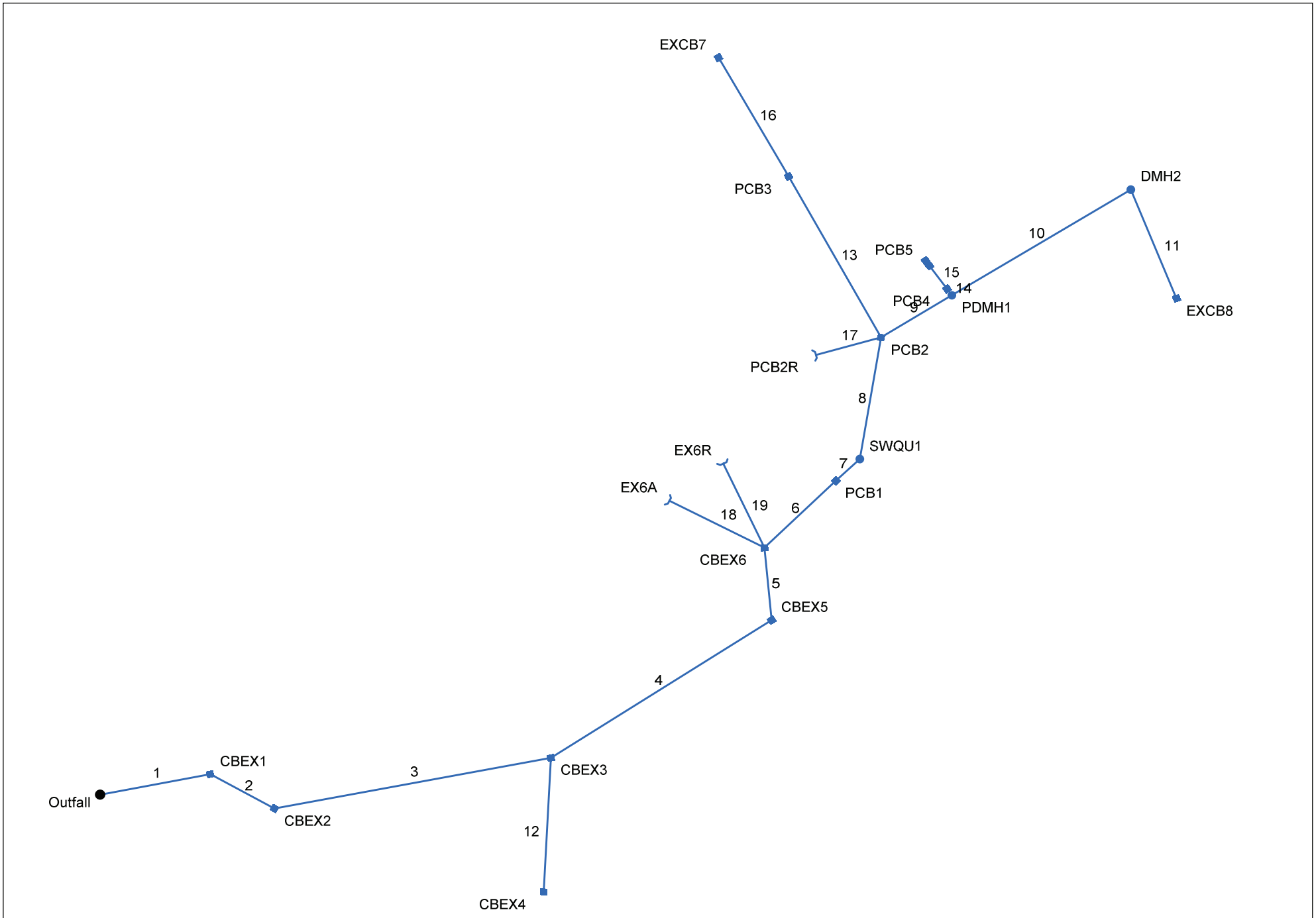
Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	CBEX1	1.21	0.00	1.21	0.00	Grate	0.0	0.00	3.11	2.30	1.35	Sag	2.00	0.020	0.050	0.013	0.09	3.00	0.26	3.00	2.0	Off
2	CBEX2	2.90	0.46	3.36	0.00	Grate	0.0	0.00	3.11	2.30	1.35	Sag	2.00	0.030	0.030	0.013	0.28	9.29	0.45	9.29	2.0	1
3	CBEX3	1.23	0.05	0.82	0.46	Comb	6.0	2.30	0.00	2.30	1.35	0.050	2.00	0.030	0.030	0.013	0.13	4.20	0.25	2.87	2.0	2
4	CBEX5	0.29	0.00	0.25	0.05	Comb	6.0	2.30	0.00	2.30	1.35	0.040	2.00	0.030	0.030	0.013	0.08	2.52	0.21	1.28	2.0	3
5	CBEX6	1.24	0.00	1.24	0.00	Grate	0.0	0.00	3.11	2.30	1.35	Sag	2.00	0.020	0.020	0.013	0.09	4.65	0.26	4.65	2.0	4
6	PCB1	1.23	0.31	1.54	0.00	Comb	6.0	2.30	3.11	2.30	1.35	Sag	2.00	0.030	0.030	0.013	0.17	5.52	0.33	5.52	2.0	5
7	SWQU1	0.00	0.31	0.00	0.31	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	6
8	PCB2	0.75	0.00	0.44	0.31	Comb	6.0	2.30	0.00	2.30	1.35	0.020	2.00	0.020	0.020	0.013	0.11	5.26	0.24	3.78	2.0	7
9	PDMH1	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	8
10	DMH2	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	9
11	EXCB8	0.08	0.00	0.08	0.00	Grate	0.0	0.00	0.00	2.30	1.35	0.040	2.00	0.040	0.040	0.013	0.05	1.30	0.00	0.00	0.0	Off
12	CBEX4	2.09	0.00	2.09	0.00	Grate	0.0	0.00	3.11	2.30	1.35	Sag	2.00	0.030	0.030	0.013	0.18	5.95	0.35	5.95	2.0	3
13	PCB3	0.56	0.00	0.56	0.00	Comb	6.0	2.30	3.11	2.30	1.35	Sag	2.00	0.030	0.030	0.013	0.06	1.97	0.22	1.97	2.0	8
14	PCB4	1.16	0.00	1.16	0.00	Comb	6.0	2.30	3.11	2.30	1.35	Sag	2.00	0.040	0.050	0.013	0.14	3.17	0.31	3.17	2.0	9
15	PCB5	1.57	0.00	1.57	0.00	Comb	6.0	4.60	6.21	4.60	1.35	Sag	2.00	0.040	0.040	0.013	0.13	3.24	0.30	3.24	2.0	14
16	EXCB7	0.64	0.00	0.64	0.00	Grate	0.0	0.00	3.11	2.30	1.35	Sag	5.00	0.050	0.050	0.013	0.16	3.10	0.16	3.10	0.0	13
17	PCB2R	0.99	0.00	0.99	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	8
18	EX6A	1.74	0.00	1.74	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	5
19	EX6R	0.99	0.00	0.99	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	5

Project File: Proposed Pinehurst Section B.stm | Number of lines: 19 | Run Date: 6/22/2021

NOTES: Inlet N-Values = 0.016; Intensity = 41.91 / (Inlet time + 5.00) ^ 0.76; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Proposed Pinehurst Section B.stm	Number of lines: 19	Date: 6/22/2021 D-6

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	67.000	-11.183	Grate	0.00	0.52	0.54	15.0	309.70	18.78	322.28	18	Cir	0.013	1.05	331.18	CBEX1 TO OUTFALL
2	1	44.000	40.767	Grate	0.00	1.59	0.50	20.0	323.18	1.34	323.77	15	Cir	0.013	1.05	331.97	CBEX2 TO CBEX1
3	2	168.000	-40.592	Comb	0.00	0.37	0.62	10.0	328.37	2.08	331.87	15	Cir	0.013	1.50	336.07	CBEX3 TO CBEX2
4	3	158.000	-22.513	Comb	0.00	0.06	0.67	5.0	332.17	5.05	340.15	15	Cir	0.013	1.35	340.15	CBEX5 TO CBEX3
5	4	46.000	-61.894	Grate	0.00	0.35	0.66	10.0	336.05	1.41	336.70	15	Cir	0.013	1.30	339.70	CBEX6 TO CBEX5
6	5	60.000	50.593	Comb	0.00	0.40	0.57	10.0	337.00	2.50	338.50	15	Cir	0.013	0.50	343.70	PCB1 TO CBEX6
7	6	20.000	0.865	MH	0.00	0.00	0.00	0.0	338.50	3.35	339.17	15	Cir	0.012	0.65	344.50	SWQU1 TO PCB1
8	7	78.000	-36.733	Comb	0.00	0.16	0.64	5.0	339.17	5.81	343.70	15	Cir	0.013	1.50	347.50	PCB2 TO SWQU1
9	8	50.000	48.378	MH	0.00	0.00	0.00	0.0	343.80	1.20	344.40	15	Cir	0.013	1.00	349.50	PDMH1 TO PCB2
10	9	126.000	0.243	MH	0.00	0.00	0.00	0.0	344.40	1.32	346.06	15	Cir	0.013	1.00	352.50	DMH2 TO PDMH1
11	10	74.000	100.465	Grate	0.00	0.05	0.30	10.0	346.06	1.68	347.30	15	Cir	0.013	1.00	350.40	EXCB8 TO DMH2
12	3	85.000	103.858	Grate	0.00	0.78	0.62	15.0	332.07	0.86	332.80	15	Cir	0.013	1.00	336.80	CBEX4 TO CBEX3
13	8	116.000	-37.719	Comb	0.00	0.45	0.34	20.0	343.70	0.95	344.80	15	Cir	0.013	0.50	349.60	PCB3 TO PCB2
14	9	5.000	-93.379	Comb	0.00	0.40	0.54	10.0	344.40	2.00	344.50	15	Cir	0.011	0.50	349.00	PCB4 TO PDMH1
15	14	20.000	0.233	Comb	0.00	0.45	0.65	10.0	344.50	2.50	345.00	15	Cir	0.012	1.00	348.70	PCB5 TO PCB4
16	13	86.000	-0.630	Grate	0.00	0.58	0.30	20.0	344.80	0.81	345.50	15	Cir	0.013	1.00	350.00	EXCB7 TO PCB3
17	8	40.371	-115.203	Hdwl	0.00	0.15	0.90	5.0	343.70	2.01	344.51	6	Cir	0.011	1.00	348.00	PCB2R TO PCB2
18	5	63.974	-56.897	Hdwl	0.00	0.34	0.70	5.0	336.70	2.00	337.98	6	Cir	0.011	1.00	340.00	EX6A TO CBEX6
19	5	58.616	-19.285	Hdwl	0.00	0.15	0.90	5.0	336.70	2.00	337.87	6	Cir	0.011	1.00	340.00	EX6R TO CBEX6

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	CBEX1 TO OUTFALL	14.87	18	Cir	67.000	309.70	322.28	18.776	311.15	323.68	n/a	323.68 j	End	Grate
2	CBEX2 TO CBEX1	13.78	15	Cir	44.000	323.18	323.77	1.341	324.43*	326.43*	2.06	328.49	1	Grate
3	CBEX3 TO CBEX2	10.71	15	Cir	168.000	328.37	331.87	2.083	329.62*	334.24*	1.78	336.02	2	Combination
4	CBEX5 TO CBEX3	7.94	15	Cir	158.000	332.17	340.15	5.051	336.02	341.26	n/a	341.26 j	3	Combination
5	CBEX6 TO CBEX5	7.80	15	Cir	46.000	336.05	336.70	1.413	341.26*	341.93*	0.82	342.75	4	Grate
6	PCB1 TO CBEX6	5.38	15	Cir	60.000	337.00	338.50	2.500	342.75*	343.17*	0.15	343.32	5	Combination
7	SWQU1 TO PCB1	4.46	15	Cir	20.000	338.50	339.17	3.350	343.32*	343.40*	0.13	343.53	6	Manhole
8	PCB2 TO SWQU1	4.50	15	Cir	78.000	339.17	343.70	5.808	343.53	344.56	n/a	344.56 j	7	Combination
9	PDMH1 TO PCB2	2.87	15	Cir	50.000	343.80	344.40	1.200	344.56	345.08	n/a	345.08 j	8	Manhole
10	DMH2 TO PDMH1	0.09	15	Cir	126.000	344.40	346.06	1.317	345.08	346.18	n/a	346.18 j	9	Manhole
11	EXCB8 TO DMH2	0.10	15	Cir	74.000	346.06	347.30	1.676	346.18	347.42	n/a	347.42	10	Grate
12	CBEX4 TO CBEX3	2.47	15	Cir	85.000	332.07	332.80	0.859	336.02*	336.15*	0.06	336.21	3	Grate
13	PCB3 TO PCB2	1.38	15	Cir	116.000	343.70	344.80	0.948	344.56	345.26	n/a	345.26 j	8	Combination
14	PCB4 TO PDMH1	3.22	15	Cir	5.000	344.40	344.50	2.000	345.08	345.22	n/a	345.22	9	Combination
15	PCB5 TO PCB4	1.86	15	Cir	20.000	344.50	345.00	2.500	345.22	345.54	n/a	345.54 j	14	Combination
16	EXCB7 TO PCB3	0.75	15	Cir	86.000	344.80	345.50	0.814	345.26	345.84	n/a	345.84 j	13	Grate
17	PCB2R TO PCB2	1.20	6	Cir	40.371	343.70	344.51	2.006	344.56*	345.88*	0.58	346.45	8	OpenHeadwall
18	EX6A TO CBEX6	2.11	6	Cir	63.974	336.70	337.98	2.001	342.75*	349.23*	1.79	351.03	5	OpenHeadwall
19	EX6R TO CBEX6	1.20	6	Cir	58.616	336.70	337.87	1.996	342.75*	344.66*	0.58	345.24	5	OpenHeadwall

Project File: Proposed Pinehurst Section B.stm | Number of lines: 19 | Run Date: 6/22/2021

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	67.000	0.52	6.80	0.54	0.28	3.75	15.0	22.9	4.0	14.87	45.50	8.58	18	18.78	309.70	322.28	311.15	323.68	312.00	331.18	CBEX1 TO OUTF
2	1	44.000	1.59	6.28	0.50	0.80	3.47	20.0	22.9	4.0	13.78	7.48	11.23	15	1.34	323.18	323.77	324.43	326.43	331.18	331.97	CBEX2 TO CBEX
3	2	168.000	0.37	4.69	0.62	0.23	2.67	10.0	22.6	4.0	10.71	9.32	8.73	15	2.08	328.37	331.87	329.62	334.24	331.97	336.07	CBEX3 TO CBEX
4	3	158.000	0.06	3.54	0.67	0.04	1.96	5.0	22.2	4.1	7.94	14.51	6.68	15	5.05	332.17	340.15	336.02	341.26	336.07	340.15	CBEX5 TO CBEX
5	4	46.000	0.35	3.48	0.66	0.23	1.92	10.0	22.0	4.1	7.80	7.68	6.36	15	1.41	336.05	336.70	341.26	341.93	340.15	339.70	CBEX6 TO CBEX
6	5	60.000	0.40	2.64	0.57	0.23	1.32	10.0	21.8	4.1	5.38	10.21	4.39	15	2.50	337.00	338.50	342.75	343.17	339.70	343.70	PCB1 TO CBEX6
7	6	20.000	0.00	2.24	0.00	0.00	1.09	0.0	21.7	4.1	4.46	12.80	3.63	15	3.35	338.50	339.17	343.32	343.40	343.70	344.50	SWQU1 TO PCB1
8	7	78.000	0.16	2.24	0.64	0.10	1.09	5.0	21.4	4.1	4.50	15.56	4.34	15	5.81	339.17	343.70	343.53	344.56	344.50	347.50	PCB2 TO SWQU1
9	8	50.000	0.00	0.90	0.00	0.00	0.52	0.0	13.2	5.5	2.87	7.07	3.95	15	1.20	343.80	344.40	344.56	345.08	347.50	349.50	PDMH1 TO PCB2
10	9	126.000	0.00	0.05	0.00	0.00	0.02	0.0	10.8	6.1	0.09	7.41	0.87	15	1.32	344.40	346.06	345.08	346.18	349.50	352.50	DMH2 TO PDMH
11	10	74.000	0.05	0.05	0.30	0.02	0.02	10.0	10.0	6.4	0.10	8.36	1.64	15	1.68	346.06	347.30	346.18	347.42	352.50	350.40	EXCB8 TO DMH2
12	3	85.000	0.78	0.78	0.62	0.48	0.48	15.0	15.0	5.1	2.47	5.98	2.01	15	0.86	332.07	332.80	336.02	336.15	336.07	336.80	CBEX4 TO CBEX
13	8	116.000	0.45	1.03	0.34	0.15	0.33	20.0	20.6	4.2	1.38	6.29	2.44	15	0.95	343.70	344.80	344.56	345.26	347.50	349.60	PCB3 TO PCB2
14	9	5.000	0.40	0.85	0.54	0.22	0.51	10.0	10.1	6.3	3.22	10.79	4.55	15	2.00	344.40	344.50	345.08	345.22	349.50	349.00	PCB4 TO PDMH1
15	14	20.000	0.45	0.45	0.65	0.29	0.29	10.0	10.0	6.4	1.86	11.06	3.09	15	2.50	344.50	345.00	345.22	345.54	349.00	348.70	PCB5 TO PCB4
16	13	86.000	0.58	0.58	0.30	0.17	0.17	20.0	20.0	4.3	0.75	5.83	2.30	15	0.81	344.80	345.50	345.26	345.84	349.60	350.00	EXCB7 TO PCB3
17	8	40.371	0.15	0.15	0.90	0.14	0.14	5.0	5.0	8.9	1.20	0.94	6.09	6	2.01	343.70	344.51	344.56	345.88	347.50	348.00	PCB2R TO PCB2
18	5	63.974	0.34	0.34	0.70	0.24	0.24	5.0	5.0	8.9	2.11	0.94	10.74	6	2.00	336.70	337.98	342.75	349.23	339.70	340.00	EX6A TO CBEX6
19	5	58.616	0.15	0.15	0.90	0.14	0.14	5.0	5.0	8.9	1.20	0.94	6.09	6	2.00	336.70	337.87	342.75	344.66	339.70	340.00	EX6R TO CBEX6

Project File: Proposed Pinehurst Section B.stm

Number of lines: 19

Run Date: 6/22/2021

NOTES:Intensity = 38.13 / (Inlet time + 3.20) ^ 0.69; Return period =Yrs. 25 ; c = cir e = ellip b = box

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	CBEX1	1.43	0.00	1.43	0.00	Grate	0.0	0.00	3.11	2.30	1.35	Sag	2.00	0.020	0.050	0.013	0.11	3.44	0.28	3.44	2.0	Off
2	CBEX2	3.42	0.59	4.02	0.00	Grate	0.0	0.00	3.11	2.30	1.35	Sag	2.00	0.030	0.030	0.013	0.33	10.83	0.49	10.83	2.0	1
3	CBEX3	1.46	0.07	0.94	0.59	Comb	6.0	2.30	0.00	2.30	1.35	0.050	2.00	0.030	0.030	0.013	0.13	4.49	0.26	3.14	2.0	2
4	CBEX5	0.36	0.00	0.29	0.07	Comb	6.0	2.30	0.00	2.30	1.35	0.040	2.00	0.030	0.030	0.013	0.08	2.71	0.21	1.45	2.0	3
5	CBEX6	1.47	0.00	1.47	0.00	Grate	0.0	0.00	3.11	2.30	1.35	Sag	2.00	0.020	0.020	0.013	0.12	5.78	0.28	5.78	2.0	4
6	PCB1	1.45	0.40	1.85	0.00	Comb	6.0	2.30	3.11	2.30	1.35	Sag	2.00	0.030	0.030	0.013	0.19	6.49	0.36	6.49	2.0	5
7	SWQU1	0.00	0.40	0.00	0.40	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	6
8	PCB2	0.91	0.00	0.51	0.40	Comb	6.0	2.30	0.00	2.30	1.35	0.020	2.00	0.020	0.020	0.013	0.11	5.65	0.25	4.16	2.0	7
9	PDMH1	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	8
10	DMH2	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	9
11	EXCB8	0.10	0.00	0.10	0.00	Grate	0.0	0.00	0.00	2.30	1.35	0.040	2.00	0.040	0.040	0.013	0.06	1.38	0.00	0.00	0.0	Off
12	CBEX4	2.47	0.00	2.47	0.00	Grate	0.0	0.00	3.11	2.30	1.35	Sag	2.00	0.030	0.030	0.013	0.21	6.99	0.38	6.99	2.0	3
13	PCB3	0.66	0.00	0.66	0.00	Comb	6.0	2.30	3.11	2.30	1.35	Sag	2.00	0.030	0.030	0.013	0.07	2.38	0.24	2.38	2.0	8
14	PCB4	1.38	0.00	1.38	0.00	Comb	6.0	2.30	3.11	2.30	1.35	Sag	2.00	0.040	0.050	0.013	0.16	3.60	0.33	3.60	2.0	9
15	PCB5	1.86	0.00	1.86	0.00	Comb	6.0	4.60	6.21	4.60	1.35	Sag	2.00	0.040	0.040	0.013	0.15	3.75	0.32	3.75	2.0	14
16	EXCB7	0.75	0.00	0.75	0.00	Grate	0.0	0.00	3.11	2.30	1.35	Sag	5.00	0.050	0.050	0.013	0.17	3.39	0.17	3.39	0.0	13
17	PCB2R	1.20	0.00	1.20	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	8
18	EX6A	2.11	0.00	2.11	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	5
19	EX6R	1.20	0.00	1.20	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	5

Project File: Proposed Pinehurst Section B.stm | Number of lines: 19 | Run Date: 6/22/2021

NOTES: Inlet N-Values = 0.016; Intensity = 38.13 / (Inlet time + 3.20) ^ 0.69; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

FUSS & O'NEILL

May 19, 2021

Crary H. Brownell
Planning and Zoning Commission Chairman
Town of East Haddam
1 Plains Road
Moodus, CT 06469
landuse@easthaddam.org

Re: Traffic Impact Statement
Lofts at Black Birch Residential Development
North Moodus Road
East Haddam, Connecticut
Fuss & O'Neill Reference No. 20210116.A10

Dear Mr. Brownell:

Banner Realty Development, LLC proposes to redevelop the existing Community Center building at the Banner Estates on North Moodus Road in East Haddam, Connecticut. The existing Community Center building on the property will be converted to 20 units of housing. The development is expected to be constructed in 2022.

The Banner Estates is located on Banner Road west of the intersection of Banner Road at North Moodus Road as shown in the attached *Figure 1*. The existing development currently houses a golf course, clubhouse, campground, single family homes, and a restaurant. The estates are bounded by undeveloped land north, south and west of the site, and North Moodus Road east of the site. This area is located in the Resort/Residential zone.

