STORMWATER POLLUTION PREVENTION PLAN

for

Proposed Distribution Facility Project

7211 and 7219 Morgan Road

Town of Clay, Onondaga County, New York

Prepared For:

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2 October 2019
100796101

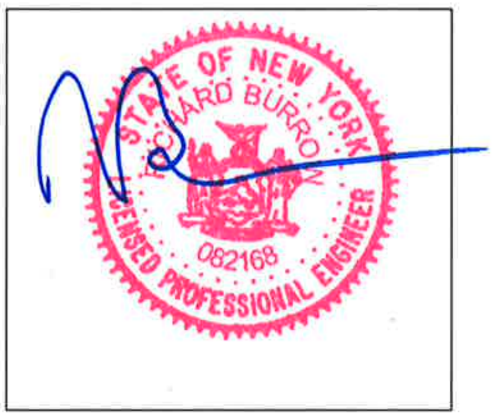
LANGAN

Preparer of the SWPPP

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the SPDES General Permit for Stormwater Discharges from Construction Activity. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil or administrative proceedings.

Name: Richard Burrow

Date: 2 October 2019



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1 Executive Summary

This Stormwater Pollution Prevention Plan (SWPPP) and accompanying project plans have been prepared in accordance with the New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity (General Permit) latest revision, the *New York State Stormwater Management Design Manual* (*Design Manual*) latest revision, and the *New York State Standards and Specifications for Erosion and Sediment Control* latest revision.

The Applicant, T.C. Syracuse Development Associates, LLC, is proposing to develop a 110-acre property at 7211 and 7219 Morgan Road, in the Town of Clay, Onondaga County, New York. The project, known as Proposed Distribution Facility Project, consists of a multistory warehouse with associated car and trailer parking, trailer loading docks, stormwater basins, site utilities, signage and landscaping. The project will maintain existing drainage patterns as much as practical, control the rate of stormwater runoff resulting from the development, and mitigate potential impacts on water quality and erosion generated during and after construction.

The pre- and post-development conditions were analyzed using the USDA Soil Conservation Service Publication Technical Release (TR-55) "Urban Hydrology for Small Watersheds." TR-55 provides procedures for estimating runoff and peak discharges in small watersheds based upon the watershed areas, land coverage, soil group types, curve numbers (CN), times of concentration (Tc), rainfall distribution type, and rainfall amount for the design storm events. The pre- and post-development peak discharge rates of runoff have been evaluated utilizing stormwater modeling software. An overall comparison of the pre- and post-development peak discharge rates for each of the design storms analyzed is provided in the table below.

Table 1-1: Overall Comparison of Pre- & Post-Development Peak Discharge Rates

Storm Event	Pre (cfs)	Post (cfs)	Diff (cfs)
1-year	21.28	5.21	- 16.07
10-year	72.28	46.64	- 25.64
25-year	106.33	104.84	- 1.49
100-year	178.51	167.43	- 11.08

The above comparison demonstrates that the peak rate of runoff from the site will not be increased as a result of the proposed development. In addition, the erosion control, sediment control, pollution-prevention, and stormwater management measures to be implemented during construction as outlined in this SWPPP and project drawings will minimize soil erosion and control sediment transport off site, and after construction will control the water quality and quantity of stormwater runoff.

2 Project Information

2.1 Project Summary

The Applicant is proposing to develop a property in the Town of Clay, Onondaga County, New York (see Figure 1, Site Location Map). Below is a summary of the project information:

Table 2-1: Project Summary

Project Name:	Proposed Distribution Facility Project
Project Location:	7211 and 7219 Morgan Road Town of Clay, Onondaga County, New York
Property Tax ID No.:	Section 114 Block 1 Lot 2.3
Property Acreage:	110 ± acres
Municipality:	Town of Clay which is a municipal separate storm sewer system (MS4)
Project Description:	Warehouse distribution facility that consists of an approximately 823,522-square foot multistory warehouse with approximately 62 loading docks, 1,804 car parking spaces and 208 trailer parking spaces
Estimated Disturbed Area:	76 ± acres, which requires coverage under the SPDES General Permit
Existing Site Conditions:	Open space (good condition), stream, pond 5 ± acres of existing impervious area
Proposed Site Conditions:	Woods (fair condition), grass (fair condition), meadow (good condition), impervious area (gravel, pavement) 50 ± acres of proposed impervious area
Stormwater Management Practices:	Bioretention Basins (for water quality) Wet Extended Detention Pond (for water quality and quantity) Dry Detention Basin (for water quantity) Hydrodynamic Separators (for pretreatment)

2.2 Project Description

The project site is currently composed of an active 18-hole public golf course, driving range, and practice area that contains cart paths and footbridges throughout the property. A two-story club house, asphalt parking lot, and a maintenance barn are present in the southeastern portion of the site near Morgan Road. The majority of the site contains maintained turf grass associated with the golf course; however, trees are present between fairways and generally along the site perimeter. There is a stream, known as Saw Mill Creek, which generally bisects the property from northeast to southwest and eventually drains to Onondaga Lake. There is also a pond at the southwest corner of the site. The site generally drains to the stormwater pond and to Saw Mill Creek, with the exception of two areas on the northern portion of the site that drain to isolated wetlands.

The project site is bounded by Morgan Road and industrial properties to the east, Liverpool Bypass and residential properties to the south, Oswego Road and commercial properties to the west, and a utility easement and an apartment complex to the north. The Town of Salina borders the site to the southwest.

Proposed Distribution Facility Project is a warehouse distribution facility that consists of an approximately 823,522-square foot multistory warehouse with approximately 62 loading docks, 1,804 car parking spaces and 208 trailer parking spaces. Four driveways are proposed off of Morgan Road, and one driveway is proposed off of Liverpool Bypass. The project will be served by public utilities. The property is approximately 110 acres; however, the project disturbance will be limited to approximately 76 acres. The remaining 34 acres will be left undisturbed and in their natural state.

Coverage under the New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity (General Permit) latest revision will be required (see Appendix A), since the project involves soil disturbance of 1 or more acres. The proposed project is also in a municipal separate storm sewer system (MS4); therefore, the Town of Clay will review and accept the SWPPP. The Notice of Intent (NOI) form and signed "MS4 SWPPP Acceptance" form will be submitted to the NYSDEC before construction begins to obtain coverage under the SPDES General Permit. The forms have been provided in Appendix B.

3 Site Conditions

3.1 Soils

The United States Department of Agriculture (USDA) Soil Conservation Service Soil Survey for Erie County has been reviewed. The surficial soil conditions are shown in Figure 2, NRCS Soils Map, and are summarized in the table below.

Table 3-1: USDA Soil Data

Map Symbol	Description	Hydrologic Soil Group
LaB	Lairdsville silt loam, 2 to 6 percent slopes	D
WwB	Williamson silt loam, 2 to 6 percent slopes	D
LvB	Lockport and Brockport silty clay loams, 0 to 6 percent slopes	C/D
Rh	Rhinebeck silt loam	C/D
Wn	Wayland soils complex, 0 to 3 percent slopes, frequently flooded	B/D

The Soil Conservation Service defines the hydrologic soil groups as follows:

- **Type A Soils**: Soils having a high infiltration rate and low runoff potential when thoroughly wet. These soils consist mainly of deep, well-drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

- **Type B Soils**: Soils having a moderate infiltration rate when thoroughly wet. These soils consist mainly of moderately deep to deep, moderately well to well-drained soils with moderately fine to moderately course textures. These soils have a moderate rate of water transmission.

- **Type C Soils**: Soils having a low infiltration rate when thoroughly wet. These soils consist mainly of soils with a layer that impedes downward movement of water, and soils with moderately fine to fine texture. These soils have a low rate of water transmission.

- **Type D Soils**: Soils having a very low infiltration rate and high runoff potential when thoroughly wet. These soils consist mainly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a clay pan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very low rate of water transmission.

Soil borings and test pits were performed under Langan's observation in July 2019 to determine the subsurface soil conditions in various locations throughout the property. Percolation testing was performed in July 2019 to determine the feasibility of infiltrating stormwater at the site.

The soils on site are predominantly silt. Decomposed shale was encountered at depths ranging from approximately 2 to 15 feet below existing grades. Weathered shale was encountered in all borings beneath the silty decomposed shale at depths ranging from approximately 15 to 20 feet below existing grades. Groundwater was observed in all borings at depths ranging from 8 to 12 feet below existing grades. The percolation tests resulted in field percolation rates ranging from less than one-half inch in all test locations except one, which had an infiltration rate of approximately 1.76 inches per hour. Therefore, this site is not well suited for stormwater infiltration.

The boring logs, test pit logs, and percolation test results are provided in Appendix E.

3.2 Enhanced Phosphorous Removal Standards

The proposed project is located within the Onondaga Lake Watershed. Post-construction stormwater management practices have been designed to conform to Enhanced Phosphorous Removal Standards, which is detailed in Chapter 10 of the *Design Manual*. The water quality volume and runoff reduction volume are calculated using the 1-year, 24-hour design storm event as opposed to the 90th percentile rain event.

3.3 Water Resources

According to the NYSDEC Freshwater Wetlands and Waters Map, a Tributary of Onondaga Lake, known as Saw Mill Creek, is located onsite and generally bisects the property from northeast to southwest. According to NYSDEC Surface Water Classifications, this stream is classified as "Class B – Fresh Surface Water". There are no NYSDEC freshwater wetlands mapped onsite.

The United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) Map identifies forested wetlands and a pond in the southern portion of the site. In addition, there are two riverine wetlands mapped, one in the southern portion of the site and one that bisects the site from northeast to southwest. See Figure 3, NYSDEC Freshwater Wetlands and Waters Map, and Figure 4, USFWS National Wetlands Inventory Map.

A wetlands and waters delineation was conducted in July 2019 in accordance with federal delineation methodology outlined under the U.S. Army Corps of Engineers Wetlands Delineation Manual and Northcentral and Northeast Regional Supplement. The identified onsite features include one stream, one pond, and twelve wetland features. The proposed development has been designed to minimize impacts to these features. Approximately 4,350 square feet (0.1 acres) of disturbance is proposed within the stream, ditch, or wetland areas. See Figure 5, Wetland Delineation Map.

3.4 Floodplains

Based on a review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), Map No. 36067C0202F, effective November 4, 2016, there are no mapped flood hazard areas onsite. See Figure 6, FEMA Effective FIRM Map.

3.5 Cultural Resources

According to the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP) Cultural Resource Information System (CRIS) database, the site is within an archaeologically sensitive area. The New York State Historic Preservation Office (SHPO) has reviewed the project and has found that no historic properties, including archaeological and/or historic resources, will be affected by this undertaking.

4 Stormwater Management Plan

The proposed topography conveys stormwater runoff via sheet flow to onsite catch basins within the paved roads and parking areas or to grass swales. Localized low and high points have been created to aid in the collection of stormwater runoff. The collected stormwater will be conveyed by a closed pipe network to stormwater management practices. The stormwater management practices will detain, treat, and release stormwater runoff in a controlled manner at a rate equal to or less than what existed prior to construction of the property.

The proposed stormwater management practices have been designed in accordance with the *Design Manual*, and include bioretention basins, a wet extended detention pond, and a dry detention basin.

4.1 Process for Stormwater Site Planning and Practice Selection Compliance

4.1.1 Site Planning

Preservation of Natural Features and Conservation

Preservation of natural features includes techniques to identify and preserve natural areas that can be used to protect water, habitat and vegetative resources. Conservation includes designing elements of the development in a way that the site design takes advantage of a site's natural features, preserves sensitive areas and identifies constraints and opportunities to prevent or reduce negative effects of a development. An evaluation of the preservation of natural features and conservation planning practices is provided in the table below.

Table 4-1: Preservation of Natural Features and Conservation

Practice	Description	Application	Reason
Preservation of Undisturbed Areas	Delineate and place into permanent conservation undisturbed forests, native vegetated areas, riparian corridors, wetlands, and natural terrain.	Considered and Not Applied	In order to take credit, these areas must be placed into legally enforceable deed restrictions, conservation easements or a maintenance agreement. The project is not proposing to place the undisturbed areas into conservation easements.
Preservation of Buffers	Define, delineate and preserve naturally vegetated buffers along perennial streams, rivers, shorelines and wetlands.	Considered and Applied	The majority of the wetlands and stream will remain undisturbed. The wetland disturbance has been limited to less than 0.1 acres and a majority of that is related to the construction one of the driveways required to provide adequate access for emergency vehicles and the traffic anticipated as part of this project.
Reduction of Clearing and Grading	Limit clearing and grading to the minimum amount needed for roads, driveways, foundations, utilities and stormwater management facilities.	Considered and Applied	The grading has been minimized to the greatest extent practical for the proposed development.
Locating Development in Less Sensitive Areas	Avoid sensitive resource areas such as floodplains, steep slopes, erodible soils, wetlands, mature forests and critical habitats by locating development to fit the terrain in areas that will create the least impact.	Considered and Applied	The majority of the sensitive resources, such as floodplains, wetlands, steep slopes, and critical habitats have been avoided.
Open Space Design	Use clustering, conservation design or open space design to reduce impervious cover, preserve more open space and protect water resources.	N/A	This is more applicable to a residential subdivision, which the proposed project is not.
Soil Restoration	Restore the original properties and porosity of the soil by deep till and amendment with compost to reduce the generation of runoff and enhance the runoff reduction performance of post construction practices.	Considered and Applied	Soil restoration will be applied to all pervious areas within the limits of disturbance to restore the original properties and porosity of the soil.

Reduction of Impervious Cover

Reduction of impervious cover includes methods to reduce the amount of rooftops, parking lots, roadways, sidewalks, and other surfaces that do not allow rain to infiltrate into the soil. An evaluation of the reduction of impervious cover techniques is provided in the table below.

Table 4-2: Reduction of Impervious Cover

Practice	Description	Application	Reason
Roadway Reduction	Minimize roadway widths and lengths to reduce site impervious area	N/A	No roadways are proposed.
Sidewalk Reduction	Minimize sidewalk lengths and widths to reduce site impervious area	Considered and Applied	Sidewalks have been limited to provide to areas where pedestrian connectivity is required and not throughout the development.
Driveway Reduction	Minimize driveway lengths and widths to reduce site impervious area	N/A	This is more suitable for residential developments. The driveway width cannot be minimized, since the driveway is designed to accommodate a WB67 tractor trailer and turning lanes are required.
Cul-de-sac Reduction	Minimize the number of cul-de-sacs and incorporate landscaped areas to reduce their impervious cover.	N/A	There are no cul-de-sacs proposed as part of this project
Building Footprint Reduction	Reduce the impervious footprint of residences and commercial buildings by using alternate or taller buildings while maintaining the same floor to area ratio.	Considered and Applied	The proposed facility is a multistory warehouse, which reduces the overall building footprint while maintaining the same floor to area ratio.
Parking Reduction	Reduce imperviousness on parking lots by eliminating unneeded spaces, providing compact car spaces and efficient parking lanes, minimizing stall dimensions, using porous pavement surfaces in overflow parking areas, and using multi-storied parking decks where appropriate.	Considered and Applied	The amount of parking provided is the minimum required for the warehouse facility.

Runoff Reduction Techniques

Green infrastructure techniques use the natural features of the site and promote runoff reduction through micromanaging runoff, promoting groundwater recharge, increasing losses through evapotranspiration, and emulating the existing hydrology. An evaluation of the runoff reduction practices is provided in the table below.

Table 4-3: Runoff-Reduction Practices

Practice	Description	Application	Reason
Conservation of Natural Areas	Retain the pre-development hydrologic and water quality characteristics of undisturbed natural areas, stream and wetland buffers by restoring and/or permanently conserving these areas on a site.	Considered and Not Applied	In order to take credit, these areas must be placed into legally enforceable deed restrictions, conservation easements or a maintenance agreement. The project is not proposing to place the undisturbed areas into conservation easements.

Practice	Description	Application	Reason
Sheet flow to Riparian Buffers or Filter Strips	Undisturbed natural areas such as forested conservation areas and stream buffers or vegetated filter strips and riparian buffers can be used to treat and control stormwater runoff from some areas of a development project.	Considered and Not Applied	The site slopes do not meet the criteria to take credit for sheet flow to riparian buffers or filter strips.
Vegetated Open Swale	The natural drainage paths, or properly designed vegetated channels, can be used instead of constructing underground storm sewers or concrete open channels to increase time of concentration, reduce the peak discharge, and provide infiltration.	Considered and Not Applied	The site slopes do not allow for the design or construction of vegetated channels to be used in lieu of underground storm sewers.
Tree Planting/Tree Box	Plant or conserve trees to reduce stormwater runoff, increase nutrient uptake, and provide bank stabilization. Trees can be used for applications such as landscaping, stormwater management practice areas, conservation areas and erosion and sediment control.	Considered and Not Applied	Tree plantings have been provided; however, the proposed trees are not within the minimum distance required to take credit.
Disconnection of Rooftop Runoff	Direct runoff from residential rooftop areas and upland overland runoff flow to designated pervious areas to reduce runoff volumes and rates.	N/A	The maximum allowed rooftop contributing area is 2,000 square feet with suitable flow dispersion and downspouts have to be at least 10 feet away from the nearest impervious surface to discourage re-connections. Based on the proposed project it is not feasible to meet these requirements. In addition, rooftop disconnection is more suitable for residential or smaller commercial buildings.
Stream Daylighting for Redevelopment Projects	Stream Daylight previously-culverted/piped streams to restore natural habitats, better attenuate runoff by increasing the storage size, promoting infiltration, and help reduce pollutant loads.	N/A	There are no previously culverted/piped streams to restore.
Rain Garden	Manage and treat small volumes of stormwater runoff using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression.	Considered and Not Applied	Similar to bioretention practices; however they do not provide the added benefit of using the portion of the water quality volume that is not reduced to meet the total water quality volume requirement. In addition, they are typically used to treat smaller areas.
Green Roof	Capture runoff by a layer of vegetation and soil installed on top of a conventional flat or sloped roof. The rooftop vegetation allows evaporation and evapotranspiration processes to reduce volume and discharge rate of runoff entering conveyance system.	Considered and Not Applied	Based on the size of the building it is not feasible to incorporate a green roof. In addition, portions of the roof will be sloped to roof leader drains.

Practice	Description	Application	Reason
Stormwater Planter	Small landscaped stormwater treatment devices that can be designed as infiltration or filtering practices. Stormwater planters use soil infiltration and biogeochemical processes to decrease stormwater quantity and improve water quality.	Considered and Not Applied	Stormwater planters use soil infiltration. The infiltration rates are extremely poor on this site, and infiltration practices cannot be used to treat stormwater "hotspot" runoff.
Rain Tank/Cistern	Capture and store stormwater runoff to be used for irrigation systems or filtered and reused for non-contact activities.	Considered and Not Applied	Based on prior similar projects, cisterns are not recommended by the end user.
Porous Pavement	Pervious types of pavements that provide an alternative to conventional paved surfaces, designed to infiltrate rainfall through the surface, thereby reducing stormwater runoff from a site and providing some pollutant uptake in the underlying soils.	Considered and Not Applied	The proposed parking lot fields are large and provide circulation for a large volume of daily vehicle traffic, which may reduce the functionality of the porous pavement.

4.1.2 Water Quality Treatment Volume Determination

The total required water quality volume was determined by totaling the individual water quality volumes for each of the subcatchments that contributed to a stormwater management system and excluding the subcatchments that were diverted from the proposed development and stormwater management systems. The water quality volume was determined based on the methodology as described in the Design Manual. The total required water quality volume detailed design calculations are provided in Appendix F.

4.1.3 Runoff Reduction Volume Determination

Standard stormwater management facilities with runoff reduction capacity were used to reduce the total water quality volume. After applying the runoff-reduction-volume techniques, the total required water quality volume was not reduced 100 percent. The minimum required runoff reduction volume was determined to verify that at least the minimum percent of the total water quality volume has been reduced. The total provided runoff reduction volume was greater than the minimum required runoff reduction volume. Therefore, the minimum required runoff reduction volume has been met. Detailed design calculations have been provided in Appendix F.

4.1.4 Standard Stormwater Management Practice Application

The portion of the water quality volume that is not reduced in the standard stormwater management practices with runoff reduction volume capacity can be credited toward meeting the total required water quality volume requirement. The total provided water quality-volume (total provided runoff-reduction volume plus total treated water quality volume) is greater than the total required water quality volume. Therefore, the total required water quality volume has been met. Detailed design calculations have been provided in Appendix F.

4.1.5 Volume and Peak Control Practice Application

The proposed stormwater management facilities have been designed and sized to provide channel protection, overbank flood control, and extreme flood protection. In addition, comparison of the peak discharge rates for pre- and post-development watershed conditions demonstrates that the peak rate of runoff from the proposed development are less than or equal to the existing conditions. Detailed design calculations have been provided in Appendix F.

4.2 Stormwater Hotspots

A stormwater hotspot is defined as a land use or activity that generates higher concentrations of hydrocarbons, trace metals or toxicants than are found in typical stormwater runoff. For projects having stormwater hotspot runoff, non-infiltration type practices have to be used for stormwater management, treatment, and runoff reduction. Bioretention practices can accept stormwater hotspot runoff as long as an impermeable liner is provided.

The loading dock area and trailer parking lot have been identified as stormwater hotspots, which is consistent with Chapter 4 of the *Design Manual*. The collected stormwater runoff from these areas will be conveyed to bioretention practices that will have an impermeable liner at the bottom. Both lined and unlined bioretention practices will have underdrain systems.

4.3 Hydrologic Analysis

4.3.1 Drainage Patterns

The site generally drains to Saw Mill Creek, which bisects the site from northeast to southwest. Runoff flows overland into the creek, where it continues to flow offsite to Onondaga Lake, which is about 1.5 miles southwest of the project site. There are two other small watersheds on the north side of the site that drain to isolated depressions at locations along the northwestern and northeastern property boundary, and a small watershed along Morgan Road that drains to a localized depression.

The proposed topography is designed to convey stormwater runoff via sheet flow to onsite catch basins within the paved roads and parking areas. Localized low and high points have been created to aid in the collection of stormwater runoff. The collected stormwater will be conveyed by a closed pipe network system to stormwater management practices, including bioretention basins, a wet extended detention pond, and a dry detention basin. The stormwater management practices will detain, treat, and release stormwater runoff in a controlled manner at a rate equal to or less than what existed prior to construction of the property. Hydrodynamic separators will provide pretreatment. The stormwater management practices have been designed in accordance with the *Design Manual*.

4.3.2 Stormwater Modeling

The USDA Soil Conservation Service Publication Technical Release (TR-55) "Urban Hydrology for Small Watersheds" has been used to analyze the pre- and post-development rainfall runoff rates and volumes. Watershed areas, curve numbers (CN), and times of concentration (T_C) were calculated for each contributing watershed. The curve number is a land-sensitive coefficient that dictates the relationship between total rainfall depth and direct storm runoff. Based on the land coverage and soil group types, the average CN has been determined for both the pervious and impervious area of each watershed for both the existing and proposed conditions.

The T_C is defined as the time for runoff to travel from the hydraulically most distant point in the watershed to a Design Point (DP). Values of the time of concentration were determined for both the pervious and impervious area of each watershed for both the existing and proposed conditions based on land cover and slope of the flow path using methods outlined in TR-55. As per TR-55, the minimum T_C used is 0.1 hours (for 6 minutes). See Appendix F for CN and T_C calculations for existing and proposed conditions.

An overall watershed boundary was developed for the pre- and post-development conditions (see Figure 7 and Figure 8, respectively). The overall watershed was broken down into smaller watersheds, or subcatchments to allow for analysis of runoff conditions at several locations. Each of these locations is defined as a Design Point (DP) to compare the effects of the proposed development to the existing conditions. Descriptions of each of the selected design points are provided below:

- Design Point A: Saw Mill Creek, along Liverpool Bypass
- Design Point B: Isolated wetland along the northwestern property boundary
- Design Point C: Isolated wetland along the northeastern property boundary
- Design Point D: Localized depression along Morgan Road

Rainfall data used in the modeling and analysis was obtained from the isohyet maps provided in the *Design Manual* and the Northeast Regional Climate Center (NRCC). A Type II rainfall distribution was used to evaluate the pre- and post-development stormwater runoff conditions for the 1-, 10-, and 100-year 24-hour storm events. The rainfall data used in the stormwater management design and analysis is provided in the table below.

Table 4-4: Rainfall Data

Storm Event	24-Hour Rainfall(1)
90^{th} Percentile(2)	1.00 inches
1-year	2.02 inches
2-year(3)	2.34 inches
10-year	3.35 inches
25-year	4.11 inches
100-year	5.61 inches

1. The 90^{th} percentile 24-hour rainfall value was taken from the *New York State Stormwater Management Design Manual*. The other 24-hour rainfall values are taken from the Northeast Regional Climate Center (NRCC).
2. The 90^{th} percentile 24-hour rainfall amount is generally used to calculate the required total water quality volume. However, since this site is located within the Onondaga Lake Watershed, the 1-year design storm was used to calculate the total water quality volume.
3. The 2-year 24-hour rainfall amount was used to calculate the sheet flow component in the time of concentration.

The rainfall data used in the stormwater management design and analysis is provided in Appendix F. The results of the computer modeling used to analyze the pre- and post-development watershed conditions are provided in Appendix G and Appendix H, respectively.

4.3.3 Water Quality Control

Stormwater runoff from developed land is recognized as a significant contributor of pollution that can adversely affect the quality of the receiving waters. Treatment of stormwater runoff is important because most runoff-related water quality contaminants are transported during the initial stages of storms. The water quality volumes have been determined based on the methodology described in the Design Manual. The total water quality volume is provided in the table below.

The total water quality volume is provided in the table below. Undisturbed portions of the site not draining to a stormwater management practice have been excluded from this table.

Table 4-5: Total Water Quality Volume

Watershed	Area (ac)	Impervious Area (ac)	WQ_v (cf)
A1	14.09	11.21	79,162
A2	31.69	25.36	178,990
A3	10.36	6.68	47,854
A4	16.96	5.22	40,650
Total	**73.10**	**48.47**	**346,656**

Detailed design calculations have been provided in Appendix F.

4.3.4 Runoff Reduction Volume

Runoff reduction is achieved by infiltration, groundwater recharge, reuse, recycle, evaporation and evapotranspiration of 100 percent of the post-development water quality volumes to replicate pre-development hydrology by maintaining pre-construction infiltration, peak runoff flow, discharge volume, and minimizing concentrated flow by using runoff-control techniques to provide treatment in a distributed manner before runoff reaches the collection system. The runoff-reduction-volume techniques that were used to reduce the total required water quality volume are in the table below.

Table 4-6: Implemented Runoff Reduction Volume Techniques

Techniques/ Practices	RRv Reduction Method	Reduction Amount
Bioretention	Standard SMP with RRv capacity	40% of WQv provided by practice (with underdrains)

After applying the runoff-reduction-volume techniques, the total required water quality volume was not reduced 100 percent. The minimum required runoff reduction volume was determined to confirm that at least the minimum percent of the total water quality volume has been reduced. The total provided runoff reduction volume was greater than the minimum required runoff reduction volume. Therefore, the minimum required runoff-reduction volume has been met. Detailed design calculations have been provided in Appendix F.

4.3.5 Water Quantity Control

The proposed water quantity controls have been designed and sized to provide channel protection, overbank flood control, and extreme flood protection, where:

- Channel Protection Volume requirements are designed to protect stream channels from erosion. This protection is accomplished by providing 24-hour extended detention of the 1-year 24-hour storm. Since the water quality volume is calculated using the 1-year 24-hour storm event, the wet pond is providing 24-hour extended detention of this storm event.

- Overbank Flood Control requirements are designed to prevent an increase in the frequency and magnitude of out-of-bank flooding generated by urban development. Overbank flood control requires storage to attenuate the post-development 10-year, 24-hour peak discharge rate to pre-development rates.

- Extreme Flood Protection requirements are designed to prevent the increased risk of flood damage from large storms; maintain the boundaries of the pre-development 100-year floodplain; and protect the physical integrity of the stormwater management practices. Extreme flood control requires storage to attenuate the post-development 100-year, 24-hour peak discharge rate to pre-development rates.

A comparison of the pre- and post-development peak discharge rates is provided in the table below. Detailed design calculations have been provided in Appendix F.

Table 4-7: Summary of Pre- & Post-Development Peak Discharge Rates

Storm Event	Design Point	Pre (cfs)	Post (cfs)	Diff (cfs)
1-year	A	21.28	5.21	- 16.07
	B	1.33	0.70	- 0.63
	C	0.99	0.99	- 0.00
	D	2.90	0.31	-2.59
10-year	A	72.28	46.64	- 25.70
	B	8.48	5.78	- 2.70
	C	4.71	4.71	- 0.00
	D	6.10	0.91	- 5.19
25-year	A	106.33	104.84	- 1.49
	B	14.01	9.98	- 4.03
	C	7.39	7.39	- 0.00
	D	7.96	1.31	- 6.65
100-year	A	178.51	167.43	- 11.08
	B	26.39	19.57	- 6.82
	C	13.26	13.26	- 0.00
	D	11.64	2.13	- 9.51

Comparison of the peak discharge rates for pre- and post-development watershed conditions demonstrates that the peak rate of runoff from the proposed development will not be increased. Therefore, the proposed development will not adversely impact the downstream or adjacent properties, receiving water bodies or courses, or wetlands.

The pre- and post-development stormwater models have been provided in Appendix G and Appendix H, respectively.

4.4 Hydraulic Analysis

Stormwater runoff from the proposed development will be collected and conveyed to the proposed stormwater management facilities by the closed pipe-network system. A hydraulic analysis of the proposed stormwater collection system was performed to verify that the system has the capacity to convey the stormwater runoff associated with the 25-year storm.

The Rational Method was used to calculate the peak surface runoff rate for the each of the drainage structures. The contributing drainage areas to each of the drainage structures were calculated and broken into impervious and pervious areas. A runoff coefficient of 0.9 was used for impervious areas and 0.4 for pervious areas. A rainfall intensity of 7.38 inches per hour was used for the 25-year storm. The minimum time of concentration of six minutes was used for each of the drainage areas as a conservative approach.

Based upon the hydraulic analysis, the proposed stormwater collection system has adequate capacity to collect and convey the stormwater runoff associated with the 25-year storm. None of the proposed drainage structures surcharge above the proposed rim elevations. The proposed stormwater collection system hydraulic analysis has been provided in Appendix H.

5 Erosion and Sediment Control Plan

This SWPPP and accompanying project plans identify erosion and sediment control measures to be implemented during and after construction to minimize erosion and sediment impacts. The erosion and sediment control measures have been designed in accordance with the *New York State Standards and Specifications for Erosion and Sediment Control*.

5.1 Construction Sequencing Schedule and Phasing

This project will be completed in phases. The purpose of the construction sequencing schedule and phasing plan is to limit the overall disturbance and ensure that previously disturbed areas are reestablished before construction in another part of the site. The duration of the construction activities will be from spring 2020 to summer 2021. The general construction sequencing and phasing is provided on the project drawings.

The Applicant is requesting written approval from the Town of Clay, which is an MS4, to disturb more than 5 acres of soil at any one time to obtain the necessary fill to construct sections of the project while balancing the site earthworks. This disturbance will reduce the need to import and export material from off site.

5.2 Erosion and Sediment Control Measures

Temporary erosion and sediment control measures to be used during construction generally include the following:

- **Stabilized Construction Access** - Before construction, the stabilized construction access shall be installed to reduce the tracking of sediment onto adjacent roadways. Construction traffic must enter and exit the site at the stabilized construction access. The stabilized construction access shall be maintained in good condition to control tracking of sediment onto rights-of-way or streets. When necessary, the placement of additional aggregate atop the filter fabric shall be done to assure the minimum thickness is maintained. All sediments and soils spilled, dropped, or washed onto the public rights-of-way shall be removed immediately. Periodic inspection and needed maintenance shall be provided after each substantial rainfall event.

- **Dust Control** - Water trucks or other approved water source shall be used, as needed, during construction to reduce dust generated on the site. Dust control shall be provided by the general contractor to a degree acceptable to the owner/operator, and in compliance with the applicable local and state dust control requirements.

- **Temporary Soil Stockpile** - Materials, such as topsoil, shall be temporarily stockpiled (if necessary) on site during construction. Stockpiles shall be located away from storm drainage, water bodies or courses, and shall be properly protected from erosion in accordance the detail provided on the accompanying plans.

- **Silt Fencing** - Before initiation of and during construction, silt fencing shall be established along the perimeter of all areas to be disturbed as a result of the construction upgradient of water courses or adjacent properties. These barriers may extend into non-impact areas to ensure adequate protection of adjacent lands. Clearing and grubbing shall be performed only as necessary for the installation of the sediment control barrier. To ensure effectiveness of the silt fencing, daily inspections shall be performed by site personnel. Maintenance of the fence shall be performed as needed and when directed by the Qualified Inspector.

- **Temporary Seeding** - Within seven days after construction ceases on any particular area of the site, all disturbed areas where there shall be no construction for longer than 14 days shall be temporarily seeded and mulched to minimize erosion and sediment loss. Other stabilization methods maybe approved by the Qualified Inspector.

- **Inlet Protection** – Inlet protection shall be installed around existing and proposed catch basins (once installed) to keep sediment from entering the storm-sewer system. During construction, the inlet protection measures shall be replaced as needed to ensure proper function of the structure.

- **Temporary Sediment Basins and Traps** - Temporary sediment basins and traps shall be constructed to intercept sediment laden runoff, reduce the amount of sediment leaving the disturbed areas, and protect drainage ways, properties, and rights-of-way. Projects that have proposed stormwater ponds can be used as temporary sediment basins during construction. Temporary sediment basins and traps shall be inspected at least every seven days. All damage caused by soil erosion and construction equipment shall be repaired upon discovery. Accumulated sediment shall be removed from the sediment basin or trap when it reaches 50 percent of the design capacity and must not exceed 50 percent. Sediment must not be placed downstream from the embankment, adjacent to a stream, or floodplain.

- **Dewatering** - Dewatering, if required, must not be discharged directly into wetlands, water courses, water bodies, and storm sewer systems without appropriate protection. Proper methods and devices shall be used to the extent permitted by law, such as pumping water into temporary sediment basins, providing surge protection at the inlet and outlet of pumps, floating the intake of the pump, or other methods to minimize and retain the suspended solids.

Permanent erosion and sediment control measures to be used after construction generally include the following:

- **Establish Permanent Vegetation** - Disturbed areas not covered by impervious surfaces shall be seeded in accordance with the accompanying plans. The type of seed, mulch, and maintenance measures shall be followed. All areas at final grade shall be seeded and mulched within 14 days after completion of the major construction. All seeded areas shall be protected with mulch or hay. Final site stabilization is achieved when all soil-disturbing activities have been completed and a uniform, perennial vegetative cover with a density of 80 percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

- **Rock Outlet Protection** - Rock outlet protection shall be installed at the locations as shown on the accompanying plans. The installation of rock outlet protection will reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving water course or water body.

Specific erosion and sediment control measures, inspection frequency, and remediation procedures are provided in the subsequent sections and on the accompanying project plans.

5.3 Pollution Prevention Controls

Good housekeeping practices are designed to maintain a clean and orderly work environment. Good housekeeping measures shall be maintained throughout the construction process by those parties involved with the direct care and development of the site. The following measures shall be implemented to control the possible exposure of harmful substances and materials to stormwater runoff:

1. Material resulting from the clearing and grubbing operation shall be stockpiled away from storm drainage, water bodies or watercourses and surrounded with adequate erosion and sediment control measures. Soil stockpile locations shall be exposed no longer than 14 days before seeding.

2. Equipment maintenance areas shall be protected from stormwater flows and shall be supplied with appropriate waste receptacles for spent chemicals, solvents, oils, greases, gasoline, and any pollutants that might contaminate the surrounding habitat or water supply. Equipment wash-down zones shall be within areas draining to sediment control devices.

3. The use of detergents, soaps, and solvents for large-scale (e.g., vehicles, buildings, pavement surfaces) washing is prohibited.

4. Material storage locations and facilities (e.g., covered storage areas, storage sheds) shall be on-site and shall be stored according to the manufacturer's standards in a dedicated staging area. Chemicals, paints, solvents, fertilizers, and other toxic material shall be stored in waterproof containers. Runoff containing such materials shall be collected, removed from the site, treated and disposed of at an approved solid waste or chemical disposal facility.

5. Petroleum spills shall be immediately contained to prevent pollutants from entering the surrounding habitat or water supply. Spill Kits shall be provided on site and shall be displayed in a prominent location for ease of access and use. All petroleum spills that occur within New York State (NYS) must be reported to the NYS Spill Hotline (1-800-457-7362) within 2 hours of discovery, except spills which meet all of the following criteria:

    - The quantity is known to be less than 5 gallons; and
    - The spill is contained and under the control of the spiller; and
    - The spill has not and will not reach the State's water or any land; and
    - The spill is cleaned up within 2 hours of discovery.
    - A spill is considered to have not impacted land if it occurs on a paved urface such as asphalt or concrete. A spill in a dirt or gravel parking lot is considred to have impacted land and is reportable.

    In addition, a record of the incidents or notifications shall be documented and attached to the SWPPP.

6. Portable sanitary waste facilities shall be provided on site for workers and shall be properly maintained.

7. Dumpsters or debris containers shall be on site and shall be of adequate size to manage respective materials. Regular collection and disposal of wastes must occur as required.

8. Temporary concrete washout facilities shall be a minimum of 50 feet from storm drain inlets, open drainage facilities, and watercourses. Each facility should be away from construction traffic or access areas to prevent disturbance or tracking. A sign shall be installed adjacent to each washout facility to inform concrete equipment operators to

use the proper facilities. When temporary concrete washout facilities are no longer required for the work, the hardened concrete shall be removed and disposed of. Materials used to construct the temporary concrete washout facilities shall be removed and disposed of. Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled or repaired, seeded, and mulched for final stabilization. Wastewater discharges from washout of concrete is prohibited.

9. Non-stormwater components of site discharge shall be clean water. Water used for construction, which discharges from the site, must originate from a public water supply or approved private well. Water used for construction that does not originate from an approved public supply must not discharge from the site.

10. Discharges from dewatering activities, including discharges from dewatering trenches and excavations, shall be managed by appropriate control measures.

11. Wastewater discharges from washout and cleanout of stucco, paint, form-release oils, curing compounds, and other construction materials is prohibited.

5.4 Soil Stabilization and Restoration

5.4.1 Stabilization

For construction sites authorized to disturb more than 5 acres of soil at any one time, the application of soil stabilization measures shall be initiated by the end of the next business day and completed within seven days from the date that current soil disturbance ceased. The soil-stabilization measures shall be in conformance with the *New York State Standards and Specifications for Erosion and Sediment Control*, latest edition. Additional site-specific practices shall be installed as needed to protect water quality.

5.4.2 Restoration

Soil restoration shall be performed in the disturbed areas. The soils shall be restored in accordance with the table below.

Table 5-1: Soil Restoration

Type of Soil Disturbance	Soil Restoration Requirement
No Soil Disturbance	Restoration not required.
Minimal Soil Disturbance (e.g., clearing and grubbing)	Restoration not required.
Areas where top soil is stripped only (e.g., no change in grade)	Aerate and apply 6 inches of topsoil in Type C and D soils.
Areas of cut or fill	Apply full soil restoration in Type C and D soils.
Heavy traffic areas on site (especially in 5 to 25 feet around buildings, but not within a 5-foot perimeter around foundation walls)	Apply full soil restoration (see below).
Areas where runoff reduction or infiltration practices are applied	Restoration not required, but can be applied to enhance soil infiltration.

Redevelopment projects	Soil restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.

Full Soil Restoration

Before applying full soil restoration, all construction, including construction equipment and material storage, site cleanup and trafficking, should be finished and the site closed to further disturbance. Full soil restoration is implemented in a two-phase process:

1. Deep rip the affected thickness of exposed subsoil, aggressively fracturing it before the protected topsoil is reapplied on the site.

2. Decompact simultaneously through the restored topsoil layer and upper half of the affected subsoil.

Low to Moderate Subsoil Moisture

The disturbed soils are returned to rough grade and the following is applied:

1. Apply 3 inches of compost over the subsoil.

2. Till compost a minimum of 12 inches into the subsoil using a cat-mounted ripper, tractor-mounted disc, or tiller mixing and circulating air and compost into subsoils.

3. Rock-pick until uplifted stone and rock of 4 inches or larger size are cleaned off the site. All construction material and foreign debris and existing root masses shall be removed from proposed planting areas.

4. Apply 6 inches of topsoil. Newly installed planting soils shall be mixed with existing soils where they meet in order to create a transitional gradient to allow for proper drainage.

5. Install plants and vegetation in accordance with the Landscaping Plan.

6 Stormwater Pollution Prevention Plan Implementation

6.1 Certification Statements

Before starting construction, the owner/operator, contractors, and subcontractors are required to sign the certification statements provided in Appendix C.

The owner/operator must sign a copy of the Owner's/Operator's certification before submitting the Notice of Intent. The owner/operator acknowledges that the SWPPP has been developed and will be implemented as the first element of construction and agrees to comply with all the terms and conditions of the general permit for which the Notice of Intent is being submitted.

The owner/operator must identify the contractors and subcontractors that will be responsible for installing, constructing, repairing, replacing, inspecting, and maintaining the erosion and sediment control practices; and constructing the post-construction stormwater management practices included in the SWPPP. The contractors and subcontractors must identify at least one trained individual from their company who will be responsible for implementation of the SWPPP. This person will be known as the trained contractor. At least one trained contractor will be on site daily when soil disturbing activities are being performed. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has begun, they must also sign the certification statement and identify their responsibilities.

6.2 Pre-Construction Meeting

Before beginning construction, the owner/operator must set up a pre-construction meeting with the City representative, qualified professional, qualified inspector, contractors, and subcontractors. The primary purpose of the pre-construction meeting is to discuss the responsibilities of each party as they relate to the implementation of the SWPPP and to clarify any questions.

6.3 Construction Site Log

The owner/operator must maintain a copy of the following, including but not limited to: General Permit, signed NOI, signed MS4 Acceptance form, NOI Acknowledgement Letter, SWPPP, signed certification statements, and inspections reports. The documents must be maintained in a secure location. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

6.4 Construction Inspections and Maintenance

6.4.1 Contractor Maintenance Inspection Requirements

The trained contractor must inspect the erosion and sediment control practices and pollution-prevention measures to ensure that they are being maintained in effective operating condition at all times. The inspections will be conducted as follows:

- For construction sites where soil disturbance is on-going, the trained contractor must inspect the measures within the active work area daily. If deficiencies are identified, the contractor will begin implementing corrective actions within one business day and must complete the corrective actions by the end of the day.

- For construction sites where soil disturbance activities have been temporarily suspended (e.g., winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the trained contractor can stop conducting the maintenance inspections. The trained contractor must resume conducting the daily maintenance inspections as soil disturbance resumes.

- For construction sites where soil disturbance has been shut down with partial project completion, the trained contractor can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved final stabilization and all post-construction stormwater management practices required for the completed part of the project have been constructed in conformance with the SWPPP and are operational.

6.4.2 Qualified Inspector Inspection Requirements

The owner/operator must have a Qualified Inspector conduct site inspections to ensure the stability and effectiveness of all protective measures and practices employed during construction. The site inspections will be conducted as follows:

- For construction sites where soil disturbance is ongoing, the Qualified Inspector must conduct a site inspection at least once every seven days.
- For construction sites where soil disturbance is ongoing and the owner/operator has received authorization to disturb greater than 5 acres, the Qualified Inspector must conduct at least two site inspections every seven days. The two site inspections shall be separated by a minimum of two full calendar days.
- For construction sites where soil disturbance activities have been temporarily suspended (e.g., winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the Qualified Inspector must conduct a site inspection at least once every 30 days. The owner/operator must notify the NYSDEC or MS4 in writing before reducing the frequency of the inspections.
- For construction sites where soil disturbance activities have been shut down with partial project completion, the Qualified Inspector can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved final stabilization and all post-construction stormwater management practices are operational. The owner/operator must notify the NYSDEC or the MS4 in writing before the shutdown.

All inspections shall be performed in accordance with this SWPPP, accompanying project plans, latest revision of *New York State Standards and Specifications for Erosion and Sediment Control,* and procedures outlined in Appendix H of the latest revision of the *Design Manual*. Inspection reports must identify and document the maintenance of the erosion and sediment control measures. A sample inspection report has been provided in Appendix D.

Specific maintenance components, schedule frequency, inspection parameters and remediation procedures are provided on the accompanying project plans. Any adjustments or modifications to the maintenance plan shall be noted in the inspection reports and submitted to the City for approval.

7 Termination of Coverage

The owner/operator may terminate coverage when:

a. Total project completion has occurred.

b. A planned shutdown with partial project completion has occurred.

c. Property ownership changes or when there is a change in operational control over the construction plans and specifications; and the new owner/operator has obtained coverage under the SPDES General Permit.

d. Coverage under an alternative SPDES general permit or an individual SPDES permit has been obtained.

If a planned shutdown with partial project completion or total project completion has occurred, then the owner/operator must have the Qualified Inspector perform a final site inspection to ensure that the following have been met:

- **Planned Shutdown with Partial Project Completion** – all soil disturbance has ceased; and all areas disturbed as of the project shutdown date have achieved final stabilization; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed part of the project have been constructed in conformance with the SWPPP and are operational.

- **Total Project Completion** – all construction activity has been completed; and all areas disturbed as of the project shutdown date have achieved final stabilization; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed part of the project have been constructed in conformance with the SWPPP and are operational.

The completed NOT must be submitted to the NYSDEC to cancel coverage. A blank copy of the NOT has been provided in Appendix B.

8 Post-Construction Requirements

8.1 Record Retention

Following construction, the owner/operator must retain a copy of the signed NOI, signed MS4 SWPPP Acceptance, NOI Acknowledgement Letter, SWPPP, project plans, and any inspection reports that were prepared in conjunction with the General Permit for at least five years from the date that the NYSDEC receives a complete NOT.

8.2 Inspection and Maintenance

Post-construction inspections and maintenance will be performed by T.C. Pursuit Services, Inc. Inspections and maintenance for the various site components and stormwater management facilities shall be performed in accordance with the accompanying project plans and this SWPPP. Detailed post-construction inspections and maintenance procedures are provided in Appendix I.

9 Conclusion

This Stormwater Pollution Prevention Plan for the Proposed Distribution Facility Project has been developed in accordance with the requirements of the Town of Clay and the New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) Phase II technical standards. This SWPPP identifies the erosion control, sediment control, pollution-prevention, and stormwater management measures to be implemented during construction to minimize soil erosion and control sediment transport off site, and after construction to control and treat stormwater runoff from the developed site.

In the opinion of the SWPPP preparer, the proposed project will not have adverse impacts if the measures for erosion control, sediment control, pollution prevention, and stormwater management measures are properly constructed and maintained in accordance with the requirements outlined herein and on the accompanying project plans.

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Figures

Map References: NYSDEC Orthoimagery (2018)

LANGAN

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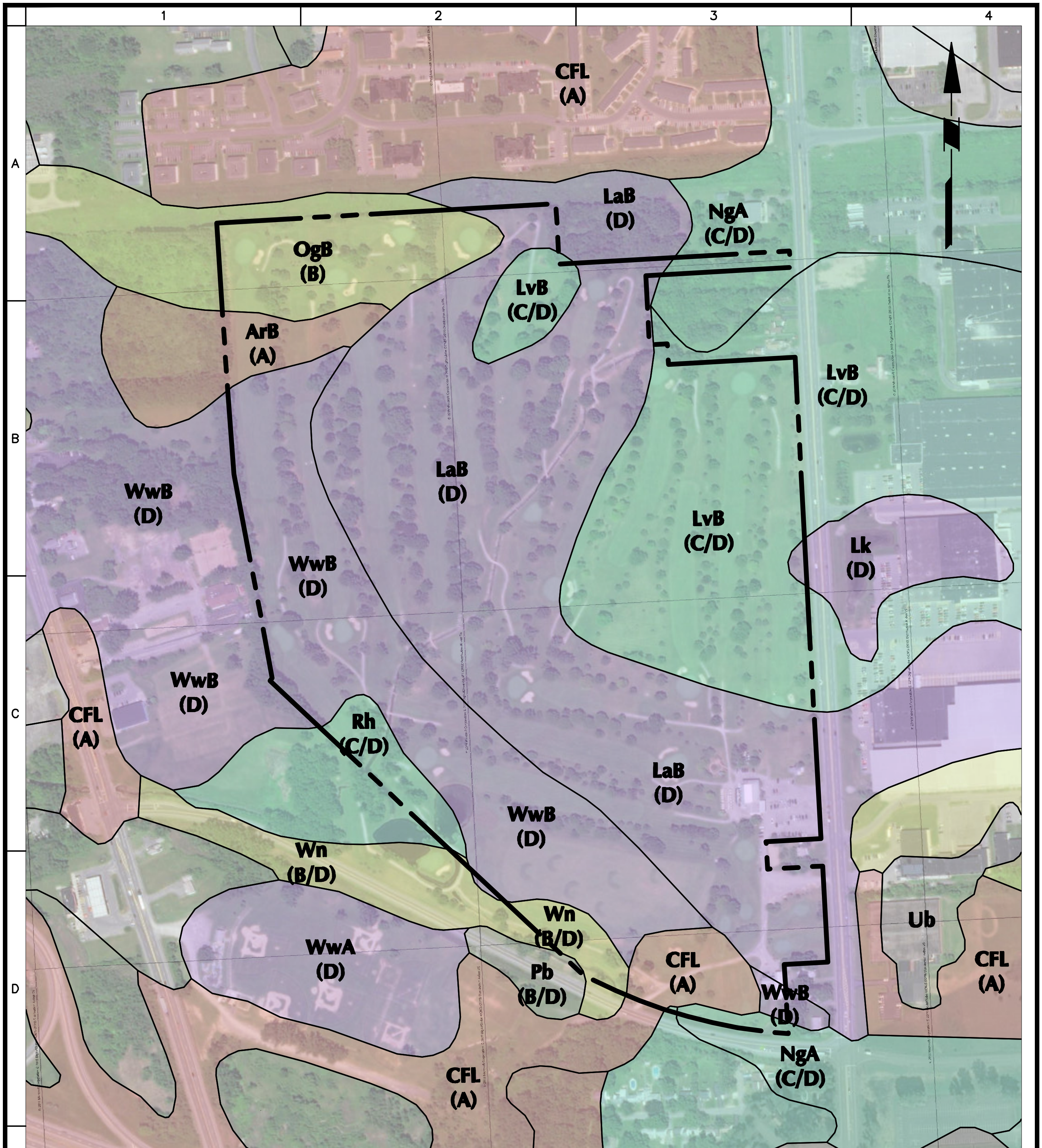
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture, and Geology, D.P.C.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project	Drawing Title	Project No.	Figure
PROPOSED DISTRIBUTION FACILITY PROJECT TOWN OF CLAY ONONDAGA COUNTY NEW YORK	**SITE LOCATION MAP**	100796101	**1**
		Date: 07/26/2019	
		Scale: 1" = 500'	
		Drawn By: MAD	

Path: \\langan.com\data\PAR\data1\100796101\Project Data\ArcGIS\MXD\Natural_Resource_Figures\For Trista\Figure 4 - Site Aerial Photograph.mxd



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SCALE: 1 INCH = 500 FEET

MAP REFERENCE: NEW YORK STATE CLEARINGHOUSE AND UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) SOIL CONSERVATION SERVICE

LANGAN Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. 300 Kimball Drive Parsippany, NJ 07054 T: 973.560.4900 F: 973.560.4901 www.langan.com NJ Certificate of Authorization No.24GA27996400	Project PROPOSED DISTRIBUTION FACILITY PROJECT TOWN OF CLAY ONONDAGA COUNTY NEW YORK	Drawing Title NRCS SOILS MAP	Project No. 100796101 Date 08/26/2019 Drawn By ALN Checked By TLK	Drawing No. 2

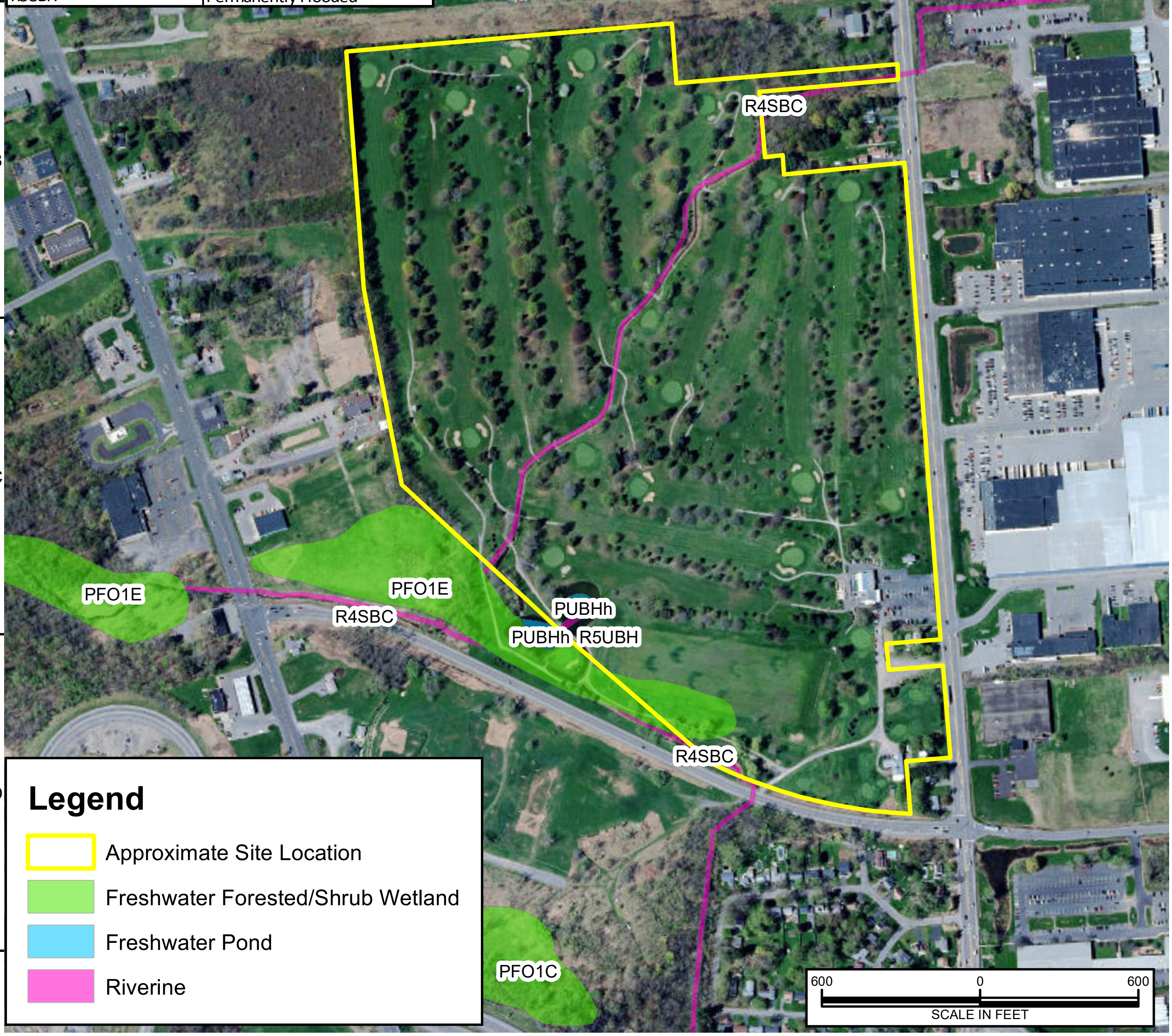
Filename: \\langan.com\data\PAR\data1\100796101\Project Data\CAD\01\SheetFiles\Figures\For SWPPP\FG02-100796101-CS101-0101.dwg Date: 8/26/2019 Time: 14:54 User: jsarabia Style Table: Langan.stb Layout: FIG 2

Map References: New York State Department of Environmental Conservation - Regulatory Freshwater Wetlands - NYS - (2010), Publication (2013); NYSDEC Water Quality Classifications, (2010); NYSDEC Orthoimagery (2018)

LANGAN 300 Kimball Drive Parsippany, NJ 07054 T: 973.560.4900 F: 973.560.4901 www.langan.com Langan Engineering & Environmental Services, Inc. Langan Engineering, Environmental, Surveying, Landscape Architecture, and Geology, D.P.C. Langan International LLC Collectively known as Langan NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400	Project **PROPOSED DISTRIBUTION FACILITY PROJECT** TOWN OF CLAY ONONDAGA COUNTY NEW YORK	Drawing Title NYSDEC FRESHWATER WETLANDS AND WATERS MAP	Project No. 100796101 Date 07/26/2019 Scale 1" = 1,000' Drawn By MAD	Figure **3**

Path: \\langan.com\data\PAR\data1\100796101\Project Data\ArcGIS\MXD\Natural_Resource_Figures\For Trista\Figure 5 - NYSDEC Freshwater Wetlands and Waters Map.mxd

Cowardin Classification	Description
PFO1E	Palustrine Forested Broad-Leaved Deciduous Seasonally Flooded/Saturated
PUBHh	Palustrine Unconsolidated Bottom Permanently Flooded Diked/Impounded
R4SBC	Riverine Intermittent Streambed Seasonally Flooded
R5UBH	Riverine Unknown Perennial Unconsolidated Bottom Permanently Flooded



Map References: USFWS National Wetlands Inventory GIS Data, Accessed (07-19-2019); NYSDEC Orthoimagery (2018)

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Project

PROPOSED DISTRIBUTION FACILITY PROJECT

TOWN OF CLAY

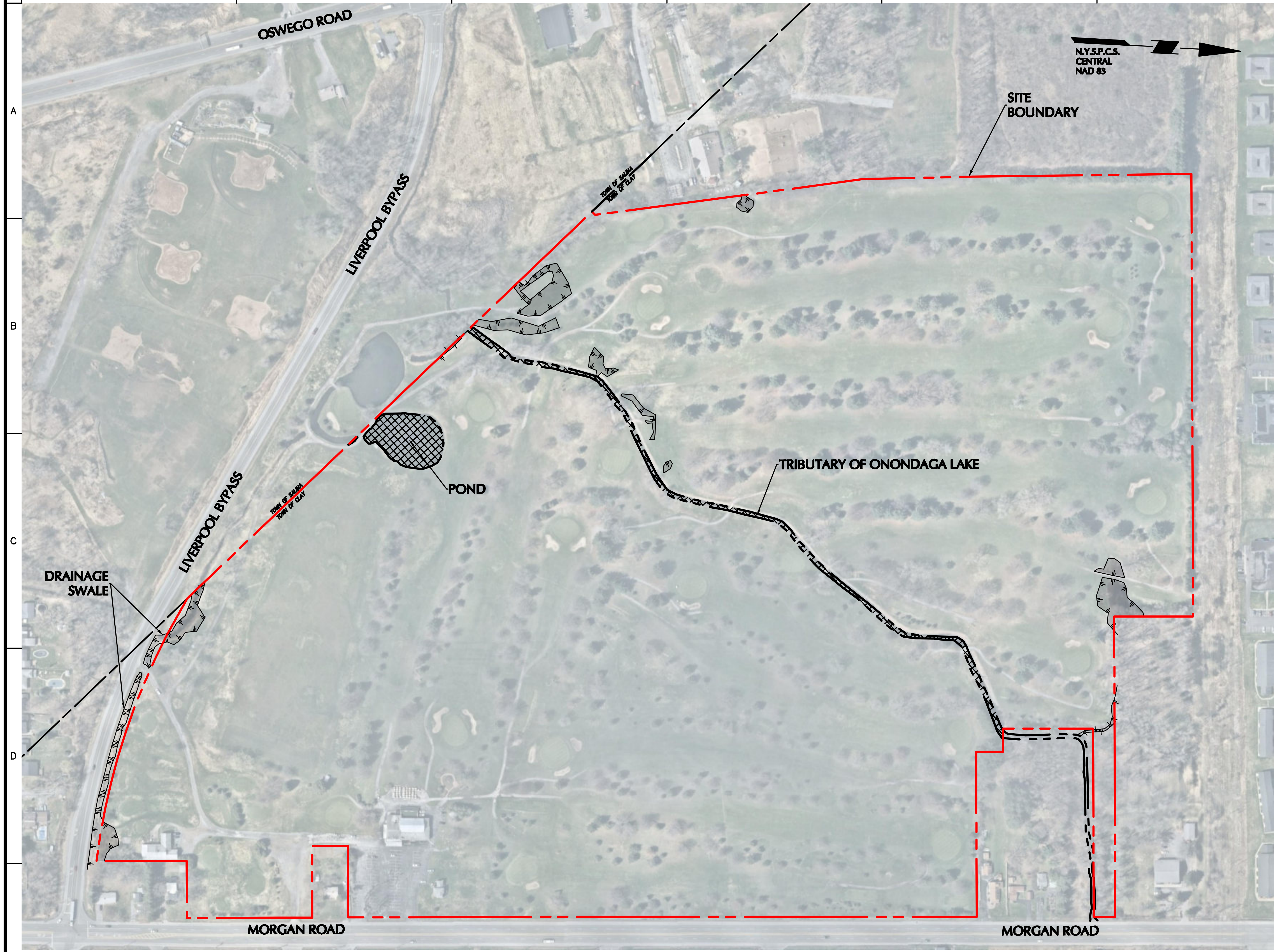
ONONDAGA COUNTY NEW YORK

Drawing Title

USFWS NATIONAL WETLANDS INVENTORY MAP

Project No.	100796101
Date	07/26/2019
Scale	1" = 600'
Drawn By	MAD
Figure	4

Path: \\langan.com\data\PAR\data1\100796101\Project Data\ArcGIS\MXD\Natural_Resource_Figures\For Trista\Figure 6 - USFWS NWI Map.mxd



LEGEND:

- WETLANDS
- WATERS
- SITE BOUNDARY

NOTE:

1. WETLANDS AND WATERS WERE DELINEATED ONSITE BY LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C. WETLAND SCIENTISTS IN JULY 2019.

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

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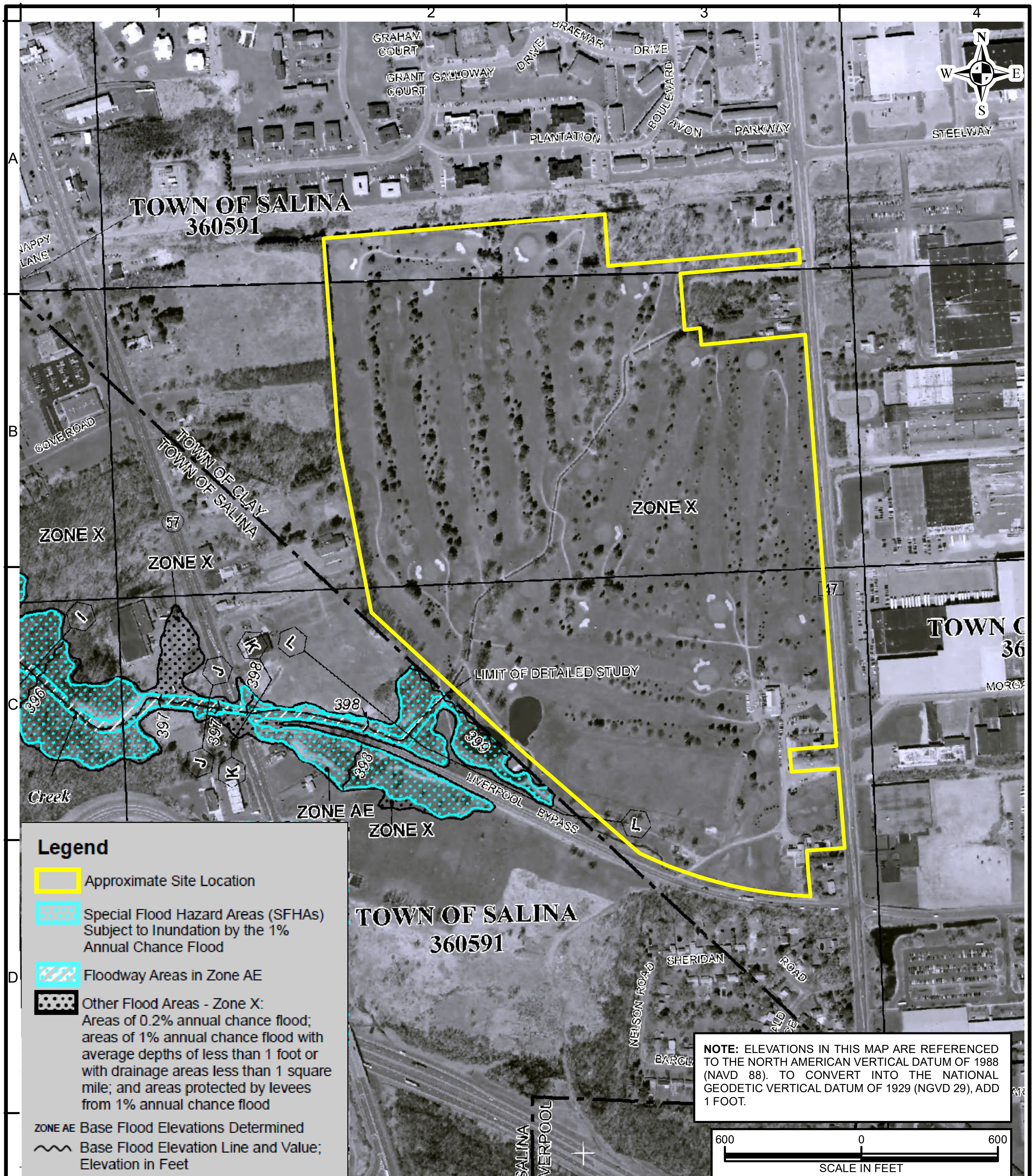
Project	Drawing Title	Project No.	Drawing No.
PROPOSED DISTRIBUTION FACILITY PROJECT SECTION 114, BLOCK No. 1, LOT No. 2.3 TOWN OF CLAY ONONDAGA COUNTY NEW YORK	WETLAND DELINEATION MAP	100796101 Date: 08/22/2019 Drawn By: AC Checked By: RM	5

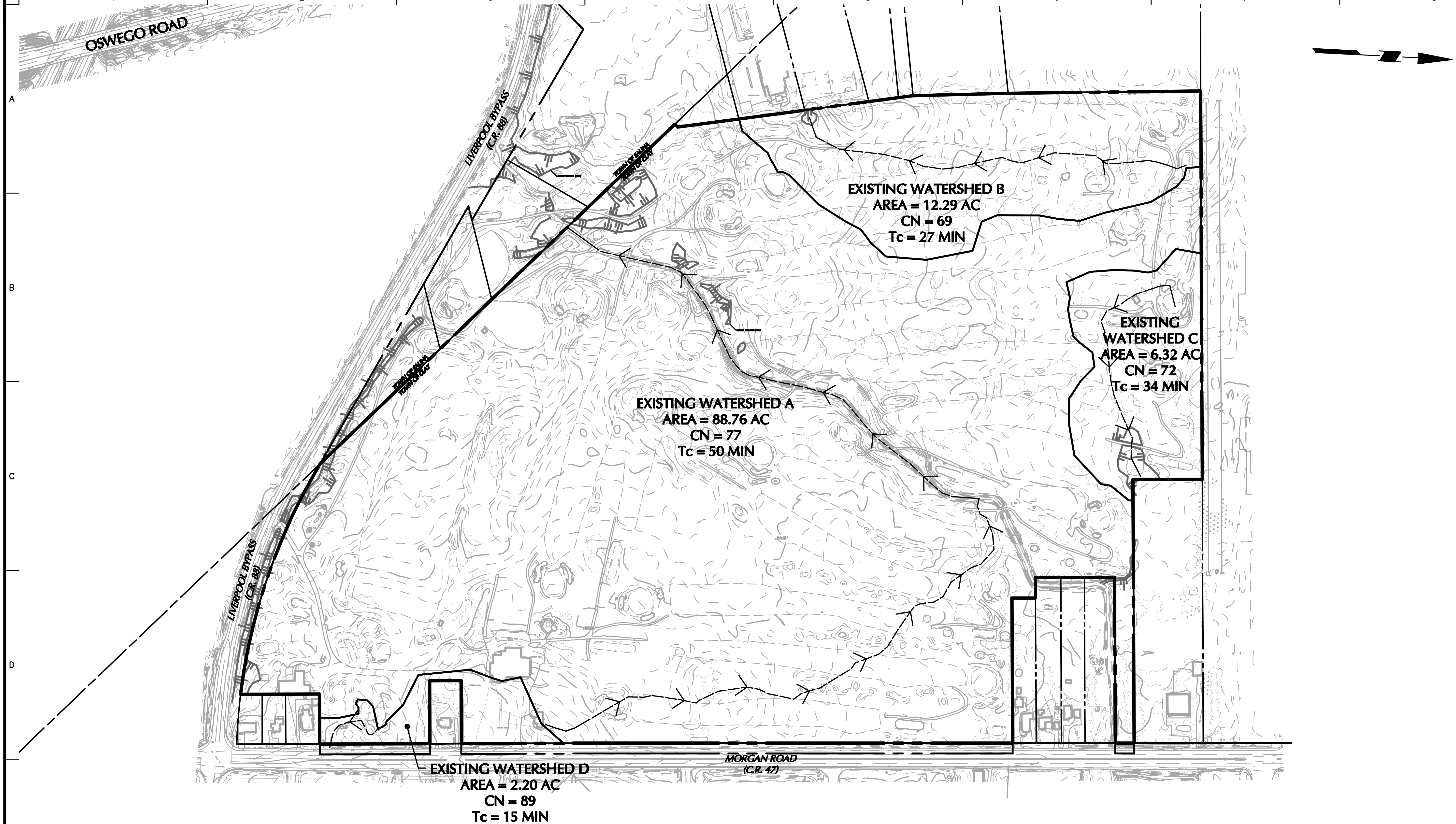
Filename: \\langan.com\data\PAR\data1\100796101\Project Data\CAD\01\SheetFiles\Natural Resources\100796101-W-WL100 - Wetlands-Waters Map.dwg Date: 8/26/2019 Time: 14:46 User: jsarabia Style Table: Langan.stb Layout: ANSIB-BL



Map References: FEMA Effective Flood Insurance Rate Map, Onondaga County, NY - Panels 89 and 202 of 520, Panel Numbers: 36067C0089F and 36067C0202F, Effective (10/04/2016)

LANGAN	Project	Drawing Title	Project No.	Figure
300 Kimball Drive Parsippany, NJ 07054 T: 973.560.4900 F: 973.560.4901 www.langan.com Langan Engineering & Environmental Services, Inc. Langan Engineering, Environmental, Surveying, Landscape Architecture, and Geology, D.P.C. Langan International LLC Collectively known as Langan NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400	**PROPOSED DISTRIBUTION FACILITY PROJECT** TOWN OF CLAY ONONDAGA COUNTY NEW YORK	FEMA EFFECTIVE FIRM MAP	100796101 Date: 06/28/2019 Scale: 1" = 600' Drawn By: MAD	**6**

Path: \\langan.com\data\PAR\data1\100796101\Project Data\ArcGIS\MXD\Natural_Resource_Figures\For Trista\Figure 7 - FEMA Effective FIRM Map.mxd



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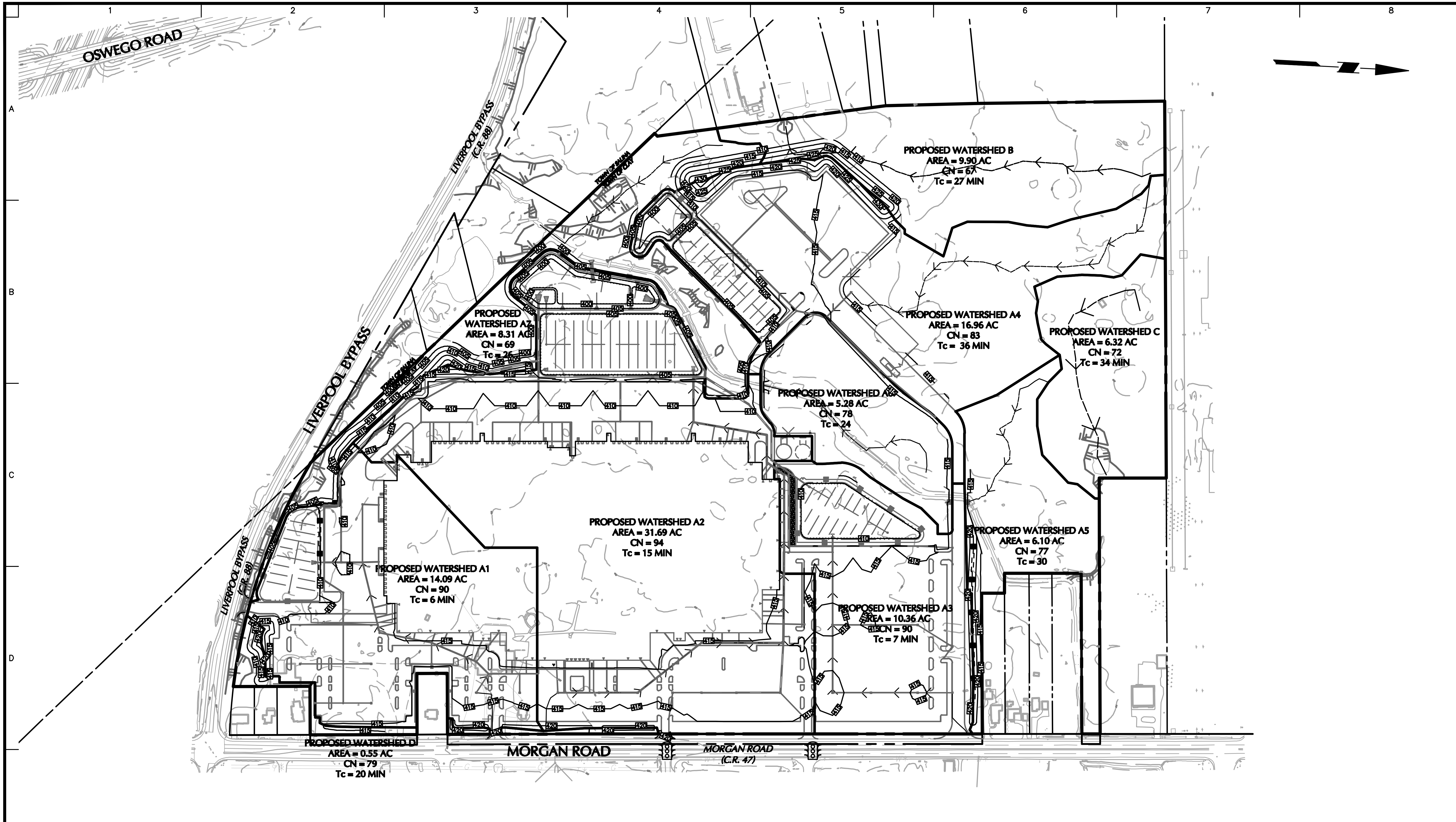
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. 300 Kimball Drive Parsippany, NJ 07054 T: 973.560.4900 F: 973.560.4901 www.langan.com NJ Certificate of Authorization No.24GA27996400	PROPOSED DISTRIBUTION FACILITY PROJECT TOWN OF CLAY ONANDAGA COUNTY NEW YORK	EXISTING WATERSHED PLAN	100796101 Date 8/28/2019 Drawn By JRS Checked By TLK	7



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Filename: \\langan.com\data\PAR\data1\100796101\Project Data\CAD\01\SheetFiles\Figures\For SWPPP\FG08-100796101-CS101-0101.dwg Date: 9/30/2019 Time: 14:46 User: jsarabia Style Table: Langan.stb Layout: FIGURE 8

WARNING:
IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

SCALE: 1 IN = 100 FEET

Date	Description	No.
	REVISIONS	

SIGNATURE — OCT 0 2 2019 — DATE SIGNED
STATE OF NEW YORK · RICHARD BURROW · 082168 · LICENSED PROFESSIONAL ENGINEER
RICHARD BURROW
PROFESSIONAL ENGINEER NY Lic. No. 082168

LANGAN
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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
PROPOSED DISTRIBUTION FACILITY PROJECT
SECTION 114. BLOCK 1, LOT 2.3
TOWN OF CLAY
ONONDAGA COUNTY NEW YORK

Drawing Title
OVERALL GRADING & DRAINAGE PLAN

Project No. 100796101
Date 10/02/2019
Drawn By JRS
Checked By TLK
Drawing No. CG100

Filename: \\langan.com\data\PAR\data1\100796101\Project Data\CAD\01\SheetFiles\Site Plan Approval\100796101-CG100-0101.dwg Date: 10/2/2019 Time: 17:58 User: ahartingsmith Style Table: Langan.stb Layout: CG100

WARNING:
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Date	Description	No.
REVISIONS		

SIGNATURE — OCT 0 2 2019 — DATE SIGNED
RICHARD BURROW
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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
PROPOSED DISTRIBUTION FACILITY PROJECT
SECTION 114. BLOCK 1, LOT 2.3
TOWN OF CLAY
ONONDAGA COUNTY NEW YORK

Drawing Title
OVERALL PHASING AND SOIL EROSION & SEDIMENT CONTROL PLAN

Project No. 100796101
Date 10/02/2019
Drawn By JRS
Checked By TLK
Drawing No. CE100

PROJECT NO. 100796101

Filename: \\langan.com\data\PAR\data1\100796101\Project Data\CAD\01\SheetFiles\Site Plan Approval\100796101-CE100-0101.dwg Date: 10/2/2019 Time: 18:02 User: ahartingsmith Style Table: Langan.stb Layout: CE100

Appendix A

NYSDEC SPDES General Permit

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES

From

CONSTRUCTION ACTIVITY

Permit No. GP-0-15-002

Issued Pursuant to Article 17, Titles 7, 8 and Article 70
of the Environmental Conservation Law

Effective Date: January 29, 2015 Expiration Date: January 28, 2020

Modification Date:

July 14, 2015 – Correction of typographical error in definition of "New Development", Appendix A

November 23, 2016 – Updated to require the use of the New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. The use of this standard will be required as of February 1, 2017.

John J. Ferguson
Chief Permit Administrator

Authorized Signature 11-14-16
Date

Address: NYS DEC
Division of Environmental Permits
625 Broadway, 4th Floor
Albany, N.Y. 12233-1750

PREFACE

Pursuant to Section 402 of the Clean Water Act ("CWA"), stormwater *discharges* from certain *construction activities* are unlawful unless they are authorized by a *National Pollutant Discharge Elimination System ("NPDES")* permit or by a state permit program. New York's *State Pollutant Discharge Elimination System ("SPDES")* is a NPDES-approved program with permits issued in accordance with the *Environmental Conservation Law ("ECL").*

This general permit ("permit") is issued pursuant to Article 17, Titles 7, 8 and Article 70 of the ECL. An *owner or operator* may obtain coverage under this permit by submitting a Notice of Intent ("NOI") to the Department. Copies of this permit and the NOI for New York are available by calling (518) 402-8109 or at any New York State Department of Environmental Conservation ("the Department") regional office (see Appendix G).They are also available on the Department's website at: http://www.dec.ny.gov/

An *owner or operator* of a *construction activity* that is eligible for coverage under this permit must obtain coverage prior to the *commencement of construction activity*. Activities that fit the definition of "*construction activity*", as defined under 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), constitute construction of a point source and therefore, pursuant to Article 17-0505 of the ECL, the *owner or operator* must have coverage under a SPDES permit prior to *commencing construction activity*. They cannot wait until there is an actual *discharge* from the construction site to obtain permit coverage.

***Note: The italicized words/phrases within this permit are defined in Appendix A.**

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES
FROM CONSTRUCTION ACTIVITIES

Part I. PERMIT COVERAGE AND LIMITATIONS

A. Permit Application

This permit authorizes stormwater *discharges* to *surface waters of the State* from the following *construction activities* identified within 40 CFR Parts 122.26(b)(14)(x), 122.26(b)(15)(i) and 122.26(b)(15)(ii), provided all of the eligibility provisions of this permit are met:

1. *Construction activities* involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a *larger common plan of development or sale* that will ultimately disturb one or more acres of land; excluding *routine maintenance activity* that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;

2. *Construction activities* involving soil disturbances of less than one (1) acre where the Department has determined that a *SPDES* permit is required for stormwater *discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of *pollutants* to *surface waters of the State.*

3. *Construction activities* located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

B. Effluent Limitations Applicable to Discharges from Construction Activities

*Discharge*s authorized by this permit must achieve, at a minimum, the effluent limitations in Part I.B.1. (a) – (f) of this permit. These limitations represent the degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The *owner or operator* must select, design, install, implement and maintain control measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in Part I.B.1.(a) – (f) of this permit and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must include in the Stormwater Pollution Prevention Plan ("SWPPP") the reason(s) for the deviation or alternative design and provide information

which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

a. **Erosion and Sediment Controls.** Design, install and maintain effective erosion and sediment controls to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such controls must be designed, installed and maintained to:

(i) *Minimize* soil erosion through application of runoff control and soil stabilization control measure to *minimize pollutant discharges*;

(ii) Control stormwater *discharge*s to *minimize* channel and streambank erosion and scour in the immediate vicinity of the *discharge* points;

(iii) *Minimize* the amount of soil exposed during *construction activity*;

(iv) *Minimize* the disturbance of *steep slopes*;

(v) *Minimize* sediment *discharge*s from the site;

(vi) Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce *pollutant discharge*s, unless *infeasible*;

(vii) *Minimize* soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted; and

(viii) Unless *infeasible*, preserve a sufficient amount of topsoil to complete soil restoration and establish a uniform, dense vegetative cover.

b. **Soil Stabilization**. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the current soil disturbance activity ceased. For construction sites that *directly discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. See Appendix A for definition of *Temporarily Ceased*.

c. **Dewatering**. *Discharge*s from dewatering activities, including *discharge*s from dewatering of trenches and excavations, must be managed by appropriate control measures.

d. **Pollution Prevention Measures**. Design, install, implement, and maintain effective pollution prevention measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such measures must be designed, installed, implemented and maintained to:

(i) *Minimize* the *discharge* of *pollutants* from equipment and vehicle washing, wheel wash water, and other wash waters. This applies to washing operations that use clean water only. Soaps, detergents and solvents cannot be used;

(ii) *Minimize* the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a *discharge* of *pollutants*, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use) ; and

(iii) Prevent the *discharge* of *pollutants* from spills and leaks and implement chemical spill and leak prevention and response procedures.

e. **Prohibited *Discharges*.** The following *discharge*s are prohibited:

(i) Wastewater from washout of concrete;

(ii) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;

(iii) Fuels, oils, or other *pollutants* used in vehicle and equipment operation and maintenance;

(iv) Soaps or solvents used in vehicle and equipment washing; and

(v) Toxic or hazardous substances from a spill or other release.

f. Surface Outlets. When discharging from basins and impoundments, the outlets shall be designed, constructed and maintained in such a manner that sediment does not leave the basin or impoundment and that erosion at or below the outlet does not occur.

C. Post-construction Stormwater Management Practice Requirements

1. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must select, design, install, and maintain the practices to meet the *performance criteria* in the New York State Stormwater Management Design Manual ("Design Manual"), dated January 2015, using sound engineering judgment. Where post-construction stormwater management practices ("SMPs") are not designed in conformance with the *performance criteria* in the Design Manual, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must design the practices to meet the applicable *sizing criteria* in Part I.C.2.a., b., c. or d. of this permit.

   a. ***Sizing Criteria* for *New Development***

      (i) Runoff Reduction Volume ("RRv"): Reduce the total Water Quality Volume ("WQv") by application of RR techniques and standard SMPs with RRv capacity. The total WQv shall be calculated in accordance with the criteria in Section 4.2 of the Design Manual.

      (ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.a.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

      In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 4.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (“Cpv”): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or

(2) The site *discharge*s directly to tidal waters, or fifth order or larger streams.

(iv) Overbank Flood Control Criteria (“Qp”): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that overbank control is not required.

(v) Extreme Flood Control Criteria (“Qf”): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that overbank control is not required.

b. ***Sizing Criteria* for *New Development* in Enhanced Phosphorus Removal Watershed**

(i) Runoff Reduction Volume (RRv): Reduce the total Water Quality Volume (WQv) by application of RR techniques and standard SMPs with RRv capacity. The total WQv is the runoff volume from the 1-year, 24 hour design storm over the post-developed watershed and shall be calculated in accordance with the criteria in Section 10.3 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.b.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 10.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (Cpv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:

(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or

(2) The site *discharge*s directly to tidal waters, or fifth order or larger streams.

(iv) Overbank Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:

(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that overbank control is not required.

(v) Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:

(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that overbank control is not required.

c. ***Sizing Criteria* for *Redevelopment Activity***

(i) Water Quality Volume (WQv): The WQv treatment objective for *redevelopment activity* shall be addressed by one of the following options. *Redevelopment activities* located in an Enhanced Phosphorus Removal Watershed (see Part III.B.3. and Appendix C of this permit) shall calculate the WQv in accordance with Section 10.3 of the Design Manual. All other *redevelopment activities* shall calculate the WQv in accordance with Section 4.2 of the Design Manual.

(1) Reduce the existing *impervious cover* by a minimum of 25% of the total disturbed, *impervious area*. The Soil Restoration criteria in Section 5.1.6 of the Design Manual must be applied to all newly created pervious areas, or
(2) Capture and treat a minimum of 25% of the WQv from the disturbed, *impervious area* by the application of standard SMPs; or reduce 25% of the WQv from the disturbed, *impervious area* by the application of RR techniques or standard SMPs with RRv capacity., or
(3) Capture and treat a minimum of 75% of the WQv from the disturbed, *impervious area* as well as any additional runoff from tributary areas by application of the alternative practices discussed in Sections 9.3 and 9.4 of the Design Manual., or
(4) Application of a combination of 1, 2 and 3 above that provide a weighted average of at least two of the above methods. Application of this method shall be in accordance with the criteria in Section 9.2.1(B) (IV) of the Design Manual.

If there is an existing post-construction stormwater management practice located on the site that captures and treats runoff from the *impervious area* that is being disturbed, the WQv treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options 1 – 4 above.

(ii) Channel Protection Volume (Cpv): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iii) Overbank Flood Control Criteria (Qp): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iv) Extreme Flood Control Criteria (Qf): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

d. ***Sizing Criteria* for Combination of *Redevelopment Activity* and *New Development***

Construction projects that include both *New Development* and *Redevelopment Activity* shall provide post-construction stormwater management controls that meet the *sizing criteria* calculated as an aggregate of the *Sizing Criteria* in Part I.C.2.a. or b. of this permit for the *New Development* portion of the project and Part I.C.2.c of this permit for *Redevelopment Activity* portion of the project.

D. Maintaining Water Quality

The Department expects that compliance with the conditions of this permit will control *discharge*s necessary to meet applicable *water quality standards*. It shall be a violation of the *ECL* for any discharge to either cause or contribute to a violation of *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, such as:

1. There shall be no increase in turbidity that will cause a substantial visible contrast to natural conditions;

2. There shall be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and

3. There shall be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

If there is evidence indicating that the stormwater *discharge*s authorized by this permit are causing, have the reasonable potential to cause, or are contributing to a violation of the *water quality standards*; the *owner or operator* must take appropriate corrective action in accordance with Part IV.C.5. of this general permit and document in accordance with Part IV.C.4. of this general permit. To address the *water quality standard* violation the *owner or operator* may need to provide additional information, include and implement appropriate controls in the SWPPP to correct the problem, or obtain an individual SPDES permit.

If there is evidence indicating that despite compliance with the terms and conditions of this general permit it is demonstrated that the stormwater *discharge*s authorized by this permit are causing or contributing to a violation of *water quality standards*, or if the Department determines that a modification of the permit is necessary to prevent a violation of *water quality standards*, the authorized *discharge*s will no longer be eligible for coverage under this permit. The Department may require the *owner or operator* to obtain an individual SPDES permit to continue discharging.

E. Eligibility Under This General Permit

1. This permit may authorize all *discharges* of stormwater from *construction activity* to *surface waters of the State* and *groundwaters* except for ineligible *discharges* identified under subparagraph F. of this Part.

2. Except for non-stormwater *discharges* explicitly listed in the next paragraph, this permit only authorizes stormwater *discharge*s from *construction activities*.

3. Notwithstanding paragraphs E.1 and E.2 above, the following non-stormwater *discharges* may be authorized by this permit: *discharge*s from firefighting activities; fire hydrant flushings; waters to which cleansers or other components have not been added that are used to wash vehicles or control dust in accordance with the SWPPP, routine external building washdown which does not use detergents; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; uncontaminated *groundwater* or spring water; uncontaminated *discharge*s from construction site de-watering operations; and foundation or footing drains where flows are not contaminated with process materials such as solvents. For those entities required to obtain coverage under this permit, and who *discharge* as noted in this paragraph, and with the exception of flows from firefighting activities, these *discharge*s must be identified in the SWPPP. Under all circumstances, the *owner or operator* must still comply with *water quality standards* in Part I.D of this permit.

4. The *owner or operator* must maintain permit eligibility to *discharge* under this permit. Any *discharges* that are not compliant with the eligibility conditions of this permit are not authorized by the permit and the *owner or operator* must either apply for a separate permit to cover those ineligible *discharges* or take steps necessary to make the *discharge* eligible for coverage.

F. Activities Which Are Ineligible for Coverage Under This General Permit
All of the following are **not** authorized by this permit:

1. *Discharge*s after *construction activities* have been completed and the site has undergone *final stabilization*;

2. *Discharge*s that are mixed with sources of non-stormwater other than those expressly authorized under subsection E.3. of this Part and identified in the SWPPP required by this permit;

3. *Discharges* that are required to obtain an individual SPDES permit or another SPDES general permit pursuant to Part VII.K. of this permit;

4. *Construction activities* or *discharges* from *construction activities* that may adversely affect an endangered or threatened species unless the *owner or operator* has obtained a permit issued pursuant to 6 NYCRR Part 182 for the project or the Department has issued a letter of non-jurisdiction for the project. All documentation necessary to demonstrate eligibility shall be maintained on site in accordance with Part II.C.2 of this permit.

5. *Discharges* which either cause or contribute to a violation of *water quality standards* adopted pursuant to the *ECL* and its accompanying regulations;

6. *Construction activities* for residential, commercial and institutional projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which disturb one or more acres of land with no existing *impervious cover*; and

   c. Which are undertaken on land with a Soil Slope Phase that is identified as an E or F, or the map unit name is inclusive of 25% or greater slope, on the United States Department of Agriculture (“USDA”) Soil Survey for the County where the disturbance will occur.

7. *Construction activities* for linear transportation projects and linear utility projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which disturb two or more acres of land with no existing *impervious cover*; and

   c. Which are undertaken on land with a Soil Slope Phase that is identified as an E or F, or the map unit name is inclusive of 25% or greater slope, on the USDA Soil Survey for the County where the disturbance will occur.

8. *Construction activities* that have the potential to affect an *historic property*, unless there is documentation that such impacts have been resolved. The following documentation necessary to demonstrate eligibility with this requirement shall be maintained on site in accordance with Part II.C.2 of this permit and made available to the Department in accordance with Part VII.F of this permit:

   a. Documentation that the *construction activity* is not within an archeologically sensitive area indicated on the sensitivity map, and that the *construction activity* is not located on or immediately adjacent to a property listed or determined to be eligible for listing on the National or State Registers of Historic Places, and that there is no new permanent building on the construction site within the following distances from a building, structure, or object that is more than 50 years old, or if there is such a new permanent building on the construction site within those parameters that NYS Office of Parks, Recreation and Historic Preservation (OPRHP), a Historic Preservation Commission of a Certified Local Government, or a qualified preservation professional has determined that the building, structure, or object more than 50 years old is not historically/archeologically significant.

      - 1-5 acres of disturbance - 20 feet
      - 5-20 acres of disturbance - 50 feet
      - 20+ acres of disturbance - 100 feet, or

   b. DEC consultation form sent to OPRHP, and copied to the NYS DEC Agency Historic Preservation Officer (APO), and
      (i) the State Environmental Quality Review (SEQR) Environmental Assessment Form (EAF) with a negative declaration or the Findings Statement, with documentation of OPRHP's agreement with the resolution; or
      (ii) documentation from OPRHP that the *construction activity* will result in No Impact; or
      (iii) documentation from OPRHP providing a determination of No Adverse Impact; or
      (iv) a Letter of Resolution signed by the owner/operator, OPRHP and the DEC APO which allows for this *construction activity* to be eligible for coverage under the general permit in terms of the State Historic Preservation Act (SHPA); or

   c. Documentation of satisfactory compliance with Section 106 of the National Historic Preservation Act for a coterminous project area:
      (i) No Affect
      (ii) No Adverse Affect

(iii) Executed Memorandum of Agreement, or

d. Documentation that:

(i) SHPA Section 14.09 has been completed by NYS DEC or another state agency.

9. *Discharge*s from *construction activities* that are subject to an existing SPDES individual or general permit where a SPDES permit for *construction activity* has been terminated or denied; or where the *owner or operator* has failed to renew an expired individual permit.

Part II. OBTAINING PERMIT COVERAGE

A. Notice of Intent (NOI) Submittal

1. An *owner or operator* of a *construction activity* that is not subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then submit a completed NOI form to the Department in order to be authorized to *discharge* under this permit. An *owner or operator* shall use either the electronic (eNOI) or paper version of the NOI that the Department prepared. Both versions of the NOI are located on the Department's website (http://www.dec.ny.gov/). The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the following address.

NOTICE OF INTENT
NYS DEC, Bureau of Water Permits
625 Broadway, 4th Floor
Albany, New York 12233-3505

2. An *owner or operator* of a *construction activity* that is subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then have its SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department. The *owner or operator* shall have the "MS4 SWPPP Acceptance" form signed in accordance with Part VII.H., and then submit that form along with a completed NOI to the Department. An *owner or operator* shall use either the electronic (eNOI) or paper version of the NOI.

   The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the address in Part II.A.1.

The requirement for an *owner or operator* to have its SWPPP reviewed and accepted by the *MS4* prior to submitting the NOI to the Department does not apply to an *owner or operator* that is obtaining permit coverage in accordance with the requirements in Part II.E. (Change of *Owner or Operator*) or where the *owner or operator* of the *construction activity* is the *regulated, traditional land use control MS4*.

3. The *owner or operator* shall have the SWPPP preparer sign the "SWPPP Preparer Certification" statement on the NOI prior to submitting the form to the Department.

4. As of the date the NOI is submitted to the Department, the *owner or operator* shall make the NOI and SWPPP available for review and copying in accordance with the requirements in Part VII.F. of this permit.

B. Permit Authorization

1. An *owner or operator* shall not *commence construction activity* until their authorization to *discharge* under this permit goes into effect.

2. Authorization to *discharge* under this permit will be effective when the *owner or operator* has satisfied all of the following criteria:

   a. project review pursuant to the State Environmental Quality Review Act ("SEQRA") have been satisfied, when SEQRA is applicable. See the Department's website (http://www.dec.ny.gov/) for more information,

   b. where required, all necessary Department permits subject to the *Uniform Procedures Act ("UPA")* (see 6 NYCRR Part 621) have been obtained, unless otherwise notified by the Department pursuant to 6 NYCRR 621.3(a)(4). *Owners or operators* of *construction activities* that are required to obtain *UPA* permits must submit a preliminary SWPPP to the appropriate DEC Permit Administrator at the Regional Office listed in Appendix F at the time all other necessary *UPA* permit applications are submitted. The preliminary SWPPP must include sufficient information to demonstrate that the *construction activity* qualifies for authorization under this permit,

   c. the final SWPPP has been prepared, and

   d. a complete NOI has been submitted to the Department in accordance with the requirements of this permit.

3. An *owner or operator* that has satisfied the requirements of Part II.B.2 above

will be authorized to *discharge* stormwater from their *construction activity* in accordance with the following schedule:

a. For *construction activities* that are not subject to the requirements of a *regulated, traditional land use control MS4*:

(i) Five (5) business days from the date the Department receives a complete electronic version of the NOI (eNOI) for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.; or

(ii) Sixty (60) business days from the date the Department receives a complete NOI (electronic or paper version) for *construction activities* with a SWPPP that has not been prepared in conformance with the design criteria in technical standard referenced in Part III.B.1. or, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C., the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, or;

(iii) Ten (10) business days from the date the Department receives a complete paper version of the NOI for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.

b. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*:

(i) Five (5) business days from the date the Department receives both a complete electronic version of the NOI (eNOI) and signed "*MS4* SWPPP Acceptance" form, or

(ii) Ten (10) business days from the date the Department receives both a complete paper version of the NOI and signed "MS4 SWPPP Acceptance" form.

4. The Department may suspend or deny an *owner's or operator's* coverage

under this permit if the Department determines that the SWPPP does not meet the permit requirements. In accordance with statute, regulation, and the terms and conditions of this permit, the Department may deny coverage under this permit and require submittal of an application for an individual SPDES permit based on a review of the NOI or other information pursuant to Part II.

5. Coverage under this permit authorizes stormwater *discharges* from only those areas of disturbance that are identified in the NOI. If an *owner or operator* wishes to have stormwater *discharges* from future or additional areas of disturbance authorized, they must submit a new NOI that addresses that phase of the development, unless otherwise notified by the Department. The *owner or operator* shall not *commence construction activity* on the future or additional areas until their authorization to *discharge* under this permit goes into effect in accordance with Part II.B. of this permit.

C. General Requirements For Owners or Operators With Permit Coverage

1. The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination ("NOT") has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4. of this permit.

2. The *owner or operator* shall maintain a copy of the General Permit (GP-0-15-002), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form, inspection reports, and all documentation necessary to demonstrate eligibility with this permit at the construction site until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department. The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

3. The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:

a. The *owner or operator* shall

have a *qualified inspector* conduct **at least** two (2) site inspections in accordance with Part IV.C. of this permit every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

b. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016.

c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

d. The *owner or operator* shall install any additional site specific practices needed to protect water quality.

e. The *owner or operator* shall include the requirements above in their SWPPP.

4. In accordance with statute, regulations, and the terms and conditions of this permit, the Department may suspend or revoke an *owner's or operator's* coverage under this permit at any time if the Department determines that the SWPPP does not meet the permit requirements. Upon a finding of significant non-compliance with the practices described in the SWPPP or violation of this permit, the Department may order an immediate stop to all activity at the site until the non-compliance is remedied. The stop work order shall be in writing, describe the non-compliance in detail, and be sent to the *owner or operator*.

5. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*, the *owner or operator* shall notify the *regulated, traditional land use control MS4* in writing of any planned amendments or modifications to the post-construction stormwater management practice component of the SWPPP required by Part III.A. 4. and 5. of this permit. Unless otherwise notified by the *regulated, traditional land use control MS4*, the *owner or operator* shall have the SWPPP amendments or modifications reviewed and accepted by the *regulated, traditional land use control MS4* prior to commencing construction of the post-construction stormwater management practice

D. Permit Coverage for Discharges Authorized Under GP-0-10-001

1. Upon renewal of SPDES General Permit for Stormwater Discharges from *Construction Activity* (Permit No. GP-0-10-001), an *owner or operator* of *a construction activity* with coverage under GP-0-10-001, as of the effective date of GP-0-15-002, shall be authorized to *discharge* in accordance with GP-0-15-002, unless otherwise notified by the Department.

   An *owner or operator* may continue to implement the technical/design components of the post-construction stormwater management controls provided that such design was done in conformance with the technical standards in place at the time of initial project authorization. However, they must comply with the other, non-design provisions of GP-0-15-002.

E. Change of *Owner or Operator*

1. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, in writing, of the requirement to obtain permit coverage by submitting a NOI with the Department. Once the new *owner or operator* obtains permit coverage, the original *owner or operator* shall then submit a completed NOT with the name and permit identification number of the new *owner or operator* to the Department at the address in Part II.A.1. of this permit. If the original *owner or operator* maintains ownership of a portion of the *construction activity* and will disturb soil, they must maintain their coverage under the permit.

Permit coverage for the new *owner or operator* will be effective as of the date the Department receives a complete NOI, provided the original *owner or operator* was not subject to a sixty (60) business day authorization period that has not expired as of the date the Department receives the NOI from the new *owner or operator*.

Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. General SWPPP Requirements

1. A SWPPP shall be prepared and implemented by the *owner or operator* of each *construction activity* covered by this permit. The SWPPP must document the selection, design, installation, implementation and maintenance of the control measures and practices that will be used to meet the effluent limitations in Part I.B. of this permit and where applicable, the post-construction stormwater management practice requirements in Part I.C. of this permit. The SWPPP shall be prepared prior to the submittal of the NOI. The NOI shall be submitted to the Department prior to the *commencement of construction activity*. A copy of the completed, final NOI shall be included in the SWPPP.

2. The SWPPP shall describe the erosion and sediment control practices and where required, post-construction stormwater management practices that will be used and/or constructed to reduce the *pollutants* in stormwater *discharges* and to assure compliance with the terms and conditions of this permit. In addition, the SWPPP shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater *discharges*.

3. All SWPPPs that require the post-construction stormwater management practice component shall be prepared by a *qualified professional* that is knowledgeable in the principles and practices of stormwater management and treatment.

4. The *owner or operator* must keep the SWPPP current so that it at all times accurately documents the erosion and sediment controls practices that are being used or will be used during construction, and all post-construction stormwater management practices that will be constructed on the site. At a minimum, the *owner or operator* shall amend the SWPPP:

   a. whenever the current provisions prove to be ineffective in minimizing *pollutants* in stormwater *discharges* from the site;

   b. whenever there is a change in design, construction, or operation at the construction site that has or could have an effect on the *discharge* of *pollutants*; and

   c. to address issues or deficiencies identified during an inspection by the *qualified inspector,* the Department or other regulatory authority.

5. The Department may notify the *owner or operator* at any time that the

SWPPP does not meet one or more of the minimum requirements of this permit. The notification shall be in writing and identify the provisions of the SWPPP that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by the Department, the *owner or operator* shall make the required changes to the SWPPP and submit written notification to the Department that the changes have been made. If the *owner or operator* does not respond to the Department's comments in the specified time frame, the Department may suspend the *owner's or operator's* coverage under this permit or require the *owner or operator* to obtain coverage under an individual SPDES permit in accordance with Part II.C.4. of this permit.

6. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The *owner or operator* shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor.* The *owner or operator* shall ensure that at least one *trained contractor* is on site on a daily basis when soil disturbance activities are being performed.

   The *owner or operator* shall have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before they commence any *construction activity*:

   > "I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater *discharge*s from *construction activities* and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

   In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the *trained contractor* responsible for SWPPP implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The *owner or operator* shall attach the certification statement(s) to the copy of the SWPPP that is maintained at the construction site. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has commenced, they must also sign the certification statement and provide the information listed above.

7. For projects where the Department requests a copy of the SWPPP or inspection reports, the *owner or operator* shall submit the documents in both electronic (PDF only) and paper format within five (5) business days, unless otherwise notified by the Department.

B. Required SWPPP Contents

1. Erosion and sediment control component - All SWPPPs prepared pursuant to this permit shall include erosion and sediment control practices designed in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Where erosion and sediment control practices are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must demonstrate *equivalence* to the technical standard. At a minimum, the erosion and sediment control component of the SWPPP shall include the following:

   a. Background information about the scope of the project, including the location, type and size of project;

   b. A site map/construction drawing(s) for the project, including a general location map. At a minimum, the site map shall show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s); floodplain/floodway boundaries; wetlands and drainage patterns that could be affected by the *construction activity*; existing and final contours ; locations of different soil types with boundaries; material, waste, borrow or equipment storage areas located on adjacent properties; and location(s) of the stormwater *discharge*(s);

   c. A description of the soil(s) present at the site, including an identification of the Hydrologic Soil Group (HSG);

   d. A construction phasing plan and sequence of operations describing the intended order of *construction activities*, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance;

e. A description of the minimum erosion and sediment control practices to be installed or implemented for each *construction activity* that will result in soil disturbance. Include a schedule that identifies the timing of initial placement or implementation of each erosion and sediment control practice and the minimum time frames that each practice should remain in place or be implemented;

f. A temporary and permanent soil stabilization plan that meets the requirements of this general permit and the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, for each stage of the project, including initial land clearing and grubbing to project completion and achievement of *final stabilization*;

g. A site map/construction drawing(s) showing the specific location(s), size(s), and length(s) of each erosion and sediment control practice;

h. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any temporary sediment basins and structural practices that will be used to divert flows from exposed soils;

i. A maintenance inspection schedule for the contractor(s) identified in Part III.A.6. of this permit, to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection schedule shall be in accordance with the requirements in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016;

j. A description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a *pollutant* source in the stormwater *discharges*;

k. A description and location of any stormwater *discharges* associated with industrial activity other than construction at the site, including, but not limited to, stormwater *discharges* from asphalt plants and concrete plants located on the construction site; and

l. Identification of any elements of the design that are not in conformance with the design criteria in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. Post-construction stormwater management practice component – The *owner or operator* of any construction project identified in Table 2 of Appendix B as needing post-construction stormwater management practices shall prepare a SWPPP that includes practices designed in conformance with the applicable *sizing criteria* in Part I.C.2.a., c. or d. of this permit and the *performance criteria* in the technical standard, New York State Stormwater Management Design Manual dated January 2015

   Where post-construction stormwater management practices are not designed in conformance with the *performance criteria* in the technical standard, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

   The post-construction stormwater management practice component of the SWPPP shall include the following:

   a. Identification of all post-construction stormwater management practices to be constructed as part of the project. Include the dimensions, material specifications and installation details for each post-construction stormwater management practice;

   b. A site map/construction drawing(s) showing the specific location and size of each post-construction stormwater management practice;

   c. A Stormwater Modeling and Analysis Report that includes:

      (i) Map(s) showing pre-development conditions, including watershed/subcatchments boundaries, flow paths/routing, and design points;

      (ii) Map(s) showing post-development conditions, including watershed/subcatchments boundaries, flow paths/routing, design points and post-construction stormwater management practices;

      (iii) Results of stormwater modeling (i.e. hydrology and hydraulic analysis) for the required storm events. Include supporting calculations (model runs), methodology, and a summary table that compares pre and post-development runoff rates and volumes for the different storm events;

      (iv) Summary table, with supporting calculations, which demonstrates that each post-construction stormwater management practice has been designed in conformance with the *sizing criteria* included in the Design Manual;

(v) Identification of any *sizing criteria* that is not required based on the requirements included in Part I.C. of this permit; and

(vi) Identification of any elements of the design that are not in conformance with the *performance criteria* in the Design Manual. Include the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the Design Manual;

d. Soil testing results and locations (test pits, borings);

e. Infiltration test results, when required; and

f. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each post-construction stormwater management practice. The plan shall identify the entity that will be responsible for the long term operation and maintenance of each practice.

3. Enhanced Phosphorus Removal Standards - All construction projects identified in Table 2 of Appendix B that are located in the watersheds identified in Appendix C shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the applicable *sizing criteria* in Part I.C.2. b., c. or d. of this permit and the *performance criteria,* Enhanced Phosphorus Removal Standards included in the Design Manual. At a minimum, the post-construction stormwater management practice component of the SWPPP shall include items 2.a - 2.f. above.

C. Required SWPPP Components by Project Type

Unless otherwise notified by the Department, *owners or operators* of *construction activities* identified in Table 1 of Appendix B are required to prepare a SWPPP that only includes erosion and sediment control practices designed in conformance with Part III.B.1 of this permit. *Owners or operators* of the *construction activities* identified in Table 2 of Appendix B shall prepare a SWPPP that also includes post-construction stormwater management practices designed in conformance with Part III.B.2 or 3 of this permit.

Part IV. INSPECTION AND MAINTENANCE REQUIREMENTS

A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices (including pollution prevention measures) and all post-construction stormwater management practices identified in the SWPPP are inspected and maintained in accordance with Part IV.B. and C. of this permit.

2. The terms of this permit shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York, or protect the public health and safety and/or the environment.

B. Contractor Maintenance Inspection Requirements

1. The *owner or operator* of each *construction activity* identified in Tables 1 and 2 of Appendix B shall have a *trained contractor* inspect the erosion and sediment control practices and pollution prevention measures being implemented within the active work area daily to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the contractor shall begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

2. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *trained contractor* can stop conducting the maintenance inspections. The *trained contractor* shall begin conducting the maintenance inspections in accordance with Part IV.B.1. of this permit as soon as soil disturbance activities resume.

3. For construction sites where soil disturbance activities have been shut down with partial project completion, the *trained contractor* can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* <u>and</u> all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

C. Qualified Inspector Inspection Requirements

The *owner or operator* shall have a *qualified inspector* conduct site inspections in conformance with the following requirements:

[Note: The *trained contractor* identified in Part III.A.6. and IV.B. of this permit **cannot** conduct the *qualified inspector* site inspections unless they meet the *qualified inspector* qualifications included in Appendix A. In order to perform these inspections, the *trained contractor* would have to be a:

- licensed Professional Engineer,
- Certified Professional in Erosion and Sediment Control (CPESC),
- Registered Landscape Architect, or
- someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity].

1. A *qualified inspector* shall conduct site inspections for all *construction activities* identified in Tables 1 and 2 of Appendix B, <u>with the exception of</u>:

   a. the construction of a single family residential subdivision with 25% or less *impervious cover* at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is <u>not</u> located in one of the watersheds listed in Appendix C and <u>not</u> directly discharging to one of the 303(d) segments listed in Appendix E;

   b. the construction of a single family home that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is <u>not</u> located in one of the watersheds listed in Appendix C and <u>not</u> directly discharging to one of the 303(d) segments listed in Appendix E;

   c. construction on agricultural property that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres; and

   d. *construction activities* located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

2. Unless otherwise notified by the Department, the *qualified inspector* shall conduct site inspections in accordance with the following timetable:

   a. For construction sites where soil disturbance activities are on-going, the *qualified inspector* shall conduct a site inspection at least once every seven (7) calendar days.

   b. For construction sites where soil disturbance activities are on-going and the *owner or operator* has received authorization in accordance with Part II.C.3 to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

c. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to reducing the frequency of inspections.

d. For construction sites where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* <u>and</u> all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization,* <u>and</u> all temporary, structural erosion and sediment control measures have been removed*;* and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice" certification statements on the NOT. The *owner or operator* shall then submit the completed NOT form to the address in Part II.A.1 of this permit.

e. For construction sites that directly *discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

3. At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved *final stabilization,* all points of *discharge* to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site, and all points of *discharge* from the construction site.

4. The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

a. Date and time of inspection;

b. Name and title of person(s) performing inspection;

c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

d. A description of the condition of the runoff at all points of *discharge* from the construction site. This shall include identification of any *discharges* of sediment from the construction site. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas. This shall include identification of any *discharges* of sediment to the surface waterbody;

f. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance;

g. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

h. Description and sketch of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection;

(Part IV.C.4.i)

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices and pollution prevention measures; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s);

k. Identification and status of all corrective actions that were required by previous inspection; and

l. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

5. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the *owner or operator* and appropriate contractor or subcontractor identified in Part III.A.6. of this permit of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

6. All inspection reports shall be signed by the *qualified inspector.* Pursuant to Part II.C.2. of this permit, the inspection reports shall be maintained on site with the SWPPP.

Part V. TERMINATION OF PERMIT COVERAGE

A. Termination of Permit Coverage

1. An *owner or operator* that is eligible to terminate coverage under this permit must submit a completed NOT form to the address in Part II.A.1 of this permit. The NOT form shall be one which is associated with this permit, signed in accordance with Part VII.H of this permit.

2. An *owner or operator* may terminate coverage when one or more the following conditions have been met:

   a. Total project completion - All *construction activity* identified in the SWPPP has been completed; <u>and</u> all areas of disturbance have achieved *final stabilization*; <u>and</u> all temporary, structural erosion and sediment control measures have been removed; <u>and</u> all post-construction stormwater management practices have been constructed in conformance with the SWPPP and are operational;

   b. Planned shutdown with partial project completion - All soil disturbance activities have ceased; <u>and</u> all areas disturbed as of the project shutdown date have achieved *final stabilization*; <u>and</u> all temporary, structural erosion and sediment control measures have been removed; <u>and</u> all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational;

   c. A new *owner or operator* has obtained coverage under this permit in accordance with Part II.E. of this permit.

   d. The *owner or operator* obtains coverage under an alternative SPDES general permit or an individual SPDES permit.

3. For *construction activities* meeting subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *qualified inspector* perform a final site inspection prior to submitting the NOT. The *qualified inspector* shall, by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice certification statements on the NOT, certify that all the requirements in Part V.A.2.a. or b. of this permit have been achieved.

4. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4* and meet subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *regulated, traditional land use control MS4* sign the "MS4 Acceptance" statement on the NOT in accordance with the requirements in Part VII.H. of this permit. The *regulated, traditional land use control MS4* official, by signing this statement, has determined that it is acceptable for the *owner or operator* to submit the NOT in accordance with the requirements of this Part. The *regulated, traditional land use control MS4* can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector*'s final site inspection certification(s) required in Part V.A.3. of this permit.

5. For *construction activities* that require post-construction stormwater management practices and meet subdivision 2a. of this Part, the *owner or operator* must, prior to submitting the NOT, ensure one of the following:

   a. the post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain such practice(s) have been deeded to the municipality in which the practice(s) is located,

   b. an executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s),

   c. for post-construction stormwater management practices that are privately owned, the *owner or operator* has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the *owner or operator's* deed of record,

   d. for post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university, hospital), government agency or authority, or public utility; the *owner or operator* has policy and procedures in place that ensures operation and maintenance of the practices in accordance with the operation and maintenance plan.

Part VI. REPORTING AND RETENTION OF RECORDS

A. Record Retention

The *owner or operator* shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the Department receives a complete NOT submitted in accordance with Part V. of this general permit.

B. Addresses

With the exception of the NOI, NOT, and MS4 SWPPP Acceptance form (which must be submitted to the address referenced in Part II.A.1 of this permit), all written correspondence requested by the Department, including individual permit applications, shall be sent to the address of the appropriate DOW Water (SPDES) Program contact at the Regional Office listed in Appendix F.

Part VII. STANDARD PERMIT CONDITIONS

A. Duty to Comply

The *owner or operator* must comply with all conditions of this permit. All contractors and subcontractors associated with the project must comply with the terms of the SWPPP. Any non-compliance with this permit constitutes a violation of the Clean Water Act (CWA) and the ECL and is grounds for an enforcement action against the *owner or operator* and/or the contractor/subcontractor; permit revocation, suspension or modification; or denial of a permit renewal application. Upon a finding of significant non-compliance with this permit or the applicable SWPPP, the Department may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied. The stop work order shall be in writing, shall describe the non-compliance in detail, and shall be sent to the *owner or operator*.

If any human remains or archaeological remains are encountered during excavation, the *owner or operator* must immediately cease, or cause to cease, all *construction activity* in the area of the remains and notify the appropriate Regional Water Engineer (RWE). *Construction activity* shall not resume until written permission to do so has been received from the RWE.

B. Continuation of the Expired General Permit

This permit expires five (5) years from the effective date. If a new general permit is not issued prior to the expiration of this general permit, an *owner or operator* with coverage under this permit may continue to operate and *discharge* in accordance with the terms and conditions of this general permit, if it is extended pursuant to the State Administrative Procedure Act and 6 NYCRR Part 621, until a new general permit is issued.

C. Enforcement

Failure of the *owner or operator,* its contractors, subcontractors, agents and/or assigns to strictly adhere to any of the permit requirements contained herein shall constitute a violation of this permit. There are substantial criminal, civil, and administrative penalties associated with violating the provisions of this permit. Fines of up to $37,500 per day for each violation and imprisonment for up to fifteen (15) years may be assessed depending upon the nature and degree of the offense.

D. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for an *owner or operator* in an enforcement action that it would have been necessary to halt or reduce the *construction activity* in order to maintain compliance with the conditions of this permit.

E. Duty to Mitigate

The *owner or operator* and its contractors and subcontractors shall take all reasonable steps to *minimize* or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

F. Duty to Provide Information

The *owner or operator* shall furnish to the Department, within a reasonable specified time period of a written request, all documentation necessary to demonstrate eligibility and any information to determine compliance with this permit or to determine whether cause exists for modifying or revoking this permit, or suspending or denying coverage under this permit, in accordance with the terms and conditions of this permit. The NOI, SWPPP and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five (5) business days of the *owner or operator* receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

G. Other Information

When the *owner or operator* becomes aware that they failed to submit any relevant facts, or submitted incorrect information in the NOI or in any of the documents required by this permit , or have made substantive revisions to the SWPPP (e.g. the scope of the project changes significantly, the type of post-construction stormwater management practice(s) changes, there is a reduction in the sizing of the post-construction stormwater management practice, or there is an increase in the disturbance area or *impervious area*), which were not reflected in the original NOI submitted to the Department, they shall promptly submit such facts or information to the Department using the contact information in Part II.A. of this permit. Failure of the *owner or operator* to correct or supplement any relevant facts within five (5) business days of becoming aware of the deficiency shall constitute a violation of this permit.

H. Signatory Requirements

1. All NOIs and NOTs shall be signed as follows:

   a. For a corporation these forms shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

      (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

(ii) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

b. For a partnership or sole proprietorship these forms shall be signed by a general partner or the proprietor, respectively; or

c. For a municipality, State, Federal, or other public agency these forms shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(i) the chief executive officer of the agency, or

(ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. The SWPPP and other information requested by the Department shall be signed by a person described in Part VII.H.1. of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Part VII.H.1. of this permit;

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of *equivalent* responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position) and,

c. The written authorization shall include the name, title and signature of the authorized representative and be attached to the SWPPP.

3. All inspection reports shall be signed by the *qualified inspector* that performs the inspection.

4. The MS4 SWPPP Acceptance form shall be signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4,* or by a duly authorized representative of that person.

   It shall constitute a permit violation if an incorrect and/or improper signatory authorizes any required forms, SWPPP and/or inspection reports.

I. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. *Owners or operators* must obtain any applicable conveyances, easements, licenses and/or access to real property prior to *commencing construction activity*.

J. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

K. Requirement to Obtain Coverage Under an Alternative Permit

1. The Department may require any *owner or operator* authorized by this permit to apply for and/or obtain either an individual SPDES permit or another SPDES general permit. When the Department requires any *discharge*r authorized by a general permit to apply for an individual SPDES permit, it shall notify the *discharge*r in writing that a permit application is required. This notice shall include a brief statement of the reasons for this decision, an application form, a statement setting a time frame for the *owner or operator* to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from *owner or operator* receipt of the notification letter, whereby the authorization to

discharge under this general permit shall be terminated. Applications must be submitted to the appropriate Permit Administrator at the Regional Office. The Department may grant additional time upon demonstration, to the satisfaction of the Department, that additional time to apply for an alternative authorization is necessary or where the Department has not provided a permit determination in accordance with Part 621 of this Title.

2. When an individual SPDES permit is issued to a discharger authorized to *discharge* under a general SPDES permit for the same *discharge*(s), the general permit authorization for outfalls authorized under the individual SPDES permit is automatically terminated on the effective date of the individual permit unless termination is earlier in accordance with 6 NYCRR Part 750.

L. Proper Operation and Maintenance

The *owner or operator* shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the *owner or operator* to achieve compliance with the conditions of this permit and with the requirements of the SWPPP.

M. Inspection and Entry

The *owner or operator* shall allow an authorized representative of the Department, EPA, applicable county health department, or, in the case of a construction site which *discharges* through an *MS4*, an authorized representative of the *MS4* receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the *owner's or operator's* premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment), practices or operations regulated or required by this permit.

4. Sample or monitor at reasonable times, for purposes of assuring permit compliance or as otherwise authorized by the Act or ECL, any substances or parameters at any location.

N. Permit Actions

This permit may, at any time, be modified, suspended, revoked, or renewed by the Department in accordance with 6 NYCRR Part 621. The filing of a request by the *owner or operator* for a permit modification, revocation and reissuance, termination, a notification of planned changes or anticipated noncompliance does not limit, diminish and/or stay compliance with any terms of this permit.

O. Definitions

Definitions of key terms are included in Appendix A of this permit.

P. Re-Opener Clause

1. If there is evidence indicating potential or realized impacts on water quality due to any stormwater discharge associated with *construction activity* covered by this permit, the *owner or operator* of such discharge may be required to obtain an individual permit or alternative general permit in accordance with Part VII.K. of this permit or the permit may be modified to include different limitations and/or requirements.

2. Any Department initiated permit modification, suspension or revocation will be conducted in accordance with 6 NYCRR Part 621, 6 NYCRR 750-1.18, and 6 NYCRR 750-1.20.

Q. Penalties for Falsification of Forms and Reports

In accordance with 6NYCRR Part 750-2.4 and 750-2.5, any person who knowingly makes any false material statement, representation, or certification in any application, record, report or other document filed or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished in accordance with ECL §71-1933 and or Articles 175 and 210 of the New York State Penal Law.

R. Other Permits

Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

APPENDIX A

Definitions

Alter Hydrology from Pre to Post-Development Conditions - means the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

Combined Sewer - means a sewer that is designed to collect and convey both "sewage" and "stormwater".

Commence (Commencement of) Construction Activities - means the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the SWPPP. See definition for "*Construction Activity(ies)*" also.

***Construction Activity*(ies) -** means any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Direct Discharge (to a specific surface waterbody) - means that runoff flows from a construction site by overland flow and the first point of discharge is the specific surface waterbody, or runoff flows from a construction site to a separate storm sewer system and the first point of discharge from the separate storm sewer system is the specific surface waterbody.

Discharge(s) - means any addition of any pollutant to waters of the State through an outlet or point source.

Environmental Conservation Law (ECL) - means chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law.

Equivalent (Equivalence) – means that the practice or measure meets all the performance, longevity, maintenance, and safety objectives of the technical standard and will provide an equal or greater degree of water quality protection.

Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

General SPDES permit - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 and Section 70-0117 of the ECL authorizing a category of discharges.

Groundwater(s) - means waters in the saturated zone. The saturated zone is a subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated.

Historic Property – means any building, structure, site, object or district that is listed on the State or National Registers of Historic Places or is determined to be eligible for listing on the State
or National Registers of Historic Places.

Impervious Area (Cover) - means all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

Infeasible – means not technologically possible, or not economically practicable and achievable in light of best industry practices.

Larger Common Plan of Development or Sale - means a contiguous area where multiple separate and distinct *construction activities* are occurring, or will occur, under one plan. The term “plan” in “larger common plan of development or sale” is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQRA) environmental assessment form or other documents, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that *construction activities* may occur on a specific plot.

For discrete construction projects that are located within a larger common plan of development or sale that are at least 1/4 mile apart, each project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline or utility project that is part of the same “common plan” is not concurrently being disturbed.

Minimize – means reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practices.

Municipal Separate Storm Sewer (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters,

ditches, man-made
channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters of the State*;*
(ii) Designed or used for collecting or conveying stormwater;
(iii) Which is not a *combined sewer*; and
(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES) - means the national system for the issuance of wastewater and stormwater permits under the Federal Water Pollution Control Act (Clean Water Act).

New Development – means any land disturbance that does not meet the definition of Redevelopment Activity included in this appendix.

NOI Acknowledgment Letter - means the letter that the Department sends to an owner or operator to acknowledge the Department’s receipt and acceptance of a complete Notice of Intent. This letter documents the owner’s or operator’s authorization to discharge in accordance with the general permit for stormwater discharges from *construction activity*.

Owner or Operator - means the person, persons or legal entity which owns or leases the property on which the *construction activity* is occurring; and/or an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications.

Performance Criteria – means the design criteria listed under the “Required Elements” sections in Chapters 5, 6 and 10 of the technical standard, New York State Stormwater Management Design Manual, dated January 2015. It does not include the Sizing Criteria (i.e. WQv, RRv, Cpv, Qp and Qf) in Part I.C.2. of the permit.

Pollutant - means dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast discharged into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in 6 NYCRR Parts 700 et seq .

Qualified Inspector - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or other Department endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

Qualified Professional - means a person that is knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other Department endorsed individual(s). Individuals preparing SWPPPs that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer <u>licensed to practice in the State of New York..</u>

Redevelopment Activity(ies) – means the disturbance and reconstruction of existing impervious area, including impervious areas that were removed from a project site within five (5) years of preliminary project plan submission to the local government (i.e. site plan, subdivision, etc.).

Regulated, Traditional Land Use Control MS4 - means a city, town or village with land use control authority that is required to gain coverage under New York State DEC's SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s).

Routine Maintenance Activity - means *construction activity* that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, including, but not limited to:

- Re-grading of gravel roads or parking lots,
- Stream bank restoration projects (does not include the placement of spoil material),
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and hydraulic capacity of the ditch,
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch),
- Placement of aggregate shoulder backing that makes the transition between the road shoulder and the ditch or embankment,
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material,
- Long-term use of equipment storage areas at or near highway maintenance facilities,
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or embankment,
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts.

Site limitations – means site conditions that prevent the use of an infiltration technique and or infiltration of the total WQv. Typical site limitations include: seasonal high groundwater, shallow depth to bedrock, and soils with an infiltration rate less than 0.5 inches/hour. The existence of site limitations shall be confirmed and documented using actual field testing (i.e. test pits, soil borings, and infiltration test) or using information from the most current United States Department of Agriculture (USDA) Soil Survey for the County where the project is located.

Sizing Criteria – means the criteria included in Part I.C.2 of the permit that are used to size post-construction stormwater management control practices. The criteria include; Water Quality Volume (WQv), Runoff Reduction Volume (RRv), Channel Protection Volume (Cpv), Overbank Flood (Qp), and Extreme Flood (Qf).

State Pollutant Discharge Elimination System (SPDES) - means the system established pursuant to Article 17 of the ECL and 6 NYCRR Part 750 for issuance of permits authorizing discharges to the waters of the state.

Steep Slope – means land area with a Soil Slope Phase that is identified as an E or F, or the map unit name is inclusive of 25% or greater slope, on the United States Department of Agriculture ("USDA") Soil Survey for the County where the disturbance will occur.

Surface Waters of the State - shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

Temporarily Ceased – means that an existing disturbed area will not be disturbed again within 14 calendar days of the previous soil disturbance.

Temporary Stabilization - means that exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

Total Maximum Daily Loads (TMDLs) - A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. It is a calculation of the maximum amount of a pollutant that a waterbody can receive on a daily basis and still meet *water quality standards*, and an allocation of that amount to the pollutant's sources. A TMDL stipulates wasteload allocations (WLAs) for point source discharges, load allocations (LAs) for nonpoint sources, and a margin of safety (MOS).

Trained Contractor - means an employee from the contracting (construction) company, identified in Part III.A.6., that has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.6., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity).

The *trained contractor* is responsible for the day to day implementation of the SWPPP.

Uniform Procedures Act (UPA) Permit - means a permit required under 6 NYCRR Part

621 of the Environmental Conservation Law (ECL), Article 70.

Water Quality Standard - means such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

APPENDIX B

Required SWPPP Components by Project Type

Table 1
CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following construction activities that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres: • Single family home not located in one of the watersheds listed in Appendix C or not *directly discharging* to one of the 303(d) segments listed in Appendix E • Single family residential subdivisions with 25% or less impervious cover at total site build-out and not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E • Construction of a barn or other agricultural building, silo, stock yard or pen.
The following construction activities that involve soil disturbances of one (1) or more acres of land: • Installation of underground, linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains • Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects • Bike paths and trails • Sidewalk construction projects that are not part of a road/ highway construction or reconstruction project • Slope stabilization projects • Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics • Spoil areas that will be covered with vegetation • Land clearing and grading for the purposes of creating vegetated open space (i.e. recreational parks, lawns, meadows, fields), excluding projects that *alter hydrology from pre to post development* conditions • Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* and do not *alter hydrology from pre to post development* conditions • Demolition project where vegetation will be established and no redevelopment is planned • Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover* • Structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State”, excluding projects that involve soil disturbances of less than five acres and construction activities that include the construction or reconstruction of impervious area
The following construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land: • All construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

Table 2

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Single family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% impervious cover at total site build-out
- Single family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a larger common plan of development or sale that will ultimately disturb five or more acres of land
- Multi-family residential developments; includes townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Airports
- Amusement parks
- Campgrounds
- Cemeteries that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other agricultural building(e.g. silo) and structural practices as identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State" that include the construction or reconstruction of *impervious area*, excluding projects that involve soil disturbances of less than five acres.
- Golf courses
- Institutional, includes hospitals, prisons, schools and colleges
- Industrial facilities, includes industrial parks
- Landfills
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTW's and water treatment plants
- Office complexes
- Sports complexes
- Racetracks, includes racetracks with earthen (dirt) surface
- Road construction or reconstruction
- Parking lot construction or reconstruction
- Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surfaced with *impervious cover,* and constructed as part of an over-head electric transmission line project , wind-power project, cell tower project, oil or gas well drilling project, sewer or water main project or other linear utility project
- All other construction activities that include the construction or reconstruction of *impervious area* <u>or</u> *alter the hydrology from pre to post development* conditions, <u>and</u> are not listed in Table 1

APPENDIX C

Watersheds Where Enhanced Phosphorus Removal Standards Are Required

Watersheds where *owners or operators* of construction activities identified in Table 2 of Appendix B must prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the technical standard, New York State Stormwater Management Design Manual ("Design Manual").

- Entire New York City Watershed located east of the Hudson River **-** Figure 1
- Onondaga Lake Watershed **-** Figure 2
- Greenwood Lake Watershed **-**Figure 3
- Oscawana Lake Watershed – Figure 4
- Kinderhook Lake Watershed – Figure 5

Figure 1 - New York City Watershed East of the Hudson

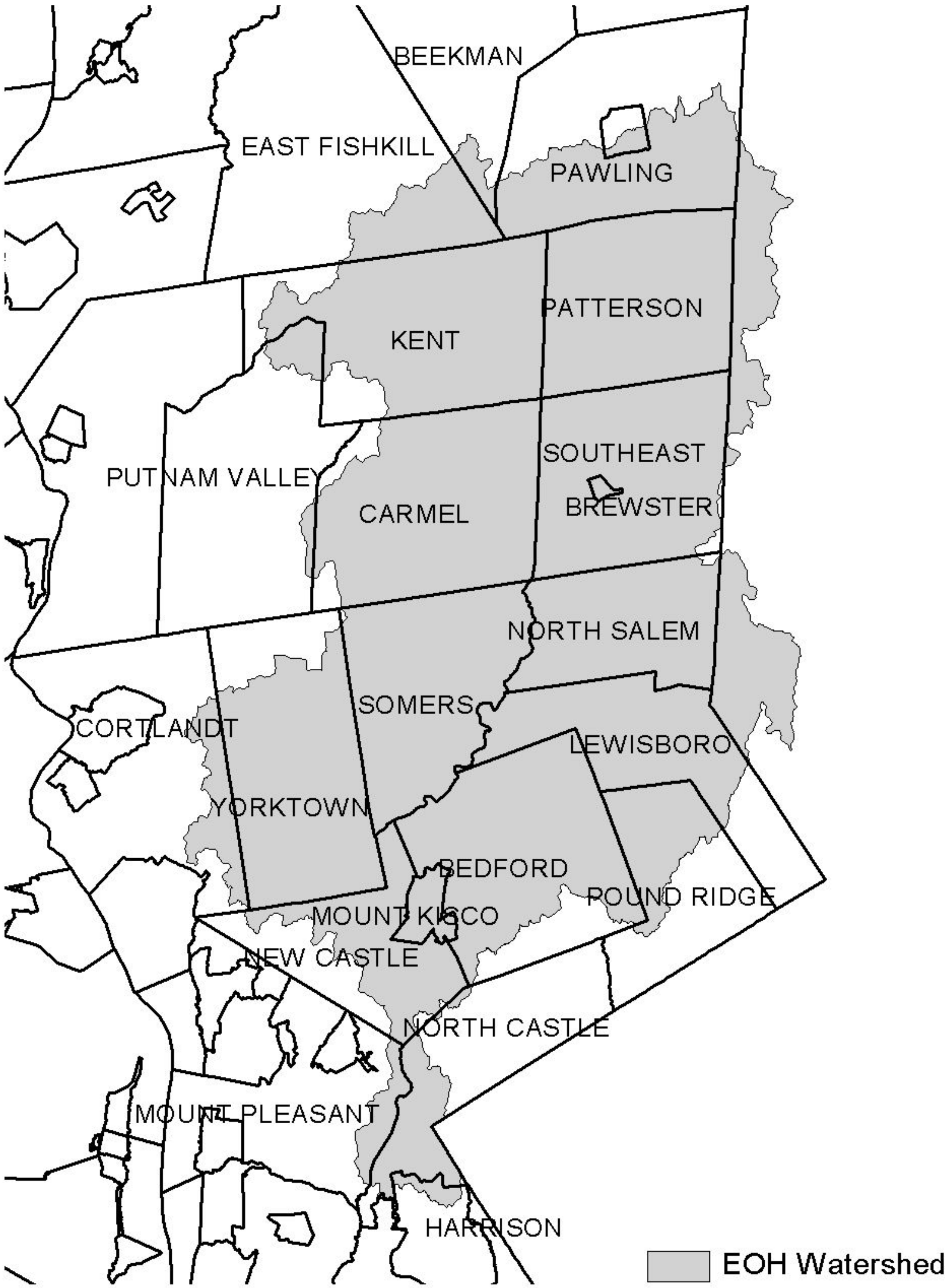


Figure 2 - Onondaga Lake Watershed

Figure 3 - Greenwood Lake Watershed

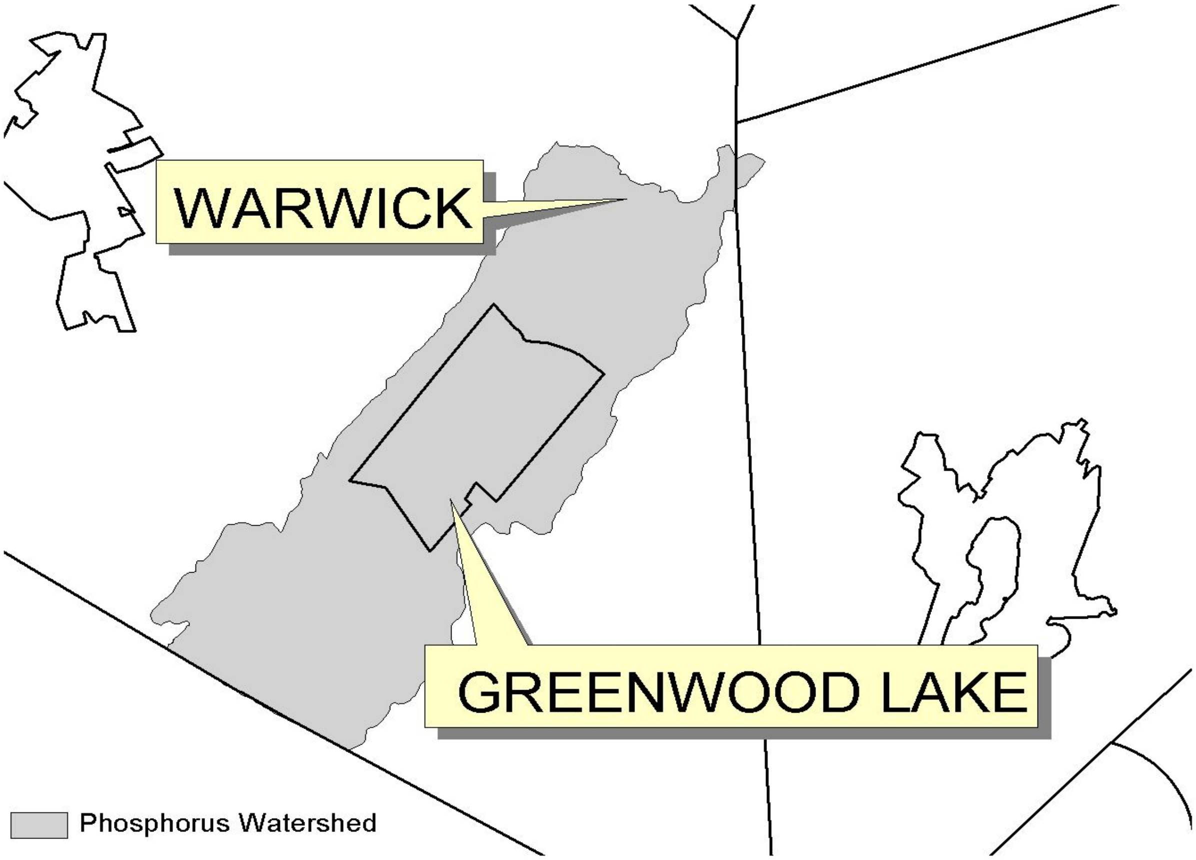


Figure 4 - Oscawana Lake Watershed

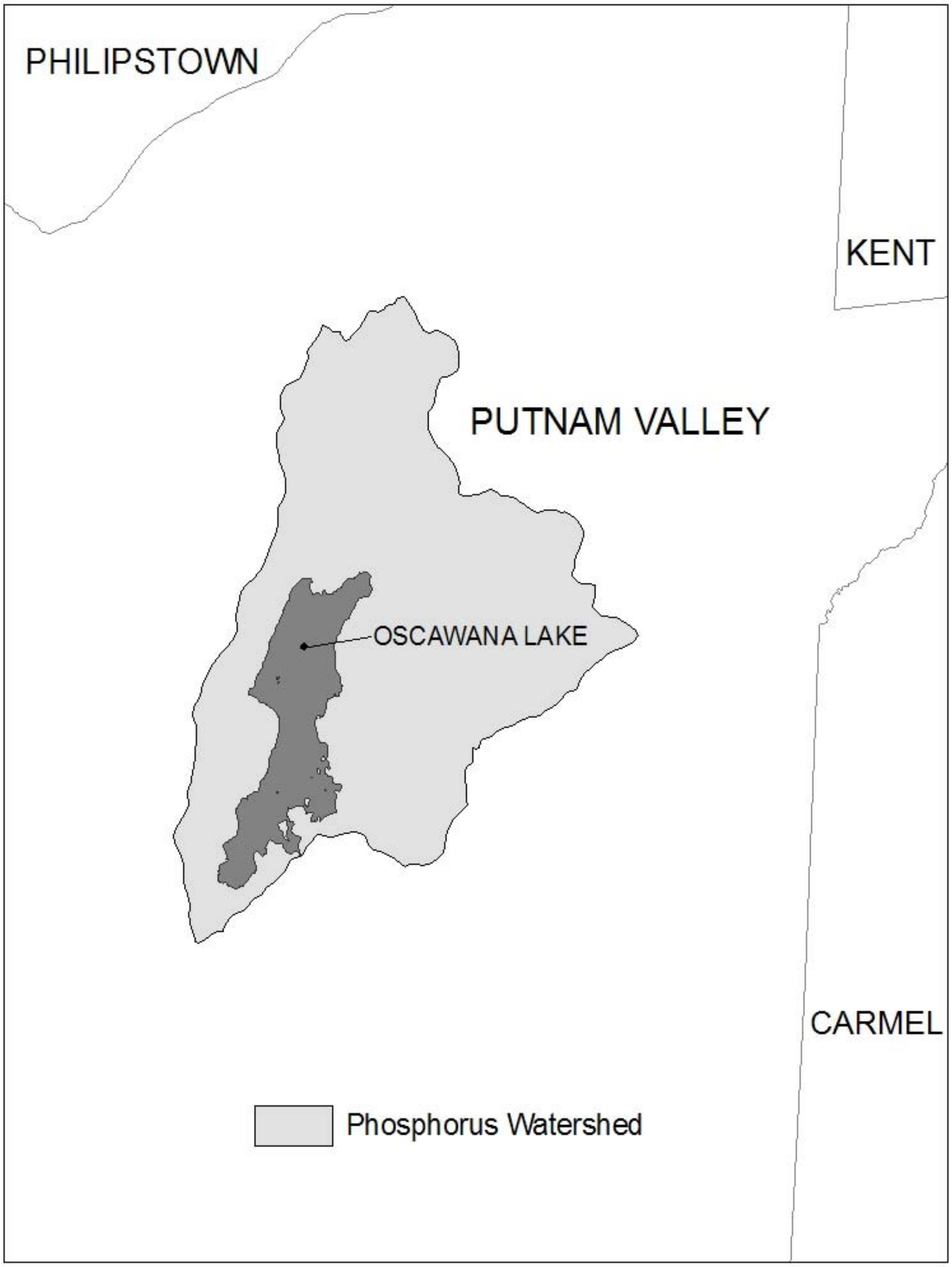
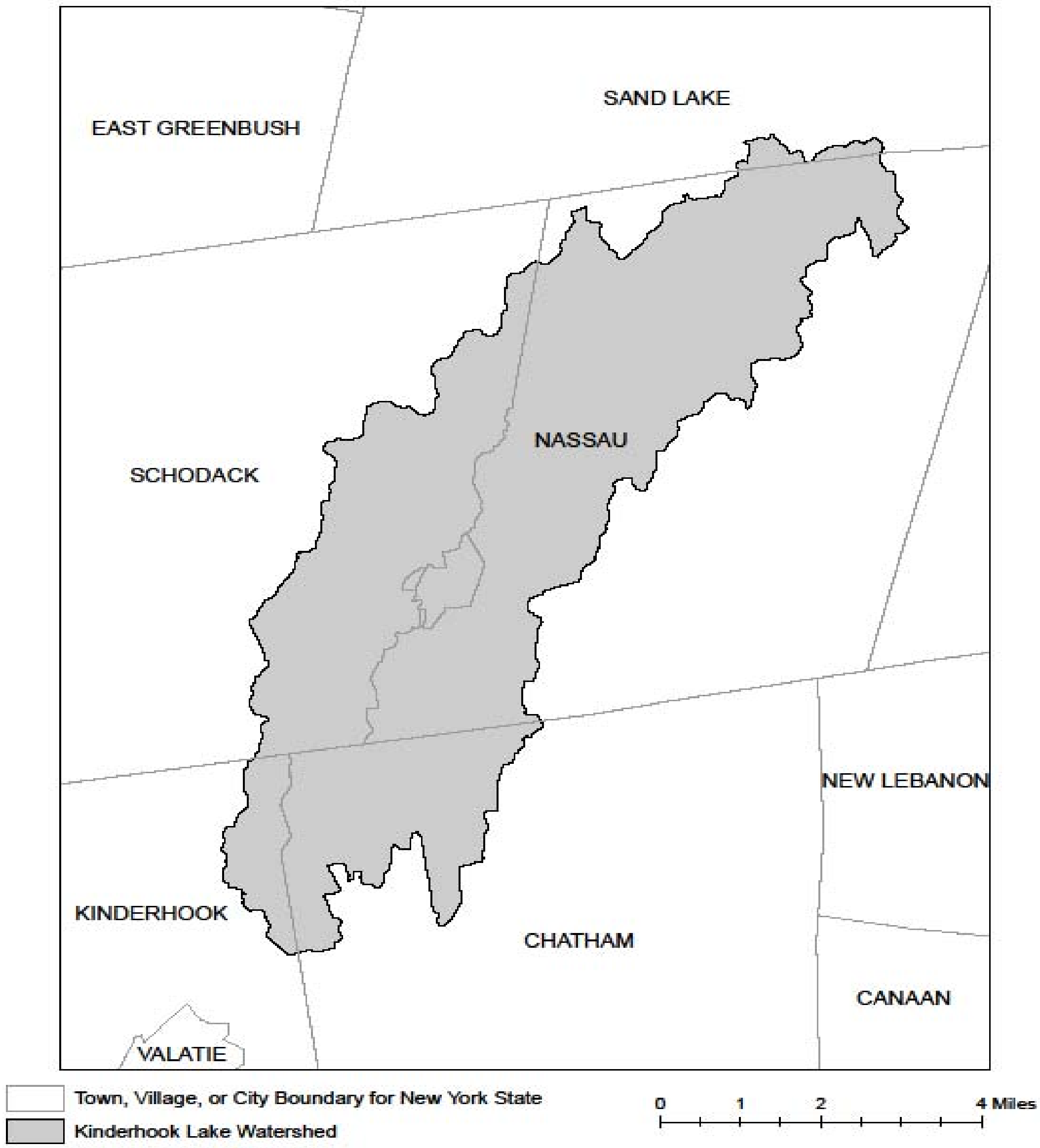


Figure 5: Kinderhook Lake Watershed



APPENDIX D

Watersheds where *owners or operators* of construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land must obtain coverage under this permit.

Entire New York City Watershed that is located east of the Hudson River **-** See Figure 1 in Appendix C

APPENDIX E

List of 303(d) segments impaired by pollutants related to *construction activity* (e.g. silt, sediment or nutrients). *Owners or operators* of single family home and single family residential subdivisions with 25% or less total impervious cover at total site build-out that involve soil disturbances of one or more acres of land, but less than 5 acres, and *directly discharge* to one of the listed segments below shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the New York State Stormwater Management Design Manual (“Design Manual”), dated January 2015.

COUNTY	WATERBODY
Albany	Ann Lee (Shakers) Pond, Stump Pond
Albany	Basic Creek Reservoir
Allegheny	Amity Lake, Saunders Pond
Bronx	Van Cortlandt Lake
Broome	Whitney Point Lake/Reservoir
Broome	Fly Pond, Deer Lake
Broome	Minor Tribs to Lower Susquehanna (north)
Cattaraugus	Allegheny River/Reservoir
Cattaraugus	Case Lake
Cattaraugus	Linlyco/Club Pond
Cayuga	Duck Lake
Chautauqua	Chautauqua Lake, North
Chautauqua	Chautauqua Lake, South
Chautauqua	Bear Lake
Chautauqua	Chadakoin River and tribs
Chautauqua	Lower Cassadaga Lake
Chautauqua	Middle Cassadaga Lake
Chautauqua	Findley Lake
Clinton	Great Chazy River, Lower, Main Stem
Columbia	Kinderhook Lake
Columbia	Robinson Pond
Dutchess	Hillside Lake
Dutchess	Wappinger Lakes
Dutchess	Fall Kill and tribs
Erie	Green Lake
Erie	Scajaquada Creek, Lower, and tribs
Erie	Scajaquada Creek, Middle, and tribs
Erie	Scajaquada Creek, Upper, and tribs
Erie	Rush Creek and tribs
Erie	Ellicott Creek, Lower, and tribs
Erie	Beeman Creek and tribs
Erie	Murder Creek, Lower, and tribs
Erie	South Branch Smoke Cr, Lower, and tribs
Erie	Little Sister Creek, Lower, and tribs
Essex	Lake George (primary county: Warren)
Genesee	Black Creek, Upper, and minor tribs
Genesee	Tonawanda Creek, Middle, Main Stem
Genesee	Oak Orchard Creek, Upper, and tribs
Genesee	Bowen Brook and tribs
Genesee	Bigelow Creek and tribs
Genesee	Black Creek, Middle, and minor tribs
Genesee	LeRoy Reservoir
Greene	Schoharie Reservoir

COUNTY	WATERBODY
Greene	Sleepy Hollow Lake
Herkimer	Steele Creek tribs
Kings	Hendrix Creek
Lewis	Mill Creek/South Branch and tribs
Livingston	Conesus Lake
Livingston	Jaycox Creek and tribs
Livingston	Mill Creek and minor tribs
Livingston	Bradner Creek and tribs
Livingston	Christie Creek and tribs
Monroe	Lake Ontario Shoreline, Western
Monroe	Mill Creek/Blue Pond Outlet and tribs
Monroe	Rochester Embayment - East
Monroe	Rochester Embayment - West
Monroe	Unnamed Trib to Honeoye Creek
Monroe	Genesee River, Lower, Main Stem
Monroe	Genesee River, Middle, Main Stem
Monroe	Black Creek, Lower, and minor tribs
Monroe	Buck Pond
Monroe	Long Pond
Monroe	Cranberry Pond
Monroe	Mill Creek and tribs
Monroe	Shipbuilders Creek and tribs
Monroe	Minor tribs to Irondequoit Bay
Monroe	Thomas Creek/White Brook and tribs
Nassau	Glen Cove Creek, Lower, and tribs
Nassau	LI Tribs (fresh) to East Bay
Nassau	East Meadow Brook, Upper, and tribs
Nassau	Hempstead Bay
Nassau	Hempstead Lake
Nassau	Grant Park Pond
Nassau	Beaver Lake
Nassau	Camaans Pond
Nassau	Halls Pond
Nassau	LI Tidal Tribs to Hempstead Bay
Nassau	Massapequa Creek and tribs
Nassau	Reynolds Channel, east
Nassau	Reynolds Channel, west
Nassau	Silver Lake, Lofts Pond
Nassau	Woodmere Channel
Niagara	Hyde Park Lake
Niagara	Lake Ontario Shoreline, Western
Niagara	Bergholtz Creek and tribs
Oneida	Ballou, Nail Creeks
Onondaga	Ley Creek and tribs
Onondaga	Onondaga Creek, Lower and tribs

APPENDIX E

List of 303(d) segments impaired by pollutants related to construction activity, cont'd.

COUNTY	WATERBODY
Onondaga	Onondaga Creek, Middle and tribs
Onondaga	Onondaga Creek, Upp, and minor tribs
Onondaga	Harbor Brook, Lower, and tribs
Onondaga	Ninemile Creek, Lower, and tribs
Onondaga	Minor tribs to Onondaga Lake
Onondaga	Onondaga Creek, Lower, and tribs
Ontario	Honeoye Lake
Ontario	Hemlock Lake Outlet and minor tribs
Ontario	Great Brook and minor tribs
Orange	Monhagen Brook and tribs
Orange	Orange Lake
Orleans	Lake Ontario Shoreline, Western
Oswego	Pleasant Lake
Oswego	Lake Neatahwanta
Putnam	Oscawana Lake
Putnam	Palmer Lake
Putnam	Lake Carmel
Queens	Jamaica Bay, Eastern, and tribs (Queens)
Queens	Bergen Basin
Queens	Shellbank Basin
Rensselaer	Nassau Lake
Rensselaer	Snyders Lake
Richmond	Grasmere, Arbutus and Wolfes Lakes
Rockland	Congers Lake, Swartout Lake
Rockland	Rockland Lake
Saratoga	Ballston Lake
Saratoga	Round Lake
Saratoga	Dwaas Kill and tribs
Saratoga	Tribs to Lake Lonely
Saratoga	Lake Lonely
Schenectady	Collins Lake
Schenectady	Duane Lake
Schenectady	Mariaville Lake
Schoharie	Engleville Pond
Schoharie	Summit Lake
Schuyler	Cayuta Lake
St. Lawrence	Fish Creek and minor tribs
St. Lawrence	Black Lake Outlet/Black Lake
Steuben	Lake Salubria
Steuben	Smith Pond
Suffolk	Millers Pond
Suffolk	Mattituck (Marratooka) Pond
Suffolk	Tidal tribs to West Moriches Bay
Suffolk	Canaan Lake
Suffolk	Lake Ronkonkoma
Suffolk	Beaverdam Creek and tribs
Suffolk	Big/Little Fresh Ponds
Suffolk	Fresh Pond
Suffolk	Great South Bay, East
Suffolk	Great South Bay, Middle

COUNTY	WATERBODY
Suffolk	Great South Bay, West
Suffolk	Mill and Seven Ponds
Suffolk	Moriches Bay, East
Suffolk	Moriches Bay, West
Suffolk	Quantuck Bay
Suffolk	Shinnecock Bay (and Inlet)
Sullivan	Bodine, Montgomery Lakes
Sullivan	Davies Lake
Sullivan	Pleasure Lake
Sullivan	Swan Lake
Tompkins	Cayuga Lake, Southern End
Tompkins	Owasco Inlet, Upper, and tribs
Ulster	Ashokan Reservoir
Ulster	Esopus Creek, Upper, and minor tribs
Ulster	Esopus Creek, Lower, Main Stem
Ulster	Esopus Creek, Middle, and minor tribs
Warren	Lake George
Warren	Tribs to L.George, Village of L George
Warren	Huddle/Finkle Brooks and tribs
Warren	Indian Brook and tribs
Warren	Hague Brook and tribs
Washington	Tribs to L.George, East Shr Lk George
Washington	Cossayuna Lake
Washington	Wood Cr/Champlain Canal, minor tribs
Wayne	Port Bay
Wayne	Marbletown Creek and tribs
Westchester	Lake Katonah
Westchester	Lake Mohegan
Westchester	Lake Shenorock
Westchester	Reservoir No.1 (Lake Isle)
Westchester	Saw Mill River, Middle, and tribs
Westchester	Silver Lake
Westchester	Teatown Lake
Westchester	Truesdale Lake
Westchester	Wallace Pond
Westchester	Peach Lake
Westchester	Mamaroneck River, Lower
Westchester	Mamaroneck River, Upp, and tribs
Westchester	Sheldrake River and tribs
Westchester	Blind Brook, Lower
Westchester	Blind Brook, Upper, and tribs
Westchester	Lake Lincolndale
Westchester	Lake Meahaugh
Wyoming	Java Lake
Wyoming	Silver Lake

Note: The list above identifies those waters from the final New York State "2014 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy", dated January 2015, that are impaired by silt, sediment or nutrients.

