Post Construction Stormwater Management Analysis

FOR

Water Gap Wellness Accessory Buildings

Smithfield Township
Monroe County, Pennsylvania

Date: August 27, 2024
Last Revised: November 27, 2024
Project #: 1022419.004

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POST CONSTRUCTION STORMWATER MANAGEMENT PLAN NARRATIVE

FOR

Water Gap Wellness Accessory Buildings

Smithfield Township
Monroe County, Pennsylvania

INTRODUCTION

Water Gap Acquisitions Partners is proposing to construct an approximately 8,000 sf Recreation Center and associated sidewalk access as part of the existing Water Gap Wellness Inn located in Smithfield Township. The plans also include an existing maintenance building that was analyzed for control of the anticipated peak stormwater discharge of both rate and volume from the property. To manage additional runoff anticipated from the new building and impervious surfaces, new stormwater management best management practices (BMPs) are proposed, including a new storm sewer system and an above-ground infiltration basin. Land uses within the past 50 years include grass fairways and buildings used in conjunction with the Water Gap Country Club that previously occupied the site since it first opened in 1922.

WATERSHED LOCATION

Stormwater runoff from the project site drains via sheet flow to an Unnamed Tributary to Cherry Creek, and as such has been analyzed as a single POI for volume, rate, and water quality control. This section of Cherry Creek, SR 2006 (formerly LR 45010) Bridge to Mouth, is classified as CWF and MF according to PA Code Chapter 93.

The site is located outside of the Brodhead/McMichaels Creek Watershed Act 167 Stormwater Management Plan. According to Section 26-226.3 of the Smithfield Township Stormwater Management Ordinance, sites located within the Township, but outside the limits of the Brodhead and McMichaels Creek Watershed, shall comply with the peak runoff rate requirements of District A. As such, the release rates for the 2-year proposed conditions must be reduced to the rate for the existing conditions 1-year design storm, and reduced to a 100% post-development to pre-development reduction for the 5-, 10-, 25-, 50- and 100-year design storm events. The rate analysis was prepared using the SCS Method.

PRE-DEVELOPMENT ANALYSIS

The project site has been analyzed as a single POI for volume, rate, and water quality control. Stormwater sheet flows off the site and is collected into an unnamed tributary which eventually discharges to Cherry Creek.

Hydraflow Hydrographs Extension for AutoCAD Civil 3D 2024 was used to develop pre-development hydrographs.

For more information on pre-development runoff calculations, refer to Section C of this report and the Pre-Development Drainage Plans.

POST-DEVELOPMENT ANALYSIS

Runoff continues to sheet flow off site, before being collected by the unnamed tributary and eventually discharging to Cherry Creek. Proposed storm sewers were designed to collect the proposed impervious and treat using an above-ground infiltration basin, before discharging to the existing stream. Portions of the LOD include previously constructed or removed impervious features and grading associated with the maintenance building construction, that have since been permanently stabilized, which were included in the stormwater calculations.

To prevent future capacity issues or erosive potential, the infiltration system was designed to meet peak runoff rate requirements of the Brodhead and McMichaels Creek Watershed District A, in accordance with the release rates criteria found in the Stormwater Management Ordinance [Chapter 26, Part 2, 26-226.3.] of Smithfield Township, meaning the outflow rates from the proposed stormwater management system shall not exceed the peak release rates of runoff prior to development of the design storms, and thus will not increase the discharge to the existing unnamed tributary.

Hydraflow Hydrographs Extension for AutoCAD Civil 3D 2024 was used to develop post development hydrographs and basin routings.

For more information, refer to Section D of this report and the Post-Development Drainage Plans.

VOLUME AND WATER QUALITY ANALYSIS AND BMPS FOR PADEP NPDES PERMITTING

The volume, rate, and water quality for the site were analyzed as one drainage area since runoff from the entire site is conveyed to Cherry Creek (as per the National Pollutant Discharge Elimination System – NPDES General Permit for Discharges of Stormwater Associated with Construction Activities Application Instructions). For volume, water quality, and stream bank erosion, one above-ground infiltration basin (structural BMP) and two vegetated swales (structural BMP) were designed to manage the proposed conditions two-year, twenty-four-hour design storm using the SCS Type II distribution. See Table 1 below for a summary of proposed PCSM volume management.

Infiltration rates:

- The infiltration basin was designed based on a soil evaluation and infiltration testing which yielded design infiltration rates. The full infiltration testing report is provided in Section H of this report. Engineered soils are proposed to meet grade for the infiltration basin, and shall be designed and tested during construction to meet or exceed the design infiltration rate based on previously conducted soil infiltration testing.

Table 1: Runoff volumes and management credit for the 2-yr 24-hr design storm.

Drainage Area	Runoff Volume (ft^3)				
	Pre-Development	Post-Development	Difference	Volume Credit	Total
POI 1	12,274	17,360	5,086	6,779	-1,693

Additional runoff volume and water quality calculations are provided in Section E of this report.

STORM SEWER ANALYSIS AND DESIGN

Runoff rates for the storm sewer capacity & conveyance calculations were calculated using the Rational Method to provide capacity and conveyance for the 100-year storm peak flow rate. Hydraflow Storm Sewers Extension for AutoCAD Civil 3D 2024 was used to size the proposed storm sewers.

Storm sewer capacity and conveyance calculations are provided in Section F of this report.

CONCLUSIONS

Stormwater runoff volume and rate increases are mitigated through the use of the proposed above-ground infiltration basin. The water quality requirements are achieved through the use of the infiltration basin and proposed vegetated swales. Stormwater peak discharge rates are reduced to the unnamed tributary.

BARRY ISETT & ASSOCIATES, INC.
Multidiscipline Engineers & Consultants
www.barryisett.com

SUMMARY OF PEAK FLOWS
SCS Method

Peak Flow Rate (CFS)

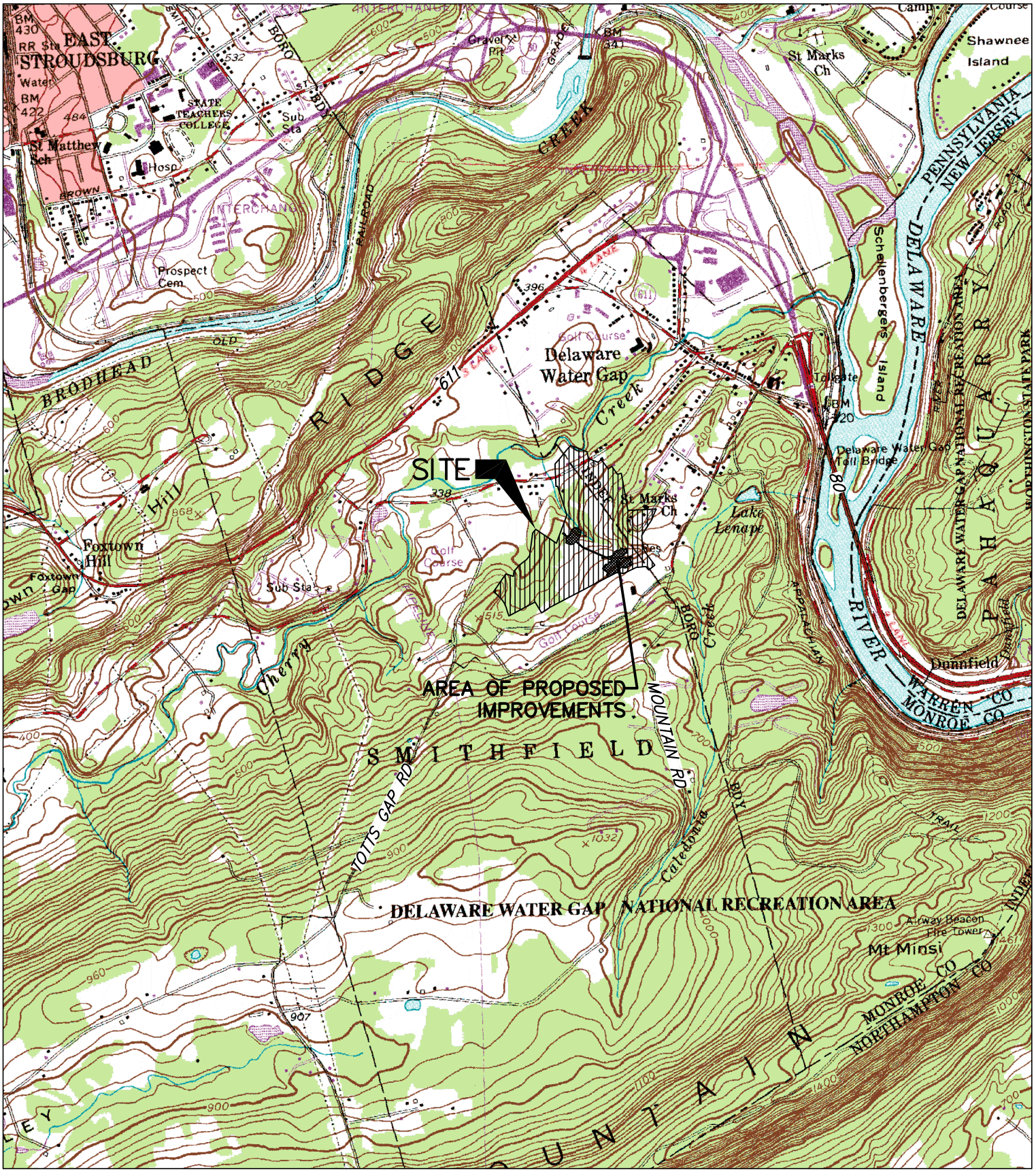
Pre-Development	*1-Yr*	*2-Yr*	*5-yr*	*10-Yr*	*25-Yr*	*50-Yr*	*100-Yr*
Pre POI 1 Total	3.1	4.6	6.9	9.1	12.7	15.9	19.8

Post-Development	*1-Yr*	*2-Yr*	*5-yr*	*10-Yr*	*25-Yr*	*50-Yr*	*100-Yr*
Post POI 1 Capture	2.4	3.3	4.5	5.7	7.5	9.0	10.9
Post POI 1 Release	0.0	0.1	0.2	0.4	0.9	1.7	4.2
Post POI 1 Bypass	1.9	2.9	4.4	5.9	8.2	10.3	12.9
Post POI 1 Total	1.9	2.9	4.4	5.9	8.4	11.0	14.4
Release Rate Requirements		1-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Post Allowable Flow		3.1	6.9	9.1	12.7	15.9	19.8

Net Change		-0.2	-2.5	-3.3	-4.3	-4.9	-5.5

The project is located outside of the Brodhead/McMichaels Creek Watershed. According to Section 26-226.3 of the Smithfield Township Stormwater Management Ordinance, "sites located within the Township, but outside the limits of the Brodhead and McMichaels Creek Watershed, shall comply with the peak runoff rate requirements of District A."

B. REFERENCE MATERIAL AND SUPPORTING DATA



WATER GAP WELLNESS
RECREATION CENTER
SMITHFIELD TOWNSHIP, MONROE COUNTY, PA

0 500 1000 2000 Feet
1:24000

SOURCE: USGS TOPOGRAPHIC MAPS, STROUDSBURG QUADRANGLE

N

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

NOAA Atlas 14, Volume 2, Version 3
Location name: Delaware Water Gap, Pennsylvania, USA*
Latitude: 40.9747°, Longitude: -75.1479°
Elevation: 537 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.326** (0.291-0.365)	**0.390** (0.348-0.437)	**0.469** (0.416-0.525)	**0.534** (0.472-0.596)	**0.620** (0.544-0.692)	**0.695** (0.605-0.776)	**0.779** (0.671-0.870)	**0.867** (0.738-0.972)	**1.01** (0.843-1.14)	**1.12** (0.926-1.28)
10-min	**0.514** (0.459-0.576)	**0.617** (0.551-0.692)	**0.741** (0.657-0.829)	**0.840** (0.743-0.938)	**0.972** (0.852-1.08)	**1.08** (0.944-1.21)	**1.21** (1.04-1.35)	**1.34** (1.14-1.50)	**1.54** (1.29-1.73)	**1.71** (1.41-1.94)
15-min	**0.638** (0.569-0.714)	**0.766** (0.684-0.860)	**0.926** (0.821-1.04)	**1.05** (0.929-1.17)	**1.22** (1.07-1.36)	**1.36** (1.18-1.52)	**1.51** (1.30-1.69)	**1.68** (1.43-1.88)	**1.93** (1.62-2.18)	**2.14** (1.76-2.43)
30-min	**0.862** (0.769-0.964)	**1.04** (0.932-1.17)	**1.30** (1.15-1.45)	**1.49** (1.32-1.67)	**1.77** (1.55-1.97)	**2.01** (1.74-2.24)	**2.26** (1.95-2.53)	**2.55** (2.17-2.86)	**2.98** (2.50-3.36)	**3.36** (2.77-3.82)
60-min	**1.06** (0.950-1.19)	**1.30** (1.16-1.46)	**1.65** (1.46-1.84)	**1.93** (1.70-2.15)	**2.33** (2.04-2.60)	**2.68** (2.34-3.00)	**3.08** (2.65-3.44)	**3.53** (3.00-3.95)	**4.21** (3.53-4.75)	**4.82** (3.98-5.48)
2-hr	**1.29** (1.16-1.43)	**1.57** (1.41-1.75)	**1.98** (1.78-2.21)	**2.33** (2.08-2.59)	**2.85** (2.53-3.17)	**3.33** (2.93-3.70)	**3.88** (3.38-4.31)	**4.52** (3.90-5.04)	**5.53** (4.69-6.23)	**6.47** (5.40-7.33)
3-hr	**1.44** (1.30-1.59)	**1.74** (1.57-1.93)	**2.17** (1.96-2.41)	**2.53** (2.28-2.80)	**3.09** (2.76-3.42)	**3.59** (3.18-3.97)	**4.17** (3.65-4.62)	**4.85** (4.19-5.40)	**5.92** (5.02-6.64)	**6.91** (5.77-7.80)
6-hr	**1.86** (1.69-2.06)	**2.23** (2.03-2.48)	**2.75** (2.49-3.05)	**3.20** (2.89-3.54)	**3.90** (3.49-4.32)	**4.54** (4.02-5.04)	**5.29** (4.63-5.88)	**6.18** (5.34-6.89)	**7.60** (6.44-8.52)	**8.92** (7.42-10.1)
12-hr	**2.32** (2.11-2.58)	**2.80** (2.54-3.11)	**3.47** (3.14-3.85)	**4.06** (3.65-4.50)	**4.98** (4.43-5.51)	**5.83** (5.13-6.46)	**6.83** (5.94-7.58)	**8.02** (6.88-8.93)	**9.92** (8.35-11.1)	**11.7** (9.65-13.2)
24-hr	**2.77** (2.56-3.03)	**3.33** (3.08-3.64)	**4.14** (3.82-4.52)	**4.85** (4.45-5.28)	**5.95** (5.42-6.45)	**6.94** (6.28-7.51)	**8.11** (7.26-8.75)	**9.47** (8.39-10.2)	**11.7** (10.2-12.5)	**13.7** (11.7-14.6)
2-day	**3.26** (3.01-3.56)	**3.91** (3.63-4.28)	**4.86** (4.49-5.30)	**5.67** (5.22-6.17)	**6.94** (6.34-7.53)	**8.08** (7.32-8.75)	**9.40** (8.45-10.2)	**10.9** (9.73-11.8)	**13.4** (11.7-14.4)	**15.7** (13.5-16.9)
3-day	**3.42** (3.17-3.72)	**4.10** (3.81-4.46)	**5.07** (4.70-5.51)	**5.91** (5.46-6.41)	**7.21** (6.61-7.79)	**8.38** (7.63-9.04)	**9.73** (8.78-10.5)	**11.3** (10.1-12.2)	**13.8** (12.2-14.8)	**16.1** (14.0-17.3)
4-day	**3.58** (3.33-3.88)	**4.29** (3.99-4.66)	**5.29** (4.91-5.73)	**6.15** (5.70-6.64)	**7.48** (6.88-8.05)	**8.68** (7.93-9.33)	**10.1** (9.12-10.8)	**11.7** (10.5-12.5)	**14.3** (12.6-15.2)	**16.6** (14.5-17.8)
7-day	**4.24** (3.94-4.59)	**5.07** (4.71-5.49)	**6.19** (5.75-6.70)	**7.16** (6.63-7.74)	**8.66** (7.97-9.32)	**9.99** (9.15-10.7)	**11.5** (10.5-12.4)	**13.3** (12.0-14.2)	**16.1** (14.3-17.2)	**18.6** (16.3-19.9)
10-day	**4.90** (4.57-5.28)	**5.83** (5.44-6.28)	**7.04** (6.56-7.58)	**8.06** (7.49-8.67)	**9.61** (8.89-10.3)	**11.0** (10.1-11.8)	**12.5** (11.4-13.4)	**14.3** (12.9-15.2)	**16.9** (15.2-18.1)	**19.3** (17.2-20.6)
20-day	**6.62** (6.23-7.06)	**7.81** (7.36-8.34)	**9.19** (8.66-9.80)	**10.3** (9.72-11.0)	**12.0** (11.2-12.8)	**13.5** (12.5-14.3)	**15.1** (14.0-16.0)	**16.8** (15.5-17.9)	**19.5** (17.8-20.7)	**21.7** (19.7-23.1)
30-day	**8.23** (7.78-8.74)	**9.68** (9.14-10.3)	**11.2** (10.6-11.8)	**12.4** (11.7-13.2)	**14.2** (13.3-15.0)	**15.7** (14.7-16.6)	**17.3** (16.2-18.3)	**19.1** (17.7-20.2)	**21.7** (20.0-22.9)	**23.9** (21.9-25.3)
45-day	**10.5** (9.96-11.1)	**12.2** (11.6-12.9)	**13.9** (13.2-14.7)	**15.3** (14.5-16.1)	**17.2** (16.3-18.2)	**18.8** (17.8-19.9)	**20.5** (19.3-21.6)	**22.3** (20.9-23.6)	**24.9** (23.2-26.3)	**27.0** (25.1-28.6)
60-day	**12.6** (12.0-13.2)	**14.7** (14.0-15.4)	**16.6** (15.8-17.4)	**18.1** (17.2-19.0)	**20.3** (19.2-21.3)	**22.0** (20.9-23.1)	**23.9** (22.6-25.1)	**25.8** (24.3-27.1)	**28.6** (26.8-30.1)	**30.9** (28.8-32.5)

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

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

Please refer to NOAA Atlas 14 document for more information.

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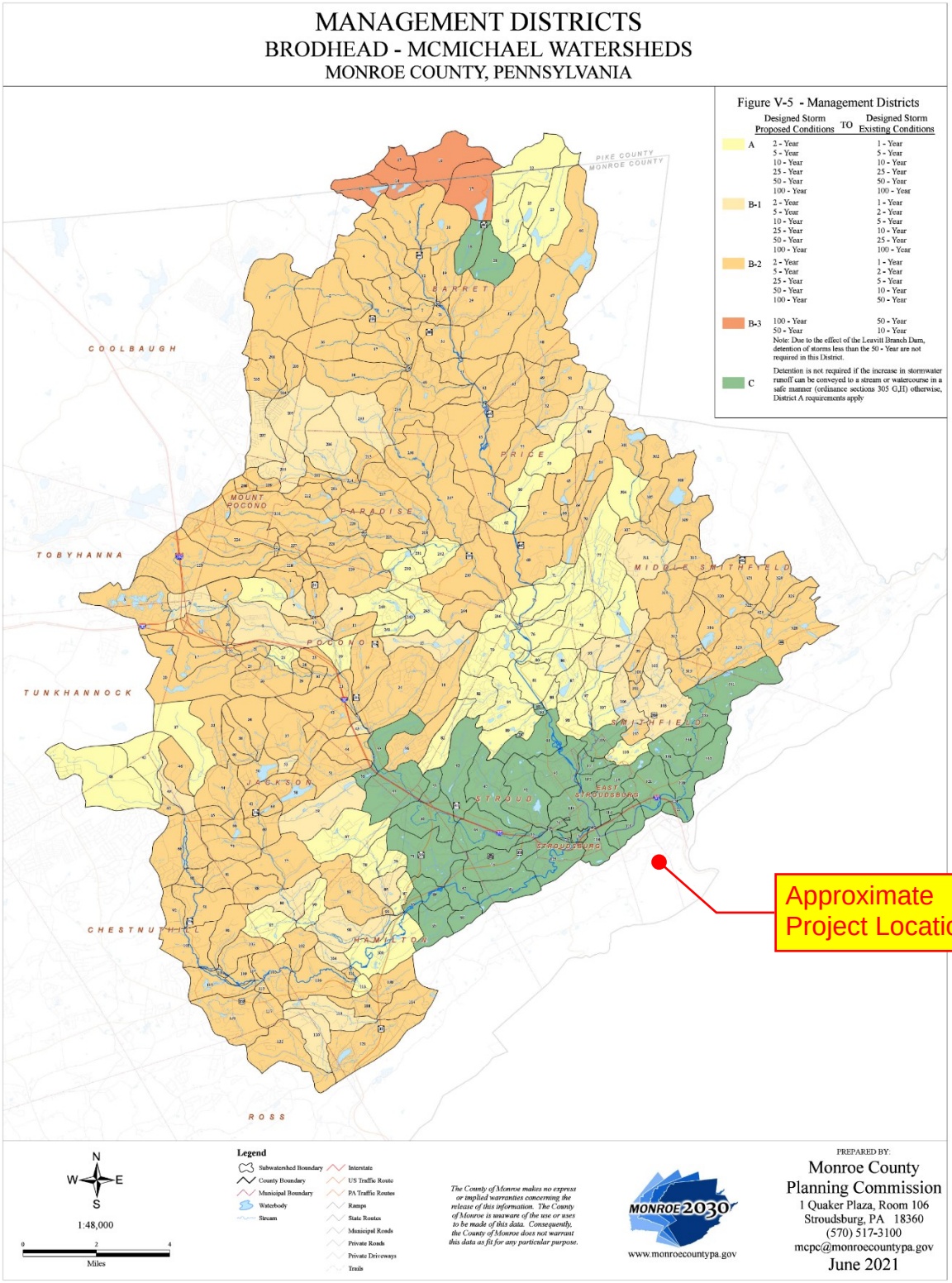
PF graphical

26 Attachment 4

Township of Smithfield



Job #: 1022419.004

SOILS LIMITATIONS & RESOLUTIONS SHEET

Project Name: Water Gap Wellness Accessory Buildings

LOCATION: Smithfield Township

COUNTY: Monroe

CHARACTERISTICS		LIMITATIONS	RESOLUTIONS	COMMENTS
HYDRIC	WETLANDS	NO DISTURBANCE (UNLESS ALLOWED BY DEP PERMIT)	DELINEATE WETLANDS PROTECT WETLANDS OBTAIN PERMIT(S)	SEE SOIL EROSION PLAN SHEET COPIES OF PERMITS
DEPTH TO BEDROCK		RESERVOIR AREAS DIVERSIONS - WATERWAYS TERRACES UTILITIES BUILDING SITES	REVISE DESIGN - RELOCATE	NOT ALWAYS POSSIBLE
TOPSOIL	POOR	VEGETATIVE STABILIZATION EMBANKMENTS HIGH ACIDITY LOW FERTILITY EXCESSIVE DRYNESS EXCESSIVE WETNESS	SOIL TESTS ADJUST SOILS IMPLEMENTS AS NEEDED	SEE SEEDING WORKSHEETS AND DETAIL SHEET NOTES
WET	HIGH WATER TABLE FLOODING HYDRIC PIPING SEEPAGE	RESERVOIR AREAS UTILITIES EMBANKMENTS DIKES LEVEES BUILDING SITES LANDSCAPING	SELECT FILL MATERIAL FROM OTHER AREA OF SITE SELECT APPROPRIATE PLANT MIXTURE PROVIDE PUMPED WATER SEDIMENT REMOVAL FACILITY DRAINAGE CHANNELS - UNDERDRAINS IMPORT BORROW MATERIAL FROM OFFSITE	SEE SEEDING WORKSHEETS AND DETAIL SHEET NOTES SEE DETAIL SHEET
WINTER GRADING FROST ACTION	POOR COMPACTION	RESERVOIR AREAS EMBANKMENTS	LIMIT DATES OF EARTH MOVING SELECT FILL MATERIAL FROM OTHER AREA OF SITE IMPORT BORROW MATERIAL FROM OFFSITE	SEE CONSTRUCTION SCHEDULE

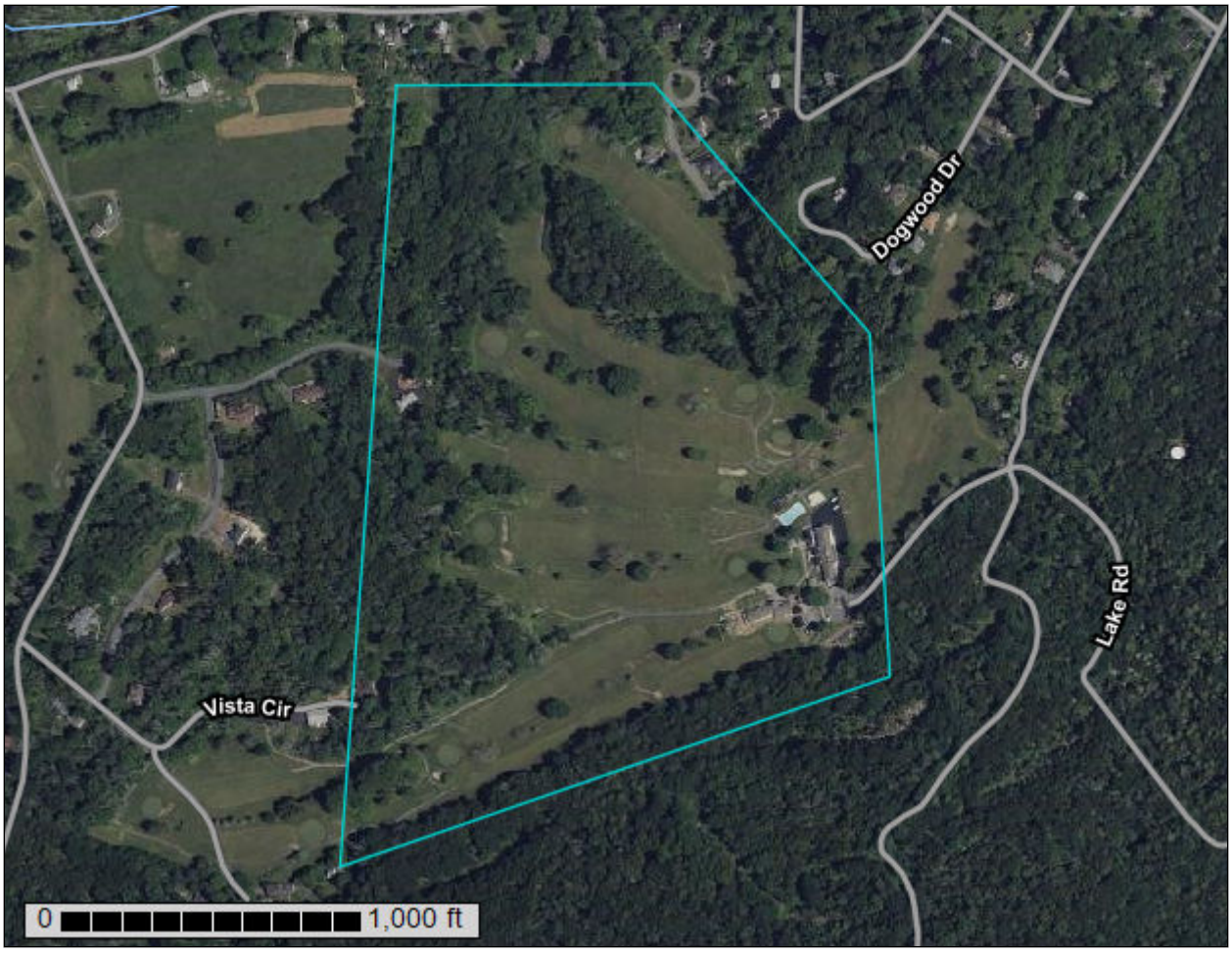
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

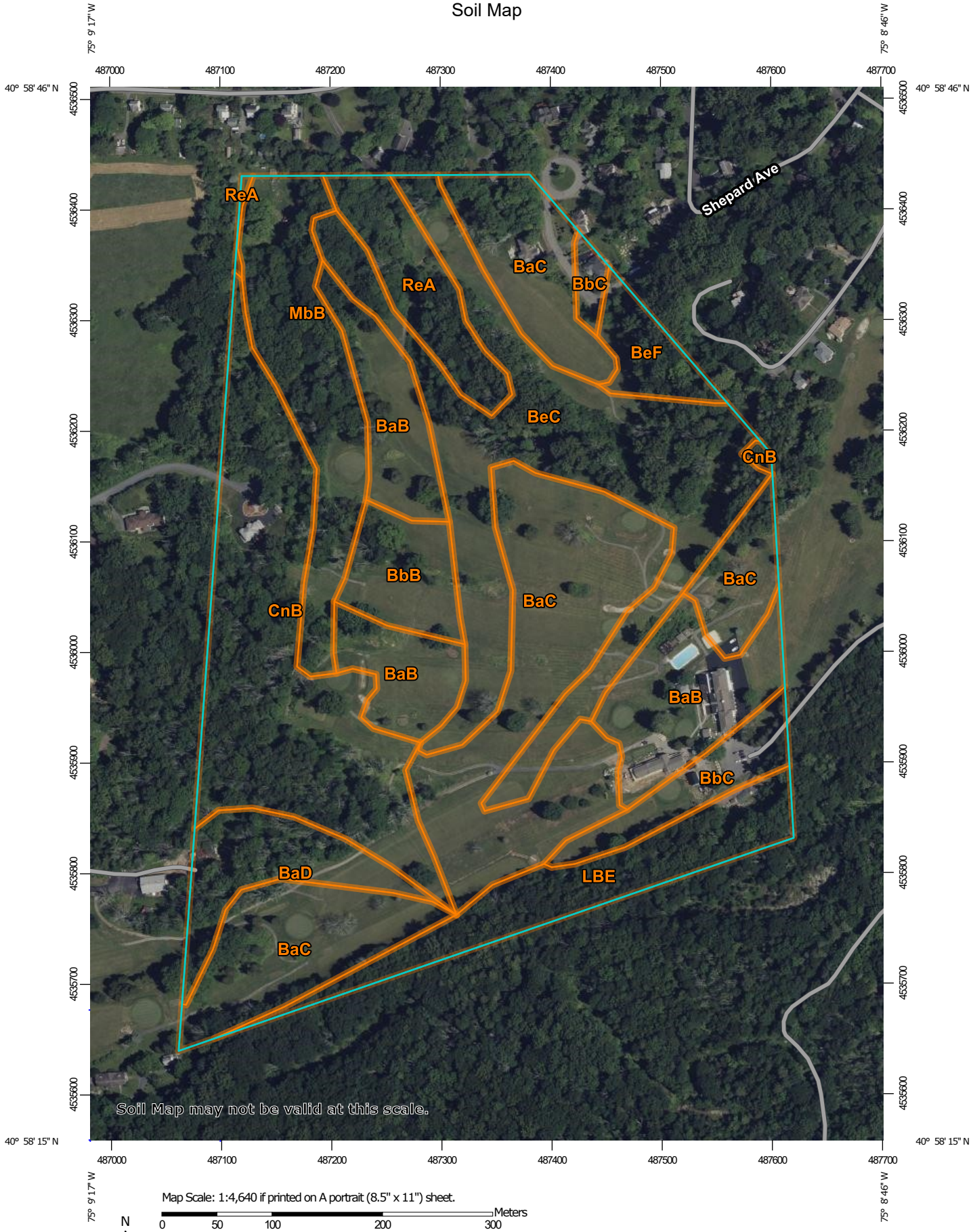
A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Monroe County, Pennsylvania



March 20, 2024

Custom Soil Resource Report
Soil Map



Map Scale: 1:4,640 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Monroe County, Pennsylvania
Survey Area Data: Version 18, Sep 7, 2023

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

Date(s) aerial images were photographed: Jun 3, 2022—Jul 20, 2022

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
BaB	Bath channery silt loam, 3 to 8 percent slopes	9.4	11.6%
BaC	Bath channery silt loam, 8 to 15 percent slopes	20.9	25.6%
BaD	Bath channery silt loam, 15 to 25 percent slopes	3.2	3.9%
BbB	Bath channery silt loam, 0 to 8 percent slopes, extremely stony	2.5	3.0%
BbC	Bath channery silt loam, 8 to 25 percent slopes, extremely stony	2.7	3.3%
BeC	Benson-Rock outcrop complex, 8 to 25 percent slopes	14.6	17.8%
BeF	Benson-Rock outcrop complex, 25 to 70 percent slopes	1.6	2.0%
CnB	Chippewa and Norwich soils, 0 to 8 percent slopes, extremely stony	12.4	15.1%
LBE	Lackawanna and Bath soils, steep, rubbly	4.8	5.9%
MbB	Mardin very stony silt loam, 0 to 8 percent slopes	6.4	7.9%
ReA	Rexford gravelly silt loam, 0 to 3 percent slopes	3.2	3.9%
Totals for Area of Interest		**81.7**	**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.

Monroe County, Pennsylvania

BaB—Bath channery silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2v30x
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Bath

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Ap - 0 to 9 inches: channery silt loam
Bw1 - 9 to 15 inches: channery silt loam
Bw2 - 15 to 25 inches: channery loam
E - 25 to 29 inches: channery loam
Bx - 29 to 52 inches: very channery silt loam
C - 52 to 72 inches: very channery silt loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: 26 to 38 inches to fragipan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F140XY030NY - Well Drained Dense Till
Hydric soil rating: No

Minor Components

Mardin

Percent of map unit: 10 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Lordstown

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Mountaintop, interfluve, crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

BaC—Bath channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2v314
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Bath

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Ap - 0 to 9 inches: channery silt loam
Bw1 - 9 to 15 inches: channery silt loam
Bw2 - 15 to 25 inches: channery loam

E - 25 to 29 inches: channery loam
Bx - 29 to 52 inches: very channery silt loam
C - 52 to 72 inches: very channery silt loam

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: 26 to 38 inches to fragipan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F140XY030NY - Well Drained Dense Till
Hydric soil rating: No

Minor Components

Lordstown

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountaintop, side slope, nose slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Mardin

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

BaD—Bath channery silt loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2v316
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F

Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Bath

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Ap - 0 to 9 inches: channery silt loam
Bw1 - 9 to 15 inches: channery silt loam
Bw2 - 15 to 25 inches: channery loam
E - 25 to 29 inches: channery loam
Bx - 29 to 52 inches: very channery silt loam
C - 52 to 72 inches: very channery silt loam

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: 26 to 38 inches to fragipan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F140XY030NY - Well Drained Dense Till
Hydric soil rating: No

Minor Components

Lordstown

Percent of map unit: 10 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountaintop, side slope, nose slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Mardin

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

BbB—Bath channery silt loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2v31k
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Bath, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: channery silt loam
Bw1 - 3 to 15 inches: channery silt loam
Bw2 - 15 to 25 inches: channery loam
E - 25 to 29 inches: channery loam
Bx - 29 to 52 inches: very channery silt loam
C - 52 to 72 inches: very channery silt loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 7.0 percent
Depth to restrictive feature: 26 to 38 inches to fragipan
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F140XY030NY - Well Drained Dense Till
Hydric soil rating: No

Minor Components

Swartswood, extremely stony

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Mardin, extremely stony

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

BbC—Bath channery silt loam, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2v31v
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Bath, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: channery silt loam
Bw1 - 3 to 15 inches: channery silt loam
Bw2 - 15 to 25 inches: channery loam
E - 25 to 29 inches: channery loam
Bx - 29 to 52 inches: very channery silt loam
C - 52 to 72 inches: very channery silt loam

Properties and qualities

Slope: 8 to 25 percent
Surface area covered with cobbles, stones or boulders: 7.0 percent
Depth to restrictive feature: 26 to 38 inches to fragipan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F140XY030NY - Well Drained Dense Till
Hydric soil rating: No

Minor Components

Swartswood, extremely stony

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Mardin, extremely stony

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, interfluve

Down-slope shape: Convex, concave
Across-slope shape: Linear, convex
Hydric soil rating: No

BeC—Benson-Rock outcrop complex, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: 9y9c
Elevation: 90 to 2,460 feet
Mean annual precipitation: 28 to 70 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Benson and similar soils: 60 percent
Rock outcrop: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Benson

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Loamy till

Typical profile

H1 - 0 to 8 inches: channery silt loam
H2 - 8 to 18 inches: very channery silt loam
H3 - 18 to 22 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D

Ecological site: F101XY011NY - Shallow Till Upland
Hydric soil rating: No

Description of Rock Outcrop

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

Minor Components

Wyoming
Percent of map unit: 4 percent
Landform: Terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Chenango
Percent of map unit: 4 percent
Landform: Outwash terraces
Landform position (three-dimensional): Riser
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Bath
Percent of map unit: 4 percent
Landform: Mountains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Mardin
Percent of map unit: 4 percent
Hydric soil rating: No

Volusia
Percent of map unit: 4 percent
Landform: Hills
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

BeF—Benson-Rock outcrop complex, 25 to 70 percent slopes

Map Unit Setting

National map unit symbol: 9y9d
Elevation: 90 to 1,800 feet
Mean annual precipitation: 28 to 51 inches
Mean annual air temperature: 40 to 55 degrees F
Frost-free period: 100 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Benson and similar soils: 60 percent
Rock outcrop: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Benson

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Loamy till

Typical profile

H1 - 0 to 8 inches: channery silt loam
H2 - 8 to 18 inches: very channery silt loam
H3 - 18 to 22 inches: unweathered bedrock

Properties and qualities

Slope: 25 to 70 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F101XY011NY - Shallow Till Upland
Hydric soil rating: No

Description of Rock Outcrop

Properties and qualities

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydric soil rating: No

Minor Components

Bath

Percent of map unit: 8 percent
Landform: Mountains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Wyoming

Percent of map unit: 7 percent
Landform: Terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

CnB—Chippewa and Norwich soils, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2vcjj
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Chippewa, extremely stony, and similar soils: 41 percent
Norwich, extremely stony, and similar soils: 39 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chippewa, Extremely Stony

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy till dominated by siltstone, sandstone, and shale fragments

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 5 inches: channery silt loam
Eg - 5 to 15 inches: channery silt loam
Bxg - 15 to 45 inches: channery silt loam
C - 45 to 72 inches: channery silt loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 7.0 percent
Depth to restrictive feature: 8 to 20 inches to fragipan
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F140XY016NY - Mineral Wetlands
Hydric soil rating: Yes

Description of Norwich, Extremely Stony

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy till dominated by reddish sandstone, siltstone and shale fragments

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 5 inches: channery silt loam
Eg - 5 to 10 inches: channery silt loam
Bg - 10 to 16 inches: channery silt loam
Bgx - 16 to 46 inches: channery silt loam
C - 46 to 72 inches: channery silt loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 7.0 percent
Depth to restrictive feature: 10 to 24 inches to fragipan
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F140XY016NY - Mineral Wetlands
Hydric soil rating: Yes

Minor Components

Norwich, extremely stony, very poorly drained

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Volusia, extremely stony

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Morris, extremely stony

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Chippewa, extremely stony, very poorly drained

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

LBE—Lackawanna and Bath soils, steep, rubbly

Map Unit Setting

National map unit symbol: 2v320
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Lackawanna, rubbly, and similar soils: 40 percent
Bath, rubbly, and similar soils: 30 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lackawanna, Rubbly

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till derived mainly from reddish sandstone, siltstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: channery loam
Bw1 - 3 to 17 inches: channery loam
Bw2 - 17 to 26 inches: channery loam
Bx - 26 to 60 inches: channery loam
C - 60 to 72 inches: very channery loam

Properties and qualities

Slope: 25 to 70 percent
Surface area covered with cobbles, stones or boulders: 20.0 percent
Depth to restrictive feature: 17 to 36 inches to fragipan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 16 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F140XY030NY - Well Drained Dense Till
Hydric soil rating: No

Description of Bath, Rubbly

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: channery silt loam
Bw1 - 3 to 15 inches: channery silt loam
Bw2 - 15 to 25 inches: channery loam
E - 25 to 29 inches: channery loam
Bx - 29 to 52 inches: very channery silt loam
C - 52 to 72 inches: very channery silt loam

Properties and qualities

Slope: 25 to 70 percent
Surface area covered with cobbles, stones or boulders: 20.0 percent
Depth to restrictive feature: 26 to 38 inches to fragipan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F140XY030NY - Well Drained Dense Till
Hydric soil rating: No

Minor Components

Lordstown, rubbly

Percent of map unit: 8 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Mountainflank, crest, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Oquaga, rubbly

Percent of map unit: 8 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank, nose slope, crest, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Mardin, rubbly

Percent of map unit: 7 percent
Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: No

Wellsboro, extremely stony

Percent of map unit: 7 percent
Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

MbB—Mardin very stony silt loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9yc2
Elevation: 750 to 1,800 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Mardin

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

A - 0 to 8 inches: very stony silt loam
Bw - 8 to 17 inches: channery silt loam
BE - 17 to 21 inches: channery silt loam
Bx - 21 to 60 inches: channery silt loam
C - 60 to 80 inches: very channery silt loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 14 to 26 inches to fragipan
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 11 to 22 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F140XY024NY - Moist Dense Till
Hydric soil rating: No

Minor Components

Lordstown

Percent of map unit: 6 percent
Hydric soil rating: No

Volusia

Percent of map unit: 5 percent
Hydric soil rating: No

Chippewa

Percent of map unit: 4 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

ReA—Rexford gravelly silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9ycq

Elevation: 590 to 1,970 feet
Mean annual precipitation: 34 to 56 inches
Mean annual air temperature: 40 to 54 degrees F
Frost-free period: 100 to 175 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rexford, somewhat poorly drained, and similar soils: 50 percent
Rexford, poorly drained, and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rexford, Somewhat Poorly Drained

Setting

Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy outwash derived from sandstone and shale

Typical profile

Ap - 0 to 8 inches: silt loam
Bw - 8 to 18 inches: silt loam
Bx - 18 to 40 inches: gravelly loam
2C - 40 to 63 inches: Error

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 15 to 24 inches to fragipan
Drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 2 to 10 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Ecological site: F140XY020NY - Dense Outwash
Hydric soil rating: No

Description of Rexford, Poorly Drained

Setting

Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy outwash derived from sandstone and shale

Typical profile

Ap - 0 to 8 inches: silt loam
Bw - 8 to 18 inches: silt loam
Bx - 18 to 40 inches: gravelly loam

2C - 40 to 63 inches: Error

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 15 to 24 inches to fragipan
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Ecological site: F140XY016NY - Mineral Wetlands
Hydric soil rating: Yes

Minor Components

Braceville

Percent of map unit: 10 percent
Landform: Outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

26 Attachment 2

Township of Smithfield

Appendix B
Stormwater Management Design Criteria

Table B-1
Runoff Curve Numbers Based on Land Use and HSG

Cover Type and Hydrologic Condition	CNs for hydrologic soil group A	B	C	D
Open Space (lawns, parks, golf courses, cementeries, landscaping, etc.)				
Poor condition (grass cover on <50% of the area)	68	79	86	89
Fair condition (grass cover on 50% to 75% of the area	49	69	79	84
Good condition (grass cover on >75& of the area)	39	61	74	80
Impervious Areas:				
Open water bodies: lakes, wetlands, ponds, etc.	100	100	100	100
Paved parking lots, roofs, driveways, etc. or other similar impervious surfaces	98	98	98	98
Porous Pavement and Pavers:				
Porous Pavement / Concrete on minimum 12" Clean Aggregate Base	40	40	66	70
Porous Pavers/ Pavement/Concrete Walks with min. 6" Clean Aggregate Base	40	52	75	80
Non-Impervious Driving Surfaces:				
Gravel	94	97	97	97
Dirt	88	93	94	94
Cultivated Agricultural Lands				
Row Crops (good), e.g., corn, sugar beets, soy beans	64	75	82	85
Small grain (good), e.g., wheat, barley, flax	60	72	80	84
Meadow (continuous grass, protected from grazing, and generally mowed for hay):	30	58	71	78
Brush (brush-weed-grass mixture, with brush the major element):				
Poor (<50% ground cover)	48	67	77	83
Fair (50% to 75% ground cover)	35	56	70	77
Good (>75% ground cover)	30	48	65	73
Woods:				
Poor (forest litter, small trees, and brush are destroyed by heavy grazing or regular burning)	45	66	77	83
Fair (woods are grazed but not burned, and some forest litter covers the soil)	36	60	73	79
Good (woods are protected from grazing, and litter and brush adequately cover the soil)	30	55	70	77

[1] Composite CNs for Residential , Commercial and Industrial Uses shall be computed based on the applicable values provided in this Table
[2] If Weighted CN is less than 40, use CN=40 for runoff computations.
[3] Designer shall submit justification for the use of CN values not specified in the above Table

Table B-2
Runoff Coefficients for the Rational Formula
By Land Use, Hydrologic Soil Group and Overland Slope (%)

Hydrologic Soil Group (HSG)	A			B			C			D		
Slope	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
Cultivated Land	0.08 (a)	0.13	0.16	0.11	0.15	0.21	0.01	0.19	0.28	0.18	0.23	0.31
	0.14 (b)	0.18	0.22	0.16	0.21	0.28	0.20	0.25	0.34	0.24	0.29	0.41
Pasture	0.12	0.20	0.30	0.18	0.28	0.37	0.24	0.34	0.44	0.30	0.40	0.50
	0.15	0.25	0.37	0.23	0.34	0.45	0.30	0.42	0.52	0.37	0.50	0.62
Open Space/Lawn	0.10	0.16	0.25	0.14	0.22	0.30	0.20	0.28	0.36	0.24	0.30	0.40
	0.14	0.22	0.30	0.20	0.28	0.37	0.26	0.35	0.44	0.30	0.40	0.50
Forest	0.05	0.08	0.11	0.08	0.11	0.14	0.10	0.13	0.16	0.12	0.16	0.20
	0.08	0.11	0.14	0.10	0.14	0.18	0.12	0.16	0.20	0.15	0.20	0.25
Meadow	0.05	0.10	0.14	0.05	0.13	0.19	0.12	0.17	0.24	0.16	0.21	0.28
	0.11	0.16	0.20	0.14	0.19	0.26	0.18	0.23	0.32	0.22	0.27	0.39
Impervious Surfaces (including	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87
dirt, gravel)	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97

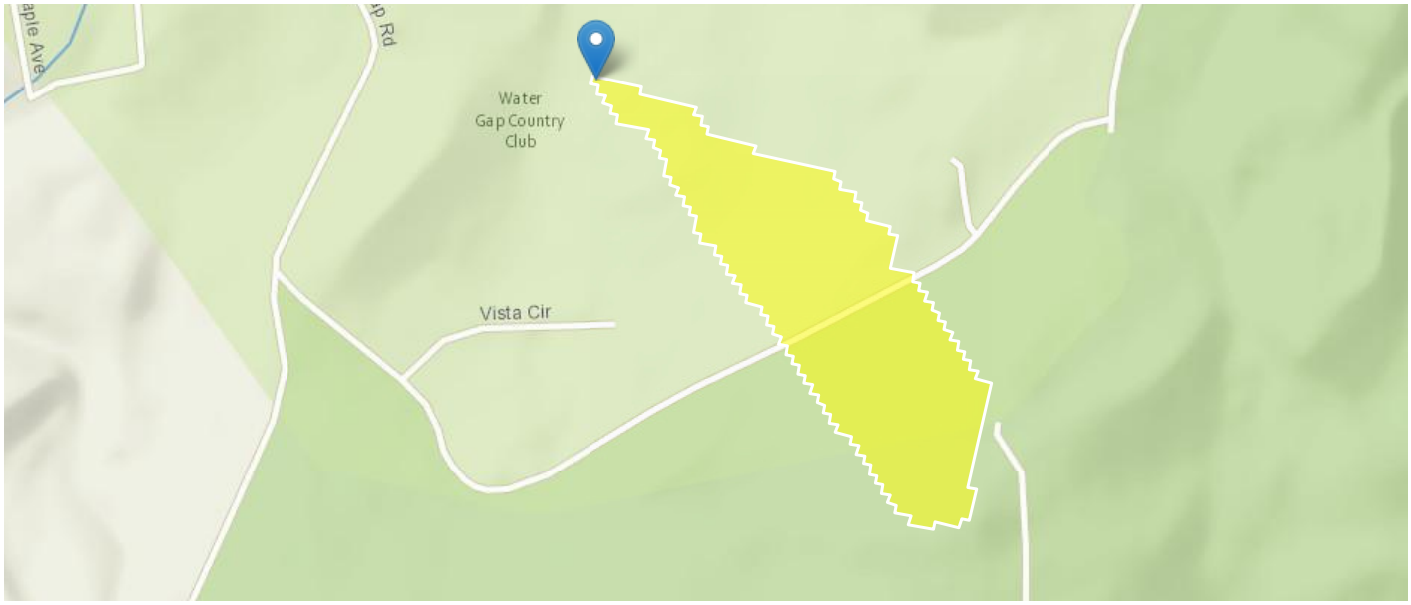
(a) Runoff coefficients for storm recurrence intervals less than 25 years.
(b) Runoff coefficients for storm recurrence intervals of 25 years or more

Source: "Recommended Hydrologic Procedures for Computing Urban Runoff from Small Watersheds in Pennsylvania" Pennsylvania DER #609-12/90

UNT TO CHERRY CREEK FLOW DEPTH CALCS

StreamStats Report - UNT to Cherry Creek

Region ID: PA
Workspace ID: PA20241127135830145000
Clicked Point (Latitude, Longitude): 40.97582, -75.15305
Time: 2024-11-27 08:58:54 -0500



Analysis of the peak flow to the UNT to Cherry Creek for stream easement determination.

Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
CARBON	Percentage of area of carbonate rock	0	percent
DRNAREA	Area that drains to a point on a stream	0.035	square miles
ELEVMAX	Maximum basin elevation	761	feet
FOREST	Percentage of area covered by forest	71.8543	percent
PRECIP	Mean Annual Precipitation	47	inches
URBAN	Percentage of basin with urban development	0	percent

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Peak Flow Region 1 SIR 2019 5094]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.035	square miles	3.04	1490
ELEVMAX	Maximum Basin Elevation	761	feet	1470	2690

Peak-Flow Statistics Disclaimers [Peak Flow Region 1 SIR 2019 5094]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Peak Flow Region 1 SIR 2019 5094]

Statistic	Value	Unit
50-percent AEP flood	1.52	ft^3/s
20-percent AEP flood	2.31	ft^3/s
10-percent AEP flood	2.89	ft^3/s
4-percent AEP flood	3.66	ft^3/s
2-percent AEP flood	4.27	ft^3/s
1-percent AEP flood	4.89	ft^3/s
0.5-percent AEP flood	5.53	ft^3/s
0.2-percent AEP flood	6.38	ft^3/s

Peak-Flow Statistics Citations

Roland, M.A., and Stuckey, M.H.,2019, Development of regression equations for the estimation of flood flows at ungaged streams in Pennsylvania: U.S. Geological Survey Scientific Investigations Report 2019–5094, 36 p. (https://doi.org/10.3133/sir20195094)

General Flow Statistics

General Flow Statistics Parameters [Statewide Mean and Base Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.035	square miles	2.26	1720
PRECIP	Mean Annual Precipitation	47	inches	33.1	50.4
CARBON	Percent Carbonate	0	percent	0	99
FOREST	Percent Forest	71.8543	percent	5.1	100
URBAN	Percent Urban	0	percent	0	89

General Flow Statistics Disclaimers [Statewide Mean and Base Flow]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

General Flow Statistics Flow Report [Statewide Mean and Base Flow]

Statistic	Value	Unit
Harmonic Mean Streamflow	0.0115	ft^3/s

General Flow Statistics Citations

Stuckey, M.H.,2006, Low-flow, base-flow, and mean-flow regression equations for Pennsylvania streams: U.S. Geological Survey Scientific Investigations Report 2006-5130, 84 p. (http://pubs.usgs.gov/sir/2006/5130/)

Base Flow Statistics

Base Flow Statistics Parameters [Statewide Mean and Base Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.035	square miles	2.26	1720
PRECIP	Mean Annual Precipitation	47	inches	33.1	50.4
CARBON	Percent Carbonate	0	percent	0	99
FOREST	Percent Forest	71.8543	percent	5.1	100
URBAN	Percent Urban	0	percent	0	89

Base Flow Statistics Disclaimers [Statewide Mean and Base Flow]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Base Flow Statistics Flow Report [Statewide Mean and Base Flow]

Statistic	Value	Unit
Base Flow 10 Year Recurrence Interval	0.0265	ft^3/s
Base Flow 25 Year Recurrence Interval	0.0236	ft^3/s
Base Flow 50 Year Recurrence Interval	0.0219	ft^3/s

Base Flow Statistics Citations

Stuckey, M.H.,2006, Low-flow, base-flow, and mean-flow regression equations for Pennsylvania streams: U.S. Geological Survey Scientific Investigations Report 2006-5130, 84 p. (http://pubs.usgs.gov/sir/2006/5130/)

Application Version: 4.24.0
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

North American Green
5401 St. Wendel-Cynthiana Rd.
Poseyville, Indiana 47633
Tel. 800.772.2040
>Fax 812.867.0247
www.nagreen.com
ECMDS v7.0

CHANNEL ANALYSIS

> > > UNT to Cherry Creek

Name	UNT to Cherry Creek
Discharge	4.27
Channel Slope	0.1096
Channel Bottom Width	0
Left Side Slope	4
Right Side Slope	6
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	Mix (Sod and Bunch)
Vegetation Density	Very Good 80-95%
Soil Type	Loam (MH)

Unreinforced Vegetation

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	4.27 cfs	4.41 ft/s	0.44 ft	0.04	4 lbs/ft2	3.01 lbs/ft2	1.33	STABLE	--
Underlying Substrate	Straight	4.27 cfs	4.41 ft/s	0.44 ft	0.04	2.4 lbs/ft2	1.47 lbs/ft2	1.62	STABLE	--

C. PRE-DEVELOPMENT RATE ANALYSIS

BARRY ISETT & ASSOCIATES, INC.
Consulting Engineers & Surveyors

www.barryisett.com

Worksheet 2: **Runoff curve number & runoff**

PROJECT: Water Gap Wellness Accessory Buildings
LOCATION: Smithfield Township
COUNTY: MONROE
STATE PA

Check one ☑ Present ☐ Developed Pre-Development - POI 1

1. Runoff curve number (CN)

Soil name & (appendix A)	Hydrologic group	cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected / connected impervious area ratio)	CN Table 2-2	CN Fig. 2-3	CN Fig. 2-4	Area X	Area acres / mi. ^2 / %	Product of CN x Area
SITE	C	Impervious	98				0.144	14.1
	C	Gravel	97				0.047	4.6
	C	Lawn	74				3.000	222.0
	D	Lawn	80				0.074	5.9
							0.000	0.0
							0.000	0.0
							0.000	0.0
							0.000	0.0
							0.000	0.0
							0.000	0.0
							0.000	0.0
		SUBTOTAL COMPOSITE	**76**				3.265	246.6
OFFSITE		WOODED STEEP BANKS FAIR					0.000	0.0
		FARMFIELD / MEADOW					0.000	0.0
		RESIDENTIAL 1/2 ACRE					0.000	0.0
		ROADS					0.000	0.0
		SUBTOTAL COMPOSITE	**0**				0.000	0.0

Totals = 3.265 246.6

CN (weighted) total product / total area = 246.6 / 3.2647 = 75.54 ; Use CN = **76**

BARRY ISETT & ASSOCIATES, INC.
Consulting Engineers & Surveyors

www.barryisett.com

Worksheet 3: Time of concentration (Tc) or travel time (Tt)

PROJECT: Water Gap Wellness Accessory Buildings
LOCATION: Smithfield Township
COUNTY: MONROE

Check one ☑ Present ☐ Developed — Pre-Development
☑ Tc ☐ Tt through subarea

1. Sheet flow (applicable to Tc only)

		ID					
1. Surface description (table 3-1)			Grass	Grass	Grass	Grass	
2. Manning's roughness coeff., n (table 3-1)			0.24	0.24	0.24	0.24	
3. Flow length, L (total L < 150 ft.)	ft.		18	132	0	0	
4. Two-yr. 24-hr rainfall, P2	in.		3.00	3.00	3.00	3.00	
5. Land slope, s	ft./ft.		0.253	0.019	0.000	0.000	
6. Tc=(0.007 x (n x L)^0.8)/(P2^0.5 x s^(	hr.		0.023	0.313	0	0	0.336

2. Shallow concentrated flow

		ID				
7. Surface description (paved or unpaved)			U			
8. Flow length, L	ft.		20	0	0	0
9. Watercourse slope, s	ft./ft.		0.027	0	0	0
10. Average velocity, V (figure 3-1)	ft./s		2.7	0	0	0
11. Tt = L / (3600 x V)	hr.		0.002	0	0.0	0	0.002

3. Channel flow - Pipe flow

		ID				
# Cross sectional flow area, a	ft.^2		0	0	0	0
or Pipe diameter, in.	in.					
# Wetted perimeter, Pw	ft.		0.00	0.00	0.00	0.00
# Hydraulic radius, r = a/Pw	ft.		0	0	0	0
# Channel slope, s	ft./ft.		0	0	0	0
# Manning's roughness coeff., n						
# V=(1.49xr^2/3 x s^1/2)/n	ft./s		0.0	0.0	0.0	0.0
# Flow length, L	ft.		0	0	0	0
# Tt = L /(3600xV)	hr.		0	0	0	0	0

Watershed or subarea Tc or Tt (Hr.) 0.338 Hr.
20 Min.

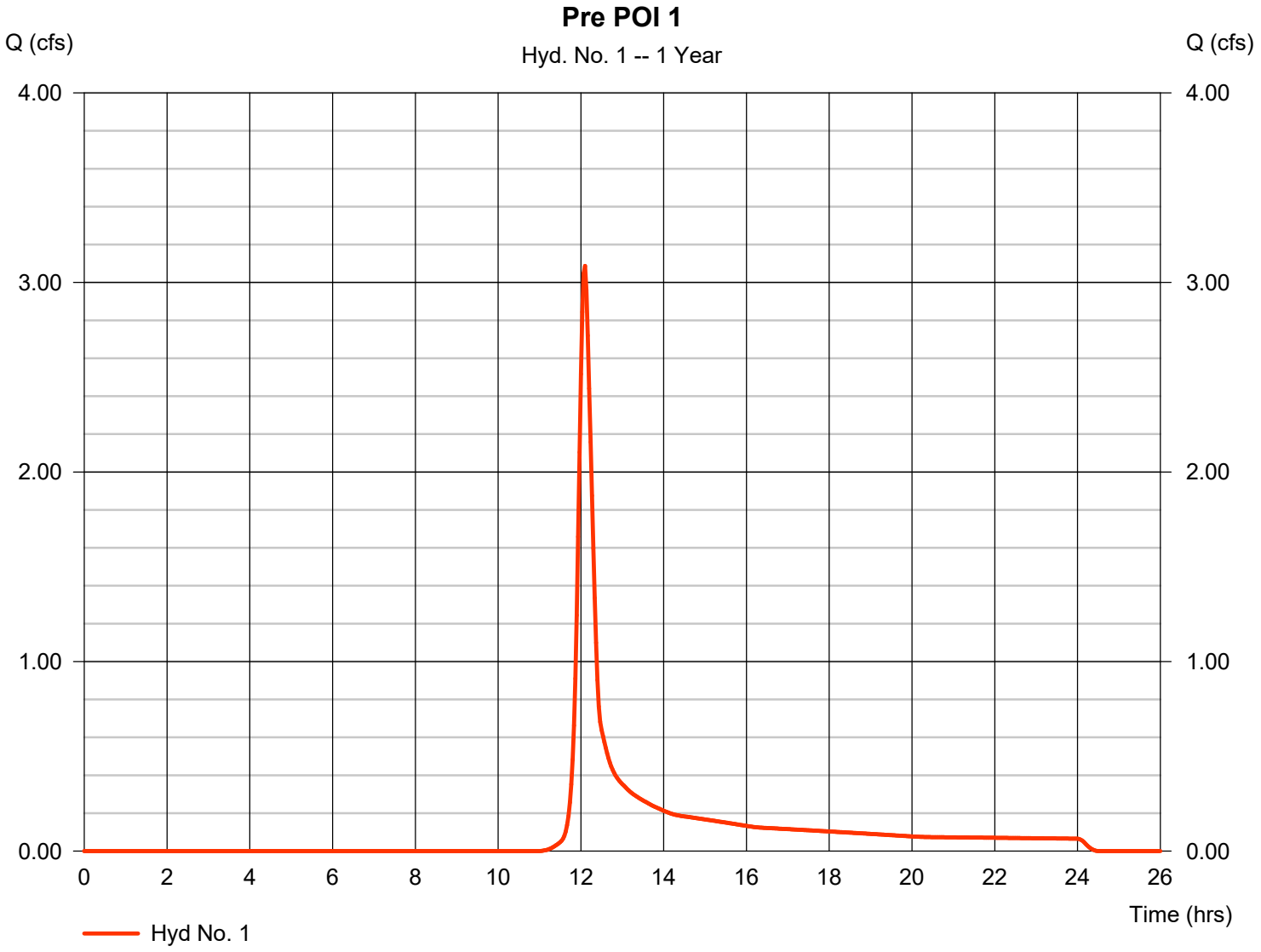
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 1

Pre POI 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.087 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	10,233 cuft
Drainage area	=	3.265 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.00 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



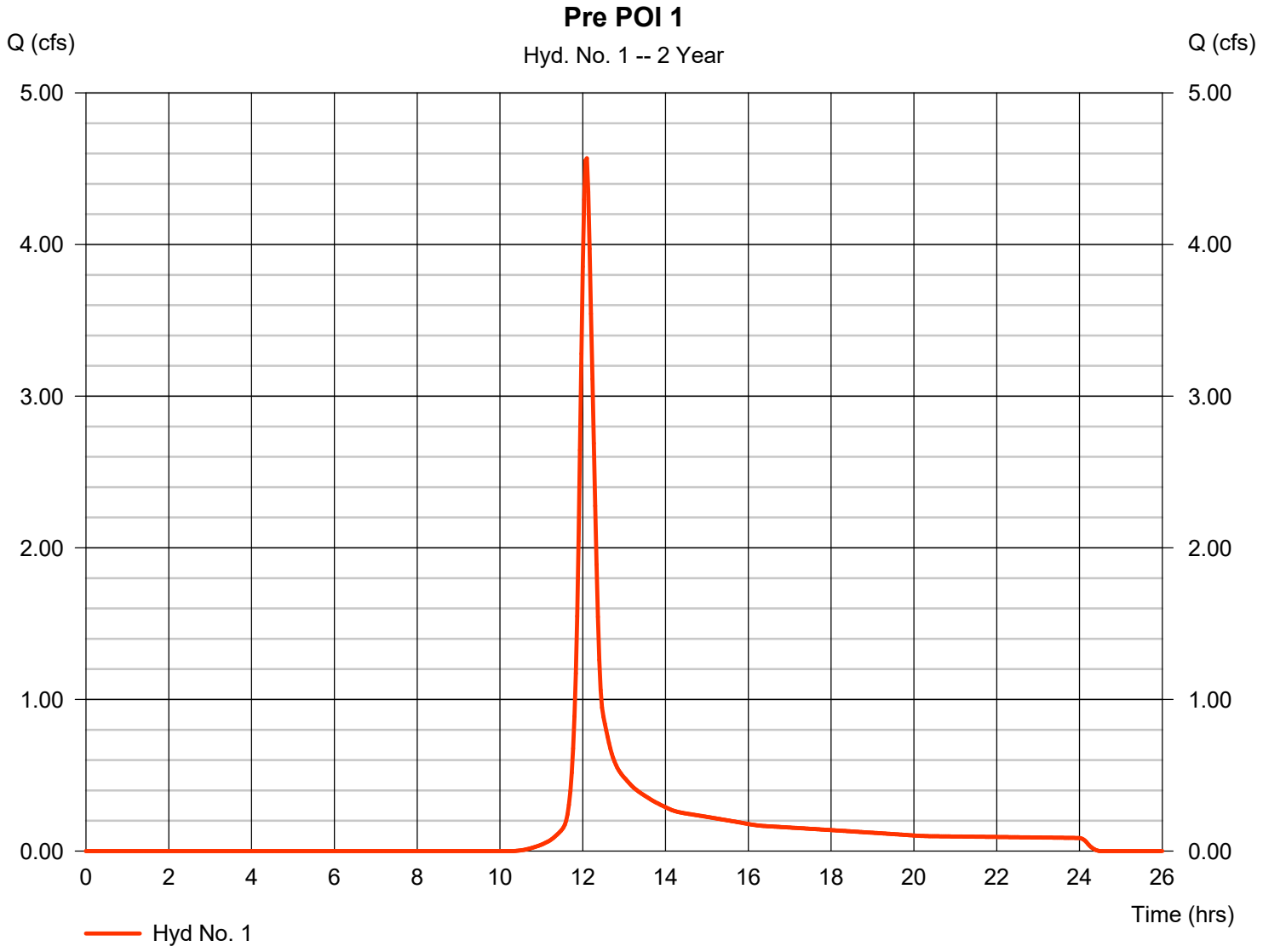
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 1

Pre POI 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.569 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	14,736 cuft
Drainage area	=	3.265 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.00 min
Total precip.	=	3.33 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



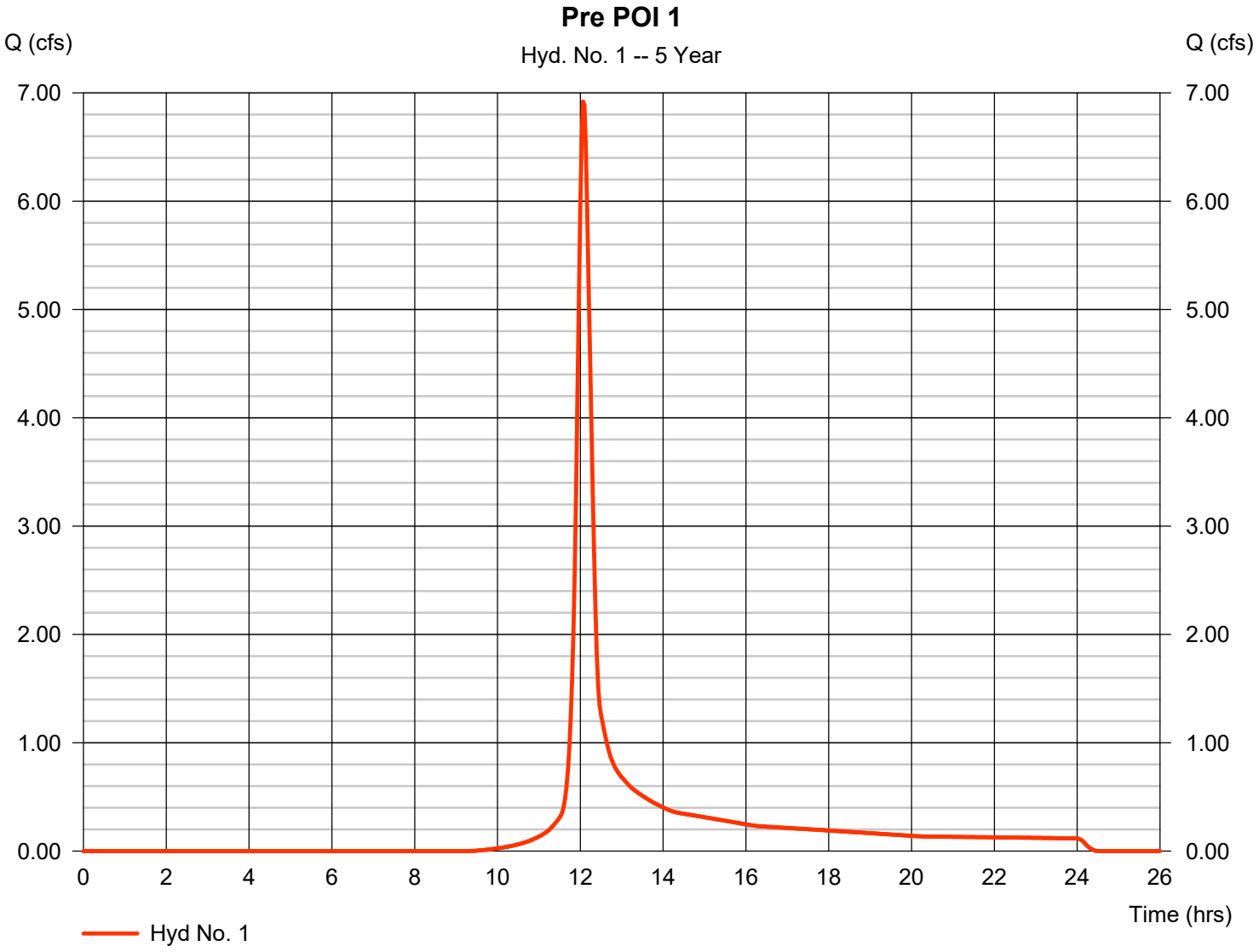
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 1

Pre POI 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.920 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	21,884 cuft
Drainage area	=	3.265 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.00 min
Total precip.	=	4.14 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



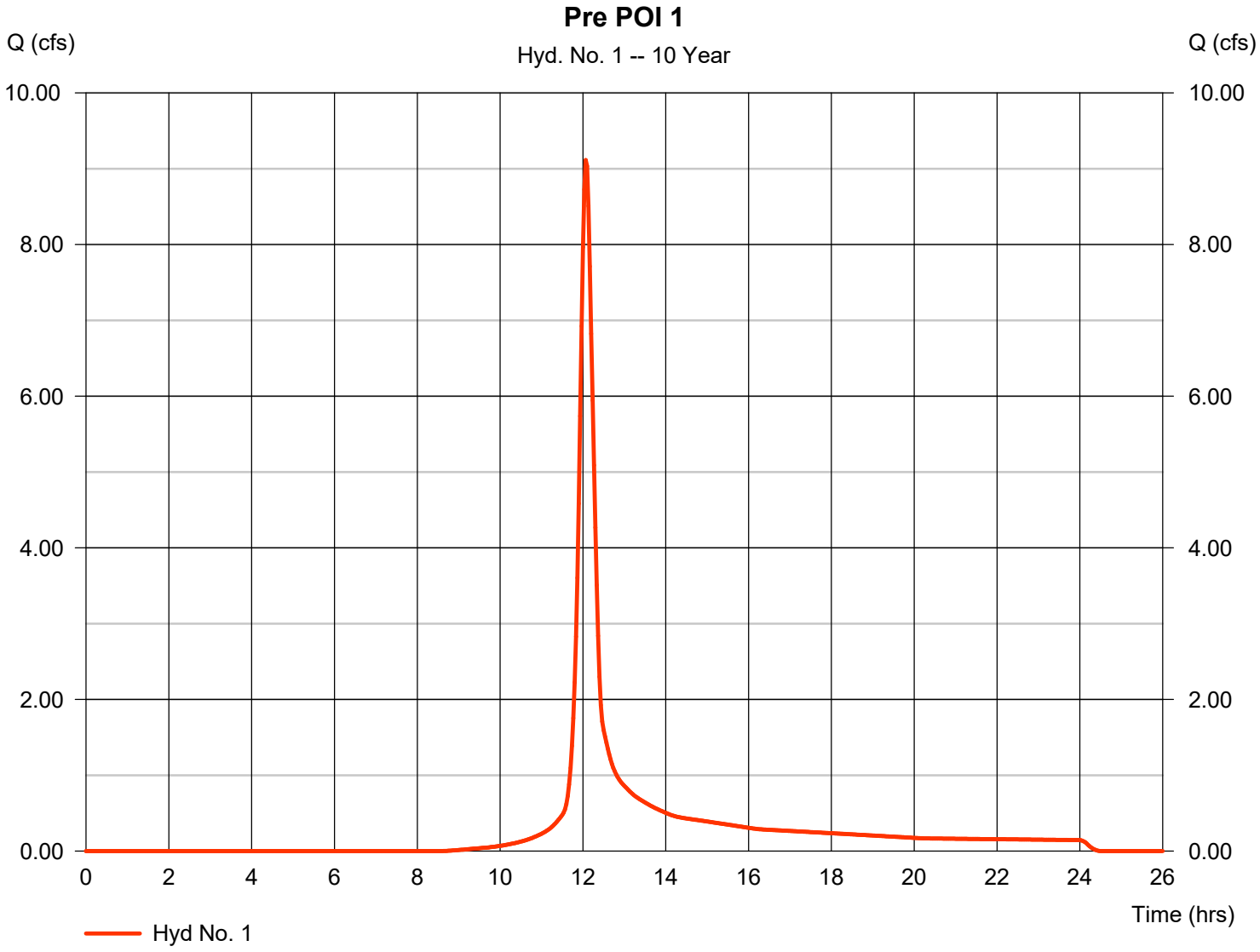
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 1

Pre POI 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.114 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	28,592 cuft
Drainage area	=	3.265 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.00 min
Total precip.	=	4.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



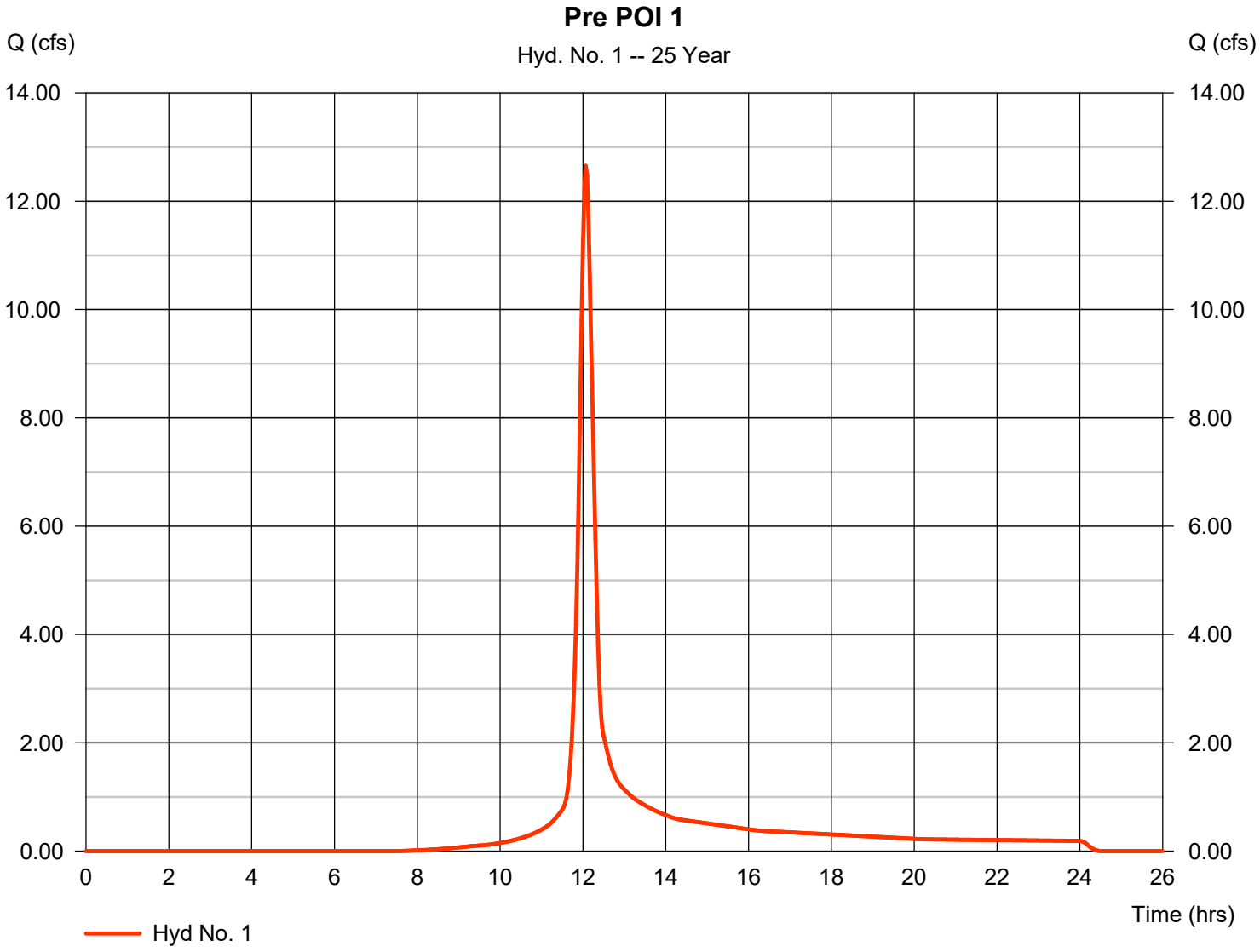
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 1

Pre POI 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.65 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	39,550 cuft
Drainage area	=	3.265 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



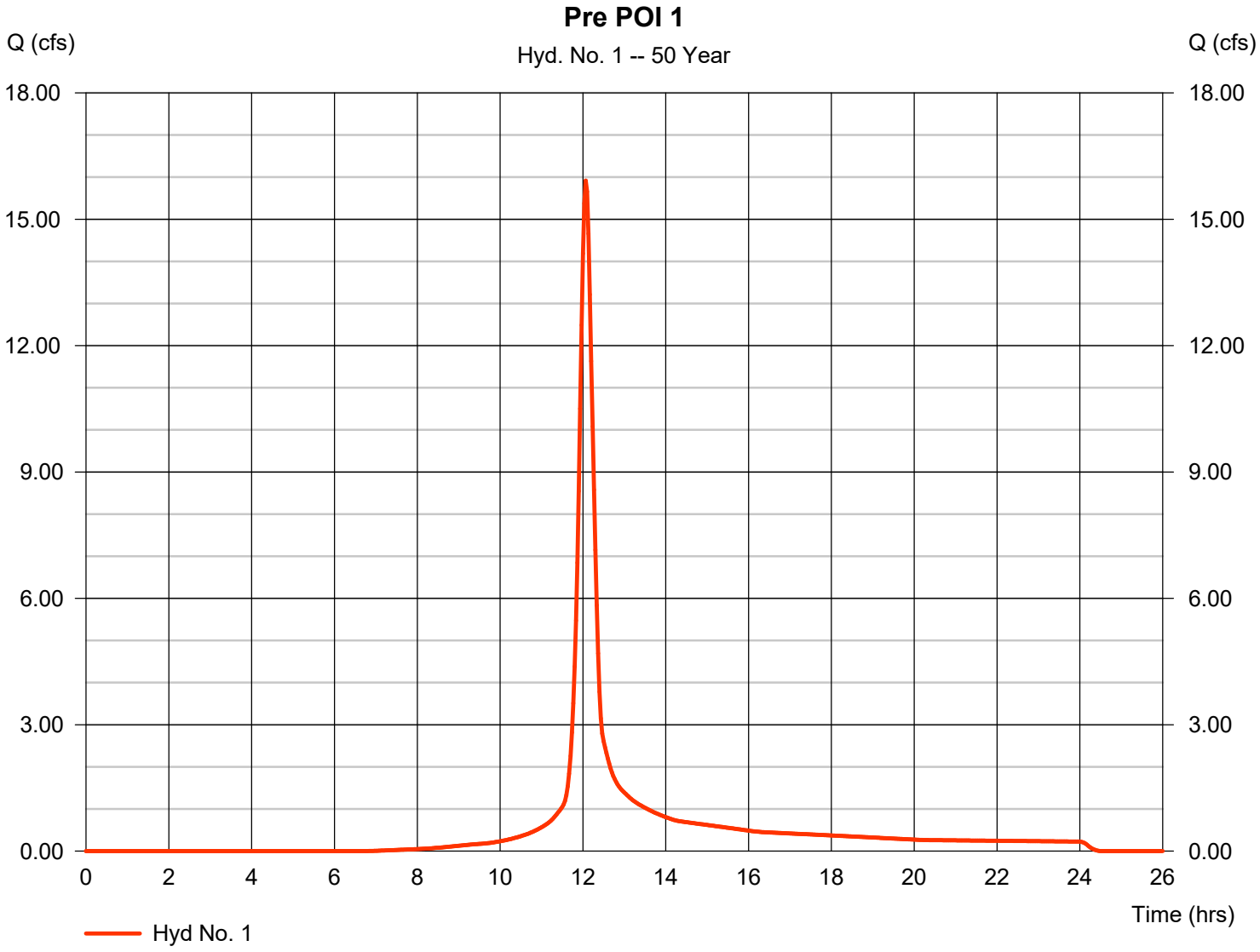
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 1

Pre POI 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.92 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	49,825 cuft
Drainage area	=	3.265 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.00 min
Total precip.	=	6.94 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

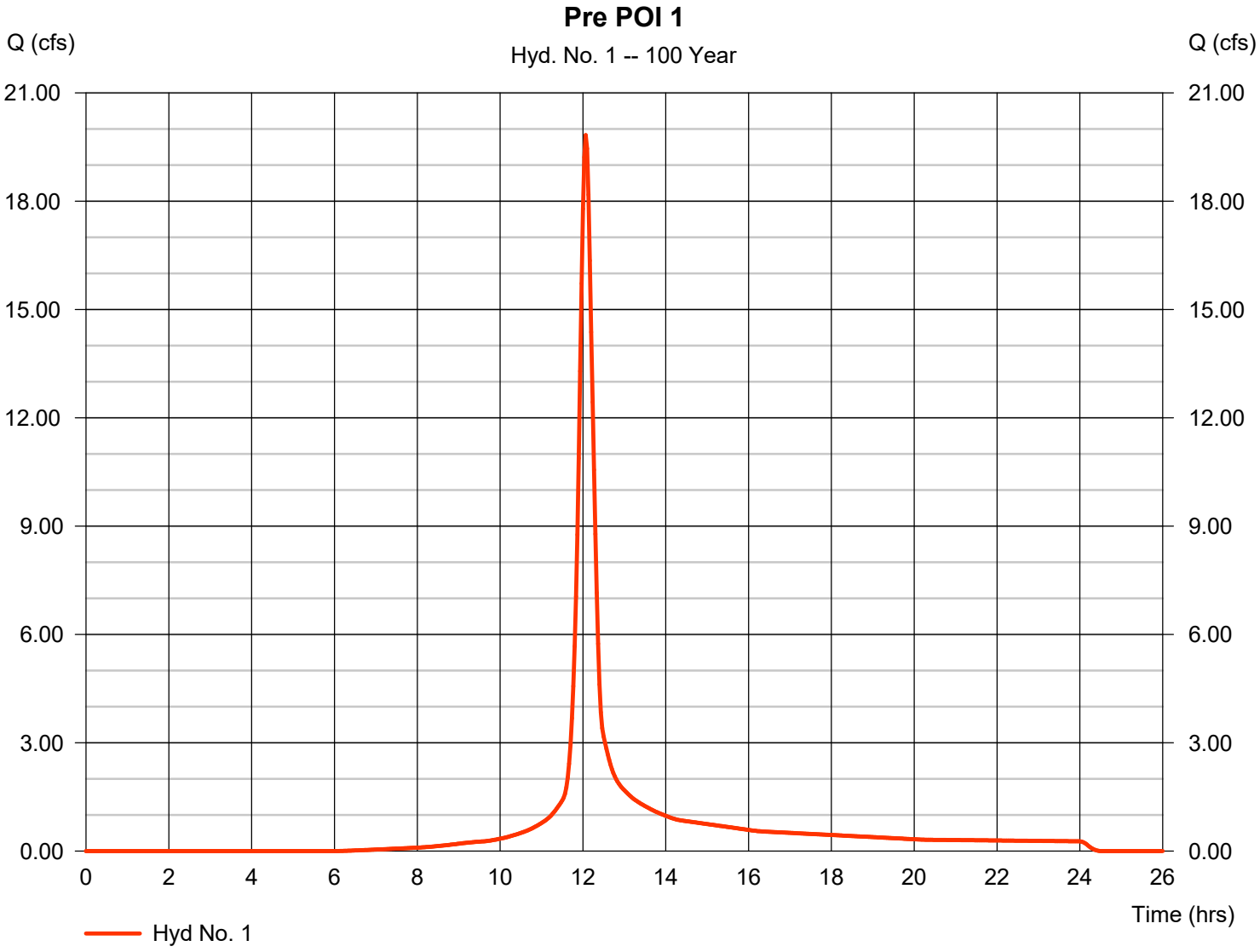


Hydrograph Report

Hyd. No. 1

Pre POI 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	19.83 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	62,319 cuft
Drainage area	=	3.265 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.00 min
Total precip.	=	8.11 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



D. POST-DEVELOPMENT RATE ANALYSIS

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Worksheet 2: **Runoff curve number & runoff**

PROJECT: Water Gap Wellness Accessory Buildings
LOCATION: Smithfield Township
COUNTY: MONROE
STATE PA

Check one ☐ Present ☑ Developed Post-Development - Capture

1. Runoff curve number (CN)

Soil name & (appendix A)	Hydrologic group	cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected / connected impervious area ratio)	CN Table 2-2	CN Fig. 2-3	CN Fig. 2-4	Area X	Area acres / mi. ^2 / %	Product of CN x Area
SITE	C	Impervious	98				0.372	36.5
	C	Gravel	97				0.135	13.1
	C	Lawn	74				0.760	56.3
							0.000	0.0
							0.000	0.0
							0.000	0.0
							0.000	0.0
							0.000	0.0
		SUBTOTAL COMPOSITE	**84**				1.267	105.9
OFFSITE		WOODED STEEP BANKS FAIR					0.000	0.0
		FARMFIELD / MEADOW					0.000	0.0
		RESIDENTIAL 1/2 ACRE					0.000	0.0
		ROADS					0.000	0.0
		SUBTOTAL COMPOSITE	**0**				0.000	0.0

Totals = 1.267 105.9

CN (weighted) total product = 105.9 = 83.58 ; Use CN = **84**
total area 1.2671

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Worksheet 3: Time of concentration (Tc) or travel time (Tt)

PROJECT: Water Gap Wellness Accessory Buildings
LOCATION: Smithfield Township
COUNTY: MONROE

Check one ☐ Present ☑ Developed — Post Development - Capture
☑ Tc ☐ Tt through subarea

1. Sheet flow (applicable to Tc only)

		ID					
1. Surface description (table 3-1)			Grass				
2. Manning's roughness coeff., n (table 3-1)			0.24				
3. Flow length, L (total L < 150 ft.)	ft.		72	0	0	0	
4. Two-yr. 24-hr rainfall, P2	in.		3.00	0.00	0.00	0.00	
5. Land slope, s	ft./ft.		0.024	0.000	0.000	0.000	
6. Tc=(0.007 x (n x L)^0.8)/(P2^0.5 x s^(	hr.		0.176	0	0	0	0.176

2. Shallow concentrated flow

		ID					
7. Surface description (paved or unpaved)							
8. Flow length, L	ft.		0	0	0	0	
9. Watercourse slope, s	ft./ft.		0	0	0	0	
10. Average velocity, V (figure 3-1)	ft./s		0	0	0	0	
11. Tt = L / (3600 x V)	hr.		0	0	0.0	0	0

3. Channel flow - Pipe flow

		ID					
# Cross sectional flow area, a	ft.^2		0	0	0	0	
or Pipe diameter, in.	in.		12	15	15	15	
# Wetted perimeter, Pw	ft.		0.00	0.00	0.00	0.00	
# Hydraulic radius, r = a/Pw	ft.		0.25	0.31	0.31	0.31	
# Channel slope, s	ft./ft.		0.0116	0.02	0.1338	0.0056	
# Manning's roughness coeff., n			0.012	0.012	0.012	0.012	
# V=(1.49xr^2/3 x s^1/2)/n	ft./s		5.3	8.0	20.8	4.3	
# Flow length, L	ft.		112	34	644	71	
# Tt = L /(3600xV)	hr.		0.006	0.001	0.009	0.005	0.021

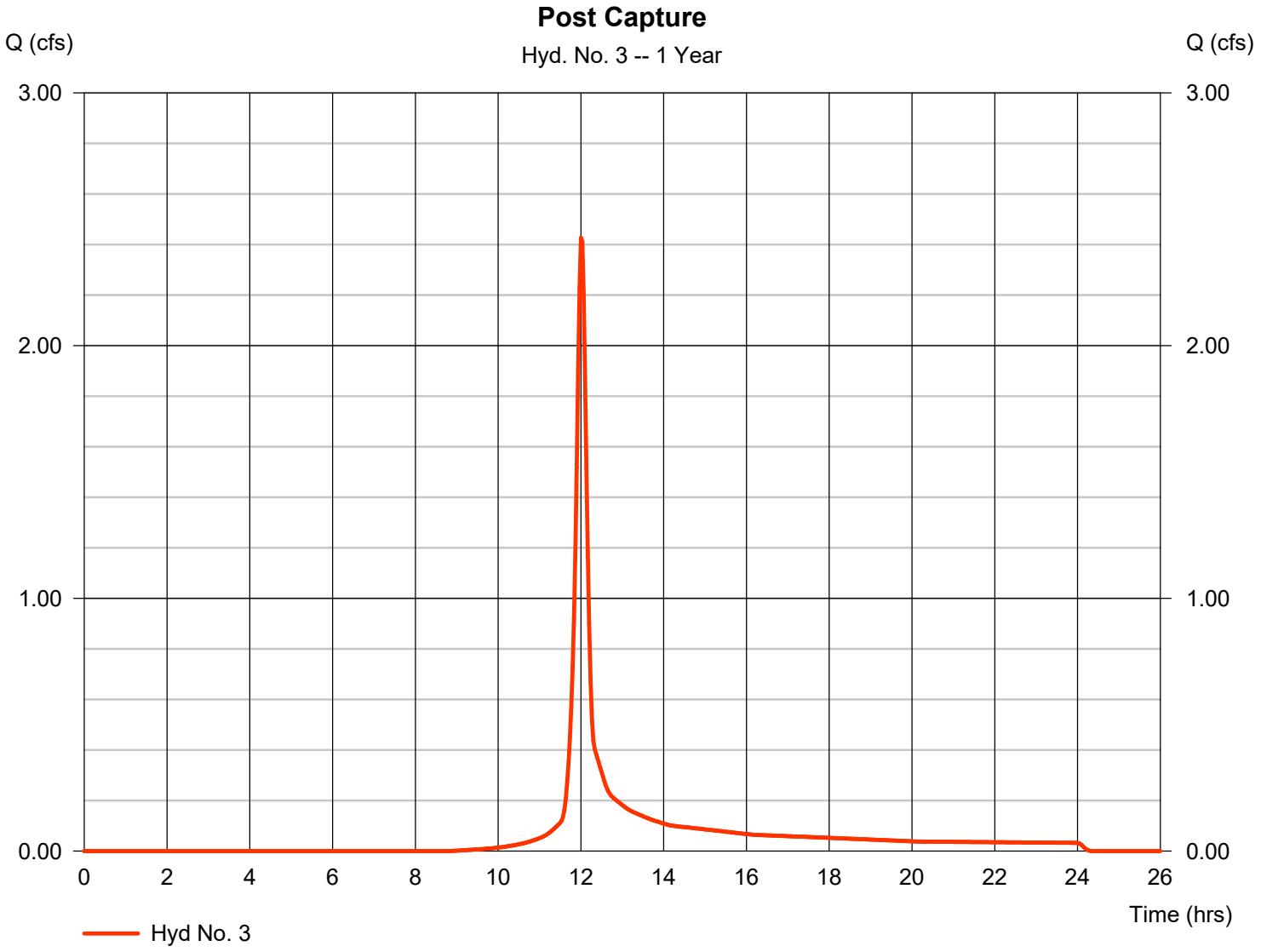
Watershed or subarea Tc or Tt (Hr.) 0.197 Hr.
12 Min.

