STORMWATER MANAGEMENT REPORT

FOR

PRELIMINARY AND FINAL MAJOR SITE PLAN

BLOCK 38, LOT 4

MANCHESTER TOWNSHIP
OCEAN COUNTY, NEW JERSEY

Prepared by:

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SECTION 1 - NARRATIVE

I. INTRODUCTION

The site is commonly known as Block 38, Lot 4, at 2132 Route 37 west in Manchester Township, Ocean County, New Jersey. Itis located on the north side of Route 37 between Farm Street and Buckingham drive. It is the former site of a florist business. The building and associated improvements were demolished and removed from the site approximately 10 years ago. There are currently piles of gravel and soil located over the former building and parking area.

II. PRESENT DRAINAGE AREAS AND DESIGN CRITERIA

Beyond the formerly developed area of the site adjacent to Route 37, the site is predominantly wooded. The project qualifies as a "MAJOR DEVELOPMENT" as outlined in the NJ Best Practices Manual. The project will disturb more than 1 acre of land, and will add more than 0.25 acres of impervious cover for the proposed improvements. As such, the stormwater runoff reductions called for in the NJBMP are required. The following Design Criteria was utilized in the design of the Stormwater Management Basins in order to meet the stormwater management requirements.

- The bottom of the basin sand layer shall be a minimum 2 feet above the seasonal high water table.
- Runoff from the pervious areas and impervious areas are calculated separately and then combined to obtain the total runoff to the basin.
- The bottom of the basins will consist of 6" thick layer of sand.
- The use of Type "D" distribution type (per bulletin NJ210-12-1) this is a 6-minute interval hydrograph and cannot be analyzed in a smaller increment.
- Use of the Del Marva curve shape factor of 285 (per bulletin 2018-4).
- Predeveloped 2-year storm runoff shall be reduced by 50%.
- Predeveloped 10-year storm runoff shall be reduced by 75%.
- Predeveloped 100-year storm runoff shall be reduced by 80%.

According to the Soils Identification Map included in this report, there are two soils types located on site. Approximately 16% of the site consists of Downer Sandy Loam and the remaining 86% consists of Lakewood Sand. Both are classified as Type "A" soils. The distinct soil areas were analyzed together in the existing conditions hydrograph. The site is analyzed first in its pre-developed condition for the associated storm events. These results can be found in table A.

The site drains to the east towards a natural low point near a residential development and commercial building. Approximately 25.67 acres of overland flow passes through the site from the west, from adjacent lot 5 which is used as a golf driving range, and the next upstream lot, lot 6, which is wooded. The overland flow from off-site will be collected at a headwall along the westerly property line and will be piped into the infiltration basin. No credit or reduction is taken for this off-site volume. It is considered a pass through hydrograph and is not included in onsite only basin routings. The infiltration basin was routed with the offsite contributions in a separate calculation; all calculations are included in section 2.

III. DEVELOPED DRAINAGE AREAS AND STORMWATER MANAGEMENT PLAN

Infiltration Basins Water Quantity Requirements

The project proposes two (2) infiltration basins that will recharge stormwater runoff from the proposed building and parking areas. An approximately 2.3 acres wooded area at the northern end of the site will remain undisturbed. Overland runoff from this area bypasses the infiltration basin.

Soil profile pits were performed on-site; their locations are shown on the site plans and copies of the soil logs and permeability results are included in the geotechnical report which is attached.

Hydrographs are created and routed through the basins using the Hydraflow Hydrographs program. As part of the NJ BMP regulations for water quantity calculations exfiltration can be used during the routings. This exfiltration causes the hydrographs to be excessively long, therefore the hydrographs are presented in graphical form only within this report for brevity. If the reviewing entity wishes to see the hydrographs in numerical form a PDF on disc can be supplied upon request.

Dewatering calculations utilize the maximum permissible (1/2 of actual analysis or 10 in/hr. max.). The lowest exfiltration found in the test pits was 10.20 in/hr., dewatering and exfiltration calculations utilized a rate of 5 in/hr. Dewatering calculations are also included in the routings of the basins, no separate hydrograph or calculation is supplied. Tube permeameter tests were performed from samples taken at varying depths in each soil profile pit. All tests show significantly higher permeability rates than utilized during calculations.

The pass through runoff generated from the adjacent properties will be collected by a headwall at the westerly property line and then piped into the infiltration basin. All developed hydrographs are summed for total developed flows. The basin is designed to allow the runoff to exit the site at the same natural low point that is exits in the predeveloped condition. Table E outlines the allowable flows compared to the post developed flows to this point. Flows are reduced for all studied storm occurrences.

TABLE A
PRESENT PEAK RATES OF ON SITE RUNOFF

STORM EVENT (YR)	TOTAL PRESENT (CFS)	ALLOWED ON SITE RUNOFF (CFS)
2	0.000	0.000(50%)
10	0.109	0.080(75%)
100	2.512	2.010(80%)

Analysis of the developed conditions yields the following:

TABLE B
DEVELOPED PEAK RATES OF RUNOFF ON SITE ONLY

STORM EVENT (YR)	Basin 1 Outflow (Hyd # 25) (CFS)	Basin 2 outflow (Hyd #20) (CFS)	Overland bypass (Hyd # 15) (CFS)	Total flow (Hyd # 29) (CFS)
2	0.00	0.000	0.000	0.000
10	0.00	0.004	0.020	0.020
100	0.00	0.126	0.727	0.854

TABLE C
COMPARISON OF ALLOWABLE VS ACTUAL PROPOSED RUNOFF ON SITE ONLY

STORM EVENT (YR)	Allowable (CFS)	Proposed (CFS)	Complies (CFS)
2	0.000	0.000	Yes
10	0.080	0.020	Yes
100	2.010	0.854	Yes

The offsite contributions will generate the following runoffs flows and will be treated as pass through, no reductions are required for these hydrographs.

TABLE D
OFF SITE CONTRIBUTIONS WITH ALLOWABLE ON SITE FLOWS

STORM EVENT (YR)	OFFSITE CONTRIBUTIONS (CFS)	ON SITE ALLOWABLE (CFS)	TOTAL ALLOWABLE (CFS)
2	1.680	0.000	1.680
10	2.643	0.080	2.723
100	15.160	2.010	17.17

TABLE E
COMPARISON OF ONSITE AND OFFSITE POST DEVELOPMENT BASIN ROUTING WITH EXFILTRATION CREDIT

STORM EVENT (YR)	Allowable Total (CFS)	Proposed Total (CFS)	Complies (CFS)
2	1.680	0.000	Yes
10	2.723	0.023	Yes
100	17.170	0.653	Yes

Water Quality Requirements

Water quality design is a consideration during the design process. The water quality storm is required to be infiltrated on site. The project will employ 2 strategies to comply with the requirement, one strategy is underground roof recharge systems to handle the roof runoff generated during the water quality storm.

A system of underground chambers is connected to the roof downspouts and sized according to the drainage area for each roof section. These systems are open bottom chambers that will be set on a stone base to

ensure recharge. All runoff from the roof for the water quality storm is directed to these systems. Each system is provided with a leaf guard to remove any possible TSS that may make their way onto the roof and into the system. They are also equipped with an overflow pipe that connects to the nearest catch basin or infiltration basin.

A second system of small scale infiltration basins is proposed on site. The basins will be sand bottomed basins that will have their first outlet orifice above the water quality design storm elevation as required in the NJBMP. The basins are designed to comply with the requirements of the NJBMP as follows.

1. The entire water quality design storm directed to each basin is completely recharged.
2. The upstream contributing area is less than 2.5 acres.
3. Maximum drain time is less than 72 hours.
4. A safety factor of 2 is used for dewatering calculations.
5. Minimum sub soil permeability rate is above 0.5 in/hr.
6. Maximum design permeability rate is less than 10 in/hr.
7. Soil testing in the area of the basins complies with the requirements.
8. Minimum distance from bottom of sand layer and SHWT is in excess of 2 feet.
9. The sand layer is specified to comply with the required permeability rate and shall be certified as such prior to installation.
10. The maximum fines in the sand layer shall be 15%

Green Infrastructure Requirements

The site is required to comply with the requirements of Green Infrastructure. The site complies as follows:

1. Stormwater is treated through infiltration into the subsoil in the infiltration basins.
2. Stormwater is managed close to its source as possible through the use of roof drywells, and sand bottomed infiltration basins.

3. The site incorporates pervious Pavement in several parking areas on site to allow the water quality storm to recharge close to its origin.

IV. Soil Erosion and Sediment Control

The New Jersey Soil Erosion and Sediment Control Act requires that the site be stabilized temporarily during construction and permanently after construction has been completed. In order to ensure stability of soils certain calculations were performed and are included in the section for Soil Erosion and Sediment Control within this report. Some of the methods used are outlined below.

1. Use of siltation fencing to capture overland silt. The site is more than one acre, as is the area of disturbance. Super silt fence is specified on the plans; the site thereby complies with the Standard for Sediment barriers.
2. Use of a Stone tracking pad at the construction entrance to remove silt and/or mud from vehicle tires when leaving the site. The site complies with the Standard for Stabilized Construction Entrances.
3. Temporary Stabilization – Notes regarding the temporary stabilization of the site are included in the plan set, the site complies with the Standard for Temporary Stabilization.
4. Permanent Stabilization – Notes regarding Permanent stabilization of the site are included in the plan set, the site complies with the Standard for Permanent Stabilization.
5. Inlet protection is provided at the inlets into the infiltration basin, the site complies with the Standard for Storm Sewer Inlet Protection.
6. Tree Protection – A tree protection fence will be installed along the limit of disturbance as required, the site complies with the Standard for Tree Protection During Construction.
7. Topsoil – The plans note the requirements for 5" minimum of topsoil to be placed on all disturbed areas to contain vegetation, the site complies with the Standard for Topsoiling.
8. Rip Rap Aprons – A rip rap apron is provided, sized for the 25-year storm flow exiting the Storm sewer pipe to provide stability at all outlets, the site complies with the Standard for Conduit Outlet Protection.

9. Stockpiles – The anticipated stockpile of soil is shown on the site plans along with the corresponding detail, the site complies with the Standards.

10. Emergency Spillway - When the failure analysis was performed (assuming the basin is full to the emergency spillway and a 10-year storm occurs) The NRCS Grassed waterway design guidelines and calculator show that the spillway will be stable during this flow. Supporting calculations can be found in the Soil Erosion and Sediment Control section of the report.

V. Summary and Conclusion

As designed, the Stormwater Management Plan meets the requirements of the Manchester Township Stormwater Management Ordinance, the NJ BMP and the New Jersey Soil Erosion and Sediment Control requirements.

SECTION 2
CALCULATIONS

SECTION 2-I
PRESENT RUNOFF AND VOLUME CALCULATIONS

Hydrograph Report

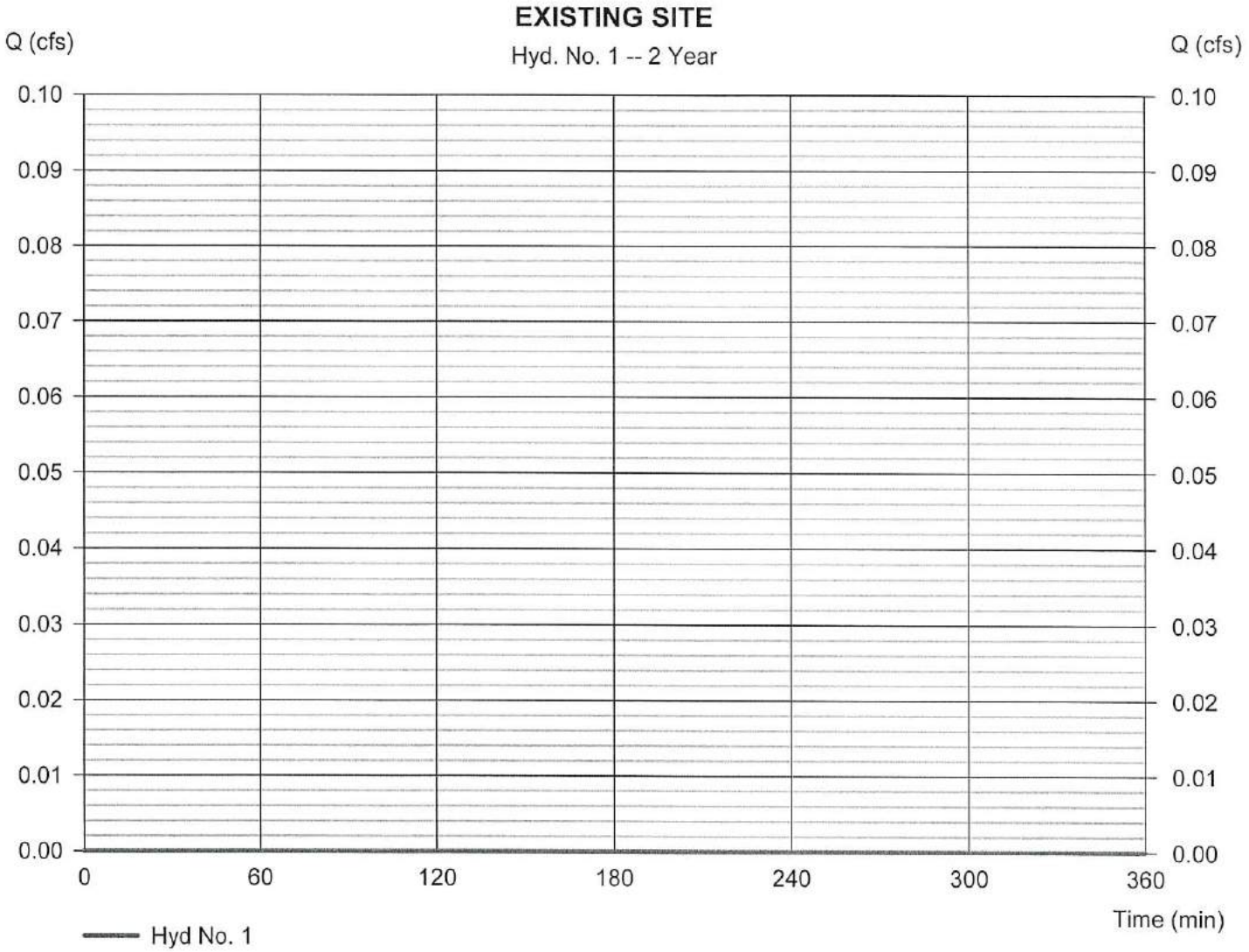
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 1

EXISTING SITE

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 6 min	Hyd. volume	= 0 cuft
Drainage area	= 7.590 ac	Curve number	= 35*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.20 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285

* Composite (Area/CN) = [(1.910 x 39) + (5.250 x 30) + (0.430 x 76)] / 7.590



TR55 Tc Worksheet

Hyd. No. 1

EXISTING SITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.40		3.40		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 20.83**	**+**	**0.00**	**+**	**0.00**	**=**	**20.83**
Shallow Concentrated Flow							
Flow length (ft)	= 900.00		0.00		0.00		
Watercourse slope (%)	= 0.80		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.44		0.00		0.00		
Travel Time (min)	**= 10.39**	**+**	**0.00**	**+**	**0.00**	**=**	**10.39**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 31.20 min

Hydrograph Report

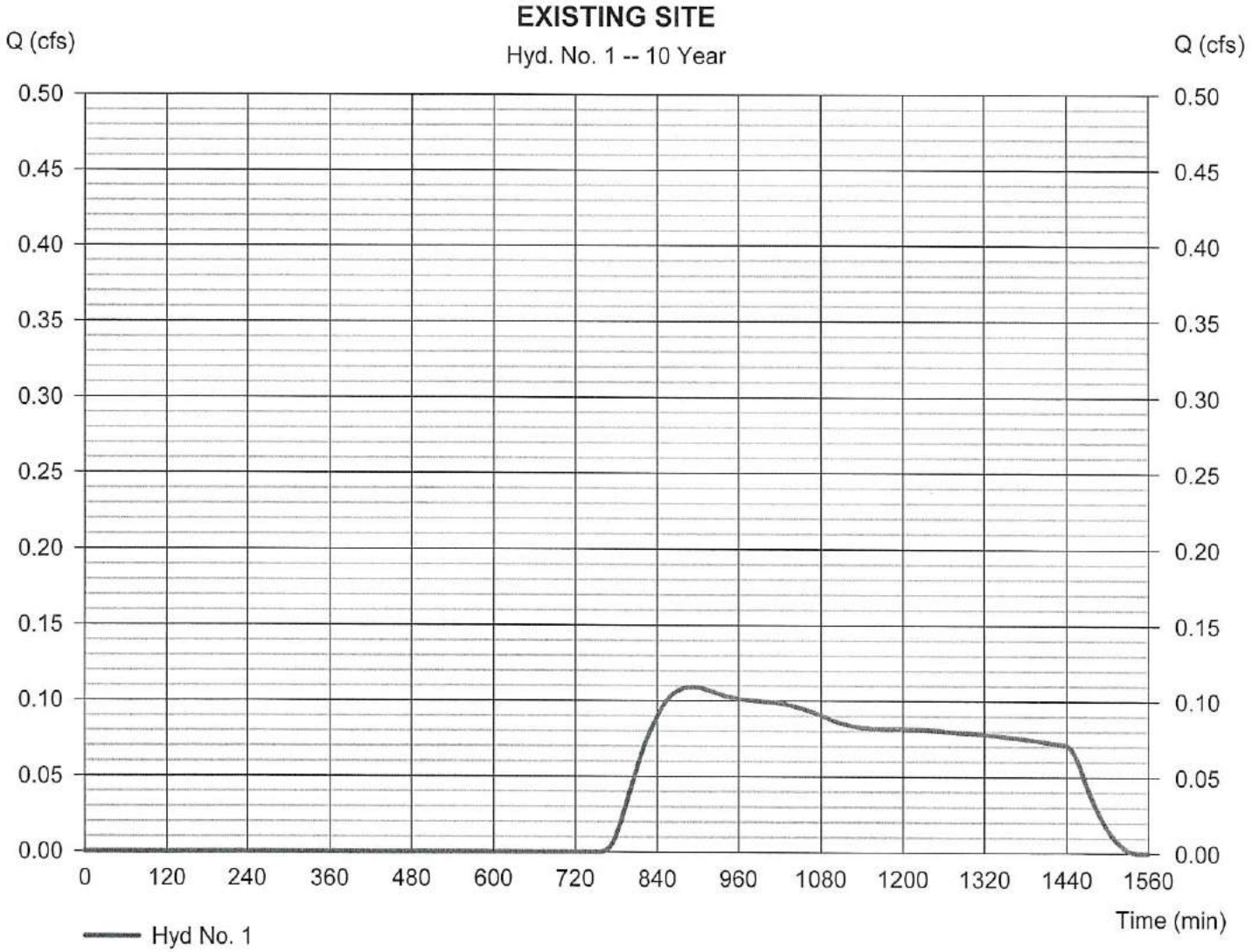
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 1

EXISTING SITE

Hydrograph type	= SCS Runoff	Peak discharge	= 0.109 cfs
Storm frequency	= 10 yrs	Time to peak	= 894 min
Time interval	= 6 min	Hyd. volume	= 3,540 cuft
Drainage area	= 7.590 ac	Curve number	= 35*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.20 min
Total precip.	= 5.33 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285

* Composite (Area/CN) = [(1.910 x 39) + (5.250 x 30) + (0.430 x 76)] / 7.590



Hydrograph Report

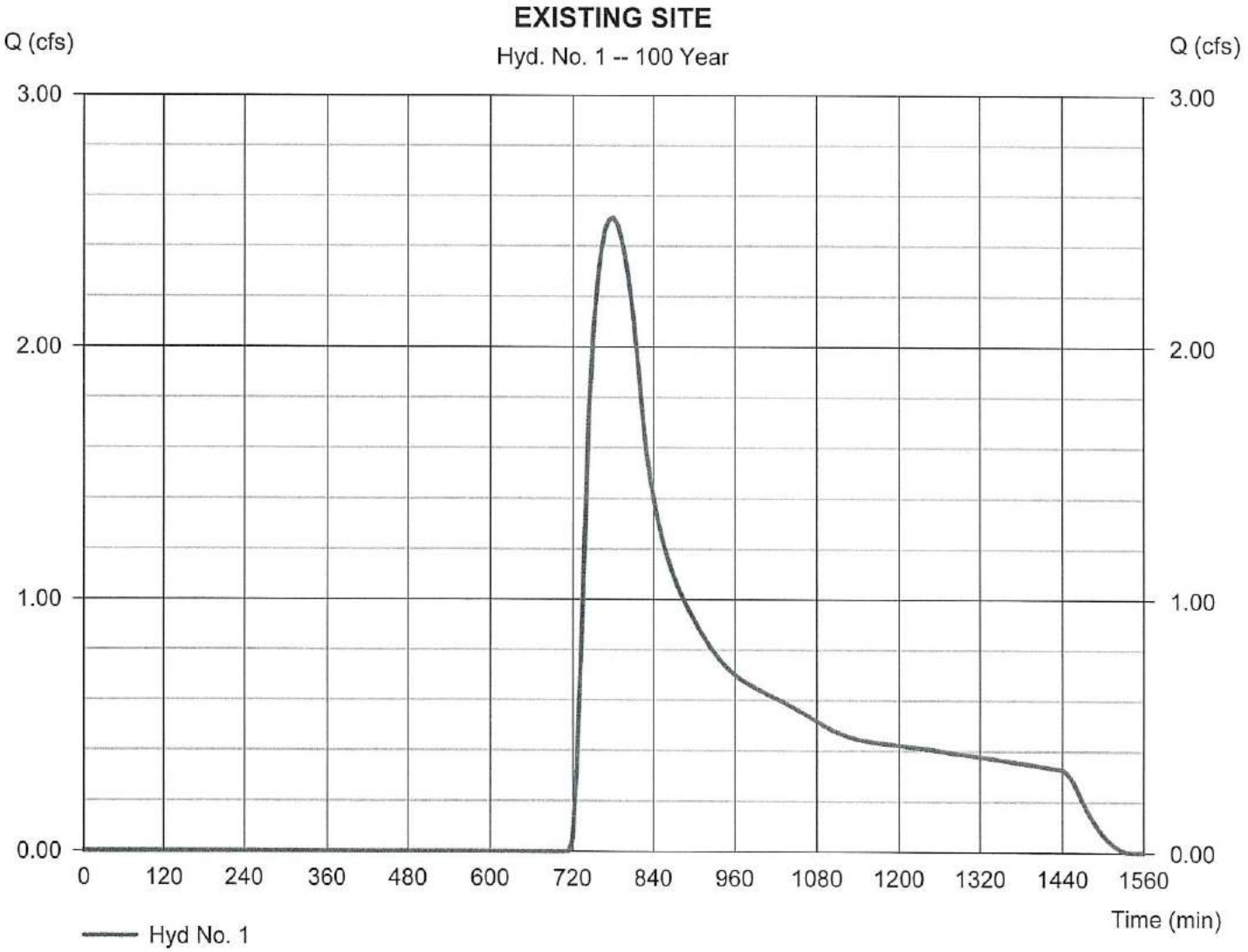
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 | Wednesday, 09 / 8 / 2021

Hyd. No. 1

EXISTING SITE

Hydrograph type	= SCS Runoff	Peak discharge	= 2.512 cfs
Storm frequency	= 100 yrs	Time to peak	= 780 min
Time interval	= 6 min	Hyd. volume	= 34,226 cuft
Drainage area	= 7.590 ac	Curve number	= 35*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.20 min
Total precip.	= 9.20 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285

* Composite (Area/CN) = [(1.910 x 39) + (5.250 x 30) + (0.430 x 76)] / 7.590



Hydrograph Report

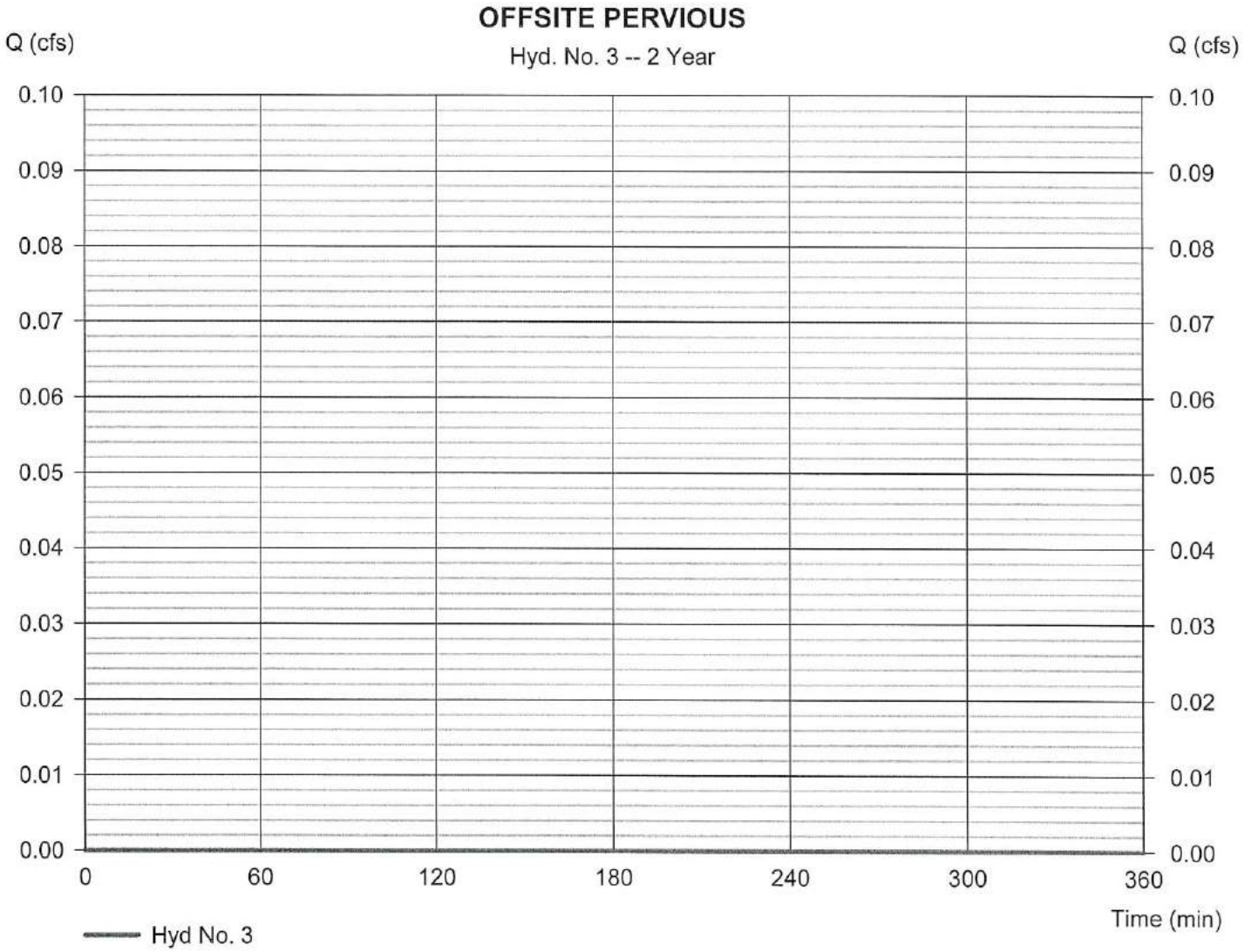
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 3

OFFSITE PERVIOUS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 6 min	Hyd. volume	= 0 cuft
Drainage area	= 20.400 ac	Curve number	= 36*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 36.40 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 484

* Composite (Area/CN) = [(6.360 x 39) + (13.430 x 32) + (0.610 x 76)] / 20.400



TR55 Tc Worksheet

Hyd. No. 3

OFFSITE PERVIOUS

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.40		0.00		0.00		
Land slope (%)	= 1.18		0.00		0.00		
Travel Time (min)	**= 25.73**	**+**	**0.00**	**+**	**0.00**	**=**	**25.73**
Shallow Concentrated Flow							
Flow length (ft)	= 1230.00		0.00		0.00		
Watercourse slope (%)	= 1.41		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.92		0.00		0.00		
Travel Time (min)	**= 10.70**	**+**	**0.00**	**+**	**0.00**	**=**	**10.70**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 36.40 min

Hydrograph Report

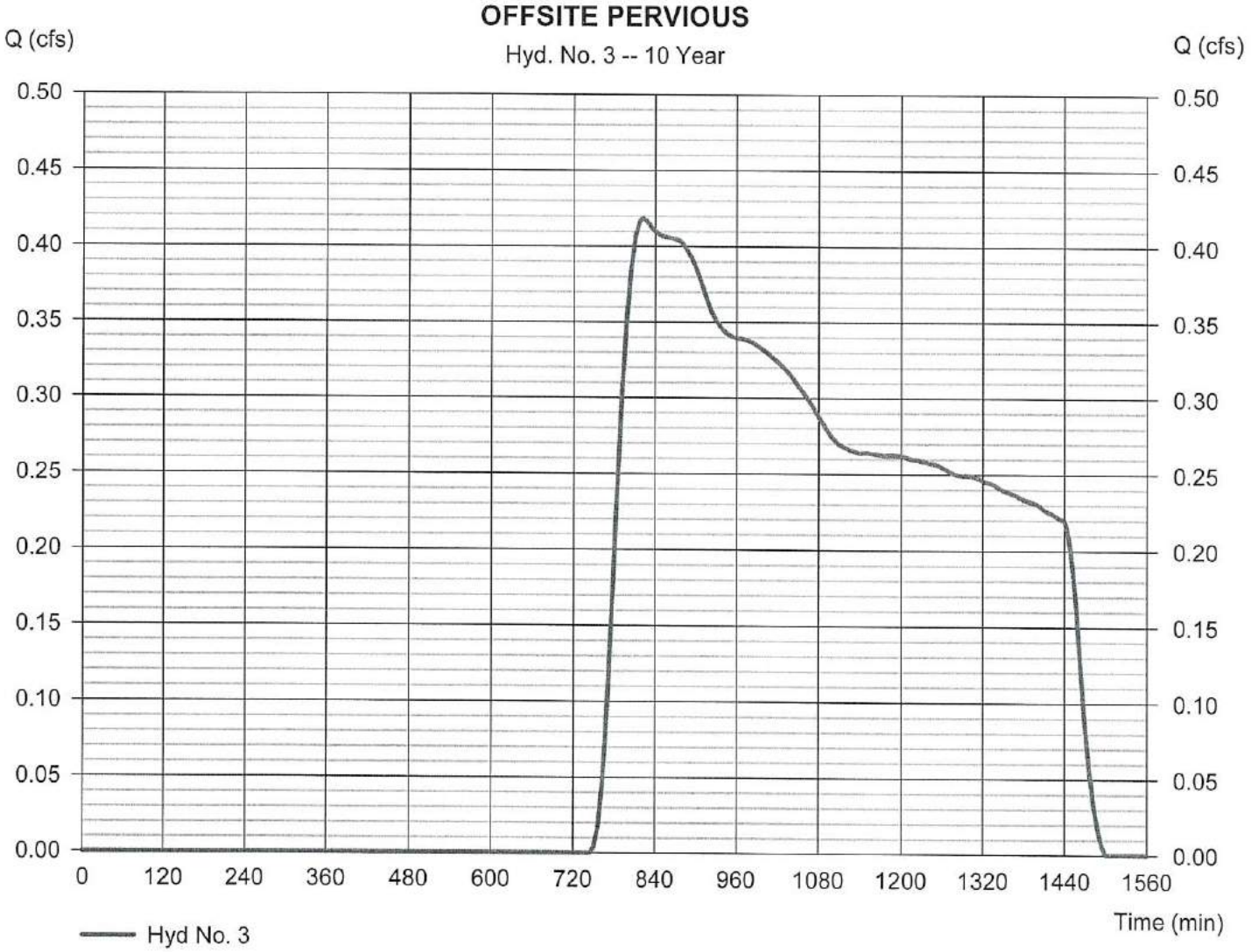
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 3

OFFSITE PERVIOUS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.419 cfs
Storm frequency	= 10 yrs	Time to peak	= 822 min
Time interval	= 6 min	Hyd. volume	= 12,297 cuft
Drainage area	= 20.400 ac	Curve number	= 36*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 36.40 min
Total precip.	= 5.33 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 484

* Composite (Area/CN) = [(6.360 x 39) + (13.430 x 32) + (0.610 x 76)] / 20.400



Hydrograph Report

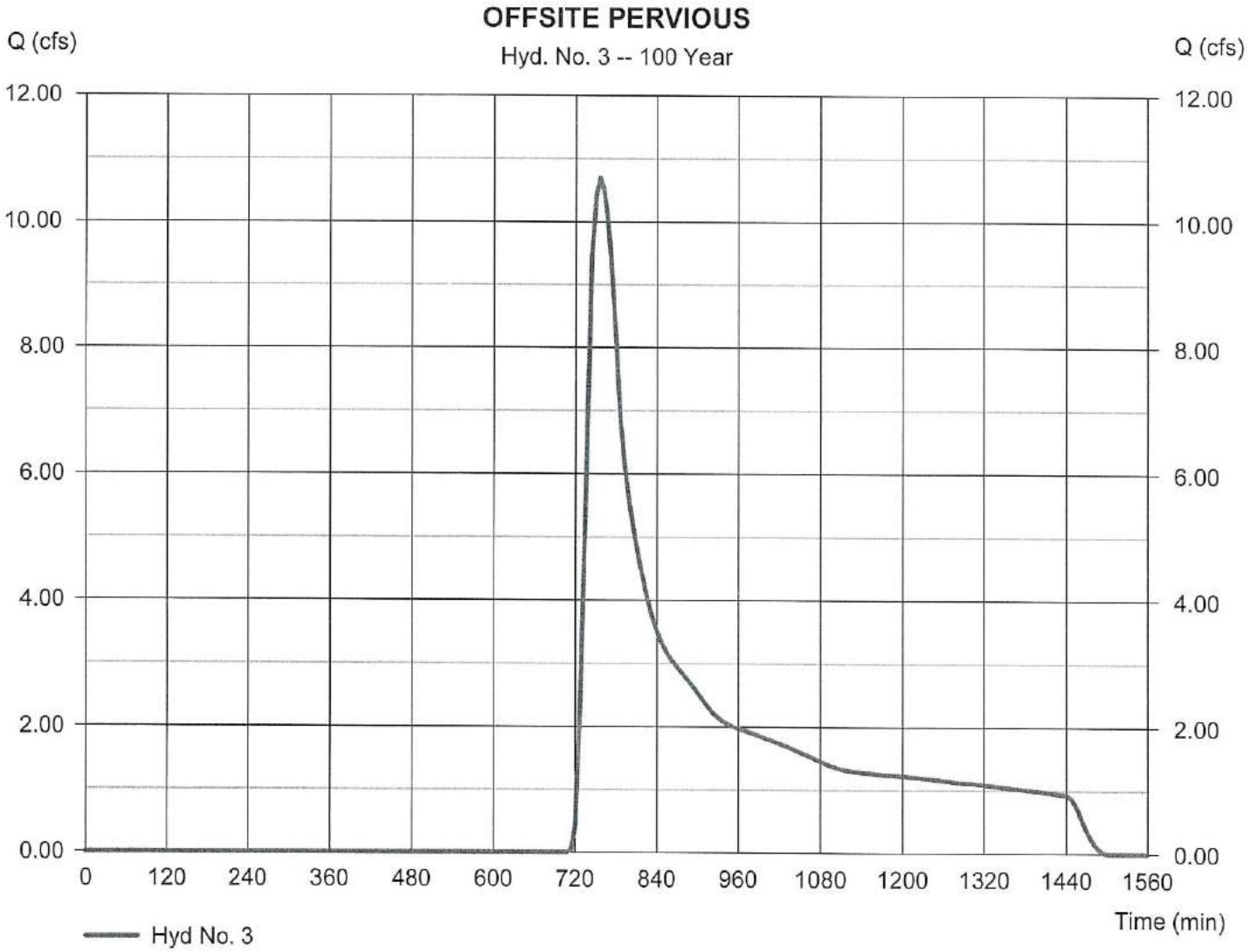
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 3

OFFSITE PERVIOUS

Hydrograph type	= SCS Runoff	Peak discharge	= 10.70 cfs
Storm frequency	= 100 yrs	Time to peak	= 756 min
Time interval	= 6 min	Hyd. volume	= 103,862 cuft
Drainage area	= 20.400 ac	Curve number	= 36*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 36.40 min
Total precip.	= 9.20 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 484

* Composite (Area/CN) = [(6.360 x 39) + (13.430 x 32) + (0.610 x 76)] / 20.400



Hydrograph Report

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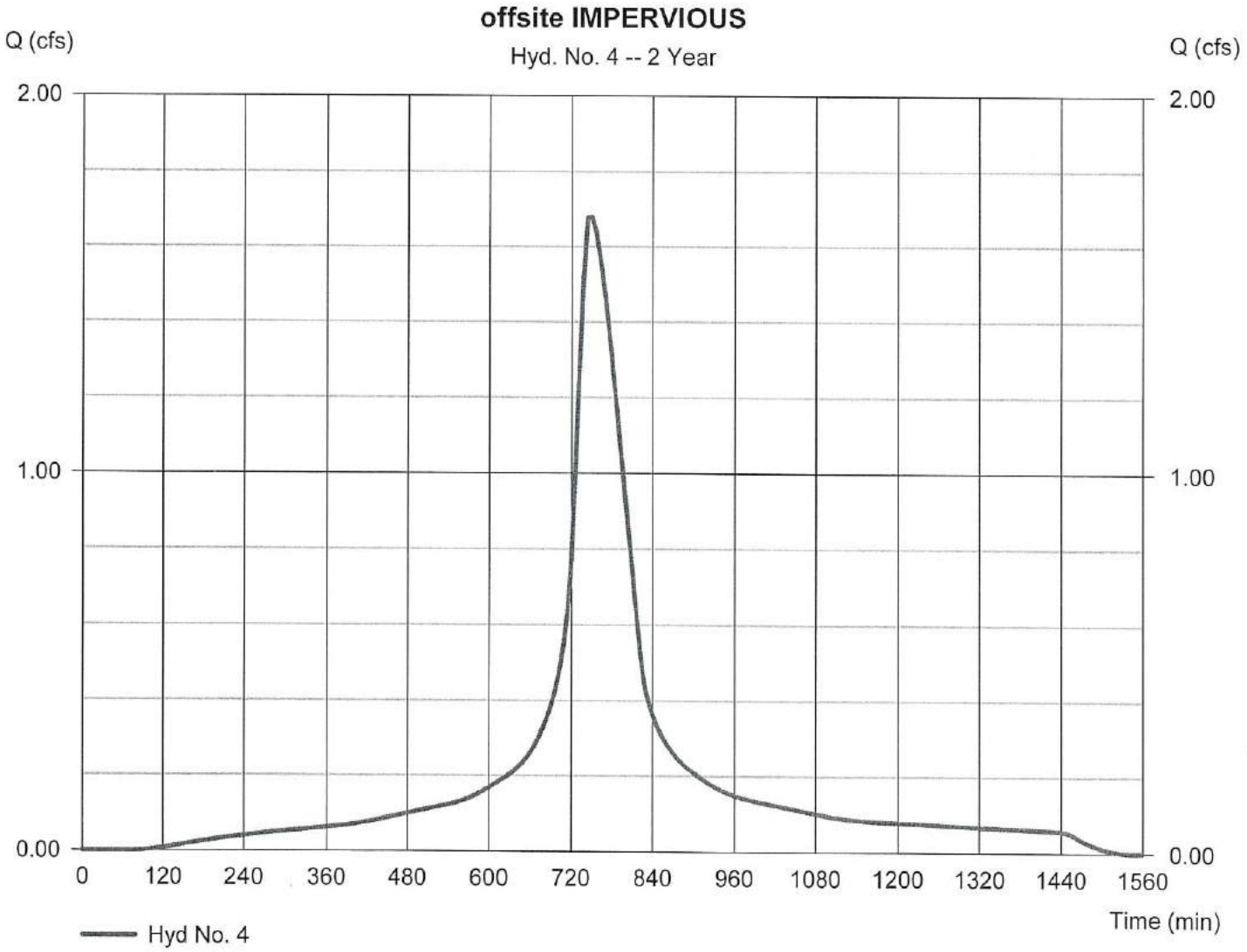
Hyd. No. 4

offsite IMPERVIOUS

Hydrograph type	= SCS Runoff	Peak discharge	= 1.680 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 6 min	Hyd. volume	= 16,437 cuft
Drainage area	= 1.430 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 36.40 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285

* Composite (Area/CN) = [(8.400 x 39) + (13.600 x 32)] / 1.430



Hydrograph Report

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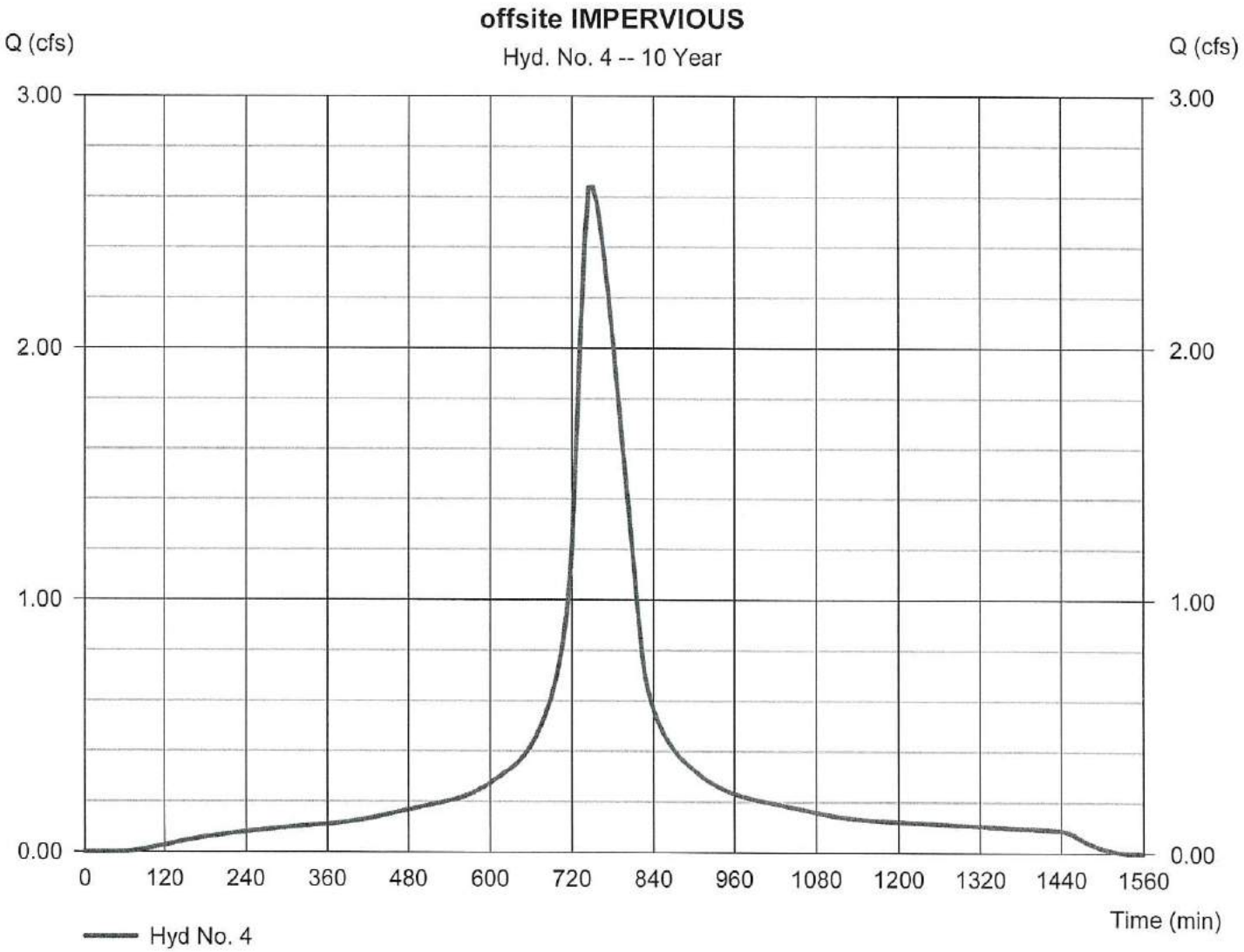
Hyd. No. 4

offsite IMPERVIOUS

Hydrograph type	= SCS Runoff	Peak discharge	= 2.639 cfs
Storm frequency	= 10 yrs	Time to peak	= 750 min
Time interval	= 6 min	Hyd. volume	= 26,268 cuft
Drainage area	= 1.430 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 36.40 min
Total precip.	= 5.33 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285

* Composite (Area/CN) = [(8.400 x 39) + (13.600 x 32)] / 1.430



Hydrograph Report

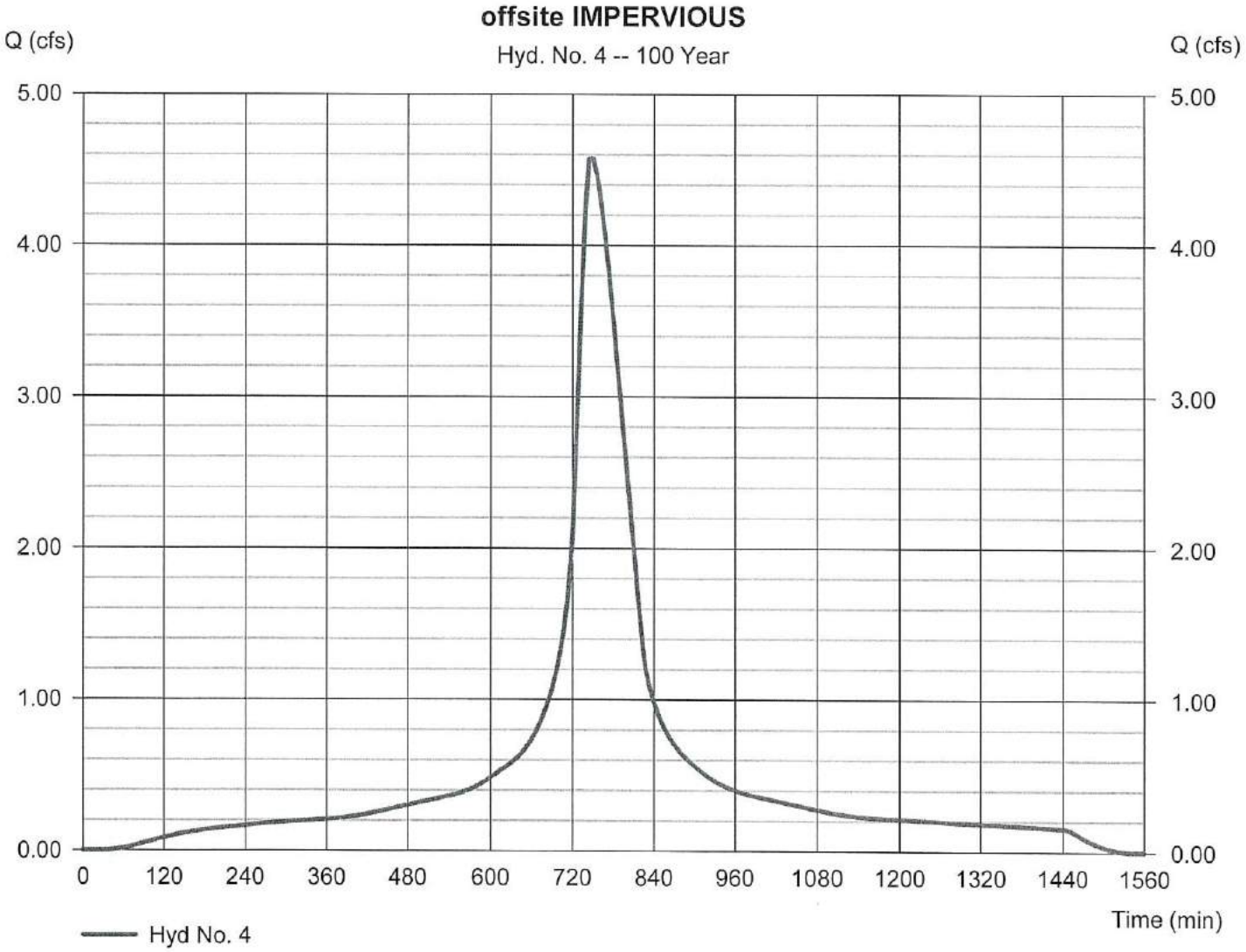
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 4

offsite IMPERVIOUS

Hydrograph type	= SCS Runoff	Peak discharge	= 4.574 cfs
Storm frequency	= 100 yrs	Time to peak	= 750 min
Time interval	= 6 min	Hyd. volume	= 46,214 cuft
Drainage area	= 1.430 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 36.40 min
Total precip.	= 9.20 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285

* Composite (Area/CN) = [(8.400 x 39) + (13.600 x 32)] / 1.430



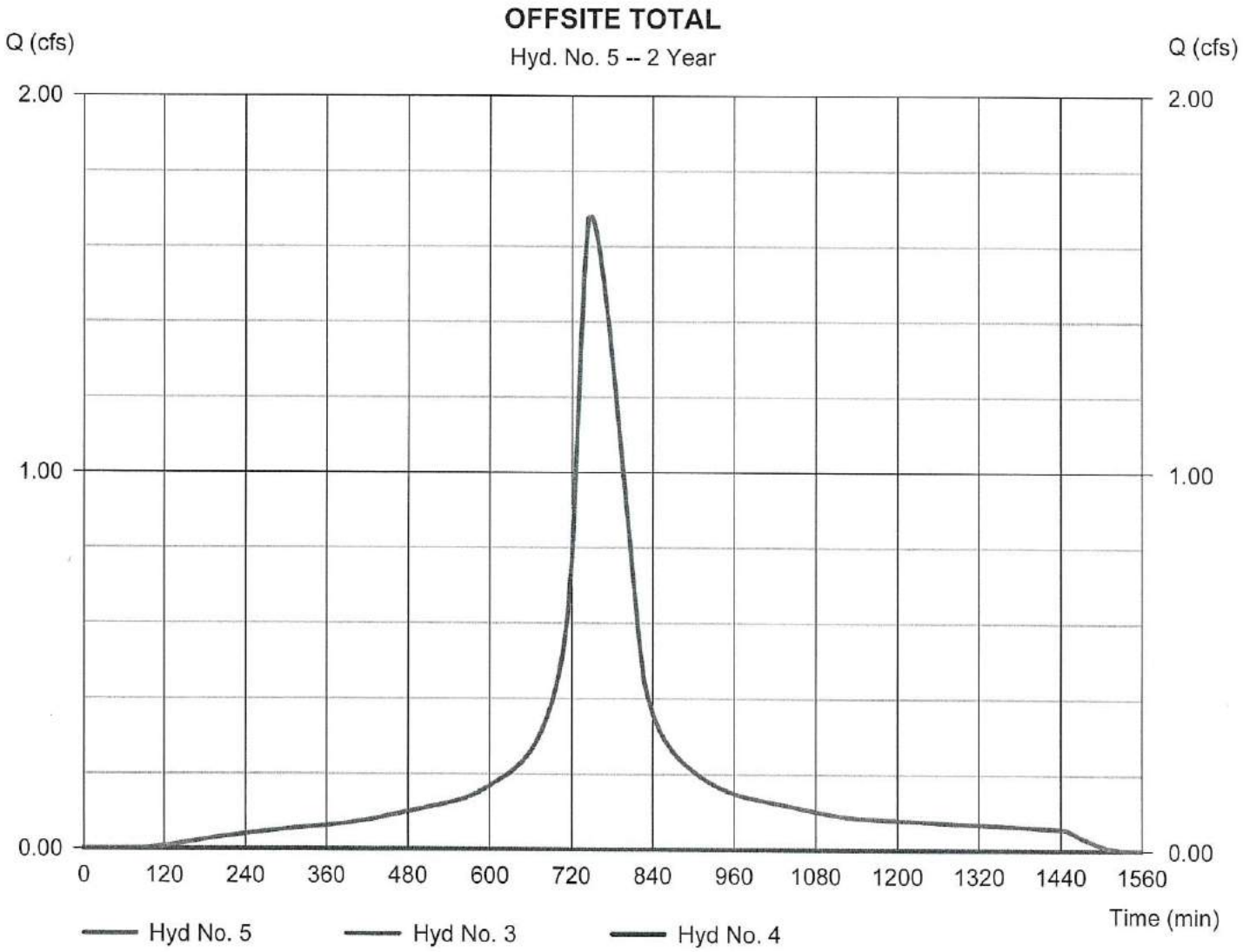
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 5

OFFSITE TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.680 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 6 min	Hyd. volume	= 16,437 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 21.830 ac



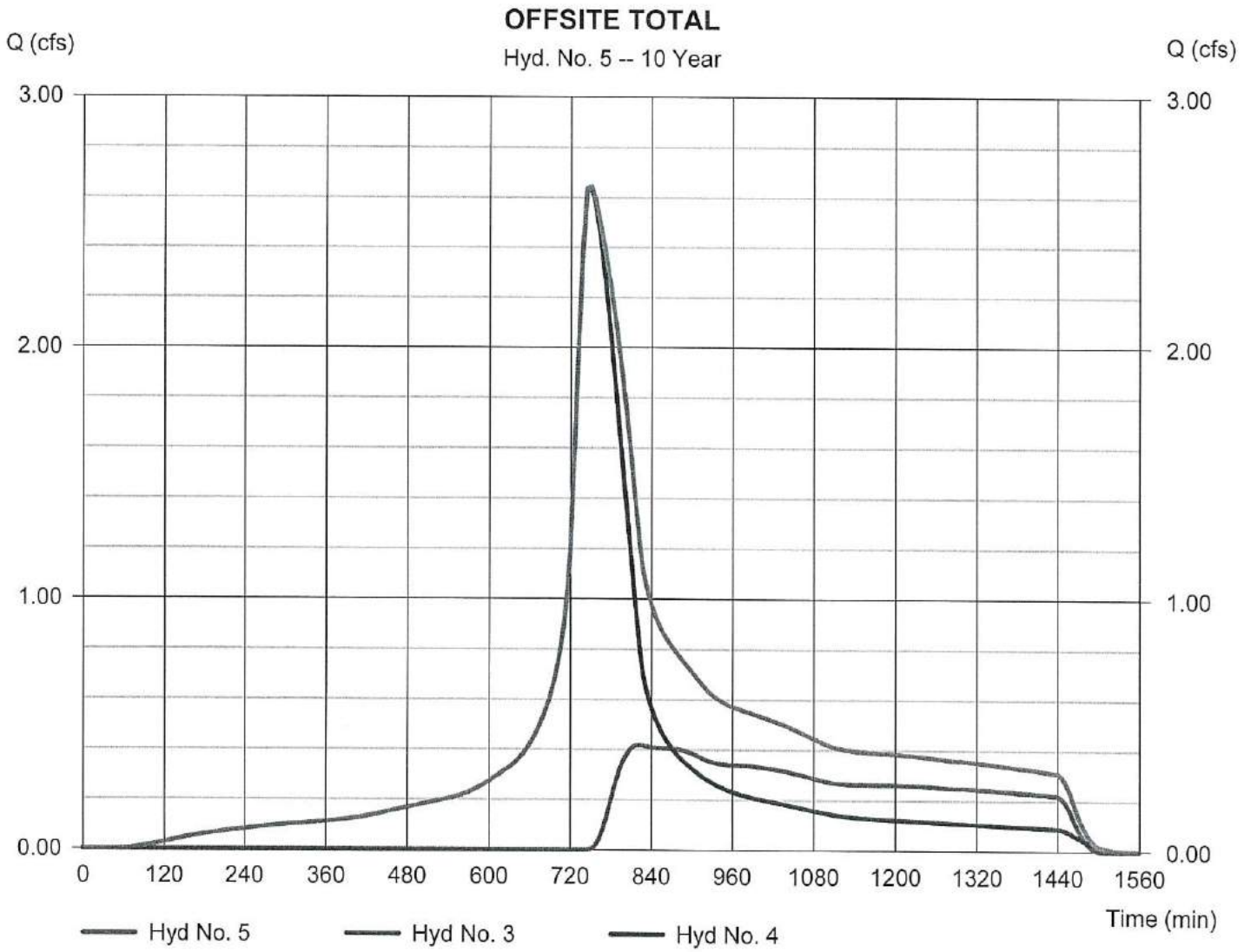
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 5

OFFSITE TOTAL

Hydrograph type	= Combine	Peak discharge	= 2.643 cfs
Storm frequency	= 10 yrs	Time to peak	= 750 min
Time interval	= 6 min	Hyd. volume	= 38,566 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 21.830 ac