APPENDIX F

LIST OF NYS DEC REGIONAL OFFICES

Region	COVERING THE FOLLOWING COUNTIES:	DIVISION OF ENVIRONMENTAL PERMITS (DEP) PERMIT ADMINISTRATORS	DIVISION OF WATER (DOW) WATER (SPDES) PROGRAM
1	NASSAU AND SUFFOLK	50 CIRCLE ROAD STONY BROOK, NY 11790 TEL. (631) 444-0365	50 CIRCLE ROAD STONY BROOK, NY 11790-3409 TEL. (631) 444-0405
2	BRONX, KINGS, NEW YORK, QUEENS AND RICHMOND	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4997	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4933
3	DUTCHESS, ORANGE, PUTNAM, ROCKLAND, SULLIVAN, ULSTER AND WESTCHESTER	21 SOUTH PUTT CORNERS ROAD NEW PALTZ, NY 12561-1696 TEL. (845) 256-3059	100 HILLSIDE AVENUE, SUITE 1W WHITE PLAINS, NY 10603 TEL. (914) 428 - 2505
4	ALBANY, COLUMBIA, DELAWARE, GREENE, MONTGOMERY, OTSEGO, RENSSELAER, SCHENECTADY AND SCHOHARIE	1150 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2069	1130 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2045
5	CLINTON, ESSEX, FRANKLIN, FULTON, HAMILTON, SARATOGA, WARREN AND WASHINGTON	1115 STATE ROUTE 86, PO BOX 296 RAY BROOK, NY 12977-0296 TEL. (518) 897-1234	232 GOLF COURSE ROAD WARRENSBURG, NY 12885-1172 TEL. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7438	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROAD AVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7165	270 MICHIGAN AVE. BUFFALO, NY 14203-2999 TEL. (716) 851-7070

Appendix B

NYSDEC SPDES General Permit Forms

0806372691

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR ______ (for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-15-002

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-
RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)
TC SYRACUSE DEVELPOMENT LLC

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
LAIGAIE

Owner/Operator Contact Person First Name
GEORGE

Owner/Operator Mailing Address
300 CONSHOHOCKEN STATE ROAD

City
WEST CONSHOHOCKEN

State
PA

Zip
19428 -

Phone (Owner/Operator)
484-530-4722

Fax (Owner/Operator)
 - -

Email (Owner/Operator)
GLAIGAIE@TRAMMELLCROW.COM

FED TAX ID
 - (not required for individuals)

Project Site Information

Project/Site Name

PROPOSED DISTRIBUTION FACILITY PROJECT

Street Address (NOT P.O. BOX)

7211 AND 7219 MORGAN ROAD

Side of Street

○ **North** ○ **South** ○ **East** ● **West**

City/Town/Village (THAT ISSUES BUILDING PERMIT)

TOWN OF CLAY

State	Zip	County	DEC Region
NY	13090 -	ONONDAGA	7

Name of Nearest Cross Street

LIVERPOOL BYPASS

Distance to Nearest Cross Street (Feet)

Project In Relation to Cross Street

○ **North** ○ **South** ○ **East** ○ **West**

Tax Map Numbers
Section-Block-Parcel

114-1-2.3

Tax Map Numbers

1. Provide the Geographic Coordinates for the project site in NYTM Units. To do this you **must** go to the NYSDEC Stormwater Interactive Map on the DEC website at:

www.dec.ny.gov/imsmaps/stormwater/viewer.htm

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located your project site, go to the tool boxes on the top and choose "i"(identify). Then click on the center of your site and a new window containing the X, Y coordinates in UTM will pop up. Transcribe these coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting)	Y Coordinates (Northing)
4 0 1 6 2 0	4 7 7 5 1 2 7

2. What is the nature of this construction project?

● **New Construction**

○ **Redevelopment with increase in impervious area**

○ **Redevelopment with no increase in impervious area**

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development Existing Land Use

- ○ FOREST
- ○ PASTURE/OPEN LAND
- ○ CULTIVATED LAND
- ○ SINGLE FAMILY HOME
- ○ SINGLE FAMILY SUBDIVISION
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ○ INDUSTRIAL
- ○ COMMERCIAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY
- ○ PARKING LOT
- ● OTHER

GOLF COURSE

Post-Development Future Land Use

- ○ SINGLE FAMILY HOME
- ○ SINGLE FAMILY SUBDIVISION
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ● INDUSTRIAL
- ○ COMMERCIAL
- ○ MUNICIPAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY (water, sewer, gas, etc.)
- ○ PARKING LOT
- ○ CLEARING/GRADING ONLY
- ○ DEMOLITION, NO REDEVELOPMENT
- ○ WELL DRILLING ACTIVITY *(Oil, Gas, etc.)
- ○ OTHER

Number of Lots

*Note: for gas well drilling, non-high volume hydraulic fractured wells only

4. In accordance with the larger common plan of development or sale, enter the total project site area; the total area to be disturbed; existing impervious area to be disturbed (for redevelopment activities); and the future impervious area constructed within the disturbed area. (Round to the nearest tenth of an acre.)

Total Site Area	Total Area To Be Disturbed	Existing Impervious Area To Be Disturbed	Future Impervious Area Within Disturbed Area
1 0 1 9 0 .96 . 6	.	.	.

5. Do you plan to disturb more than 5 acres of soil at any one time? ○ **Yes** ○ **No**

6. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	**B**	**C**	**D**
5 %	8 %	23 %	64 %

7. Is this a phased project? ○ **Yes** ○ **No**

8. Enter the planned start and end dates of the disturbance activities.

Start Date __/__/____ - **End Date** __/__/____

9. Identify the nearest surface waterbody(ies) to which construction site runoff will discharge.

Name

9a. Type of waterbody identified in Question 9?

- ○ Wetland / State Jurisdiction On Site (Answer 9b)
- ○ Wetland / State Jurisdiction Off Site
- ○ Wetland / Federal Jurisdiction On Site (Answer 9b)
- ○ Wetland / Federal Jurisdiction Off Site
- ○ Stream / Creek On Site
- ○ Stream / Creek Off Site
- ○ River On Site
- ○ River Off Site
- ○ Lake On Site
- ○ Lake Off Site
- ○ Other Type On Site
- ○ Other Type Off Site

9b. How was the wetland identified?

- ○ Regulatory Map
- ● Delineated by Consultant
- ○ Delineated by Army Corps of Engineers
- ○ Other (identify)

10. Has the surface waterbody(ies) in question 9 been identified as a 303(d) segment in Appendix E of GP-0-15-002? ○ Yes ○ No

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-15-002? ○ Yes ○ No

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters? ○ Yes ○ No
If no, skip question 13.

13. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey? ○ Yes ○ No
If Yes, what is the acreage to be disturbed?

14. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area? ○ Yes ○ No

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)? ○ **Yes** ○ **No** ○ **Unknown**

16. What is the name of the municipality/entity that owns the separate storm sewer system?

17. Does any runoff from the site enter a sewer classified as a Combined Sewer? ○ **Yes** ○ **No** ○ **Unknown**

18. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law? ○ **Yes** ○ **No**

19. Is this property owned by a state authority, state agency, federal government or local government? ○ **Yes** ○ **No**

20. Is this a remediation project being done under a Department approved work plan? (i.e. CERCLA, RCRA, Voluntary Cleanup Agreement, etc.) ○ **Yes** ○ **No**

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book)? ● **Yes** ○ **No**

22. Does this construction activity require the development of a SWPPP that includes the post-construction stormwater management practice component (i.e. Runoff Reduction, Water Quality and Quantity Control practices/techniques)? ● **Yes** ○ **No**
If No, skip questions 23 and 27-39.

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the current NYS Stormwater Management Design Manual? ● **Yes** ○ **No**

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

- ○ **Professional Engineer (P.E.)**
- ○ **Soil and Water Conservation District (SWCD)**
- ○ **Registered Landscape Architect (R.L.A)**
- ○ **Certified Professional in Erosion and Sediment Control (CPESC)**
- ○ **Owner/Operator**
- ○ **Other**

SWPPP Preparer

Contact Name (Last, Space, First)

Mailing Address

City

State Zip

-

Phone - -

Fax - -

Email

SWPPP Preparer Certification

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-15-002. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First Name **MI**

Last Name

Signature

Date / /

25. Has a construction sequence schedule for the planned management practices been prepared? ◯ Yes ◯ No

26. Select **all** of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural

- ◯ Check Dams
- ◯ Construction Road Stabilization
- ◯ Dust Control
- ◯ Earth Dike
- ◯ Level Spreader
- ◯ Perimeter Dike/Swale
- ◯ Pipe Slope Drain
- ◯ Portable Sediment Tank
- ◯ Rock Dam
- ◯ Sediment Basin
- ◯ Sediment Traps
- ◯ Silt Fence
- ◯ Stabilized Construction Entrance
- ◯ Storm Drain Inlet Protection
- ◯ Straw/Hay Bale Dike
- ◯ Temporary Access Waterway Crossing
- ◯ Temporary Stormdrain Diversion
- ◯ Temporary Swale
- ◯ Turbidity Curtain
- ◯ Water bars

Biotechnical

- ◯ Brush Matting
- ◯ Wattling

Vegetative Measures

- ◯ Brush Matting
- ◯ Dune Stabilization
- ◯ Grassed Waterway
- ◯ Mulching
- ◯ Protecting Vegetation
- ◯ Recreation Area Improvement
- ◯ Seeding
- ◯ Sodding
- ◯ Straw/Hay Bale Dike
- ◯ Streambank Protection
- ◯ Temporary Swale
- ◯ Topsoiling
- ◯ Vegetating Waterways

Permanent Structural

- ◯ Debris Basin
- ◯ Diversion
- ◯ Grade Stabilization Structure
- ◯ Land Grading
- ◯ Lined Waterway (Rock)
- ◯ Paved Channel (Concrete)
- ◯ Paved Flume
- ◯ Retaining Wall
- ◯ Riprap Slope Protection
- ◯ Rock Outlet Protection
- ◯ Streambank Protection

Other

Post-construction Stormwater Management Practice (SMP) Requirements

Important: Completion of Questions 27-39 is not required if response to Question 22 is No.

27. Identify all site planning practices that were used to prepare the final site plan/layout for the project.

- ○ **Preservation of Undisturbed Areas**
- ○ **Preservation of Buffers**
- ○ **Reduction of Clearing and Grading**
- ○ **Locating Development in Less Sensitive Areas**
- ○ **Roadway Reduction**
- ○ **Sidewalk Reduction**
- ○ **Driveway Reduction**
- ○ **Cul-de-sac Reduction**
- ○ **Building Footprint Reduction**
- ○ **Parking Reduction**

27a. Indicate which of the following soil restoration criteria was used to address the requirements in Section 5.1.6("Soil Restoration") of the Design Manual (2010 version).

- ○ All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).

- ○ Compacted areas were considered as impervious cover when calculating the **WQv Required**, and the compacted areas were assigned a post-construction Hydrologic Soil Group (HSG) designation that is one level less permeable than existing conditions for the hydrology analysis.

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout).

Total WQv Required

☐☐☐.☐☐☐ **acre-feet**

29. Identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity in Table 1 (See Page 9) that were used to reduce the Total WQv Required(#28).

Also, provide in Table 1 the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

Note: Redevelopment projects shall use Tables 1 and 2 to identify the SMPs used to treat and/or reduce the WQv required. If runoff reduction techniques will not be used to reduce the required WQv, skip to question 33a after identifying the SMPs.

Table 1 - Runoff Reduction (RR) Techniques and Standard Stormwater Management Practices (SMPs)

	Total Contributing Area (acres)		Total Contributing Impervious Area(acres)
RR Techniques (Area Reduction)			
○ Conservation of Natural Areas (RR-1)	.	and/or	.
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)	.	and/or	.
○ Tree Planting/Tree Pit (RR-3)	.	and/or	.
○ Disconnection of Rooftop Runoff (RR-4)	.	and/or	.
RR Techniques (Volume Reduction)			
○ Vegetated Swale (RR-5)			.
○ Rain Garden (RR-6)			.
○ Stormwater Planter (RR-7)			.
○ Rain Barrel/Cistern (RR-8)			.
○ Porous Pavement (RR-9)			.
○ Green Roof (RR-10)			.
Standard SMPs with RRv Capacity			
○ Infiltration Trench (I-1)			.
○ Infiltration Basin (I-2)			.
○ Dry Well (I-3)			.
○ Underground Infiltration System (I-4)			.
○ Bioretention (F-5)			.
○ Dry Swale (O-1)			.
Standard SMPs			
○ Micropool Extended Detention (P-1)			.
○ Wet Pond (P-2)			.
○ Wet Extended Detention (P-3)			.
○ Multiple Pond System (P-4)			.
○ Pocket Pond (P-5)			.
○ Surface Sand Filter (F-1)			.
○ Underground Sand Filter (F-2)			.
○ Perimeter Sand Filter (F-3)			.
○ Organic Filter (F-4)			.
○ Shallow Wetland (W-1)			.
○ Extended Detention Wetland (W-2)			.
○ Pond/Wetland System (W-3)			.
○ Pocket Wetland (W-4)			.
○ Wet Swale (O-2)			.

Table 2 - Alternative SMPs (DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Alternative SMP	Total Contributing Impervious Area(acres)
○ Hydrodynamic	.
○ Wet Vault	.
○ Media Filter	.
○ Other	.

Provide the name and manufacturer of the Alternative SMPs (i.e. proprietary practice(s)) being used for WQv treatment.

Name

Manufacturer

Note: Redevelopment projects which do not use RR techniques, shall use questions 28, 29, 33 and 33a to provide SMPs used, total WQv required and total WQv provided for the project.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29.

Total RRv provided

. **acre-feet**

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28).

○ **Yes** ○ **No**

If Yes, go to question 36.
If No, go to question 32.

32. Provide the Minimum RRv required based on HSG.
[Minimum RRv Required = (P)(0.95)(Ai)/12, Ai=(S)(Aic)]

Minimum RRv Required

. **acre-feet**

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)?

○ **Yes** ○ **No**

If Yes, go to question 33.
Note: Use the space provided in question #39 to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). A detailed evaluation of the specific site limitations and justification for not reducing 100% of the WQv required (#28) must also be included in the SWPPP.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. Identify the Standard SMPs in Table 1 and, if applicable, the Alternative SMPs in Table 2 that were used to treat the remaining total WQv(=Total WQv Required in 28 - Total RRv Provided in 30).

Also, provide in Table 1 and 2 the total impervious area that contributes runoff to each practice selected.

Note: Use Tables 1 and 2 to identify the SMPs used on Redevelopment projects.

33a. Indicate the Total WQv provided (i.e. WQv treated) by the SMPs identified in question #33 and Standard SMPs with RRv Capacity identified in question 29.

WQv Provided

___.___ **acre-feet**

Note: For the standard SMPs with RRv capacity, the WQv provided by each practice = the WQv calculated using the contributing drainage area to the practice - RRv provided by the practice. (See Table 3.5 in Design Manual)

34. Provide the sum of the Total RRv provided (#30) and the WQv provided (#33a). ___.___

35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)? ○ **Yes** ○ **No**

If Yes, go to question 36.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

36. Provide the total Channel Protection Storage Volume (CPv) required and provided or select waiver (36a), if applicable.

CPv Required	**CPv Provided**
___.___ **acre-feet**	___.___ **acre-feet**

36a. The need to provide channel protection has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.

○ Reduction of the total CPv is achieved on site through runoff reduction techniques or infiltration systems.

37. Provide the Overbank Flood (Qp) and Extreme Flood (Qf) control criteria or select waiver (37a), if applicable.

Total Overbank Flood Control Criteria (Qp)

Pre-Development	**Post-development**
___.___ **CFS**	___.___ **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development	**Post-development**
___.___ **CFS**	___.___ **CFS**

37a. The need to meet the Qp and Qf criteria has been waived because:

- ○ Site discharges directly to tidal waters or a fifth order or larger stream.
- ○ Downstream analysis reveals that the Qp and Qf controls are not required

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed? ○ Yes ○ No

If Yes, Identify the entity responsible for the long term Operation and Maintenance

39. Use this space to summarize the specific site limitations and justification for not reducing 100% of WQv required(#28). (See question 32a) This space can also be used for other pertinent project information.

40. Identify other DEC permits, existing and new, that are required for this project/facility.

- ○ Air Pollution Control
- ○ Coastal Erosion
- ○ Hazardous Waste
- ○ Long Island Wells
- ○ Mined Land Reclamation
- ○ Solid Waste
- ○ Navigable Waters Protection / Article 15
- ○ Water Quality Certificate
- ○ Dam Safety
- ○ Water Supply
- ○ Freshwater Wetlands/Article 24
- ○ Tidal Wetlands
- ○ Wild, Scenic and Recreational Rivers
- ○ Stream Bed or Bank Protection / Article 15
- ○ Endangered or Threatened Species(Incidental Take Permit)
- ○ Individual SPDES
- ○ SPDES Multi-Sector GP
- ○ Other
- ○ None

41. Does this project require a US Army Corps of Engineers Wetland Permit? ○ **Yes** ○ **No**
If Yes, Indicate Size of Impact. .

42. Is this project subject to the requirements of a regulated, traditional land use control MS4? ○ **Yes** ○ **No**
(If No, skip question 43)

43. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI? ○ **Yes** ○ **No**

44. If this NOI is being submitted for the purpose of continuing or transferring coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned.

Owner/Operator Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name **MI**

Print Last Name

Owner/Operator Signature

Date

/ /

NYS Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form

for

Construction Activities Seeking Authorization Under SPDES General Permit

*(NOTE: Attach Completed Form to Notice Of Intent and Submit to Address Above)

I. Project Owner/Operator Information
1. Owner/Operator Name:
2. Contact Person:
3. Street Address:
4. City/State/Zip:
II. Project Site Information
5. Project/Site Name:
6. Street Address:
7. City/State/Zip:
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information
8. SWPPP Reviewed by:
9. Title/Position:
10. Date Final SWPPP Reviewed and Accepted:
IV. Regulated MS4 Information
11. Name of MS4:
12. MS4 SPDES Permit Identification Number: NYR20A
13. Contact Person:
14. Street Address:
15. City/State/Zip:
16. Telephone Number:

MS4 SWPPP Acceptance Form - continued

V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in question 5 has been reviewed and meets the substantive requirements in the SPDES General Permit For Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s). Note: The MS4, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.

Printed Name:

Title/Position:

Signature:

Date:

VI. Additional Information

(NYS DEC - MS4 SWPPP Acceptance Form - January 2015)

SWPPP Preparer Certification Form

SPDES General Permit for Stormwater Discharges
From Construction Activity (GP-0-15-002)

Project Site Information

Project/Site Name

Proposed Distribution Facility Project

Owner/Operator Information

Owner/Operator (Company Name/Private Owner/Municipality Name)

T.C. Syracuse Development Associates, LLC

Certification Statement – SWPPP Preparer

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-15-002. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Richard		Burrow
First name	MI	Last Name

Signature

Date

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Owner/Operator Certification Form

SPDES General Permit For Stormwater Discharges From Construction Activity (GP-0-15-002)

Project/Site Name: ______________________________

eNOI Submission Number: ______________________________

eNOI Submitted by: ☐ **Owner/Operator** ☐ **SWPPP Preparer** ☐ **Other**

Certification Statement - Owner/Operator

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Owner/Operator First Name M.I. Last Name

____
Signature

____
Date

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505
(NOTE: Submit completed form to address above)

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity

Please indicate your permit identification number: NYR ___ ___ ___ ___ ___ ___

I. Owner or Operator Information	
1. Owner/Operator Name:	
2. Street Address:	
3. City/State/Zip:	
4. Contact Person:	4a.Telephone:
4b. Contact Person E-Mail:	
II. Project Site Information	
5. Project/Site Name:	
6. Street Address:	
7. City/Zip:	
8. County:	
III. Reason for Termination	
9a. □ All disturbed areas have achieved final stabilization in accordance with the general permit and SWPPP. ***Date final stabilization completed** (month/year): ______________________________	
9b. □ Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR ____ ____ ____ ____ ____ ____ (Note: Permit coverage can not be terminated by owner identified in I.1. above until new owner/operator obtains coverage under the general permit)	
9c. □ Other (Explain on Page 2)	
IV. Final Site Information:	
10a. Did this construction activity require the development of a SWPPP that includes post-construction stormwater management practices? □ yes □ no (If no, go to question 10f.)	
10b. Have all post-construction stormwater management practices included in the final SWPPP been constructed? □ yes □ no (If no, explain on Page 2)	
10c. Identify the entity responsible for long-term operation and maintenance of practice(s)? ____	

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

10d. Has the entity responsible for long-term operation and maintenance been given a copy of the operation and maintenance plan required by the general permit? □ yes □ no

10e. Indicate the method used to ensure long-term operation and maintenance of the post-construction stormwater management practice(s):

□ Post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain practice(s) have been deeded to the municipality.

□ Executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s).

□ For post-construction stormwater management practices that are privately owned, a mechanism is in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the owner or operator's deed of record.

□ For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university or hospital), government agency or authority, or public utility; policy and procedures are in place that ensures operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

10f. Provide the total area of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? ______________________________
(acres)

11. Is this project subject to the requirements of a regulated, traditional land use control MS4? □ yes □ no

(If Yes, complete section VI - "MS4 Acceptance" statement

V. Additional Information/Explanation:

(Use this section to answer questions 9c. and 10b., if applicable)

VI. MS4 Acceptance - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative (Note: Not required when 9b. is checked -transfer of coverage)

I have determined that it is acceptable for the owner or operator of the construction project identified in question 5 to submit the Notice of Termination at this time.

Printed Name:	
Title/Position:	
Signature:	Date:

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

VII. Qualified Inspector Certification - Final Stabilization:	
I hereby certify that all disturbed areas have achieved final stabilization as defined in the current version of the general permit, and that all temporary, structural erosion and sediment control measures have been removed. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.	
Printed Name:	
Title/Position:	
Signature:	Date:
VIII. Qualified Inspector Certification - Post-construction Stormwater Management Practice(s):	
I hereby certify that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.	
Printed Name:	
Title/Position:	
Signature:	Date:
IX. Owner or Operator Certification	
I hereby certify that this document was prepared by me or under my direction or supervision. My determination, based upon my inquiry of the person(s) who managed the construction activity, or those persons directly responsible for gathering the information, is that the information provided in this document is true, accurate and complete. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.	
Printed Name:	
Title/Position:	
Signature:	Date:

(NYS DEC Notice of Termination - January 2015)

Appendix C

Certification Statements

Owner's/Operator's Certification

"I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted."

Name (please print) ______________________________

Title ______________________________ **Date** ______________

Address ______________________________

Phone ______________ **Email** ______________________

Signature ______________________________

Contractor's Certification

"I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations."

Contracting Firm Name ______________________________

Address ______________________________

Phone ______________ **Fax** ______________

Name (please print) ______________________________

Title ______________________ **Date** ____________

Signature ______________________________

SWPPP Responsibilities ______________________________

____

____

____

Trained Individual Name (please print) ______________________________

Title ______________________ **Date** ____________

Signature ______________________________

SWPPP Responsibilities ______________________________

____

____

Note: All Contractors involved with Stormwater related activities shall sign a Contractor's Certification.

Subcontractor's Certification

"I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations."

Subcontracting Firm Name ______________________________

Address ______________________________

Phone ______________________ **Fax** ______________________

Name (please print) ______________________________

Title ______________________ **Date** ______________

Signature ______________________________

SWPPP Responsibilities ______________________________

____

____

____

Trained Individual Name (please print) ______________________________

Title ______________________ **Date** ______________

Signature ______________________________

SWPPP Responsibilities ______________________________

____

____

Note: All subcontractors involved with Stormwater related activities shall sign a Subcontractor's Certification.

Appendix D

Sample Inspection Report

EXAMPLE EROSION CONTROL REPORT

PROJECT NO: ____________ PROJECT NAME: ________________________ DATE: ___________

MUNICIPALITY: __________________________ LOCATION: ______________________________

CONTRACTOR: ___________________________ OWNER: _________________________________

DATE OF PREVIOUS INSPECTION: __________ INSPECTOR'S NAME: _____________________

DATE OF MOST RECENT STORM
0.5" OR GREATER: __________ DATE OF INSPECTION: ___________________

LAST RAIN EVENT: _____________________ DEPTH: __________________________________

WEATHER: ______________________________ TEMPERATURE: __________ °F __________

SPECIAL NOTES: ____

EROSION CONTROL CHECKLIST

ADDITIONAL ACTION REQUIRED BY PROJECT MANAGER OR PROJECT ENGINEER ☐ YES ☐ NO

PHOTOS OR SKETCHES ATTACHED ☐ ADDITIONAL REMARKS ATTACHED ☐

___________________________________ ___________________________________

Inspector (print name) **Inspection Date**

___________________________________ ___________________________________

Qualified Professional (print name) **Qualified Professional Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Maintaining Water Quality

Yes No NA

☐ ☐ ☐ Is there an increase in turbidity causing a substantial visible contrast to natural conditions?
☐ ☐ ☐ Is there residue from oil and floating substances, visible oil film, or globules of grease?
☐ ☐ ☐ All disturbance is within the limits of the approved plans.
☐ ☐ ☐ Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions

Yes No NA

☐ ☐ ☐ Is construction site litter and debris appropriately managed?
☐ ☐ ☐ Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
☐ ☐ ☐ Is construction impacting the adjacent properties?
☐ ☐ ☐ Is dust adequately controlled?

2. Temporary Stream Crossing

Yes No NA

☐ ☐ ☐ Maximum diameter pipes necessary to span creek without dredging are installed.
☐ ☐ ☐ Installed non-woven geotextile fabric beneath approaches
☐ ☐ ☐ Is fill composed of aggregate (no earth or soil)?
☐ ☐ ☐ Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

Runoff Control Practices

1. Excavation Dewatering

Yes No NA

☐ ☐ ☐ Upstream and downstream berms (sandbags, inflatable damns, etc.) are installed per plan.
☐ ☐ ☐ Clean water from upstream pool is being pumped to the downstream pool.
☐ ☐ ☐ Sediment laden water from work area is being discharged to a silt-trapping device.
☐ ☐ ☐ Constructed upstream berm with one-foot minimum freeboard.

2. Level Spreader

Yes No NA

☐ ☐ ☐ Installed per plan.
☐ ☐ ☐ Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
☐ ☐ ☐ Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales

Yes No NA

☐ ☐ ☐ Installed per plan with minimum side slopes 2H:1V or flatter.
☐ ☐ ☐ Stabilized by geotextile fabric, seed, or mulch with no erosion occuring.
☐ ☐ ☐ Sediment-laden runoff directed to sediment trapping structure.

4. Stone Check Dam

Yes No NA

☐ ☐ ☐ Is channel stable? (flow is not eroding soil underneath or around the structure).
☐ ☐ ☐ Check is in good condition (rocks in place and no permanent pools behind the structure).
☐ ☐ ☐ Has accumulated sediment been removed?

5. Rock Outlet Protection

Yes No NA

☐ ☐ ☐ Installed per plan.
☐ ☐ ☐ Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles

Yes No NA

☐ ☐ ☐ Stockpiles are stabilized with vegetation and/or mulch.
☐ ☐ ☐ Sediment control is installed at the toe of the slope.

2. Revegetation

Yes No NA

☐ ☐ ☐ Temporary seedings and mulch have been applied to idle areas.
☐ ☐ ☐ 4 inches minimum of topsoil has been applied under permanent seedings

Sediment Control Practices

1. Stabilized Construction Entrance

Yes No NA

☐ ☐ ☐ Stone is clean enough to effectively remove mud from vehicles.
☐ ☐ ☐ Installed per standards and specifications?
☐ ☐ ☐ Does all traffic use the stabilized entrance to enter and leave the site?
☐ ☐ ☐ Is adequate drainage provided to prevent ponding at entrance?

2. Silt Fence

Yes No NA

☐ ☐ ☐ Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
☐ ☐ ☐ Joints constructed by wrapping the two ends together for continuous support.
☐ ☐ ☐ Fabric buried 6 inches minimum.
☐ ☐ ☐ Posts are stable, fabric is tight and without rips or frayed areas.

Sediment accumulation is ____% of design capacity.

3. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated practices)

Yes	No	NA	
☐	☐	☐	Installed concrete blocks lengthwise so open ends face outward, not upward.
☐	☐	☐	Place wire screen between No. 3 crushed stone and concrete blocks.
☐	☐	☐	Drainage area is 1 acre or less.
☐	☐	☐	Excavated area is 900 cubic feet.
☐	☐	☐	Excavated side slopes should be 2:1.
☐	☐	☐	2" x 4" frame is constructed and structurally sound.
☐	☐	☐	Posts 3-foot maximum spacing between posts.
☐	☐	☐	Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
☐	☐	☐	Posts are stable, fabric is tight and without rips or frayed areas.

Sediment accumulation is ____% of design capacity.

4. Temporary Sediment Trap

Yes	No	NA	
☐	☐	☐	Outlet structure is constructed per the approved plan or drawing.
☐	☐	☐	Geotextile fabric has been placed beneath rock fill.

Sediment accumulation is ____% of design capacity.

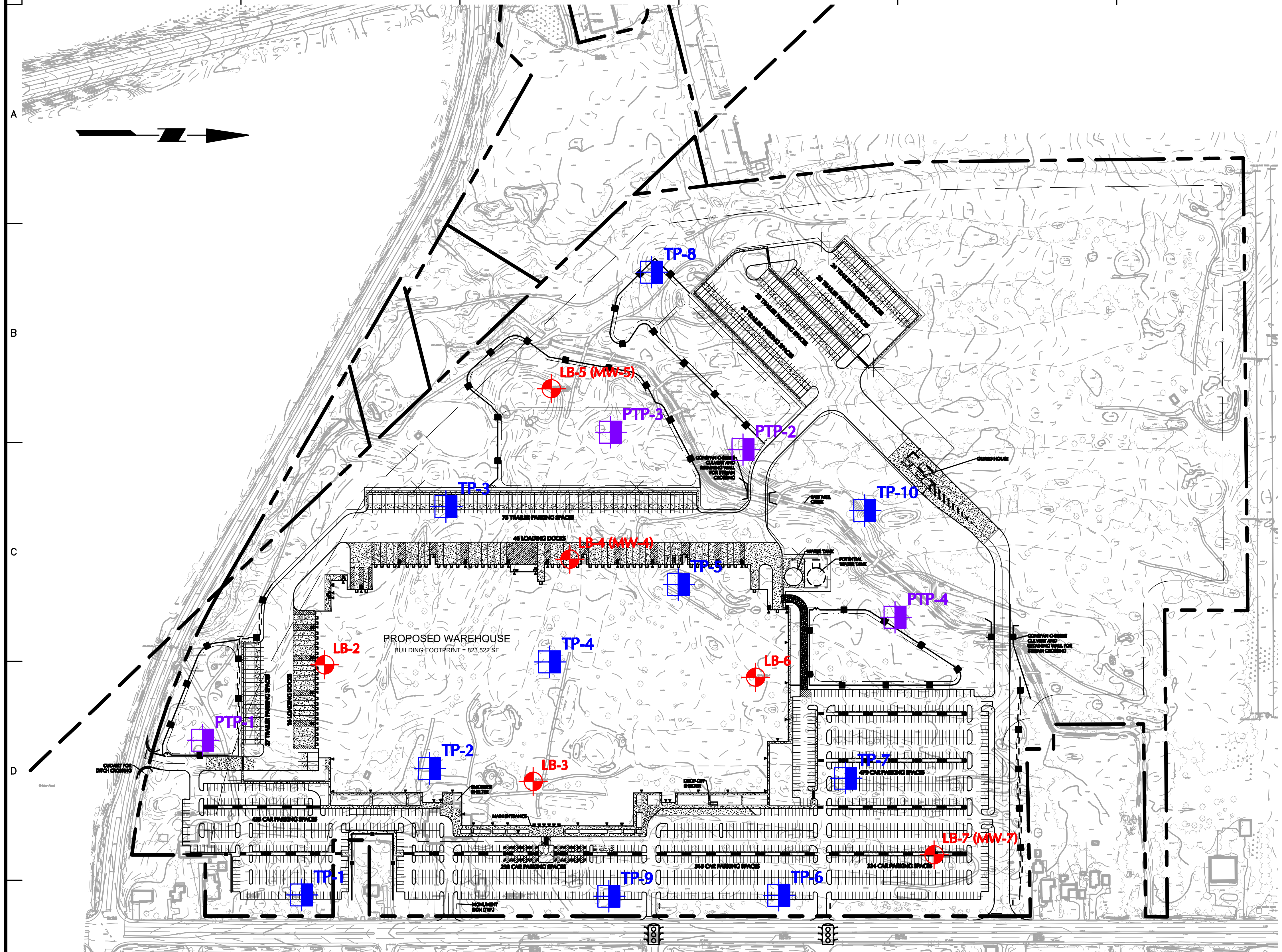
5. Temporary Sediment Basin

Yes	No	NA	
☐	☐	☐	Basin and outlet structure constructed per the approved plan.
☐	☐	☐	Basin side slopes are stablized with seed/mulch.
☐	☐	☐	Drainage structure is flushed and basin surface restored upon removal of sediment basin facility.

Sediment accumulation is ____% of design capacity.

Appendix E

Soil Testing Information



LEGEND

LB-2 (MW-2) GEOTECHNICAL BORING LOCATION ("MW" DENOTES MONITORING WELL LOCATION)

TP-1 GEOTECHNICAL TEST PIT LOCATION

PTP-1 GEOTECHNICAL PERCOLATION TEST LOCATION

NOTES

1. ALL BORING, TEST PIT, AND PERCOLATION TEST LOCATIONS ARE APPROXIMATE.
2. BASE DRAWING REPRODUCED FROM LATEST OVERALL SITE PLAN PREPARED BY LANGAN.
3. EXISTING CONDITIONS INFORMATION PROVIDED BY LANGAN SURVEYORS.
4. BORINGS WERE PERFORMED BETWEEN 17 AND 22 JULY 2019 BY SJB SERVICES, INC. UNDER THE DIRECT SUPERVISION OF LANGAN.
5. TEST PITS WERE PERFORMED ON 23 AND 24 JULY 2019 BY SJB SERVICES, INC. UNDER THE DIRECT SUPERVISION OF LANGAN.
6. PERCOLATION TESTS WERE PERFORMED ON 24 AND 25 JULY 2019 BY LANGAN.
7. LB-1 WAS NOT COMPLETED AS A PART OF THIS INVESTIGATION.

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

LANGAN	Project	Drawing Title		Drawing No.
Langan Engineering and Environmental Services, Inc. 300 Kimball Drive Parsippany, NJ 07054 T: 973.560.4900 F: 973.560.4901 www.langan.com NJ Certificate of Authorization No.24GA27996400	PROPOSED WAREHOUSE DEVELOPMENT TOWN OF CLAY ONANDAGA COUNTY NEW YORK	LOCATION PLAN	Project No. 100796101 Date 09/10/2019 Drawn By AC Checked By KS	2

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Log of Boring **LB-2** Sheet 1 of 2

Project: Project Eagle - Proposed Warehouse Development	Project No.: 100796101
Location: Clay, NY	Elevation and Datum: Approx. el 407 (NAVD 88)
Drilling Company: SJB Services, Inc.	Date Started: 7/15/19 / Date Finished: 7/17/19
Drilling Equipment: Track-Mounted Drill Rig	Completion Depth: 35.1 ft / Rock Depth: N.E.
Size and Type of Bit: 2-7/8in Tricone Roller Bit, H.S.A.	Number of Samples: Disturbed 10 / Undisturbed 0 / Core 0
Casing Diameter (in): 3 / Casing Depth (ft): 16	Water Level (ft.): First 10 / Completion - / 24 HR. -
Casing Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	Drilling Foreman: Guy
Sampler: 2-inch-diameter Split Spoon	
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	Field Engineer: Karly Summerlin

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+407.0 / +406.6	Dark brown Silty fine SAND (dry) [TOPSOIL]	0						Started boring on 7/15/2019 at 7:58AM. S-1 at 0 ft
+405.0	Brown SILT, some fine sand, trace clay, trace coarse gravel (dry)	0–2	S-1	SS	17	2, 5, 8, 8	13	
+403.3	Brown Silty CLAY, trace fine sand (dry)	2–3.5	S-2A	SS	20	9, 9, 6	15	S-2 at 2 ft
		3.5–4	S-2B	SS	4	18		
	Light brownish gray SILT, some clay, trace fine sand, calcareous (dry)	4–6	S-3	SS	13	5, 12, 10, 13	22	Augered to 4 ft with H.S.A.; brown cuttings. S-3 at 4 ft
+401.0	Light brownish gray SILT, some clay, trace fine sand, calcareous (dry)							
	Light bluish gray CLAY, some silt, trace fine gravel, calcareous (dry)	6–8	S-4	SS	17	11, 22, 30, 15	52	S-4 at 6 ft
	Light bluish gray CLAY, some silt, trace fine sand, calcareous (moist)	8–10	S-5	SS	22	7, 11, 15, 20	26	Augered to 8 ft. Slow advancement. Light gray cuttings. S-5 at 8 ft
+392.0	Dark brownish gray CLAY, some f-c sand, some silt, trace rock fragments, calcareous (wet)	10–11.9	S-6	SS	23	32, 27, 36, 50/5	63	S-6 at 10 ft. Augered to 11 ft with H.S.A. Stopped boring at 9:45 AM and backfilled with soil cuttings. Resumed on 7/16/2019 at 1:25 PM using mud rotary with tricone roller bit.
	Bluish gray CLAY, some f-m sand, trace silt, trace rock fragments (wet) [DECOMPOSED ROCK]	15	S-7	SS	5	50/5	50/5	Drilled to 15 ft; light brown wash. Advanced casing to 11 ft below grade (8 blows). S-7 at 15 ft
		17						Drilled to 17 ft; light brown-gray wash. Stopped for the day at 7/16/2019 2:30 PM.
		20						

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Log of Boring **LB-2** Sheet 2 of 2

Project	Project No.
Project Eagle - Proposed Warehouse Development	100796101
Location	**Elevation and Datum**
Clay, NY	Approx. el 407 (NAVD 88)

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+387.0	Bluish gray CLAY, some f-m sand, trace silt, trace rock fragments (wet) [DECOMPOSED ROCK]	20	S-8	SS	4	50/4	50/4	Resumed drilling on 7/17/2019 7:05 AM. Drilled to 20 ft; light gray wash. S-8 at 20 ft
	Bluish gray Sandy CLAY, some rock fragments, trace silt (wet) [DECOMPOSED ROCK]	25	S-9	SS	8	45 50/2	50/2	Drilled to 25 ft; light gray wash. S-9 at 25 ft Spoon bouncing at 25.5 ft. Advanced casing to 16 ft (130 blows). Drilled to 30 ft; light gray wash. Slow drilling (20 min/5 ft).
	Bluish gray Sandy CLAY, some rock fragments, trace silt (wet) [DECOMPOSED ROCK]	30	S-10	SS	2	50/2	50/2	Drilled to 30 ft; light gray wash. Slow drilling. S-10 at 30 ft Spoon bouncing at 30 ft.
+371.9	No Recovery End of Boring at 35.1 ft.	35	S-11	SS	0	50/1	50/1	S-11 at 35 ft Spoon bouncing at 35 ft. Finished boring on 7/17/2019 at 9:00 AM. Boring was backfilled using soil cuttings and bentonite chips.

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Log of Boring **LB-3** Sheet 1 of 2

Project: Project Eagle - Proposed Warehouse Development		Project No.: 100796101	
Location: Clay, NY		Elevation and Datum: Approx. el 414.5 (NAVD 88)	
Drilling Company: SJB Services, Inc.		Date Started: 7/18/19	Date Finished: 7/18/19
Drilling Equipment: Track-Mounted Drill Rig		Completion Depth: 35.1 ft	Rock Depth: 25 ft
Size and Type of Bit: 2-7/8in Tricone Roller Bit		Number of Samples: Disturbed 11; Undisturbed 0; Core 0	
Casing Diameter (in): 3	Casing Depth (ft): 5	Water Level (ft.): First 10; Completion -; 24 HR. -	
Casing Hammer: Automatic	Weight (lbs): 140; Drop (in): 30	Drilling Foreman: Guy	
Sampler: 2-inch-diameter Split Spoon		Field Engineer: Karly Summerlin	
Sampler Hammer: Automatic	Weight (lbs): 140; Drop (in): 30		

Elev. (ft)	Sample Description	Depth Scale	Sample Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+414.5 / +414.3	Dark brown SILT, some f-m sand, trace clay, trace roots [TOPSOIL]	0	S-1A	SS	3	1		Started boring on 7/18/2019 at 7:20AM. S-1 at 0 ft
	Brownish gray SILT, some clay, trace fine sand, calcareous (dry)	1	S-1B	SS	16	4, 4, 6	8	
	Light brownish gray SILT, some clay, trace fine sand, calcareous (dry)	2	S-2	SS	15	5, 10, 17, 14	27	S-2 at 2 ft
+410.5	Brownish gray CLAY, some silt, trace fine sand, trace fine gravel, calcareous (moist)	4	S-3	SS	17	7, 12, 14, 16	26	Advanced casing to 4 ft (140 blows). Drilled to 4 ft; light brown wash. S-3 at 4 ft
	Brownish gray CLAY, some silt, trace fine sand, trace fine gravel, calcareous (moist)	6	S-4	SS	12	13, 12, 19, 21	31	S-4 at 6 ft
+406.5	Grayish brown to brown SILT, some clay, trace fine sand, calcareous (moist)	8	S-5	SS	18	30, 37, 29, 45	66	Advanced casing to 5 ft (20 blows). Drilled to 8 ft; light grayish brown wash. S-5 at 8 ft
+404.5	Grayish brown Clayey SILT, trace fine sand, trace rock fragments [DECOMPOSED ROCK] (wet)	10	S-6	SS	16	50, 42, 38, 48	80	S-6 at 10 ft
	Bluish gray SILT, some f-m sand, trace clay, trace rock fragments (wet) [DECOMPOSED ROCK]	15	S-7	SS	3	50/3	50/3	Drilled to 15 ft; light grayish brown wash. S-7 at 15 ft. Spoon bouncing at 15.5 ft. Drilled to 20 ft; light gray wash.
		20						

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Log of Boring LB-3 Sheet 2 of 2

Project	Project Eagle - Proposed Warehouse Development	Project No.	100796101
Location	Clay, NY	Elevation and Datum	Approx. el 414.5 (NAVD 88)

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+394.5	Bluish gray SILT, some clay, some f-m sand, trace rock fragments (wet) [DECOMPOSED ROCK]	20	S-8	SS	8	45 50/2	50/2	S-8 at 20 ft. Spoon bouncing at 21 ft. Drilled to 25 ft; light gray wash.
+389.5	Dark gray ROCK FRAGMENTS, some f-c sand, some silt, trace clay [WEATHERED ROCK]	25	S-9	SS	13	21 42 50/4	50/4	S-9 at 25 ft. Spoon bouncing at 26.5 ft. Drilled to 30 ft; gray wash.
	Gray ROCK FRAGMENTS, some f-c sand, some silt, trace clay [WEATHERED ROCK]	30	S-10	SS	3	50/3	50/3	S-10 at 30 ft. Spoon bouncing at 30.5 ft. Drilled to 35 ft; gray wash.
+379.4	No Recovery End of Boring at 35.1 ft.	35	S-11	SS	0	50/1	50/1	S-11 at 35 ft. Spoon bouncing at 35 ft. Finished boring on 7/18/2019 at 9:55 AM. Boring was backfilled using soil cuttings and bentonite chips.

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Log of Boring **LB-4** Sheet 1 of 2

Project: Project Eagle - Proposed Warehouse Development	Project No.: 100796101
Location: Clay, NY	Elevation and Datum: Approx. el 409 (NAVD 88)
Drilling Company: SJB Services, Inc.	Date Started: 7/18/19 — Date Finished: 7/18/19
Drilling Equipment: Track-Mounted Drill Rig	Completion Depth: 18 ft — Rock Depth: N.E.
Size and Type of Bit: 2-7/8in Tricone Roller Bit	Number of Samples: Disturbed 7 — Undisturbed 0 — Core 0
Casing Diameter (in): 3 — Casing Depth (ft): 18	Water Level (ft.): First 8 — Completion - — 24 HR. -
Casing Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	Drilling Foreman: Guy
Sampler: 2-inch-diameter Split Spoon	
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	Field Engineer: Karly Summerlin

Elev. (ft)	Sample Description	Depth Scale
+409.0	Brown SILT, trace f-m sand, trace roots [TOPSOIL]	0
+407.0	Brown Silty CLAY, trace fine sand, calcareous (dry)	2
+405.5	Light brownish gray SILT, some clay, trace fine sand, calcareous (moist)	3.5
	Brownish gray SILT, some clay, trace fine sand, calcareous (moist)	4
	Brownish gray SILT, some clay, trace fine sand, calcareous (moist)	6
+401.0	Grayish brown SILT, some clay, trace fine sand, calcareous (wet)	8
+400.0	Bluish gray SILT, some f-m sand, trace clay, trace rock fragments (wet) [DECOMPOSED ROCK]	9
	Bluish gray SILT, some f-m sand, trace clay, trace rock fragments (wet) [DECOMPOSED ROCK]	10
	Dark bluish gray SILT, some f-m sand, some clay, trace rock fragments (wet) [DECOMPOSED ROCK]	15
+391.0	End of Boring at 18 ft.	18

Sample Data

Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)
S-1	SS	18	1, 3, 3, 5	6
S-2A	SS	16	6, 7, 10	17
S-2B	SS	6	33	
S-3	SS	16	24, 23, 23, 20	46
S-4	SS	5	50/5	50/5
S-5A	SS	4	9, 7	13
S-5B	SS	8	6, 42	
S-6	SS	14	49, 49, 50/4	50/4
S-7	SS	10	29, 50/4	50/4

Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)

- Started boring on 7/18/2019 at 10:20AM. S-1 at 0 ft
- S-2 at 2 ft
- Advanced casing to 4 ft (120 blows). Drilled to 4 ft; light brown wash S-3 at 4 ft
- S-4 at 6 ft
- Drilled to 8 ft; light grayish brown wash S-5 at 8 ft
- S-6 at 10 ft
- Spoon bouncing at 11.5 ft. Drilled to 15 ft; light gray wash.
- S-7 at 15 ft
- Drilled to 19ft; light gray wash.

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Project	Project Eagle - Proposed Warehouse Development	Project No.	100796101
Location	Clay, NY	Elevation and Datum	Approx. el 409 (NAVD 88)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+389.0		20						Advanced casing to 10 ft (150 blows). Advanced casing to 18 ft. Cleaned out hole to 19 ft; gray wash. Lost wash return at 19 ft. Casing unable to advance past 18 ft and unable to retrieve casing. Finished boring at on 7/18/2019 at 1:30PM. Moved 5.5 ft NE and redrill as LB-4A. Boring was backfilled using soil cuttings and bentonite chips.
			21						
			22						
			23						
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			45						

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Log of Boring **LB-4A** Sheet 1 of 2

Project: Project Eagle - Proposed Warehouse Development		Project No.: 100796101	
Location: Clay, NY		Elevation and Datum: Approx. el 409 (NAVD 88)	
Drilling Company: SJB Services, Inc.		Date Started: 7/18/19	Date Finished: 7/19/19
Drilling Equipment: Track-Mounted Drill Rig		Completion Depth: 35.2 ft	Rock Depth: 25 ft
Size and Type of Bit: 2-7/8in Tricone Roller Bit		Number of Samples: Disturbed 4; Undisturbed 0; Core 0	
Casing Diameter (in): 3	Casing Depth (ft): 19.5	Water Level (ft.): First -; Completion -; 24 HR. -	
Casing Hammer: Automatic; Weight (lbs): 140	Drop (in): 30	Drilling Foreman: Guy	
Sampler: 2-inch-diameter Split Spoon		Field Engineer: Karly Summerlin	
Sampler Hammer: Automatic; Weight (lbs): 140	Drop (in): 30		

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+409.0	SEE LB-4 LOG	0						Started boring on 7/18/2019 at 1:40 PM.
			3						Advanced casing to 4 ft. Drilled to 20 ft.
	+389.0		20						

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Project	Project No.
Project Eagle - Proposed Warehouse Development	100796101
Location	**Elevation and Datum**
Clay, NY	Approx. el 409 (NAVD 88)

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+389.0	Bluish gray SILT, some f-c sand, some clay, trace rock fragments (wet) [DECOMPOSED ROCK]	20	S-8	SS	3	50/3	50/3	Stopped drilling on 7/18/2019 at 2:40 PM. Resumed on 7/19/2019 at 7:00 AM. Advanced casing to 19.5 ft (spin). Cleaned out hole to 20 ft. S-8 at 20 ft Drilled to 25 ft; gray wash
	Dark gray ROCK FRAGMENTS, some f-c sand, some silt, trace clay (wet) [WEATHERED ROCK]	25	S-9	SS	3	50/3	50/3	S-9 at 25 ft Spoon bouncing at 25.5 ft. Drilled to 30 ft; gray wash
	Dark gray ROCK FRAGMENTS, some f-c sand, trace silt (wet) [WEATHERED ROCK]	30	S-10	SS	3	50/3	50/3	S-10 at 30 ft Spoon bouncing at 30.5 ft. Drilled to 35 ft; no wash return from 31 ft to 35 ft.
+373.8	Dark gray ROCK FRAGMENTS, some f-c sand, some silt, trace clay (wet) [WEATHERED ROCK] End of Boring at 35.2 ft.	35	S-11	SS	2	50/2	50/2	S-11 at 35 ft Spoon bouncing at 35 ft. Finished boring on 7/19/2019 at 10:20 AM. Installed 15 ft 1" PVC monitoring well and flush mount well cover.

Depth scale: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45

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Log of Boring **LB-5** Sheet 1 of 2

Project: Project Eagle - Proposed Warehouse Development		Project No.: 100796101	
Location: Clay, NY		Elevation and Datum: Approx. el 406.5 (NAVD 88)	
Drilling Company: SJB Services, Inc.		Date Started: 7/17/19	Date Finished: 7/17/19
Drilling Equipment: Track-Mounted Drill Rig		Completion Depth: 26.3 ft	Rock Depth: N.E.
Size and Type of Bit: 2-7/8in Tricone Roller Bit		Number of Samples: Disturbed 9; Undisturbed 0; Core 0	
Casing Diameter (in): 3	Casing Depth (ft): 9	Water Level (ft.): First 10; Completion -; 24 HR. -	
Casing Hammer: Automatic; Weight (lbs): 140	Drop (in): 30	Drilling Foreman: Guy	
Sampler: 2-inch-diameter Split Spoon		Field Engineer: Karly Summerlin	
Sampler Hammer: Automatic; Weight (lbs): 140	Drop (in): 30		

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+406.5		0						
+406.2	Dark brown SILT, trace fine sand, trace roots (dry) [TOPSOIL]							Started boring on 7/17/2019 at 10:35AM.
	Tannish brown SILT, trace fine sand (dry)	1	S-1	SS	14	WOH, 1, 1, 1	2	S-1 at 0 ft
	Tannish brown SILT, trace fine sand (moist)	2–3	S-2	SS	18	2, 2, 3, 6	5	S-2 at 2 ft
	Tannish brown SILT, trace fine sand, trace clay (moist)	4–5	S-3	SS	15	3, 4, 4, 5	8	Advanced casing to 4 ft. Drilled to 4 ft; brown wash. S-3 at 4 ft
+400.5	Tannish brown SILT, some fine sand (moist)	6–7	S-4	SS	12	3, 3, 7, 11	10	S-4 at 6 ft
+398.5	Tannish brown SILT, trace fine sand (moist)	8–9	S-5	SS	16	5, 7, 6, 9	13	Drilled to 8 ft; brown wash. S-5 at 8 ft
	Tannish brown SILT, trace fine sand (wet)	10	S-6A	SS	12	12, 12		S-6 at 10 ft
+395.5	Brown f-m SAND, some silt, trace clay (wet)	11	S-6B	SS	11	10, 20	22	
		12–14						
+391.5	Gray Silty f-m SAND, some fine gravel (moist)	15–16	S-7	SS	16	19, 21, 26, 40	47	Drilled to 15 ft; brown wash. S-7 at 15 ft
		17–19						Advanced casing to 9 ft. Drilled to 20 ft; light grayish brown wash. Slow drilling at 16 ft.
+386.5		20						

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Log of Boring **LB-5** Sheet 2 of 2

Project	Project Eagle - Proposed Warehouse Development	Project No.	100796101
Location	Clay, NY	Elevation and Datum	Approx. el 406.5 (NAVD 88)

Elev. (ft)	Sample Description	Depth Scale	Sample Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
386.5	Bluish gray SILT, some f-m sand, trace clay, trace rock fragments (wet) [DECOMPOSED ROCK]	20	S-8	SS	3	50/3	50/3	S-8 at 20 ft Drilled to 25 ft; light brownish gray wash. Light gray wash and slower drilling at 23 ft.
	Dark bluish gray SILT, some rock fragments, some f-c sand, trace clay (wet) [DECOMPOSED ROCK]	25	S-9	SS	15	11 21 50/3	50/3	S-9 at 25 ft
380.2	End of Boring at 26.3 ft.	26.3						Spoon bouncing at 26.3 ft. Finished boring on 7/17/2019 at 12:10 PM. Installed 15 ft 1" PVC monitoring well and flush mount well cover.

Depth scale: 20 – 45 ft

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Log of Boring **LB-6** Sheet 1 of 2

Project: Project Eagle - Proposed Warehouse Development		Project No.: 100796101	
Location: Clay, NY		Elevation and Datum: Approx. el 414.5 (NAVD 88)	
Drilling Company: SJB Services, Inc.		Date Started: 7/19/19	Date Finished: 7/22/19
Drilling Equipment: Track-Mounted Drill Rig		Completion Depth: 35.1 ft	Rock Depth: 35 ft
Size and Type of Bit: 2-7/8in Tricone Roller Bit		Number of Samples: Disturbed 11; Undisturbed 0; Core 0	
Casing Diameter (in): 3	Casing Depth (ft): 19	Water Level (ft.): First ∇ 12; Completion ▼ -; 24 HR. ▼ -	
Casing Hammer: Automatic; Weight (lbs): 140	Drop (in): 30	Drilling Foreman: Guy	
Sampler: 2-inch-diameter Split Spoon			
Sampler Hammer: Automatic; Weight (lbs): 140	Drop (in): 30	Field Engineer: Karly Summerlin	

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+414.5	Grayish brown Clayey f-m SAND, some roots, trace clay (moist) [TOPSOIL]	0	S-1A	SS	10	1 / 1	3	Started boring on 7/19/2019 at 12:00 PM. S-1 at 0 ft
+413.5	Light brownish gray SILT, trace fine sand, trace clay, calcareous (moist)	1	S-1B	SS	6	2 / 6		
+412.5	Light brownish gray Silty CLAY, trace fine sand, calcareous (moist)	2	S-2	SS	18	6 / 13 / 23 / 23	36	S-2 at 2 ft
+410.5	Dark bluish gray to tan Silty CLAY, trace fine sand, calcareous (moist)	4	S-3	SS	19	20 / 22 / 27 / 12	49	Advanced casing to 4 ft (spin). Drilled to 4 ft; light brownish gray wash. S-3 at 4 ft
+408.5	Brownish gray CLAY, some silt, trace fine gravel, trace f-c sand, calcareous (moist)	6	S-4	SS	12	16 / 30 / 50/4	50/4	S-4 at 6 ft
+406.5	Bluish gray SILT, some f-c SAND, trace fine gravel, trace clay, calcareous (moist)	8	S-5	SS	19	22 / 44 / 58 / 50/4	102	Advanced casing to 5 ft. Drilled to 8 ft; light brownish gray wash. S-5 at 8 ft
	Bluish gray SILT, some f-c SAND, trace clay, calcareous (moist)	10	S-6	SS	9	45 / 50/4	50/4	Drilled to 10 ft; light brownish gray wash. S-6 at 10 ft
	∇	12						
+399.5	Dark gray Sandy CLAY, some fine gravel, trace silt (wet)	15	S-7	SS	15	20 / 20 / 15 / 12	35	Drilled to 15 ft; light gray wash. S-7 at 15 ft
		17						Drilled to 20 ft; light gray wash.
+394.5		20						

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Project	Project No.
Project Eagle - Proposed Warehouse Development	100796101
Location	**Elevation and Datum**
Clay, NY	Approx. el 414.5 (NAVD 88)

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+394.5	Bluish gray Clayey ROCK FRAGMENTS, some f-c sand, trace silt (wet) [DECOMPOSED ROCK]	20	S-8	SS	5	50/5	50/5	S-8 at 20 ft Advanced casing to 10 ft. Stoped on 7/19/2019 at 1:45 PM. Resumed drilling on 7/22/2019 at 6:55 AM. Advanced casing to 19 ft (spin). Drilled to 25 ft; light gray wash.
	Dark gray Sandy CLAY, some rock fragments, trace silt (wet) [DECOMPOSED ROCK]	25	S-9	SS	3	50/4	50/4	S-9 at 25 ft Spoon bouncing at 25.5 ft. Drilled to 30 ft; gray wash. Light chatter at 29 ft.
	Dark gray Clayey f-c SAND, some rock fragments, trace silt (wet) [DECOMPOSED ROCK]	30	S-10	SS	2	50/3	50/3	S-10 at 30 ft Spoon bouncing at 30.5 ft. Drilled to 35 ft; no wash return 30 ft - 33 ft, gray wash 33 ft - 35 ft.
+379.5 +379.4	Dark gray ROCK FRAGMENTS, trace silt (wet) [WEATHERED ROCK] End of Boring at 35.1 ft.	35	S-11	SS	1	50/1	50/1	S-11 at 35 ft Spoon bouncing at 35 ft. Finished boring on 7/22/2019 at 8:55 AM. Boring was backfilled using soil cuttings and bentonite chips.

Depth scale: 20 – 45 ft. N-Value scale: 10 20 30 40.

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Log of Boring **LB-7** Sheet 1 of 2

Project: Project Eagle - Proposed Warehouse Development	Project No.: 100796101
Location: Clay, NY	Elevation and Datum: Approx. el 419 (NAVD 88)
Drilling Company: SJB Services, Inc.	Date Started: 7/22/19 · Date Finished: 7/22/19
Drilling Equipment: Track-Mounted Drill Rig	Completion Depth: 25.3 ft · Rock Depth: N.E.
Size and Type of Bit: 2-7/8in Tricone Roller Bit	Number of Samples: Disturbed 9 · Undisturbed 0 · Core 0
Casing Diameter (in): 3 · Casing Depth (ft): 4	Water Level (ft.): First ▽ 12 · Completion ▼ - · 24 HR. ▼ -
Casing Hammer: Automatic · Weight (lbs): 140 · Drop (in): 30	Drilling Foreman: Guy
Sampler: 2-inch-diameter Split Spoon	
Sampler Hammer: Automatic · Weight (lbs): 140 · Drop (in): 30	Field Engineer: Karly Summerlin

Elev. (ft)	Sample Description	Depth Scale (ft)	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+419.0	Brown SILT, some f-c sand, trace roots (moist) [TOPSOIL]	0	S-1	SS	9	1, 3, 3, 3	6	Started boring on 7/22/2019 at 9:40AM. S-1 at 0 ft
+417.0	Bluish gray to gray to tan SILT, some f-c sand, some clay, trace fine gravel (moist)	2	S-2	SS	11	2, 3, 3, 7	6	S-2 at 2 ft
+415.0	No Recovery	4	S-3	SS	0	11, 12, 22, 33	34	Advanced casing to 4 ft (spin). Drilled to 4 ft; light brown to light grayish brown wash. S-3 at 4 ft. No recovery.
	Light gray to tan CLAY, some silt, trace fine sand, trace organics (wet)	6	S-4	SS	0	33, 42, 29, 28	71	S-4 at 6 ft. No recovery. Readvance spoon - 6 blows/8 in, rest for 5 minutes before retrieving. 1" recovery in second spoon.
+411.0	Bluish gray to dark gray to tan Clayey f-c SAND, some fine gravel (moist)	8	S-5	SS	11	31, 45, 43, 35	88	Drilled to 8 ft; light grayish brown wash. S-5 at 8 ft
+409.0	Bluish gray to brownish gray Clayey f-c SAND, some silt, some f-c gravel (moist)	10	S-6	SS	13	19, 13, 27, 47	40	S-6 at 10 ft
	▽ (water level)	12						
+404.0	Bluish gray Clayey f-c SAND, trace rock fragments, trace silt (wet) [DECOMPOSED ROCK]	15	S-7	SS	3	50/3	50/3	Drilled to 15 ft; light grayish brown wash. S-7 at 15 ft. Spoon bouncing at 15.5 ft. Drilled to 20 ft; light gray wash.
		20						

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Log of Boring **LB-7** Sheet 2 of 2

Project	Project No.
Project Eagle - Proposed Warehouse Development	100796101
Location	**Elevation and Datum**
Clay, NY	Approx. el 419 (NAVD 88)

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+399.0	Bluish gray Clayey f-c SAND, some rock fragments, trace silt (wet) [DECOMPOSED ROCK]	20	S-8	SS	8	8 20 50/4	50/4	S-8 at 20 ft
		21–24						Spoon bouncing at 26.5 ft. Drilled to 25 ft; light gray wash.
+393.7	Bluish gray Clayey ROCK FRAGMENTS, some f-c sand, trace silt (wet) [DECOMPOSED ROCK]	25	S-9	SS	4	50/4	50/4	S-9 at 25 ft
	End of boring at 25.3 ft.	26–45						Spoon bouncing at 25.3 ft. Finished boring on 7/22/2019 at 12:00 PM. Installed 15 ft 1" PVC monitoring well and flush mount well cover.

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LOG OF TEST PIT PTP-1

PROJECT NAME	PROJECT NUMBER	DATE
Project Eagle - Proposed Warehouse Development	100796101	7/23/2019

LOCATION	ELEVATION
Clay, NY	Approx. el 408.5 (NAVD 88)

EXCAVATION CONTRACTOR	DEPTH	WATER LEVEL - First	WATER LEVEL - Completion
SJB Services, Inc.	6.5 ft	6.2 ft ▽	- ▼

EQUIPMENT	FOREMAN	LANGAN PERSONNEL
Ford 555E Mini-Track Excavator	Art	Karly Summerlin

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+408.5	Dark brown Silty fine SAND (moist) [TOPSOIL]	0			Began excavating on 7/23/19.
	+407.5	Grayish brown SILT, trace fine sand, trace clay (moist)	1			
			2			
			3			
			4			
			5			
		▽	6			Groundwater level observed at 6.2' bgs.
	+402.0	End of Test Pit at 6.5'.				Finished excavating on 7/23/19. Test Pit backfilled with excavated soils upon completion.
			7			
			8			
			9			
			10			
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT PTP-2

PROJECT NAME	PROJECT NUMBER	DATE
Project Eagle - Proposed Warehouse Development	100796101	7/23/2019

LOCATION	ELEVATION
Clay, NY	Approx. el 408 (NAVD 88)

EXCAVATION CONTRACTOR	DEPTH	WATER LEVEL - First	WATER LEVEL - Completion
SJB Services, Inc.	8.5 ft	8.5 ft ▽	6.8 ft ▼

EQUIPMENT	FOREMAN	LANGAN PERSONNEL
Ford 555E Mini-Track Excavator	Art	Karly Summerlin

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+408.0	Brown Silty fine SAND (moist)	0			Began excavating on 7/23/19.
			1			
			1.5			Roots encountered from 0' to 1.5' bgs.
			2			
			3			
	+404.5	Bluish gray SILT, some clay, some f-c gravel (moist)	3.5			
			4			
			5			
			6			
		▼	7			Groundwater level observed to be at approx. 6.8 ft below grade at 2PM on 7/24/19.
	+400.0	Gray SILT, some f-m sand, trace clay, trace f-c gravel (moist) [DECOMPOSED ROCK] ▽	8			
	+399.5	End of Test Pit at 8.5'.	8.5			Initial groundwater level observed at 11AM on 7/23/19. Finished excavating on 7/23/19. Test Pit backfilled with excavated soils on 7/24/19.
			9			
			10			
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT PTP-3

PROJECT NAME	PROJECT NUMBER	DATE
Project Eagle - Proposed Warehouse Development	100796101	7/23/2019

LOCATION	ELEVATION
Clay, NY	Approx. el 407.5 (NAVD 88)

EXCAVATION CONTRACTOR	DEPTH	WATER LEVEL - First	WATER LEVEL - Completion
SJB Services, Inc.	9.5 ft	-	8 ft

EQUIPMENT	FOREMAN	LANGAN PERSONNEL
Ford 555E Mini-Track Excavator	Art	Karly Summerlin

ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
+407.5	Dark brown Silty f-m SAND (moist) [TOPSOIL]	0			Began excavating on 7/23/19.
+406.0	Brown SILT, trace fine sand, trace clay (moist)	1.5			Roots encountered from 0' to 1.5' bgs.
+403.5	Brownish gray SILT, trace clay, trace fine sand, trace f-c gravel (moist)	4			
+399.5	Bluish gray to brown SILT, some fine to coarse sand, some clay, trace f-c gravel (wet) [DECOMPOSED ROCK]	8			Groundwater level observed at approx. 8 ft below grade at 12PM on 7/24/19. Difficulty excavating below 8 ft.
+398.0	End of Test Pit at 9.5'.	9.5			Finished excavating on 7/23/19. Test Pit backfilled with excavated soil on 7/24/19.

Depth Scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

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LOG OF TEST PIT PTP-4

PROJECT NAME	PROJECT NUMBER	DATE
Project Eagle - Proposed Warehouse Development	100796101	7/23/2019

LOCATION	ELEVATION
Clay, NY	Approx. el 413 (NAVD 88)

EXCAVATION CONTRACTOR	DEPTH	WATER LEVEL - First	WATER LEVEL - Completion
SJB Services, Inc.	9 ft	9 ft	8.5 ft

EQUIPMENT	FOREMAN	LANGAN PERSONNEL
Ford 555E Mini-Track Excavator	Art	Karly Summerlin

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+413.0	Dark brown Silty fine SAND (moist)	0			Began excavating on 7/23/19.
	+411.5	Brownish gray Clayey SILT, some f-c gravel, trace f-m sand (moist)				
	+405.0	Gray SILT, trace f-c sand, trace clay, trace f-c gravel (moist) [DECOMPOSED ROCK]	8			Groundwater level observed at approx. 8.5 ft below grade at 1PM on 7/24/19.
	+404.0	End of Test Pit at 9'.	9			Initial groundwater level observed at 11AM on 7/23/19. Finished excavating on 7/23/19. Test Pit backfilled with excavated soil on 7/24/19.

Depth scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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LOG OF TEST PIT TP-1

PROJECT NAME: Project Eagle - Proposed Warehouse Development	PROJECT NUMBER: 100796101	DATE: 7/24/2019
LOCATION: Clay, NY	ELEVATION: Approx. el 416.5 (NAVD 88)	
EXCAVATION CONTRACTOR: SJB Services, Inc.	DEPTH: 9 ft	WATER LEVEL - First: - ; WATER LEVEL - Completion: -
EQUIPMENT: Ford 555E Mini-Track Excavator	FOREMAN: Art	LANGAN PERSONNEL: Karly Summerlin

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+416.5	Brown Silty f-m SAND (moist) [TOPSOIL]	0			Began excavating on 7/23/19.
	+415.5	Gray to tan SILT, some fine sand (moist)	1			
	+414.5	Dark gray Sandy SILT, trace clay, trace fine gravel (moist)	2			
	+414.0	Brown SILT, some fine sand, trace clay (moist)	2.5			
	+410.5	Gray SILT, some clay, trace fine sand (moist) [DECOMPOSED ROCK]	6			
	+407.5	End of Test Pit at 9'.	9			Finished excavating on 7/23/19. Test Pit backfilled with excavated soil on 7/24/19.

Depth Scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

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LOG OF TEST PIT TP-2

PROJECT NAME: Project Eagle - Proposed Warehouse Development	PROJECT NUMBER: 100796101	DATE: 7/24/2019
LOCATION: Clay, NY	ELEVATION: Approx. el 415 (NAVD 88)	
EXCAVATION CONTRACTOR: SJB Services, Inc.	DEPTH: 9 ft	WATER LEVEL - First: - ; WATER LEVEL - Completion: -
EQUIPMENT: Ford 555E Mini-Track Excavator	FOREMAN: Art	LANGAN PERSONNEL: Karly Summerlin

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+415.0	Dark brown Silty f-m SAND (moist) [TOPSOIL]	0			Began excavating on 7/23/19.
	+414.0	Brownish gray SILT, some clay, trace fine sand (moist)	1			
	+409.0	Gray SILT, some clay, trace fine sand (moist) [DECOMPOSED ROCK]	6			
	+406.0	End of Test Pit at 9'.	9			Finished excavating on 7/23/19. Test Pit backfilled with excavated soil on 7/24/19.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

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LOG OF TEST PIT TP-3

PROJECT NAME: Project Eagle - Proposed Warehouse Development	PROJECT NUMBER: 100796101	DATE: 7/24/2019
LOCATION: Clay, NY	ELEVATION: Approx. el 402.5 (NAVD 88)	
EXCAVATION CONTRACTOR: SJB Services, Inc.	DEPTH: 6 ft	WATER LEVEL - First: 5.5 ft; WATER LEVEL - Completion: -
EQUIPMENT: Ford 555E Mini-Track Excavator	FOREMAN: Art	LANGAN PERSONNEL: Karly Summerlin

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+402.5	Dark brown Silty f-m SAND (moist) [TOPSOIL]	0			Began excavating on 7/23/19.
	+401.5	Bluish gray SILT, trace clay, trace fine sand (moist)	1			
	+400.5	Bluish gray SILT, some clay, trace fine sand (moist) [DECOMPOSED ROCK]	2			Initial groundwater level observed on 7/23/19.
	+396.5	End of Test Pit at 6'.	6			Finished excavating on 7/23/19. Test Pit backfilled with excavated soil on 7/24/19.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

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LOG OF TEST PIT TP-4

PROJECT NAME: Project Eagle - Proposed Warehouse Development	PROJECT NUMBER: 100796101	DATE: 7/24/2019
LOCATION: Clay, NY	ELEVATION: Approx. el 413.5 (NAVD 88)	
EXCAVATION CONTRACTOR: SJB Services, Inc.	DEPTH: 7 ft	WATER LEVEL - First: - ; WATER LEVEL - Completion: -
EQUIPMENT: Ford 555E Mini-Track Excavator	FOREMAN: Art	LANGAN PERSONNEL: Karly Summerlin

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+413.5	Dark brown Silty f-m SAND (moist) [TOPSOIL]	0			Began excavating on 7/23/19.
	+412.5	Bluish gray to tan SILT, some clay, trace fine sand (moist)	1			
	+408.5	Gray SILT, some clay, trace fine sand, trace fine gravel (moist) [DECOMPOSED ROCK]	5			
	+406.5	End of Test Pit at 7'.	7			Finished excavating on 7/23/19. Test Pit backfilled with excavated soil on 7/24/19.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

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LOG OF TEST PIT TP-5

PROJECT NAME	PROJECT NUMBER	DATE
Project Eagle - Proposed Warehouse Development	100796101	7/24/2019

LOCATION	ELEVATION
Clay, NY	Approx. el 413.5 (NAVD 88)

EXCAVATION CONTRACTOR	DEPTH	WATER LEVEL - First	WATER LEVEL - Completion
SJB Services, Inc.	4.5 ft	-	-

EQUIPMENT	FOREMAN	LANGAN PERSONNEL
Ford 555E Mini-Track Excavator	Art	Karly Summerlin

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+413.5	Dark brown Silty f-m SAND (moist) [TOPSOIL]	0			Began excavating on 7/23/19. Roots encountered from 0' to 0.75' bgs.
	+412.8	Brown SILT, some fine sand, trace clay (moist)	1			
	+411.5	Bluish gray to tan SILT, trace fine sand, trace clay (moist)	2–3			
	+410.0	Bluish gray SILT, some clay, trace fine sand (moist) [DECOMPOSED ROCK]	4			
	+409.0	End of Test Pit at 4.5'.	5–15			Finished excavating on 7/23/19. Test Pit backfilled with excavated soil on 7/24/19.

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LOG OF TEST PIT TP-6

PROJECT NAME Project Eagle - Proposed Warehouse Development	PROJECT NUMBER 100796101		DATE 7/24/2019	
LOCATION Clay, NY	ELEVATION Approx. el 416 (NAVD 88)			
EXCAVATION CONTRACTOR SJB Services, Inc.	DEPTH 4.5 ft		WATER LEVEL - First -	WATER LEVEL - Completion -
EQUIPMENT Ford 555E Mini-Track Excavator	FOREMAN Art		LANGAN PERSONNEL Karly Summerlin	

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+416.0	Dark brown Silty fine SAND (moist) [TOPSOIL]	0			Began excavating on 7/23/19. Roots encountered from 0' to 0.75' bgs.
	+415.3	Bluish gray Sandy SILT, trace clay, trace fine gravel (moist)	1 2 3			
	+412.3	Gray SILT, some clay, trace fine sand (moist) [DECOMPOSED ROCK]	4			
	+411.5	End of Test Pit at 4.5'.	5 6 7 8 9 10 11 12 13 14 15			Finished excavating on 7/23/19. Test Pit backfilled with excavated soil on 7/24/19.

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LOG OF TEST PIT TP-7

PROJECT NAME	PROJECT NUMBER	DATE
Project Eagle - Proposed Warehouse Development	100796101	7/24/2019

LOCATION	ELEVATION
Clay, NY	Approx. el 417 (NAVD 88)

EXCAVATION CONTRACTOR	DEPTH	WATER LEVEL - First	WATER LEVEL - Completion
SJB Services, Inc.	8 ft	-	-

EQUIPMENT	FOREMAN	LANGAN PERSONNEL
Ford 555E Mini-Track Excavator	Art	Karly Summerlin

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+417.0	Dark brown Silty f-m SAND (moist) [TOPSOIL]	0			Began excavating on 7/23/19. Roots encountered from 0' to 0.75' bgs.
	+416.3	Bluish gray to tan SILT, some fine sand (moist)	1			
	+415.0	Bluish gray to tan SILT, some fine sand, trace clay (moist)	2			
	+411.0	Gray SILT, some clay, trace f-c sand, trace f-c gravel (moist) [DECOMPOSED ROCK]	6			
	+409.0	End of Test Pit at 8'.	8			Finished excavating on 7/23/19. Test Pit backfilled with excavated soil on 7/24/19.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

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LOG OF TEST PIT TP-8

PROJECT NAME Project Eagle - Proposed Warehouse Development	PROJECT NUMBER 100796101	DATE 7/24/2019
LOCATION Clay, NY	ELEVATION Approx. el 405 (NAVD 88)	
EXCAVATION CONTRACTOR SJB Services, Inc.	DEPTH 7.5 ft	WATER LEVEL - First 6.8 ft ▽ / WATER LEVEL - Completion - ▼
EQUIPMENT Ford 555E Mini-Track Excavator	FOREMAN Art	LANGAN PERSONNEL Karly Summerlin

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+405.0	Dark brown Silty f-m SAND (moist) [TOPSOIL]	0			Began excavating on 7/23/19.
	+404.0	Brown SILT, some fine sand (moist)	1			
		▽	6.8			Initial groundwater level observed on 7/23/19.
	+398.0	Brown Silty f-m SAND, trace f-c gravel (wet)	7			
	+397.5	End of Test Pit at 7.5'.	7.5			Finished excavating on 7/23/19. Test Pit backfilled with excavated soil on 7/24/19.

Depth Scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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LOG OF TEST PIT TP-9

PROJECT NAME: Project Eagle - Proposed Warehouse Development	PROJECT NUMBER: 100796101	DATE: 7/24/2019
LOCATION: Clay, NY	ELEVATION: Approx. el 418.5 (NAVD 88)	
EXCAVATION CONTRACTOR: SJB Services, Inc.	DEPTH: 9 ft	WATER LEVEL - First: - ; WATER LEVEL - Completion: -
EQUIPMENT: Ford 555E Mini-Track Excavator	FOREMAN: Art	LANGAN PERSONNEL: Karly Summerlin

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+418.5	Brown Silty f-m SAND (moist) [TOPSOIL]	0			Began excavating on 7/23/19. Roots encountered from 0' to 1' bgs.
	+417.5	Bluish gray to tan SILT, trace fine sand, trace fine gravel, trace clay (moist)	1			
	+411.5	Gray SILT, trace clay, trace fine sand, trace f-c gravel (moist) [DECOMPOSED ROCK]	7			
	+409.5	End of Test Pit at 9'.	9			Finished excavating on 7/23/19. Test Pit backfilled with excavated soil on 7/24/19.

Depth Scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

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LOG OF TEST PIT TP-10

PROJECT NAME: Project Eagle - Proposed Warehouse Development	PROJECT NUMBER: 100796101	DATE: 7/24/2019
LOCATION: Clay, NY	ELEVATION: Approx. el 411 (NAVD 88)	
EXCAVATION CONTRACTOR: SJB Services, Inc.	DEPTH: 10 ft	WATER LEVEL - First: - ; WATER LEVEL - Completion: -
EQUIPMENT: Ford 555E Mini-Track Excavator	FOREMAN: Art	LANGAN PERSONNEL: Karly Summerlin

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+411.0	Dark brown Silty f-m SAND (moist) [TOPSOIL]	0			Began excavating on 7/23/19.
	+410.0	Brownish gray SILT, some fine sand, trace clay (moist)	1			
	+401.5	Gray SILT, some f-c sand, trace clay, trace f-c gravel (moist) [DECOMPOSED ROCK]	9.5			
	+401.0	End of Test Pit at 10'.	10			Finished excavating on 7/23/19. Test Pit backfilled with excavated soil on 7/24/19.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

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PERCOLATION TEST PTP-1

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PROJECT INFORMATION

Project Name:	Project Eagle
Location:	Clay, NY
Project No:	100796101
Client:	TCC
Langan Representative:	Karly Summerlin
Equipment and Method:	CAT Excavator/Test Pit
Contractor:	SJB Services, Inc. (Art)

TEST GENERAL INFORMATION

Depth of PT:	4 ft
Elevation of PT:	el 404.5
Soil Type:	Grayish brown SILT
Test Hole Dia:	12 in
Test Hole Length:	12 in
Elevation of GW:	el 402.5
Weather:	Sunny, 70's °F

INITIAL CONDITIONS - PRE-SOAK

Start Time: 3:45 PM 7/24/2019

Initial Height of Water (in): 11.75

INITIAL CONDITIONS - PERCOLATION TEST

Start Time: 7:07 AM 7/25/2019

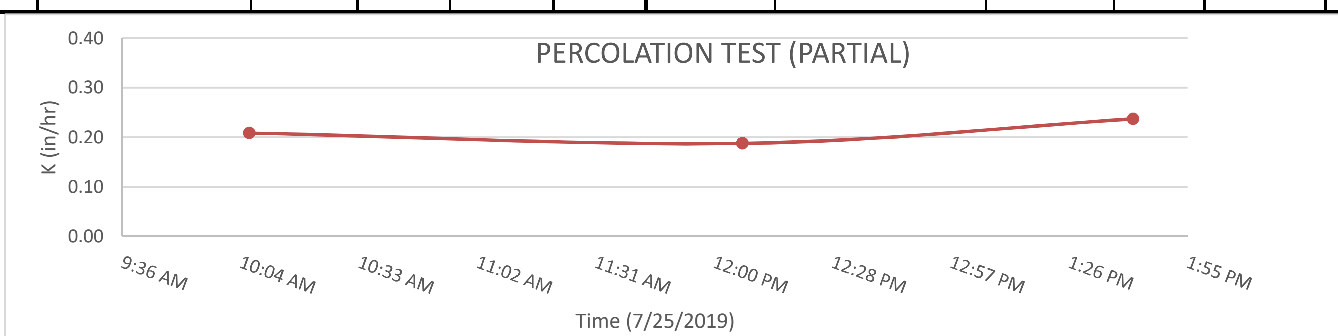
Initial Height of Water (in): 9

PRE-SOAK

Time	Pre-Soak Time (min)	Height (in)	t2-t1 (hr)	h2-h1 (in)	Refill?
5:05 PM	80	11.00	1.33	0.75	
6:00 PM	135	10.88	0.92	0.13	
7:00 PM	195	10.63	1.00	0.25	

PERCOLATION TEST (PARTIAL)

	Run Time (min)	Height (in)	t2-t1 (hr)	h2-h1 (in)	K (in/hr)
7:07 AM	0	9.00	-	-	-
10:07 AM	180	8.38	3.00	0.63	0.21
12:07 PM	300	8.00	2.00	0.38	0.19
1:42 PM	395	7.63	1.58	0.38	0.24



STABILIZED PERCOLATION RATE AT EL 404.5 FT

Stabilized Rate of Percolation, Km (in/hr): 0.19

Inspector Remarks:

Water remained in test bucket the following morning after the pre-soak period.

Took approximately 4 hours to drain 1 inch, did not continue test.

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PERCOLATION TEST PTP-2

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PROJECT INFORMATION		TEST GENERAL INFORMATION	
Project Name:	Project Eagle	Depth of PT:	4.5 ft
Location:	Clay, NY	Elevation of PT:	el 403.5
Project No:	100796101	Soil Type:	Bluish Gray SILT
Client:	TCC	Test Hole Dia:	12 in
Langan Representative:	Karly Summerlin	Test Hole Length:	12 in
Equipment and Method:	CAT Excavator/Test Pit	Elevation of GW:	el 401.5
Contractor:	SJB Services, Inc. (Art)	Weather:	Sunny, 70's °F

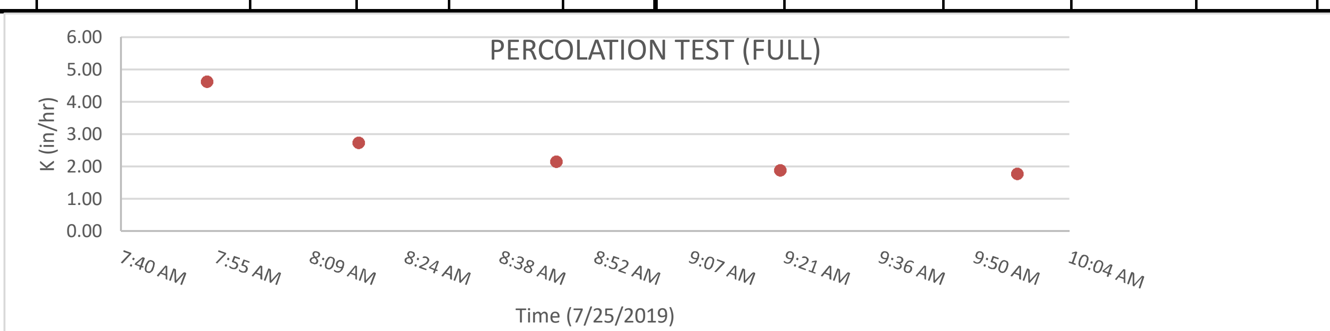
INITIAL CONDITIONS - PRE-SOAK	INITIAL CONDITIONS - PERCOLATION TEST
Start Time: 4:15 PM 7/24/2019	Start Time: 7:41 AM 7/25/2019
Initial Height of Water (in): 11.5	Initial Height of Water (in): 6

PRE-SOAK

Time	Pre-Soak Time (min)	Height (in)	t2-t1 (hr)	h2-h1 (in)	Refill?
4:45 PM	30	6.00	0.50	5.50	12"
5:10 PM	55	7.25	0.42	3.75	-
6:06 PM	111	4.13	0.93	3.13	-
7:09 PM	174	2.50	1.05	1.63	12"

PERCOLATION TEST (FULL)

`	`	Run #2	Run #3	Run #4	Run #5
Start	7:41 AM	7:55 AM	8:19 AM	8:49 AM	9:23 AM
End	7:54 AM	8:17 AM	8:47 AM	9:21 AM	9:57 AM
Min Elapsed	13	22	28	32	34
h2-h1 (in)	1.0	1.0	1.0	1.0	1.0
K (in/hr)	4.62	2.73	2.14	1.88	1.76



STABILIZED PERCOLATION RATE AT EL 403.5 FT

Stabilized Rate of Percolation, Km (in/hr): 1.76

Inspector Remarks:

PERCOLATION TEST PTP-3

DRAFT

PROJECT INFORMATION	
Project Name:	Project Eagle
Location:	Clay, NY
Project No:	100796101
Client:	TCC
Langan Representative:	Karly Summerlin
Equipment and Method:	CAT Excavator/Test Pit
Contractor:	SJB Services, Inc. (Art)

TEST GENERAL INFORMATION	
Depth of PT:	4 ft
Elevation of PT:	el 403.5
Soil Type:	Brownish Gray SILT
Test Hole Dia:	12 in
Test Hole Length:	12 in
Elevation of GW:	el 399.5
Weather:	Sunny, 70's °F

INITIAL CONDITIONS - PRE-SOAK

Start Time: 3:55 PM 7/24/2019
Initial Height of Water (in): 11.75

INITIAL CONDITIONS - PERCOLATION TEST

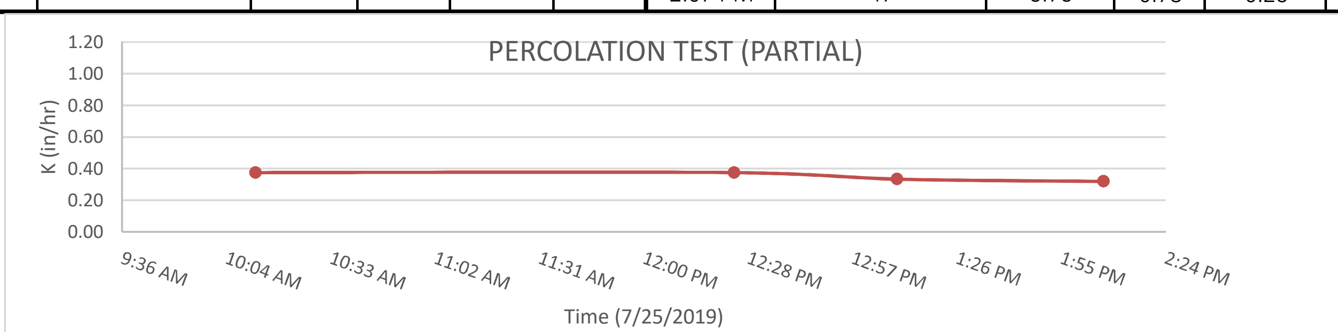
Start Time: 7:13 AM 7/25/2019
Initial Height of Water (in): 11.5

PRE-SOAK

Time	Pre-Soak Time (min)	Height (in)	t2-t1(hr)	h2-h1 (in)	Refill?
4:45 PM	50	11.00	0.83	0.75	11.75"
5:11 PM	76	10.25	0.43	1.25	-
6:09 PM	134	9.25	0.97	1.00	-
7:13 PM	198	8.50	1.07	0.75	11.5"

PERCOLATION TEST (PARTIAL)

`	`				
	Run Time (min)	Height (in)	t2-t1(hr)	h2-h1 (in)	K (in/hr)
7:13 AM	0	4.88	-	-	
10:13 AM	180	3.75	3.00	1.13	0.38
	Run #2				
10:25 AM	0	6.00	-	-	
12:25 PM	120	5.25	2.00	0.75	0.38
1:10 PM	165	5.00	0.75	0.25	0.33
	Run #3				
1:20 PM	0	6.00	-	-	
2:07 PM	47	5.75	0.78	0.25	0.32



STABILIZED PERCOLATION RATE AT EL 403.5 FT

Stabilized Rate of Percolation, Km (in/hr): 0.32

Inspector Remarks:

Water remained in test bucket the following morning after the pre-soak period.
Took over 1 hour to drain less than 0.25 inch, did not continue test.

LANGAN PERCOLATION TEST PTP-4 DRAFT

PROJECT INFORMATION		TEST GENERAL INFORMATION	
Project Name:	Project Eagle	Depth of PT:	4 ft
Location:	Clay, NY	Elevation of PT:	el 407
Project No:	100796101	Soil Type:	Brownish Gray Clayey SILT
Client:	TCC	Test Hole Dia:	12 in
Langan Representative:	Karly Summerlin	Test Hole Length:	12 in
Equipment and Method:	CAT Excavator/Test Pit	Elevation of GW:	el 404.5
Contractor:	SJB Services, Inc. (Art)	Weather:	Sunny, 70's °F

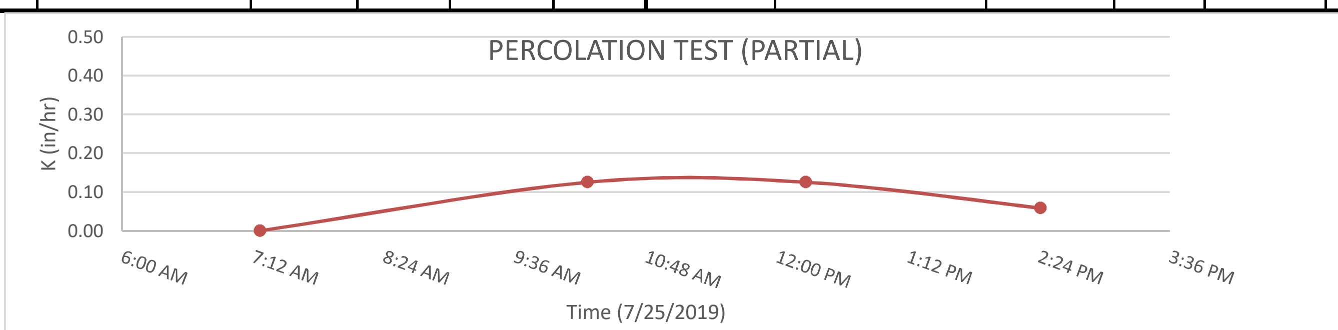
INITIAL CONDITIONS - PRE-SOAK	INITIAL CONDITIONS - PERCOLATION TEST
Start Time: 4:00 PM 7/24/2019	Start Time: 7:16 AM 7/25/2019
Initial Height of Water (in): 12.5	Initial Height of Water (in): 10.25

PRE-SOAK

Time	Pre-Soak Time (min)	Height (in)	t2-t1(hr)	h2-h1 (in)	Refill?
4:45 PM	45	11.50	0.75	1.00	12"
5:15 PM	75	11.75	0.50	0.25	-
6:11 PM	131	11.63	0.93	0.13	-
7:20 PM	200	11.50	1.15	0.13	12"

PERCOLATION TEST (PARTIAL)

`	Run Time (min)	Height (in)	t2-t1(hr)	h2-h1 (in)	K (in/hr)
7:16 AM	0	10.25	-	-	-
10:16 AM	180	9.88	3.00	0.38	0.13
12:16 PM	300	9.63	2.00	0.25	0.13
2:25 PM	429	9.50	2.15	0.13	0.06



STABILIZED PERCOLATION RATE AT EL 410 FT

Stabilized Rate of Percolation, Km (in/hr): 0.06

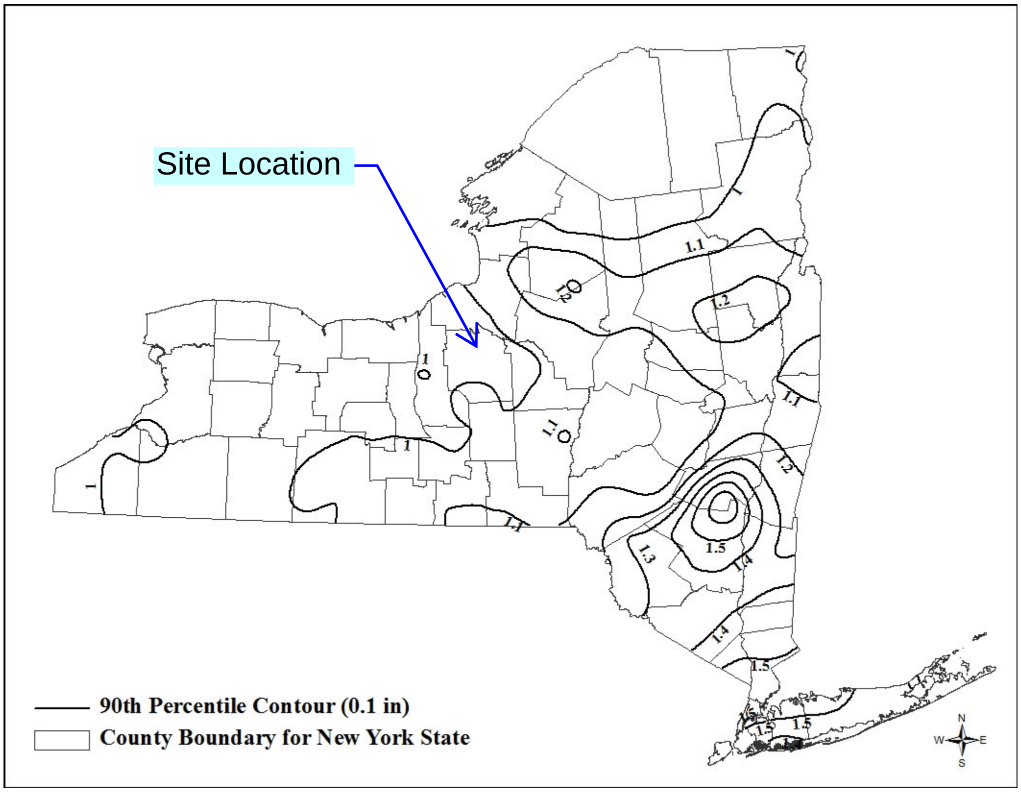
Inspector Remarks:

Water remained in test bucket the following morning after the pre-soak period.
Took over 7 hours to drain less than 1 inch, did not continue test.

Appendix F

Design Calculations

Figure 4.1: 90th Percentile Rainfall in New York State (NYSDEC, 2013)



Basis of Design for Water Quality

As a basis for design, the following assumptions may be made:

Measuring Impervious Cover: the measured area of a site plan that does not have permanent vegetative or permeable cover shall be considered total impervious cover. Impervious cover is defined as all impermeable surfaces and includes: paved and gravel road surfaces, paved and gravel parking lots, paved driveways, building structures, paved sidewalks, and miscellaneous impermeable structures such as patios, pools, and sheds. Where site size makes direct measurement of impervious cover impractical, the land use/impervious cover relationships presented in Table 4.2 can be used to initially estimate impervious cover. In site specific planning impervious cover must be calculated based the specific proposed impervious cover.

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New York
Location	
Longitude	76.206 degrees West
Latitude	43.120 degrees North
Elevation	0 feet
Date/Time	Tue, 03 Sep 2019 16:10:22 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.54	0.71	0.88	1.08	**1yr**	0.76	0.98	1.23	1.46	1.73	2.02	2.26	**1yr**	1.79	2.17	2.60	3.16	3.70	**1yr**
2yr	0.33	0.51	0.63	0.84	1.05	1.29	**2yr**	0.91	1.18	1.46	1.73	2.02	2.34	2.64	**2yr**	2.07	2.54	2.99	3.61	4.18	**2yr**
5yr	0.40	0.62	0.77	1.03	1.32	1.63	**5yr**	1.14	1.45	1.84	2.17	2.51	2.87	3.27	**5yr**	2.54	3.14	3.65	4.34	4.95	**5yr**
10yr	0.45	0.71	0.89	1.21	1.58	1.95	**10yr**	1.36	1.70	2.20	2.58	2.96	3.35	3.84	**10yr**	2.97	3.69	4.25	4.98	5.63	**10yr**
25yr	0.54	0.85	1.09	1.50	1.99	2.46	**25yr**	1.71	2.09	2.77	3.23	3.67	4.11	4.76	**25yr**	3.64	4.57	5.19	5.99	6.67	**25yr**
50yr	0.61	0.98	1.25	1.76	2.37	2.95	**50yr**	2.05	2.45	3.32	3.84	4.34	4.80	5.60	**50yr**	4.25	5.38	6.04	6.88	7.59	**50yr**
100yr	0.71	1.14	1.47	2.08	2.83	3.52	**100yr**	2.44	2.88	3.96	4.55	5.10	5.61	6.59	**100yr**	4.96	6.34	7.03	7.91	8.64	**100yr**
200yr	0.81	1.32	1.71	2.45	3.38	4.20	**200yr**	2.91	3.38	4.72	5.40	6.01	6.54	7.76	**200yr**	5.79	7.46	8.18	9.10	9.83	**200yr**
500yr	0.98	1.61	2.10	3.05	4.27	5.31	**500yr**	3.69	4.19	5.95	6.76	7.45	8.04	9.64	**500yr**	7.12	9.27	10.01	10.95	11.68	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.25	0.39	0.48	0.64	0.79	0.89	**1yr**	0.68	0.87	0.93	1.10	1.37	1.76	1.89	**1yr**	1.56	1.81	2.31	2.86	3.38	**1yr**
2yr	0.32	0.50	0.62	0.83	1.03	1.15	**2yr**	0.89	1.13	1.28	1.58	1.90	2.28	2.56	**2yr**	2.02	2.46	2.91	3.53	4.08	**2yr**
5yr	0.37	0.56	0.70	0.96	1.22	1.37	**5yr**	1.05	1.34	1.51	1.89	2.29	2.67	3.05	**5yr**	2.36	2.93	3.41	4.05	4.65	**5yr**
10yr	0.40	0.61	0.76	1.06	1.37	1.55	**10yr**	1.18	1.52	1.71	2.12	2.57	3.00	3.45	**10yr**	2.66	3.31	3.85	4.47	5.12	**10yr**
25yr	0.45	0.68	0.85	1.21	1.59	1.81	**25yr**	1.37	1.77	2.03	2.50	2.97	3.53	4.07	**25yr**	3.12	3.91	4.52	5.05	5.81	**25yr**
50yr	0.48	0.73	0.91	1.30	1.76	2.04	**50yr**	1.52	2.00	2.29	2.78	3.28	3.99	4.61	**50yr**	3.53	4.44	5.11	5.53	6.38	**50yr**
100yr	0.52	0.79	0.99	1.43	1.96	2.33	**100yr**	1.69	2.28	2.60	3.12	3.63	4.51	5.23	**100yr**	3.99	5.03	5.79	6.06	7.03	**100yr**
200yr	0.57	0.85	1.08	1.57	2.19	2.64	**200yr**	1.89	2.58	2.94	3.48	4.02	5.11	5.95	**200yr**	4.52	5.72	6.55	6.61	7.73	**200yr**
500yr	0.67	1.00	1.29	1.87	2.67	3.14	**500yr**	2.30	3.07	3.52	4.04	4.59	6.03	7.07	**500yr**	5.34	6.80	7.75	7.42	8.77	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.31	0.47	0.58	0.78	0.96	1.08	**1yr**	0.83	1.06	1.22	1.57	1.85	2.17	2.43	**1yr**	1.92	2.33	2.79	3.39	3.98	**1yr**
2yr	0.35	0.54	0.67	0.91	1.12	1.26	**2yr**	0.97	1.23	1.38	1.73	2.10	2.44	2.73	**2yr**	2.16	2.63	3.08	3.77	4.31	**2yr**
5yr	0.42	0.65	0.81	1.11	1.42	1.62	**5yr**	1.22	1.58	1.77	2.23	2.64	3.12	3.52	**5yr**	2.76	3.38	3.90	4.63	5.28	**5yr**
10yr	0.50	0.77	0.95	1.33	1.72	2.00	**10yr**	1.48	1.96	2.16	2.74	3.26	3.76	4.27	**10yr**	3.33	4.10	4.67	5.47	6.19	**10yr**
25yr	0.63	0.95	1.18	1.69	2.23	2.63	**25yr**	1.92	2.57	2.79	3.64	4.29	4.82	5.53	**25yr**	4.27	5.32	5.92	6.84	7.62	**25yr**
50yr	0.74	1.12	1.40	2.01	2.71	3.24	**50yr**	2.34	3.17	3.40	4.48	5.25	5.81	6.74	**50yr**	5.14	6.48	7.08	8.09	8.93	**50yr**
100yr	0.88	1.33	1.67	2.41	3.31	3.95	**100yr**	2.86	3.87	4.14	5.56	6.47	6.99	8.20	**100yr**	6.19	7.88	8.46	9.58	10.46	**100yr**
200yr	1.05	1.57	2.00	2.89	4.03	4.87	**200yr**	3.48	4.76	5.04	6.90	7.98	8.43	9.97	**200yr**	7.46	9.58	10.13	11.34	12.26	**200yr**
500yr	1.37	2.04	2.62	3.81	5.42	6.40	**500yr**	4.67	6.26	6.49	9.17	10.54	10.78	12.91	**500yr**	9.54	12.42	12.84	14.18	15.14	**500yr**

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Northeast Regional Climate Center

NOAA Atlas 14, Volume 10, Version 3
Location name: Liverpool, New York, USA*
Latitude: 43.1215°, Longitude: -76.2083°
Elevation: 412.63 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	0.280 (0.230-0.341)	0.337 (0.277-0.411)	0.431 (0.352-0.527)	0.508 (0.412-0.624)	0.615 (0.479-0.785)	0.695 (0.527-0.904)	0.779 (0.569-1.05)	0.874 (0.598-1.20)	1.01 (0.660-1.43)	1.13 (0.713-1.62)
10-min	0.396 (0.326-0.483)	0.477 (0.392-0.582)	0.610 (0.498-0.744)	0.720 (0.584-0.884)	0.871 (0.678-1.11)	0.985 (0.747-1.28)	1.10 (0.807-1.49)	1.24 (0.848-1.70)	1.43 (0.936-2.03)	1.60 (1.01-2.29)
15-min	0.466 (0.383-0.568)	0.562 (0.461-0.684)	0.718 (0.587-0.878)	0.847 (0.687-1.04)	1.02 (0.798-1.31)	1.16 (0.878-1.51)	1.30 (0.949-1.75)	1.46 (0.997-2.00)	1.69 (1.10-2.38)	1.88 (1.19-2.70)
30-min	0.654 (0.537-0.796)	0.788 (0.646-0.960)	1.01 (0.822-1.23)	1.19 (0.964-1.46)	1.44 (1.12-1.84)	1.63 (1.23-2.12)	1.82 (1.33-2.45)	2.05 (1.40-2.80)	2.37 (1.55-3.34)	2.63 (1.67-3.79)
60-min	0.841 (0.691-1.02)	1.01 (0.832-1.24)	1.30 (1.06-1.58)	1.53 (1.24-1.88)	1.85 (1.44-2.36)	2.09 (1.59-2.73)	2.35 (1.72-3.16)	2.63 (1.80-3.61)	3.05 (1.99-4.31)	3.39 (2.15-4.88)
2-hr	1.08 (0.893-1.31)	1.28 (1.06-1.55)	1.61 (1.33-1.95)	1.88 (1.54-2.30)	2.26 (1.77-2.86)	2.54 (1.95-3.28)	2.84 (2.09-3.78)	3.17 (2.19-4.30)	3.64 (2.41-5.09)	4.03 (2.58-5.73)
3-hr	1.23 (1.02-1.48)	1.45 (1.20-1.74)	1.81 (1.49-2.18)	2.11 (1.73-2.56)	2.52 (1.98-3.17)	2.83 (2.17-3.62)	3.15 (2.33-4.17)	3.51 (2.44-4.73)	4.02 (2.67-5.59)	4.43 (2.86-6.27)
6-hr	1.49 (1.24-1.78)	1.74 (1.46-2.09)	2.17 (1.80-2.60)	2.52 (2.08-3.04)	3.00 (2.39-3.75)	3.37 (2.61-4.28)	3.75 (2.80-4.92)	4.17 (2.94-5.57)	4.77 (3.21-6.57)	5.26 (3.44-7.36)
12-hr	1.75 (1.47-2.07)	2.06 (1.73-2.44)	2.56 (2.15-3.05)	2.98 (2.48-3.57)	3.56 (2.86-4.42)	4.00 (3.13-5.05)	4.45 (3.36-5.79)	4.96 (3.53-6.57)	5.69 (3.87-7.75)	6.27 (4.16-8.70)
24-hr	2.03 (1.72-2.39)	2.38 (2.02-2.81)	2.97 (2.50-3.51)	3.45 (2.89-4.10)	4.11 (3.32-5.06)	4.62 (3.64-5.77)	5.14 (3.92-6.62)	5.72 (4.12-7.50)	6.54 (4.51-8.82)	7.20 (4.84-9.88)
2-day	2.36 (2.02-2.77)	2.75 (2.34-3.22)	3.38 (2.87-3.97)	3.90 (3.29-4.60)	4.62 (3.76-5.62)	5.16 (4.11-6.39)	5.72 (4.40-7.28)	6.33 (4.61-8.22)	7.17 (5.01-9.58)	7.85 (5.34-10.7)
3-day	2.63 (2.25-3.06)	3.03 (2.59-3.53)	3.68 (3.14-4.30)	4.22 (3.58-4.95)	4.96 (4.06-6.01)	5.52 (4.42-6.80)	6.10 (4.71-7.72)	6.73 (4.94-8.69)	7.59 (5.34-10.1)	8.27 (5.67-11.2)
4-day	2.86 (2.46-3.32)	3.26 (2.80-3.80)	3.93 (3.36-4.58)	4.48 (3.81-5.25)	5.24 (4.31-6.33)	5.82 (4.67-7.14)	6.42 (4.97-8.08)	7.05 (5.20-9.07)	7.92 (5.61-10.5)	8.61 (5.94-11.6)
7-day	3.46 (3.00-4.00)	3.89 (3.36-4.50)	4.60 (3.96-5.33)	5.18 (4.43-6.03)	5.98 (4.95-7.17)	6.60 (5.33-8.02)	7.22 (5.64-9.01)	7.89 (5.87-10.1)	8.79 (6.29-11.5)	9.51 (6.63-12.7)
10-day	4.02 (3.49-4.63)	4.48 (3.89-5.16)	5.23 (4.52-6.04)	5.85 (5.03-6.79)	6.71 (5.57-8.00)	7.37 (5.98-8.91)	8.03 (6.31-9.96)	8.73 (6.55-11.1)	9.69 (6.98-12.6)	10.4 (7.32-13.8)
20-day	5.68 (4.97-6.49)	6.25 (5.46-7.14)	7.17 (6.24-8.22)	7.94 (6.88-9.14)	9.00 (7.54-10.6)	9.82 (8.04-11.7)	10.6 (8.42-13.0)	11.5 (8.71-14.4)	12.6 (9.19-16.2)	13.4 (9.55-17.6)
30-day	7.10 (6.23-8.07)	7.75 (6.80-8.82)	8.81 (7.70-10.1)	9.69 (8.42-11.1)	10.9 (9.17-12.8)	11.8 (9.74-14.1)	12.8 (10.2-15.5)	13.7 (10.5-17.1)	14.9 (11.0-19.1)	15.8 (11.4-20.6)
45-day	8.92 (7.87-10.1)	9.66 (8.51-10.9)	10.9 (9.53-12.3)	11.9 (10.4-13.5)	13.2 (11.2-15.4)	14.3 (11.8-16.9)	15.3 (12.3-18.5)	16.4 (12.6-20.3)	17.7 (13.1-22.5)	18.6 (13.5-24.1)
60-day	10.5 (9.28-11.8)	11.3 (9.97-12.7)	12.6 (11.1-14.2)	13.7 (12.0-15.5)	15.1 (12.8-17.6)	16.3 (13.5-19.2)	17.4 (14.0-20.9)	18.5 (14.3-22.8)	19.8 (14.8-25.1)	20.8 (15.1-26.8)

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

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

Please refer to NOAA Atlas 14 document for more information.

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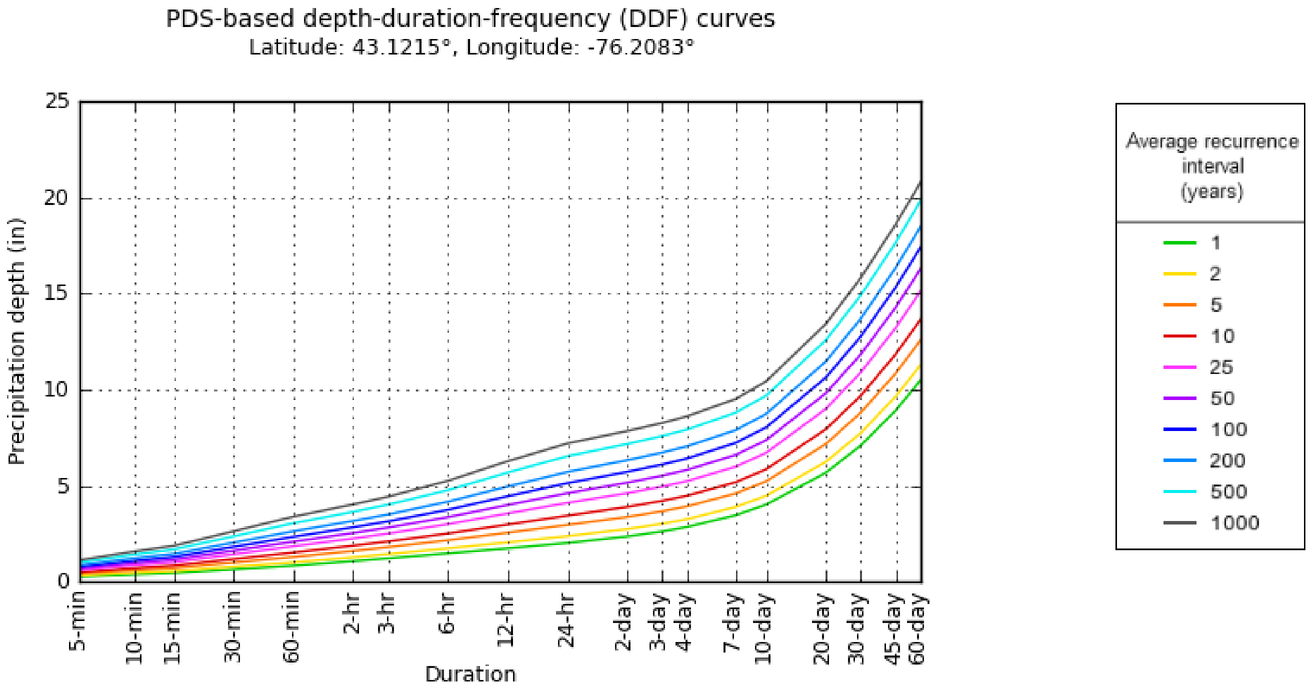
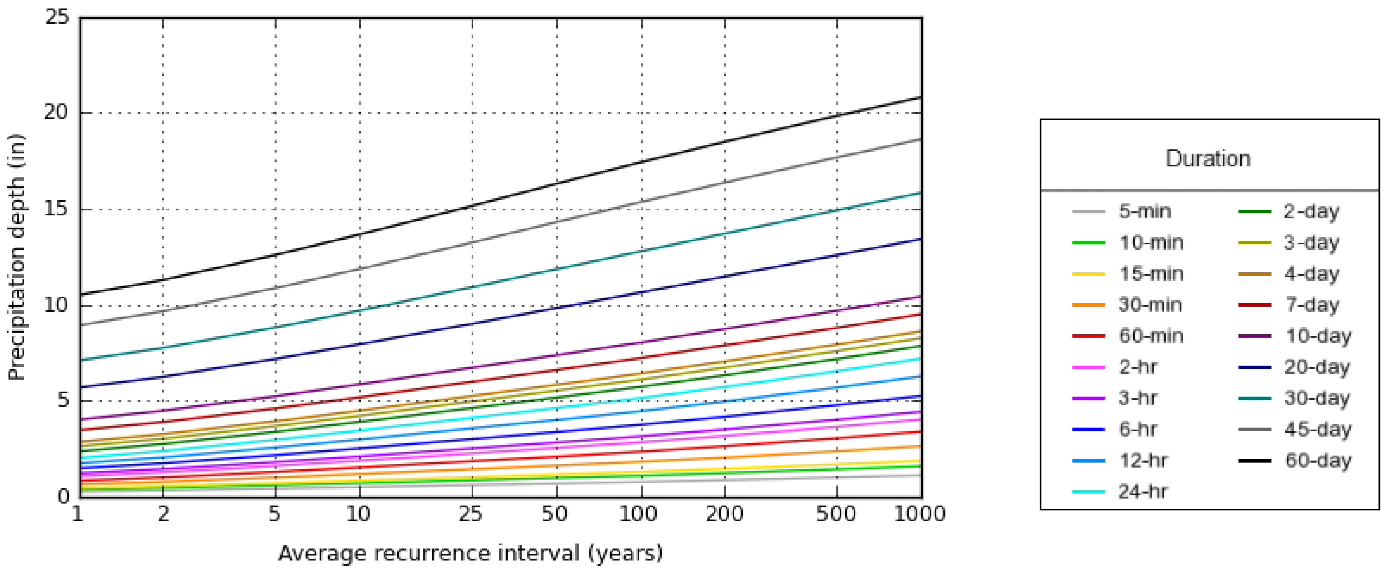
PF graphical





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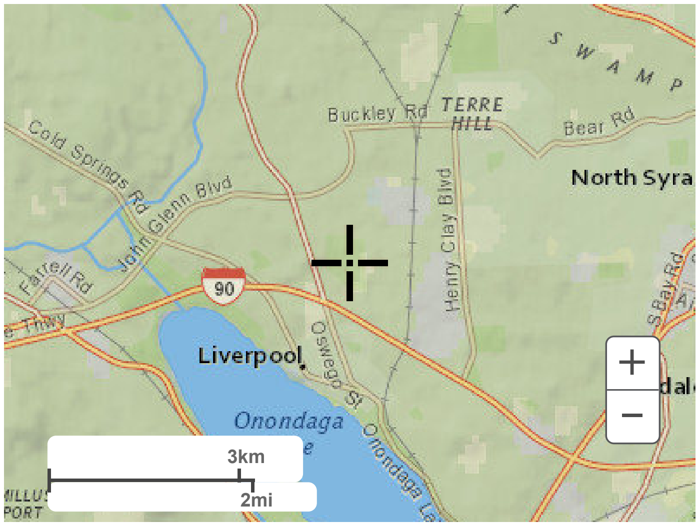
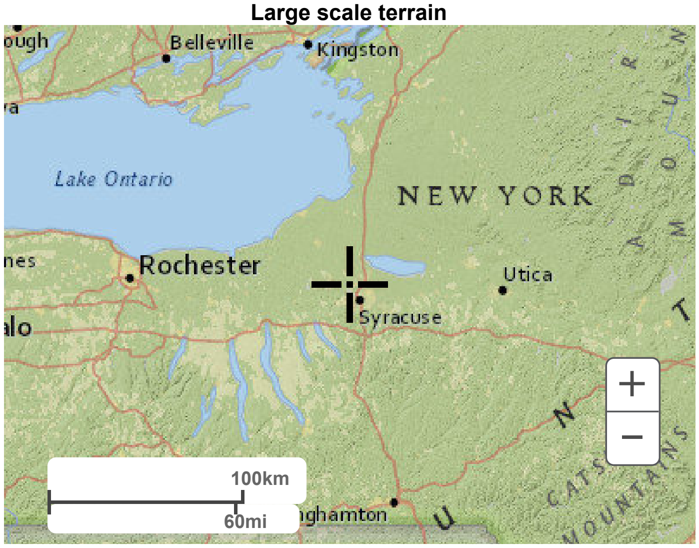
Maps & aerials

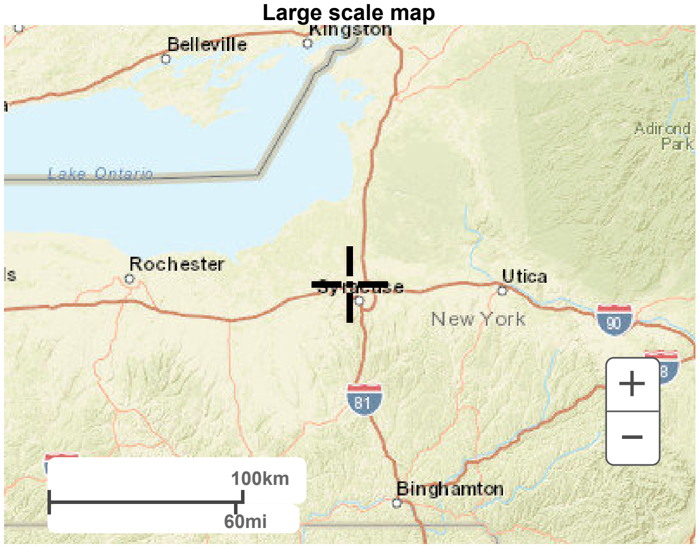
Small scale terrain



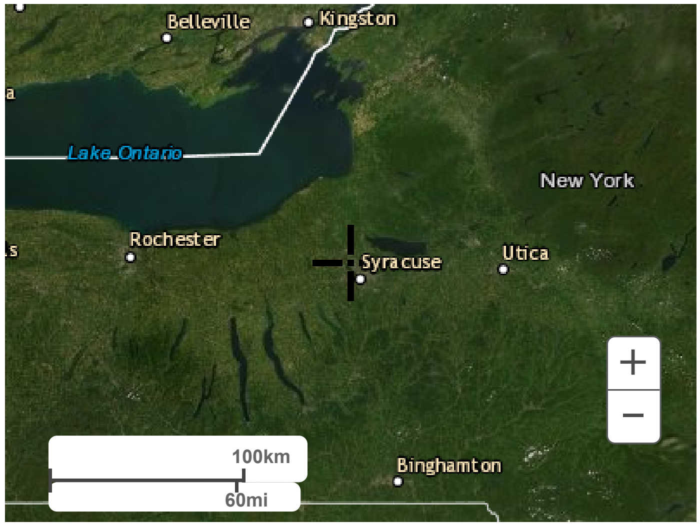
Large scale terrain



Large scale map



Large scale aerial



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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

Stormwater Management Summary Table
Proposed Distribution Facility Project
100796101

Runoff Reduction and Water Quality Volume

Total WQv required	346,656	cubic feet
Total RRv required	84,477	cubic feet
RRv provided in bioretention	87,542	cubic feet
RRv provided > RRv required	**OK**	
Total WQv required after RRv	259,114	cubic feet
WQv provided in bioretention	129,050	cubic feet
WQv provided in wet pond	130,064	cubic feet
Total WQv provided	259,114	cubic feet
WQv provided > WQv required	**OK**	

Volume and Peak Rate control

Channel Protection: 1-year storm	Existing	Proposed
Design Point A	21.28 cfs	5.21 cfs
Design Point B	1.33 cfs	0.70 cfs
Design Point C	0.99 cfs	0.99 cfs
Design Point D	2.90 cfs	0.31 cfs

Overbank Flood: 10-year storm	Existing	Proposed
Design Point A	72.28 cfs	49.64 cfs
Design Point B	8.48 cfs	5.78 cfs
Design Point C	4.71 cfs	4.71 cfs
Design Point D	6.10 cfs	0.91 cfs

Extreme Flood: 100-year storm	Existing	Proposed
Design Point A	178.51 cfs	167.43 cfs
Design Point B	26.39 cfs	19.57 cfs
Design Point C	13.26 cfs	13.26 cfs
Design Point D	11.64 cfs	2.13 cfs

Existing Curve Number Calculations
Proposed Distribution Facility Project
100796101

Existing Watershed A				
Land Cover Description	**Hydrologic Soil Group**	**Curve Number**	**Area (Acres)**	**CN x Area**
Impervious	N/A	98	3.51	344.4
Open Space - Good Condition	A	39	2.99	116.6
Open Space - Good Condition	B	61	2.97	180.9
Open Space - Good Condition	C	74	21.79	1,612.4
Open Space - Good Condition	D	80	57.51	4,600.4
		Total	88.76	6,855
			Weighted Curve Number:	**77**

Existing Watershed B				
Land Cover Description	**Hydrologic Soil Group**	**Curve Number**	**Area (Acres)**	**CN x Area**
Impervious	N/A	98	0.15	14.5
Open Space - Good	A	39	1.79	69.8
Open Space - Good	B	61	2.62	159.8
Open Space - Good	C	74	0.00	0.0
Open Space - Good	D	80	7.73	618.5
		Total	12.29	848.1
			Weighted Curve Number:	**69**

Existing Watershed C				
Land Cover Description	**Hydrologic Soil Group**	**Curve Number**	**Area (Acres)**	**CN x Area**
Impervious	N/A	98	0.32	31.5
Open Space - Good Condition	A	39	0.03	1.0
Open Space - Good Condition	B	61	2.52	153.7
Open Space - Good Condition	C	74	1.23	91.0
Open Space - Good Condition	D	80	2.22	177.5
		Total	6.32	455
			Weighted Curve Number:	**72**

Existing Watershed D				
Land Cover Description	**Hydrologic Soil Group**	**Curve Number**	**Area (Acres)**	**CN x Area**
Impervious	N/A	98	1.07	104.7
Open Space - Good Condition	A	39	0.00	0.0
Open Space - Good Condition	B	61	0.00	0.0
Open Space - Good Condition	C	74	0.00	0.0
Open Space - Good Condition	D	80	1.13	90.2
		Total	2.20	195
			Weighted Curve Number:	**89**

Existing Time of Concentration Calculations

Proposed Distribution Facility Project

100796101

Existing Watershed A

Sheet flow (Applicable to T_c Only)		Segment ID		**1**		
1.	Surface description (table 3-1)			**Bermuda Grass**		
2.	Manning's roughness coeff., n (table 3-1)			**0.41**		
3.	Flow Length, L (total L $\leq$ 100 ft)		ft	**150**		
4.	Two-yr 24-hr rainfall, P_2		in	**2.34**	**(see NRCC rainfall data for 2yr 24hour)**	
5.	Land slope, s		ft/ft	**0.0253**		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	**0.537**	=	**0.537**
Shallow concentrated flow		Segment ID		**2**		
7.	Surface description (paved or unpaved)			**unpaved**		
8.	Flow length, L		ft	**1696**		
9.	Watercourse slope, s		ft/ft	**0.009**		
10.	Average velocity, V (figure 3-1)		ft/s	**2**		
11.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	**0.236**	=	**0.236**
Channel flow		Segment ID		**3**		
12.	Cross sectional flow area, a		ft^2	**36.00**		
13.	Wetted perimeter, p_w		ft	**19.4**	**1.51008**	
14.	Hydraulic radius, r $\quad r = \dfrac{a}{p_w}$	Compute r	ft	**1.86**		
15.	Channel slope, s		ft/ft	**0.0042**	**0.06514**	
16.	Manning's roughness coeff., n			**0.02**		
17.	$V = \dfrac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	**7.33**		
18.	Flow length, L		ft	**1658**		
19.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	**0.063**	=	**0.063**
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)					**0.836** hr
					Use Tc =	**50** **min.**

Existing Watershed B

Sheet flow (Applicable to T_c Only)			Segment ID		**1**		
1.	Surface description (table 3-1)				**Bermuda Grass**		
2.	Manning's roughness coeff., n (table 3-1)				**0.41**		
3.	Flow Length, L (total L $\leq$ 100 ft)			ft	**100**		
4.	Two-yr 24-hr rainfall, P_2			in	**2.34**	**(see NRCC rainfall data for 2yr 24hour)**	
5.	Land slope, s			ft/ft	**0.0540**		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$		Compute T_t	hr	**0.287**	=	**0.287**
Shallow concentrated flow			Segment ID		**2**		
7.	Surface description (paved or unpaved)				**unpaved**		
8.	Flow length, L			ft	**1,182**		
9.	Watercourse slope, s			ft/ft	**0.015**		
10.	Average velocity, V (figure 3-1)			ft/s	**1.97**		
11.	$T_t = \dfrac{L}{3600\ V}$		Compute T_t	hr	**0.167**	=	**0.167**
Channel flow			Segment ID		**N/A**		
12.	Cross sectional flow area, a			ft^2	-		
13.	Wetted perimeter, p_w			ft	-		
14.	Hydraulic radius, r	$r = \dfrac{a}{p_w}$	Compute r	ft	-		
15.	Channel slope, s			ft/ft	-		
16.	Manning's roughness coeff., n				-		
17.	$V = \dfrac{1.49\ r^{2/3}\ s^{1/2}}{n}$		Compute V	ft/s	-		
18.	Flow length, L			ft	-		
19.	$T_t = \dfrac{L}{3600\ V}$		Compute T_t	hr	-	=	-
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)						**0.454** hr
						Use Tc =	**27** **min.**

Existing Watershed C

Sheet flow (Applicable to T_c Only)

#	Description		Units	Segment ID: 1		
1.	Surface description (table 3-1)			**Bermuda Grass**		
2.	Manning's roughness coeff., n (table 3-1)			**0.41**		
3.	Flow Length, L (total L $\leq$ 100 ft)		ft	**100**		
4.	Two-yr 24-hr rainfall, P_2		in	**2.34**	(see NRCC rainfall data for 2yr 24hour)	
5.	Land slope, s		ft/ft	**0.0285**		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5}s^{0.4}}$	Compute T_t	hr	**0.370**	=	**0.370**

Shallow concentrated flow

#	Description		Units	Segment ID: 2		
7.	Surface description (paved or unpaved)			**unpaved**		
8.	Flow length, L		ft	**710**		
9.	Watercourse slope, s		ft/ft	**0.005**		
10.	Average velocity, V (figure 3-1)		ft/s	**1**		
11.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	**0.197**	=	**0.197**

Channel flow

#	Description		Units	Segment ID: -		
12.	Cross sectional flow area, a		ft^2	-		
13.	Wetted perimeter, p_w		ft	-		
14.	Hydraulic radius, r $\quad r = \dfrac{a}{p_w}$	Compute r	ft	-		
15.	Channel slope, s		ft/ft	-		
16.	Manning's roughness coeff., n			-		
17.	$V = \dfrac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	-		
18.	Flow length, L		ft	-		
19.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	-	=	-
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)					**0.568** hr

Use Tc = 34 min.

Existing Watershed D

Sheet flow (Applicable to T_c Only)

			Segment ID	1		
1.	Surface description (table 3-1)			**Bermuda Grass**		
2.	Manning's roughness coeff., n (table 3-1)			**0.41**		
3.	Flow Length, L (total L $\leq$ 100 ft)		ft	**65**		
4.	Two-yr 24-hr rainfall, P_2		in	**2.34**	**(see NRCC rainfall data for 2yr 24hour)**	
5.	Land slope, s		ft/ft	**0.0605**		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5}s^{0.4}}$	Compute T_t	hr	**0.194**	=	**0.194**

Sheet flow (Applicable to T_c Only)

			Segment ID	2		
1.	Surface description (table 3-1)			**Paved**		
2.	Manning's roughness coeff., n (table 3-1)			**0.01**		
3.	Flow Length, L (total L $\leq$ 100 ft)		ft	**85**		
4.	Two-yr 24-hr rainfall, P_2		in	**2.34**	**(see NRCC rainfall data for 2yr 24hour)**	
5.	Land slope, s		ft/ft	**0.0328**		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5}s^{0.4}}$	Compute T_t	hr	**0.017**	=	**0.017**

Shallow concentrated flow

			Segment ID	3		
7.	Surface description (paved or unpaved)			**Paved**		
8.	Flow length, L		ft	**105**		
9.	Watercourse slope, s		ft/ft	**0.005**		
10.	Average velocity, V (figure 3-1)		ft/s	**1.45**		
11.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	**0.020**	=	**0.020**

Shallow concentrated flow

			Segment ID	4		
7.	Surface description (paved or unpaved)			**Unpaved**		
8.	Flow length, L		ft	**47**		
9.	Watercourse slope, s		ft/ft	**0.050**		
10.	Average velocity, V (figure 3-1)		ft/s	**3.6**		
11.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	**0.004**	=	**0.004**

Channel flow

			Segment ID	5		
12.	Cross sectional flow area, a		ft^2	**3.00**		
13.	Wetted perimeter, p_w		ft	**6.32**	**0.60851**	
14.	Hydraulic radius, r $r = \dfrac{a}{p_w}$	Compute r	ft	**0.47**		
15.	Channel slope, s		ft/ft	**0.0167**	**0.12917**	
16.	Manning's roughness coeff., n			**0.02**		
17.	$V = \dfrac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	**5.86**		
18.	Flow length, L		ft	**383**		
19.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	**0.018**	=	**0.018**
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)					**0.253** hr

Use Tc = 15 **min.**

Proposed Curve Number Calculations
Proposed Distribution Facility Project
100796101

Watershed A1				
Land Cover Description	**Hydrologic Soil Group**	**Curve Number**	**Area (Acres)**	**CN x Area**
Impervious	N/A	98	11.21	1098.9
Open Space - Good	A	39	1.47	57.4
Open Space - Good	B	61	0.17	10.4
Open Space - Good	C	74	0.12	9.1
Open Space - Good	D	80	1.11	88.6
		Total	14.09	1264.4
			Weighted Curve Number:	**90**

Watershed A2				
Land Cover Description	**Hydrologic Soil Group**	**Curve Number**	**Area (Acres)**	**CN x Area**
Impervious	N/A	98	25.36	2485.5
Open Space - Good	A	39	0.00	0.0
Open Space - Good	B	61	0.19	11.3
Open Space - Good	C	74	1.52	112.8
Open Space - Good	D	80	4.62	369.6
		Total	31.69	2979.2
			Weighted Curve Number:	**94**

Watershed A3				
Land Cover Description	**Hydrologic Soil Group**	**Curve Number**	**Area (Acres)**	**CN x Area**
Impervious	N/A	98	6.68	654.2
Open Space - Good	A	39	0.00	0.0
Open Space - Good	B	61	0.00	0.0
Open Space - Good	C	74	2.21	163.7
Open Space - Good	D	80	1.48	118.1
		Total	10.36	935.9
			Weighted Curve Number:	**90**

Watershed A4				
Land Cover Description	Hydrologic Soil Group	Curve Number	Area (Acres)	CN x Area
Impervious	N/A	98	5.22	511.3
Open Space - Good	A	39	0.46	18.0
Open Space - Good	B	61	1.63	99.4
Open Space - Good	C	74	0.06	4.2
Open Space - Good	D	80	9.60	767.8
		Total	16.96	1400.7
			Weighted Curve Number:	**83**

Watershed A5				
Land Cover Description	Hydrologic Soil Group	Curve Number	Area (Acres)	CN x Area
Impervious	N/A	98	0.11	10.3
Open Space - Good	A	39	0.00	0.0
Open Space - Good	B	61	0.00	0.0
Open Space - Good	C	74	1.98	146.6
Open Space - Good	D	80	4.01	320.7
		Total	6.10	467.3
			Weighted Curve Number:	**77**

Watershed A6				
Land Cover Description	Hydrologic Soil Group	Curve Number	Area (Acres)	CN x Area
Impervious	N/A	98	0.14	13.3
Open Space - Good	A	39	0.00	0.0
Open Space - Good	B	61	0.00	0.0
Open Space - Good	C	74	0.00	0.0
Open Space - Good	D	80	5.15	411.9
		Total	5.28	411.9
			Weighted Curve Number:	**78**

Watershed A7				
Land Cover Description	**Hydrologic Soil Group**	**Curve Number**	**Area (Acres)**	**CN x Area**
Impervious	N/A	98	0.83	81.5
Open Space - Good	A	39	0.08	3.2
Open Space - Good	B	61	0.84	51.1
Open Space - Good	C	74	1.61	119.0
Open Space - Good	D	80	4.95	395.9
		Total	8.31	569.2
			Weighted Curve Number:	**69**

Watershed B				
Land Cover Description	**Hydrologic Soil Group**	**Curve Number**	**Area (Acres)**	**CN x Area**
Impervious	N/A	98	0.08	7.6
Open Space - Good	A	39	1.79	69.8
Open Space - Good	B	61	2.65	161.9
Open Space - Good	C	74	0.00	0.0
Open Space - Good	D	80	5.38	430.4
		Total	9.90	662.1
			Weighted Curve Number:	**67**

Watershed C				
Land Cover Description	**Hydrologic Soil Group**	**Curve Number**	**Area (Acres)**	**CN x Area**
Impervious	N/A	98	0.32	31.5
Open Space - Good Condition	A	39	0.03	1.0
Open Space - Good Condition	B	61	2.52	153.7
Open Space - Good Condition	C	74	1.23	91.0
Open Space - Good Condition	D	80	2.22	177.5
		Total	6.32	455
			Weighted Curve Number:	**72**

Watershed D				
Land Cover Description	**Hydrologic Soil Group**	**Curve Number**	**Area (Acres)**	**CN x Area**
Impervious	N/A	98	0.00	0.0
Open Space - Good Condition	A	39	0.00	0.0
Open Space - Good Condition	B	61	0.00	0.0
Open Space - Good Condition	C	74	0.10	7.4
Open Space - Good Condition	D	80	0.45	36.2
		Total	0.55	44
			Weighted Curve Number:	**79**

Proposed Time of Concentrations
Proposed Distribution Facility Project
100796101

Proposed Watershed A1

Sheet flow (Applicable to T_c Only)		Segment ID	**1**		
1.	Surface description (table 3-1)		**Paved**		
2.	Manning's roughness coeff., n (table 3-1)		**0.01**		
3.	Flow Length, L (total L $\leq$ 100 ft)	ft	**100**		
4.	Two-yr 24-hr rainfall, P_2	in	**2.34**	**(see NRCC Rainfall data)**	
5.	Land slope, s	ft/ft	**0.049**		
6.	$T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ Compute T_t	hr	**0.02**	=	**0.02**
Shallow concentrated flow		Segment ID	**2**		
7.	Surface description (paved or unpaved)		**Paved**		
8.	Flow length, L	ft	**77**		
9.	Watercourse slope, s	ft/ft	**0.025**		
10.	Average velocity, V (figure 3-1)	ft/s	**3.20**		
11.					
12.	$T_t = \frac{L}{3600\ V}$ Compute T_t	hr	**0.01**	=	**0.01**
Channel flow/Pipe Flow		Segment ID	**3**		
13.	Cross sectional flow area, a	ft^2	-		
14.	Wetted perimeter, p_w	ft	-		
15.	Hydraulic radius, r $\quad r = \frac{a}{p_w}$ Compute r	ft	-		
16.	Channel slope, s	ft/ft	-		
17.	Manning's roughness coeff., n		**0.02**		
18.	$V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s	**0.00**	**assume** 3 ft/s	
19.	Flow length, L	ft	**861**		
20.	$T_t = \frac{L}{3600\ V}$ Compute T_t	hr	**0.08**	=	**0.08**
21.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)				**0.10** hr
				Use Tc =	**6** **min.**

Proposed Watershed A2

Sheet flow (Applicable to T_c Only)

			Units	Value		Result
		Segment ID		**1**		
1.	Surface description (table 3-1)			**Bermuda Grass**		
2.	Manning's roughness coeff., n (table 3-1)			**0.41**		
3.	Flow Length, L (total L $\leq$ 100 ft)		ft	**30**		
4.	Two-yr 24-hr rainfall, P_2		in	**2.34**	**(see NRCC rainfall data for 2yr 24hour)**	
5.	Land slope, s		ft/ft	**0.271**		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	**0.057**	=	**0.06**

Sheet flow (Applicable to T_c Only)

			Units	Value		Result
		Segment ID		**2**		
1.	Surface description (table 3-1)			**Asphalt**		
2.	Manning's roughness coeff., n (table 3-1)			**0.01**		
3.	Flow Length, L (total L $\leq$ 100 ft)		ft	**70**		
4.	Two-yr 24-hr rainfall, P_2		in	**2.34**	**(see NRCC rainfall data for 2yr 24hour)**	
5.	Land slope, s		ft/ft	**0.029**		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	**0.015**	=	**0.02**

Shallow concentrated flow

			Units	Value		Result
		Segment ID		**3**		
13.	Surface description (paved or unpaved)			**Paved**		
14.	Flow length, L		ft	**39**		
15.	Watercourse slope, s		ft/ft	**0.024**		
16.	Average velocity, V (figure 3-1)		ft/s	**3.2**		
17.						
18.	$T_t = \dfrac{L}{3600\,V}$	Compute T_t	hr	**0.003**	=	**0.003**

Channel flow/Pipe Flow

			Units	Value		Result
		Segment ID		**5**		
19.	Cross sectional flow area, a		ft^2	-		
20.	Wetted perimeter, p_w		ft	-		
21.	Hydraulic radius, r $r = \dfrac{a}{p_w}$	Compute r	ft	-		
22.	Channel slope, s		ft/ft	-		
23.	Manning's roughness coeff., n			-		
24.	$V = \dfrac{1.49\, r^{2/3} s^{1/2}}{n}$	Compute V	ft/s	-	**assume**	3 ft/s
25.	Flow length, L		ft	**1,922**		
26.	$T_t = \dfrac{L}{3600\,V}$	Compute T_t	hr	**0.18**	=	**0.18**
27	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)					**0.25** hr

Use Tc = **15** **min.**

Proposed Watershed A3

Sheet flow (Applicable to T_c Only)

		Segment ID		**1**		
1.	Surface description (table 3-1)			**Paved**		
2.	Manning's roughness coeff., n (table 3-1)			**0.01**		
3.	Flow Length, L (total L $\leq$ 100 ft)		ft	**100**		
4.	Two-yr 24-hr rainfall, P_2		in	**2.34**	(see NRCC rainfall data for 2yr 24hour)	
5.	Land slope, s		ft/ft	**0.017**		
6.	$T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	**0.03**	=	**0.03**

Shallow concentrated flow

		Segment ID		**2**		
7.	Surface description (paved or unpaved)			**Paved**		
8.	Flow length, L		ft	**53**		
9.	Watercourse slope, s		ft/ft	**0.017**		
10.	Average velocity, V (figure 3-1)		ft/s	**2.7**		
11.	$T_t = \frac{L}{3600\ V}$	Compute T_t	hr	**0.01**	=	**0.01**

Channel flow/Pipe Flow

		Segment ID		**3**		
12.	Cross sectional flow area, a		ft^2	-		
13.	Wetted perimeter, p_w		ft	-		
14.	Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft	-		
15.	Channel slope, s		ft/ft	-		
16.	Manning's roughness coeff., n			-		
17.	$V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	-	**assume**	3 ft/s
18.	Flow length, L		ft	**907**		
19.	$T_t = \frac{L}{3600\ V}$	Compute T_t	hr	**0.08**	=	**0.08**
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)					**0.11** hr

Use Tc = **7** **min.**

Proposed Watershed A4

Sheet flow (Applicable to T_c Only)

				Value		
		Segment ID		**1**		
1.	Surface description (table 3-1)			**Bermuda Grass**		
2.	Manning's roughness coeff., n (table 3-1)			**0.41**		
3.	Flow Length, L (total L $\leq$ 100 ft)		ft	**100**		
4.	Two-yr 24-hr rainfall, P_2		in	**2.34**	**(see NRCC rainfall data for 2yr 24hour)**	
5.	Land slope, s		ft/ft	**0.03**		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	**0.35**	=	**0.35**

Shallow concentrated flow

				Value		
		Segment ID		**2**		
7.	Surface description (paved or unpaved)			**Unpaved**		
8.	Flow length, L		ft	**1,205**		
9.	Watercourse slope, s		ft/ft	**0.009**		
10.	Average velocity, V (figure 3-1)		ft/s	**1.55**		
11.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	**0.22**	=	**0.22**

Channel flow/Pipe Flow

				Value		
		Segment ID		**3**		
12.	Cross sectional flow area, a		ft^2	-		
13.	Wetted perimeter, p_w		ft	-		
14.	Hydraulic radius, r; $r = \dfrac{a}{p_w}$	Compute r	ft	-		
15.	Channel slope, s		ft/ft	-		
16.	Manning's roughness coeff., n			-		
17.	$V = \dfrac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	-	**assume**	3 ft/s
18.	Flow length, L		ft	**482**		
19.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	**0.04**	=	**0.04**
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)					**0.61** hr

Use Tc = **36** **min.**

Proposed Watershed A5

Sheet flow (Applicable to T_c Only)

			Segment ID	**1**		
1.	Surface description (table 3-1)			**Bermuda Grass**		
2.	Manning's roughness coeff., n (table 3-1)			**0.41**		
3.	Flow Length, L (total L $\leq$ 100 ft)		ft	**100**		
4.	Two-yr 24-hr rainfall, P_2		in	**2.34**	(see NRCC rainfall data for 2yr 24hour)	
5.	Land slope, s		ft/ft	**0.02**		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	**0.46**	=	**0.46**

Shallow concentrated flow

			Segment ID	**2**		
7.	Surface description (paved or unpaved)			**Unpaved**		
8.	Flow length, L		ft	**466**		
9.	Watercourse slope, s		ft/ft	**0.025**		
10.	Average velocity, V (figure 3-1)		ft/s	**2.5**		
11.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	**0.05**	=	**0.05**

Channel flow

			Segment ID	-		
12.	Cross sectional flow area, a		ft^2	-		
13.	Wetted perimeter, p_w		ft	-		
14.	Hydraulic radius, r $\quad r = \dfrac{a}{p_w}$	Compute r	ft	-		
15.	Channel slope, s		ft/ft	-		
16.	Manning's roughness coeff., n			-		
17.	$V = \dfrac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	-		
18.	Flow length, L		ft	-		
19.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	-	=	-
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)					**0.51** hr

Use Tc = 30 min.

Proposed Watershed A6

Sheet flow (Applicable to T_c Only)		Segment ID		**1**		
1.	Surface description (table 3-1)			**Bermuda Grass**		
2.	Manning's roughness coeff., n (table 3-1)			**0.41**		
3.	Flow Length, L (total L $\leq$ 100 ft)		ft	**100**		
4.	Two-yr 24-hr rainfall, P_2		in	**2.34**	(see NRCC rainfall data for 2yr 24hour)	
5.	Land slope, s		ft/ft	**0.026**		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	**0.38**	=	**0.38**
Shallow concentrated flow		Segment ID		**2**		
7.	Surface description (paved or unpaved)			**Unpaved**		
8.	Flow length, L		ft	**189**		
9.	Watercourse slope, s		ft/ft	**0.064**		
10.	Average velocity, V (figure 3-1)		ft/s	**4.3**		
11.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	**0.01**	=	**0.01**
Channel flow		Segment ID		**3**		
12.	Cross sectional flow area, a		ft^2	**50.75**		
13.	Wetted perimeter, p_w		ft	**11.97**		
14.	Hydraulic radius, r $r = \dfrac{a}{p_w}$	Compute r	ft	**4.24**		
15.	Channel slope, s		ft/ft	**0.0385**		
16.	Manning's roughness coeff., n			**0.02**		
17.	$V = \dfrac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	**38.29**		
18.	Flow length, L		ft	**413**		
19.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	**0.003**	=	**0.003**
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)					**0.40** hr
					Use Tc =	**24** **min.**

Proposed Watershed A7

Sheet flow (Applicable to T_c Only)

			Unit	Segment ID	1		
1.	Surface description (table 3-1)				**Bermuda Grass**		
2.	Manning's roughness coeff., n (table 3-1)				**0.41**		
3.	Flow Length, L (total L ≤ 100 ft)		ft		**100**		
4.	Two-yr 24-hr rainfall, P_2		in		**2.34**	(see NRCC rainfall data for 2yr 24hour)	
5.	Land slope, s		ft/ft		**0.03**		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr		**0.35**	=	**0.35**

Shallow concentrated flow

			Unit	Segment ID	2		
7.	Surface description (paved or unpaved)				**Unpaved**		
8.	Flow length, L		ft		**527**		
9.	Watercourse slope, s		ft/ft		**0.014**		
10.	Average velocity, V (figure 3-1)		ft/s		**1.75**		
11.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr		**0.08**	=	**0.08**

Channel flow

			Unit	Segment ID	3		
12.	Cross sectional flow area, a		ft^2		**18.13**		
13.	Wetted perimeter, p_w		ft		**16.47**		
14.	Hydraulic radius, r $r = \dfrac{a}{p_w}$	Compute r	ft		**1.10**		
15.	Channel slope, s		ft/ft		**0.0160**		
16.	Manning's roughness coeff., n				**0.02**		
17.	$V = \dfrac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s		**10.04**		
18.	Flow length, L		ft		**100**		
19.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr		**0.003**	=	**0.003**
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)						**0.43** hr

Use Tc = 26 min.

Proposed Watershed B

Sheet flow (Applicable to T_c Only)		Segment ID		**1**		
1.	Surface description (table 3-1)			**Bermuda Grass**		
2.	Manning's roughness coeff., n (table 3-1)			**0.41**		
3.	Flow Length, L (total L $\leq$ 100 ft)		ft	**100**		
4.	Two-yr 24-hr rainfall, P_2		in	**2.34**	(see NRCC rainfall data for 2yr 24hour)	
5.	Land slope, s		ft/ft	**0.0540**		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	**0.287**	=	**0.287**
Shallow concentrated flow		Segment ID		**2**		
7.	Surface description (paved or unpaved)			**unpaved**		
8.	Flow length, L		ft	**1,208**		
9.	Watercourse slope, s		ft/ft	**0.014**		
10.	Average velocity, V (figure 3-1)		ft/s	**1.97**		
11.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	**0.170**	=	**0.170**
Channel flow		Segment ID		**N/A**		
12.	Cross sectional flow area, a		ft^2	-		
13.	Wetted perimeter, p_w		ft	-		
14.	Hydraulic radius, r $\quad r = \dfrac{a}{p_w}$	Compute r	ft	-		
15.	Channel slope, s		ft/ft	-		
16.	Manning's roughness coeff., n			-		
17.	$V = \dfrac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	-		
18.	Flow length, L		ft	-		
19.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	-	=	-
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)					**0.457** hr
					Use Tc =	**27** **min.**

Proposed Watershed C

Sheet flow (Applicable to T_c Only)

			Unit	Value		
		Segment ID		1		
1.	Surface description (table 3-1)			Bermuda Grass		
2.	Manning's roughness coeff., n (table 3-1)			0.41		
3.	Flow Length, L (total L $\leq$ 100 ft)		ft	100		
4.	Two-yr 24-hr rainfall, P_2		in	2.34	(see NRCC rainfall data for 2yr 24hour)	
5.	Land slope, s		ft/ft	0.0285		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.370	=	0.370

Shallow concentrated flow

			Unit	Value		
		Segment ID		2		
7.	Surface description (paved or unpaved)			unpaved		
8.	Flow length, L		ft	710		
9.	Watercourse slope, s		ft/ft	0.005		
10.	Average velocity, V (figure 3-1)		ft/s	1		
11.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	0.197	=	0.197

Channel flow

			Unit	Value		
		Segment ID		-		
12.	Cross sectional flow area, a		ft^2	-		
13.	Wetted perimeter, p_w		ft	-		
14.	Hydraulic radius, r ($r = \dfrac{a}{p_w}$)	Compute r	ft	-		
15.	Channel slope, s		ft/ft	-		
16.	Manning's roughness coeff., n			-		
17.	$V = \dfrac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	-		
18.	Flow length, L		ft	-		
19.	$T_t = \dfrac{L}{3600\ V}$	Compute T_t	hr	-	=	-
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)					0.568 hr

Use Tc = 34 min.

Proposed Watershed D

Sheet flow (Applicable to T_c Only)

				Units	Value		
				Segment ID	**1**		
1.	Surface description (table 3-1)				**Bermuda Grass**		
2.	Manning's roughness coeff., n (table 3-1)				**0.41**		
3.	Flow Length, L (total L $\leq$ 100 ft)			ft	**100**		
4.	Two-yr 24-hr rainfall, P_2			in	**2.34**	(see NRCC rainfall data for 2yr 24hour)	
5.	Land slope, s			ft/ft	**0.0432**		
6.	$T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5}s^{0.4}}$		Compute T_t	hr	**0.314**	=	**0.314**

Shallow concentrated flow

				Units	Value		
				Segment ID	**2**		
7.	Surface description (paved or unpaved)				**Unpaved**		
8.	Flow length, L			ft	**115**		
9.	Watercourse slope, s			ft/ft	**0.014**		
10.	Average velocity, V (figure 3-1)			ft/s	**1.9**		
11.	$T_t = \dfrac{L}{3600\ V}$		Compute T_t	hr	**0.017**	=	**0.017**

Channel flow

				Units	Value		
				Segment ID	-		
12.	Cross sectional flow area, a			ft^2	-		
13.	Wetted perimeter, p_w			ft	-		
14.	Hydraulic radius, r	$r = \dfrac{a}{p_w}$	Compute r	ft	-		
15.	Channel slope, s			ft/ft	-		
16.	Manning's roughness coeff., n				-		
17.	$V = \dfrac{1.49\ r^{2/3}\ s^{1/2}}{n}$		Compute V	ft/s	-		
18.	Flow length, L			ft	-		
19.	$T_t = \dfrac{L}{3600\ V}$		Compute T_t	hr	-	=	-
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)						**0.331** hr

Use Tc = 20 min.

Minimum Runoff Reduction Volume (RRv)
Proposed Distribution Facility Project
100796101
RRv = P x Rv x Aic x S / 12

Aic (new impervious area)=	49.54	acres	
P (1-year, 24-hour rainfall event) =	2.02	inches	Per Figure 4.1
Rv = 0.05+0.009(I) =	0.950		I = 100%
S (HSG reduction factor) =	0.24		See below
Runoff Reduction Volume =	**1.939**	acre-feet	
	84,477	cubic feet	

Specific Reduction Factor	Area (ac)	S
Hydrologic Soil Group A	2.99	0.55
Hydrologic Soil Group B	2.97	0.4
Hydrologic Soil Group C	21.79	0.3
Hydrologic Soil Group D	57.51	0.2
Weighted Specific Reduction Factor:		0.24

Per Section 4.3

Water Quality Volume and Bioretention Calculations
Proposed Distribution Facility Project
100796101

Bioretention Basin #1	Watershed A1 (South)		
A (contributing area) =	14.09	acres	from CN Calcs
Impervious (%) =	79.6%		from CN Calcs
P (1-year, 24-hour rainfall event) =	2.02	inches	per Figure 4.1
Rv = 0.05+0.009(I) =	0.766		per Section 4.2
Water Quality Volume =	**1.817**	acre-feet	
	79,162	cubic feet	
To Size Bioretention Area			
Af=[(WQv)*(df)]/[(k)*(hf+df)*(tf)]			
Filter bed depth df =	2.5	ft	
Permeability coefficient k =	0.5	ft/day	(bioretention soil)
Avg height of ponding hf =	0.25	ft	
Filter bed drain time tf =	2.0	days	(recommended)
Required filter bed area Af =	**71,966**	sq ft	
Provided filter bed area:	**35,798**	sq ft	
Provided water quality volume:	**39,378**	cubic feet	
Runoff Reduction			
40% of provided storage or WQv:	**15,751**	cubic feet	whichever is smaller
Volume treated:	**23,627**	cubic feet	
Modified CN (to compute peak water quality discharge)			
Qa = WQv/area	0.77	inches	
CN = 1000 / (10 + 5P + 10Qa - 10*(Qa^2 + 1.25QaP)^.5			per Chapter 8
CN =	84		
Tc =	0.1	hr	
S = (1000/CN)-10	1.87		
Ia = 0.2S	0.37		
Ia/P =	0.19		
qu =	1000	csm/in (per TR-55)	
Qp = qu * A * Qa	**16.95**	cfs	
Orifice Size for Water Quality Bypass			
Qp = C*A*(2gh)^0.5			
Qp, water quality peak discharge =	**16.95**	cfs	
C = discharge coefficient =	0.60		
H = head	1.30	ft	
A = cross sectional orifice area =	3.09	sf	
Proposed diameter =	2.0	ft	
A = proposed area =	3.14	sf	
Proposed Qp	**17.25**	cfs	
Provide 24" diameter pipe with 1.30' of head from center of pipe orifice.			
Diverts 17.25 cfs for WQv > 16.95 CFS			**O.K.**

Bioretention Basin #2		Watershed A2 (West)	
A (contributing area) =	31.69	acres	
Impervious (%) =	80.0%		
P (1-year, 24-hour rainfall event) =	2.02	inches	per Figure 4.1
Rv = 0.05+0.009(I) =	0.770		per Section 4.2
Water Quality Volume =	**4.109**	acre-feet	
	178,990	cubic feet	
To Size Bioretention Area			
Af=[(WQv)*(df)]/[(k)*(hf+df)*(tf)]			
Filter bed depth df =	2.5	ft	
Permeability coefficient k =	0.5	ft/day	(bioretention soil)
Avg height of ponding hf =	0.25	ft	
Filter bed drain time tf =	2.0	days	(recommended)
Required filter bed area Af =	**162,719**	sq ft	
Provided filter bed area:	**80,646**	sq ft	
Provided water quality volume:	**88,711**	cubic feet	
Runoff Reduction			
40% of provided storage or WQv:	**35,484**	cubic feet	whichever is smaller
Volume treated:	**53,226**	cubic feet	
Modified CN (to compute peak water quality discharge)			
Qa = WQv/area	0.77	inches	
CN = 1000 / (10 + 5P + 10Qa - 10*(Qa^2 + 1.25QaP)^.5			per Chapter 8
CN =	84		
Tc =	0.1	hr	
S = (1000/CN)-10	1.87		
Ia = 0.2S	0.37		
Ia/P =	0.19		
qu =	1000	csm/in (per TR-55)	
Qp = qu * A * Qa	**38.18**	cfs	
Since there are two outfalls to Bioretention Basin #2, a weighted average was determined for each of the outfalls.			
Drainage Area to DIV. MH-201	20.16	AC	72.7%
Drainage Area to DIV. MH-211	7.57	AC	27.3%
Orifice Size for Water Quality Bypass - DIV. MH-201			
Qp = C*A*(2gh)^0.5			
Qp, water quality peak discharge =	**27.76**	cfs	
C = discharge coefficient =	0.60		
H = head	1.40	ft	
A = cross sectional orifice area =	4.87	sf	
Proposed diameter =	2.5	ft	
A = proposed area =	4.91	sf	
Proposed Qp	**27.97**	cfs	
Provide 30" diameter pipe with 1.40' of head from center of pipe orifice.			
Diverts 27.97 cfs for WQv > 27.76 CFS			**O.K.**
Orifice Size for Water Quality Bypass - DIV. MH-211			
Qp = C*A*(2gh)^0.5			
Qp, water quality peak discharge =	**10.42**	cfs	
C = discharge coefficient =	0.60		
H = head	1.55	ft	
A = cross sectional orifice area =	1.74	sf	
Proposed diameter =	1.5	ft	
A = proposed area =	1.77	sf	
Proposed Qp	**10.59**	cfs	
Provide 18" diameter pipe with 1.55' of head from center of pipe orifice.			
Diverts 10.59 cfs for WQv > 10.42 CFS			O.K.

