MOTT MACDONALD

PennEast PIPELINE

Blue Mountain Interconnect Post Construction Stormwater Management Report

PennEast Pipeline Project

Date October, 2019

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
W. MICHAEL CLARK
ENGINEER
PE082720

10/25/2019

PennEast Pipeline Project
353754-MM-EN-CO-015

Mott MacDonald
111 Wood Avenue South
Iselin, NJ 08830-4112
973-379-3400

PennEast Pipeline
Company, LLC.
835 Knitting Mills Way
Wyomissing, PA 19610
610-373-7999

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Issue and revision record

Revision	Date	Originator	Checkout	Approver	Descriptor
0	12/2018	P. Zhinhel	J. Dening	M. Wilcox	Issued for PADEP
1	10/2019	P. Zhinhel	J. Dening	M. Wilcox	Per PADEP comments.

Information class: **Standard**

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1 Executive Summary

PennEast proposes to construct, install and operate the Project facilities to provide approximately 1.1 million dekatherms per day (MMDth/d) of year-round transportation service from northern Pennsylvania to markets in New Jersey, eastern and southeastern Pennsylvania and surrounding states. The Project is designed to provide a long-term solution to bring the lowest cost natural gas available in the country, produced in the Marcellus Shale region in northern Pennsylvania, to homes and businesses in New Jersey, Pennsylvania and surrounding states.

The Project facilities include a 36-inch diameter, 115-mile mainline pipeline, extending from Luzerne County, Pennsylvania, to Mercer County, New Jersey. The Project will extend from various receipt point interconnections in the eastern Marcellus region, including interconnections with Transcontinental Gas Pipe Line Company, LLC (Transco) and gathering systems operated by Williams Partners L.P., Energy Transfer Partners, L.P. (formerly Regency Energy Partners, LP), and UGI Energy Services, LLC in Luzerne County, Pennsylvania, to various delivery point interconnections in the heart of major northeastern natural gas-consuming markets, including interconnections with UGI Central Penn Gas, Inc., (Blue Mountain) in Carbon County, Pennsylvania, UGI Utilities, Inc. and Columbia Gas Transmission, LLC in Northampton County, Pennsylvania, and Elizabethtown Gas, NRG REMA, LLC, Texas Eastern Transmission, LP (Texas Eastern) and Algonquin Gas Transmission, LLC (Algonquin) in Hunterdon County, New Jersey. The terminus of the proposed PennEast system will be located at a delivery point with Transco in Mercer County, New Jersey.

This report provides an engineering analysis of the stormwater management practices for the Blue Mountain interconnect site, which is a part of the PennEast Pipeline Project. The methods of analysis included use of the stormwater modeling software Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc., Rational Method Calculations, and the associated PADEP BMP worksheets. The methods of analysis were used to demonstrate the meeting of the proposed requirements for the following facilities:

- Infiltration basin
- Level spreader
- Swales

The resulting data for the stormwater facilities can be found in Section 4 and in the appendices. The completed model and worksheets show that the post-construction stormwater runoff does not exceed the pre-construction stormwater flows and that the volume requirements are met. The report shows that the proposed stormwater BMPs for the Blue Mountain Interconnect site for the PennEast pipeline will allow the proposed project to comply with the applicable regulatory requirements under Pennsylvania Code Section 102.8, and the applicable Act 167 requirements.

2 Introduction/Overview

The PennEast Pipeline Project was developed in response to market demands in New Jersey and Pennsylvania, and interest from shippers that require transportation capacity to accommodate increased demand and greater reliability of natural gas in the region. The Project will include a new pipeline and above ground facilities that will provide a new source of natural gas supply from the Marcellus Shale producing region to New Jersey and Pennsylvania.

The Blue Mountain Interconnect site is located in Lower Towamensing Township in Carbon County, PA. (See Figure 1 for a Location Map and Appendix I for PCSM Plan). The Blue Mountain Interconnect site is being developed to create a metering station to support the proposed pipeline. The proposed site will include the pipeline meter and supporting equipment on a gravel pad. Stormwater management facilities are proposed to meet the regulatory requirements for this type of development.

3 Regulatory Compliance

Regulatory jurisdiction over stormwater runoff from the Blue Mountain Interconnect is the responsibility of the Pennsylvania Department of Environmental Protection (PADEP) under Title 25 – Environmental Protection, Chapter 102 Erosion and Sediment Control, Section 102.8 – Post-Construction Stormwater Requirements. This Post-Construction Stormwater Management Plan fulfills part of the requirements of the Erosion and Sediment Control General Permit (ESCGP-3).

The following text presents each of the requirements of Pennsylvania Code Section 102.8, incorporating the requirements of Act 167 where applicable, and indicates how they will be addressed. Regulatory requirements are shown in **bold**, and compliance is shown in *italics*.

3.1 Post-Construction Stormwater Management Plan General Requirements

(b) General PCSM planning and design. The management of post construction stormwater shall be planned and conducted to the extent practicable in accordance with the following:

This site does not have an Act 167 Watershed Management Plan, thus it is subject to the requirements of item (g)(2) of Pennsylvania Code Section 102.8. Volume must be provided as the difference between the post-development and pre-development 2-year runoff volume and the post-development peak runoff rate must not exceed pre-development peak runoff rate under any storm condition. Volume and peak flow requirements have been met with the objective to preserve the integrity of stream channels and the receiving stream.

(1) Preserve the integrity of stream channels and maintain and protect the physical, biological and chemical qualities of the receiving stream.

One of the objectives in minimizing changes in runoff volume and rate of runoff flow is to preserve the integrity of stream channels and any receiving streams. There is a perennial stream located within 150 feet of the site. In order to minimize disturbance and preserve the integrity of existing stream, the proposed gravel pad and access road will be located outside of 150 feet buffer.

Under existing conditions, offsite stormwater runoff flows overland across the site away from the existing stream. Under proposed conditions, runoff from the site will be conveyed through vegetated swales and pipe where it will be attenuated by a subsurface infiltration basin within the site. It will be discharged overland with a level spreader towards an existing snow making pond located approximately 500 feet northwest. Therefore, the project falls into definition of nondischarge alternative as environmentally sound and cost-effective BMPs that individually or collectively eliminate the net change in stormwater volume, rate and quality for storm events up to and including the 2-year/24-hour storm when compared to the stormwater rate, volume and quality prior to the earth disturbance activities to maintain and protect the existing quality of the receiving surface waters of the Commonwealth.

(2) Prevent an increase in the rate of stormwater runoff.

Increases in the rate of stormwater runoff are not anticipated. Stormwater management will be provided by vegetated swales and infiltration basin to attenuate peaks in post-development runoff. See Table 1.

(3) Minimize any increase in stormwater runoff volume.

Increases in stormwater runoff volume up to and including the 2-year storm are not anticipated. Stormwater management will be provided with infiltration basin and infiltration surface to provide storage and infiltration of post-development runoff. See Table 2.

(4) Minimize impervious areas.

The site has been designed to minimize the area of disturbance, which minimizes impervious areas. Gravel is proposed in lieu of asphalt, and areas that are not graveled will be vegetated. Given the limited site traffic (several vehicles a week), and the fact that equipment will block vehicular access to parts of the site, it is anticipated that the gravel will have some infiltrative capacity, however, it has been considered impervious in this analysis for regulatory purposes. Certain areas of the pad have been restricted from vehicular traffic through the use of concrete barriers as per discussion with PADEP, these areas will be considered pervious. The extents of the pad have been restricted to be minimum necessary for safe and effective operation of the station.

(5) Maximize the protection of existing drainage features and existing vegetation.

The existing stream located to the east of the pad area has been preserved and protected to the greatest extent practicable, through minimizing the extents of the project area to the minimum to accomplish the project objectives.

(6) Minimize land clearing and grading.

The site layout has been designed to minimize the area of disturbance as previously discussed, which minimizes land clearing and grading.

(7) Minimize soil compaction.

The site has been designed to minimize the area of disturbance, which minimizes areas of soil compaction. Heavy construction equipment will be restricted to access roads, designated laydown areas and localized work areas. Areas to be used for PCSM BMPs will be clearly identified during construction, and the contractor will be required to prevent compaction of soils in areas that are occupied or to be occupied by PCSM BMPs.

(8) Utilize other structural or nonstructural BMPs that prevent or minimize changes in stormwater runoff.

Gravel is proposed instead of asphalt in order to minimize any increase in the rate or volume of stormwater runoff from the site, and a subsurface infiltration basin (BMP) is utilized to minimize any remaining changes in stormwater runoff from pre-development to post-development.

3.1.1 Fifteen Factors of the Post-Construction Stormwater Management Plan

(f) PCSM Plan contents. The PCSM Plan must contain drawings and a narrative consistent with the requirements of this chapter. The PCSM Plan shall be designed to minimize the threat to human health, safety and the environment to the greatest extent practicable. PCSM Plans must contain at a minimum the following:

(1) The existing topographic features of the project site and the immediate surrounding area.

The proposed Blue Mountain Interconnect site is located Lower Towamensing Township, in Carbon County, Pennsylvania.

The drainage area of the project site is 1.84 acres, with existing slopes ranging from 10% to 26%, the site generally drains from south to north and eventually discharges to Aquashicola Creek. See Existing Conditions figure in Appendix E for site topographic information.

(2) The types, depth, slope, locations and limitations of the soils and geologic formations.

The Blue Mountain Interconnect site lies within the Bloomsburg Formation, according to the Pennsylvania Department of Conservation and Natural Resources (PADCNR). The Bloomsburg Formation is Silurian age, predominantly red shale and siltstone. United States Geological Survey (USGS) mapping indicates there are fault lines within the vicinity of the proposed meter station site.

Although the proposed meter station site falls within the approximate outlines of the Bloomsburg Formation, it is possible that other formations or rock types could occur in the vicinity of the meter station, due to the approximate nature of USGS maps.

Based on the Natural Resources Conservation Service (NRCS) Web Soil Survey, the surficial geology within the area of interest consists heavily of the Buchanan very stony loam, Meckesville channery loam and Meckesville very stony loam.

The Buchanan very stony loam has 8 to 25 percent slopes, is moderately well drained, has a high runoff class, and has a moderately low to moderately high rate of water transmission.

The Meckesville channery loam has 8 to 15 percent slopes, well drained, has a medium runoff class, and moderately high rate of water transmission.

The Meckesville very stony loam has 8 to 25 percent slopes, well drained, has a medium runoff class, and moderately high rate of water transmission.

The excerpt in Appendix C from Table E.1 in the PADEP Erosion and Sediment Pollution Control Program M These limitations have been addressed through site specific testing for infiltration rates which serve as the basis of design for stormwater BMPs.

(3) The characteristics of the project site, including the past, present and proposed land uses and the proposed alteration to the project site.

Aerial images depict the Blue Mountain Interconnect site and its surroundings as forested land. There are no known wetlands located near the property. The proposed site location existed over the past five years as predominantly forested land accessible by Blue Mountain Drive to the west of the property. In order to estimate runoff analysis conservatively, the existing predevelopment site was assumed to be 83% good condition woods, 12% meadow and 5% roadway. Under the proposed construction, the existing wooded areas will be turned into meadow. The runoff rate under the existing conditions was calculated based on this site land use.

The project proposes to construct a metering station on approximately 0.20 acres of gravel. The site will continue to drain from south to the north. The subsurface infiltration system will be installed to comply with regulatory stormwater requirements.

(4) An identification of the net change in volume and rate of stormwater from preconstruction hydrology to post construction hydrology for the entire project site and each drainage area.

See Section 4 of this report for details on net change in volume and rate of stormwater runoff from pre-construction to post construction.

The summary of these net changes is provided in the Tables 1 & 2.

Infiltration volume is provided up to the 2-year storm, and peak runoff rate does not exceed pre-construction rates (see column 'Maximum Allowable Proposed Peak') under the 1, 2, 10, 50, and 100 year/24-hour storm events.

Table 1: Peak Flow Summary

Recurrence Interval (yrs)	Existing Peak Flow (cfs)	Maximum Allowable Proposed Peak Flow (cfs)	Proposed Peak Q (cfs)	Proposed Less than Allowable? (Y/N)
1	1.21	1.21	1.15	Yes
2	1.78	1.78	1.62	Yes
5	3.19	3.19	2.87	Yes
10	5.17	5.17	4.57	Yes
25	8.95	8.95	7.95	Yes
50	12.92	12.92	11.93	Yes
100	17.83	17.83	17.22	Yes

Table 2: Volume Summary

Recurrence Interval (yrs)	Existing Volume (cf)	Proposed Unmitigated Volume from Model (cf)	Difference between Proposed and Existing (cf)	Proposed Basin and Infiltration Area Capacity (cf)	Adequate Infiltration Volume? (Y/N)
1	2,168	3,373	1,204	673 + 914 = 1,587	Yes
2	3,216	4,600	1,384	673 + 914 = 1,587	Yes

(5) An identification of the location of surface waters of this Commonwealth, which may receive runoff within or from the project site and their classification under Chapter 93 (relating to water quality standards).

The site drains to Aquashicola Creek, which in turn drains to the Lehigh River, see Figure 1. The site is part of the Aquashicola Creek watershed. Chapter 93.9d from the Pennsylvania Code indicates that Aquashicola Creek from source to Buckwha Creek is classified as "HQ-CWF", MF". HQ-CWF indicates the stream is high quality waters with cold water fishes maintenance or propagation, or both, of fish species including the family Salmonidae and additional flora and fauna which are indigenous to a cold water habitat. MF (migratory fishes) indicates the passage, maintenance and propagation of anadromous and catadromous fishes and other fishes which move to or from flowing waters to complete their life cycle in other waters.

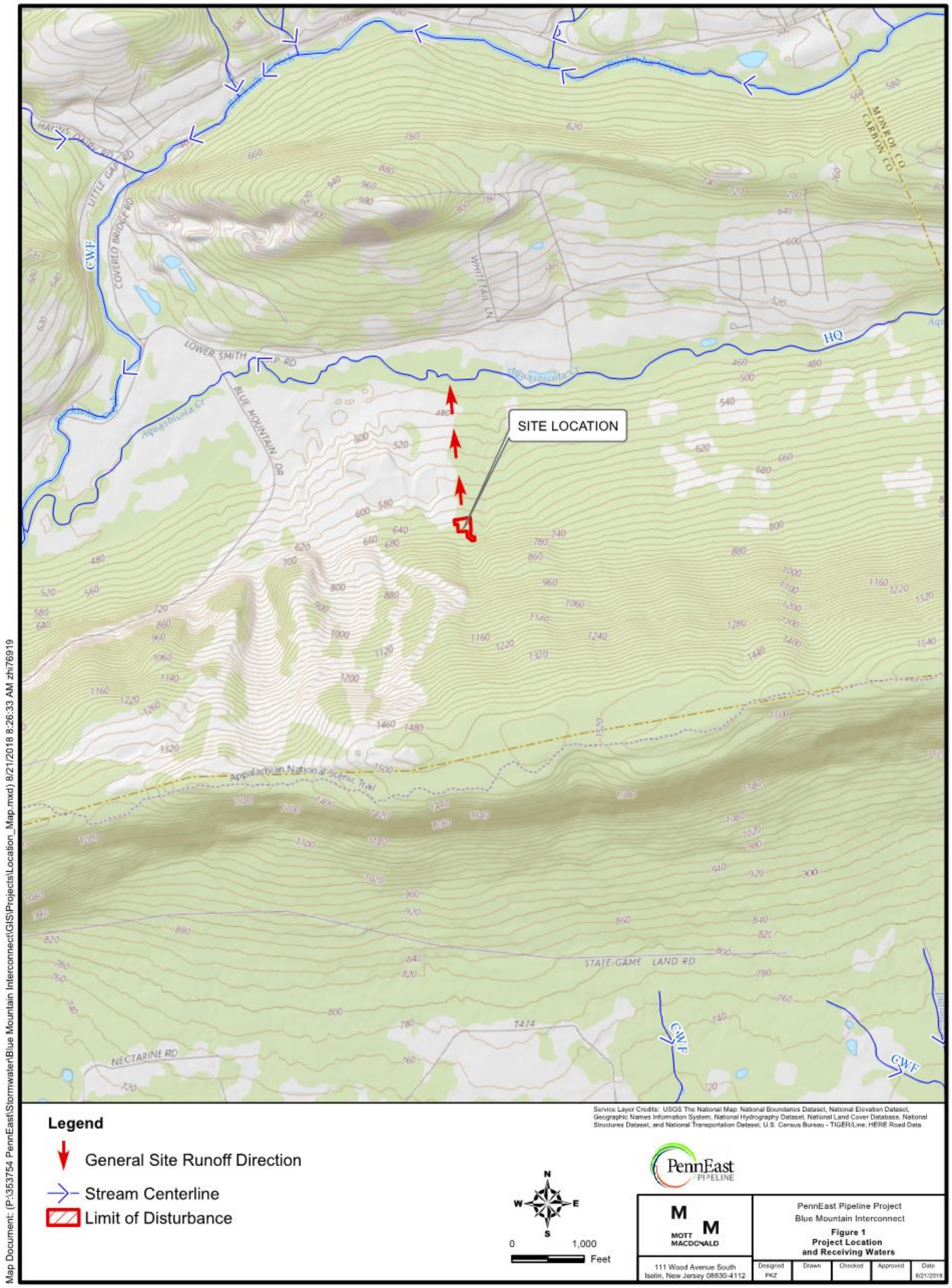

Figure 1: USGS Map showing project site and flow path to receiving waters

(6) A written description of the location and type of PCSM BMPs including construction details for permanent stormwater BMPs including permanent stabilization specifications and locations.

BMPs have been designed according to the recommendations set out in the Pennsylvania Stormwater BMP Manual, as follows:

Vegetated Swale: Swale 1 and Swale 2 are designed to collect the runoff from site and offsite areas that drain towards the proposed pad. Both swales are designed in accordance with Pennsylvania BMP to provide for 50% TSS removal rate. The swale will provide pretreatment from gravel surfaces on the site and reduce basin loading ratio. The swales will convey the 100-year storm event with a minimum of 6 inches of freeboard.

Subsurface infiltration basin: A subsurface infiltration basin will be constructed in the northern portion of the site. Runoff from the offsite area south of the site and the gravel pad drains to the basin. The basin temporarily stores the runoff to attenuate peak flows. The basin bottom will be sloped at 0.25% and will have an approximate base area of 1,571 square feet. The basin will consist 3 rows of 36 inch diameter varying length HDPE pipes with headers in a gravel bed. The infiltration basin will be constructed on uncompacted subgrade.

As per discussions with PA DEP areas receiving pre-treatment by passing through other BMPs such as vegetated swales and hydrodynamic separators may be factored out of the loading ratios. The recommended guideline in the PA BMP Manual is Impervious Loading Ratio of 5:1 and Total Loading Ratio of 8:1, which are achieved, see Table 3. It is also noted that the hydrologic calculations in Section 4 demonstrate that the basin performance requirements are met. Very little sediment load is anticipated as the site sees minimal vehicular traffic and some of the flow reaching the basin receives pre-treatment from vegetated swales. Properly implemented inspection and maintenance practices will determine the basin's performance.

Table 3: Basin Loading Ratios

BASIN ID	BASIN FLOOR AREA (ACRES)	TOTAL DRAINAGE AREA (ACRES)	INFLUENT IMPERVIOUS AREA (ACRES)	LOADING RATIO BASED ON TOTAL AREA	LOADING RATIO BASED ON INFLUENT IMPERVIOUS AREA
BASIN	0.04	2.28	0.10	2.5	2.5

In addition to structural BMPs, the follow non-structural PCSM BMPs are employed on the site:

- The site has been designed to minimize the area of disturbance, which minimizes impervious areas, and the extents of the gravel pad have been restricted to be minimum necessary for safe, effective operation of the station. Gravel was selected in lieu of asphalt for the pad area, the extents of the gravel were limited where possible to align with BMPs 5.7 – Reduce Impervious Cover.
- Existing drainage features and vegetated areas (forests and open space) have been preserved where possible and protected to the greatest extent practicable. By maintaining natural cover, runoff volume and peak flow increases are mitigated. Grading has been minimized, as previously discussed in accordance with BMP 5.6.1 Minimized Total Disturbed Area – Grading.

- In accordance with BMP 5.6.2 – Minimized Soil Compaction in Disturbed Areas, the site has been designed to minimize the area of disturbance, which minimizes soil compaction. Care will be taken to prevent the use of heavy machinery on stormwater BMPs and on areas of the site not being developed; the contractor will be required to prevent compaction of soils in areas that are occupied or to be occupied by PCSM BMPs.

See the Post-Construction Stormwater Management Plan drawing for location of infiltration site on site and construction details of infiltration basin, outlet control structure, inlets and level spreader.

(7) A sequence of PCSM BMP implementation or installation in relation to earth disturbance activities of the project site and a schedule of inspections for critical stages of PCSM BMP installation.

1. At least seven (7) days before starting any earth disturbance activities, the owner and/or operator shall notify the PADEP and Carbon County Conservation District by either telephone or certified mail of the intent to commence earth disturbance activities. Attendance at a pre-construction conference is required upon request of the PADEP.

2. At least three (3) days before starting any earth disturbance activities, contractors involved in those activities shall notify the Pennsylvania One Call system at 1-800-242-1776 to determine the location of existing subsurface utilities.

3. Install the rock construction entrance as shown on the ESC Plan.

4. Install compost filter sock sediment traps ST-1, ST-2 and ST-3 on the northerly end of the interconnect site, downslope of proposed disturbed area as shown on the ESC Plan. Compost filter socks CS-1, through CS-6 will be installed on the easterly and westerly limits of disturbance. Engineer will inspect installation of the compost sock sediment traps and compost filter socks prior to the start of clearing and grubbing operations.

5. Perform clearing and grubbing to those areas described in each stage of work. Remove excess topsoil from the Limits of Disturbance and stockpile off-site. The Contractor shall be responsible for ensuring that any off-site stockpile/waste areas have an E&S plan approved by the local conservation district or PADEP prior to being activated. After stripping topsoil, orange safety fencing will be installed at the perimeter of stormwater infiltration areas to prevent compaction of subgrade soils by heavy construction equipment.

6. Perform grading activities as described by proposed contours, notes, and details shown on the plan drawings. Install weighted filter tube in Swales 1 and 2 and maintain per BMP Maintenance Schedule in Section 7 of this report until the site has been stabilized. Per project specifications, additional temporary placement of compost filter sock may be necessary at the contractor's discretion, should accelerated erosion be encountered during grading activities.

7. Installation of subsurface stormwater infiltration system shall be coordinated with bulk filling operations. Engineer shall inspect the subgrade soils prior to installation of the geotextile fabric and stone base. Install crushed stone base and perforated HDPE piping in accordance with the project specifications. Fill the areas between the pipe runs and the edges with crushed stone. Coordinate with the Engineer for final inspection of the installed subsurface infiltration system before backfilling. Contractor shall inspect the compost filter sock sediment traps daily during filling operations and installation of the stormwater infiltration system and remove sediment when it reaches 1/3 of the height of the socks.

8. The proposed 4-inch Blue Mountain Lateral pipeline will be installed to the interconnect pad area. Additional temporary placement of compost filter sock may be necessary at the Engineer's or contractor's discretion should accelerated erosion be encountered during trenching, pipeline placement and backing.

9. Grades will be left 1 foot below top of stormwater inlet grate elevations at IN-1, IN-2 and IN-3 to prevent silt-laden stormwater runoff from entering the subsurface piping. Inlet filter bags shall be installed on inlet grates and checked per BMP Maintenance Schedule. Install PCSM BMPs in accordance with proposed contours, notes, and details shown on the E&SCP & PCSM Plan Drawings. Once the site has been stabilized and inspected by the Engineer, grading shall be brought to final elevations.
10. Gravel shall be installed on the pad area and access road. Gravel shall be fine graded and compacted.
11. Place topsoil in areas to be vegetated. Fine grade topsoil, apply fertilizer and seed. At the completion of seeding, install erosion control blankets over seeded areas in accordance with this plan.
12. Temporary BMPs installed by contractor during grading shall remain in place until final stabilization has occurred with a minimum uniform 70% perennial vegetative cover or other permanent non-vegetative cover, with a density sufficient to resist accelerated surface erosion and subsurface characteristics sufficient to resist sliding and other movements.
13. Upon achieving site stabilization, excavate accumulated sediment in traps. Repair, regrade, reseed, and mulch any bare soil areas as needed to stabilize the surface.
14. Clean work area of any debris created during construction activities.

(8) Supporting calculations.

See Appendix B for supporting calculations for hydraulic analysis and BMP design.

(9) Plan drawings.

See Post-Construction Stormwater Management Plan drawing in Appendix I.

(10) A long-term operation and maintenance schedule, which provides for inspection of PCSM BMPs, including the repair, replacement, or other routine maintenance of the PCSM BMPs to support its proper function and operation. The program must provide for completion of a written report documenting each inspection and BMP repair and maintenance activities and how access to the PCSM BMPs will be provided.

A maintenance program that provides for routine inspection, as well as repair and replacement as necessary, is essential to effective and efficient operation of the proposed stormwater BMPs. Implementation of the following maintenance plan is a key component in achieving the intent of this PCSM Plan and minimizing negative impacts of stormwater runoff from the proposed facilities. The permittee and any co-permittees shall be responsible for long-term operation and maintenance of the stormwater BMPs unless a different person is identified in the Notice of Termination and has agreed to long-term operation and maintenance of the stormwater BMPs. A formal long-term operation and maintenance plan will be provided in subsequent stages of the undertaking, outlining additional details of maintenance schedules, procedures and reporting requirements.

PennEast will be responsible for the proper construction, stabilization, and maintenance of erosion and sediment controls and post-construction stormwater management facilities which include the vegetated areas. Vegetated areas will be inspected for erosion, distressed vegetation and bare ground. General maintenance will include the regular removal of debris and litter to help prevent possible damage to vegetated areas. Growth of woody vegetation will be controlled by mowing (approximately two times per year) and clearing as appropriate.

Infiltration basin:

- *Inlets will be inspected and cleaned at least two times per year and after runoff events (>1 in rainfall depth).*

- *The basin will be inspected after runoff events to make sure that runoff drains down within 72 hours. The basin will also be inspected for accumulation of sediment, damage to outlet control structures, erosion control measures, and signs of water contamination/spills.*
- *Inspect for litter*

Vegetated swale:

Maintenance activities to be performed annually and within 48 hours after every major storm event

(> 1 inch rainfall depth).

- *Inspect and correct erosion problems, damage to vegetation, and sediment and debris accumulation (address when > 3 inches at any spot or covering vegetation).*
- *Inspect vegetation on side slopes for erosion and formation of rills or gullies, correct as needed.*
- *Inspect for pools of standing water; dewater and discharge to an approved location and restore to design grade.*
- *Mow and trim vegetation to provide safety, aesthetics, proper swale operation, or to suppress weeds and invasive vegetation; dispose of cuttings in a local composting facility; mow only when swale is dry to avoid rutting.*
- *Inspect for litter; remove prior to mowing.*
- *Inspect for uniformity in cross-section and longitudinal slope, correct as needed.*
- *Inspect swale inlet (curb cuts, pipes, etc.) and outlet for signs of erosion or blockage, correct as needed.*

Maintenance activities to be performed as needed:

- Plant alternative grass species: Standard Upland ROW, Residential, Clover/Food Plot with ROW as listed in the E&S site restoration plans in the event of unsuccessful establishment
- *Reseed bare areas; install appropriate erosion control measures when native soil is exposed, or erosion channels are forming.*
- *Rototill and replant swale if draw down time is more than 48 hours.*
- *Inspect and correct check dams when signs of altered water flow (channelization, obstructions, erosion, etc.) are identified.*
- *Water during dry periods, fertilize, and apply pesticide only when absolutely necessary*

Maintenance under winter conditions:

- *Inspect swale immediately after the spring melt, remove residuals (e.g. sand) and replace damaged vegetation without disturbing remaining vegetation.*
- *If roadside or parking lot runoff is directed to the swale, mulching and/or soil aeration/manipulation may be required in the spring to restore soil structure and moisture capacity and to reduce the impacts of de-icing agents.*
- *Use nontoxic, organic de-icing agents, applied either as blended, magnesium chloride-based liquid products or as pretreated salt.*
- *Use salt-tolerant vegetation in swales.*

Infiltration basin:

- *Inlets will be inspected and cleaned at least two times per year and after runoff events (> 1 inch rainfall depth).*

- *Vehicles will not be parked or driven on the basin, and excessive compaction by mowers will be avoided.*
- *The basin will be inspected after runoff events to make sure that runoff drains down within 72 hours. The basin will also be inspected for accumulation of sediment, damage to outlet control structures, erosion control measures, signs of water contamination/spills, and slope stability in the berms. Accumulated sediment will be removed from the basin as required, the original cross section of the basin will be restored, and sediment will be properly disposed of.*

(11) Procedures which verify that the proper measures for recycling or disposal of materials associated with or from the PCSM BMPs are in accordance with Department laws, regulations and requirements.

The responsible party (construction contractor) for earth disturbance activities must verify that proper mechanisms are in place to control waste materials. Construction wastes include, but are not limited to, excess soil materials, damaged netting or matting, sanitary wastes, and general trash that could adversely affect or impact water quality. Measures for housekeeping of the site, materials management, and litter control should be planned and implemented throughout the life of the project.

The contractor/operator will remove, recycle or dispose from the site excess construction materials and wastes in accordance with PADEP's Solid Waste Management Regulations at 25 PA. Code 260.1 et seq., 271.1 et seq. The contractor/operator will not illegally bury, dump, or discharge any building material or wastes at the site.

Sediment removed from erosion control measures or facilities and other soils deemed unsuitable for use as fill shall be stabilized and disposed of offsite at a licensed disposal facility. Offsite disposal must comply with local, county, state and federal rules, regulations, and laws.

(12) An identification of naturally occurring geologic formations or soil conditions that may have the potential to cause pollution after earth disturbance activities are completed and PCSM BMPs are operational and development of a management plan to avoid or minimize potential pollution and its impacts.

Based on NRCS Web Soil Survey, the existing soils have a reaction of acidity or alkalinity (pH levels). Upon review of PADCNR's "Geologic Units Containing Potentially Significant Acid-Producing Sulfide Minerals" map, this valve site lies in a known region containing acid-producing soils. Further soil testing will be required to determine potential limitations and countermeasures.

(13) An identification of potential thermal impacts from post construction stormwater to surface waters of this Commonwealth including BMPs to avoid, minimize or mitigate potential pollution from thermal impacts.

Infiltration of runoff collected in the subsurface infiltration basin is anticipated to mitigate thermal impacts from post-construction stormwater. Because the infiltrations basin is subsurface it will further mitigate thermal impacts. It is not expected that runoff collected in the infiltration basin and discharged overland to the receiving water will be retained for more than 24 hours, thus thermal impacts of discharge from infiltration basin are not expected. Existing shade trees are being preserved to the greatest extent possible, and no riprap and concrete channels have been proposed, to minimize the heat transfer to the runoff.

(14) A riparian forest buffer management plan when required under §102.14 (relating to riparian buffer requirements).

The project is not located within 150 feet of a perennial or intermittent river, stream, or creak, or lake, pond, or reservoir. The project is located within a watershed of an Exceptional Value or High Quality, however the project will eliminate the net change in stormwater volume, rate and quality for stormwater events up to and including the 2-year/24-hour storm. The project will use various *structural and non-structural BMPs to meet the water quantity and quality requirements. The peak runoffs will be attenuated with an infiltration trench. The stormwater will be routed through structural and non-structural BMPs and discharged overland towards the stream which is greater than 150' away from the site. The project falls into the definition of a non-discharge alternative. See Section 4 for compliance calculations and descriptions. Therefore, a riparian forest buffer management plan is not required.*

(15)Additional information requested by the Department.

Additional information requested by the Department will be provided.

3.1.2 Post Construction Stormwater Management Plan Stormwater Analysis

This section addresses the portion of the regulations pertaining to the site-specific stormwater analysis.

(g) PCSM Plan Stormwater analysis. Except for regulated activities that require site restoration or reclamation, and small earth disturbance activities identified in subsection (n), PCSM Plans for proposed activities requiring a permit under this chapter require the following additional information:

(1) Predevelopment site characterization and assessment of soil and geology including appropriate infiltration and geotechnical studies that identify location and depths of test sites and methods used.

Subsurface Infiltration tests using a double ring infiltrometer in the four test pits were conducted at the location of the proposed infiltration basin. At least one Infiltration test was conducted at an elevation equal to the proposed basin invert. The infiltration tests at BMTP-8 and BMTP-9 (which fall within the infiltration basin footprint) were conducted at 4.0 and 3.1 feet below existing grade. Upon completion of the infiltration testing, the test location was excavated an additional 2 feet to further identify subsurface material and look for evidence of groundwater. Initial proposed basin invert elevation was set at 639.0 feet. The test pit elevations are summarized in a Table 4:

Table 4: Test Pit Summary

Test Pit No.	Existing Grade Elevation (feet)	Proposed BMP Invert (feet)	Infiltration Test Elevation (feet)	Excavation Depth Elevation (feet)	Depth to High Groundwater (feet)
BMTP-6	649.0	639.0	646.5	644.5	No evidence of high groundwater observed
BMTP-7	652.4	639.0	649.6	647.6	No evidence of high groundwater observed
BMTP-8	642.7	639.0	638.7	636.7	No evidence of high groundwater observed
BMTP-9	643.2	639.0	640.1	638.1	No evidence of high groundwater observed

Test Pit BMTP-6 was excavated to 4.5 feet below existing grade on May 17, 2018. Infiltration testing was performed at this location 2.5 feet below existing grade to maintain two feet of separation from the decomposed rock layer. No restrictive zones or bedrock were encountered within 2.0 feet of the testing depth. Two tests were performed at this location.

Test Pit BMTP-7 was excavated to 4.8 feet below existing grade on May 17, 2018. Infiltration testing was performed at this location 2.8 feet below existing grade to maintain two feet of separation from *the decomposed rock layer. No restrictive zones or bedrock were encountered within 2.0 feet of testing depth. Two tests were performed at this location.*

Test Pit BMTP-8 was excavated to 6.0 feet below existing grade on June 15, 2018. Infiltration testing was performed at this location 4.0 feet below existing grade to maintain two feet of separation from the decomposed rock layer. No restrictive zones or bedrock were encountered within 2.0 feet of testing depth. Two tests were performed at this location.

Test Pit BMTP-9 was excavated to 5.1 feet below existing grade on June 15, 2018. Infiltration testing was performed at this location 3.1 feet below existing grade to maintain two feet separation from the decomposed rock layer. No restrictive zones or bedrock were countered within 2.0 feet of testing depth.

The boring location plan and proposed test pit location plan can be found on PCSM plan in Appendix I, drawing number 028-03-06-001.

The results of the infiltration tests are summarized as follows:

Table 5: Infiltration Test Summary

Test Pit	Test #1	Test #2	Final Rate Used
BMTP-6	0.25 inch/hr	0.25 inch/hr	0.25 inch/hr
BMTP-7	0.50 inch/hr	0.25 inch/hr	0.38 inch/hr
Subsurface Infiltration Basin			
BMTP-8	6.60 inch/hr	5.40 inch/hr	6.00 inch/hr
BMTP-9	3.00 inch/hr	6.00 inch/hr	4.50 inch/hr
Observed Overall Rate			5.25 inch/hr
Design Rate (Factor of Safety of 2)			2.63 inch/hr

(2) Analysis demonstrating that the PCSM BMPs will meet the volume reduction and water quality requirements specified in an applicable Department approved and current Act 167 stormwater management watershed plan; or manage the net change for storms up to and including the 2-year/24-hour storm event when compared to preconstruction runoff volume and water quality. The analysis for the 2-year/24-hour storm event shall be conducted using the following minimum criteria:

The project site is located in Carbon County, in the Aquashicola Creek watershed, which does not have an Act 167 Stormwater Management Plan. As such, the applicable runoff volume requirements are to manage the net change in volume between pre-construction and post-construction, for storms up to and including the 2-year/24-hour storm event.

Please see Section 4 of this report for details on the pre-development and post-development runoff volume calculations with detailed calculations provided in Appendix B.

i. **Existing predevelopment non-forested pervious areas must be considered meadow in good condition or its equivalent except for repair, reconstruction or restoration of roadways or rail lines, or construction, repair, reconstruction or restoration of utility infrastructure when the site will be returned to existing condition.**

The existing pre-developed site is mainly good condition woods with an area of grass small roadway. For the purposes of hydraulic calculations, existing onsite grass was assumed to be meadow.

ii. **When the existing project site contains impervious area, 20% of the existing impervious area to be disturbed must be considered meadow in good condition or better, except for repair, reconstruction or restoration of roadways or rail lines, or construction, repair, reconstruction, or restoration of utility infrastructure when the site will be returned to existing condition.**

Not applicable. The existing pre-development site is mainly good condition woods with an area of grass. There is a small impervious area representing part of an existing access road, but it is not being disturbed by this project.

iii. **When the existing site contains impervious area and the existing site conditions have public health, safety or environmental limitations, the applicant may demonstrate to the Department that it is not practicable to satisfy the requirement in subparagraph (ii), but the stormwater volume reduction and water quality treatment will be maximized to the extent practicable to maintain and protect existing water quality and existing and designated uses.**

Not applicable. The stormwater volume reduction and water quality treatment requirements are achieved.

iv. **Approaches other than that required under paragraph (2) may be proposed by the applicant when the applicant demonstrates to the Department that the alternative will either be more protective than required under paragraph (2) or will maintain and protect existing water quality and existing and designated uses by maintaining the site hydrology, water quality, and erosive impacts of the conditions prior to initiation of any earth disturbance activities.**

Not applicable.

(3) Analysis demonstrating that the PCSM BMPs will meet the rate requirements specified in an applicable Department approved and current Act 167 stormwater management watershed plan; or manage the net change in peak rate for the 2, 10, 50, and 100 year/24-hour storm events in a manner not to exceed preconstruction rates.

The project site is located in Carbon County, in the Aquashicola Creek watershed. According to PADEP's eMapPA,, Carbon County does not have an Act 167 Stormwater Management Plan. As such, the applicable requirement is that the post-development peak runoff rate must not exceed pre-development peak runoff rate under the 2-, 10-, 50-, and 100-year/24-hour storm events.

The peak runoff rate requirements are achieved; summarized in the table below. See Section 4 of this report for details on the pre-development and post-development peak runoff rate calculations.

i. **Hydrologic computations or a routing analysis are required to demonstrate that this requirement has been met.**

See Section 4 of this report for details on hydrologic computations that demonstrate that runoff rate requirements have been met.

ii. **Exempt from this requirement are Department- approved direct discharges to tidal areas or Department-approved no detention areas.**

Not applicable. Project site does not discharge to tidal areas or no-detention areas.

iii. **Approaches other than that required under paragraph (3) may be proposed by the applicant when the applicant demonstrates to the Department that the alternative will either be more protective than required under paragraph (3) or will maintain and**

protect existing water quality and existing and designated uses by maintaining the preconstruction site hydrologic impact.

Not applicable. The requirements of paragraph (3) have been met.

(4) Identification of the methodologies for calculating the total runoff volume and peak rate of runoff and provide supporting documentation and calculations.

See Section 4 of this report for details on the pre-development and post-development peak runoff rate and total runoff volume calculation methodology, which was completed using TR-55 methodology implemented by Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016. See Appendix B for calculation documentation.

(5) Identification of construction techniques or special considerations to address soil and geologic limitations.

Methods to address potential soil limitations have been provided on the PCSM plans.

(h) PCSM implementation for special protection waters. To satisfy the anti-degradation implementation requirements in §93.4c(b) (relating to implementation of anti-degradation requirements), an earth disturbance activity that requires a permit under this chapter and for which any receiving water that is classified as High Quality or Exceptional Value under Chapter 93, the person proposing the activity shall, in the permit application, do the following:

(1) Evaluate and include non-discharge alternatives in the PCSM Plan unless a person demonstrates that non-discharge alternatives do not exist for the project.

(2) If the person makes the demonstration in paragraph (1) that non-discharge alternatives do not exist for the project, the PCSM Plan must include ABACT, except as provided in §93.4c(b)(1)(iii).

(3) For purposes of this chapter, non-discharge alternatives and ABACT and their design standards are listed in the Pennsylvania Stormwater Best Management Practices Manua,l Commonwealth of Pennsylvania, Department of Environmental Protection, No. 363-0300-002 (December 2006), as amended and updated.

The project will eliminate the net change in stormwater volume, rate and quality for stormwater events up to and including the 2-year/24-hour storm. The project will use various structural and non-structural BMPs to meet the water quantity and quality requirements. The peak runoffs will be attenuated with subsurface infiltration basin. The stormwater will be routed through a series of structural and non-structural BMPs and discharged overland towards snow sow making pond located approximately 500 feet northwest. Therefore, the project falls into definition of nondischarge alternative. See Section 4 for compliance calculations and description.

4 Hydrologic and Hydraulic Analysis

This Section outlines the hydrologic calculations that were performed in order to design the stormwater BMPs for the Blue Mountain Interconnect site, and to confirm that requirements for stormwater runoff volume and peak rate would be met.

4.1 Existing Conditions

The total drainage area to the point of analysis including site and offsite areas is 4.71 acres of forested, paved, and grassed land, of which the project site is 1.84 acres. In general, the gravel pad and a small offsite area slope drain southeast to northwest, which the northwestern portion of the site drains towards the southeast. The onsite soils were identified using the USDA's Web Soil Survey. The project site consists of primarily channery and very stony loam, which is Hydrologic Soil Group C (see Appendix C for a breakdown of existing condition soils type and curve numbers). Existing condition curve numbers were assigned as per Table 2-2a from USDA's TR-55 "Urban Hydrology for Small Watersheds" (see Appendix B). The time of concentration was calculated using TR-55 methodology, and the routing is shown in the Existing Conditions figure in Appendix E. For times of concentration less than 5 minutes, a minimum time of concentration of 5 minutes was assumed.

Under existing conditions, the land use breakdown is given in Table 6. The drainage area boundaries are shown in the Existing Conditions figure in Appendix E.

Table 6: Existing Conditions Land Use

DA	Cover	Soils	HSG	Area (sf)	Area (Ac)	CN	CN*Area	Weighted CN
SITE	MEAD	MbC2	C	856	0.020	71	1.40	71.0
SITE	MEAD	McD	C	45	0.001	71	0.07	71.0
	MEAD Total				**0.021**		**1.47**	**71.0**
SITE	WO	BhD	C/D	8,753	0.201	70	14.07	70.0
SITE	WO	MbC2	C	2,788	0.064	70	4.48	70.0
SITE	WO	McD	C	5,415	0.124	70	8.70	70.0
	WO Total				**0.389**		**27.25**	**70.0**
SITE Total					**0.410**		**28.72**	**70.1**
SITE-BYP	IMP/GRAVEL	MbC2	C	1,653	0.038	98	3.72	98.0
SITE-BYP	IMP/GRAVEL	McD	C	169	0.004	98	0.38	98.0
	IMP/GRAVEL Total				**0.042**		**4.10**	**98.0**
SITE-BYP	MEAD	MbC2	C	6,262	0.144	71	10.21	71.0
	MEAD Total				**0.144**		**10.21**	**71.0**
SITE-BYP	WO	BhD	C/D	14,379	0.330	70	23.11	70.0
SITE-BYP	WO	MbC2	C	2,666	0.061	70	4.28	70.0
SITE-BYP	WO	McD	C	22	0.000	70	0.03	70.0
	WO Total				**0.392**		**27.43**	**70.0**
SITE-BYP Total					**0.577**		**27.43**	**47.5**
SITE Total					**0.987**		**70.45**	**71.4**
OFFSITE-BASIN	IMP/GRAVEL	BhD	C/D	65	0.001	98	0.15	98.0
OFFSITE-BASIN	IMP/GRAVEL	McD	C	2,077	0.048	98	4.67	98.0
	IMP/GRAVEL Total				**0.049**		**4.82**	**98.0**
OFFSITE-BASIN	MEAD	KvF	A	10,964	0.252	30	7.55	30.0

DA	Cover	Soils	HSG	Area (sf)	Area (Ac)	CN	CN*Area	Weighted CN
OFFSITE-BASIN	MEAD	DeF	A	4,489	0.103	30	3.09	30.0
	MEAD Total				**0.355**		**10.64**	**30.0**
OFFSITE-BASIN	WO	BhD	C	12,347	0.283	70	19.84	70.0
OFFSITE-BASIN	WO	McD	C	22,151	0.509	70	35.60	70.0
OFFSITE-BASIN	WO	KvF	A	30,518	0.701	30	21.02	30.0
	WO Total				**1.493**		**76.46**	**51.2**
OFFSITE-BASIN Total					**1.896**		**91.92**	**48.5**
OFFSITE	IMP/DIRT	McD	C	331	0.008	87	0.66	87.0
	IMP/DIRT Total				**0.008**		**0.66**	**87.0**
OFFSITE	IMP/GRAVEL	BhD	C/D	546	0.013	98	1.23	98.0
OFFSITE	IMP/GRAVEL	McD	C	1,731	0.040	98	3.89	98.0
	IMP/GRAVEL Total				**0.052**		**5.12**	**98.0**
OFFSITE	MEAD	MbC2	A	2,108	0.048	30	1.45	30.0
OFFSITE	MEAD	KvF	A	23	0.001	30	0.02	30.0
	MEAD Total				**0.049**		**1.47**	**30.0**
OFFSITE	WO	BhD	C/D	27,673	0.635	70	44.47	70.0
OFFSITE	WO	MbC2	C	2,217	0.051	70	3.56	70.0
OFFSITE	WO	McD	C	3,669	0.084	70	5.90	70.0
OFFSITE	WO	KvF	A	41,438	0.951	30	28.54	30.0
	WO Total				**1.722**		**82.47**	**47.9**
OFFSITE Total					**1.830**		**89.72**	**49.0**
Grand Total					**4.714**		**252.08**	**53.5**

Precipitation data was obtained from NOAA Atlas 14. The rainfall data is summarized in Table 7, these rainfall depths were applied to the model as a NRCS Type II rainfall.

Table 7: 24-Hour Design Rainfall Depths

Return Period (years)	Rainfall (inches)
1	2.63
2	3.15
5	3.92
10	4.58
25	5.61
50	6.55
100	7.62

4.2 Proposed Conditions

For the purposes of determining peak flow and volume reduction, gravel (compacted crushed stone) is considered to be impervious, thus it has been modeled as such in the hydraulic calculations. For design purposes, it was assumed that the entire equipment pad was compacted. Infiltration basin and swales were designed to meet the regulatory stormwater requirements. Areas that will be restricted from vehicular traffic will be considered to be pervious. These areas were designed to provide additional infiltration volume that accounts for 40% void space within the surface gravel layer. Runoff from the site and offsite areas to the south will be intercepted with vegetated swales and routed to the underground infiltration facility. The outflow from the basin will be discharged overland via a level spreader.

Under proposed conditions, the land use breakdown is given in Table 8. The drainage area boundaries are shown in the Proposed Conditions figure in Appendix F.

Table 8: Proposed Condition Land Use

DA	Cover	Soils	HSG	Area (sf)	Area (Ac)	CN	CN*Area	Weighted CN
SITE-BASIN	IMP/GRAVEL	BhD	C/D	1,757	0.040	98	3.95	98.0
SITE-BASIN	IMP/GRAVEL	MbC2	C	2,308	0.053	98	5.19	98.0
SITE-BASIN	IMP/GRAVEL	McD	C	356	0.008	98	0.80	98.0
	IMP/GRAVEL Total				**0.102**		**9.95**	**98.0**
SITE-BASIN	GRAVEL	BhD	C/D	2,781	0.064	89	5.68	89.0
SITE-BASIN	GRAVEL	MbC2	C	145	0.003	89	0.30	89.0
SITE-BASIN	GRAVEL	McD	C	580	0.013	89	1.19	89.0
	GRAVEL Total				**0.080**		**7.16**	**89.0**
SITE-BASIN	MEAD	BhD	C/D	4,229	0.097	71	6.89	71.0
SITE-BASIN	MEAD	MbC2	C	1,221	0.028	71	1.99	71.0
SITE-BASIN	MEAD	McD	C	4,524	0.104	71	7.37	71.0
	MEAD Total				**0.229**		**16.26**	**71.0**
SITE-BASIN Total					**0.411**		**33.37**	**81.2**
SITE-BYP	IMP/GRAVEL	MbC2	C	2,438	0.056	98	5.48	98.0
SITE-BYP	IMP/GRAVEL	McD	C	169	0.004	98	0.38	98.0
	IMP/GRAVEL Total				**0.060**		**5.86**	**98.0**
SITE-BYP	MEAD	BhD	C/D	14,378	0.330	71	23.43	71.0
SITE-BYP	MEAD	MbC2	C	8,108	0.186	71	13.22	71.0
SITE-BYP	MEAD	McD	C	22	0.000	71	0.04	71.0
	MEAD Total				**0.517**		**36.69**	**71.0**
SITE-BYP Total					**0.577**		**42.55**	**73.8**
SITE Total					0.988		75.92	76.9
OFFSITE-BASIN	IMP/GRAVEL	BhD	C/D	65	0.001	98	0.15	98.0
OFFSITE-BASIN	IMP/GRAVEL	McD	C	2,077	0.048	98	4.67	98.0
	IMP/GRAVEL Total				**0.049**		**4.82**	**98.0**
OFFSITE-BASIN	MEAD	BhD	C/D	1,597	0.037	71	2.60	71.0
OFFSITE-BASIN	MEAD	McD	C	14,422	0.331	71	23.51	71.0
OFFSITE-BASIN	MEAD	KvF	A	10,964	0.252	30	7.55	30.0
OFFSITE-BASIN	MEAD	DeF	A	4,489	0.103	30	3.09	30.0
	MEAD Total				**0.722**		**36.75**	**50.9**
OFFSITE-BASIN	WO	BhD	C/D	10,729	0.246	70	17.24	70.0
OFFSITE-BASIN	WO	McD	C	7,729	0.177	70	12.42	70.0
OFFSITE-BASIN	WO	KvF	A	30,518	0.701	30	21.02	30.0
	WO Total				**1.124**		**50.68**	**45.1**
OFFSITE-BASIN Total					**1.896**		**92.25**	**48.7**
OFFSITE	IMP/DIRT	McD	C	331	0.008	87	0.66	87.0
	IMP/DIRT Total				0.008		0.66	87.0
OFFSITE	IMP/GRAVEL	BhD	C/D	2,276	0.052	98	5.12	98.0
	IMP/GRAVEL Total				0.052		5.12	98.0

DA	Cover	Soils	HSG	Area (sf)	Area (Ac)	CN	CN*Area	Weighted CN
OFFSITE	MEAD	BhD	C/D	1,470	0.034	71	2.40	71.0
OFFSITE	MEAD	MbC2	C	4,325	0.099	71	7.05	71.0
OFFSITE	MEAD	McD	C	3,668	0.084	71	5.98	71.0
OFFSITE	MEAD	KvF	A	23	0.001	30	0.02	30.0
	MEAD Total				**0.218**		**15.44**	**70.9**
OFFSITE	WO	BhD	C/D	26,203	0.602	70	42.11	70.0
OFFSITE	WO	McD	C	1	0.000	70	0.00	70.0
OFFSITE	WO	KvF	A	41,438	0.951	30	28.54	30.0
	WO Total				1.553		70.65	45.5
OFFSITE Total					**1.823**		**91.21**	**50.0**
Grand Total					**4.714**		**260.04**	**55.2**

4.3 Model Development

A model was developed in the Hydraflow Hydrographs extension for AutoCAD Civil 3D v2016 to simulate existing and proposed flow. This model was used to determine the existing and proposed runoff volumes and peak runoff rates. The basin's outlet control structure will be constructed with the lowest opening 0.5" above the basin invert, to drain completely within 72 hours at the design infiltration rate of 2.63 in/hr, based on the observed rate of 5.25 in/hr with a factor of safety 2 applied. The proposed flows were routed through the basin and the attenuated flow rates calculated. Model inputs and summary and output reports can be found in Appendix H.

4.4 Stormwater Management Rules Compliance

The project meets the requirements listed under the Pennsylvania code for Post-Construction Stormwater Management (PCSM) Section 102.8 for runoff volume and peak rate.

4.4.1 Volume Control

A subsurface stormwater basin is utilized to provide storage and infiltration to prevent any increases in stormwater runoff volume, up to and including the 2-year/24-hour storm event using the prescribed land use characteristics, thus it meets the PADEP requirements.

The project is subject to the volume control Design Storm Method that requires for storms up to the 2-year storm there be no increase in runoff volume as a result of this project. Because there is no other mechanism such as irrigation or rainwater harvesting, for releasing the required retention volume, infiltration capacity of subsurface infiltration basin will be employed to remove the required runoff volume.

This was accomplished by providing the required volume below the low outlet of the basin's outlet control structure and using additional storage capacity with the stone pad, as shown in Table 9. Basin drain time is shown in Table 11.

The low orifice in the infiltration basin was placed above the invert, providing the required infiltration volume (See Appendix B). Additional volume is infiltrated by the uncompacted gravel pad areas within the site. As such, regulatory volume control requirements are met. The required volume was achieved as follows:

Table 9: Volume Summary

Recurrence Interval (yrs)	Existing Volume (cf)	Proposed Unmitigated Volume from Model (cf)	Difference between Proposed and Existing (cf)	Proposed Basin and Infiltration Area Capacity (cf)	Adequate Infiltration Volume? (Y/N)
1	2,168	3,373	1,204	673 + 914 = 1,587	Yes
2	3,216	4,600	1,384	673 + 914 = 1,587	Yes

Table 10: Basin Drain Time

Basin Depth (ft)	Basin 100-Yr Dewatering Depth Adjusted for Rock Porosity (ft)	Design Infiltration Rate (in/hr)	Drain Time (hrs)	Allowable Drain Time (hrs)	Drain Time less than allowable
3.5	3.16	2.63	11.77	72	Yes

4.4.2 Peak Flow Control

A stormwater infiltration basin is utilized to provide storage attenuation to prevent any increases in the rate of stormwater runoff, thus it meets the PADEP requirements. The model indicates that the basin will result in a peak runoff rate under the 2, 10, 50, and 100 year/24-hour storm events that does not exceed preconstruction rates.

The attenuated flows are summarized in Table 11.

Table 11: Peak Flows Summary

Recurrence Interval (yrs)	Existing Peak Flow (cfs)	Maximum Allowable Proposed Peak Flow (cfs)	Proposed Peak Q (cfs)	Proposed Less than Allowable? (Y/N)
1	1.21	1.21	1.15	Yes
2	1.78	1.78	1.62	Yes
5	3.19	3.19	2.87	Yes
10	5.17	5.17	4.57	Yes
25	8.95	8.95	7.95	Yes
50	12.92	12.92	11.93	Yes
100	17.83	17.83	17.22	Yes

4.4.3 Water Quality

Soil classifications were obtained from the USDA Web Soil Survey to estimate if there would be adequate infiltration.

The water quality requirements were met through basin infiltration of a minimum of 0.5” of runoff from the impervious area, equivalent to 479 cf. This was accomplished by providing the required volume below the low outlet of the basin's outlet control structure. Compliance with water quality requirements is demonstrated using BMP Worksheet 10 in Appendix C.

BMPs utilized to comply with water quality requirements include the following:

- 6.4.8 Vegetated Swale. Vegetated swales will be constructed along the south side to convey the flow from site and offsite areas to infiltration basin.
- 6.7.2 Landscape Restoration. Disturbed area outside the proposed gravel pad and access drive will be replanted with native vegetation.
- 6.7.3 Soil Amendment and Restoration. The characteristic soil affected by compaction will be restored by ripping and addition of amendments such as compost or other material.

4.4.4 Swale Design

Pipe and swale capacities were sized based on output flows from the model as well as Rational Method calculations, and the Manning's equation was used to select the appropriate size for each location. Sizing calculations are provided in Appendix B.

Swale capacities were designed based on the requirements set out in the PADEP Erosion and Sediment Pollution Control Manual. Sizing calculations are provided in Appendix B.

Level spreader sizing was based upon requirements defined in the PADEP Erosion and Sediment Pollution Control Manual. The proposed level spreader has been placed on a grassy area.

5 Offsite Discharge Analysis

Attenuated peak flows from the basin are discharged through level spreader towards snow making pond located approximately 500 feet northwest as shown in the Off-site Stormwater Discharge Plan (see Appendix J). The point of discharge from the site has been designed to be stable so as not to impact offsite areas, see calculations on Page 46 in Appendix B. Therefore, the project falls into definition of nondischarge alternative. The nondischarge alternative is defined in §102.1 as environmentally sound and cost-effective BMPs that individually or collectively eliminate the net change in stormwater volume, rate and quality for storm events up to and including the 2-year/24-hour storm when compared to the stormwater rate, volume and quality prior to the earth disturbance activities to maintain and protect the existing quality of the receiving surface waters of this Commonwealth.

The Blue Mountain Interconnect project falls into definition of nondischarge alternative. As such, no downstream properties are affected by the proposed work and there is no downstream erosion. Proper construction and maintenance requirements are in place to support continued performance of BMPs. The overall peak flow and runoff volume has been reduced while maintaining the overall existing drainage patterns, thus fulfilling PADEP off-site discharge requirements.

6 Conclusion

As demonstrated in the sections above, the design of the proposed stormwater BMPs for the Blue Mountain Interconnect site for the PennEast pipeline allow the proposed project to comply with the applicable regulatory requirements under Pennsylvania Code Section 102.8.

Appendices

A. Rainfall Data

NOAA Atlas 14, Volume 2, Version 3
Location name: Lower Towamensing Twp, Pennsylvania, USA*
Latitude: 40.8182°, Longitude: -75.505°
Elevation: 659.54 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.318 (0.286-0.354)	0.380 (0.341-0.423)	0.453 (0.405-0.503)	0.512 (0.457-0.568)	0.590 (0.522-0.654)	0.655 (0.575-0.727)	0.724 (0.631-0.804)	0.803 (0.690-0.894)	0.911 (0.772-1.02)	1.01 (0.843-1.14)
10-min	0.504 (0.453-0.561)	0.604 (0.542-0.673)	0.720 (0.645-0.801)	0.810 (0.723-0.899)	0.930 (0.822-1.03)	1.03 (0.902-1.14)	1.13 (0.988-1.26)	1.25 (1.08-1.39)	1.42 (1.20-1.59)	1.56 (1.30-1.75)
15-min	0.627 (0.563-0.697)	0.753 (0.676-0.839)	0.903 (0.809-1.00)	1.02 (0.909-1.13)	1.17 (1.04-1.30)	1.30 (1.14-1.44)	1.43 (1.25-1.59)	1.57 (1.35-1.75)	1.78 (1.50-1.99)	1.95 (1.63-2.20)
30-min	0.852 (0.765-0.948)	1.03 (0.926-1.15)	1.27 (1.14-1.41)	1.46 (1.30-1.62)	1.72 (1.52-1.90)	1.92 (1.69-2.13)	2.15 (1.88-2.39)	2.40 (2.07-2.68)	2.77 (2.35-3.11)	3.09 (2.58-3.49)
60-min	1.06 (0.949-1.18)	1.29 (1.16-1.43)	1.62 (1.45-1.80)	1.89 (1.69-2.10)	2.27 (2.01-2.51)	2.59 (2.27-2.87)	2.95 (2.57-3.27)	3.34 (2.88-3.72)	3.94 (3.34-4.42)	4.47 (3.73-5.04)
2-hr	1.28 (1.16-1.43)	1.56 (1.40-1.73)	1.96 (1.76-2.18)	2.30 (2.06-2.55)	2.81 (2.49-3.11)	3.26 (2.88-3.61)	3.78 (3.30-4.19)	4.38 (3.78-4.87)	5.31 (4.51-5.95)	6.17 (5.16-6.96)
3-hr	1.42 (1.29-1.58)	1.72 (1.55-1.91)	2.14 (1.94-2.38)	2.50 (2.25-2.76)	3.04 (2.71-3.36)	3.52 (3.12-3.89)	4.07 (3.57-4.50)	4.71 (4.08-5.22)	5.72 (4.87-6.38)	6.63 (5.56-7.45)
6-hr	1.82 (1.65-2.02)	2.18 (1.98-2.41)	2.68 (2.43-2.97)	3.12 (2.81-3.45)	3.80 (3.39-4.19)	4.41 (3.91-4.87)	5.12 (4.48-5.66)	5.95 (5.14-6.59)	7.26 (6.17-8.10)	8.47 (7.07-9.49)
12-hr	2.25 (2.05-2.50)	2.71 (2.46-3.00)	3.36 (3.04-3.72)	3.92 (3.53-4.34)	4.81 (4.29-5.31)	5.62 (4.96-6.21)	6.56 (5.73-7.25)	7.67 (6.61-8.50)	9.44 (7.97-10.5)	11.1 (9.18-12.4)
24-hr	2.63 (2.43-2.85)	3.15 (2.92-3.42)	3.92 (3.63-4.25)	4.58 (4.23-4.96)	5.61 (5.14-6.05)	6.55 (5.96-7.03)	7.62 (6.88-8.16)	8.88 (7.94-9.47)	10.9 (9.57-11.6)	12.7 (11.0-13.5)
2-day	3.08 (2.85-3.35)	3.70 (3.43-4.02)	4.59 (4.25-4.98)	5.36 (4.94-5.80)	6.54 (5.99-7.06)	7.60 (6.91-8.19)	8.83 (7.97-9.49)	10.3 (9.16-11.0)	12.5 (11.0-13.4)	14.6 (12.7-15.6)
3-day	3.25 (3.01-3.53)	3.89 (3.61-4.24)	4.82 (4.46-5.23)	5.61 (5.18-6.07)	6.83 (6.26-7.37)	7.92 (7.22-8.53)	9.18 (8.30-9.85)	10.6 (9.53-11.4)	12.9 (11.4-13.8)	15.0 (13.1-16.0)
4-day	3.42 (3.17-3.71)	4.09 (3.80-4.45)	5.05 (4.67-5.48)	5.86 (5.42-6.35)	7.12 (6.54-7.68)	8.24 (7.52-8.87)	9.53 (8.63-10.2)	11.0 (9.89-11.8)	13.3 (11.8-14.3)	15.5 (13.5-16.5)
7-day	4.05 (3.75-4.41)	4.84 (4.47-5.28)	5.91 (5.46-6.44)	6.83 (6.30-7.43)	8.24 (7.55-8.95)	9.50 (8.65-10.3)	10.9 (9.88-11.8)	12.6 (11.3-13.5)	15.1 (13.4-16.2)	17.4 (15.2-18.7)
10-day	4.68 (4.35-5.07)	5.57 (5.18-6.04)	6.73 (6.25-7.28)	7.71 (7.13-8.33)	9.17 (8.45-9.89)	10.5 (9.59-11.3)	11.9 (10.8-12.8)	13.5 (12.2-14.5)	16.0 (14.3-17.1)	18.1 (16.1-19.4)
20-day	6.32 (5.94-6.74)	7.46 (7.01-7.96)	8.78 (8.24-9.37)	9.88 (9.25-10.5)	11.5 (10.7-12.2)	12.8 (11.9-13.7)	14.3 (13.3-15.2)	16.0 (14.7-17.0)	18.4 (16.8-19.5)	20.5 (18.6-21.7)
30-day	7.88 (7.44-8.37)	9.26 (8.74-9.83)	10.7 (10.1-11.3)	11.9 (11.2-12.6)	13.6 (12.8-14.4)	15.0 (14.0-15.9)	16.5 (15.4-17.5)	18.2 (16.9-19.2)	20.5 (18.9-21.8)	22.5 (20.7-23.9)
45-day	9.99 (9.50-10.5)	11.7 (11.1-12.3)	13.3 (12.6-14.0)	14.6 (13.8-15.4)	16.4 (15.5-17.3)	17.9 (16.9-18.9)	19.5 (18.3-20.5)	21.1 (19.8-22.3)	23.4 (21.9-24.7)	25.3 (23.6-26.8)
60-day	12.0 (11.4-12.6)	14.0 (13.3-14.7)	15.8 (15.0-16.6)	17.3 (16.4-18.2)	19.3 (18.3-20.3)	21.0 (19.8-22.0)	22.7 (21.4-23.8)	24.5 (23.0-25.7)	27.0 (25.3-28.4)	29.1 (27.1-30.6)

[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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B. Calculation Sheet

EXISTING CONDITIONS

SITE -Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.4
Flow length, ft	100
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	23.00
Sheet flow time, min	**8.1**
SHALLOW CONC. FLOW	
Flow length, ft	227
Watercourse slope, %	13.83
Surface Description	unpaved
Velocity, ft/s	6.00
Sh. Conc. Flow time, min	**0.6**
TIME OF CONC., mins	**8.7**

EXISTING CONDITIONS

OFFSITE -Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.24
Flow length, ft	100
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	20.50
Sheet flow time, min	**5.7**
SHALLOW CONC. FLOW	
Flow length, ft	979
Watercourse slope, %	31.87
Surface Description	unpaved
Velocity, ft/s	9.11
Sh. Conc. Flow time, min	**1.8**
TIME OF CONC., mins	**7.5**

PROPOSED CONDITIONS

SITE BYPASS -Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.24
Flow length, ft	100
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	26.20
Sheet flow time, min	**5.1**
SHALLOW CONC. FLOW	
Flow length, ft	224
Watercourse slope, %	14.55
Surface Description	unpaved
Velocity, ft/s	6.16
Sh. Conc. Flow time, min	**0.6**
TIME OF CONC., mins	**5.7**

PROPOSED CONDITIONS

SITE TO BASIN -Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.24
Flow length, ft	100
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	23.00
Sheet flow time, min	**5.4**
SHALLOW CONC. FLOW	
Flow length, ft	70
Watercourse slope, %	15.71
Surface Description	unpaved
Velocity, ft/s	6.40
Sh. Conc. Flow time, min	**0.2**
CHANNEL FLOW	
Left side slope, %	33.3333
Right side slope, %	33.3333
bottom width, ft	3
channel flow depth, ft	0.70
Channel flow length, ft	98.00
channel bed slope, %	3.00
Mannings N	0.024
Accn. Due to gravity, ft/sec2	32.2
Freeboard, ft	0
H:V, left	3.00
H:V, right	3.00
bed slope, ft/ft	0.030
top width at flow depth, ft	7.20
top width including freeboard, ft	7.20
wetted area, sq. ft	3.57
wetted peri, ft	7.43
hyd. Radius, ft	0.48
velocity, ft/s	6.60
Discharge, cfs	23.56
Theta, rad	0.03
Froudes Number	1.39
Flow Type	**supercritical**
Channel flow time, mins	**0.2**

PIPE FLOW	
Pipe Diamater, in	15
Manning's N	0.012
% Slope	1
Pipe length, ft	112
diameter of pipe, d, ft	1.25
wetted area, sf =	1.23

wetted perimeter, P, ft =	3.93
R =	0.3125
Slope, ft/ft =	0.01
Full Flow Velocity, ft/s =	5.72
Full Flow Q, cfs =	7.02
Pipe flow time, mins	**0.3**
TIME OF CONC., mins	**6.1**

PROPOSED CONDITIONS

OFFSITE-Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.24
Flow length, ft	100
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	20.50
Sheet flow time, min	**5.7**
SHALLOW CONC. FLOW	
Flow length, ft	979
Watercourse slope, %	31.87
Surface Description	unpaved
Velocity, ft/s	9.11
Sh. Conc. Flow time, min	**1.8**
TIME OF CONC., mins	**7.5**

SWALE-1 -Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.24
Flow length, ft	42
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	25.95
Sheet flow time, min	**2.58**
TIME OF CONC., mins	**2.6**

SWALE-2 -Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.24
Flow length, ft	100
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	23.00
Sheet flow time, min	**5.41**
SHALLOW CONC. FLOW	
Flow length, ft	70
Watercourse slope, %	18.57
Surface Description	unpaved
Velocity, ft/s	6.95
Sh. Conc. Flow time, min	**0.17**
TIME OF CONC., mins	**5.6**

TABLE 5.2
Runoff Coefficients for the Rational Equation*

LAND USE	A Soils[1]			B Soils[1]			C Soils[1]			D Soils[1]		
	< 2%	2 - 6%	>6%	< 2%	2 - 6%	>6%	< 2%	2 - 6%	>6%	< 2%	2 - 6%	>6%
Cultivated land	0.08	0.13	0.16	0.11	0.15	0.21	0.14	0.19	0.26	0.18	0.23	0.31
Pasture	0.12	0.20	0.30	0.18	0.28	0.37	0.24	0.34	0.44	0.30	0.40	0.50
Meadow	0.10	0.16	0.25	0.14	0.22	0.30	0.20	0.28	0.36	0.24	0.30	0.40
Forest	0.05	0.08	0.11	0.08	0.11	0.14	0.10	0.13	0.16	0.12	0.16	0.20
Residential lot size 1/8 acre	0.25	0.28	0.31	0.27	0.30	0.35	0.30	0.33	0.38	0.33	0.36	0.42
Residential lot size 1/4 acre	0.22	0.26	0.29	0.24	0.29	0.33	0.27	0.31	0.36	0.30	0.34	0.40
Residential lot size 1/3 acre	0.19	0.23	0.26	0.22	0.26	0.30	0.25	0.29	0.34	0.28	0.32	0.39
Residential lot size 1/2 acre	0.16	0.20	0.24	0.19	0.23	0.28	0.22	0.27	0.32	0.26	0.30	0.37
Residential lot size 1 acre	0.14	0.19	0.22	0.17	0.21	0.26	0.20	0.25	0.31	0.24	0.29	0.35
Industrial	0.67	0.68	0.68	0.68	0.68	0.69	0.68	0.68	0.69	0.69	0.69	0.70
Commercial	0.71	0.71	0.72	0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Streets	0.70	0.71	0.72	0.71	0.72	0.74	0.72	0.73	0.76	0.73	0.75	0.78
Open Space	0.05	0.10	0.14	0.08	0.13	0.19	0.12	0.17	0.24	0.15	0.21	0.28
Parking	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87
Construction Sites - Bare packed soil, smooth	0.30	0.35	.040	0.35	.040	0.45	0.40	0.45	0.50	0.50	0.55	0.60
Construction Sites - Bare packed soil, rough	.020	0.25	0.30	0.25	0.30	0.35	0.30	0.35	0.40	0.40	0.45	0.50

Source: PADEP Erosion and Sediment Pollution Control Program Manual, March 2012

PENNEAST-BLUE MOUNTAIN INTERCONNECT
PROPOSED CONDITIONS RUNOFF COEFFICIENT CALCULATIONS FOR PROPOSED SWALES
***Note: Rational C Coefficients adopted from PA Erosion and Sediment Pollution Control Program Manual, Mar 2012, Table 5.2**

DA	Land Use	Soils	HSG	Area	Area (Acres)	C	C*A	RC
SWALE1	MEAD	Bhd	C/D	2011	0.046	0.36	0.017	0.36
SWALE1	MEAD	MbC2	C	1221	0.028	0.36	0.010	0.36
SWALE1	MEAD	McD	C	2546	0.058	0.36	0.021	0.36
SWALE1 Total					**0.133**		**0.048**	**0.36**
SWALE2	IMP	Bhd	C/D	59	0.001	0.87	0.001	0.87
SWALE2	IMP	McD	C	2077	0.048	0.87	0.041	0.87
SWALE2	MEAD	Bhd	C/D	3814	0.088	0.36	0.032	0.36
SWALE2	MEAD	DeF	A	4489	0.103	0.11	0.011	0.11
SWALE2	MEAD	McD	C	16431	0.377	0.36	0.136	0.36
SWALE2	WOODS	BhD	C/D	10736	0.246	0.16	0.039	0.16
SWALE2	WOODS	KvF	A	41426	0.951	0.11	0.105	0.11
SWALE2	WOODS	McD	C	7730	0.177	0.16	0.028	0.16
SWALE2 Total					**1.992**		**0.394**	**0.20**
Grand Total					**2.124**		**0.442**	**0.21**

The "RC" value is an area averaged runoff coefficient value (arithmetic mean) calculated as:

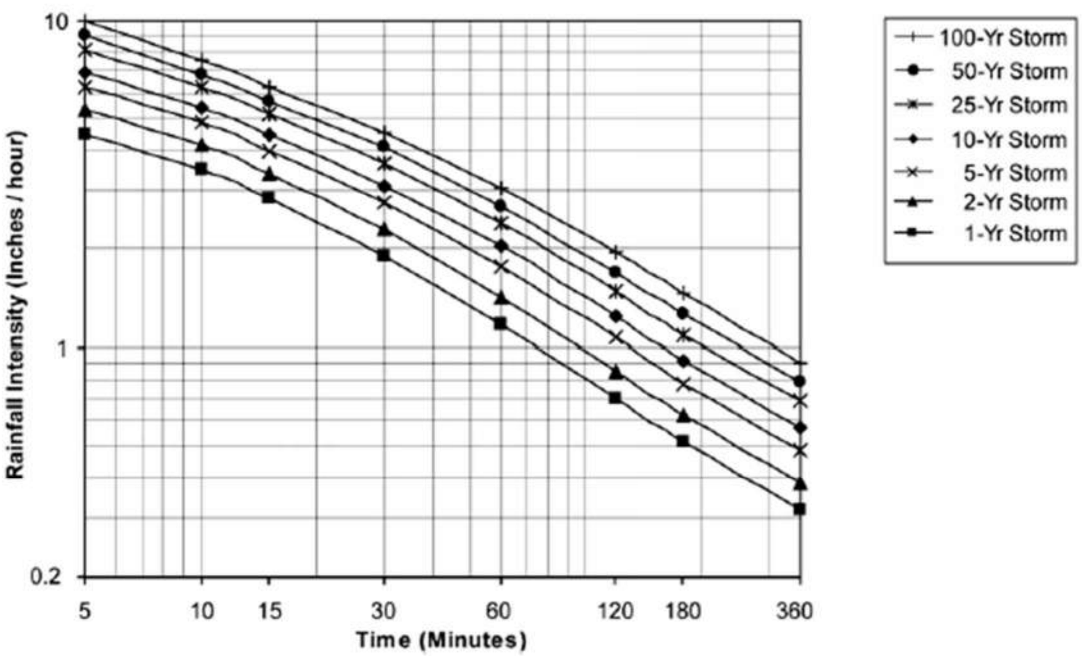
$$RC=\frac{\sum_{i=1}^{n} C_i \; x \; Area_i}{\sum_{i=1}^{n} Area_i}$$

PENNEAST-BLUE MOUNTAIN INTERCONNECT
RATIONAL METHOD PEAK FLOW CALCULATIONS FOR PROPOSED SWALES

Return Period (Yrs)	10
Time of Concentration (Min)	5 **(Unless otherwise noted below)**

DA	Area (Acres)	RC	Tc (mins)	Rainfall Intensity (in/hr)	Q (cfs)
SWALE1	0.133	0.36	5.0	6.9	0.3
SWALE2	1.992	0.20	5.6	6.6	2.6

Rainfall Intensity for 1-year through 100-year Storms for Region 5



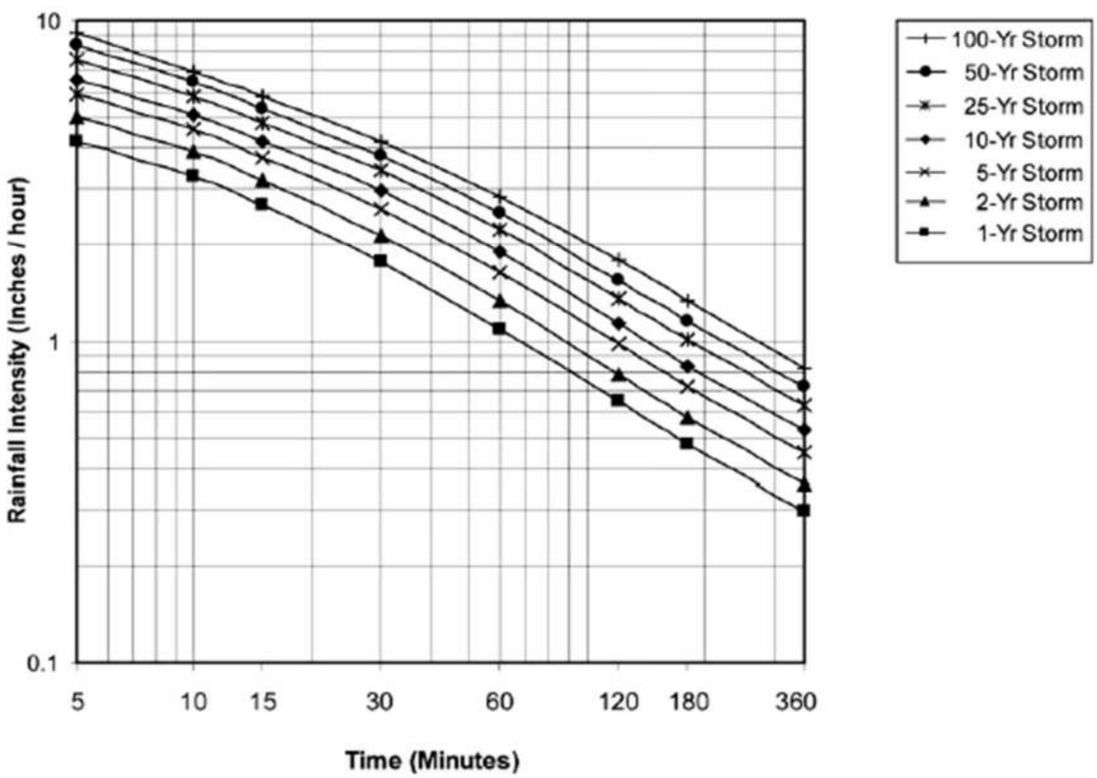
Adapted from Appendix A of PennDOT Publication 584 (2008 Edition)

PENNEAST-BLUE MOUNTAIN INTERCONNECT
RATIONAL METHOD PEAK FLOW CALCULATIONS FOR PROPOSED SWALES

Return Period (Yrs) 100
Time of Concentration (Min) 5 **(Unless otherwise noted below)**

DA	Area (Acres)	RC	Tc (mins)	Rainfall Intensity (in/hr)	Q (cfs)
SWALE1	0.133	0.36	5.0	9.2	0.4
SWALE2	1.992	0.20	5.6	8.5	3.3

Rainfall Intensity for 1-year through 100-year Storms for Region 4



Adapted from Appendix A of PennDOT Publication 584 (2008 Edition)

PENNEAST-BLUE MOUNTAIN INTERCONNECT

PROPOSED CONDITIONS RUNOFF COEFFICIENT CALCULATIONS FOR PROPOSED INLETS

***Note: Rational C Coefficients adopted from PA Erosion and Sediment Pollution Control Program Manual, Mar 2012, Table 5.2**

DA	Land Use	Soils	HSG	Area	Area (Acres)	C	C*A	RC
INLET1	IMP	Bhd	C/D	1606	0.037	0.87	0.032	0.87
INLET1	IMP	McD	C	3989	0.092	0.87	0.080	0.87
INLET1	MEAD	Bhd	C/D	711	0.016	0.36	0.006	0.36
INLET1	MEAD	MbC2	C	932	0.021	0.36	0.008	0.36
INLET1	MEAD	McD	C	8268	0.190	0.36	0.068	0.36
INLET1 Total					**0.356**		**0.194**	**0.54**
INLET2	IMP	Bhd	C/D	2832	0.065	0.87	0.057	0.87
INLET2	IMP	MbC2	C	859	0.020	0.87	0.017	0.87
INLET2	IMP	McD	C	927	0.021	0.87	0.019	0.87
INLET2 Total					**0.106**		**0.092**	**0.87**
INLET3	MEAD	Bhd	C/D	6176	0.142	0.36	0.051	0.36
INLET3	MEAD	MbC2	C	1434	0.033	0.36	0.012	0.36
INLET3	MEAD	McD	C	474	0.011	0.36	0.004	0.36
INLET3 Total					**0.186**		**0.067**	**0.36**
Grand Total					**0.648**		**0.353**	**0.54**

The "RC" value is an area averaged runoff coefficient value (arithmetic mean) calculated as:

$$RC=\frac{\sum_{i=1}^{n} C_i \ x \ Area_i}{\sum_{i=1}^{n} Area_i}$$

PENNEAST-BLUE MOUNTAIN INTERCONNECT
RATIONAL METHOD PEAK FLOW CALCULATIONS FOR PROPOSED INLETS

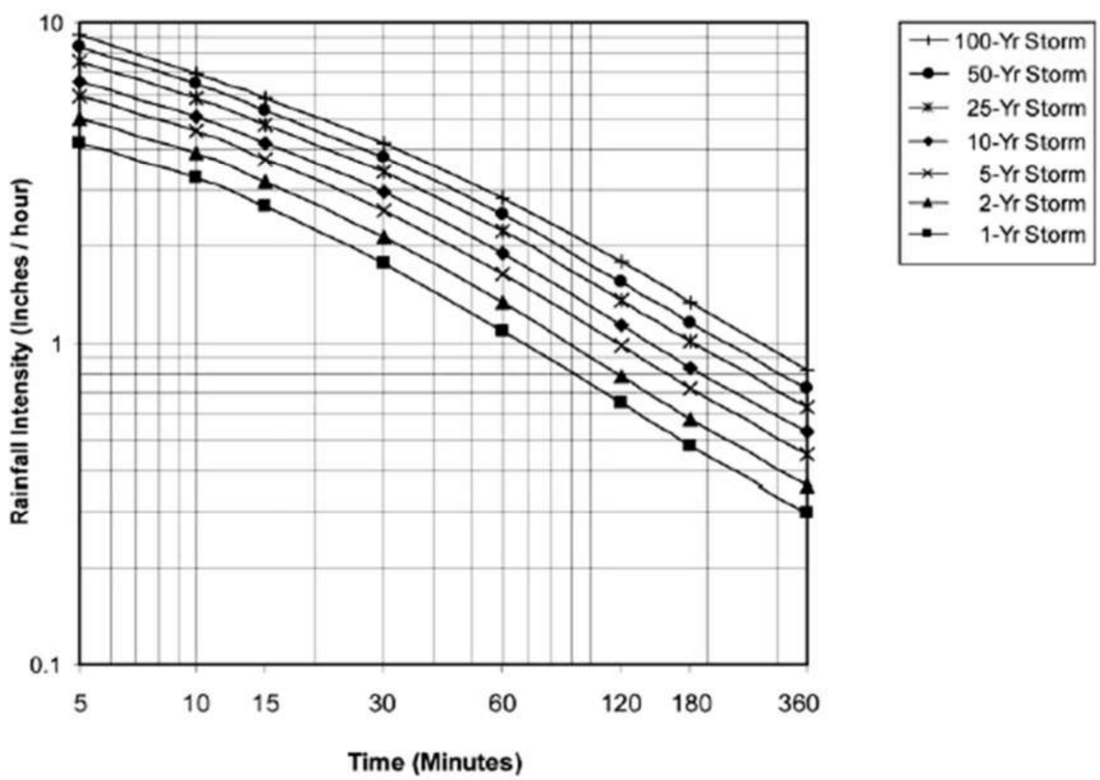
Return Period (Yrs) 10

Time of Concentration (Min) 5 **(Unless otherwise noted below)**

DA	Area (Acres)	RC	Tc (mins)	Rainfall Intensity (in/hr)	Q (cfs)
INLET1	0.356	0.54	5.6	6.3	1.2
INLET2	0.106	0.87	5.0	6.9	0.6
INLET3	0.186	0.36	5.0	6.9	0.5

TOTAL FLOW FOR INLET2	ADD
INLET1	1.2
INLET2	0.6
TOTAL	**1.9**

Rainfall Intensity for 1-year through 100-year Storms for Region 4



Adapted from Appendix A of PennDOT Publication 584 (2008 Edition)

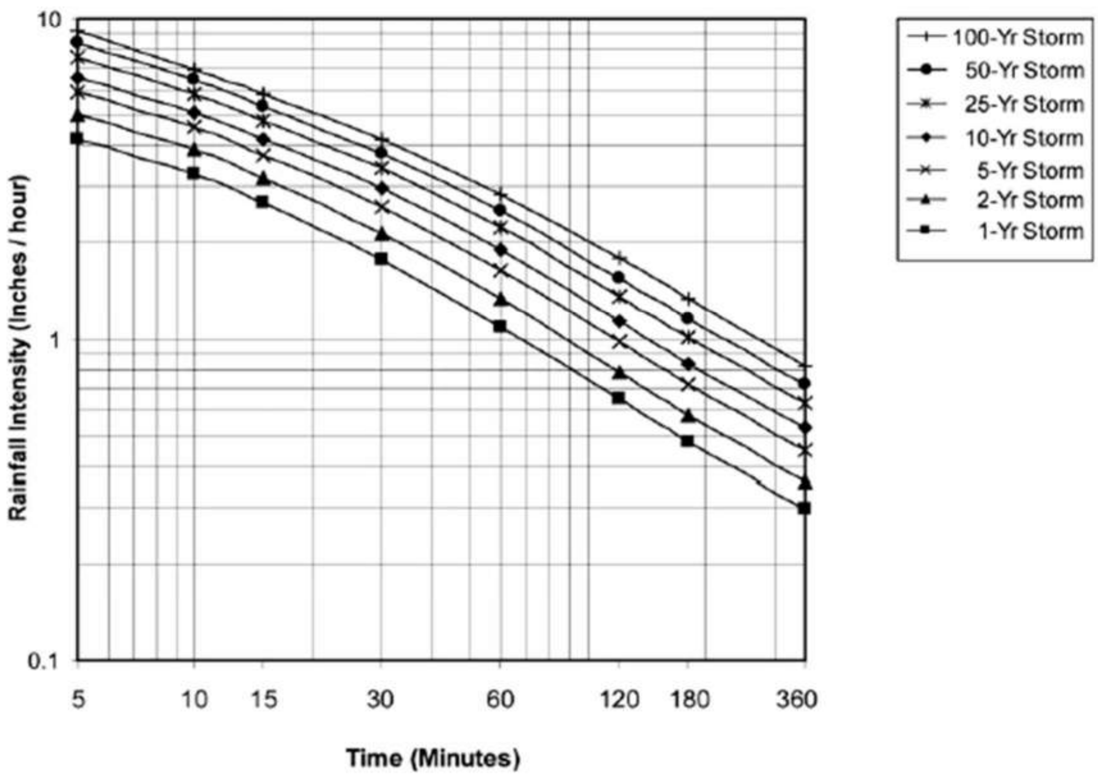
PENNEAST-BLUE MOUNTAIN INTERCONNECT
RATIONAL METHOD PEAK FLOW CALCULATIONS FOR PROPOSED INLETS

Return Period (Yrs) 100
Time of Concentration (Min) 5 **(Unless otherwise noted below)**

DA	Area (Acres)	RC	Tc (mins)	Rainfall Intensity (in/hr)	Q (cfs)
INLET1	0.356	0.54	5.6	8.9	1.7
INLET2	0.106	0.87	5.0	9.2	0.8
INLET3	0.186	0.36	5.0	9.2	0.6

TOTAL FLOW FOR INLET2	ADD
INLET1	1.7
INLET2	0.8
TOTAL	**2.6**

Rainfall Intensity for 1-year through 100-year Storms for Region 4



Adapted from Appendix A of PennDOT Publication 584 (2008 Edition)

PROJECT NAME:	**SWALE 1**	
LOCATION:	**LOWER TOWAMENSING TWP, CARBON COUNTY PA**	
PREPARED BY:	**DATE:**	**3/15/2018**
CHECKED BY:	**DATE:**	**3/15/2018**
CHANNEL OR CHANNEL SECTION	SOLVE FOR FLOW DEPTH	
Temporary or Permanent (T or P)	P	
Required Capacity, Qr (cfs)	0.40	**See attached Rational Peak Flow Calculations**
Left side slope, %	33.33	
Right side slope, %	33.33	
Bottom width, ft	2	
Channel Depth provided, ft	1	
Channel bed slope, %	1	
Mannings N	0.1	
Accn. Due to gravity, ft/sec2	32.2	
DESIGN METHOD FOR LINING - SHEAR STRESS		
CHECK FOR SHEAR STRESS		
H:V, left	3.00	
H:V, right	3.00	
bed slope, ft/ft	0.01	
Calculated channel flow depth, ft	0.27	
top width at flow depth, ft	3.64	
Bottom Width:Flow Depth Ratio	7.32	**Ratio Ok**
wetted area, sq. ft	0.77	
wetted peri, ft	3.73	
hyd. Radius, ft	0.21	
velocity, ft/s	0.52	
Discharge, cfs	0.40	
Theta, rad	0.010	
Froudes Number	0.18	
Flow type	subcritical	
Shear Stress, Lb/Sq.Ft	0.17	
Protective Lining	**Vegetated**	
Lining required	**TRM-435**	
D_{50}, inches		
Placement Thickness, inches		
Adjusted Mannings N	0.11	
Calculated Critical Slope, Sc ft/ft	0.29	
0.7 Sc, ft/ft	0.20	
1.3 Sc, ft/ft	0.37	
Stable Flow?	Stable	
Calculated Freeboard, ft	0.50	
Freeboard Provided, ft	0.73	**Freeboard Ok, Calculated<Provided**

PROJECT NAME:	**SWALE 2**	
LOCATION:	**LOWER TOWAMENSING TWP, CARBON COUNTY PA**	
PREPARED BY:	**DATE:**	**3/15/2018**
CHECKED BY:	**DATE:**	**3/15/2018**

CHANNEL OR CHANNEL SECTION	SOLVE FOR FLOW DEPTH	
Temporary or Permanent (T or P)	P	
Required Capacity, Qr (cfs)	3.30	**See attached Rational Peak Flow Calculations**
Left side slope, %	33.33	
Right side slope, %	33.33	
Bottom width, ft	3	
Channel Depth provided, ft	1.5	
Channel bed slope, %	2.6	
Mannings N	0.06	
Accn. Due to gravity, ft/sec2	32.2	
DESIGN METHOD FOR LINING - SHEAR STRESS		
CHECK FOR SHEAR STRESS		
H:V, left	3.00	
H:V, right	3.00	
bed slope, ft/ft	0.026	
Calculated channel flow depth, ft	0.42	
top width at flow depth, ft	5.51	
Bottom Width:Flow Depth Ratio	7.17	**Ratio Ok**
wetted area, sq. ft	1.78	
wetted peri, ft	5.65	
hyd. Radius, ft	0.32	
velocity, ft/s	1.85	
Discharge, cfs	3.30	
Theta, rad	0.026	
Froudes Number	0.51	
Flow type	subcritical	
Shear Stress, Lb/Sq.Ft	0.68	
Protective Lining	**Vegetated**	
Lining required	**TRM-435**	
D_{50}, inches		
Placement Thickness, inches		
Adjusted Mannings N	0.06	
Calculated Critical Slope, Sc ft/ft	0.08	
0.7 Sc, ft/ft	0.06	
1.3 Sc, ft/ft	0.11	
Stable Flow?	Stable	
Calculated Freeboard, ft	0.50	
Freeboard Provided, ft	1.08	**Freeboard Ok, Calculated<Provided**

PENNEAST-BLUE MOUNTAIN INTERCONNECT
PROPOSED DRAINAGE PIPES CAPACITY ANALYSIS

Pipe ID	P#1	100-Year Swale-2 Flow
Upstream Str	IN-1	
Downstream Str	IN-2	
peak Discharge, cfs	3.3	
Pipe Diamater, in	15.00	
Manning's N	0.011	
% Slope	2.00	
diameter of pipe, d, ft	1.25	
wetted area, sf =	1.23	
wetted perimeter, P, ft =	3.93	
R =	0.31	
Slope, ft/ft =	0.02	
Full Flow Velocity, ft/s =	**8.82**	
Full Flow Q, cfs =	**10.83**	**Capacity Ok**

Pipe ID	P#2	100-Year Swale-1 and Swale-2 Flow
Upstream Str	IN-2	
Downstream Str	MH-1	
peak Discharge, cfs	3.7	
Pipe Diamater, in	15.00	
Manning's N	0.011	
% Slope	1.00	
diameter of pipe, d, ft	1.25	
wetted area, sf =	1.23	
wetted perimeter, P, ft =	3.93	
R =	0.31	
Slope, ft/ft =	0.01	
Full Flow Velocity, ft/s =	**6.24**	
Full Flow Q, cfs =	**7.65**	**Capacity Ok**

Pipe ID	P#3	
Upstream Str	MH-1	
Downstream Str	BASIN	
peak Discharge, cfs	3.7	100-Year Swale-1 and Swale-2 Flow
Pipe Diamater, in	15.00	
Manning's N	0.011	
% Slope	1.00	
diameter of pipe, d, ft	1.25	
wetted area, sf =	1.23	
wetted perimeter, P, ft =	3.93	
R =	0.31	
Slope, ft/ft =	0.01	
Full Flow Velocity, ft/s =	**6.24**	
Full Flow Q, cfs =	**7.65**	**Capacity Ok**

Pipe ID	P#5,6	
Upstream Str		
Downstream Str		
peak Discharge, cfs	7.26	100-Year Basin Discharge
Pipe Diamater, in	15.00	
Manning's N	0.011	
% Slope	2.25	
diameter of pipe, d, ft	1.25	
wetted area, sf =	1.23	
wetted perimeter, P, ft =	3.93	
R =	0.31	
Slope, ft/ft =	0.0225	
Full Flow Velocity, ft/s =	**9.36**	
Full Flow Q, cfs =	**11.48**	**Capacity Ok**

PENNEAST-BLUE MOUNTAIN INTERCONNECT
LEVEL SPREADER

From Pennsylvania Stormwater Best Management Manual Chapter 6.8.1 Design Consideration 7

Conventional level spreaders designed to diffuse all flow rates should be sized based on the following:

For grass or thick ground cover vegetation:

a) 13 linear feet of level spreader for every 1 cfs flow
b) Slopes of 8% or less from level spreader to toe of slope

For forested areas with little or no ground cover vegetation:

a) 100 linear feet of level spreader for every 1 cfs flow
b) Slopes of 6% or less from level spreader to toe of slope

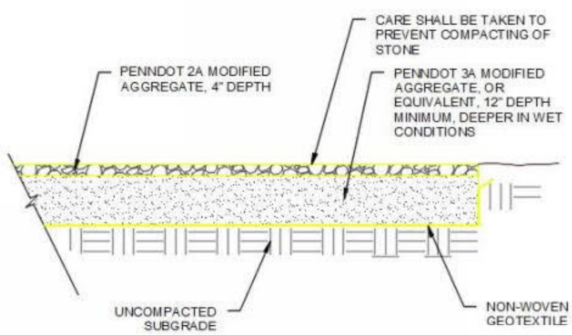
Level Spreader ID	LS-1	
Level Spreader Discharge Type	Subsurface	
10-YR Peak Discharge, cfs	1.61	10-Year Basin Discharge from Model Hydrograph 12
DS Ground Cover	Grass	
Crest Elev.	639.75	
Design Criteria cfs/lf	13.0	
Calculated Crest Length, ft	21	
Design Crest Length, ft	**30**	
Weir Coefficient	3.33	Use sharp crested value to calculate higher velocity to be conservative.
Weir Head (H)	0.06	
Flow Area	1.91	
Velocity	0.84	
Velocity Non-Erosive	YES	

In accordance with Pennsylvania Stormwater Best Management Practices Manual - Chapter 6.8.1

AT SURFACE INFILTRATION AREA VOLUME AND DRAW DOWN TIME

Infiltration Area, sq ft	2,285
Voids Ratio	40%
Area Depth, in	12
Effective Area Depth, in	4.8
Calculated Volume, cu ft	914

Infitration Rate, in/hr	2.63
Drain Time, hr	1.83

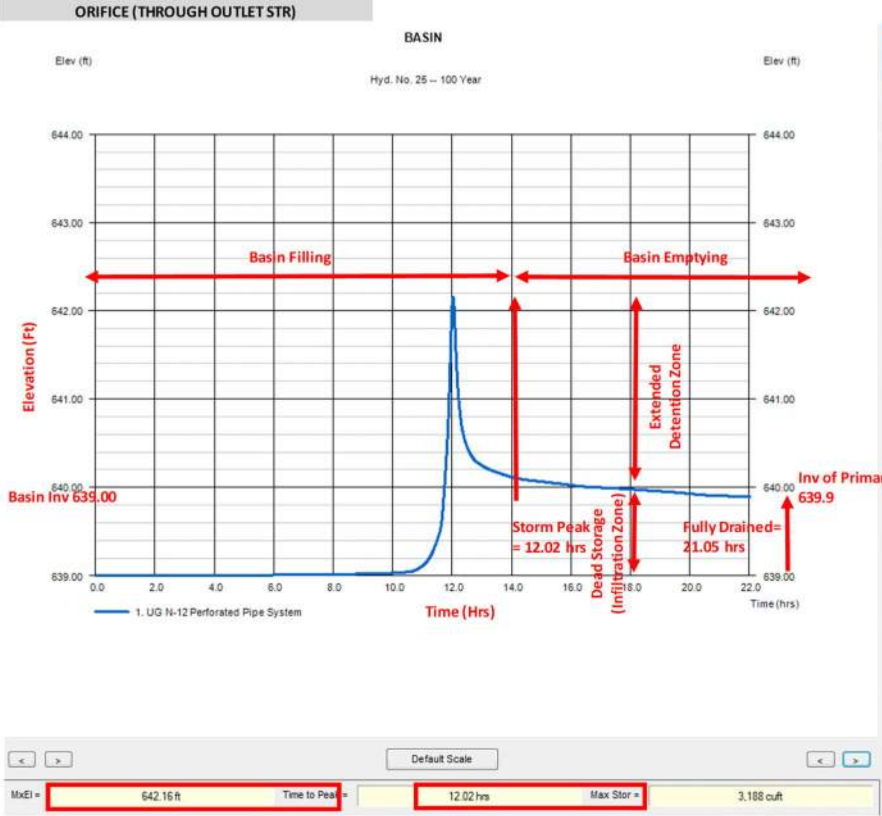


PAD INFILTRATION AREA
CROSS SECTION DETAIL
(COMPACTION TO BE MINIMIZED)
N.T.S.

BASIN DEWATERING TIME CALCULATIONS

BASIN NAME	**UG-BASIN**	
BASIN BARREL DIA., FT	3	
BMTP-6, IN/HR	6	
BMTP-4, IN/HR	4.5	
AVERAGE, IN/HR	5.25	
FOS	**2.00**	****BASIN FLOOD TEST HAS SAFETY FACTOR BUILT IN***
DESIGN RATE, IN/HR	**2.63**	
INFILTRATION OF STORAGE VOLUME BELOW PRIMARY ORIFICE		
BASIN INV. EL., FT	639.00	
BASIN PIPE INV. EL., FT	639.50	
BASIN FULL ELEV., FT	642.16	***100-YEAR EVENT***
BASIN DEPTH, FT	3.50	
100-YEAR DEWATERING DEPTH, FT	3.16	
ROCK BED DEPTH, FT	0.50	
POROSITY, %	40	
ROCK BED DEPTH ADJUSTED FOR POROSITY, FT	0.20	
ADJUSTED 100-YEAR DEWATERING DEPTH, FT	2.86	
TOP OF DEAD STORAGE EL., FT	639.90	
DELTA STORAGE DEPTH, IN	7.20	
DRAIN TIME (1)	**2.74**	***DRAIN TIME FOR DEAD STORAGE BELOW PRIMARY ORIFICE***

INFILTRATION OF STORAGE VOLUME ABOVE PRIMARY ORIFICE (THROUGH OUTLET STR)



Time (hrs)	Elev (ft)
20.72	639.91
20.73	639.91
20.75	639.91
20.77	639.91
20.78	639.91
20.80	639.91
20.82	639.91
20.83	639.91
20.85	639.91
20.87	639.91
20.88	639.91
20.90	639.91
20.92	639.91
20.93	639.91
20.95	639.91
20.97	639.91
20.98	639.91
21.00	639.91
21.02	639.91
21.03	639.90
21.05	639.90
21.07	639.90
21.08	639.90
21.10	639.90
21.12	639.90
21.13	639.90
21.15	639.90
21.17	639.90

DRAIN TIME (2)	**9.03**	***DRAIN TIME FROM 100-YEAR STORM PEAK TO DEAD STORAGE ELEVATION***
TOTAL DRAIN TIME	**11.77**	

Basin Infiltration Volume Table

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Pond No. 1 - UG N-12 Perforated Pipe System

Pond Data

UG Chambers -Invert elev. = 639.50 ft, Rise x Span = 3.00 x 3.00 ft, Barrel Len = 65.00 ft, No. Barrels = 4, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 639.00 ft, Width = 5.25 ft, Height = 4.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	639.00	n/a	0	0
0.45	639.45	n/a	285	285
0.90	639.90	n/a	387	673
1.35	640.35	n/a	483	1,155
1.80	640.80	n/a	519	1,674
2.25	641.25	n/a	529	2,203
2.70	641.70	n/a	516	2,720
3.15	642.15	n/a	476	3,196
3.60	642.60	n/a	369	3,565
4.05	643.05	n/a	285	3,850
4.50	643.50	n/a	285	4,135

Culvert / Orifice Structures

		[A]	[B]	[C]	[PrfRsr]
Rise (in)	=	18.00	10.00	0.00	0.00
Span (in)	=	18.00	9.00	0.00	0.00
No. Barrels	=	1	1	0	0
Invert El. (ft)	=	639.00	639.90	0.00	0.00
Length (ft)	=	65.00	0.00	0.00	0.00
Slope (%)	=	1.00	0.00	0.00	n/a
N-Value	=	.013	.013	.013	n/a
Orifice Coeff.	=	0.60	0.60	0.60	0.60
Multi-Stage	=	n/a	Yes	No	No

Weir Structures

		[A]	[B]	[C]	[D]
Crest Len (ft)	=	4.00	0.75	0.00	0.00
Crest El. (ft)	=	642.33	640.90	0.00	0.00
Weir Coeff.	=	3.33	3.33	3.33	3.33
Weir Type	=	Rect	Rect	---	---
Multi-Stage	=	No	Yes	No	No

Exfil.(in/hr) = 2.930 (by Wet area)
TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	639.00	0.00	0.00	---	---	0.00	0.00	---	---	0.000	---	0.000
0.05	29	639.04	0.00	0.00	---	---	0.00	0.00	---	---	0.102	---	0.102
0.09	57	639.09	0.00	0.00	---	---	0.00	0.00	---	---	0.103	---	0.103
0.14	86	639.13	0.00	0.00	---	---	0.00	0.00	---	---	0.105	---	0.105
0.18	114	639.18	0.00	0.00	---	---	0.00	0.00	---	---	0.107	---	0.107
0.22	143	639.22	0.00	0.00	---	---	0.00	0.00	---	---	0.109	---	0.109
0.27	171	639.27	0.00	0.00	---	---	0.00	0.00	---	---	0.110	---	0.110
0.31	200	639.31	0.00	0.00	---	---	0.00	0.00	---	---	0.112	---	0.112
0.36	228	639.36	0.00	0.00	---	---	0.00	0.00	---	---	0.114	---	0.114
0.40	257	639.40	0.00	0.00	---	---	0.00	0.00	---	---	0.115	---	0.115
0.45	285	639.45	0.00	0.00	---	---	0.00	0.00	---	---	0.117	---	0.117
0.50	324	639.49	0.00	0.00	---	---	0.00	0.00	---	---	0.119	---	0.119
0.54	363	639.54	0.00	0.00	---	---	0.00	0.00	---	---	0.121	---	0.121
0.58	402	639.59	0.00	0.00	---	---	0.00	0.00	---	---	0.122	---	0.122
0.63	440	639.63	0.00	0.00	---	---	0.00	0.00	---	---	0.124	---	0.124
0.68	479	639.67	0.00	0.00	---	---	0.00	0.00	---	---	0.126	---	0.126
0.72	518	639.72	0.00	0.00	---	---	0.00	0.00	---	---	0.127	---	0.127
0.76	556	639.76	0.00	0.00	---	---	0.00	0.00	---	---	0.129	---	0.129
0.81	595	639.81	0.00	0.00	---	---	0.00	0.00	---	---	0.131	---	0.131
0.86	634	639.85	0.00	0.00	---	---	0.00	0.00	---	---	0.133	---	0.133
0.90	673	639.90	0.00	0.00			0.00	0.00	---	---	0.134	---	0.134
0.94	721	639.95	0.03 ic	0.02 ic			0.00	0.00	---	---	0.136	---	0.160
0.99	769	639.99	0.07 ic	0.07 ic			0.00	0.00	---	---	0.138	---	0.207
1.03	817	640.03	0.13 ic	0.13 ic			0.00	0.00	---	---	0.140	---	0.266
1.08	866	640.08	0.20 ic	0.19 ic			0.00	0.00	---	---	0.141	---	0.336
1.13	914	640.12	0.27 ic	0.27 ic			0.00	0.00	---	---	0.143	---	0.415
1.17	962	640.17	0.36 ic	0.36 ic			0.00	0.00	---	---	0.145	---	0.503
1.22	1,010	640.21	0.46 ic	0.45 ic			0.00	0.00	---	---	0.146	---	0.598
1.26	1,059	640.26	0.55 ic	0.55 ic			0.00	0.00	---	---	0.148	---	0.699
1.30	1,107	640.30	0.66 ic	0.66 ic			0.00	0.00	---	---	0.150	---	0.808
1.35	1,155	640.35	0.77 ic	0.77 ic	---	---	0.00	0.00	---	---	0.152	---	0.922
1.39	1,207	640.40	0.89 ic	0.89 ic	---	---	0.00	0.00	---	---	0.153	---	1.042

Primary Orifice Invert=639.9

Storage Volume = 673 cuft

Continues on next page...

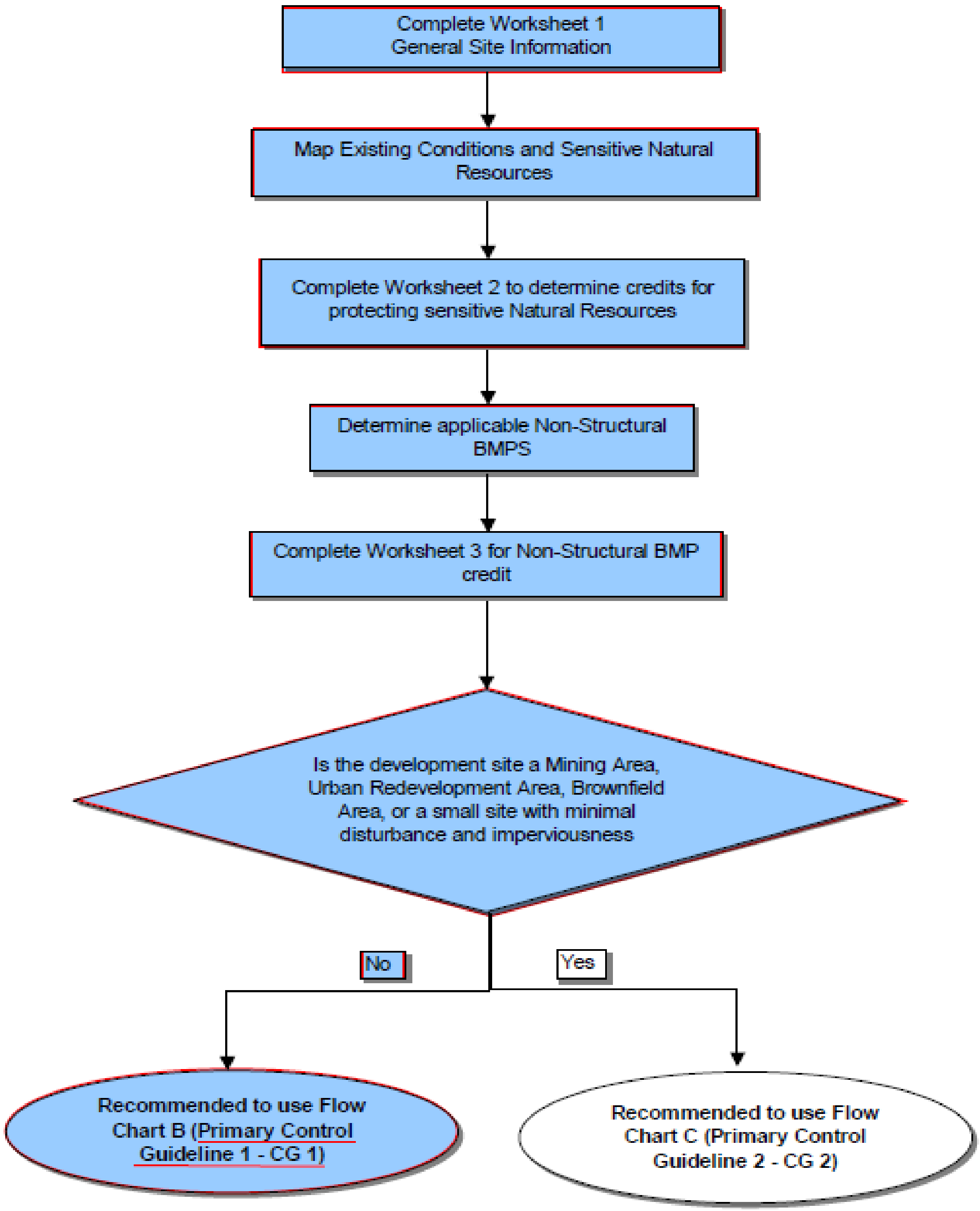
UG N-12 Perforated Pipe System

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
1.44	1,259	640.44	1.02 ic	1.01 ic	---	---	0.00	0.00	---	---	0.155	---	1.168
1.49	1,311	640.48	1.16 ic	1.14 ic	---	---	0.00	0.00	---	---	0.157	---	1.299
1.53	1,363	640.53	1.31 ic	1.28 ic	---	---	0.00	0.00	---	---	0.158	---	1.435
1.58	1,415	640.57	1.42 ic	1.42 ic	---	---	0.00	0.00	---	---	0.160	---	1.576
1.62	1,467	640.62	1.59 ic	1.56 ic	---	---	0.00	0.00	---	---	0.162	---	1.721
1.66	1,518	640.66	1.71 ic	1.71 ic	---	---	0.00	0.00	---	---	0.164	---	1.872
1.71	1,570	640.71	1.90 ic	1.86 ic	---	---	0.00	0.00	---	---	0.165	---	2.026
1.75	1,622	640.75	2.03 ic	1.99 ic	---	---	0.00	0.00	---	---	0.167	---	2.159
1.80	1,674	640.80	2.10 ic	2.09 ic	---	---	0.00	0.00	---	---	0.169	---	2.261
1.85	1,727	640.84	2.23 ic	2.19 ic	---	---	0.00	0.00	---	---	0.170	---	2.358
1.89	1,780	640.89	2.30 ic	2.28 ic	---	---	0.00	0.00	---	---	0.172	---	2.451
1.93	1,833	640.93	2.38 ic	2.37 ic	---	---	0.00	0.02	---	---	0.174	---	2.556
1.98	1,886	640.98	2.51 ic	2.45 ic	---	---	0.00	0.06	---	---	0.176	---	2.683
2.03	1,939	641.02	2.66 ic	2.53 ic	---	---	0.00	0.11	---	---	0.177	---	2.820
2.07	1,992	641.07	2.80 ic	2.61 ic	---	---	0.00	0.17	---	---	0.179	---	2.966
2.12	2,044	641.11	2.95 ic	2.69 ic	---	---	0.00	0.25	---	---	0.181	---	3.118
2.16	2,097	641.16	3.11 ic	2.76 ic	---	---	0.00	0.33	---	---	0.182	---	3.276
2.20	2,150	641.20	3.26 ic	2.84 ic	---	---	0.00	0.42	---	---	0.184	---	3.440
2.25	2,203	641.25	3.42 ic	2.91 ic	---	---	0.00	0.52	---	---	0.186	---	3.610
2.30	2,255	641.29	3.64 ic	2.98 ic	---	---	0.00	0.62	---	---	0.188	---	3.784
2.34	2,306	641.34	3.80 ic	3.04 ic	---	---	0.00	0.73	---	---	0.189	---	3.962
2.38	2,358	641.38	3.96 ic	3.11 ic	---	---	0.00	0.84	---	---	0.191	---	4.145
2.43	2,410	641.43	4.19 ic	3.18 ic	---	---	0.00	0.96	---	---	0.193	---	4.331
2.47	2,461	641.47	4.34 ic	3.24 ic	---	---	0.00	1.09	---	---	0.194	---	4.522
2.52	2,513	641.52	4.57 ic	3.30 ic	---	---	0.00	1.22	---	---	0.196	---	4.716
2.57	2,565	641.56	4.72 ic	3.36 ic	---	---	0.00	1.35	---	---	0.198	---	4.914
2.61	2,616	641.61	4.94 ic	3.42 ic	---	---	0.00	1.49	---	---	0.200	---	5.115
2.66	2,668	641.65	5.16 ic	3.48 ic	---	---	0.00	1.64	---	---	0.201	---	5.320
2.70	2,720	641.70	5.37 ic	3.54 ic	---	---	0.00	1.79	---	---	0.203	---	5.529
2.74	2,767	641.74	5.57 ic	3.60 ic	---	---	0.00	1.94	---	---	0.205	---	5.741
2.79	2,815	641.79	5.76 ic	3.65 ic	---	---	0.00	2.10	---	---	0.206	---	5.956
2.84	2,862	641.84	6.00 ic	3.71 ic	---	---	0.00	2.26	---	---	0.208	---	6.174
2.88	2,910	641.88	6.19 ic	3.76 ic	---	---	0.00	2.42	---	---	0.210	---	6.395
2.92	2,958	641.92	6.43 ic	3.82 ic	---	---	0.00	2.59	---	---	0.212	---	6.619
2.97	3,005	641.97	6.61 ic	3.84 ic	---	---	0.00	2.76	---	---	0.213	---	6.816
3.02	3,053	642.01	6.81 ic	3.85 ic	---	---	0.00	2.94	---	---	0.215	---	7.006
3.06	3,100	642.06	6.98 ic	3.86 ic	---	---	0.00	3.12	---	---	0.217	---	7.199
3.11	3,148	642.10	7.09 oc	3.79 ic	---	---	0.00	3.30	---	---	0.218	---	7.311
3.15	3,196	642.15	7.29 oc	3.80 ic	---	---	0.00	3.49	---	---	0.220	---	7.509
3.19	3,233	642.20	7.49 oc	3.81 ic	---	---	0.00	3.68	---	---	0.222	---	7.708
3.24	3,269	642.24	7.69 oc	3.81 ic	---	---	0.00	3.87	---	---	0.224	---	7.909
3.29	3,306	642.28	7.89 oc	3.82 ic	---	---	0.00	4.07	---	---	0.225	---	8.111
3.33	3,343	642.33	8.09 oc	3.82 ic	---	---	0.00	4.27	---	---	0.227	---	8.315
3.38	3,380	642.37	8.29 oc	3.82 ic	---	---	0.13	4.47	---	---	0.229	---	8.648
3.42	3,417	642.42	8.50 oc	3.82 ic	---	---	0.36	4.68	---	---	0.230	---	9.087
3.47	3,454	642.46	8.70 oc	3.82 ic	---	---	0.66	4.89	---	---	0.232	---	9.596
3.51	3,491	642.51	8.91 oc	3.81 ic	---	---	1.02	5.10 s	---	---	0.234	---	10.16
3.56	3,528	642.55	9.11 oc	3.81 ic	---	---	1.42	5.30 s	---	---	0.236	---	10.77
3.60	3,565	642.60	9.31 oc	3.80 ic	---	---	1.87	5.50 s	---	---	0.237	---	11.41
3.64	3,593	642.65	9.50 oc	3.80 ic	---	---	2.35	5.70 s	---	---	0.239	---	12.09
3.69	3,622	642.69	9.69 oc	3.80 ic	---	---	2.88	5.89 s	---	---	0.241	---	12.81
3.73	3,650	642.73	9.88 oc	3.79 ic	---	---	3.43	6.09 s	---	---	0.242	---	13.55
3.78	3,679	642.78	10.06 oc	3.79 ic	---	---	4.02	6.28 s	---	---	0.244	---	14.33
3.83	3,707	642.82	10.25 oc	3.78 ic	---	---	4.64	6.47 s	---	---	0.246	---	15.13
3.87	3,736	642.87	10.43 oc	3.77 ic	---	---	5.28	6.66 s	---	---	0.248	---	15.96
3.92	3,764	642.91	10.61 oc	3.77 ic	---	---	5.96	6.84 s	---	---	0.249	---	16.82
3.96	3,793	642.96	10.79 oc	3.76 ic	---	---	6.66	7.03 s	---	---	0.251	---	17.70
4.01	3,821	643.00	10.97 oc	3.75 ic	---	---	7.38	7.22 s	---	---	0.253	---	18.60
4.05	3,850	643.05	11.15 oc	3.74 ic	---	---	8.14	7.40 s	---	---	0.254	---	19.54
4.09	3,879	643.09	11.32 oc	3.74 ic	---	---	8.91	7.58 s	---	---	0.256	---	20.49
4.14	3,907	643.14	11.49 oc	3.73 ic	---	---	9.71	7.77 s	---	---	0.258	---	21.46
4.18	3,936	643.18	11.66 oc	3.72 ic	---	---	10.53	7.95 s	---	---	0.260	---	22.45
4.23	3,964	643.23	11.83 oc	3.71 ic	---	---	11.37	8.13 s	---	---	0.261	---	23.47
4.28	3,993	643.27	12.00 oc	3.70 ic	---	---	12.23	8.31 s	---	---	0.263	---	24.50
4.32	4,021	643.32	12.17 oc	3.69 ic	---	---	13.12	8.48 s	---	---	0.265	---	25.55
4.37	4,050	643.36	12.33 oc	3.67 ic	---	---	14.02	8.66 s	---	---	0.266	---	26.62
4.41	4,078	643.41	12.50 oc	3.66 ic	---	---	14.95	8.83 s	---	---	0.268	---	27.71
4.46	4,107	643.45	12.66 oc	3.65 ic	---	---	15.89	9.01 s	---	---	0.270	---	28.82
4.50	4,135	643.50	12.82 oc	3.64 ic	---	---	16.86	9.18 s	---	---	0.272	---	29.95

...End

C. BMP Worksheets


Complete Worksheet 1
General Site Information
Map Existing Conditions and Sensitive Natural Resources
Complete Worksheet 2 to determine credits for protecting sensitive Natural Resources
Determine applicable Non-Structural BMPS
Complete Worksheet 3 for Non-Structural BMP credit
Is the development site a Mining Area, Urban Redevelopment Area, Brownfield Area, or a small site with minimal disturbance and imperviousness
No
Yes
Recommended to use Flow Chart B (Primary Control Guideline 1 - CG 1)
Recommended to use Flow Chart C (Primary Control Guideline 2 - CG 2)

Worksheet 1. General Site Information

Date: October-19

Project Name: PennEast Pipeline - Blue Mountain Interconnect

Municipality: Lower Towamesing

County: Carbon

Total Area (acres): 0.99

Major River Basin: Delaware

http://www.dep.state.pa.us/dep/deputate/watermgt/wc/default.htm - newtopics

Watershed: Lehigh River

Sub-Basin: Lehigh

Nearest Surface Water(s) to Receive Runoff: Aquashicola Creek

Chapter 93 - Designated Water Use: HQ-CWF, MF

http://www.pacode.com/secure/data/025/chapter93/chap93toc.html

Impaired according to Chapter 303(d) List ? Yes ☐ No ☑

http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/303d-Report.h

List Causes of Impairment:

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes ☐ No ☑

http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm

Existing or planned drinking water supply? Yes ☐ No ☑

If yes, distance from proposed discharge (miles): ____________

Approved Act 167 Plan? Yes ☐ No ☑

http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/Approved_1.html

Existing River Conservation Plan? Yes ☐ No ☑

http://www.dcnr.state.pa.us/cs/groups/public/documents/document/d_001448.pdf

Worksheet 2. Sensitive Natural Resources

INSTRUCTIONS:

1. Provide Sensitive Resources Map according to non-structural BMP 5.4.1 in Chapter 5. This map should identify wetlands, woodlands, natural drainage ways, steep slopes, and other sensitive natural areas.

2. Summarize the existing extent of each sensitive resource in the Existing Sensitive Resources Table (below, using Acres). If none present, insert 0.

3. Summarize Total Protected Area as defined under BMPs in Chapter 5.

4. Do not count any area twice. For example, an area that is both a floodplain and a wetland may only be considered once.

EXISTING NATURAL SENSITIVE RESOURCE	MAPPED? yes/no/n/a	TOTAL AREA (Ac.)	PROTECTED AREA (Ac.)
Waterbodies	no	0.00	
Floodplains	no	0.00	
Riparian Areas	no	0.00	
Wetlands	no	0.00	
Woodlands	no	0.00	
Natural Drainage Ways	no	0.00	
Steep Slopes, 15%-25%	no	0.00	
Steep Slopes, over 25%	no	0.00	
Other:	no	0.00	
Other:	no	0.00	
TOTAL EXISTING:		**0.00**	**0.00**

Worksheet 3. Nonstructural BMP Credits

PROTECTED AREA

1.1 Area of Protected Sensitive/Special Value Features (see WS 2)	0.00	Ac.
1.2 Area of Riparian Forest Buffer Protection	0.00	Ac.
1.3 Area of Minimum Disturbance/Reduced Grading	0.00	Ac.
TOTAL	0.00	Ac.

Site Area	*minus*	Protected Area	=	Stormwater Management Area
0.99	-	0.00	=	0.99

VOLUME CREDITS

3.1 Minimum Soil Compaction

Lawn		sq. ft	x 1/4" x 1/12 =	0	cubic ft
Meadow		sq. ft	x 1/3" x 1/12 =	0	cubic ft

3.3 Protect Existing Trees

For Trees within 100 feet of impervious area:

Tree Canopy		sq. ft	x 1/2" x 1/12 =	0	cubic ft

For Trees within 20 feet of impervious area:

Tree Canopy		sq. ft	x 1" x 1/12 =	0	cubic ft

5.1 Disconnect Roof Leaders to Vegetated Areas

For runoff directed to areas protected under 5.8.1 and 5.8.2

Roof Area		sq. ft	x 1/3" x 1/12 =	0	cubic ft

For all other disconnected roof areas

Roof Area		sq. ft	x 1/4" x 1/12 =	0	cubic ft

5.2 Disconnect Non-Roof Impervious to Vegetated Areas

For runoff directed to areas protected under 5.8.1 and 5.8.2

Impervious Area		sq. ft	x 1/3" x 1/12 =	0	cubic ft

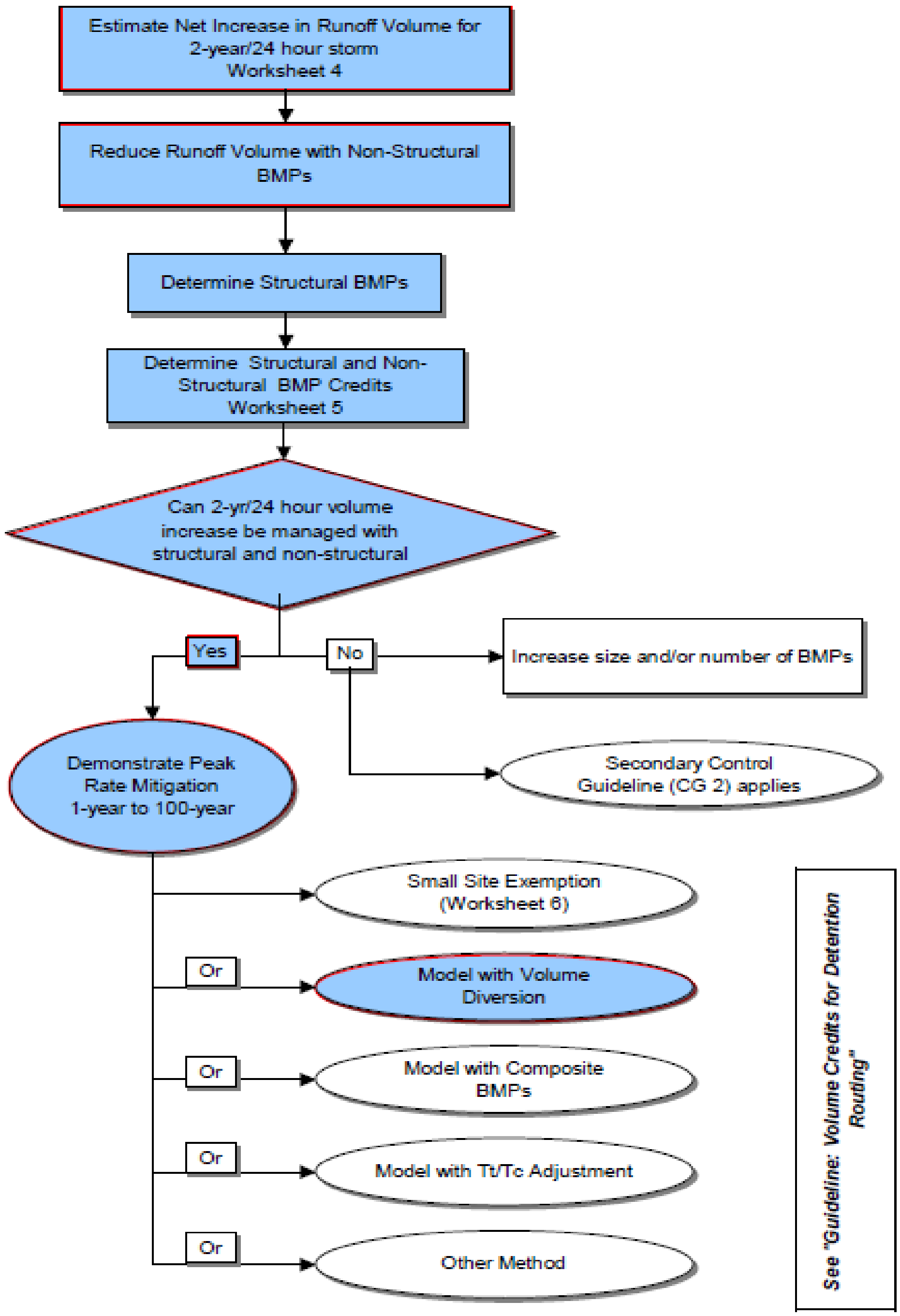
For all other disconnected areas

Impervious Area		sq. ft	x 1/4" x 1/12 =	0	cubic ft

TOTAL NON-STRUCTURAL VOLUME CREDIT* 0 cubic ft

* For use on Worksheet 5

FLOW CHART B
Control Guideline 1 Process



Worksheet 4A. Change in Runoff Volume for 1-Yr Storm Event

PROJECT: PennEast Pipeline - Blue Mountain Interconnect
Drainage Area: 4.71 acres
1-Year Rainfall: 2.63 in

Total Site Area: 0.99 acres
Protected Site Area: 0.00 acres
Managed Area: 0.99 acres

Existing Conditions:

Cover Type/ Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (cubic ft)
Impervious/Gravel	MbC2	1,653	0.04	98	0.20	0.04	2.40	331
Impervious/Gravel	McD	169	0.00	98	0.20	0.04	2.40	34
Meadow	MbC2	7,118	0.16	71	4.08	0.82	0.56	331
Meadow	McD	45	0.00	71	4.08	0.82	0.56	2
Woods	BhD	23,140	0.53	70	4.29	0.86	0.52	1,000
Woods	MbC2	5,454	0.13	70	4.29	0.86	0.52	236
Woods	McD	5,437	0.12	70	4.29	0.86	0.52	235
TOTAL:		**43,016**	**0.99**				2.63	**2,168**

Developed Conditions:

Cover Type/ Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (cubic ft)
Impervious/Gravel	BhD	1,757	0.04	98	0.20	0.04	2.40	351
Impervious/Gravel	MbC2	4,746	0.11	98	0.20	0.04	2.40	949
Impervious/Gravel	McD	525	0.01	98	0.20	0.04	2.40	105
Gravel	BhD	2,781	0.06	89	1.24	0.25	1.57	364
Gravel	MbC2	145	0.00	89	1.24	0.25	1.57	19
Gravel	McD	580	0.01	89	1.24	0.25	1.57	76
Meadow	BhD	18,606	0.43	71	4.08	0.82	0.56	864
Meadow	MbC2	9,330	0.21	71	4.08	0.82	0.56	433
Meadow	McD	4,546	0.10	71	4.08	0.82	0.56	211
TOTAL:		**43,016**	**0.99**				2.63	**3,373**

1-Year Volume Increase (cubic ft):	1,204

1-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = Q = (P - 0.2S)^2 / (P + 0.8S) where

   P = 1-Year Rainfall (in)

   S = (1000/CN) - 10

2. Runoff Volume (CF) = Q x Area x 1/12

   Q = Runoff (in)

   Area = Land use area (sq. ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSG.
The use of a weighted CN value for volume calculations is not acceptable.

Worksheet 4B. Change in Runoff Volume for 2-Yr Storm Event

PROJECT: PennEast Pipeline - Blue Mountain Interconnect
Drainage Area: 4.71 acres
2-Year Rainfall: 3.15 in

Total Site Area: 0.99 acres
Protected Site Area: 0.00 acres
Managed Area: 0.99 acres

Existing Conditions:

Cover Type/ Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (cubic ft)
Impervious/Gravel	MbC2	1,653	0.04	98	0.20	0.04	2.92	402
Impervious/Gravel	McD	169	0.00	98	0.20	0.04	2.92	41
Meadow	MbC2	7,118	0.16	71	4.08	0.82	0.85	503
Meadow	McD	45	0.00	71	4.08	0.82	0.85	3
Woods	BhD	23,140	0.53	70	4.29	0.86	0.80	1,541
Woods	MbC2	5,454	0.13	70	4.29	0.86	0.80	363
Woods	McD	5,437	0.12	70	4.29	0.86	0.80	362
TOTAL:		**43,016**	**0.99**				3.15	**3,216**

Developed Conditions:

Cover Type/ Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (cubic ft)
Impervious/Gravel	BhD	1,757	0.04	98	0.20	0.04	2.92	427
Impervious/Gravel	MbC2	4,746	0.11	98	0.20	0.04	2.92	1,154
Impervious/Gravel	McD	525	0.01	98	0.20	0.04	2.92	128
Gravel	BhD	2,781	0.06	89	1.24	0.25	2.04	472
Gravel	MbC2	145	0.00	89	1.24	0.25	2.04	25
Gravel	McD	580	0.01	89	1.24	0.25	2.04	98
Meadow	BhD	18,606	0.43	71	4.08	0.82	0.85	1,315
Meadow	MbC2	9,330	0.21	71	4.08	0.82	0.85	659
Meadow	McD	4,546	0.10	71	4.08	0.82	0.85	321
TOTAL:		**43,016**	**0.99**				3.15	**4,600**

2-Year Volume Increase (cubic ft):	1,384

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = Q = (P - 0.2S)^2 / (P + 0.8S) where

   P = 1-Year Rainfall (in)

   S = (1000/CN) - 10

2. Runoff Volume (CF) = Q x Area x 1/12

   Q = Runoff (in)

   Area = Land use area (sq. ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSG.