Hydrograph Report

Hyd. No. 3

Post Capture

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.426 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	6,305 cuft
Drainage area	=	1.267 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



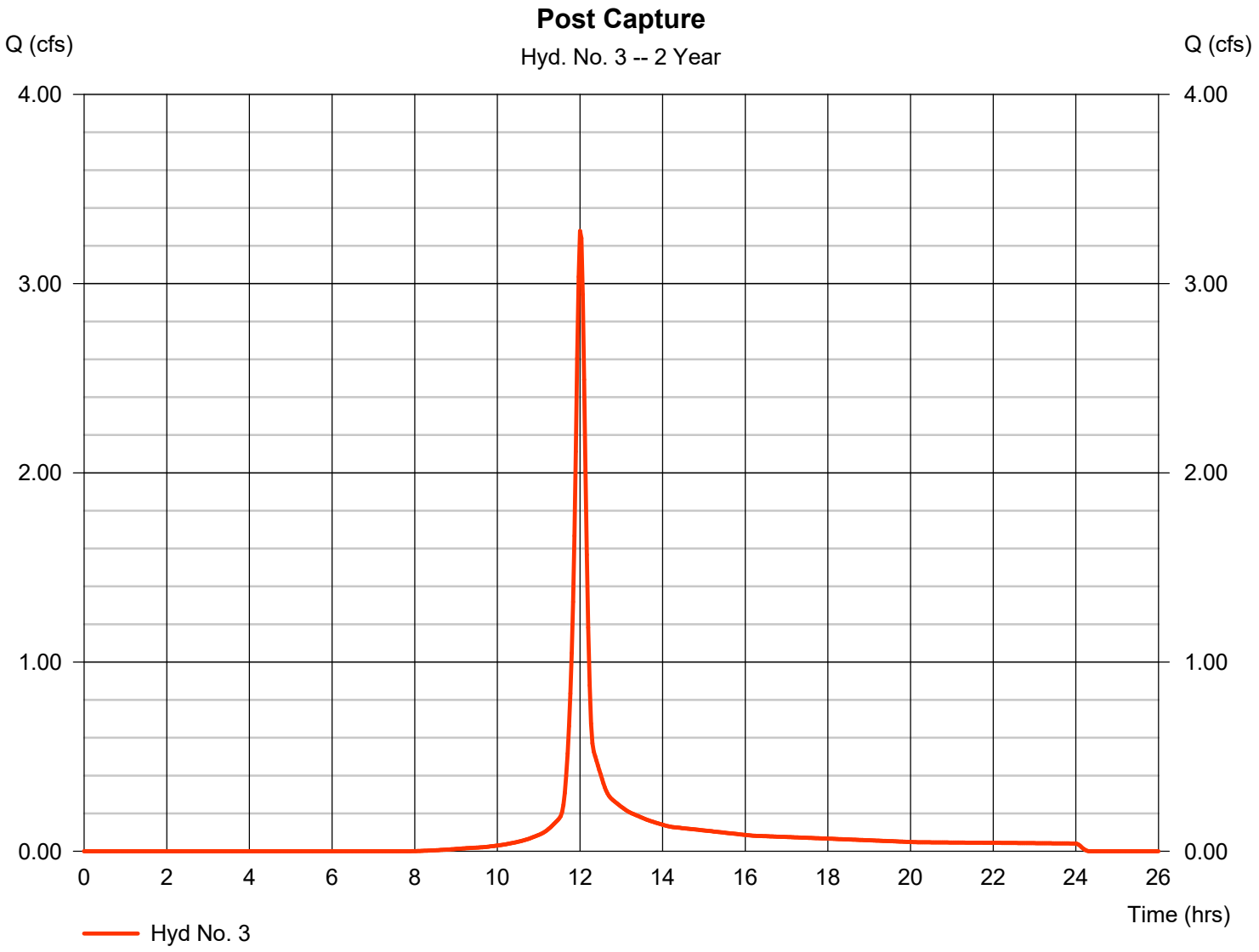
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Wednesday, 11 / 6 / 2024

Hyd. No. 3

Post Capture

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.278 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	8,498 cuft
Drainage area	=	1.267 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	3.33 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

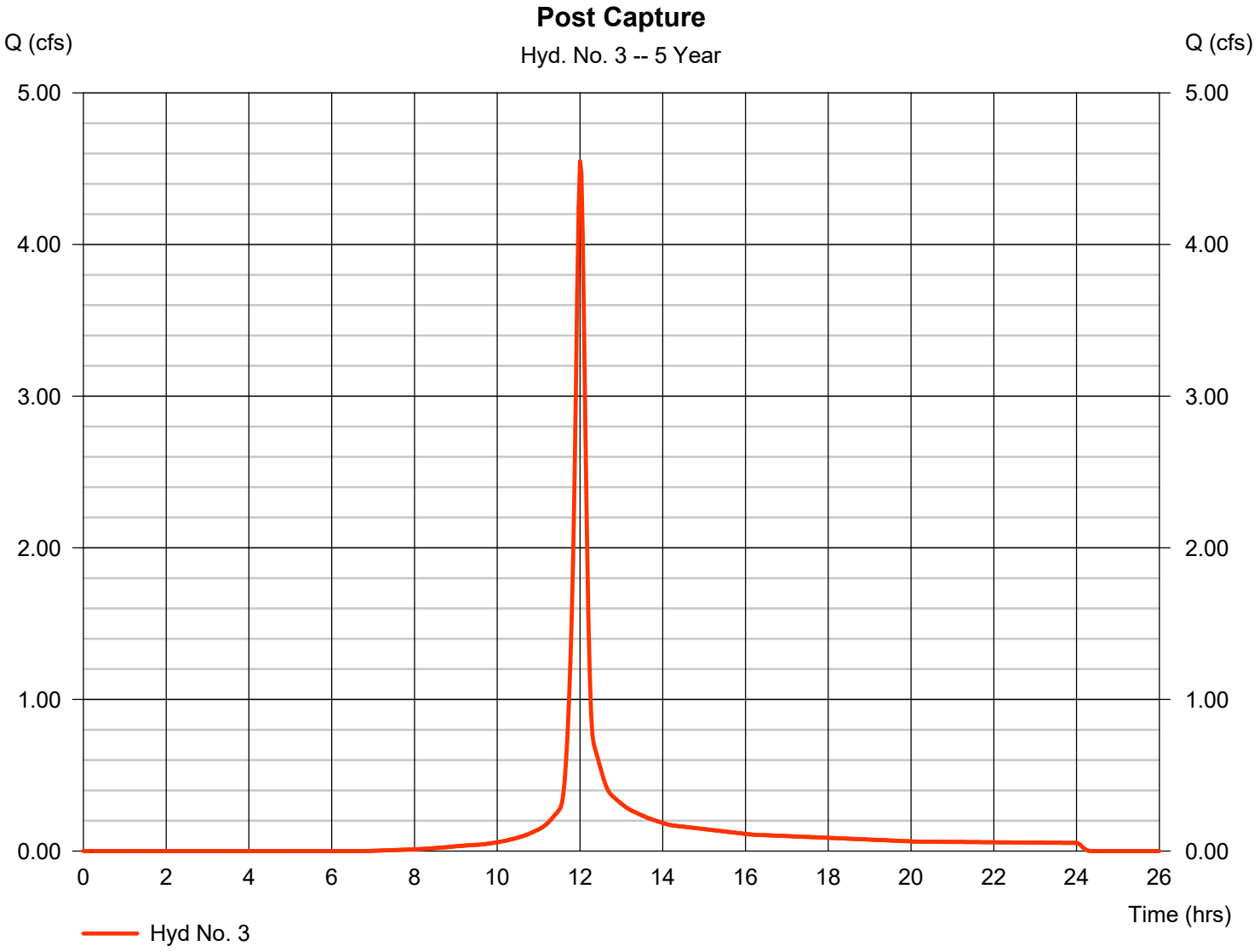


Hydrograph Report

Hyd. No. 3

Post Capture

Hydrograph type	= SCS Runoff	Peak discharge	= 4.549 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 11,833 cuft
Drainage area	= 1.267 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 4.14 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



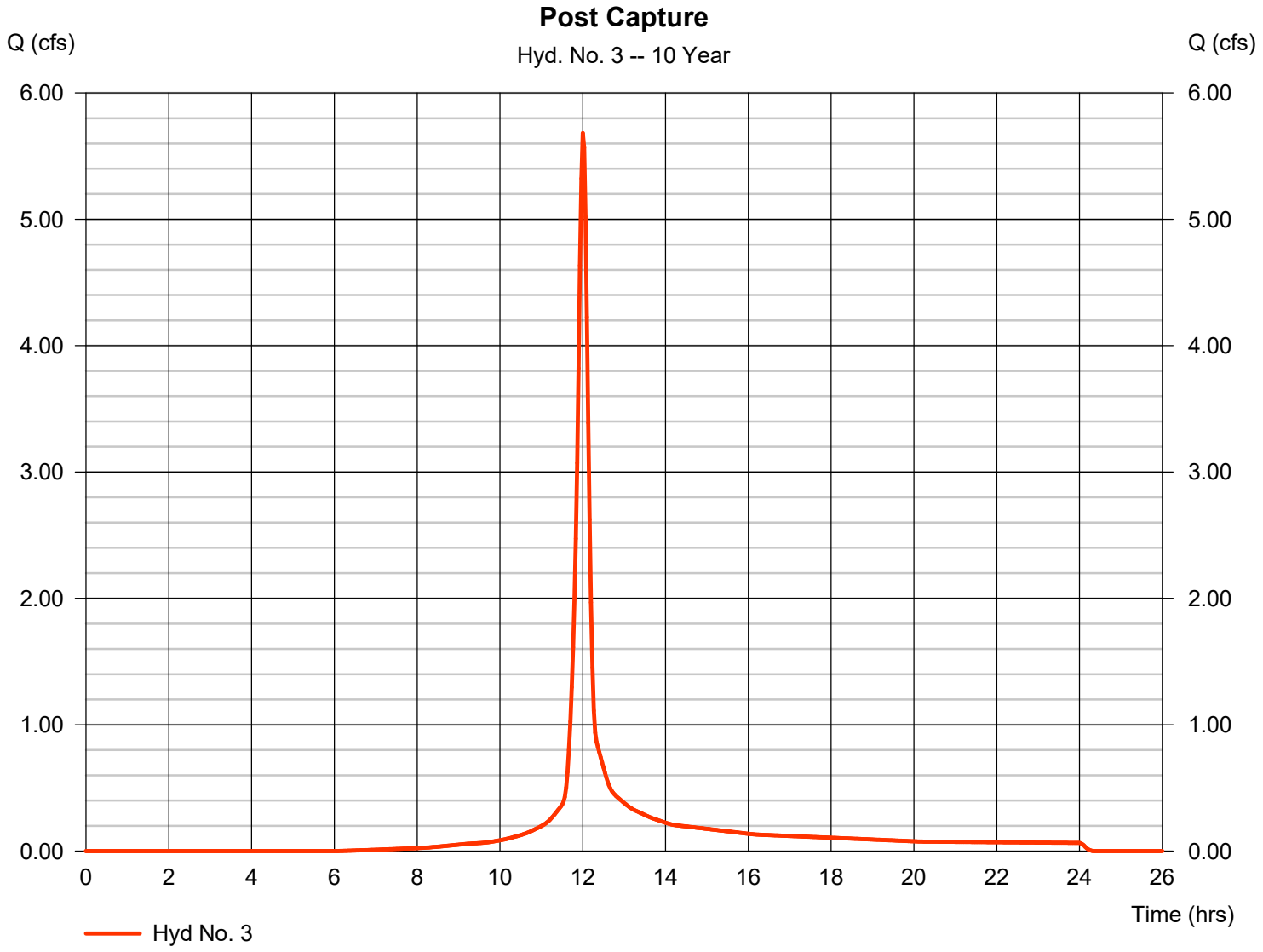
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Wednesday, 11 / 6 / 2024

Hyd. No. 3

Post Capture

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.682 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	14,862 cuft
Drainage area	=	1.267 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	4.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

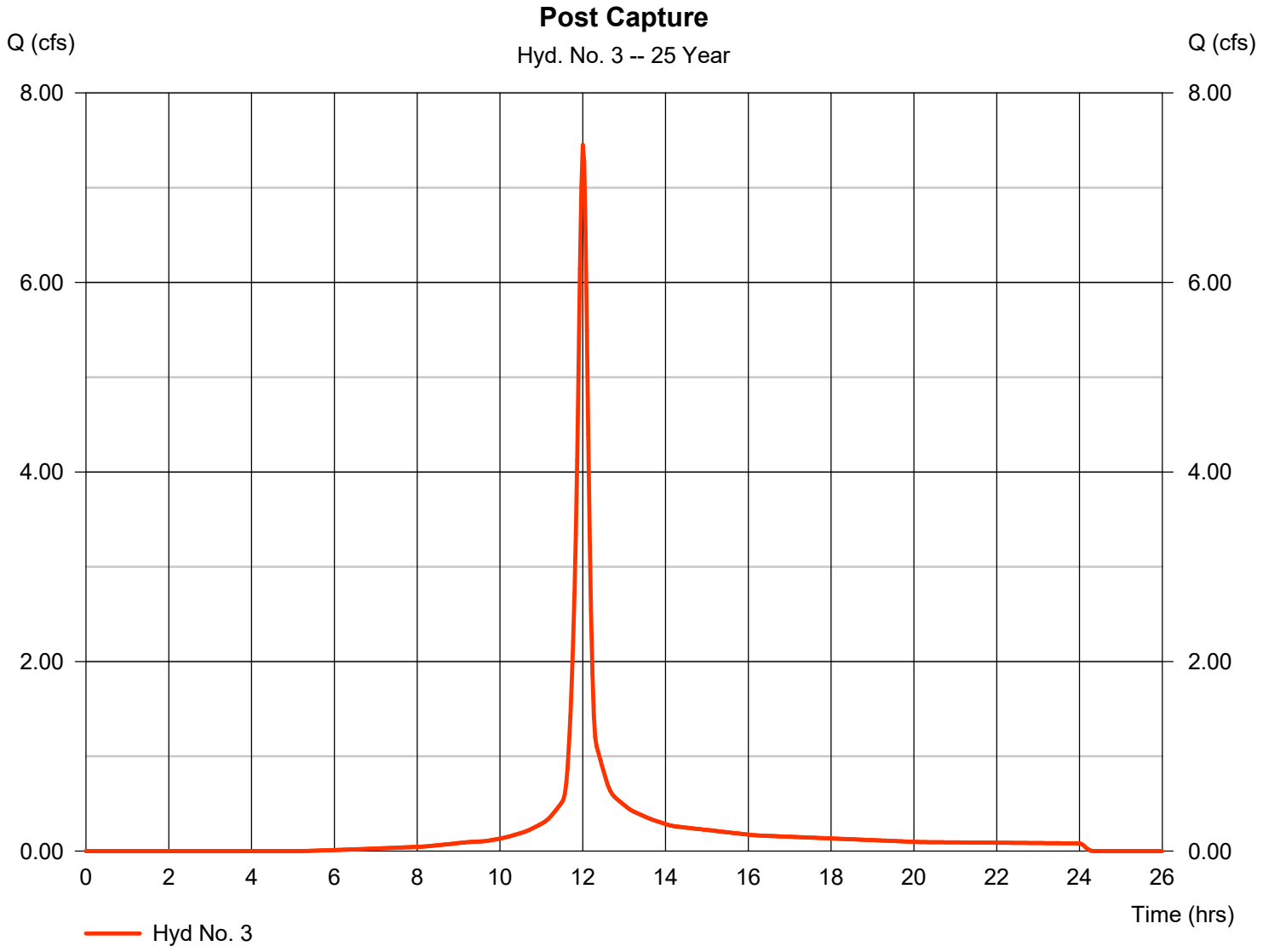


Hydrograph Report

Hyd. No. 3

Post Capture

Hydrograph type	= SCS Runoff	Peak discharge	= 7.451 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 19,682 cuft
Drainage area	= 1.267 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 5.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



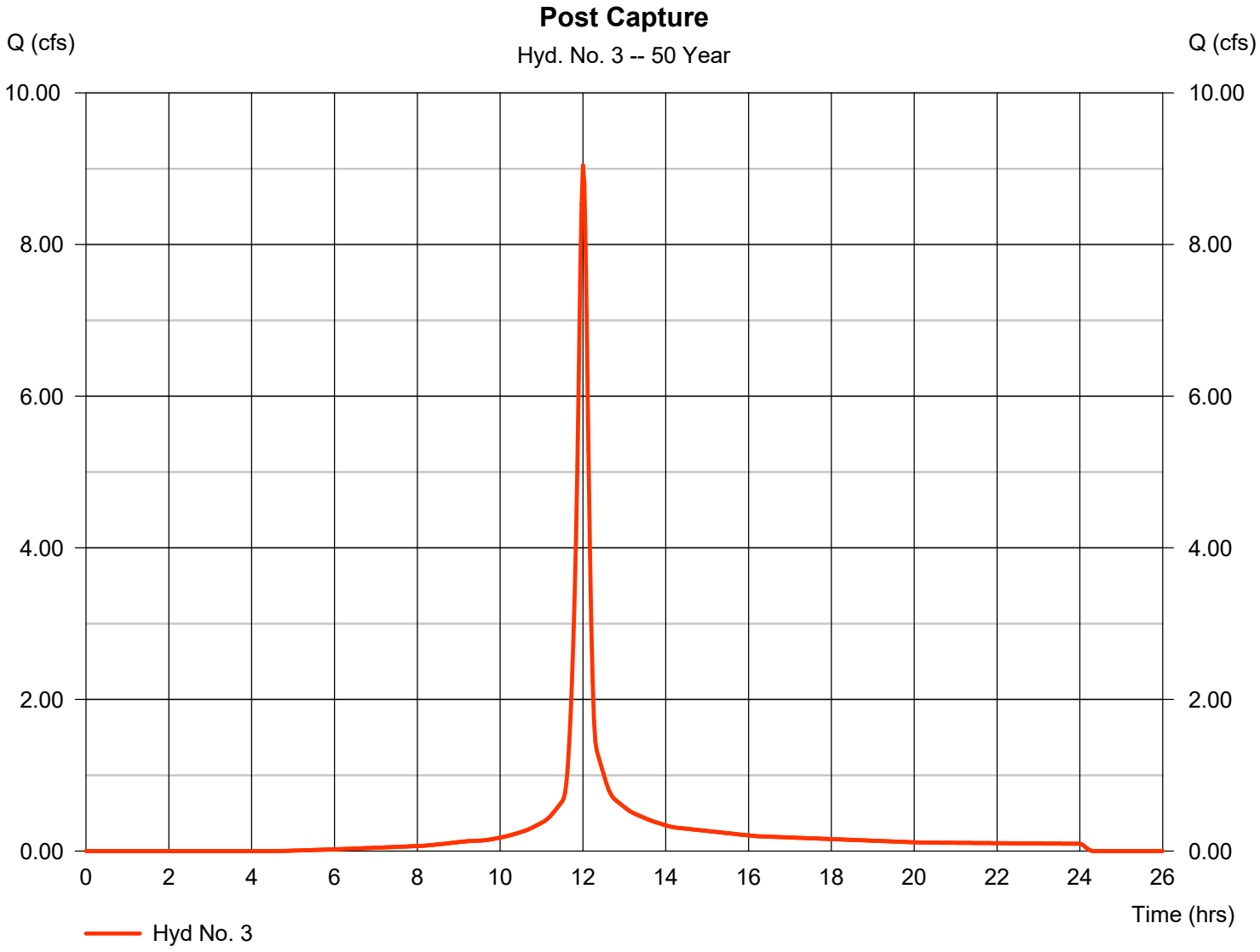
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Wednesday, 11 / 6 / 2024

Hyd. No. 3

Post Capture

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.045 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	24,108 cuft
Drainage area	=	1.267 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	6.94 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

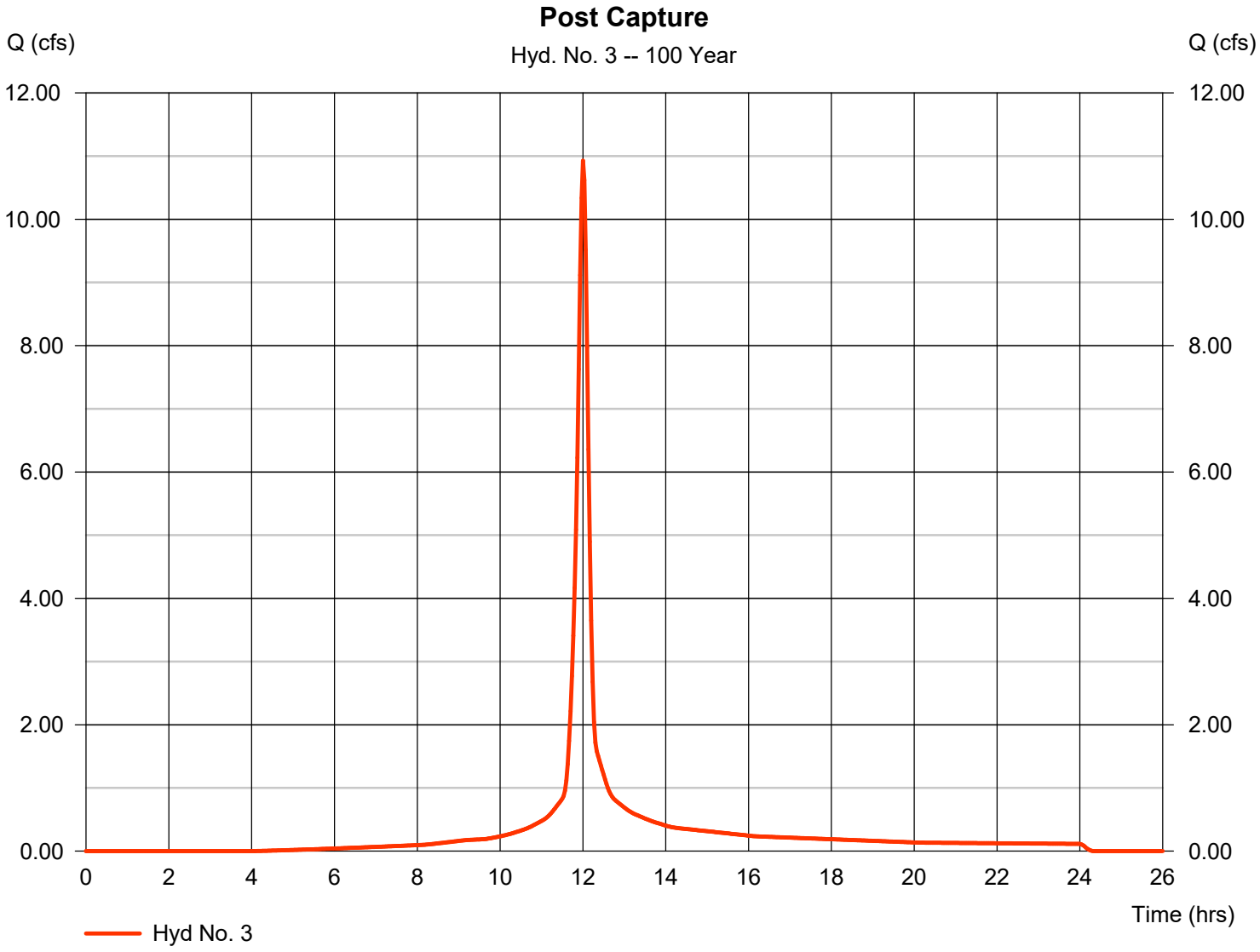


Hydrograph Report

Hyd. No. 3

Post Capture

Hydrograph type	= SCS Runoff	Peak discharge	= 10.93 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 29,410 cuft
Drainage area	= 1.267 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 8.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Pond No. 1 - Infiltration Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 450.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	450.00	7,417	0	0
0.75	450.75	8,989	6,142	6,142
1.00	451.00	9,501	2,311	8,453
2.00	452.00	11,496	10,482	18,935
3.00	453.00	13,464	12,466	31,400

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)	= 450.75	0.00	0.00	0.00
Length (ft)	= 40.00	0.00	0.00	0.00
Slope (%)	= 15.00	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

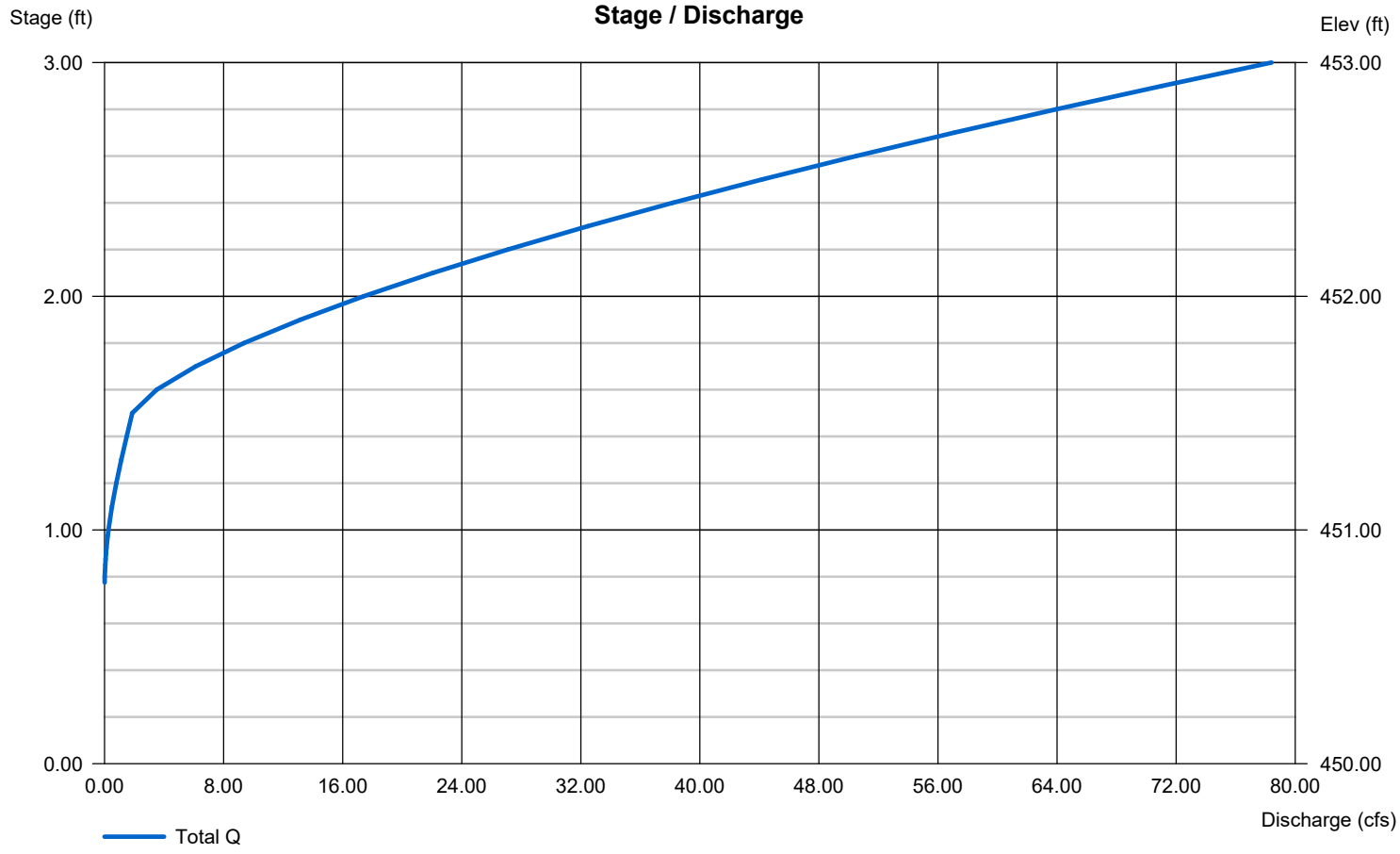
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	0.00	0.00	0.00
Crest El. (ft)	= 451.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Ciplti	---	---	---
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).



Hydrograph Report

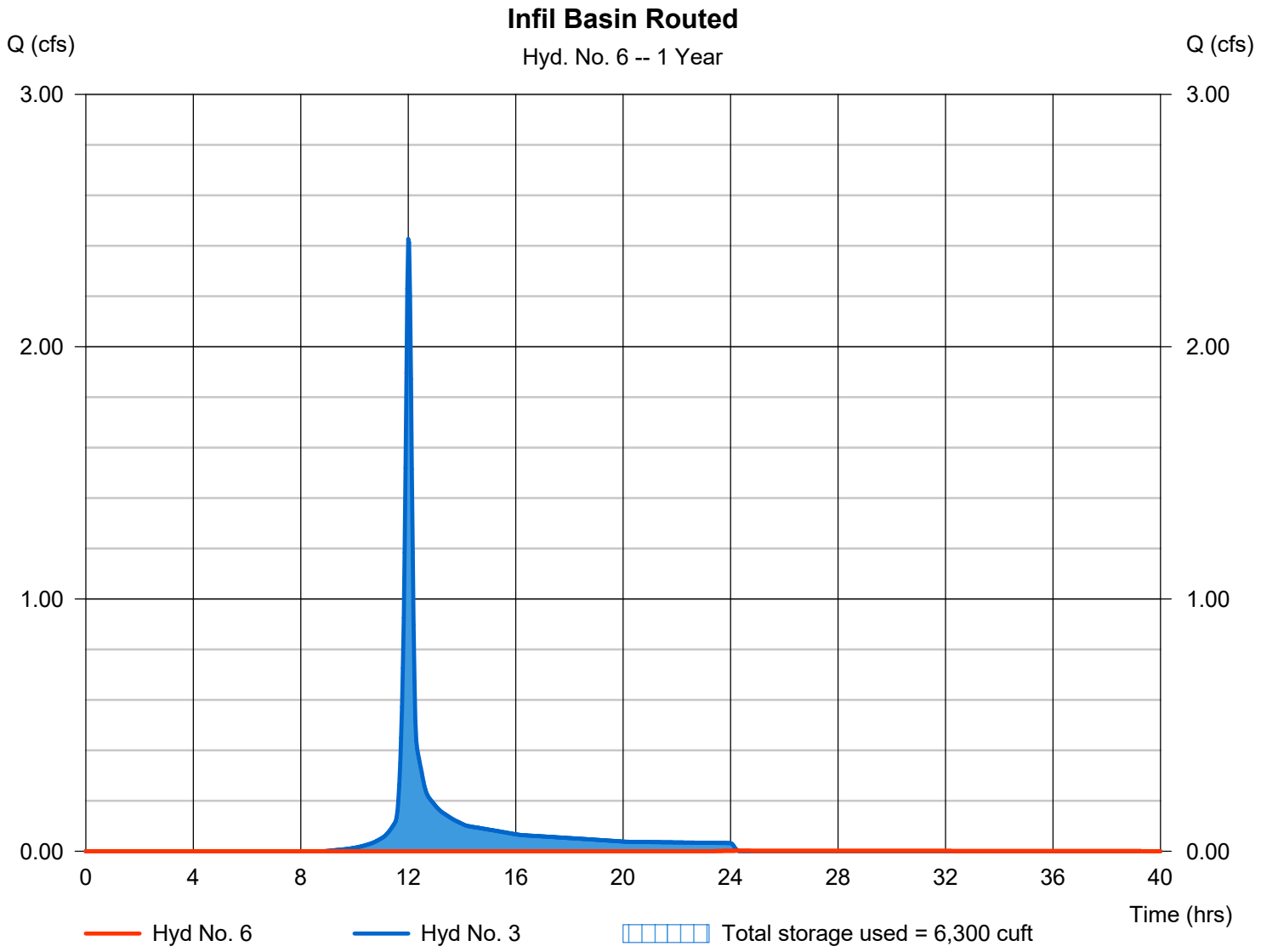
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 6

Infil Basin Routed

Hydrograph type	=	Reservoir	Peak discharge	=	0.002 cfs
Storm frequency	=	1 yrs	Time to peak	=	24.27 hrs
Time interval	=	2 min	Hyd. volume	=	81 cuft
Inflow hyd. No.	=	3 - Post Capture	Max. Elevation	=	450.77 ft
Reservoir name	=	Infiltration Basin	Max. Storage	=	6,300 cuft

Storage Indication method used.



Hydrograph Report

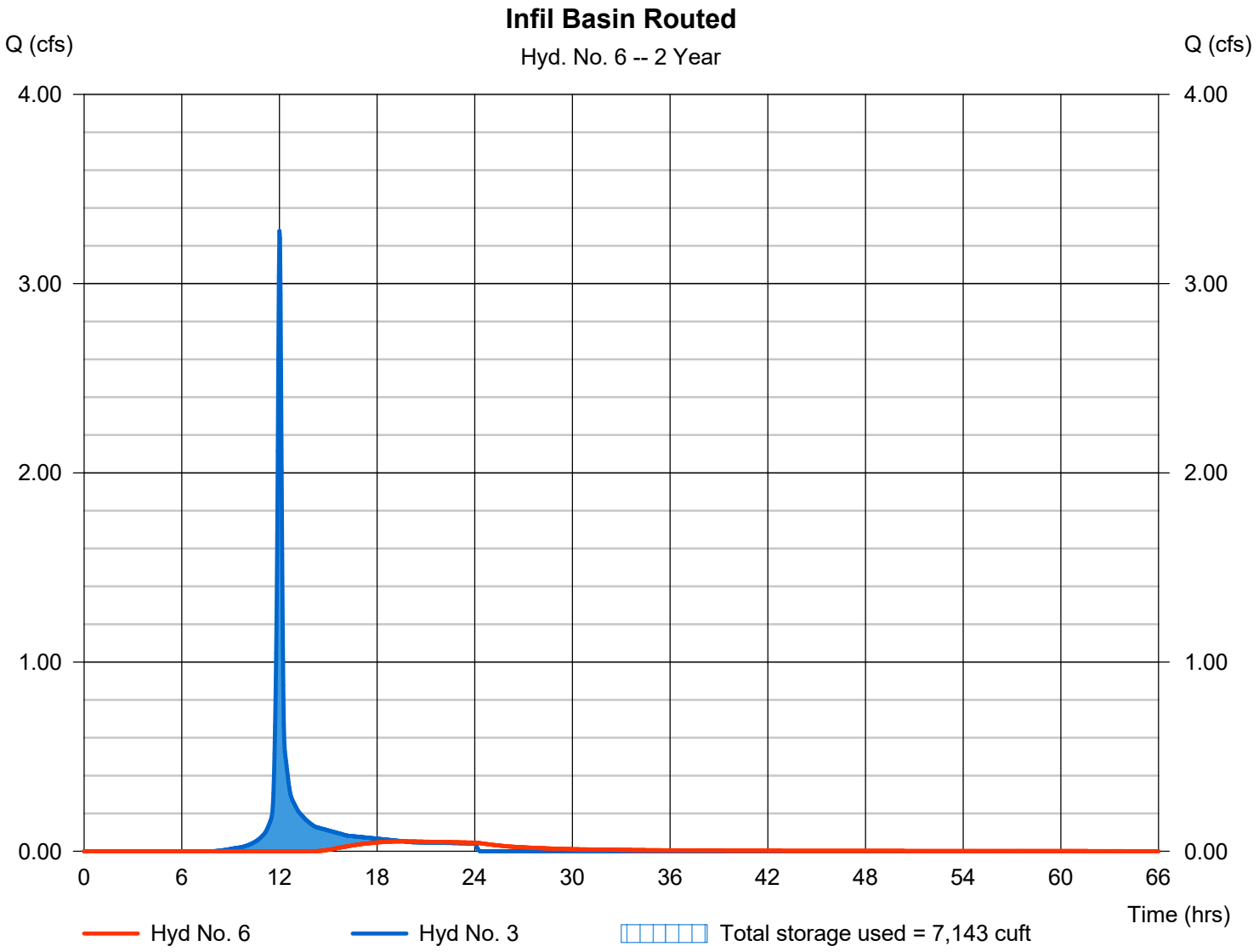
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 6

Infil Basin Routed

Hydrograph type	=	Reservoir	Peak discharge	=	0.052 cfs
Storm frequency	=	2 yrs	Time to peak	=	19.63 hrs
Time interval	=	2 min	Hyd. volume	=	2,275 cuft
Inflow hyd. No.	=	3 - Post Capture	Max. Elevation	=	450.86 ft
Reservoir name	=	Infiltration Basin	Max. Storage	=	7,143 cuft

Storage Indication method used.



Hydrograph Report

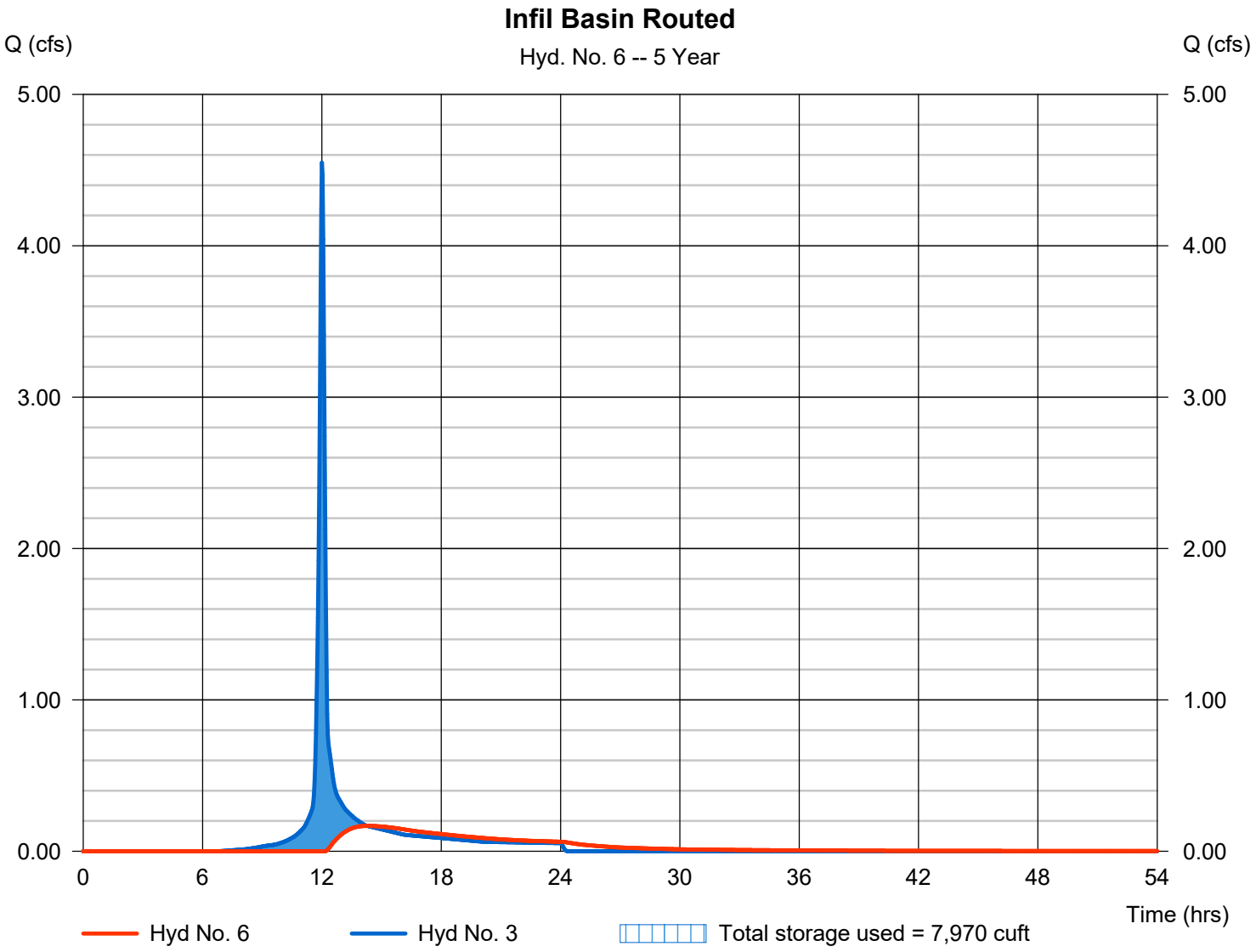
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 6

Infil Basin Routed

Hydrograph type	=	Reservoir	Peak discharge	=	0.167 cfs
Storm frequency	=	5 yrs	Time to peak	=	14.30 hrs
Time interval	=	2 min	Hyd. volume	=	5,610 cuft
Inflow hyd. No.	=	3 - Post Capture	Max. Elevation	=	450.95 ft
Reservoir name	=	Infiltration Basin	Max. Storage	=	7,970 cuft

Storage Indication method used.



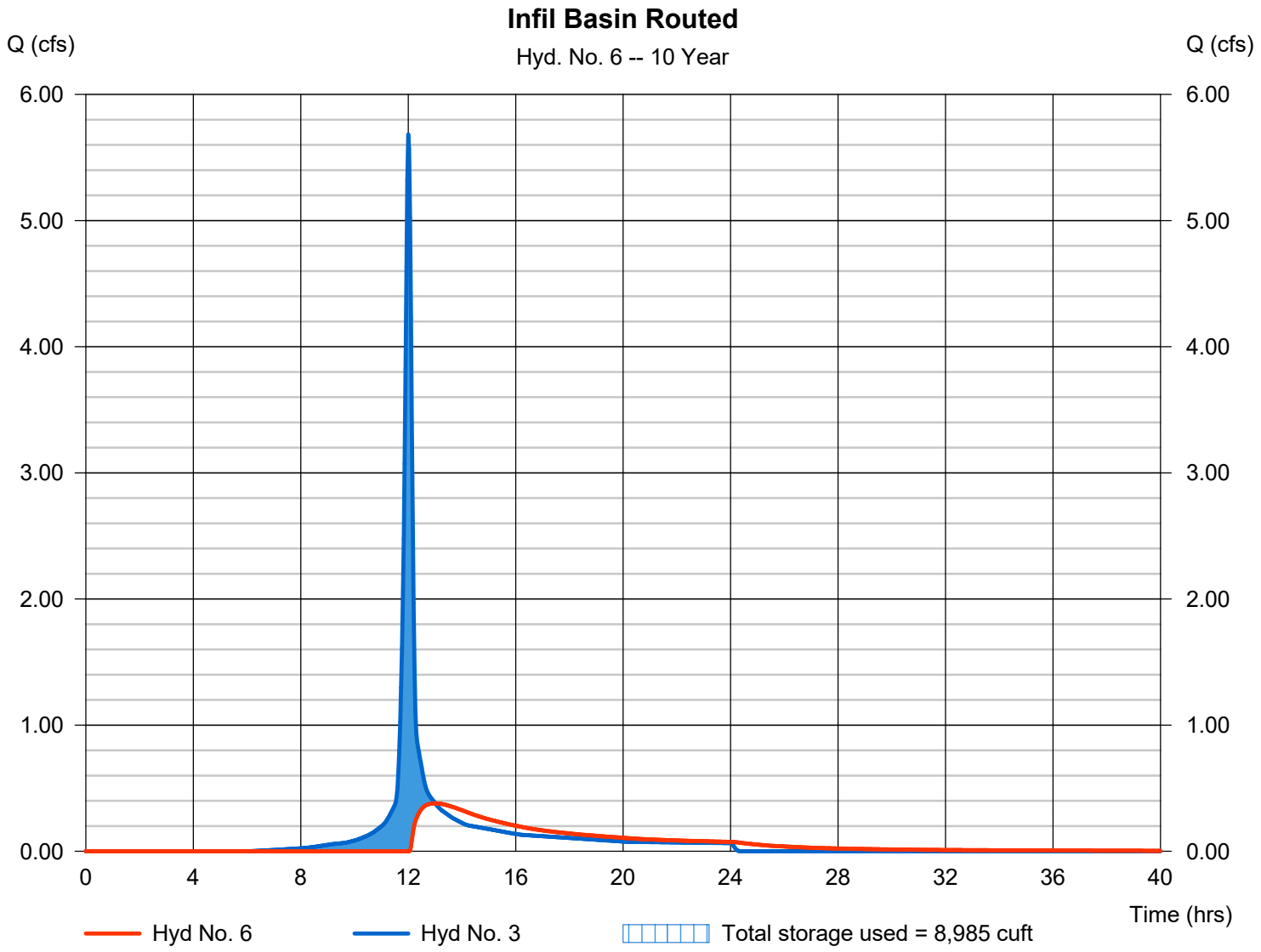
Hydrograph Report

Hyd. No. 6

Infil Basin Routed

Hydrograph type	=	Reservoir	Peak discharge	=	0.380 cfs
Storm frequency	=	10 yrs	Time to peak	=	13.00 hrs
Time interval	=	2 min	Hyd. volume	=	8,639 cuft
Inflow hyd. No.	=	3 - Post Capture	Max. Elevation	=	451.05 ft
Reservoir name	=	Infiltration Basin	Max. Storage	=	8,985 cuft

Storage Indication method used.



Hydrograph Report

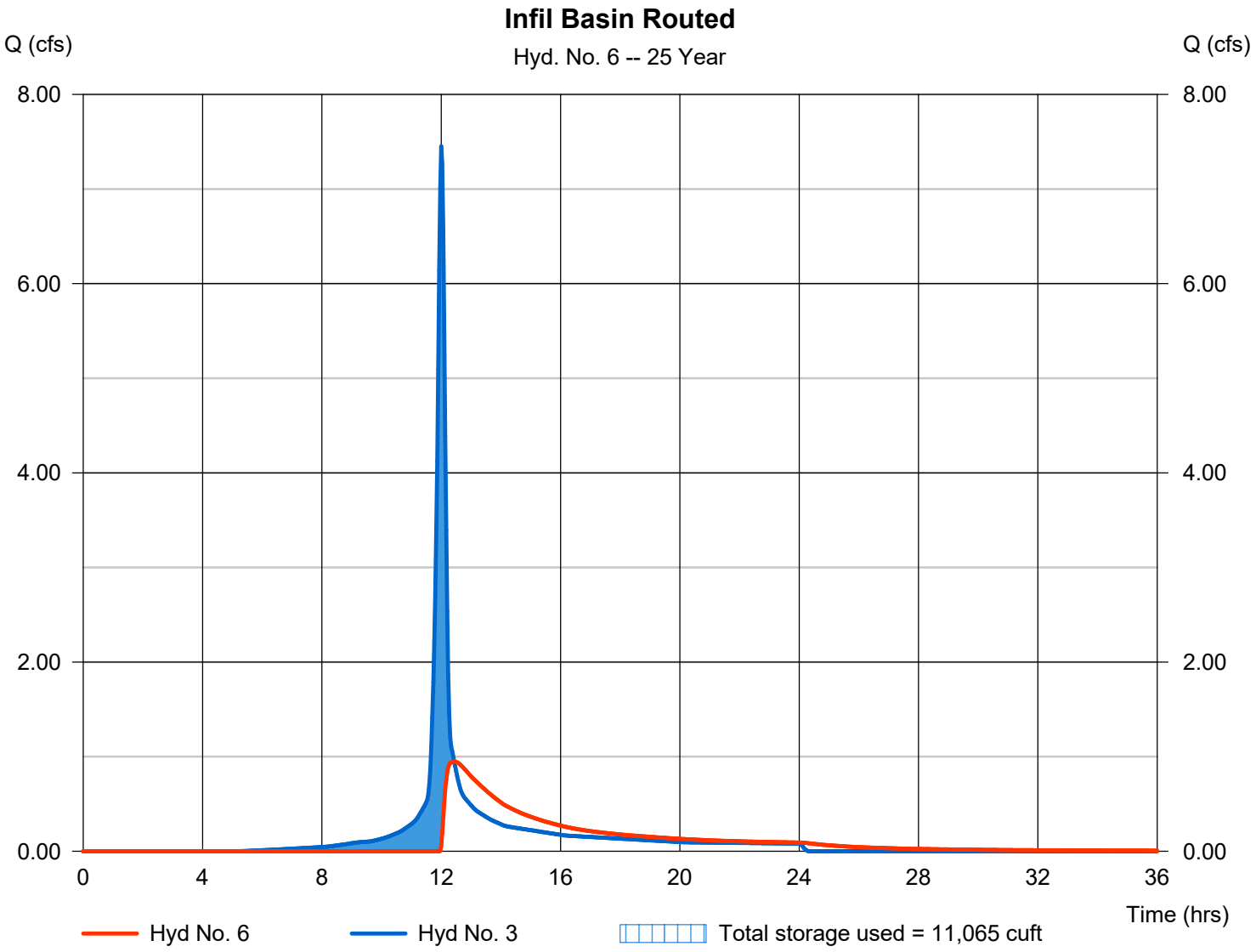
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 6

Infil Basin Routed

Hydrograph type	=	Reservoir	Peak discharge	=	0.949 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.43 hrs
Time interval	=	2 min	Hyd. volume	=	13,459 cuft
Inflow hyd. No.	=	3 - Post Capture	Max. Elevation	=	451.25 ft
Reservoir name	=	Infiltration Basin	Max. Storage	=	11,065 cuft

Storage Indication method used.



Hydrograph Report

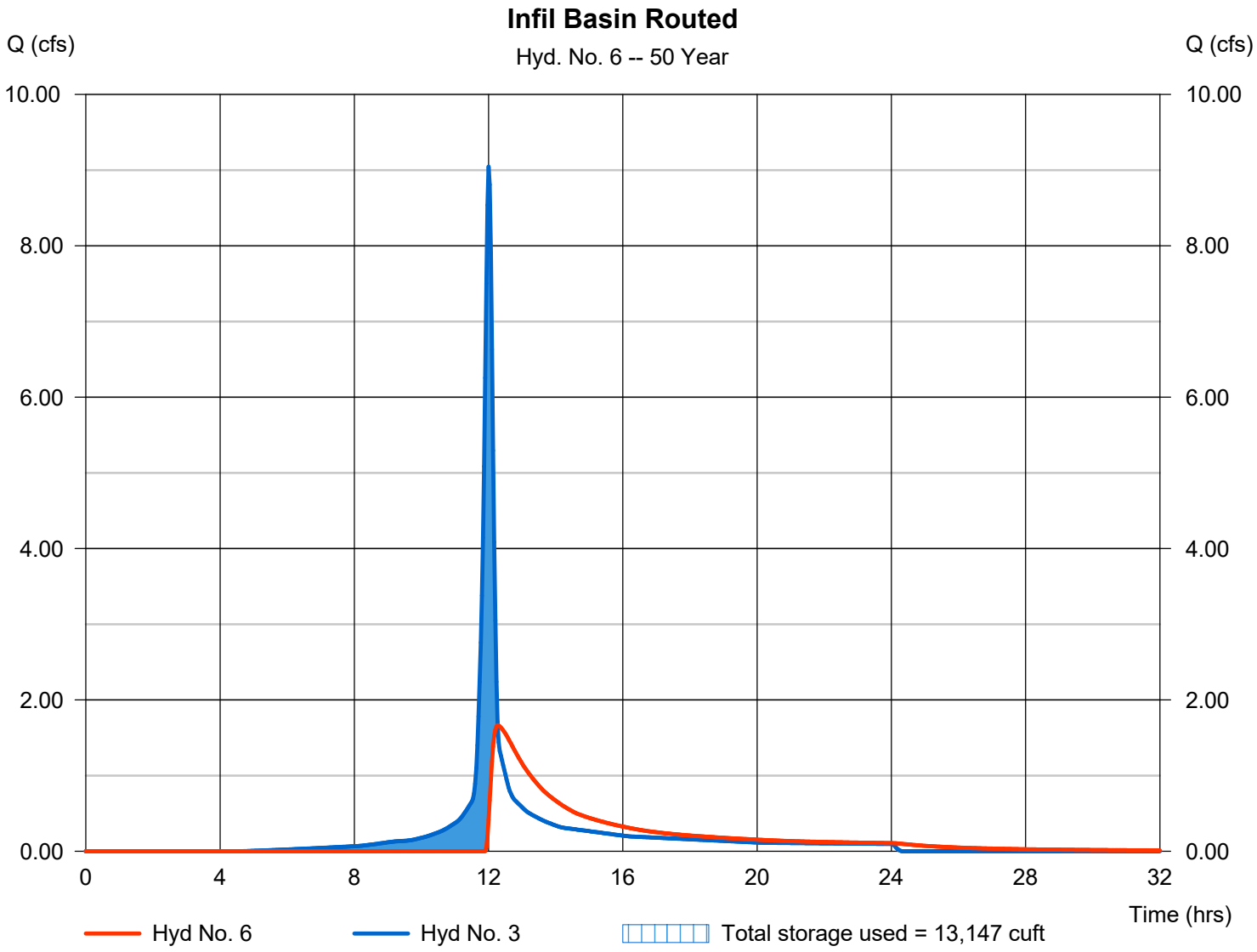
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 6

Infil Basin Routed

Hydrograph type	=	Reservoir	Peak discharge	=	1.666 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.27 hrs
Time interval	=	2 min	Hyd. volume	=	17,885 cuft
Inflow hyd. No.	=	3 - Post Capture	Max. Elevation	=	451.45 ft
Reservoir name	=	Infiltration Basin	Max. Storage	=	13,147 cuft

Storage Indication method used.