Bioretention Basin #3		Watershed A3 (East)	
A (contributing area) =	10.36	acres	
Impervious (%) =	64.4%		
P (1-year, 24-hour rainfall event) =	2.02	inches	per Figure 4.1
Rv = 0.05+0.009(I) =	0.630		per Section 4.2
Water Quality Volume =	**1.099**	acre-feet	
	47,854	cubic feet	
To Size Bioretention Area			
Af=[(WQv)*(df)]/[(k)*(hf+df)*(tf)]			
Filter bed depth df =	2.5	ft	
Permeability coefficient k =	0.5	ft/day	(bioretention soil)
Avg height of ponding hf =	0.25	ft	
Filter bed drain time tf =	2.0	days	(recommended)
Required filter bed area Af =	**43,503**	sq ft	
Provided filter bed area:	**45,503**	sq ft	
Provided water quality volume:	**50,053**	cubic feet	
Runoff Reduction			
40% of provided storage or WQv:	**20,021**	cubic feet	whichever is smaller
Volume treated:	**27,832**	cubic feet	
Modified CN (to compute peak water quality discharge)			
Qa = WQv/area	1.33	inches	
CN = 1000 / (10 + 5P + 10Qa - 10*(Qa^2 + 1.25QaP)^.5			per Chapter 8
CN =	93		
Tc =	0.1	hr	
S = (1000/CN)-10	0.76		
Ia = 0.2S	0.15		
Ia/P =	0.07		
qu =	1000	csm/in (per TR-55)	
Qp = qu * A * Qa	**21.54**	cfs	
Orifice Size for Water Quality Bypass			
Qp = C*A*(2gh)^0.5			
Qp, water quality peak discharge =	**21.54**	cfs	
C = discharge coefficient =	0.60		
H = head	2.05	ft	
A = cross sectional orifice area =	3.13	sf	
Proposed diameter =	2.0	ft	
A = proposed area =	3.14	sf	
Proposed Qp	**21.66**	cfs	
Provide 24" diameter pipe with 2.05' of head from center of pipe orifice.			
Diverts 21.66 cfs for WQv > 21.54 CFS			**O.K.**

Bioretention Basin #4		Watershed A4 (North)	
A (contributing area) =	16.96	acres	
Impervious (%) =	30.8%		
P (1-year, 24-hour rainfall event) =	2.02	inches	per Figure 4.1
Rv = 0.05+0.009(I) =	0.327		per Section 4.2
Water Quality Volume =	**0.933**	acre-feet	
	40,650	cubic feet	
To Size Bioretention Area			
Af=[(WQv)*(df)]/[(k)*(hf+df)*(tf)]			
Filter bed depth df =	2.5	ft	
Permeability coefficient k =	0.5	ft/day	(bioretention soil)
Avg height of ponding hf =	0.25	ft	
Filter bed drain time tf =	2.0	days	(recommended)
Required filter bed area Af =	**36,954**	sq ft	
Provided filter bed area:	**37,012**	sq ft	
Provided water quality volume:	**40,713**	cubic feet	
Runoff Reduction			
40% of provided storage or WQv:	**16,285**	cubic feet	whichever is smaller
Volume treated:	**24,365**	cubic feet	
Modified CN (to compute peak water quality discharge)			
Qa = WQv/area	0.66	inches	
CN = 1000 / (10 + 5P + 10Qa - 10*(Qa^2 + 1.25QaP)^.5			per Chapter 8
CN =	82		
Tc =	0.1	hr	
S = (1000/CN)-10	2.20		
Ia = 0.2S	0.44		
Ia/P =	0.22		
qu =	975	csm/in (per TR-55)	
Qp = qu * A * Qa	**17.09**	cfs	
Orifice Size for Water Quality Bypass			
Qp = C*A*(2gh)^0.5			
Qp, water quality peak discharge =	**17.09**	cfs	
C = discharge coefficient =	0.60		
H = head	1.30	ft	
A = cross sectional orifice area =	3.11	sf	
Proposed diameter =	2	ft	
A = proposed area =	3.14	sf	
Proposed Qp	**17.25**	cfs	
Provide 24" diameter pipe with 1.30' of head from center of pipe orifice.			
Diverts 17.25 cfs for WQv > 17.09 CFS			**O.K.**

Wet Extended Detention Pond
Proposed Distribution Facility Project
100796101

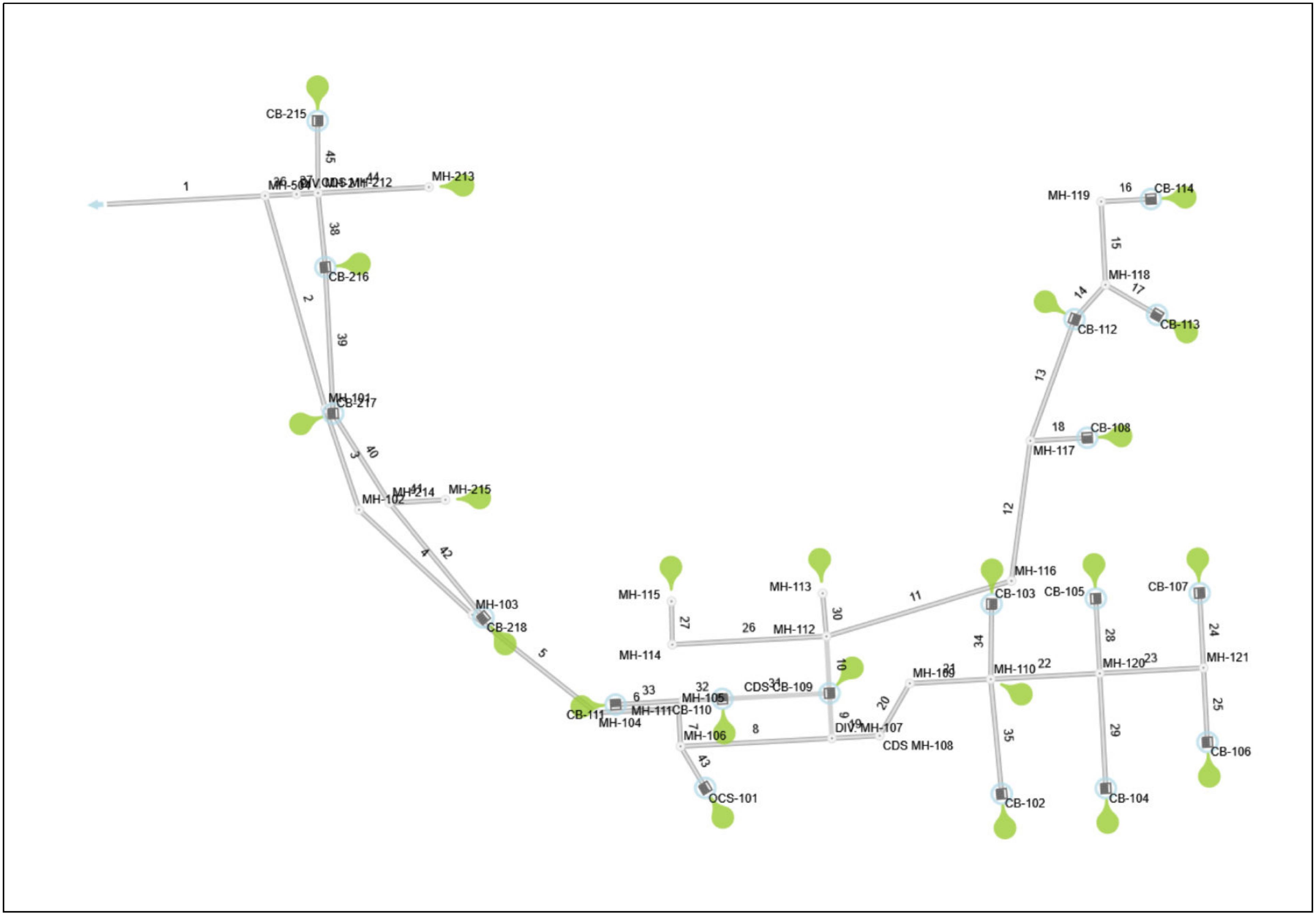
Wet Pond #1	Watersheds A1, A2, A3		
Water Quality Volume =	**7.025**	acre-feet	
	306,006	cubic feet	
Runoff Reduction Volume =	**71,257**	cubic feet	
WQv treated by bioretention =	**104,685**	cubic feet	
WQv to be treated =	**130,064**	cubic feet	
Pretreatment Required =	**13,006**	cubic feet	10% minimum
Pretreatment Provided =	**13,269**	cubic feet	O.K.
Permanent Pool Required =	**65,032**	cubic feet	50% minimum
Permanent Pool Provided =	**73,148**	cubic feet	O.K.
Extended Detention Required =	**65,032**	cubic feet	50% maximum
Extended Detention Provided =	**56,916**	cubic feet	O.K.
Volume Treated =	**130,064**	cubic feet	O.K.

Plan View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



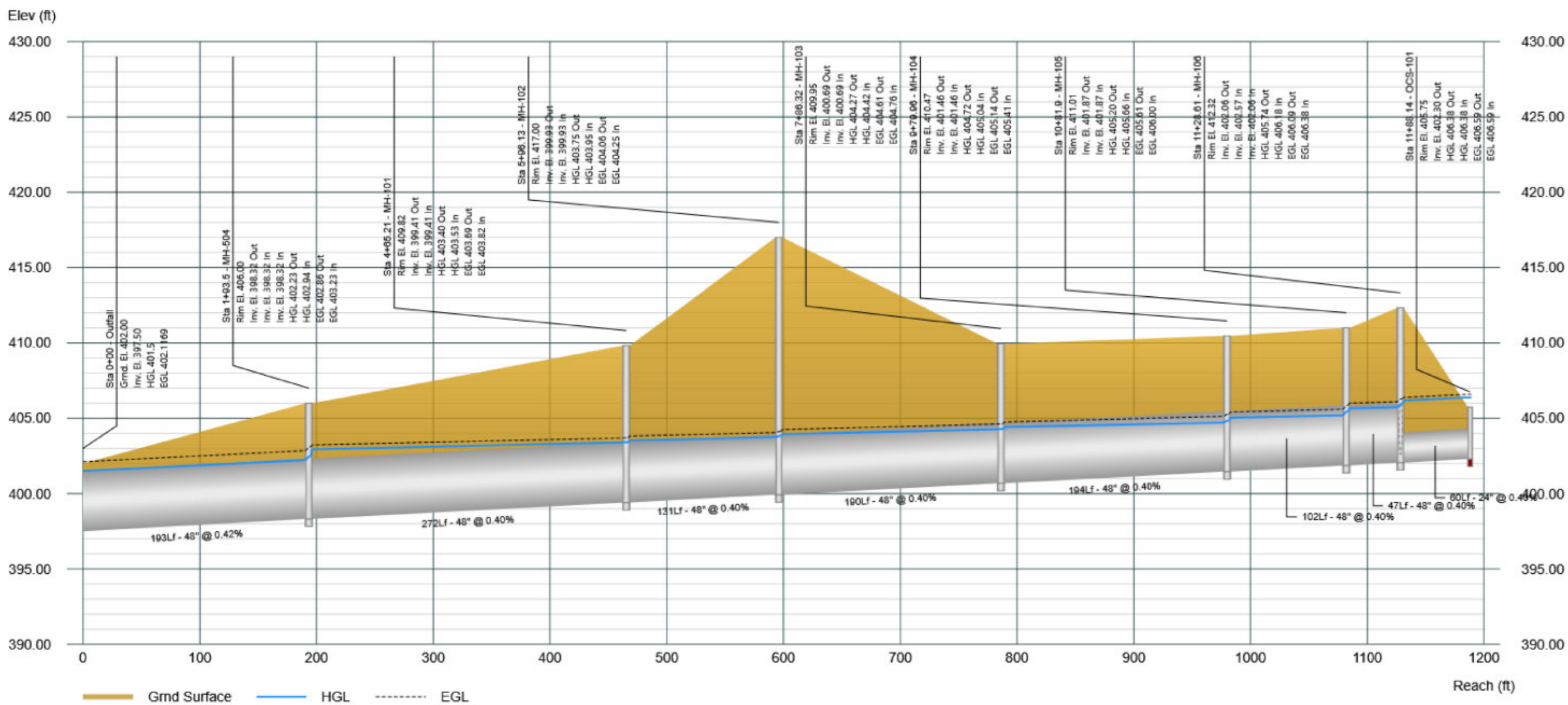
Project File: 2019-09-30 STM #100.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

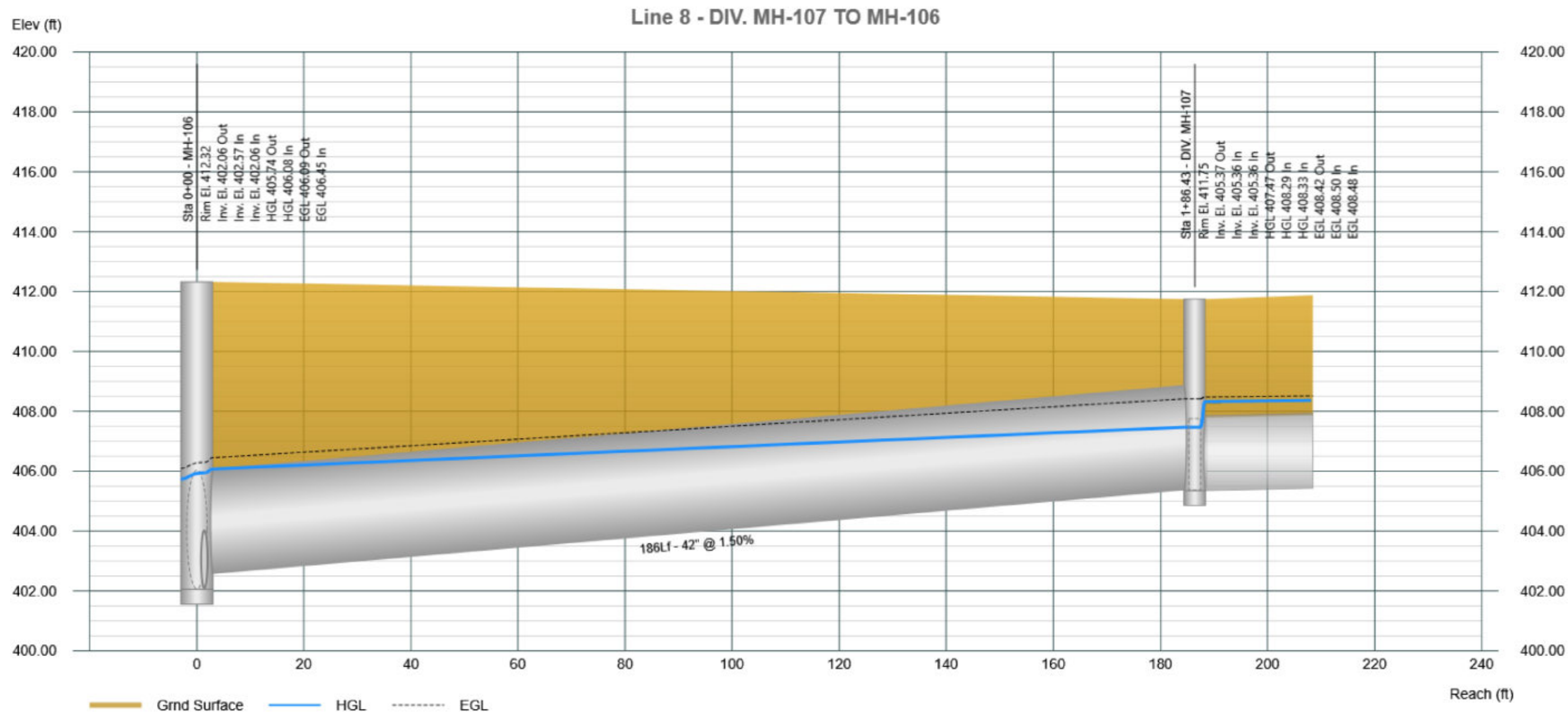


Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

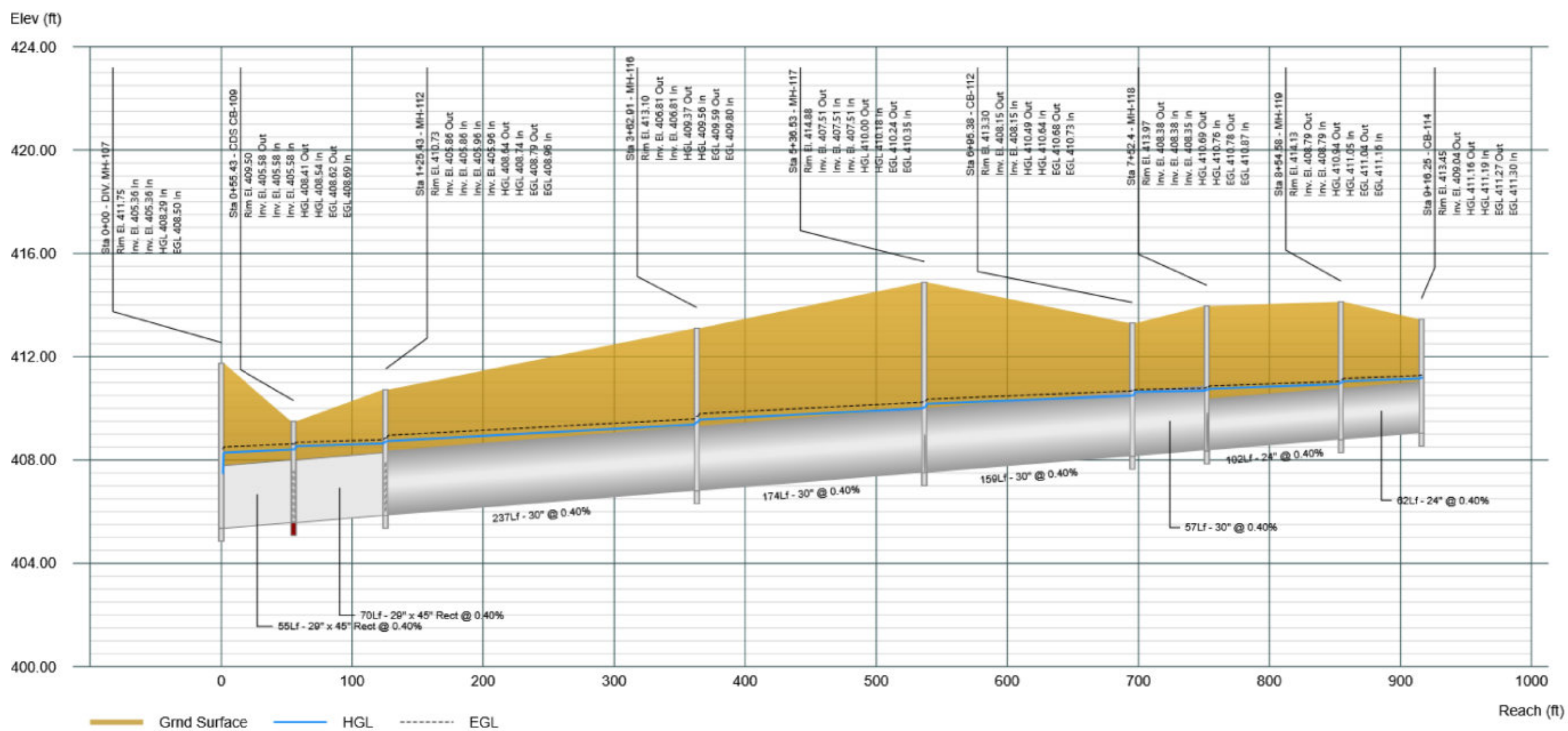
09-30-2019



Project File: 2019-09-30 STM #100.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

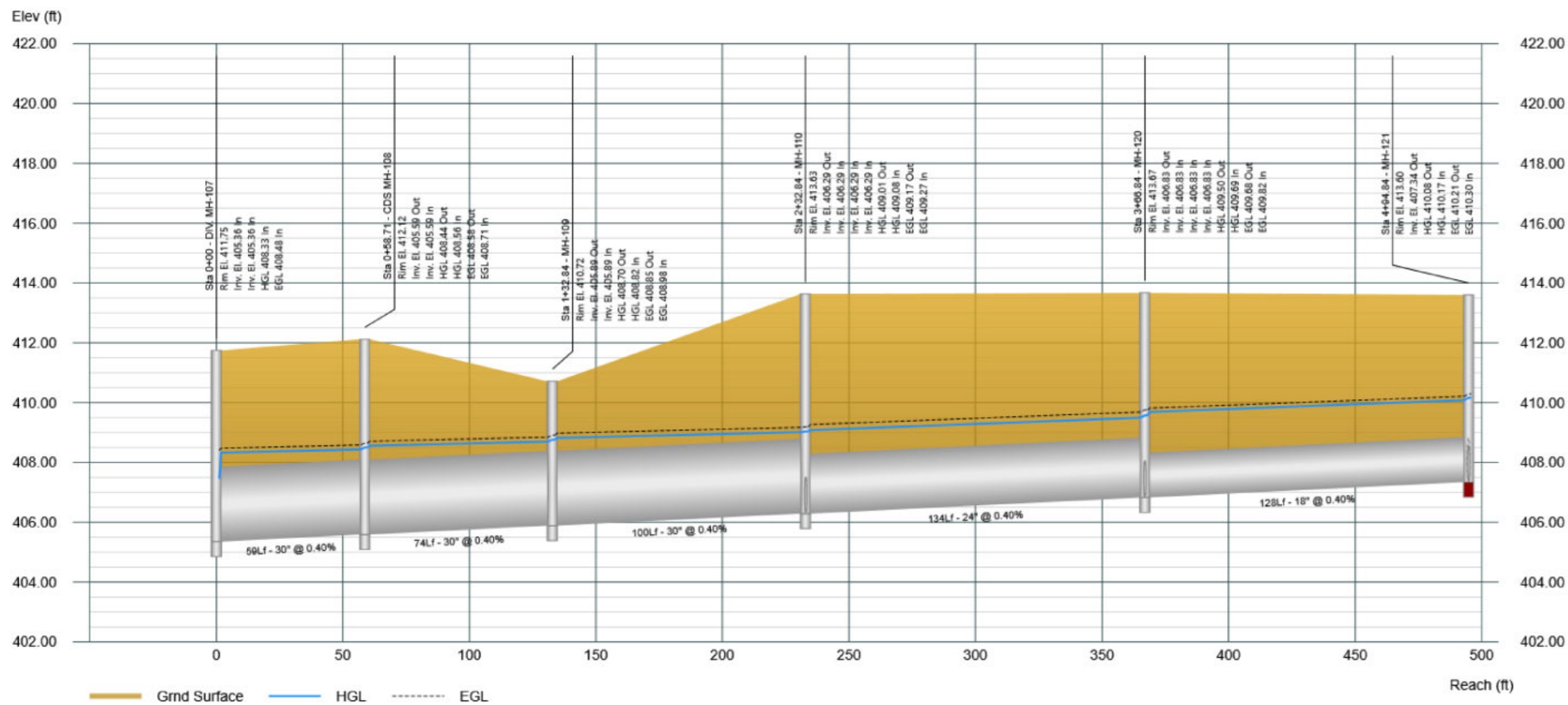


Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



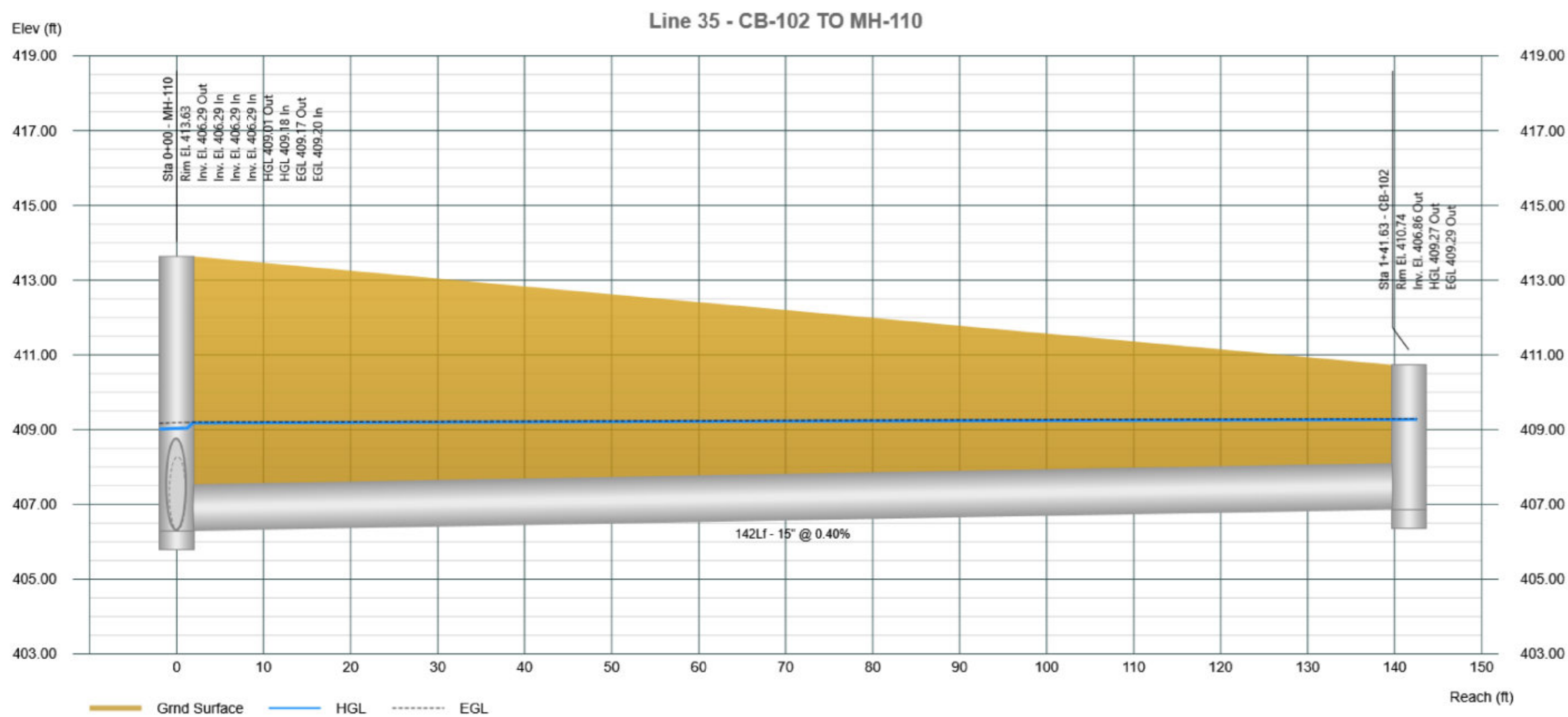
Project File: 2019-09-30 STM #100.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

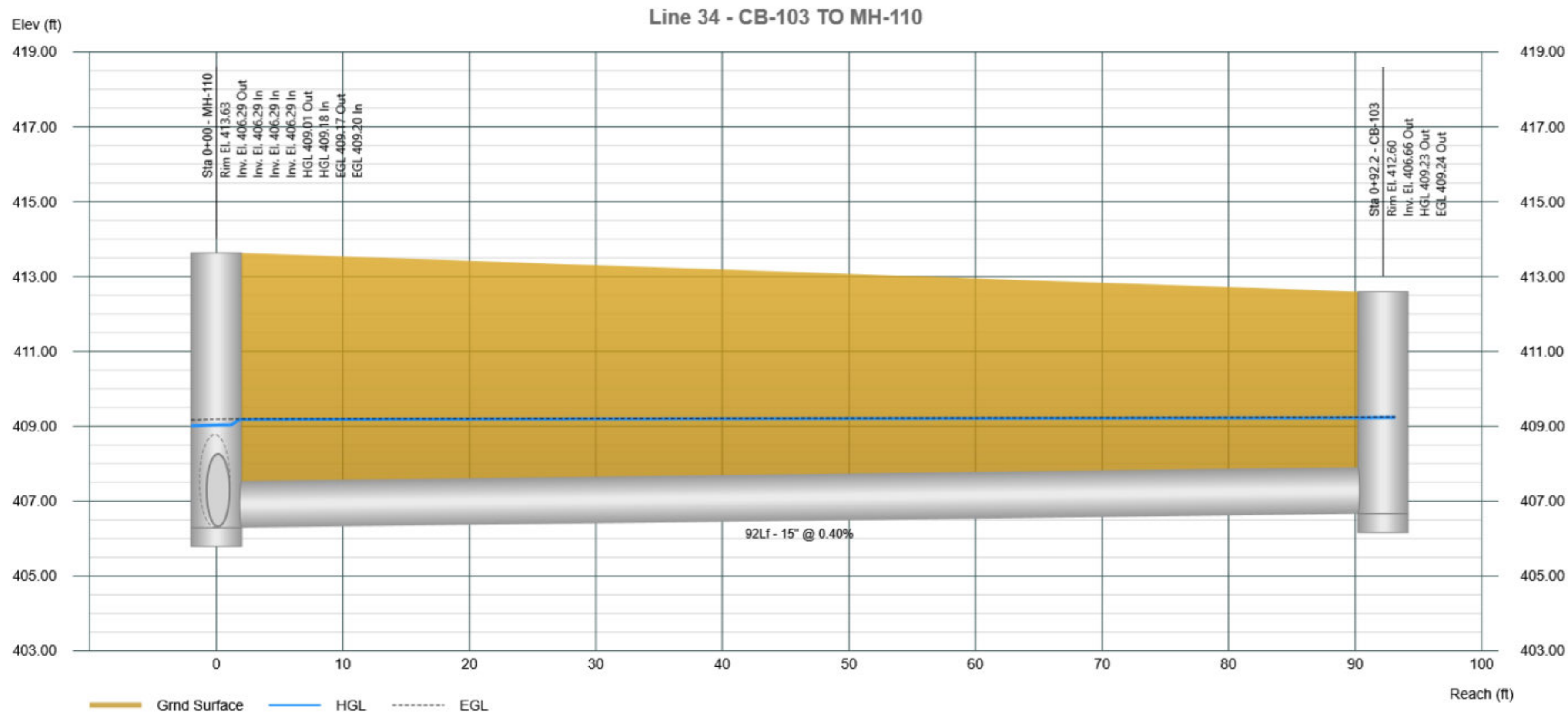


Profile View

Stormwater Studio 2019 v 3.0.0.14

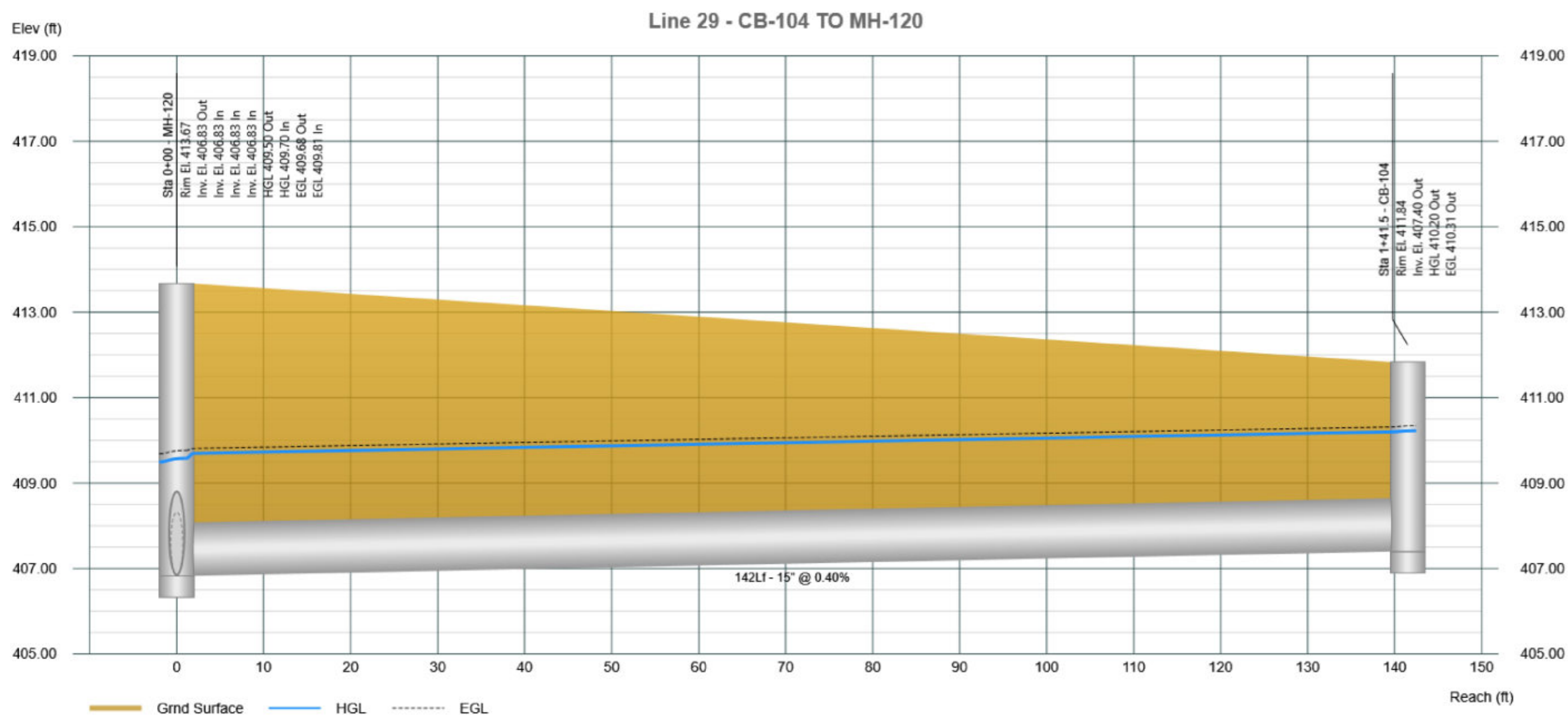
Project Name: STM #200

09-30-2019



Profile View

Stormwater Studio 2019 v 3.0.0.14

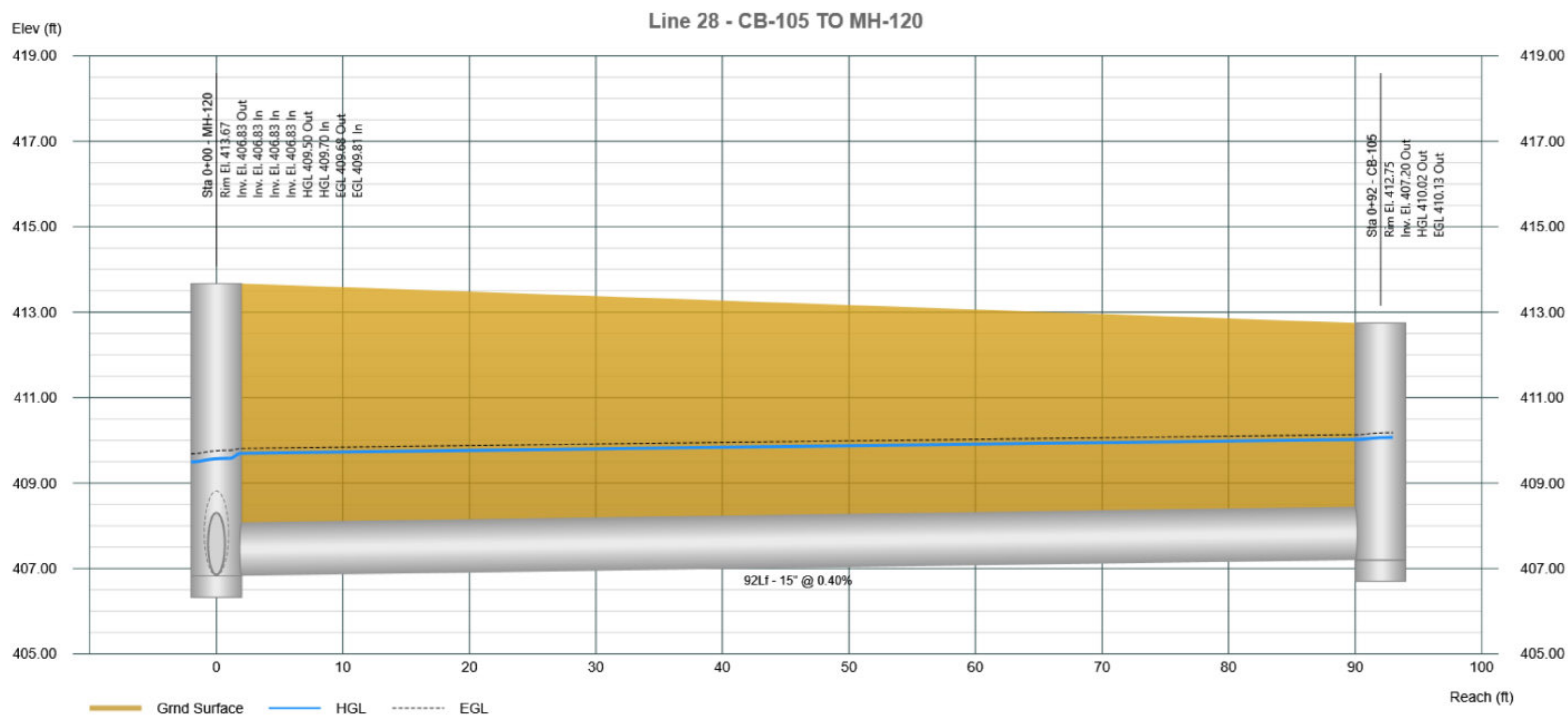


Profile View

Stormwater Studio 2019 v 3.0.0.14

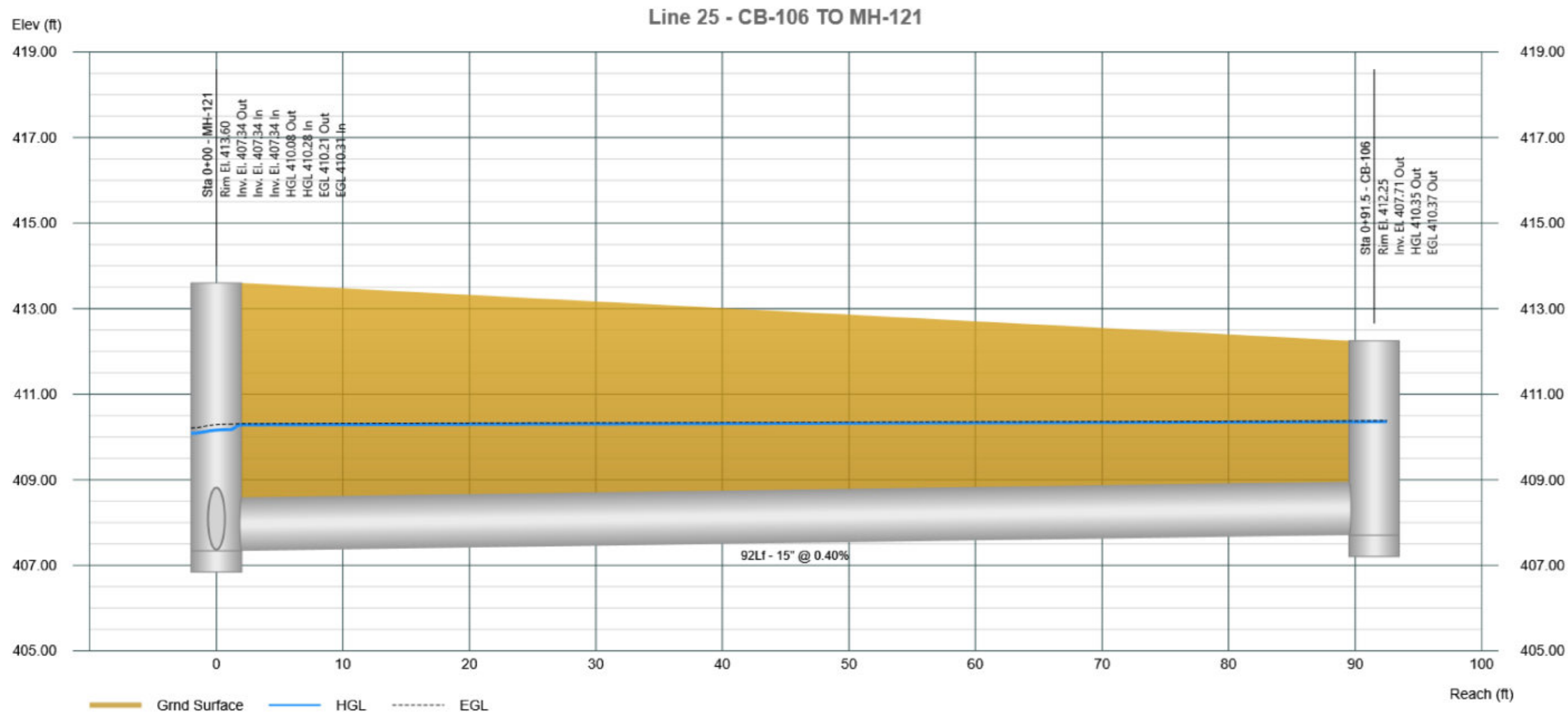
Project Name: STM #200

09-30-2019



Profile View

Stormwater Studio 2019 v 3.0.0.14

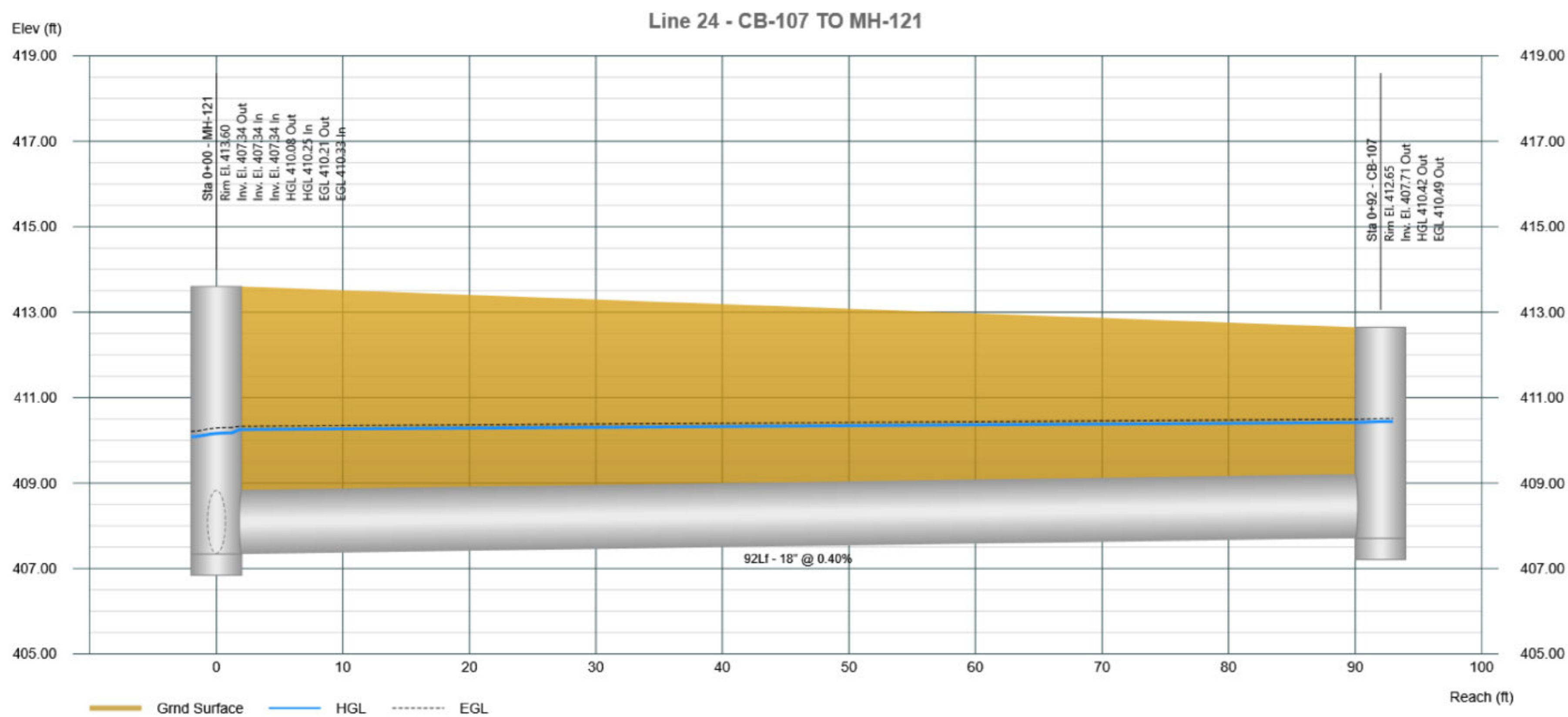


Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

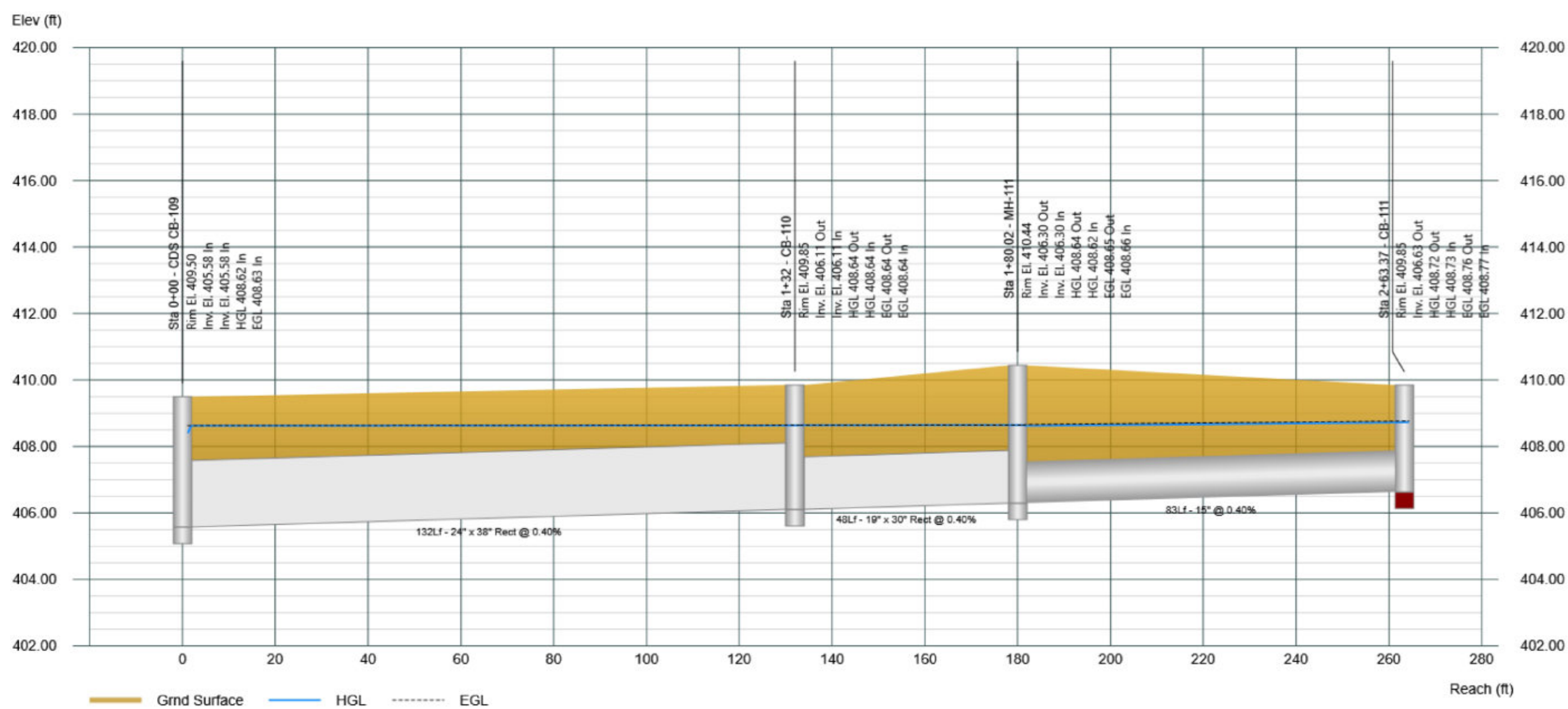


Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



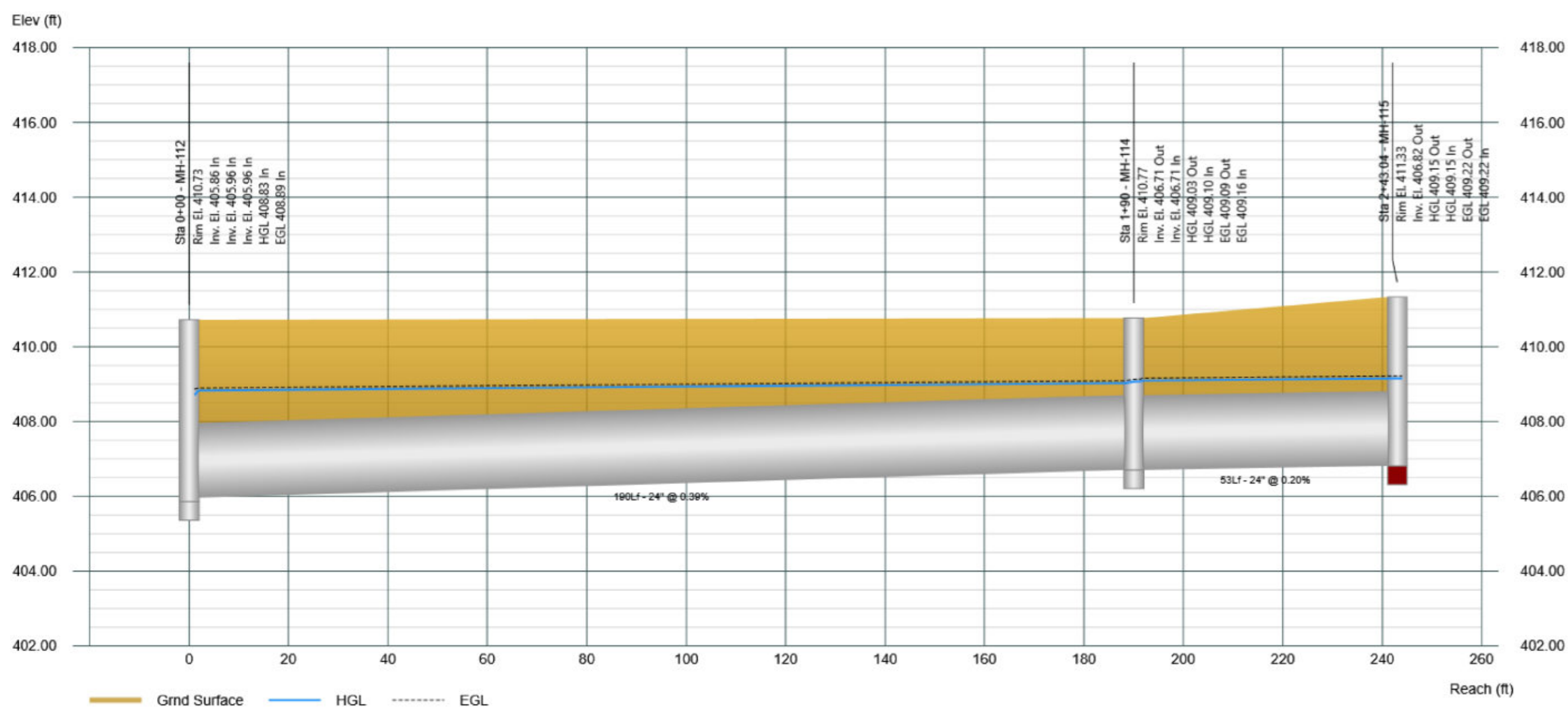
Project File: 2019-09-30 STM #100.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



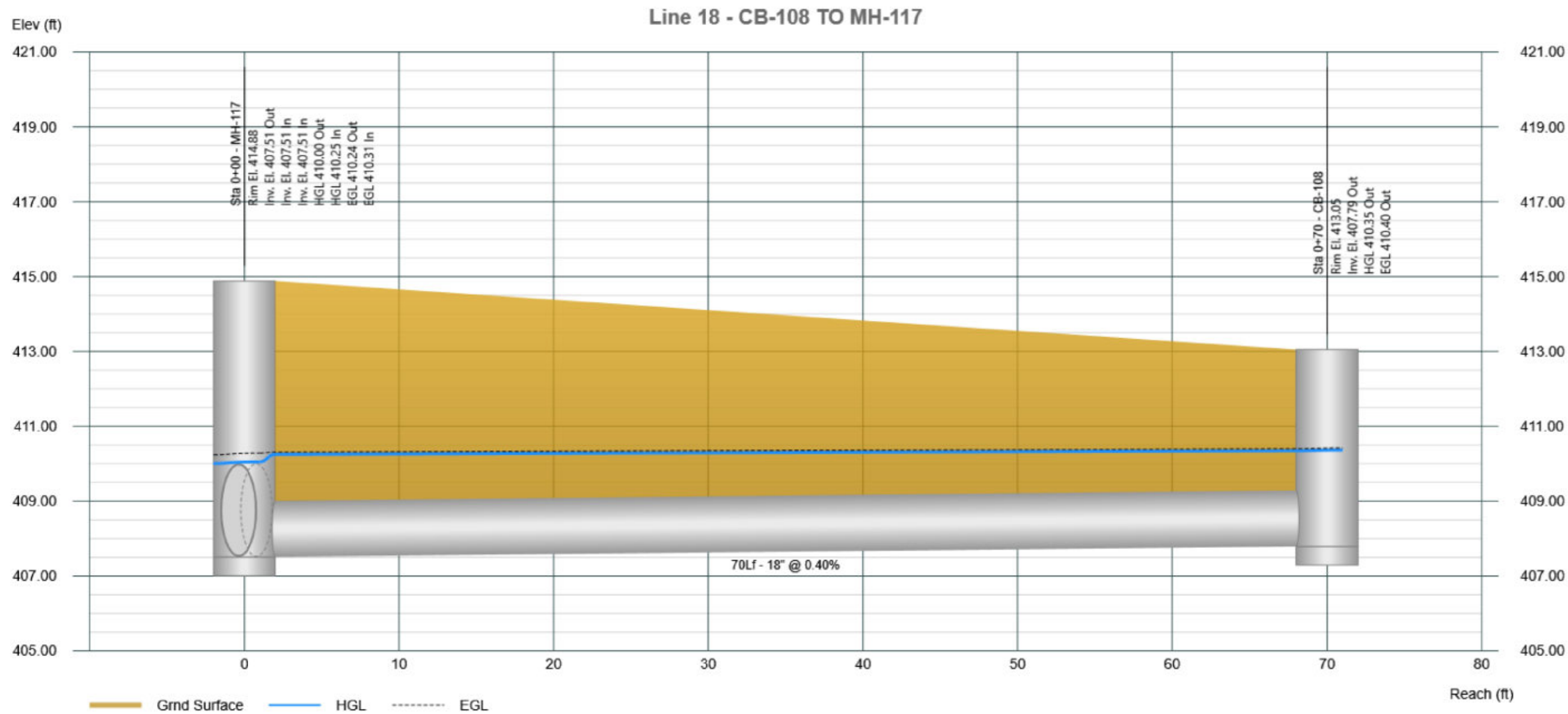
Project File: 2019-09-30 STM #100.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



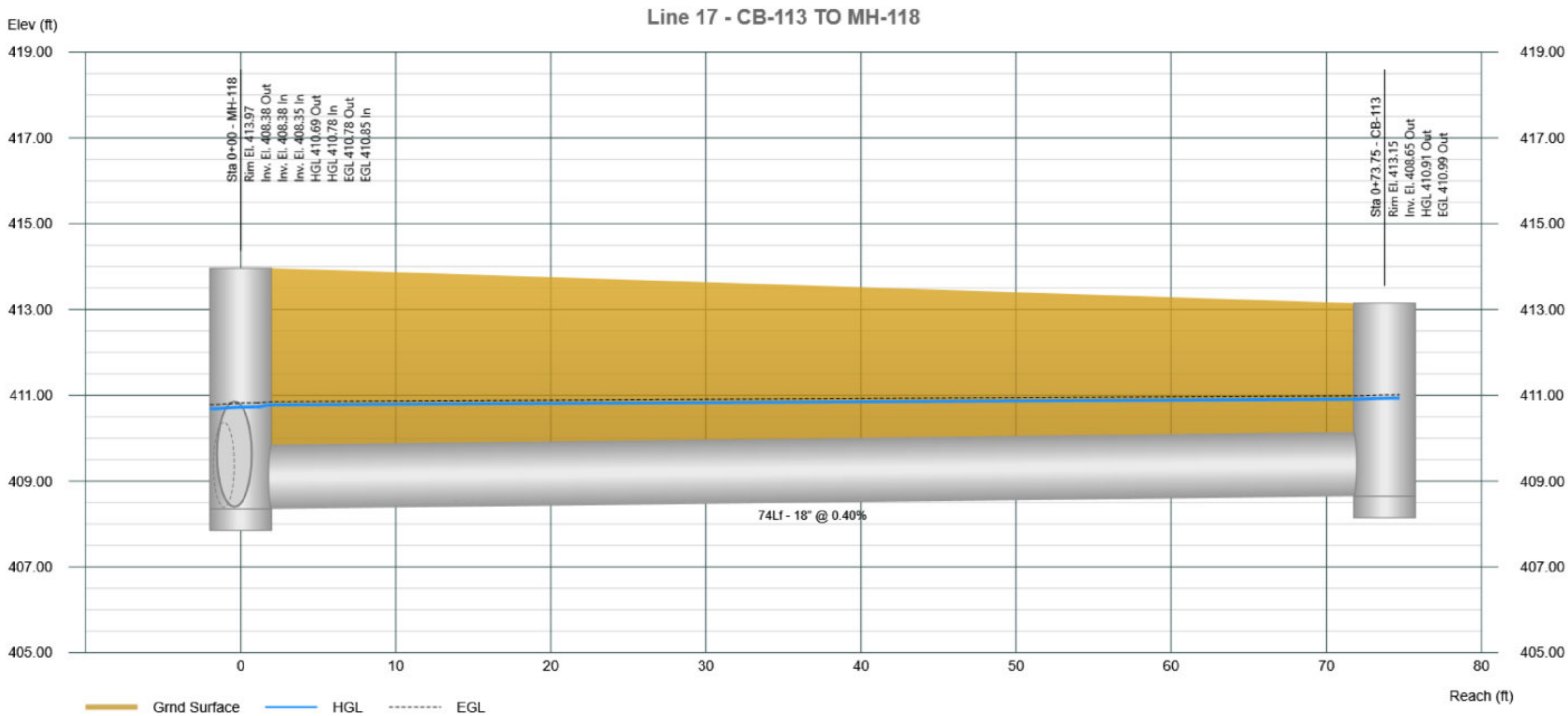
Project File: 2019-09-30 STM #100.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



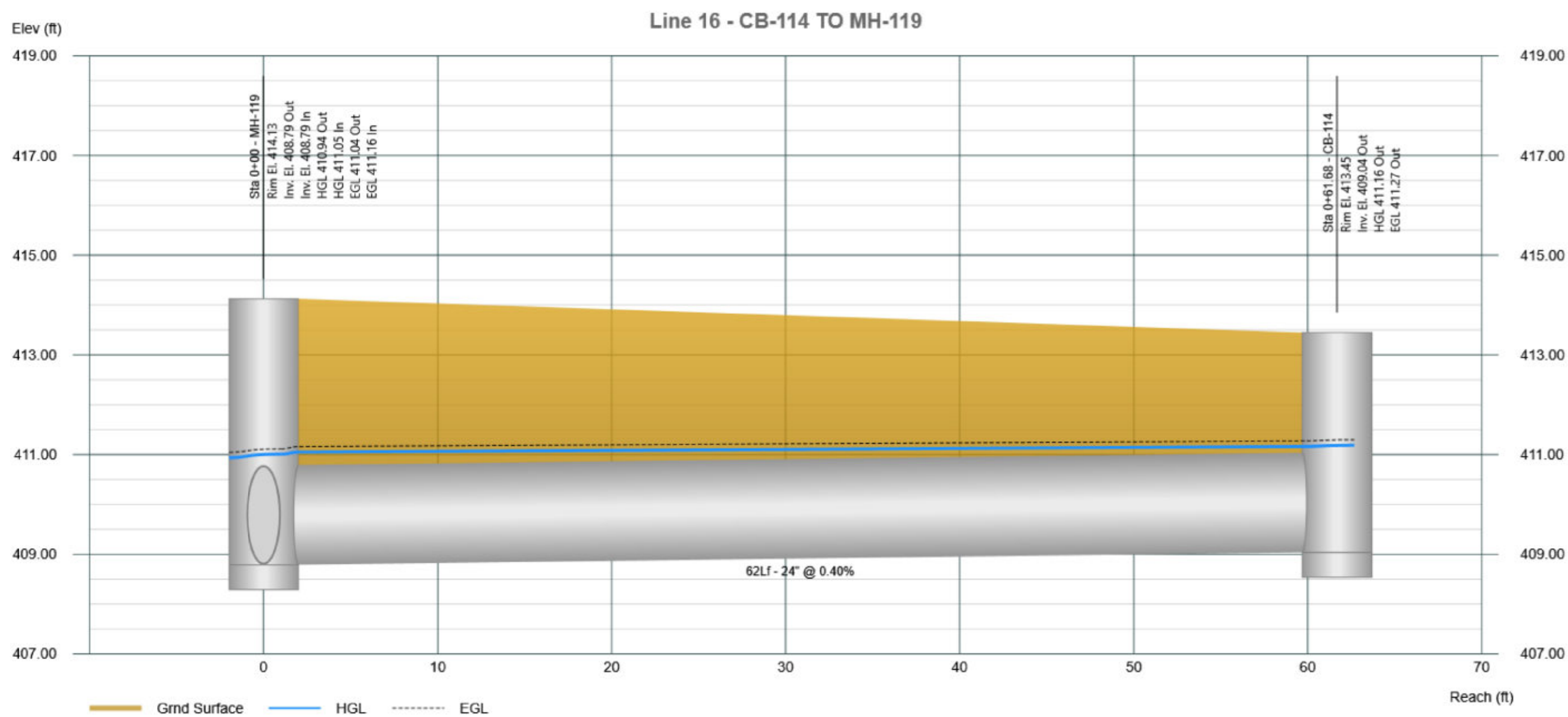
Project File: 2019-09-30 STM #100.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



Storm Sewer Tabulation*

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
MH-504 TO HW-504	193.50	0.000	19.284	0.00	0.00	18.44	0.0	19.94	0.00	79.14	81.09	6.32	48	0.42	398.32	397.50	402.23	401.50	406.00	402.00	1
MH-101 TO MH-504	271.71	0.000	11.704	0.00	0.00	11.25	0.0	18.86	0.00	54.11	78.74	4.31	48	0.40	399.41	398.32	403.40	402.94	409.82	406.00	2
MH-102 TO MH-101	130.92	0.000	11.704	0.00	0.00	11.25	0.0	18.35	0.00	54.79	78.74	4.38	48	0.40	399.93	399.41	403.81	403.58	417.00	409.82	3
MH-103 TO MH-102	190.19	0.000	11.704	0.00	0.00	11.25	0.0	17.63	0.00	55.80	78.74	4.52	48	0.40	400.69	399.93	404.39	404.06	409.95	417.00	4
MH-104 TO MH-103	193.64	0.000	11.704	0.00	0.00	11.25	0.0	16.92	0.00	56.86	78.74	4.74	48	0.40	401.46	400.69	404.91	404.60	410.47	409.95	5
MH-105 TO MH-104	101.94	0.000	11.704	0.00	0.00	11.25	0.0	16.55	0.00	57.43	78.74	4.74	48	0.40	401.87	401.46	405.44	405.28	411.01	410.47	6
MH-106 TO MH-105	46.70	0.000	11.704	0.00	0.00	11.25	0.0	16.38	0.00	57.70	78.74	4.60	48	0.40	402.06	401.87	406.01	405.92	412.32	411.01	7
DIV. MH-107 TO MH-106	186.43	0.000	11.704	0.00	0.00	11.25	0.0	15.76	0.00	47.22	106.79	6.36	42	1.50	405.37	402.57	407.47	406.37	411.75	412.32	8
CDS CB-109 TO DIV. MH-107	55.43	0.821	8.228	0.98	0.80	7.96	10.0	15.52	0.00	33.68	46.23	3.72	29x45r	0.40	405.58	405.36	408.41	408.29	409.50	411.75	9
MH-112 TO CDS CB-109	70.00	0.000	6.448	0.00	0.00	6.23	0.0	14.04	0.00	27.89	46.23	3.08	29x45r	0.40	405.86	405.58	408.64	408.54	410.73	409.50	10
MH-116 TO MH-112	237.48	0.000	4.129	0.00	0.00	3.93	0.0	12.98	0.00	18.38	22.48	3.75	30	0.40	406.81	405.86	409.40	408.76	413.10	410.73	11
MH-117 TO MH-116	173.63	0.000	4.129	0.00	0.00	3.93	0.0	12.23	0.00	18.98	22.48	3.87	30	0.40	407.51	406.81	410.13	409.63	414.88	413.10	12
CB-112 TO MH-117	158.85	1.036	3.441	0.98	1.02	3.31	10.0	11.45	0.00	16.52	22.48	3.37	30	0.40	408.15	407.51	410.64	410.35	413.30	414.88	13
MH-118 TO CB-112	57.02	0.000	2.405	0.00	0.00	2.29	0.0	11.05	0.00	11.67	22.48	2.38	30	0.40	408.38	408.15	410.87	410.81	413.97	413.30	14
MH-119 TO MH-118	102.18	0.000	1.615	0.00	0.00	1.57	0.0	10.41	0.00	8.22	12.40	2.62	24	0.40	408.79	408.38	411.13	410.95	414.13	413.97	15
CB-114 TO MH-119	61.68	1.615	1.615	0.97	1.57	1.57	10.0	10.02	0.00	8.38	12.40	2.67	24	0.40	409.04	408.79	411.38	411.26	413.45	414.13	16
CB-113 TO MH-118	73.75	0.790	0.790	0.92	0.73	0.73	10.0	10.02	0.00	3.89	5.76	2.20	18	0.40	408.65	408.35	411.11	410.97	413.15	413.97	17
CB-108 TO MH-117	70.00	0.688	0.688	0.91	0.63	0.63	10.0	10.02	0.00	3.35	5.76	1.90	18	0.40	407.79	407.51	410.51	410.42	413.05	414.88	18
CDS MH-108 TO DIV. MH-107	58.71	0.000	3.476	0.00	0.00	3.29	0.0	13.50	0.00	15.06	22.48	3.07	30	0.40	405.59	405.36	408.44	408.33	412.12	411.75	19
MH-109 TO CDS MH-108	74.12	0.000	3.476	0.00	0.00	3.29	0.0	13.12	0.00	15.30	22.48	3.12	30	0.40	405.89	405.59	408.72	408.59	410.72	412.12	20
MH-110 TO MH-109	100.00	0.591	3.476	0.95	0.56	3.29	10.0	12.61	0.00	15.64	22.48	3.19	30	0.40	406.29	405.89	409.07	408.88	413.63	410.72	21
MH-120 TO MH-110	134.00	0.000	2.380	0.00	0.00	2.24	0.0	11.99	0.00	10.93	12.40	3.48	24	0.40	406.83	406.29	409.58	409.16	413.67	413.63	22

* Results NOT current with inputs. r = rectangular e = elliptical

Project File: 2019-09-30 STM #100.sws

Storm Sewer Tabulation*

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
MH-121 TO MH-120	128.00	0.000	1.081	0.00	0.00	1.00	0.0	11.27	0.00	5.05	5.76	2.86	18	0.40	407.34	406.83	410.20	409.81	413.60	413.67	23
CB-107 TO MH-121	92.00	0.776	0.776	0.93	0.72	0.72	10.0	10.02	0.00	3.86	5.76	2.19	18	0.40	407.71	407.34	410.56	410.40	412.65	413.60	24
CB-106 TO MH-121	91.50	0.305	0.305	0.92	0.28	0.28	10.0	10.02	0.00	1.50	3.54	1.22	15	0.40	407.71	407.34	410.49	410.43	412.25	413.60	25
MH-114 TO MH-112	190.00	0.000	1.221	0.00	0.00	1.21	0.0	10.45	0.00	6.33	12.28	2.02	24	0.39	406.71	405.96	409.06	408.86	410.77	410.73	26
MH-115 TO MH-114	53.04	1.221	1.221	0.99	1.21	1.21	10.0	10.02	0.00	6.47	8.85	2.06	24	0.20	406.82	406.71	409.19	409.13	411.33	410.77	27
CB-105 TO MH-120	92.00	0.644	0.644	0.96	0.62	0.62	10.0	10.02	0.00	3.31	3.54	2.70	15	0.40	407.20	406.83	410.14	409.82	412.75	413.67	28
CB-104 TO MH-120	141.50	0.655	0.655	0.95	0.62	0.62	10.0	10.02	0.00	3.33	3.54	2.71	15	0.40	407.40	406.83	410.32	409.82	411.84	413.67	29
MH-111 TO MH-110	53.04	1.097	1.097	0.99	1.09	1.09	10.0	10.02	0.00	5.81	8.85	1.85	24	0.20	406.07	405.96	408.91	408.86	411.33	410.73	30
CB-110 TO CDS CB-109	132.00	0.572	0.959	0.98	0.56	0.92	10.0	12.58	0.00	4.37	28.63	0.69	24x38r	0.40	406.11	405.58	408.64	408.62	409.85	409.50	31
MH-111 TO CB-110	48.02	0.000	0.388	0.00	0.00	0.36	0.0	10.90	0.00	1.85	15.30	0.47	19x30r	0.40	406.30	406.11	408.65	408.64	410.44	409.85	32
CB-111 TO MH-111	83.35	0.388	0.388	0.93	0.36	0.36	10.0	10.02	0.00	1.93	3.54	1.57	15	0.40	406.63	406.30	408.73	408.63	409.85	410.44	33
CB-103 TO MH-110	92.20	0.237	0.237	0.95	0.23	0.23	10.0	10.02	0.00	1.20	3.54	0.98	15	0.40	406.66	406.29	409.31	409.27	412.60	413.63	34
CB-102 TO MH-110	141.63	0.269	0.269	0.99	0.27	0.27	10.0	10.02	0.00	1.42	3.54	1.16	15	0.40	406.86	406.29	409.36	409.26	410.74	413.63	35
DIV. MH-211 TO MH-504	38.59	0.000	7.580	0.00	0.00	7.19	0.0	13.52	0.00	32.87	154.58	5.97	36	7.15	401.08	398.32	402.91	402.91	407.02	406.00	36
CDS MH-212 TO DIV. MH-21	26.41	0.000	7.580	0.00	0.00	7.19	0.0	13.43	0.00	32.99	36.56	5.69	36	0.40	401.19	401.08	403.47	403.38	410.80	407.02	37
CB-216 TO CDS MH-212	91.60	0.868	4.174	0.95	0.82	3.84	10.0	13.01	0.00	17.92	22.48	3.65	30	0.40	401.56	401.19	404.49	404.26	408.75	410.80	38
CB-217 TO CB-216	180.00	1.402	3.305	0.93	1.30	3.02	10.0	12.02	0.00	14.68	22.48	2.99	30	0.40	402.28	401.56	404.98	404.67	408.30	408.75	39
MH-214 TO CB-217	129.72	0.000	1.903	0.00	0.00	1.71	0.0	11.24	0.00	8.63	12.40	2.75	24	0.40	402.80	402.28	405.34	405.09	409.98	408.30	40
MH-215 TO MH-214	69.26	1.152	1.152	0.99	1.14	1.14	10.0	10.02	0.00	6.10	12.40	1.94	24	0.40	403.08	402.80	405.56	405.49	410.85	409.98	41
CB-218 TO MH-214	182.36	0.751	0.751	0.76	0.57	0.57	10.0	10.02	0.00	3.05	3.54	2.49	15	0.40	403.53	402.80	406.01	405.47	409.00	409.98	42
OCS-101 TO MH-106	59.53	0.000	0.000	0.00	0.00	0.00	0.0	0.00	0.00	11.49	12.40	3.66	24	0.40	402.30	402.06	406.68	406.47	405.75	412.32	43
MH-213 TO CDS MH-212	136.75	2.432	2.432	0.99	2.41	2.41	10.0	10.02	0.00	12.89	22.48	2.63	30	0.40	401.74	401.19	404.50	404.32	410.86	410.80	44

* Results NOT current with inputs. r = rectangular e = elliptical

Project File: 2019-09-30 STM #100.sws

Storm Sewer Tabulation*

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

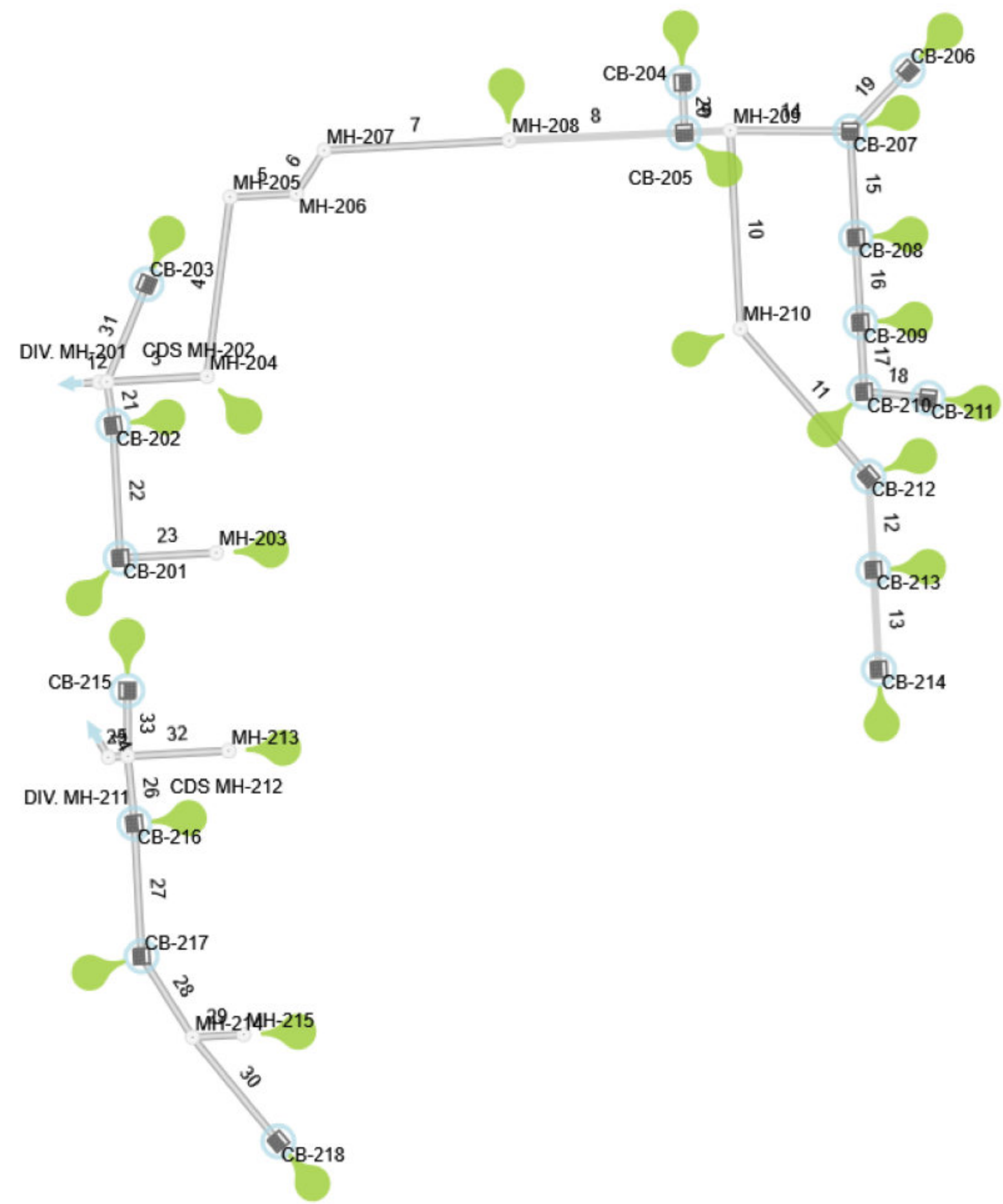
Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
CB-215 TO CDS MH-212	88.60	0.974	0.974	0.97	0.94	0.94	10.0	10.02	0.00	5.06	5.76	2.86	18	0.40	401.54	401.19	404.58	404.31	408.75	410.80	45

* Results NOT current with inputs.

Project File: 2019-09-30 STM #100.sws

Plan View

Stormwater Studio 2019 v 3.0.0.14

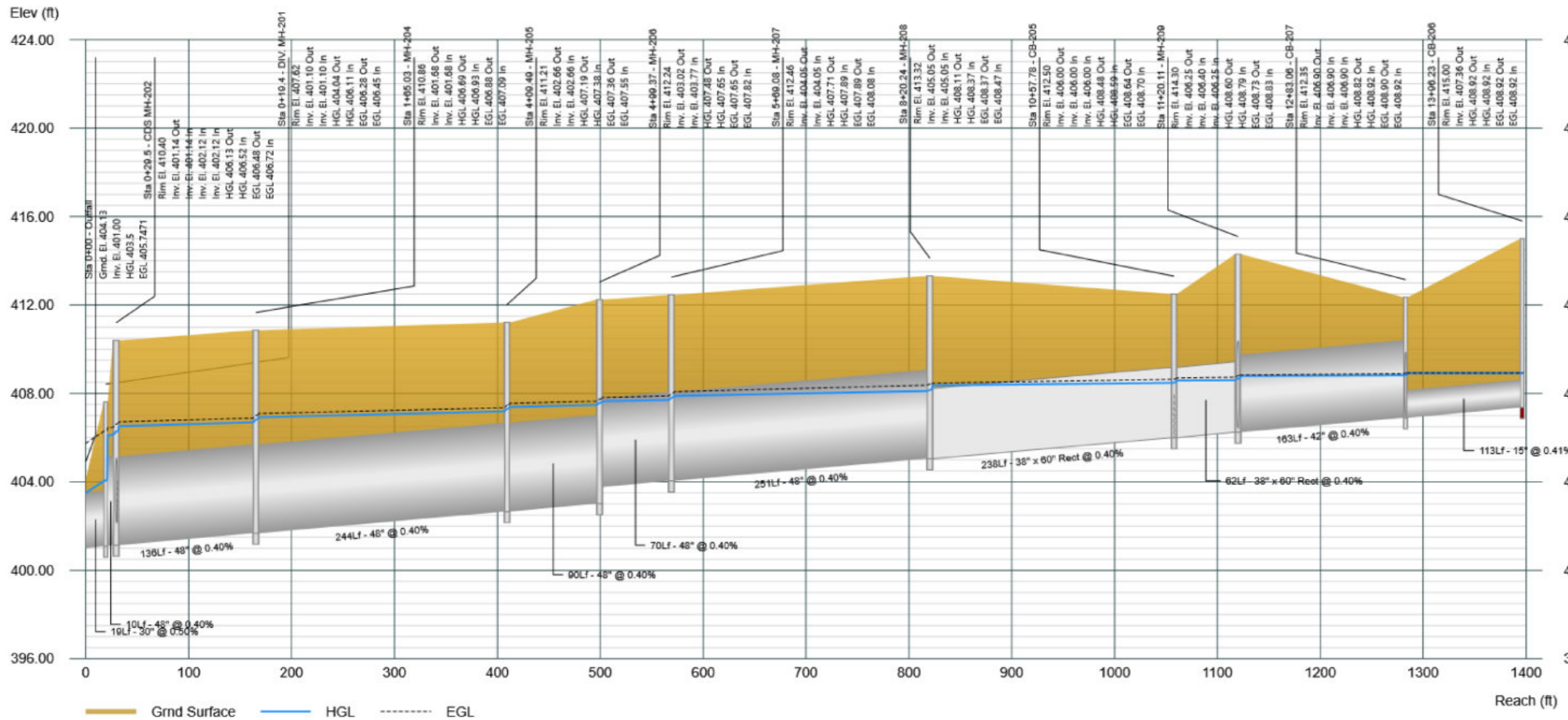


Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



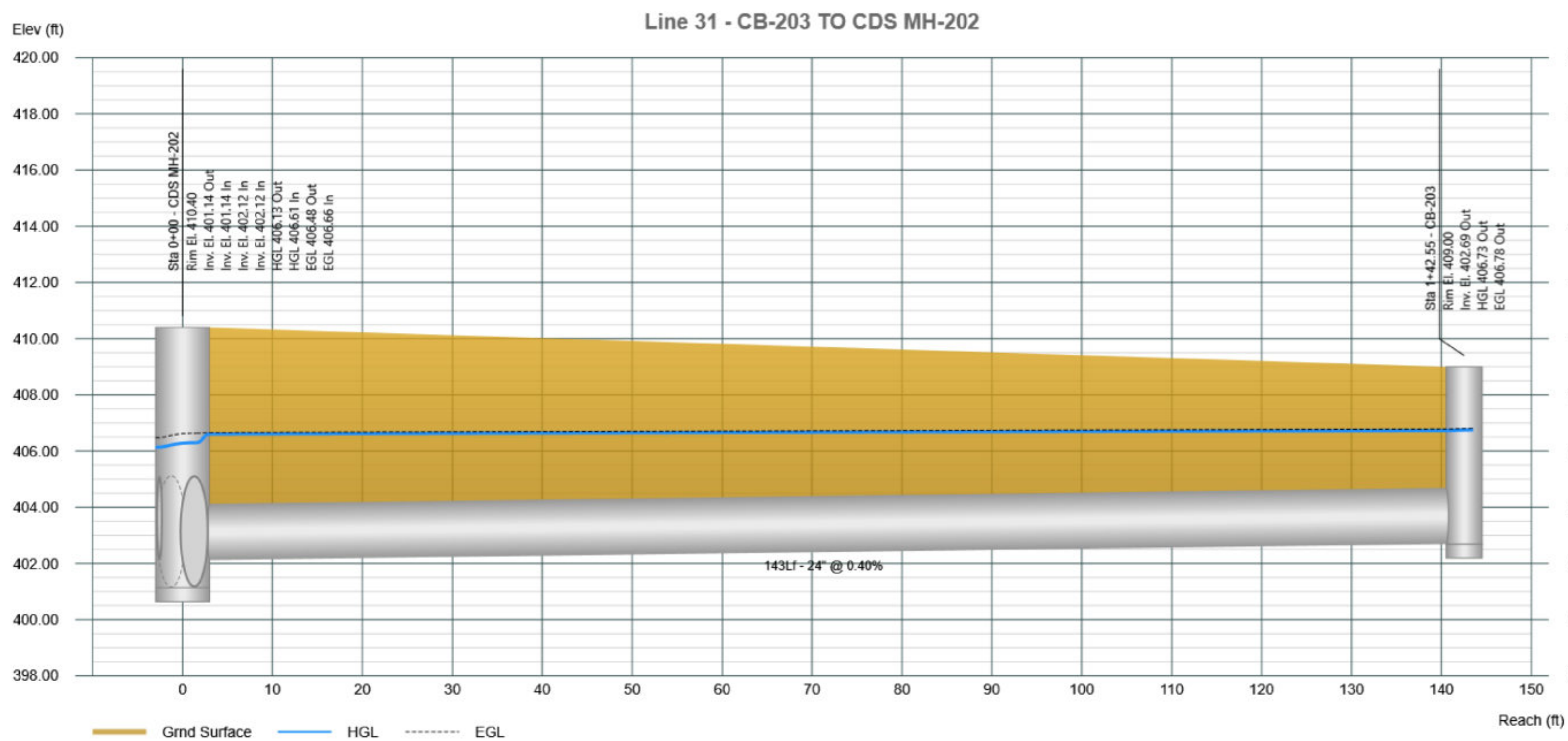
Project File: 2019-09-30 STM #200.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



Profile View

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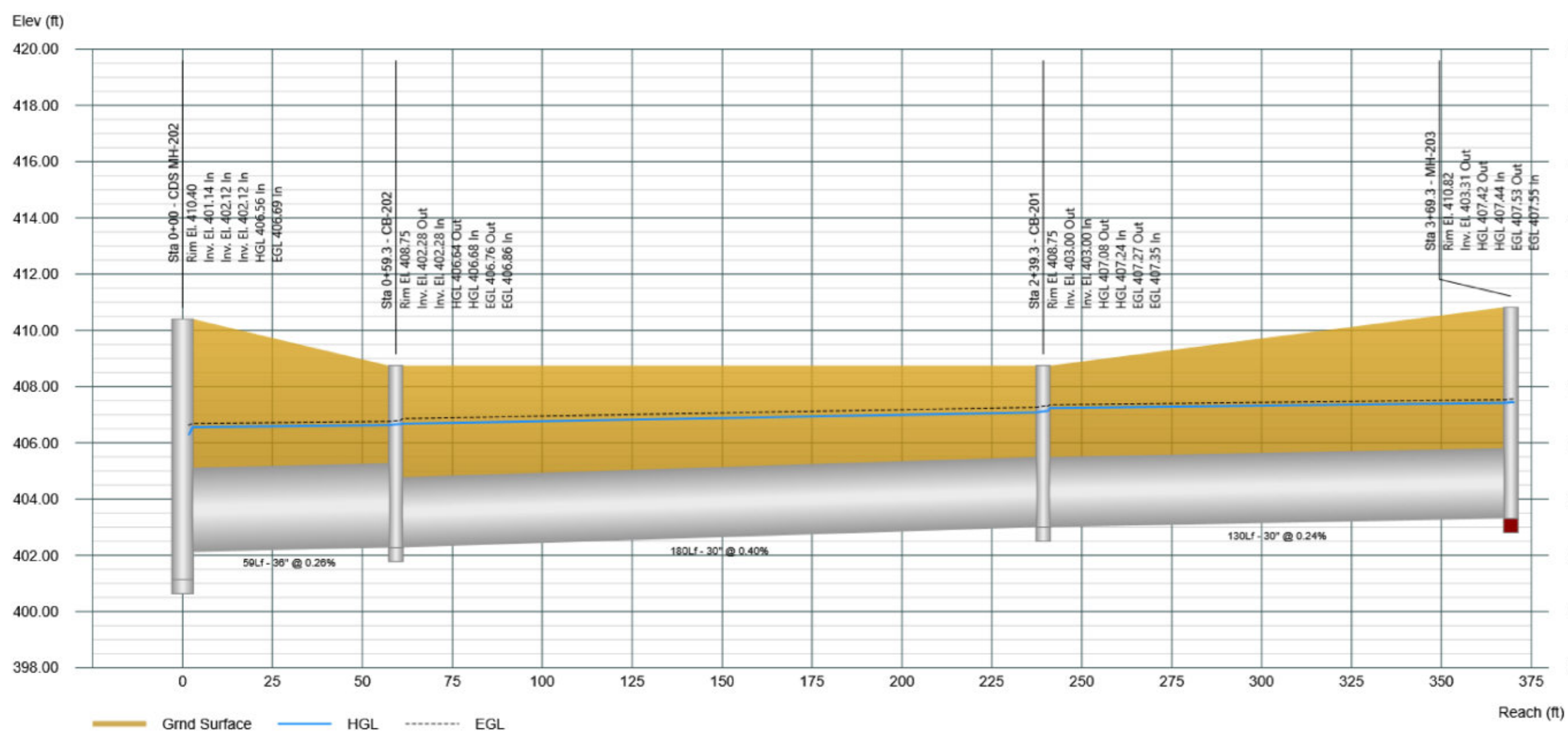
Project Name: STM #200

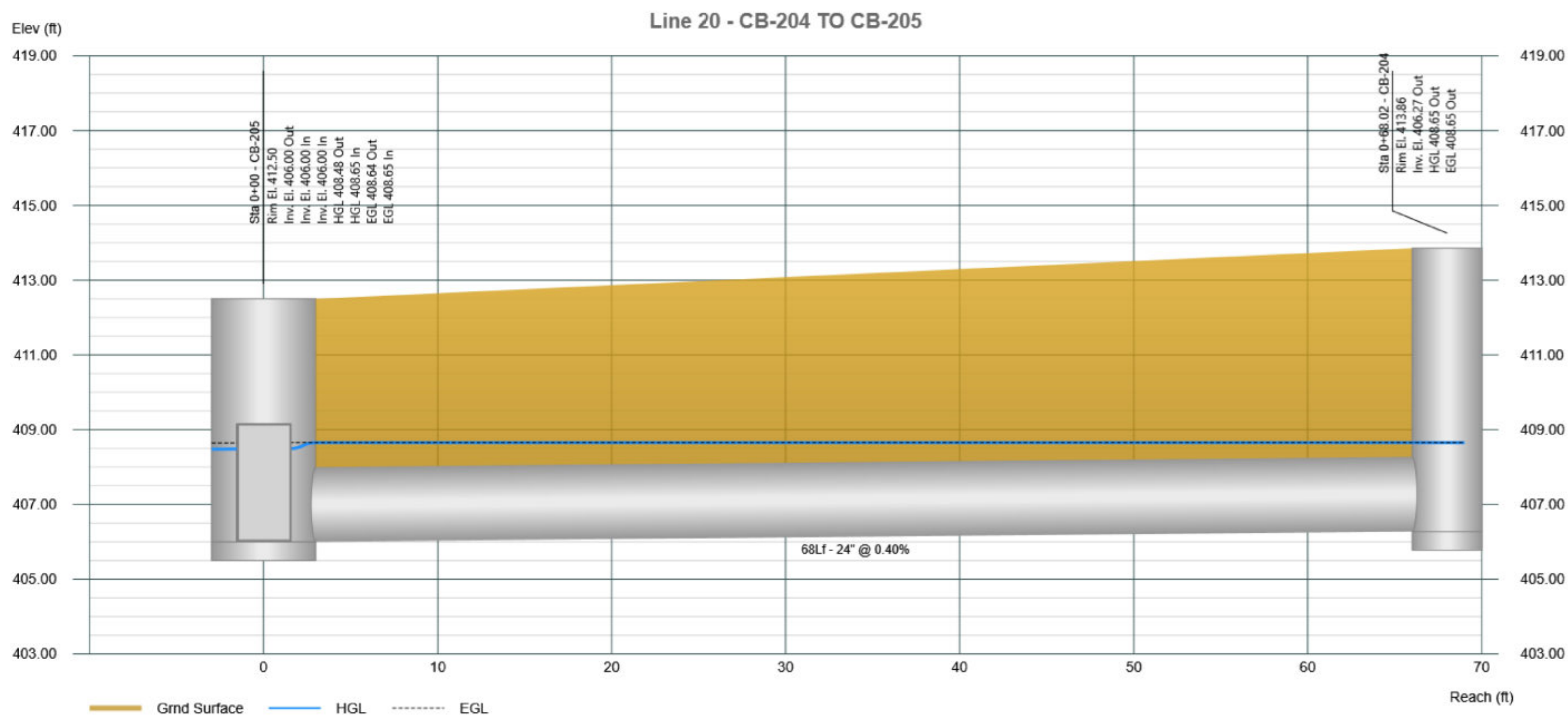
09-30-2019



Project File: 2019-09-30 STM #200.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

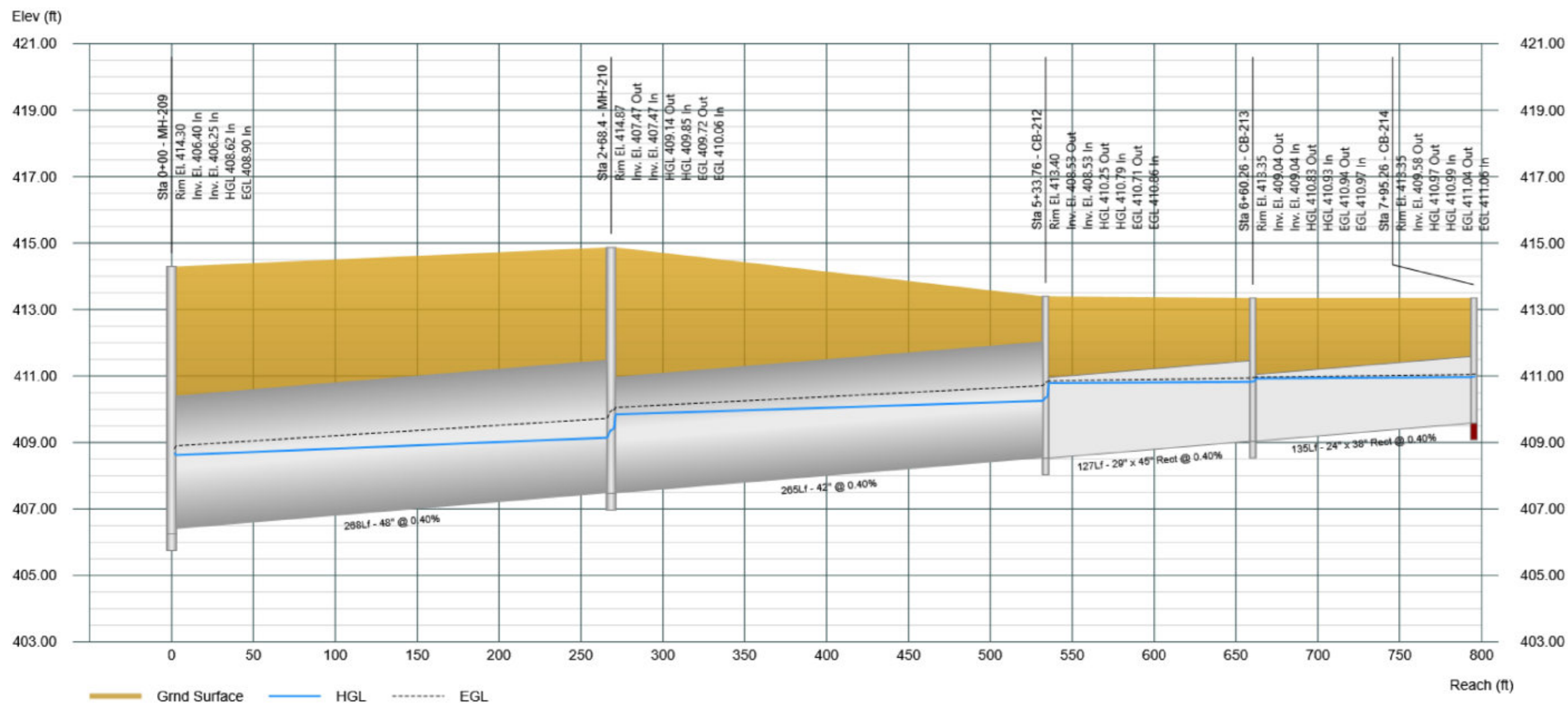


Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



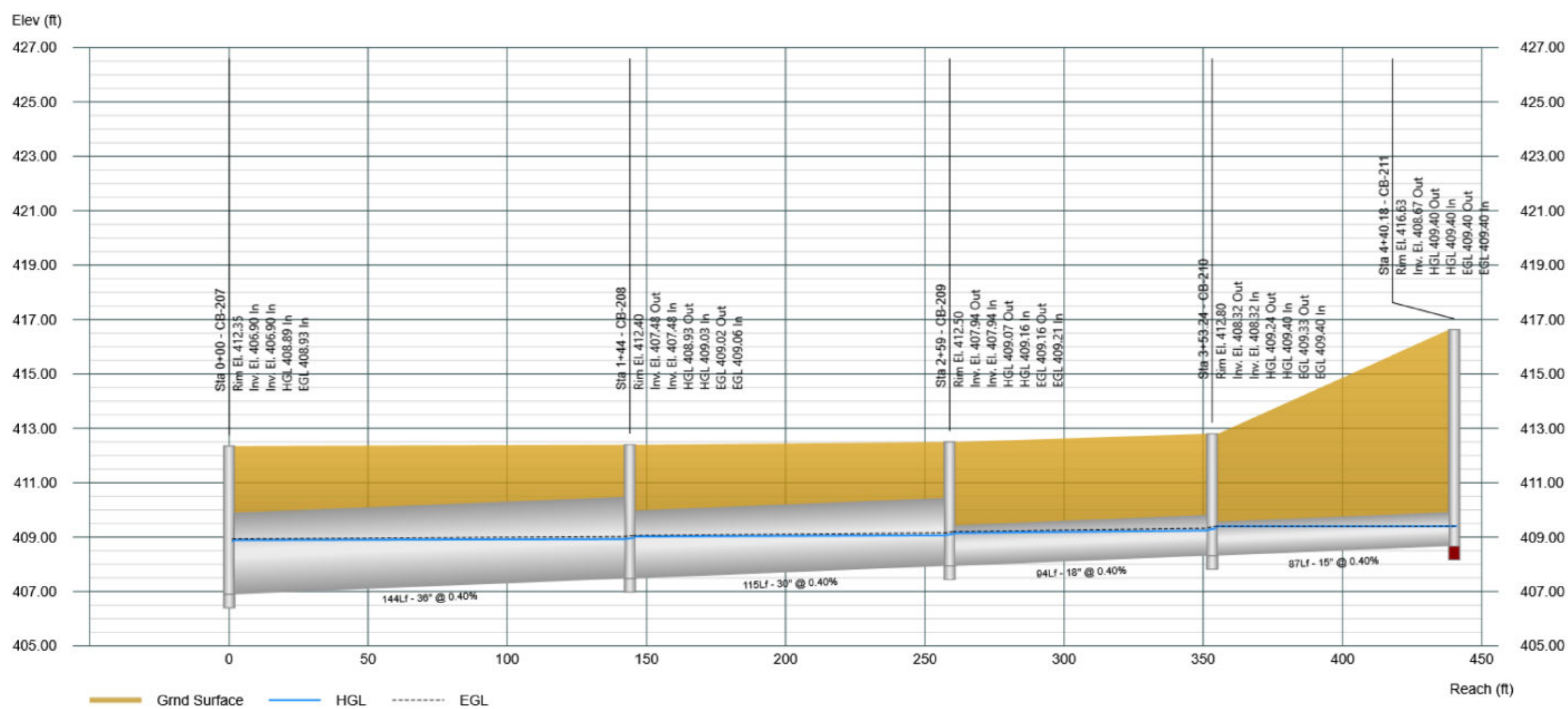
Project File: 2019-09-30 STM #200.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



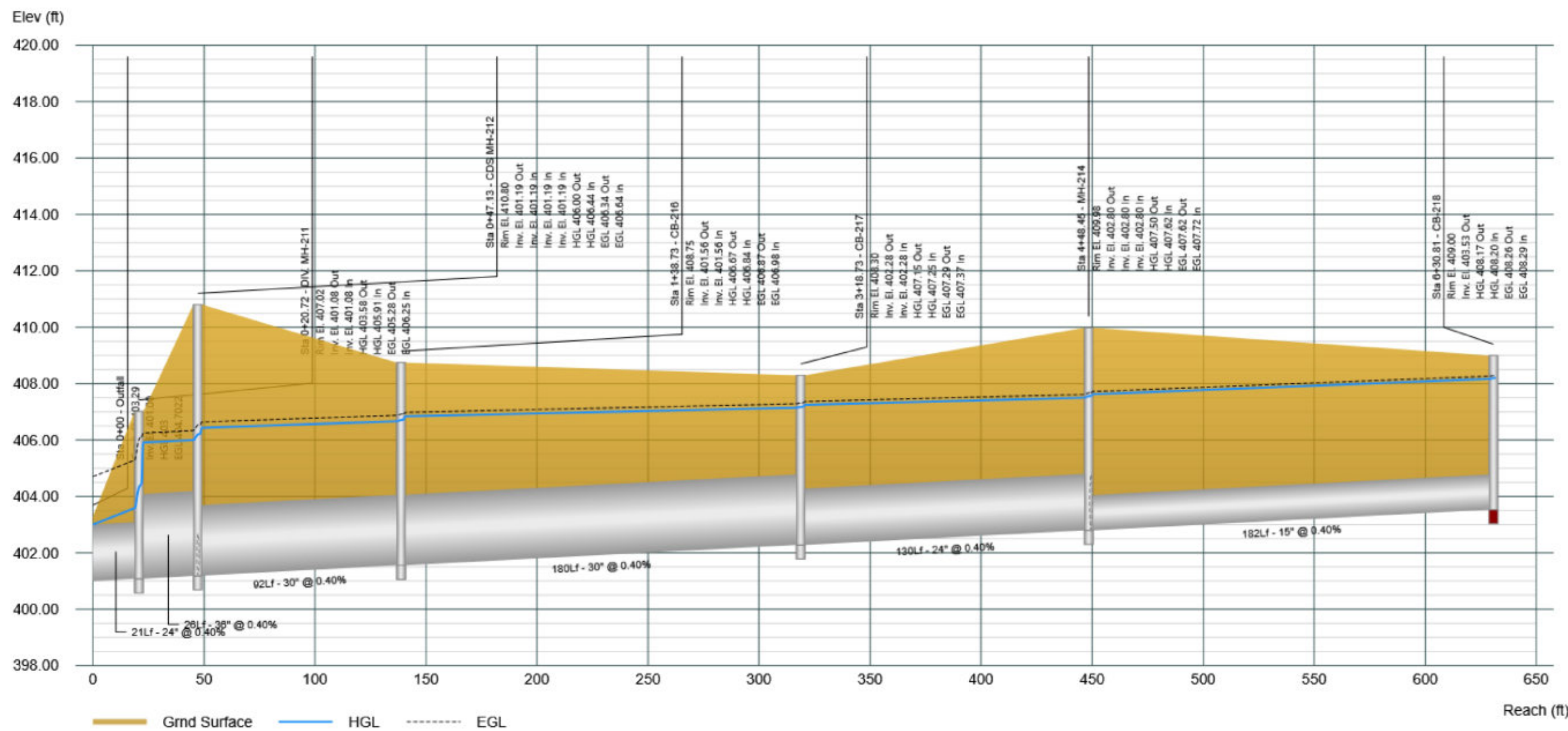
Project File: 2019-09-30 STM #200.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



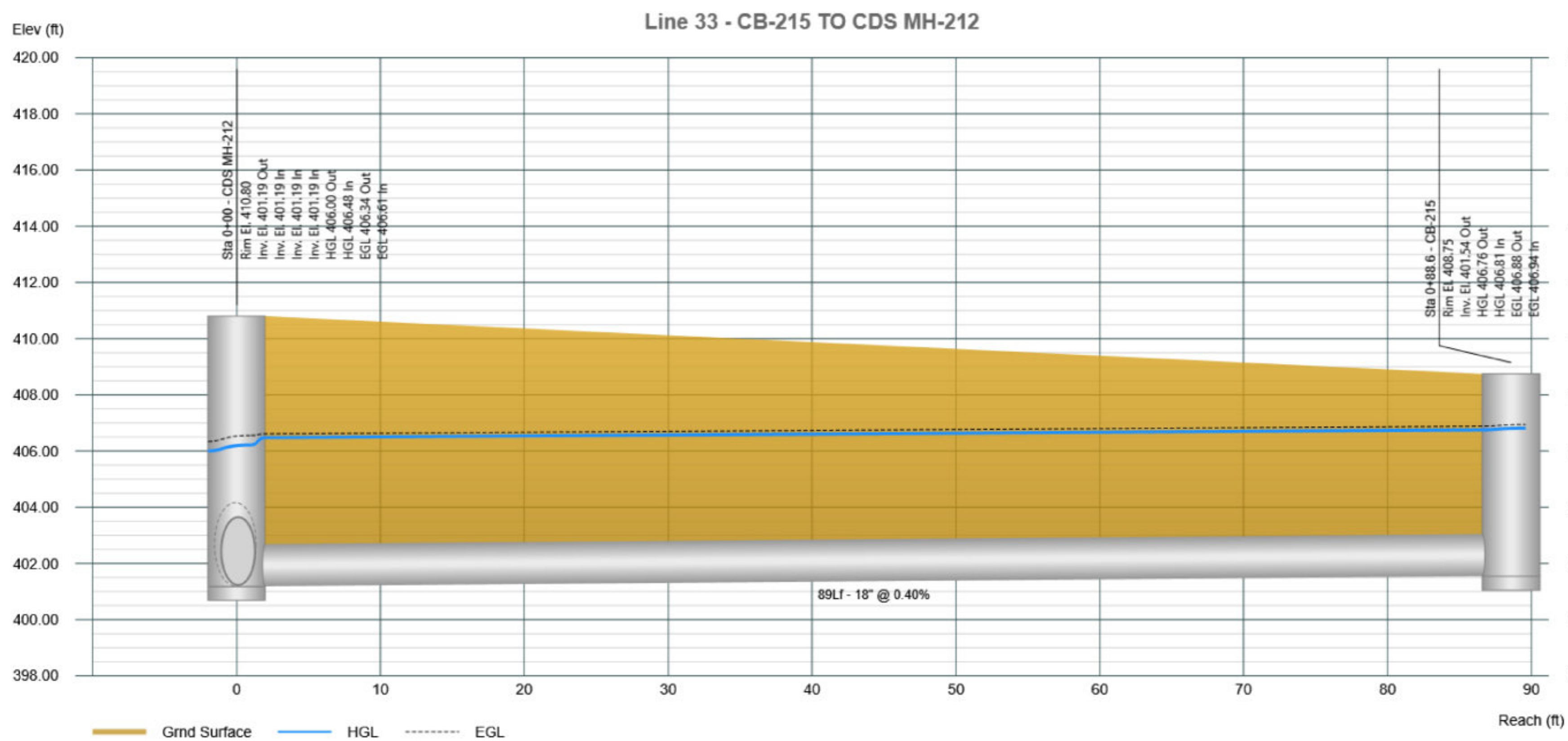
Project File: 2019-09-30 STM #200.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



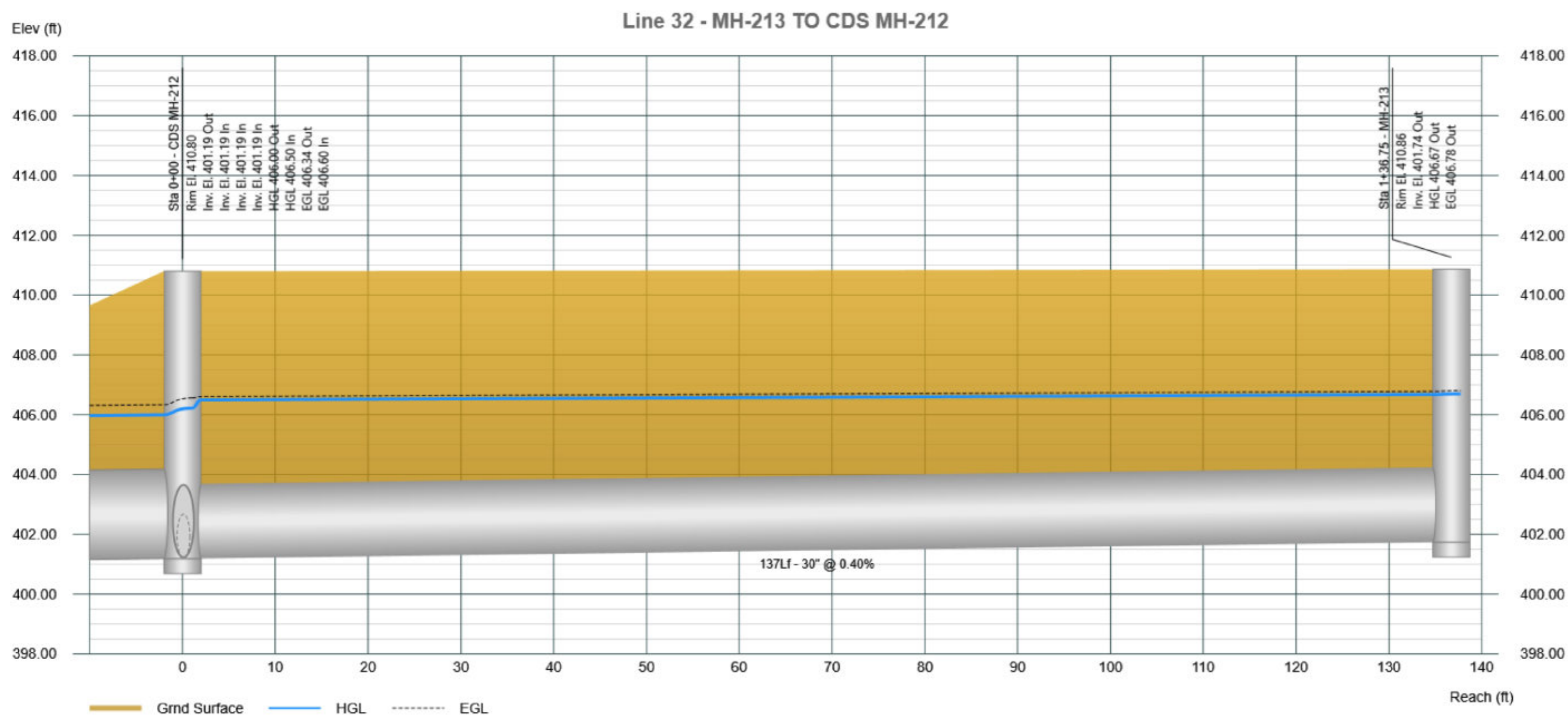
Project File: 2019-09-30 STM #200.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



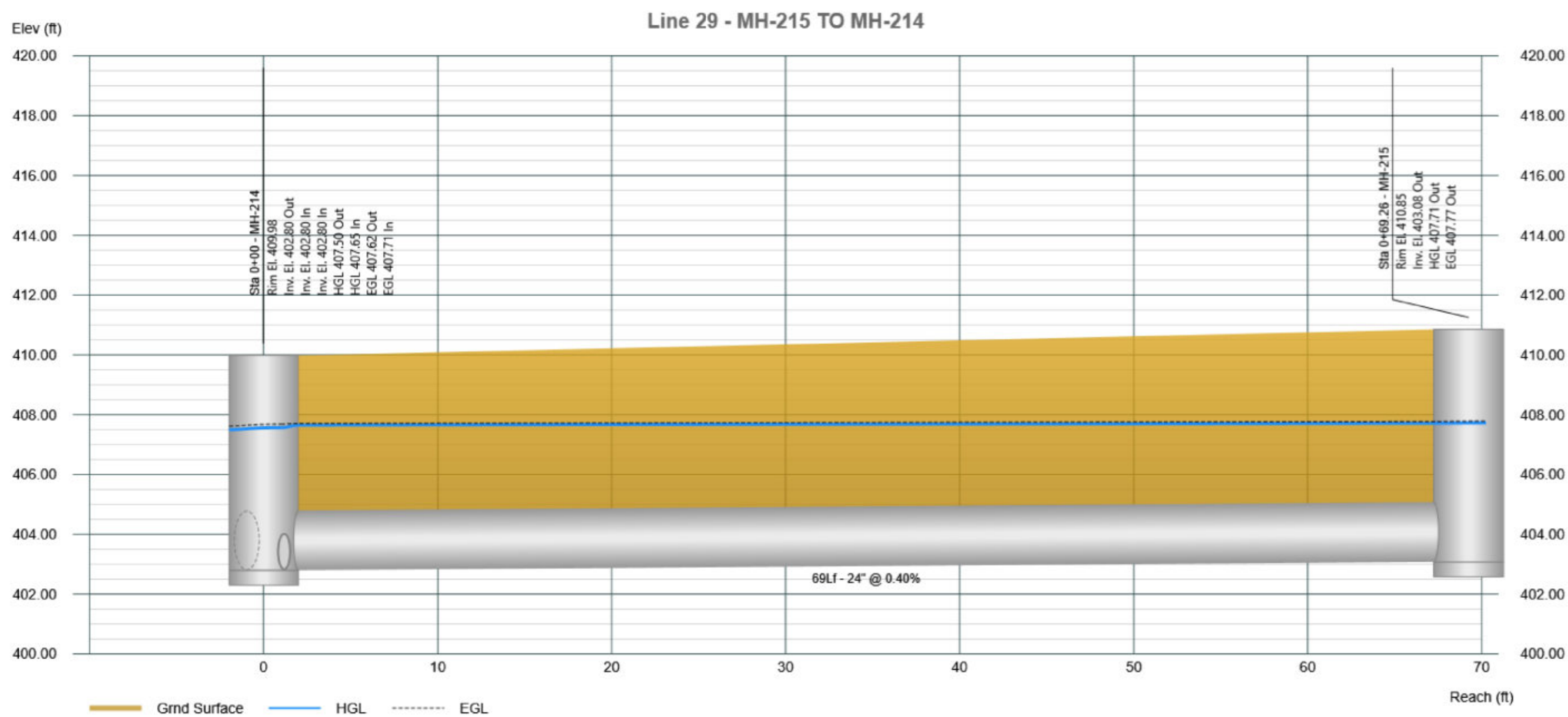
Project File: 2019-09-30 STM #200.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



Project File: 2019-09-30 STM #200.sws

Storm Sewer Tabulation

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
DIV. MH-201 TO HW-201	19.40	0.000	20.122	0.00	0.00	19.48	0.0	27.47	3.03	59.00	25.13	12.02	30	0.50	401.10	401.00	404.04	403.50	407.62	404.13	1
CDS MH-202 TO DIV. MH-201	110.10	0.000	20.122	0.00	0.00	19.48	0.0	27.44	3.03	59.04	78.72	4.70	48	0.40	401.14	401.10	406.13	406.11	410.40	407.62	2
MH-204 TO CDS MH-202	135.54	1.314	14.895	0.99	1.30	14.34	10.0	26.90	3.07	44.00	78.74	3.50	48	0.40	401.68	401.14	406.69	406.52	410.86	410.40	3
MH-205 TO MH-204	244.46	0.000	13.581	0.00	0.00	13.04	0.0	25.88	3.14	40.96	78.74	3.26	48	0.40	402.66	401.68	407.19	406.93	411.21	410.86	4
MH-206 TO MH-205	89.88	0.000	13.581	0.00	0.00	13.04	0.0	25.51	3.17	41.32	78.74	3.29	48	0.40	403.02	402.66	407.48	407.38	412.24	411.21	5
MH-207 TO MH-206	69.71	0.000	13.581	0.00	0.00	13.04	0.0	25.23	3.19	41.59	78.36	3.40	48	0.40	404.05	403.77	407.71	407.65	412.46	412.24	6
MH-208 TO MH-207	251.16	1.215	13.581	0.99	1.20	13.04	10.0	24.25	3.27	42.59	78.74	3.79	48	0.40	405.05	404.05	408.11	407.89	413.32	412.46	7
CB-205 TO MH-208	237.54	1.692	12.366	0.93	1.57	11.84	10.0	23.04	3.37	39.87	97.17	2.87	38x60r	0.40	406.00	405.05	408.48	408.37	412.50	413.32	8
MH-209 TO CB-205	62.33	0.000	10.590	0.00	0.00	10.18	0.0	22.67	3.40	34.63	97.17	2.81	38x60r	0.40	406.25	406.00	408.60	408.59	414.30	412.50	9
MH-210 TO MH-209	268.40	1.453	6.984	0.99	1.44	6.80	10.0	14.11	4.46	30.37	78.74	5.18	48	0.40	407.47	406.40	409.14	408.62	414.87	414.30	10
CB-212 TO MH-210	265.35	1.814	5.530	0.97	1.76	5.36	10.0	12.52	4.76	25.55	55.15	4.55	42	0.40	408.53	407.47	410.25	409.85	413.40	414.87	11
CB-213 TO CB-212	126.50	1.848	3.717	0.97	1.79	3.61	10.0	11.49	4.99	17.97	46.23	2.40	29x45r	0.40	409.04	408.53	410.83	410.79	413.35	413.40	12
CB-214 TO CB-213	135.00	1.868	1.868	0.97	1.81	1.81	10.0	10.02	5.35	9.70	28.63	1.91	24x38r	0.40	409.58	409.04	410.97	410.93	413.35	413.35	13
CB-207 TO MH-209	162.94	1.179	3.606	0.95	1.12	3.38	10.0	21.05	3.55	12.01	55.15	1.92	42	0.40	406.90	406.25	408.82	408.79	412.35	414.30	14
CB-208 TO CB-207	144.00	0.967	2.378	0.93	0.90	2.21	10.0	19.50	3.72	8.22	36.56	2.04	36	0.40	407.48	406.90	408.93	408.89	412.40	412.35	15
CB-209 TO CB-208	115.00	0.677	1.411	0.94	0.64	1.31	10.0	18.10	3.88	5.10	22.48	1.98	30	0.40	407.94	407.48	409.07	409.03	412.50	412.40	16
CB-210 TO CB-209	94.24	0.686	0.734	0.92	0.63	0.68	10.0	17.31	3.98	2.69	5.76	2.05	18	0.40	408.32	407.94	409.24	409.16	412.80	412.50	17
CB-211 TO CB-210	86.94	0.047	0.047	0.96	0.05	0.05	10.0	10.02	5.35	0.24	3.54	0.27	15	0.40	408.67	408.32	409.40	409.40	416.63	412.80	18
CB-206 TO CB-207	113.17	0.049	0.049	0.96	0.05	0.05	10.0	10.02	5.35	0.25	3.59	0.20	15	0.41	407.36	406.90	408.92	408.92	415.00	412.35	19
CB-204 TO CB-205	68.02	0.084	0.084	0.97	0.08	0.08	10.0	10.02	5.35	0.44	12.40	0.14	24	0.40	406.27	406.00	408.65	408.65	413.86	412.50	20
CB-202 TO CDS MH-202	59.30	0.802	4.116	0.98	0.79	4.06	10.0	11.70	4.94	20.05	29.67	2.84	36	0.26	402.28	402.12	406.64	406.56	408.75	410.40	21
CB-201 TO CB-202	180.00	0.820	3.314	0.98	0.80	3.27	10.0	10.82	5.14	16.83	22.48	3.43	30	0.40	403.00	402.28	407.08	406.68	408.75	408.75	22

Notes: IDF File = Project Eagle-2.idf, Return Period = 25-yrs. r = rectangular e = elliptical

Project File: 2019-09-30 STM #200.sws

Storm Sewer Tabulation

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
MH-203 TO CB-201	130.00	2.495	2.495	0.99	2.47	2.47	10.0	10.02	5.35	13.22	17.36	2.69	30	0.24	403.31	403.00	407.42	407.24	410.82	408.75	23
DIV. MH-211 TO HW-202	20.72	0.000	7.580	0.00	0.00	7.19	0.0	13.52	4.57	32.87	5.76	18.60	18	0.40	401.08	401.00	405.21	402.50	407.02	403.29	24
CDS MH-212 TO DIV. MH-211	26.41	0.000	7.580	0.00	0.00	7.19	0.0	13.43	4.59	32.99	36.56	4.67	36	0.40	401.19	401.08	414.69	414.61	410.80	407.02	25
CB-216 TO CDS MH-212	91.60	0.868	4.174	0.95	0.82	3.84	10.0	13.01	4.67	17.92	22.48	3.65	30	0.40	401.56	401.19	415.36	415.13	408.75	410.80	26
CB-217 TO CB-216	180.00	1.402	3.305	0.93	1.30	3.02	10.0	12.02	4.87	14.68	22.48	2.99	30	0.40	402.28	401.56	415.81	415.50	408.30	408.75	27
MH-214 TO CB-217	129.72	0.000	1.903	0.00	0.00	1.71	0.0	11.24	5.04	8.63	12.40	2.75	24	0.40	402.80	402.28	416.13	415.88	409.98	408.30	28
MH-215 TO MH-214	69.26	1.152	1.152	0.99	1.14	1.14	10.0	10.02	5.35	6.10	12.40	1.94	24	0.40	403.08	402.80	416.34	416.28	410.85	409.98	29
CB-218 TO MH-214	182.36	0.751	0.751	0.76	0.57	0.57	10.0	10.02	5.35	3.05	3.54	2.49	15	0.40	403.53	402.80	416.80	416.25	409.00	409.98	30
CB-203 TO CDS MH-202	142.55	1.111	1.111	0.97	1.08	1.08	10.0	10.02	5.35	5.77	12.40	1.84	24	0.40	402.69	402.12	406.73	406.61	409.00	410.40	31
MH-213 TO CDS MH-212	136.75	2.432	2.432	0.99	2.41	2.41	10.0	10.02	5.35	12.89	22.48	2.63	30	0.40	401.74	401.19	415.37	415.19	410.86	410.80	32
CB-215 TO CDS MH-212	88.60	0.974	0.974	0.97	0.94	0.94	10.0	10.02	5.35	5.06	5.76	2.86	18	0.40	401.54	401.19	415.45	415.18	408.75	410.80	33

Notes: IDF File = Project Eagle-2.idf, Return Period = 25-yrs.

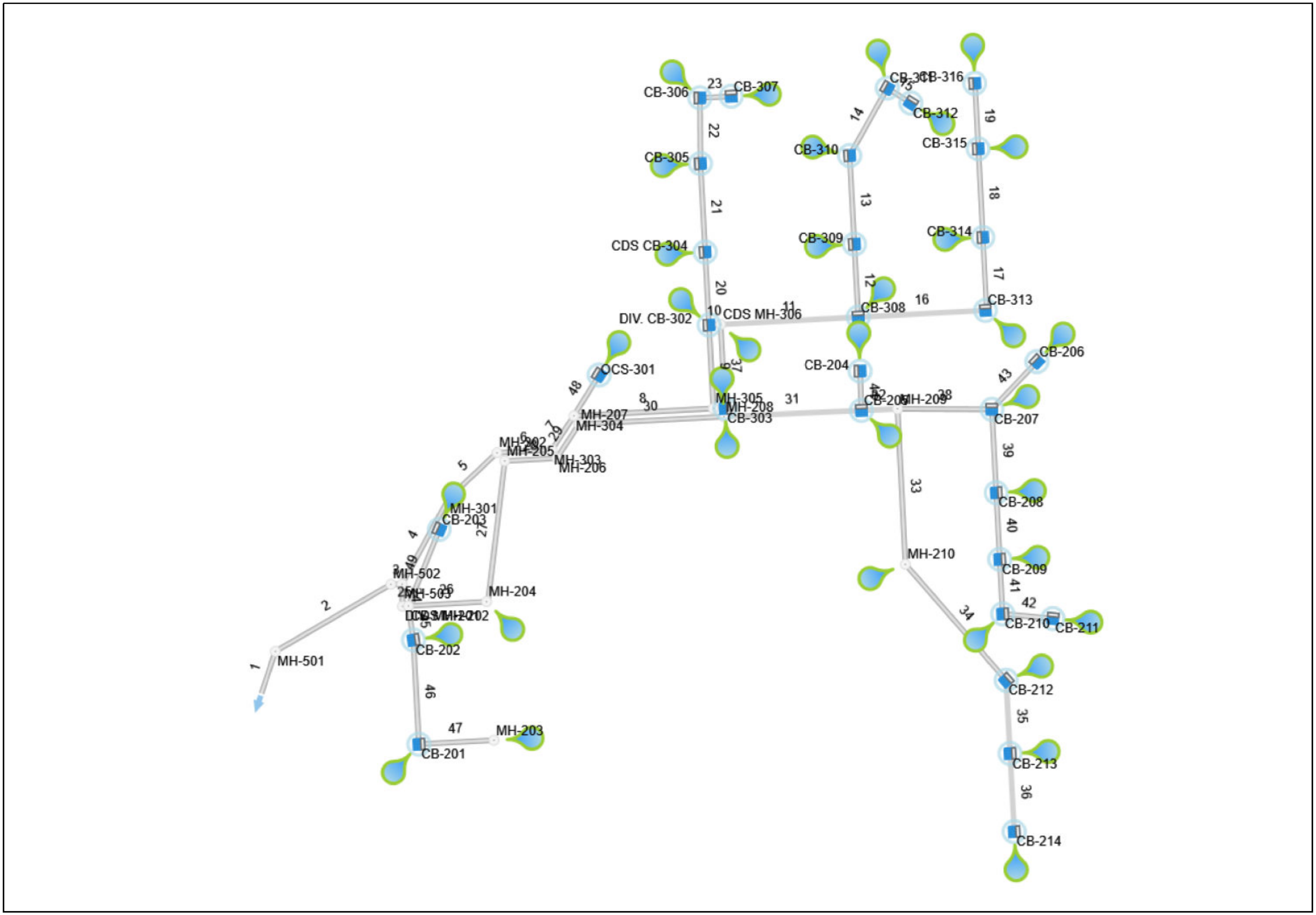
Project File: 2019-09-30 STM #200.sws

Plan View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

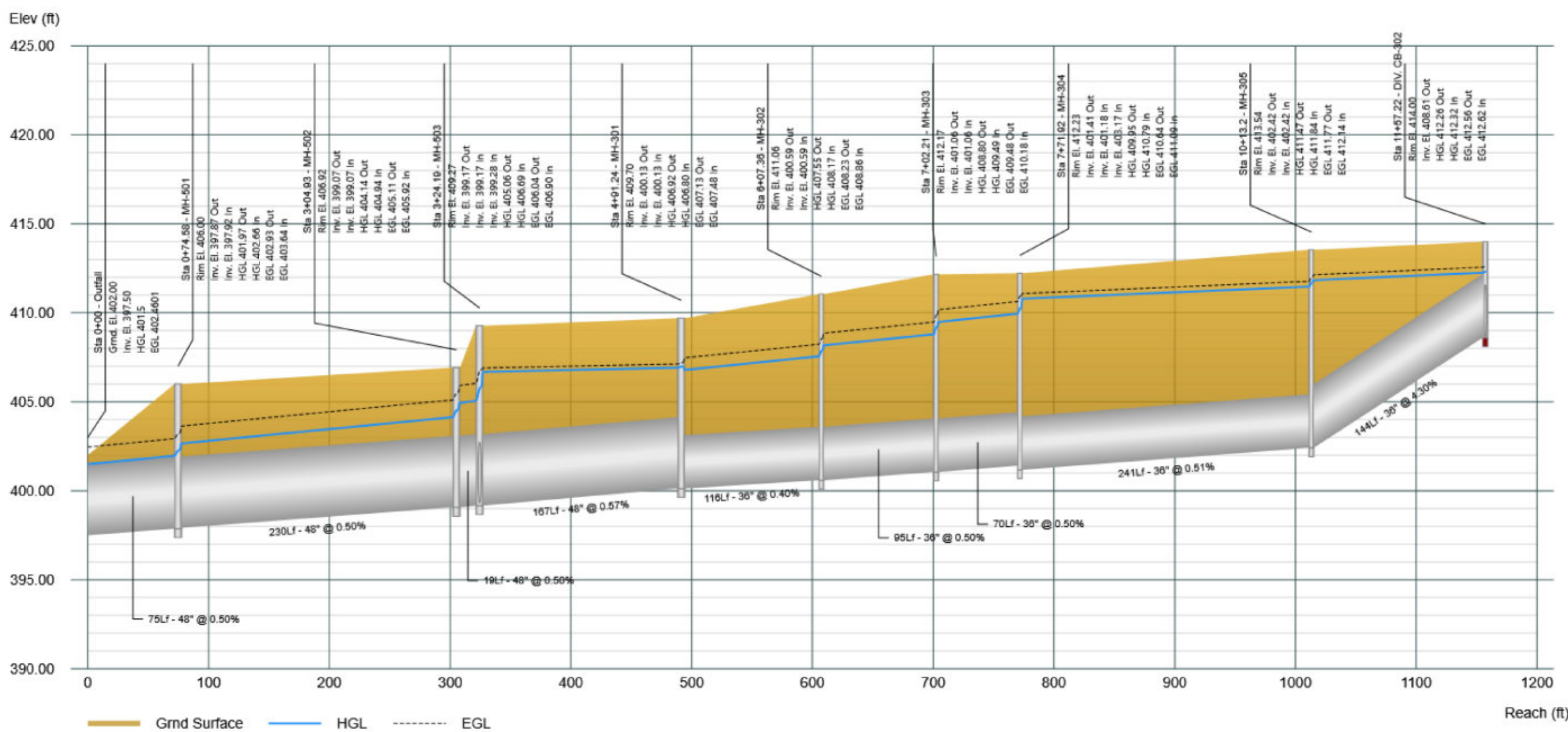
09-30-2019



Project File: 2019-09-30 STM #300.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

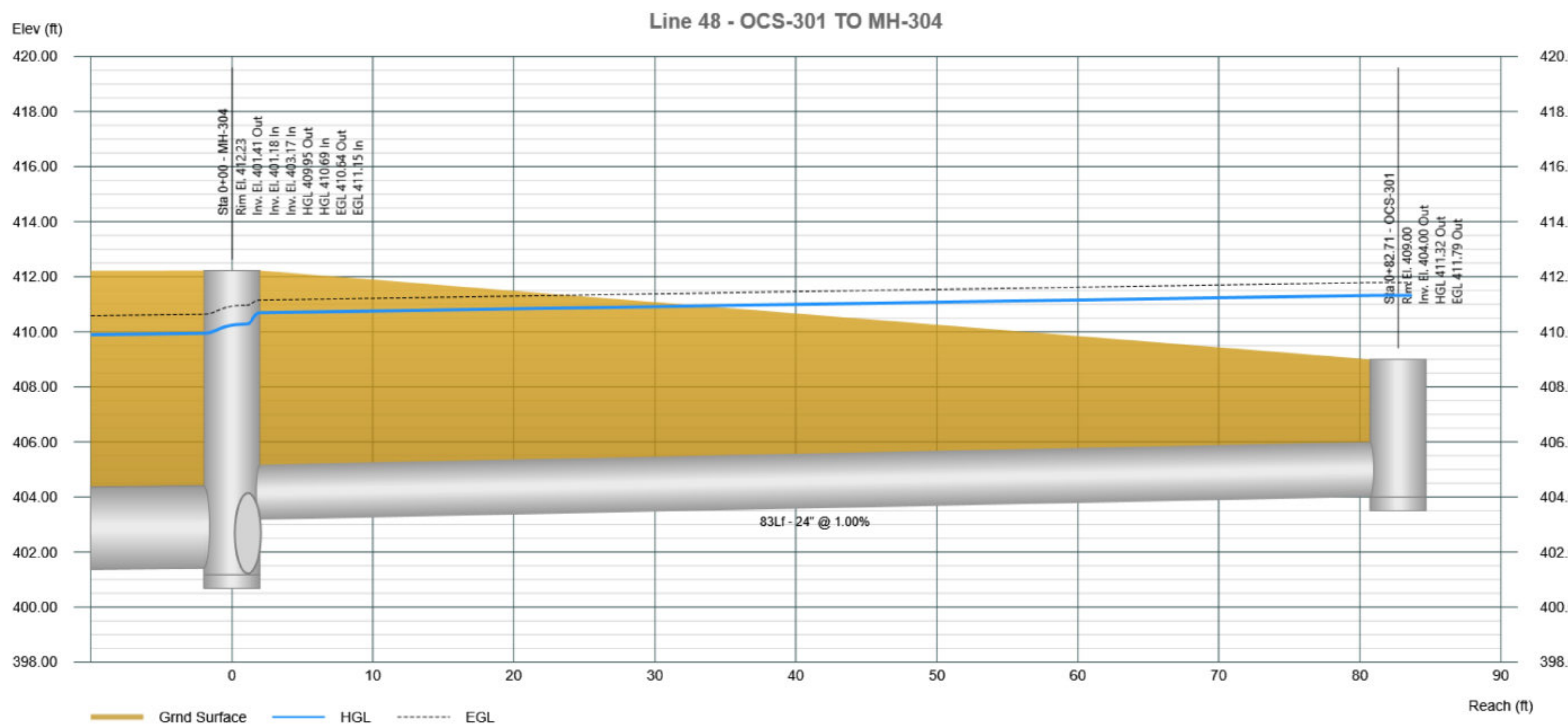


Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



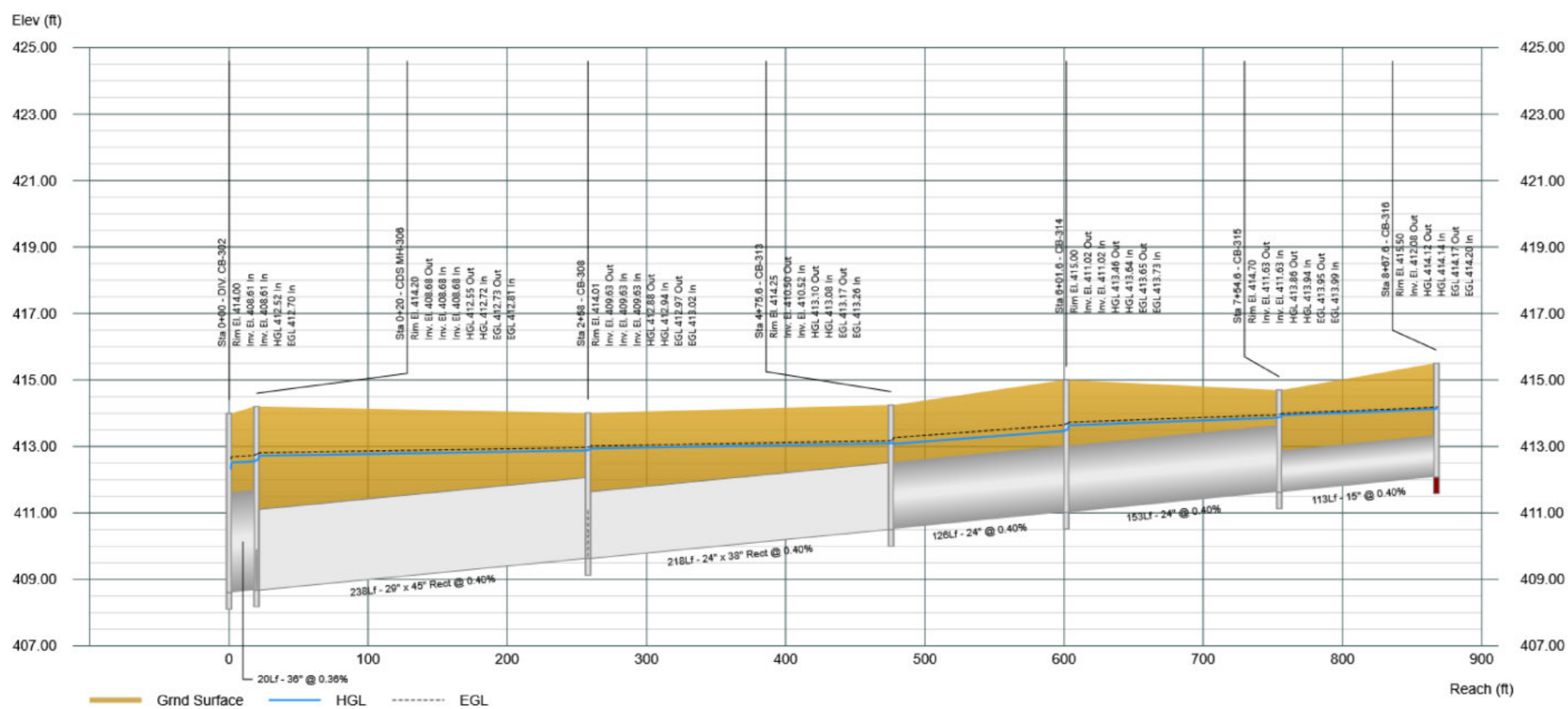
Project File: 2019-09-30 STM #300.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



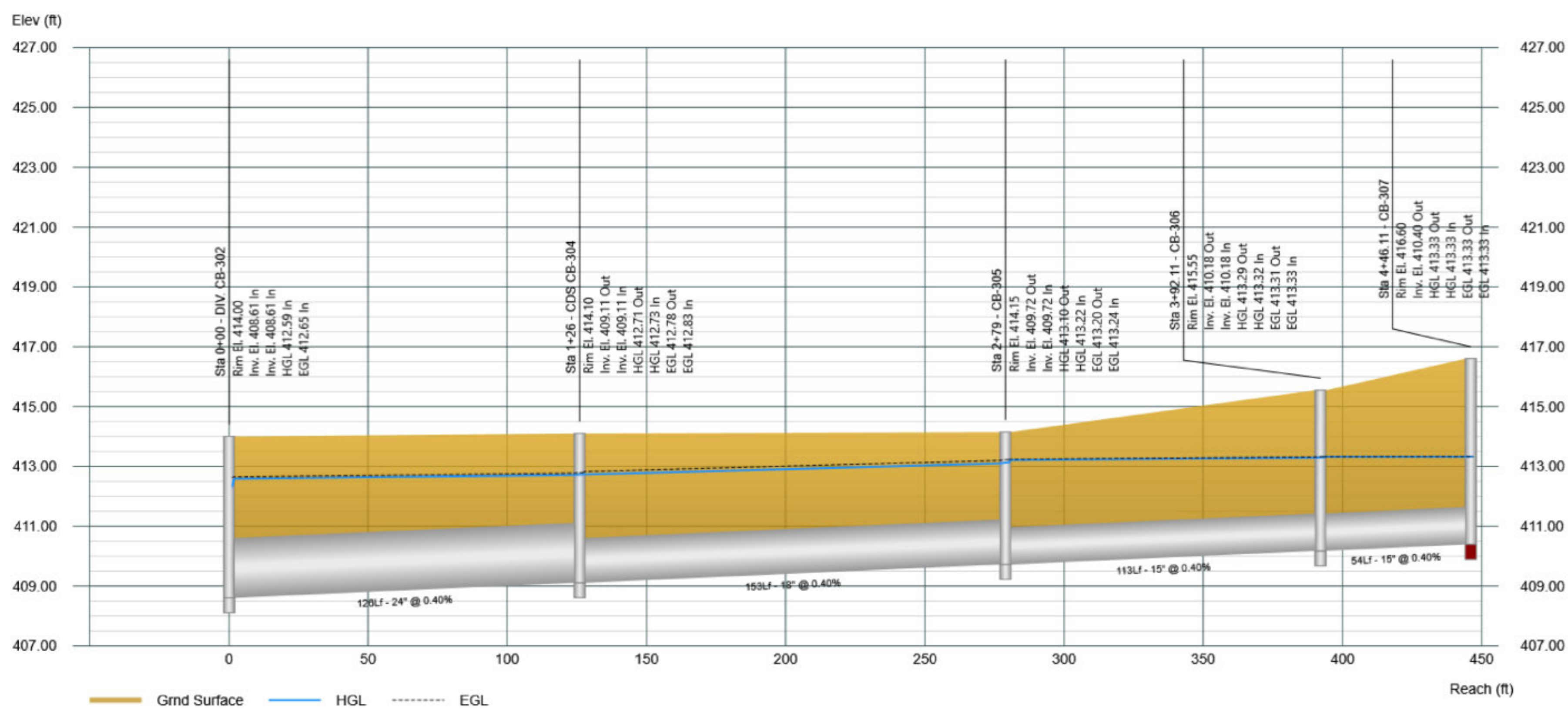
Project File: 2019-09-30 STM #300.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



Project File: 2019-09-30 STM #300.sws

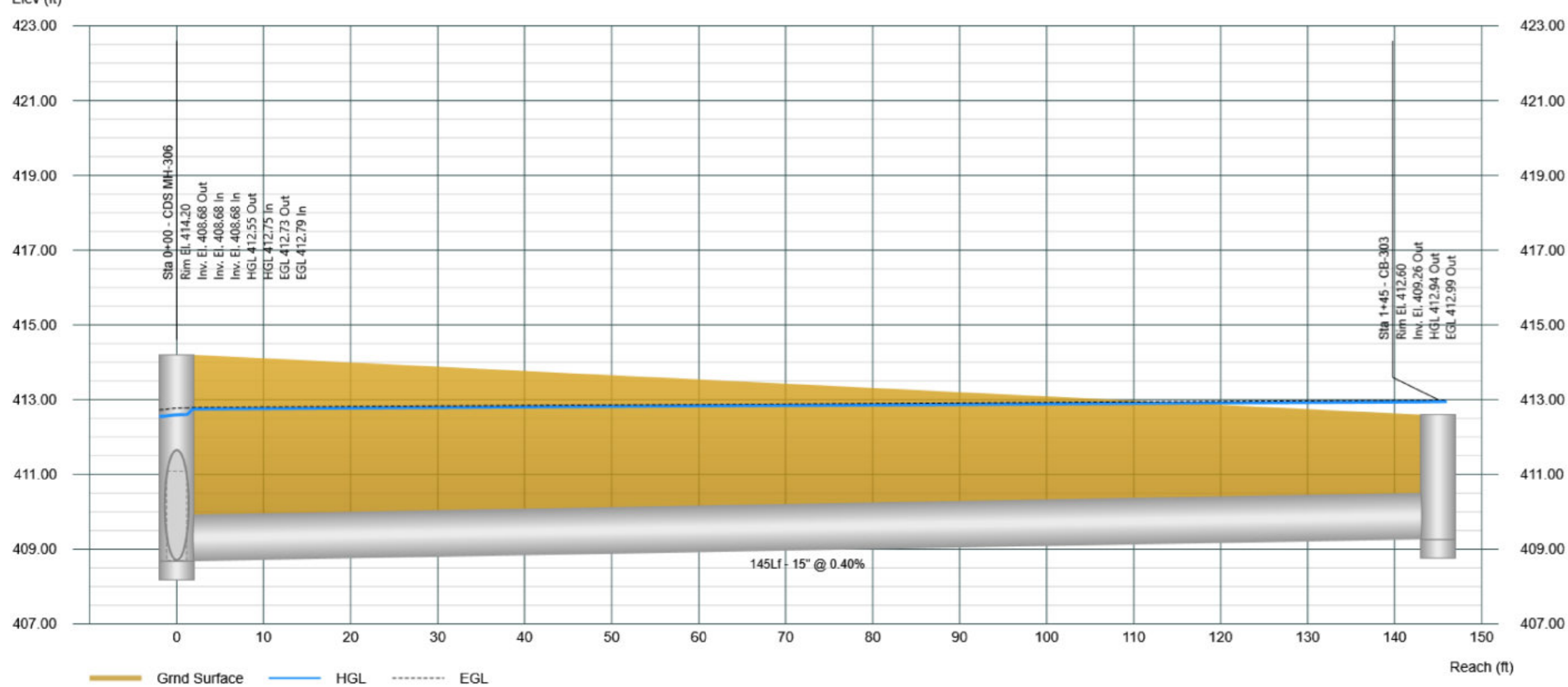
Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

Line 37 - CB-303 TO CDS MH-306

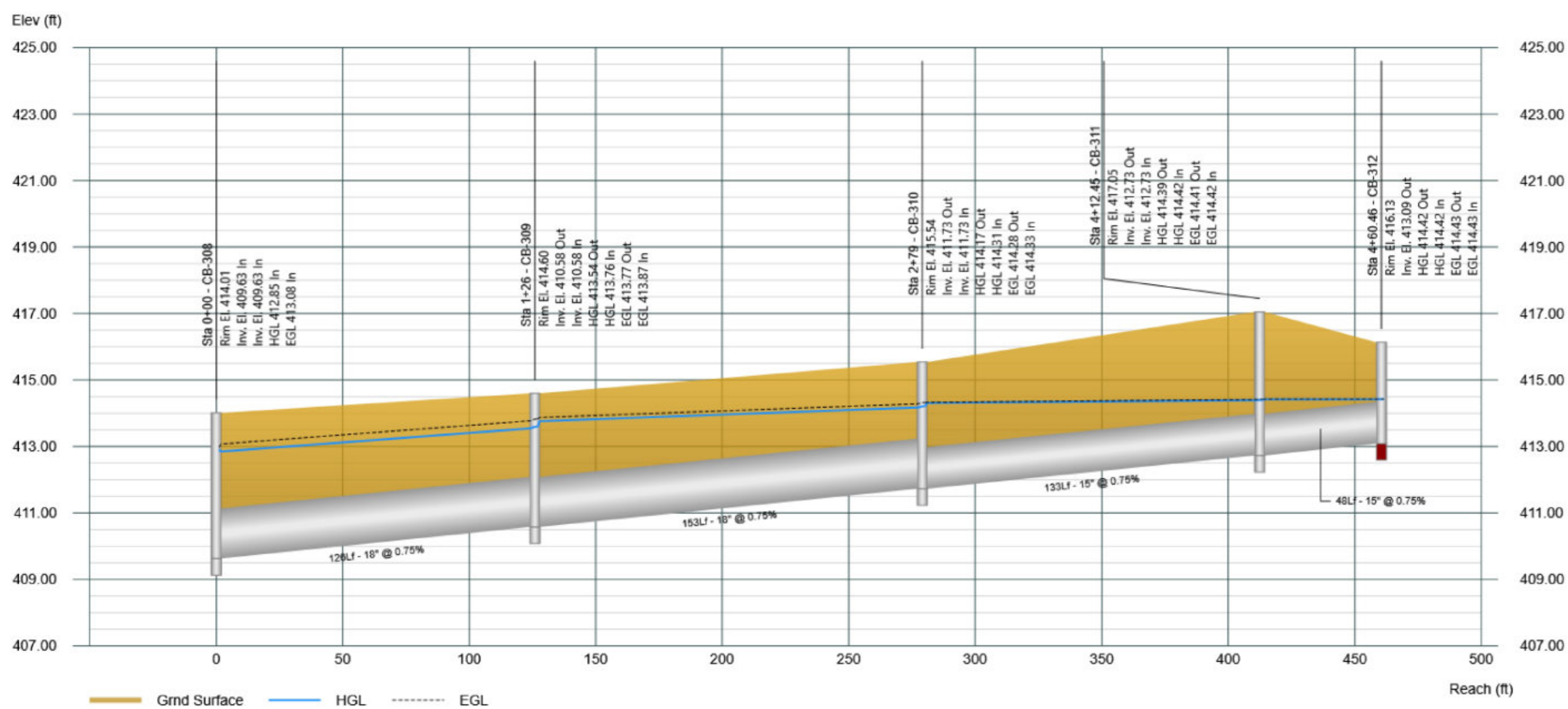


Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



Project File: 2019-09-30 STM #300.sws

Storm Sewer Tabulation

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
MH-501 TO HW-502	74.58	0.000	28.276	0.00	0.00	27.25	0.0	28.01	2.99	98.74	88.03	7.86	48	0.50	397.87	397.50	401.97	401.50	406.00	402.00	1
MH-502 TO MH-501	230.35	0.000	28.276	0.00	0.00	27.25	0.0	27.59	3.02	99.49	88.03	7.92	48	0.50	399.07	397.92	404.14	402.66	406.92	406.00	2
MH-503 TO MH-502	19.26	0.000	28.276	0.00	0.00	27.25	0.0	27.56	3.02	99.56	88.02	7.92	48	0.50	399.17	399.07	405.06	404.94	409.27	406.92	3
MH-301 TO MH-503	167.05	0.000	8.154	0.00	0.00	7.77	0.0	19.04	3.77	46.45	94.29	3.70	48	0.57	400.13	399.17	406.92	406.69	409.70	409.27	4
MH-302 TO MH-301	116.13	0.000	8.154	0.00	0.00	7.77	0.0	18.75	3.80	46.71	36.56	6.61	36	0.40	400.59	400.13	407.55	406.80	411.06	409.70	5
MH-303 TO MH-302	94.84	0.000	8.154	0.00	0.00	7.77	0.0	18.52	3.83	46.93	40.87	6.64	36	0.50	401.06	400.59	408.80	408.17	412.17	411.06	6
MH-304 TO MH-303	69.71	0.000	8.154	0.00	0.00	7.77	0.0	18.35	3.85	47.08	40.87	6.66	36	0.50	401.41	401.06	409.95	409.49	412.23	412.17	7
MH-305 TO MH-304	241.28	0.000	8.154	0.00	0.00	7.77	0.0	17.48	3.96	30.76	41.38	4.35	36	0.51	402.42	401.18	411.47	410.79	413.54	412.23	8
DIV. CB-302 TO MH-305	144.02	0.435	8.154	0.98	0.43	7.77	10.0	16.98	4.02	31.28	119.83	4.42	36	4.30	408.61	402.42	412.26	411.84	414.00	413.54	9
CDS MH-306 TO DIV. CB-302	220.00	0.509	6.243	0.98	0.50	5.92	10.0	16.89	4.04	23.91	34.68	3.38	36	0.36	408.68	408.61	412.55	412.52	414.20	414.00	10
CB-308 TO CDS MH-306	238.00	0.509	5.332	0.99	0.50	5.04	10.0	15.33	4.26	21.49	53.34	2.37	29x45r	0.40	409.63	408.68	412.88	412.72	414.01	414.20	11
CB-309 TO CB-308	126.00	0.513	1.654	0.99	0.51	1.56	10.0	14.85	4.34	6.77	7.90	3.83	18	0.75	410.58	409.63	413.54	412.85	414.60	414.01	12
CB-310 TO CB-309	153.00	0.811	1.141	0.94	0.76	1.05	10.0	14.01	4.48	4.71	7.89	2.67	18	0.75	411.73	410.58	414.17	413.76	415.54	414.60	13
CB-311 TO CB-310	133.45	0.237	0.331	0.87	0.21	0.29	10.0	12.22	4.83	1.40	4.84	1.14	15	0.75	412.73	411.73	414.39	414.31	417.05	415.54	14
CB-312 TO CB-311	48.01	0.094	0.094	0.89	0.08	0.08	10.0	10.02	5.35	0.45	4.85	0.36	15	0.75	413.09	412.73	414.42	414.42	416.13	417.05	15
CB-313 TO CB-308	217.60	0.783	3.168	0.96	0.75	2.98	10.0	12.70	4.73	14.08	33.03	2.22	24x38r	0.40	410.50	409.63	413.10	412.94	414.25	414.01	16
CB-314 TO CB-313	126.00	0.780	2.385	0.97	0.76	2.23	10.0	12.10	4.85	10.80	12.40	3.44	24	0.40	411.02	410.52	413.46	413.08	415.00	414.25	17
CB-315 TO CB-314	153.00	1.108	1.605	0.95	1.05	1.47	10.0	11.05	5.09	7.48	12.40	2.38	24	0.40	411.63	411.02	413.86	413.64	414.70	415.00	18
CB-316 TO CB-315	113.00	0.497	0.497	0.84	0.42	0.42	10.0	10.02	5.35	2.23	3.54	1.82	15	0.40	412.08	411.63	414.12	413.94	415.50	414.70	19
CDS CB-304 TO DIV. CB-302	126.00	0.439	1.476	0.99	0.43	1.42	10.0	14.68	4.37	6.21	12.40	1.98	24	0.40	409.11	408.61	412.71	412.59	414.10	414.00	20
CB-305 TO CDS CB-304	153.00	0.721	1.038	0.95	0.68	0.99	10.0	13.79	4.52	4.47	5.76	2.53	18	0.40	409.72	409.11	413.10	412.73	414.15	414.10	21
CB-306 TO CB-305	113.11	0.219	0.317	0.98	0.21	0.30	10.0	12.34	4.80	1.46	3.54	1.19	15	0.40	410.18	409.72	413.29	413.22	415.55	414.15	22

Notes: IDF File = Project Eagle-2.idf, Return Period = 25-yrs. r = rectangular e = elliptical

Project File: 2019-09-30 STM #300.sws

Storm Sewer Tabulation

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
CB-307 TO CB-306	54.00	0.098	0.098	0.91	0.09	0.09	10.0	10.02	5.35	0.48	3.54	0.39	15	0.40	410.40	410.18	413.33	413.32	416.60	415.55	23
DIV. MH-201 TO MH-503	38.31	0.000	20.122	0.00	0.00	19.48	0.0	27.47	3.03	59.00	190.03	6.13	42	4.75	401.10	399.28	406.64	406.46	407.62	409.27	24
CDS MH-202 TO DIV. MH-201	110.10	0.000	20.122	0.00	0.00	19.48	0.0	27.44	3.03	59.04	78.72	4.70	48	0.40	401.14	401.10	407.53	407.51	410.40	407.62	25
MH-204 TO CDS MH-202	135.54	1.314	14.895	0.99	1.30	14.34	10.0	26.90	3.07	44.00	78.74	3.50	48	0.40	401.68	401.14	408.10	407.93	410.86	410.40	26
MH-205 TO MH-204	244.44	0.000	13.581	0.00	0.00	13.04	0.0	25.88	3.14	40.96	78.74	3.26	48	0.40	402.66	401.68	408.59	408.33	411.21	410.86	27
MH-206 TO MH-205	89.88	0.000	13.581	0.00	0.00	13.04	0.0	25.51	3.17	41.32	78.74	3.29	48	0.40	403.02	402.66	408.89	408.79	412.24	411.21	28
MH-207 TO MH-206	69.71	0.000	13.581	0.00	0.00	13.04	0.0	25.23	3.19	41.59	78.36	3.31	48	0.40	404.05	403.77	409.13	409.05	412.46	412.24	29
MH-208 TO MH-207	251.16	1.215	13.581	0.99	1.20	13.04	10.0	24.25	3.27	42.59	78.74	3.39	48	0.40	405.05	404.05	409.59	409.30	413.32	412.46	30
CB-205 TO MH-208	237.54	1.692	12.366	0.93	1.57	11.84	10.0	23.04	3.37	39.87	97.17	2.52	38x60r	0.40	406.00	405.05	409.91	409.75	412.50	413.32	31
MH-209 TO CB-205	62.33	0.000	10.590	0.00	0.00	10.18	0.0	22.67	3.40	34.63	97.17	2.19	38x60r	0.40	406.25	406.00	410.02	409.99	414.30	412.50	32
MH-210 TO MH-209	268.40	1.453	6.984	0.99	1.44	6.80	10.0	14.11	4.46	30.37	78.74	2.91	48	0.40	407.47	406.40	410.21	410.09	414.87	414.30	33
CB-212 TO MH-210	265.35	1.814	5.530	0.97	1.76	5.36	10.0	12.52	4.76	25.55	55.15	3.65	42	0.40	408.53	407.47	410.60	410.37	413.40	414.87	34
CB-213 TO CB-212	126.50	1.848	3.717	0.97	1.79	3.61	10.0	11.49	4.99	17.97	46.23	2.25	29x45r	0.40	409.04	408.53	410.96	410.93	413.35	413.40	35
CB-214 TO CB-213	135.00	1.868	1.868	0.97	1.81	1.81	10.0	10.02	5.35	9.70	28.63	1.77	24x38r	0.40	409.58	409.04	411.10	411.06	413.35	413.35	36
CB-303 TO CDS MH-306	145.00	0.402	0.402	0.95	0.38	0.38	10.0	10.02	5.35	2.04	3.54	1.67	15	0.40	409.26	408.68	412.94	412.75	412.60	414.20	37
CB-207 TO MH-209	162.94	1.179	3.606	0.95	1.12	3.38	10.0	21.05	3.55	12.01	55.15	1.27	42	0.40	406.90	406.25	410.17	410.14	412.35	414.30	38
CB-208 TO CB-207	144.00	0.967	2.378	0.93	0.90	2.21	10.0	19.50	3.72	8.22	36.56	1.19	36	0.40	407.48	406.90	410.21	410.19	412.40	412.35	39
CB-209 TO CB-208	115.00	0.677	1.411	0.94	0.64	1.31	10.0	18.10	3.88	5.10	22.48	1.06	30	0.40	407.94	407.48	410.25	410.23	412.50	412.40	40
CB-210 TO CB-209	94.24	0.686	0.734	0.92	0.63	0.68	10.0	17.31	3.98	2.69	5.76	1.52	18	0.40	408.32	407.94	410.34	410.26	412.80	412.50	41
CB-211 TO CB-210	86.94	0.047	0.047	0.96	0.05	0.05	10.0	10.02	5.35	0.24	3.54	0.20	15	0.40	408.67	408.32	410.40	410.40	416.63	412.80	42
CB-206 TO CB-207	113.17	0.049	0.049	0.96	0.05	0.05	10.0	10.02	5.35	0.25	3.59	0.20	15	0.41	407.36	406.90	410.20	410.20	415.00	412.35	43
CB-204 TO CB-205	68.02	0.084	0.084	0.97	0.08	0.08	10.0	10.02	5.35	0.44	12.40	0.14	24	0.40	406.27	406.00	410.03	410.03	413.86	412.50	44

Notes: IDF File = Project Eagle-2.idf, Return Period = 25-yrs. r = rectangular e = elliptical

Project File: 2019-09-30 STM #300.sws

Storm Sewer Tabulation

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
CB-202 TO CDS MH-202	59.30	0.802	4.116	0.98	0.79	4.06	10.0	11.70	4.94	20.05	29.67	2.84	36	0.26	402.28	402.12	408.04	407.97	408.75	410.40	45
CB-201 TO CB-202	180.00	0.820	3.314	0.98	0.80	3.27	10.0	10.82	5.14	16.83	22.48	3.43	30	0.40	403.00	402.28	408.48	408.08	408.75	408.75	46
MH-203 TO CB-201	130.00	2.495	2.495	0.99	2.47	2.47	10.0	10.02	5.35	13.22	17.36	2.69	30	0.24	403.31	403.00	408.81	408.63	410.82	408.75	47
OCS-301 TO MH-304	82.71	0.000	0.000	0.00	0.00	0.00	0.0	0.00	5.36	17.17	19.60	5.47	24	1.00	404.00	403.17	411.32	410.69	409.00	412.23	48
CB-203 TO CDS MH-202	142.55	1.111	1.111	0.97	1.08	1.08	10.0	10.02	5.35	5.77	12.40	1.84	24	0.40	402.69	402.12	408.13	408.01	409.00	410.40	49

Notes: IDF File = Project Eagle-2.idf, Return Period = 25-yrs.