Worksheet 5. Structural BMP Volume Credits

PROJECT: PennEast Pipeline - Blue Mountain Interconnect
SUB-BASIN: Lehigh

Required Control Volume (cubic ft) - from Worksheet 4:		1,384
Non-structural Volume Credit (cubic ft) - from Worksheet 3:	-	0
Structural Volume Requirement (cubic ft) *(Required Control Volume minus Non-structural Credit)*		1,384

Proposed BMP		Area (sq. ft)	Storage Volume (cubic ft)
6.4.1	Porous Pavement		
6.4.2	Infiltration Basin	1,571	673
6.4.3	Infiltration Bed		
6.4.4	Infiltration Trench		
6.4.5	Rain Garden / Bioretention		
6.4.6	Dry Well / Seepage Pit		
6.4.7	Constructed Filter		
6.4.8	Vegetated Swale		
6.4.9	Vegetated Filter Strip		
6.4.10	Berm		
6.5.1	Vegetated Roof		
6.5.2	Capture and Re-use		
6.6.1	Constructed Wetlands		
6.6.2	Wet Pond / Retention Basin		
6.6.3	Dry Extended Detention Basin		
6.6.4	Water Quality Filters		
6.7.1	Riparian Buffer Restoration		
6.7.2	Landscape Restoration / Reforestation		
6.7.3	Soil Amendment		
6.8.1	Level Spreader		
6.8.2	Special Storage Areas		
Other	Infiltration Area	2,285	914

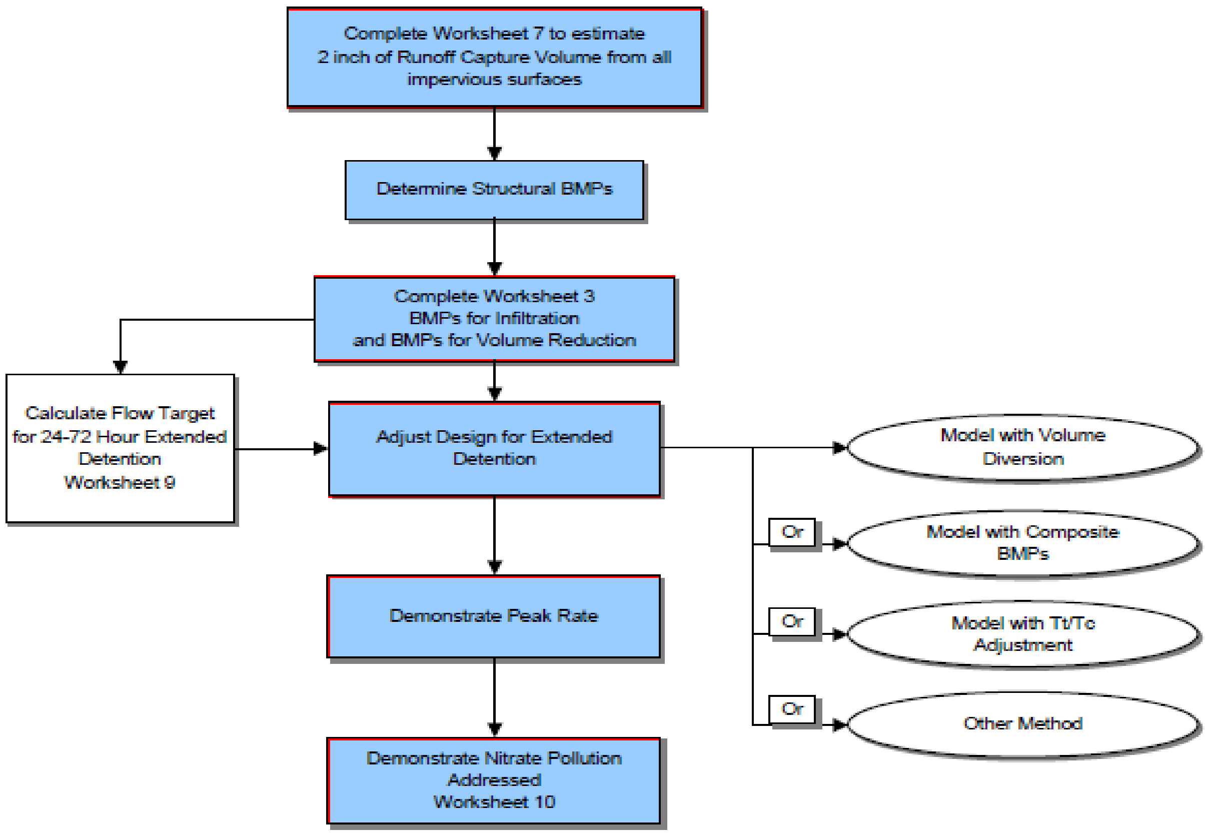
Total Structural Volume (cubic ft): 1,587

Structural Volume Requirement (cubic ft): 1,384

DIFFERENCE 203.14 cubic ft

Note: The infiltration volume provided is significantly larger than the worksheet voume because it is based on the modeled runoff volumes which account for the existing infiltration facility.

FLOW CHART C
Control Guideline 2 Process



Since the Act 167 Plan requires complinace with CG1 and CG2 Flow Chart C and Worksheets 7 and 8 have been included.

Worksheet 7. Calculation of Runoff Volume (PRV and EDV) for CG-2 Only

PROJECT: PennEast Pipeline - Blue Mountain Interconnect
DRAINAGE AREA: 0.990

Total Site Area: 0.99 acres
Protected Site Area: 0.00 acres
Managed Area: 0.60 acres
Total Impervious Area: 0.23 acres

2 Inch Runoff - Multiply Total Impervious Area by 2 inch

Cover Type	Area (ac)	Runoff Capture Volume (cubic ft)
Roof	0.00	0
Pavement	0.20	1452
Other Impervious	0.00	0
TOTAL:	0.20	1452

1 Inch Rainfall -

Cover Type	Area (square ft)	Area (ac)	Runoff (in)	Runoff Volumes (cubic ft)
Impervious Dirt	331	0.01	0.22	6
Impervious/Gravel	13,766	0.32	0.79	907
Meadow	65,860	1.51	0.01	43
TOTAL:	79,956	1.84		957

1. Total Runoff Capture Volume (cu ft) = Total Impervious Area (sq ft x 2 inch x 1/12

2. PRV (cu ft) = Total Impervious Area (sq ft) x 1 inch x 1/12

3. EDV (cu ft) = Total Area (sq ft) x 1 inch x 1/12

Water quality volume requirements for land areas with existing cover consisting of meadow, brush, wood-grass combination, or woods proposed for conversion to any other non-equivalent type of pervious cover shall be sized for one-half (1/2) the volume required for impervious surfaces as mentioned in this worksheet and calculated in items 1 through 3 above

Worksheet 8. Structural BMP Volume Credits

PROJECT: PennEast Pipeline - Blue Mountain Interconnect
SUB-BASIN: Lehigh

Required Control Volume (cubic ft) - *from Worksheet 7:* 1,452
Non-structural Volume Credit (cubic ft) - *from Worksheet 3:* - 0

Structural Volume Reqmt (cubic ft) 1,452
(Required Control Volume minus Non-structural Credit)

Proposed BMP*		Area (square ft)	Storage Volume (cubic ft)
6.4.1	Porous Pavement		
6.4.2	Infiltration Basin	1571	673
6.4.3	Infiltration Bed		
6.4.4	Infiltration Trench		
6.4.5	Rain Garden / Bioretention		
6.4.6	Dry Well / Seepage Pit		
6.4.7	Constructed Filter		
6.4.8	Vegetated Swale		
6.4.9	Vegetated Filter Strip		
6.4.10	Berm		
6.5.1	Vegetated Roof		
6.5.2	Capture and Re-use		
6.6.1	Constructed Wetlands		
6.6.2	Wet Pond / Retention Basin		
6.6.3	Dry Extended Detention Basin		
6.6.4	Water Quality Filters		
6.7.1	Riparian Buffer Restoration		
6.7.2	Landscape Restoration / Reforestation		
6.7.3	Soil Amendment		
6.8.1	Level Spreader		
6.8.2	Special Storage Areas		
Other	Infiltration Area	2285	914

Total Structural Volume (cubic ft): 1587

Structural Volume Requirement (cubic ft): 1452

DIFFERENCE 135

Worksheet 10. Water Quality Compliance for Nitrate

Does the site design incorporate the following BMPs to address nitrate pollution? A summary "yes" rating is achieved if at least 2 Primary BMPs for nitrate are provided across the site or 4 secondary BMPs for nitrate are provided across the site (or 1 primary and 2 secondary).

PRIMARY BMPs FOR NITRATE:

	YES	NO
NS BMP 5.4.2 - Protect / Conserve / Enhance Riparian Buffers		X
NS BMP 5.5.4 - Cluster Uses at Each Site		X
NS BMP 5.6.1 - Minimize Total Disturbed Area		X
NS BMP 5.6.3 - Re-Vegetate / Re-Forest Disturbed Areas		X
NS BMP 5.9.1 - Street Sweeping / Vacuuming		X
Structural BMP 6.7.1 - Riparian Buffer Restoration		X
Structural BMP 6.7.2 - Landscape Restoration	X	

SECONDARY BMPs FOR NITRATE:

	YES	NO
NS BMP 5.4.1 - Protect Sensitive / Special Value Features		X
NS BMP 5.4.3 - Protect / Utilize Natural Drainage Features		X
NS BMP 5.6.2 - Minimize Soil Compaction		X
Structural BMP 6.4.5 - Rain Garden / Bioretention		X
Structural BMP 6.4.8 - Vegetated Swale	X	
Structural BMP 6.4.9 - Vegetated Filter Strip		X
Structural BMP 6.6.1 - Constructed Wetland		X
Structural BMP 6.7.1 - Riparian Buffer Restoration		X
Structural BMP 6.7.2 - Landscape Restoration	X	
Structural BMP 6.7.3 - Soils Amendment / Restoration	X	

D. Soil Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for

Carbon County, Pennsylvania

Blue Mountain Interconnect

May 14, 2018

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

Soil Map

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

Soil Map


75° 30' 22" W
75° 30' 16" W
457330
457350
457370
457390
457410
457430
40° 49' 8" N
4518790
4518770
4518750
4518730
4518710
4518690
4518670
4518650
4518630
40° 49' 3" N
MbC2
BhD
McD
Soil Map may not be valid at this scale.
Map Scale: 1:804 if printed on A portrait (8.5" x 11") sheet.
Meters
0
10
20
40
60
Feet
0
35
70
140
210
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Carbon County, Pennsylvania
Survey Area Data: Version 15, Oct 3, 2017

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

Date(s) aerial images were photographed: Sep 20, 2010—Aug 28, 2016

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BhD	Buchanan very stony loam, 8 to 25 percent slopes	1.2	45.5%
MbC2	Meckesville channery loam, 8 to 15 percent slopes, moderately eroded	0.7	27.1%
McD	Meckesville very stony loam, 8 to 25 percent slopes	0.7	27.4%
Totals for Area of Interest		**2.6**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

Carbon County, Pennsylvania

BhD—Buchanan very stony loam, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: l35t
Elevation: 600 to 2,400 feet
Mean annual precipitation: 38 to 46 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 140 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Buchanan and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Buchanan

Setting

Landform: Mountain slopes, valley sides
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank, base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Mountain slope colluvium derived from sedimentary rock

Typical profile

H1 - 0 to 5 inches: very stony loam
H2 - 5 to 25 inches: gravelly loam
H3 - 25 to 60 inches: gravelly loam

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Andover

Percent of map unit: 5 percent
Landform: Depressions

Hydric soil rating: Yes

MbC2—Meckesville channery loam, 8 to 15 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: l385
Elevation: 600 to 2,800 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 130 to 190 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Meckesville and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Meckesville

Setting

Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandstone, siltstone and shale colluvium derived from sedimentary rock

Typical profile

H1 - 0 to 9 inches: channery loam
H2 - 9 to 36 inches: gravelly loam
H3 - 36 to 60 inches: very cobbly loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 25 to 48 inches to fragipan
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

McD—Meckesville very stony loam, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: l387
Elevation: 600 to 2,800 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 130 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Meckesville and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Meckesville

Setting

Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandstone, siltstone and shale colluvium derived from sedimentary rock

Typical profile

H1 - 0 to 9 inches: very stony loam
H2 - 9 to 36 inches: gravelly loam
H3 - 36 to 60 inches: very cobbly loam

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 25 to 48 inches to fragipan
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Hydric soil rating: No

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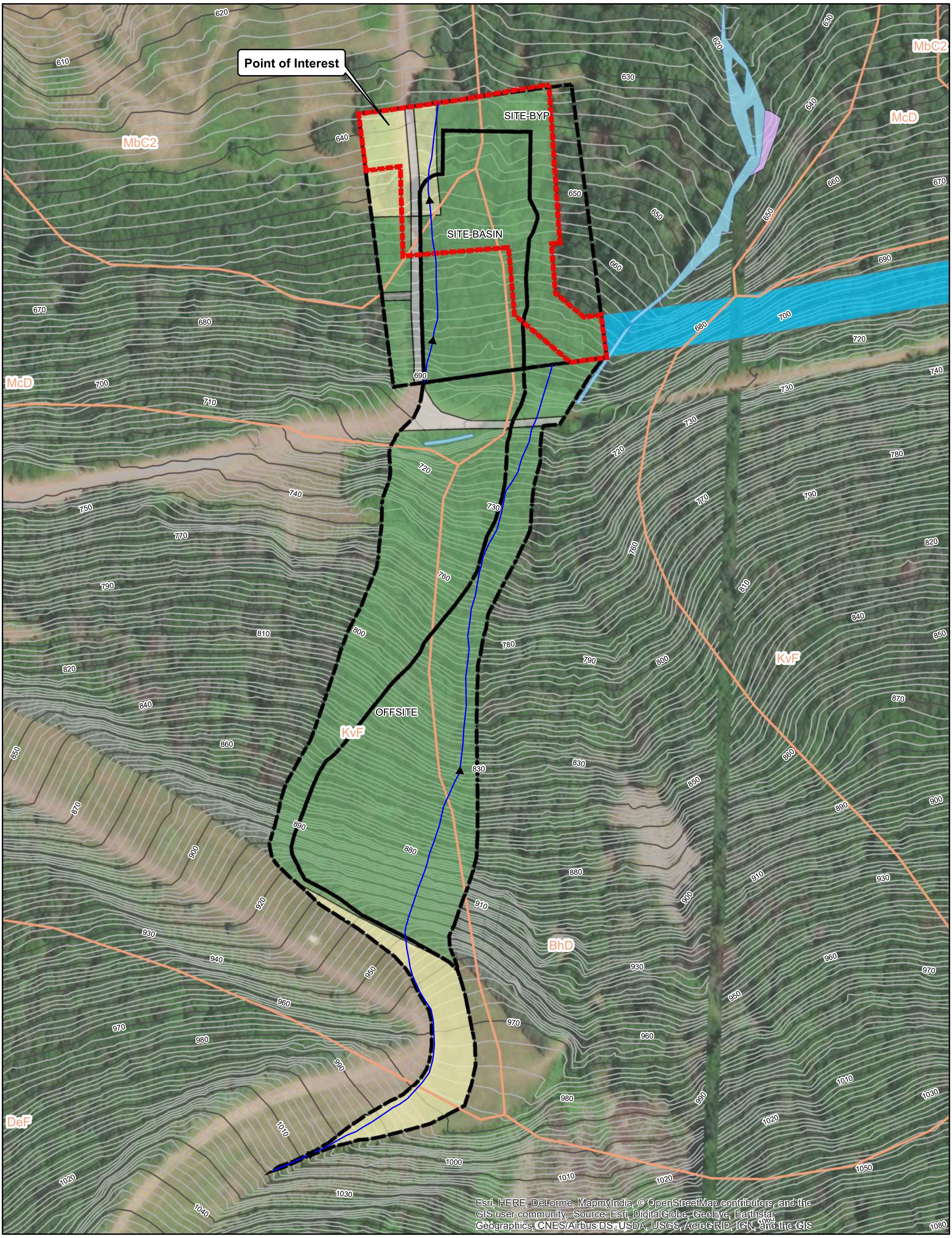
**TABLE E.1 LIMITATIONS OF PENNSYLVANIA SOILS PERTAINING TO EARTHMOVING PROJECTS (Absence of an X does not mean "No Potential Limitation")
NOTE: THIS IS NOT NECESSARILY AN ALL-INCLUSIVE LIST.**

SITE	SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASLY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH/ LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK-SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Blue Mountain Interconnect	BhD	X	C/S	X	X		X	X	X	X	X	X	X				X
	McD	X	S	X	X		X	X	X	X	X		X				X
	MbC2	X	C/S				X		X	X	X	X	X				X

E. Existing Conditions Drainage Area Map



Legend

COVER

- IMP/DIRT - Impervious
- IMP/GRAVEL - Impervious
- MEAD - Meadow
- WO - Woods

- Mainline Easement
- Tc Path
- Limit of Disturbance
- Drainage Area

- Soils
- Stream
- 10ft Contours
- 2ft Contours

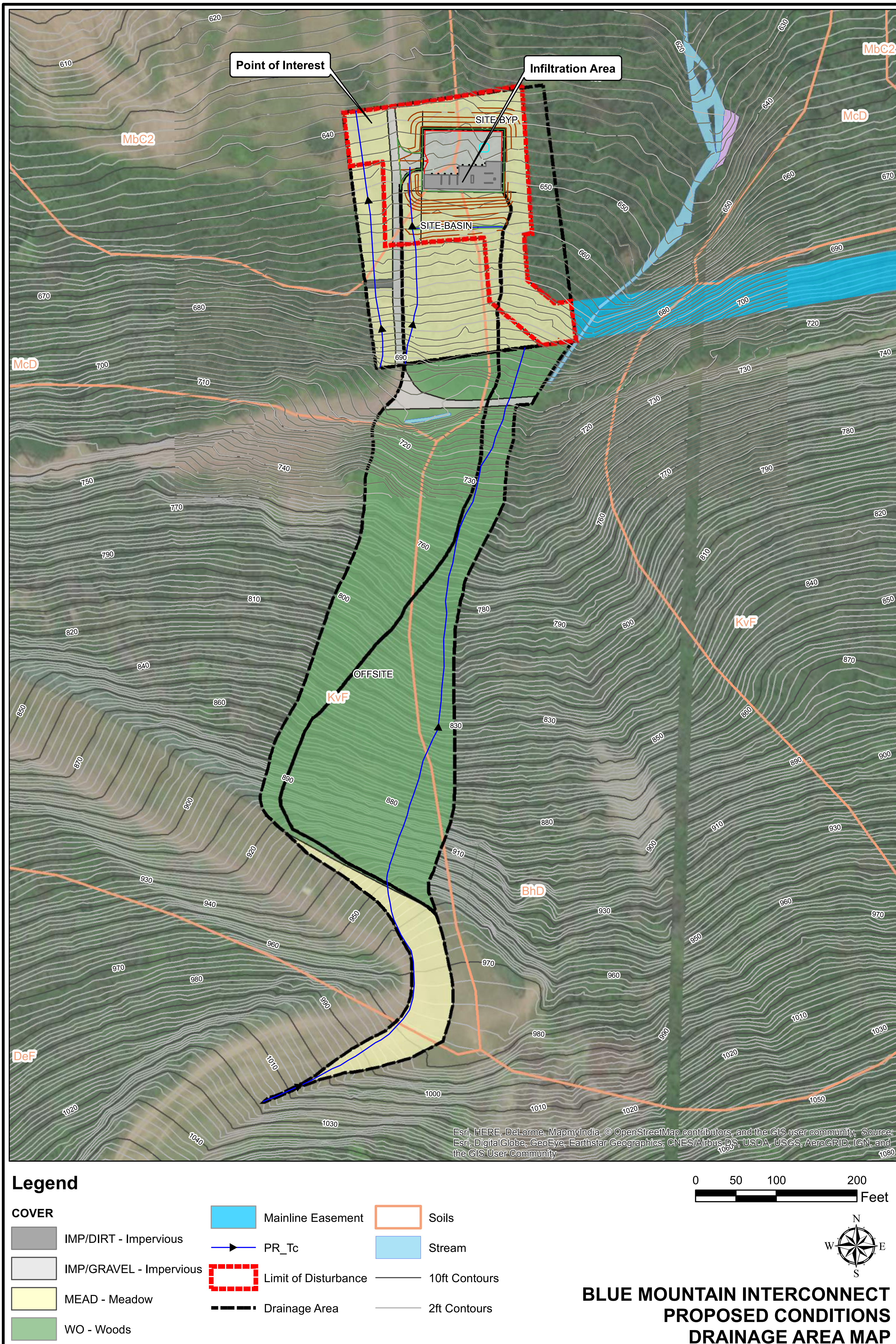
0 50 100 200 Feet

N S W E

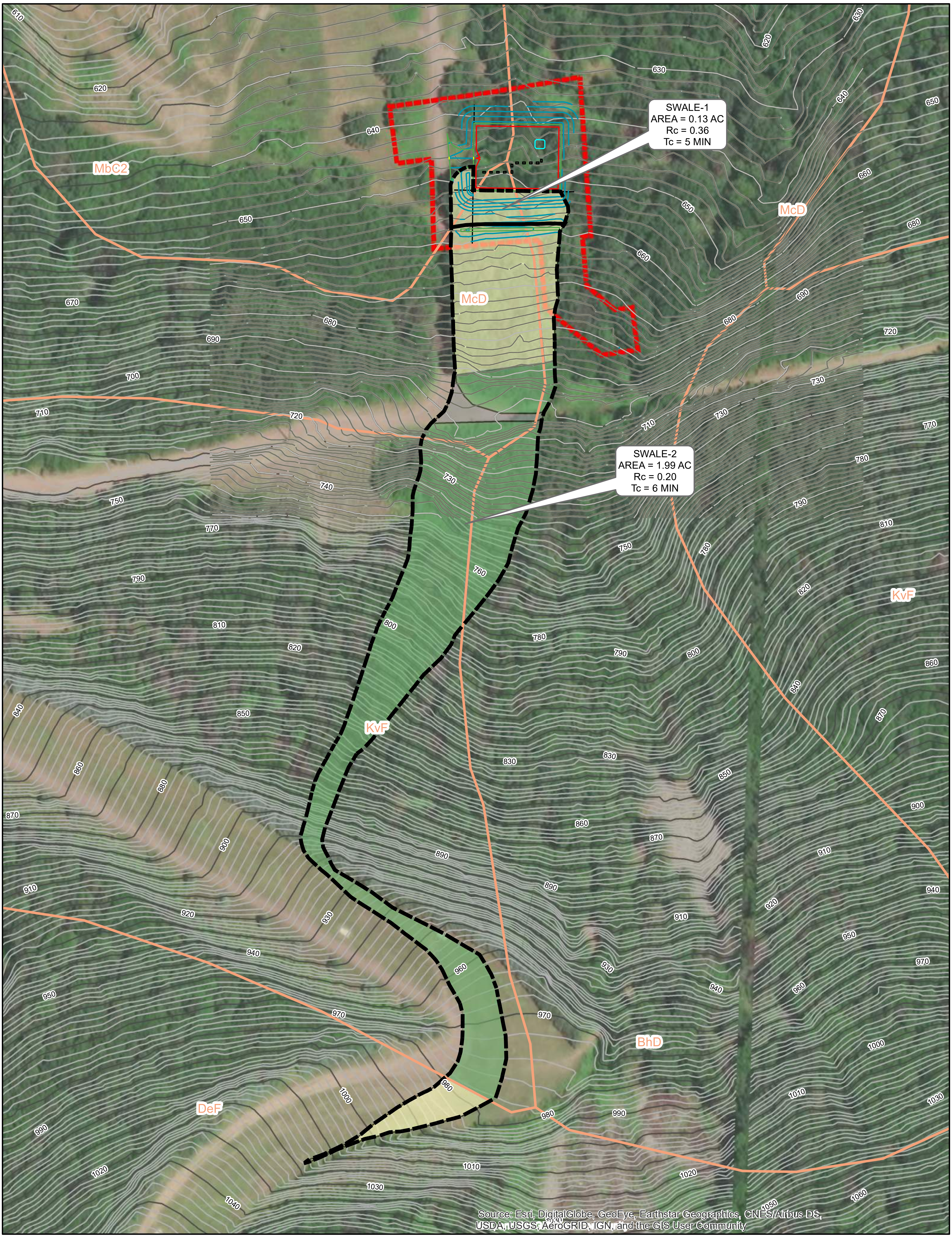
BLUE MOUNTAIN INTERCONNECT
EXISTING CONDITIONS
DRAINAGE AREA MAP

Map Document: (P:\353754 PennEast\Stormwater\Blue Mountain Interconnect\GIS\Projects\EX_DA_Map.mxd) 28/08/2018 14:09:48 ZHI76919

F. Proposed Conditions Drainage Area Map



Map Document: (P:\353754 PennEast\Stormwater\Blue Mountain Interconnect\GIS\Projects\PR_DA_Map.mxd) 8/28/2018 2:08:32 PM zhi76919



Legend

COVER

- IMP/GRAVEL - Impervious/Gravel
- MEAD - Meadow
- WO - Woods

- Swale Drainage Area
- Limit of Disturbance
- Soils
- 10ft Contours
- 2ft Contours

0 50 100 200 Feet

N W E S

BLUE MOUNTAIN INTERCONNECT
PROPOSED CONDITIONS
SWALE DRAINAGE AREA MAP

Map Document: (P:\353754 PennEast\Stormwater\Blue Mountain Interconnect\GIS\Projects\Swale_DA_Map.mxd) 26/08/2019 08:48:32 ZHI76919

G. Infiltration Memo

MOTT MACDONALD

Technical Note

Project:	PennEast Pipeline Project		
Our reference:	353754-GT-SW-05	**Your reference:**	353754-GT-SW-05
Prepared by:	E. Vigliorolo, EIT	**Date:**	June 19, 2018
Approved by:	V. Shah, PE, PhD	**Checked by:**	T. Rajah, EIT
Subject:	Test Pit and Infiltration Testing – Blue Mountain Interconnect		

1 Introduction

This technical note addresses the geotechnical considerations of native soils for stormwater design for the Blue Mountain Interconnect located in Lower Towamensing, Carbon County, Pennsylvania (site). The subsurface investigation consisting of four test pits, BMTP-6, BMTP-7, BMTP-8, and BMTP-9 were excavated by Craig Test Boring Co., Inc. of Mays Landing, New Jersey on May 17, 2018 and June 15, 2018. Infiltration testing using double-ring infiltrometers was performed within each test pit. A Locus Map depicting the area of our investigation is provided in Attachment A.

2 Subsurface Investigation and Infiltration Testing Results

Given the presence of suitable soils and absence of competent bedrock within testing zones, all infiltration tests were performed using a double-ring infiltrometer. The double-ring infiltrometer was placed on level ground within the excavated test pits, and driven a minimum of two inches below the excavated surface. Two 30-minute presoaking periods were conducted prior to start of infiltration testing. Both the outer and inner ring were filled with 4 inches of water, beginning with the outer ring. The drop in the water level during the second 30-minute presoaking period was used to determine the timed intervals to be used during testing. The timed interval between readings was determined based on the following criteria:

- If water level drop is two inches or more, 10-minute intervals were used for recording measurements.
- If water level drop is less than two inches, 30-minute intervals were used for recording measurements.

After each reading, both rings were refilled with water to the four-inch level in an iterative manner. Water level depths at the determined timed interval were recorded until a minimum of eight readings were completed or until a stabilized rate of drop was obtained, whichever occurred first. A stabilized rate of drop is defined as the difference of a 0.25-inch or less drop between the highest and lowest reading of four consecutive readings. The drop that occurs in the center ring during the final period or the average stabilized rate is expressed in inches per hour and represents the infiltration rate for that test location. At the completion of the infiltration test, each test pit was excavated an additional two feet to observe the subsurface conditions below the test depth. The test pit and infiltration test results are summarized below:

BMTP-6

Test Pit BMTP-6 was excavated to 4.5 feet below existing grade on May 17, 2018. Two infiltration tests were performed at 2.5 feet below existing grade within this test pit. Both tests yielded an infiltration rate of 0.25 inches per hour (in/hr). No restrictive zones or bedrock were encountered within two feet of the testing depth. In accordance with the Pennsylvania Stormwater Best Management Practices Manual (PA BMP), a minimum factor of safety of 2.0 is recommended in relation to soils encountered at this location. Therefore, the recommended design infiltration rate is 0.125 in/hr.

The general description of the soil profile observed within the excavated test pits is provided below:

- **0 – 6 inches**: Topsoil; Dark brown sandy Silt with root and boulders, moist
- **6 – 33.6 inches**: Yellowish brown clayey Silt, some coarse to fine gravel, trace fine sand, frequent decomposed rock fragments, moist
- **33.6 – 54 inches**: Red-brown clayey Silt, some coarse to fine sand, some decomposed rock fragments, moist

Mottling was not observed and groundwater was not encountered within this test pit.

BMTP-7

Test Pit BMTP-7 was also excavated to 4.8 feet below existing grade on May 17, 2018. Two infiltration tests were performed at 2.8 feet below existing grade within this test pit. The first test yielded an infiltration rate of 0.5 in/hr, and the second test yielded an infiltration rate of 0.25 in/hr. It is recommended that an average infiltration rate of 0.375 in/hr be considered at this location. No restrictive zones or bedrock were encountered within 2.0 feet of testing depth. In accordance with the PA BMP, a minimum factor of safety of 2.0 is recommended in relation to soils encountered at this location. Therefore, the recommended design infiltration rate is 0.188 in/hr.

The general description of the soil profile observed within the excavated test pits are provided below:

- **0 – 4 inches**: Topsoil; Dark brown sandy Silt with roots, moist
- **4 – 42 inches**: Yellowish brown clayey Silt, some coarse to fine gravel, little coarse to fine sand, frequent decomposed rock fragments, moist
- **42 – 57.6 inches**: Reddish brown coarse to fine Sand, some clayey silt, frequent decomposed rock fragments, moist

Mottling was not observed and groundwater was not encountered within this test pit.

BMTP-8

Test Pit BMTP-8 was excavated to 6.0 feet below existing grade on June 15, 2018. Two infiltration tests were performed at 4.0 feet below existing grade within this test pit. The first test yielded an infiltration rate of 6.6 in/hr, and the second test yielded an infiltration rate of 5.4 in/hr. It is recommended that an average infiltration rate of 6.0 in/hr be considered at this location. No restrictive zones or bedrock were encountered within 2.0 feet of testing depth. In accordance with the PA BMP, a minimum factor of safety of 2.0 is recommended in relation to soils encountered at this location. Therefore, the recommended design infiltration rate is 3.0 in/hr.

The general description of the soil profile observed within the excavated test pits is provided below:

- **0 – 7 inches**: Topsoil; Dark brown with roots, dry
- **7 – 29 inches**: Reddish brown silty Clay, some fine sand, trace roots, dry
- **29 – 72 inches**: Reddish brown decomposed rock, some clay, trace silt, dry

Mottling was not observed and groundwater was not encountered within this test pit. Boulders were encountered throughout the test pit.

BMTP-9

Test Pit BMTP-9 was excavated to 5.1 feet below existing grade on June 15, 2018. Two infiltration tests were performed at 3.1 feet below existing grade within this test pit. The first test yielded an infiltration rate of 3.0 in/hr, and the second test yielded an infiltration rate of 6.0 in/hr. It is recommended that an average infiltration rate of 4.5 in/hr be considered at this location. It should be noted, as per the request of the stormwater design engineer, the infiltration test was performed in a rock layer at 3.1-feet below existing grade or the bottom of the proposed stormwater drainage feature. No restrictive zones or bedrock were encountered within 2.0 feet of testing depth. In accordance with the PA BMP, a minimum factor of safety of 2.0 is recommended in relation to soils encountered at this location. Therefore, the recommended design infiltration rate is 2.25 in/hr.

The general description of the soil profile observed within the excavated test pits is provided below:

- **0 – 8 inches**: Topsoil; Dark brown with roots
- **8 – 26 inches**: Reddish brown silty Clay, dry
- **26 – 61 inches**: Reddish brown to dark gray decomposed rock, little silt and clay, dry

Mottling was not observed and groundwater was not encountered within this test pit. Boulders were encountered throughout the test pit.

Table 1- Infiltration Test Result

Test Pit No.	Existing Grade El. (feet)	Infiltration Test El. (feet)	Infiltration Test Results (Average) (in/hr)	Recommended Safety Factor	Recommended Design Infiltration Rate (in/hr)
BMTP-6	649.0	646.5	0.25	2.0	0.125
BMTP-7	652.4	649.6	0.375	2.0	0.188
BMTP-8	642.7	638.7	6.0	2.0	3.0
BMTP-9	643.2	640.1	4.5	2.0	2.25

Infiltration rates observed during our investigation were dependent on the subsurface conditions encountered within each test pit. Test locations which resulted in low infiltration rates consisted of predominately low permeable soils such as silt and clays, whereas test locations resulting in high infiltration rates contained more permeable soils such as sands, gravel, cobbles, and boulders. The test pit logs and infiltration test forms are provided in Attachment B.

Pennsylvania Stormwater Best Management Practices Manual. Department of Environmental Protection. Bureau of Watershed Management. December 30, 2006 was utilized as the reference document for this scope of work.

Attachments:

- Attachment A – Locus Map
- Attachment B – Test Pit Logs and Infiltration Test Forms

Attachments

A. Locus Map

NAME	LATITUDE	LONGITUDE	ELEVATION (ft)
BM-TP6	40.8183904	-75.505545	649.0
BM-TP7	40.8183544	-75.505252	652.4
BM-TP8	40.8185414	-75.5054906	642.7
BM-TP9	40.8184982	-75.5053116	643.2

NOTES:
1. SCALE IS APPROXIMATE
2. GOOGLE EARTH AERIAL IMAGERY DATED 04/17/2017

50 0 50 100
SCALE IN FEET

MOTT MACDONALD
Certificate No. 24GA28016600
111 Wood Avenue South
Iselin, New Jersey 08830-4112

PENNEAST PIPELINE PROJECT
BLUE MOUNTAIN INTERCONNECT
CARBON COUNTY, PA

Designed	Drawn	Checked	Approved	Date
EAV	EAV	EWP	TR	06-20-2018

B. Test Pit Logs and Infiltration Test Forms

MOTT MACDONALD

TEST PIT LOG

SITE LOCATION	Blue Mountain Interconnect	**TEST PIT NUMBER**	**BMTP-6**
PROJECT NUMBER	353754	**MOTT MACDONALD REPRESENTATIVE**	T. Rajah
GENERAL LOCATION	Lower Towamensing, PA	**CONTRACTOR**	Craig Test Boring Co. Inc.
TIME OPENED	10:30 AM	**TIME CLOSED**	5:30 PM
DEPTH TO WATER (Feet BGS)	Not Encountered	**EQUIPMENT**	Backhoe excavator
TESTING DEPTH (Feet BGS)	2.5	**FINAL EXCAVATION DEPTH (Feet BGS)**	4.5
DATE	5/17/2018		

N

0-6”: TOPSOIL with Boulders, moist

6-33.6”: Yellowish brown to reddish brown Clayey SILT, some coarse to fine Gravel, trace fine Sand, trace Decomposed Rock, moist

33.6-54”: Reddish brown Clayey SILT, some Decomposed Rock, some coarse to fine Sand, moist

Note: All classifications and descriptions in this log are solely based on visual field observations. They were developed to generally characterize soils for environmental purposes only. They are not to be relied for any other purpose.

MOTT MACDONALD

Infiltration Test Form

Geotechnical Investigation:

Project Name:	PennEast Pipeline	Date:	5/17/2018
Job Number:	353754	Site Location :	Blue Mountain Station
Contractor:	Craig Test Boring, Inc.	Weather/Temp:	Cloudy 65°
Infiltration Test ID :	BMTP-6 (TP-3)	Report by: T. Rajah	
Testing Depth :	2.5' (30")	Infiltration Test Method :	Double-Ring Infiltrometer

Infiltration Test Pit Soil Description:

Depth Range (inches)		Description of Soil/Rock Layers
0"	6"	TOPSOIL WITH BOULDERS, Moist; SANDY SILT WITH ROOTS
6"	30"	Yellowish brown Clayey SILT, Some c-f Gravel, trace fine Sand, Decomposed rocks, Moist
30"	33.6"	Yellowish brown/red brown clayey SILT, Some c-f Gravel, trace fine Sand, Decomposed Rocks, moist
33.6"	54"	Red/brown clayey SILT, Some Decomposed Rocks, some c-f sand, Moist

Percolation Test:

Test #1

Time (min.)	30 pre-soak	30 pre-soak	30	30	30	30	30		
Test Depth (feet)	**Reading No. 1**	**Reading No. 2**	**Reading No. 3**	**Reading No. 4**	**Reading No. 5**	**Reading No. 6**	**Reading No. 7**	**Reading No. 8**	**Infil. Rate (in. / hour)**
2.5'	1"	0.75"	1"	0.25"	0.25"	0.125"	0.125"	X	0.25"

Test #2

Time (min.)	30 pre-soak	30 pre-soak	30	30	30	30			
Test Depth (feet)	**Reading No. 1**	**Reading No. 2**	**Reading No. 3**	**Reading No. 4**	**Reading No. 5**	**Reading No. 6**	**Reading No. 7**	**Reading No. 8**	**Infil. Rate (in. / hour)**
2.5'	1"	0.125"	0.25"	0.25"	0.125"	0.125"	X	X	0.25"

MOTT MACDONALD M M

TEST PIT LOG

SITE LOCATION	Blue Mountain Interconnect	**TEST PIT NUMBER**	**BMTP-7**
PROJECT NUMBER	353754	**MOTT MACDONALD REPRESENTATIVE**	T. Rajah
GENERAL LOCATION	Lower Towamensing, PA	**CONTRACTOR**	Craig Test Boring Co. Inc.
TIME OPENED	10:00 AM	**TIME CLOSED**	4:30 PM
DEPTH TO WATER (Feet BGS)	Not Encountered	**EQUIPMENT**	Backhoe excavator
TESTING DEPTH (Feet BGS)	2.8	**FINAL EXCAVATION DEPTH (Feet BGS)**	4.8
DATE	5/17/2018		

N

0-4”: TOPSOIL, moist

4-42”: Yellowish brown Clayey SILT, some coarse to fine Gravel, little coarse to fine Sand, Decomposed rocks, moist

42-57.6”: Reddish brown coarse to fine SAND, some Clayey Silt, some Decomposed Rocks, moist

Note: All classifications and descriptions in this log are solely based on visual field observations. They were developed to generally characterize soils for environmental purposes only. They are not to be relied for any other purpose.

MOTT MACDONALD M M

Infiltration Test Form

Geotechnical Investigation:

- Project Name: **PennEast Pipeline** — Date: 5/17/18
- Job Number: **353754** — Site Location: Blue Mountain
- Contractor: Craig Test Boring, Inc. — Weather/Temp: Cloudy
- Infiltration Test ID: BMTP-7 (TP-4) — Report by: T. Rajah
- Testing Depth: 2.8' — Infiltration Test Method: Double-Ring Infiltrometer

Infiltration Test Pit Soil Description:

Depth Range (inches)		Description of Soil/Rock Layers
0"	4"	TOPSOIL, moist; SANDY SILT WITH ROOTS
4"	42"	yellowish brown clayey SILT, some c-f Gravel, little c-f Sand, Decomposed Rocks, Moist
42"	57.6"	Reddish brown C-F SAND, Some clayey Silt, Some Decomposed Rocks, moist

Percolation Test:

Test #1

Time (min.)	30 pre-soak	30 pre-soak	30	30	30				
Test Depth (feet)	Reading No. 1	Reading No. 2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	Infil. Rate (in. / hour)
2.8'	0.5"	0.5"	0.5"	0.25"	0.25"	X	X	X	0.5"

Test #2

Time (min.)	30 pre-soak	30 pre-soak	30	30	30				
Test Depth (feet)	Reading No. 1	Reading No. 2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	Infil. Rate (in. / hour)
2.8'	1.0"	0.5"	0.25"	0.125"	0.125"	X	X	X	0.25"

MOTT MACDONALD

TEST PIT LOG

SITE LOCATION	Blue Mountain Interconnect	**TEST PIT NUMBER**	**BMTP-8**
PROJECT NUMBER	353754	**MOTT MACDONALD REPRESENTATIVE**	C. Guilcapi
GENERAL LOCATION	Lower Towamensing, PA	**CONTRACTOR**	Craig Test Boring Co. Inc.
TIME OPENED	11:00 AM	**TIME CLOSED**	3:22 PM
DEPTH TO WATER (Feet BGS)	Not Encountered	**EQUIPMENT**	Backhoe excavator
TESTING DEPTH (Feet BGS)	4	**FINAL EXCAVATION DEPTH (Feet BGS)**	6
DATE	6/15/2018		

N

0-7”: Dark brown TOPSOIL some roots, dry

7-29”: Reddish brown Silty CLAY, some sand, trace roots, dry

29-72”: Reddish brown DECOMPOSED ROCK, some clay, trace silt, dry

Note: All classifications and descriptions in this log are solely based on visual field observations.
They were developed to generally characterize soils for environmental purposes only.
They are not to be relied for any other purpose.

MOTT MACDONALD M M

Infiltration Test Form

Geotechnical Investigation:

■ Project Name:	PennEast Pipeline	■ Date:	06/15/18
■ Job Number:	353754	■ Site Location :	BLUE MTN, PA
■ Contractor:	Craig Test Boring, Inc.	■ Weather/Temp:	65° / Mostly Sunny
■ Infiltration Test ID :	BM-TP-8	■ Report by:	Chris Guilcapi
■ Testing Depth :	4 ft.	■ Infiltration Test Method :	Double-Ring Infiltrometer

Infiltration Test Pit Soil Description:

Depth Range (inches)		Description of Soil/Rock Layers
0	7	Dark Brown, TOPSOIL, some roots.
7	29	Reddish Brown, Silty CLAY, some sand, trace roots
29	72	Reddish Brown, DECOMPOSED ROCK, some clay, trace silt.

Percolation Test:

Test #1 11:24

Time (min.)	30 pre-soak	30 pre-soak	10	10	10	10	10	10	
Test Depth (feet)	Reading No. 1	Reading No. 2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	Infil. Rate (in. / hour)
4	4	3	1	1	0.8	1	1.[illegible]	1.1	6.6

Test #2 1:38

Time (min.)	30 pre-soak	30 pre-soak	10	10	10	10	10	10	
Test Depth (feet)	Reading No. 1	Reading No. 2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	Infil. Rate (in. / hour)
4	4	4	1.2	1.1	1	1	0.9	0.9	5.4

MOTT MACDONALD

TEST PIT LOG

SITE LOCATION	Blue Mountain Interconnect	**TEST PIT NUMBER**	**BMTP-9**
PROJECT NUMBER	353754	**MOTT MACDONALD REPRESENTATIVE**	S. Grigoryan
GENERAL LOCATION	Lower Towamensing, PA	**CONTRACTOR**	Craig Test Boring Co. Inc.
TIME OPENED	10:30 AM	**TIME CLOSED**	1:30 PM
DEPTH TO WATER (Feet BGS)	Not Encountered	**EQUIPMENT**	Backhoe excavator
TESTING DEPTH (Feet BGS)	3.1	**FINAL EXCAVATION DEPTH (Feet BGS)**	5.1
DATE	6/15/2018		

N

0-8”: TOPSOIL, dry

8-26”: Reddish brown Silty CLAY, dry

26-61”: Reddish brown to dark gray DECOMPOSED ROCK, little silty clay, dry

Note: All classifications and descriptions in this log are solely based on visual field observations. They were developed to generally characterize soils for environmental purposes only. They are not to be relied for any other purpose.

MOTT MACDONALD

Infiltration Test Form

Geotechnical Investigation:

- Project Name: PennEast Pipeline
- Date: 6/15/18
- Job Number: 353754
- Site Location: Blue Mountain
- Contractor: Craig Test Boring, Inc.
- Weather/Temp: Sunny; 70°F
- Infiltration Test ID: BMTP-9
- Report by: S. Gregorgan
- Testing Depth: 3.1 ft
- Infiltration Test Method: Double-Ring Infiltrometer

Infiltration Test Pit Soil Description:

Depth Range (inches)		Description of Soil/Rock Layers
0	8	Topsoil
8	26	Reddish Brown Silty CLAY, wet
26	61	Reddish brown to dark gray DECOMPOSED ROCK, little silty clay

Percolation Test:

Test #1

Time (min.)	30 pre-soak	30 pre-soak	10	10	10	10	10	10	
Test Depth (feet)	**Reading No. 1**	**Reading No. 2**	**Reading No. 3**	**Reading No. 4**	**Reading No. 5**	**Reading No. 6**	**Reading No. 7**	**Reading No. 8**	**Infil. Rate (in. / hour)**
3.1	4"	3"	1"	1"	0.7"	0.7"	0.5"	0.5"	3

Test #2

Time (min.)	30 pre-soak	30 pre-soak	10	10	10	10	10	10	
Test Depth (feet)	**Reading No. 1**	**Reading No. 2**	**Reading No. 3**	**Reading No. 4**	**Reading No. 5**	**Reading No. 6**	**Reading No. 7**	**Reading No. 8**	**Infil. Rate (in. / hour)**
3.1	4"	2.5"	1.5"	1"	0.7"	1"	1"	1"	6

H. Model Input and Output Report

BASIN REPORT

Hyd. No. 25

BASIN

Hydrograph type	= Reservoir	Peak discharge	= 0.257 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.08 hrs
Time interval	= 1 min	Hyd. volume	= 312 cuft
Inflow hyd. No.	= 24 - TO BASIN	Reservoir name	= UG N-12 Perforate
Max. Elevation	= 640.12 ft	Max. Storage	= 904 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

Hydrograph Discharge Table *

(Printed values >= 1.00% of Qp. Print interval = 5)

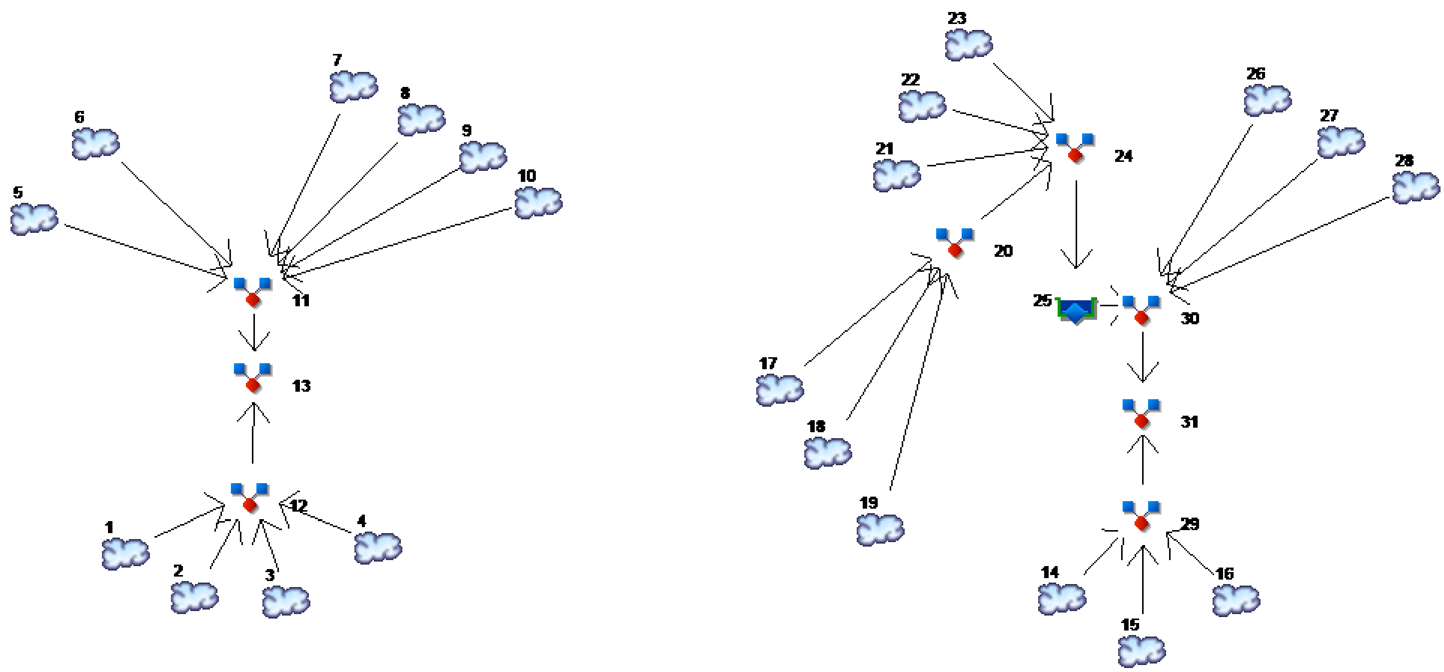
Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.00	1.149	639.99	0.077	0.074	-----	-----	-----	-----	-----	-----	0.138	0.074
12.08	0.415	640.12 <<	0.258	0.257	-----	-----	-----	-----	-----	-----	0.143	0.257 <<
12.17	0.204	640.09	0.209	0.205	-----	-----	-----	-----	-----	-----	0.141	0.205
12.25	0.185	640.05	0.156	0.152	-----	-----	-----	-----	-----	-----	0.140	0.152
12.33	0.167	640.02	0.117	0.114	-----	-----	-----	-----	-----	-----	0.139	0.114
12.42	0.147	640.00	0.088	0.085	-----	-----	-----	-----	-----	-----	0.138	0.085
12.50	0.127	639.98	0.064	0.061	-----	-----	-----	-----	-----	-----	0.137	0.061
12.58	0.109	639.96	0.044	0.041	-----	-----	-----	-----	-----	-----	0.137	0.041
12.67	0.102	639.94	0.027	0.024	-----	-----	-----	-----	-----	-----	0.136	0.024
12.75	0.097	639.93	0.017	0.016	-----	-----	-----	-----	-----	-----	0.135	0.016
12.83	0.093	639.91	0.009	0.008	-----	-----	-----	-----	-----	-----	0.135	0.008

...End

*- Time steps with zero outflow might not be shown.

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11



Legend

Hyd.	Origin	Description
1	SCS Runoff	EX-OFFSITE-IMP/GRAVEL
2	SCS Runoff	EX-SITE-BYP-IMP/DIRT
3	SCS Runoff	EX-OFFSITE-MEAD
4	SCS Runoff	EX-OFFSITE-WOODS
5	SCS Runoff	EX-SITE-MEAD
6	SCS Runoff	EX-SITE-WOODS
7	SCS Runoff	EX-SITE-BYP-IMP/DIRT
8	SCS Runoff	EX-SITE-BYP-IMP/GRAVEL
9	SCS Runoff	EX-SITE-BYP-MEAD
10	SCS Runoff	EX-SITE-BYP-WOODS
11	Combine	EX-SITE-TOTAL
12	Combine	EX-OFFSITE-TOTAL
13	Combine	EX-TOTAL
14	SCS Runoff	PR-OFFSITE-IMP/GRAVEL
15	SCS Runoff	PR-OFFSITE-MEAD
16	SCS Runoff	PR-OFFSITE-WOODS
17	SCS Runoff	PR-OFFSITE-IMP/GRAVEL
18	SCS Runoff	PR-OFFSITE-MEAD
19	SCS Runoff	PR-OFFSITE-WOODS
20	Combine	OFFSITE TO BASIN
21	SCS Runoff	PR-SITE-MEAD
22	SCS Runoff	PR-SITE-IMP/GRAVEL
23	SCS Runoff	PR-SITE-GRAVEL
24	Combine	TO BASIN
25	Reservoir	BASIN
26	SCS Runoff	PR-SITE-BYP-IMP/GRAVEL
27	SCS Runoff	PR-SITE-BYP-IMP/DIRT
28	SCS Runoff	PR-SITE-BYP-MEAD
29	Combine	EX-OFFSITE-TOTAL
30	Combine	PR-SITE-TOTAL
31	Combine	PR-TOTAL

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	0.353	0.425	-------	0.531	0.621	0.763	0.892	1.038	EX-OFFSITE-IMP/GRAVEL
2	SCS Runoff	------	0.018	0.024	-------	0.032	0.040	0.051	0.061	0.073	EX-SITE-BYP-IMP/DIRT
3	SCS Runoff	------	0.000	0.000	-------	0.000	0.000	0.002	0.006	0.026	EX-OFFSITE-MEAD
4	SCS Runoff	------	0.009	0.041	-------	0.569	1.650	3.988	6.597	9.930	EX-OFFSITE-WOODS
5	SCS Runoff	------	0.016	0.026	-------	0.043	0.058	0.083	0.107	0.136	EX-SITE-MEAD
6	SCS Runoff	------	0.286	0.473	-------	0.785	1.076	1.560	2.027	2.578	EX-SITE-WOODS
7	SCS Runoff	------	0.023	0.030	-------	0.040	0.049	0.064	0.077	0.091	EX-SITE-BYP-IMP/DIRT
8	SCS Runoff	------	0.142	0.171	-------	0.213	0.250	0.307	0.359	0.418	EX-SITE-BYP-IMP/GRAVEL
9	SCS Runoff	------	0.117	0.188	-------	0.306	0.416	0.598	0.773	0.979	EX-SITE-BYP-MEAD
10	SCS Runoff	------	0.289	0.477	-------	0.791	1.084	1.572	2.043	2.598	EX-SITE-BYP-WOODS
11	Combine	5, 6, 7, 8, 9, 10	0.869	1.361	-------	2.173	2.928	4.180	5.386	6.799	EX-SITE-TOTAL
12	Combine	1, 2, 3, 4,	0.371	0.448	-------	1.023	2.241	4.773	7.532	11.03	EX-OFFSITE-TOTAL
13	Combine	11, 12	1.211	1.778	-------	3.193	5.169	8.953	12.92	17.83	EX-TOTAL
14	SCS Runoff	------	0.182	0.219	-------	0.273	0.320	0.393	0.459	0.534	PR-OFFSITE-IMP/GRAVEL
15	SCS Runoff	------	0.190	0.303	-------	0.491	0.666	0.954	1.231	1.556	PR-OFFSITE-MEAD
16	SCS Runoff	------	0.002	0.008	-------	0.073	0.413	1.350	2.450	3.928	PR-OFFSITE-WOODS
17	SCS Runoff	------	0.171	0.206	-------	0.258	0.302	0.370	0.433	0.504	PR-OFFSITE-IMP/GRAVEL
18	SCS Runoff	------	0.004	0.020	-------	0.218	0.507	1.085	1.709	2.495	PR-OFFSITE-MEAD
19	SCS Runoff	------	0.001	0.004	-------	0.032	0.225	0.846	1.615	2.653	PR-OFFSITE-WOODS
20	Combine	17, 18, 19	0.171	0.209	-------	0.452	0.980	2.260	3.741	5.641	OFFSITE TO BASIN
21	SCS Runoff	------	0.220	0.352	-------	0.569	0.770	1.103	1.419	1.787	PR-SITE-MEAD
22	SCS Runoff	------	0.384	0.462	-------	0.578	0.676	0.830	0.970	1.130	PR-SITE-IMP/GRAVEL
23	SCS Runoff	------	0.228	0.293	-------	0.390	0.473	0.602	0.719	0.851	PR-SITE-GRAVEL
24	Combine	20, 21, 22, 23	0.999	1.309	-------	1.938	2.767	4.629	6.673	9.226	TO BASIN
25	Reservoir	24	0.016	0.257	-------	0.851	1.609	3.010	4.906	7.258	BASIN
26	SCS Runoff	------	0.230	0.277	-------	0.347	0.406	0.498	0.582	0.678	PR-SITE-BYP-IMP/GRAVEL
27	SCS Runoff	------	0.026	0.034	-------	0.046	0.056	0.073	0.087	0.104	PR-SITE-BYP-IMP/DIRT
28	SCS Runoff	------	0.497	0.794	-------	1.284	1.739	2.489	3.203	4.035	PR-SITE-BYP-MEAD
29	Combine	14, 15, 16,	0.368	0.518	-------	0.786	1.313	2.645	4.128	5.999	EX-OFFSITE-TOTAL
30	Combine	25, 26, 27, 28,	0.751	1.101	-------	2.096	3.261	5.321	7.903	11.22	PR-SITE-TOTAL
31	Combine	29, 30	1.115	1.616	-------	2.868	4.574	7.950	11.93	17.22	PR-TOTAL

Proj. file: Proposed.gpw	Saturday, 10 / 13 / 2018

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.353	1	718	858	------	------	------	EX-OFFSITE-IMP/GRAVEL
2	SCS Runoff	0.018	1	719	41	------	------	------	EX-SITE-BYP-IMP/DIRT
3	SCS Runoff	0.000	1	n/a	0	------	------	------	EX-OFFSITE-MEAD
4	SCS Runoff	0.009	1	1079	312	------	------	------	EX-OFFSITE-WOODS
5	SCS Runoff	0.016	1	720	40	------	------	------	EX-SITE-MEAD
6	SCS Runoff	0.286	1	720	733	------	------	------	EX-SITE-WOODS
7	SCS Runoff	0.023	1	719	52	------	------	------	EX-SITE-BYP-IMP/DIRT
8	SCS Runoff	0.142	1	719	366	------	------	------	EX-SITE-BYP-IMP/GRAVEL
9	SCS Runoff	0.117	1	720	291	------	------	------	EX-SITE-BYP-MEAD
10	SCS Runoff	0.289	1	720	738	------	------	------	EX-SITE-BYP-WOODS
11	Combine	0.869	1	720	2,220	5, 6, 7, 8, 9, 10	------	------	EX-SITE-TOTAL
12	Combine	0.371	1	718	1,211	1, 2, 3, 4,	------	------	EX-OFFSITE-TOTAL
13	Combine	1.211	1	720	3,431	11, 12	------	------	EX-TOTAL
14	SCS Runoff	0.182	1	718	442	------	------	------	PR-OFFSITE-IMP/GRAVEL
15	SCS Runoff	0.190	1	719	434	------	------	------	PR-OFFSITE-MEAD
16	SCS Runoff	0.002	1	1440	36	------	------	------	PR-OFFSITE-WOODS
17	SCS Runoff	0.171	1	718	416	------	------	------	PR-OFFSITE-IMP/GRAVEL
18	SCS Runoff	0.004	1	905	124	------	------	------	PR-OFFSITE-MEAD
19	SCS Runoff	0.001	1	1440	11	------	------	------	PR-OFFSITE-WOODS
20	Combine	0.171	1	718	551	17, 18, 19	------	------	OFFSITE TO BASIN
21	SCS Runoff	0.220	1	718	478	------	------	------	PR-SITE-MEAD
22	SCS Runoff	0.384	1	717	898	------	------	------	PR-SITE-IMP/GRAVEL
23	SCS Runoff	0.228	1	718	470	------	------	------	PR-SITE-GRAVEL
24	Combine	0.999	1	718	2,397	20, 21, 22, 23	------	------	TO BASIN
25	Reservoir	0.016	1	729	15	24	639.93	704	BASIN
26	SCS Runoff	0.230	1	717	539	------	------	------	PR-SITE-BYP-IMP/GRAVEL
27	SCS Runoff	0.026	1	718	53	------	------	------	PR-SITE-BYP-IMP/DIRT
28	SCS Runoff	0.497	1	718	1,079	------	------	------	PR-SITE-BYP-MEAD
29	Combine	0.368	1	719	912	14, 15, 16,	------	------	EX-OFFSITE-TOTAL
30	Combine	0.751	1	718	1,686	25, 26, 27, 28,	------	------	PR-SITE-TOTAL
31	Combine	1.115	1	718	2,598	29, 30	------	------	PR-TOTAL

Hydrograph Report

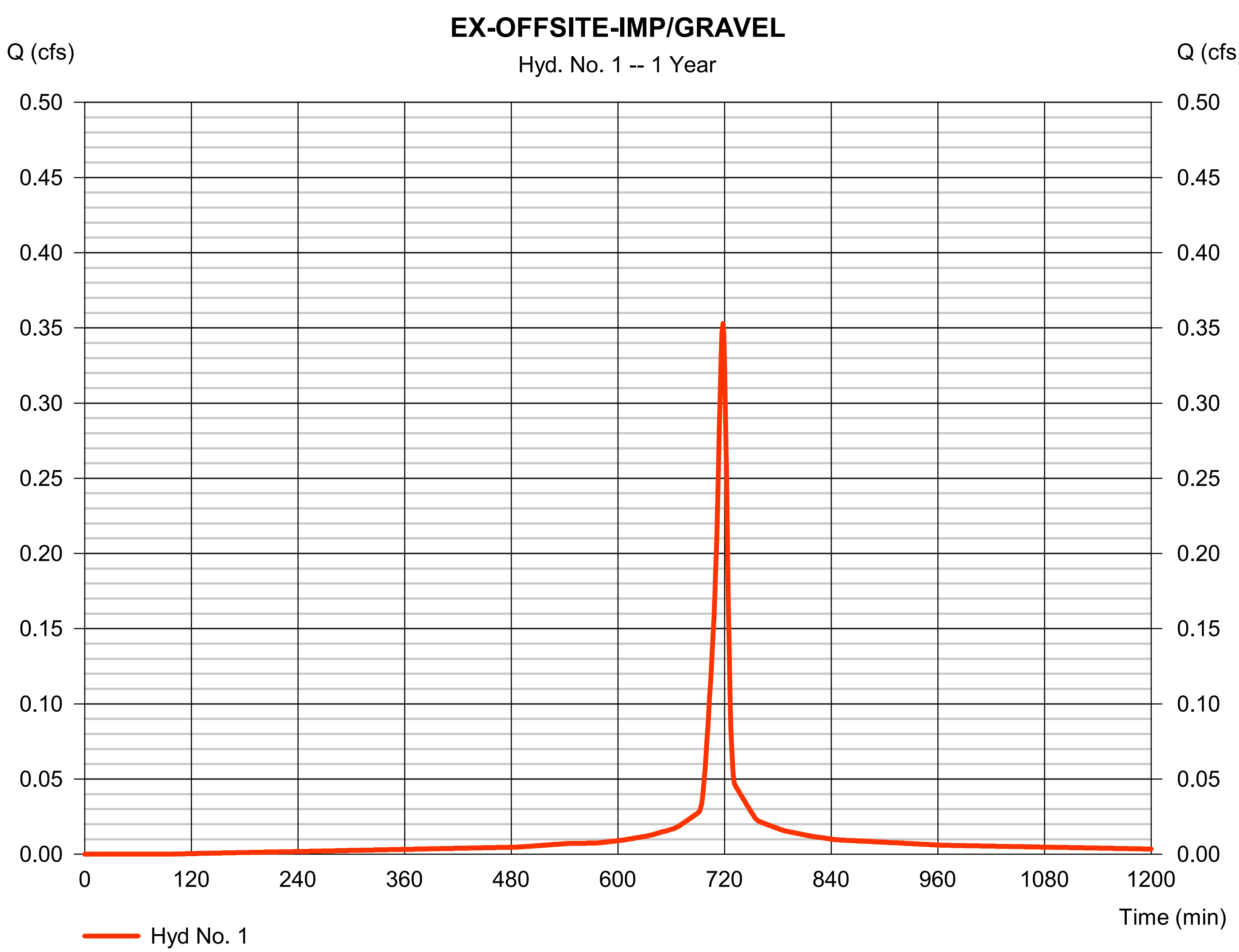
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 1

EX-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.353 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 858 cuft
Drainage area	= 0.101 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.101



Hydrograph Report

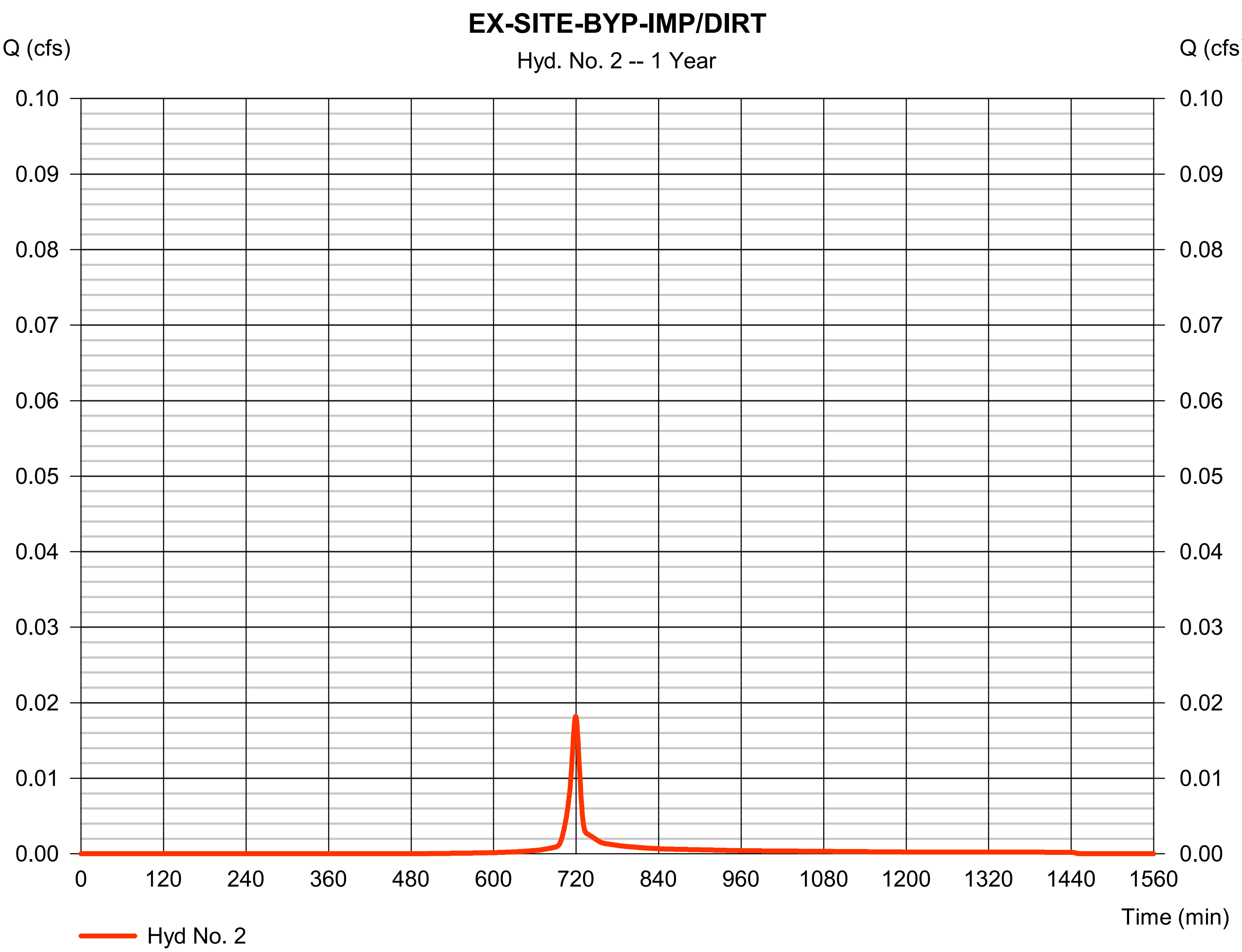
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 2

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.018 cfs
Storm frequency	= 1 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 41 cuft
Drainage area	= 0.008 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.80 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.008



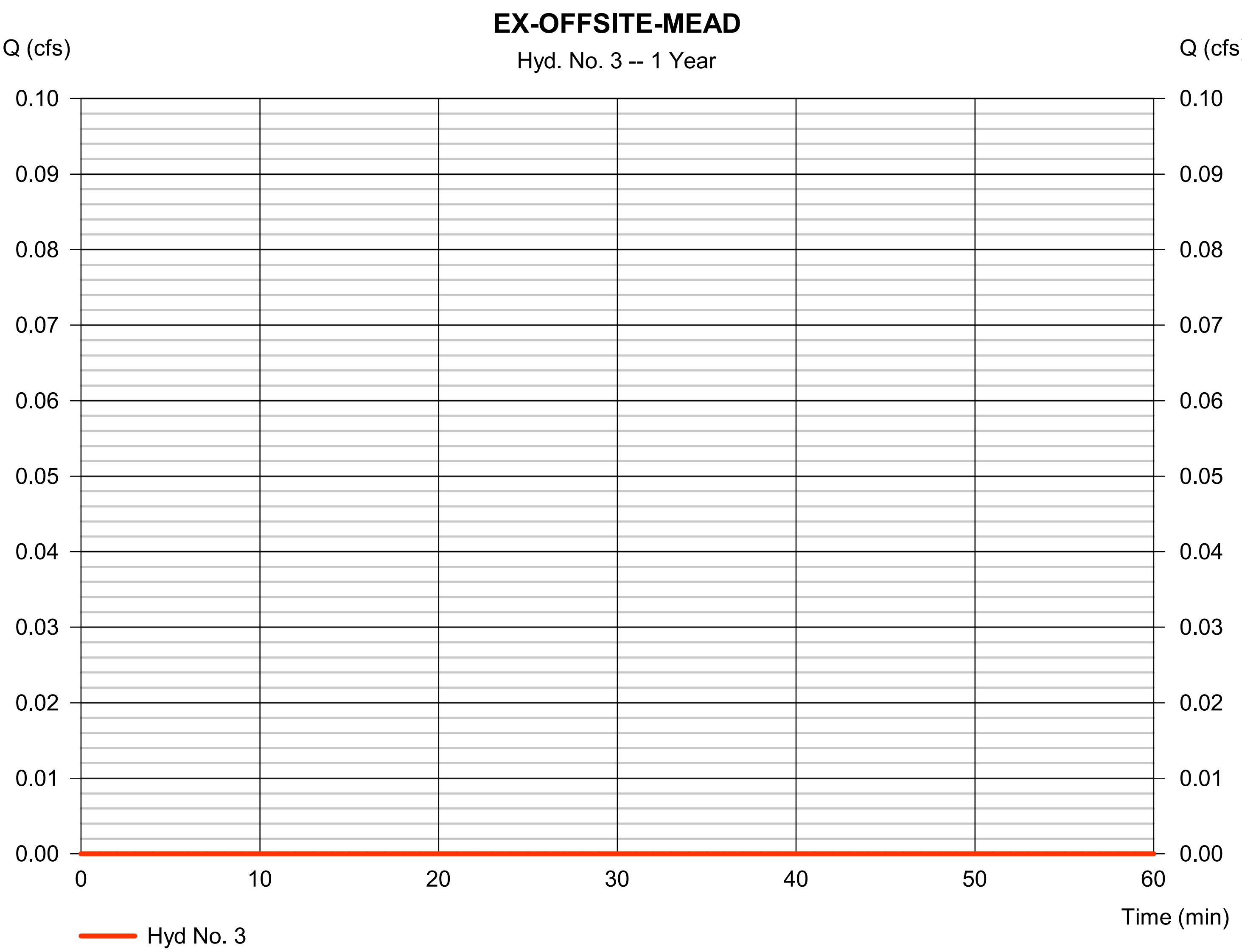
Hydrograph Report

Hyd. No. 3

EX-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Drainage area	= 0.404 ac	Curve number	= 30*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.100 x 70)] / 0.404



Hydrograph Report

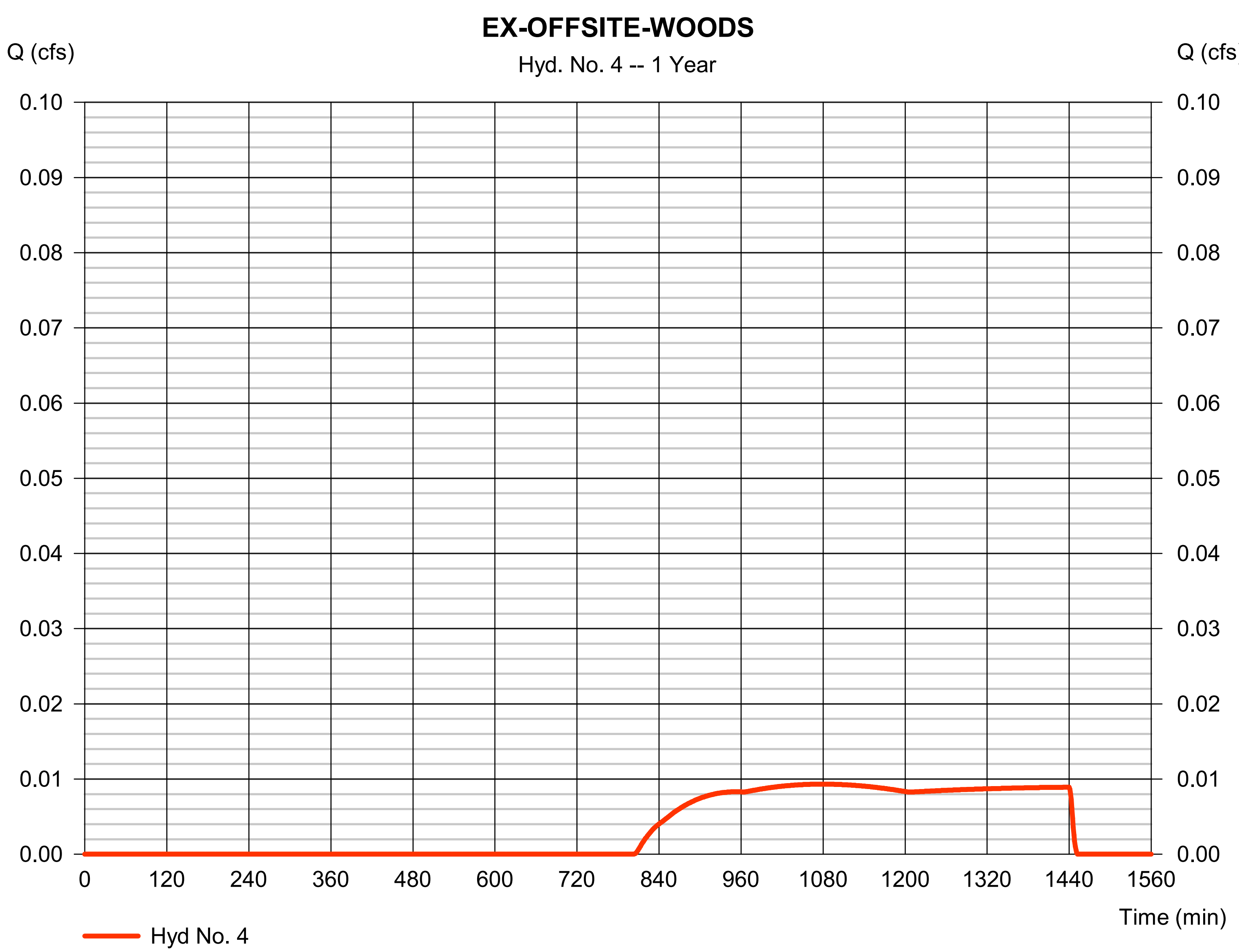
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 4

EX-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.009 cfs
Storm frequency	= 1 yrs	Time to peak	= 1079 min
Time interval	= 1 min	Hyd. volume	= 312 cuft
Drainage area	= 3.210 ac	Curve number	= 49*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.562 x 70) + (1.652 x 30)] / 3.210



Hydrograph Report

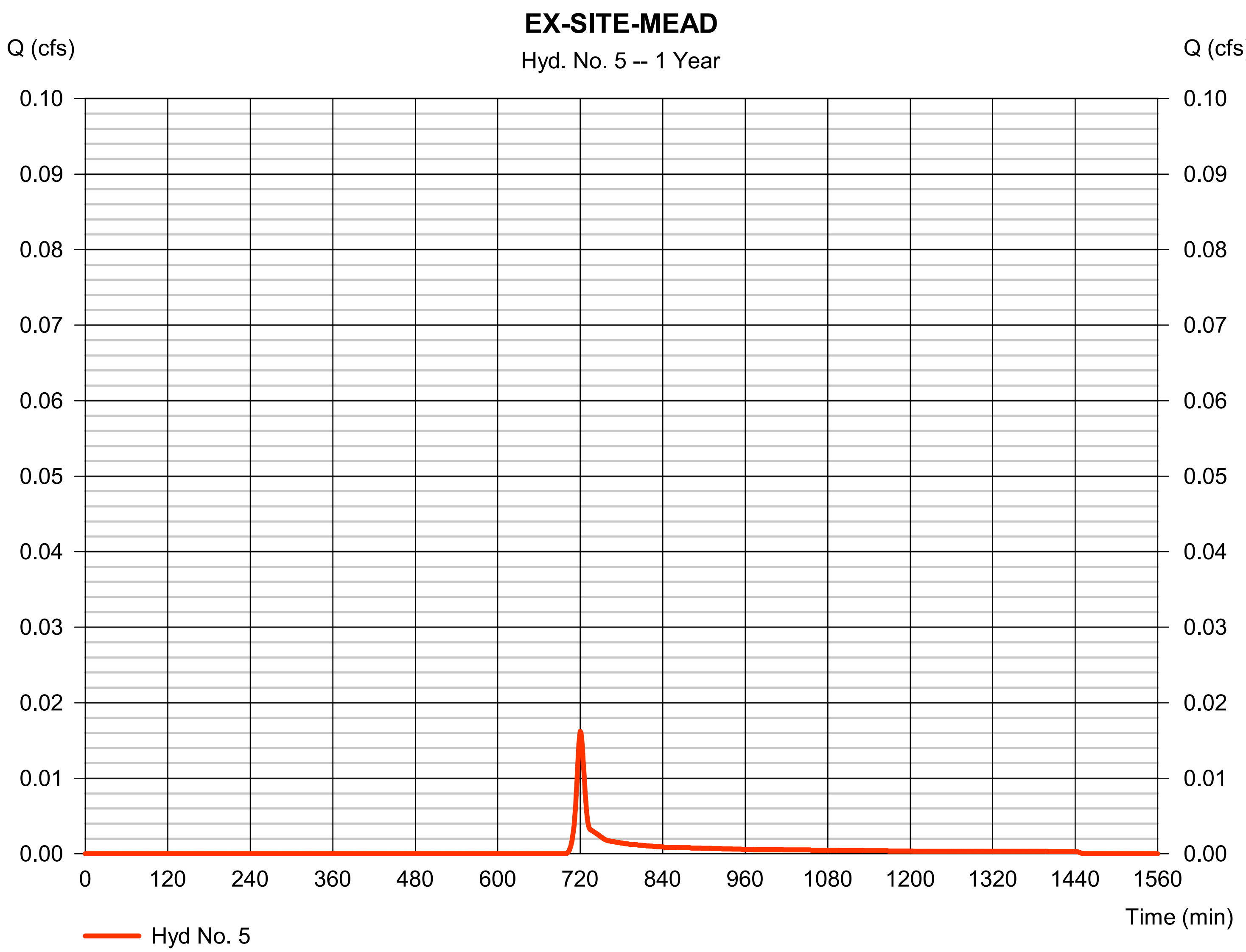
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 5

EX-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.016 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 40 cuft
Drainage area	= 0.020 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.020 x 71)] / 0.020



Hydrograph Report

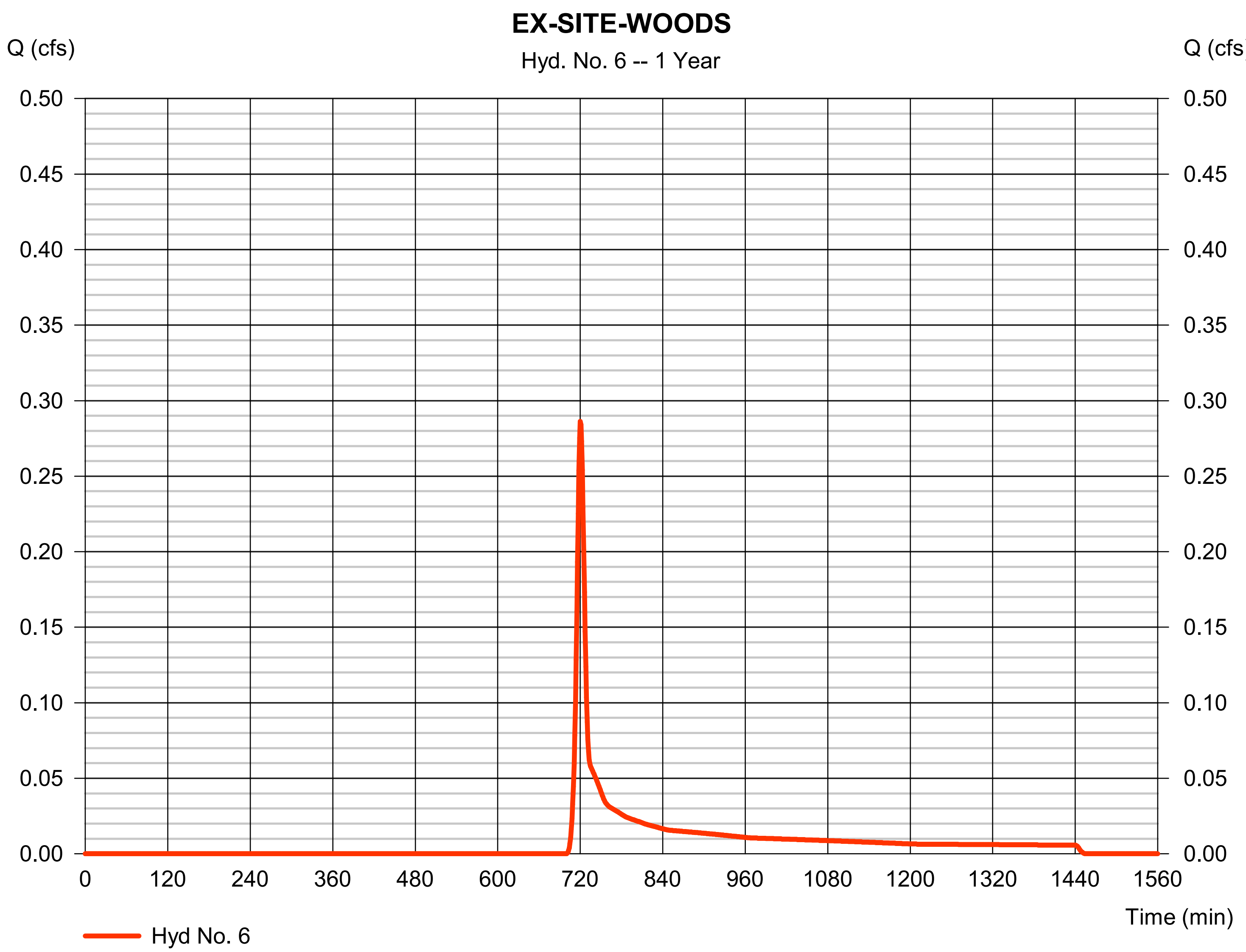
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 6

EX-SITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.286 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 733 cuft
Drainage area	= 0.389 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.240 x 70) + (0.060 x 70) + (0.460 x 70)] / 0.389



Hydrograph Report

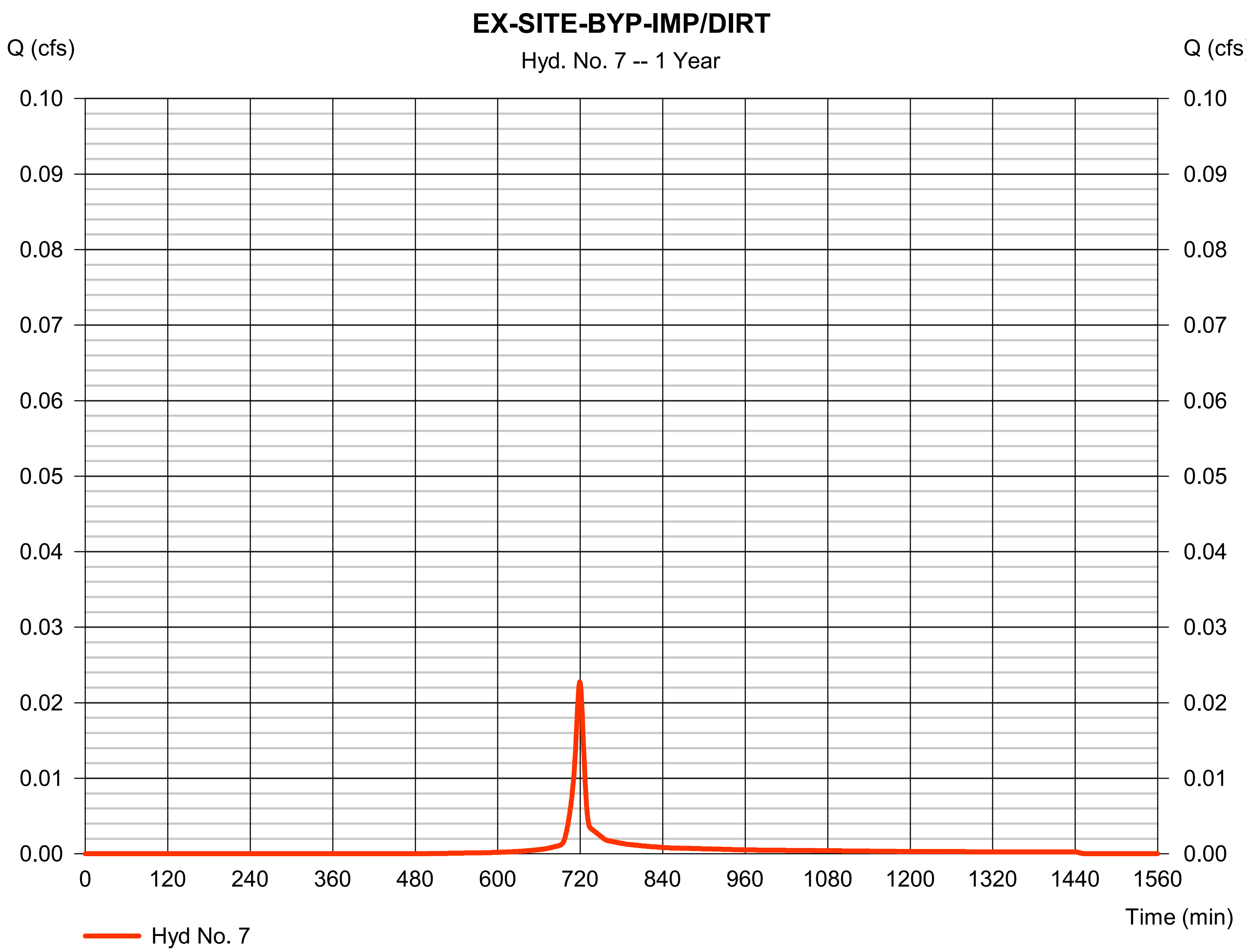
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 7

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.023 cfs
Storm frequency	= 1 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 52 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.010



Hydrograph Report

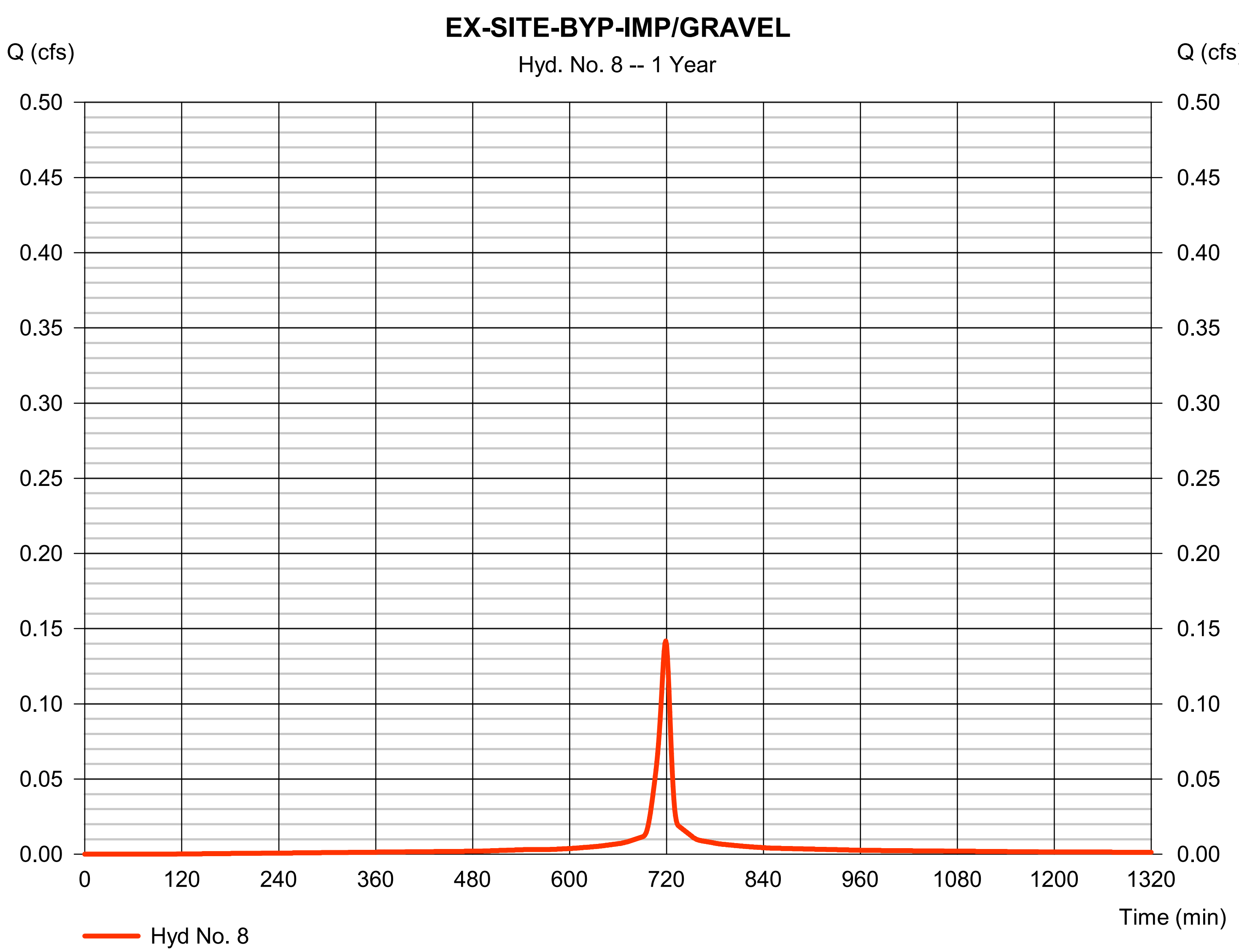
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 8

EX-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.142 cfs
Storm frequency	= 1 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 366 cuft
Drainage area	= 0.042 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.040 x 98)] / 0.042



Hydrograph Report

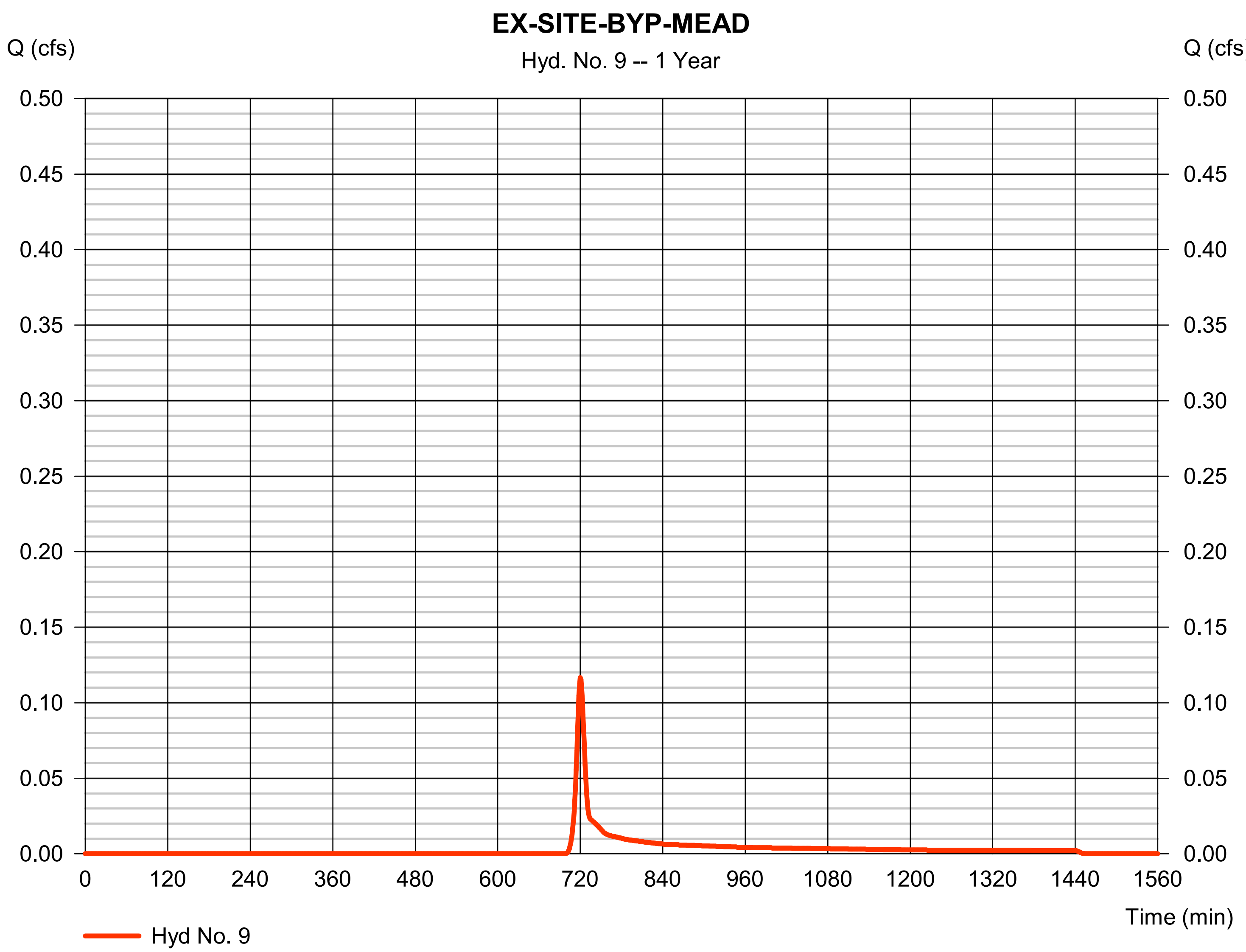
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 9

EX-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.117 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 291 cuft
Drainage area	= 0.144 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.190 x 71)] / 0.144



Hydrograph Report

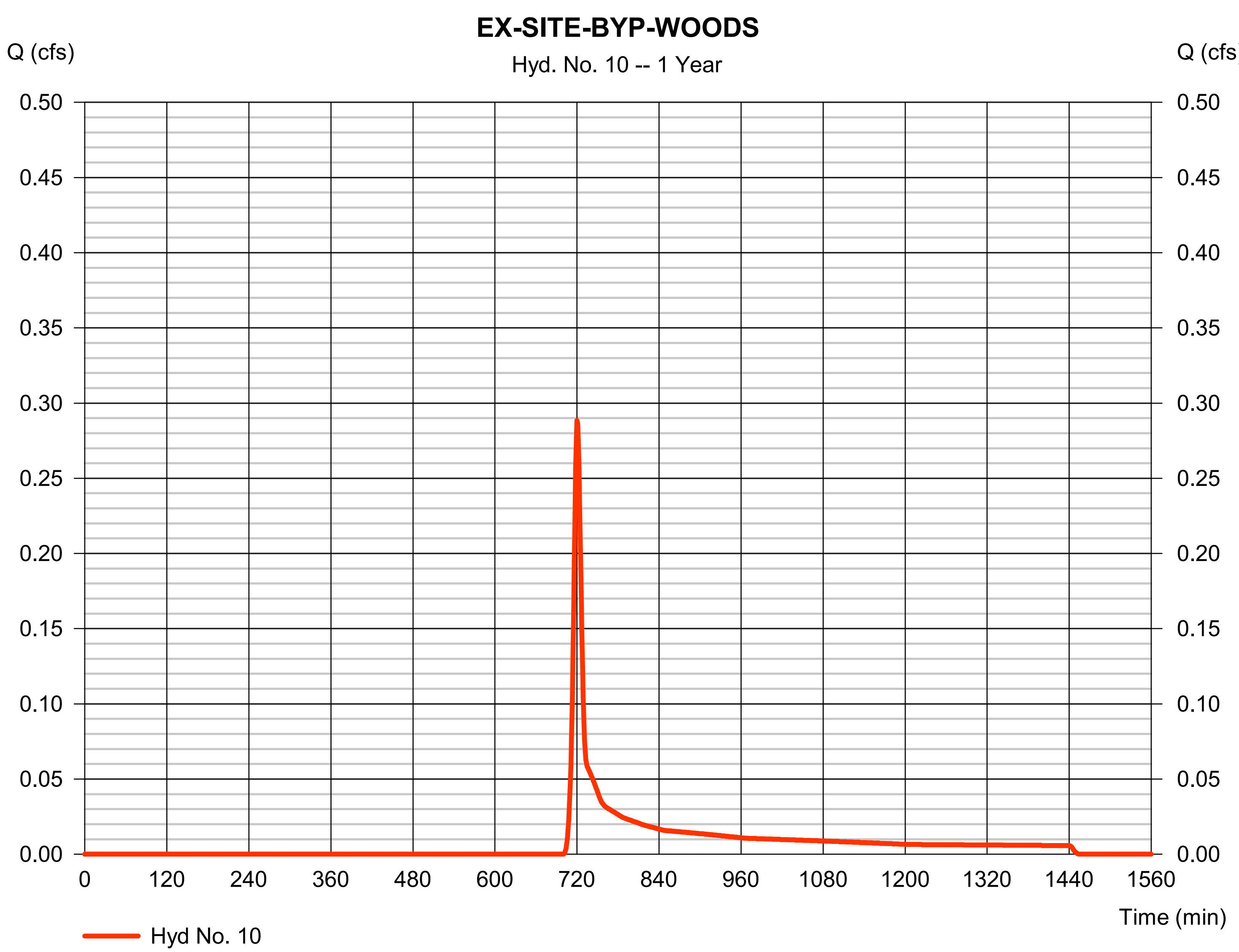
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 10

EX-SITE-BYP-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.289 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 738 cuft
Drainage area	= 0.392 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 70) + (0.110 x 70) + (0.090 x 70)] / 0.392



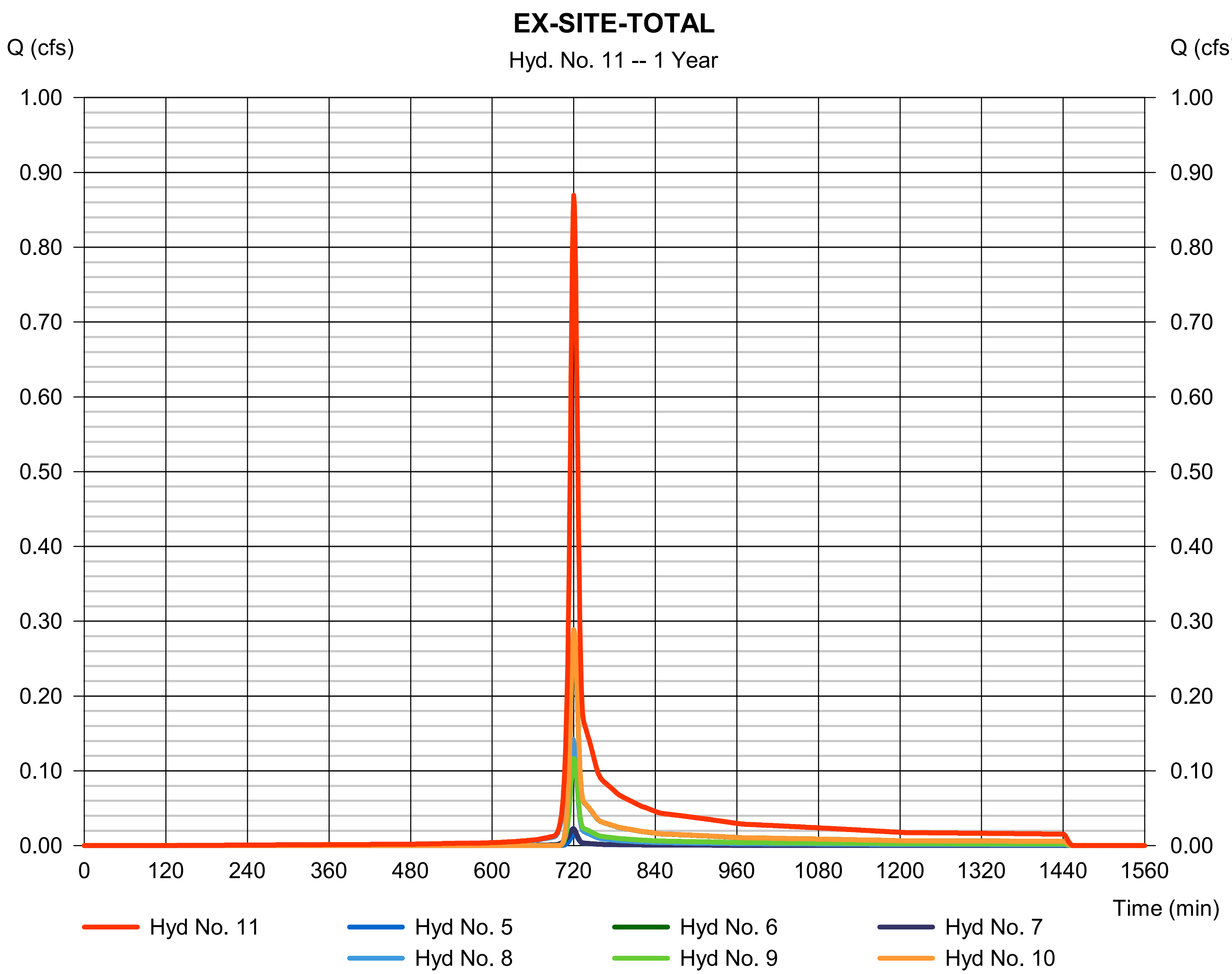
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 11

EX-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 0.869 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 2,220 cuft
Inflow hyds.	= 5, 6, 7, 8, 9, 10	Contrib. drain. area	= 0.997 ac



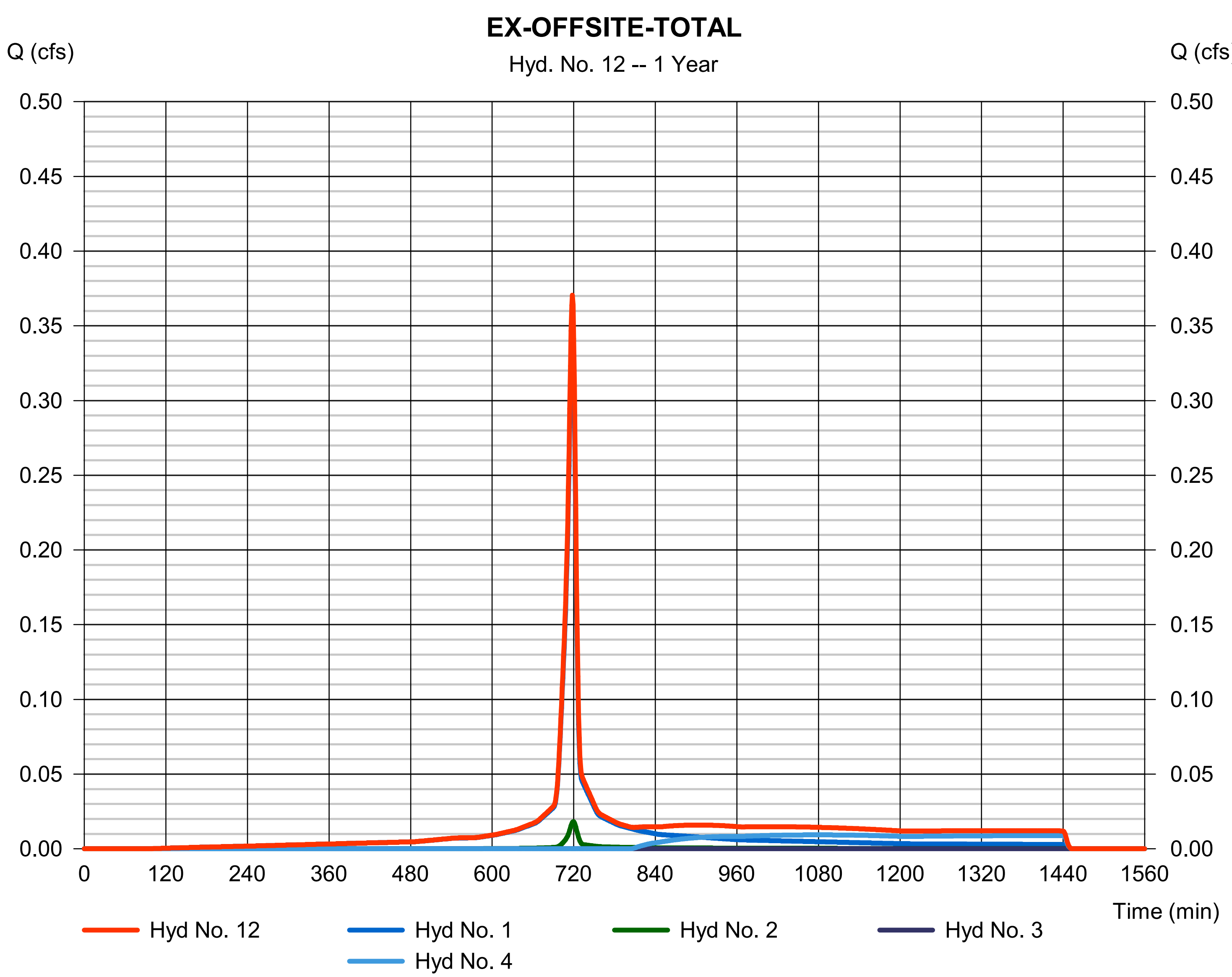
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 12

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 0.371 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,211 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 3.723 ac



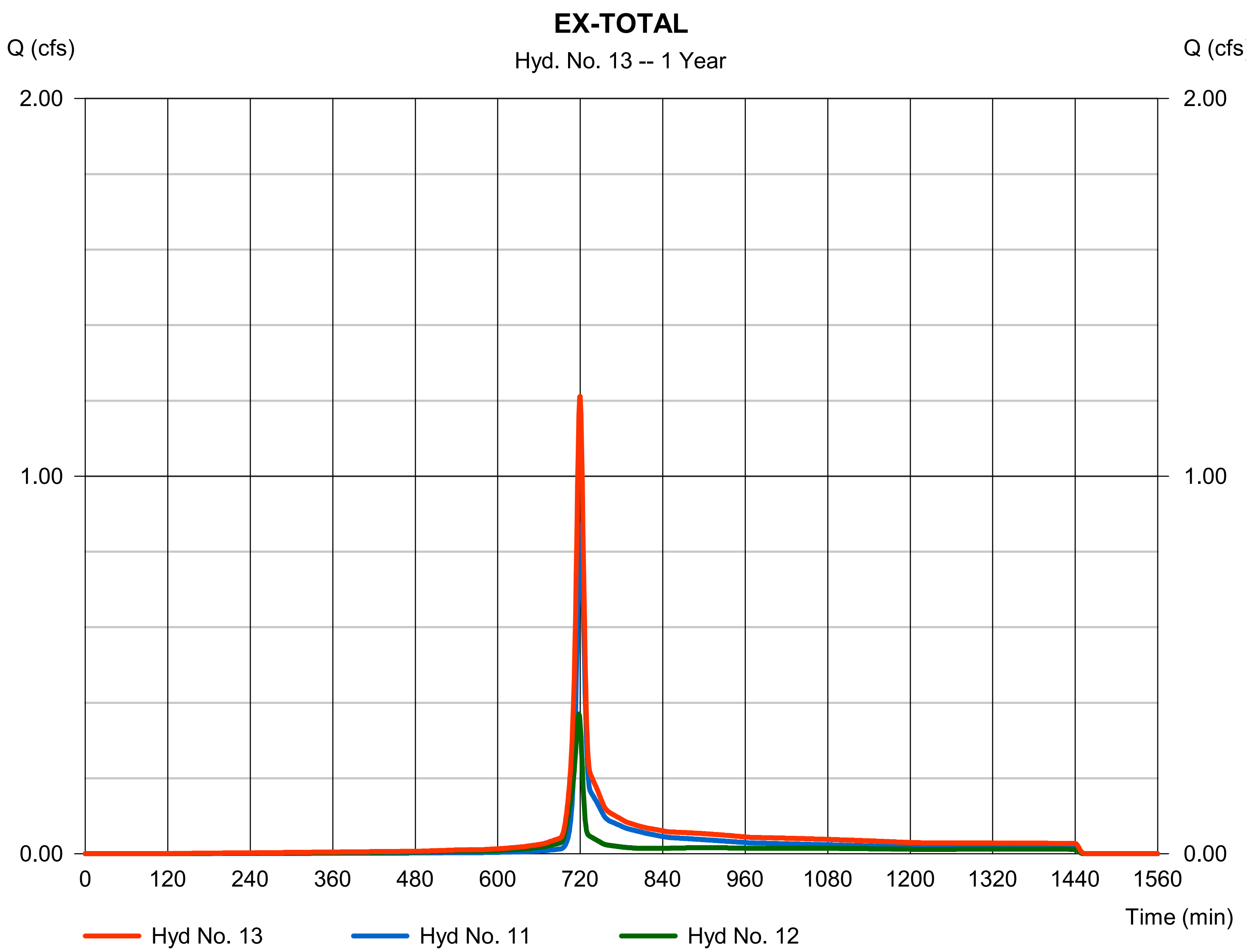
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 13

EX-TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.211 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 3,431 cuft
Inflow hyds.	= 11, 12	Contrib. drain. area	= 0.000 ac



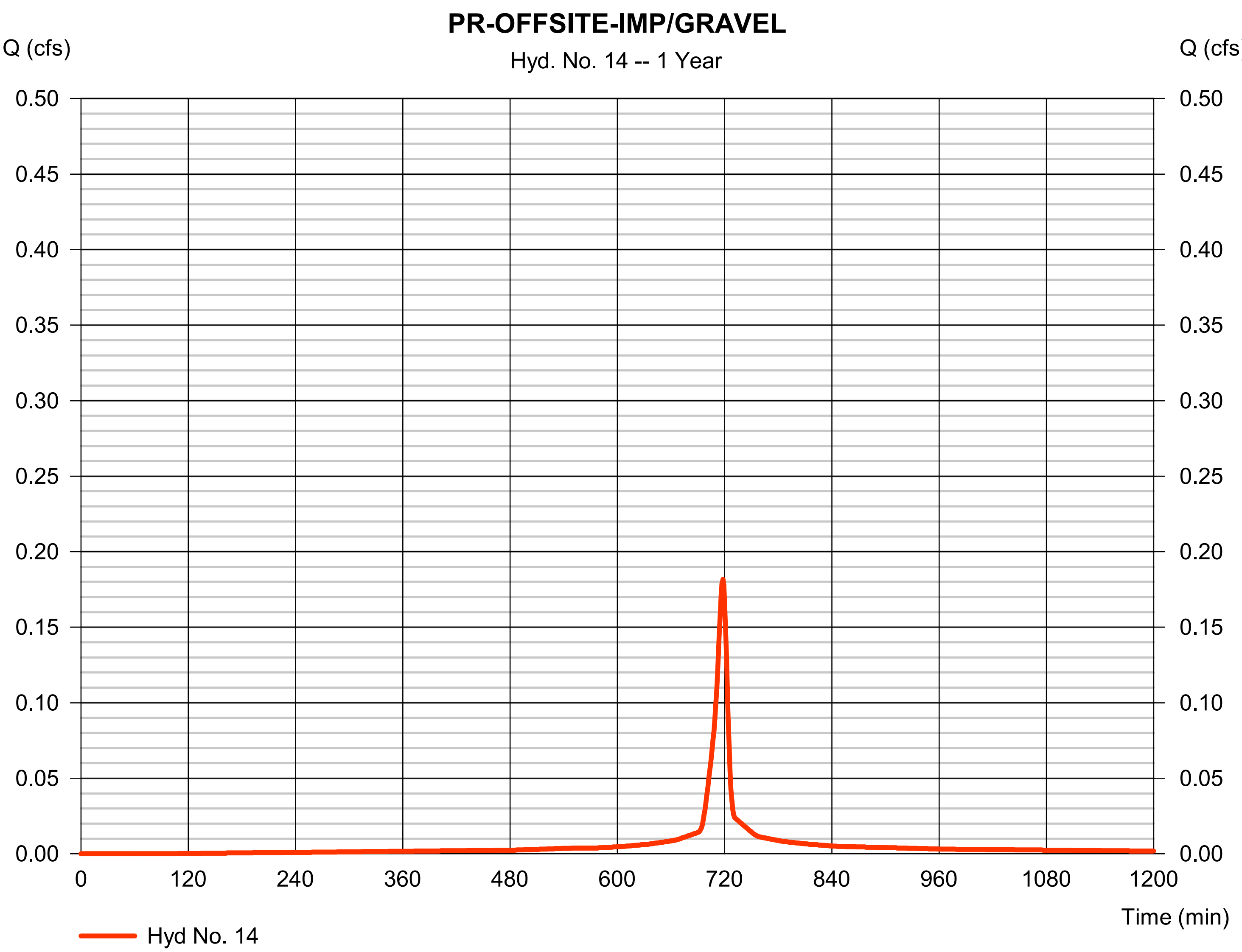
Hydrograph Report

Hyd. No. 14

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.182 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 442 cuft
Drainage area	= 0.052 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.013 x 98)] / 0.052



Hydrograph Report

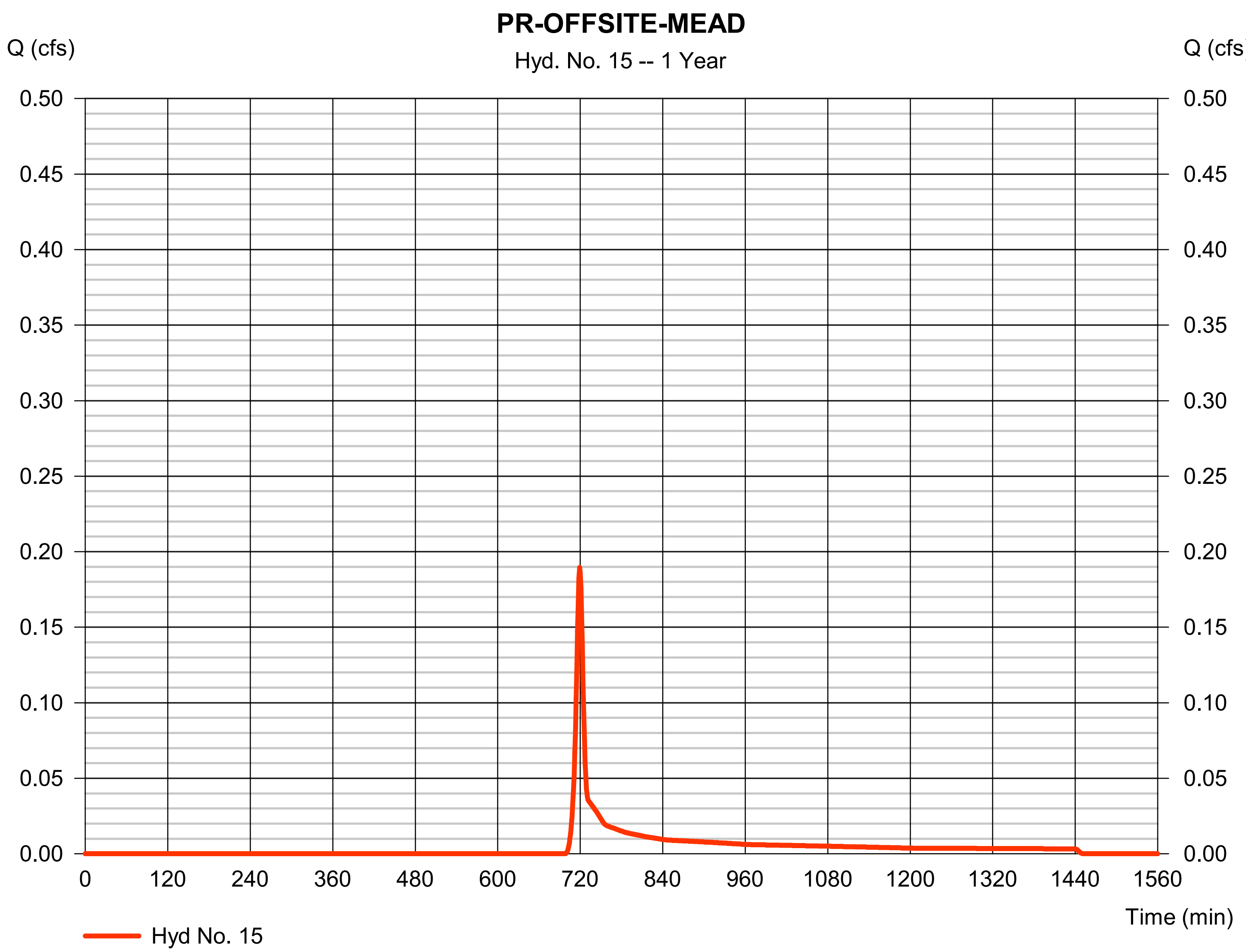
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 15

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.190 cfs
Storm frequency	= 1 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 434 cuft
Drainage area	= 0.220 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.034 x 71) + (0.099 x 71) + (0.084 x 71) + (0.001 x 30)] / 0.220



Hydrograph Report

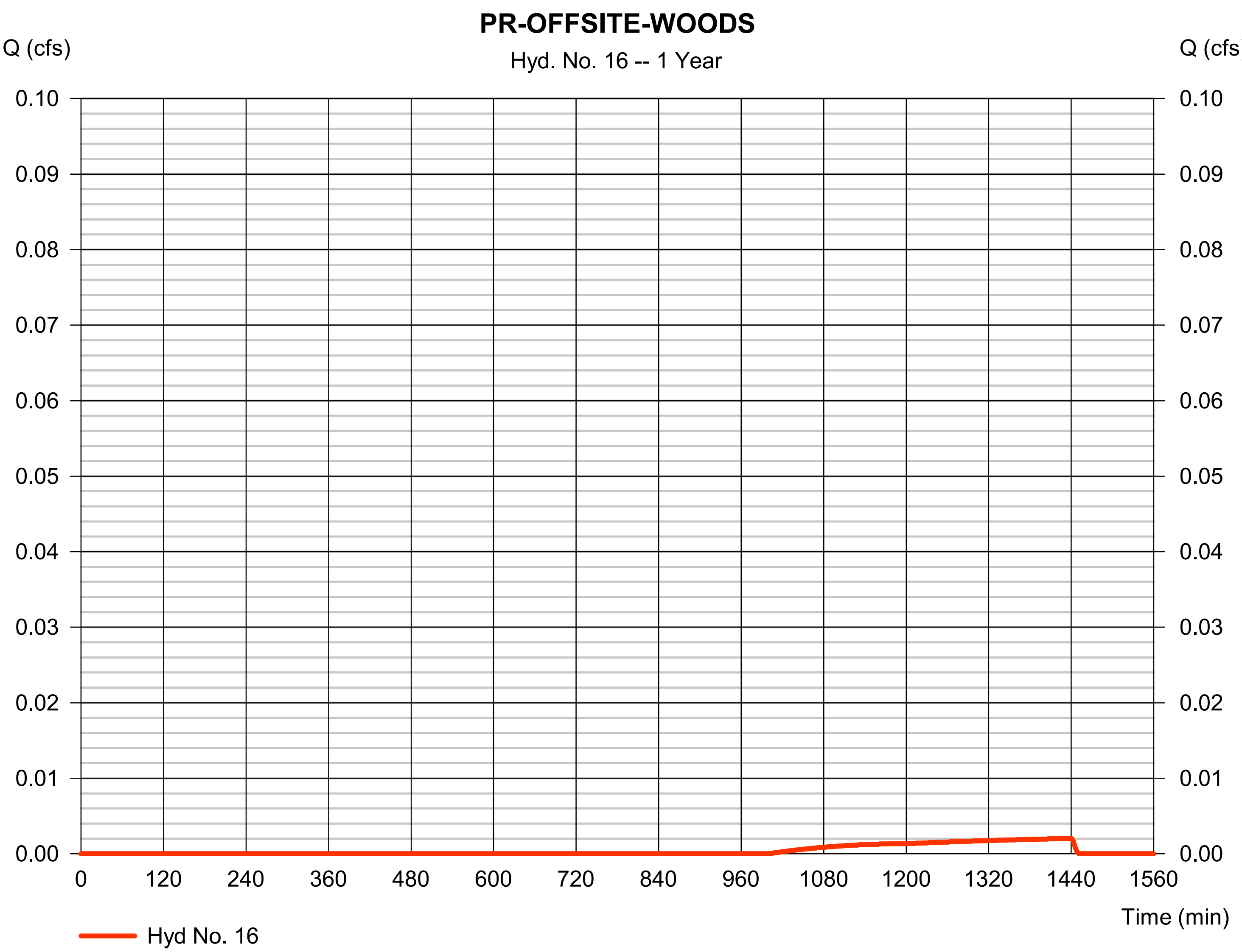
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 16

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.002 cfs
Storm frequency	= 1 yrs	Time to peak	= 1440 min
Time interval	= 1 min	Hyd. volume	= 36 cuft
Drainage area	= 1.550 ac	Curve number	= 46*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.602 x 70) + (0.951 x 30)] / 1.550



Hydrograph Report

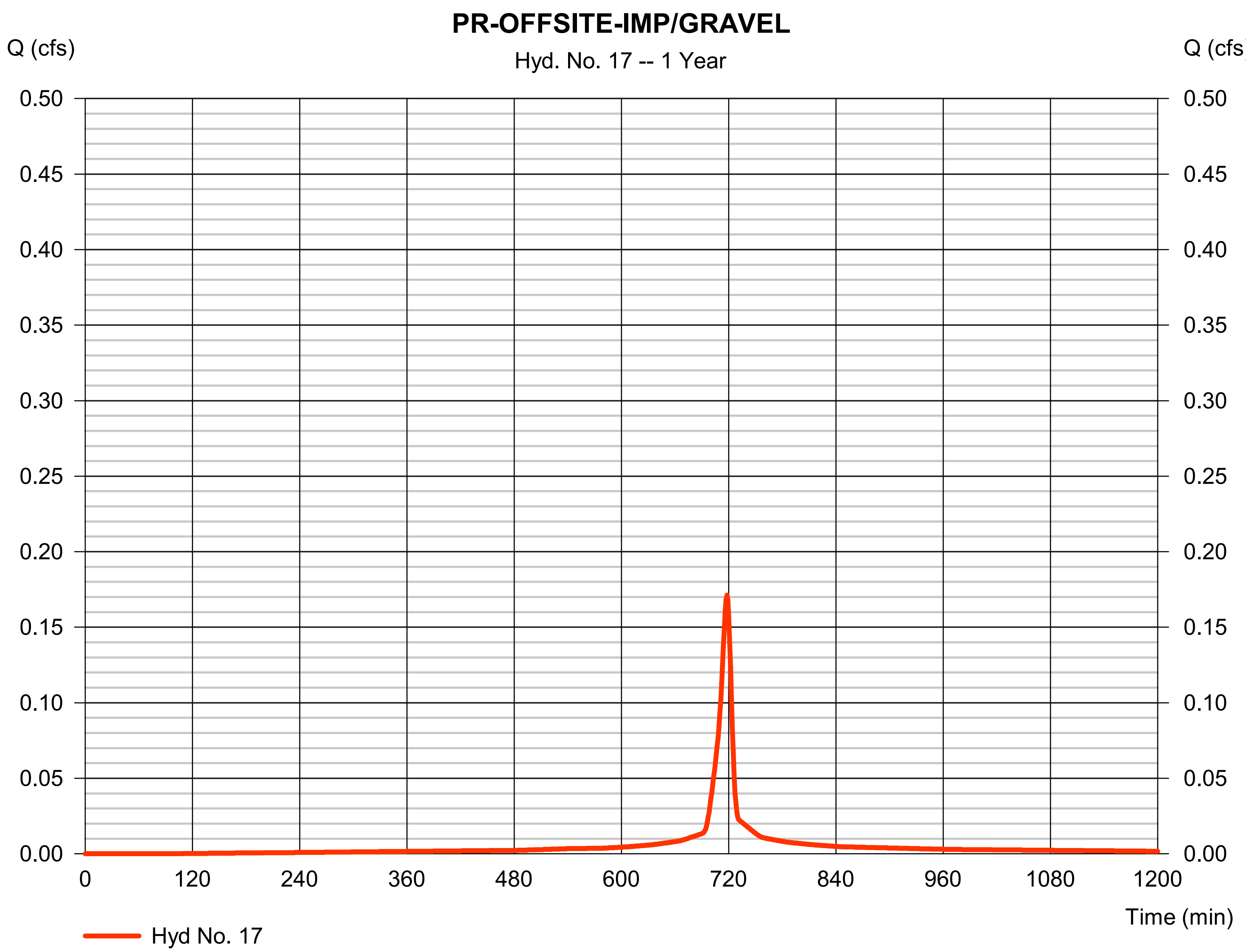
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 17

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.171 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 416 cuft
Drainage area	= 0.049 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.049



Hydrograph Report

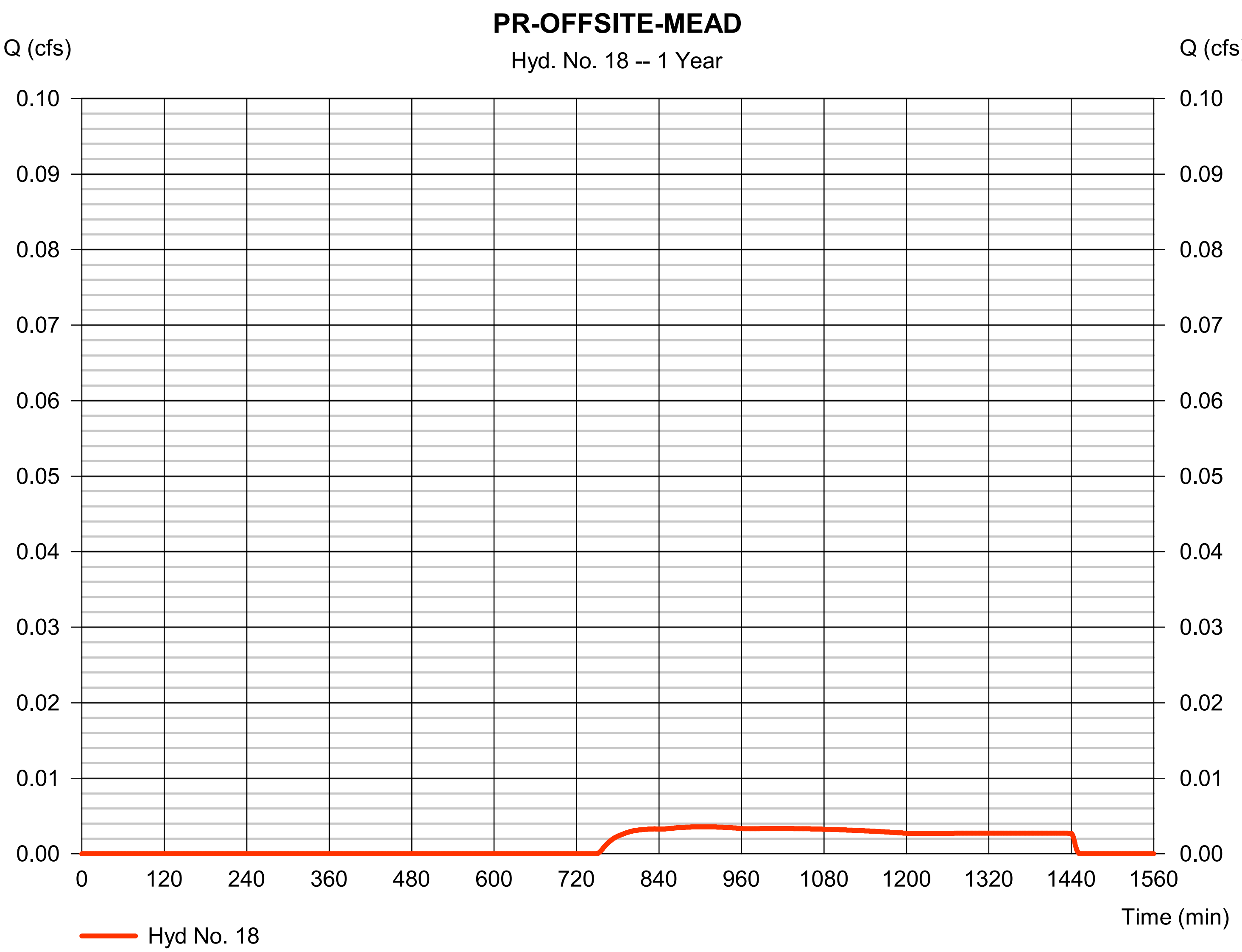
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 18

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.004 cfs
Storm frequency	= 1 yrs	Time to peak	= 905 min
Time interval	= 1 min	Hyd. volume	= 124 cuft
Drainage area	= 0.720 ac	Curve number	= 51*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.037 x 71) + (0.331 x 71) + (0.252 x 30) + (0.103 x 30)] / 0.720



Hydrograph Report

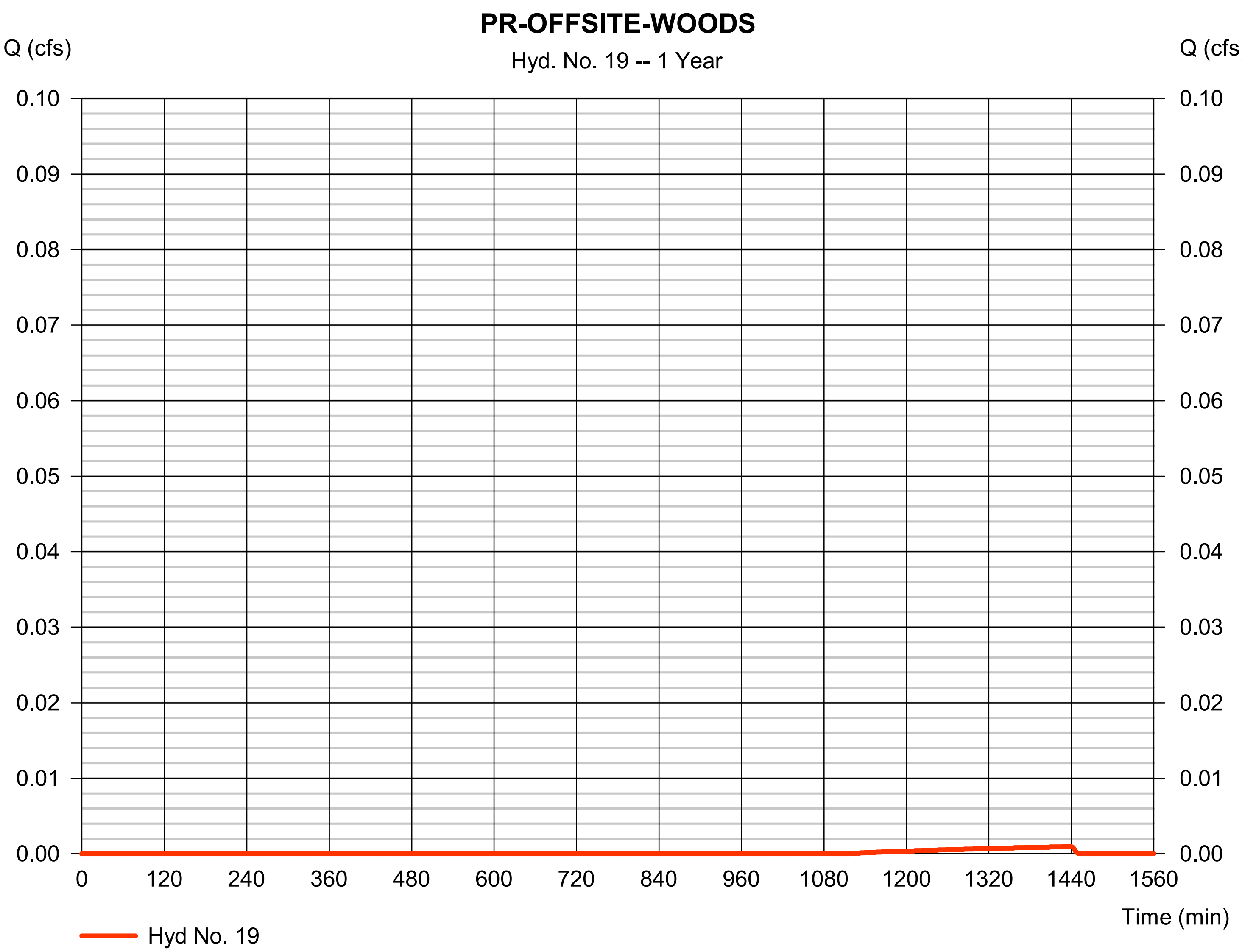
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 19

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.001 cfs
Storm frequency	= 1 yrs	Time to peak	= 1440 min
Time interval	= 1 min	Hyd. volume	= 11 cuft
Drainage area	= 1.130 ac	Curve number	= 45*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.180 x 70) + (0.700 x 30)] / 1.130



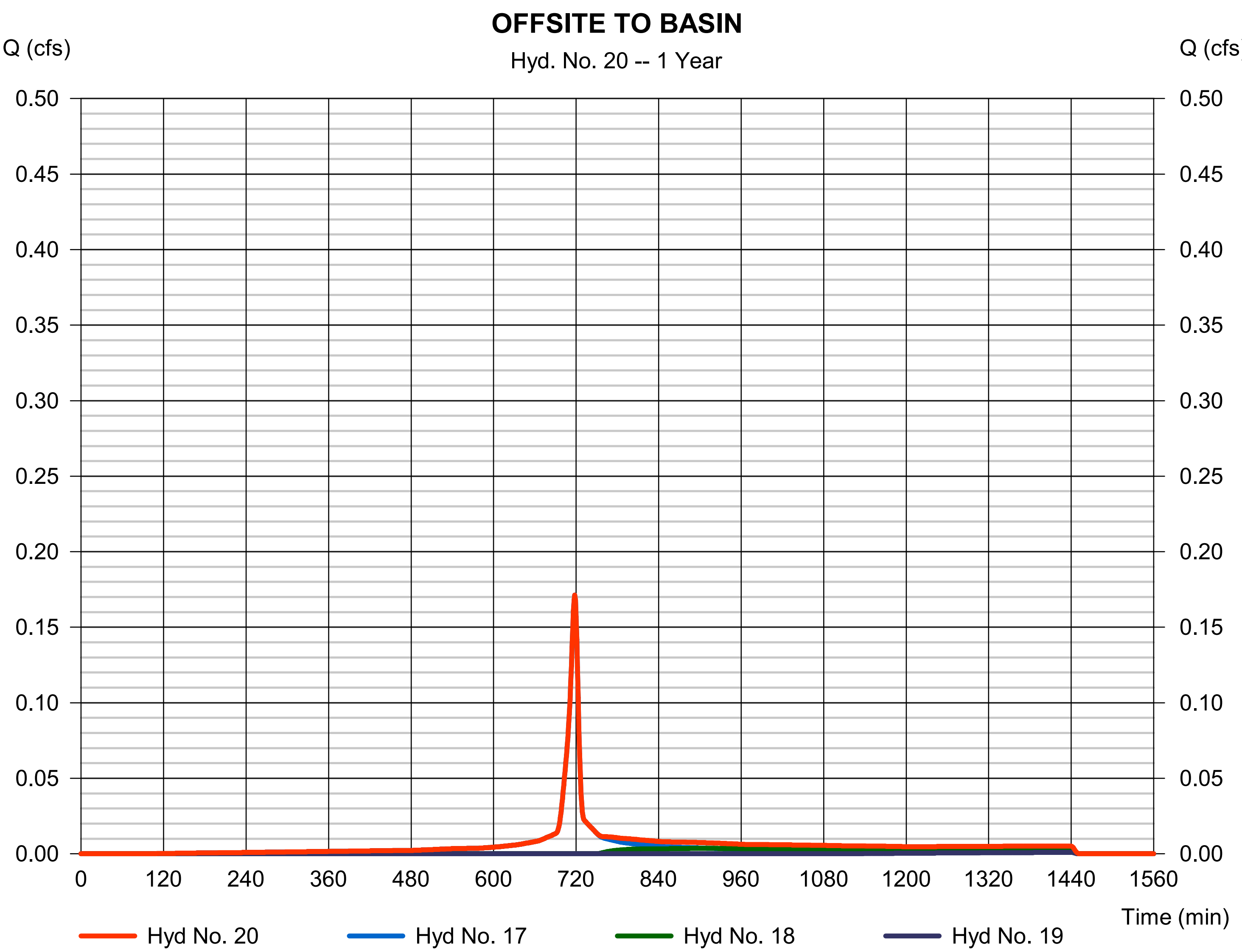
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 20