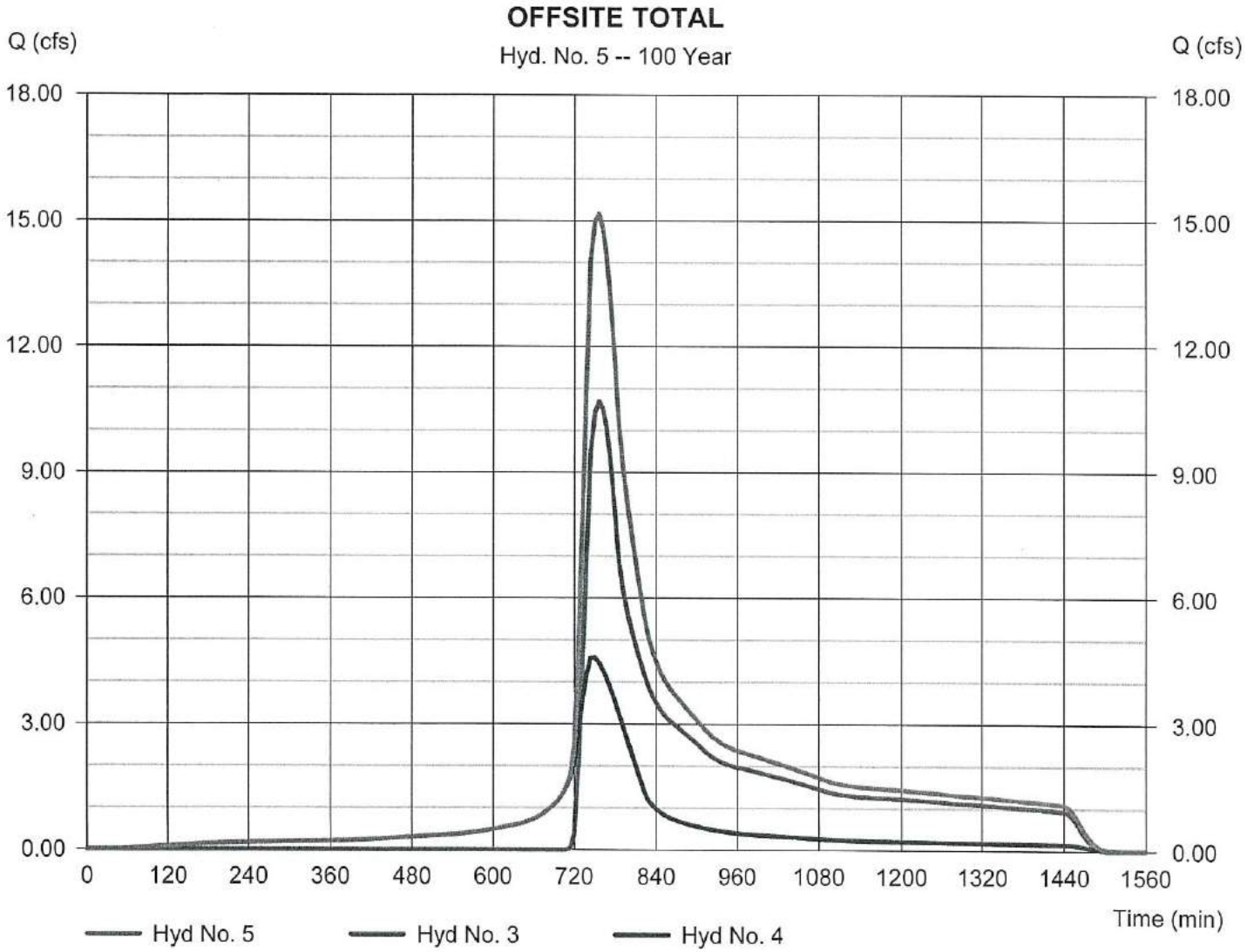
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 5

OFFSITE TOTAL

Hydrograph type	= Combine	Peak discharge	= 15.16 cfs
Storm frequency	= 100 yrs	Time to peak	= 756 min
Time interval	= 6 min	Hyd. volume	= 150,076 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 21.830 ac



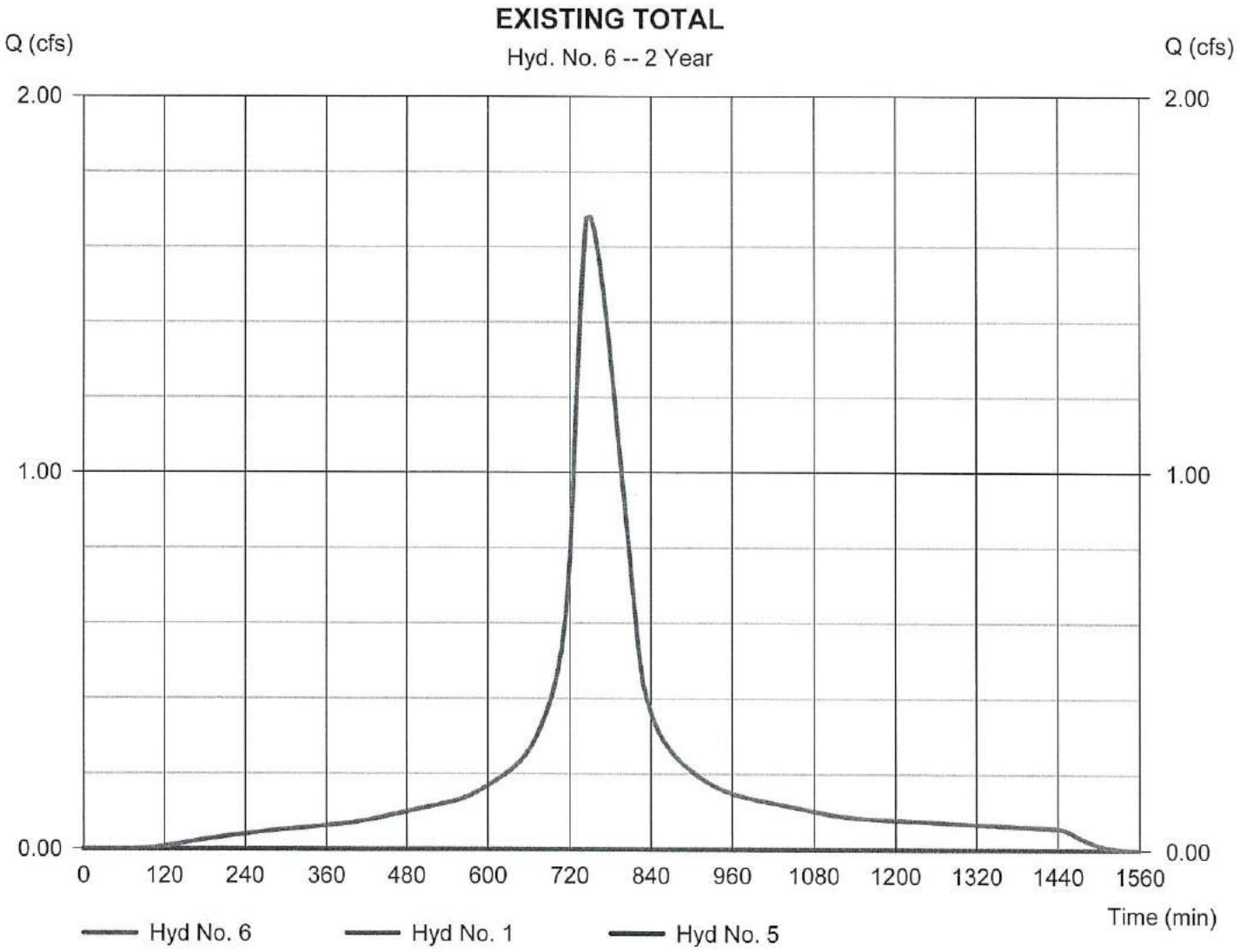
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 6

EXISTING TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.680 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 6 min	Hyd. volume	= 16,437 cuft
Inflow hyds.	= 1, 5	Contrib. drain. area	= 7.590 ac



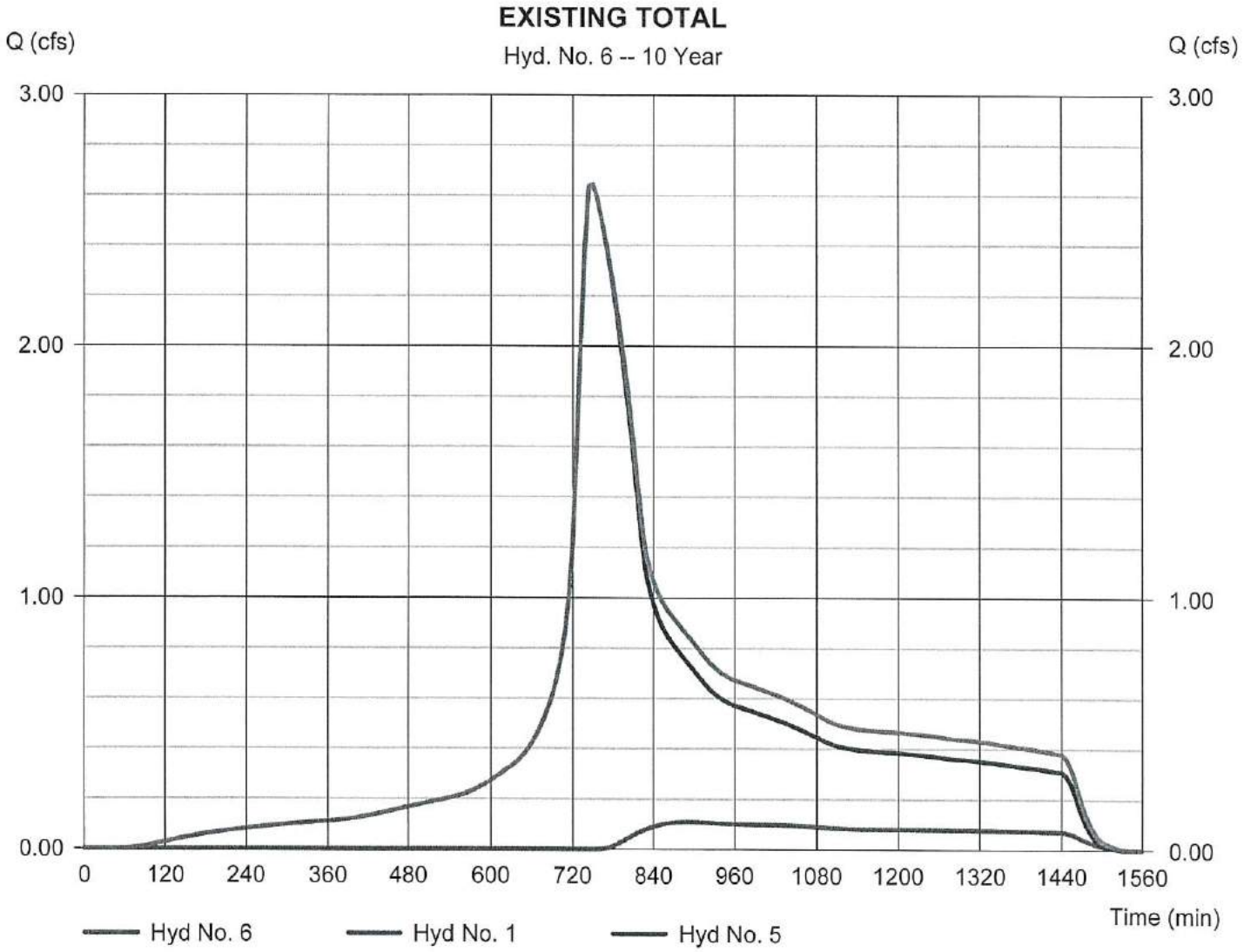
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 6

EXISTING TOTAL

Hydrograph type	= Combine	Peak discharge	= 2.643 cfs
Storm frequency	= 10 yrs	Time to peak	= 750 min
Time interval	= 6 min	Hyd. volume	= 42,106 cuft
Inflow hyds.	= 1, 5	Contrib. drain. area	= 7.590 ac



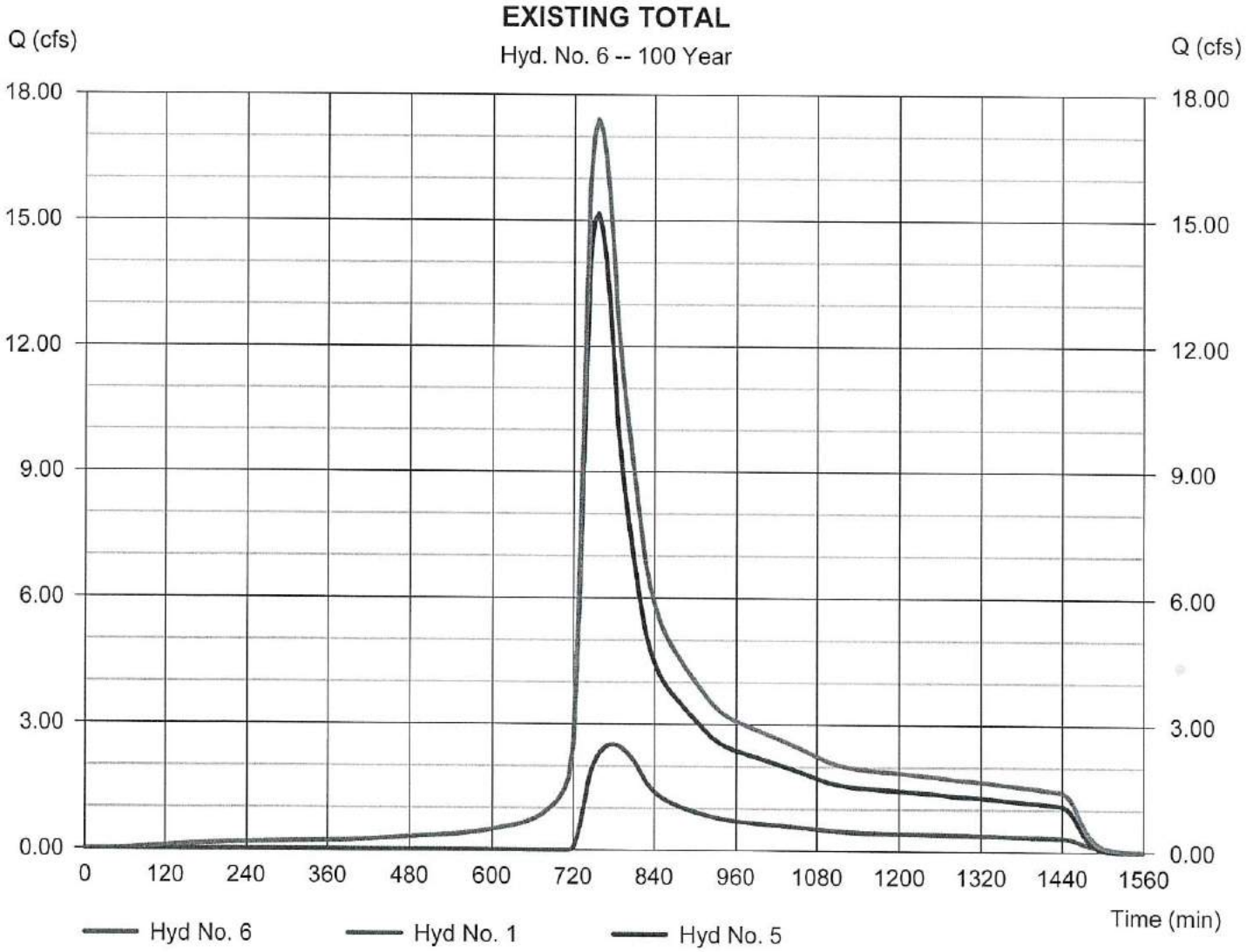
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 6

EXISTING TOTAL

Hydrograph type	= Combine	Peak discharge	= 17.41 cfs
Storm frequency	= 100 yrs	Time to peak	= 756 min
Time interval	= 6 min	Hyd. volume	= 184,302 cuft
Inflow hyds.	= 1, 5	Contrib. drain. area	= 7.590 ac



SECTION 2-II
DEVELOPED CONDITION HYDROGRAPHS

BASIN #1 CALCULATIONS

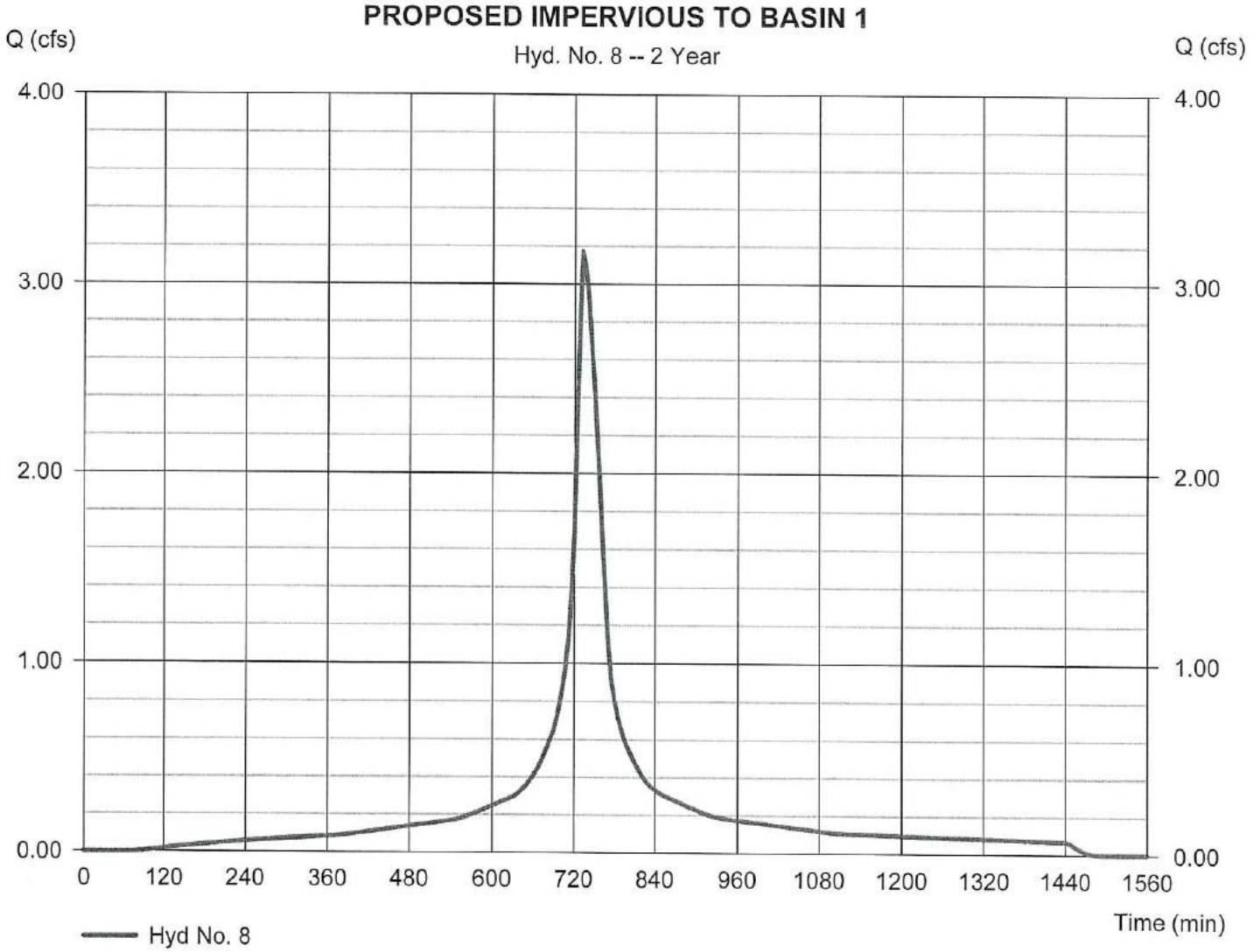
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 8

PROPOSED IMPERVIOUS TO BASIN 1

Hydrograph type	= SCS Runoff	Peak discharge	= 3.174 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 20,920 cuft
Drainage area	= 1.820 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 11.60 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285



Hydrograph Report

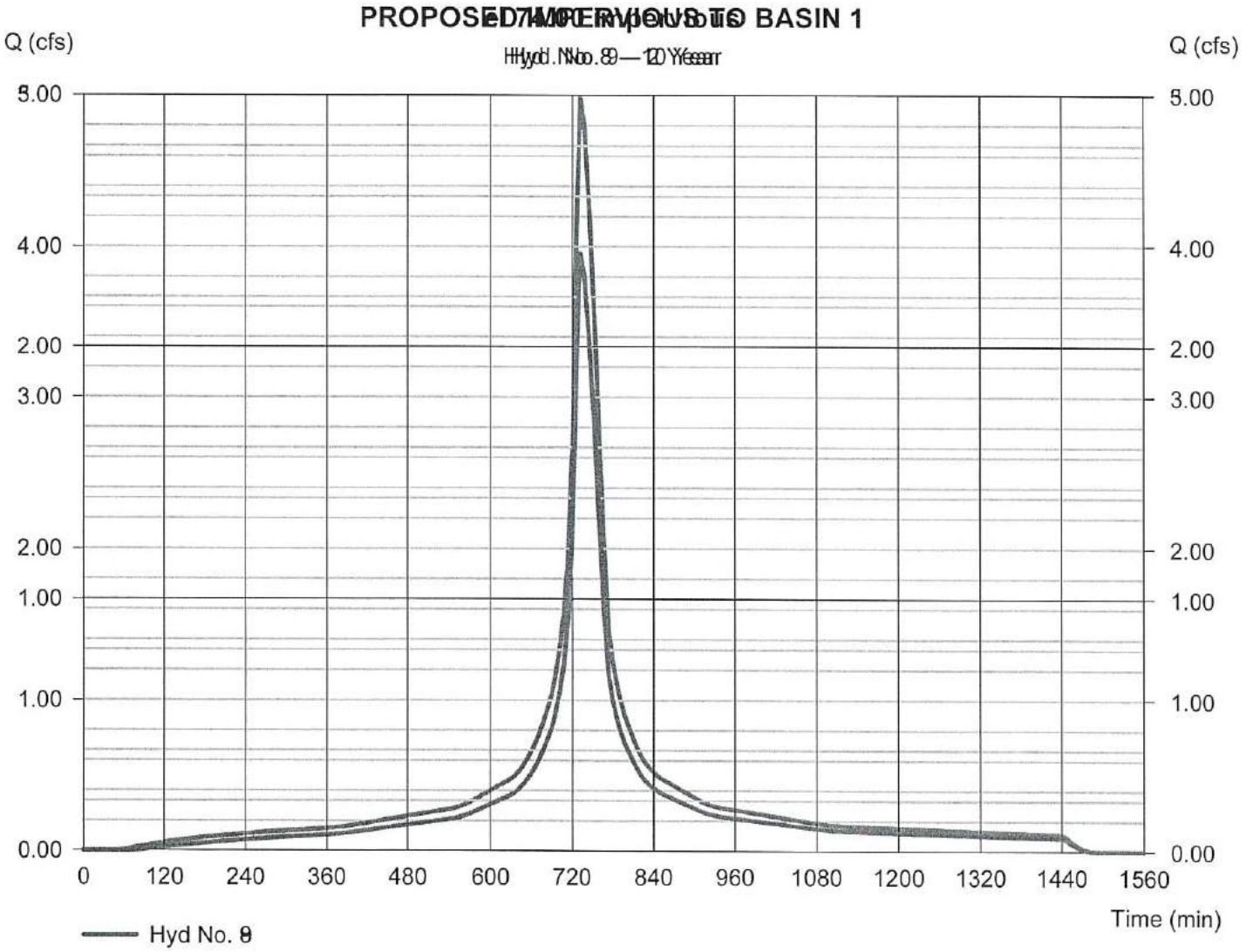
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 8

PROPOSED IMPERVIOUS TO BASIN 1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.982 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 35,632 cuft
Drainage area	= 1.820 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.60 min
Total precip.	= 5.32 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285

* Composite (Area/CN) = [(0.550 x 61) + (0.890 x 39)] / 1.360



Hydrograph Report

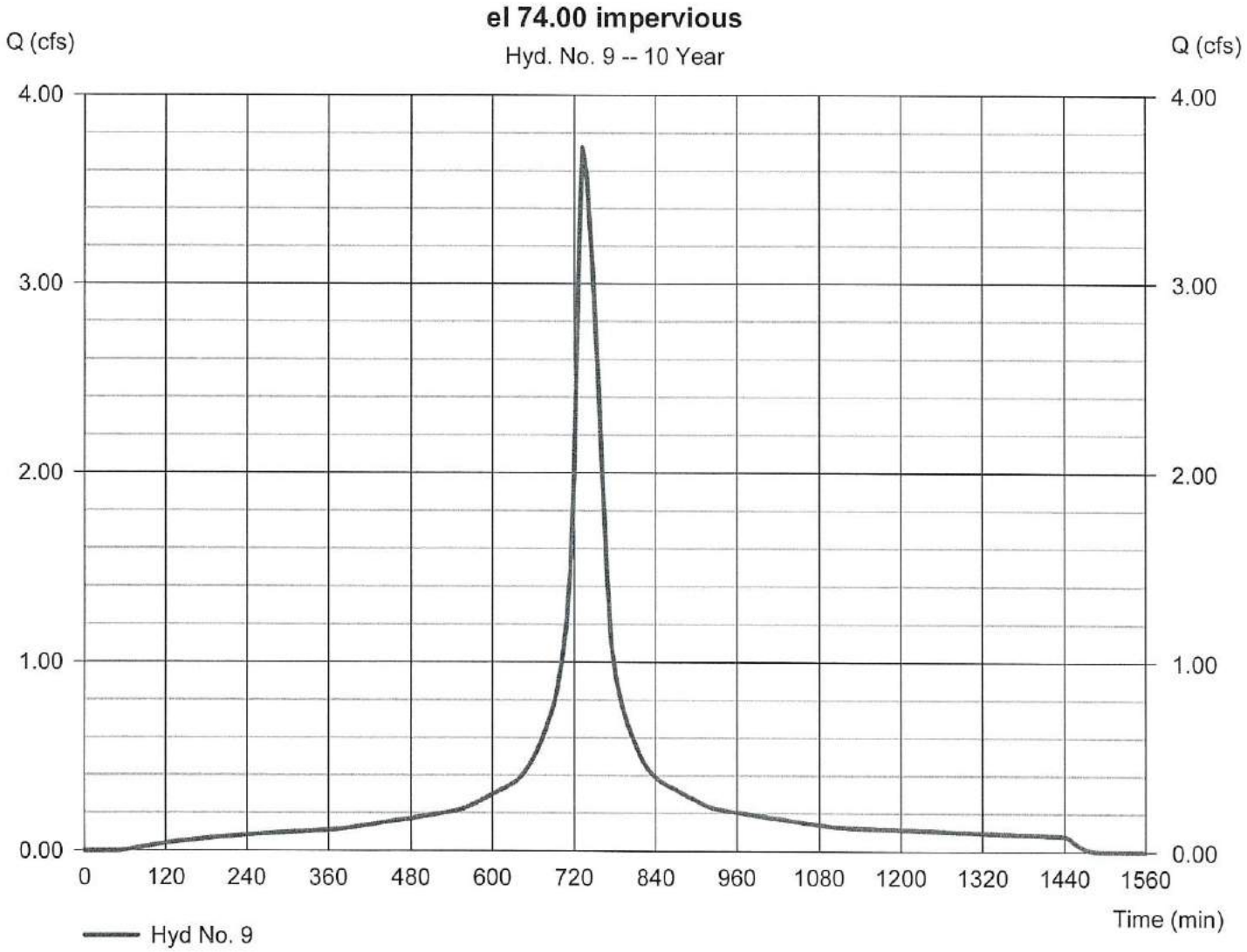
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 9

el 74.00 impervious

Hydrograph type	= SCS Runoff	Peak discharge	= 3.725 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 24,982 cuft
Drainage area	= 1.360 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.33 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285

* Composite (Area/CN) = [(0.550 x 61) + (0.890 x 39)] / 1.360



Hydrograph Report

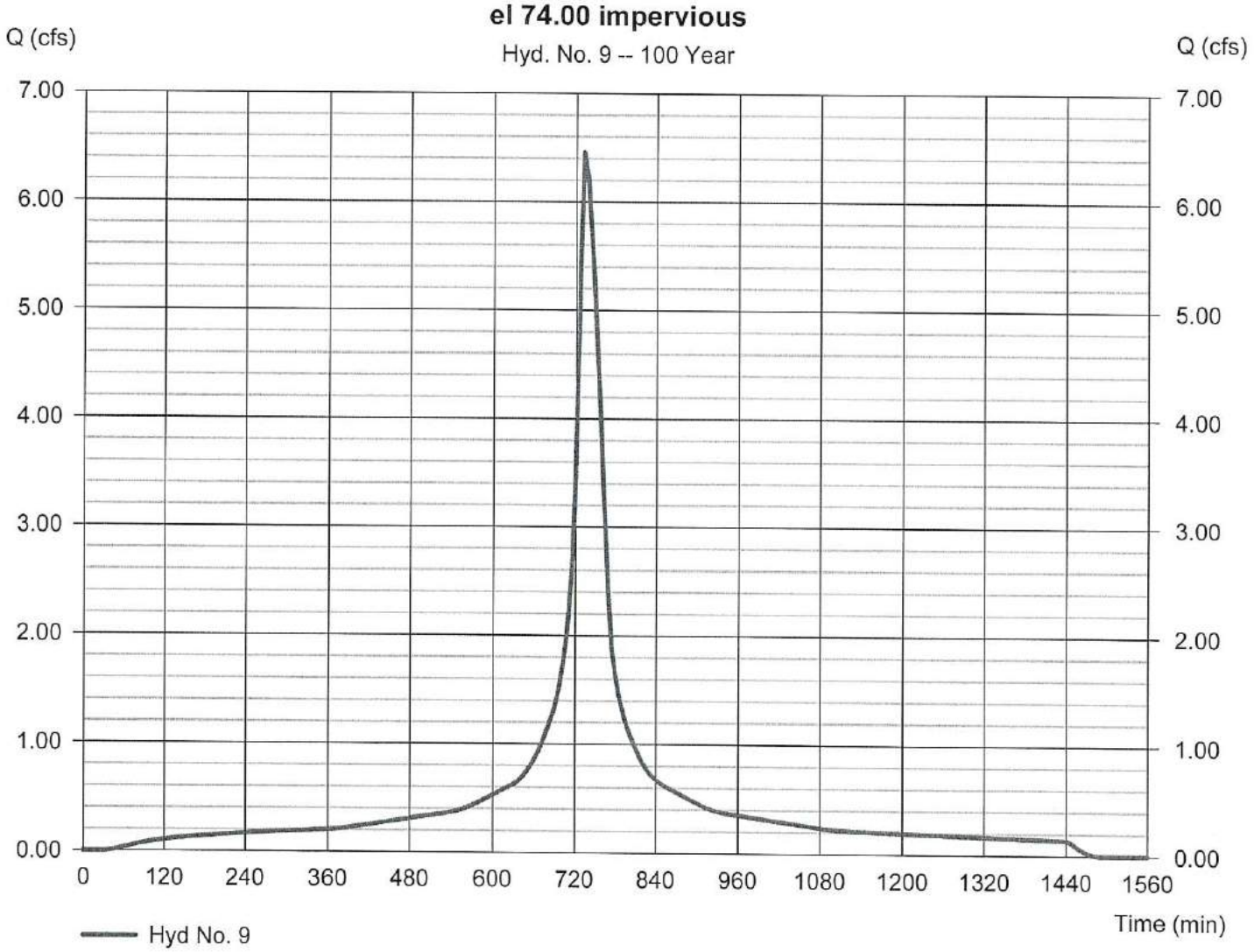
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 9

el 74.00 impervious

Hydrograph type	= SCS Runoff	Peak discharge	= 6.455 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 43,952 cuft
Drainage area	= 1.360 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 9.20 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285

* Composite (Area/CN) = [(0.550 x 61) + (0.890 x 39)] / 1.360



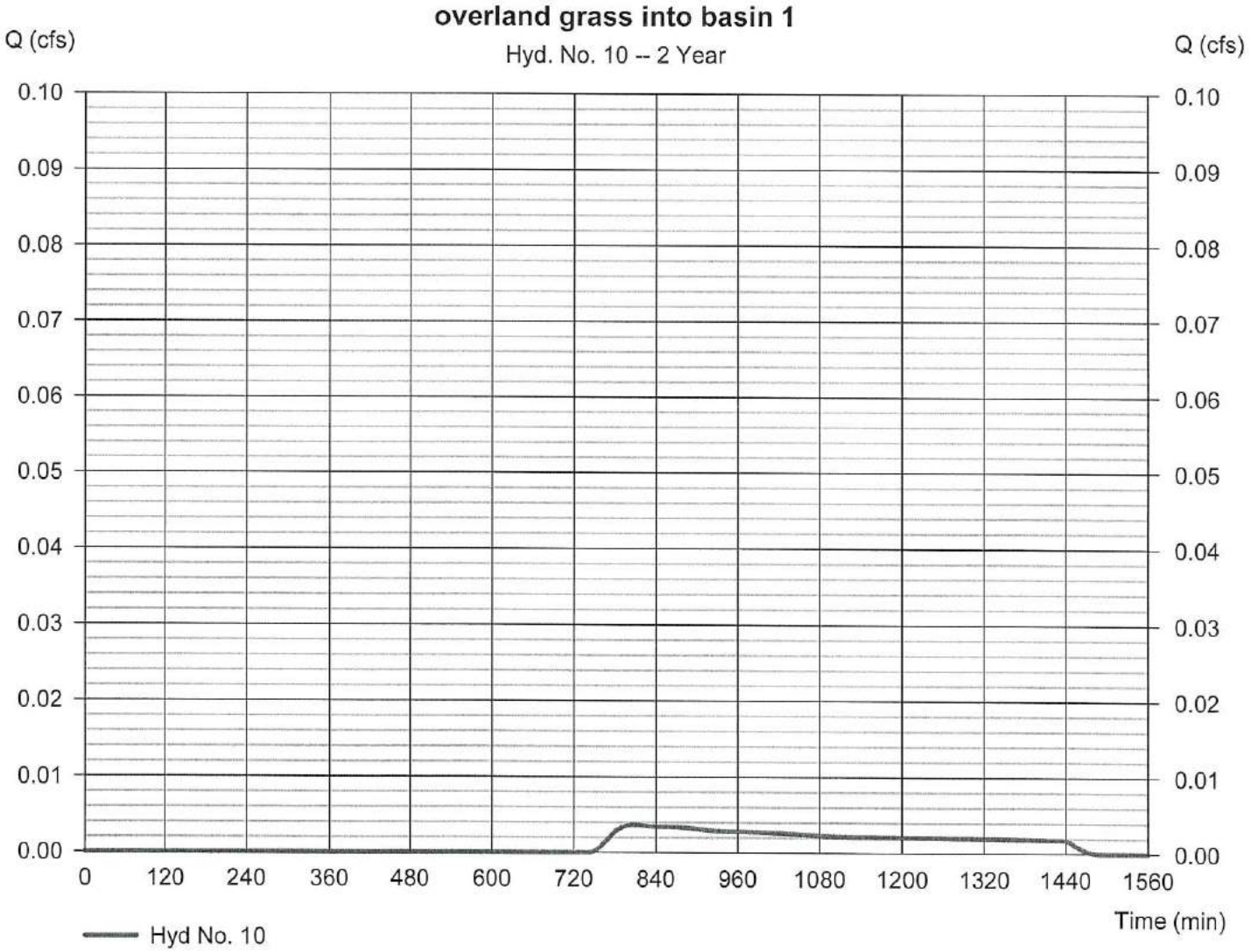
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 10

overland grass into basin 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.004 cfs
Storm frequency	= 2 yrs	Time to peak	= 810 min
Time interval	= 6 min	Hyd. volume	= 102 cuft
Drainage area	= 0.260 ac	Curve number	= 47
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285



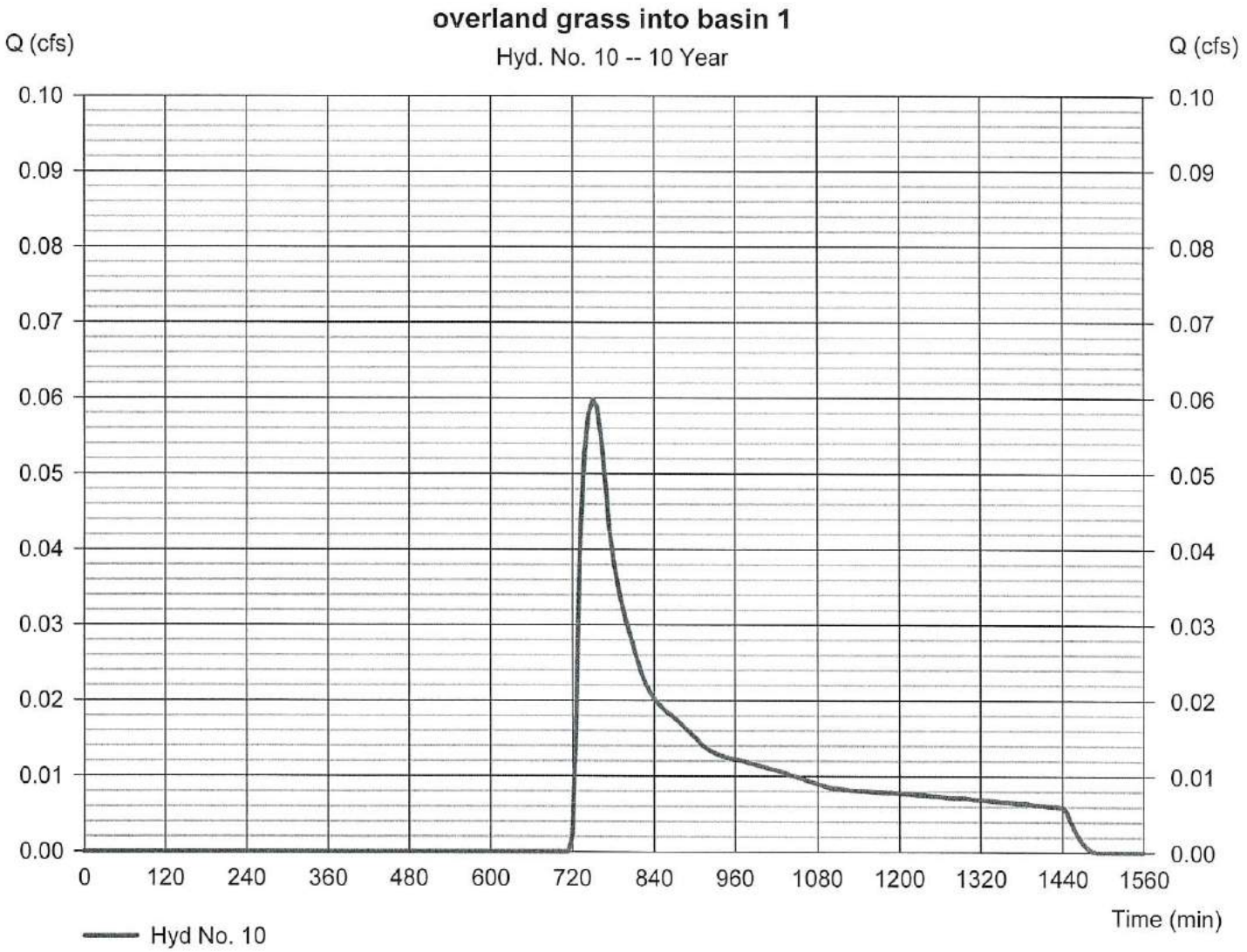
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 10

overland grass into basin 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.060 cfs
Storm frequency	= 10 yrs	Time to peak	= 750 min
Time interval	= 6 min	Hyd. volume	= 618 cuft
Drainage area	= 0.260 ac	Curve number	= 47
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.33 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285



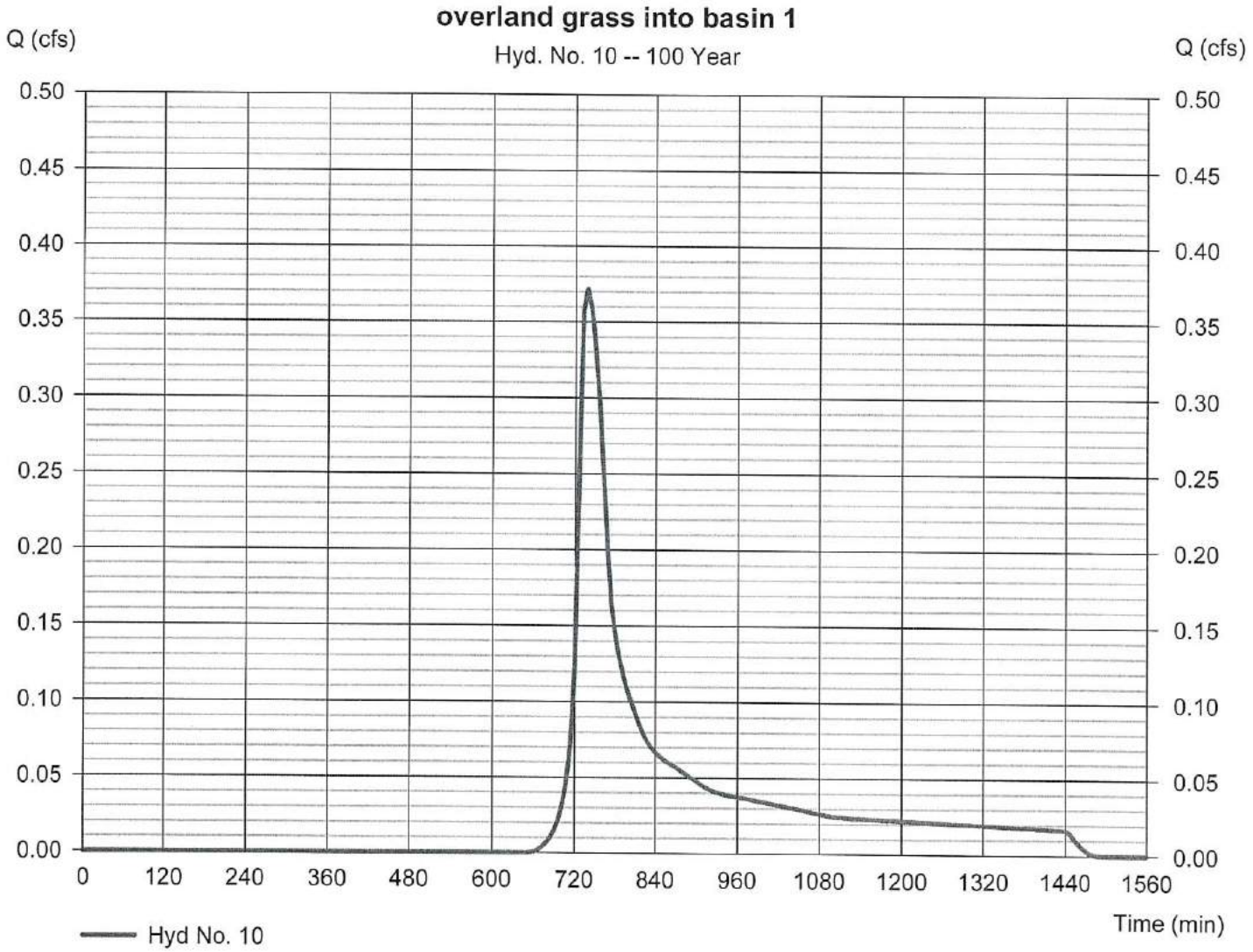
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 10

overland grass into basin 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.372 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 2,482 cuft
Drainage area	= 0.260 ac	Curve number	= 47
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 9.20 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285



Hydrograph Report

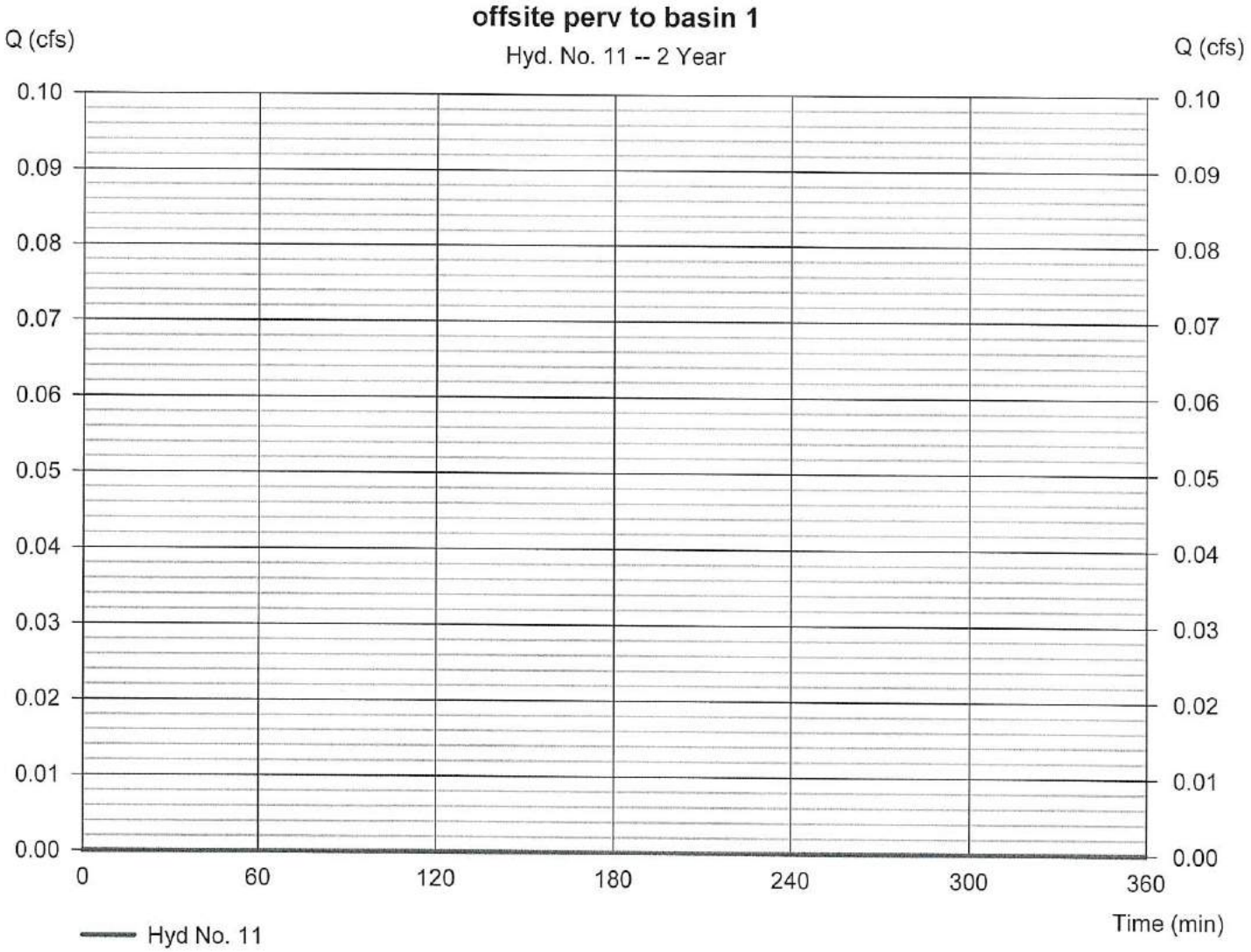
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 11

offsite perv to basin 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 6 min	Hyd. volume	= 0 cuft
Drainage area	= 16.560 ac	Curve number	= 36*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 36.40 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 484

* Composite (Area/CN) = [(6.360 x 39) + (13.430 x 32) + (0.610 x 76)] / 16.560



TR55 Tc Worksheet

Hyd. No. 11

offsite perv to basin 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.40		0.00		0.00		
Land slope (%)	= 1.18		0.00		0.00		
Travel Time (min)	**= 25.73**	**+**	**0.00**	**+**	**0.00**	**=**	**25.73**
Shallow Concentrated Flow							
Flow length (ft)	= 1230.00		0.00		0.00		
Watercourse slope (%)	= 1.41		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.92		0.00		0.00		
Travel Time (min)	**= 10.70**	**+**	**0.00**	**+**	**0.00**	**=**	**10.70**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 36.40 min

Hydrograph Report

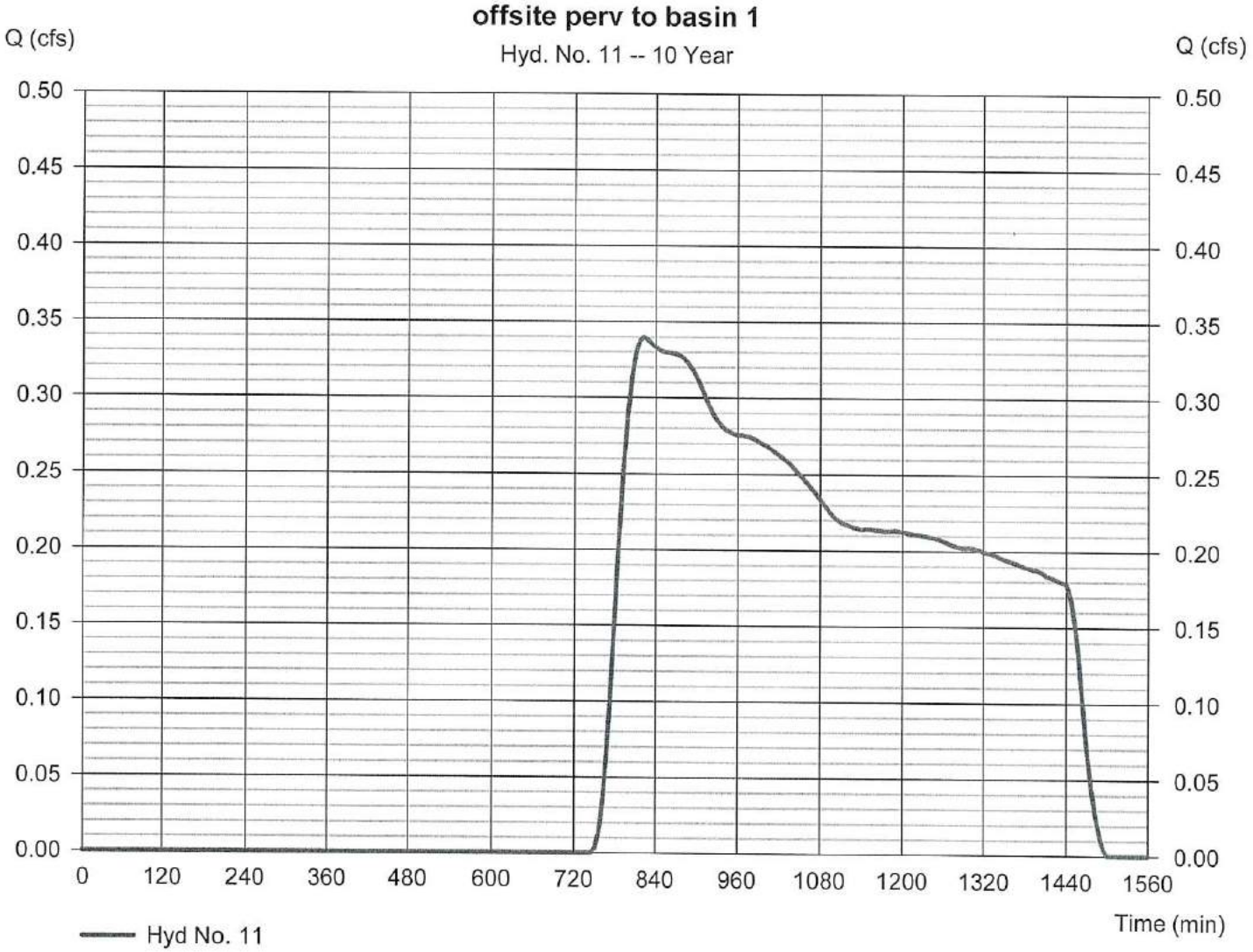
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 11

offsite perv to basin 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.340 cfs
Storm frequency	= 10 yrs	Time to peak	= 822 min
Time interval	= 6 min	Hyd. volume	= 9,982 cuft
Drainage area	= 16.560 ac	Curve number	= 36*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 36.40 min
Total precip.	= 5.33 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 484

* Composite (Area/CN) = [(6.360 x 39) + (13.430 x 32) + (0.610 x 76)] / 16.560



Hydrograph Report

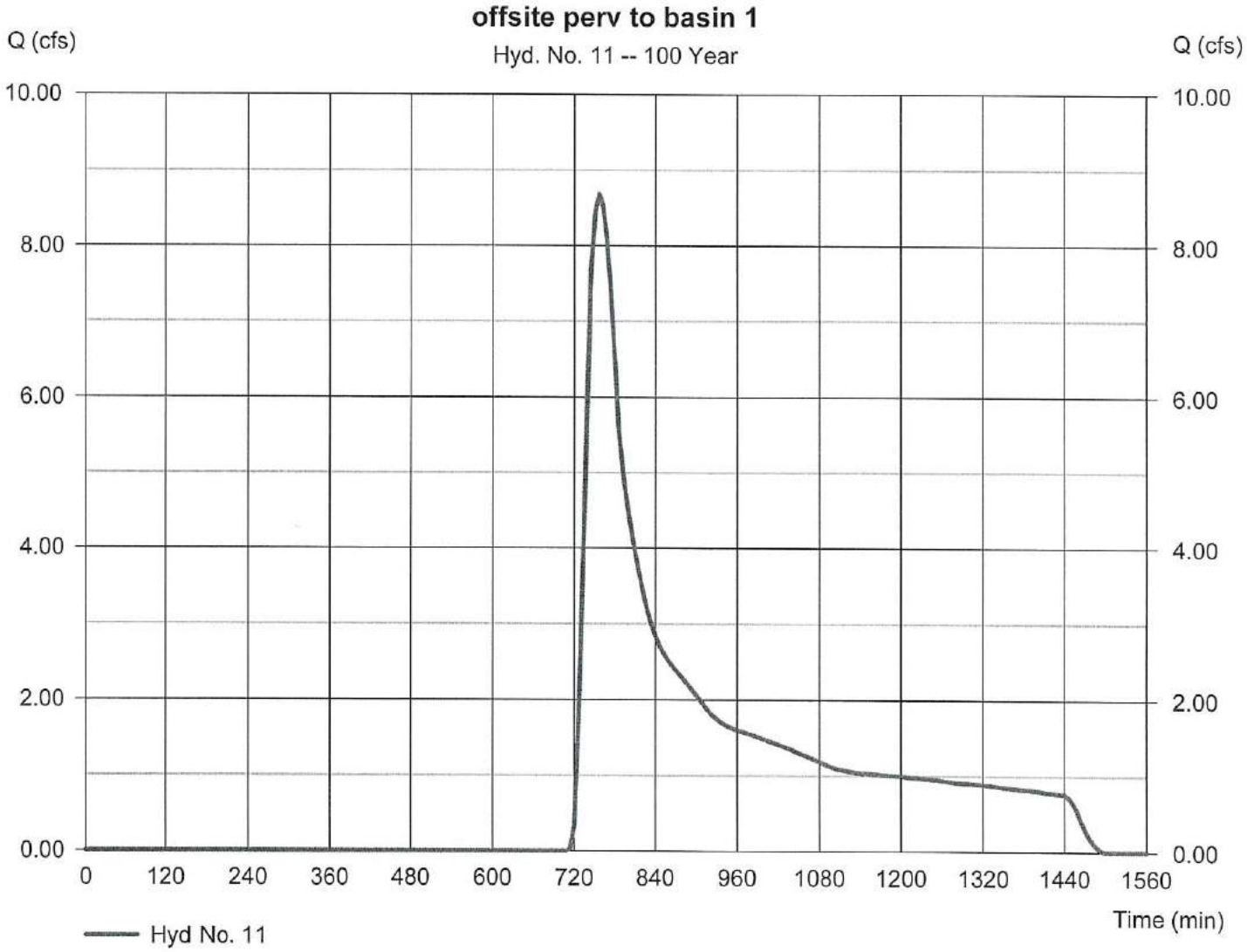
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 11

offsite perv to basin 1

Hydrograph type	= SCS Runoff	Peak discharge	= 8.682 cfs
Storm frequency	= 100 yrs	Time to peak	= 756 min
Time interval	= 6 min	Hyd. volume	= 84,312 cuft
Drainage area	= 16.560 ac	Curve number	= 36*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 36.40 min
Total precip.	= 9.20 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 484