Fuss & O'Neill has been retained to study the impact of the proposed redevelopment on the traffic conditions throughout the adjacent roadway network. This letter has been prepared to document the findings of the study and is being submitted to the Town of East Haddam in support of the community's land use application.

146 Hartford Road
Manchester, CT
06040
t 860.646.2469
800.286.2469
f 860.533.5143

www.fando.com

California
Connecticut
Maine
Massachusetts
New Hampshire
Rhode Island
Vermont

Existing Traffic Conditions

Traffic Volumes

The greatest potential for traffic impact on the roadway network by the proposed residential redevelopment will occur during the morning and afternoon peak hours, the periods when commuter related trips are at their highest levels. In order to determine the traffic impact of the

proposed redevelopment on adjacent street traffic, representatives of Fuss & O'Neill, Inc. conducted morning and afternoon peak hour turning movement counts (TMC's) on Tuesday, April 20, 2021 at the intersection of North Moodus Road at Banner Road. The traffic count data indicates that the morning peak hour of traffic is 7:00 a.m. to 8:00 a.m., and the afternoon peak hour is 4:30 p.m. to 5:30 p.m. These peak hours were subsequently analyzed for impacts. The raw count data is attached to this letter.

Growth Rate

Upon consultation with the Connecticut Department of Transportation (CTDOT) Planning Department, the 2021 existing traffic volumes were grown utilizing a 1.3 percent annual growth rate to account for traffic growth in the study area over a one-year period. These grown background volumes are shown in Figure 2 attached.

Other Developments and Roadway Improvements

Fuss & O'Neill contacted the Town of East Haddam Planning and Zoning Commission as well as CTDOT Planning Bureau to identify any other pending or approved developments having site related traffic in the study area. No such developments were identified.

Proposed Conditions

Site Access and Circulation

The existing clubhouse is accessed via the existing residential development/golf course driveway on Banner Road with no changes proposed to the site driveway connection on Banner Road.

34 parking spaces, including 3 accessible spaces, will be provided for the 20 additional residential units.

Trip Generation

The expected site generated traffic for the morning and afternoon peak hours was calculated using existing empirical data from the Institute of Transportation Engineers (ITE) publication *Trip Generation*, 10th edition, 2017. This publication is an industry-accepted resource for determining trip generation.

Trip generation for the weekday morning and weekday afternoon peak hours was calculated using the ITE land use code 220, "Multifamily Housing (Low-Rise)". A 20 unit low rise housing development is expected to generate a total of 10 trips (2 entering, 8 exiting) in the morning peak

hour, and 14 trips (9 entering, 5 exiting) in the afternoon peak hour. An excerpt from the ITE Trip Generation manual for the weekday morning and weekday afternoon peak hours for a Multifamily Housing (Low-Rise) has been attached to this letter.

Trip Distribution

The distribution of traffic entering and exiting the proposed site was applied to the roadway network based on the existing regional traffic distribution and the layout of the adjacent roadway network. During the peak hours, the following arrival distributions are anticipated:

- 10 percent from North Moodus Road north of the site
- 90 percent from North Moodus Road south of the site

This regional arrival/departure distribution for the new site generated traffic is shown in Figure 3 attached to this letter.

Combined Traffic Volumes

The site generated traffic was distributed to the roadway network system based on the arrival/departure distributions with the results shown in Figure 4 attached. These volumes were then added to the 2022 baseline volumes, shown in Figure 2, to yield the 2022 peak hour combined traffic volumes which are shown in Figure 5 of the traffic volume figures attached to this letter.

Analysis

Crash Data

Crash data was gathered at the intersection of North Moodus Road at Banner Road from the UConn Crash Repository Database. The records were gathered from the most recent three years of available data, 2018 through 2020. No crashes were reported within 300 feet of the intersection of North Moodus Road at Banner Road during the study period analyzed.

Intersection Sight Distance

Intersection sight distances were calculated at the intersection of North Moodus Road at Banner Road in accordance with criteria set forth in the 2003 CTDOT *Highway Design Manual*. The sight distance is measured from a point 15 feet back from the edge of the travel-way at a height of 3.5 feet, the standard height of a driver's eye.

The speed limit posted on North Moodus Road is 25 miles per hour and design speed is 30 miles per hour. In accordance with the criteria set forth in the *Highway Design Manual*, 335 feet of intersection sight distance is required for passenger cars looking to the north (left) and south (right) from Banner Road when approaching a two lane road.

At the intersection of North Moodus Road at Banner Road, following the clearing of vegetation in the northwest and southwest corners of the intersection, there is in excess of 1,000 feet of intersection site distance looking south (right) and greater than 335 feet of intersection sight distance looking north (left). These sight distances meet CTDOT criteria for safe egress from Banner Road onto North Moodus Road. It is recommended that the Town of East Haddam clear and regularly maintain the vegetation growth along the west side of North Moodus Road both north and south of Banner Road to maintain adequate intersection sight lines at this Town intersection.

Intersection Capacity Analysis

Capacity analysis for the unsignalized intersection of North Moodus Road at Banner Road was conducted using Synchro Professional Software, version 10.0.

In discussing intersection capacity analysis results, level of service (LOS) is commonly used to describe the operating condition of an intersection. LOS is rated on a scale from A to F, with A describing a condition of very low delay, less than 10 seconds per vehicle, and F describing a condition where delay will exceed 50 seconds per vehicle for an unsignalized intersection. Delay is described as a measure of driver discomfort, frustration, fuel consumption, and lost travel time. Therefore, intersections with longer delay times are less acceptable to most drivers.

In discussing stop controlled unsignalized intersection capacity analysis, LOS is used to provide a description of the delay and operational characteristics of the turns from the minor street (stop controlled) to the major street, and turns from the major street to the minor street. Though vehicles are not delayed by the minor street and do not experience delay, therefore they are not rated with a level of service. Using the above referenced methodologies, morning and afternoon peak hour analyses were conducted at the intersection of North Moodus Road at Banner Road.

At the intersection of North Moodus Road at Banner Road during the morning and afternoon peak hour all approaches operate efficiently at LOS A in both the background and combined conditions. The additional volume from the proposed residential conversion is de minimis and will result in no reduction in LOS at the study intersection. All intersection approach delays average to less than one second of delay per vehicle.

A copy of the analysis worksheets for the intersection of North Moodus Road at Banner Road is attached to this letter.

Conclusion

The purpose of preparing this traffic impact statement is to identify the impact of the proposed 20 apartment unit's site generated traffic. The study efforts indicate that the proposed conversion of the existing clubhouse on the Banner Estate to a 20 unit apartment complex will generate a total of 10 vehicle trips (2 entering, 8 exiting) during the morning peak hour and a total of 14 vehicle trips (9 entering, 5 exiting) during the afternoon peak hour.

At the intersection of North Moodus Road at Banner Road, following the clearing of vegetation along the northwest and southwest corners of the intersection, the sight distances meet CTDOT criteria for safe egress from Banner Road. It is recommended that the Town of East Haddam clear and regularly maintain the vegetation growth along the west side of North Moodus Road both north and south of Banner Road to maintain adequate intersection sight lines at this Town intersection.

The capacity analysis revealed that all intersection approaches will maintain an efficient LOS A operation in both background and combined conditions of the morning and afternoon peak hours. The additional volume of vehicles generated by the proposed conversion is de minimis and will result in no reduction in LOS.

A review of the crash records provided by the UConn Crash Repository Database for the latest three years of available data indicated that there were no crashes at the intersection of North Moodus Road and Banner Road.

Based on the results of the foregoing analysis, it is the professional opinion of Fuss & O'Neill, Inc. that the proposed redevelopment, along with the sight line maintenance recommendation outlined above, will not have a significant impact to traffic operations within the study area.

Sincerely,

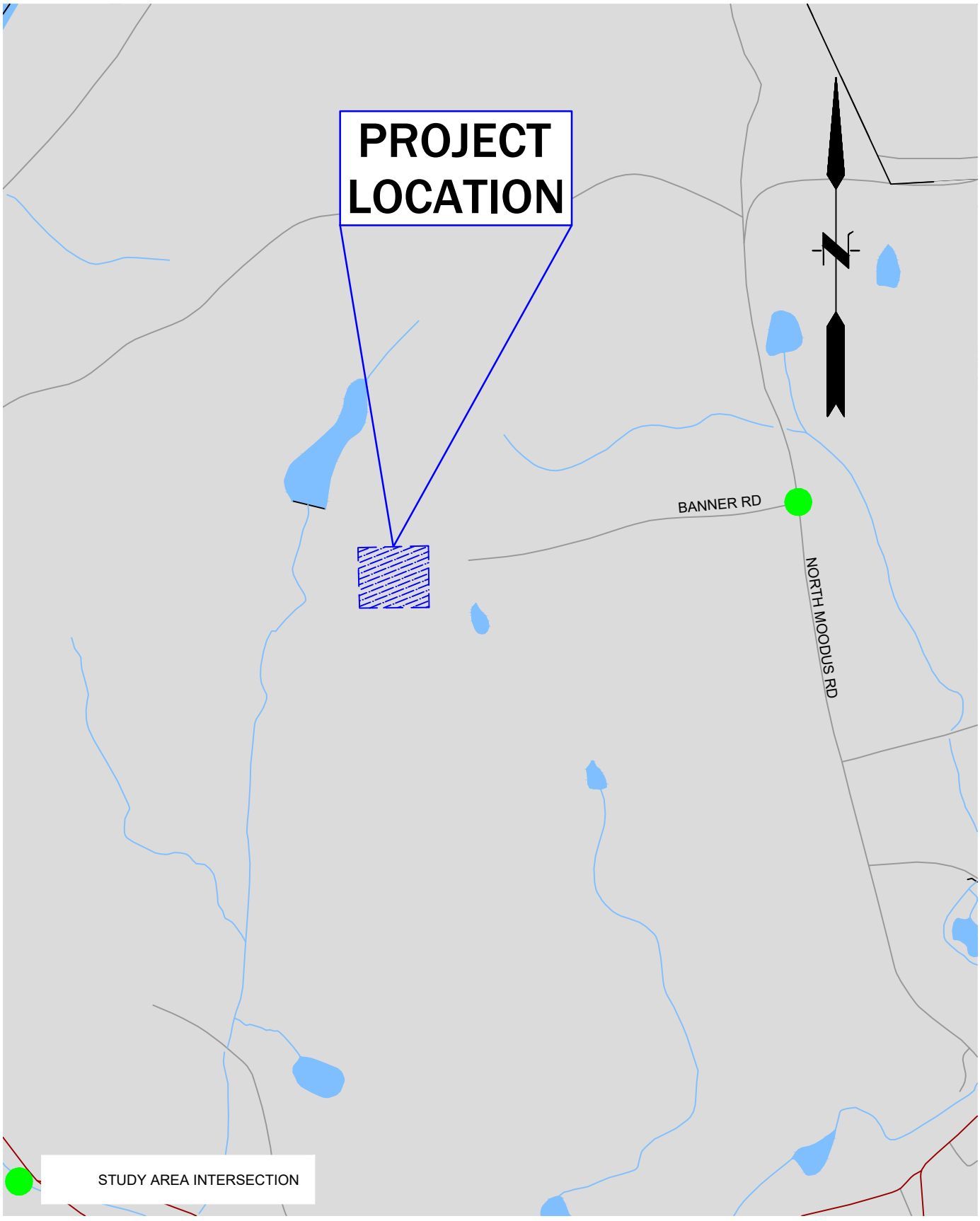
Gina DePasquale, E.I.T.
Traffic Engineer

Mark G. Vertucci, P.E., PTOE
Vice President

Enclosures: Traffic Volume Figures
Turning Movement Count Data
Trip Generation Worksheet
Synchro Analysis Worksheets

Appendix 1

Traffic Volume Figures



SCALE:
HOR .: 1" 1000
VERT.:
DATUM:
HOR .:
VERT.:
0 1 1000
GRAPHIC SCALE

FUSS & O'NEILL
146 HARTFORD ROAD
MANCHESTER, CONNECTICUT 06040
860.646.2469
www.fando.com

TOWN OF EAST HADDAM

LOFTS AT BLACK BIRCH RESIDENTIAL DEVELOPMENT

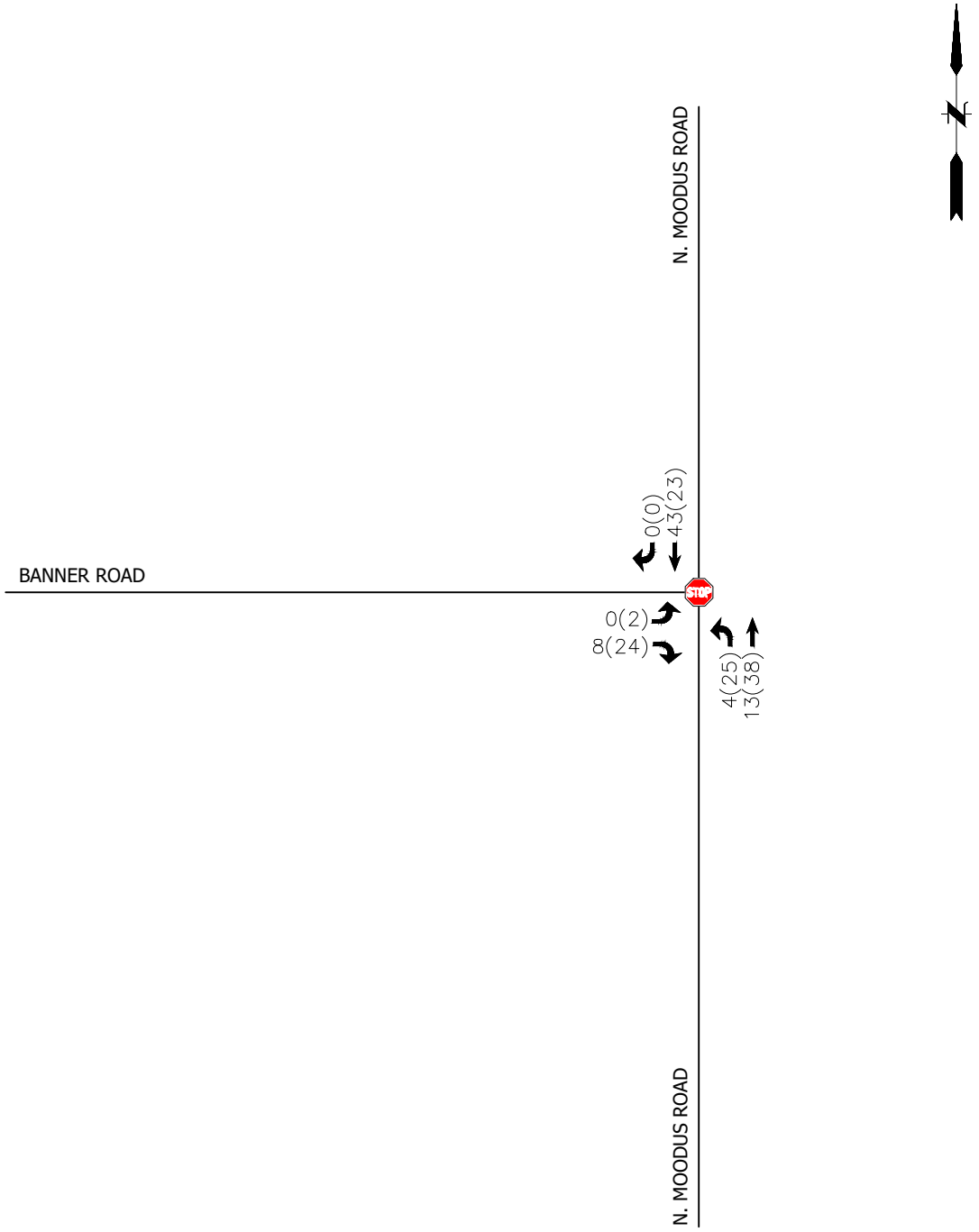
NORTH MOODUS ROAD

EAST HADDAM CONNECTICUT

PROJ. No.: 20210116.A10
DATE: MAY 2021

FIG 1

File Path: J:\DWG\P2021\0116\A10\Civil\Traffic Figures\20210116A10_LOC01.dwg Layout: EAST HADDAM LOFTS Plotted: Wed, May 05, 2021 - 12:24 PM User: gde as uale
Plotter: DWG TO PDF.PC3 CTB File: FO.STB
LAYER STATE:
MS VIEW:



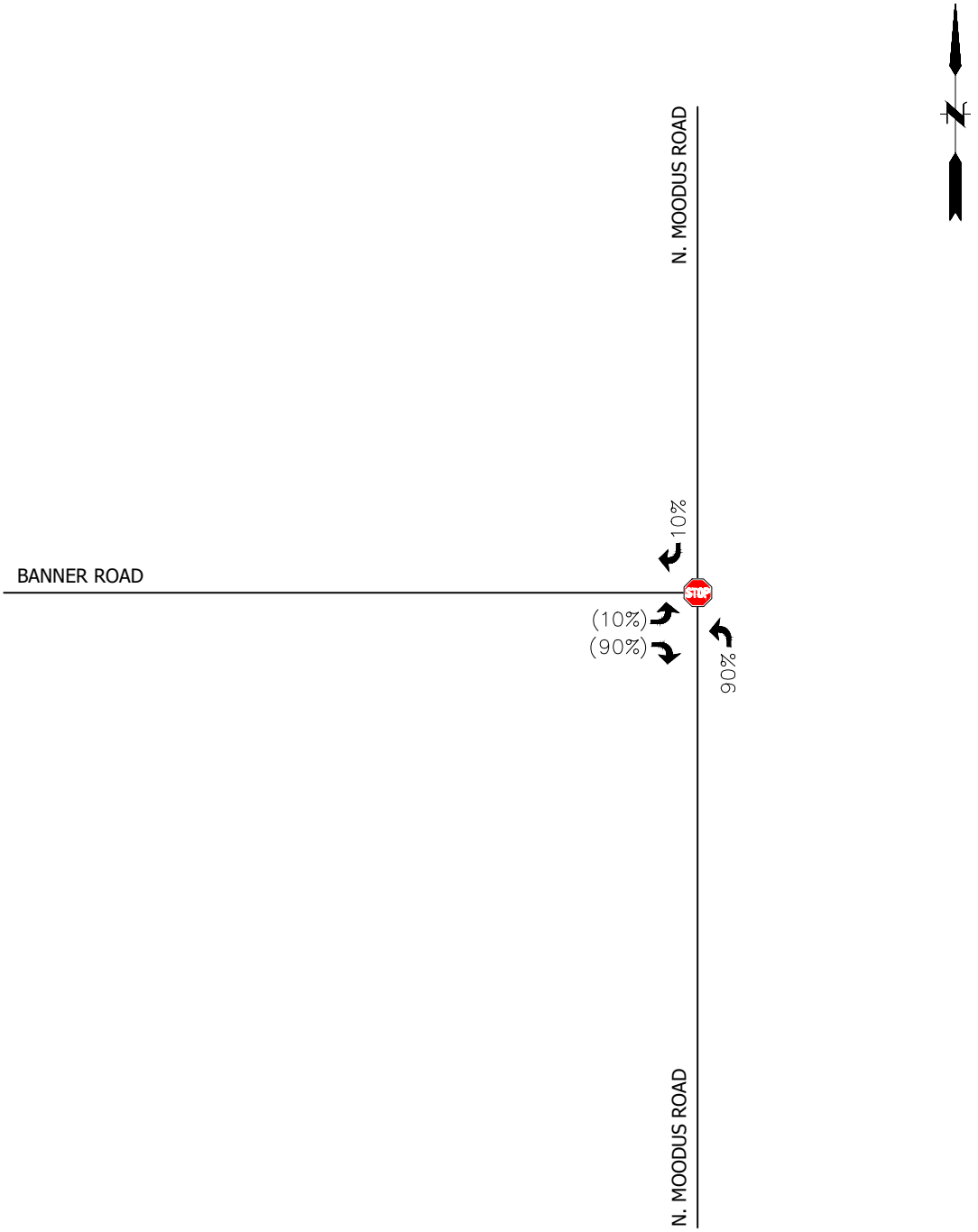
XX(XX) = WEEKDAY MORNING PEAK HOUR (WEEKDAY PM PEAK HOUR)

FUSS & O'NEILL
146 HARTFORD ROAD
MANCHESTER, CONNECTICUT 06040
860.646.2469
www.fando.com

FIGURE 2: 2022 BASELINE TRAFFIC VOLUMES

PROJ. NO: 20210116.A10 BANNER REALTY DEVELOPMENT, LLC. MAY 2021

File Path: J:\DWG\P2021\0116\A10\Civil\Traffic Figures\20210116A10_TVF01.dwg Layout: FIG 2. 2022 BASELINE Plotted: Wed, May 19, 2021 - 8:02 AM User: GINA DEPASQUALE



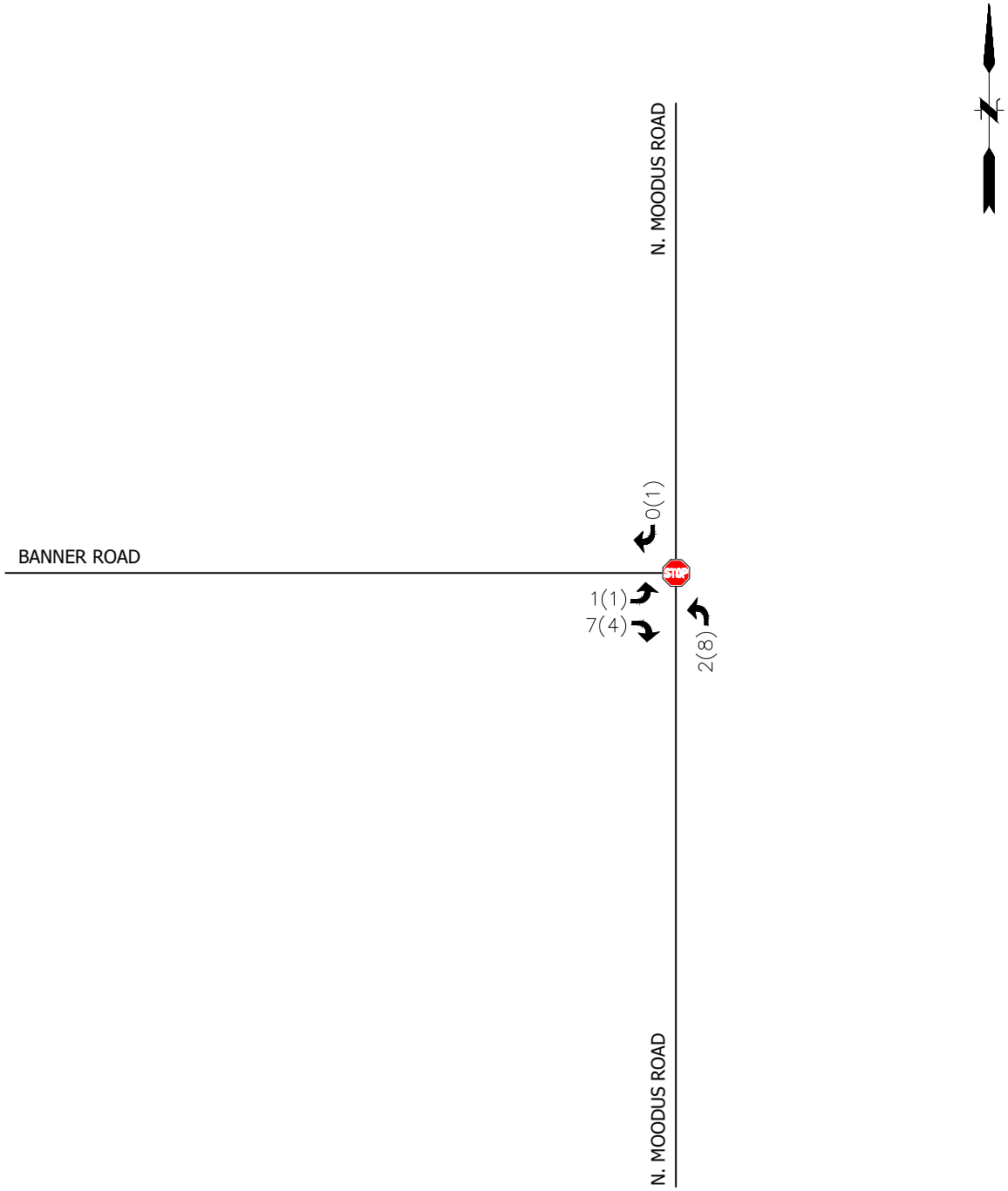
XX(XX) = ENTERING TRAFFIC (EXITING TRAFFIC)