OFFSITE TO BASIN

Hydrograph type	= Combine	Peak discharge	= 0.171 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 551 cuft
Inflow hyds.	= 17, 18, 19	Contrib. drain. area	= 1.899 ac



Hydrograph Report

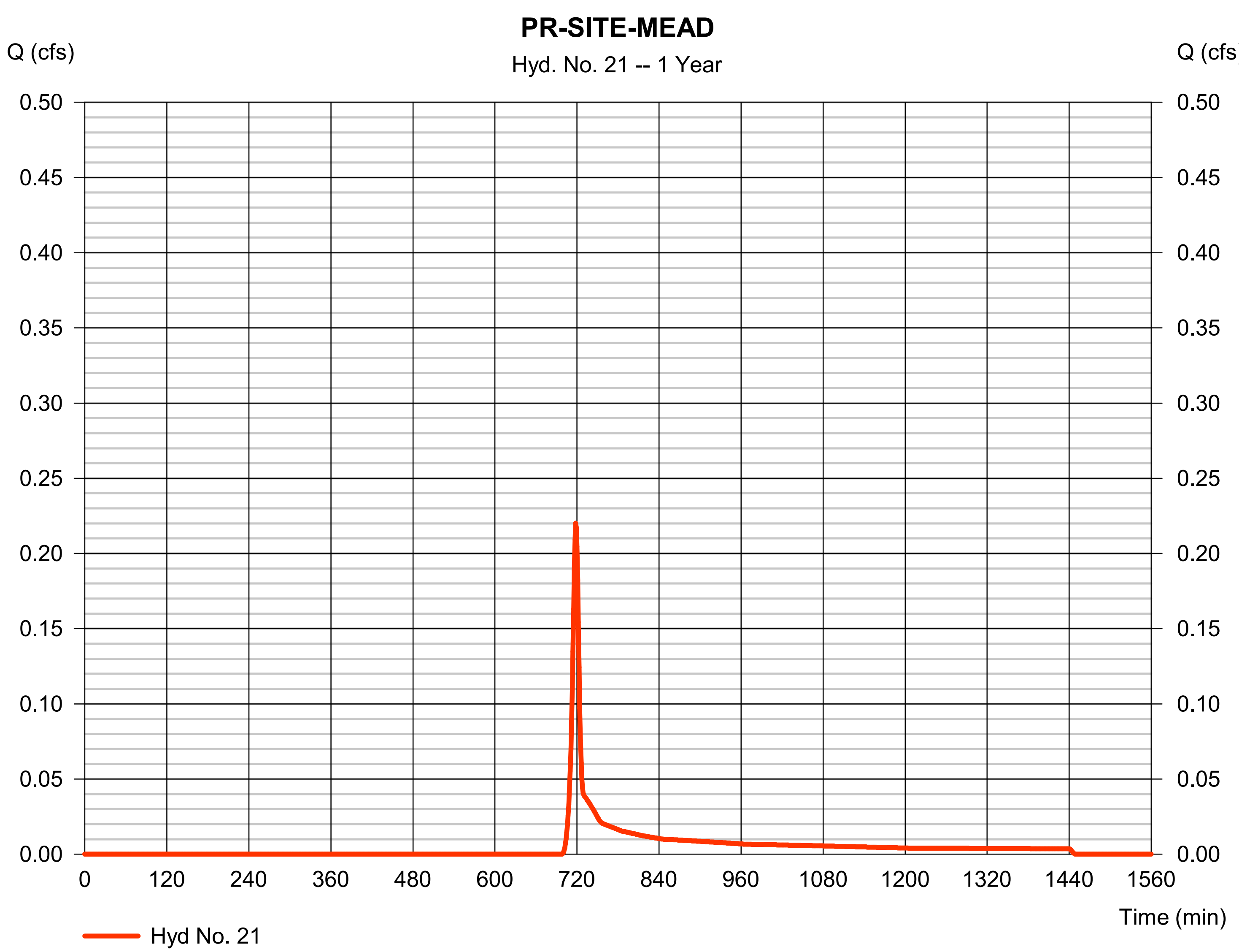
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 21

PR-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.220 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 478 cuft
Drainage area	= 0.229 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.10 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.134 x 71) + (0.003 x 71) + (0.435 x 71)] / 0.229



Hydrograph Report

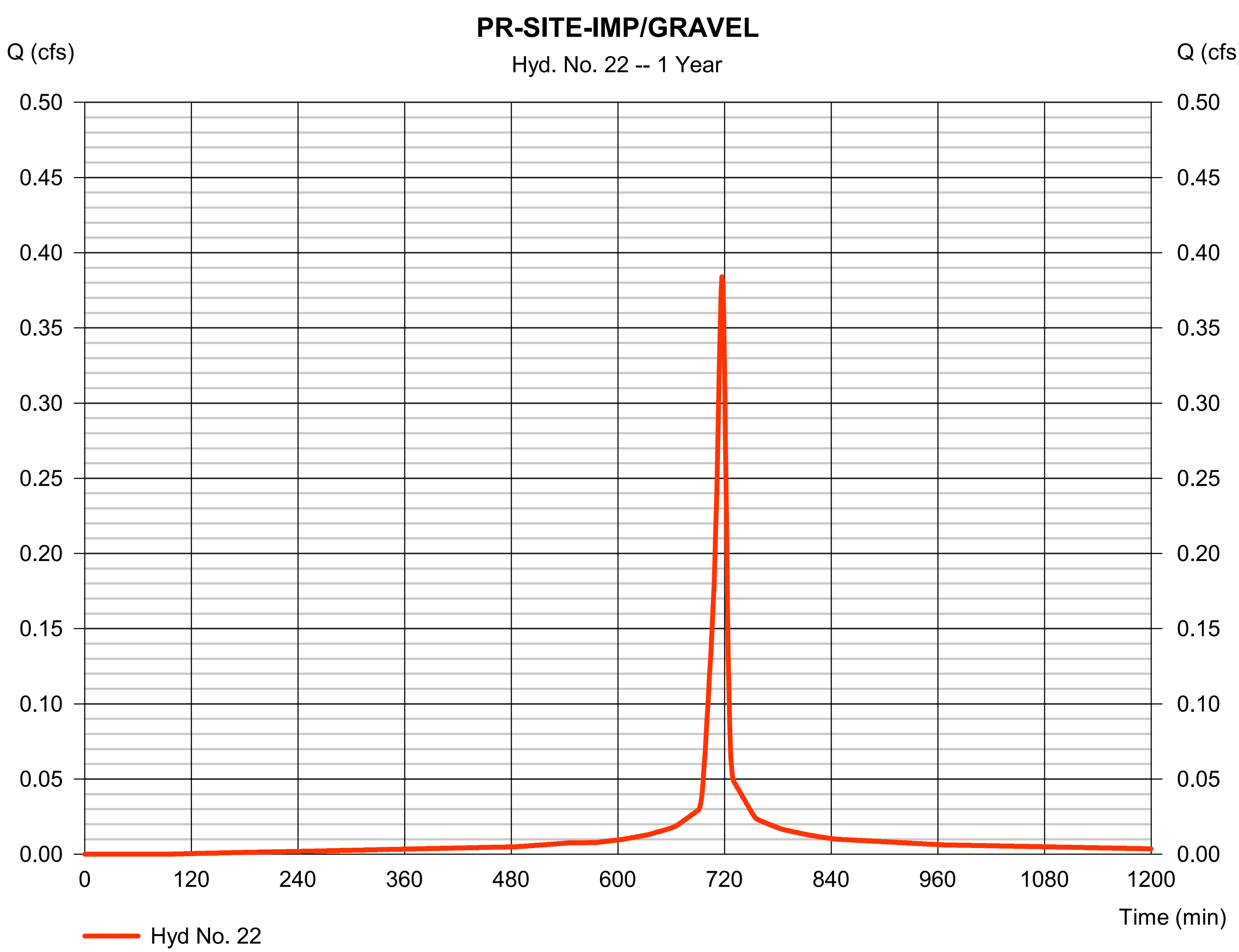
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 22

PR-SITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.384 cfs
Storm frequency	= 1 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 898 cuft
Drainage area	= 0.100 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.053 x 98) + (0.008 x 98)] / 0.100



Hydrograph Report

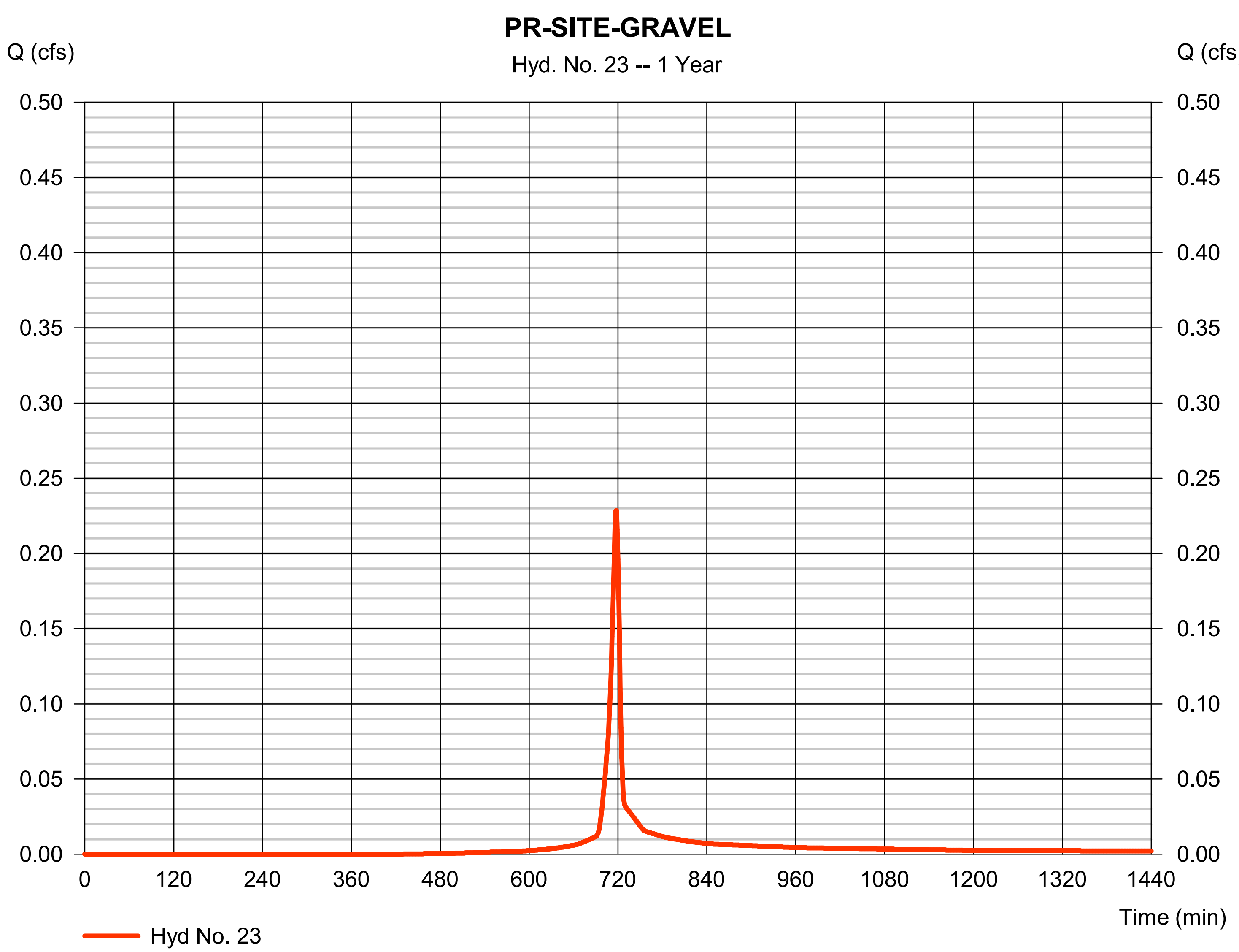
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 23

PR-SITE-GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.228 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 470 cuft
Drainage area	= 0.080 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.064 x 89) + (0.003 x 89) + (0.013 x 89)] / 0.080



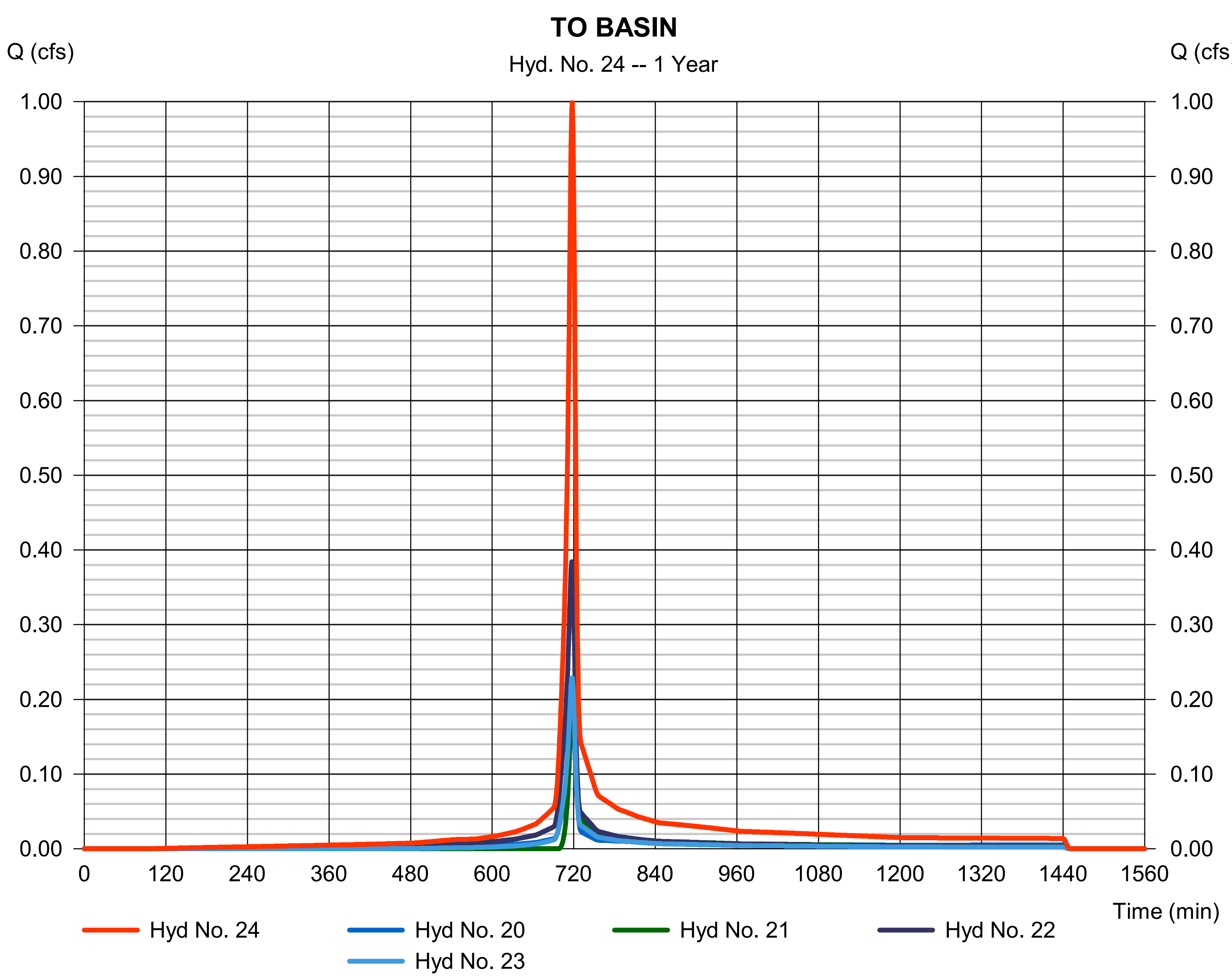
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 24

TO BASIN

Hydrograph type	= Combine	Peak discharge	= 0.999 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 2,397 cuft
Inflow hyds.	= 20, 21, 22, 23	Contrib. drain. area	= 0.409 ac



Hydrograph Report

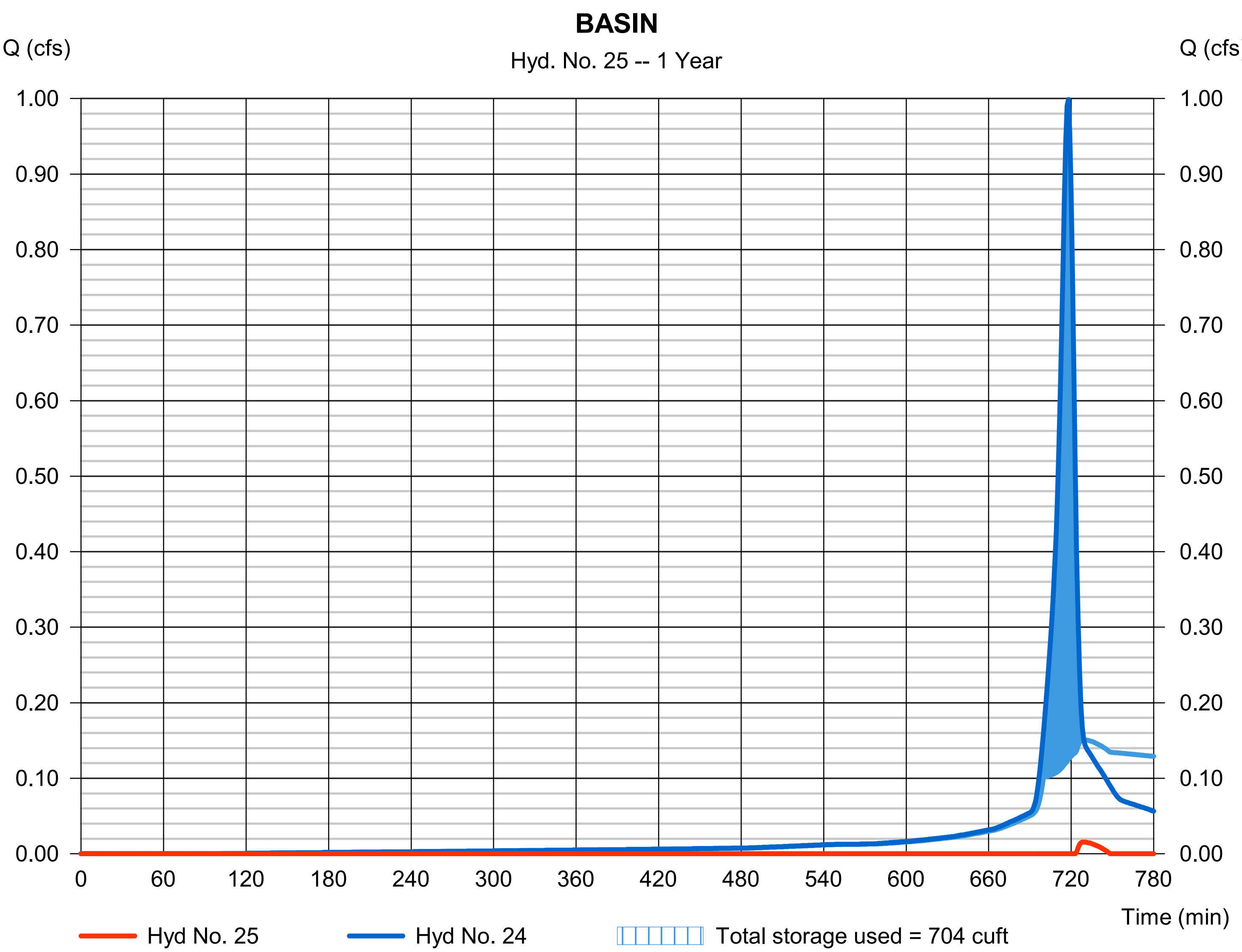
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 25

BASIN

Hydrograph type	= Reservoir	Peak discharge	= 0.016 cfs
Storm frequency	= 1 yrs	Time to peak	= 729 min
Time interval	= 1 min	Hyd. volume	= 15 cuft
Inflow hyd. No.	= 24 - TO BASIN	Max. Elevation	= 639.93 ft
Reservoir name	= UG N-12 Perforated Pipe System	Max. Storage	= 704 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Pond No. 1 - UG N-12 Perforated Pipe System

Pond Data

UG Chambers -Invert elev. = 639.50 ft, Rise x Span = 3.00 x 3.00 ft, Barrel Len = 65.00 ft, No. Barrels = 4, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 639.00 ft, Width = 5.25 ft, Height = 4.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	639.00	n/a	0	0
0.45	639.45	n/a	285	285
0.90	639.90	n/a	387	673
1.35	640.35	n/a	483	1,155
1.80	640.80	n/a	519	1,674
2.25	641.25	n/a	529	2,203
2.70	641.70	n/a	516	2,720
3.15	642.15	n/a	476	3,196
3.60	642.60	n/a	369	3,565
4.05	643.05	n/a	285	3,850
4.50	643.50	n/a	285	4,135

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	10.00	0.00	0.00
Span (in)	= 18.00	9.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 639.00	639.90	0.00	0.00
Length (ft)	= 65.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.75	0.00	0.00
Crest El. (ft)	= 642.33	640.90	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Rect	---	---
Multi-Stage	= No	Yes	No	No

Exfil.(in/hr) = 2.930 (by Wet area)
TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	639.00	0.00	0.00	---	---	0.00	0.00	---	---	0.000	---	0.000
0.05	29	639.04	0.00	0.00	---	---	0.00	0.00	---	---	0.102	---	0.102
0.09	57	639.09	0.00	0.00	---	---	0.00	0.00	---	---	0.103	---	0.103
0.14	86	639.13	0.00	0.00	---	---	0.00	0.00	---	---	0.105	---	0.105
0.18	114	639.18	0.00	0.00	---	---	0.00	0.00	---	---	0.107	---	0.107
0.22	143	639.22	0.00	0.00	---	---	0.00	0.00	---	---	0.109	---	0.109
0.27	171	639.27	0.00	0.00	---	---	0.00	0.00	---	---	0.110	---	0.110
0.31	200	639.31	0.00	0.00	---	---	0.00	0.00	---	---	0.112	---	0.112
0.36	228	639.36	0.00	0.00	---	---	0.00	0.00	---	---	0.114	---	0.114
0.40	257	639.40	0.00	0.00	---	---	0.00	0.00	---	---	0.115	---	0.115
0.45	285	639.45	0.00	0.00	---	---	0.00	0.00	---	---	0.117	---	0.117
0.50	324	639.49	0.00	0.00	---	---	0.00	0.00	---	---	0.119	---	0.119
0.54	363	639.54	0.00	0.00	---	---	0.00	0.00	---	---	0.121	---	0.121
0.58	402	639.59	0.00	0.00	---	---	0.00	0.00	---	---	0.122	---	0.122
0.63	440	639.63	0.00	0.00	---	---	0.00	0.00	---	---	0.124	---	0.124
0.68	479	639.67	0.00	0.00	---	---	0.00	0.00	---	---	0.126	---	0.126
0.72	518	639.72	0.00	0.00	---	---	0.00	0.00	---	---	0.127	---	0.127
0.76	556	639.76	0.00	0.00	---	---	0.00	0.00	---	---	0.129	---	0.129
0.81	595	639.81	0.00	0.00	---	---	0.00	0.00	---	---	0.131	---	0.131
0.86	634	639.85	0.00	0.00	---	---	0.00	0.00	---	---	0.133	---	0.133
0.90	673	639.90	0.00	0.00	---	---	0.00	0.00	---	---	0.134	---	0.134
0.94	721	639.95	0.03 ic	0.02 ic	---	---	0.00	0.00	---	---	0.136	---	0.160
0.99	769	639.99	0.07 ic	0.07 ic	---	---	0.00	0.00	---	---	0.138	---	0.207
1.03	817	640.03	0.13 ic	0.13 ic	---	---	0.00	0.00	---	---	0.140	---	0.266
1.08	866	640.08	0.20 ic	0.19 ic	---	---	0.00	0.00	---	---	0.141	---	0.336
1.13	914	640.12	0.27 ic	0.27 ic	---	---	0.00	0.00	---	---	0.143	---	0.415
1.17	962	640.17	0.36 ic	0.36 ic	---	---	0.00	0.00	---	---	0.145	---	0.503
1.22	1,010	640.21	0.46 ic	0.45 ic	---	---	0.00	0.00	---	---	0.146	---	0.598
1.26	1,059	640.26	0.55 ic	0.55 ic	---	---	0.00	0.00	---	---	0.148	---	0.699
1.30	1,107	640.30	0.66 ic	0.66 ic	---	---	0.00	0.00	---	---	0.150	---	0.808
1.35	1,155	640.35	0.77 ic	0.77 ic	---	---	0.00	0.00	---	---	0.152	---	0.922
1.39	1,207	640.40	0.89 ic	0.89 ic	---	---	0.00	0.00	---	---	0.153	---	1.042

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UG N-12 Perforated Pipe System

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
1.44	1,259	640.44	1.02 ic	1.01 ic	---	---	0.00	0.00	---	---	0.155	---	1.168
1.49	1,311	640.48	1.16 ic	1.14 ic	---	---	0.00	0.00	---	---	0.157	---	1.299
1.53	1,363	640.53	1.31 ic	1.28 ic	---	---	0.00	0.00	---	---	0.158	---	1.435
1.58	1,415	640.57	1.42 ic	1.42 ic	---	---	0.00	0.00	---	---	0.160	---	1.576
1.62	1,467	640.62	1.59 ic	1.56 ic	---	---	0.00	0.00	---	---	0.162	---	1.721
1.66	1,518	640.66	1.71 ic	1.71 ic	---	---	0.00	0.00	---	---	0.164	---	1.872
1.71	1,570	640.71	1.90 ic	1.86 ic	---	---	0.00	0.00	---	---	0.165	---	2.026
1.75	1,622	640.75	2.03 ic	1.99 ic	---	---	0.00	0.00	---	---	0.167	---	2.159
1.80	1,674	640.80	2.10 ic	2.09 ic	---	---	0.00	0.00	---	---	0.169	---	2.261
1.85	1,727	640.84	2.23 ic	2.19 ic	---	---	0.00	0.00	---	---	0.170	---	2.358
1.89	1,780	640.89	2.30 ic	2.28 ic	---	---	0.00	0.00	---	---	0.172	---	2.451
1.93	1,833	640.93	2.38 ic	2.37 ic	---	---	0.00	0.02	---	---	0.174	---	2.556
1.98	1,886	640.98	2.51 ic	2.45 ic	---	---	0.00	0.06	---	---	0.176	---	2.683
2.03	1,939	641.02	2.66 ic	2.53 ic	---	---	0.00	0.11	---	---	0.177	---	2.820
2.07	1,992	641.07	2.80 ic	2.61 ic	---	---	0.00	0.17	---	---	0.179	---	2.966
2.12	2,044	641.11	2.95 ic	2.69 ic	---	---	0.00	0.25	---	---	0.181	---	3.118
2.16	2,097	641.16	3.11 ic	2.76 ic	---	---	0.00	0.33	---	---	0.182	---	3.276
2.20	2,150	641.20	3.26 ic	2.84 ic	---	---	0.00	0.42	---	---	0.184	---	3.440
2.25	2,203	641.25	3.42 ic	2.91 ic	---	---	0.00	0.52	---	---	0.186	---	3.610
2.30	2,255	641.29	3.64 ic	2.98 ic	---	---	0.00	0.62	---	---	0.188	---	3.784
2.34	2,306	641.34	3.80 ic	3.04 ic	---	---	0.00	0.73	---	---	0.189	---	3.962
2.38	2,358	641.38	3.96 ic	3.11 ic	---	---	0.00	0.84	---	---	0.191	---	4.145
2.43	2,410	641.43	4.19 ic	3.18 ic	---	---	0.00	0.96	---	---	0.193	---	4.331
2.47	2,461	641.47	4.34 ic	3.24 ic	---	---	0.00	1.09	---	---	0.194	---	4.522
2.52	2,513	641.52	4.57 ic	3.30 ic	---	---	0.00	1.22	---	---	0.196	---	4.716
2.57	2,565	641.56	4.72 ic	3.36 ic	---	---	0.00	1.35	---	---	0.198	---	4.914
2.61	2,616	641.61	4.94 ic	3.42 ic	---	---	0.00	1.49	---	---	0.200	---	5.115
2.66	2,668	641.65	5.16 ic	3.48 ic	---	---	0.00	1.64	---	---	0.201	---	5.320
2.70	2,720	641.70	5.37 ic	3.54 ic	---	---	0.00	1.79	---	---	0.203	---	5.529
2.74	2,767	641.74	5.57 ic	3.60 ic	---	---	0.00	1.94	---	---	0.205	---	5.741
2.79	2,815	641.79	5.76 ic	3.65 ic	---	---	0.00	2.10	---	---	0.206	---	5.956
2.84	2,862	641.84	6.00 ic	3.71 ic	---	---	0.00	2.26	---	---	0.208	---	6.174
2.88	2,910	641.88	6.19 ic	3.76 ic	---	---	0.00	2.42	---	---	0.210	---	6.395
2.92	2,958	641.92	6.43 ic	3.82 ic	---	---	0.00	2.59	---	---	0.212	---	6.619
2.97	3,005	641.97	6.61 ic	3.84 ic	---	---	0.00	2.76	---	---	0.213	---	6.816
3.02	3,053	642.01	6.81 ic	3.85 ic	---	---	0.00	2.94	---	---	0.215	---	7.006
3.06	3,100	642.06	6.98 ic	3.86 ic	---	---	0.00	3.12	---	---	0.217	---	7.199
3.11	3,148	642.10	7.09 oc	3.79 ic	---	---	0.00	3.30	---	---	0.218	---	7.311
3.15	3,196	642.15	7.29 oc	3.80 ic	---	---	0.00	3.49	---	---	0.220	---	7.509
3.19	3,233	642.20	7.49 oc	3.81 ic	---	---	0.00	3.68	---	---	0.222	---	7.708
3.24	3,269	642.24	7.69 oc	3.81 ic	---	---	0.00	3.87	---	---	0.224	---	7.909
3.29	3,306	642.28	7.89 oc	3.82 ic	---	---	0.00	4.07	---	---	0.225	---	8.111
3.33	3,343	642.33	8.09 oc	3.82 ic	---	---	0.00	4.27	---	---	0.227	---	8.315
3.38	3,380	642.37	8.29 oc	3.82 ic	---	---	0.13	4.47	---	---	0.229	---	8.648
3.42	3,417	642.42	8.50 oc	3.82 ic	---	---	0.36	4.68	---	---	0.230	---	9.087
3.47	3,454	642.46	8.70 oc	3.82 ic	---	---	0.66	4.89	---	---	0.232	---	9.596
3.51	3,491	642.51	8.91 oc	3.81 ic	---	---	1.02	5.10 s	---	---	0.234	---	10.16
3.56	3,528	642.55	9.11 oc	3.81 ic	---	---	1.42	5.30 s	---	---	0.236	---	10.77
3.60	3,565	642.60	9.31 oc	3.80 ic	---	---	1.87	5.50 s	---	---	0.237	---	11.41
3.64	3,593	642.65	9.50 oc	3.80 ic	---	---	2.35	5.70 s	---	---	0.239	---	12.09
3.69	3,622	642.69	9.69 oc	3.80 ic	---	---	2.88	5.89 s	---	---	0.241	---	12.81
3.73	3,650	642.73	9.88 oc	3.79 ic	---	---	3.43	6.09 s	---	---	0.242	---	13.55
3.78	3,679	642.78	10.06 oc	3.79 ic	---	---	4.02	6.28 s	---	---	0.244	---	14.33
3.83	3,707	642.82	10.25 oc	3.78 ic	---	---	4.64	6.47 s	---	---	0.246	---	15.13
3.87	3,736	642.87	10.43 oc	3.77 ic	---	---	5.28	6.66 s	---	---	0.248	---	15.96
3.92	3,764	642.91	10.61 oc	3.77 ic	---	---	5.96	6.84 s	---	---	0.249	---	16.82
3.96	3,793	642.96	10.79 oc	3.76 ic	---	---	6.66	7.03 s	---	---	0.251	---	17.70
4.01	3,821	643.00	10.97 oc	3.75 ic	---	---	7.38	7.22 s	---	---	0.253	---	18.60
4.05	3,850	643.05	11.15 oc	3.74 ic	---	---	8.14	7.40 s	---	---	0.254	---	19.54
4.09	3,879	643.09	11.32 oc	3.74 ic	---	---	8.91	7.58 s	---	---	0.256	---	20.49
4.14	3,907	643.14	11.49 oc	3.73 ic	---	---	9.71	7.77 s	---	---	0.258	---	21.46
4.18	3,936	643.18	11.66 oc	3.72 ic	---	---	10.53	7.95 s	---	---	0.260	---	22.45
4.23	3,964	643.23	11.83 oc	3.71 ic	---	---	11.37	8.13 s	---	---	0.261	---	23.47
4.28	3,993	643.27	12.00 oc	3.70 ic	---	---	12.23	8.31 s	---	---	0.263	---	24.50
4.32	4,021	643.32	12.17 oc	3.69 ic	---	---	13.12	8.48 s	---	---	0.265	---	25.55
4.37	4,050	643.36	12.33 oc	3.67 ic	---	---	14.02	8.66 s	---	---	0.266	---	26.62
4.41	4,078	643.41	12.50 oc	3.66 ic	---	---	14.95	8.83 s	---	---	0.268	---	27.71
4.46	4,107	643.45	12.66 oc	3.65 ic	---	---	15.89	9.01 s	---	---	0.270	---	28.82
4.50	4,135	643.50	12.82 oc	3.64 ic	---	---	16.86	9.18 s	---	---	0.272	---	29.95

...End

Hydrograph Report

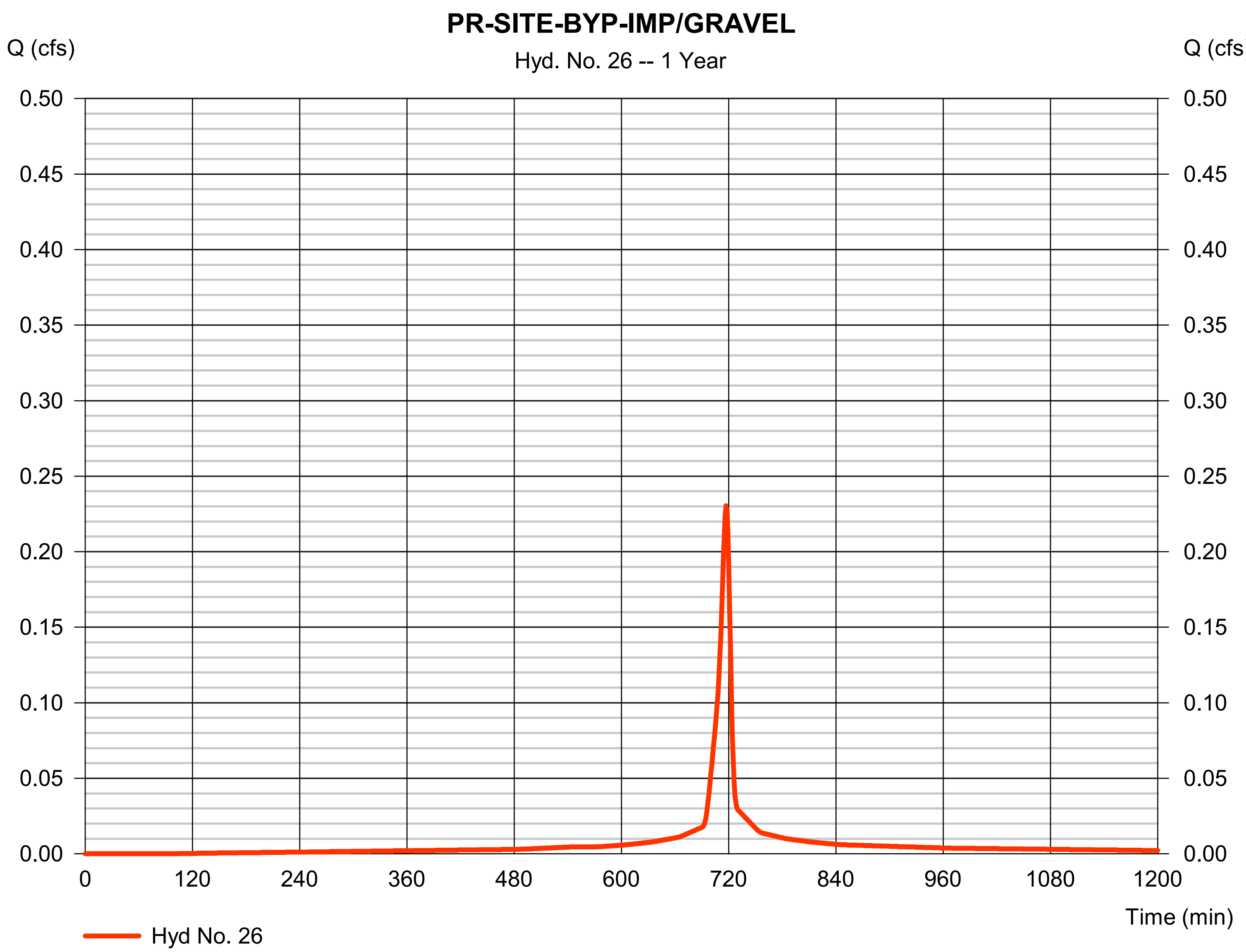
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 26

PR-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.230 cfs
Storm frequency	= 1 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 539 cuft
Drainage area	= 0.060 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.060 x 98)] / 0.060



Hydrograph Report

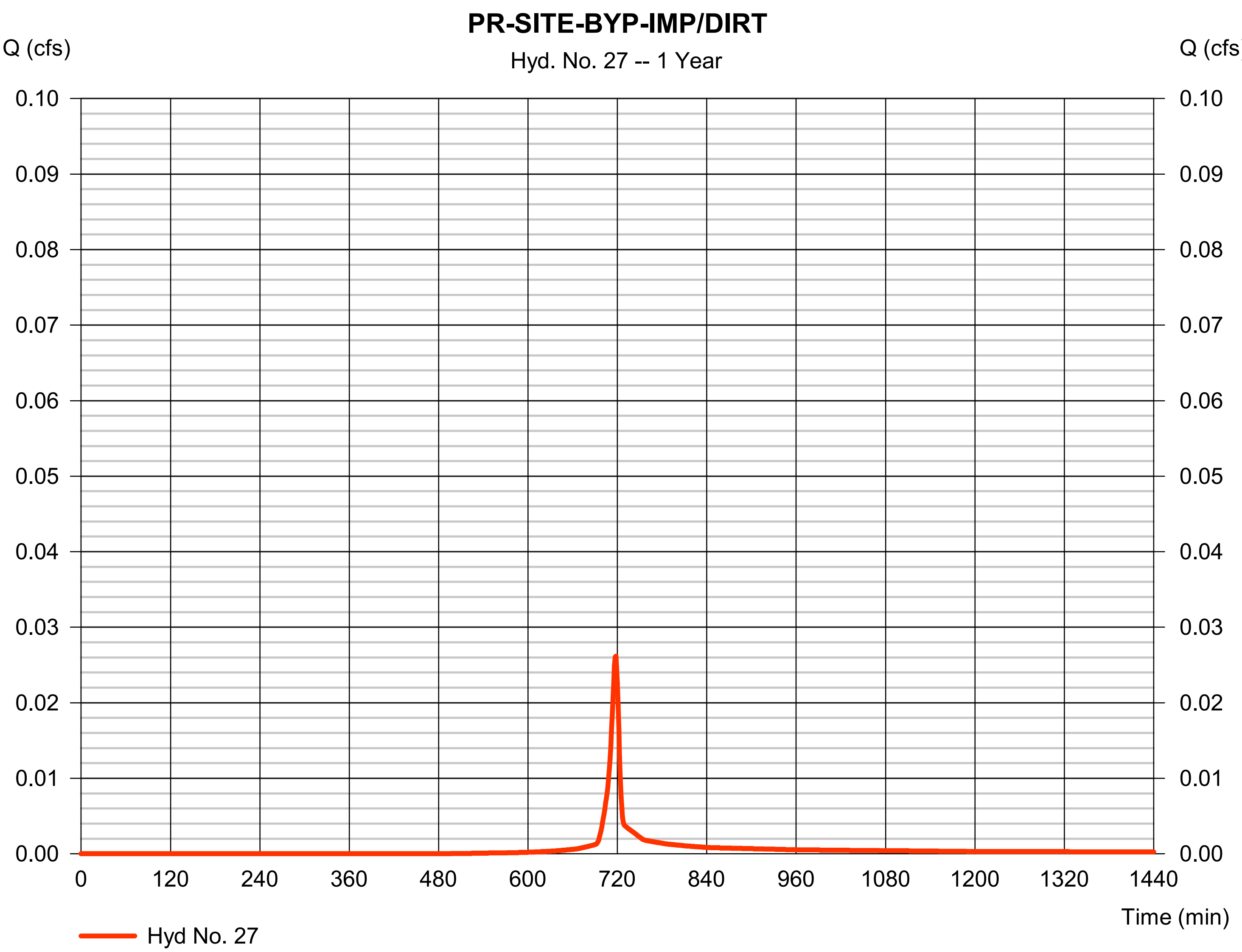
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 27

PR-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.026 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 53 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.008 x 87)] / 0.010



Hydrograph Report

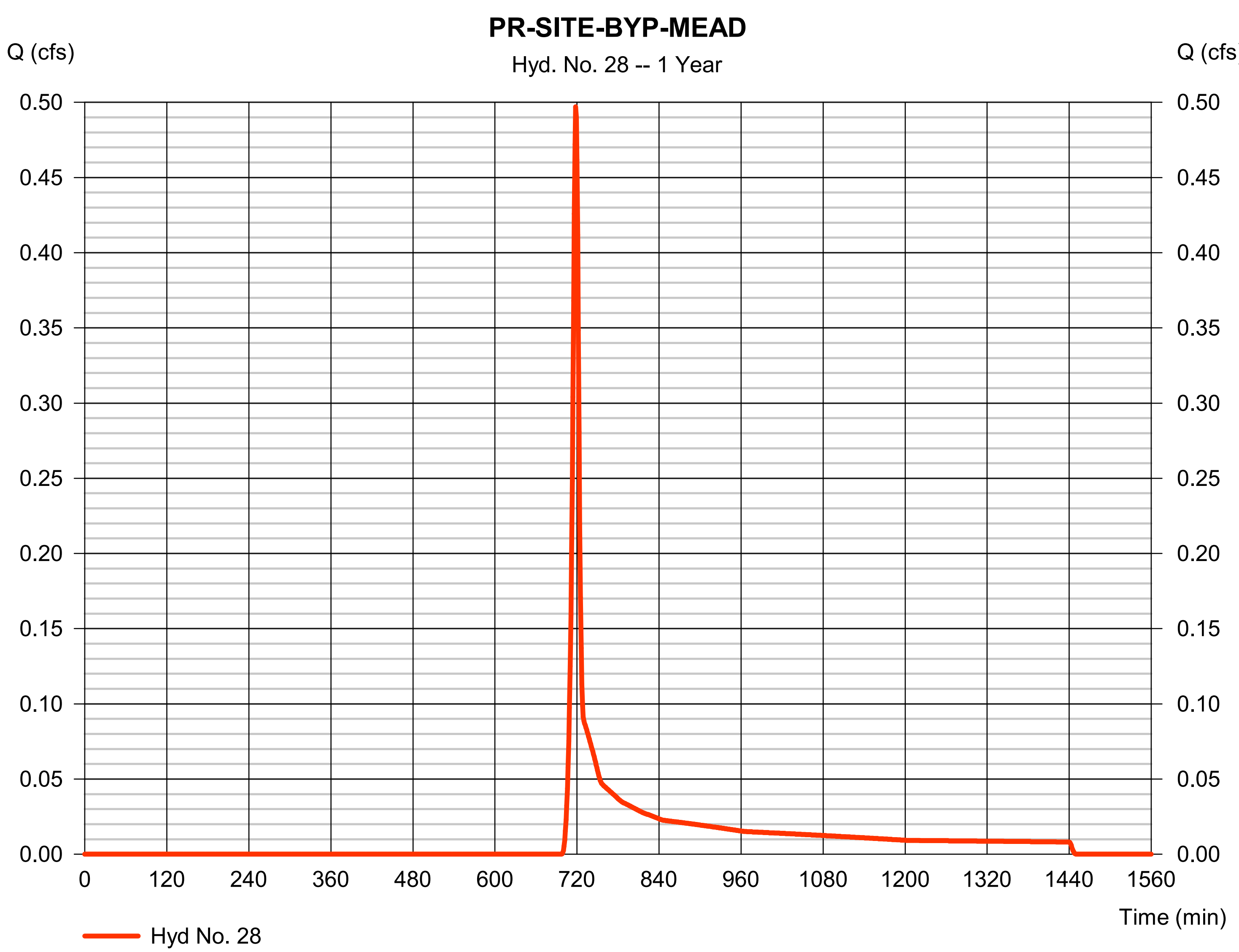
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 28

PR-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.497 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,079 cuft
Drainage area	= 0.517 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 71) + (0.290 x 71) + (0.085 x 71)] / 0.517



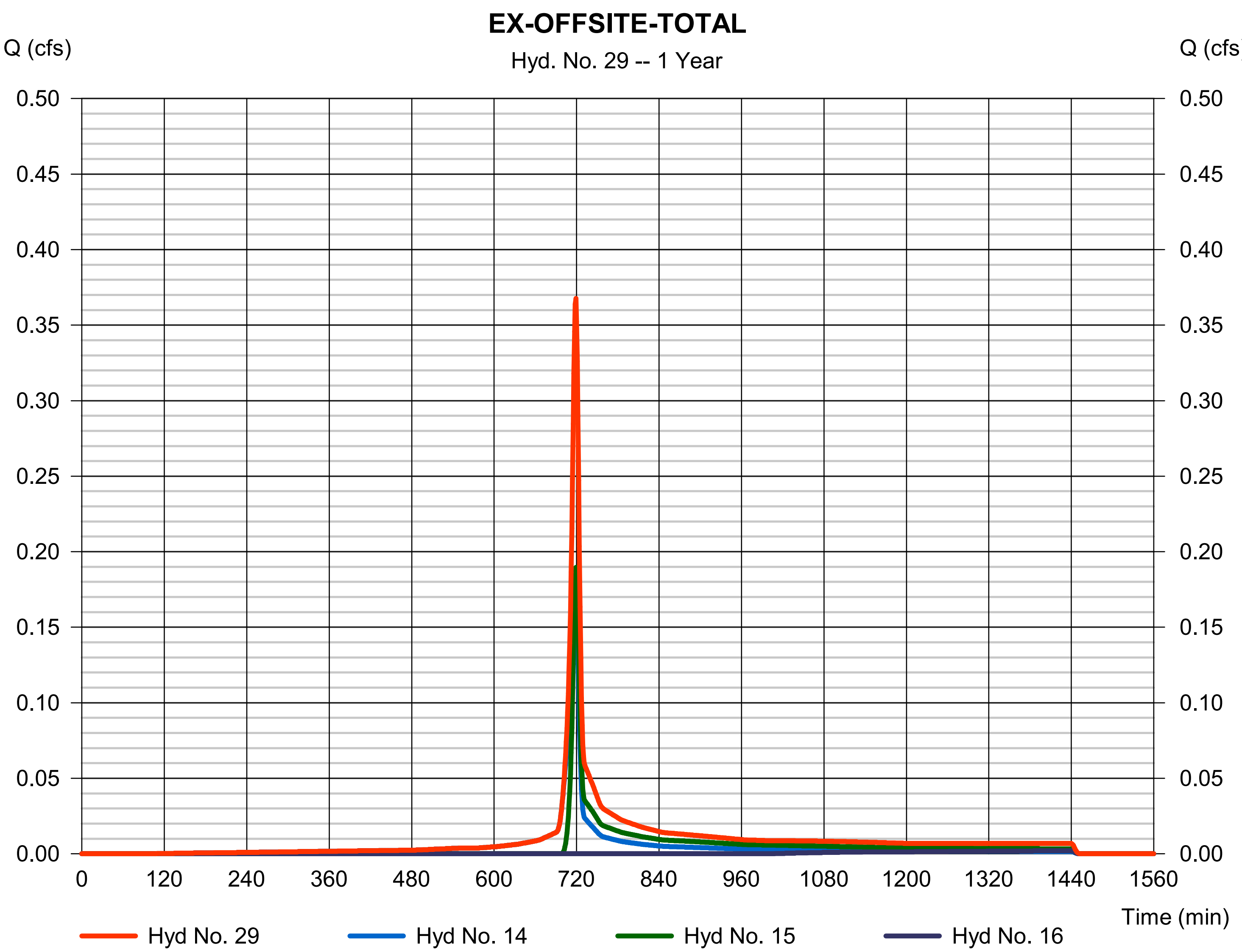
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 29

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 0.368 cfs
Storm frequency	= 1 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 912 cuft
Inflow hyds.	= 14, 15, 16	Contrib. drain. area	= 1.822 ac



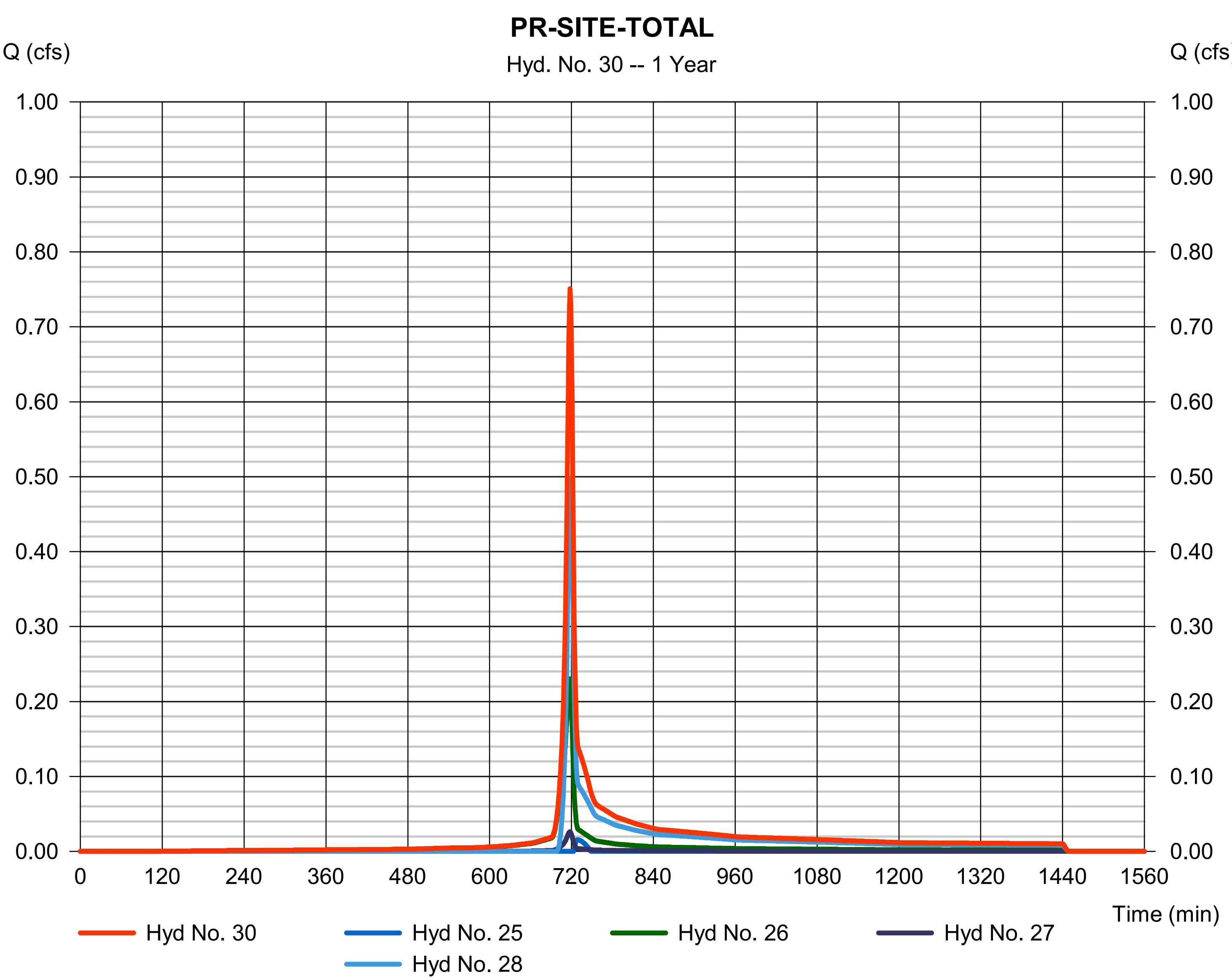
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 30

PR-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 0.751 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,686 cuft
Inflow hyds.	= 25, 26, 27, 28	Contrib. drain. area	= 0.587 ac



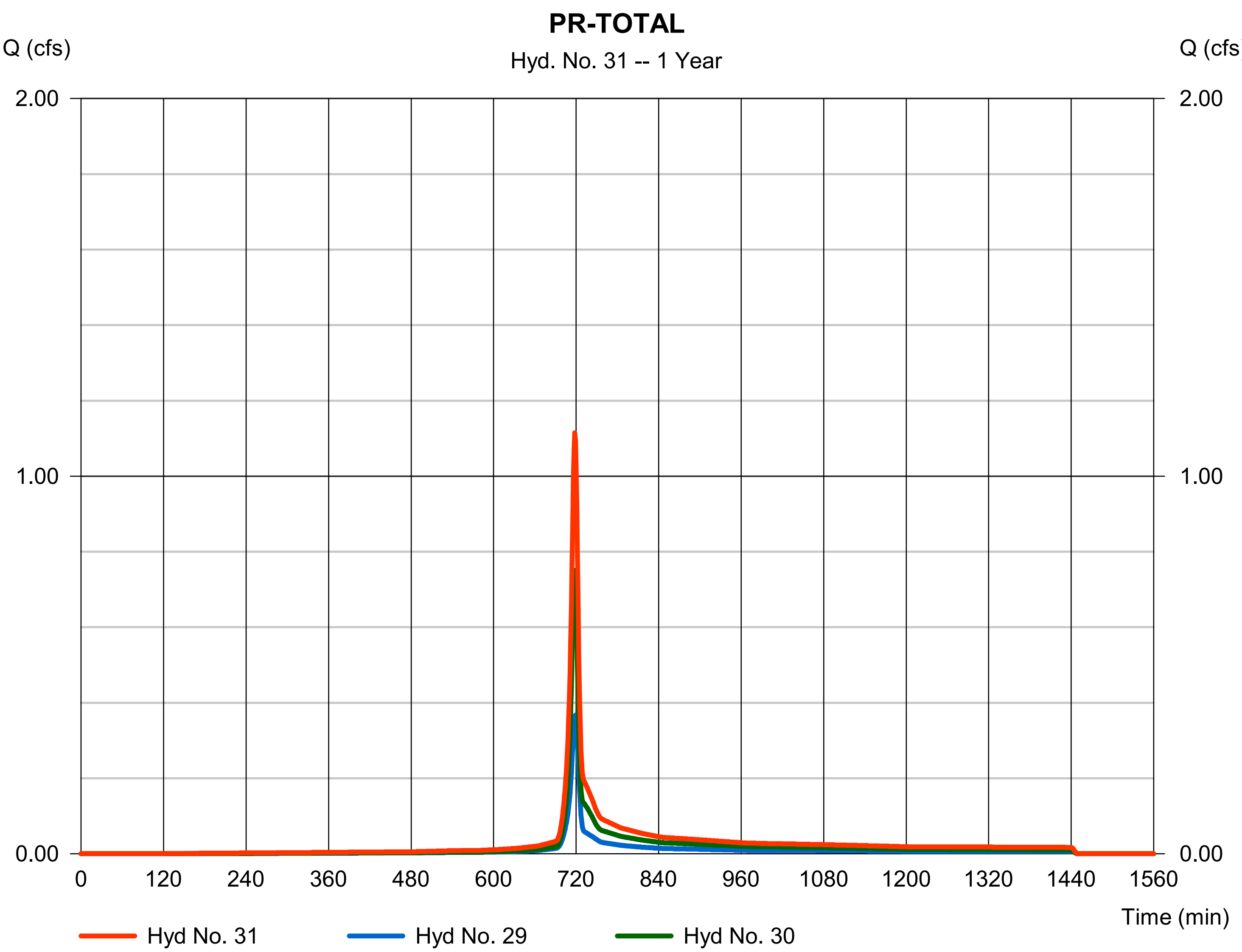
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 31

PR-TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.115 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 2,598 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.425	1	718	1,043	------	------	------	EX-OFFSITE-IMP/GRAVEL
2	SCS Runoff	0.024	1	719	54	------	------	------	EX-SITE-BYP-IMP/DIRT
3	SCS Runoff	0.000	1	n/a	0	------	------	------	EX-OFFSITE-MEAD
4	SCS Runoff	0.041	1	747	1,130	------	------	------	EX-OFFSITE-WOODS
5	SCS Runoff	0.026	1	720	62	------	------	------	EX-SITE-MEAD
6	SCS Runoff	0.473	1	720	1,128	------	------	------	EX-SITE-WOODS
7	SCS Runoff	0.030	1	719	68	------	------	------	EX-SITE-BYP-IMP/DIRT
8	SCS Runoff	0.171	1	719	445	------	------	------	EX-SITE-BYP-IMP/GRAVEL
9	SCS Runoff	0.188	1	720	443	------	------	------	EX-SITE-BYP-MEAD
10	SCS Runoff	0.477	1	720	1,137	------	------	------	EX-SITE-BYP-WOODS
11	Combine	1.361	1	720	3,283	5, 6, 7, 8, 9, 10	------	------	EX-SITE-TOTAL
12	Combine	0.448	1	718	2,227	1, 2, 3, 4,	------	------	EX-OFFSITE-TOTAL
13	Combine	1.778	1	719	5,510	11, 12	------	------	EX-TOTAL
14	SCS Runoff	0.219	1	718	537	------	------	------	PR-OFFSITE-IMP/GRAVEL
15	SCS Runoff	0.303	1	719	660	------	------	------	PR-OFFSITE-MEAD
16	SCS Runoff	0.008	1	916	281	------	------	------	PR-OFFSITE-WOODS
17	SCS Runoff	0.206	1	718	506	------	------	------	PR-OFFSITE-IMP/GRAVEL
18	SCS Runoff	0.020	1	726	355	------	------	------	PR-OFFSITE-MEAD
19	SCS Runoff	0.004	1	1060	154	------	------	------	PR-OFFSITE-WOODS
20	Combine	0.209	1	718	1,015	17, 18, 19	------	------	OFFSITE TO BASIN
21	SCS Runoff	0.352	1	718	727	------	------	------	PR-SITE-MEAD
22	SCS Runoff	0.462	1	717	1,092	------	------	------	PR-SITE-IMP/GRAVEL
23	SCS Runoff	0.293	1	717	610	------	------	------	PR-SITE-GRAVEL
24	Combine	1.309	1	718	3,444	20, 21, 22, 23	------	------	TO BASIN
25	Reservoir	0.257	1	725	312	24	640.12	904	BASIN
26	SCS Runoff	0.277	1	717	655	------	------	------	PR-SITE-BYP-IMP/GRAVEL
27	SCS Runoff	0.034	1	718	70	------	------	------	PR-SITE-BYP-IMP/DIRT
28	SCS Runoff	0.794	1	718	1,642	------	------	------	PR-SITE-BYP-MEAD
29	Combine	0.518	1	719	1,479	14, 15, 16,	------	------	EX-OFFSITE-TOTAL
30	Combine	1.101	1	718	2,679	25, 26, 27, 28,	------	------	PR-SITE-TOTAL
31	Combine	1.616	1	718	4,157	29, 30	------	------	PR-TOTAL

Proposed.gpw	Return Period: 2 Year	Saturday, 10 / 13 / 2018

Hydrograph Report

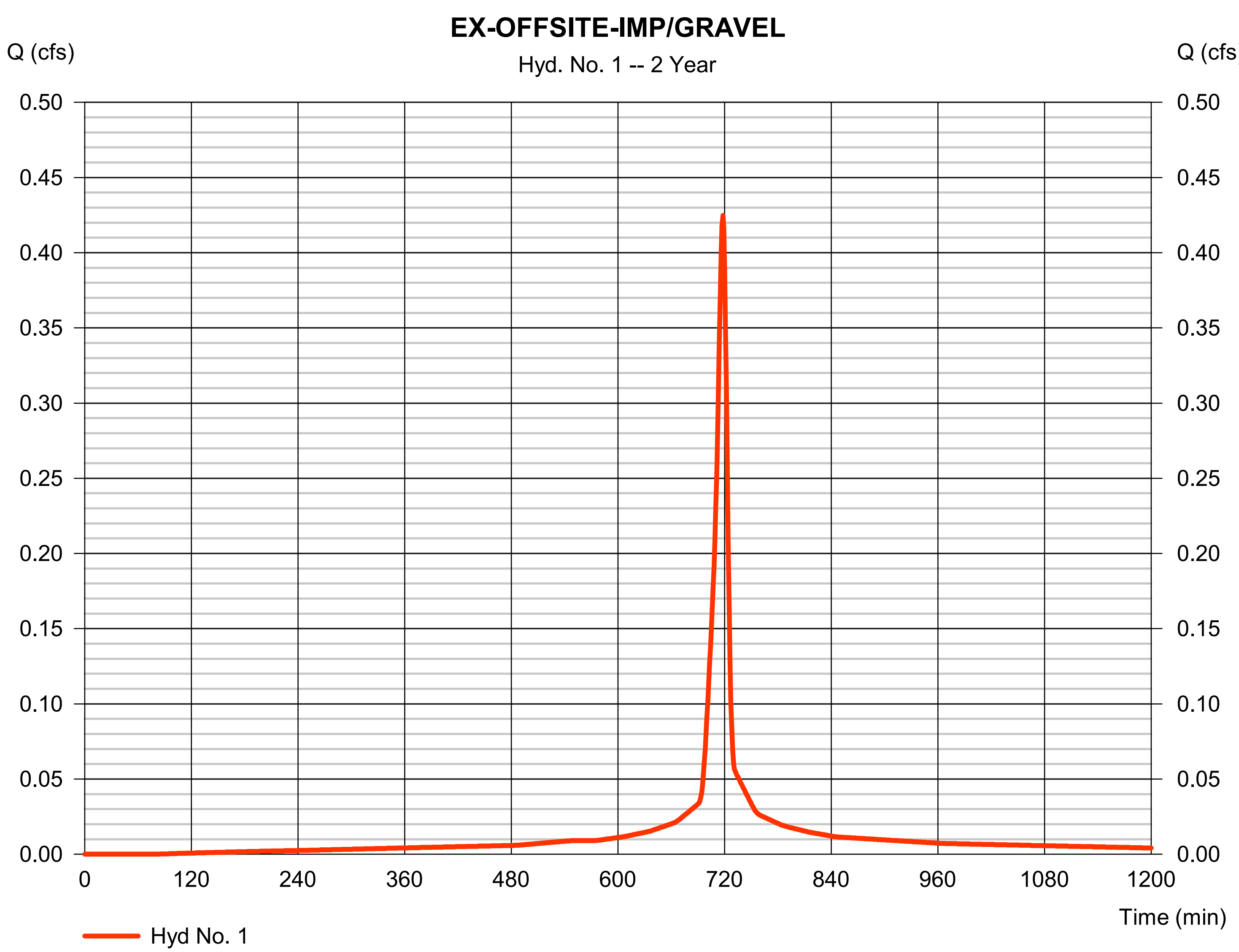
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 1

EX-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.425 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,043 cuft
Drainage area	= 0.101 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.101



Hydrograph Report

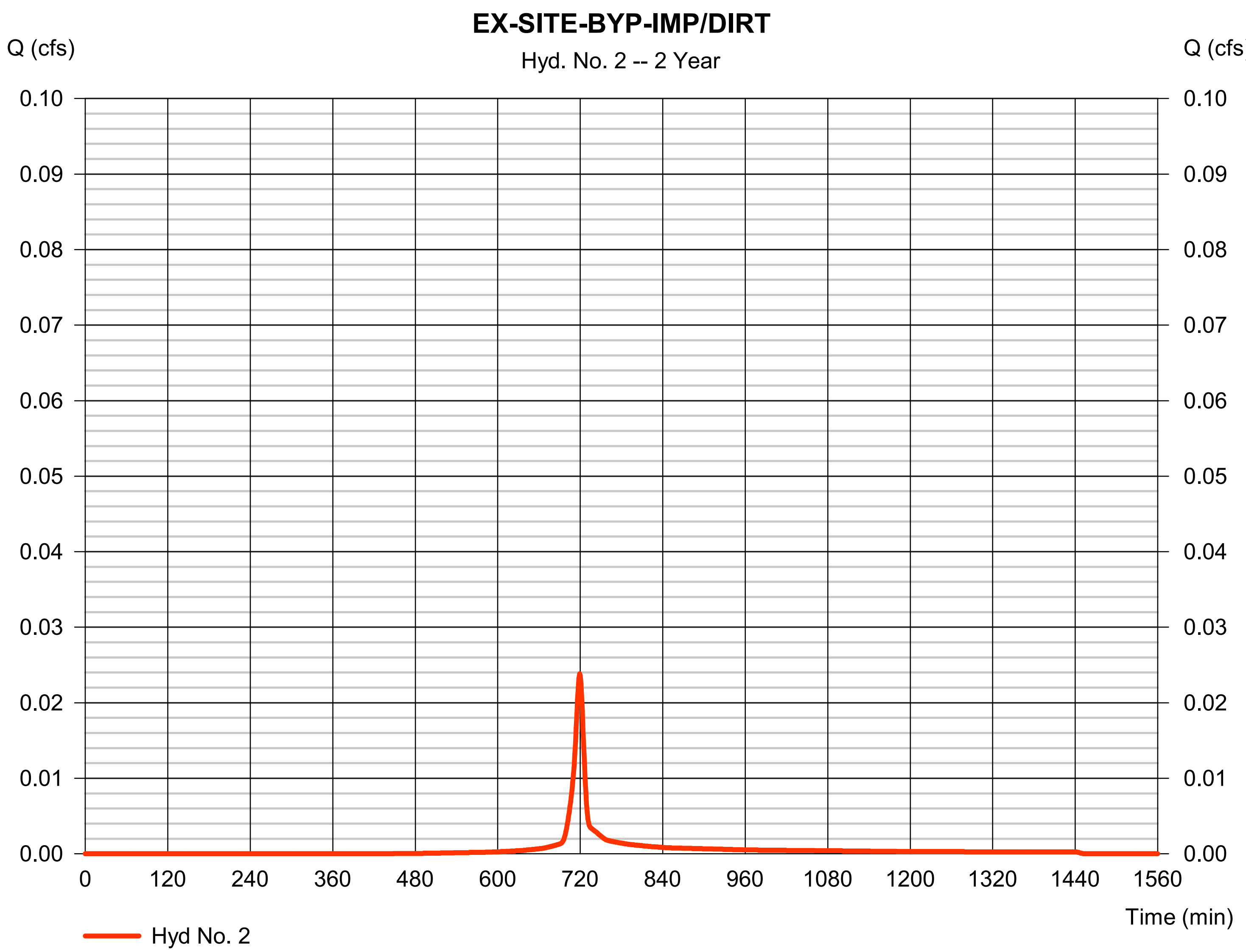
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 2

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.024 cfs
Storm frequency	= 2 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 54 cuft
Drainage area	= 0.008 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.80 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.008



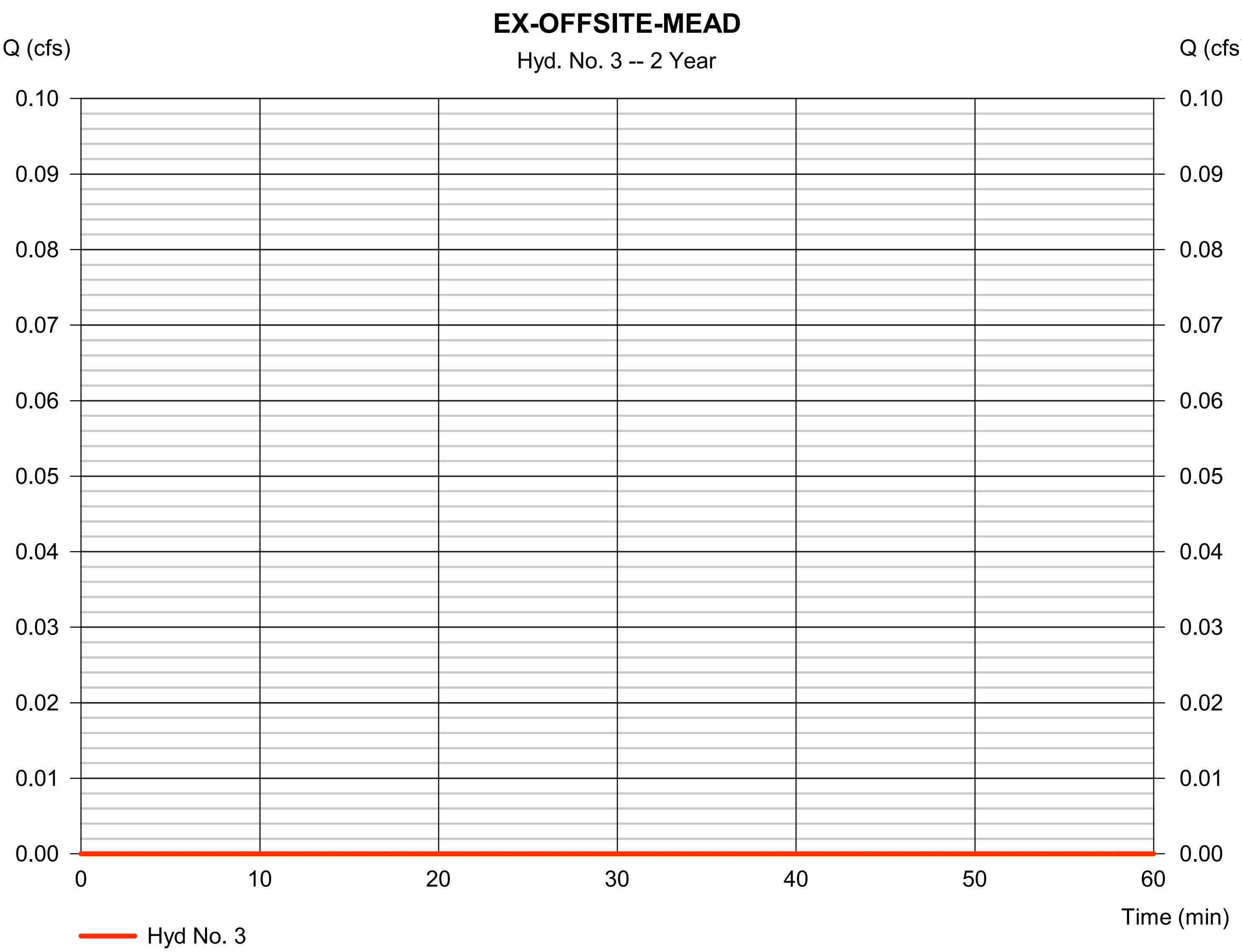
Hydrograph Report

Hyd. No. 3

EX-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Drainage area	= 0.404 ac	Curve number	= 30*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.100 x 70)] / 0.404



Hydrograph Report

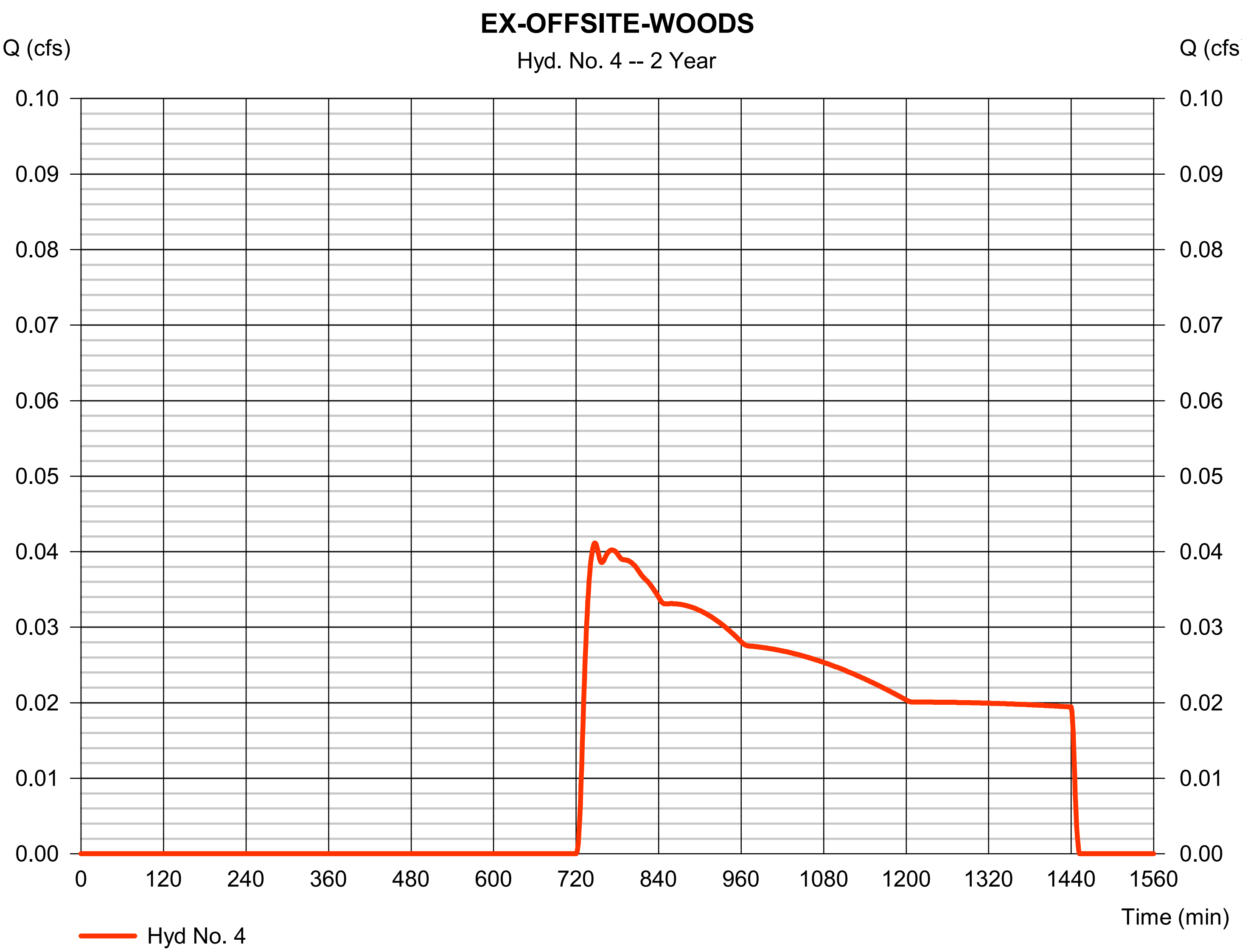
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 4

EX-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.041 cfs
Storm frequency	= 2 yrs	Time to peak	= 747 min
Time interval	= 1 min	Hyd. volume	= 1,130 cuft
Drainage area	= 3.210 ac	Curve number	= 49*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.562 x 70) + (1.652 x 30)] / 3.210



Hydrograph Report

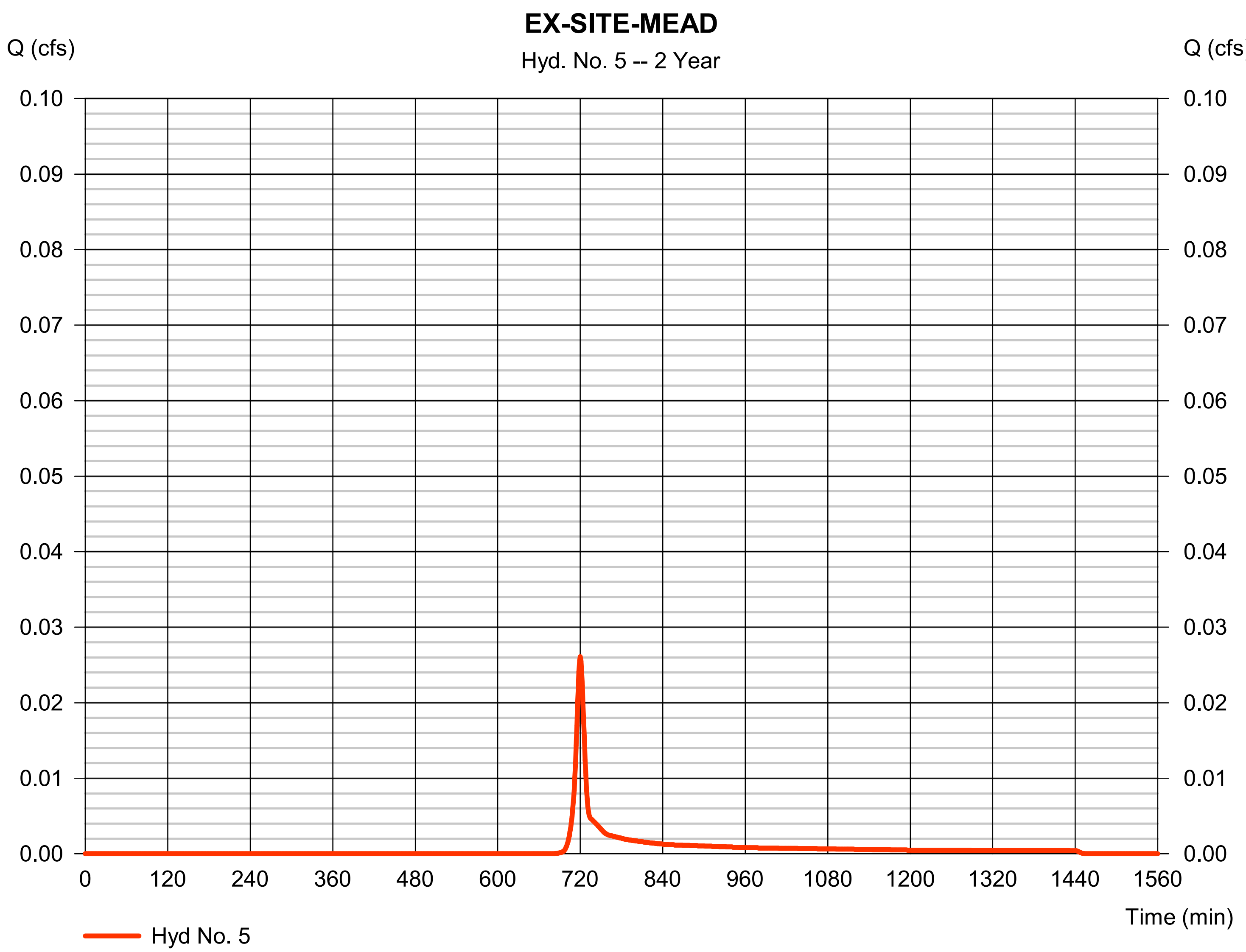
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 5

EX-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.026 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 62 cuft
Drainage area	= 0.020 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.020 x 71)] / 0.020



Hydrograph Report

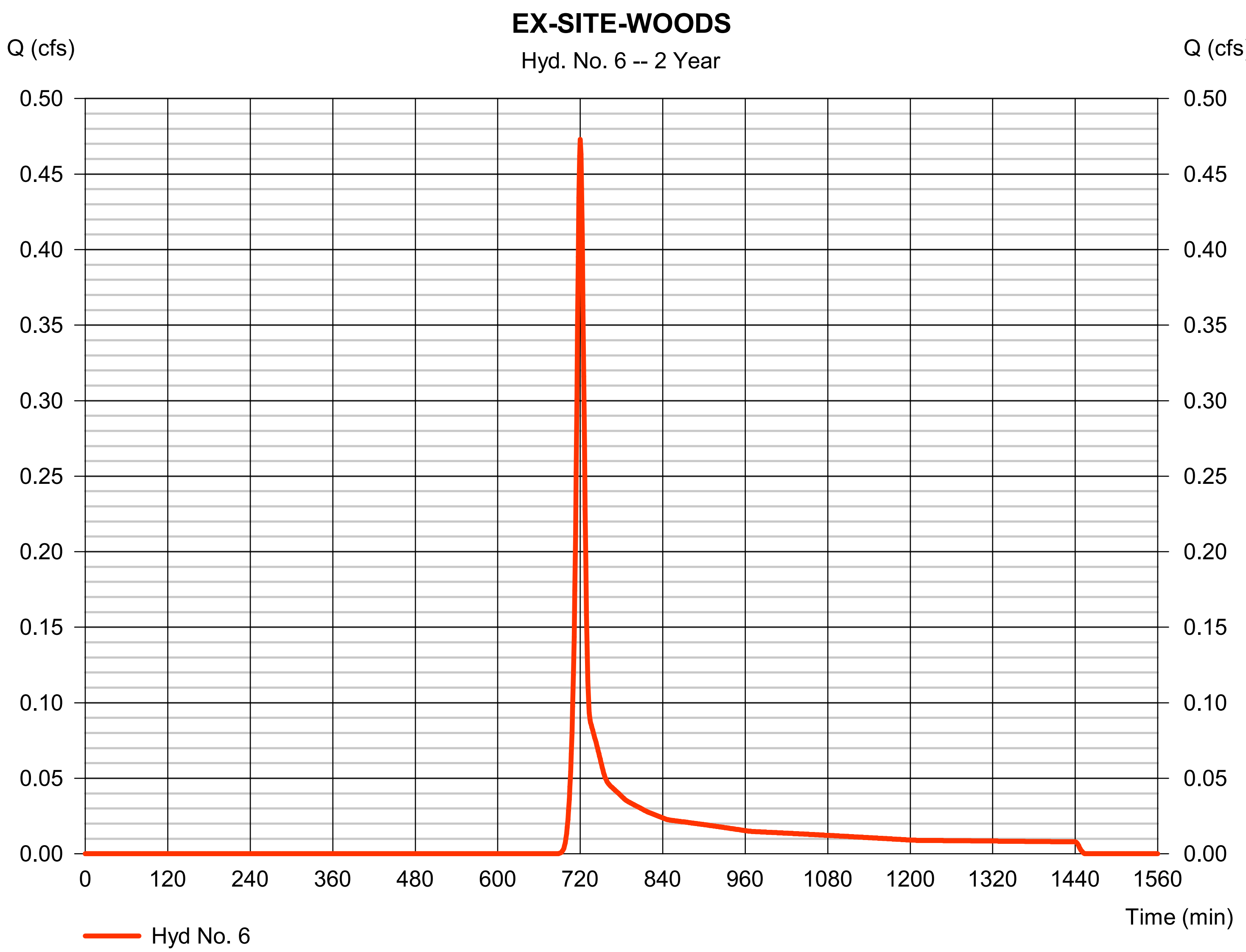
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 6

EX-SITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.473 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 1,128 cuft
Drainage area	= 0.389 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.240 x 70) + (0.060 x 70) + (0.460 x 70)] / 0.389



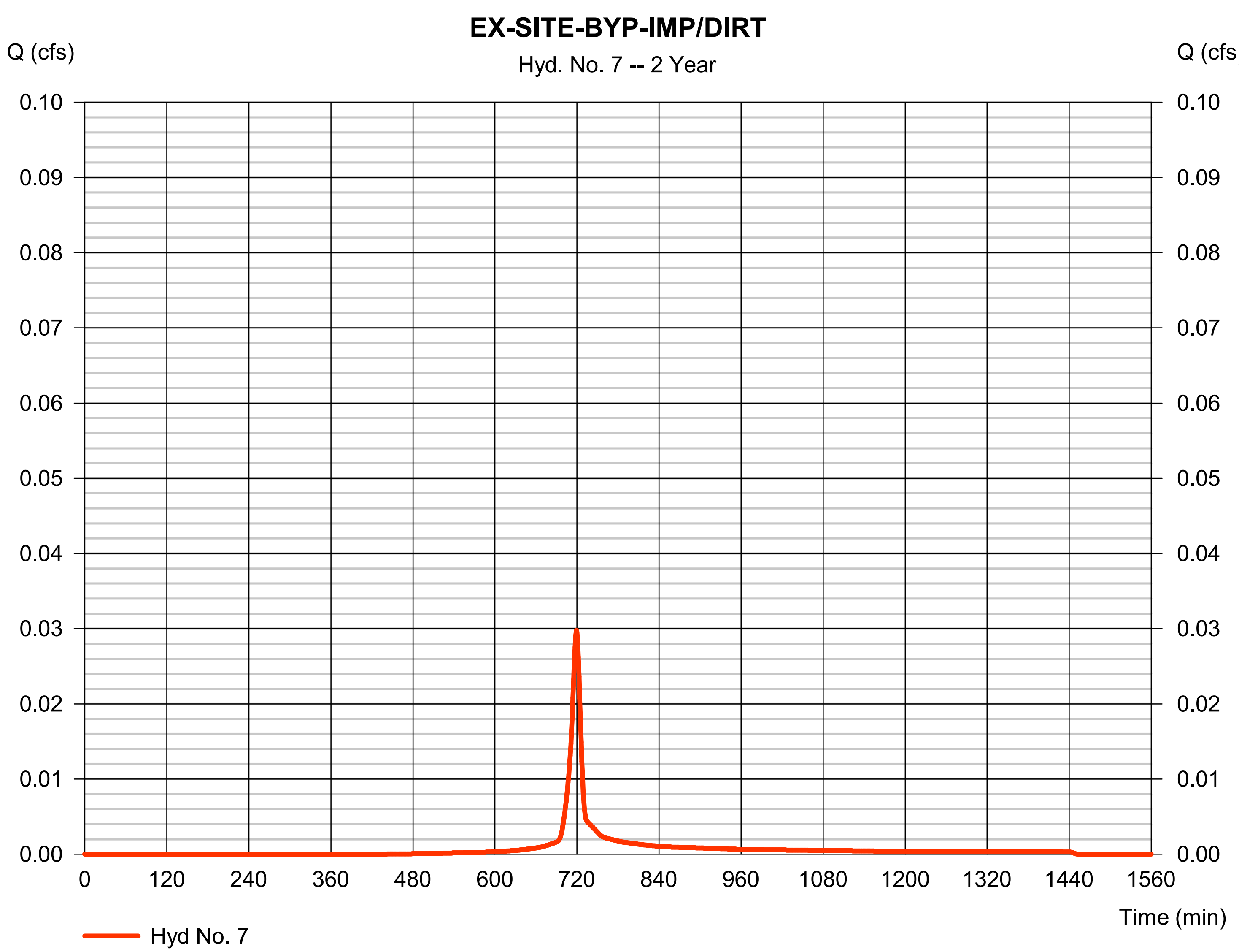
Hydrograph Report

Hyd. No. 7

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.030 cfs
Storm frequency	= 2 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 68 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.010



Hydrograph Report

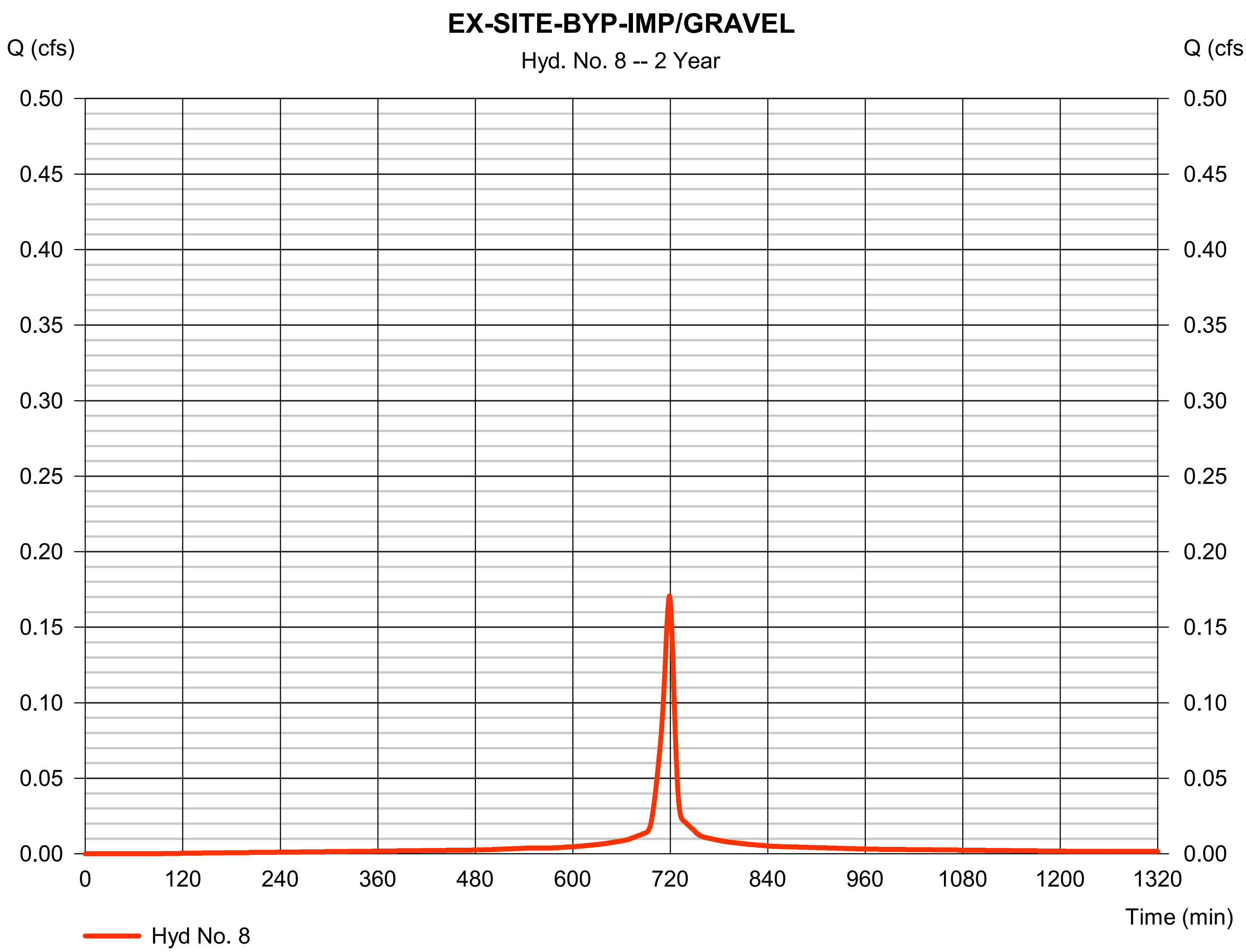
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 8

EX-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.171 cfs
Storm frequency	= 2 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 445 cuft
Drainage area	= 0.042 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.040 x 98)] / 0.042



Hydrograph Report

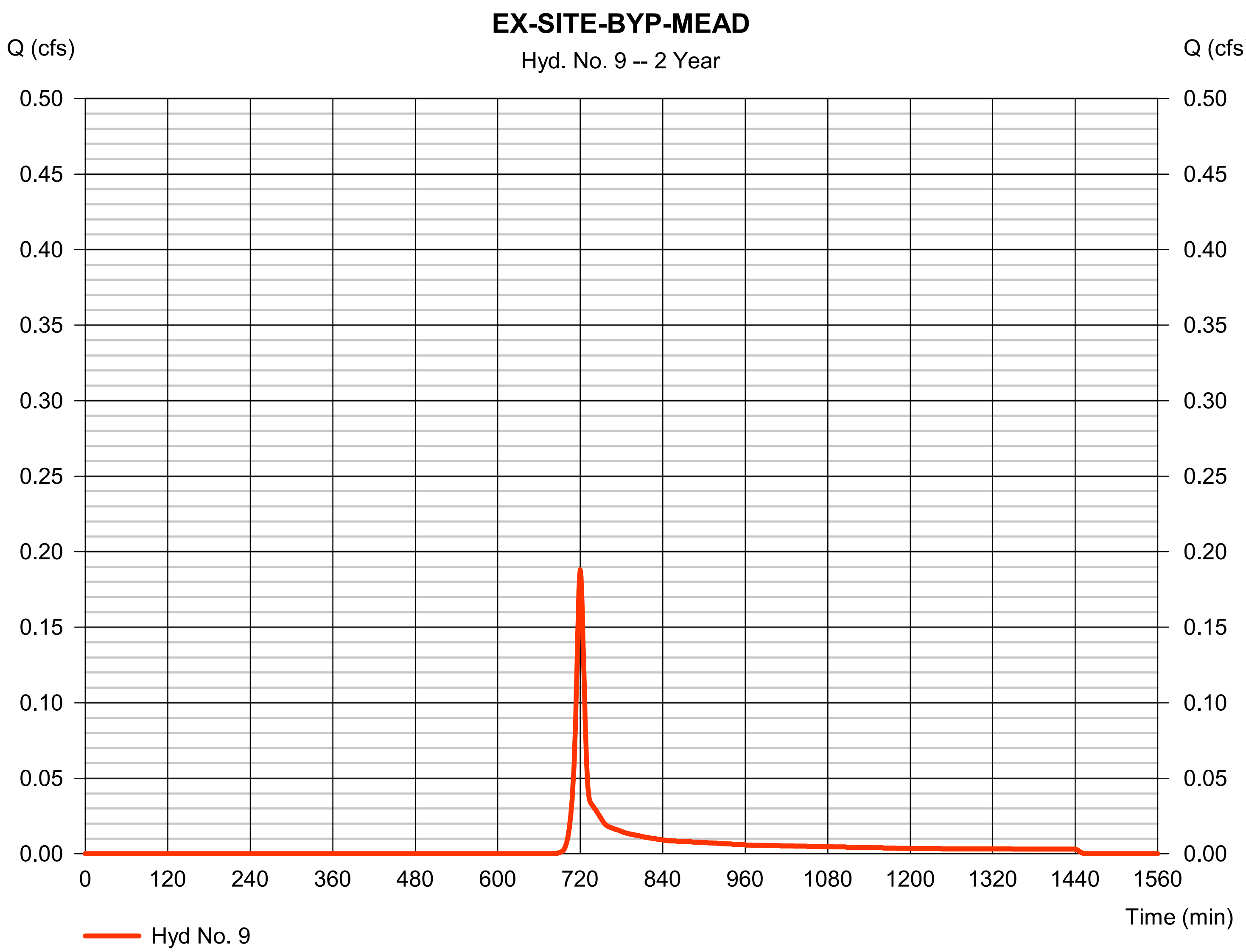
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 9

EX-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.188 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 443 cuft
Drainage area	= 0.144 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.190 x 71)] / 0.144



Hydrograph Report

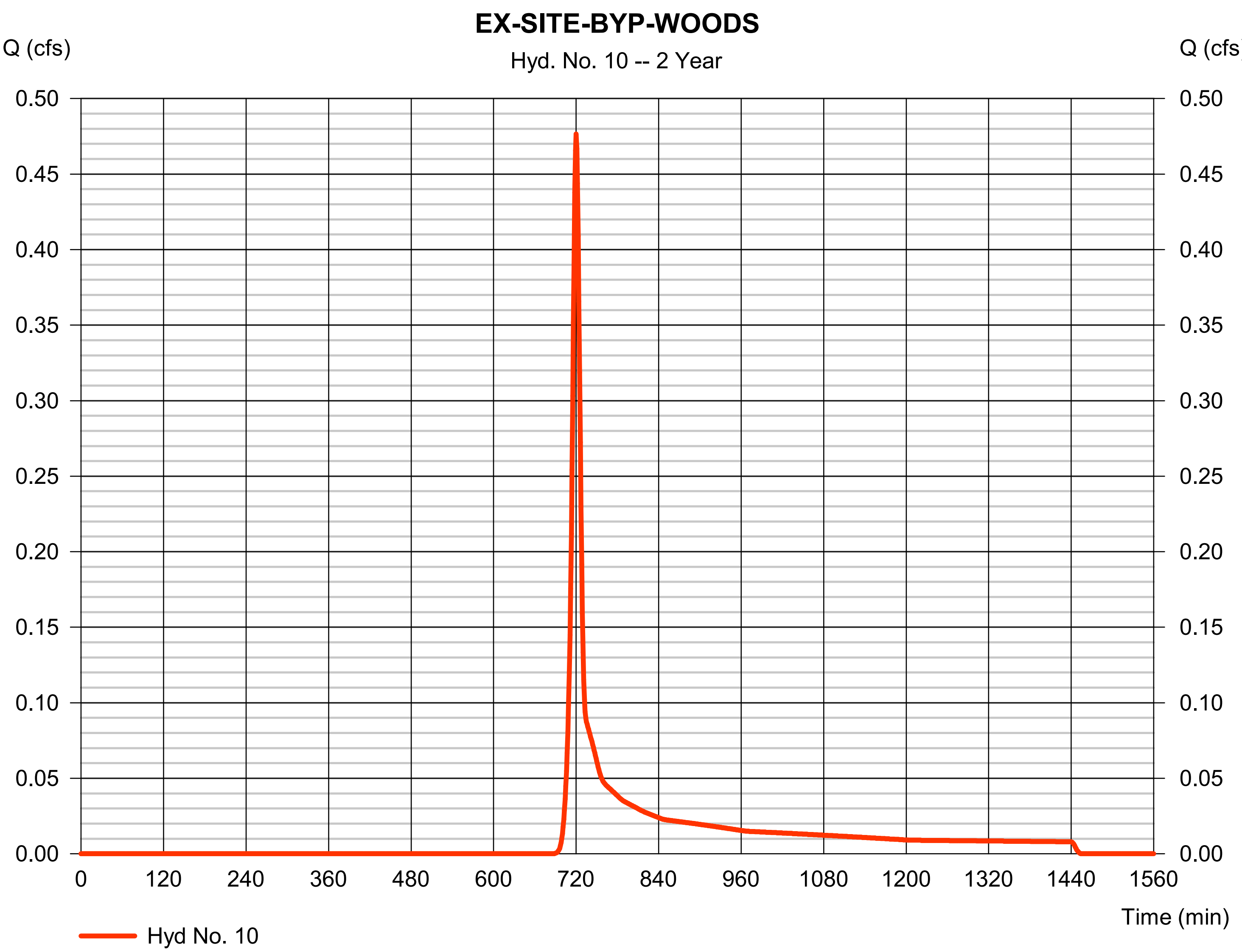
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 10

EX-SITE-BYP-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.477 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 1,137 cuft
Drainage area	= 0.392 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 70) + (0.110 x 70) + (0.090 x 70)] / 0.392



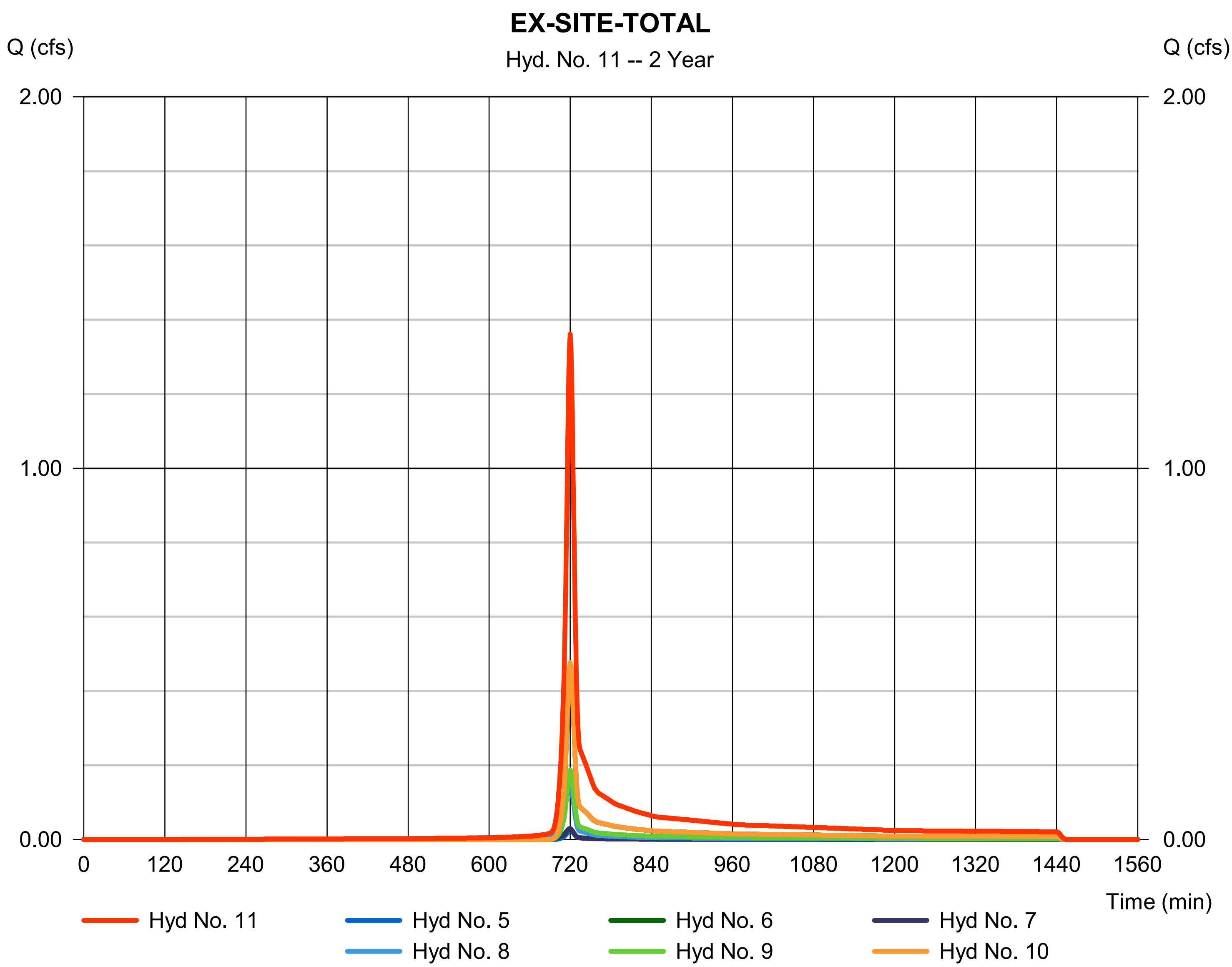
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 11

EX-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.361 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 3,283 cuft
Inflow hyds.	= 5, 6, 7, 8, 9, 10	Contrib. drain. area	= 0.997 ac



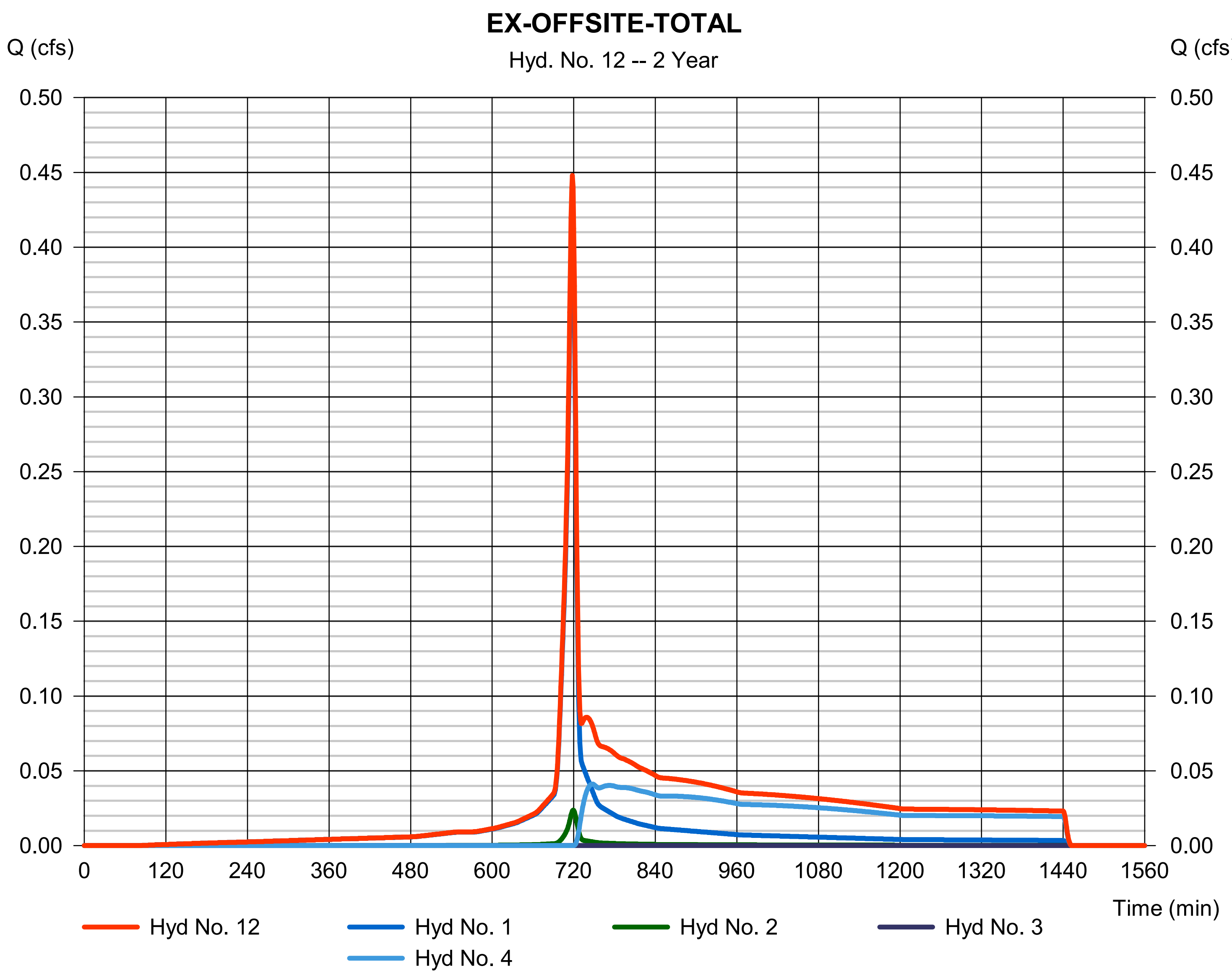
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 12

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 0.448 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 2,227 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 3.723 ac



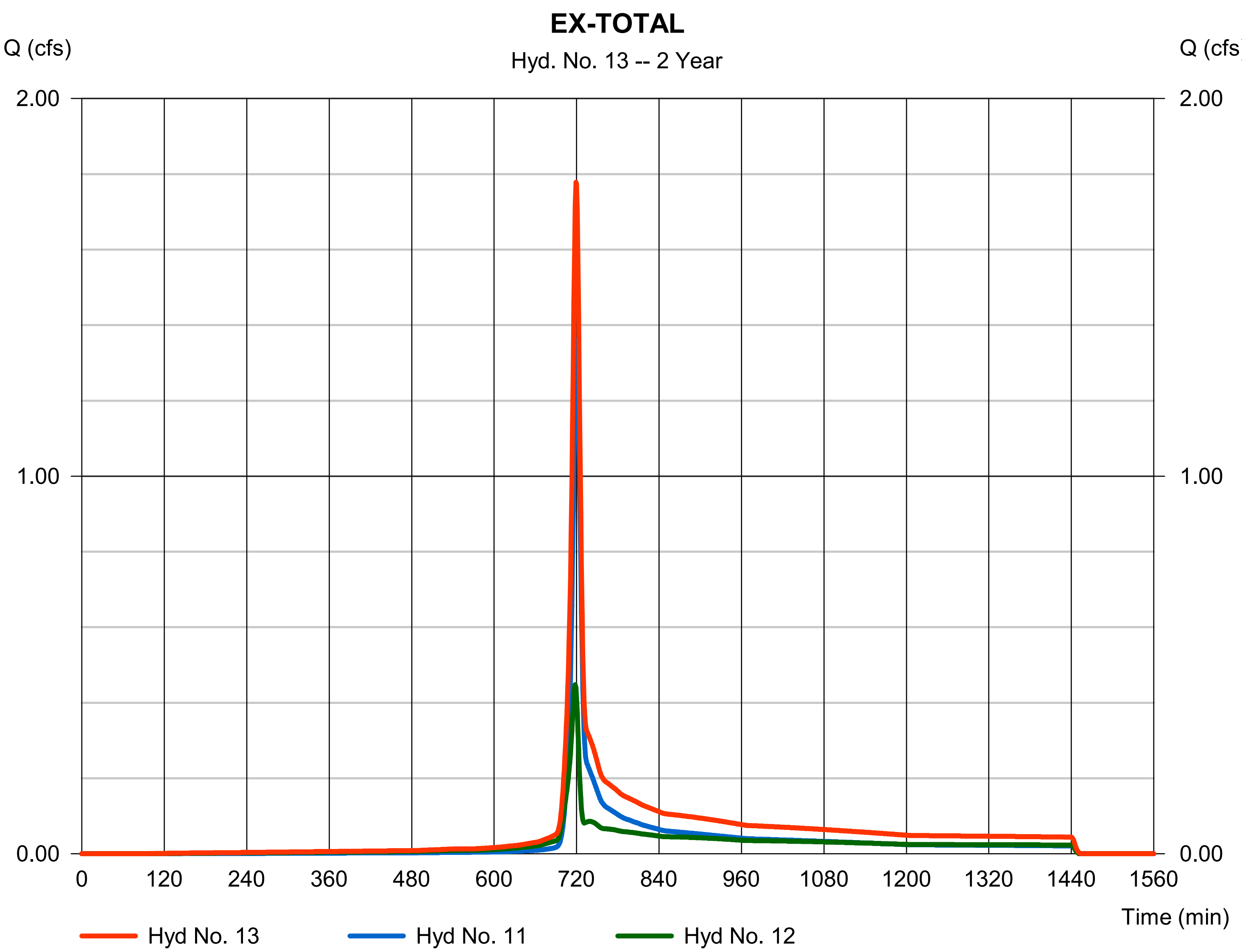
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 13

EX-TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.778 cfs
Storm frequency	= 2 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 5,510 cuft
Inflow hyds.	= 11, 12	Contrib. drain. area	= 0.000 ac



Hydrograph Report

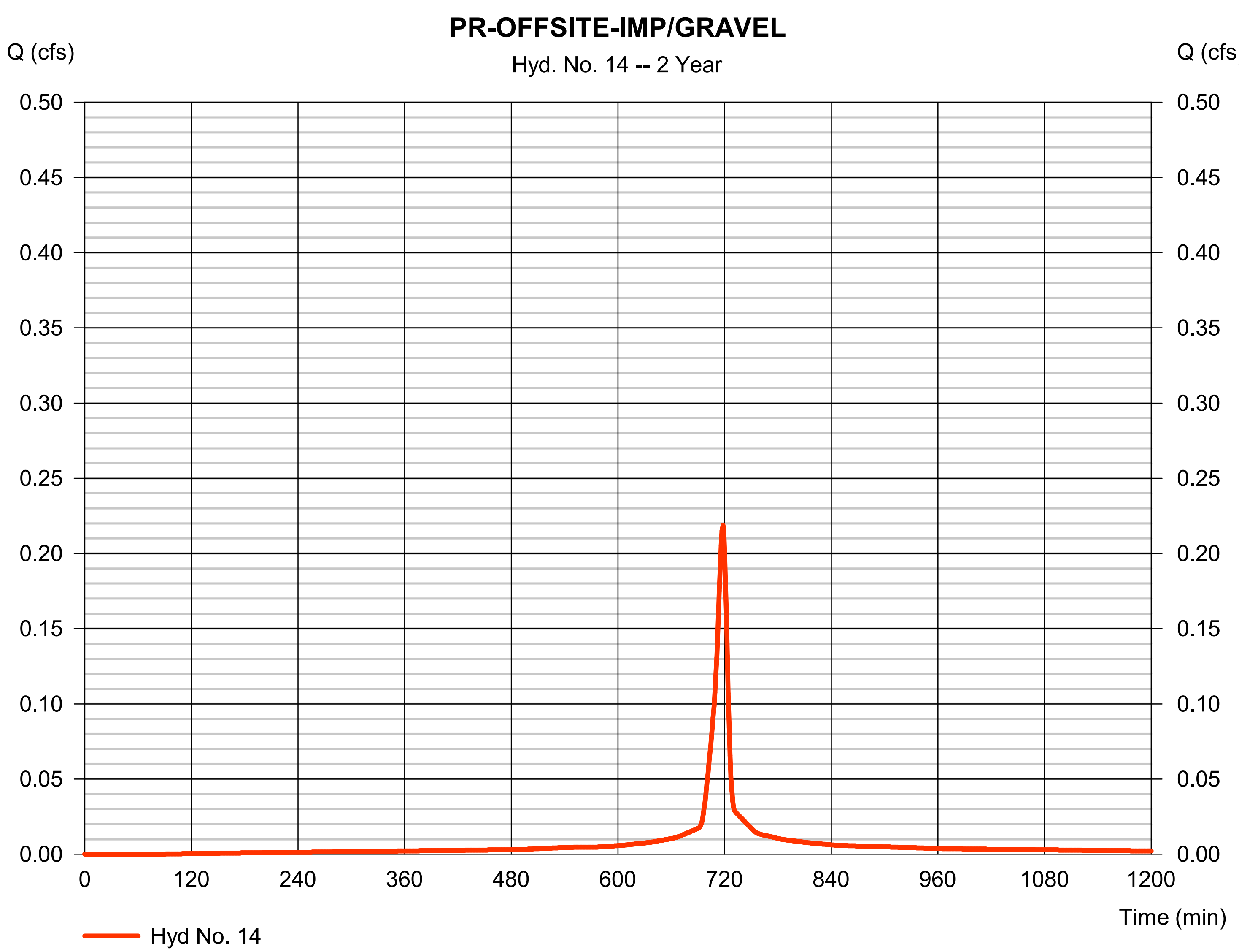
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 14

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.219 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 537 cuft
Drainage area	= 0.052 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.013 x 98)] / 0.052



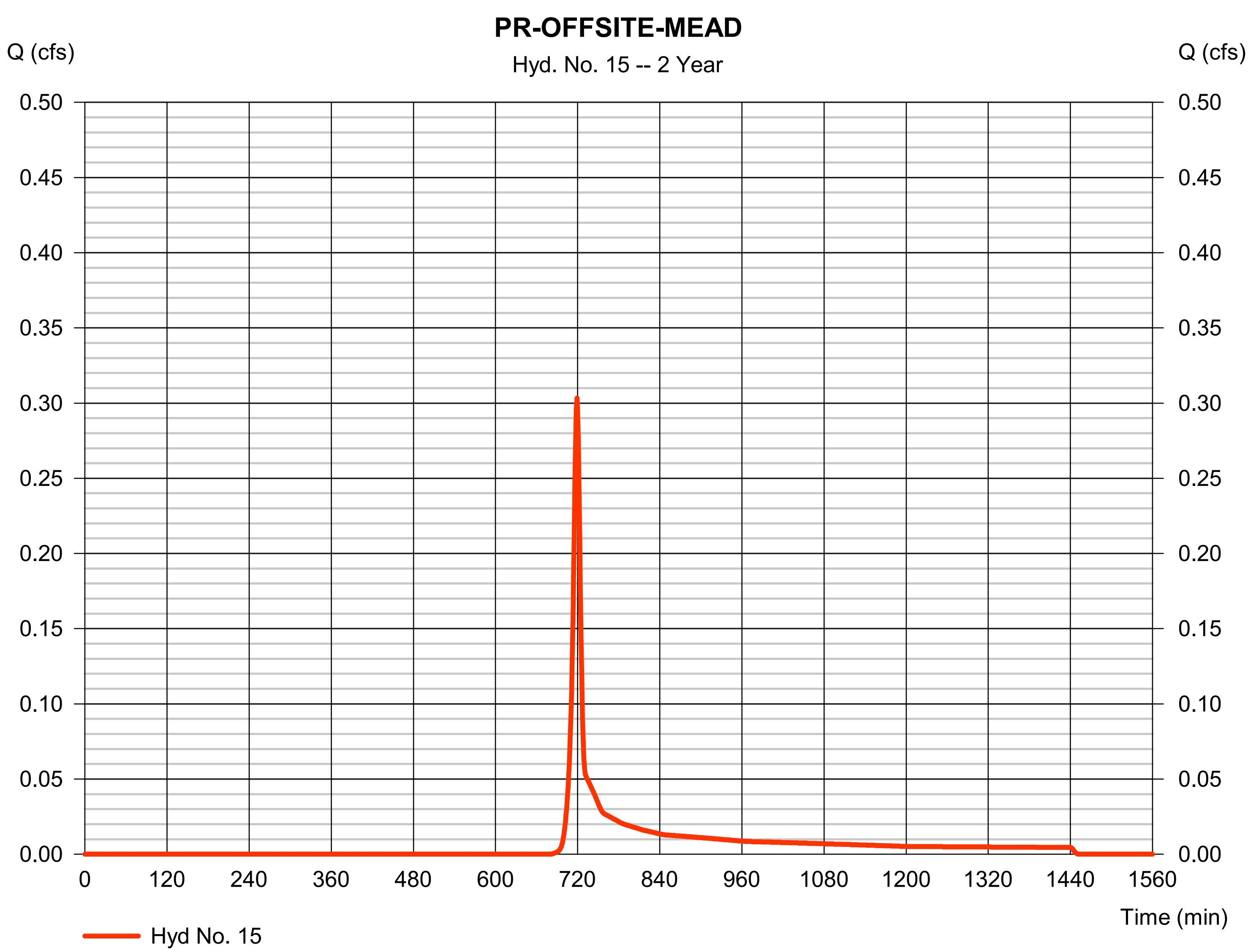
Hydrograph Report

Hyd. No. 15

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.303 cfs
Storm frequency	= 2 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 660 cuft
Drainage area	= 0.220 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.034 x 71) + (0.099 x 71) + (0.084 x 71) + (0.001 x 30)] / 0.220



Hydrograph Report

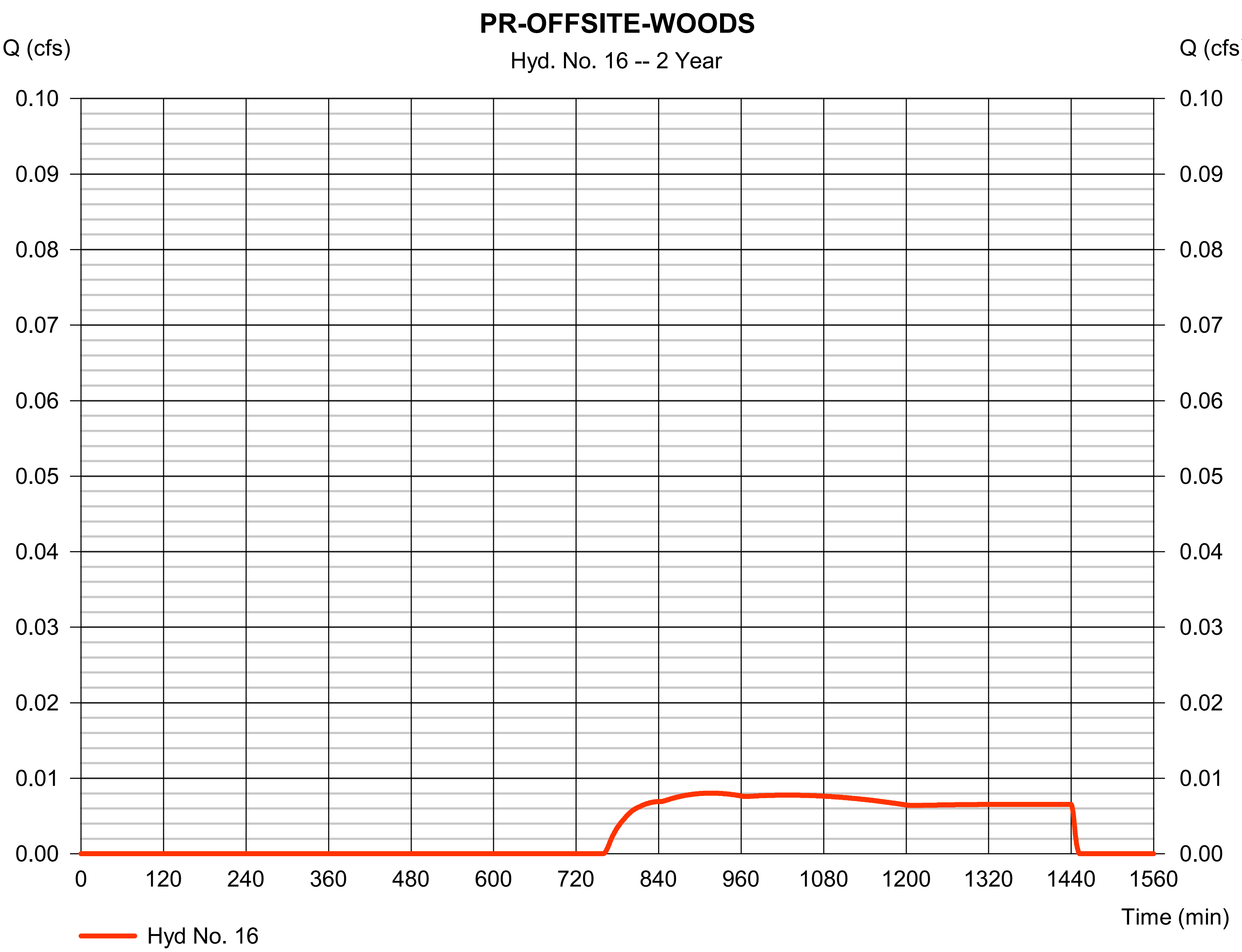
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 16

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.008 cfs
Storm frequency	= 2 yrs	Time to peak	= 916 min
Time interval	= 1 min	Hyd. volume	= 281 cuft
Drainage area	= 1.550 ac	Curve number	= 46*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.602 x 70) + (0.951 x 30)] / 1.550



Hydrograph Report

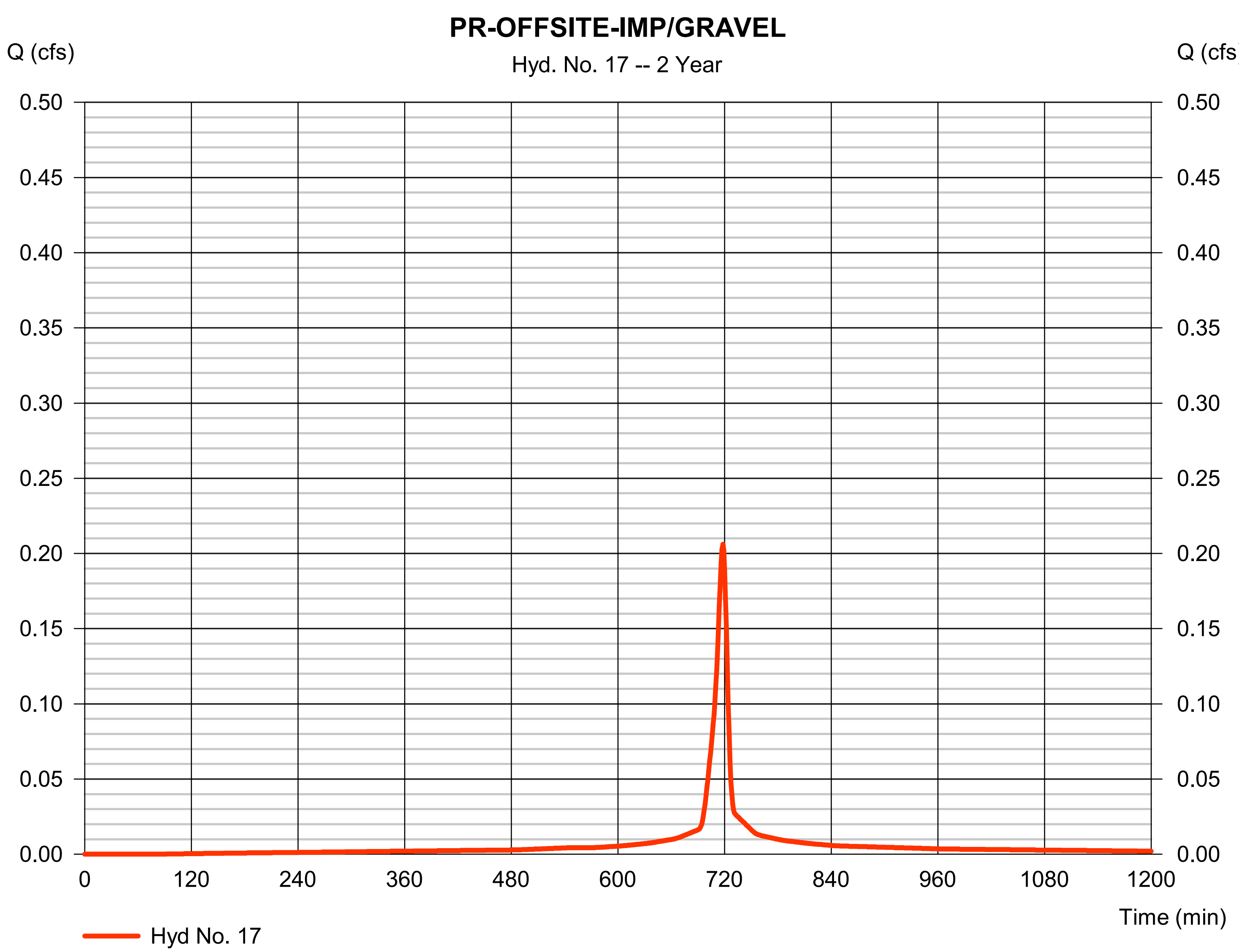
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 17

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.206 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 506 cuft
Drainage area	= 0.049 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.049



Hydrograph Report

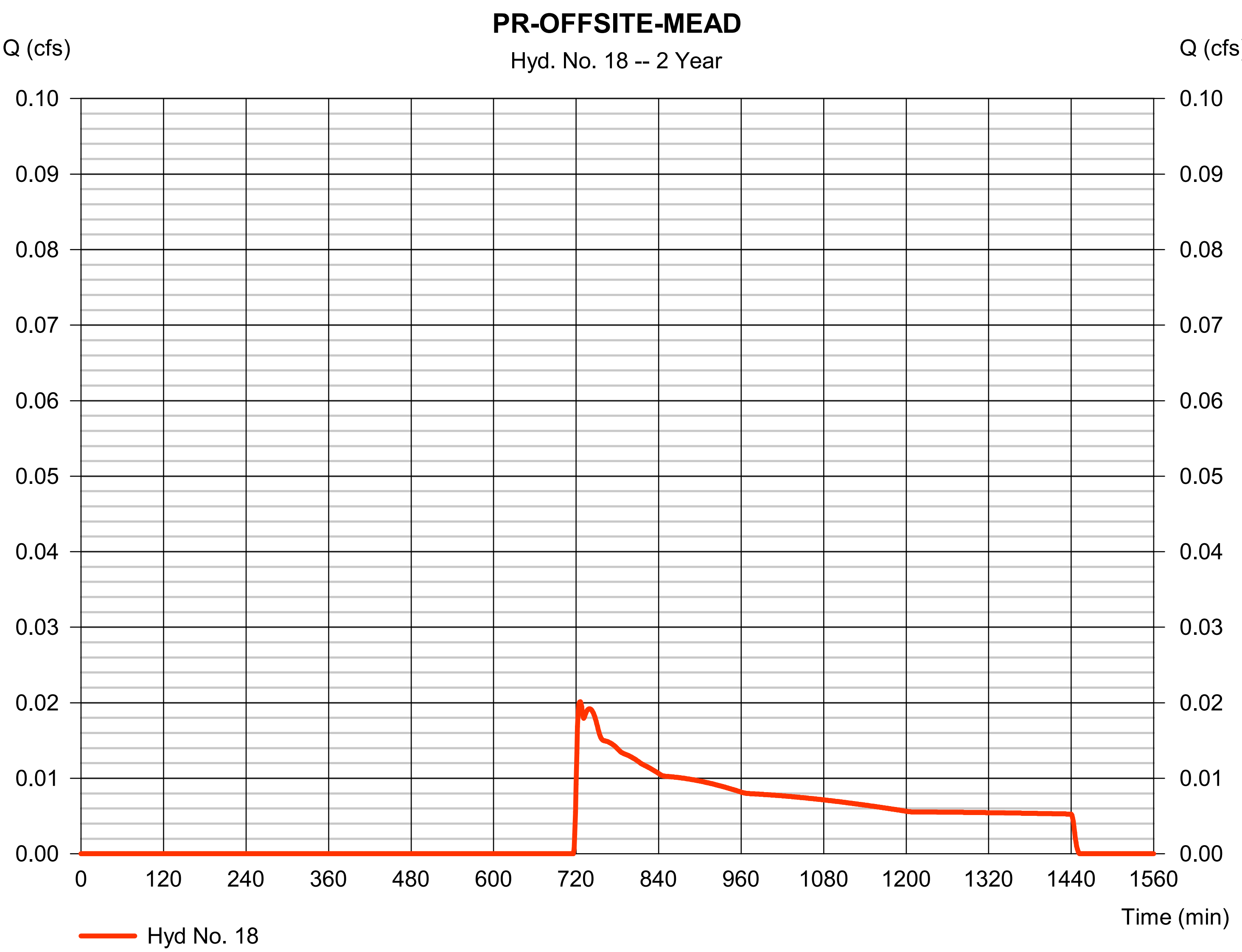
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 18

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.020 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 1 min	Hyd. volume	= 355 cuft
Drainage area	= 0.720 ac	Curve number	= 51*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.037 x 71) + (0.331 x 71) + (0.252 x 30) + (0.103 x 30)] / 0.720



Hydrograph Report

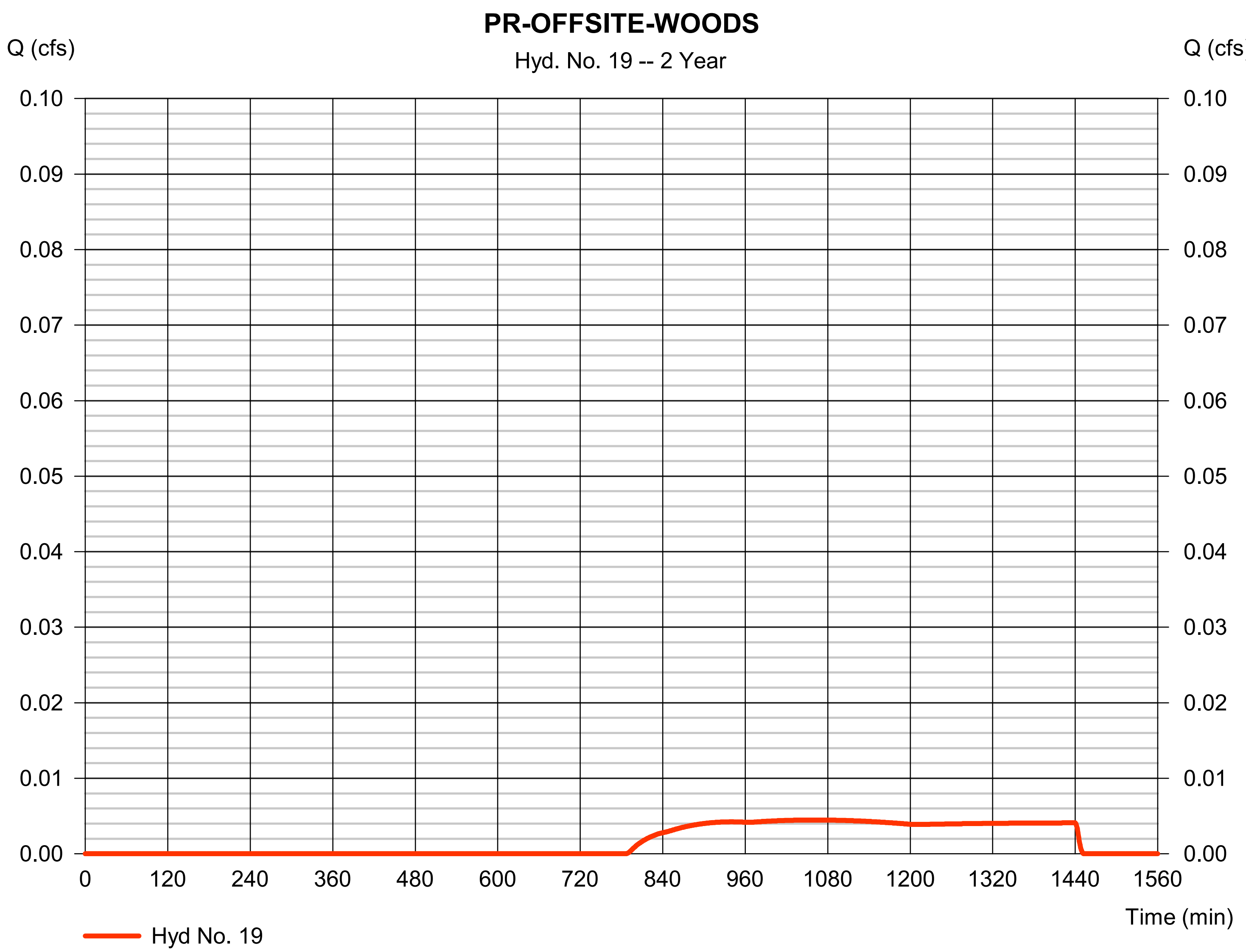
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 19

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.004 cfs
Storm frequency	= 2 yrs	Time to peak	= 1060 min
Time interval	= 1 min	Hyd. volume	= 154 cuft
Drainage area	= 1.130 ac	Curve number	= 45*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.180 x 70) + (0.700 x 30)] / 1.130



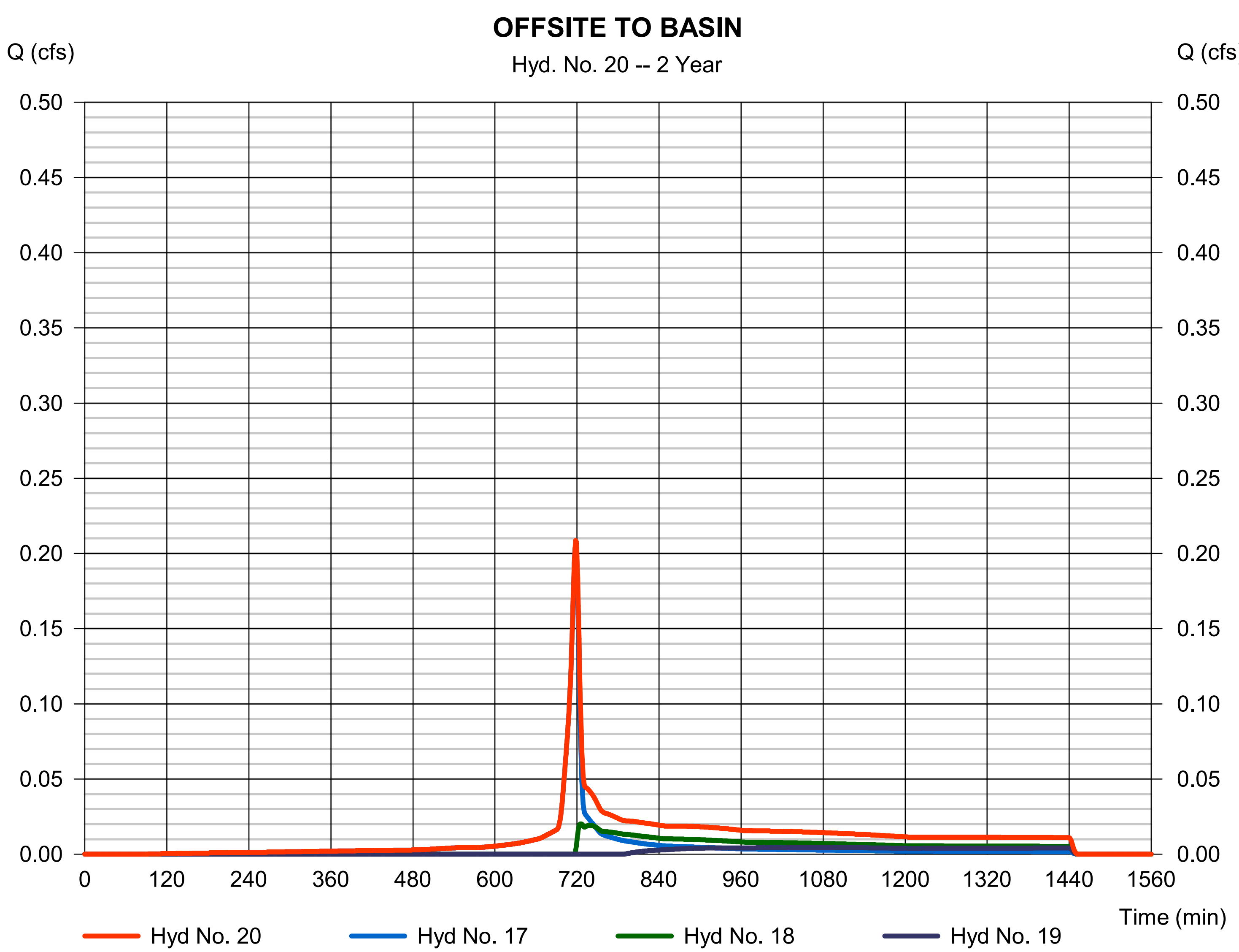
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 20

OFFSITE TO BASIN

Hydrograph type	= Combine	Peak discharge	= 0.209 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,015 cuft
Inflow hyds.	= 17, 18, 19	Contrib. drain. area	= 1.899 ac



Hydrograph Report

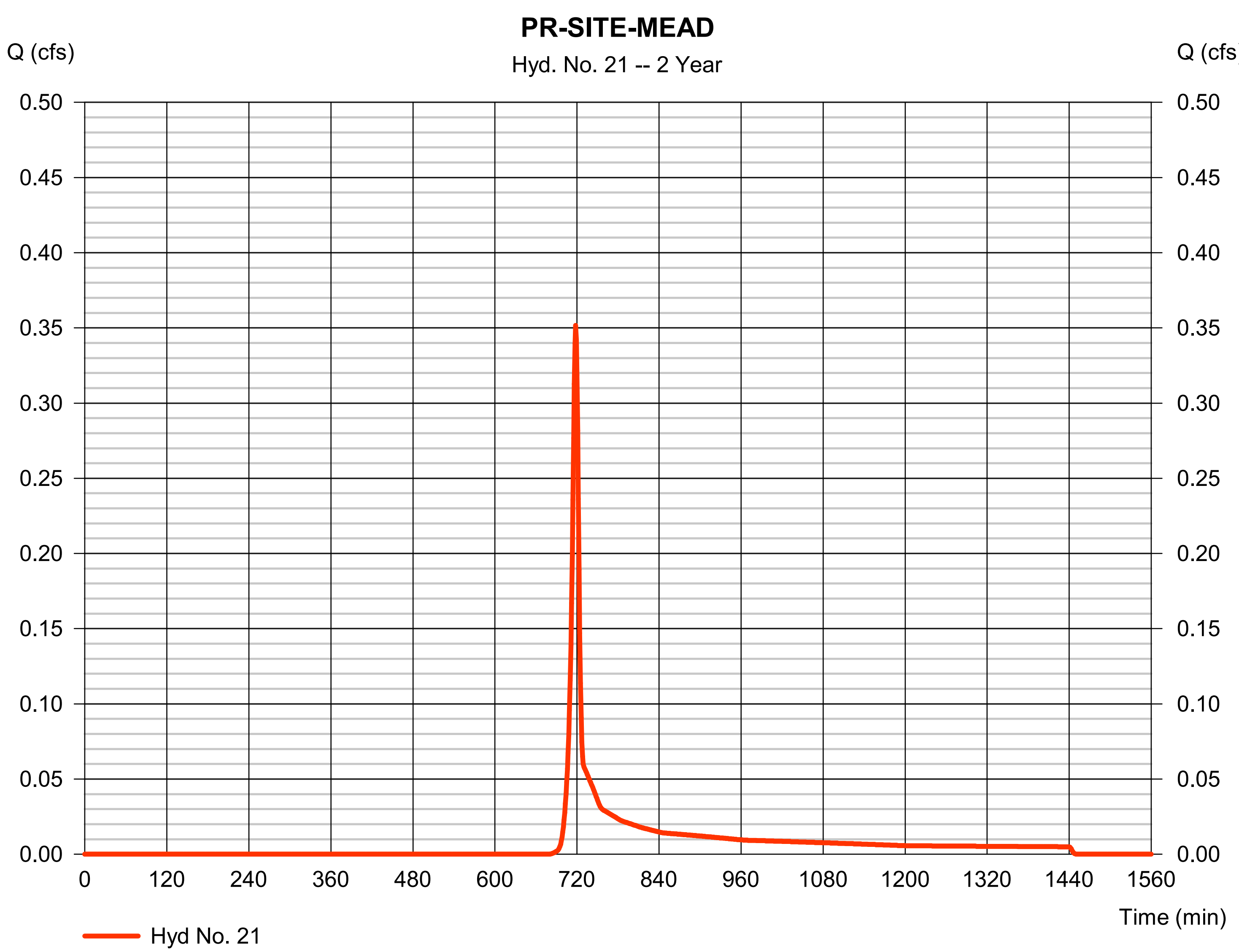
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 21

PR-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.352 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 727 cuft
Drainage area	= 0.229 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.10 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.134 x 71) + (0.003 x 71) + (0.435 x 71)] / 0.229



Hydrograph Report

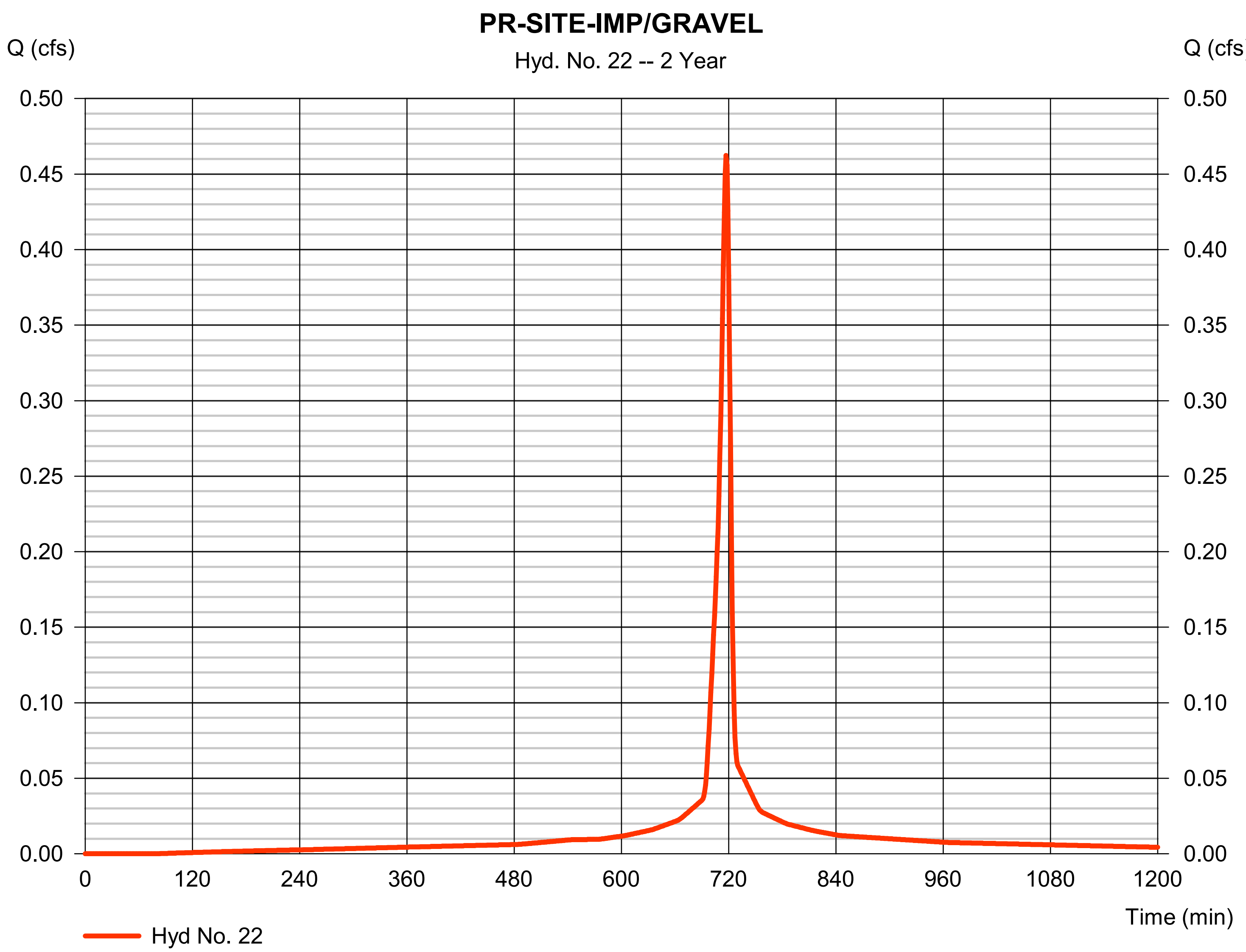
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 22

PR-SITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.462 cfs
Storm frequency	= 2 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 1,092 cuft
Drainage area	= 0.100 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.053 x 98) + (0.008 x 98)] / 0.100



Hydrograph Report

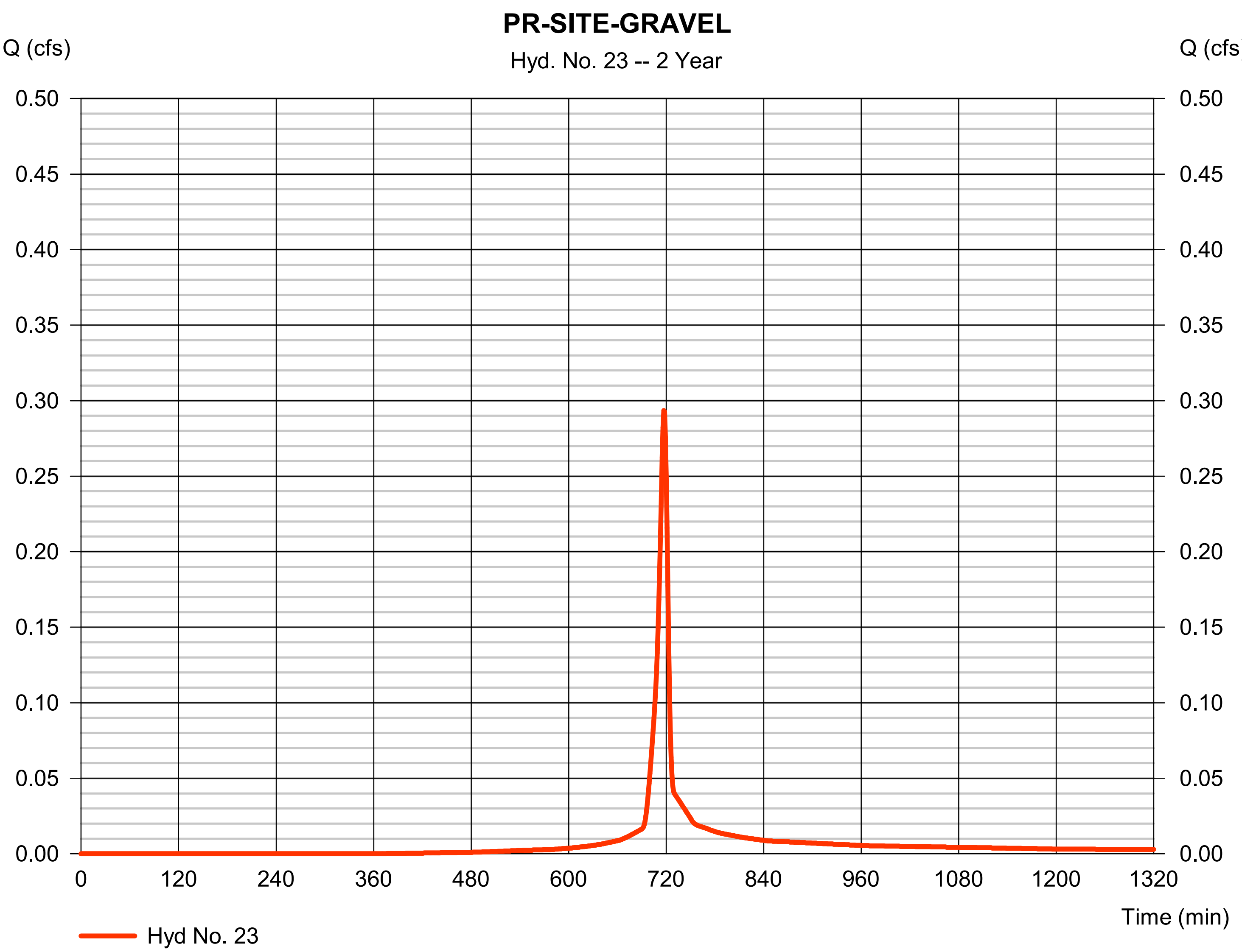
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 23

PR-SITE-GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.293 cfs
Storm frequency	= 2 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 610 cuft
Drainage area	= 0.080 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.064 x 89) + (0.003 x 89) + (0.013 x 89)] / 0.080



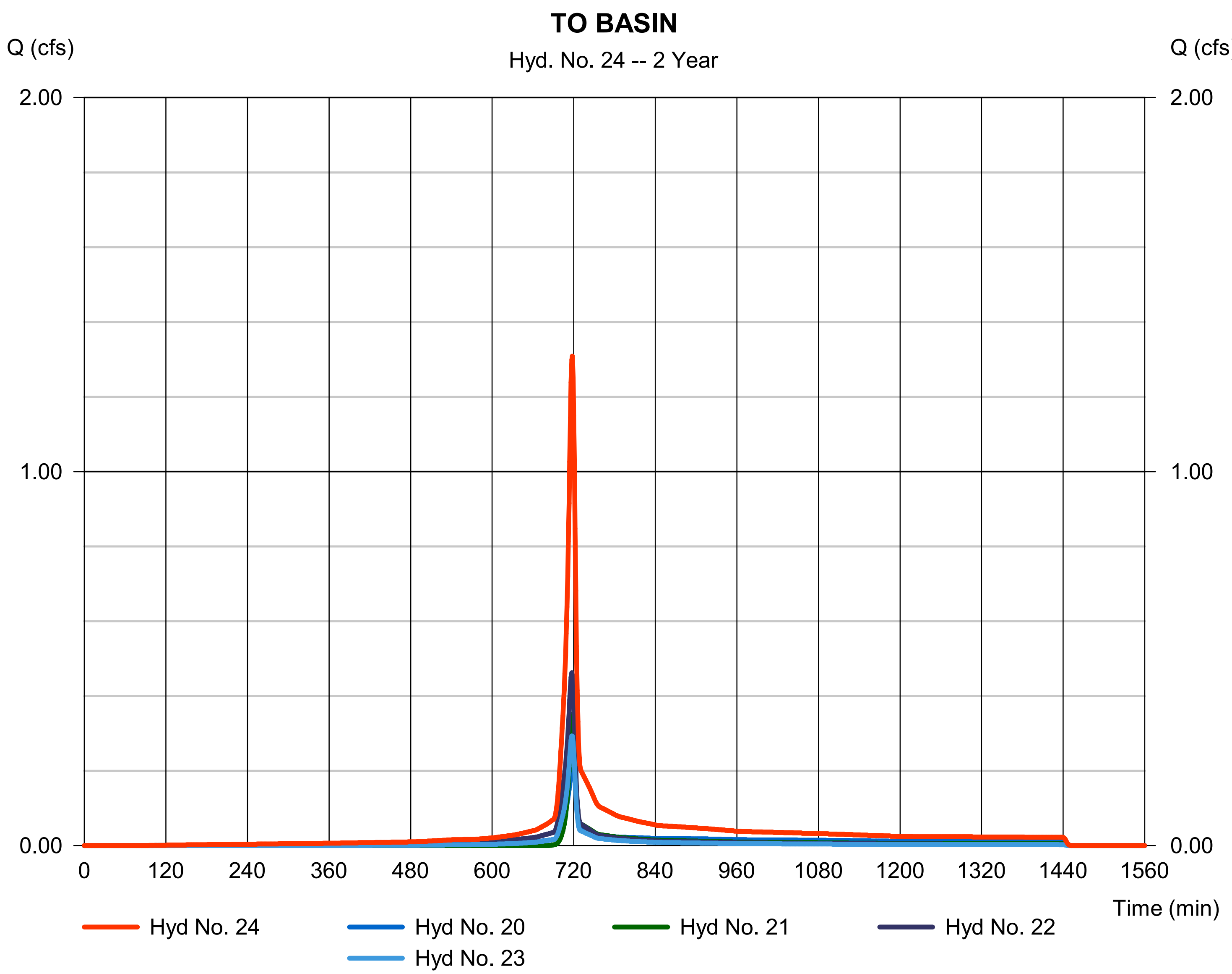
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 24

TO BASIN

Hydrograph type	= Combine	Peak discharge	= 1.309 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 3,444 cuft
Inflow hyds.	= 20, 21, 22, 23	Contrib. drain. area	= 0.409 ac



Hydrograph Report

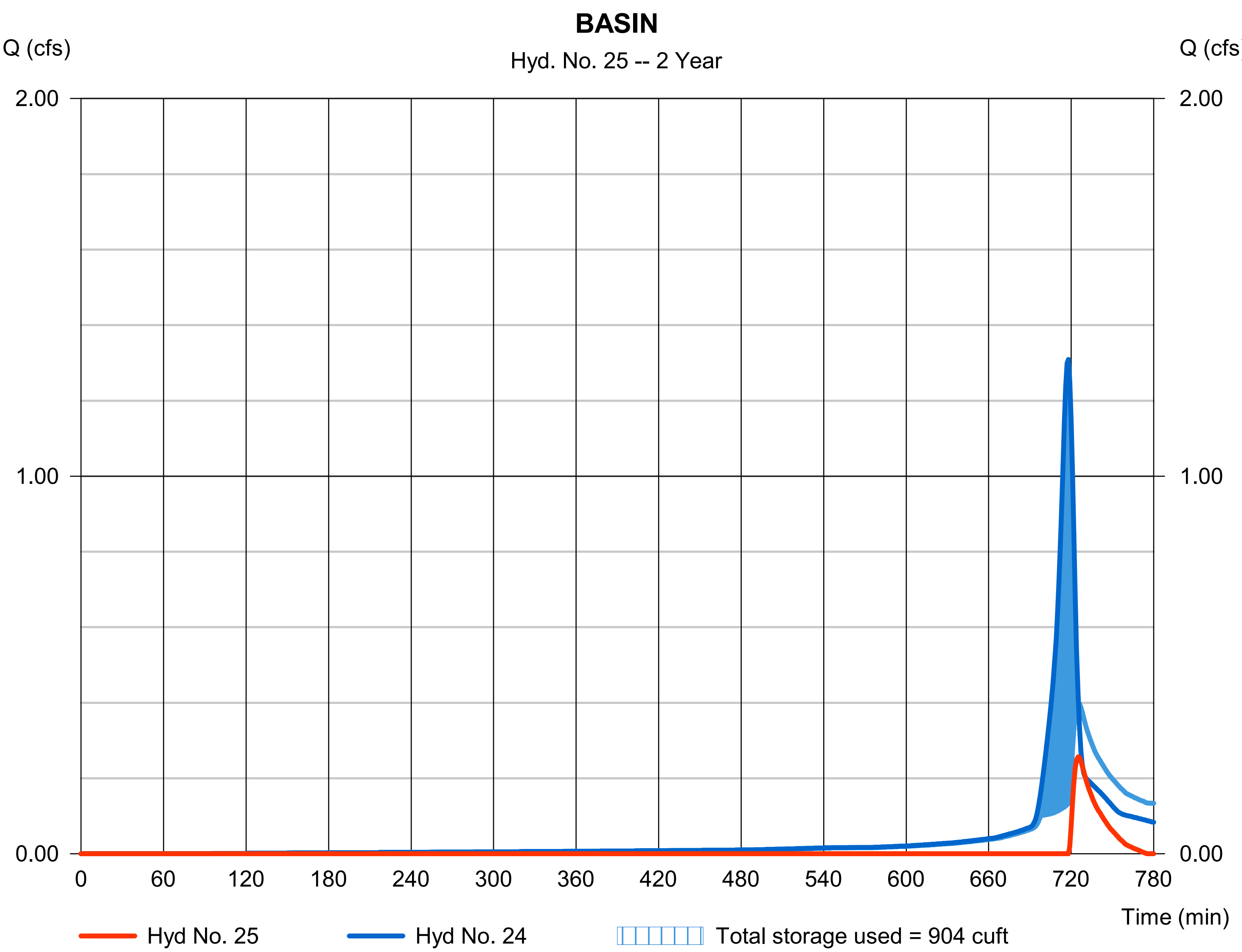
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 25

BASIN

Hydrograph type	= Reservoir	Peak discharge	= 0.257 cfs
Storm frequency	= 2 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 312 cuft
Inflow hyd. No.	= 24 - TO BASIN	Max. Elevation	= 640.12 ft
Reservoir name	= UG N-12 Perforated Pipe System	Max. Storage	= 904 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

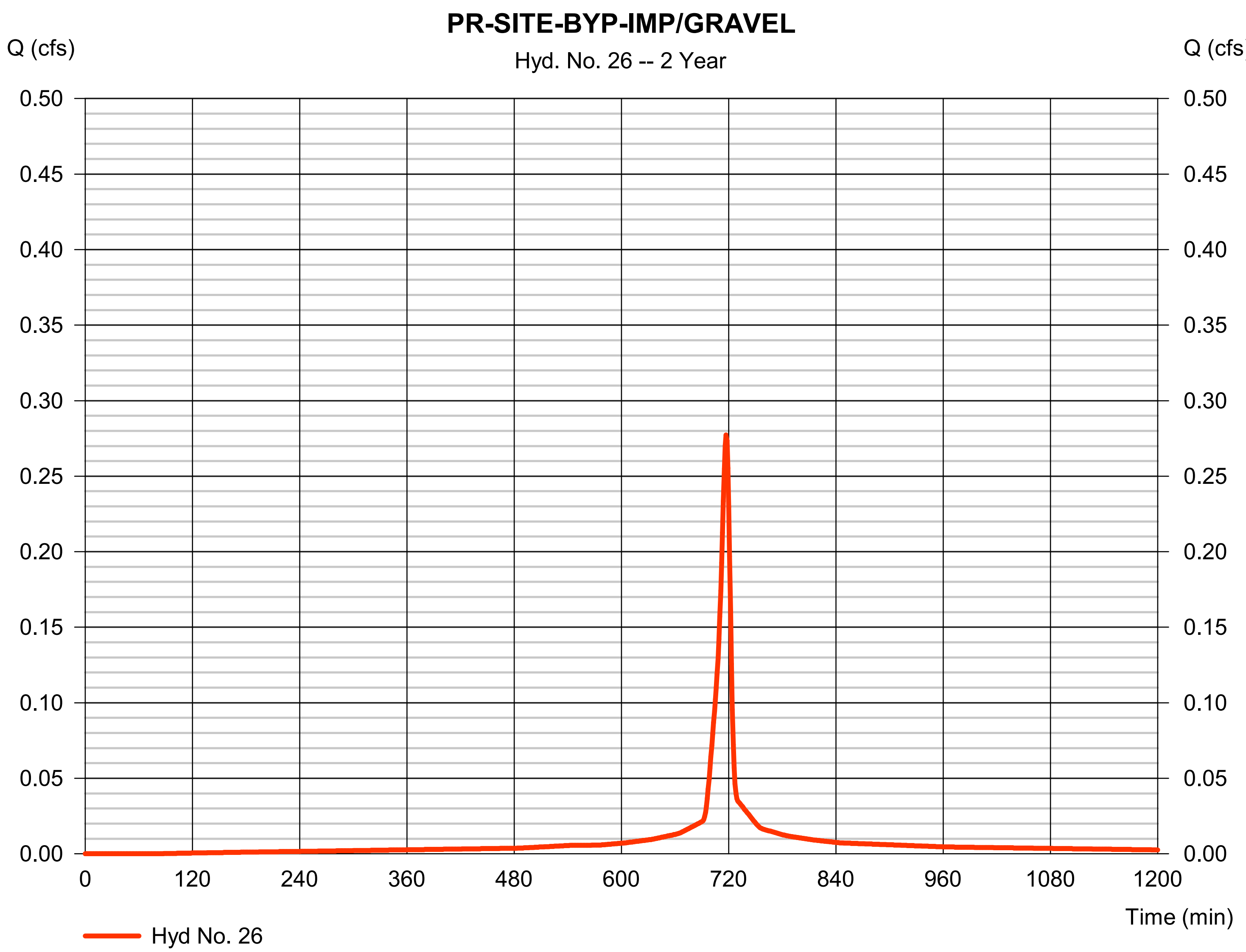
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 26

PR-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.277 cfs
Storm frequency	= 2 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 655 cuft
Drainage area	= 0.060 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.060 x 98)] / 0.060



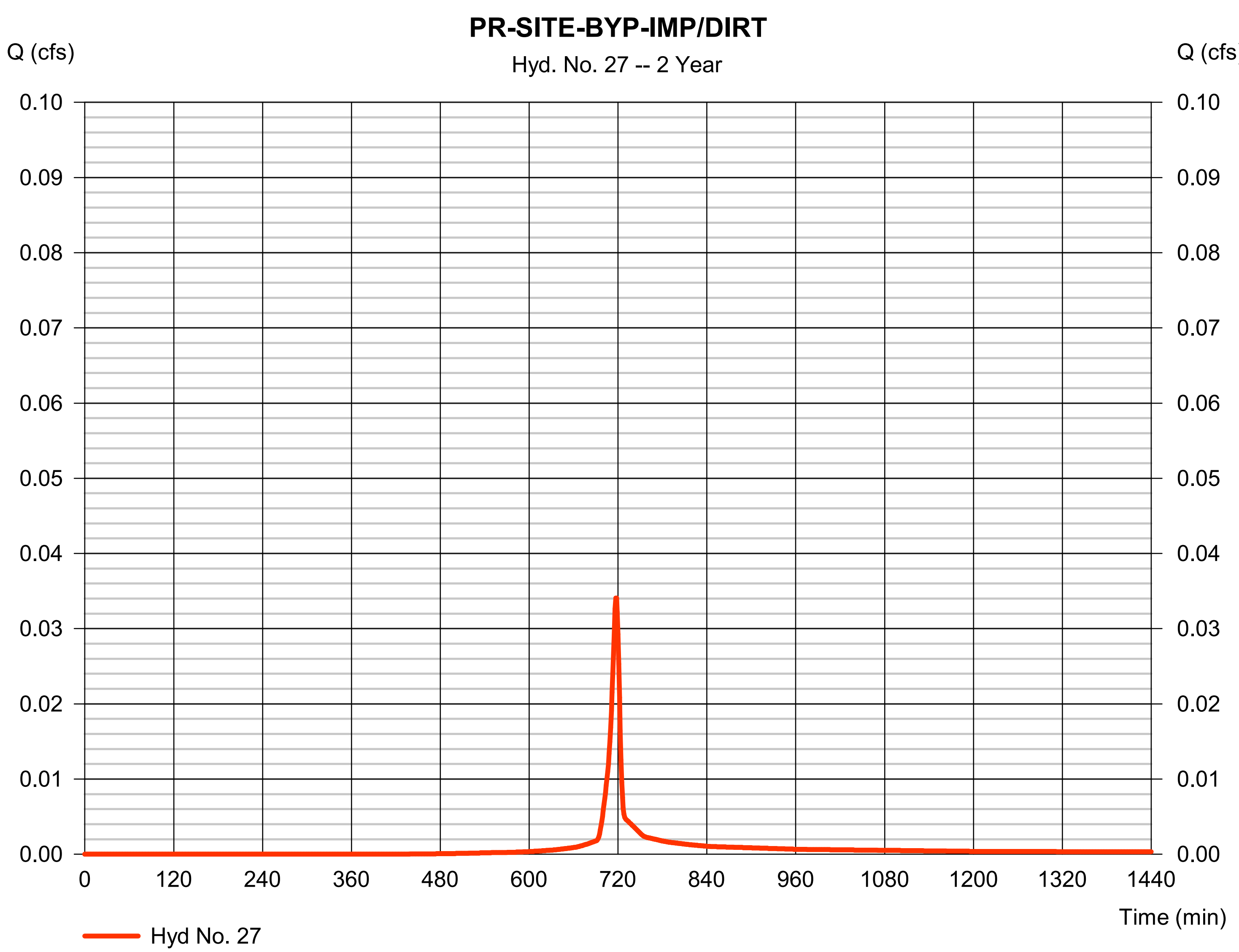
Hydrograph Report

Hyd. No. 27

PR-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.034 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 70 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.008 x 87)] / 0.010



Hydrograph Report

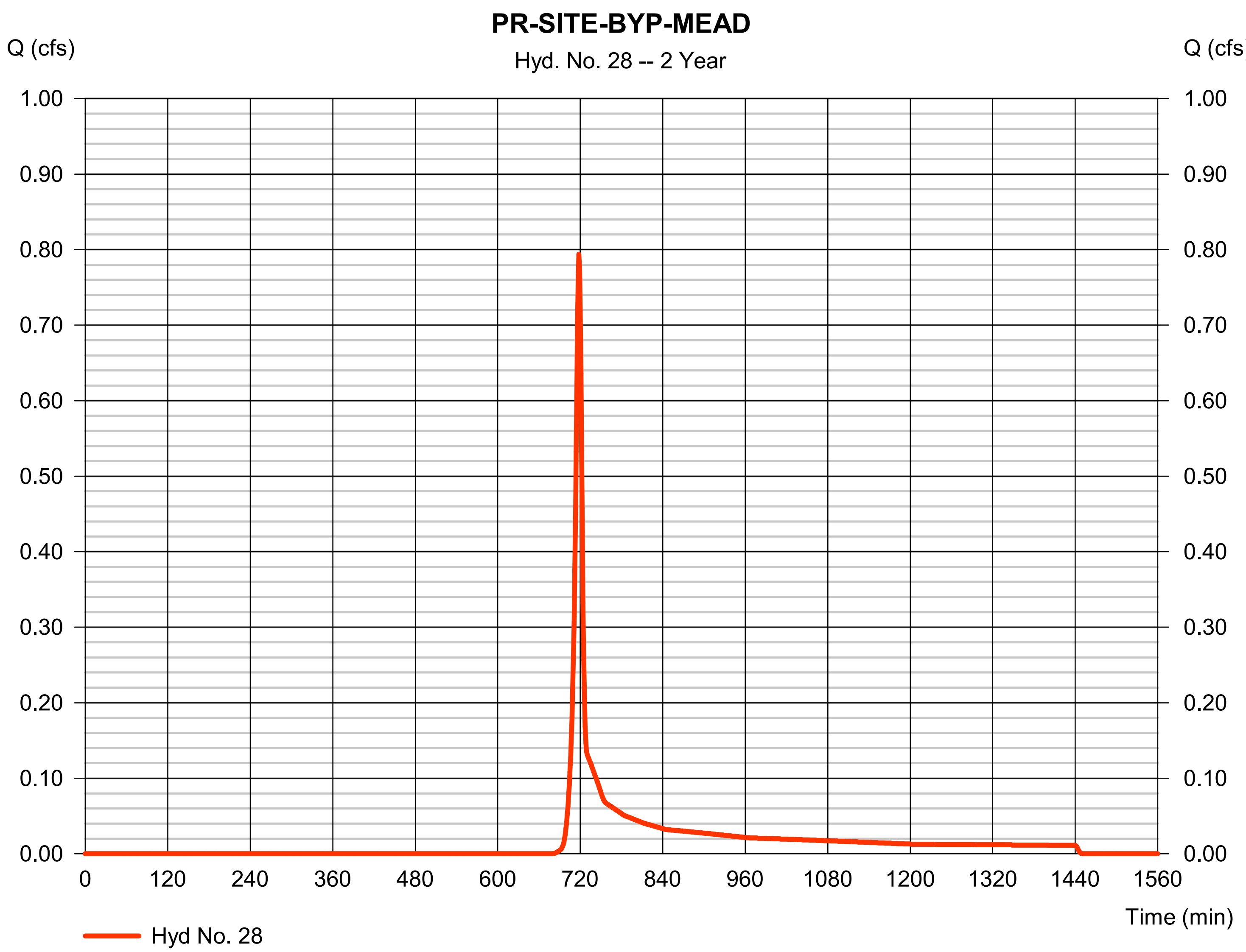
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 28

PR-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.794 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,642 cuft
Drainage area	= 0.517 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 3.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 71) + (0.290 x 71) + (0.085 x 71)] / 0.517



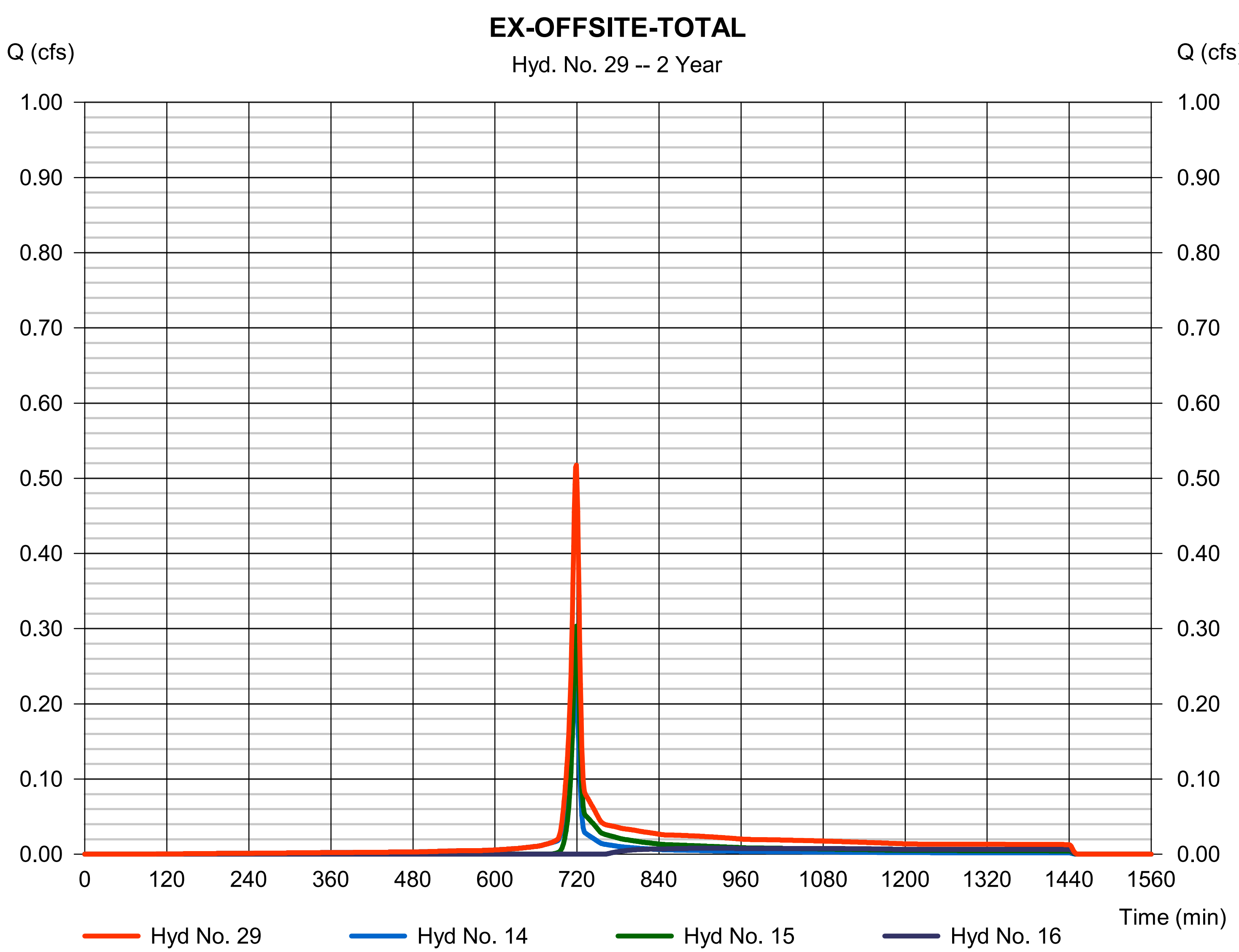
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 29

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 0.518 cfs
Storm frequency	= 2 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 1,479 cuft
Inflow hyds.	= 14, 15, 16	Contrib. drain. area	= 1.822 ac



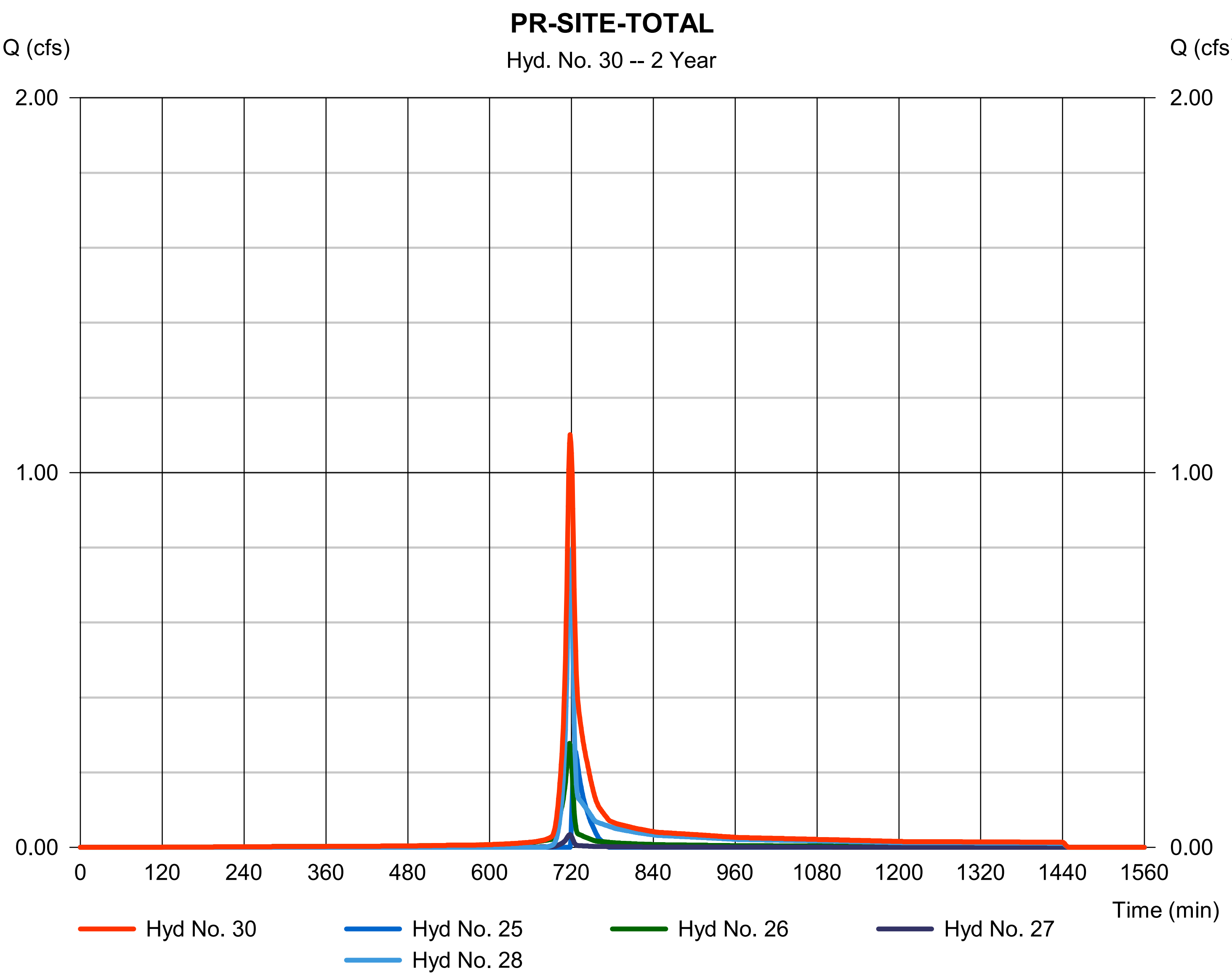
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 30

PR-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.101 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 2,679 cuft
Inflow hyds.	= 25, 26, 27, 28	Contrib. drain. area	= 0.587 ac



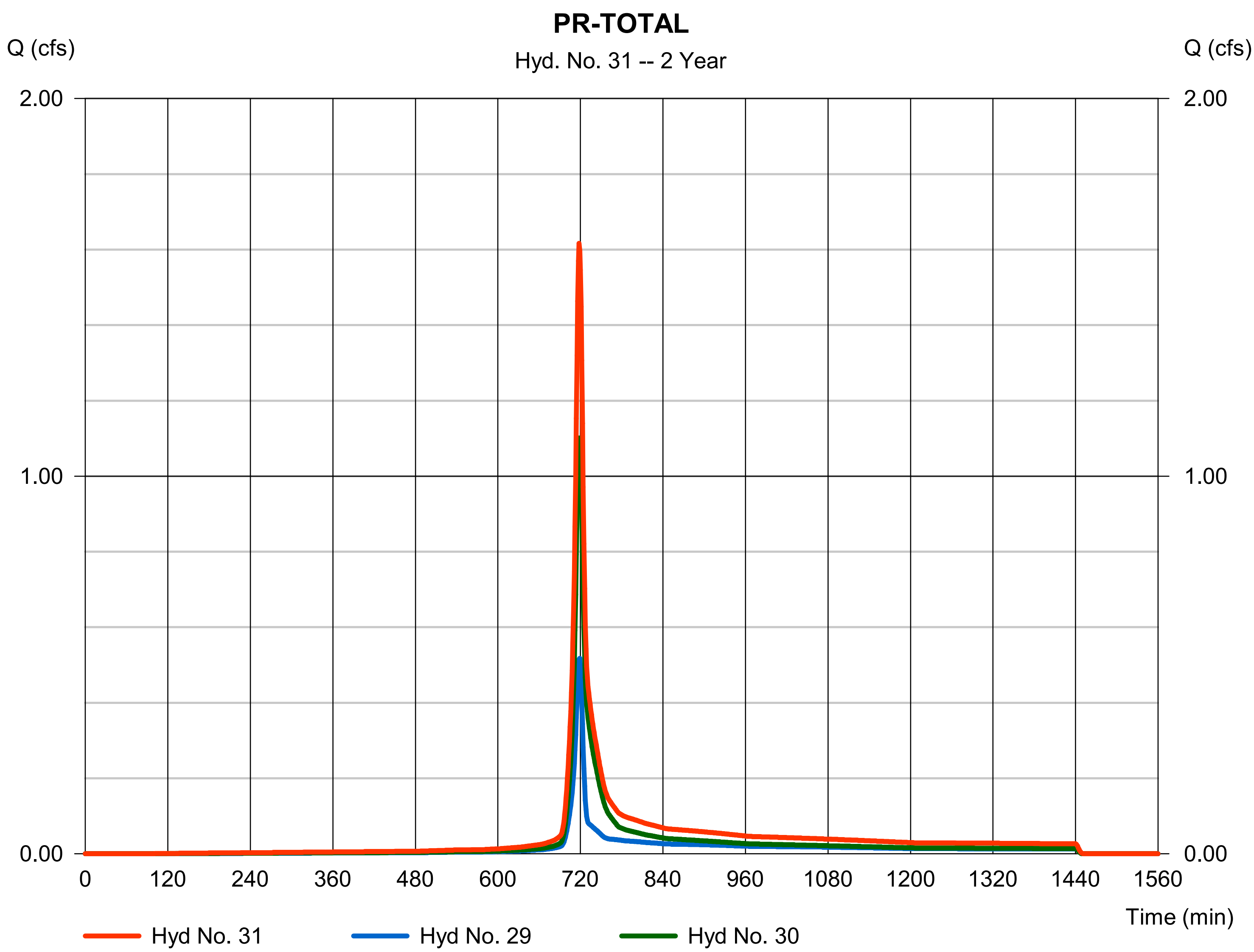
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 31

PR-TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.616 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 4,157 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.531	1	718	1,317	------	------	------	EX-OFFSITE-IMP/GRAVEL
2	SCS Runoff	0.032	1	719	74	------	------	------	EX-SITE-BYP-IMP/DIRT
3	SCS Runoff	0.000	1	n/a	0	------	------	------	EX-OFFSITE-MEAD
4	SCS Runoff	0.569	1	722	3,134	------	------	------	EX-OFFSITE-WOODS
5	SCS Runoff	0.043	1	720	97	------	------	------	EX-SITE-MEAD
6	SCS Runoff	0.785	1	720	1,803	------	------	------	EX-SITE-WOODS
7	SCS Runoff	0.040	1	719	93	------	------	------	EX-SITE-BYP-IMP/DIRT
8	SCS Runoff	0.213	1	719	562	------	------	------	EX-SITE-BYP-IMP/GRAVEL
9	SCS Runoff	0.306	1	720	700	------	------	------	EX-SITE-BYP-MEAD
10	SCS Runoff	0.791	1	720	1,817	------	------	------	EX-SITE-BYP-WOODS
11	Combine	2.173	1	720	5,072	5, 6, 7, 8, 9, 10	------	------	EX-SITE-TOTAL
12	Combine	1.023	1	721	4,526	1, 2, 3, 4,	------	------	EX-OFFSITE-TOTAL
13	Combine	3.193	1	720	9,597	11, 12	------	------	EX-TOTAL
14	SCS Runoff	0.273	1	718	678	------	------	------	PR-OFFSITE-IMP/GRAVEL
15	SCS Runoff	0.491	1	719	1,043	------	------	------	PR-OFFSITE-MEAD
16	SCS Runoff	0.073	1	724	1,019	------	------	------	PR-OFFSITE-WOODS
17	SCS Runoff	0.258	1	718	639	------	------	------	PR-OFFSITE-IMP/GRAVEL
18	SCS Runoff	0.218	1	721	877	------	------	------	PR-OFFSITE-MEAD
19	SCS Runoff	0.032	1	741	635	------	------	------	PR-OFFSITE-WOODS
20	Combine	0.452	1	720	2,151	17, 18, 19	------	------	OFFSITE TO BASIN
21	SCS Runoff	0.569	1	718	1,148	------	------	------	PR-SITE-MEAD
22	SCS Runoff	0.578	1	717	1,380	------	------	------	PR-SITE-IMP/GRAVEL
23	SCS Runoff	0.390	1	717	823	------	------	------	PR-SITE-GRAVEL
24	Combine	1.938	1	718	5,502	20, 21, 22, 23	------	------	TO BASIN
25	Reservoir	0.851	1	723	1,151	24	640.38	1,190	BASIN
26	SCS Runoff	0.347	1	717	828	------	------	------	PR-SITE-BYP-IMP/GRAVEL
27	SCS Runoff	0.046	1	717	96	------	------	------	PR-SITE-BYP-IMP/DIRT
28	SCS Runoff	1.284	1	718	2,593	------	------	------	PR-SITE-BYP-MEAD
29	Combine	0.786	1	719	2,740	14, 15, 16,	------	------	EX-OFFSITE-TOTAL
30	Combine	2.096	1	720	4,667	25, 26, 27, 28,	------	------	PR-SITE-TOTAL
31	Combine	2.868	1	719	7,407	29, 30	------	------	PR-TOTAL

Hydrograph Report

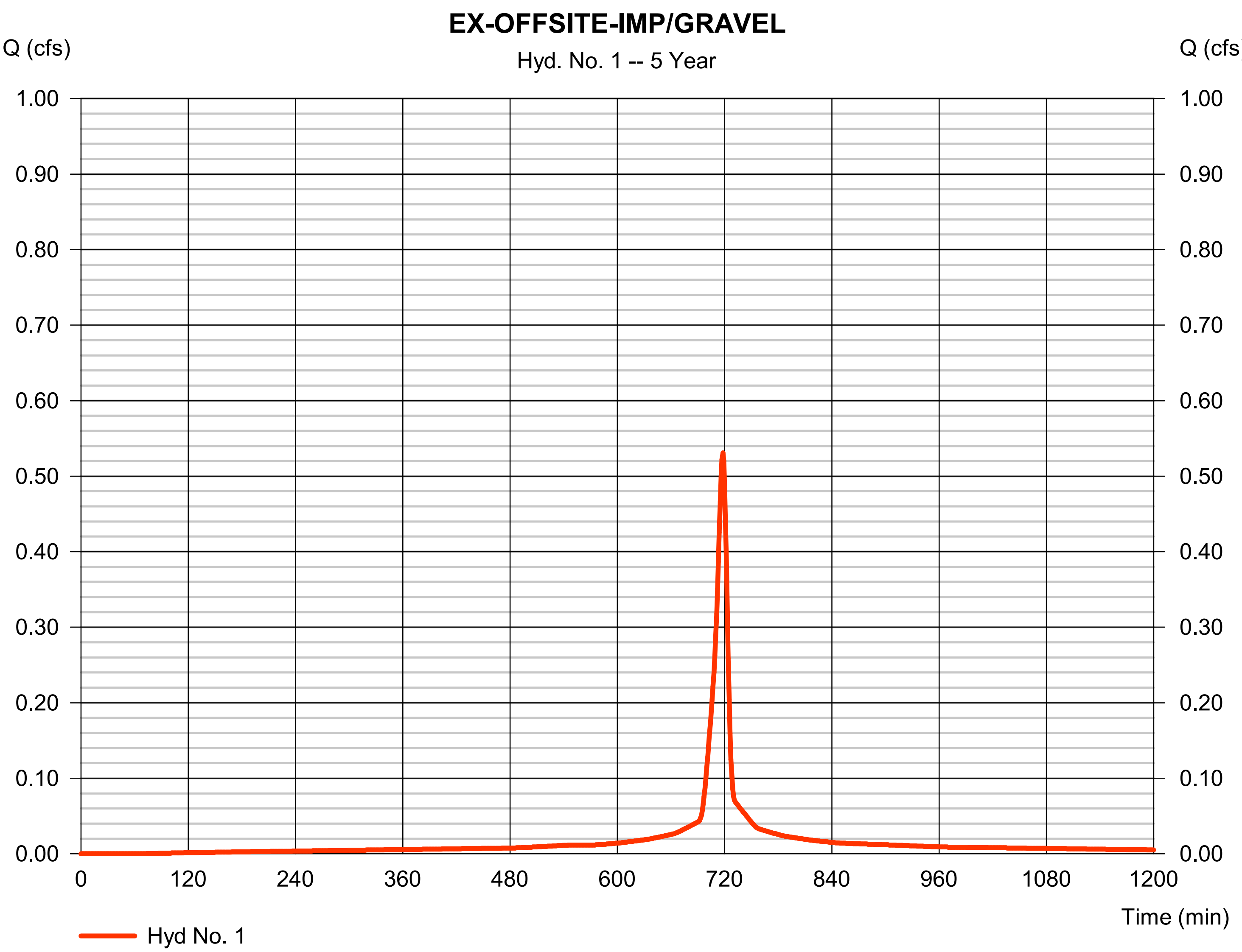
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 1

EX-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.531 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,317 cuft
Drainage area	= 0.101 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.101



Hydrograph Report

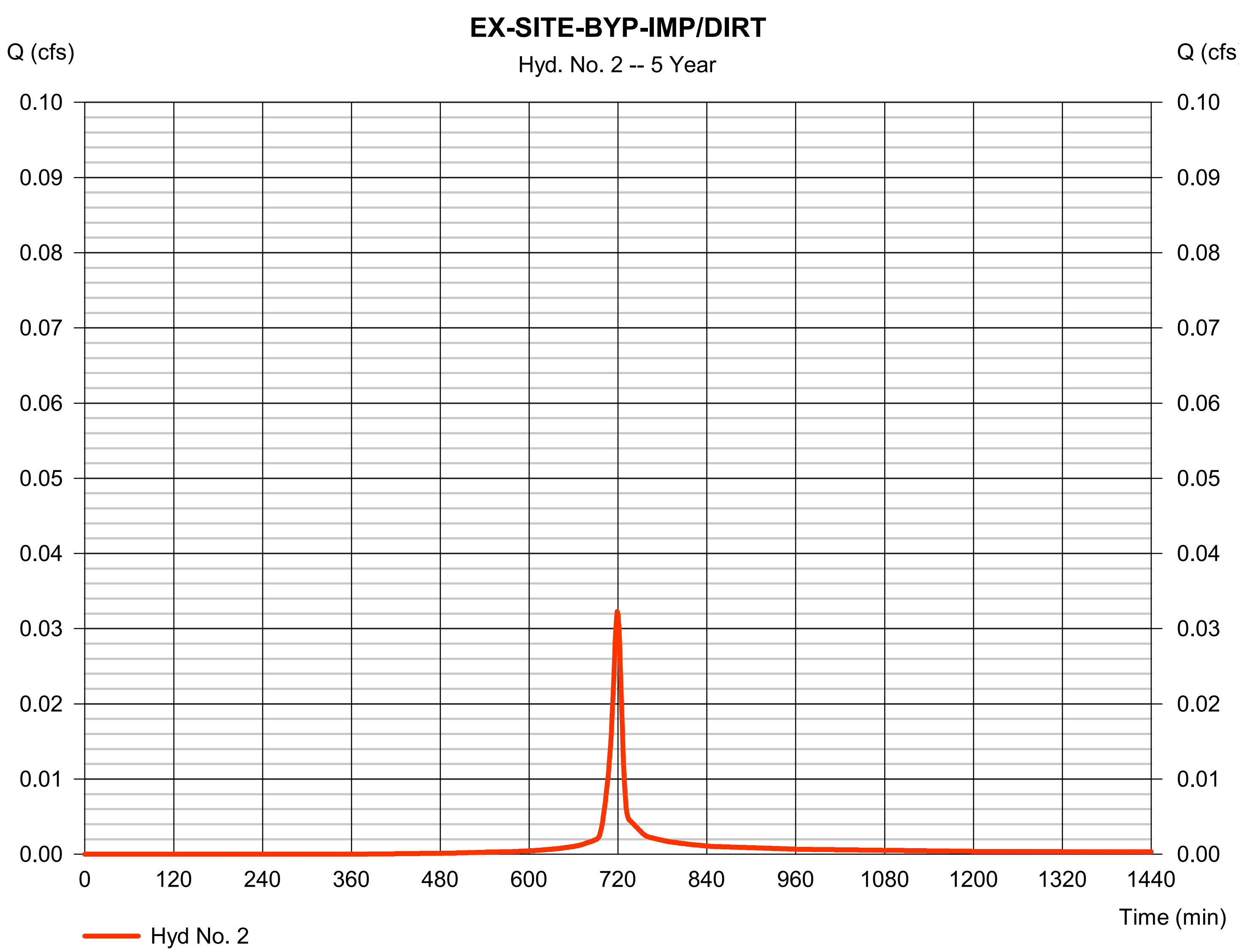
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 2

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.032 cfs
Storm frequency	= 5 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 74 cuft
Drainage area	= 0.008 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.80 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.008



Hydrograph Report

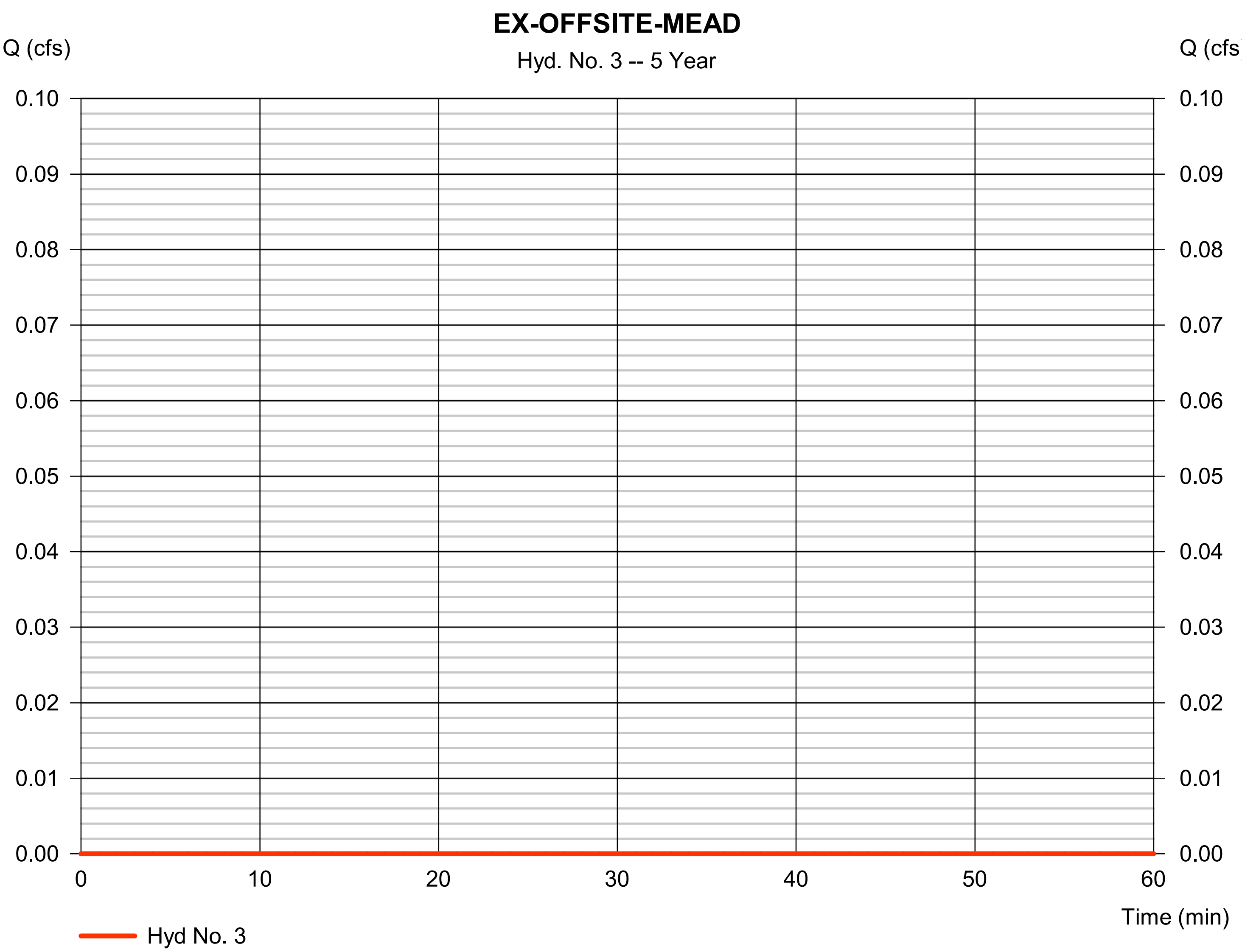
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 3

EX-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 5 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Drainage area	= 0.404 ac	Curve number	= 30*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.100 x 70)] / 0.404



Hydrograph Report

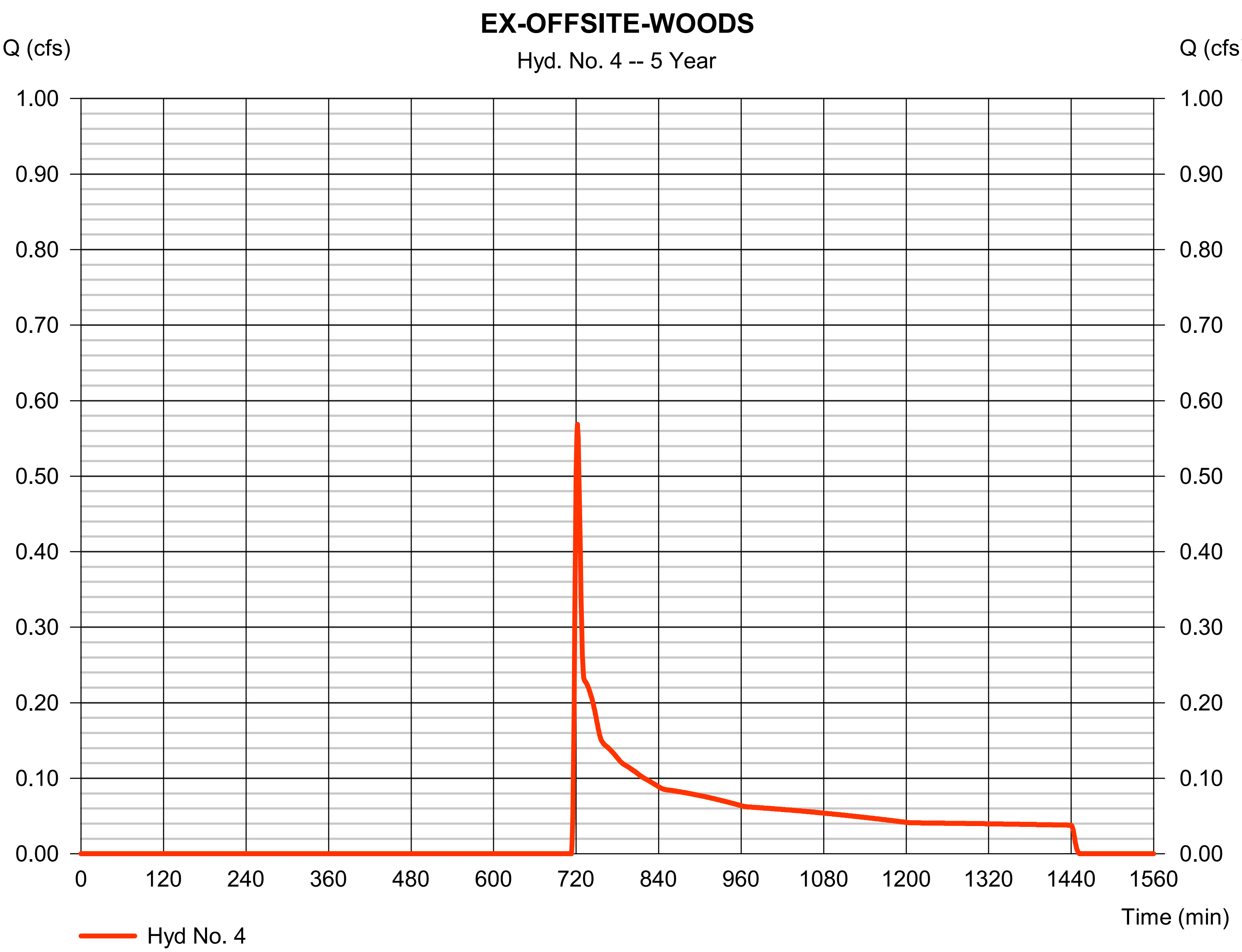
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 4

EX-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.569 cfs
Storm frequency	= 5 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 3,134 cuft
Drainage area	= 3.210 ac	Curve number	= 49*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.562 x 70) + (1.652 x 30)] / 3.210



Hydrograph Report

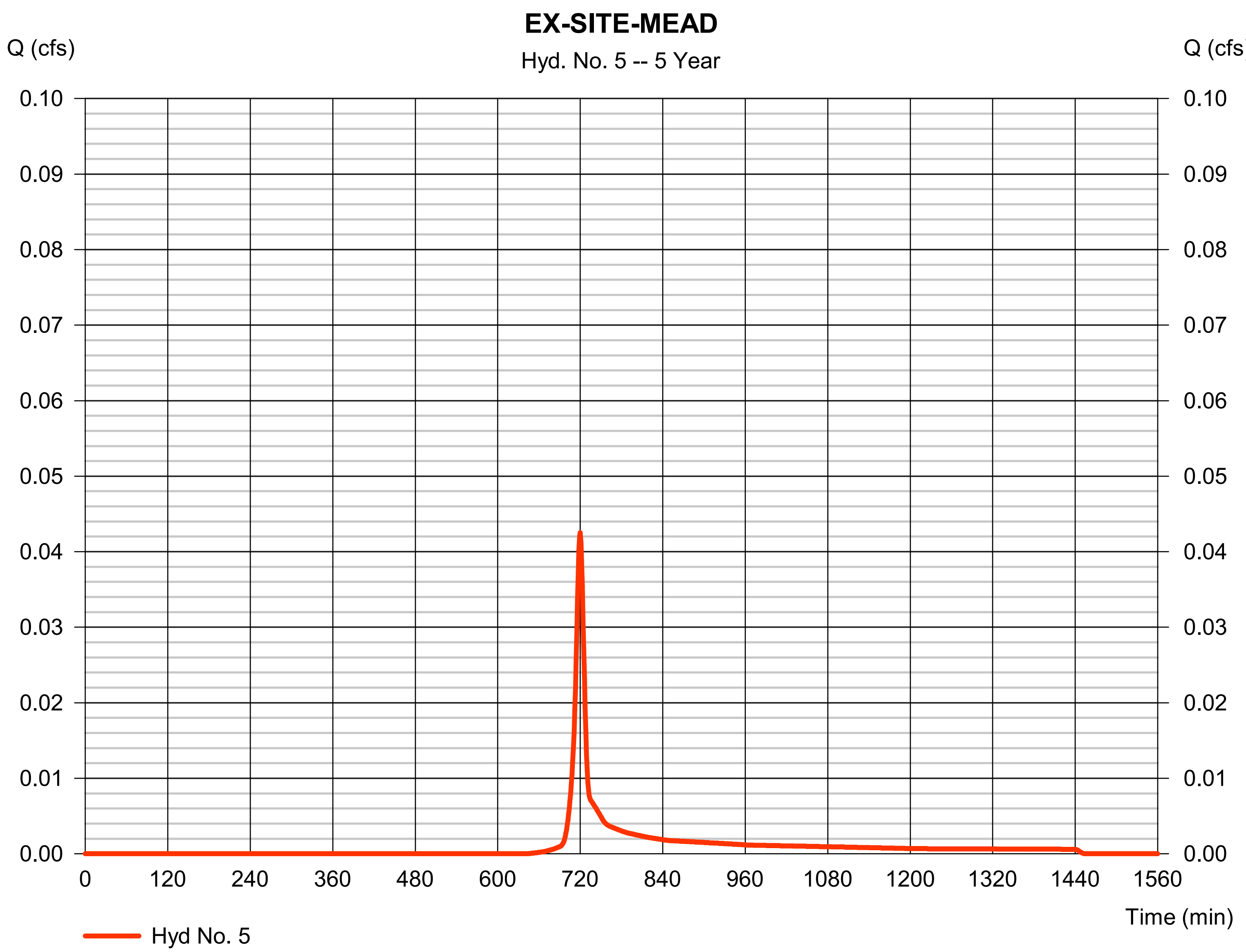
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 5

EX-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.043 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 97 cuft
Drainage area	= 0.020 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.020 x 71)] / 0.020



Hydrograph Report

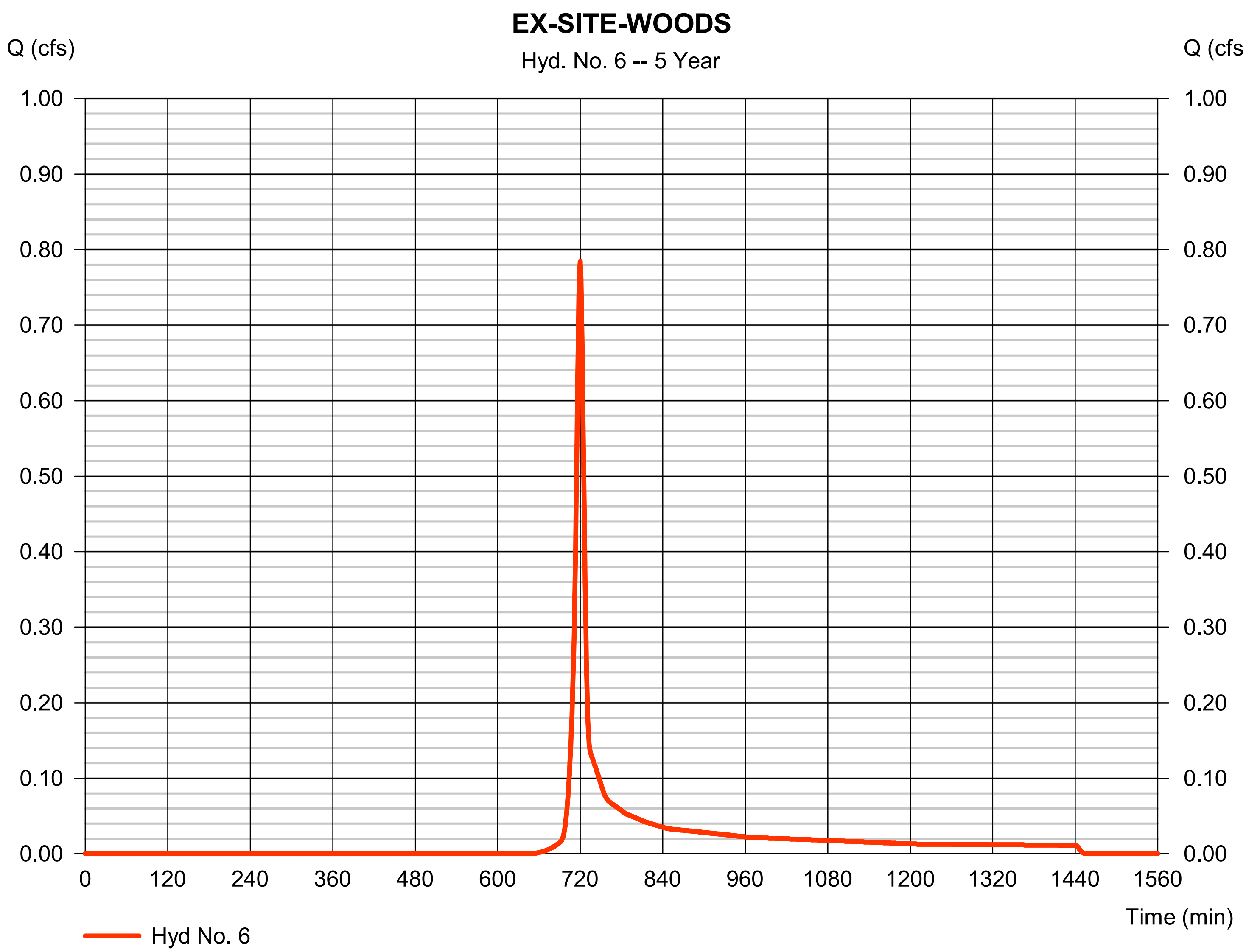
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 6

EX-SITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.785 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 1,803 cuft
Drainage area	= 0.389 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.240 x 70) + (0.060 x 70) + (0.460 x 70)] / 0.389



Hydrograph Report

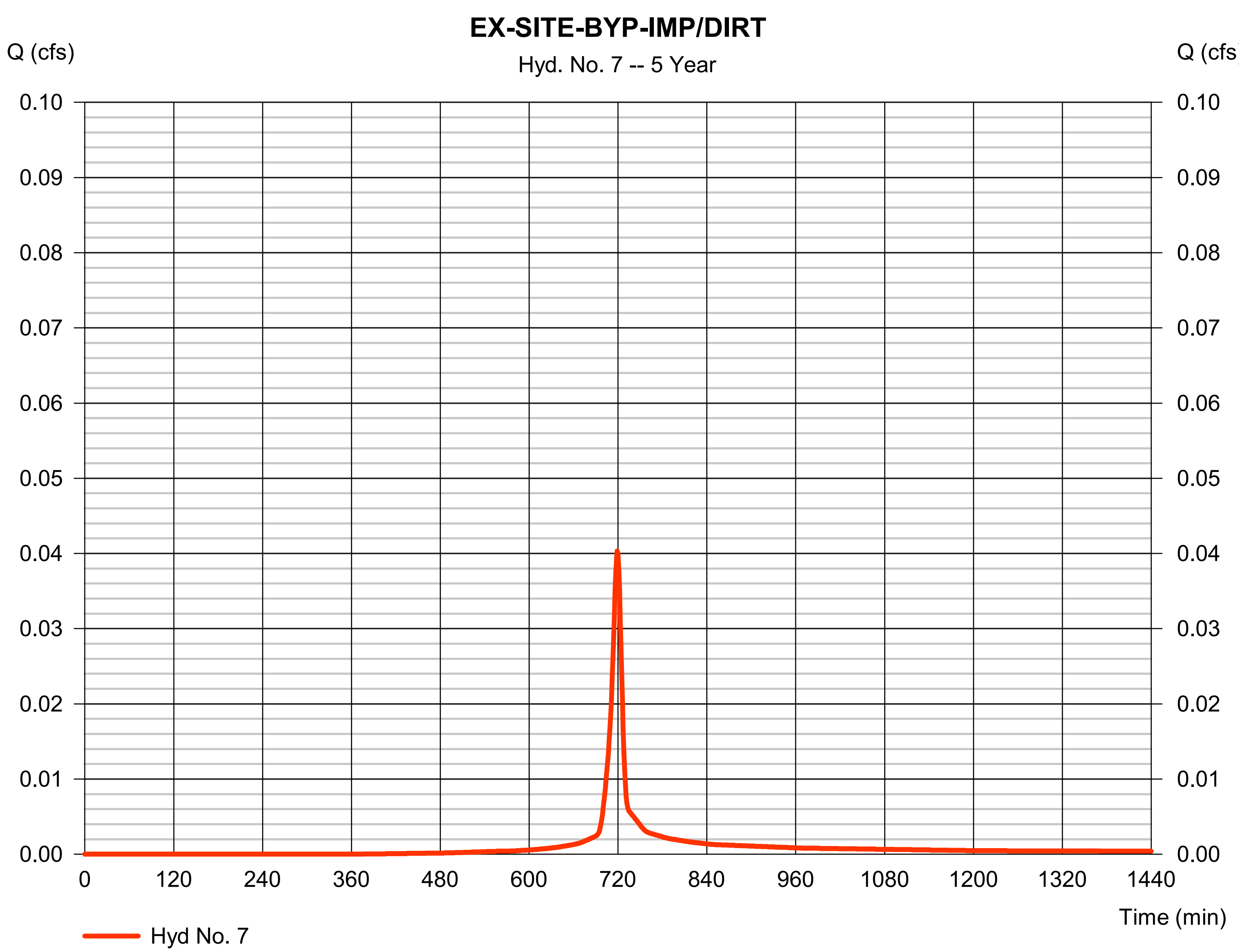
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 7

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.040 cfs
Storm frequency	= 5 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 93 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.010



Hydrograph Report

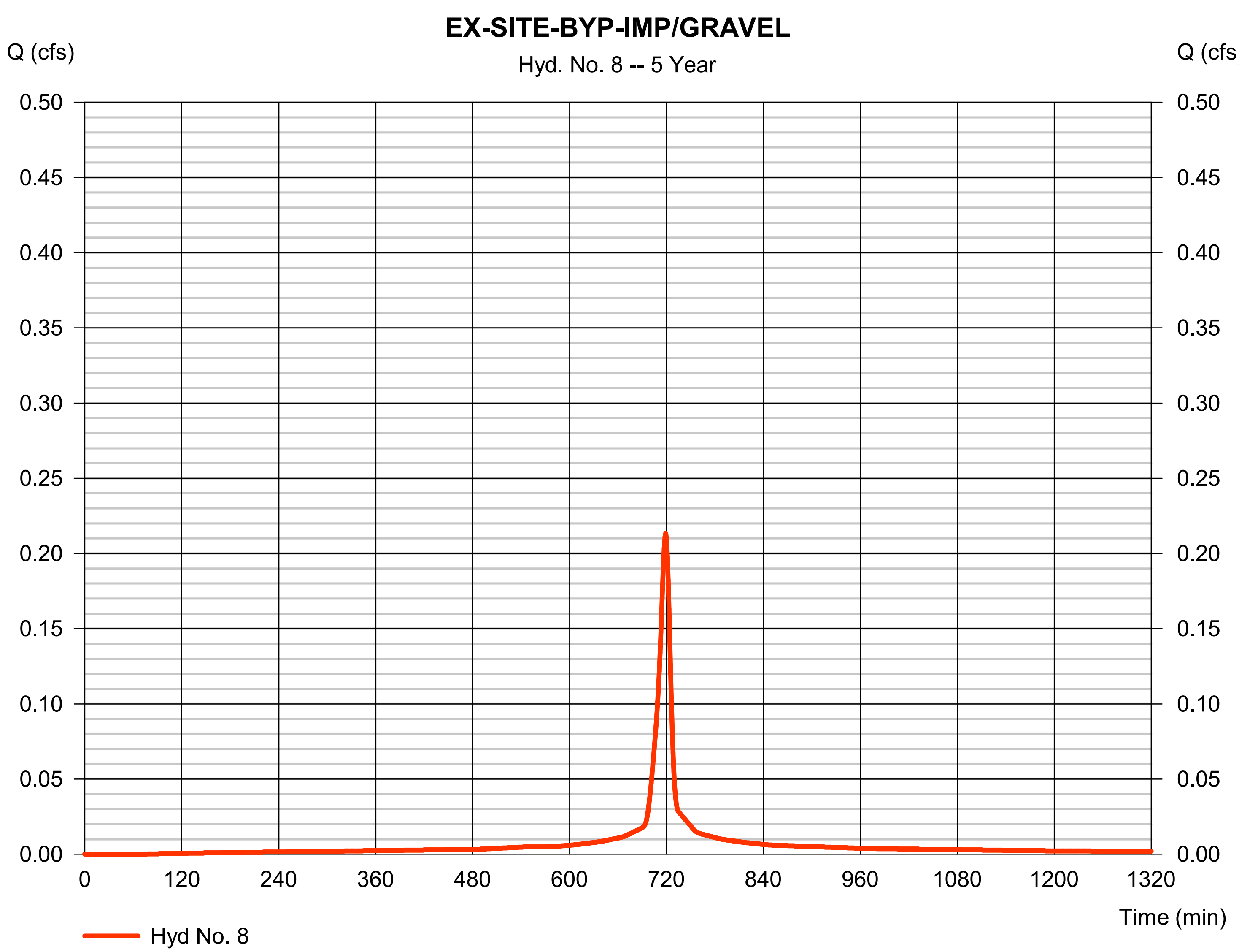
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 8

EX-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.213 cfs
Storm frequency	= 5 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 562 cuft
Drainage area	= 0.042 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.040 x 98)] / 0.042



Hydrograph Report

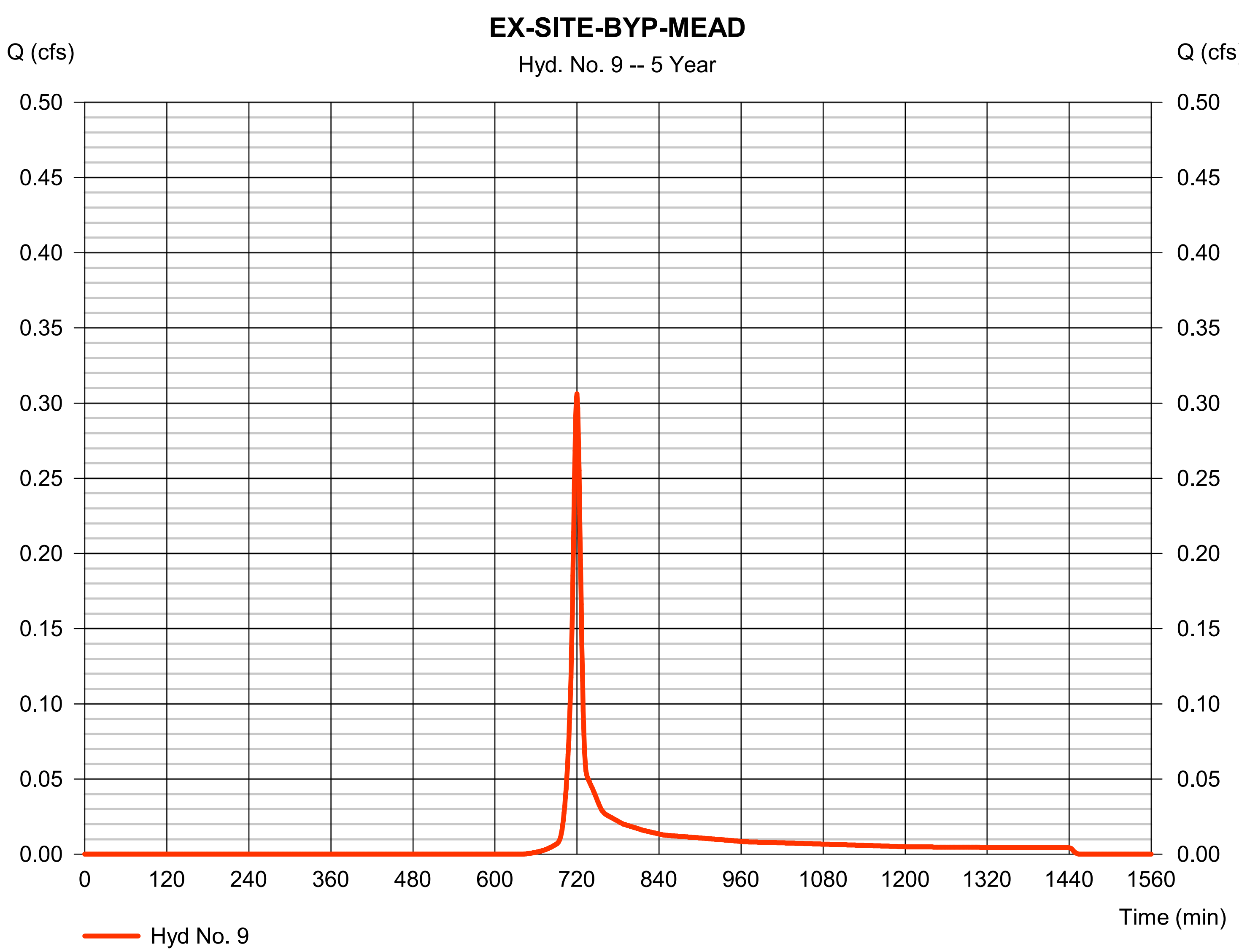
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 9

EX-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.306 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 700 cuft
Drainage area	= 0.144 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.190 x 71)] / 0.144



Hydrograph Report

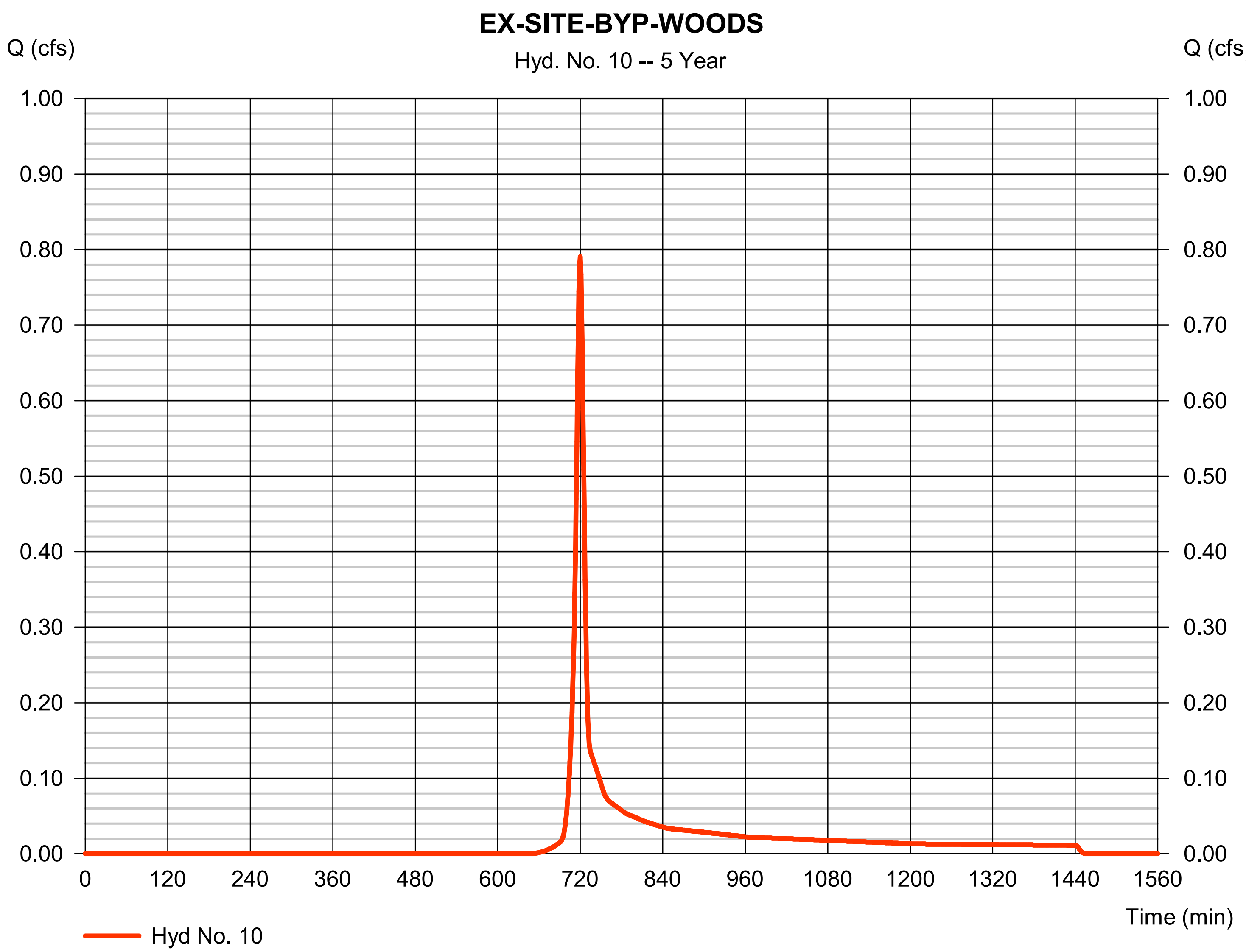
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 10

EX-SITE-BYP-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.791 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 1,817 cuft
Drainage area	= 0.392 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 70) + (0.110 x 70) + (0.090 x 70)] / 0.392



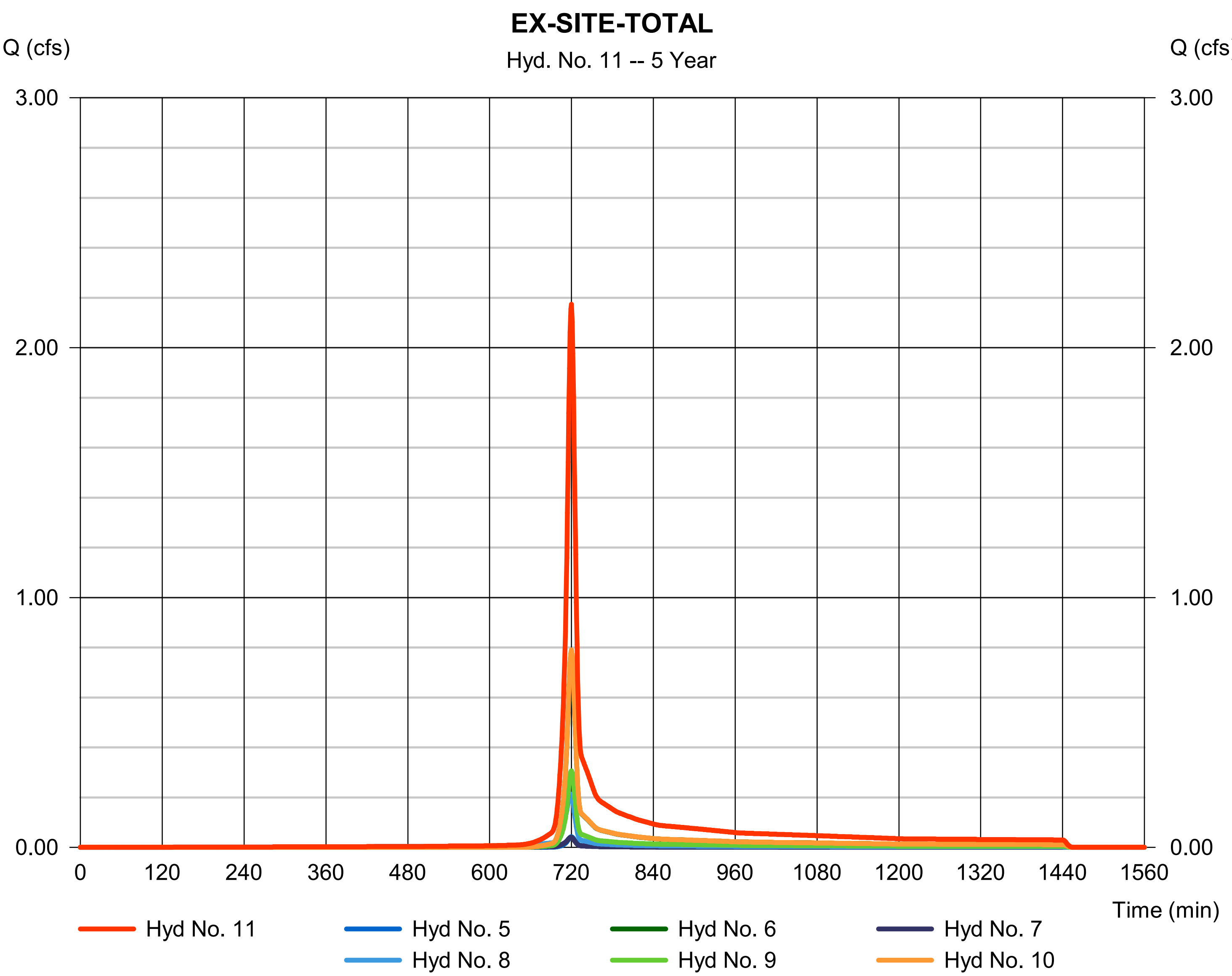
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 11

EX-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 2.173 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 5,072 cuft
Inflow hyds.	= 5, 6, 7, 8, 9, 10	Contrib. drain. area	= 0.997 ac



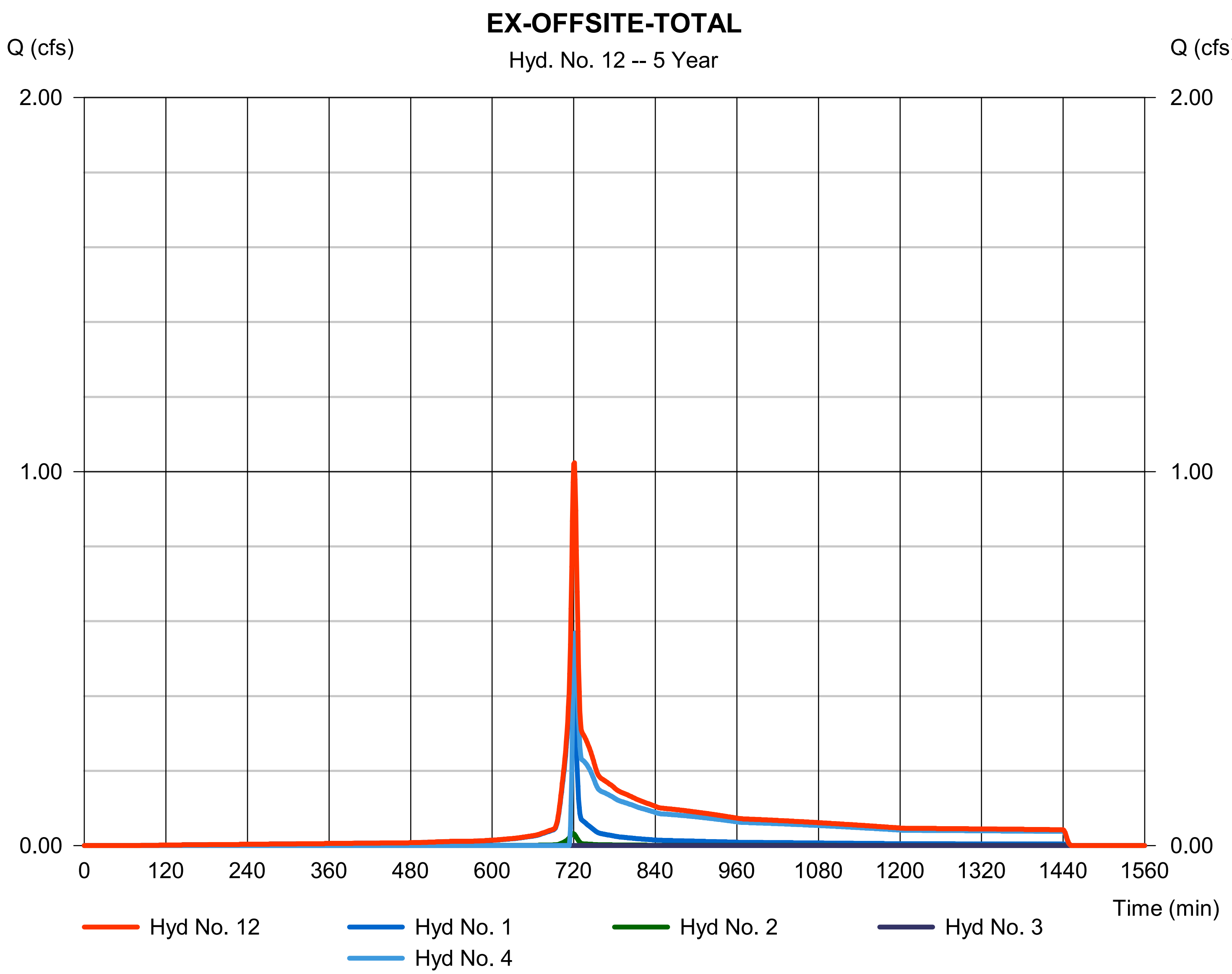
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 12

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.023 cfs
Storm frequency	= 5 yrs	Time to peak	= 721 min
Time interval	= 1 min	Hyd. volume	= 4,526 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 3.723 ac



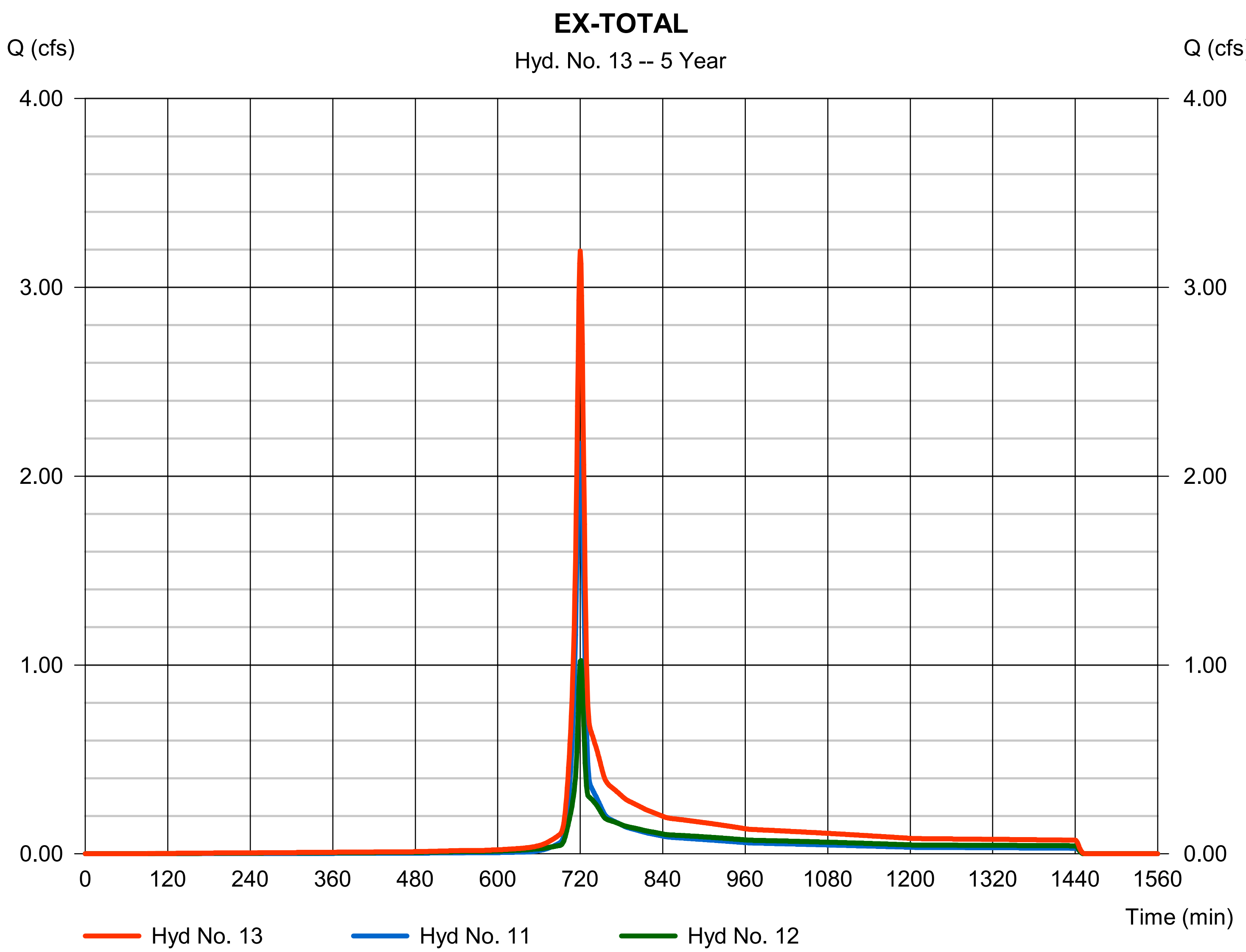
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 13

EX-TOTAL

Hydrograph type	= Combine	Peak discharge	= 3.193 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 9,597 cuft
Inflow hyds.	= 11, 12	Contrib. drain. area	= 0.000 ac



Hydrograph Report

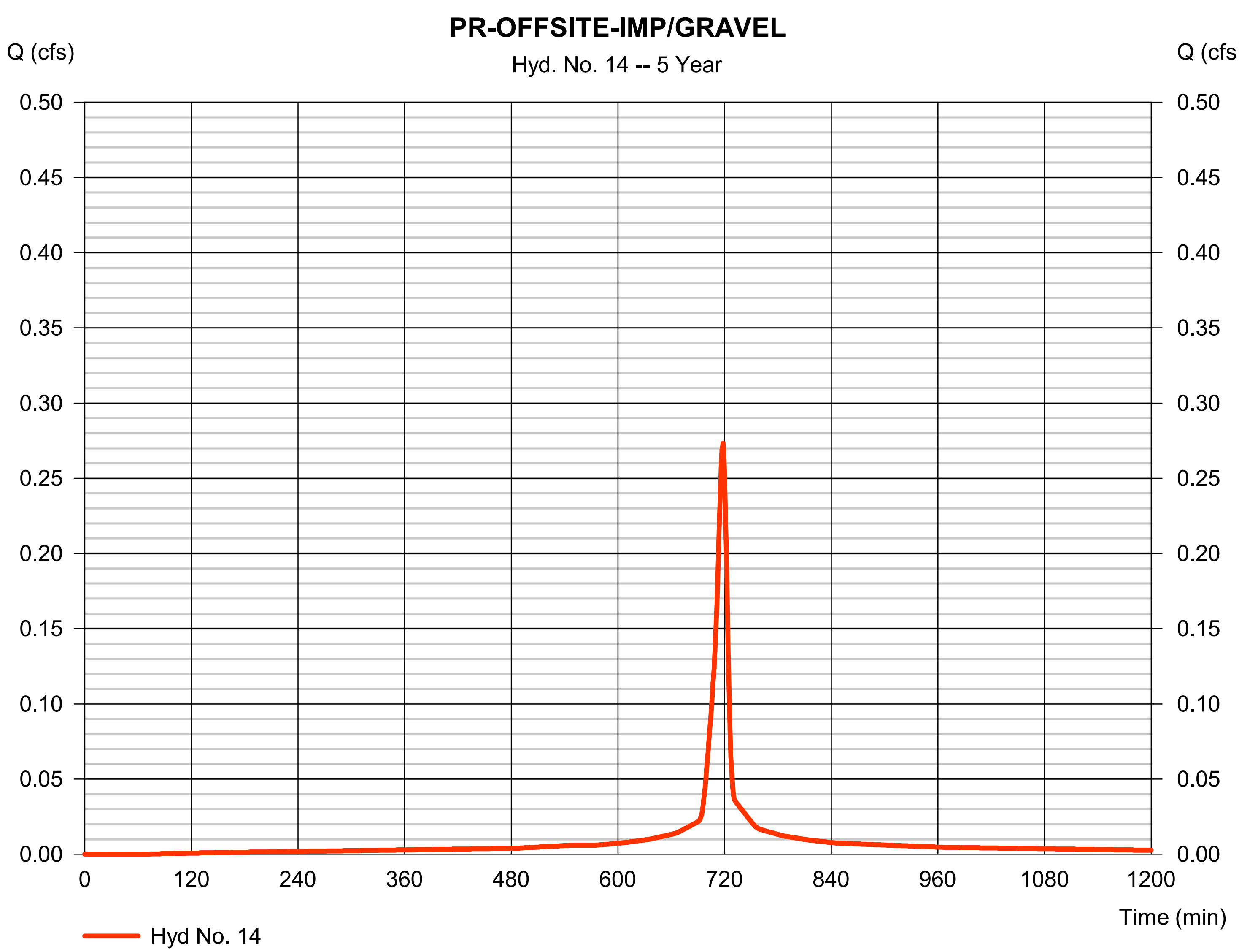
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 14

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.273 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 678 cuft
Drainage area	= 0.052 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.013 x 98)] / 0.052



Hydrograph Report

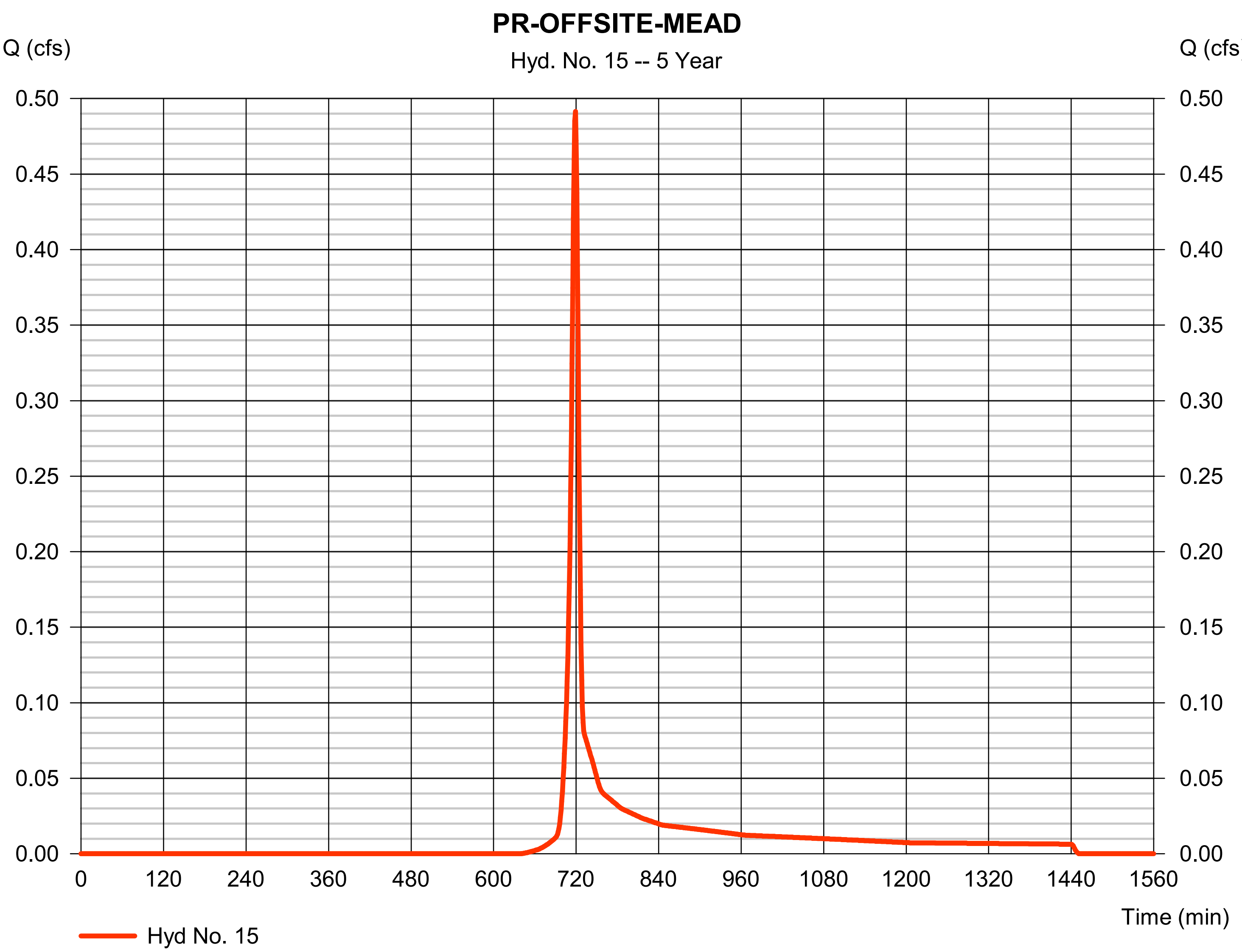
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 15

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.491 cfs
Storm frequency	= 5 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 1,043 cuft
Drainage area	= 0.220 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.034 x 71) + (0.099 x 71) + (0.084 x 71) + (0.001 x 30)] / 0.220



Hydrograph Report

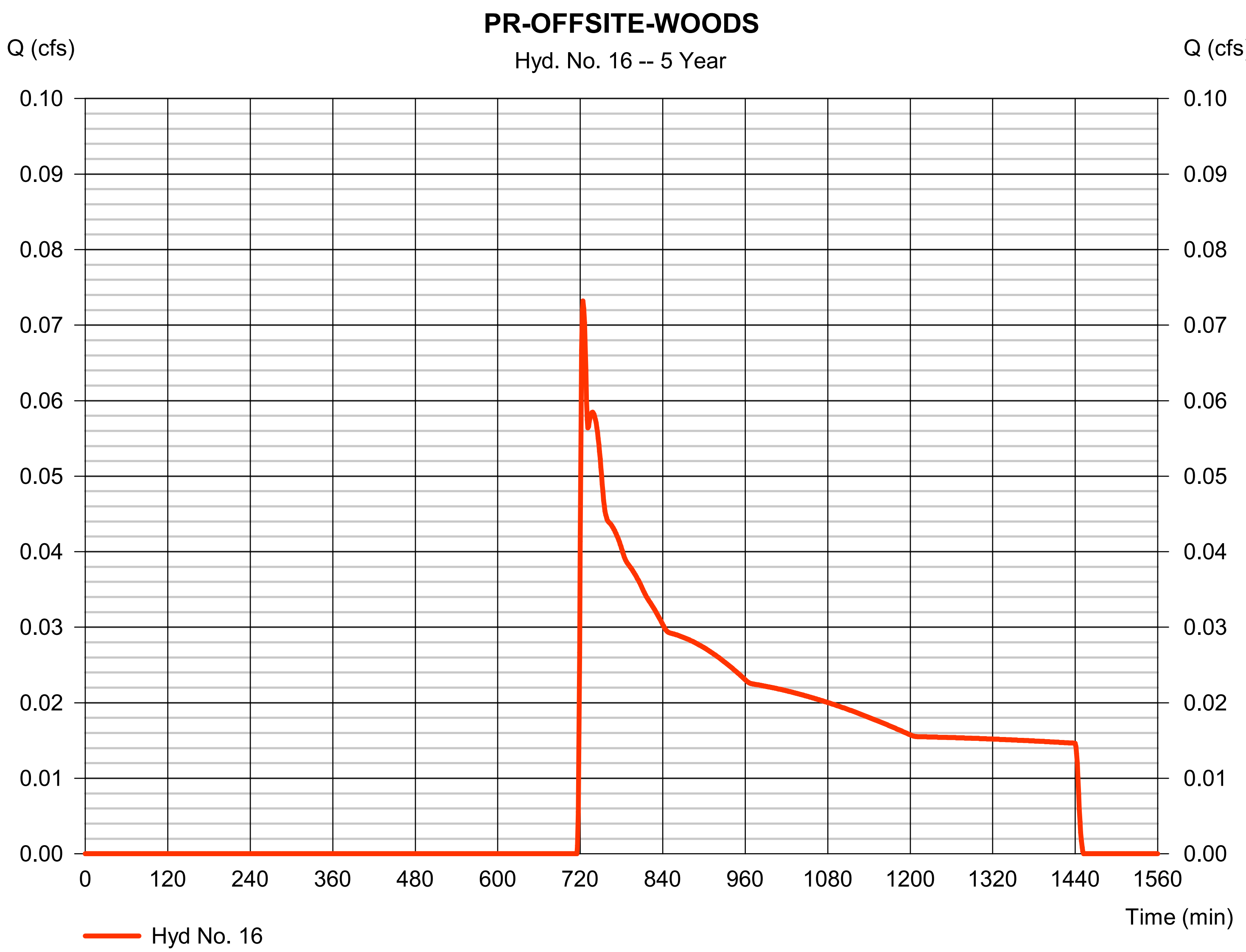
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 16

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.073 cfs
Storm frequency	= 5 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 1,019 cuft
Drainage area	= 1.550 ac	Curve number	= 46*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.602 x 70) + (0.951 x 30)] / 1.550



Hydrograph Report

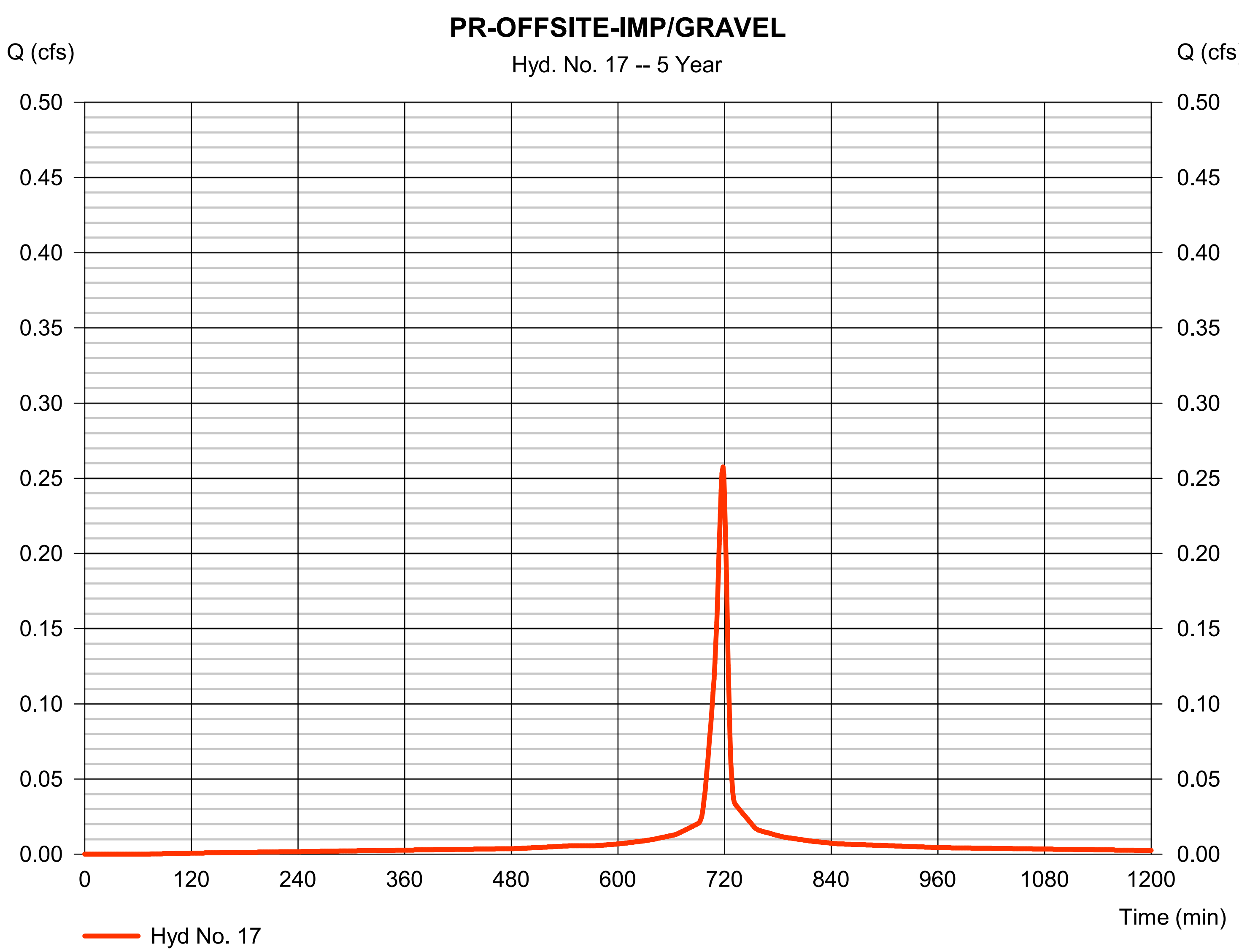
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 17

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.258 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 639 cuft
Drainage area	= 0.049 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.049



Hydrograph Report

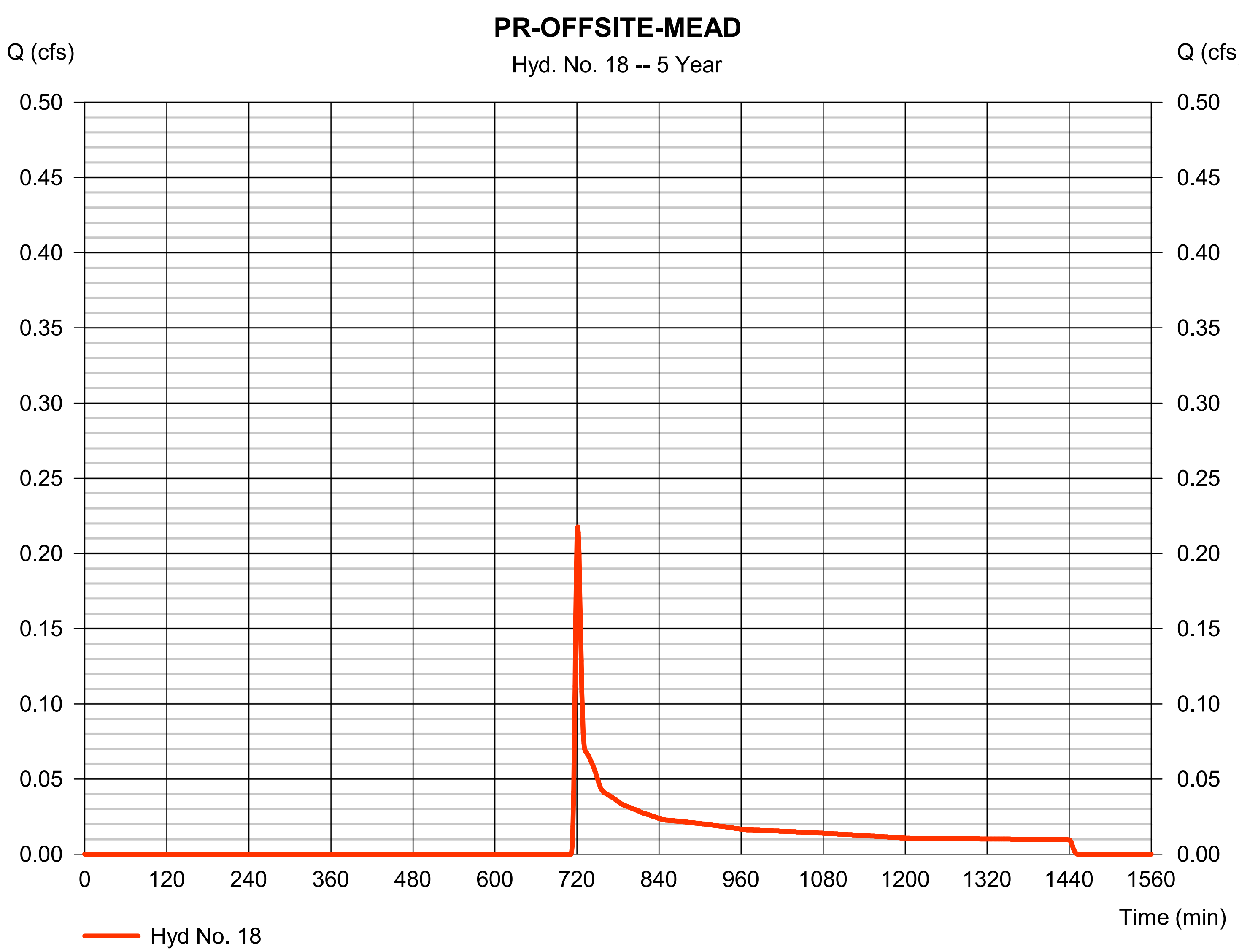
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 18

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.218 cfs
Storm frequency	= 5 yrs	Time to peak	= 721 min
Time interval	= 1 min	Hyd. volume	= 877 cuft
Drainage area	= 0.720 ac	Curve number	= 51*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.037 x 71) + (0.331 x 71) + (0.252 x 30) + (0.103 x 30)] / 0.720



Hydrograph Report

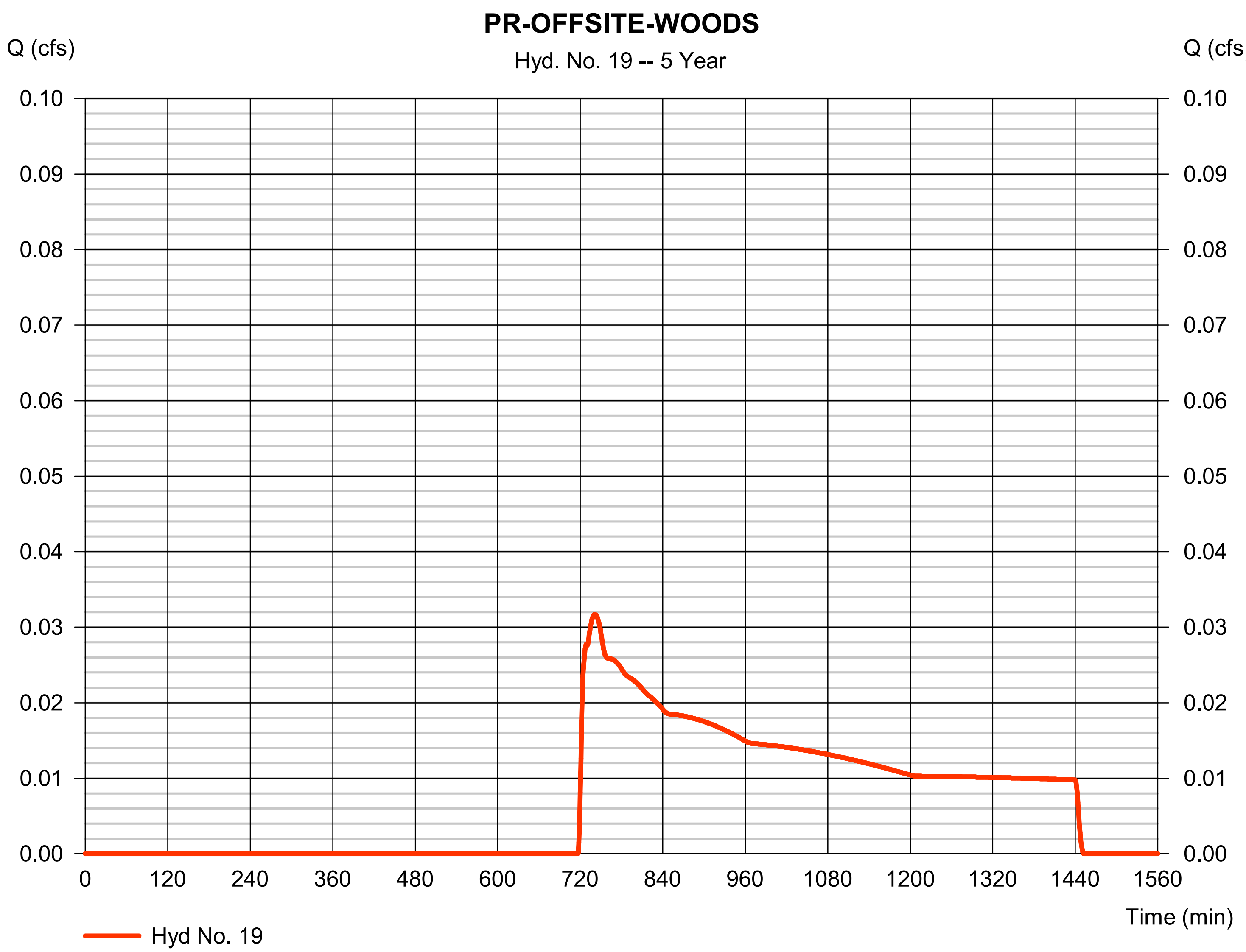
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 19

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.032 cfs
Storm frequency	= 5 yrs	Time to peak	= 741 min
Time interval	= 1 min	Hyd. volume	= 635 cuft
Drainage area	= 1.130 ac	Curve number	= 45*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.180 x 70) + (0.700 x 30)] / 1.130



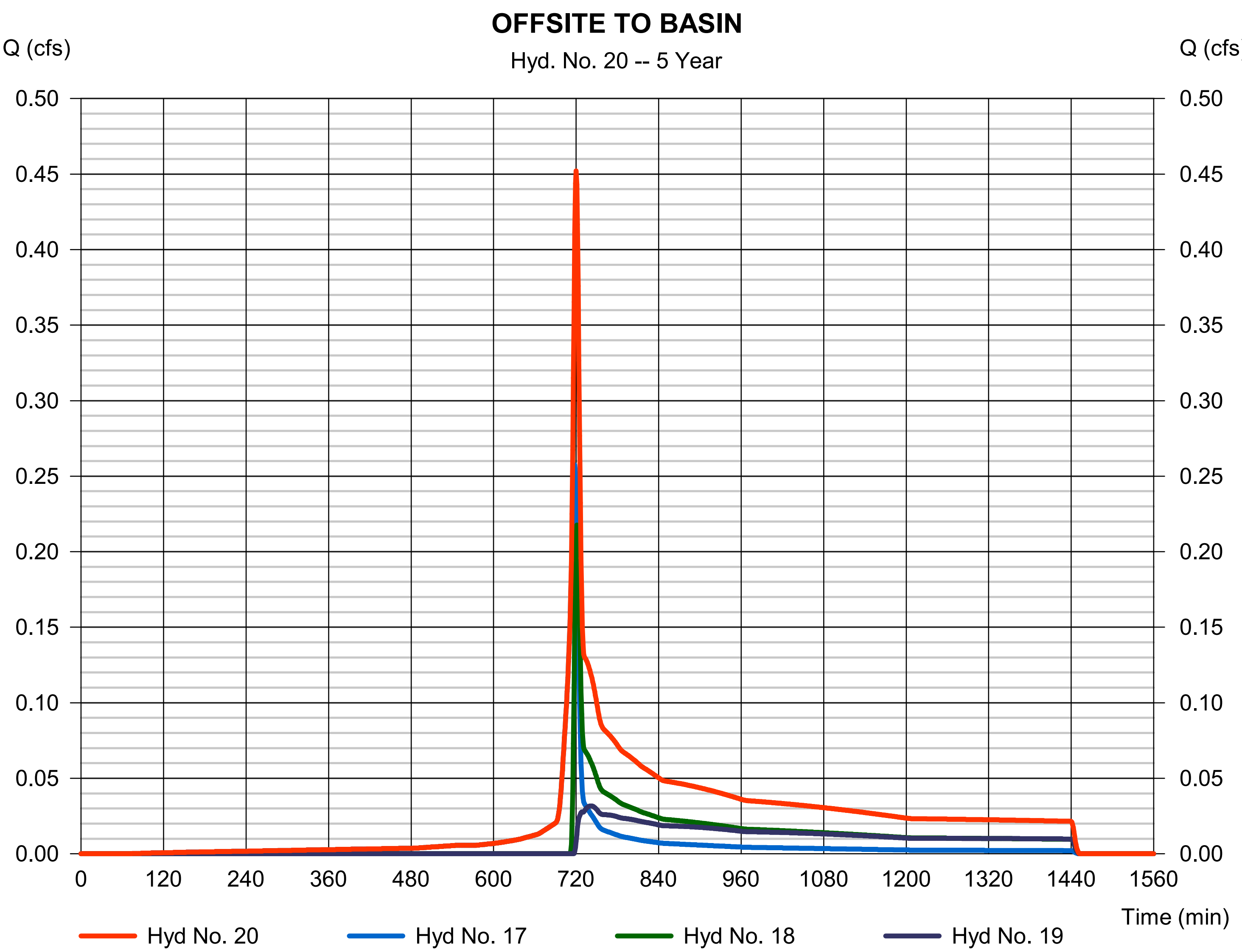
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 20

OFFSITE TO BASIN

Hydrograph type	= Combine	Peak discharge	= 0.452 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 2,151 cuft
Inflow hyds.	= 17, 18, 19	Contrib. drain. area	= 1.899 ac



Hydrograph Report

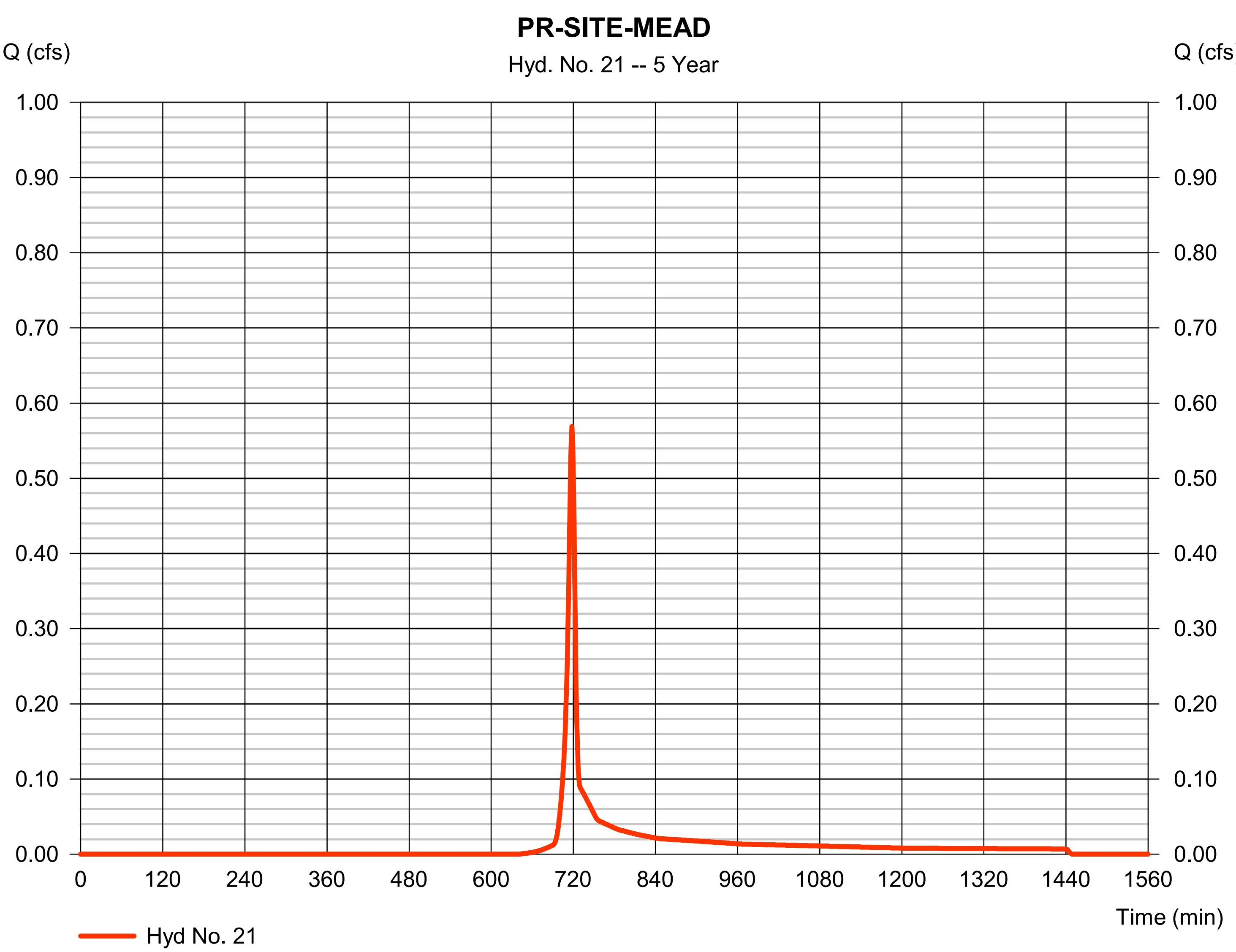
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 21