* Composite (Area/CN) = [(6.360 x 39) + (13.430 x 32) + (0.610 x 76)] / 16.560



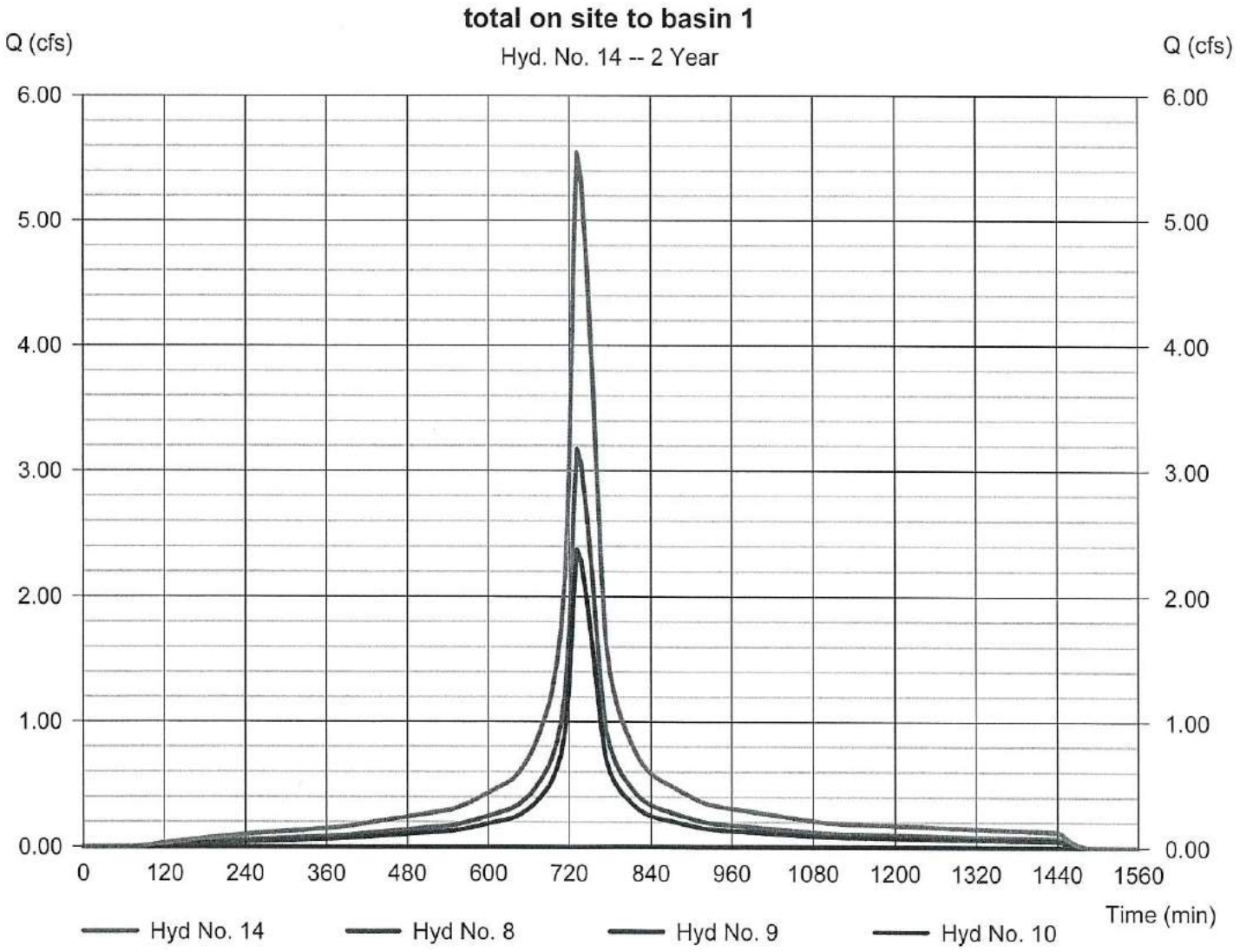
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 14

total on site to basin 1

Hydrograph type	= Combine	Peak discharge	= 5.546 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 36,655 cuft
Inflow hyds.	= 8, 9, 10	Contrib. drain. area	= 3.440 ac



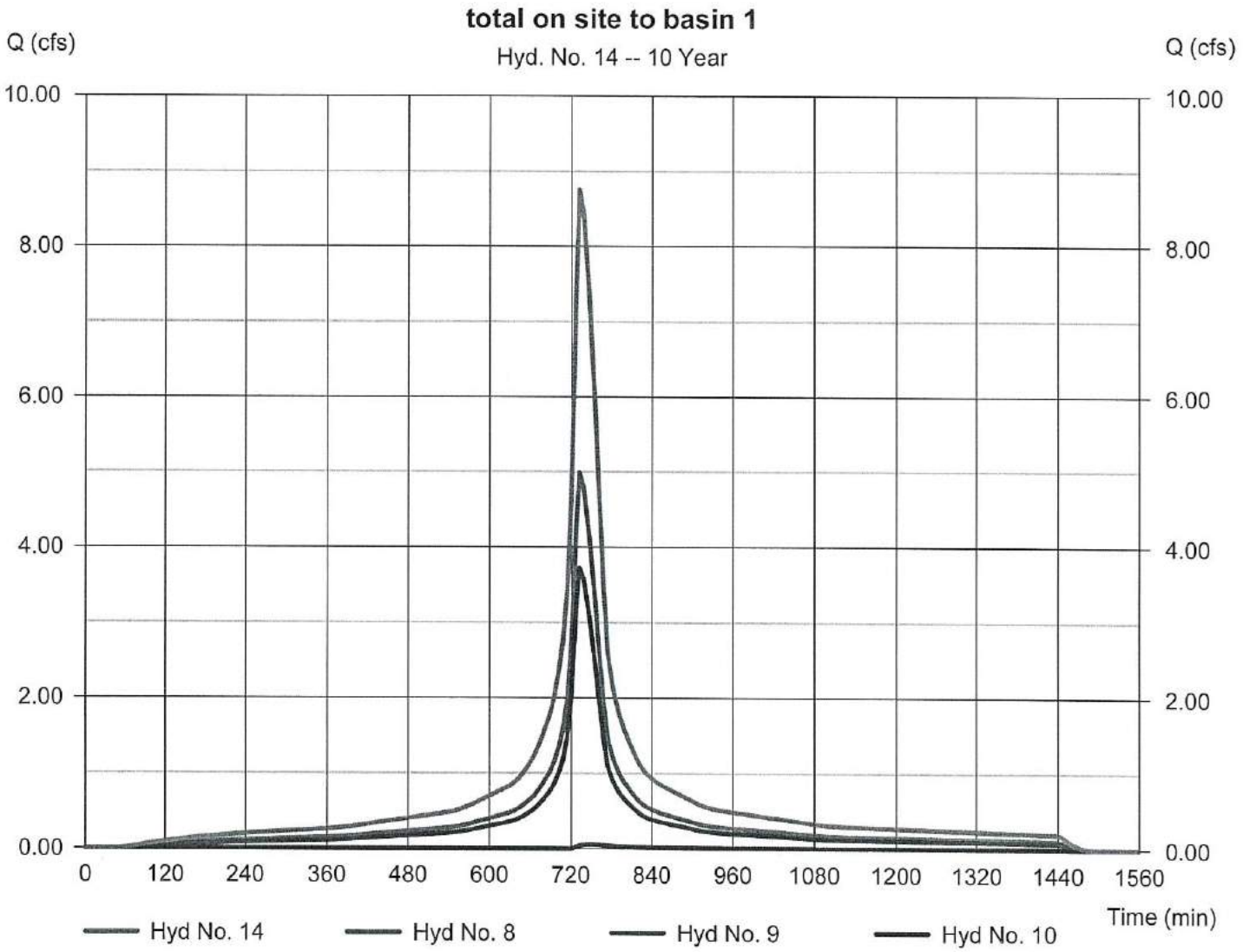
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 14

total on site to basin 1

Hydrograph type	= Combine	Peak discharge	= 8.753 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 59,033 cuft
Inflow hyds.	= 8, 9, 10	Contrib. drain. area	= 3.440 ac



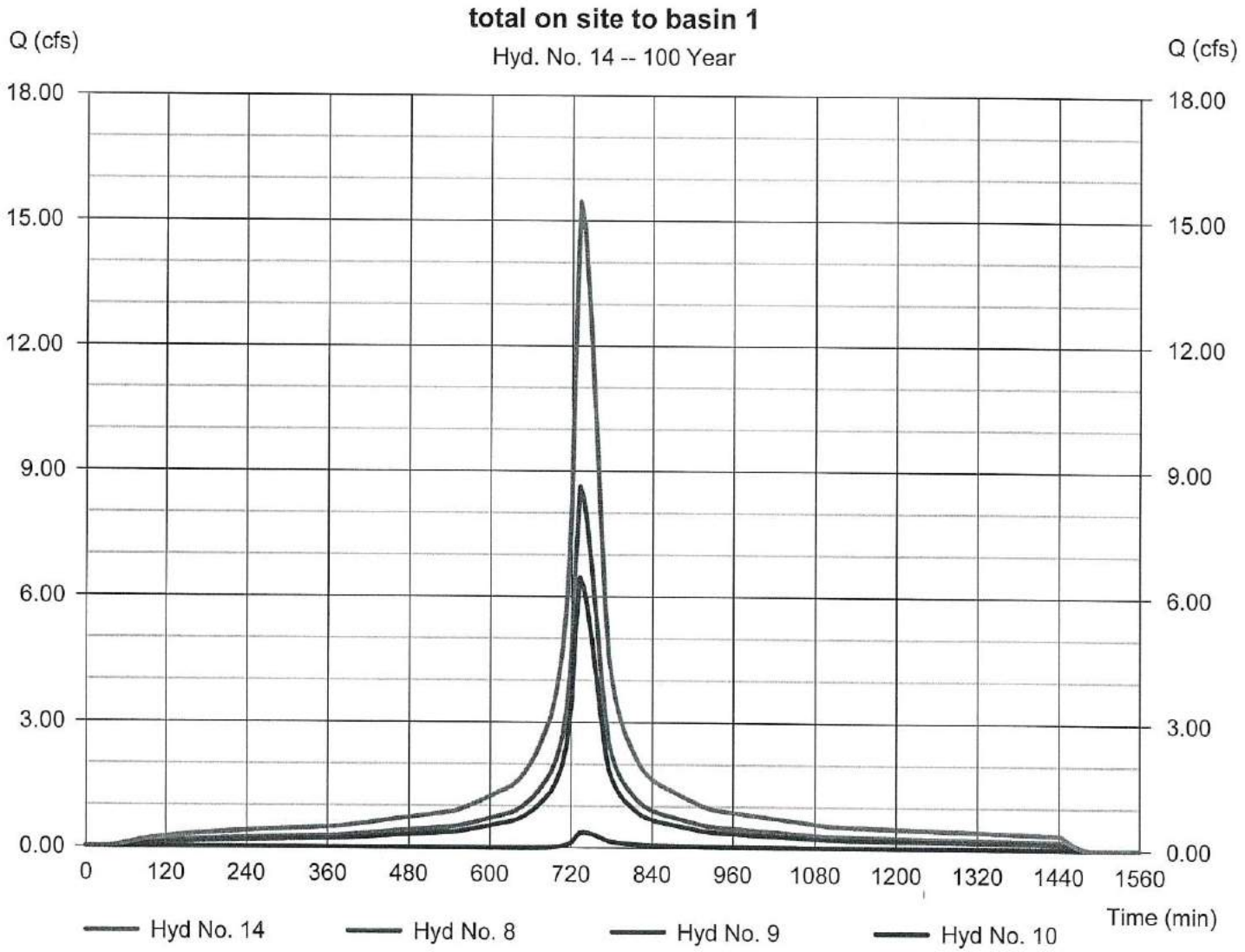
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 14

total on site to basin 1

Hydrograph type	= Combine	Peak discharge	= 15.45 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 105,252 cuft
Inflow hyds.	= 8, 9, 10	Contrib. drain. area	= 3.440 ac



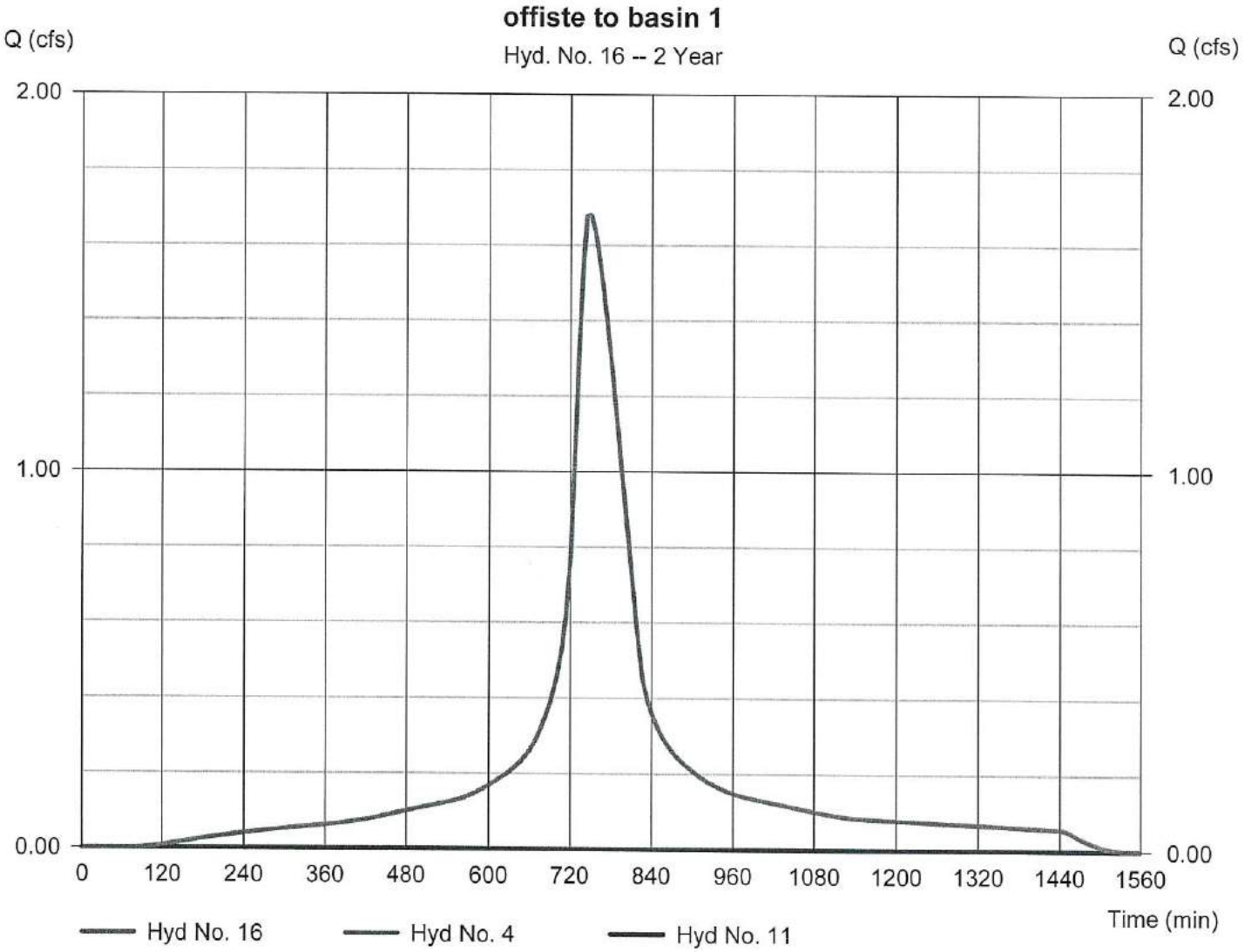
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 16

offiste to basin 1

Hydrograph type	= Combine	Peak discharge	= 1.680 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 6 min	Hyd. volume	= 16,437 cuft
Inflow hyds.	= 4, 11	Contrib. drain. area	= 17.990 ac



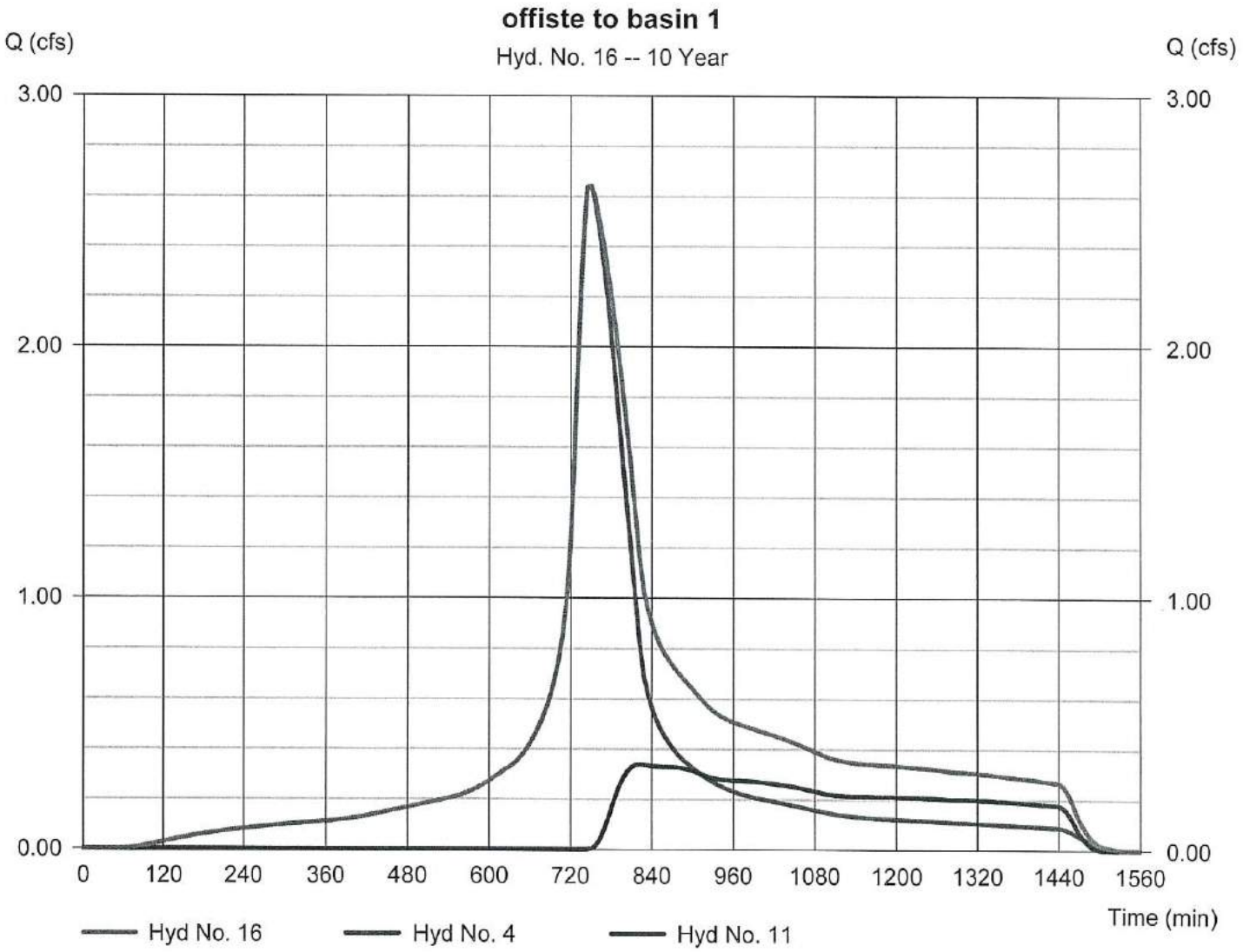
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 16

offiste to basin 1

Hydrograph type	= Combine	Peak discharge	= 2.642 cfs
Storm frequency	= 10 yrs	Time to peak	= 750 min
Time interval	= 6 min	Hyd. volume	= 36,251 cuft
Inflow hyds.	= 4, 11	Contrib. drain. area	= 17.990 ac



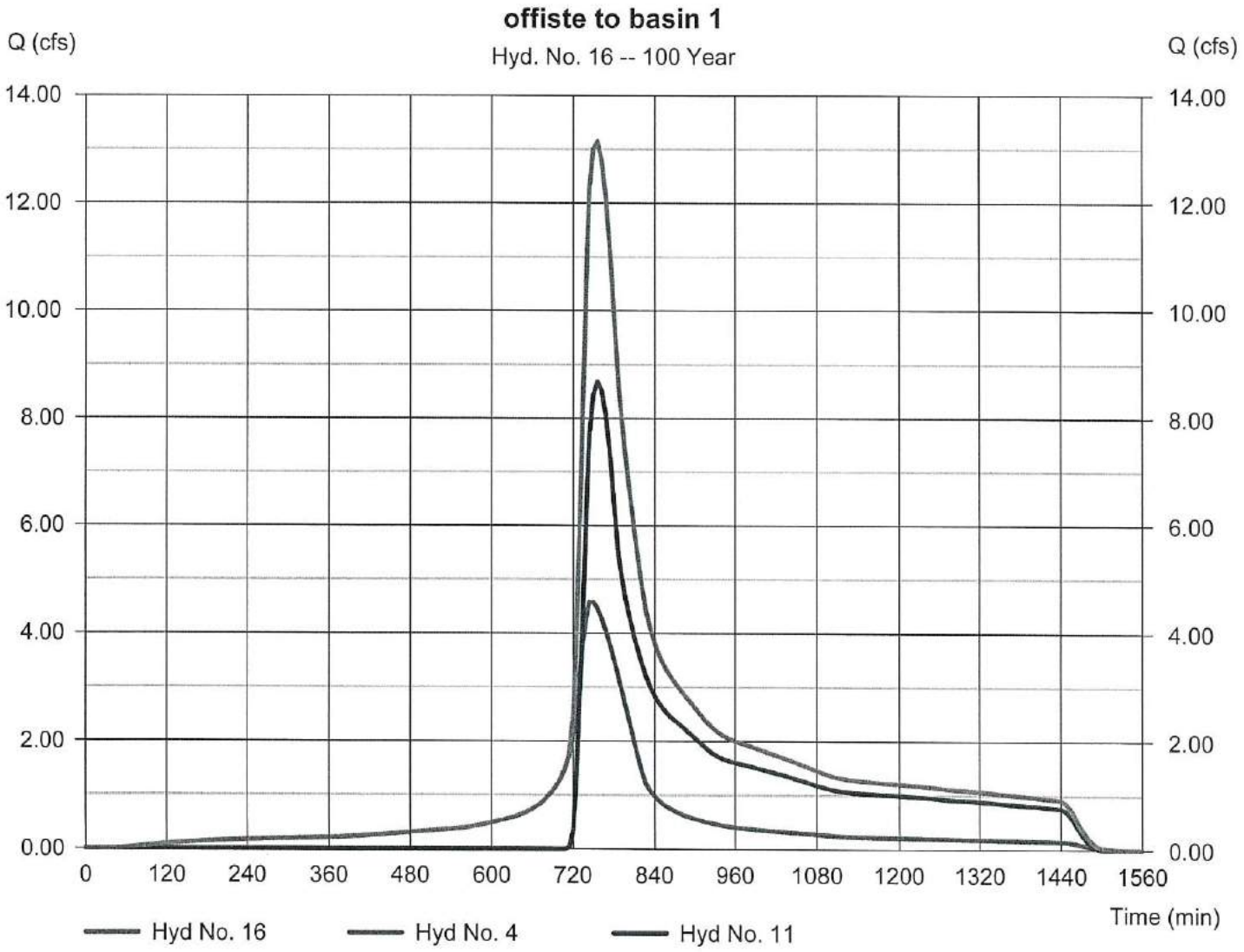
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 16

offiste to basin 1

Hydrograph type	= Combine	Peak discharge	= 13.15 cfs
Storm frequency	= 100 yrs	Time to peak	= 756 min
Time interval	= 6 min	Hyd. volume	= 130,525 cuft
Inflow hyds.	= 4, 11	Contrib. drain. area	= 17.990 ac



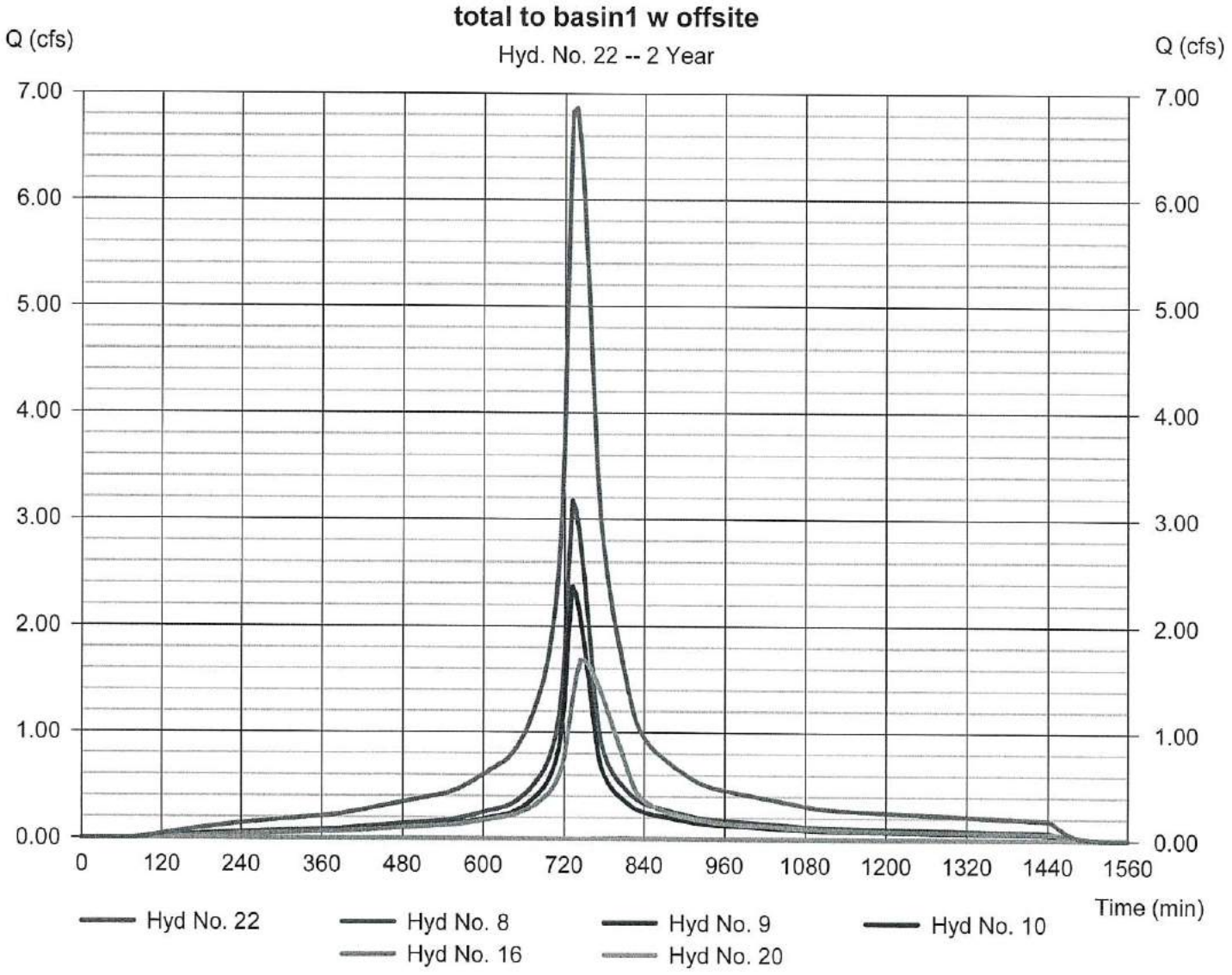
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 22

total to basin1 w offsite

Hydrograph type	= Combine	Peak discharge	= 6.864 cfs
Storm frequency	= 2 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 53,092 cuft
Inflow hyds.	= 8, 9, 10, 16, 20	Contrib. drain. area	= 3.440 ac



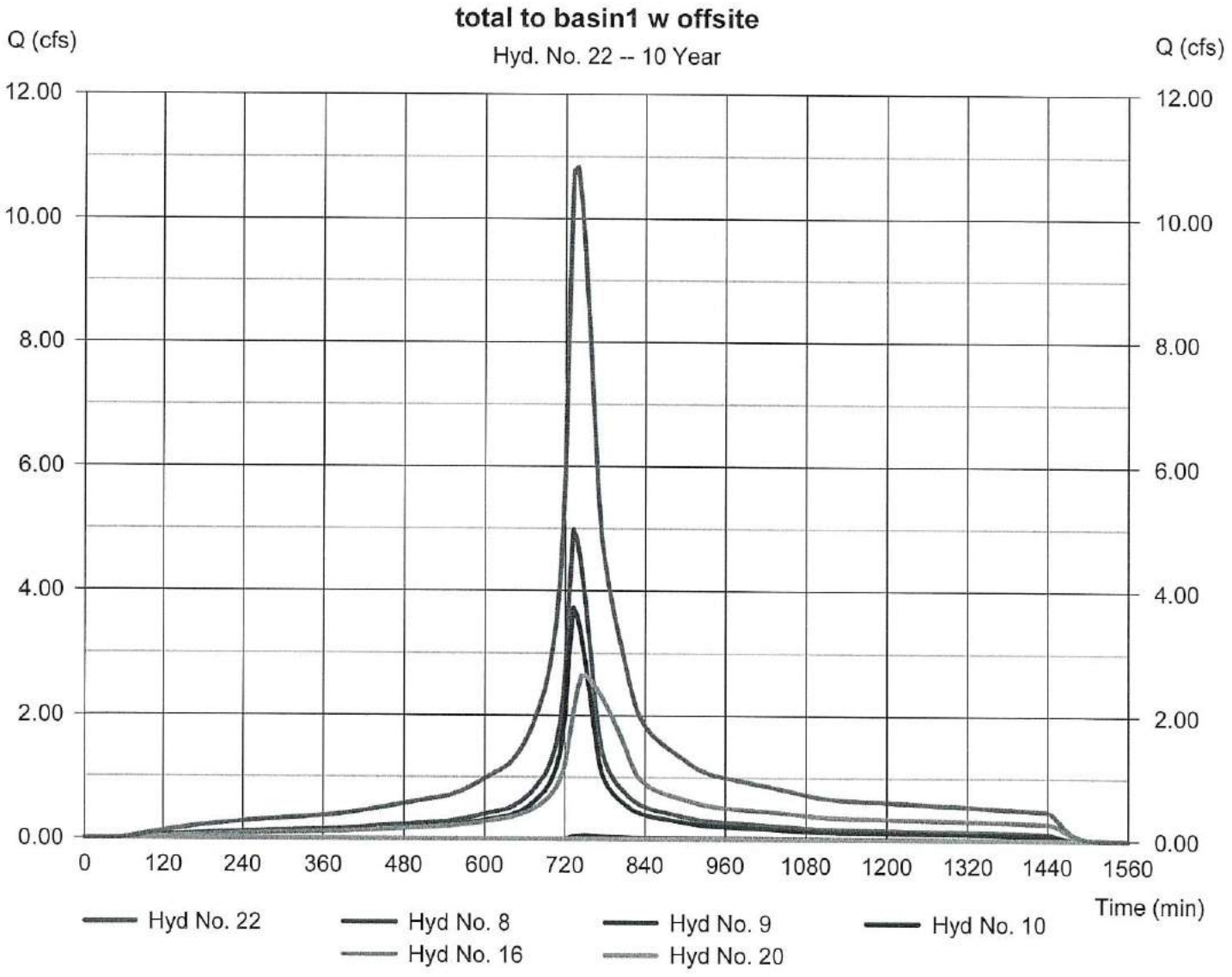
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 22

total to basin1 w offsite

Hydrograph type	= Combine	Peak discharge	= 10.83 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 95,289 cuft
Inflow hyds.	= 8, 9, 10, 16, 20	Contrib. drain. area	= 3.440 ac



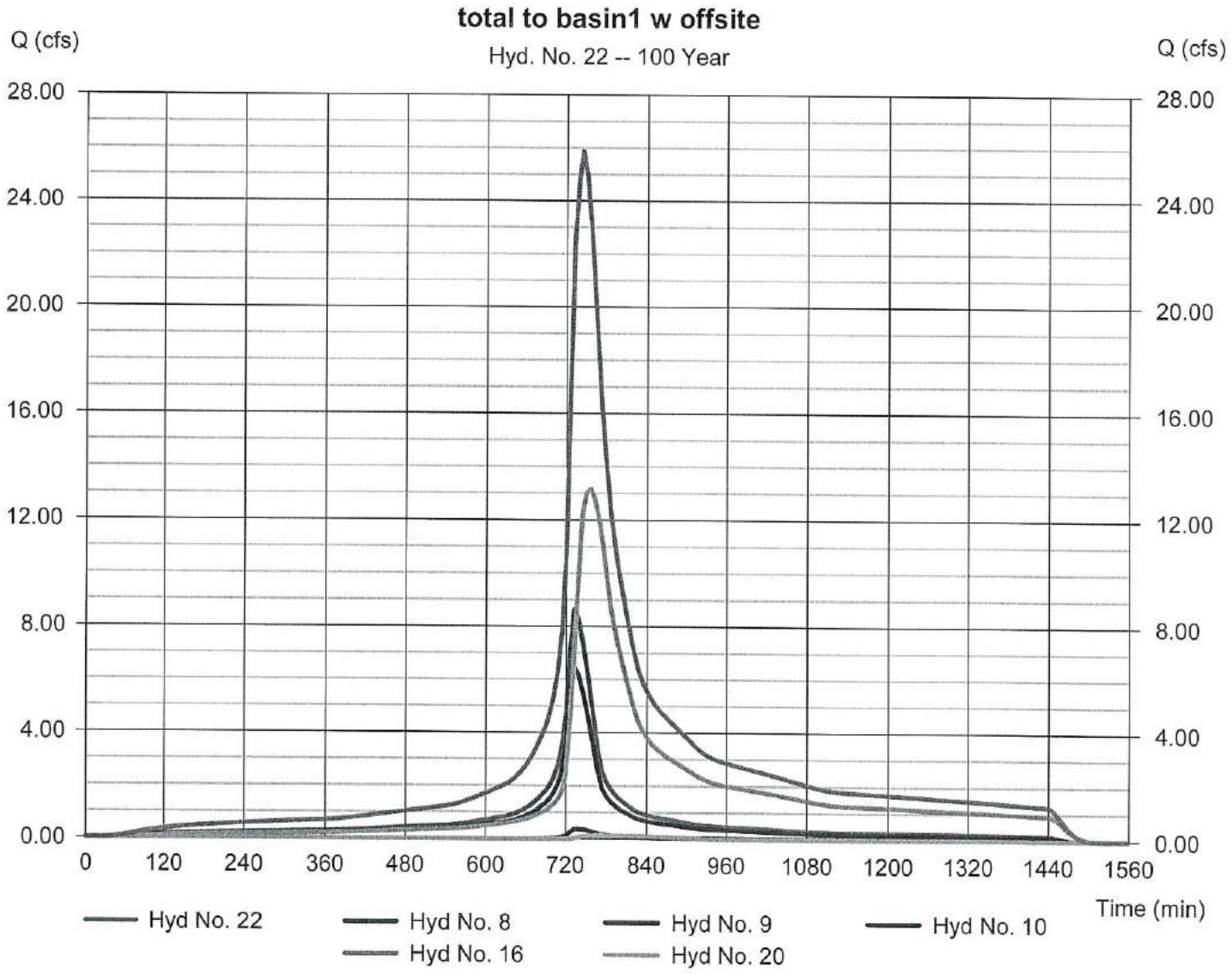
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 22

total to basin1 w offsite

Hydrograph type	= Combine	Peak discharge	= 25.87 cfs
Storm frequency	= 100 yrs	Time to peak	= 744 min
Time interval	= 6 min	Hyd. volume	= 236,891 cuft
Inflow hyds.	= 8, 9, 10, 16, 20	Contrib. drain. area	= 3.440 ac



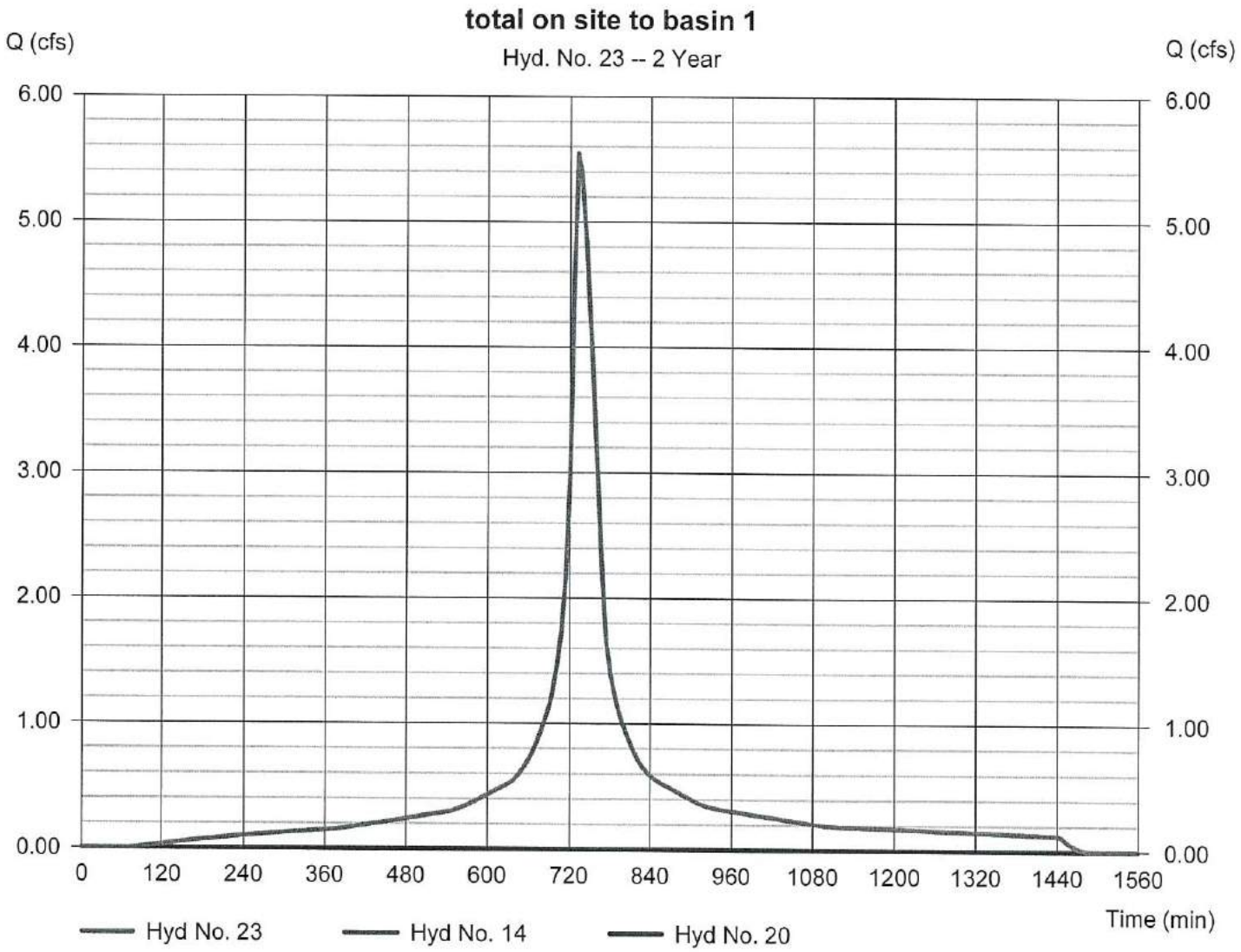
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 23

total on site to basin 1

Hydrograph type	= Combine	Peak discharge	= 5.546 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 36,655 cuft
Inflow hyds.	= 14, 20	Contrib. drain. area	= 0.000 ac



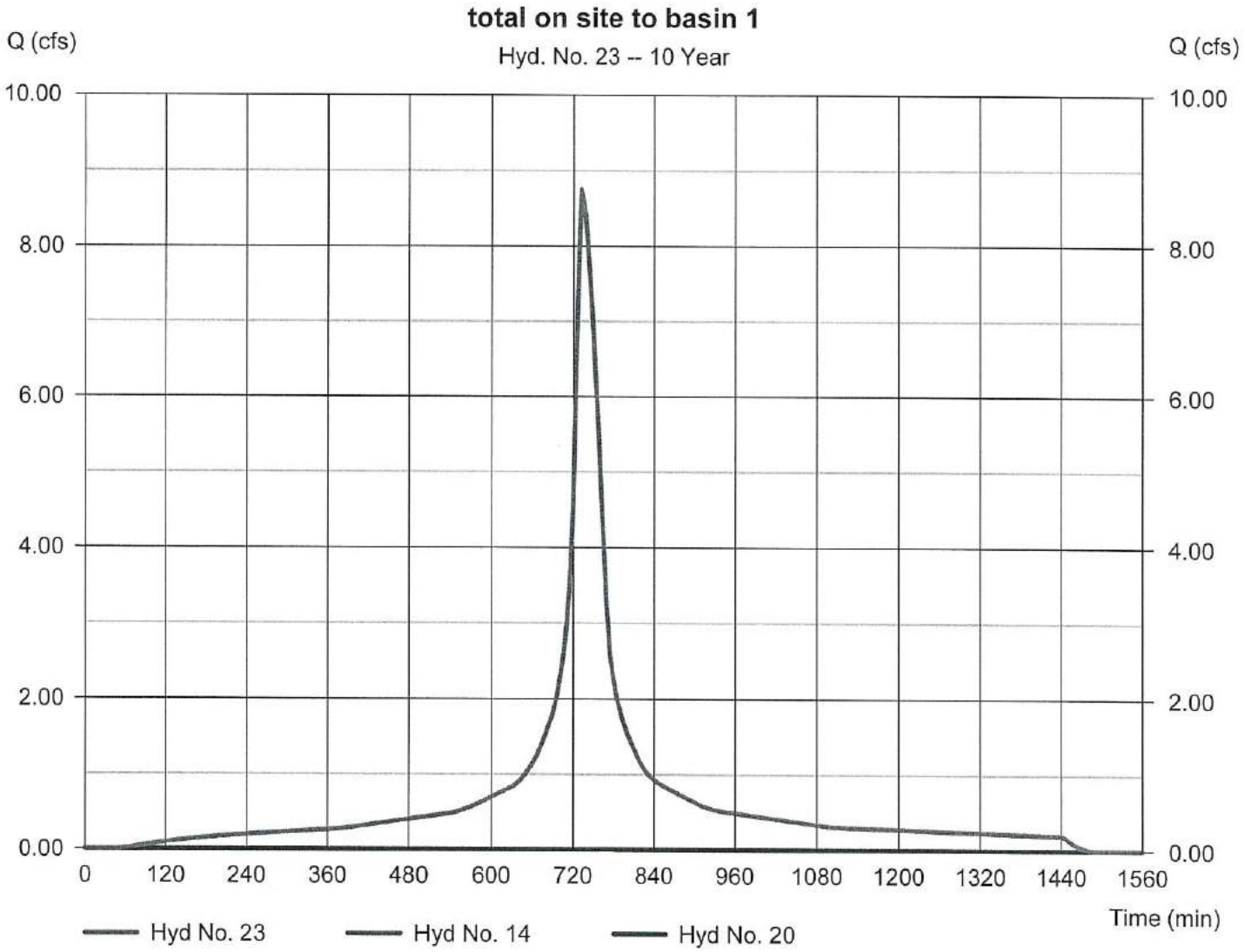
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 23

total on site to basin 1

Hydrograph type	= Combine	Peak discharge	= 8.753 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 59,038 cuft
Inflow hyds.	= 14, 20	Contrib. drain. area	= 0.000 ac



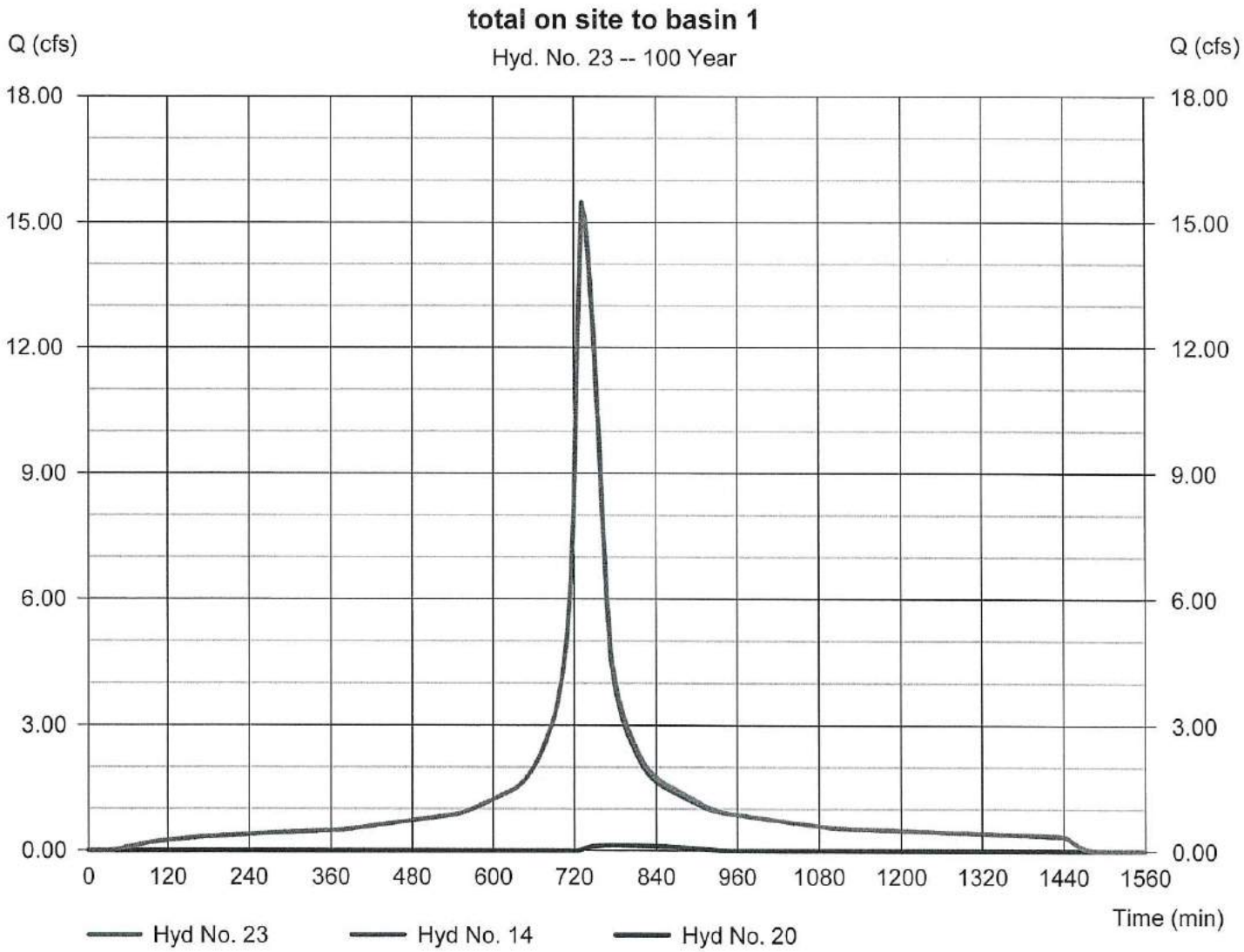
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 23

total on site to basin 1

Hydrograph type	= Combine	Peak discharge	= 15.48 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 106,366 cuft
Inflow hyds.	= 14, 20	Contrib. drain. area	= 0.000 ac



BASIN #2 CALCULATIONS

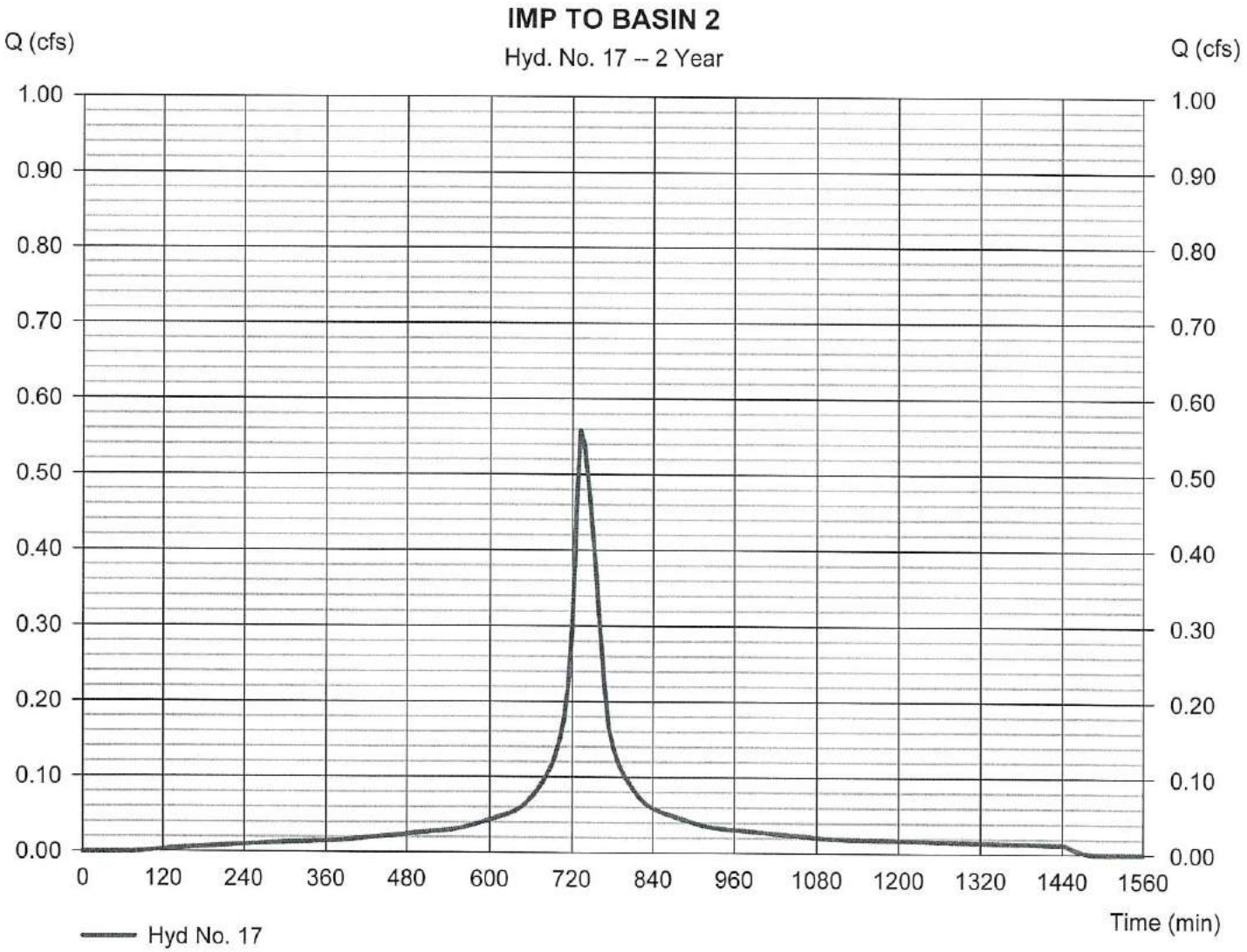
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 17

IMP TO BASIN 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.558 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 3,678 cuft
Drainage area	= 0.320 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285



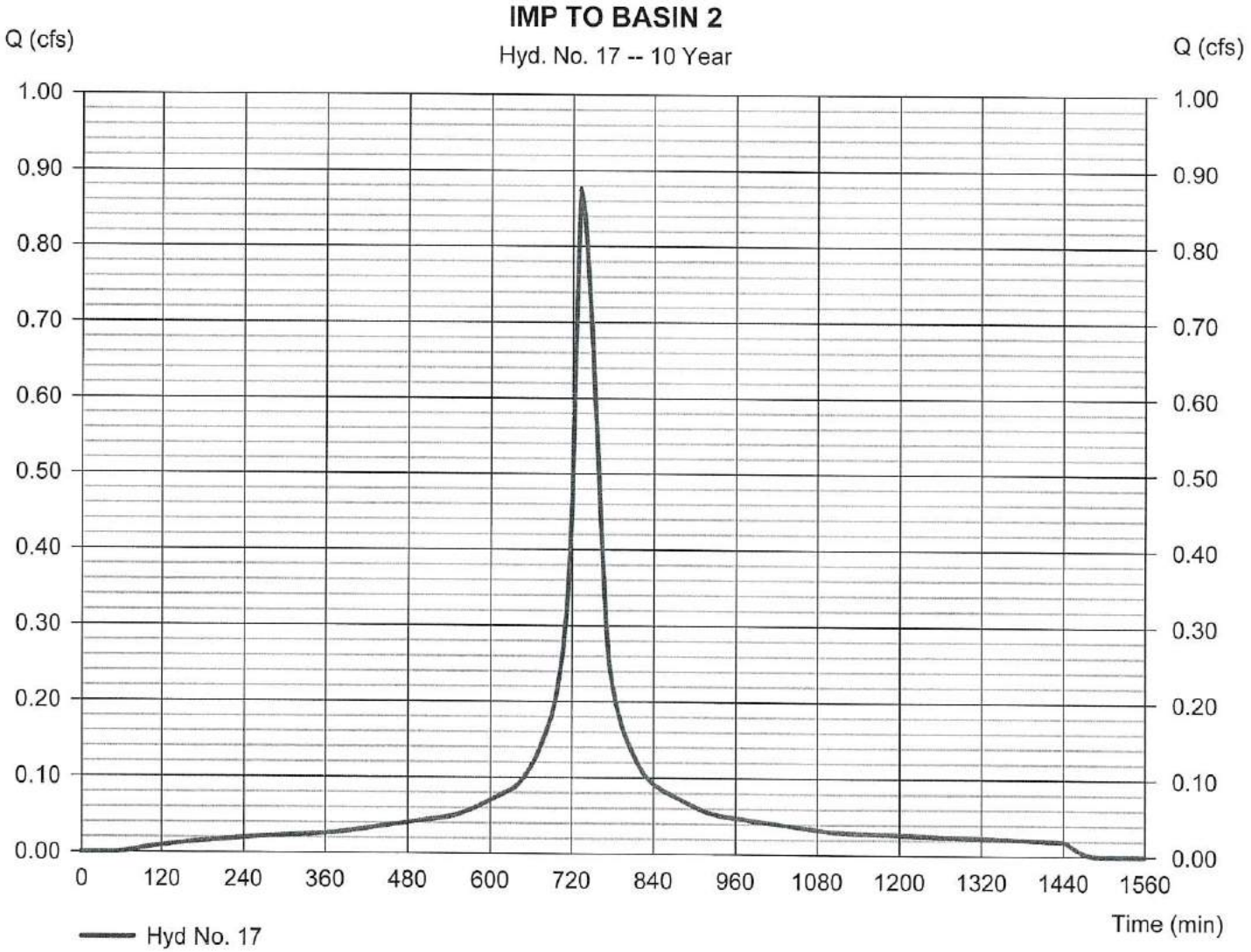
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 17

IMP TO BASIN 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.876 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 5,878 cuft
Drainage area	= 0.320 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.33 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285