Hydrograph Report

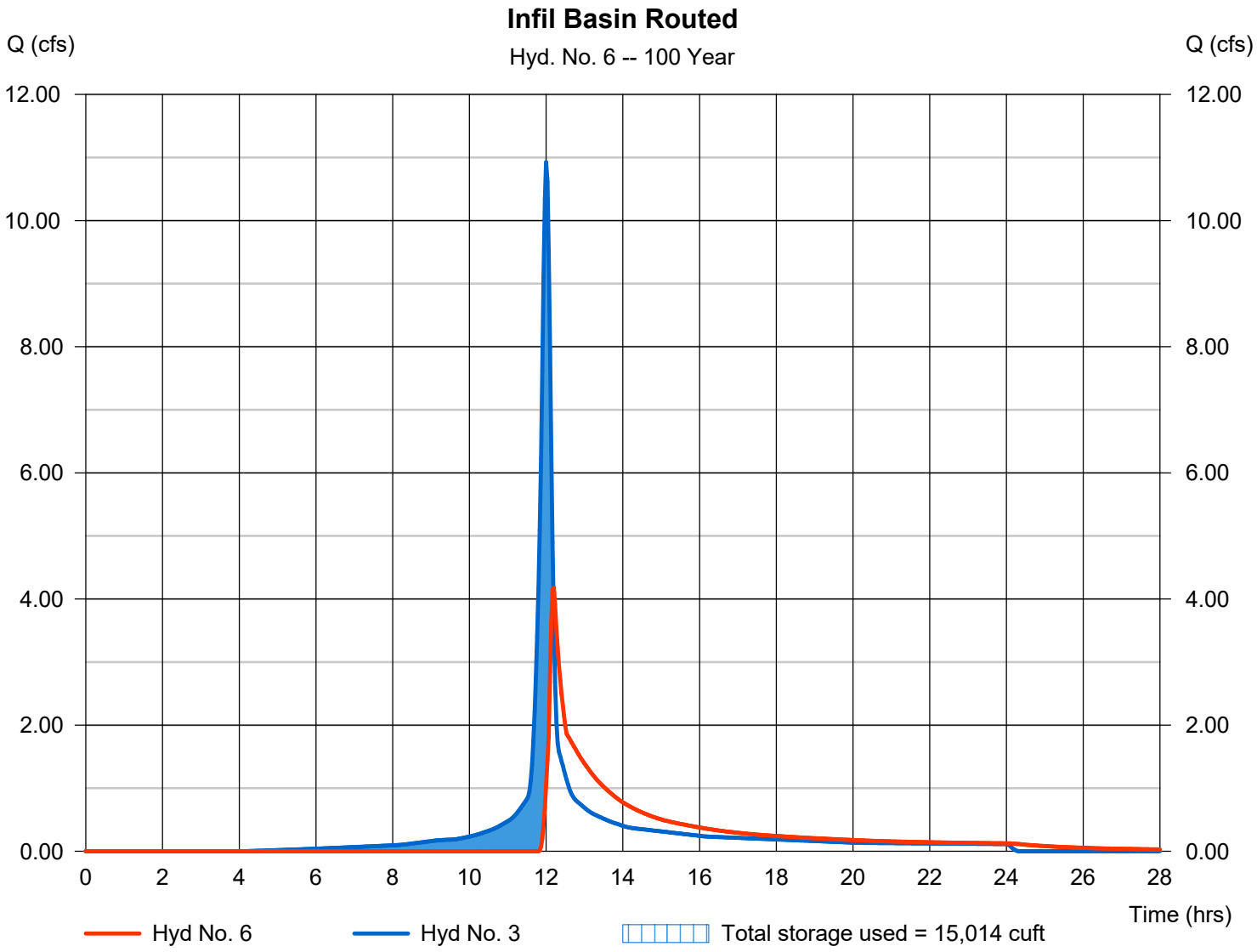
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 6

Infil Basin Routed

Hydrograph type	=	Reservoir	Peak discharge	=	4.180 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	23,187 cuft
Inflow hyd. No.	=	3 - Post Capture	Max. Elevation	=	451.63 ft
Reservoir name	=	Infiltration Basin	Max. Storage	=	15,014 cuft

Storage Indication method used.



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Consulting Engineers & Surveyors

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Worksheet 2: **Runoff curve number & runoff**

PROJECT: Water Gap Wellness Accessory Buildings
LOCATION: Smithfield Township
COUNTY: MONROE
STATE PA

Check one ☐ Present ☑ Developed Post-Development - Bypass

1. Runoff curve number (CN)

Soil name & (appendix A)	Hydrologic group	cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected / connected impervious area ratio)	CN Table 2-2	CN Fig. 2-3	CN Fig. 2-4	Area X	Area acres / mi. ^2 / %	Product of CN x Area
SITE	C	Impervious	98				0.057	5.5
	C	Gravel	97				0.046	4.4
	C	Lawn	74				1.821	134.8
	D	Lawn	80				0.074	5.9
							0.000	0.0
							0.000	0.0
							0.000	0.0
							0.000	0.0
		SUBTOTAL COMPOSITE	**75**				1.998	150.6
OFFSITE		WOODED STEEP BANKS FAIR					0.000	0.0
		FARMFIELD / MEADOW					0.000	0.0
		RESIDENTIAL 1/2 ACRE					0.000	0.0
		ROADS					0.000	0.0
		SUBTOTAL COMPOSITE	**0**				0.000	0.0

Totals = 1.998 150.6

CN (weighted) total product = 150.6 = 75.39 ; Use CN = **75**
total area 1.9975

BARRY ISETT & ASSOCIATES, INC.
Consulting Engineers & Surveyors

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Worksheet 3: Time of concentration (Tc) or travel time (Tt)

PROJECT: Water Gap Wellness Accessory Buildings
LOCATION: Smithfield Township
COUNTY: MONROE

Check one ☐ Present ☑ Developed — Post Development - Bypass
☑ Tc ☐ Tt through subarea

1. Sheet flow (applicable to Tc only)

		ID					
1. Surface description (table 3-1)			Imp.	Grass	Grass		
2. Manning's roughness coeff., n (table 3-1)			0.011	0.24	0.24		
3. Flow length, L (total L < 150 ft.)	ft.		14	26	67	0	
4. Two-yr. 24-hr rainfall, P2	in.		3.00	3.00	3.00	0.00	
5. Land slope, s	ft./ft.		0.029	0.023	0.018	0.000	
6. Tc=(0.007 x (n x L)^0.8)/(P2^0.5 x s^(	hr.		0.004	0.079	0.186	0	0.269

2. Shallow concentrated flow

		ID				
7. Surface description (paved or unpaved)						
8. Flow length, L	ft.	0	0	0	0	
9. Watercourse slope, s	ft./ft.	0	0	0	0	
10. Average velocity, V (figure 3-1)	ft./s	0	0	0	0	
11. Tt = L / (3600 x V)	hr.	0	0	0.0	0	0

3. Channel flow - Pipe flow

		ID				
# Cross sectional flow area, a	ft.^2	0	0	0	0	
or Pipe diameter, in.	in.					
# Wetted perimeter, Pw	ft.	0.00	0.00	0.00	0.00	
# Hydraulic radius, r = a/Pw	ft.	0	0	0	0	
# Channel slope, s	ft./ft.	0	0	0	0	
# Manning's roughness coeff., n						
# V=(1.49xr^2/3 x s^1/2)/n	ft./s	0.0	0.0	0.0	0.0	
# Flow length, L	ft.	0	0	0	0	
# Tt = L /(3600xV)	hr.	0	0	0	0	0

Watershed or subarea Tc or Tt (Hr.) 0.269 Hr.
16 Min.

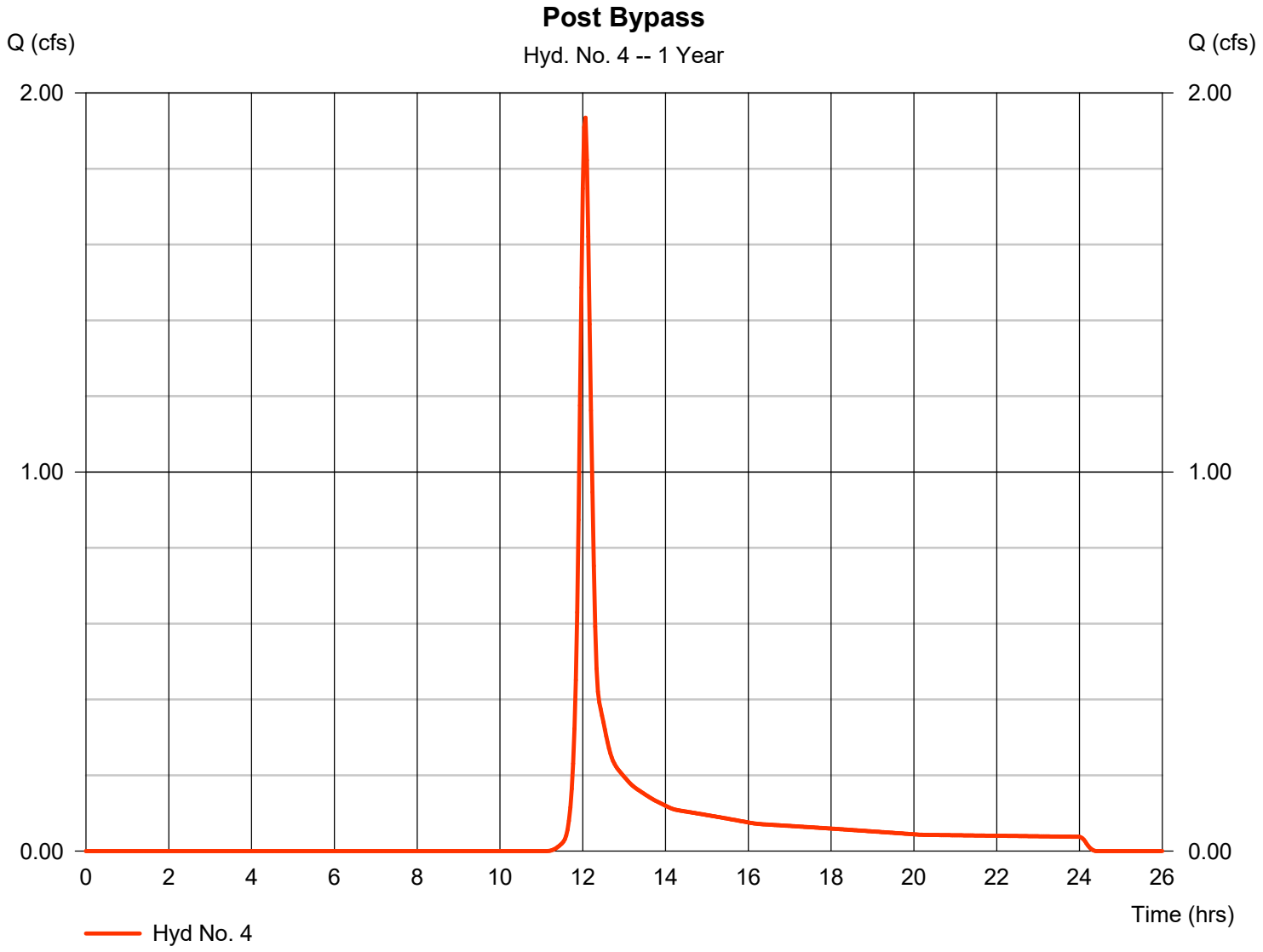
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 4

Post Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.935 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	5,754 cuft
Drainage area	=	1.998 ac	Curve number	=	75
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.00 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



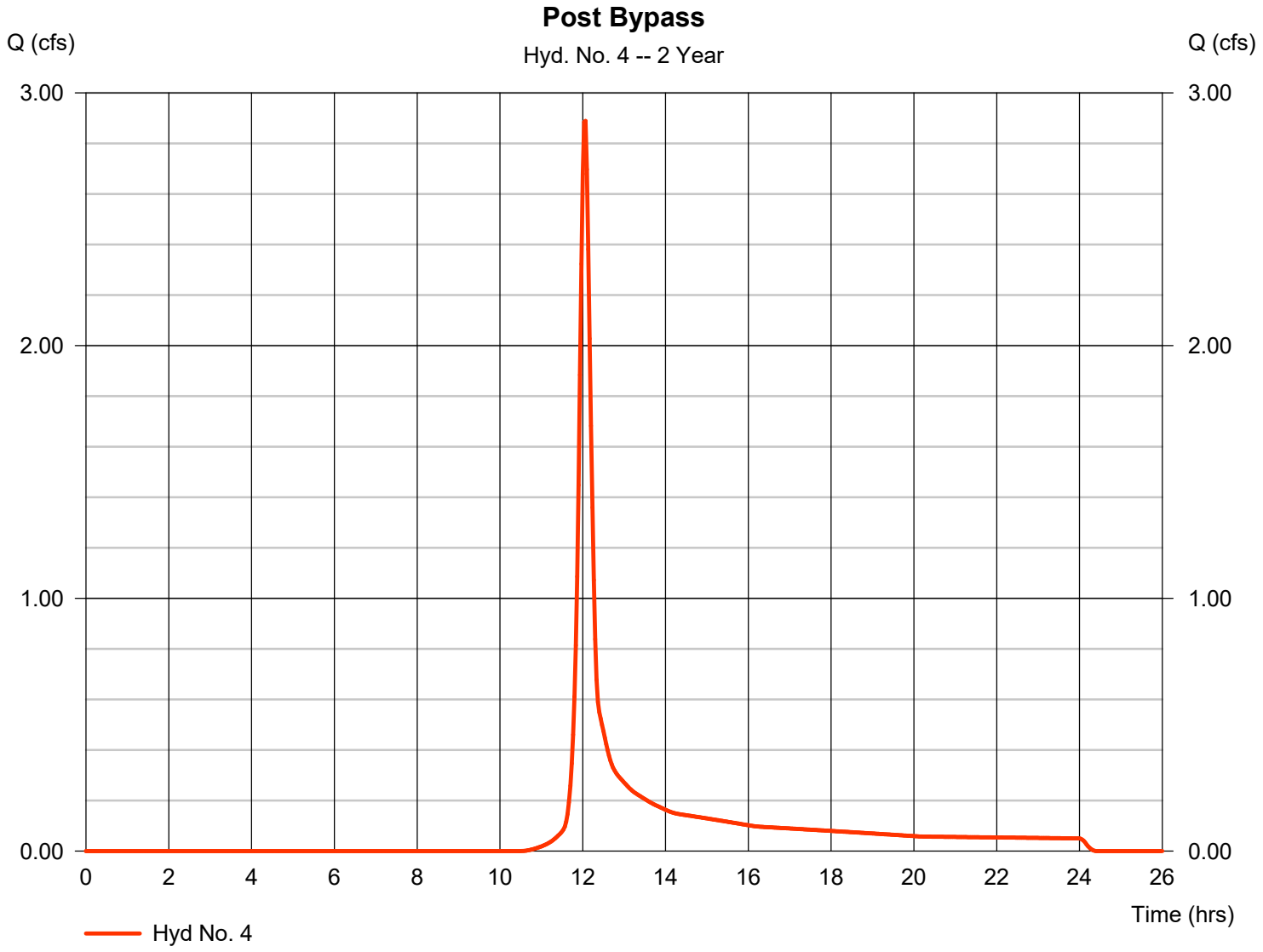
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 4

Post Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.889 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	8,365 cuft
Drainage area	=	1.998 ac	Curve number	=	75
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.00 min
Total precip.	=	3.33 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



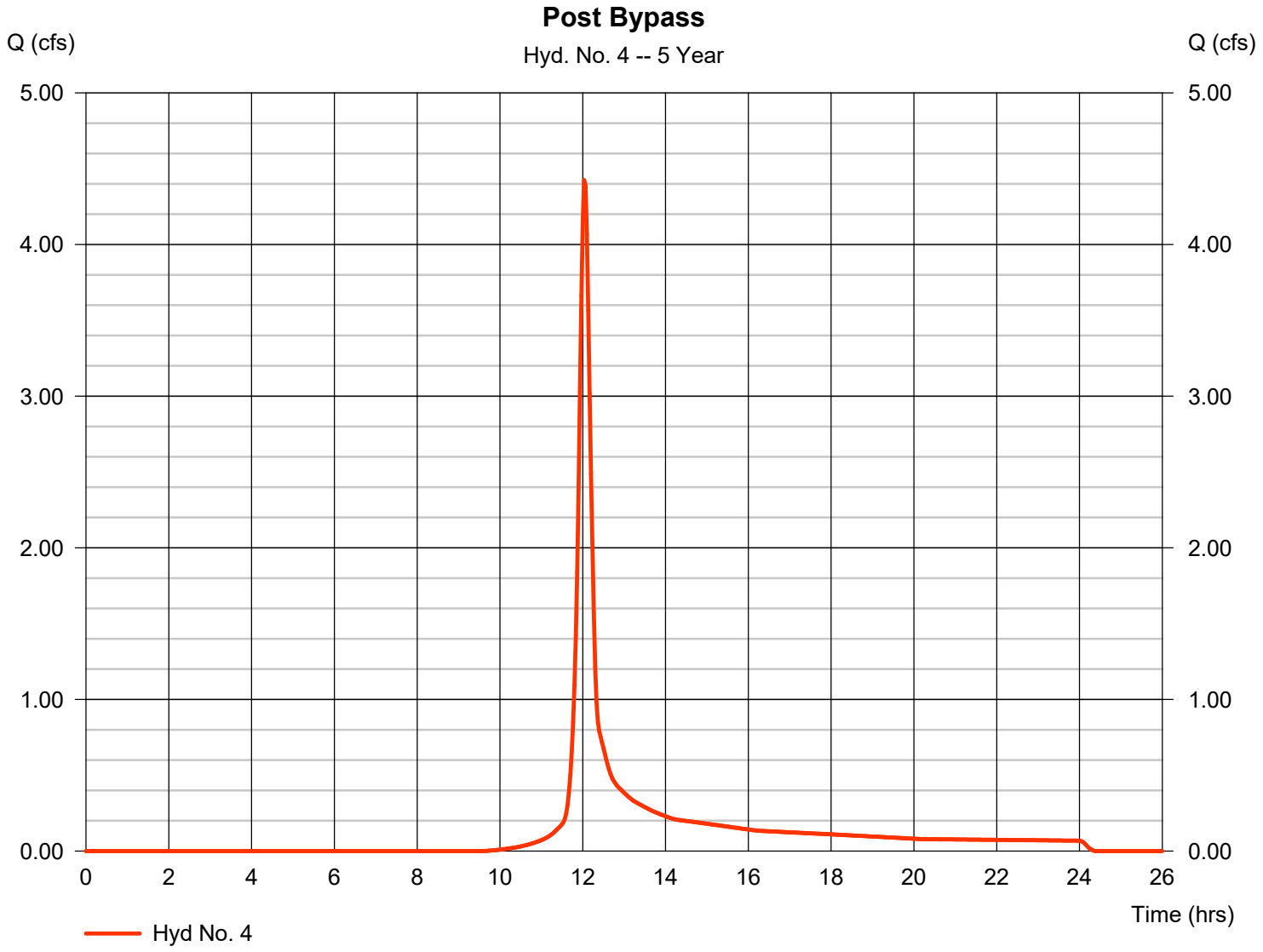
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 4

Post Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.424 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	12,533 cuft
Drainage area	=	1.998 ac	Curve number	=	75
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.00 min
Total precip.	=	4.14 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



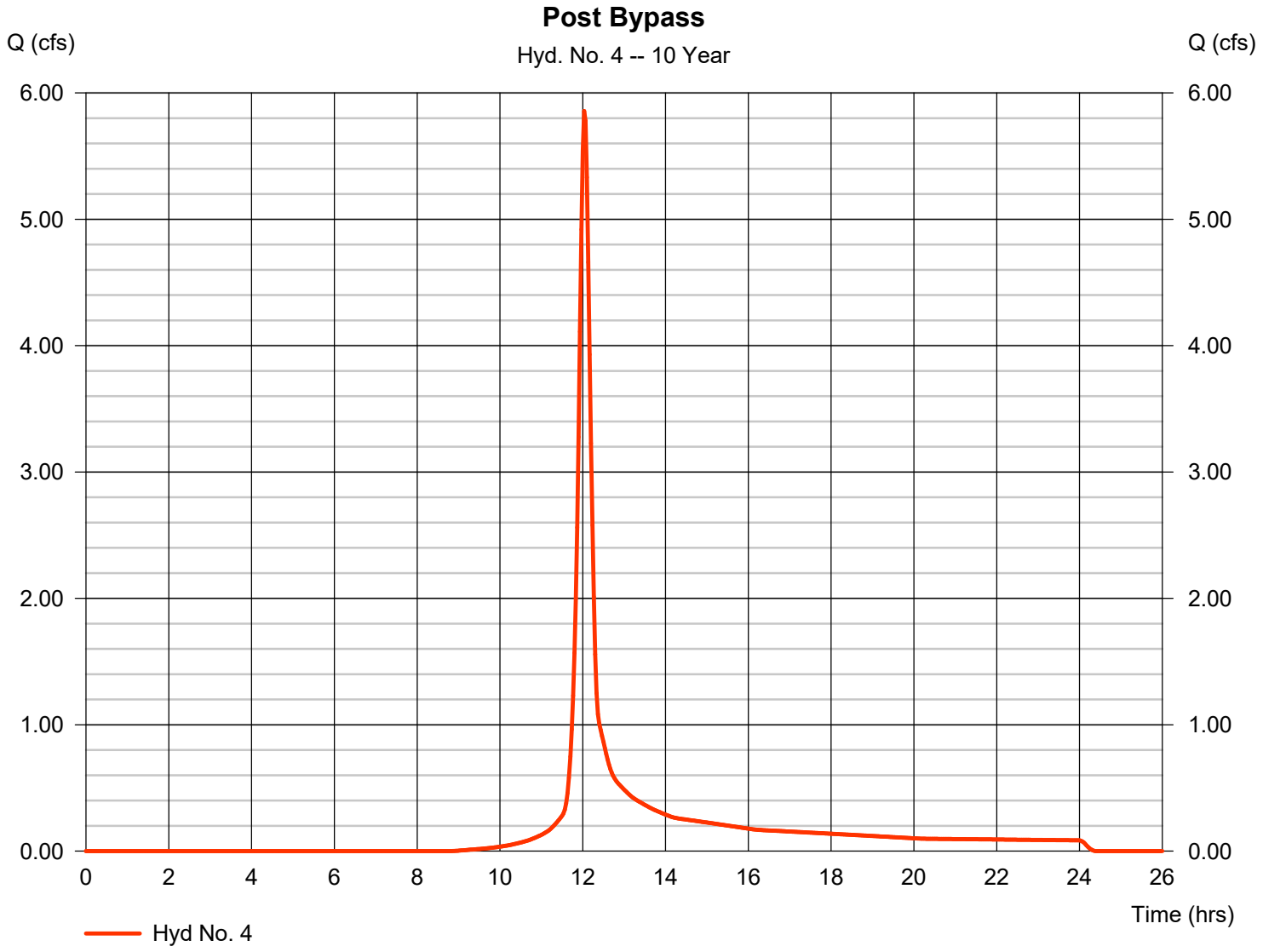
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 4

Post Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.857 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	16,464 cuft
Drainage area	=	1.998 ac	Curve number	=	75
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.00 min
Total precip.	=	4.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

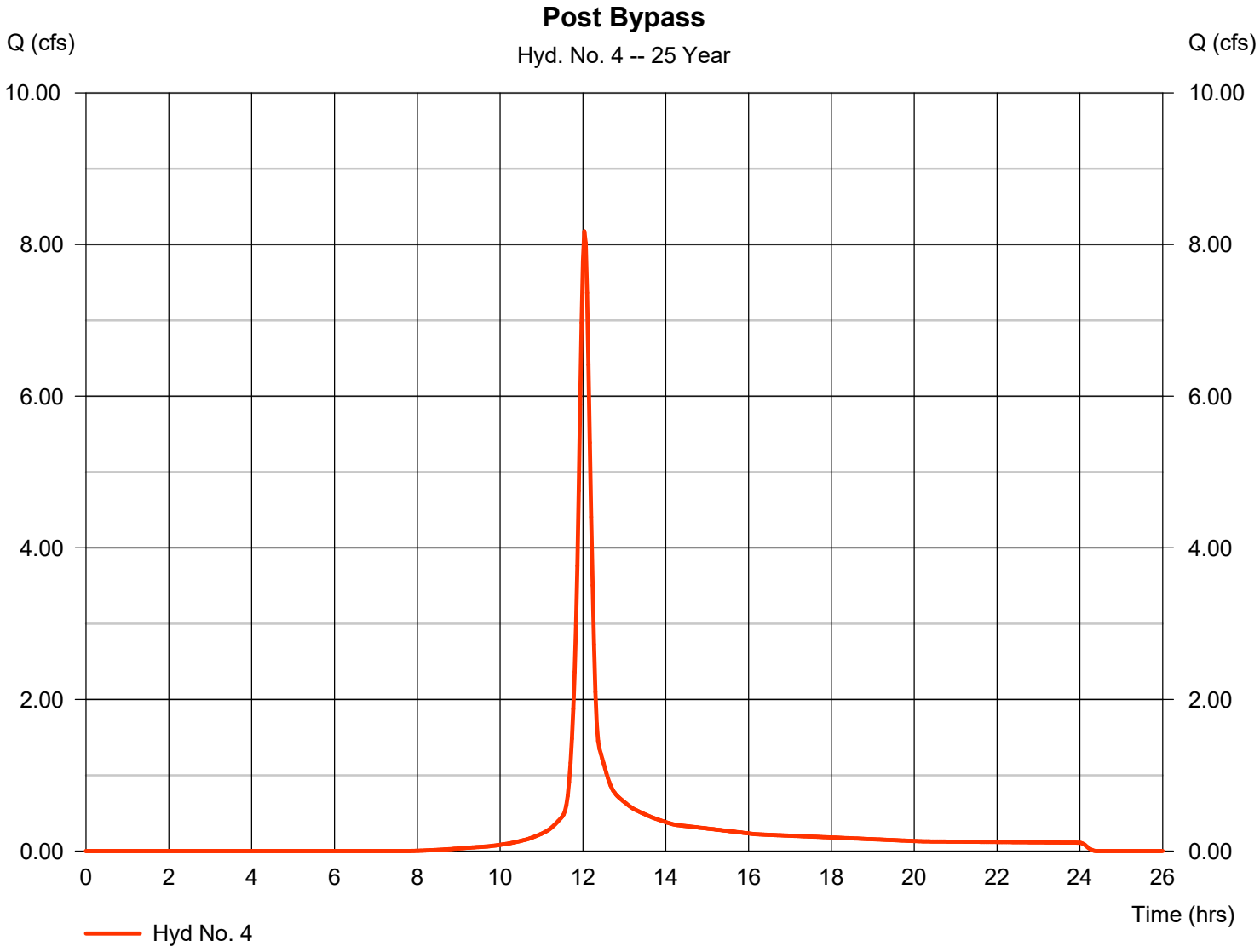


Hydrograph Report

Hyd. No. 4

Post Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.173 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	22,908 cuft
Drainage area	=	1.998 ac	Curve number	=	75
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



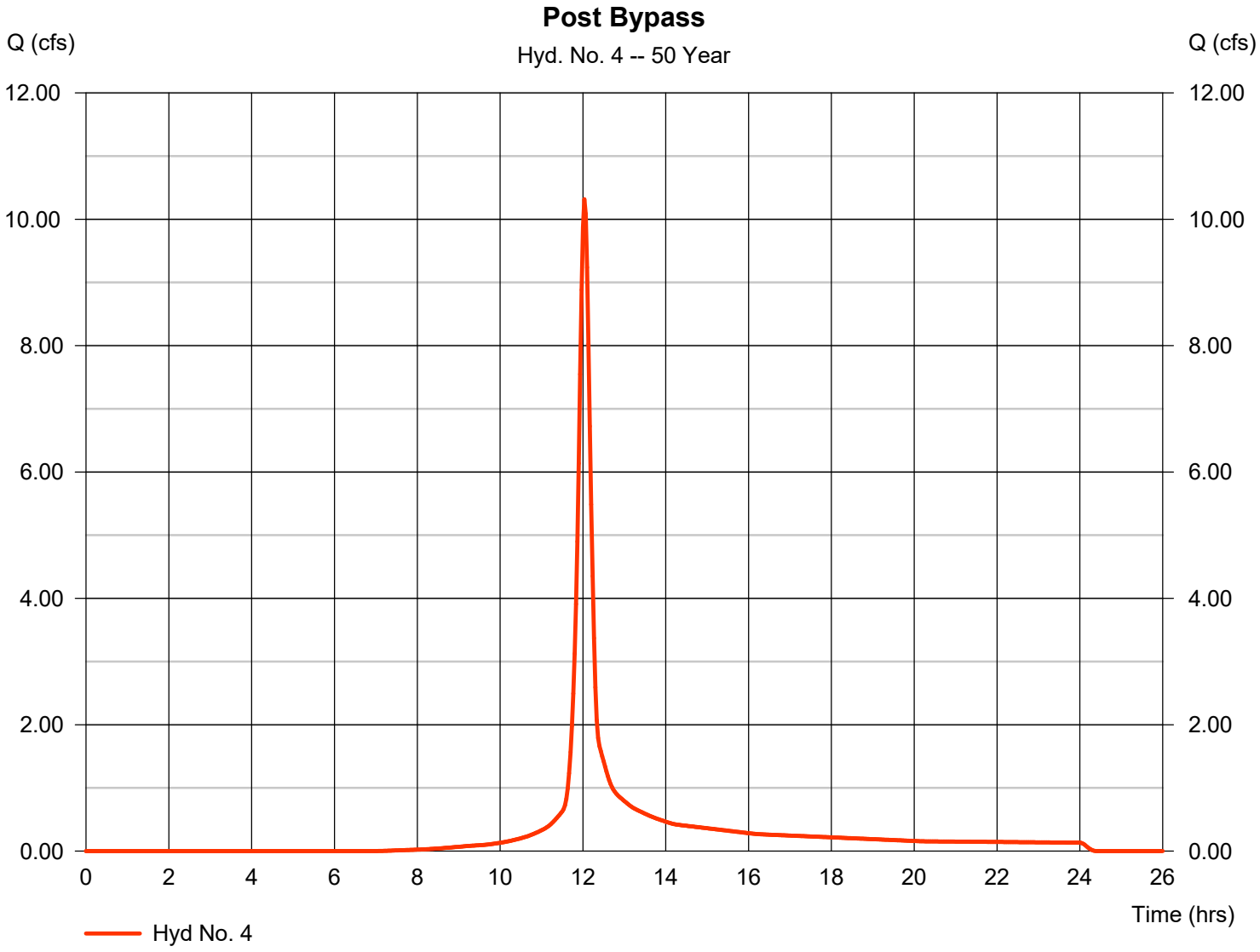
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 4

Post Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.32 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	28,969 cuft
Drainage area	=	1.998 ac	Curve number	=	75
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.00 min
Total precip.	=	6.94 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



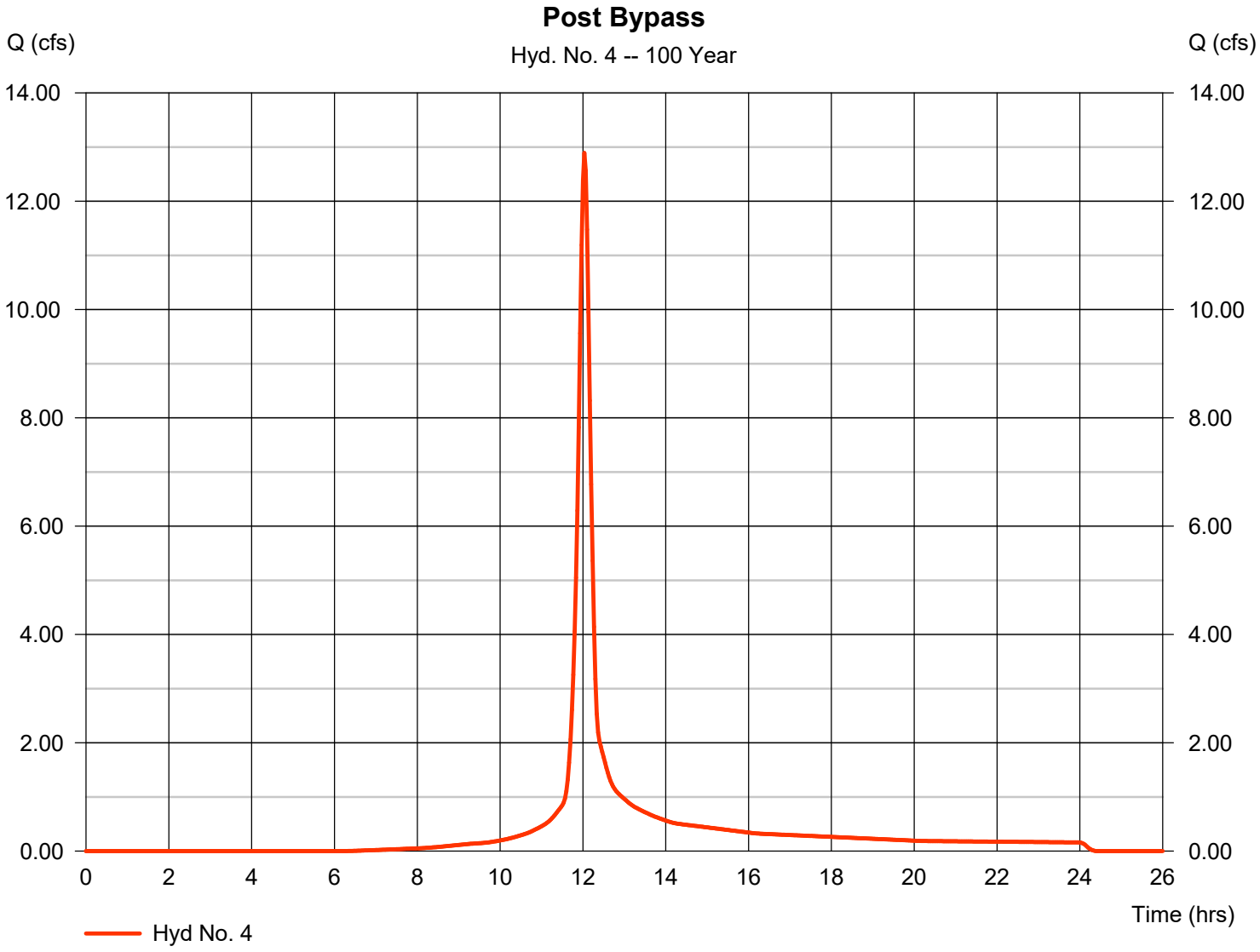
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 4

Post Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.89 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	36,354 cuft
Drainage area	=	1.998 ac	Curve number	=	75
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.00 min
Total precip.	=	8.11 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

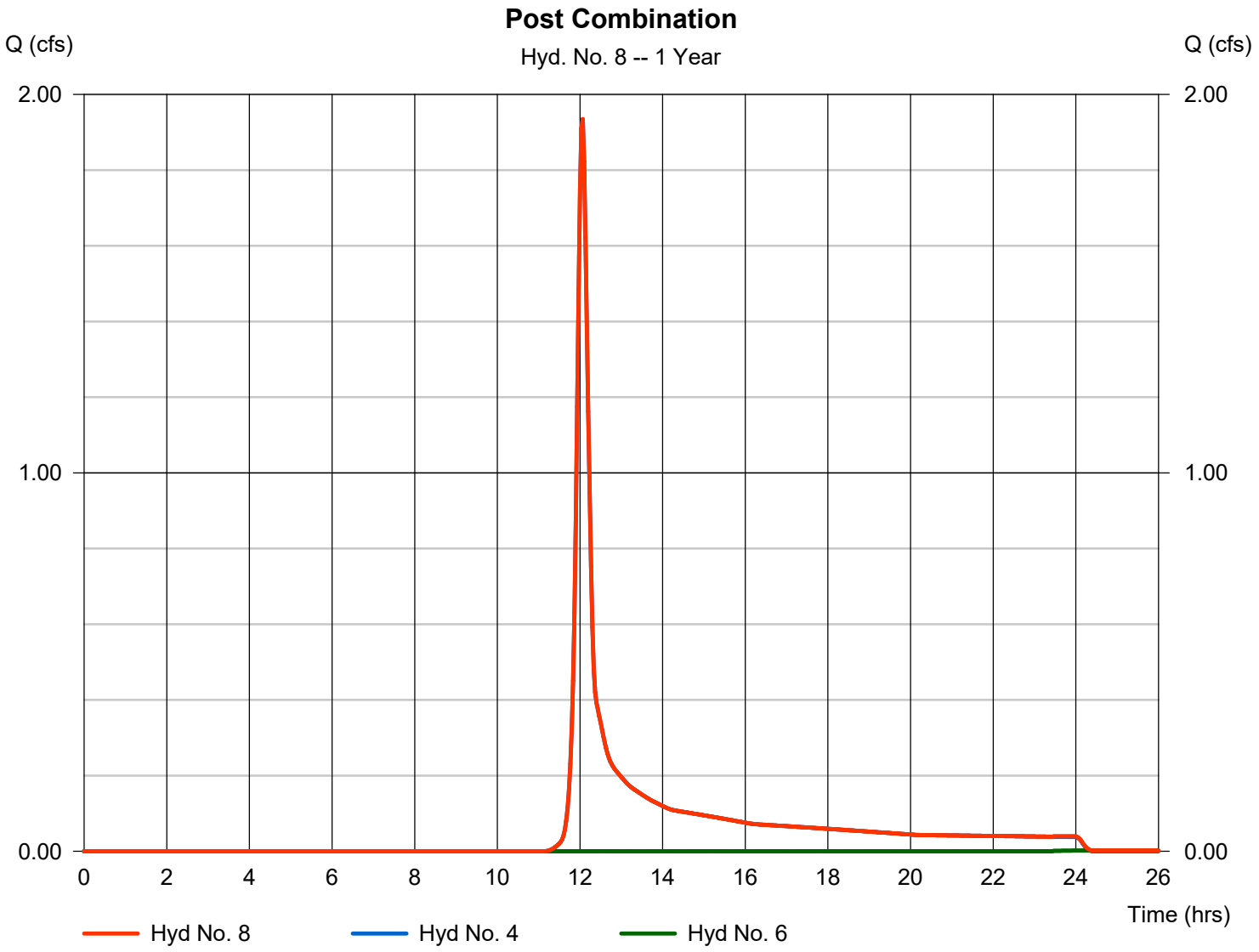


Hydrograph Report

Hyd. No. 8

Post Combination

Hydrograph type	= Combine	Peak discharge	= 1.935 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 5,836 cuft
Inflow hyds.	= 4, 6	Contrib. drain. area	= 1.998 ac



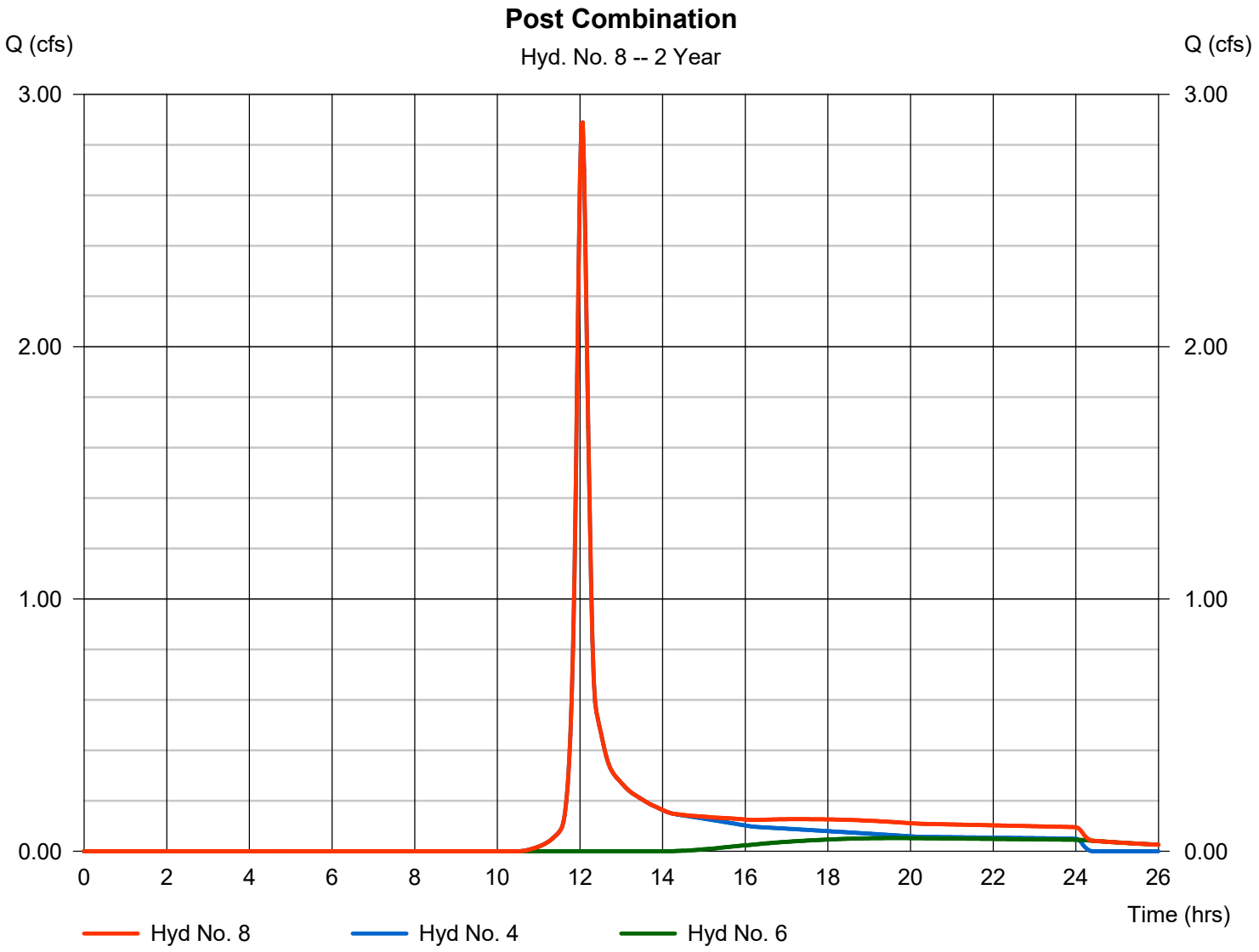
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 8

Post Combination

Hydrograph type	= Combine	Peak discharge	= 2.889 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 10,640 cuft
Inflow hyds.	= 4, 6	Contrib. drain. area	= 1.998 ac

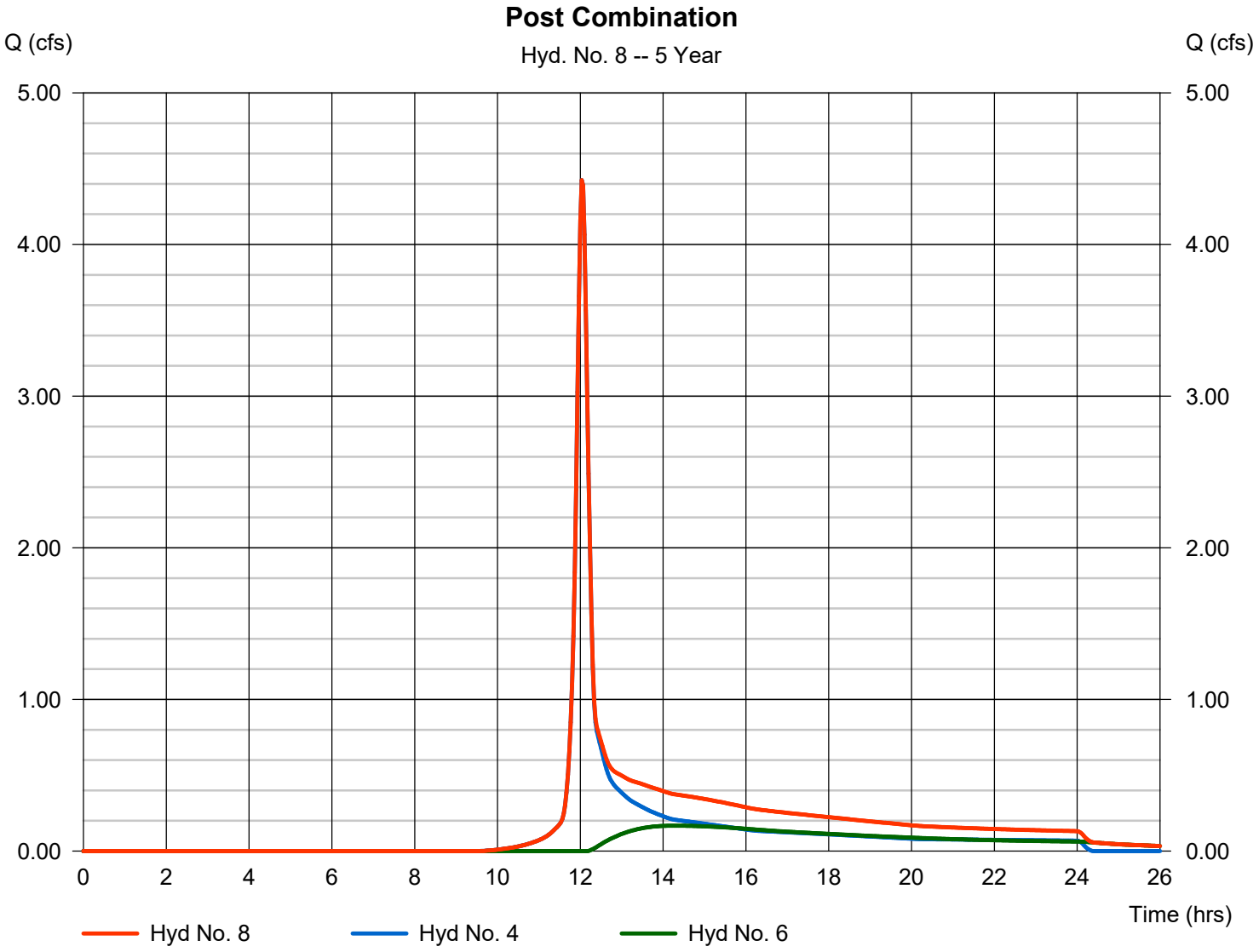


Hydrograph Report

Hyd. No. 8

Post Combination

Hydrograph type	= Combine	Peak discharge	= 4.424 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 18,143 cuft
Inflow hyds.	= 4, 6	Contrib. drain. area	= 1.998 ac



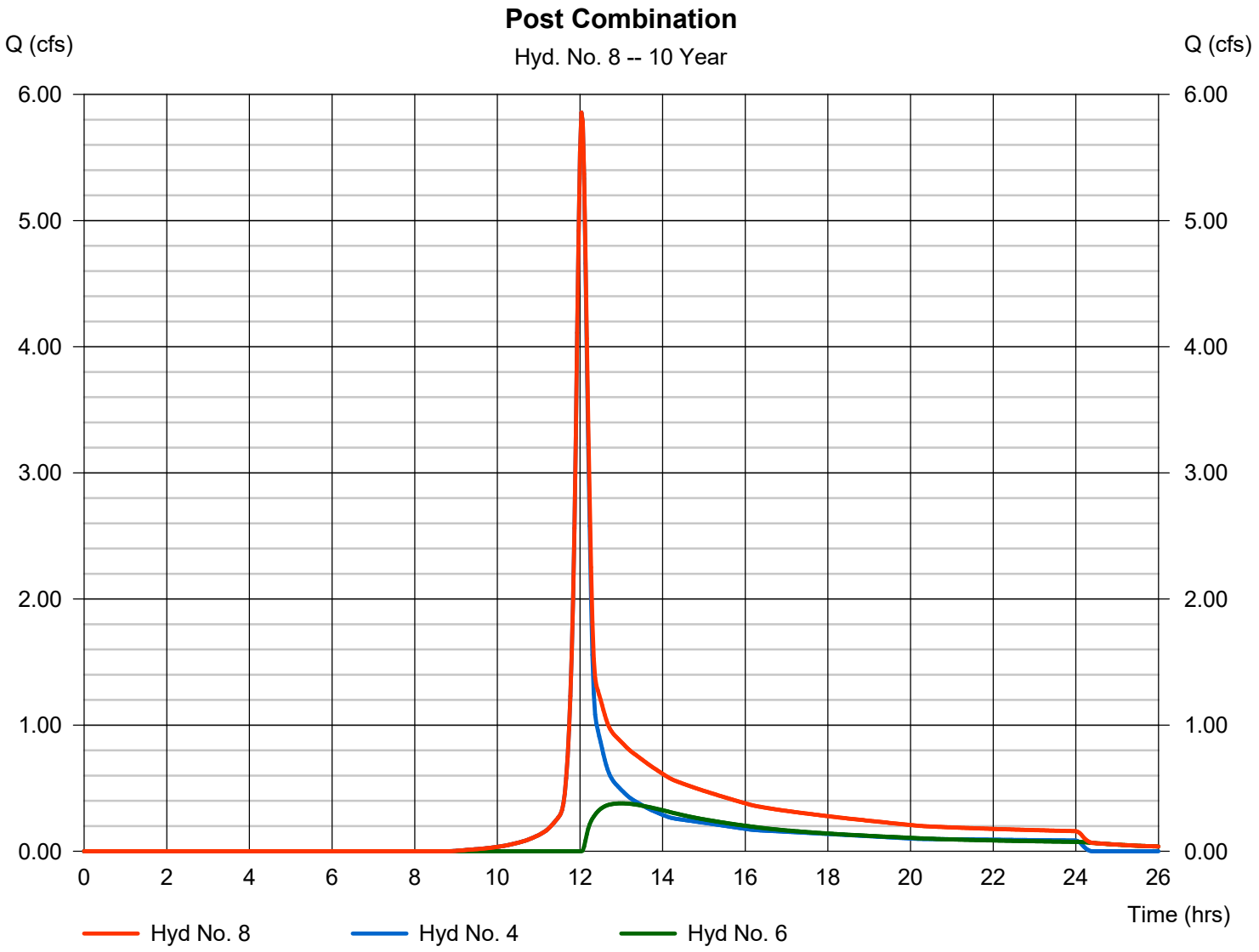
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 8

Post Combination

Hydrograph type	= Combine	Peak discharge	= 5.857 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 25,102 cuft
Inflow hyds.	= 4, 6	Contrib. drain. area	= 1.998 ac



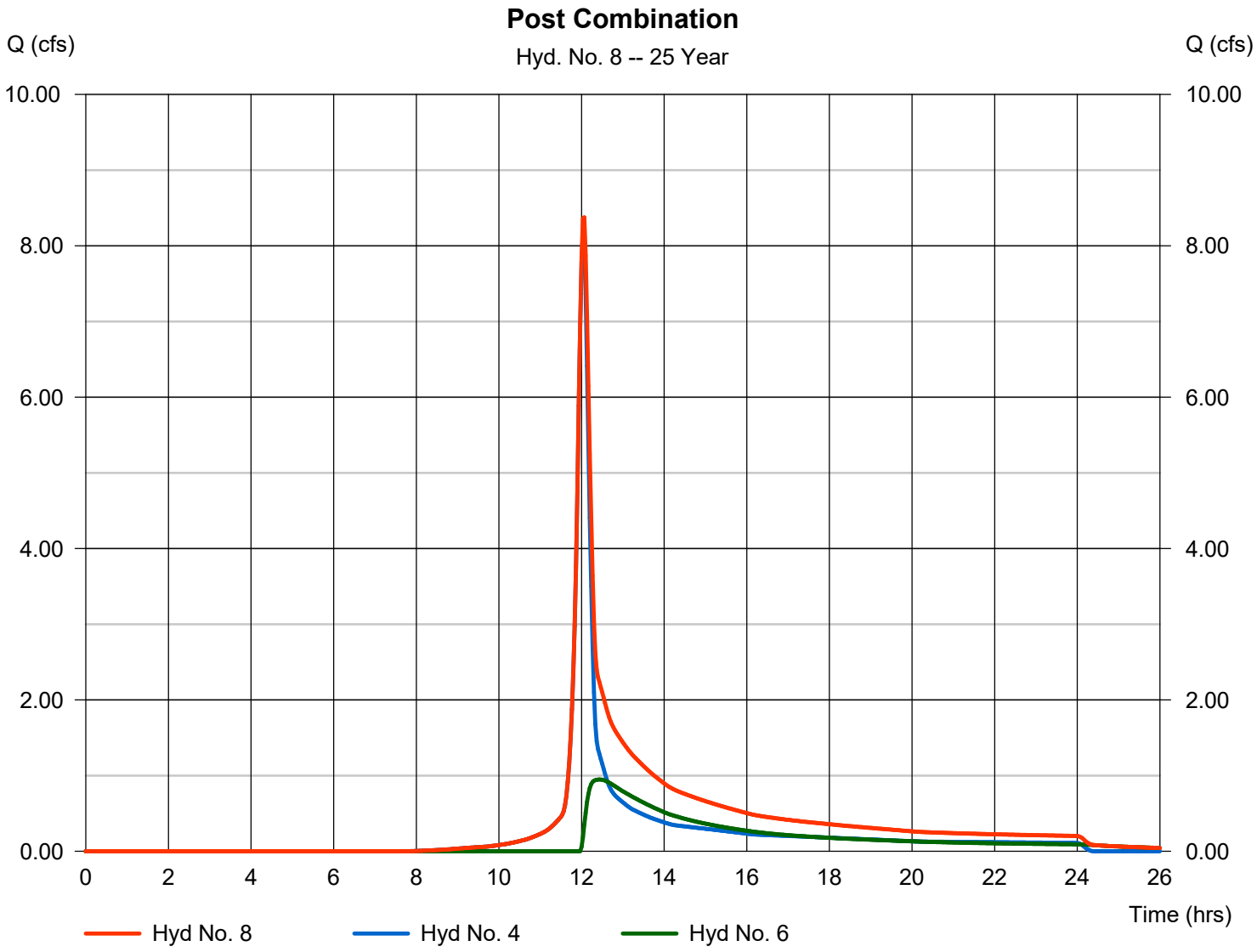
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 8

Post Combination

Hydrograph type	= Combine	Peak discharge	= 8.375 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 36,366 cuft
Inflow hyds.	= 4, 6	Contrib. drain. area	= 1.998 ac

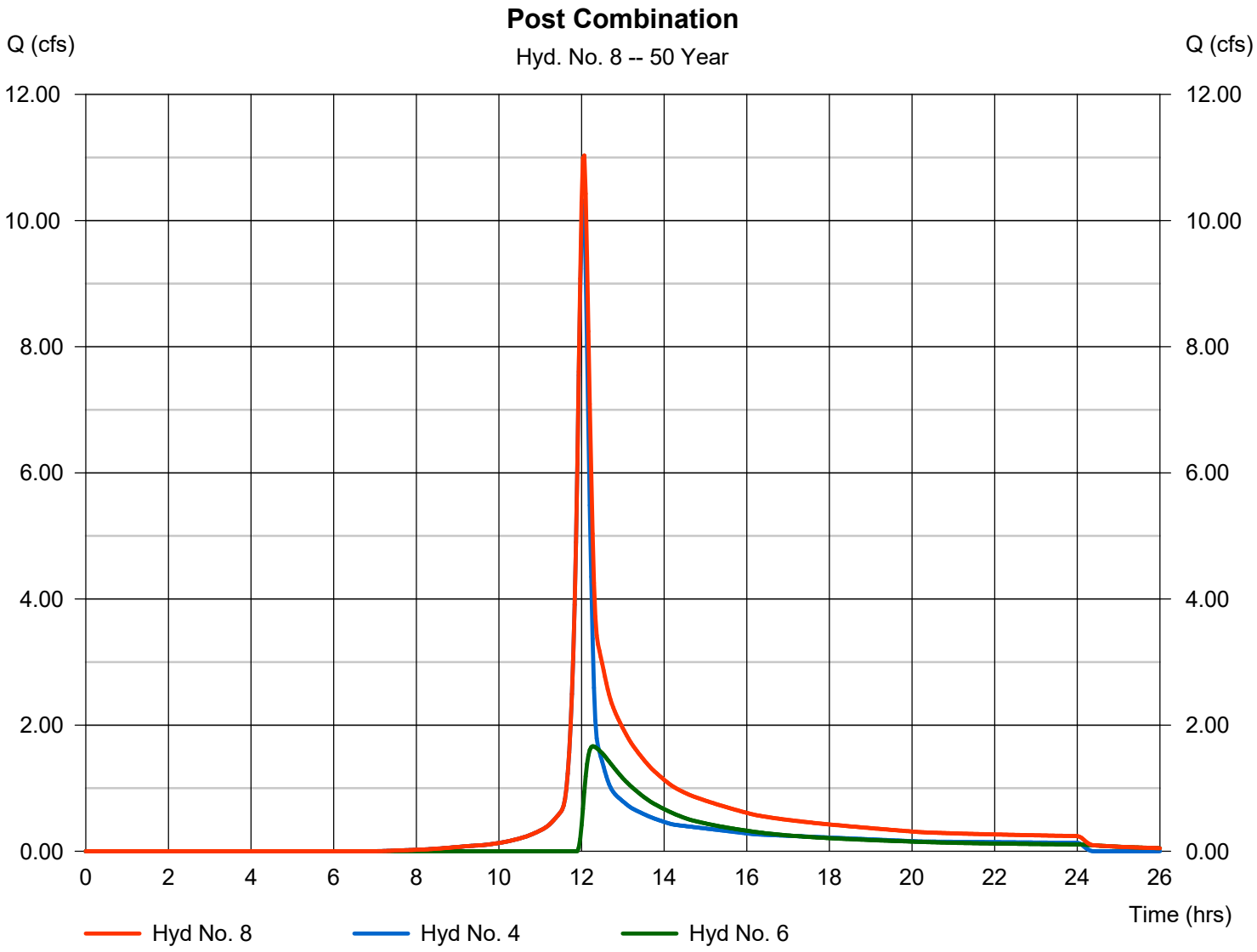


Hydrograph Report

Hyd. No. 8

Post Combination

Hydrograph type	= Combine	Peak discharge	= 11.03 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 46,854 cuft
Inflow hyds.	= 4, 6	Contrib. drain. area	= 1.998 ac



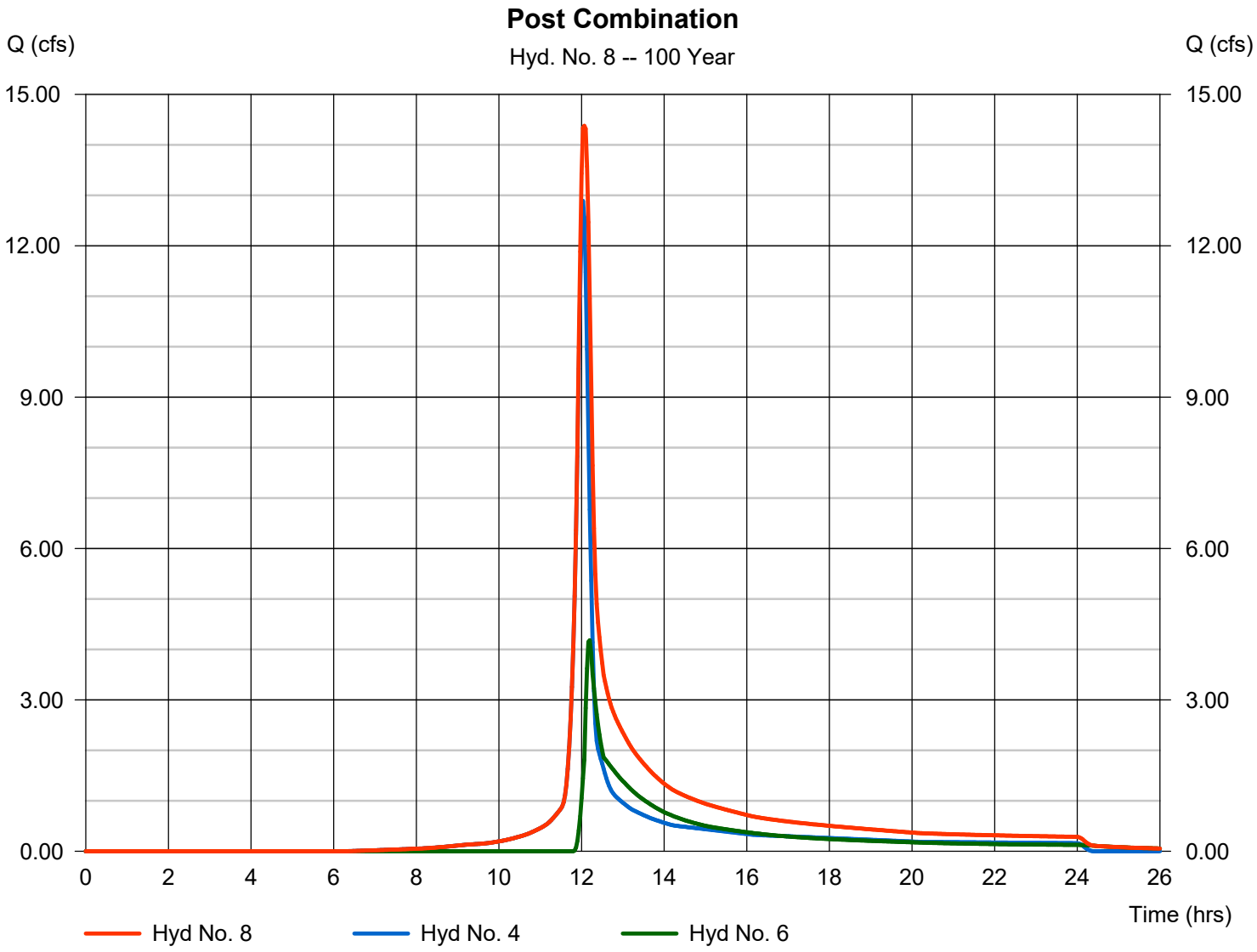
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 8

Post Combination

Hydrograph type	= Combine	Peak discharge	= 14.38 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 59,542 cuft
Inflow hyds.	= 4, 6	Contrib. drain. area	= 1.998 ac



SPILLWAY ANALYSIS

Spillway Sizing

PROJECT NAME: Water Gap Wellness Accessory Buildings **Job Number:** 1022419.004
LOCATION: Smithfield Township, Monroe County **Date:**
PREPARED BY: CRS **Revised:**

Flow into pond for 100-year storm frequency:

Q = 10.9 cfs (From Post-Development Analysis)

Capacity of the emergency spillway:

Q = CLH^1.5 C = 2.8
L = 12
H = 0.50

Q = 11.88 cfs > 10.9 OK

Check actual depth and velocity:

Top of Berm Elevation = 453.00
Spillway Elevation = 451.50

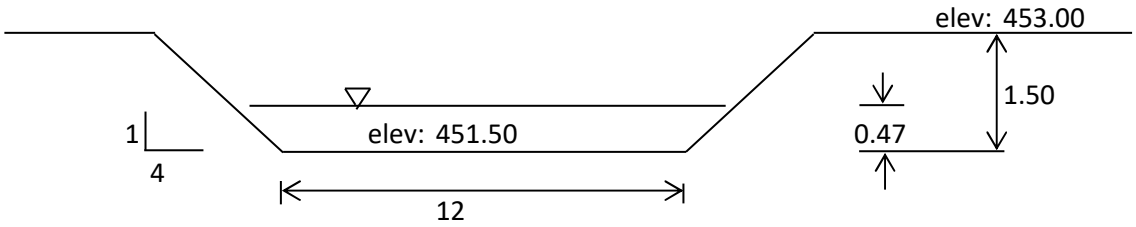
H = [Q/C*L]^2/3

= 0.47 at elevation 451.97

Freeboard: 453.00 - 451.97 = 1.03 ft

V = Q/A Side Slope (H:V) = 4

= 1.66 fps



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Pond No. 1 - Infiltration Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 450.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	450.00	7,417	0	0
0.75	450.75	8,989	6,142	6,142
1.00	451.00	9,501	2,311	8,453
2.00	452.00	11,496	10,482	18,935
3.00	453.00	13,464	12,466	31,400

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	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)	= 450.75	0.00	0.00	0.00
Length (ft)	= 40.00	0.00	0.00	0.00
Slope (%)	= 15.00	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

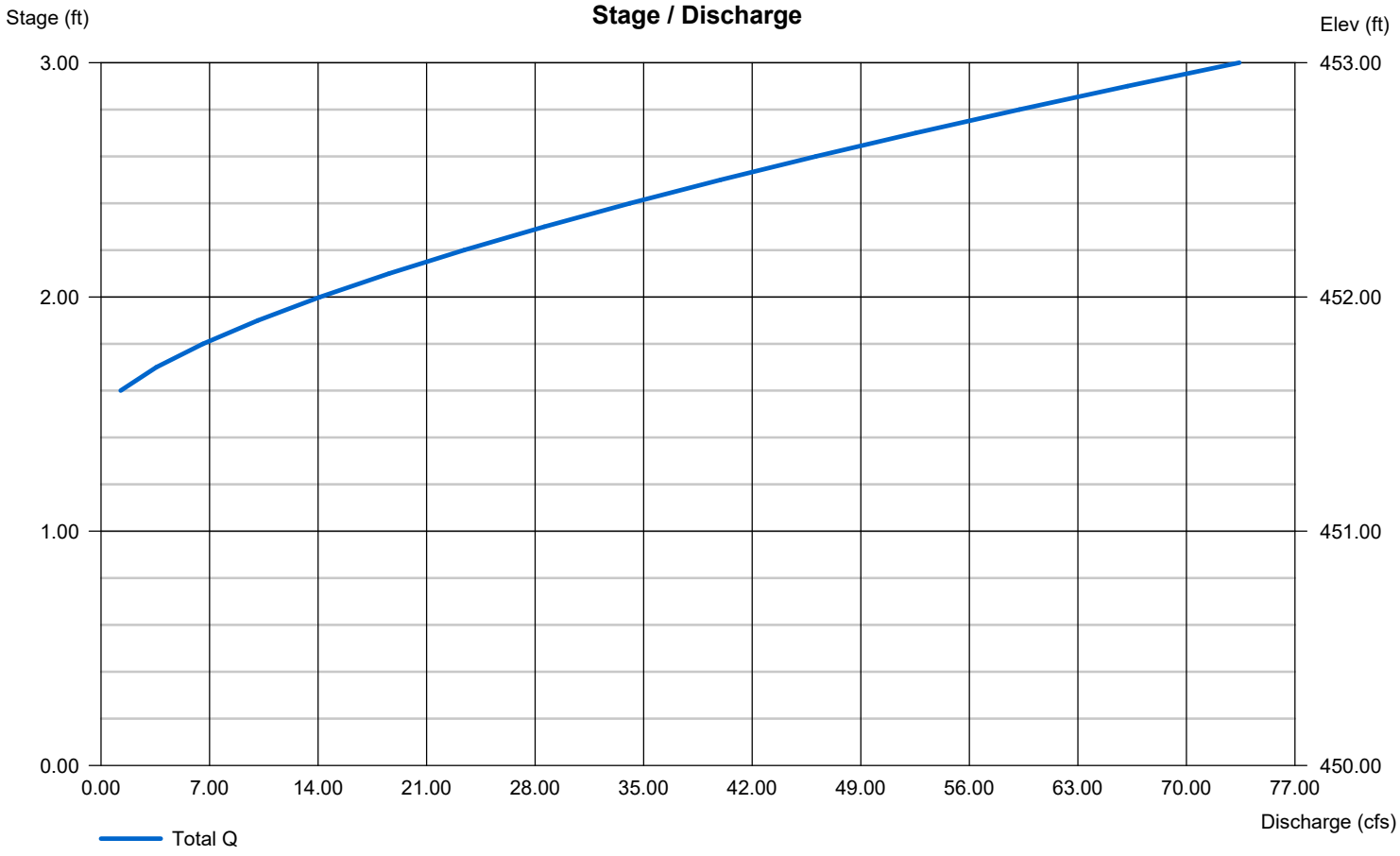
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	0.00	0.00	0.00
Crest El. (ft)	= 451.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Ciplti	---	---	---
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).



Hydrograph Report

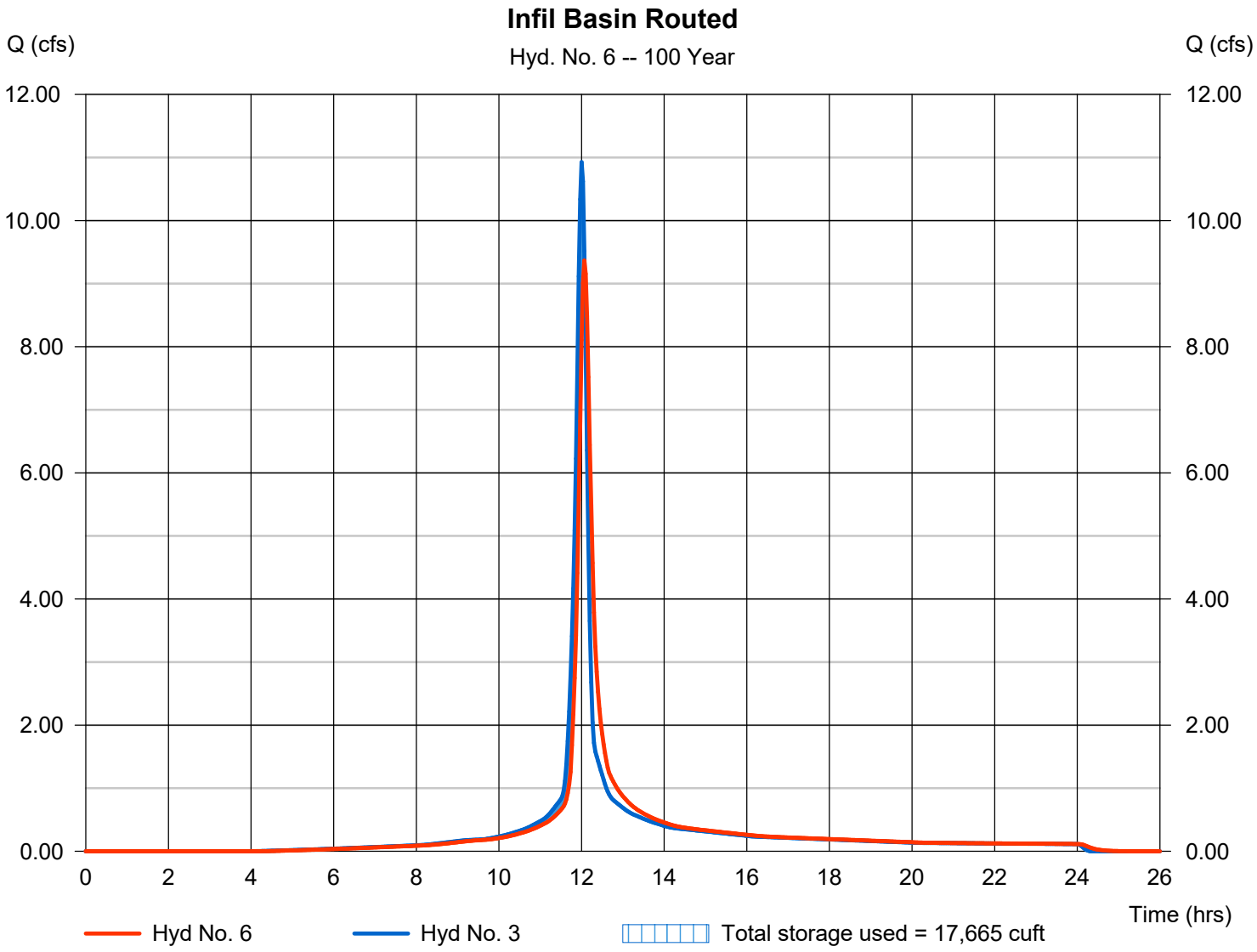
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 10 / 31 / 2024

Hyd. No. 6

Infil Basin Routed

Hydrograph type	=	Reservoir	Peak discharge	=	9.364 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	29,410 cuft
Inflow hyd. No.	=	3 - Post Capture	Max. Elevation	=	451.88 ft
Reservoir name	=	Infiltration Basin	Max. Storage	=	17,665 cuft

Storage Indication method used. Wet pond routing start elevation = 451.50 ft.



North American Green
5401 St. Wendel-Cynthiana Rd.
Poseyville, Indiana 47633
Tel. 800.772.2040
>Fax 812.867.0247
www.nagreen.com
ECMDS v7.0

CHANNEL ANALYSIS

> > > Emergency Spillway

Name	Emergency Spillway
Discharge	10.9
Channel Slope	0.0001
Channel Bottom Width	12
Left Side Slope	4
Right Side Slope	4
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	Mix (Sod and Bunch)
Vegetation Density	Very Good 80-95%
Soil Type	Silt Loam (SM)

S75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S75 Unvegetated	Straight	10.9 cfs	0.31 ft/s	1.81 ft	0.057	1.6 lbs/ft2	0.01 lbs/ft2	141.28	STABLE	D
Underlying Substrate	Straight	10.9 cfs	0.31 ft/s	1.81 ft	0.057	1.17 lbs/ft2	0.01 lbs/ft2	144.91	STABLE	D

Unreinforced Vegetation

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	10.9 cfs	0.11 ft/s	3.8 ft	0.252	4 lbs/ft2	0.02 lbs/ft2	168.63	STABLE	--
Underlying Substrate	Straight	10.9 cfs	0.11 ft/s	3.8 ft	0.252	4 lbs/ft2	0.01 lbs/ft2	268.68	STABLE	--

E. BMP WORKSHEETS

General Information

Instructions | *General* | Volume | Rate | Quality

Project Name: **Water Gap Wellness Accessory Buildings**

Application Type: **PAG-02 NOI**

County: **Monroe**

Municipality: **Smithfield Township**

Project Type: **Other**

◉ New Project ○ Minor / Major Amendment

Area: **3.22** acres
(In Watershed)

Total Earth Disturbance: **3.22** acres
(In Watershed)

No. of Post-Construction Discharge Points: **1**

Start DP Numbering at: **001**

Discharge Point (DP) No.	Drainage Area (DA) (acres)	Earth Disturbance in DA (acres)	Existing Impervious in DA (acres)	Proposed Impervious in DA (acres)	Receiving Waters	Ch. 93 Class	Structural BMP(s)
001	1.22	1.22	0.00	0.47	Cherry Creek	CWF, MF	Yes
Undetained Areas	2.00	2.00	0.15	0.10	Cherry Creek	CWF, MF	
Totals:	**3.22**	**3.22**	**0.156**	**0.57**			

PROJECT SITE MEETS SMALL SITE EXCEPTION - RATE WORKSHEET NOT REQUIRED

Volume to BMPs

2-Year Rainfall: 3.33 in

Basin Total DA	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Impervious	C	22,095	0.51	98	0.20	0.04	3.10	5702
Lawn	C	33,101	0.76	74	3.51	0.70	1.12	3101
TOTAL		55,196	1.3					8,803

Infiltration Basin	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Impervious	C	20,569	0.47	98	0.20	0.04	3.10	5309
Lawn	C	32,730	0.75	74	3.51	0.70	1.12	3066
TOTAL		53,299	1.2					8,374

Swale 3	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Impervious	C	167	0.00	98	0.20	0.04	3.10	43
Lawn	C	18,316	0.42	74	3.51	0.70	1.12	1716
Lawn	D	258	0.01	80	2.50	0.50	1.50	32
TOTAL		18,741	0.4					1,791

Swale 4	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Impervious	C	1,464	0.03	98	0.20	0.04	3.10	378
Lawn	C	25,497	0.59	74	3.51	0.70	1.12	2388
Lawn	D	1,753	0.04	80	2.50	0.50	1.50	220
TOTAL		28,714	0.7					2,986

Volume Management

Project: Water Gap Wellness Accessory Buildings

Instructions | General | *Volume* | Rate | Quality

2-Year / 24-Hour Storm Event (NOAA Atlas 14): **3.33** inches

Alternative 2-Year / 24-Hour Storm Event [ ] inches

Alternative Source: [ ]

Pre-Construction Conditions: *No. Rows:* **4** ☐ *Exempt from Meadow in Good Condition* ☑ *Automatically Calculate CN, Ia, Runoff and Volume*

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	0.13 0.12500	C	98	0.041	3.10	1,405
Pervious as Meadow	2.99 2.99102	C	71	0.817	0.96	10,393
Impervious as Meadow	0.03 0.03125	C	71	0.817	0.96	109
Pervious as Meadow	0.07 0.07376	D	78	0.564	1.37	367
TOTAL (ACRES):	**3.22**				**TOTAL (CF):**	**12,274**

Post-Construction Conditions: *No. Rows:* **3**

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	0.57 0.57463	C	98	0.041	3.10	6,460
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	2.57 2.57264	C	74	0.703	1.12	10,497
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	0.07 0.07376	D	80	0.500	1.50	402
TOTAL (ACRES):	**3.22**				**TOTAL (CF):**	**17,360**

NET CHANGE IN VOLUME TO MANAGE (CF): 5,086

Non-Structural BMP Volume Credits:

☐ Tree Planting Credit

☐ Other (attach calculations):

Structural BMP Volume Credits: *No. Structural BMPs:* **3** *Start BMP Numbering at:* **1**

DP No.	BMP No.	BMP Name	MRC?	Discharge	Incremental BMP DA (acres)	Volume Routed to BMP (CF)	Infiltration / Vegetated Area (SF)	Infiltration Rate (in/hr)	Infiltration Period (hrs)	Vegeta-ted?	Media Depth (ft)	Storage Volume (CF)	Infiltration Credit (CF)	ET Credit (CF)
001	1	Infiltration Basin	-	Off-Site	1.22	8,374	7,417	0.30	33	Yes	0.5	6,142	**5,507**	**1,272**
001	2	Vegetated Swale	-	Off-Site	0.40	1,791								
001	3	Vegetated Swale	-	Off-Site	0.70	2,986								
												Totals:	**5,507**	**1,272**

INFILTRATION & ET CREDITS (CF): 6,779

NET CHANGE IN VOLUME TO MANAGE (CF): 5,086

TOTAL CREDITS (CF): 6,779

VOLUME REQUIREMENT SATISFIED

BARRY ISETT & ASSOCIATES, INC.
Consulting Engineers & Surveyors
85 S. Route 100 & Kressler Lane
P.O. Box 147
Trexlertown, PA 18087-0147

Page:
Job #:
Date:
Revised:

Project: **Water Gap Wellness Accessory Bu**
Location: Smithfield Township
County: Monroe

INFILTRATION CALCULATIONS

Rain Garden Infiltration Volume

Inf. Rate:	0.3	in/hr*
Inf. Area:	7,417	sf
Inf. Time:	33	hours

Storage Volume = 6,142 cf at elev: 450.75

Infiltration Volume = Inf. Rate x Inf. Area x Inf. Time
= 6,119 cf

Total Volume Infiltrated = Storage Volume + Infiltration Volume
= 12,261 cf
Note: Volume actually being captured = **cf**

Loading Ratios

Total Drainage Area	=	55,196 sf
Impervious Drainage Area	=	22,095 sf
Infiltration Area	=	7,417 sf
Total Loading Ratio	=	**7.4 :1**
Impervious Loading Ratio	=	**3.0 :1**

Dewatering Time (After rainfall event)

= Storage Volume / (Inf. Rate x Area)
= **33.1 Hrs**

*Note: Infiltration rate is based the geometric mean Saturated K for test pits #….

Rate Control

Project: Water Gap Wellness Accessory Buildings

Instructions | General | Volume | *Rate* | Quality

SMALL SITE EXCEPTION SATISFIED: RATE CONTROL NOT REQUIRED

Precipitation Amounts:

NOAA 2-Year 24-Hour Storm Event (in):	**3.33**	Alternative 2-Year 24-Hour Storm Event (in):	
NOAA 10-Year 24-Hour Storm Event (in):	**4.85**	Alternative 10-Year 24-Hour Storm Event (in):	
NOAA 50-Year 24-Hour Storm Event (in):	**6.94**	Alternative 50-Year 24-Hour Storm Event (in):	
NOAA 100-Year 24-Hour Storm Event (in):	**8.11**	Alternative 100-Year 24-Hour Storm Event (in):	

☑ **Report Summary of Peak Rates Only**

Attach model input and output data or other calculations to support the rates reported below.

	Peak Discharge Rates (cfs)			
	Pre-Construction	**Post-Construction**	**Net Change**	
2-Year Storm:	**4.60**	**2.90**	**-1.70**	***Rate Control Satisfied***
10-Year Storm:	**9.10**	**5.90**	**-3.20**	***Rate Control Satisfied***
50-Year Storm:	**15.90**	**11.00**	**-4.90**	***Rate Control Satisfied***
100-Year Storm:	**19.80**	**14.40**	**-5.40**	***Rate Control Satisfied***

DP No.	BMP No.	BMP Name	MRC?	Inflow to BMP (cfs)				Outflow from BMP (cfs)			
				2-yr	10-yr	50-yr	100-yr	2-yr	10-yr	50-yr	100-yr

001	1	Infiltration Basin	-	3.30	5.70	9.00	10.90	0.10	0.40	1.70	4.20
001	2	Vegetated Swale	-								
001	3	Vegetated Swale	-								

Water Quality

Project: Water Gap Wellness Accessory Buildings

PRINT

Instructions | General | Volume | Rate | *Quality*

Pre-Construction Pollutant Loads:

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Soil Group	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
					TSS	TP	TN	TSS	TP	TN
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	Residential	0.13	C	1,405	65.0	0.29	2.05	5.70	0.03	0.18
Pervious as Meadow	Grassland/Herbaceous	2.99	C	10,393	48.8	0.22	2.30	31.67	0.14	1.49
Impervious as Meadow	Grassland/Herbaceous	0.03	C	109	48.8	0.22	2.30	0.33	0.00	0.02
Pervious as Meadow	Grassland/Herbaceous	0.07	D	367	48.8	0.22	2.30	1.12	0.01	0.05
	TOTAL (ACRES):	**3.22**					**TOTALS:**	**38.82**	**0.17**	**1.74**

Post-Construction Pollutant Loads (without BMPs):

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Soil Group	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
					TSS	TP	TN	TSS	TP	TN
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	Residential	0.57	C	6,460	65.0	0.29	2.05	26.22	0.12	0.83

Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	Open Space	2.57	C	10,497	78.0	0.25	1.25	51.13	0.16	0.82
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	Open Space	0.07	D	402	78.0	0.25	1.25	1.96	0.01	0.03
	TOTAL (ACRES):	**3.22**					**TOTALS:**	**79.31**	**0.29**	**1.68**

POLLUTANT LOAD REDUCTION REQUIREMENTS (LBS):	**40.48**	**0.11**	**0.00**

☑ **Characterize Undetained Areas (for Untreated Stormwater)** *No. Rows:* **3**

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	**0.065**	**C**	**98**	**0.041**	**3.10**	**731**
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	**0.816**	**C**	**74**	**0.703**	**1.12**	**3,330**
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	**0.028**	**D**	**80**	**0.500**	**1.50**	**153**

Non-Structural BMP Water Quality Credits:

☐ Pervious Undetained Area Credit

☐ Other (attach calculations)

Structural BMP Water Quality Credits:

☑ *Use default BMP Outflows and Median BMP Outflow Concentrations*

DP No.	BMP No.	BMP Name	MRC?	BMP DA (acres)	Vol. Routed to BMP (CF)	Inf. & ET Credits (CF)	Capture & Buffer Credits (CF)	Outflow (CF)	Outflow Conc. (mg/L)			Pollutant Loads (lbs)		
									TSS	TP	TN	TSS	TP	TN
001	1	Infiltration Basin	-	1.22	8,374	6,779		1,595	10.00	0.24	0.96	1.00	0.02	0.10

001	2	Vegetated Swale	-	0.40	1,791			1,791	13.70	0.18	0.63	1.53	0.02	0.07
001	3	Vegetated Swale	-	0.70	2,986			2,986	13.70	0.18	0.63	2.55	0.03	0.12

	TSS	TP	TN
POLLUTANT LOADS FROM STRUCTURAL BMP (TREATED) OUTFLOWS (LBS):	**5.08**	**0.08**	**0.28**
POLLUTANT LOADS FROM UNTREATED STORMWATER (LBS):	**19.93**	**0.07**	**0.37**
NON-STRUCTURAL BMP WATER QUALITY CREDITS (LBS):			
NET POLLUTANT LOADS FROM SITE, POST-CONSTRUCTION (LBS):	**25.01**	**0.15**	**0.65**
POLLUTANT LOADS FROM SITE, PRE-CONSTRUCTION (LBS):	**38.82**	**0.17**	**1.74**

WATER QUALITY REQUIREMENT SATISFIED

CERTIFICATION

I certify under penalty of law and subject to the penalties of 18 Pa.C.S. § 4904 (relating to unsworn falsification to authorities) that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I further certify that the structure, function, and calculations contained in this spreadsheet have not been modified in comparison to the spreadsheet DEP has posted to its website or, if modifications were made, an explanation of the modifications made is attached to this spreadsheet.

Collin Stout	10/31/2024
Spreadsheet User Name	Date

RECHARGE VOLUME CALCULATION

BARRY ISETT & ASSOCIATES, INC.
Consulting Engineers & Surveyors

www.barryisett.com

Worksheet 2: **Runoff curve number & runoff**

PROJECT: Water Gap Wellness Accessory Buildings
LOCATION: Smithfield Township
COUNTY: MONROE
STATE PA

Check one ☐ Present ☑ Developed Post-Development - Bypass

1. Runoff curve number (CN)

Soil name & (appendix A)	Hydrologic group	cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected / connected impervious area ratio)	CN Table 2-2	CN Fig. 2-3	CN Fig. 2-4	Area X	Area acres / mi. ^2 / %	Product of CN x Area
SITE	C	Impervious	98				0.002	0.2
	C	Lawn	74				1.265	93.6
							0.000	0.0
							0.000	0.0
							0.000	0.0
							0.000	0.0
							0.000	0.0
							0.000	0.0
		SUBTOTAL COMPOSITE	**74**				1.267	93.8
OFFSITE		WOODED STEEP BANKS FAIR					0.000	0.0
		FARMFIELD / MEADOW					0.000	0.0
		RESIDENTIAL 1/2 ACRE					0.000	0.0
		ROADS					0.000	0.0
		SUBTOTAL COMPOSITE	**0**				0.000	0.0

Totals = 1.267 93.8

CN (weighted) total product / total area = 93.8 / 1.2671 = 74.03 ; Use CN = **74**

Re_v (cf) = [I * Impervious area (sf)] / 12

P = I = (200/CN) – 2

CN = 74

Re_v = {[(200/74) – 2] * 21,603} / 12

Re_v = (0.703 * 21,603) / 12

Re_v = 15,180 / 12

Re_v = 1,265 cf

Total Volume mitigation = 6,779 cf

F. CAPACITY ANALYSIS

BARRY ISETT & ASSOCIATES, INC.
Consulting Engineers & Surveyors

85 S. Route 100 & Kressler Lane
P.O. Box 147
Trexlertown, PA 18087-0147

SUBAREAS COEFFICIENTS AND SURFACE FLOWS

PROJECT: **WGW Accessory Buildings**
LOCATION: Smithfield Township
COUNTY: MONROE

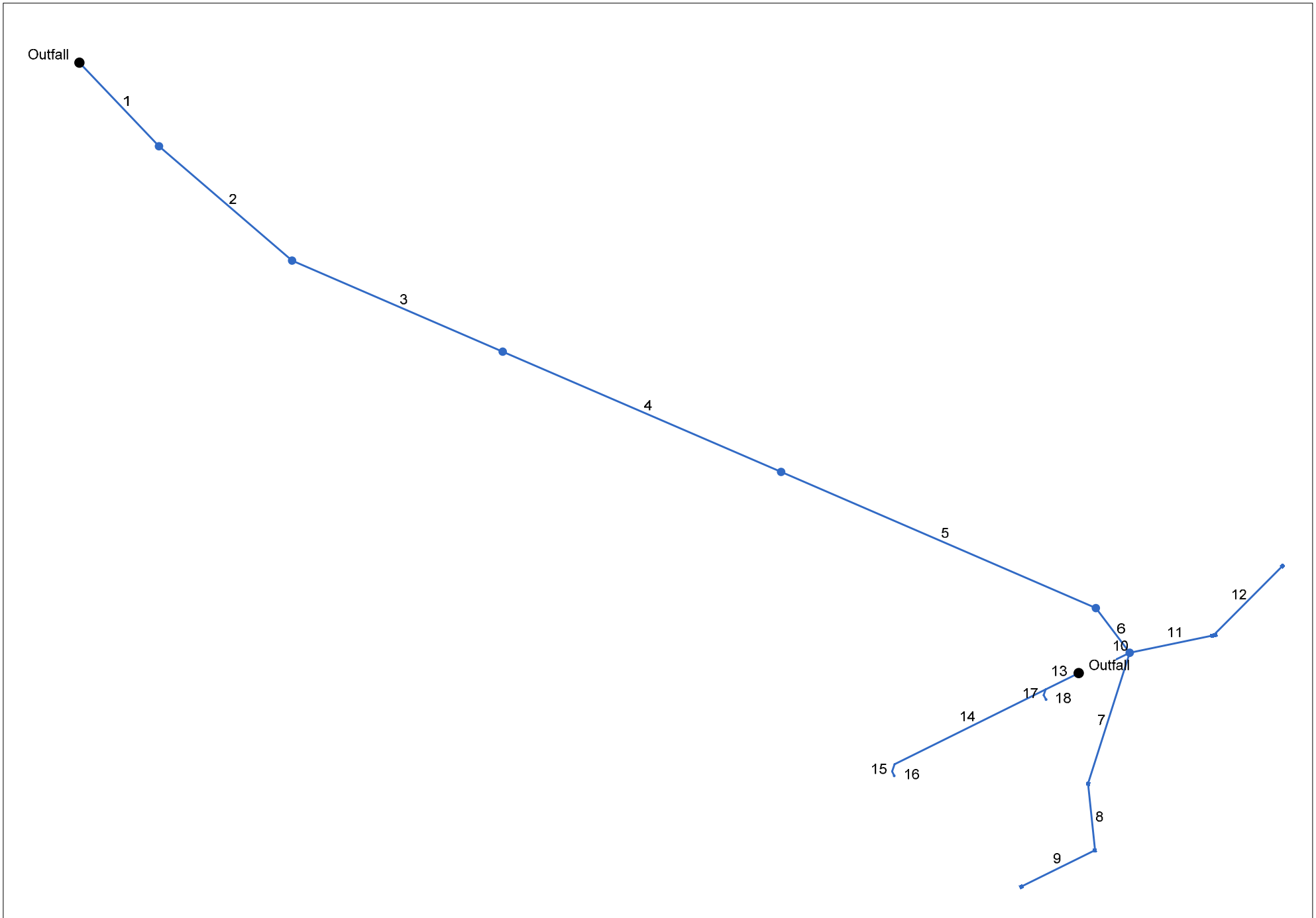
JOB #
DATE:
REVISED:

* RAINFALL REGION **IV**
DESIGN STORM **100** YR FREQUENCY

POST-DEVELOPMENT CONDITIONS

INLET #	TYPE						AREA	COMP.	C X A	Tc (Min.)	IND. Q		COMMENTS
COVER TYPE		IMP	Lawn C 6+	Woods C 6	Lawn D 6+		(Acres)	C	INC.	IND.	I (in./hr.)	Q (cfs)	
C COEFFICIENTS		0.96	0.44	0.2	0.5								
IN-21	M	0.035	1.888		0.761		2.684	0.46	1.245	5	7.32	9.11	
IN-20	M	0.116	4.514	10.58	0.760		15.974	0.29	4.594	5	7.32	33.63	
AD-12	M	0.102	0.088				0.190	0.72	0.137	5	7.32	1.00	
IN-11	M	0.173	0.155				0.328	0.71	0.234	5	7.32	1.71	
DEP-9	M	0.011	0.031				0.042	0.57	0.024	5	7.32	0.18	0.74 = Total
RD 8	M	0.027					0.027	0.96	0.026	5	7.32	0.19	
RD 7	M	0.053					0.053	0.96	0.051	5	7.32	0.37	
AD-6	M	0.046	0.100				0.146	0.60	0.088	5	7.32	0.64	
AD-4	M	0.042	0.031				0.073	0.74	0.054	5	7.32	0.40	
AD-2	M	0.054	0.045				0.099	0.73	0.072	5	7.32	0.53	

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



Project File: 20241111_Basin-Upslope-StormSewer_100-yr.stm	Number of lines: 18	Date: 11/20/2024

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-18	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
2	MH-17	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
3	MH-16	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
4	MH-15	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
5	MH-14	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
6	MH-10	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
7	AD-6	0.64*	0.00	0.64	0.00	Grate	0.0	0.00	0.24	0.12	2.00	Sag	2.00	0.050	0.020	0.000	0.30	11.81	0.30	11.81	0.0	Off
8	AD-4	0.40*	0.00	0.40	0.00	Grate	0.0	0.00	0.14	0.07	2.00	Sag	2.00	0.050	0.020	0.000	0.33	13.64	0.33	13.64	0.0	Off
9	AD-2	0.53*	0.00	0.53	0.00	Grate	0.0	0.00	0.20	0.10	2.00	Sag	2.00	0.050	0.020	0.000	0.29	11.66	0.29	11.66	0.0	Off
10		0.74*	0.00	0.00	0.74	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
11	IN-11	1.71*	0.00	1.71	0.00	Grate	0.0	0.00	1.12	0.56	2.00	Sag	2.00	0.050	0.020	0.000	0.30	11.99	0.30	11.99	0.0	Off
12	AD-12	1.00*	0.00	1.00	0.00	Grate	0.0	0.00	0.37	0.19	2.00	Sag	2.00	0.050	0.020	0.000	0.30	12.15	0.30	12.15	0.0	Off
13		0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
14		0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
15		0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
16	RD-7	0.37*	0.00	0.00	0.37	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
17		0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
18	RD-8	0.19*	0.00	0.00	0.19	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off

Project File: 20241111_Basin-Upslope-StormSewer_100-yr.stm | Number of lines: 18 | Run Date: 11/20/2024

NOTES: Inlet N-Values = 0.016; Known Qs only; * Indicates Known Q added. All curb inlets are throat.