PR-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.569 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,148 cuft
Drainage area	= 0.229 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.10 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.134 x 71) + (0.003 x 71) + (0.435 x 71)] / 0.229



Hydrograph Report

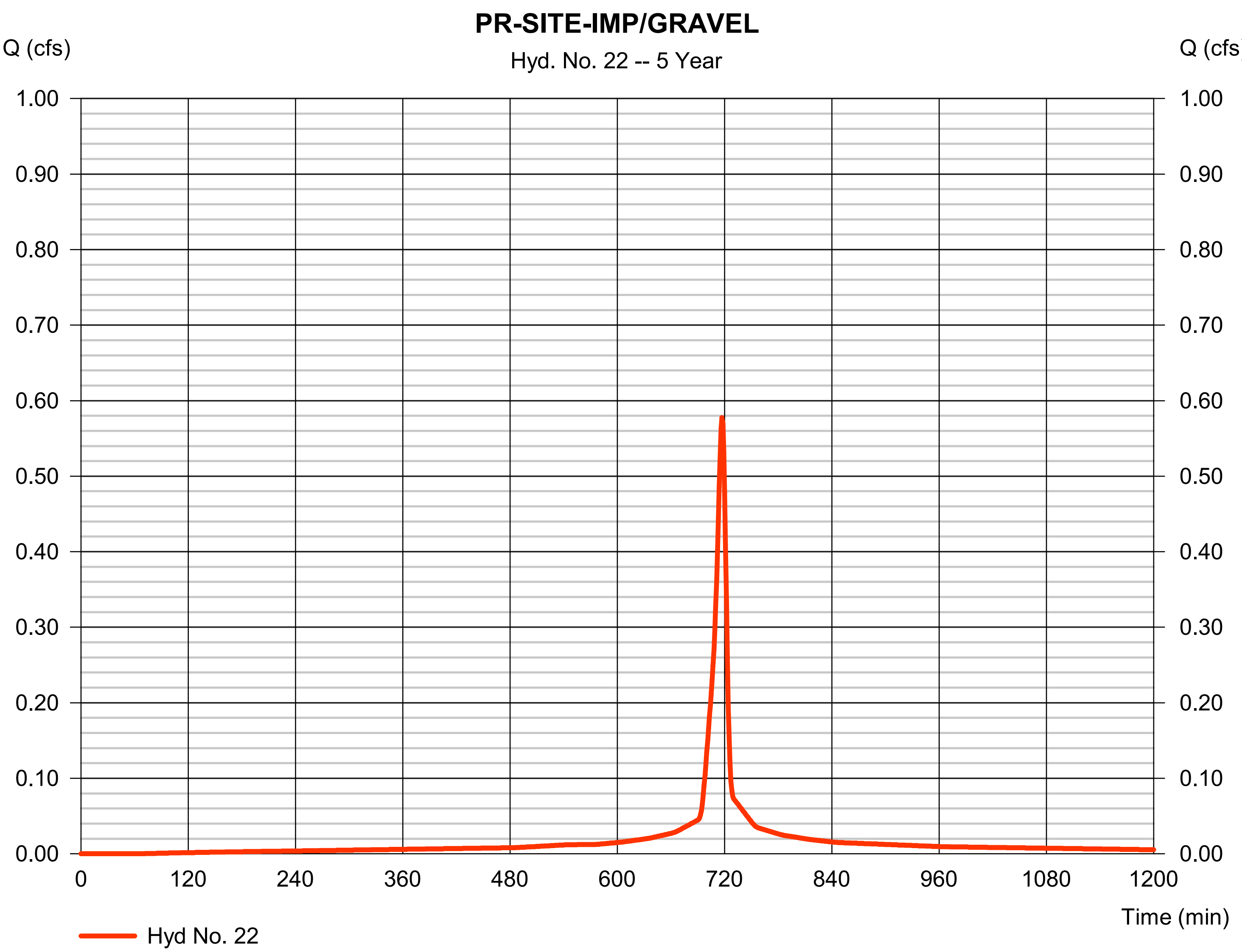
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 22

PR-SITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.578 cfs
Storm frequency	= 5 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 1,380 cuft
Drainage area	= 0.100 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.053 x 98) + (0.008 x 98)] / 0.100



Hydrograph Report

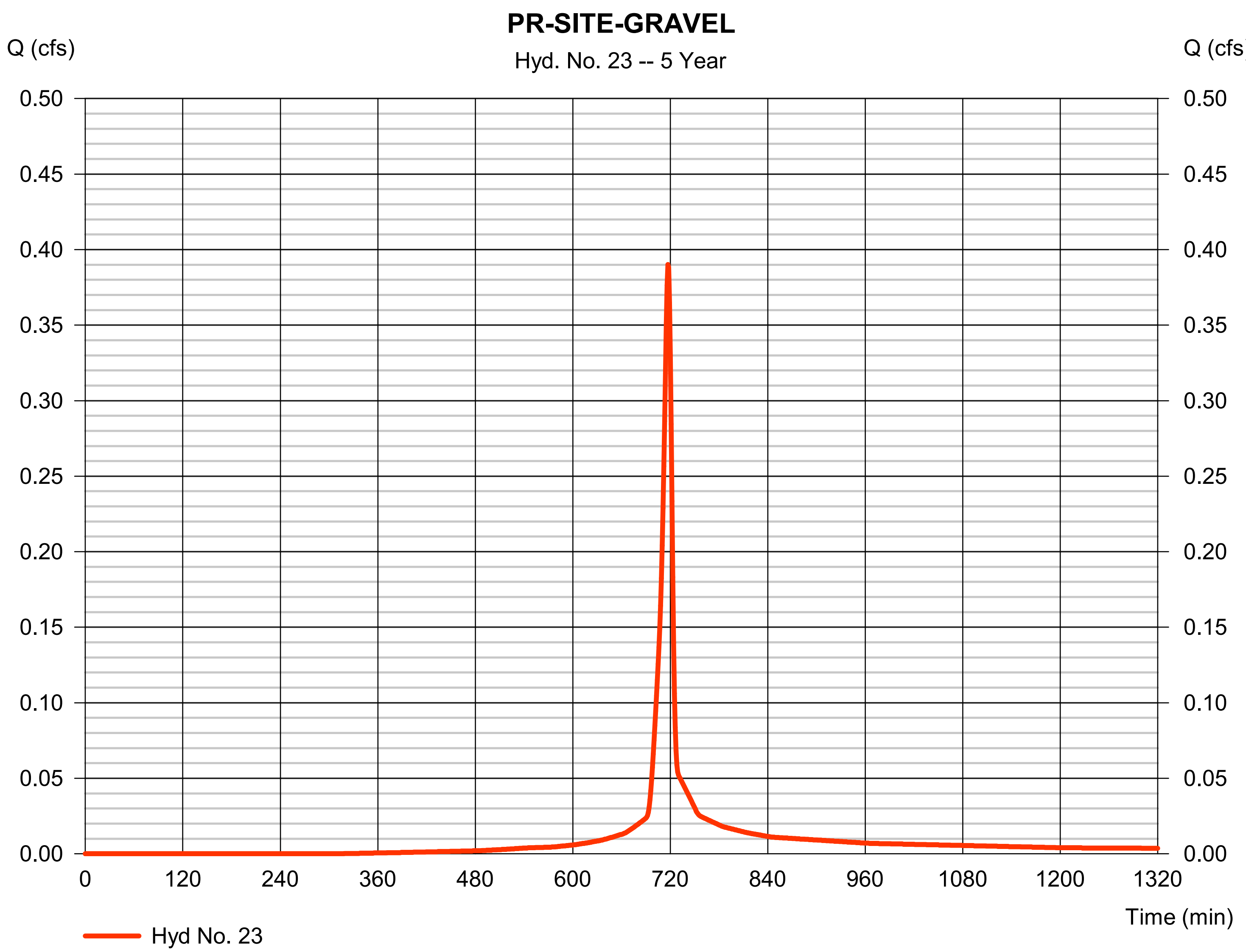
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 23

PR-SITE-GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.390 cfs
Storm frequency	= 5 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 823 cuft
Drainage area	= 0.080 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.064 x 89) + (0.003 x 89) + (0.013 x 89)] / 0.080



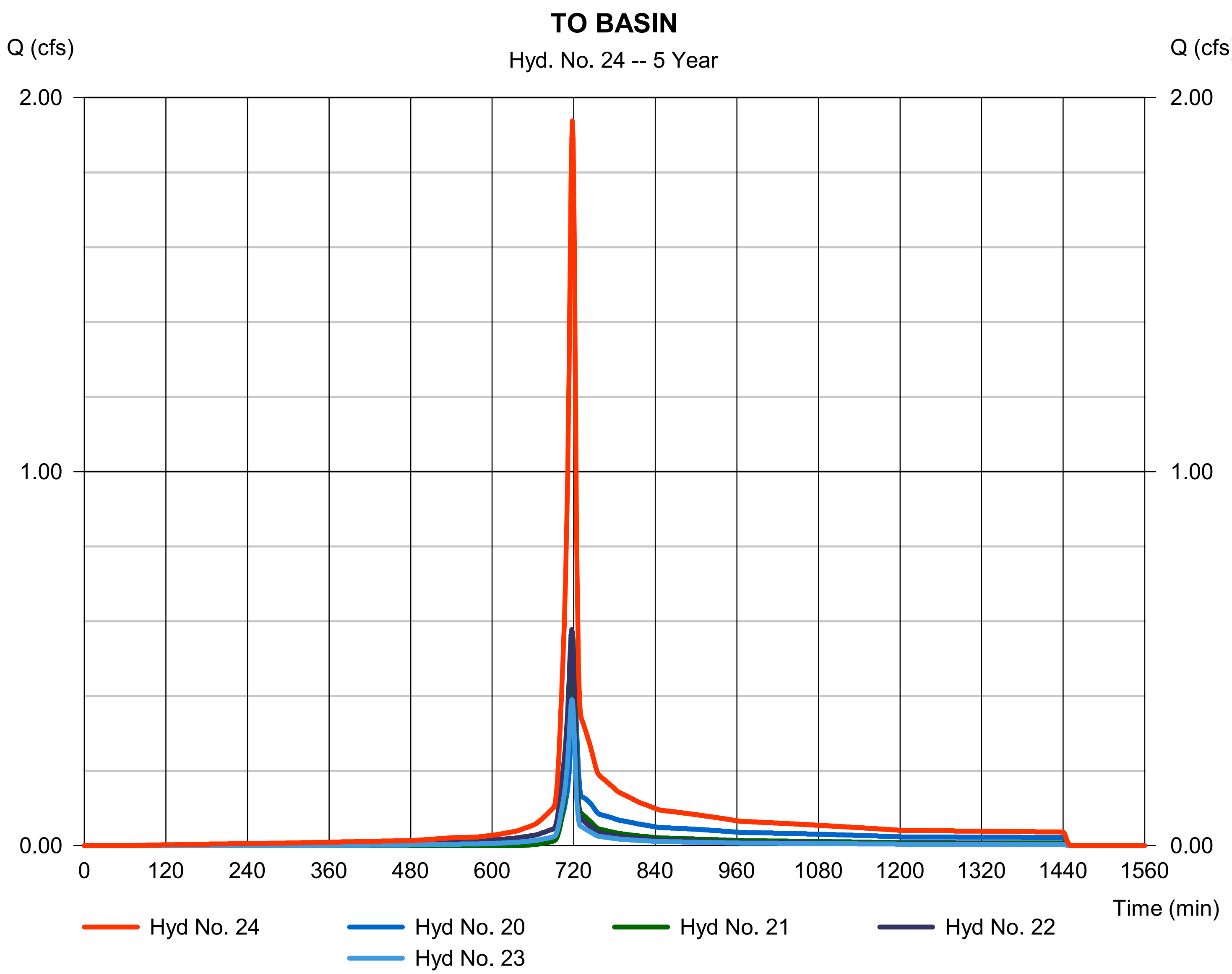
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 24

TO BASIN

Hydrograph type	= Combine	Peak discharge	= 1.938 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 5,502 cuft
Inflow hyds.	= 20, 21, 22, 23	Contrib. drain. area	= 0.409 ac



Hydrograph Report

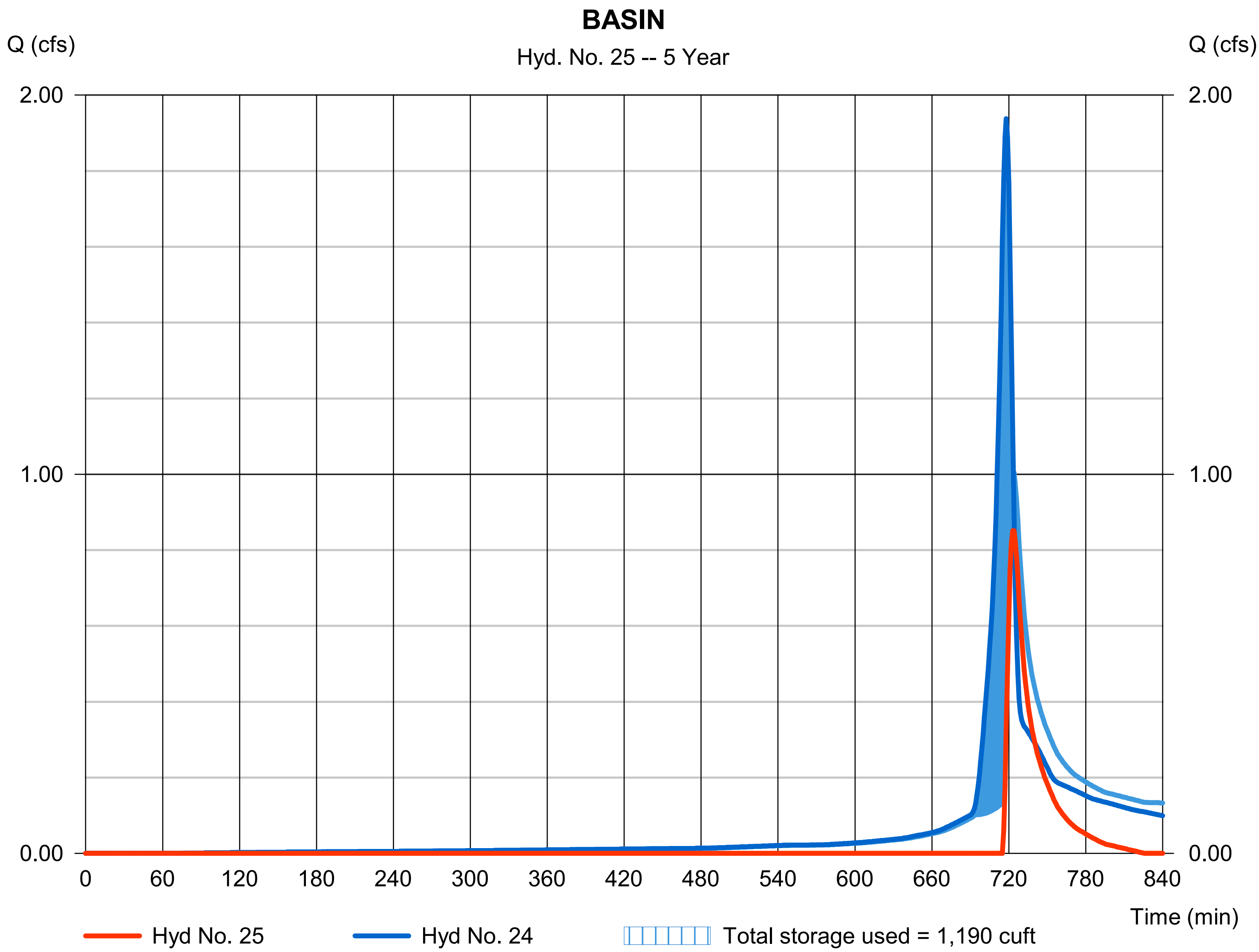
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 25

BASIN

Hydrograph type	= Reservoir	Peak discharge	= 0.851 cfs
Storm frequency	= 5 yrs	Time to peak	= 723 min
Time interval	= 1 min	Hyd. volume	= 1,151 cuft
Inflow hyd. No.	= 24 - TO BASIN	Max. Elevation	= 640.38 ft
Reservoir name	= UG N-12 Perforated Pipe System	Max. Storage	= 1,190 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

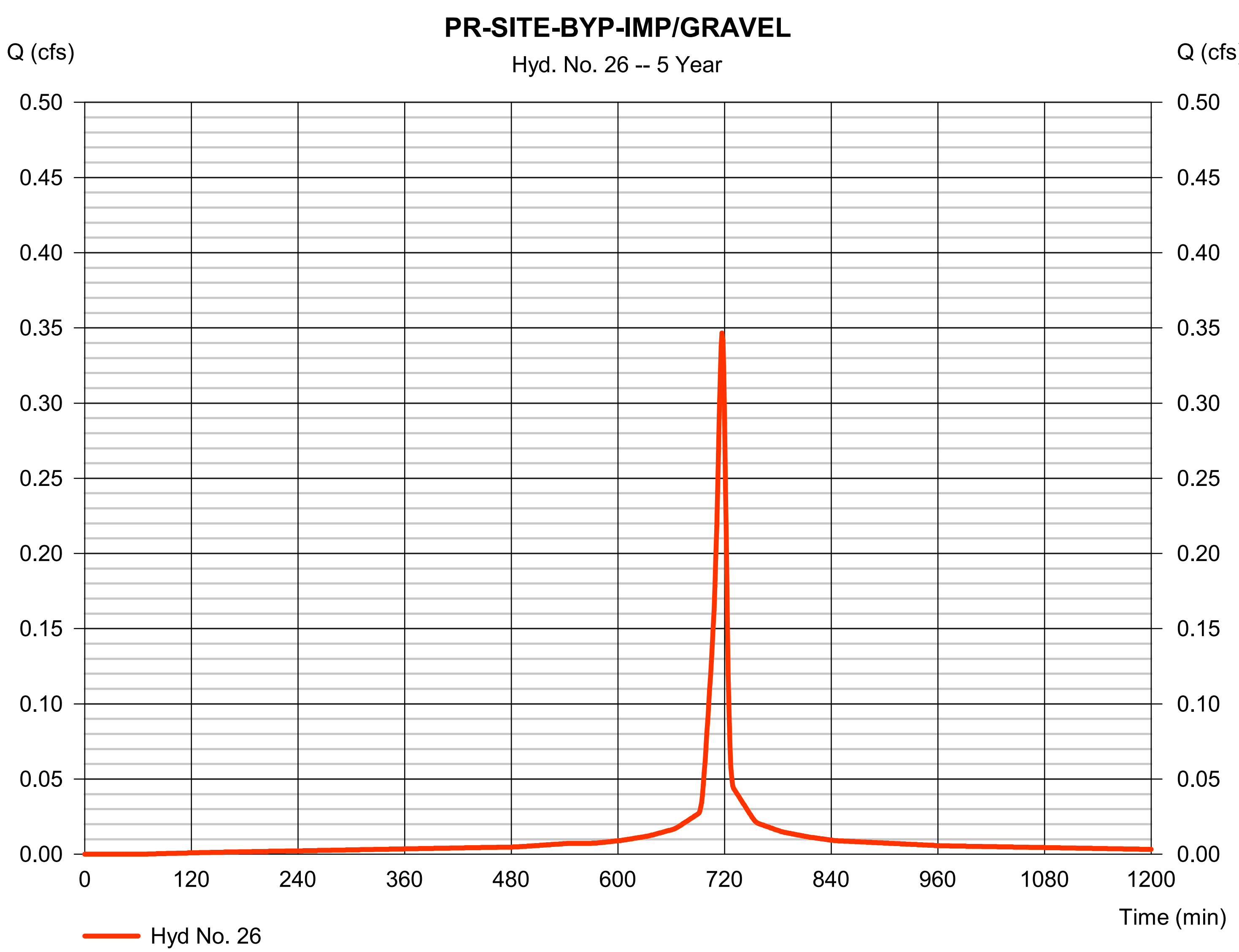
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 26

PR-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.347 cfs
Storm frequency	= 5 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 828 cuft
Drainage area	= 0.060 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.060 x 98)] / 0.060



Hydrograph Report

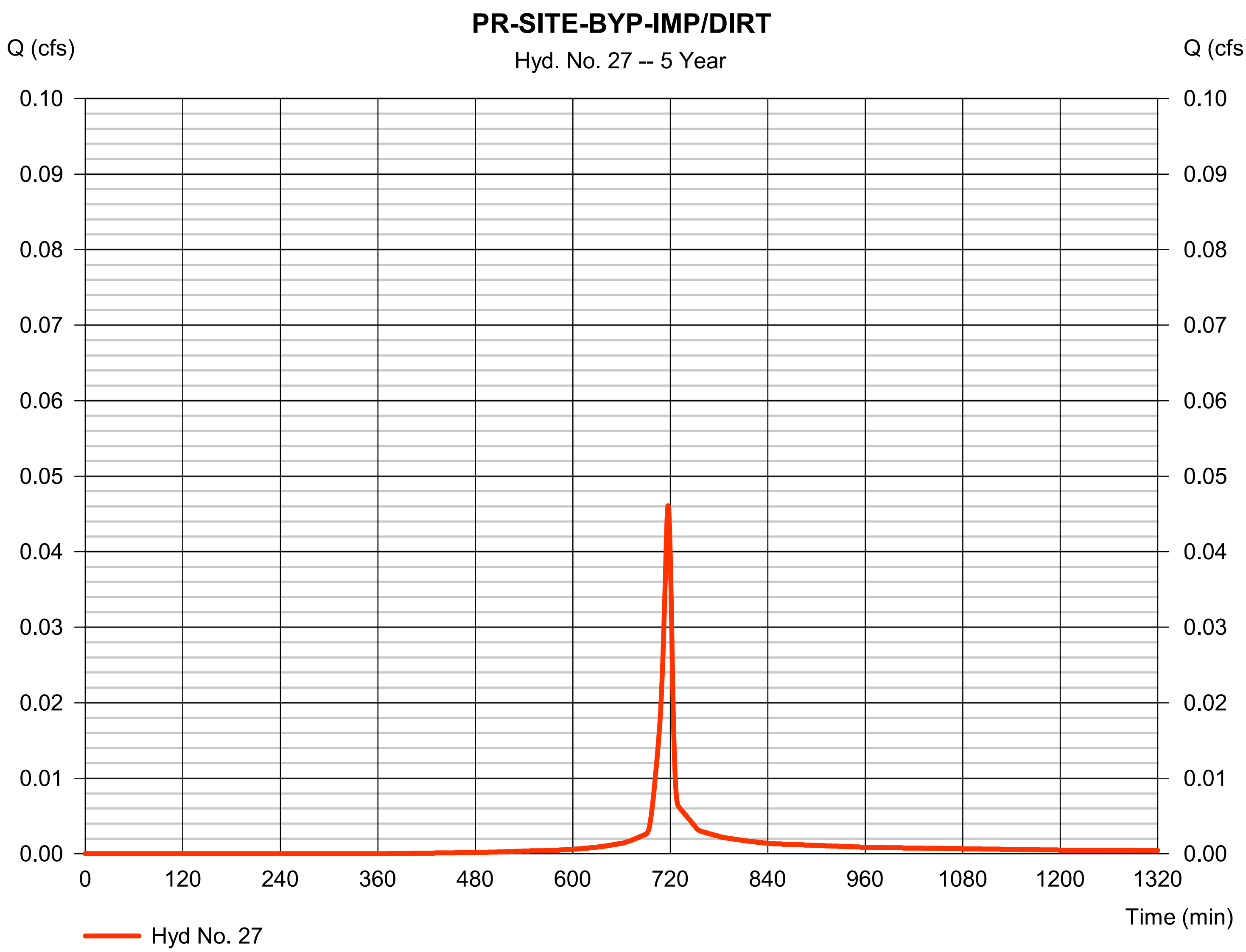
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 27

PR-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.046 cfs
Storm frequency	= 5 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 96 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.008 x 87)] / 0.010



Hydrograph Report

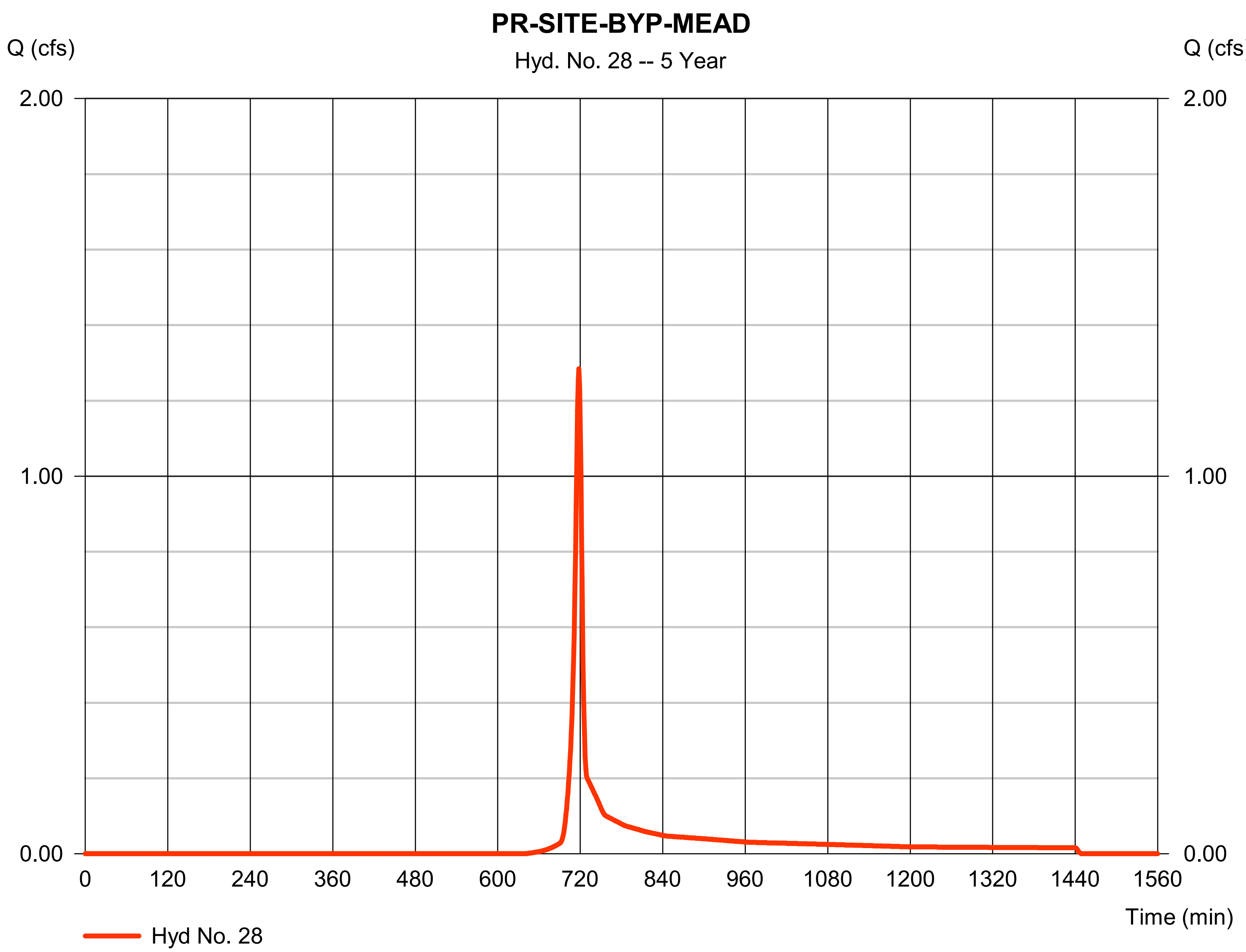
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 28

PR-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 1.284 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 2,593 cuft
Drainage area	= 0.517 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 3.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 71) + (0.290 x 71) + (0.085 x 71)] / 0.517



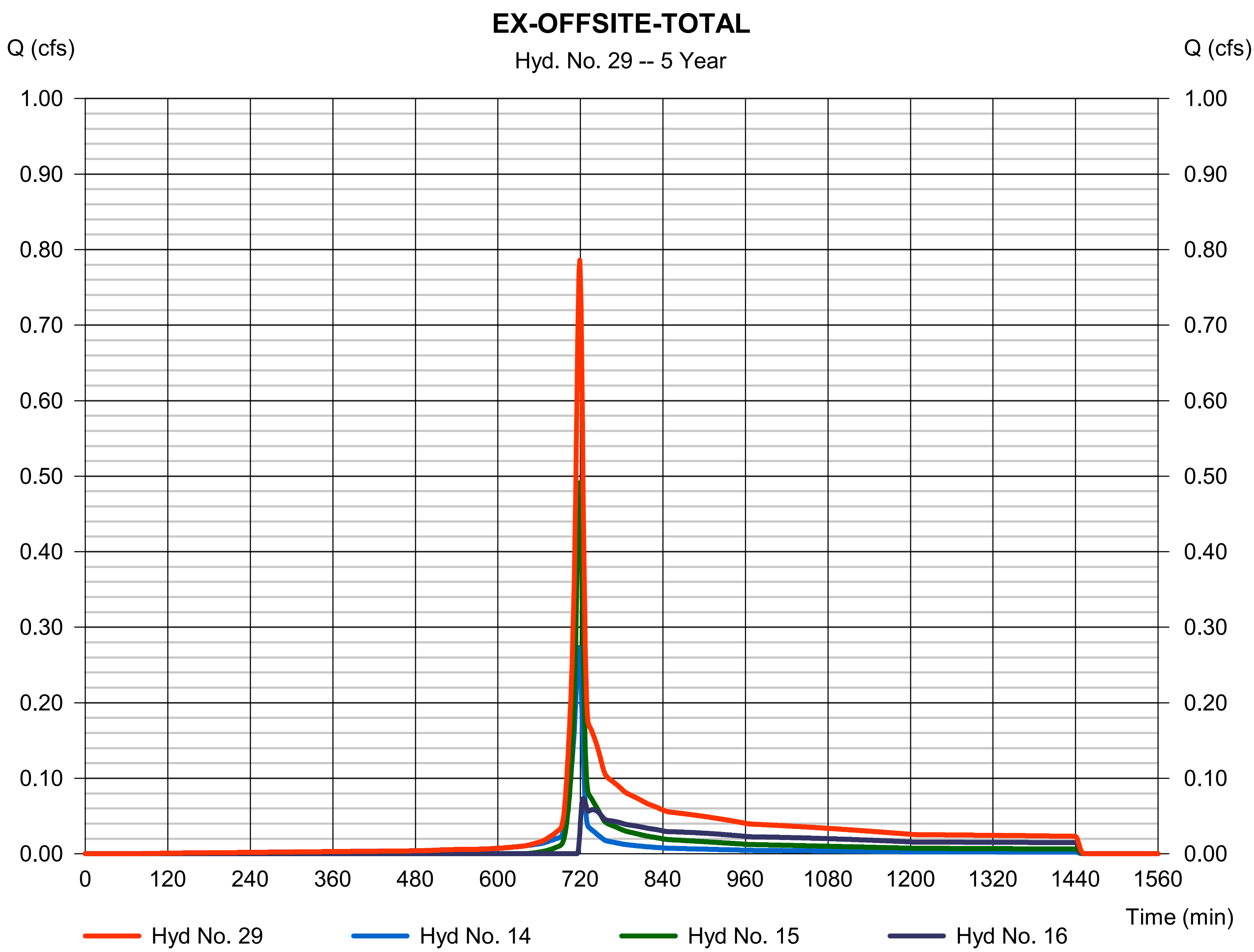
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 29

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 0.786 cfs
Storm frequency	= 5 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 2,740 cuft
Inflow hyds.	= 14, 15, 16	Contrib. drain. area	= 1.822 ac



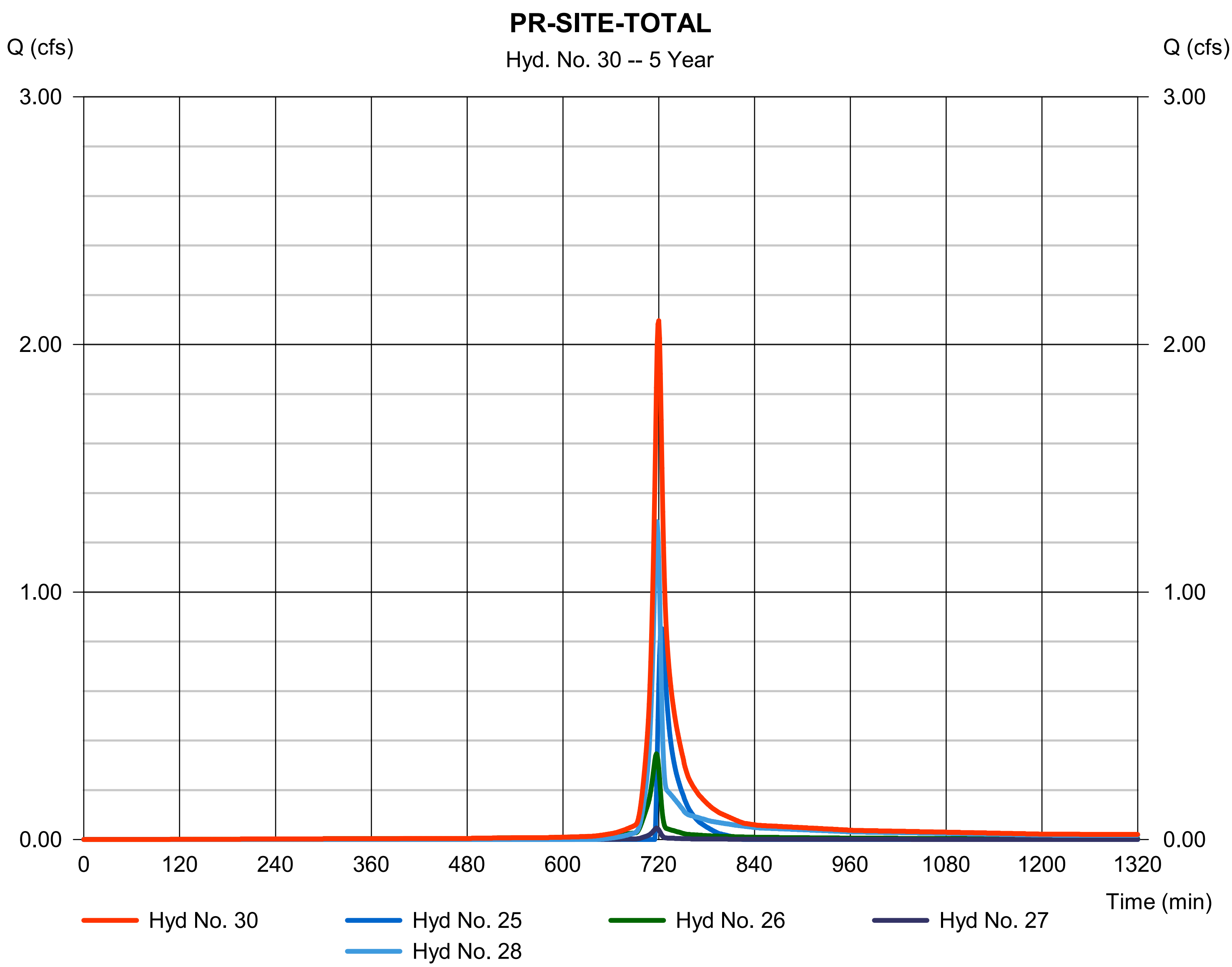
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 30

PR-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 2.096 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 4,667 cuft
Inflow hyds.	= 25, 26, 27, 28	Contrib. drain. area	= 0.587 ac



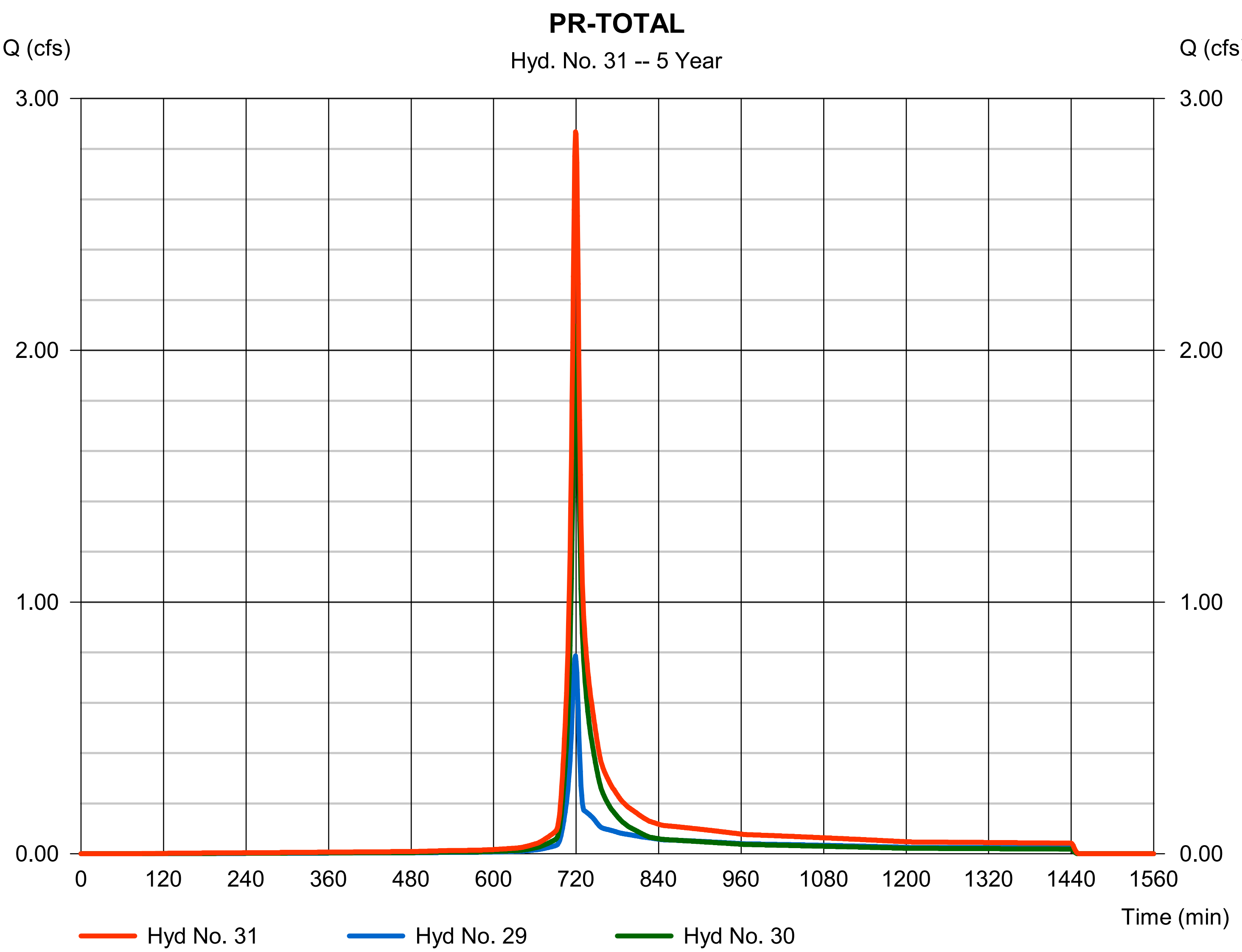
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 31

PR-TOTAL

Hydrograph type	= Combine	Peak discharge	= 2.868 cfs
Storm frequency	= 5 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 7,407 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.621	1	718	1,553	------	------	------	EX-OFFSITE-IMP/GRAVEL
2	SCS Runoff	0.040	1	719	92	------	------	------	EX-SITE-BYP-IMP/DIRT
3	SCS Runoff	0.000	1	n/a	0	------	------	------	EX-OFFSITE-MEAD
4	SCS Runoff	1.650	1	721	5,494	------	------	------	EX-OFFSITE-WOODS
5	SCS Runoff	0.058	1	720	131	------	------	------	EX-SITE-MEAD
6	SCS Runoff	1.076	1	720	2,444	------	------	------	EX-SITE-WOODS
7	SCS Runoff	0.049	1	719	115	------	------	------	EX-SITE-BYP-IMP/DIRT
8	SCS Runoff	0.250	1	719	662	------	------	------	EX-SITE-BYP-IMP/GRAVEL
9	SCS Runoff	0.416	1	720	943	------	------	------	EX-SITE-BYP-MEAD
10	SCS Runoff	1.084	1	720	2,463	------	------	------	EX-SITE-BYP-WOODS
11	Combine	2.928	1	720	6,758	5, 6, 7, 8, 9, 10	------	------	EX-SITE-TOTAL
12	Combine	2.241	1	720	7,139	1, 2, 3, 4,	------	------	EX-OFFSITE-TOTAL
13	Combine	5.169	1	720	13,897	11, 12	------	------	EX-TOTAL
14	SCS Runoff	0.320	1	718	799	------	------	------	PR-OFFSITE-IMP/GRAVEL
15	SCS Runoff	0.666	1	719	1,405	------	------	------	PR-OFFSITE-MEAD
16	SCS Runoff	0.413	1	722	1,956	------	------	------	PR-OFFSITE-WOODS
17	SCS Runoff	0.302	1	718	753	------	------	------	PR-OFFSITE-IMP/GRAVEL
18	SCS Runoff	0.507	1	720	1,468	------	------	------	PR-OFFSITE-MEAD
19	SCS Runoff	0.225	1	722	1,270	------	------	------	PR-OFFSITE-WOODS
20	Combine	0.980	1	720	3,491	17, 18, 19	------	------	OFFSITE TO BASIN
21	SCS Runoff	0.770	1	718	1,547	------	------	------	PR-SITE-MEAD
22	SCS Runoff	0.676	1	717	1,626	------	------	------	PR-SITE-IMP/GRAVEL
23	SCS Runoff	0.473	1	717	1,010	------	------	------	PR-SITE-GRAVEL
24	Combine	2.767	1	718	7,674	20, 21, 22, 23	------	------	TO BASIN
25	Reservoir	1.609	1	723	2,343	24	640.64	1,484	BASIN
26	SCS Runoff	0.406	1	717	976	------	------	------	PR-SITE-BYP-IMP/GRAVEL
27	SCS Runoff	0.056	1	717	119	------	------	------	PR-SITE-BYP-IMP/DIRT
28	SCS Runoff	1.739	1	718	3,492	------	------	------	PR-SITE-BYP-MEAD
29	Combine	1.313	1	720	4,161	14, 15, 16,	------	------	EX-OFFSITE-TOTAL
30	Combine	3.261	1	720	6,930	25, 26, 27, 28,	------	------	PR-SITE-TOTAL
31	Combine	4.574	1	720	11,091	29, 30	------	------	PR-TOTAL

Proposed.gpw	Return Period: 10 Year	Saturday, 10 / 13 / 2018

Hydrograph Report

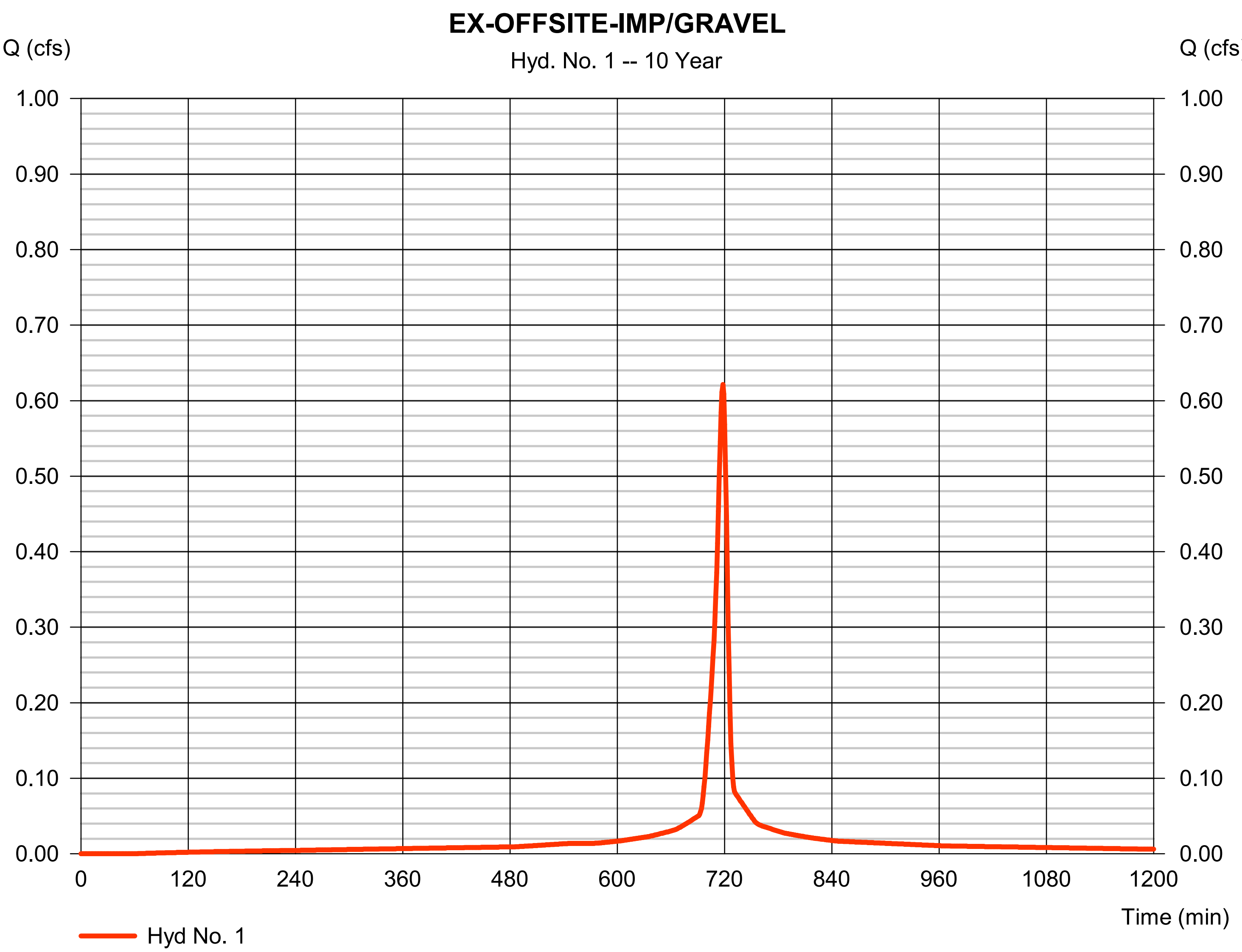
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 1

EX-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.621 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,553 cuft
Drainage area	= 0.101 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.101



Hydrograph Report

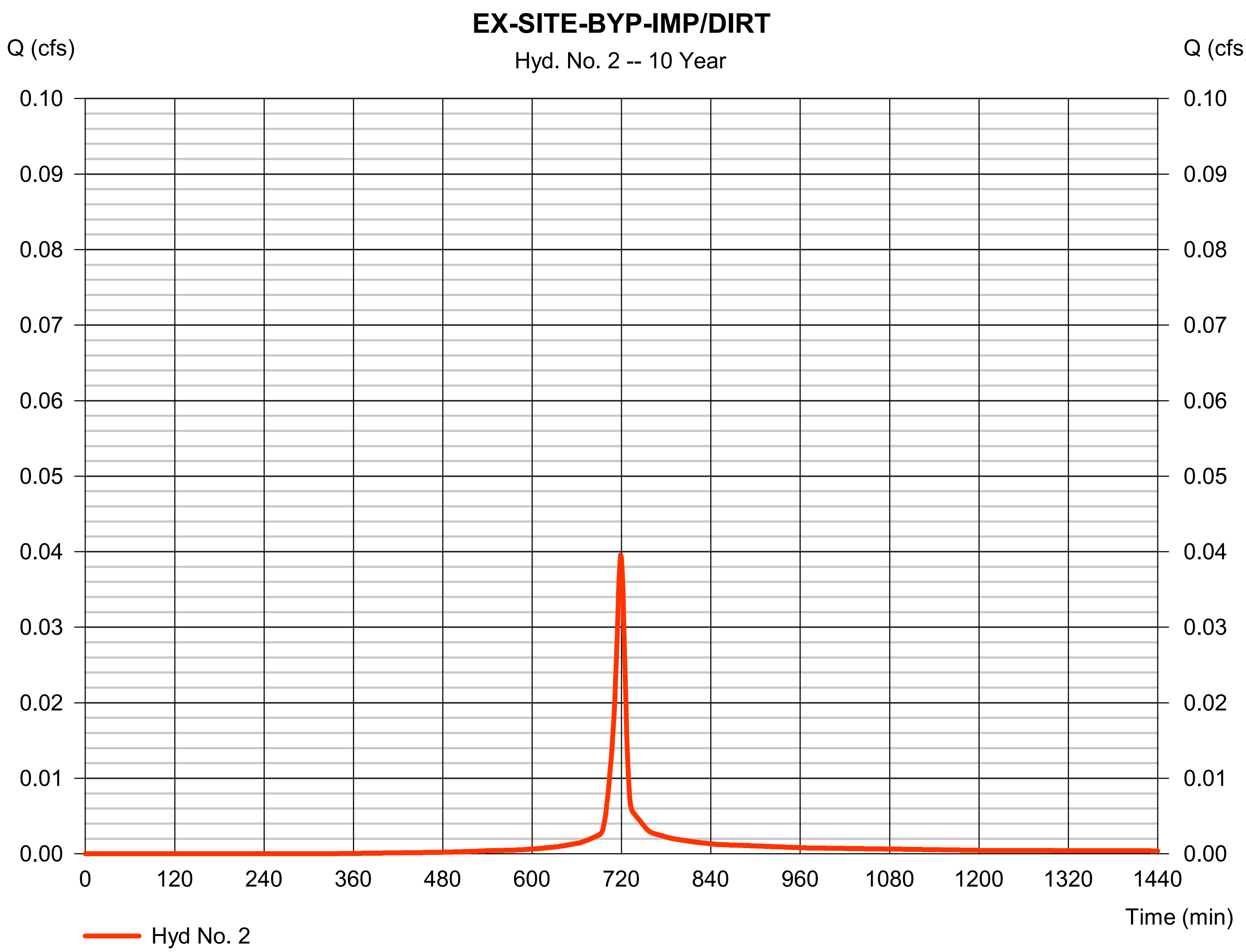
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 2

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.040 cfs
Storm frequency	= 10 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 92 cuft
Drainage area	= 0.008 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.80 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.008



Hydrograph Report

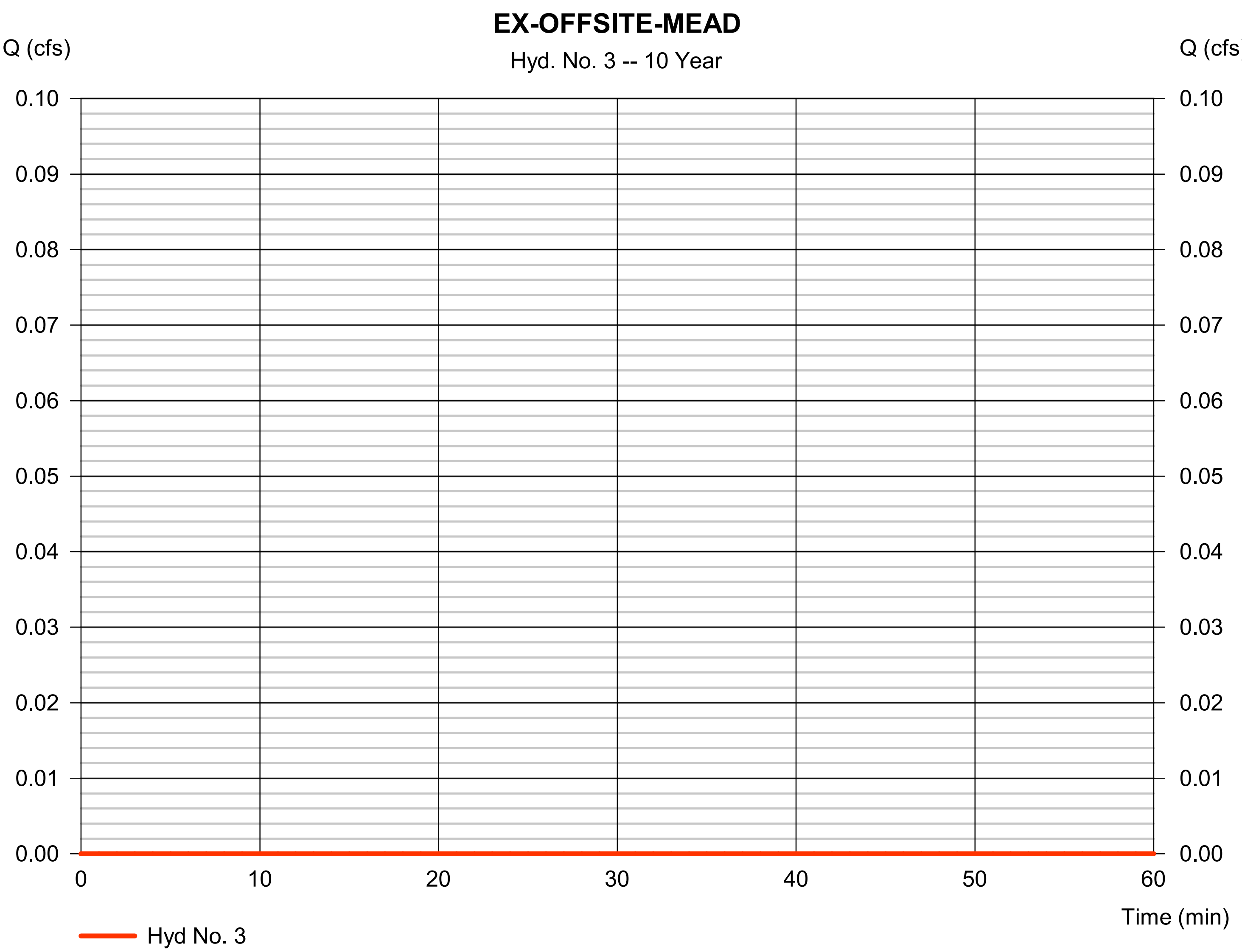
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 3

EX-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Drainage area	= 0.404 ac	Curve number	= 30*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.100 x 70)] / 0.404



Hydrograph Report

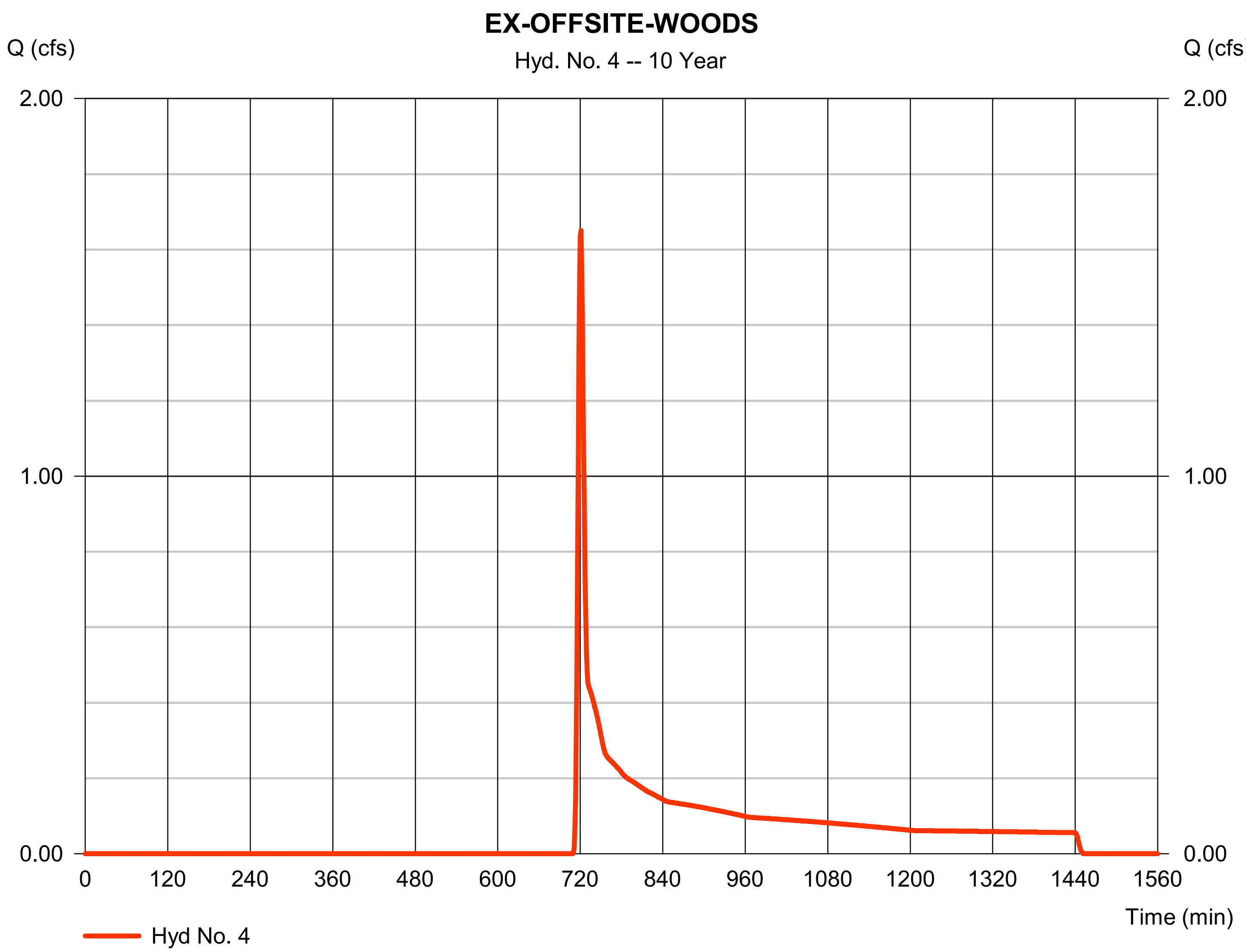
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 4

EX-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 1.650 cfs
Storm frequency	= 10 yrs	Time to peak	= 721 min
Time interval	= 1 min	Hyd. volume	= 5,494 cuft
Drainage area	= 3.210 ac	Curve number	= 49*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.562 x 70) + (1.652 x 30)] / 3.210



Hydrograph Report

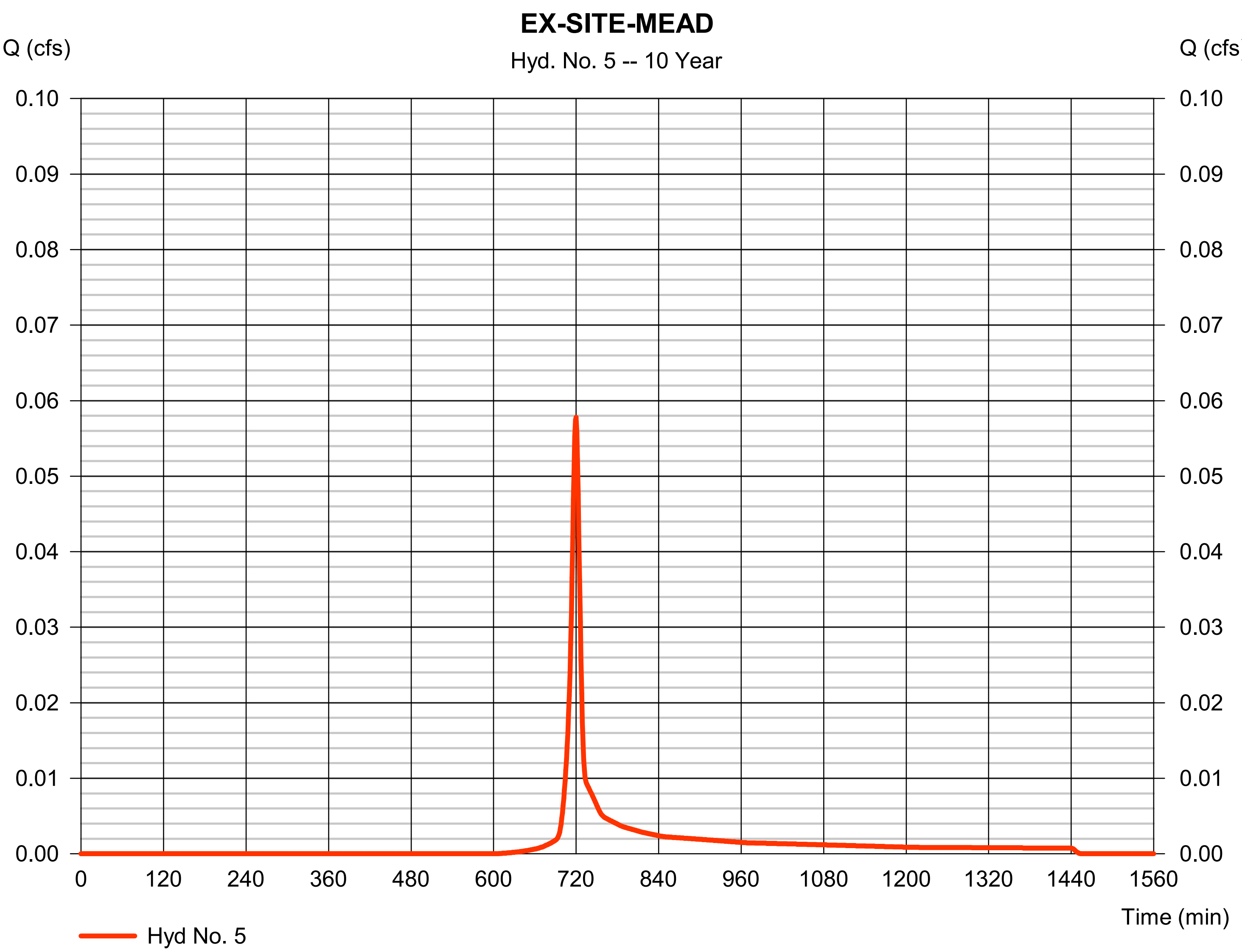
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 5

EX-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.058 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 131 cuft
Drainage area	= 0.020 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.020 x 71)] / 0.020



Hydrograph Report

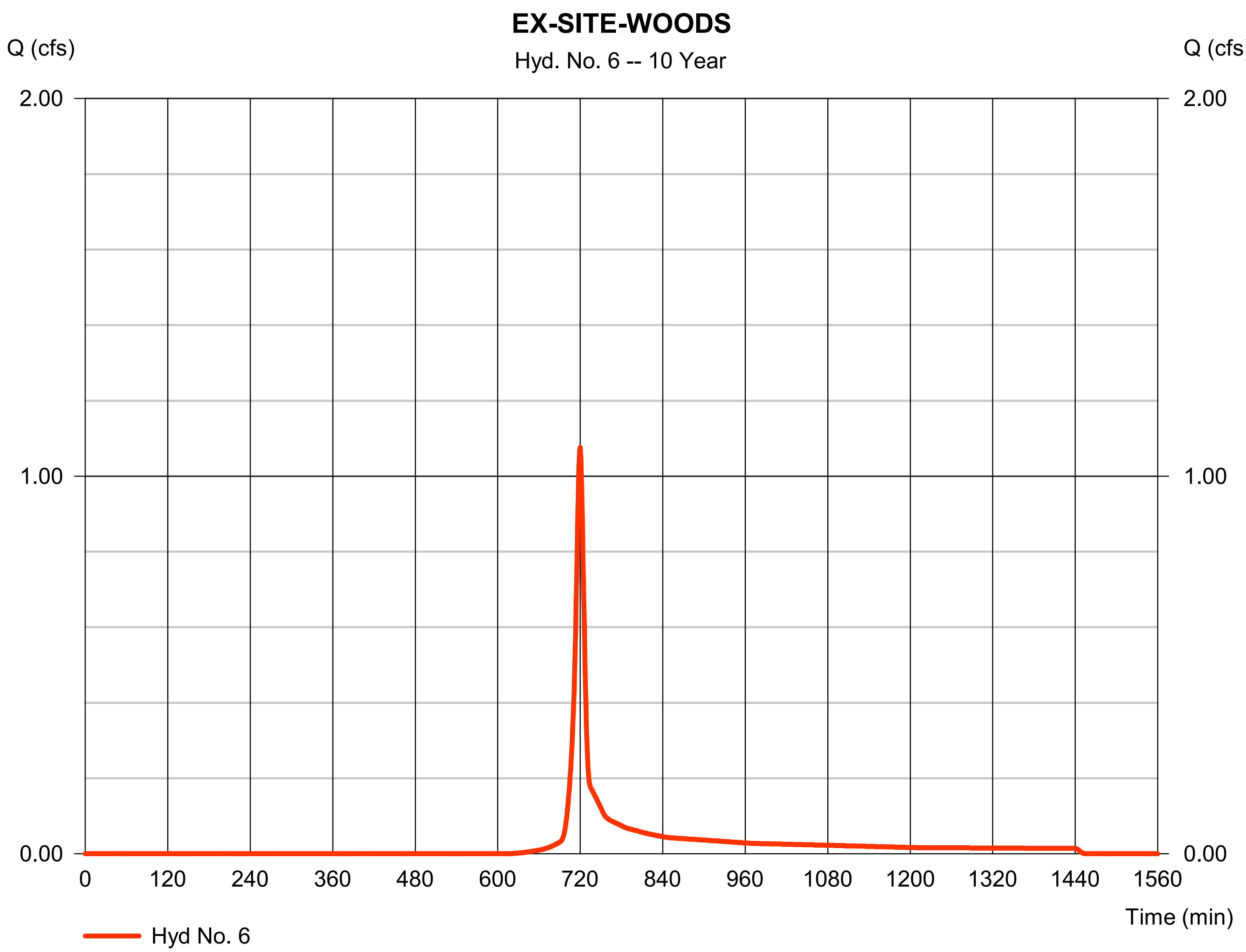
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 6

EX-SITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 1.076 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 2,444 cuft
Drainage area	= 0.389 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.240 x 70) + (0.060 x 70) + (0.460 x 70)] / 0.389



Hydrograph Report

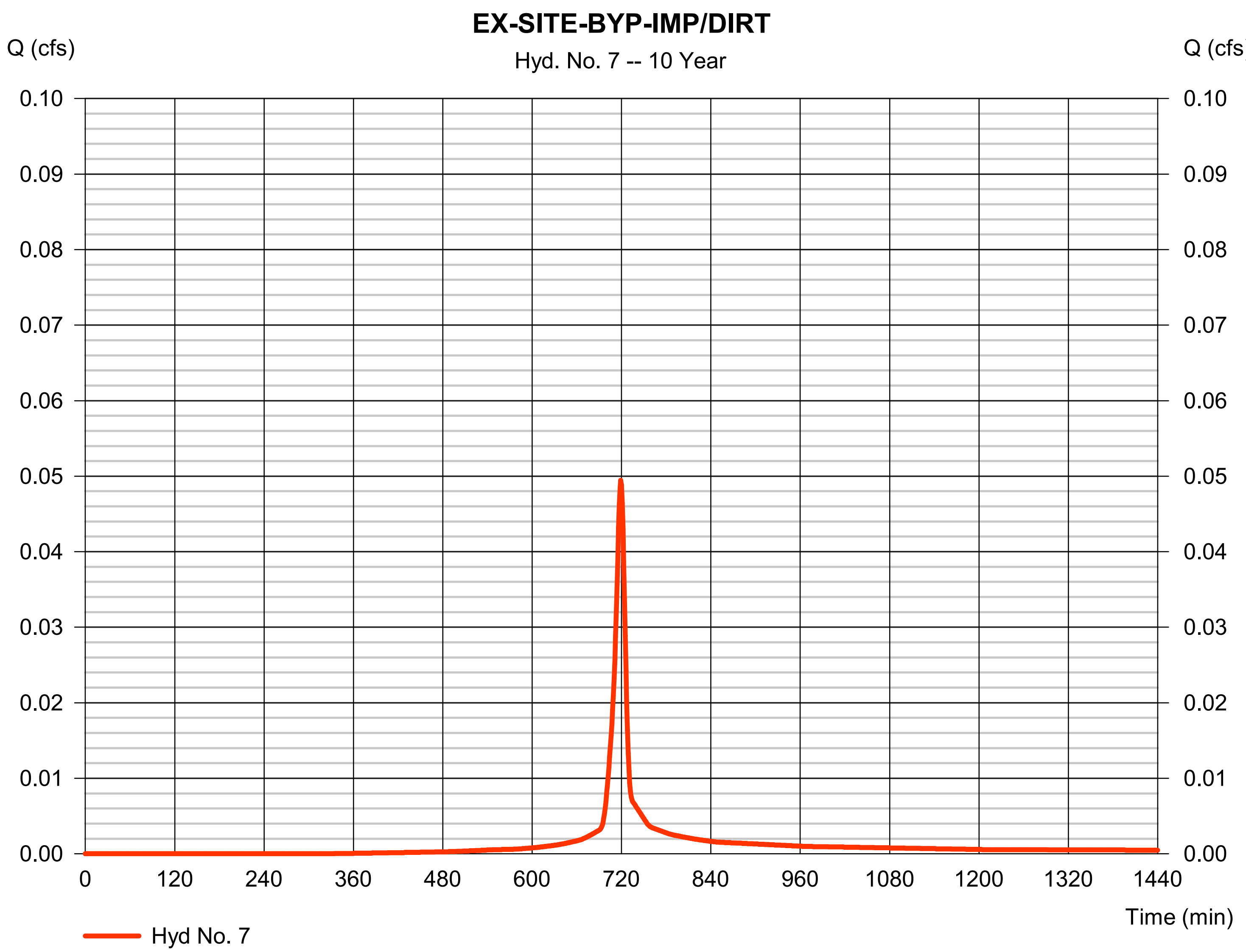
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 7

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.049 cfs
Storm frequency	= 10 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 115 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.010



Hydrograph Report

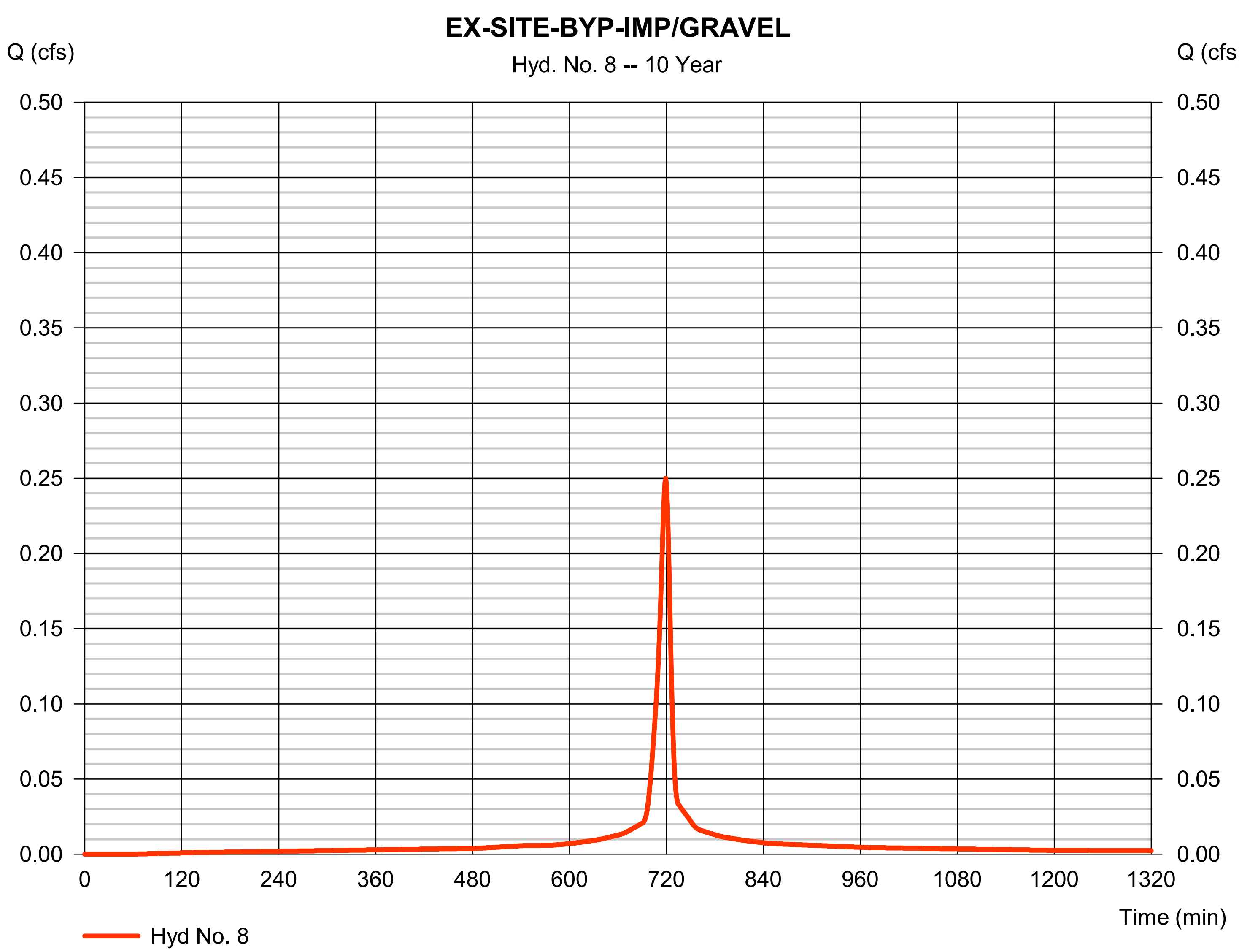
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 8

EX-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.250 cfs
Storm frequency	= 10 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 662 cuft
Drainage area	= 0.042 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.040 x 98)] / 0.042



Hydrograph Report

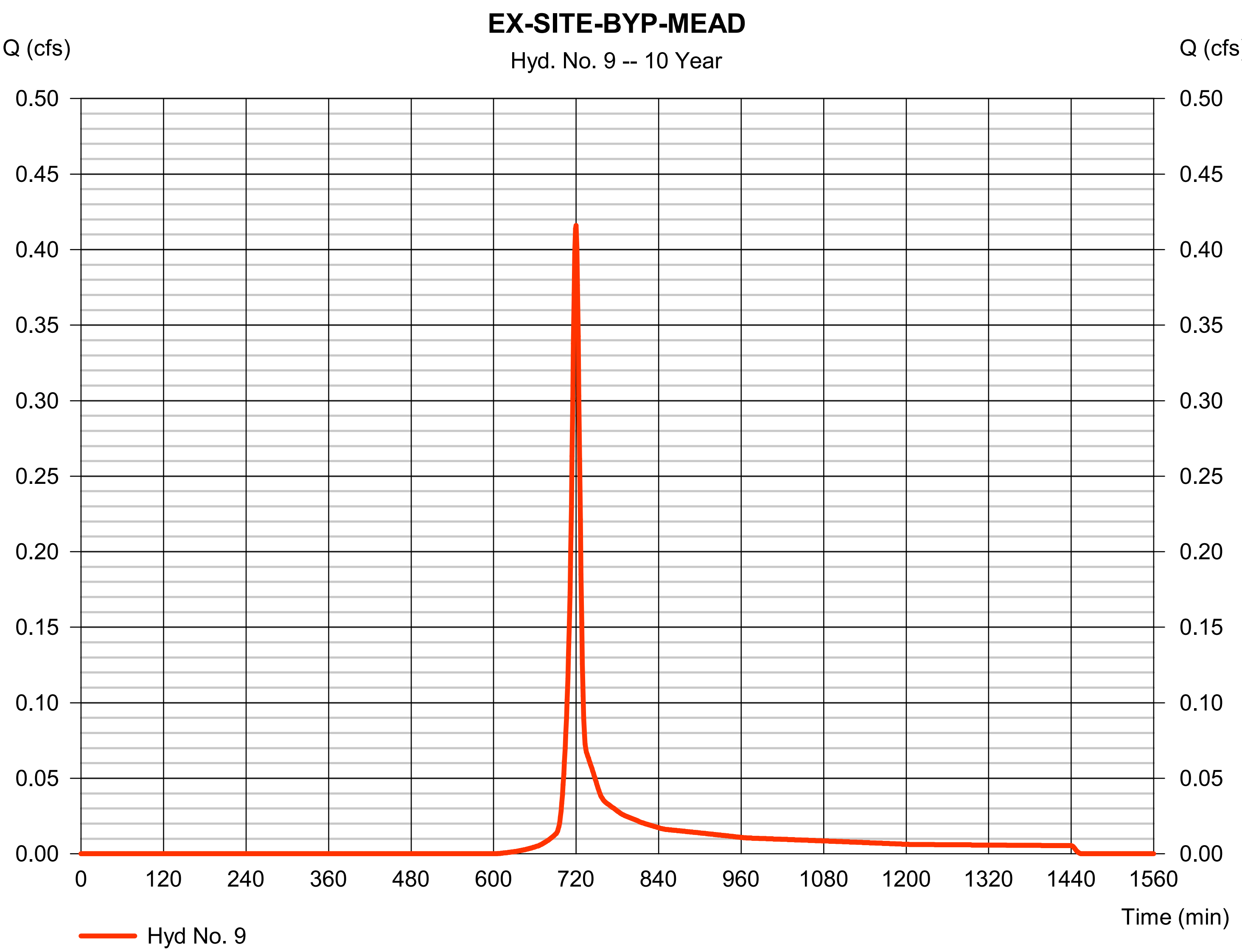
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 9

EX-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.416 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 943 cuft
Drainage area	= 0.144 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.190 x 71)] / 0.144



Hydrograph Report

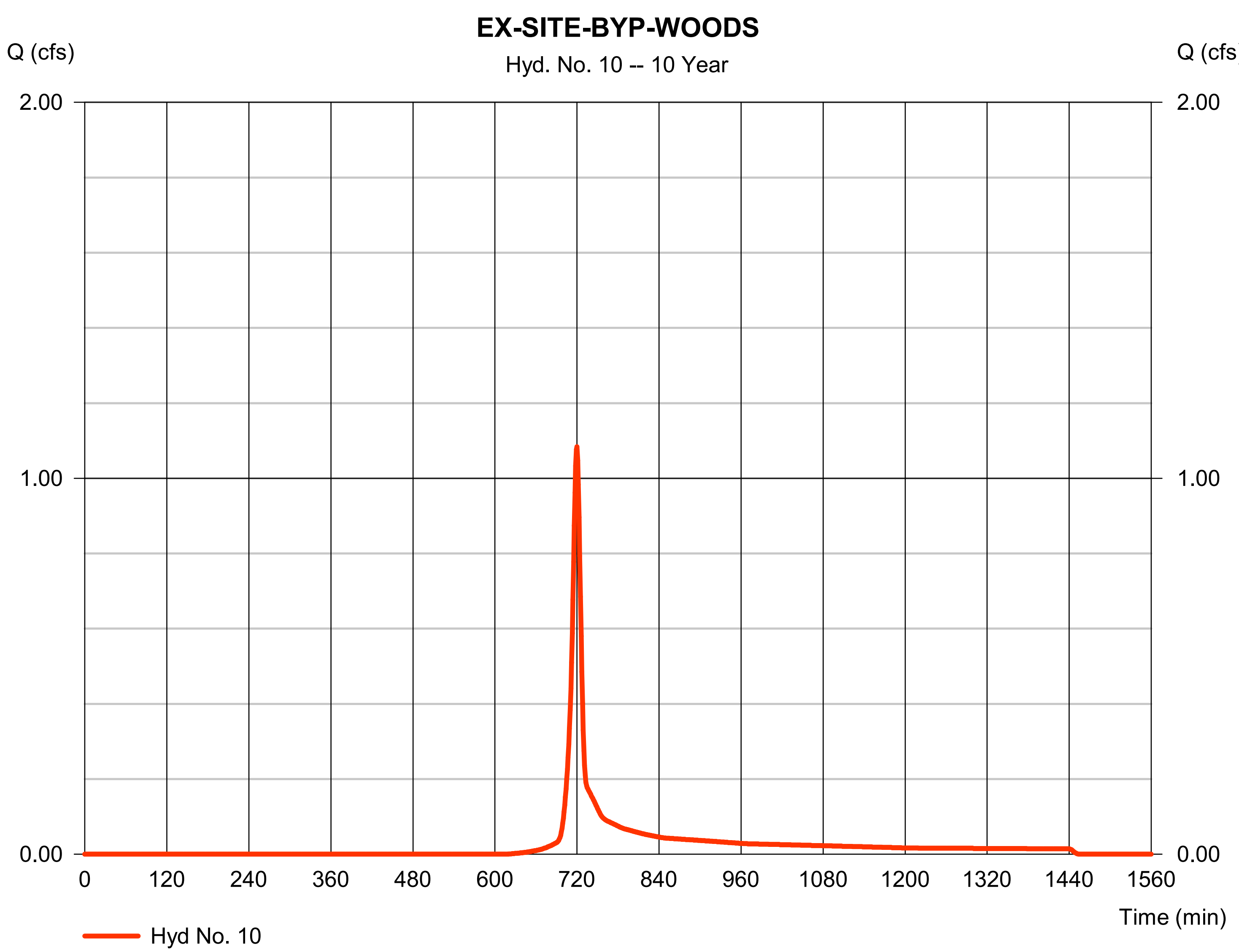
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 10

EX-SITE-BYP-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 1.084 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 2,463 cuft
Drainage area	= 0.392 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 70) + (0.110 x 70) + (0.090 x 70)] / 0.392



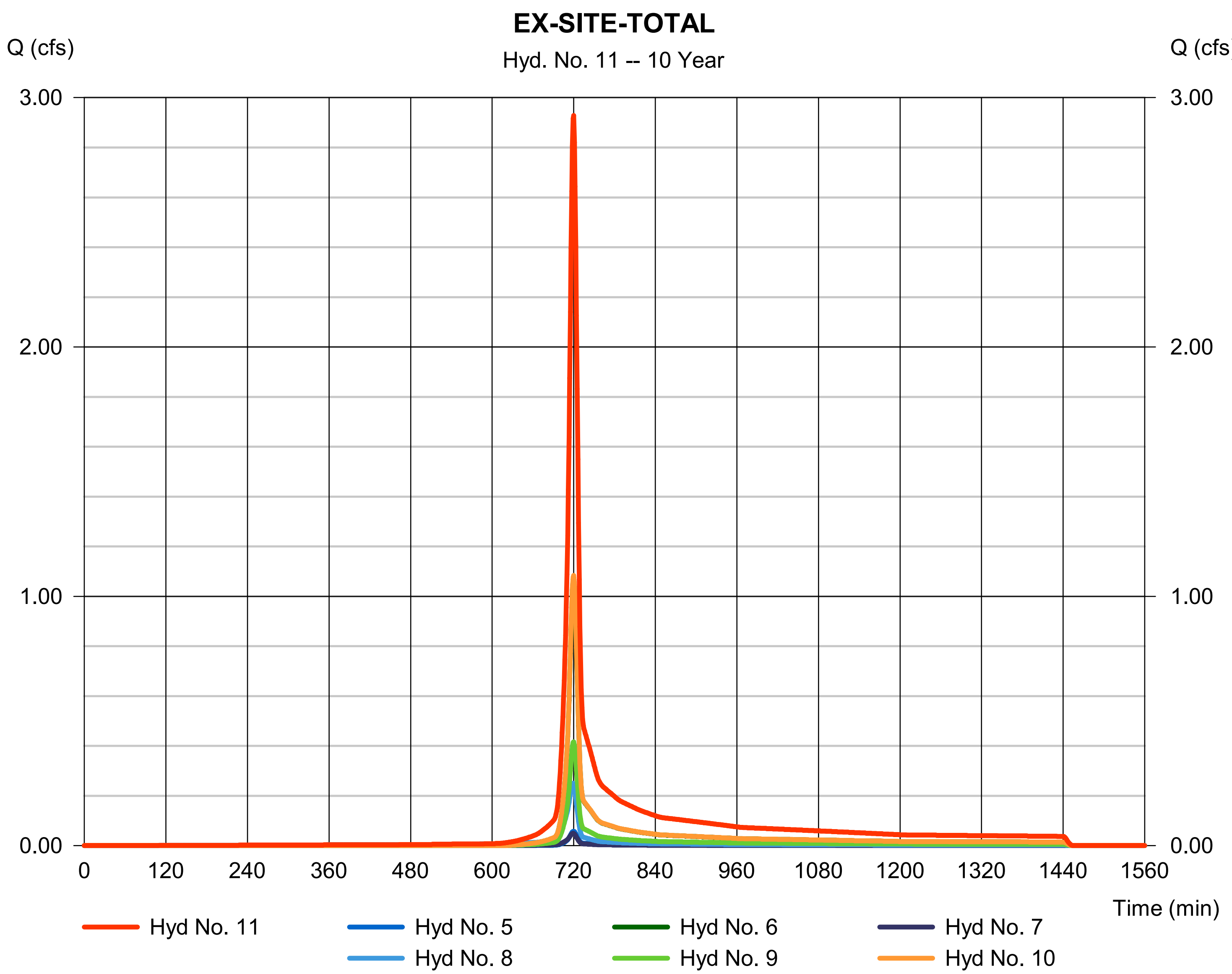
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 11

EX-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 2.928 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 6,758 cuft
Inflow hyds.	= 5, 6, 7, 8, 9, 10	Contrib. drain. area	= 0.997 ac



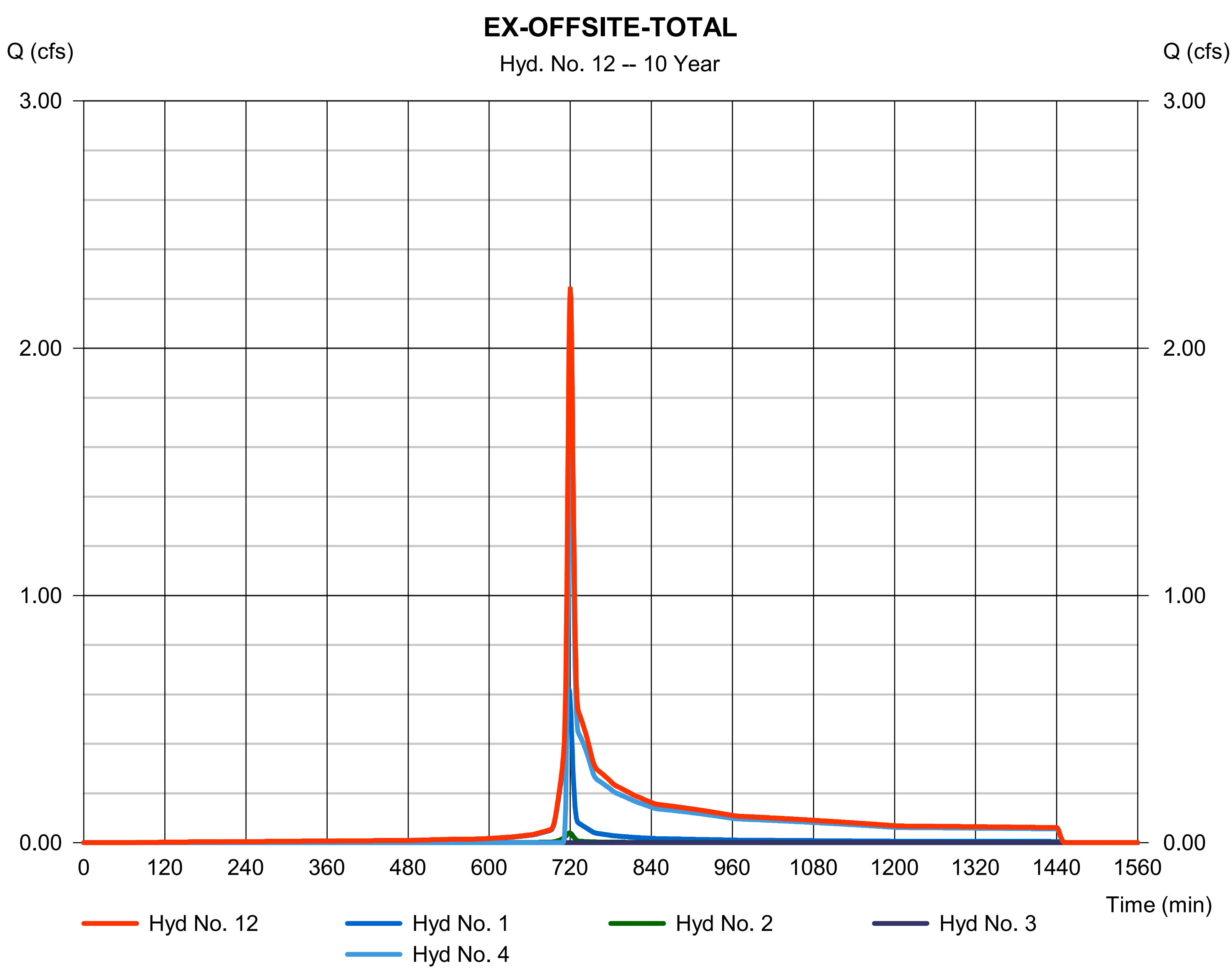
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 12

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 2.241 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 7,139 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 3.723 ac



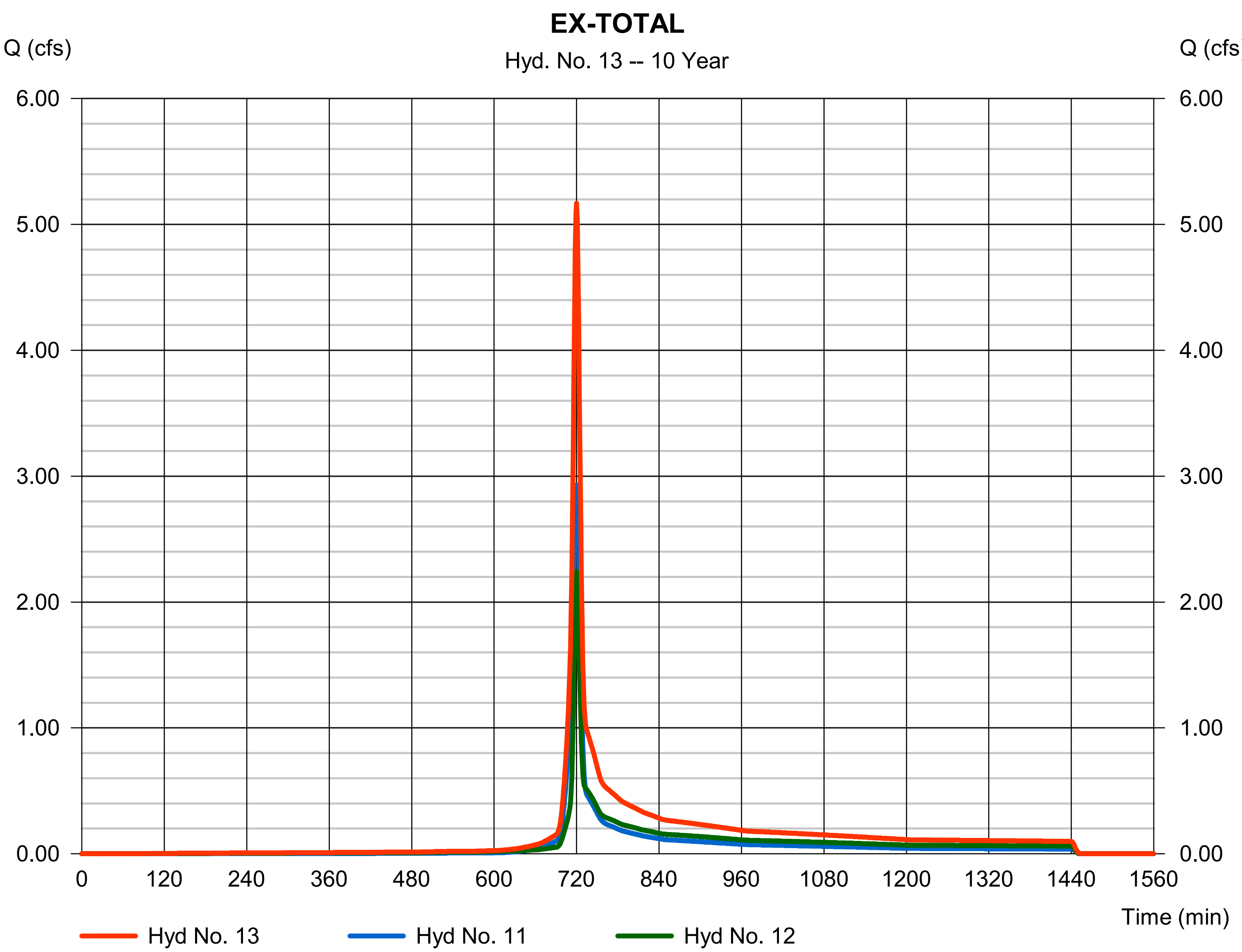
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 13

EX-TOTAL

Hydrograph type	= Combine	Peak discharge	= 5.169 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 13,897 cuft
Inflow hyds.	= 11, 12	Contrib. drain. area	= 0.000 ac



Hydrograph Report

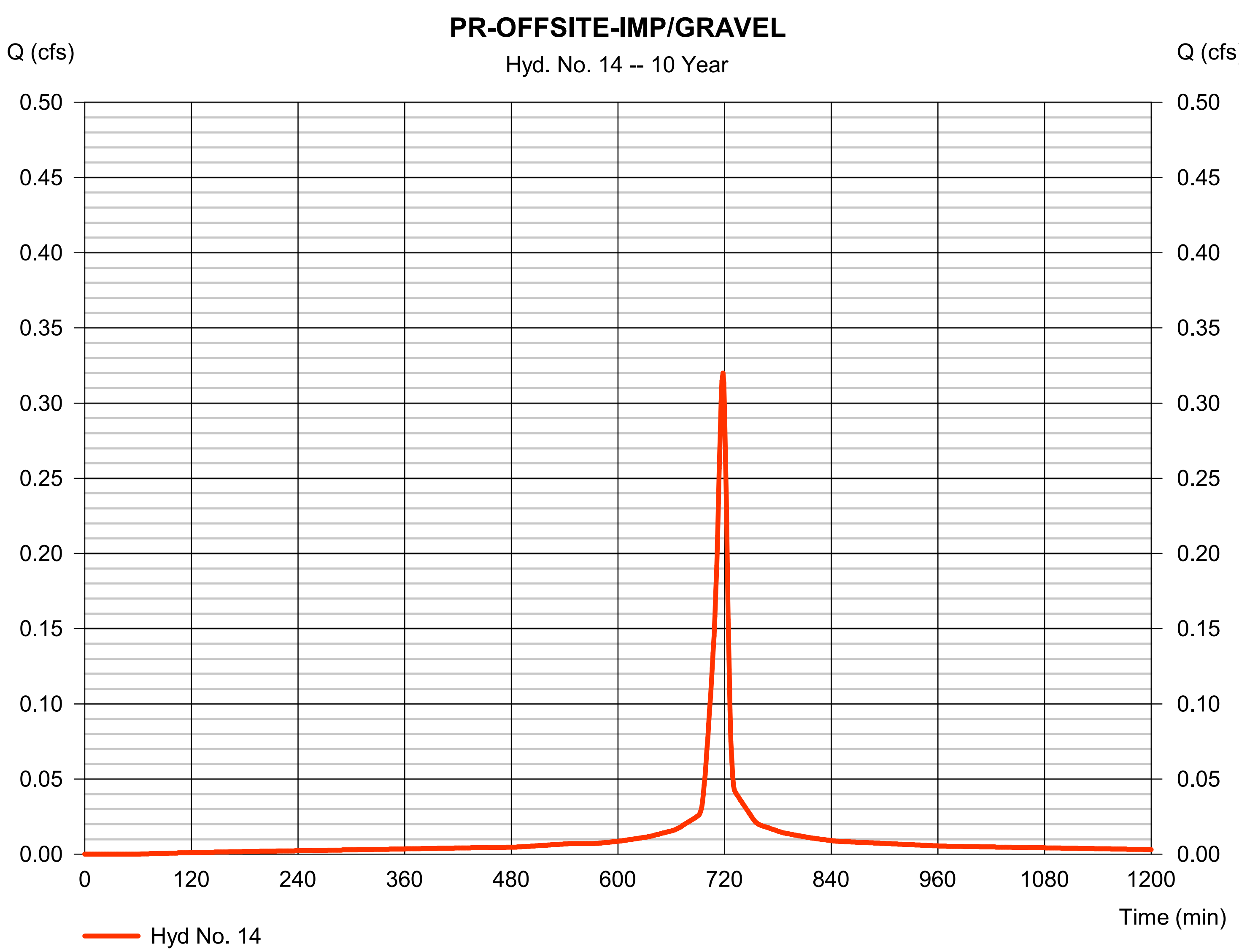
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 14

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.320 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 799 cuft
Drainage area	= 0.052 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.013 x 98)] / 0.052



Hydrograph Report

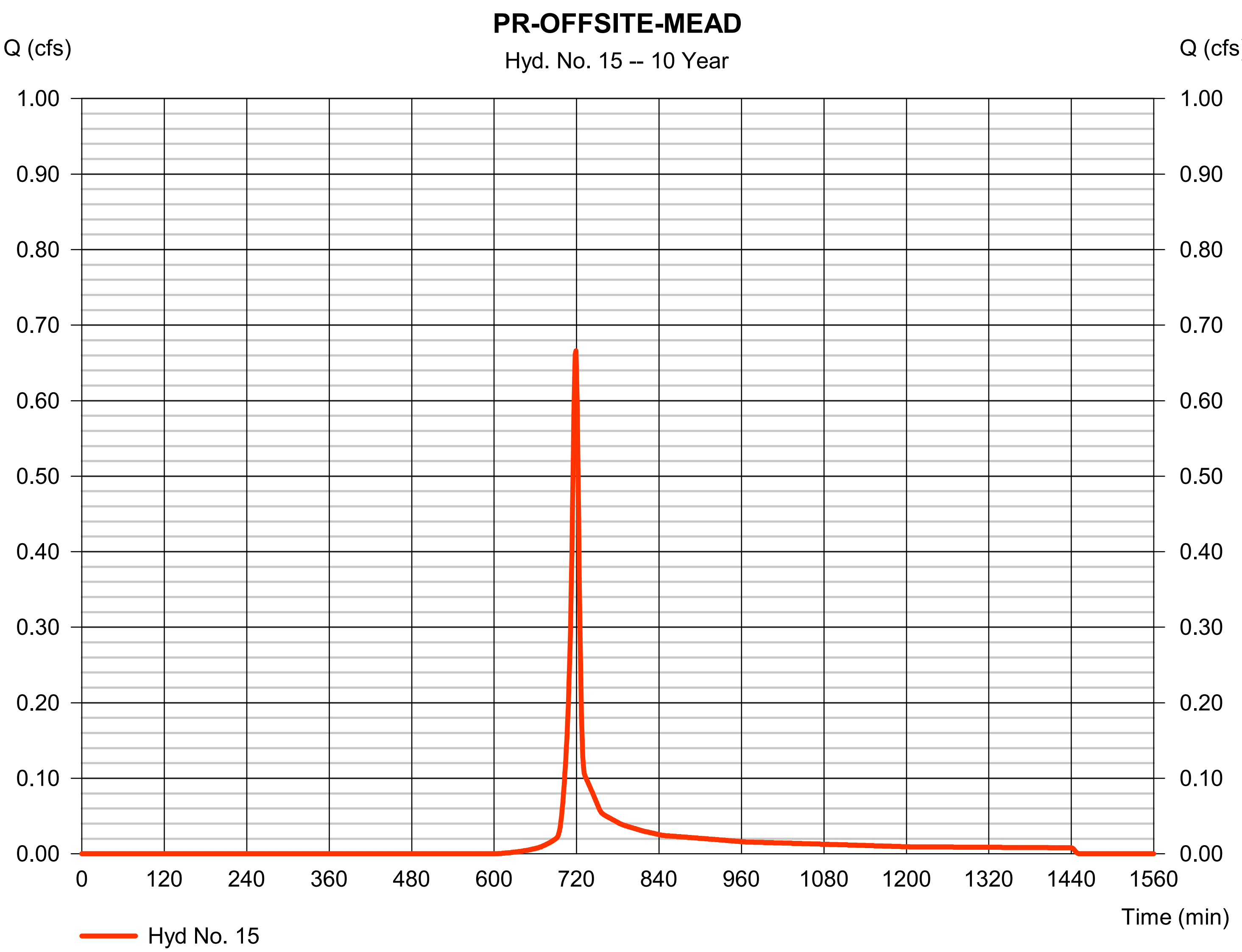
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 15

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.666 cfs
Storm frequency	= 10 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 1,405 cuft
Drainage area	= 0.220 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.034 x 71) + (0.099 x 71) + (0.084 x 71) + (0.001 x 30)] / 0.220



Hydrograph Report

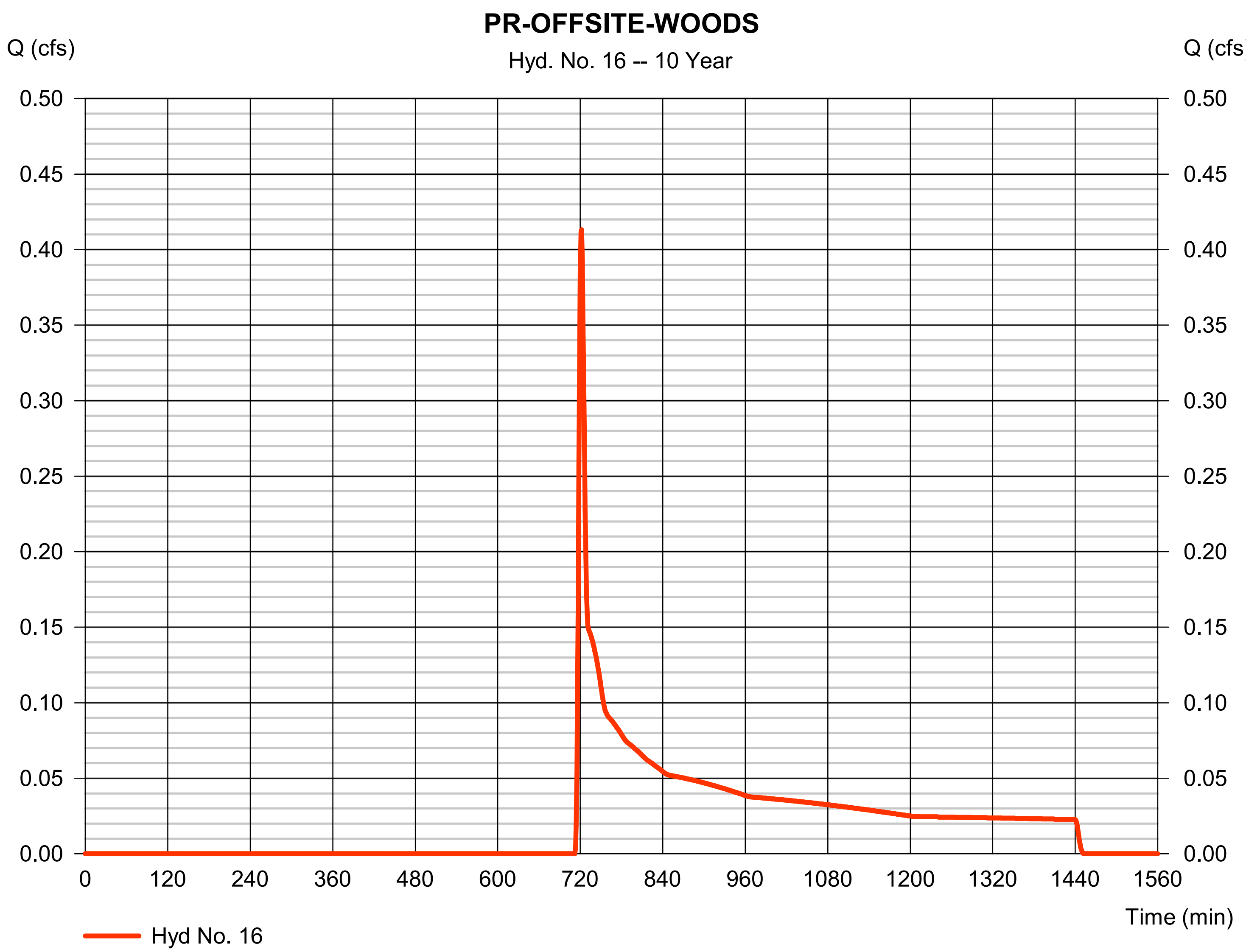
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 16

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.413 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 1,956 cuft
Drainage area	= 1.550 ac	Curve number	= 46*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.602 x 70) + (0.951 x 30)] / 1.550



Hydrograph Report

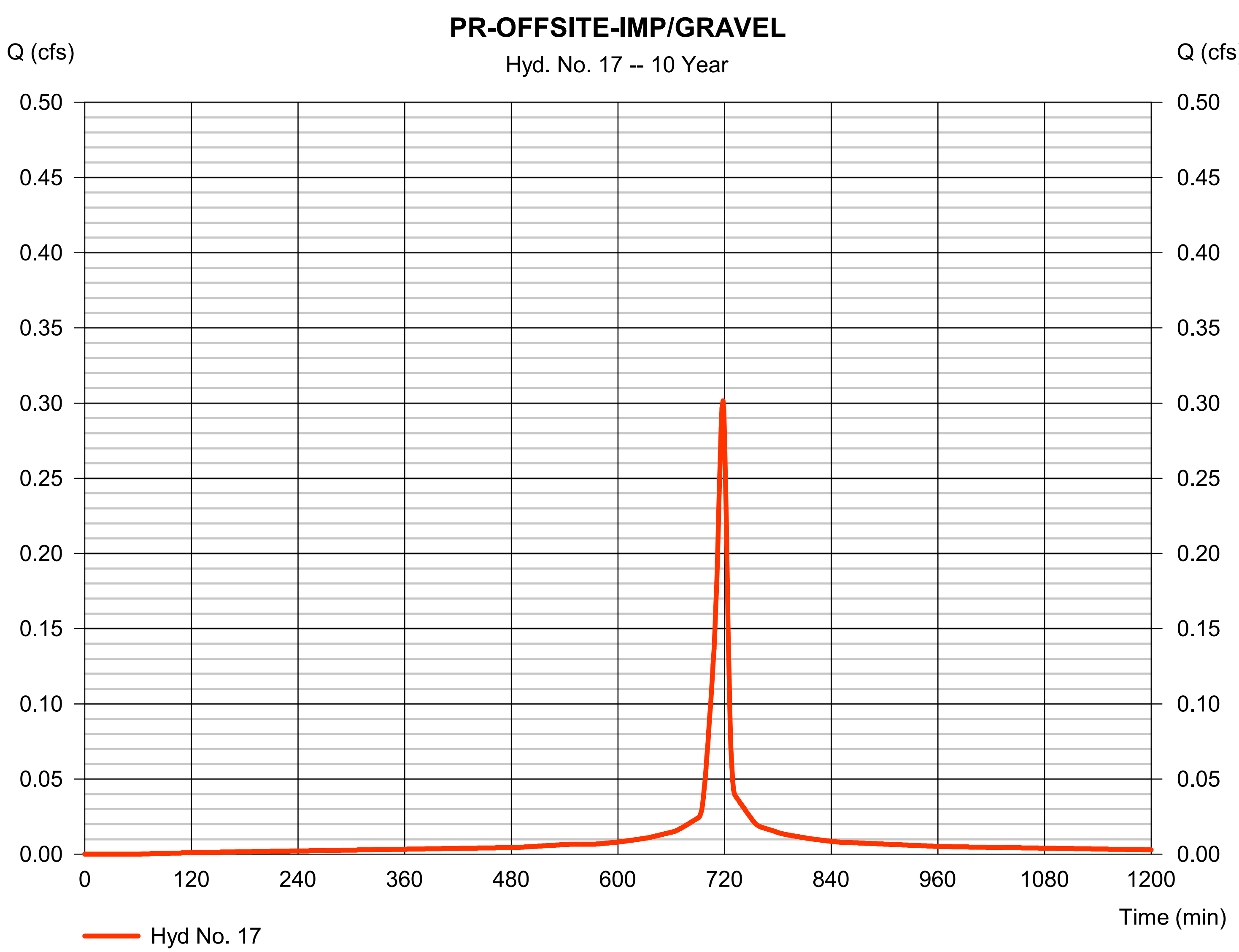
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 17

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.302 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 753 cuft
Drainage area	= 0.049 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.049



Hydrograph Report

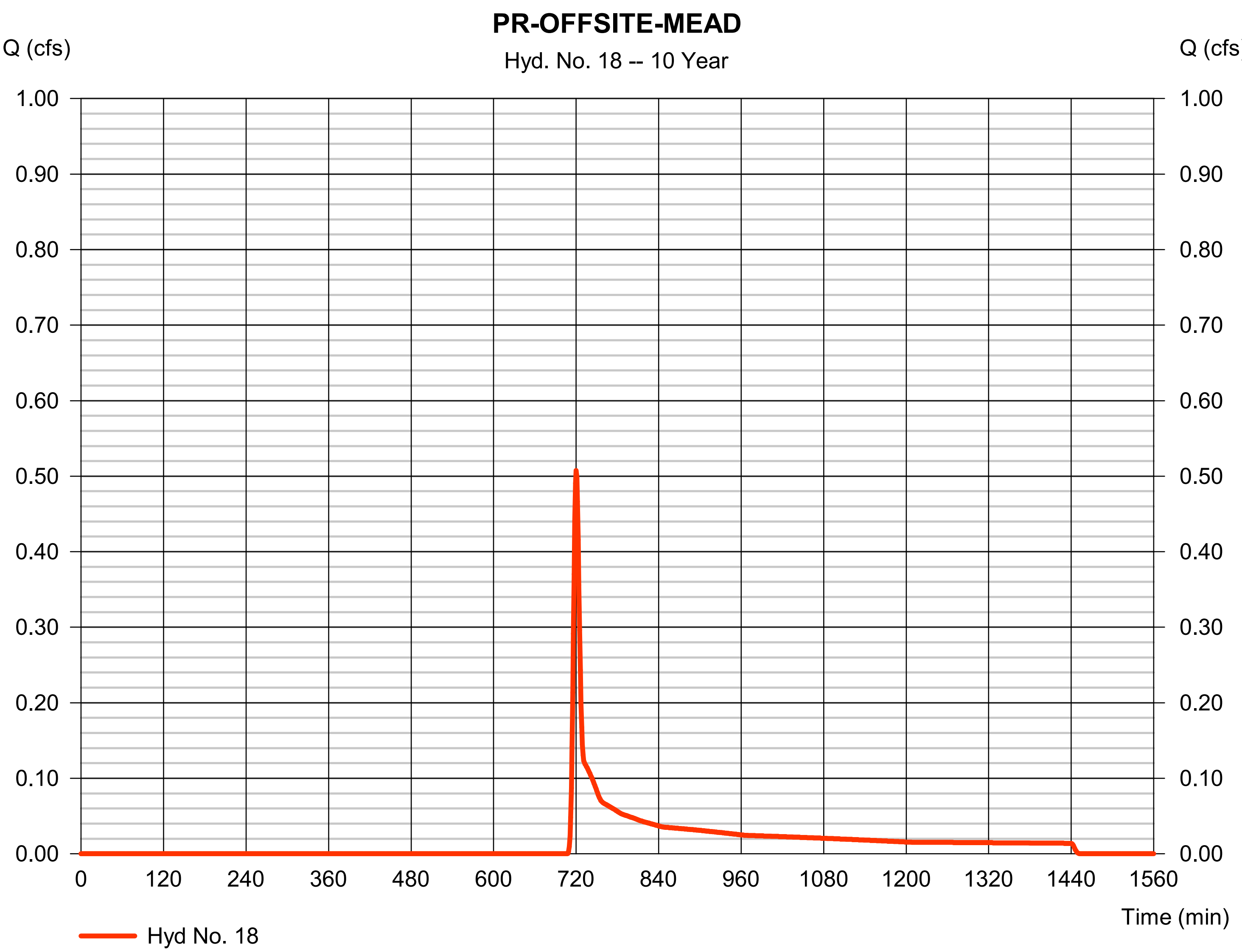
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 18

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.507 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 1,468 cuft
Drainage area	= 0.720 ac	Curve number	= 51*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.037 x 71) + (0.331 x 71) + (0.252 x 30) + (0.103 x 30)] / 0.720



Hydrograph Report

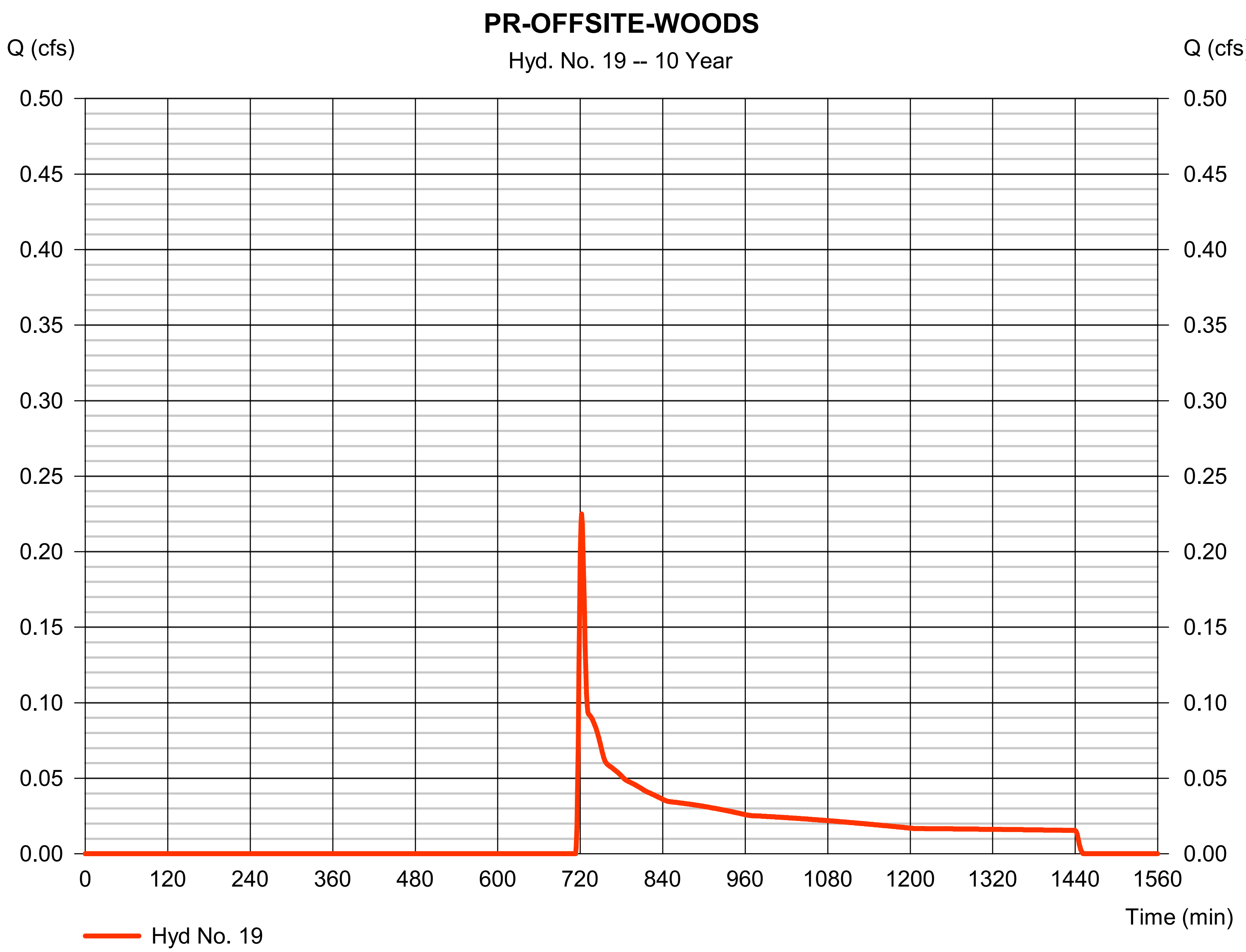
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 19

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.225 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 1,270 cuft
Drainage area	= 1.130 ac	Curve number	= 45*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.180 x 70) + (0.700 x 30)] / 1.130



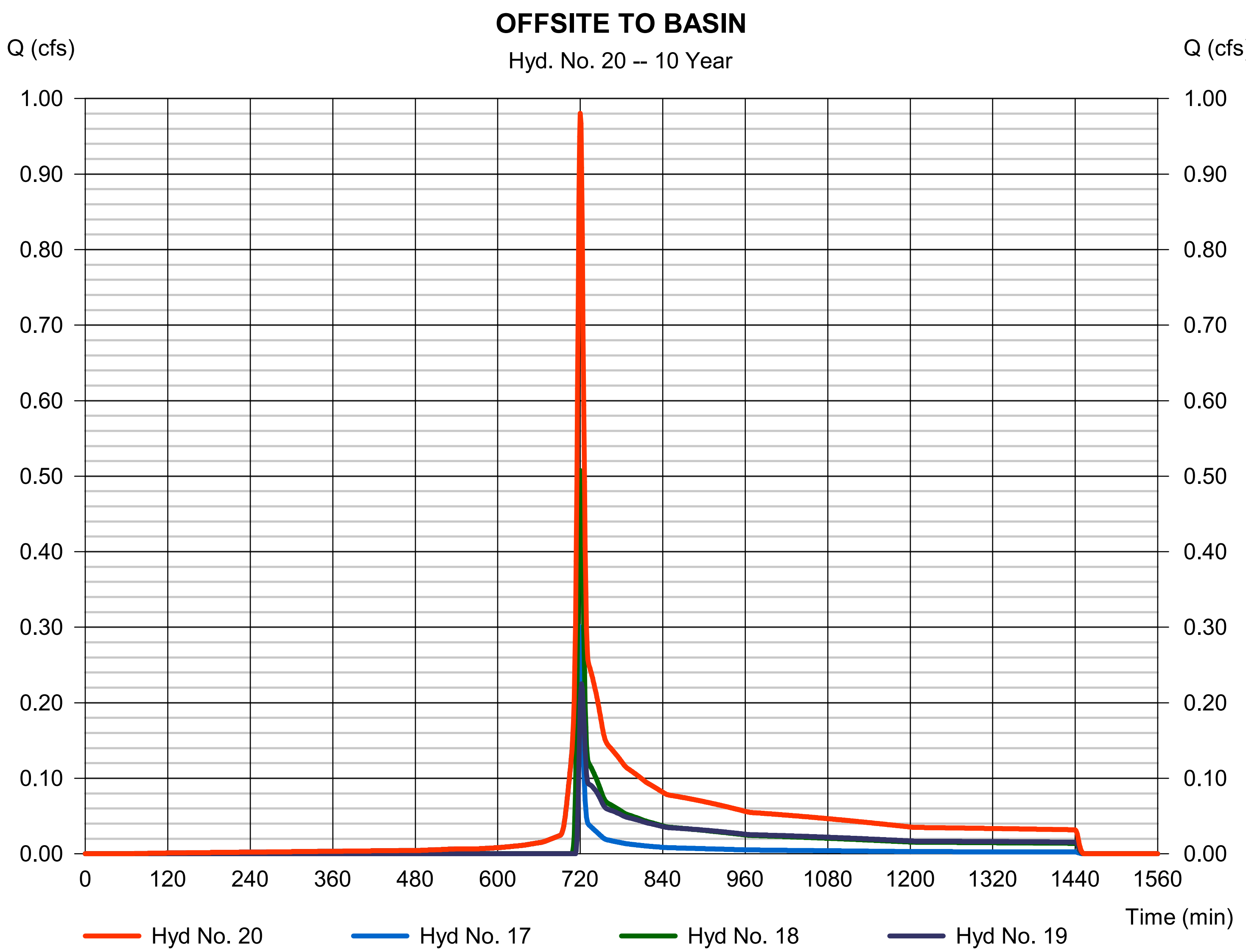
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 20

OFFSITE TO BASIN

Hydrograph type	= Combine	Peak discharge	= 0.980 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 3,491 cuft
Inflow hyds.	= 17, 18, 19	Contrib. drain. area	= 1.899 ac



Hydrograph Report

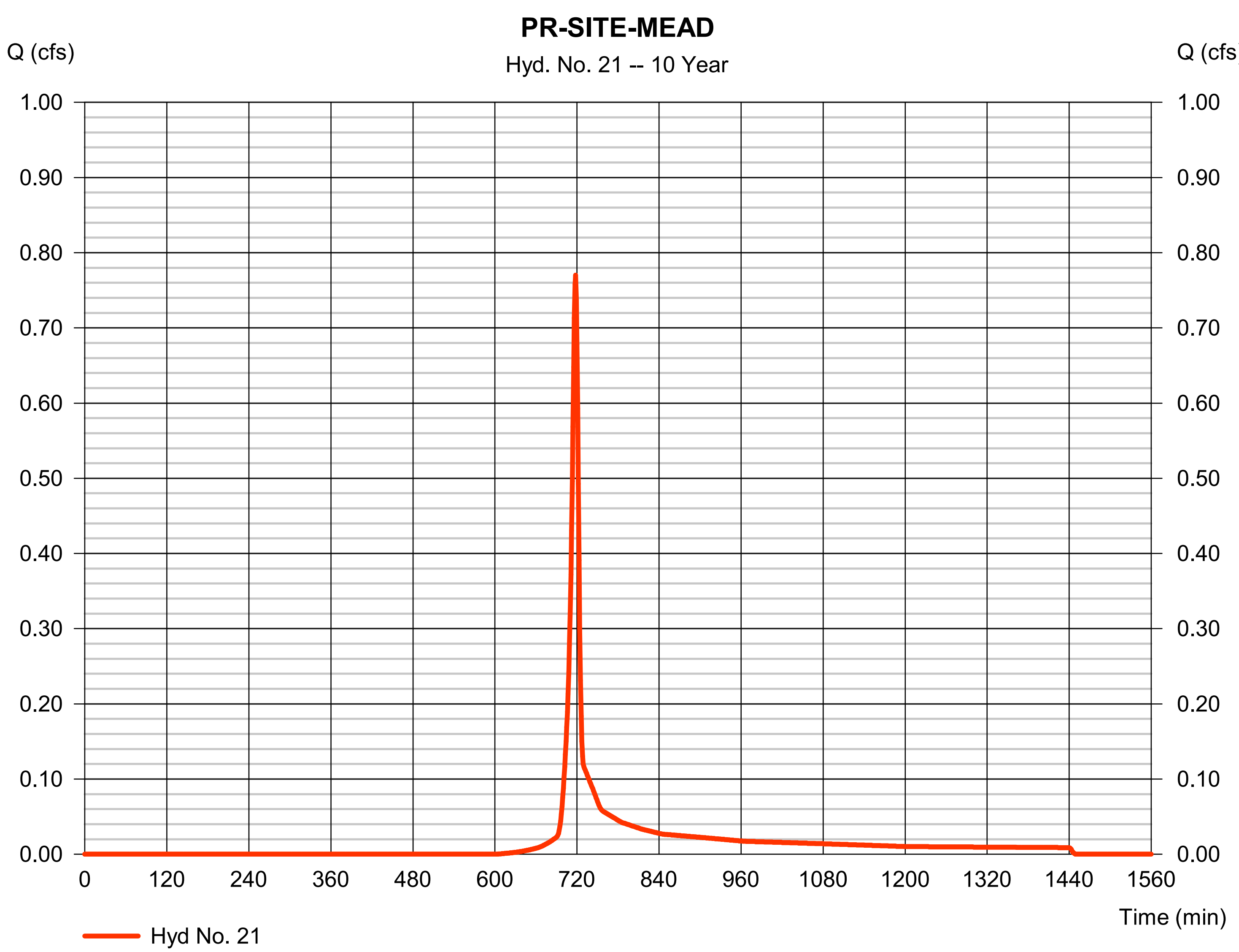
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 21

PR-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.770 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,547 cuft
Drainage area	= 0.229 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.10 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.134 x 71) + (0.003 x 71) + (0.435 x 71)] / 0.229



Hydrograph Report

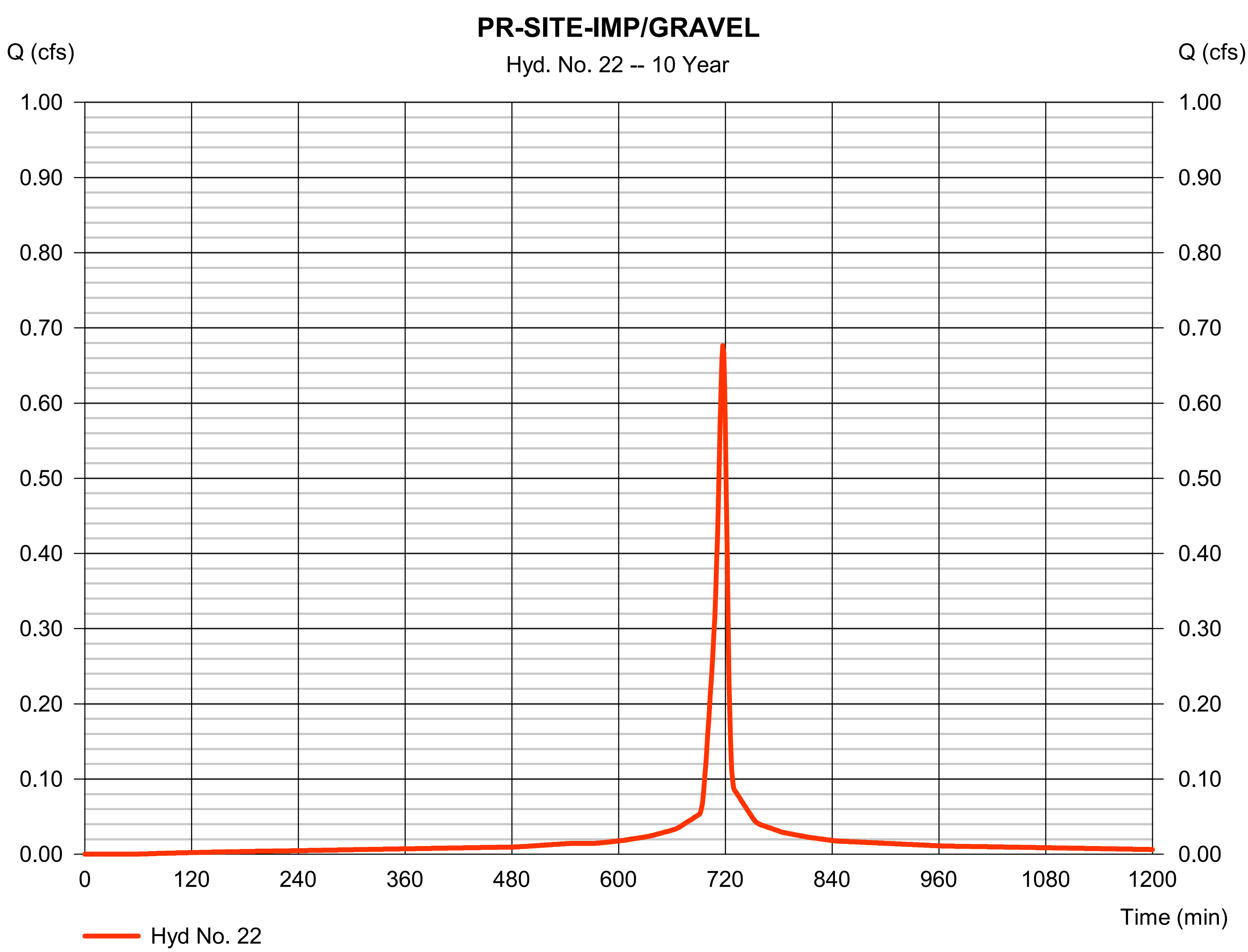
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 22

PR-SITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.676 cfs
Storm frequency	= 10 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 1,626 cuft
Drainage area	= 0.100 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.053 x 98) + (0.008 x 98)] / 0.100



Hydrograph Report

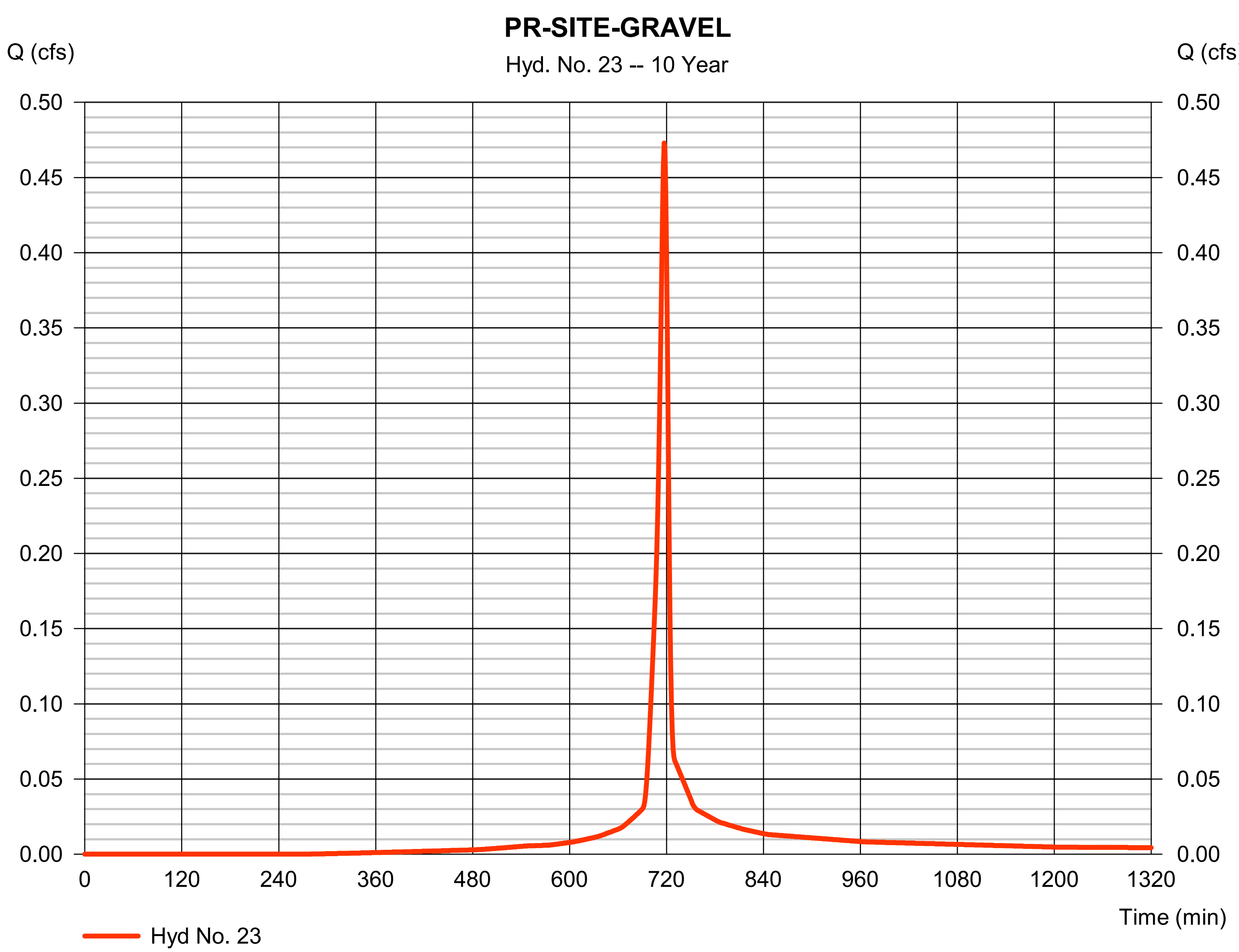
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 23

PR-SITE-GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.473 cfs
Storm frequency	= 10 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 1,010 cuft
Drainage area	= 0.080 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.064 x 89) + (0.003 x 89) + (0.013 x 89)] / 0.080