FUSS & O'NEILL
146 HARTFORD ROAD
MANCHESTER, CONNECTICUT 06040
860.646.2469
www.fando.com

FIGURE 3: TRIP DISTRIBUTION

PROJ. NO: 20210116.A10 BANNER REALTY DEVELOPMENT, LLC. MAY 2021

File Path: J:\DWG\P2021\10116\A10\Civil\Traffic Figures\20210116A10_TVF01.dwg Layout: FIG 3. TRIP DIST Plotted: Wed, May 19, 2021 - 8:02 AM User: GINA DEPASQUALE



XX(XX) = WEEKDAY MORNING PEAK HOUR (WEEKDAY PM PEAK HOUR)

SITE GENERATED TRAFFIC VOLUMES

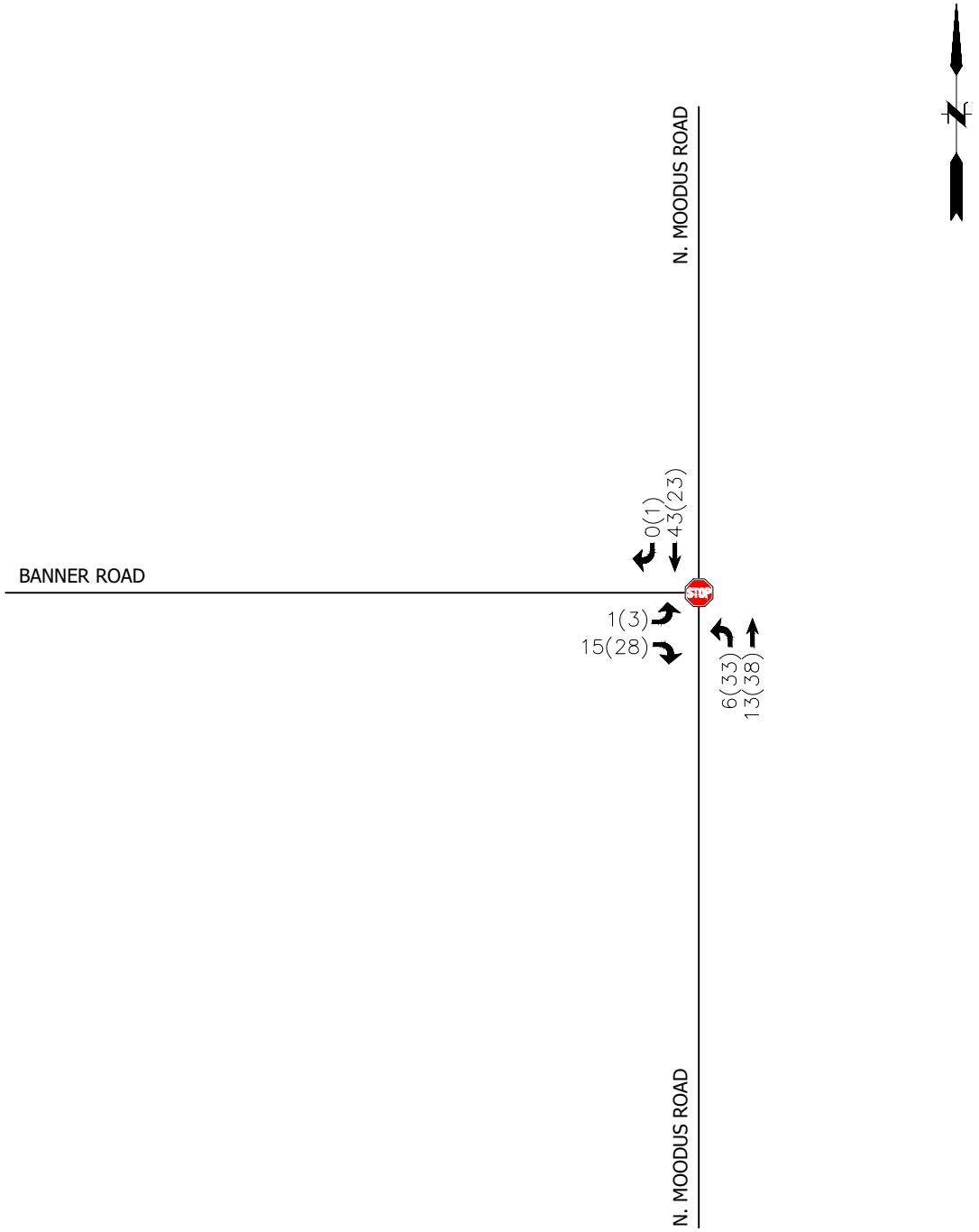
	ENTER	EXIT	TOTAL
MORNING	2	8	10
AFTERNOON	9	5	14

FUSS & O'NEILL
146 HARTFORD ROAD
MANCHESTER, CONNECTICUT 06040
860.646.2469
www.fando.com

FIGURE 4: TRIP GENERATION

PROJ. NO: 20210116.A10 BANNER REALTY DEVELOPMENT, LLC. MAY 2021

File Path: J:\DWG\P2021\10116\A10\Civil\Traffic Figures\20210116A10_TVF01.dwg Layout: FIG 4. TRIP GEN Plotted: Wed, May 19, 2021 - 8:02 AM User: GINA DEPASQUALE



XX(XX) = WEEKDAY MORNING PEAK HOUR (WEEKDAY PM PEAK HOUR)

FUSS & O'NEILL
146 HARTFORD ROAD
MANCHESTER, CONNECTICUT 06040
860.646.2469
www.fando.com

FIGURE 5: 2022 COMBINED TRAFFIC VOLUMES

PROJ. NO: 20210116.A10 BANNER REALTY DEVELOPMENT, LLC. MAY 2021

File Path: J:\DWG\P2021\10116\A10\Civil\Traffic Figures\20210116A10_TVF01.dwg Layout: FIG 5. 2022 COMBINED Plotted: Wed, May 19, 2021 - 8:02 AM User: GINA DEPASQUALE

FUSS & O'NEILL

Appendix 2-a

AM Turning Movement Count Data

Connecticut Counts LLC
Kensington, Connecticut 06037
(860) 828-1693

N. Moodus Road at Banner Road
E. Haddam, Connecticut

File Name : 21725
Site Code : 21725
Start Date : 4/20/2021
Page No : 1

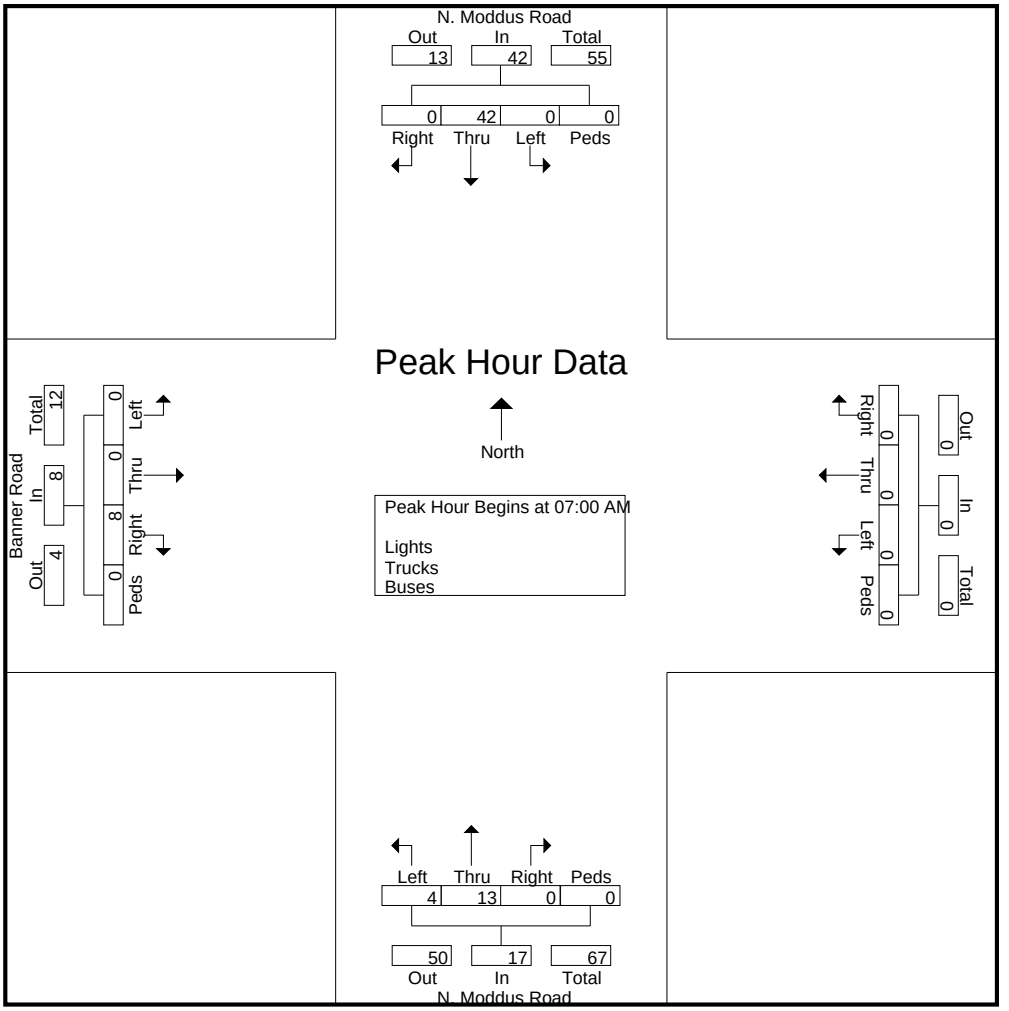
Groups Printed- Lights - Trucks - Buses

	N. Moddus Road From North					From East					N. Moddus Road From South					Banner Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	0	13	0	0	13	0	0	0	0	0	0	2	0	0	2	1	0	0	0	1	16
07:15 AM	0	16	0	0	16	0	0	0	0	0	0	3	1	0	4	4	0	0	0	4	24
07:30 AM	0	8	0	0	8	0	0	0	0	0	0	5	1	0	6	3	0	0	0	3	17
07:45 AM	0	5	0	0	5	0	0	0	0	0	0	3	2	0	5	0	0	0	0	0	10
Total	0	42	0	0	42	0	0	0	0	0	0	13	4	0	17	8	0	0	0	8	67
08:00 AM	0	7	0	0	7	0	0	0	0	0	0	5	1	0	6	1	0	0	0	1	14
08:15 AM	1	10	0	0	11	0	0	0	0	0	0	0	2	0	2	4	0	0	0	4	17
08:30 AM	0	8	0	0	8	0	0	0	0	0	0	1	2	0	3	3	0	2	0	5	16
08:45 AM	1	4	0	0	5	0	0	0	0	0	0	4	5	0	9	1	0	0	0	1	15
Total	2	29	0	0	31	0	0	0	0	0	0	10	10	0	20	9	0	2	0	11	62
Grand Total	2	71	0	0	73	0	0	0	0	0	0	23	14	0	37	17	0	2	0	19	129
Apprch %	2.7	97.3	0	0		0	0	0	0		0	62.2	37.8	0		89.5	0	10.5	0		
Total %	1.6	55	0	0	56.6	0	0	0	0	0	0	17.8	10.9	0	28.7	13.2	0	1.6	0	14.7	
Lights	2	67	0	0	69	0	0	0	0	0	0	21	13	0	34	17	0	1	0	18	121
% Lights	100	94.4	0	0	94.5	0	0	0	0	0	0	91.3	92.9	0	91.9	100	0	50	0	94.7	93.8
Trucks	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1	3
% Trucks	0	1.4	0	0	1.4	0	0	0	0	0	0	0	7.1	0	2.7	0	0	50	0	5.3	2.3
Buses	0	3	0	0	3	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	5
% Buses	0	4.2	0	0	4.1	0	0	0	0	0	0	8.7	0	0	5.4	0	0	0	0	0	3.9

Connecticut Counts LLC
Kensington, Connecticut 06037
(860) 828-1693

File Name : 21725
Site Code : 21725
Start Date : 4/20/2021
Page No : 2

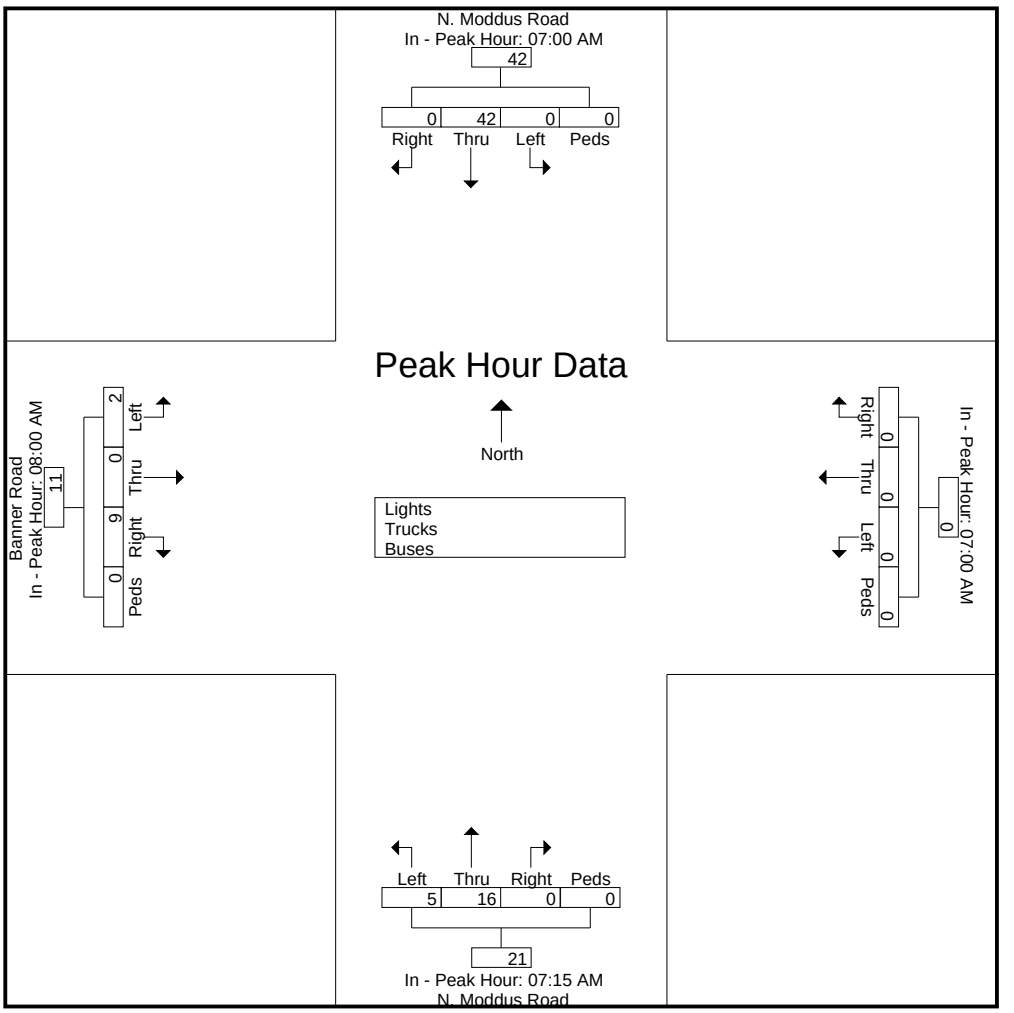
	N. Moddus Road From North					From East					N. Moddus Road From South					Banner Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	13	0	0	13	0	0	0	0	0	0	2	0	0	2	1	0	0	0	1	16
07:15 AM	0	16	0	0	16	0	0	0	0	0	0	3	1	0	4	4	0	0	0	4	24
07:30 AM	0	8	0	0	8	0	0	0	0	0	0	5	1	0	6	3	0	0	0	3	17
07:45 AM	0	5	0	0	5	0	0	0	0	0	0	3	2	0	5	0	0	0	0	0	10
Total Volume	0	42	0	0	42	0	0	0	0	0	0	13	4	0	17	8	0	0	0	8	67
% App. Total	0	100	0	0		0	0	0	0		0	76.5	23.5	0		100	0	0	0		
PHF	.000	.656	.000	.000	.656	.000	.000	.000	.000	.000	.000	.650	.500	.000	.708	.500	.000	.000	.000	.500	.698



Connecticut Counts LLC
Kensington, Connecticut 06037
(860) 828-1693

File Name : 21725
Site Code : 21725
Start Date : 4/20/2021
Page No : 3

	N. Moddus Road From North					From East					N. Moddus Road From South					Banner Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	07:00 AM					07:00 AM					07:15 AM					08:00 AM					
+0 mins.	0	13	0	0	13	0	0	0	0	0	0	3	1	0	4	1	0	0	0	1	
+15 mins.	0	16	0	0	16	0	0	0	0	0	0	5	1	0	6	4	0	0	0	4	
+30 mins.	0	8	0	0	8	0	0	0	0	0	0	3	2	0	5	3	0	2	0	5	
+45 mins.	0	5	0	0	5	0	0	0	0	0	0	5	1	0	6	1	0	0	0	1	
Total Volume	0	42	0	0	42	0	0	0	0	0	0	16	5	0	21	9	0	2	0	11	
% App. Total	0	100	0	0		0	0	0	0		0	76.2	23.8	0		81.8	0	18.2	0		
PHF	.000	.656	.000	.000	.656	.000	.000	.000	.000	.000	.000	.800	.625	.000	.875	.563	.000	.250	.000	.550	



FUSS & O'NEILL

Appendix 2-b

PM Turning Movement Count Data

Connecticut Counts LLC
Kensington, Connecticut 06037
(860) 828-1693

N. Moodus Rd at Banner Road
E. Haddam, Connecticut

File Name : 21726
Site Code : 21726
Start Date : 4/20/2021
Page No : 1

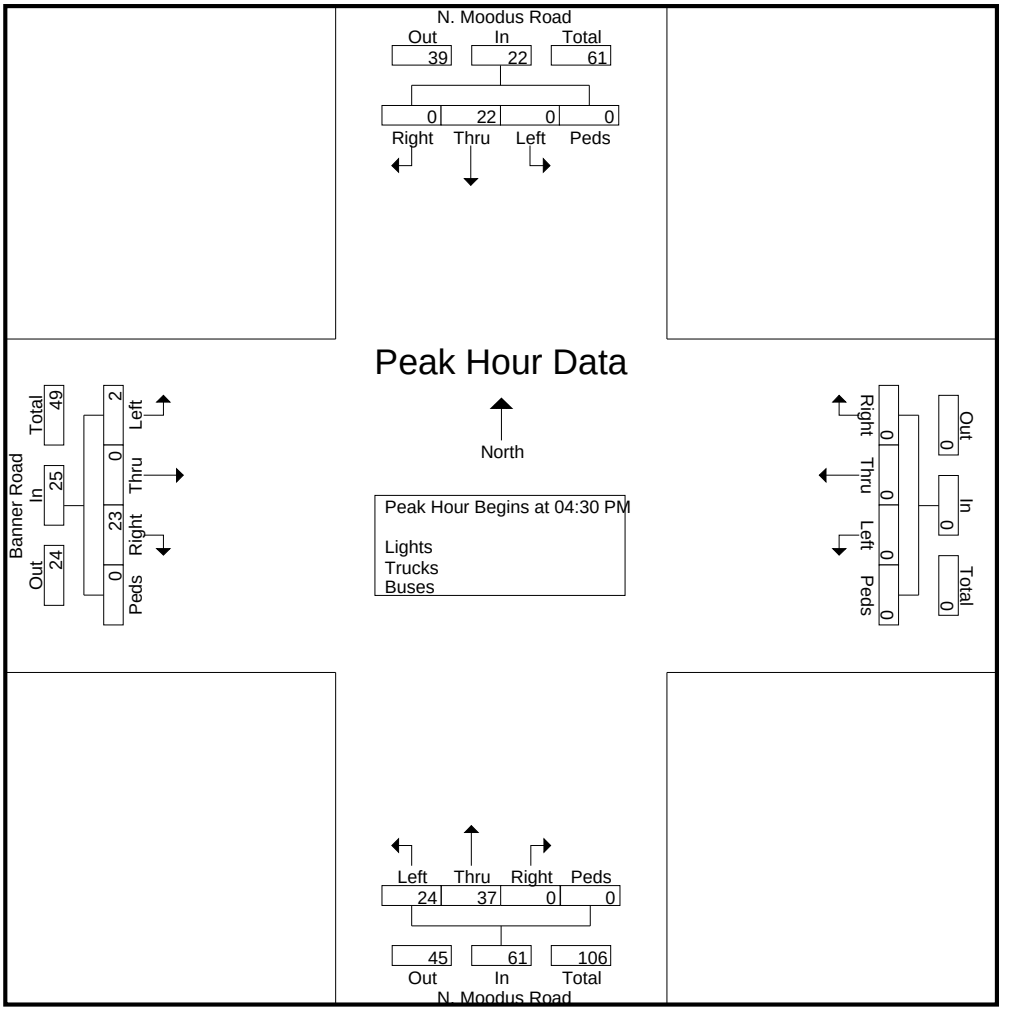
Groups Printed- Lights - Trucks - Buses

	N. Moodus Road From North					From East					N. Moodus Road From South					Banner Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	0	3	0	0	3	0	0	0	0	0	0	9	6	0	15	2	0	0	0	2	20
04:15 PM	0	4	0	0	4	0	0	0	0	0	0	11	6	0	17	3	0	1	1	5	26
04:30 PM	0	9	0	0	9	0	0	0	0	0	0	10	6	0	16	1	0	0	0	1	26
04:45 PM	0	1	0	0	1	0	0	0	0	0	0	11	5	0	16	3	0	1	0	4	21
Total	0	17	0	0	17	0	0	0	0	0	0	41	23	0	64	9	0	2	1	12	93
05:00 PM	0	6	0	0	6	0	0	0	0	0	0	8	6	0	14	11	0	1	0	12	32
05:15 PM	0	6	0	0	6	0	0	0	0	0	0	8	7	0	15	8	0	0	0	8	29
05:30 PM	3	2	0	0	5	0	0	0	0	0	0	10	4	0	14	2	0	0	2	4	23
05:45 PM	1	3	0	0	4	0	0	0	0	0	0	5	3	0	8	4	0	1	0	5	17
Total	4	17	0	0	21	0	0	0	0	0	0	31	20	0	51	25	0	2	2	29	101
Grand Total	4	34	0	0	38	0	0	0	0	0	0	72	43	0	115	34	0	4	3	41	194
Apprch %	10.5	89.5	0	0		0	0	0	0		0	62.6	37.4	0		82.9	0	9.8	7.3		
Total %	2.1	17.5	0	0	19.6	0	0	0	0	0	0	37.1	22.2	0	59.3	17.5	0	2.1	1.5	21.1	
Lights	4	34	0	0	38	0	0	0	0	0	0	72	42	0	114	33	0	4	3	40	192
% Lights	100	100	0	0	100	0	0	0	0	0	0	100	97.7	0	99.1	97.1	0	100	100	97.6	99
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buses	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	2
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	2.3	0	0.9	2.9	0	0	0	2.4	1

Connecticut Counts LLC
Kensington, Connecticut 06037
(860) 828-1693

File Name : 21726
Site Code : 21726
Start Date : 4/20/2021
Page No : 2

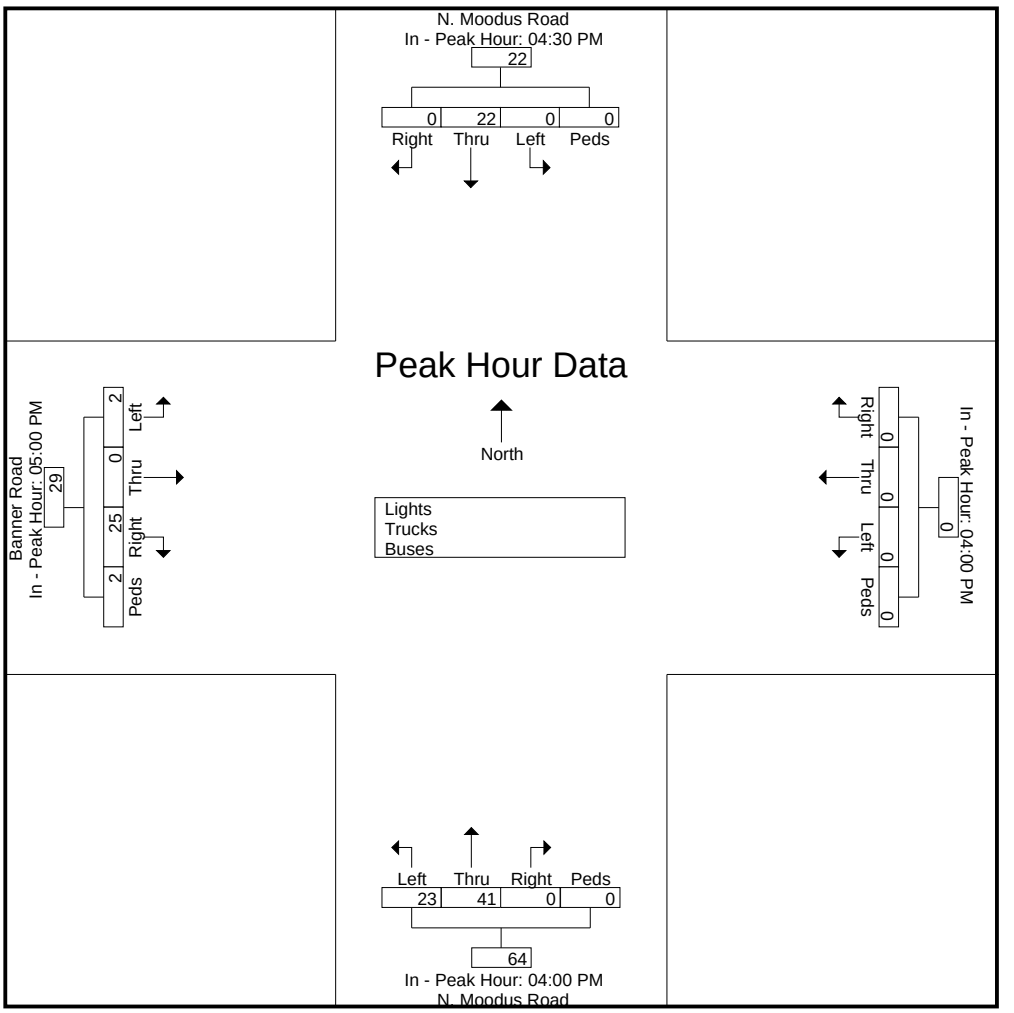
	N. Moodus Road From North					From East					N. Moodus Road From South					Banner Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	9	0	0	9	0	0	0	0	0	0	10	6	0	16	1	0	0	0	1	26
04:45 PM	0	1	0	0	1	0	0	0	0	0	0	11	5	0	16	3	0	1	0	4	21
05:00 PM	0	6	0	0	6	0	0	0	0	0	0	8	6	0	14	11	0	1	0	12	32
05:15 PM	0	6	0	0	6	0	0	0	0	0	0	8	7	0	15	8	0	0	0	8	29
Total Volume	0	22	0	0	22	0	0	0	0	0	0	37	24	0	61	23	0	2	0	25	108
% App. Total	0	100	0	0		0	0	0	0		0	60.7	39.3	0		92	0	8	0		
PHF	.000	.611	.000	.000	.611	.000	.000	.000	.000	.000	.000	.841	.857	.000	.953	.523	.000	.500	.000	.521	.844



Connecticut Counts LLC
Kensington, Connecticut 06037
(860) 828-1693

File Name : 21726
Site Code : 21726
Start Date : 4/20/2021
Page No : 3

	N. Moodus Road From North					From East					N. Moodus Road From South					Banner Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	04:30 PM					04:00 PM					04:00 PM					05:00 PM					
+0 mins.	0	9	0	0	9	0	0	0	0	0	0	9	6	0	15	11	0	1	0	12	
+15 mins.	0	1	0	0	1	0	0	0	0	0	0	11	6	0	17	8	0	0	0	8	
+30 mins.	0	6	0	0	6	0	0	0	0	0	0	10	6	0	16	2	0	0	2	4	
+45 mins.	0	6	0	0	6	0	0	0	0	0	0	11	5	0	16	4	0	1	0	5	
Total Volume	0	22	0	0	22	0	0	0	0	0	0	41	23	0	64	25	0	2	2	29	
% App. Total	0	100	0	0		0	0	0	0		0	64.1	35.9	0		86.2	0	6.9	6.9		
PHF	.000	.611	.000	.000	.611	.000	.000	.000	.000	.000	.000	.932	.958	.000	.941	.568	.000	.500	.250	.604	



FUSS & O'NEILL

Appendix 3

ITE Trip Generation Worksheet

Land Use: 220
Multifamily Housing (Low-Rise)

Description

Low-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have one or two levels (floors). Multifamily housing (mid-rise) (Land Use 221), multifamily housing (high-rise) (Land Use 222), and off-campus student apartment (Land Use 225) are related land uses.

Additional Data

In prior editions of *Trip Generation Manual*, the low-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 three sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.72 residents per occupied dwelling unit.

For the two sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 96.2 percent of the total dwelling units were occupied.

This land use included data from a wide variety of units with different sizes, price ranges, locations, and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Time-of-day distribution data for this land use are presented in Appendix A. For the 10 general urban/suburban sites with 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 4:45 and 5:45 p.m., respectively. For the one site with Saturday data, the overall highest vehicle volume was counted between 9:45 and 10:45 a.m. For the one site with Sunday data, the overall highest vehicle volume was counted between 11:45 a.m. and 12:45 p.m.

For the one dense multi-use urban site with 24-hour count 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 6:15 and 7:15 p.m., respectively.

For the three sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.72 residents per occupied dwelling unit.

The average numbers of person trips per vehicle trip at the five general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.13 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.21 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in British Columbia (CAN), California, District of Columbia, Florida, Georgia, Illinois, Indiana, Maine, Maryland, Minnesota, New Jersey, New York, Ontario, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Virginia, and Washington.

It is expected that the number of bedrooms and number of residents are likely correlated to the number of trips generated by a residential site. Many of the studies included in this land use did not indicate the total number of bedrooms. To assist in the future analysis of this land use, it is important that this information be collected and included in trip generation data submissions.

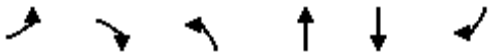
Source Numbers

168, 187, 188, 204, 211, 300, 305, 306, 319, 320, 321, 357, 390, 412, 418, 525, 530, 571, 579, 583, 864, 868, 869, 870, 896, 903, 918, 946, 947, 948, 951

FUSS & O'NEILL

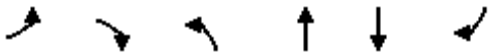
Appendix 4-a

Synchro Analysis Worksheets
AM Background



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	8	4	13	43	0
Future Volume (vph)	0	8	4	13	43	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.865					
Flt Protected				0.989		
Satd. Flow (prot)	1611	0	0	1842	1863	0
Flt Permitted				0.989		
Satd. Flow (perm)	1611	0	0	1842	1863	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	648			528	505	
Travel Time (s)	14.7			12.0	11.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	9	4	14	47	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	9	0	0	18	47	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 14.2%		ICU Level of Service A	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	8	4	13	43	0
Future Volume (Veh/h)	0	8	4	13	43	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	9	4	14	47	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	69	47	47			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	69	47	47			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	933	1022	1560			

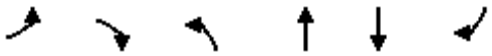
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	9	18	47
Volume Left	0	4	0
Volume Right	9	0	0
cSH	1022	1560	1700
Volume to Capacity	0.01	0.00	0.03
Queue Length 95th (ft)	1	0	0
Control Delay (s)	8.6	1.6	0.0
Lane LOS	A	A	
Approach Delay (s)	8.6	1.6	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	14.2%	ICU Level of Service	A
Analysis Period (min)	15		

FUSS & O'NEILL

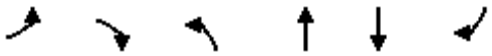
Appendix 4-b

Synchro Analysis Worksheets
AM Combined



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1	15	6	13	43	0
Future Volume (vph)	1	15	6	13	43	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.873					
Flt Protected	0.997			0.984		
Satd. Flow (prot)	1621	0	0	1833	1863	0
Flt Permitted	0.997			0.984		
Satd. Flow (perm)	1621	0	0	1833	1863	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	648			528	505	
Travel Time (s)	14.7			12.0	11.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	16	7	14	47	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	17	0	0	21	47	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 16.0%		ICU Level of Service A	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	15	6	13	43	0
Future Volume (Veh/h)	1	15	6	13	43	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	16	7	14	47	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	75	47	47			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	75	47	47			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	100			
cM capacity (veh/h)	924	1022	1560			

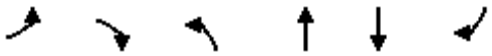
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	17	21	47
Volume Left	1	7	0
Volume Right	16	0	0
cSH	1016	1560	1700
Volume to Capacity	0.02	0.00	0.03
Queue Length 95th (ft)	1	0	0
Control Delay (s)	8.6	2.5	0.0
Lane LOS	A	A	
Approach Delay (s)	8.6	2.5	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	16.0%	ICU Level of Service	A
Analysis Period (min)	15		

FUSS & O'NEILL

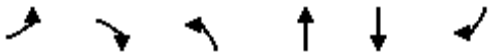
Appendix 4-c

Synchro Analysis Worksheets
PM Background



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	2	24	25	38	23	0
Future Volume (vph)	2	24	25	38	23	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.875					
Flt Protected	0.996			0.981		
Satd. Flow (prot)	1623	0	0	1827	1863	0
Flt Permitted	0.996			0.981		
Satd. Flow (perm)	1623	0	0	1827	1863	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	648			528	505	
Travel Time (s)	14.7			12.0	11.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	26	27	41	25	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	0	0	68	25	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 20.0%		ICU Level of Service A	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	24	25	38	23	0
Future Volume (Veh/h)	2	24	25	38	23	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	26	27	41	25	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	120	25	25			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	120	25	25			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	98			
cM capacity (veh/h)	861	1051	1589			

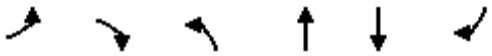
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	28	68	25
Volume Left	2	27	0
Volume Right	26	0	0
cSH	1035	1589	1700
Volume to Capacity	0.03	0.02	0.01
Queue Length 95th (ft)	2	1	0
Control Delay (s)	8.6	3.0	0.0
Lane LOS	A	A	
Approach Delay (s)	8.6	3.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

FUSS & O'NEILL

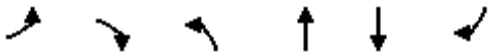
Appendix 4-d

Synchro Analysis Worksheets
PM Combined



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	3	28	33	38	23	1
Future Volume (vph)	3	28	33	38	23	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.877				0.995	
Flt Protected	0.995			0.977		
Satd. Flow (prot)	1625	0	0	1820	1853	0
Flt Permitted	0.995			0.977		
Satd. Flow (perm)	1625	0	0	1820	1853	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	648			528	505	
Travel Time (s)	14.7			12.0	11.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	30	36	41	25	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	33	0	0	77	26	0
Sign Control	Stop			Free	Free	

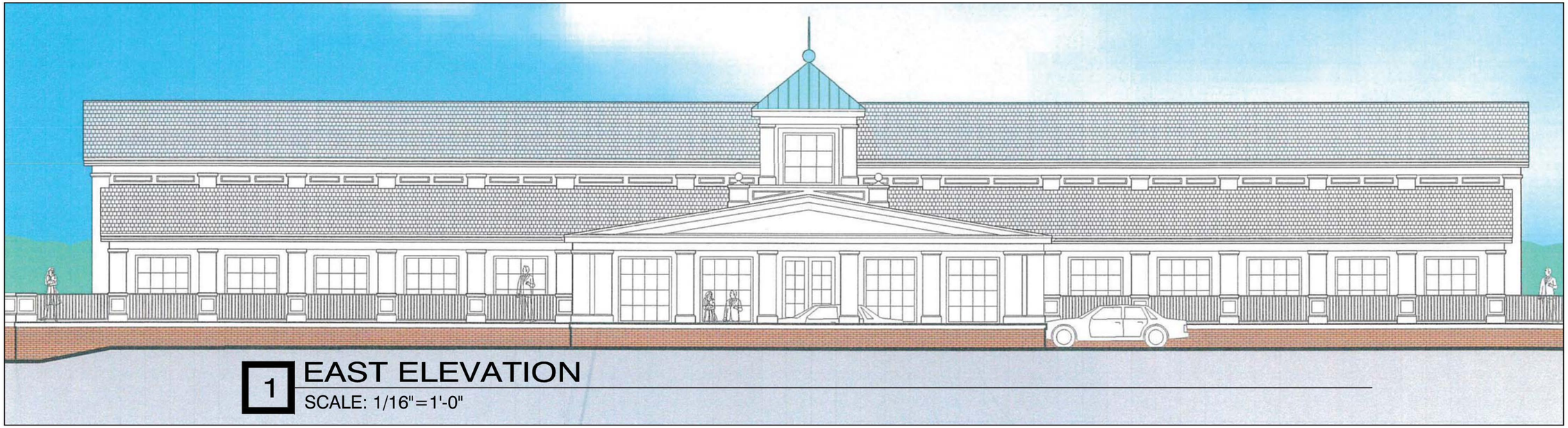
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 20.5%		ICU Level of Service A	
Analysis Period (min) 15			



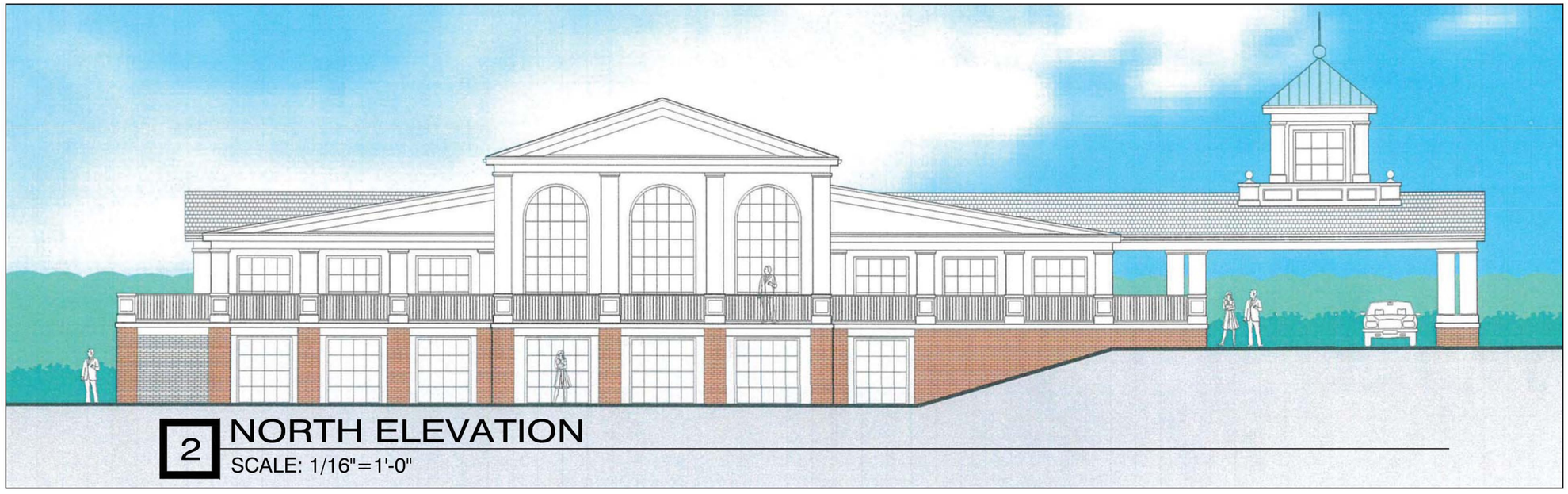
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	28	33	38	23	1
Future Volume (Veh/h)	3	28	33	38	23	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	30	36	41	25	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	138	26	26			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	138	26	26			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	98			
cM capacity (veh/h)	835	1050	1588			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	33	77	26
Volume Left	3	36	0
Volume Right	30	0	1
cSH	1026	1588	1700
Volume to Capacity	0.03	0.02	0.02
Queue Length 95th (ft)	2	2	0
Control Delay (s)	8.6	3.5	0.0
Lane LOS	A	A	
Approach Delay (s)	8.6	3.5	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	20.5%	ICU Level of Service	A
Analysis Period (min)	15		



1 EAST ELEVATION
SCALE: 1/16"=1'-0"



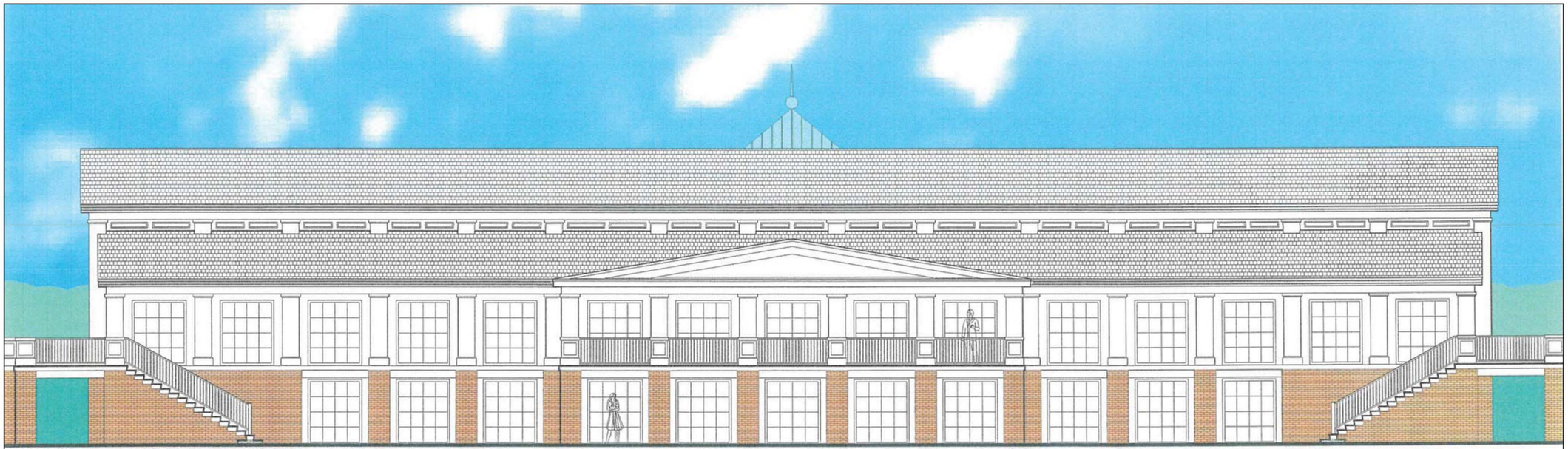
2 NORTH ELEVATION
SCALE: 1/16"=1'-0"

HENDREN ASSOCIATES
ARCHITECTS AND PLANNERS

GARY W. HENDREN, AIA
ARCHITECT
119 BRAINTREE ST, STE 209
BOSTON, MA
T 617-782-6003 F 617-782-6063
WWW.HENDRENASSOCIATES.COM

The Lofts at Black Birch
Community Center Redevelopment

SHEET TITLE: EXTERIOR ELEVATIONS	DWG. NO.: PR-4
DATE: 06/16/21 SCALE:	
DRAWN BY: GGO CHKD. BY:	
JOB NO.:	



1 SOUTH ELEVATION
SCALE: 1/16"=1'-0"

HENDREN ASSOCIATES
ARCHITECTS AND PLANNERS

GARY W. HENDREN, AIA
ARCHITECT
119 BRAINTREE ST, STE 209
BOSTON, MA
T 617-782-6003 F 617-782-6063
WWW.HENDRENASSOCIATES.COM

The Lofts at Black Birch
Community Center Redevelopment

SHEET TITLE: SECOND PROPOSED PLAN	DWG. NO.: PR-5
DATE: 06/16/21 SCALE:	
DRAWN BY: GGO CHKD. BY:	
JOB NO.:	

WMC
CONSULTING ENGINEERS

87 Holmes Road
Newington, CT 06111

Phone: (860) 667-9624
Fax: (860) 665-1551

March 10, 2021

Mr. Timothy S. Hollister, Esq.
Hinckley Allen
20 Church Street
Hartford, CT 06103

Re: Banner Estates - Wastewater Disposal for Proposed New Housing Units

Dear Mr. Hollister:

It is our understanding that Banner Estates is proposing to construct twenty (20) units of housing to be located in the original function hall building. The units are to be studio apartments with one bedroom for each. The existing function hall is currently connected to the existing subsurface wastewater disposal systems serving the existing building units. If approved by Town, the proposed 20 units would be connected to a new subsurface wastewater disposal system.