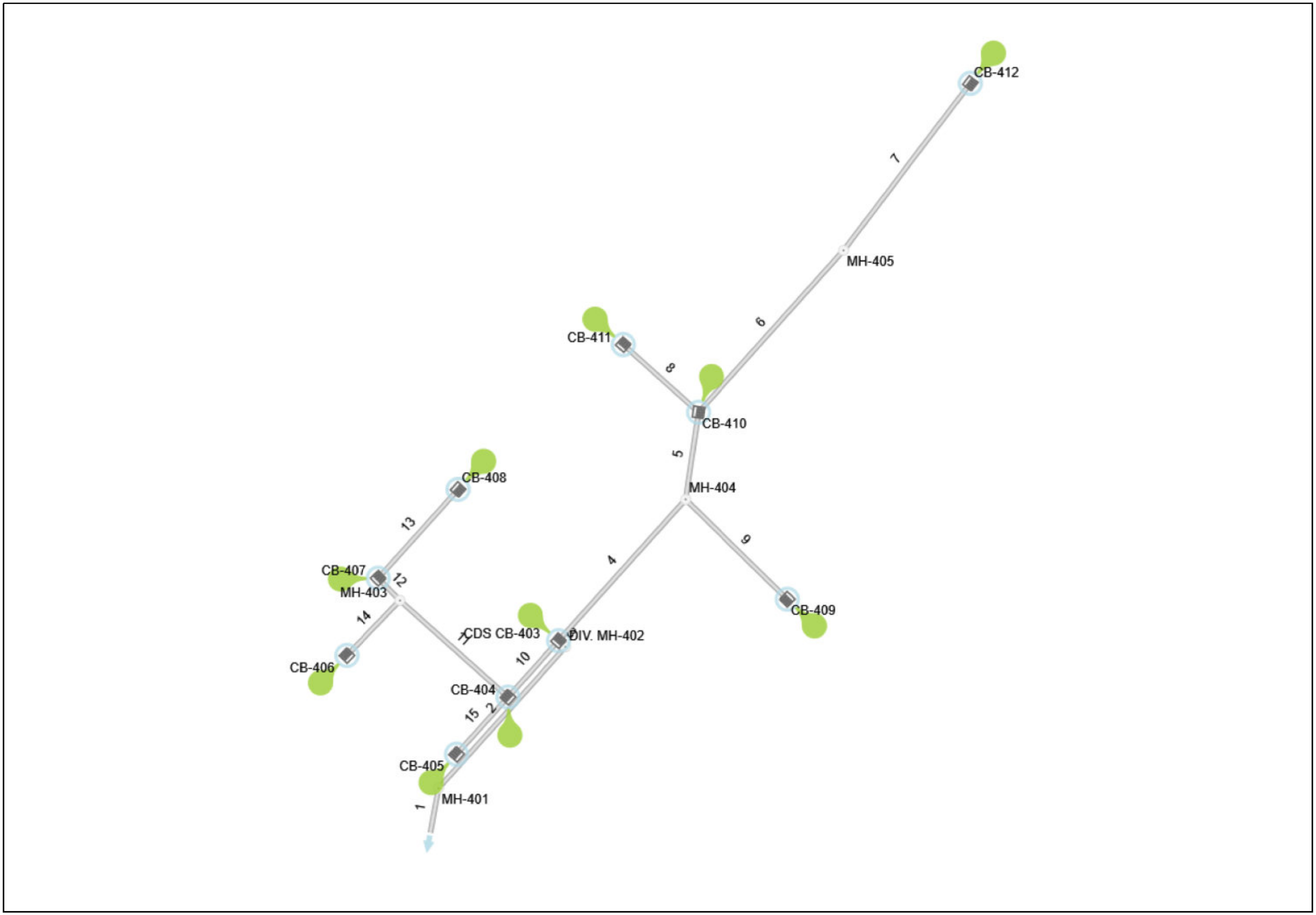
Project File: 2019-09-30 STM #300.sws

Plan View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

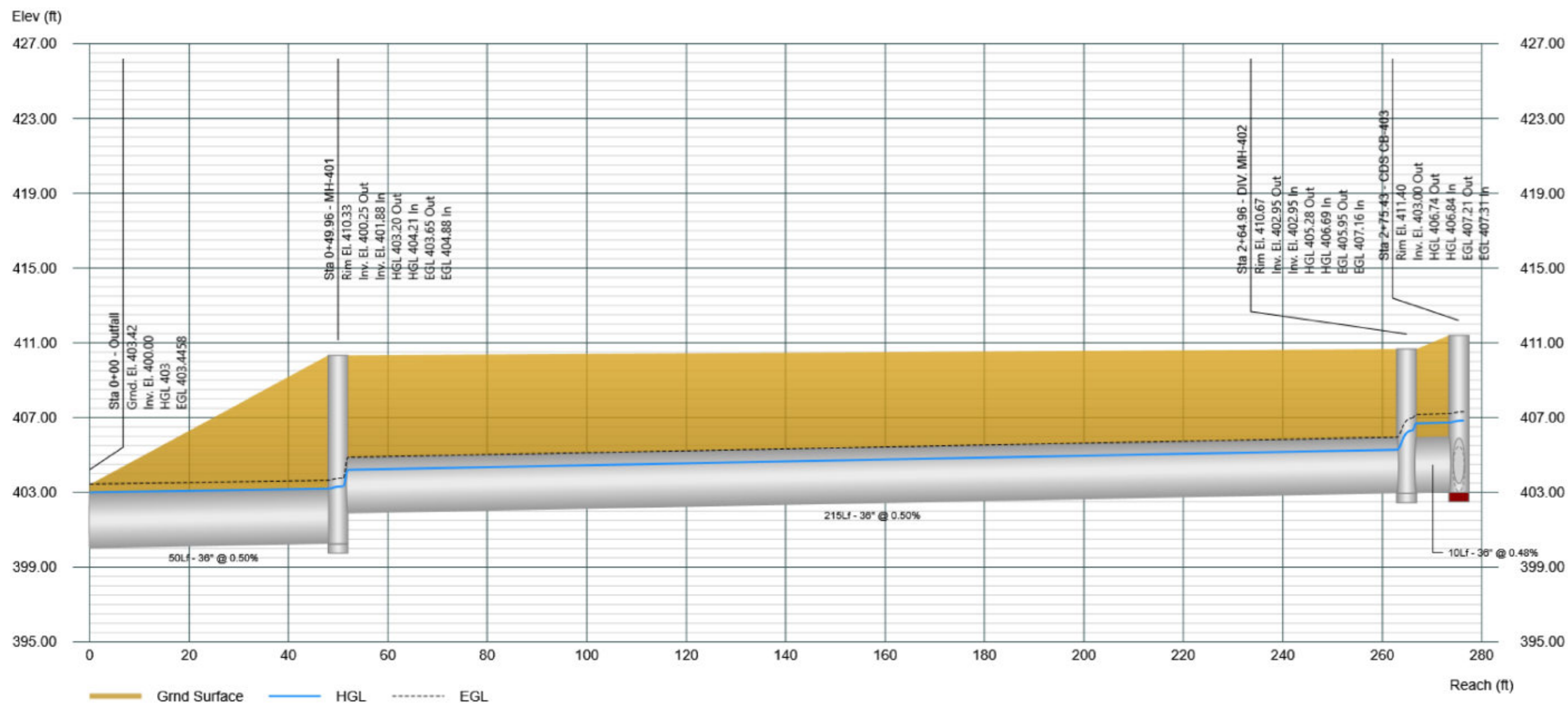


Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



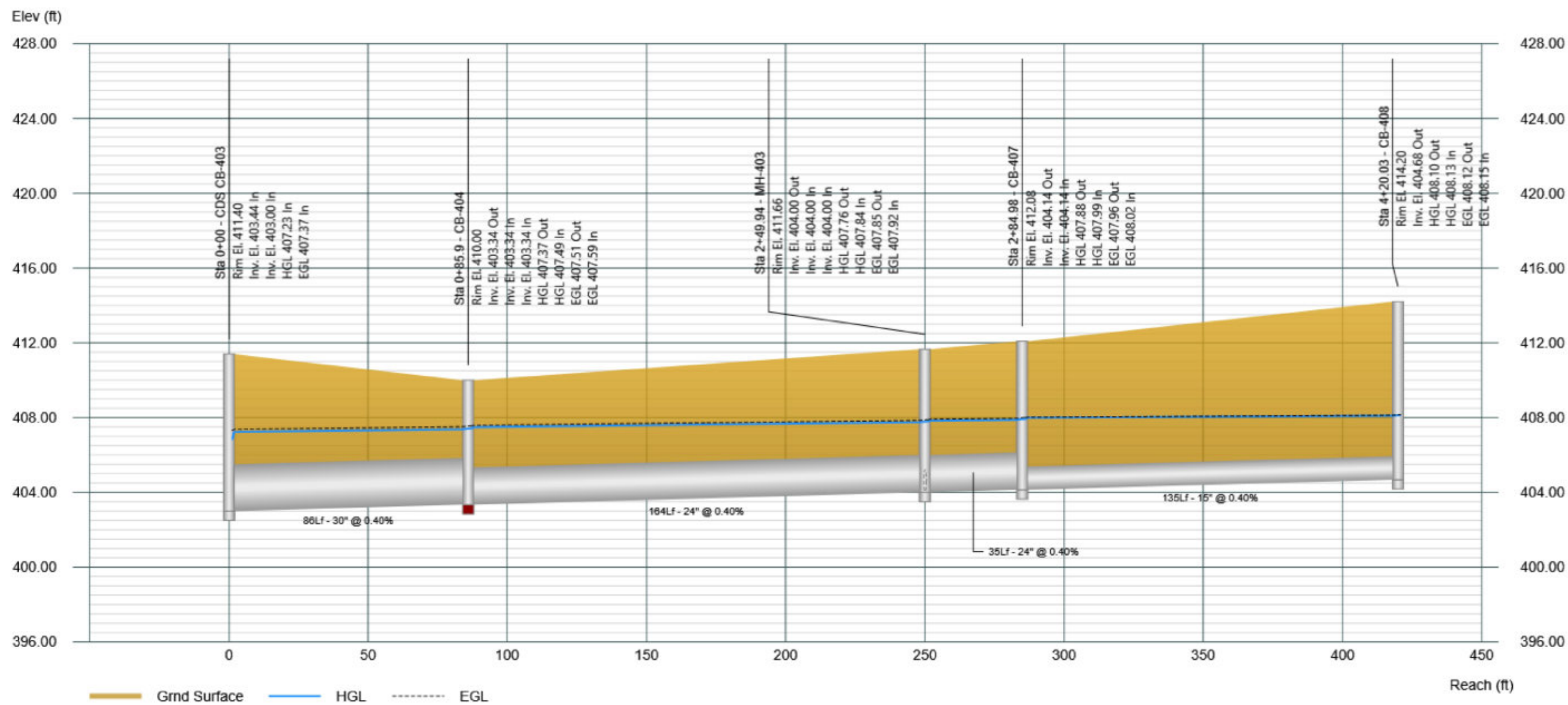
Project File: 2019-09-30 STM #400.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



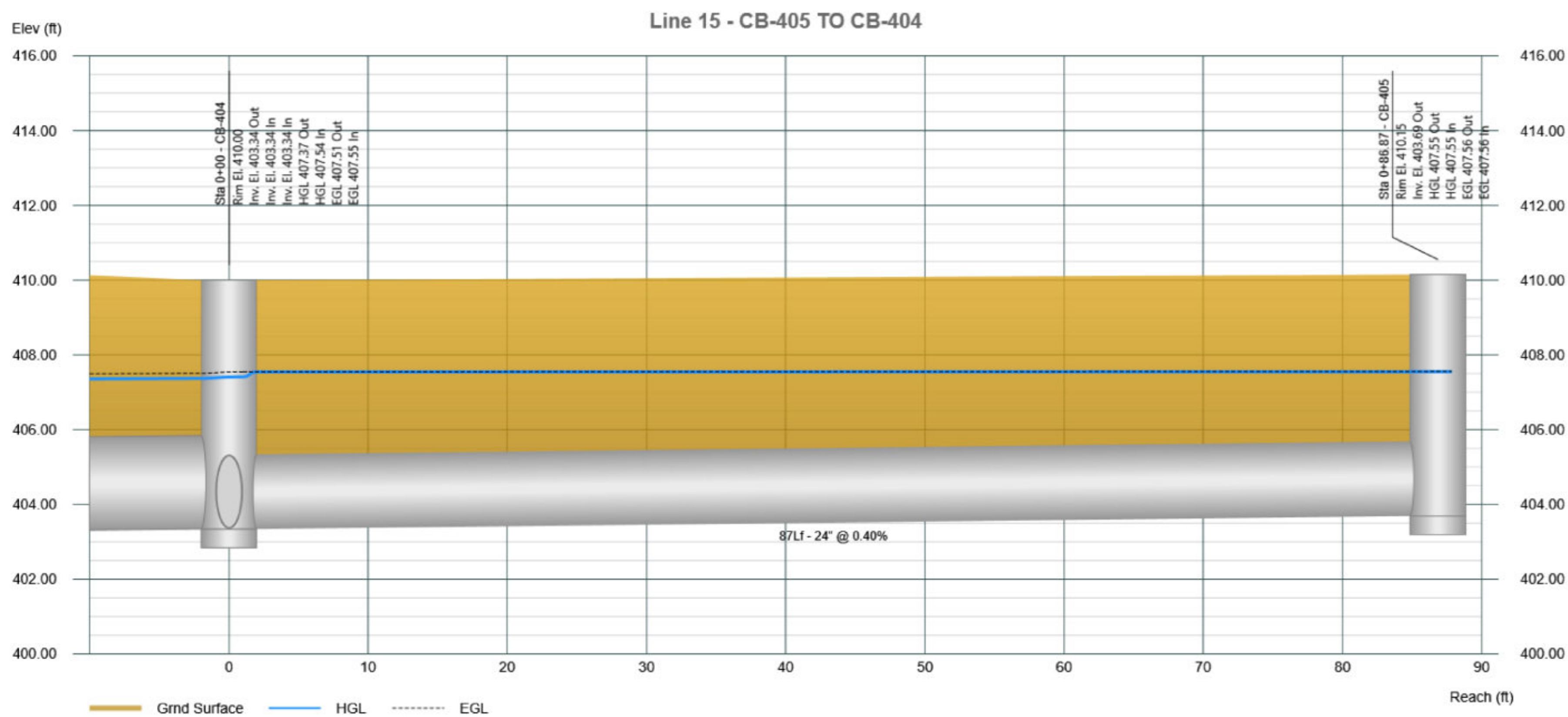
Project File: 2019-09-30 STM #400.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



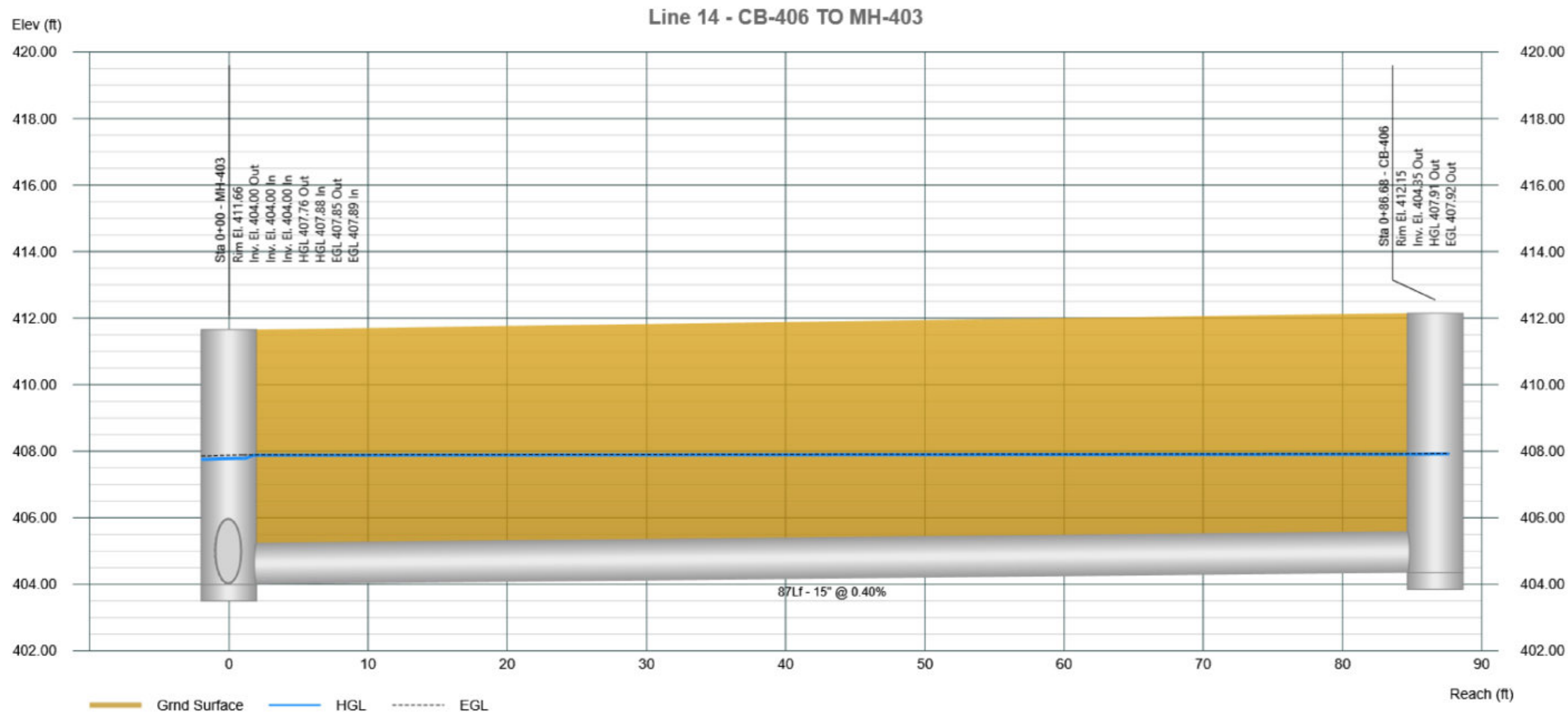
Project File: 2019-09-30 STM #400.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

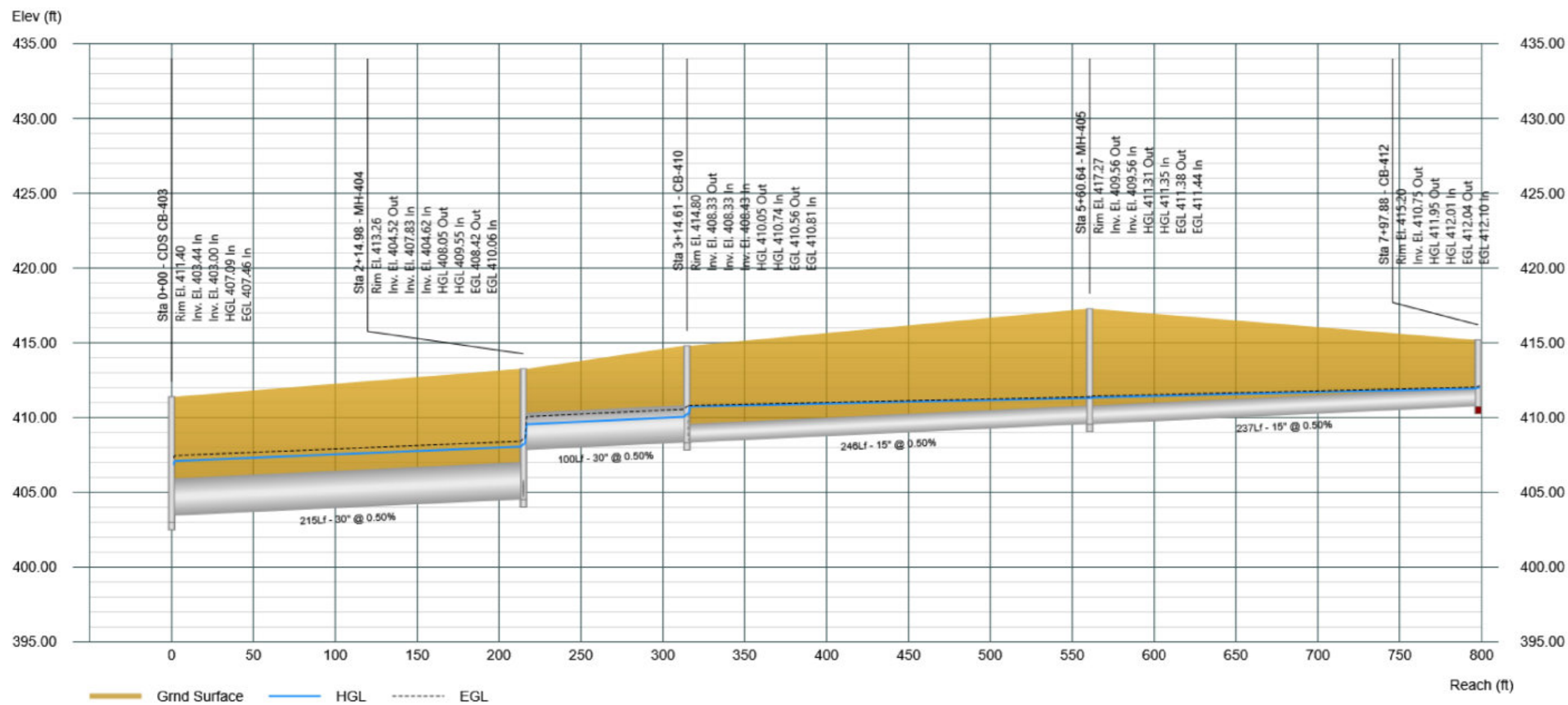


Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



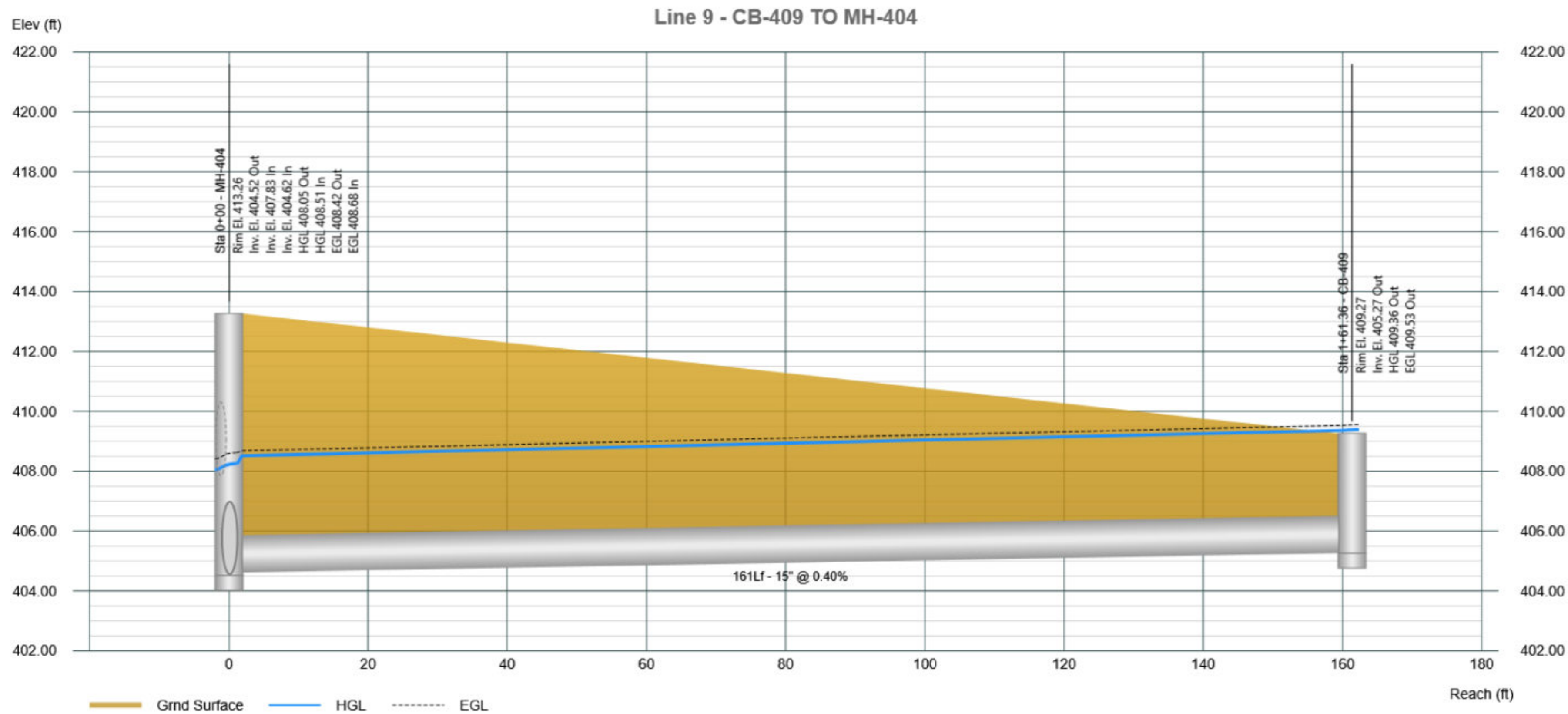
Project File: 2019-09-30 STM #400.sws

Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019

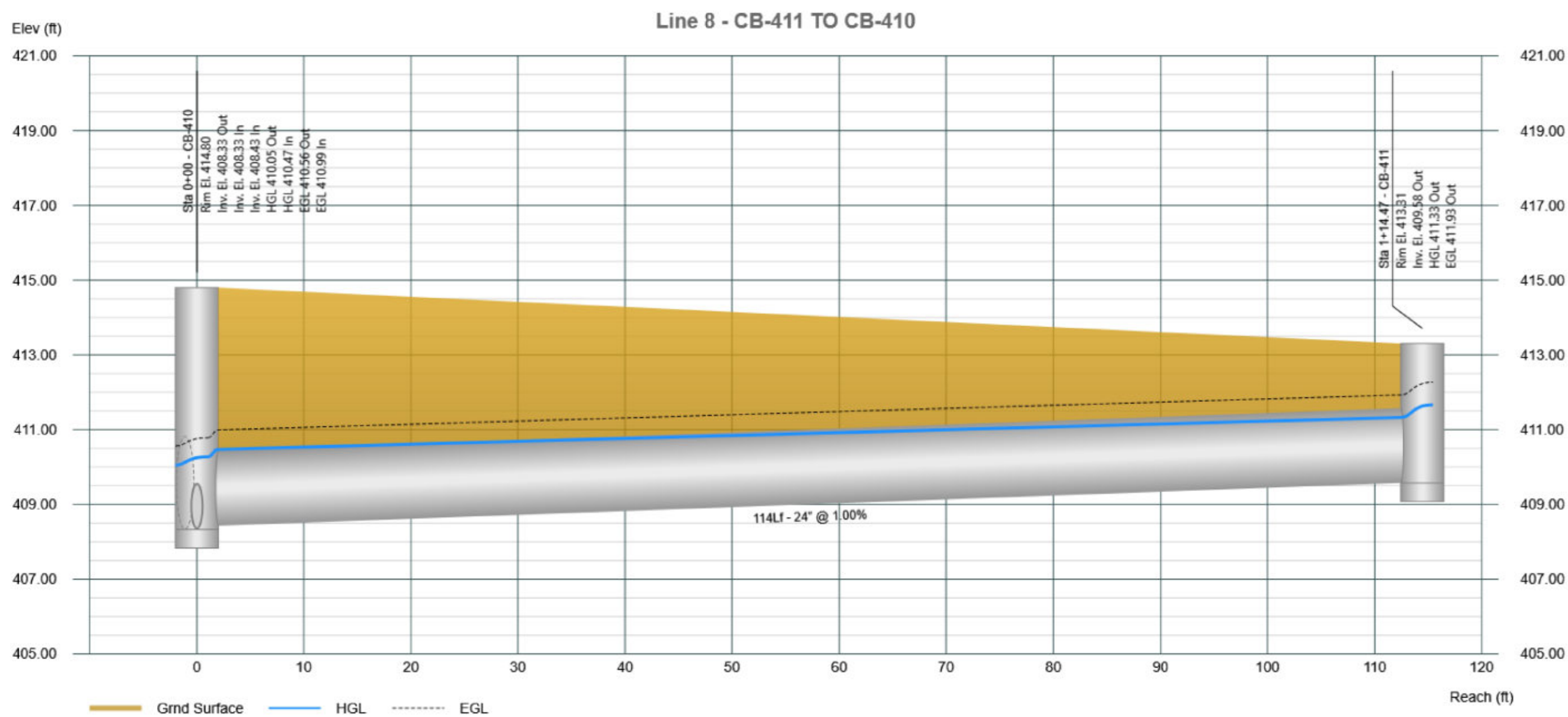


Profile View

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

09-30-2019



Project File: 2019-09-30 STM #400.sws

Storm Sewer Tabulation

Stormwater Studio 2019 v 3.0.0.14

Project Name: STM #200

10-01-2019

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
MH-401 TO HW-403	49.96	0.000	14.704	0.00	0.00	8.87	0.0	15.31	4.27	37.84	40.87	5.36	36	0.50	400.25	400.00	403.20	403.00	410.33	403.42	1
DIV. MH-402 TO MH-401	214.99	0.000	14.704	0.00	0.00	8.87	0.0	14.66	4.37	38.77	40.87	6.58	36	0.50	402.95	401.88	405.28	404.21	410.67	410.33	2
CDS CB-403 TO DIV. MH-40	210.47	0.545	14.704	0.88	0.48	8.87	10.0	14.63	4.38	38.81	39.93	5.49	36	0.48	403.00	402.95	406.74	406.69	411.40	410.67	3
MH-404 TO CDS CB-403	214.98	0.000	10.428	0.00	0.00	5.28	0.0	13.91	4.50	23.76	25.19	4.84	30	0.50	404.52	403.44	408.05	407.09	413.26	411.40	4
CB-410 TO MH-404	99.64	0.593	9.623	0.99	0.59	4.52	10.0	13.52	4.57	20.66	25.18	5.73	30	0.50	408.33	407.83	410.05	409.55	414.80	413.26	5
MH-405 TO CB-410	246.03	0.000	0.550	0.00	0.00	0.54	0.0	11.68	4.94	2.69	3.96	2.19	15	0.50	409.56	408.33	411.31	410.74	417.27	414.80	6
CB-412 TO MH-405	237.24	0.550	0.550	0.99	0.54	0.54	10.0	10.02	5.35	2.92	3.96	2.39	15	0.50	410.75	409.56	411.95	411.35	415.20	417.27	7
CB-411 TO CB-410	114.47	8.480	8.480	0.40	3.39	3.39	10.0	10.02	5.35	18.15	19.60	6.00	24	1.00	409.58	408.43	411.33	410.47	413.31	414.80	8
CB-409 TO MH-404	161.36	0.805	0.805	0.94	0.76	0.76	10.0	10.02	5.35	4.05	3.54	3.30	15	0.40	405.27	404.62	409.36	408.51	409.27	413.26	9
CB-404 TO CDS CB-403	85.90	1.257	3.731	0.92	1.16	3.11	10.0	13.05	4.66	14.49	22.48	2.95	30	0.40	403.34	403.00	407.37	407.23	410.00	411.40	10
MH-403 TO CB-404	164.03	0.000	1.994	0.00	0.00	1.63	0.0	12.02	4.87	7.92	12.40	2.52	24	0.40	404.00	403.34	407.76	407.49	411.66	410.00	11
CB-407 TO MH-403	35.04	1.404	1.702	0.81	1.14	1.43	10.0	11.77	4.92	7.05	12.40	2.24	24	0.40	404.14	404.00	407.88	407.84	412.08	411.66	12
CB-408 TO CB-407	135.05	0.298	0.298	0.99	0.29	0.29	10.0	10.02	5.35	1.58	3.54	1.29	15	0.40	404.68	404.14	408.10	407.99	414.20	412.08	13
CB-406 TO MH-403	86.68	0.292	0.292	0.67	0.20	0.20	10.0	10.02	5.35	1.05	3.54	0.85	15	0.40	404.35	404.00	407.91	407.88	412.15	411.66	14
CB-405 TO CB-404	86.87	0.480	0.480	0.68	0.33	0.33	10.0	10.02	5.35	1.75	12.40	0.56	24	0.40	403.69	403.34	407.55	407.54	410.15	410.00	15
OCS-402 TO HW-402	44.38	0.000	0.000	0.00	0.00	0.00	0.0	0.00	5.36	0.00	14.54	0.00	24	0.55	400.24	400.00	400.24	400.00	403.25	402.29	16
OCS-401 TO HW-401	110.01	0.000	0.000	0.00	0.00	0.00	0.0	0.00	5.36	0.00	39.74	0.00	30	1.25	400.00	398.62	400.00	398.62	405.00	406.00	17

Notes: IDF File = Project Eagle-2.idf, Return Period = 25-yrs.

Project File: 2019-09-30 STM #400.sws

Date:	**10/2/2019**
Project:	**Town of Clay**
Project No:	**100796101**

Calculated By:	**RG**
Checked By:	**TK**

Manning's Equation

MH-107 to HW-101

Design Parameters:

Pipe Diameter, D	30	in
Pipe Material	RCP	
Slope, s	0.40	%
Flow Depth, y	FULL	

Calculations:

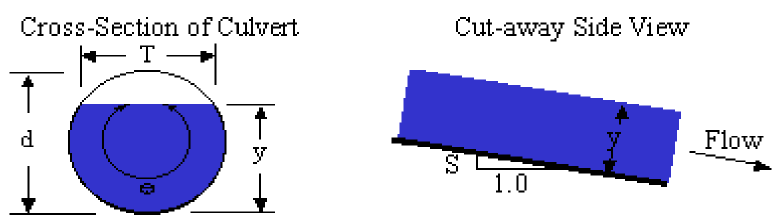
Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)]$ = ...	4.91	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	0.63	ft
Angle, θ = ...	6.28	radians
Wetted Perimeter, $P = \theta D/2$	7.85	ft
Flow Depth, y	2.50	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . **25.94 cfs**

16.77 MGD

Velocity, $V = Q/A$ . . . . **5.28 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}\left(\theta - \sin(\theta)\right)$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Capacity Check:

WQ Peak Flow Rate = ... **17.25 cfs**

per Hydraflow Hydrographs - A1 to Bio #1

Date: 10/2/2019
Project: Town of Clay
Project No: 100796101

Calculated By: RG
Checked By: TK

Manning's Equation

OCS-101 to MH-106

Design Parameters:

Pipe Diameter, D	30	in
Pipe Material	RCP	
Slope, s	0.40	%
Flow Depth, y	FULL	

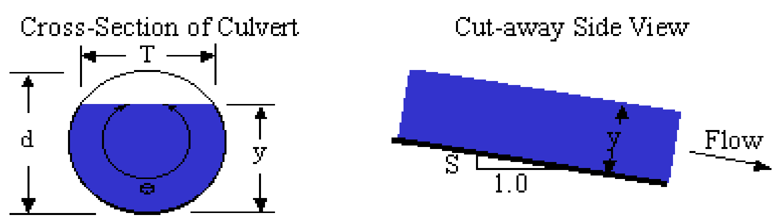
Calculations:

Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)] =$	4.91	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	0.63	ft
Angle, θ =	6.28	radians
Wetted Perimeter, $P = \theta D/2$	7.85	ft
Flow Depth, y	2.50	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . . **25.94 cfs**
16.77 MGD

Velocity, $V = Q/A$ . . . . . **5.28 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}\left(\theta - \sin(\theta)\right)$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1} S)}}$$

Capacity Check:

100 Yr Peak Flow Rate = ... **15.94 cfs**
per Hydraflow Hydrographs - Bio A1

Date: 10/2/2019
Project: Town of Clay
Project No: 100796101

Calculated By: RG
Checked By: TK

Manning's Equation
MH-107 to MH-106

Design Parameters:

Pipe Diameter, D	42	in
Pipe Material	RCP	
Slope, s	1.50	%
Flow Depth, y	FULL	

Calculations:

Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)] =$	9.62	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	0.88	ft
Angle, θ =	6.28	radians
Wetted Perimeter, $P = \theta D/2$	11.00	ft
Flow Depth, y	3.50	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	

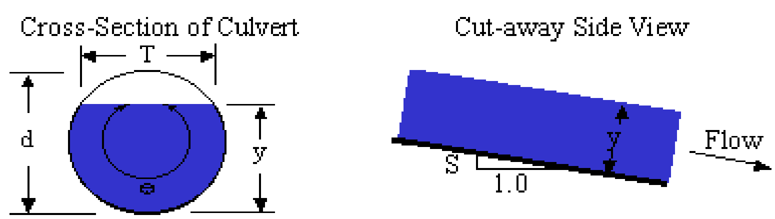
Subcritical Flow

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . **123.22 cfs**

79.64 MGD

Velocity, $V = Q/A$ . . . . **12.81 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}\left(\theta - \sin(\theta)\right)$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1} S)}}$$

Capacity Check:

25 Yr Peak Flow Rate = ... **51.36 cfs**

per Hydraflow Hydrographs - A1 to Detention

Date: 10/2/2019
Project: Town of Clay
Project No: 100796101

Calculated By: RG
Checked By: TK

Manning's Equation
MH-106 to MH-504

Design Parameters:

Pipe Diameter, D	48	in
Pipe Material	RCP	
Slope, s	0.40	%
Flow Depth, y	FULL	

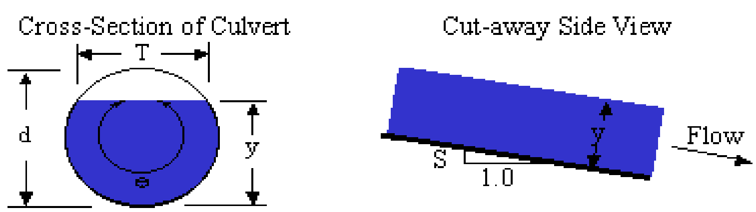
Calculations:

Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)]$ =	12.57	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	1.00	ft
Angle, θ =	6.28	radians
Wetted Perimeter, $P = \theta D/2$	12.57	ft
Flow Depth, y	4.00	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . . . **90.85 cfs**
58.72 MGD

Velocity, $V = Q/A$ . . . . . . **7.23 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}(\theta - \sin(\theta))$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Capacity Check:

25 Yr Peak Flow Rate =	51.36	cfs
per Hydraflow Hydrographs - A1 to Detention		
25 Yr Peak Flow Rate =	14.45	cfs
per Hydraflow Hydrographs - Bio A1		
Total Flow =	**65.81**	**cfs**

Date: 10/2/2019
Project: Town of Clay
Project No: 100796101

Calculated By: RG
Checked By: TK

Manning's Equation

DIV MH-211 to MH-504

Design Parameters:

Pipe Diameter, D	36	in
Pipe Material	RCP	
Slope, s	7.15	%
Flow Depth, y	FULL	

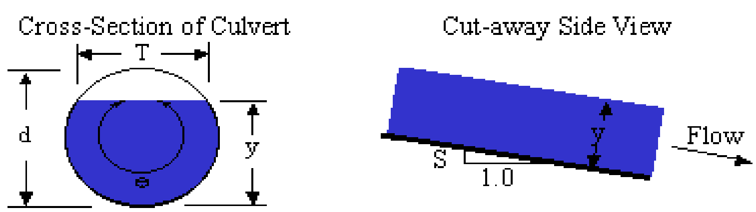
Calculations:

Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)]$ = ...	7.07	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	0.75	ft
Angle, θ = ...	6.28	radians
Wetted Perimeter, $P = \theta D/2$	9.42	ft
Flow Depth, y	3.00	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . **178.35 cfs**
115.27 MGD

Velocity, $V = Q/A$ . . . . **25.23 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}(\theta - \sin(\theta))$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1} S)}}$$

Capacity Check:

25 Yr Peak Flow Rate = ...	90.37	cfs
per Hydraflow Hydrographs - A2 to Detention		
Drainage Area Ratio = ...	0.236	
Total Flow = ...	**21.33**	**cfs**

Date:	10/2/2019
Project:	Town of Clay
Project No:	100796101
Calculated By:	RG
Checked By:	TK

Manning's Equation

DIV MH-201 to HW-201

Design Parameters:

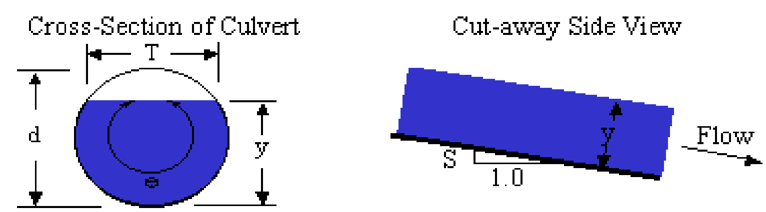
Pipe Diameter, D	30	in
Pipe Material	RCP	
Slope, s	0.50	%
Flow Depth, y	FULL	

Calculations:

Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)] =$	4.91	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	0.63	ft
Angle, $\theta =$	6.28	radians
Wetted Perimeter, $P = \theta D/2$	7.85	ft
Flow Depth, y	2.50	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$	**29.00 cfs**
	18.75 MGD
Velocity, $V = Q/A$	**5.91 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}\left(\theta - \sin(\theta)\right)$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Capacity Check:

WQ Peak Flow Rate =	38.56 cfs
per Hydraflow Hydrographs - A2 to Bio #2	
Drainage Area Ratio =	0.764
Total Flow =	**29.46 cfs**

Date: 10/2/2019
Project: Town of Clay
Project No: 100796101

Calculated By: RG
Checked By: TK

Manning's Equation
DIV MH-211 to HW-202

Design Parameters:

Pipe Diameter, D	24	in
Pipe Material	RCP	
Slope, s	0.40	%
Flow Depth, y	FULL	

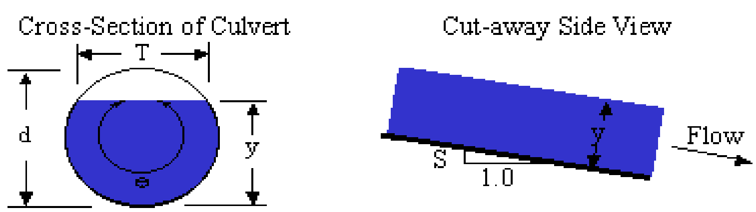
Calculations:

Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)] =$	3.14	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	0.50	ft
Angle, $\theta =$	6.28	radians
Wetted Perimeter, $P = \theta D/2$	6.28	ft
Flow Depth, y	2.00	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . . **14.31 cfs**
9.25 MGD

Velocity, $V = Q/A$ . . . . . **4.55 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}\left(\theta - \sin(\theta)\right)$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Capacity Check:

WQ Peak Flow Rate =	38.56 cfs
per Hydraflow Hydrographs - A2 to Bio #2	
Drainage Area Ratio =	0.236
Total Flow =	**9.10 cfs**

Date:	**10/2/2019**
Project:	**Town of Clay**
Project No:	**100796101**

Calculated By:	**RG**
Checked By:	**TK**

Manning's Equation

CB-301 to MH-304

Design Parameters:

Pipe Diameter, D	24	in
Pipe Material	RCP	
Slope, s	1.00	%
Flow Depth, y	FULL	

Calculations:

Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)] =$	3.14	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	0.50	ft
Angle, θ = ...	6.28	radians
Wetted Perimeter, $P = \theta D/2$	6.28	ft
Flow Depth, y	2.00	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

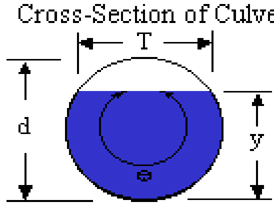
- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . **22.62 cfs**

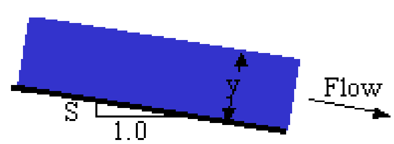
14.62 MGD

Velocity, $V = Q/A$ . . . . **7.20 fps**

Cross-Section of Culvert



Cut-away Side View



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}\left(\theta - \sin(\theta)\right)$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Capacity Check:

100 Yr Peak Flow Rate = ... **17.25 cfs**

per Hydraflow Hydrographs - Bio A3

Date:	10/2/2019
Project:	Town of Clay
Project No:	100796101

Calculated By:	RG
Checked By:	TK

Manning's Equation

DIV CB-302 to HW-301

Design Parameters:

Pipe Diameter, D	30	in
Pipe Material	RCP	
Slope, s	0.40	%
Flow Depth, y	FULL	

Calculations:

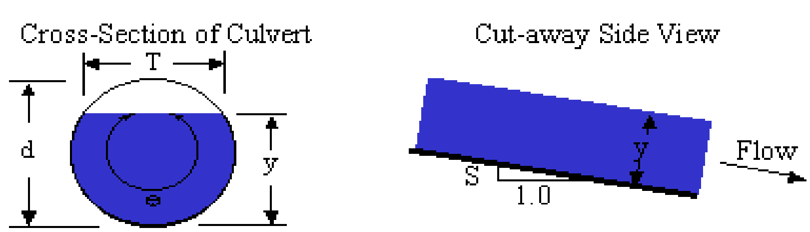
Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)]$ = ...	4.91	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	0.63	ft
Angle, θ = ...	6.28	radians
Wetted Perimeter, $P = \theta D/2$	7.85	ft
Flow Depth, y	2.50	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . **25.94 cfs**

16.77 MGD

Velocity, $V = Q/A$ . . . . **5.28 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}(\theta - \sin(\theta))$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Capacity Check:

WQ Peak Flow Rate = ... **21.66 cfs**

per Hydraflow Hydrographs - A3 to Bio #3

Date: 10/2/2019
Project: Town of Clay
Project No: 100796101

Calculated By: RG
Checked By: TK

Manning's Equation

DIV MH-306 to MH-304

Design Parameters:

Pipe Diameter, D	36	in
Pipe Material	RCP	
Slope, s	0.51	%
Flow Depth, y	FULL	

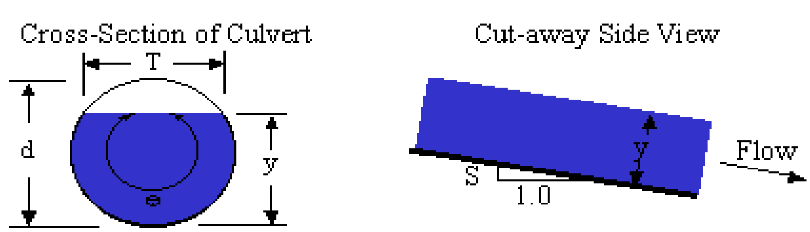
Calculations:

Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)] =$	7.07	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	0.75	ft
Angle, $\theta =$	6.28	radians
Wetted Perimeter, $P = \theta D/2$	9.42	ft
Flow Depth, y	3.00	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . **47.63 cfs**
30.79 MGD

Velocity, $V = Q/A$ . . . . **6.74 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}(\theta - \sin(\theta))$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Capacity Check:

25 Yr Peak Flow Rate = ... **26.28 cfs**
per Hydraflow Hydrographs - A3 to Detention

Date: 10/2/2019
Project: Town of Clay
Project No: 100796101

Calculated By: RG
Checked By: TK

Manning's Equation

MH-304 to MH-502

Design Parameters:

Pipe Diameter, D	36	in
Pipe Material	RCP	
Slope, s	0.50	%
Flow Depth, y	FULL	

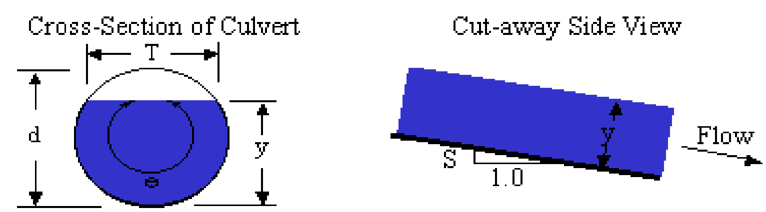
Calculations:

Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)]$ =	7.07	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	0.75	ft
Angle, θ =	6.28	radians
Wetted Perimeter, $P = \theta D/2$	9.42	ft
Flow Depth, y	3.00	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . . . **47.16 cfs**
30.48 MGD

Velocity, $V = Q/A$ . . . . . . **6.67 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}(\theta - \sin(\theta))$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Capacity Check:

25 Yr Peak Flow Rate =	26.28	cfs
per Hydraflow Hydrographs - A3 to Detention		
25 Yr Peak Flow Rate =	12.43	cfs
per Hydraflow Hydrographs - Bio A3		
Total Flow =	**38.71**	**cfs**

Date:	10/2/2019
Project:	Town of Clay
Project No:	100796101

Calculated By:	RG
Checked By:	TK

Manning's Equation

MH-503 to HW-502

Design Parameters:

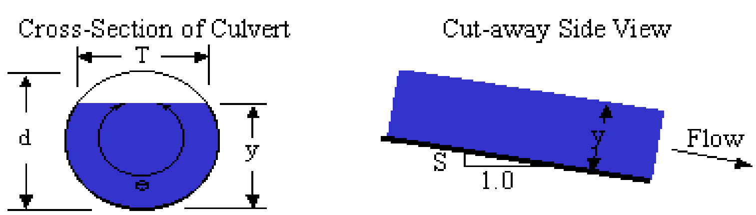
Pipe Diameter, D	48	in
Pipe Material	RCP	
Slope, s	0.50	%
Flow Depth, y	FULL	

Calculations:

Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)]$ =	12.57	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	1.00	ft
Angle, θ =	6.28	radians
Wetted Perimeter, $P = \theta D/2$	12.57	ft
Flow Depth, y	4.00	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$	**101.57 cfs**
	65.65 MGD
Velocity, $V = Q/A$	**8.08 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}\left(\theta - \sin(\theta)\right)$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Capacity Check:

25 Yr Peak Flow Rate =	90.37 cfs
per Hydraflow Hydrographs - A2 to Detention	
Drainage Area Ratio =	0.764
25 Yr Peak Flow Rate =	26.28 cfs
per Hydraflow Hydrographs - A3 to Detention	
Total Flow =	**95.32 cfs**

Date: **10/2/2019**
Project: **Town of Clay**
Project No: **100796101**

Calculated By: **RG**
Checked By: **TK**

Manning's Equation

MH-504 to HW-504

Design Parameters:

Pipe Diameter, D	48	in
Pipe Material	RCP	
Slope, s	0.40	%
Flow Depth, y	FULL	

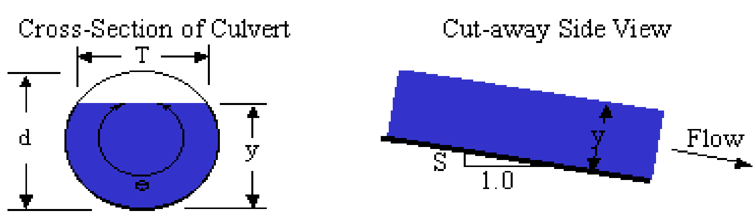
Calculations:

Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)] =$	12.57	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	1.00	ft
Angle, θ =	6.28	radians
Wetted Perimeter, $P = \theta D/2$	12.57	ft
Flow Depth, y	4.00	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . . . **90.85 cfs**
58.72 MGD

Velocity, $V = Q/A$ . . . . . . **7.23 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}\left(\theta - \sin(\theta)\right)$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Capacity Check:

25 Yr Peak Flow Rate =	90.37	cfs
per Hydraflow Hydrographs - A2 to Detention		
Drainage Area Ratio =	0.236	
25 Yr Peak Flow Rate =	51.36	cfs
per Hydraflow Hydrographs - A1 to Detention		
Total Flow =	**72.69**	**cfs**

Date:	**10/2/2019**
Project:	**Town of Clay**
Project No:	**100796101**

Calculated By:	**RG**
Checked By:	**TK**

Manning's Equation

CB-401 to HW-401

Design Parameters:

Pipe Diameter, D	30	in
Pipe Material	RCP	
Slope, s	1.25	%
Flow Depth, y	FULL	

Calculations:

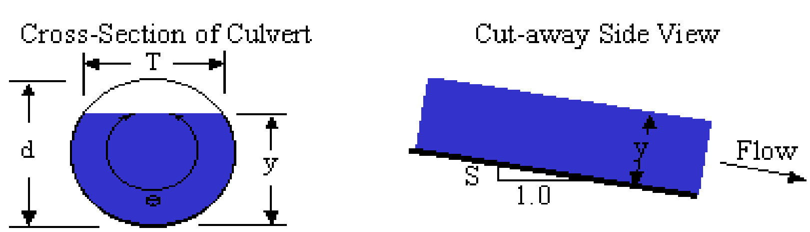
Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)] =$	4.91 ft^2
Manning's Coefficient, n	0.013
Hydraulic Radius, R	0.63 ft
Angle, $\theta =$	6.28 radians
Wetted Perimeter, $P = \theta D/2$	7.85 ft
Flow Depth, y	2.50 ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00 ft
Gravity Constant, g	32.174 ft/s^2
Froude Number, F	0.00
	Subcritical Flow

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . **45.86 cfs**

29.64 MGD

Velocity, $V = Q/A$ . . . . **9.34 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}\left(\theta - \sin(\theta)\right)$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1} S)}}$$

Capacity Check:

100 Yr Peak Flow Rate = ... **24.15 cfs**

per Hydraflow Hydrographs - North Detention

Date:	10/2/2019
Project:	Town of Clay
Project No:	100796101
Calculated By:	RG
Checked By:	TK

Manning's Equation

OCS-402 to HW-402

Design Parameters:

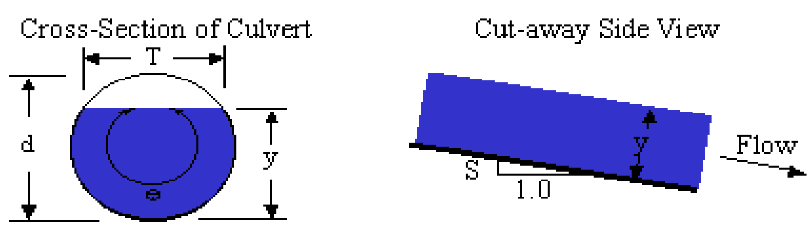
Pipe Diameter, D	24	in
Pipe Material	RCP	
Slope, *s*	0.56	%
Flow Depth, y	FULL	

Calculations:

Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)]$ = ...	3.14	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	0.50	ft
Angle, θ = ...	6.28	radians
Wetted Perimeter, $P = \theta D/2$	6.28	ft
Flow Depth, y	2.00	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$	**16.93**	**cfs**
	10.94	**MGD**
Velocity, $V = Q/A$	**5.39**	**fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}(\theta - \sin(\theta))$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Capacity Check:

100 Yr Peak Flow Rate = ...	**16.86**	**cfs**
per Hydraflow Hydrographs - Bio A4		

Date:	10/2/2019
Project:	Town of Clay
Project No:	100796101
Calculated By:	RG
Checked By:	TK

Manning's Equation

OCS-200 to HW-503

Design Parameters:

Pipe Diameter, D	24	in
Pipe Material	RCP	
Slope, s	2.00	%
Flow Depth, y	FULL	

Calculations:

Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)] =$	3.14	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	0.50	ft
Angle, θ = ...	6.28	radians
Wetted Perimeter, $P = \theta D/2$	6.28	ft
Flow Depth, y	2.00	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

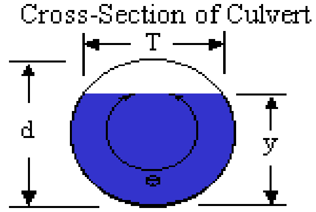
- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . **31.99 cfs**

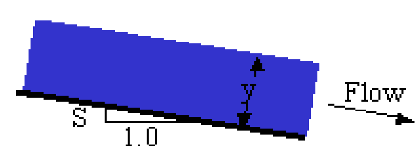
20.68 MGD

Velocity, $V = Q/A$ . . . . **10.18 fps**

Cross-Section of Culvert



Cut-away Side View



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}(\theta - \sin(\theta))$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Capacity Check:

100 Yr Peak Flow Rate = ... **27.90 cfs**

per Hydraflow Hydrographs - Bio A2

Date:	**10/2/2019**
Project:	**Town of Clay**
Project No:	**100796101**

Calculated By:	**RG**
Checked By:	**TK**

Manning's Equation

CB-501 to HW-501

Design Parameters:

Pipe Diameter, D	42	in
Pipe Material	RCP	
Slope, s	0.60	%
Flow Depth, y	FULL	

Calculations:

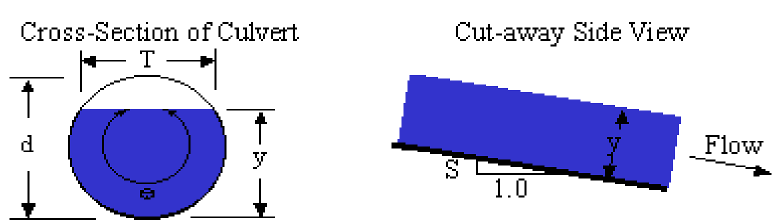
Cross-Sectional Area, $A = D^2/8\,[\theta - \sin(\theta)] =$	9.62	ft^2
Manning's Coefficient, n	0.013	
Hydraulic Radius, R	0.88	ft
Angle, θ =	6.28	radians
Wetted Perimeter, $P = \theta D/2$	11.00	ft
Flow Depth, y	3.50	ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00	ft
Gravity Constant, g	32.174	ft/s^2
Froude Number, F	0.00	
	Subcritical Flow	

- **Flow & Velocity:**

Flow, $Q_o = \dfrac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$ . . . . **77.93 cfs**

50.37 MGD

Velocity, $V = Q/A$ . . . . **8.10 fps**



$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}\left(\theta - \sin(\theta)\right)$$

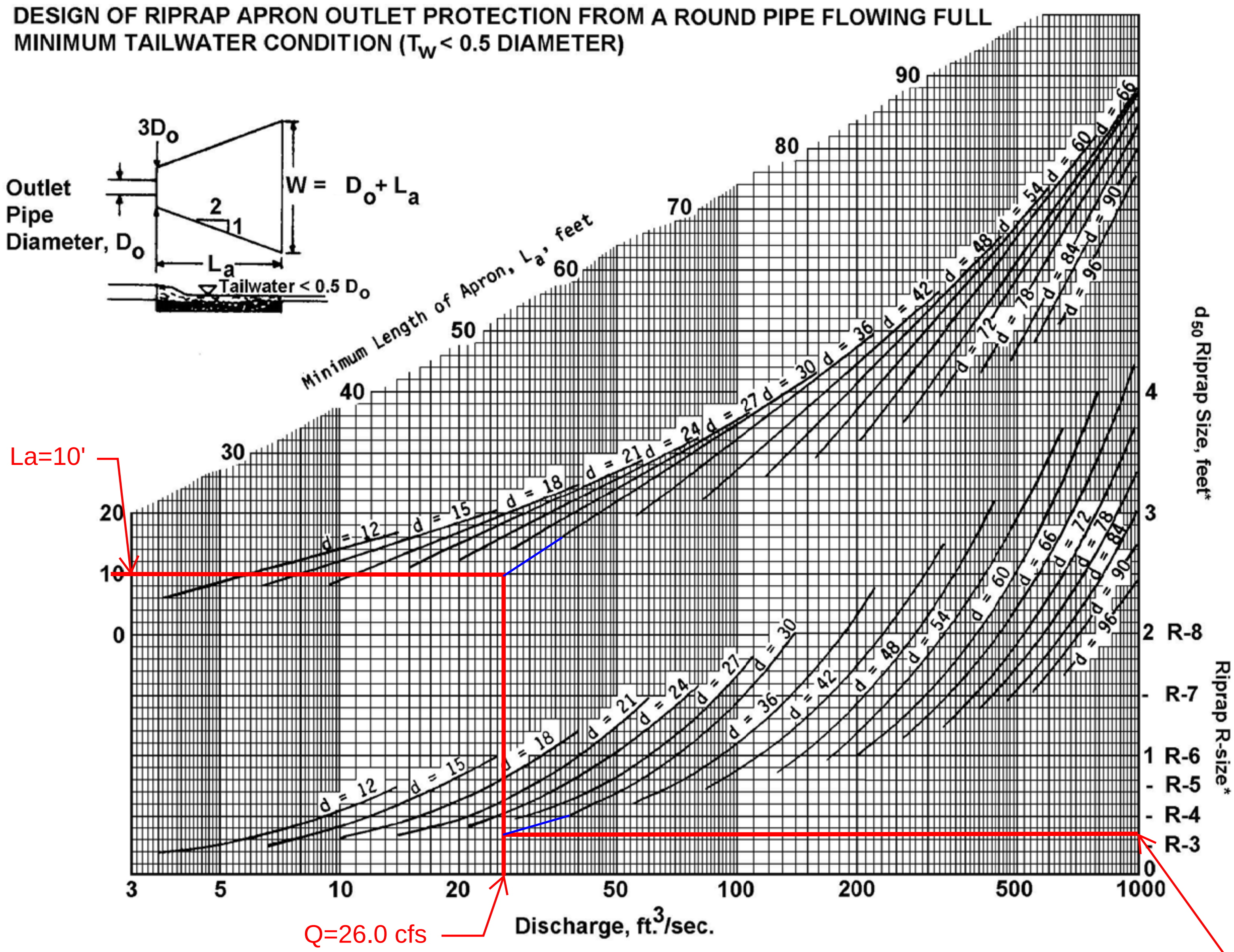
$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Capacity Check: Two (2) Barrels = 77.93 cfs x 2 = **155.86 cfs**

100 Yr Peak Flow Rate = ... **115.23 cfs**

per Hydraflow Hydrographs - Wet Pond #1

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-101 OUTLET

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

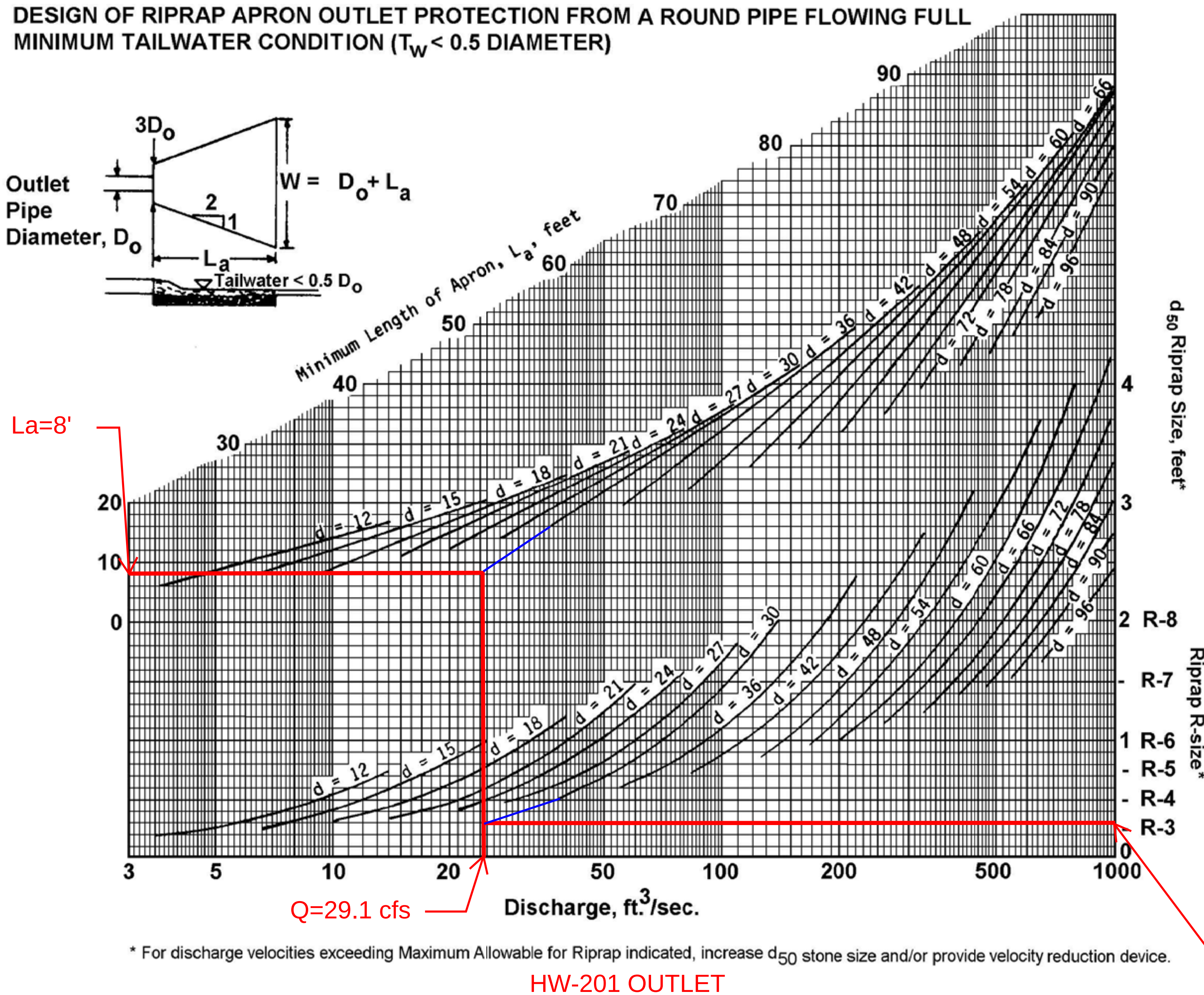


Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full,
Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

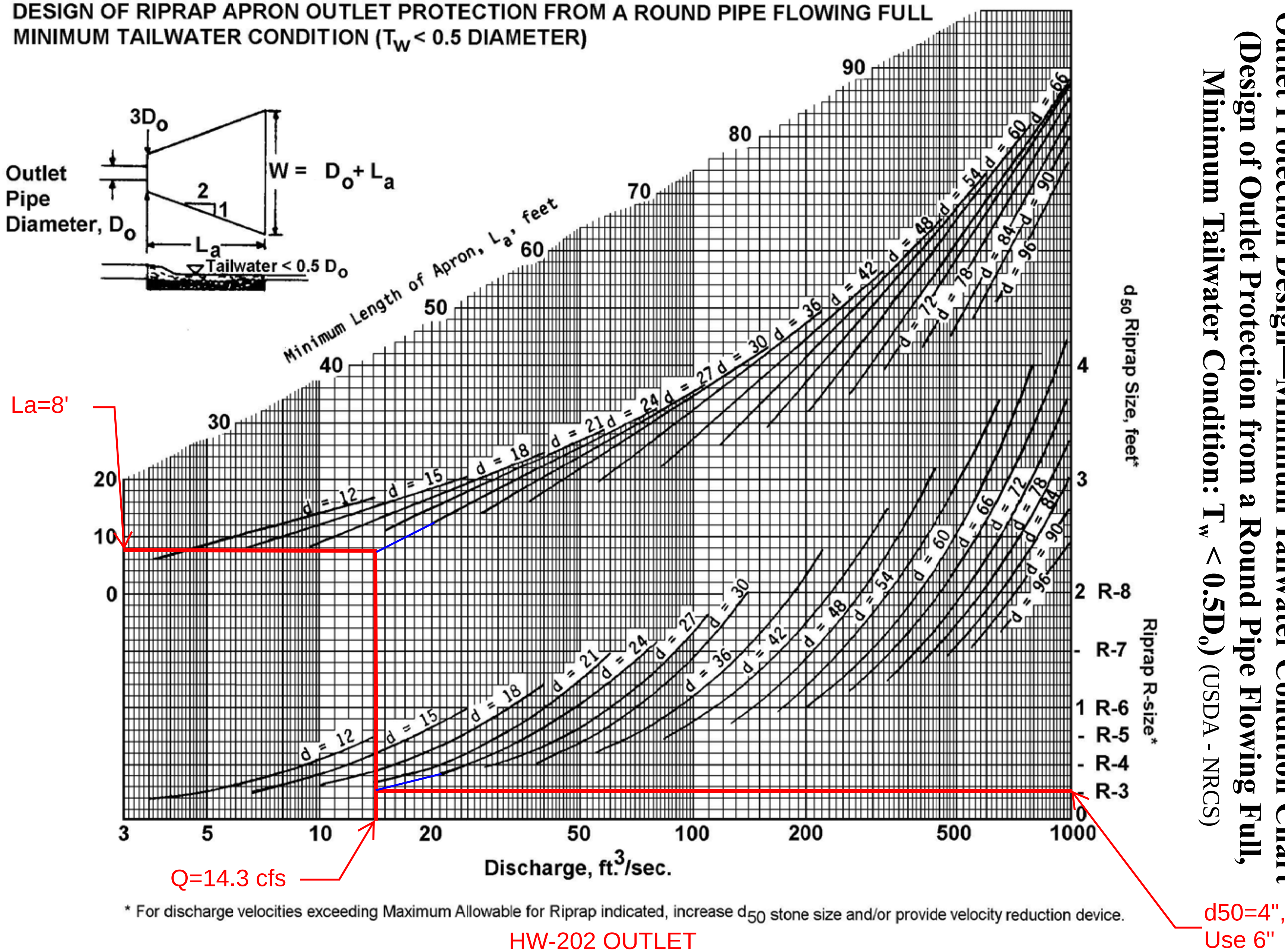
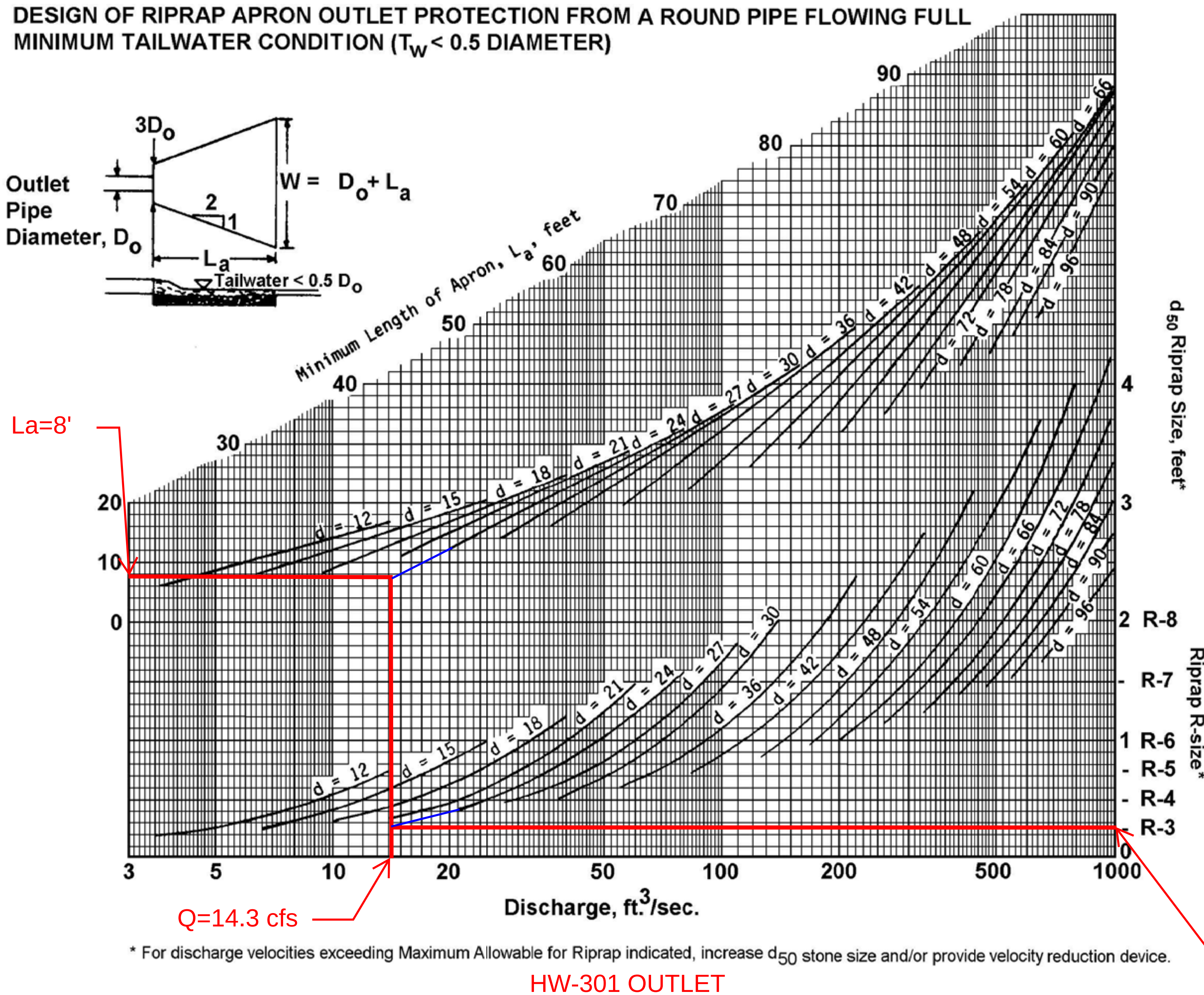


Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



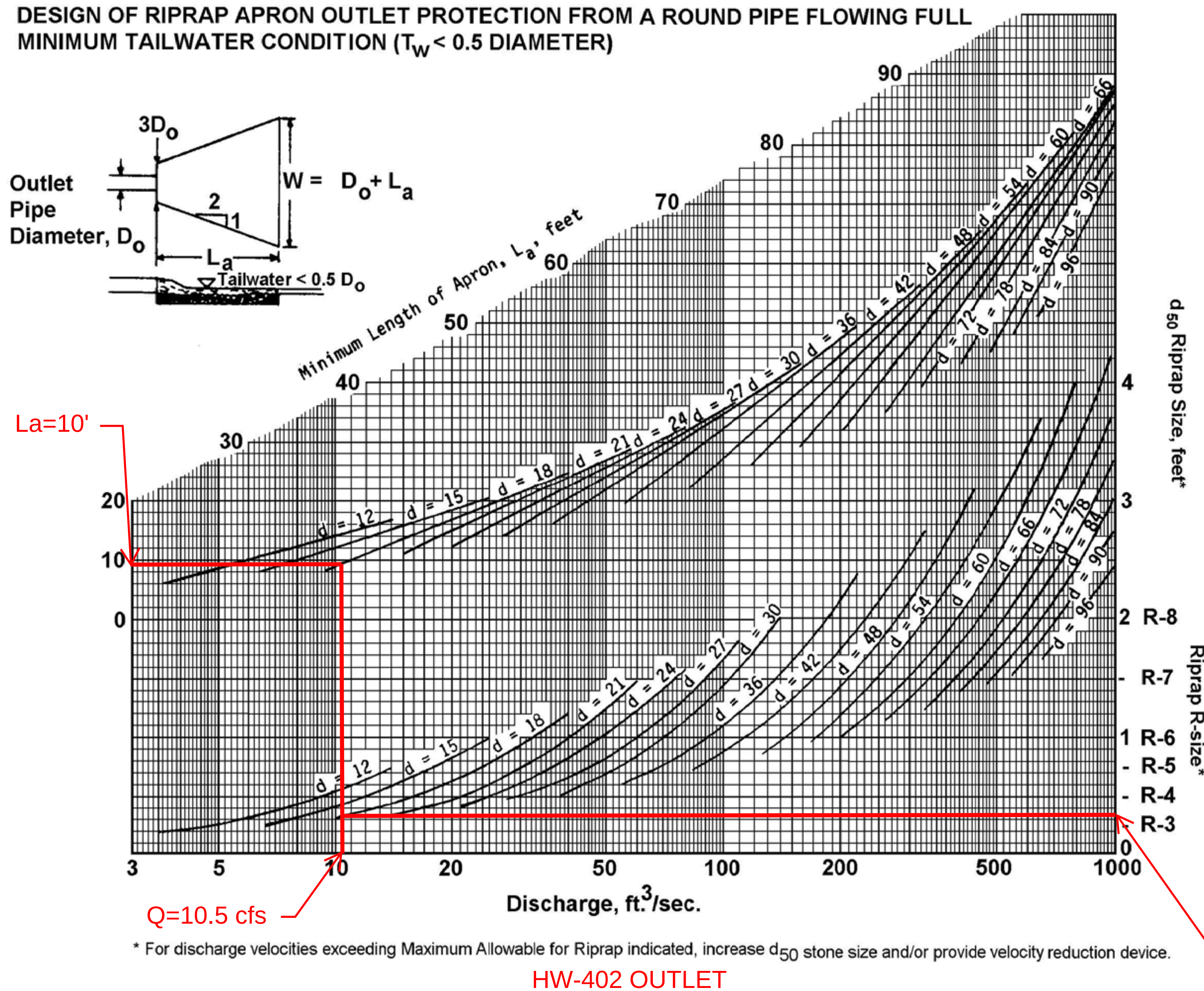
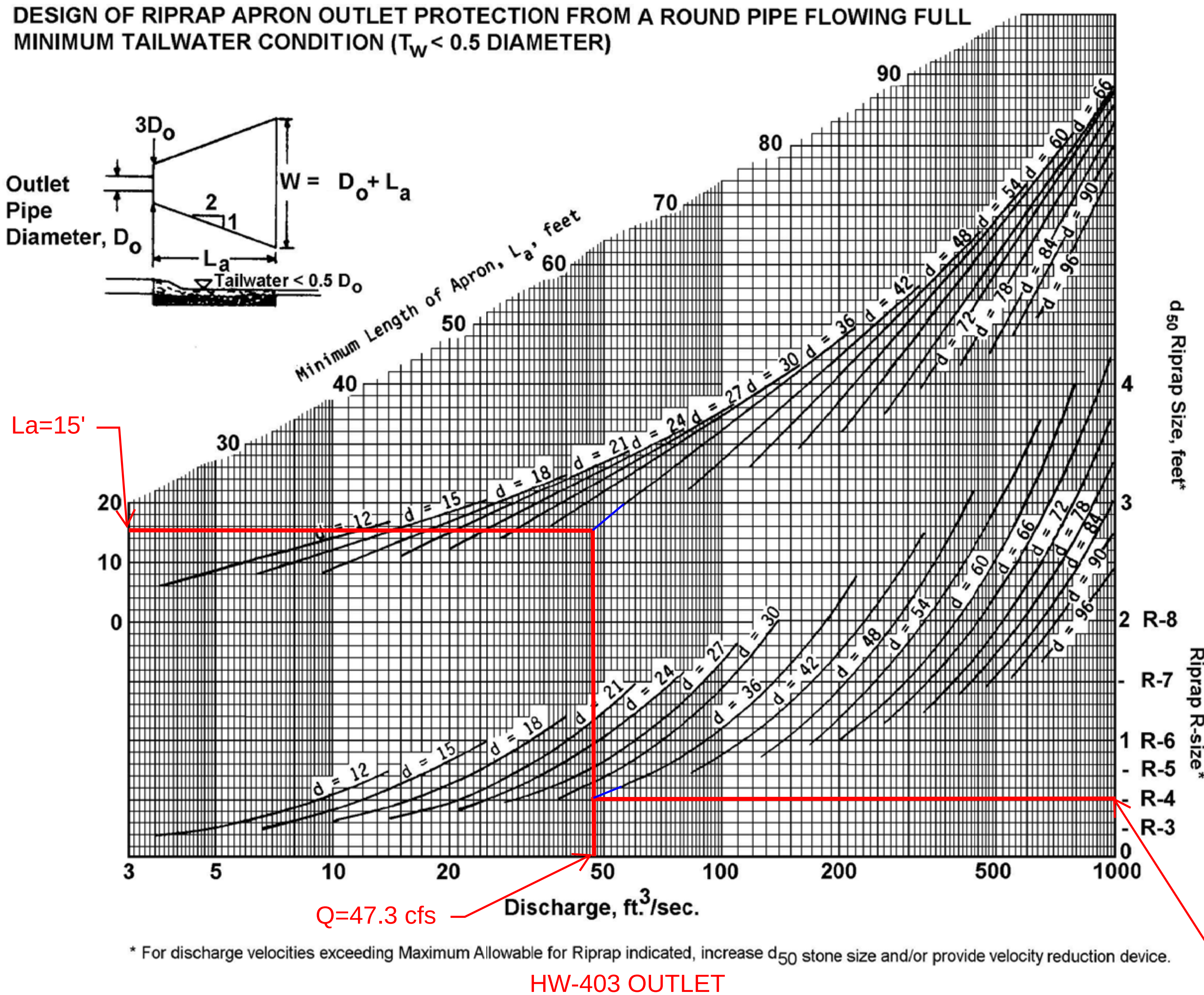


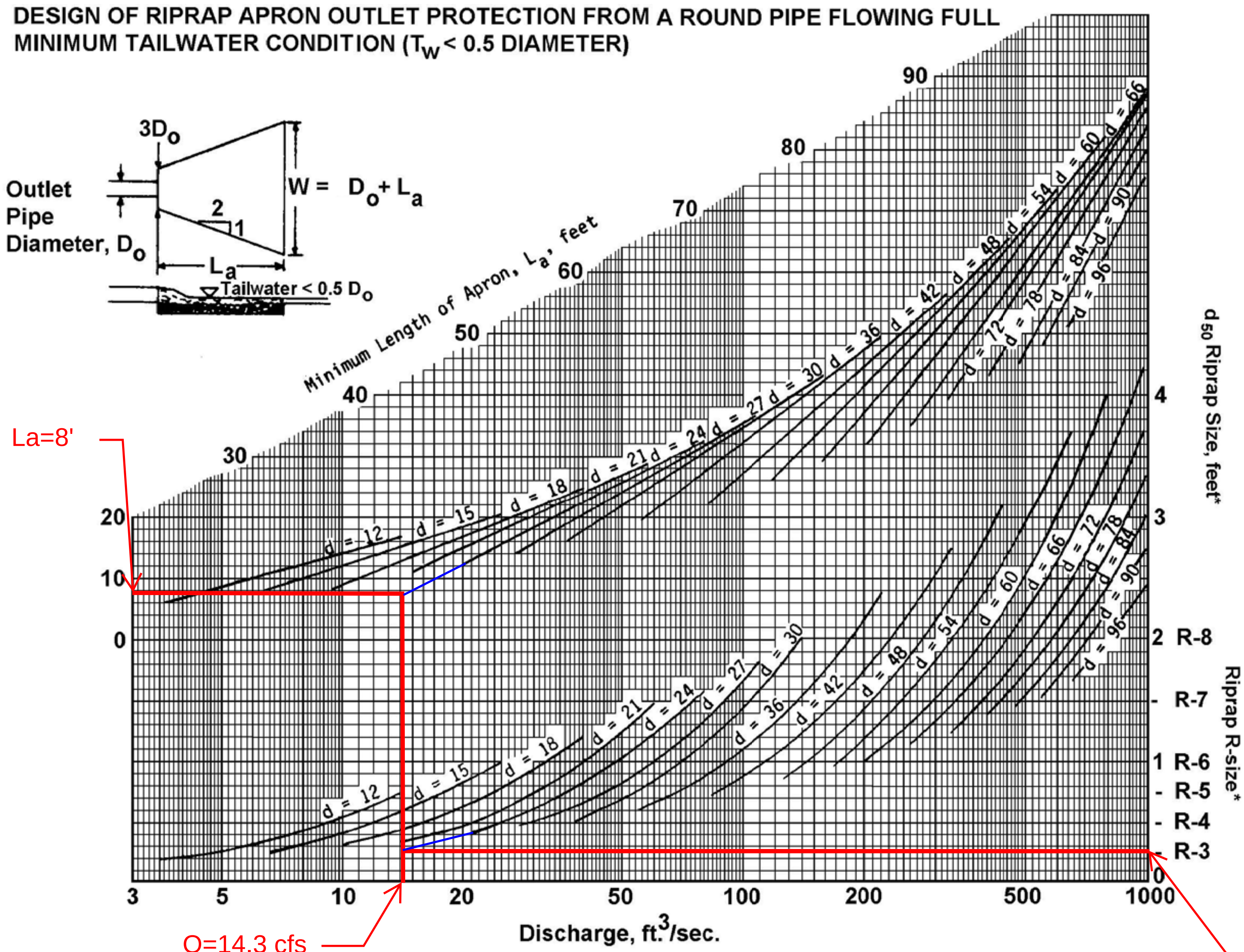
Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

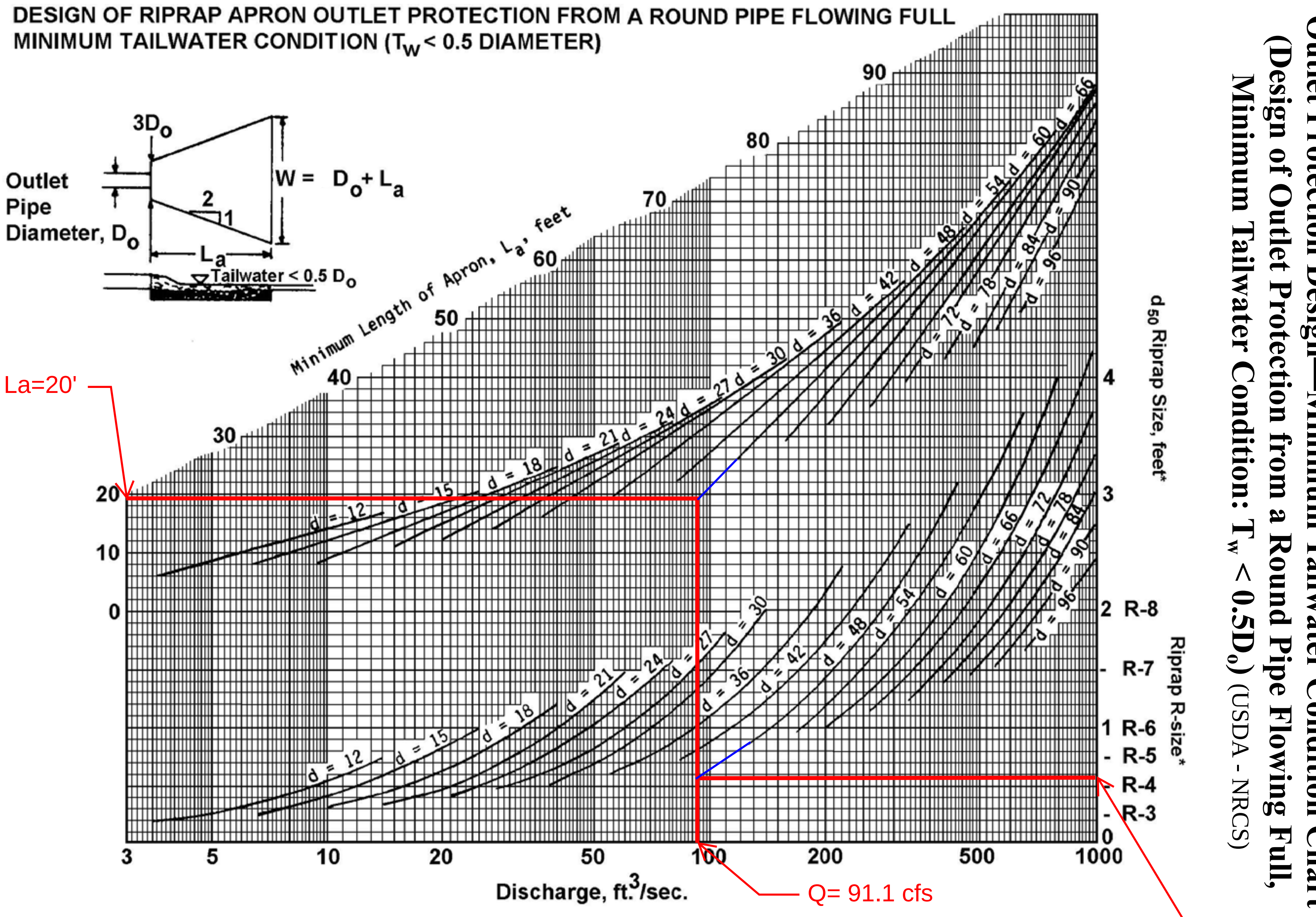
Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full,
Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-404 OUTLET

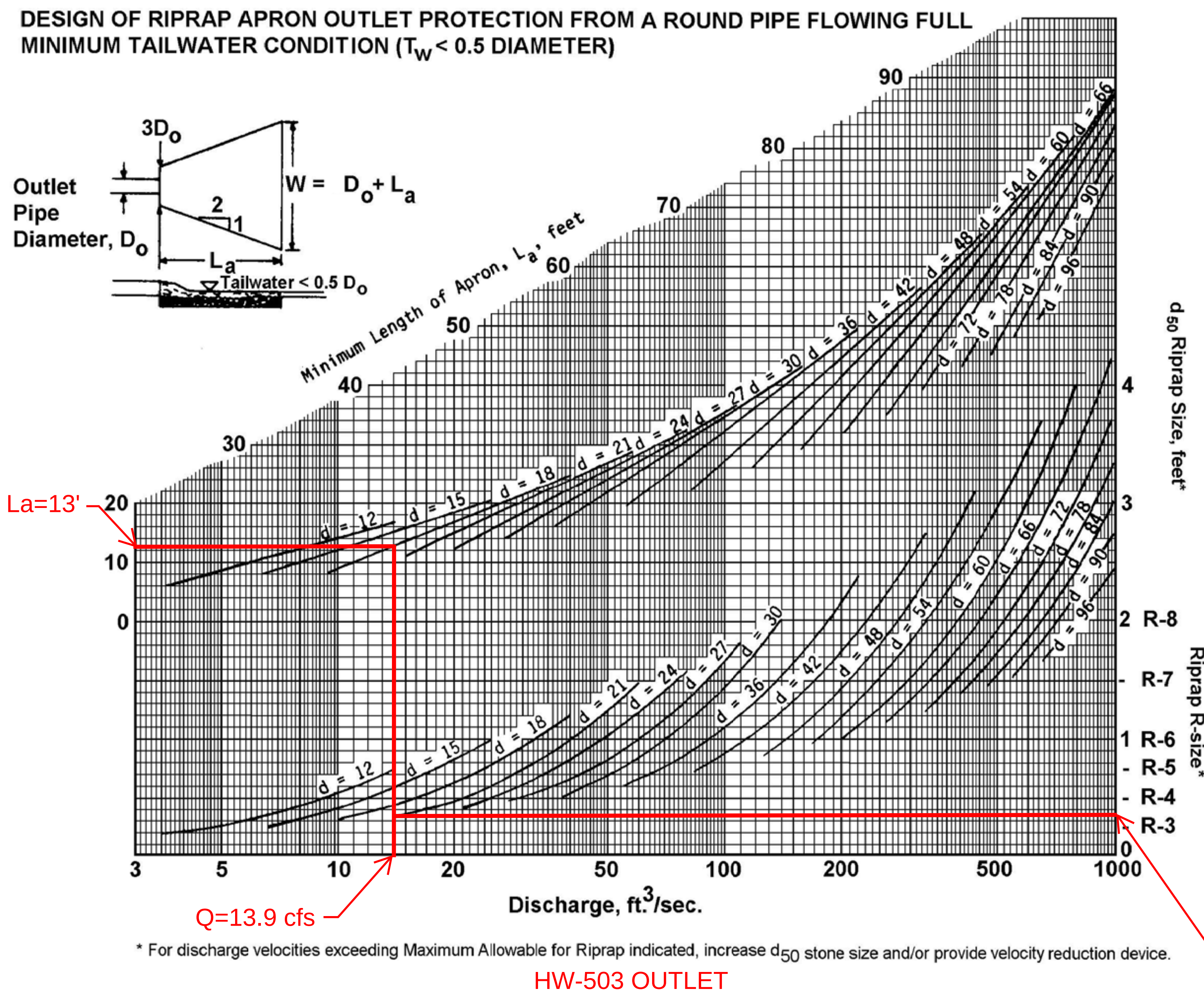
Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

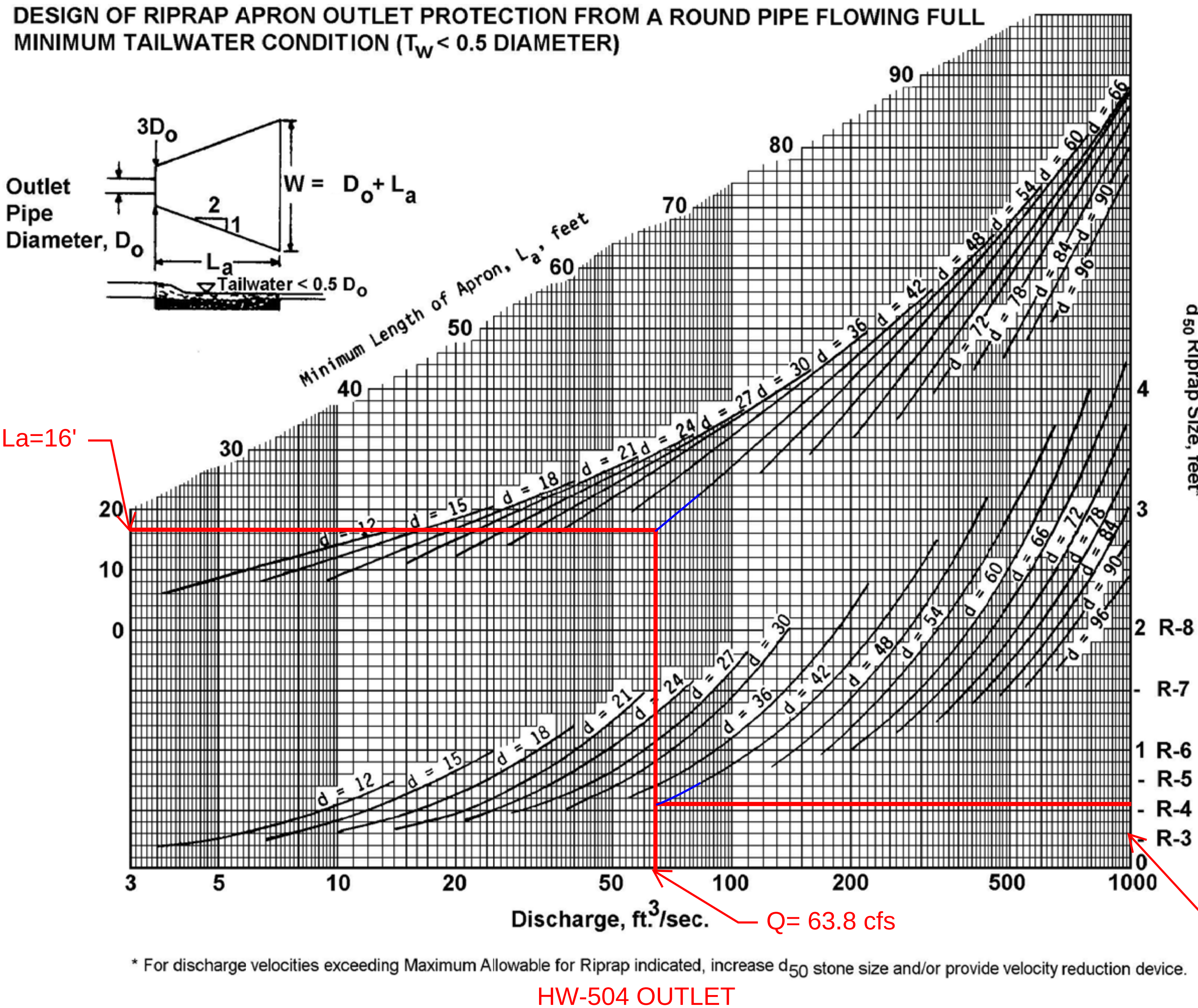
HW-502 OUTLET

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full,
Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



d50=4"
Use 6"

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



Rip Rap Sizing using Flowing Full Capacity Worksheet

Structure	pipe size (in)	pipe size (ft)	hydraulic radius, R (ft)	Pipe Area (sf)	Slope (ft/ft)	n	velocity, full (fps)	Discharge, Full (cfs)	Req'd/WQ Flow (cfs)	End Section?	Top Width of Rip Rap, $3D_o$ (ft)	Bottom Width of Rip Rap, W (ft)	Length of Rip Rap, L_a (ft)	d_{50} Rip Rap Size (in)	Rip Rap thickness (in)
HW-101	24	2.0	0.5	3.1	0.004	0.013	4.6	14.3	16.8	yes	6.0	12.0	10	6	14
HW-201	30	2.5	0.6	4.9	0.005	0.013	5.9	29.1	28.8	yes	7.5	14.5	12	6	14
HW-202	18	1.5	0.4	1.8	0.004	0.013	3.8	6.7	7.9	yes	4.5	9.5	8	6	14
HW-301	24	2.0	0.5	3.1	0.004	0.013	4.6	14.3	10.4	yes	6.0	10.0	8	6	14
HW-402	18	1.5	0.4	1.8	0.010	0.013	6.0	10.5	9.9	yes	4.5	11.5	10	6	14
HW-403	36	3.0	0.8	7.1	0.005	0.013	6.7	47.3	41.2	yes	9.0	18.0	15	6	14
HW-404	24	2.0	0.5	3.1	0.004	0.013	4.6	14.3	10.2	yes	6.0	10.0	8	6	14
HW-502	48	4.0	1.0	12.6	0.004	0.013	7.2	91.1	70.3	yes	12.0	24.0	20	9	20
HW-503	24	2.0	0.5	3.1	0.018	0.013	9.6	30.0	12.7	yes	6.0	15.0	13	6	14
HW-504	48	4.0	1.0	12.6	0.004	0.013	7.2	91.1	58.9	yes	12.0	20.0	16	9	20

LANGAN

Appendix G

Pre-Development Stormwater Analysis

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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	------	21.28	-------	-------	-------	72.28	106.33	-------	178.51	Ex WS A
2	SCS Runoff	------	1.329	-------	-------	-------	8.484	14.01	-------	26.39	Ex WS B
3	SCS Runoff	------	0.994	-------	-------	-------	4.705	7.385	-------	13.26	Ex WS C
4	SCS Runoff	------	2.901	-------	-------	-------	6.100	7.963	-------	11.64	Ex WS D

Proj. file: Existing Hydrographs.gpw

Tuesday, 10 / 1 / 2019

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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	21.28	2	746	147,872	------	------	------	Ex WS A
2	SCS Runoff	1.329	2	736	9,986	------	------	------	Ex WS B
3	SCS Runoff	0.994	2	738	6,819	------	------	------	Ex WS C
4	SCS Runoff	2.901	2	722	8,133	------	------	------	Ex WS D

Existing Hydrographs.gpw	Return Period: 1 Year	Tuesday, 10 / 1 / 2019

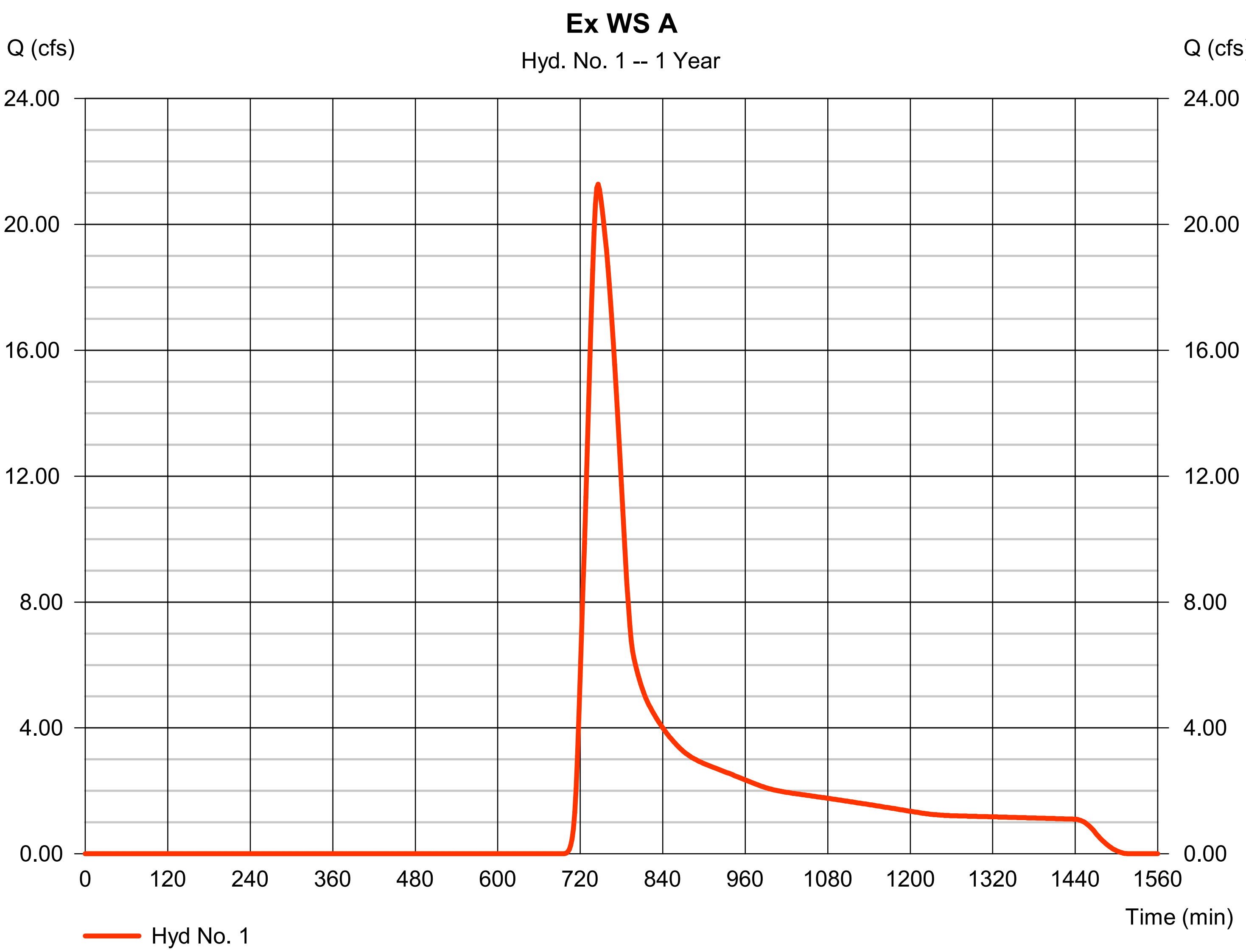
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 1

Ex WS A

Hydrograph type	= SCS Runoff	Peak discharge	= 21.28 cfs
Storm frequency	= 1 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 147,872 cuft
Drainage area	= 88.760 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 50.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



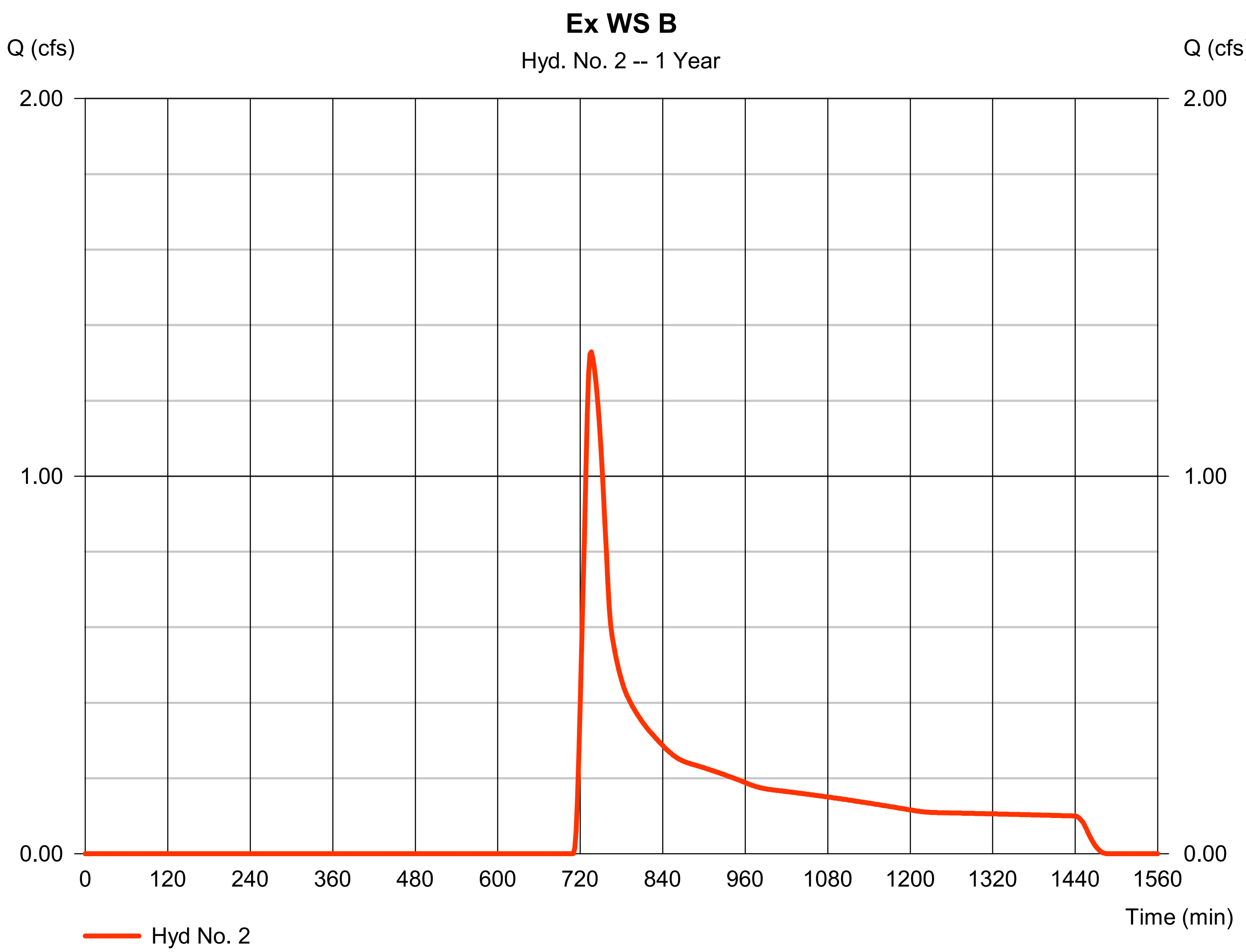
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 2

Ex WS B

Hydrograph type	= SCS Runoff	Peak discharge	= 1.329 cfs
Storm frequency	= 1 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 9,986 cuft
Drainage area	= 12.290 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 27.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



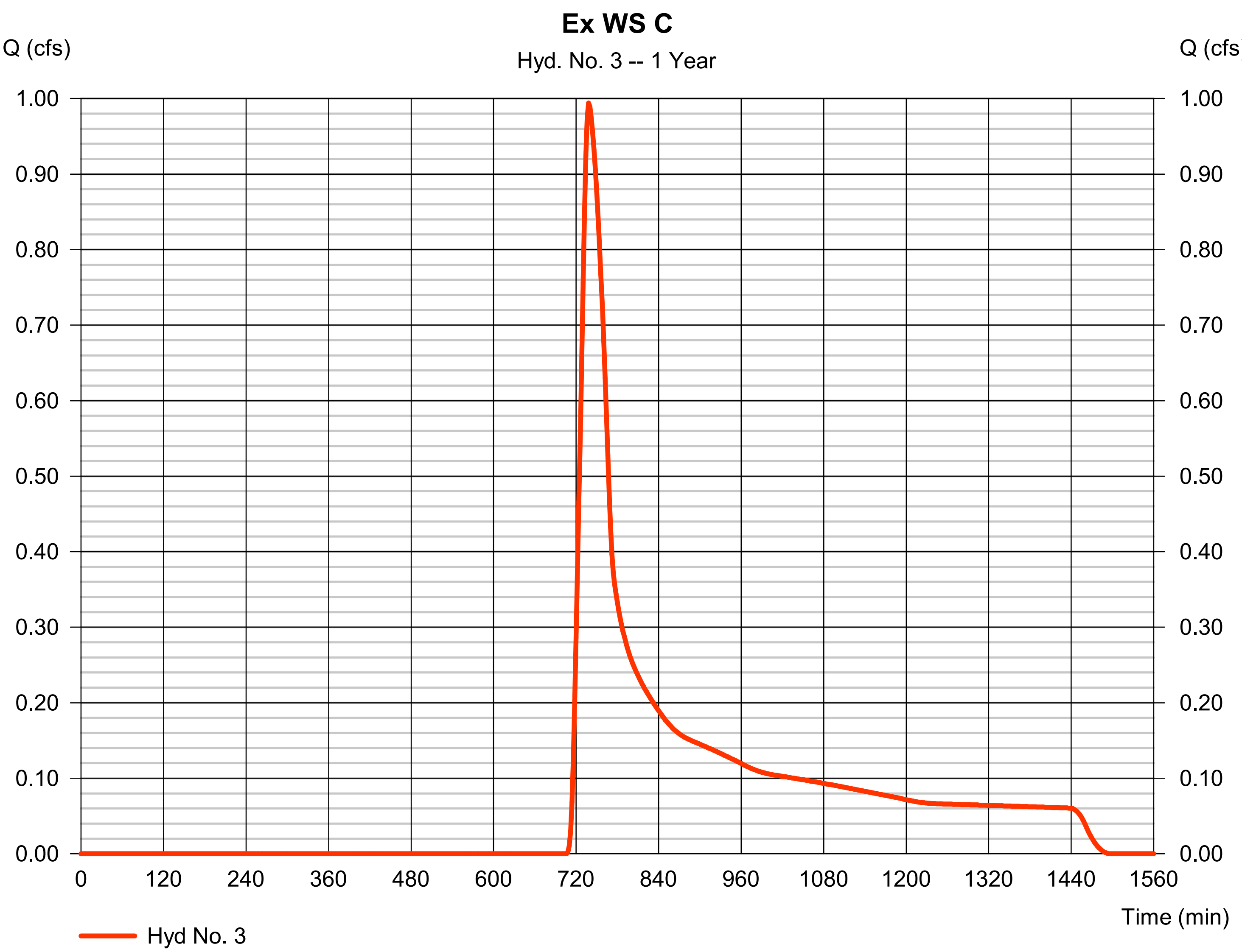
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 | Tuesday, 10 / 1 / 2019

Hyd. No. 3

Ex WS C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.994 cfs
Storm frequency	= 1 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 6,819 cuft
Drainage area	= 6.320 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 34.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



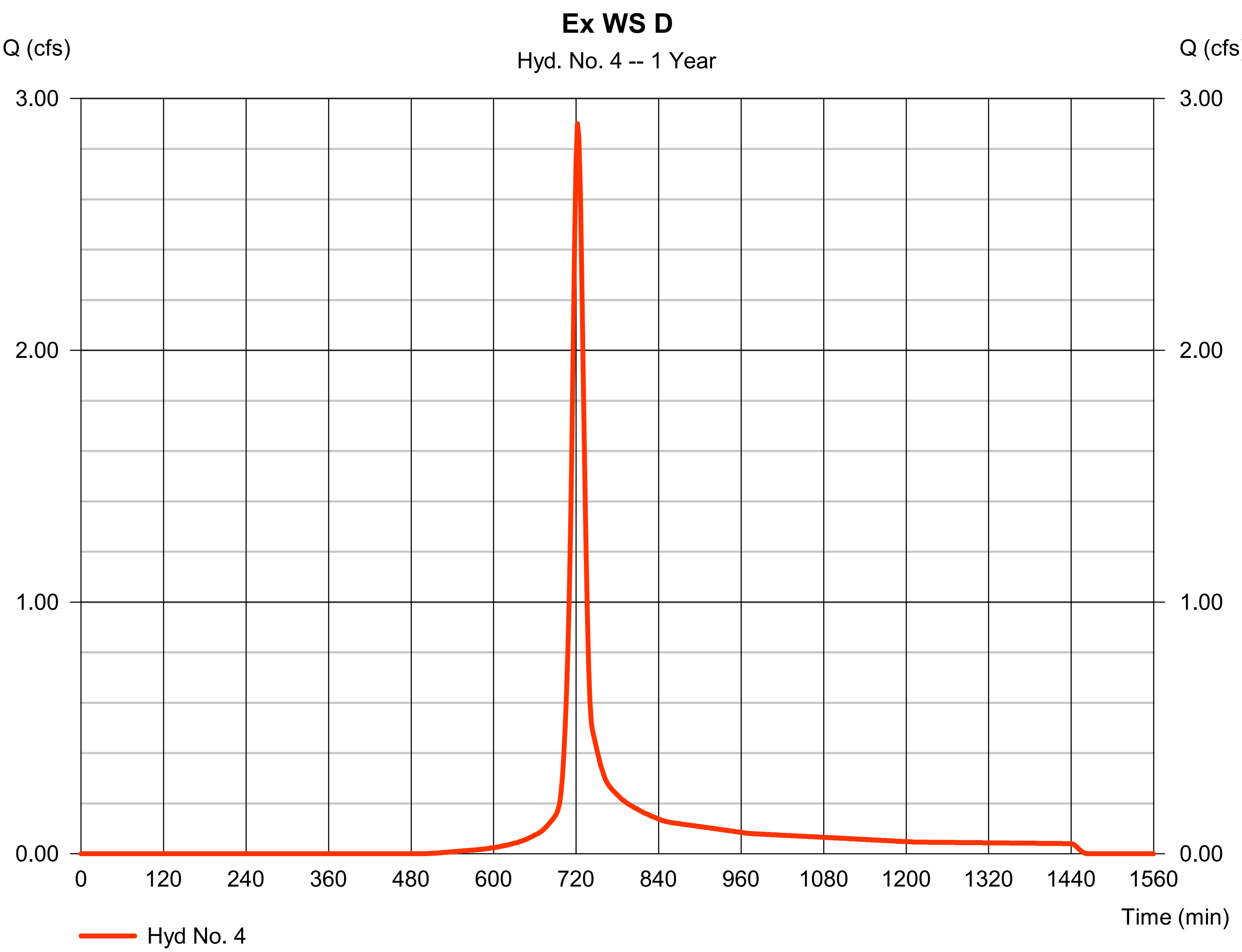
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 4

Ex WS D

Hydrograph type	= SCS Runoff	Peak discharge	= 2.901 cfs
Storm frequency	= 1 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 8,133 cuft
Drainage area	= 2.200 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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	72.28	2	744	425,331	------	------	------	Ex WS A
2	SCS Runoff	8.484	2	732	38,608	------	------	------	Ex WS B
3	SCS Runoff	4.705	2	736	23,226	------	------	------	Ex WS C
4	SCS Runoff	6.100	2	722	17,277	------	------	------	Ex WS D

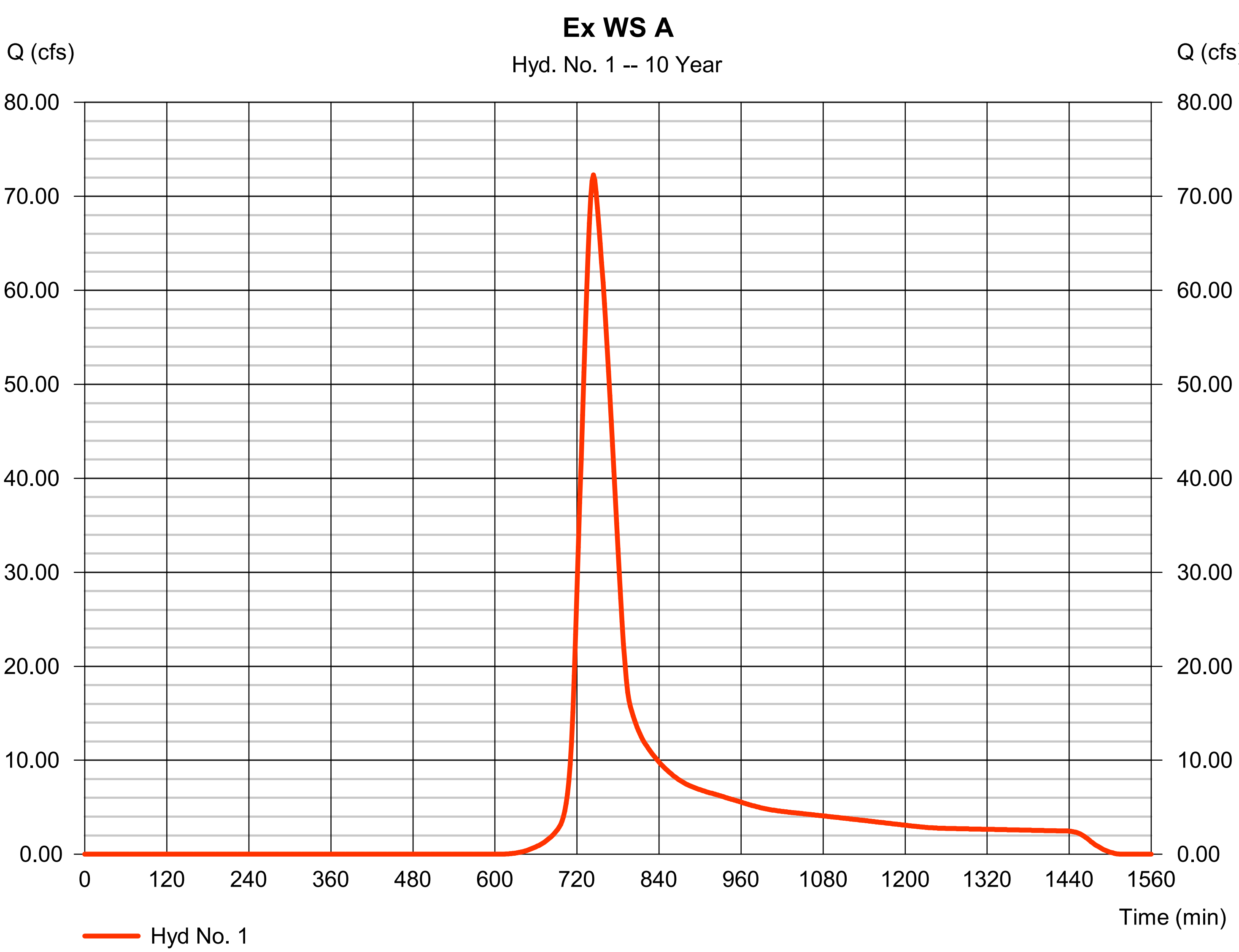
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 1

Ex WS A

Hydrograph type	= SCS Runoff	Peak discharge	= 72.28 cfs
Storm frequency	= 10 yrs	Time to peak	= 744 min
Time interval	= 2 min	Hyd. volume	= 425,331 cuft
Drainage area	= 88.760 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 50.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



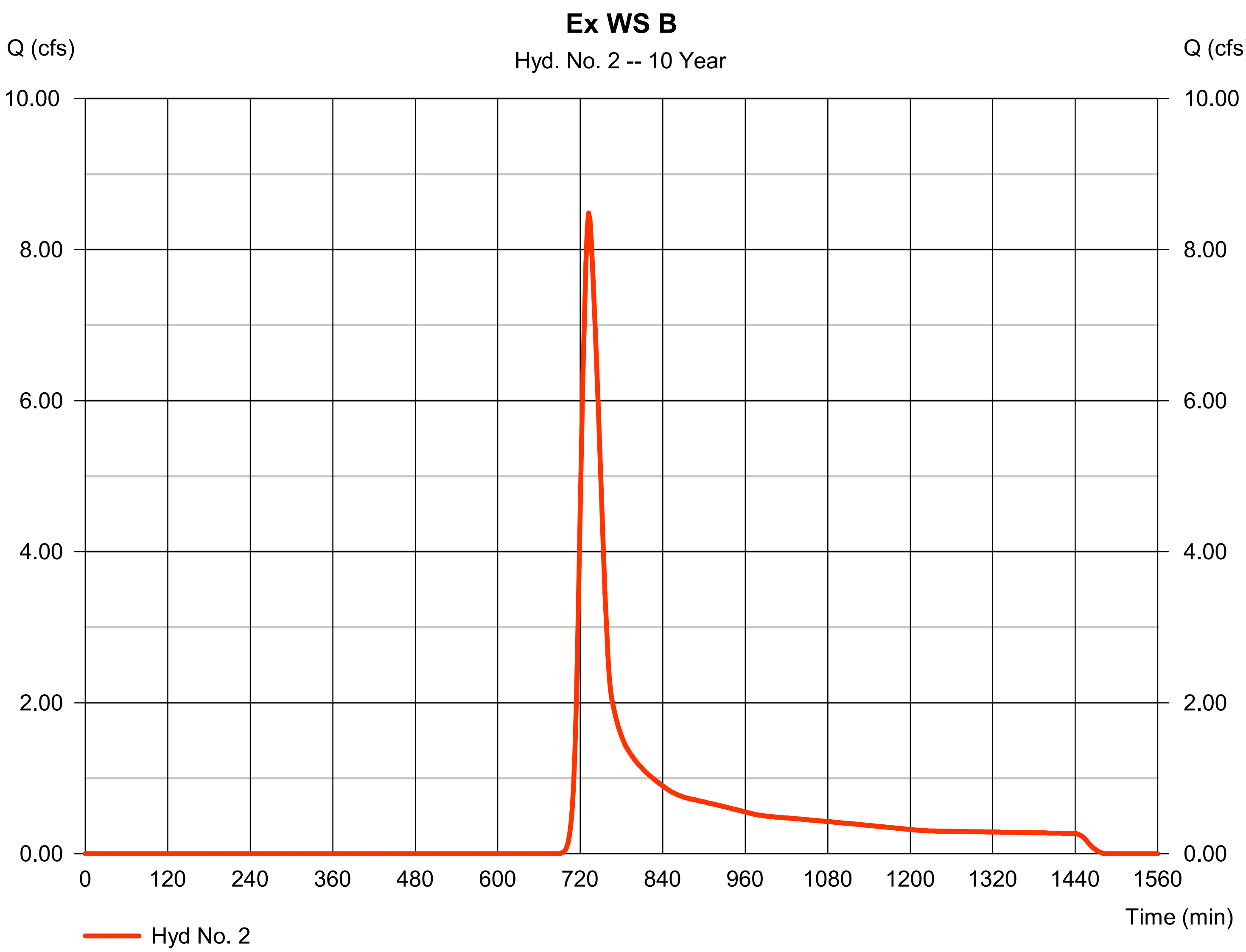
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 2

Ex WS B

Hydrograph type	= SCS Runoff	Peak discharge	= 8.484 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 38,608 cuft
Drainage area	= 12.290 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 27.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



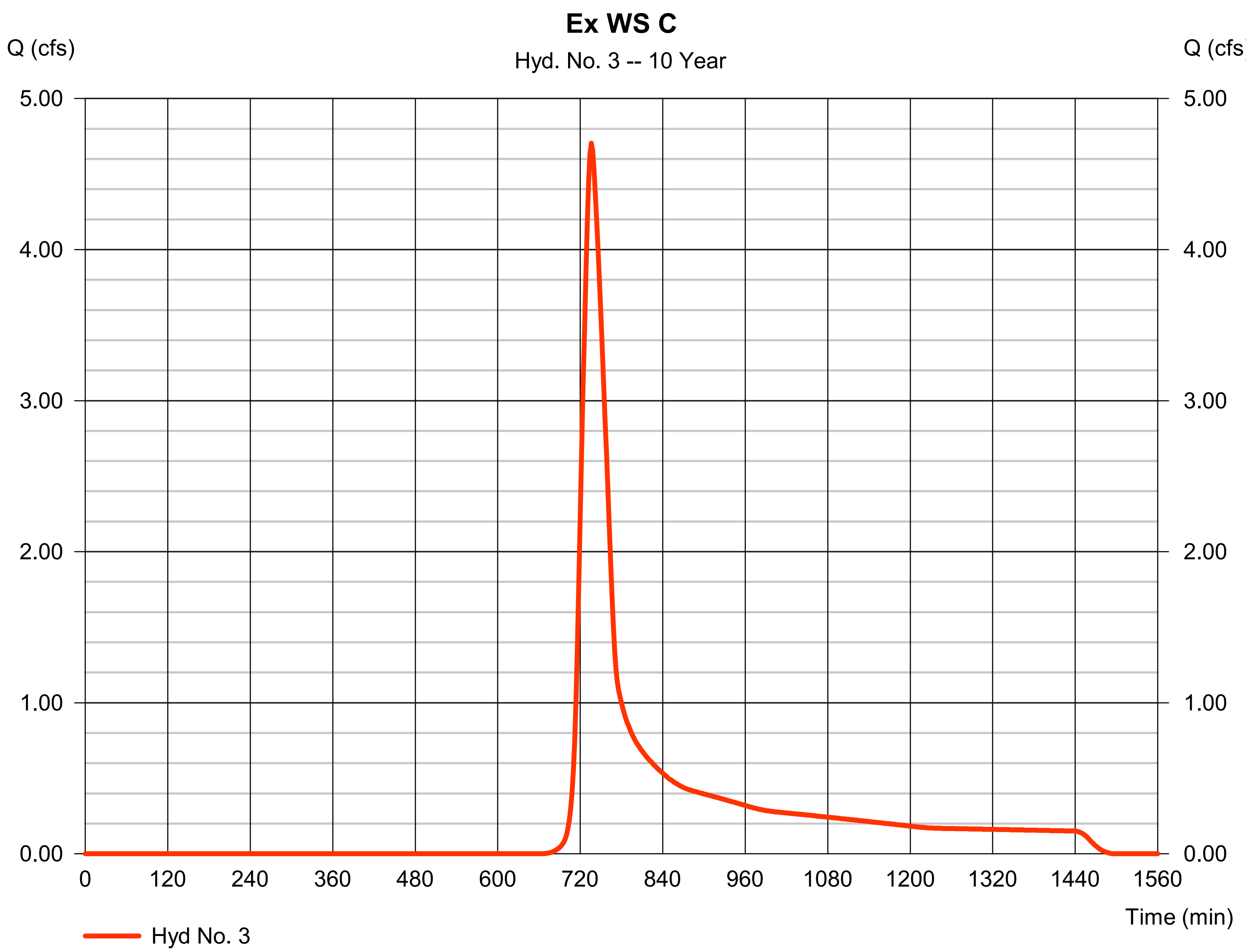
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 3

Ex WS C

Hydrograph type	= SCS Runoff	Peak discharge	= 4.705 cfs
Storm frequency	= 10 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 23,226 cuft
Drainage area	= 6.320 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 34.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



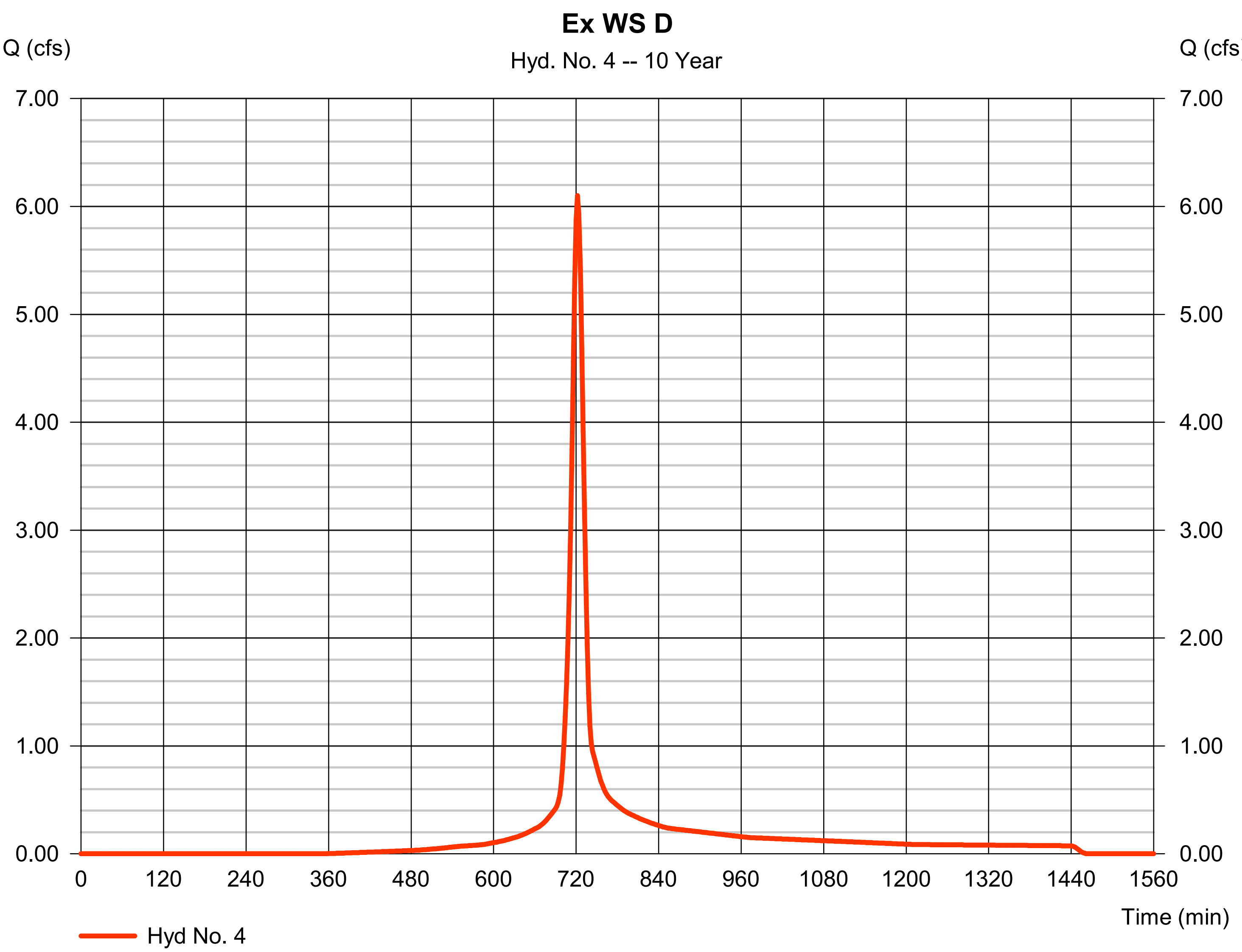
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 4

Ex WS D

Hydrograph type	= SCS Runoff	Peak discharge	= 6.100 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 17,277 cuft
Drainage area	= 2.200 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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	106.33	2	744	611,636	------	------	------	Ex WS A
2	SCS Runoff	14.01	2	732	59,722	------	------	------	Ex WS B
3	SCS Runoff	7.385	2	736	34,876	------	------	------	Ex WS C
4	SCS Runoff	7.963	2	722	22,786	------	------	------	Ex WS D

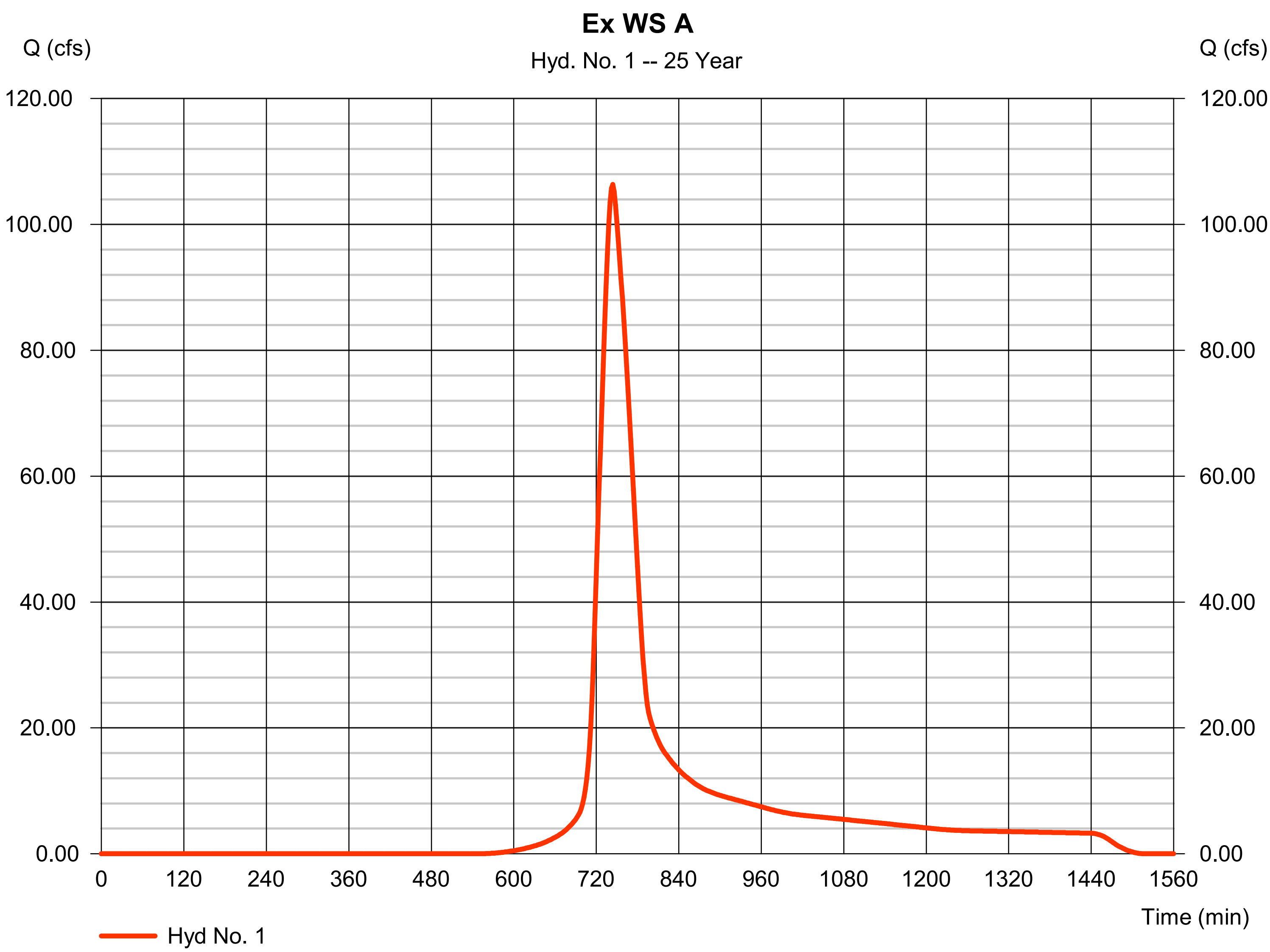
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 1

Ex WS A

Hydrograph type	= SCS Runoff	Peak discharge	= 106.33 cfs
Storm frequency	= 25 yrs	Time to peak	= 744 min
Time interval	= 2 min	Hyd. volume	= 611,636 cuft
Drainage area	= 88.760 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 50.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



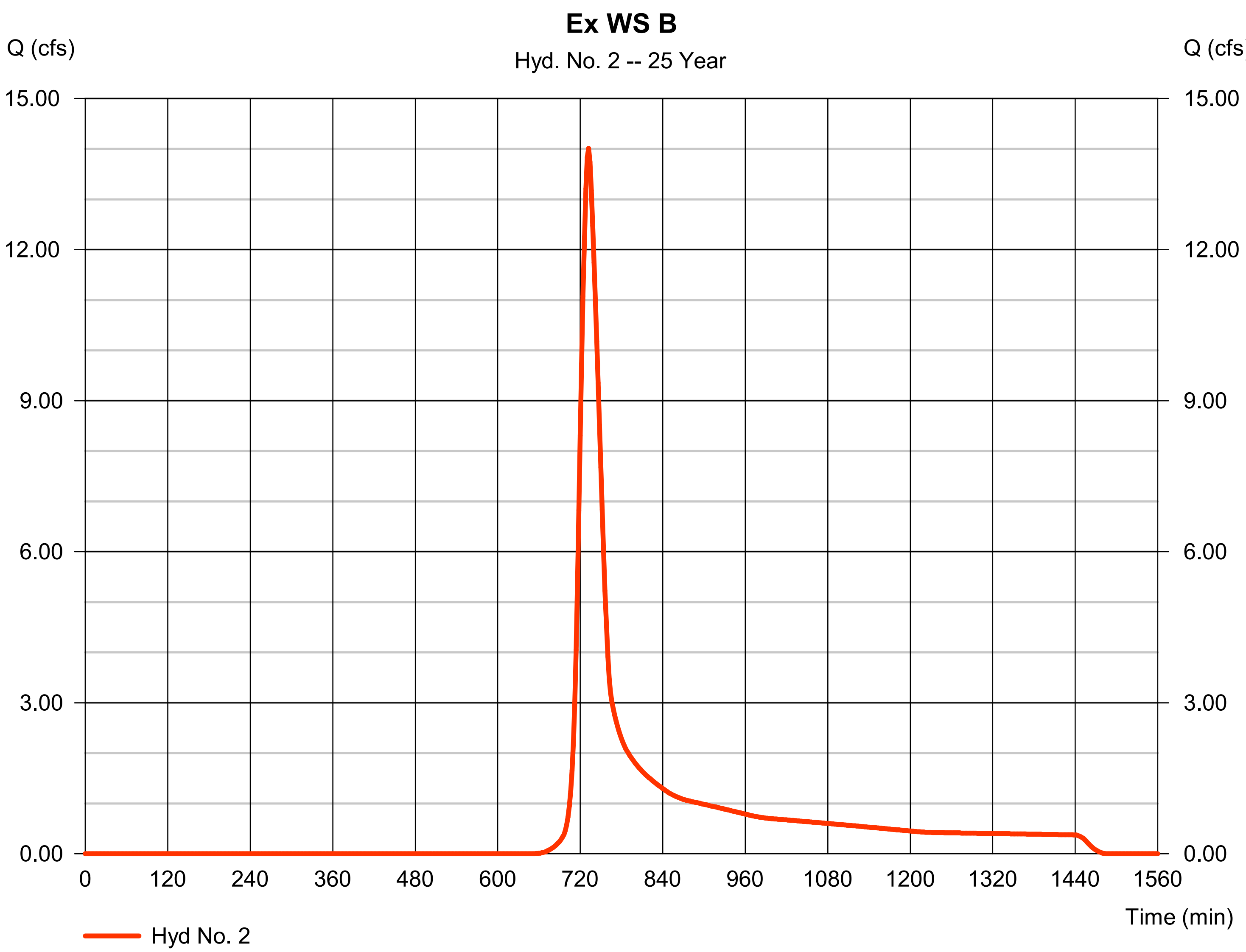
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 2

Ex WS B

Hydrograph type	= SCS Runoff	Peak discharge	= 14.01 cfs
Storm frequency	= 25 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 59,722 cuft
Drainage area	= 12.290 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 27.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



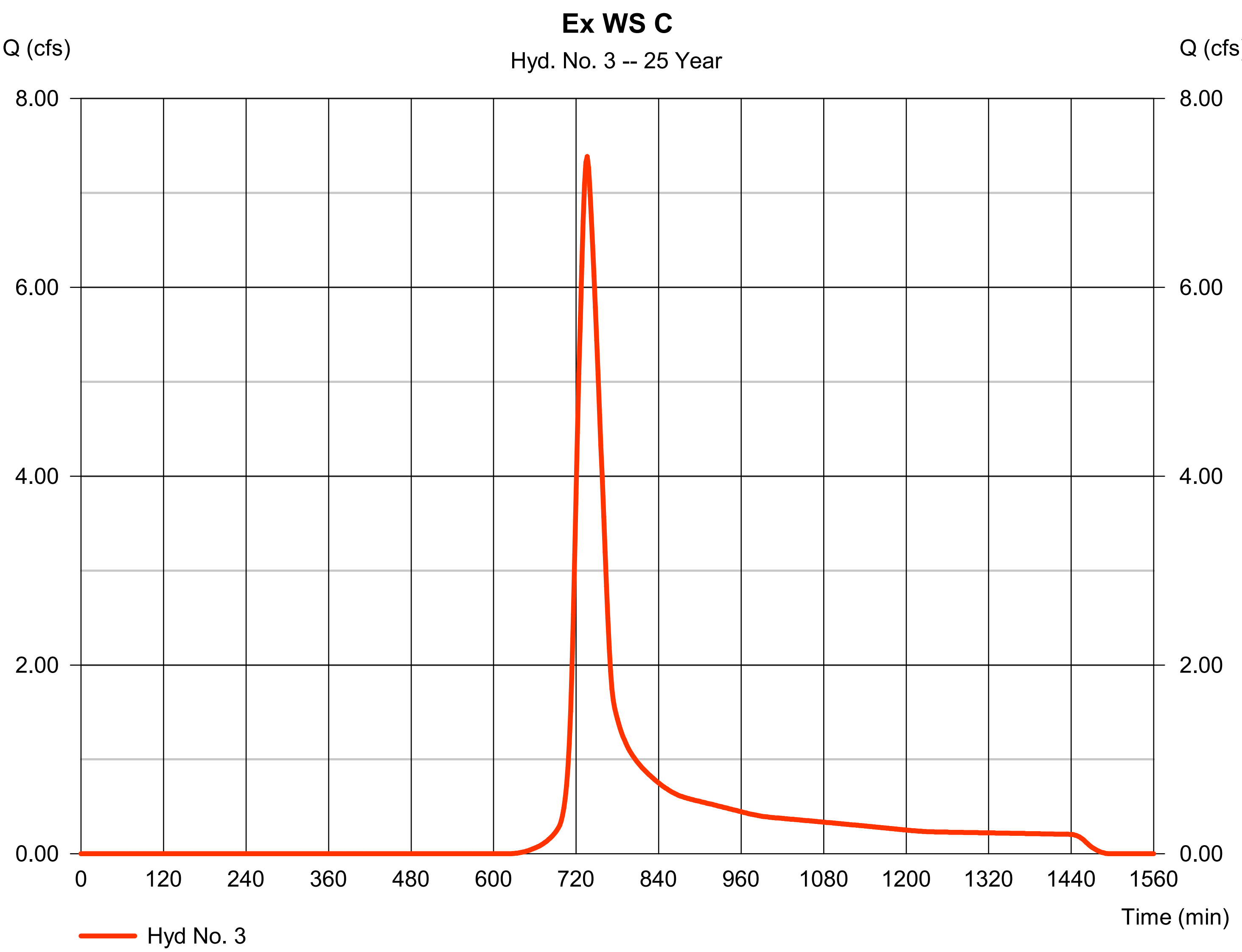
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 3

Ex WS C

Hydrograph type	= SCS Runoff	Peak discharge	= 7.385 cfs
Storm frequency	= 25 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 34,876 cuft
Drainage area	= 6.320 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 34.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



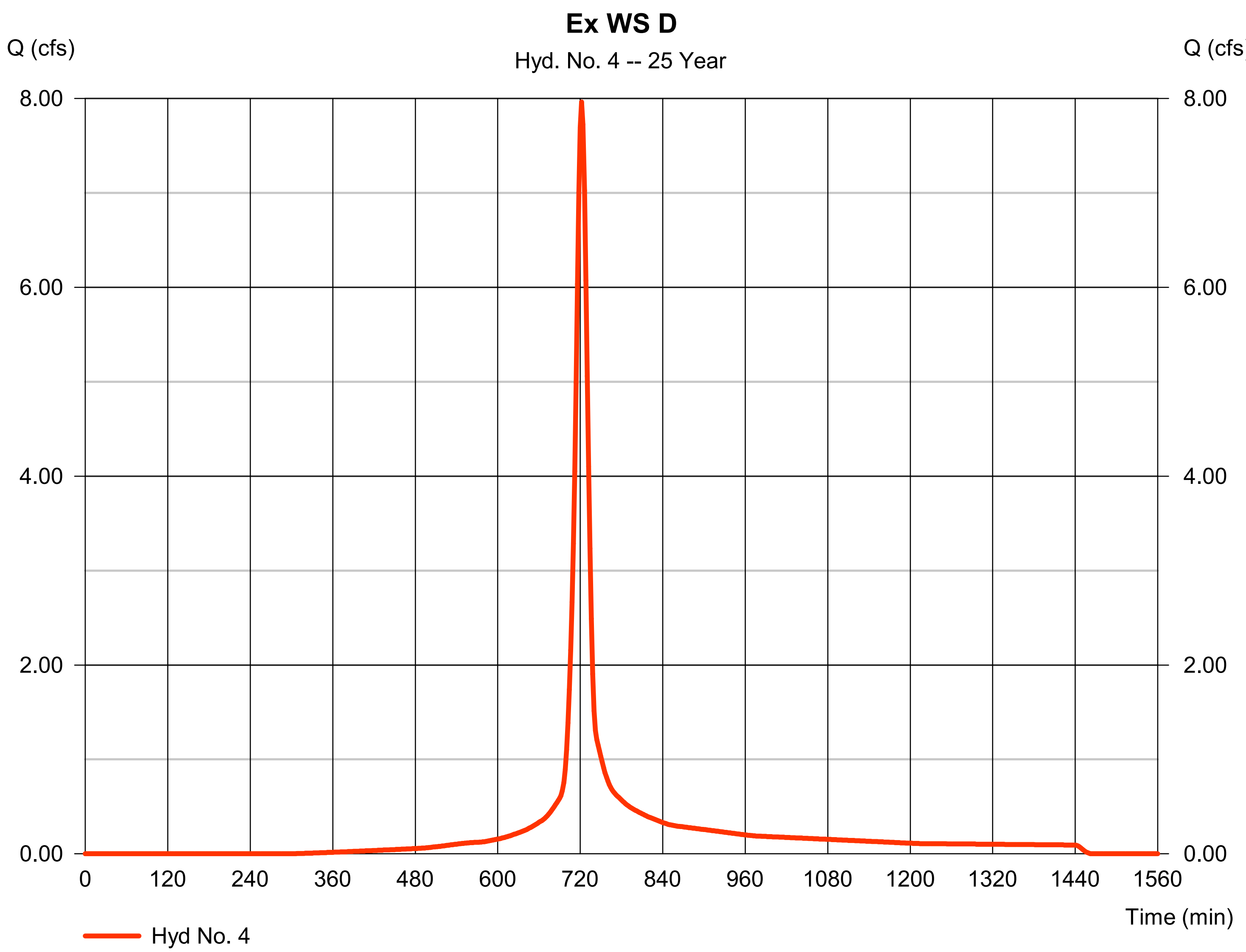
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 4