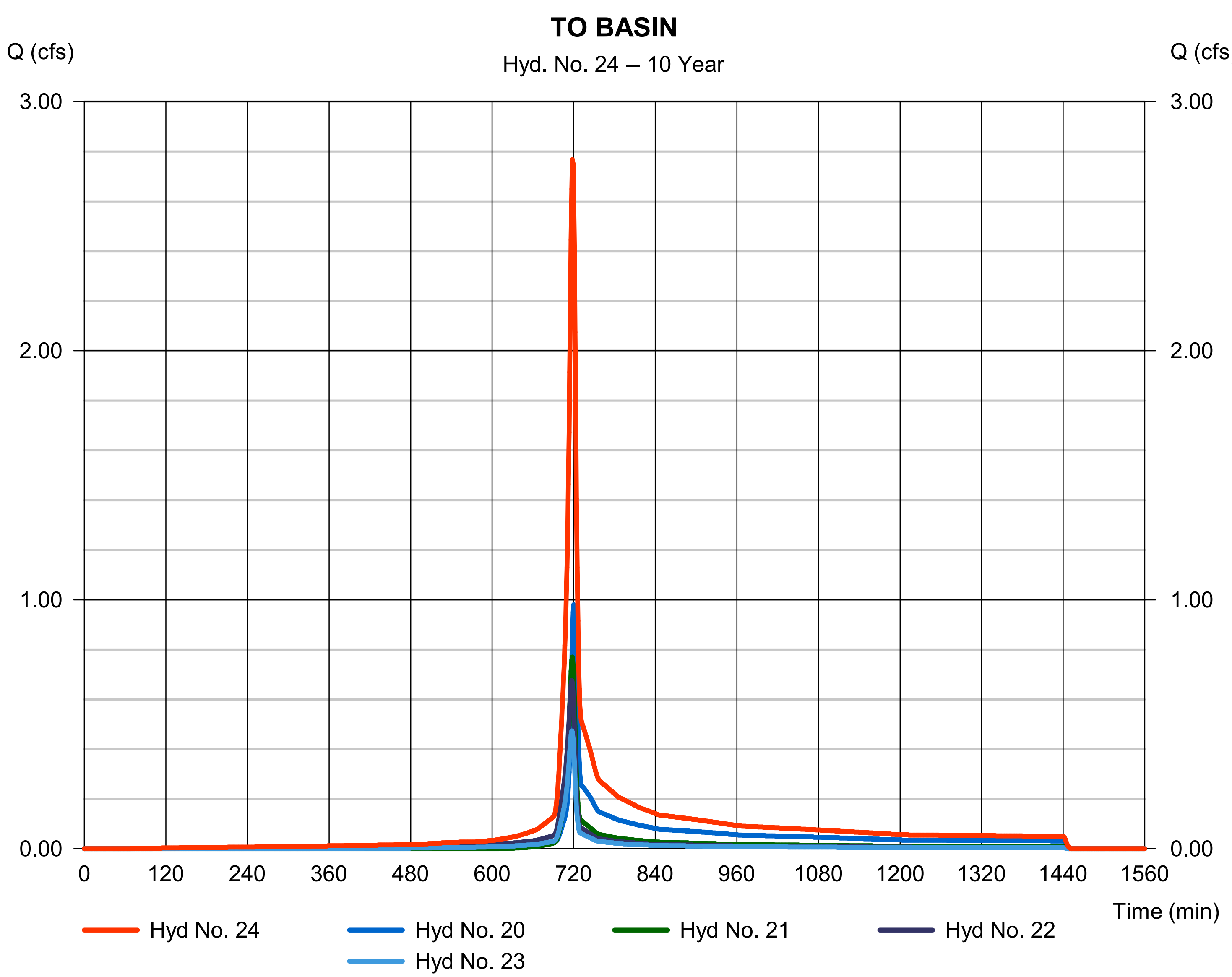
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 24

TO BASIN

Hydrograph type	= Combine	Peak discharge	= 2.767 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 7,674 cuft
Inflow hyds.	= 20, 21, 22, 23	Contrib. drain. area	= 0.409 ac



Hydrograph Report

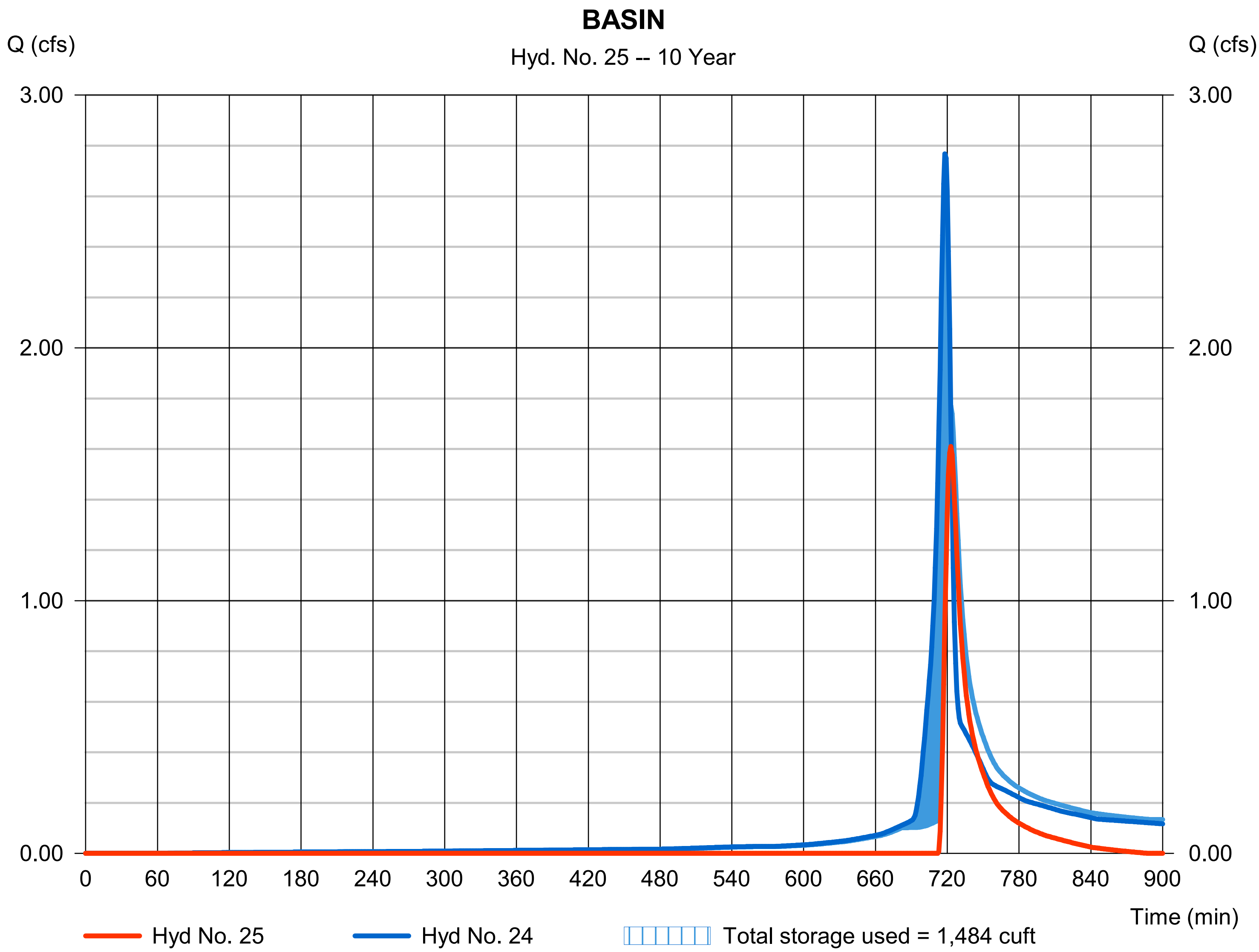
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 25

BASIN

Hydrograph type	= Reservoir	Peak discharge	= 1.609 cfs
Storm frequency	= 10 yrs	Time to peak	= 723 min
Time interval	= 1 min	Hyd. volume	= 2,343 cuft
Inflow hyd. No.	= 24 - TO BASIN	Max. Elevation	= 640.64 ft
Reservoir name	= UG N-12 Perforated Pipe System	Max. Storage	= 1,484 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

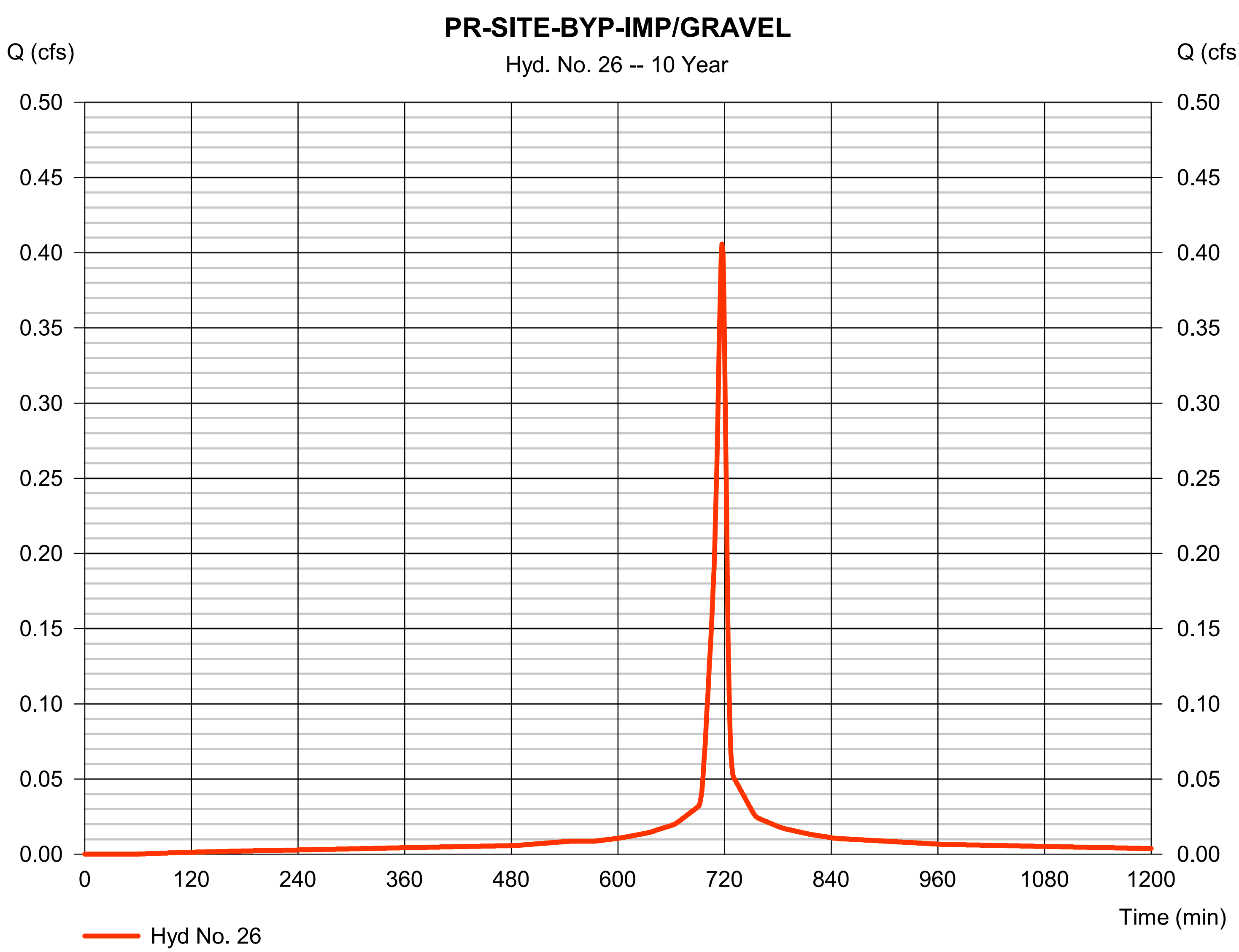
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 26

PR-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.406 cfs
Storm frequency	= 10 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 976 cuft
Drainage area	= 0.060 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.060 x 98)] / 0.060



Hydrograph Report

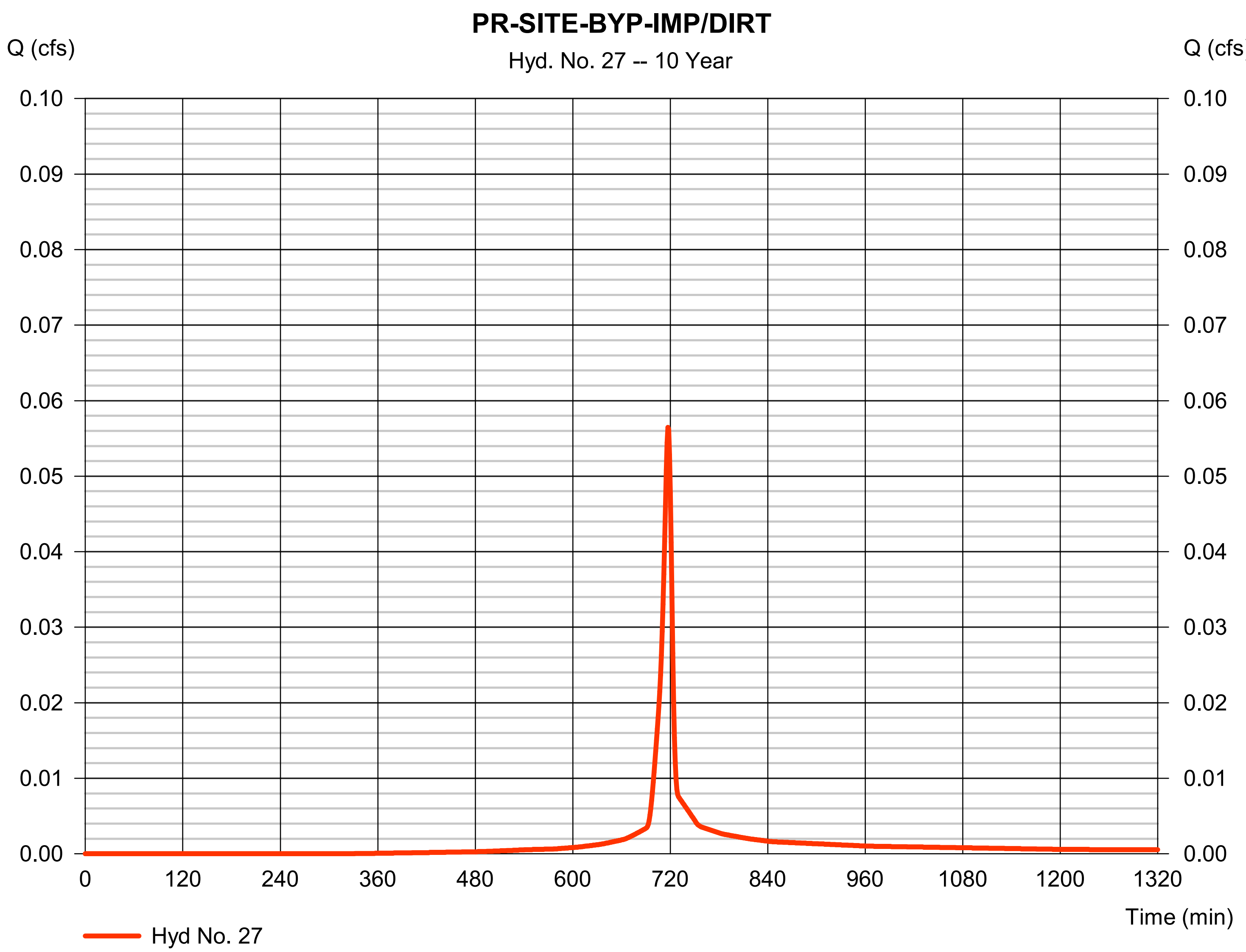
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 27

PR-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.056 cfs
Storm frequency	= 10 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 119 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.008 x 87)] / 0.010



Hydrograph Report

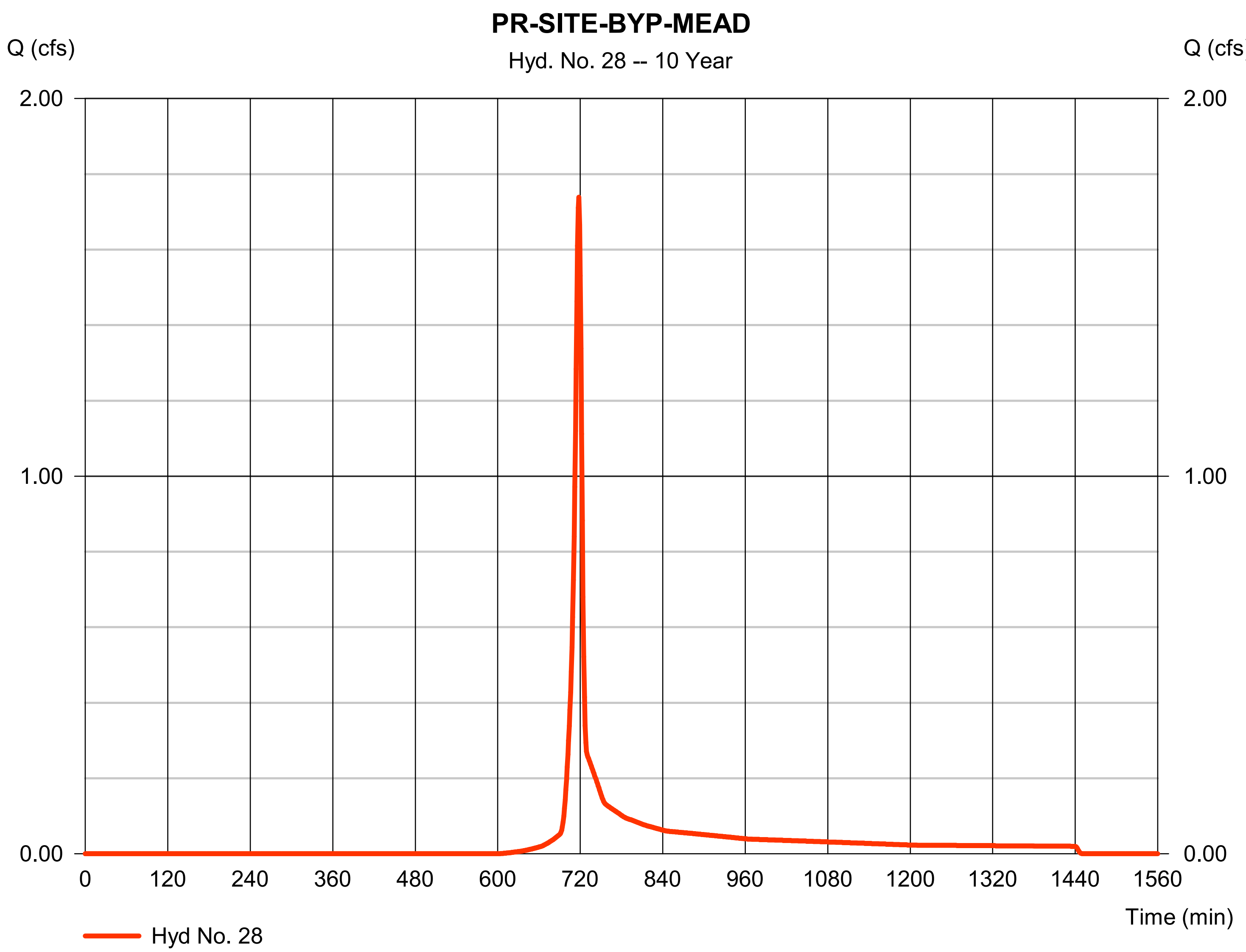
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 28

PR-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 1.739 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 3,492 cuft
Drainage area	= 0.517 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 4.58 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 71) + (0.290 x 71) + (0.085 x 71)] / 0.517



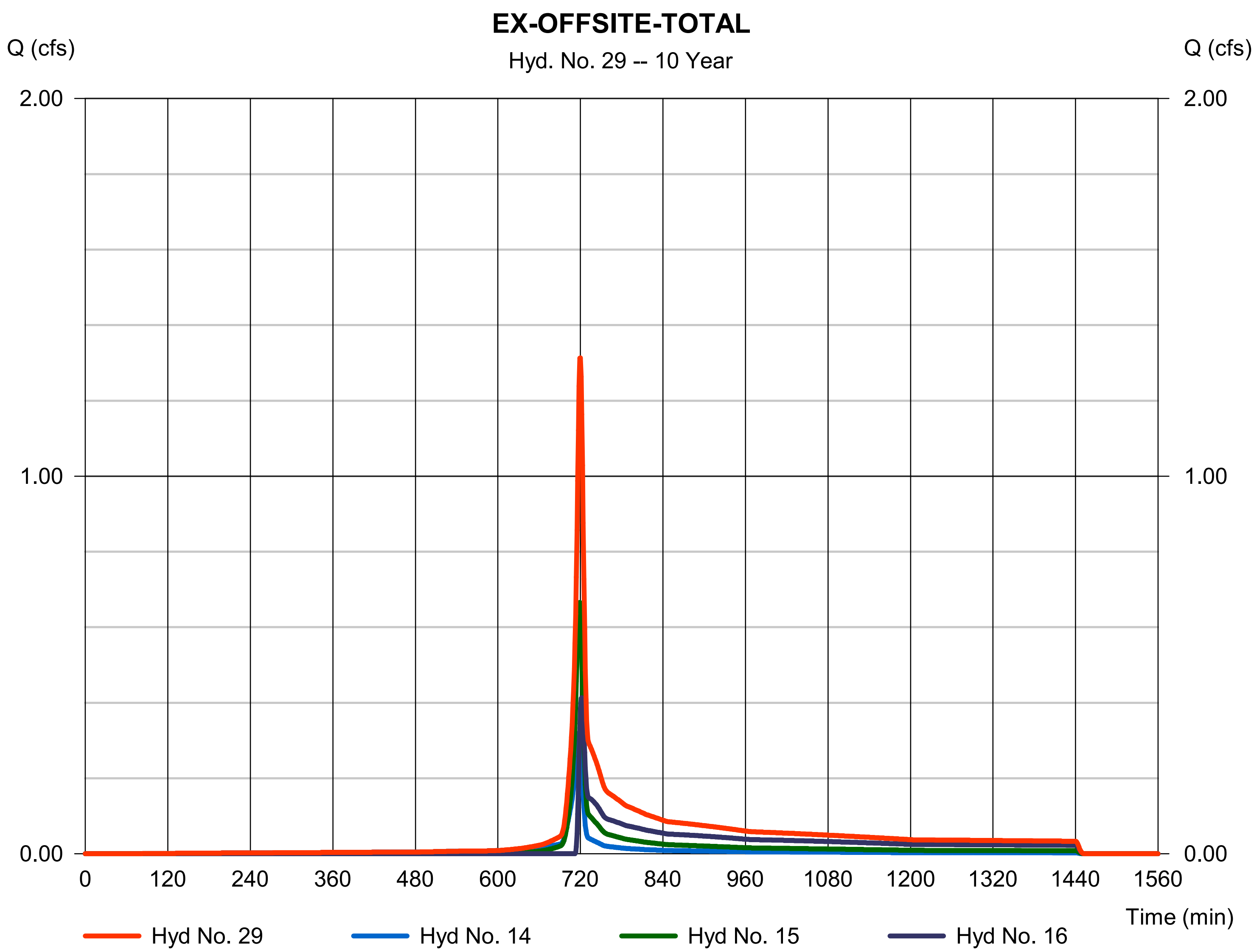
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 29

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.313 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 4,161 cuft
Inflow hyds.	= 14, 15, 16	Contrib. drain. area	= 1.822 ac



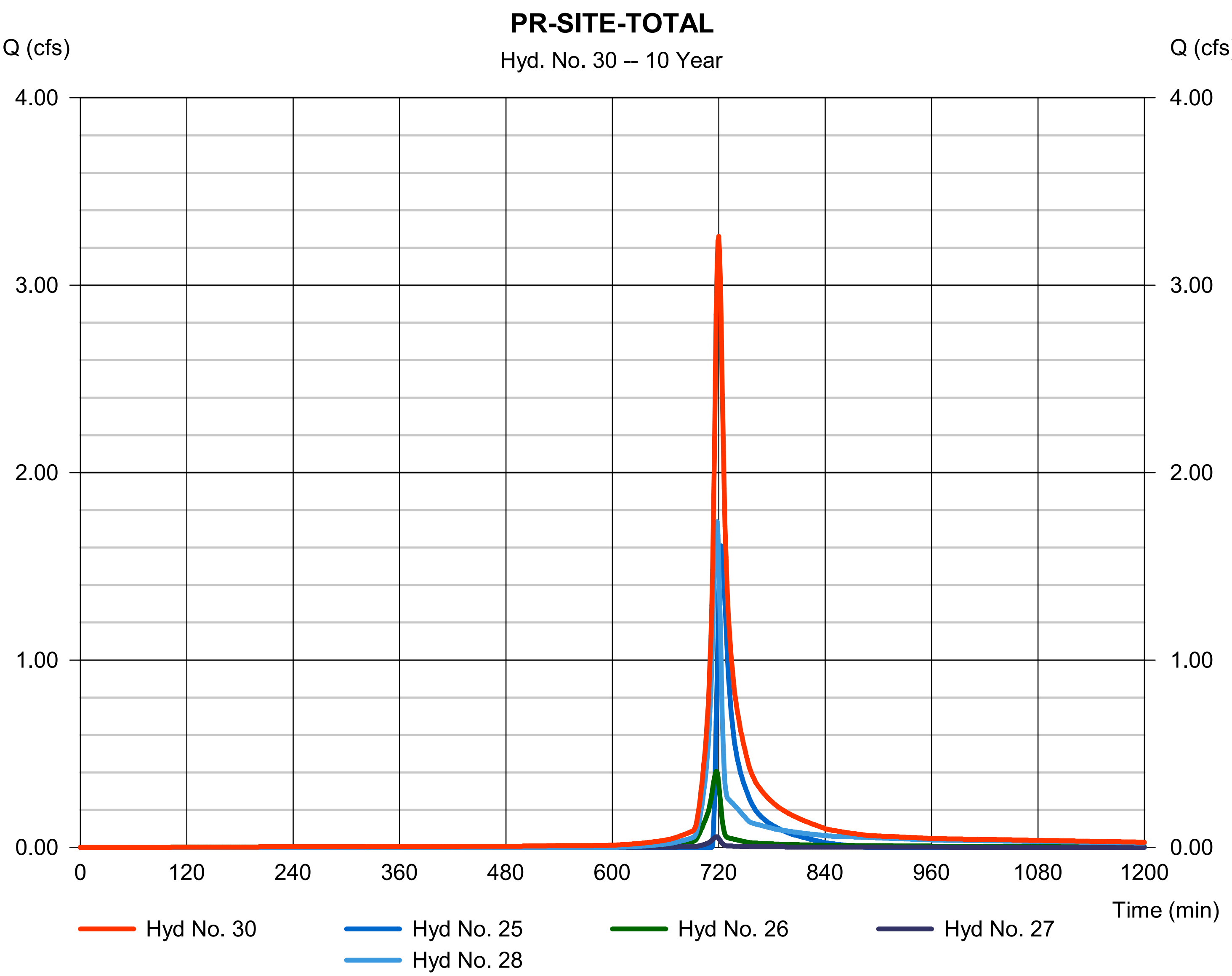
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 30

PR-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 3.261 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 6,930 cuft
Inflow hyds.	= 25, 26, 27, 28	Contrib. drain. area	= 0.587 ac



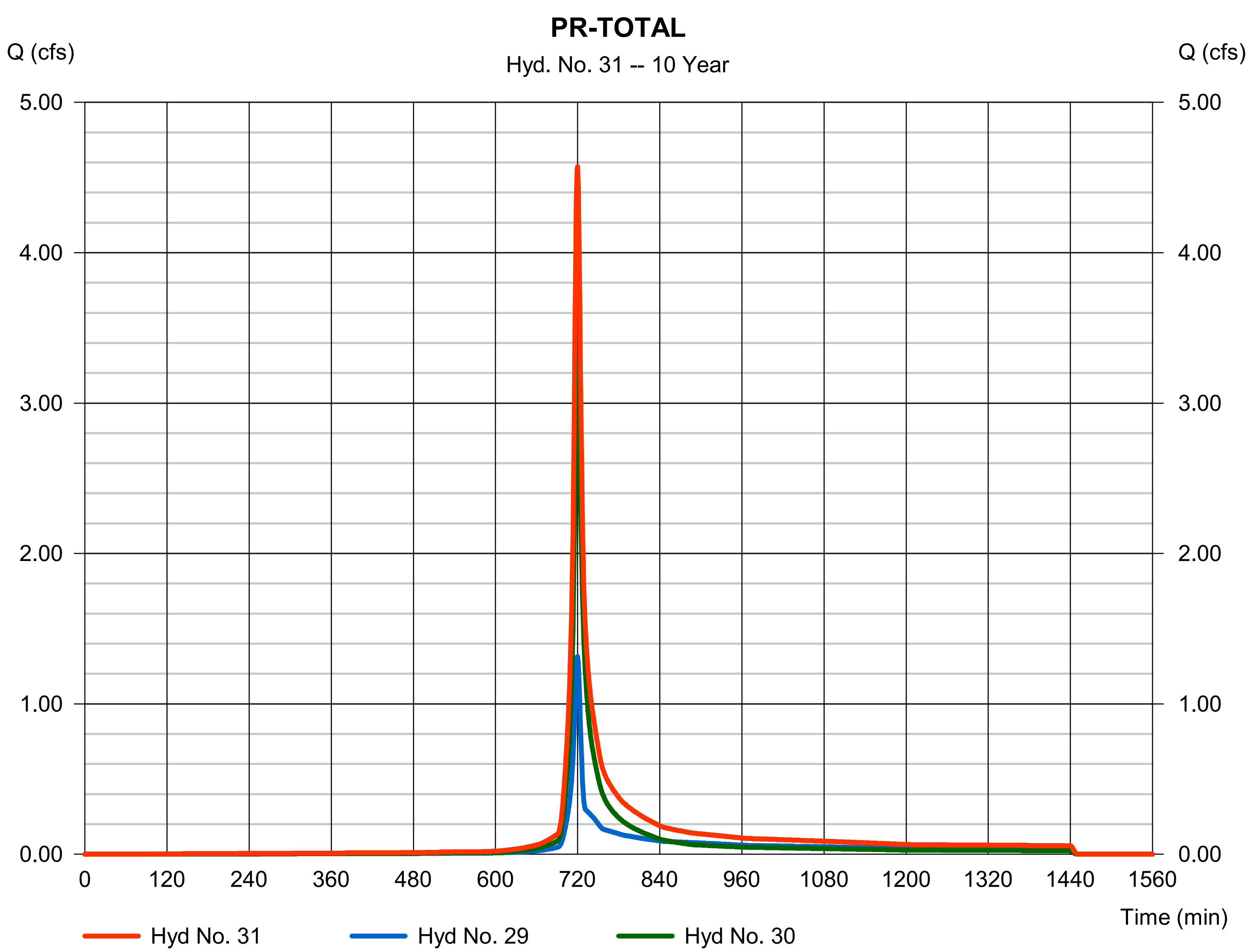
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 31

PR-TOTAL

Hydrograph type	= Combine	Peak discharge	= 4.574 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 11,091 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.763	1	718	1,920	------	------	------	EX-OFFSITE-IMP/GRAVEL
2	SCS Runoff	0.051	1	719	120	------	------	------	EX-SITE-BYP-IMP/DIRT
3	SCS Runoff	0.002	1	1440	52	------	------	------	EX-OFFSITE-MEAD
4	SCS Runoff	3.988	1	720	10,148	------	------	------	EX-OFFSITE-WOODS
5	SCS Runoff	0.083	1	719	188	------	------	------	EX-SITE-MEAD
6	SCS Runoff	1.560	1	720	3,529	------	------	------	EX-SITE-WOODS
7	SCS Runoff	0.064	1	719	150	------	------	------	EX-SITE-BYP-IMP/DIRT
8	SCS Runoff	0.307	1	719	819	------	------	------	EX-SITE-BYP-IMP/GRAVEL
9	SCS Runoff	0.598	1	719	1,353	------	------	------	EX-SITE-BYP-MEAD
10	SCS Runoff	1.572	1	720	3,556	------	------	------	EX-SITE-BYP-WOODS
11	Combine	4.180	1	719	9,596	5, 6, 7, 8, 9, 10	------	------	EX-SITE-TOTAL
12	Combine	4.773	1	719	12,241	1, 2, 3, 4,	------	------	EX-OFFSITE-TOTAL
13	Combine	8.953	1	719	21,837	11, 12	------	------	EX-TOTAL
14	SCS Runoff	0.393	1	718	989	------	------	------	PR-OFFSITE-IMP/GRAVEL
15	SCS Runoff	0.954	1	719	2,015	------	------	------	PR-OFFSITE-MEAD
16	SCS Runoff	1.350	1	720	3,891	------	------	------	PR-OFFSITE-WOODS
17	SCS Runoff	0.370	1	718	932	------	------	------	PR-OFFSITE-IMP/GRAVEL
18	SCS Runoff	1.085	1	719	2,607	------	------	------	PR-OFFSITE-MEAD
19	SCS Runoff	0.846	1	720	2,604	------	------	------	PR-OFFSITE-WOODS
20	Combine	2.260	1	720	6,143	17, 18, 19	------	------	OFFSITE TO BASIN
21	SCS Runoff	1.103	1	718	2,218	------	------	------	PR-SITE-MEAD
22	SCS Runoff	0.830	1	717	2,011	------	------	------	PR-SITE-IMP/GRAVEL
23	SCS Runoff	0.602	1	717	1,305	------	------	------	PR-SITE-GRAVEL
24	Combine	4.629	1	718	11,678	20, 21, 22, 23	------	------	TO BASIN
25	Reservoir	3.010	1	723	5,055	24	641.14	2,069	BASIN
26	SCS Runoff	0.498	1	717	1,207	------	------	------	PR-SITE-BYP-IMP/GRAVEL
27	SCS Runoff	0.073	1	717	155	------	------	------	PR-SITE-BYP-IMP/DIRT
28	SCS Runoff	2.489	1	718	5,008	------	------	------	PR-SITE-BYP-MEAD
29	Combine	2.645	1	719	6,895	14, 15, 16,	------	------	EX-OFFSITE-TOTAL
30	Combine	5.321	1	720	11,426	25, 26, 27, 28,	------	------	PR-SITE-TOTAL
31	Combine	7.950	1	719	18,321	29, 30	------	------	PR-TOTAL

Proposed.gpw	Return Period: 25 Year	Saturday, 10 / 13 / 2018

Hydrograph Report

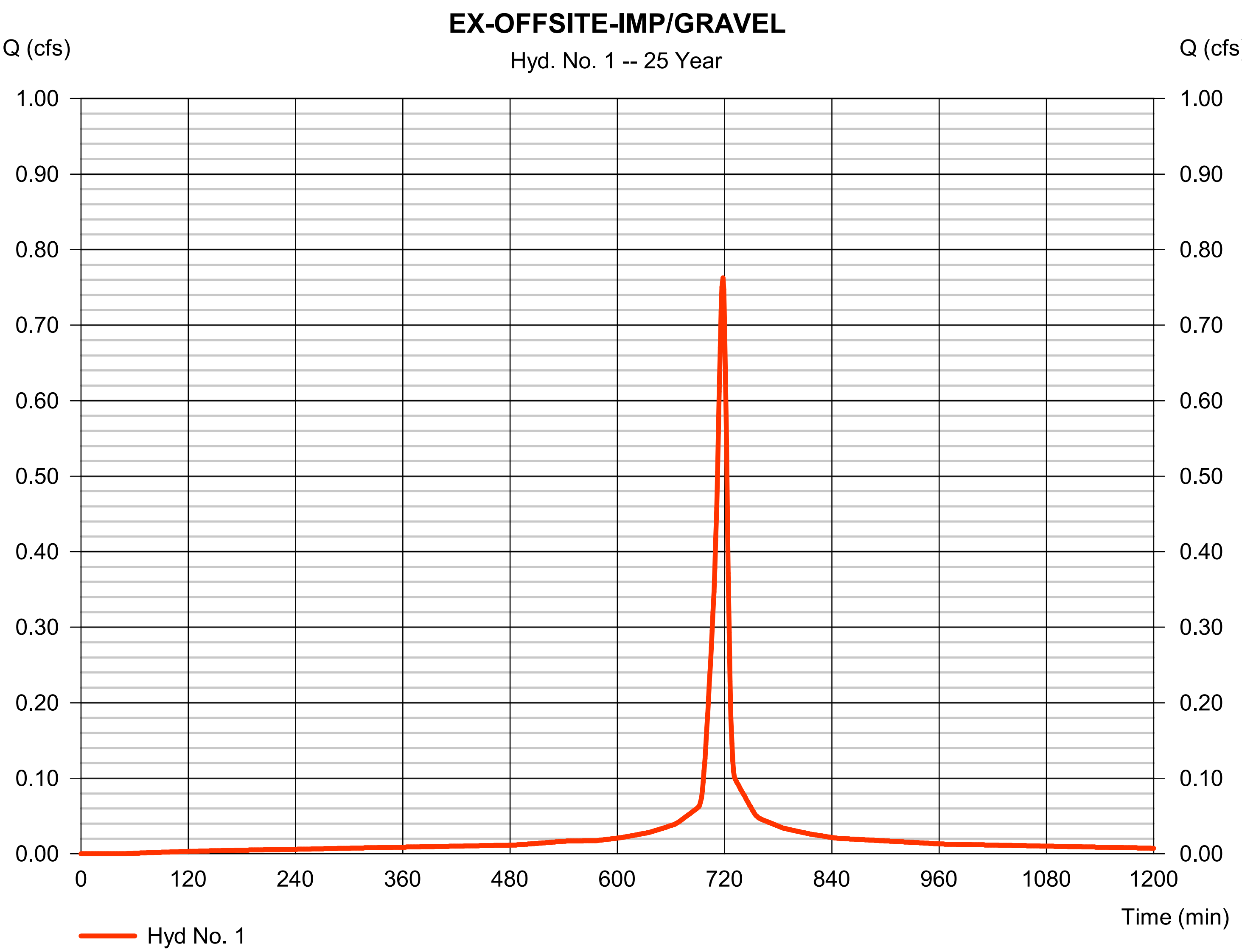
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 1

EX-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.763 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,920 cuft
Drainage area	= 0.101 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.101



Hydrograph Report

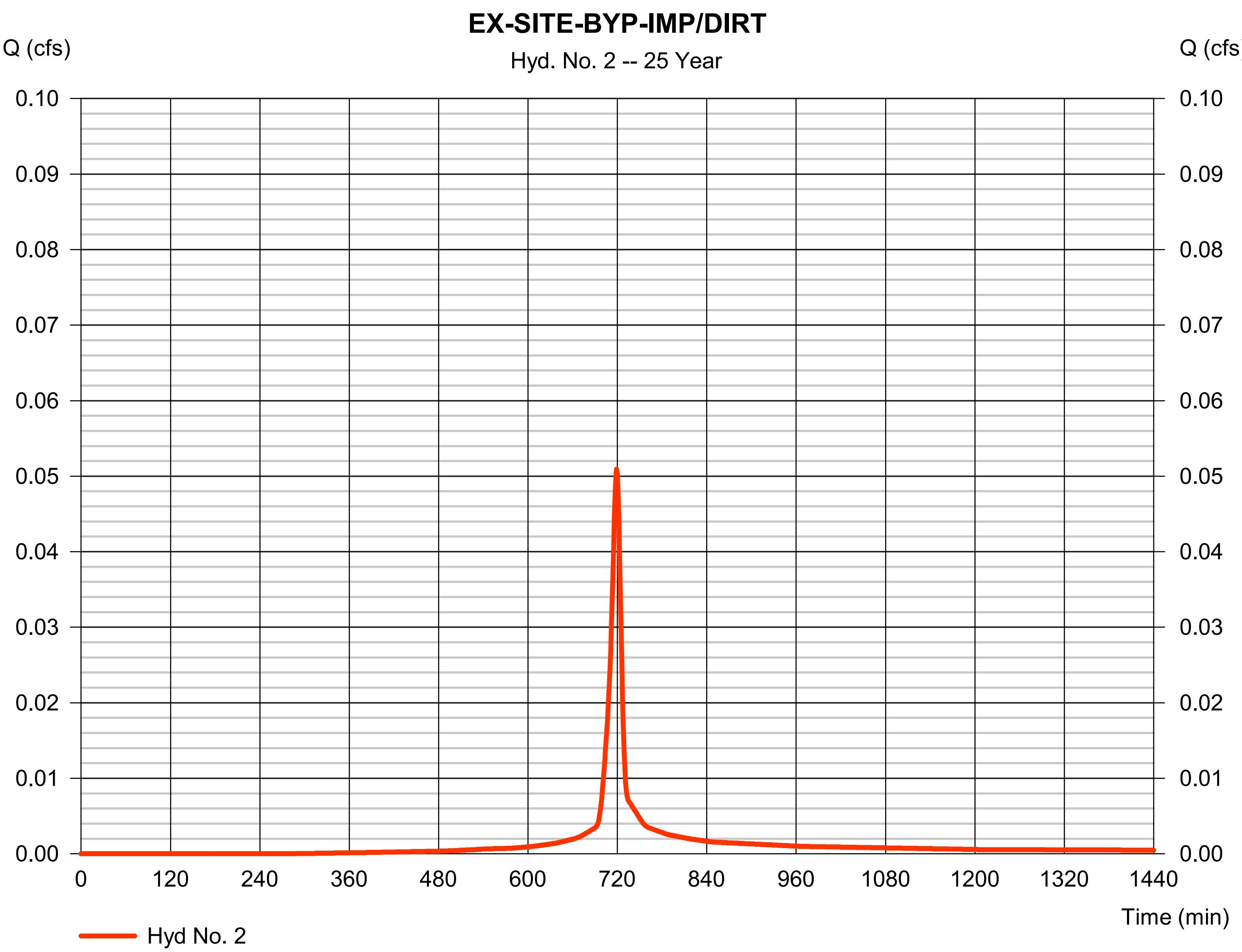
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 2

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.051 cfs
Storm frequency	= 25 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 120 cuft
Drainage area	= 0.008 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.80 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.008



Hydrograph Report

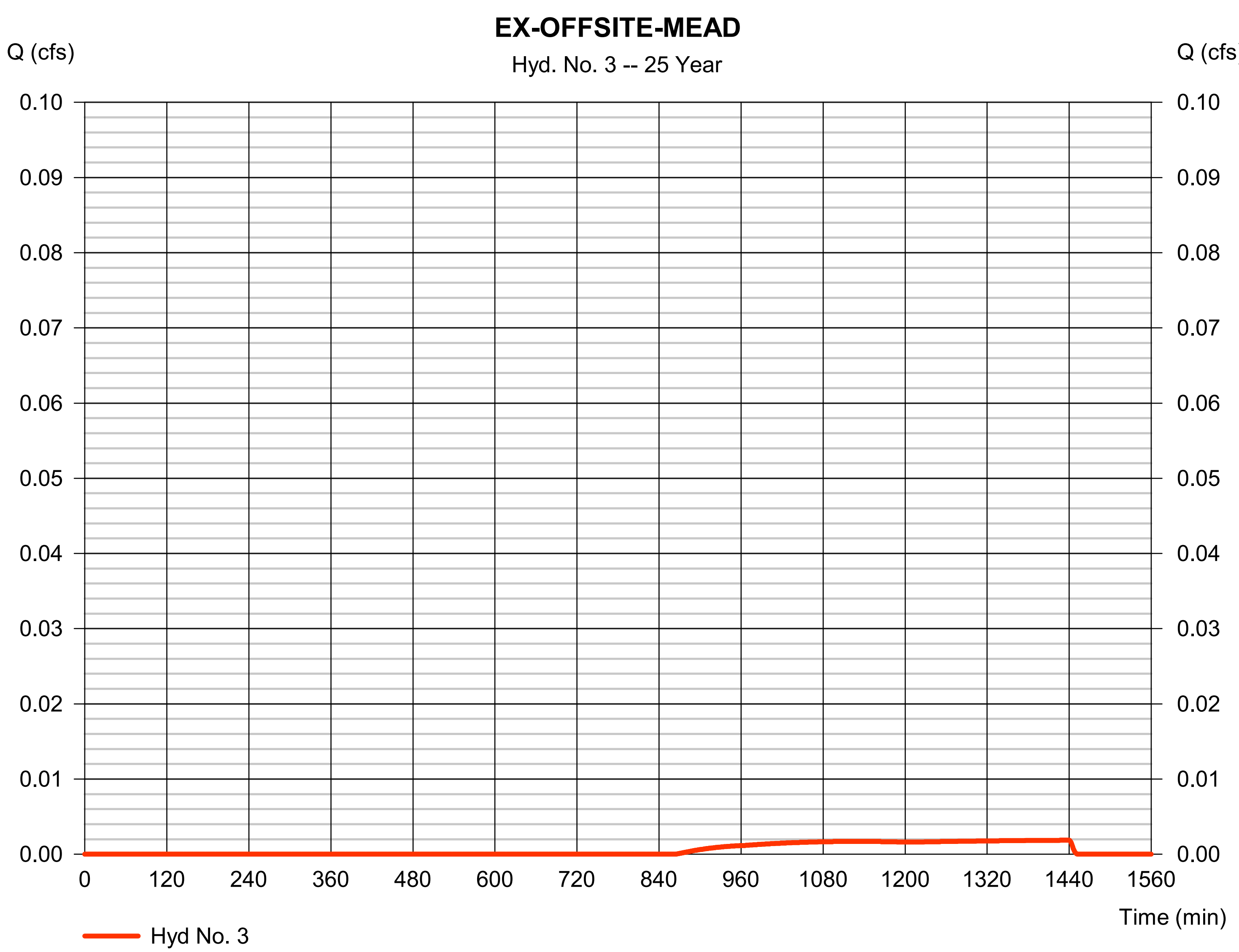
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 3

EX-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.002 cfs
Storm frequency	= 25 yrs	Time to peak	= 1440 min
Time interval	= 1 min	Hyd. volume	= 52 cuft
Drainage area	= 0.404 ac	Curve number	= 30*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.100 x 70)] / 0.404



Hydrograph Report

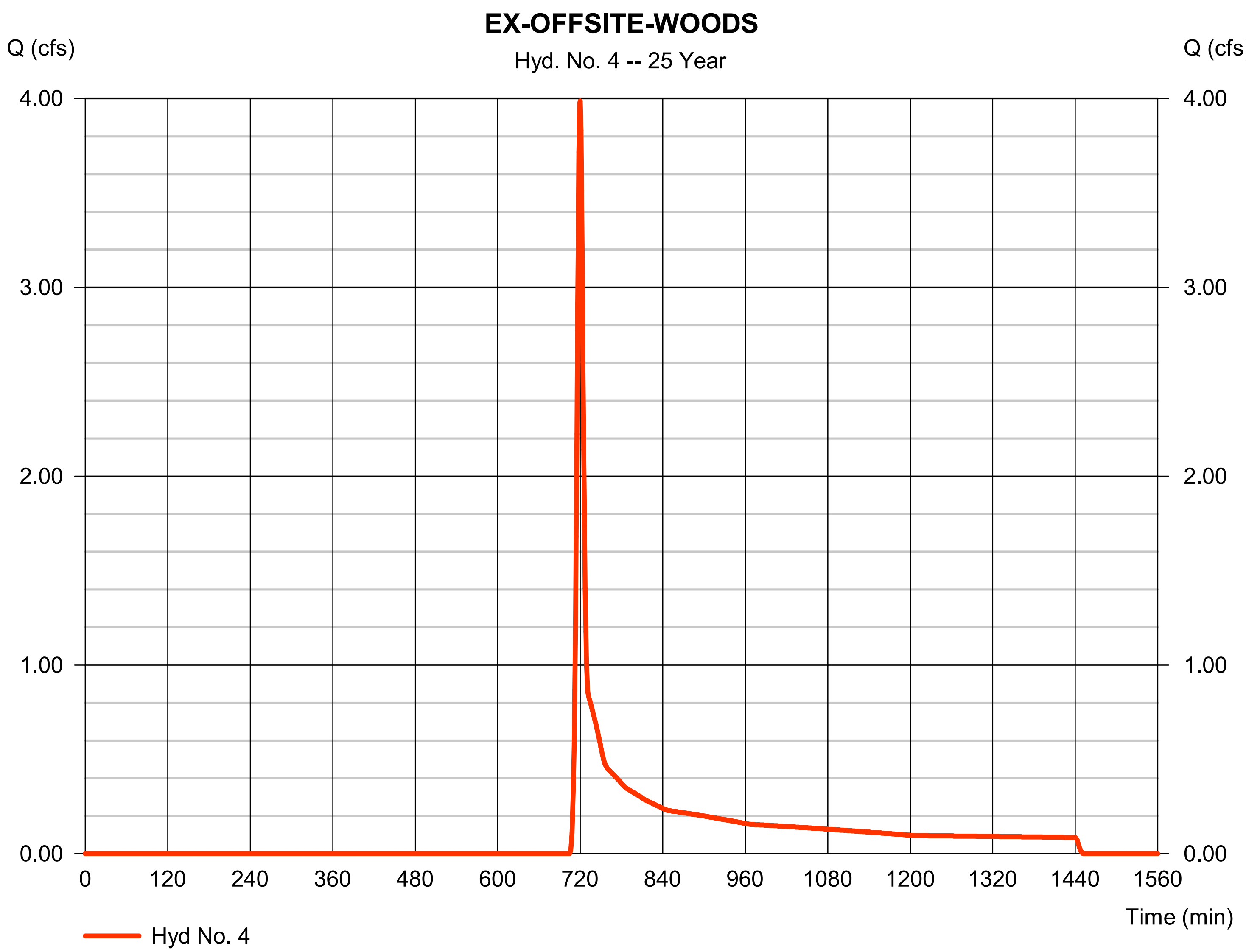
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 4

EX-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 3.988 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 10,148 cuft
Drainage area	= 3.210 ac	Curve number	= 49*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.562 x 70) + (1.652 x 30)] / 3.210



Hydrograph Report

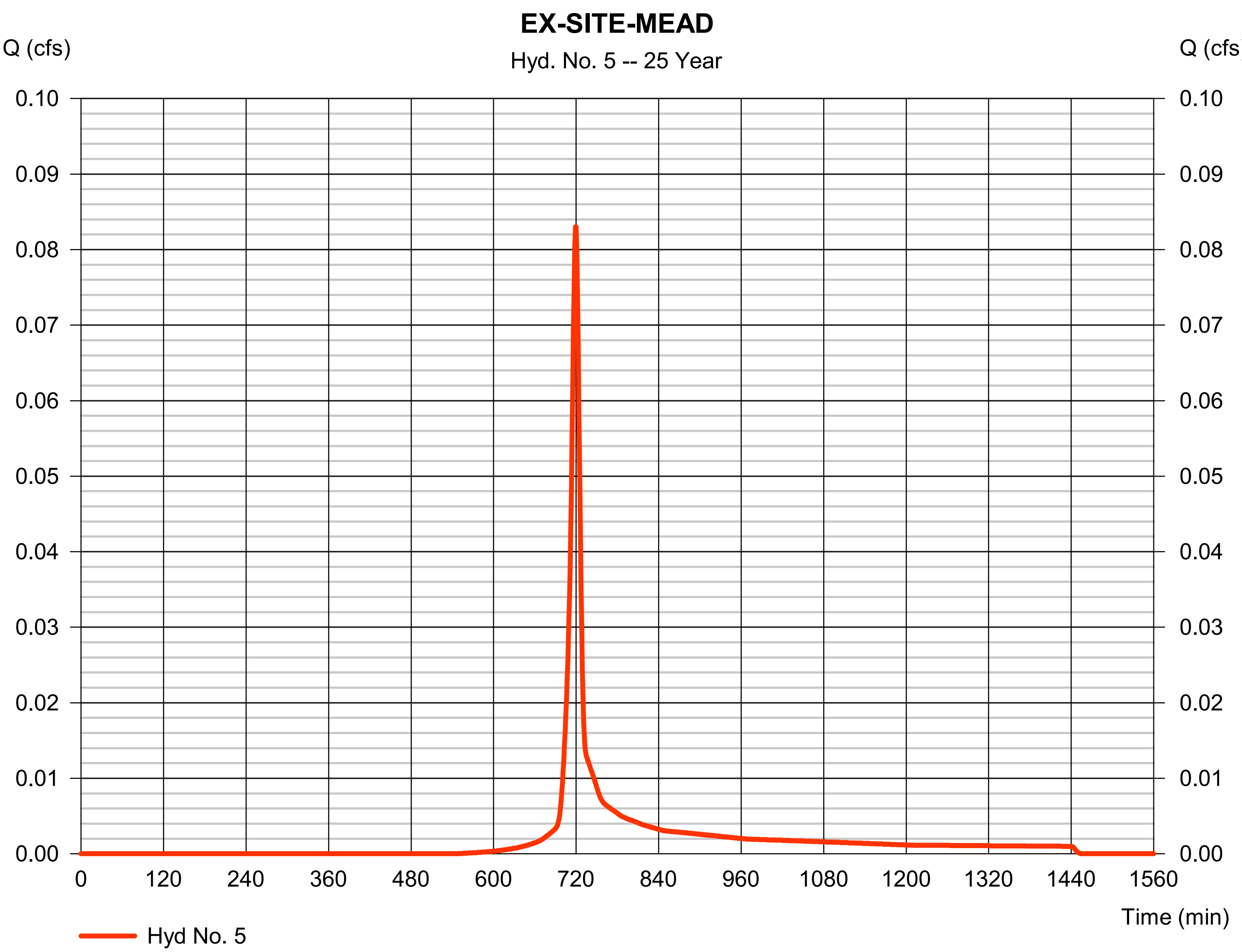
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 5

EX-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.083 cfs
Storm frequency	= 25 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 188 cuft
Drainage area	= 0.020 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.020 x 71)] / 0.020



Hydrograph Report

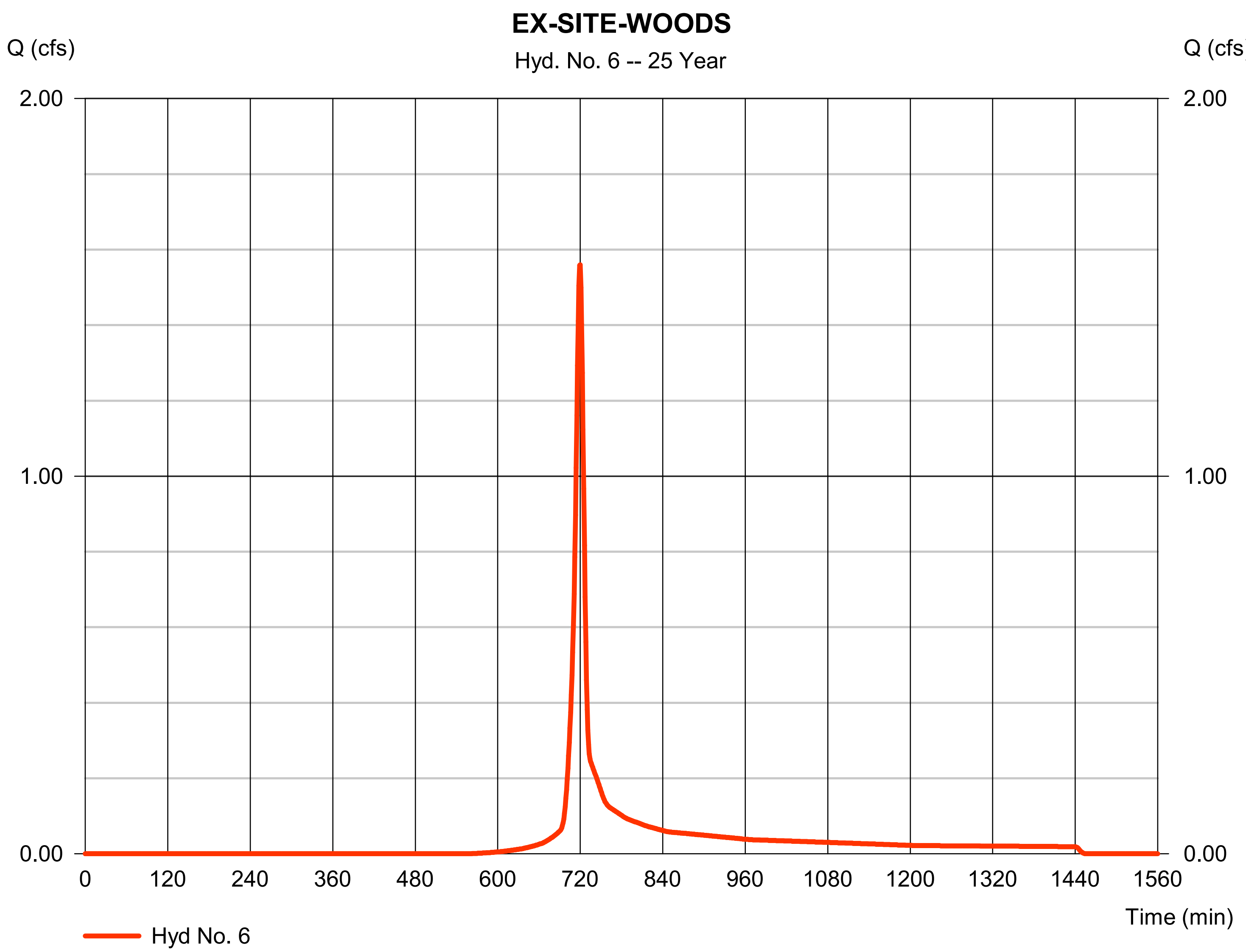
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 6

EX-SITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 1.560 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 3,529 cuft
Drainage area	= 0.389 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.240 x 70) + (0.060 x 70) + (0.460 x 70)] / 0.389



Hydrograph Report

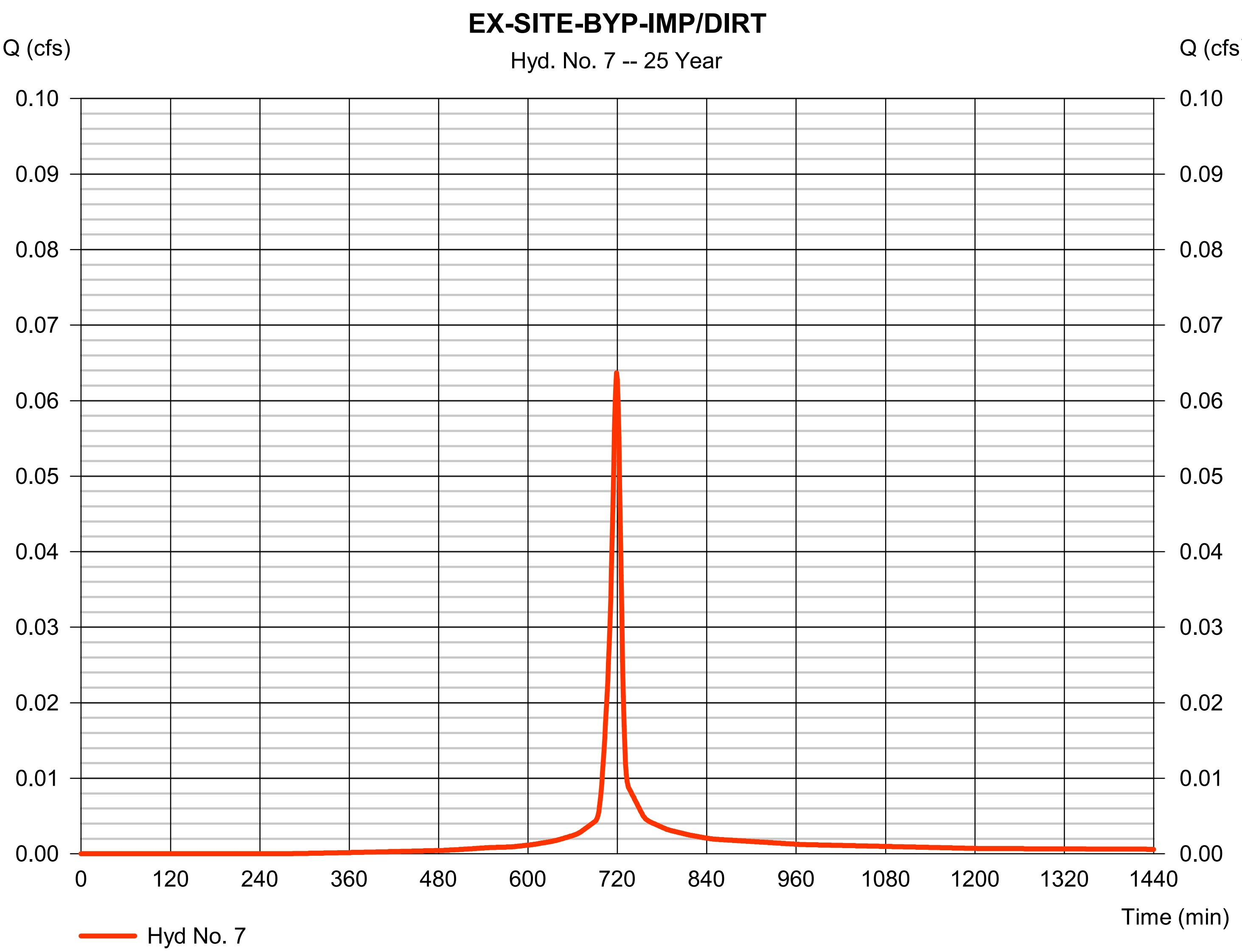
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 7

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.064 cfs
Storm frequency	= 25 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 150 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.010



Hydrograph Report

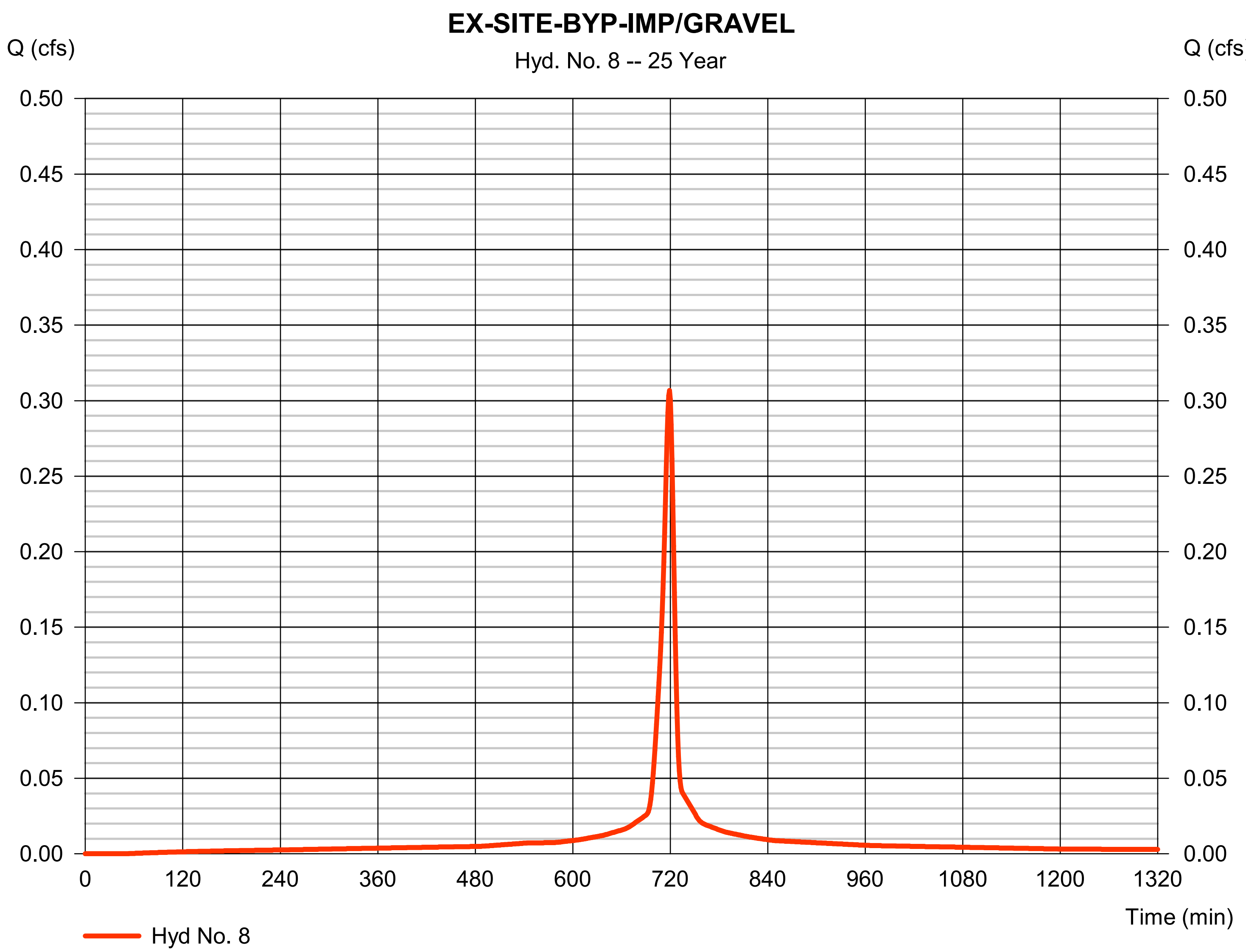
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 8

EX-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.307 cfs
Storm frequency	= 25 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 819 cuft
Drainage area	= 0.042 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.040 x 98)] / 0.042



Hydrograph Report

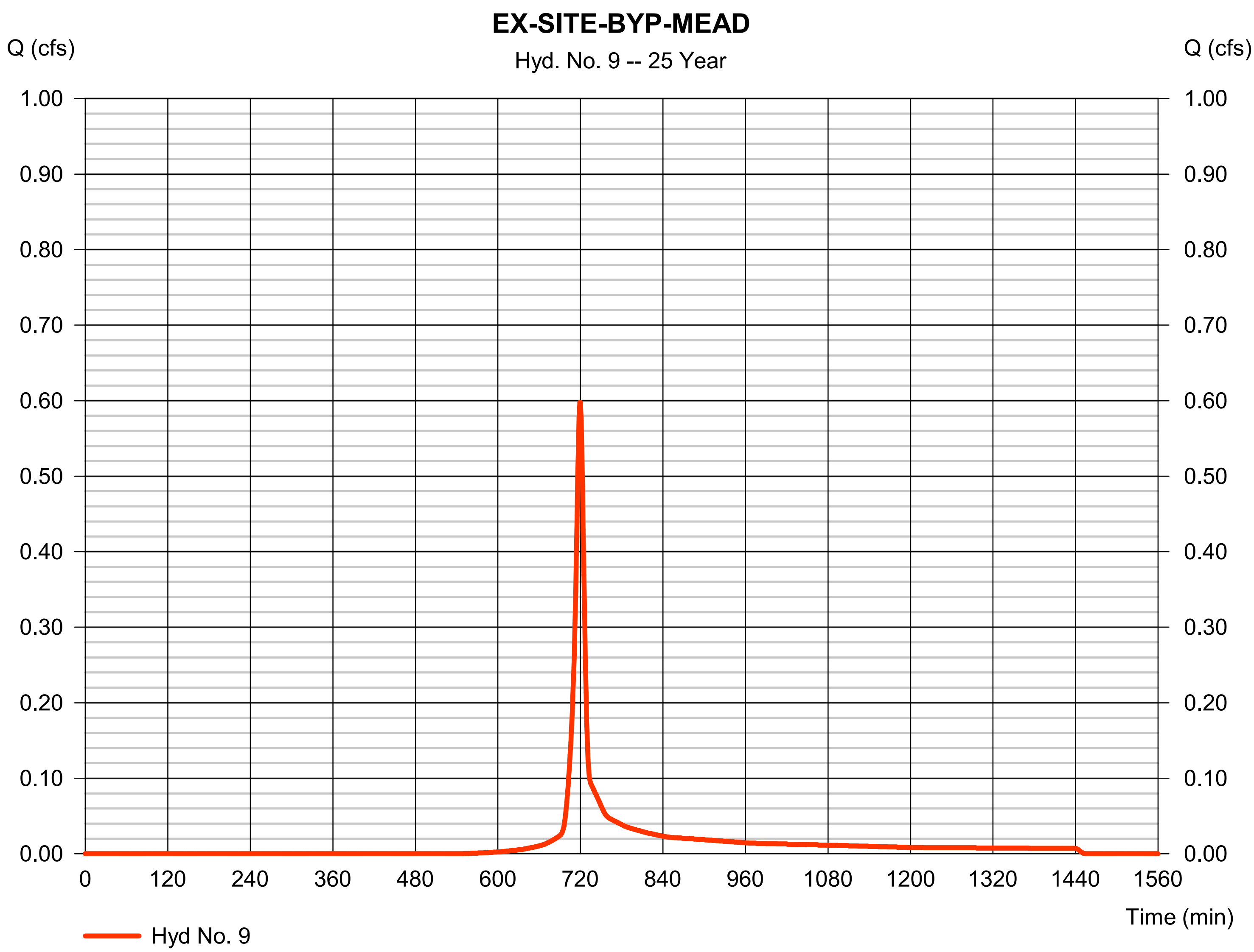
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 9

EX-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.598 cfs
Storm frequency	= 25 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 1,353 cuft
Drainage area	= 0.144 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.190 x 71)] / 0.144



Hydrograph Report

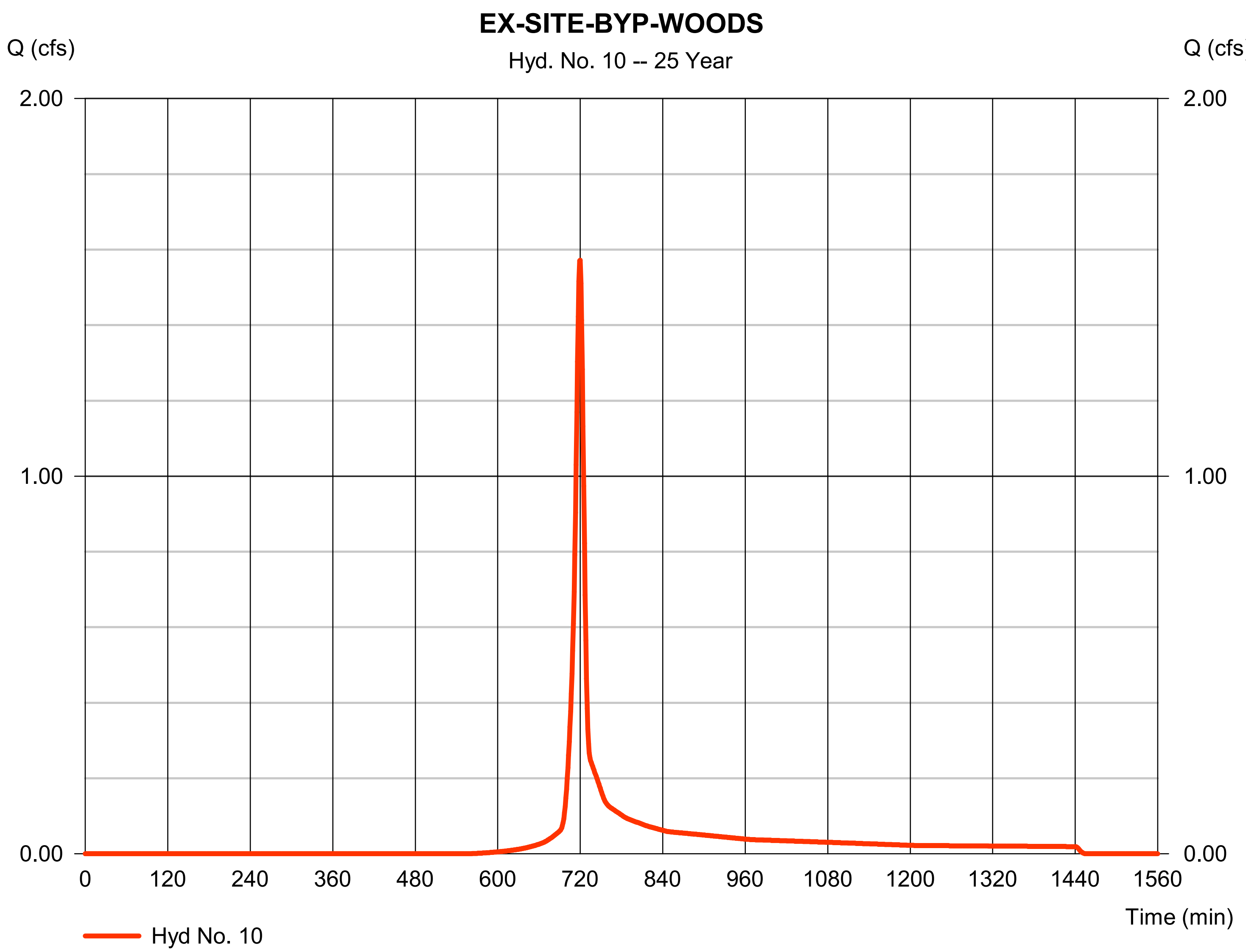
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 10

EX-SITE-BYP-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 1.572 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 3,556 cuft
Drainage area	= 0.392 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 70) + (0.110 x 70) + (0.090 x 70)] / 0.392



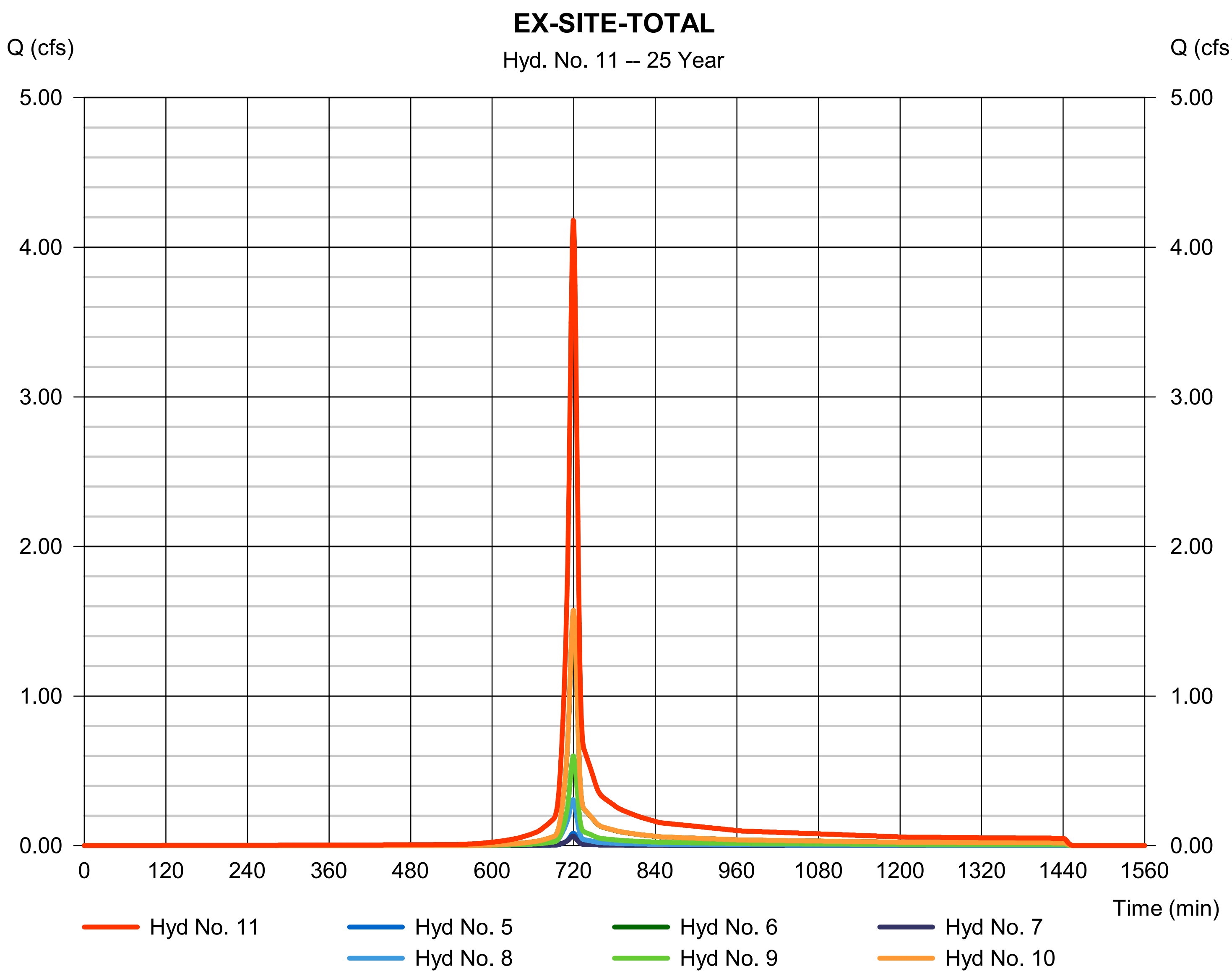
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 11

EX-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 4.180 cfs
Storm frequency	= 25 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 9,596 cuft
Inflow hyds.	= 5, 6, 7, 8, 9, 10	Contrib. drain. area	= 0.997 ac



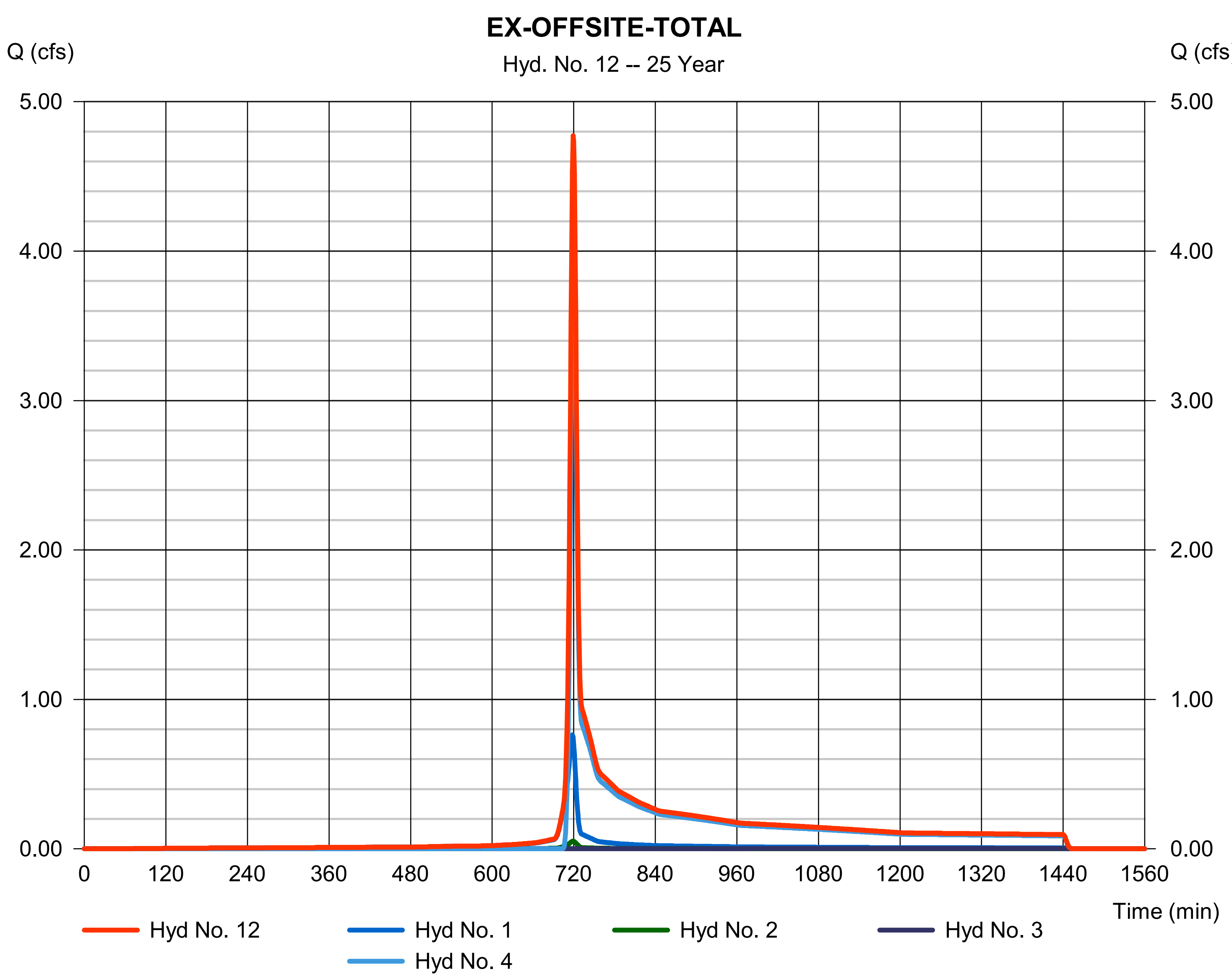
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 12

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 4.773 cfs
Storm frequency	= 25 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 12,241 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 3.723 ac



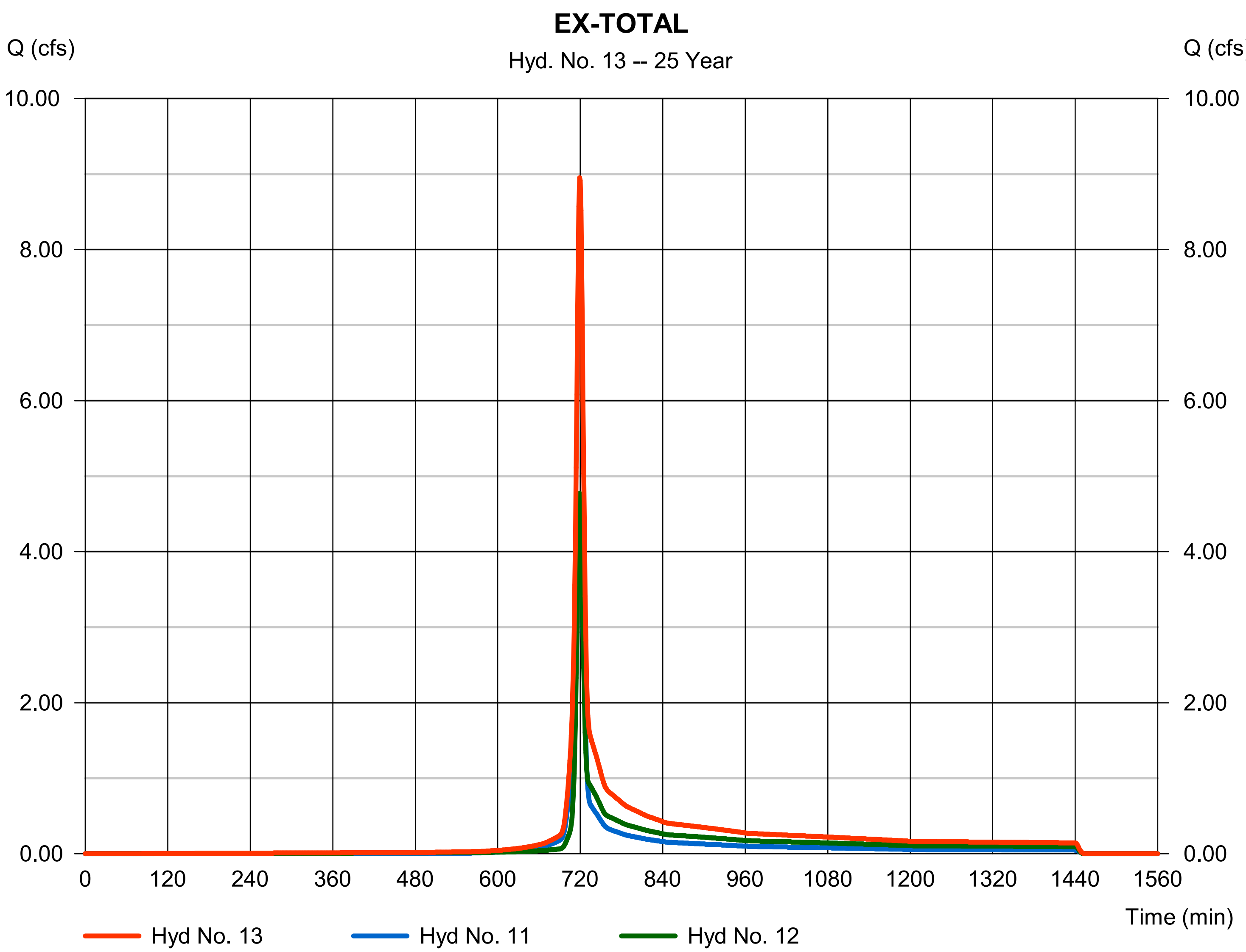
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 13

EX-TOTAL

Hydrograph type	= Combine	Peak discharge	= 8.953 cfs
Storm frequency	= 25 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 21,837 cuft
Inflow hyds.	= 11, 12	Contrib. drain. area	= 0.000 ac



Hydrograph Report

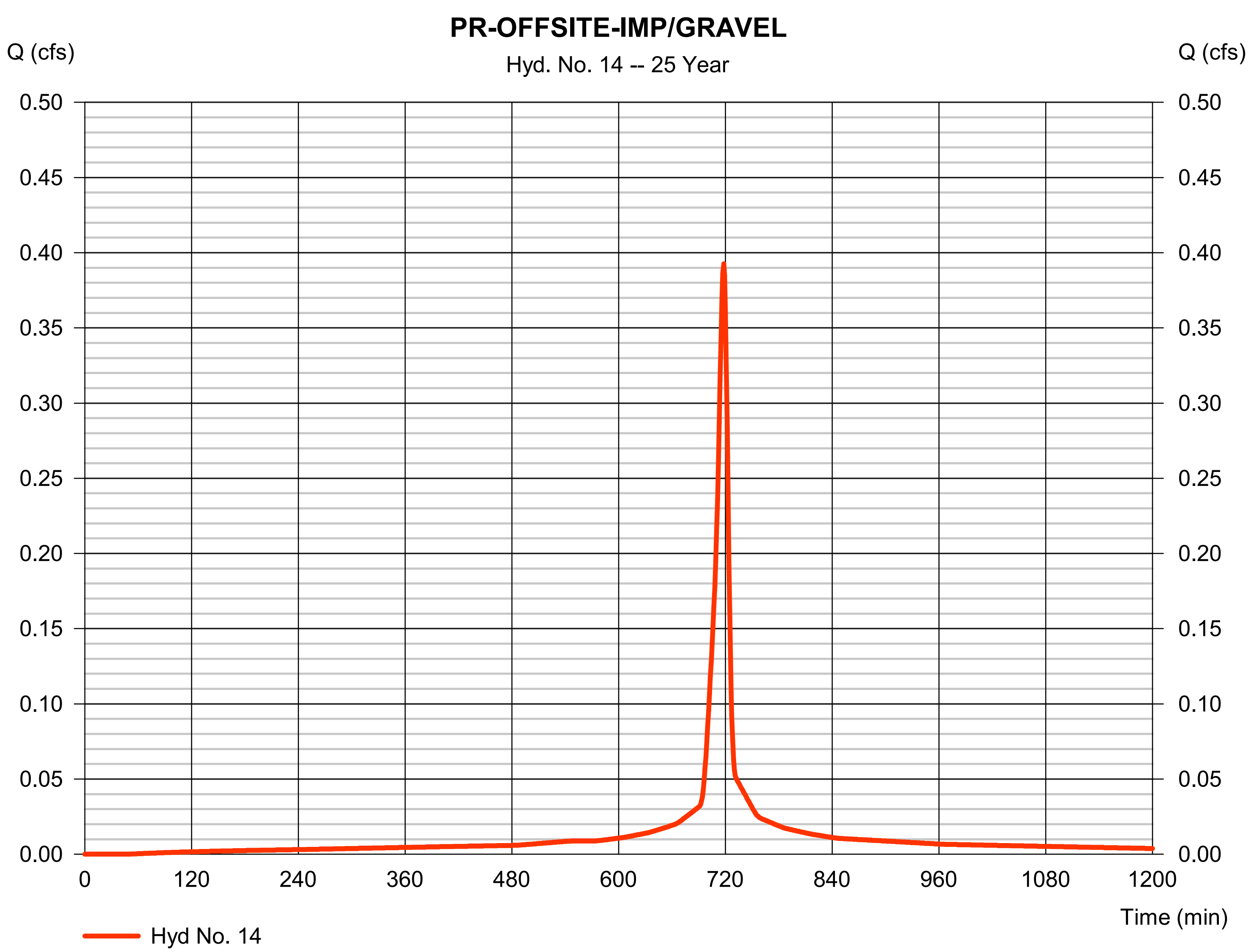
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 14

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.393 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 989 cuft
Drainage area	= 0.052 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.013 x 98)] / 0.052



Hydrograph Report

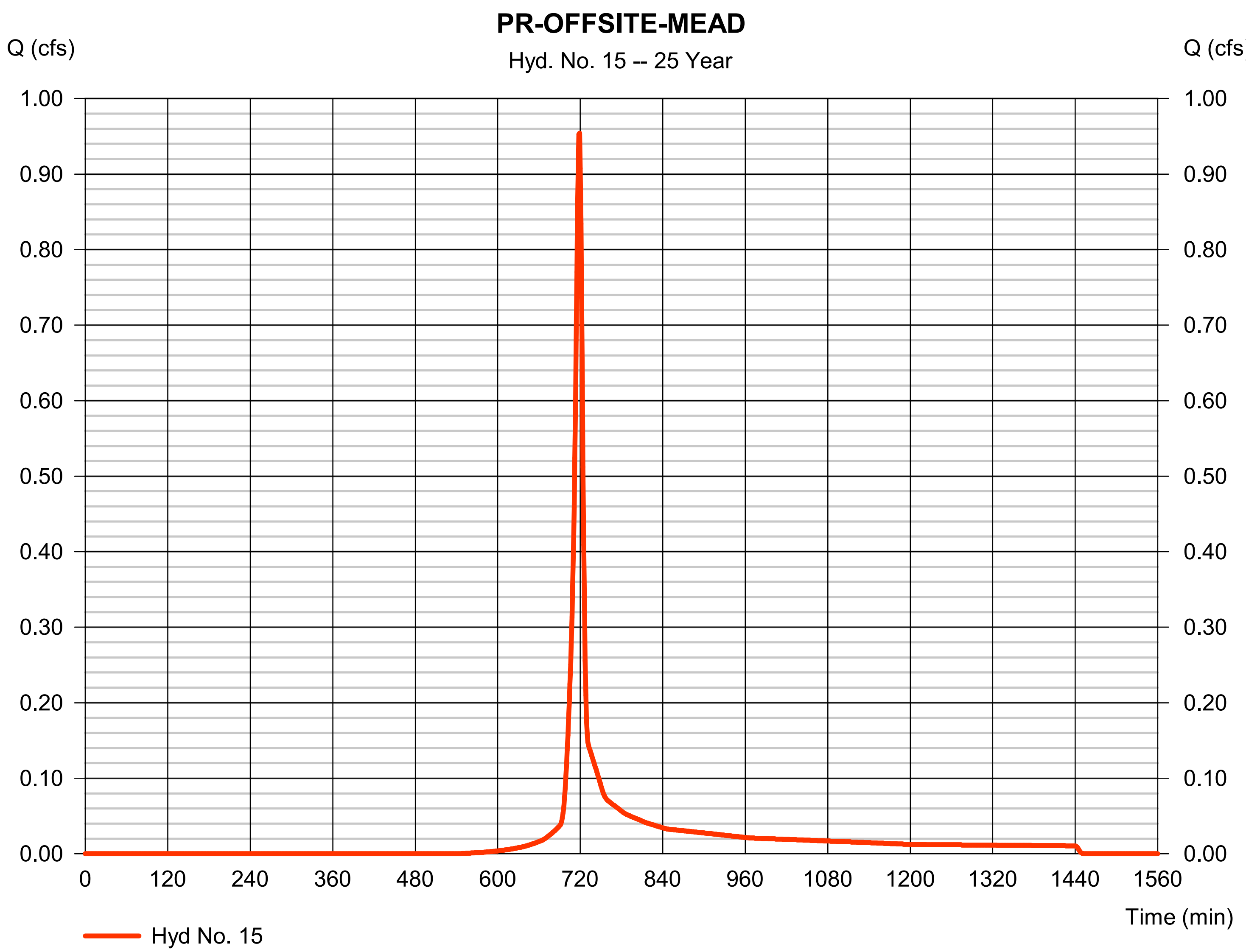
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 15

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.954 cfs
Storm frequency	= 25 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 2,015 cuft
Drainage area	= 0.220 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.034 x 71) + (0.099 x 71) + (0.084 x 71) + (0.001 x 30)] / 0.220



Hydrograph Report

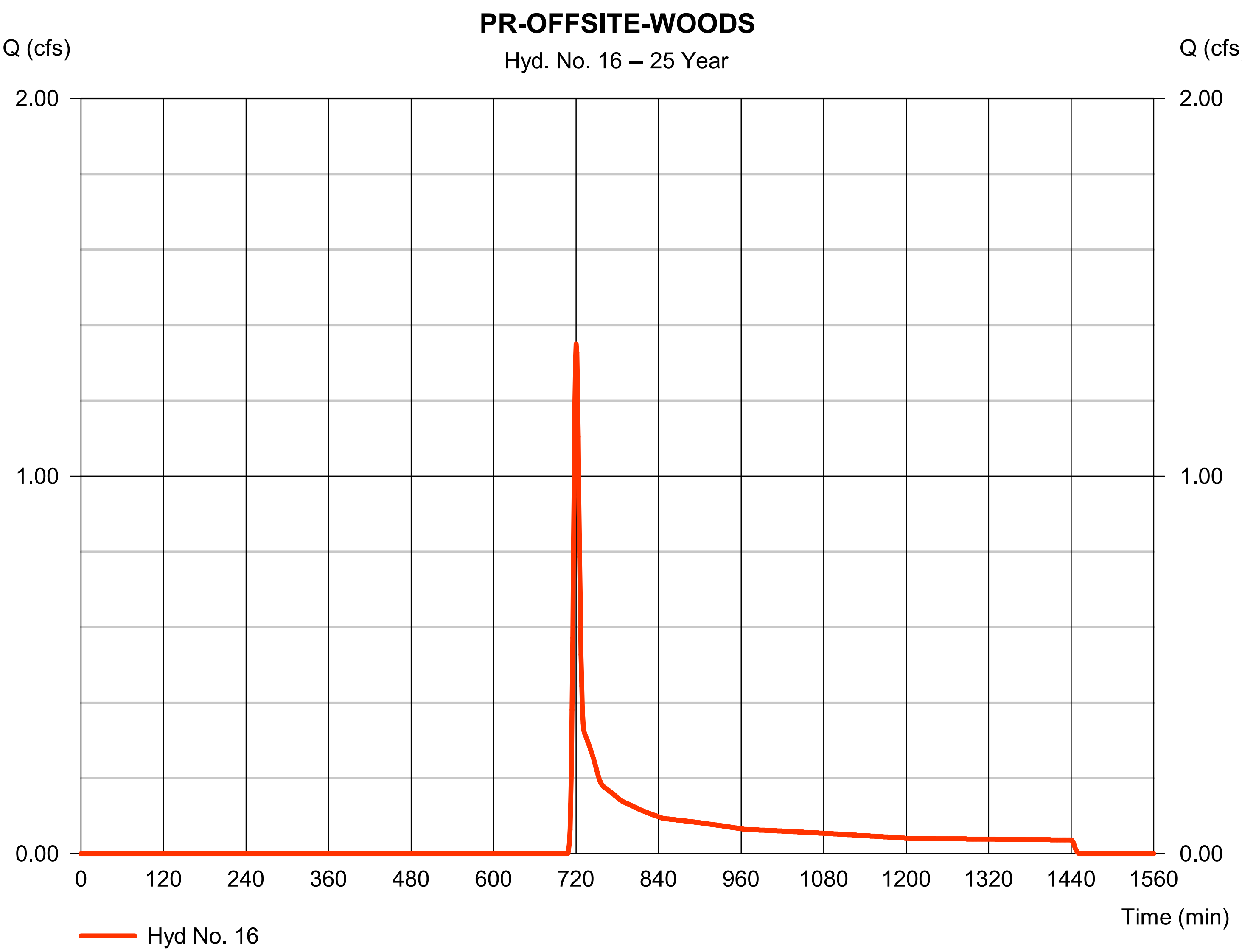
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 16

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 1.350 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 3,891 cuft
Drainage area	= 1.550 ac	Curve number	= 46*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.602 x 70) + (0.951 x 30)] / 1.550



Hydrograph Report

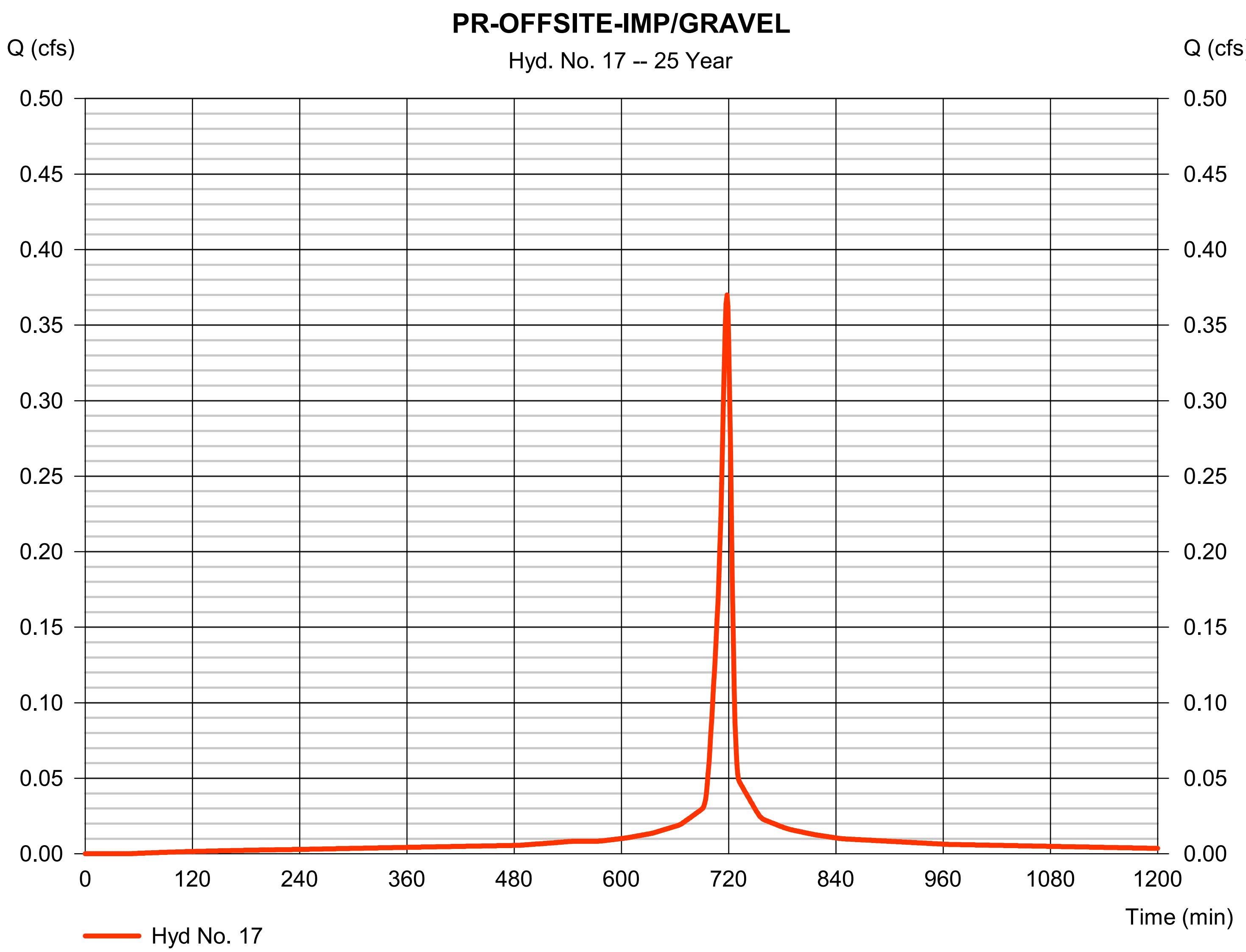
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 17

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.370 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 932 cuft
Drainage area	= 0.049 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.049



Hydrograph Report

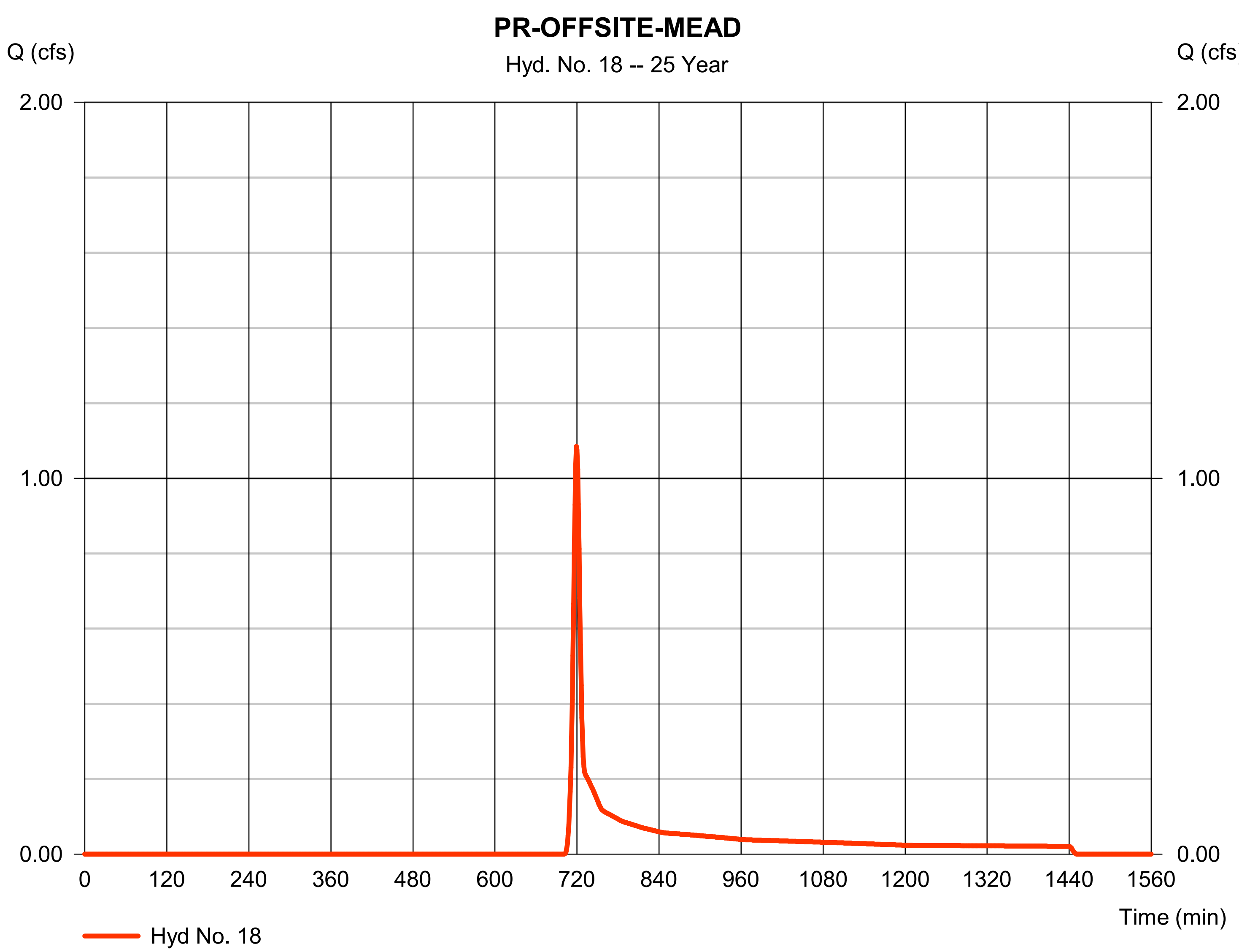
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 18

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 1.085 cfs
Storm frequency	= 25 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 2,607 cuft
Drainage area	= 0.720 ac	Curve number	= 51*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.037 x 71) + (0.331 x 71) + (0.252 x 30) + (0.103 x 30)] / 0.720



Hydrograph Report

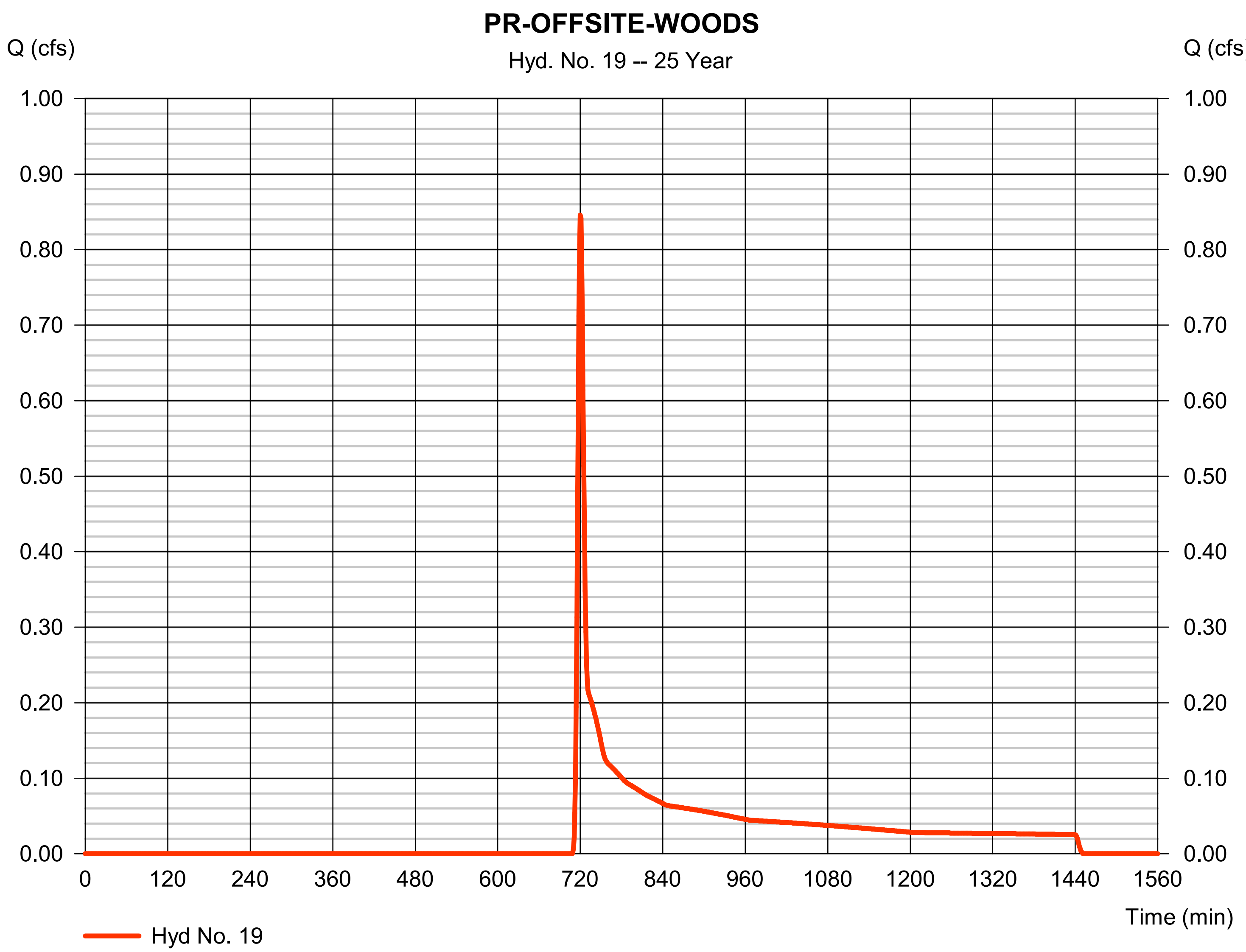
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 19

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.846 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 2,604 cuft
Drainage area	= 1.130 ac	Curve number	= 45*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.180 x 70) + (0.700 x 30)] / 1.130



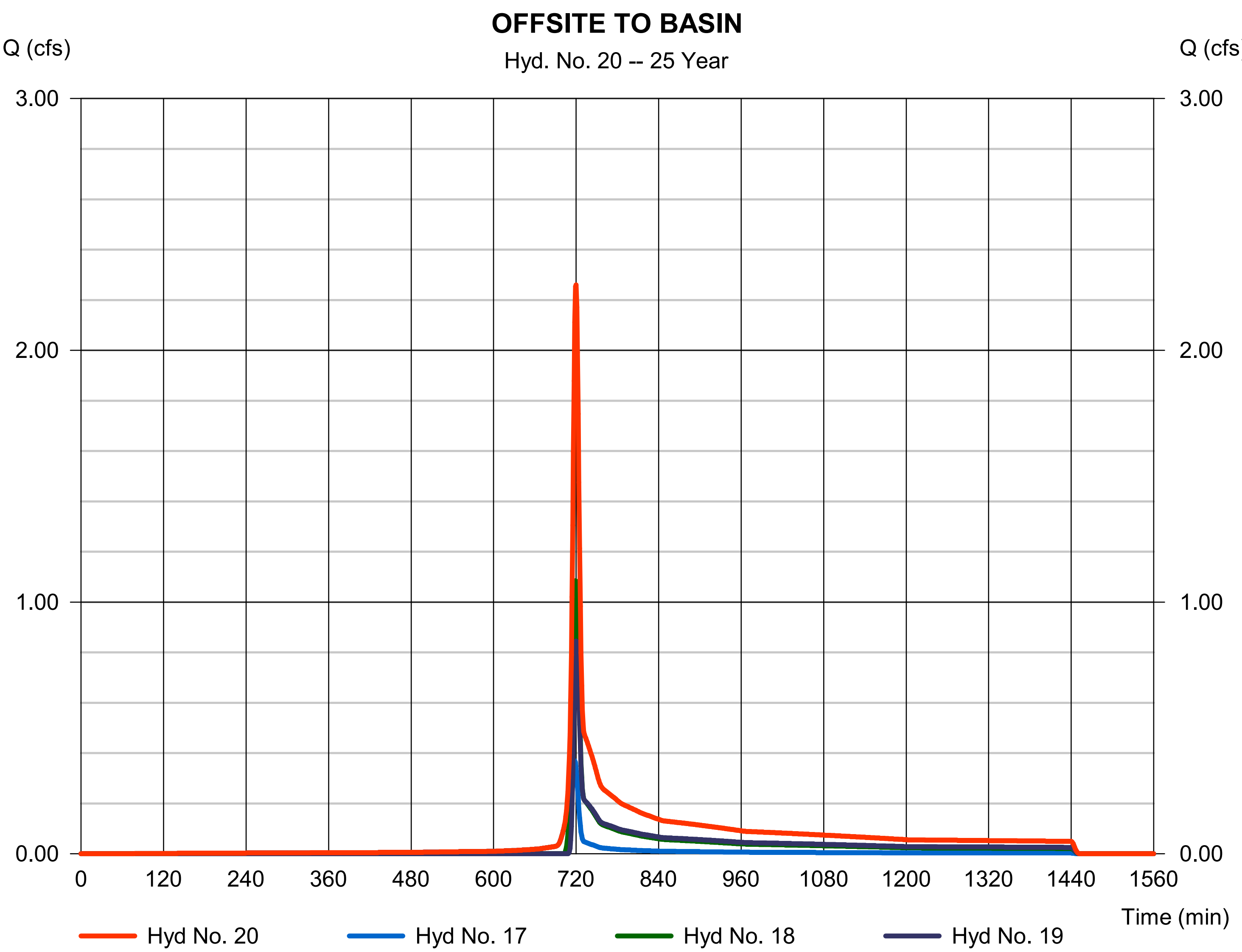
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 20

OFFSITE TO BASIN

Hydrograph type	= Combine	Peak discharge	= 2.260 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 6,143 cuft
Inflow hyds.	= 17, 18, 19	Contrib. drain. area	= 1.899 ac



Hydrograph Report

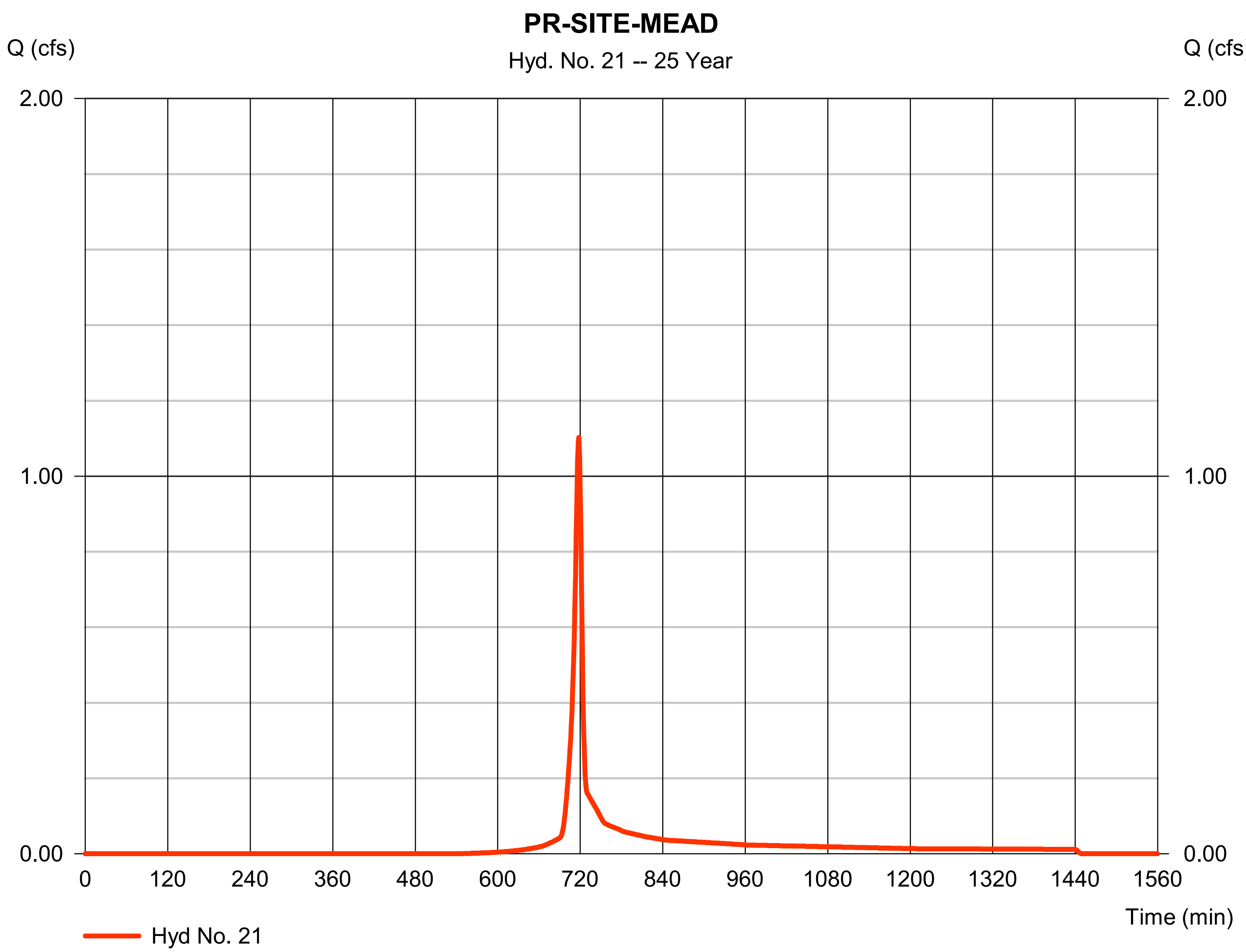
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 21

PR-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 1.103 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 2,218 cuft
Drainage area	= 0.229 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.10 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.134 x 71) + (0.003 x 71) + (0.435 x 71)] / 0.229



Hydrograph Report

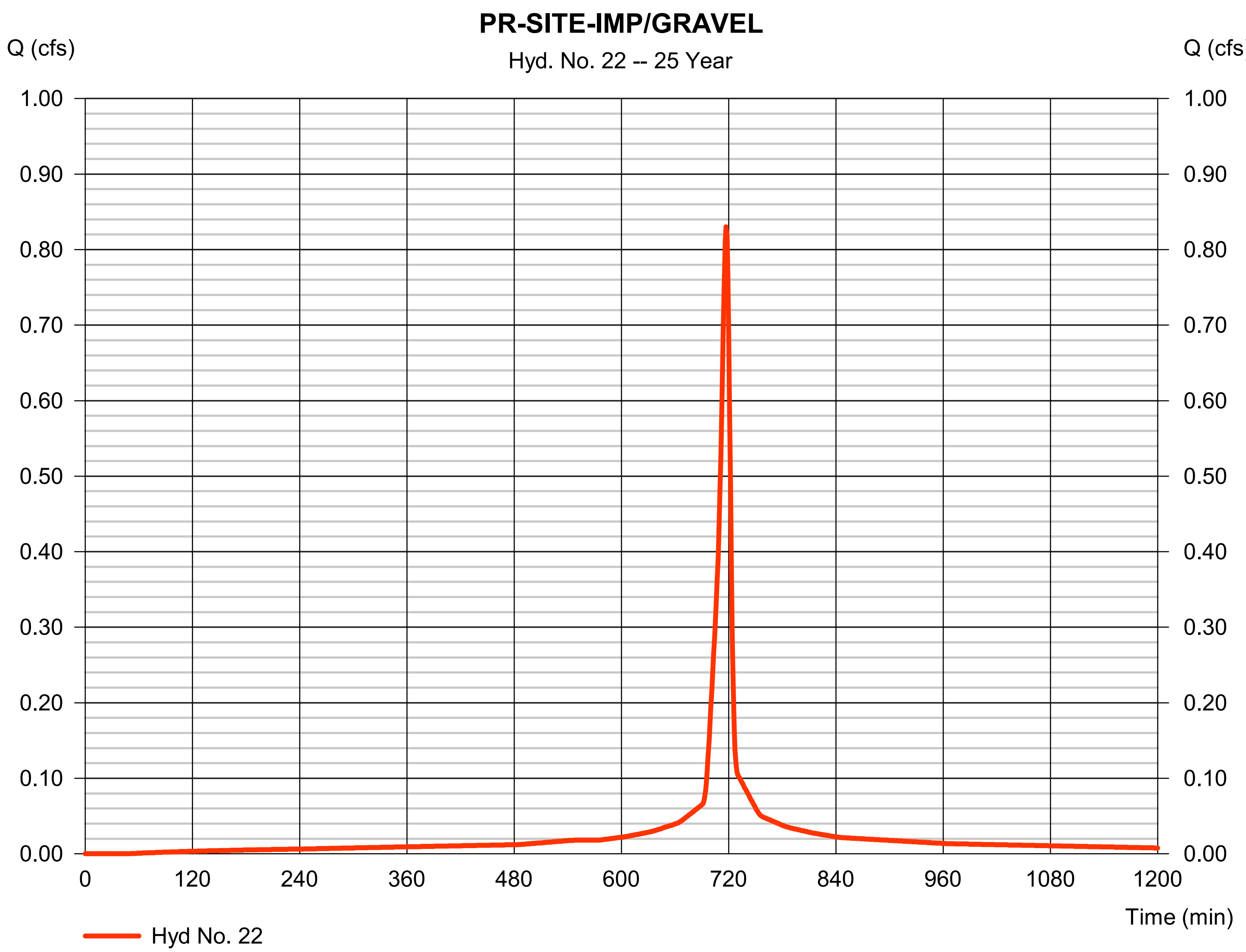
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 22

PR-SITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.830 cfs
Storm frequency	= 25 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 2,011 cuft
Drainage area	= 0.100 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.053 x 98) + (0.008 x 98)] / 0.100



Hydrograph Report

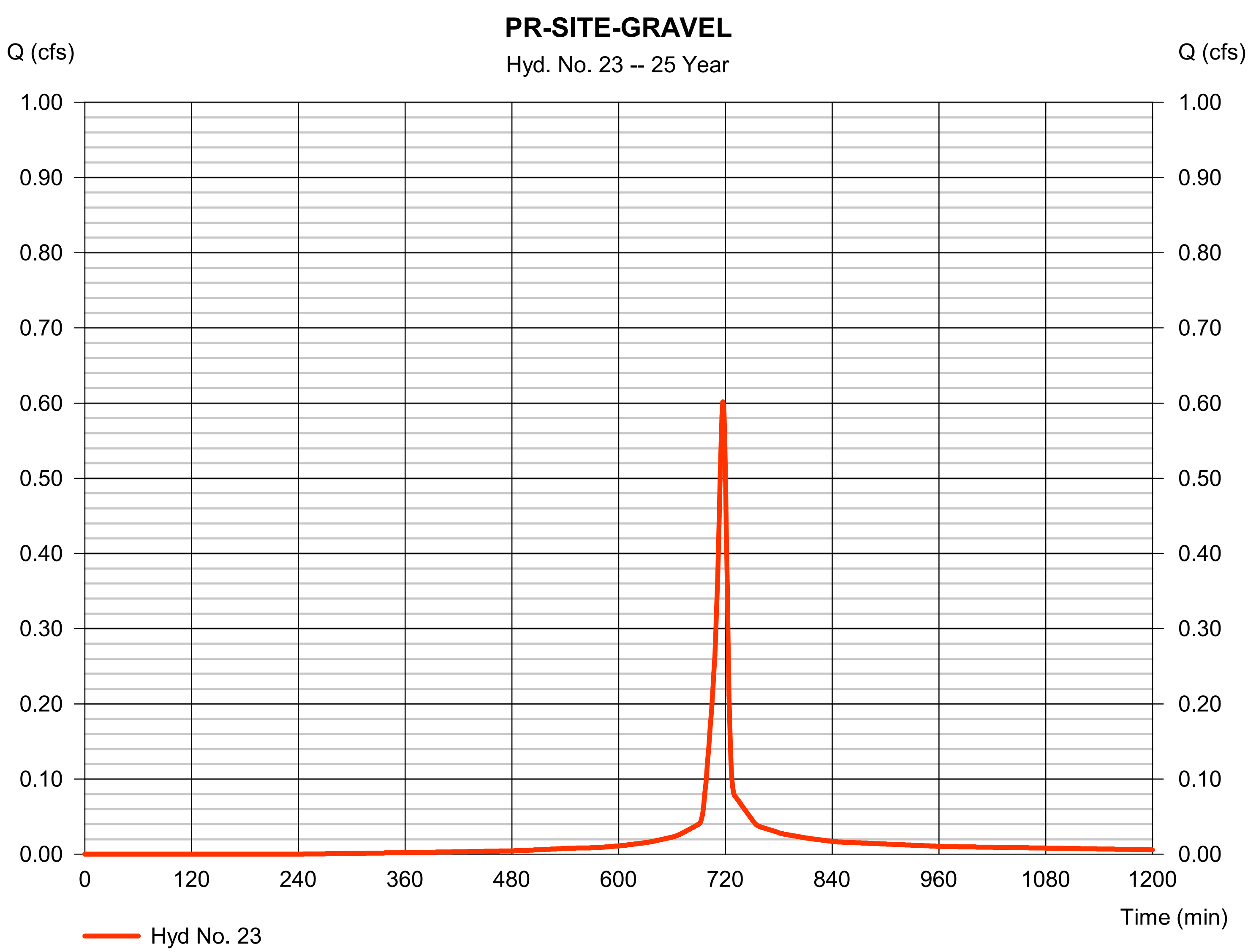
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 23

PR-SITE-GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.602 cfs
Storm frequency	= 25 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 1,305 cuft
Drainage area	= 0.080 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.064 x 89) + (0.003 x 89) + (0.013 x 89)] / 0.080



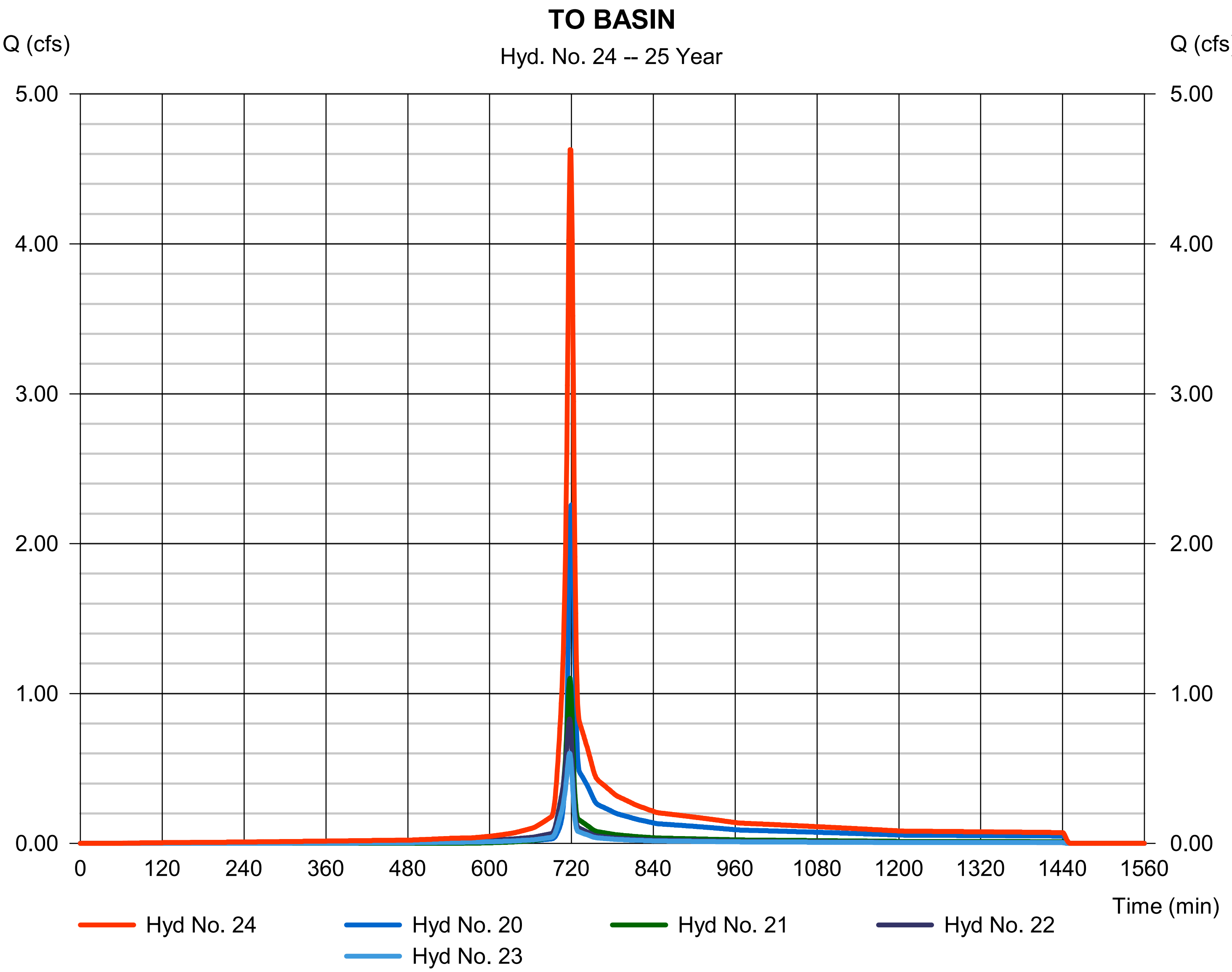
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 24

TO BASIN

Hydrograph type	= Combine	Peak discharge	= 4.629 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 11,678 cuft
Inflow hyds.	= 20, 21, 22, 23	Contrib. drain. area	= 0.409 ac



Hydrograph Report

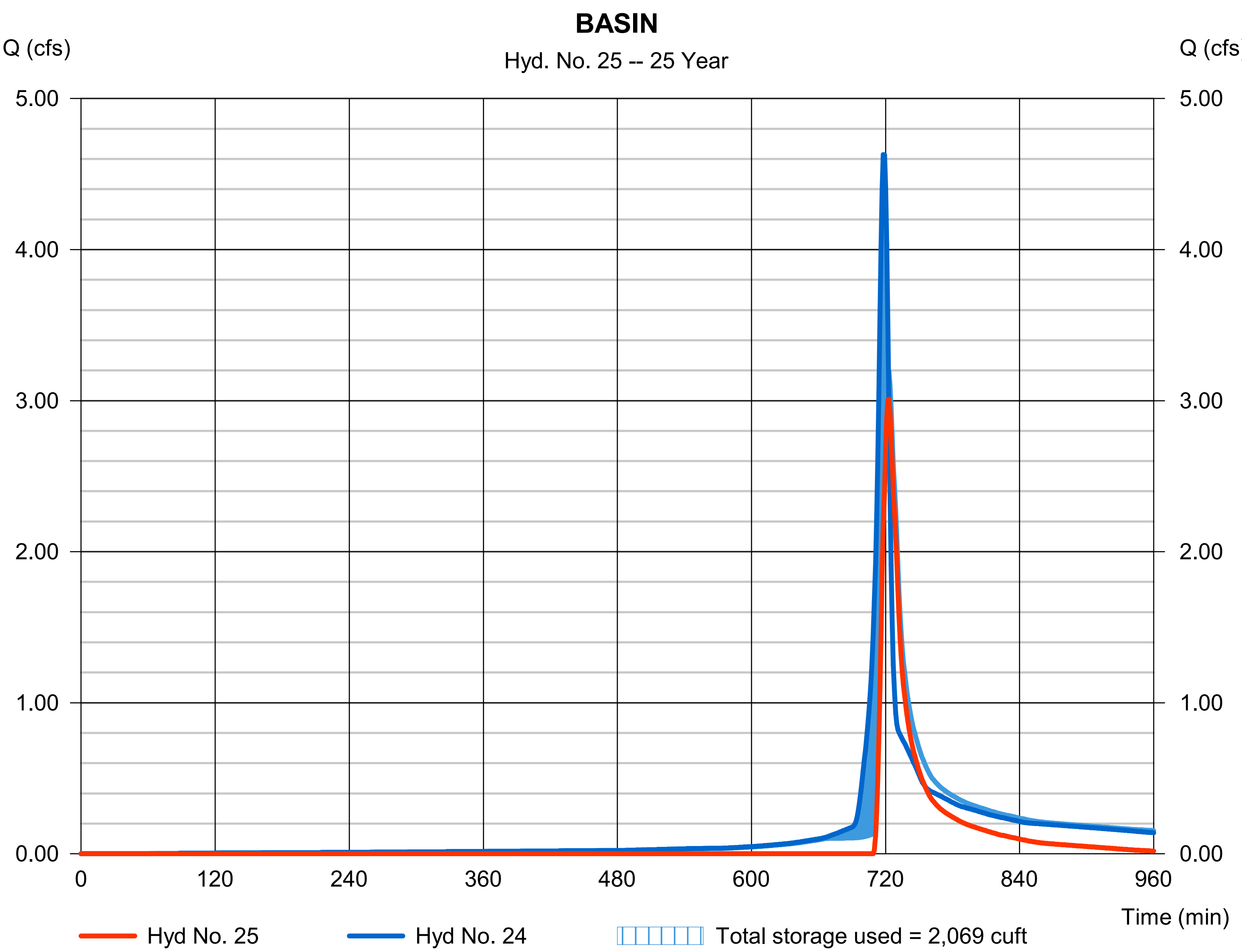
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 25

BASIN

Hydrograph type	= Reservoir	Peak discharge	= 3.010 cfs
Storm frequency	= 25 yrs	Time to peak	= 723 min
Time interval	= 1 min	Hyd. volume	= 5,055 cuft
Inflow hyd. No.	= 24 - TO BASIN	Max. Elevation	= 641.14 ft
Reservoir name	= UG N-12 Perforated Pipe System	Max. Storage	= 2,069 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

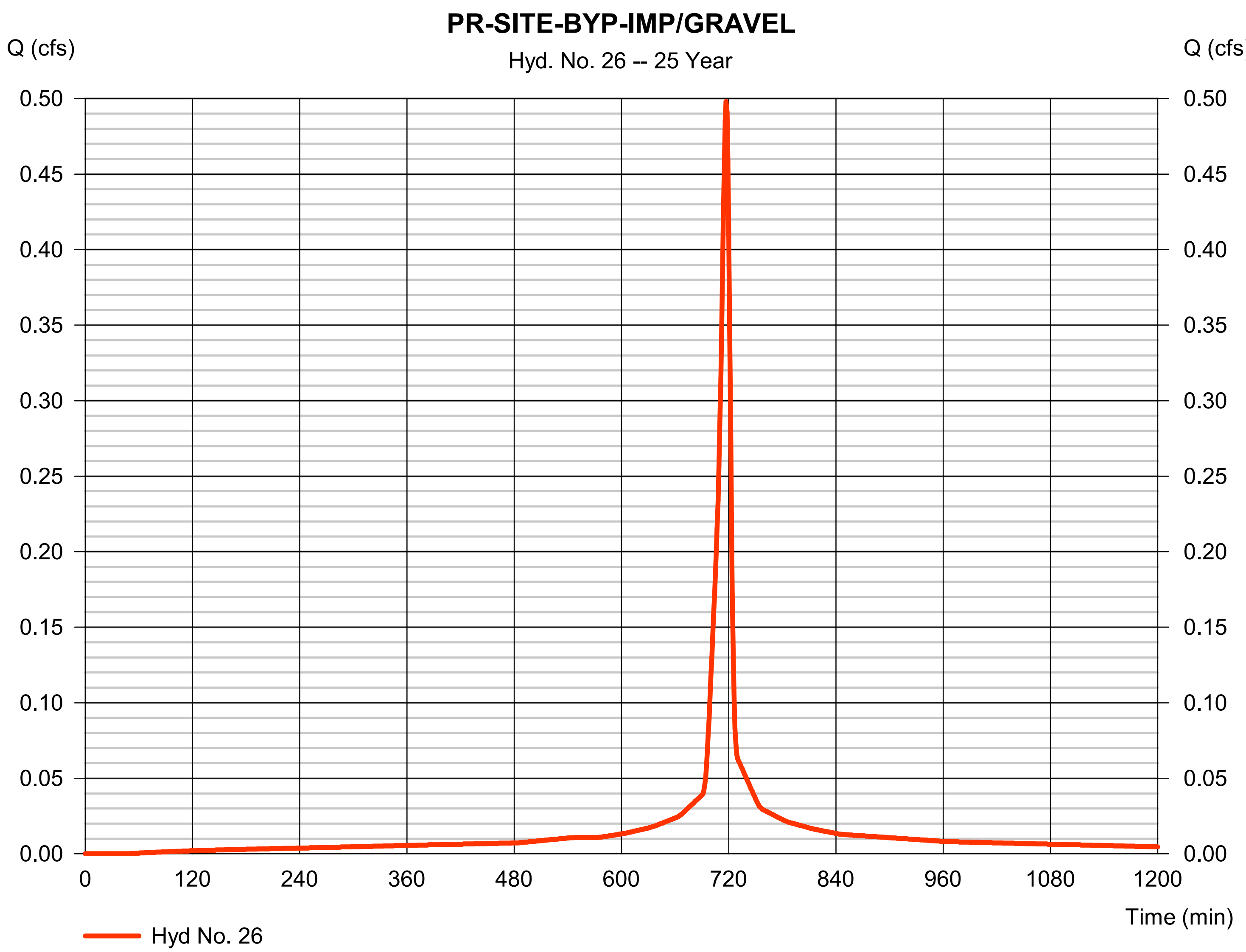
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 26