For reference, the existing wastewater disposal systems for the site are approved by the Connecticut Department of Energy and Environmental Protection (DEEP) for 17,400 gallons per day.

A question has arisen as to the availability of adequate wastewater disposal for the proposed 20 units. The estimated wastewater discharge from these units, based upon Connecticut Health Code and DEEP criteria is based upon 150 gallons per bedroom per day or a total estimated flow of 3,000 gallons per day (gpd).

As you are aware, the Banner property is quite large, comprised of over several hundred acres of land. Over the 30 years of our involvement with the planning and design of both the existing units and the Town-approved plan for over 300 units of housing, we have done extensive site testing throughout the property for the investigation of on-site subsurface wastewater disposal options. These investigations have shown that there are many areas of the property that are suitable for subsurface wastewater disposal. In fact we have developed a plan, which has been reviewed by the DEEP, that will properly accommodate the wastewater from the over 300 units approved by the Town.

Please find attached, a drawing of the location of the proposed subsurface wastewater disposal system, which is comprised of a small pump station, a 4,000 gallon septic tank, an appropriately designed leaching field and appurtenant piping, designed to serve the proposed 20 units. This system has been designed to meet or exceed DEEP requirements for hydraulics and pollutant renovation.

Based upon our investigations and analyses, it is our professional opinion that the proposed subsurface disposal system is adequate to accommodate the approximate 3,000gpd design flow for the twenty units.

Should you have any questions concerning this report, please do not hesitate to contact us at your convenience.

Sincerely,

Wengell, McDonnell & Costello

Stephen R. McDonnell, P.E.

APPROVED BY THE EAST HADDAM PLANNING AND ZONING COMMISSION
CHAIRMAN/SECRETARY_____ DATE: _____
EXPIRATION DATE: _____

GRADING NOTES:

1) BEFORE STARTING EACH PORTION OF WORK, THE CONTRACTOR SHALL COMPARE THE EXISTING CONDITIONS SHOWN ON THE DRAWINGS, WITH ACTUAL FIELD CONDITIONS. THE CONTRACTOR MUST NOTIFY THE ENGINEER OF ANY DISCREPANCIES, IN WRITING. COMMENCEMENT OF WORK IN ANY AREA SIGNIFIES ACCEPTANCE OF EXISTING CONDITIONS SHOWN ON THE DRAWINGS AS BEING SUBSTANTIALLY CORRECT.
2) AFTER CLEARING LIMITS AREA ESTABLISHED, THE AREA THAT IS NOT TO BE GRADED IS TO BE MARKED OUT. THE SITE WILL THEN BE EVALUATED TO DETERMINE IF ANY TREE(S) WARRANT PRESERVATION. ANY TREE(S) DESIGNATED FOR PRESERVATION SHALL BE PROPERLY PROTECTED TO THE DRIPLINE AND FLAGGED PRIOR TO SITE CLEARING.
3) SMOOTHLY BLEND ALL PROPOSED GRADES TO EXISTING CONDITION. ROUND OFF TOP AND TOE OF ALL SLOPES.
4) ALL GRADING SHALL BE PERFORMED TO ELIMINATE LOW POINTS AND DEPRESSIONS WHICH WOULD TRAP SURFACE WATER. CONTACT THE DESIGN ENGINEER IF CHANGES ARE WARRANTED.
5) MINOR GRADING REVISIONS ARE PERMITTED TO MEET FIELD CONDITIONS W/ THE APPROVAL OF THE DESIGN ENGINEER.
6) ALL HANDICAP PARKING SPACES, SEATING AREAS AND PASSENGER LOADING ZONES SHALL NOT EXCEED 2.0% IN ANY DIRECTION.
7) THE CLEARING LIMIT LINE SHALL BE COINCIDENT W/ THE LIMITS OF CONSTRUCTION UNLESS OTHERWISE NOTED.

COUNTRY CLUB LANE
TENNIS COURTS
POOL
PRO SHOP
BANNER LANE
BANNER ROAD
Pinehurst Lane
Augusta Dr.
SECTION A
SECTION B
150 FT WELL RADIUS
CB AND PIPE TO REMAIN
PAVED LEAK OFF TO CB
PROPOSED TYPE 'C' CB #3
TF. 349.6
INV. 344.8±
4" DIP FIRE PROTECTION
PROPOSED 20,000 GAL. FIRE SUPPRESSION TANK & HYDRANT ASSEMBLY
PUMP HOUSE
20K GAL
ALL DRAINAGE PIPES SHALL BE CLEANED AND VIDEO INSPECTED PRIOR TO CONSTRUCTION
COMMUNITY CENTER RENOVATION (20±-BEDROOM UNITS)
REMOVE EXISTING CB
INSTALL STORMWATER QUALITY UNIT W/ INTERNAL BYPASS
TF. 344.5
INV. 339.17
±20' - 15" HDPE @ 2.5%
PROPOSED TYPE 'C' CB #1
TF. 343.7
INV. 338.5±
PERMANENT PAVEMENT REPAIR (TYP.)
PROPOSED 1-1/2" PE FORCE MAIN
PROPOSED GRINDER PUMP
PLUG EXISTING SAN. LATERAL
TEST PIT AT WATER MAIN
ENSURE 4' MIN. COVER
INSULATE AS NECESSARY
PROPOSED DOUBLE TYPE 'C' CB #5
TF. 348.7
INV. 345.0
±20' - 15" HDPE @ 2.5%
PROPOSED TYPE 'C' CB #4
TF. 349.0
INV. 344.5
RESET GATE VALVES AS NECESSARY (TYP.)
CONVERT CB TO DMH #2
TF. 352.5±
CB AND PIPE TO REMAIN
±5' - 15" HDPE @ 2.0%
PROPOSED DMH #1
TF. 349.5
INV. 344.4±
INSTALL NEW TYPE 'C' CB #2
TF. 347.5
INV. MATCH EXIST.
REPLACE TYPE 'C' CB FRAME AND GRATE CB #6
TF. 346.3±
REPLACE TYPE 'C' CB FRAME AND GRATE CB #7
TF. 346.2±
EXISTING IRRIGATION POND
100' UPLAND REVIEW AREA (TYP.)
PROPOSED 1-1/2" PE FORCE MAIN
DISTRIBUTION BOX
INV. TBD
INV. TBD
±XX' - 4" PVC @ 1.0%
PROPOSED 5,000 GAL. SEPTIC TANK
TF. TBD
INV. TBD
±XX' - 4" PVC @ 1.0%
DISTRIBUTION BOX
INV. TBD
INV. TBD
DISTRIBUTION BOX
INV. TBD
INV. TBD
100' HIGH CAPACITY INFILTRATORS (TYP. OF 4 ROWS)
INV. TBD

GRAPHIC SCALE
0 20 40 80 140
(IN FEET)
1 inch = 40 ft.

NO.	DATE	DESCRIPTION
REVISIONS		

SUPV.	S.R.M.
DESIGN	R.E.B.
DRAWN	R.E.B.
CHECKED	S.R.M.
DATE	05/17/21

SCALE
1" = 40'

WMC CONSULTING ENGINEERS
• WENGELL, McDONNELL & COSTELLO •
87 HOLMES ROAD
NEWINGTON, CT 06111
(860) 667-9624

PREPARED FOR
LOFTS AT BLACK BIRCH LLC.
1 BANNER ROAD
EAST HADDAM, CT 06423

WASTEWATER DISPOSAL CONCEPT PLAN
THE LOFTS AT BLACK BIRCH - COMMUNITY CENTER RENOVATION
BANNER LANE - EAST HADDAM, CONNECTICUT

SIZE	PROJECT	FILE NAME	NUMBER	REV.	SHEET
D	BLACK BIRCH APTS	07056.3 PD	07056.30	-	WD-1

Zilko, Joyce F.

From: Keith Nadeau <Keith.Nadeau@ctwater.com>
Sent: Tuesday, June 8, 2021 1:55 PM
To: Gomes, Andrea L.
Cc: Nicholas Meder; Jeffrey Racicot; Christopher Kornatz
Subject: RE: Redevelopment of Community Center Building - 1 Banner Road, East Haddam

[EXTERNAL EMAIL]

Andrea,

As a verification, Connecticut Water's Banner Village water system has adequate capacity to provide domestic only water service to the proposed 20 – one bedroom residential units.

Please note that fire protection is not available from our water system.

Keith Nadeau, P.E.
Connecticut Water

From: Gomes, Andrea L. <agomes@hinckleyallen.com>
Sent: Monday, June 7, 2021 2:29 PM
To: Keith Nadeau <Keith.Nadeau@ctwater.com>
Cc: Nicholas Meder <Nicholas.Meder@ctwater.com>; Jeffrey Racicot <Jeffrey.Racicot@ctwater.com>; Christopher Kornatz <Christopher.Kornatz@ctwater.com>
Subject: RE: Redevelopment of Community Center Building - 1 Banner Road, East Haddam

Please note: THIS EMAIL ORIGINATED FROM AN EXTERNAL SOURCE.

Thank you, Keith. I appreciate it.

Best,
Andrea

From: Keith Nadeau <Keith.Nadeau@ctwater.com>
Sent: Monday, June 7, 2021 2:23 PM
To: Gomes, Andrea L. <agomes@hinckleyallen.com>
Cc: Nicholas Meder <Nicholas.Meder@ctwater.com>; Jeffrey Racicot <Jeffrey.Racicot@ctwater.com>; Christopher Kornatz <Christopher.Kornatz@ctwater.com>
Subject: RE: Redevelopment of Community Center Building - 1 Banner Road, East Haddam

[EXTERNAL EMAIL]

Andrea,

I forwarded your previous email to our operations personnel to verify service.

I am still waiting to hear back.

Please note that this system provides domestic water service only.
It does not have capacity to provide fire protection nor emergency needs.

We will provide verification either way prior to June 18, 2021.

Keith

From: Gomes, Andrea L. <agomes@hinckleyallen.com>
Sent: Monday, June 7, 2021 1:42 PM
To: Keith Nadeau <Keith.Nadeau@ctwater.com>
Cc: Hollister, Timothy S. <thollister@hinckleyallen.com>
Subject: RE: Redevelopment of Community Center Building - 1 Banner Road, East Haddam

Please note: THIS EMAIL ORIGINATED FROM AN EXTERNAL SOURCE.

Good afternoon Keith:

I am following up on my below email regarding the water supply for the Redevelopment of the Community Center building at 1 Banner Road in East Haddam.

This email will confirm our understanding that, unless we hear from your office to the contrary before June 18, 2021, when we intend to submit our application to the Town, Connecticut Water is able to provide water for domestic and emergency needs for 20 residential units in the Community Center building at 1 Banner Road.

Thank you,
Andrea

Andrea L. Gomes
Associate

Hinckley Allen
20 Church Street
Hartford, CT 06103-1221
p: 860-331-2603 | f: 860-278-3802
agomes@hinckleyallen.com

From: Gomes, Andrea L. <agomes@hinckleyallen.com>
Sent: Tuesday, June 1, 2021 2:20 PM
To: keith.nadeau@ctwater.com
Cc: Hollister, Timothy S. <thollister@hinckleyallen.com>
Subject: Redevelopment of Community Center Building - 1 Banner Road, East Haddam

Good afternoon Keith:

I understand that you have been in contact with Steve McDonnell of WMC Consulting Engineers regarding the redevelopment of the former Community Center building at 1 Banner Road, East Haddam, CT into 20 one-bedroom apartment units (your recent email exchange with Steve is attached).

As you may recall, Connecticut Water previously had confirmed that the infrastructure and water supply-on site would be sufficient for 86 residential units approved by the East Haddam Planning and Zoning Commission in 2005 and 2006,

consisting mostly of two-bedroom units, some of which contained additional lofted bedroom areas. To date, less than 50 of those 86 approved residential units have been constructed.

Would you please confirm our understanding that that the existing infrastructure and water supply-on site is sufficient for the proposed redevelopment of the former Community Center building into 20, one-bedroom units?

Please let me know if you have any questions.

Thank you,
Andrea

Andrea L. Gomes
Associate

Hinckley Allen
20 Church Street
Hartford, CT 06103-1221
p: 860-331-2603 | f: 860-278-3802
agomes@hinckleyallen.com

RECEIVED
SEP 22 2005
WENGELL, McDONNELL & COSTELLO
CONSULTING ENGINEERS

PLANNING & ZONING COMMISSION
TOWN OF EAST HADDAM
LAND USE OFFICE
(860) 873-5031
HOURS: Mon., Wed., & Thurs. 9AM-4PM / Tues. 9AM-7PM / Fri. 9AM-12 NOON

Date: September 14, 2005

To: Banner Lodge Enterprises, LLC
P.O. Box 26
New Rochelle, NY 10802

Re: Banner Lodge Enterprises, 1 Banner Road, Special Exception Review for a Floating Zone Application for a Planned Recreational Development for thirty-three units (Phase I) on 403.577 acres.

The East Haddam Planning and Zoning Commission at their regular meeting of September 13, 2005 approved your Special Exception Application for a Floating Zone Application for a Planned Recreational Development for thirty-three units. The Commission through two public hearing heard and reviewed considerable information. A list of information submitted is listed in Appendix I. This approval was granted with the following conditions:

1. The conditions of the August 3, 2005 Inland Wetlands and Watercourses Commission shall also be condition this Special Exception.

2. The area next to the driving range on the east side shall be landscaped to protect the adjacent properties. This landscaping plan shall be brought to the Land Use Administrator for review and approval prior to the endorsement of the final mylars, and shall depicted thereon.

3. The conditions of the "Declaration of Covenants and Restrictions Regarding Sewerage Systems" shall be met. Specifically, prior to the endorsement and filing of the mylars, a Permanent Fund in the initial amount of Fourteen Thousand Dollars ($14,000) shall be created.

4. At the time of mylar filing the Amended and Restated Declaration of Banner Village Condominium and New Banner Village Association, Inc Bylaws and presented amendments shall be filed in the East Haddam Land Records.

5. The Land Use Administrator shall specify as to which maps are to be filed as mylars in the East Haddam Land Records.

The applicant has represented to the Commission that additional applications or phases may be applied for in the future. Phase II may include reactivation of the remaining fifty-three units previously approved in 1988 and a new clubhouse. Phase III may include further development of the properties presently undeveloped to the south and west. The Commission has heard testimony concerning the overall site with which it would typically deal in the context of a Special Exception Application. However, because future phases may influence the overall site development, the Commission is prepared to defer consideration of these issues at this time. Therefore, this Phase I approval is conditioned on the understanding that submission of substantial additional information will be required for the Commission to review these future Phases. The list provided below contains only a part of what will be required for review but is being noted at this time because they were obvious points of concern from the public's and Commission's perspective.

Traffic

The applicant's engineer, traffic engineers for the Banner Lodge Enterprises and the proposed new middle school, town engineer, Land Use Administrator, and Director of Public Works shall meet to discuss the overall impact of new traffic generated by these developments. The area of focus shall include Banner Road, North Moodus Road, Clark Gates Road, Andrews Road, Power House Road, and Cherry Swamp Road. The final report shall include discussion of suitability of the entire sections of the above mentioned roads and recommendation of possible needed improvements. The review shall also consider the traffic generation impacts on the intersections of North Moodus Road and Falls Road (Rte 149), Andrews Road and Falls Road (Rte 149), and Power House Road and Leesville Road (Rte 151).

Emergency Access

The applicant's engineer and traffic engineer shall meet with the Land Use Administrator, the Director of Public Works, the East Haddam Fire Chief, East Haddam Ambulance Association, and the East Haddam Fire Marshall to discuss the need for emergency access, emergency water supply for fire suppression, and any other potential emergency service related issues. The findings of these meetings shall be part of any future plans.

Water Supply

The property presently has approval from the Department of Public Utilities for eighty-six units. Any variation or change of use will require review and approval from the water provider, presently Birmingham Utilities, the Department of Public Utilities, and possibly the Department of Environmental Protection. <u>All</u> reports, tests, and studies required by these groups and agencies shall be made part of the public record for any future submission.

Electrical Supply

The applicant's engineer and the engineers for the proposed new middle school engineers should discuss together with Connecticut Light and Power Company about the adequacy of the existing lines in relation to any proposed plans.

Septic Capacity

The septic system for this property is permitted by the Department of Environmental Protection. The East Haddam Water Pollution Control Authority has over sight of the facility to insure that the operation and maintenance continues. Improvements which would increase the flow from what is being discharged from the approved thirty-three units shall require the review of the Department of Environmental Protection and the East Haddam Water Pollution Control Authority. All reports, tests, and studies required by these groups and agencies shall be made a part of the public record for any future submission.

Buffering from Adjacent Neighboring Properties

The next submittals shall show existing residential structures and existing vegetative buffers. Planting plans shall be submitted for those areas that do not meet the requirements for buffing as prescribed in the Zoning Regulations.

Overall Development Plans

The Commission understands that additional work (such as determination of suitable soils for septic, identifying buildable areas, water quantity investigation,) and market driven factors may determine if there is ever a Phase III development. The Commission is concerned that the Phase II proposal may preclude certain options for Phase III proposal. The applicant is placed on notice that the failure of the applicant to recognize what is needed in the Phase III will not be accepted as a justification for development in Phase II that does not meet the standards of the East Haddam Zoning Regulations. Many times in the past, applications have not properly planned out utility access, road areas that provide better grades or less wetland impacts, adequate drainage areas, emergency facilities and access, and suitable areas for expansion. It would be a benefit to the applicant to have a plan that details the overall development plan at the next round of submissions. The regulatory boards have no obligation to approve future applications that have been made inferior due to the lack long range planning on part of the applicant. The ability to provide buildout analysis can only assist in determining what is needed in the above referenced sections.

The application was approved in accordance with Section 14A - Site Plan Review, Section 14B - Special Exception Review, and Section 17.5 Floating Zone - Planned Recreational Development of the East Haddam Zoning Regulations. This approval letter is to be printed on the final mylar and filed in the East Haddam Land Records with the Town Clerks Office within ninety (90) days of this approval. Two paper copies of the final plan shall be submitted to the Zoning Department for our files.

Sincerely,

Harvey Thomas
Chairman, East Haddam Planning and Zoning Commission

Cc: WMC Consulting Engineers / Alan Wengell
Ackerly & Ward / William Ward
Hendren Design Associates / Gary Hendren
East Haddam Board of Selectmen / Bradley Parker
East Haddam Director of Public Works / Fred Thumm
East Haddam School Building Committee / Todd Moss - Chairman
East Haddam Fire Chief / Donald Angersola
East Haddam Fire Marshal / Scott Brooks
Land Tech Consultants Inc. / Michael Bartos

APPENDIX I

Public Hearings

July 12, 2005 and August 9, 2005

Information Received

1. Application For Site Plan Review Section 14A, Special Exception Review Section 14B, and Floating Zone Application - Section 17.5 Special Requirement for Planned Recreational Development - Resort Zones PRD-R - Phase I

2. List of properties within 100 feet of the proposed property under application.

3. Notification form and return receipts of notification.

4. Cover letter from WMC - Banner Country Club application dated June 1, 2005

5. Storm Drainage Analysis of Banner Country Club Sections 'A' & 'B', May 2005 prepared by WMC Consulting Engineers.

6. Letter from WMC Consulting Engineers dated July 21, 2005 - Response to Attorney Branse letter dated July 7, 2005.

7. Letter from WMC Consulting Engineers dated August 8, 2005 - Section 'A' Roadway Relocation.

8. Drainage Report dated August 8, 2005 - Banner Lodge Drainage System including proposed relocated road.

9. Amended and Restated Declaration of Banner Village Condominium, East Haddam, Connecticut. July 26, 2005

10. New Banner Village Association, Inc. - Bylaws - July 26, 2005

11. Amendment of Bylaws of New Banner Village Association, Inc. - July 26, 2005

12. Five maps of Banner properties presented at the field walk held in July.

13. Letter from the Department of Public Utility Control dated June 21, 1988 - interim approval.

14. Letter from the Department of Public Utility Control dated June 23, 1988 - interim approval for Phases A, B, C

15. Letter from the Department of Public Utility Control dated July 20, 1988 Review letter for final approval.

16. Letter from the Department of Public Utility Control dated July 25, 2005 Certificate of Public Convenience and Necessity for Phases A, B, & C.

17. Letter from the Department of Public Utility Control dated August 8, 1988 Certificate of Public Convenience and Necessity for Phase D.

18. Letter from Birmingham Utilities, Inc. dated August 9, 2005 - Approval and well capacity is in place for 86 units.

19. Department of Environmental Protection permit to discharge a maximum flow of 11,775 gallons per day for Banner Estates, LLC. dated April 28, 2004.

20. Department of Environmental Protection "Permit to Transfer Application" Banner Estates LLC to New Banner Village Condominium Association, Inc.

21. WMC Consulting Engineers "2005 Evaluation Report Banner Country Club Sewerage System" May 31, 2005

22. WMC Consulting Engineers "Annual Report on the Sewage Disposal System Serving Banner Country Club" June 1, 2005

23. Declaration of Covenants and Restrictions Regarding a Community Sewerage System. Banner Village. On file under Volume 647, Page 123 in the East Haddam Land Records, date February 6, 2004.

24. Bubaris Traffic Associates, "Site Traffic Assessment, Proposed Banner Estates" May 31, 2005

25. Site Plan prepared by WMC Consulting Engineers entitled "Section 'A' Roadway Relocation - Site Grading and Utility Plan - Banner Road, East Haddam" dated July 7, 2005.

26. Site Plan prepared by WMC Consulting Engineers entitled "Section 'A' Roadway Relocation - Site Grading and Utility Plan - Banner Road, East Haddam" dated July 20, 2005 with a last revision date of August 8, 2005.

27. Site Plan prepared by WMC Consulting Engineers entitled "Banner Country Club Phase I (Previously Sections 'A' & 'B') - As - Built Plan dated May 23, 2005.

28. Perimeter Survey of Banner Estates, Cherry Swamp Road & Banner Road, East Haddam, Ct., 3 Sheets date May 11, 2005 prepared by Merlyn J. Jenkins & Associates, Inc.

29. Architectural Drawing and Floor Plans "Banner Country Club, East Haddam, Ct Section A and Section B Prepared by Hendren Design Associates, with a last revision date of May 11, 2005.