Ex WS D

Hydrograph type	= SCS Runoff	Peak discharge	= 7.963 cfs
Storm frequency	= 25 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 22,786 cuft
Drainage area	= 2.200 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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	178.51	2	744	1,012,001	------	------	------	Ex WS A
2	SCS Runoff	26.39	2	732	107,592	------	------	------	Ex WS B
3	SCS Runoff	13.26	2	736	60,727	------	------	------	Ex WS C
4	SCS Runoff	11.64	2	722	33,936	------	------	------	Ex WS D

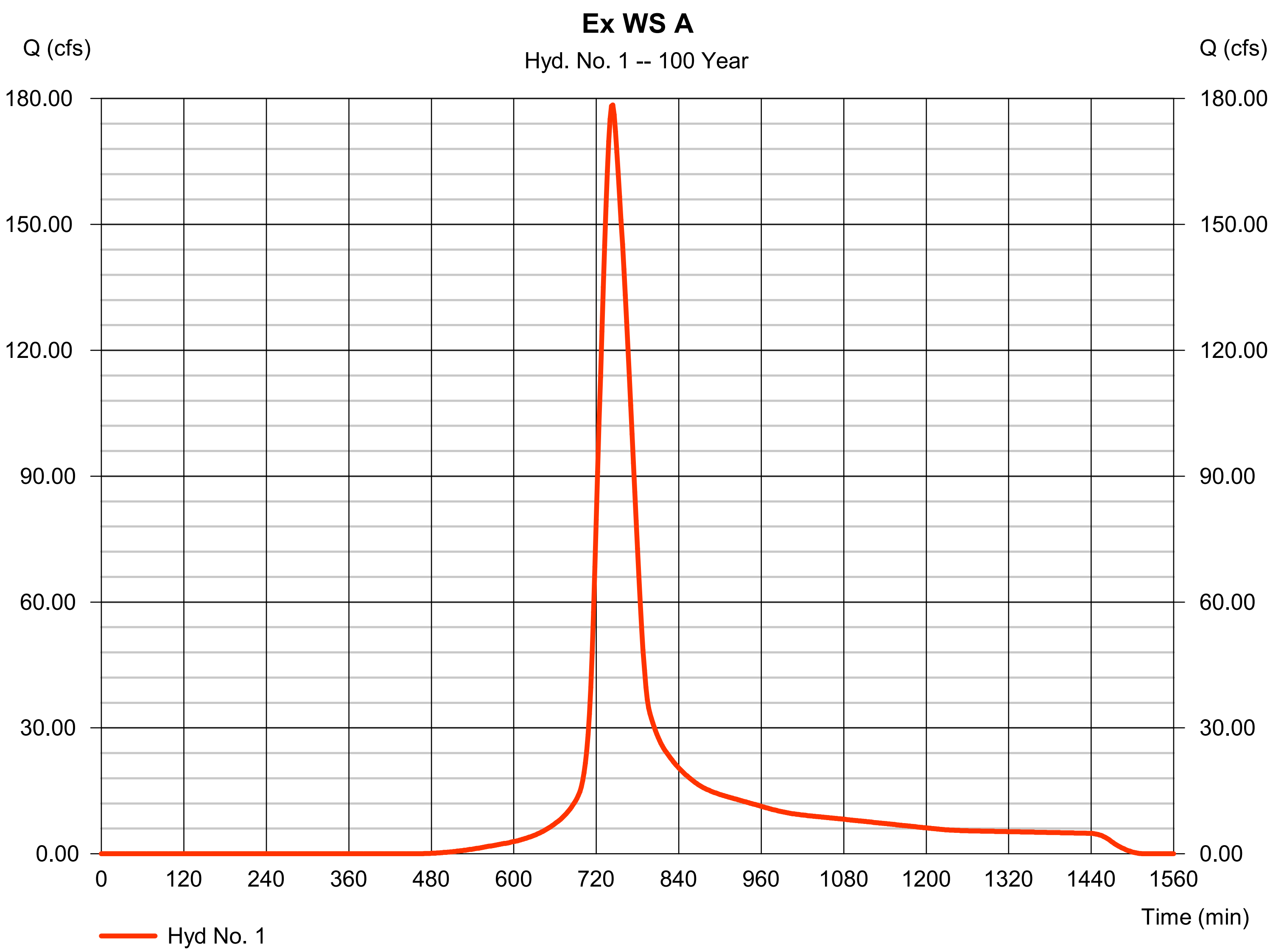
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 1

Ex WS A

Hydrograph type	= SCS Runoff	Peak discharge	= 178.51 cfs
Storm frequency	= 100 yrs	Time to peak	= 744 min
Time interval	= 2 min	Hyd. volume	= 1,012,001 cuft
Drainage area	= 88.760 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 50.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



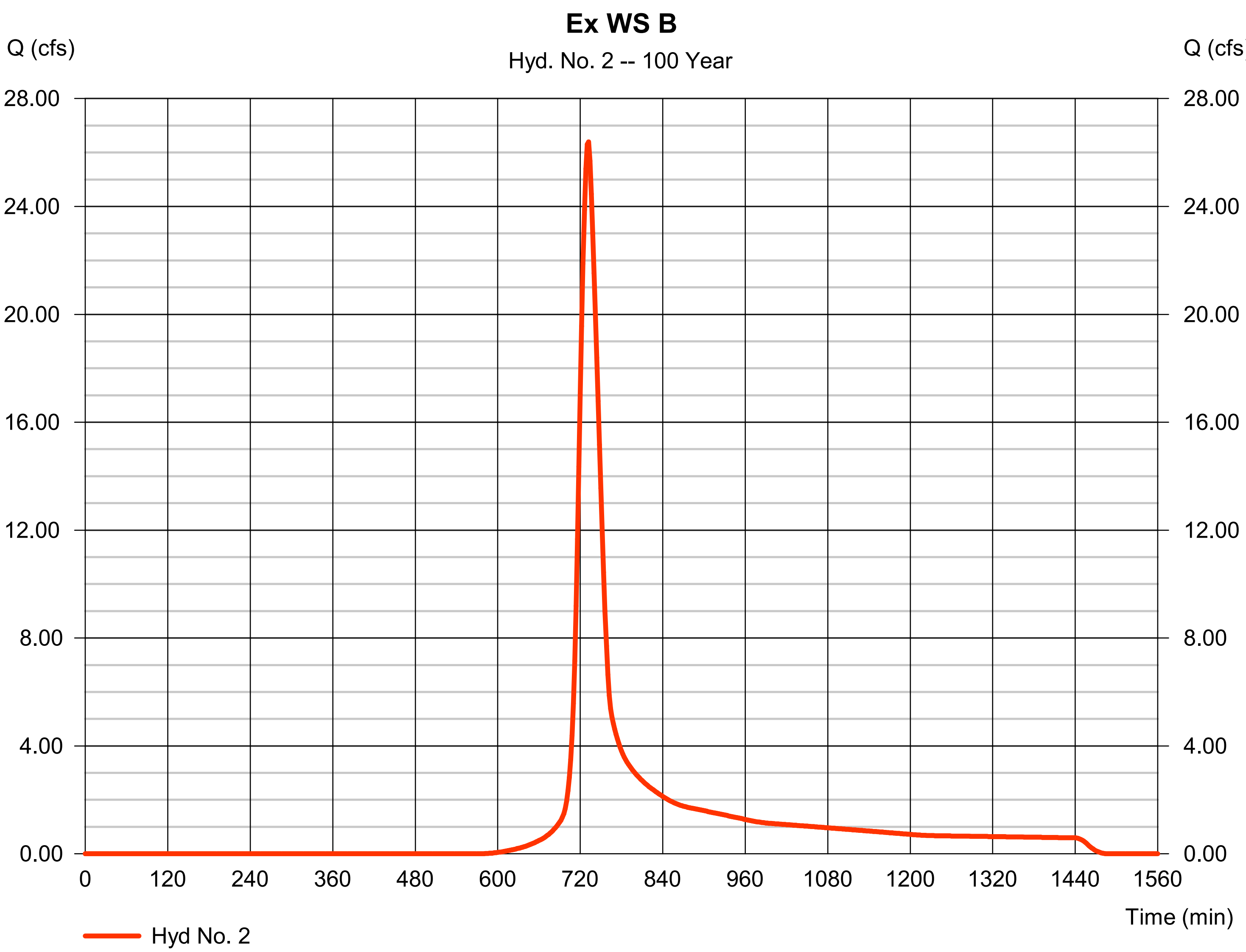
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 2

Ex WS B

Hydrograph type	= SCS Runoff	Peak discharge	= 26.39 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 107,592 cuft
Drainage area	= 12.290 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 27.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



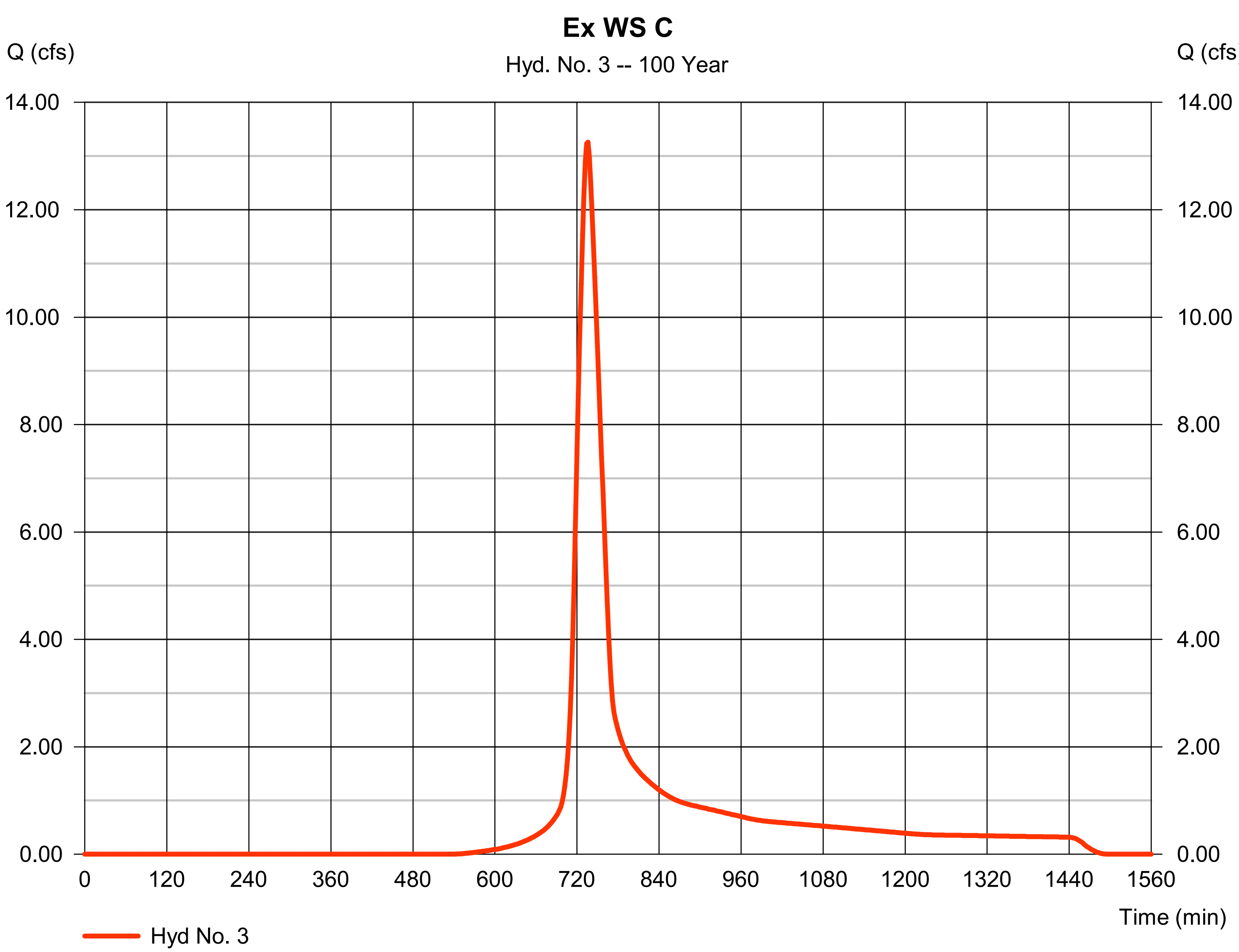
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 3

Ex WS C

Hydrograph type	= SCS Runoff	Peak discharge	= 13.26 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 60,727 cuft
Drainage area	= 6.320 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 34.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



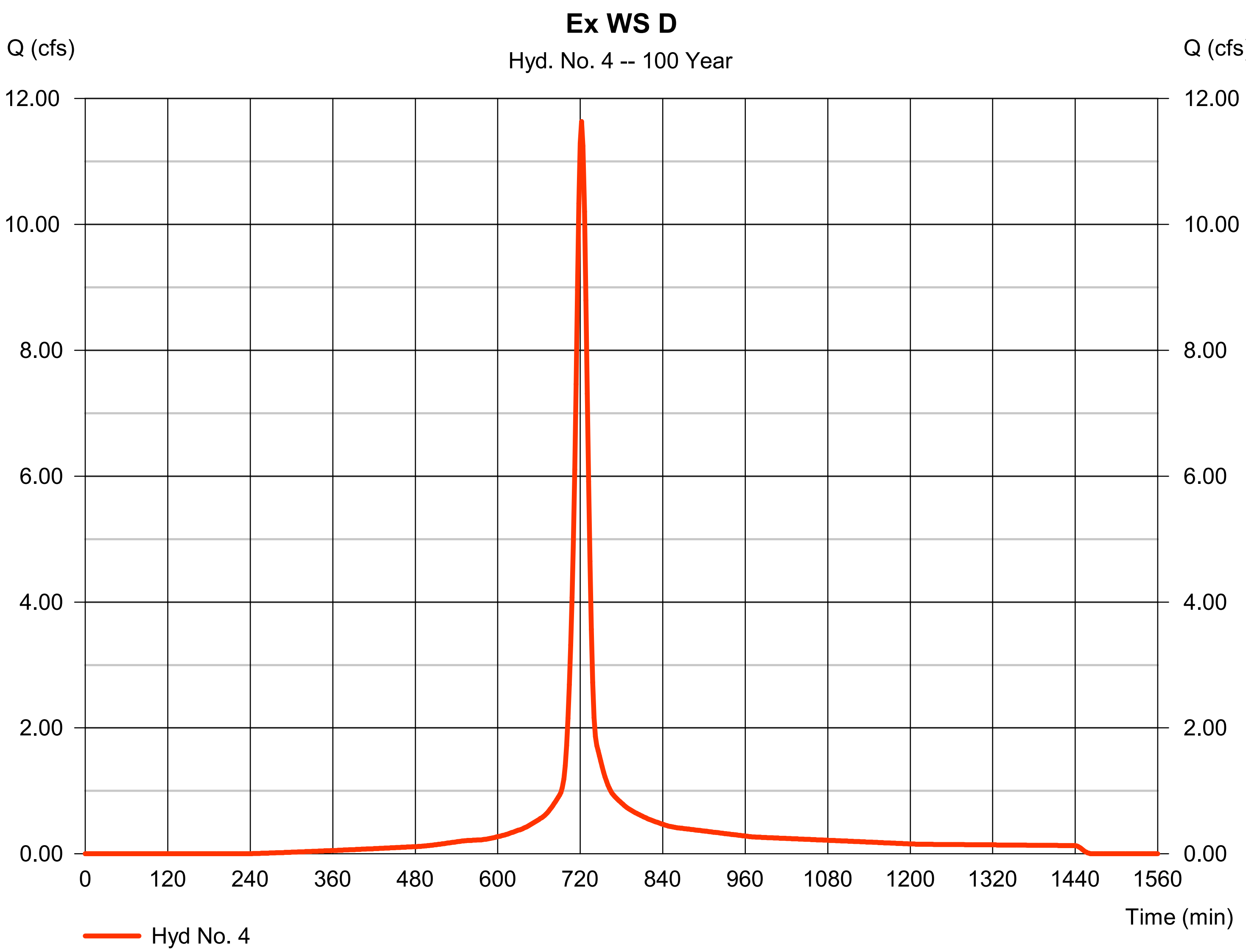
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 4

Ex WS D

Hydrograph type	= SCS Runoff	Peak discharge	= 11.64 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 33,936 cuft
Drainage area	= 2.200 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Appendix H

Post-Development Stormwater Analysis

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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	------	26.28	-------	-------	-------	53.15	68.61	-------	98.93	Pr WS A1
2	Diversion1	1	17.25	-------	-------	-------	17.25	17.25	-------	17.25	A1 to Bio #1
3	Diversion2	1	9.034	-------	-------	-------	35.90	51.36	-------	81.68	A1 to Detention
5	SCS Runoff	------	55.61	-------	-------	-------	102.44	128.93	-------	180.71	Pr WS A2
6	Diversion1	5	38.56	-------	-------	-------	38.56	38.56	-------	38.56	A2 to Bio #2
7	Diversion2	5	17.05	-------	-------	-------	63.88	90.37	-------	142.15	A2 to Detention
9	SCS Runoff	------	18.24	-------	-------	-------	37.08	47.94	-------	69.26	Pr WS A3
10	Diversion1	9	18.24	-------	-------	-------	21.66	21.66	-------	21.66	A3 to Bio #3
11	Diversion2	9	0.000	-------	-------	-------	15.42	26.28	-------	47.60	A3 to Detention
13	SCS Runoff	------	9.026	-------	-------	-------	23.15	32.00	-------	50.01	Pr WS A4
14	Diversion1	13	9.026	-------	-------	-------	17.25	17.25	-------	17.25	A4 to Bio #4
15	Diversion2	13	0.000	-------	-------	-------	5.904	14.75	-------	32.76	A4 to Detention
17	SCS Runoff	------	2.122	-------	-------	-------	7.094	10.38	-------	17.39	Pr WS A5
18	Reach	17	2.129	-------	-------	-------	7.104	10.44	-------	17.48	PR Reach A5
19	SCS Runoff	------	2.217	-------	-------	-------	6.950	10.07	-------	16.64	Pr WS A6
20	Combine	18, 19	4.259	-------	-------	-------	13.84	20.22	-------	33.67	Combine
21	Reach	20	4.240	-------	-------	-------	13.85	20.25	-------	33.73	PR Reach A6
22	SCS Runoff	------	0.971	-------	-------	-------	6.203	10.20	-------	19.13	Pr WS A7
24	Reservoir	2	3.078	-------	-------	-------	11.87	14.45	-------	15.94	Bio A1
25	Reservoir	6	13.33	-------	-------	-------	25.88	27.14	-------	27.90	Bio A2
26	Reservoir	10	0.936	-------	-------	-------	8.284	12.43	-------	17.25	Bio A3
27	Reservoir	14	1.279	-------	-------	-------	13.01	15.62	-------	16.86	Bio A4
29	Combine	3, 7, 11,	19.00	-------	-------	-------	102.56	152.20	-------	249.39	A1+A2+A3 Bypass
30	Combine	24, 25, 26,	16.68	-------	-------	-------	43.65	52.02	-------	60.05	A1+A2+A3 thru Bioretention
31	Combine	29, 30	22.91	-------	-------	-------	129.84	192.35	-------	303.21	A1 + A2 + A3
32	Reservoir	31	4.034	-------	-------	-------	35.25	74.67	-------	115.23	Wet Pond #1
34	Combine	15, 27,	1.279	-------	-------	-------	13.01	24.24	-------	47.03	A4
35	Reservoir	34	0.101	-------	-------	-------	2.367	7.742	-------	24.15	North Detention
37	Combine	21, 22, 32, 35,	5.208	-------	-------	-------	49.64	104.84	-------	167.43	Total WS A

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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	
39	SCS Runoff	------	0.695	-------	-------	-------	5.777	9.983	-------	19.57	Pr WS B
40	SCS Runoff	------	0.994	-------	-------	-------	4.705	7.385	-------	13.26	Pr WS C
41	SCS Runoff	------	0.310	-------	-------	-------	0.913	1.307	-------	2.127	Pr WS D

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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	26.28	2	716	53,276	------	------	------	Pr WS A1
2	Diversion1	17.25	2	712	50,023	1	------	------	A1 to Bio #1
3	Diversion2	9.034	2	716	3,253	1	------	------	A1 to Detention
5	SCS Runoff	55.61	2	722	158,709	------	------	------	Pr WS A2
6	Diversion1	38.56	2	716	149,610	5	------	------	A2 to Bio #2
7	Diversion2	17.05	2	722	9,099	5	------	------	A2 to Detention
9	SCS Runoff	18.24	2	718	41,784	------	------	------	Pr WS A3
10	Diversion1	18.24	2	718	41,784	9	------	------	A3 to Bio #3
11	Diversion2	0.000	2	n/a	0	9	------	------	A3 to Detention
13	SCS Runoff	9.026	2	736	43,143	------	------	------	Pr WS A4
14	Diversion1	9.026	2	736	43,143	13	------	------	A4 to Bio #4
15	Diversion2	0.000	2	n/a	0	13	------	------	A4 to Detention
17	SCS Runoff	2.122	2	732	10,162	------	------	------	Pr WS A5
18	Reach	2.129	2	734	10,160	17	------	------	PR Reach A5
19	SCS Runoff	2.217	2	730	9,352	------	------	------	Pr WS A6
20	Combine	4.259	2	732	19,511	18, 19	------	------	Combine
21	Reach	4.240	2	734	19,511	20	------	------	PR Reach A6
22	SCS Runoff	0.971	2	732	6,646	------	------	------	Pr WS A7
24	Reservoir	3.078	2	738	47,727	2	405.89	23,516	Bio A1
25	Reservoir	13.33	2	738	140,421	6	401.89	73,290	Bio A2
26	Reservoir	0.936	2	798	40,720	10	409.04	25,021	Bio A3
27	Reservoir	1.279	2	804	43,088	14	403.32	21,817	Bio A4
29	Combine	19.00	2	718	12,352	3, 7, 11,	------	------	A1+A2+A3 Bypass
30	Combine	16.68	2	738	228,867	24, 25, 26,	------	------	A1+A2+A3 thru Bioretention
31	Combine	22.91	2	724	241,220	29, 30	------	------	A1 + A2 + A3
32	Reservoir	4.034	2	892	162,497	31	402.28	163,825	Wet Pond #1
34	Combine	1.279	2	804	43,088	15, 27,	------	------	A4
35	Reservoir	0.101	2	2638	7,320	34	402.83	37,545	North Detention
37	Combine	5.208	2	734	195,975	21, 22, 32, 35,	------	------	Total WS A

Proposed Hydrographs.gpw	Return Period: 1 Year	Tuesday, 10 / 1 / 2019

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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
39	SCS Runoff	0.695	2	738	6,448	------	------	------	Pr WS B
40	SCS Runoff	0.994	2	738	6,819	------	------	------	Pr WS C
41	SCS Runoff	0.310	2	726	1,067	------	------	------	Pr WS D

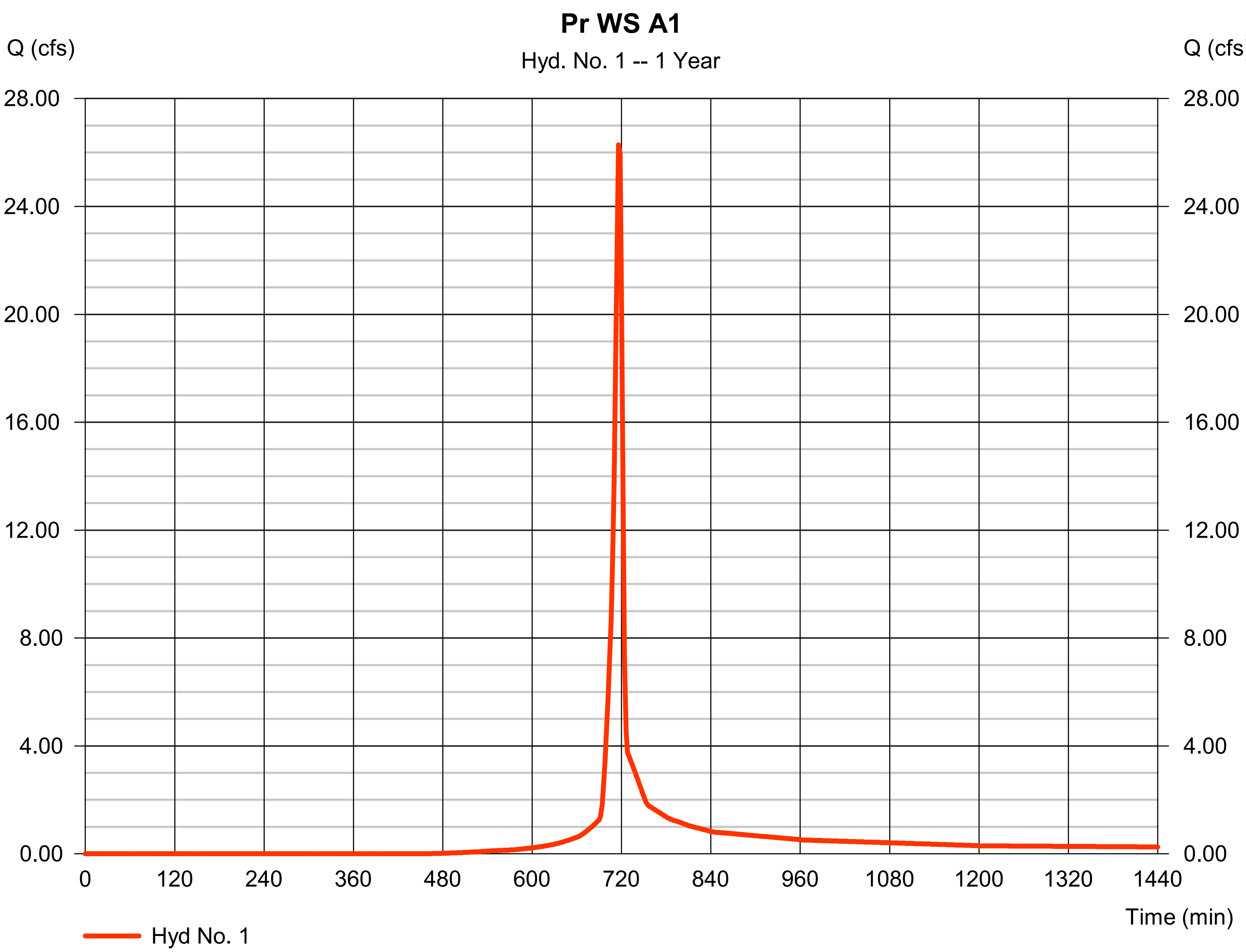
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 1

Pr WS A1

Hydrograph type	= SCS Runoff	Peak discharge	= 26.28 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 53,276 cuft
Drainage area	= 14.090 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



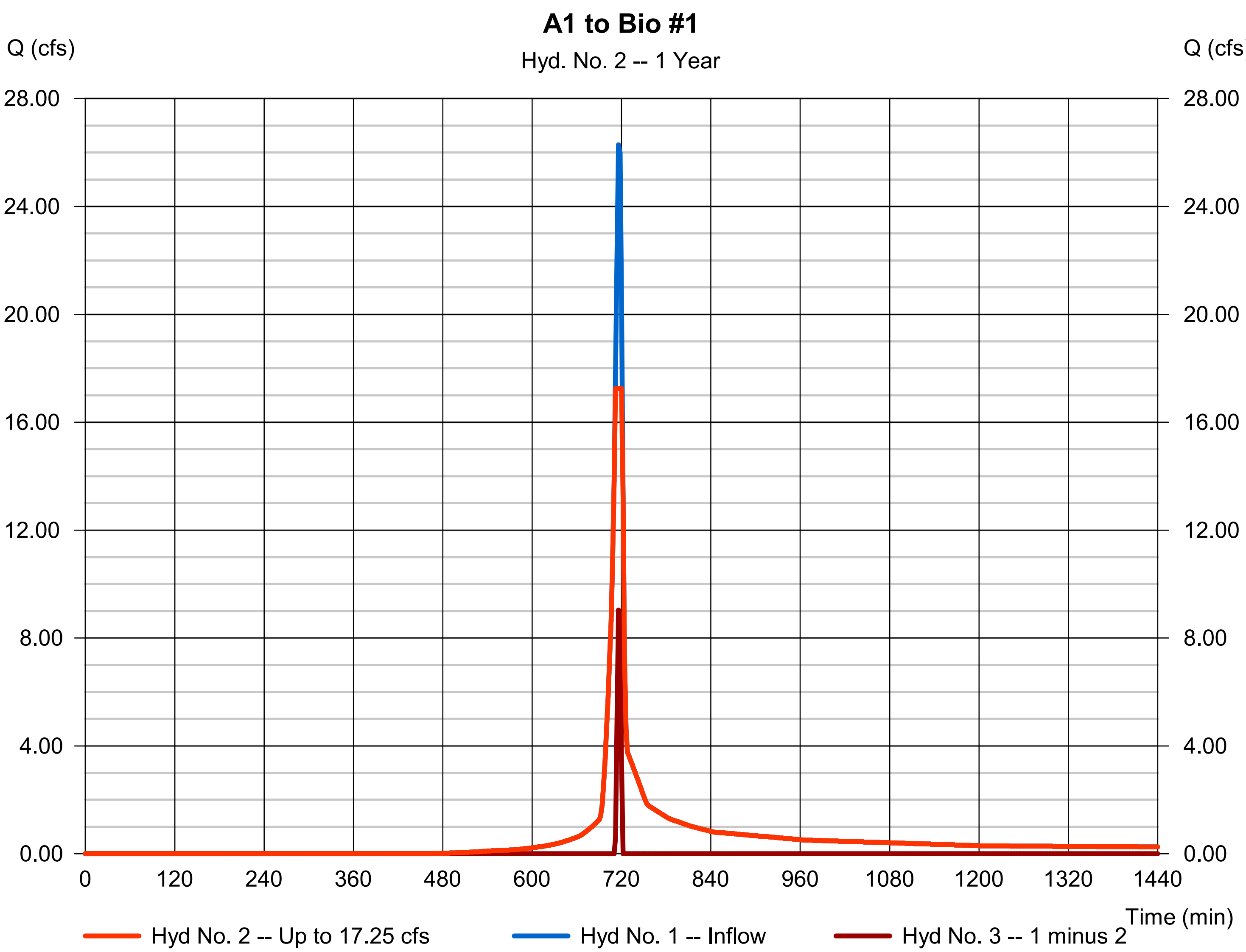
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 2

A1 to Bio #1

Hydrograph type	= Diversion1	Peak discharge	= 17.25 cfs
Storm frequency	= 1 yrs	Time to peak	= 712 min
Time interval	= 2 min	Hyd. volume	= 50,023 cuft
Inflow hydrograph	= 1 - Pr WS A1	2nd diverted hyd.	= 3
Diversion method	= Constant Q	Constant Q	= 17.25 cfs

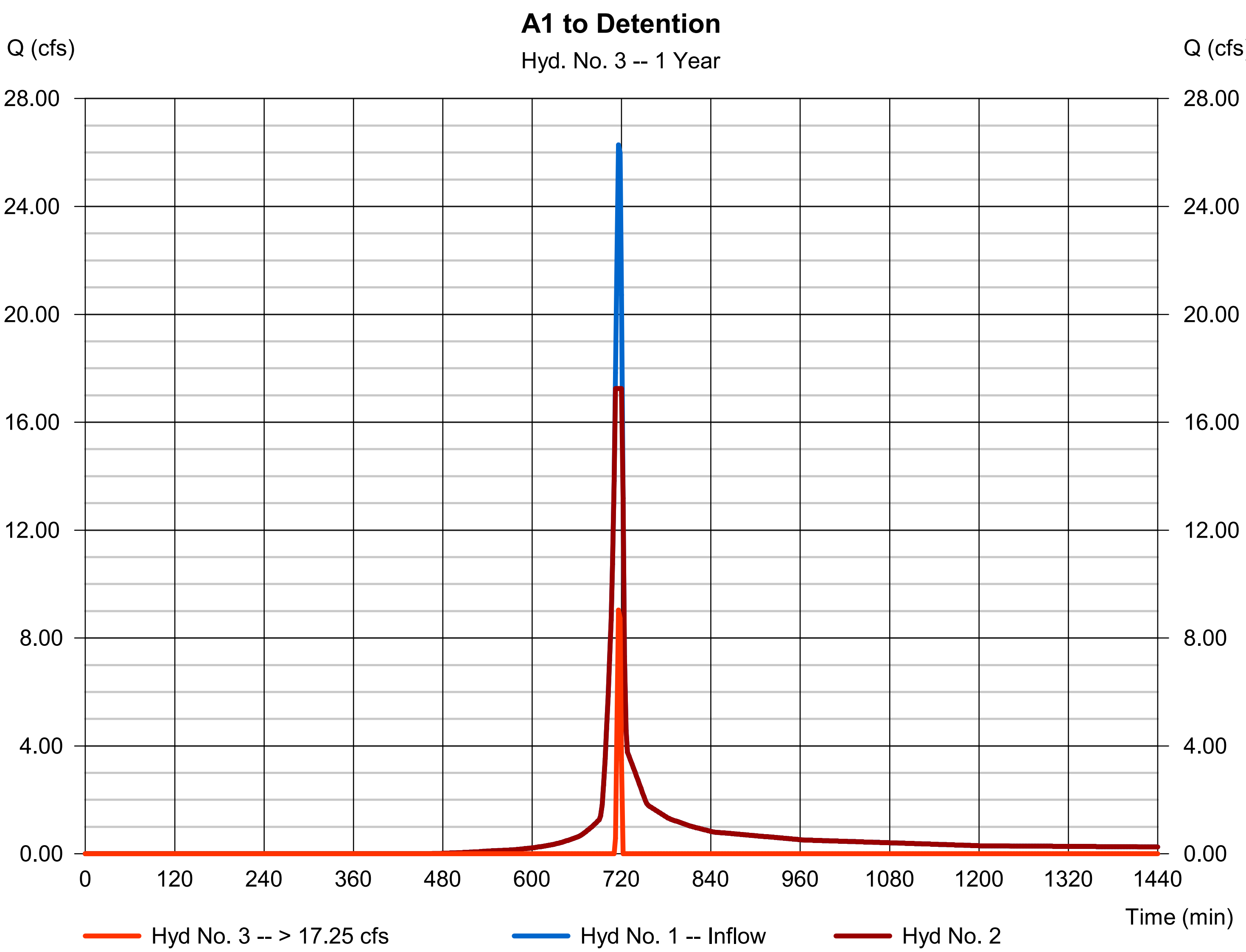


Hydrograph Report

Hyd. No. 3

A1 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 9.034 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 3,253 cuft
Inflow hydrograph	= 1 - Pr WS A1	2nd diverted hyd.	= 2
Diversion method	= Constant Q	Constant Q	= 17.25 cfs



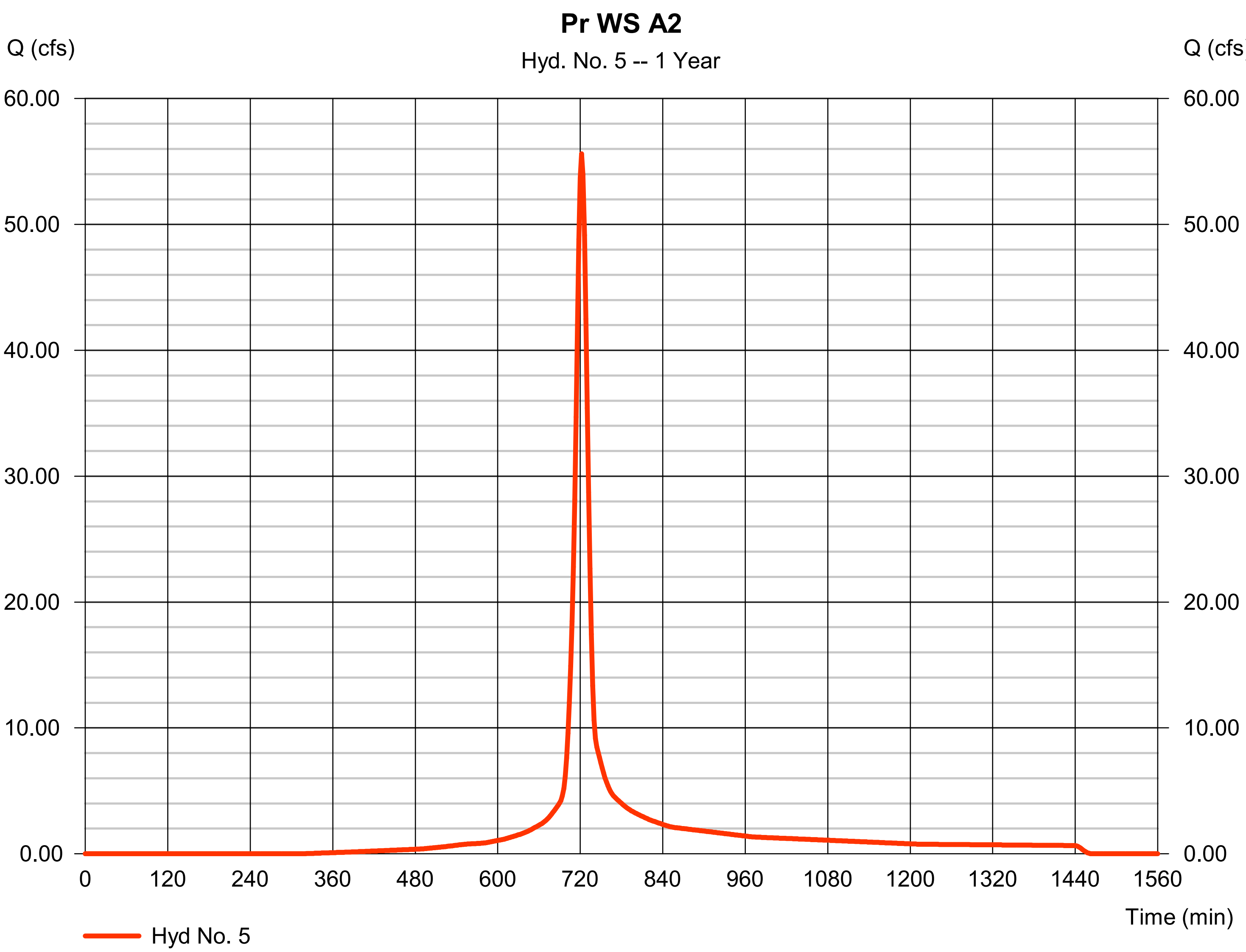
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 5

Pr WS A2

Hydrograph type	= SCS Runoff	Peak discharge	= 55.61 cfs
Storm frequency	= 1 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 158,709 cuft
Drainage area	= 31.690 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



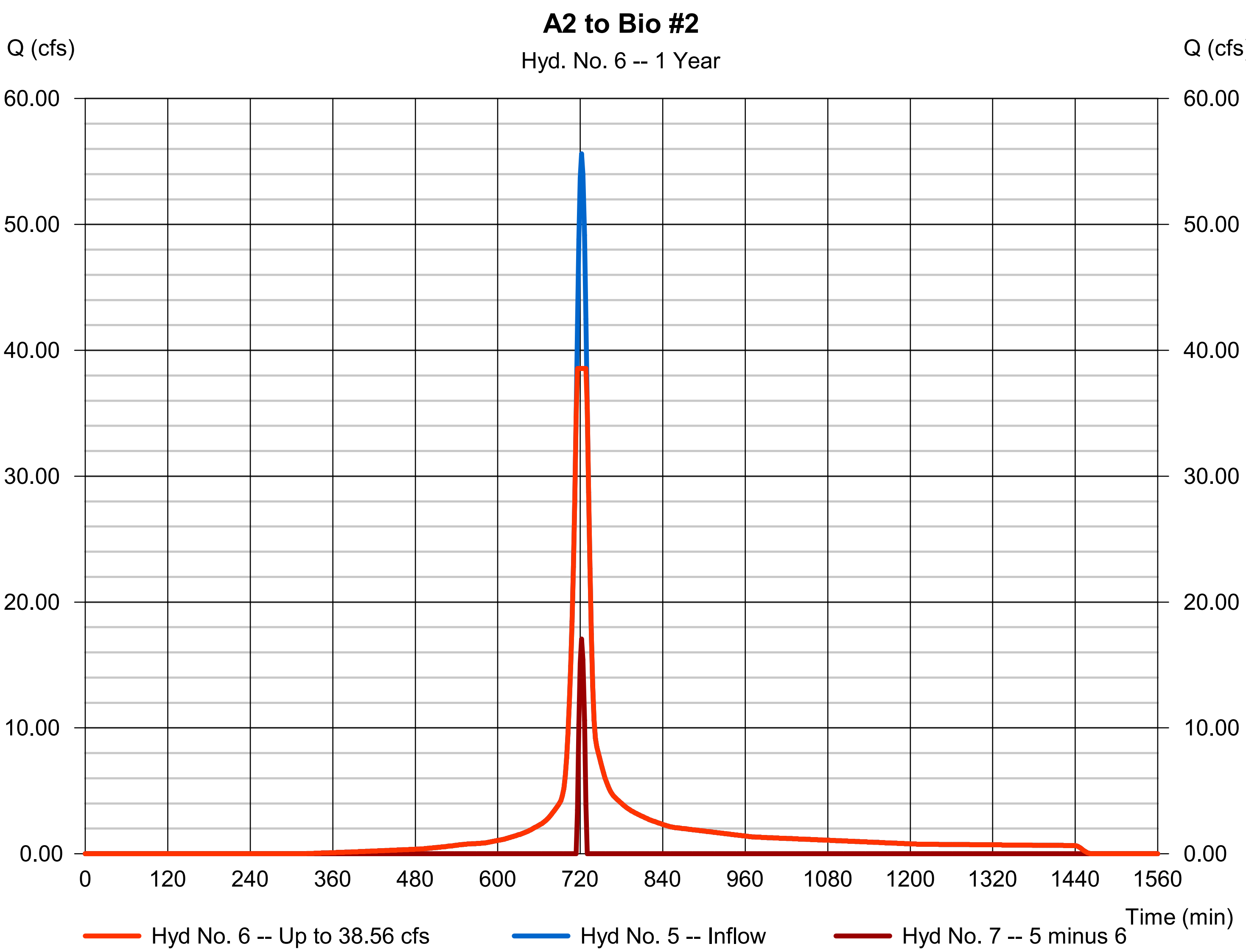
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 6

A2 to Bio #2

Hydrograph type	= Diversion1	Peak discharge	= 38.56 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 149,610 cuft
Inflow hydrograph	= 5 - Pr WS A2	2nd diverted hyd.	= 7
Diversion method	= Constant Q	Constant Q	= 38.56 cfs



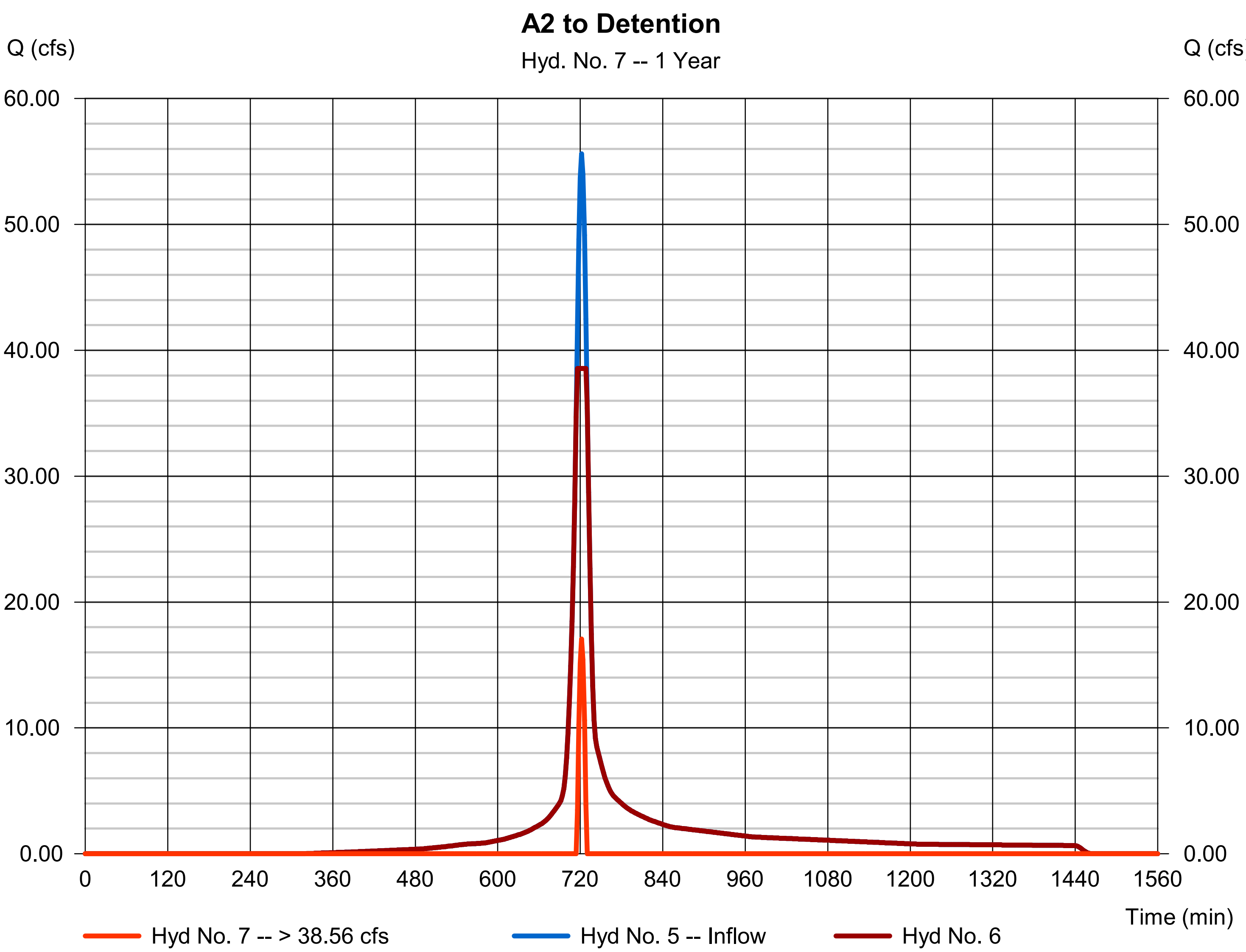
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 | Tuesday, 10 / 1 / 2019

Hyd. No. 7

A2 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 17.05 cfs
Storm frequency	= 1 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 9,099 cuft
Inflow hydrograph	= 5 - Pr WS A2	2nd diverted hyd.	= 6
Diversion method	= Constant Q	Constant Q	= 38.56 cfs



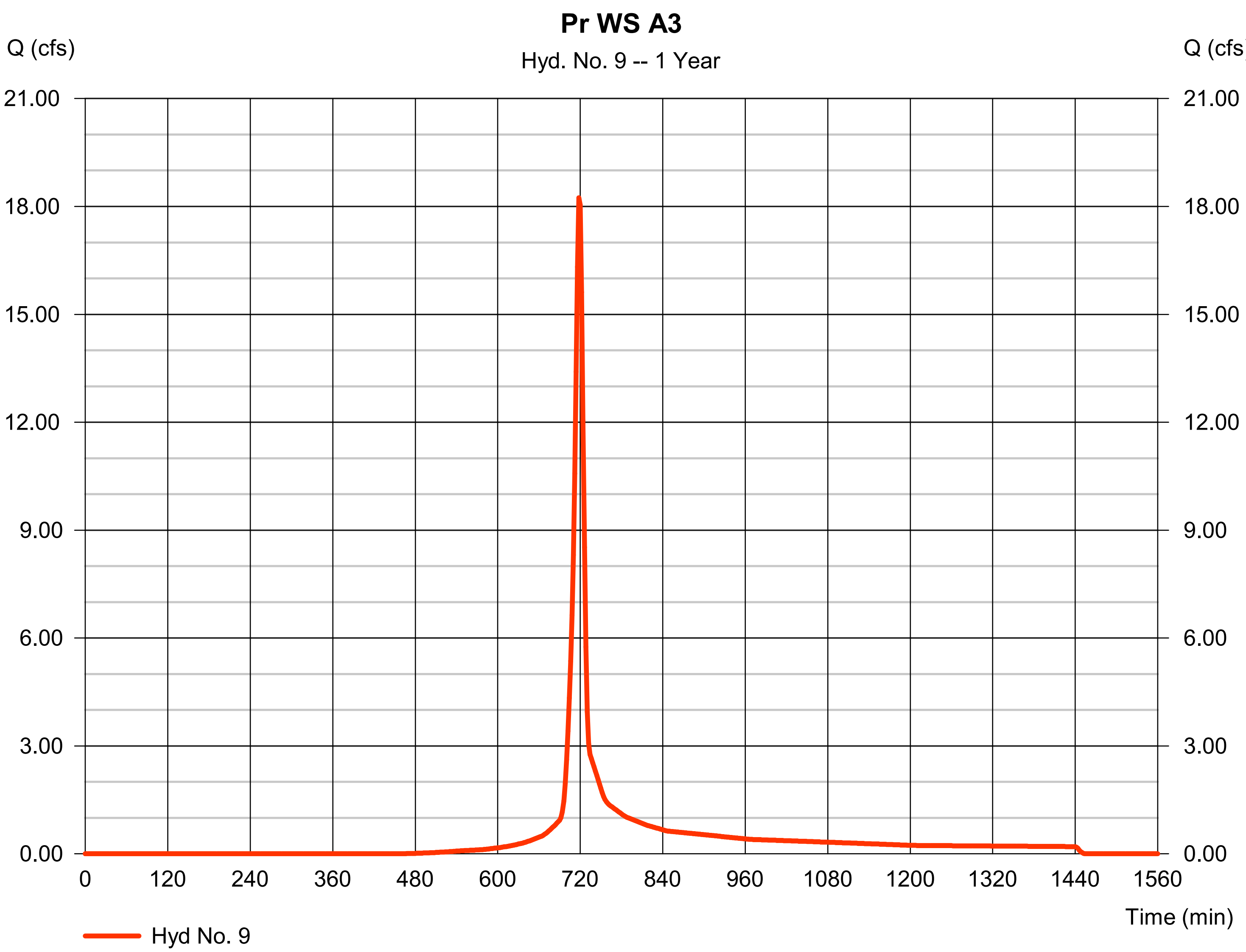
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 9

Pr WS A3

Hydrograph type	= SCS Runoff	Peak discharge	= 18.24 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 41,784 cuft
Drainage area	= 10.360 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



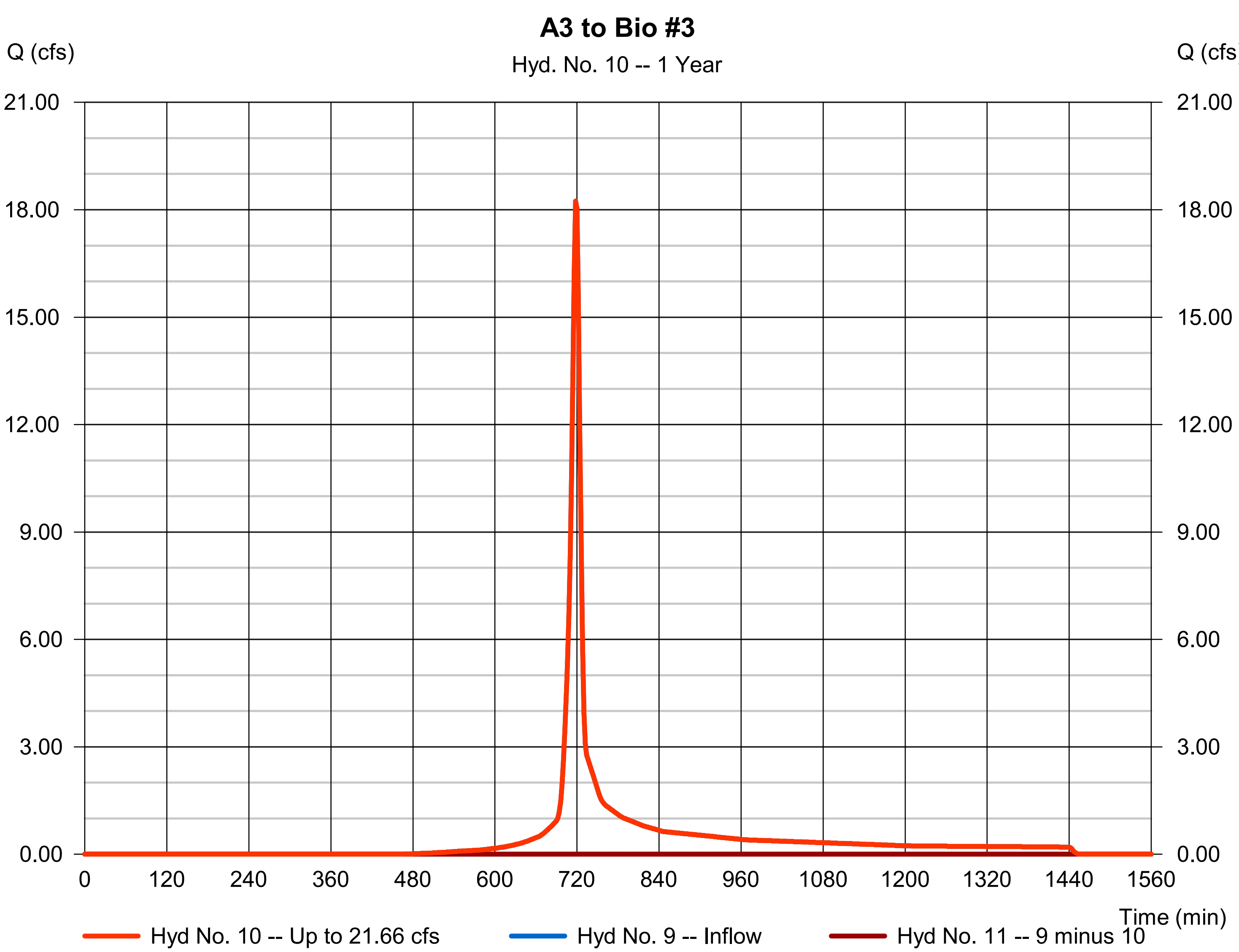
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 10

A3 to Bio #3

Hydrograph type	= Diversion1	Peak discharge	= 18.24 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 41,784 cuft
Inflow hydrograph	= 9 - Pr WS A3	2nd diverted hyd.	= 11
Diversion method	= Constant Q	Constant Q	= 21.66 cfs



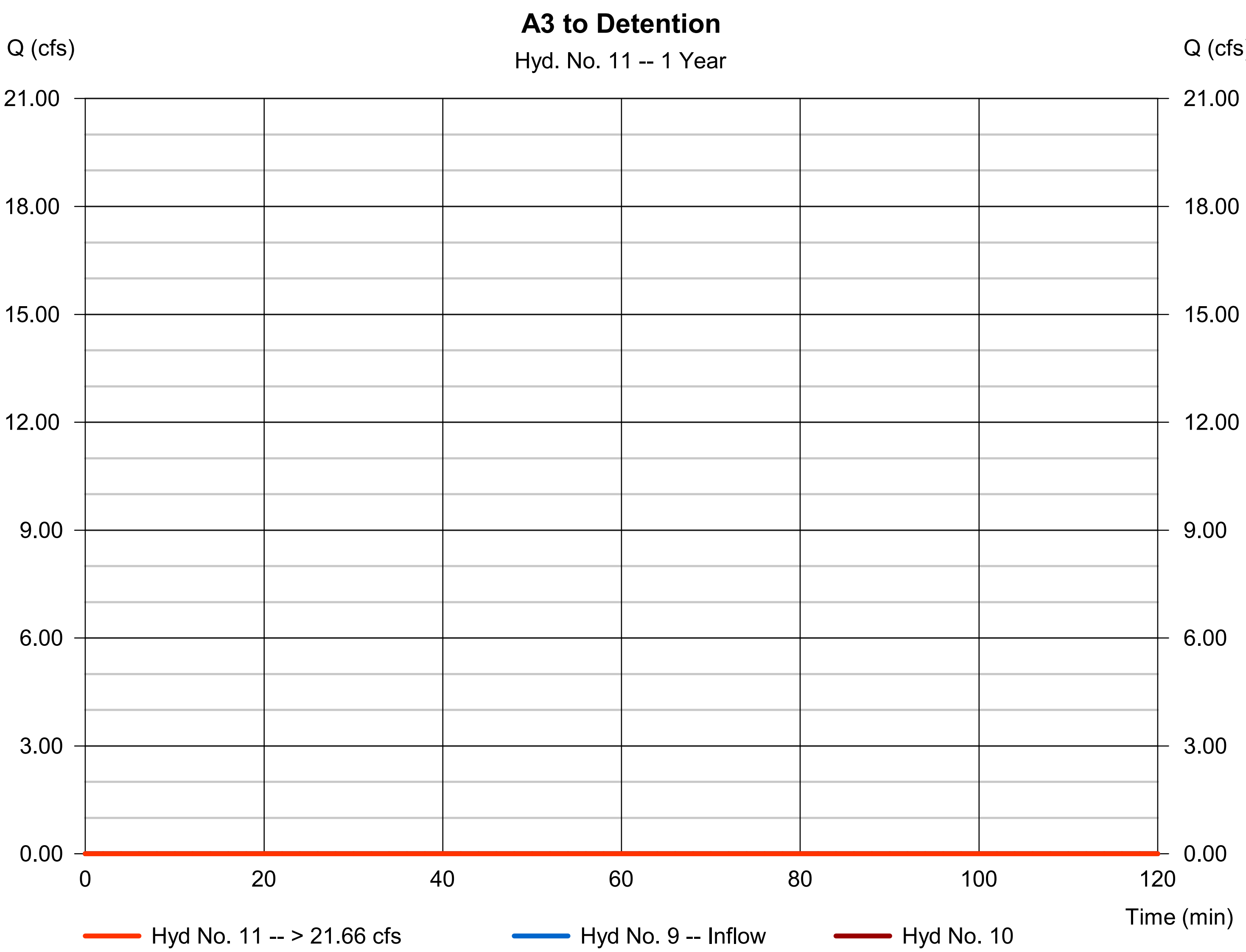
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 11

A3 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 9 - Pr WS A3	2nd diverted hyd.	= 10
Diversion method	= Constant Q	Constant Q	= 21.66 cfs



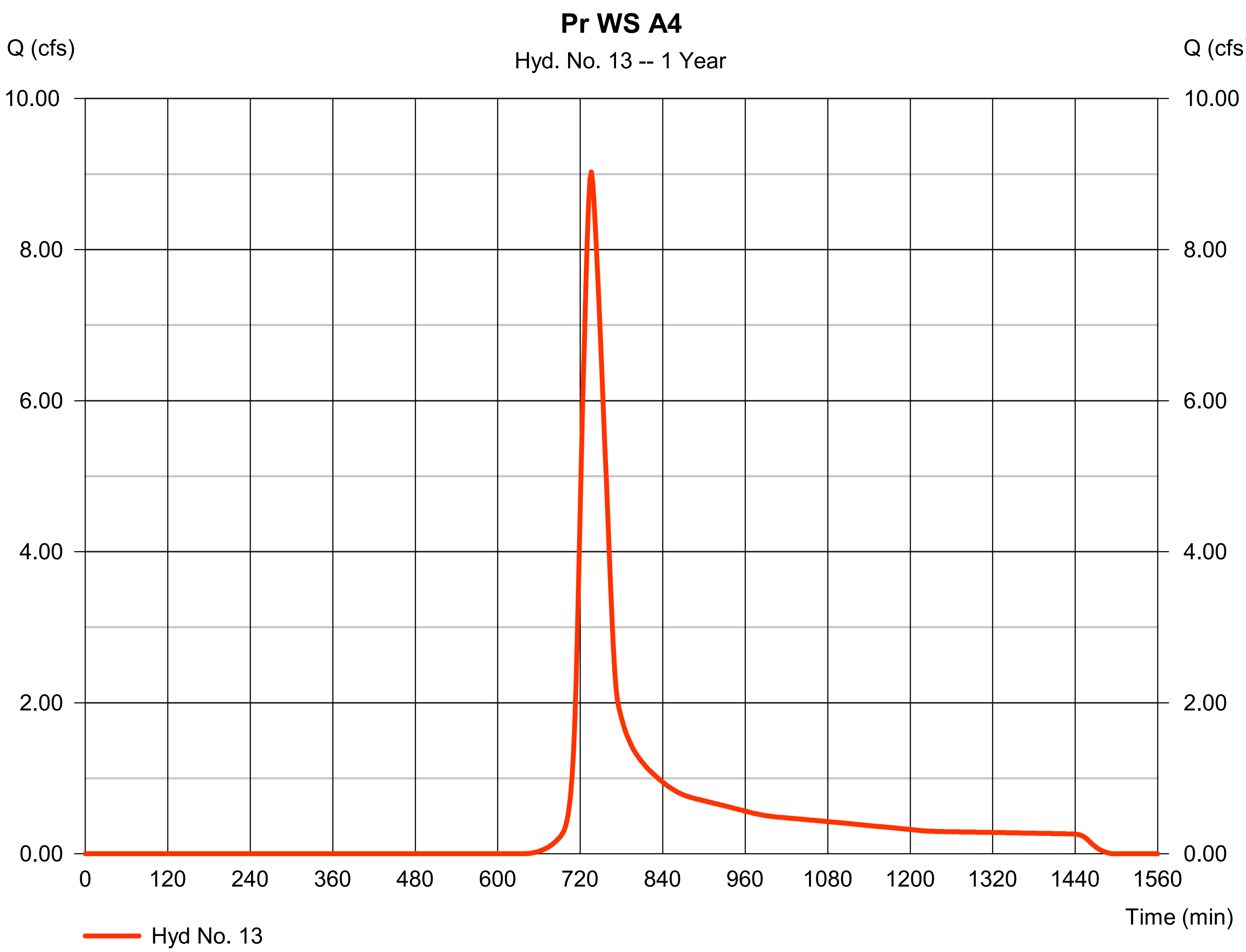
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 13

Pr WS A4

Hydrograph type	= SCS Runoff	Peak discharge	= 9.026 cfs
Storm frequency	= 1 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 43,143 cuft
Drainage area	= 16.960 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 36.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



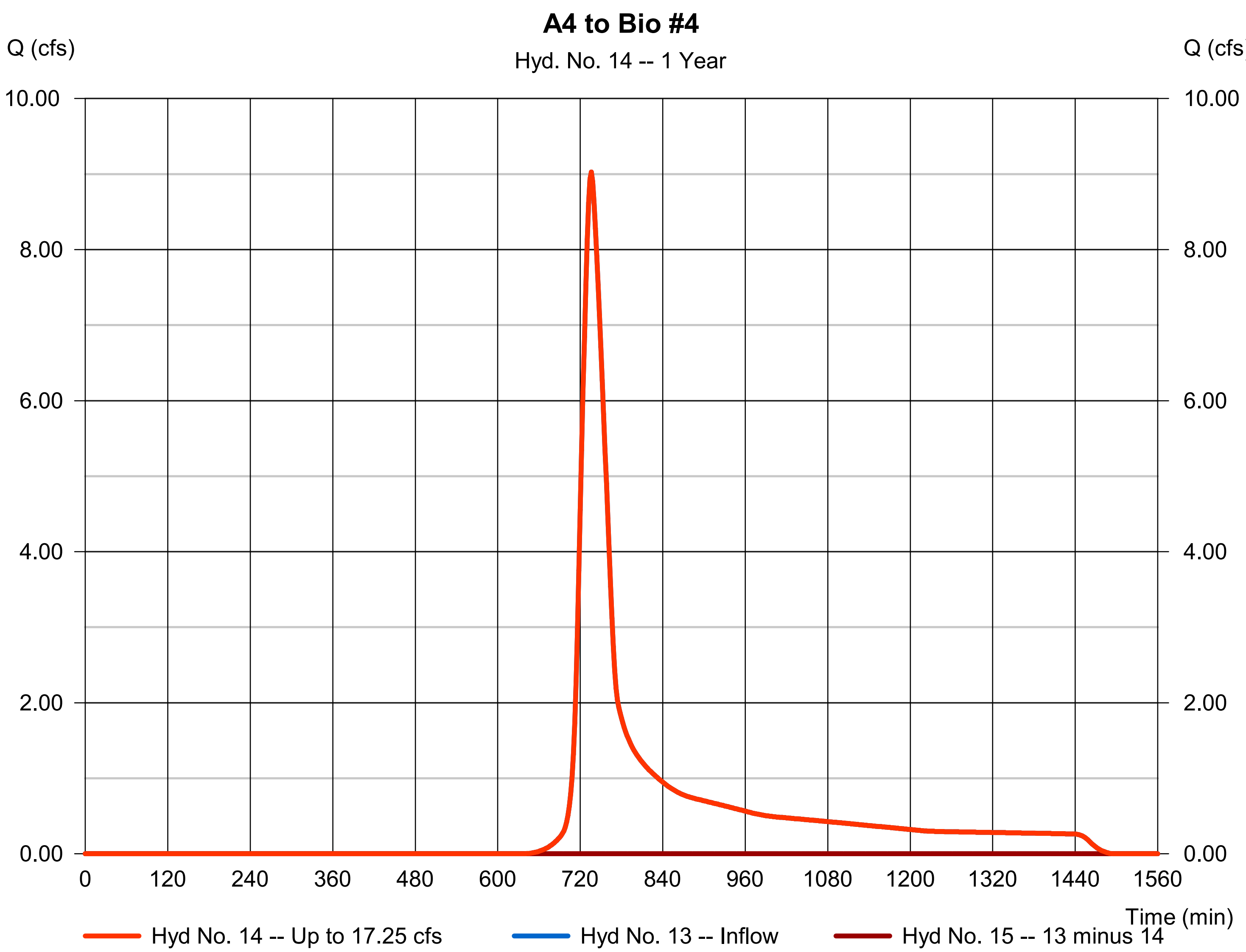
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 14

A4 to Bio #4

Hydrograph type	= Diversion1	Peak discharge	= 9.026 cfs
Storm frequency	= 1 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 43,143 cuft
Inflow hydrograph	= 13 - Pr WS A4	2nd diverted hyd.	= 15
Diversion method	= Constant Q	Constant Q	= 17.25 cfs



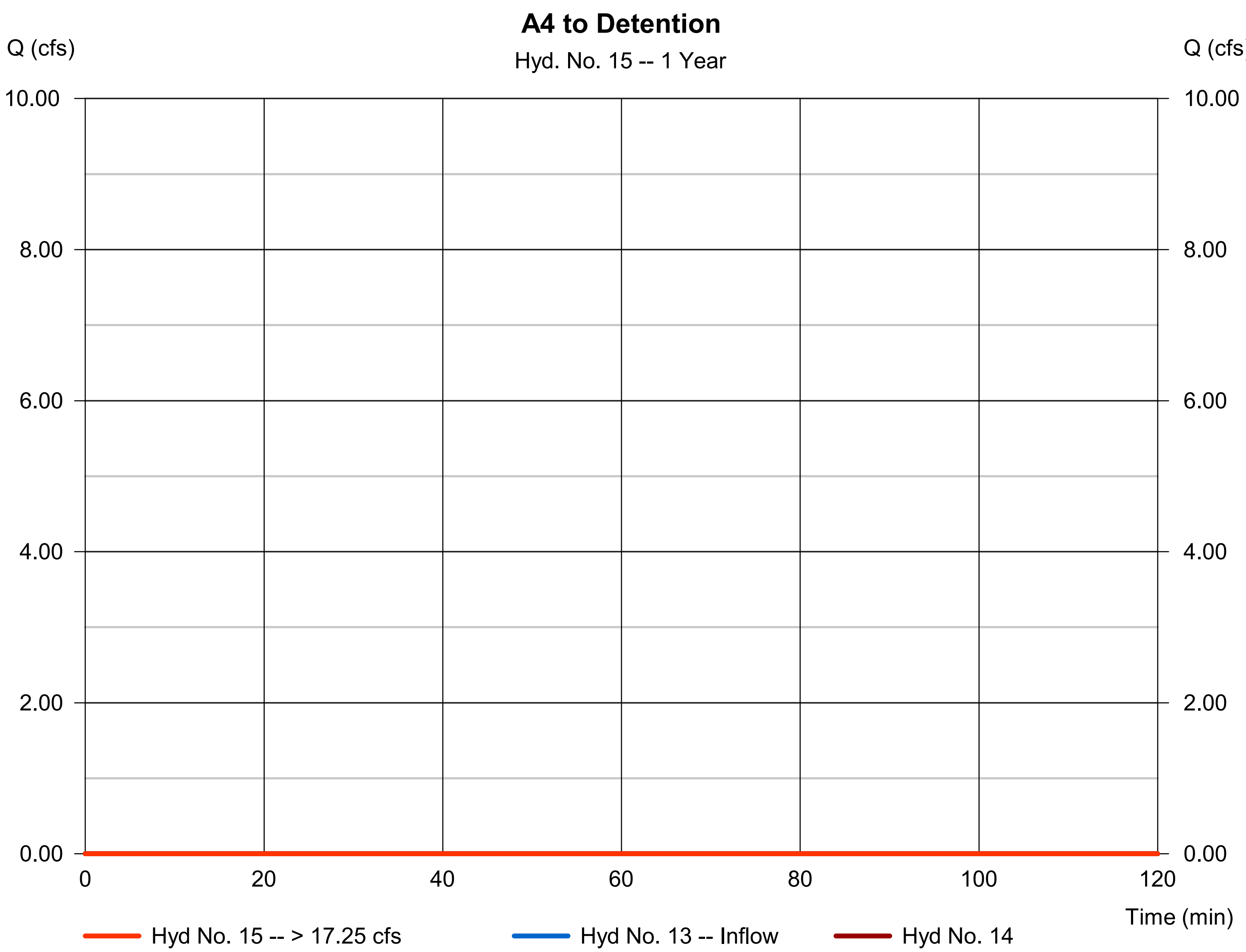
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 15

A4 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 13 - Pr WS A4	2nd diverted hyd.	= 14
Diversion method	= Constant Q	Constant Q	= 17.25 cfs



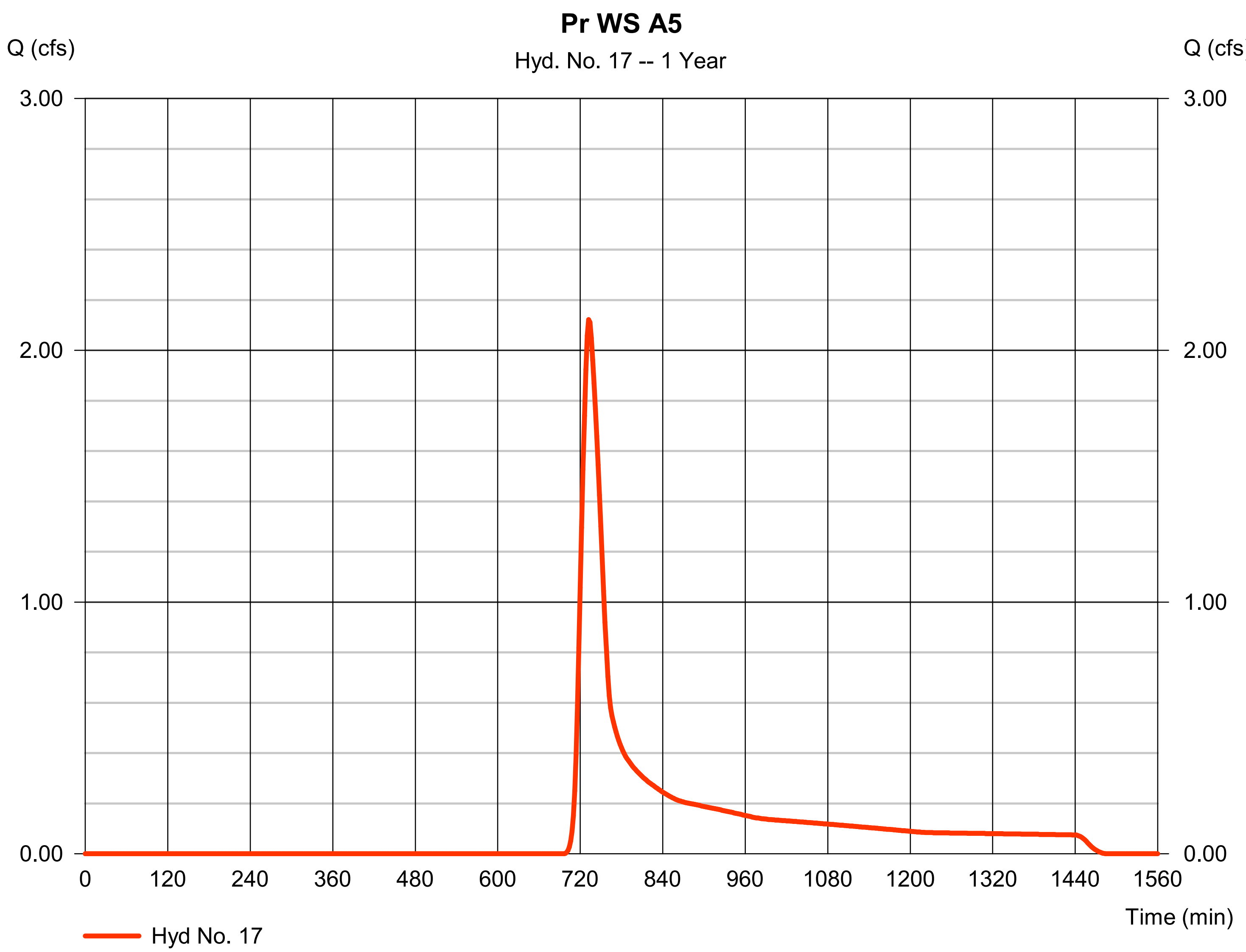
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 17

Pr WS A5

Hydrograph type	= SCS Runoff	Peak discharge	= 2.122 cfs
Storm frequency	= 1 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 10,162 cuft
Drainage area	= 6.100 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 30.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

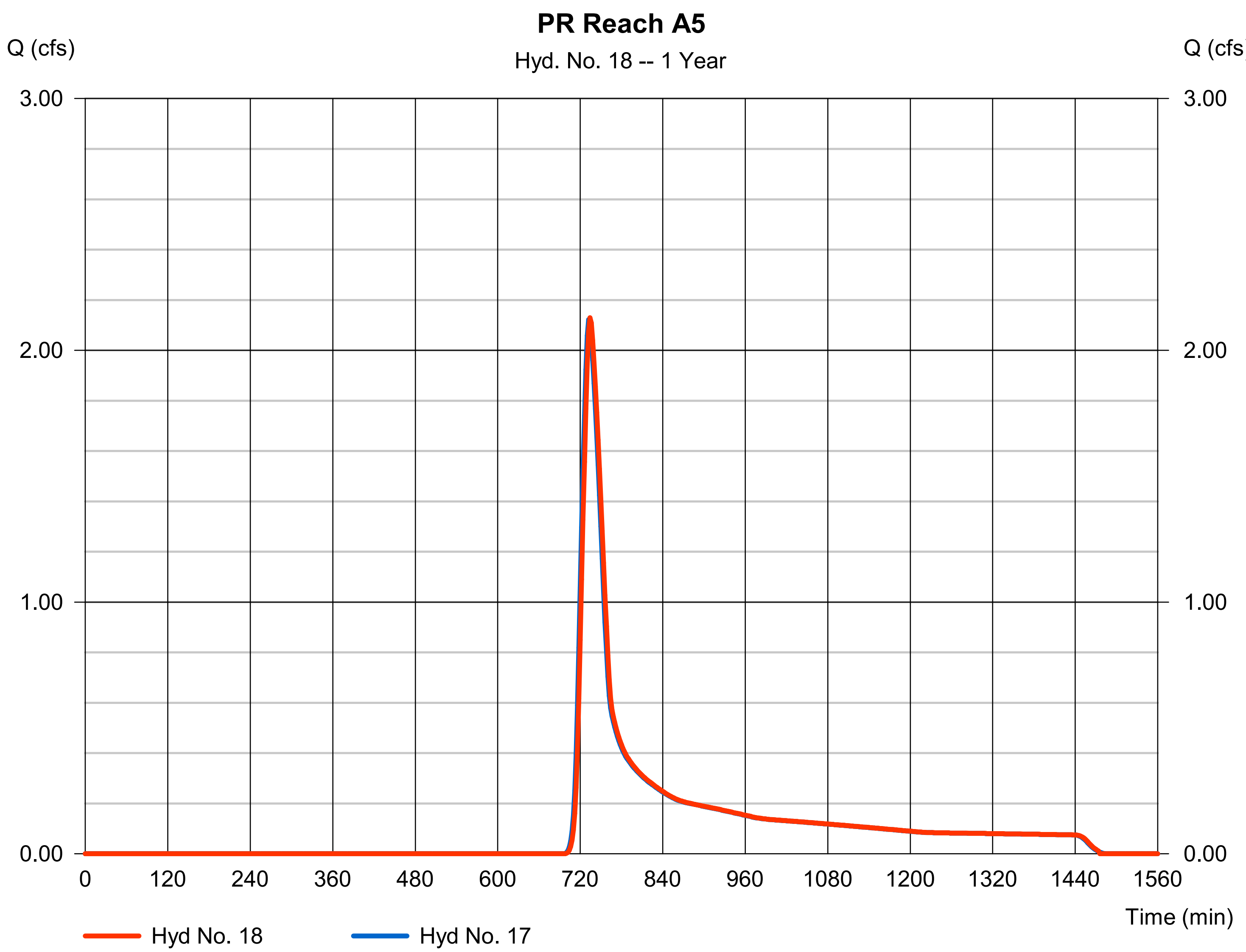
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 18

PR Reach A5

Hydrograph type	= Reach	Peak discharge	= 2.129 cfs
Storm frequency	= 1 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 10,160 cuft
Inflow hyd. No.	= 17 - Pr WS A5	Section type	= Trapezoidal
Reach length	= 101.0 ft	Channel slope	= 1.6 %
Manning's n	= 0.025	Bottom width	= 12.0 ft
Side slope	= 2.0:1	Max. depth	= 1.0 ft
Rating curve x	= 1.437	Rating curve m	= 1.425
Ave. velocity	= 1.61 ft/s	Routing coeff.	= 1.1547

Modified Att-Kin routing method used.



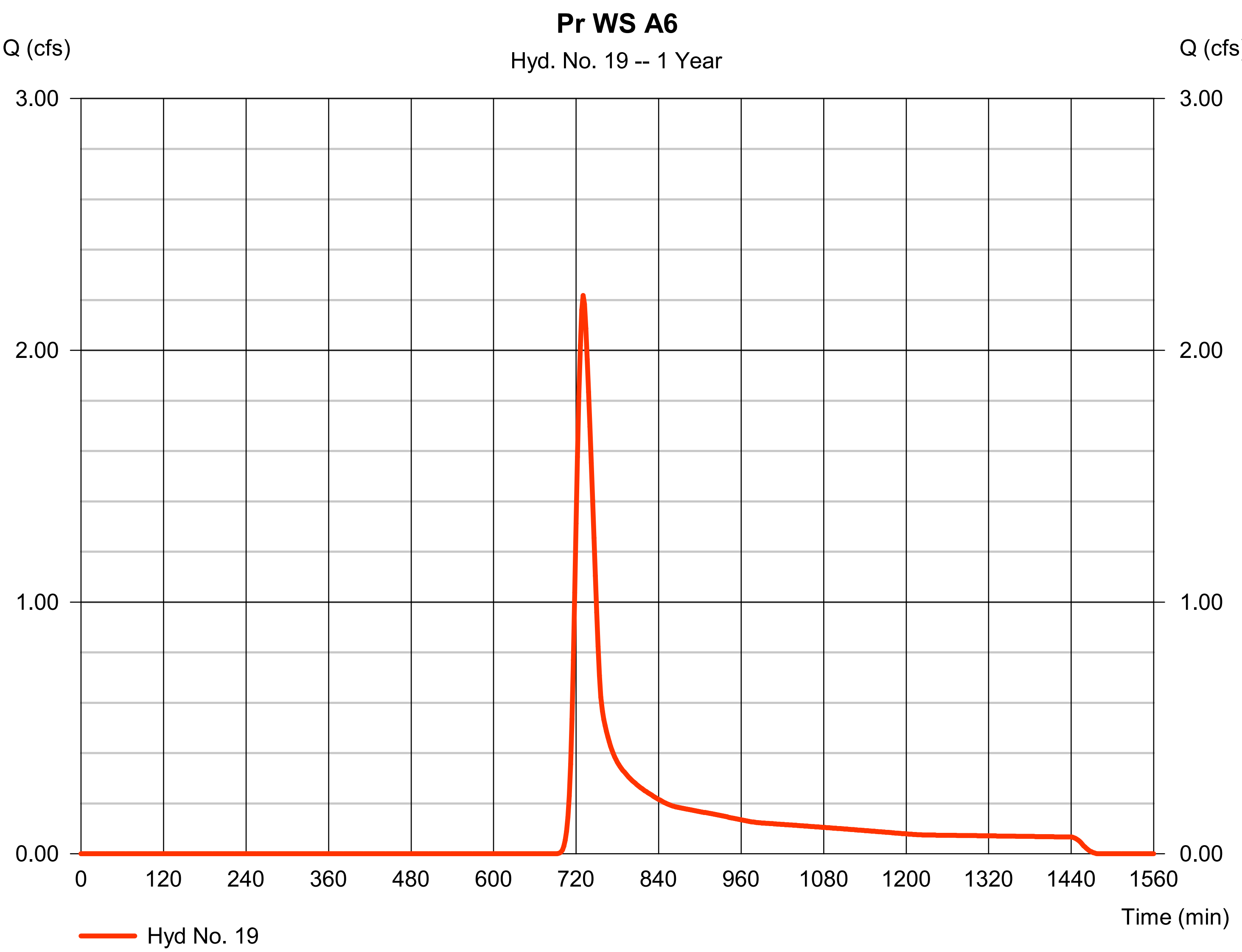
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 19

Pr WS A6

Hydrograph type	= SCS Runoff	Peak discharge	= 2.217 cfs
Storm frequency	= 1 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 9,352 cuft
Drainage area	= 5.280 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 24.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



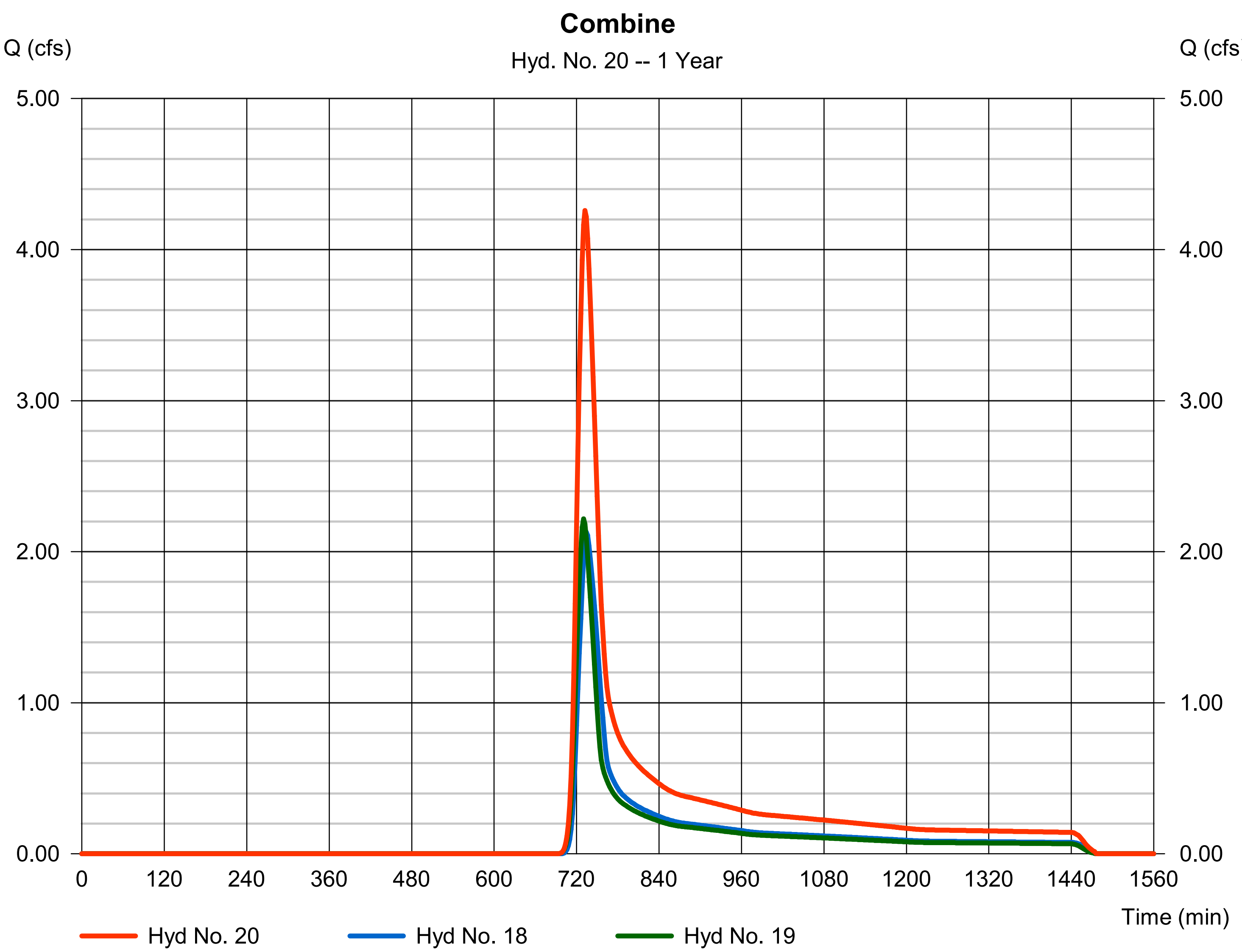
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 20

Combine

Hydrograph type	= Combine	Peak discharge	= 4.259 cfs
Storm frequency	= 1 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 19,511 cuft
Inflow hyds.	= 18, 19	Contrib. drain. area	= 5.280 ac



Hydrograph Report

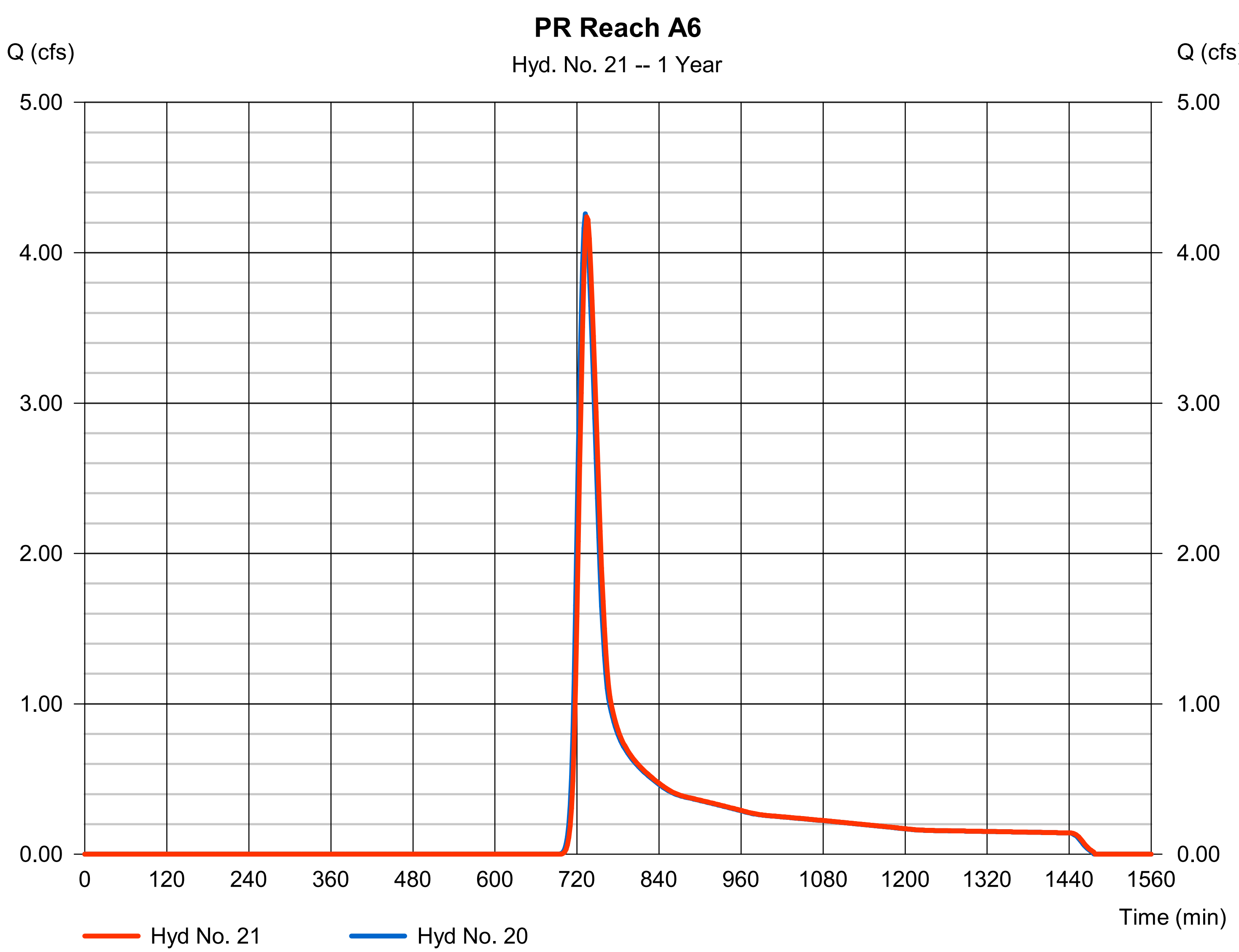
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 21

PR Reach A6

Hydrograph type	= Reach	Peak discharge	= 4.240 cfs
Storm frequency	= 1 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 19,511 cuft
Inflow hyd. No.	= 20 - Combine	Section type	= Trapezoidal
Reach length	= 413.0 ft	Channel slope	= 3.8 %
Manning's n	= 0.025	Bottom width	= 6.0 ft
Side slope	= 2.0:1	Max. depth	= 5.0 ft
Rating curve x	= 3.540	Rating curve m	= 1.395
Ave. velocity	= 3.73 ft/s	Routing coeff.	= 0.8611

Modified Att-Kin routing method used.



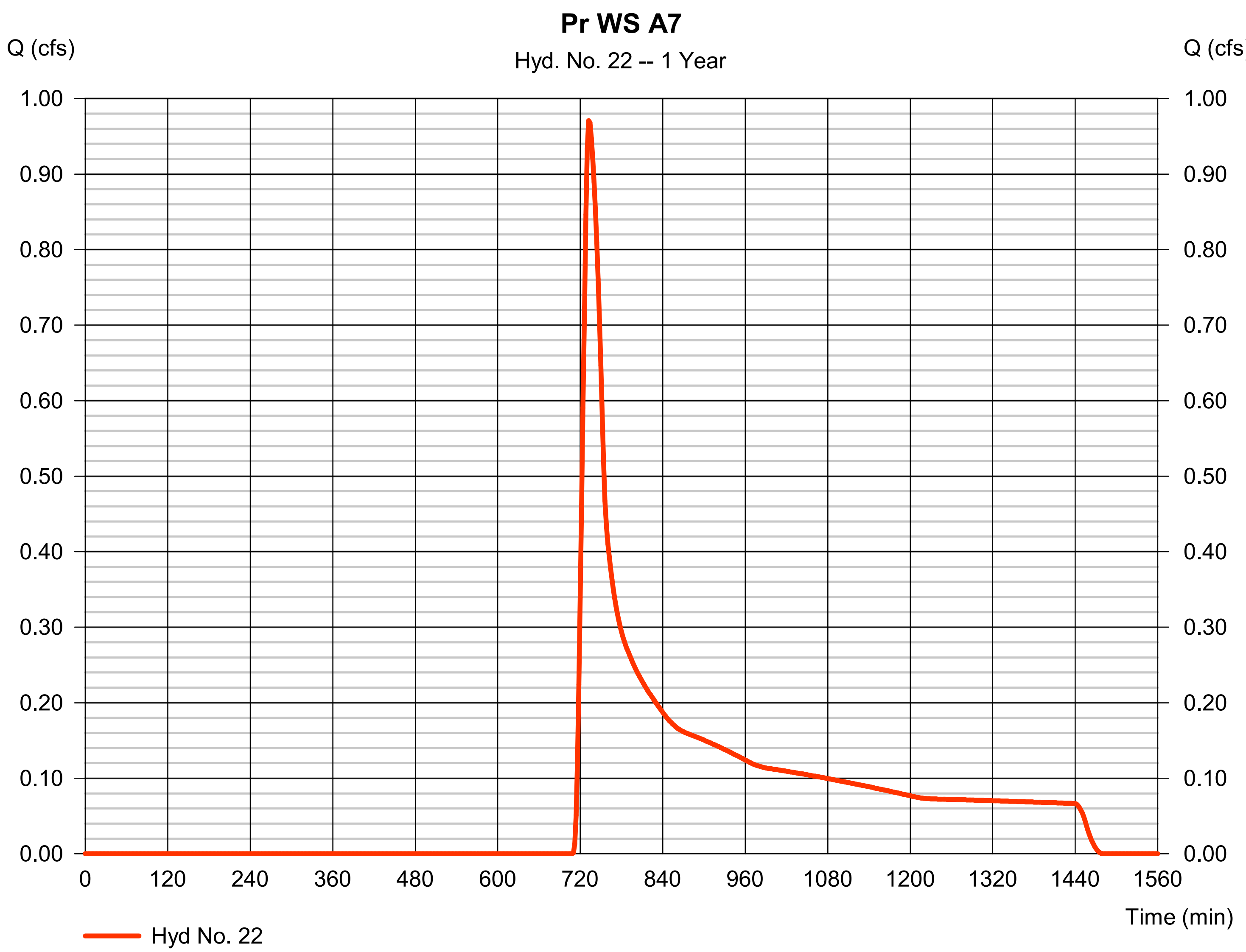
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 22

Pr WS A7

Hydrograph type	= SCS Runoff	Peak discharge	= 0.971 cfs
Storm frequency	= 1 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 6,646 cuft
Drainage area	= 8.310 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 26.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

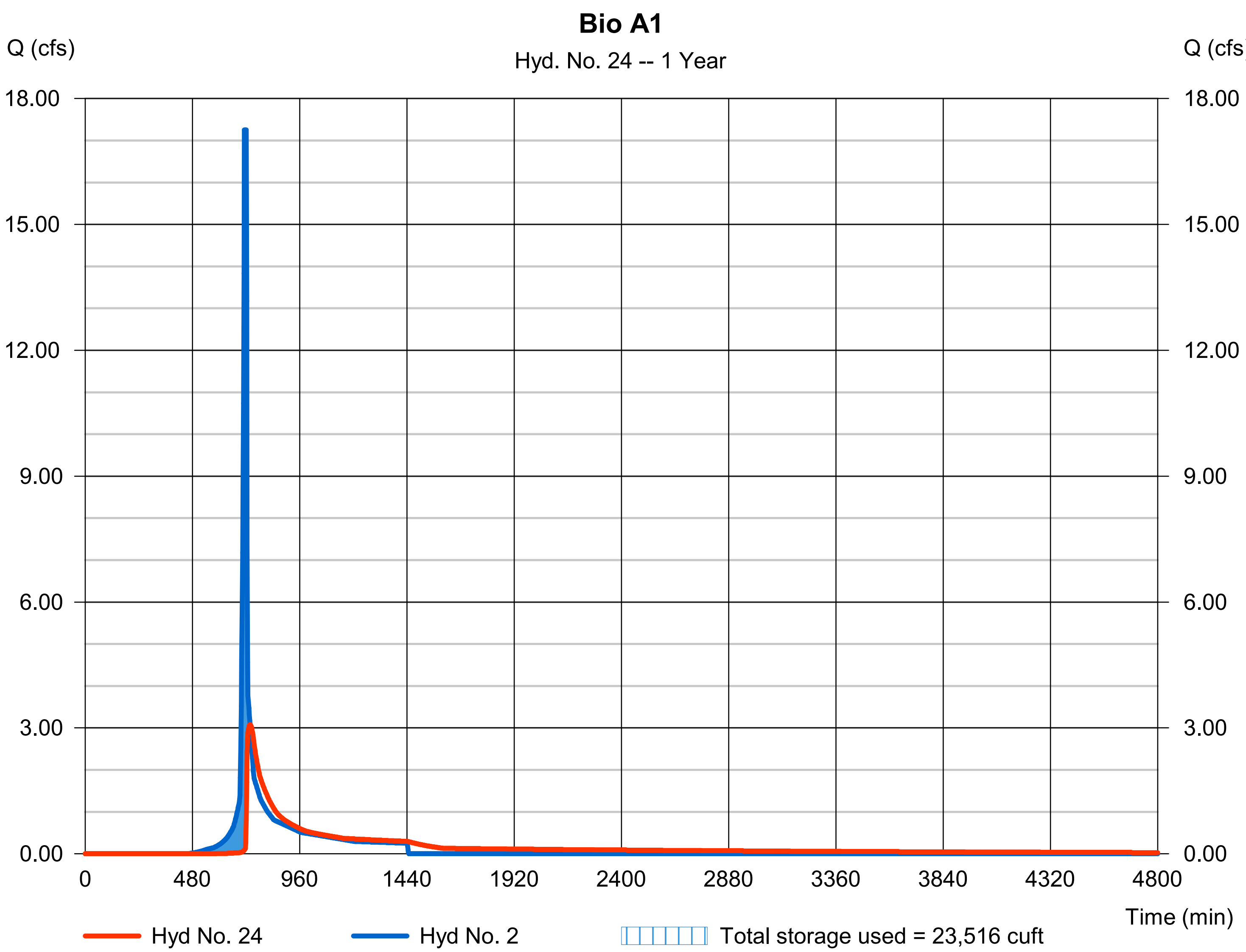
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 24

Bio A1

Hydrograph type	= Reservoir	Peak discharge	= 3.078 cfs
Storm frequency	= 1 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 47,727 cuft
Inflow hyd. No.	= 2 - A1 to Bio #1	Max. Elevation	= 405.89 ft
Reservoir name	= Bio A1 (south)	Max. Storage	= 23,516 cuft

Storage Indication method used. Outflow includes exfiltration.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Pond No. 1 - Bio A1 (south)

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 405.25 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	405.25	35,798	0	0
0.75	406.00	37,619	27,526	27,526
1.75	407.00	40,097	38,848	66,373
2.25	407.50	41,358	20,361	86,734

Culvert / Orifice Structures

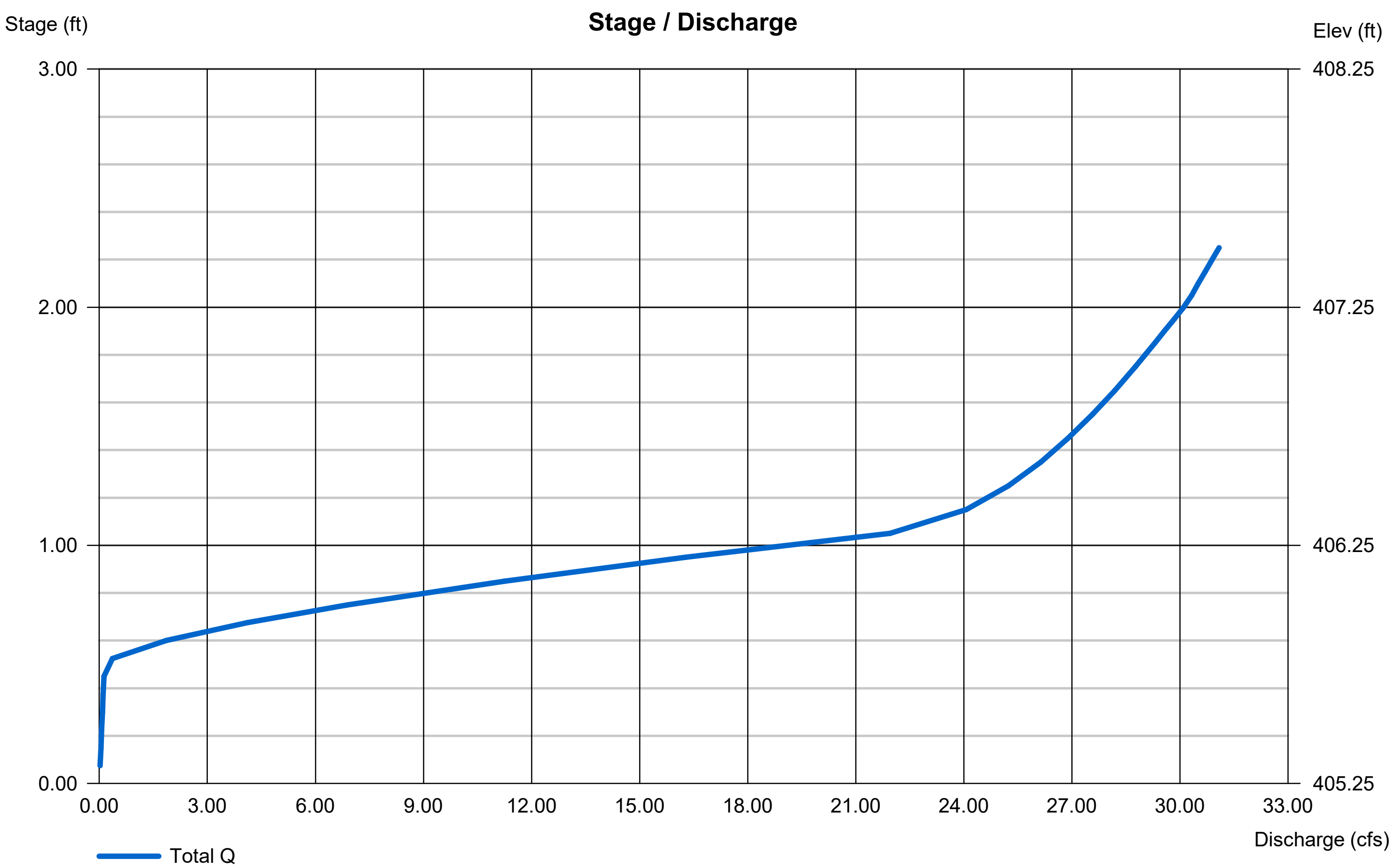
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 402.30	0.00	0.00	0.00
Length (ft)	= 60.00	0.00	0.00	0.00
Slope (%)	= 0.40	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 405.75	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.250 (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).



Hydrograph Report

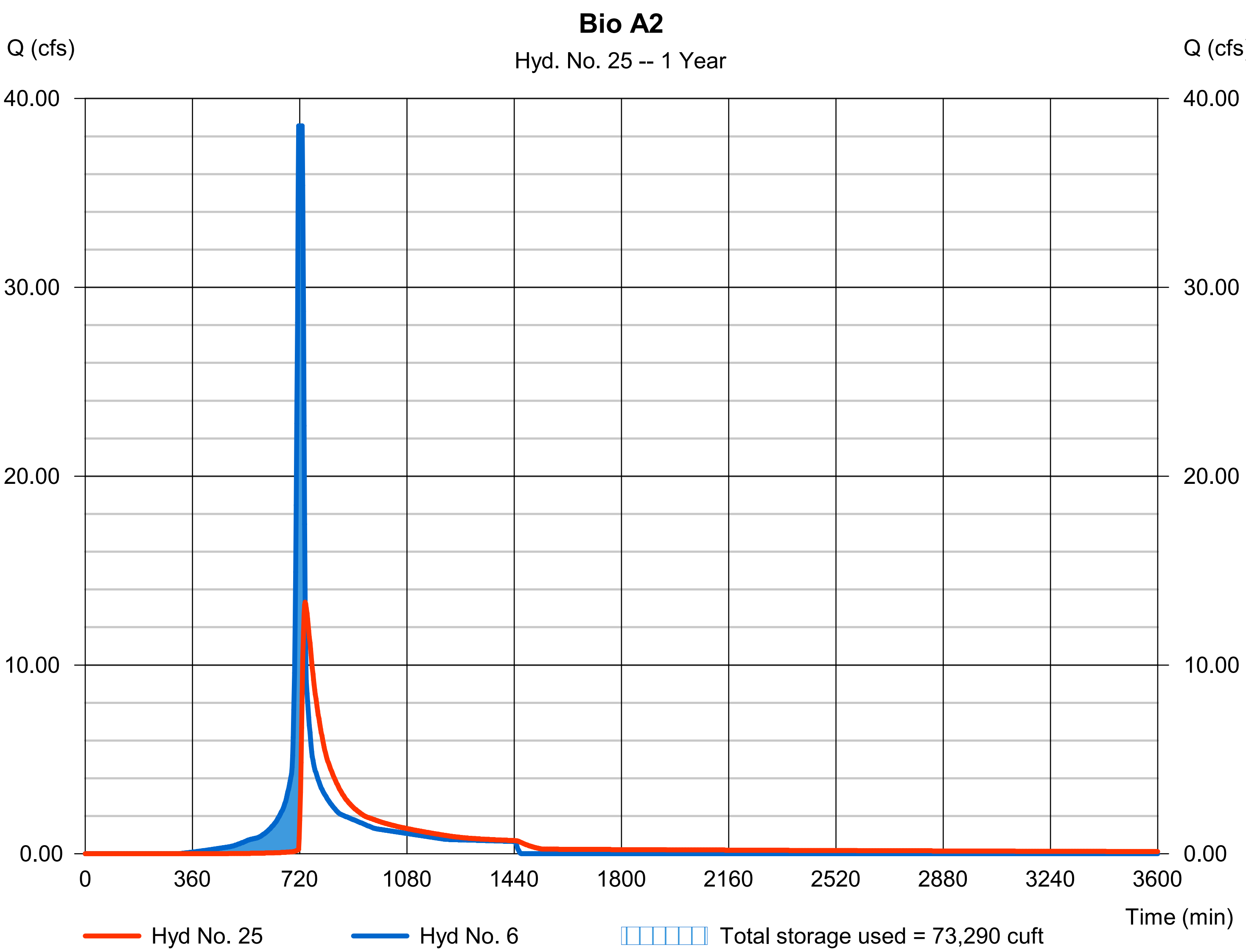
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 25

Bio A2

Hydrograph type	= Reservoir	Peak discharge	= 13.33 cfs
Storm frequency	= 1 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 140,421 cuft
Inflow hyd. No.	= 6 - A2 to Bio #2	Max. Elevation	= 401.89 ft
Reservoir name	= Bio A2 (west)	Max. Storage	= 73,290 cuft

Storage Indication method used. Outflow includes exfiltration.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Pond No. 2 - Bio A2 (west)

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 401.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	401.00	80,646	0	0
1.00	402.00	84,524	82,569	82,569
2.00	403.00	88,459	86,475	169,045
3.00	404.00	92,451	90,439	259,483
4.00	405.00	96,499	94,458	353,942
5.00	406.00	100,603	98,534	452,476

Culvert / Orifice Structures

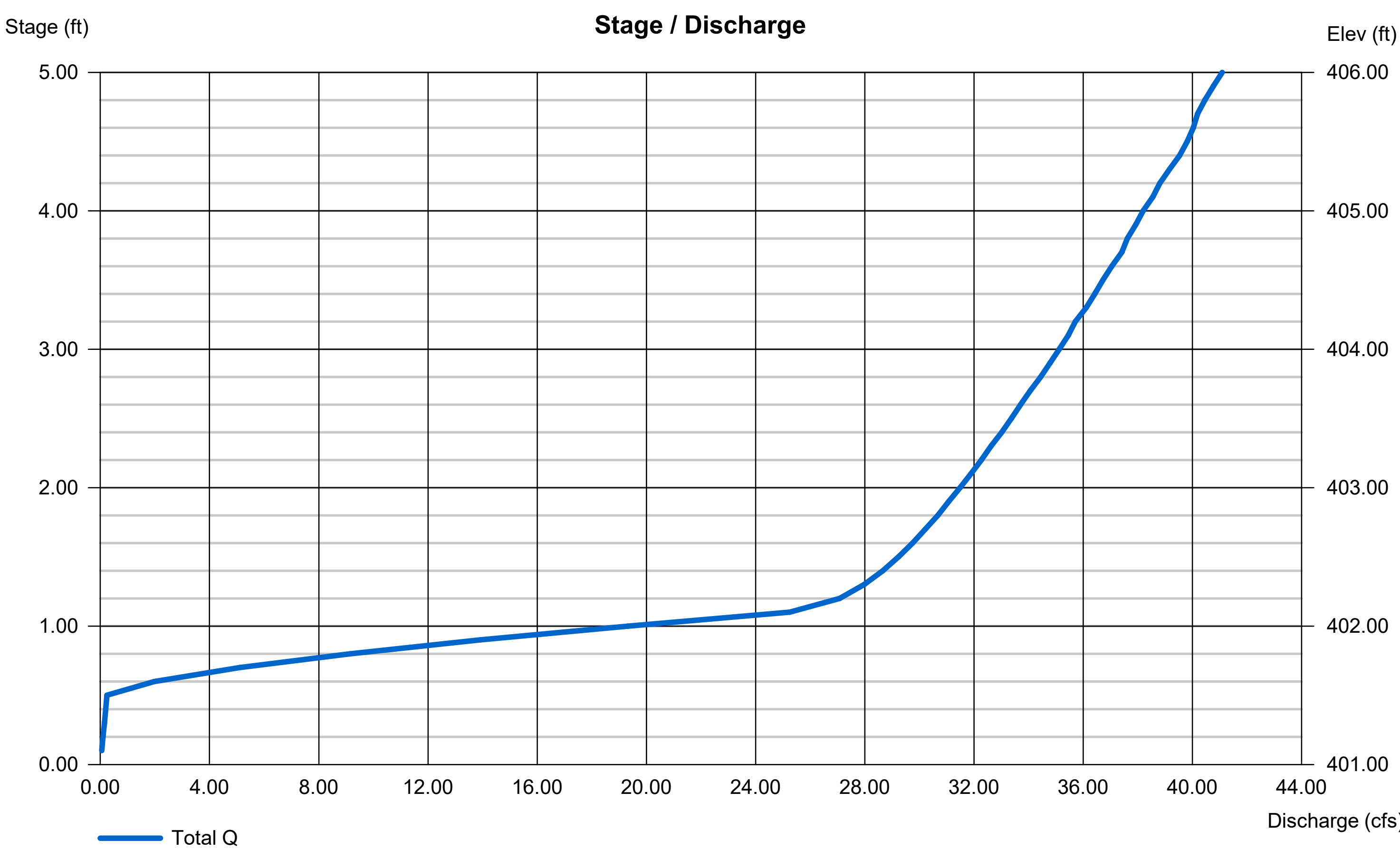
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 397.75	0.00	0.00	0.00
Length (ft)	= 54.00	0.00	0.00	0.00
Slope (%)	= 2.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 401.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.250 (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).



Hydrograph Report

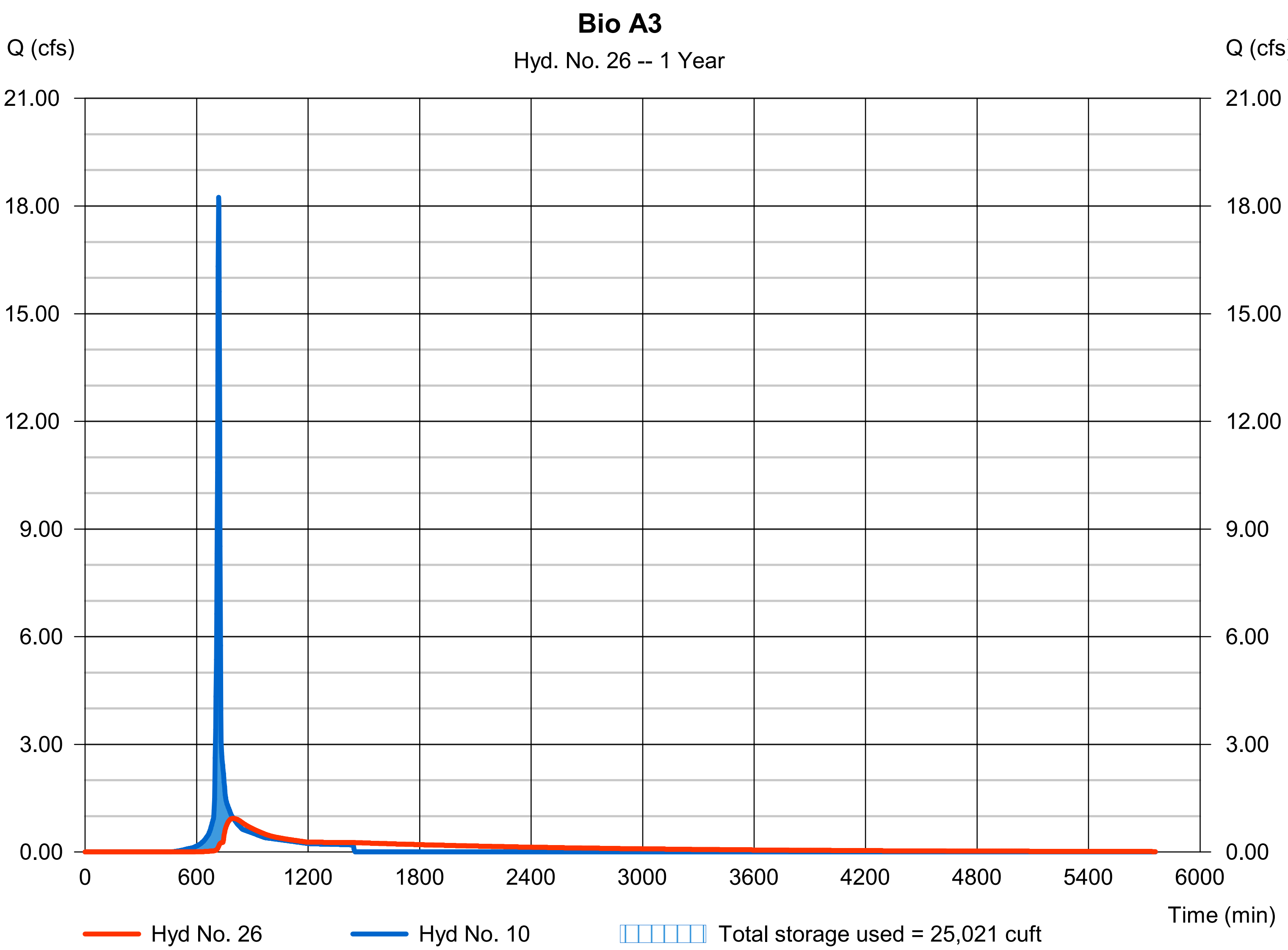
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 26

Bio A3

Hydrograph type	= Reservoir	Peak discharge	= 0.936 cfs
Storm frequency	= 1 yrs	Time to peak	= 798 min
Time interval	= 2 min	Hyd. volume	= 40,720 cuft
Inflow hyd. No.	= 10 - A3 to Bio #3	Max. Elevation	= 409.04 ft
Reservoir name	= Bio A3 (east)	Max. Storage	= 25,021 cuft

Storage Indication method used. Outflow includes exfiltration.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Pond No. 3 - Bio A3 (east)

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 408.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	408.50	45,503	0	0
0.50	409.00	46,963	23,113	23,113
1.50	410.00	49,927	48,433	71,546
2.50	411.00	52,947	51,424	122,970

Culvert / Orifice Structures

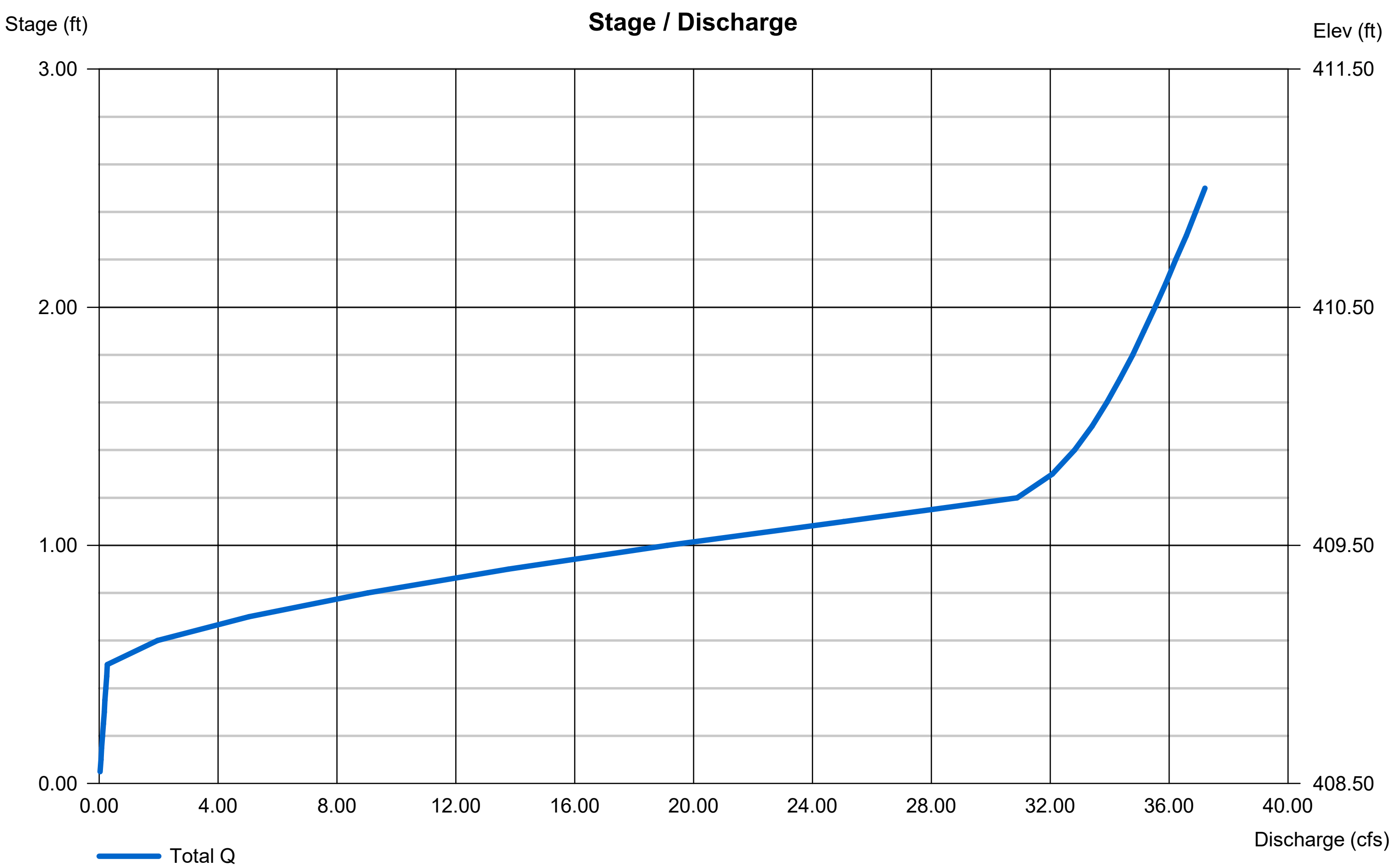
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 404.00	0.00	0.00	0.00
Length (ft)	= 83.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 409.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.250 (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).



Hydrograph Report

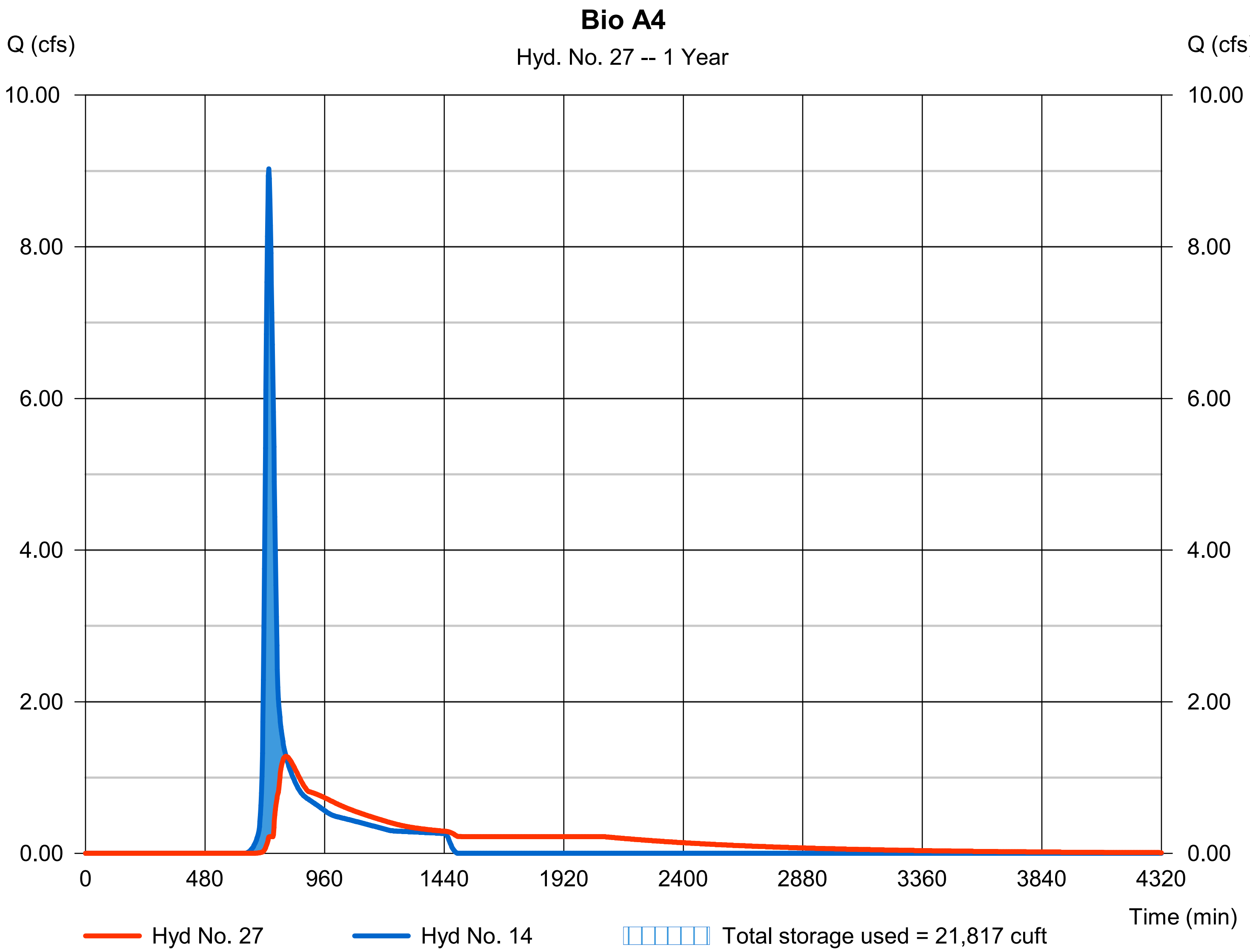
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 27

Bio A4

Hydrograph type	= Reservoir	Peak discharge	= 1.279 cfs
Storm frequency	= 1 yrs	Time to peak	= 804 min
Time interval	= 2 min	Hyd. volume	= 43,088 cuft
Inflow hyd. No.	= 14 - A4 to Bio #4	Max. Elevation	= 403.32 ft
Reservoir name	= Bio A4 (north)	Max. Storage	= 21,817 cuft

Storage Indication method used. Outflow includes exfiltration.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Pond No. 4 - Bio A4 (north)

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 402.75 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	402.75	37,012	0	0
0.25	403.00	37,734	9,342	9,342
1.25	404.00	40,654	39,181	48,523
2.25	405.00	43,631	42,130	90,653
3.25	406.00	46,664	45,135	135,787

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 400.24	0.00	0.00	0.00
Length (ft)	= 44.00	0.00	0.00	0.00
Slope (%)	= 0.55	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

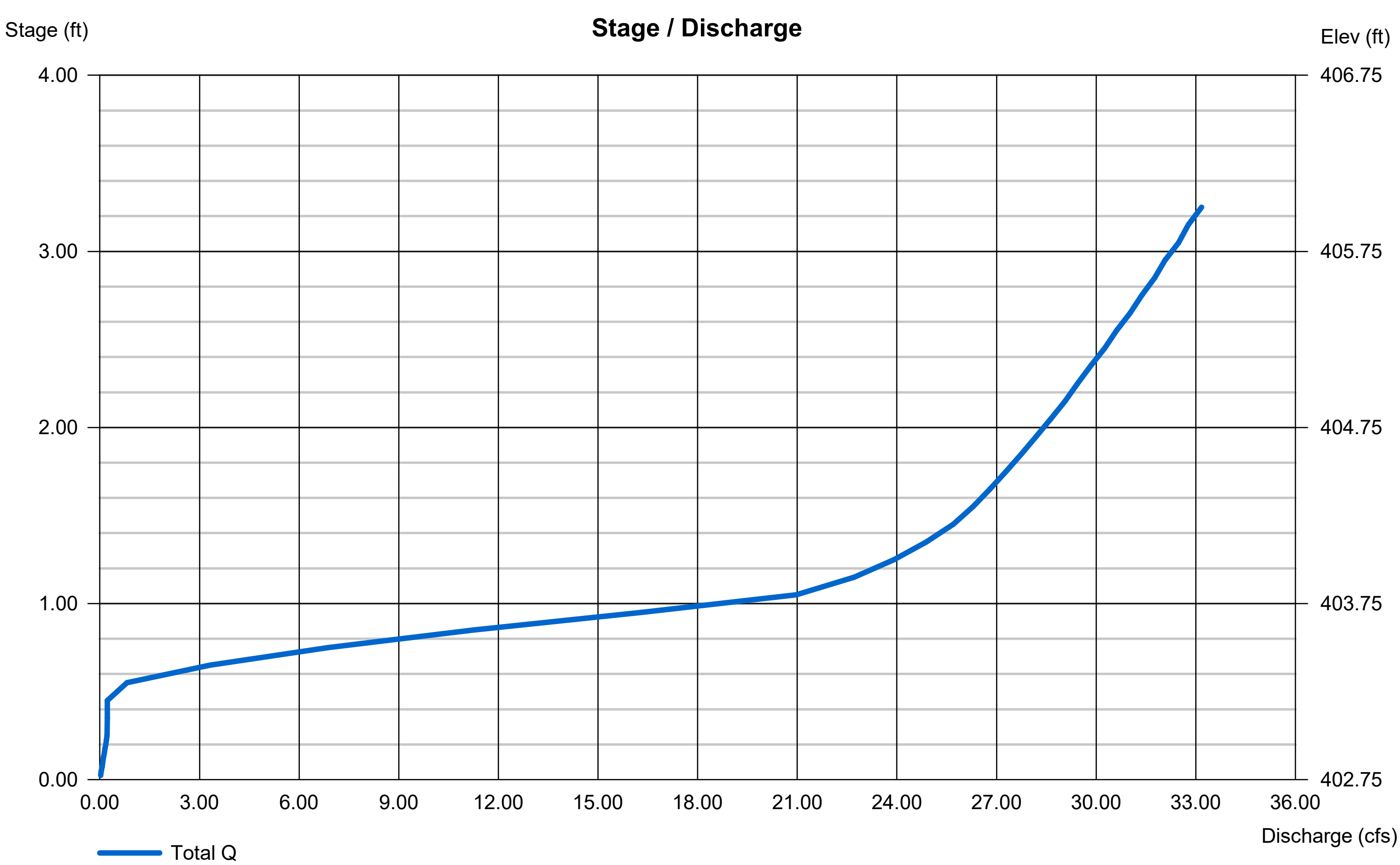
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 403.25	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.250 (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).



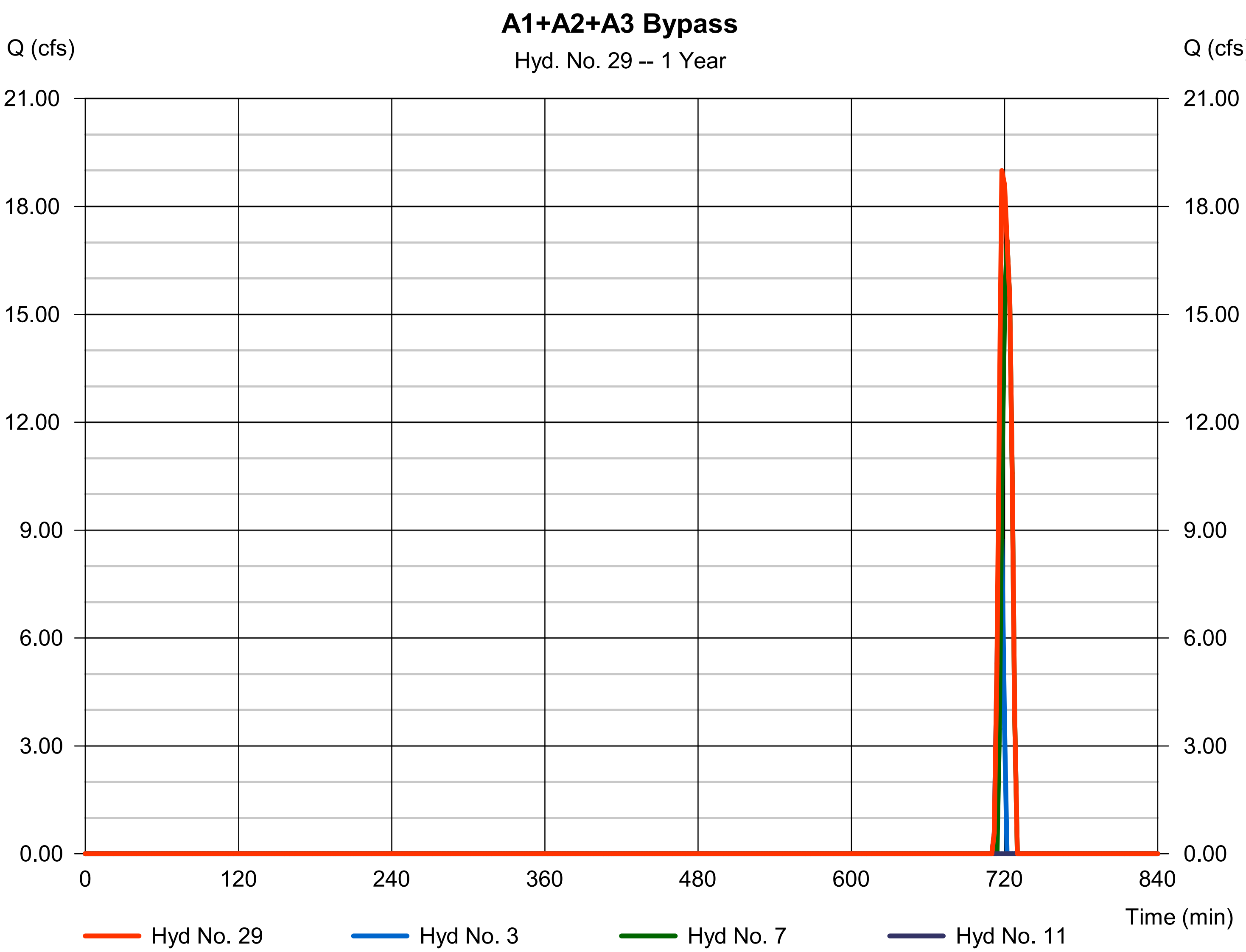
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 29

A1+A2+A3 Bypass

Hydrograph type	= Combine	Peak discharge	= 19.00 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 12,352 cuft
Inflow hyds.	= 3, 7, 11	Contrib. drain. area	= 0.000 ac

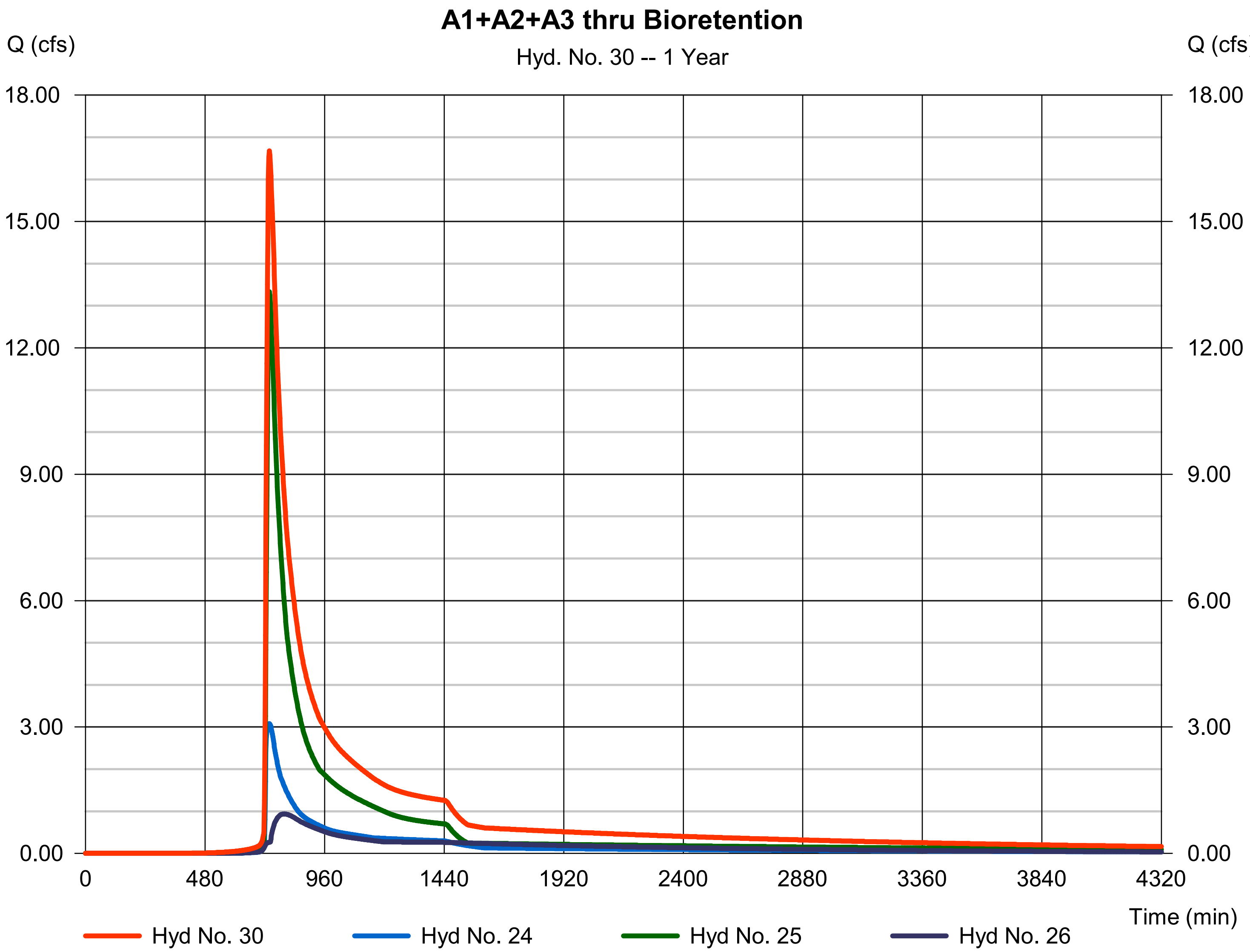


Hydrograph Report

Hyd. No. 30

A1+A2+A3 thru Bioretention

Hydrograph type	= Combine	Peak discharge	= 16.68 cfs
Storm frequency	= 1 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 228,867 cuft
Inflow hyds.	= 24, 25, 26	Contrib. drain. area	= 0.000 ac



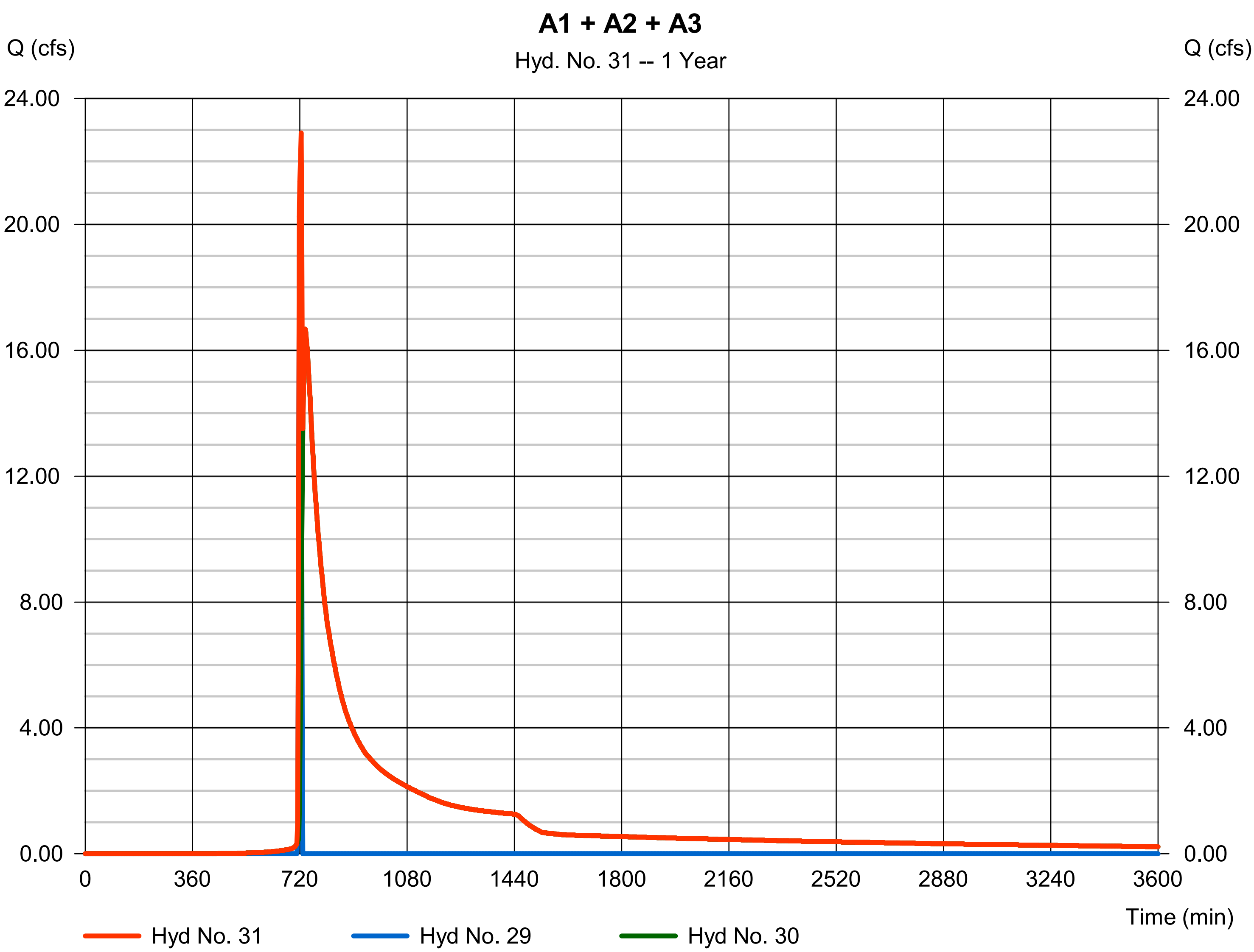
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 31

A1 + A2 + A3

Hydrograph type	= Combine	Peak discharge	= 22.91 cfs
Storm frequency	= 1 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 241,220 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.000 ac



Hydrograph Report

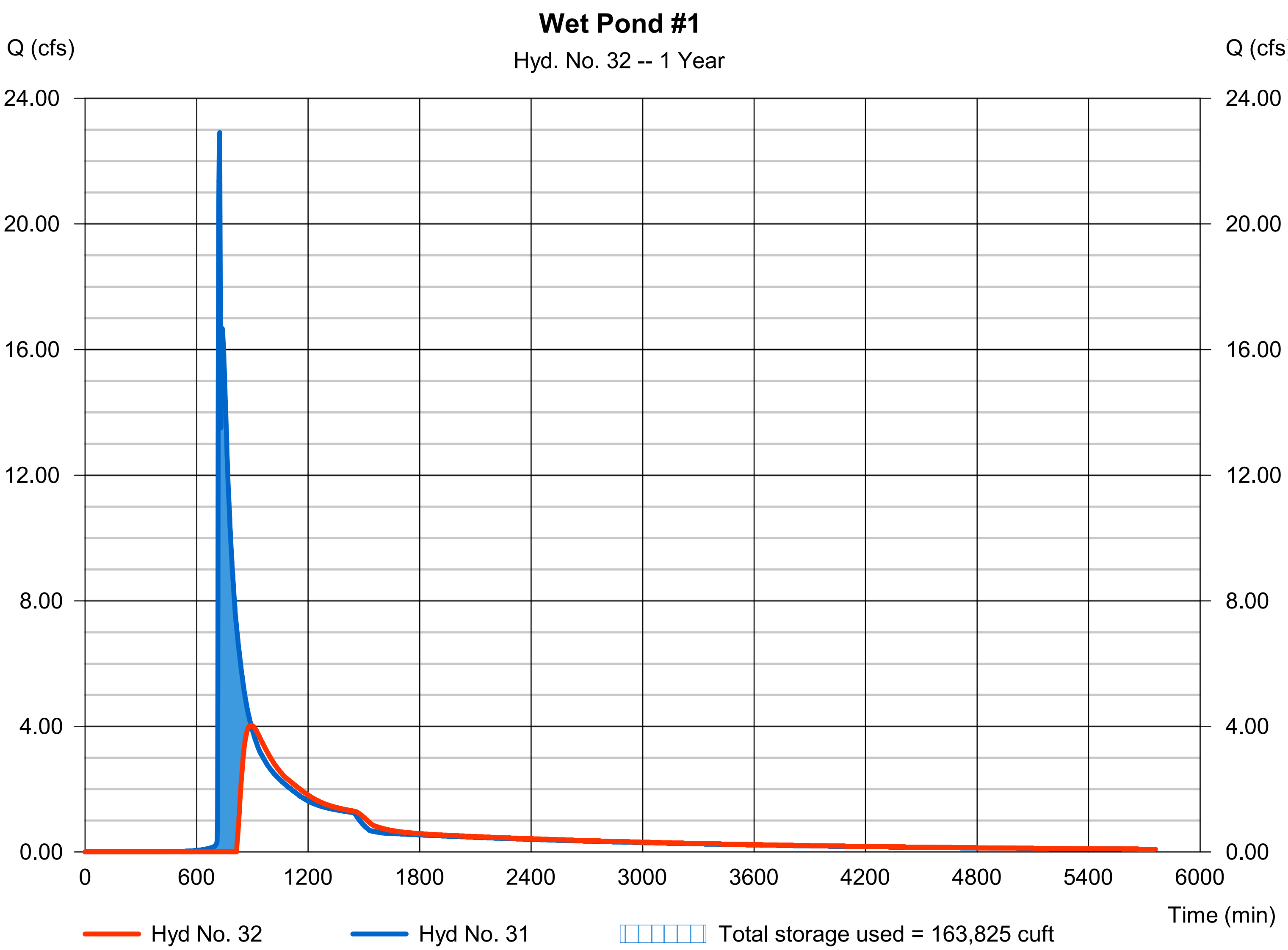
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 32

Wet Pond #1

Hydrograph type	= Reservoir	Peak discharge	= 4.034 cfs
Storm frequency	= 1 yrs	Time to peak	= 892 min
Time interval	= 2 min	Hyd. volume	= 162,497 cuft
Inflow hyd. No.	= 31 - A1 + A2 + A3	Max. Elevation	= 402.28 ft
Reservoir name	= Wet Pond #1	Max. Storage	= 163,825 cuft

Storage Indication method used. Wet pond routing start elevation = 400.00 ft.



Pond Report

Pond No. 9 - Wet Pond #1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 397.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	397.50	23,939	0	0
2.50	400.00	34,930	73,148	73,148
3.00	400.50	37,790	18,174	91,321
3.50	401.00	39,299	19,269	110,590
4.00	401.50	40,822	20,027	130,617
4.50	402.00	42,360	20,792	151,410
5.50	403.00	45,477	43,905	195,314
6.50	404.00	48,650	47,050	242,364
7.50	405.00	51,880	50,251	292,616
8.50	406.00	55,206	53,529	346,145
9.50	407.00	57,712	56,449	402,593

Culvert / Orifice Structures

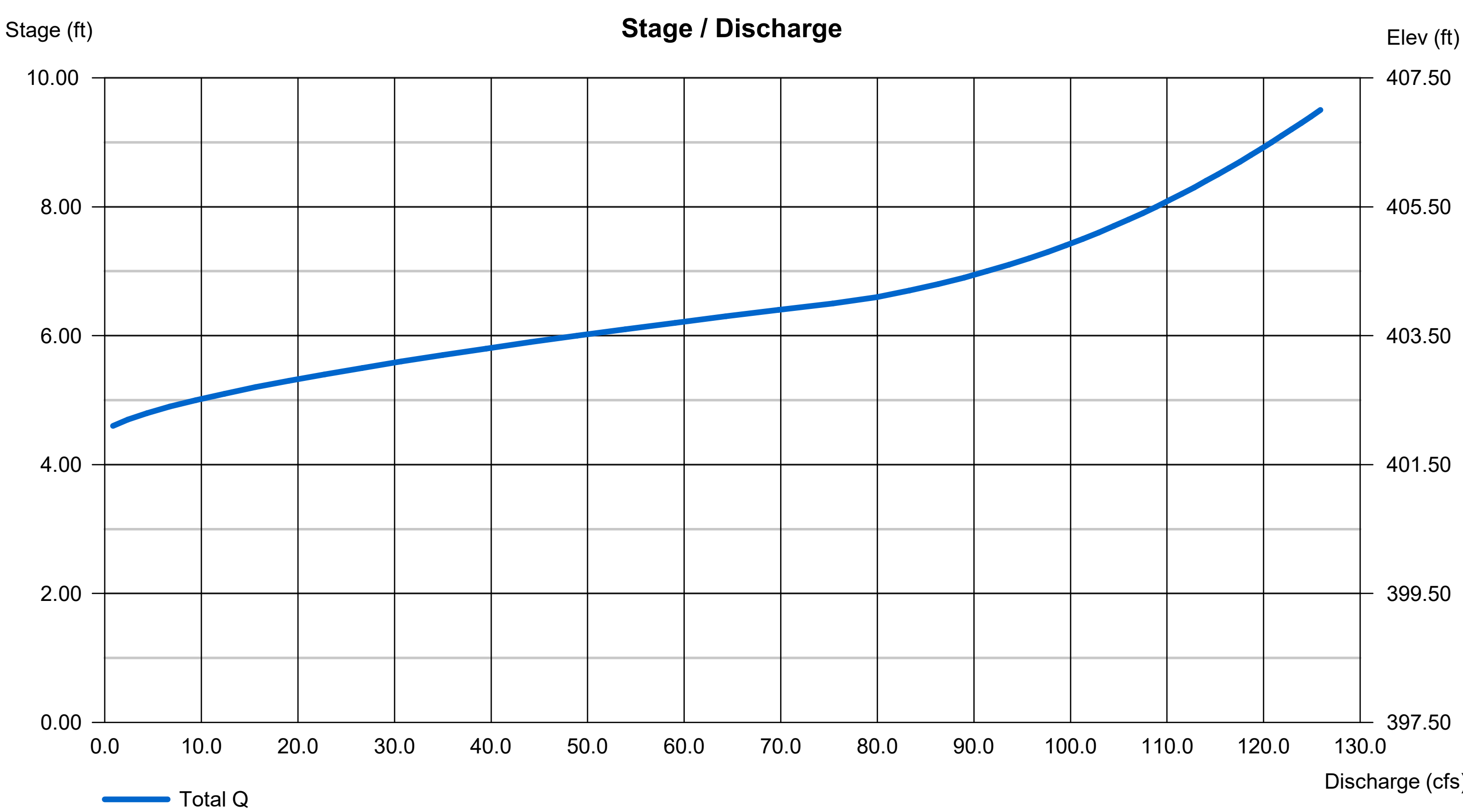
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 42.00	5.00	30.00	0.00
Span (in)	= 42.00	5.00	30.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 397.50	400.00	401.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 402.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

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

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



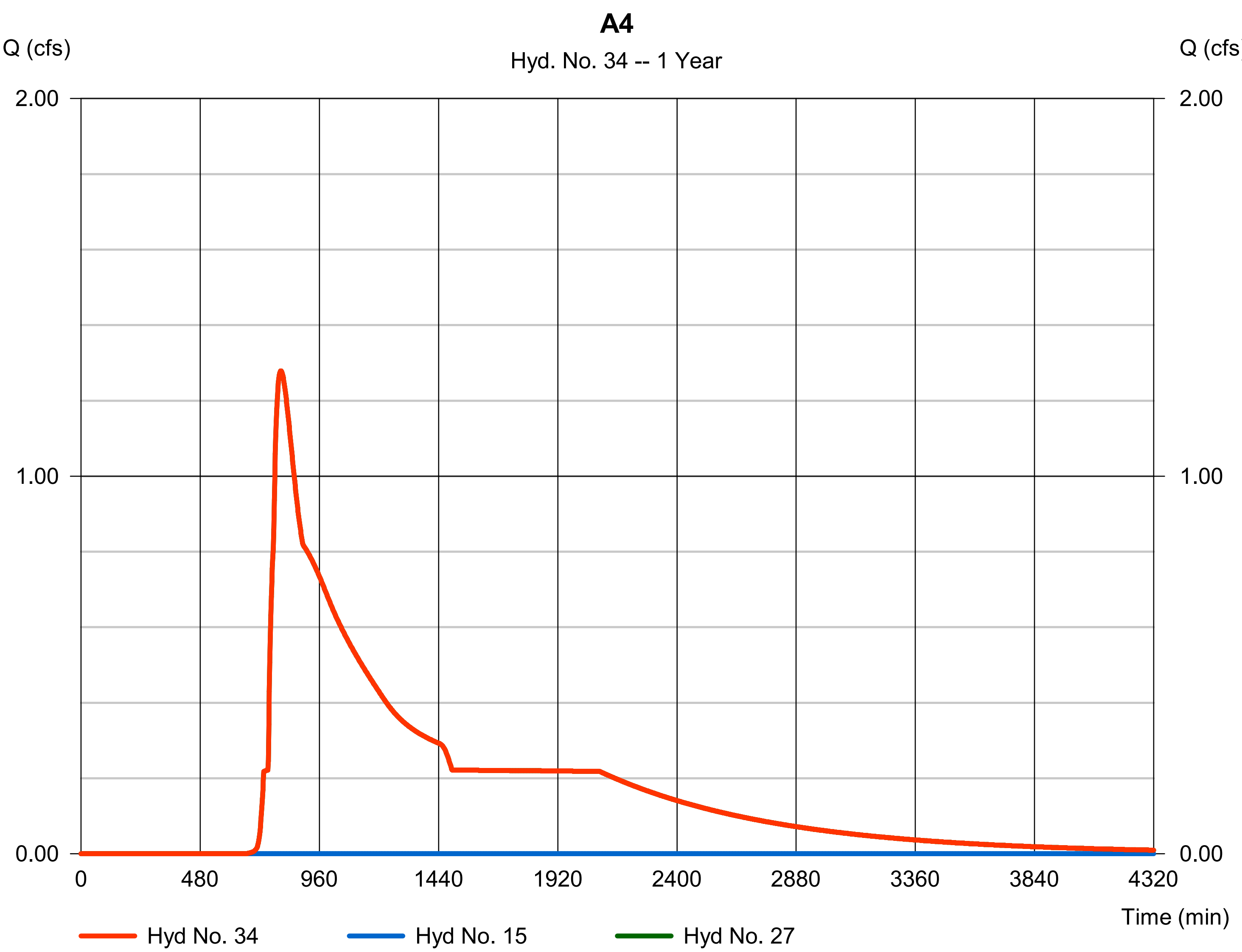
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 34

A4

Hydrograph type	= Combine	Peak discharge	= 1.279 cfs
Storm frequency	= 1 yrs	Time to peak	= 804 min
Time interval	= 2 min	Hyd. volume	= 43,088 cuft
Inflow hyds.	= 15, 27	Contrib. drain. area	= 0.000 ac



Hydrograph Report

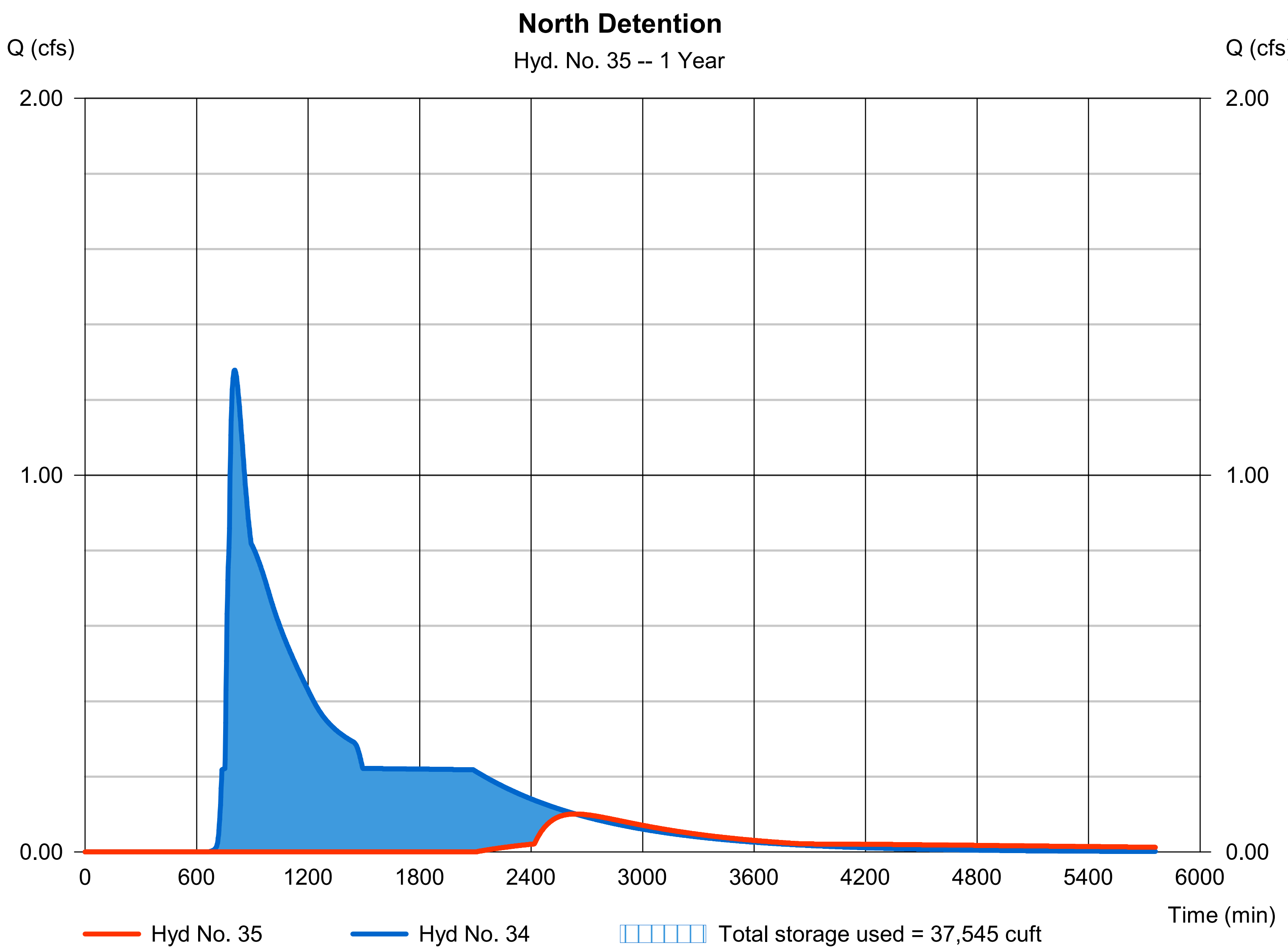
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 35

North Detention

Hydrograph type	= Reservoir	Peak discharge	= 0.101 cfs
Storm frequency	= 1 yrs	Time to peak	= 2638 min
Time interval	= 2 min	Hyd. volume	= 7,320 cuft
Inflow hyd. No.	= 34 - A4	Max. Elevation	= 402.83 ft
Reservoir name	= Dry Detention #1	Max. Storage	= 37,545 cuft

Storage Indication method used.