PR-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.498 cfs
Storm frequency	= 25 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 1,207 cuft
Drainage area	= 0.060 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.060 x 98)] / 0.060



Hydrograph Report

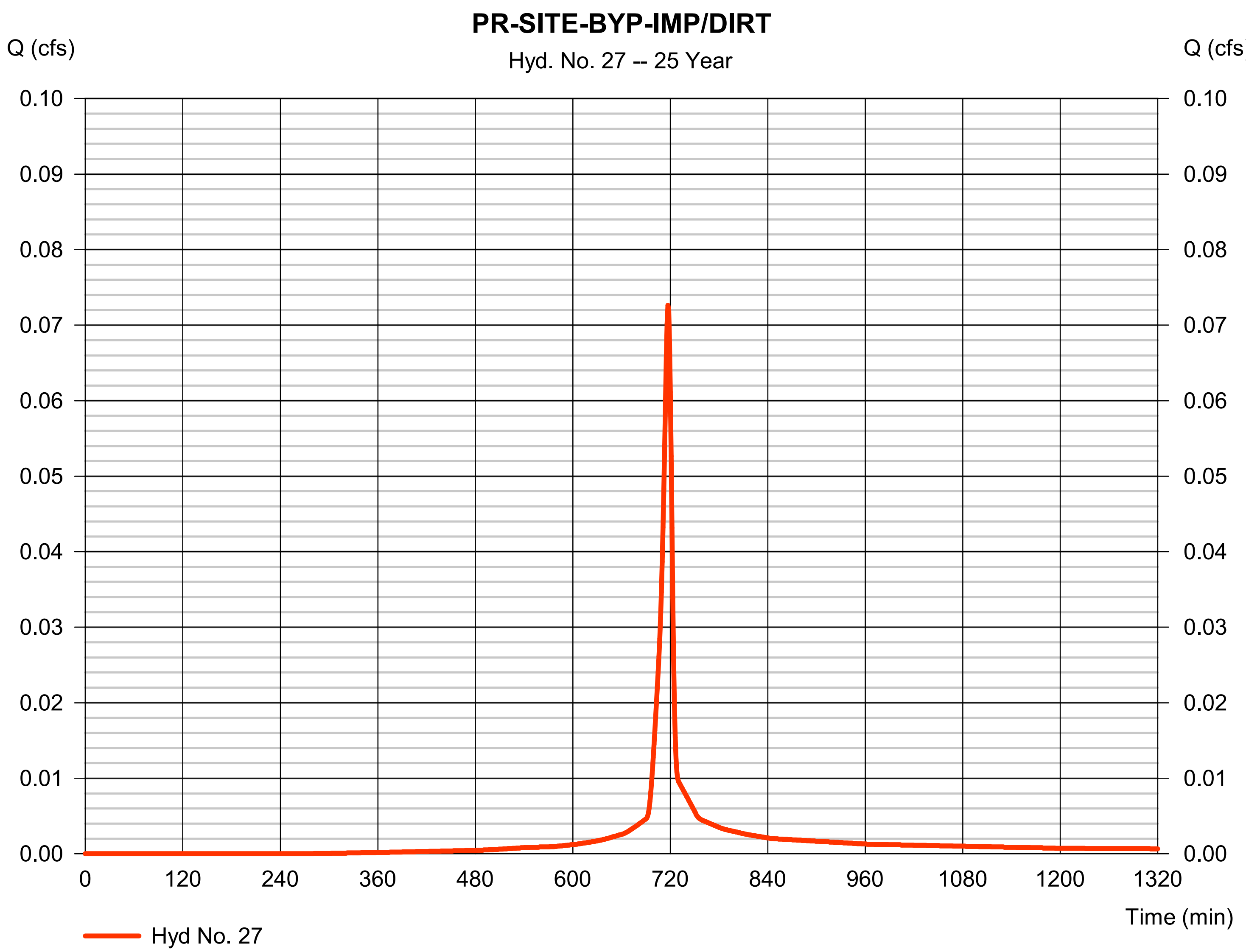
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 27

PR-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.073 cfs
Storm frequency	= 25 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 155 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.008 x 87)] / 0.010



Hydrograph Report

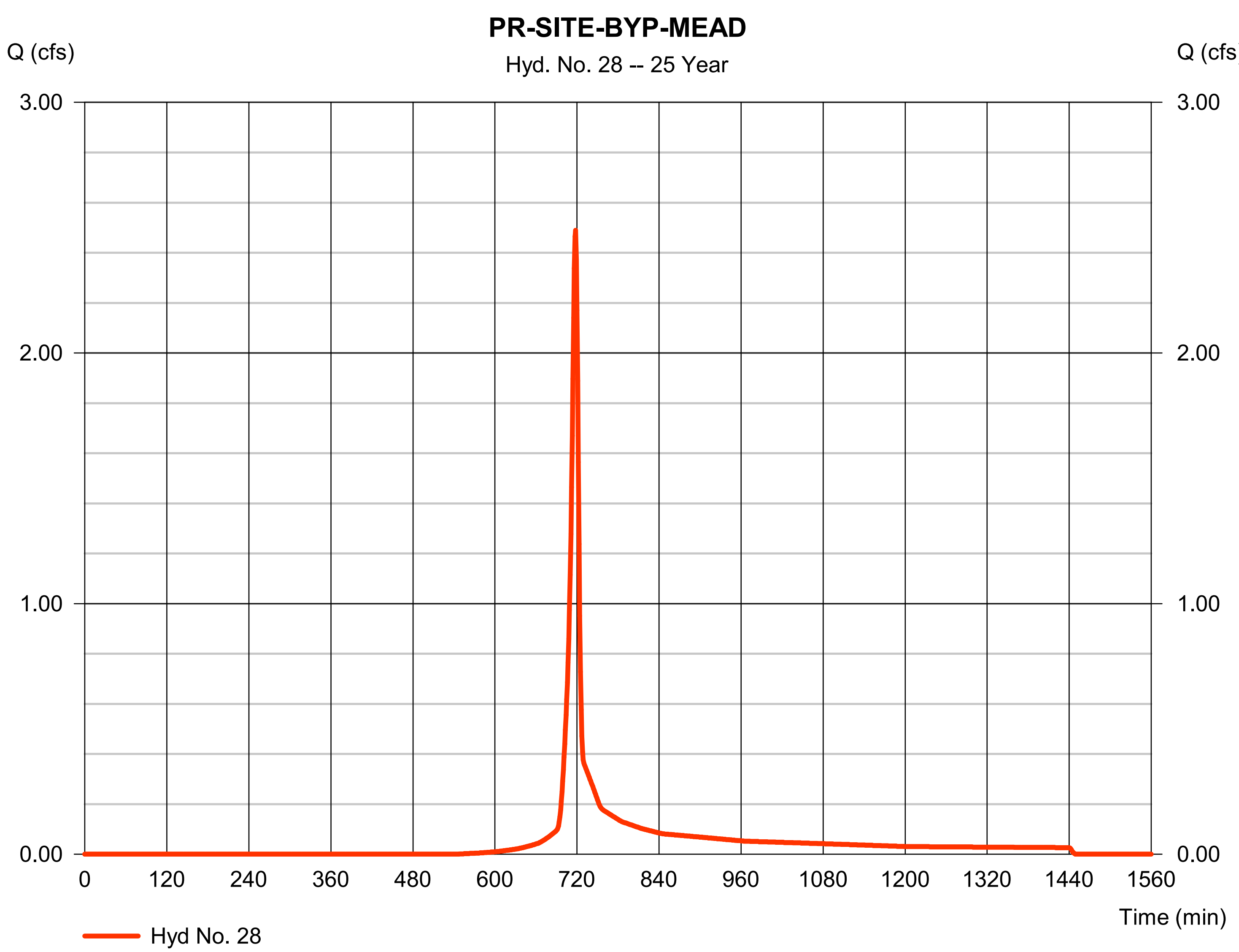
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 28

PR-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 2.489 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 5,008 cuft
Drainage area	= 0.517 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 5.61 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 71) + (0.290 x 71) + (0.085 x 71)] / 0.517



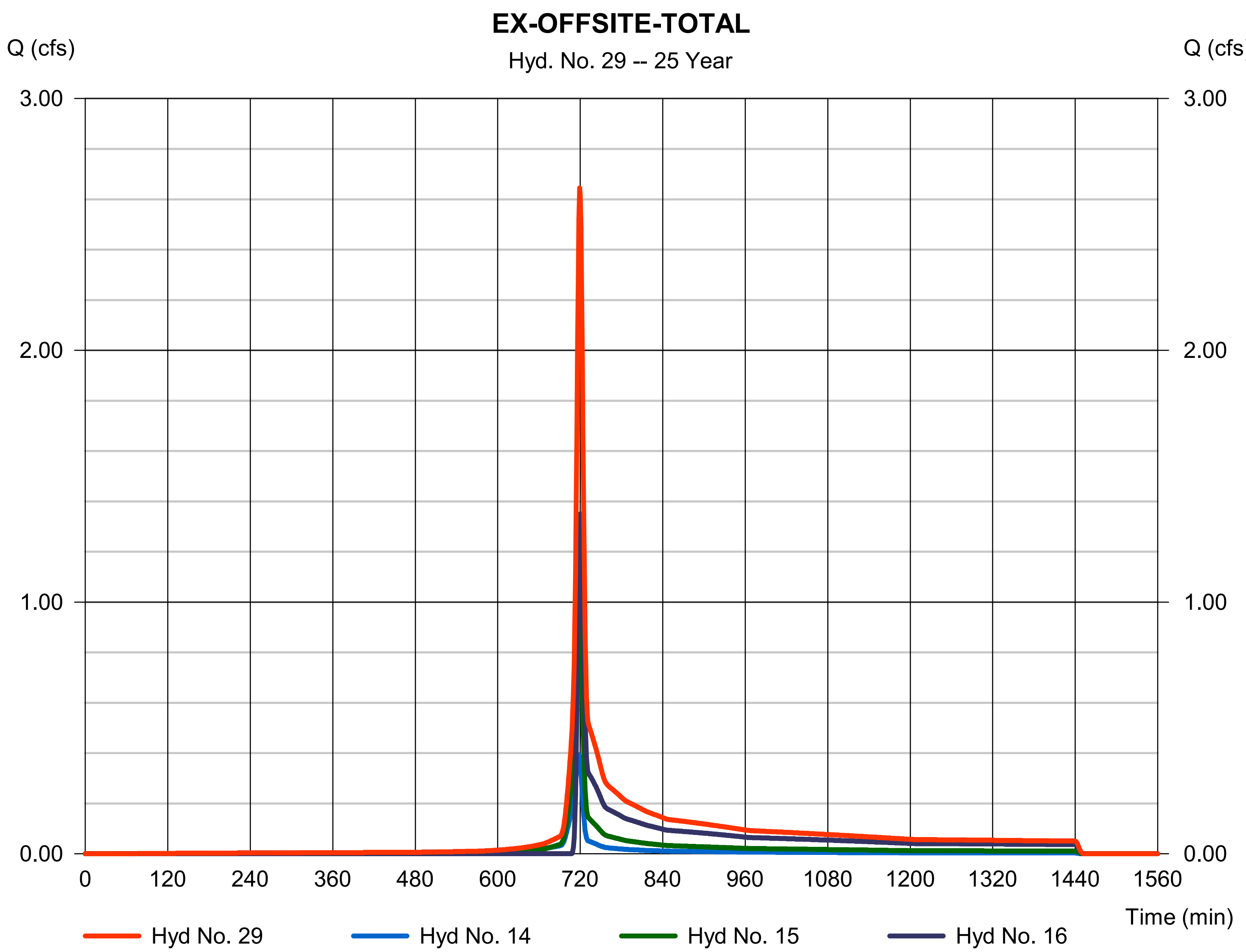
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 29

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 2.645 cfs
Storm frequency	= 25 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 6,895 cuft
Inflow hyds.	= 14, 15, 16	Contrib. drain. area	= 1.822 ac



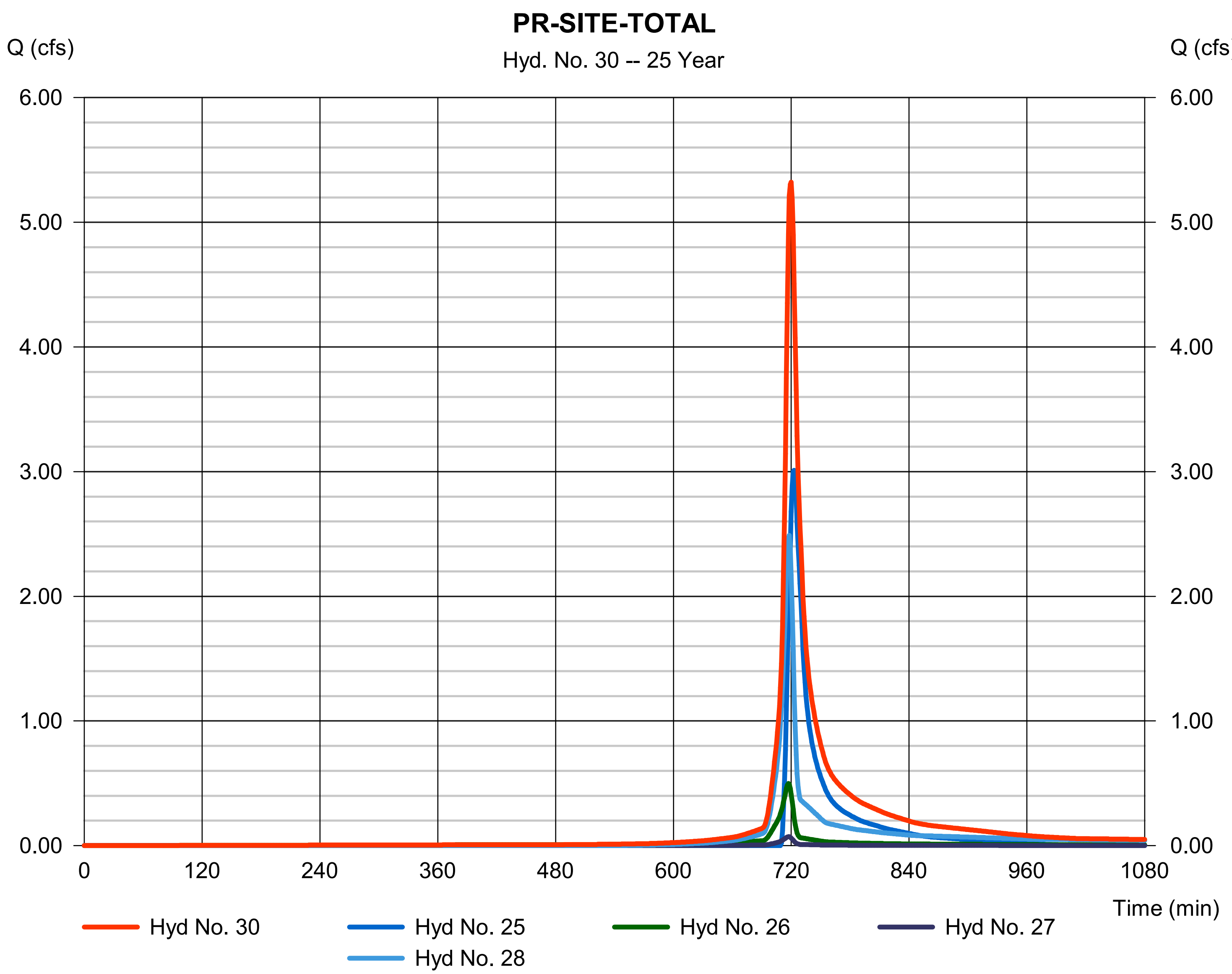
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 30

PR-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 5.321 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 11,426 cuft
Inflow hyds.	= 25, 26, 27, 28	Contrib. drain. area	= 0.587 ac



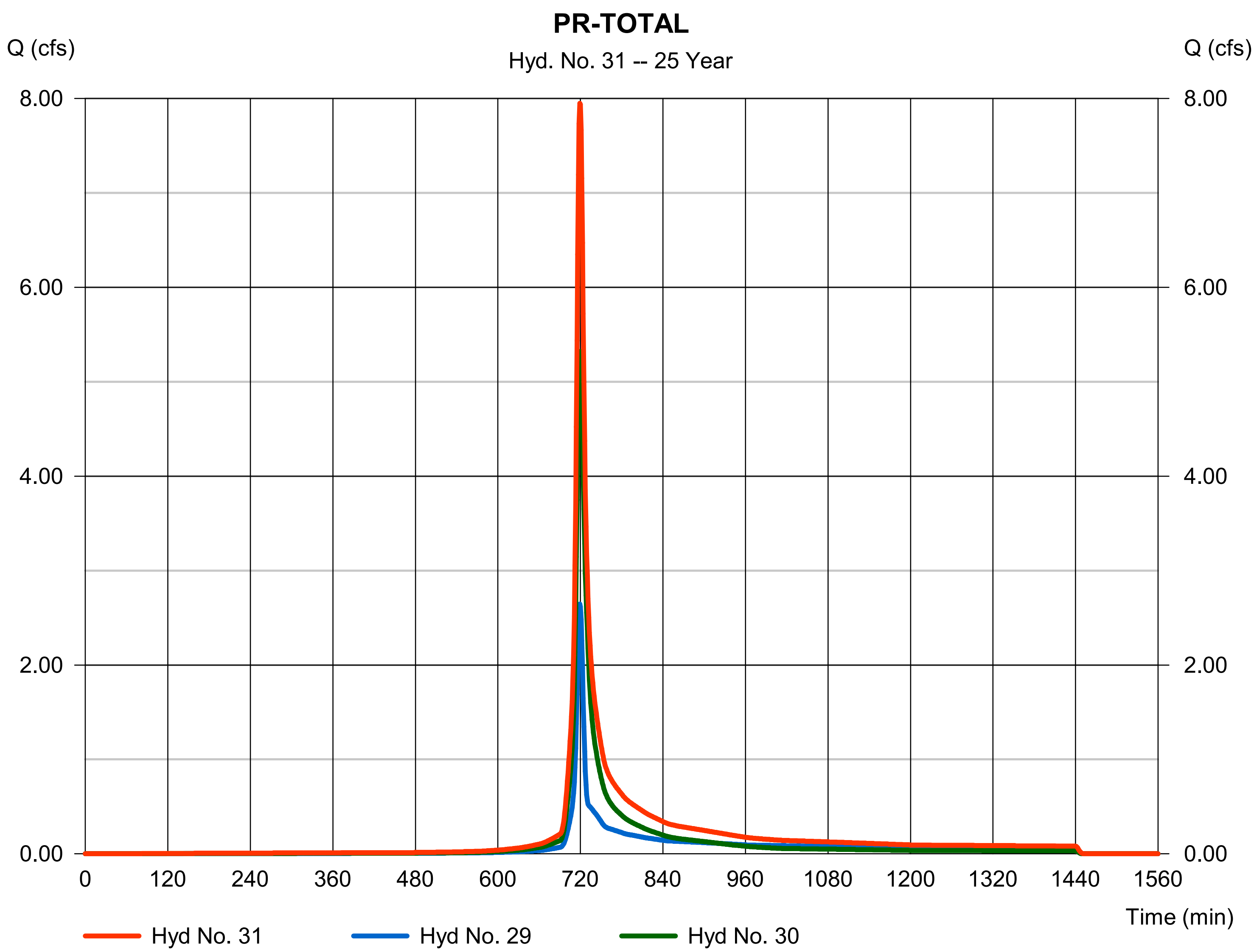
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 31

PR-TOTAL

Hydrograph type	= Combine	Peak discharge	= 7.950 cfs
Storm frequency	= 25 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 18,321 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.892	1	718	2,256	------	------	------	EX-OFFSITE-IMP/GRAVEL
2	SCS Runoff	0.061	1	719	147	------	------	------	EX-SITE-BYP-IMP/DIRT
3	SCS Runoff	0.006	1	893	201	------	------	------	EX-OFFSITE-MEAD
4	SCS Runoff	6.597	1	719	15,248	------	------	------	EX-OFFSITE-WOODS
5	SCS Runoff	0.107	1	719	243	------	------	------	EX-SITE-MEAD
6	SCS Runoff	2.027	1	719	4,586	------	------	------	EX-SITE-WOODS
7	SCS Runoff	0.077	1	719	183	------	------	------	EX-SITE-BYP-IMP/DIRT
8	SCS Runoff	0.359	1	719	962	------	------	------	EX-SITE-BYP-IMP/GRAVEL
9	SCS Runoff	0.773	1	719	1,750	------	------	------	EX-SITE-BYP-MEAD
10	SCS Runoff	2.043	1	719	4,622	------	------	------	EX-SITE-BYP-WOODS
11	Combine	5.386	1	719	12,346	5, 6, 7, 8, 9, 10	------	------	EX-SITE-TOTAL
12	Combine	7.532	1	719	17,851	1, 2, 3, 4,	------	------	EX-OFFSITE-TOTAL
13	Combine	12.92	1	719	30,198	11, 12	------	------	EX-TOTAL
14	SCS Runoff	0.459	1	718	1,162	------	------	------	PR-OFFSITE-IMP/GRAVEL
15	SCS Runoff	1.231	1	718	2,607	------	------	------	PR-OFFSITE-MEAD
16	SCS Runoff	2.450	1	719	6,076	------	------	------	PR-OFFSITE-WOODS
17	SCS Runoff	0.433	1	718	1,095	------	------	------	PR-OFFSITE-IMP/GRAVEL
18	SCS Runoff	1.709	1	719	3,835	------	------	------	PR-OFFSITE-MEAD
19	SCS Runoff	1.615	1	720	4,129	------	------	------	PR-OFFSITE-WOODS
20	Combine	3.741	1	719	9,058	17, 18, 19	------	------	OFFSITE TO BASIN
21	SCS Runoff	1.419	1	718	2,870	------	------	------	PR-SITE-MEAD
22	SCS Runoff	0.970	1	717	2,363	------	------	------	PR-SITE-IMP/GRAVEL
23	SCS Runoff	0.719	1	717	1,578	------	------	------	PR-SITE-GRAVEL
24	Combine	6.673	1	718	15,868	20, 21, 22, 23	------	------	TO BASIN
25	Reservoir	4.906	1	722	8,347	24	641.61	2,614	BASIN
26	SCS Runoff	0.582	1	717	1,418	------	------	------	PR-SITE-BYP-IMP/GRAVEL
27	SCS Runoff	0.087	1	717	189	------	------	------	PR-SITE-BYP-IMP/DIRT
28	SCS Runoff	3.203	1	718	6,479	------	------	------	PR-SITE-BYP-MEAD
29	Combine	4.128	1	719	9,845	14, 15, 16,	------	------	EX-OFFSITE-TOTAL
30	Combine	7.903	1	720	16,433	25, 26, 27, 28,	------	------	PR-SITE-TOTAL
31	Combine	11.93	1	720	26,278	29, 30	------	------	PR-TOTAL

Proposed.gpw	Return Period: 50 Year	Saturday, 10 / 13 / 2018

Hydrograph Report

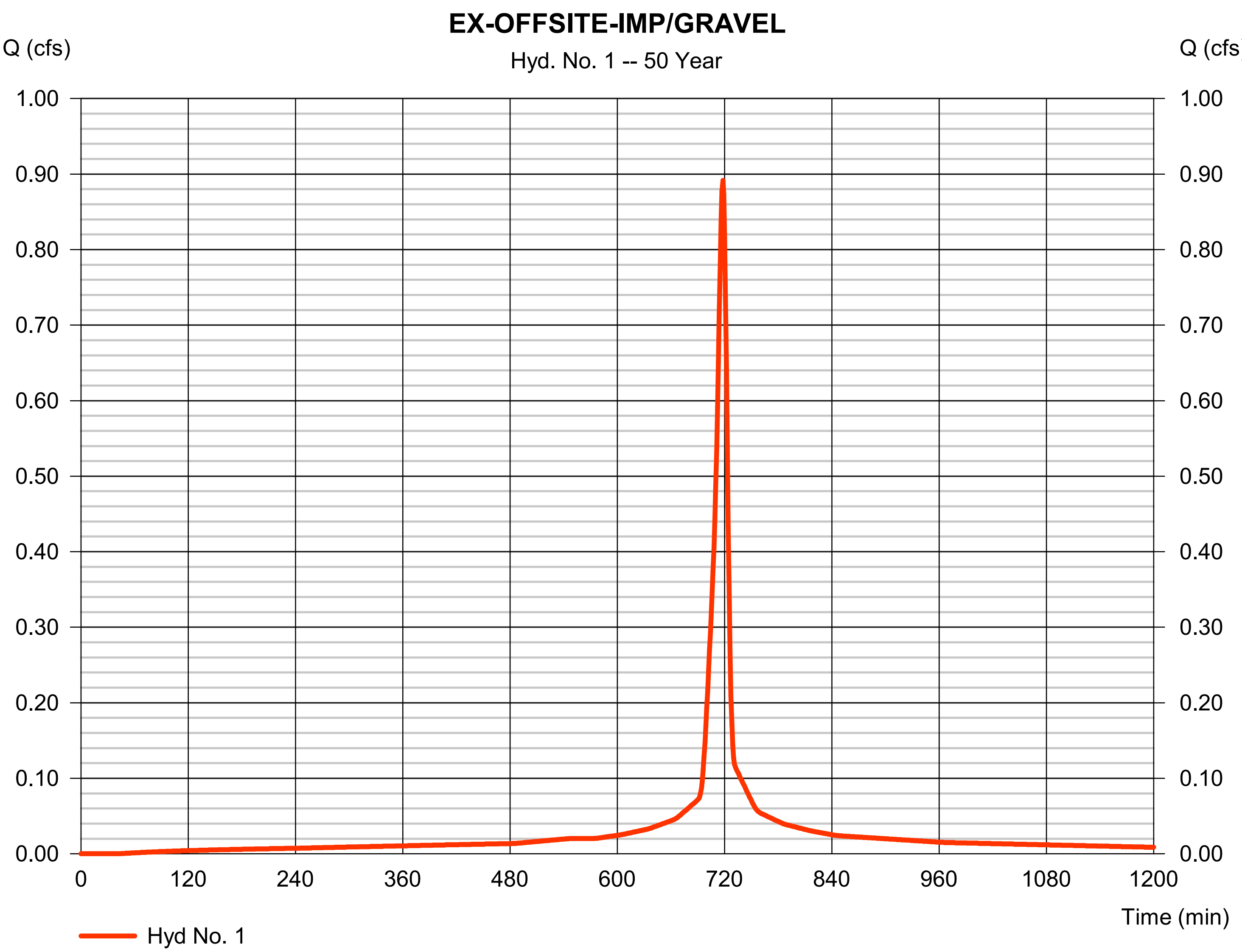
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 1

EX-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.892 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 2,256 cuft
Drainage area	= 0.101 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.101



Hydrograph Report

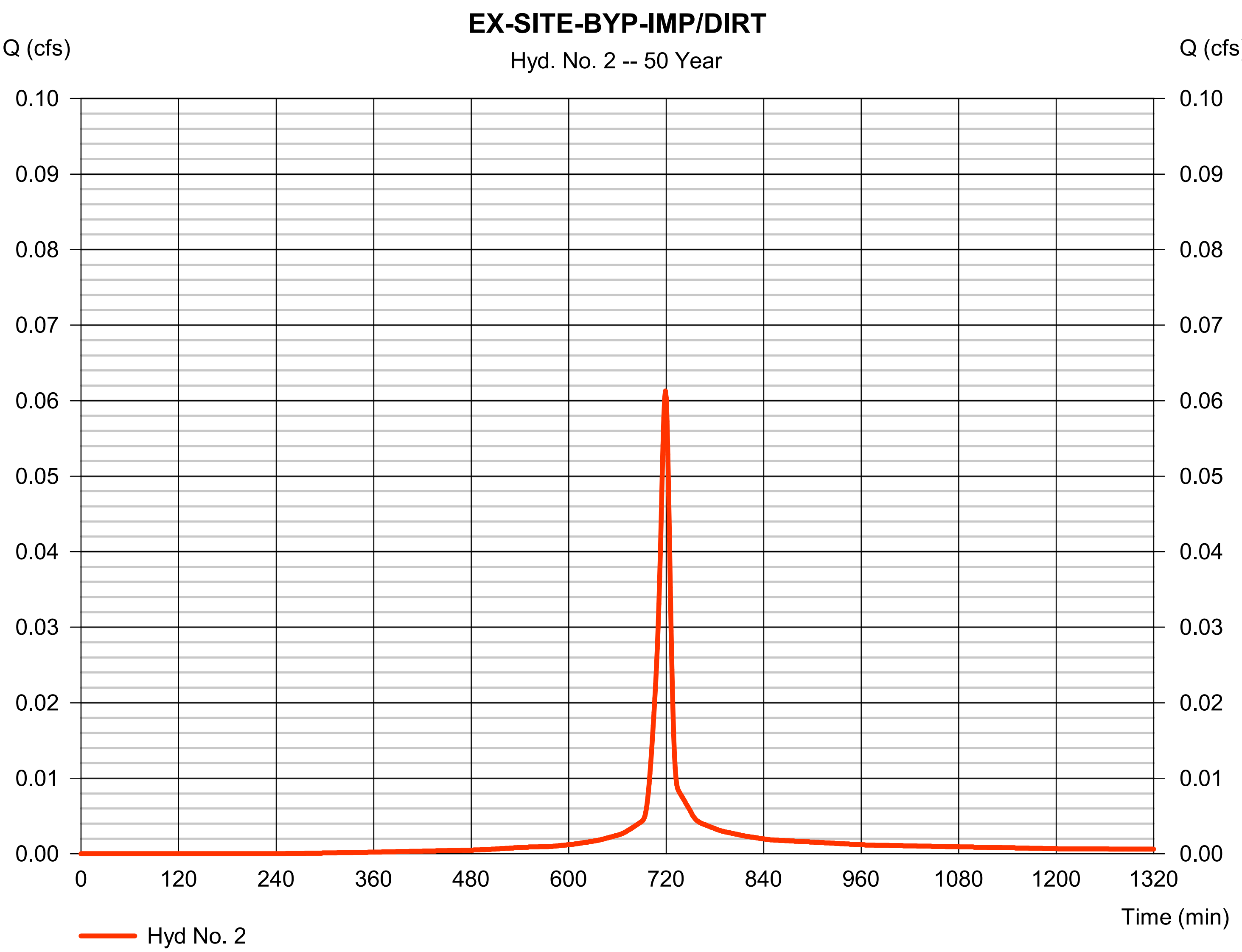
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 2

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.061 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 147 cuft
Drainage area	= 0.008 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.80 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.008



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 3

EX-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.006 cfs
Storm frequency	= 50 yrs	Time to peak	= 893 min
Time interval	= 1 min	Hyd. volume	= 201 cuft
Drainage area	= 0.404 ac	Curve number	= 30*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.100 x 70)] / 0.404

Hydrograph Report

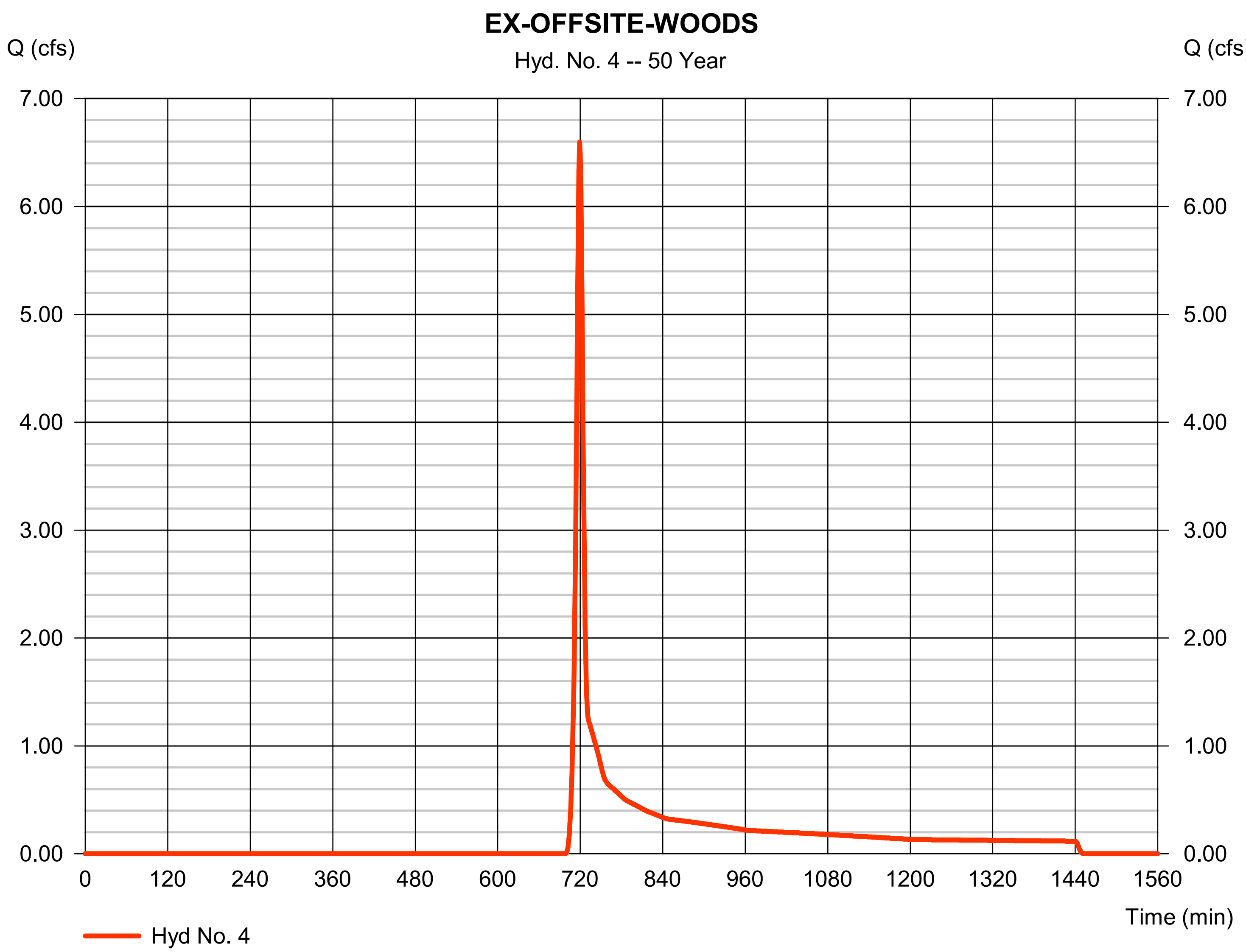
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 4

EX-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 6.597 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 15,248 cuft
Drainage area	= 3.210 ac	Curve number	= 49*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.562 x 70) + (1.652 x 30)] / 3.210



Hydrograph Report

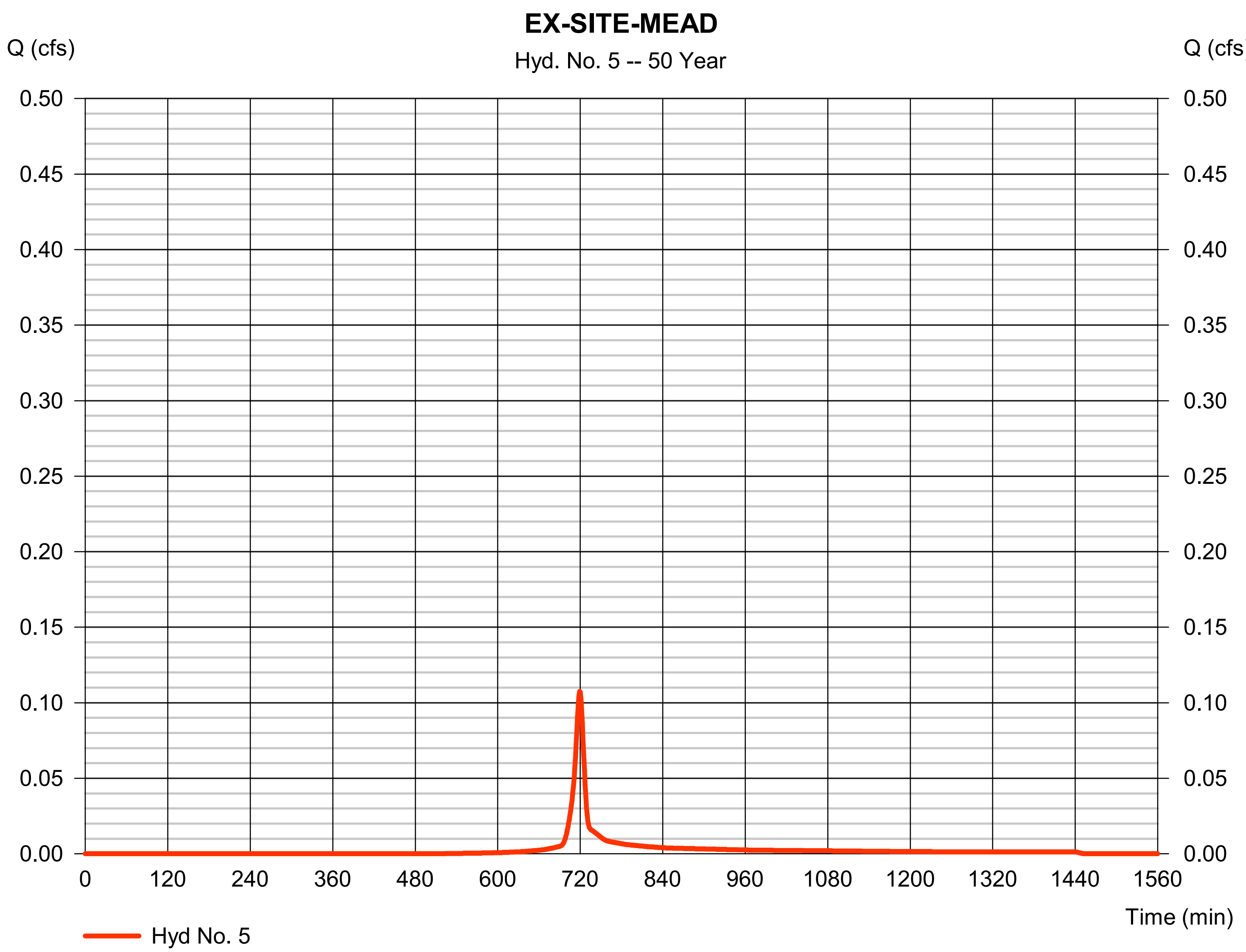
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 5

EX-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.107 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 243 cuft
Drainage area	= 0.020 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.020 x 71)] / 0.020



Hydrograph Report

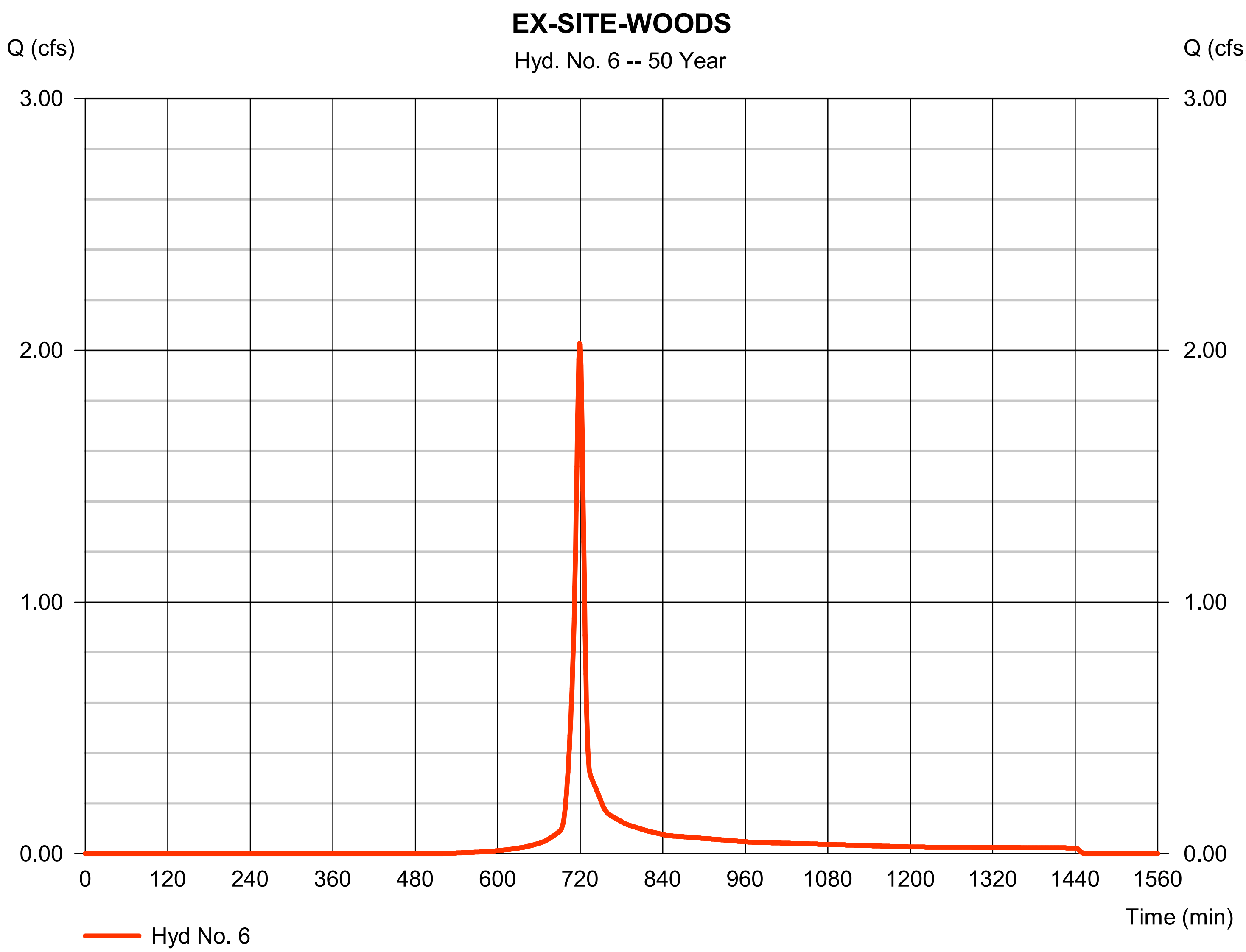
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 6

EX-SITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 2.027 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 4,586 cuft
Drainage area	= 0.389 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.240 x 70) + (0.060 x 70) + (0.460 x 70)] / 0.389



Hydrograph Report

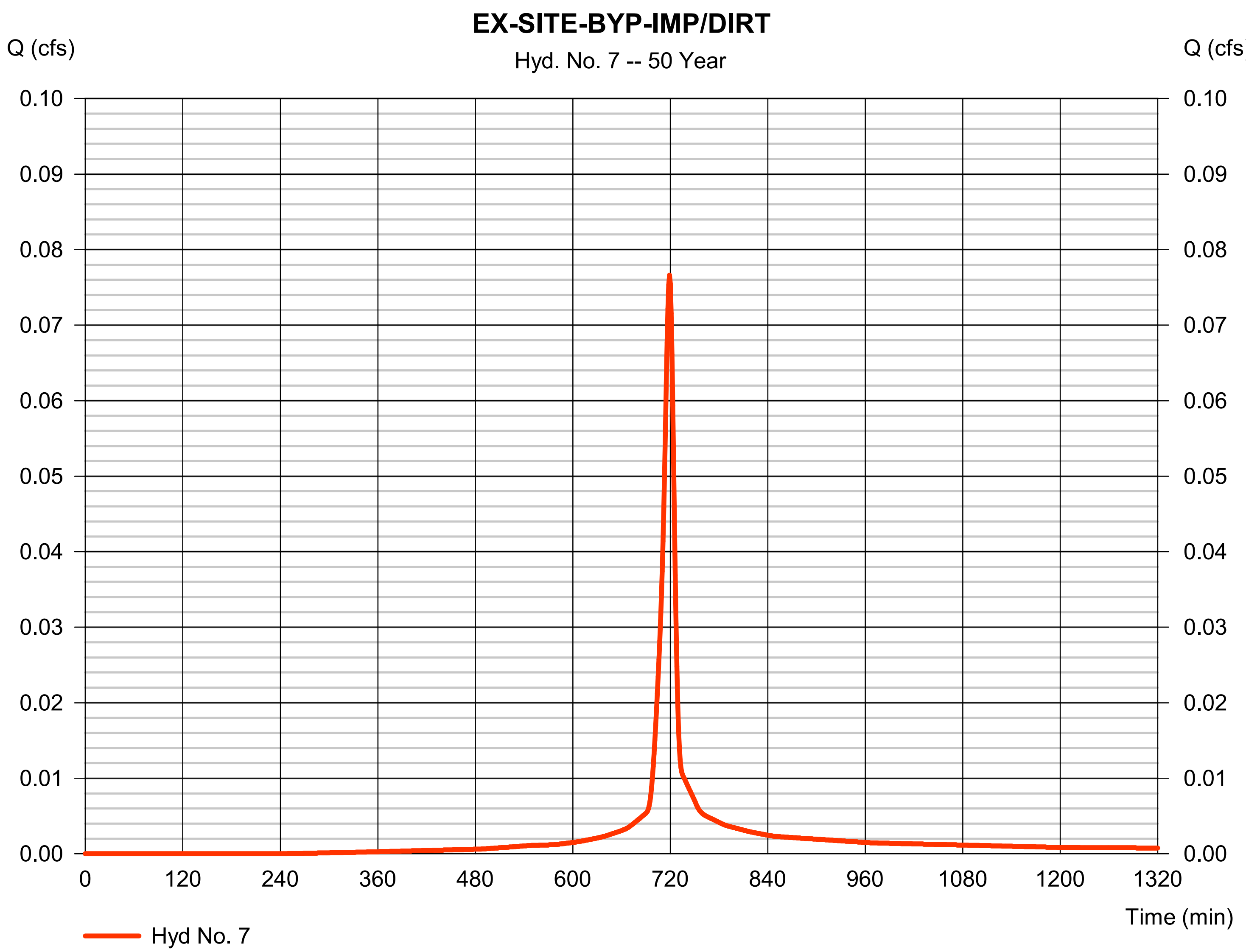
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 7

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.077 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 183 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.010



Hydrograph Report

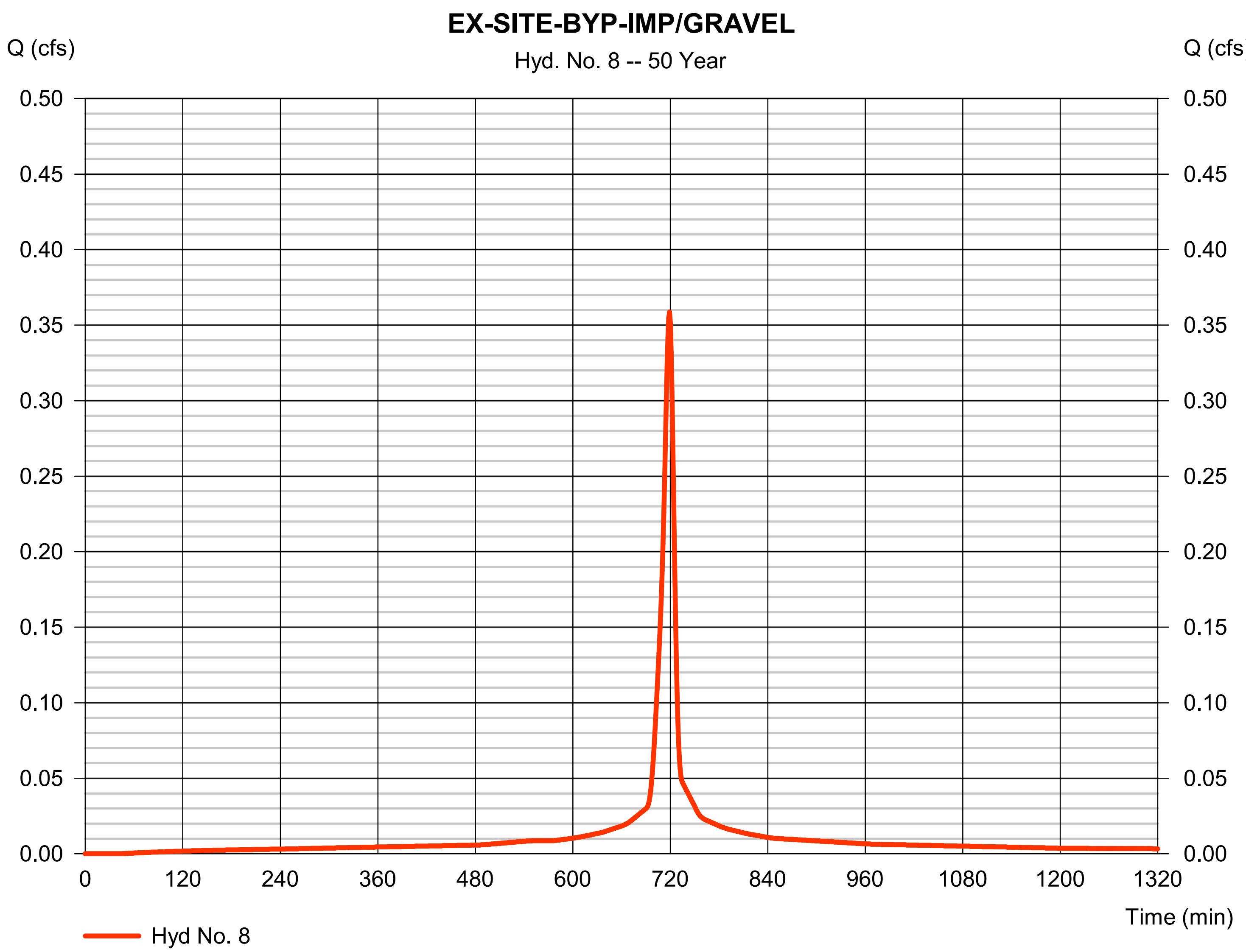
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 8

EX-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.359 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 962 cuft
Drainage area	= 0.042 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.040 x 98)] / 0.042



Hydrograph Report

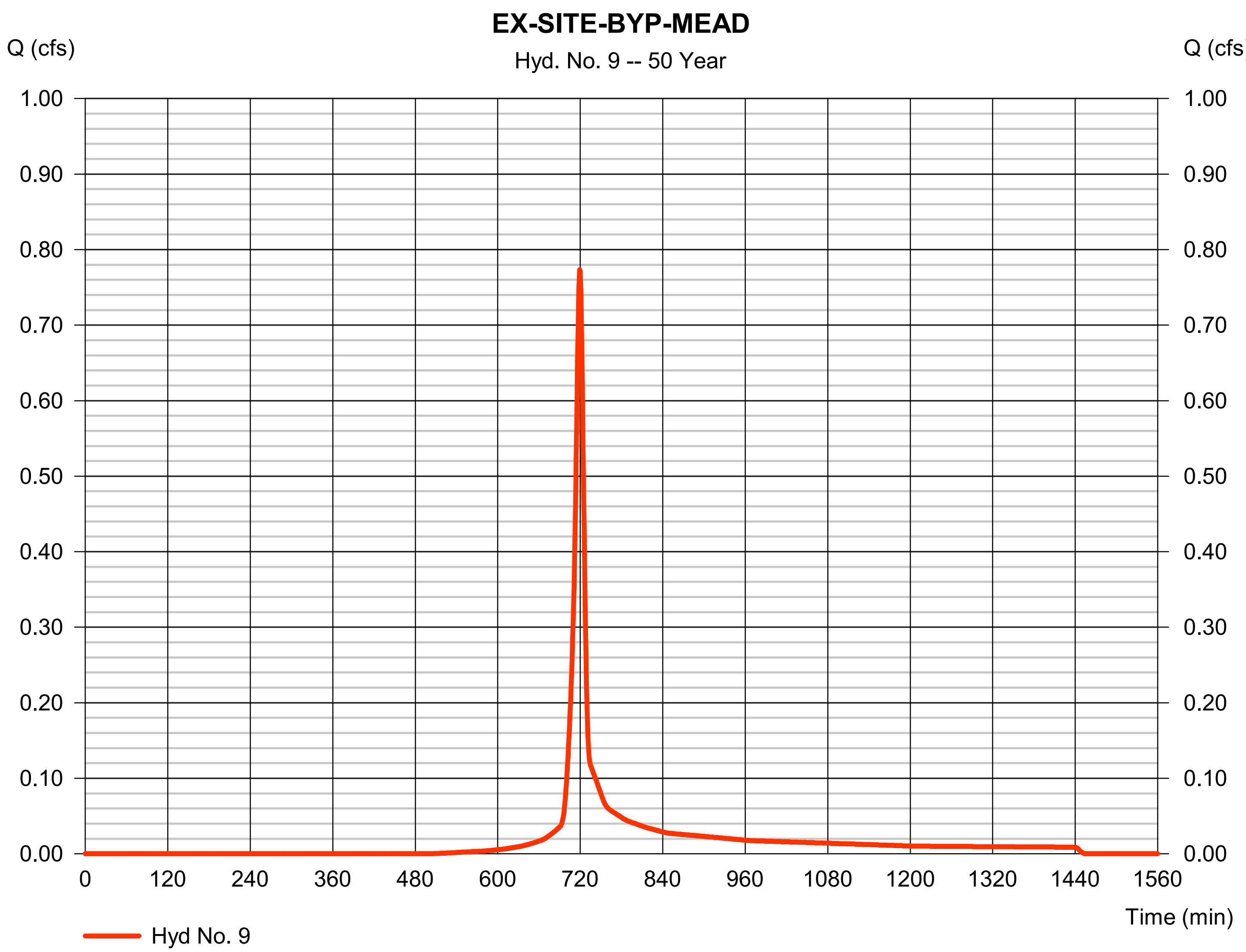
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 9

EX-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.773 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 1,750 cuft
Drainage area	= 0.144 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.190 x 71)] / 0.144



Hydrograph Report

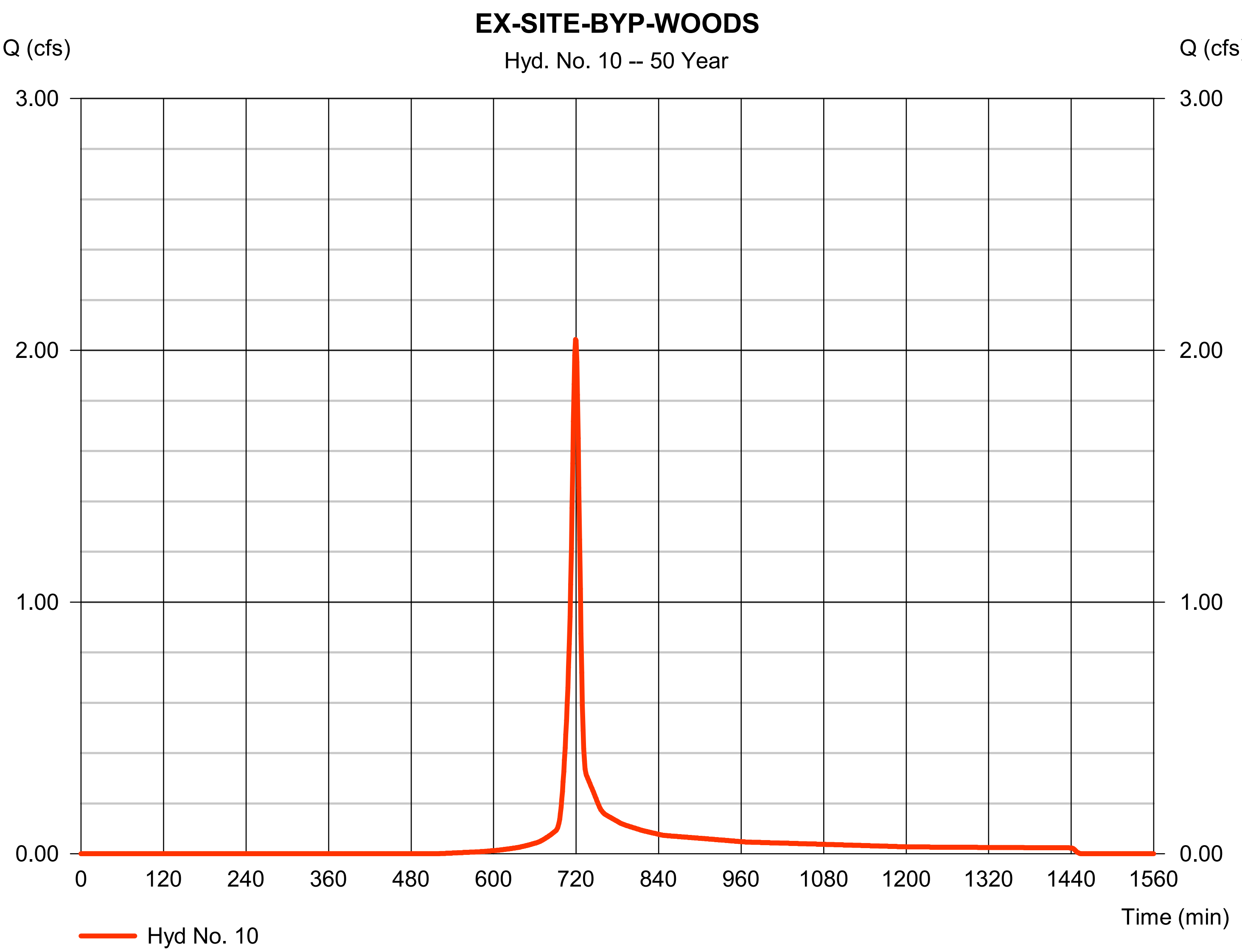
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 10

EX-SITE-BYP-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 2.043 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 4,622 cuft
Drainage area	= 0.392 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 70) + (0.110 x 70) + (0.090 x 70)] / 0.392



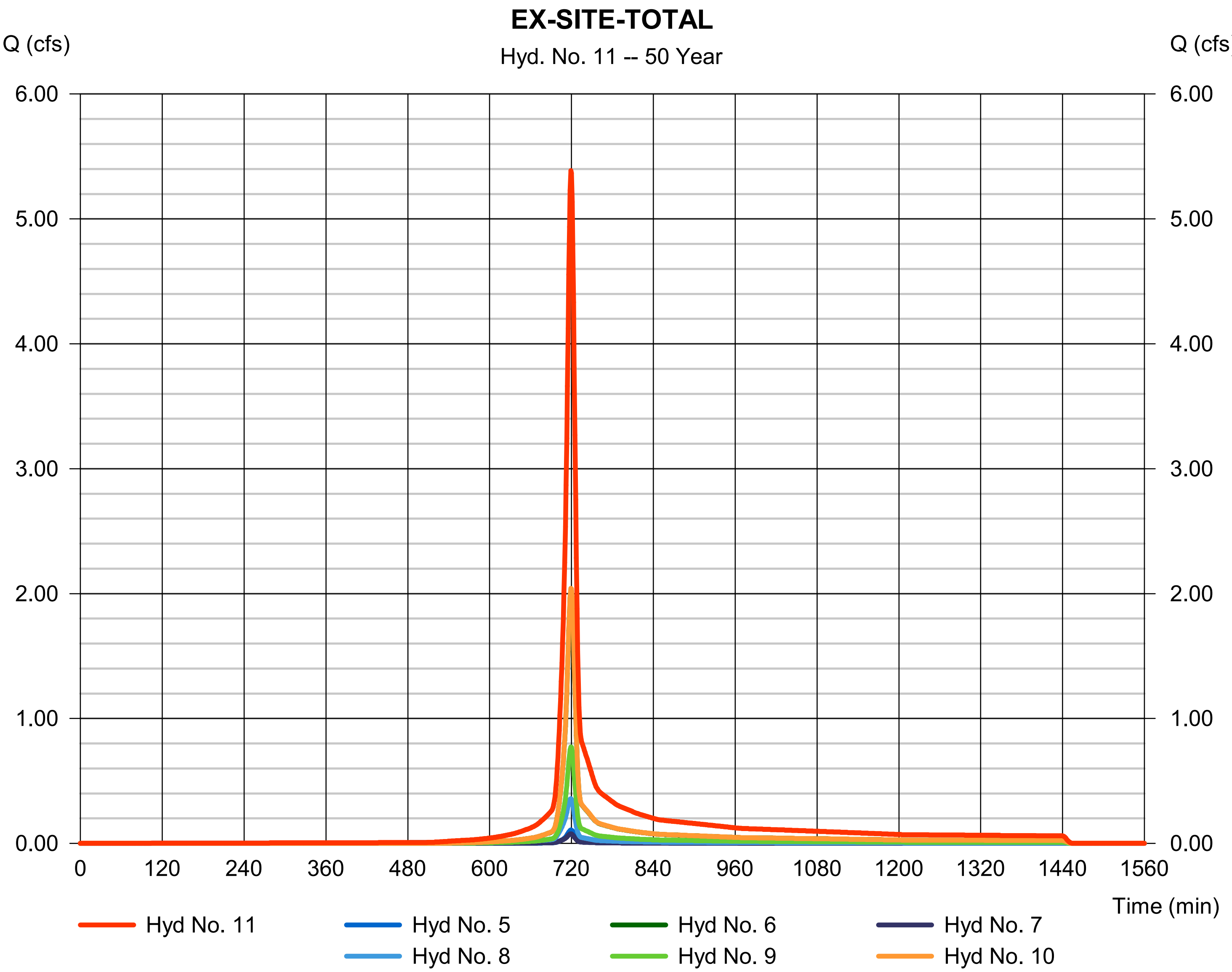
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 11

EX-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 5.386 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 12,346 cuft
Inflow hyds.	= 5, 6, 7, 8, 9, 10	Contrib. drain. area	= 0.997 ac



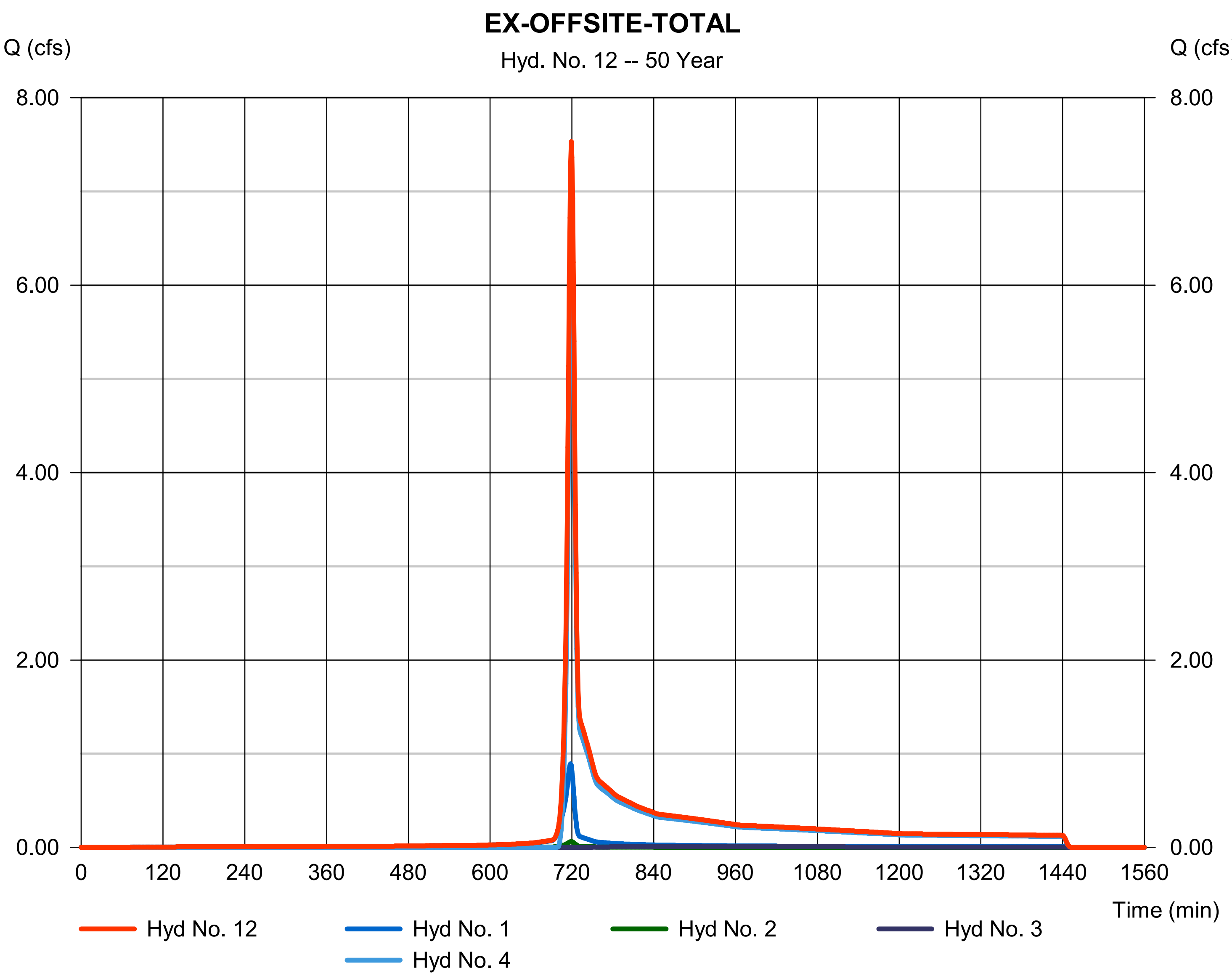
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 12

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 7.532 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 17,851 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 3.723 ac



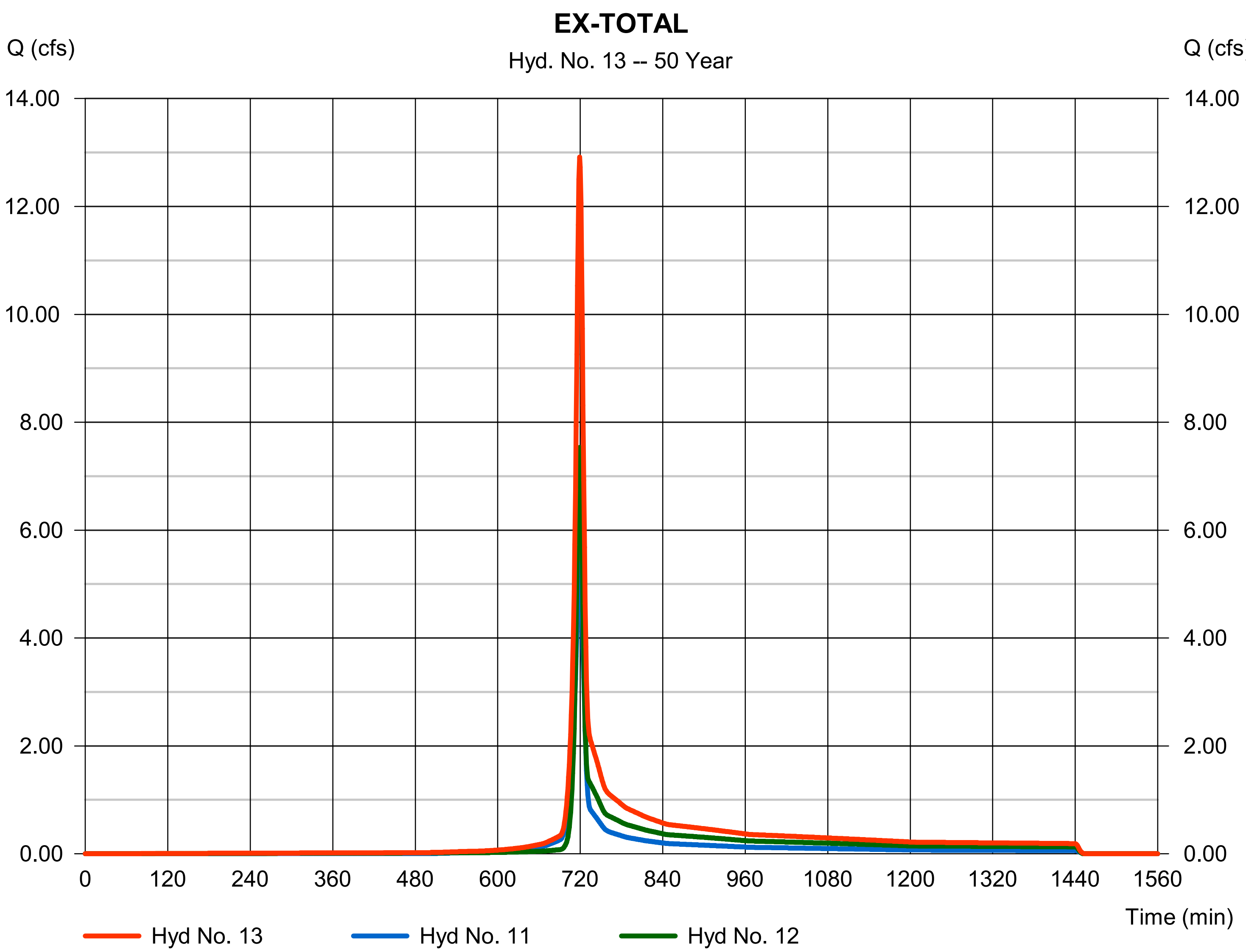
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 13

EX-TOTAL

Hydrograph type	= Combine	Peak discharge	= 12.92 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 30,198 cuft
Inflow hyds.	= 11, 12	Contrib. drain. area	= 0.000 ac



Hydrograph Report

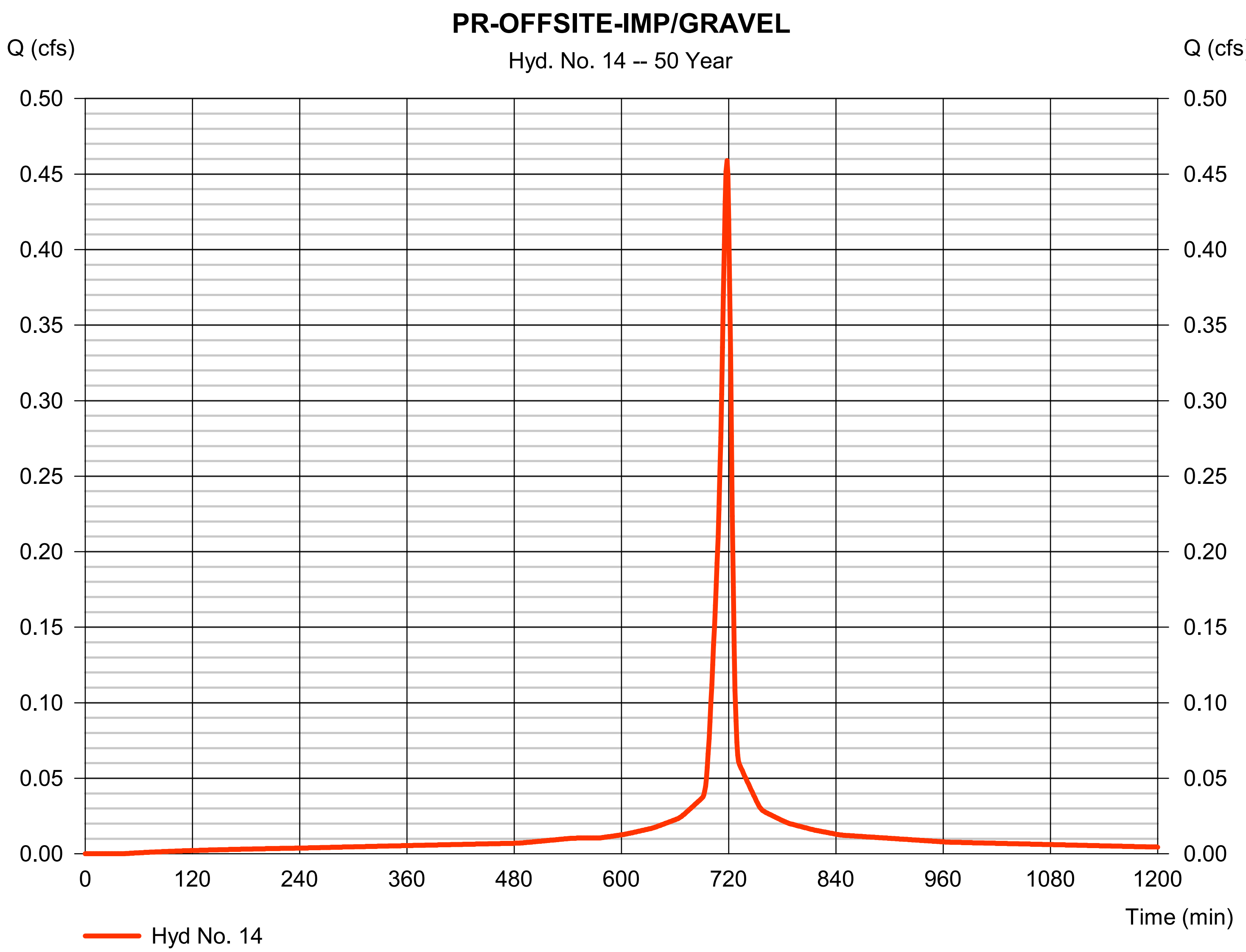
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 14

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.459 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,162 cuft
Drainage area	= 0.052 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.013 x 98)] / 0.052



Hydrograph Report

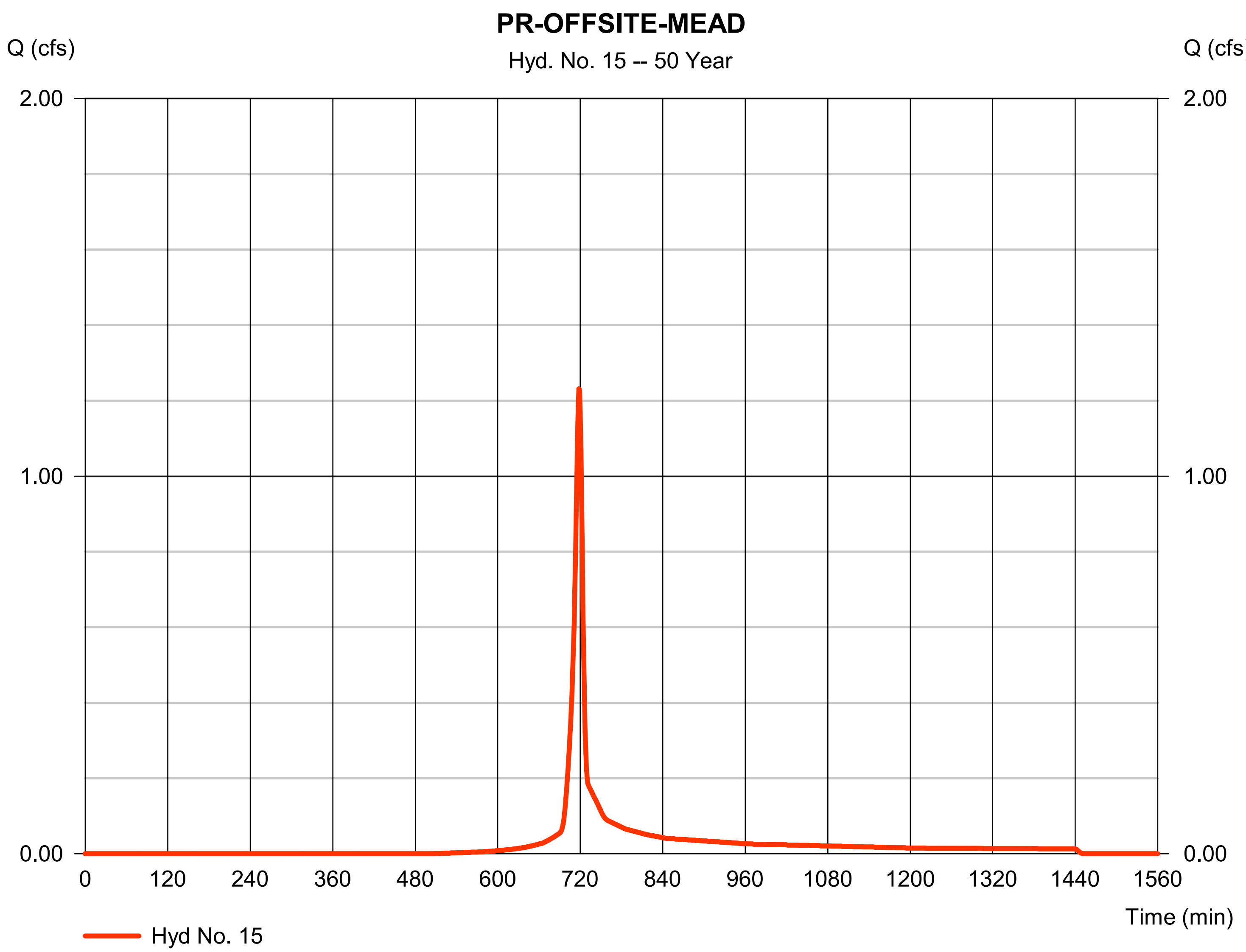
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 15

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 1.231 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 2,607 cuft
Drainage area	= 0.220 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.034 x 71) + (0.099 x 71) + (0.084 x 71) + (0.001 x 30)] / 0.220



Hydrograph Report

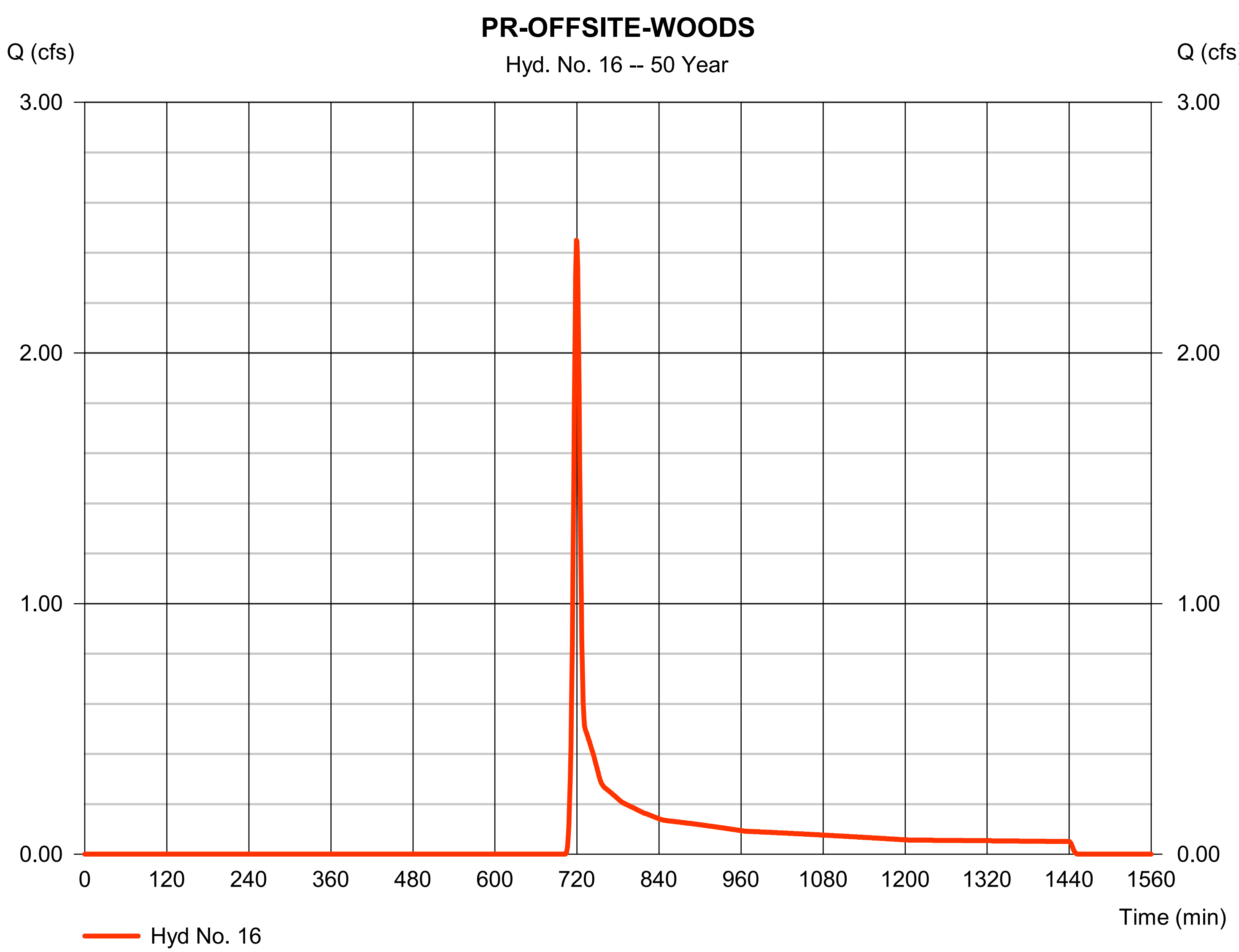
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 16

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 2.450 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 6,076 cuft
Drainage area	= 1.550 ac	Curve number	= 46*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.602 x 70) + (0.951 x 30)] / 1.550



Hydrograph Report

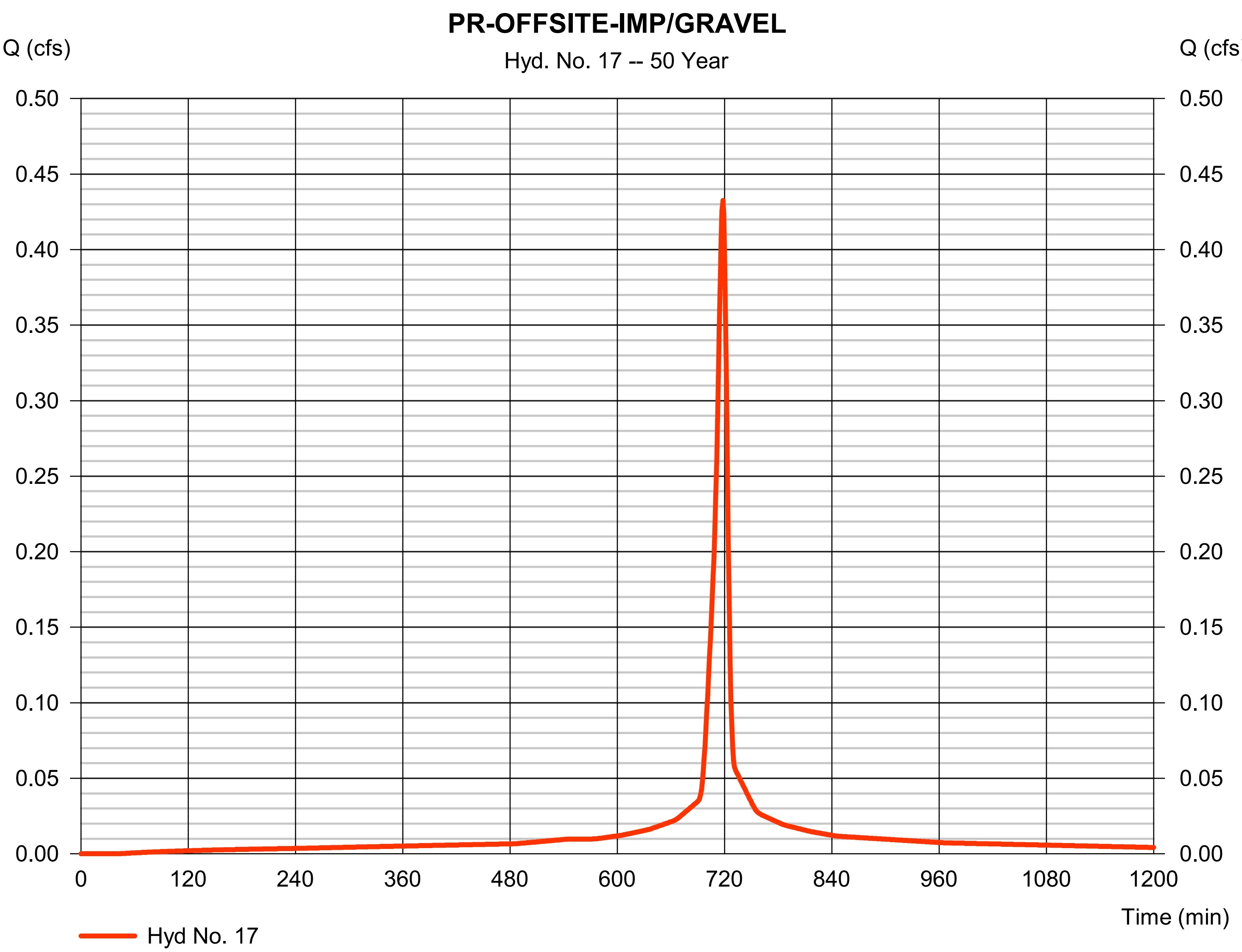
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 17

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.433 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,095 cuft
Drainage area	= 0.049 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.049



Hydrograph Report

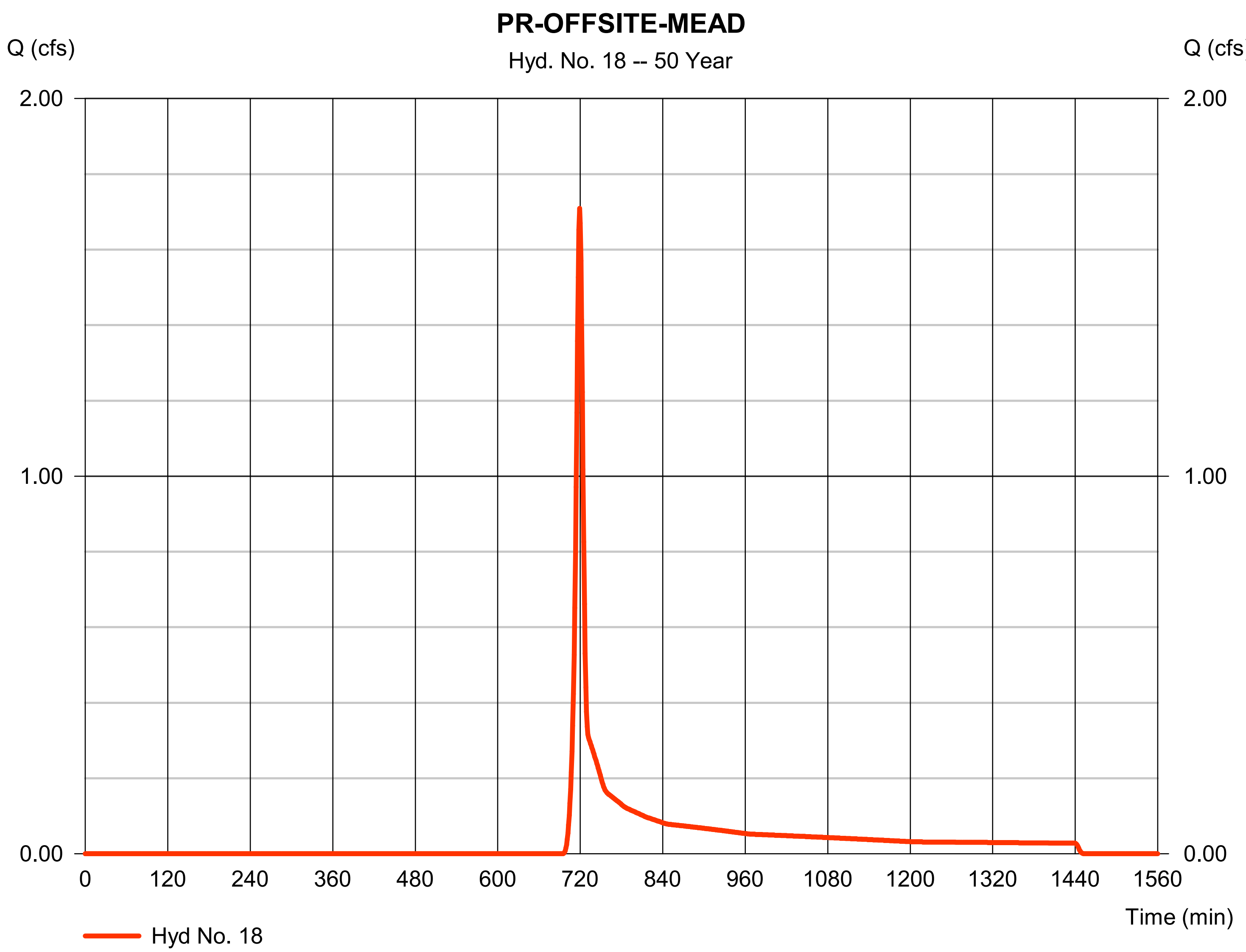
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 18

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 1.709 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 3,835 cuft
Drainage area	= 0.720 ac	Curve number	= 51*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.037 x 71) + (0.331 x 71) + (0.252 x 30) + (0.103 x 30)] / 0.720



Hydrograph Report

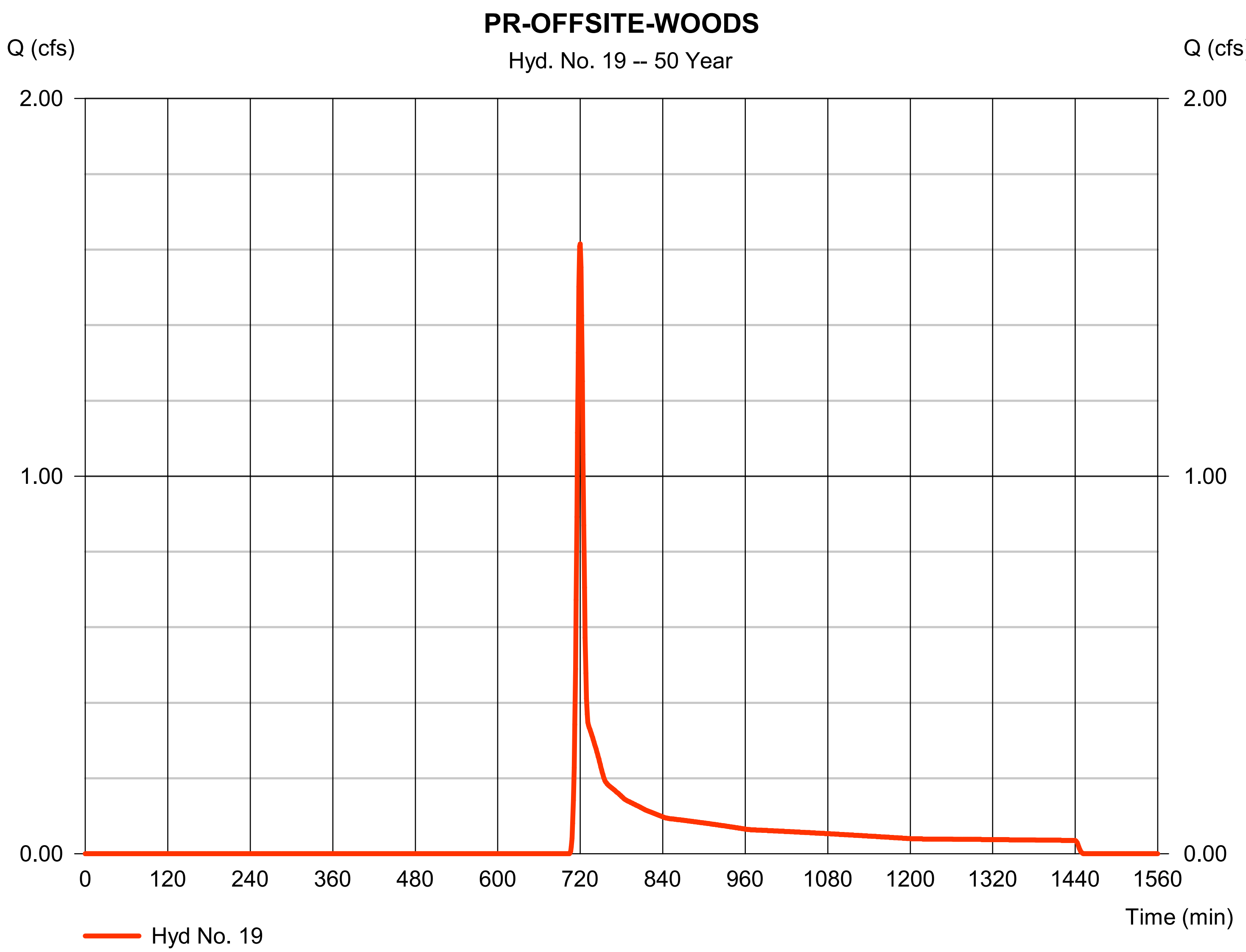
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 19

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 1.615 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 4,129 cuft
Drainage area	= 1.130 ac	Curve number	= 45*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.180 x 70) + (0.700 x 30)] / 1.130



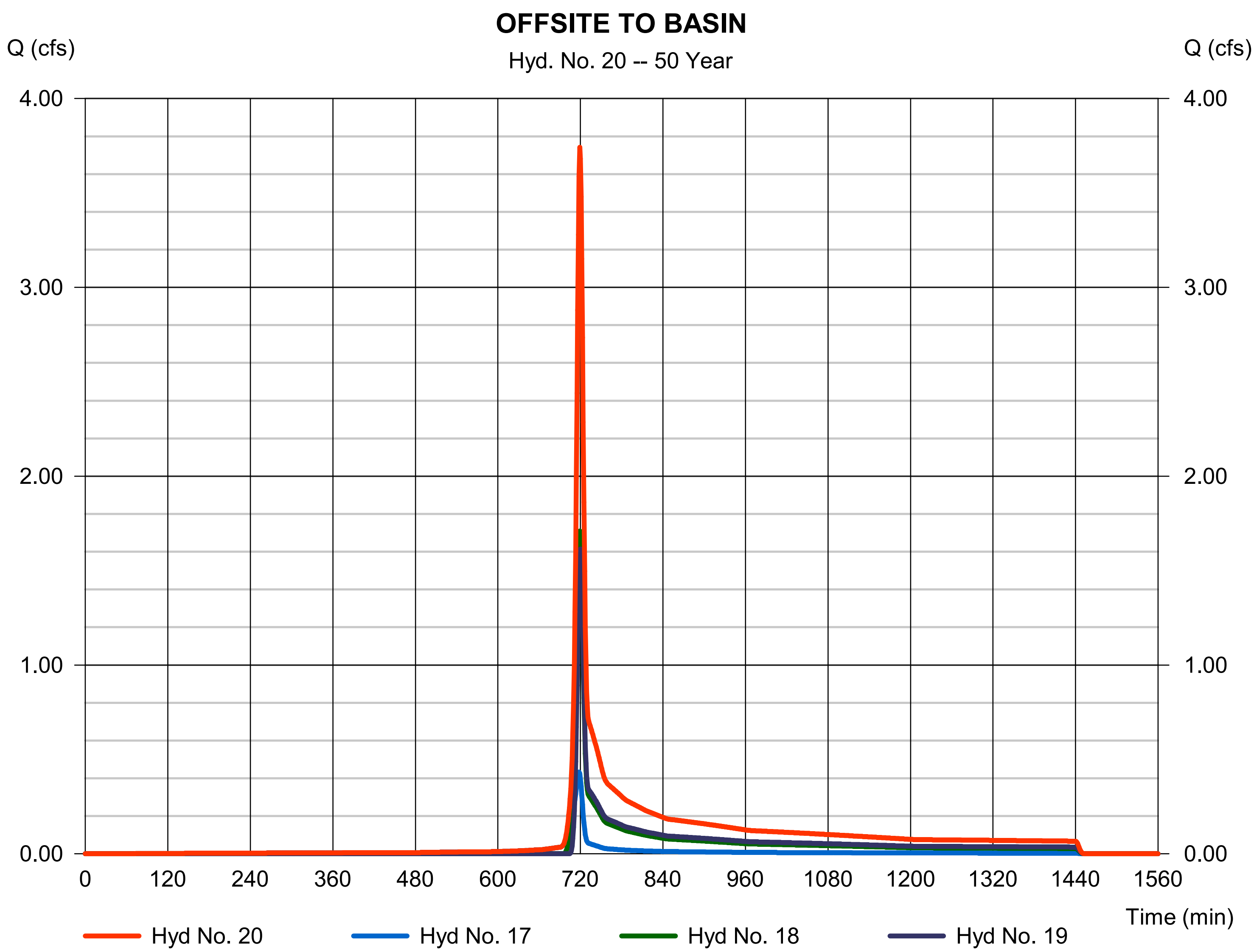
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 20

OFFSITE TO BASIN

Hydrograph type	= Combine	Peak discharge	= 3.741 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 9,058 cuft
Inflow hyds.	= 17, 18, 19	Contrib. drain. area	= 1.899 ac



Hydrograph Report

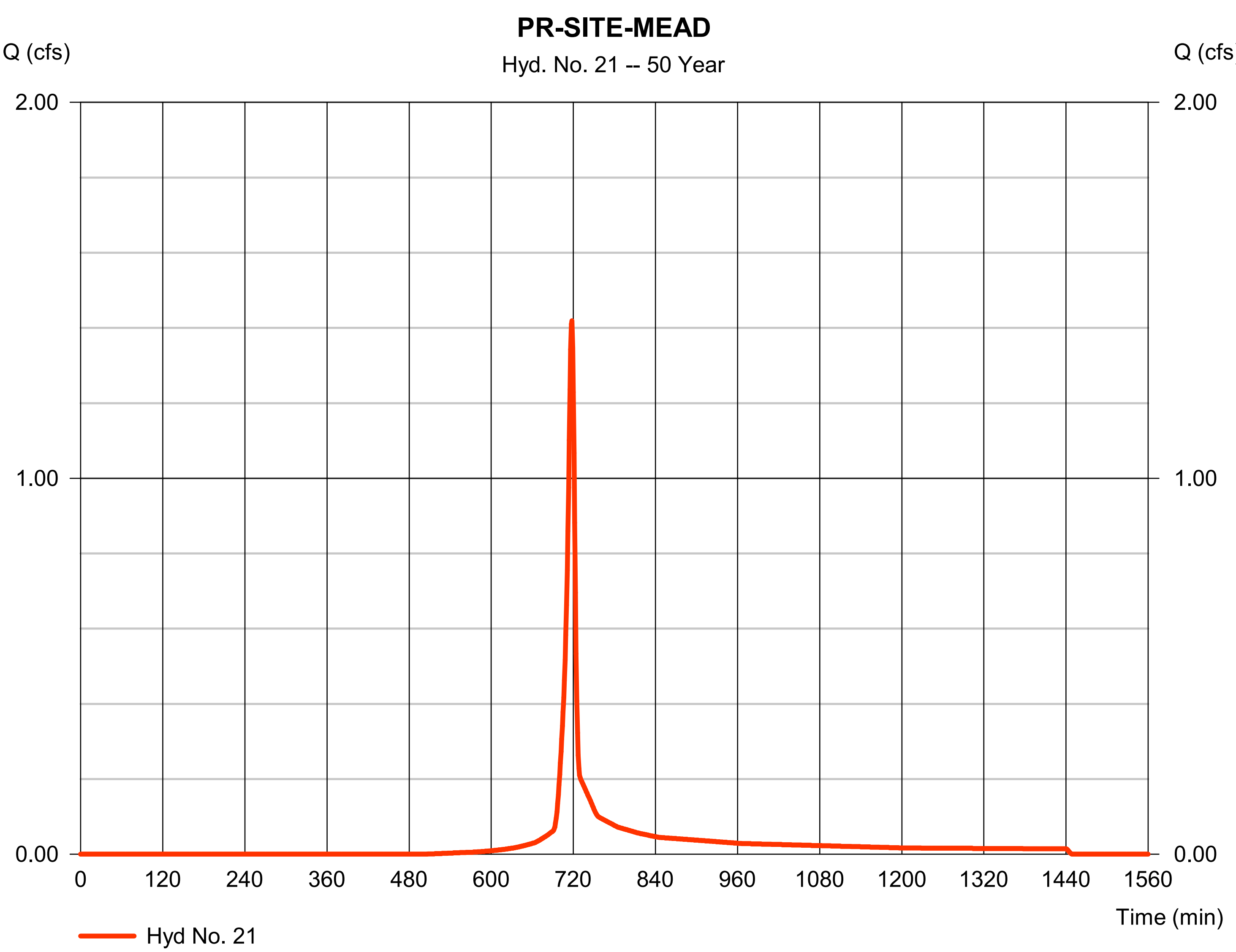
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 21

PR-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 1.419 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 2,870 cuft
Drainage area	= 0.229 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.10 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.134 x 71) + (0.003 x 71) + (0.435 x 71)] / 0.229



Hydrograph Report

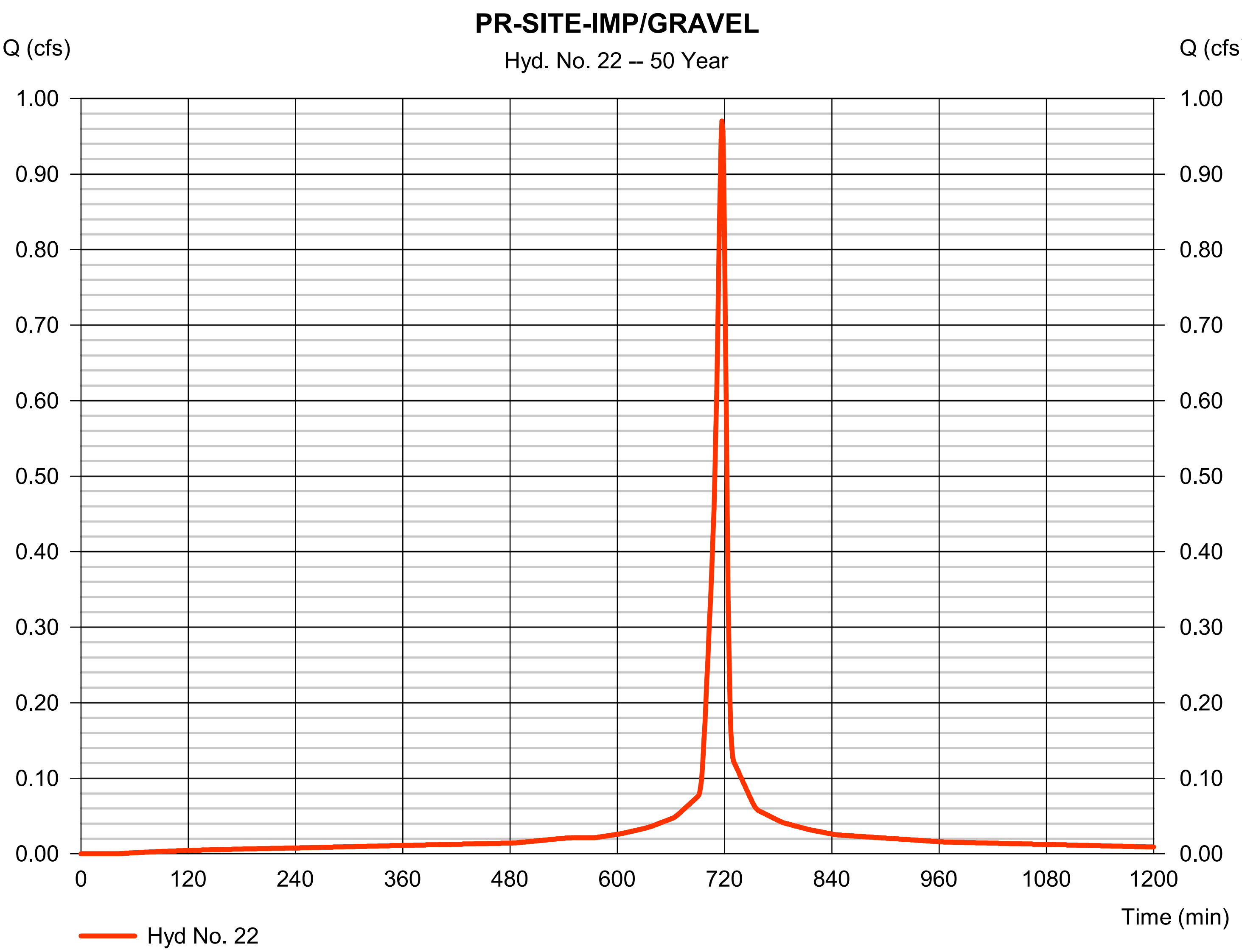
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 22

PR-SITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.970 cfs
Storm frequency	= 50 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 2,363 cuft
Drainage area	= 0.100 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.053 x 98) + (0.008 x 98)] / 0.100



Hydrograph Report

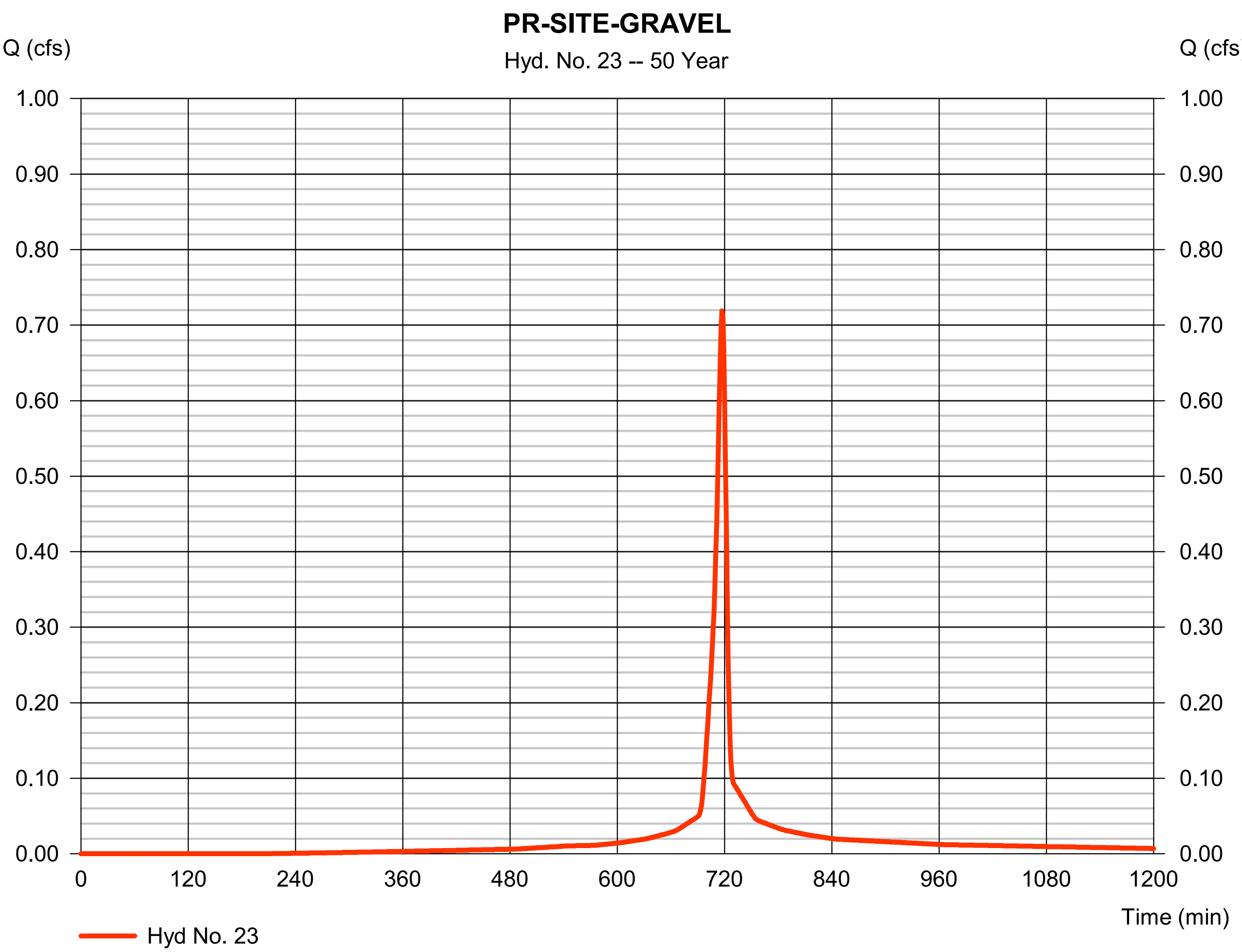
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 23

PR-SITE-GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.719 cfs
Storm frequency	= 50 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 1,578 cuft
Drainage area	= 0.080 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.064 x 89) + (0.003 x 89) + (0.013 x 89)] / 0.080



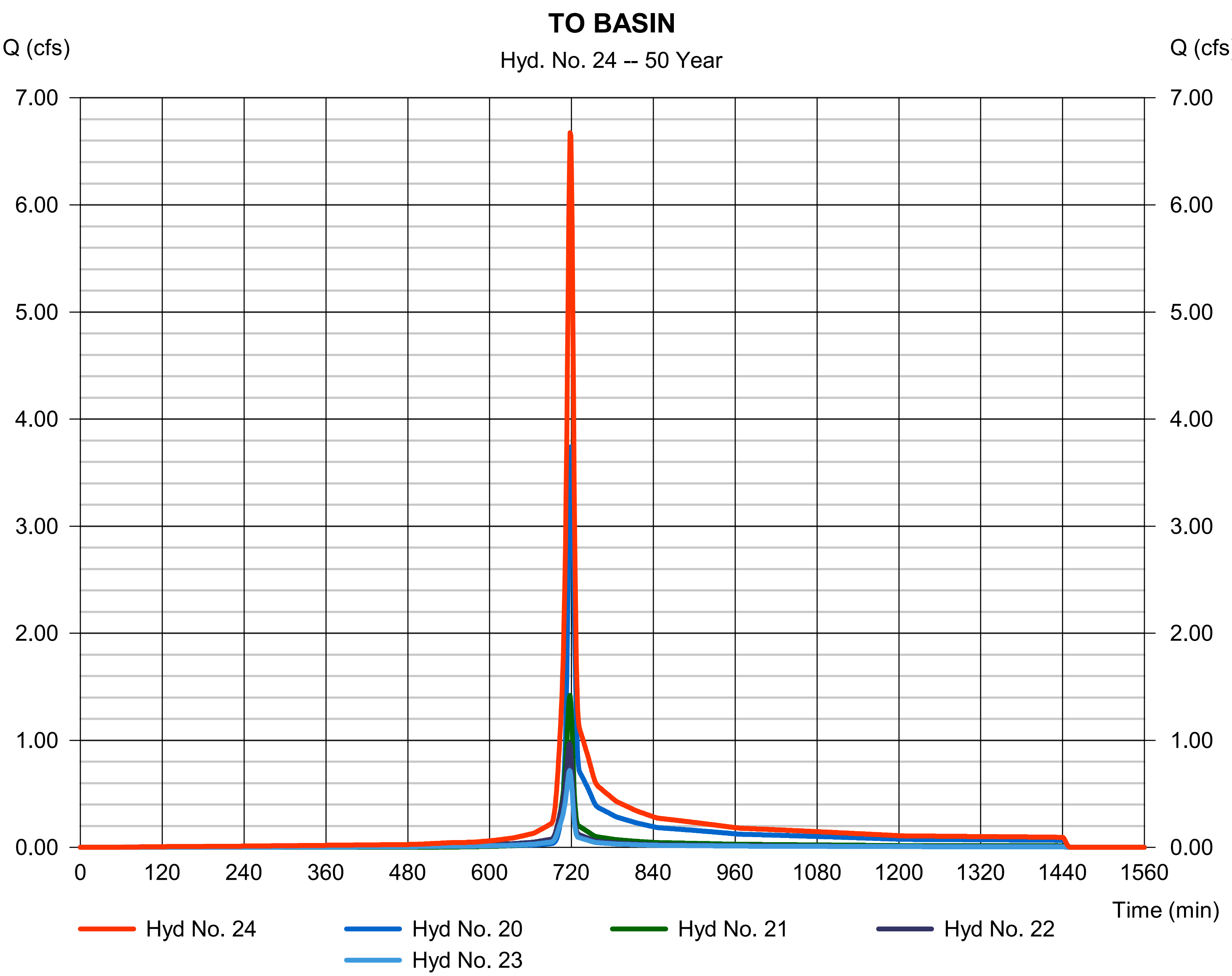
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 24

TO BASIN

Hydrograph type	= Combine	Peak discharge	= 6.673 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 15,868 cuft
Inflow hyds.	= 20, 21, 22, 23	Contrib. drain. area	= 0.409 ac



Hydrograph Report

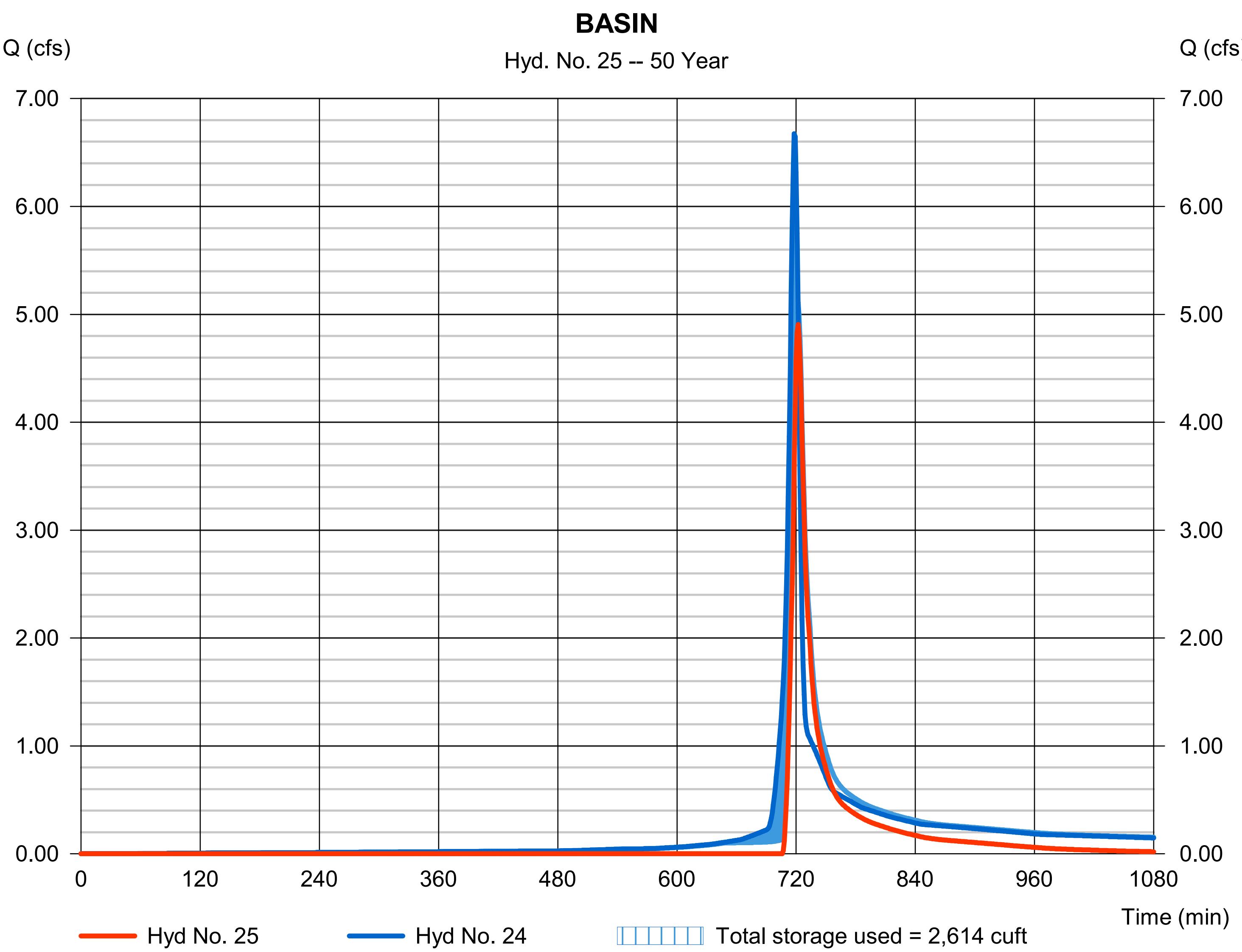
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 25

BASIN

Hydrograph type	= Reservoir	Peak discharge	= 4.906 cfs
Storm frequency	= 50 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 8,347 cuft
Inflow hyd. No.	= 24 - TO BASIN	Max. Elevation	= 641.61 ft
Reservoir name	= UG N-12 Perforated Pipe System	Max. Storage	= 2,614 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

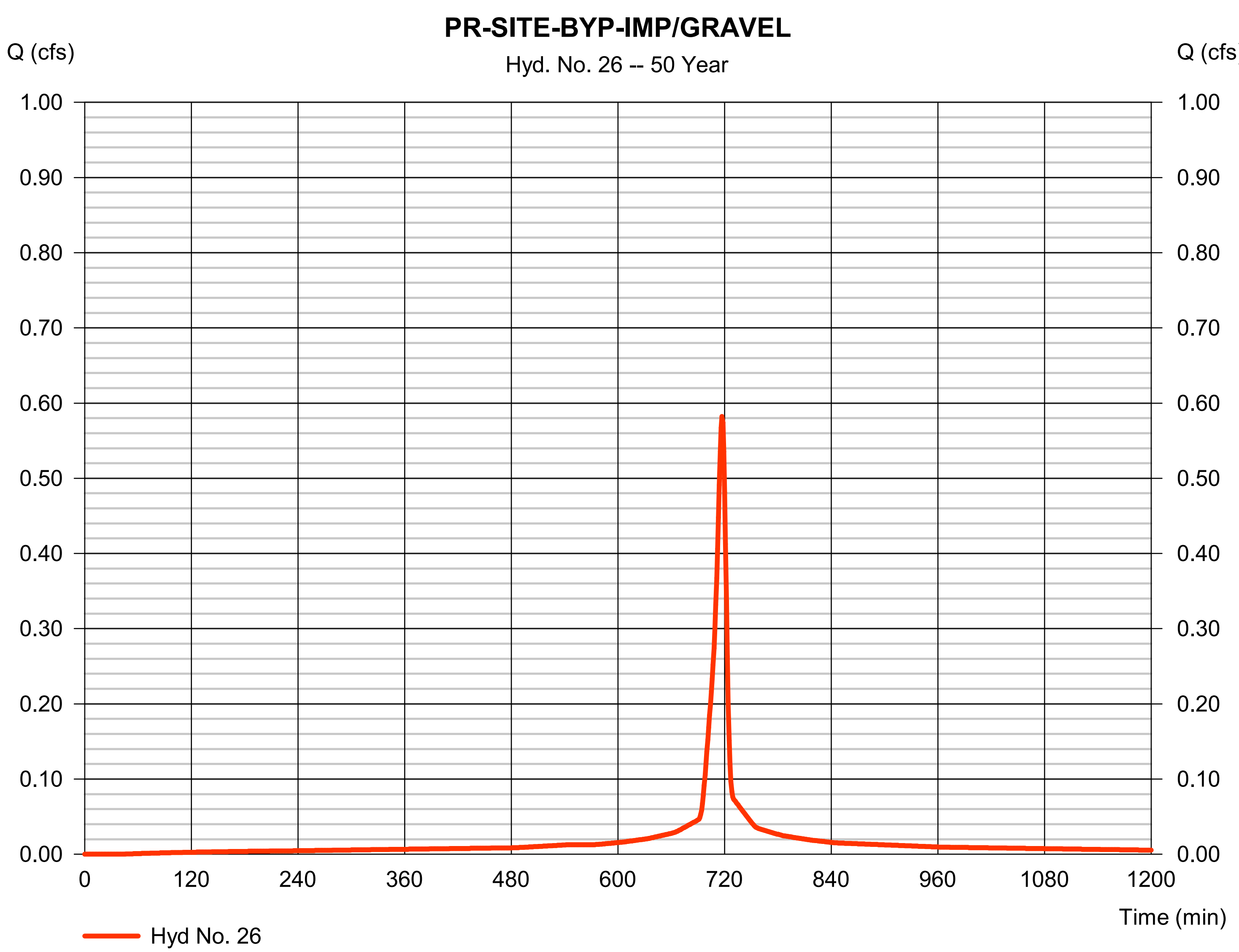
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 26

PR-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.582 cfs
Storm frequency	= 50 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 1,418 cuft
Drainage area	= 0.060 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.060 x 98)] / 0.060



Hydrograph Report

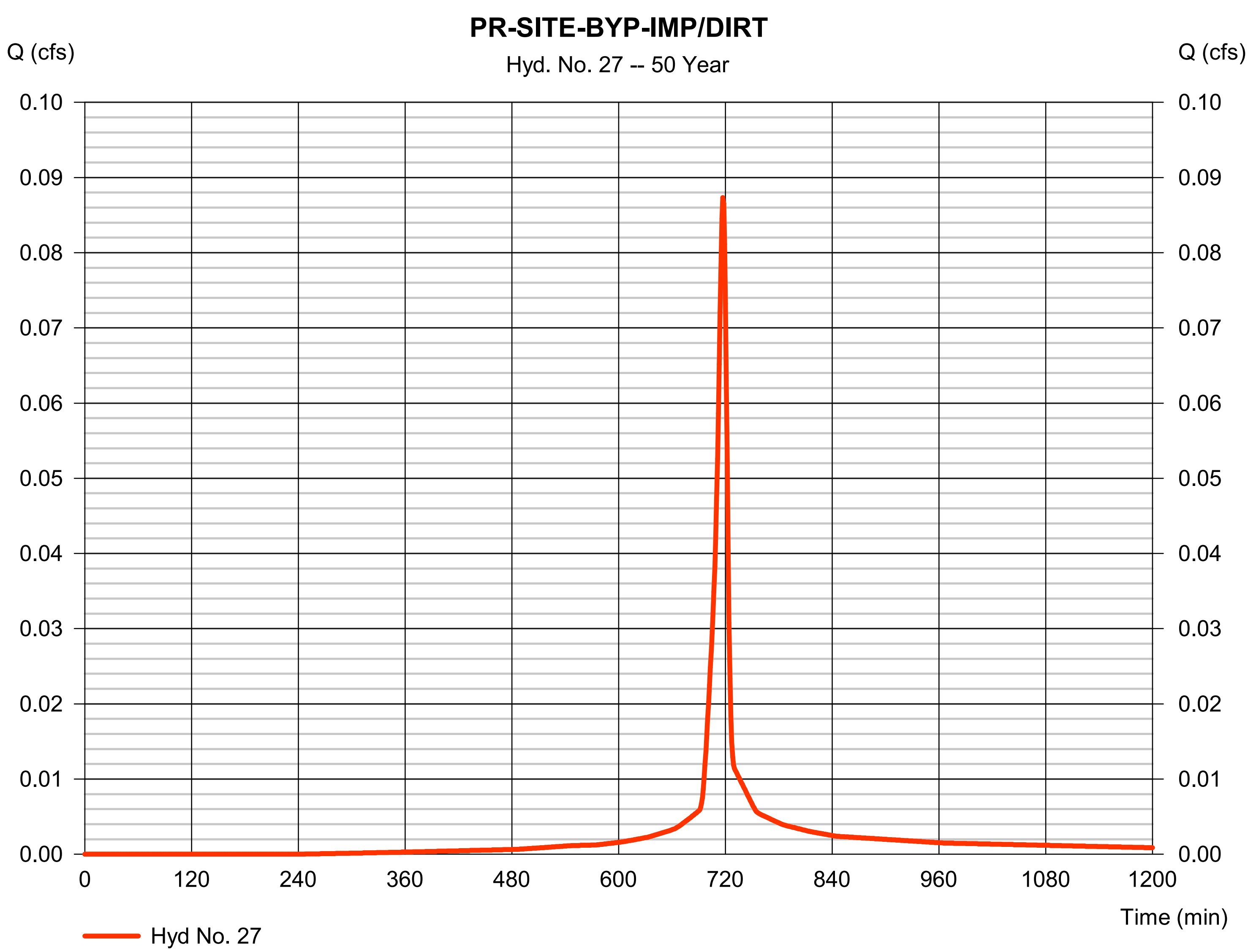
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 27

PR-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.087 cfs
Storm frequency	= 50 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 189 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.008 x 87)] / 0.010



Hydrograph Report

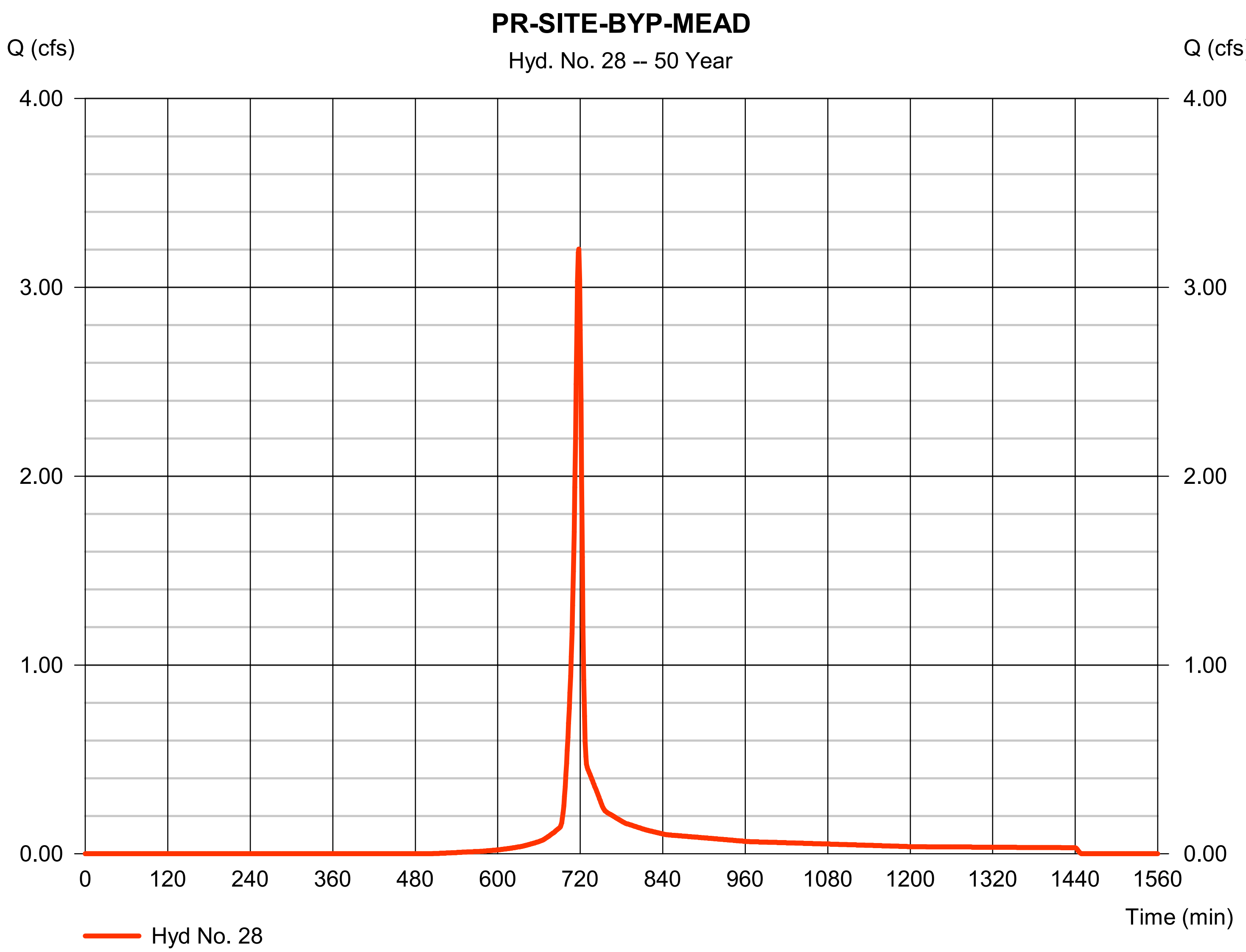
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 28

PR-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 3.203 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 6,479 cuft
Drainage area	= 0.517 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 6.55 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 71) + (0.290 x 71) + (0.085 x 71)] / 0.517



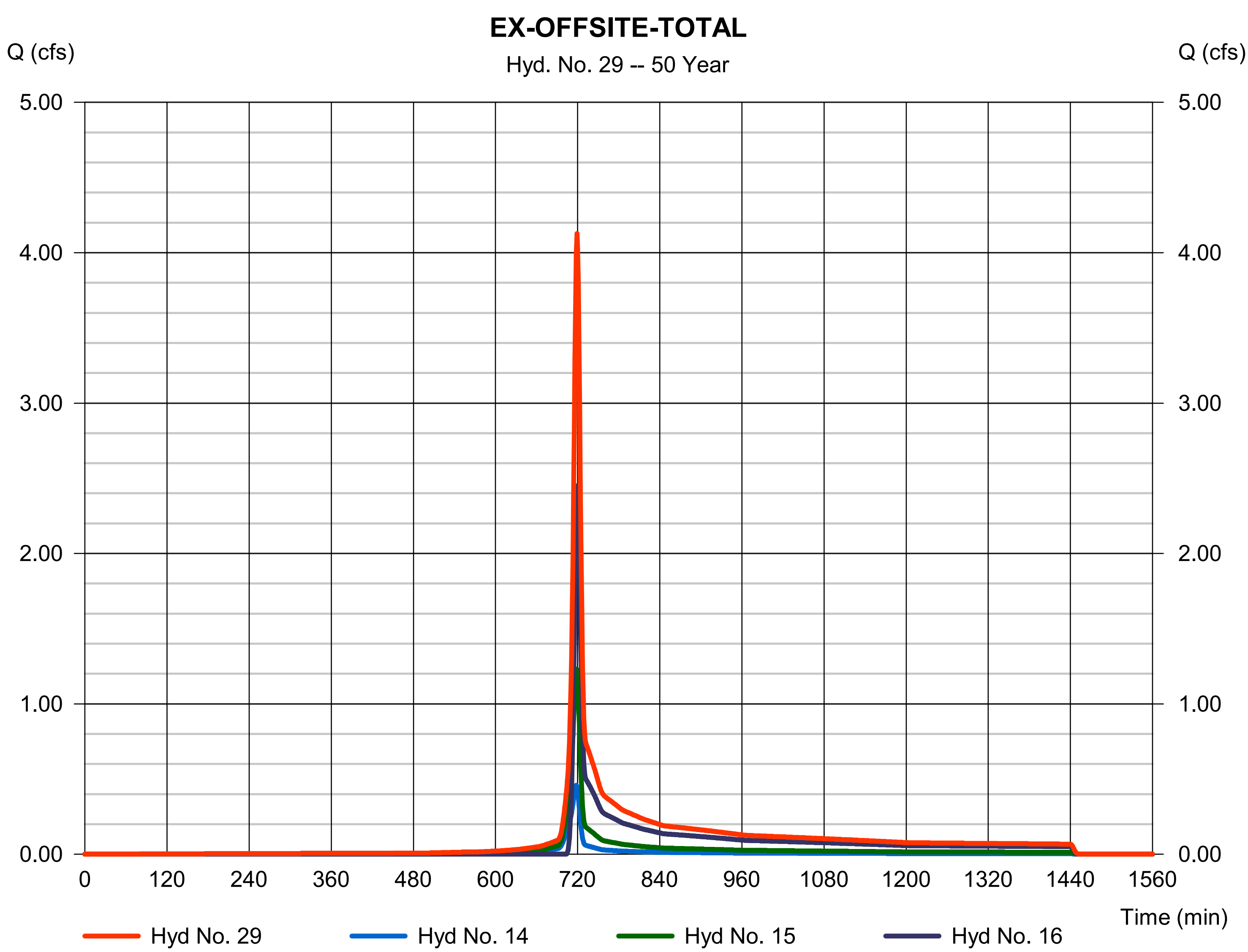
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 29

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 4.128 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 9,845 cuft
Inflow hyds.	= 14, 15, 16	Contrib. drain. area	= 1.822 ac