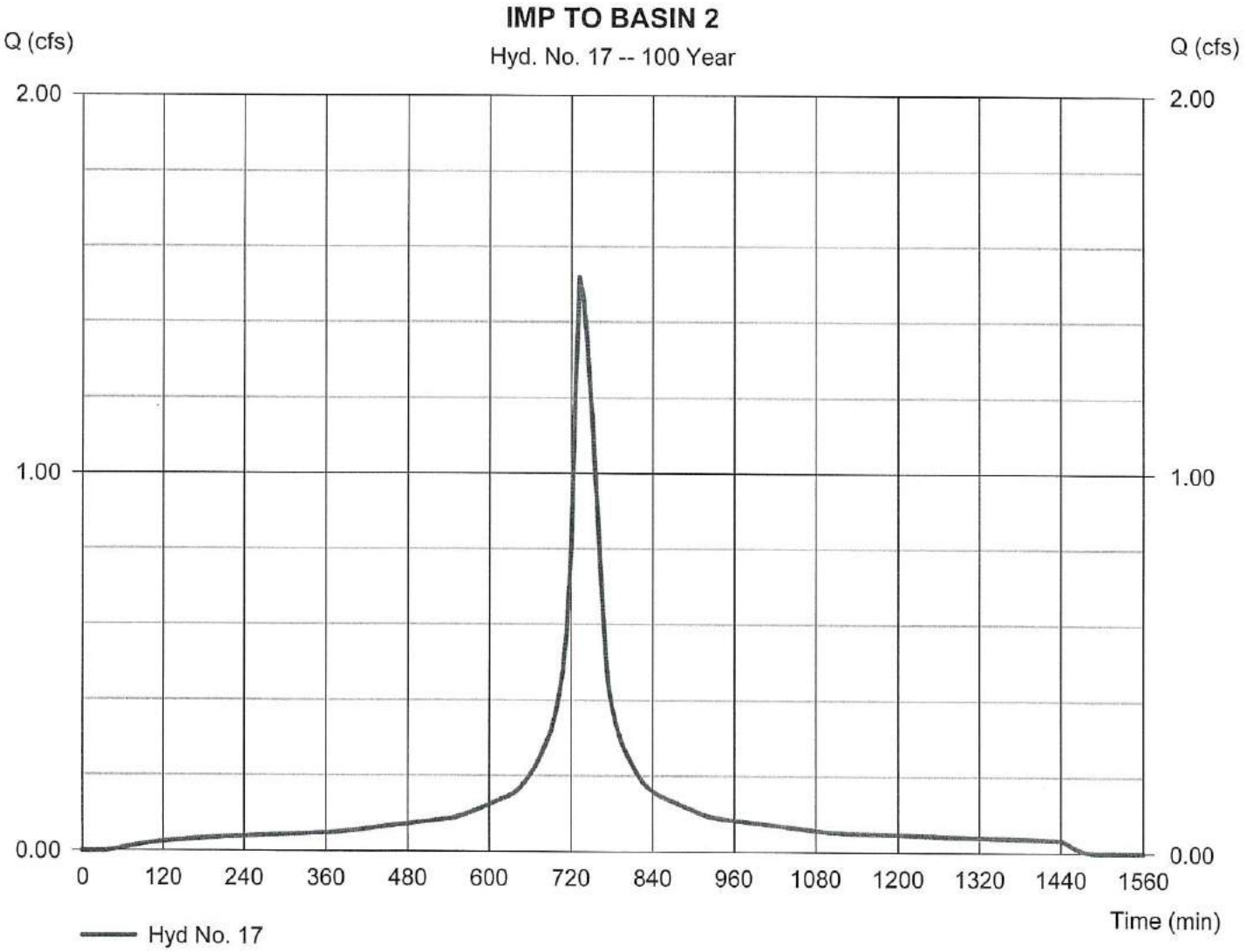
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 17

IMP TO BASIN 2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.519 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 10,342 cuft
Drainage area	= 0.320 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 9.20 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285



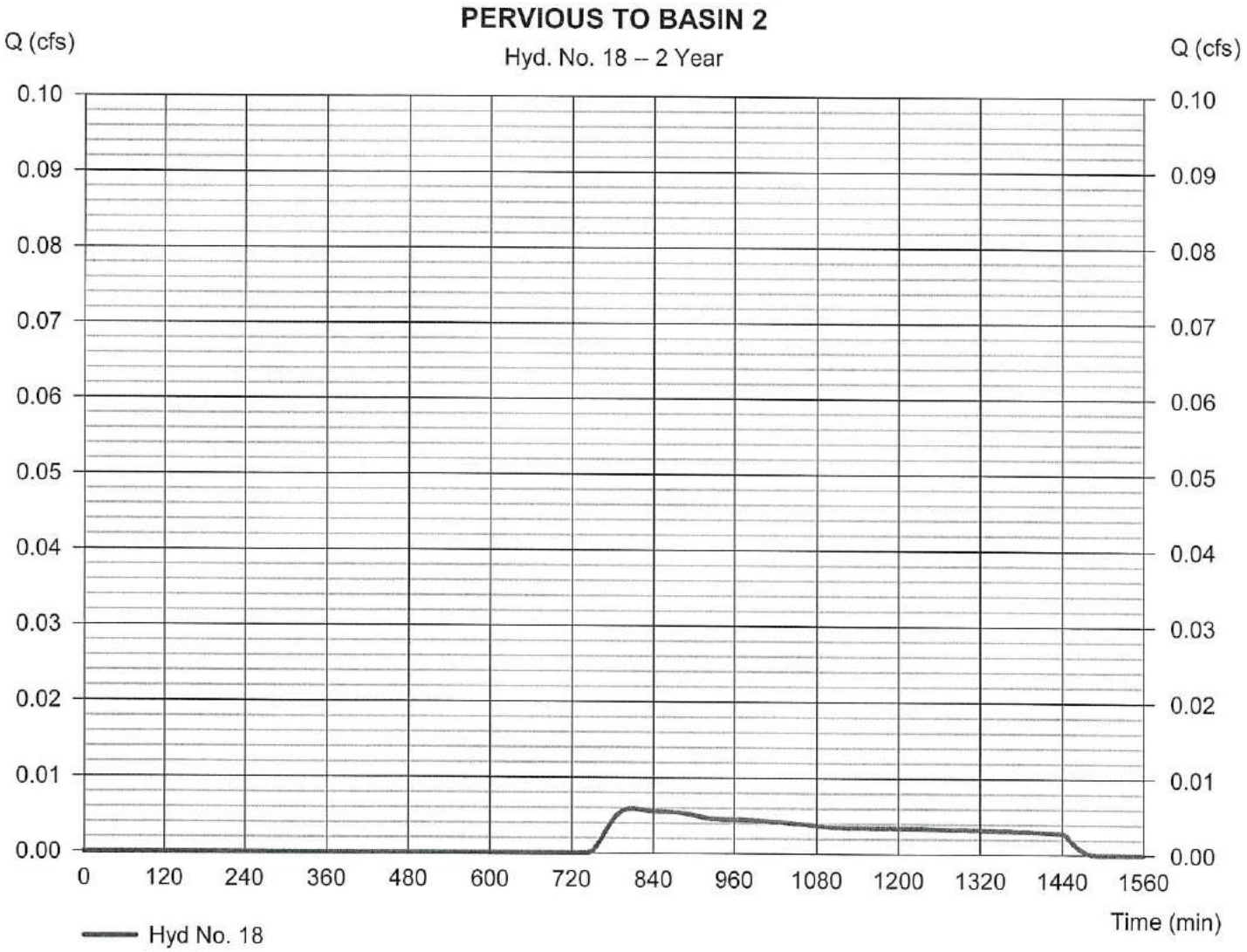
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 18

PERVIOUS TO BASIN 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.006 cfs
Storm frequency	= 2 yrs	Time to peak	= 810 min
Time interval	= 6 min	Hyd. volume	= 165 cuft
Drainage area	= 0.420 ac	Curve number	= 47
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285



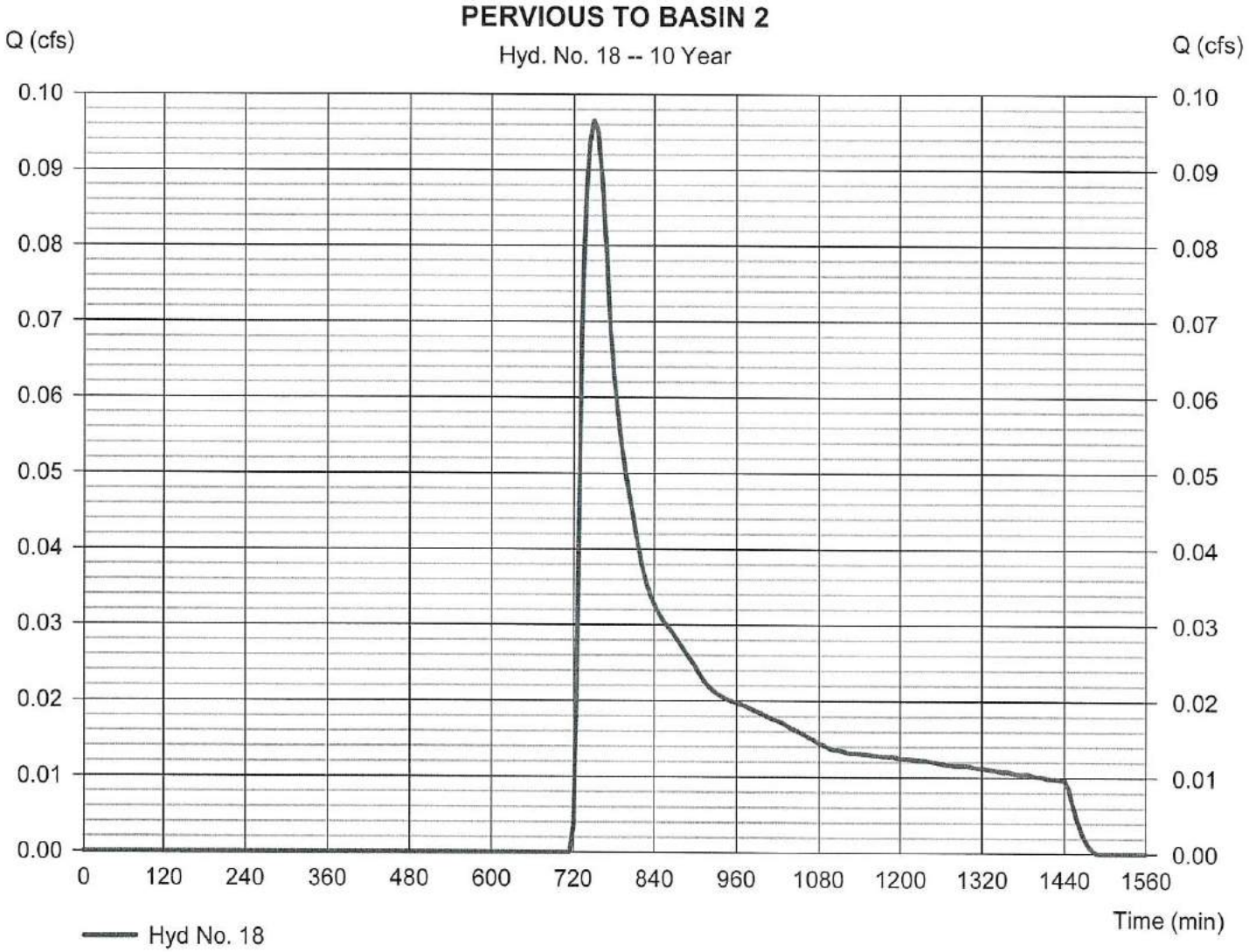
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 18

PERVIOUS TO BASIN 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.097 cfs
Storm frequency	= 10 yrs	Time to peak	= 750 min
Time interval	= 6 min	Hyd. volume	= 998 cuft
Drainage area	= 0.420 ac	Curve number	= 47
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.33 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285



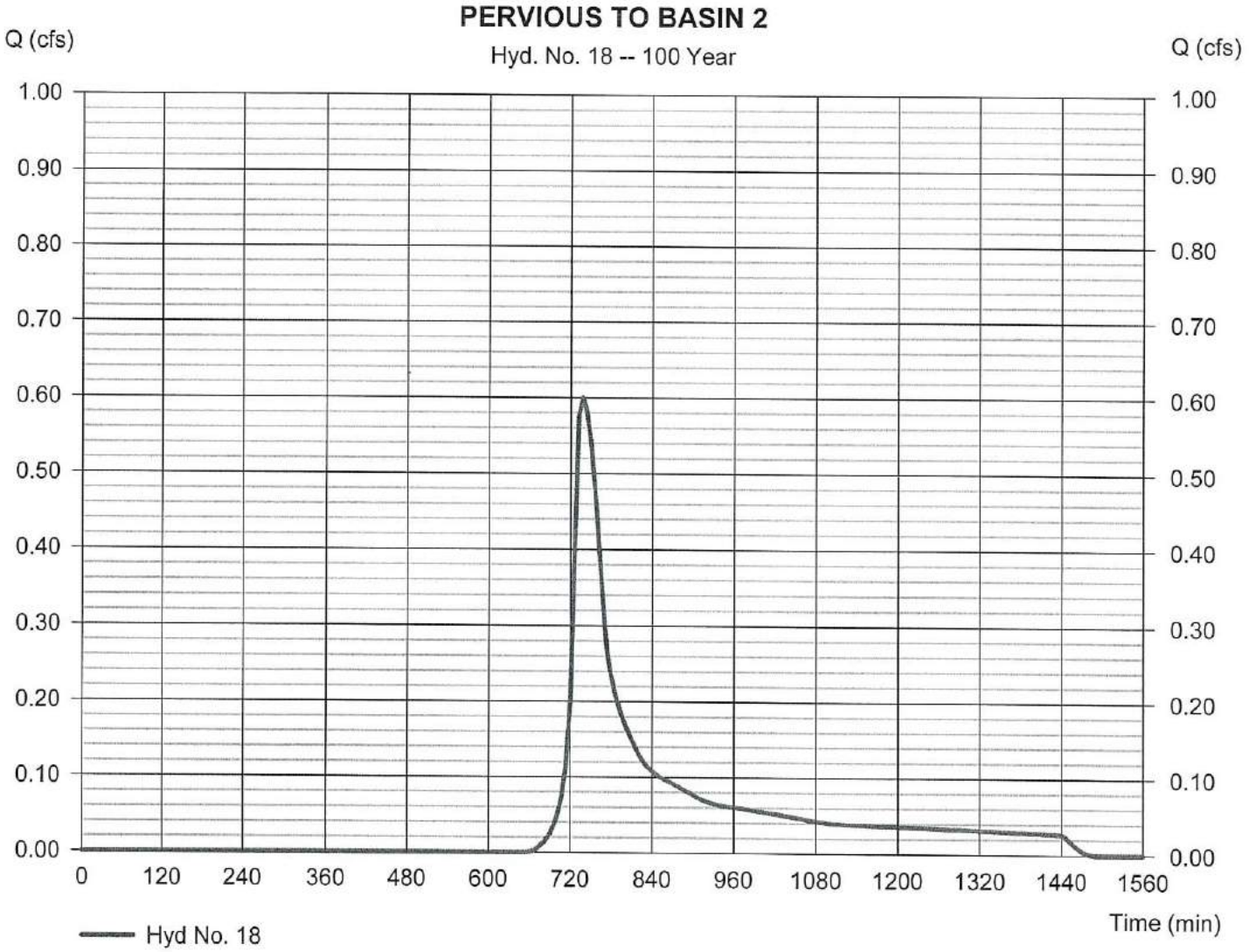
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 18

PERVIOUS TO BASIN 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.600 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 4,010 cuft
Drainage area	= 0.420 ac	Curve number	= 47
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 9.20 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285



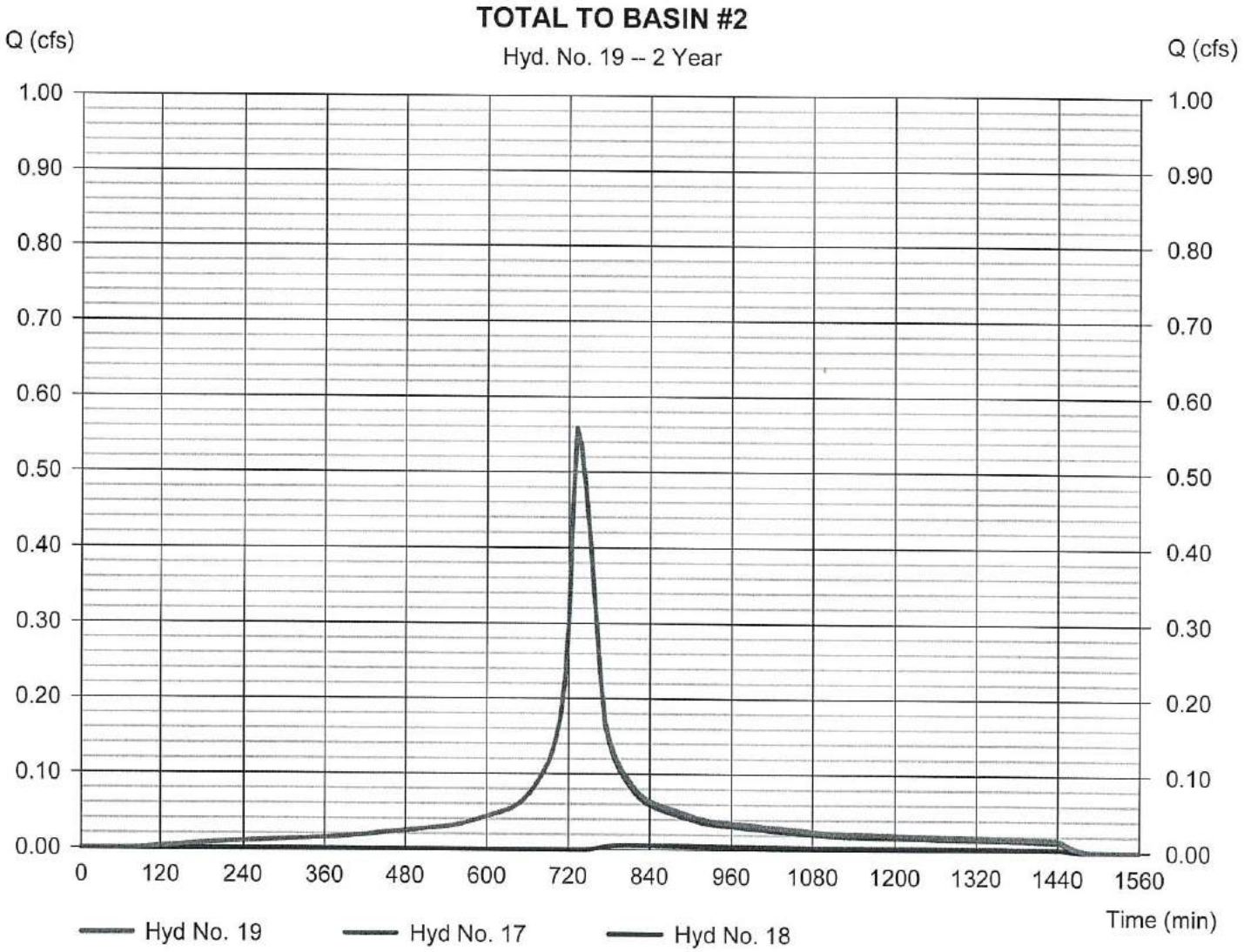
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 19

TOTAL TO BASIN #2

Hydrograph type	= Combine	Peak discharge	= 0.558 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 3,843 cuft
Inflow hyds.	= 17, 18	Contrib. drain. area	= 0.740 ac



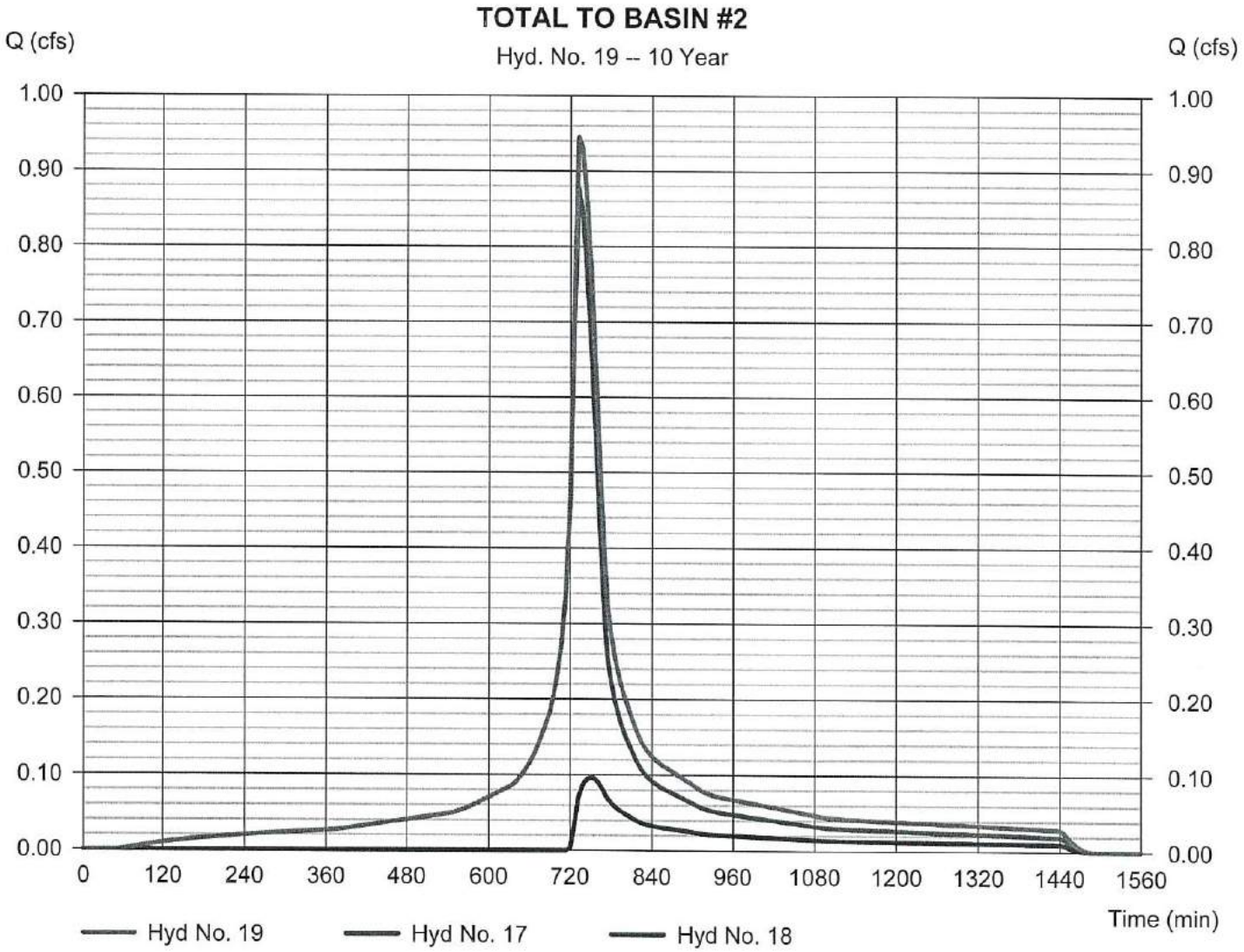
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 19

TOTAL TO BASIN #2

Hydrograph type	= Combine	Peak discharge	= 0.945 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 6,876 cuft
Inflow hyds.	= 17, 18	Contrib. drain. area	= 0.740 ac



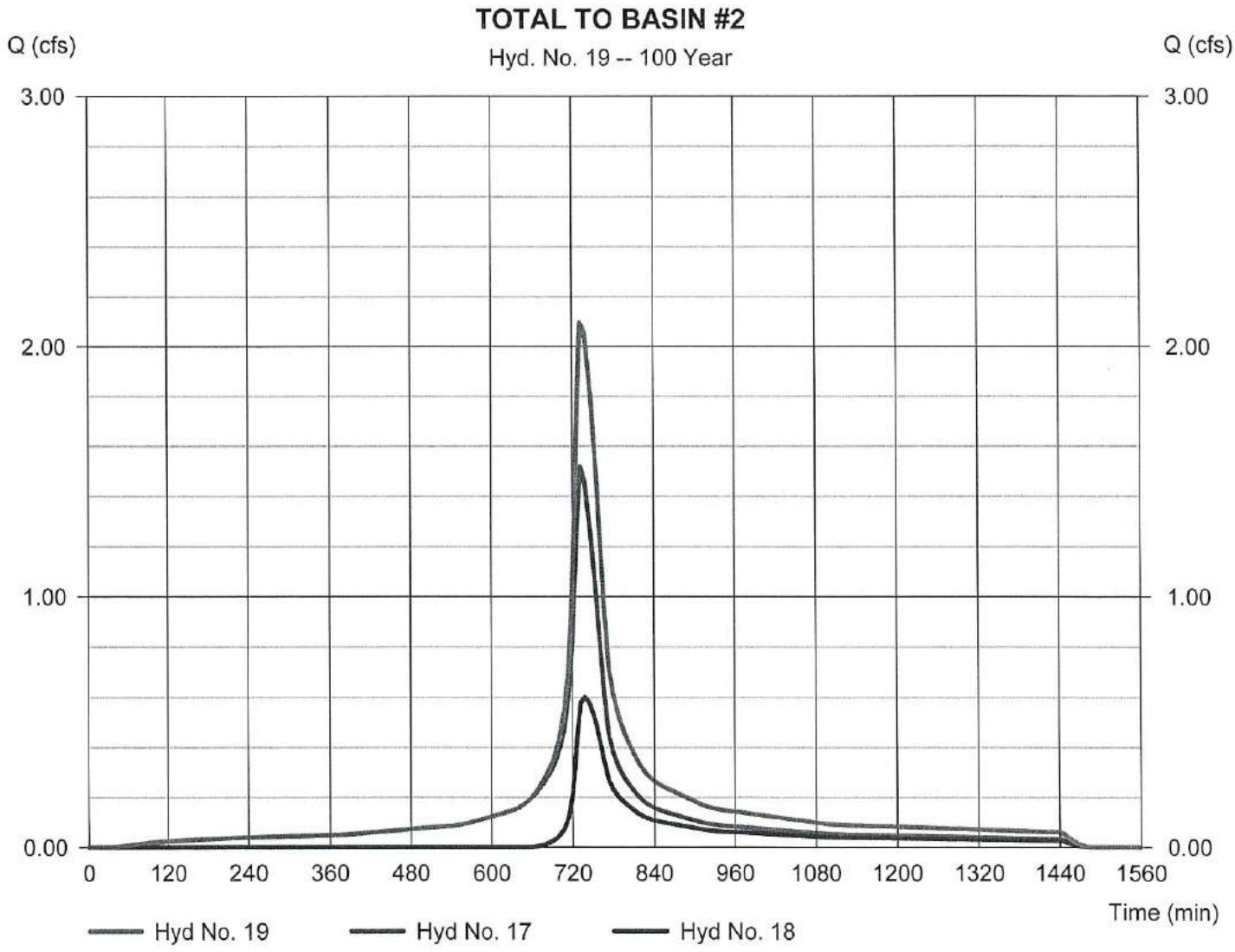
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 19

TOTAL TO BASIN #2

Hydrograph type	= Combine	Peak discharge	= 2.096 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 14,351 cuft
Inflow hyds.	= 17, 18	Contrib. drain. area	= 0.740 ac



SECTION 2-III
INFILTRATION BASIN ROUTING CALCULATIONS

Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Pond No. 1 - infiltration basin 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 72.25 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	72.25	54,580	0	0
0.25	72.50	54,878	13,681	13,681
0.75	73.00	55,473	27,585	41,266
1.25	73.50	57,270	28,182	69,447
1.75	74.00	59,081	29,084	98,531
2.25	74.50	60,907	29,993	128,524
2.75	75.00	62,745	30,909	159,433
3.25	75.50	65,841	32,140	191,573

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	2.50	0.00	0.00
Span (in)	= 12.00	2.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 72.13	72.50	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .010	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 20.00	16.00	0.00	0.00
Crest El. (ft)	= 73.75	73.50	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	Rect	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 5.000 (by Contour)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	72.25	0.00	0.00	---	---	0.00	0.00	---	---	0.000	---	0.000
0.25	13,681	72.50	0.00	0.00	---	---	0.00	0.00	---	---	6.352	---	6.352
0.75	41,266	73.00	0.00	0.10 ic	---	---	0.00	0.00	---	---	6.420	---	6.524
1.25	69,447	73.50	0.00	0.16 ic	---	---	0.00	0.00	---	---	6.628	---	6.784
1.75	98,531	74.00	0.00	0.19 ic	---	---	6.50	18.84	---	---	6.838	---	32.37
2.25	128,524	74.50	0.00	0.23 ic	---	---	33.77	53.28	---	---	7.049	---	94.33
2.75	159,433	75.00	0.00	0.25 ic	---	---	72.67	97.88	---	---	7.262	---	178.07
3.25	191,573	75.50	0.00	0.28 ic	---	---	120.38	150.70	---	---	7.620	---	278.98

Hydrograph Report

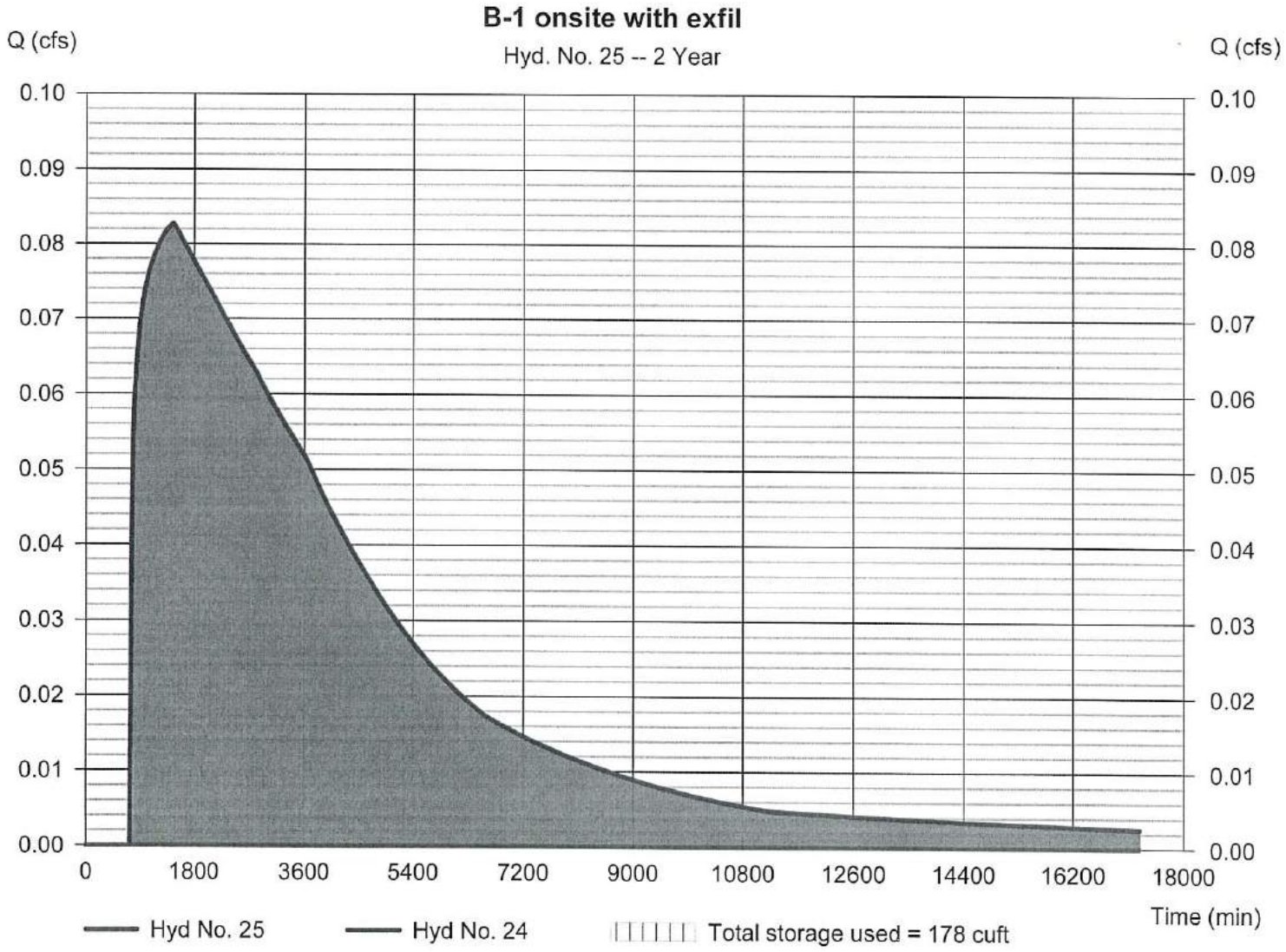
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 25

B-1 onsite with exfil

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 930 min
Time interval	= 6 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 24 - B-1 onsite no exfil	Max. Elevation	= 72.25 ft
Reservoir name	= infiltration basin 1	Max. Storage	= 178 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

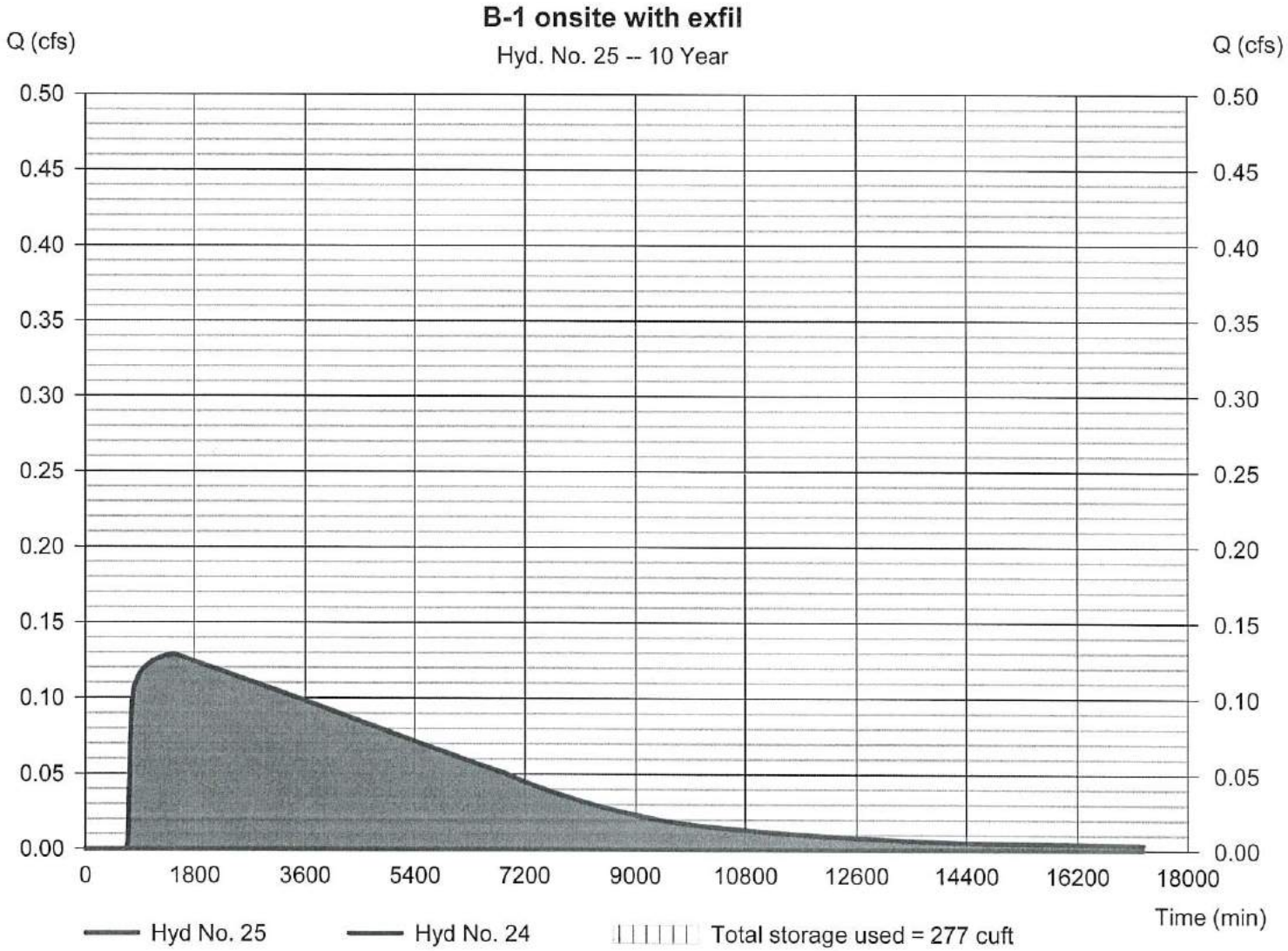
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 25

B-1 onsite with exfil

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= 1272 min
Time interval	= 6 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 24 - B-1 onsite no exfil	Max. Elevation	= 72.26 ft
Reservoir name	= infiltration basin 1	Max. Storage	= 277 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

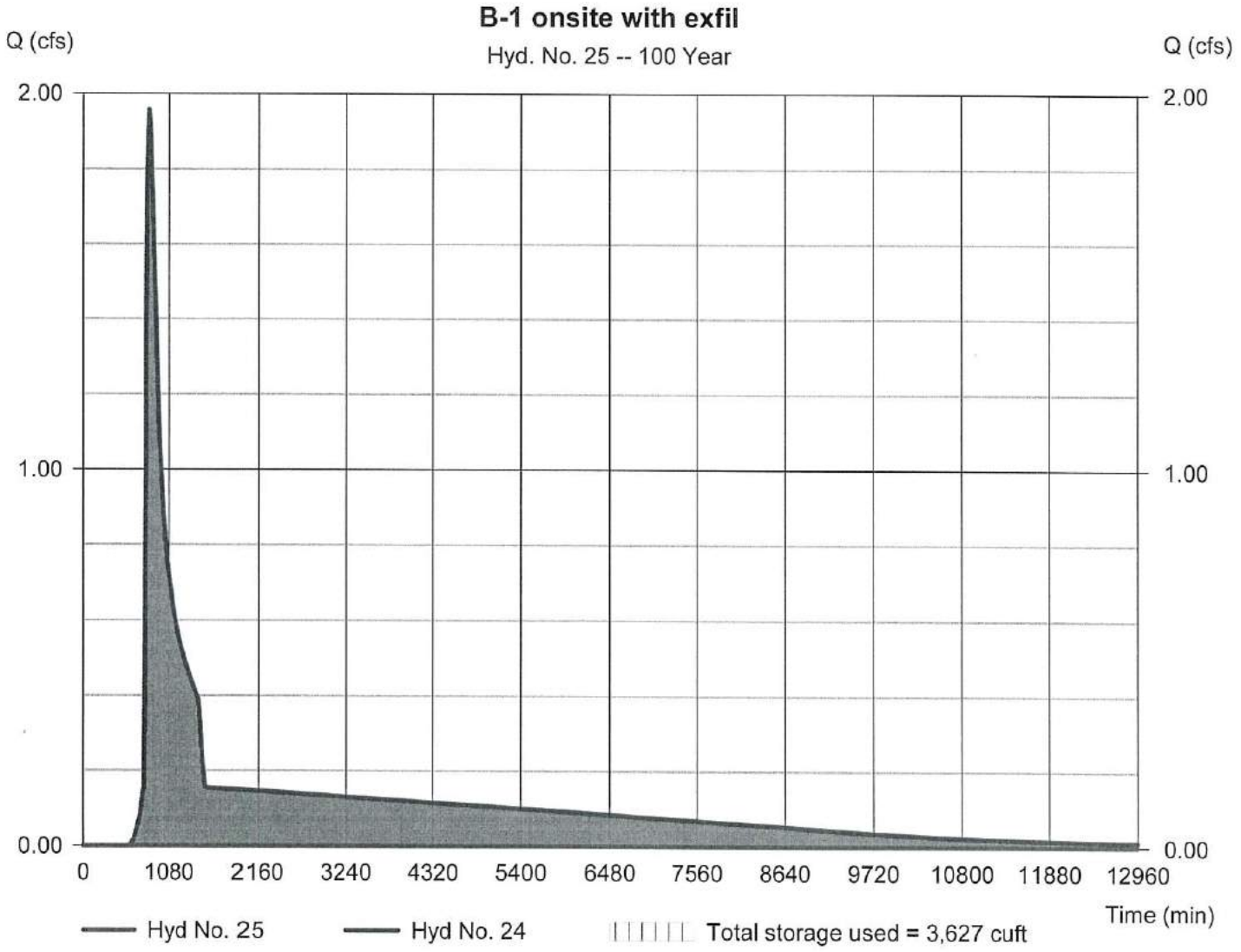
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 25

B-1 onsite with exfil

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= 864 min
Time interval	= 6 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 24 - B-1 onsite no exfil	Max. Elevation	= 72.32 ft
Reservoir name	= infiltration basin 1	Max. Storage	= 3,627 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

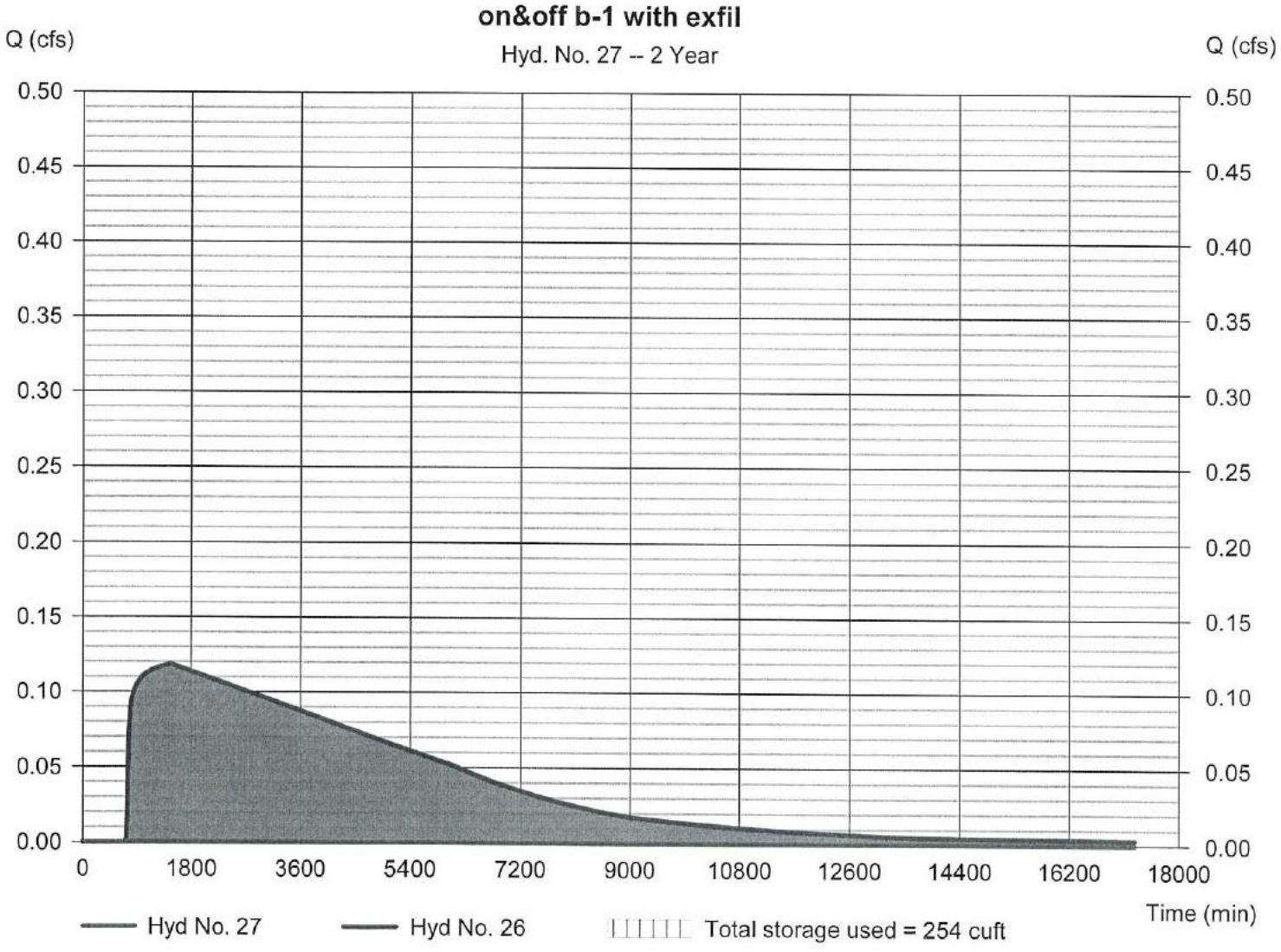
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 27

on&off b-1 with exfil

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 798 min
Time interval	= 6 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 26 - on&off to b-1 no exfil	Max. Elevation	= 72.25 ft
Reservoir name	= infiltration basin 1	Max. Storage	= 254 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

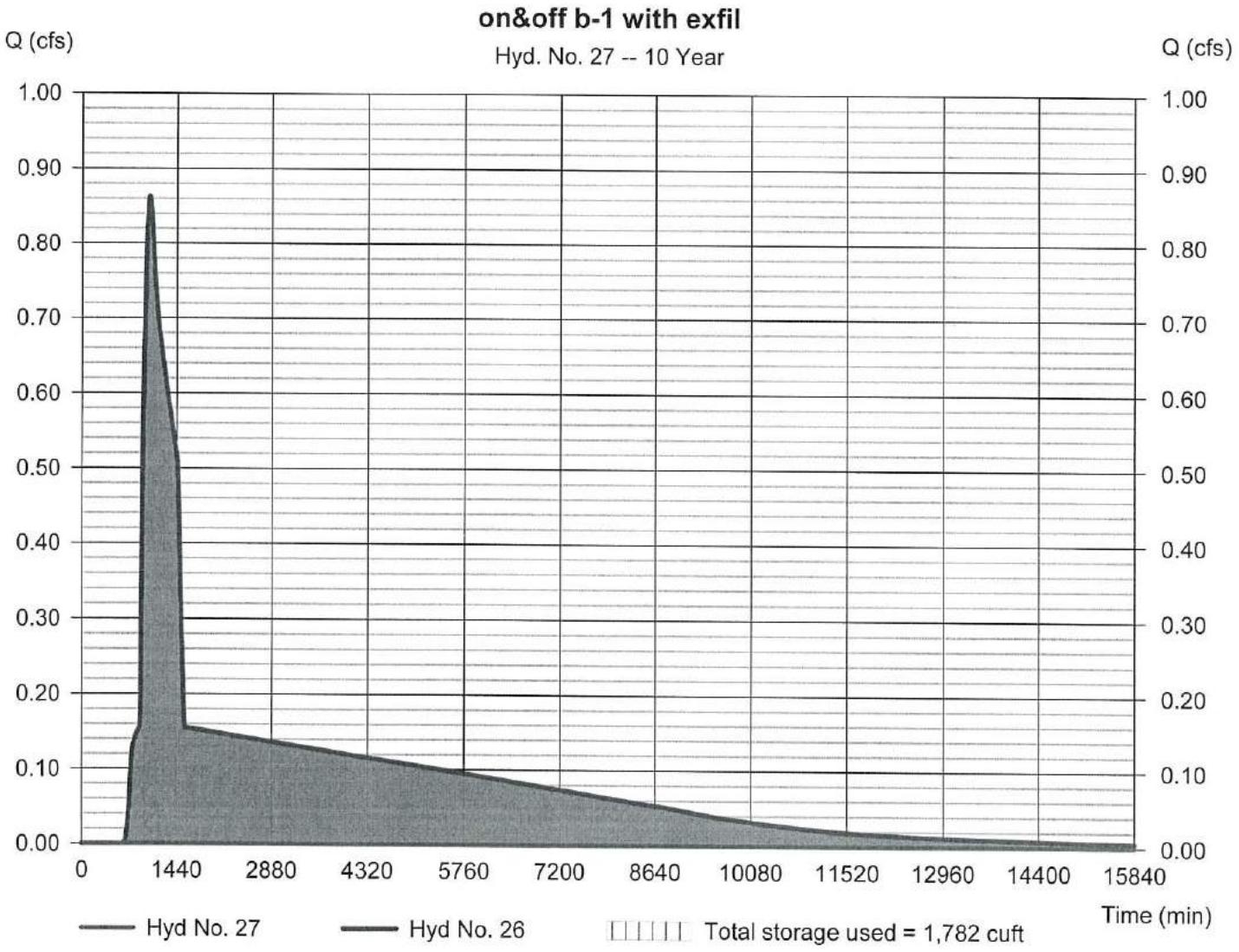
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 27

on&off b-1 with exfil

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= 1050 min
Time interval	= 6 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 26 - on&off to b-1 no exfil	Max. Elevation	= 72.28 ft
Reservoir name	= infiltration basin 1	Max. Storage	= 1,782 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

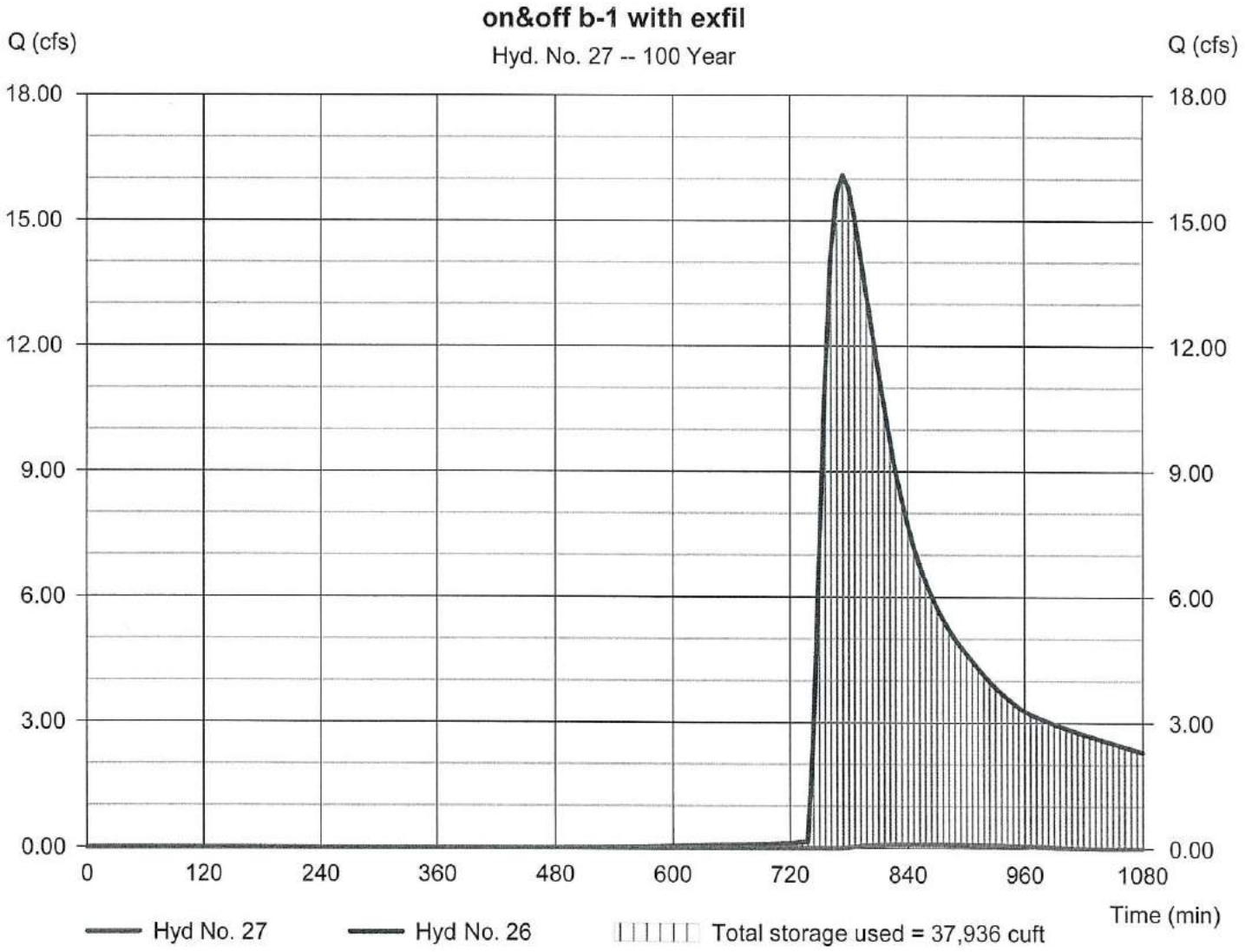
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 27

on&off b-1 with exfil

Hydrograph type	= Reservoir	Peak discharge	= 0.095 cfs
Storm frequency	= 100 yrs	Time to peak	= 858 min
Time interval	= 6 min	Hyd. volume	= 951 cuft
Inflow hyd. No.	= 26 - on&off to b-1 no exfil	Max. Elevation	= 72.94 ft
Reservoir name	= infiltration basin 1	Max. Storage	= 37,936 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Pond No. 9 - BASIN # 2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 75.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	75.00	3,053	0	0
0.50	75.50	3,598	1,661	1,661
1.00	76.00	4,142	1,933	3,594
2.00	77.00	5,358	4,737	8,330

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	2.50	0.00	0.00
Span (in)	= 15.00	2.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 75.00	75.50	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .010	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	Inactive	0.00	0.00	0.00
Crest El. (ft)	= 76.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Ciplti	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 5.000 (by Contour)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	75.00	0.00	0.00	---	---	0.00	---	---	---	0.000	---	0.000
0.50	1,661	75.50	0.00	0.00	---	---	0.00	---	---	---	0.416	---	0.416
1.00	3,594	76.00	0.00	0.10 ic	---	---	0.00	---	---	---	0.479	---	0.583
2.00	8,330	77.00	0.00	0.19 ic	---	---	0.00	---	---	---	0.620	---	0.814

Hydrograph Report

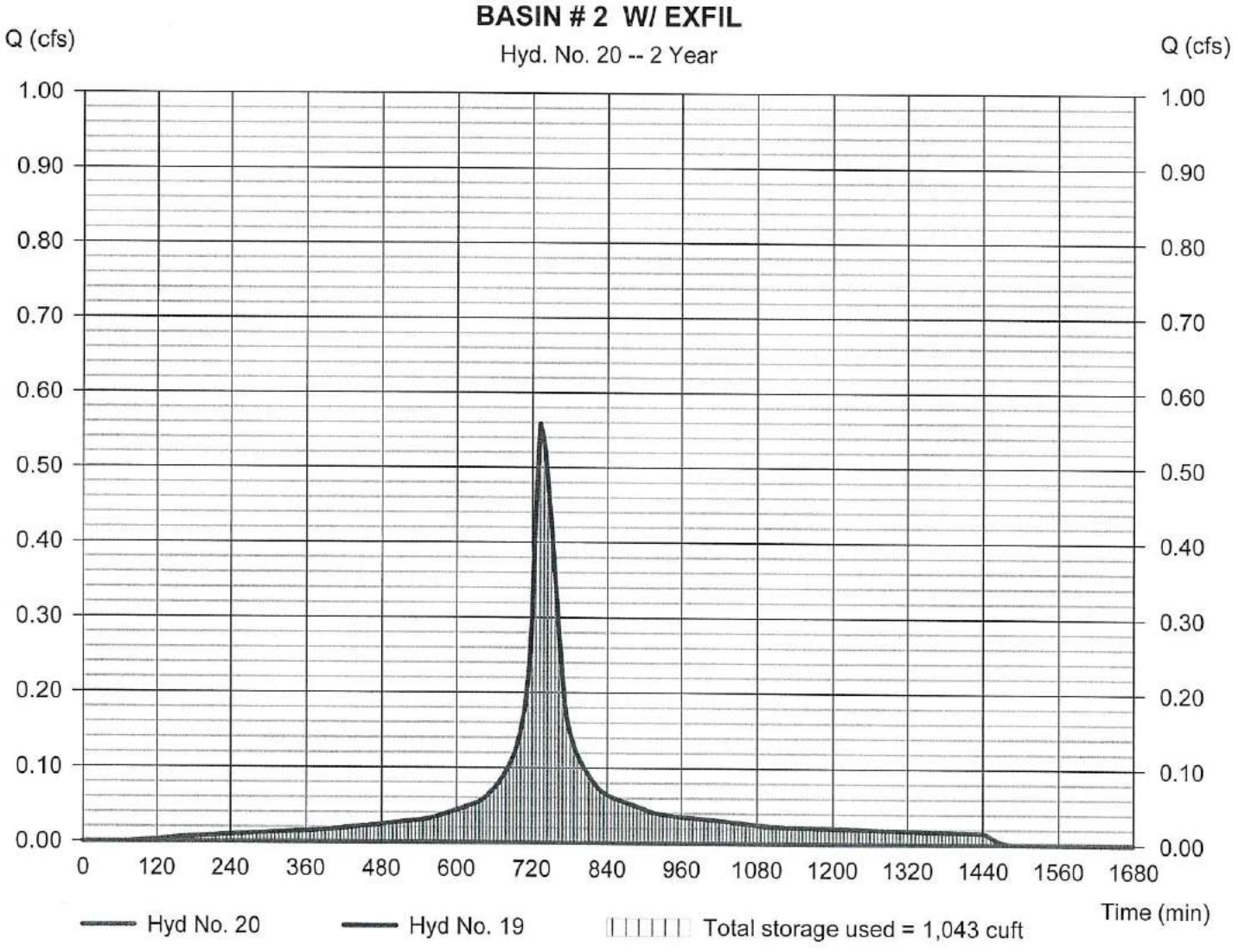
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 20

BASIN # 2 W/ EXFIL

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 834 min
Time interval	= 6 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 19 - TOTAL TO BASIN #2	Max. Elevation	= 75.32 ft
Reservoir name	= BASIN # 2	Max. Storage	= 1,043 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