30. Review letter from the East Haddam Inland Wetlands and Watercourses Commission dated August 3, 2005.

31. Review letter from Branse & Willis, LLC dated July 7, 2005 "items needed for evaluation".

32. Review letter from Branse & Willis, LLC dated August 9, 2005 " Declaration of Covenants and Restrictions Regarding a Community Sewerage System and Certificate of Community Wells"' submission is satisfactory.

33. Review letter to Land-Tech Consultants, Inc. dated June 27, 2005 review of traffic report.

34. Review letter to Land-Tech Consultants, Inc. dated June 27, 2005 review of drainage.

35. Review letter to Land-Tech Consultants, Inc. dated August 4, 2005 review of roadway relocation.

36. Review letter to Land-Tech Consultants, Inc. dated August 23, 2005 review revised drainage and North Moodus Road site line.

37. Letter from Christopher & Ellen Behilo dated May 23, 2005.

MATCH LINE THIS SHEET

SECTION "C" BUILDINGS

MATCH LINE THIS SHEET

MATCH LINE THIS SHEET

PHASE 1 LIMIT LINE

PHASE 1

PHASE 1 PARKING
85 SPACES

PHASE 1 LIMIT LINE

POOL

PUMP HOUSE

FUNCTION HALL
F.F. 351.94

CONCRETE

DECK

CONSTRUCTION AREA

CONCRETE WALK

BIT

MAGNETIC

1) THIS MAP PRESENTS THE RESULTS OF RECORD DATA OBTAINED FROM THE FOLLOWING SOURCES:

A) MAP ENTITLED "PROPOSED SANITARY SYSTEM, BANNER VILLAGE CONDOMINIUMS, SECTIONS A,B & C, MOODUS, CONN., SCALE 1"=40', 11 / 30 /88, RADCLIFF ENGINEERING CO., CONSULTING ENGINEERS & SURVEYORS, ESSEX INDUSTRIAL PARK, CENTERBROOK, CONN.".

B) MAP ENTITLED "AS BUILT SUBSURFACE SEWAGE DISPOSAL SYSTEM, SECTIONS A & B, BANNER VILLAGE CONDOMINIUM, MOODUS–EAST HADDAM, CONNECTICUT, MAY 30, 1989, SCALE 1"=40', ARTHUR E. BARDEN, PROFESSION LAND SURVEYOR, SUITE #115–327 EAST MAIN STREET, CLINTON, CONNECTICUT 06413".

C) MAP ENTITLED "MAP SHOWING AS BUILT UNIT LOCATIONS FOR BANNER VILLAGE CONDOMINIUMS, SECTIONS A & B, MOODUS, CONNECTICUT, PREPARED FOR WILLIAMS ASSOCIATES IV, APRIL 1, 1988, SCALE 1"=40', ARTHUR E. BARDEN, PROFESSION LAND SURVEYOR, SUITE #115–327 EAST MAIN STREET, CLINTON, CONNECTICUT 06413".

D) FIELD VERIFICATION SURVEY BY WILLIAM B. HEARN L.S, L.S. NO. 18,857 IN APRIL, 2005.

2) THIS MAP WAS PREPARED FOR BANNER LODGE ENTERPRISES TO BE USED IN MATTERS THAT RELATE TO THE EXISTING CONDITIONS AS SHOWN. USE OF THIS MAP FOR OTHER PURPOSES OR BY OTHER PARTIES IS NOT AUTHORIZED OR VALID.

TO THE BEST OF MY KNOWLEDGE AND BELIEF, THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON.

ALAN R. WENGELL, P.E. _____ DATE: _____

APPROVED BY THE EAST HADDAM PLANNING AND ZONING COMMISSION/ZONING BOARD OF APPEALS.

_____ _____

CHAIRMAN/SECRETARY DATE:

NO.	DATE	DESCRIPTION

REVISIONS

SUPV.	A.R.W.
DESIGN	V.F.
DRAWN	V.F.
CHECKED	A.R.W.
DATE	05/23/05

SCALE
1' = 40'

WMC CONSULTING ENGINEERS
• WENGELL, McDONNELL & COSTELLO •
87 HOLMES ROAD
NEWINGTON, CT 06111
(860) 667–9624

PREPARED FOR
BANNER LODGE ENTERPRISES
P.O. BOX 157
NEW ROCHELLE, NY 10802

BANNER COUNTRY CLUB
PHASE I (PREVIOUSLY SECTIONS "A" & "B")
AS–BUILT PLAN

SIZE	PROJECT	FILE NAME	NUMBER	REV.	SHEET	1
D	–BANNER COUNTRY CLUB–	AS–BUILT	99101.10	–	OF	1

PLANNING & ZONING COMMISSION
TOWN OF EAST HADDAM
LAND USE OFFICE
(860) 873-5031
HOURS: Mon., Wed., & Thurs. 9AM-4PM / Tues. 9AM-7PM / Fri. 9AM-12 NOON

Date: December 12, 2006

To: Banner Lodge Enterprises, LLC
P.O. Box 26
New Rochelle, NY 10802

Re: Banner Lodge Enterprises, 1 Banner Road, Special Exception Review for a Phase II Floating Zone Application for a Planned Recreational Development for an additional fifty-three (53) units on 403.577 acres.

The East Haddam Planning and Zoning Commission at their regular meeting of December 12, 2006 approved your Special Exception Application for a Phase II Floating Zone Application for a Planned Recreational Development for an additional fifty-three (53) units. The Commission, through three public hearing heard and reviewed considerable information. A list of information submitted is listed in Appendix I & II. This approval was granted with the following conditions:

1. The conditions of the November 21, 2006 Inland Wetlands and Watercourses Commission shall also be part of this Special Exception approval.

2. The public improvements (signage and stop bar) depicted in a survey of Banner Road and North Moodus Road, WMC Consulting Engineers, dated 11/28/06 shall be installed by May 1, 2007.

3. The applicant shall contact Public Works Department and the Land Use Office to see that signage required on North Moodus Road for the increased traffic associated with this project and the school is installed by May 1, 2007.

4. The Land Use Administrator shall specify as to which maps are to be filed as mylars in the East Haddam Land Records.

The applicant has represented to the Commission that additional applications or phases may be applied for in the future. Phase III may include further development of the properties presently undeveloped to the south and west. The Commission has heard testimony concerning the overall site with which it would typically deal in the context of a Special Exception Application. The Commission has been urged by members of the public to address limitations or restrictions on those future intentions and plans, but the Commission cannot make a decision on applications that have not yet been filed. Approval of this pending application is not to be construed as any indication of how the Commission would view future applications, even ones that conform to the conceptual

future plans presented in this current application. In evaluating every application, the Commission evaluates the overall, cumulative impacts of the proposal before it and has the option to require traffic reports and other impact studies that address those cumulative impacts, including impact on the surrounding road system, points of access, and levels of service (LOS). Those same criteria would be applied to a future application for this property and the Commission would expect that the issues raised in this proceeding would be addressed in that future application. The fact that additional development is possible on a parcel of land does not require that the Commission approve such additional development if the criteria of its regulations are not met.

The application was approved in accordance with Section 14A - Site Plan Review, Section 14B - Special Exception Review, and Section 17.5 Floating Zone - Planned Recreational Development of the East Haddam Zoning Regulations. This approval letter is to be printed on the final mylar and filed in the East Haddam Land Records with the Town Clerks Office within ninety (90) days of this approval. Two paper copies of the final plan shall be submitted to the Zoning Department for our files.

Sincerely,

Harvey Thomas
Chairman, East Haddam Planning and Zoning Commission

Cc: WMC Consulting Engineers / Alan Wengell
Ackerly & Ward / William Ward
Hendren Design Associates / Gary Hendren
East Haddam Board of Selectmen / Bradley Parker
East Haddam Director of Public Works / Fred Thumm
East Haddam School Building Committee / Todd Moss - Chairman
East Haddam Fire Chief / Donald Angersola
East Haddam Fire Marshal / Scott Brooks

APPENDIX I
PHASE I APPLICATION
Public Hearings

July 12, 2005 and August 9, 2005

Information Received

1. Application For Site Plan Review Section 14A, Special Exception Review Section 14B, and Floating Zone Application - Section 17.5 Special Requirement for Planned Recreational Development - Resort Zones PRD-R - Phase I

2. List of properties within 100 feet of the proposed property under application.

3. Notification form and return receipts of notification.

4. Cover letter from WMC - Banner Country Club application dated June 1, 2005

5. Storm Drainage Analysis of Banner Country Club Sections 'A' & 'B', May 2005 prepared by WMC Consulting Engineers.

6. Letter from WMC Consulting Engineers dated July 21, 2005 - Response to Attorney Branse letter dated July 7, 2005.

7. Letter from WMC Consulting Engineers dated August 8, 2005 - Section 'A' Roadway Relocation.

8. Drainage Report dated August 8, 2005 - Banner Lodge Drainage System including proposed relocated road.

9. Amended and Restated Declaration of Banner Village Condominium, East Haddam, Connecticut. July 26, 2005

10. New Banner Village Association, Inc. - Bylaws - July 26, 2005

11. Amendment of Bylaws of New Banner Village Association, Inc. - July 26, 2005

12. Five maps of Banner properties presented at the field walk held in July.

13. Letter from the Department of Public Utility Control dated June 21, 1988 - interim approval.

14. Letter from the Department of Public Utility Control dated June 23, 1988 - interim approval for Phases A, B, C

15. Letter from the Department of Public Utility Control dated July 20, 1988 Review letter for final approval.

16. Letter from the Department of Public Utility Control dated July 25, 2005 Certificate of Public Convenience and Necessity for Phases A, B, & C.

17. Letter from the Department of Public Utility Control dated August 8, 1988 Certificate of Public Convenience and Necessity for Phase D.

18. Letter from Birmingham Utilities, Inc. dated August 9, 2005 - Approval and well capacity is in place for 86 units.

19. Department of Environmental Protection permit to discharge a maximum flow of 11,775 gallons per day for Banner Estates, LLC. dated April 28, 2004.

20. Department of Environmental Protection "Permit to Transfer Application" Banner Estates LLC to New Banner Village Condominium Association, Inc.

21. WMC Consulting Engineers "2005 Evaluation Report Banner Country Club Sewerage System" May 31, 2005

22. WMC Consulting Engineers "Annual Report on the Sewage Disposal System Serving Banner Country Club" June 1, 2005

23. Declaration of Covenants and Restrictions Regarding a Community Sewerage System. Banner Village. On file under Volume 647, Page 123 in the East Haddam Land Records, date February 6, 2004.

24. Bubaris Traffic Associates, "Site Traffic Assessment, Proposed Banner Estates" May 31, 2005

25. Site Plan prepared by WMC Consulting Engineers entitled "Section 'A' Roadway Relocation - Site Grading and Utility Plan - Banner Road, East Haddam" dated July 7, 2005.

26. Site Plan prepared by WMC Consulting Engineers entitled "Section 'A' Roadway Relocation - Site Grading and Utility Plan - Banner Road, East Haddam" dated July 20, 2005 with a last revision date of August 8, 2005.

27. Site Plan prepared by WMC Consulting Engineers entitled "Banner Country Club Phase I (Previously Sections 'A' & 'B') - As - Built Plan dated May 23, 2005.

28. Perimeter Survey of Banner Estates, Cherry Swamp Road & Banner Road, East Haddam, Ct., 3 Sheets date May 11, 2005 prepared by Merlyn J. Jenkins & Associates, Inc.

29. Architectural Drawing and Floor Plans "Banner Country Club, East Haddam, Ct Section A and Section B Prepared by Hendren Design Associates, with a last revision date of May 11, 2005.

30. Review letter from the East Haddam Inland Wetlands and Watercourses Commission dated August 3, 2005.

31. Review letter from Branse & Willis, LLC dated July 7, 2005 "items needed for evaluation".

32. Review letter from Branse & Willis, LLC dated August 9, 2005 " Declaration of Covenants and Restrictions Regarding a Community Sewerage System and Certificate of Community Wells'" submission is satisfactory.

33. Review letter to Land-Tech Consultants, Inc. dated June 27, 2005 review of traffic report.

34. Review letter to Land-Tech Consultants, Inc. dated June 27, 2005 review of drainage.

35. Review letter to Land-Tech Consultants, Inc. dated August 4, 2005 review of roadway relocation.

36. Review letter to Land-Tech Consultants, Inc. dated August 23, 2005 review revised drainage and North Moodus Road site line.

37. Letter from Christopher & Ellen Behilo dated May 23, 2005.

Map of Section A – Erosion Control Plan	10/18/05
Wetlands Buffer revegetation Plan	10/26/06
Map with construction details	7/20/05
Reduced copy of Site Grading and Drainage Plan	3/15/06
Pond Edge Planting Plan Site Plan	10/6/05

3. Planning and Zoning approval letter, dated August 22, 2005

4. Meeting Minutes – Traffic Discussion – December 21, 2005

5. Letter – State of Connecticut DEP – June 7, 2005 – Section feasibility for Section D

6. Letter – State of Connecticut DEP – March 22, 2006 – design for discussion

7. Review letter – from Nathan L. Jacobson & Associates, Inc., dated August 22, 2006

8. Report from Bubaris Traffic Associates, dated August 18, 2006

9. Email from WMC Engineers dated October 6, 2006, Banner's WPCA response

10. Memorandum from Eric Knapp, Esq. To East Haddam IWWC, dated October 10, 2006. Re: Authority of wetlands agency to review items outside the scope of the permit sought

11. Letter from Penelope Sharp, Environmental Consultant, to James Ventres dated August 24, 2006. Re: field investigation, Banner Country Club, August 3, 2006.

12. Letter from REMA Ecological Services, LLC to WMC Consulting Engineers, dated August 29, 2006. Re: supplemental wetlands information.

13. Letter from REMA Ecological Services, LLC to Anthony Longhitano, dated September 22, 2006. Re: Response to comments by Penelope Sharp

14. Letter from REMA Ecological Services, LLC to Anthony Longhitano, dated September 28, 2006. Re: Pollutant Loading Computations: TSS

15. Letter from WMC Consulting Engineers to James Ventres dated September 26, 2006. Re: Banner Country Club and a request for extension

16. Review letter from Nathan L. Jacobson to James Ventres, dated August 22, 2006. Re: Banner Country Club – Phase II Development.

17. Report from Bubaris Traffic Associates to Alan Wengell, P.E., dated May 31, 2005. Re: Site Traffic Assessment

18. Report from Bubaris Traffic Associates to Alan Wengell, P.E., dated May 31, 2005. Re: Site Traffic Assessment

19. Report from Bubaris Traffic Associates to Alan Wengell, P.E., dated August 18, 2005.

20. Report from Bubaris Traffic Associates to Alan Wengell, P.E., dated September 26, 2006. Re: comment on the recommended improvements for the proposed East Haddam Middle School on Clark Gates Road as they may have a bearing on the subject Banner Estates.

21. Traffic Impact Study Grades 4-8 Middle School prepared for the School building Committee by BL Companies dated October 2005;revised February 2006.

22. Declaration of Covenants and Restrictions regarding a Community Sewerage System – Banner Village, dated February 6, 2004.

23. Letter to James Ventres from WMC Dated October 19, 2006, requesting a thirty-day extension.

24. Letter to James Ventres from WMC dated October 25, 2006, requesting an additional five-day extension for the Planning and Zoning Commission permit application.

25. Letter to James Ventres from the East Haddam Volunteer Fire Department dated October 3, 2006 re: requests to be added to the plan in order to provide proper fire protection.

26. Letter from the East Haddam Ambulance Association dated September 20, 2006 re: the Association's recommendations for the development of a second paved emergency access road, etc.

27. Letter to James Ventres from WMC dated October 17, 2006 re: Banner Country Club Estates Waste Sites Survey

28. Letter to Brian Curtis, P.E., from WMC dated October 17, 2006 re: Banner Country Club- Phase II Development Revisions of October 12, 2006

29. Letter to James Ventres from Nathan L. Jacobson & Associates, Inc. dated October 19, 2006, re: their review of Banner Country Club – Phase II Development

30. Letter to James Ventres from Nathan L. Jacobson & Associates, Inc. dated October 23, 2006 re: Banner Phase II Development

31. Letter to East Haddam Planning and Zoning Commission from P.R.I.M.E. dated October 10, 2006 re: Bubaris traffic study and the impact of future growth in the neighborhood.

32. Letter to Alan Wengell, P.E., from Bubaris Traffic Associates dated October 23, 2006 re: response to P.R.I.M.E's memo (see above).

33. Letter to James Ventres from Dr. Nicholas Bellantoni, Connecticut State Archaeologist dated October 24, 2006, recommending an archaeological reconnaissance survey for the proposed development.

34. Letter to Chairman Harvey Thomas from Karl Stofko, DDS, East Haddam Municipal Historian dated January 31, 2002 informing him of an important archaeological Native American site located on the Banner Estates property.

35. Letter to James Ventres from Penelope Sharp, Environmental Scientist dated October 24, 2006, re: her field investigation of the Banner Country Club property.

36. Email from Alan Wengell to James Ventres dated October 6, 2006, re: Banner WPCA response.

37. Return receipts, mailed August 3, 2006, notifying abutting property owners of the public hearing.

38. Emergency Access Photolog Waste Survey, photos dated September 1, 2006

39. Proposed site improvement plan, prepared by To Design, LLC, revised to June 28, 2006.

40. Email from Commission member, Wendy Goodfriend, questions and concerns regarding plans for improvements at Banner, email dated August 25, 2006.

41. Photos of dumping sites on Banner property dated September 28, 2006.

42. Review letter from Brian Curtis P.E., Nathan L. Jacobson & Associates dated November 7, 2006

43. Review letter from Penelope C. Sharp, Environmental Consultant, dated November 8, 2006

44. Review letter from Brian Curtis P.E., Nathan L. Jacobson & Associates dated November 9, 2006.

45. Survey of Banner Road and North Moodus Road, WMC Consulting Engineers, 11/28/06.

46. Operation and Maintenance Manual of the Banner Lodge Effluent Pump Station. F.J. Smith , November 2, 2006

47. Letter from N. Moodus Area Residents for "Prime" dated November 22, 2006.

APPROVED BY THE EAST HADDAM PLANNING AND ZONING COMMISSION
CHAIRMAN/SECRETARY_____ DATE: _____
EXPIRATION DATE: _____

Banner Road
Oakmont Lane
Bayliner Lane
Lake View Drive
Banner Lane
Country Club Lane
Peach Tree Road
Pinehurst Lane
Augusta Circle
50 FT RESIDENTIAL SETBACK
150' FT WELL RADIUS
100' REGULATED AREA

GRAPHIC SCALE
80 0 40 80 160 240
(IN FEET)
1 inch = 80 ft.

NOTES:
1) SEE LEGEND SHEET SG-4.

NO.	DATE	DESCRIPTION
1	08/16/06	Revise Roadway Names per Hendren Design
2	09/26/06	Revised per Curtis Comments of 08/22/06
3	10/12/06	Revised per Wetlands Commnents of 09/28/06
4	11/08/06	Revised per Curtis Comments of 11/08/06
5	01/25/07	Filing Documents
6	01/31/07	Construction Plans

REVISIONS

SUPV.	A.R.W.
DESIGN	R.E.B.
DRAWN	R.E.B.
CHECKED	J.A.C.
DATE	06/15/06

SCALE
1" = 80'

WMC CONSULTING ENGINEERS
• WENGELL, McDONNELL & COSTELLO •
87 HOLMES ROAD
NEWINGTON, CT 06111
(860) 667-9624

PREPARED FOR
BANNER LODGE ENTERPRISES
P.O. BOX 157
NEW ROCHELLE, NY 10802

SITE DEVELOPMENT PLAN
CORE AREA
BANNER COUNTRY CLUB PHASE II

SIZE	PROJECT	FILE NAME	NUMBER	REV.	SHEET OF
D -	BCC	- PHASE II -	99101.30	-	PD-1

East Haddam Planning and Zoning Commission

Town Office Building
7 Main Street, P.O. Box K
East Haddam, CT 06423
Office: 860-873-5031
Fax: 860-873-5042
Email: landuse@easthaddam.org

RECEIVED

JAN 30 2017

WENGELL, McDONNELL & COSTELLO
CONSULTING ENGINEERS

December 22, 2016

Banner Lodge Enterprises, LLC
PO Box 157
New Rochelle, NY 10802

Attn: Anthony Longhitano

Re: Banner Lodge Enterprises, Banner Road, Map 73, Lots 32, 41
Special Exception Review for 247 additional residential units under Sections 14B and Section 17 – Planned Recreational Development – Resort Zone PRD-R

Dear Mr. Longhitano,

The East Haddam Planning & Zoning Commission at a regular meeting on December 13, 2016 voted to approve, subject to conditions and modifications set forth below, your Planning and Zoning Special Exception Application in connection with your proposed Phase III project with the latest plans and documents as listed in Appendix I. The Commission has reviewed all of the information submitted, information provided at the public hearings, and information through staff review. The information provided is listed as an appendix to this approval letter. All information presented in print and verbally in the public hearing process is an integral part of this application. Based on substantial evidence in the record, the Commission made the following findings;

The application has been approved subject to the following conditions and modifications:

1. **East Haddam Inland Wetlands and Watercourse Approval:** The conditions for the East Haddam Inland Wetlands and Watercourses Commission's approval granted August 21, 2016 are part of this approval.

2. **Water Supply and Water Diversion Permits:** The proposed potable water supply is considered a public community water system exceeding 50,000 gallons per day when fully built out and is reviewed and regulated by the State Department of Public Health

and the Connecticut Department of Energy and Environmental Protection (CT DEEP). Detailed information on the water supply system has not been included with the application. Complete information on potential impacts on inland wetlands that may be caused by water supply withdrawals and irrigation supply withdrawals has not been included in the application materials. The applicant has represented that there will be no adverse impacts to the wetlands or watercourses. Detailed information will have to be provided to the State Department of Health and the CT DEEP. All information submitted to these agencies shall also be submitted to the Land Use Office concurrently. All responses from the CT DEEP shall also be forwarded to the Land Use Office. If it is determined by these agencies that potential adverse impacts to the wetlands or watercourses are possible with the implementation of the water system, the application shall be returned to the East Haddam Inland Wetlands and Watercourses Commission as a new application. If the testing determines that the overall yield will permit fewer units then what was approved, the owner shall re-submit an application to modify the Planning and Zoning approval.