Pond No. 7 - Dry Detention #1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 400.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	400.00	10,783	0	0
2.00	402.00	13,895	24,610	24,610
4.00	404.00	17,231	31,063	55,673
6.00	406.00	20,793	37,964	93,637

Culvert / Orifice Structures

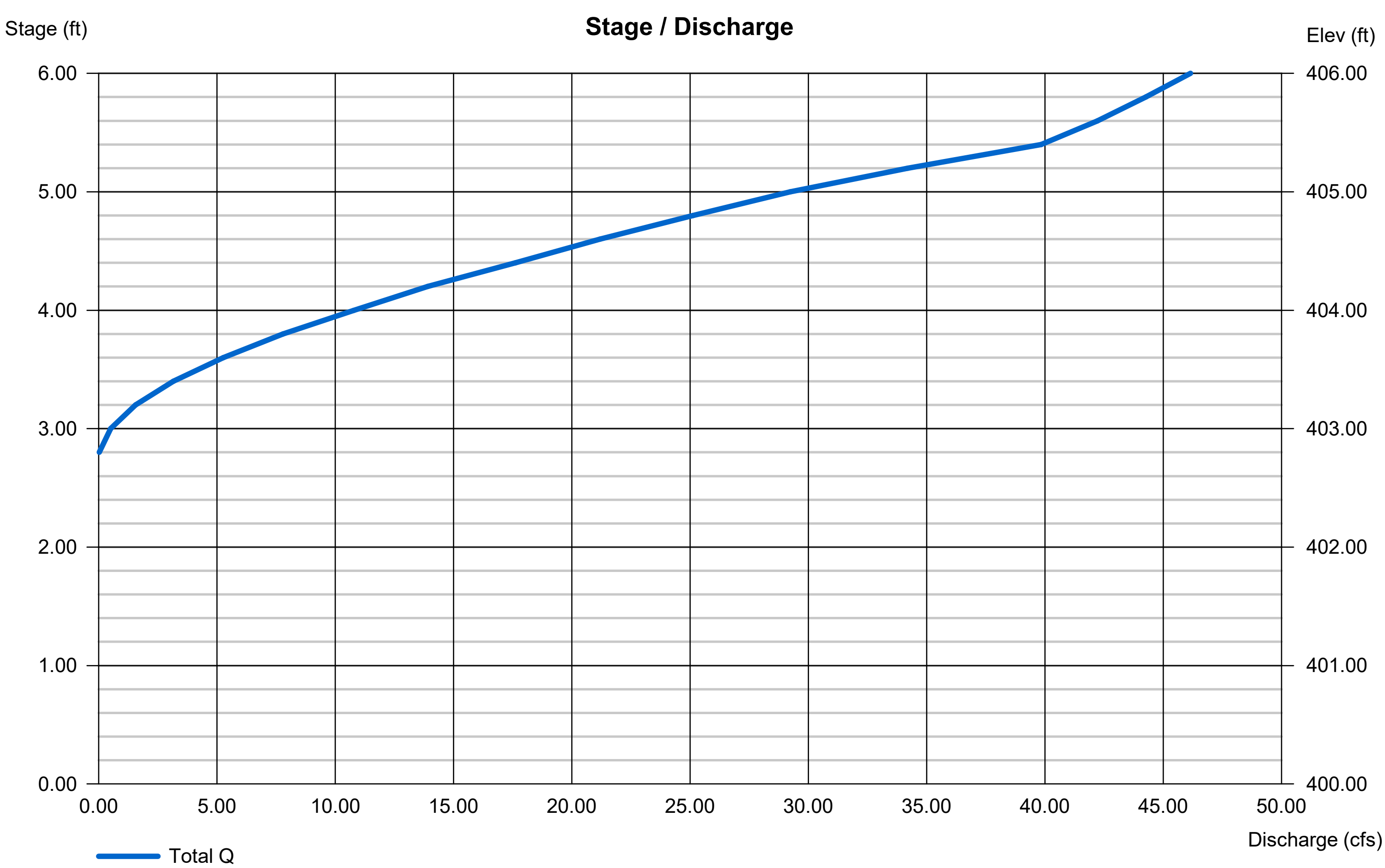
		[A]	[B]	[C]	[PrfRsr]
Rise (in)	=	30.00	4.50	36.00	0.00
Span (in)	=	30.00	4.50	36.00	0.00
No. Barrels	=	1	0	1	0
Invert El. (ft)	=	400.00	400.00	402.75	0.00
Length (ft)	=	0.00	0.00	0.00	0.00
Slope (%)	=	0.00	0.00	0.00	n/a
N-Value	=	.013	.013	.013	n/a
Orifice Coeff.	=	0.60	0.60	0.60	0.60
Multi-Stage	=	n/a	Yes	Yes	No

Weir Structures

		[A]	[B]	[C]	[D]
Crest Len (ft)	=	4.00	0.00	0.00	0.00
Crest El. (ft)	=	405.00	0.00	0.00	0.00
Weir Coeff.	=	3.33	3.33	3.33	3.33
Weir Type	=	Rect	---	---	---
Multi-Stage	=	Yes	No	No	No

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

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



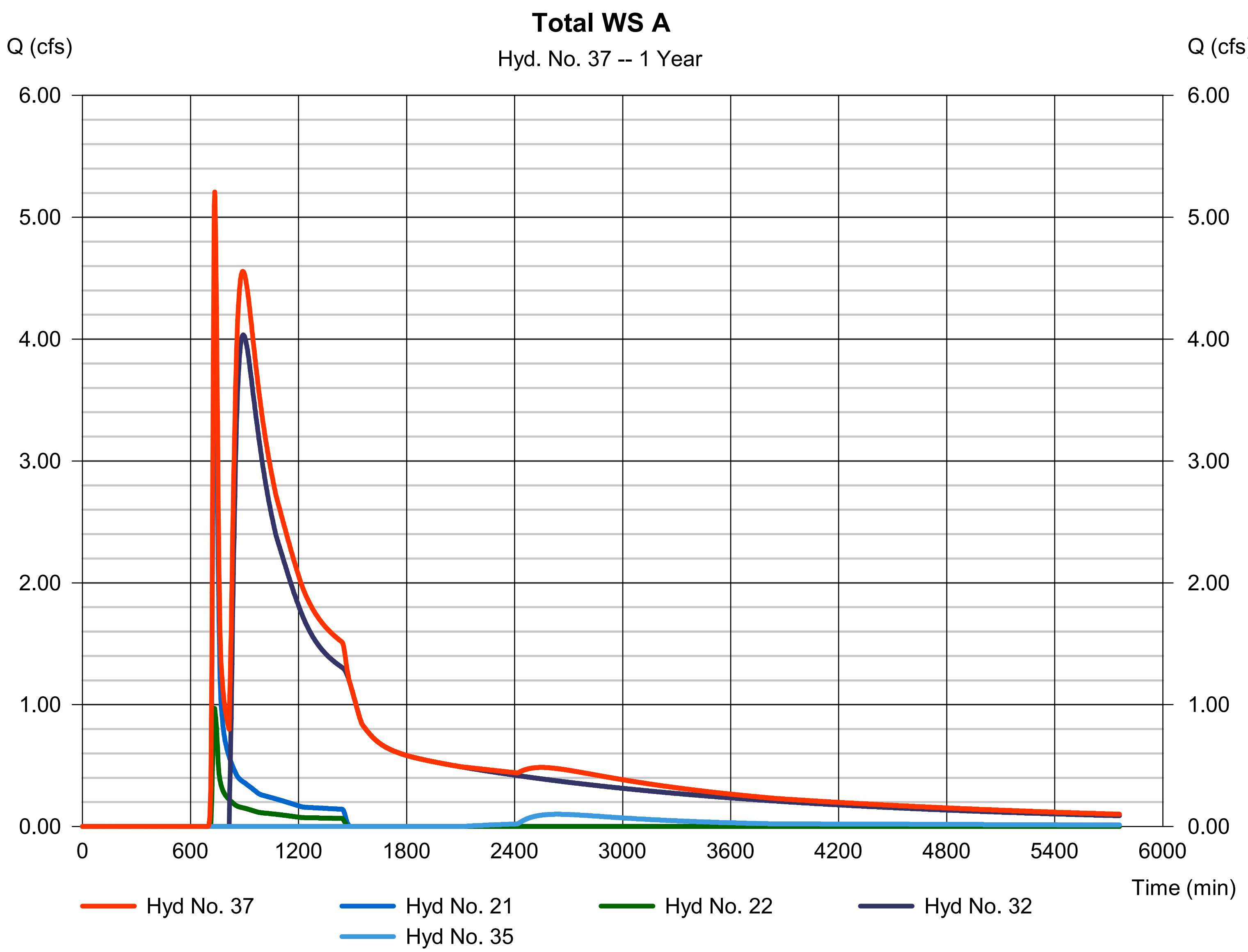
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 37

Total WS A

Hydrograph type	= Combine	Peak discharge	= 5.208 cfs
Storm frequency	= 1 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 195,975 cuft
Inflow hyds.	= 21, 22, 32, 35	Contrib. drain. area	= 8.310 ac

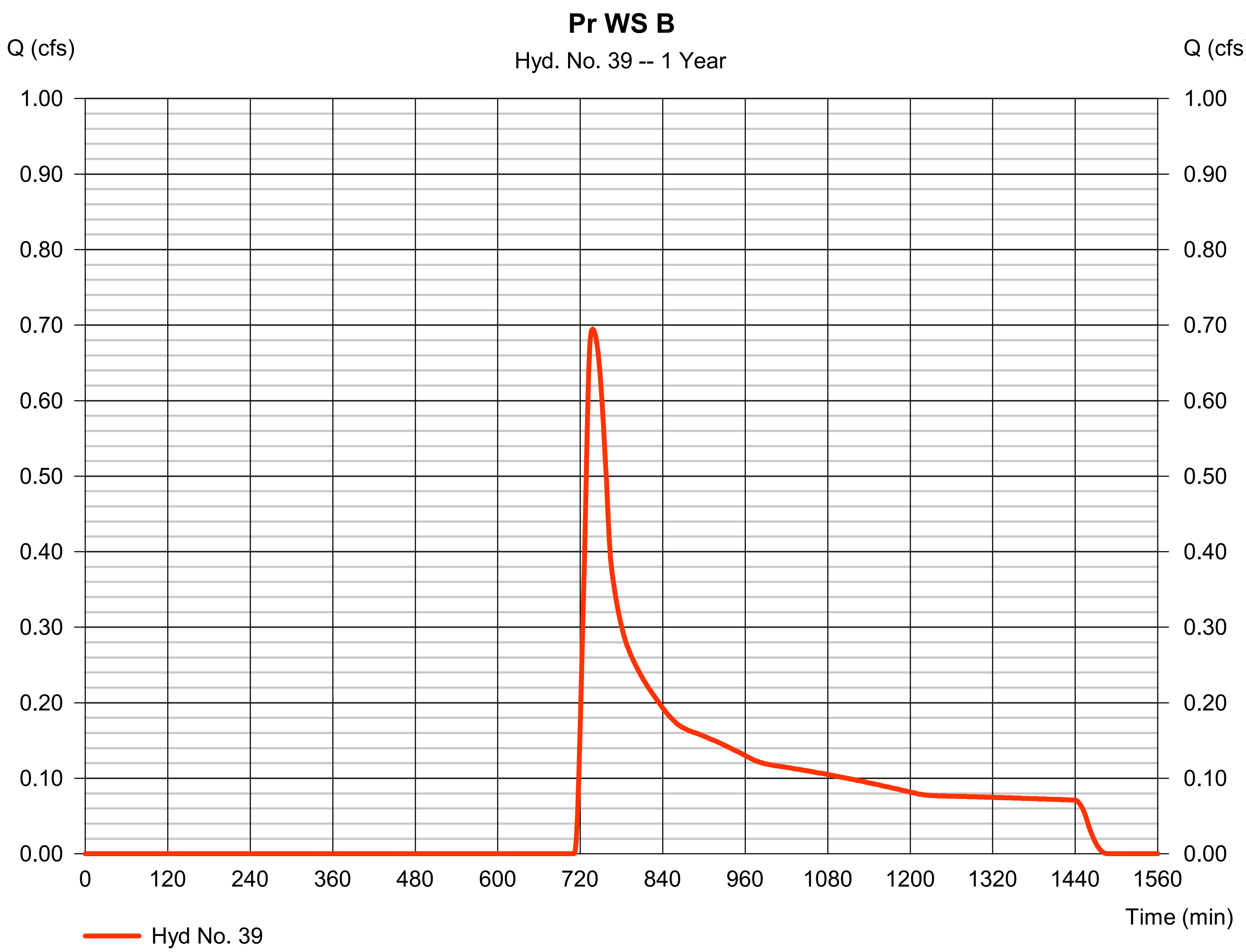


Hydrograph Report

Hyd. No. 39

Pr WS B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.695 cfs
Storm frequency	= 1 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 6,448 cuft
Drainage area	= 9.900 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 27.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



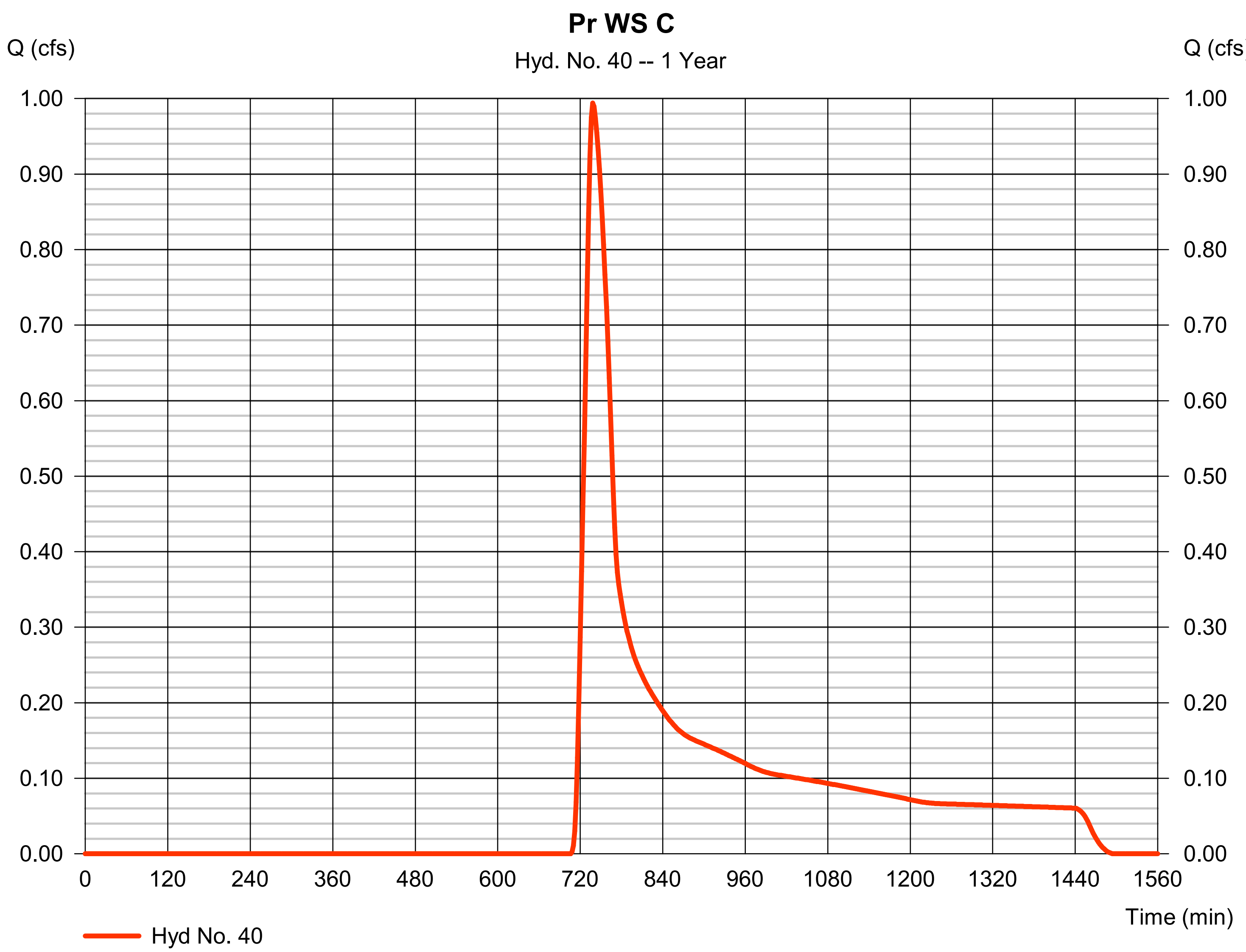
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 40

Pr WS C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.994 cfs
Storm frequency	= 1 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 6,819 cuft
Drainage area	= 6.320 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 34.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



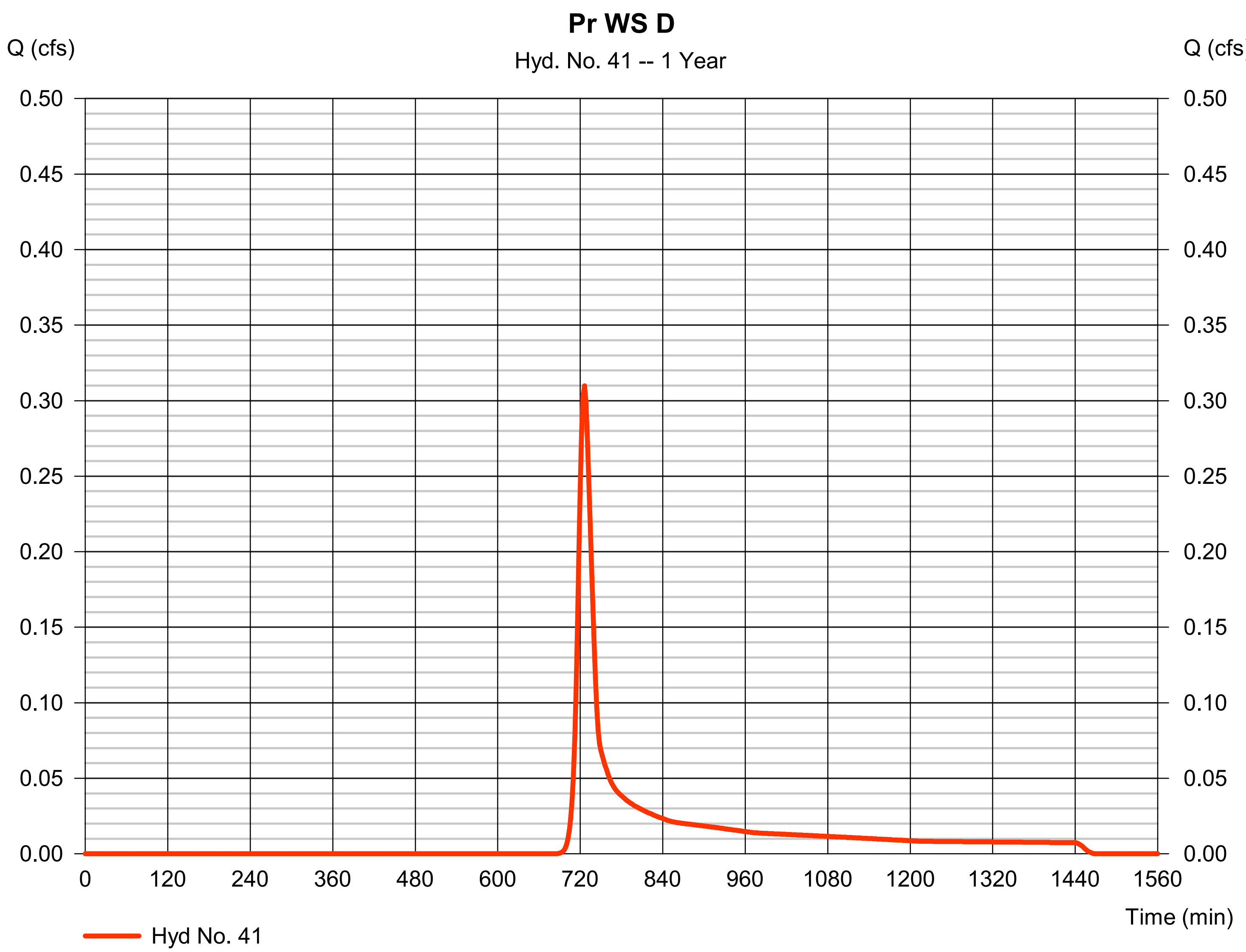
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 41

Pr WS D

Hydrograph type	= SCS Runoff	Peak discharge	= 0.310 cfs
Storm frequency	= 1 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 1,067 cuft
Drainage area	= 0.550 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 20.00 min
Total precip.	= 2.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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	53.15	2	716	110,665	------	------	------	Pr WS A1
2	Diversion1	17.25	2	706	89,869	1	------	------	A1 to Bio #1
3	Diversion2	35.90	2	716	20,795	1	------	------	A1 to Detention
5	SCS Runoff	102.44	2	722	301,660	------	------	------	Pr WS A2
6	Diversion1	38.56	2	710	246,623	5	------	------	A2 to Bio #2
7	Diversion2	63.88	2	722	55,037	5	------	------	A2 to Detention
9	SCS Runoff	37.08	2	718	86,793	------	------	------	Pr WS A3
10	Diversion1	21.66	2	712	79,445	9	------	------	A3 to Bio #3
11	Diversion2	15.42	2	718	7,348	9	------	------	A3 to Detention
13	SCS Runoff	23.15	2	736	105,486	------	------	------	Pr WS A4
14	Diversion1	17.25	2	726	100,248	13	------	------	A4 to Bio #4
15	Diversion2	5.904	2	736	5,239	13	------	------	A4 to Detention
17	SCS Runoff	7.094	2	732	29,231	------	------	------	Pr WS A5
18	Reach	7.104	2	732	29,229	17	------	------	PR Reach A5
19	SCS Runoff	6.950	2	730	26,118	------	------	------	Pr WS A6
20	Combine	13.84	2	730	55,347	18, 19	------	------	Combine
21	Reach	13.85	2	732	55,347	20	------	------	PR Reach A6
22	SCS Runoff	6.203	2	730	25,698	------	------	------	Pr WS A7
24	Reservoir	11.87	2	724	87,518	2	406.12	31,882	Bio A1
25	Reservoir	25.88	2	738	237,292	6	402.14	94,192	Bio A2
26	Reservoir	8.284	2	730	78,332	10	409.28	36,736	Bio A3
27	Reservoir	13.01	2	756	100,187	14	403.64	34,206	Bio A4
29	Combine	102.56	2	718	83,181	3, 7, 11,	------	------	A1+A2+A3 Bypass
30	Combine	43.65	2	732	403,142	24, 25, 26,	------	------	A1+A2+A3 thru Bioretention
31	Combine	129.84	2	720	486,323	29, 30	------	------	A1 + A2 + A3
32	Reservoir	35.25	2	750	407,589	31	403.21	204,971	Wet Pond #1
34	Combine	13.01	2	756	105,426	15, 27,	------	------	A4
35	Reservoir	2.367	2	854	69,606	34	403.30	44,842	North Detention
37	Combine	49.64	2	738	558,240	21, 22, 32, 35,	------	------	Total WS A

Proposed Hydrographs.gpw	Return Period: 10 Year	Tuesday, 10 / 1 / 2019

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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
39	SCS Runoff	5.777	2	732	27,569	------	------	------	Pr WS B
40	SCS Runoff	4.705	2	736	23,226	------	------	------	Pr WS C
41	SCS Runoff	0.913	2	724	2,896	------	------	------	Pr WS D

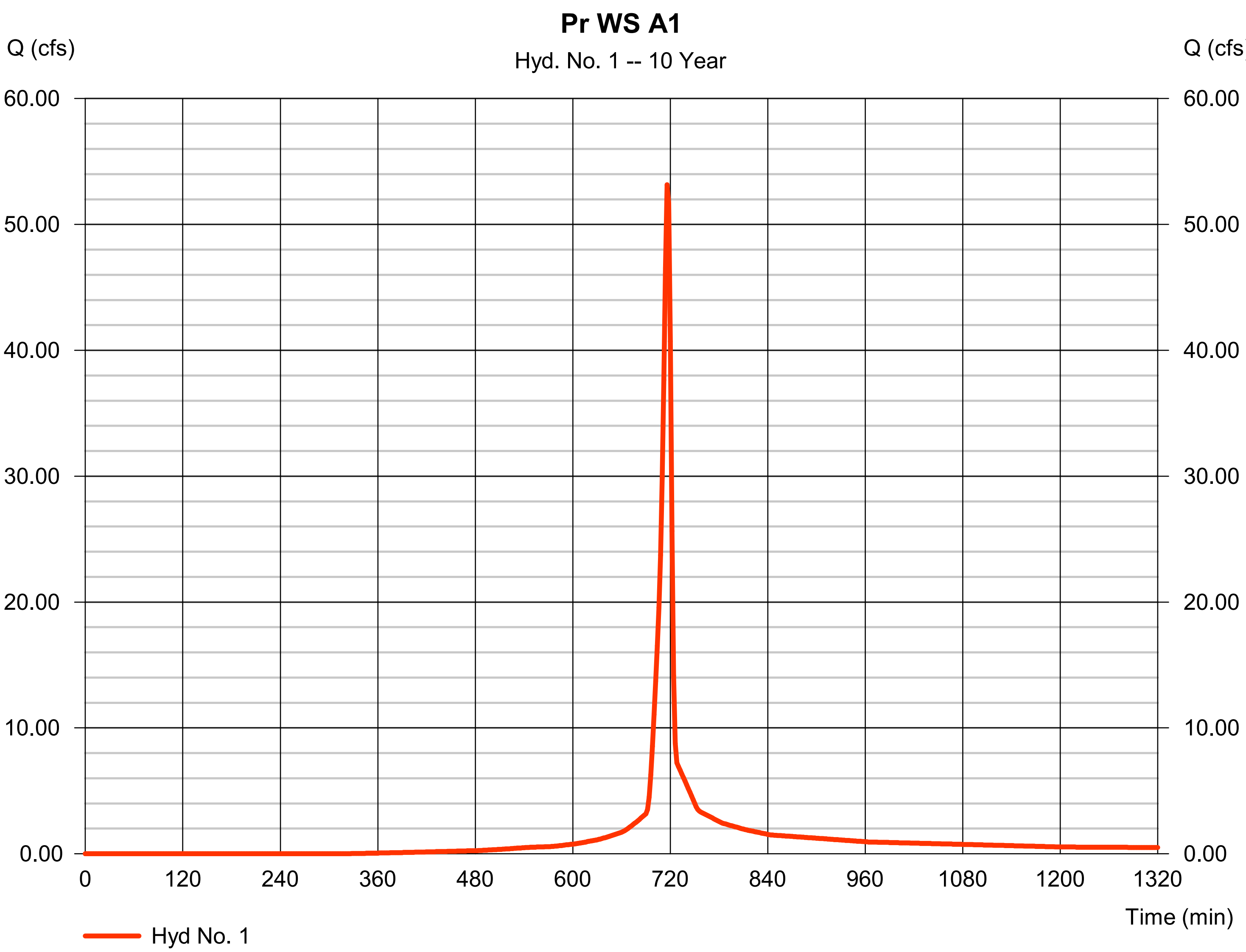
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 1

Pr WS A1

Hydrograph type	= SCS Runoff	Peak discharge	= 53.15 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 110,665 cuft
Drainage area	= 14.090 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



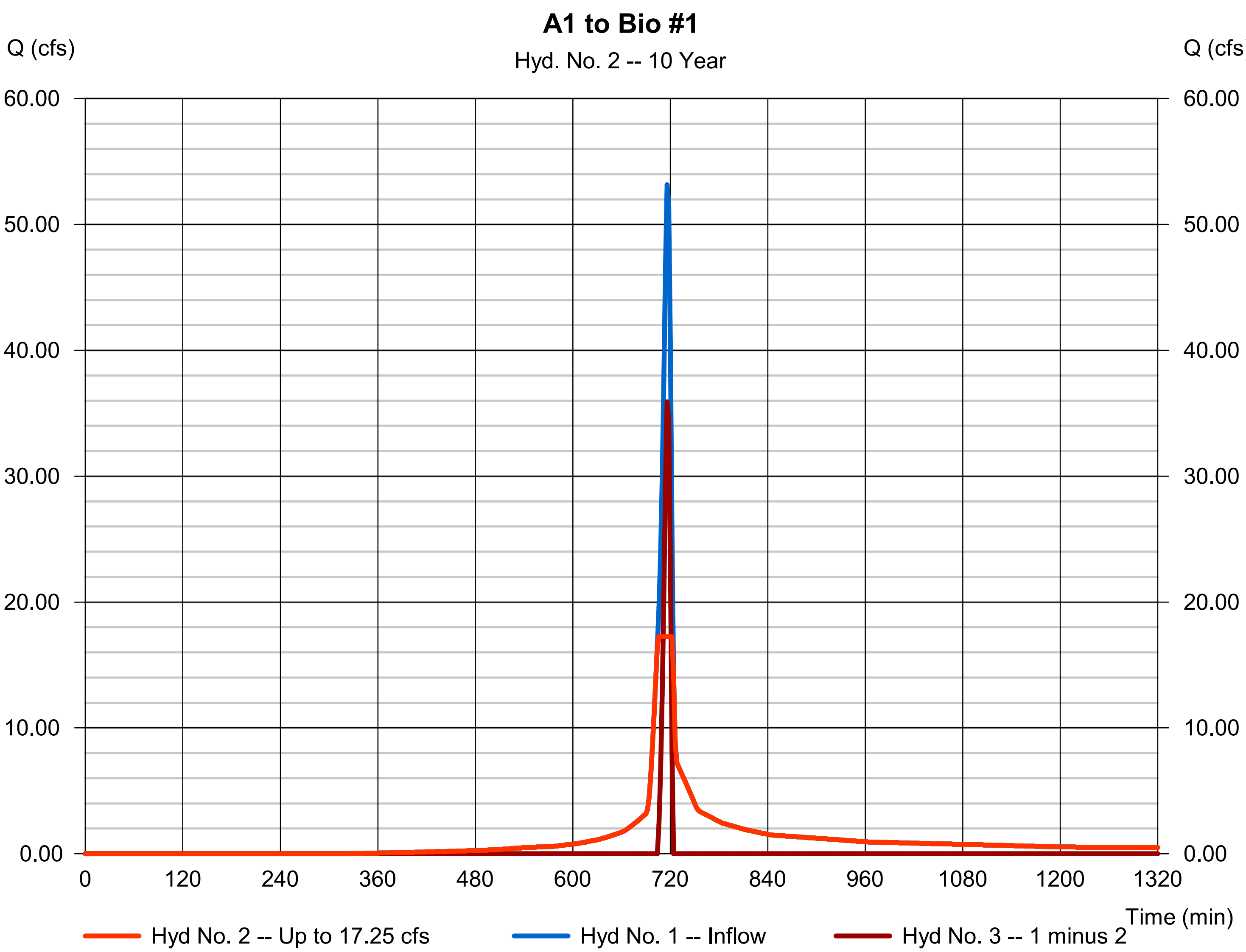
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 2

A1 to Bio #1

Hydrograph type	= Diversion1	Peak discharge	= 17.25 cfs
Storm frequency	= 10 yrs	Time to peak	= 706 min
Time interval	= 2 min	Hyd. volume	= 89,869 cuft
Inflow hydrograph	= 1 - Pr WS A1	2nd diverted hyd.	= 3
Diversion method	= Constant Q	Constant Q	= 17.25 cfs



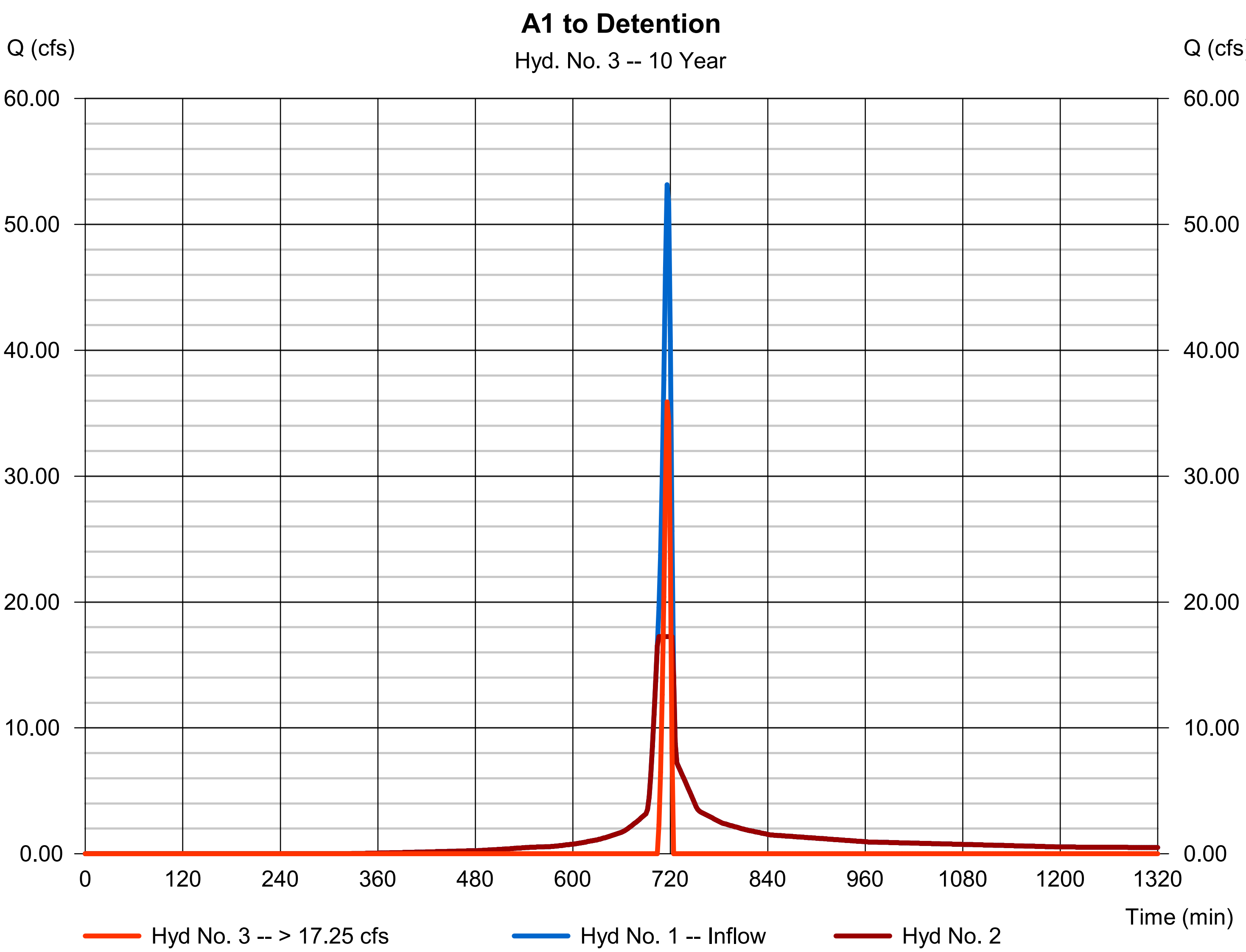
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 3

A1 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 35.90 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 20,795 cuft
Inflow hydrograph	= 1 - Pr WS A1	2nd diverted hyd.	= 2
Diversion method	= Constant Q	Constant Q	= 17.25 cfs



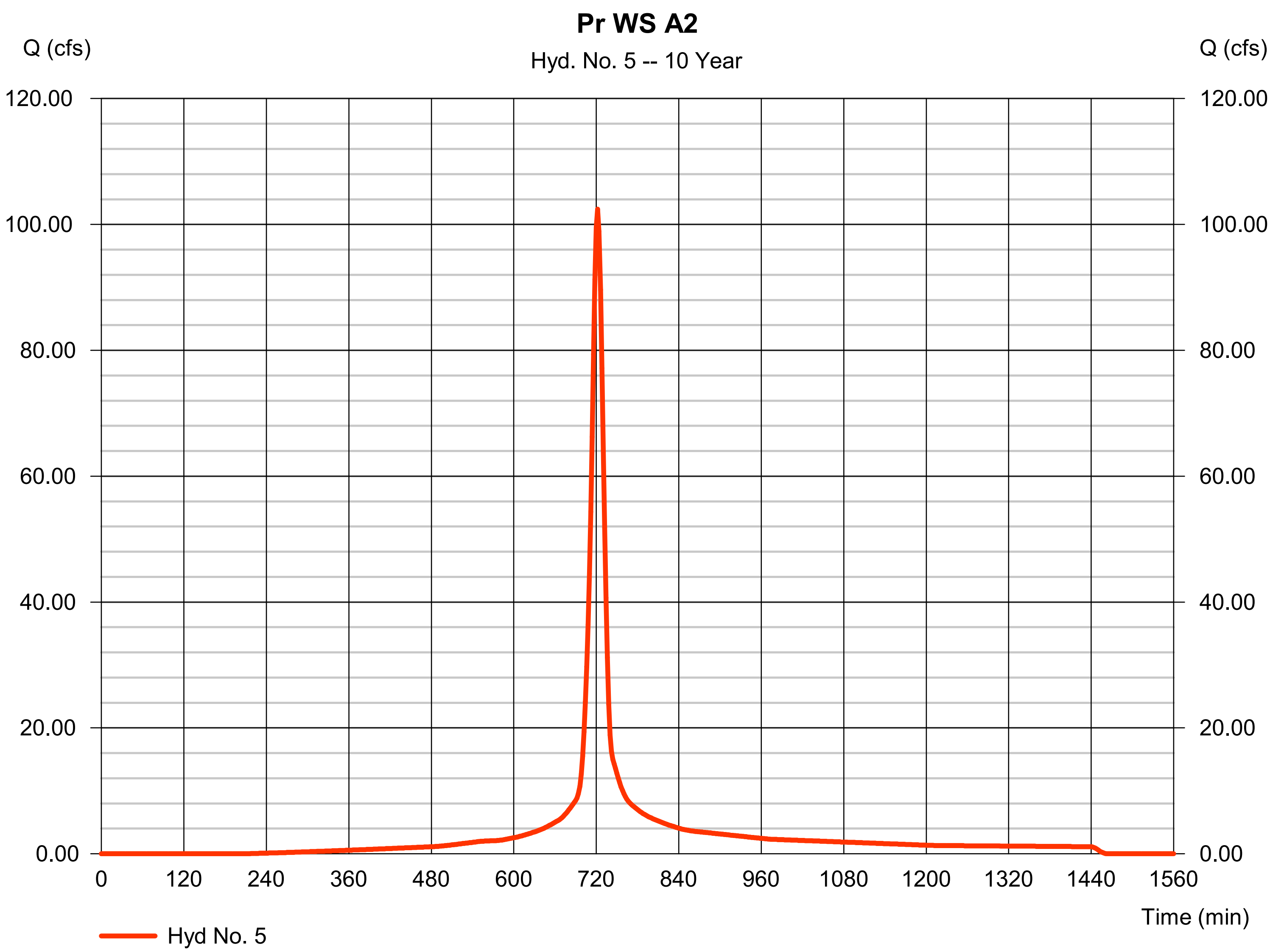
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 5

Pr WS A2

Hydrograph type	= SCS Runoff	Peak discharge	= 102.44 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 301,660 cuft
Drainage area	= 31.690 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



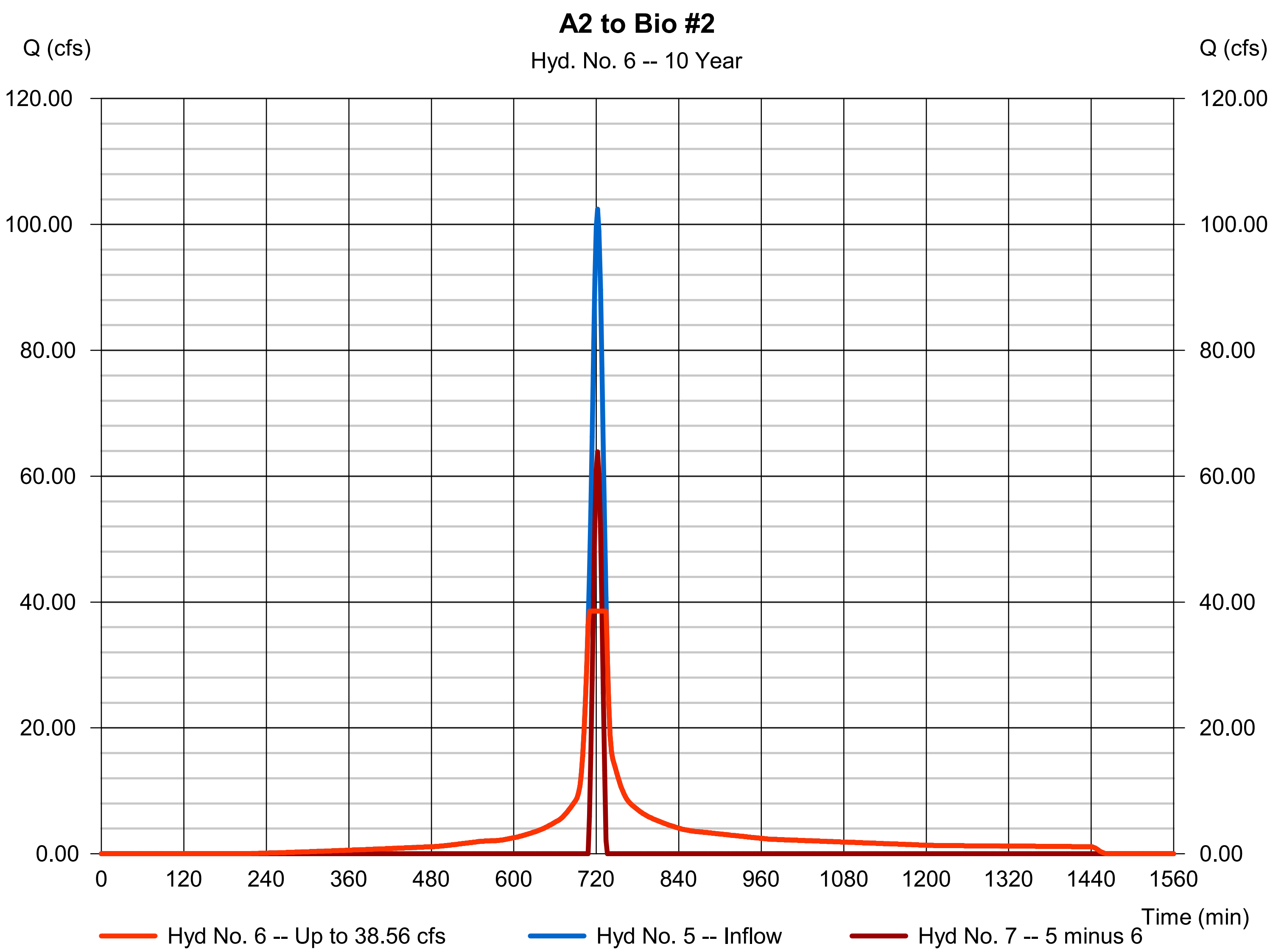
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 6

A2 to Bio #2

Hydrograph type	= Diversion1	Peak discharge	= 38.56 cfs
Storm frequency	= 10 yrs	Time to peak	= 710 min
Time interval	= 2 min	Hyd. volume	= 246,623 cuft
Inflow hydrograph	= 5 - Pr WS A2	2nd diverted hyd.	= 7
Diversion method	= Constant Q	Constant Q	= 38.56 cfs



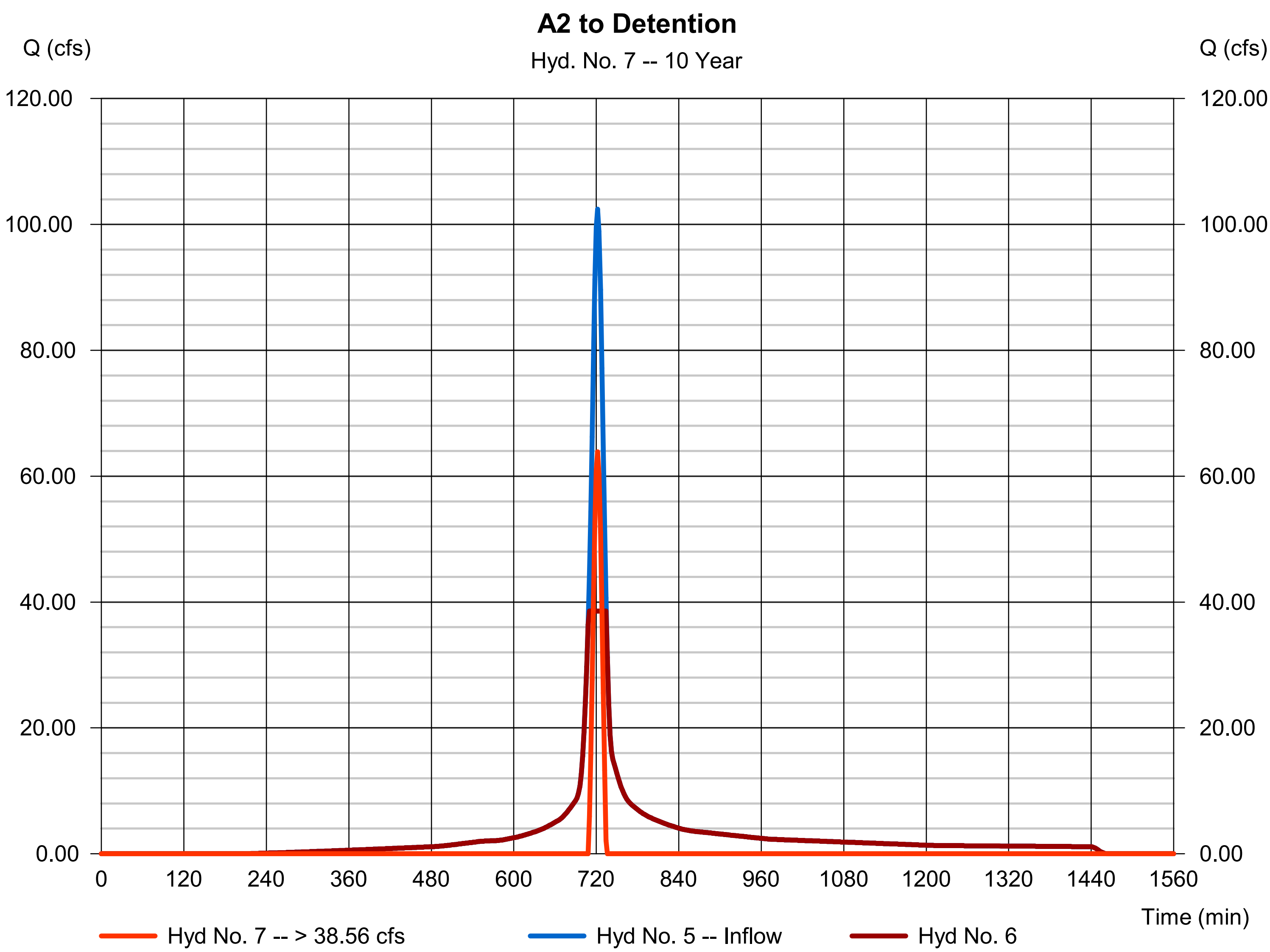
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 7

A2 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 63.88 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 55,037 cuft
Inflow hydrograph	= 5 - Pr WS A2	2nd diverted hyd.	= 6
Diversion method	= Constant Q	Constant Q	= 38.56 cfs



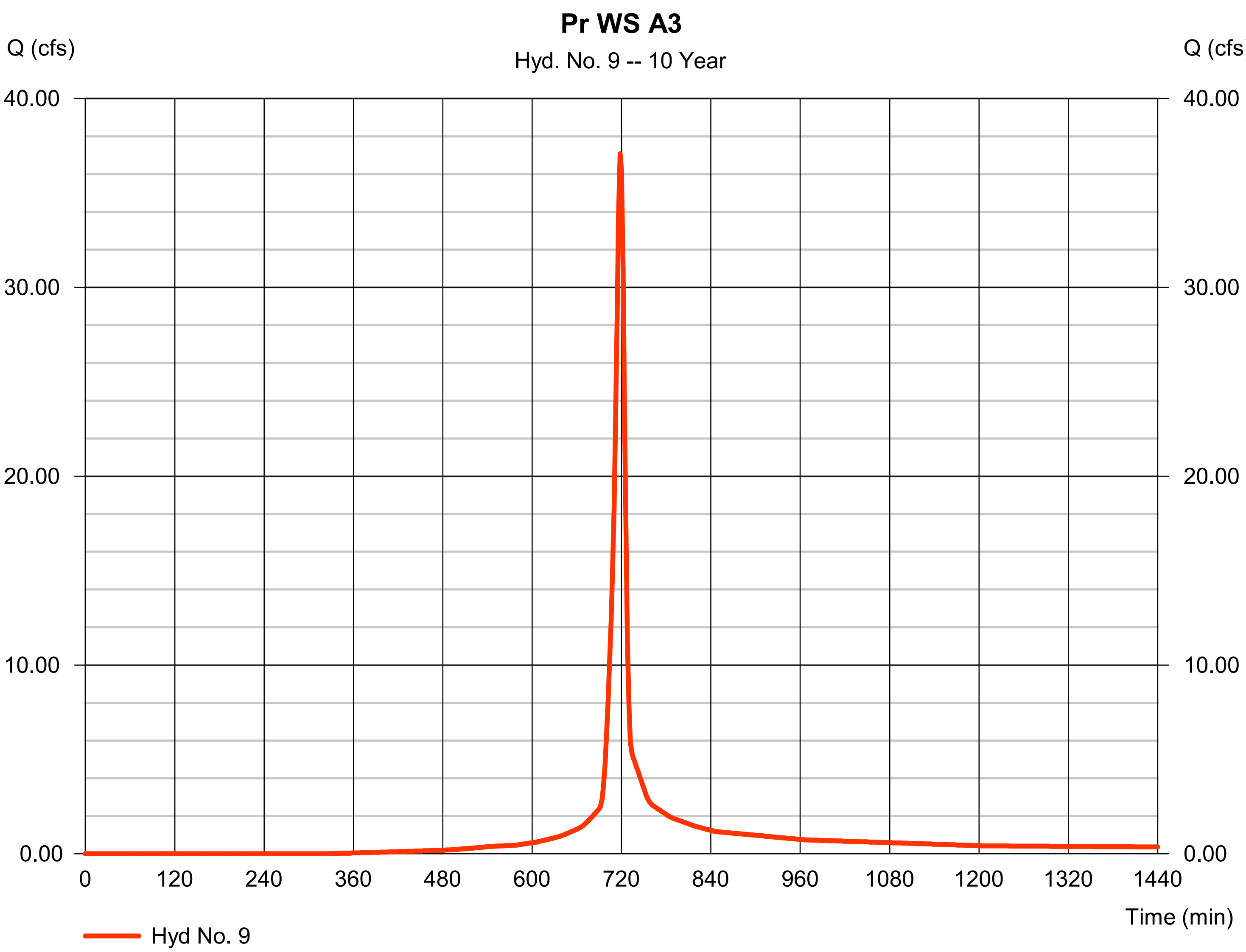
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 9

Pr WS A3

Hydrograph type	= SCS Runoff	Peak discharge	= 37.08 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 86,793 cuft
Drainage area	= 10.360 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



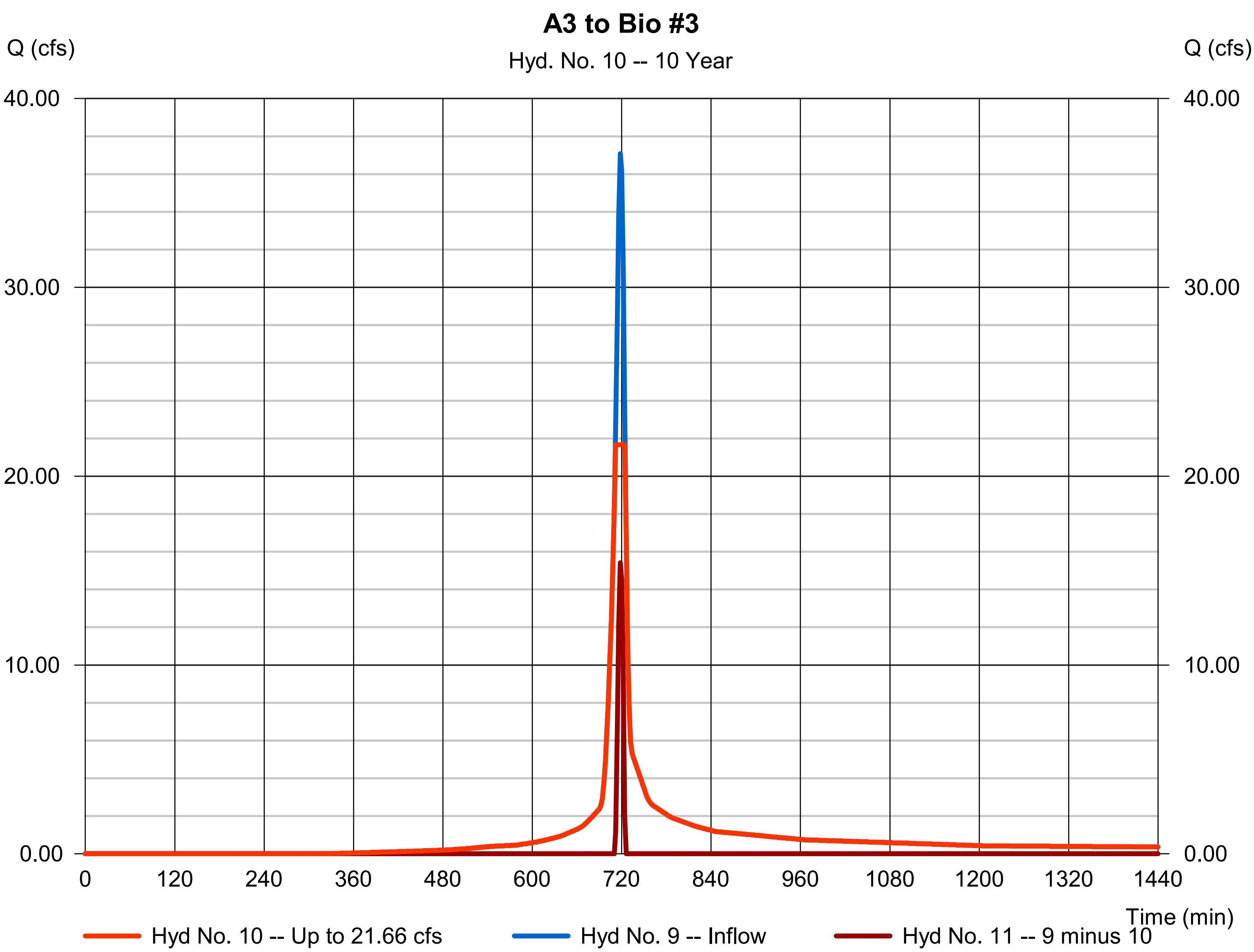
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 10

A3 to Bio #3

Hydrograph type	= Diversion1	Peak discharge	= 21.66 cfs
Storm frequency	= 10 yrs	Time to peak	= 712 min
Time interval	= 2 min	Hyd. volume	= 79,445 cuft
Inflow hydrograph	= 9 - Pr WS A3	2nd diverted hyd.	= 11
Diversion method	= Constant Q	Constant Q	= 21.66 cfs



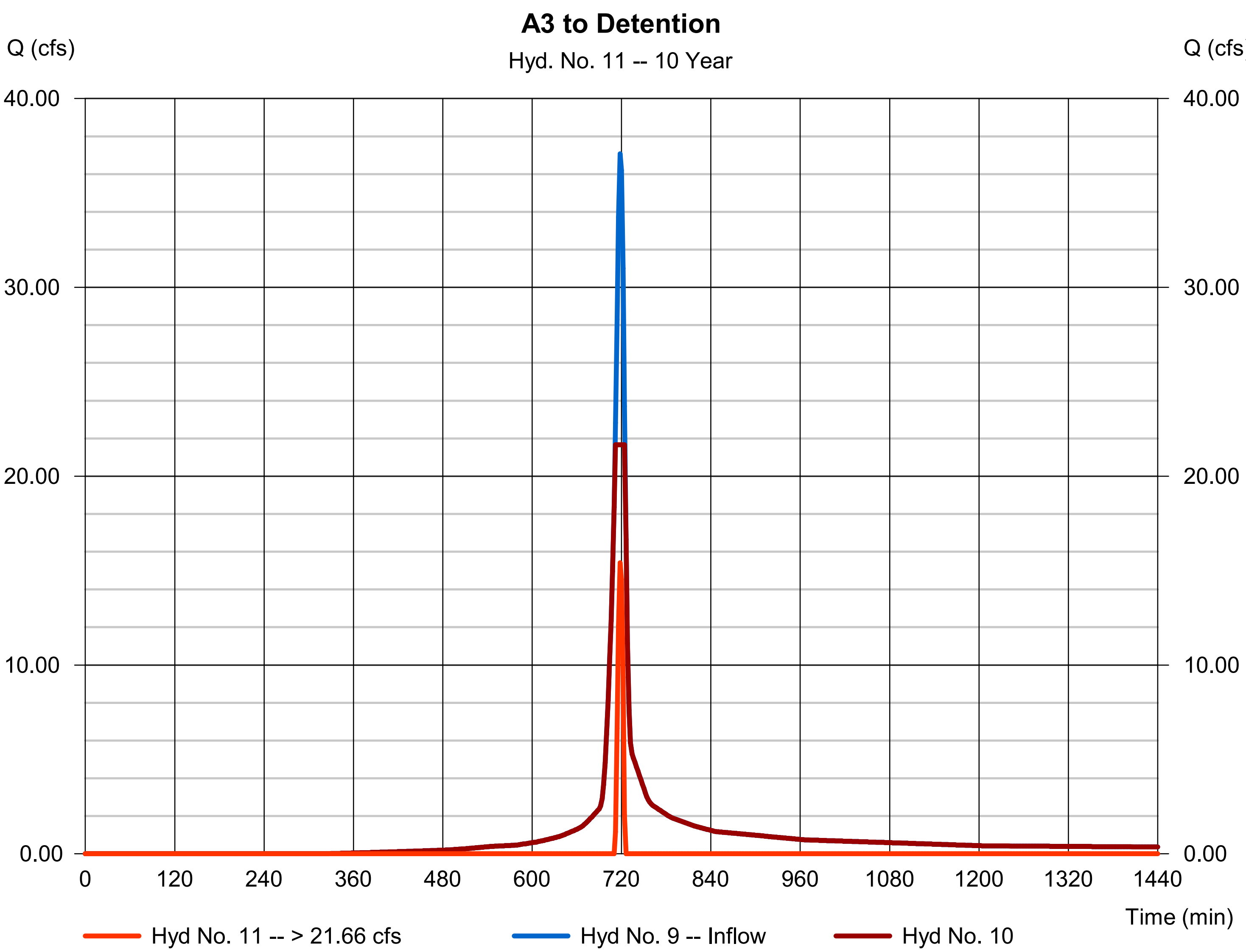
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 11

A3 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 15.42 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 7,348 cuft
Inflow hydrograph	= 9 - Pr WS A3	2nd diverted hyd.	= 10
Diversion method	= Constant Q	Constant Q	= 21.66 cfs



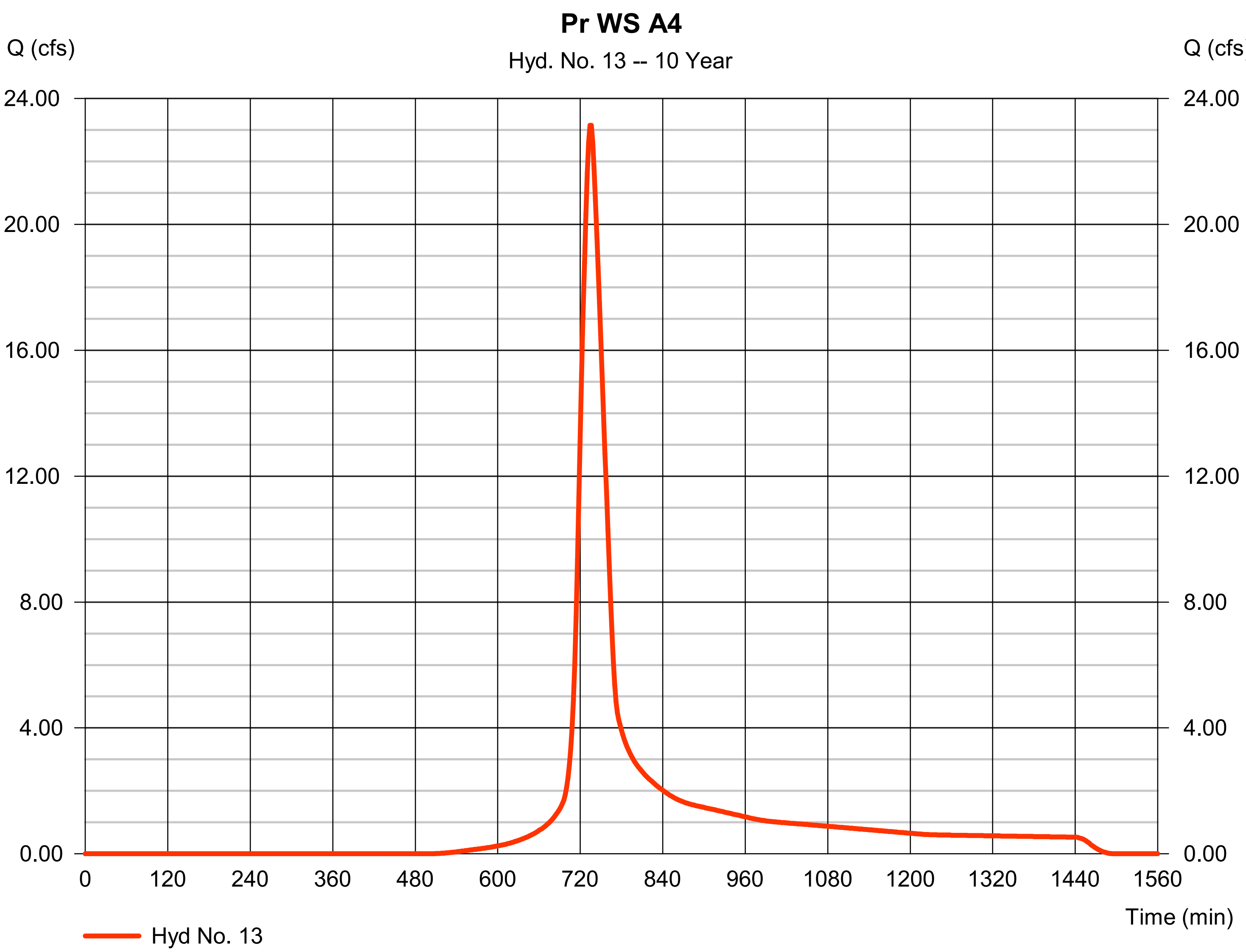
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 13

Pr WS A4

Hydrograph type	= SCS Runoff	Peak discharge	= 23.15 cfs
Storm frequency	= 10 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 105,486 cuft
Drainage area	= 16.960 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 36.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



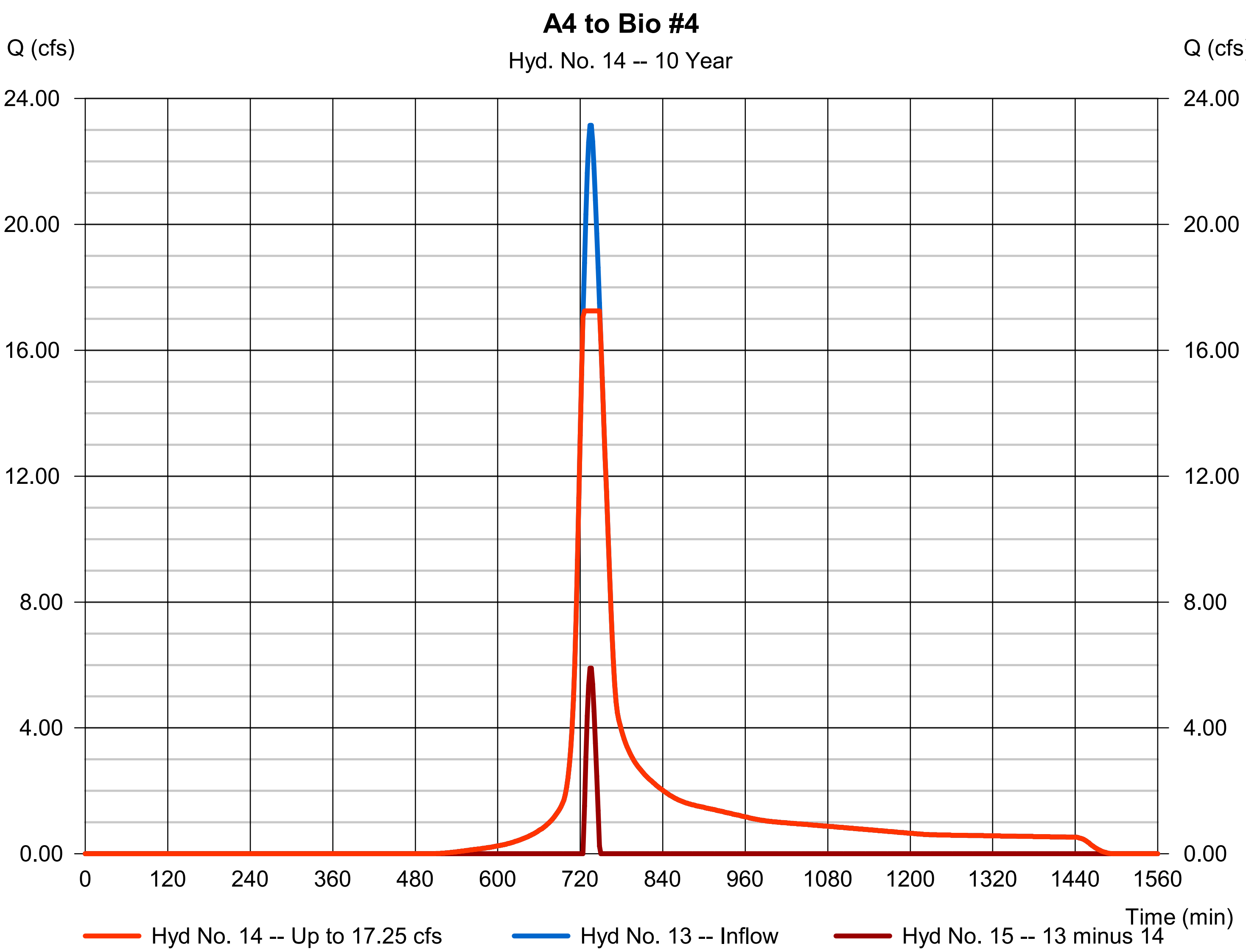
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 14

A4 to Bio #4

Hydrograph type	= Diversion1	Peak discharge	= 17.25 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 100,248 cuft
Inflow hydrograph	= 13 - Pr WS A4	2nd diverted hyd.	= 15
Diversion method	= Constant Q	Constant Q	= 17.25 cfs

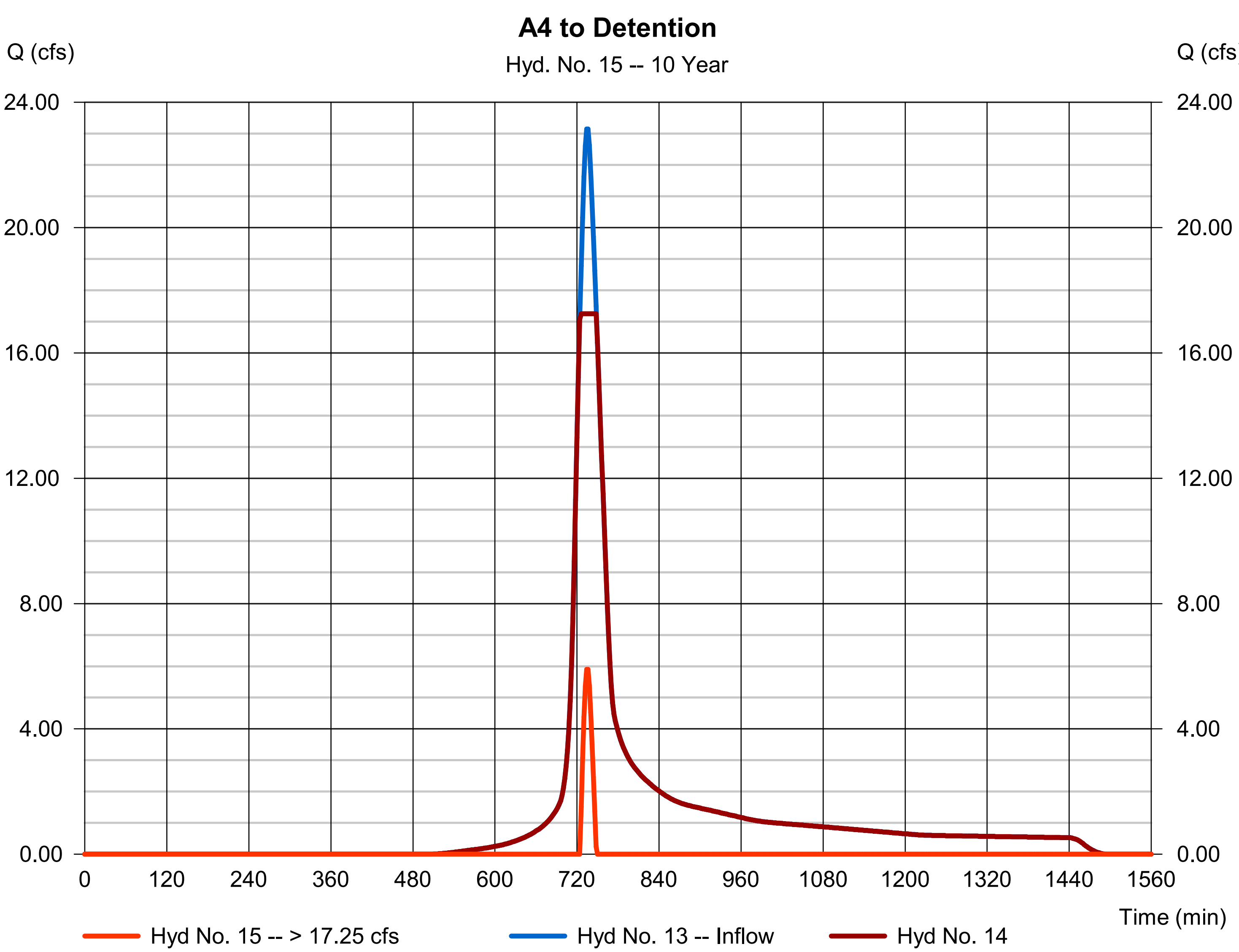


Hydrograph Report

Hyd. No. 15

A4 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 5.904 cfs
Storm frequency	= 10 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 5,239 cuft
Inflow hydrograph	= 13 - Pr WS A4	2nd diverted hyd.	= 14
Diversion method	= Constant Q	Constant Q	= 17.25 cfs



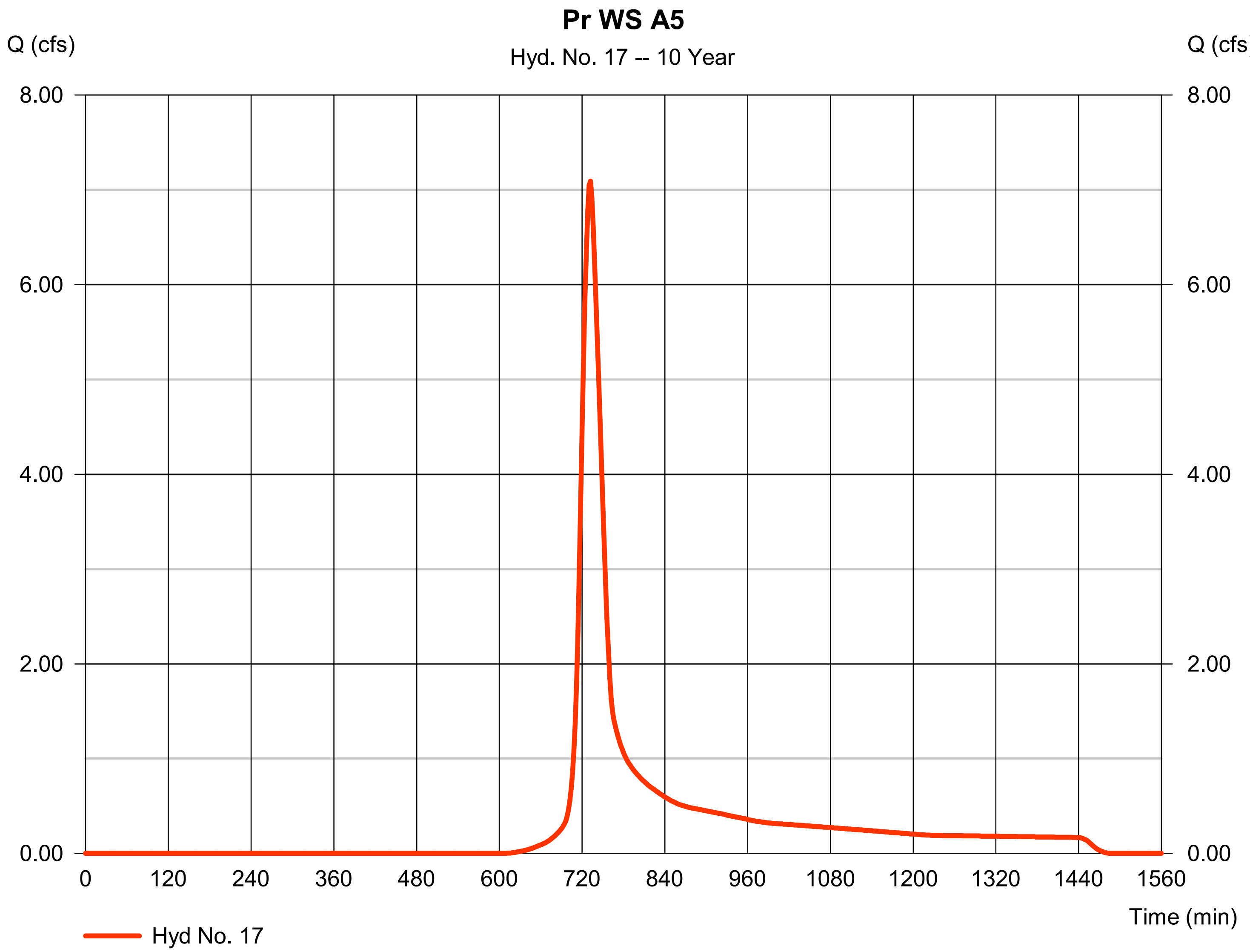
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 17

Pr WS A5

Hydrograph type	= SCS Runoff	Peak discharge	= 7.094 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 29,231 cuft
Drainage area	= 6.100 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 30.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

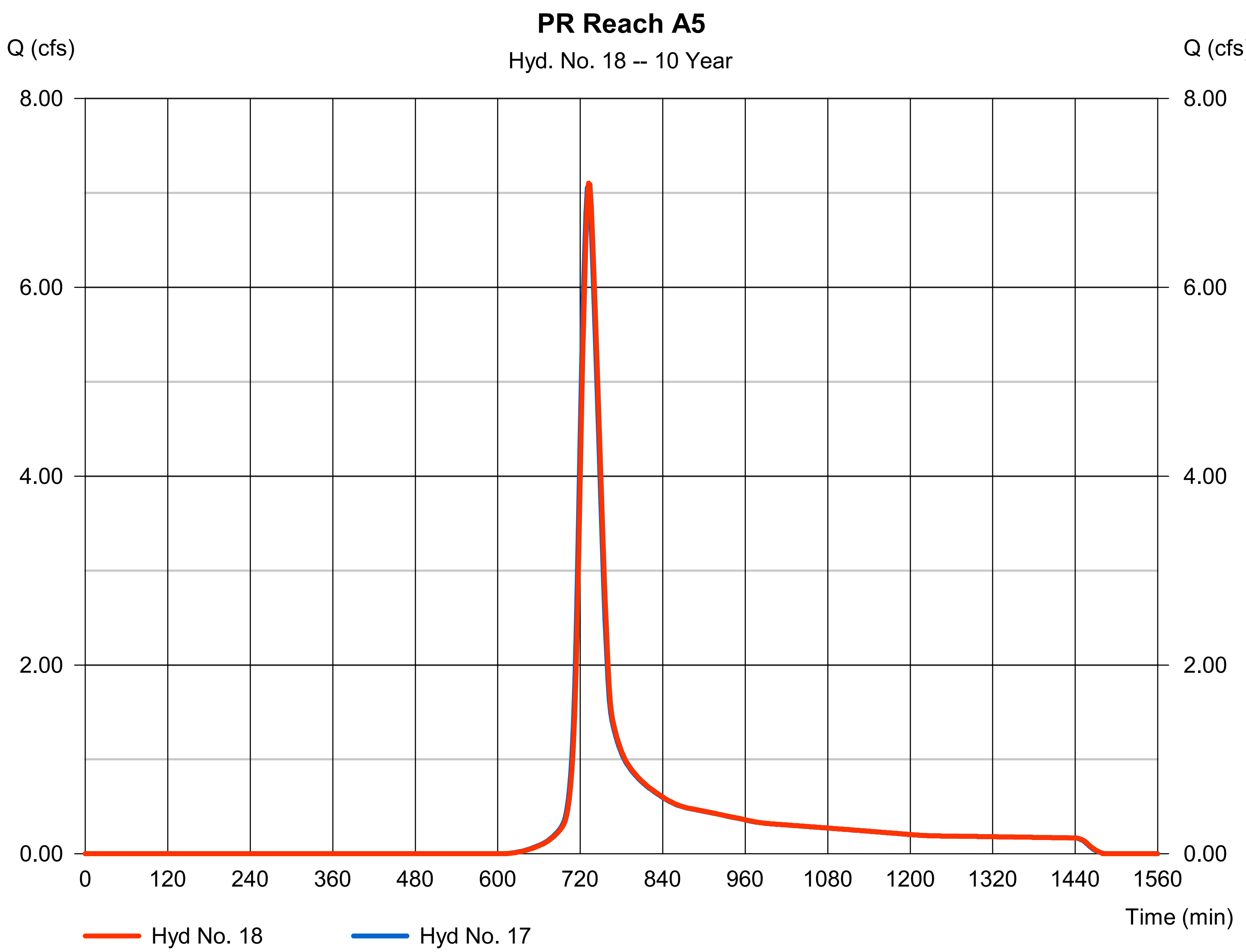
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 18

PR Reach A5

Hydrograph type	= Reach	Peak discharge	= 7.104 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 29,229 cuft
Inflow hyd. No.	= 17 - Pr WS A5	Section type	= Trapezoidal
Reach length	= 101.0 ft	Channel slope	= 1.6 %
Manning's n	= 0.025	Bottom width	= 12.0 ft
Side slope	= 2.0:1	Max. depth	= 1.0 ft
Rating curve x	= 1.437	Rating curve m	= 1.425
Ave. velocity	= 2.31 ft/s	Routing coeff.	= 1.3238

Modified Att-Kin routing method used.



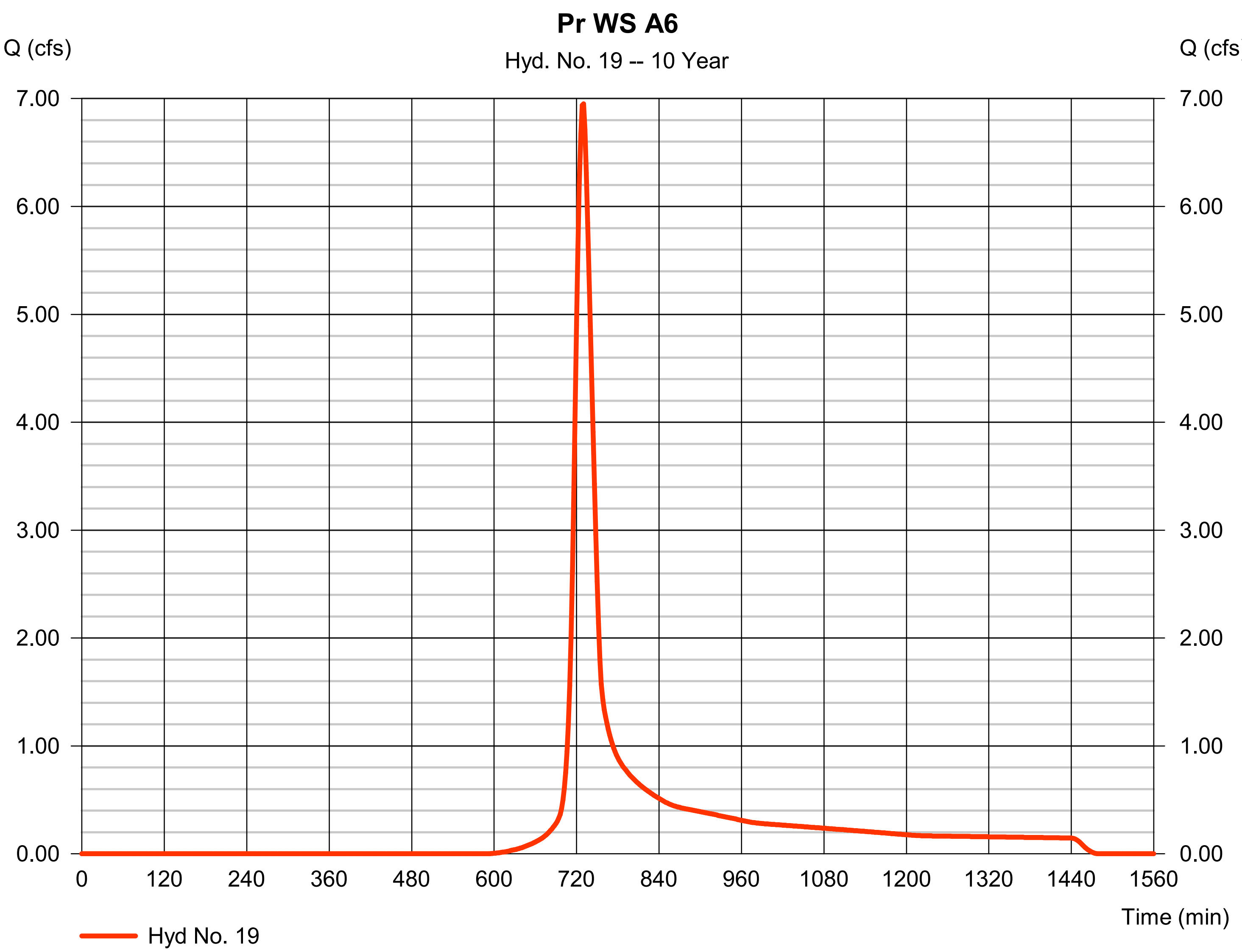
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 19

Pr WS A6

Hydrograph type	= SCS Runoff	Peak discharge	= 6.950 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 26,118 cuft
Drainage area	= 5.280 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 24.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



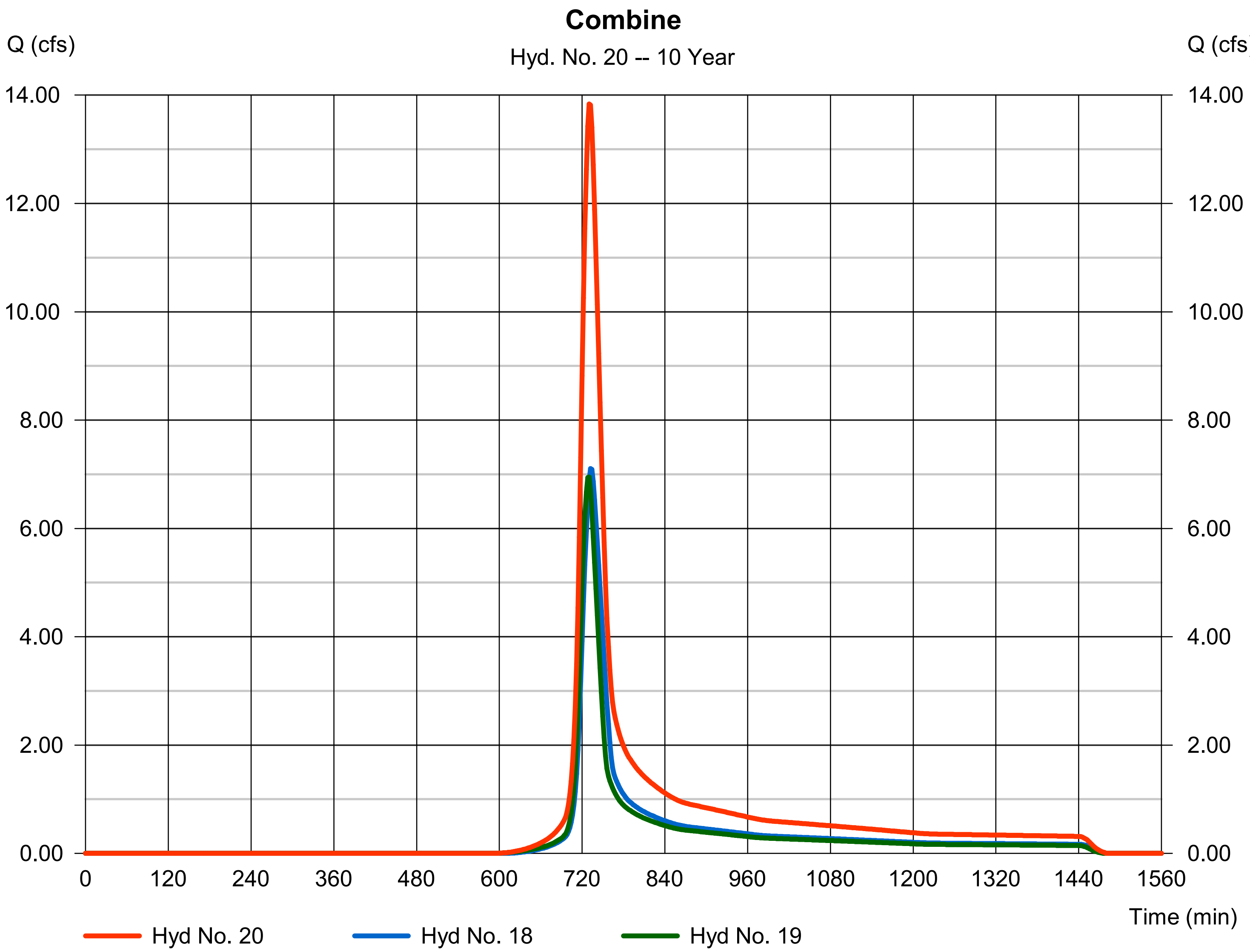
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 20

Combine

Hydrograph type	= Combine	Peak discharge	= 13.84 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 55,347 cuft
Inflow hyds.	= 18, 19	Contrib. drain. area	= 5.280 ac



Hydrograph Report

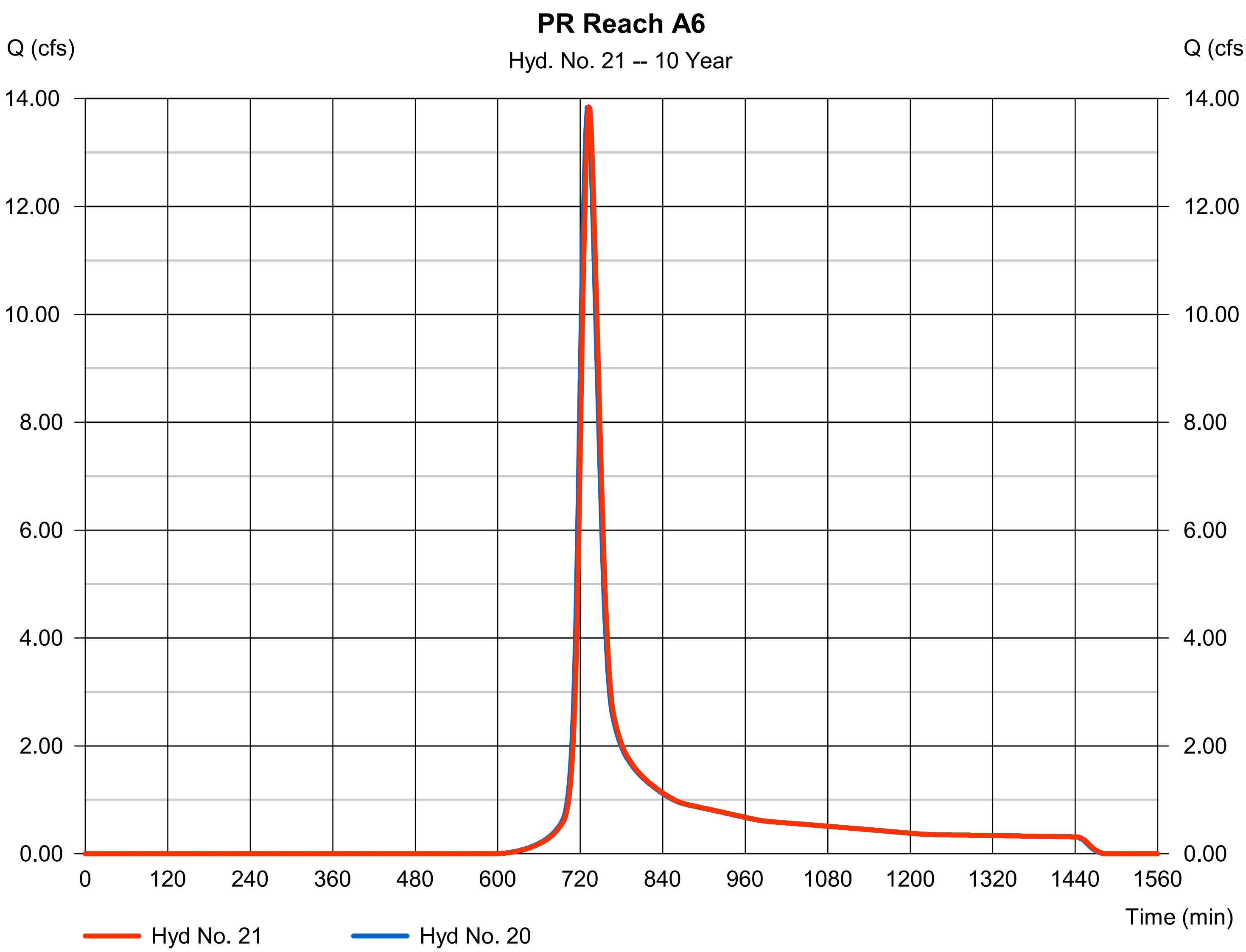
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 21

PR Reach A6

Hydrograph type	= Reach	Peak discharge	= 13.85 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 55,347 cuft
Inflow hyd. No.	= 20 - Combine	Section type	= Trapezoidal
Reach length	= 413.0 ft	Channel slope	= 3.8 %
Manning's n	= 0.025	Bottom width	= 6.0 ft
Side slope	= 2.0:1	Max. depth	= 5.0 ft
Rating curve x	= 3.540	Rating curve m	= 1.395
Ave. velocity	= 5.21 ft/s	Routing coeff.	= 1.0270

Modified Att-Kin routing method used.



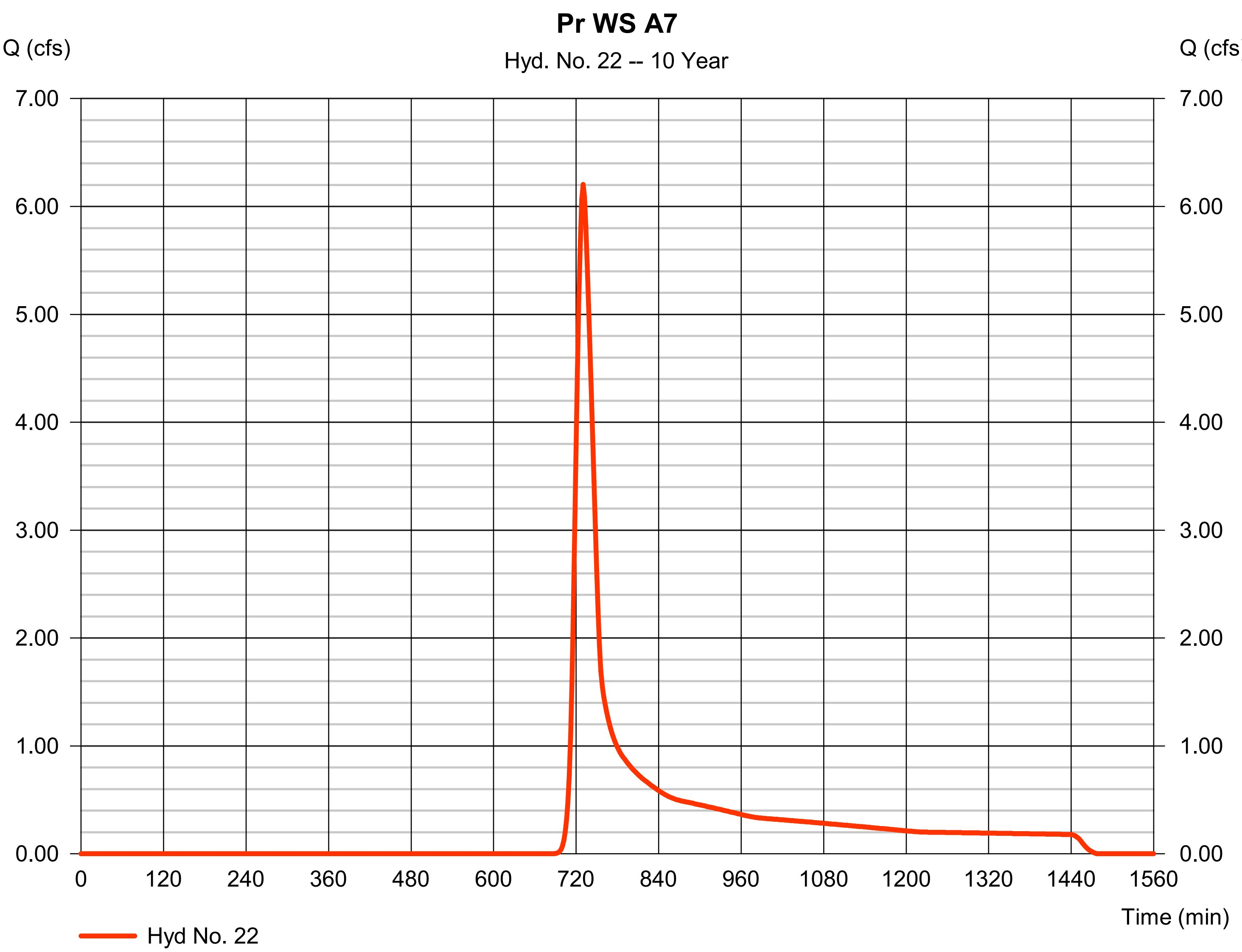
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 22

Pr WS A7

Hydrograph type	= SCS Runoff	Peak discharge	= 6.203 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 25,698 cuft
Drainage area	= 8.310 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 26.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

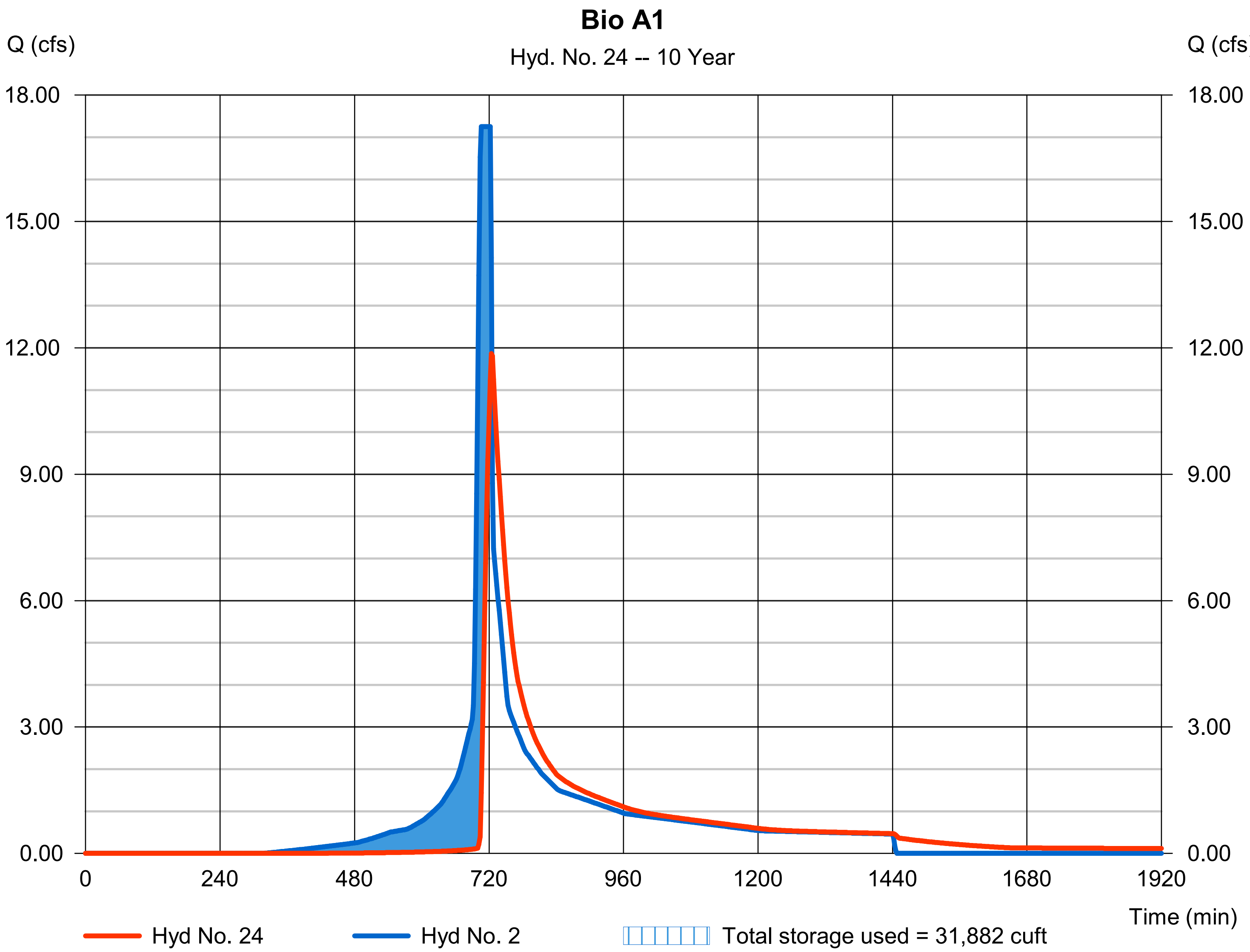
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 24

Bio A1

Hydrograph type	= Reservoir	Peak discharge	= 11.87 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 87,518 cuft
Inflow hyd. No.	= 2 - A1 to Bio #1	Max. Elevation	= 406.12 ft
Reservoir name	= Bio A1 (south)	Max. Storage	= 31,882 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

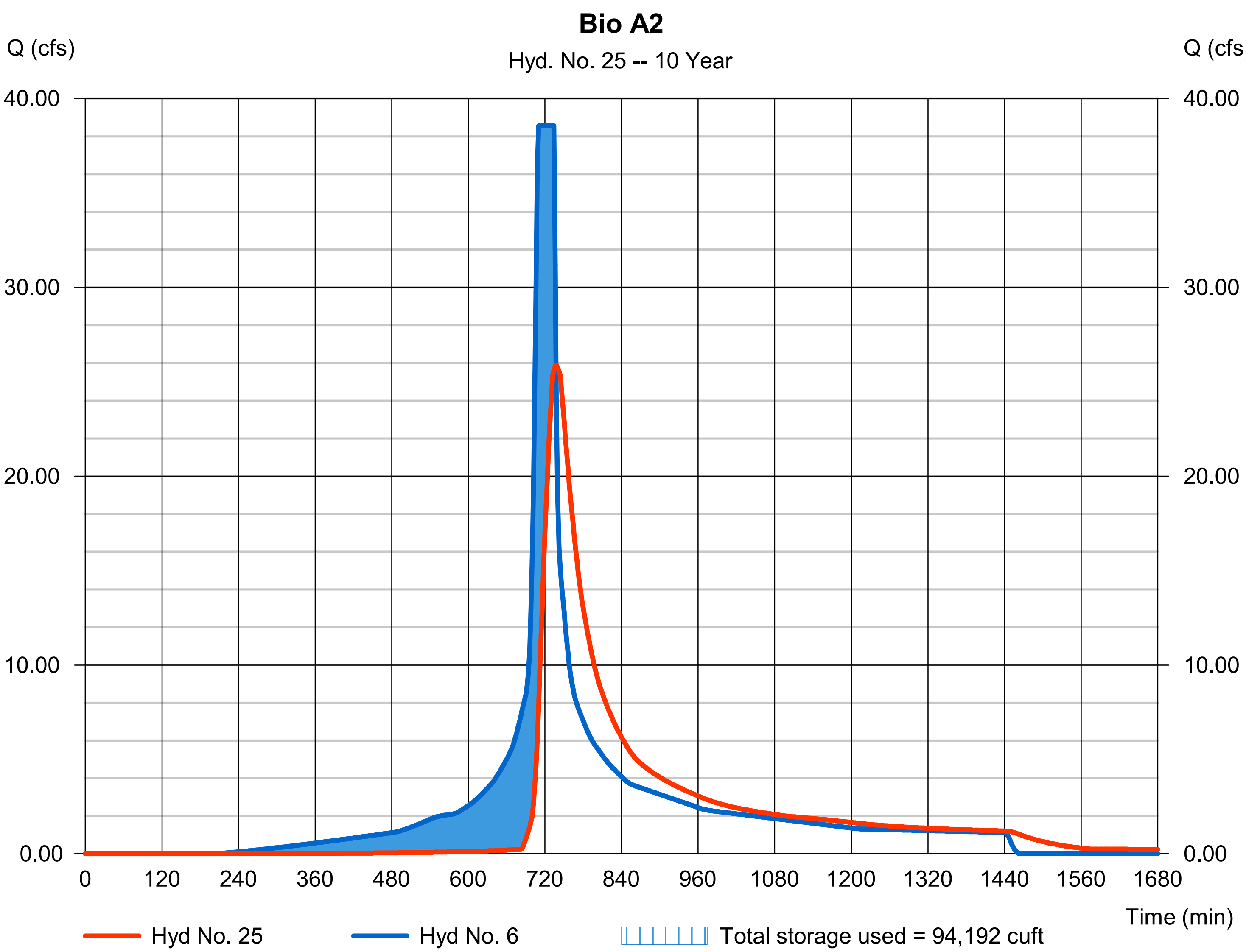
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 25

Bio A2

Hydrograph type	= Reservoir	Peak discharge	= 25.88 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 237,292 cuft
Inflow hyd. No.	= 6 - A2 to Bio #2	Max. Elevation	= 402.14 ft
Reservoir name	= Bio A2 (west)	Max. Storage	= 94,192 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

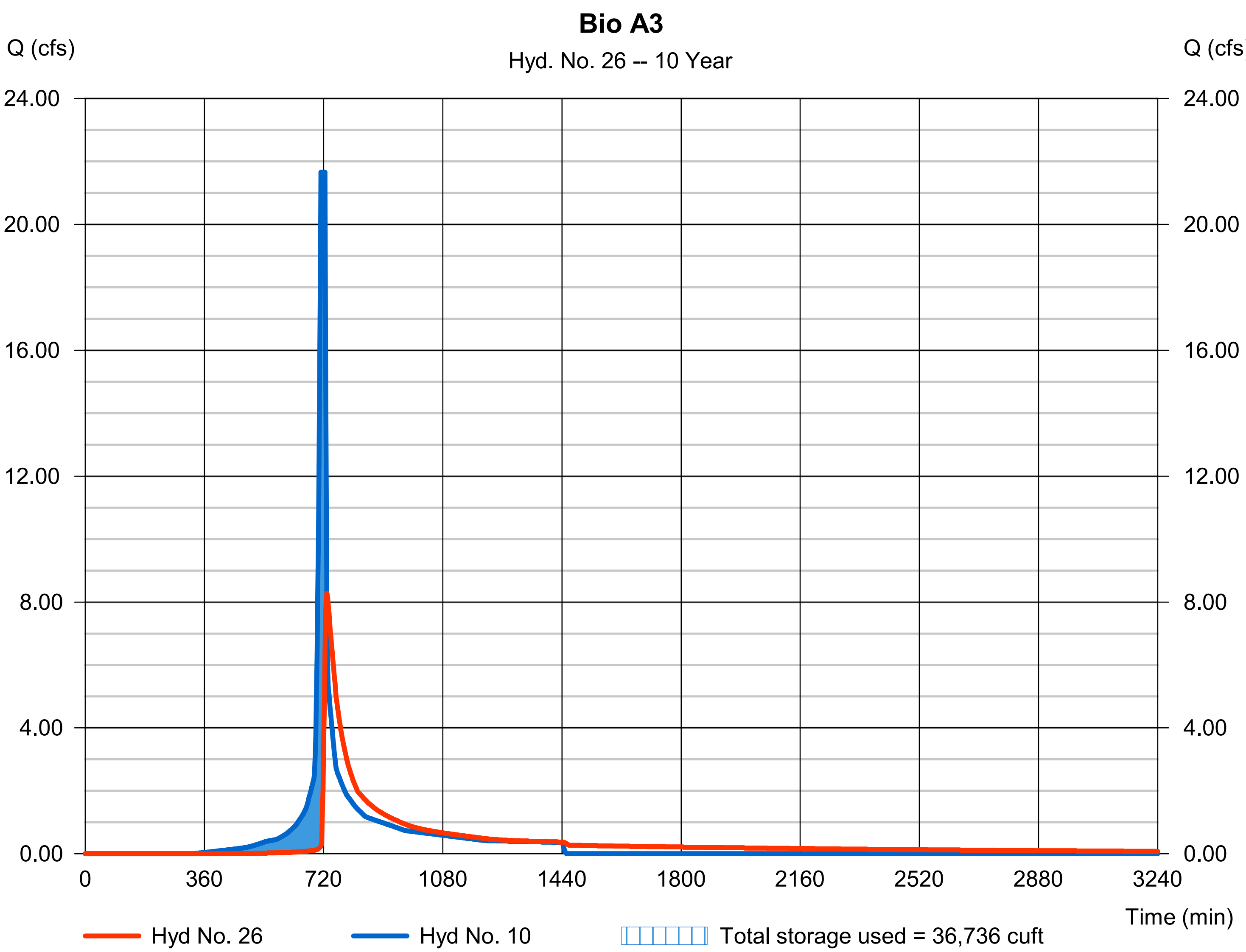
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 26

Bio A3

Hydrograph type	= Reservoir	Peak discharge	= 8.284 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 78,332 cuft
Inflow hyd. No.	= 10 - A3 to Bio #3	Max. Elevation	= 409.28 ft
Reservoir name	= Bio A3 (east)	Max. Storage	= 36,736 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

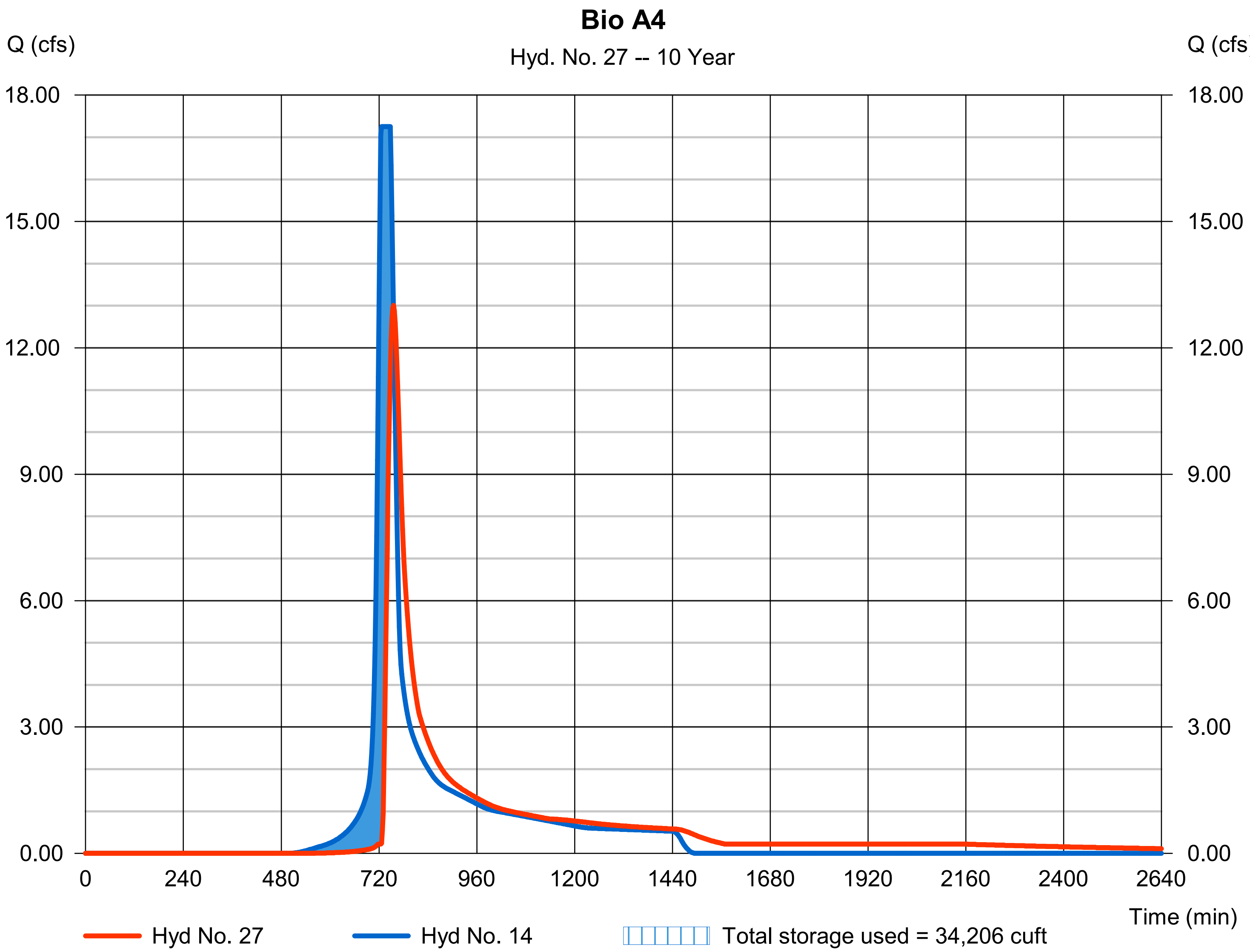
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 27

Bio A4

Hydrograph type	= Reservoir	Peak discharge	= 13.01 cfs
Storm frequency	= 10 yrs	Time to peak	= 756 min
Time interval	= 2 min	Hyd. volume	= 100,187 cuft
Inflow hyd. No.	= 14 - A4 to Bio #4	Max. Elevation	= 403.64 ft
Reservoir name	= Bio A4 (north)	Max. Storage	= 34,206 cuft

Storage Indication method used. Outflow includes exfiltration.



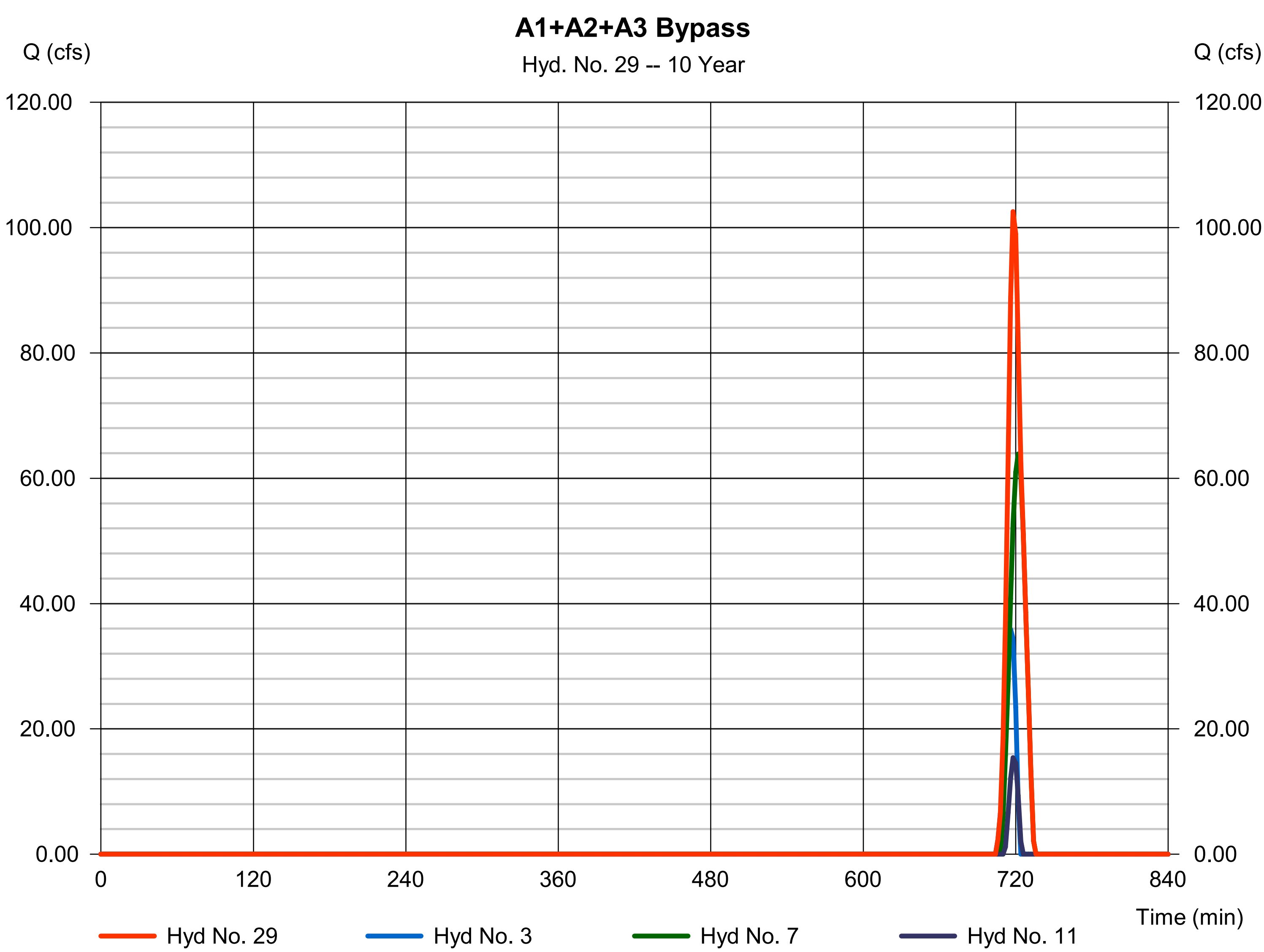
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 29

A1+A2+A3 Bypass

Hydrograph type	= Combine	Peak discharge	= 102.56 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 83,181 cuft
Inflow hyds.	= 3, 7, 11	Contrib. drain. area	= 0.000 ac



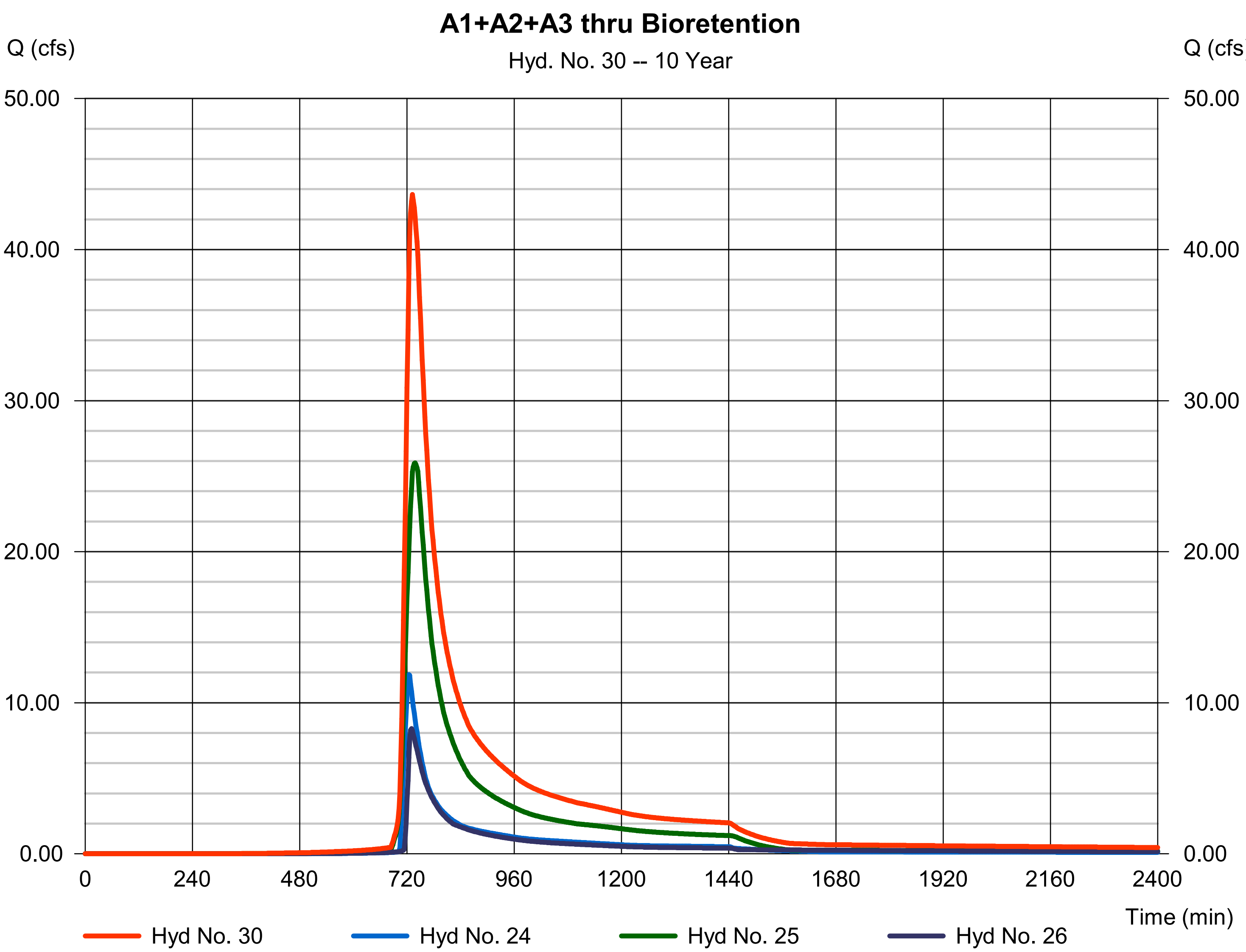
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 30

A1+A2+A3 thru Bioretention

Hydrograph type	= Combine	Peak discharge	= 43.65 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 403,142 cuft
Inflow hyds.	= 24, 25, 26	Contrib. drain. area	= 0.000 ac



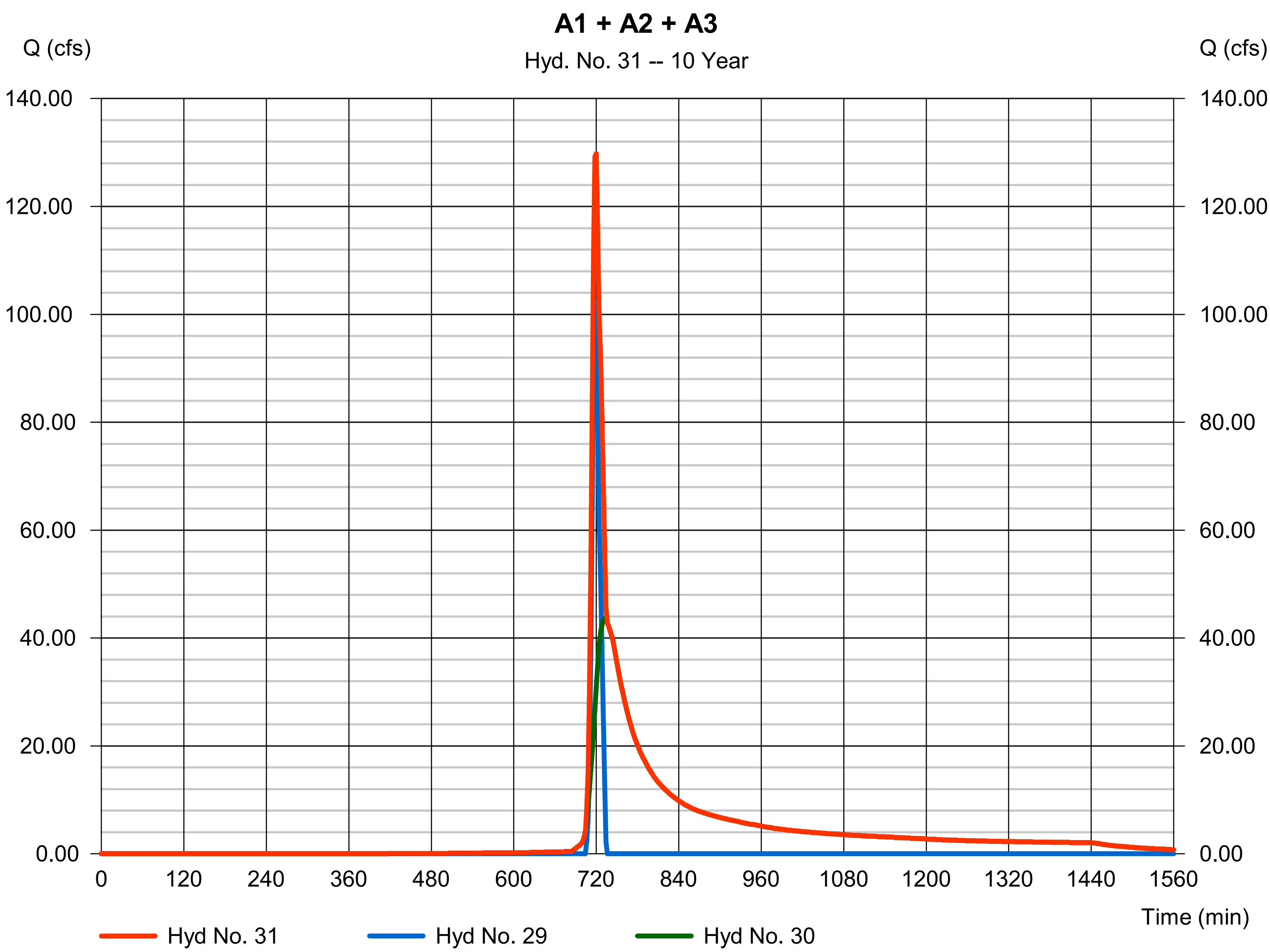
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 31

A1 + A2 + A3

Hydrograph type	= Combine	Peak discharge	= 129.84 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 486,323 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.000 ac



Hydrograph Report

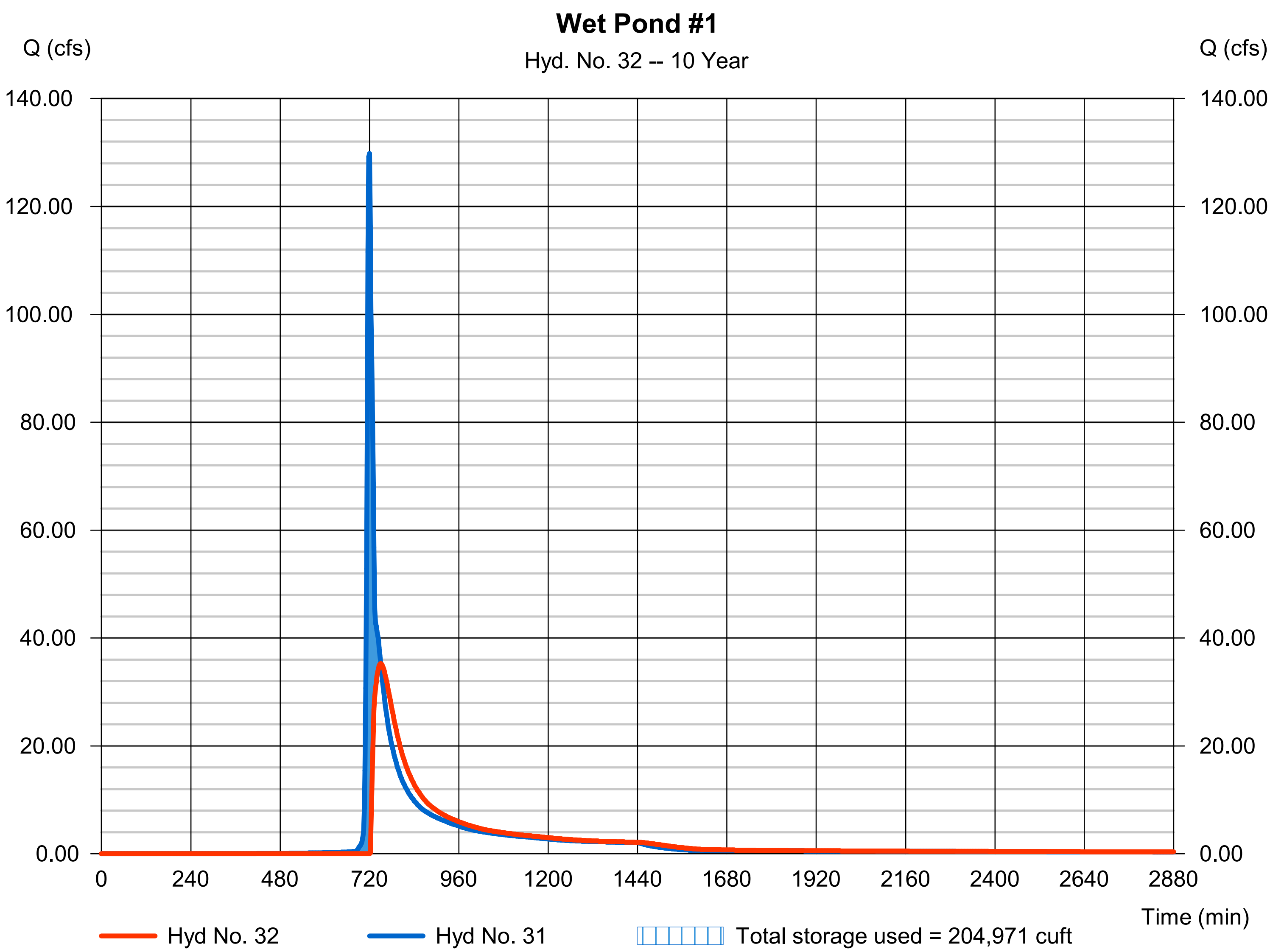
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 32

Wet Pond #1

Hydrograph type	= Reservoir	Peak discharge	= 35.25 cfs
Storm frequency	= 10 yrs	Time to peak	= 750 min
Time interval	= 2 min	Hyd. volume	= 407,589 cuft
Inflow hyd. No.	= 31 - A1 + A2 + A3	Max. Elevation	= 403.21 ft
Reservoir name	= Wet Pond #1	Max. Storage	= 204,971 cuft

Storage Indication method used. Wet pond routing start elevation = 400.00 ft.



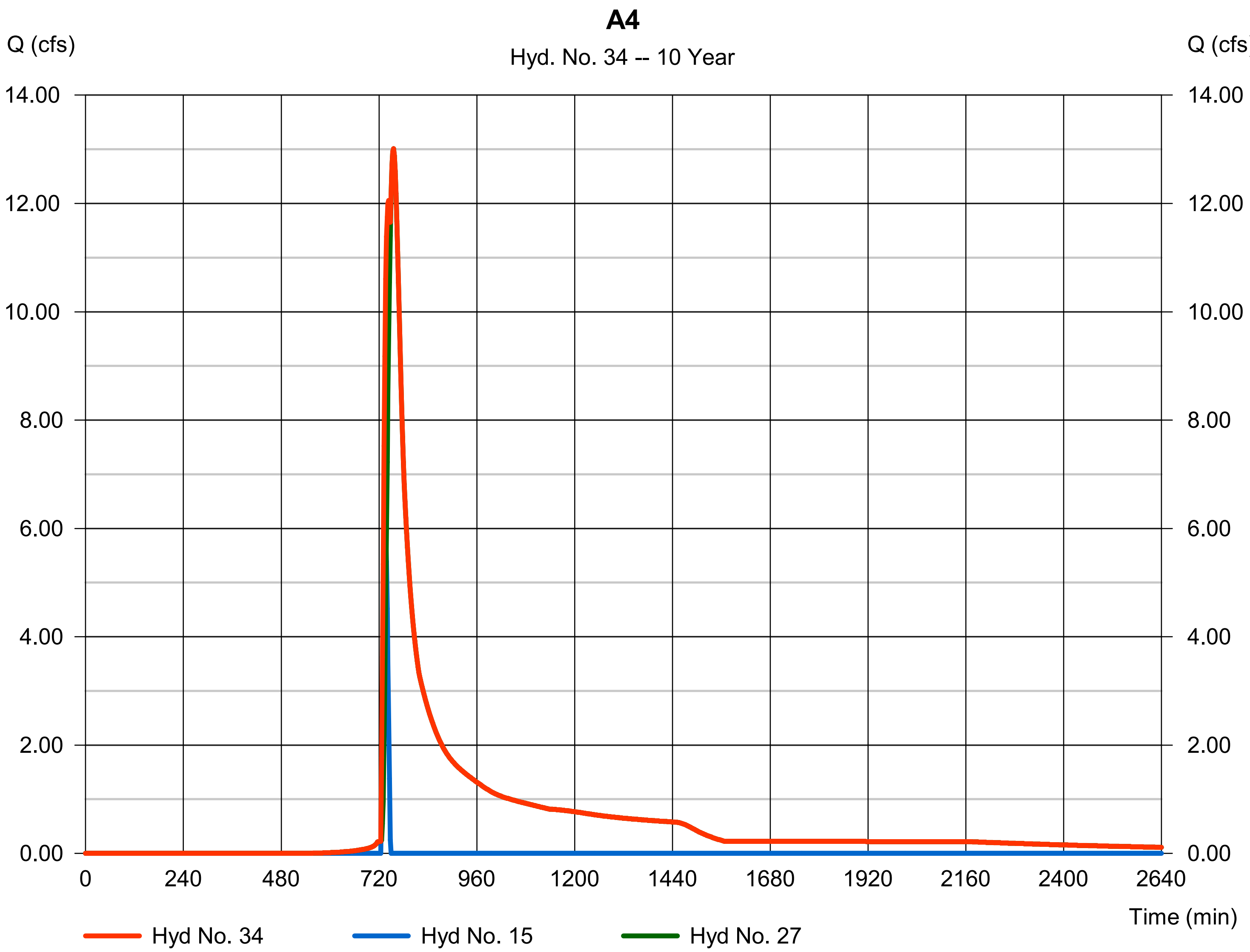
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 34

A4

Hydrograph type	= Combine	Peak discharge	= 13.01 cfs
Storm frequency	= 10 yrs	Time to peak	= 756 min
Time interval	= 2 min	Hyd. volume	= 105,426 cuft
Inflow hyds.	= 15, 27	Contrib. drain. area	= 0.000 ac



Hydrograph Report

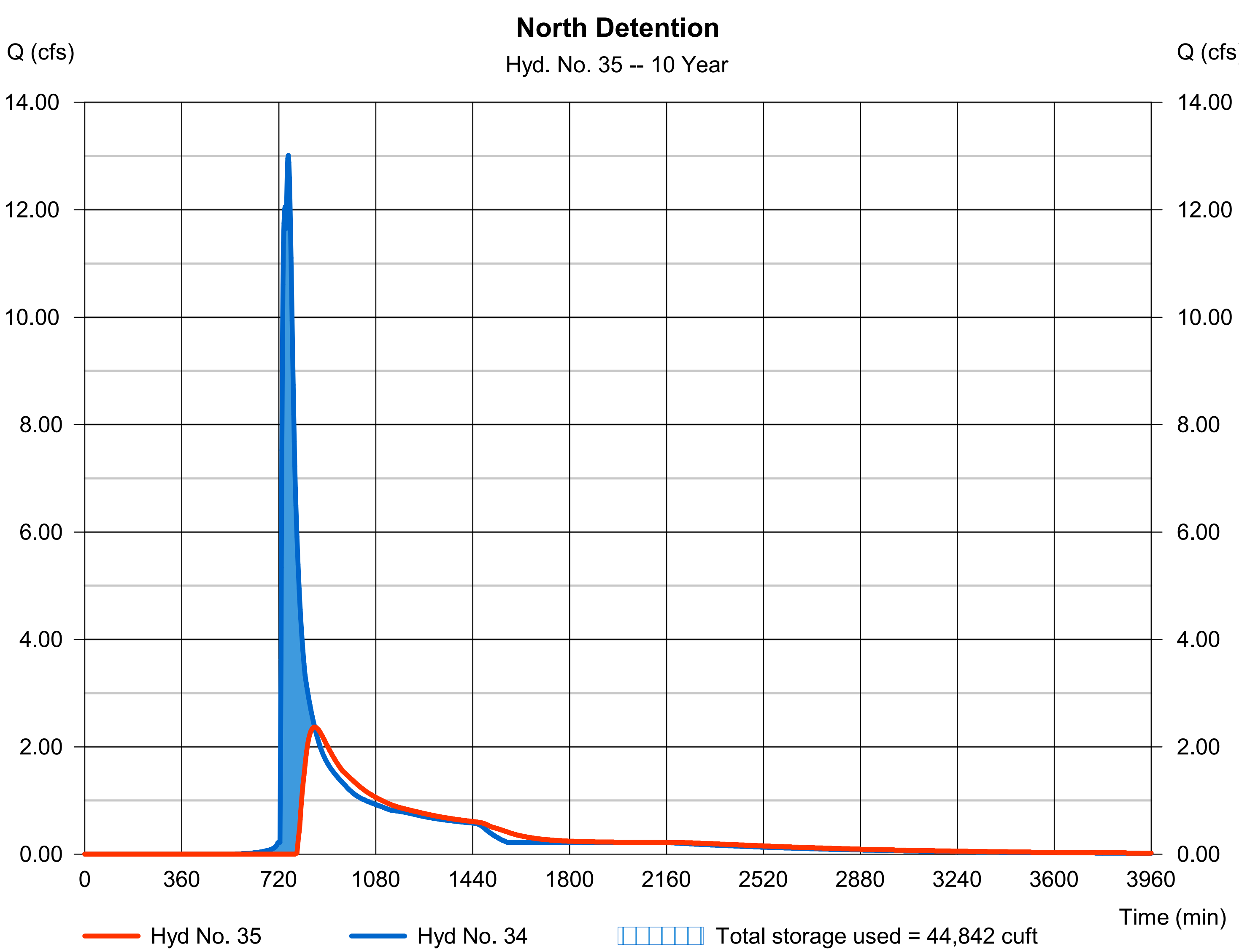
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 35

North Detention

Hydrograph type	= Reservoir	Peak discharge	= 2.367 cfs
Storm frequency	= 10 yrs	Time to peak	= 854 min
Time interval	= 2 min	Hyd. volume	= 69,606 cuft
Inflow hyd. No.	= 34 - A4	Max. Elevation	= 403.30 ft
Reservoir name	= Dry Detention #1	Max. Storage	= 44,842 cuft

Storage Indication method used.