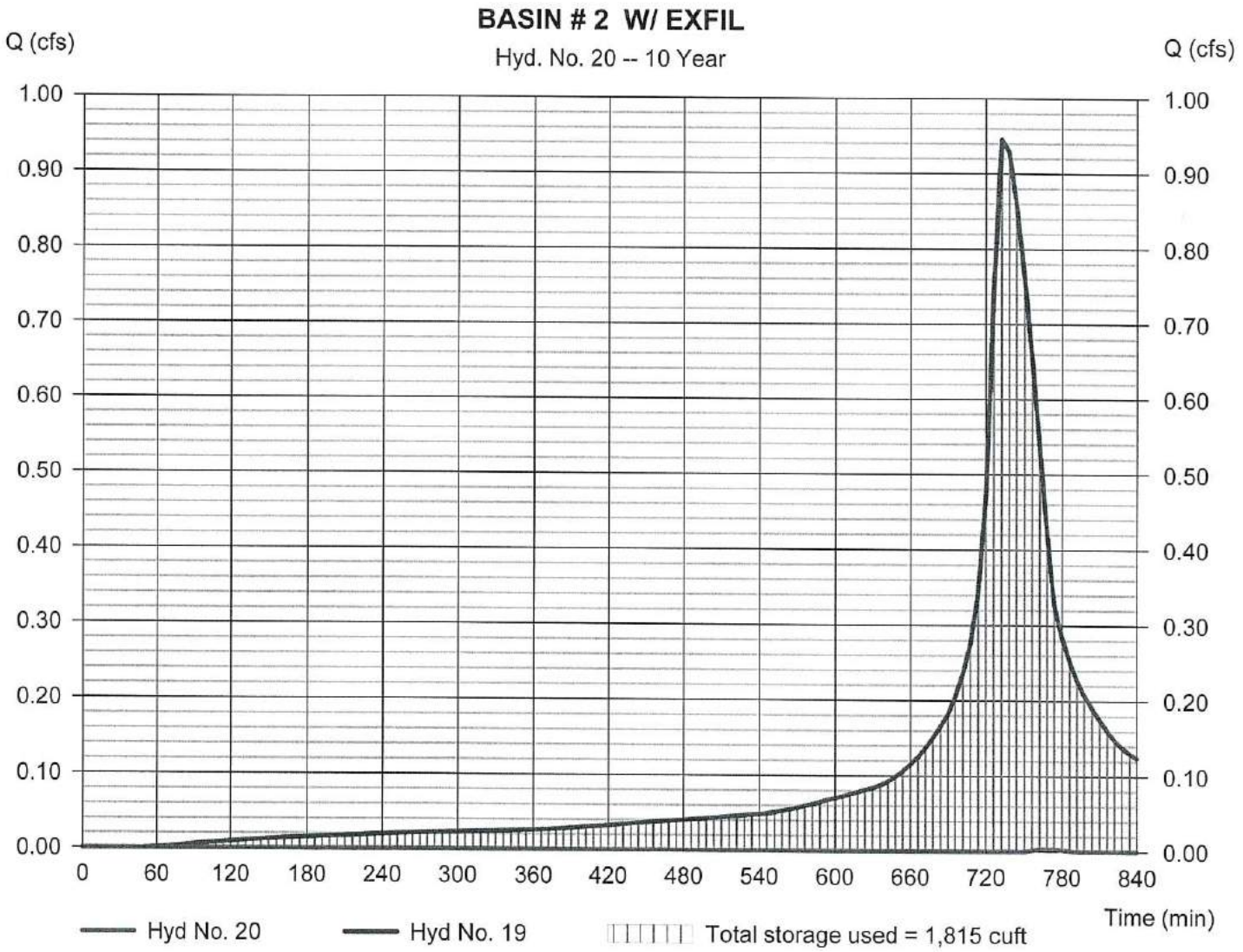
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 20

BASIN # 2 W/ EXFIL

Hydrograph type	= Reservoir	Peak discharge	= 0.004 cfs
Storm frequency	= 10 yrs	Time to peak	= 768 min
Time interval	= 6 min	Hyd. volume	= 6 cuft
Inflow hyd. No.	= 19 - TOTAL TO BASIN #2	Max. Elevation	= 75.54 ft
Reservoir name	= BASIN # 2	Max. Storage	= 1,815 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

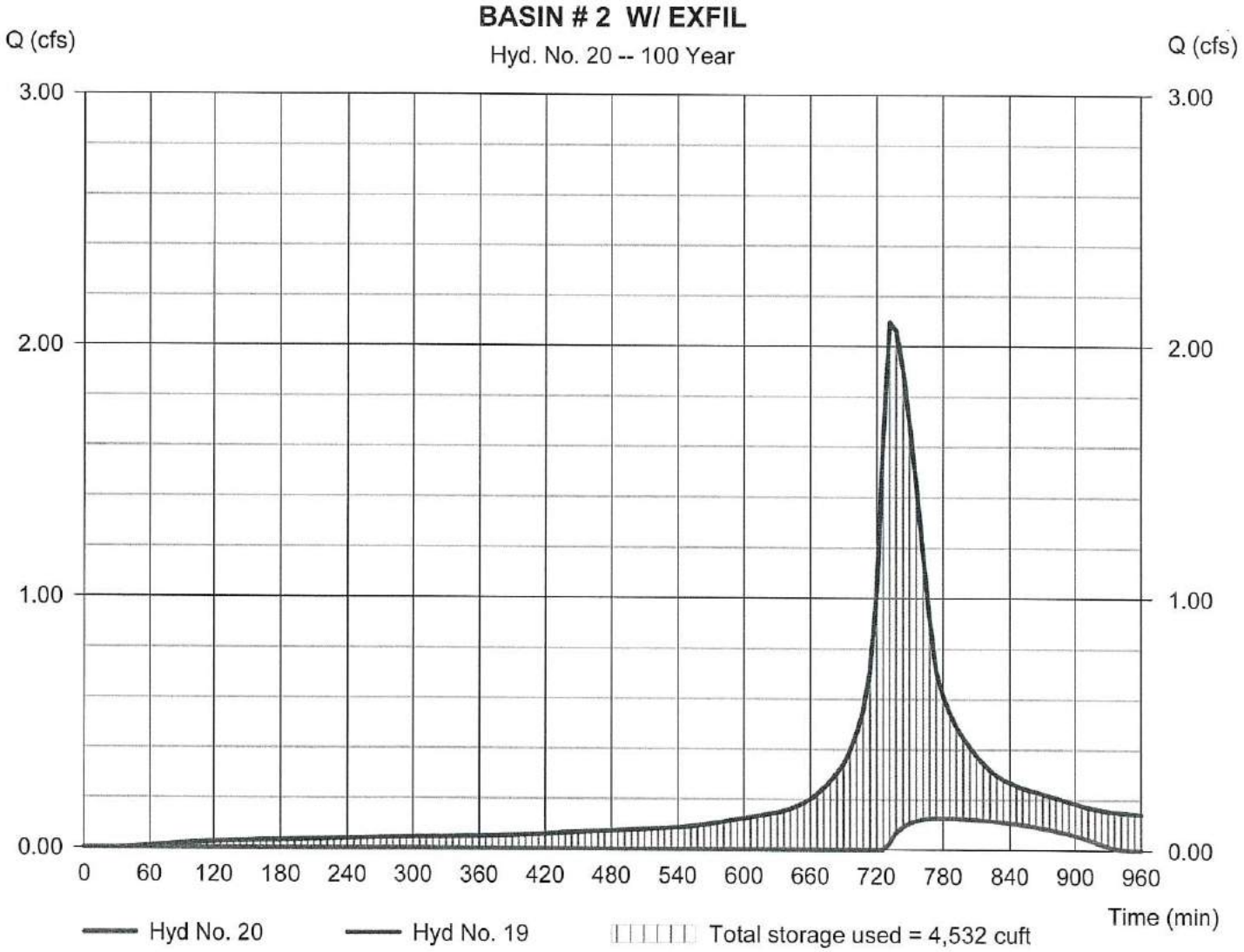
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 20

BASIN # 2 W/ EXFIL

Hydrograph type	= Reservoir	Peak discharge	= 0.126 cfs
Storm frequency	= 100 yrs	Time to peak	= 780 min
Time interval	= 6 min	Hyd. volume	= 1,114 cuft
Inflow hyd. No.	= 19 - TOTAL TO BASIN #2	Max. Elevation	= 76.20 ft
Reservoir name	= BASIN # 2	Max. Storage	= 4,532 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



BYPASS AREAS

Hydrograph Report

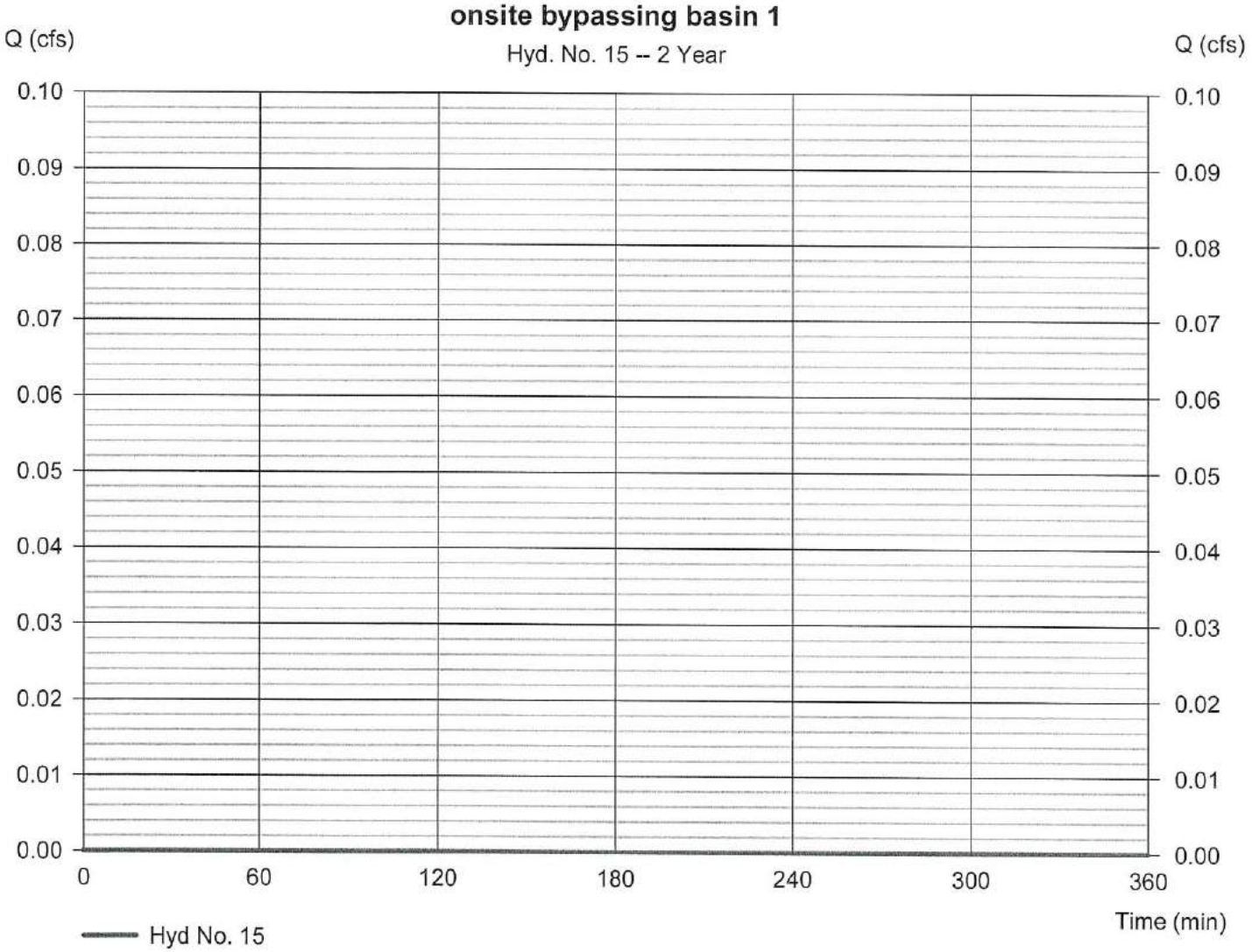
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 15

onsite bypassing basin 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 6 min	Hyd. volume	= 0 cuft
Drainage area	= 3.400 ac	Curve number	= 32*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.20 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285

* Composite (Area/CN) = [(3.170 x 30) + (0.060 x 39)] / 3.400



TR55 Tc Worksheet

Hyd. No. 15

onsite bypassing basin 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.40		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 20.83**	**+**	**0.00**	**+**	**0.00**	**=**	**20.83**
Shallow Concentrated Flow							
Flow length (ft)	= 900.00		0.00		0.00		
Watercourse slope (%)	= 0.80		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.44		0.00		0.00		
Travel Time (min)	**= 10.39**	**+**	**0.00**	**+**	**0.00**	**=**	**10.39**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 31.20 min

Hydrograph Report

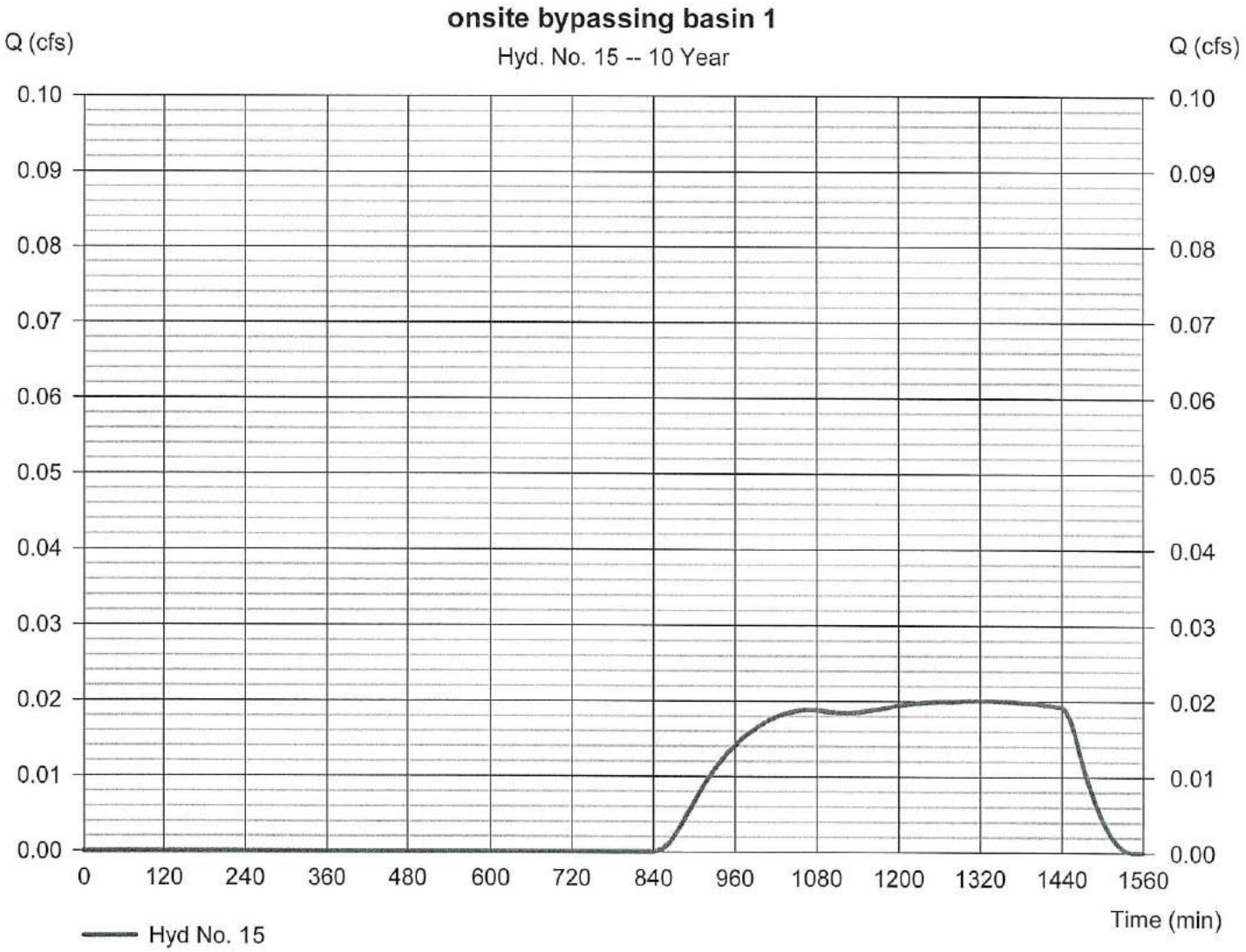
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 15

onsite bypassing basin 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.020 cfs
Storm frequency	= 10 yrs	Time to peak	= 1314 min
Time interval	= 6 min	Hyd. volume	= 641 cuft
Drainage area	= 3.400 ac	Curve number	= 32*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.20 min
Total precip.	= 5.33 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285

* Composite (Area/CN) = [(3.170 x 30) + (0.060 x 39)] / 3.400



Hydrograph Report

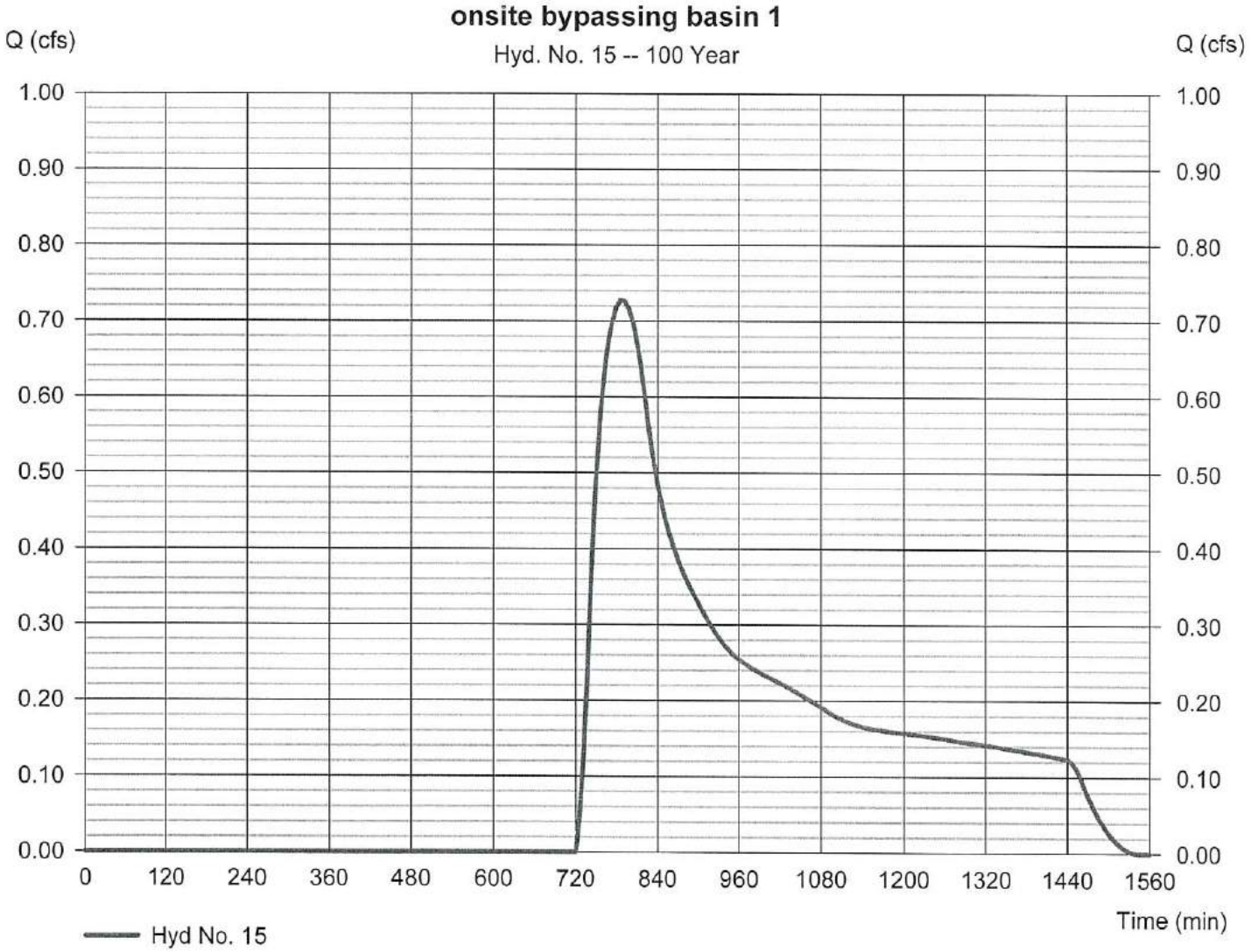
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 15

onsite bypassing basin 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.727 cfs
Storm frequency	= 100 yrs	Time to peak	= 786 min
Time interval	= 6 min	Hyd. volume	= 11,455 cuft
Drainage area	= 3.400 ac	Curve number	= 32*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.20 min
Total precip.	= 9.20 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285

* Composite (Area/CN) = [(3.170 x 30) + (0.060 x 39)] / 3.400



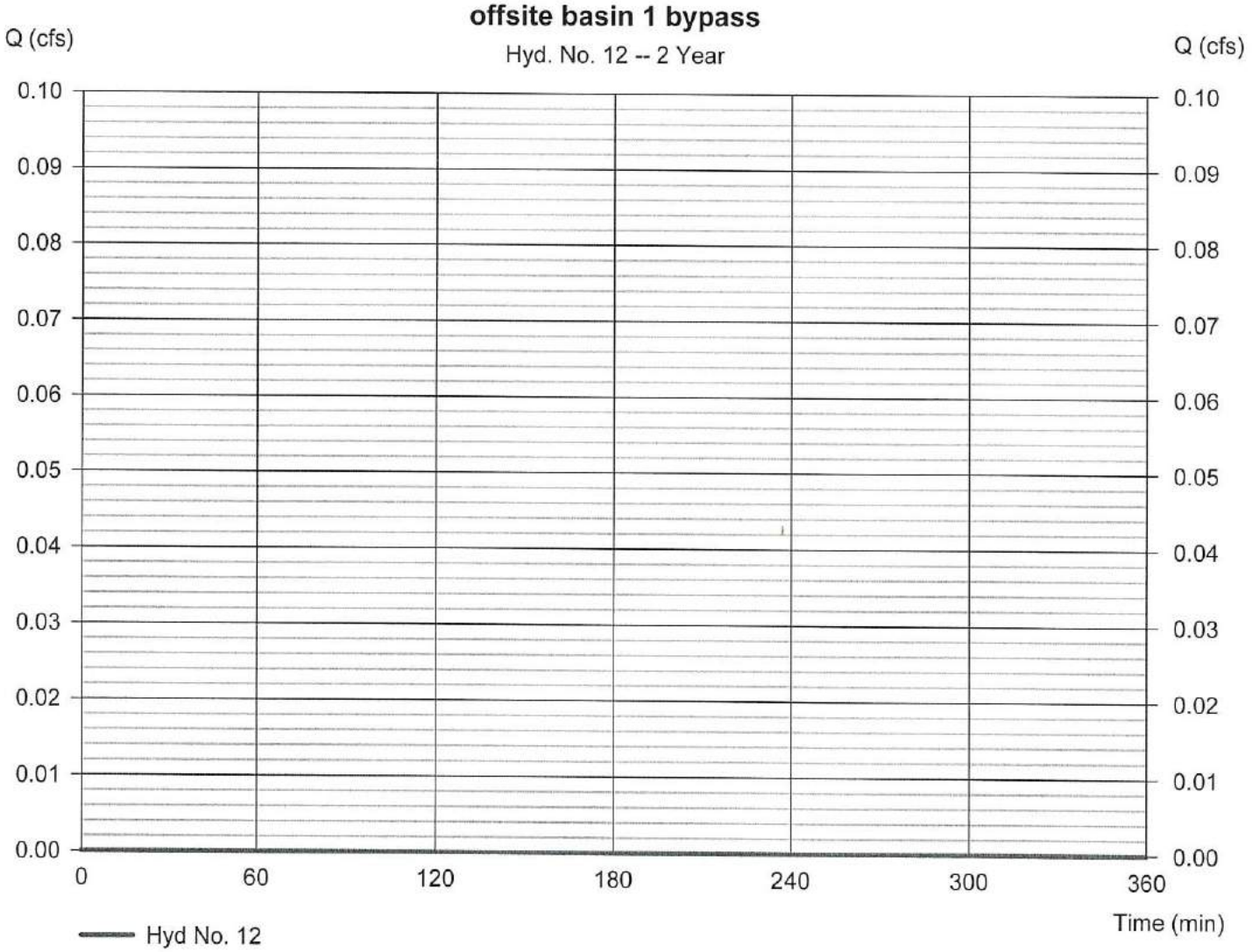
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 12

offsite basin 1 bypass

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 6 min	Hyd. volume	= 0 cuft
Drainage area	= 3.840 ac	Curve number	= 32
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 81.60 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285



TR55 Tc Worksheet

Hyd. No. 12

offsite basin 1 bypass

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.40		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 15.79**	**+**	**0.00**	**+**	**0.00**	**=**	**15.79**
Shallow Concentrated Flow							
Flow length (ft)	= 7433.00		0.00		0.00		
Watercourse slope (%)	= 1.36		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.88		0.00		0.00		
Travel Time (min)	**= 65.84**	**+**	**0.00**	**+**	**0.00**	**=**	**65.84**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 81.60 min

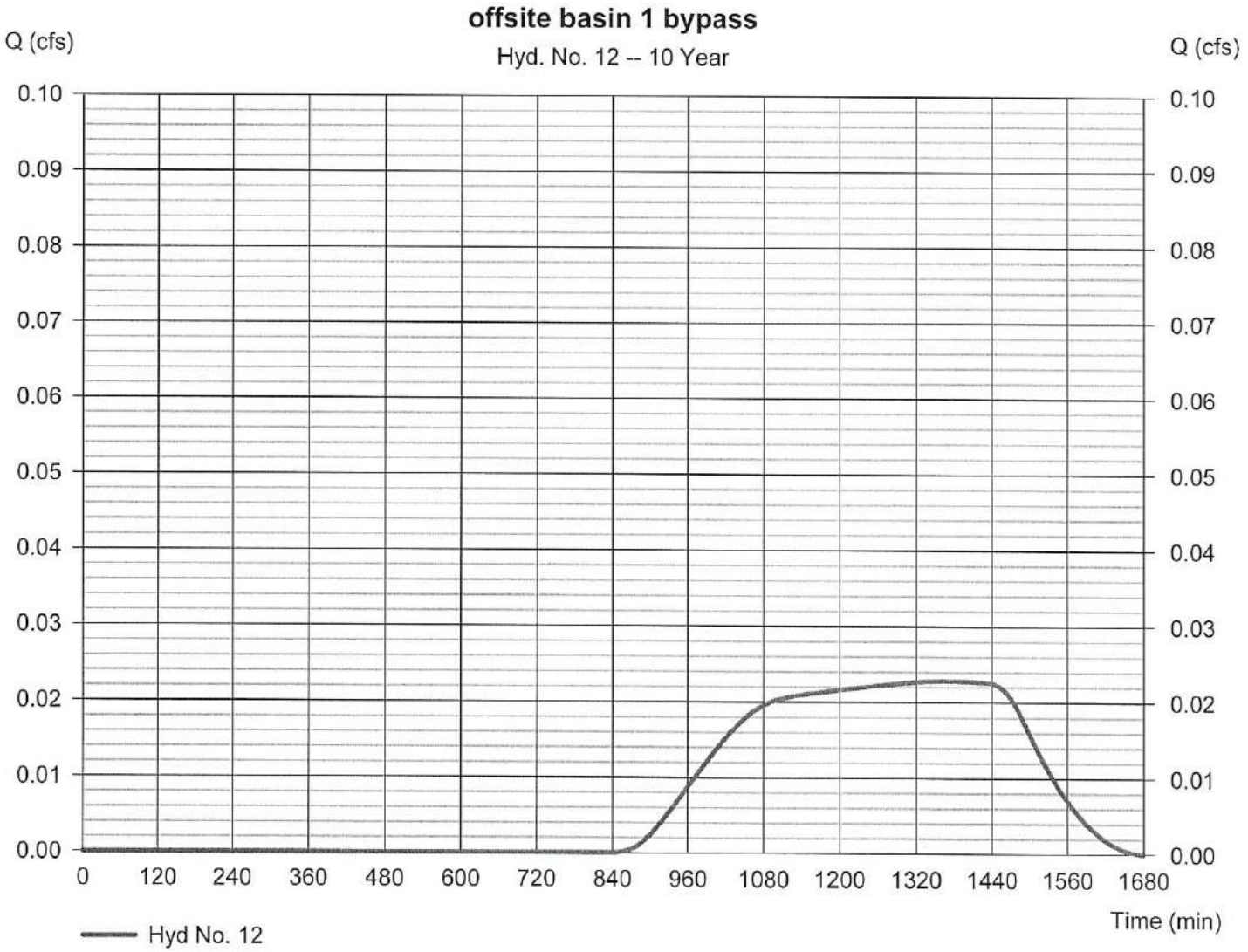
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 12

offsite basin 1 bypass

Hydrograph type	= SCS Runoff	Peak discharge	= 0.023 cfs
Storm frequency	= 10 yrs	Time to peak	= 1362 min
Time interval	= 6 min	Hyd. volume	= 732 cuft
Drainage area	= 3.840 ac	Curve number	= 32
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 81.60 min
Total precip.	= 5.33 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285



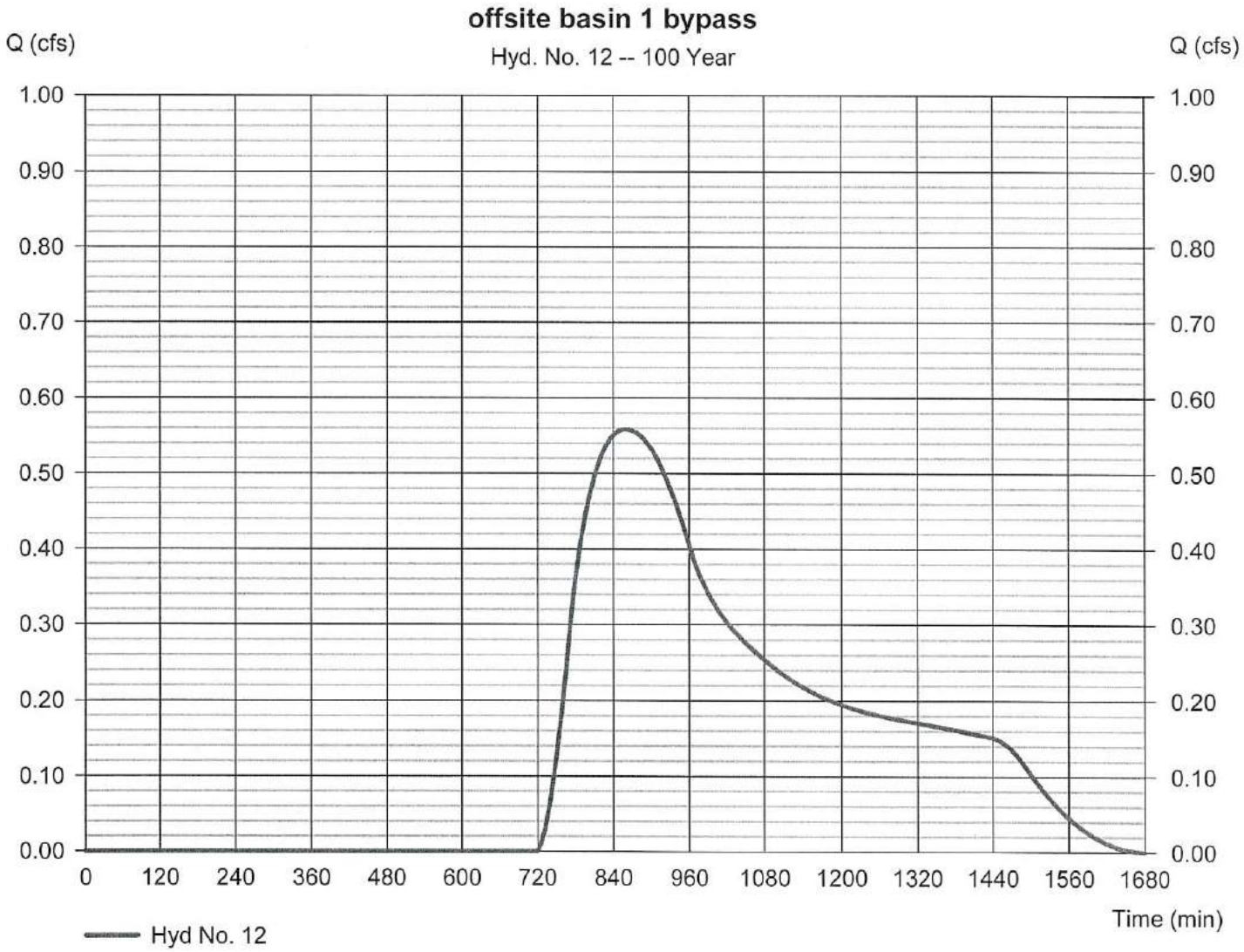
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 12

offsite basin 1 bypass

Hydrograph type	= SCS Runoff	Peak discharge	= 0.558 cfs
Storm frequency	= 100 yrs	Time to peak	= 858 min
Time interval	= 6 min	Hyd. volume	= 13,097 cuft
Drainage area	= 3.840 ac	Curve number	= 32
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 81.60 min
Total precip.	= 9.20 in	Distribution	= Custom
Storm duration	= U:\NOAA_D.cds	Shape factor	= 285



DEVELOPED TOTAL

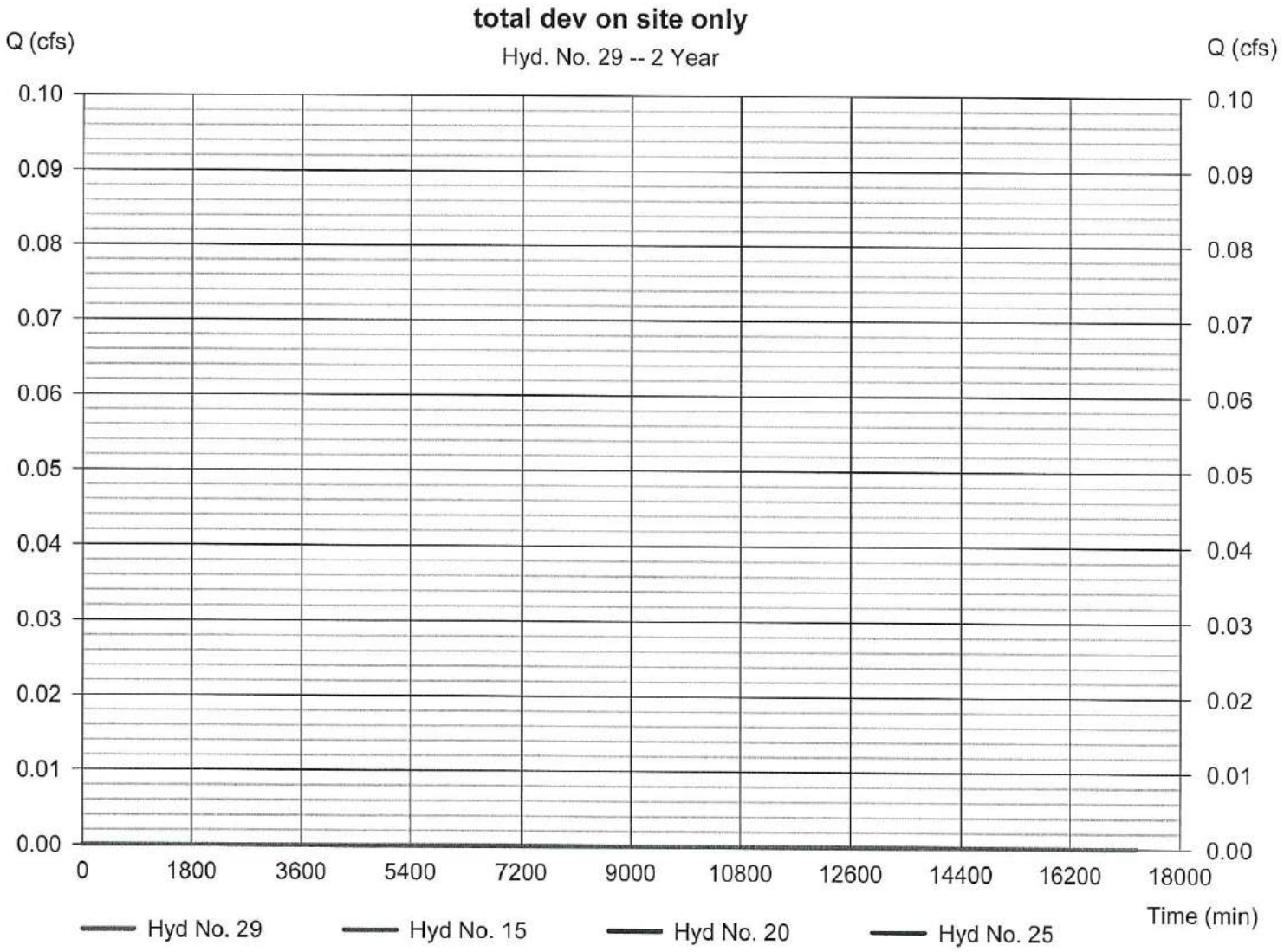
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 29

total dev on site only

Hydrograph type	= Combine	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 834 min
Time interval	= 6 min	Hyd. volume	= 0 cuft
Inflow hyds.	= 15, 20, 25	Contrib. drain. area	= 3.400 ac



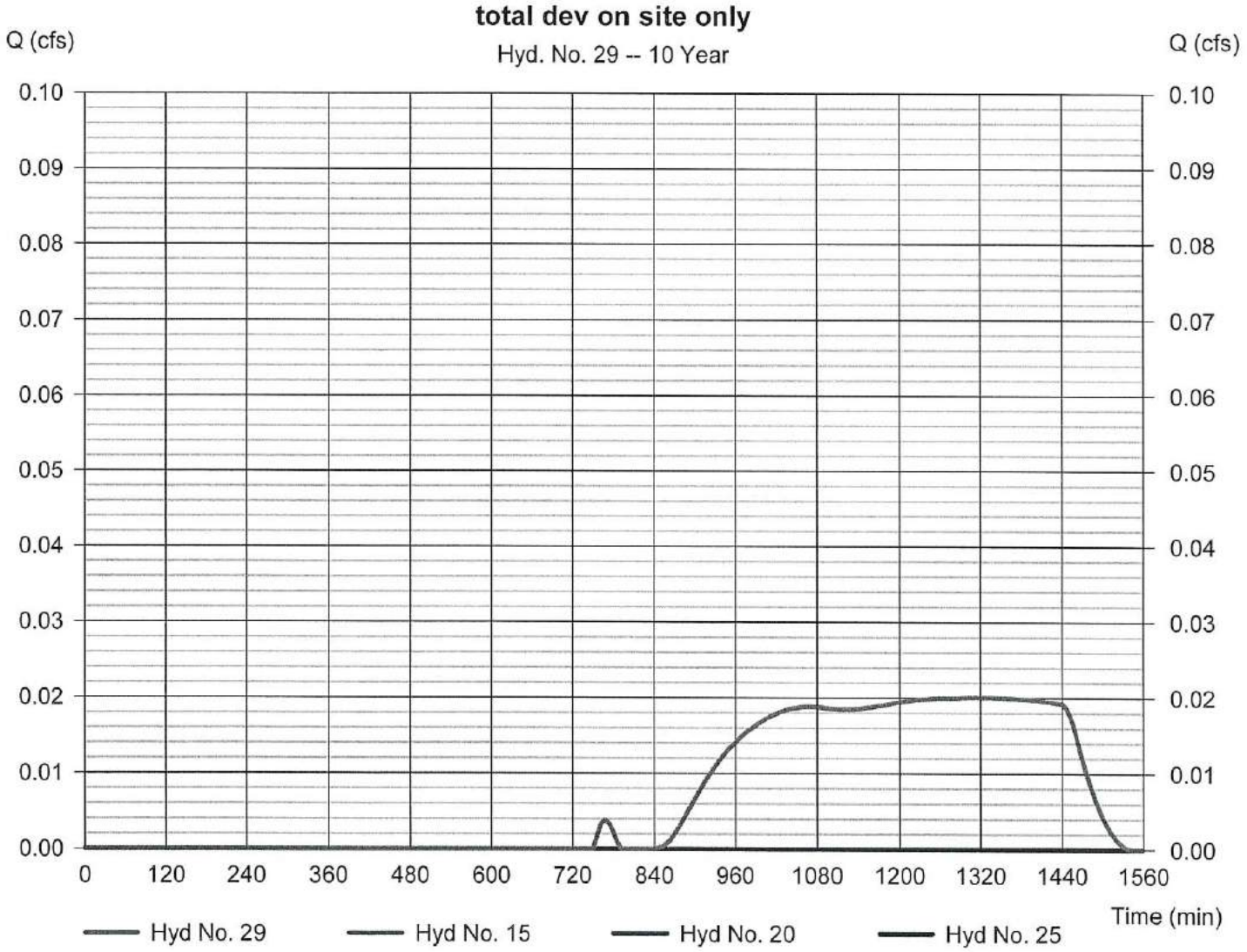
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 29

total dev on site only

Hydrograph type	= Combine	Peak discharge	= 0.020 cfs
Storm frequency	= 10 yrs	Time to peak	= 1314 min
Time interval	= 6 min	Hyd. volume	= 646 cuft
Inflow hyds.	= 15, 20, 25	Contrib. drain. area	= 3.400 ac



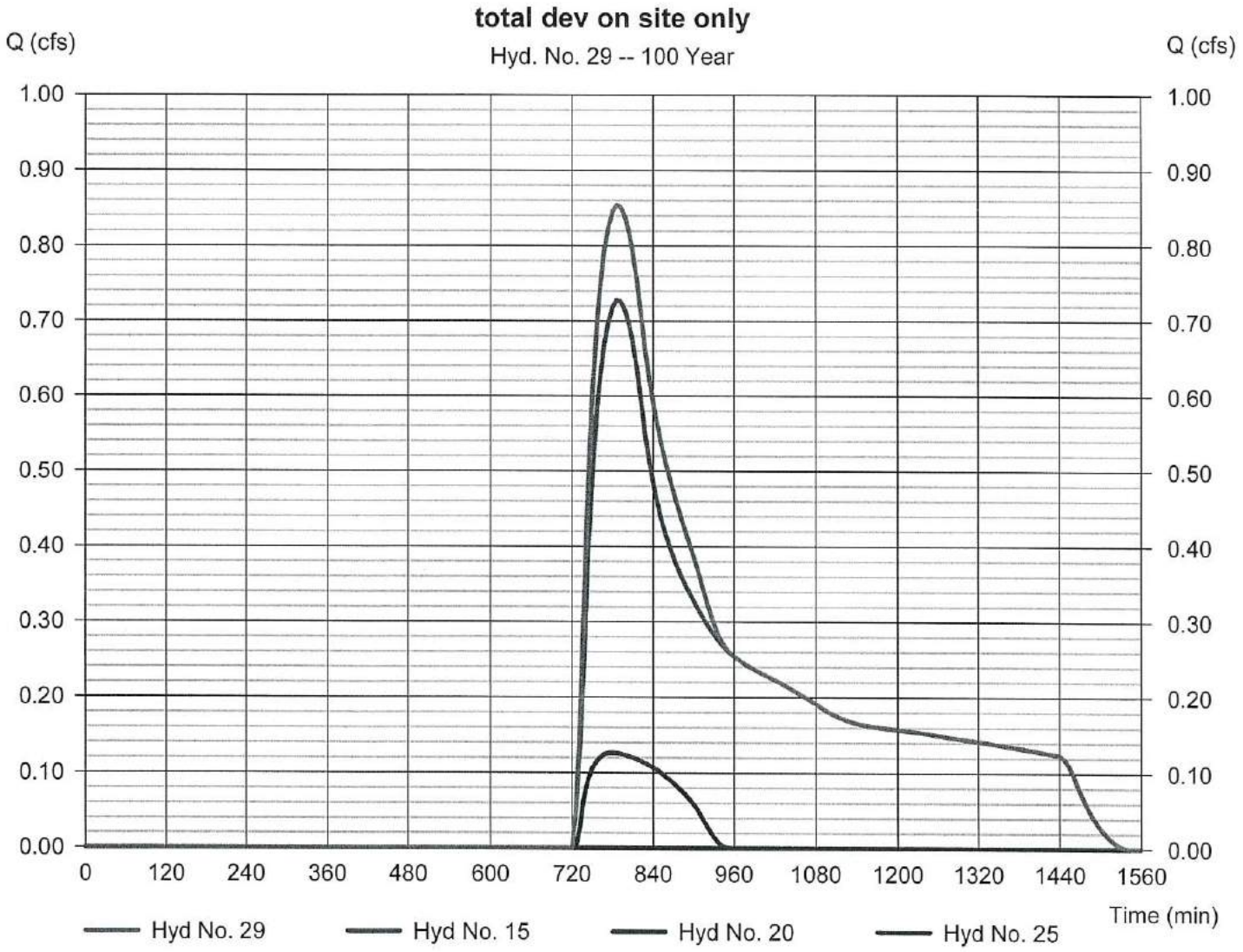
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 29

total dev on site only

Hydrograph type	= Combine	Peak discharge	= 0.854 cfs
Storm frequency	= 100 yrs	Time to peak	= 786 min
Time interval	= 6 min	Hyd. volume	= 12,569 cuft
Inflow hyds.	= 15, 20, 25	Contrib. drain. area	= 3.400 ac



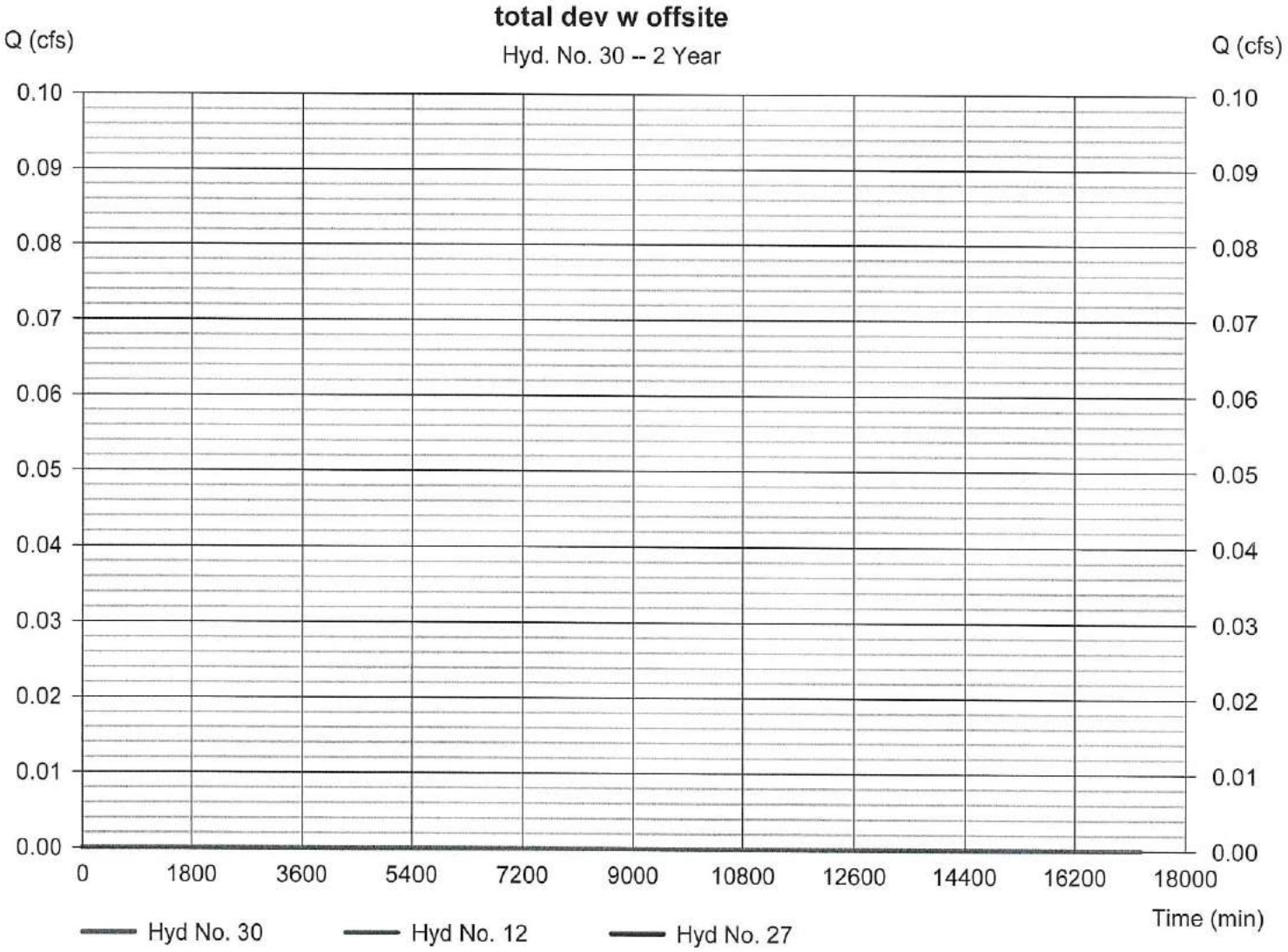
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 30

total dev w offsite

Hydrograph type	= Combine	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 798 min
Time interval	= 6 min	Hyd. volume	= 0 cuft
Inflow hyds.	= 12, 27	Contrib. drain. area	= 3.840 ac



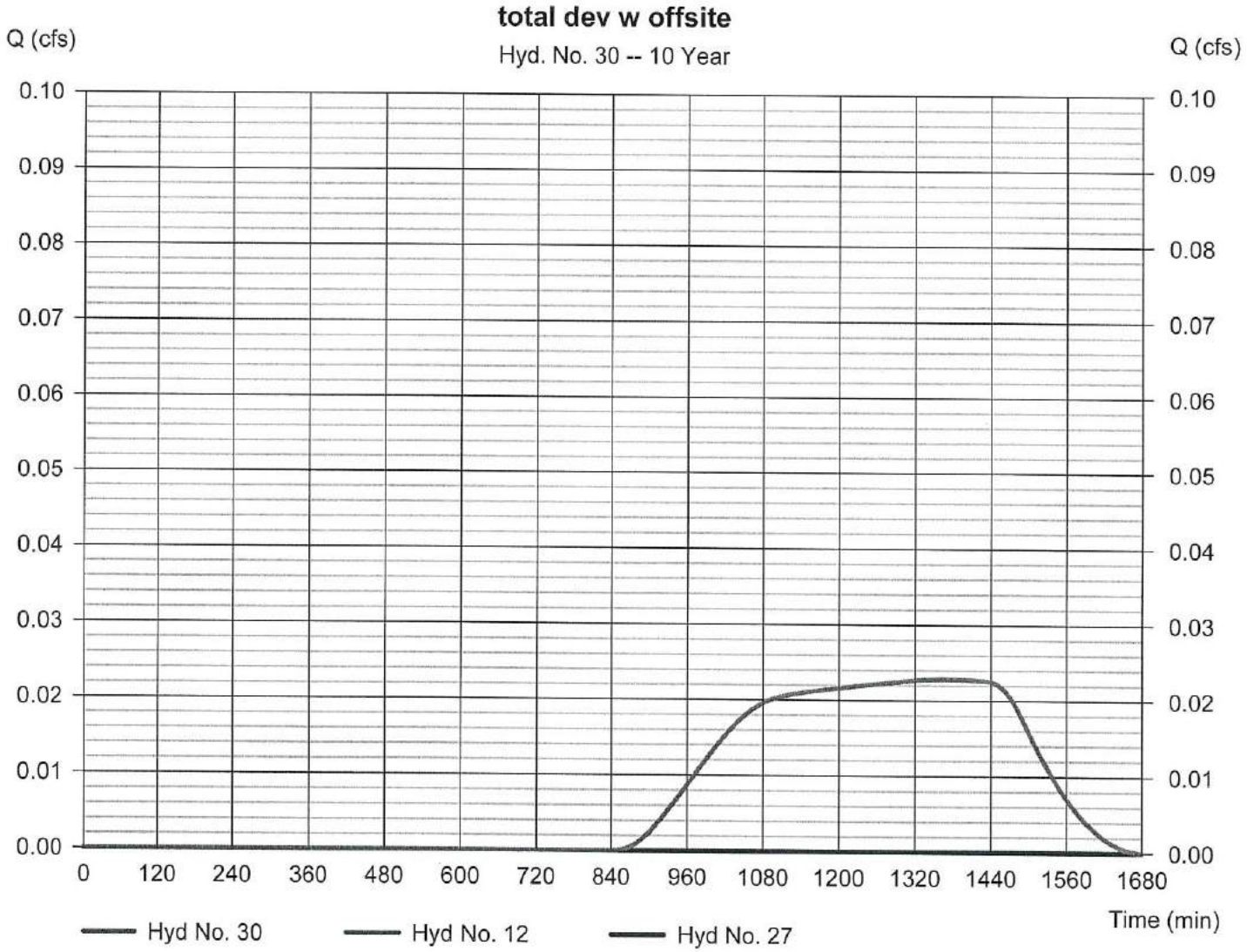
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 30

total dev w offsite

Hydrograph type	= Combine	Peak discharge	= 0.023 cfs
Storm frequency	= 10 yrs	Time to peak	= 1362 min
Time interval	= 6 min	Hyd. volume	= 732 cuft
Inflow hyds.	= 12, 27	Contrib. drain. area	= 3.840 ac



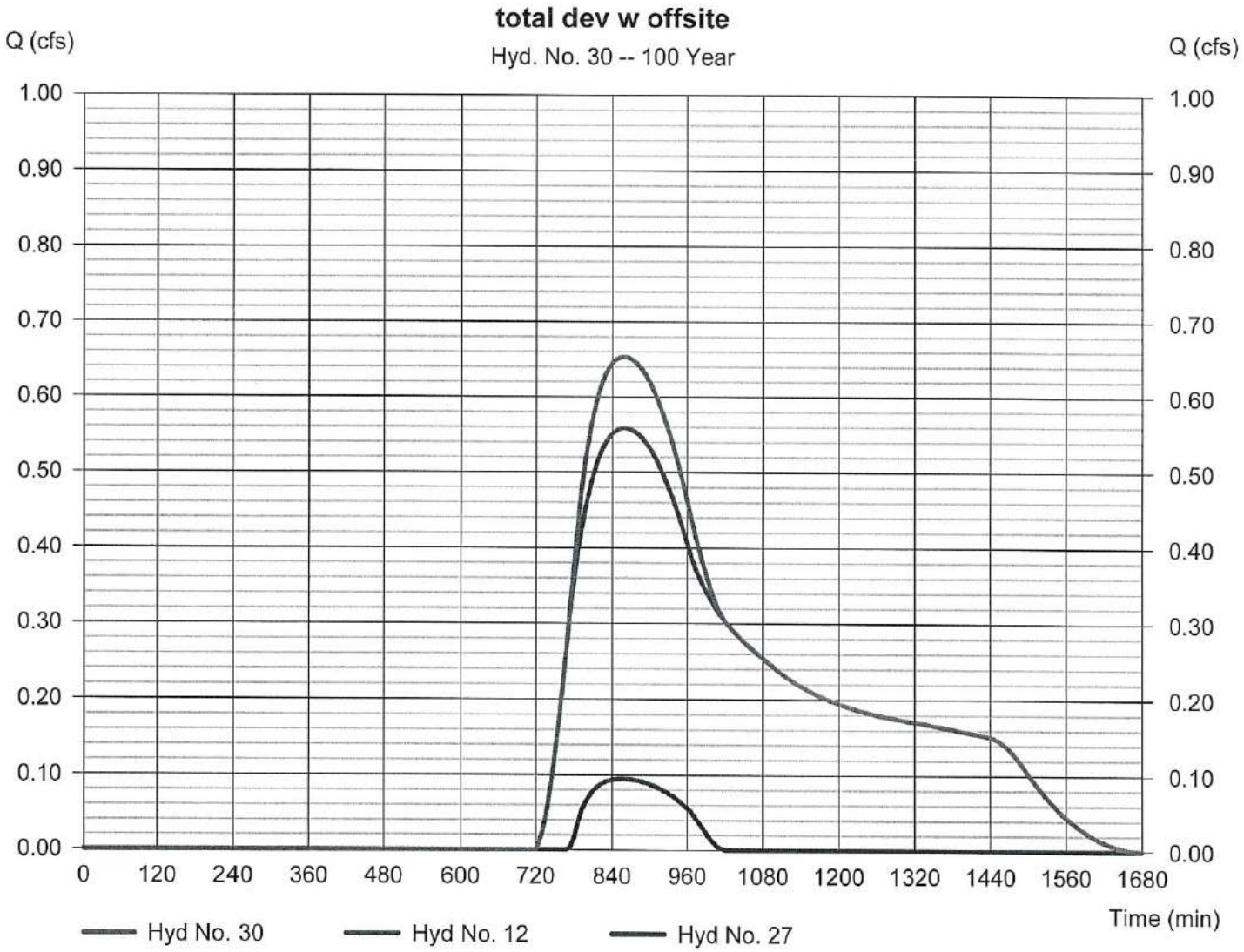
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 30

total dev w offsite

Hydrograph type	= Combine	Peak discharge	= 0.653 cfs
Storm frequency	= 100 yrs	Time to peak	= 858 min
Time interval	= 6 min	Hyd. volume	= 14,048 cuft
Inflow hyds.	= 12, 27	Contrib. drain. area	= 3.840 ac