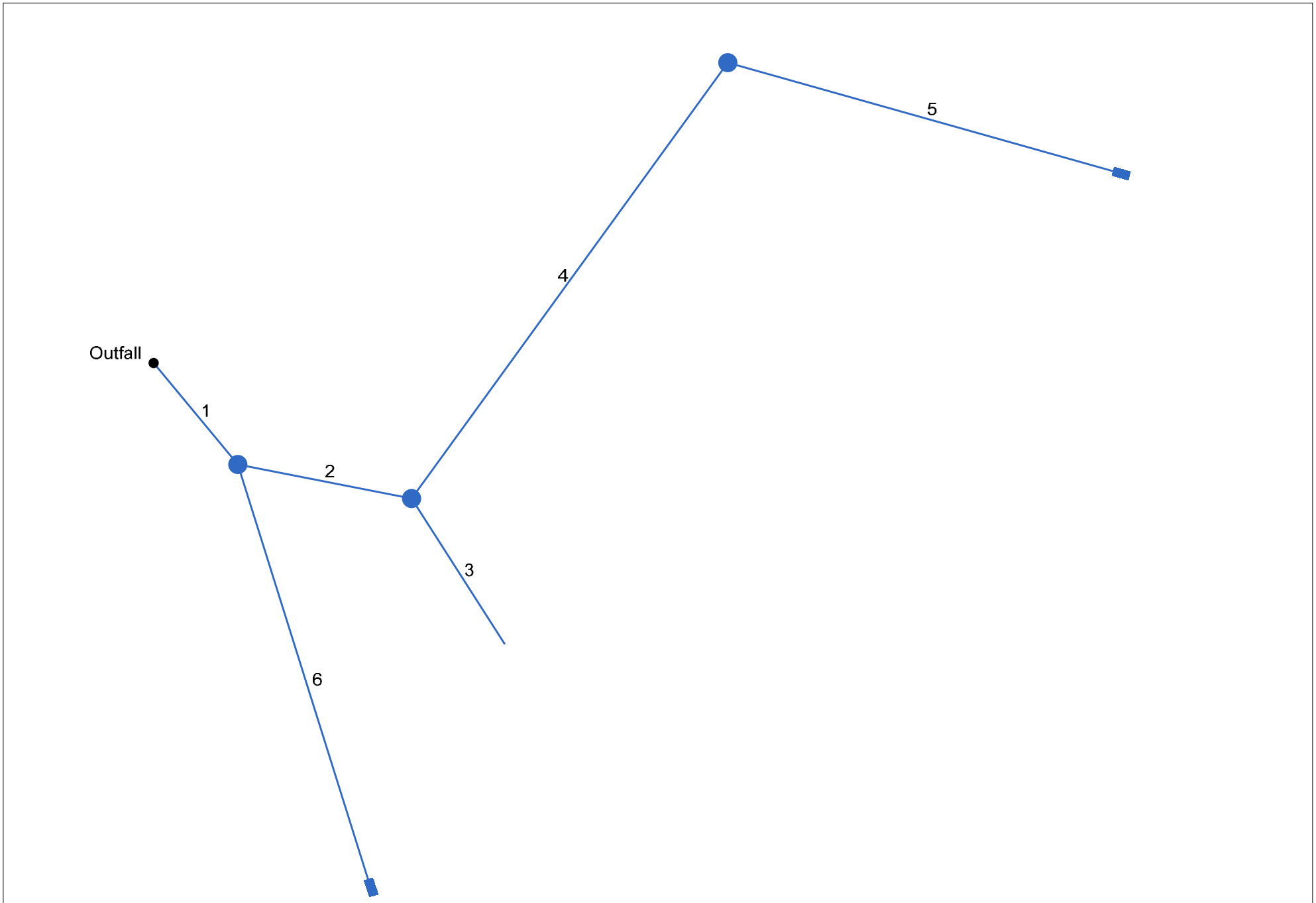
Pipes

Line No.	Inlet ID	DnStm Ln No	Known Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Line Length (ft)	Line Slope (%)	Line Size (in)	n-val Pipe	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	Cover Dn (ft)	Cover Up (ft)	HGL Dn (ft)	HGL Up (ft)	
1	MH-18	Outfall	0.00	5.02	5.25	4.09	70.934	0.56	15	0.012	450.00	450.40	451.44	454.82	0.19	3.17	451.63	452.00	
2	MH-17	1	0.00	5.02	18.86	4.67	107.647	7.26	15	0.012	450.57	458.39	454.82	462.72	3.00	3.08	452.03	459.30 j	
3	MH-16	2	0.00	5.02	27.09	5.96	140.723	15.00	15	0.012	458.56	479.67	462.72	488.50	2.91	7.58	459.30	480.58	
4	MH-15	3	0.00	5.02	25.81	10.77	185.715	13.61	15	0.012	483.37	508.65	488.50	512.50	3.88	2.60	483.74	509.56	
5	MH-14	4	0.00	5.02	25.08	10.60	210.272	12.85	15	0.012	509.35	536.38	512.50	541.49	1.90	3.86	509.73	537.29	
6	MH-10	5	0.00	5.02	9.84	5.96	34.369	1.98	15	0.012	536.55	537.23	541.49	544.91	3.69	6.43	537.29	538.14	
7	AD-6	6	0.64	1.57	8.17	3.12	84.392	4.48	12	0.012	537.40	541.18	544.91	546.08	6.51	3.90	538.14	541.71 j	
8	AD-4	7	0.40	0.93	8.16	3.38	41.174	4.47	12	0.012	541.35	543.19	546.08	546.78	3.73	2.59	541.71	543.59	
9	AD-2	8	0.53	0.53	0.61	3.43	50.344	0.99	6	0.012	543.69	544.19	546.78	546.62	2.59	1.93	544.05	544.56	
10		6	0.74	0.74	15.08	6.43	8.840	15.27	12	0.012	542.65	544.00	544.91	544.00	1.26	-1.00	542.80	544.36	
11	IN-11	6	1.71	2.71	3.87	4.96	52.550	1.01	12	0.012	540.20	540.73	544.91	544.01	3.71	2.28	540.82	541.44	
12	AD-12	11	1.00	1.00	3.86	2.77	59.896	1.00	12	0.012	540.90	541.50	544.01	543.75	2.11	1.25	541.44	541.92 j	
13		Outfall	0.00	0.56	0.61	3.49	22.553	1.02	6	0.012	544.00	544.23	544.00	546.90	-0.50	2.17	544.38	544.61	
14		13	0.00	0.37	0.61	2.61	103.333	1.00	6	0.012	544.23	545.26	546.90	546.90	2.17	1.14	544.61	545.57 j	
15		14	0.00	0.37	0.63	2.91	4.714	1.06	6	0.012	545.26	545.31	546.90	546.97	1.14	1.16	545.57	545.62	
16	RD-7	15	0.37	0.37	0.61	2.91	3.000	1.00	6	0.012	545.31	545.34	546.97	547.50	1.16	1.66	545.62	545.65	
17		13	0.00	0.19	0.63	1.75	3.771	1.06	6	0.012	544.23	544.27	546.90	546.93	2.17	2.16	544.61	544.49	
18	RD-8	17	0.19	0.19	0.61	2.31	3.000	1.00	6	0.012	544.27	544.30	546.93	546.99	2.16	2.19	544.49	544.52	

Project File: 20241111_Basin-Upslope-StormSewer_100-yr.stm | Number of lines: 18 | Date: 11/20/2024

NOTES: ** Critical depth

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



Project File: 20241031_Basin-Downslope-StormSewer_100-yr.stm	Number of lines: 6	Date: 10/31/2024

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-24	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
2	MH-23	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
3	BSN Outlet	4.20*	0.00	0.00	4.20	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
4	MH-22	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
5	IN-21	9.11*	0.00	9.11	0.00	Grate	0.0	0.00	40.59	20.29	2.00	Sag	2.00	0.050	0.020	0.000	0.30	11.99	0.30	11.99	0.0	Off
6	IN-20	33.63*	0.00	33.63	0.00	Grate	0.0	0.00	171.36	85.68	2.00	Sag	2.00	0.050	0.020	0.000	0.30	11.99	0.30	11.99	0.0	Off

Project File: 20241031_Basin-Downslope-StormSewer_100-yr.stm | Number of lines: 6 | Run Date: 10/31/2024

NOTES: Inlet N-Values = 0.016; Known Qs only; * Indicates Known Q added. All curb inlets are throat.

Pipes

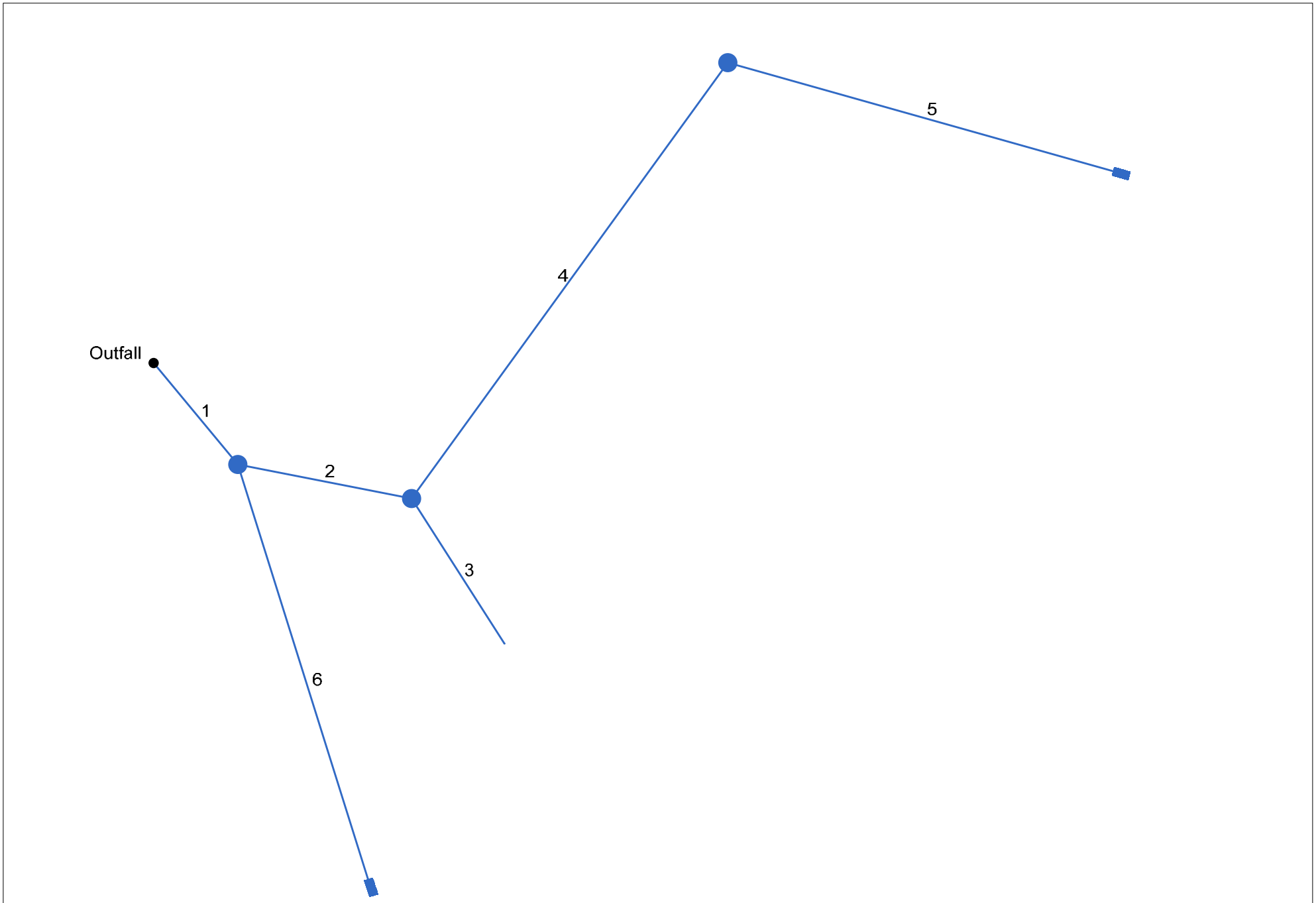
Line No.	Inlet ID	DnStm Ln No	Known Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Line Length (ft)	Line Slope (%)	Line Size (in)	n-val Pipe	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	Cover Dn (ft)	Cover Up (ft)	HGL Dn (ft)	HGL Up (ft)	
1	MH-24	Outfall	0.00	46.94	57.47	14.98	30.538	5.50	24	0.012	436.00	437.68	438.65	444.85	0.65	5.17	437.97	439.65	
2	MH-23	1	0.00	13.31	13.97	11.92	41.123	3.99	15	0.012	439.42	441.06	444.85	447.75	4.18	5.44	440.40	442.29	
3	BSN Outlet	2	4.20	4.20	14.94	11.07	40.000	15.00	12	0.012	444.75	450.75	447.75	452.18	2.00	0.43	445.11	451.61	
4	MH-22	2	0.00	9.11	9.89	7.95	125.000	2.00	15	0.012	441.23	443.73	447.75	447.00	5.27	2.02	442.29	444.89	
5	IN-21	4	9.11	9.11	9.90	8.21	94.803	2.00	15	0.012	443.90	445.80	447.00	449.75	1.85	2.70	444.89	446.96	
6	IN-20	1	33.63	33.63	54.78	14.60	103.031	5.00	24	0.012	439.22	444.37	444.85	449.90	3.63	3.53	440.35	446.28	

Project File: 20241031_Basin-Downslope-StormSewer_100-yr.stm | Number of lines: 6 | Date: 10/31/2024

NOTES: ** Critical depth

MAXIMUM BASIN STORM SEWER CAPACITY (INCLUDING SWALE CAPACITY)

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



Project File: 20241031_Basin-Downslope-StormSewer_Maximum.stm	Number of lines: 6	Date: 10/31/2024

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-24	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
2	MH-23	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
3	BSN Outlet	4.20*	0.00	0.00	4.20	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
4	MH-22	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
5	IN-21	9.11*	0.00	9.11	0.00	Grate	0.0	0.00	40.59	20.29	2.00	Sag	2.00	0.050	0.020	0.000	0.30	11.99	0.30	11.99	0.0	Off
6	IN-20	43.95*	0.00	43.95	0.00	Grate	0.0	0.00	226.40	113.20	2.00	Sag	2.00	0.050	0.020	0.000	0.30	11.99	0.30	11.99	0.0	Off

Project File: 20241031_Basin-Downslope-StormSewer_Maximum.stm | Number of lines: 6 | Run Date: 10/31/2024

NOTES: Inlet N-Values = 0.016; Known Qs only; * Indicates Known Q added. All curb inlets are throat.

Pipes

Line No.	Inlet ID	DnStm Ln No	Known Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Line Length (ft)	Line Slope (%)	Line Size (in)	n-val Pipe	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	Cover Dn (ft)	Cover Up (ft)	HGL Dn (ft)	HGL Up (ft)	
1	MH-24	Outfall	0.00	57.26	57.47	18.26	30.538	5.50	24	0.012	436.00	437.68	438.65	444.85	0.65	5.17	437.97	439.67	
2	MH-23	1	0.00	13.31	13.97	11.92	41.123	3.99	15	0.012	439.42	441.06	444.85	447.75	4.18	5.44	440.40	442.29	
3	BSN Outlet	2	4.20	4.20	14.94	11.07	40.000	15.00	12	0.012	444.75	450.75	447.75	452.18	2.00	0.43	445.11	451.61	
4	MH-22	2	0.00	9.11	9.89	7.95	125.000	2.00	15	0.012	441.23	443.73	447.75	447.00	5.27	2.02	442.29	444.89	
5	IN-21	4	9.11	9.11	9.90	8.21	94.803	2.00	15	0.012	443.90	445.80	447.00	449.75	1.85	2.70	444.89	446.96	
6	IN-20	1	43.95	43.95	54.78	16.71	103.031	5.00	24	0.012	439.22	444.37	444.85	449.90	3.63	3.53	440.58	446.34	

Project File: 20241031_Basin-Downslope-StormSewer_Maximum.stm | Number of lines: 6 | Date: 10/31/2024

NOTES: ** Critical depth

SWALE CAPACITY ANALYSIS

PAGE

STANDARD WORK SHEET # 11
CHANNEL DESIGN DATA

PROJECT: Water Gap Wellness Accessory Buildings
LOCATION: Smithfield Township
COUNTY: MONROE
CHECKED BY:

JOB #
DATE:
REVISED:

CHANNEL OR CHANNEL SECTION		Ch 1	Ch 1	Ch 2	Ch 2	
TEMPORARY OR PERMANENT?	(T OR P)	T	P	T	P	
DESIGN STORM	(2, 5 OR 10YR)	N/A	N/A	N/A	N/A	
ACRES	(AC)	0.06	0.06	0.05	0.05	
MULTIPLIER	(1.6, 2.25 OR 2.75)[1]	1.60	2.75	1.60	2.75	
Qr (REQUIRED CAPACITY)	(CFS)	0.10	0.17	0.08	0.14	
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	0.1	0.2	0.1	0.1	
PROTECTIVE LINING[2]		NAG S-75	Grass	NAG S-75	Grass	
n (MANNING'S COEFFICIENT)[2]		0.038	0.074	0.037	0.067	
Va (ALLOWABLE VELOCITY)	(FPS)	N/A	5	N/A	5	
V (CALCULATED AT FLOW DEPTH d)	(FPS)	1.23	0.98	1.48	1.15	
ta (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	1.60	N/A	1.60	N/A	
td (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.17	0.32	0.24	0.40	
CHANNEL BOTTOM WIDTH	(FT)	1.0	1.0	1.0	1.0	
CHANNEL SIDE SLOPES	(H:V)	3:1	3:1	3:1	3:1	
D (TOTAL DEPTH)	(FT)	1.00	1.00	1.00	1.00	
CHANNEL TOP WIDTH @ D	(FT)	7.0	7.0	7.0	7.0	
d (CALCULATED FLOW DEPTH)	(FT)	0.06	0.13	0.05	0.09	
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	1.4	1.8	1.3	1.5	
BOTTOM WIDTH : DEPTH RATIO	(12:1 MAX)	16.7	7.7	20.0	11.1	
d_{50} STONE SIZE (IN)	(IN)	N/A	N/A	N/A	N/A	
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	0.07	0.18	0.06	0.11	
R (HYDRAULIC RADIUS)		0.05	0.10	0.04	0.07	
S (BED SLOPE)[3]	(FT/FT)	0.052	0.052	0.088	0.088	
Sc (CRITICAL SLOPE)	(FT/FT)	0.057	0.176	0.057	0.159	
.7Sc	(FT/FT)	0.040	0.123	0.040	0.112	
1.3Sc	(FT/FT)	0.075	0.229	0.074	0.207	
STABLE FLOW ?(Y/N)	(Y/N)	N	Y	Y	Y	
FREEBOARD BASED ON UNSTABLE FLOW FT	(FT)	0.01	N/A	N/A	N/A	
FREEBOARD BASED ON STABLE FLOW FT	(FT)	N/A	0.03	0.01	0.02	
MINIMUM REQUIRED FREEBOARD FT***	(FT)	0.50	0.50	0.50	0.50	
FREEBOARD PROVIDED	(FT)	0.94	0.87	0.95	0.91	
DESIGN METHOD FOR PROTECTIVE LINING **** PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S	V	S	V	

1 Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.

2 Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.

3 Slopes may not be averaged.

4 Minimum Freeboard is 0.5 ft. or 1/4 Total Channel Depth, whichever is greater.

5 Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is recommended for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

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CHANNEL ANALYSIS

> > > Channel 1

Name	Channel 1
Discharge	0.1
Channel Slope	0.052
Channel Bottom Width	1
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	None
Vegetation Density	None
Soil Type	None

S75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S75 Unvegetated	Straight	0.1 cfs	1.3 ft/s	0.06 ft	0.038	1.6 lbs/ft2	0.21 lbs/ft2	7.63	STABLE	D
Underlying Substrate	Straight	0.1 cfs	1.3 ft/s	0.06 ft	0.038	0.37 lbs/ft2	0.18 lbs/ft2	2.09	STABLE	D

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CHANNEL ANALYSIS

> > > Channel 1 Veg

Name	Channel 1 Veg
Discharge	0.17
Channel Slope	0.052
Channel Bottom Width	1
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	Sod Former
Vegetation Density	Excellent > 95%
Soil Type	Silt Loam (SM)

Unreinforced Vegetation

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	0.17 cfs	0.97 ft/s	0.13 ft	0.074	4 lbs/ft2	0.41 lbs/ft2	9.69	STABLE	--
Underlying Substrate	Straight	0.17 cfs	0.97 ft/s	0.13 ft	0.074	4 lbs/ft2	0.32 lbs/ft2	12.65	STABLE	--

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CHANNEL ANALYSIS

> > > Channel 2

Name	Channel 2
Discharge	0.08
Channel Slope	0.088
Channel Bottom Width	1
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	None
Vegetation Density	None
Soil Type	None

S75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S75 Unvegetated	Straight	0.08 cfs	1.44 ft/s	0.05 ft	0.037	1.6 lbs/ft2	0.26 lbs/ft2	6.25	STABLE	D
Underlying Substrate	Straight	0.08 cfs	1.44 ft/s	0.05 ft	0.037	0.37 lbs/ft2	0.23 lbs/ft2	1.65	STABLE	D

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CHANNEL ANALYSIS

> > > Channel 2 Veg

Name	Channel 2 Veg
Discharge	0.14
Channel Slope	0.088
Channel Bottom Width	1
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	Sod Former
Vegetation Density	Excellent > 95%
Soil Type	Silt Loam (SM)

Unreinforced Vegetation

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	0.14 cfs	1.17 ft/s	0.09 ft	0.067	4 lbs/ft2	0.51 lbs/ft2	7.82	STABLE	--
Underlying Substrate	Straight	0.14 cfs	1.17 ft/s	0.09 ft	0.067	4 lbs/ft2	0.41 lbs/ft2	9.72	STABLE	--

PAGE

STANDARD WORK SHEET # 11
CHANNEL DESIGN DATA

PROJECT: Water Gap Wellness Accessory Buildings
LOCATION: Smithfield Township
COUNTY: MONROE
CHECKED BY:

JOB #
DATE:
REVISED:

CHANNEL OR CHANNEL SECTION		Ch 3	Ch 3	Ch 4	Ch 4	
TEMPORARY OR PERMANENT?	(T OR P)	T	P	T	P	
DESIGN STORM	(2, 5 OR 10YR)	N/A	N/A	N/A	N/A	
ACRES	(AC)	15.98	15.98	2.69	2.69	
MULTIPLIER	(1.6, 2.25 OR 2.75)[1]	1.60	2.75	1.60	2.75	
Qr (REQUIRED CAPACITY)	(CFS)	25.57	43.95	4.30	7.40	
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	25.7	43.0	4.3	7.4	
PROTECTIVE LINING[2]		NAG S-75	Grass	NAG S-75	Grass	
n (MANNING'S COEFFICIENT)[2]		0.032	0.051	0.036	0.065	
Va (ALLOWABLE VELOCITY)	(FPS)	N/A	5	N/A	5	
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.11	3.33	2.26	1.71	
ta (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	1.60	N/A	1.60	N/A	
td (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.58	0.86	0.28	0.45	
CHANNEL BOTTOM WIDTH	(FT)	3.0	3.0	3.0	3.0	
CHANNEL SIDE SLOPES	(H:V)	4:1	4:1	4:1	4:1	
D (TOTAL DEPTH)	(FT)	2.00	2.00	1.25	1.25	
CHANNEL TOP WIDTH @ D	(FT)	19.0	19.0	13.0	13.0	
d (CALCULATED FLOW DEPTH)	(FT)	0.93	1.46	0.41	0.73	
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	10.4	14.7	6.3	8.8	
BOTTOM WIDTH : DEPTH RATIO	(12:1 MAX)	3.2	2.1	7.3	4.1	
d_{50} STONE SIZE (IN)	(IN)	N/A	N/A	N/A	N/A	
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	6.25	12.91	1.90	4.32	
R (HYDRAULIC RADIUS)		0.59	0.86	0.30	0.48	
S (BED SLOPE)[3]	(FT/FT)	0.016	0.016	0.015	0.015	
Sc (CRITICAL SLOPE)	(FT/FT)	0.018	0.041	0.029	0.080	
.7Sc	(FT/FT)	0.013	0.029	0.020	0.056	
1.3Sc	(FT/FT)	0.024	0.053	0.037	0.104	
STABLE FLOW ?(Y/N)	(Y/N)	N	Y	Y	Y	
FREEBOARD BASED ON UNSTABLE FLOW FT	(FT)	0.29	N/A	N/A	N/A	
FREEBOARD BASED ON STABLE FLOW FT	(FT)	N/A	0.37	0.10	0.18	
MINIMUM REQUIRED FREEBOARD FT***	(FT)	0.50	0.50	0.50	0.50	
FREEBOARD PROVIDED	(FT)	1.07	0.54	0.84	0.52	
DESIGN METHOD FOR PROTECTIVE LINING **** PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S	V	S	V	

1 Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.

2 Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.

3 Slopes may not be averaged.

4 Minimum Freeboard is 0.5 ft. or 1/4 Total Channel Depth, whichever is greater.

5 Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is recommended for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

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CHANNEL ANALYSIS

> > > Channel 3

Name	Channel 3
Discharge	25.7
Channel Slope	0.016
Channel Bottom Width	3
Left Side Slope	4
Right Side Slope	4
Existing Bend Radius	54
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	Mix (Sod and Bunch)
Vegetation Density	Very Good 80-95%
Soil Type	Silt Loam (SM)

S75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S75 Unvegetated	Straight	25.7 cfs	4.09 ft/s	0.93 ft	0.032	1.6 lbs/ft2	0.93 lbs/ft2	1.72	STABLE	D
Underlying Substrate	Straight	25.7 cfs	4.09 ft/s	0.93 ft	0.032	1.17 lbs/ft2	0.59 lbs/ft2	2	STABLE	D
S75 Unvegetated	Bend	25.7 cfs	4.09 ft/s	0.93 ft	0.032	1.6 lbs/ft2	1.41 lbs/ft2	1.14	STABLE	D
Underlying Substrate	Bend	25.7 cfs	4.09 ft/s	0.93 ft	0.032	1.17 lbs/ft2	0.89 lbs/ft2	1.32	STABLE	D

Unreinforced Vegetation

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	25.7 cfs	2.81 ft/s	1.18 ft	0.054	4 lbs/ft2	1.18 lbs/ft2	3.39	STABLE	--
Underlying Substrate	Straight	25.7 cfs	2.81 ft/s	1.18 ft	0.054	3.74 lbs/ft2	0.72 lbs/ft2	5.22	STABLE	--
Unreinforced Vegetation	Bend	25.7 cfs	2.81 ft/s	1.18 ft	0.054	4 lbs/ft2	1.92 lbs/ft2	2.08	STABLE	--
Underlying Substrate	Bend	25.7 cfs	2.81 ft/s	1.18 ft	0.054	3.74 lbs/ft2	1.16 lbs/ft2	3.21	STABLE	--

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CHANNEL ANALYSIS

> > > Channel 3 Veg

Name	Channel 3 Veg
Discharge	43.95
Channel Slope	0.016
Channel Bottom Width	3
Left Side Slope	4
Right Side Slope	4
Existing Bend Radius	54
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	Mix (Sod and Bunch)
Vegetation Density	Very Good 80-95%
Soil Type	Silt Loam (SM)

Unreinforced Vegetation

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	43.95 cfs	3.41 ft/s	1.46 ft	0.05	4 lbs/ft2	1.46 lbs/ft2	2.74	STABLE	--
Underlying Substrate	Straight	43.95 cfs	3.41 ft/s	1.46 ft	0.05	3.23 lbs/ft2	0.86 lbs/ft2	3.77	STABLE	--
Unreinforced Vegetation	Bend	43.95 cfs	3.41 ft/s	1.46 ft	0.05	4 lbs/ft2	2.51 lbs/ft2	1.59	STABLE	--
Underlying Substrate	Bend	43.95 cfs	3.41 ft/s	1.46 ft	0.05	3.23 lbs/ft2	1.48 lbs/ft2	2.19	STABLE	--

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CHANNEL ANALYSIS

> > > Channel 4

Name	Channel 4
Discharge	4.3
Channel Slope	0.015
Channel Bottom Width	3
Left Side Slope	4
Right Side Slope	4
Existing Bend Radius	47.63
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	Mix (Sod and Bunch)
Vegetation Density	Very Good 80-95%
Soil Type	Silt Loam (SM)

S75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S75 Unvegetated	Straight	4.3 cfs	2.28 ft/s	0.41 ft	0.036	1.6 lbs/ft2	0.38 lbs/ft2	4.19	STABLE	D
Underlying Substrate	Straight	4.3 cfs	2.28 ft/s	0.41 ft	0.036	1.17 lbs/ft2	0.28 lbs/ft2	4.22	STABLE	D
S75 Unvegetated	Bend	4.3 cfs	2.28 ft/s	0.41 ft	0.036	1.6 lbs/ft2	0.47 lbs/ft2	3.39	STABLE	D
Underlying Substrate	Bend	4.3 cfs	2.28 ft/s	0.41 ft	0.036	1.17 lbs/ft2	0.34 lbs/ft2	3.42	STABLE	D

Unreinforced Vegetation

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	4.3 cfs	1.4 ft/s	0.58 ft	0.07	4 lbs/ft2	0.54 lbs/ft2	7.41	STABLE	--
Underlying Substrate	Straight	4.3 cfs	1.4 ft/s	0.58 ft	0.07	4 lbs/ft2	0.37 lbs/ft2	10.82	STABLE	--
Unreinforced Vegetation	Bend	4.3 cfs	1.4 ft/s	0.58 ft	0.07	4 lbs/ft2	0.74 lbs/ft2	5.38	STABLE	--
Underlying Substrate	Bend	4.3 cfs	1.4 ft/s	0.58 ft	0.07	4 lbs/ft2	0.51 lbs/ft2	7.86	STABLE	--

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CHANNEL ANALYSIS

> > > Channel 4 Veg

Name	Channel 4 Veg
Discharge	7.4
Channel Slope	0.015
Channel Bottom Width	3
Left Side Slope	4
Right Side Slope	4
Existing Bend Radius	47.63
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	Mix (Sod and Bunch)
Vegetation Density	Very Good 80-95%
Soil Type	Silt Loam (SM)

Unreinforced Vegetation

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	7.4 cfs	1.72 ft/s	0.73 ft	0.065	4 lbs/ft2	0.68 lbs/ft2	5.88	STABLE	--
Underlying Substrate	Straight	7.4 cfs	1.72 ft/s	0.73 ft	0.065	4 lbs/ft2	0.45 lbs/ft2	8.96	STABLE	--
Unreinforced Vegetation	Bend	7.4 cfs	1.72 ft/s	0.73 ft	0.065	4 lbs/ft2	1.01 lbs/ft2	3.98	STABLE	--
Underlying Substrate	Bend	7.4 cfs	1.72 ft/s	0.73 ft	0.065	4 lbs/ft2	0.66 lbs/ft2	6.05	STABLE	--

G. OUTLET PROTECTION CALCULATIONS

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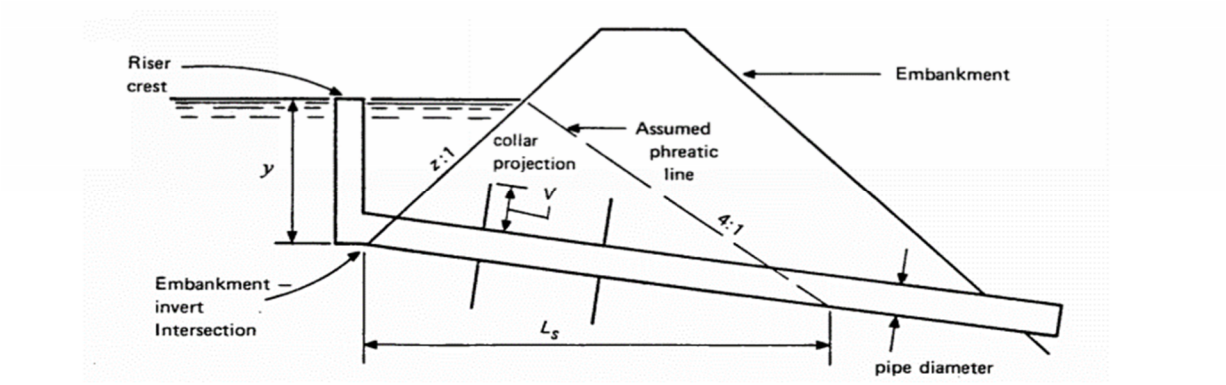
Job	WATER GAP WELLNESS ACCESSORY BUILDINGS		
Sheet No	1	**Of**	2
Calculated By	CRS	**Date**	10/22/2024
Checked By		**Date**	
Scale		N/A	

Anti-Seep Collar Design

Design of Anti-Seep Collars is in accordance with the procedures outlined in the Pennsylvania Department of Enivronmental Protection (DEP) Erosion and Sediment Pollution Control Program (E&S) Manual, dated March 2012. Refer to the E&S Manual for additional information.

Pond / Basin:	Infiltration Basin
Temporary / Permanent:	Permanent

Figure 7.6 from the E&S Manual



Step 1 - Determine the length of the pipe in the saturated zone (Ls).

$$Ls = y\,(z + 4)\,(1 + (S / 0.25\text{-}S))$$

Where:

S	=	Pipe Slope	=	0.1500	ft/ft
z	=	Basin Side Slope	=	4	: 1
y	=	Height	=	0.87	ft

Ls = 18 ft

Step 2 - Determine the required increase in flow path (Lf) (10% for temporary, 15% for permanent)

Lf = 1.15 x Ls
Lf = 1.15 x 18
Lf = 21 ft

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Job	WATER GAP WELLNESS ACCESSORY BUILDINGS		
Sheet No	2	**Of**	2
Calculated By	CRS	**Date**	10/22/2024
Checked By		**Date**	
Scale		N/A	

Anti-Seep Collar Design Cont.

Step 3 - Determine the number of collars (N) and projection (V)

$$N = (Lf - Ls) / 2V$$

Where:

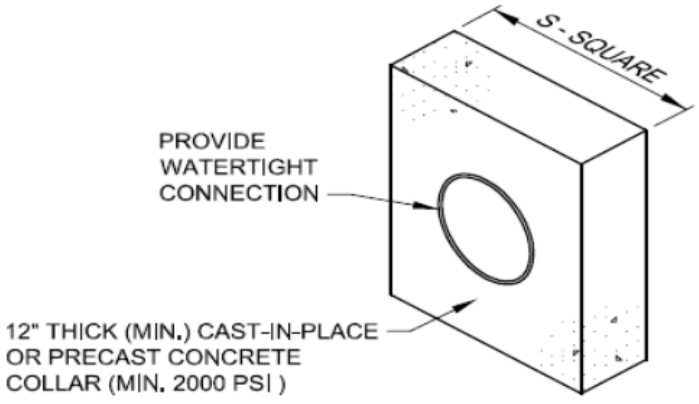
V	=	Collar Projection	=	2	ft
N	=	Number of Collars	=	2	
V min	=	0.5 (Lf - Ls) for N=1	=	2	ft
or	=	(Lf - Ls) / 2N for N≥2	=	1	ft

Step 4 - Determine the collar spacing

Maximum Spacing	=	14 V	=	28	ft
or	=	Ls / (N-1)	=	18	ft
Minimum Spacing	=	5 V	=	10	ft
Recommended Spacing	=	18	ft		

Step 4 - Determine the collar size

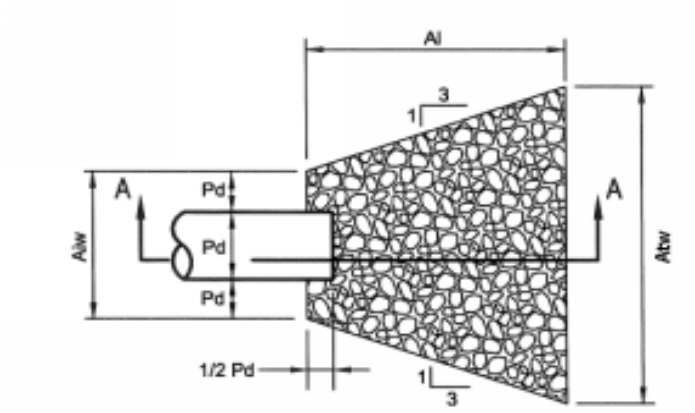
Standard Construction Detail #7-16 from the E&S Manual



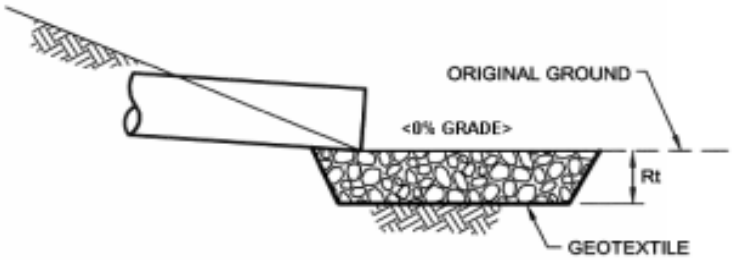
D	=	Pipe Barrel Diameter	=	15	inches
S	=	2 V + D	=	63	inches

STANDARD E&S WORKSHEET #20
Riprap Apron Outlet Protection

PROJECT: Water Gap Wellness Accessory Buildings — JOB #
LOCATION: Smithfield Township — DATE:
COUNTY: MONROE — REVISED:
CHECKED BY:



PLAN VIEW



SECTION A - A

NO.	PIPE DIA. Do (in.)	TAIL WATER COND. (Max or Min.)	MAN. "n" FOR PIPE	PIPE SLOPE (FT/FT)	Q (CFS)	V* (FPS)	RIPRAP SIZE	Rt (in)	Al (ft)	Aiw (ft)	Atw (ft)
OP-1	15	Max	0.012	0.006	5.0	4.88	R-3	9.0	6	3.8	6.15
OP-2	24	Min	0.012	0.055	57.3	20.90	R-7	45.0	28	6.0	34
										0.0	0
										0.0	0
										0.0	0
										0.0	0
										0.0	0
										0.0	0

*The anticipated velocity (V) should not exceed the maximum permissible shown in Table 6.6 for the proposed riprap protection. Adjust for less than full pipe flow. Use Manning's equation to calculate velocity for pipe slopes ≥ 0.05 ft/ft.

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Consulting Engineers & Surveyors

85 S. Route 100
Allentown, PA 18106

PROJECT:
LOCATION:
COUNTY:

OUTLET VELOCITY CALCULATION

OP-1

Pipe Slope (ft/ft)	0.0056	ft/ft	
Mannings n	0.012		
Pipe Diameter (ft)	1.25	ft	
Design Discharge Q (cfs)	5.02	cfs	(100-Year Storm)

Full-Flow Discharge

$Q_f = (0.464/n)*D^{8/3}*S^{1/2}$ $Q_f =$ 5.2 cfs

Full-Flow Velocity

$V_f = Q_f/A$ $V_f =$ 4.3 fps

Flow Ratio

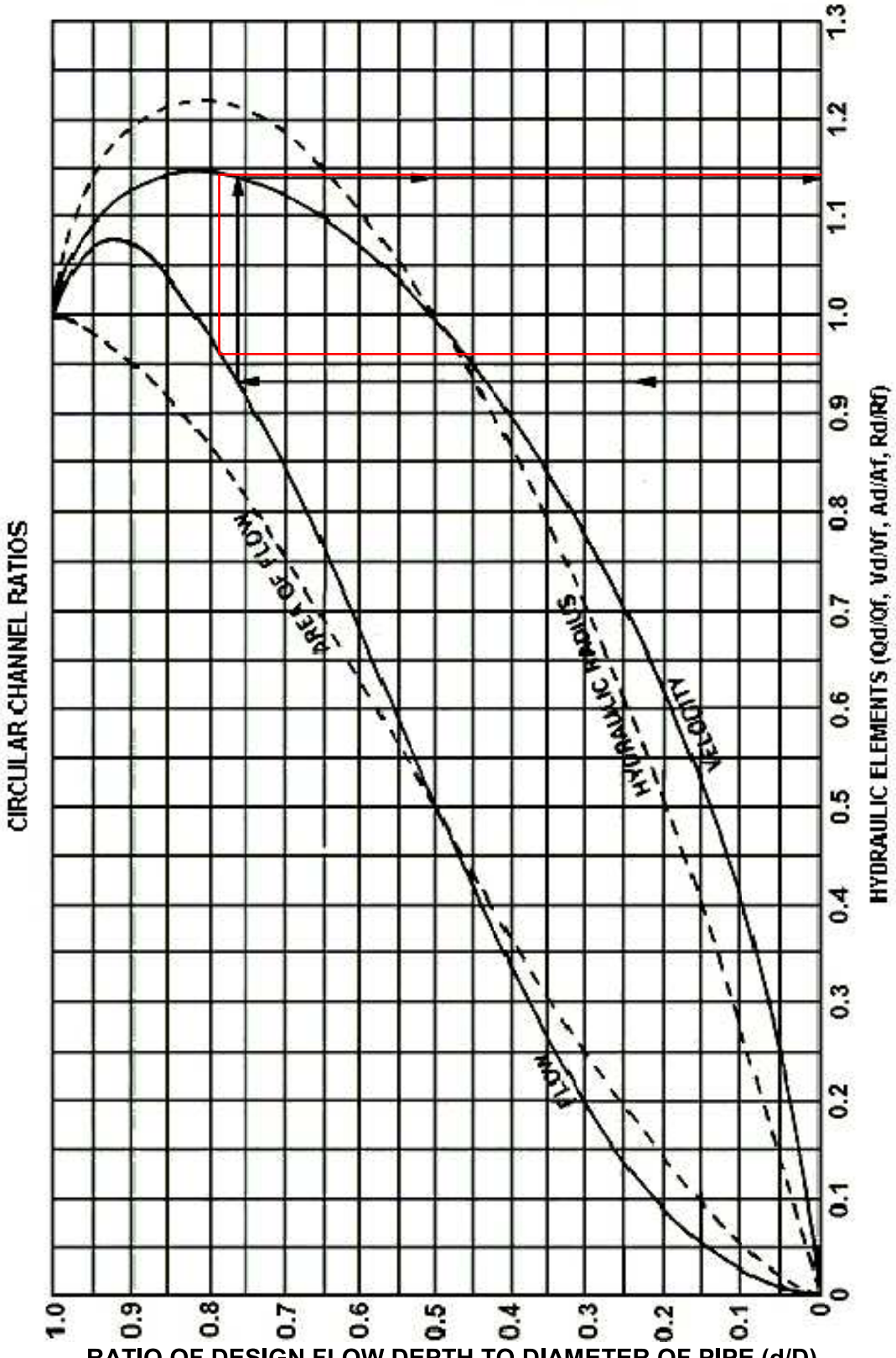
Ratio of Part-Full to Full-Flow Discharge: 0.96

Velocity Ratio (From Figure 9.1): 1.14

Design Velocity

$V = V_f$ * (Velocity Ratio) **V = 4.88 fps**

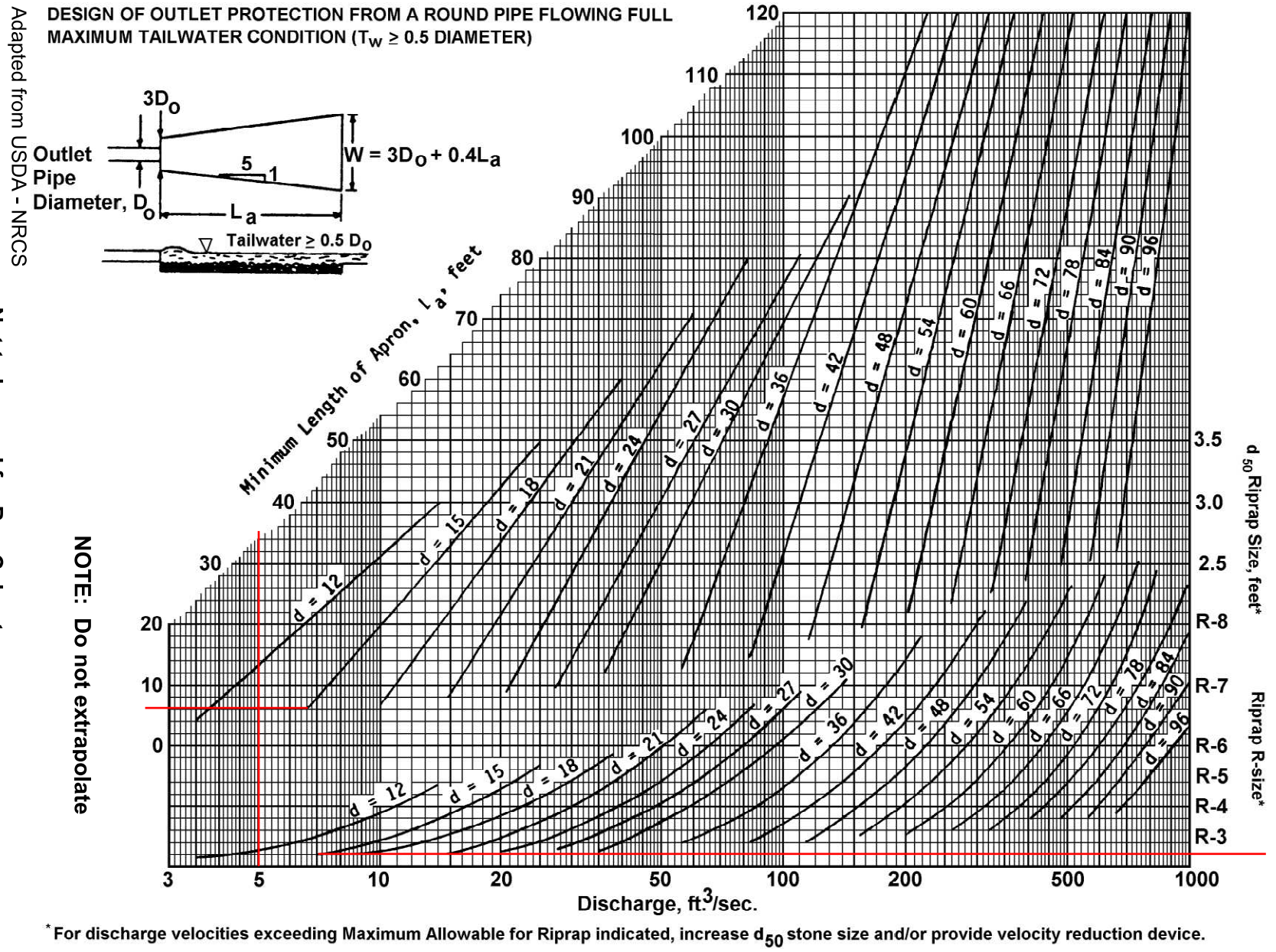
FIGURE 9.1
Velocity Adjustment Nomograph for Less Than Full Pipe Flow



Adapted from *Design and Construction of Sanitary and Storm Sewers,* p. 87, ASCE, 1969

Do not use this nomograph to determine "equivalent pipe sizes" for discharges (Q_d) that do not intersect curves corresponding to proposed pipe sizes on Figures 9.3 and 9.4.