3. **Septic:** The Residential units are proposed to be constructed on land currently utilized by a 17,500 gallons per day subsurface sewage disposal facility that serves the existing residential units, clubhouse, etc. Construction of additional Phase III housing units in this area necessitates construction of an entirely new wastewater collection, treatment, and disposal facility. The current and proposed sewerage system is regulated by the Connecticut Department of Energy and Environmental Protection (CT DEEP) because wastewater flows exceed 5,000 gallons per day and community sewerage facilities are utilized (more than one residential structure connected to a common system). The current 86 approved residential units coupled with 247 new residential units and ancillary facilities will result in wastewater design flows on the order of 80,000 gallons per day. The treated wastewater effluent must be discharged to the groundwater on this particular site given the surrounding surface water and groundwater classification established by the CT DEEP. This is a large volume of wastewater in terms of subsurface effluent disposal. This magnitude of flow will require specialized natural soil deposits to accept the wastewater from a hydrogeological standpoint, as well as an effluent renovation standpoint. The proposal designates existing golf fairways No. 13 and 14 for a drip irrigation effluent disposal system. Very little detail on the wastewater collection, treatment, and disposal facilities had been included with the application. The applicant has represented that there will be no adverse impacts to the wetlands or watercourses. This information will have to be provided to the CT DEEP. All information submitted to the CT DEEP agency shall also be submitted to the Land Use Office concurrently. All responses from the CT DEEP shall also be forwarded to the Land Use Office. If it is determined that potential adverse impacts to the wetlands or watercourses are possible with the implementation of the septic system, the application shall be returned to the East Haddam Inland Wetlands and Watercourse Commission as a new application. If the testing determines that the overall yield will permit fewer units then what was approved, the owner shall re-submit an application to modify the Planning and Zoning approval.

4. **Traffic – Major Traffic Generator – 100 units or more**

   A Connecticut Department of Transportation Certificate of Operation shall be granted prior to exceeding the requirements of Section 14-312—1 of the Office of the State Traffic Administration regulations as amended. All material submitted to Connecticut Department of Transportation shall also be submitted to the Land Use Office concurrently.

5. **Stormwater Management**

   a. The applicant shall provide a single Operation and Maintenance Manual that incorporates the information of the application and conditions of all local, state, federal permits, and any other important factors to install, operate, and maintain the road, private driveways, stormwater infiltration systems, catch basins, rain garden, dry water quality swale, buffer plants, detention basins, and bio retention basins prior to the start of construction. This Operation and Maintenance Manual shall be reviewed by the Commission staff for completeness prior to the start of construction. This O&M Manual shall include a management plan that incorporates the Best Management Practices.

   b. The stormwater treatment system, which include storm drains, catch basins, vortechnic units, detention basins, water quality swales, and bioretention basins, shall be maintained per the consultants and manufacturers recommendations. This includes the plantings in the bioretention basins. An inspection and maintenance report, prepared by a qualified professional acceptable to the Land Use Office, shall be submitted annually to the Land Use Office in October for each facility installed. All maintenance work and repairs recommended in the maintenance report shall be completed in a timely manner as weather permits. An inspection and maintenance plan shall be part of the association's Common Interest Ownership documents and the association shall be required to continue the required inspections and maintenance. This amendment to the associations Common Interest Ownership documents shall be reviewed and approved by the Land Use Office prior to the mylar filing.

   c. The applicant shall file a "Stormwater Treatment Facility Maintenance Declaration" that creates obligations to protect and maintain the stormwater facilities. The declaration shall reference the Operation and Maintenance Manual schedule specific to this application for each stormwater facility. This declaration shall be reviewed and approved by the Land Use Office and filed at the time of the mylar filing. (See Appendix D of the East Haddam Subdivision Regulations for a sample declaration.)

d. The applicant shall develop, for the Inland Wetlands Officer's review, a cost estimate for the inspection and maintenance of all stormwater treatment systems. The estimate should include the expected cost for the next five years of operation including repair and replanting of the bioretention basins and swales. The estimated cost shall be part of a bond to be held by the Land Use Office for five years after the completion of the Cherry Swamp access road, associated residential housing development, and stormwater facilities. If the bond is used by the Town, the bond amount used shall be replaced by the owner within thirty days. The bond shall be in place prior to commencement of construction. The applicant submitted a 2016 estimate of $217,565. The Commission acknowledges the construction process may take up to ten years or more. The bonding shall be for the phases under active construction and for a period of five years after completion of each section.

e. After the completion of each stormwater facility, the engineer shall provide a Class T-2 improvement location survey by a licensed surveyor of the facilities constructed and certify that they were built per the plans submitted.

6. Fire Protection

Prior to the installation of each fire protection water tank, the applicant shall contact the East Haddam Fire Chief to review equipment compatibility of the fire protection tanks and the Town's equipment. Each water tank shall pass leak testing following installation.

7. Conservation Easement

A Conservation Easement in the standard Town form documentation shall be filed at the time of the mylar filing. The designated open space is identified on sheet OS-1 dated 09/06/16. The interior boundaries (metes and bounds) will need to be firmly established by the surveyor prior to creating the conservation easement. As discussed in the public hearing, the easement will allow for the creation of a small parking area along Cherry Swamp Road for public access and to allow the East Haddam Conservation Commission to create recreational trails within the open space area. Please note that Conservation Easements need approval through the Town Meeting process prior to filing in the Town Records. Prior to the start of construction, the owner shall mark the boundaries of the Conservation Easement Area with iron pins which protrude from ground surface not more than one inch and such pins shall not contain sharp edges. These pins are to be located at each change of boundary direction and at every 100-foot interval on straight-aways.

8. General Construction:

a. The Project Engineer – ie Professional licensed engineer, architect, environmental scientist, and contractors ("The Project Team") shall be listed with the Town prior to the start of construction, and continually updated until construction is complete. The list shall include the name, work phone number, cell phone number and home phone number of each individual involved on the Project Team so contact can be made at any time in case of emergencies. This Project Team shall make weekly inspections, recommend additional Erosion and Sediment Control measures, and file weekly reports to the Town. After every 1 inch or greater of rainfall within a twenty-four hour period the site will be inspected and assessed by the Project Engineer. Erosion and Sediment Control failures which compromise the wetlands and watercourses shall be reported by the Project Engineer to the Inland Wetlands Enforcement Officer (IWEO) immediately.

b. The wetland flagging shall be re-established in the field prior to the installation of erosion control measures.

c. The limits of clearing of vegetation, as shown on the plans, shall be marked prior to initiating any vegetation clearing.

d. The erosion control measure as proposed, as shown on the plans, shall be installed before any stump and earth removal occurs. No stumping or heavy machinery is to go into or through the wetlands in the fly over areas.

e. The wetland flagging, the erosion control fencing and the limits of tree clearing shall be inspected by the East Haddam Inland Wetlands Enforcement Officer as part of a pre-construction meeting, and no construction shall commence until the IWEO issues written authorization that the above listed is in compliance.

f. The use of wood chips for erosion control may occur with approval of the East Haddam Inland Wetlands Enforcement Officer on a site-by-site basis.

g. All synthetic means of erosion control measures are to be removed once the site is stabilized to the satisfaction of the East Haddam Inland Wetlands Enforcement Officer.

h. Any non-organic debris (e.g., trash, building materials, metals, plastics, etc.) in and around ponds, wetlands, and upland review areas shall be removed.

i. Tree and brush removal shall not occur during the wildlife breeding season, approximately mid-March through mid-July.

9. Plantings and Invasive Species

a. A monitoring report for all plantings and any corrective actions on evasive species shall be submitted in October of each year for a period of five years after each planting.

b. Invasive Species – A minimum of 2 inspections per year, over a five year period from completion of construction, shall be conducted on all disturbed areas. Invasive species found, as identified by the Connecticut Invasive Species list, are to be removed as soon as possible with approved methods.

c. A bond shall be in place prior to commencement of construction to cover twenty percent (20%) of the cost of the proposed plantings including stormwater management systems/bioretention areas. The bond shall remain in place for five (5) years from the finish of construction on this project. A January 22, 2016 estimate provided by WMC was $13,500 for the 20% required. Bonding estimates shall be evaluated every five years.

10. Erosion Control

a. A bond shall be in place, prior to commencement of construction, to cover twenty percent (20%) of the cost of the proposed erosion control measures. The bond shall remain in place for one year from the completion of construction on the project. A January 22, 2016 estimate provided by Nathan L. Jacobsen & Associates was $64,420 for the 20% required. Due to the length of the project, the Commission agreed that the 20% required should be for the phases that are open and not the entire project.

11. Additional Conditions

a. The proposal was broken down into eleven phases (sheet OS-1). Residential construction is proposed in ten phases.
   3.B - 15 buildings – 36 residential units – Banner Lane
   3.C - 8 buildings – 24 residential units – Sand Hill Lane
   3.D – 10 buildings – 20 residential units – Oakmont Circle
   3.E – 6 buildings – 16 residential units – Spyglass Hill Road and Farmneck Lane
   3.F – 10 buildings– 28 residential units – Quail Hollow Lane
   3.G – 16 buildings – 55 residential units – Spyglass Hill Road, Banner Road
   3.H – 4 buildings – 12 residential units – Hunter Court
   3.I – 8 buildings – 24 residential units – Duckwoods Court
   3.J – 6 buildings – 24 residential units – Mirror Pond Road
   3.K – 18 buildings – 40 residential units – Eagle Ridge Road

   At no time shall more than two residential phases be open to residential unit construction unless the following is completed to the satisfaction of the Commission

and/or Zoning Enforcement Officer and / or the Town Engineer on the oldest phase that is open:

1. eighty (80) percent of the units have received certificate of occupancy,
2. the final course of the roadway for the area has been installed,
3. the lighting and sidewalks have been installed,
4. the plantings are completed around the finished buildings and streets,
5. all Class A-2/T-2 improvement location surveys for the buildings, streets, sewer, water, power, and detention / stormwater facilities for the phase has been submitted.

Once the conditions stated above are completed, building permits for the next phase can be issued.

b. Produce a Class A-2/T-2 improvement location survey of the golf course after construction to demonstrate that the conditions of the Inland Wetlands permit have been followed. Three copies shall be submitted to the Commission. The as-built shall incorporate the following: Watercourses, Wetland Soils, Wetland Areas to be cut (label the heights of maintenance cutting), Limits of Clearing, Edge of Woodland, Rough Grass Area, Fairways, Greens, Tees, underground utilities, golf cart access paths, vernal pools and the roads.

c. At the time of construction, the work proposed on Banner Road will require review of the East Haddam Public Works Department and a road construction permit is approved by the Department of Public Works.

d. Sheet LL-9 shows a vegetative barrier using existing vegetation and plantings between Spyglass Road and the properties to the north from Station 28+00 to Station 34+00 which is the intersection of North Moodus Road. At the time of construction of Spyglass Road the existing vegetation shall be evaluated with the Land Use Office to determine if it provides a sufficient buffer to the properties to the north. Additional plantings or barrier fencing may be needed. Final determination will be made by the Land Use Administrator.

e. Any fees incurred by the Town for outside consulting review of the construction process will be reimbursed by the owner prior to the filing of the mylar.

f. The application was approved in accordance with Section 14A - Site Plan Review, Section 14B - Special Exception Review, and Section 17.5 Floating Zone - Planned Recreational Development of the East Haddam Zoning Regulations. This approval letter and the approval letter of the East Haddam Inland Wetlands and Watercourses Commission are to be printed on the final mylar and filed in the East Haddam Land Records with the Town Clerks Office within ninety (90) days of this approval. Two paper copies of the final plan and an electronic PDF copy shall be submitted to the Zoning Department for our files. At the time of mylar filing, the

following shall also be presented for filing; An approved Conservation Easement and finalized map of the easement area, documents that an inspection and maintenance plan is part of the association's Common Interest Ownership language, and a "Stormwater Treatment Facility Maintenance Declaration" that creates obligations to protect and maintain the stormwater facilities.

Sincerely,

Crary H. Brownell Jr

Crary Brownell, Chairman - East Haddam Planning and Zoning Commission

Cc: Town Clerk
WMC Consulting Engineers / Steven McDonnell P.E.
Connecticut Water
Nathan L. Jacobsen and Associates / Brian Curtis P.E.
East Haddam Board Selectmen
East Haddam Water Pollution Control / Andrew Lord - Chairman
East Haddam Inland Wetlands and Watercourses Commission / Randolph Dill - Chairman
Chatham Health District / Elizabeth Davidson
East Haddam Fire Marshal / Donald Angersola
East Haddam Fire Chief / Brian Auld
CT Department of Health / Lori Mathieu / Public Health Drinking Water Section Chief
DEEP – Inland Water Resources Division / Cheryl Chase – Director Inland Water Resources Division
DEEP – Water Permitting and Enforcement Division / Antoanela Daha - Sanitary Engineer

Appendix I - Materials submitted

Application & Cover Letters – Banner Realty Development dated September 16, 2015 and September 8, 2016

Plans submitted by WMC Consulting Engineers for Banner Country Club – Phase III

Description	Sheet	Date	Revised
Cover Sheet		9/15/15	9/6/2016
Index Pan	1-1	1/22/16	9/6/2016
Construction Phasing and Dedicated Open Space	OS-1	1/22/16	9/6/2016
Existing Condition Core Area	EC-1	1/22/16	9/6/2016
Layout & Landscaping Plan	LL 1-9	1/22/16	11/08/2016
Site grading, Drainage and Utility Plan	SG 1-10	1/22/16	9/6/2016
	SG		10/10/2016
	SG- 4, 5, 6, 9		11/08/2016
Roadway Profiles	PR 1-13	1/22/16	9/6/2016
	PR 8, 11		10/11/2016
Erosion & Sediment Control Plans	ES 1-9	1/22/16	9/6/2016
Wastewater Disposal Plans	WD 1-5	1/22/16	9/6/2016
Site Planting Plans	SP 1-3	1/22/16	9/6/2016
Detention Basin Plans	DB 1-5	1/22/16	9/6/2016
Construction Details	CD 1-12	1/22/16	9/6/2016
Construction Details	CD 4	1/22/16	10/20/2016
Erosion Control Details	ED 1-4	1/22/16	9/6/2016

	Sheet	Date	Revised
Architectural Elevations	AE 1-12	1/22/16	9/6/2016

WMC – Response email 11/08/2016

WMC – Response letter 1/22/16

WMC - Response letter 7/17/16

WMC - Erosion Control Bond Estimate 1/22/16

WMC - Stormwater Treatment Insp. Bond Estimate 1/22/16

WMC - Plant Mitigation Bond Estimate 1/22/16

WMC - Stormwater Management – Operation and Maintenance Plan 2012

Design & Performance of Drip Dispersal Systems in Freezing Environments

CT DEEP Wastewater Discharge Permit Application

Oakson, Inc – Drip Dispersal for Low-Impact Development

Bubaris Traffic Associates Report Banner Estates Expansion 8/1/14

Bubaris Traffic Associates Report Response 11/23/15

Bubaris Traffic Associates Report Response 1/5/16

Bubaris Traffic Associates Report Response		9/26/16
Hydro Dynamics Engineering, LLC Banner Village pumping test		3/31/14
Hydro Dynamics Engineering, LLC Response to NLJ letter		1/26/16
Hydro Dynamics Engineering, LLC Dynamics of ground water		1/26/16
US Geological Service article	How Ground Water Occurs	1/26/16
Connecticut Water Company	Banner Village	6/2/11
Connecticut Water Company	Banner Village	7/12/13
Sample Conservation Easement in the Town form for Open Space		
Sample Stormwater Treatment Facility Maintenance Declaration from Appendix D		
E. H. Inland Wetlands and Watercourses Commission approval		8/22/12
Nathan L. Jacobsen & Associates – review email		10/21/2016
Nathan L. Jacobson & Associates review letter		10/20/2016
Nathan L. Jacobson & Associates review letter		10/10/2016
Nathan L. Jacobson & Associates review letter		1/11/15
Nathan L. Jacobson & Associates review letter		11/6/15
Nathan L. Jacobson & Associates review letter		5/14/12
Penelope C. Sharp review letter		5/10/12
Review comments from Richard Pettinelli and James Ventres		2015
E. H. Planning and Zoning approval letter for Phase I		9/14/05
E. H. Planning and Zoning approval letter for Phase II		12/12/06
Documents provided to the Commission from Ms. Riling		12 / 2015
Sections of the East Haddam Plan of Conservation and Development -		2008
Letter from Banner Residents		10/11/16
Report from East Haddam Fire Chief – Brian Auld		11/03/2016



GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300 ft.

NOTE: SHEET NUMBERS CORRESPOND WITH ALL ASSOCIATED LAYOUT, GRADING AND EROSION CONTROL SHEETS

NO.	DATE	DESCRIPTION
		REVISIONS

SUPV.	S.R.M.
DESIGN	R.E.B.
DRAWN	R.E.B.
CHECKED	S.R.M.
DATE	09/06/16

SCALE:
HORZ. 1" = 300'

WMC CONSULTING ENGINEERS

• WENGELL, McDONNELL & COSTELLO •
87 HOLMES ROAD
NEWINGTON, CT 06111
(860) 667-9624

PREPARED FOR
BANNER REALTY DEVELOPMENT L.L.C.
P.O. BOX 8214
WHITE PLAINS, NY 10602

INDEX PLAN
BANNER COUNTRY CLUB PHASE III

SIZE	PROJECT	FILE NAME	NUMBER	REV.	SHEET OF
D	BCC	PHASE III	07056.10		I-1



GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300 ft.

PHASE 3 CONSTRUCTION SEQUENCING / PHASING NOTES: (ALL DURATIONS APPROXIMATE)

3.A (MARCH 2017 – DECEMBER 2017)
1) INSTALL EROSION CONTROL MEASURES FROM PHASE II (CONSTRUCT BIORETENTION BASIN #2 AND TEMPORARY SEDIMENT TRAPS)
2) EXPAND BIORETENTION BASIN #1
3) ROUGH GRADE MIRROR POND ROAD TO STA. 110+00. INSTALL STORM DRAINAGE IN MIRROR POND ROAD TO STA. 110+00
4) CONSTRUCT TREATMENT PLANT
5) CONSTRUCT STORAGE TANK(S)
6) CONSTRUCT DRIP IRRIGATION SYSTEM ON HOLE 14
7) INSTALL FORCE MAIN TO STORAGE TANK
8) INSTALL WATER PUMP STATION FROM STORAGE TANK TO DRIP IRRIGATION SYSTEMS
*) PRIOR TO THE CONSTRUCTION OF BANNER LANE, PINEHURST LANE AND AUGUSTA CIRCLE SHALL BE PAVED WITH FINISHING COURSE 1-1/2" BITUMINOUS CONCRETE CLASS II

3.B (JANUARY 2018 – DECEMBER 2018)
9) INSTALL GRAVITY SANITARY SEWER BANNER ROAD TO TREATMENT PLANT AND SAND HILL LANE FROM COUNTRY CLUB LANE
10) INSTALL WATER SUPPLY LINE FROM WELL #4 TO PUMP HOUSE
(TO SERVE EXISTING RESIDENTIAL UNITS WHEN SWITCH OVER MADE TO NEW SEWAGE TREATMENT PLANT)
11) INSTALL WATER SUPPLY LINE FROM WELL #8 TO PUMP HOUSE
12) TREATMENT PLANT TESTING AND ONLINE
13) ABANDON EXISTING SUBSURFACE SEWAGE DISPOSAL SYSTEMS A, B AND C (CONNECT TO NEW MAIN)
14) CONSTRUCT DETENTION BASIN (POND310)
*15) CONSTRUCT BANNER LANE AND ALL ASSOCIATED UTILITIES
16) CONSTRUCT FUNCTION HALL PARKING LOTS AND INSTALL DRAINAGE SYSTEMS (STAGING AREA)
17) INSTALL BINDER COURSE AND CURBING MIRROR POND ROAD FROM STA. 110+00 TO STA. 119+75 (ALL WEATHER ACCESS TO SWTP)
18) CONSTRUCT UNITS 35 TO 48 AND C21 AND C22

3.C (JANUARY 2019 – DECEMBER 2019)
19) CONSTRUCT COUNTRY CLUB LANE DRAINAGE SYSTEM TO OUTFALL (ROUGH GRADE SAND HILL LANE)
20) CONSTRUCT SAND HILL LANE AND INSTALL ALL ASSOCIATED UTILITIES
21) CONSTRUCT UNITS 72 TO 79

3.D (JANUARY 2020 – DECEMBER 2020)
22) CONSTRUCT OAKMONT CIRCLE AND INSTALL ALL ASSOCIATED UTILITIES
23) CONSTRUCT UNITS 49 TO 58
24) CONSTRUCT UNDERGROUND DETENTION FACILITY (810)
25) CONSTRUCT DETENTION BASIN (POND610)

3.E (JUNE 2020 – DECEMBER 2021)
26) CLOSE FRONT 9 HOLES TO GOLF COURSE
27) CONSTRUCT SPYGLASS HILL ROAD AND INSTALL ALL ASSOCIATED UTILITIES
28) CONSTRUCT ROAD FARMNECK LANE AND INSTALL ALL ASSOCIATED UTILITIES
29) CONSTRUCT SANITARY PUMP STATION (PS10)
30) CONSTRUCT UNITS 1 TO 6
31) CONSTRUCT NEW GOLF HOLES 5, 6 AND 7

3.F (JANUARY 2022 – DECEMBER 2022)
32) CONSTRUCT QUAIL HOLLOW LANE
33) UNITS 60 TO 71

3.G (JANUARY 2023 – DECEMBER 2023)
34) CONSTRUCT UNITS 19 TO 22 ALONG SPY GLASS HILL ROAD
35) CONSTRUCT UNITS 23 TO 34 ALONG SPY GLASS HILL ROAD

3.H (JANUARY 2024 – DECEMBER 2024)
36) CONSTRUCT HUNTER COURT AND INSTALL ALL ASSOCIATED UTILITIES
37) CONSTRUCT UNITS 7 TO 10

3.I (JANUARY 2025 – DECEMBER 2025)
38) CONSTRUCT DUCKWOODS COURT AND INSTALL ALL ASSOCIATED UTILITIES
39) CONSTRUCT SANITARY PUMP STATION (PS20)
40) CONSTRUCT UNITS 11 TO 18

3.J (JANUARY 2026 – DECEMBER 2026)
41) CONSTRUCT DETENTION BASIN (POND110)
42) CONSTRUCT MIRROR POND ROAD FROM TREATMENT PLANT TO CHERRY SWAMP ROAD AND ALL UTILITIES
43) CONSTRUCT SANITARY PUMP STATION (PS30)
44) CONSTRUCT UNITS 80 TO 85

3.K (JANUARY 2027 – DECEMBER 2027)
45) INSTALL CLOSED DRAINAGE SYSTEM ALONG CHERRY SWAMP ROAD
46) CONSTRUCT EAGLE RIDGE ROAD AND INSTALL ALL ASSOCIATED UTILITIES
47) CONSTRUCT SANITARY PUMP STATION (PS40)
48) CONSTRUCT UNITS 87 TO 104

PHASING LEGEND

- PHASE 3A
- PHASE 3B
- PHASE 3C
- PHASE 3D
- PHASE 3E
- PHASE 3F
- PHASE 3G
- PHASE 3H
- PHASE 3I
- PHASE 3J
- PHASE 3K
- OPEN SPACE

NO.	DATE	DESCRIPTION

REVISIONS

SUPV.	S.R.M.
DESIGN	R.E.B.
DRAWN	R.E.B.
CHECKED	S.R.M.
DATE	09/06/16

SCALE:
HORZ. 1" = 300'

WMC CONSULTING ENGINEERS
• WENGELL, McDONNELL & COSTELLO •
87 HOLMES ROAD
NEWINGTON, CT 06111
(860) 667-9624

PREPARED FOR
BANNER REALTY DEVELOPMENT L.L.C.
P.O. BOX 8214
WHITE PLAINS, NY 10602

CONSTRUCTION PHASING & DESIGNATED OPEN SPACE PLAN BANNER COUNTRY CLUB PHASE III

SIZE	PROJECT	FILE NAME	NUMBER	REV.	SHEET OF
D –	BCC	– PHASE III –	07056.10 –		OS–1

Anthony Longhitano
The Lofts at Black Birch, LLC
c/o LDG Properties LLC
P.O. Box 8214
White Plains, NY 10602

June 16, 2021

Mr. Crary H. Brownell, Chair,
and Commission Members
Planning and Zoning Commission
Town of East Haddam
Town Hall, Land Use Office
1 Plains Road
Moodus, CT 06469

Mr. James F. Ventres, Land Use
Administrator / Zoning Enforcement
Officer
Town of East Haddam
Town Hall, Land Use Office
1 Plains Road
Moodus, CT 06469

Re: Application of The Lofts at Black Birch LLC for Site Plan Approval for 20 Rental Apartments in the former Community Center at 1 Banner Road, East Haddam, CT, "The Lofts at Black Birch"

Dear Chair Brownell, Commission Members, and Mr. Ventres:

The Lofts at Black Birch, LLC ("The Lofts") is the owner of real property located at 1 Banner Road (Map 73 / Lot 032) in East Haddam, Connecticut (the "Subject Property"). The Lofts is filing an application for site plan approval with the East Haddam Planning and Zoning Commission in connection with the proposed redevelopment of the former community center on the Subject Property into 20 one-bedroom apartments, in accordance with Connecticut General Statutes § 8-30g.