SECTION 2-IV
WATER QUALITY CALCUALTIONS

Hydrograph Report

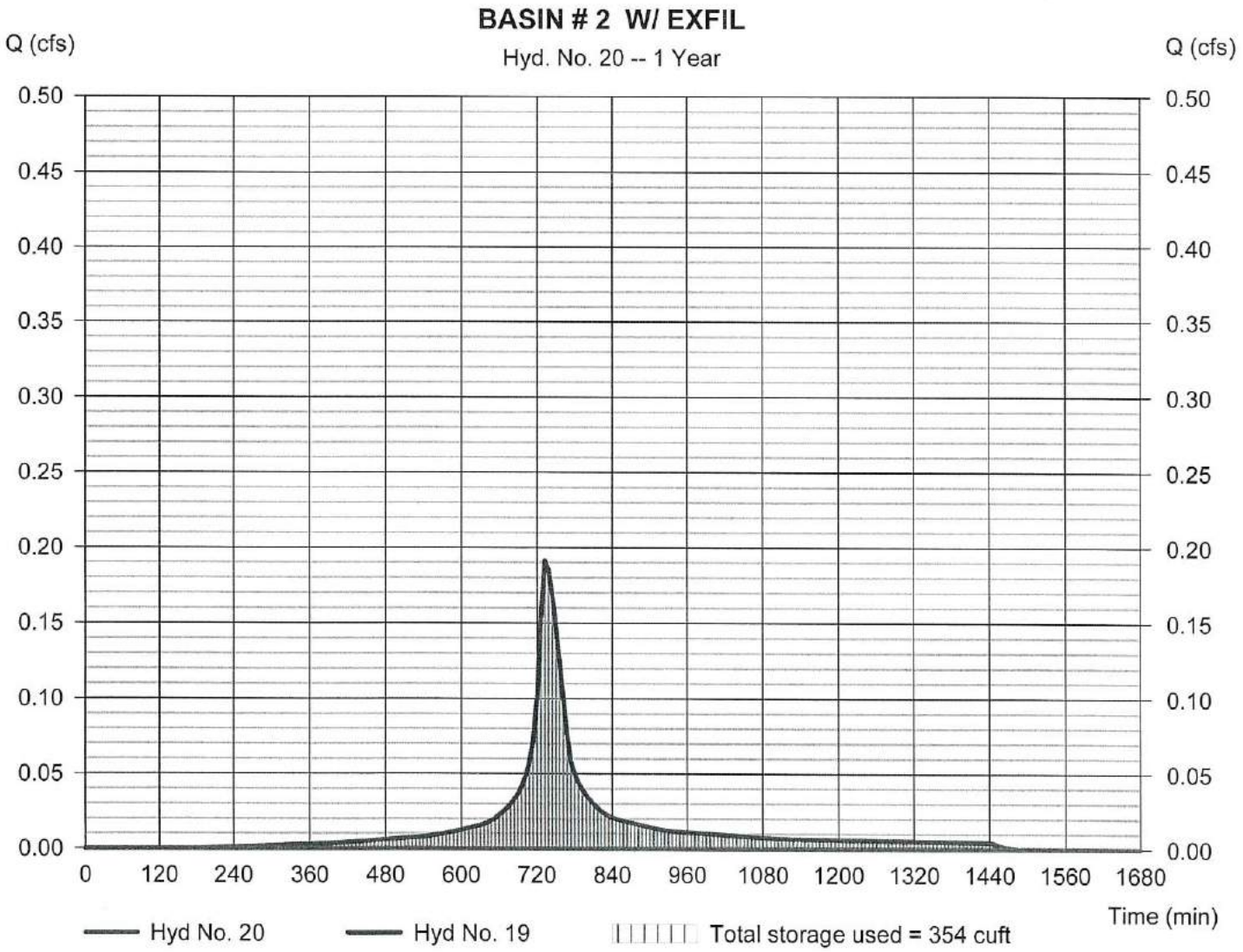
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 20

BASIN # 2 W/ EXFIL

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 6 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 19 - TOTAL TO BASIN #2	Max. Elevation	= 75.11 ft
Reservoir name	= BASIN # 2	Max. Storage	= 354 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Pond No. 9 - BASIN # 2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 75.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	75.00	3,053	0	0
0.50	75.50	3,598	1,661	1,661
1.00	76.00	4,142	1,933	3,594
2.00	77.00	5,358	4,737	8,330

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	2.50	0.00	0.00
Span (in)	= 15.00	2.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 75.00	75.50	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .010	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	Inactive	0.00	0.00	0.00
Crest El. (ft)	= 76.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Ciplti	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 5.000 (by Contour)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	75.00	0.00	0.00	---	---	0.00	---	---	---	0.000	---	0.000
0.50	1,661	75.50	0.00	0.00	---	---	0.00	---	---	---	0.416	---	0.416
1.00	3,594	76.00	0.00	0.10 ic	---	---	0.00	---	---	---	0.479	---	0.583
2.00	8,330	77.00	0.00	0.19 ic	---	---	0.00	---	---	---	0.620	---	0.814

Hydrograph Report

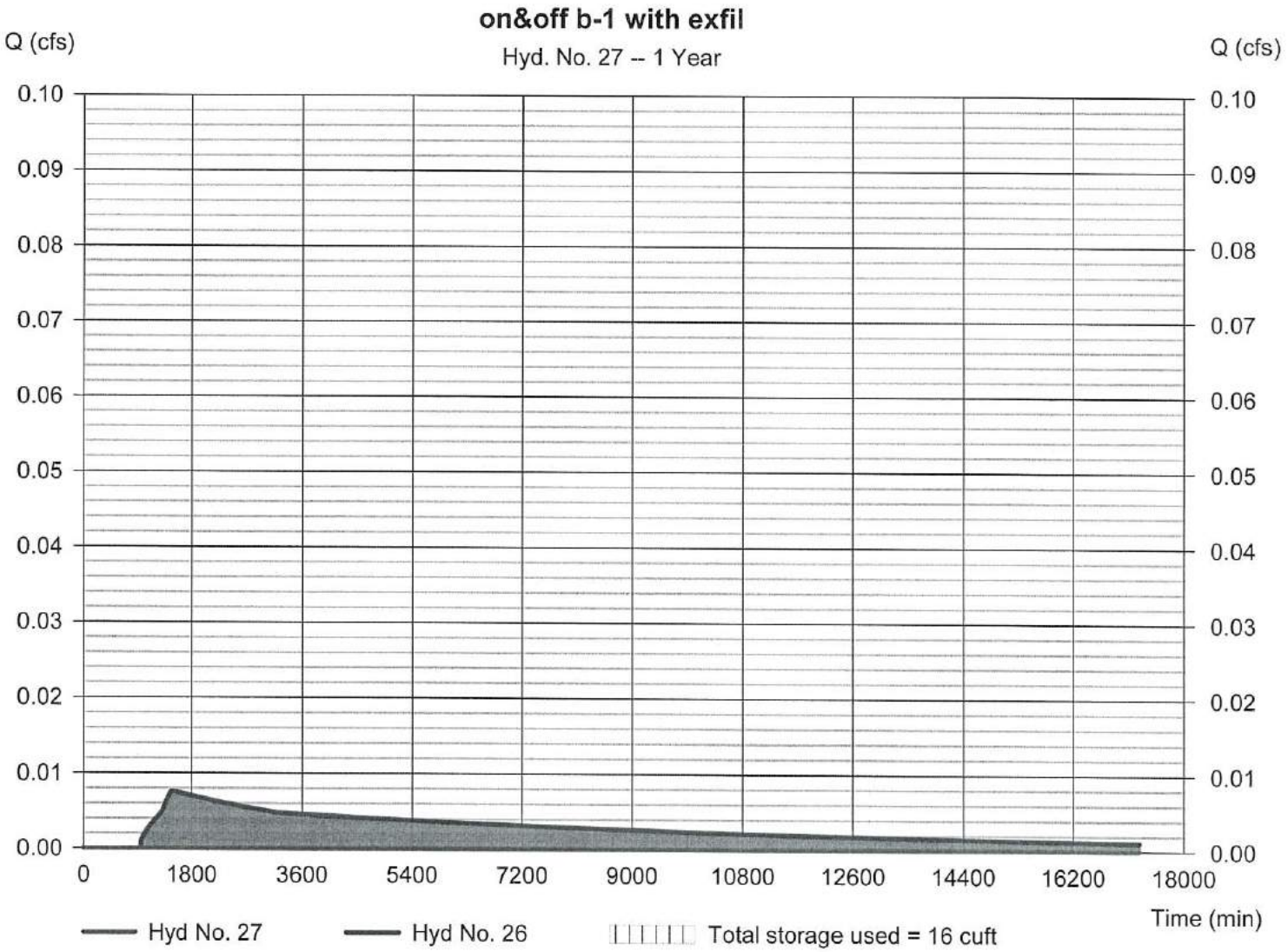
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 27

on&off b-1 with exfil

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 1236 min
Time interval	= 6 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 26 - on&off to b-1 no exfil	Max. Elevation	= 72.25 ft
Reservoir name	= infiltration basin 1	Max. Storage	= 16 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Pond No. 1 - infiltration basin 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 72.25 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	72.25	54,580	0	0
0.25	72.50	54,878	13,681	13,681
0.75	73.00	55,473	27,585	41,266
1.25	73.50	57,270	28,182	69,447
1.75	74.00	59,081	29,084	98,531
2.25	74.50	60,907	29,993	128,524
2.75	75.00	62,745	30,909	159,433
3.25	75.50	65,841	32,140	191,573

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	2.50	0.00	0.00
Span (in)	= 12.00	2.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 72.13	72.50	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .010	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 20.00	16.00	0.00	0.00
Crest El. (ft)	= 73.75	73.50	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	Rect	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 5.000 (by Contour)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	72.25	0.00	0.00	---	---	0.00	0.00	---	---	0.000	---	0.000
0.25	13,681	72.50	0.00	0.00	---	---	0.00	0.00	---	---	6.352	---	6.352
0.75	41,266	73.00	0.00	0.10 ic	---	---	0.00	0.00	---	---	6.420	---	6.524
1.25	69,447	73.50	0.00	0.16 ic	---	---	0.00	0.00	---	---	6.628	---	6.784
1.75	98,531	74.00	0.00	0.19 ic	---	---	6.50	18.84	---	---	6.838	---	32.37
2.25	128,524	74.50	0.00	0.23 ic	---	---	33.77	53.28	---	---	7.049	---	94.33
2.75	159,433	75.00	0.00	0.25 ic	---	---	72.67	97.88	---	---	7.262	---	178.07
3.25	191,573	75.50	0.00	0.28 ic	---	---	120.38	150.70	---	---	7.620	---	278.98

SECTION 2-V
SOIL EROSION & SEDIMENT CONTROL CALCULATIONS

10 YR EVENT FAILURE ANALYSIS

Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Pond No. 3 - scs stability basin 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 73.75 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	73.75	57,270	0	0
0.25	74.00	59,081	14,542	14,542
1.00	74.50	60,907	44,989	59,531
1.50	75.00	62,745	30,909	90,440
2.00	75.50	65,841	32,140	122,580

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.50	0.00	0.00
Span (in)	= 12.00	2.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 72.13	72.28	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .010	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 20.00	16.00	0.00	0.00
Crest El. (ft)	= 73.75	73.75	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	Rect	---	---
Multi-Stage	= No	No	No	No

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

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	73.75	3.98 oc	0.19 ic	---	---	0.00	0.00	---	---	---	---	4.168
0.25	14,542	74.00	4.43 ic	0.21 ic	---	---	6.50	6.66	---	---	---	---	17.79
1.00	59,531	74.50	5.17 ic	0.24 ic	---	---	33.77	34.61	---	---	---	---	73.79
1.50	90,440	75.00	5.82 ic	0.27 ic	---	---	72.67	74.46	---	---	---	---	153.22
2.00	122,580	75.50	6.41 ic	0.29 ic	---	---	120.38	123.34	---	---	---	---	250.42

Hydrograph Report

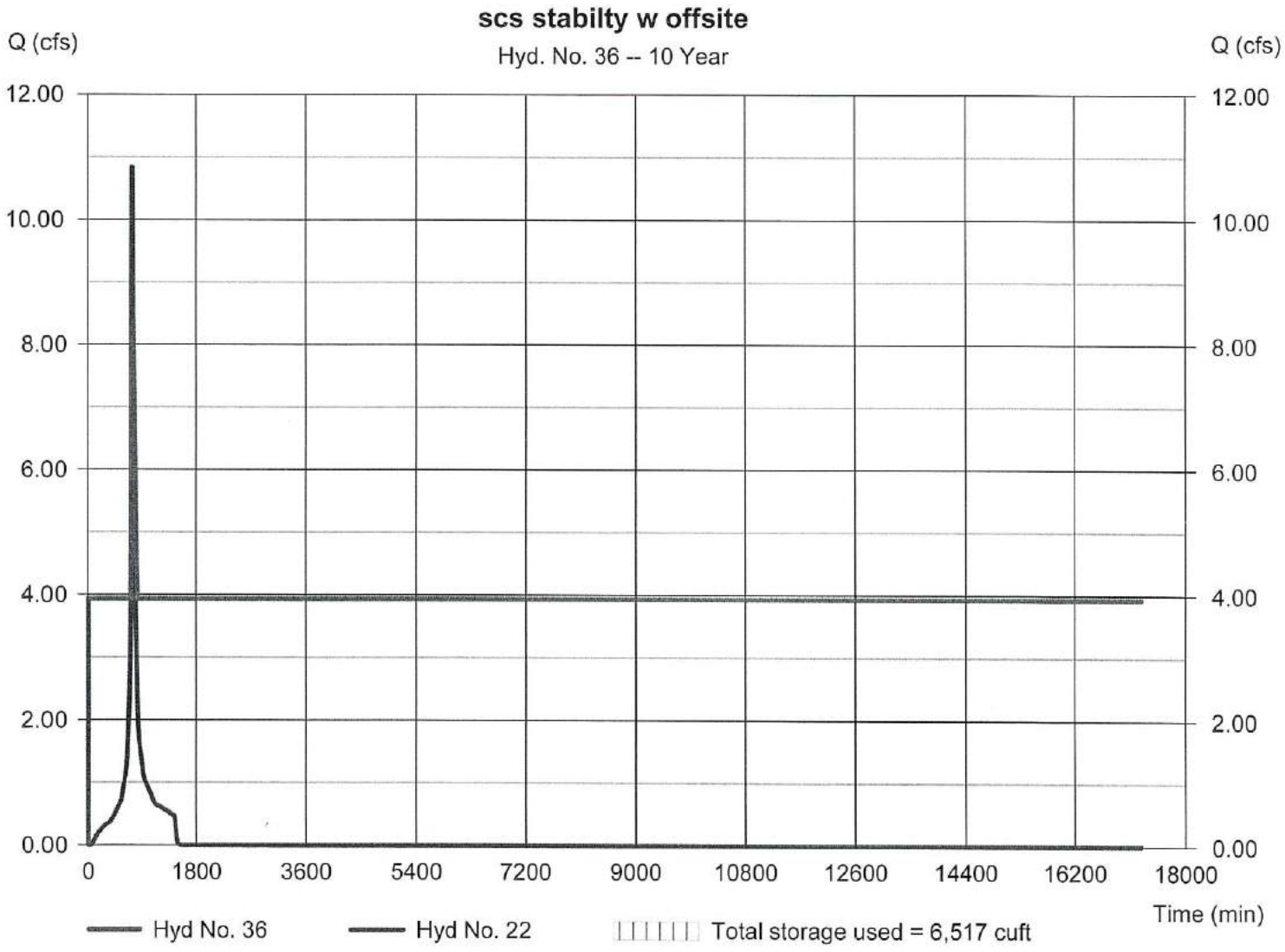
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 36

scs stabilty w offsite

Hydrograph type	= Reservoir	Peak discharge	= 8.363 cfs
Storm frequency	= 10 yrs	Time to peak	= 756 min
Time interval	= 6 min	Hyd. volume	= 4,088,425 cuft
Inflow hyd. No.	= 22 - total to basin1 w offsite	Max. Elevation	= 73.86 ft
Reservoir name	= scs stability basin 1	Max. Storage	= 6,517 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Pond No. 10 - basin 2 scs

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 76.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	76.00	4,142	0	0
1.00	77.00	5,358	4,737	4,737

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.50	0.00	0.00
Span (in)	= 15.00	2.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 75.00	75.14	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	16.00	0.00	0.00
Crest El. (ft)	= 0.00	76.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	Rect	---	---
Multi-Stage	= No	No	No	No

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

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	76.00	1.46 oc	0.14 ic	---	---	---	0.00	---	---	---	---	1.601
1.00	4,737	77.00	6.70 oc	0.22 ic	---	---	---	53.28	---	---	---	---	60.19

Hydrograph Report

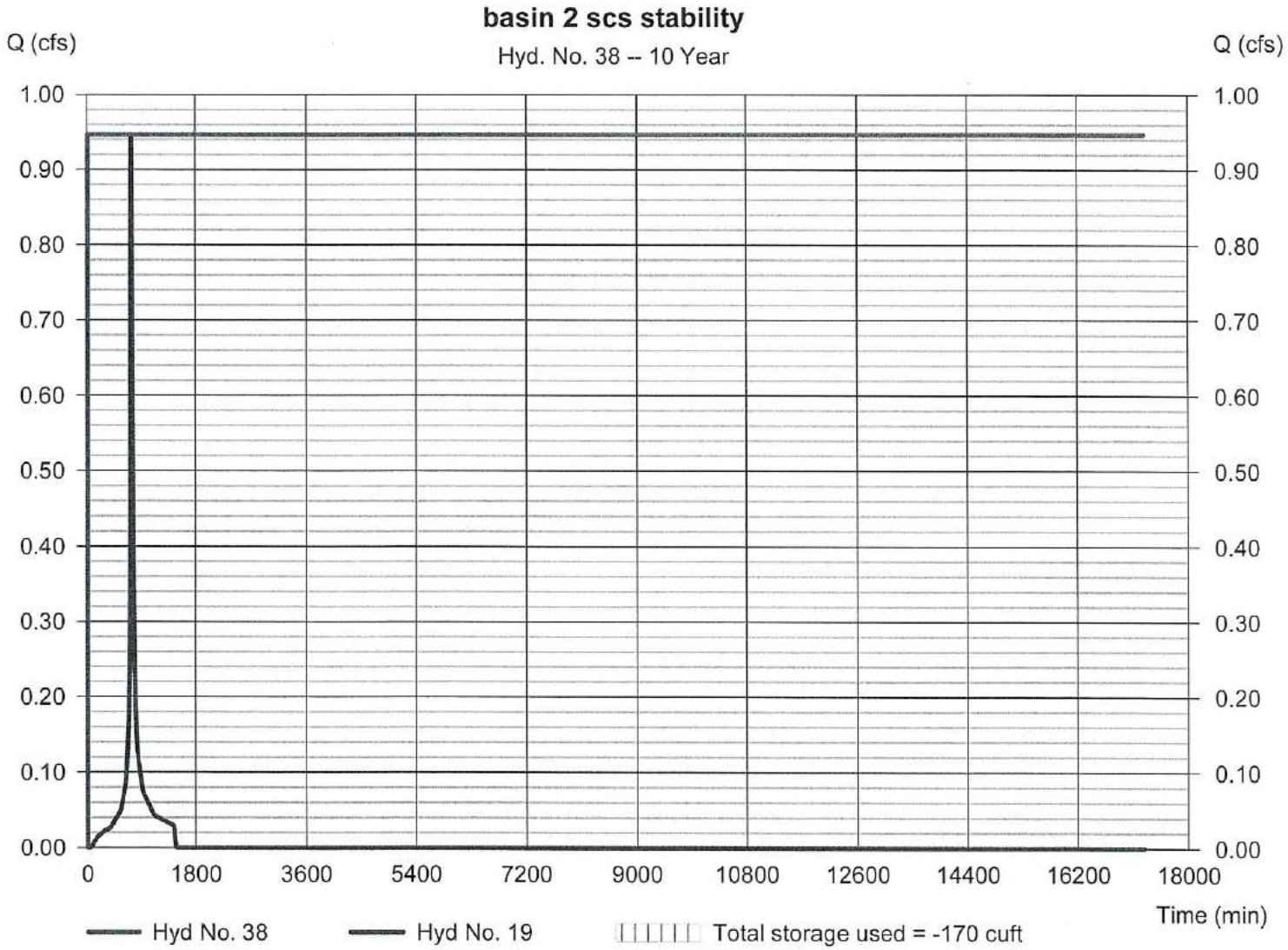
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 38

basin 2 scs stability

Hydrograph type	= Reservoir	Peak discharge	= 0.947 cfs
Storm frequency	= 10 yrs	Time to peak	= 6 min
Time interval	= 6 min	Hyd. volume	= 981,588 cuft
Inflow hyd. No.	= 19 - TOTAL TO BASIN #2	Max. Elevation	= 76.00 ft
Reservoir name	= basin 2 scs	Max. Storage	= -170 cuft

Storage Indication method used.



Date: 5/20/2021
Project: Spring Hill
Project No: 19119.00

Calculated By: TRP
Checked By: TRP

Conduit Outlet Protection Calculations

Rip Rap Pad # R-1A

Design Parameters:

Design Storm Flow for 25 Year, Q	1.38 cfs
Vertical Dimension of Outlet Pipe, D_o	12 in
Horizontal Dimension of Outlet Pipe, W_o	12 in
Tailwater Depth, TW[1]	0.14 ft

Apron Dimension Calculations:

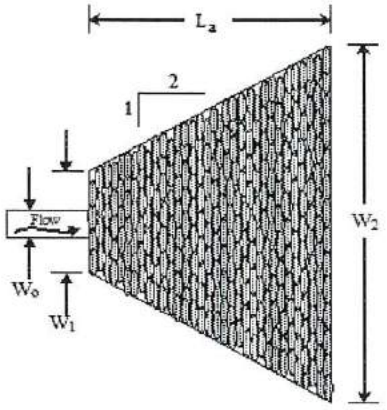
Unit Dicharge, $q = Q/D_o$ = 1.38 cfs per foot

- **Case I:** $TW < \backslash D_o$

  Apron Length, $L_a = \frac{1.8q}{D_o^{1/2}} + 7D_o$ = 9.48 ft or **L_a = 10 ft**

  Width, $W_1 = 3W_o$ = 3. ft or **W_1 = 6 ft**

  Width, $W_2 = 3W_o + L_a$ = 12.48 ft or **W_2 = 13 ft**

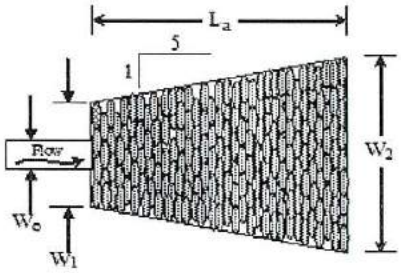


- **Case II:** $TW \geq \backslash D_o$

  Apron Length, $L_a = \frac{3q}{D_o^{1/2}}$ = **L_a =**

  Width, $W_1 = 3W_o$ = **W_1 =**

  Width, $W_2 = 3W_o + 0.4L_a$ = **W_2 =**



Rip Rap Stone Size Calculations:

Median Stone, $d_{50} = \frac{0.02q1.33}{TW}$ = 1.52 in Therefore, use **d_{50} = 6 in**

Notes:

1. Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the structural lining shall extend at least one foot above the tailwater elevation, but no lower than two-thirds of the vertical conduit dimension above the conduit invert.
2. The side slopes shall be 2:1 or flatter.
3. The bottom grade shall be 0.0% (level).
4. There shall be no overfall at the end of the apron or at the end of the culvert.
5. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
6. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
7. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
8. No bends or curves at the intersection of the conduit and apron will be permitted.

Footnote:

1. Tailwater depth shall be the 2 year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.

2. For multiple pipes, increase rip-rap sizes by 25% when pipe spacing is greater than or equal to $1/4W_o$.

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EMAIL: osainc@verizon.net

Date: 12/24/2019
Project: Spring Hill
Project No: 19119.00

Calculated By: TRP
Checked By: TRP

Conduit Outlet Protection Calculations

Rip Rap Pad # B

Design Parameters:

Design Storm Flow for 25 Year, Q	16.11 cfs
Vertical Dimension of Outlet Pipe, D_o	24 in
Horizontal Dimension of Outlet Pipe, W_o	24 in
Tailwater Depth, TW[1]	0.71 ft

Apron Dimension Calculations:

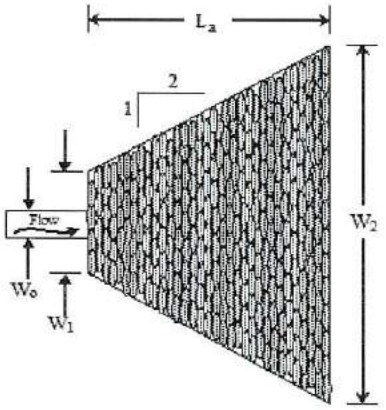
Unit Dicharge, $q = Q/D_o$ = 8.06 cfs per foot

- **Case I:** $TW < \backslash D_o$

  Apron Length, $L_a = \frac{1.8q}{D_o^{1/2}} + 7D_o$ = 24.25 ft or **L_a = 25 ft**

  Width, $W_1 = 3W_o$ = 6. ft or **W_1 = 6 ft**

  Width, $W_2 = 3W_o + L_a$ = 30.25 ft or **W_2 = 31 ft**

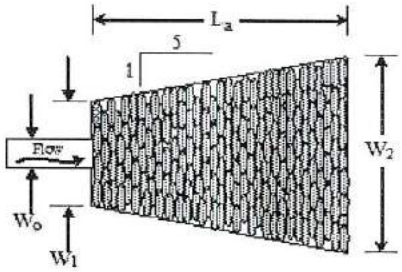


- **Case II:** $TW \geq \backslash D_o$

  Apron Length, $L_a = \frac{3q}{D_o^{1/2}}$ = **L_a =**

  Width, $W_1 = 3W_o$ = **W_1 =**

  Width, $W_2 = 3W_o + 0.4L_a$ = **W_2 =**



Rip Rap Stone Size Calculations:

Median Stone, $d_{50} = \frac{0.02q1.33}{TW}$ = 3.14 in Therefore, use **d_{50} = 6 in**

Notes:

1. Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the structural lining shall extend at least one foot above the tailwater elevation, but no lower than two-thirds of the vertical conduit dimension above the conduit invert.
2. The side slopes shall be 2:1 or flatter.
3. The bottom grade shall be 0.0% (level).
4. There shall be no overfall at the end of the apron or at the end of the culvert.
5. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
6. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
7. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
8. No bends or curves at the intersection of the conduit and apron will be permitted.

Footnote:

1. Tailwater depth shall be the 2 year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.

2. For multiple pipes, increase rip-rap sizes by 25% when pipe spacing is greater than or equal to $1/4W_o$.

Date: 9/8/2021
Project: Spring Hill
Project No: 19119.00

Calculated By: TRP
Checked By: TRP

Conduit Outlet Protection Calculations

Rip Rap Pad # 13A

Design Parameters:

Design Storm Flow for 25 Year, Q	3.60 cfs
Vertical Dimension of Outlet Pipe, D_o	15 in
Horizontal Dimension of Outlet Pipe, W_o	15 in
Tailwater Depth, TW[1]	0.32 ft

Apron Dimension Calculations:

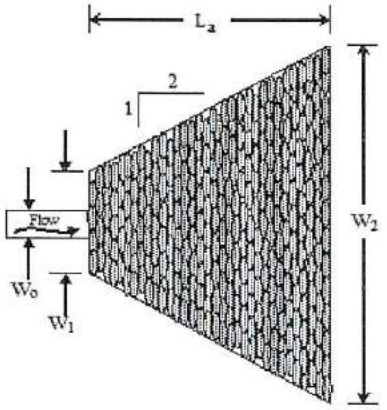
Unit Dicharge, $q = Q/D_o$ = 2.88 cfs per foot

- **Case I:** $TW < \backslash D_o$

  Apron Length, $L_a = \frac{1.8q}{D_o^{1/2}} + 7D_o$ = 13.39 ft or **L_a = 14 ft**

  Width, $W_1 = 3W_o$ = 3.75 ft or **W_1 = 6 ft**

  Width, $W_2 = 3W_o + L_a$ = 17.14 ft or **W_2 = 18 ft**

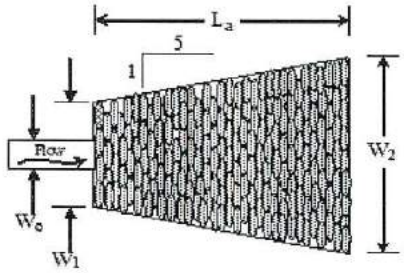


- **Case II:** $TW \geq \backslash D_o$

  Apron Length, $L_a = \frac{3q}{D_o^{1/2}}$ = **L_a =**

  Width, $W_1 = 3W_o$ = **W_1 =**

  Width, $W_2 = 3W_o + 0.4L_a$ = **W_2 =**



Rip Rap Stone Size Calculations:

Median Stone, $d_{50} = \frac{0.02q1.33}{TW}$ = 1.78 in Therefore, use **d_{50} = 6 in**

Notes:

1. Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the structural lining shall extend at least one foot above the tailwater elevation, but no lower than two-thirds of the vertical conduit dimension above the conduit invert.
2. The side slopes shall be 2:1 or flatter.
3. The bottom grade shall be 0.0% (level).
4. There shall be no overfall at the end of the apron or at the end of the culvert.
5. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
6. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
7. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
8. No bends or curves at the intersection of the conduit and apron will be permitted.

Footnote:

1. Tailwater depth shall be the 2 year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.

2. For multiple pipes, increase rip-rap sizes by 25% when pipe spacing is greater than or equal to $1/4W_o$.

Date: 9/8/2021
Project: Spring Hill
Project No: 19119.00

Calculated By: TRP
Checked By: TRP

Conduit Outlet Protection Calculations

Rip Rap Pad # 12A

Design Parameters:

Design Storm Flow for 25 Year, Q	0.32 cfs
Vertical Dimension of Outlet Pipe, D_o	15 in
Horizontal Dimension of Outlet Pipe, W_o	15 in
Tailwater Depth, TW[1]	0.32 ft

Apron Dimension Calculations:

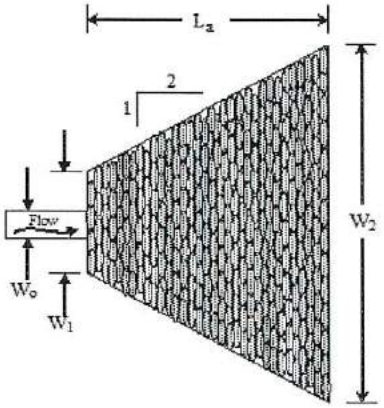
Unit Dicharge, $q = Q/D_o$ = 0.26 cfs per foot

- **Case I:** $TW < \backslash D_o$

  Apron Length, $L_a = \frac{1.8q}{D_o^{1/2}} + 7D_o$ = 9.16 ft or **L_a = 10 ft**

  Width, $W_1 = 3W_o$ = 3.75 ft or **W_1 = 6 ft**

  Width, $W_2 = 3W_o + L_a$ = 12.91 ft or **W_2 = 13 ft**

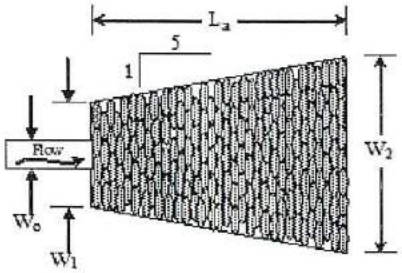


- **Case II:** $TW \geq \backslash D_o$

  Apron Length, $L_a = \frac{3q}{D_o^{1/2}}$ = **L_a =**

  Width, $W_1 = 3W_o$ = **W_1 =**

  Width, $W_2 = 3W_o + 0.4L_a$ = **W_2 =**



Rip Rap Stone Size Calculations:

Median Stone, $d_{50} = \frac{0.02q1.33}{TW}$ = 0.07 in Therefore, use **d_{50} = 6 in**

Notes:

1. Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the structural lining shall extend at least one foot above the tailwater elevation, but no lower than two-thirds of the vertical conduit dimension above the conduit invert.
2. The side slopes shall be 2:1 or flatter.
3. The bottom grade shall be 0.0% (level).
4. There shall be no overfall at the end of the apron or at the end of the culvert.
5. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
6. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
7. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
8. No bends or curves at the intersection of the conduit and apron will be permitted.

Footnote:

1. Tailwater depth shall be the 2 year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.
2. For multiple pipes, increase rip-rap sizes by 25% when pipe spacing is greater than or equal to $1/4W_o$.

Date: 9/8/2021
Project: Spring Hill
Project No: 19119.00

Calculated By: TRP
Checked By: TRP

Conduit Outlet Protection Calculations

Rip Rap Pad # 7A

Design Parameters:

Design Storm Flow for 25 Year, Q	18.66 cfs
Vertical Dimension of Outlet Pipe, D_o	24 in
Horizontal Dimension of Outlet Pipe, W_o	24 in
Tailwater Depth, TW[1]	0.32 ft

Apron Dimension Calculations:

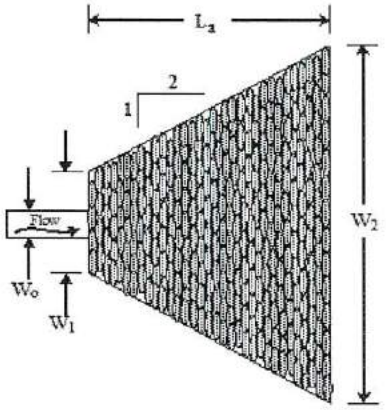
Unit Dicharge, $q = Q/D_o$ = 9.33 cfs per foot

- **Case I:** $TW < \backslash D_o$

  Apron Length, $L_a = \frac{1.8q}{D_o^{1/2}} + 7D_o$ = 25.88 ft or L_a = **26 ft**

  Width, $W_1 = 3W_o$ = 6. ft or W_1 = **6 ft**

  Width, $W_2 = 3W_o + L_a$ = 31.88 ft or W_2 = **32 ft**

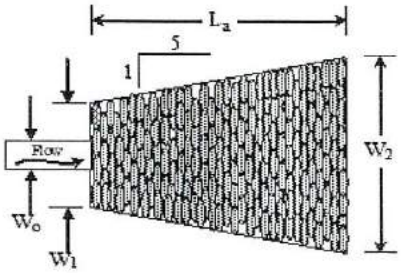


- **Case II:** $TW \geq \backslash D_o$

  Apron Length, $L_a = \frac{3q}{D_o^{1/2}}$ = L_a =

  Width, $W_1 = 3W_o$ = W_1 =

  Width, $W_2 = 3W_o + 0.4L_a$ = W_2 =



Rip Rap Stone Size Calculations:

Median Stone, $d_{50} = \frac{0.02q1.33}{TW}$ = 8.48 in Therefore, use d_{50} = **9 in**

Notes:

1. Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the structural lining shall extend at least one foot above the tailwater elevation, but no lower than two-thirds of the vertical conduit dimension above the conduit invert.
2. The side slopes shall be 2:1 or flatter.
3. The bottom grade shall be 0.0% (level).
4. There shall be no overfall at the end of the apron or at the end of the culvert.
5. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
6. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
7. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
8. No bends or curves at the intersection of the conduit and apron will be permitted.

Footnote:

1. Tailwater depth shall be the 2 year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.

2. For multiple pipes, increase rip-rap sizes by 25% when pipe spacing is greater than or equal to $1/4W_o$.

Date: 9/8/2021
Project: Spring Hill
Project No: 19119.00

Calculated By: TRP
Checked By: TRP

Conduit Outlet Protection Calculations

Rip Rap Pad # 4A

Design Parameters:

Design Storm Flow for 25 Year, Q	3.50 cfs
Vertical Dimension of Outlet Pipe, D_o	15 in
Horizontal Dimension of Outlet Pipe, W_o	15 in
Tailwater Depth, TW[1]	0.32 ft

Apron Dimension Calculations:

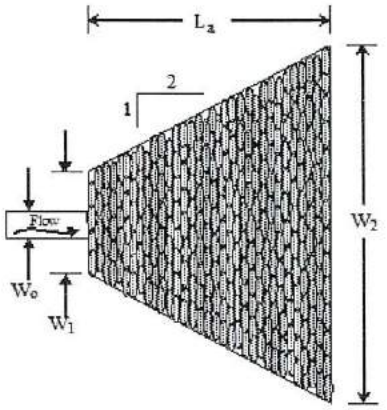
Unit Dicharge, $q = Q/D_o$ = 2.80 cfs per foot

- **Case I:** $TW < \backslash D_o$

  Apron Length, $L_a = \frac{1.8q}{D_o^{1/2}} + 7D_o$ = 13.26 ft or **L_a = 14 ft**

  Width, $W_1 = 3W_o$ = 3.75 ft or **W_1 = 6 ft**

  Width, $W_2 = 3W_o + L_a$ = 17.01 ft or **W_2 = 18 ft**

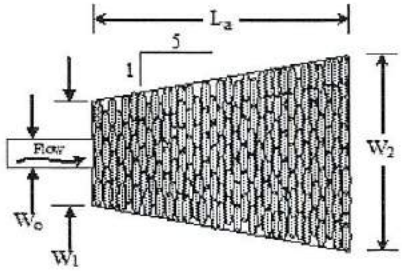


- **Case II:** $TW \geq \backslash D_o$

  Apron Length, $L_a = \frac{3q}{D_o^{1/2}}$ = **L_a =**

  Width, $W_1 = 3W_o$ = **W_1 =**

  Width, $W_2 = 3W_o + 0.4L_a$ = **W_2 =**



Rip Rap Stone Size Calculations:

Median Stone, $d_{50} = \frac{0.02q1.33}{TW}$ = 1.71 in Therefore, use **d_{50} = 6 in**

Notes:

1. Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the structural lining shall extend at least one foot above the tailwater elevation, but no lower than two-thirds of the vertical conduit dimension above the conduit invert.
2. The side slopes shall be 2:1 or flatter.
3. The bottom grade shall be 0.0% (level).
4. There shall be no overfall at the end of the apron or at the end of the culvert.
5. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
6. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
7. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
8. No bends or curves at the intersection of the conduit and apron will be permitted.

Footnote:

1. Tailwater depth shall be the 2 year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.
2. For multiple pipes, increase rip-rap sizes by 25% when pipe spacing is greater than or equal to $1/4W_o$.

Date: 9/8/2021
Project: Spring hill
Project No: 19119.00

Calculated By: TRP
Checked By: TRP

Conduit Outlet Protection Calculations

Rip Rap Pad # ocs-1

Design Parameters:

Design Storm Flow for 25 Year, Q	0.35 cfs
Vertical Dimension of Outlet Pipe, D_o	12
Horizontal Dimension of Outlet Pipe, W_o	12 in
Tailwater Depth, TW[1]	0.00 ft

Apron Dimension Calculations:

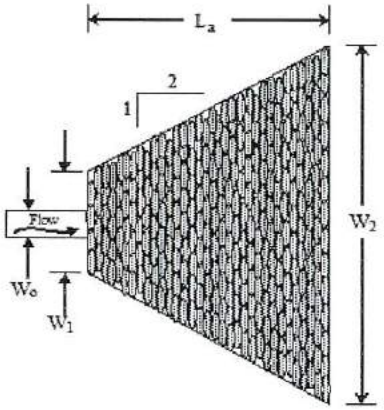
Unit Dicharge, $q = Q/D_o$ = 0.35 cfs per foot

- **Case I:** $TW < \backslash D_o$

  Apron Length, $L_a = \frac{1.8q}{D_o^{1/2}} + 7D_o$ = 7.63 ft or L_a = **8 ft**

  Width, $W_1 = 3W_o$ = 3. ft or W_1 = **6 ft**

  Width, $W_2 = 3W_o + L_a$ = 10.63 ft or W_2 = **11 ft**

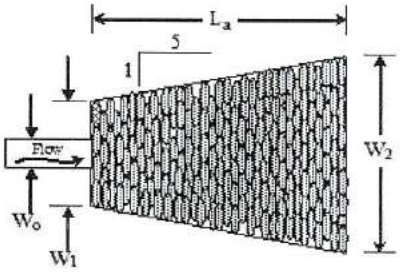


- **Case II:** $TW \geq \backslash D_o$

  Apron Length, $L_a = \frac{3q}{D_o^{1/2}}$ = L_a =

  Width, $W_1 = 3W_o$ = W_1 =

  Width, $W_2 = 3W_o + 0.4L_a$ = W_2 =



Rip Rap Stone Size Calculations:

Median Stone, $d_{50} = \frac{0.02q1.33}{TW}$ = #DIV/0! #DIV/0! d_{50} = **####**

Notes:

1. Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the structural lining shall extend at least one foot above the tailwater elevation, but no lower than two-thirds of the vertical conduit dimension above the conduit invert.
2. The side slopes shall be 2:1 or flatter.
3. The bottom grade shall be 0.0% (level).
4. There shall be no overfall at the end of the apron or at the end of the culvert.
5. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
6. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
7. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
8. No bends or curves at the intersection of the conduit and apron will be permitted.

Footnote:

1. Tailwater depth shall be the 2 year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.
2. For multiple pipes, increase rip-rap sizes by 25% when pipe spacing is greater than or equal to $1/4W_o$.

United States Department of Agriculture
Natural Resources Conservation Service

10 YEAR FAILURE ANALISIS
W/ OFFSITE CONTRIBUTIONS

GRASSED WATERWAY DESIGN

(11/2013)

Landuser: Spring Hill-Manchester
County: Ocean

Designed by: trp
Checked by:

Date: 9/8/2021
Date:

Waterway Type: Trapezoidal

Solve for: Depth

Retardance Values:
Capacity = D
Stability = E

W/W ID	Reach Station		Reach Station	Design Q (cfs)	Slope (%)	Bottom Width (ft)	Side Slope Ratio (Z:1)	Depth (ft)	Capacity TW_2 (ft)	Capacity D_2 (ft)	Capacity V_2 (fps)	Stability V_1 (fps)	Seed Area (ac)
		to		8.363	1.3	20	3	0.4	22.5	0.4	1.0	1.4	0.0
		to											
		to											
		to											
		to											
		to											
		to											
		to											

Total Waterway Length= 0 feet Total Waterway Area = 0.0

Warnings:
Velocity is less than 1.5 fps in Line 1

ROOF RUNOFF TREATMENT CALCULATIONS

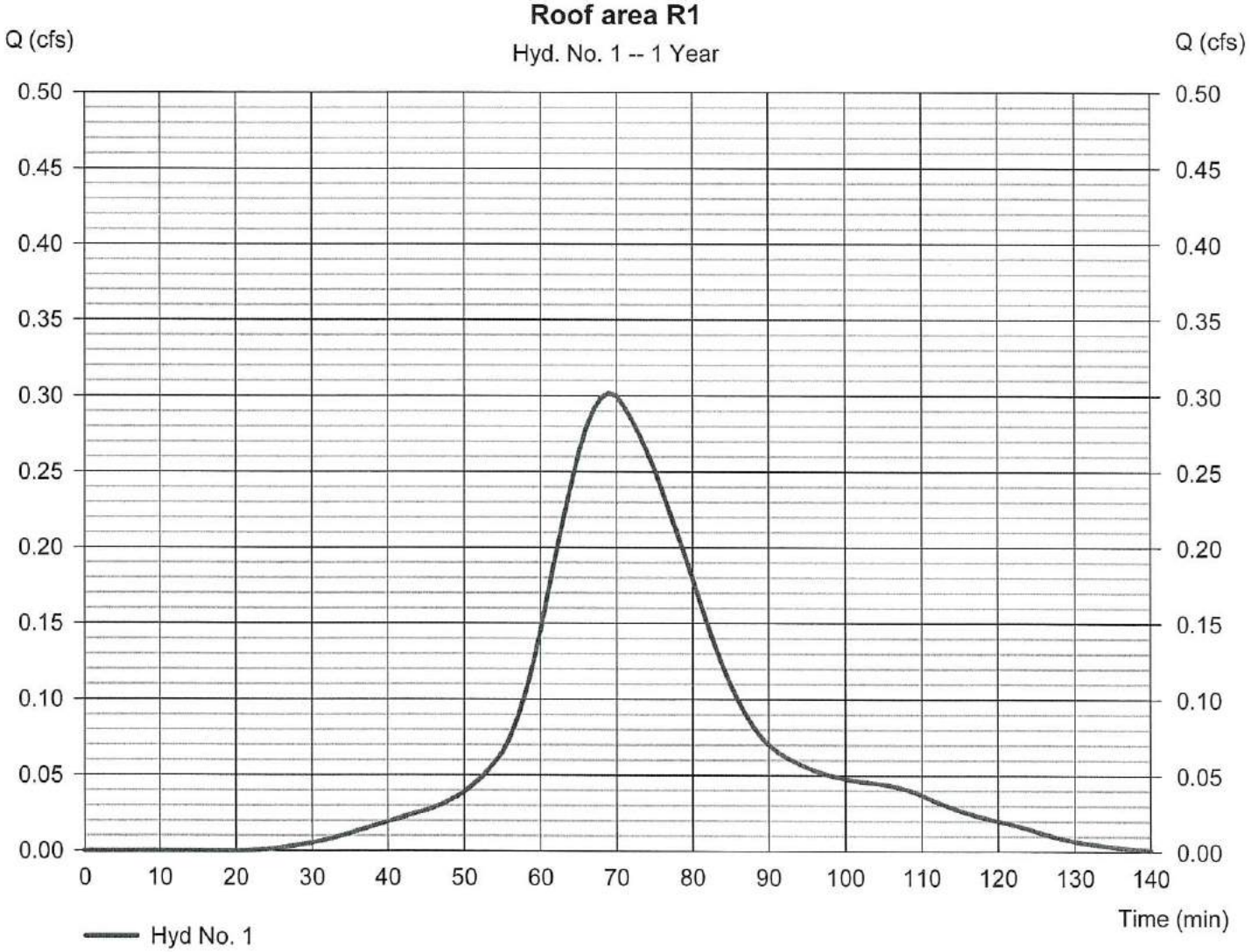
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 1

Roof area R1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.302 cfs
Storm frequency	= 1 yrs	Time to peak	= 69 min
Time interval	= 1 min	Hyd. volume	= 522 cuft
Drainage area	= 0.140 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= U:\NJDEP WQ 2020.cds	Shape factor	= 285



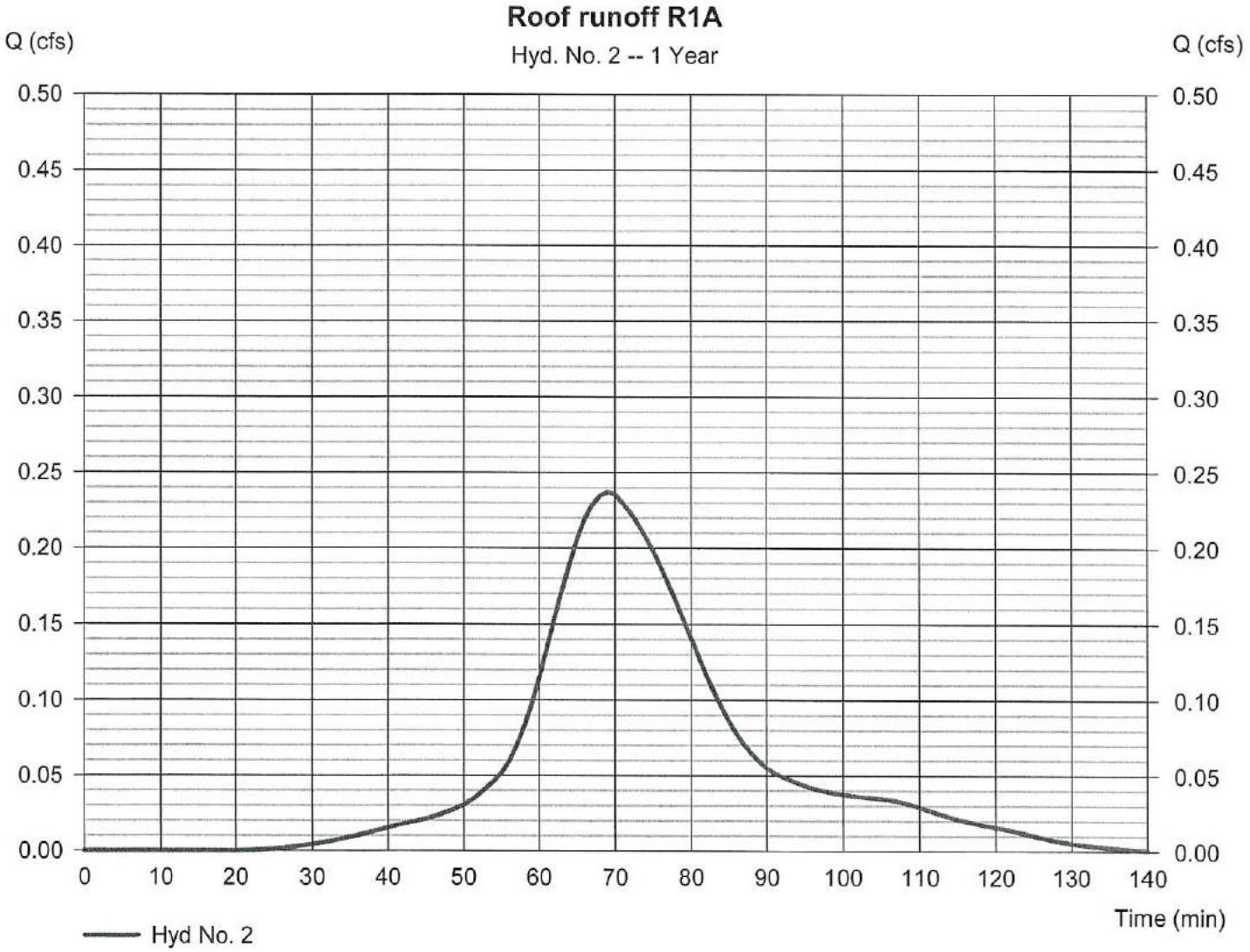
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 2

Roof runoff R1A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.237 cfs
Storm frequency	= 1 yrs	Time to peak	= 69 min
Time interval	= 1 min	Hyd. volume	= 410 cuft
Drainage area	= 0.110 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= U:\NJDEP WQ 2020.cds	Shape factor	= 285



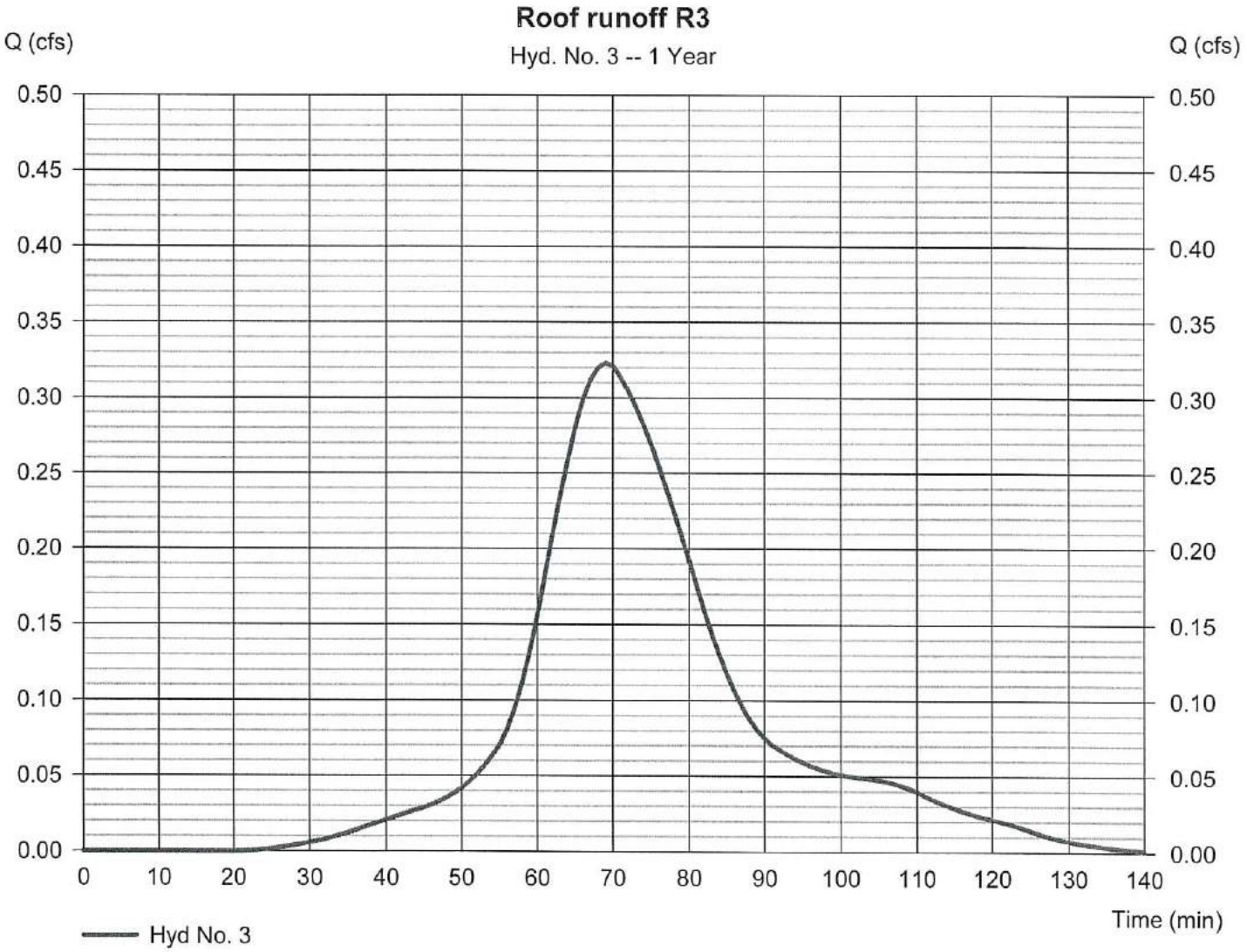
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 3

Roof runoff R3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.323 cfs
Storm frequency	= 1 yrs	Time to peak	= 69 min
Time interval	= 1 min	Hyd. volume	= 560 cuft
Drainage area	= 0.150 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= U:\NJDEP WQ 2020.cds	Shape factor	= 285