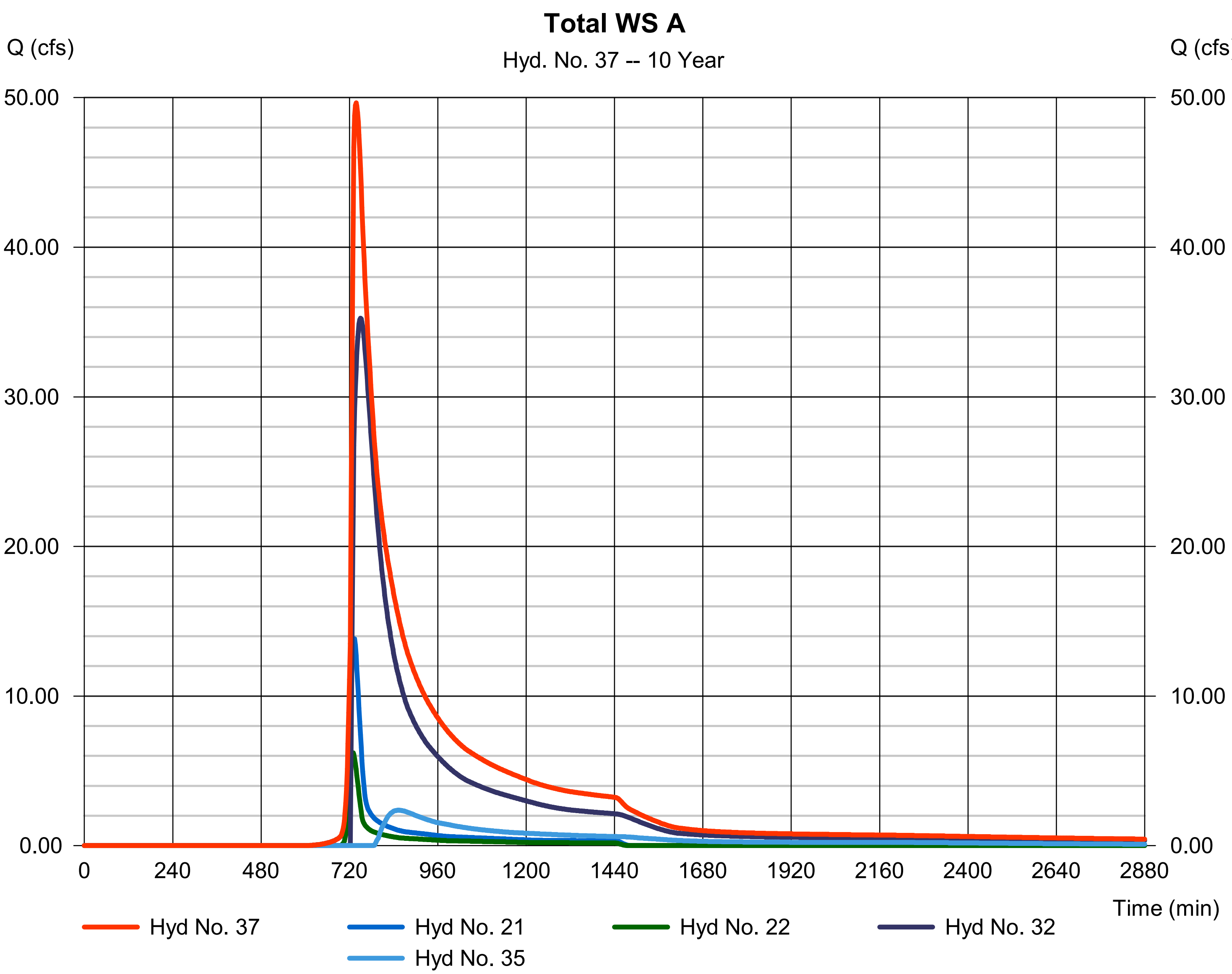
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 37

Total WS A

Hydrograph type	= Combine	Peak discharge	= 49.64 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 558,240 cuft
Inflow hyds.	= 21, 22, 32, 35	Contrib. drain. area	= 8.310 ac



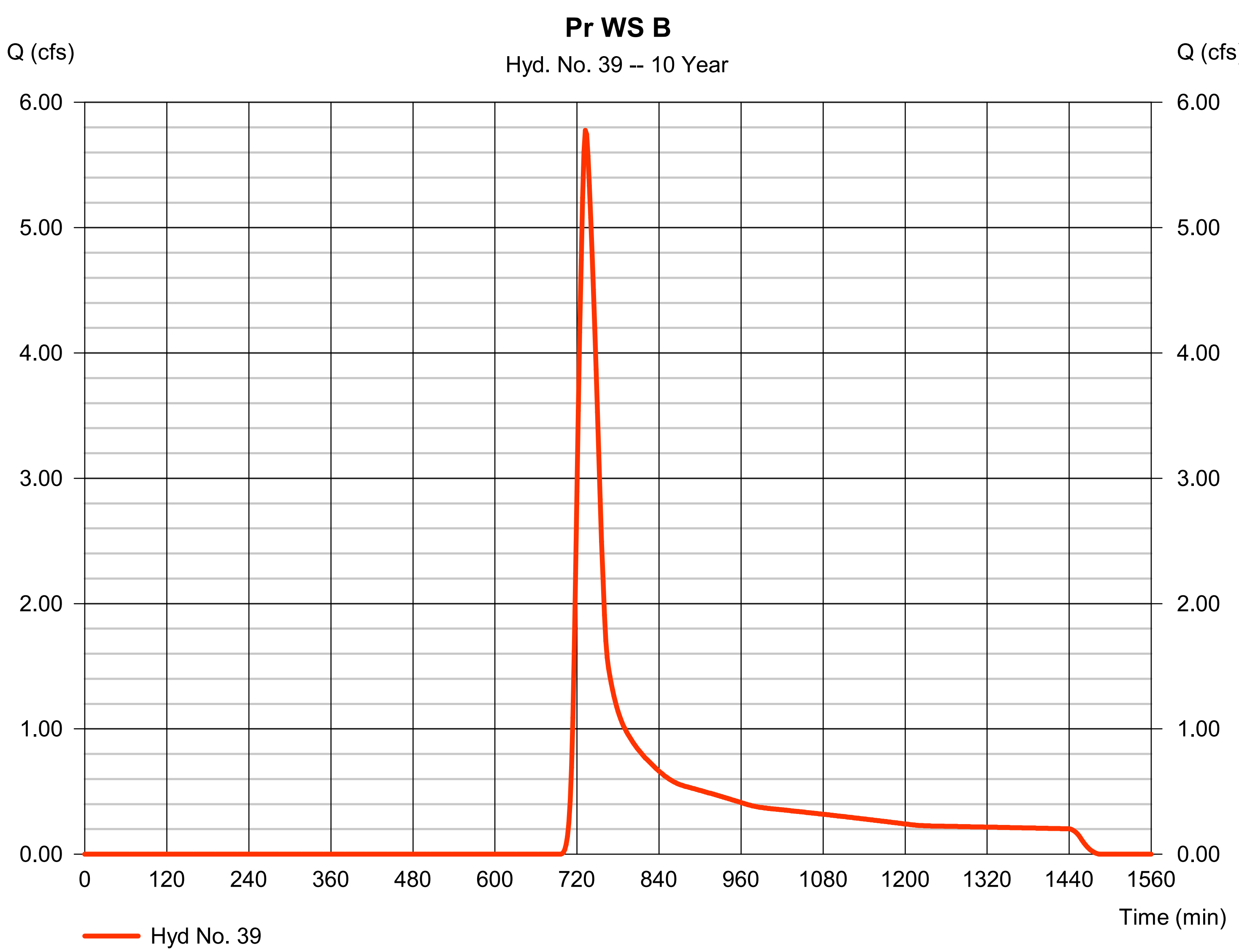
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 39

Pr WS B

Hydrograph type	= SCS Runoff	Peak discharge	= 5.777 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 27,569 cuft
Drainage area	= 9.900 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 27.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



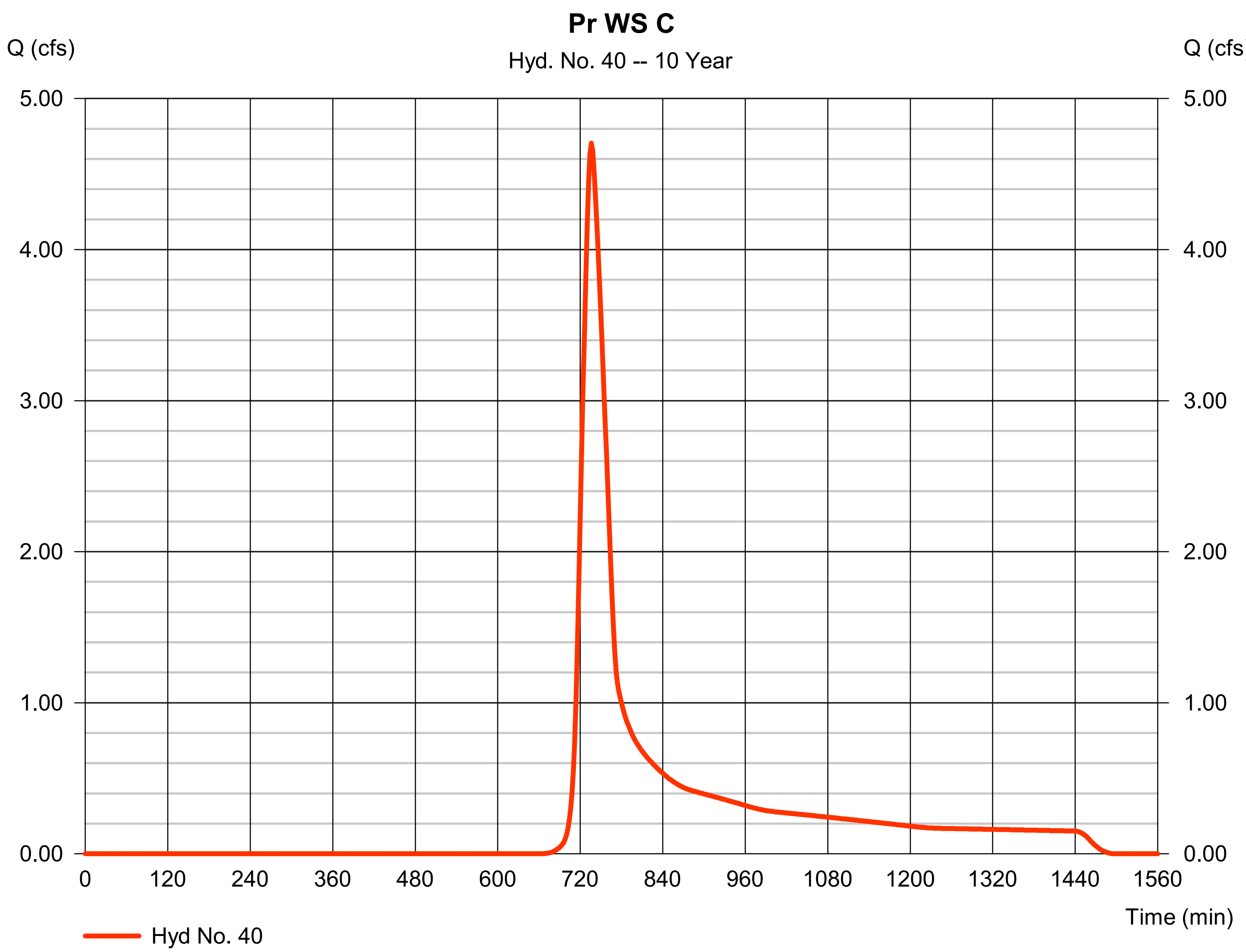
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 40

Pr WS C

Hydrograph type	= SCS Runoff	Peak discharge	= 4.705 cfs
Storm frequency	= 10 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 23,226 cuft
Drainage area	= 6.320 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 34.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



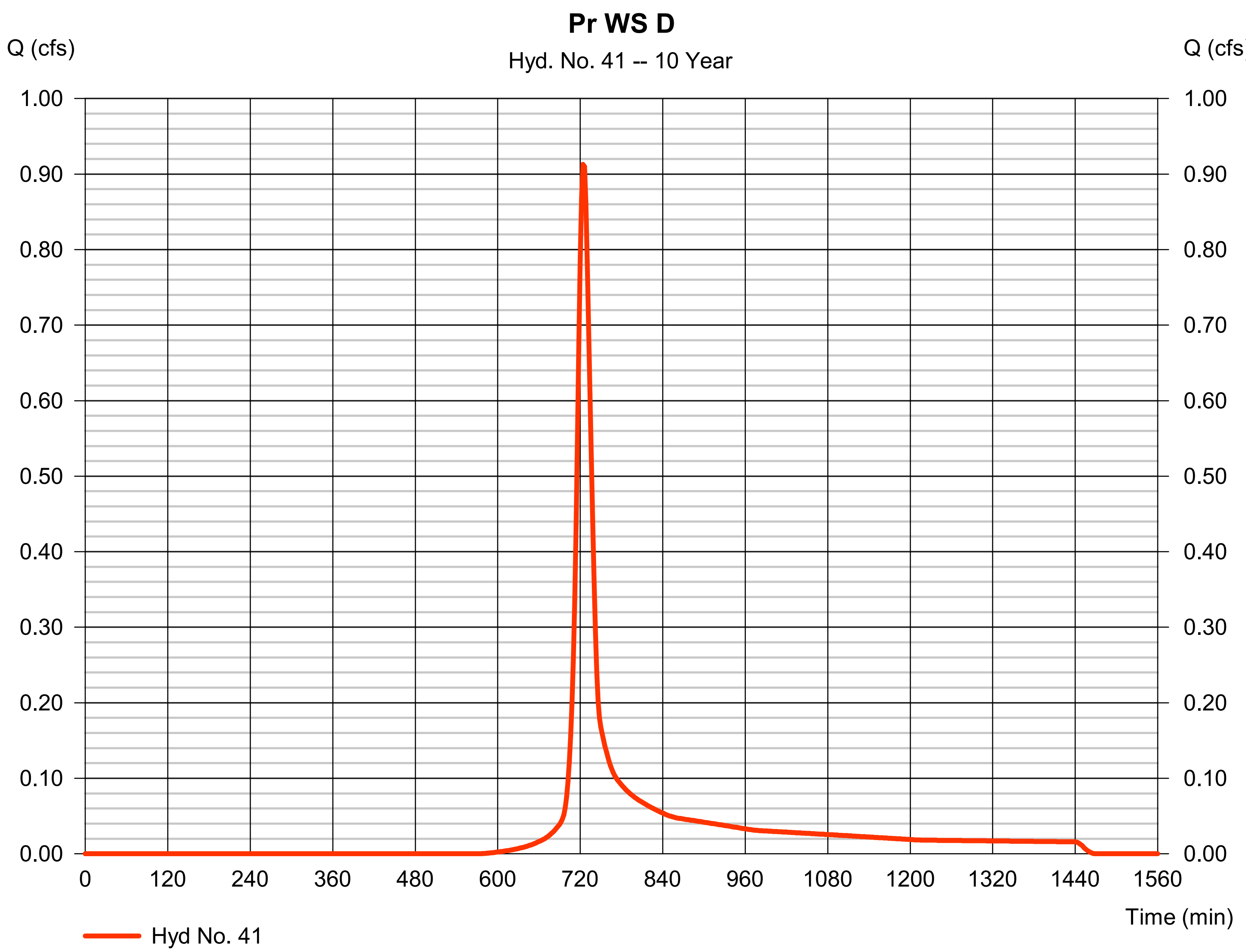
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 41

Pr WS D

Hydrograph type	= SCS Runoff	Peak discharge	= 0.913 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 2,896 cuft
Drainage area	= 0.550 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 20.00 min
Total precip.	= 3.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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	68.61	2	716	144,983	------	------	------	Pr WS A1
2	Diversion1	17.25	2	702	111,643	1	------	------	A1 to Bio #1
3	Diversion2	51.36	2	716	33,341	1	------	------	A1 to Detention
5	SCS Runoff	128.93	2	722	384,954	------	------	------	Pr WS A2
6	Diversion1	38.56	2	718	298,873	5	------	------	A2 to Bio #2
7	Diversion2	90.37	2	722	86,081	5	------	------	A2 to Detention
9	SCS Runoff	47.94	2	718	113,709	------	------	------	Pr WS A3
10	Diversion1	21.66	2	710	98,518	9	------	------	A3 to Bio #3
11	Diversion2	26.28	2	718	15,191	9	------	------	A3 to Detention
13	SCS Runoff	32.00	2	734	144,977	------	------	------	Pr WS A4
14	Diversion1	17.25	2	720	125,626	13	------	------	A4 to Bio #4
15	Diversion2	14.75	2	734	19,351	13	------	------	A4 to Detention
17	SCS Runoff	10.38	2	732	42,034	------	------	------	Pr WS A5
18	Reach	10.44	2	732	42,033	17	------	------	PR Reach A5
19	SCS Runoff	10.07	2	728	37,261	------	------	------	Pr WS A6
20	Combine	20.22	2	730	79,295	18, 19	------	------	Combine
21	Reach	20.25	2	732	79,295	20	------	------	PR Reach A6
22	SCS Runoff	10.20	2	730	39,750	------	------	------	Pr WS A7
24	Reservoir	14.45	2	724	109,284	2	406.17	33,870	Bio A1
25	Reservoir	27.14	2	738	289,487	6	402.21	100,396	Bio A2
26	Reservoir	12.43	2	728	97,397	10	409.37	41,129	Bio A3
27	Reservoir	15.62	2	758	125,564	14	403.69	36,229	Bio A4
29	Combine	152.20	2	718	134,613	3, 7, 11,	------	------	A1+A2+A3 Bypass
30	Combine	52.02	2	728	496,168	24, 25, 26,	------	------	A1+A2+A3 thru Bioretention
31	Combine	192.35	2	718	630,779	29, 30	------	------	A1 + A2 + A3
32	Reservoir	74.67	2	732	552,044	31	403.99	241,790	Wet Pond #1
34	Combine	24.24	2	738	144,915	15, 27,	------	------	A4
35	Reservoir	7.742	2	786	109,076	34	403.80	52,517	North Detention
37	Combine	104.84	2	732	780,165	21, 22, 32, 35,	------	------	Total WS A

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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
39	SCS Runoff	9.983	2	732	43,592	------	------	------	Pr WS B
40	SCS Runoff	7.385	2	736	34,876	------	------	------	Pr WS C
41	SCS Runoff	1.307	2	724	4,099	------	------	------	Pr WS D

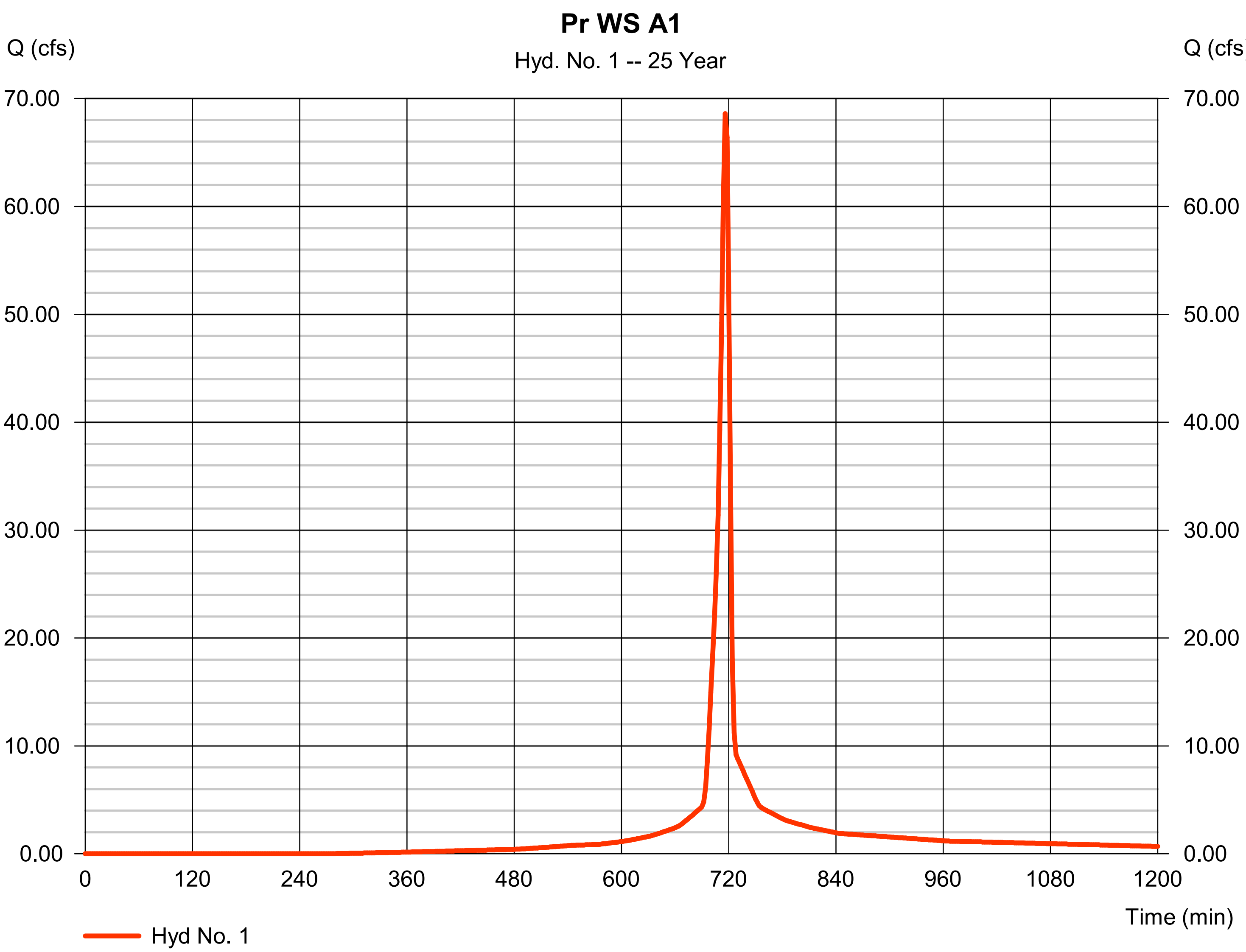
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 1

Pr WS A1

Hydrograph type	= SCS Runoff	Peak discharge	= 68.61 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 144,983 cuft
Drainage area	= 14.090 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



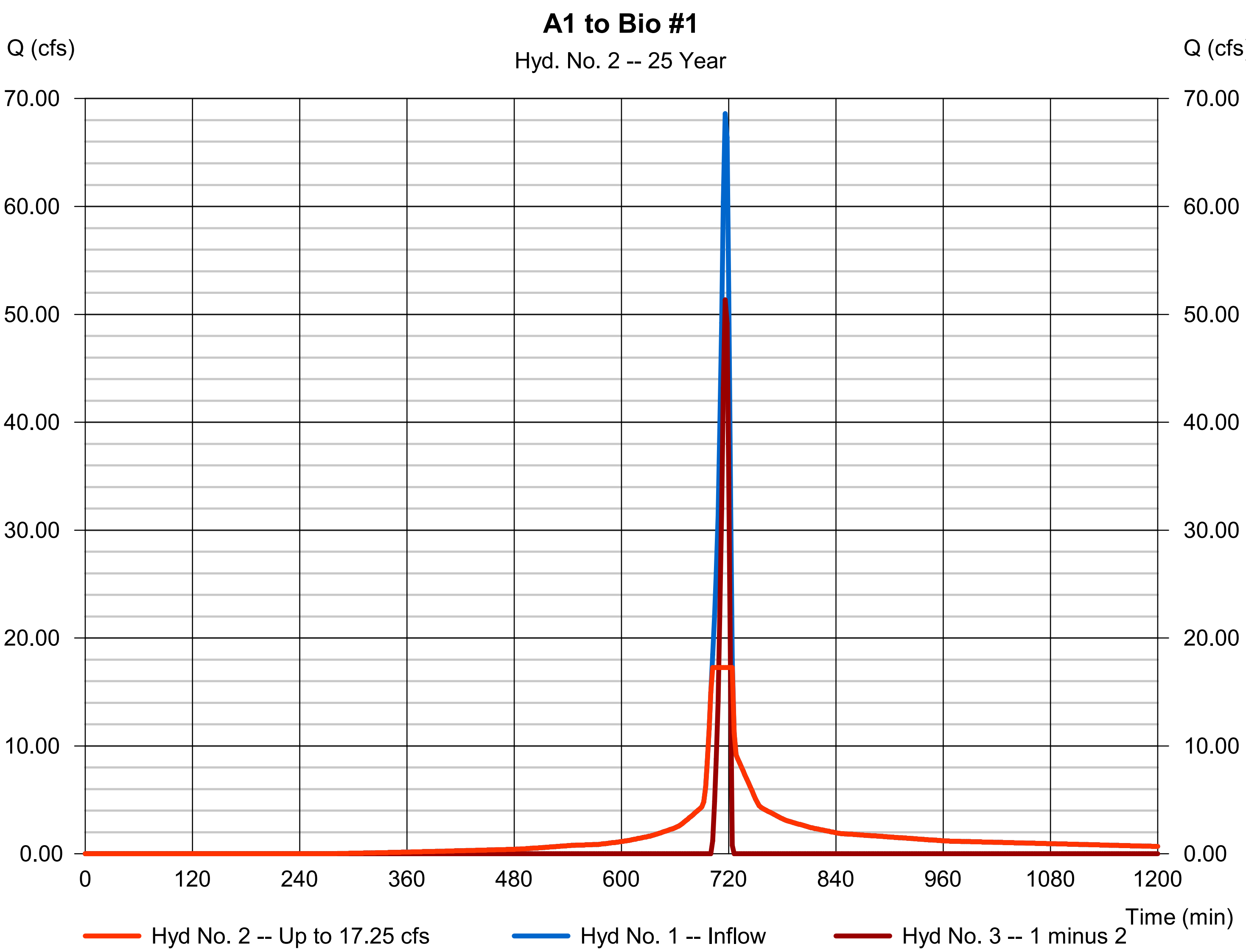
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 2

A1 to Bio #1

Hydrograph type	= Diversion1	Peak discharge	= 17.25 cfs
Storm frequency	= 25 yrs	Time to peak	= 702 min
Time interval	= 2 min	Hyd. volume	= 111,643 cuft
Inflow hydrograph	= 1 - Pr WS A1	2nd diverted hyd.	= 3
Diversion method	= Constant Q	Constant Q	= 17.25 cfs



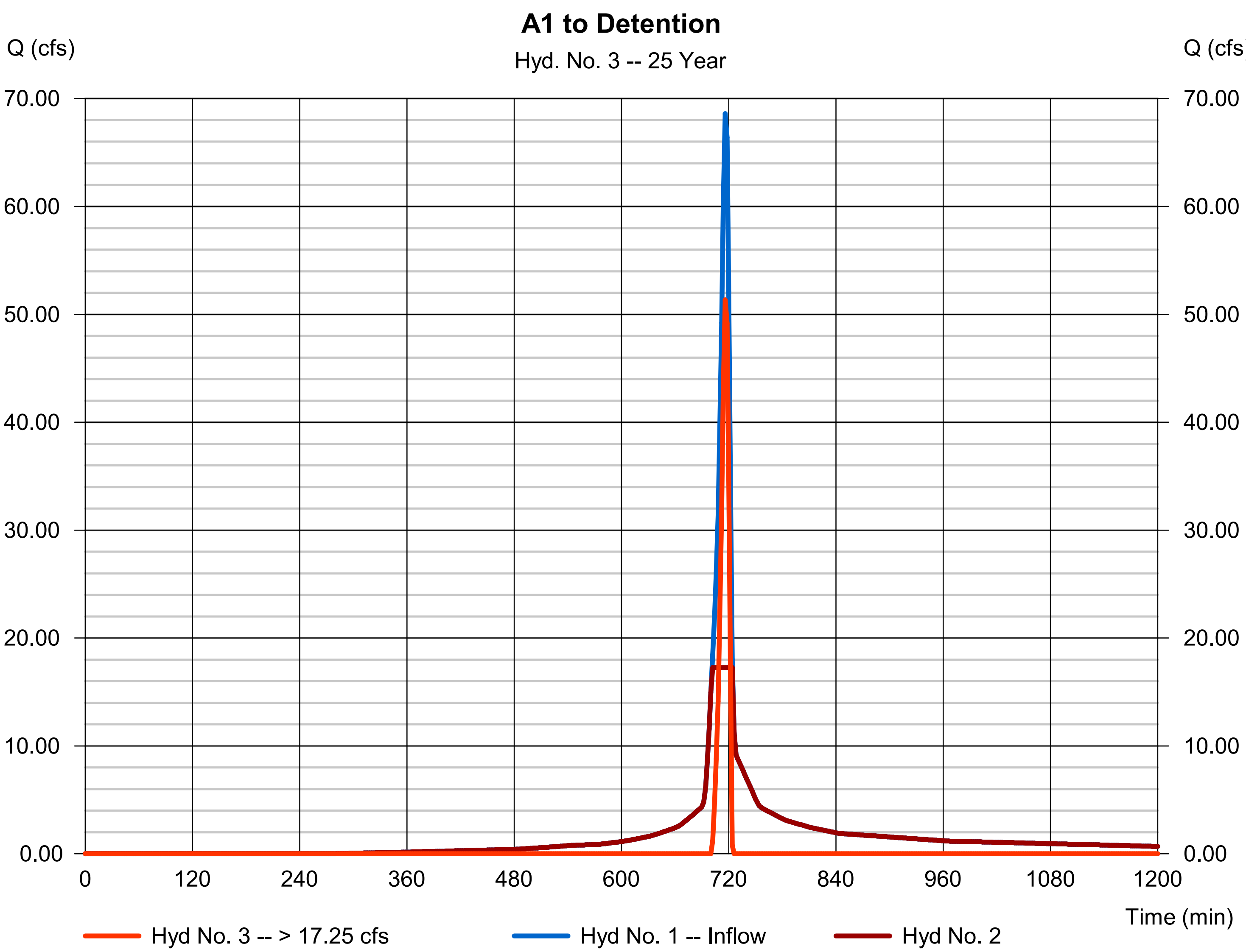
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 3

A1 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 51.36 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 33,341 cuft
Inflow hydrograph	= 1 - Pr WS A1	2nd diverted hyd.	= 2
Diversion method	= Constant Q	Constant Q	= 17.25 cfs



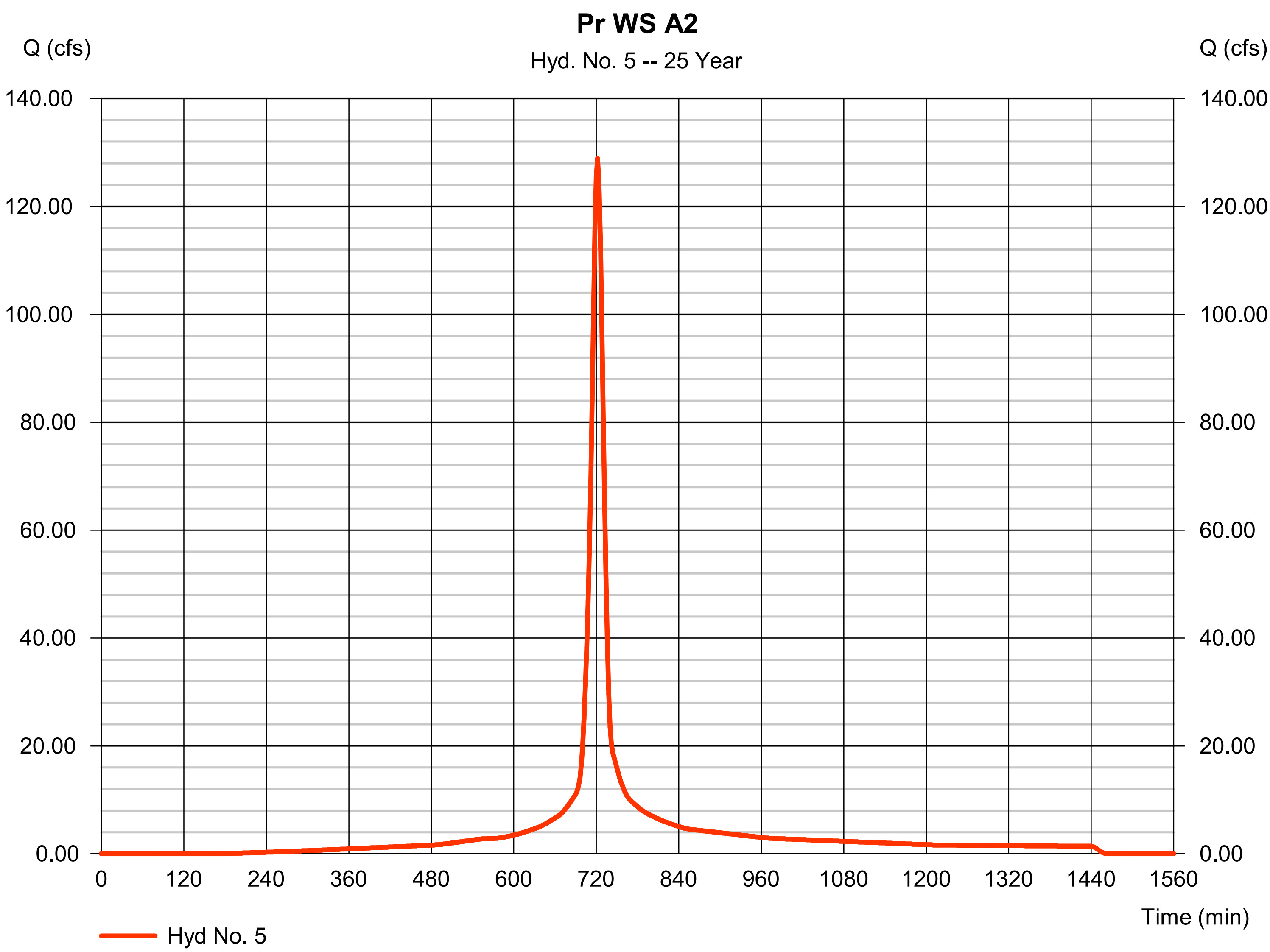
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 | Tuesday, 10 / 1 / 2019

Hyd. No. 5

Pr WS A2

Hydrograph type	= SCS Runoff	Peak discharge	= 128.93 cfs
Storm frequency	= 25 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 384,954 cuft
Drainage area	= 31.690 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



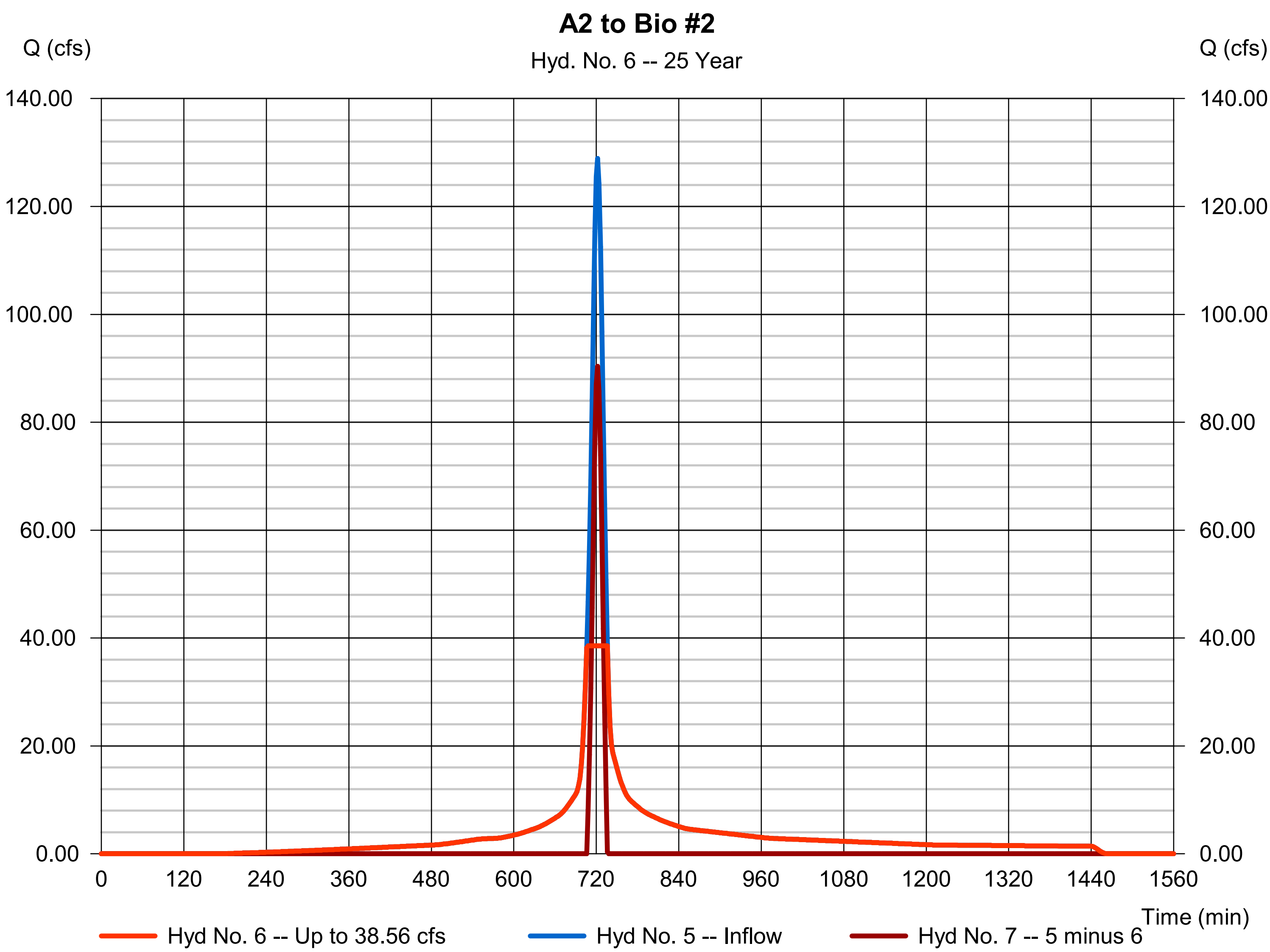
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 6

A2 to Bio #2

Hydrograph type	= Diversion1	Peak discharge	= 38.56 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 298,873 cuft
Inflow hydrograph	= 5 - Pr WS A2	2nd diverted hyd.	= 7
Diversion method	= Constant Q	Constant Q	= 38.56 cfs



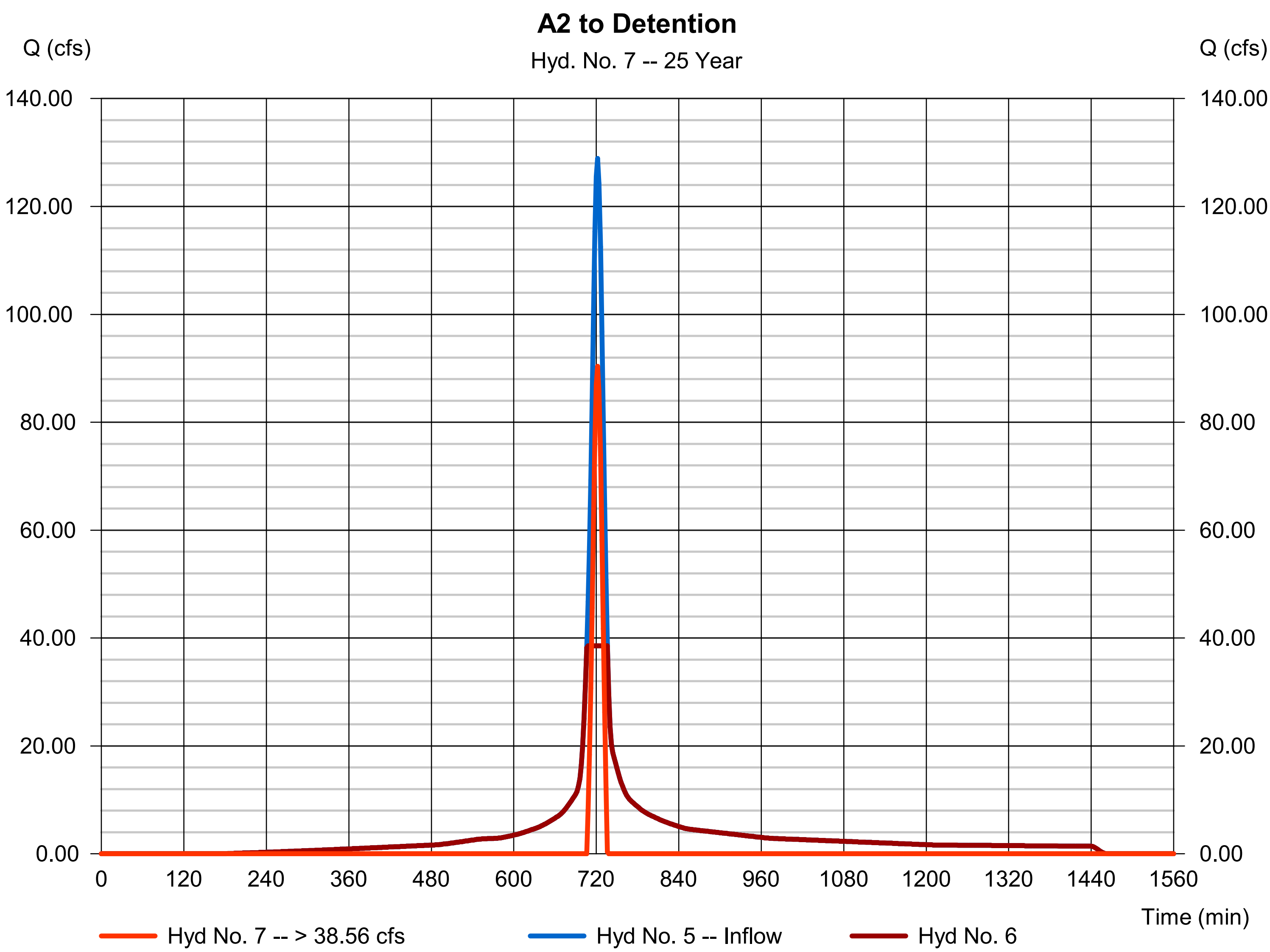
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 7

A2 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 90.37 cfs
Storm frequency	= 25 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 86,081 cuft
Inflow hydrograph	= 5 - Pr WS A2	2nd diverted hyd.	= 6
Diversion method	= Constant Q	Constant Q	= 38.56 cfs



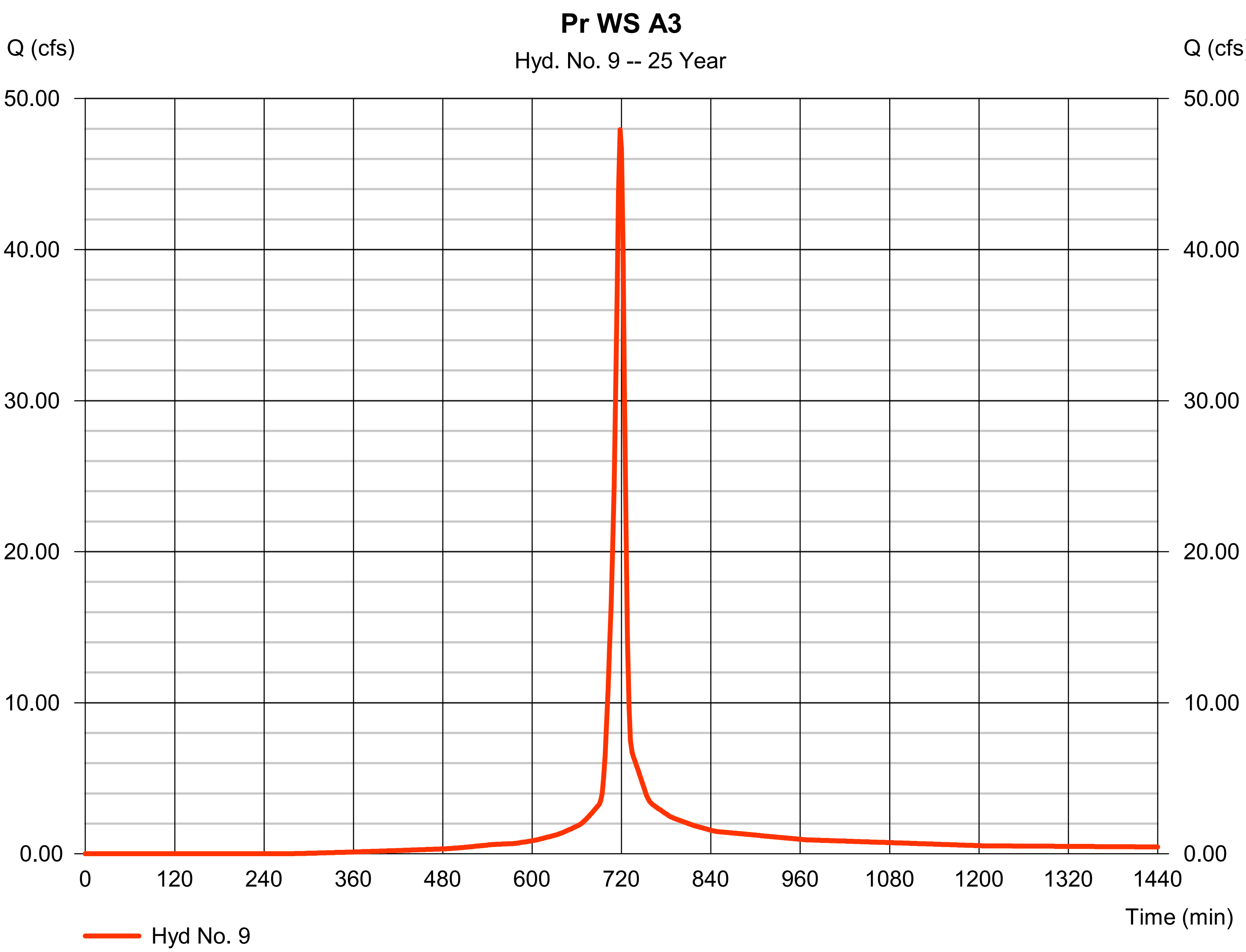
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 9

Pr WS A3

Hydrograph type	= SCS Runoff	Peak discharge	= 47.94 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 113,709 cuft
Drainage area	= 10.360 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



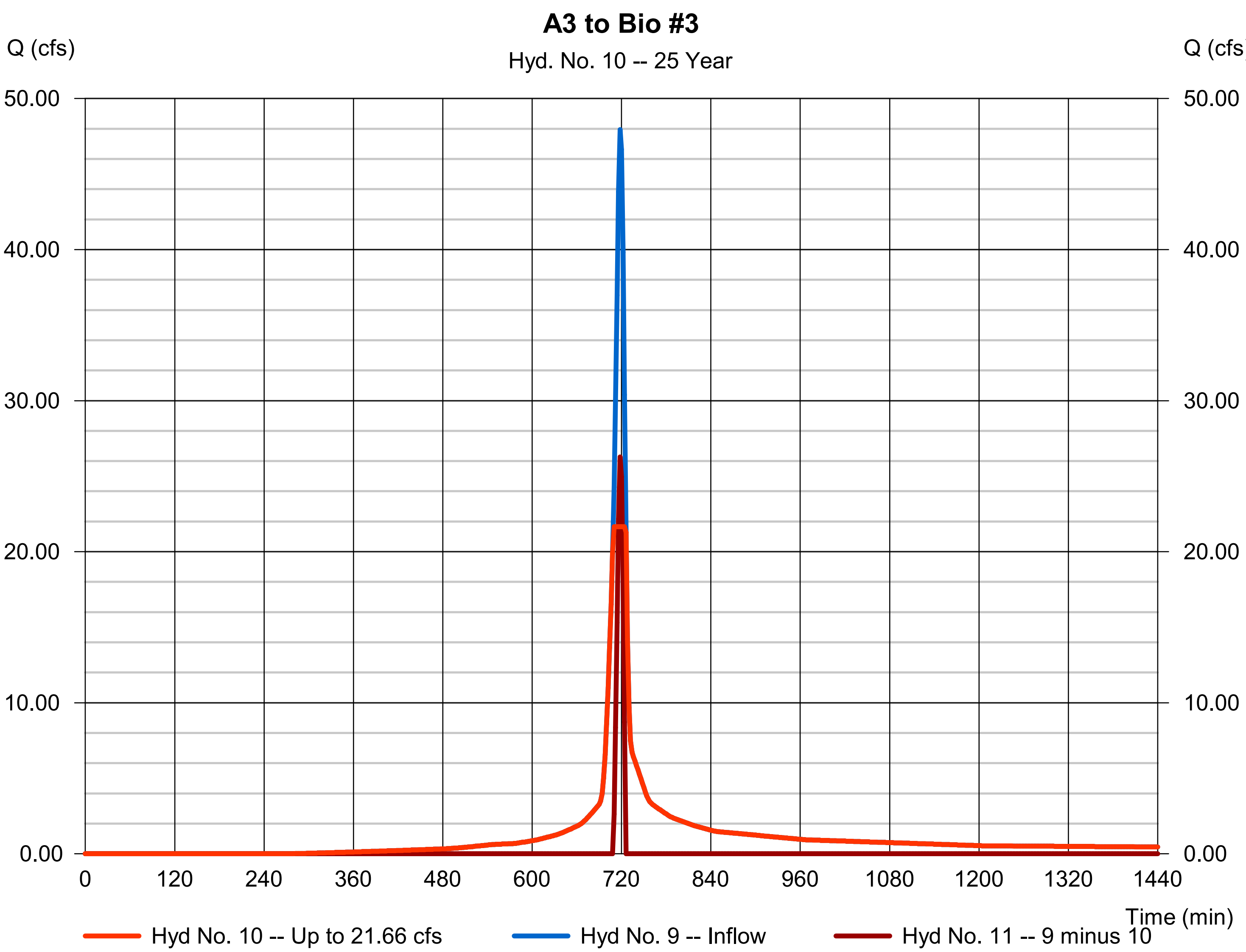
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 | Tuesday, 10 / 1 / 2019

Hyd. No. 10

A3 to Bio #3

Hydrograph type	= Diversion1	Peak discharge	= 21.66 cfs
Storm frequency	= 25 yrs	Time to peak	= 710 min
Time interval	= 2 min	Hyd. volume	= 98,518 cuft
Inflow hydrograph	= 9 - Pr WS A3	2nd diverted hyd.	= 11
Diversion method	= Constant Q	Constant Q	= 21.66 cfs



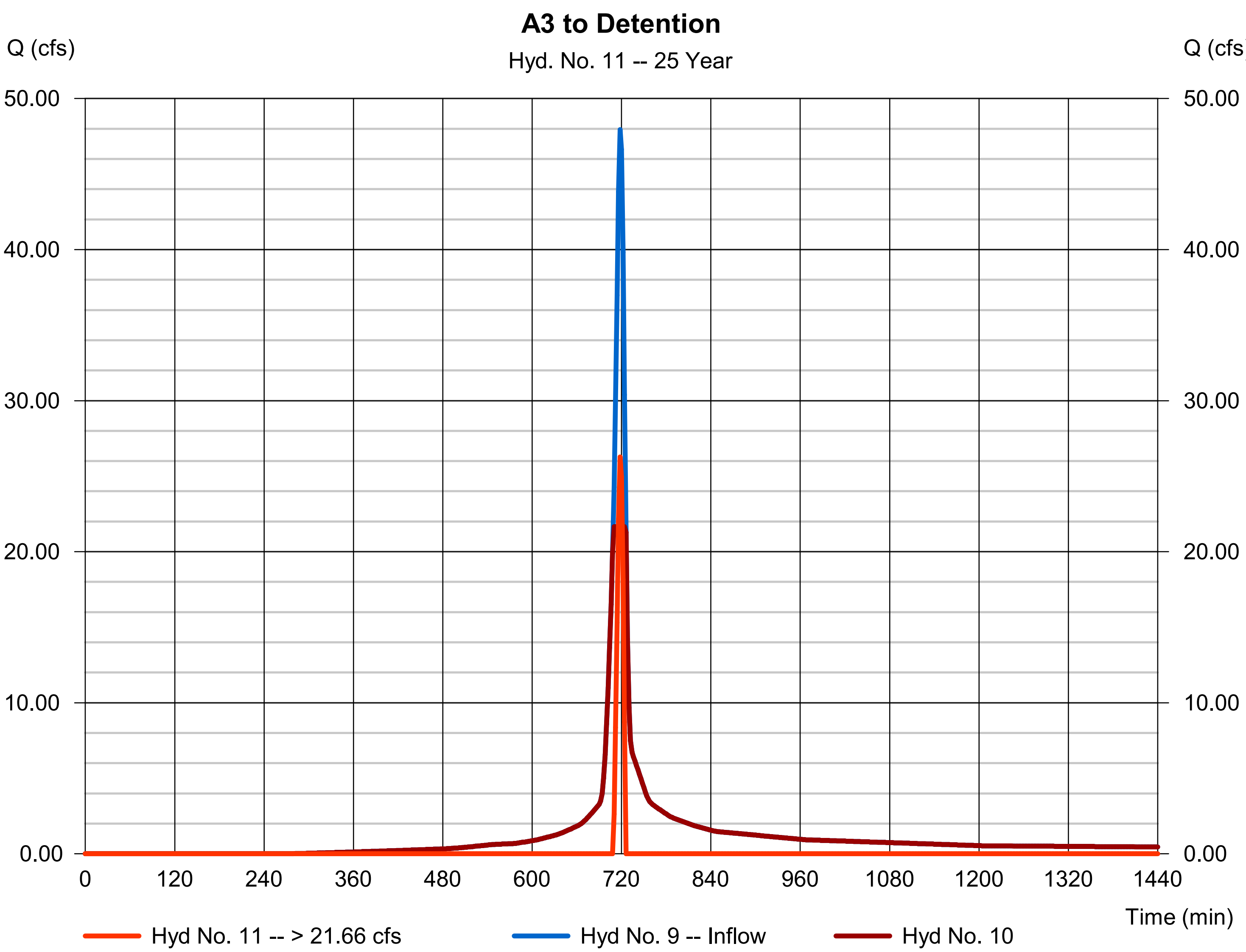
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 11

A3 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 26.28 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 15,191 cuft
Inflow hydrograph	= 9 - Pr WS A3	2nd diverted hyd.	= 10
Diversion method	= Constant Q	Constant Q	= 21.66 cfs



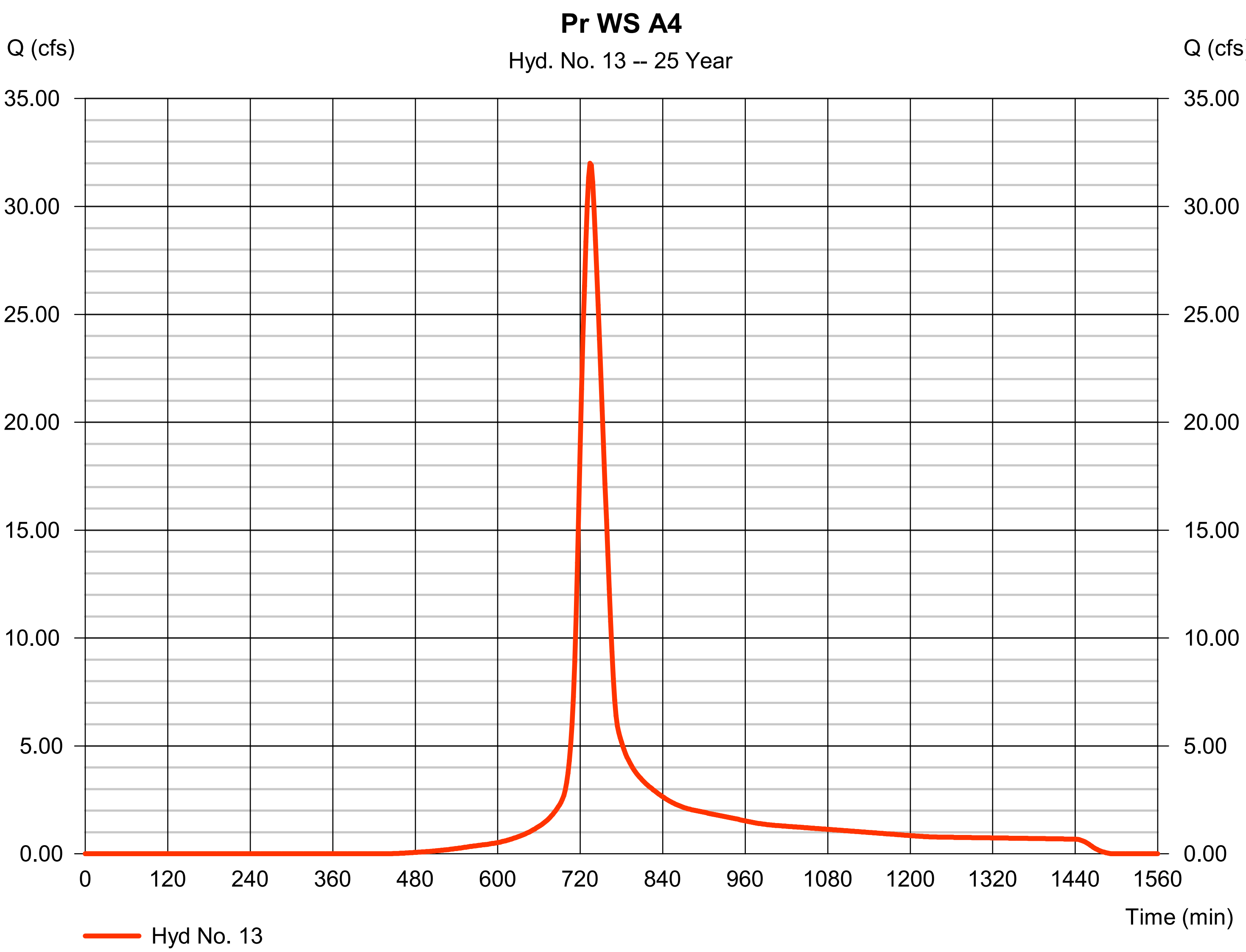
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 13

Pr WS A4

Hydrograph type	= SCS Runoff	Peak discharge	= 32.00 cfs
Storm frequency	= 25 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 144,977 cuft
Drainage area	= 16.960 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 36.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



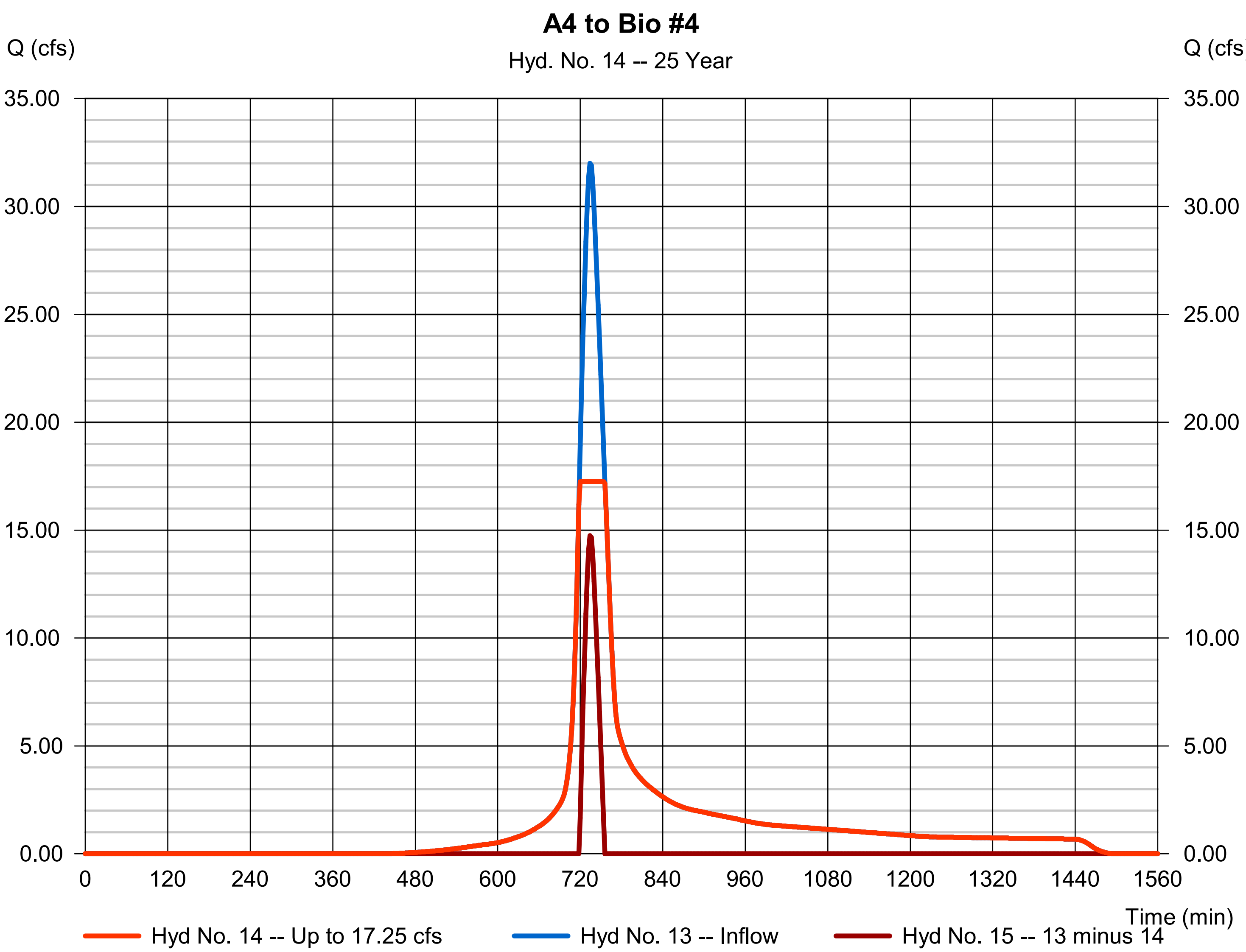
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 14

A4 to Bio #4

Hydrograph type	= Diversion1	Peak discharge	= 17.25 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 125,626 cuft
Inflow hydrograph	= 13 - Pr WS A4	2nd diverted hyd.	= 15
Diversion method	= Constant Q	Constant Q	= 17.25 cfs



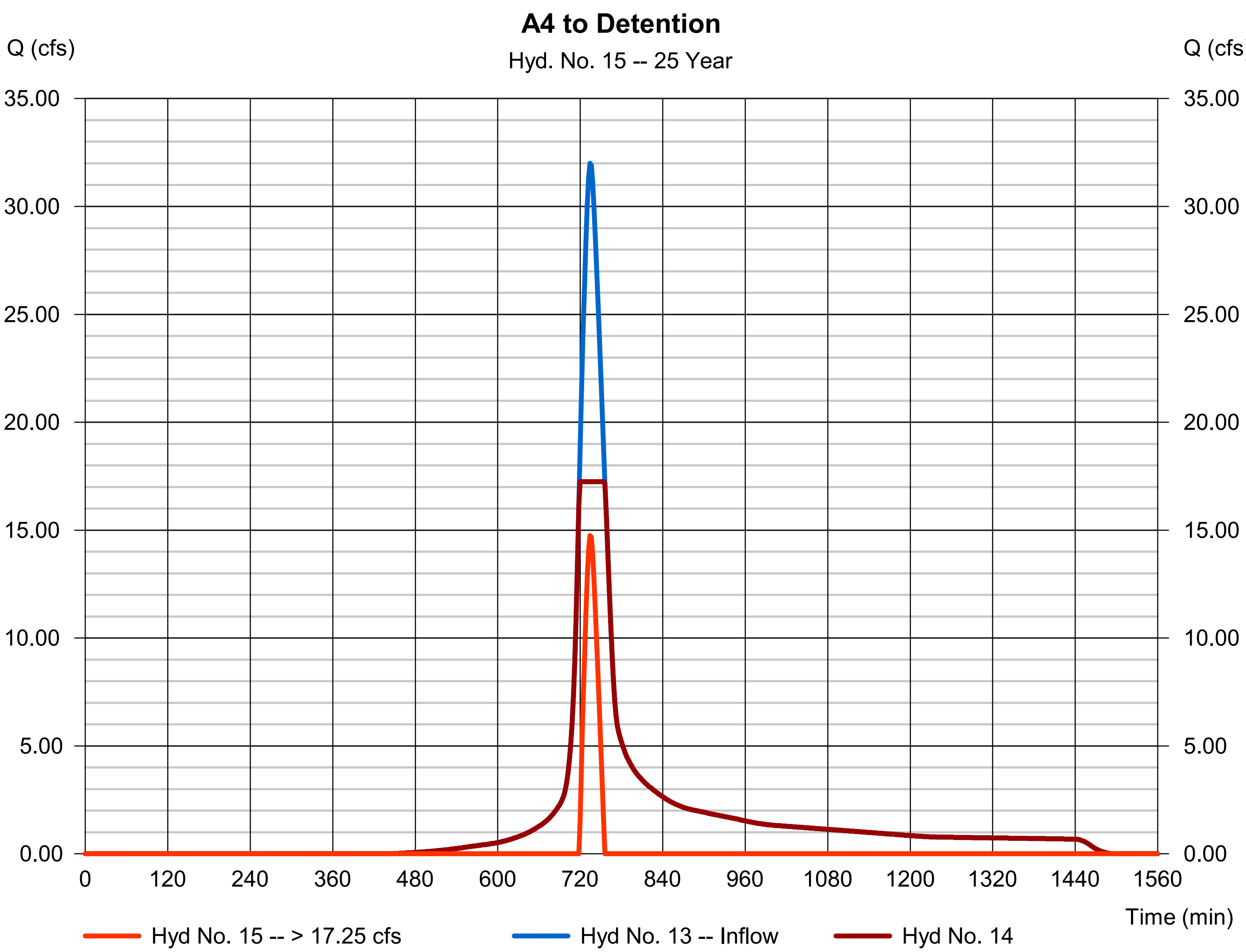
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 15

A4 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 14.75 cfs
Storm frequency	= 25 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 19,351 cuft
Inflow hydrograph	= 13 - Pr WS A4	2nd diverted hyd.	= 14
Diversion method	= Constant Q	Constant Q	= 17.25 cfs



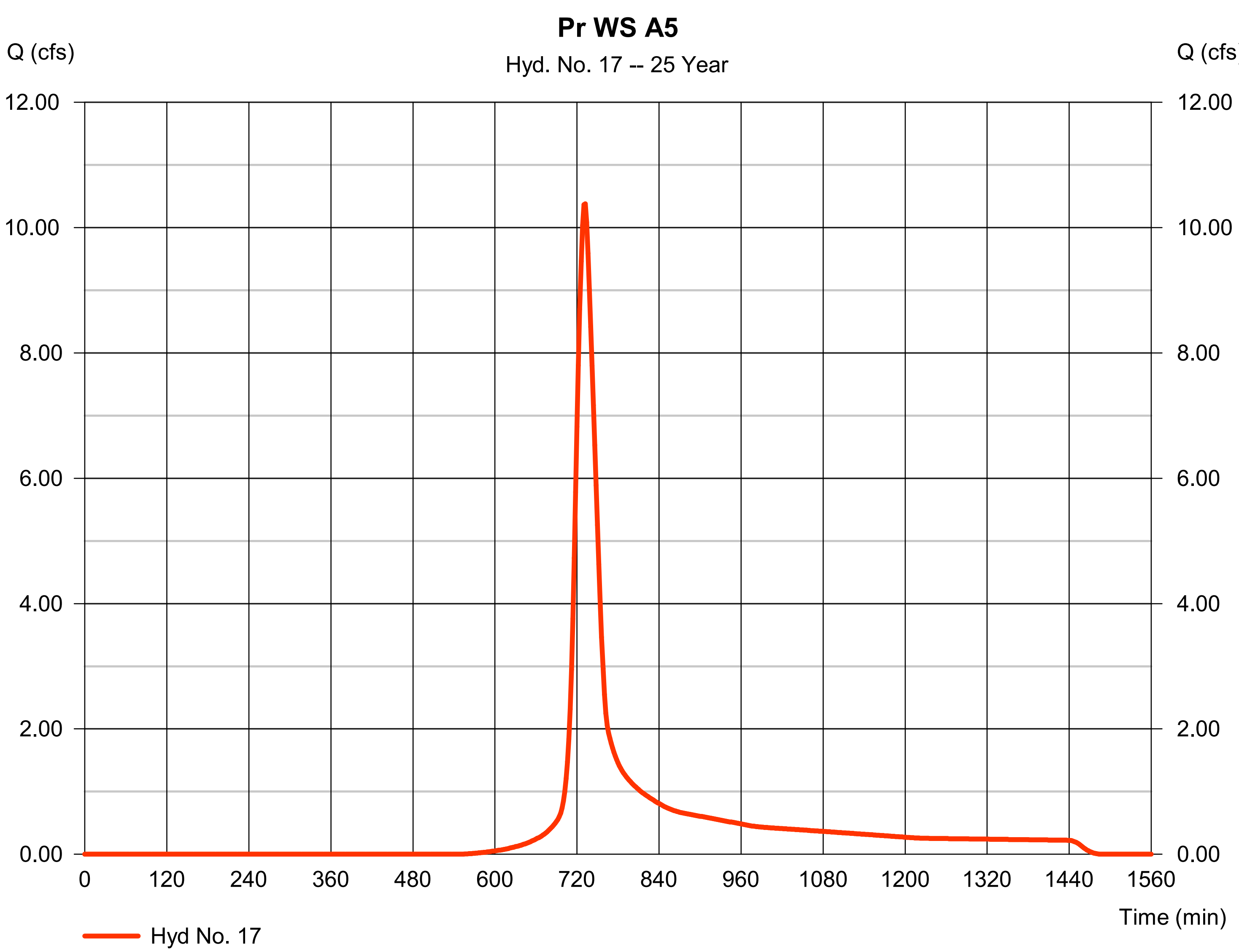
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 17

Pr WS A5

Hydrograph type	= SCS Runoff	Peak discharge	= 10.38 cfs
Storm frequency	= 25 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 42,034 cuft
Drainage area	= 6.100 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 30.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

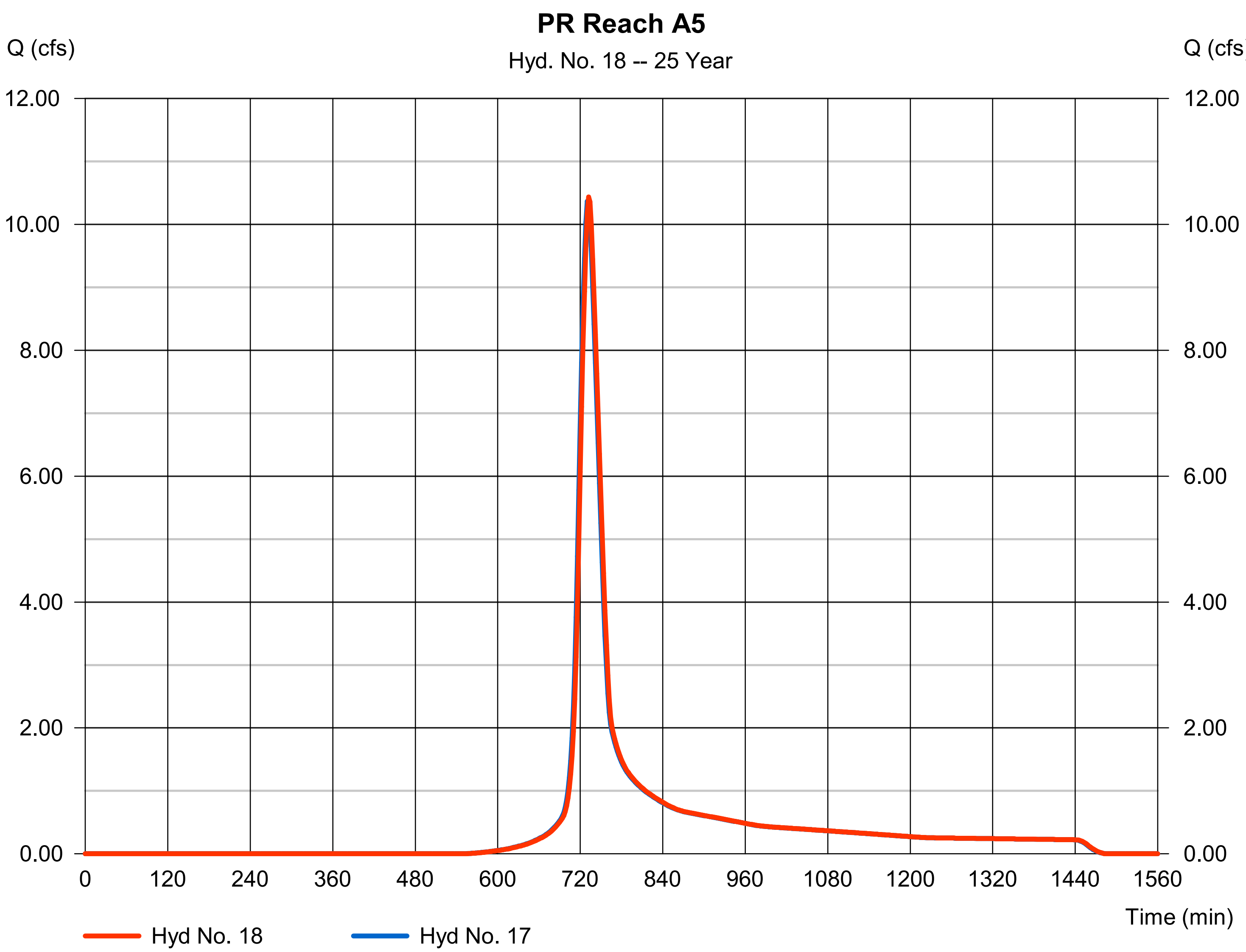
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 18

PR Reach A5

Hydrograph type	= Reach	Peak discharge	= 10.44 cfs
Storm frequency	= 25 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 42,033 cuft
Inflow hyd. No.	= 17 - Pr WS A5	Section type	= Trapezoidal
Reach length	= 101.0 ft	Channel slope	= 1.6 %
Manning's n	= 0.025	Bottom width	= 12.0 ft
Side slope	= 2.0:1	Max. depth	= 1.0 ft
Rating curve x	= 1.437	Rating curve m	= 1.425
Ave. velocity	= 2.59 ft/s	Routing coeff.	= 1.3736

Modified Att-Kin routing method used.



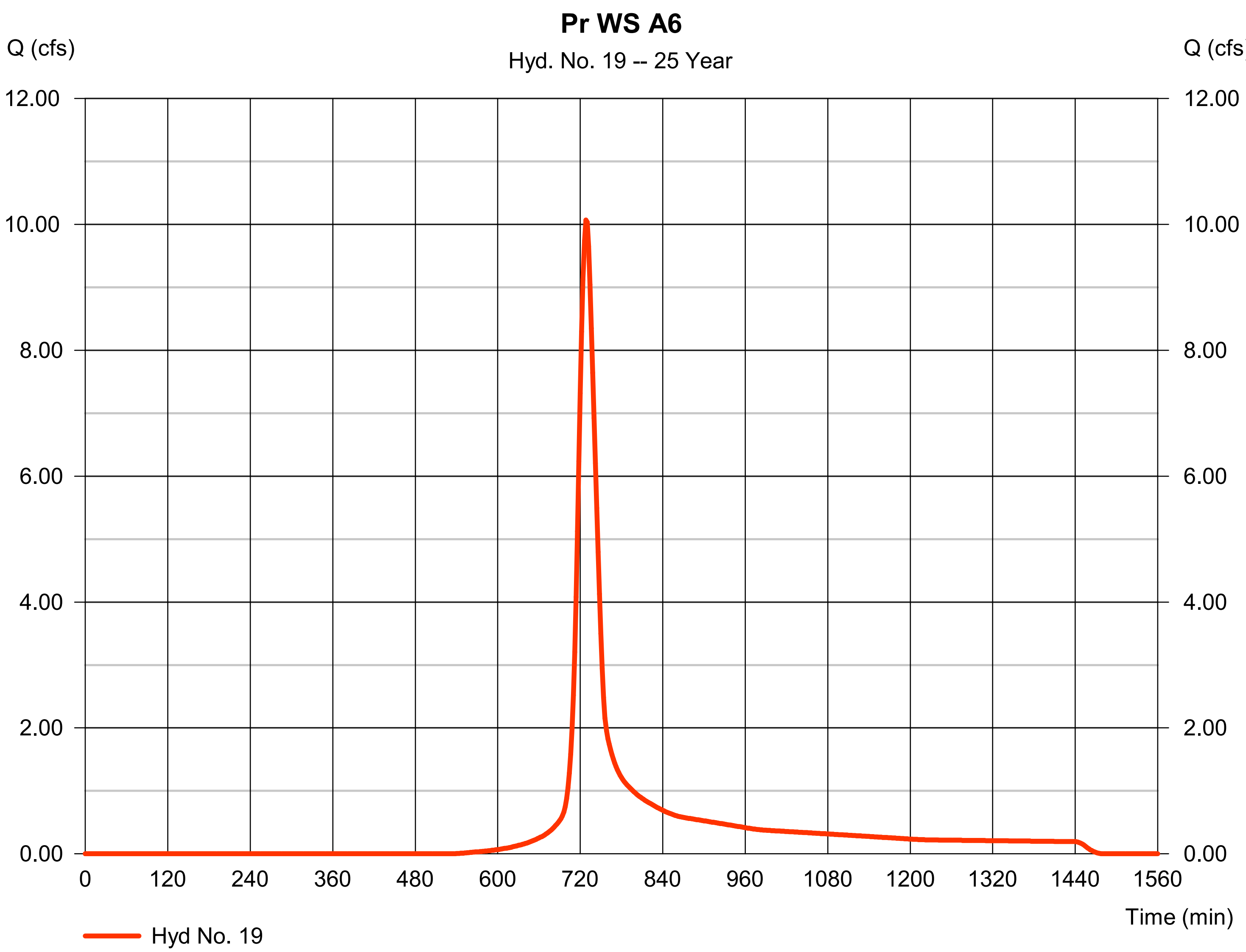
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 | Tuesday, 10 / 1 / 2019

Hyd. No. 19

Pr WS A6

Hydrograph type	= SCS Runoff	Peak discharge	= 10.07 cfs
Storm frequency	= 25 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 37,261 cuft
Drainage area	= 5.280 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 24.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



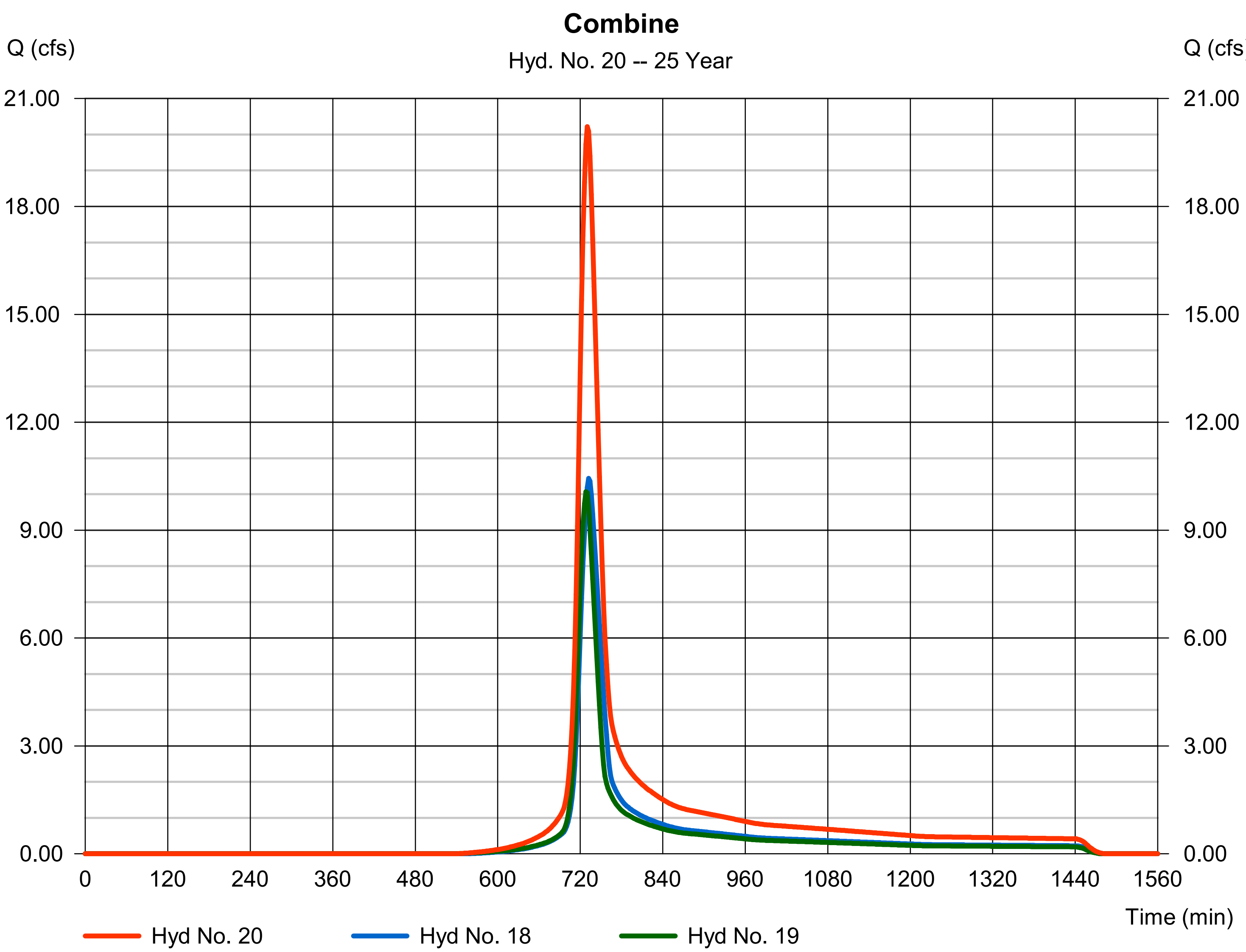
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 20

Combine

Hydrograph type	= Combine	Peak discharge	= 20.22 cfs
Storm frequency	= 25 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 79,295 cuft
Inflow hyds.	= 18, 19	Contrib. drain. area	= 5.280 ac



Hydrograph Report

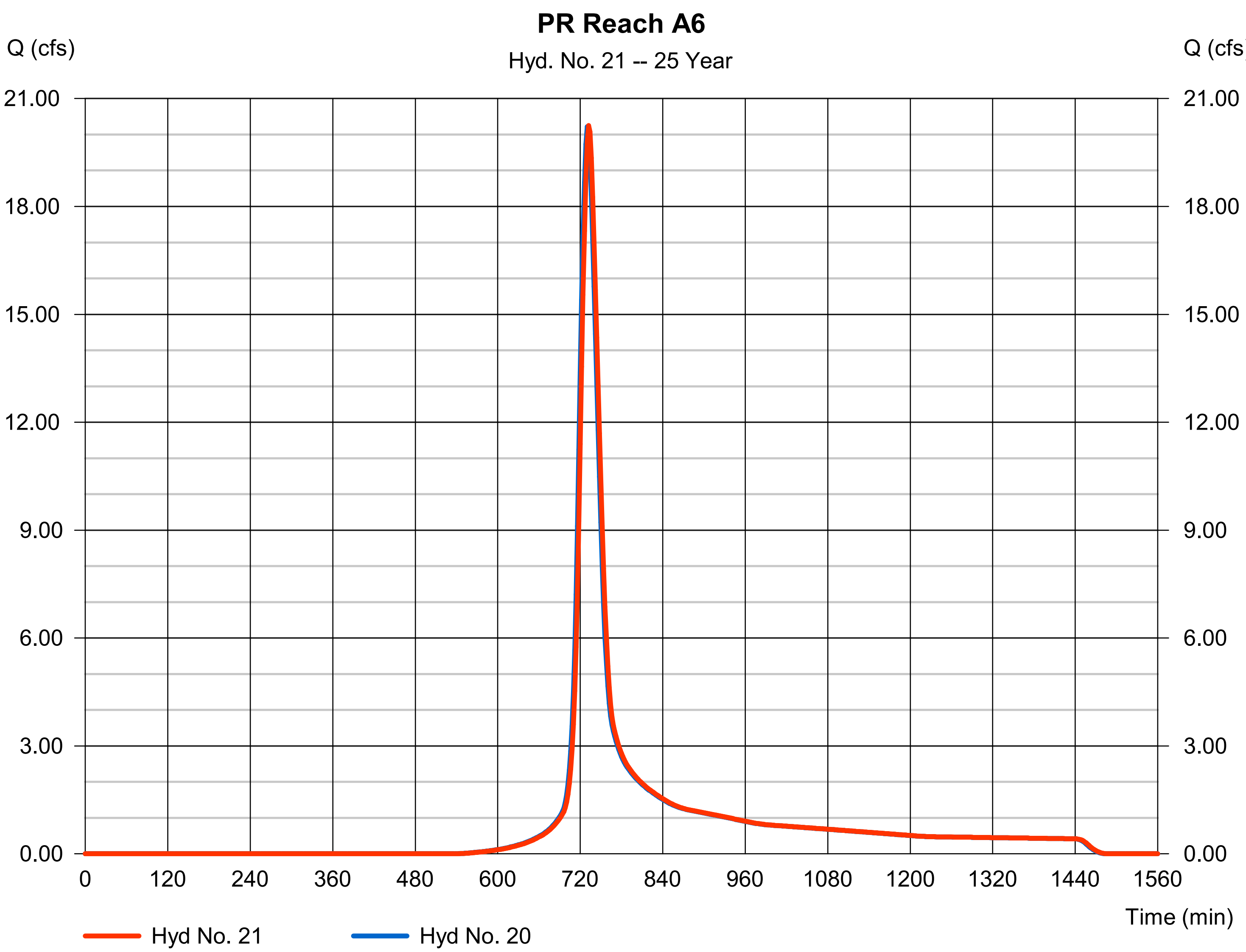
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 21

PR Reach A6

Hydrograph type	= Reach	Peak discharge	= 20.25 cfs
Storm frequency	= 25 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 79,295 cuft
Inflow hyd. No.	= 20 - Combine	Section type	= Trapezoidal
Reach length	= 413.0 ft	Channel slope	= 3.8 %
Manning's n	= 0.025	Bottom width	= 6.0 ft
Side slope	= 2.0:1	Max. depth	= 5.0 ft
Rating curve x	= 3.540	Rating curve m	= 1.395
Ave. velocity	= 5.80 ft/s	Routing coeff.	= 1.0806

Modified Att-Kin routing method used.



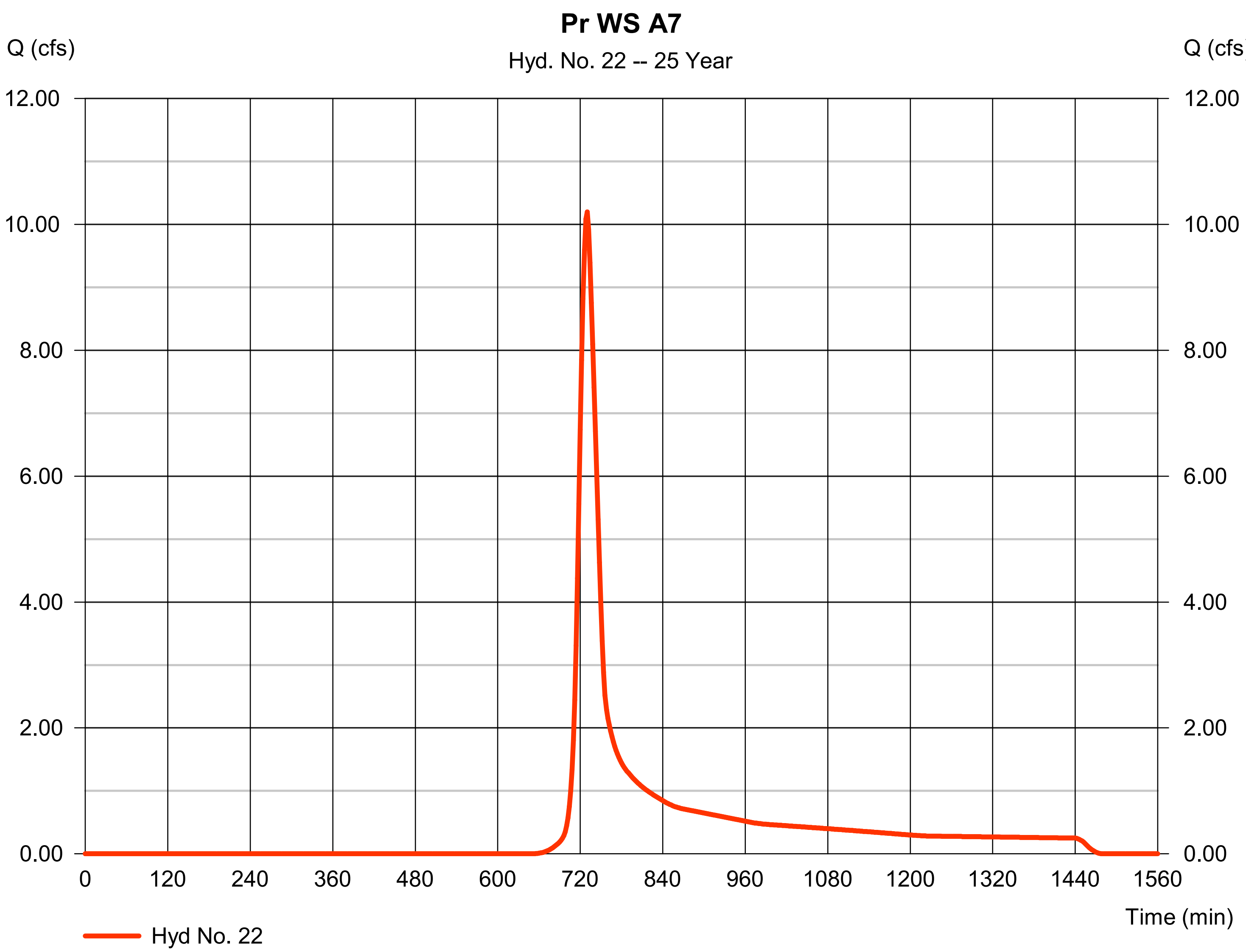
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 22

Pr WS A7

Hydrograph type	= SCS Runoff	Peak discharge	= 10.20 cfs
Storm frequency	= 25 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 39,750 cuft
Drainage area	= 8.310 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 26.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

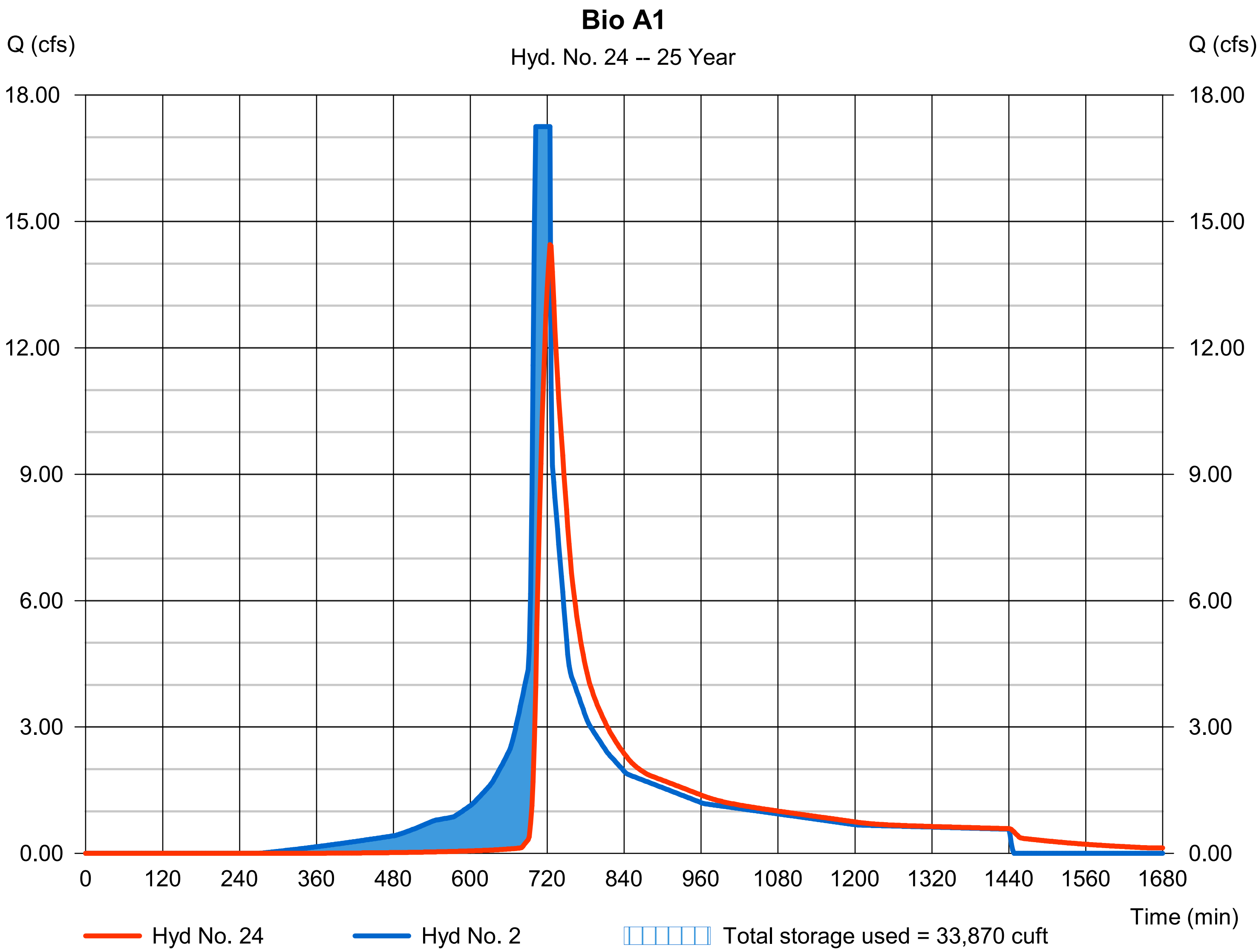
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 24

Bio A1

Hydrograph type	= Reservoir	Peak discharge	= 14.45 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 109,284 cuft
Inflow hyd. No.	= 2 - A1 to Bio #1	Max. Elevation	= 406.17 ft
Reservoir name	= Bio A1 (south)	Max. Storage	= 33,870 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

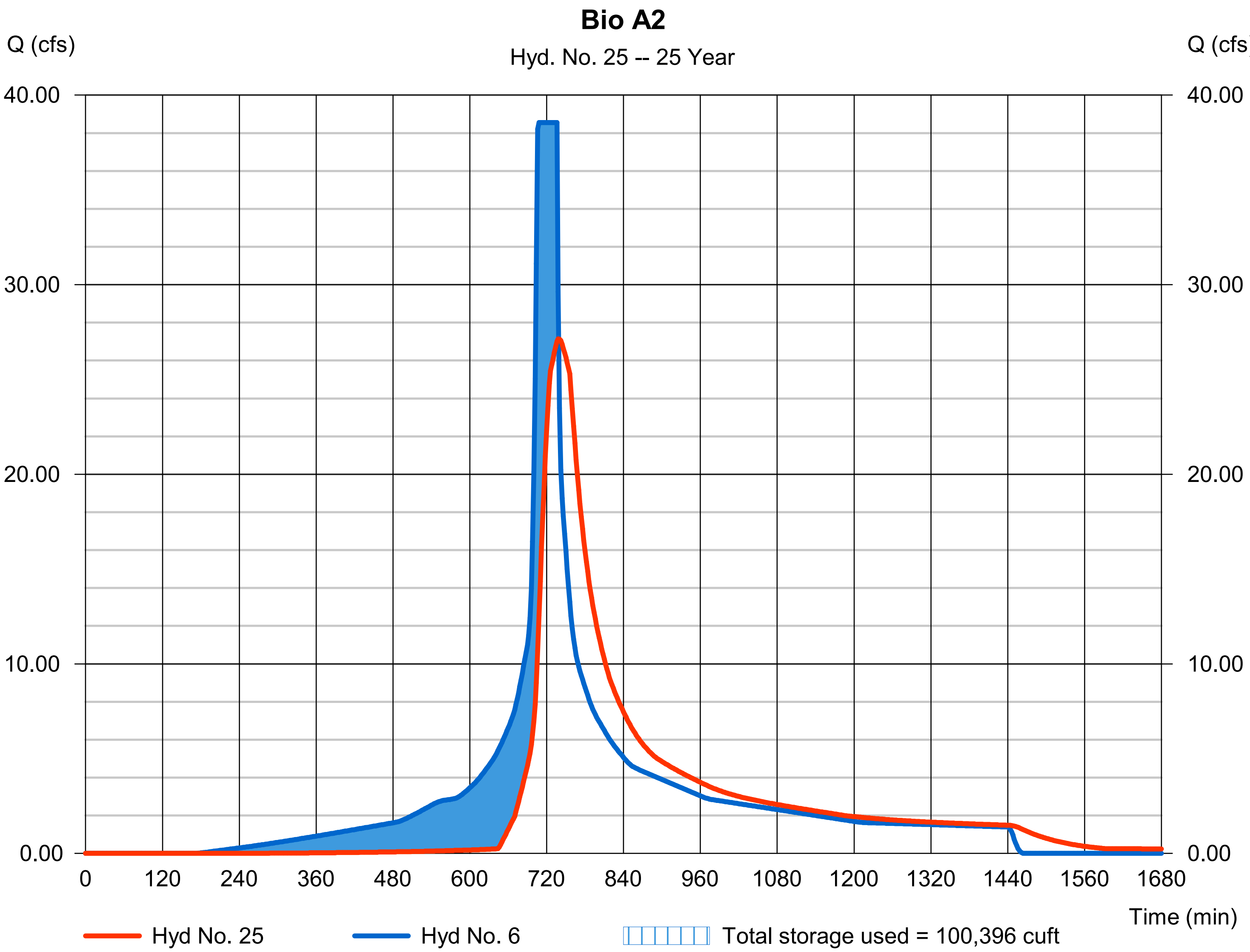
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 25

Bio A2

Hydrograph type	= Reservoir	Peak discharge	= 27.14 cfs
Storm frequency	= 25 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 289,487 cuft
Inflow hyd. No.	= 6 - A2 to Bio #2	Max. Elevation	= 402.21 ft
Reservoir name	= Bio A2 (west)	Max. Storage	= 100,396 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

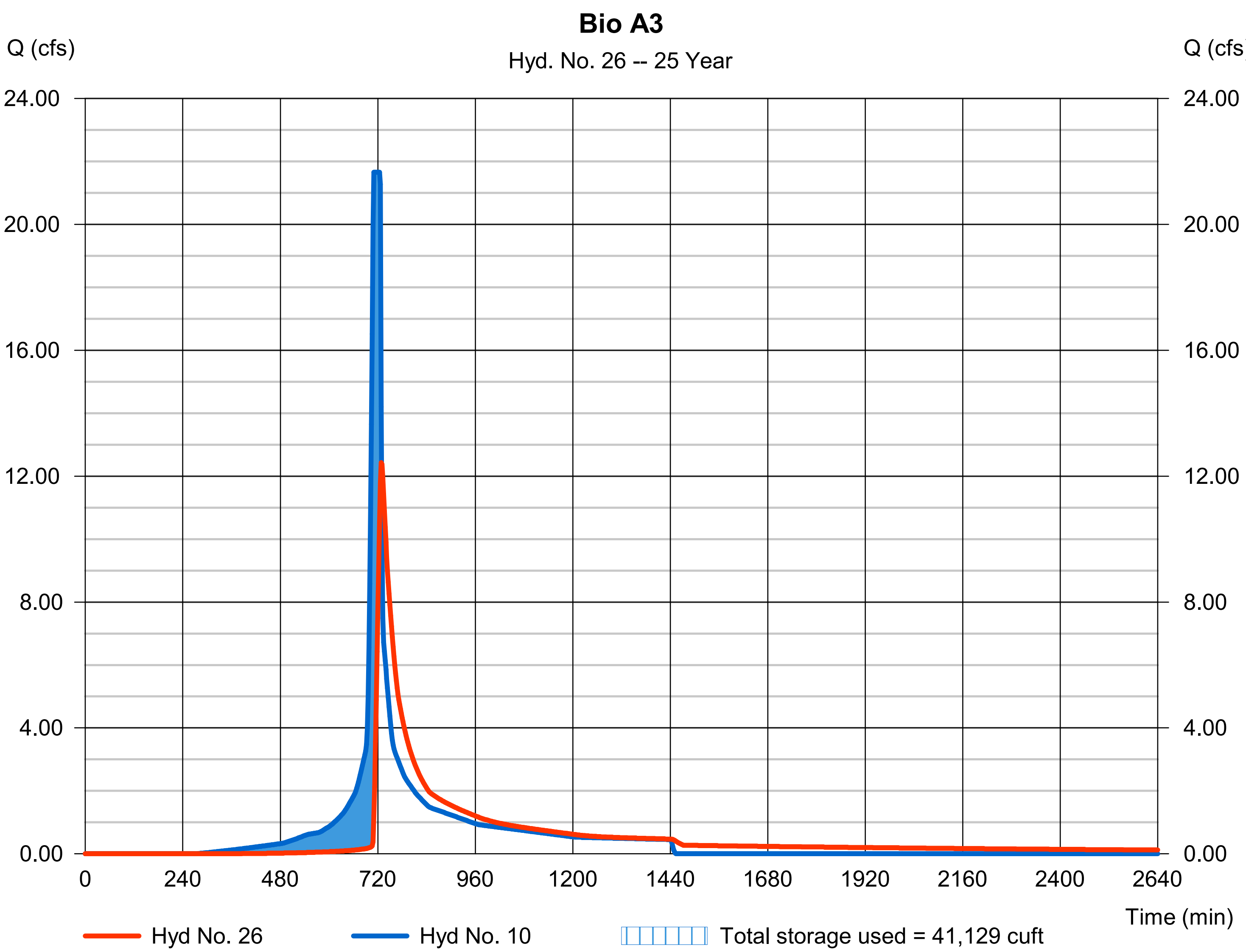
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 26

Bio A3

Hydrograph type	= Reservoir	Peak discharge	= 12.43 cfs
Storm frequency	= 25 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 97,397 cuft
Inflow hyd. No.	= 10 - A3 to Bio #3	Max. Elevation	= 409.37 ft
Reservoir name	= Bio A3 (east)	Max. Storage	= 41,129 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

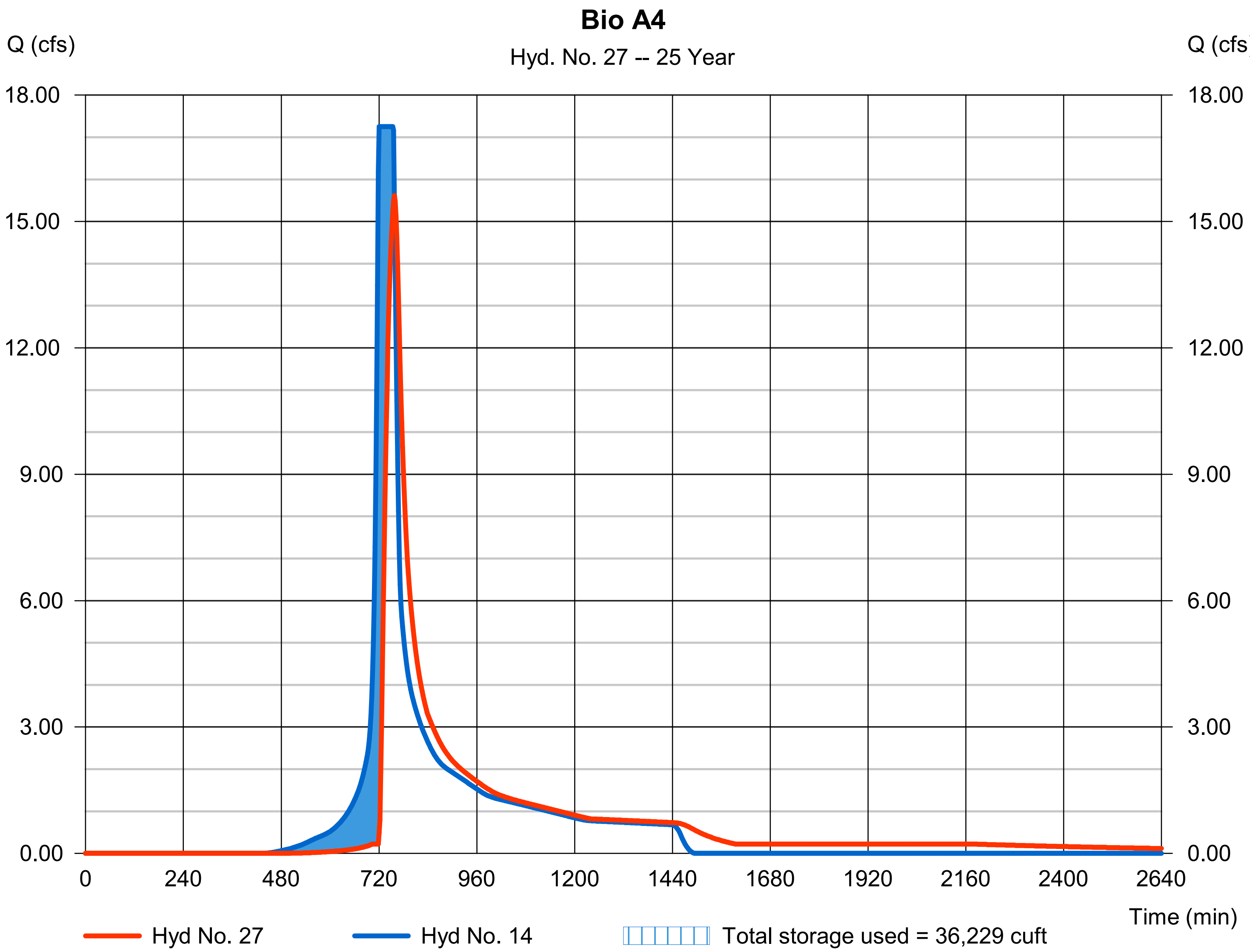
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 27

Bio A4

Hydrograph type	= Reservoir	Peak discharge	= 15.62 cfs
Storm frequency	= 25 yrs	Time to peak	= 758 min
Time interval	= 2 min	Hyd. volume	= 125,564 cuft
Inflow hyd. No.	= 14 - A4 to Bio #4	Max. Elevation	= 403.69 ft
Reservoir name	= Bio A4 (north)	Max. Storage	= 36,229 cuft

Storage Indication method used. Outflow includes exfiltration.



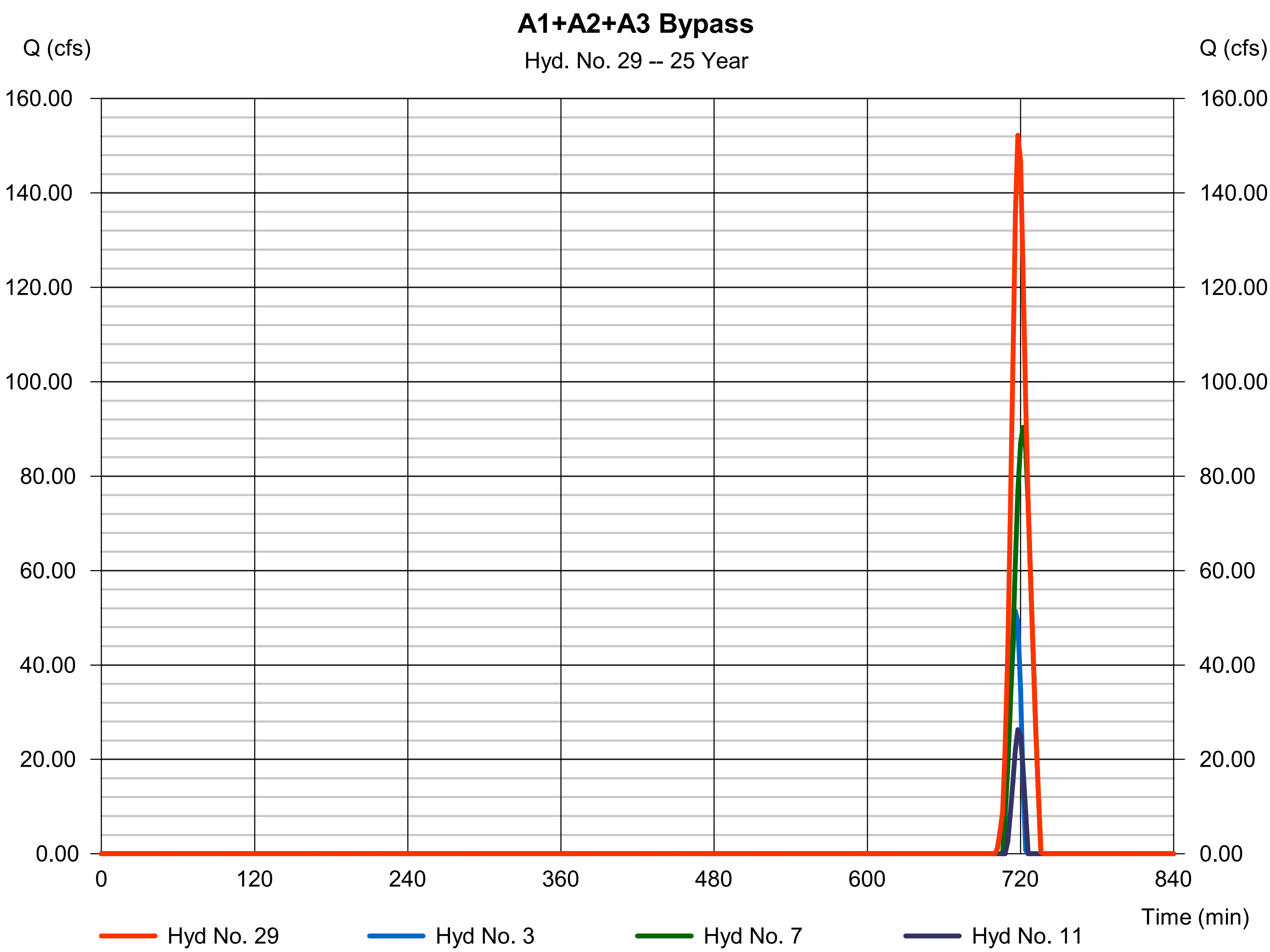
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 29

A1+A2+A3 Bypass

Hydrograph type	= Combine	Peak discharge	= 152.20 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 134,613 cuft
Inflow hyds.	= 3, 7, 11	Contrib. drain. area	= 0.000 ac



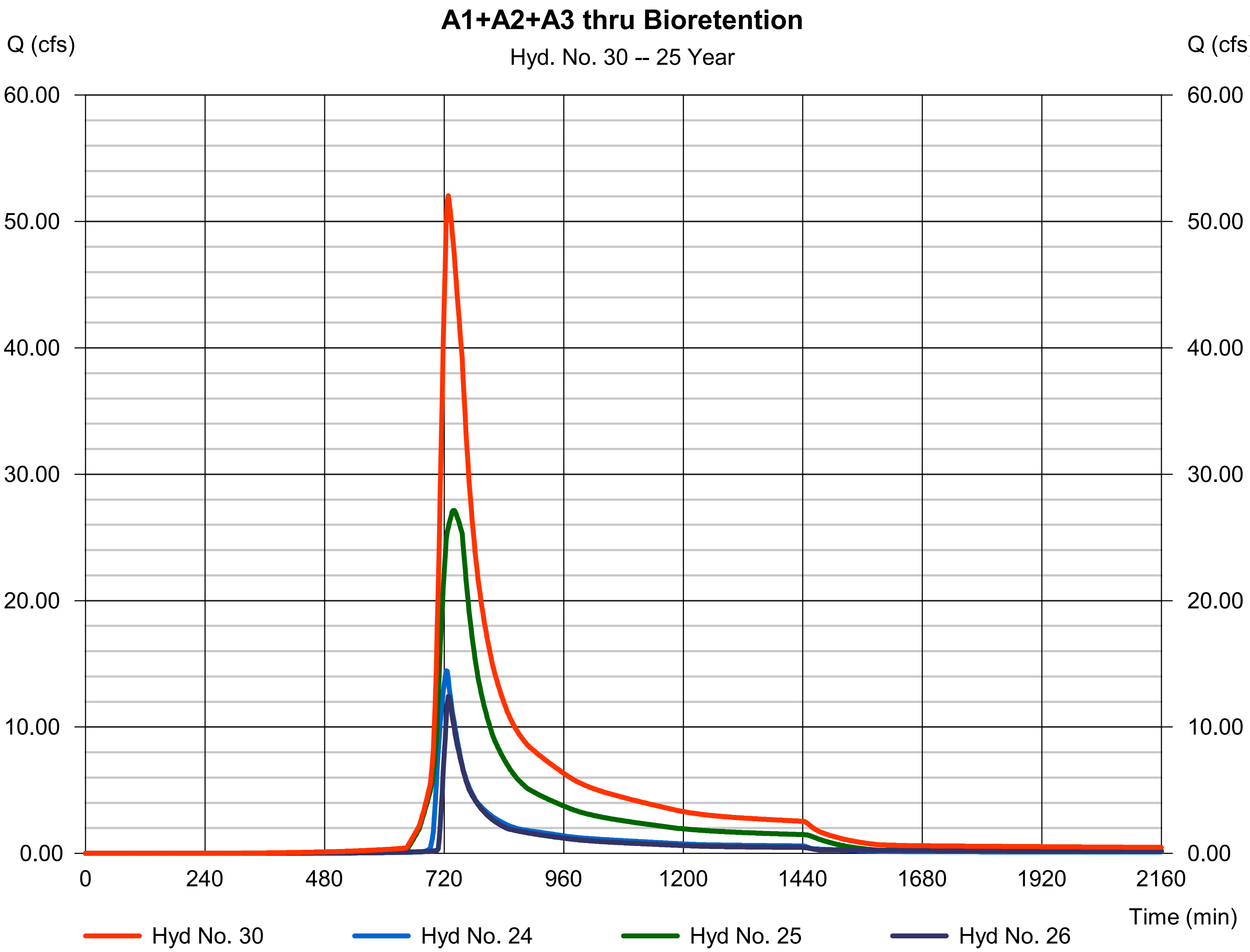
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 30

A1+A2+A3 thru Bioretention

Hydrograph type	= Combine	Peak discharge	= 52.02 cfs
Storm frequency	= 25 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 496,168 cuft
Inflow hyds.	= 24, 25, 26	Contrib. drain. area	= 0.000 ac



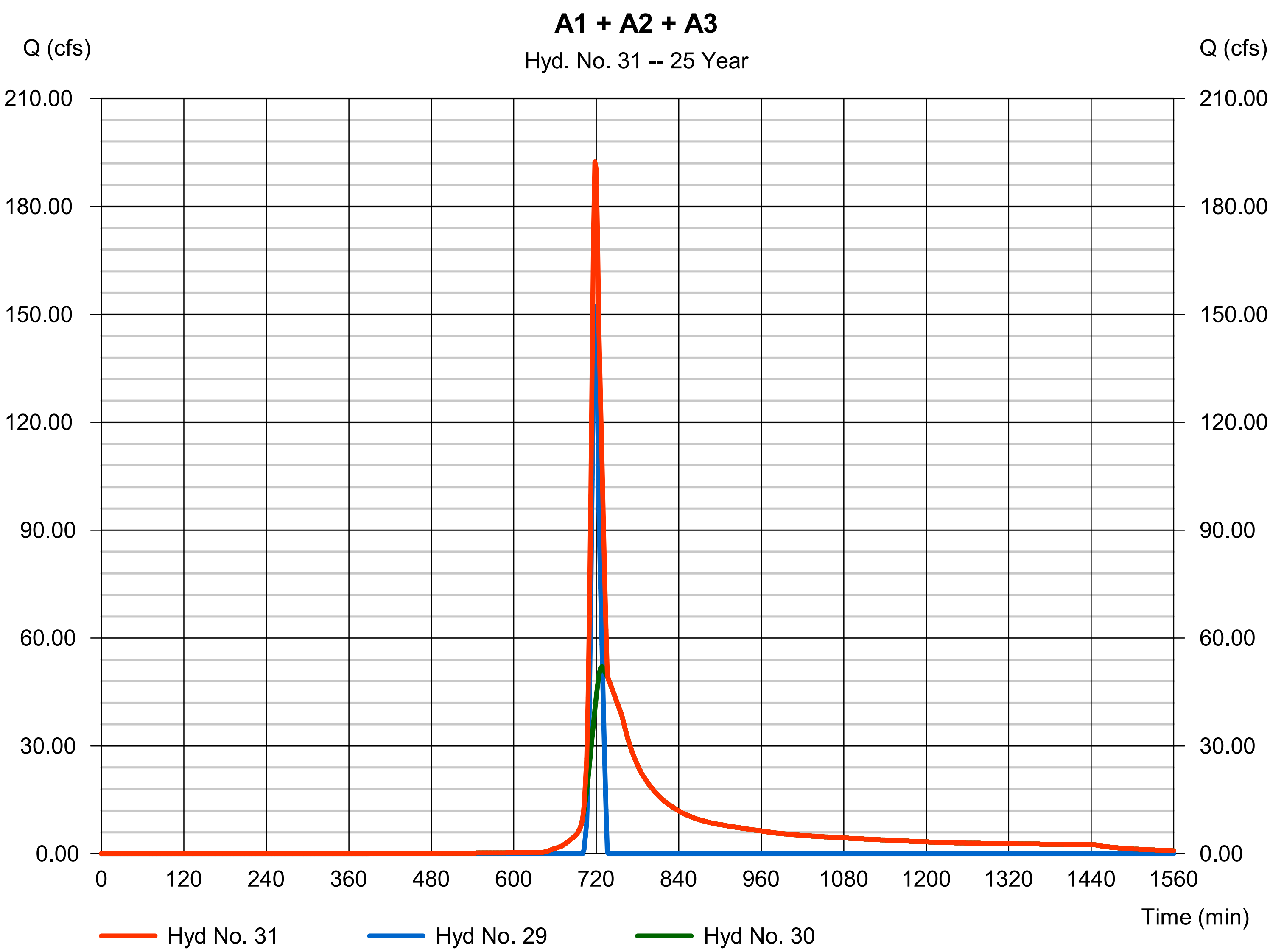
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 31

A1 + A2 + A3

Hydrograph type	= Combine	Peak discharge	= 192.35 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 630,779 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.000 ac



Hydrograph Report

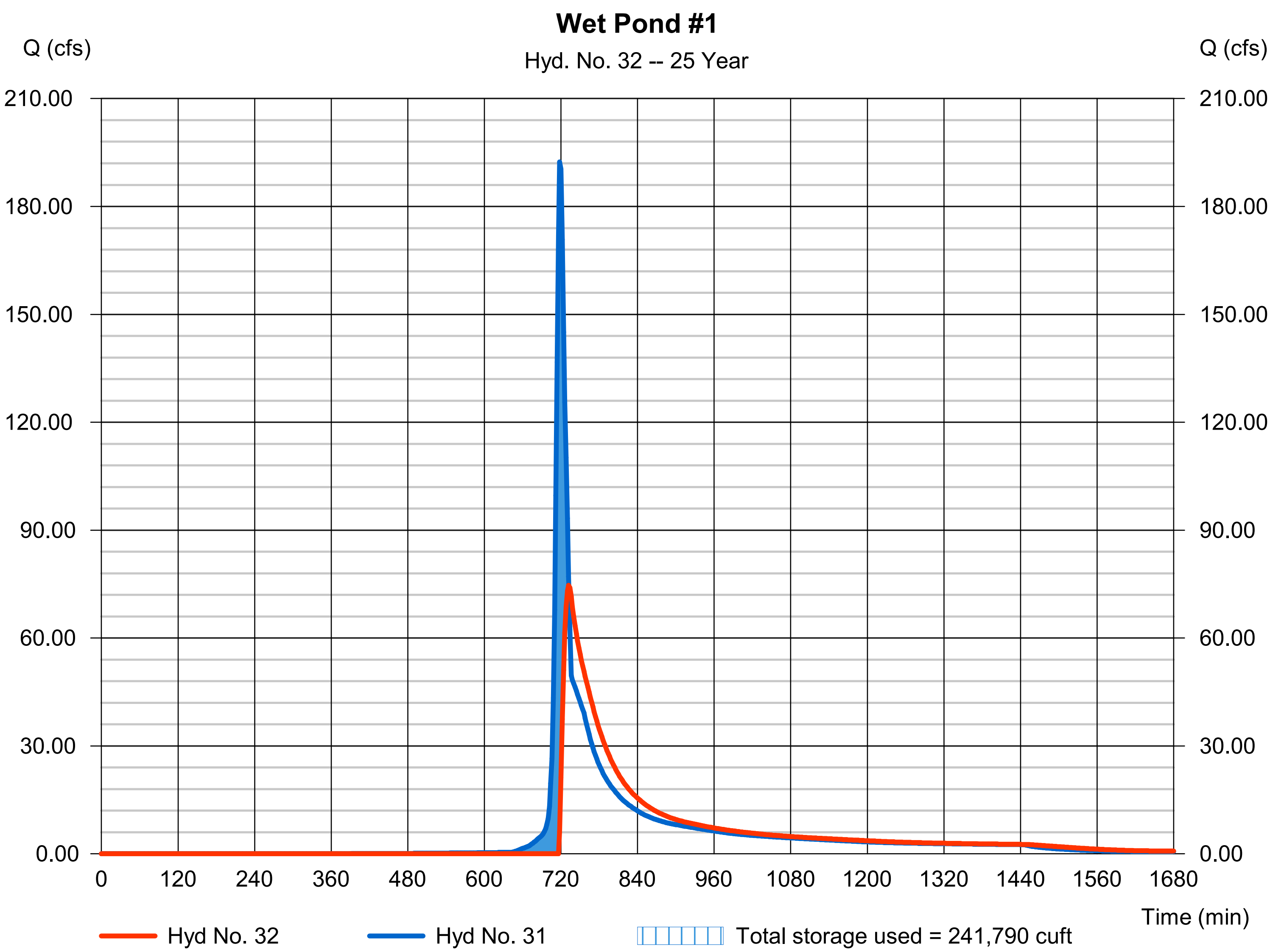
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 32

Wet Pond #1

Hydrograph type	= Reservoir	Peak discharge	= 74.67 cfs
Storm frequency	= 25 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 552,044 cuft
Inflow hyd. No.	= 31 - A1 + A2 + A3	Max. Elevation	= 403.99 ft
Reservoir name	= Wet Pond #1	Max. Storage	= 241,790 cuft

Storage Indication method used. Wet pond routing start elevation = 400.00 ft.



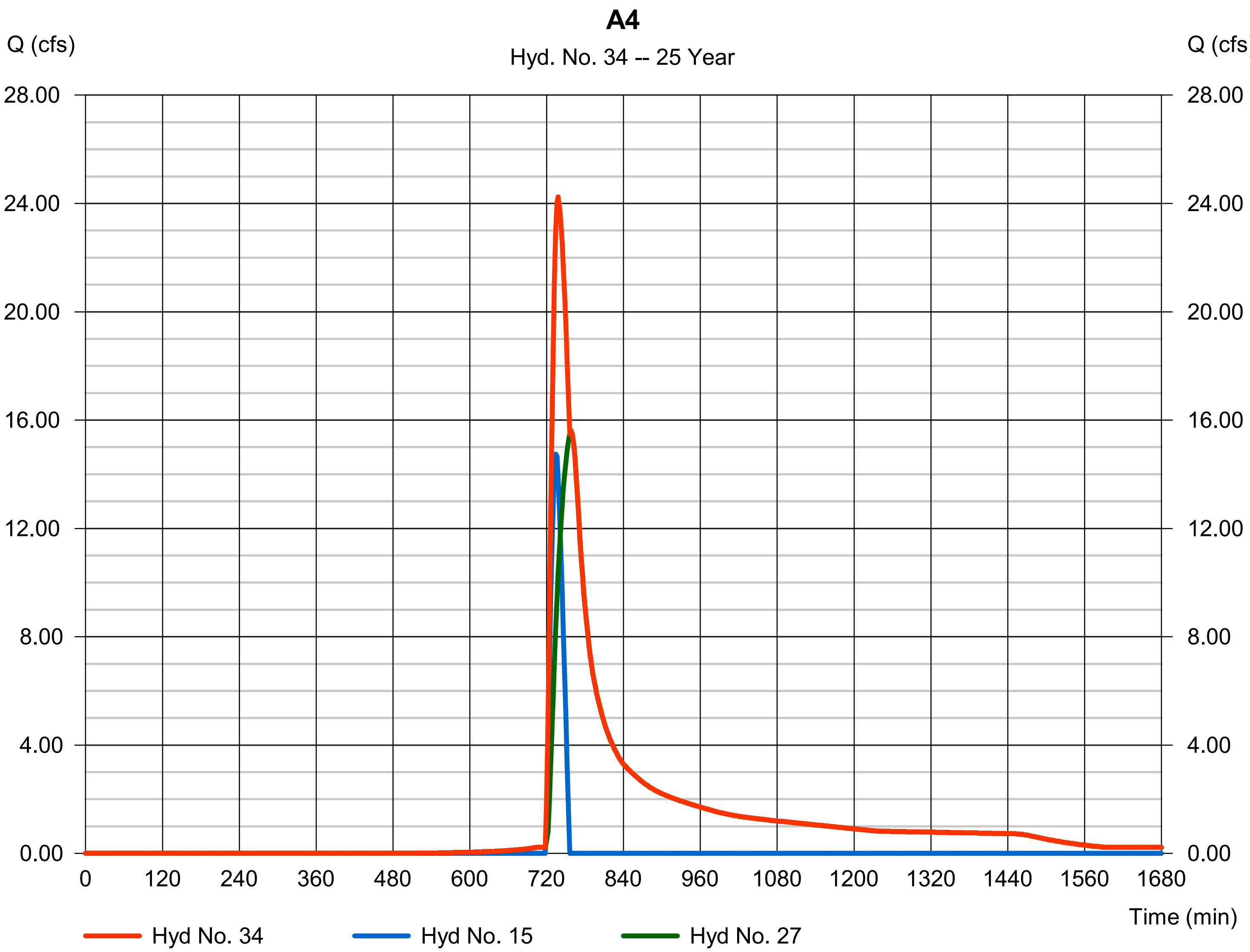
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 34

A4

Hydrograph type	= Combine	Peak discharge	= 24.24 cfs
Storm frequency	= 25 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 144,915 cuft
Inflow hyds.	= 15, 27	Contrib. drain. area	= 0.000 ac



Hydrograph Report

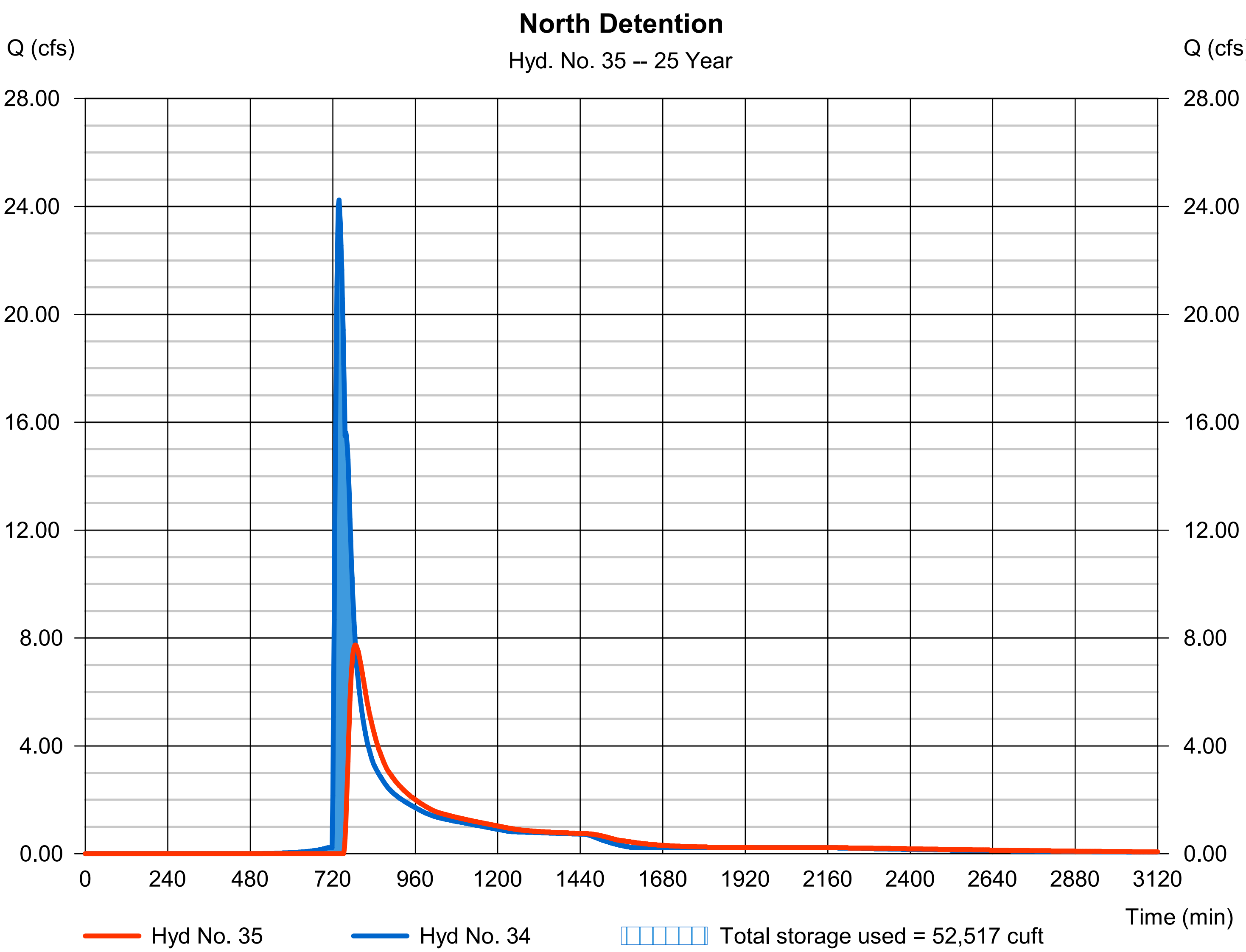
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 35

North Detention

Hydrograph type	=	Reservoir	Peak discharge	=	7.742 cfs
Storm frequency	=	25 yrs	Time to peak	=	786 min
Time interval	=	2 min	Hyd. volume	=	109,076 cuft
Inflow hyd. No.	=	34 - A4	Max. Elevation	=	403.80 ft
Reservoir name	=	Dry Detention #1	Max. Storage	=	52,517 cuft

Storage Indication method used.



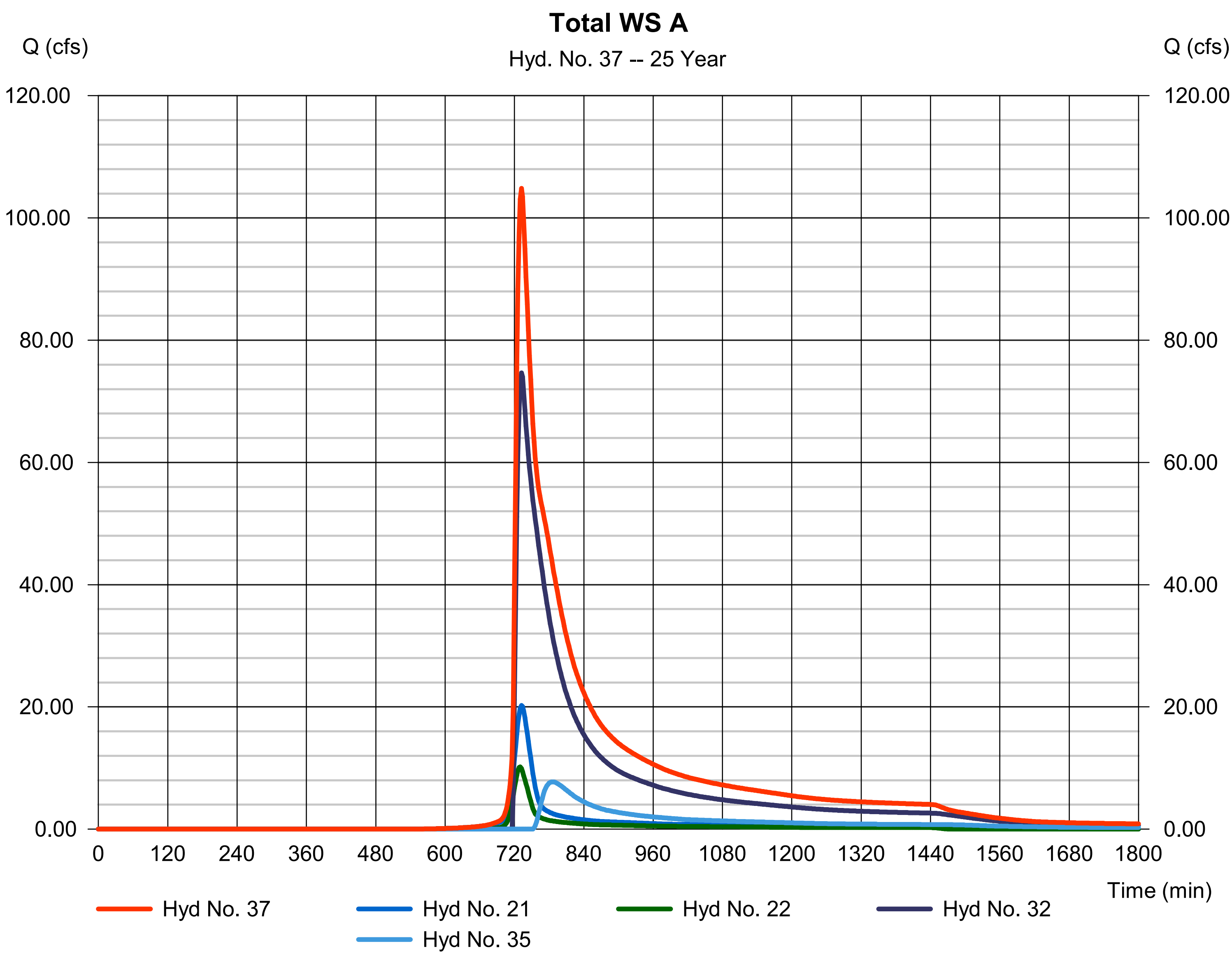
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 37

Total WS A

Hydrograph type	= Combine	Peak discharge	= 104.84 cfs
Storm frequency	= 25 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 780,165 cuft
Inflow hyds.	= 21, 22, 32, 35	Contrib. drain. area	= 8.310 ac



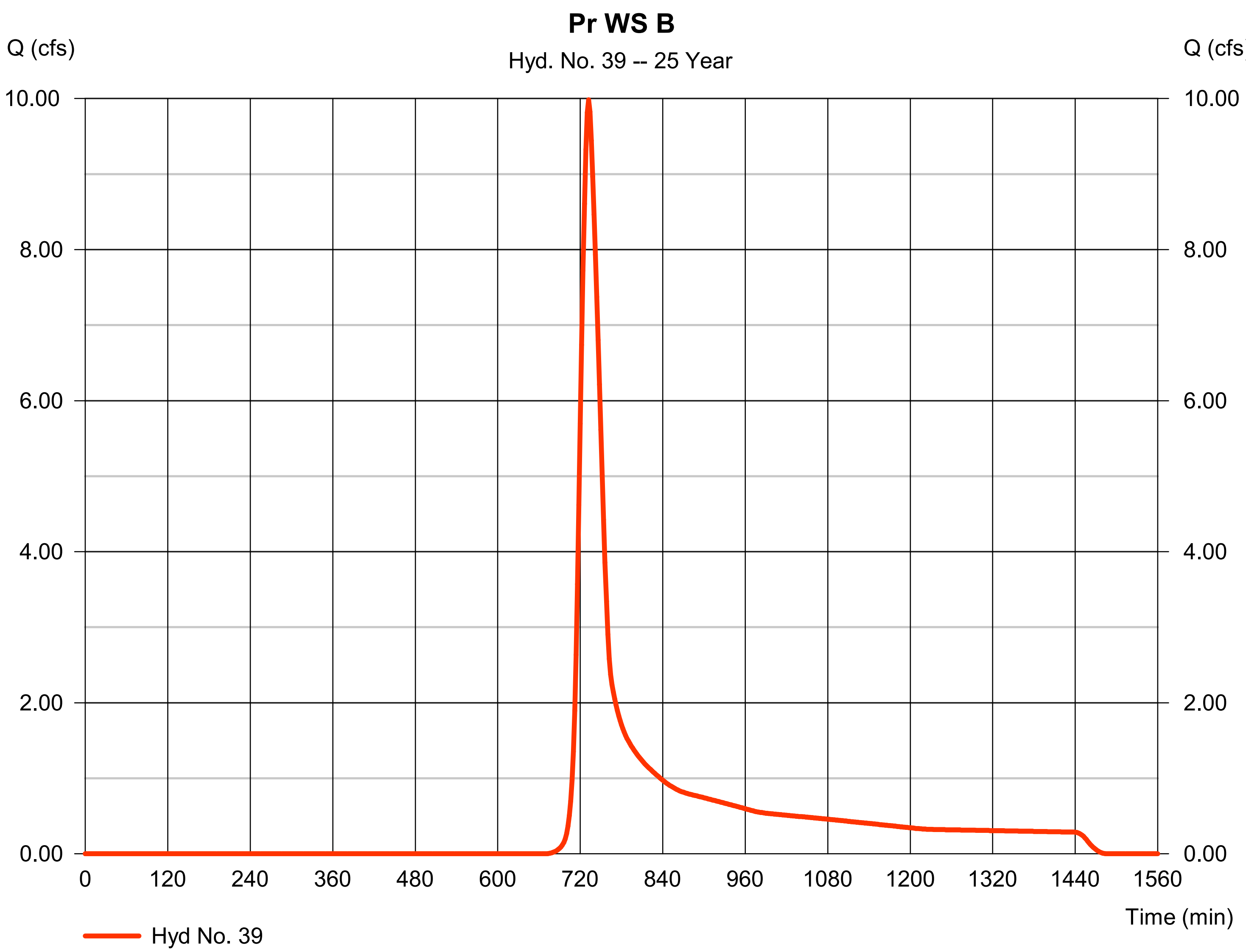
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 39

Pr WS B

Hydrograph type	= SCS Runoff	Peak discharge	= 9.983 cfs
Storm frequency	= 25 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 43,592 cuft
Drainage area	= 9.900 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 27.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



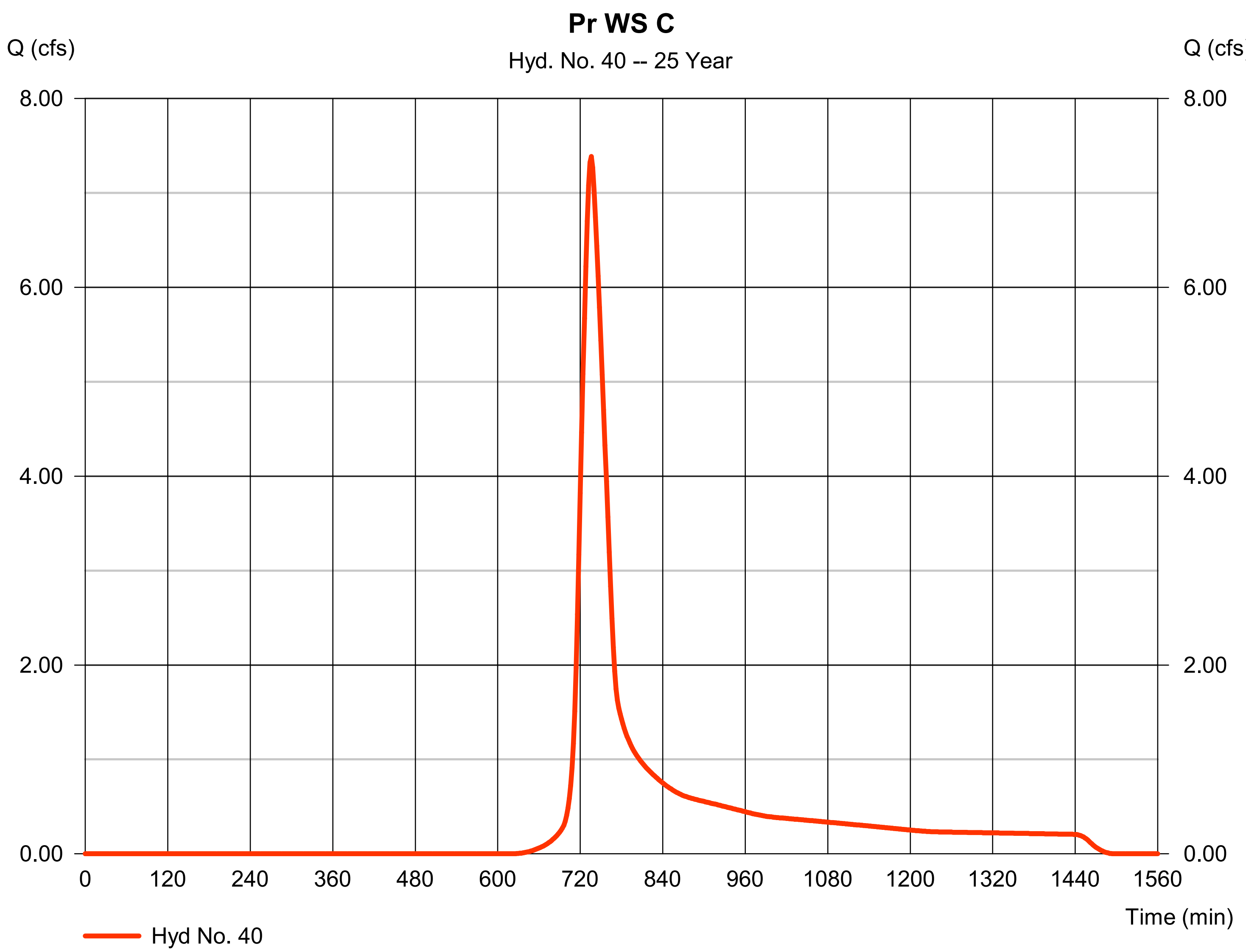
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 40

Pr WS C

Hydrograph type	= SCS Runoff	Peak discharge	= 7.385 cfs
Storm frequency	= 25 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 34,876 cuft
Drainage area	= 6.320 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 34.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



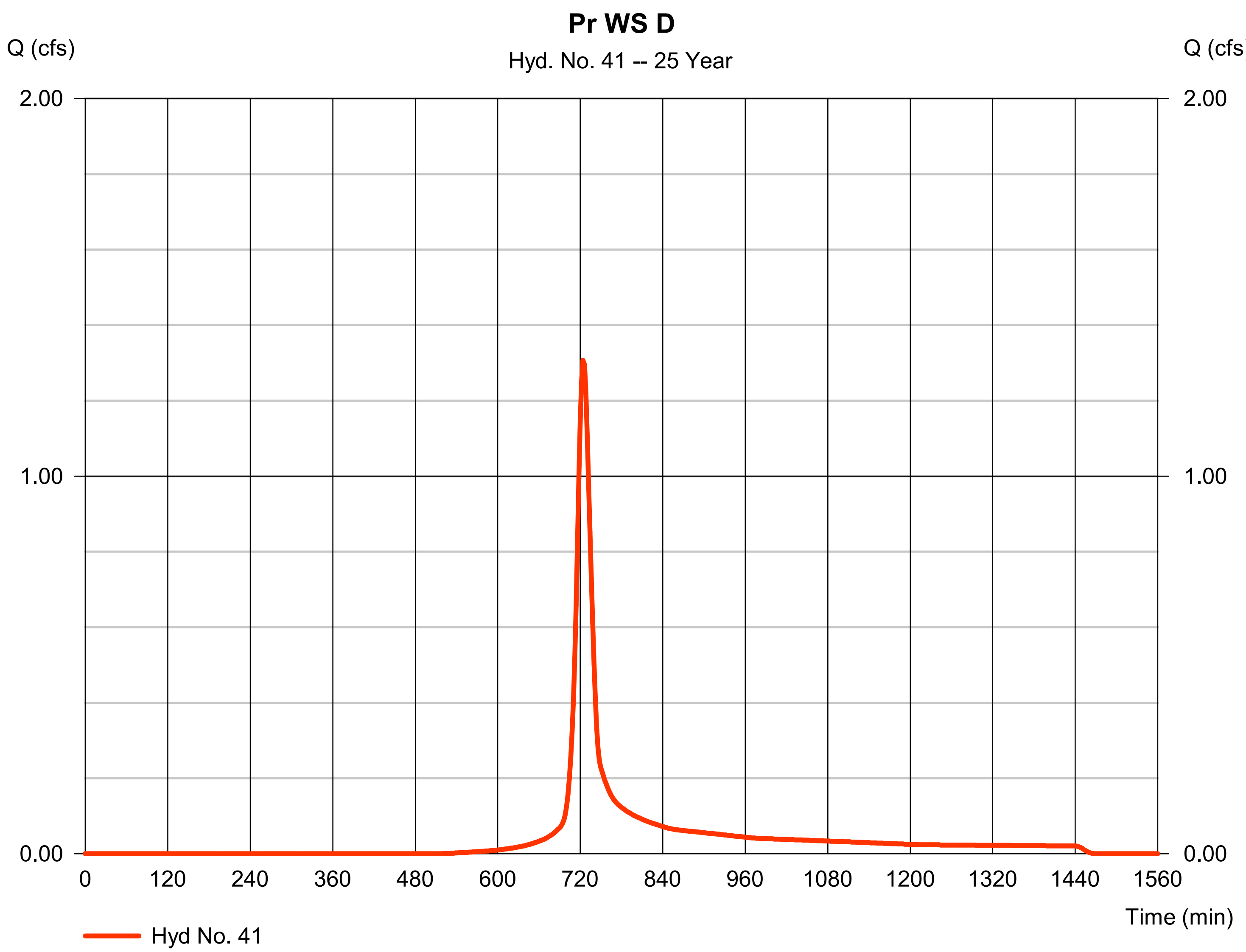
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 41

Pr WS D

Hydrograph type	= SCS Runoff	Peak discharge	= 1.307 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 4,099 cuft
Drainage area	= 0.550 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 20.00 min
Total precip.	= 4.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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	98.93	2	716	214,175	------	------	------	Pr WS A1
2	Diversion1	17.25	2	698	153,681	1	------	------	A1 to Bio #1
3	Diversion2	81.68	2	716	60,495	1	------	------	A1 to Detention
5	SCS Runoff	180.71	2	722	550,769	------	------	------	Pr WS A2
6	Diversion1	38.56	2	704	398,739	5	------	------	A2 to Bio #2
7	Diversion2	142.15	2	722	152,029	5	------	------	A2 to Detention
9	SCS Runoff	69.26	2	718	167,976	------	------	------	Pr WS A3
10	Diversion1	21.66	2	706	134,190	9	------	------	A3 to Bio #3
11	Diversion2	47.60	2	718	33,786	9	------	------	A3 to Detention
13	SCS Runoff	50.01	2	734	227,083	------	------	------	Pr WS A4
14	Diversion1	17.25	2	714	171,726	13	------	------	A4 to Bio #4
15	Diversion2	32.76	2	734	55,357	13	------	------	A4 to Detention
17	SCS Runoff	17.39	2	730	69,549	------	------	------	Pr WS A5
18	Reach	17.48	2	732	69,548	17	------	------	PR Reach A5
19	SCS Runoff	16.64	2	728	61,066	------	------	------	Pr WS A6
20	Combine	33.67	2	730	130,614	18, 19	------	------	Combine
21	Reach	33.73	2	732	130,614	20	------	------	PR Reach A6
22	SCS Runoff	19.13	2	730	71,613	------	------	------	Pr WS A7
24	Reservoir	15.94	2	726	151,311	2	406.19	35,011	Bio A1
25	Reservoir	27.90	2	742	389,275	6	402.29	107,731	Bio A2
26	Reservoir	17.25	2	728	133,056	10	409.47	45,640	Bio A3
27	Reservoir	16.86	2	762	171,662	14	403.71	37,230	Bio A4
29	Combine	249.39	2	718	246,309	3, 7, 11,	------	------	A1+A2+A3 Bypass
30	Combine	60.05	2	728	673,641	24, 25, 26,	------	------	A1+A2+A3 thru Bioretention
31	Combine	303.21	2	718	919,952	29, 30	------	------	A1 + A2 + A3
32	Reservoir	115.23	2	732	841,211	31	406.00	346,087	Wet Pond #1
34	Combine	47.03	2	736	227,019	15, 27,	------	------	A4
35	Reservoir	24.15	2	758	191,167	34	404.75	69,921	North Detention
37	Combine	167.43	2	730	1,234,606	21, 22, 32, 35,	------	------	Total WS A

Proposed Hydrographs.gpw	Return Period: 100 Year	Tuesday, 10 / 1 / 2019

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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
39	SCS Runoff	19.57	2	732	80,489	------	------	------	Pr WS B
40	SCS Runoff	13.26	2	736	60,727	------	------	------	Pr WS C
41	SCS Runoff	2.127	2	724	6,655	------	------	------	Pr WS D

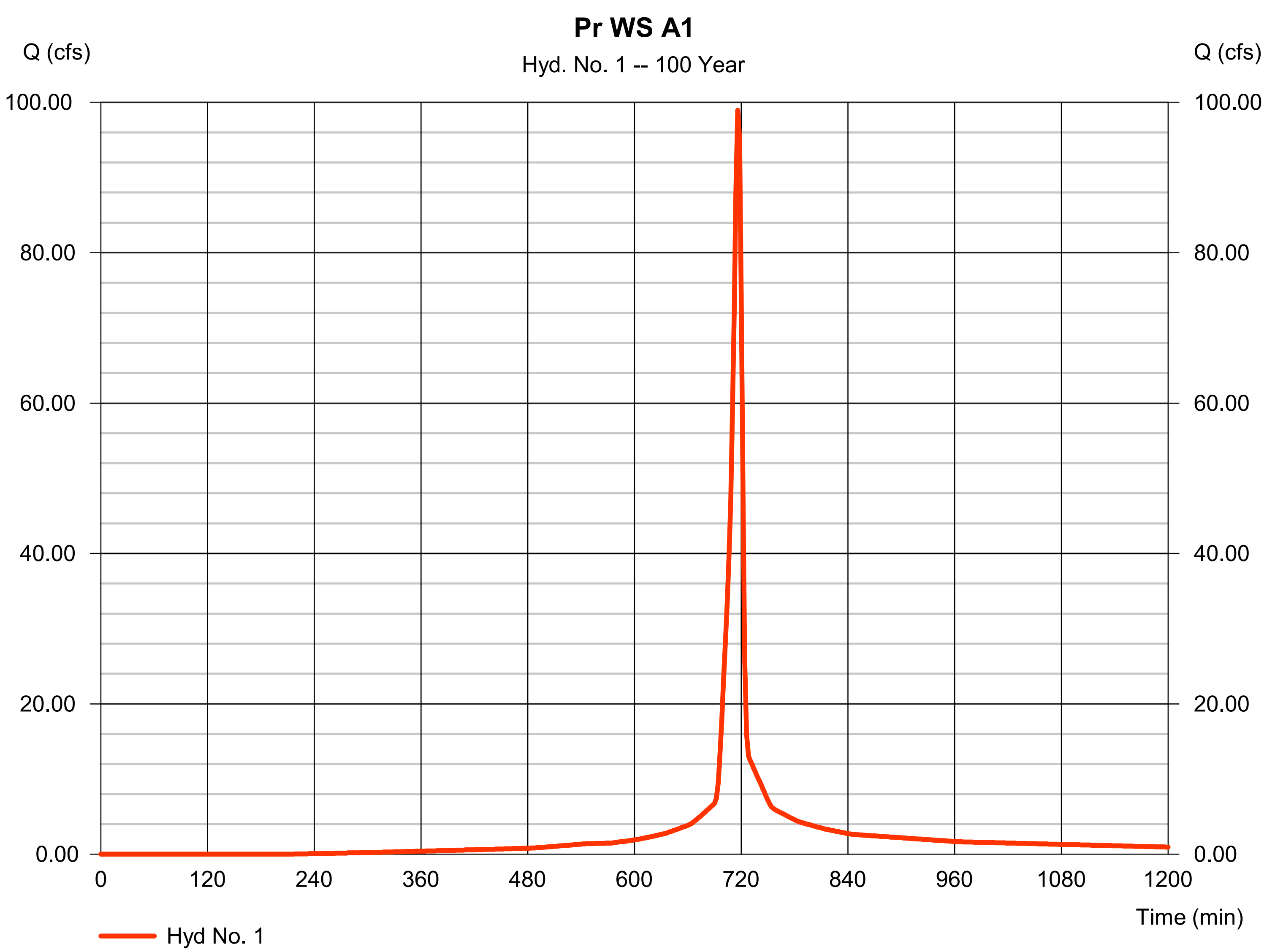
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 1

Pr WS A1

Hydrograph type	= SCS Runoff	Peak discharge	= 98.93 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 214,175 cuft
Drainage area	= 14.090 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



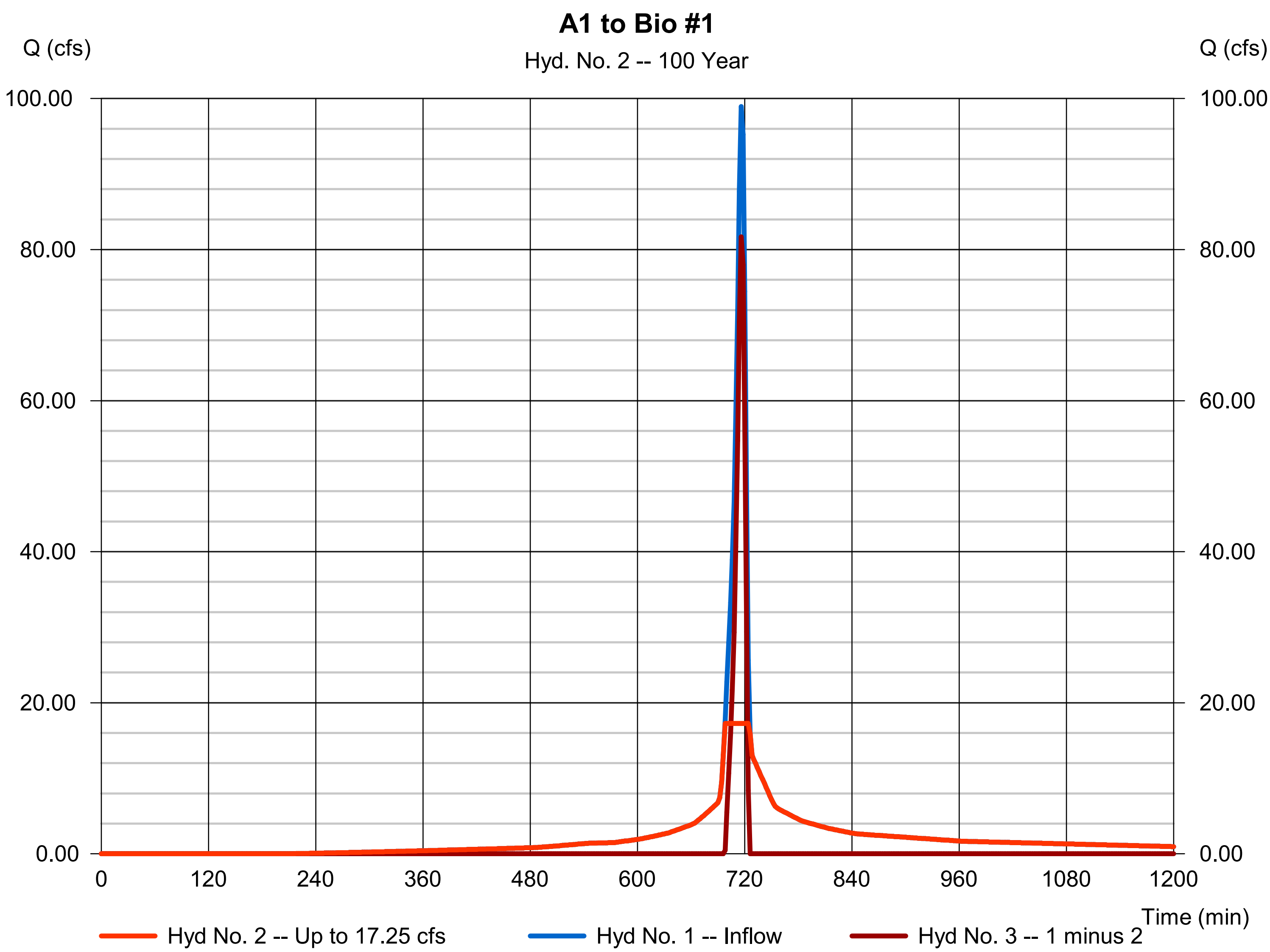
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 2

A1 to Bio #1

Hydrograph type	= Diversion1	Peak discharge	= 17.25 cfs
Storm frequency	= 100 yrs	Time to peak	= 698 min
Time interval	= 2 min	Hyd. volume	= 153,681 cuft
Inflow hydrograph	= 1 - Pr WS A1	2nd diverted hyd.	= 3
Diversion method	= Constant Q	Constant Q	= 17.25 cfs



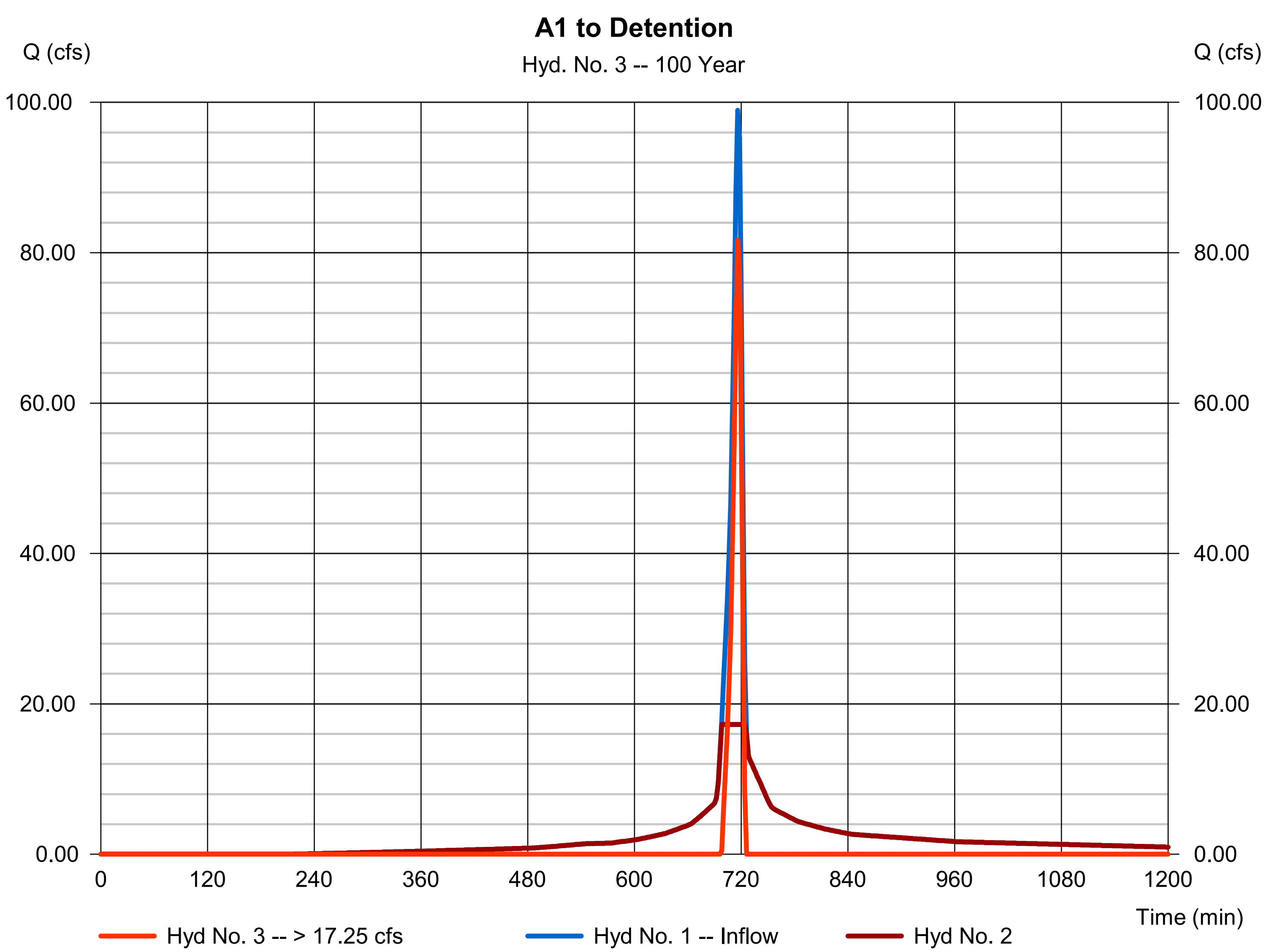
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 3

A1 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 81.68 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 60,495 cuft
Inflow hydrograph	= 1 - Pr WS A1	2nd diverted hyd.	= 2
Diversion method	= Constant Q	Constant Q	= 17.25 cfs

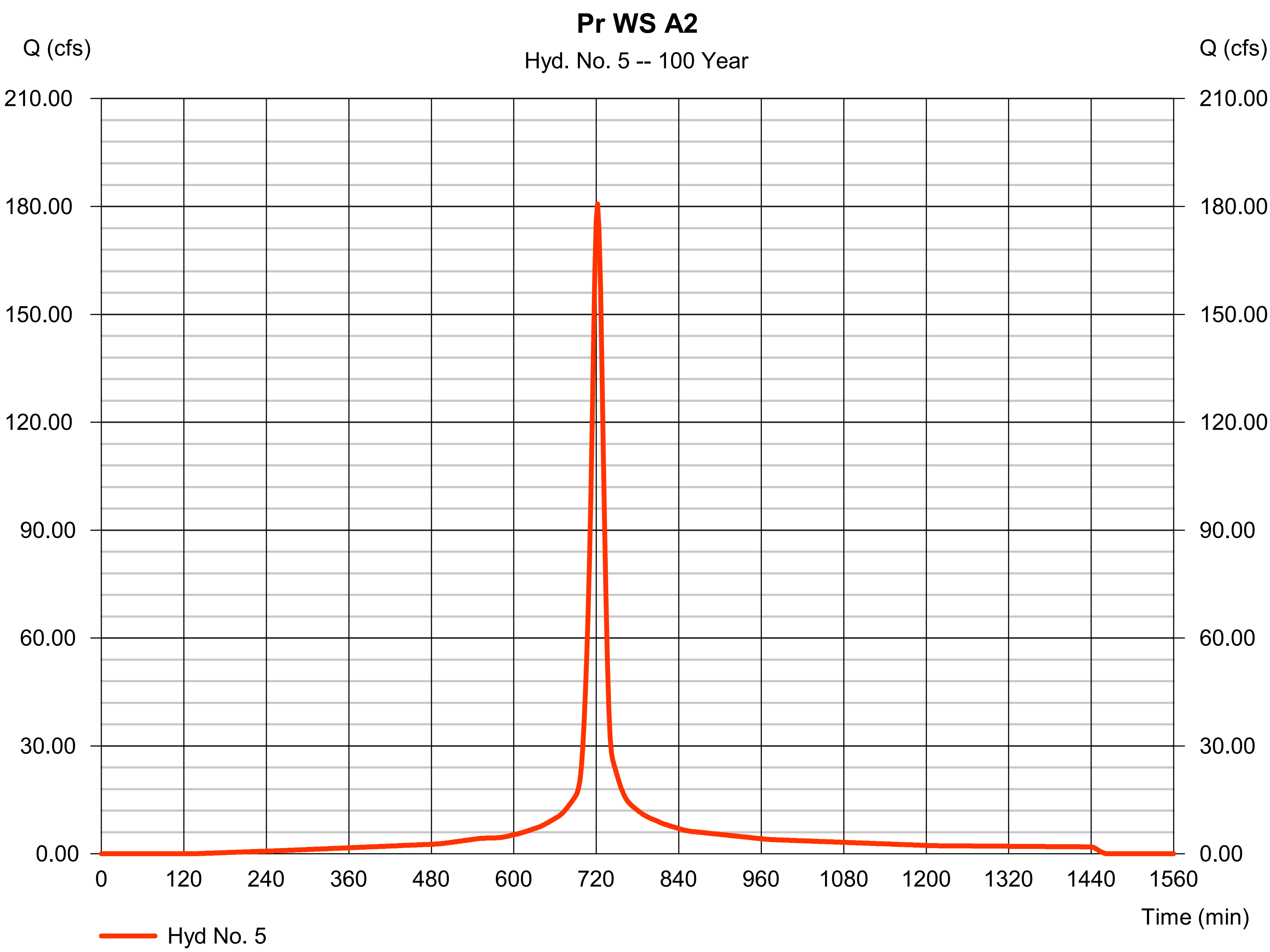


Hydrograph Report

Hyd. No. 5

Pr WS A2

Hydrograph type	= SCS Runoff	Peak discharge	= 180.71 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 550,769 cuft
Drainage area	= 31.690 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