The law firm of Hinckley Allen is our legal counsel for this application. The Lofts hereby authorizes Hinckley Allen to execute any application forms or other documents in connection with these applications and to submit documentation pertaining to the application on its behalf. Attorneys Timothy Hollister and Andrea Gomes of Hinckley Allen will be the primary contacts on this matter.

Thank you for your consideration concerning this matter.

Very truly yours,

By:_____
The Lofts at Black Birch, LLC
Duly Authorized

STEPHEN R. MC DONNELL, P.E.

EDUCATION	B.S. Civil Engineering, Norwich University, 1975 M.S. Civil Engineering, University of Connecticut, 1977 Continuing education in construction management, business management, sewer system investigations, soils investigations and on-site wastewater disposal.
REGISTRATION	Professional Engineer - Connecticut 1981
PROFESSIONAL EXPERIENCE	Mr. McDonnell has been involved in a variety of civil and environmental engineering projects ranging from feasibility and planning studies to design and construction management. Prior to the founding of WMC, he has held positions with other consulting engineering firms from project engineer through vice president. His responsibilities have included complete technical and fiscal management of an engineering group involved with wastewater disposal, water supply, hydraulics and drainage, site design and solid waste management projects. Mr. McDonnell's responsibilities with WMC include client liaison, technical and fiscal management. Utilizing skills developed over his career, he is responsible for all site/environmental engineering work with the firm including projects related to hydraulics and drainage, wastewater collection, treatment and recycling, water supply, site design, sidewalks, parking lots, refuse recycling and disposal, composting, etc. Mr. McDonnell has completed a wide variety of environmental engineering projects including: complete hydrological and hydraulic studies and designs for stormwater collection systems, dams and spillways; wastewater disposal programs including on-site wastewater disposal systems analyses and designs for community systems, wastewater collection treatment and disposal systems planning design and construction management; water supply system planning design and construction management; solid waste landfill design, transfer station planning and design, recycling program planning, composting system design and regional resource recovery system planning. He is particularly skilled in public presentations in a manner which is thorough yet readily understood by the public. This approach is effective in building a public consensus for project development. In addition to Mr. McDonnell's responsibilities with the firm, he is active in professional associations, has held several offices and is a Past President of the Connecticut Section of the American Society of Civil Engineers.
SOCIETIES	American Society of Civil Engineers Connecticut Society of Civil Engineers (past president) Water and Environment Federation New England Water Pollution Control Association American Waterworks Association

STEPHEN R. MC DONNELL, P.E.

REPRESENTATIVE PROJECTS	Master planning and site design of 7 recreation fields, irrigation system, concession stand and other amenities for the Harwinton Recreation Complex
	Site design for the Salisbury School in Salisbury including recreation fields, roadways, parking, walkways, water system improvements including elevated steel water storage tank and DEEP approve membrane bioreactor wastewater treatment system and including the only DEEP approved wastewater treatment system utilizing constructed wetlands.
	Site design for four playing fields for Glastonbury High School
	$1 million sidewalk improvement project for Winsted, new sidewalks for Harwinton Town Hall and Library, $1.2 million sidewalk Improvement Project for New London
	Greenway/Trail design for projects in Winsted (6 miles), Burlington (2 miles), Suffield, Granby and East Granby
	Site Design for the Tanger Westbrook Factory Outlet Stores including parking, walks, drainage, water supply, membrane bioreactor wastewater system.
	Site design for the Hearth at Madison assisted living facility including roadways, parking, walks, drainage, stormwater detainage and treatment, water supply and membrane bioreactor wastewater treatment system.
	Site design for the Saybrook at Haddam assisted living facility in Haddam, including roadways, walkways parking, stormwater collection, underground detainage, water supply system and DEEP wastewater on-site disposal system.
	Site design for the Hearth at Branford assisted living facility including site grading, stormwater collection, treatment and detainage system and walkways.
	Site design for RHAM High School in Hebron including parking, roadways, walks, storm drainage, stormwater treatment, water supply and sewers. Site design for three schools in Watertown including roadways, parking, walks, stormwater collection, treatment, detainage, water system improvements.
	Site design for the new middle school in East Haddam including playing fields, roadways, walks, drainage, underground and surface detainage, water supply system and DEEP approved sub-surface wastewater disposal system.
	Site design for the Old Lyme High School/Middle School/Center School campus including playing fields, roadways, walkways, parking, stormwater collection, treatment, underground detainage, water supply system including .2 mg steel storage tank, and DEEP approved sub-surface wastewater disposal system.
	Site design for Joel Barlow High School in Redding, including parking, roads, sidewalks, water supply system, stormwater detention, DEEP approve membrane bioreactor wastewater treatment system and constructed fill leaching system.

ROBERT BARNESCHI, Associate

EDUCATION

B.S. Civil Engineering Technology, Central Connecticut State University
Additional Course Work in hydrology, hydraulics and drainage

REGISTRATION

Engineer in Training, State of Connecticut

PROFESSIONAL EXPERIENCE

Mr. Barneschi has over 20 years of experience on a wide variety of civil engineering projects. Since joining WMC, Mr. Barneschi has served as project engineer involved in projects ranging from sewer, pump station and water main design, hydrology, hydraulics and drainage studies and design to dam designs, roadway planning and design, sidewalk and greenway design, construction inspection, site planning and design, on-site sewage disposal systems and environmental assessments. He has served as project engineer for many site planning projects performing roadway design, sidewalk design, site grading, sanitary sewer, septic system and utilities design and coordination, hydraulics and drainage planning and design, sedimentation and erosion control plans, on-site sanitary system design and cost estimating.

Mr. Barneschi has served as a construction engineer on sewer, water and site projects and is familiar with construction equipment, techniques and scheduling.

Mr. Barneschi's responsibilities with WMC include on-site wastewater disposal system, sewer, low pressure sewer, pump station, water supply and drainage system design, dam design and technical responsibility for roadway and site planning and design as well as environmental assessments and the study and design of stormwater management systems. He has expertise in the firm's hydrology/hydraulics computer analyses as well as the firm's CADD systems. Mr. Barneschi's recent assignments include:

- design of 7 playing fields for Harwinton,
- design of all site improvements including playing fields, walkways, road, parking area for Salisbury School in Salisbury
- design of 4 fields for Glastonbury High School
- design of roadways for Montville, Farmington, Winsted and Plymouth
- design of over five miles of sidewalks for Berlin, Winsted, South Windsor and Harwinton
- design of greenway trail improvements for 6 miles of trail in Torrington and Winsted and 2 miles of trail in Burlington
- site design including roads, parking, sidewalk and utilities for over ten school projects and 6 assisted living facilities
- design of dam improvements for Moodus Reservoir in Haddam
- design of a low pressure sewer system for Southwick, Massachusetts
- site design including water, sewer, drainage, grading, roadways and parking for 6 municipal school projects
- on-site wastewater disposal system design for over 10 DEEP and Department of Health approved systems
- hydrologic and hydraulic study of the Patchogue River in Westbrook
- roadway design for 10 bridge projects

SOCIETIES

American Society of Civil Engineers

HENDREN ASSOCIATES
ARCHITECTS + PLANNERS

◆ ◆ ◆

119 Braintree Street, Suite 209, Boston , Ma. 02134
Tel 617 782 6003 / Fax 617 782 6063

GARY W. HENDREN
Principal Architect

EDUCATION:

Bachelor of Architectural Design, University of Florida. 1977
Bachelor of Architecture, Boston Architectural Center. 1982

REGISTRATIONS:

Registered Architect: Massachusetts, New Hampshire, Vermont, Connecticut and National Council of Architectural Boards Certificate – NCARB

AFFILITATIONS:

American Institute of Architects
Boston Society of Architects

EMPLOYMENT:

1980-1986	Associate	Lozano White and Associates, Cambridge, Ma.
1986-1992	Principal	Hendren Khalsa Associates, Boston, Ma.
1992-2002	Associate VP	Edwards and Kelcey, Inc., Boston, Ma.
2002- Present	Principal	Hendren Associates Architects, Allston, Ma.

PROFESSIONAL EXPERIENCE:

Registered Architect with over 45 years of experience in the architectural profession.

Principal or Executive Associate and lead designer for the past thirty-five years.

Mr. Hendren has been involved with most projects from their inception to completion and is familiar with all aspects of building development including programming, permitting, feasibility studies, design, construction documentation and project management.

Mr. Hendren has a wide range of experience in different building types and styles ranging from resort / recreation, retail stores, offices and health clubs to residential apartments and mixed-use urban centers.

Mr. Hendren has worked in both the public and private sectors including interior space planning, mass transit, industrial facilities, high-rise apartments and land use planning.

Select Project Experience Attached- Expanded List is Available upon Request

Gary W. Hendren, AIA

HENDREN ASSOCIATES ARCHITECTS + PLANNERS

SELECT PROJECT EXPERIENCE

MULTI-FAMILY:

• Cyrus Fellows Crossing I & II, Cambridge, Ma.	72 Units
• Damon Place Condominiums, Hull, Ma.	51 Units
• Ferncroft Village Apartments, Middleton, Ma.	200 Units
• The Carillon, Boston, Ma.	31 Units
• Minute Man Commons, Lincoln, Ma.	32 Units
• Market Street Crossing, Allston, Ma.	120 Units
• Parsons Crossing, Brighton, Ma.	Mixed-Use

COMMERCIAL / OFFICE

• Two Brattle Square Office Building, Cambridge, Ma.	36,000 GSF
• Woods Design Center, Grand Cayman, BWI	18,000 GSF
• Bread & Circus Supermarket, Cambridge, Ma.	35,000 GSF
• Peabody Construction Headquarters, Braintree, Ma.	30,000 GSF
• Park Center Plaza, Brighton, Ma.	19,000 GSF
• Beacon Hill Athletic Club, Weston & Brighton, Ma.	10,000 GSF
• 1285 Beacon Street, Brookline, Ma.	50,000 GSF
• Bodyscapes, Brookline, Ma.	12,000 GSF
• 212 Stuart Street, Boston, Ma.	64,000 GSF

SPACE PLANNING AND INTERIOR DESIGN

• New England Telephone Office, Brookline , Ma. and Pawtucket RI	16,800 SF
• Millipore Offices, Concord, Ma.	90,000 SF
• Mansfield Music and Arts, Mansfield, Ma.	18,000 SF
• Aids Action Committee Offices, Jamaica Plain, Ma.	40,000 GSF

RESORT / RECREATION

• Six Flags Pavilions, Agawam, Ma.	3 Locations
• Beyond the Reef, Grand Cayman, BWI	41 Bungalows
• Cabrita Point, St. Thomas, UCVI	26 Luxury Homes
• Canton Sportsplex, Canton, Ma.	250,000 GSF

INSTITUTIONAL

• DMH-Secure Treatment Facility, Northampton, Ma.	Prototype
• River Bend Continuing Care, Ashland, Ma.	156 Units
• U.S. Naval Operations Offices, Newport, RI	Renovation
• USPS Sorting Facility, Boston, Ma.	Renovation
• Boston Police Department, Brighton, Ma.	Renovation

TRANSIT

• Essex Station, MBTA, Boston, Ma.	Renov & New Const
• Cape Cod Commuter Rail Study, Ma.	Feasibility Study
• North Station Platforms, Commuter Rail, Boston Ma.	Renovation
• Warwick Intermodal Station, Warwick, RI	New Construction



Mark Vertucci, PE, PTOE

Vice President

"As a child, I drew chalk roads on my driveway and installed paper road signs around my house. I coerced my mother to take me on long day trips just to drive along roads I had never been on before. Transportation has always been a passion of mine. To me, it is not all about the destination. Getting there is half the fun."

mvertucci@fando.com 800.286.2469 x5381

EDUCATION
BS, Civil Engineering - 1998
Rensselaer Polytechnic Institute

LICENSES & REGISTRATIONS
Professional Engineer CT
Professional Traffic Operations Engineer
Professional Engineer RI
Professional Engineer NY
Professional Engineer MA

PROFESSIONAL AFFILIATIONS
Inst Transportation Engineers

EXPERIENCE
25 Years Professional Experience

Mark is a Vice President in our Transportation Business Line. He has many years of experience in traffic engineering, transportation planning, site development, and roadway improvement projects. Throughout his career, he has prepared numerous traffic impact studies, planning studies, corridor studies, parking studies, and traffic management plans.

Mark has extensive experience with traffic signal design projects, roadway design projects, and intelligent transportation systems. Mark is certified by the Institute of Transportation Engineers (ITE) as a Professional Traffic Operations Engineer (PTOE), and is a Past President and current Vice President of the Connecticut Chapter of ITE.

REPRESENTATIVE PROJECTS:

Office of the State Traffic Administration (OSTA) Major Traffic Generator Certificate Applications, Traffic Impact Studies, and PZC Meeting Expert Testimony, Various Locations: As Senior Transportation Engineer and Project Manager, Mark prepared dozens of traffic impact studies and OSTA applications across the State of Connecticut for retail, residential, office, manufacturing, and mixed-use facilities. His thorough knowledge of the OSTA review process and established relationships with CTDOT Traffic and OSTA staff have resulted in the completion of successful permit approvals in short time frames. He has provided expert testimony at numerous Town Planning and Zoning Commission meetings, and has extensive experience with traffic counting software, intersection capacity and queuing analyses, and crash data analysis.

CTDOT On-call Traffic Engineering, throughout CT: Project Manager for a three-year on-call contract with CTDOT to provide traffic engineering services, including: maintenance and protection of traffic plans, traffic studies and reports, traffic signal and signal system design, pavement markings, highway signs, utility coordination, railroad at-grade crossing design, and preparation of materials for public involvement meetings. As part of this on-call assignment, Mark managed State Project 171-372, which included accessible pedestrian signal designs at 62 traffic signals in the Hartford area, and State Project 170-3078, which included the complete replacement of traffic signal equipment at 10 locations in District 3. Additionally, served as Senior Traffic Engineer on 174-387, which reviewed and revised 395 traffic signals in 42 towns throughout Connecticut.

City-wide Bicycle and Pedestrian Improvements, Stamford, CT: Senior Transportation Engineer for numerous bicycle and pedestrian safety projects through the City that have included proven measures to reduce crashes and improve safety, such as high visibility retroreflective thermoplastic crosswalks, curb extensions at corners, "turning vehicles yield to pedestrians" signs, "no turn on red signs" and other signage, implementation of bike lanes, road diets, pavement marking and parking improvements. In addition, some of these projects have included the implementation of leading pedestrian intervals (LPI) at traffic signals and Rectangular Rapid Flashing Beacons (RRFB's). These "quick hit" projects have been done in conjunction with programmed capital improvement projects on City roadways including Hope Street, Stillwater Avenue, Strawberry Hill/Newfield Streets, Long Ridge Road, and West Broad Street.

Greenwich Avenue Corridor Improvements and Roundabout Design, Stamford, CT: Project Director for conceptual plan alternatives to improve traffic safety and flow, pedestrian circulation, and the streetscape throughout the corridor limits. This project included review of operations, safety, and capacity at 13 intersections and assessment of existing conditions parking demand and turnover on the study corridors. Traffic capacity analysis and a simulation model were developed for the study area. Three conceptual alignment alternatives, intersection improvement options, and cost estimates were prepared. This project included a public involvement process, including workshops with stakeholders to achieve input during the concept planning stage. Following selection of the preferred alternative, this project culminated with the design and permitting of a new roundabout at the Greenwich Avenue/Pulaski Street/O&G Industries Drive intersection.

Clearance Interval and Pedestrian Timing Revisions, CT DOT, Various Locations, CT: Senior Traffic Engineer for State Project No. 174-387. Under Fuss & O'Neill's Task Based Traffic Engineering Services contract, the clearance interval and pedestrian timings at 395 traffic signals in 42 towns within the western half of the state were reviewed and revised as needed to meet current state and federal standards. The project involved reviewing operating speeds, approach grades, sight distances, and geometry at each signalized intersection and calculating the appropriate clearance intervals and pedestrian crossing times.

APS Signal Upgrades, CT DOT, Greater Hartford Area, CT: Senior Traffic Engineer for State Project

Nos. 171-371 and 171-381. Under Fuss & O'Neill's Task Based Traffic Engineering Services contract, 53 traffic signals in the Greater Hartford area were upgraded with accessible pedestrian signals (APS) to meet the latest federal ADA requirements. This included upgrading the pedestrian signal equipment, recalculating pedestrian crossing times, and designing ADA compliant pedestrian ramps, transition areas, sidewalk extensions and detectable warning surfaces.

Route 34 Expressway to Boulevard Conversion Public/Private Partnership, New Haven, CT: Mark served as Senior Project Manager for the planning study and preliminary design of the conversion of the existing Route 34 expressway terminus into a vibrant urban boulevard, allowing for the development of a major office and R&D project within the existing highway right-of-way. Mark worked extensively with the developer, City, and state agencies to initiate the first phase of this important urban renewal project. Significant roadway improvements were proposed to accommodate the redistribution of the expressway traffic volumes onto the Boulevard, while, at the same time, to promote a mode shift to pedestrian, bicycle, and transit usage. This project involved a number of challenges, including: the transition details from expressway to urban boulevard, closure of three existing expressway ramps, design of tunnel access roadways to the development site, extensive stakeholder coordination, complex construction sequencing, and an aggressive design and permitting schedule.

Citywide Traffic Management Plan, Norwalk, CT: Senior Traffic Engineer for the development of a Citywide Traffic Management Plan that will serve as a blueprint for meeting the City's long-term transportation goals. The Plan included new traffic impact study guidelines, access management guidelines, a traffic calming toolbox, a Travel Demand Management (TDM) toolbox, and new standards and details for roadway design and construction. Extensive public outreach was conducted to include businesses and residents in the decision-making process.

Residential Development, 243 Steele Road, West Hartford, CT: Senior Transportation Engineer for site visits, analysis of roadway and intersection capacity, preparation of a Traffic Impact Statement, and OSTA submissions. This project included development of traffic volume figures, analysis of crash statistics, attendance at town meetings, and response to comments from the client, the Town, and the community.

Harbor Point Development, Stamford, CT: Senior Project Manager for transportation planning, traffic engineering, and City and State permitting support for the $3.5 billion Harbor Point development in the south end of Stamford. Project experience included the Gateway office development, the Yale and Towne mixed-use/residential project, and the proposed $750 million Bridgewater Headquarters project. In conjunction with these concurrent development projects, an interactive traffic model of the south end of Stamford was prepared to analyze traffic operations and impacts at more than 50 intersections and to answer a variety of "what if?" scenarios. A comprehensive set of roadway improvements was proposed to mitigate project impacts. Mark is currently working for the City on the design of two significant roadway improvement

projects to facilitate traffic flow into and out of the south end development, including the widening of Atlantic Street and a new roundabout at the intersection of Greenwich Avenue and Pulaski Street.

Two-way Street Conversion Study, New Haven, CT: Project Manager for an extensive study of the downtown New Haven street network to determine which roadways may be suitable for one-way to two-way conversions in order to improve mobility and circulation. The project included a comprehensive data collection effort, capacity analysis at 62 intersections, and a significant public involvement process featuring a four-day design workshop and public presentations in New Haven. The study reviewed geometric constraints and impacts to transit routes, on-street parking, and bike lanes to assess which roadways would be suitable for conversions in the short term, which would require further study, and which roadways would not operate acceptably under two-way flow. An overall master plan with details and sections for specific streets was prepared along with a priority matrix outlining the phasing of the work program and costs.

Civil and Traffic Engineering, Willington, CT: Senior Project Manager for land development, transportation engineering, and permitting services for a new Love's truck stop facility on Polster Road and State Route 320 in the vicinity of Interstate 84 Exit 71. Mark completed a traffic impact study, off-site roadway improvement plan, and comprehensive off-site signage plan directing traffic to the facility. He coordinated extensively with the Town of Willington and CTDOT in support of the local and state permitting processes. He attended several Planning and Zoning meetings to present the findings of the traffic study, address public concerns, and secure local project approval.

Campus-wide Traffic Safety Study, Confidential Aerospace Manufacturer, Windsor Locks, CT: Senior Project Manager for a comprehensive review of parking lot access and circulation, pedestrian safety, and traffic operations on campus roadways. The study involved a series of meetings with facility staff and employees. Concept plans were developed for circulation and layout improvements at each parking area, parking lot access management, roadway and intersection realignments, upgrade of signage and pavement markings per the latest MUTCD, and improvements to pedestrian facilities to meet current ADA standards. Following completion of the study, Mark managed the design and construction administration for the first two phases of the campus parking lot improvements in the C, D, E, F, G, and H lots.

State Office Building Renovation Traffic/OSTA, CTDAS, Hartford, CT: Senior Transportation Engineer for traffic engineering services related to the proposed parking expansion at the State Office Building at 165 Capital Avenue as part of this CTDAS project that involves the complete renovation of the State Office Building. This project included submitting a request to OSTA for an Administrative Decision Review, cost estimates for roadway improvements, traffic signal control plan modification, as well as maintenance and protection of traffic planning.