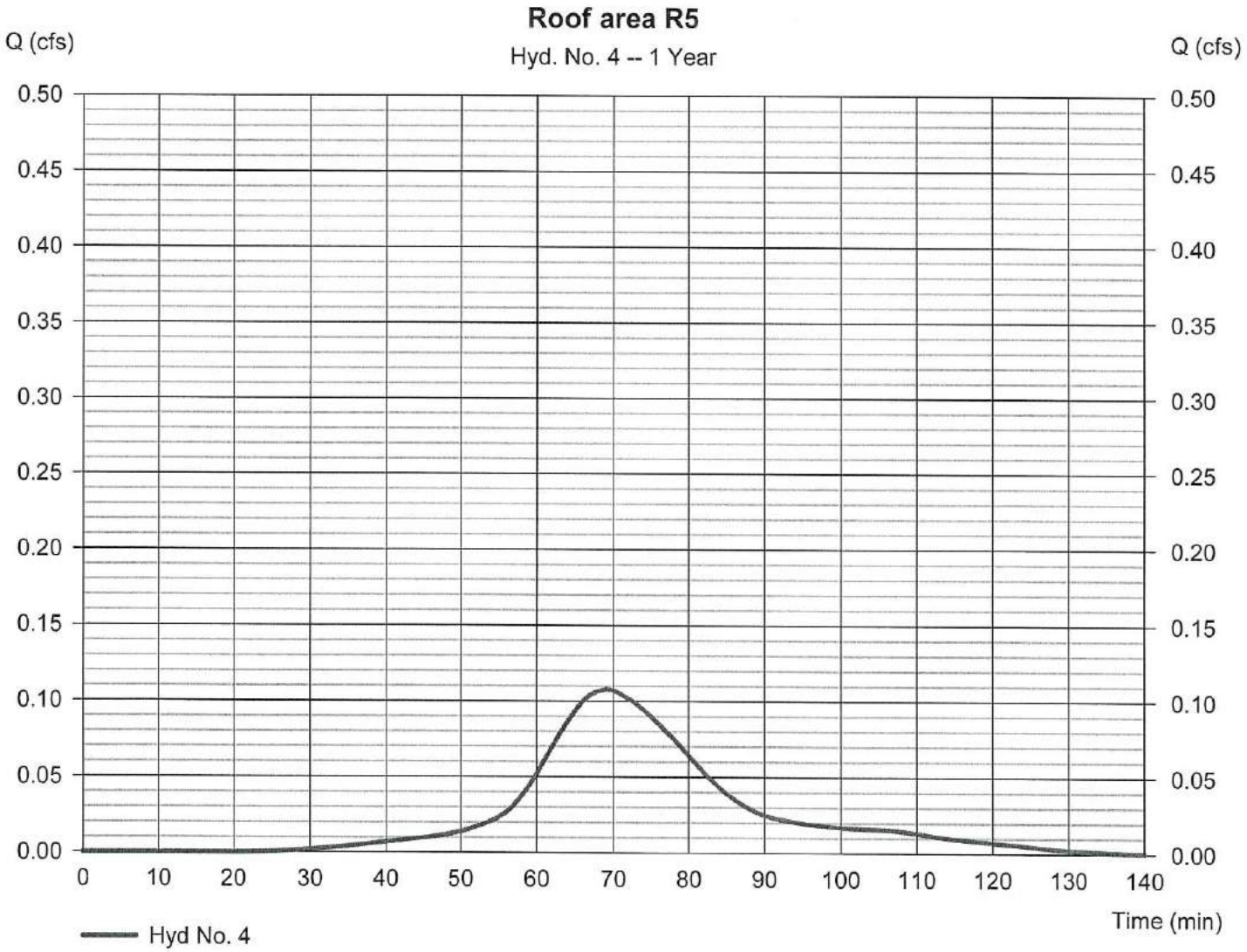
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 4

Roof area R5

Hydrograph type	= SCS Runoff	Peak discharge	= 0.108 cfs
Storm frequency	= 1 yrs	Time to peak	= 69 min
Time interval	= 1 min	Hyd. volume	= 187 cuft
Drainage area	= 0.050 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= U:\NJDEP WQ 2020.cds	Shape factor	= 285



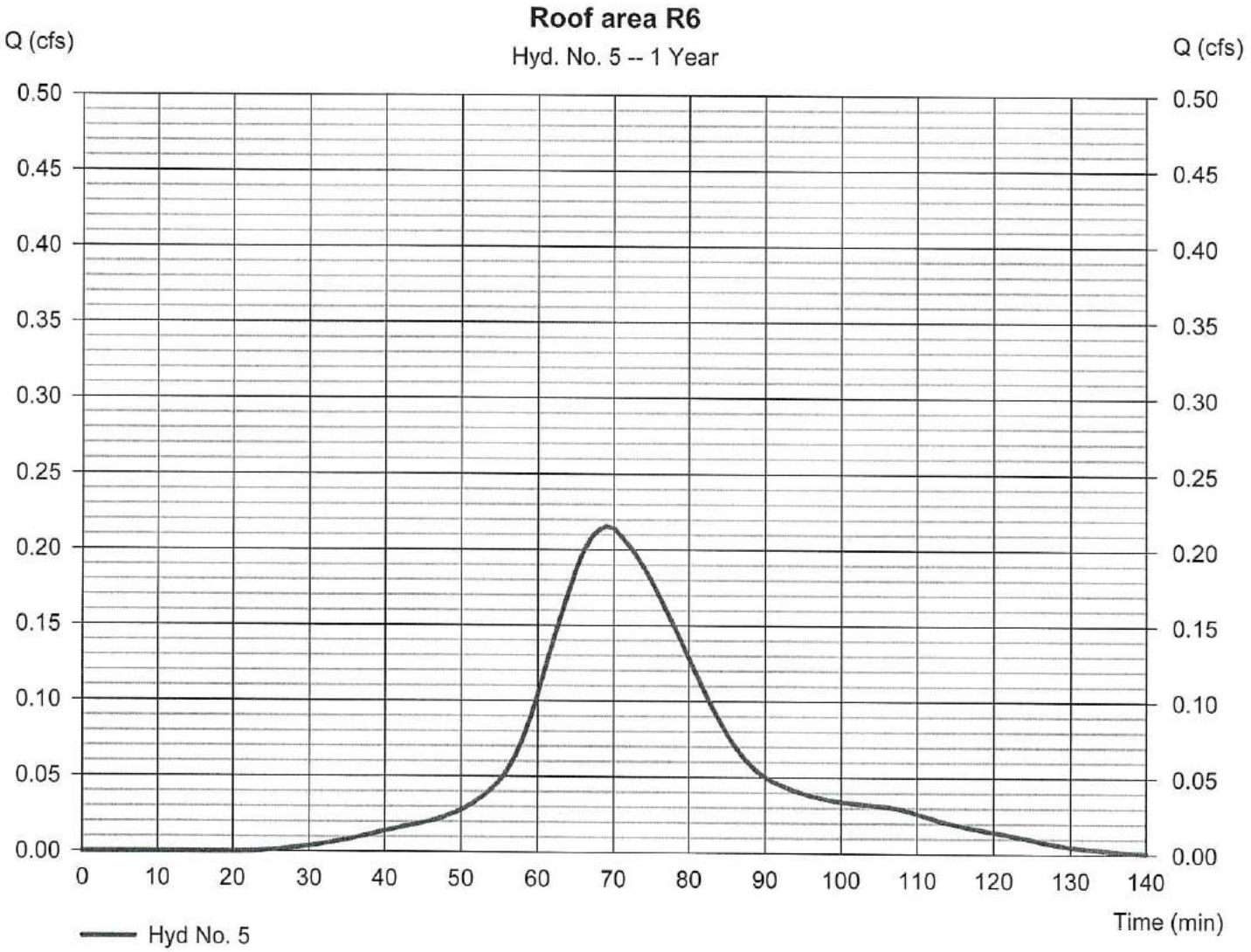
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 5

Roof area R6

Hydrograph type	= SCS Runoff	Peak discharge	= 0.215 cfs
Storm frequency	= 1 yrs	Time to peak	= 69 min
Time interval	= 1 min	Hyd. volume	= 373 cuft
Drainage area	= 0.100 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= U:\NJDEP WQ 2020.cds	Shape factor	= 285



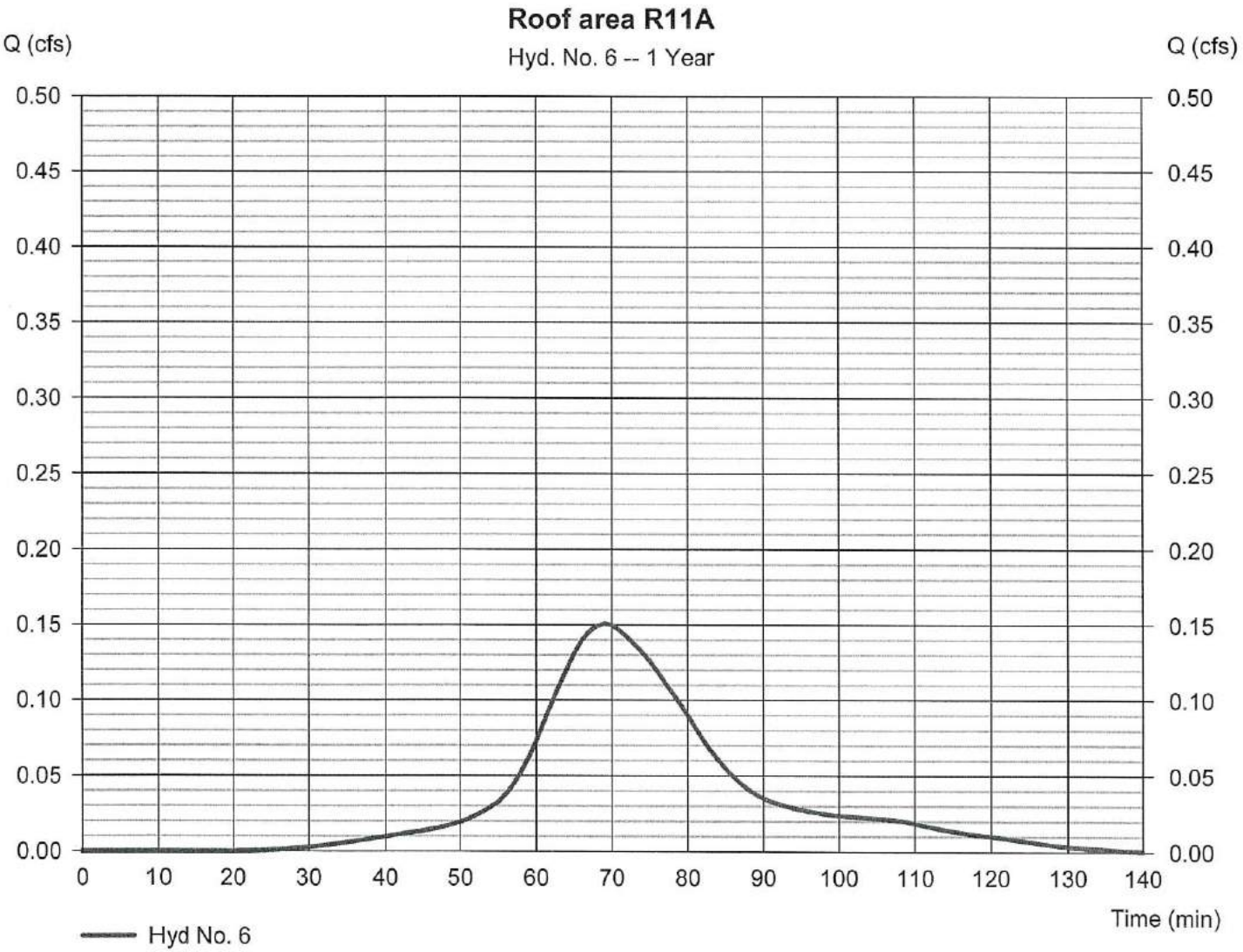
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 6

Roof area R11A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.151 cfs
Storm frequency	= 1 yrs	Time to peak	= 69 min
Time interval	= 1 min	Hyd. volume	= 261 cuft
Drainage area	= 0.070 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= U:\NJDEP WQ 2020.cds	Shape factor	= 285



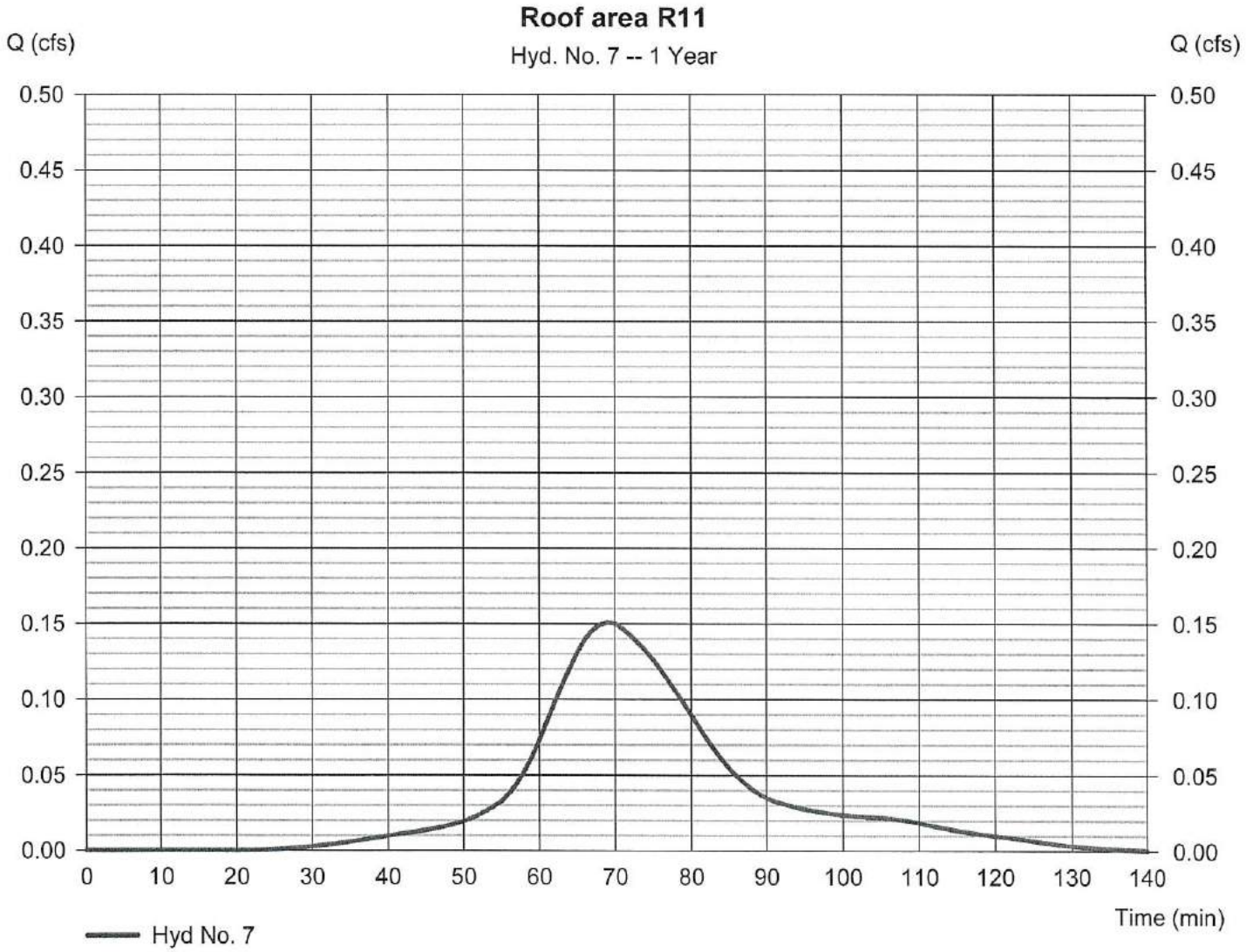
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 7

Roof area R11

Hydrograph type	= SCS Runoff	Peak discharge	= 0.151 cfs
Storm frequency	= 1 yrs	Time to peak	= 69 min
Time interval	= 1 min	Hyd. volume	= 261 cuft
Drainage area	= 0.070 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= U:\NJDEP WQ 2020.cds	Shape factor	= 285



Hydrograph Report

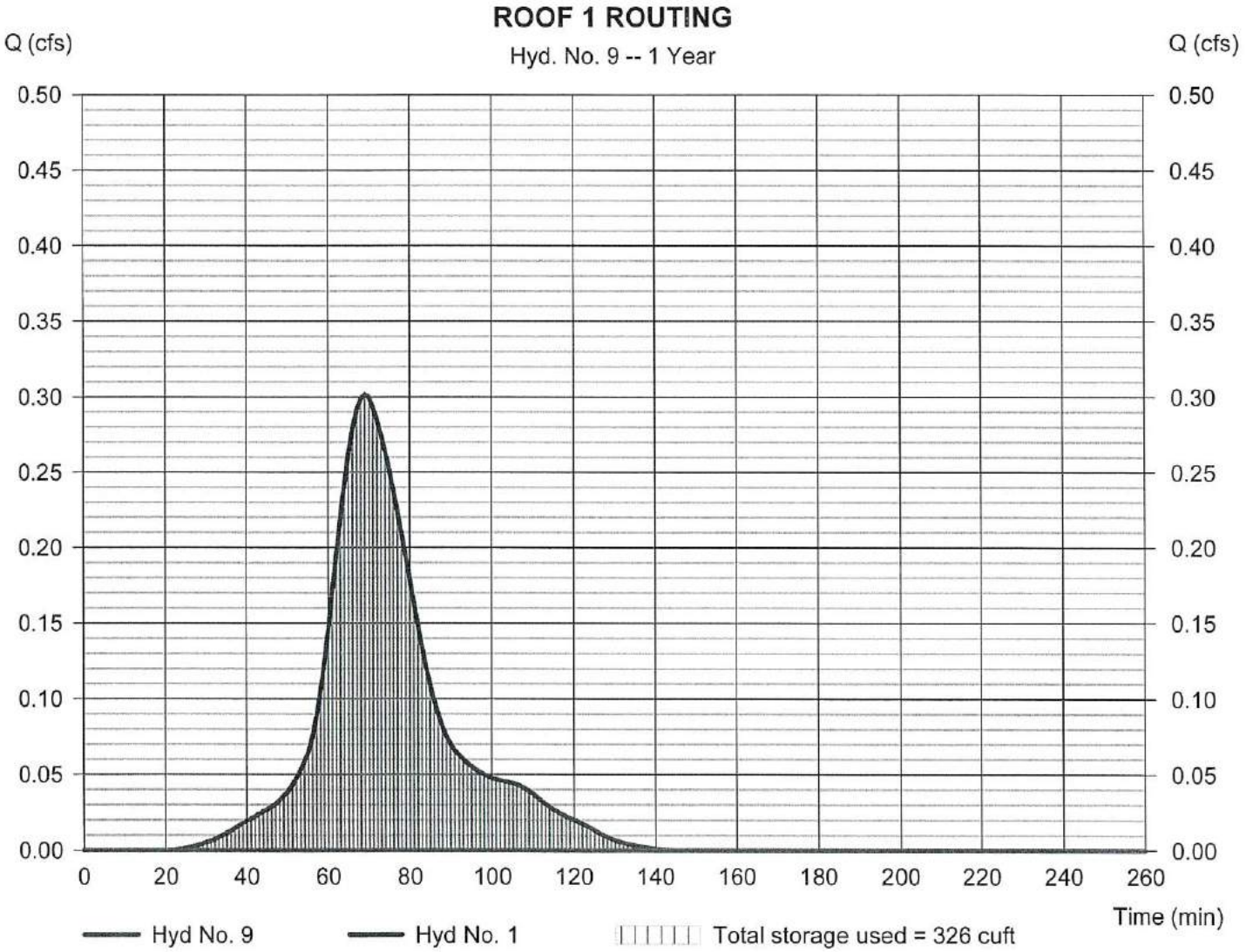
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Hyd. No. 9

ROOF 1 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 252 min
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - Roof area R1	Max. Elevation	= 74.76 ft
Reservoir name	= R-1	Max. Storage	= 326 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Pond No. 1 - R-1

Pond Data

UG Chambers -Invert elev. = 73.00 ft, Rise x Span = 3.75 x 6.42 ft, Barrel Len = 30.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	73.00	n/a	0	0
0.38	73.38	n/a	72	72
0.75	73.75	n/a	71	144
1.13	74.13	n/a	70	213
1.50	74.50	n/a	68	281
1.88	74.88	n/a	64	346
2.25	75.25	n/a	60	406
2.63	75.63	n/a	55	461
3.00	76.00	n/a	48	508
3.38	76.38	n/a	38	546
3.75	76.75	n/a	21	567

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 75.75	0.00	0.00	0.00
Length (ft)	= 36.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .010	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

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

Exfil.(in/hr) = 5.000 (by Wet area)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	73.00	0.00	---	---	---	---	---	---	---	0.000	---	0.000
0.38	72	73.38	0.00	---	---	---	---	---	---	---	0.036	---	0.036
0.75	144	73.75	0.00	---	---	---	---	---	---	---	0.039	---	0.039
1.13	213	74.13	0.00	---	---	---	---	---	---	---	0.042	---	0.042
1.50	281	74.50	0.00	---	---	---	---	---	---	---	0.046	---	0.046
1.88	346	74.88	0.00	---	---	---	---	---	---	---	0.050	---	0.050
2.25	406	75.25	0.00	---	---	---	---	---	---	---	0.056	---	0.056
2.63	461	75.63	0.00	---	---	---	---	---	---	---	0.065	---	0.065
3.00	508	76.00	0.26 ic	---	---	---	---	---	---	---	0.000	---	0.262
3.38	546	76.38	1.39 ic	---	---	---	---	---	---	---	0.000	---	1.390
3.75	567	76.75	2.67 ic	---	---	---	---	---	---	---	0.069	---	2.743

Hydrograph Report

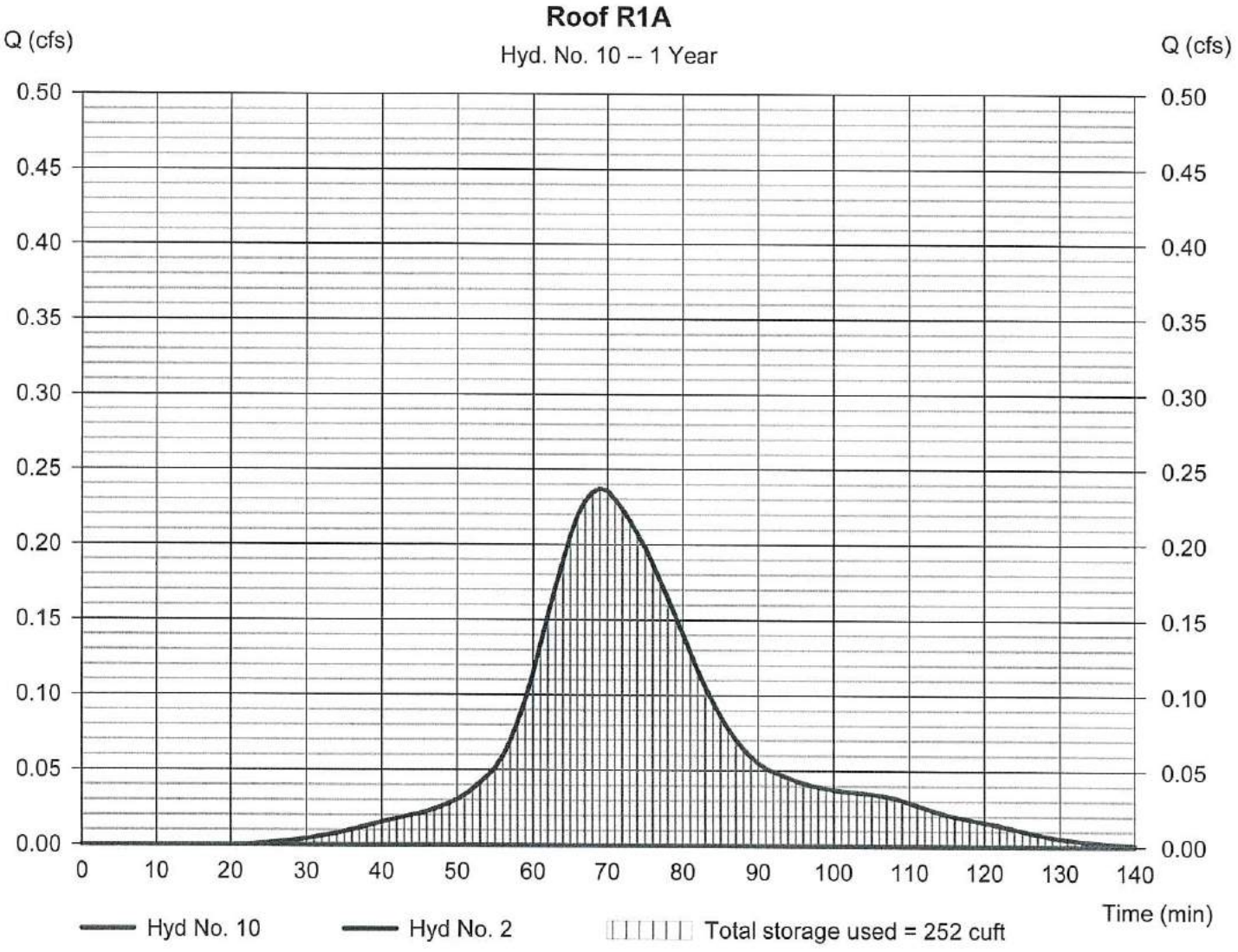
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 10

Roof R1A

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Roof runoff R1A	Max. Elevation	= 74.63 ft
Reservoir name	= R-1A	Max. Storage	= 252 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Pond No. 2 - R-1A

Pond Data

UG Chambers -Invert elev. = 73.00 ft, Rise x Span = 3.75 x 6.42 ft, Barrel Len = 25.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	73.00	n/a	0	0
0.38	73.38	n/a	60	60
0.75	73.75	n/a	59	120
1.13	74.13	n/a	58	178
1.50	74.50	n/a	56	234
1.88	74.88	n/a	54	288
2.25	75.25	n/a	50	338
2.63	75.63	n/a	46	384
3.00	76.00	n/a	40	424
3.38	76.38	n/a	32	455
3.75	76.75	n/a	18	473

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 75.75	0.00	0.00	0.00
Length (ft)	= 47.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .010	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

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

Exfil.(in/hr) = 5.000 (by Wet area)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	73.00	0.00	---	---	---	---	---	---	---	0.000	---	0.000
0.38	60	73.38	0.00	---	---	---	---	---	---	---	0.030	---	0.030
0.75	120	73.75	0.00	---	---	---	---	---	---	---	0.032	---	0.032
1.13	178	74.13	0.00	---	---	---	---	---	---	---	0.035	---	0.035
1.50	234	74.50	0.00	---	---	---	---	---	---	---	0.038	---	0.038
1.88	288	74.88	0.00	---	---	---	---	---	---	---	0.042	---	0.042
2.25	338	75.25	0.00	---	---	---	---	---	---	---	0.046	---	0.046
2.63	384	75.63	0.00	---	---	---	---	---	---	---	0.054	---	0.054
3.00	424	76.00	0.26 ic	---	---	---	---	---	---	---	0.000	---	0.262
3.38	455	76.38	1.39 ic	---	---	---	---	---	---	---	0.000	---	1.390
3.75	473	76.75	2.67 ic	---	---	---	---	---	---	---	0.058	---	2.731

Hydrograph Report

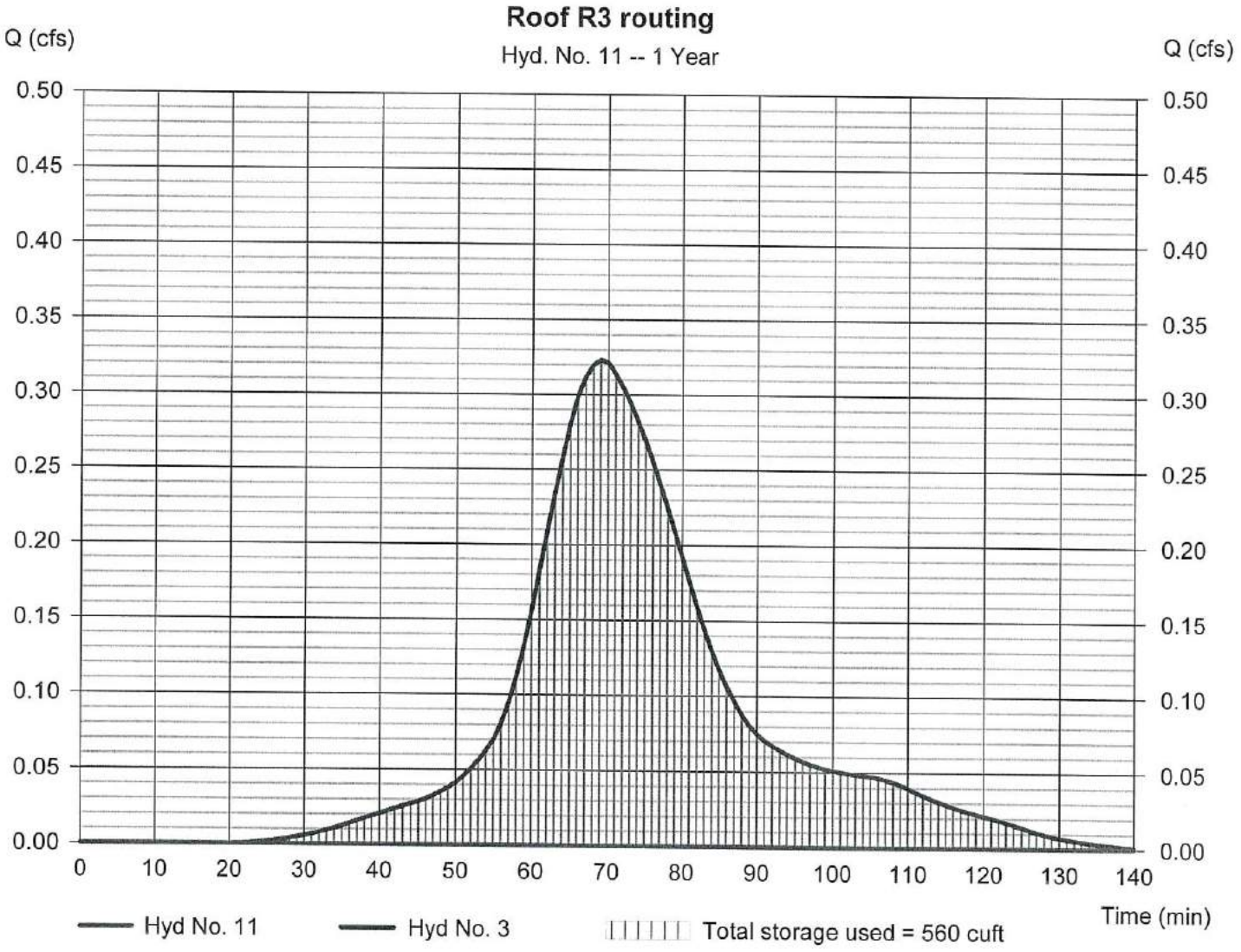
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 11

Roof R3 routing

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 3 - Roof runoff R3	Max. Elevation	= 72.35 ft
Reservoir name	= R-3	Max. Storage	= 560 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Pond No. 3 - R-3

Pond Data

UG Chambers -Invert elev. = 70.00 ft, Rise x Span = 3.75 x 6.42 ft, Barrel Len = 40.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	70.00	n/a	0	0
0.38	70.38	n/a	96	96
0.75	70.75	n/a	95	191
1.13	71.13	n/a	93	285
1.50	71.50	n/a	90	375
1.88	71.88	n/a	86	461
2.25	72.25	n/a	80	541
2.63	72.63	n/a	73	614
3.00	73.00	n/a	64	678
3.38	73.38	n/a	50	728
3.75	73.75	n/a	28	756

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 72.75	0.00	0.00	0.00
Length (ft)	= 40.00	0.00	0.00	0.00
Slope (%)	= 2.75	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

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

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

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	70.00	0.00	---	---	---	---	---	---	---	---	---	0.000
0.38	96	70.38	0.00	---	---	---	---	---	---	---	---	---	0.000
0.75	191	70.75	0.00	---	---	---	---	---	---	---	---	---	0.000
1.13	285	71.13	0.00	---	---	---	---	---	---	---	---	---	0.000
1.50	375	71.50	0.00	---	---	---	---	---	---	---	---	---	0.000
1.88	461	71.88	0.00	---	---	---	---	---	---	---	---	---	0.000
2.25	541	72.25	0.00	---	---	---	---	---	---	---	---	---	0.000
2.63	614	72.63	0.00	---	---	---	---	---	---	---	---	---	0.000
3.00	678	73.00	0.26 ic	---	---	---	---	---	---	---	---	---	0.262
3.38	728	73.38	1.39 ic	---	---	---	---	---	---	---	---	---	1.390
3.75	756	73.75	2.67 ic	---	---	---	---	---	---	---	---	---	2.674

Hydrograph Report

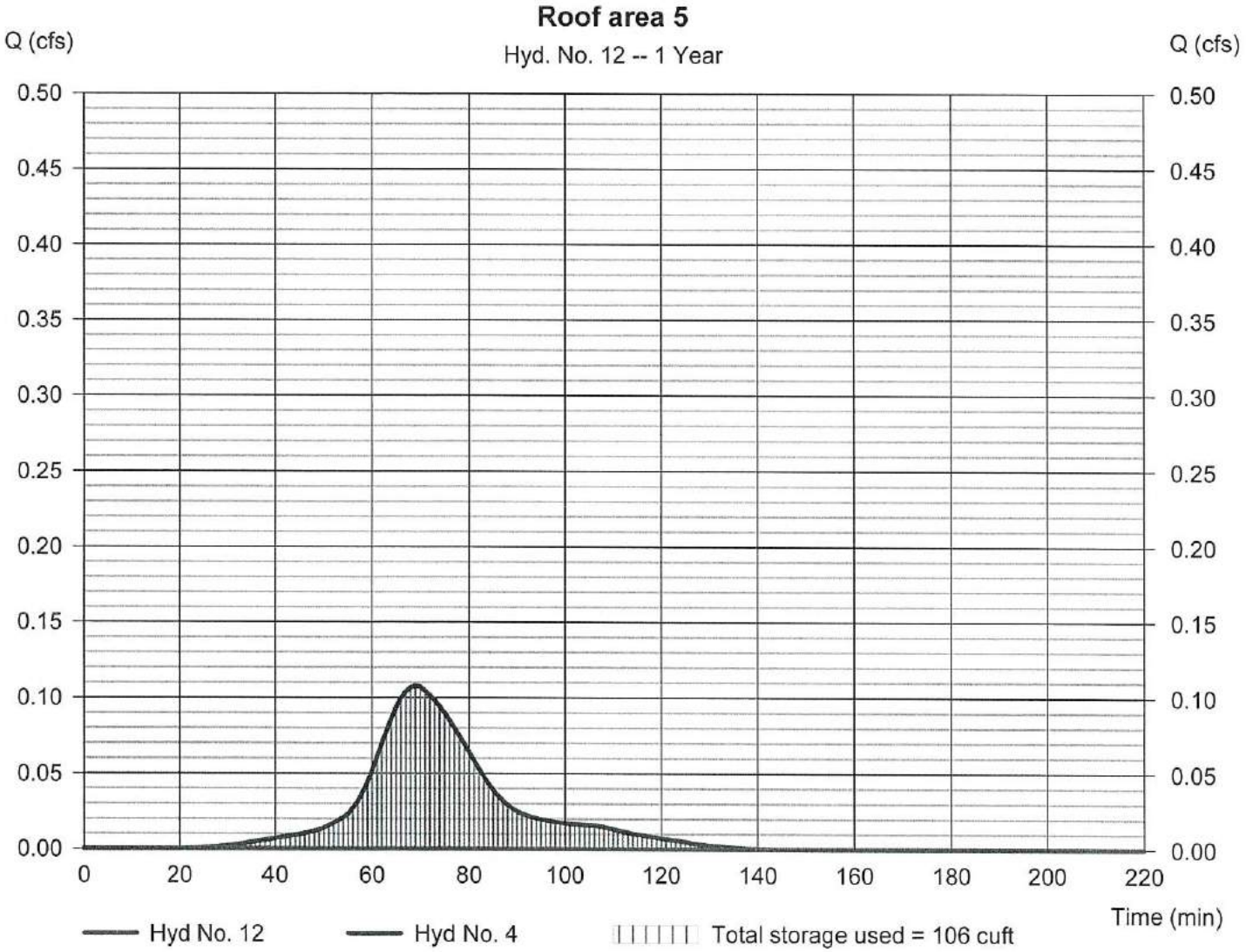
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 12

Roof area 5

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 206 min
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 4 - Roof area R5	Max. Elevation	= 71.11 ft
Reservoir name	= R-5	Max. Storage	= 106 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Pond No. 4 - R-5

Pond Data

UG Chambers -Invert elev. = 72.10 ft, Rise x Span = 3.75 x 6.42 ft, Barrel Len = 15.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	72.10	n/a	0	0
0.38	72.47	n/a	36	36
0.75	72.85	n/a	36	72
1.13	73.22	n/a	35	107
1.50	73.60	n/a	34	141
1.88	73.97	n/a	32	173
2.25	74.35	n/a	30	203
2.63	74.72	n/a	27	230
3.00	75.10	n/a	24	254
3.38	75.47	n/a	19	273
3.75	75.85	n/a	11	284

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 74.85	0.00	0.00	0.00
Length (ft)	= 23.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

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

Exfil.(in/hr) = 5.000 (by Wet area)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	72.10	0.00	---	---	---	---	---	---	---	0.000	---	0.000
0.38	36	72.47	0.00	---	---	---	---	---	---	---	0.018	---	0.018
0.75	72	72.85	0.00	---	---	---	---	---	---	---	0.019	---	0.019
1.13	107	73.22	0.00	---	---	---	---	---	---	---	0.021	---	0.021
1.50	141	73.60	0.00	---	---	---	---	---	---	---	0.023	---	0.023
1.88	173	73.97	0.00	---	---	---	---	---	---	---	0.025	---	0.025
2.25	203	74.35	0.00	---	---	---	---	---	---	---	0.028	---	0.028
2.63	230	74.72	0.00	---	---	---	---	---	---	---	0.032	---	0.032
3.00	254	75.10	0.24 oc	---	---	---	---	---	---	---	0.000	---	0.244
3.38	273	75.47	0.97 oc	---	---	---	---	---	---	---	0.000	---	0.969
3.75	284	75.85	1.44 oc	---	---	---	---	---	---	---	0.035	---	1.471

Hydrograph Report

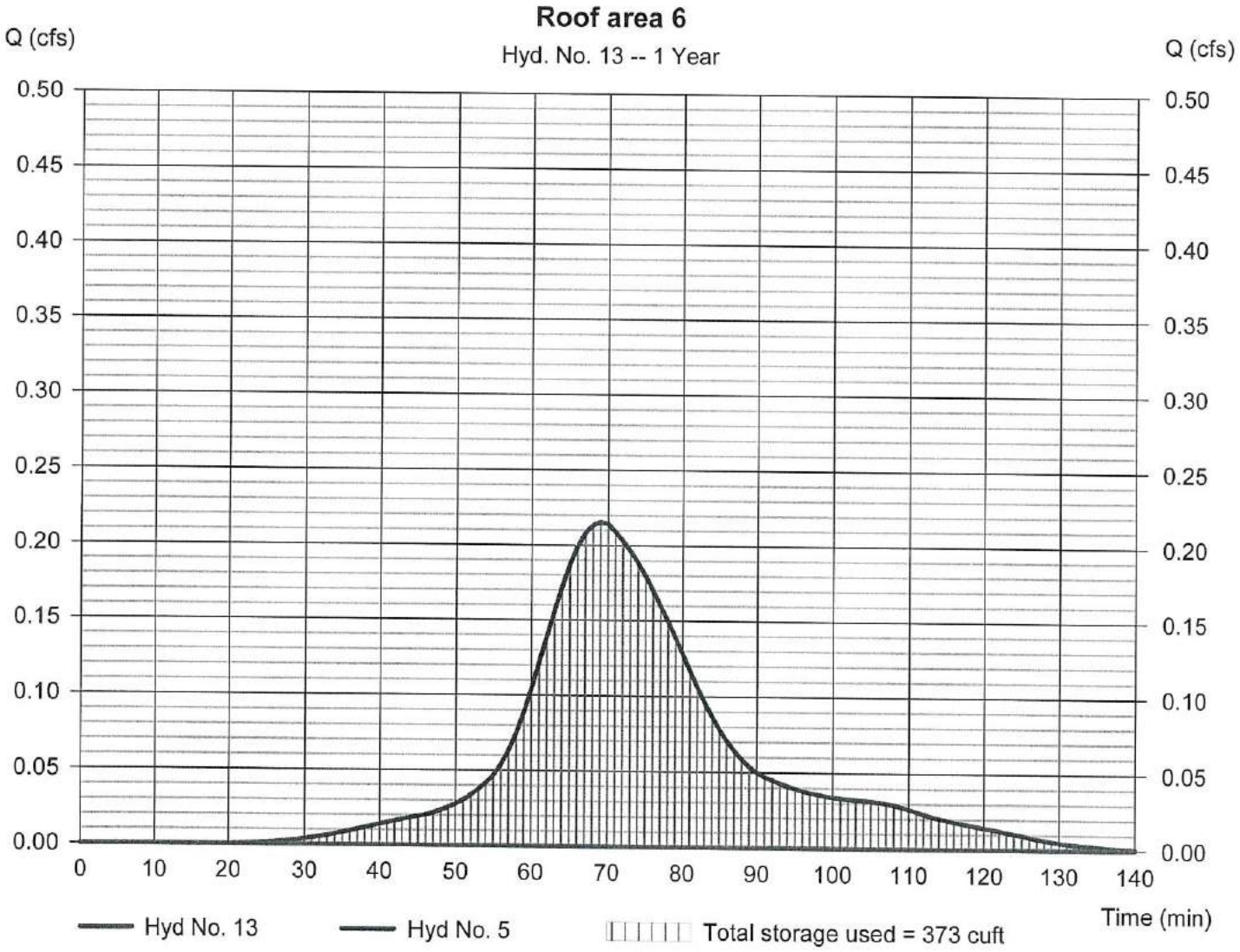
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 13

Roof area 6

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 5 - Roof area R6	Max. Elevation	= 72.54 ft
Reservoir name	= R-6	Max. Storage	= 373 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Pond No. 5 - R-6

Pond Data

UG Chambers -Invert elev. = 70.00 ft, Rise x Span = 3.75 x 6.42 ft, Barrel Len = 25.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	70.00	n/a	0	0
0.38	70.38	n/a	60	60
0.75	70.75	n/a	59	120
1.13	71.13	n/a	58	178
1.50	71.50	n/a	56	234
1.88	71.88	n/a	54	288
2.25	72.25	n/a	50	338
2.63	72.63	n/a	46	384
3.00	73.00	n/a	40	424
3.38	73.38	n/a	32	455
3.75	73.75	n/a	18	473

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 72.75	0.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .010	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

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

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

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	70.00	0.00	---	---	---	---	---	---	---	---	---	0.000
0.38	60	70.38	0.00	---	---	---	---	---	---	---	---	---	0.000
0.75	120	70.75	0.00	---	---	---	---	---	---	---	---	---	0.000
1.13	178	71.13	0.00	---	---	---	---	---	---	---	---	---	0.000
1.50	234	71.50	0.00	---	---	---	---	---	---	---	---	---	0.000
1.88	288	71.88	0.00	---	---	---	---	---	---	---	---	---	0.000
2.25	338	72.25	0.00	---	---	---	---	---	---	---	---	---	0.000
2.63	384	72.63	0.00	---	---	---	---	---	---	---	---	---	0.000
3.00	424	73.00	0.26 ic	---	---	---	---	---	---	---	---	---	0.262
3.38	455	73.38	1.39 ic	---	---	---	---	---	---	---	---	---	1.390
3.75	473	73.75	2.67 ic	---	---	---	---	---	---	---	---	---	2.674

Hydrograph Report

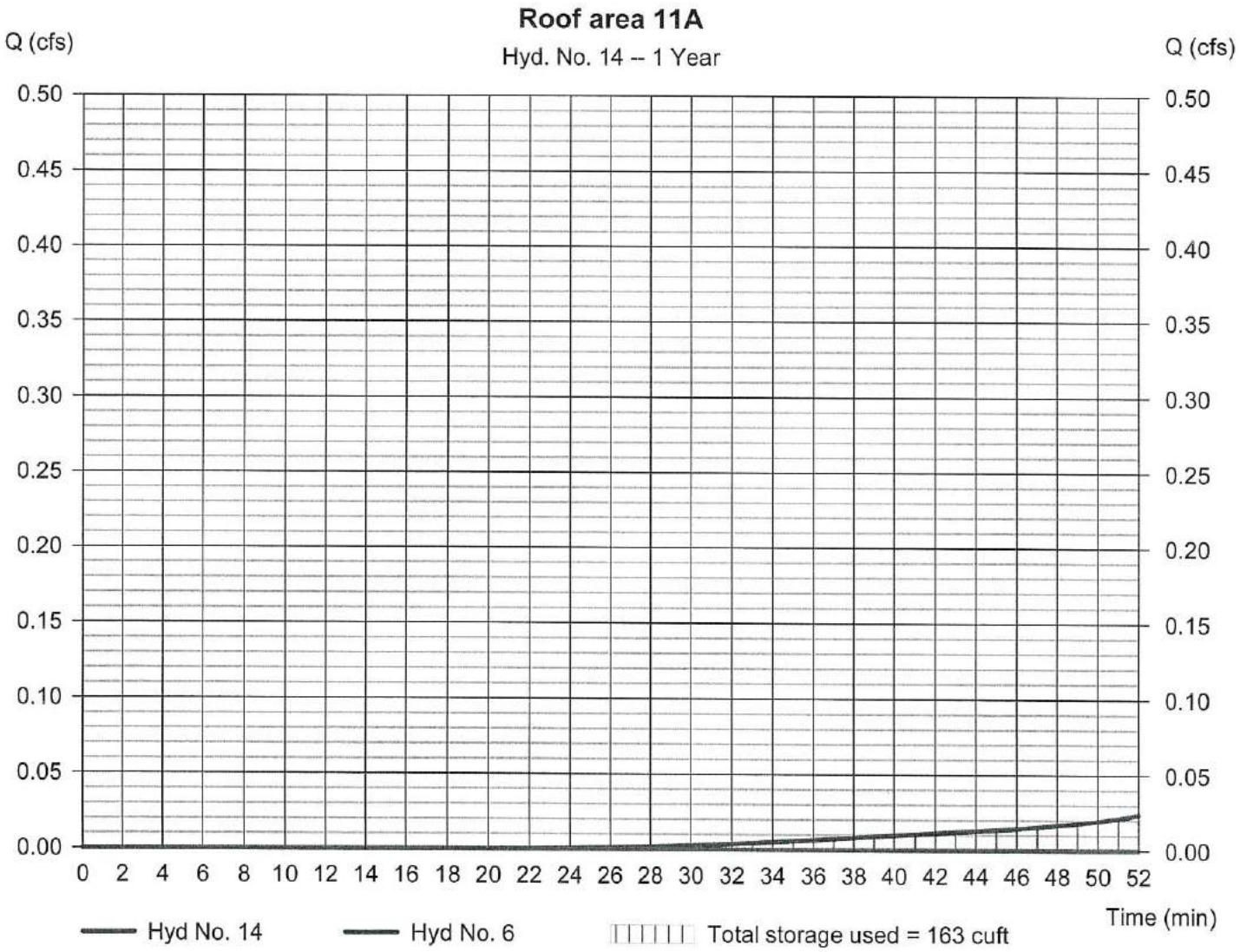
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 14

Roof area 11A

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 50 min
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 6 - Roof area R11A	Max. Elevation	= 75.01 ft
Reservoir name	= R-11a	Max. Storage	= 163 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Pond No. 6 - R-11a

Pond Data

UG Chambers -Invert elev. = 73.25 ft, Rise x Span = 3.75 x 6.42 ft, Barrel Len = 15.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	73.25	n/a	0	0
0.38	73.63	n/a	36	36
0.75	74.00	n/a	36	72
1.13	74.38	n/a	35	107
1.50	74.75	n/a	34	141
1.88	75.13	n/a	32	173
2.25	75.50	n/a	30	203
2.63	75.88	n/a	27	230
3.00	76.25	n/a	24	254
3.38	76.63	n/a	19	273
3.75	77.00	n/a	11	284

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 76.00	0.00	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

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

Exfil.(in/hr) = 5.000 (by Wet area)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	73.25	0.00	---	---	---	---	---	---	---	0.000	---	0.000
0.38	36	73.63	0.00	---	---	---	---	---	---	---	0.018	---	0.018
0.75	72	74.00	0.00	---	---	---	---	---	---	---	0.019	---	0.019
1.13	107	74.38	0.00	---	---	---	---	---	---	---	0.021	---	0.021
1.50	141	74.75	0.00	---	---	---	---	---	---	---	0.023	---	0.023
1.88	173	75.13	0.00	---	---	---	---	---	---	---	0.025	---	0.025
2.25	203	75.50	0.00	---	---	---	---	---	---	---	0.028	---	0.028
2.63	230	75.88	0.00	---	---	---	---	---	---	---	0.032	---	0.032
3.00	254	76.25	0.26 ic	---	---	---	---	---	---	---	0.000	---	0.262
3.38	273	76.63	0.99 oc	---	---	---	---	---	---	---	0.000	---	0.987
3.75	284	77.00	1.48 oc	---	---	---	---	---	---	---	0.035	---	1.516

Hydrograph Report

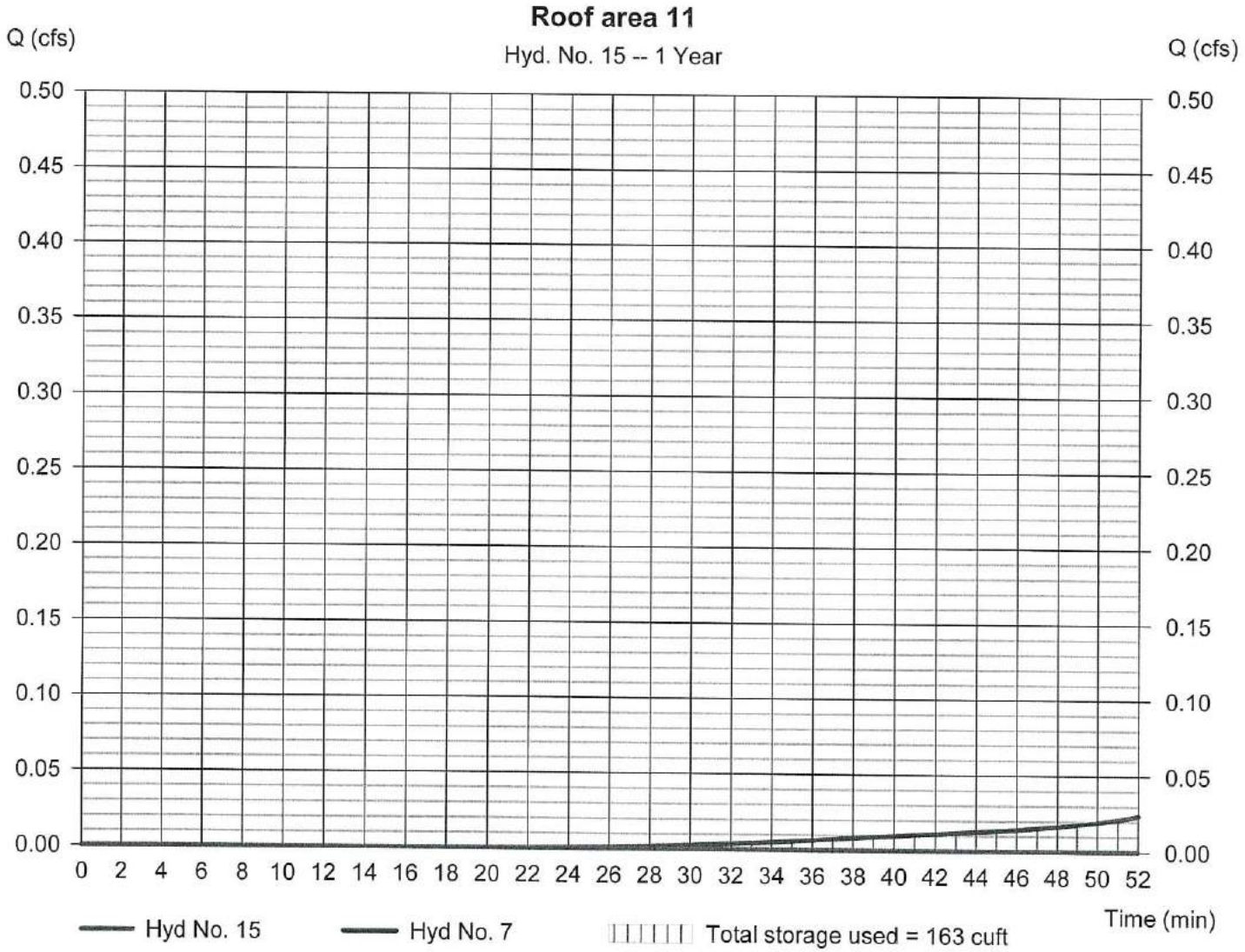
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 09 / 8 / 2021

Hyd. No. 15

Roof area 11

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 50 min
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 7 - Roof area R11	Max. Elevation	= 75.01 ft
Reservoir name	= R-11	Max. Storage	= 163 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 09 / 8 / 2021

Pond No. 7 - R-11

Pond Data

UG Chambers -Invert elev. = 73.25 ft, Rise x Span = 3.75 x 6.42 ft, Barrel Len = 15.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	73.25	n/a	0	0
0.38	73.63	n/a	36	36
0.75	74.00	n/a	36	72
1.13	74.38	n/a	35	107
1.50	74.75	n/a	34	141
1.88	75.13	n/a	32	173
2.25	75.50	n/a	30	203
2.63	75.88	n/a	27	230
3.00	76.25	n/a	24	254
3.38	76.63	n/a	19	273
3.75	77.00	n/a	11	284

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 76.00	0.00	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

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

Exfil.(in/hr) = 5.000 (by Wet area)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	73.25	0.00	---	---	---	---	---	---	---	0.000	---	0.000
0.38	36	73.63	0.00	---	---	---	---	---	---	---	0.018	---	0.018
0.75	72	74.00	0.00	---	---	---	---	---	---	---	0.019	---	0.019
1.13	107	74.38	0.00	---	---	---	---	---	---	---	0.021	---	0.021
1.50	141	74.75	0.00	---	---	---	---	---	---	---	0.023	---	0.023
1.88	173	75.13	0.00	---	---	---	---	---	---	---	0.025	---	0.025
2.25	203	75.50	0.00	---	---	---	---	---	---	---	0.028	---	0.028
2.63	230	75.88	0.00	---	---	---	---	---	---	---	0.032	---	0.032
3.00	254	76.25	0.26 ic	---	---	---	---	---	---	---	0.000	---	0.262
3.38	273	76.63	0.99 oc	---	---	---	---	---	---	---	0.000	---	0.987
3.75	284	77.00	1.48 oc	---	---	---	---	---	---	---	0.035	---	1.516

GROUNDWATER MOUNDING ANALYSIS

19119.02-Spring Hills Manchester
Hantush groundwater mounding analysis
basin 1

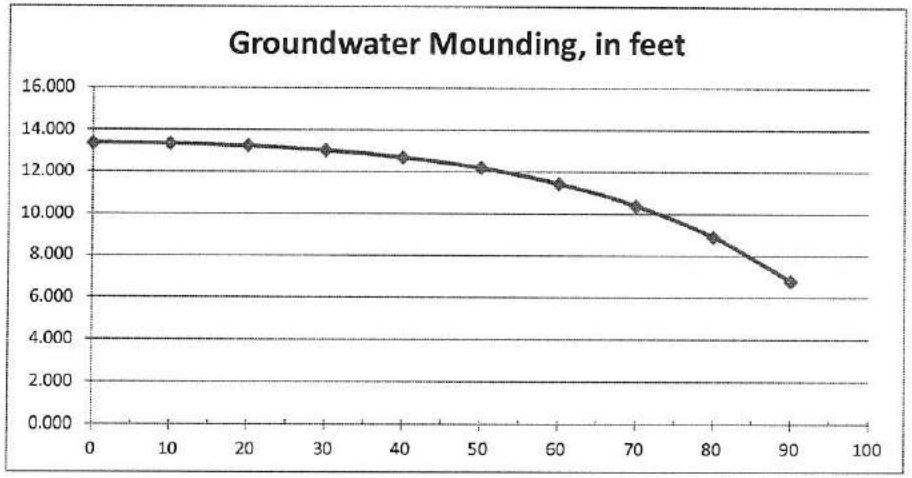
Input Values

2.50	*R*	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
12.50	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
90.000	x	1/2 length of basin (x direction, in feet)
200.000	y	1/2 width of basin (y direction, in feet)
9.78	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

23.368	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
13.368	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
13.368	0
13.333	10
13.222	20
13.016	30
12.684	40
12.182	50
11.448	60
10.399	70
8.912	80
6.794	90

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

19119.02-Spring Hills Manchester
Hantush groundwater mounding analysis
Basin 1 yx

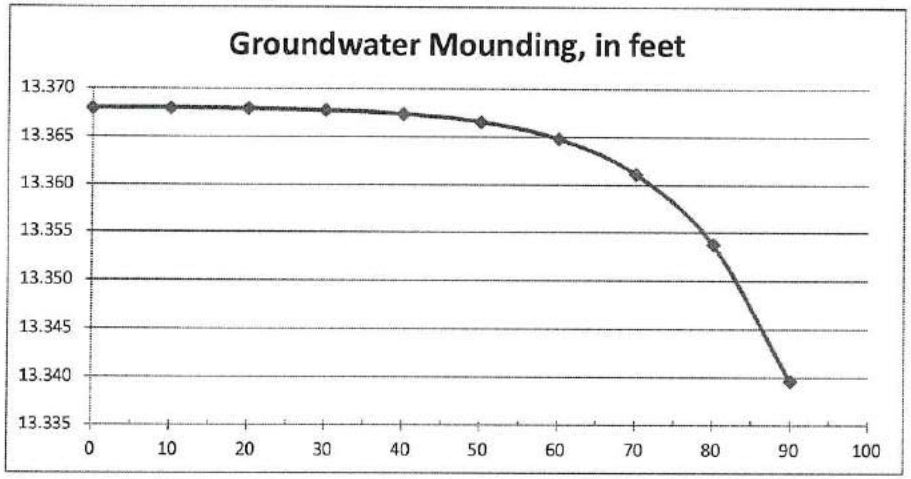
Input Values

2.50	*R*	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
12.50	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
200.000	x	1/2 length of basin (x direction, in feet)
90.000	y	1/2 width of basin (y direction, in feet)
9.78	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

23.368	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
13.368	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
13.368	0
13.368	10
13.368	20
13.368	30
13.367	40
13.367	50
13.365	60
13.361	70
13.354	80
13.340	90

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

19119.02-Spring Hills Manchester
Hantush groundwater mounding analysis
basin 2

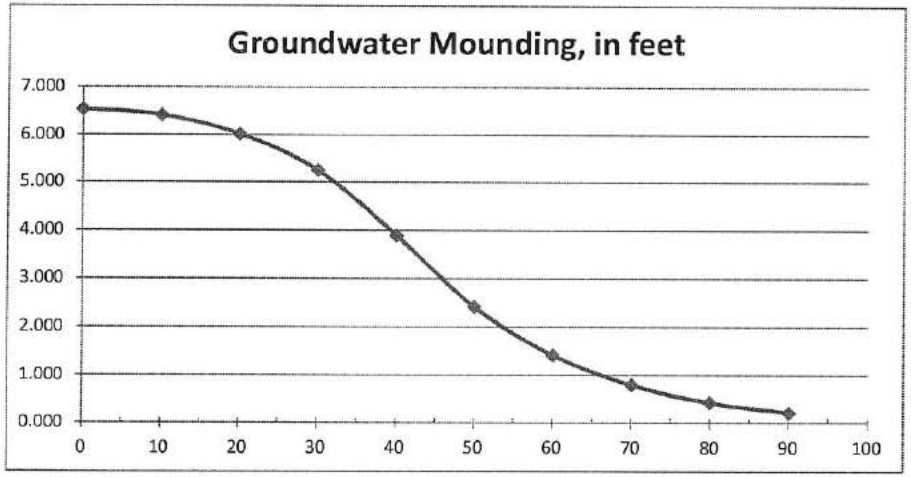
Input Values

2.50	*R*	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
12.50	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
40.000	x	1/2 length of basin (x direction, in feet)
20.000	y	1/2 width of basin (y direction, in feet)
9.78	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

16.539	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
6.539	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
6.539	0
6.414	10
6.014	20
5.243	30
3.893	40
2.411	50
1.419	60
0.797	70
0.428	80
0.220	90

Re-Calculate Now



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19119.02-Spring Hills Manchester
Hantush groundwater mounding analysis
basin 2

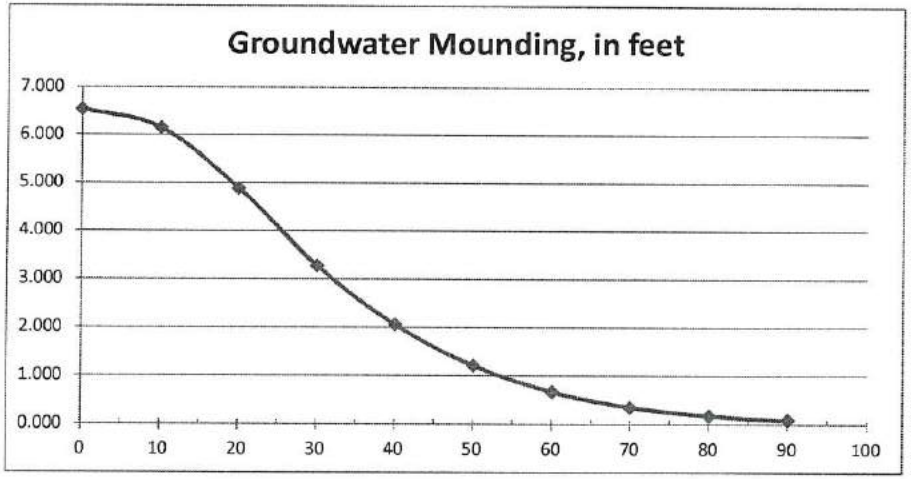
Input Values

2.50	*R*	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
12.50	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
20.000	x	1/2 length of basin (x direction, in feet)
40.000	y	1/2 width of basin (y direction, in feet)
9.78	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

16.539	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
6.539	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
6.539	0
6.144	10
4.878	20
3.277	30
2.056	40
1.208	50
0.669	60
0.351	70
0.176	80
0.085	90

Re-Calculate Now



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3-I
U.S.D.A. WSS SOIL INFORMATION

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 Ocean County, New Jersey

Spring Hill Manchester

December 6, 2019

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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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


74° 17' 5" W
74° 16' 51" W
40° 0' 8" N
561060
561110
561160
561210
561260
561310
561360
4428240
4428190
4428140
4428090
4428040
4427990
4427940
4427890
4427840
LakB
DocBO
Farm Rd
37
Soil Map may not be valid at this scale.
39° 59' 54" N
Map Scale: 1:2,130 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 30 60 120 180
Feet
0 100 200 400 600
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Ocean County, New Jersey
Survey Area Data: Version 17, Sep 16, 2019

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

Date(s) aerial images were photographed: Jun 26, 2019—Jun 29, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
DocBO	Downer loamy sand, 0 to 5 percent slopes, Northern Tidewater Area	1.2	16.1%
LakB	Lakehurst sand, 0 to 5 percent slopes	6.1	83.9%
Totals for Area of Interest		**7.3**	**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.