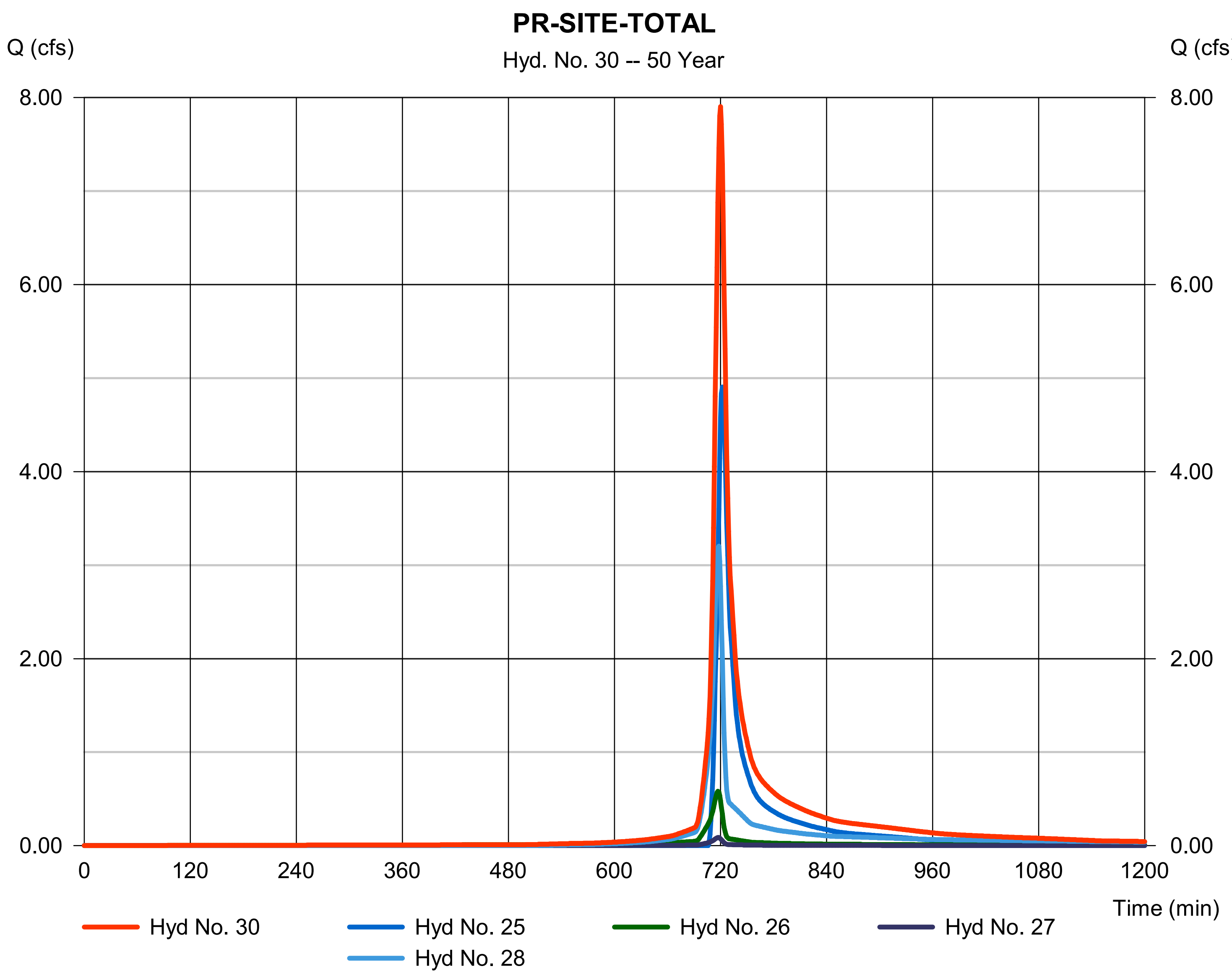
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 30

PR-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 7.903 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 16,433 cuft
Inflow hyds.	= 25, 26, 27, 28	Contrib. drain. area	= 0.587 ac



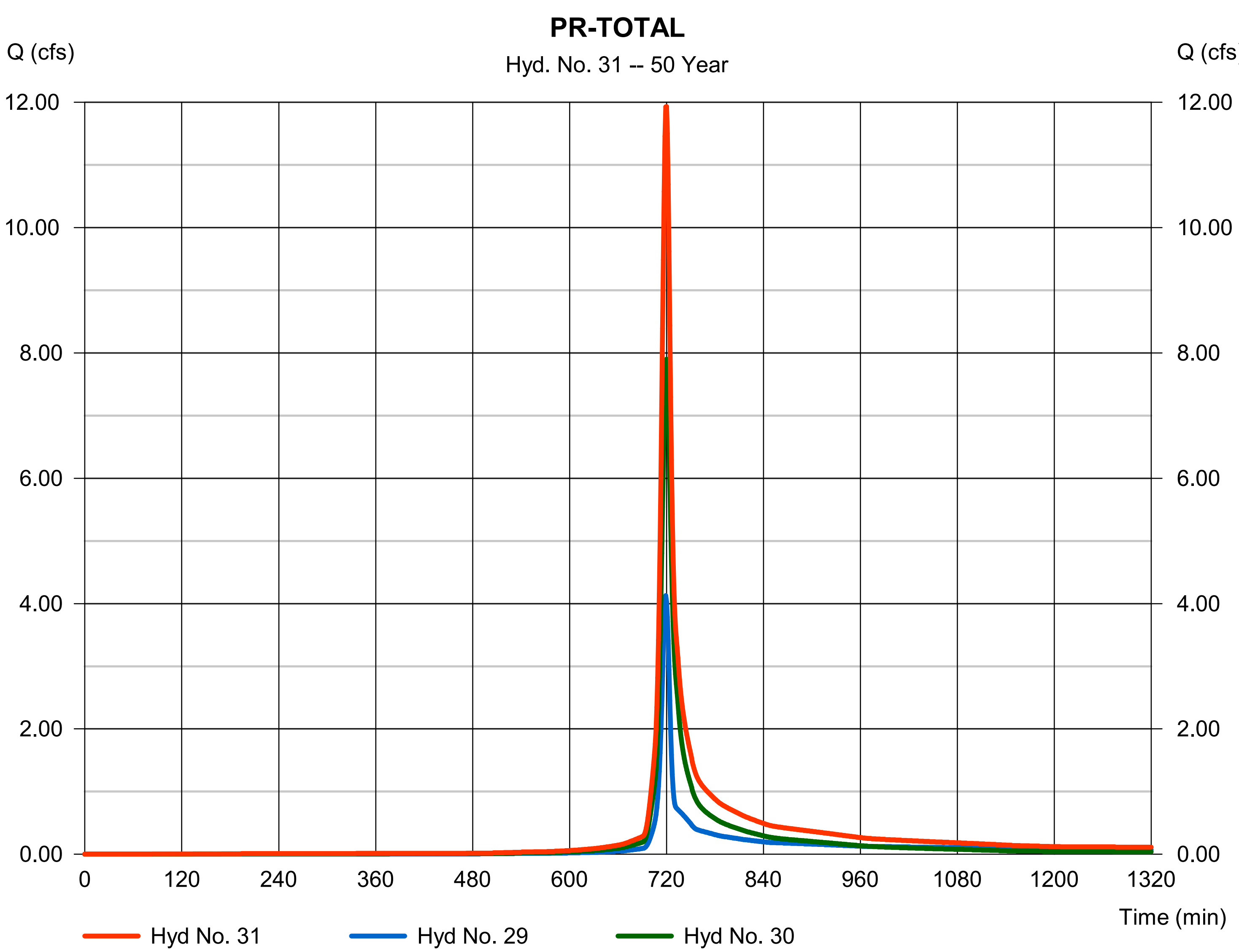
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 31

PR-TOTAL

Hydrograph type	= Combine	Peak discharge	= 11.93 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 26,278 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.038	1	718	2,638	------	------	------	EX-OFFSITE-IMP/GRAVEL
2	SCS Runoff	0.073	1	719	177	------	------	------	EX-SITE-BYP-IMP/DIRT
3	SCS Runoff	0.026	1	726	474	------	------	------	EX-OFFSITE-MEAD
4	SCS Runoff	9.930	1	719	21,853	------	------	------	EX-OFFSITE-WOODS
5	SCS Runoff	0.136	1	719	309	------	------	------	EX-SITE-MEAD
6	SCS Runoff	2.578	1	719	5,845	------	------	------	EX-SITE-WOODS
7	SCS Runoff	0.091	1	719	221	------	------	------	EX-SITE-BYP-IMP/DIRT
8	SCS Runoff	0.418	1	719	1,125	------	------	------	EX-SITE-BYP-IMP/GRAVEL
9	SCS Runoff	0.979	1	719	2,222	------	------	------	EX-SITE-BYP-MEAD
10	SCS Runoff	2.598	1	719	5,890	------	------	------	EX-SITE-BYP-WOODS
11	Combine	6.799	1	719	15,612	5, 6, 7, 8, 9, 10	------	------	EX-SITE-TOTAL
12	Combine	11.03	1	719	25,142	1, 2, 3, 4,	------	------	EX-OFFSITE-TOTAL
13	Combine	17.83	1	719	40,755	11, 12	------	------	EX-TOTAL
14	SCS Runoff	0.534	1	718	1,358	------	------	------	PR-OFFSITE-IMP/GRAVEL
15	SCS Runoff	1.556	1	718	3,310	------	------	------	PR-OFFSITE-MEAD
16	SCS Runoff	3.928	1	719	8,964	------	------	------	PR-OFFSITE-WOODS
17	SCS Runoff	0.504	1	718	1,280	------	------	------	PR-OFFSITE-IMP/GRAVEL
18	SCS Runoff	2.495	1	719	5,406	------	------	------	PR-OFFSITE-MEAD
19	SCS Runoff	2.653	1	719	6,158	------	------	------	PR-OFFSITE-WOODS
20	Combine	5.641	1	719	12,844	17, 18, 19	------	------	OFFSITE TO BASIN
21	SCS Runoff	1.787	1	718	3,644	------	------	------	PR-SITE-MEAD
22	SCS Runoff	1.130	1	717	2,763	------	------	------	PR-SITE-IMP/GRAVEL
23	SCS Runoff	0.851	1	717	1,891	------	------	------	PR-SITE-GRAVEL
24	Combine	9.226	1	718	21,141	20, 21, 22, 23	------	------	TO BASIN
25	Reservoir	7.258	1	721	12,845	24	642.16	3,188	BASIN
26	SCS Runoff	0.678	1	717	1,658	------	------	------	PR-SITE-BYP-IMP/GRAVEL
27	SCS Runoff	0.104	1	717	228	------	------	------	PR-SITE-BYP-IMP/DIRT
28	SCS Runoff	4.035	1	718	8,227	------	------	------	PR-SITE-BYP-MEAD
29	Combine	5.999	1	719	13,632	14, 15, 16,	------	------	EX-OFFSITE-TOTAL
30	Combine	11.22	1	719	22,957	25, 26, 27, 28,	------	------	PR-SITE-TOTAL
31	Combine	17.22	1	719	36,589	29, 30	------	------	PR-TOTAL

Proposed.gpw	Return Period: 100 Year	Saturday, 10 / 13 / 2018

Hydrograph Report

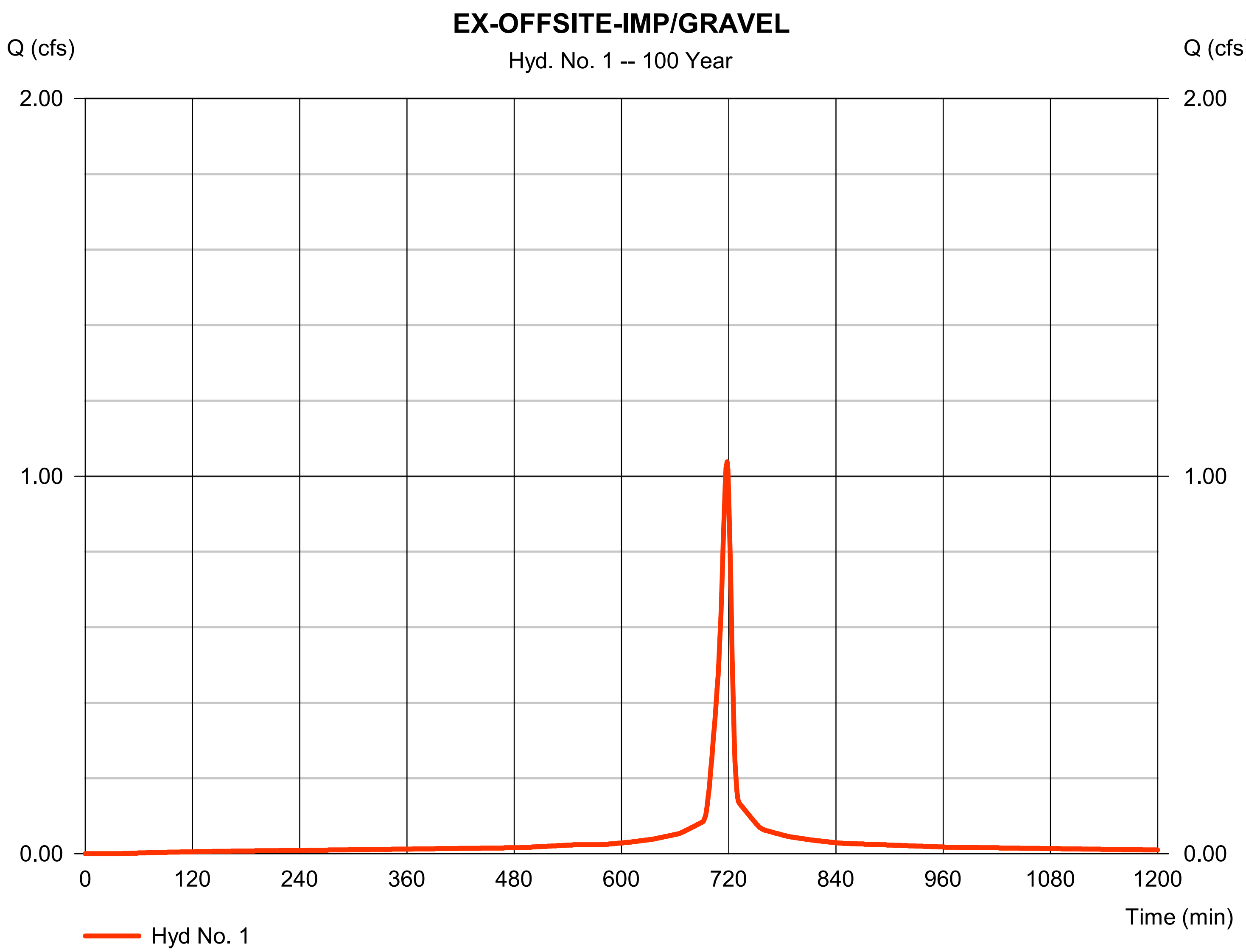
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 1

EX-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 1.038 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 2,638 cuft
Drainage area	= 0.101 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.101



Hydrograph Report

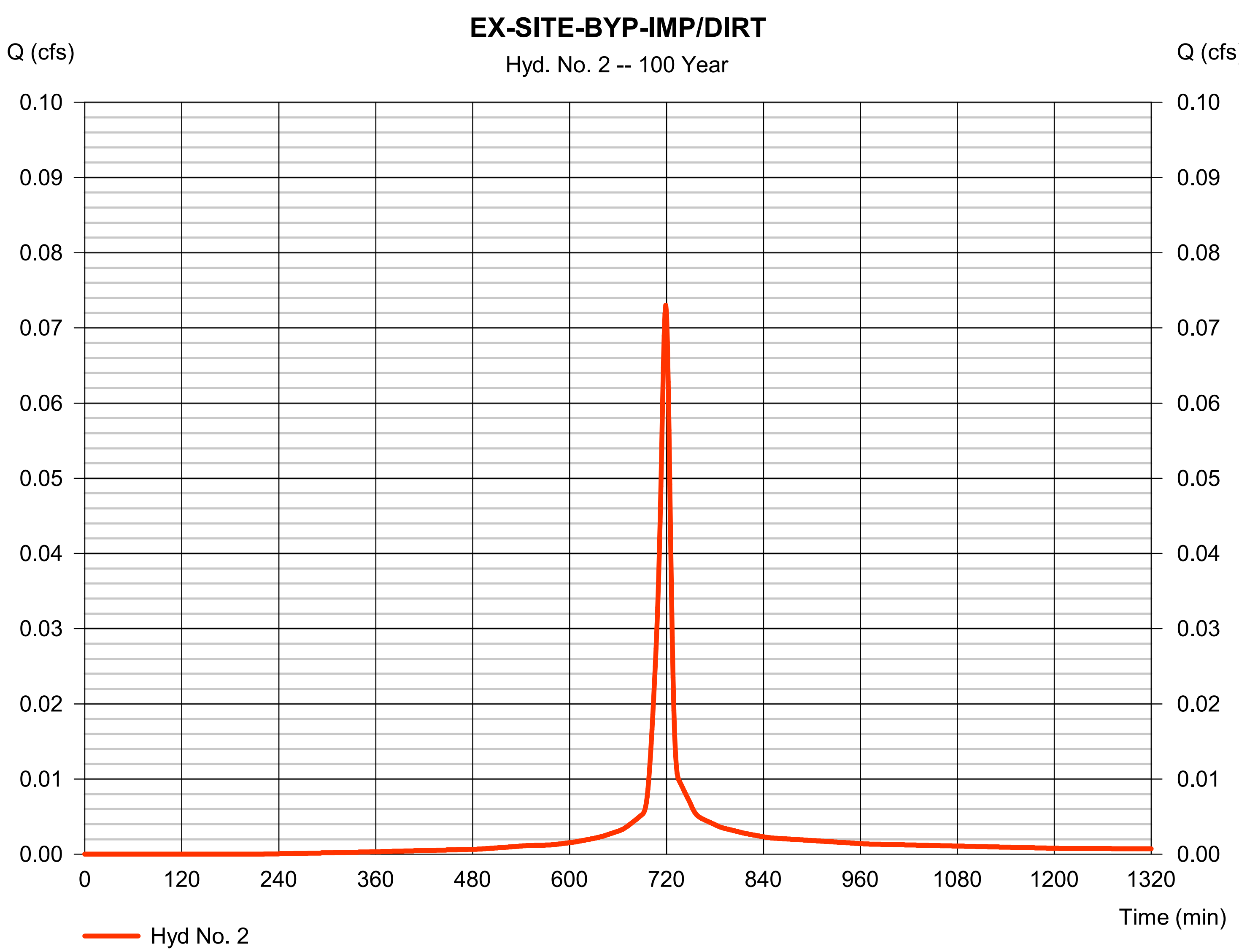
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 2

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.073 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 177 cuft
Drainage area	= 0.008 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.80 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.008



Hydrograph Report

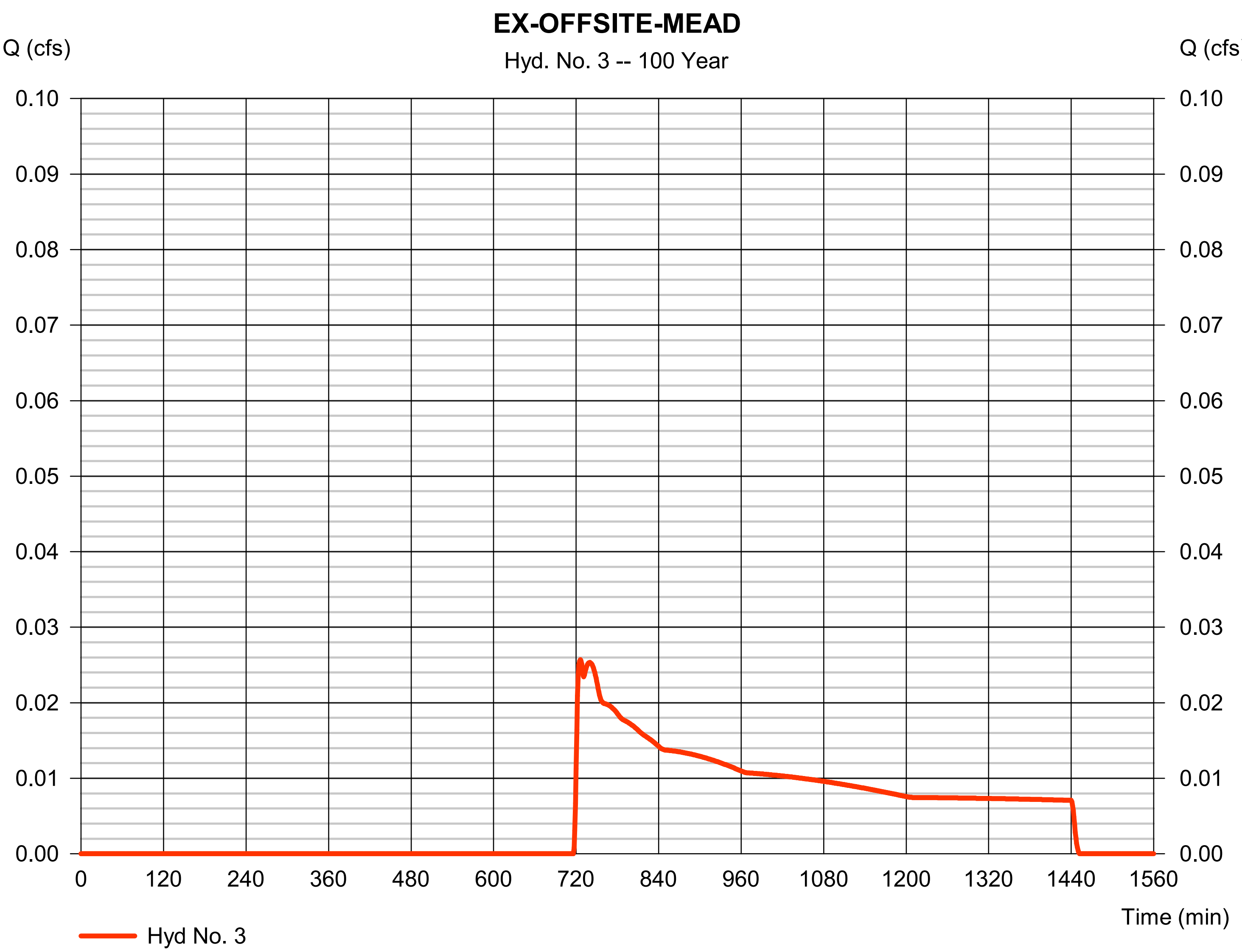
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 3

EX-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.026 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 1 min	Hyd. volume	= 474 cuft
Drainage area	= 0.404 ac	Curve number	= 30*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.100 x 70)] / 0.404



Hydrograph Report

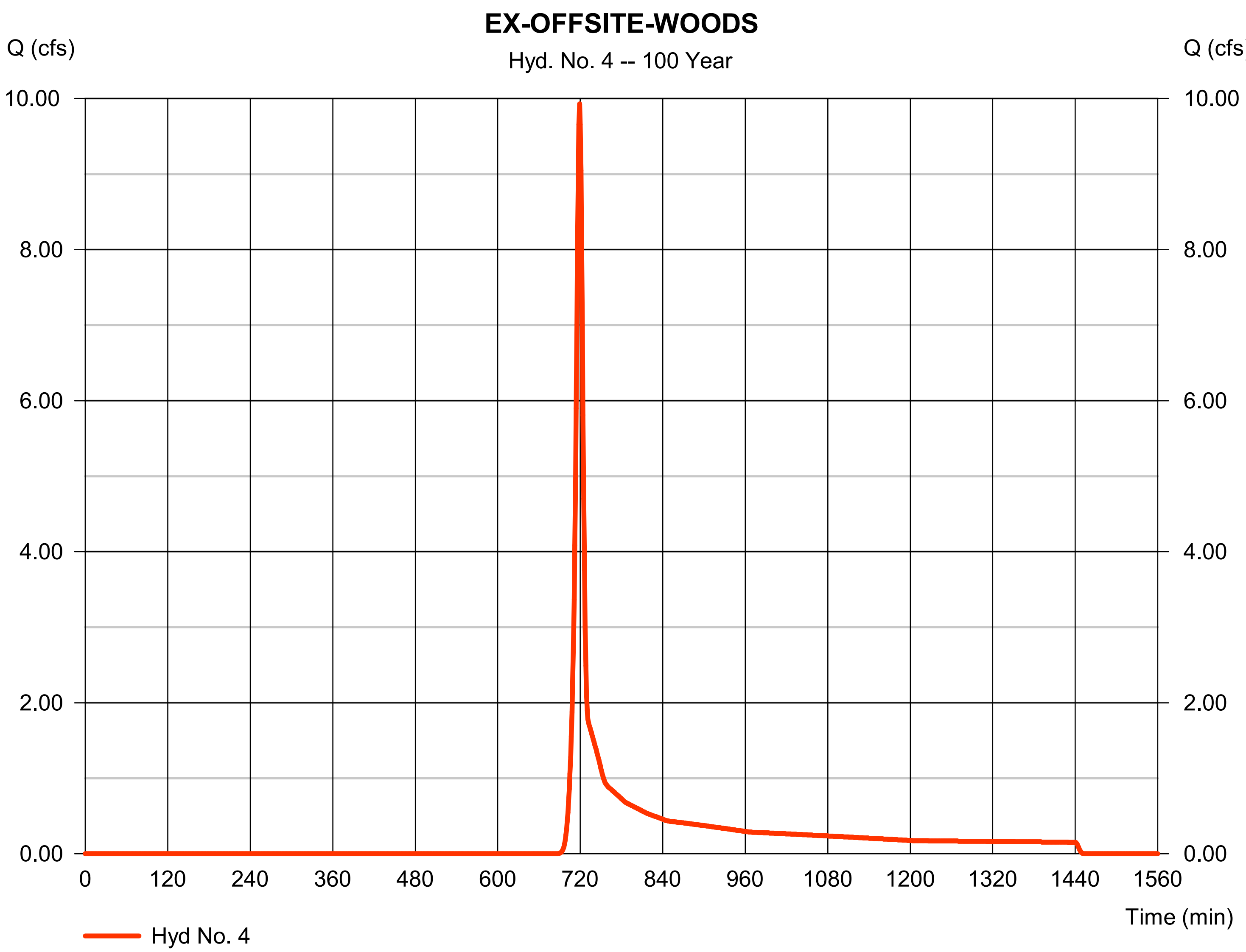
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 4

EX-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 9.930 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 21,853 cuft
Drainage area	= 3.210 ac	Curve number	= 49*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.562 x 70) + (1.652 x 30)] / 3.210



Hydrograph Report

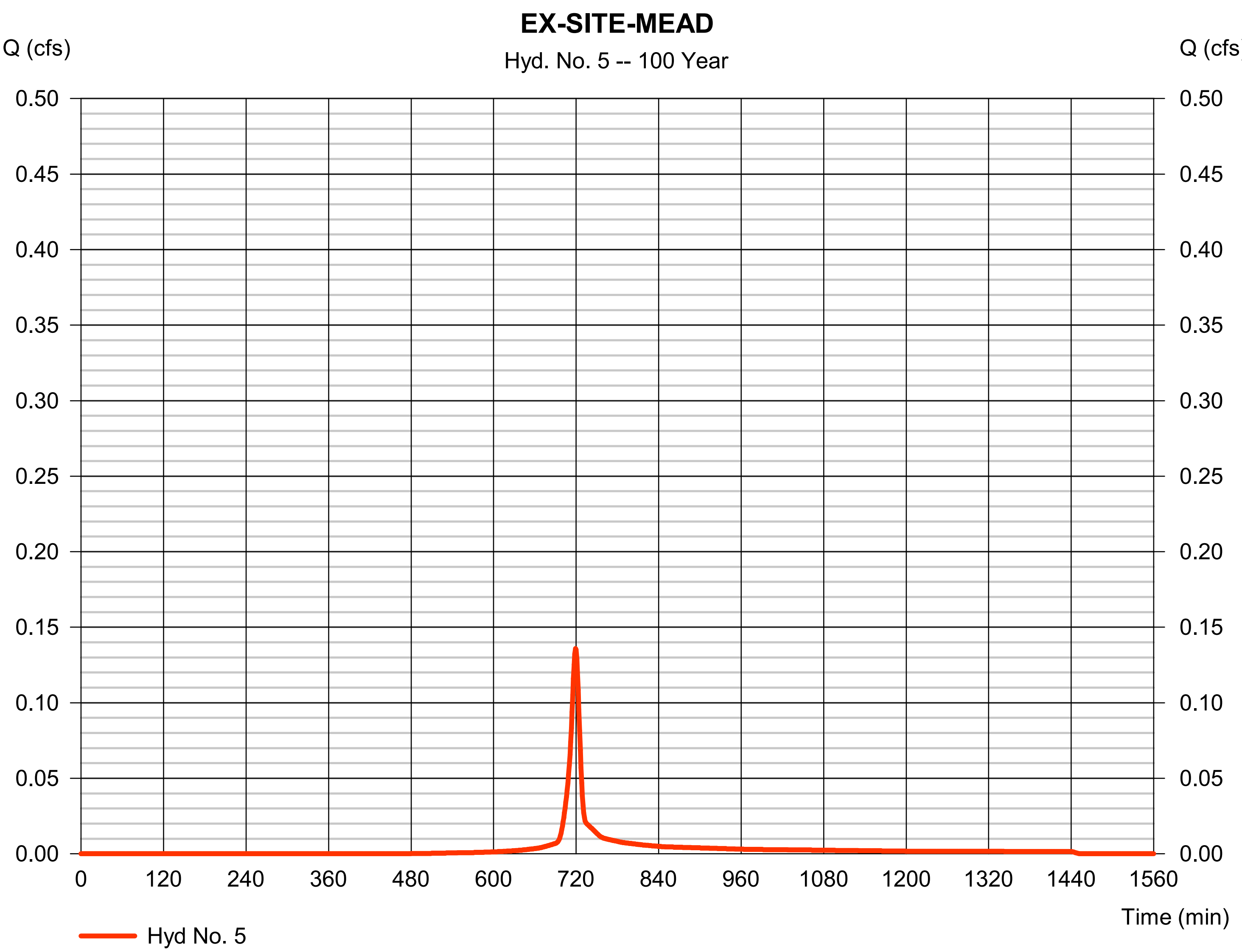
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 5

EX-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.136 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 309 cuft
Drainage area	= 0.020 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.020 x 71)] / 0.020



Hydrograph Report

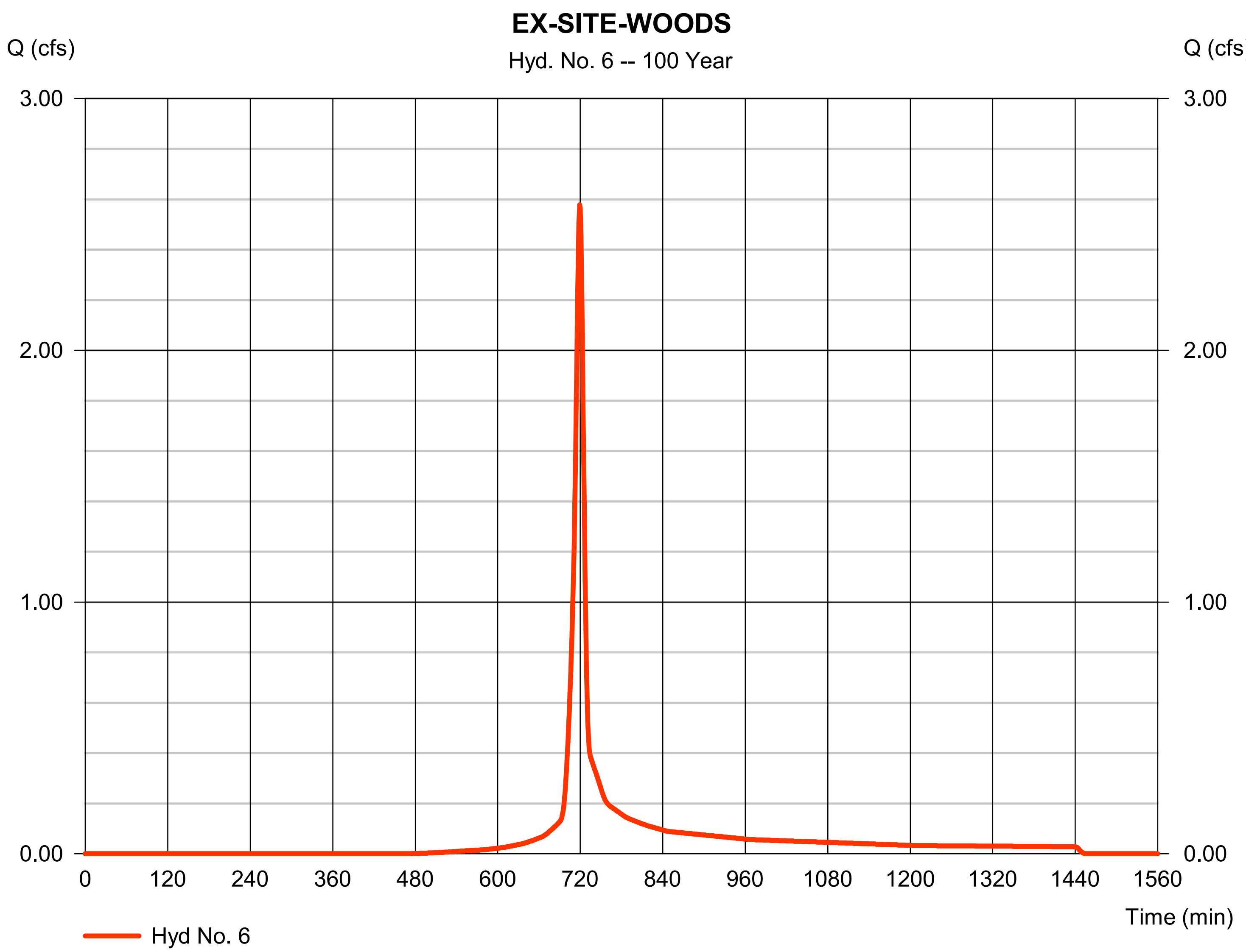
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 6

EX-SITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 2.578 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 5,845 cuft
Drainage area	= 0.389 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.240 x 70) + (0.060 x 70) + (0.460 x 70)] / 0.389



Hydrograph Report

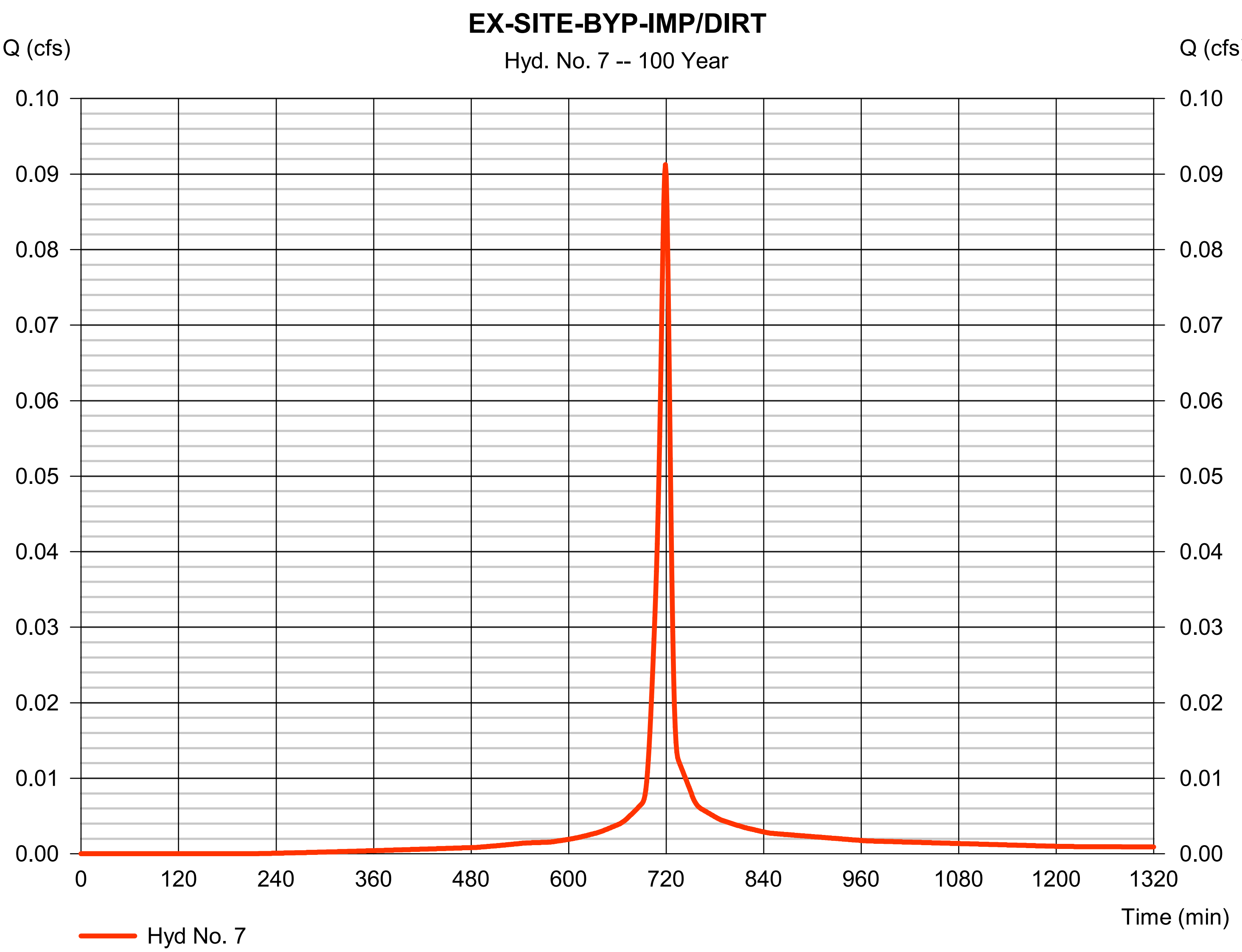
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 7

EX-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.091 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 221 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 87)] / 0.010



Hydrograph Report

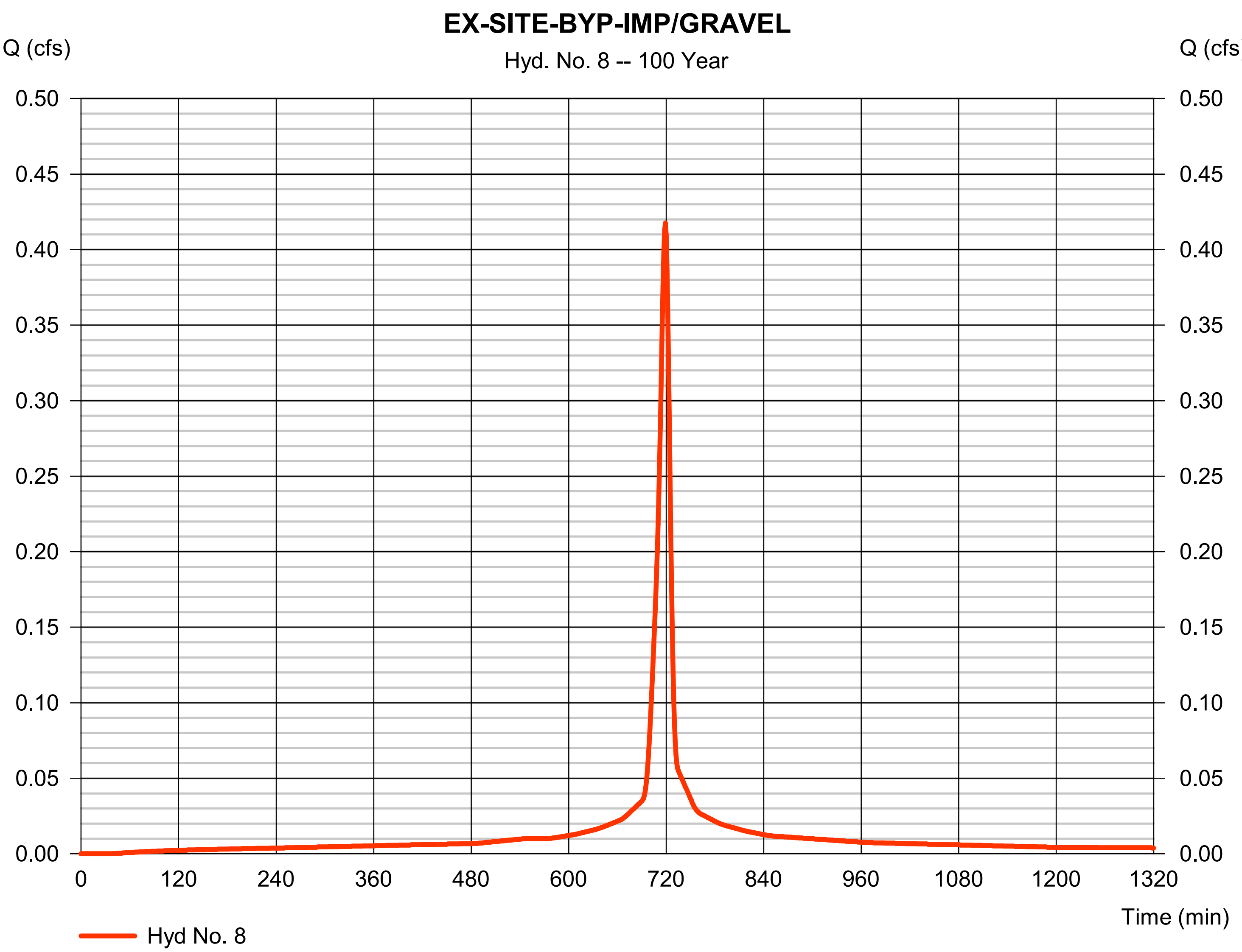
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 8

EX-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.418 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 1,125 cuft
Drainage area	= 0.042 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.040 x 98)] / 0.042



Hydrograph Report

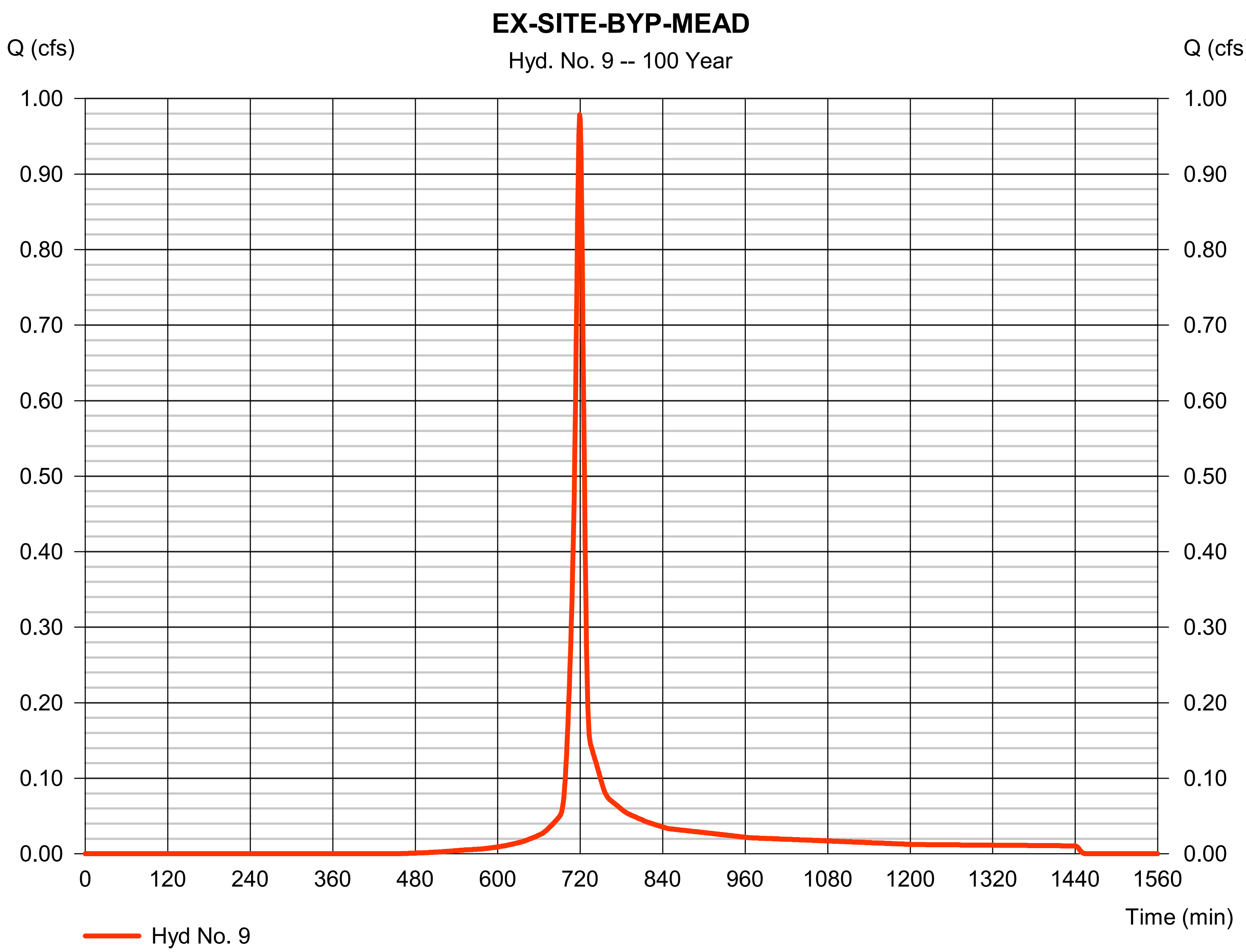
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 9

EX-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.979 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 2,222 cuft
Drainage area	= 0.144 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.190 x 71)] / 0.144



Hydrograph Report

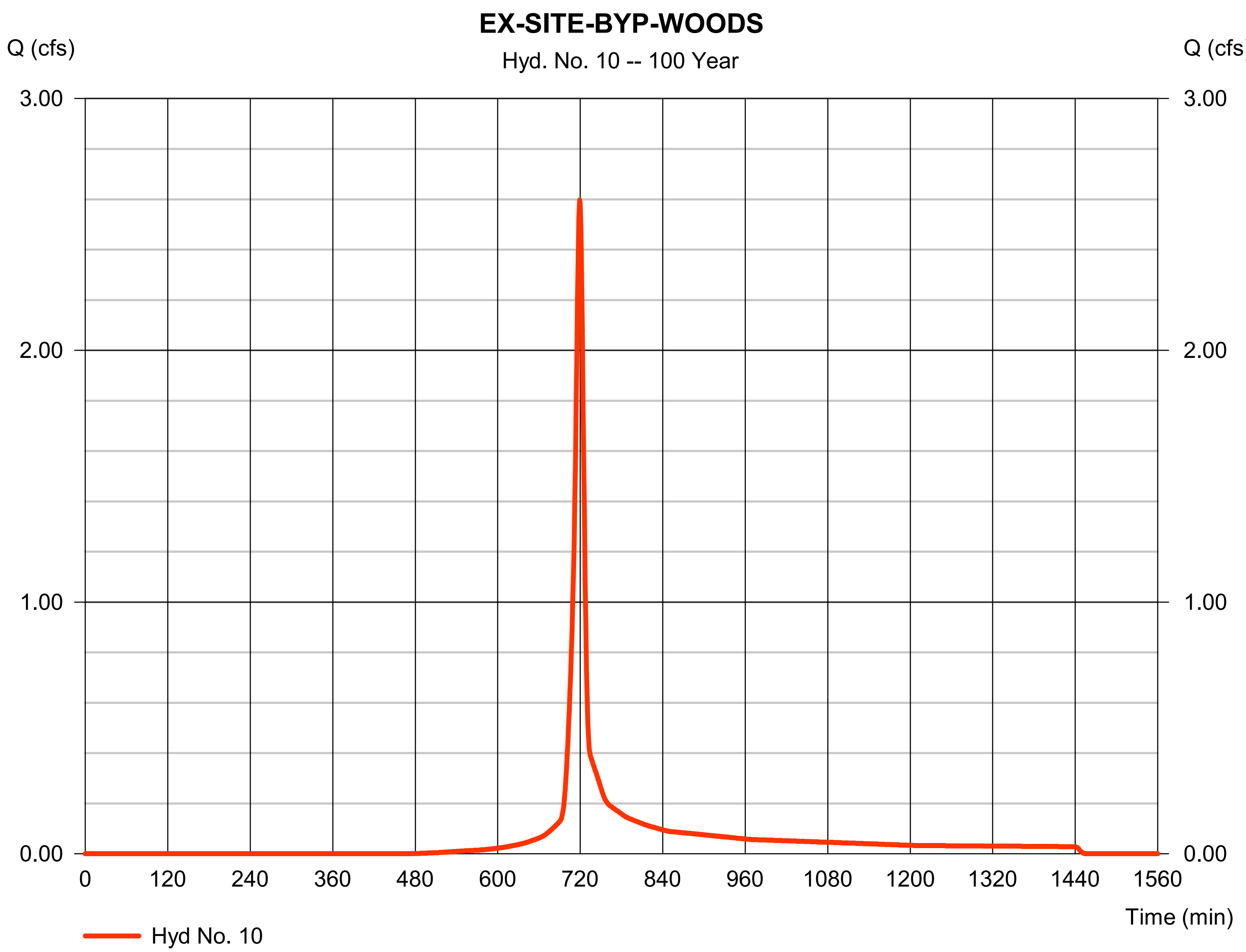
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 10

EX-SITE-BYP-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 2.598 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 5,890 cuft
Drainage area	= 0.392 ac	Curve number	= 70*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.70 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 70) + (0.110 x 70) + (0.090 x 70)] / 0.392



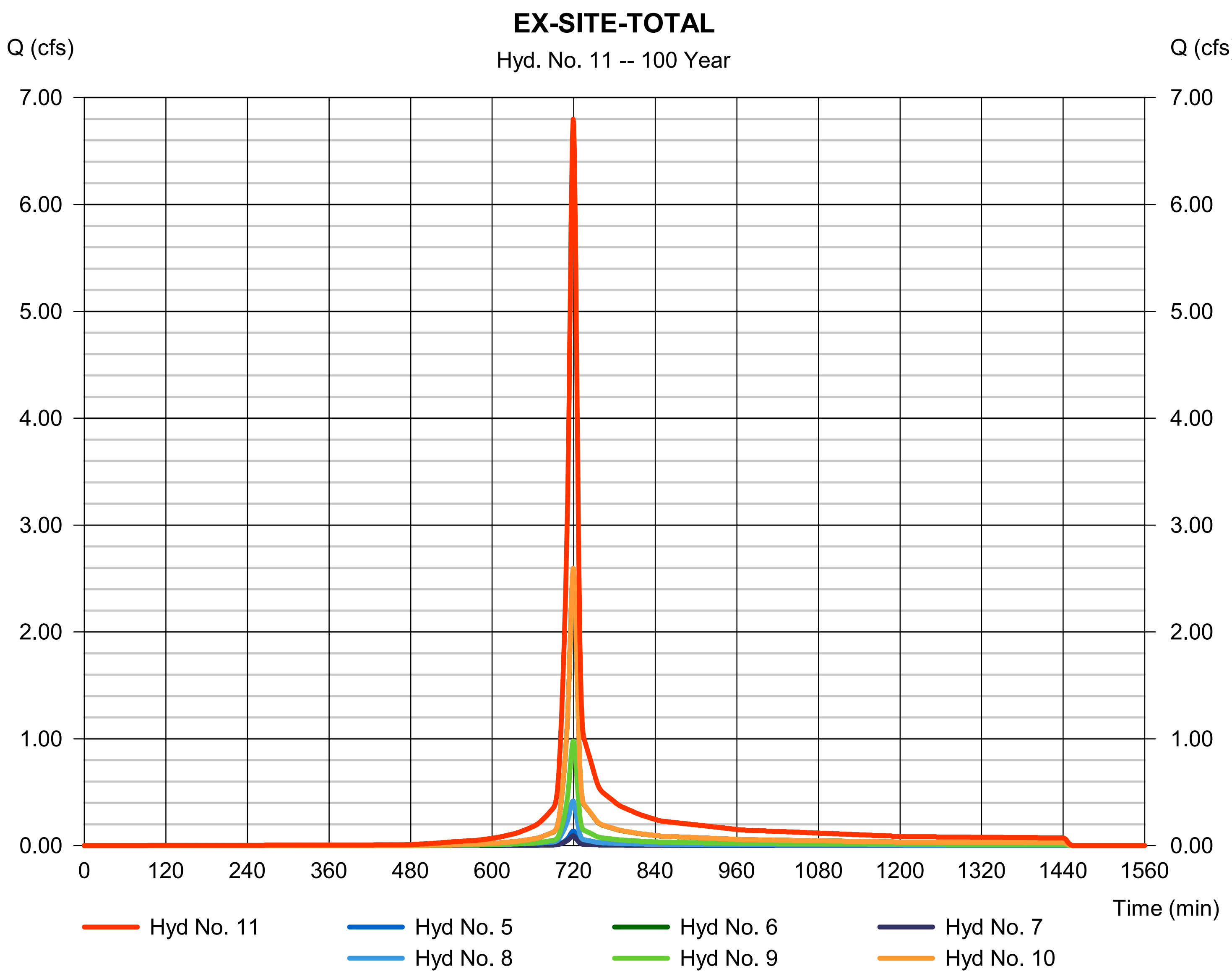
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 11

EX-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 6.799 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 15,612 cuft
Inflow hyds.	= 5, 6, 7, 8, 9, 10	Contrib. drain. area	= 0.997 ac



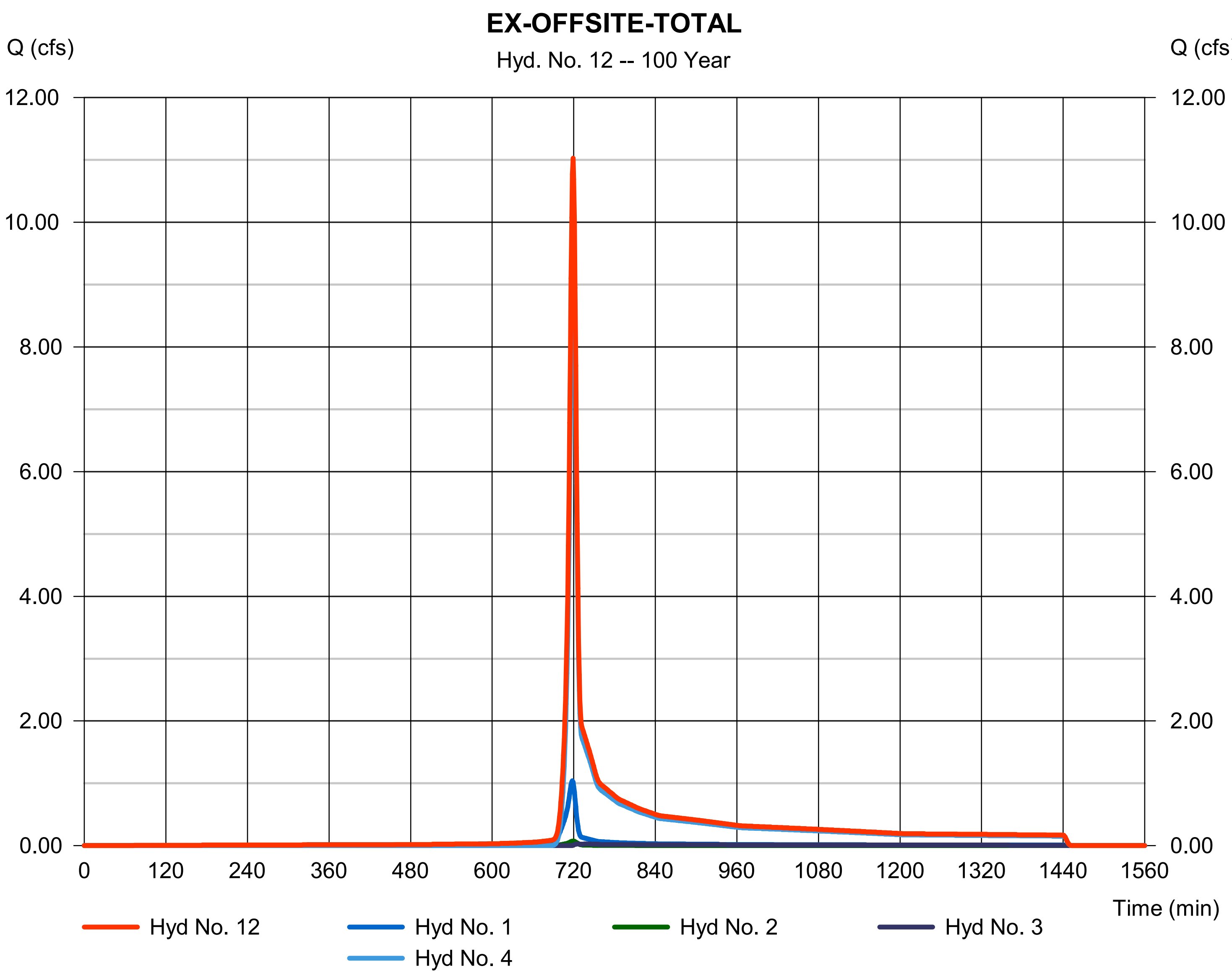
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 12

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 11.03 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 25,142 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 3.723 ac



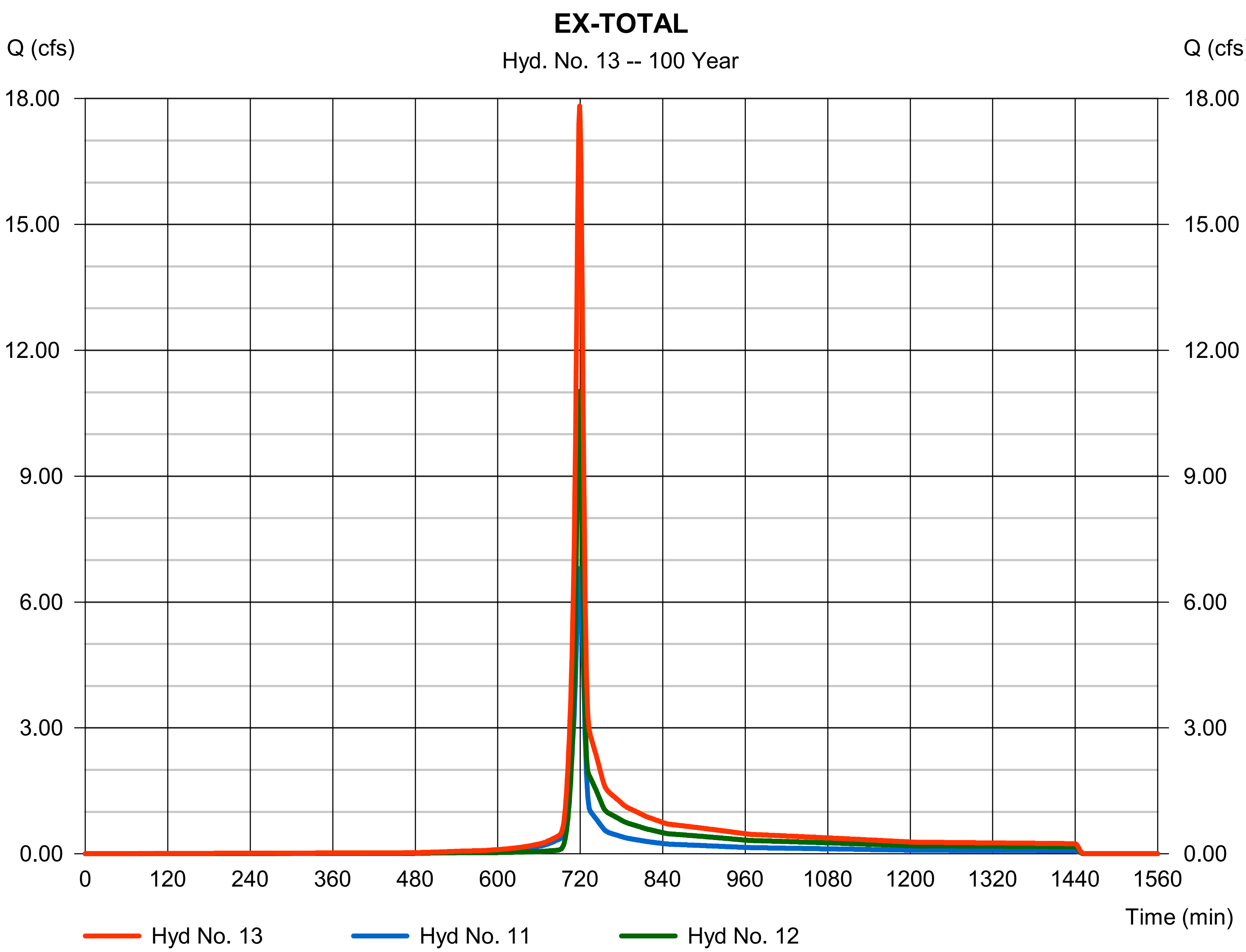
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 13

EX-TOTAL

Hydrograph type	= Combine	Peak discharge	= 17.83 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 40,755 cuft
Inflow hyds.	= 11, 12	Contrib. drain. area	= 0.000 ac



Hydrograph Report

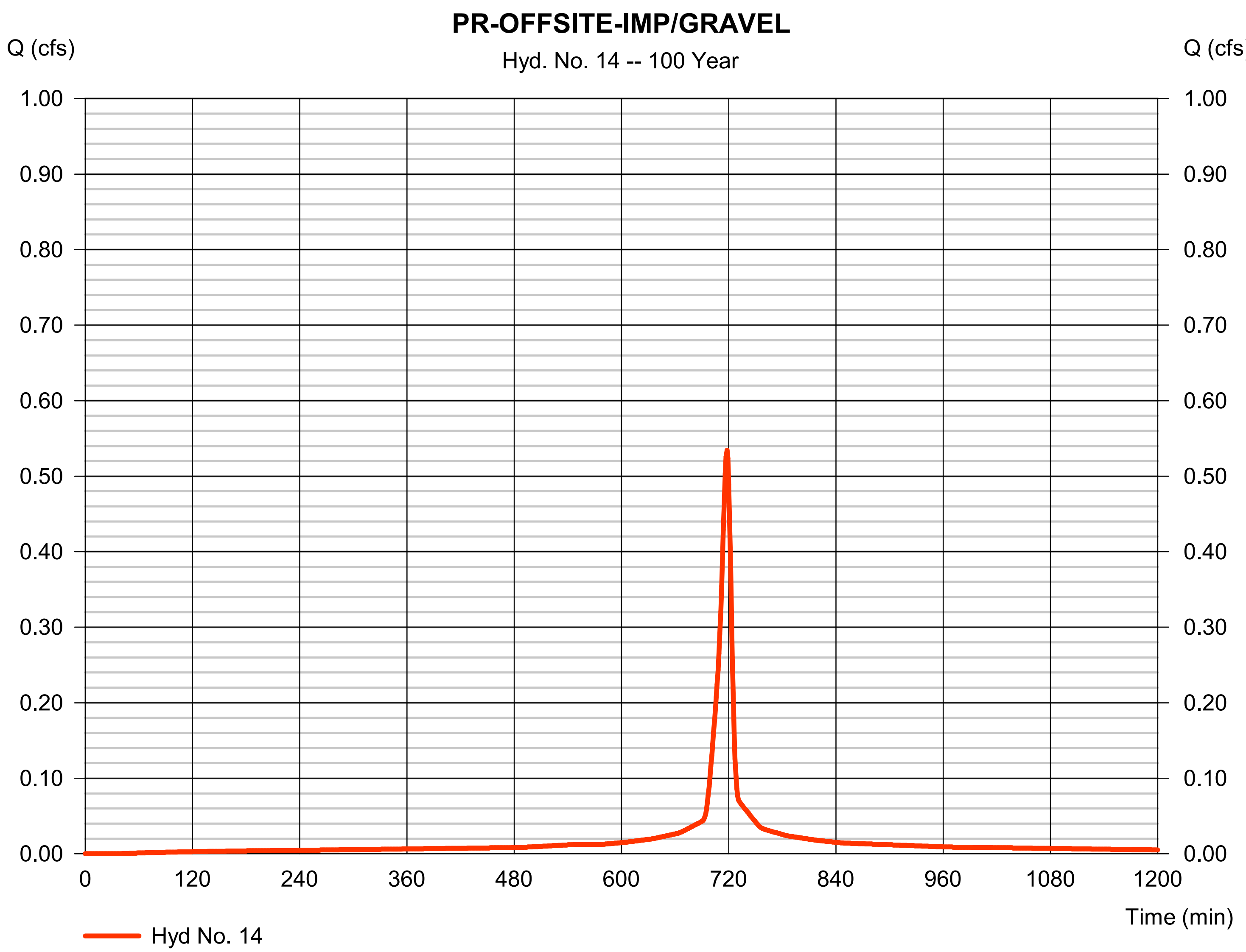
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 14

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.534 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,358 cuft
Drainage area	= 0.052 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.013 x 98)] / 0.052



Hydrograph Report

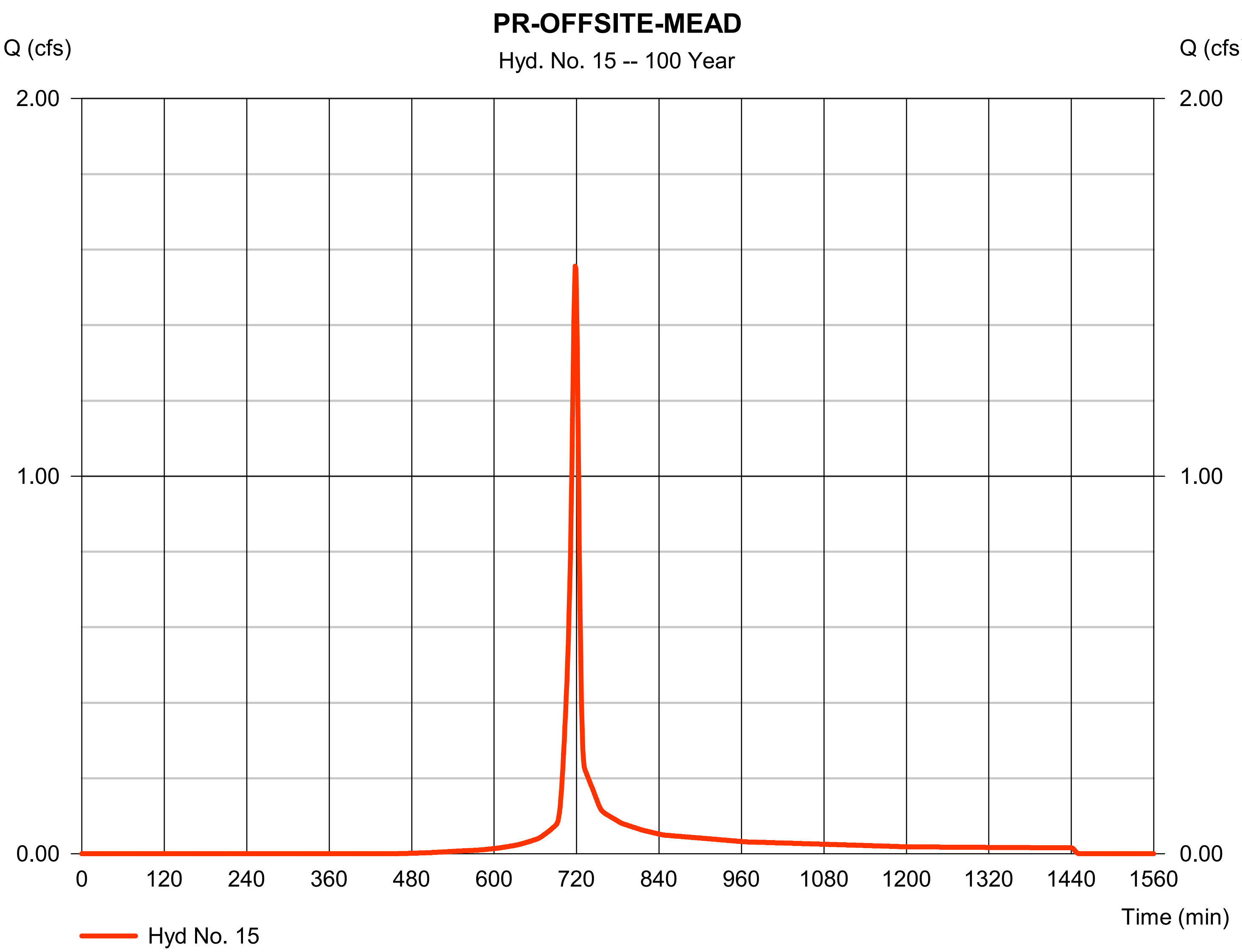
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 15

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 1.556 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 3,310 cuft
Drainage area	= 0.220 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.034 x 71) + (0.099 x 71) + (0.084 x 71) + (0.001 x 30)] / 0.220



Hydrograph Report

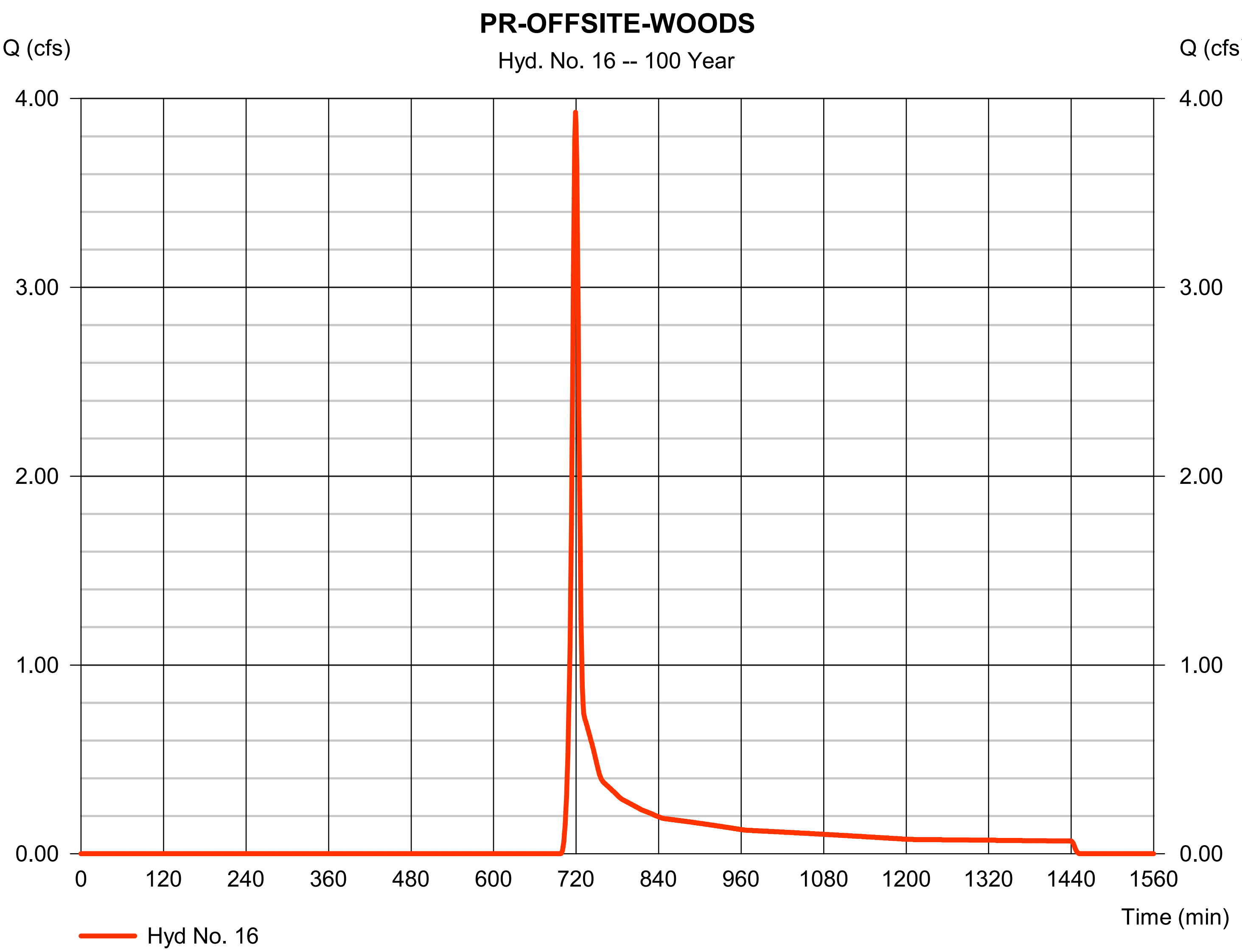
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 16

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 3.928 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 8,964 cuft
Drainage area	= 1.550 ac	Curve number	= 46*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.602 x 70) + (0.951 x 30)] / 1.550



Hydrograph Report

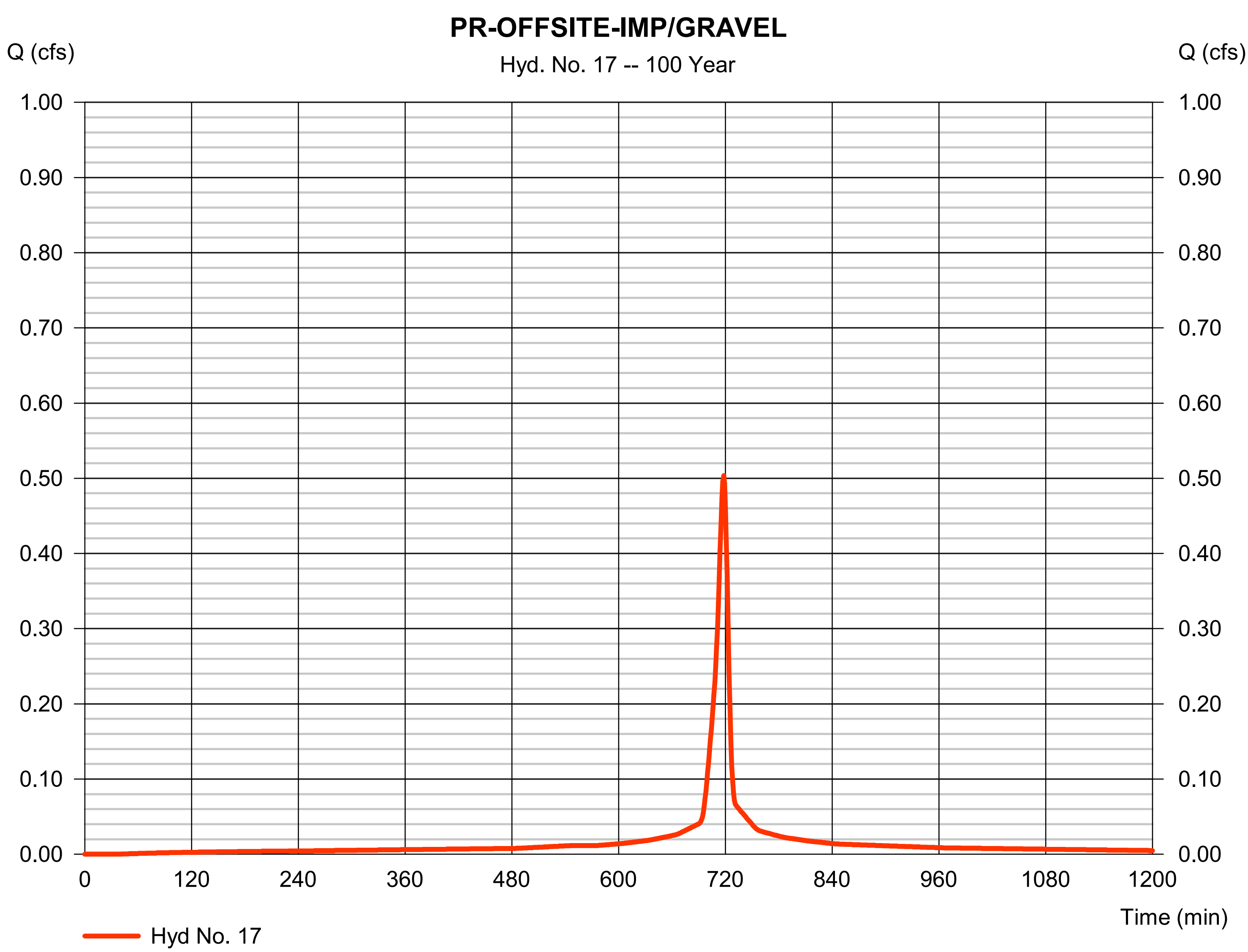
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 17

PR-OFFSITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.504 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 1,280 cuft
Drainage area	= 0.049 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.010 x 98) + (0.050 x 98)] / 0.049



Hydrograph Report

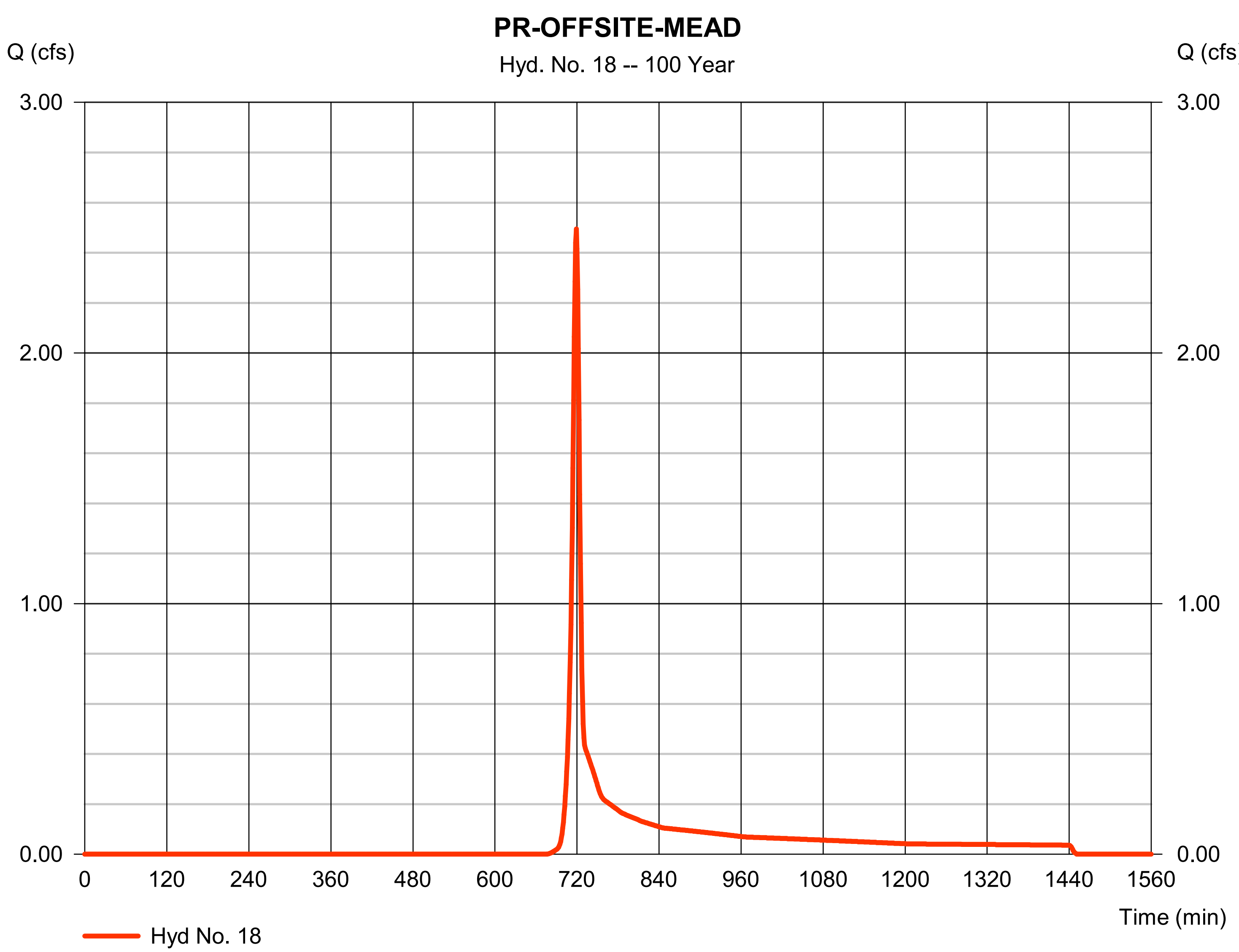
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 18

PR-OFFSITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 2.495 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 5,406 cuft
Drainage area	= 0.720 ac	Curve number	= 51*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.037 x 71) + (0.331 x 71) + (0.252 x 30) + (0.103 x 30)] / 0.720



Hydrograph Report

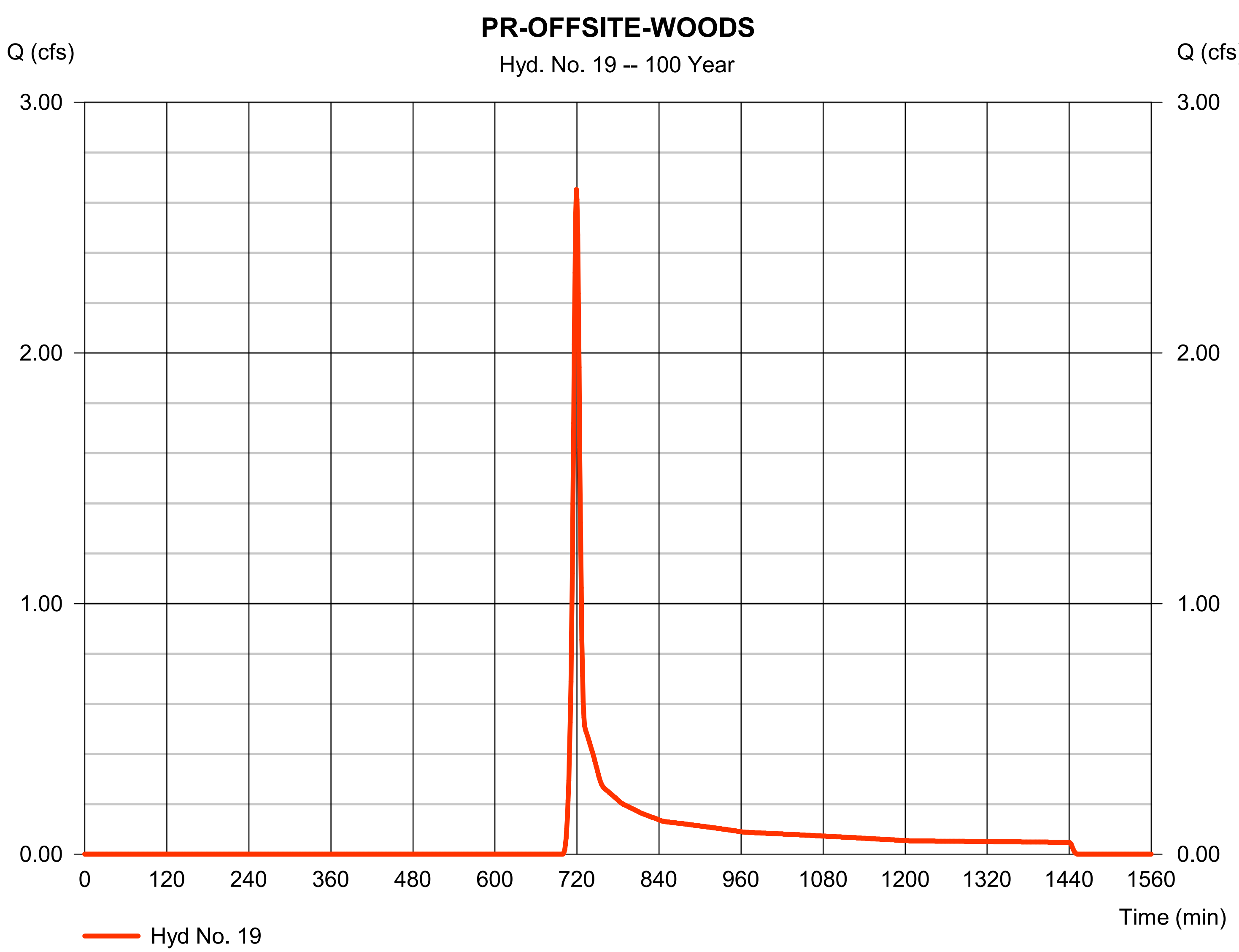
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 19

PR-OFFSITE-WOODS

Hydrograph type	= SCS Runoff	Peak discharge	= 2.653 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 6,158 cuft
Drainage area	= 1.130 ac	Curve number	= 45*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 70) + (0.180 x 70) + (0.700 x 30)] / 1.130



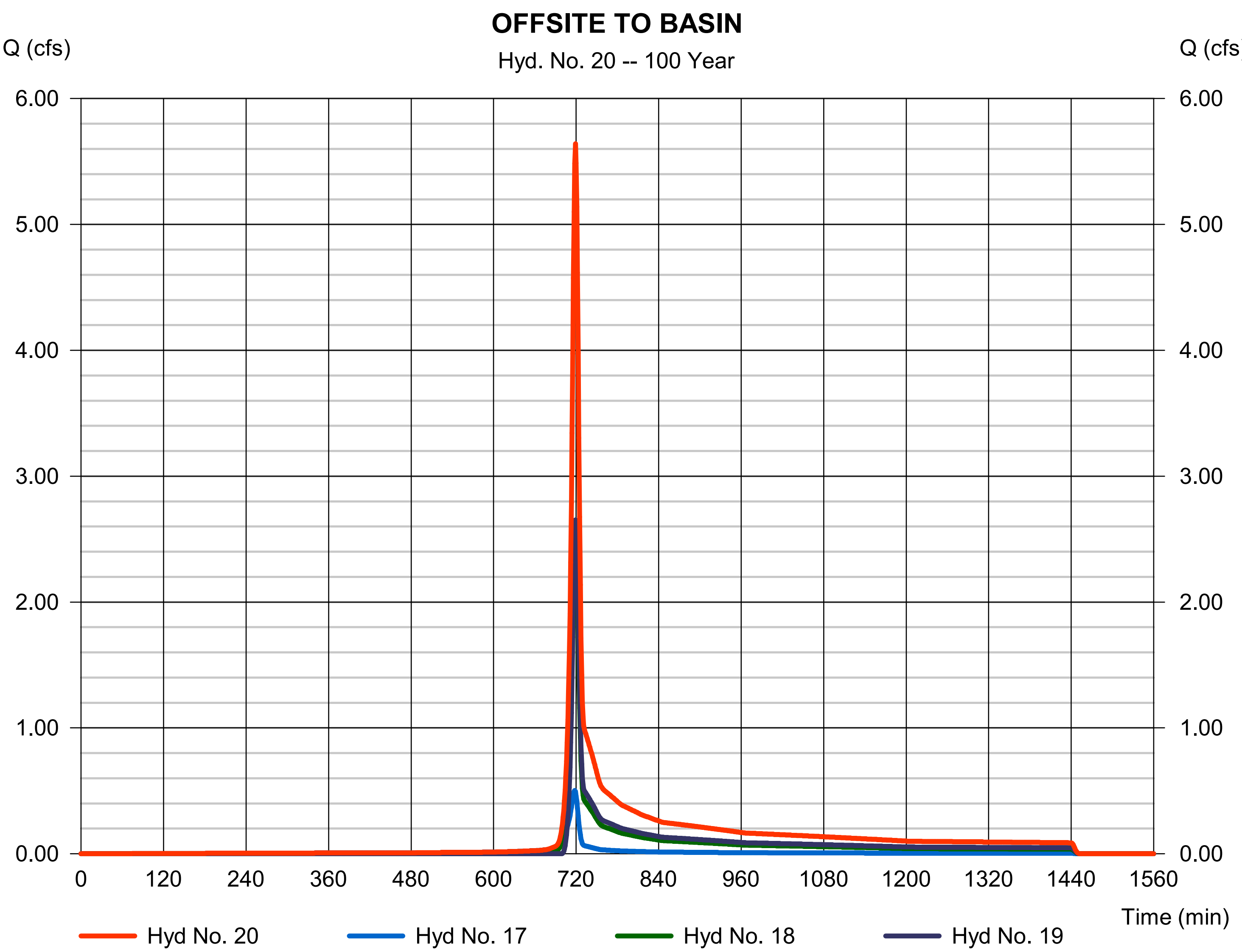
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 20

OFFSITE TO BASIN

Hydrograph type	= Combine	Peak discharge	= 5.641 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 12,844 cuft
Inflow hyds.	= 17, 18, 19	Contrib. drain. area	= 1.899 ac



Hydrograph Report

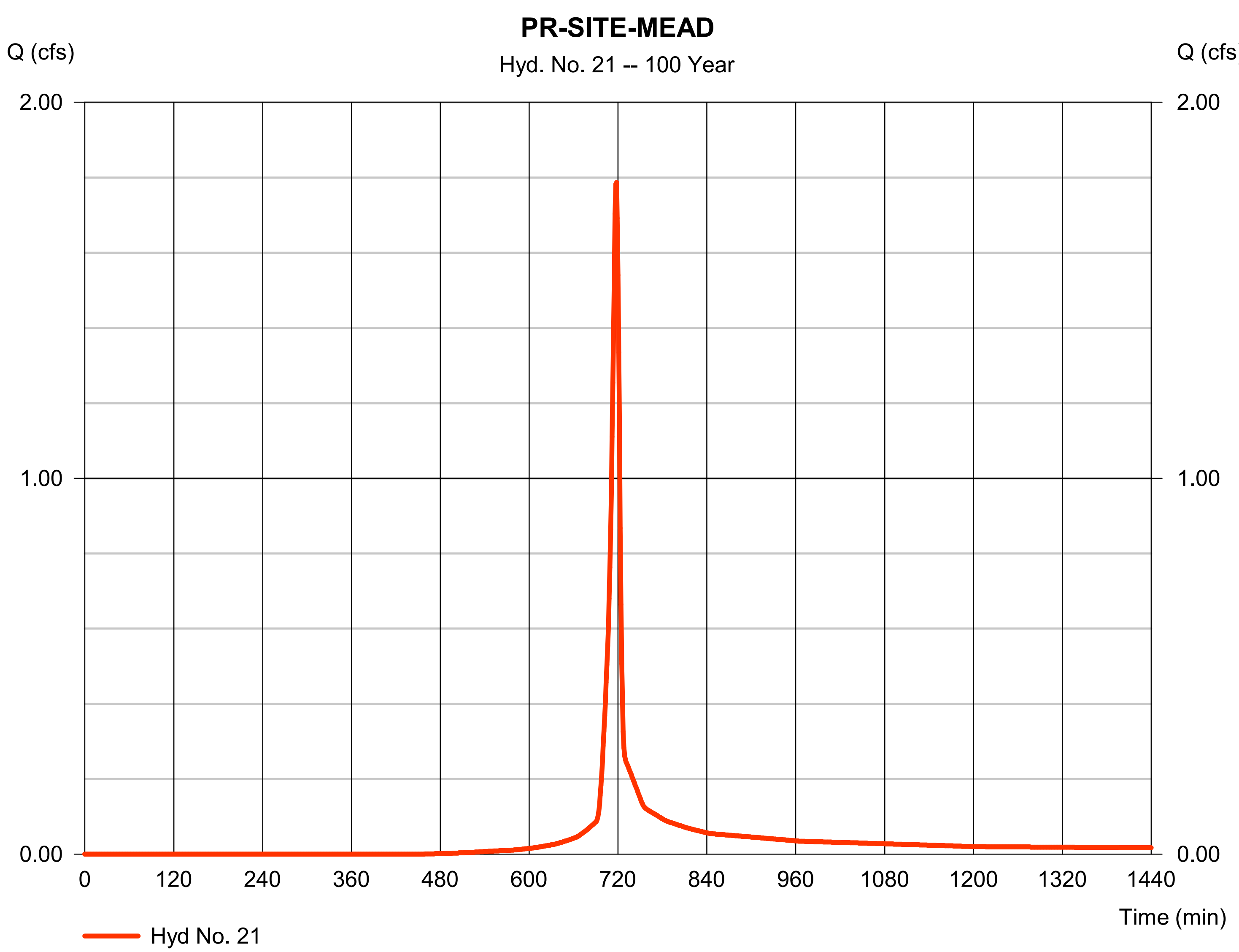
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 21

PR-SITE-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 1.787 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 3,644 cuft
Drainage area	= 0.229 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.10 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.134 x 71) + (0.003 x 71) + (0.435 x 71)] / 0.229



Hydrograph Report

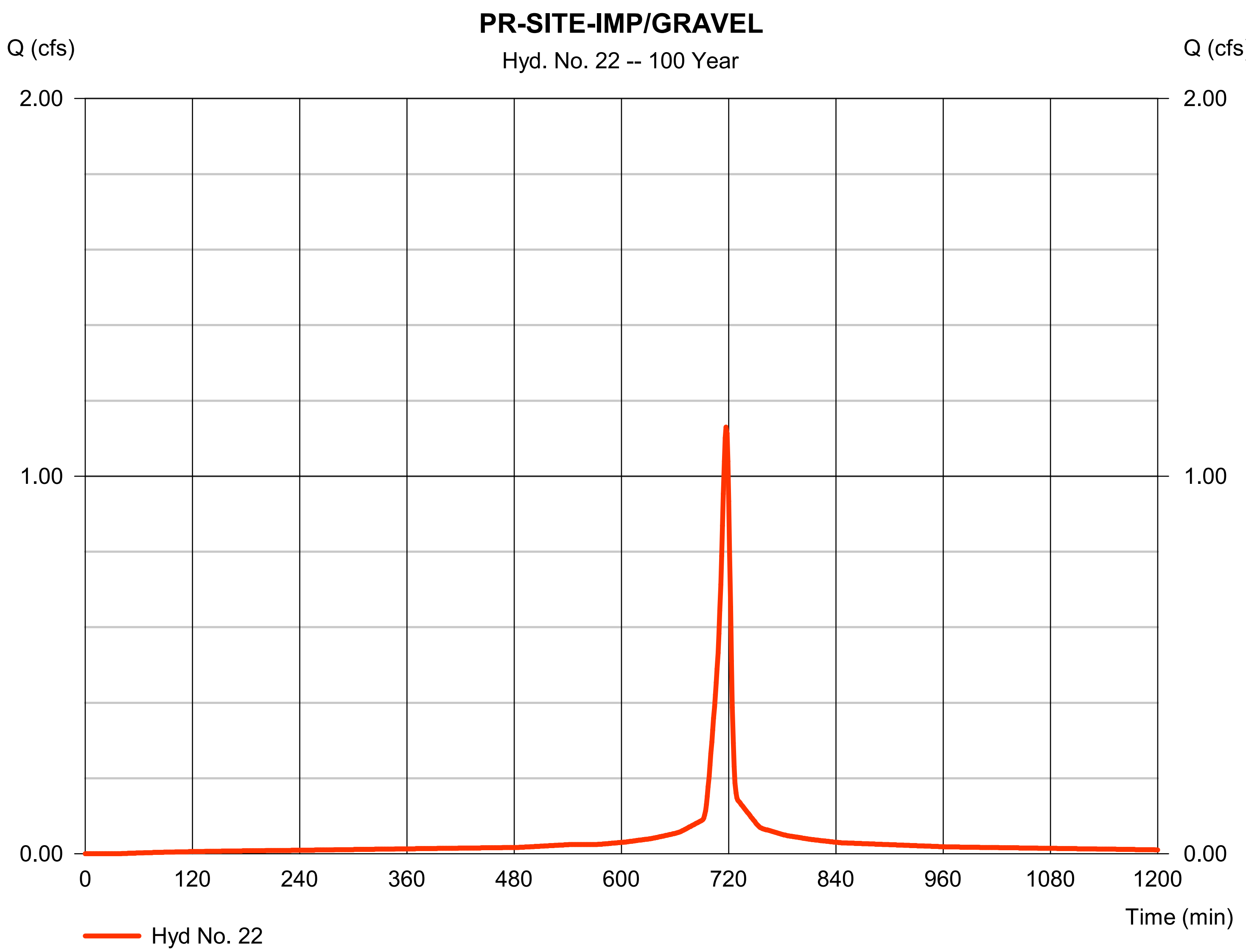
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 22

PR-SITE-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 1.130 cfs
Storm frequency	= 100 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 2,763 cuft
Drainage area	= 0.100 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.040 x 98) + (0.053 x 98) + (0.008 x 98)] / 0.100



Hydrograph Report

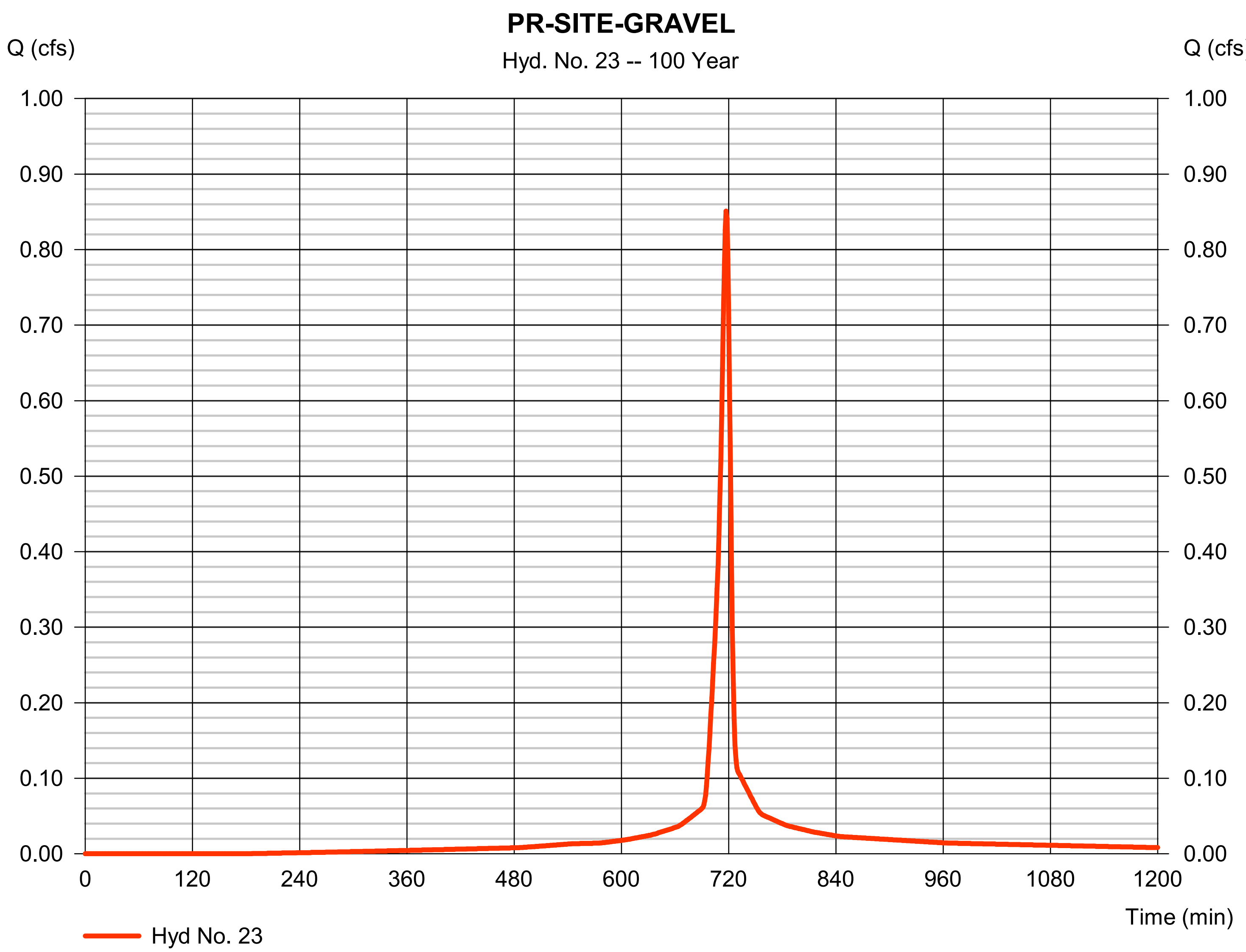
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 23

PR-SITE-GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.851 cfs
Storm frequency	= 100 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 1,891 cuft
Drainage area	= 0.080 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.064 x 89) + (0.003 x 89) + (0.013 x 89)] / 0.080



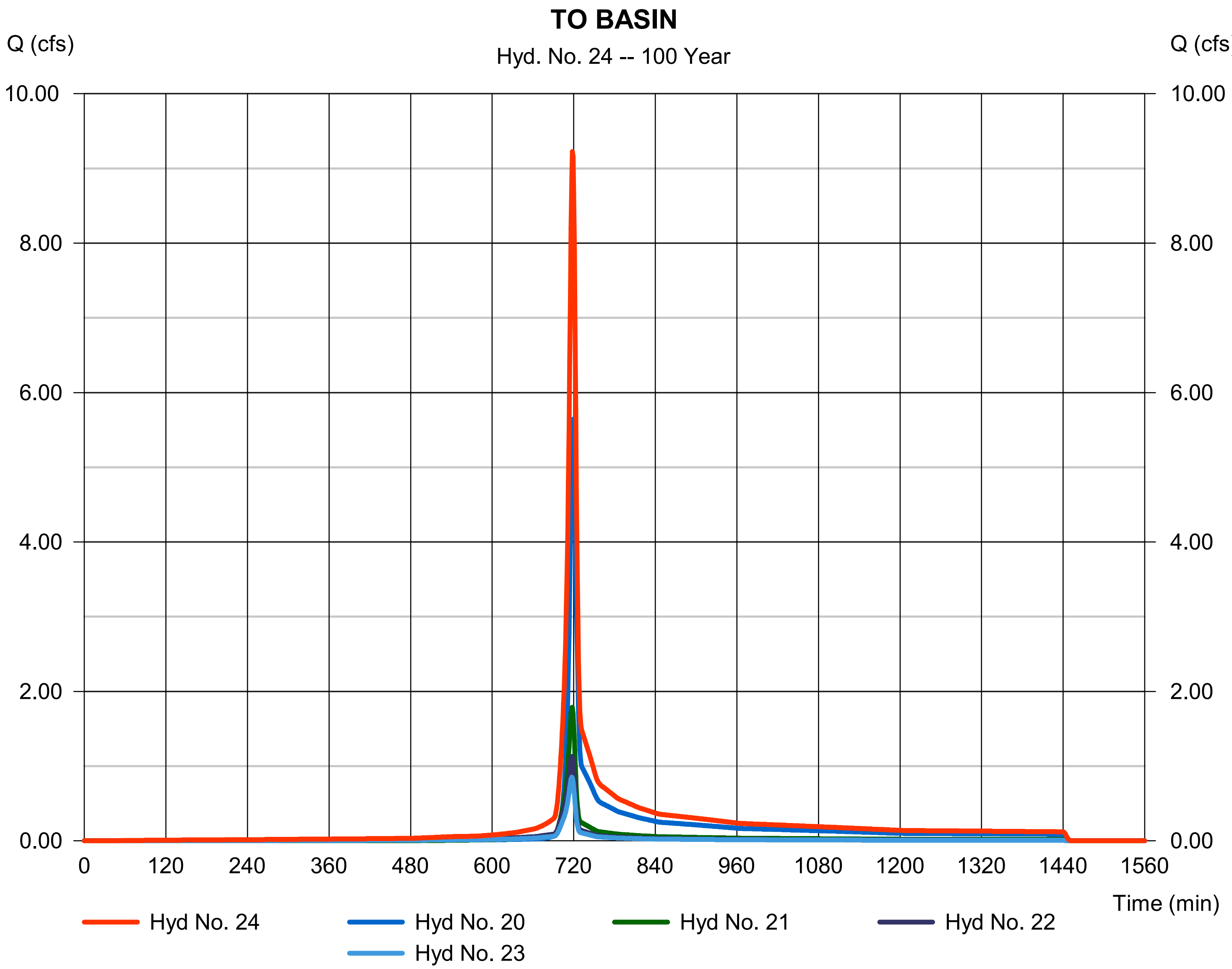
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 24

TO BASIN

Hydrograph type	= Combine	Peak discharge	= 9.226 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 21,141 cuft
Inflow hyds.	= 20, 21, 22, 23	Contrib. drain. area	= 0.409 ac



Hydrograph Report

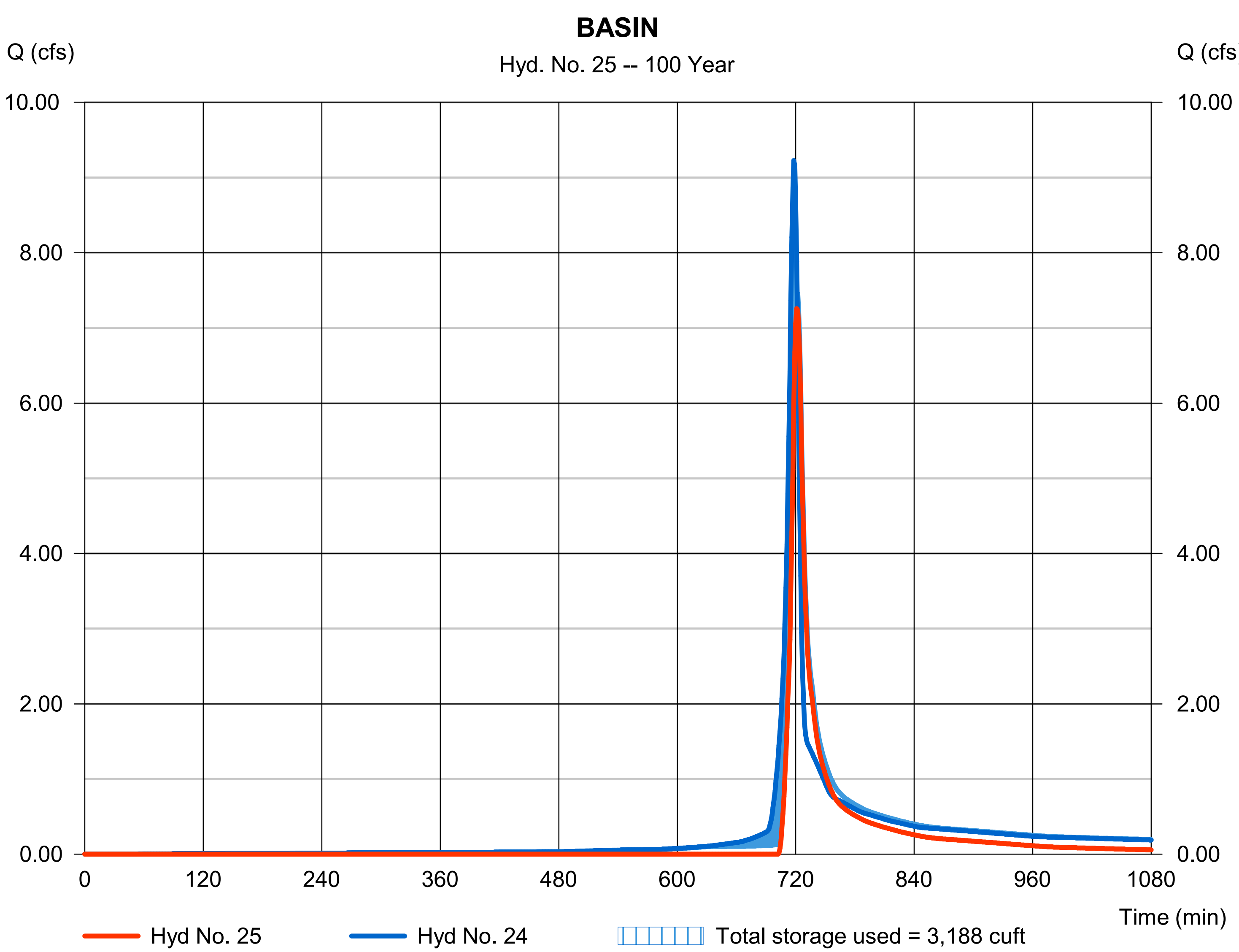
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 25

BASIN

Hydrograph type	= Reservoir	Peak discharge	= 7.258 cfs
Storm frequency	= 100 yrs	Time to peak	= 721 min
Time interval	= 1 min	Hyd. volume	= 12,845 cuft
Inflow hyd. No.	= 24 - TO BASIN	Max. Elevation	= 642.16 ft
Reservoir name	= UG N-12 Perforated Pipe System	Max. Storage	= 3,188 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

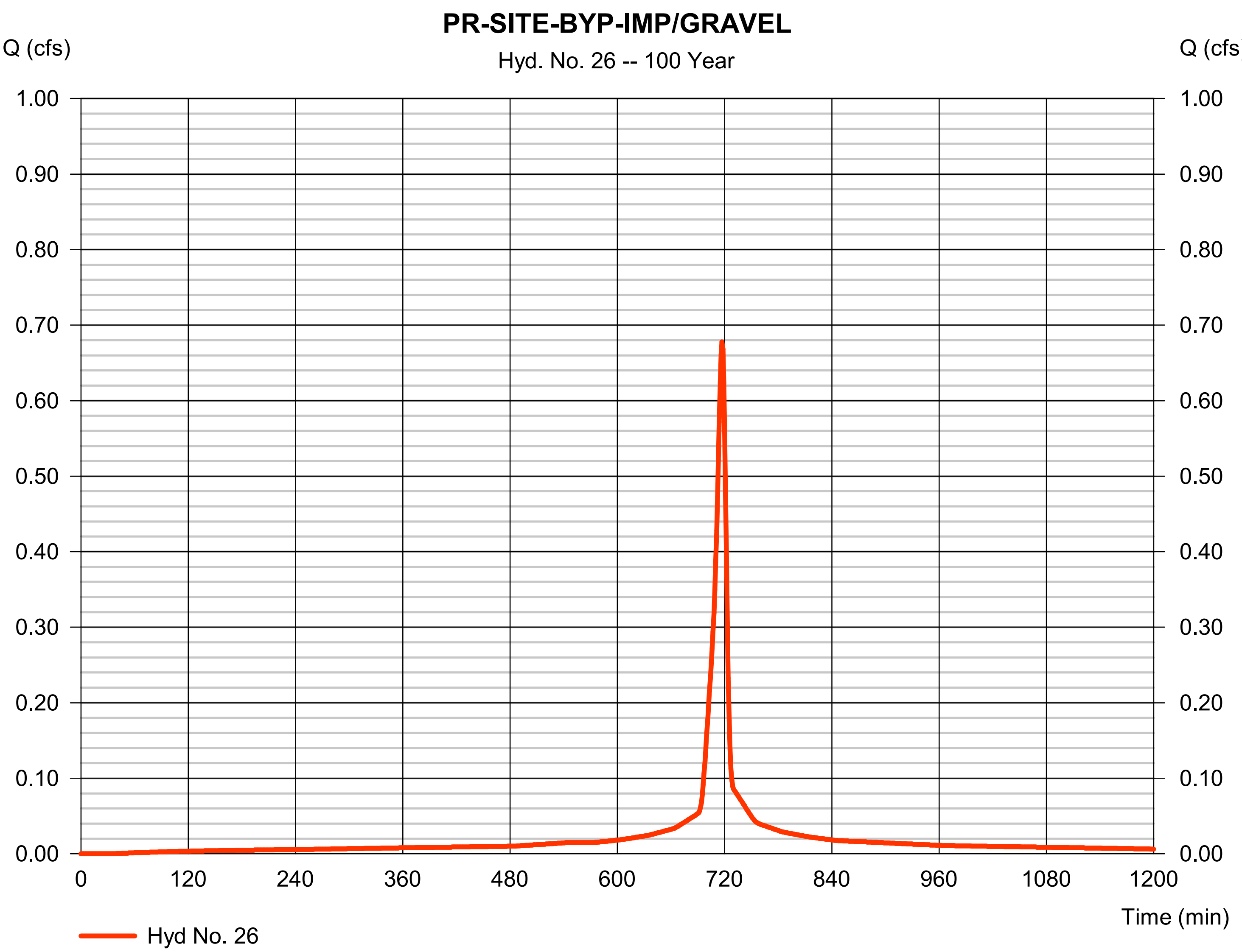
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 26

PR-SITE-BYP-IMP/GRAVEL

Hydrograph type	= SCS Runoff	Peak discharge	= 0.678 cfs
Storm frequency	= 100 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 1,658 cuft
Drainage area	= 0.060 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.060 x 98)] / 0.060



Hydrograph Report

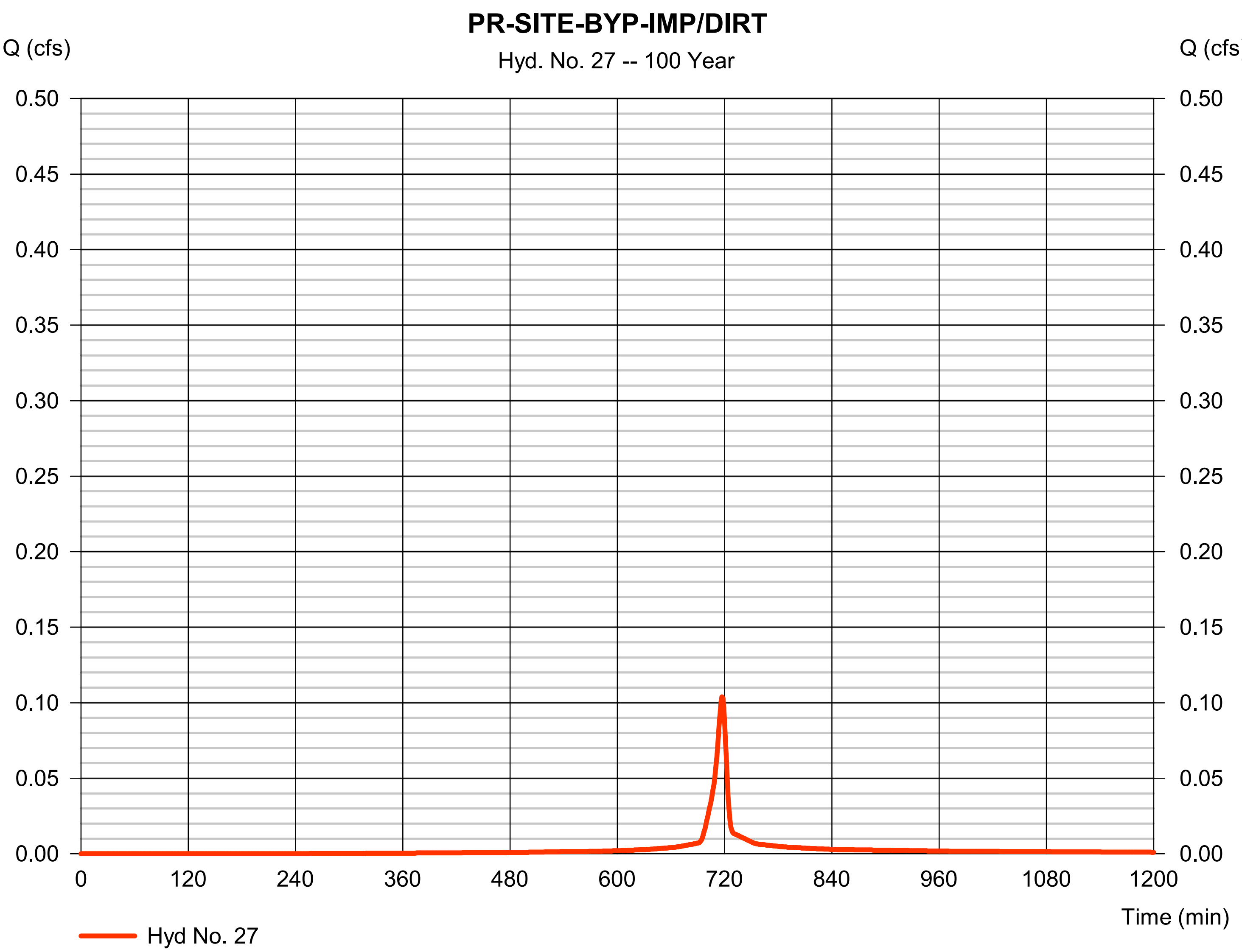
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Saturday, 10 / 13 / 2018

Hyd. No. 27

PR-SITE-BYP-IMP/DIRT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.104 cfs
Storm frequency	= 100 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 228 cuft
Drainage area	= 0.010 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.008 x 87)] / 0.010



Hydrograph Report

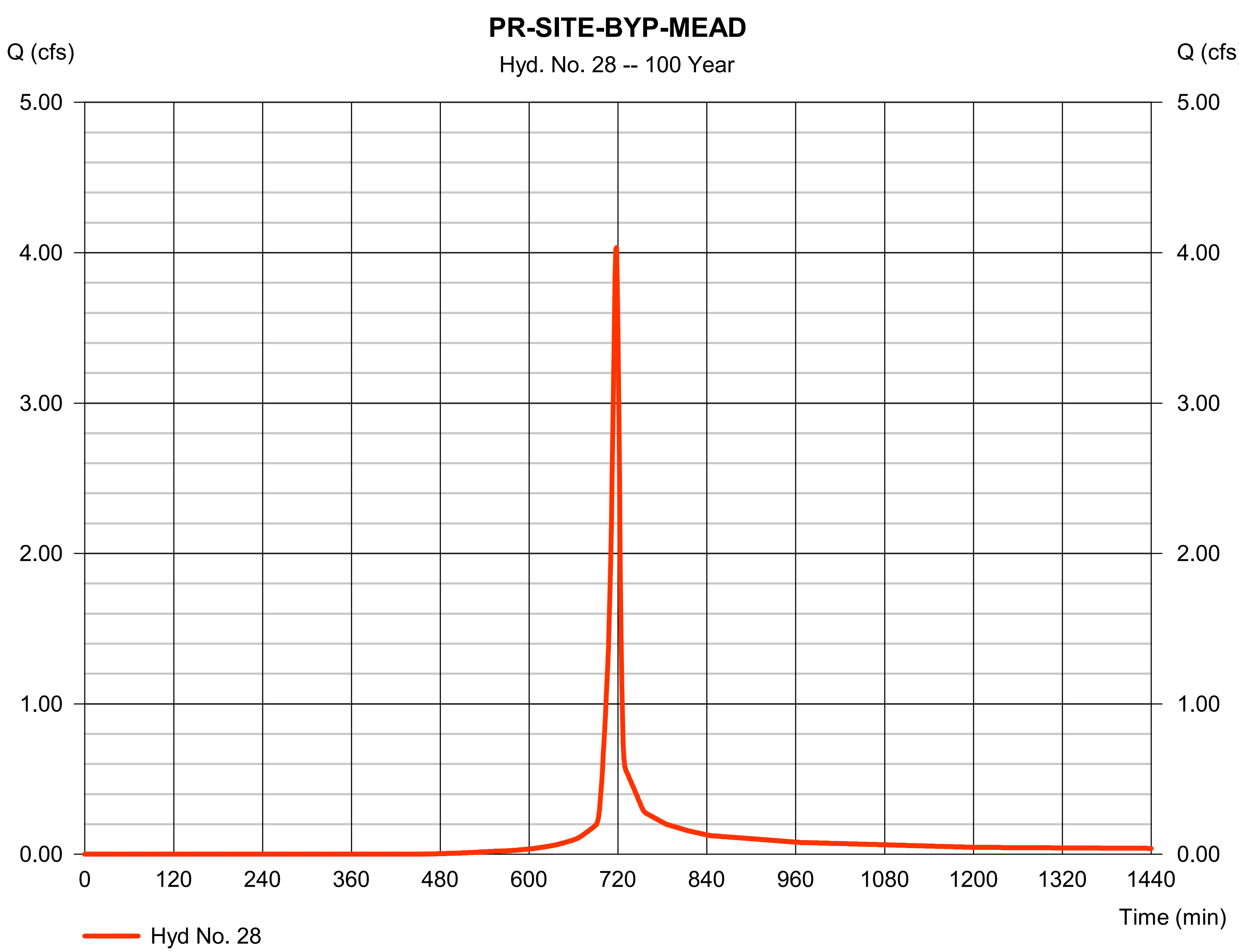
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 | Saturday, 10 / 13 / 2018

Hyd. No. 28

PR-SITE-BYP-MEAD

Hydrograph type	= SCS Runoff	Peak discharge	= 4.035 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 8,227 cuft
Drainage area	= 0.517 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.70 min
Total precip.	= 7.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.580 x 71) + (0.290 x 71) + (0.085 x 71)] / 0.517



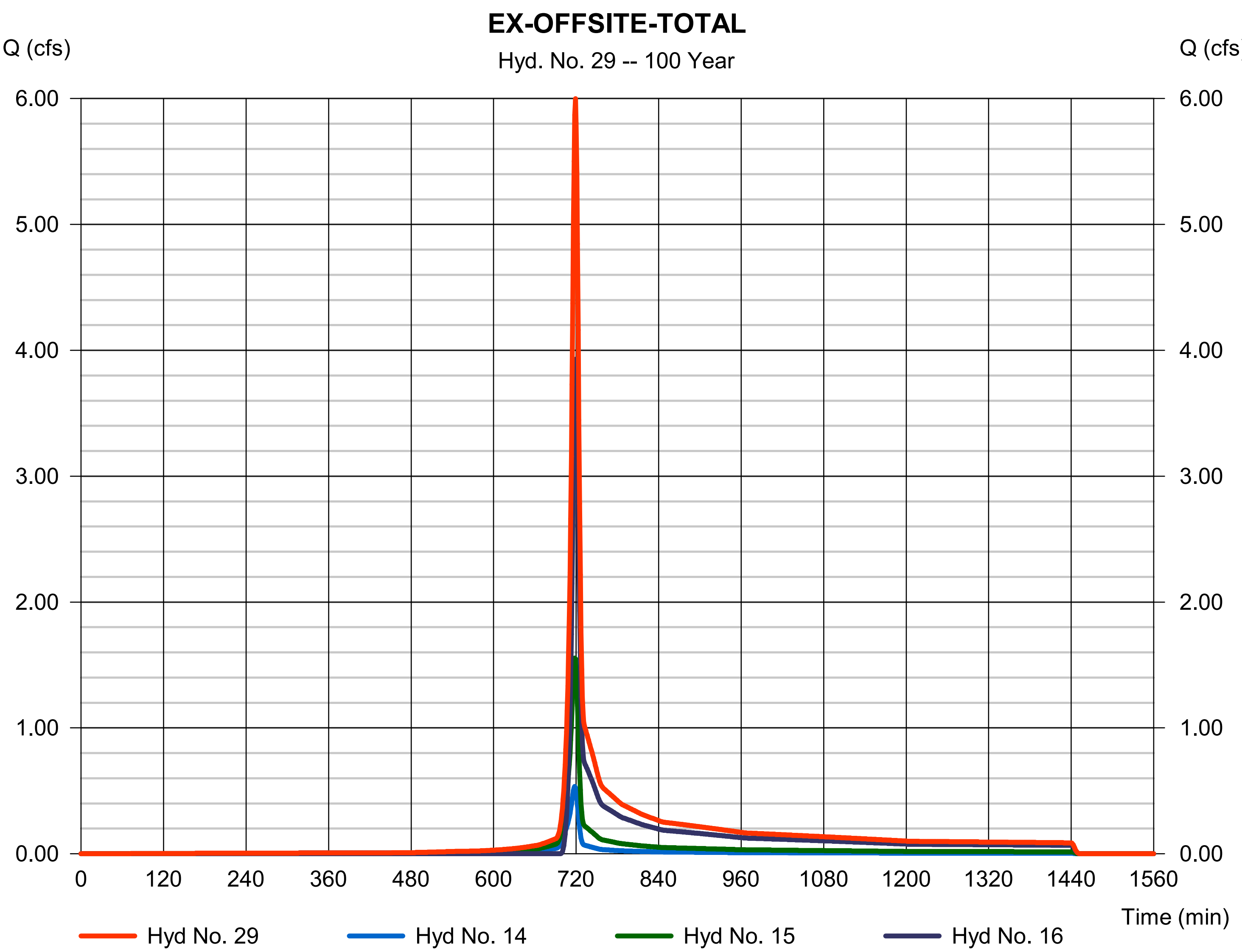
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 29

EX-OFFSITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 5.999 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 13,632 cuft
Inflow hyds.	= 14, 15, 16	Contrib. drain. area	= 1.822 ac



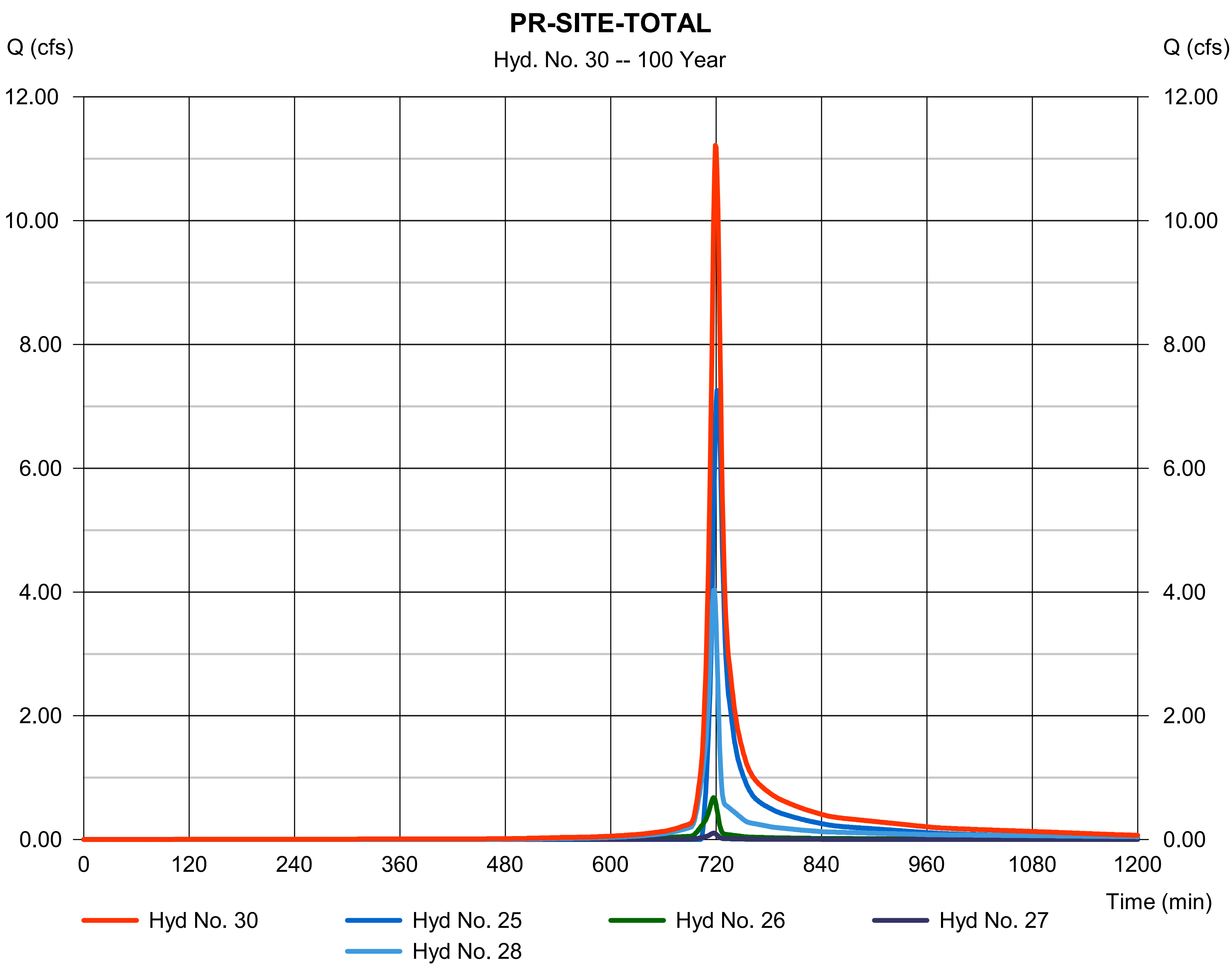
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 30

PR-SITE-TOTAL

Hydrograph type	= Combine	Peak discharge	= 11.22 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 22,957 cuft
Inflow hyds.	= 25, 26, 27, 28	Contrib. drain. area	= 0.587 ac



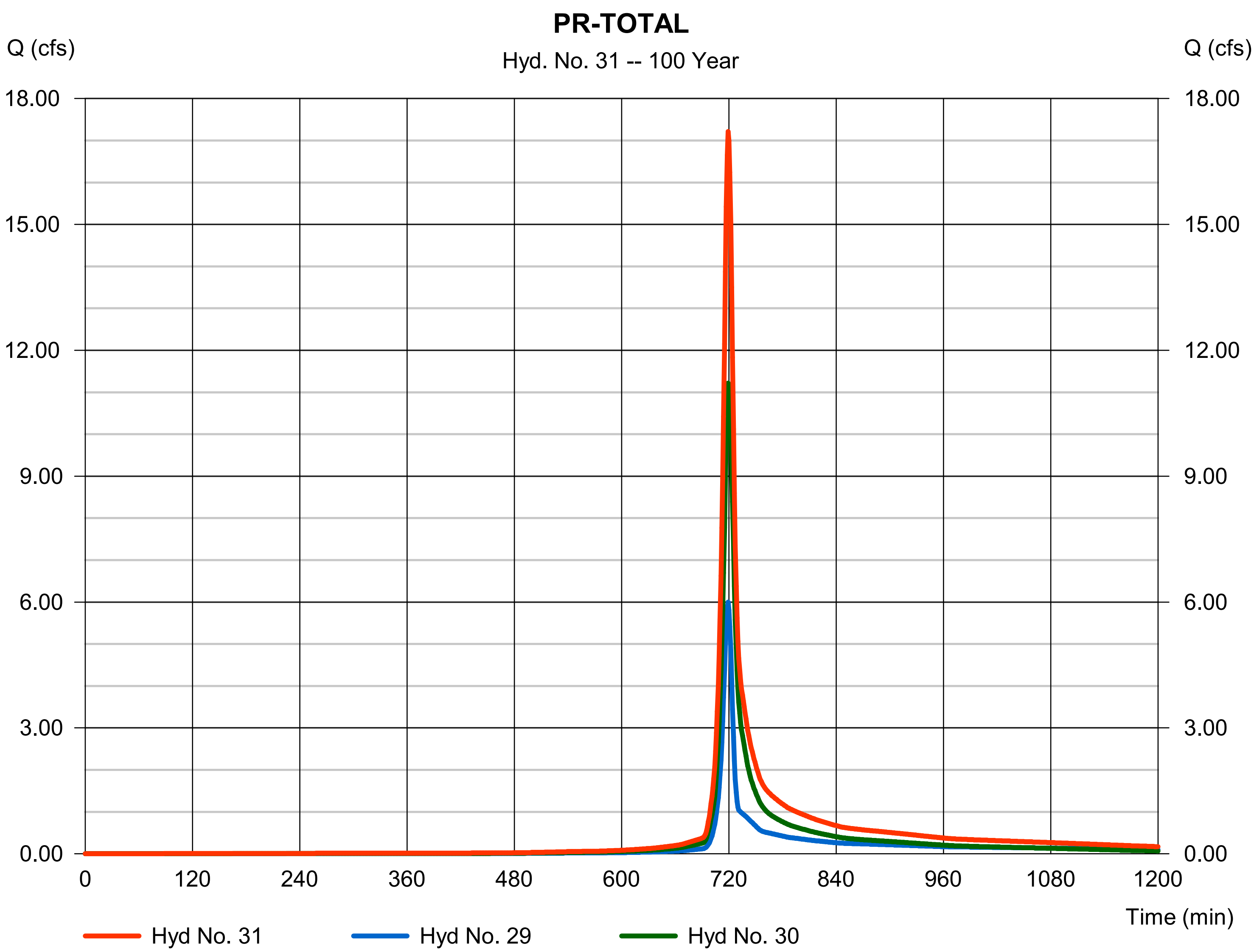
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Hyd. No. 31

PR-TOTAL

Hydrograph type	= Combine	Peak discharge	= 17.22 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 36,589 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.000 ac



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Saturday, 10 / 13 / 2018

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	36.9738	16.1000	0.7641	--------
2	94.4784	24.8001	0.9391	--------
3	0.0000	0.0000	0.0000	--------
5	176.2795	30.1001	1.0248	--------
10	317.8354	35.8000	1.1154	--------
25	309.7854	36.4000	1.0685	--------
50	1324.7950	53.7998	1.3207	--------
100	68.0213	20.7000	0.7186	--------

File name: Irvington.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	3.60	3.06	2.67	2.39	2.16	1.98	1.83	1.70	1.60	1.50	1.42	1.35
2	3.90	3.37	2.97	2.66	2.41	2.20	2.03	1.88	1.75	1.64	1.55	1.46
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	4.60	4.01	3.56	3.19	2.90	2.65	2.44	2.26	2.11	1.97	1.86	1.75
10	5.08	4.46	3.98	3.58	3.25	2.98	2.75	2.54	2.37	2.22	2.08	1.96
25	5.80	5.13	4.60	4.17	3.81	3.50	3.24	3.01	2.82	2.64	2.49	2.35
50	6.10	5.48	4.96	4.52	4.14	3.82	3.54	3.29	3.07	2.88	2.71	2.55
100	6.60	5.81	5.21	4.74	4.36	4.05	3.79	3.56	3.36	3.19	3.04	2.90

Tc = time in minutes. Values may exceed 60.

Precip. file name: P:\353754 PennEast\Stormwater\Site 10 - Transco\SW Model\Site10.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.63	3.15	0.00	3.92	4.58	5.61	6.55	7.62
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Hydraflow Table of Contents

5 - Year

50 - Year

I. PCSM Drawings (Attached)

J. Offsite Stormwater Discharge Plan (Attached)