OP-1



*For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

FIGURE 9.4
Riprap Apron Design, Maximum Tailwater Condition

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85 S. Route 100
Allentown, PA 18106

PROJECT: **0**
LOCATION: **0**
COUNTY: **0**

OUTLET VELOCITY CALCULATION

OP-2

Pipe Slope (ft/ft)	0.055	ft/ft	
Mannings n	0.012		
Pipe Diameter (ft)	2	ft	
Design Discharge Q (cfs)	57.26	cfs	(100-Year Storm)

Full-Flow Discharge

$Q_f = (0.464/n)*D^{8/3}*S^{1/2}$ $Q_f =$ 57.6 cfs

Full-Flow Velocity

$V_f = Q_f/A$ $V_f =$ 18.3 fps

Flow Ratio

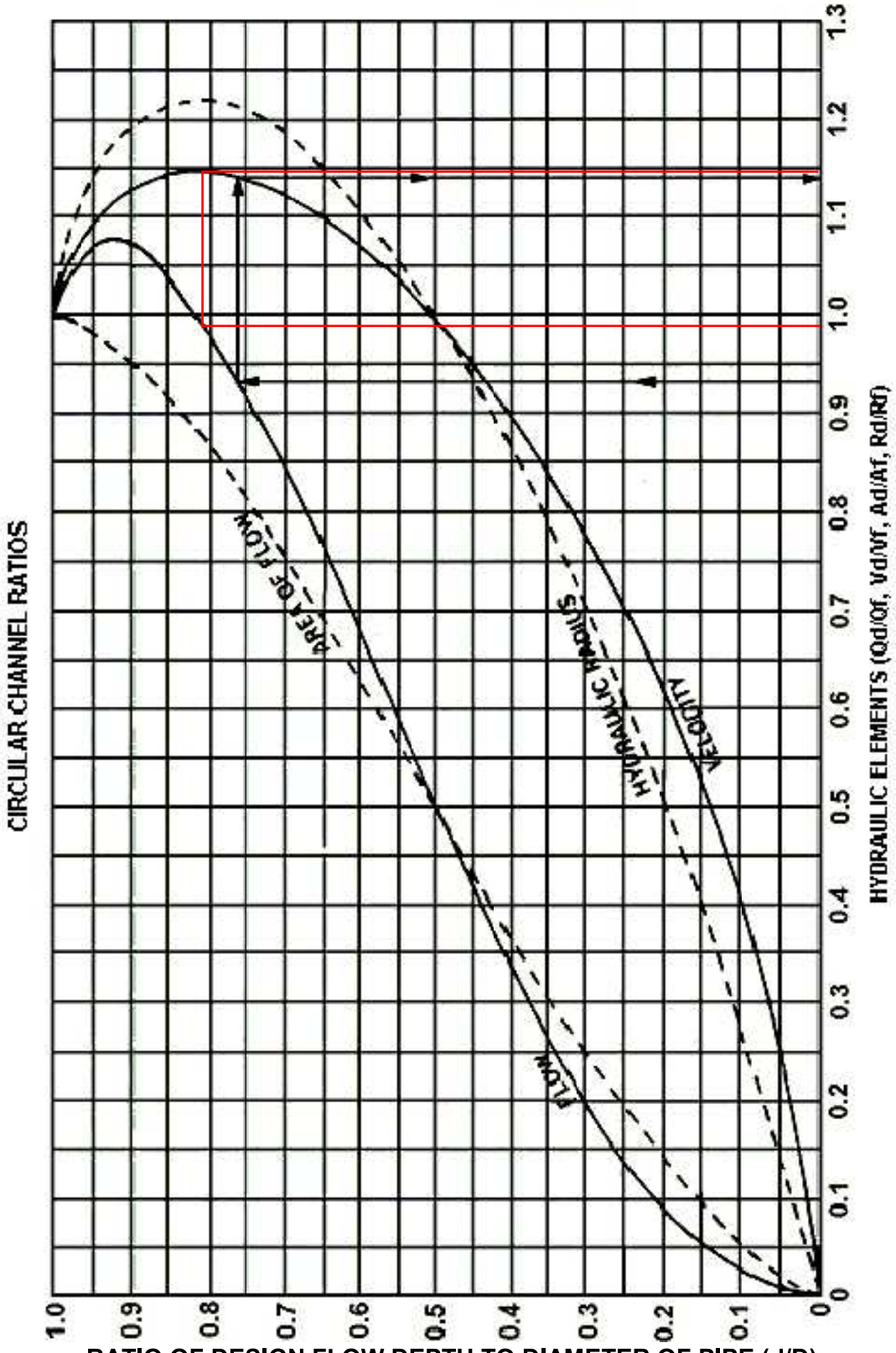
Ratio of Part-Full to Full-Flow Discharge: 0.99

Velocity Ratio (From Figure 9.1): 1.14

Design Velocity

$V = V_f$ * (Velocity Ratio) **V = 20.90 fps**

FIGURE 9.1
Velocity Adjustment Nomograph for Less Than Full Pipe Flow



Adapted from *Design and Construction of Sanitary and Storm Sewers,* p. 87, ASCE, 1969

Do not use this nomograph to determine "equivalent pipe sizes" for discharges (Q_d) that do not intersect curves corresponding to proposed pipe sizes on Figures 9.3 and 9.4.

OP-2

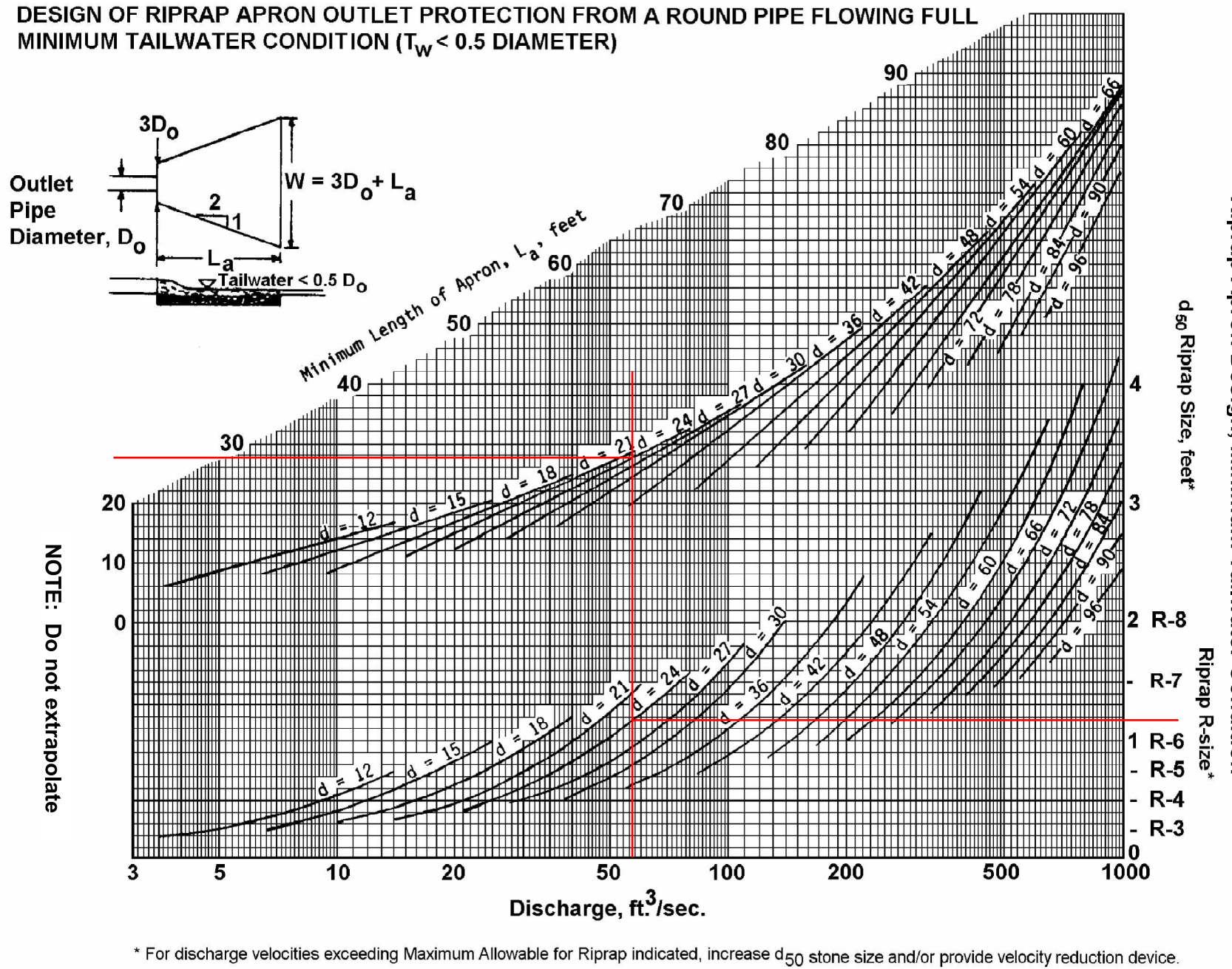


FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition

* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

SLOPE STABILITY ANALYSIS

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SLOPE ANALYSIS

> > > Rec. Building

Country	United States
State/Region	Pennsylvania
City	Scranton
Annual R Factor	100.00
Adjusted R Factor	15.00
Total Slope Length	24
Protection Type	Permanent
Protection Period	3
Beginning Month	March
Slope Gradient (H:1)	2
Soil Type	Silt Loam
K Factor	0.33

Reach 1

Start: 0ft End: 24 ft
Vegetation Type: 80-95%

Material	ASL bare	ASL mat	MSL bare	MSL mat	Soil Loss Tolerance	SF	Remarks	Staple / App Rate
S75	0.1 in	0.0 in	0.1 in	0.0 in	0.25 in	>10	STABLE	C
Estb. Veg.	0.7 in	0.0 in	N/A in	N/A in	0.03 in	3.23	STABLE	--

H. INFILTRATION TESTING RESULTS

Supplemental
Stormwater Infiltration Report

for the

Proposed Accessory Buildings Land Development
Water Gap Wellness
Stroudsburg, Monroe County, Pennsylvania

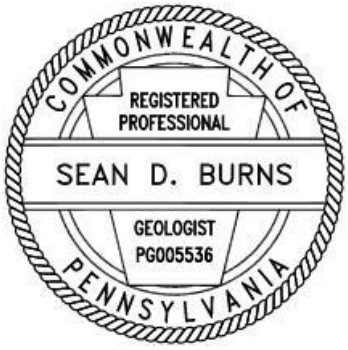
Prepared for:

Water Gap Wellness
296 Mountain Road
Stroudsburg, Pennsylvania 18360

Prepared by:

Barry Isett and Associates, Inc.
525 Main St.
Stroudsburg, Pennsylvania, 18360

Sean D. Burns, P.G.
PA Registration: PG005536
Project Geologist



Date: May 02, 2024
Project No.: 1022419.004

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

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List of Appendices

SUPPLEMENTAL

STORMWATER INFILTRATION REPORT

Proposed Accessory Buildings Land Development

Water Gap Wellness

296 Mountain Road

Stroudsburg, Monroe County, Pennsylvania

1.0 INTRODUCTION

Barry Isett & Associates, Inc. (Isett), has evaluated the feasibility for infiltration of stormwater at the Water Gap Wellness center in Smithfield Township, Monroe County, Pennsylvania. The purpose of this evaluation was to assess the feasibility of an alternate surface stormwater management system to support the proposed site development. This study included a review of applicable site information from published sources; a review of previous subsurface information obtained at the site by Isett; a field investigation consisting of test pits and infiltration testing; an analysis of data; and presentation of geotechnical recommendations for stormwater management design.

This report satisfies the deliverable requirements outlined in Isett's *Proposal for Environmental Services* dated April 5, 2024.

2.0 BACKGROUND

Isett previously performed a stormwater infiltration evaluation for a proposed subsurface infiltration system to support recent and proposed site development. The infiltration evaluation consisted of three (3) test pits and infiltration tests within the footprint of the proposed infiltration system located west of the existing maintenance building. Due to the occurrence of a shallow bedrock limiting horizon within the proposed infiltration system footprint, the design team and owner considered it prudent to evaluate an alternate stormwater infiltration location on the site before proceeding with modifications to the original stormwater management system design.

The prior *Stormwater Infiltration Evaluation* prepared by Isett for the previously proposed stormwater management system is included as *Appendix A* for reference.

3.0 SITE DESCRIPTION

The roughly 74-acre site consists of the Water Gap Wellness mental health and recovery center, golf course, wooded area, wetland, and access roads. The site is bordered as follows:

- North: residential development, wooded area, and maintained lawns
- East and south: wooded area and a topographic ridge
- West: wooded area and residential development

Topographic relief at the site is high, with grade sloping from approximately El. 635 feet in the south to approximately El. 355 feet in the north. The specific study area for this evaluation was limited to the footprint of the proposed alternative stormwater management system. The study area is located near the western site

border, within the golf course and along the tree line. Existing grades within the study area range from approximately El. 453 feet in the east to approximately El. 443 feet in the west. *Figure 1* in *Appendix B* shows the site and surrounding area on a recent aerial photograph obtained from *Google Earth Pro*, dated October 14, 2022.

The location of the site is depicted in Appendix B.

4.0 PROPOSED SITE DEVELOPMENT

Recent site development at the site includes a maintenance building with perimeter gravel drive lane, concrete pads and decks around an existing dwelling structure, and new bituminous drive lanes. Proposed site improvements include the construction of a 7,900 square foot recreation center with a finished floor elevation of 547.5 feet.

A new stormwater management system is required to accommodate additional stormwater runoff from the recent and proposed impervious area. The currently proposed stormwater management system includes a surface infiltration basin located approximately 700 feet northwest, and approximately 100 feet downgradient of the recent/proposed development area. The proposed infiltration basin has a footprint of approximately 11,000 square feet, and an invert elevation of El. 448 feet.

5.0 DOCUMENT REVIEW

5.1 Soils

United States Department of Agriculture, Natural Resource Conservation Service (USDA/NRCS) soil mapping indicates the presence of two (2) soil units within the footprint of the proposed stormwater management basin: Bath channery silt loam, 3 to 8 % slopes (Bab) and Chippewa and Norwich soils, 0 to 8% slopes, extremely stony (CnB) within the site.

The Bath channery silt loam consists of loamy till derived mainly from gray and brown siltstone, sandstone, and shale. Depth to restrictive features is typically 26 inches to 38 inches to fragipan, and reported infiltration rates typically range from 0.00 inches per hour to 0.14 inches per hour in the most limiting layer.

The Chippewa and Norwich soils consist of loamy till dominated by siltstone, sandstone, and shale fragments. Depth to restrictive features is typically 8 inches to 20 inches to fragipan, and reported infiltration rates typically range from 0.00 inches per hour to 0.14 inches per hour in the most limiting layer.

The USDA Custom Soil Resource Report is included as *Appendix C*.

5.2 Geologic Setting

According to mapping presented by the United States Geological Survey, the project site is situated on the Blue Mountain Section of the Ridge and Valley Physiographic Province. The Blue Mountain Section consists of a long linear ridge to the south and valley to the north. The valley widens eastward and includes low linear ridges and shallow valleys. Sediments originate from fluvial erosion, and some glacial erosion and deposition in the northeast. Relief is low (100 to 300 feet) to very high (>1,000 feet). The geologic structure of the Blue Mountain Section is characterized by the southern limb of a broad fold (Blue Mountain) with small folds to the north.

The project site is underlain by the Silurian-aged Bloomsburg Formation (Sb). The Bloomsburg Formation consists of red shale and siltstone. It contains some sandstone, thin impure limestone, green shale, and mudstone. It is moderately well bedded and has fissile to thin beds. The sandstone units are mostly flaggy to

thick. The maximum thickness of the formation is about 500 feet. Maps showing the site geology and topography are include in *Appendix B*.

6.0 FIELD INVESTIGATION

6.1 Test Pits

On April 26, 2024, three (3) test pits, identified as TP-101 through TP-103, were performed within the footprint of the proposed surface infiltration basin to classify the soil conditions and perform infiltration tests to support the stormwater management design. The test pit locations were determined by the project civil engineer. The excavations were prepared using a Kubota KX040-4 mini-excavator to depths ranging from 5.2 to 5.5 feet below existing grades, corresponding to El. 445.0 ft. to El. 442.6 feet.

The presence of limiting zones was evaluated to a depth of no less than 3 feet below the infiltration testing elevation.

The locations of these excavations are depicted on the *Testing Location Plan* provided as *Appendix D*.

6.2 Infiltration Testing

At the direction of the project civil engineer, infiltration tests were conducted at each test pit location at an elevation of 448.0 feet. This testing was performed using the double-ring infiltrometer test method in general accordance with the protocols outlined in Appendix C of the Pennsylvania Stormwater Best Management Practices Manual (PA BMP Manual) dated December 30, 2006.

The test rings measured 12 inches in height, with a 6-inch diameter inner ring and a 12-inch diameter outer ring. One test was conducted within each excavation.

7.0 OBSERVATIONS

7.1 Stratigraphy

The soil profile was relatively consistent between the test pits. Below a relatively thin (4 inches) to thick (1.5 feet) layer of surficial topsoil, naturally occurring glacial till soils were encountered. The glacial till soils consisted of Sandy SILT (ML), Sandy Silty CLAY with Gravel (CL-ML), and Silty SAND with Gravel (SM) in accordance with the Unified Soil Classification System (USCS). The glacial till stratum soils were found to be relatively consistent with the description of the Bath channery silt loam.

The glacial soils were gray, tan, dark-brown, and brown, exhibited low plasticity or were non-plastic, were moist to wet, and became increasingly granular with depth. Granular particles were subangular to rounded, indicative of deposition in a glacial outwash environment in the geologic past. Excavation within the glacial till required moderate excavation effort, suggestive of a loose to medium dense relative density.

A limiting horizon consisting of a high groundwater table was encountered at the location of TP-102 at approximately El. 446.2 feet. The water surface rose to approximately El. 447.2 feet within one hour of completing the test pit. Groundwater, bedrock, or other limiting zones were not encountered in TP-101 or TP-103 above elevations 444.4 feet and El. 442.6 feet, respectively. The groundwater encountered at TP-102 is representative of an artesian condition originating in the underlying fractured bedrock.

Soil profiles and morphologic characteristics were documented in the field.

This subsurface information is presented on the *Typed Test Pit Logs*, provided in *Appendix E*.

Representative test pit photographs are included in *Appendix F*.

7.2 Infiltration Rates

Refer to the following table for a summary of the infiltration testing performed for this proposed surface infiltration basin.

Table 1. Double Ring Infiltrometer Test Results

Test No.	Test Depth (*in.*)	Test Elevation (*ft.*)	Measurement Interval, *t* (*min.*)	Water Level Drop (in.)				Stabilized or Final Measurement (*in.*)	Infiltration Rate (*in/hr.*)	Design Infiltration Rate (*in/hr.*)
				1	2	3	4			
TP-101	20	448.0	30	0.42	0.30	0.30	0.36	0.36	0.72	**0.36**
TP-102	26	448.0	30	0.00	0.00	0.00	0.00	0.00	0.12	**0.00**
TP-103	1	448.0	30	0.66	0.42	0.48	0.54	0.54	1.08	**0.54**

Notes: 1) *The design infiltration rate applies a safety factor of two (2).*
2) *Intervals 1 through 4 represent final intervals performed for the specific test location.*

The test at TP-103 was performed within the topsoil. The tests at TP-101 and TP-102 were performed within the glacial till stratum.

Tests performed at El. 448.0 feet yielded an unfactored, average infiltration rate of 0.60 inches per hour, and design (safety factor of 2.0 applied) average infiltration rate of 0.30 inches per hour. The design infiltration rate at any particular location should be considered representative of the specific soil horizon at that test elevation.

The ability for water to infiltrate the soils was impacted by the relatively high fine-particle (silt and clay) content of the glacial till, as well as the presence of an elevated groundwater table at TP-102.

The readings collected during this testing, including the depths at which tests were conducted, and the raw infiltration rates are provided in *Appendix G*.

8.0 RECOMMENDATIONS

Infiltration testing confirmed permeability of the soils making stormwater infiltration a feasible option for managing post-construction stormwater at the majority of test locations.

A limiting condition (high groundwater) was encountered during the exploratory excavation at one location (TP-102). It will be necessary to modify the proposed system where limiting horizons were encountered. It is recommended that the new system be designed with a minimum 2-foot clearance above regularly occurring seasonal high groundwater table to minimize the effect of groundwater mounding on the infiltration system.

In order to maintain compliance with the PA BMP Manual infiltration system guidelines, Isett expects that the invert elevation would have to be raised to a minimum elevation of approximately El. 449.2 feet. Appropriate stormwater management within the study area would involve placement of approved fill to raise grades. The approved fill should consist of an engineered soil mixture of suitable permeability. Additional infiltration testing would be required for acceptance of the engineered soil mixture as an infiltration medium.

All stormwater management systems designed for the purpose of infiltration must be excavated in a manner that prevents any additional compaction and permeability loss of the infiltrating soils. Excavation should be performed with back-hoe or track-hoe type equipment, with work performed from the inside out.

Upon establishment of the proposed subgrade elevation(s), construction equipment and vehicle travel must be prohibited from the prepared area. Where unavoidable, low contact pressure, tracked equipment should be implemented to perform the required tasks.

If required, maximum basin slope geometry shall be 2H:1V.

9.0 DISCLAIMER

The findings in this report are based on conditions readily visible and recorded at the time of this evaluation. Observations and findings are limited to the locations in which this evaluation was conducted. Isett has used its experience and professional judgment in rendering the conclusions in this report.

All proposed stormwater/infiltration BMPs should be consistent with applicable municipal ordinances and the requirements of the PA BMP Design Manual. It is advisable to have a qualified soil scientist, or a professional geologist familiar with the project and contents of this report witness the preparation of infiltration BMPs at the time of construction.

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

Appendix A

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS
5420 Crackersport Road, Allentown, PA 18104
610.398.0904 610.481.9098
barryisett.com

STORMWATER INFILTRATION EVALUATION

FOR

WATER GAP WELLNESS - EXISTING MAINTENANCE BUILDING

Smithfield Township, Monroe County, Pennsylvania

Isett Project No.: 1022419.004-02INFSG
Date: February 9, 2024

Barry Isett & Associates, Inc. (Isett), has conducted an evaluation of the above-referenced project site in Smithfield Township, Monroe County, Pennsylvania, to assess the general feasibility for soils to infiltrate stormwater in support of the recently constructed maintenance building.

This evaluation was accomplished by observing and recording the morphologic characteristics of the soils and performing permeability testing to quantify infiltration rates in general conformance to the requirements prescribed by the Pennsylvania Department of Environmental Protection (PA DEP), and other reviewing agencies. The observations made and the results derived from this study are detailed below.

Background

Soils

According to the United States Department of Agriculture Natural Resources Conservation Service (USDA/NRCS) mapping, the soils underlying the subject site are mapped as Bath channery silt loam.

Bath series are very deep, well-drained soils formed in till from siltstone, sandstone, and shale. Solum thickness ranges from 40 to 80 inches. A fragipan can sometimes be observed. Depth to bedrock typically ranges from 40 inches to 240 inches or more.

Geology

According to the online geologic mapping application Pennsylvania GEOlogic Data Exploration (PaGEODE) (www.gis.dcnr.state.pa.us/pageode/), the subject site is underlain by the Bloomsburg Formation. The Bloomsburg Formation consists of red shale and siltstone. It contains some sandstone, green shale, and mudstone. It is moderately well-bedded. Its maximum thickness is about 500 feet.

Morphologic Evaluation

On February 7, 2024, three (3) backhoe excavations (TP-201 through TP-203) were prepared to evaluate morphological conditions in the vicinity of the proposed stormwater BMP. The locations of these excavations are depicted on the attached test location plan. The soil profiles were reviewed, and the morphologic characteristics of the soils were documented. Profiles were generally exposed to depths of 9-14 feet below ground surface (bgs.). Detailed soil profile logs are attached to this letter.

Isett generally found the soils to be very deep and moderately well-drained. The soils showed characteristics of the Bath and Lackawanna series. The topsoil generally consisted of dark grayish brown channery silt loam that was underlain by yellowish brown channery loam. These soils overlaid reddish brown very to extremely channery reddish brown loam, which transitioned to a weak red diggable shale bedrock. Coarse fragments generally increased with depth.

Diggable shale bedrock was encountered within all three test pits. The bedrock was observed at depths starting at 75 inches to 160 inches bgs. No groundwater seeps were observed within any of the excavations.

Redoximorphic features were observed within each test pit. However, these features likely formed as a result of perched saturation from slow permeability or form a textural discontinuity and shall not be interpreted to indicate a seasonal high-water table.

Testing

Isett performed infiltration testing in test pits TP-201 and TP-202 using the double-ring infiltrometer test method in general accordance with the protocol described in Appendix C (p.6) of the Pennsylvania Stormwater Best Management Practices Manual (December 30, 2006) (BMP Manual). The test rings measured 12 inches in height, with a 6-inch diameter inner ring and a 12-inch diameter outer ring. Infiltration tests were conducted at depths of 4.25 feet bgs and 7.00 feet bgs. The following is a summary of the test results.

The tests conducted at an elevation of 541.50 feet yielded raw infiltration rates ranging from 3.00 to 8.50 inches per hour (in/hr.), with design rates incorporating a safety factor of two, that range from 1.50 to 4.25 in/hr.

The readings collected during this testing, including the depths at which tests were conducted, the raw infiltration rates, and the calculated design infiltration rates, are attached to this letter.

Conclusions

Isett has determined that the morphologic characteristics of the soils characterized by excavations TP-201 through TP-203 are generally consistent with USDA/NRCS mapping and with the soil characteristics prescribed in Appendix C (p.6) of the BMP Manual. Infiltration testing generally confirmed the permeability of the soils with rates in the range of those preferred by the reviewing agencies, making stormwater infiltration a feasible option at the locations and elevations evaluated.

The infiltration tests were conducted at the lowest elevation where two feet of suitable soil material was able to be maintained per the BMP Manual. If a deeper infiltration elevation is required due to design constraints, the diggable shale material may be undercut and a minimum of 2 feet of amended soils shall be added to achieve infiltration rates in the range of those preferred by the reviewing agencies to provide sufficient treatment to the stormwater.

Disclaimers

The findings in this report are based on conditions readily visible and recorded at the time of this evaluation. Observations and findings are limited to the locations in which this evaluation was

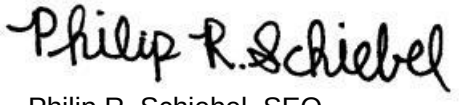
conducted. Isett has used its experience and professional judgment in rendering the conclusions in this report.

All proposed stormwater/infiltration BMPs) should be consistent with applicable municipal ordinances and the requirements of the *BMP Manual*.

Please be aware that any areas reserved for infiltration must be protected from construction traffic prior to and during site development to prevent compaction of the soils.

It is advisable to have a qualified soil scientist or a professional geologist witness the preparation of infiltration BMPs at the time of construction.

Report prepared by:



Philip R. Schiebel, SEO
Staff Environmental Scientist
(PA SEO No. 03975)

Attachments

Test Location Plan
Water Gap Wellness – Existing Maintenance Building
Smithfield Township, Monroe County, Pennsylvania

N
Not to Scale

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS
610.398.0904
barryisett.com

Date: February 7, 2024
Project: Water Gap Wellness –Existing Maintenance Building
Location Smithfield Township
Monroe County, Pennsylvania

Soil Log # TP-201 **Stormwater Limiting Zone: 75”-108”+** **Condition: Bedrock** **Lat/Long: 40.97384, -75.14879**

Horizon	Depth	Color	Texture		Structure			Consistence	Redox Features	Boundary (Dist/Topo)
			C.F.	Class	Grade	Size	Type			
---	0-6	---	Gravel Stone					---	---	---
A	6-16	10YR 4/2	ch	sil	3	co	pl	fr	---	c/s
Bw1	16-36	10YR 5/4	ch	sil	2	med	sbk	fr	---	g/w
Bw2	36-46	7.5 YR 4/4	vch	l	1	fi	sbk	fi	c/d	g/w
2C	46-75	5YR 4/4	exch	l	1	fi	gr	fr	---	d/w
2R	75-108	10R 4/3	Diggable Shale					---	---	---
---	---	---	---	---	---	---	---	---	---	---

Qualified Soil Scientist: Philip R. Schiebel, SEO (PA SEO No. 03975) **Soil Series: Bath Taxadjunct**

Drainage Class
Moderately Well Drained

Coarse Fragments (C.F.)
15–35%
gr – gravelly
ch – channery
cb – cobbly
fl – flaggy
st – stony
35–65%
vgr – very gravelly
vch – very channery
vcb – very cobbly
vfl – very flaggy
vst – very stony
>65%
exgr – extremely gravelly
exch – extremely channery
excb – extremely cobbly
exfl – extremely flaggy
exst – extremely stony

Textural Class
cs – coarse sand
s – sand
fs – fine sand
ls – loamy sand
sl – sandy loam
l – loam
sil – silt loam
si – silt
scl – sandy clay loam
cl – clay loam
sicl – silty clay loam
sc – sandy clay
sic – silty clay
c – clay

Structure
Grade
0 – structureless
1 – weak
2 – moderate
3 – strong

Structure
Size
fi – fine
med – medium
co – coarse
Type
sg – single grain
gr – granular
pl – platy
pr – prismatic
cm – columnar
abk – angular blocky
sbk – subangular blocky
m – massive
Consistence
l – loose
vfr – very friable
fr – friable
fi – firm
vfi – very firm
exfi – extremely firm

Redox Features
Abundance
f – few <2%
c – common 2–20%
m – many >20%
Redox Features
Contrast
f – faint
d – distinct
p – prominent
Boundary
Distinctness
a – abrupt < 1” thick
c – clear 1–2.5”
g – gradual 2.5–5”
d – diffuse > 5”
Topography
s – smooth
w – wavy
i – irregular
b – broken

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS
610.398.0904
barryisett.com

Date: February 7, 2024
Project: Water Gap Wellness –Existing Maintenance Building
Location Smithfield Township
Monroe County, Pennsylvania

Soil Log # TP-202 **Stormwater Limiting Zone: 110”-138”+** **Condition: Bedrock** **Lat/Long: 40.97363, -75.14903**

Horizon	Depth	Color	Texture		Structure			Consistence	Redox Features	Boundary (Dist/Topo)
			C.F.	Class	Grade	Size	Type			
A	0-15	10YR 4/2	ch	sil	3	co	pl	fr	---	c/s
Bw1	15-33	10YR 4/6	ch	sil	1	med	sbk	fr	---	g/w
Bw2	33-49	10YR 5/4	---	l	2	med	sbk	fr	c/d	g/w
2Bw	49-60	7.5YR 4/4	vch	l	1	fi	sbk	fi	c/d	g/w
2C	60-110	5YR 4/4	exch	l	1	fi	gr	fr	---	d/w
2R	110-138	10R 4/3	Diggable Shale					---	---	---
---	---	---	---	---	---	---	---	---	---	---

Qualified Soil Scientist: Philip R. Schiebel, SEO (PA SEO No. 03975) **Soil Series: Bath Taxadjunct**

Drainage Class
Moderately Well Drained

Coarse Fragments (C.F.)
15–35%
gr – gravelly
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cb – cobbly
fl – flaggy
st – stony
35–65%
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Structure
Grade
0 – structureless
1 – weak
2 – moderate
3 – strong

Structure
Size
fi – fine
med – medium
co – coarse
Type
sg – single grain
gr – granular
pl – platy
pr – prismatic
cm – columnar
abk – angular blocky
sbk – subangular blocky
m – massive

Consistence
l – loose
vfr – very friable
fr – friable
fi – firm
vfi – very firm
exfi – extremely firm

Redox Features
Abundance
f – few <2%
c – common 2–20%
m – many >20%
Redox Features
Contrast
f – faint
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BARRY ISETT & associates INC
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barryisett.com

Date: February 7, 2024
Project: Water Gap Wellness –Existing Maintenance Building
Location Smithfield Township
Monroe County, Pennsylvania

Soil Log # TP-203 **Stormwater Limiting Zone: 160”-165”+** **Condition: Bedrock** **Lat/Long: 40.97348, -75.14902**

Horizon	Depth	Color	Texture		Structure			Consistence	Redox Features	Boundary (Dist/Topo)
			C.F.	Class	Grade	Size	Type			
A	0-16	10YR 4/2	ch	sil	3	co	pl	fr	---	c/s
Bw1	16-35	10YR 4/6	ch	sil	1	med	sbk	fr	---	g/w
Bw2	35-50	10YR 5/4	---	l	2	med	sbk	fr	c/d	g/w
2Bw	50-72	7.5YR 4/4	vch	l	1	fi	sbk	fi	c/d	g/w
2C	72-160	5YR 4/4	exch	l	1	fi	gr	fr	---	d/w
2R	160-165	10R 4/3	Diggable Shale					---	---	---
---	---	---	---	---	---	---	---	---	---	---

Qualified Soil Scientist: Philip R. Schiebel, SEO (PA SEO No. 03975) **Soil Series: Bath Taxadjunct**

Drainage Class
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DOUBLE RING INFILTROMETER TESTING FIELD READINGS FOR STORMWATER INFILTRATION

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Project: **Water Gap Wellness - Existing Maintenance Building**
Smithfield Township
Monroe County, Pennsylvania
Test Date: **February 7, 2024**

Table 1. Double Ring Infiltrometer Test Results

Test No.	Test Depth (in.)	Surface Elev. (ft.)	Test Elev. (ft)	Hole Dia. (in.)	Reading Interval *t (min.)*	Readings *(in)*								Stabilized or Final Drop (in.)	Infiltration Rate (in/hr.)	Design Inf. Rate (in/hr.)
						1	2	3	4	5	6	7	8			
TP-1A	51	545.73	541.50	6.00	30.00	4.50	4.50	4.25	4.25	---	---	---	---	4.25	8.50	4.25
TP-1B	51			6.00	30.00	1.50	1.75	1.50	1.50	---	---	---	---	1.50	3.00	1.50
TP-2A	84	548.50	541.50	6.00	30.00	3.00	2.75	2.75	2.75	---		---	---	2.75	5.50	2.75
TP-2B	84			6.00	30.00	1.75	1.50	1.50	1.50	---		---	---	1.50	3.00	1.50

Notes: 1) A stabilized rate of drop is indicated by a ¼ inch or less difference between the highest and lowest drop in four (4) consecutive readings.
2) The drop that occurs in the inner ring during the final period, expressed as inches per hour, shall represent the infiltration rate for that test location.
3) The design infiltration rate reflects a safety factor of two (2).
E = Empty

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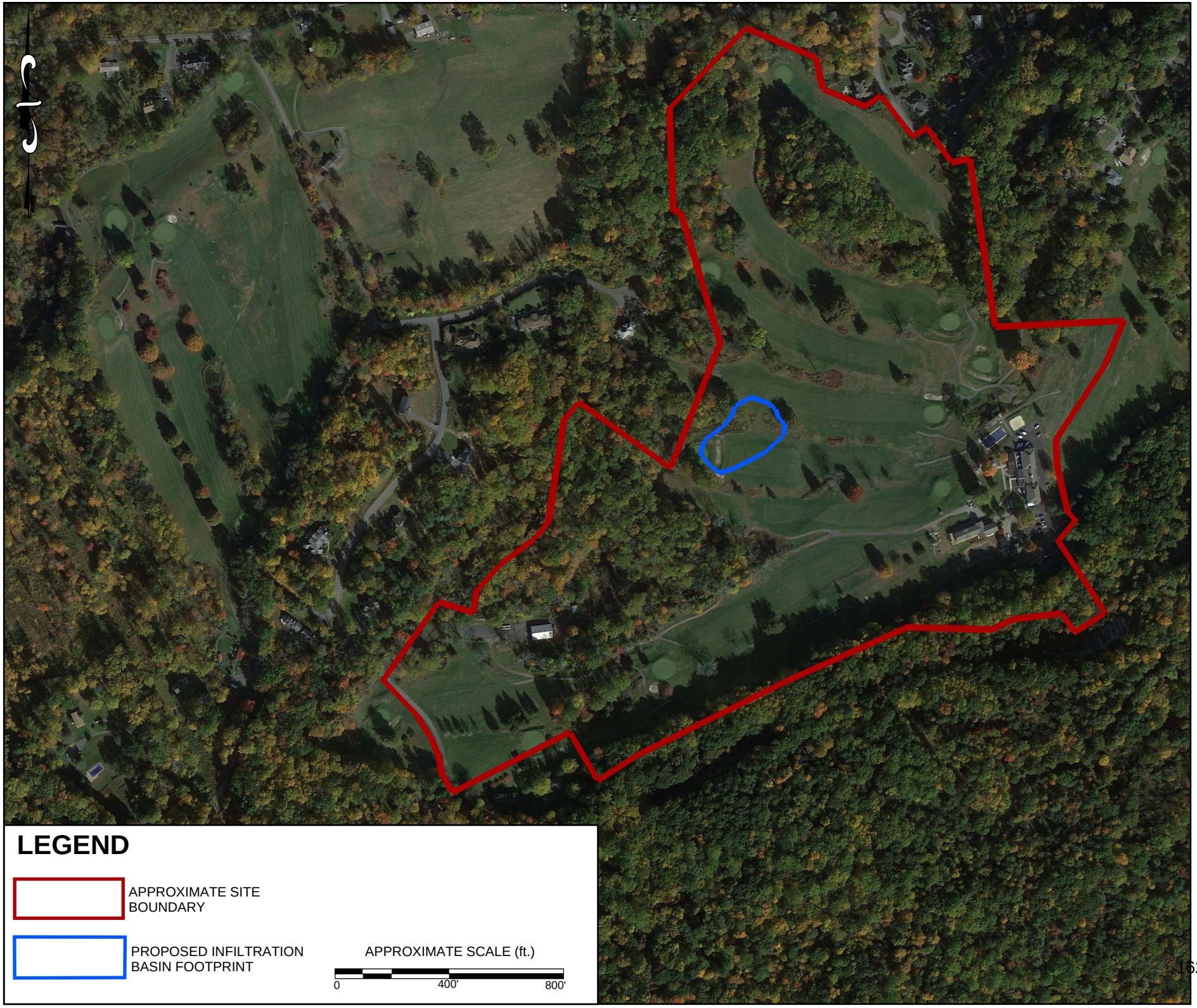
Appendix B



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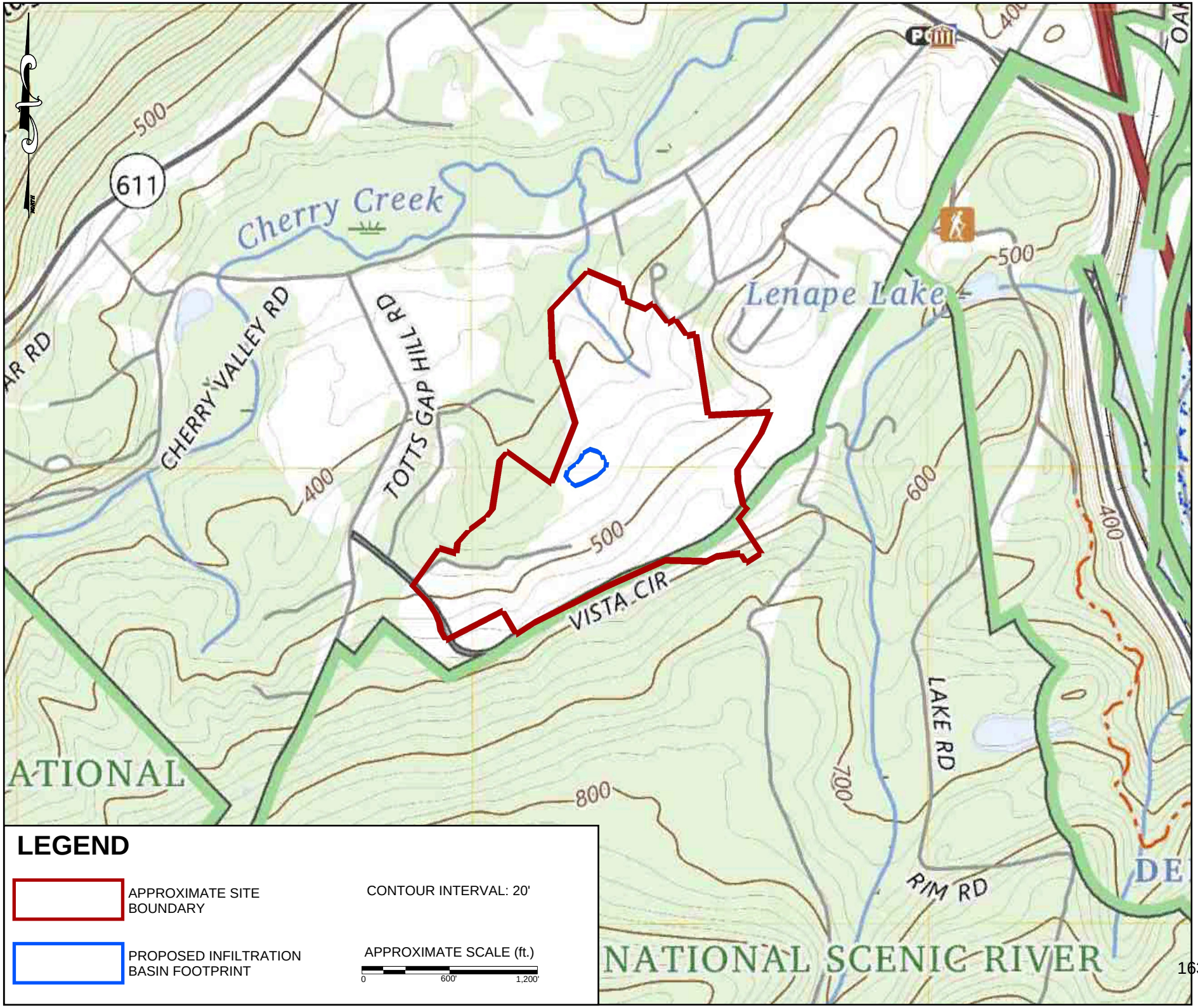
SITE AERIAL PHOTOGRAPH

WATER GAP WELLNESS ACCESSORY BUILDINGS LD
296 MOUNTAIN ROAD
STROUDSBURG
MONROE COUNTY, PENNSYLVANIA

DATE: 4/30/2024	DSGN:
SCALE: GRAPHIC	CHK: JDK
DRAWN: SDB	APPRD:
JOB: 1022419.004	P MGR: JK

SHEET: FIGURE 1

DRAWING SOURCE: *Google Earth* - Accessed 4/30/2024



LEGEND

APPROXIMATE SITE BOUNDARY

PROPOSED INFILTRATION BASIN FOOTPRINT

CONTOUR INTERVAL: 20'

APPROXIMATE SCALE (ft.)

0 600' 1,200'

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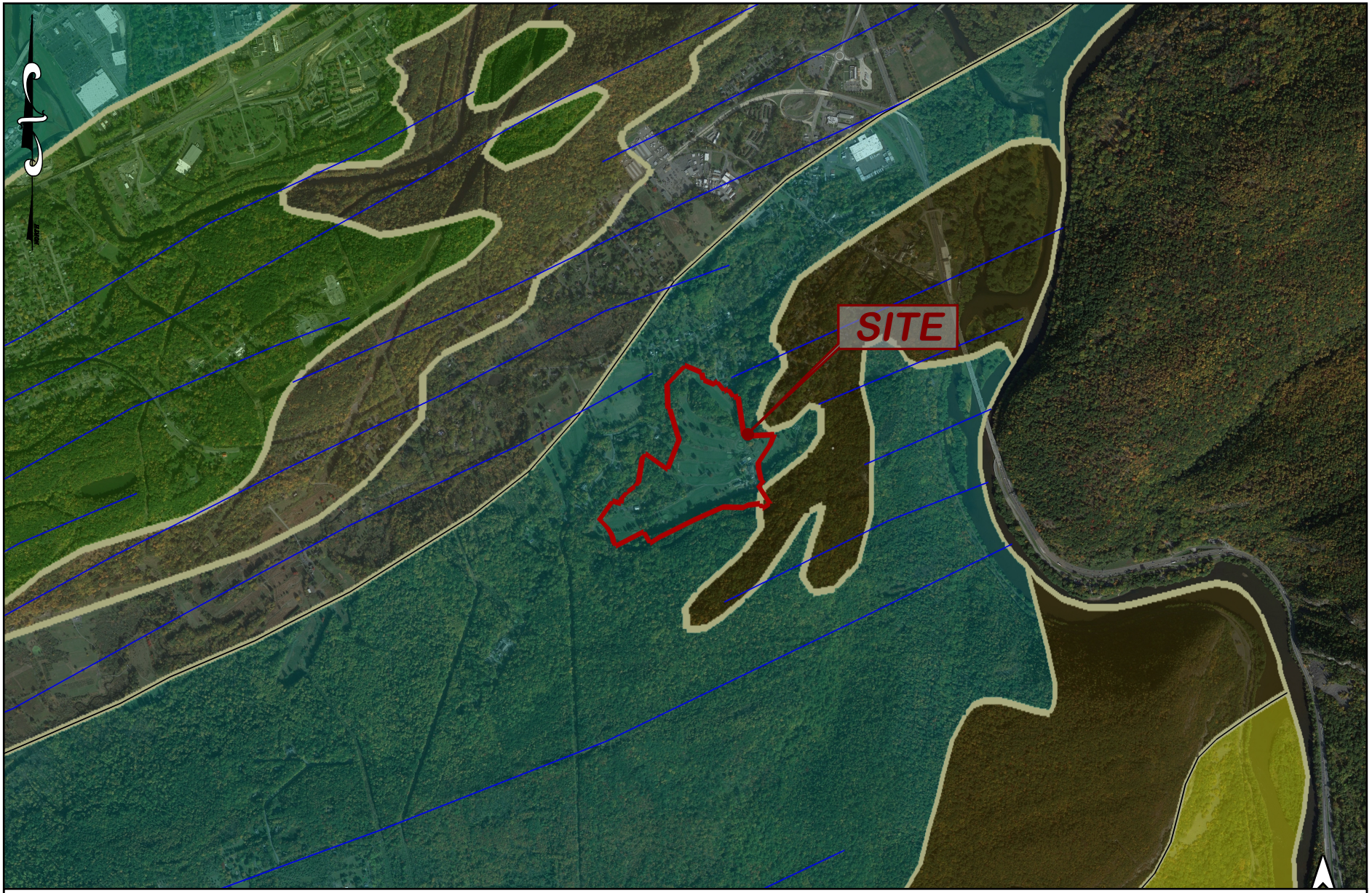
SITE TOPOGRAPHY

WATER GAP WELLNESS ACCESSORY BUILDINGS LD
296 MOUNTAIN ROAD
STROUDSBURG
MONROE COUNTY, PENNSYLVANIA

DATE: 4/30/2024	DSGN:
SCALE: GRAPHIC	CHK: JDK
DRAWN: SDB	APPRD:
JOB: 1022419.004	P MGR: JK

SHEET: FIGURE 2

DRAWING SOURCE: PADCNR Web Mapping Application - Accessed 4/30/2024



LEGEND

APPROXIMATE SITE LOCATION

GEOLOGIC CONTACT

APPROXIMATE SCALE (miles)

0 2,000' 4,000'

FAULTS

Existence Certain, location accurate

Existence Certain, location approximate

FOLDS

Anticline

Syncline

Fold pair

GEOLOGIC UNITS

- Sb - Bloomsburg Formation
- Ss - Shawangunk Formation
- Omgs - Shale and Graywacke of Martinsburg Formation
- Sdp - Decker Formation through Poxono Island Formation
- Drc - Ridgeley Formation through Coeymans Formation
- Dbe - Buttermilk Falls Limestone through Esopus Formation

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SITE GEOLOGY

WATER GAP WELLNESS ACCESSORY BUILDINGS LD
296 MOUNTAIN ROAD
STROUDSBURG
MONROE COUNTY, PENNSYLVANIA

DATE: 4/30/2024	DSGN:
SCALE: GRAPHIC	CHK: JDK
DRAWN: SDB	APPRD:
JOB: 1022419.004	P MGR: JK

SHEET:

FIGURE 3

DRAWING SOURCE: PADCNR Web Mapping Application - Accessed 4/30/2024

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MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

Appendix C

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 Monroe County, Pennsylvania

April 29, 2024

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

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

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

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

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

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

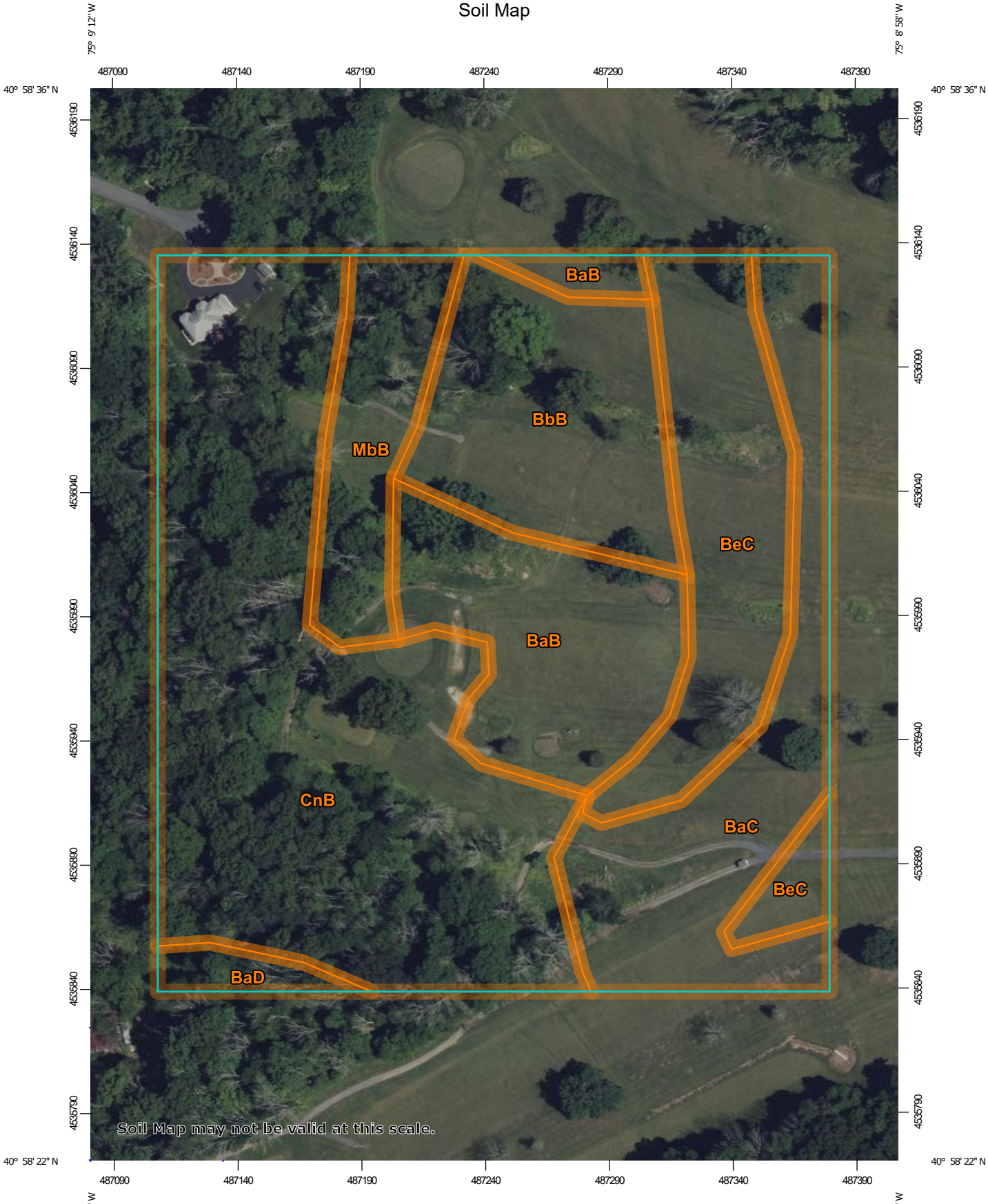
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Soil Map



Map Scale: 1:2,100 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 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Monroe County, Pennsylvania
Survey Area Data: Version 18, Sep 7, 2023

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

Date(s) aerial images were photographed: Jun 3, 2022—Jul 20, 2022

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
BaB	Bath channery silt loam, 3 to 8 percent slopes	2.5	12.6%
BaC	Bath channery silt loam, 8 to 15 percent slopes	2.9	14.6%
BaD	Bath channery silt loam, 15 to 25 percent slopes	0.3	1.4%
BbB	Bath channery silt loam, 0 to 8 percent slopes, extremely stony	2.5	12.3%
BeC	Benson-Rock outcrop complex, 8 to 25 percent slopes	2.7	13.6%
CnB	Chippewa and Norwich soils, 0 to 8 percent slopes, extremely stony	7.7	38.5%
MbB	Mardin very stony silt loam, 0 to 8 percent slopes	1.4	6.9%
Totals for Area of Interest		**20.0**	**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.

Monroe County, Pennsylvania

BaB—Bath channery silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2v30x
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Bath

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Ap - 0 to 9 inches: channery silt loam
Bw1 - 9 to 15 inches: channery silt loam
Bw2 - 15 to 25 inches: channery loam
E - 25 to 29 inches: channery loam
Bx - 29 to 52 inches: very channery silt loam
C - 52 to 72 inches: very channery silt loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: 26 to 38 inches to fragipan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F140XY030NY - Well Drained Dense Till
Hydric soil rating: No

Minor Components

Mardin

Percent of map unit: 10 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Lordstown

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Mountaintop, interfluve, crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

BaC—Bath channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2v314
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Bath

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Ap - 0 to 9 inches: channery silt loam
Bw1 - 9 to 15 inches: channery silt loam
Bw2 - 15 to 25 inches: channery loam

E - 25 to 29 inches: channery loam
Bx - 29 to 52 inches: very channery silt loam
C - 52 to 72 inches: very channery silt loam

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: 26 to 38 inches to fragipan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F140XY030NY - Well Drained Dense Till
Hydric soil rating: No

Minor Components

Lordstown

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountaintop, side slope, nose slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Mardin

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

BaD—Bath channery silt loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2v316
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F

Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Bath

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Ap - 0 to 9 inches: channery silt loam
Bw1 - 9 to 15 inches: channery silt loam
Bw2 - 15 to 25 inches: channery loam
E - 25 to 29 inches: channery loam
Bx - 29 to 52 inches: very channery silt loam
C - 52 to 72 inches: very channery silt loam

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: 26 to 38 inches to fragipan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F140XY030NY - Well Drained Dense Till
Hydric soil rating: No

Minor Components

Lordstown

Percent of map unit: 10 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountaintop, side slope, nose slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Mardin

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

BbB—Bath channery silt loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2v31k
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Bath, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: channery silt loam
Bw1 - 3 to 15 inches: channery silt loam
Bw2 - 15 to 25 inches: channery loam
E - 25 to 29 inches: channery loam
Bx - 29 to 52 inches: very channery silt loam
C - 52 to 72 inches: very channery silt loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 7.0 percent
Depth to restrictive feature: 26 to 38 inches to fragipan
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F140XY030NY - Well Drained Dense Till
Hydric soil rating: No

Minor Components

Swartswood, extremely stony

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Mardin, extremely stony

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

BeC—Benson-Rock outcrop complex, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: 9y9c
Elevation: 90 to 2,460 feet
Mean annual precipitation: 28 to 70 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Benson and similar soils: 60 percent
Rock outcrop: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Benson

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Loamy till

Typical profile

H1 - 0 to 8 inches: channery silt loam
H2 - 8 to 18 inches: very channery silt loam
H3 - 18 to 22 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F101XY011NY - Shallow Till Upland
Hydric soil rating: No

Description of Rock Outcrop

Interpretive groups

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

Minor Components

Wyoming

Percent of map unit: 4 percent
Landform: Terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Chenango

Percent of map unit: 4 percent
Landform: Outwash terraces
Landform position (three-dimensional): Riser
Down-slope shape: Convex, linear

Across-slope shape: Linear, convex
Hydric soil rating: No

Bath

Percent of map unit: 4 percent
Landform: Mountains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Mardin

Percent of map unit: 4 percent
Hydric soil rating: No

Volusia

Percent of map unit: 4 percent
Landform: Hills
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

CnB—Chippewa and Norwich soils, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2vcjj
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Chippewa, extremely stony, and similar soils: 41 percent
Norwich, extremely stony, and similar soils: 39 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chippewa, Extremely Stony

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave

Across-slope shape: Concave
Parent material: Loamy till dominated by siltstone, sandstone, and shale fragments

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 5 inches: channery silt loam
Eg - 5 to 15 inches: channery silt loam
Bxg - 15 to 45 inches: channery silt loam
C - 45 to 72 inches: channery silt loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 7.0 percent
Depth to restrictive feature: 8 to 20 inches to fragipan
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F140XY016NY - Mineral Wetlands
Hydric soil rating: Yes

Description of Norwich, Extremely Stony

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy till dominated by reddish sandstone, siltstone and shale fragments

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 5 inches: channery silt loam
Eg - 5 to 10 inches: channery silt loam
Bg - 10 to 16 inches: channery silt loam
Bgx - 16 to 46 inches: channery silt loam
C - 46 to 72 inches: channery silt loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 7.0 percent
Depth to restrictive feature: 10 to 24 inches to fragipan
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches

Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F140XY016NY - Mineral Wetlands
Hydric soil rating: Yes

Minor Components

Norwich, extremely stony, very poorly drained

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Volusia, extremely stony

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Morris, extremely stony

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Chippewa, extremely stony, very poorly drained

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

MbB—Mardin very stony silt loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9yc2
Elevation: 750 to 1,800 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Mardin

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

A - 0 to 8 inches: very stony silt loam
Bw - 8 to 17 inches: channery silt loam
BE - 17 to 21 inches: channery silt loam
Bx - 21 to 60 inches: channery silt loam
C - 60 to 80 inches: very channery silt loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 14 to 26 inches to fragipan
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 11 to 22 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D

Ecological site: F140XY024NY - Moist Dense Till
Hydric soil rating: No

Minor Components

Lordstown
Percent of map unit: 6 percent
Hydric soil rating: No

Volusia
Percent of map unit: 5 percent
Hydric soil rating: No

Chippewa
Percent of map unit: 4 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

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Appendix D

LEGEND

APPROXIMATE SITE BOUNDARY

PROPOSED INFILTRATION BASIN FOOTPRINT

TP-101 APPROXIMATE TEST PIT LOCATION - APRIL 2024

TP-1 APPROXIMATE TEST PIT LOCATION - FEBRUARY 2024

NOTES:

1. INFILTRATION TEST PITS TP-101 THROUGH TP-103 PERFORMED ON APPRIL 26, 2024 BY WGW UNDER THE SUPERVISION OF ISETT.

3. TEST PIT LOCATIONS WERE FIELD LOCATED BY ISETT'S GEOTECHNICAL PROFESSIONAL AND SHOULD BE CONSIDERED APPROXIMATE.

APPROXIMATE SCALE (ft)

0 200' 400'

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS
5420, Crackersport Rd., Allentown, PA 18104
610.398.0904 610.481.9098
barryisett.com

TESTING LOCATION PLAN

WATER GAP WELLNESS ACCESSORY BUILDINGS LD
296 MOUNTAIN ROAD
STROUDSBURG
MONROE COUNTY, PENNSYLVANIA

DATE: 4/30/2024	DSGN:
SCALE: GRAPHIC	CHK: JDK
DRAWN: SDB	APPRD:
JOB: 1022419.004	P MGR: JK

SHEET: FIGURE 4

DRAWING SOURCE: *Google Earth* - Accessed 10/06/2022

BARRY ISETT & associates INC
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Appendix E

TEST PIT NUMBER TP-101

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

CLIENT Water Gap Wellness
PROJECT NAME Accessory Buildings Land Development
PROJECT NUMBER 1022419.004
PROJECT LOCATION 296 Mountain Road, Stroudsburg, PA 18350
DATE STARTED 4/26/24 **COMPLETED** 4/26/24
GROUND ELEVATION 449.7 ft **TEST PIT SIZE** 72x48 inches
EXCAVATION CONTRACTOR Water Gap Wellness
GROUND WATER LEVELS:
EXCAVATION METHOD Mini-Excavator
AT TIME OF EXCAVATION 4/26/2024, Not Encountered
LOGGED BY BRF **CHECKED BY** SDB
AT END OF EXCAVATION
NOTES
BEFORE BACKFILLING

DEPTH (ft)	SAMPLE DEPTH TYPE & NUMBER	U.S.C.S.	Moisture Content	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0			Moist		TOPSOIL	449.3
		ML	Moist		(ML) f-c Sandy SILT, trace f-m, Gravel, tan-brown, low plasticity, subangular to rounded, 10YR4/2, friable [GLACIAL TILL]	449.0
		CL-ML	Moist		(CL-ML) f-c Sandy Silty CLAY with f-m Gravel, few cobbles, brown, low to moderate plasticity, subangular to rounded, 10YR4/4, friable [GLACIAL TILL] El. 448 ft.: Performed infiltration test	
2.5						
		SM	Very Moist		(SM) Silty f-c SAND with f-c GRAVEL, some cobbles, brown to dark-brown, low plasticity, subrounded to rounded, 7.5YR2/2, friable [GLACIAL TILL]	
5.0						

0.4
0.7
3.0
5.3

END OF TEST PIT, 5.3 feet.

TEST PIT NUMBER TP-102

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

CLIENT Water Gap Wellness
PROJECT NAME Accessory Buildings Land Development
PROJECT NUMBER 1022419.004
PROJECT LOCATION 296 Mountain Road, Stroudsburg, PA 18350
DATE STARTED 4/26/24 **COMPLETED** 4/26/24
GROUND ELEVATION 450.2 ft **TEST PIT SIZE** 72x48 inches
EXCAVATION CONTRACTOR Water Gap Wellness
GROUND WATER LEVELS:
EXCAVATION METHOD Mini-Excavator
AT TIME OF EXCAVATION
LOGGED BY BRF **CHECKED BY** SDB
AT END OF EXCAVATION 4/26/2024, 3.00 ft
NOTES
BEFORE BACKFILLING

DEPTH (ft)	SAMPLE DEPTH TYPE & NUMBER	REMARKS	U.S.C.S.	Moisture Content	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0		Topsoil thickness = 1.5 ft. on west side of test pit		Moist		TOPSOIL	
						0.8	449.4
			ML	Moist		(ML) f-c Sandy SILT, trace f-m, Gravel, tan-brown, low plasticity, subangular to rounded, 10YR4/2, friable [GLACIAL TILL]	
						1.2	449.0
2.5			SM	Very Moist to Wet		(SM) Silty f-c SAND with f-c GRAVEL, some cobbles, brown to dark-brown, low plasticity, subrounded to rounded, 7.5YR2/2, friable [GLACIAL TILL]	
						El. 448 ft.: Performed infiltration test	
						El. 447.2 ft.: Groundwater Encountered	
5.0						5.3	444.9

END OF TEST PIT, 5.3 feet.

TEST PIT NUMBER TP-103

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

CLIENT Water Gap Wellness
PROJECT NAME Accessory Buildings Land Development
PROJECT NUMBER 1022419.004
PROJECT LOCATION 296 Mountain Road, Stroudsburg, PA 18350
DATE STARTED 4/26/24 **COMPLETED** 4/26/24
GROUND ELEVATION 448.1 ft **TEST PIT SIZE** 72x48 inches
EXCAVATION CONTRACTOR Water Gap Wellness
GROUND WATER LEVELS:
EXCAVATION METHOD Mini-Excavator
AT TIME OF EXCAVATION
LOGGED BY BRF **CHECKED BY** SDB
AT END OF EXCAVATION
NOTES
BEFORE BACKFILLING 4/26/2024, Not Encountered

DEPTH (ft)	SAMPLE DEPTH TYPE & NUMBER	U.S.C.S.	Moisture Content	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0			Moist		TOPSOIL El. 448 ft.: Performed infiltration test	447.8
		ML	Moist		(ML) f-c Sandy SILT, trace f-m, Gravel, tan-brown, low plasticity, subangular to rounded, 10YR4/2, friable [GLACIAL TILL]	
				1.2		446.9
		CL-ML	Moist		(CL-ML) f-c Sandy Silty CLAY with f-m Gravel, few cobbles, brown, low to moderate plasticity, subangular to rounded, 10YR4/4, friable [GLACIAL TILL]	
2.5				2.8		445.3
		SM	Moist to Very Moist		(SM) Silty f-c SAND with f-c GRAVEL, some cobbles, brown to dark-brown, low plasticity, subrounded to rounded, 7.5YR2/2, friable [GLACIAL TILL]	
5.0				5.5		442.6
					END OF TEST PIT, 5.5 feet.	

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Appendix F

Photo #1 – TP-101 Excavation

Photo #2 – TP-101 Soil Profile

Photo #3 – TP-102 – Note High Groundwater Limiting Horizon

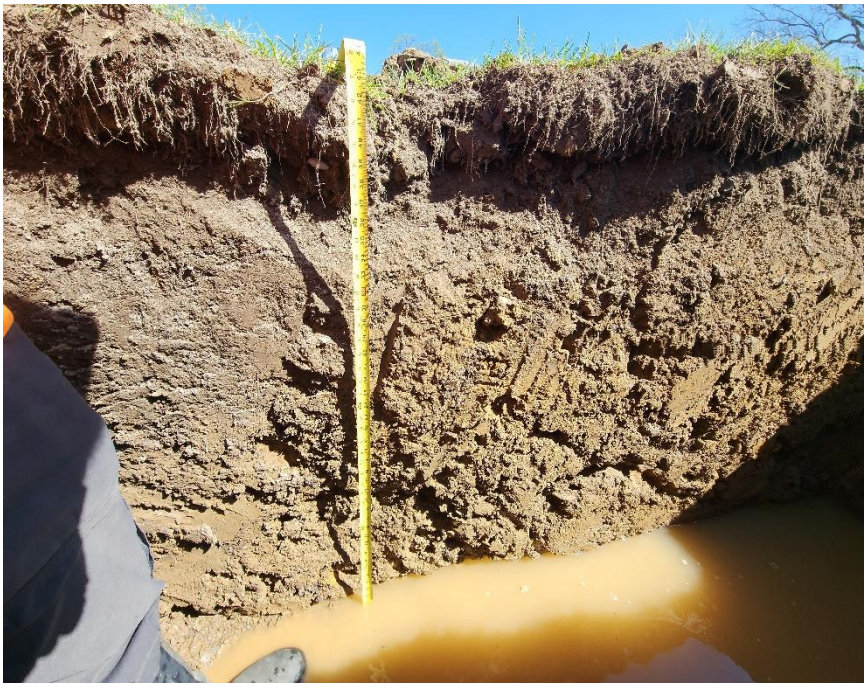

Photo #4 – TP-102 Soil Profile

Photo #5 – TP-103 Soil Profile

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Appendix G

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

INFILTRATION TESTING FIELD DATA COLLECTION FORM

Client: Water Gap Wellness
Project Number: 1022419.004 Date: 4/26/24
Project: Water Gap Wellness Accesssory Buildings Land Development
Project Location: 296 Mountian Road, Stroudsburg, PA

Test Pit ID#:	TP-101	Test Pit Dim. (ft.):	4 ft. x 6 ft.
Lattitude:	40.974904	Weather:	Clear, 50s - 60s
Longitude:	-75.15162	BIA Representative:	S. Burns, B. Fox
GSE (ft.):	449.7		
Proposed Testing Depth (ft.):	1.7	Test Elev. (ft.):	448.0
Total Depth (ft.):	5.3	Bottom Elev. (ft.):	444.4

Presoak:

	Water Level Drop (ft.)	
Elapsed Time (min.)	Ring #1	Ring #2
30	0.08	0.00
60	0.08	0.01

If the water level drop in the 2nd measurement interval is 2 inches or more, use 10 minute measurement intervals during the infiltration test. Otherwise, use 30 minute measurement intervals.

Test:

	Water Level Drop (ft.)	
Elapsed Time (min.)	Ring #1	Ring #2
30	0.06	0.01
60	0.04	0.01
90	0.04	0.01
120	0.05	0.01

Infiltration Rate (in/hr.): 0.72

Notes: Infiltration test performed at El. 448.0 ft. No evidence of limiting horizons within 3.6 feet of infiltration testing elevation.

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

INFILTRATION TESTING FIELD DATA COLLECTION FORM

Client: Water Gap Wellness
Project Number: 1022419.004 Date: 4/26/24
Project: Water Gap Wellness Accesssory Buildings Land Development
Project Location: 296 Mountian Road, Stroudsburg, PA

Test Pit ID#:	TP-102	Test Pit Dim. (ft.):	4 ft. x 6 ft.
Lattitude:	40.975031	Weather:	Clear, 50s - 60s
Longitude:	-75.151272	BIA Representative:	S. Burns, B. Fox
GSE (ft.):	450.23		
Proposed Testing Depth (ft.):	2.2	Test Elev. (ft.):	448.0
Total Depth (ft.):	5.2	Bottom Elev. (ft.):	445.0

Presoak:

	Water Level Drop (ft.)	
Elapsed Time (min.)	Ring #1	Ring #2
30	0.02	0.00
60	0.00	0.00

If the water level drop in the 2nd measurement interval is 2 inches or more, use 10 minute measurement intervals during the infiltration test. Otherwise, use 30 minute measurement intervals.

Test:

	Water Level Drop (ft.)	
Elapsed Time (min.)	Ring #1	Ring #2
30	0.00	0.00
60	0.00	0.00
90	0.00	0.00
120	0.00	0.00

Infiltration Rate (in/hr.): 0.00

Notes: Infiltration test performed at El. 448.0 ft. Groundwater encountered at El. 446.2 ft. - rose to El. 447.2 ft. over duration of test.

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MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

INFILTRATION TESTING FIELD DATA COLLECTION FORM

Client: Water Gap Wellness
Project Number: 1022419.004 Date: 4/26/24
Project: Water Gap Wellness Accesssory Buildings Land Development
Project Location: 296 Mountian Road, Stroudsburg, PA

Test Pit ID#:	TP-103	Test Pit Dim. (ft.):	4 ft. x 6 ft.
Lattitude:	40.975194	Weather:	Clear, 50s - 60s
Longitude:	-75.151268	BIA Representative:	S. Burns, B. Fox
GSE (ft.):	448.13		
Proposed Testing Depth (ft.):	0.1	Test Elev. (ft.):	448.0
Total Depth (ft.):	5.5	Bottom Elev. (ft.):	442.6

Presoak:

	Water Level Drop (ft.)	
Elapsed Time (min.)	Ring #1	Ring #2
30	0.19	0.16
60	0.13	0.08

If the water level drop in the 2nd measurement interval is 2 inches or more, use 10 minute measurement intervals during the infiltration test. Otherwise, use 30 minute measurement intervals.

Test:

	Water Level Drop (ft.)	
Elapsed Time (min.)	Ring #1	Ring #2
30	0.13	0.04
60	0.08	0.03
90	0.06	0.01
120	0.07	0.01
150	0.08	0.01

Infiltration Rate (in/hr.): 1.08

Notes: Infiltration test performed at El. 448.0 ft. No evidence of limiting horizons within 5.4 feet of infiltration testing elevation.

I. DRAINAGE PLANS

24x36

PREVIOUSLY DISTURBED AREAS

PREVIOUSLY DISTURBED AREAS FROM 2022, THAT ARE NOT EXPECTED TO BE REDISTURBED, HAVE BEEN INCLUDED FOR PURPOSES OF STORMWATER ANALYSIS

PRE-DEVELOPMENT STORMWATER MANAGEMENT ANALYSIS WAS PERFORMED USING THE CONDITIONS OF THE SITE PRIOR TO THE CONSTRUCTION OF THE MAINTENANCE BUILDING AND ASSOCIATED IMPROVEMENTS CURRENTLY EXISTING ON SITE.

SOIL CLASSIFICATIONS

BaB	BATH CHANNERY SILT LOAM – HSG C 3 TO 8 PERCENT SLOPES
BaC	BATH CHANNERY SILT LOAM – HSG C 8 TO 15 PERCENT SLOPES
BbB	BATH CHANNERY SILT LOAM – HSG C 0 TO 8 PERCENT SLOPES, EXTREMELY STONY
BbC	BATH CHANNERY SILT LOAM – HSG C 8 TO 25 PERCENT SLOPES, EXTREMELY STONY
BeC	BENSON–ROCK OUTCROP COMPLEX – HSG D 8 TO 25 PERCENT SLOPES
CnB	CHIPPEWA AND NORWICH SOIL – HSG D 0 TO 8 PERCENT SLOPES, EXTREMELY STONY
LBE	LACKAWANNA AND BATH SOILS – HSG D STEEP, RUBBLY
MbB	MARDIN VERY STONY SILT LOAM – HSG D 0 TO 8 PERCENT SLOPES

PRE–DEVELOPMENT DRAINAGE LEGEND

DRAINAGE BOUNDARY

TIME OF CONCENTRATION

POI 1 DRAINAGE SUBAREA

DP001 DISCHARGE POINT

0 50' 100' 150'
SCALE: 1"=50'

Know what's **below.**
Call before you dig.
SITE SERIAL #20240651009

REVISIONS	DATE	BY
1: TOWNSHIP COMMENTS	11/25/24	TAL

JAMES PETER KELLEY
REGISTERED PROFESSIONAL ENGINEER
No. 19441-E
COMMONWEALTH OF PENNSYLVANIA

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

272.200.2050
barryisett.com
525 Main Street, Suite 200
Stroudsburg, PA 18360

PRE-DEVELOPMENT DRAINAGE PLAN
WATER GAP WELLNESS RECREATION CENTER
WATER GAP ACQUISITIONS PARTNERS, LLC
SMITHFIELD TOWNSHIP
MONROE COUNTY, PA

DATE: 8/26/2024	DSGN: TAL/DFG
SCALE: 1"=50'	CHK: CRS
DRAWN: TAL	APPRD: JPK
JOB: 1022419.004	P MGR: JPK

SHEET: 1 OF 4

D-1

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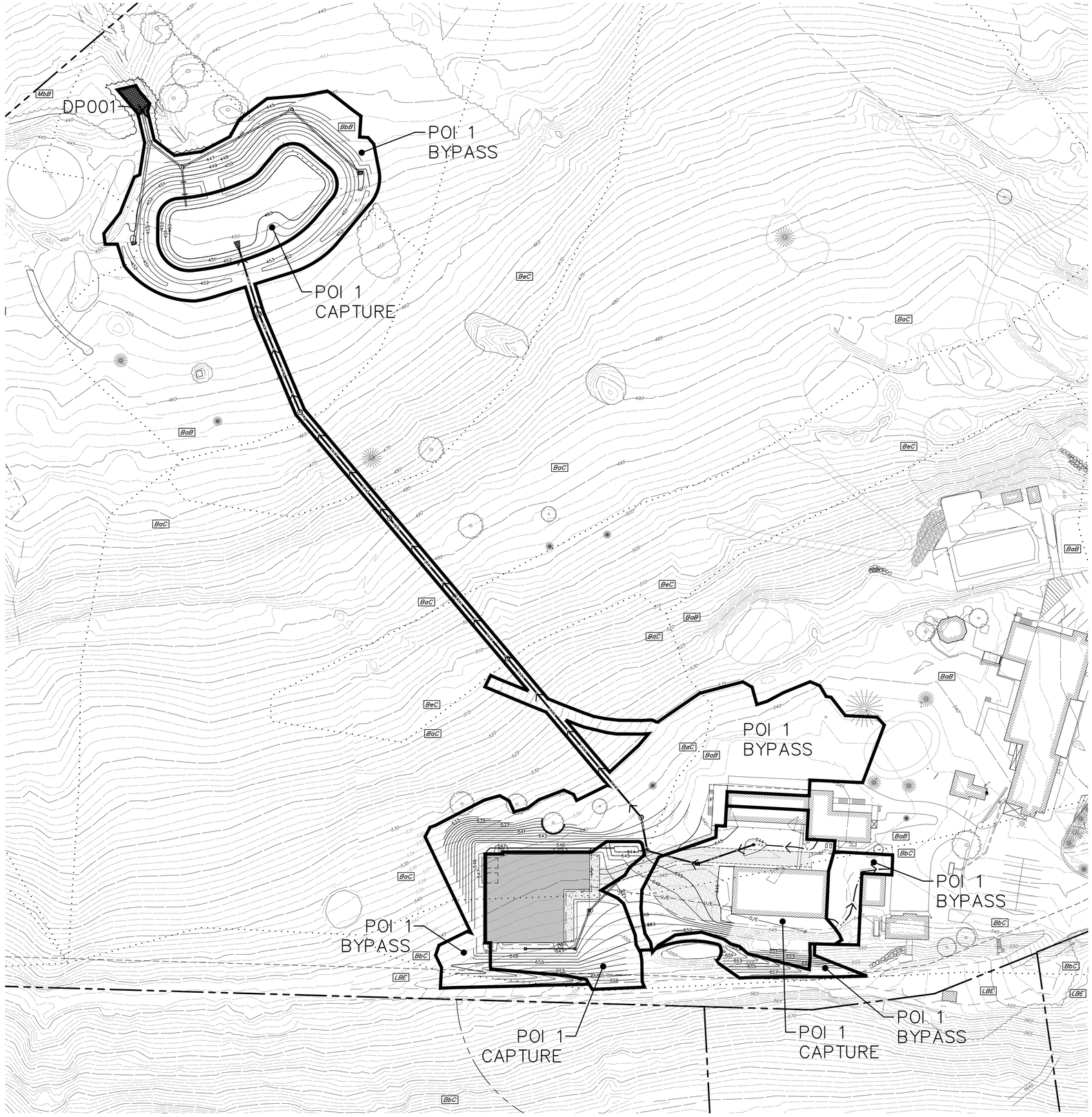

REVISIONS	DATE	BY
1: TOWNSHIP COMMENTS	11/25/24	TAL

JAMES PETER KELLEY
REGISTERED PROFESSIONAL ENGINEER
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COMMONWEALTH OF PENNSYLVANIA

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

272.200.2050
barryisett.com
525 Main Street, Suite 200
Stroudsburg, PA 18360

SOIL CLASSIFICATIONS

BaB	BATH CHANNERY SILT LOAM – HSG C 3 TO 8 PERCENT SLOPES
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BbC	BATH CHANNERY SILT LOAM – HSG C 8 TO 25 PERCENT SLOPES, EXTREMELY STONY
BeC	BENSON–ROCK OUTCROP COMPLEX – HSG D 8 TO 25 PERCENT SLOPES
CnB	CHIPPEWA AND NORWICH SOIL – HSG D 0 TO 8 PERCENT SLOPES, EXTREMELY STONY
LBE	LACKAWANNA AND BATH SOILS – HSG D STEEP, RUBBLY
MbB	MARDIN VERY STONY SILT LOAM – HSG D 0 TO 8 PERCENT SLOPES

POST–DEVELOPMENT LEGEND

DRAINAGE BOUNDARY
TIME OF CONCENTRATION
POI 1 — DRAINAGE SUBAREA
DP001 — DISCHARGE POINT

0 50' 100' 150'
SCALE: 1"=50'

POST DEVELOPMENT DRAINAGE PLAN

WATER GAP WELLNESS RECREATION CENTER
WATER GAP ACQUISITIONS PARTNERS, LLC
SMITHFIELD TOWNSHIP
MONROE COUNTY, PA

DATE: 8/26/2024	DSGN: TAL/DFG
SCALE: 1"=50'	CHK: CRS
DRAWN: TAL	APPRD: JPK
JOB: 1022419.004	P MGR: JPK

SHEET: 2 OF 4

D-2

Know what's below. Call before you dig.
SITE SERIAL #20240651009

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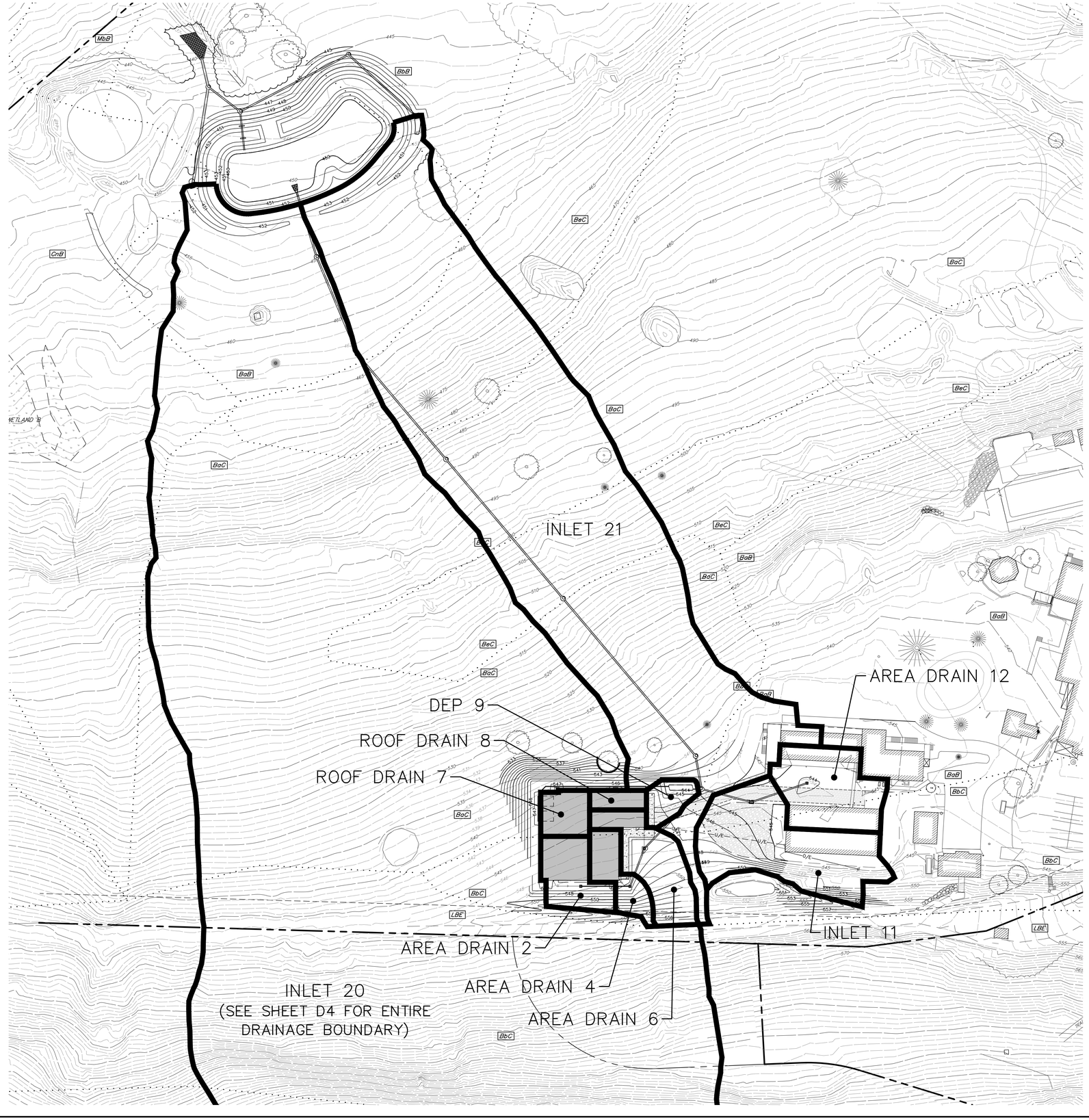

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BaB	BATH CHANNERY SILT LOAM – HSG C 3 TO 8 PERCENT SLOPES
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BbC	BATH CHANNERY SILT LOAM – HSG C 8 TO 25 PERCENT SLOPES, EXTREMELY STONY
BeC	BENSON–ROCK OUTCROP COMPLEX – HSG D 8 TO 25 PERCENT SLOPES
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LBE	LACKAWANNA AND BATH SOILS – HSG D STEEP, RUBBLY
MbB	MARDIN VERY STONY SILT LOAM – HSG D 0 TO 8 PERCENT SLOPES

INLET DRAINAGE LEGEND

INLET 1 — INLETE DRAINAGE BOUNDARY
DRAINAGE SUBAREA

0 50' 100' 150'
SCALE: 1"=50'

Know what's below. Call before you dig.
SITE SERIAL #20240651009

REVISIONS	DATE	BY
1: TOWNSHIP COMMENTS	11/25/24	TAL

JAMES PETER KELLEY
REGISTERED PROFESSIONAL ENGINEER
No. 19441-E
COMMONWEALTH OF PENNSYLVANIA

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS

272.200.2050
barryisett.com
525 Main Street, Suite 200
Stroudsburg, PA 18360

POST DEVELOPMENT INLET DRAINAGE PLAN
WATER GAP WELLNESS RECREATION CENTER
WATER GAP ACQUISITIONS PARTNERS, LLC
SMITHFIELD TOWNSHIP
MONROE COUNTY, PA

DATE: 8/26/2024	DSGN: TAL/DFG
SCALE: 1"=50'	CHK: CRS
DRAWN: TAL	APPRD: JPK
JOB: 1022419.004	P MGR: JPK

SHEET: 3 OF 4

D-3

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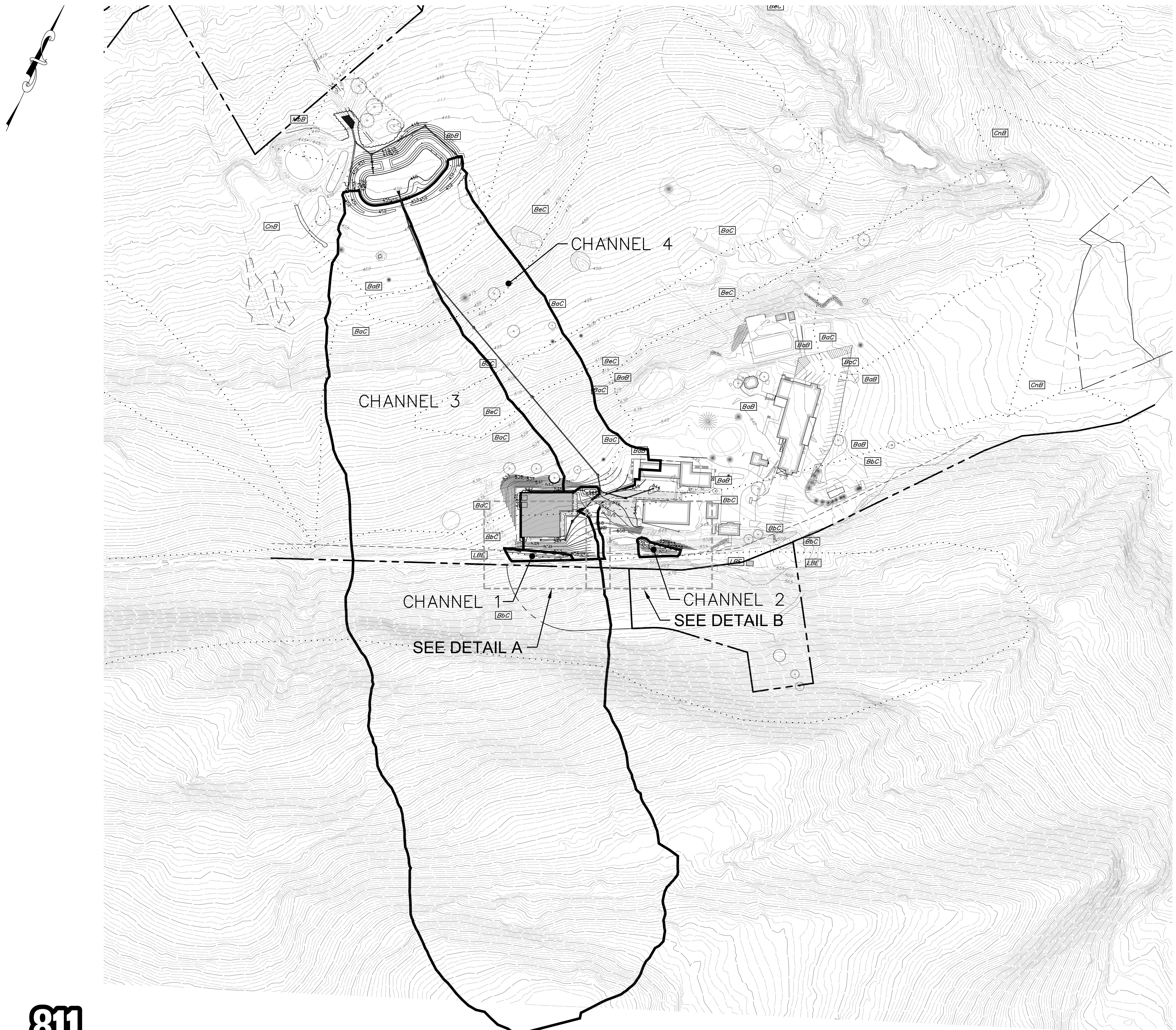
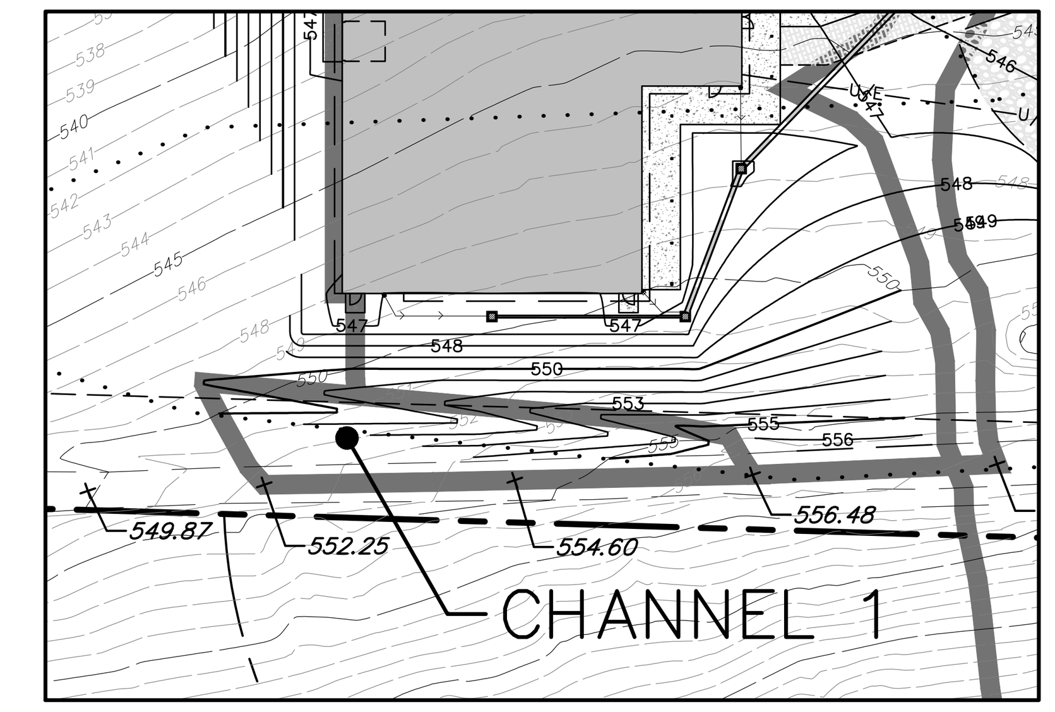
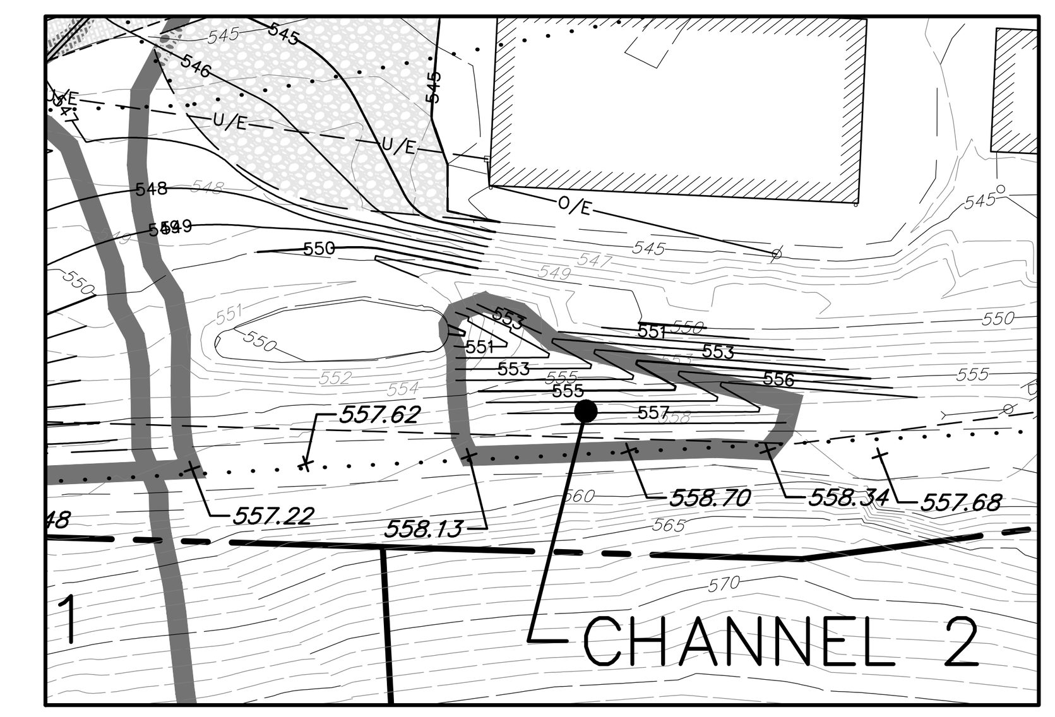




DETAIL A
SCALE: 1"=50'



DETAIL B
SCALE: 1"=50'

SOIL CLASSIFICATIONS

BaB	BATH CHANNERY SILT LOAM – HSG C 3 TO 8 PERCENT SLOPES
BaC	BATH CHANNERY SILT LOAM – HSG C 8 TO 15 PERCENT SLOPES
BbB	BATH CHANNERY SILT LOAM – HSG C 0 TO 8 PERCENT SLOPES, EXTREMELY STONY
BbC	BATH CHANNERY SILT LOAM – HSG C 8 TO 25 PERCENT SLOPES, EXTREMELY STONY
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LBE	LACKAWANNA AND BATH SOILS – HSG D STEEP, RUBBLY
MbB	MARDIN VERY STONY SILT LOAM – HSG D 0 TO 8 PERCENT SLOPES

CHANNEL DRAINAGE LEGEND

(line)	CHANNEL DRAINAGE BOUNDARY
CHANNEL 1	DRAINAGE SUBAREA

0 100' 200' 300'
SCALE: 1"=100'

Know what's **below.**
Call before you dig.
SITE SERIAL #20240651009

REVISIONS	DATE	BY
1. TOWNSHIP COMMENTS	11/25/24	TAL

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
JAMES PETER KELLEY
No. 41844-E

BARRY ISETT & associates INC
MULTI-DISCIPLINE ENGINEERS AND CONSULTANTS
272.200.2050
barryisett.com
525 Main Street, Suite 200
Stroudsburg, PA 18360

POST DEVELOPMENT CHANNEL DRAINAGE PLAN

WATER GAP WELLNESS RECREATION CENTER
WATER GAP ACQUISITIONS PARTNERS, LLC
SMITHFIELD TOWNSHIP
MONROE COUNTY, PA

DATE: 8/26/2024	DSGN: TAL/DFG
SCALE: 1"=40'	CHK: CRS
DRAWN: TAL	APPRD: JPK
JOB: 1022419.004	P MGR: JPK

SHEET: 4 OF 4

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