Ocean County, New Jersey

DocBO—Downer loamy sand, 0 to 5 percent slopes, Northern Tidewater Area

Map Unit Setting

National map unit symbol: 2thw1
Elevation: 60 to 90 feet
Mean annual precipitation: 41 to 50 inches
Mean annual air temperature: 46 to 66 degrees F
Frost-free period: 190 to 260 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Downer and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Downer

Setting

Landform: Knolls, low hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, rise
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Loamy fluviomarine deposits

Typical profile

Ap - 0 to 10 inches: loamy sand
BE - 10 to 16 inches: loamy sand
Bt - 16 to 28 inches: sandy loam
C1 - 28 to 48 inches: loamy sand
C2 - 48 to 80 inches: sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 0.2 mmhos/cm)
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Hammonton

Percent of map unit: 10 percent
Landform: Flats, broad interstream divides
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Dip
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Atsion

Percent of map unit: 5 percent
Landform: Drainageways, flats, depressions, deflation flats
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Dip, talf
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: Yes

Evesboro

Percent of map unit: 5 percent
Landform: Flats, fluviomarine terraces, knolls, dunes
Landform position (three-dimensional): Riser, rise
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

LakB—Lakehurst sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: rdtz
Elevation: 20 to 150 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: Farmland of local importance

Map Unit Composition

Lakehurst and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lakehurst

Setting

Landform: Flats, dunes
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Sandy fluviomarine deposits

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 4 inches: sand
E - 4 to 18 inches: sand
Bh - 18 to 32 inches: sand
BC - 32 to 45 inches: sand
C - 45 to 54 inches: sand
Cg - 54 to 80 inches: sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High to very high (2.00 to 19.98 in/hr)
Depth to water table: About 18 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Berryland, rarely flooded

Percent of map unit: 5 percent
Landform: Flats, drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Atsion, rarely flooded

Percent of map unit: 5 percent
Landform: Flats, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope, dip, talf
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Quakerbridge

Percent of map unit: 5 percent
Landform: Flats, knolls
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Linear
Hydric soil rating: No

APPENDIX

Hydrologic Runoff Calculations

average "CN" worksheet

drainage area				
offsite	cover	area	cn	
	imp	1.43	98	140.14
	grass	6.36	39	248.04
	woods	17.27	32	552.64
	stone	0.61	76	46.36
total		25.67		987.18
	composite cn		**38.46**	

onsite	cover	area	cn	
	grass	1.91	39	74.49
	woods	5.25	30	157.5
	stone	0.43	85	36.55
total		7.59		268.54
	composite cn		**35.38**	

DA # 3	cover	area	cn	
	imp	0	98	0
	grass	0	39	0
	building			
total		0		0
	composite cn		**#DIV/0!**	

DA # 4	cover	area	cn	
	imp		98	
	grass	0	39	0
	building	0	98	0
total		0		0
	composite cn		**#DIV/0!**	

DA # 5	cover	area	cn	
	imp	0	98	0
	grass	0	39	0
total		0		0
	composite cn		#DIV/0!	

basin	cover	area	cn	
area	type d	0	77	0
	type a	0	30	0
total		0		0
	composite cn		#DIV/0!	

bypass

to seminole	cover	area	cn	
area	type d	0	77	0
	type a	0	39	0
total		0		0
	composite cn		#DIV/0!	

to north	cover	area	cn	
area	type d	0	77	0
	type a	0	39	0
total		0		0
	composite cn		#DIV/0!	
	total area	**33.26**		

existing areas

uplands	cover	area	c	
	imp	0	98	0
type a	woods	0	30	0
type d	woods	0	77	0
total		0		0
	composite c		**#DIV/0!**	

wetlands	cover	area	c	
	imp	0	98	0
type a	woods	0	30	0
type d	woods	0	77	0
wetlands	woods	0	77	0
total		0		0
	composite c		**#DIV/0!**	

STORM SEWER CALCULATIONS

O'DONNELL, STANTON ASSOCIATES
1705 ROUTE 37 EAST
TOMS RIVER, NJ 08753
732-573-0490

DRAINAGE COMPUTATIONS
SPRING HILL MANCHESTER

JOB NUMBER_19119.00
STORM FREQUENCY 25 YEARS
"I"=2.0 FOR TC = 60 MIN.
SCS RAINFALL

REVISED 9/8/2021

LOCATION		INLET	INLET	C	A	SUMA	CA	SUM CA	TO INLET	IN PIPE	TC END	I in/hr	"Q"	CAP	VEL	LENGTH	PIPE SIZE	SLOPE	"N"	TYPE			
		FROM	TO		(AC.)	(AC.)	(AC.)	(AC.)						CFS	FT/SEC	FEET	INCHES	%			NOTE		
		CB1	CB2	0.61	0.17	0.17	0.10	0.10	10.00	0.36	10.36	6.20	1.15	5.94	4.84	105	15	0.500	0.010	HDPE	25 yr	INCLUDES BASIN 1 FLOW	
		CB2	CB3	0.69	0.11	0.28	0.08	0.18	10.36	0.65	11.02	6.20	1.71	5.94	4.84	190	15	0.500	0.010	HDPE	25 yr		
		CB 3	CB4	0.98	0.10	0.38	0.10	0.28	11.02	0.31	11.33	6.20	3.23	5.94	4.84	90	15	0.500	0.010	HDPE	25 yr		
		CB4	FES4A	0.85	0.20	0.41	0.17	0.45	11.33	0.21	11.53	6.20	3.50	5.94	4.84	60	15	0.500	0.010	HDPE	25 yr		
	LF This run															445							
		CB5	CB6	0.87	0.35	0.87	0.30	0.30	10.00	0.48	10.48	6.20	1.89	5.94	4.84	140	15	0.500	0.010	HDPE	25 yr		
offsite		HW12	CB6	0.35	22.00	22.00	7.70	7.70	57.39	0.03	57.42	2.20	16.94	18.60	5.92	10	24	0.400	0.010	HDPE	25 yr		
		CB6	CB7	0.93	0.24	22.59	0.22	8.23	57.42	0.39	57.81	2.20	18.10	18.60	5.92	140	24	0.400	0.010	HDPE	25 yr		
		CB11	CB7	0.81	0.19	0.19	0.15	0.15	10.00	0.31	10.31	6.20	0.93	5.94	4.84	90	15	0.500	0.010	HDPE	25 yr		
		CB7	FES7A	0.92	0.11	22.89	0.10	8.48	57.81	0.06	57.87	2.20	18.66	43.35	6.13	22	24	0.250	0.010	HDPE	25 yr		
	LF This run															402							
		CB9	CB13	0.96	0.14	0.14	0.13	0.13	10.00	0.50	10.50	6.20	0.83	2.66	2.16	65	15	0.100	0.010	HDPE	25 yr		
		CB10	CB13	0.91	0.38	10.00	0.35	0.48	10.50	0.38	10.88	6.20	2.98	3.25	2.65	60	15	0.150	0.010	HDPE	25 yr		
		CB13	FES 13A	0.92	0.11	0.63	0.10	0.58	10.50	0.03	10.53	6.20	3.60	3.76	3.06	5	15	0.200	0.010	HDPE	25 yr		
		CB12	FES12A	0.96	0.15	0.15	0.14	0.14	10.00	0.05	10.05	2.20	0.32	4.60	3.75	11	15	0.300	0.010	HDPE	25 yr		
	LF This run															125							
TOTAL ON SITE AREA TO BASIN					2.25																		
	total lf pipe															1777							
								roof runoff is included in pipes															

SOIL LOGS AND PERMEAEBILITY TEST RESULTS

AIR, LAND & SEA

Environmental Management Services, Inc.

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August 30, 2021 **Electonically Transmitted, Original Mailed**

Mr. Thomas Petzold, Project Manager
O'Donnell, Stanton & Associates, Inc.
1705 Route 37 East
Toms River, NJ 08753

Re: **Soils Report – Spring Hills Manchester**
State Highway Route 37 West
Block 38, Lot 4
Manchester Township, Ocean County
OSA Project # 19119.02
AL&S Project #T – 5012.1

Dear Mr. Petzold,

Air, Land & Sea Environmental Management Services, Inc. (AL&S) mobilized to the above referenced property on 8/10/2021, 8/13/2021 and 8/25/2021 to observe the installation of fifteen (15) Test Pits at the above referenced property within the proposed storm water management basins and proposed parking area. The location of Test Pits were provided to AL&S' by O'Donnell Stanton & Associates, Inc. (OSA) and identified in the field as TP – 3001 through TP – 3015. OSA will prepare the Test Pit Location Plan to accompany this report.

The purpose of our investigation was to assess soil conditions, identify the estimated depth to the seasonal high water table and ground water and collect disturbed soil samples for permeability analysis. Soil Test Pit Logs TP - 3001 through TP - 3015, including results from Disturbed Tube Permeameter Soil Analysis are included herein as **Attachment A**.

My general observations included consistently sandy soils with a relatively deep estimated seasonal high water table (ESHWT). Most Test Pits began to collapse at depths of 4 – 6 feet below existing grade, thereby warranting the collection of disturbed soils samples for safety precautions. The depth to the ESHWT, if observed, was included within the attached Test Pit Logs. To that end, AL&S prepared a Summary of Soil Characteristics (see **Table 1.0**) on the following page. This Table identified the ESHWT based on my professional judgment and soil characteristics as to the approximate depth to the ESHWT.

AL&S will add that all soil samples, being sandy in nature, had extremely consistent soil characteristics. AL&S performed testing of the soil sample, plus a replicate, and it was determined that both samples were extremely consistent with respect to density and permeability rates. The reported results reflect these observations.

Table 1.0 – Summary of Soil Characteristics and Disturbed Tube Permeameter Analysis

Test Pit Identification	Date	Soil Description (depth to ESHWT in feet below grade)	Sample Depth (feet below grade)	Permeability Rate (in. / hr.)
TP - 3001	8/13/2021	Sandy loam, single grain, loose with trace silt. (13.0)	9.0 – 9.5'	15.0
TP – 3002	8/13/2021	Medium -coarse sand, single grain, loose. (13.0)	9.0 – 9.5'	24.3
TP – 3003	8/13/2021	Medium – coarse sand, single grain, loose.	9.0 – 9.5'	10.2
TP - 3004	8/13/2021	Medium – coarse sand, single grain, loose.	9.0 – 9.5'	17.1
TP – 3005	8/13/2021	Sandy loam, single grain, loose.	9.0 – 9.5'	22.9
TP – 3006	8/10/2021	Loamy sand, single grain, loose. (11.0)	9.0 – 9.5'	20.5
TP – 3007	8/10/2021	Sandy loam, single grain, loose.	8.5 – 9.0'	16.2
TP – 3008	8/25/2021	Medium – coarse sand, single grain, loose.	3.0 – 3.5'	17.7
TP – 3009	8/25/2021	Medium - coarse sand, single grain, loose.	3.0 – 3.5'	27.8
TP – 3010	8/25/2021	Medium - coarse sand, single grain, loose.	3.0 – 3.5'	26.0
TP – 3011	8/25/2021	Medium - coarse sand, single grain, loose.	3.0 – 3.5'	32.4
TP – 3012	8/25/2021	Loamy sand, single grain, loose.	3.0 – 3.5'	21.6
TP – 3013	8/25/2021	Medium - coarse sand, single grain, loose.	3.0 – 3.5'	35.4
TP – 3014	8/25/2021	Loamy sand, single grain, loose.	3.0 – 3.5'	19.5
TP - 3015	8/25/2021	Medium - coarse sand, single grain, loose.	3.0 – 3.5'	22.9

Should you have any questions or comments I may be reached via email or on my cell phone at (732) 600-2700.

Sincerely,
AIR, LAND & SEA

Z. John Triggis, Jr., President
Principal Environmental Consultant

ATTACHMENT A

AIR, LAND & SEA

Environmental Management Services, Inc.

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TEST PIT LOG # 3001

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 13, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 6"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
6 – 72"	Brownish yellow (10 YR 6/8)	Sandy loam, single grain loose.
* 72 – 120"	Yellowish brown (10 YR 5/8)	Sandy loam, single grain, loose, with trace silts.
120 – 162"	Reddish brown (2.5 YR 4/3)	Sand, single grain, loose.
162 – 180"	Light reddish brown (2.5 YR 6/4)	Coarse sand, single grain, loose. At 14 - 15' below grade, dark reddish brown (2.5 YR 2.5/3) coarse sands were beginning with small fragments of sandstone. Soils moist at 11' below grade. Common, medium, faint, Strong brown mottles at 13' below grade. Soils saturated at 15' below grade.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 108 - 114" or 9.0 – 9.5' below grade for Disturbed Tube Permeameter Analysis. Soils below 6' were loose and Test Pit was collapsing. Soils moist at 11' below grade and noticeably saturated at 15' below grade. Based on experience, professional judgment the estimated season high water table was determined to be 13' below grade and based on observed mottling. Groundwater was estimated to be 15' below grade and based on saturated soils.

Site Evaluator: _____ Date: 5/15/2021

Z. John Zingis, Jr. President
Principal Environmental Consultant

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11 Tunes Brook Drive, Brick NJ 08723
Tel: (732) 295-3900 - JZingishome3@verizon.net

Disturbed Tube Permeameter Test Results
Test Pit #3001

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3001 Replicate: _____ Date Collected: **08-13-2021**

Material Tested: _____ Fill __X__ Test in Native Soil – Indicate Depth **9.0 – 9.5'**

Type of Sample: ____ Undisturbed __X__ Disturbed

Description of Sample: Sandy loam, single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
435 - 250 = 185 grams

Sample Volume (L x 2.54 cm/inch x 3.14r^2) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.6 grams/cc

Standpipe Used _____ Yes _____N_____ No

Indicate Internal Radius, cm _____N/A_____

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	390 sec.	6.5 T
1)	0:00 sec.	390 sec.	6.5 T
1)	0:00 sec.	390 sec.	6.5 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr * 4 / 6.5 * ln (3 / 2)

K = 15.0 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None	_____ Cracks	_____ Worm Channels
_____ Root Channels	_____ Soil/Tube Contact	
_____ Large Gravel	_____ Large Roots	
_____ Dry Soil	_____ Smearing	_____ Compaction
_____ Other – Specify _____		

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/24/2021

Z. John Zingis, Jr. President
Principal Environmental Consultant

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TEST PIT LOG # 3002

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 13, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 8"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
8 – 96"	Yellowish brown (10 YR 5/8)	Sandy loam, single grain loose.
* 96 – 120"	Brownish yellow (10 YR 6/8)	Medium coarse sand, single grain, loose.
120 – 192"	Reddish brown (7.5 YR 4/3)	Coarse sand, single grain, soft. Common, medium, faint Strong brown mottling observed at 13' below grade. Soils noticeably wet at 15' below grade.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 108 – 114" or 9.0 – 9.5' below grade for Disturbed Tube Permeameter Analysis. Soils below 6' were loose and Test Pit was collapsing. Evidence of an estimated seasonal high water table was observed at 13' below grade and based on mottling. Ground water was observed at 15' below grade and was based on saturated soils.

Site Evaluator: _____ Date: 8/13/2021

Z. John Zingis, Jr. President
Principal Environmental Consultant

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11 Tunes Brook Drive, Brick NJ 08723
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Disturbed Tube Permeameter Test Results
Test Pit #3002

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3002 Replicate: _____ Date Collected: **08-13-2021**

Material Tested: _____ Fill __X__ Test in Native Soil – Indicate Depth **9.0 – 9.5'**

Type of Sample: ____ Undisturbed __X__ Disturbed

Description of Sample: Medium – coarse sand , single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
435 - 253 = 182 grams

Sample Volume (L x 2.54 cm/inch x 3.14r^2) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.6 grams/cc

Standpipe Used _____ Yes _____N_____ No

Indicate Internal Radius, cm _____N/A_____

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	240 sec.	4.0 T
1)	0:00 sec.	240 sec.	4.0 T
1)	0:00 sec.	240 sec.	4.0 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr * 4 / 4.0 * ln (3 / 2)

K = 24.3 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None	_____ Cracks	_____ Worm Channels
_____ Root Channels	_____ Soil/Tube Contact	
_____ Large Gravel	_____ Large Roots	
_____ Dry Soil	_____ Smearing	_____ Compaction
_____ Other – Specify _____		

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/20/2021

Z. John Zingis, Jr. President
Principal Environmental Consultant

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TEST PIT LOG # 3003

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 13, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 8"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
8 – 78"	Yellowish brown (10 YR 5/8)	Sandy loam, single grain loose.
* 78 – 180"	Brownish yellow (10 YR 6/8)	Medium - coarse sand, single grain, loose.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 108 – 114" or 9.0 – 9.5' below grade for Disturbed Tube Permeameter Analysis. Test Pit began to collapse at 6' below grade. No evidence of an estimated seasonal high water table was observed within Test Pit. No ground water encountered within Test Pit.

Site Evaluator: _____ Date: 8/13/2021

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Principal Environmental Consultant

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Disturbed Tube Permeameter Test Results
Test Pit #3003

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3003 Replicate: ____ Date Collected: **08-13-2021**

Material Tested: ____ Fill __X__ Test in Native Soil – Indicate Depth **9.0 – 9.5'**

Type of Sample: ____ Undisturbed __X__ Disturbed

Description of Sample: Medium – coarse sand , single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
445 - 255 = 190 grams

Sample Volume (L x 2.54 cm/inch x 3.14r^2) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.6 grams/cc

Standpipe Used _____ Yes ____N____ No

Indicate Internal Radius, cm ____N/A____

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	570 sec.	9.5 T
1)	0:00 sec.	570 sec.	9.5 T
1)	0:00 sec.	570 sec.	9.5 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr * 4 / 9.5 * ln (3 / 2)

K = 10.2 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None	_____ Cracks	_____ Worm Channels
_____Root Channels	_____ Soil/Tube Contact	
_____ Large Gravel	_____ Large Roots	
_____ Dry Soil	_____ Smearing	_____ Compaction
_____Other – Specify _____		

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/20/2021

Z. John Zingis, Jr. President
Principal Environmental Consultant

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TEST PIT LOG # 3004

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 13, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 6"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
6 – 84"	Yellowish brown (10 YR 5/8)	Sandy loam, single grain loose.
* 84 – 180"	Brownish yellow (10 YR 6/8)	Medium - coarse sand, single grain, loose.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 108 – 114" or 9.0 – 9.5' below grade for Disturbed Tube Permeameter Analysis. Test Pit began to collapse at 6' below grade. No evidence of an estimated seasonal high water table was observed within Test Pit. No ground water encountered within Test Pit.

Site Evaluator: _____ Date: 8/15/2021
Z. John Zingis, Jr. President
Principal Environmental Consultant

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11 Tunes Brook Drive, Brick NJ 08723
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Disturbed Tube Permeameter Test Results
Test Pit #3004

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3004 Replicate: ____ Date Collected: **08-13-2021**

Material Tested: _____ Fill X Test in Native Soil – Indicate Depth **9.0 – 9.5'**

Type of Sample: _____ Undisturbed X Disturbed

Description of Sample: Medium – coarse sand , single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
440 - 252 = 188 grams

Sample Volume (L x 2.54 cm/inch x 3.14r^2) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.6 grams/cc

Standpipe Used _____ Yes N No

Indicate Internal Radius, cm N/A

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	340 sec.	5.7 T
1)	0:00 sec.	340 sec.	5.7 T
1)	0:00 sec.	340 sec.	5.7 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr. * 4 / 5.7 * ln (3 / 2)

K = 17.1 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None	_____ Cracks	_____ Worm Channels
_____Root Channels	_____ Soil/Tube Contact	
_____ Large Gravel	_____ Large Roots	
_____ Dry Soil	_____ Smearing	_____ Compaction
_____Other – Specify _____		

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/26/2021

Z. John Zingaro, Jr. President
Principal Environmental Consultant

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TEST PIT LOG # 3005

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 13, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 8"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
8 – 84"	Yellowish brown (10 YR 5/8)	Sandy loam, single grain loose, with small (< ½") quartz pebbles, 10% of matrix.
* 84 – 180"	Brownish yellow (10 YR 6/8)	Sandy loam, single grain, loose.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 108 – 114" or 9.0 – 9.5' below grade for Disturbed Tube Permeameter Analysis. Soils below 6' were loose and Test Pit was collapsing. No evidence of an estimated seasonal high water table was observed throughout the Test Pit.

Site Evaluator: _____ Date: 8/13/2021
Z. John Zingis, Jr. President
Principal Environmental Consultant

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11 Tunes Brook Drive, Brick NJ 08723
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Disturbed Tube Permeameter Test Results
Test Pit #3005

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3005 Replicate: ____ Date Collected: **08-13-2021**

Material Tested: _____ Fill __X__ Test in Native Soil – Indicate Depth **9.0 – 9.5'**

Type of Sample: ____ Undisturbed __X__ Disturbed

Description of Sample: Sandy loam, single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
459 - 258 = 201 grams

Sample Volume (L x 2.54 cm/inch x 3.14r^2) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.7 grams/cc

Standpipe Used _____ Yes _____N_____ No

Indicate Internal Radius, cm _____N/A_____

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	255 sec.	4.25 T
1)	0:00 sec.	255 sec.	4.25 T
1)	0:00 sec.	255 sec.	4.25 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr. * 4 / 4.25 * ln (3 / 2)

K = 22.9 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None	_____ Cracks	_____ Worm Channels
_____Root Channels	_____ Soil/Tube Contact	
_____ Large Gravel	_____ Large Roots	
_____ Dry Soil	_____ Smearing	_____ Compaction
_____Other – Specify _____		

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/24/2021
Z. John Zingis, Jr. President
Principal Environmental Consultant

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TEST PIT LOG # 3006

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 10, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 6"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
6 – 72"	Dark yellowish brown (10 YR 4/6)	Sandy loam, single grain loose.
* 72 – 144"	Brownish yellow (10 YR 6/8)	Loamy sand, single grain, loose. Common, medium, faint, Strong brown mottles observed approximately 11.0' below grade. No saturated soils or ground water.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 114 – 120" or 9.5 – 10.0' below grade for Disturbed Tube Permeameter Analysis. Evidence of mottling and an estimated seasonal high water table was observed approximately 11.0' below grade. No ground water encountered within Test Pit.

Site Evaluator: _____ Date: 8/10/2021

Z. John Zinzis, Jr. President
Principal Environmental Consultant

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Environmental Management Services, Inc.
11 Tunes Brook Drive, Brick NJ 08723
Tel: (732) 295-3900 - JZingishome3@verizon.net

Disturbed Tube Permeameter Test Results
Test Pit #3006

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3006 Replicate: ____ Date Collected: **08-10-2021**

Material Tested: _____ Fill __X__ Test in Native Soil – Indicate Depth **9.0 – 9.5'**

Type of Sample: ____ Undisturbed __X__ Disturbed

Description of Sample: Loamy sand, single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
455 - 258 = 197 grams

Sample Volume (L x 2.54 cm/inch x 3.14r^2) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.7 grams/cc

Standpipe Used _____Yes _____N_____ No

Indicate Internal Radius, cm _____N/A_____

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	285 sec.	4.75 T
1)	0:00 sec.	285 sec.	4.75 T
1)	0:00 sec.	285 sec.	4.75 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr. * 4 / 4.75 * ln (3 / 2)

K = 20.5 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None	_____ Cracks	_____ Worm Channels
_____ Root Channels	_____ Soil/Tube Contact	
_____ Large Gravel	_____ Large Roots	
_____ Dry Soil	_____ Smearing	_____ Compaction
_____ Other – Specify _____		

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/24/2021

Z. John Zingis, Jr. President
Principal Environmental Consultant

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TEST PIT LOG # 3007

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 10, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 8"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
8 – 72"	Brownish yellow (10 YR 6/8)	Sandy loam, single grain, loose
72 – 78"	Strong brown (7.5 YR 4/6)	Loamy clay, single grain, soft, with a wavy boundary.
* 78 – 132"	Yellowish brown (10 YR 5/8)	Sandy loam, single grain, loose.
132 – 144"	Brownish yellow (10 YR 6/8)	Sand, single grain, loose, with quartz pebbles (< 1") and 10% of matrix.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 102 – 108" or 8.5 – 9.0' below grade for Disturbed Tube Permeameter Analysis. Excavation began to collapse at 6' below grade. No mottling or evidence of an estimated seasonal high water table was observed. No ground water encountered within Test Pit.

Site Evaluator: _____ Date: 8/10/2021
Z. John Zingis, Jr. President
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Disturbed Tube Permeameter Test Results
Test Pit #3007

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3007 Replicate: ____ Date Collected: **08-10-2021**

Material Tested: _____ Fill __X__ Test in Native Soil – Indicate Depth **8.5 – 9.0'**

Type of Sample: ____ Undisturbed __X__ Disturbed

Description of Sample: Sandy loam, single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
449 - 252 = 197 grams

Sample Volume (L x 2.54 cm/inch x 3.14r^2) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.7 grams/cc

Standpipe Used _____ Yes N No

Indicate Internal Radius, cm N/A

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	360 sec.	6.0 T
1)	0:00 sec.	360 sec.	6.0 T
1)	0:00 sec.	360 sec.	6.0 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr. * 4 / 6.0 * ln (3 / 2)

K = 16.2 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None _____ Cracks _____ Worm Channels

_____ Root Channels _____ Soil/Tube Contact

_____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other – Specify _____

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/26/2021

Z. John Zingis, Jr. President
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TEST PIT LOG # 3008

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 25, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 6"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
* 6 – 80"	Yellowish brown (10 YR 5/8)	Medium – coarse sand, single grain loose.
80 – 120"	Light olive brown (2.5 Y 5/6)	Very coarse sand, single grain, loose.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 36 - 42" below grade for Disturbed Tube Permeameter Analysis. Soils below 6' were loose and Test Pit was collapsing. No evidence of an estimated seasonal high water table or ground water observed within the Test Pit.

Site Evaluator: _____ Date: 8/25/2021

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Disturbed Tube Permeameter Test Results
Test Pit #3008

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3008 Replicate: ____ Date Collected: **08-25-2021**

Material Tested: _____ Fill __X__ Test in Native Soil – Indicate Depth **36 – 42"**

Type of Sample: ____ Undisturbed __X__ Disturbed

Description of Sample: Medium – coarse sand, single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
448 - 253 = 195 grams

Sample Volume (L x 2.54 cm/inch x $3.14r^2$) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.7 grams/cc

Standpipe Used _____Yes _____N_____ No

Indicate Internal Radius, cm _____N/A_____

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	330 sec.	5.5 T
1)	0:00 sec.	330 sec.	5.5 T
1)	0:00 sec.	330 sec.	5.5 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr. * 4 / 5.5 * ln (3 / 2)

K = 17.7 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None _____ Cracks _____ Worm Channels

_____ Root Channels _____ Soil/Tube Contact

_____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other – Specify _____

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/20/2021

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TEST PIT LOG # 3009

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 25, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 6"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
* 6 – 52"	Yellowish brown (10 YR 5/8)	Medium – coarse sand, single grain loose.
52 – 120"	Light olive brown (2.5 Y 5/6)	Very coarse sand, single grain, loose.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 36 - 42" below grade for Disturbed Tube Permeameter Analysis. Soils below 6' were loose and Test Pit was collapsing. No evidence of an estimated seasonal high water table or ground water observed within the Test Pit.

Site Evaluator: _____ Date: 8/25/2021

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Disturbed Tube Permeameter Test Results
Test Pit #3009

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3009 Replicate: ____ Date Collected: **08-25-2021**

Material Tested: _____ Fill __X__ Test in Native Soil – Indicate Depth **36 – 42"**

Type of Sample: ____ Undisturbed __X__ Disturbed

Description of Sample: Medium – coarse sand, single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
451 - 258 = 193 grams

Sample Volume (L x 2.54 cm/inch x 3.14r^2) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.7 grams/cc

Standpipe Used _____ Yes N No

Indicate Internal Radius, cm N/A

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	210 sec.	3.5 T
1)	0:00 sec.	210 sec.	3.5 T
1)	0:00 sec.	210 sec.	3.5 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr. * 4 / 3.5 * ln (3 / 2)

K = 27.8 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None	_____ Cracks	_____ Worm Channels
_____ Root Channels	_____ Soil/Tube Contact	
_____ Large Gravel	_____ Large Roots	
_____ Dry Soil	_____ Smearing	_____ Compaction
_____ Other – Specify _____		

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/24/2021

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TEST PIT LOG # 3010

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 25, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 6"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
* 6 – 59"	Yellowish brown (10 YR 5/8)	Medium – coarse sand, single grain loose.
59 – 120"	Light olive brown (2.5 Y 5/6)	Very coarse sand, single grain, loose.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 36 - 42" below grade for Disturbed Tube Permeameter Analysis. Soils below 6' were loose and Test Pit was collapsing. No evidence of an estimated seasonal high water table or ground water observed within the Test Pit.

Site Evaluator: _____ Date: 8/25/2021

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Disturbed Tube Permeameter Test Results
Test Pit #3010

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3010 Replicate: ____ Date Collected: **08-25-2021**

Material Tested: _____ Fill X Test in Native Soil – Indicate Depth **36 – 42"**

Type of Sample: ____ Undisturbed X Disturbed

Description of Sample: Medium – coarse sand, single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
448 - 256 = 192 grams

Sample Volume (L x 2.54 cm/inch x $3.14r^2$) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.7 grams/cc

Standpipe Used _____ Yes N No

Indicate Internal Radius, cm N/A

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	225 sec.	3.75 T
1)	0:00 sec.	225 sec.	3.75 T
1)	0:00 sec.	225 sec.	3.75 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr. * 4 / 3.75 * ln (3 / 2)

K = 26.0 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None	_____ Cracks	_____ Worm Channels
_____ Root Channels	_____ Soil/Tube Contact	
_____ Large Gravel	_____ Large Roots	
_____ Dry Soil	_____ Smearing	_____ Compaction
_____ Other – Specify _____		

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/24/2021

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TEST PIT LOG # 3011

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 25, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 6"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
* 6 – 80"	Yellowish brown (10 YR 5/8)	Medium – coarse sand, single grain loose.
80 – 120"	Light olive brown (2.5 Y 5/6)	Very coarse sand, single grain, loose.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 36 - 42" below grade for Disturbed Tube Permeameter Analysis. Soils below 6' were loose and Test Pit was collapsing. No evidence of an estimated seasonal high water table or ground water observed within the Test Pit.

Site Evaluator: _____ Date: 8/25/2021

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Disturbed Tube Permeameter Test Results
Test Pit #3011

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3011 Replicate: ____ Date Collected: **08-25-2021**

Material Tested: _____ Fill __X__ Test in Native Soil – Indicate Depth **36 – 42"**

Type of Sample: ____ Undisturbed __X__ Disturbed

Description of Sample: Medium – coarse sand, single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
455 - 254 = 201 grams

Sample Volume (L x 2.54 cm/inch x $3.14r^2$) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.7 grams/cc

Standpipe Used _____ Yes _____N_____ No

Indicate Internal Radius, cm _____N/A_____

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	180 sec.	3.0 T
1)	0:00 sec.	180 sec.	3.0 T
1)	0:00 sec.	180 sec.	3.0 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr. * 4 / 3.0 * ln (3 / 2)

K = 32.4 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None	_____ Cracks	_____ Worm Channels
_____ Root Channels	_____ Soil/Tube Contact	
_____ Large Gravel	_____ Large Roots	
_____ Dry Soil	_____ Smearing	_____ Compaction
_____ Other – Specify _____		

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/26/2021

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TEST PIT LOG # 3012

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 25, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 9"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
* 9 – 60"	Yellowish brown (10 YR 5/8)	Loamy sand, single grain loose.
60 – 110"	Yellow (10 YR 5/8)	Coarse sand, single grain, loose.
110 – 120"	Yellowish brown (10 YR 5/8)	Loamy sand, single grain, soft.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 36 - 42" below grade for Disturbed Tube Permeameter Analysis. Soils below 6' were loose and Test Pit was collapsing. No evidence of an estimated seasonal high water table or ground water observed within the Test Pit.

Site Evaluator: _____ Date: 8/25/2021
Z. John Zingis, Jr. President
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Disturbed Tube Permeameter Test Results
Test Pit #3012

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3012 Replicate: ____ Date Collected: **08-25-2021**

Material Tested: _____ Fill __X__ Test in Native Soil – Indicate Depth **36 – 42"**

Type of Sample: ____ Undisturbed __X__ Disturbed

Description of Sample: Medium – coarse sand, single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
441 - 250 = 201 grams

Sample Volume (L x 2.54 cm/inch x 3.14r^2) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.6 grams/cc

Standpipe Used _____Yes _____N_____ No

Indicate Internal Radius, cm _____N/A_____

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	270 sec.	4.5 T
1)	0:00 sec.	270 sec.	4.5 T
1)	0:00 sec.	270 sec.	4.5 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr. * 4 / 4.5 * ln (3 / 2)

K = 21.6 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None _____ Cracks _____ Worm Channels

_____ Root Channels _____ Soil/Tube Contact

_____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other – Specify _____

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/26/2021

Z. John Zingis, Jr. President
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TEST PIT LOG # 3013

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 25, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 12"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
* 12 – 112"	Yellowish brown (10 YR 5/8)	Medium – coarse sand, single grain loose.
112 – 120"	Strong brown (7.5 YR 5/8)	Loamy sand, single grain, soft.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 36 - 42" below grade for Disturbed Tube Permeameter Analysis. Soils below 6' were loose and Test Pit was collapsing. No evidence of an estimated seasonal high water table or ground water observed within the Test Pit.

Site Evaluator: _____ Date: 8/25/2021

Z. John Zingale, Jr. President
Principal Environmental Consultant

Air, Land & Sea
Environmental Management Services, Inc.
11 Tunes Brook Drive, Brick NJ 08723
Tel: (732) 295-3900 - JZingishome3@verizon.net

Disturbed Tube Permeameter Test Results
Test Pit #3013

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3013 Replicate: ____ Date Collected: **08-25-2021**

Material Tested: _____ Fill __X__ Test in Native Soil – Indicate Depth **36 – 42"**

Type of Sample: ____ Undisturbed __X__ Disturbed

Description of Sample: Medium – coarse sand, single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
448 - 255 = 193 grams

Sample Volume (L x 2.54 cm/inch x 3.14r^2) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.7 grams/cc

Standpipe Used _____Yes _____N_____ No

Indicate Internal Radius, cm _____N/A_____

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	165 sec.	2.75 T
1)	0:00 sec.	165 sec.	2.75 T
1)	0:00 sec.	165 sec.	2.75 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr. * 4 / 2.75 * ln (3 / 2)

K = 35.4 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None	_____ Cracks	_____ Worm Channels
_____Root Channels	_____ Soil/Tube Contact	
_____ Large Gravel	_____ Large Roots	
_____ Dry Soil	_____ Smearing	_____ Compaction
_____Other – Specify _____		

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/26/2021

Z. John Zingis, Jr. President
Principal Environmental Consultant

AIR, LAND & SEA

Environmental Management Services, Inc.

11 Tunes Brook Drive • Brick • New Jersey • 08723
Telephone: 732 • 295 • 3900
www.AIR-LAND-SEA.net

TEST PIT LOG # 3014

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 25, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 8"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
* 8 – 112"	Yellowish brown (10 YR 5/8)	Loamy sand, single grain, loose.
112 – 120"	Yellowish brown (10 YR 5/8)	Loamy sand, single grain, soft.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 36 - 42" below grade for Disturbed Tube Permeameter Analysis. Soils below 6' were loose and Test Pit was collapsing. No evidence of an estimated seasonal high water table or ground water observed within the Test Pit.

Site Evaluator: _____ Date: 8/25/2021

Z. John Zingale, Jr. President
Principal Environmental Consultant

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Environmental Management Services, Inc.
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Tel: (732) 295-3900 - JZingishome3@verizon.net

Disturbed Tube Permeameter Test Results
Test Pit #3014

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3014 Replicate: ____ Date Collected: **08-25-2021**

Material Tested: _____ Fill __X__ Test in Native Soil – Indicate Depth **36 – 42"**

Type of Sample: ____ Undisturbed __X__ Disturbed

Description of Sample: Loamy sand, single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
450 - 256 = 194 grams

Sample Volume (L x 2.54 cm/inch x $3.14r^2$) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.7 grams/cc

Standpipe Used _____Yes _____N_____ No

Indicate Internal Radius, cm _____N/A_____

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	300 sec.	5.0 T
1)	0:00 sec.	300 sec.	5.0 T
1)	0:00 sec.	300 sec.	5.0 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr. * 4 / 5.0 * ln (3 / 2)

K = 19.5 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None	_____ Cracks	_____ Worm Channels
_____Root Channels	_____ Soil/Tube Contact	
_____ Large Gravel	_____ Large Roots	
_____ Dry Soil	_____ Smearing	_____ Compaction
_____Other – Specify _____		

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/26/2021

Z. John Zingis, Jr. President
Principal Environmental Consultant

AIR, LAND & SEA

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Telephone: 732 • 295 • 3900
www.AIR-LAND-SEA.net

TEST PIT LOG # 3015

CLIENT: O'Donnell, Stanton & Assoc., Inc. AL&S PROJECT NUMBER: S – 5012.1

BLOCK(S): 38 LOT(S): 4 Date: August 25, 2021

STREET ADDRESS: Route 37 Westbound – Vacant Land

MUNICIPALITY: Manchester Township COUNTY: Ocean

Horizon Depth	Color/Munsell	Soil Characterization
0 - 8"	Dark Gray (10 YR 4/1)	Topsoil, mixed sands, single grain, loose.
* 8 – 100"	Yellowish brown (10 YR 5/8)	Medium – coarse sand, single grain loose.
100 – 120"	Light olive brown (2.5 Y 5/6)	Very coarse sand, single grain, loose.

SPECIAL COMMENTS or NOTES: * - Soil sample collected at 36 - 42" below grade for Disturbed Tube Permeameter Analysis. Soils below 6' were loose and Test Pit was collapsing. No evidence of an estimated seasonal high water table or ground water observed within the Test Pit.

Site Evaluator: _____ Date: 8/25/2021

Z. John Zingis, Jr. President
Principal Environmental Consultant

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Environmental Management Services, Inc.
11 Tunes Brook Drive, Brick NJ 08723
Tel: (732) 295-3900 - JZingishome3@verizon.net

Disturbed Tube Permeameter Test Results
Test Pit #3015

DATE: **August 26, 2021** PROJECT NUMBER: **S – 5012.1**

CLIENT: **O'Donnell, Stanton & Assoc., Inc.**

BLOCK(S): **38** LOT(S): **4**

STREET ADDRESS: **Route 37 West (Vacant Land)** MUNICIPALITY: **Manchester**

COUNTY: **Ocean** PAGE: **1 of 2**

Test Number: 3015 Replicate: ____ Date Collected: **08-25-2021**

Material Tested: _____ Fill __X__ Test in Native Soil – Indicate Depth **36 – 42"**

Type of Sample: ____ Undisturbed __X__ Disturbed

Description of Sample: Medium – coarse sand, single grain, loose.

Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91

Length of Sample, L, in inches 4

Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample – Wt. Of Empty Tube)
448 - 256 = 192 grams

Sample Volume (L x 2.54 cm/inch x 3.14r^2) = 116.4 cc

Bulk Density (Sample Weight/Sample Volume), 1.7 grams/cc

Standpipe Used _____Yes _____N_____ No

Indicate Internal Radius, cm _____N/A_____

Height of Water Above Rim of Test Basin, in inches (in):

At the Beginning of Each Test Interval: 3 inches

At the End of Each Test Interval: 2 inches

Tube Permeameter Test Data
Block: 38, Lot 4
Municipality: Manchester Twp., Ocean County

Rate of Water Level Drop:

	Time, Start of Test Interval, T_1	Time End of of Test Interval, T_2	Length of Test Interval, T, in minutes
1)	0:00 sec.	255 sec.	4.25 T
1)	0:00 sec.	255 sec.	4.25 T
1)	0:00 sec.	255 sec.	4.25 T

Calculation of Permeability (K = in. / Hr.):

K = 60 min/hr. * L(in.) / T(mins.) * ln (H1/H2)

K = 60 min/hr. * 4 / 4.25 * ln (3 / 2)

K = 22.9 in. / Hr.

Defects in the Sample (Check Appropriate Items):

X None	_____ Cracks	_____ Worm Channels
_____ Root Channels	_____ Soil/Tube Contact	
_____ Large Gravel	_____ Large Roots	
_____ Dry Soil	_____ Smearing	_____ Compaction
_____ Other – Specify _____		

I hereby certify that the information furnished on this form is true and accurate.

Signature of Site Evaluator _____ Date 8/20/2021

Z. John Zingis, Jr. President
Principal Environmental Consultant

DRAINAGE AREA MAPS

DETENTION BASIN

OFFSITE SHEET FLOW
100' @ 1.18%

OFFSITE SHALLOW CONCENTRATED FLOW
1230' @ 1.41%

LOT 6
BLOCK 38
N/F JERSEY CENTRAL POWER & LIGHT/FE DEP
DEEDS P228

LOT 1
BLOCK 38.70
N/F LEISURE VILLAGE WEST ASSOC

LOT 5
N/F KARAYS LLC
C/O A P MARZELLI
DB12258 P327
508,840 SF
11.681 AC

LOT 1
BLOCK 38.69
N/F LEISURE VILLAGE WEST ASSOC

LOT 4
BLOCK 38
TAX MAPS
DB13810 P1981

OFFSITE DRAINAGE AREA
A=25.67 ACRES
IMP = 1.43 AC.
GRASS = 6.36 AC.
WOODS = 17.27 AC.
STONE = 0.61 AC.

N32° 20' 07"E
1,272.10'

EXISTING DRAINAGE AREA
A= 7.59 ACRES
GRASS = 1.91 AC.
STONE = 0.43 AC.
WOODS = 5.25 AC.

TOTAL TC TO LOW POINT OF DISCHARGE = 31.20 MIN.

900 LF SHALLOW CONCENTRATED FLOW @ 0.80%
TC = 10.39 MIN.

100' SHEET FLOW @ 2.00%
TC = 20.83 MIN.

NEW JERSEY STATE HIGHWAY ROUTE NO 37
N57° 39' 53"W
260.00'

S57° 39' 53"E
260.00'

GRAPHIC SCALE
60 0 30 60 120 240
(IN FEET)
1 inch = 60 ft

NO.	DATE	DESCRIPTION OF REVISION	BY	ENGR.
1.	08/02/21	REVISED EXISTING DRAINAGE AREA COVERAGES	TRP	MEZ

O'DONNELL, STANTON & ASSOCIATES, Inc.
ENGINEERS, PLANNERS AND SURVEYORS
MEMBER OF THE VAN CLEEF ENGINEERING GROUP
CERTIFICATE OF AUTHORIZATION #24GA28132300
1705 ROUTE 37 EAST
TOMS RIVER, NEW JERSEY 08753
(732) 573-0490 (PHONE) (732) 573-0499 (FAX)
EMAIL: RECEPTIONIST@OSAENGINEERS.COM
MARK E. ZELINA, P.E.
PROFESSIONAL ENGINEER N.J. LIC. NO. 31650
DATE: 9/9/21

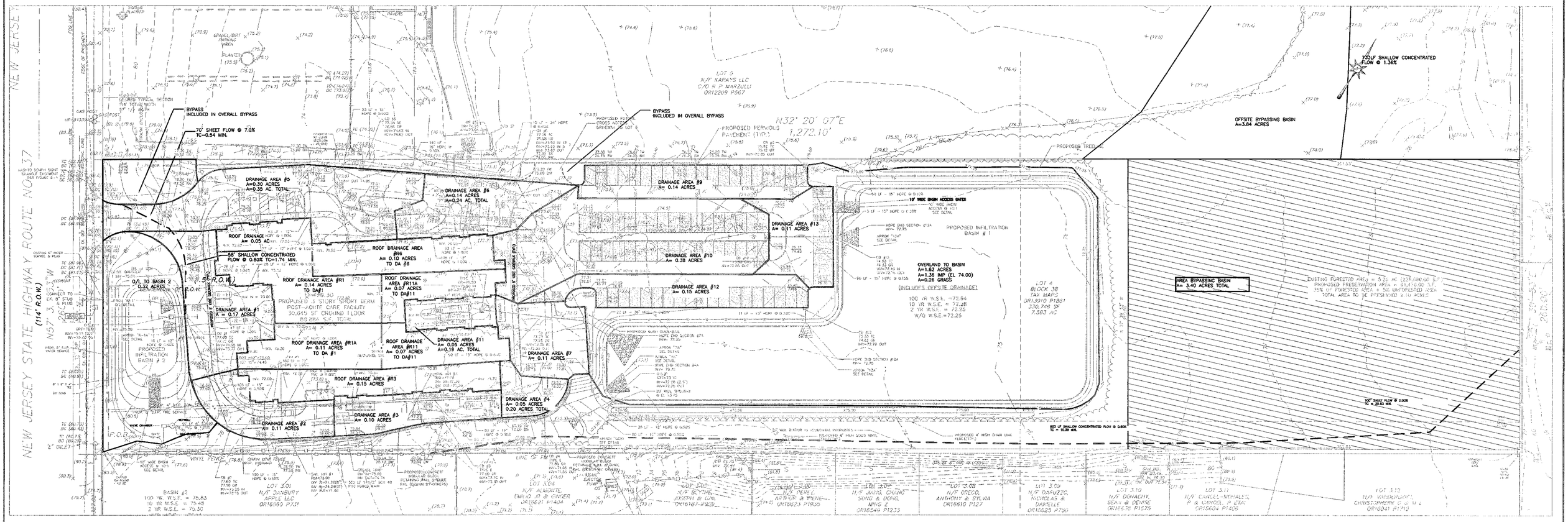
PRELIMINARY & FINAL PLAT - MAJOR SITE PLAN

PREPARED FOR
SPRING HILLS MANCHESTER
TAX BLOCK 38 - TAX LOT 4

EXISTING AND OFFSITE DRAINAGE AREA MAP

MANCHESTER TOWNSHIP
OCEAN COUNTY NEW JERSEY

CHECKED BY	CALC. BY	DRAWN BY	SCALE	DATE	PROJECT NO.	DWG NO.
	TRP	TRP	1" = 60'	05/25/21	19119.02	1 / 1



DEVELOPED DRAINAGE AREA MAP

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

NO.	DATE	DESCRIPTION OF REVISION	BY	ENGR.
1.	08/02/21	REVISED EXISTING DRAINAGE AREA COVERAGES	TRP	MEZ

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MARK E. ZELINA, P.E.
PROFESSIONAL ENGINEER N.J. LIC. NO. 31650
DATE: 9/6/21

PRELIMINARY & FINAL PLAT - MAJOR SITE PLAN
PREPARED FOR
SPRING HILLS MANCHESTER
TAX BLOCK 38 - TAX LOT 4
PROPOSED DRAINAGE AREA MAP
MANCHESTER TOWNSHIP
OCEAN COUNTY **NEW JERSEY**

CHECKED BY	CALC. BY	DRAWN BY	SCALE	DATE	PROJECT NO.	DWG NO.
	TRP	TRP	1" = 40'	05/25/21	19119.02	1 / 1

NEW JERSEY STATE HIGHWAY ROUTE NO. 37
(114' R.O.W.)

57' 1/2 WIDTH

GRAVEL/DIRT PARKING AREA

TRASH ENCLOS.

PROPOSED CONCRETE MODULAR BLOCK RETAINING WALL(DESIGN BY OTHERS)

578 SF

WOOD SHED

PROPOSED FUTURE CROSS ACCESS DRIVEWAY TO LOT 5

PROPOSED PERVIO PAVEMENT (TYP.)

P.O.B.

UP-8133MC

EDGE LINE

Ex. CONC. CURB

I-BAR FOUND 0.2' NE 0.1' NW

R1-1

24" STOP BAR

PROPOSED CURB (TYP.)

GRAVEL AREA TO 6' SE

LAWN EDGE LINE

R5-1

R7

PATH OF FRONT TIRE

PATH OF FRONT BUMPER

SITE I.D. SIGN

TP-3006

PROPOSED INFILTRATION BASIN # 2

TP-3007

PROPOSED 5' WIDE SIDEWALK (TYP.)

PROPOSED 3 STORY SHORT TERM POST-ACUTE CARE FACILITY
30,645 SF GROUND FLOOR
88,886 S.F. TOTAL

WOODSLINE (APPROX.)

GENERATOR

PROPOSED 5' WIDE SIDEWALK (TYP.)

LOADING ZONE

COMPACTOR

PROPOSED CONC. SIDEWALK

TP-3008

TP-3009

TP-3010

TP-3011

TP-3012

TP-3013

TP-3014

TP-3015

PROPOSED WOOD GUIDE RAIL

TP-3001

N57° 39' 53"W
260.00'

P.O.B.

'E' INLET

FENCE 4.9' SE

FENCE 4.8' SE

10' WIDE BASIN ACCESS @ 10:1 SEE DETAIL

CAPPED PIN FOUND 4.2' SE

VINYL FENCE

CHAIN LINK FENCE

LINE OF FM K-3833

PROPOSED CONCRETE MODULAR BLOCK RETAINING WALL & GUIDE RAIL (DESIGN BY OTHERS)

PROPOSED CONCRETE MODULAR BLOCK RETAINING WALL & GUIDE RAIL (DESIGN BY OTHERS)

SAN. EJECTOR PUMP

SHED

SHED

SAN MH
RIM 81.78
INV. 77.84

LOT 3.01
N/F DANBURY APPLE LLC
OR16560 P731

LOT 3.04
N/F ALMONTE, EMILIO JR & GINGER
OR16621 P1404

LOT 3.05
N/F BLYTHE, JOSEPH & GAIL
OR16187 P909

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

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MARK E. ZELINA, P.E.
PROFESSIONAL ENGINEER N.J. LIC. NO. 31650
DATE: 6/15/21

NO.	DATE	DESCRIPTION OF REVISION	BY	ENGR.

PRELIMINARY & FINAL PLAT - MAJOR SITE PLAN
PREPARED FOR
SPRING HILLS MANCHESTER
TAX BLOCK 38 - TAX LOT 4
FIRE TRUCK TURNING PLAN
MANCHESTER TOWNSHIP
OCEAN COUNTY **NEW JERSEY**

CHECKED BY	CALC. BY	DRAWN BY	SCALE	DATE	PROJECT NO.	DWG NO.
	TRP	TRP	1" = 20'	05/25/21	19119.02	1 / 1