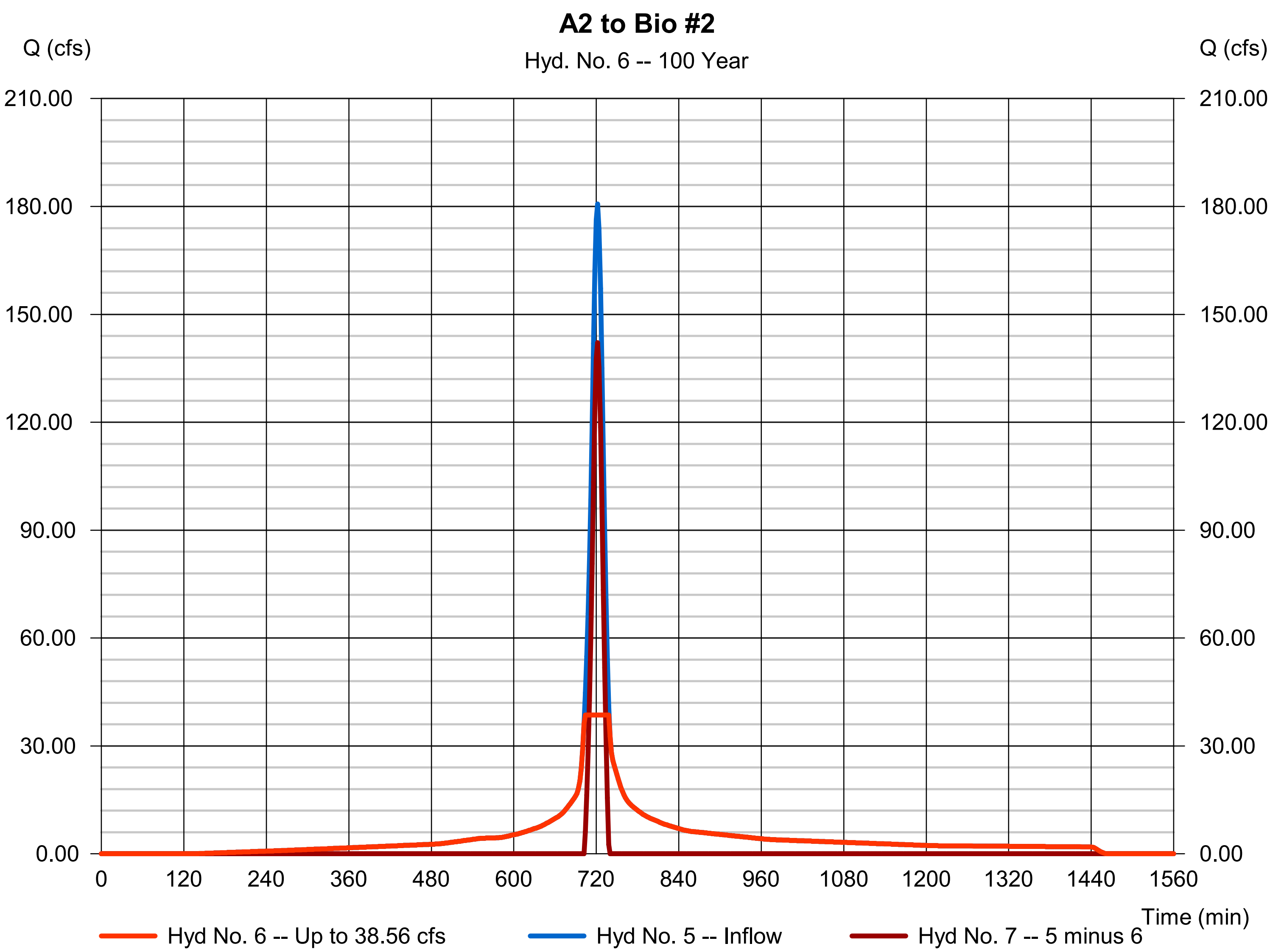
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 6

A2 to Bio #2

Hydrograph type	= Diversion1	Peak discharge	= 38.56 cfs
Storm frequency	= 100 yrs	Time to peak	= 704 min
Time interval	= 2 min	Hyd. volume	= 398,739 cuft
Inflow hydrograph	= 5 - Pr WS A2	2nd diverted hyd.	= 7
Diversion method	= Constant Q	Constant Q	= 38.56 cfs



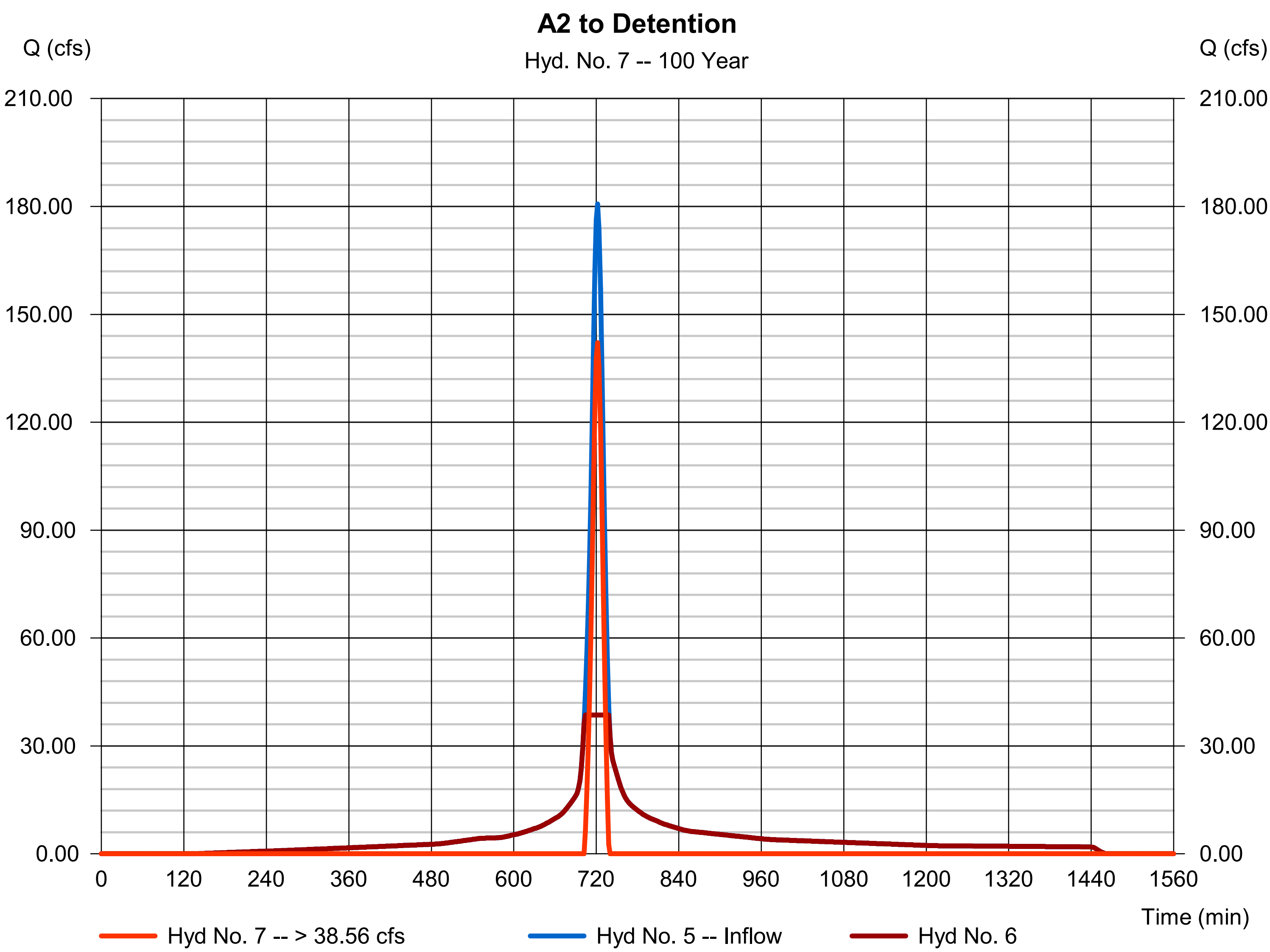
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 7

A2 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 142.15 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 152,029 cuft
Inflow hydrograph	= 5 - Pr WS A2	2nd diverted hyd.	= 6
Diversion method	= Constant Q	Constant Q	= 38.56 cfs



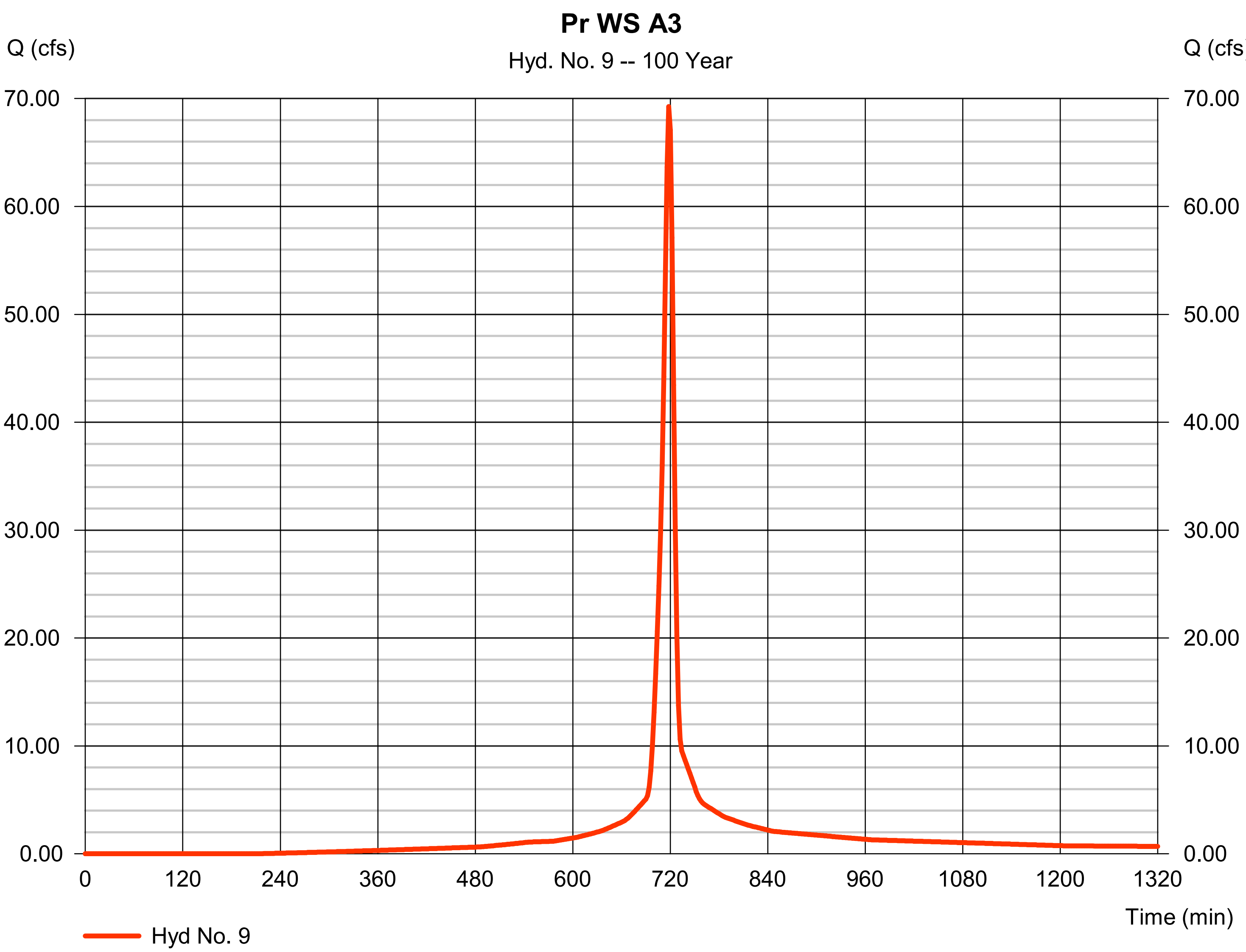
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 9

Pr WS A3

Hydrograph type	= SCS Runoff	Peak discharge	= 69.26 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 167,976 cuft
Drainage area	= 10.360 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



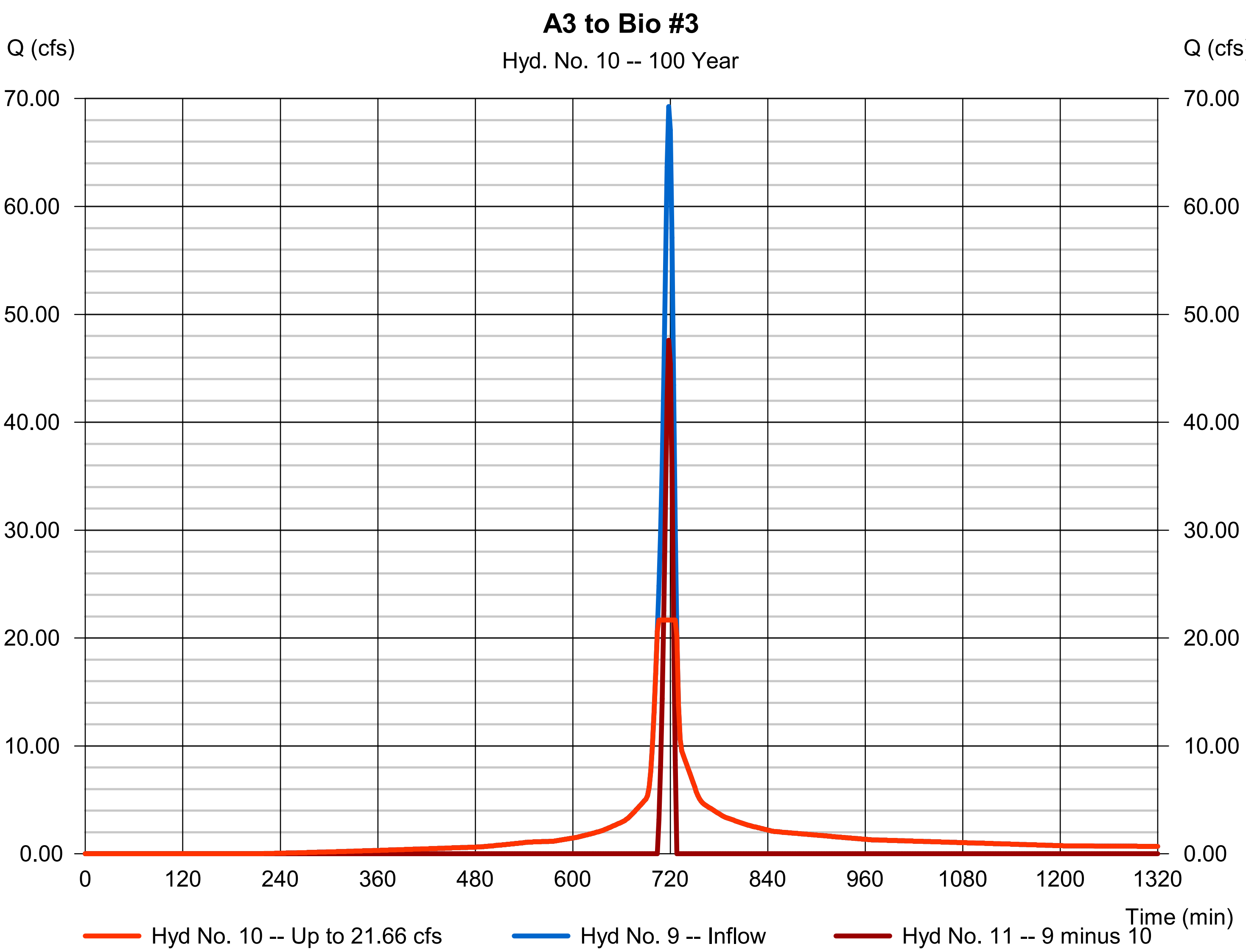
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 10

A3 to Bio #3

Hydrograph type	= Diversion1	Peak discharge	= 21.66 cfs
Storm frequency	= 100 yrs	Time to peak	= 706 min
Time interval	= 2 min	Hyd. volume	= 134,190 cuft
Inflow hydrograph	= 9 - Pr WS A3	2nd diverted hyd.	= 11
Diversion method	= Constant Q	Constant Q	= 21.66 cfs



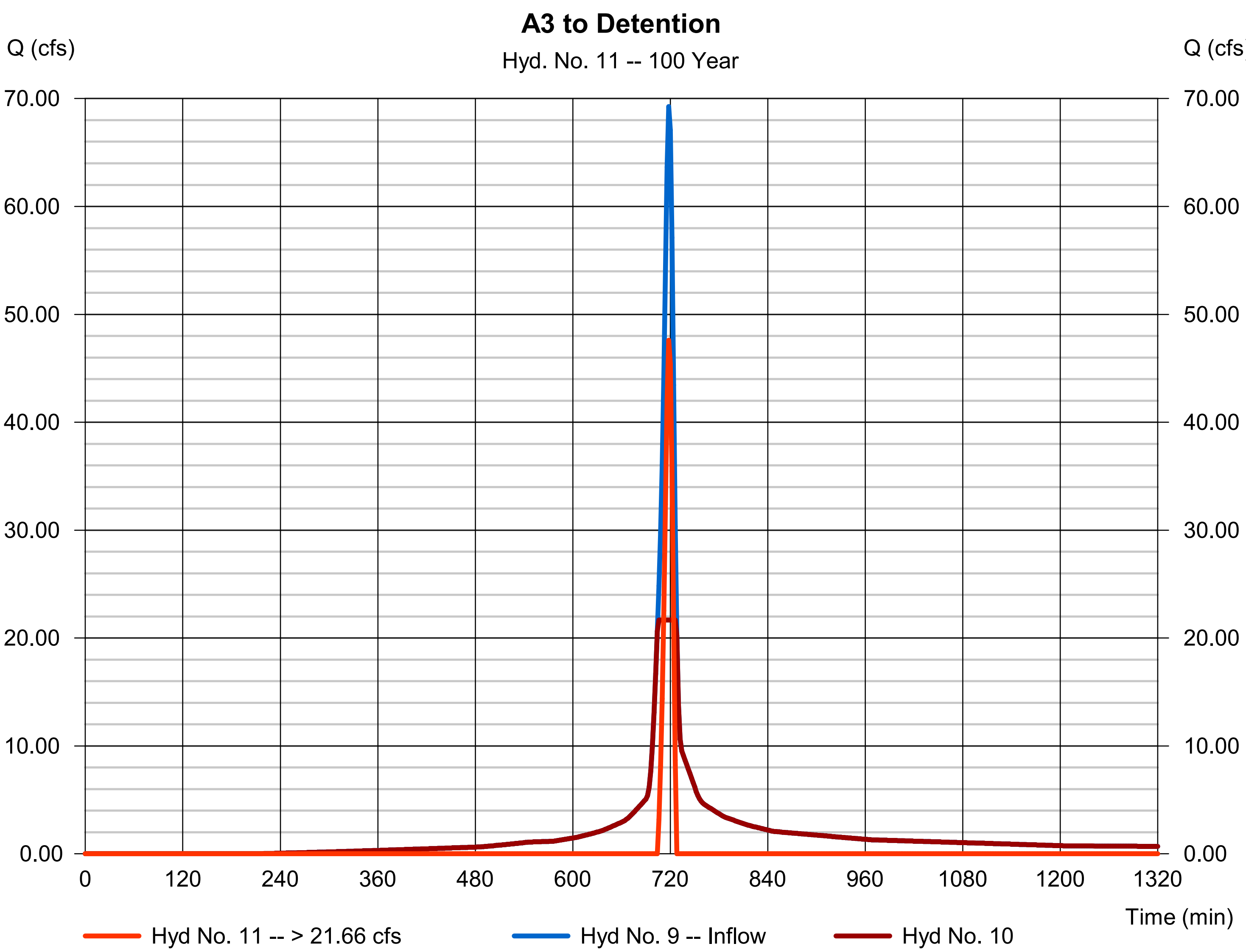
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 11

A3 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 47.60 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 33,786 cuft
Inflow hydrograph	= 9 - Pr WS A3	2nd diverted hyd.	= 10
Diversion method	= Constant Q	Constant Q	= 21.66 cfs



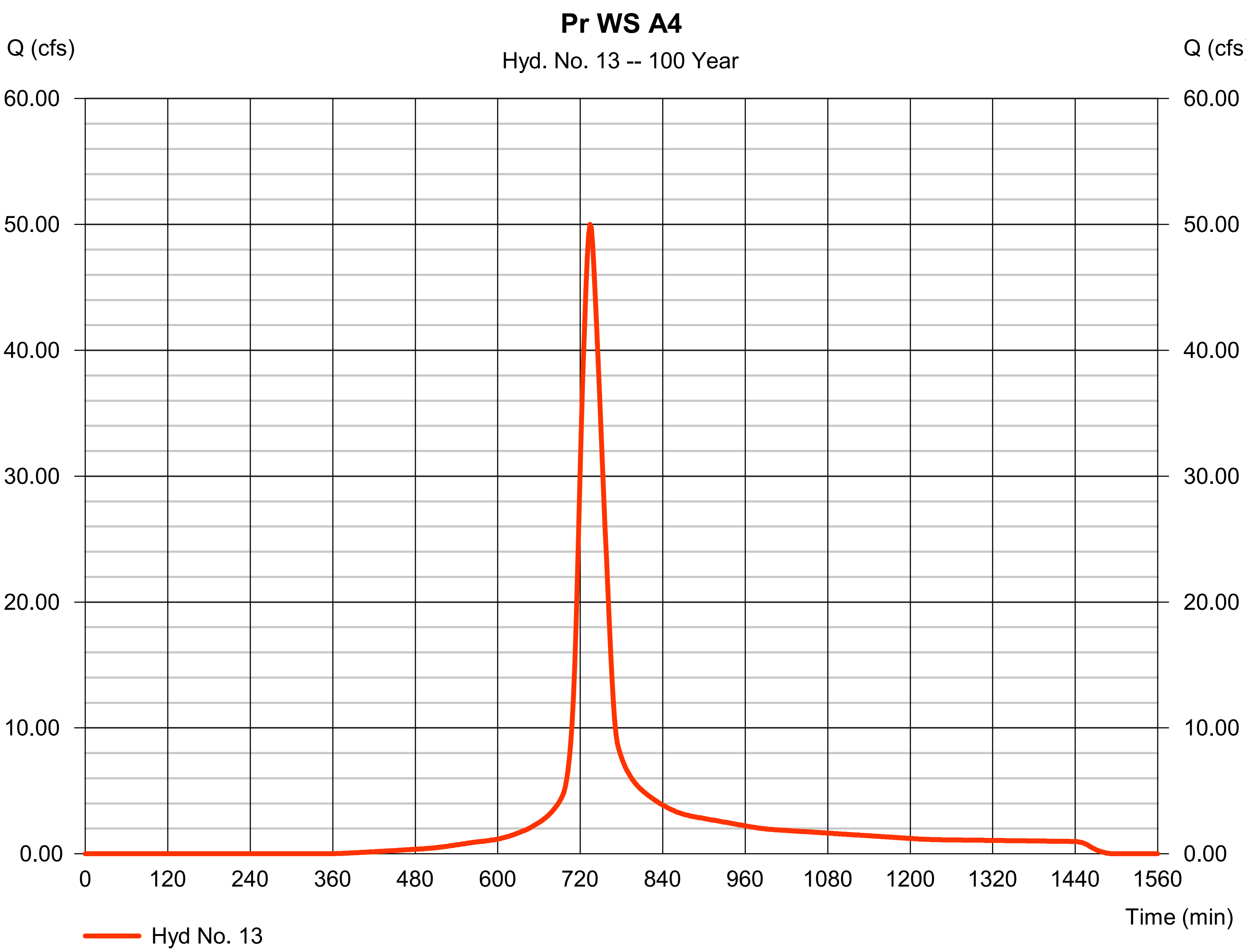
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 13

Pr WS A4

Hydrograph type	= SCS Runoff	Peak discharge	= 50.01 cfs
Storm frequency	= 100 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 227,083 cuft
Drainage area	= 16.960 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 36.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



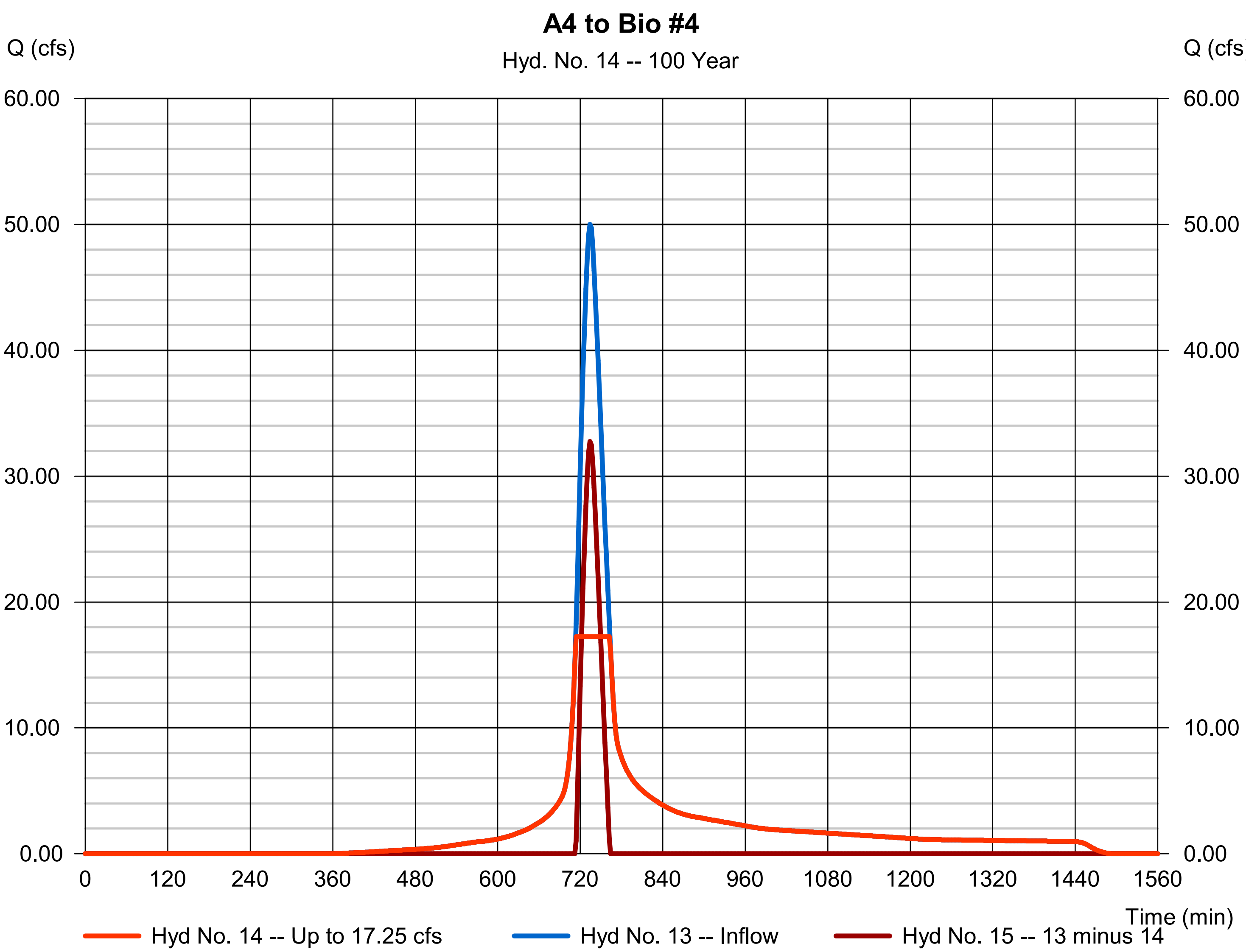
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 | Tuesday, 10 / 1 / 2019

Hyd. No. 14

A4 to Bio #4

Hydrograph type	= Diversion1	Peak discharge	= 17.25 cfs
Storm frequency	= 100 yrs	Time to peak	= 714 min
Time interval	= 2 min	Hyd. volume	= 171,726 cuft
Inflow hydrograph	= 13 - Pr WS A4	2nd diverted hyd.	= 15
Diversion method	= Constant Q	Constant Q	= 17.25 cfs



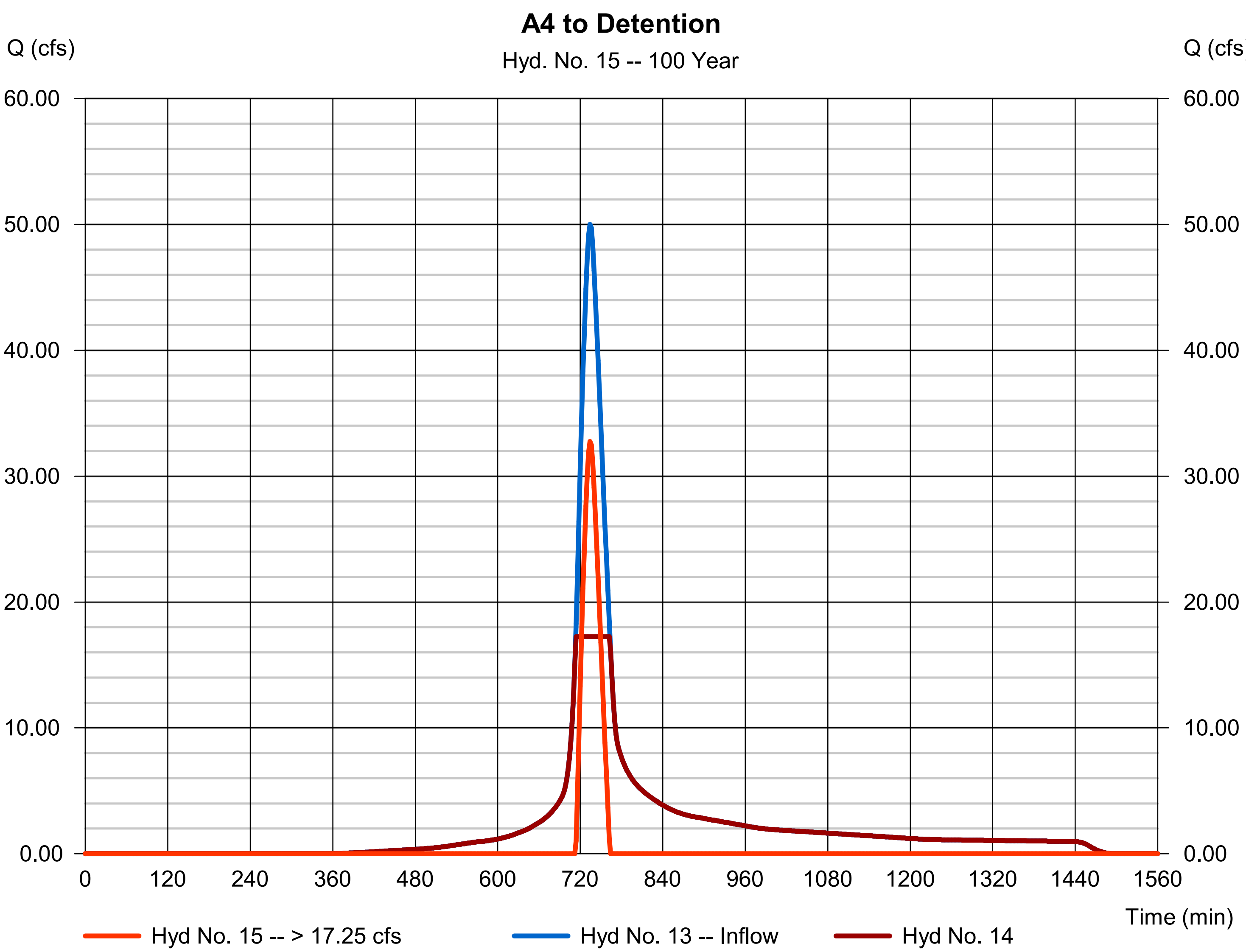
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 15

A4 to Detention

Hydrograph type	= Diversion2	Peak discharge	= 32.76 cfs
Storm frequency	= 100 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 55,357 cuft
Inflow hydrograph	= 13 - Pr WS A4	2nd diverted hyd.	= 14
Diversion method	= Constant Q	Constant Q	= 17.25 cfs



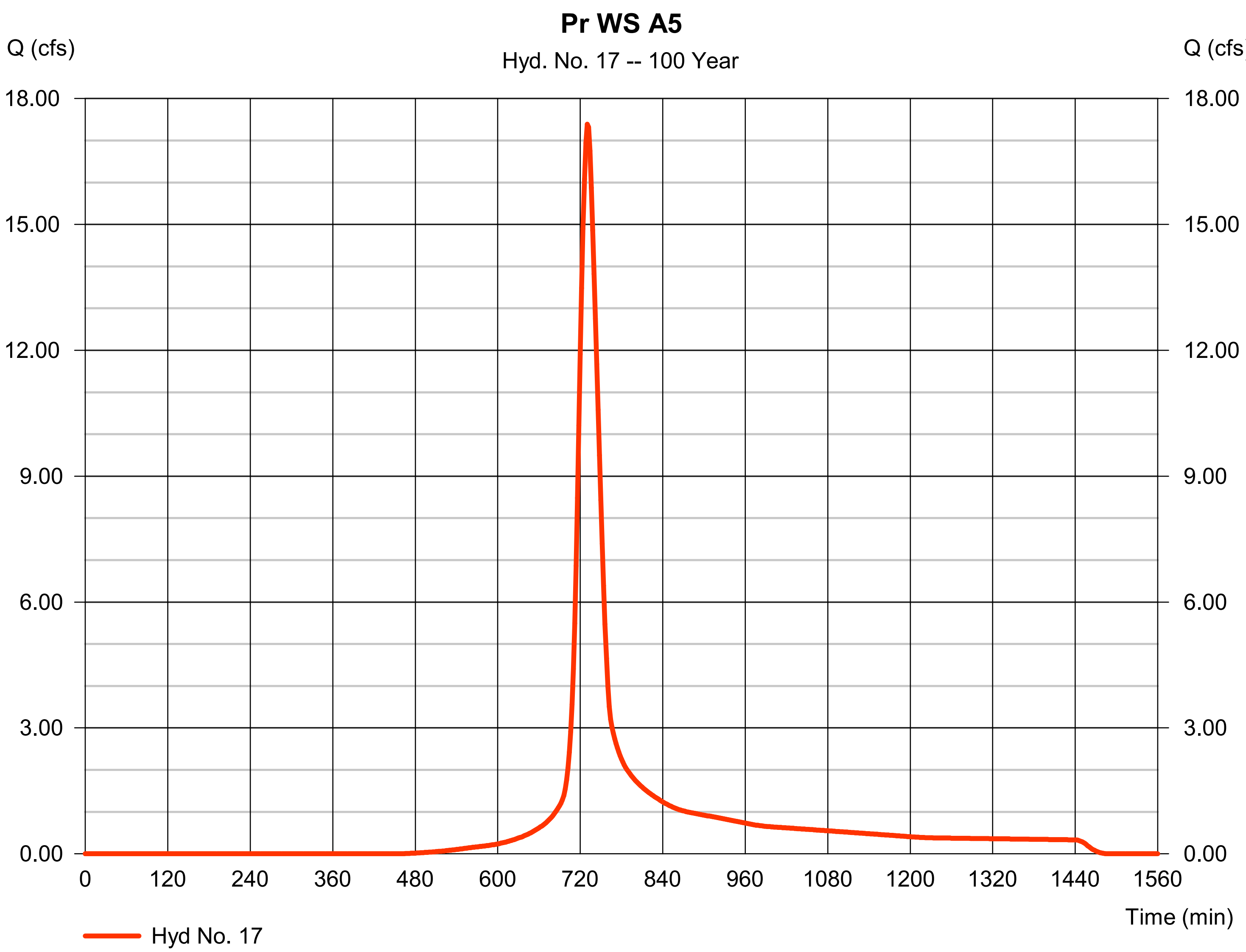
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 17

Pr WS A5

Hydrograph type	= SCS Runoff	Peak discharge	= 17.39 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 69,549 cuft
Drainage area	= 6.100 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 30.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

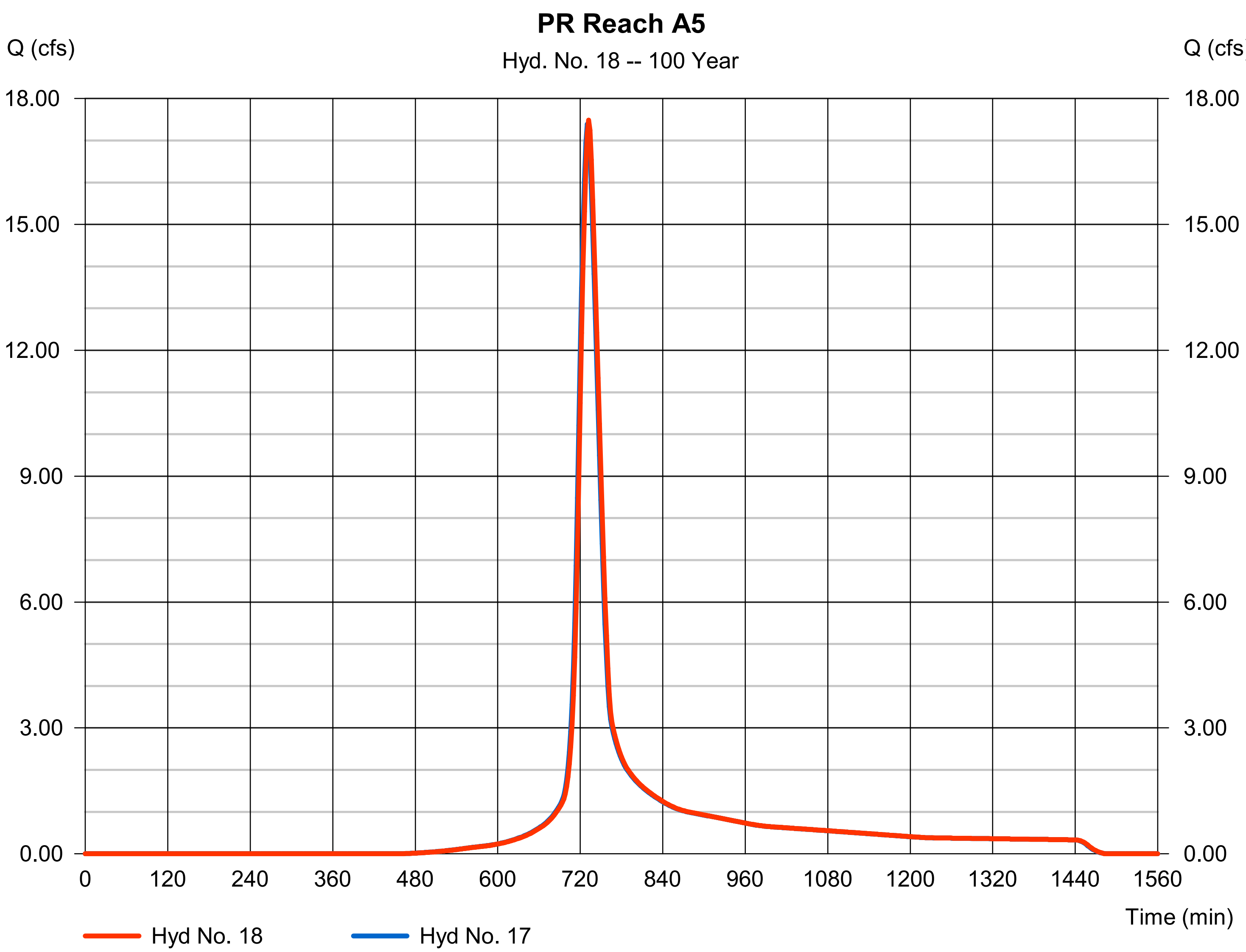
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 18

PR Reach A5

Hydrograph type	= Reach	Peak discharge	= 17.48 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 69,548 cuft
Inflow hyd. No.	= 17 - Pr WS A5	Section type	= Trapezoidal
Reach length	= 101.0 ft	Channel slope	= 1.6 %
Manning's n	= 0.025	Bottom width	= 12.0 ft
Side slope	= 2.0:1	Max. depth	= 1.0 ft
Rating curve x	= 1.437	Rating curve m	= 1.425
Ave. velocity	= 3.02 ft/s	Routing coeff.	= 1.4378

Modified Att-Kin routing method used.



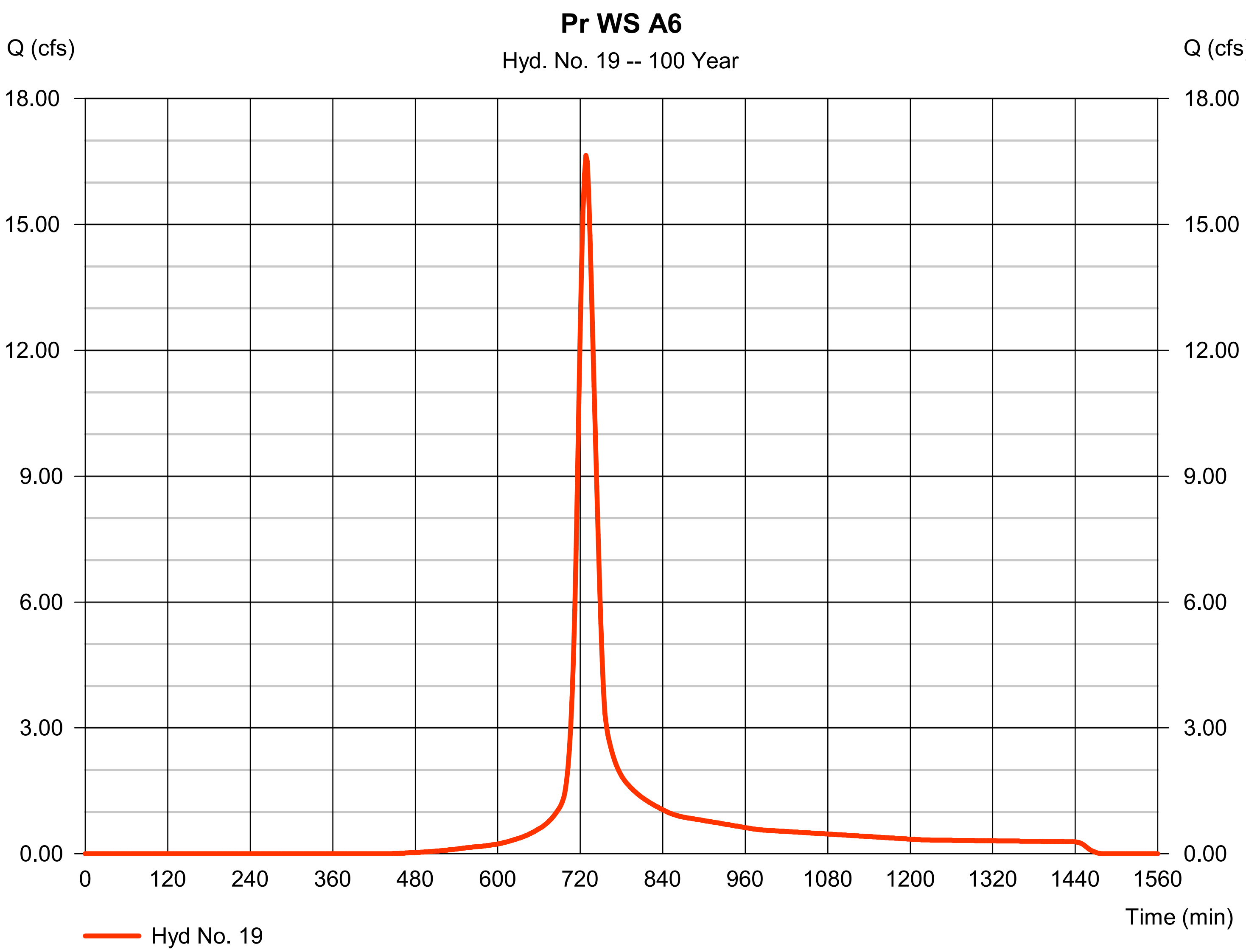
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 19

Pr WS A6

Hydrograph type	= SCS Runoff	Peak discharge	= 16.64 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 61,066 cuft
Drainage area	= 5.280 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 24.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



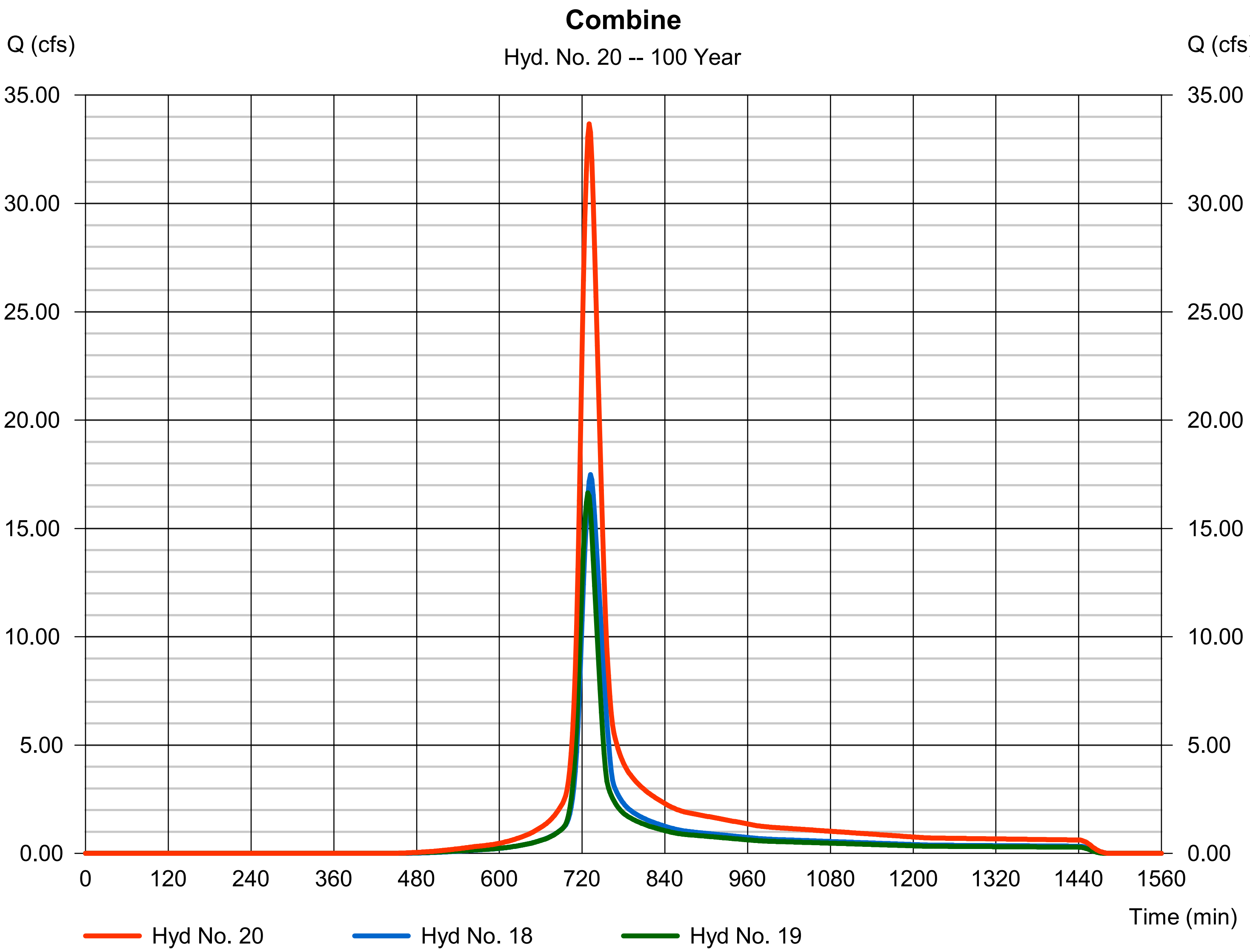
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 20

Combine

Hydrograph type	= Combine	Peak discharge	= 33.67 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 130,614 cuft
Inflow hyds.	= 18, 19	Contrib. drain. area	= 5.280 ac



Hydrograph Report

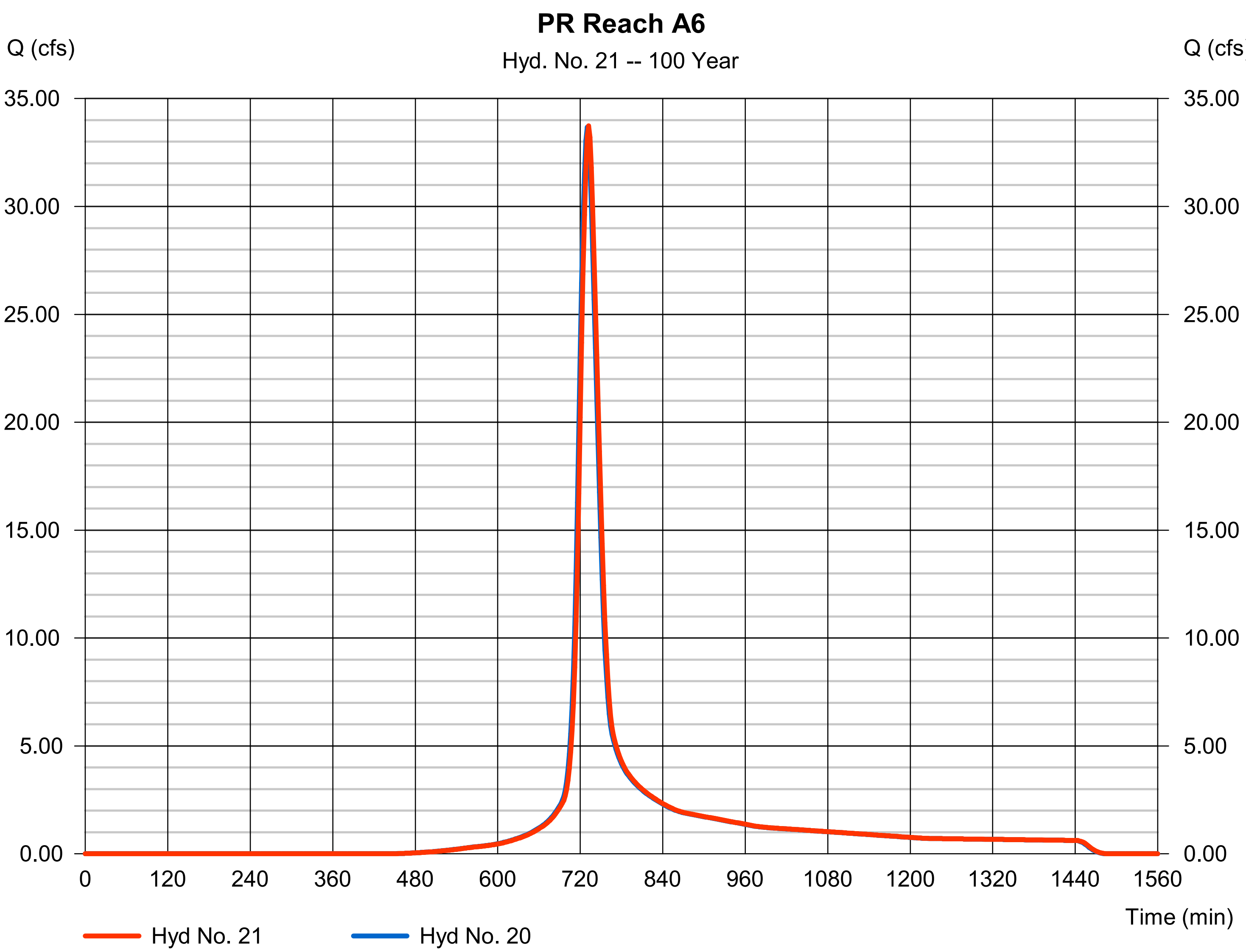
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 21

PR Reach A6

Hydrograph type	= Reach	Peak discharge	= 33.73 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 130,614 cuft
Inflow hyd. No.	= 20 - Combine	Section type	= Trapezoidal
Reach length	= 413.0 ft	Channel slope	= 3.8 %
Manning's n	= 0.025	Bottom width	= 6.0 ft
Side slope	= 2.0:1	Max. depth	= 5.0 ft
Rating curve x	= 3.540	Rating curve m	= 1.395
Ave. velocity	= 6.70 ft/s	Routing coeff.	= 1.1518

Modified Att-Kin routing method used.



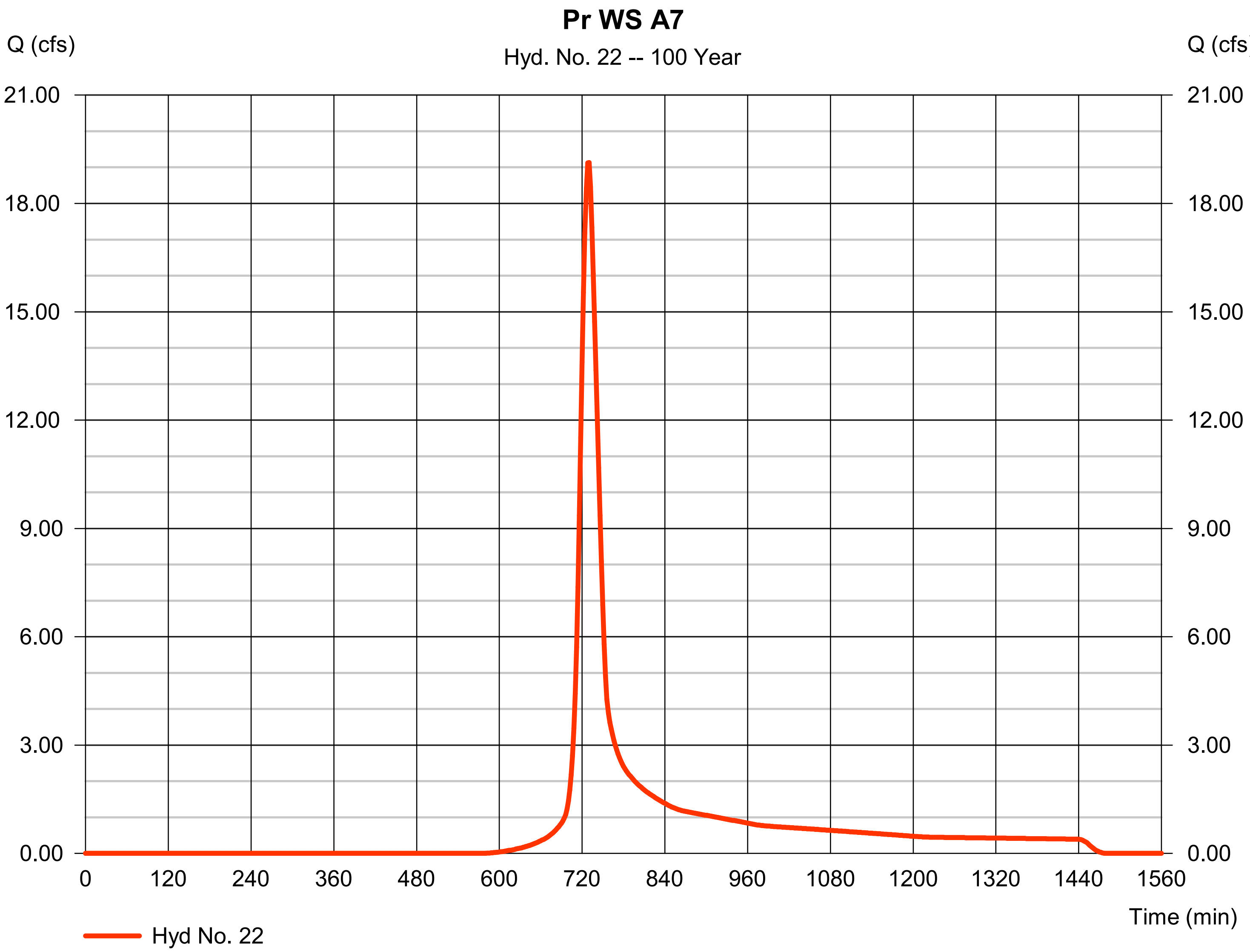
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 22

Pr WS A7

Hydrograph type	= SCS Runoff	Peak discharge	= 19.13 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 71,613 cuft
Drainage area	= 8.310 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 26.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

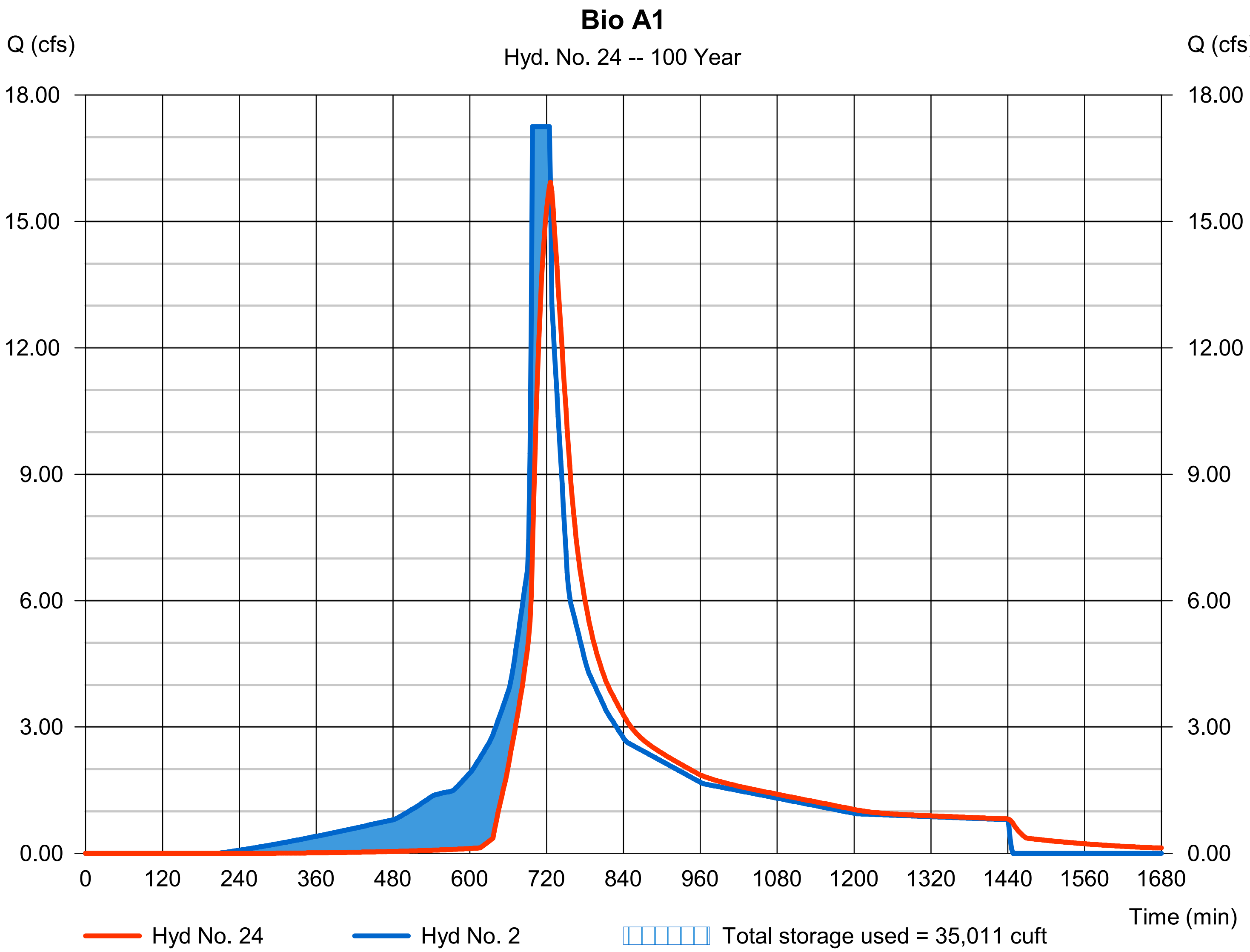
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 24

Bio A1

Hydrograph type	= Reservoir	Peak discharge	= 15.94 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 151,311 cuft
Inflow hyd. No.	= 2 - A1 to Bio #1	Max. Elevation	= 406.19 ft
Reservoir name	= Bio A1 (south)	Max. Storage	= 35,011 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

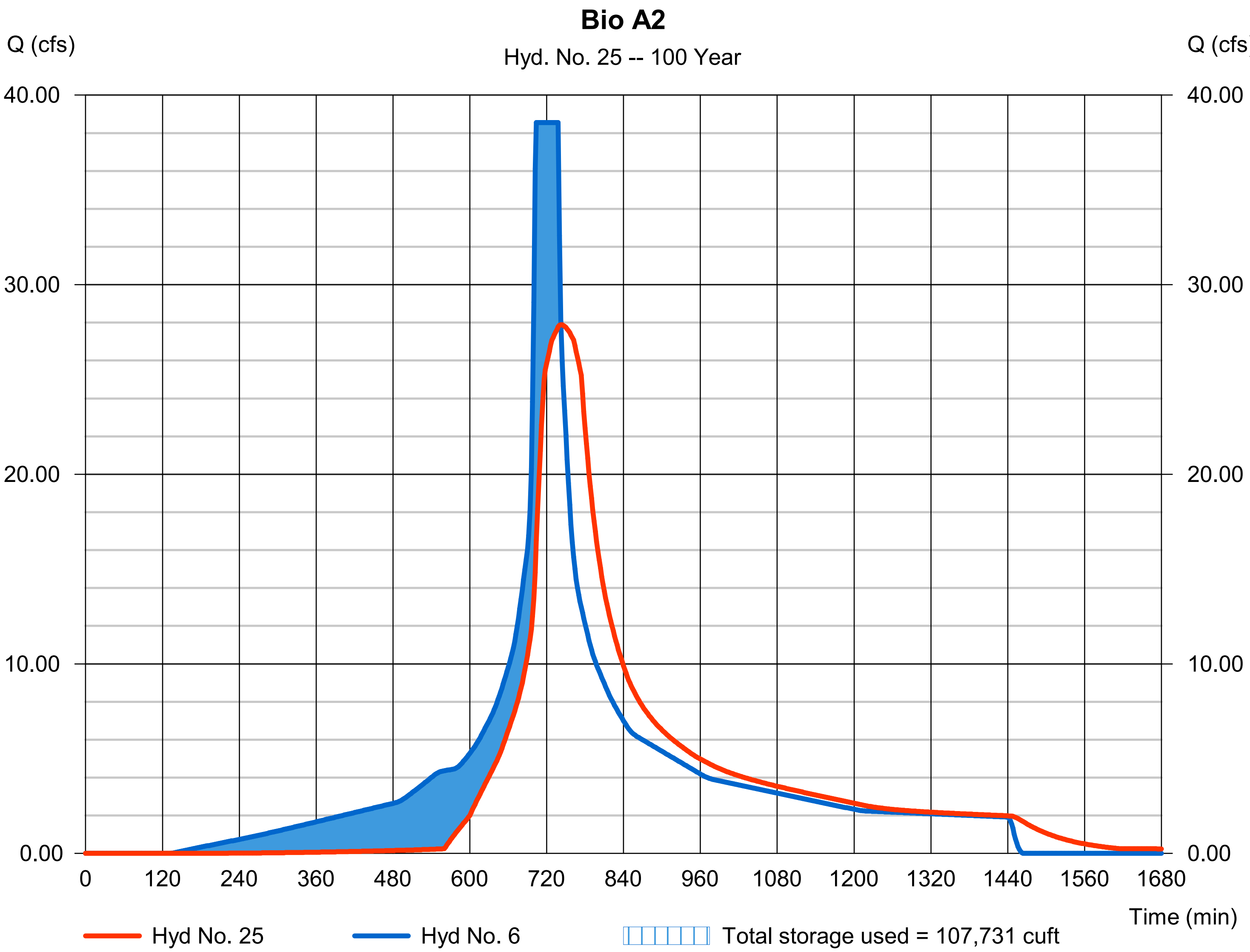
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 25

Bio A2

Hydrograph type	= Reservoir	Peak discharge	= 27.90 cfs
Storm frequency	= 100 yrs	Time to peak	= 742 min
Time interval	= 2 min	Hyd. volume	= 389,275 cuft
Inflow hyd. No.	= 6 - A2 to Bio #2	Max. Elevation	= 402.29 ft
Reservoir name	= Bio A2 (west)	Max. Storage	= 107,731 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

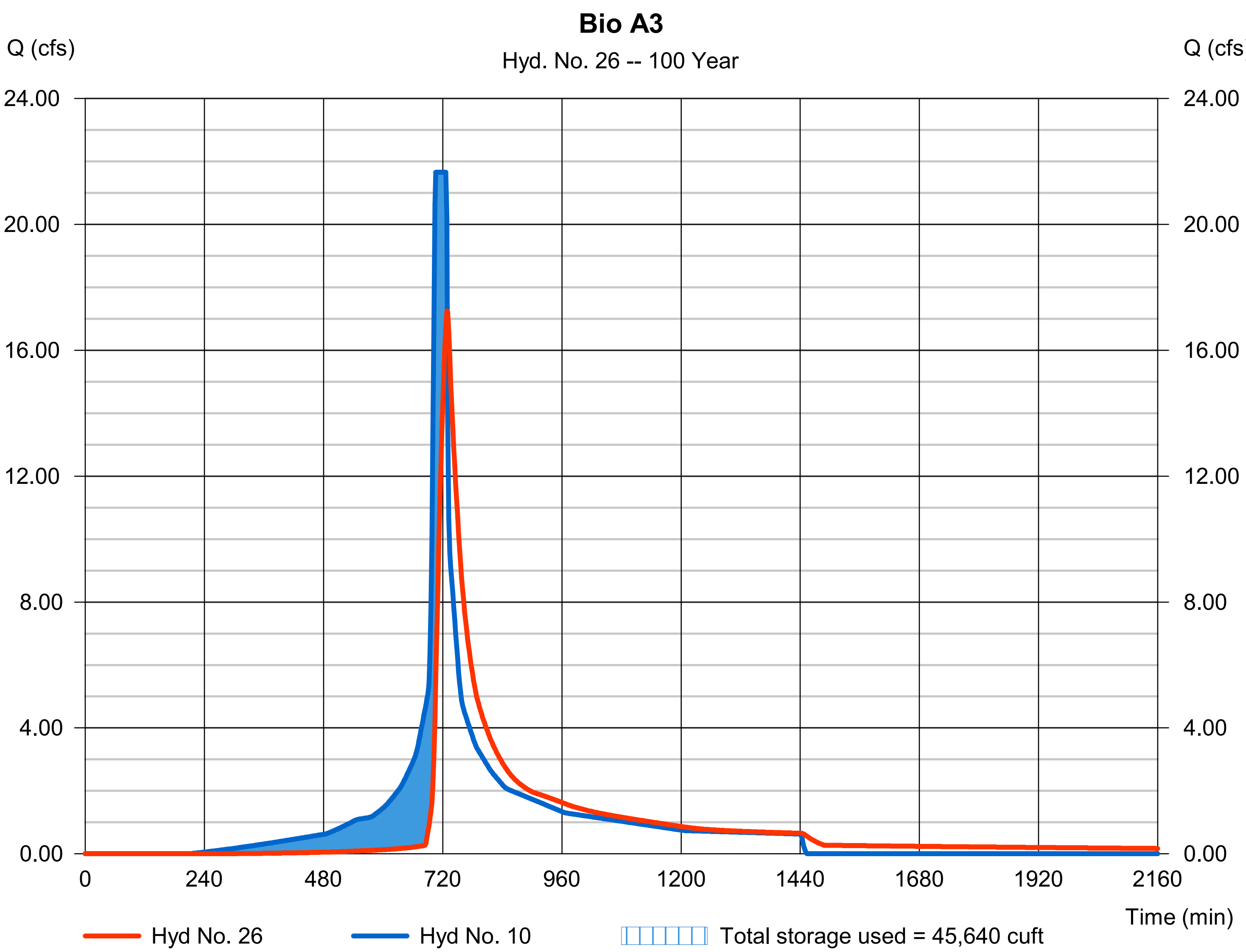
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 26

Bio A3

Hydrograph type	= Reservoir	Peak discharge	= 17.25 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 133,056 cuft
Inflow hyd. No.	= 10 - A3 to Bio #3	Max. Elevation	= 409.47 ft
Reservoir name	= Bio A3 (east)	Max. Storage	= 45,640 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

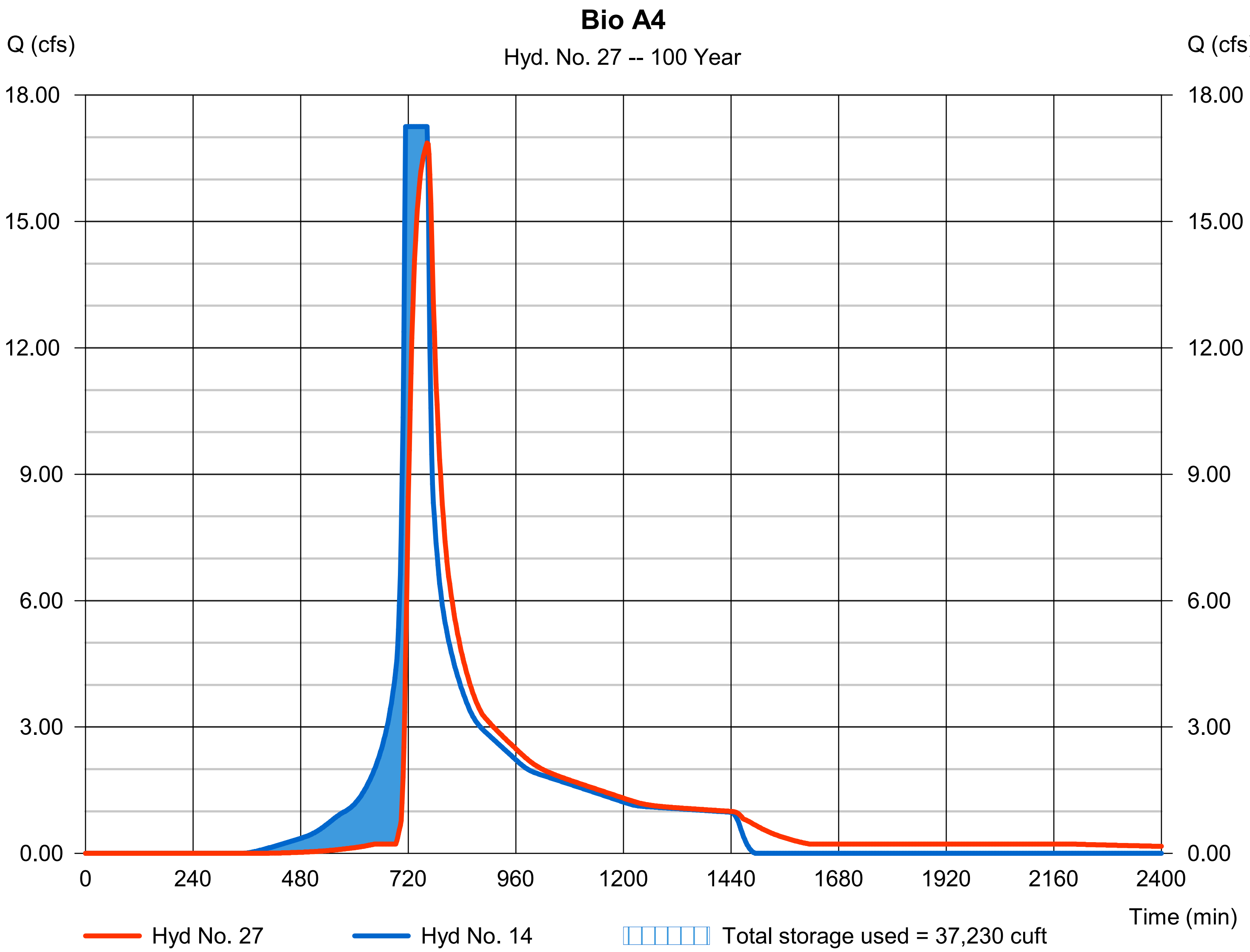
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 27

Bio A4

Hydrograph type	= Reservoir	Peak discharge	= 16.86 cfs
Storm frequency	= 100 yrs	Time to peak	= 762 min
Time interval	= 2 min	Hyd. volume	= 171,662 cuft
Inflow hyd. No.	= 14 - A4 to Bio #4	Max. Elevation	= 403.71 ft
Reservoir name	= Bio A4 (north)	Max. Storage	= 37,230 cuft

Storage Indication method used. Outflow includes exfiltration.



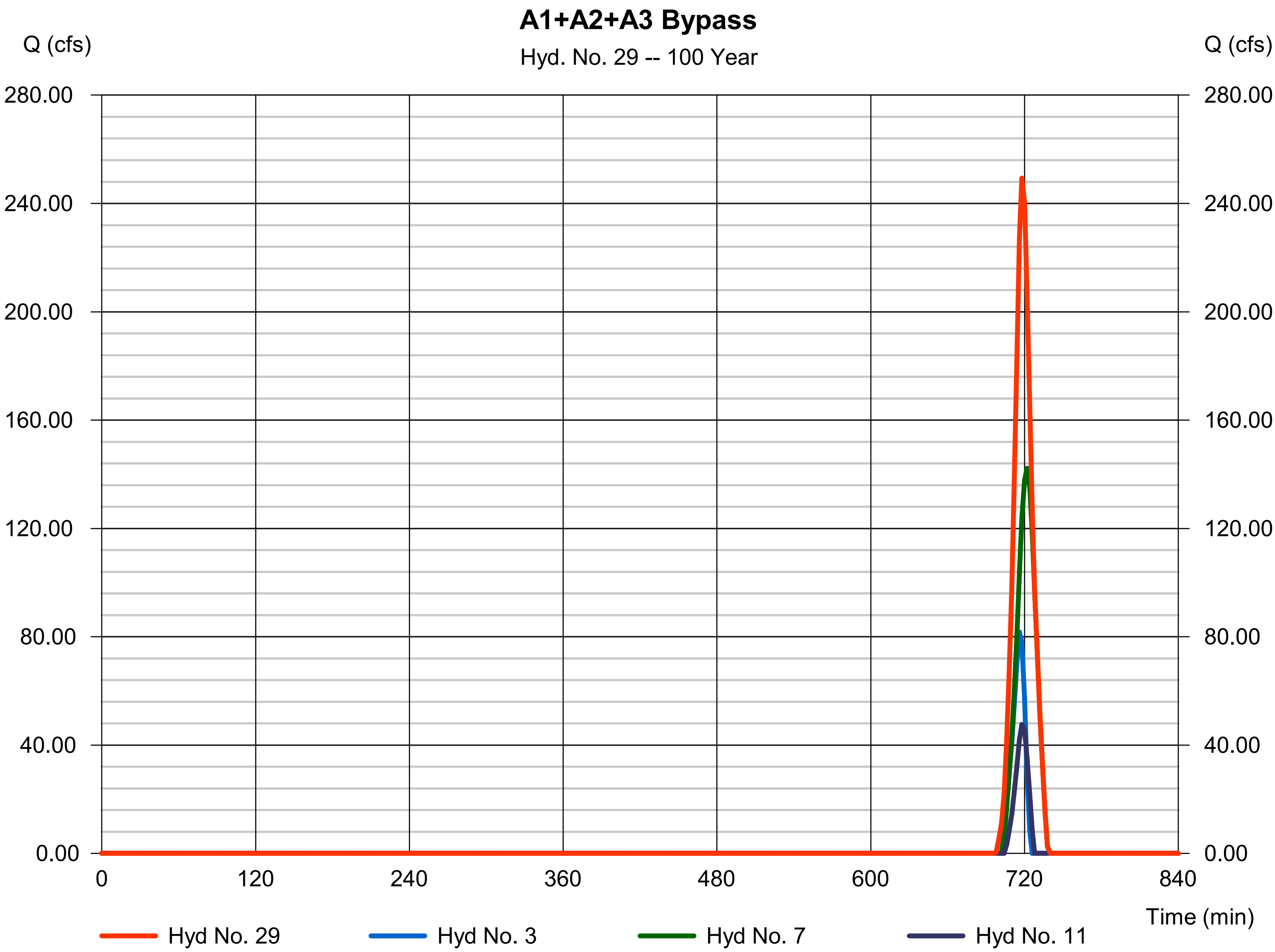
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 29

A1+A2+A3 Bypass

Hydrograph type	= Combine	Peak discharge	= 249.39 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 246,309 cuft
Inflow hyds.	= 3, 7, 11	Contrib. drain. area	= 0.000 ac



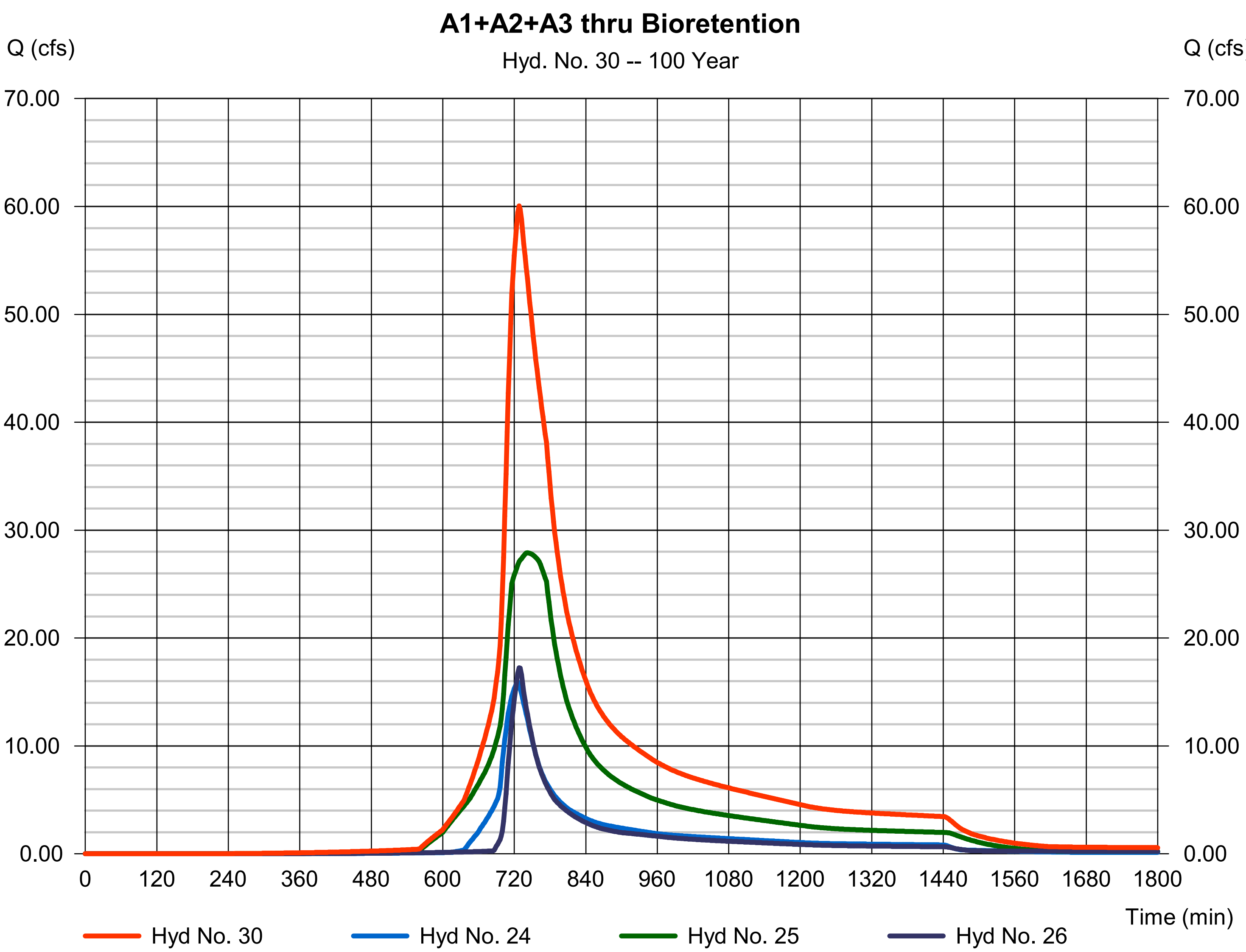
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 30

A1+A2+A3 thru Bioretention

Hydrograph type	= Combine	Peak discharge	= 60.05 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 673,641 cuft
Inflow hyds.	= 24, 25, 26	Contrib. drain. area	= 0.000 ac



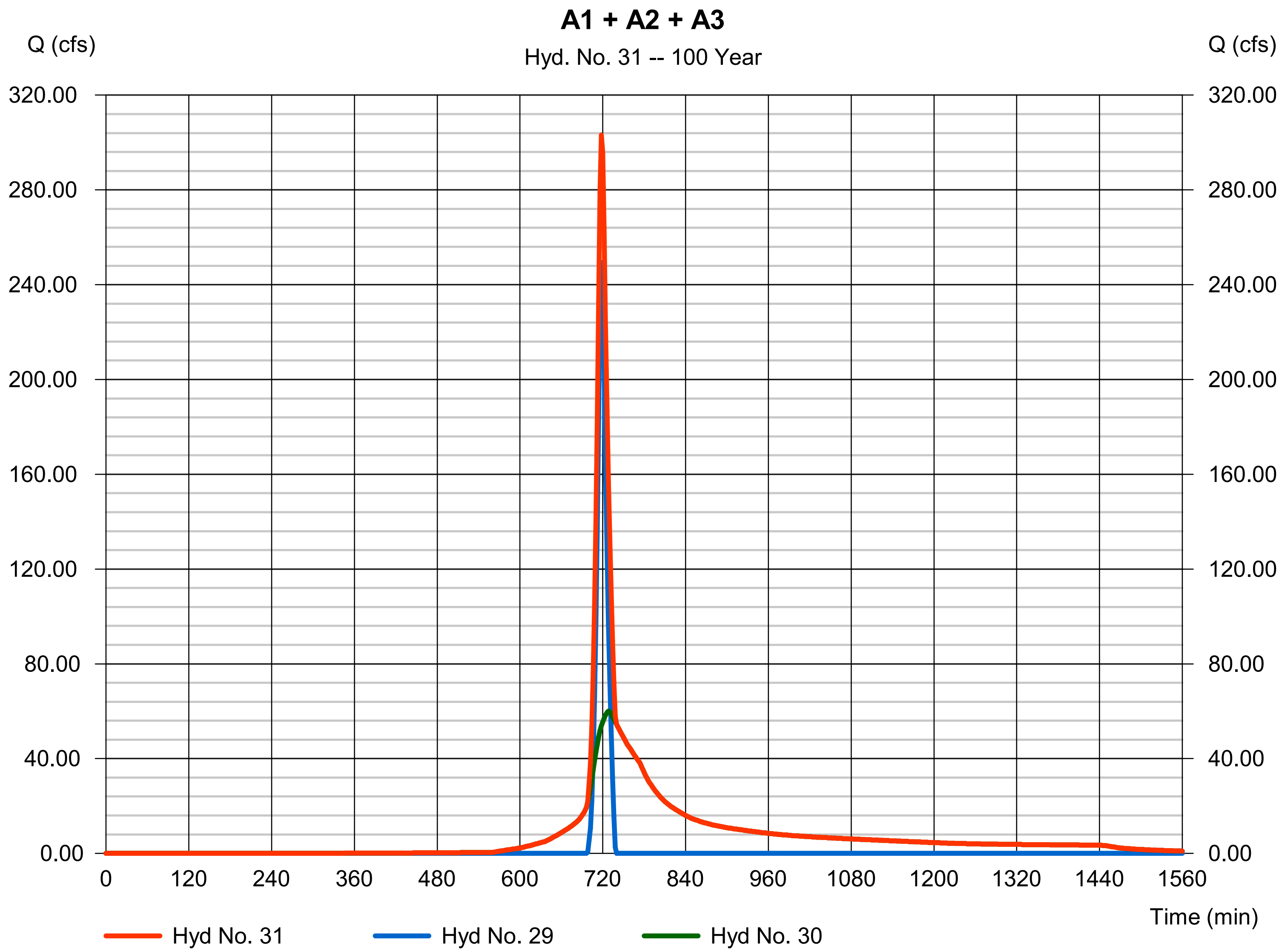
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 | Tuesday, 10 / 1 / 2019

Hyd. No. 31

A1 + A2 + A3

Hydrograph type	= Combine	Peak discharge	= 303.21 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 919,952 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.000 ac



Hydrograph Report

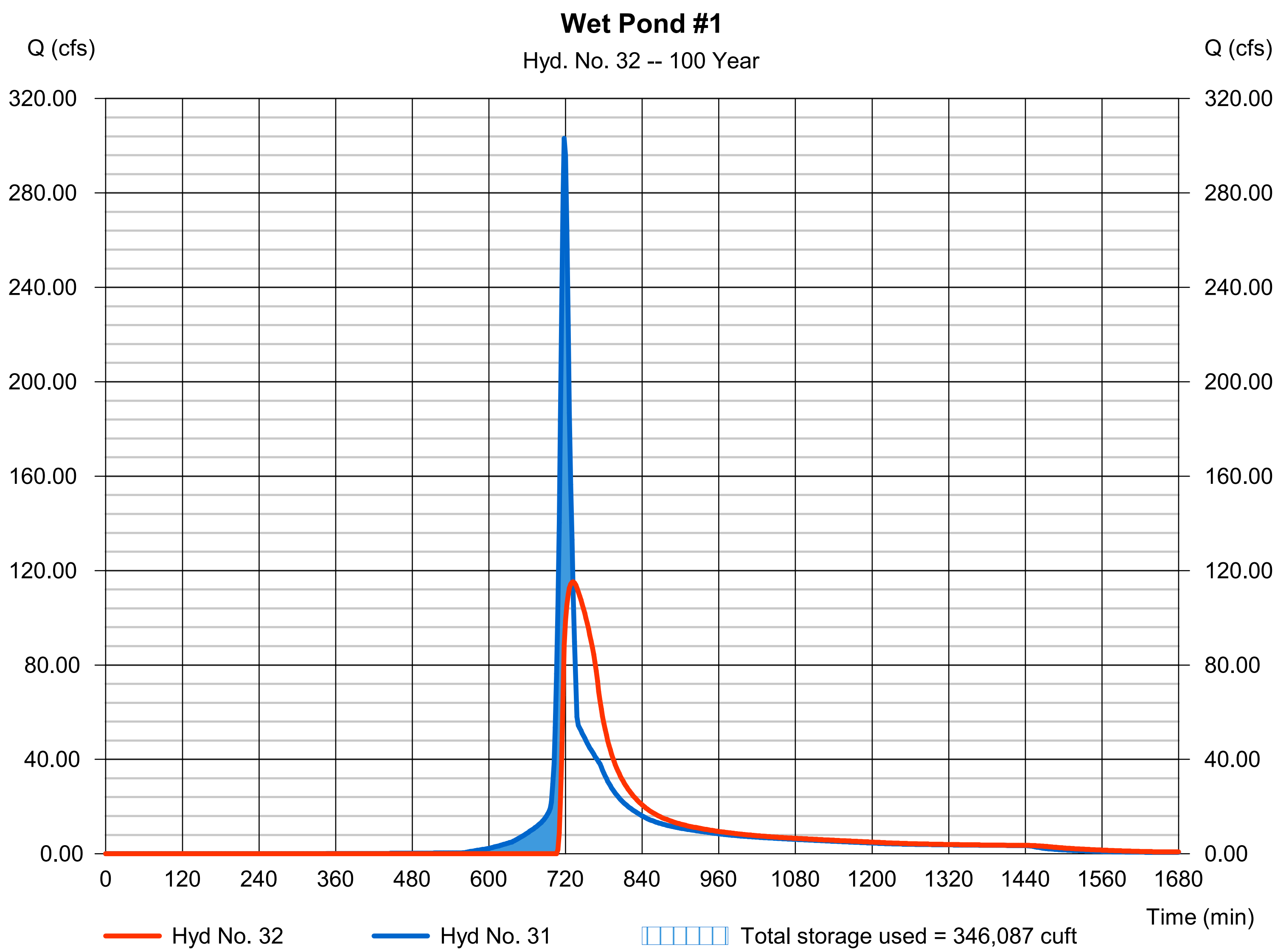
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 32

Wet Pond #1

Hydrograph type	= Reservoir	Peak discharge	= 115.23 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 841,211 cuft
Inflow hyd. No.	= 31 - A1 + A2 + A3	Max. Elevation	= 406.00 ft
Reservoir name	= Wet Pond #1	Max. Storage	= 346,087 cuft

Storage Indication method used. Wet pond routing start elevation = 400.00 ft.



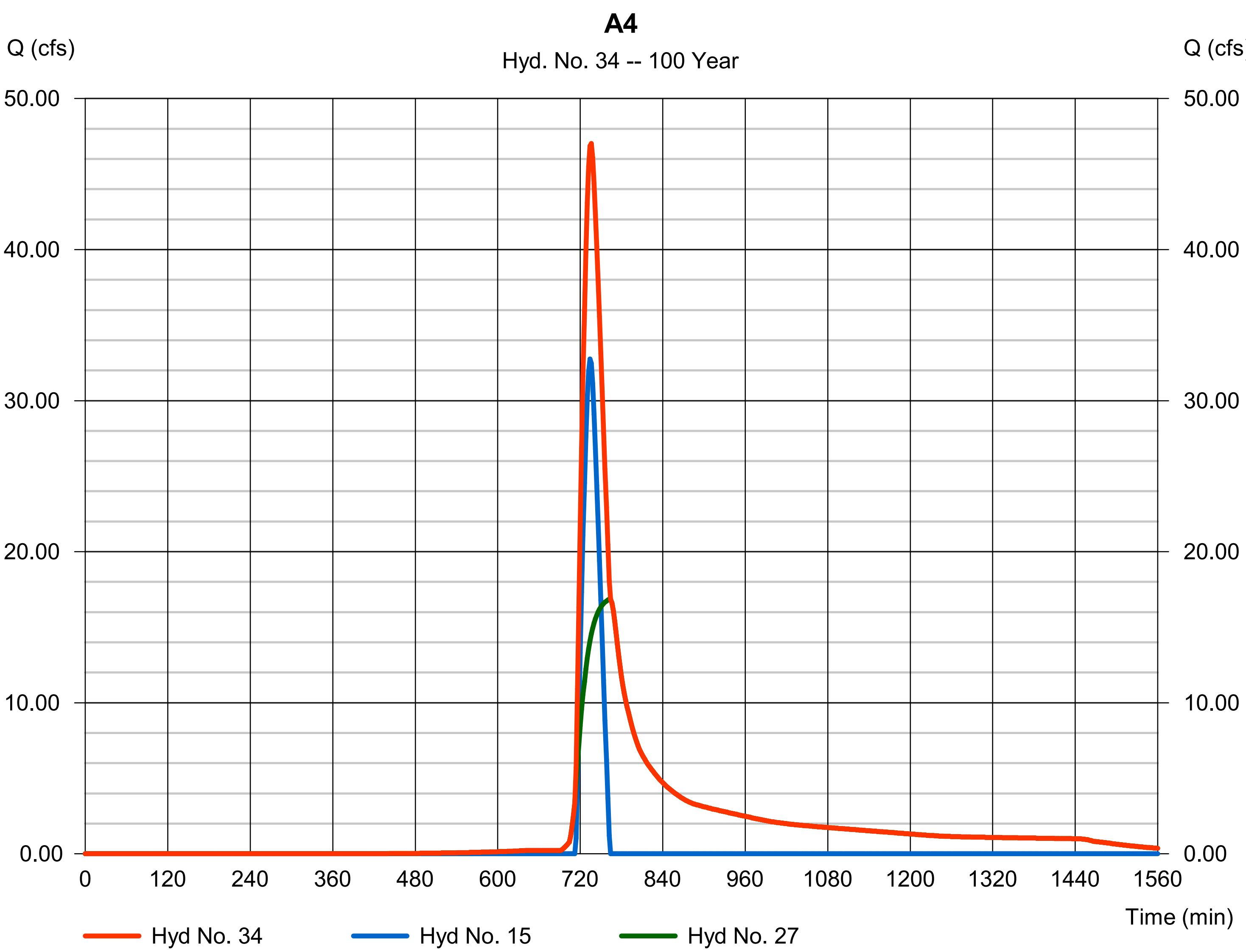
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 34

A4

Hydrograph type	= Combine	Peak discharge	= 47.03 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 227,019 cuft
Inflow hyds.	= 15, 27	Contrib. drain. area	= 0.000 ac



Hydrograph Report

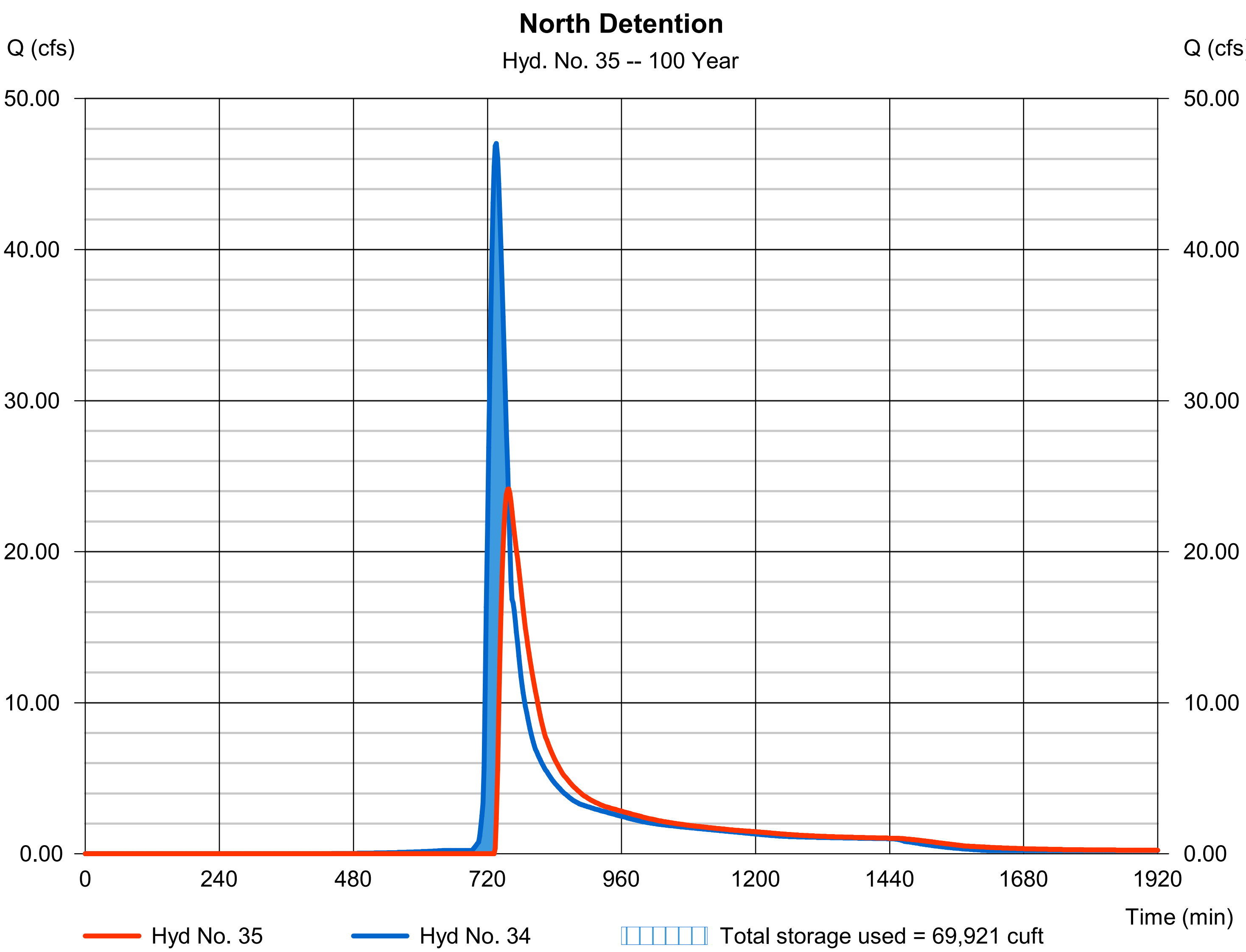
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 35

North Detention

Hydrograph type	= Reservoir	Peak discharge	= 24.15 cfs
Storm frequency	= 100 yrs	Time to peak	= 758 min
Time interval	= 2 min	Hyd. volume	= 191,167 cuft
Inflow hyd. No.	= 34 - A4	Max. Elevation	= 404.75 ft
Reservoir name	= Dry Detention #1	Max. Storage	= 69,921 cuft

Storage Indication method used.



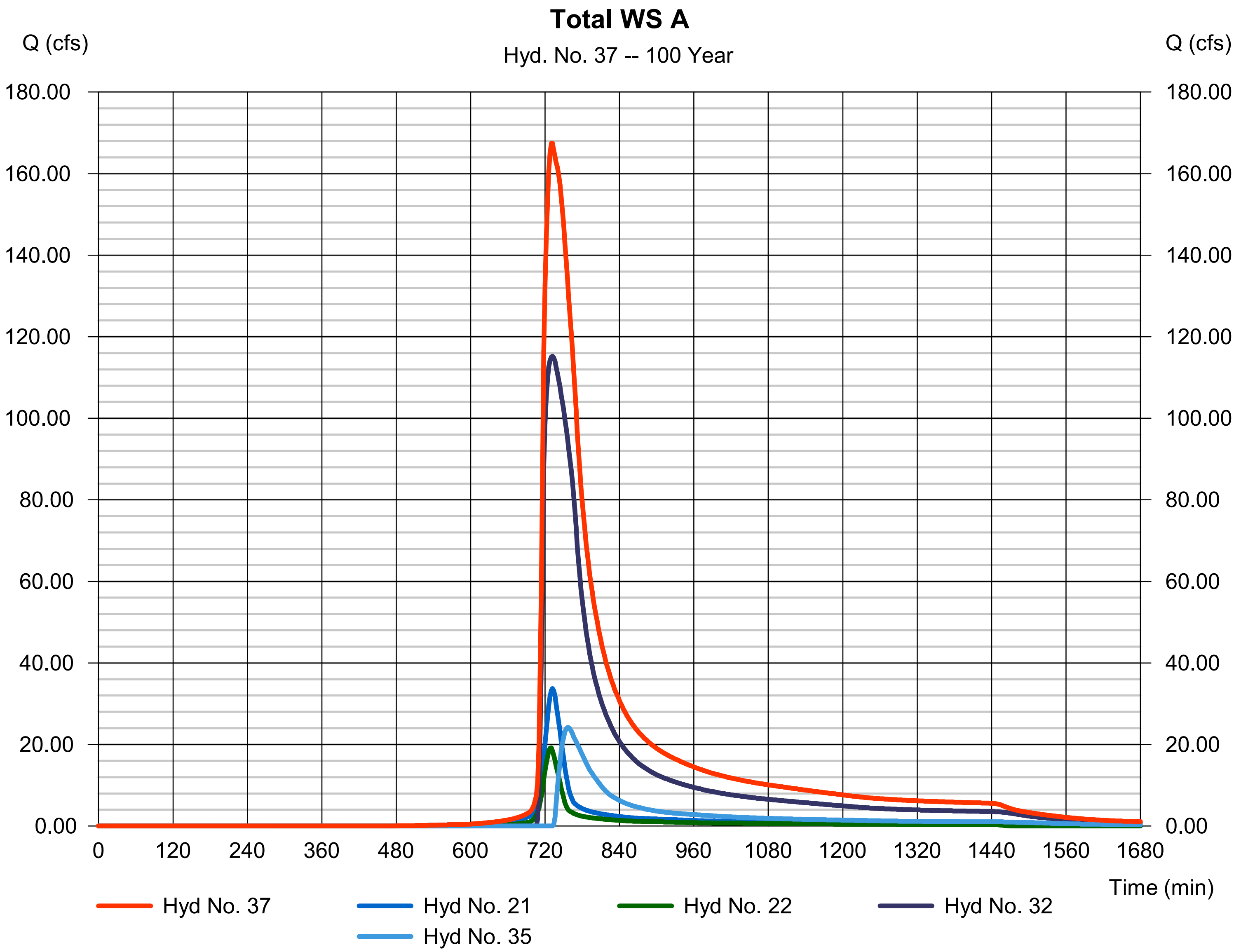
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 37

Total WS A

Hydrograph type	= Combine	Peak discharge	= 167.43 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 1,234,606 cuft
Inflow hyds.	= 21, 22, 32, 35	Contrib. drain. area	= 8.310 ac



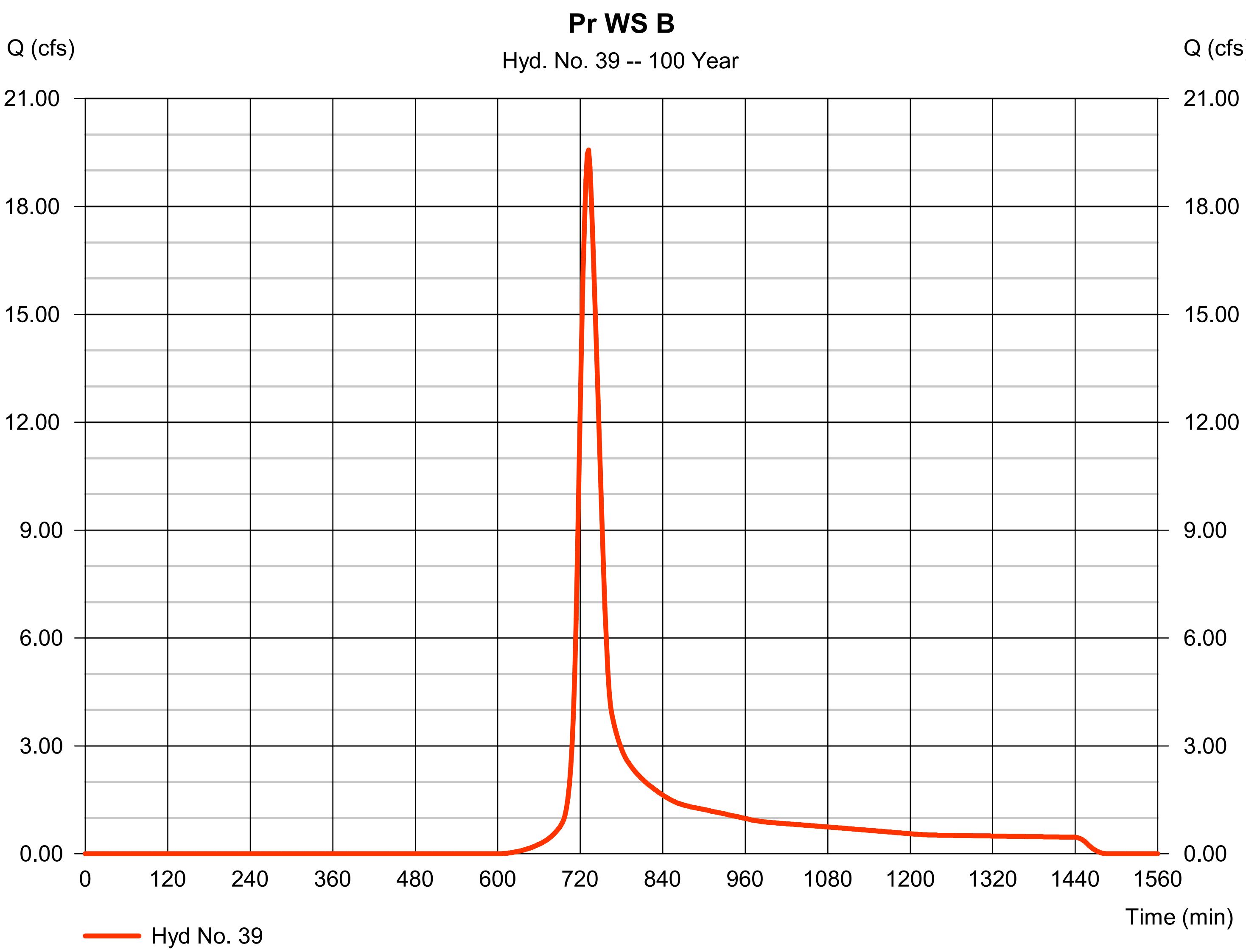
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 39

Pr WS B

Hydrograph type	= SCS Runoff	Peak discharge	= 19.57 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 80,489 cuft
Drainage area	= 9.900 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 27.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



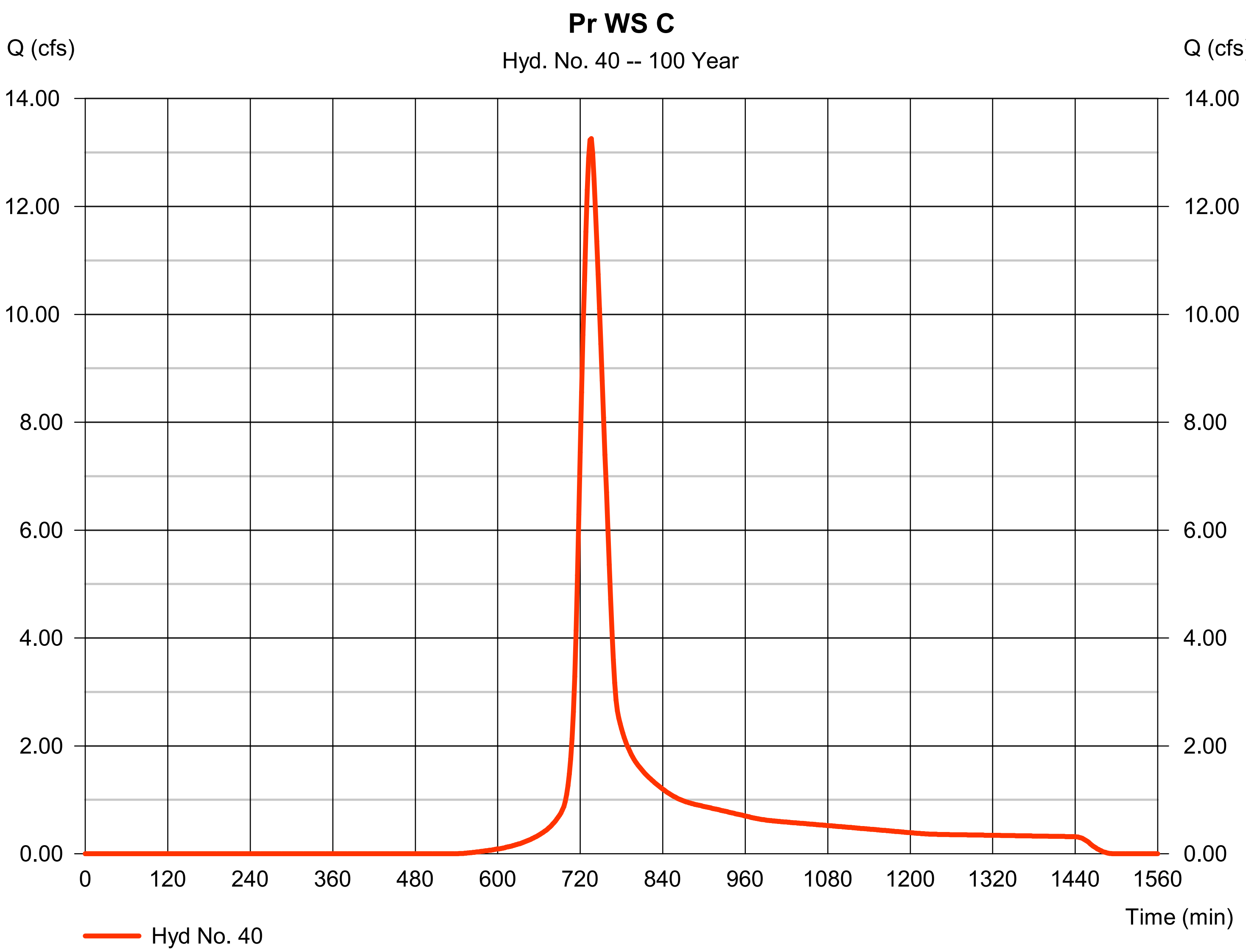
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 10 / 1 / 2019

Hyd. No. 40

Pr WS C

Hydrograph type	= SCS Runoff	Peak discharge	= 13.26 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 60,727 cuft
Drainage area	= 6.320 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 34.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



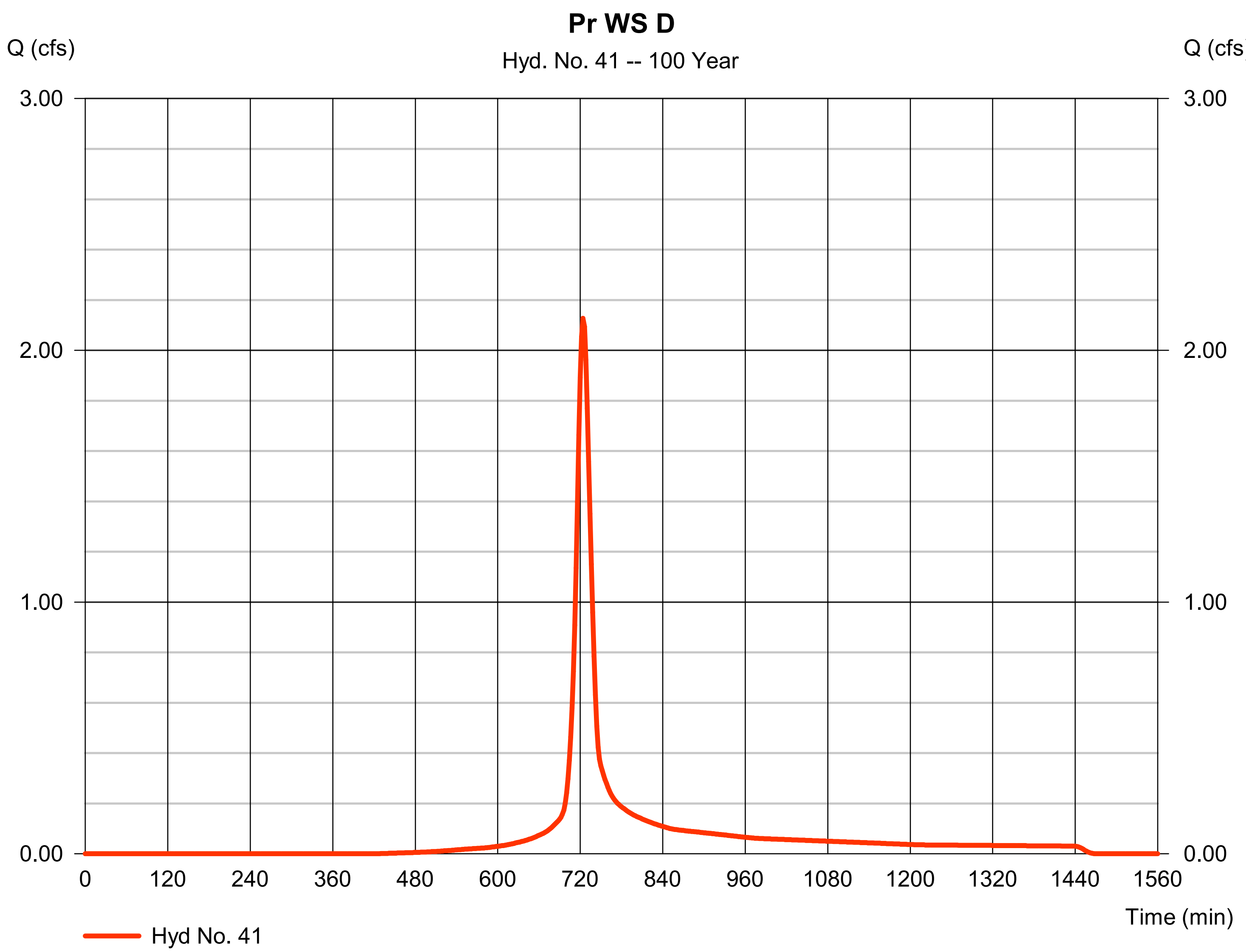
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 10 / 1 / 2019

Hyd. No. 41

Pr WS D

Hydrograph type	= SCS Runoff	Peak discharge	= 2.127 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 6,655 cuft
Drainage area	= 0.550 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 20.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Appendix I

Post-Construction Inspection and Maintenance

Post Construction Inspection and Maintenance Site Checklist

	Yes	No	NA
1. Steep Slopes (any slope 3:1 or steeper) **(Frequency: Annual)**			
a. Vegetation and ground cover adequate.	☐	☐	☐
i. Minimum 80% ground cover. *<u>Maintenance</u>: Topsoil, rake and seed bare areas. Remove any dead or dying plants and decaying plant material. Replace dead and dying plants.*	☐	☐	☐
ii. Excessively tall grass (greater than 6" in height) *<u>Maintenance</u>: Mow slopes 3:1 or flatter to have a grass height of 4" to 6". Increase mowing frequency as necessary. Steep slopes planted with meadow mix as shown on the approved plans do not have to be mowed.*	☐	☐	☐
iii. Unauthorized plants. *<u>Maintenance</u>: Remove any unauthorized plants, including roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
b. Slope erosion.	☐	☐	☐
i. Small bare areas (min. 50 square feet). *<u>Maintenance</u>: Topsoil, rake and seed bare areas.*	☐	☐	☐
ii. Ruts less than 12" wide. *<u>Maintenance</u>: Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Backfill ruts and compact soil. Topsoil, rake and seed bare areas. Alternatively, hydroseeding can be used to seed the slope.*	☐	☐	☐
iii. Ruts greater than 12" wide. *<u>Maintenance</u>: Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Re-grade, backfill ruts and compact soil. Install erosion control mats on slopes 3:1 or steeper to protect the re-graded slope. Topsoil, rake and seed bare areas. Inspect on a weekly basis until 80% ground cover is achieved. Alternatively, hydroseeding can be used to seed the slope.*	☐	☐	☐
c. Uneven settling *<u>Maintenance</u>: Visually inspect for uneven settling. Classify the settling based upon the categories below.*	☐	☐	☐
i. Greater than 0" but less than 2" of settling. *<u>Maintenance</u>: No immediate action required. Re-inspect in 6 months.*	☐	☐	☐
ii. Greater than 2" but less than 4" of settling. *<u>Maintenance</u>: Immediately repair. Re-grade and compact the soil. Topsoil, rake and seed the area. Re-inspect in 6 months.*	☐	☐	☐

	Yes	No	NA
iii. Greater than 4" of settling. *Maintenance: Immediately stabilize the area and consult a NYS Licensed Professional Engineer within 2 weeks before making any additional repairs.*	☐	☐	☐

2. Swales (Frequency: Annual)	**Yes**	**No**	**NA**
a. Inflow Points	☐	☐	☐
i. Vegetation and ground cover adequate. *<u>Maintenance</u>: Reseed bare areas. Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the disturbed area by their removal.*	☐	☐	☐
ii. Free from erosion/undercutting. *Maintenance: Immediately stabilize and repair any areas where erosion around has occurred. Rake and seed the area. Seed mixture shall meet the seed mixture requirements specified on the approved plans.*	☐	☐	☐
iii. Rip rap in good condition. *Maintenance: Replace stone, as necessary.*	☐	☐	☐
iv. No evidence of sediment buildup. *Maintenance: Remove and properly dispose of any accumulated sediment when the depth is 20% of swale design depth.*	☐	☐	☐
b. Check Dams	☐	☐	☐
i. No evidence of sediment buildup. *Maintenance: Remove accumulated sediment behind dams when sediment depth is one-third the dam height.*	☐	☐	☐
ii. Stone in good condition. *Maintenance: Replace stone, as necessary.*	☐	☐	☐
iii. No evidence of erosion *Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and reseed area.*	☐	☐	☐
c. Energy Dissipaters	☐	☐	☐
i. No evidence of sediment buildup. *Maintenance: Remove and properly dispose of any accumulated sediment when half of the void space is filled.*	☐	☐	☐
ii. Rip rap in good condition. *Maintenance: Replace stone, as necessary.*	☐	☐	☐
iii. No evidence of erosion. *Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and reseed.*	☐	☐	☐

Notes:

1. The site must be returned to the approved conditions when any repairs are made.
2. Unauthorized plants are any plants that are growing or have been installed that are not any of the plants shown on the approved plans.
3. All seed mixtures shall meet the seed mixture requirements specified on the approved plans.
4. Replace any dead or dying plants with plants specified in the planting schedule shown on the approved plans.

Comments:

Actions to be taken:

Post Construction Inspection and Maintenance Checklist
Bioretention Basin

	Yes	No	NA
1. Embankment			
(Frequency: Annual)			
a. Vegetation and ground cover adequate.	☐	☐	☐
i. Minimum 80% ground cover. *Maintenance: Topsoil, rake and seed bare areas. Replace dead and dying plants.*	☐	☐	☐
ii. Excessively tall grass (greater than 6" in height) *Maintenance: Mow grass to have a height of 4" to 6". Increase mowing frequency as necessary.*	☐	☐	☐
iii. Unauthorized plants. *Maintenance: Remove any unauthorized plants, including roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
b. Slope erosion.	☐	☐	☐
i. Small bare areas (min. 50 square feet). *Maintenance: Topsoil, rake and seed bare areas.*	☐	☐	☐
ii. Ruts less than 12" wide. *Maintenance: Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Backfill ruts and compact soil. Topsoil, rake and seed bare areas. Alternatively, hydroseeding can be used to seed the slope.*	☐	☐	☐
iii. Ruts greater than 12" wide. *Maintenance: Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Re-grade, backfill ruts and compact soil. Install erosion control mats on slopes 3:1 or steeper to protect the re-graded slope. Topsoil, rake and seed bare areas. Inspect on a weekly basis until 80% ground cover is achieved. Alternatively, hydroseeding can be used to seed the slope.*	☐	☐	☐
c. Uneven settling *Maintenance: Install permanent benchmarks or other permanent reference point in each practice to be used with as-built elevations to measure uneven settling.*	☐	☐	☐
i. Greater than 0" but less than 2" of settling. *Maintenance: No immediate action required. Re-inspect in 6 months.*	☐	☐	☐
ii. Greater than 2" but less than 4" of settling.	☐	☐	☐

Maintenance: Immediately repair. Re-grade and compact the soil. Topsoil, rake and seed the area. Re-inspect in 6 months.

	Yes	No	NA
iii. Greater than 4" of settling. *Maintenance: Immediately stabilize the area and consult a NYS Licensed Professional Engineer within 2 weeks before making any additional repairs.*	☐	☐	☐
d. Animal burrows. *Maintenance: Fill animal burrows with similar material to the existing material and compact. Rake and seed the area.*	☐	☐	☐
e. Cracking, bulging, or sliding of slope.	☐	☐	☐
i. Upstream face.	☐	☐	☐
ii. Downstream face.	☐	☐	☐
iii. At or beyond downstream toe.	☐	☐	☐
iv. At or beyond upstream toe.	☐	☐	☐
v. Emergency spillway. *Maintenance: Immediately stabilize the slope and consult an NYS Licensed Professional Engineer within 2 weeks before making any additional repairs.*	☐	☐	☐
f. Seeps/leaks at downstream face. *Maintenance: Look for changes in the color of the vegetation, plant species and their density to help locate the leak source.*	☐	☐	☐
g. Rip rap slope protection failure. *Maintenance: Stabilize slope, re-grade and compact the soil. Replace stone as necessary.*	☐	☐	☐
i. Emergency spillway clear of any obstructions or debris. *Maintenance: Remove and properly dispose of any trash and debris. Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the disturbed area by their removal.*	☐	☐	☐

2. Inflow Points
(Frequency: Annual)

	Yes	No	NA
a. Vegetation and ground cover adequate. *Maintenance: Reseed bare areas. Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the disturbed area by their removal.*	☐	☐	☐
b. Free from erosion/undercutting.	☐	☐	☐

Maintenance: Immediately stabilize and repair any areas where erosion around has occurred. Rake and seed the area. Seed mixture shall meet the seed mixture requirements specified on the approved plans.

c. Rip rap in good condition. ☐ ☐ ☐
Maintenance: Replace stone, as necessary.

	Yes	No	NA
d. Pipes free from damage, corrosion, and sediment. *Maintenance: Immediately repair any damaged pipes. If pipes are severely damaged and cannot be repaired, replace the pipes. Remove and properly dispose of any sediment.*	☐	☐	☐

3. Outlet Structure/Overflow Spillway (Frequency: Annual)

	Yes	No	NA
a. Outlet structure in good condition.	☐	☐	☐
i. In good condition, no need for repairs.	☐	☐	☐
a. Cracks or displacement *Maintenance: Repair any minor cracks or displacement. Replace structure if major cracks or displacement is observed.*	☐	☐	☐
b. Minor spalling (<1"). *Maintenance: Repair any minor spalling observed.*	☐	☐	☐
c. Major spalling (rebars exposed). *Maintenance: Replace structure.*	☐	☐	☐
d. Joint failures. *Maintenance: Replace structure.*	☐	☐	☐
e. Water tightness. *Maintenance: Reseal structure for water tightness if minor leaks are observed. Replace structure if significant leaks are observed.*	☐	☐	☐
ii. Clear of sediment. *Maintenance: Remove and properly dispose of any accumulated sediment when at 50% of sump height.*	☐	☐	☐
iii. Clear of debris and trash. *Maintenance: Remove and properly dispose of any debris and trash.*	☐	☐	☐
iv. Pipes free from damage, corrosion, and sediment. *Maintenance: Immediately repair any damaged pipes. If pipes are severely damaged and cannot be repaired, replace the pipes. Remove and properly dispose of any sediment.*	☐	☐	☐
b. Overflow spillway	☐	☐	☐

i. In good condition, no need for repairs. ☐ ☐ ☐
Maintenance: Replace stone, as necessary.

ii. Clear of sediment. ☐ ☐ ☐
Maintenance: Remove and properly dispose of any accumulated sediment when half of the void space is filled.

iii. Clear of debris and trash. ☐ ☐ ☐
Maintenance: Remove and properly dispose of any debris and trash.

Yes No NA

iv. No evidence of erosion. ☐ ☐ ☐
Maintenance: Immediately stabilize and repair any areas where erosion occurred around or below the overflow spillway. Replace stone, as necessary. Topsoil, rake and seed the area.

v. No evidence of erosion at downstream toe of drop structure or weir spillway. ☐ ☐ ☐
Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and reseed.

4. Check Dams/Energy Dissipaters/Swales (Frequency: Annual)

Yes No NA

a. Check Dams ☐ ☐ ☐

i. No evidence of sediment buildup. ☐ ☐ ☐
Maintenance: Remove accumulated sediment behind dams when sediment depth is one-third the dam height.

ii. Stone in good condition. ☐ ☐ ☐
Maintenance: Replace stone, as necessary.

iii. No evidence of erosion ☐ ☐ ☐
Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and reseed area.

b. Energy Dissipaters ☐ ☐ ☐

i. No evidence of sediment buildup. ☐ ☐ ☐
Maintenance: Remove and properly dispose of any accumulated sediment when half of the void space is filled.

ii. Rip rap in good condition. ☐ ☐ ☐
Maintenance: Replace stone, as necessary.

iii. No evidence of erosion. ☐ ☐ ☐

Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and reseed.

c. Swales ☐ ☐ ☐

i. No evidence of sediment buildup. ☐ ☐ ☐
Maintenance: Remove and properly dispose of any accumulated sediment when the depth is 20% of swale design depth.

ii. No evidence of erosion. ☐ ☐ ☐
Maintenance: Immediately stabilize. Backfill any ruts and compact the soil. Topsoil, rake and seed the area.

5. Sediment Forebay
(Frequency: Monthly) **Yes No NA**

a. Free of sediment. ☐ ☐ ☐
Maintenance: Remove and properly dispose of any accumulated sediment when at 50% of the design capacity.

b. No evidence of erosion. ☐ ☐ ☐
Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Topsoil, rake and seed the area.

c. Overflow Spillway. ☐ ☐ ☐

i. In good working condition, no need for repairs. ☐ ☐ ☐
Maintenance: Replace stone, as necessary.

ii. Clear of sediment. ☐ ☐ ☐
Maintenance: Remove and properly dispose of any accumulated sediment when half of the void space is filled.

iii. Clear of trash and debris. ☐ ☐ ☐
Maintenance: Remove and properly dispose of any debris and trash.

iv. No evidence of erosion. ☐ ☐ ☐
Maintenance: Immediately stabilize and repair any areas where erosion occurred around or below the overflow spillway. Replace stone, as necessary. Topsoil, rake and seed the area.

v. No evidence of erosion at downstream toe of drop structure or weir spillway. ☐ ☐ ☐
Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and seed the area.

6. Debris Cleanout
(Frequency: Monthly)

	Yes	No	NA
a. Contributing areas clean of debris. *Maintenance: Remove and properly dispose of any trash and debris.*	☐	☐	☐
b. No dumping of yard wastes into practice. *Maintenance: Remove any yard wastes. Remind any maintenance personnel, landscapers, etc. to properly dispose of any yard wastes.*	☐	☐	☐
c. Clear of debris and litter. *Maintenance: Remove and properly dispose of any trash and debris.*	☐	☐	☐

7. Bioretention Basin Vegetation
(Frequency: Monthly)

	Yes	No	NA
a. Plant height not less than design water depth of 3”. *Maintenance: Remove any plants that have heights less than 3”. Replace with plants specified on the approved plans that have a minimum height of 3”.*	☐	☐	☐
b. Plant composition according to approved plans. *Maintenance: Remove any dead or dying plants and decaying plant material. Replace dead and dying plants.*	☐	☐	☐
c. No placement of unapproved plants. *Maintenance: Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use herbicides.*	☐	☐	☐
d. Grass height not greater than 6”. *Maintenance: Mow grass. Increase frequency of mowing as necessary to keep grass heights less than 6”.*	☐	☐	☐
e. Sparse or bare vegetation in more than 10% of bioretention area. *Maintenance: Install replacement plants, as necessary. Topsoil, rake and seed the area.*	☐	☐	☐
f. Nuisance weeds or vegetation taking over more than 25% of the basin. *Maintenance: Remove any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the disturbed area*	☐	☐	☐
g. Mulch is in good condition and the appropriate thickness.	☐	☐	☐

Maintenance: Replace decomposed mulch to the thickness shown on the approved plans.

8. Bioretention Basin Dewatering
(Frequency: Monthly)

	Yes	No	NA
a. Dewaters between storms. *Maintenance: If filter bed is clogged or draining poorly, remove top few inches of discolored filter media. Rake the remaining material and replace the removed filter bed media.*	☐	☐	☐
b. No evidence of standing water 48 or more hours after a rainfall. *Maintenance: If standing water covers more than 15% of the planting bed 48 hours after a rainfall, remove top few inches of planting bed media. Rake the filter bed media to loosen the soil. Recheck after next rainfall event. If still not dewatering fully after 48 hours, remove and replace the entire filter bed media. If problem persists, contact a NYS licensed Professional Engineer.*	☐	☐	☐

	Yes	No	NA
c. Underdrain present and no evidence of standing water 48 or more hours after a rainfall. *Maintenance: Flush underdrain system to remove any trapped sediment. If no sediment is present, remove top few inches of planting bed media. Rake the filter bed media to loosen the soil. Recheck after next rainfall event. If still not dewatering fully after 48 hours, remove entire filter bed material and check the gravel drainage layer for clogging. Replace filter bed media and gravel drainage layer with new material. If problem persists, contact a NYS licensed Professional Engineer.*	☐	☐	☐

9. Bioretention Basin Filter Bed Integrity
(Frequency: Annual)

	Yes	No	NA
a. Filter bed has not been blocked or filled inappropriately. *Maintenance: Remove all blockages and inappropriate fill. Restore filter bed to elevation shown on the approved plans.*	☐	☐	☐
b. Filter bed flat and level. *Maintenance: Remove all blockages, inappropriate fill, or accumulated sediment if present. Check embankment for differential settlement. If differential settlement is noted, refer to Item 1.c for maintenance procedures. If no differential settlement*	☐	☐	☐

is noted, rake and level the planting bed media so that it is flat and level.

c. Uneven ponding. ☐ ☐ ☐
<u>*Maintenance*</u>*: Remove all blockages, inappropriate fill, or accumulated sediment if present. Check embankment for differential settlement. If differential settlement is noted, refer to Item 1.c for maintenance procedures. If no differential settlement is noted, rake and level the planting bed media so that it is flat and level.*

Notes:

1. The site must be returned to the approved conditions when any repairs are made.
2. Unauthorized plants are any plants that are growing or have been installed that are not any of the plants shown on the approved plans.
3. All seed mixtures shall meet the seed mixture requirements specified on the approved plans.
4. Replace any dead or dying plants with plants specified in the planting schedule shown on the approved plans.
5. Replaced stone shall meet the stone requirements specified on the approved plans.
6. Replaced filter bed media shall meet the filter bed media requirements specified on the approved plans.
7. Replaced gravel drainage layer shall meet the gravel drainage layer requirements specified on the approved plans.

Comments:

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Actions to be taken:

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Post Construction Inspection and Maintenance Checklist
Stormwater Pond

1. Embankment
(Frequency: Annual)

	Yes	No	NA
a. Vegetation and ground cover adequate.	☐	☐	☐
i. Minimum 80% ground cover. *Maintenance: Topsoil, rake and seed bare areas. Replace dead and dying plants.*	☐	☐	☐
ii. Excessively tall grass (greater than 6” in height) *Maintenance: Mow grass to have a height of 4” to 6”. Increase mowing frequency as necessary.*	☐	☐	☐
iii. Unauthorized plants. *Maintenance: Remove any unauthorized plants, including roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
b. Slope erosion.	☐	☐	☐
i. Small bare areas (min. 50 square feet). *Maintenance: Topsoil, rake and seed bare areas.*	☐	☐	☐
ii. Ruts less than 12” wide. *Maintenance: Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Backfill ruts and compact soil. Topsoil, rake and seed bare areas. Alternatively, hydroseeding can be used to seed the slope.*	☐	☐	☐
iii. Ruts greater than 12” wide. *Maintenance: Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Re-grade, backfill ruts and compact soil. Install erosion control mats on slopes 3:1 or steeper to protect the re-graded slope. Topsoil, rake and seed bare areas. Inspect on a weekly basis until 80% ground cover is achieved. Alternatively, hydroseeding can be used to seed the slope.*	☐	☐	☐
c. Uneven settling *Maintenance: Install permanent benchmarks or other permanent reference point in each practice to be used with as-built elevations to measure uneven settling.*	☐	☐	☐
i. Greater than 0” but less than 2” of settling. *Maintenance: No immediate action required. Re-inspect in 6 months.*	☐	☐	☐
ii. Greater than 2” but less than 4” of settling. *Maintenance: Immediately repair. Re-grade and compact the soil. Topsoil, rake and seed the area. Re-inspect in 6 months.*	☐	☐	☐

	Yes	No	NA
iii. Greater than 4" of settling. *Maintenance: Immediately stabilize the area and consult a NYS Licensed Professional Engineer within 2 weeks before making any additional repairs.*	☐	☐	☐
d. Animal burrows. *Maintenance: Fill animal burrows with similar material to the existing material and compact. Topsoil, rake and seed the area.*	☐	☐	☐
e. Cracking, bulging, or sliding of slope.	☐	☐	☐
i. Upstream face.	☐	☐	☐
ii. Downstream face.	☐	☐	☐
iii. At or beyond downstream toe.	☐	☐	☐
iv. At or beyond upstream toe.	☐	☐	☐
v. Emergency spillway. *Maintenance: Immediately stabilize the slope and consult an NYS Licensed Professional Engineer within 2 weeks before making any additional repairs.*	☐	☐	☐
f. Seeps/leaks at downstream face. *Maintenance: Look for changes in the color of the vegetation, plant species and their density to help locate the leak source.*	☐	☐	☐
g. Rip rap slope protection failure. *Maintenance: Stabilize slope, re-grade and compact the soil. Replace stone, as necessary.*	☐	☐	☐
i. Emergency spillway clear of any obstructions or debris. *Maintenance: Remove and properly dispose of any trash and debris. Remove any unauthorized plants, or any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐

2. Inflow Points
(Frequency: Annual)

	Yes	No	NA
a. Vegetation and ground cover adequate. *Maintenance: Reseed bare areas. Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
b. Free from erosion/undercutting. *Maintenance: Immediately stabilize and repair any areas where erosion around has occurred. Topsoil, rake and seed the area.*	☐	☐	☐
c. Rip rap in good condition. *Maintenance: Replace stone, as necessary.*	☐	☐	☐
d. Pipes free from damage, corrosion, and sediment. *Maintenance: Immediately repair any damaged pipes. If pipes are severely damaged and cannot be repaired, replace the pipes. Remove and properly dispose of any sediment.*	☐	☐	☐

3. Outlet Structure/Overflow Spillway (Frequency: Annual)

	Yes	No	NA
a. Riser pipe	☐	☐	☐
i. In good condition, no need for repairs. *Maintenance: Repair any minor damages. Replace structure if significant damages are observed.*	☐	☐	☐
ii. Clear of sediment. *Maintenance: Remove and properly dispose of any accumulated sediment when at 50% of sump height.*	☐	☐	☐
iii. Clear of debris and trash. *Maintenance: Remove and properly dispose of any debris and trash.*	☐	☐	☐
b. Concrete outlet structure	☐	☐	☐
i. In good condition, no need for repairs.	☐	☐	☐
a. Cracks or displacement. *Maintenance: Repair any minor cracks. If minor displacement is observed, re-inspect in 6 months. Replace structure if major cracks or significant displacement is observed.*	☐	☐	☐
b. Minor spalling (<1"). *Maintenance: Repair any minor spalling.*	☐	☐	☐
c. Major spalling (rebars exposed). *Maintenance: Replace structure.*	☐	☐	☐
d. Joint failures. *Maintenance: Replace structure.*	☐	☐	☐
e. Water tightness. *Maintenance: Reseal structure for water tightness if minor leaks are observed. Replace structure if significant leaks are observed.*	☐	☐	☐
ii. Clear of sediment. *Maintenance: Remove and properly dispose of any accumulated sediment when at 50% of sump height.*	☐	☐	☐
iii. Clear of debris and trash. *Maintenance: Remove and properly dispose of any debris and trash.*	☐	☐	☐
iv. Pipes free from damage, corrosion, and sediment. *Maintenance: Immediately repair any damaged pipes. If pipes are severely damaged and cannot be repaired, replace the pipes. Remove and properly dispose of any sediment.*	☐	☐	☐
c. Low flow orifice is unobstructed. *Maintenance: Remove and properly dispose of any debris and trash.*	☐	☐	☐

	Yes	No	NA
d. Low flow trash rack.	☐	☐	☐
i. Clear of debris and trash. Maintenance: *Remove and properly dispose of any debris and trash.*	☐	☐	☐
ii. Clear of any corrosion. Maintenance: *If significant corrosion is observed, replace trash rack.*	☐	☐	☐
e. Weir trash rack.	☐	☐	☐
i. Clear of debris and trash. Maintenance: *Remove and properly dispose of any debris and trash.*	☐	☐	☐
ii. Clear of any corrosion. Maintenance: *If significant corrosion is observed, replace trash rack.*	☐	☐	☐
f. Control valve operational. Maintenance: *Replace if not functioning or operational.*	☐	☐	☐
g. Pond valve operational, chained and locked. Maintenance: *Replace valve if not functioning or operational.*	☐	☐	☐
h. Overflow spillway	☐	☐	☐
i. In good condition, no need for repairs. Maintenance: *Replace any dislodged stone with the same stone type.*	☐	☐	☐
ii. Clear of sediment. Maintenance: *Remove and properly dispose of any accumulated sediment when half of the void space is filled.*	☐	☐	☐
iii. Clear of debris and trash. Maintenance: *Remove and properly dispose of any debris and trash.*	☐	☐	☐
iv. No evidence of erosion. Maintenance: *Immediately stabilize and repair any areas where erosion occurred around or below the overflow spillway. Replace stone, as necessary. Topsoil, rake and seed the area.*	☐	☐	☐
v. No evidence of erosion at downstream toe of drop structure or weir spillway. Maintenance: *Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and seed the area.*	☐	☐	☐

4. Sediment Forebay
(Frequency: Monthly)

	Yes	No	NA
a. Free of sediment. Maintenance: *Remove and properly dispose of any accumulated sediment when at 50% of the design capacity.*	☐	☐	☐

	Yes	No	NA
b. No evidence of erosion. *Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Topsoil, rake and seed the area.*	☐	☐	☐
c. Overflow Spillway.	☐	☐	☐
i. In good working condition, no need for repairs. *Maintenance: Replace stone, as necessary.*	☐	☐	☐
ii. Clear of sediment. *Maintenance: Remove and properly dispose of any accumulated sediment when half of the void space is filled.*	☐	☐	☐
iii. Clear of trash and debris. *Maintenance: Remove and properly dispose of any debris and trash.*	☐	☐	☐
iv. No evidence of erosion. *Maintenance: Immediately stabilize and repair any areas where erosion occurred around or below the overflow spillway. Replace stone, as necessary. Topsoil, rake and seed the area.*	☐	☐	☐
v. No evidence of erosion at downstream toe of drop structure or weir spillway. *Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and seed the area.*	☐	☐	☐

5. Permanent Pool (Wet Ponds)
(Frequency: Monthly)

	Yes	No	NA
a. Undesirable vegetative growth. *Maintenance: Mow grass to have a height of 4" to 6". Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
b. Floating or floatable debris removal required. *Maintenance: Remove and properly dispose of any debris and trash.*	☐	☐	☐
c. Visible pollution. *Maintenance: Coordinate removal/cleanup of any oil, gas, or contaminants with the appropriate clean-up personnel.*	☐	☐	☐
d. Erosion occurring along shoreline. *Maintenance: Leave a 10' unmowed vegetated buffer around the perimeter of the permanent pool to help prevent shoreline erosion.*	☐	☐	☐

6. Dry Pond Areas
(Frequency: Monthly)

a. Vegetation adequate. *Maintenance: Topsoil, rake and seed the area.*	☐	☐	☐

	Yes	No	NA
b. Undesirable vegetative growth. *<u>Maintenance</u>: Mow grass to have a height of 4" to 6". Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
c. Undesirable woody vegetation. *<u>Maintenance</u>: Remove any undesirable woody vegetation, including their roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
d. Low flow channels clear of obstructions. *<u>Maintenance</u>: Remove and properly dispose of any debris and trash.*	☐	☐	☐
e. Standing water or wet spots. *<u>Maintenance</u>: Re-grade areas to ensure positive drainage. Topsoil, rake and seed the area.*	☐	☐	☐
f. Sediment and trash accumulation. *<u>Maintenance</u>: Remove and properly dispose of any accumulated sediment and trash.*	☐	☐	☐

7. Wetland Vegetation
(Frequency: Annual)

	Yes	No	NA
a. Vegetation health and growing. *<u>Maintenance</u>: Remove any dead or dying plants and decaying plant material. Replace dead and dying plants.*	☐	☐	☐

	Yes	No	NA
i. Wetland maintaining 50% surface area coverage of wetland plants after second growing season. *<u>Maintenance</u>: If unsatisfactory, install reinforcement plants.*	☐	☐	☐
b. Dominant wetland plants:			
i. Survival of desired wetland plant species. *<u>Maintenance</u>: Remove any dead or dying plants and decaying plant material. Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use herbicides. Replace any dead and dying plants.*	☐	☐	☐
ii. Distribution according to landscaping plan. *<u>Maintenance</u>: Install additional wetland plants as necessary.*	☐	☐	☐
c. Evidence of invasive species. *<u>Maintenance</u>: Remove invasive species, including roots. Do not use herbicides. Install additional wetland plants as necessary.*	☐	☐	☐
d. Maintenance of adequate water depths for desired wetland plant species. *<u>Maintenance</u>: Remove and properly dispose of any accumulated sediment that may impact the water depth.*	☐	☐	☐

	Yes	No	NA
e. Harvesting of emergent plantings needed. *<u>Maintenance</u>: A qualified professional shall identify the plants to be removed.*	☐	☐	☐
f. Accumulated sediment reducing pool volume significantly or plants are "choked" with sediment. *<u>Maintenance</u>: Remove and properly dispose of any accumulated sediment when at 50% of the design capacity. A bathymetric study may be necessary to determine the amount of water and accumulated sediment in the pond.*	☐	☐	☐
g. Eutrophication level of wetland. *<u>Maintenance</u>: Reduce the amount of phosphorus being applied upstream starting in early April and through September. Chemical treatments can be applied; however, consult a NYS licensed Professional Engineer prior to starting any treatments as chemical treatments may require a permit.*	☐	☐	☐

8. Miscellaneous
(Frequency: Monthly)

	Yes	No	NA
a. Encroachment on pond or easement area. *<u>Maintenance</u>: Remove any encroachments into the pond or easement area.*	☐	☐	☐

	Yes	No	NA
b. Maintenance access routes in good condition. *<u>Maintenance</u>: Repair any minor damage or erosion to the maintenance access routes. If significant damage or erosion is noted, stabilize, re-grade and re-establish the maintenance access routes in accordance with the plans.*	☐	☐	☐
c. Signs of hydrocarbon build-up. *<u>Maintenance</u>: Coordinate removal/cleanup of any oil, gas, or contaminants with the appropriate clean-up personnel.*	☐	☐	☐
d. Fence in good condition. *<u>Maintenance</u>: Replace any damaged sections of fence.*	☐	☐	☐
e. Safety signs are installed. *<u>Maintenance</u>: Replace any missing signs.*	☐	☐	☐

Notes:

1. The site must be returned to the approved conditions when any repairs are made.
2. Unauthorized plants are any plants that are growing or have been installed that are not any of the plants shown on the approved plans.
3. All seed mixtures shall meet the seed mixture requirements specified on the approved plans.
4. Replace any dead or dying plants with plants specified in the planting schedule shown on the approved plans.
5. Replaced stone shall meet the stone requirements specified on the approved plans.

Comments:

Actions to be taken:

Post Construction Inspection and Maintenance Checklist
Dry Detention Basin

	Yes	No	NA
1. Embankment (Frequency: Annual)			
a. Vegetation and ground cover adequate.	☐	☐	☐
i. Minimum 80% ground cover. <u>Maintenance</u>: *Topsoil, rake and seed bare areas. Replace dead and dying plants.*	☐	☐	☐
ii. Excessively tall grass (greater than 6” in height) <u>Maintenance</u>: *Mow grass to have a height of 4” to 6”. Increase mowing frequency as necessary.*	☐	☐	☐
iii. Unauthorized plants. <u>Maintenance</u>: *Remove any unauthorized plants, including roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
b. Slope erosion.	☐	☐	☐
i. Small bare areas (min. 50 square feet). <u>Maintenance</u>: *Topsoil, rake and seed bare areas.*	☐	☐	☐
ii. Ruts less than 12” wide. <u>Maintenance</u>: *Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Backfill ruts and compact soil. Topsoil, rake and seed bare areas. Alternatively, hydroseeding can be used to seed the slope.*	☐	☐	☐
iii. Ruts greater than 12” wide. <u>Maintenance</u>: *Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Re-grade, backfill ruts and compact soil. Install erosion control mats on slopes 3:1 or steeper to protect the re-graded slope. Topsoil, rake and seed bare areas. Inspect on a weekly basis until 80% ground cover is achieved. Alternatively, hydroseeding can be used to seed the slope.*	☐	☐	☐
c. Uneven settling <u>Maintenance</u>: *Install permanent benchmarks or other permanent reference point in each practice to be used with as-built elevations to measure uneven settling.*	☐	☐	☐
i. Greater than 0” but less than 2” of settling. <u>Maintenance</u>: *No immediate action required. Re-inspect in 6 months.*	☐	☐	☐
ii. Greater than 2” but less than 4” of settling.	☐	☐	☐

<u>Maintenance</u>: Immediately repair. Re-grade and compact the soil. Topsoil, rake and seed the area. Re-inspect in 6 months.

	Yes	No	NA
iii. Greater than 4" of settling. *<u>Maintenance</u>: Immediately stabilize the area and consult a NYS Licensed Professional Engineer within 2 weeks before making any additional repairs.*	☐	☐	☐
d. Animal burrows. *<u>Maintenance</u>: Fill animal burrows with similar material to the existing material and compact. Topsoil, rake and seed the area.*	☐	☐	☐
e. Cracking, bulging, or sliding of slope.	☐	☐	☐
i. Upstream face.	☐	☐	☐
ii. Downstream face.	☐	☐	☐
iii. At or beyond downstream toe.	☐	☐	☐
iv. At or beyond upstream toe.	☐	☐	☐
v. Emergency spillway. *<u>Maintenance</u>: Immediately stabilize the slope and consult an NYS Licensed Professional Engineer within 2 weeks before making any additional repairs.*	☐	☐	☐
f. Seeps/leaks at downstream face. *<u>Maintenance</u>: Look for changes in the color of the vegetation, plant species and their density to help locate the leak source.*	☐	☐	☐
g. Rip rap slope protection failure. *<u>Maintenance</u>: Stabilize slope, re-grade and compact the soil. Replace stone, as necessary.*	☐	☐	☐
i. Emergency spillway clear of any obstructions or debris. *<u>Maintenance</u>: Remove and properly dispose of any trash and debris. Remove any unauthorized plants, or any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐

2. Inflow Points
(Frequency: Annual)

	Yes	No	NA
a. Vegetation and ground cover adequate. *<u>Maintenance</u>: Reseed bare areas. Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
b. Free from erosion/undercutting. *<u>Maintenance</u>: Immediately stabilize and repair any areas where erosion around has occurred. Topsoil, rake and seed the area.*	☐	☐	☐

c. Rip rap in good condition. ☐ ☐ ☐
   Maintenance: Replace stone, as necessary.

d. Pipes free from damage, corrosion, and sediment. ☐ ☐ ☐
   Maintenance: Immediately repair any damaged pipes. If pipes are severely damaged and cannot be repaired, replace the pipes. Remove and properly dispose of any sediment.

3. Outlet Structure/Overflow Spillway
(Frequency: Annual) — **Yes No NA**

a. Riser pipe ☐ ☐ ☐
   i. In good condition, no need for repairs. ☐ ☐ ☐
      Maintenance: Repair any minor damages. Replace structure if significant damages are observed.
   ii. Clear of sediment. ☐ ☐ ☐
      Maintenance: Remove and properly dispose of any accumulated sediment when at 50% of sump height.
   iii. Clear of debris and trash. ☐ ☐ ☐
      Maintenance: Remove and properly dispose of any debris and trash.

b. Concrete outlet structure ☐ ☐ ☐
   i. In good condition, no need for repairs. ☐ ☐ ☐
      a. Cracks or displacement. ☐ ☐ ☐
         Maintenance: Repair any minor cracks. If minor displacement is observed, re-inspect in 6 months. Replace structure if major cracks or significant displacement is observed.
      b. Minor spalling (<1”). ☐ ☐ ☐
         Maintenance: Repair any minor spalling.
      c. Major spalling (rebars exposed). ☐ ☐ ☐
         Maintenance: Replace structure.
      d. Joint failures. ☐ ☐ ☐
         Maintenance: Replace structure.
      e. Water tightness. ☐ ☐ ☐
         Maintenance: Reseal structure for water tightness if minor leaks are observed. Replace structure if significant leaks are observed.
   ii. Clear of sediment. ☐ ☐ ☐
      Maintenance: Remove and properly dispose of any accumulated sediment when at 50% of sump height.
   iii. Clear of debris and trash. ☐ ☐ ☐
      Maintenance: Remove and properly dispose of any debris and trash.

	Yes	No	NA
iv. Pipes free from damage, corrosion, and sediment. *Maintenance: Immediately repair any damaged pipes. If pipes are severely damaged and cannot be repaired, replace the pipes. Remove and properly dispose of any sediment.*	☐	☐	☐
c. Low flow orifice is unobstructed. *Maintenance: Remove and properly dispose of any debris and trash.*	☐	☐	☐

	Yes	**No**	**NA**
d. Low flow trash rack.	☐	☐	☐
i. Clear of debris and trash. *Maintenance: Remove and properly dispose of any debris and trash.*	☐	☐	☐
ii. Clear of any corrosion. *Maintenance: If significant corrosion is observed, replace trash rack.*	☐	☐	☐
e. Weir trash rack.	☐	☐	☐
i. Clear of debris and trash. *Maintenance: Remove and properly dispose of any debris and trash.*	☐	☐	☐
ii. Clear of any corrosion. *Maintenance: If significant corrosion is observed, replace trash rack.*	☐	☐	☐
f. Control valve operational. *Maintenance: Replace if not functioning or operational.*	☐	☐	☐
g. Pond valve operational, chained and locked. *Maintenance: Replace valve if not functioning or operational.*	☐	☐	☐
h. Overflow spillway	☐	☐	☐
i. In good condition, no need for repairs. *Maintenance: Replace any dislodged stone with the same stone type.*	☐	☐	☐
ii. Clear of sediment. *Maintenance: Remove and properly dispose of any accumulated sediment when half of the void space is filled.*	☐	☐	☐
iii. Clear of debris and trash. *Maintenance: Remove and properly dispose of any debris and trash.*	☐	☐	☐
iv. No evidence of erosion. *Maintenance: Immediately stabilize and repair any areas where erosion occurred around or below the overflow*	☐	☐	☐

spillway. Replace stone, as necessary. Topsoil, rake and seed the area.

v. No evidence of erosion at downstream toe of drop structure or weir spillway. ☐ ☐ ☐
Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and seed the area.

4. Sediment Forebay
(Frequency: Monthly) **Yes No NA**

a. Free of sediment. ☐ ☐ ☐
Maintenance: Remove and properly dispose of any accumulated sediment when at 50% of the design capacity.

Yes No NA

b. No evidence of erosion. ☐ ☐ ☐
Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Topsoil, rake and seed the area.

c. Overflow Spillway. ☐ ☐ ☐

i. In good working condition, no need for repairs. ☐ ☐ ☐
Maintenance: Replace stone, as necessary.

ii. Clear of sediment. ☐ ☐ ☐
Maintenance: Remove and properly dispose of any accumulated sediment when half of the void space is filled.

iii. Clear of trash and debris. ☐ ☐ ☐
Maintenance: Remove and properly dispose of any debris and trash.

iv. No evidence of erosion. ☐ ☐ ☐
Maintenance: Immediately stabilize and repair any areas where erosion occurred around or below the overflow spillway. Replace stone, as necessary. Topsoil, rake and seed the area.

v. No evidence of erosion at downstream toe of drop structure or weir spillway. ☐ ☐ ☐
Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and seed the area.

5. Dry Pond Areas
(Frequency: Monthly) **Yes No NA**

a. Vegetation adequate. ☐ ☐ ☐
Maintenance: Topsoil, rake and seed the area.

b. Undesirable vegetative growth. ☐ ☐ ☐

Maintenance: Mow grass to have a height of 4" to 6". Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.

		Yes	No	NA
c.	Undesirable woody vegetation. *<u>Maintenance</u>: Remove any undesirable woody vegetation, including their roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
d.	Low flow channels clear of obstructions. *<u>Maintenance</u>: Remove and properly dispose of any debris and trash.*	☐	☐	☐
e.	Standing water or wet spots. *<u>Maintenance</u>: Re-grade areas to ensure positive drainage. Topsoil, rake and seed the area.*	☐	☐	☐
f.	Sediment and trash accumulation. *<u>Maintenance</u>: Remove and properly dispose of any accumulated sediment and trash.*	☐	☐	☐

6. Vegetation
(Frequency: Annual)

		Yes	No	NA
a.	Vegetation health and growing. *<u>Maintenance</u>: Remove any dead or dying plants and decaying plant material. Replace dead and dying plants.*	☐	☐	☐
b.	Evidence of invasive species. *<u>Maintenance</u>: Remove invasive species, including roots. Do not use herbicides. Install additional wetland plants as necessary.*	☐	☐	☐
c.	Accumulated sediment reducing volume significantly. *<u>Maintenance</u>: Remove and properly dispose of any accumulated sediment when at 50% of the design capacity.*	☐	☐	☐

7. Miscellaneous
(Frequency: Monthly)

		Yes	No	NA
a.	Encroachment on pond or easement area. *<u>Maintenance</u>: Remove any encroachments into the pond or easement area.*	☐	☐	☐
b.	Maintenance access routes in good condition. *<u>Maintenance</u>: Repair any minor damage or erosion to the maintenance access routes. If significant damage or erosion is noted, stabilize, re-grade and re-establish the maintenance access routes in accordance with the plans.*	☐	☐	☐
c.	Signs of hydrocarbon build-up.	☐	☐	☐

Maintenance: Coordinate removal/cleanup of any oil, gas, or contaminants with the appropriate clean-up personnel.

d. Fence in good condition. ☐ ☐ ☐
Maintenance: Replace any damaged sections of fence.

e. Safety signs are installed. ☐ ☐ ☐
Maintenance: Replace any missing signs.

Notes:

1. The site must be returned to the approved conditions when any repairs are made.
2. Unauthorized plants are any plants that are growing or have been installed that are not any of the plants shown on the approved plans.
3. All seed mixtures shall meet the seed mixture requirements specified on the approved plans.
4. Replace any dead or dying plants with plants specified in the planting schedule shown on the approved plans.
5. Replaced stone shall meet the stone requirements specified on the approved plans.

Comments:

Actions to be taken: