MICRO
STORMWATER
DRAINAGE STUDY

LAKE POINTE LODGE

PARKVILLE, MISSOURI

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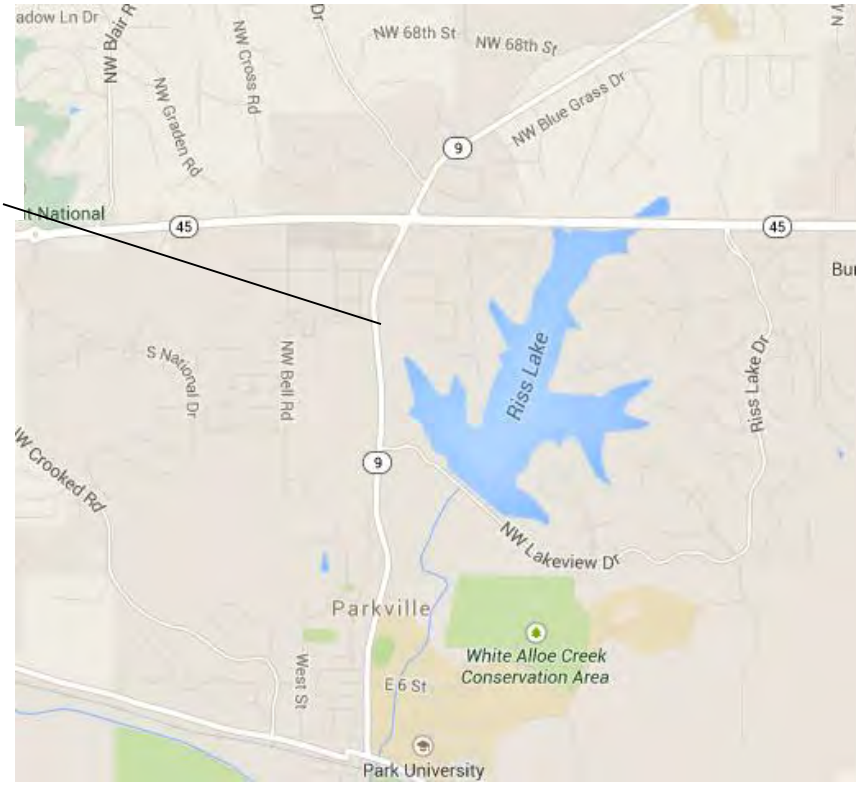
Project Location



March 6, 2015
OA #: 014-3121

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GENERAL INFORMATION

This micro stormwater management study is being submitted on behalf of Kevin Green Homes for the proposed improvements in Parkville, Missouri.

Project Location and Description

The proposed site lies within the Northeast ¼ of Section 26, Township 51 North, Range 34 West, in Platte County, Parkville, Missouri and includes approximately 4.66 acres. The site is located on the east side of Missouri Highway 9 and south of 62nd Street (See Appendix A for Site Maps).

Study Purpose

The purpose of this study is to explain that the proposed improvements for Lake Point Lodge Apartment Development are in conformance with the City of Parkville Ordinances and Procedures. This document adopts the Standard Specifications and Design Criteria, "Division V – Design Criteria, Section 5600 - Storm Drainage Systems and Facilities" of the American Public Works Association, Kansas City Metropolitan Chapter (APWA) adopted February 16, 2011 and the Mid-America Regional Council, Manual of Best Management Practices for Stormwater Quality October 2012, referred to hereafter as "2012 MARC BMP Manual". This study will analyze the post-development peak stormwater discharges from the site to ensure there are no adverse impacts on downstream receiving stormwater systems or properties and discuss best management practices to improve storm water quality. The study will also review existing flood plain information.

FEMA Flood Classification

Some portion of this site is located within the floodplain according to FIRM Map 29165C0383D (see FEMA Firmette, Appendix B).

Soils Descriptions

Soil classifications were obtained from the Natural Resource Conservation Service's website by utilizing the Web Soil Survey feature. The site soil composition and classification can be viewed in the chart below. These soil properties are not expected to change as a result of development, except as described later in this report, and are shown in Table 1.

Table 1: Soil Classifications

Soil Description	Hydrologic Soil Group
Knox silt clay loam	B
Knox-Urban land complex	C
Snead-Rock outcrop complex	D

A more detailed printout from the online Web Soil Survey is included in Appendix B.

METHODOLOGY

General Criteria and References

This report was prepared in accordance with the provisions of the "STORM WATER MANAGEMENT PLAN-PROCEDURES, FORMAT AND GUIDELINES-PART I - DRAINAGE STUDY", dated June 17, 2002 and revised April 8, 2010. The analytical and design criteria used in the study conform to those of "Division V - *Section 5600 – Storm Drainage Systems and Facilities*" of the Kansas City Metropolitan Chapter of the American Public Works Association's *"Standard Specifications and Design Criteria"* dated February 2006 and all supplements thereto. Based on these criteria, allowable overall discharge from the development will be based on limiting 100-year (1%) and 10-year (10%) post development peak discharges to no more than existing peak discharges for each respective storm. Pre and post development flows from the apartment site are shown below and were evaluated using Hydraflow for the 10 and 100-year storm events. Existing and proposed hydrographs were calculated using the 24-hour SCS Type II rainfall distribution. Existing times of concentration were determined using Hydraflow.

HYDROLOGIC/HYDRAULIC ANALYSES

Existing Conditions Analysis

The existing site consists of a 4.66 acre property located on the southeast corner of the intersection of 62nd St and MO highway 9. The site is composed of mostly undeveloped woods with driveways to a home and a sewer lift station. Current drainage patterns go from west to east to a ravine on the east side of the site that flows south.

A composite curve number of 75 was generated for the site by referencing the Web Soil Survey available in Appendix C, APWA Section 5600 and considering the following factors:

- Existing impervious area
- Existing pervious area
- Hydrologic soil group

The following tables summarize the pre-development composite curve number generation.

Table 2: Pre-Development Curve Number Analysis

Cover Description	Soil HSG	CN	Area (ac.)	Product of CN x Area
Woods (Fair)	D	79	2.84	224.36
Woods-grass (Fair)	D	82	0.38	31.16
Woods-grass (Fair)	B	65	0.44	28.60
Woods (Fair)	B	60	0.83	49.80
Woods-grass (Fair)	C	76	0.17	12.92
Composite	**-**	**74**	**4.66**	**346.84**

An analysis on the Pre-development site was conducted using Hydraflow and implemented the composite curve number and rainfall information and distribution acquired from APWA section 5600. Pre-development flows are summarized in the following table. Detailed reports from Hydraflow are available in Appendix C.

Table 3a: Pre-Development Peak Flows

Outfall	Total Tributary Area (AC)	Q (10-Year Storm) (cfs)	Q (100-Year Storm) (cfs)
Outfall 1	4.66	16.90	34.30

Table 3b: Pre-Development Volumes

Outfall	Total Tributary Area (AC)	V (10-Year Storm) (in)	V (100-Year Storm) (in)
Outfall 1	4.66	1.04	2.13

Proposed Conditions Analysis

The proposed site is 4.66 acres and will consist of a multi-family apartment building, clubhouse and parking. Approximately half the site will remain wooded area. The developed portion of the site will direct runoff to pervious pavement and a level spreader for stormwater treatment. Excess runoff will be directed to a proposed storm system, and then discharge into a ditch on the east side of the site (See Figure 2 in Appendix A for proposed conditions).

A post-development composite curve number was generated using the same methodology implemented during the pre-development curve number analysis. The following table summarizes the post-development composite curve number generation.

Table 4 Post Development Curve Number Analysis

Cover Description	Soil HSG	CN	Area (ac.)	Product of CN x Area
Parking Lot and Buildings	D	98	1.61	155.82
Open space (turf), good	C	74	0.61	44.4
Woods-grass (Fair)	D	82	0.07	55.76
Woods (Fair)	D	79	1.86	199.08
Open space (turf), good	D	80	0.51	40.8
Composite	**-**	**86**	**4.66**	**400**

An analysis of the Post-development site was conducted using Hydraflow, the composite curve number, rainfall information and distribution acquired from APWA section 5600. Post-development flows to the outfall are summarized in the following table. Detailed reports from Hydraflow are available in Appendix C.

Table 5a: Post Development Peak Flows

Outfall	Total Tributary Area (AC)	Q (10-Year Storm) (cfs)	Q (100-Year Storm) (cfs)
Outfall 1	4.66	16.76	34.31

Table 5b: Post Development Volumes

Outfall	Total Tributary Area (AC)	V (10-Year Storm) (in)	V (100-Year Storm) (in)
Outfall 1	4.66	1.49	2.70

STORMWATER TREATMENT REQUIREMENTS

Detention

The proposed infiltration trench and pervious pavement sections will be designed to provide stormwater detention, reducing the overall proposed runoff from the site.

BMP Analysis

This site will require a level of service (LOS) of 7 per worksheet 1A (See Appendix C). In order to meet this LOS runoff will be diverted to native vegetation, pervious pavement or an infiltration trench.

As shown in worksheet 2, the BMP package for this project meets the level of service required for the site.

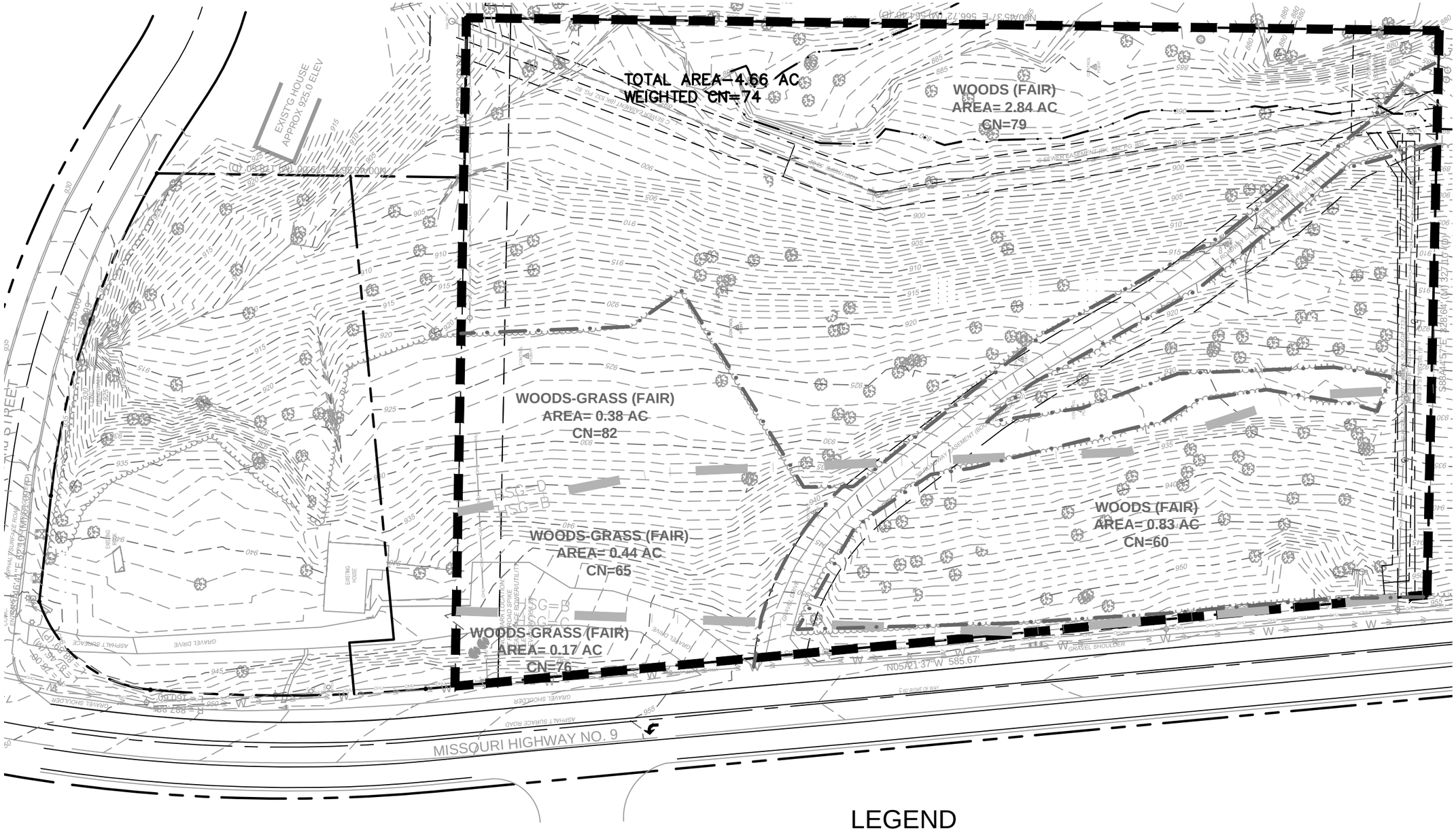
CONCLUSIONS AND RECOMMENDATIONS

Drainage patterns on the site remain relatively unchanged and detention is provided to reduce the peak flow from the site. A comprehensive package of Best Management Practices has been designed to be implemented with construction to ensure storm water quality is maintained or improved. Based on these facts and other information provided herein, we request that this micro stormwater study be approved. If you have any questions or comments or need additional information, please do not hesitate to contact us at (816) 361-1177

OLSSON ASSOCIATES

Appendix A

Maps



LEGEND

- PROPERTY LINE
- 100YR FLOODPLAIN LIMITS
- HYDRAULIC SOIL GROUP
- EXISTING DRAIN BOUNDARY
- TREE LINE
- W — W EXISTING WATER
- SS EXISTING SANITARY
- OHW EXISTING OVERHEAD WIRES

N

0' 30' 60' 120'

SCALE IN FEET

OLSSON ASSOCIATES

OLSSON ASSOCIATES - CIVIL ENGINEERING

REV. NO.	DATE	REVISIONS DESCRIPTION

FIGURE 1
EXISTING CONDITIONS

PARKVILLE APARTMENTS
STORMWATER STUDY

drawn by:
checked by:
approved by:
project no.:
drawing no.: 143121

SHEET
FIG1

DWG: F:\PROJECTS\014-3121\Documents\Reports\Storm Report\Appendices\143121_Figures.dwg USER: bfreeman
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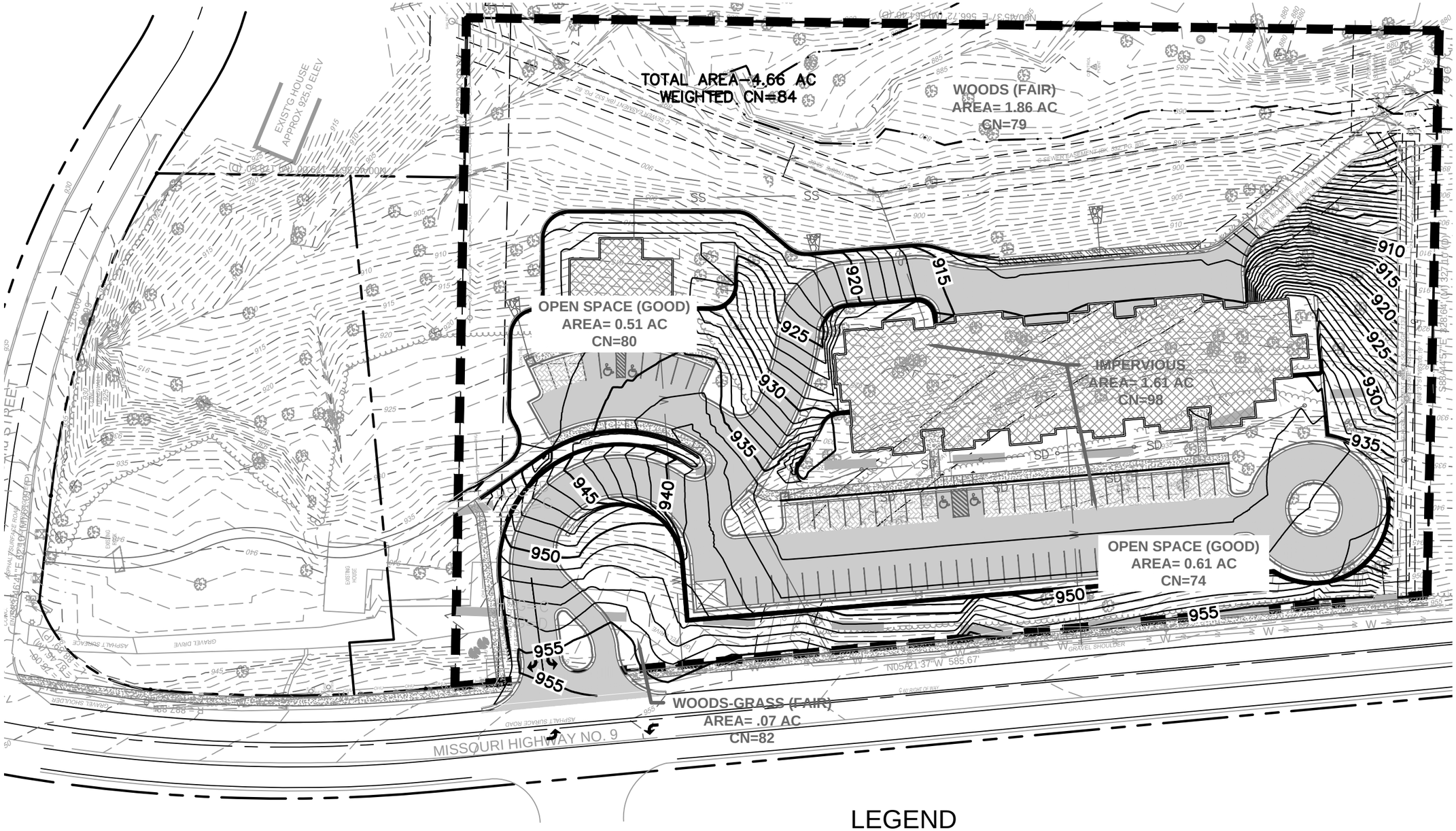

LEGEND

- PROPERTY LINE
- 100YR FLOODPLAIN LIMITS
- HYDRAULIC SOIL GROUP
- EXISTING DRAIN BOUNDARY
- TREE LINE
- W — W — EXISTING WATER
- SS — EXISTING SANITARY
- OHW — EXISTING OVERHEAD WIRES

N

0' 30' 60' 120'

SCALE IN FEET

OLSSON ASSOCIATE

OLSSON ASSOCIATES - CIVIL ENGINEERING

REV. NO.	DATE	REVISIONS DESCRIPTION

FIGURE 2
PROPOSED CONDITIONS

PARKVILLE APARTMENTS
STORMWATER STUDY

drawn by:
checked by:
approved by:
project no.:
drawing no.: 143121

SHEET
FIG2

DWG: F:\PROJECTS\014-3121\Documents\Reports\Storm Report\Appendices\143121_Figures.dwg USER: bfreeman
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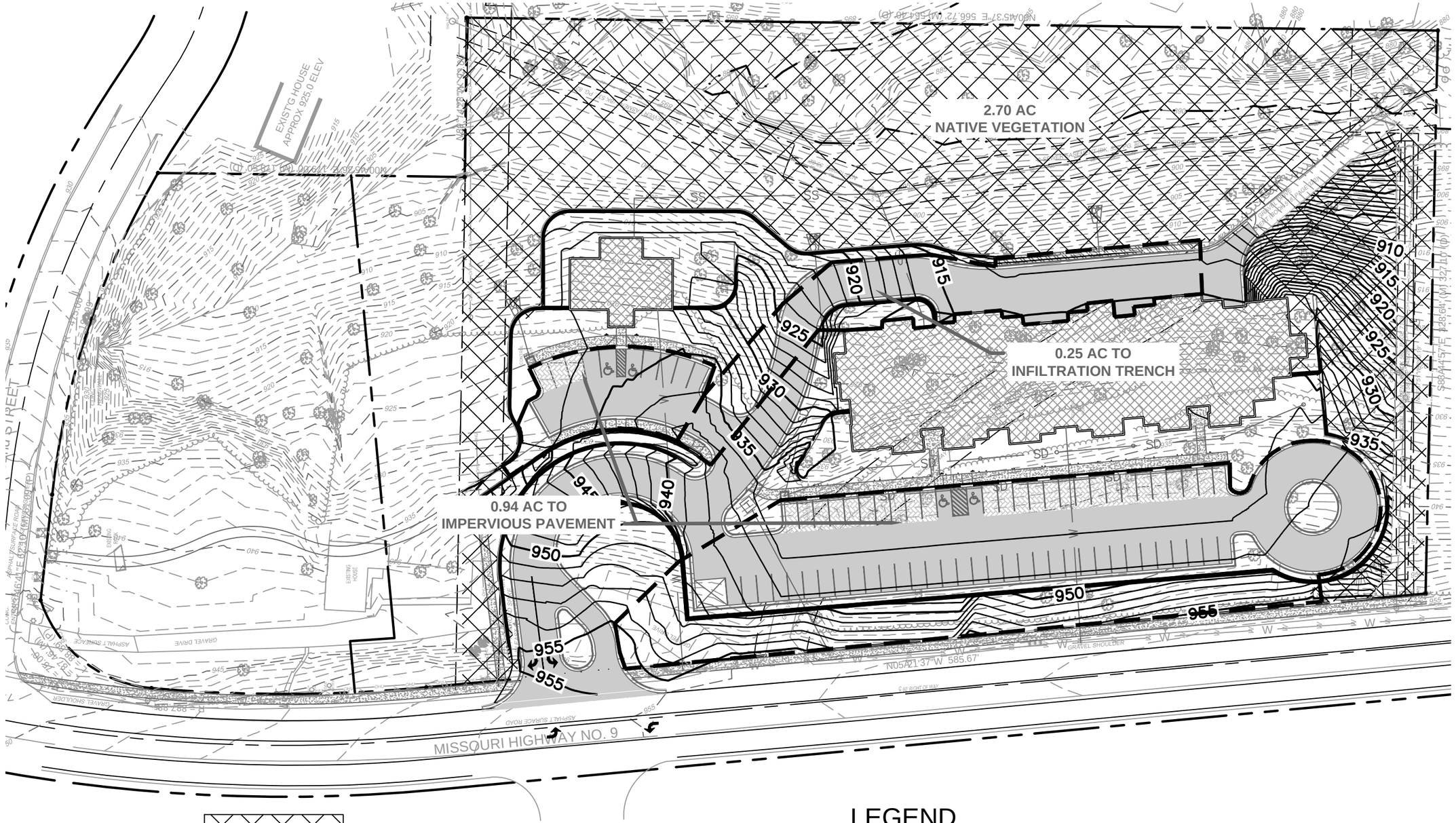

LEGEND

- NATIVE VEGETATION BMP
- PERVIOUS PAVEMENT BMP
- INFILTRATION TRENCH BMP
- PROPERTY LINE
- 100YR FLOODPLAIN LIMITS
- HYDRAULIC SOIL GROUP
- BMP DRAIN BOUNDARY
- TREE LINE
- W — EXISTING WATER
- SS — EXISTING SANITARY
- OHW — EXISTING OVERHEAD WIRES

N

0' 30' 60' 120'
SCALE IN FEET

OLSSON ASSOCIATE
OLSSON ASSOCIATES - CIVIL ENGINEERING

REV. NO.	DATE	REVISIONS DESCRIPTION

FIGURE 3
BMP

PARKVILLE APARTMENTS
STORMWATER STUDY

drawn by:
checked by:
approved by:
project no.:
drawing no.: 143121

SHEET
FIG3

DWG: F:\PROJECTS\014-3121\Documents\Reports\Storm Report\Appendices\143121_Figures.dwg USER: bfreeman
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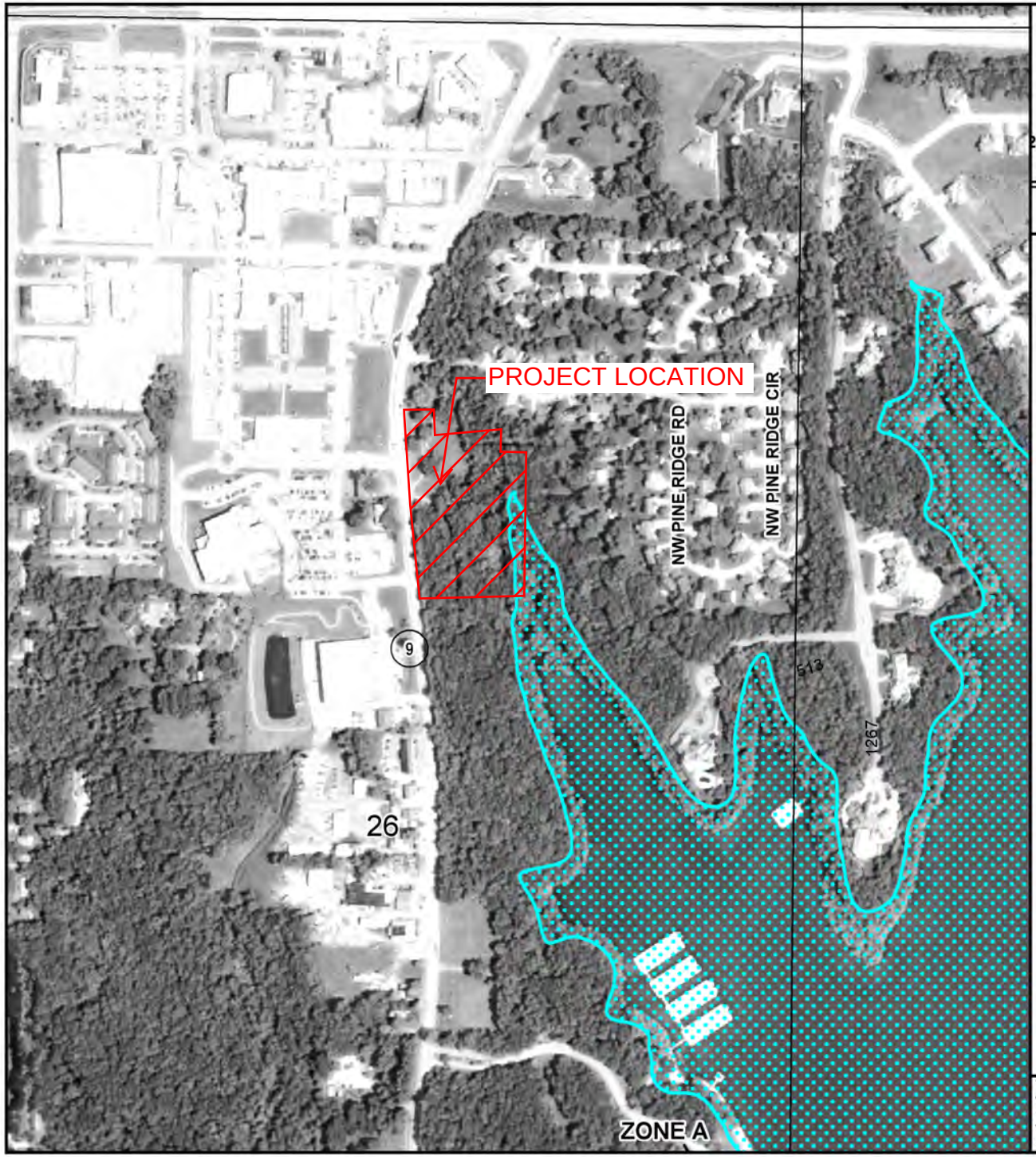
Appendix B

FEMA Flood Classification Firmette/Soils Report



MAP SCALE 1" = 500'

250 0 500 1000 FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0383D

FIRM

FLOOD INSURANCE RATE MAP

PLATTE COUNTY, MISSOURI

AND INCORPORATED AREAS

PANEL 383 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PARKVILLE, CITY OF	290294	0383	D
PLATTE COUNTY	290475	0383	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
29165C0383D

EFFECTIVE DATE
APRIL 2, 2015

Federal Emergency Management Agency

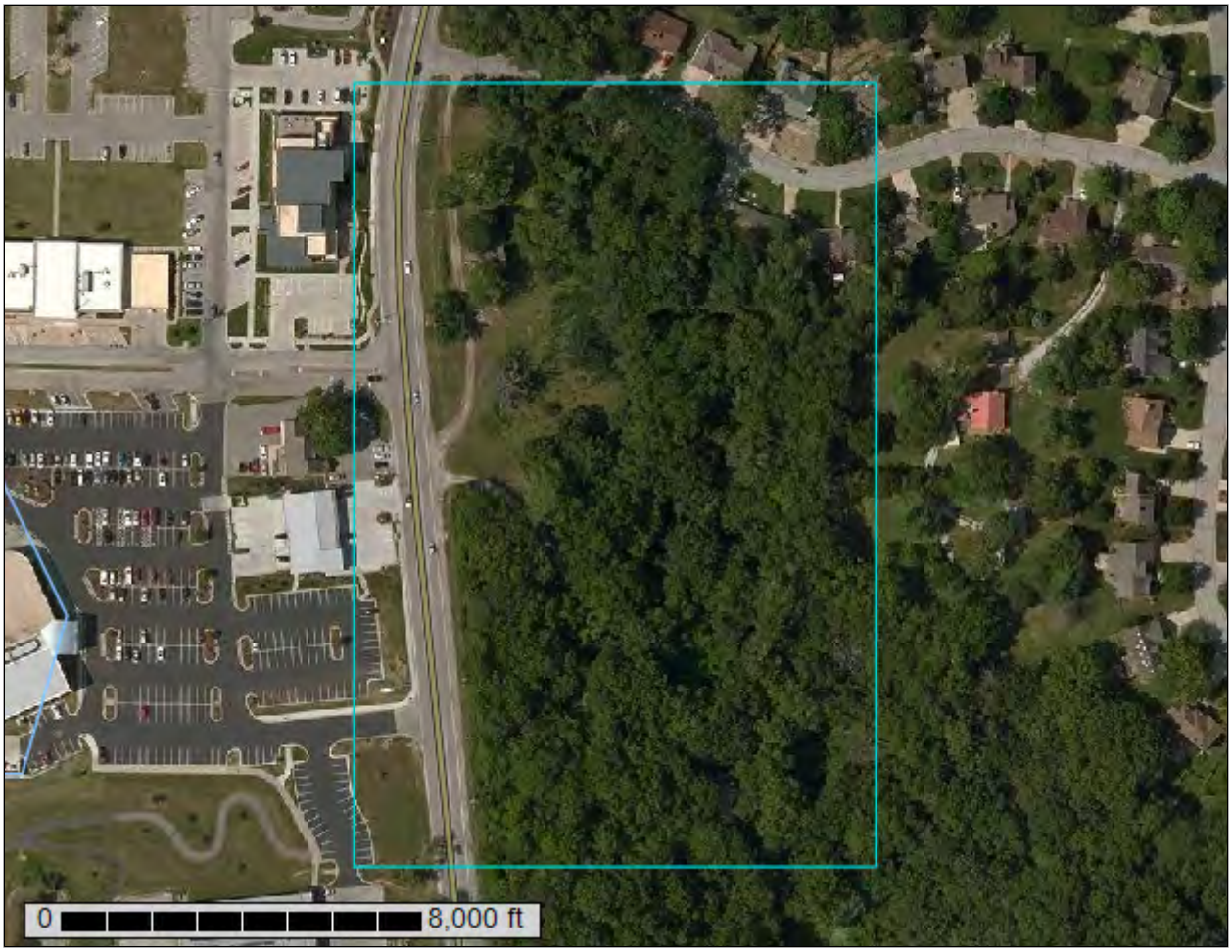
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

United States Department of Agriculture

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 Platte County, Missouri



January 28, 2015

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 (http://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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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.

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,550 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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: Platte County, Missouri
Survey Area Data: Version 13, Aug 5, 2014

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

Date(s) aerial images were photographed: Jul 23, 2014—Sep 7, 2014

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

Platte County, Missouri (MO165)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
10059	Knox silty clay loam, 14 to 20 percent slopes, severely eroded	1.9	16.6%
10064	Knox-Urban land complex, 14 to 20 percent slopes	2.2	19.4%
10066	Knox-Urban land complex, 5 to 9 percent slopes	1.4	12.5%
10141	Snead-Rock outcrop complex, 14 to 30 percent slopes	6.0	51.5%
Totals for Area of Interest		**11.6**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

Platte County, Missouri

10059—Knox silty clay loam, 14 to 20 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: 2qkyq
Elevation: 700 to 1,000 feet
Mean annual precipitation: 33 to 41 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 177 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Knox and similar soils: 95 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Knox

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess

Typical profile

Ap - 0 to 6 inches: silty clay loam
Bt - 6 to 32 inches: silty clay loam
C - 32 to 60 inches: silt loam

Properties and qualities

Slope: 14 to 20 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Deep loess exposed backslope savanna (R107BY003MO), Quercus alba-quercus velutina/rhus aromatica/bromus pubescens-helianthus hirsutus (F107BY004MO)
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)

10064—Knox-Urban land complex, 14 to 20 percent slopes

Map Unit Setting

National map unit symbol: 2qkyv
Elevation: 700 to 1,000 feet
Mean annual precipitation: 33 to 41 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 177 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Knox and similar soils: 70 percent
Urban land: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Knox

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess

Typical profile

Ap - 0 to 6 inches: silt loam
Bt - 6 to 46 inches: silty clay loam
C - 46 to 80 inches: silt loam

Properties and qualities

Slope: 14 to 20 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Deep loess exposed backslope savanna (R107BY003MO), Quercus alba-quercus velutina/rhus aromatica/bromus pubescens-helianthus hirsutus (F107BY004MO)
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)

Description of Urban Land

Setting

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

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

10066—Knox-Urban land complex, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2qkyx
Elevation: 700 to 1,000 feet
Mean annual precipitation: 33 to 41 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 177 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Knox and similar soils: 65 percent
Urban land: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Knox

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess

Typical profile

Ap - 0 to 6 inches: silt loam
Bt - 6 to 46 inches: silty clay loam
C - 46 to 80 inches: silt loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Deep loess upland prairie (R107BY002MO)
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)

Description of Urban Land

Setting
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

10141—Snead-Rock outcrop complex, 14 to 30 percent slopes

Map Unit Setting
National map unit symbol: 2ql0p
Elevation: 600 to 1,100 feet
Mean annual precipitation: 33 to 41 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 177 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition
Snead and similar soils: 70 percent
Rock outcrop: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Snead

Setting
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from calcareous shale

Typical profile
Ap - 0 to 3 inches: silty clay loam
Bw - 3 to 24 inches: silty clay

Cr - 24 to 80 inches: bedrock

Properties and qualities

Slope: 14 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Moderately well 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 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Shale backslope savanna (R109XY012MO)
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)

Description of Rock Outcrop

Typical profile

R - 0 to 80 inches: bedrock

Properties and qualities

Slope: 14 to 30 percent
Depth to restrictive feature: 0 inches to lithic bedrock
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)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

Minor Components

Sampsel

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Concave
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Physical Properties

Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

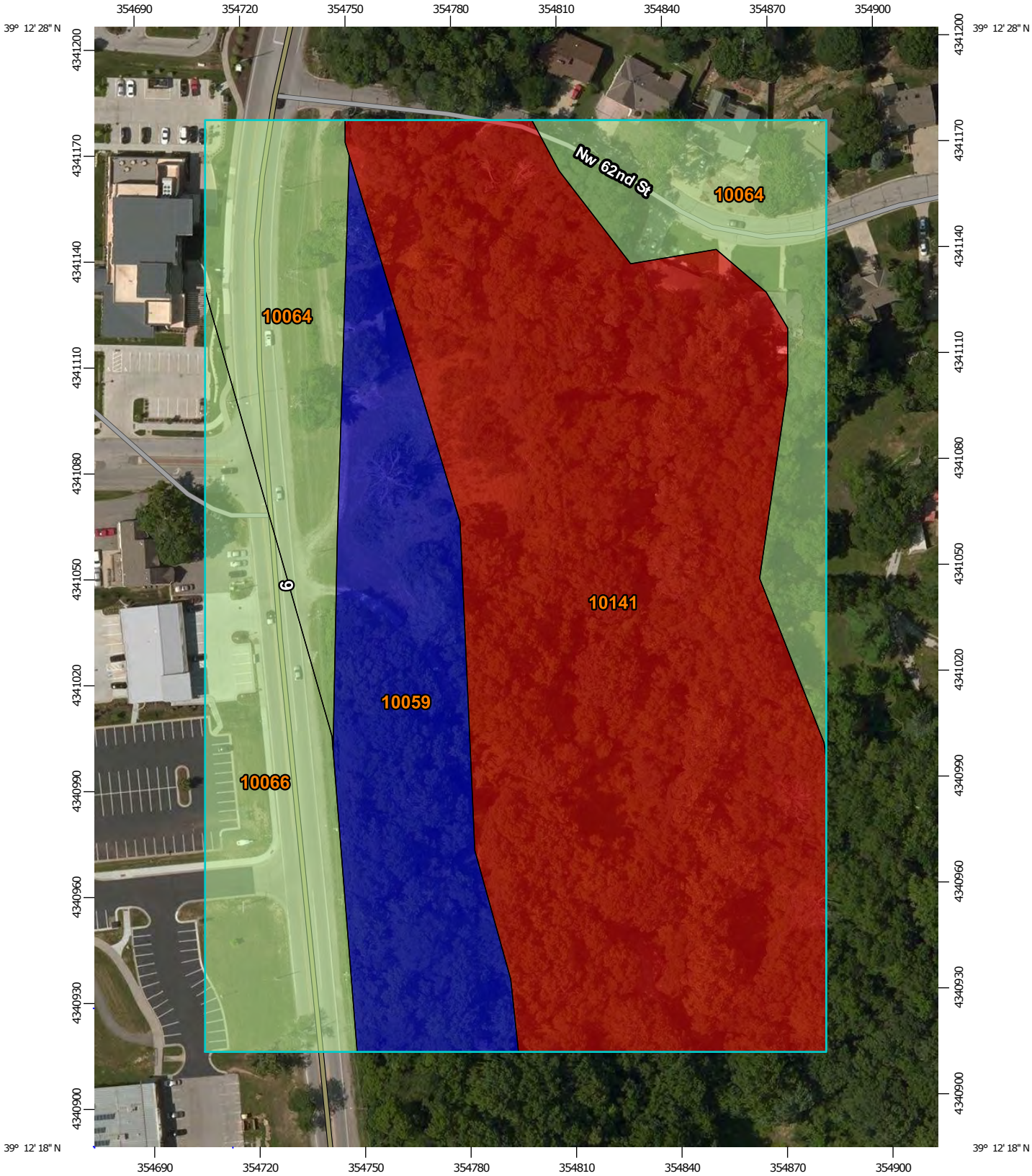
Saturated Hydraulic Conductivity (Ksat) (KSAT)

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Map—Saturated Hydraulic Conductivity (Ksat) (KSAT)



Map Scale: 1:1,550 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

<= 1.0000

> 1.0000 and <= 3.3632

> 3.3632 and <= 9.0000

Not rated or not available

Soil Rating Lines

<= 1.0000

> 1.0000 and <= 3.3632

> 3.3632 and <= 9.0000

Not rated or not available

Soil Rating Points

<= 1.0000

> 1.0000 and <= 3.3632

> 3.3632 and <= 9.0000

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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: Platte County, Missouri
Survey Area Data: Version 13, Aug 5, 2014

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

Date(s) aerial images were photographed: Jul 23, 2014—Sep 7, 2014

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.

Table—Saturated Hydraulic Conductivity (Ksat) (KSAT)

Saturated Hydraulic Conductivity (Ksat)— Summary by Map Unit — Platte County, Missouri (MO165)				
Map unit symbol	**Map unit name**	**Rating (micrometers per second)**	**Acres in AOI**	**Percent of AOI**
10059	Knox silty clay loam, 14 to 20 percent slopes, severely eroded	9.0000	1.9	16.6%
10064	Knox-Urban land complex, 14 to 20 percent slopes	3.3632	2.2	19.4%
10066	Knox-Urban land complex, 5 to 9 percent slopes	3.3632	1.4	12.5%
10141	Snead-Rock outcrop complex, 14 to 30 percent slopes	1.0000	6.0	51.5%
Totals for Area of Interest			**11.6**	**100.0%**

Rating Options—Saturated Hydraulic Conductivity (Ksat) (KSAT)

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

Top Depth: 3

Bottom Depth: 48

Units of Measure: Inches

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group (HSG)

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

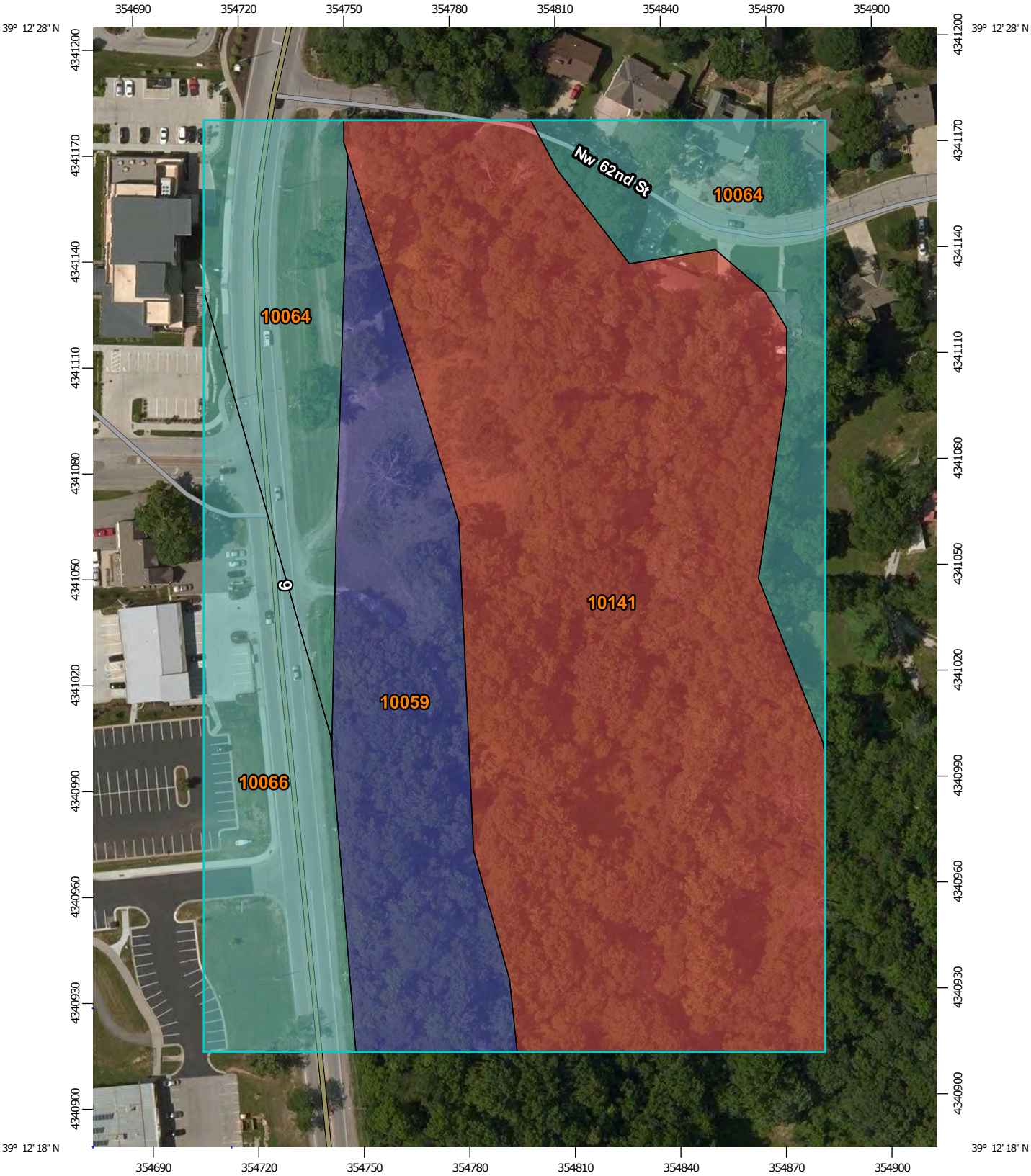
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group (HSG)



Map Scale: 1:1,550 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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: Platte County, Missouri
Survey Area Data: Version 13, Aug 5, 2014

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

Date(s) aerial images were photographed: Jul 23, 2014—Sep 7, 2014

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.

Table—Hydrologic Soil Group (HSG)

Hydrologic Soil Group— Summary by Map Unit — Platte County, Missouri (MO165)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
10059	Knox silty clay loam, 14 to 20 percent slopes, severely eroded	B	1.9	16.6%
10064	Knox-Urban land complex, 14 to 20 percent slopes	C	2.2	19.4%
10066	Knox-Urban land complex, 5 to 9 percent slopes	C	1.4	12.5%
10141	Snead-Rock outcrop complex, 14 to 30 percent slopes	D	6.0	51.5%
Totals for Area of Interest			**11.6**	**100.0%**

Rating Options—Hydrologic Soil Group (HSG)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Appendix C

Supporting Information & Calculations

OLSSON ASSOCIATES

3/2/2015

WORKSHEET 1: REQUIRED LEVEL OF SERVICE - UNDEVELOPED SITE

Project :	NSPJ Parkville Apartments		
Location:	Parkville, Missouri		
By:	BAF	Date:	3.02.2015
Checked:		Date:	

1. Runoff Curve Number

A. Predevelopment CN

Cover Description	Soil HSG	CN	Area (ac.)	Product of CN x Area
Woods (Fair)	D	79	2.84	224.36
Woods-grass (Fair)	D	82	0.38	31.16
Woods-grass (Fair)	B	65	0.44	28.6
Woods (Fair)	B	60	0.83	49.8
Woods-grass (Fair)	C	76	0.17	12.92
				0
		Totals:	4.66	346.84

Area-Weighted CN = total product/total area = 74.429185 **74**

B. Postdevelopment CN

Cover Description	Soil HSG	CN	Area (ac.)	Product of CN x Area
Parking Lot	D	98	1.61	157.78
Open space (turf), good	D	80	0.61	48.8
Woods-grass (Fair)	D	82	0.07	5.74
Woods (Fair)	D	79	1.86	146.94
Open space (turf), good	D	80	0.51	40.8
		Totals:	4.66	400

Area-Weighted CN = total product/total area = 85.849785 **86**

C. Level of Service (LS) Calculation

Predevelopment CN:	74
Postdevelopment CN:	86
Difference:	12
LS Required:	7

Change in CN	LS
17+	8
7 to 16	7
4 to 6	6
1 to 3	5
0	4
-7 to -1	3
-8 to -17	2
-18 to -21	1
-22 -	0

3/2/2015

WORKSHEET 2: DEVELOP MITIGATION PACKAGE(S) THAT MEET THE REQUIRED LS

Project : NSPJ Parkville Apartments
Location: Parkville, Missouri
By: JJK — Date: 3.02.2015
Checked: — Date:

1. Required LS (from Table 1 or 1A or Worksheet 1 or 1A, as appropriate): 7

2. Proposed BMP Option Package No. 1

Plan ID	BMP #	Cover/BMP Description	Treatment Area	VR from Table 5 or 6	Product of VR x Area
	1	Native Vegetation	2.70	9.25	25
	2	Porous Asphalt	0.94	7.50	7
	3	Infiltration Trench	0.25	9.00	2
	4		0.00	0.00	0
	5		0.00	0.00	0
	6		0.00	0.00	0
	7		0.00	0.00	0
	8	Untreated	0.77	0.00	0
		Total:	**4.66**	**Total:**	**34**
				Weighted VR	**7.4**
				Points Left	-1.655

Meets required LS (Yes/No)? YES (if No, or if additional options are being tested, proceed below)

3. Proposed BMP Option Package No. 2

Plan ID	BMP #	Cover/BMP Description	Treatment Area	VR from Table 5 or 6	Product of VR x Area
	1		0.00	0.00	0
	2		0.00	0.00	0
	3		0.00	0.00	0
	4		0.00	0.00	0
	5		0.00	0.00	0
	6		0.00	0.00	0
	7		0.00	0.00	0
	8		0.00	0.00	0
		Total:	**0.00**	**Total:**	**0**

Meets required LS (Yes/No)? NO (if No, or if additional options are being tested, proceed below)

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HYDRO.gpw

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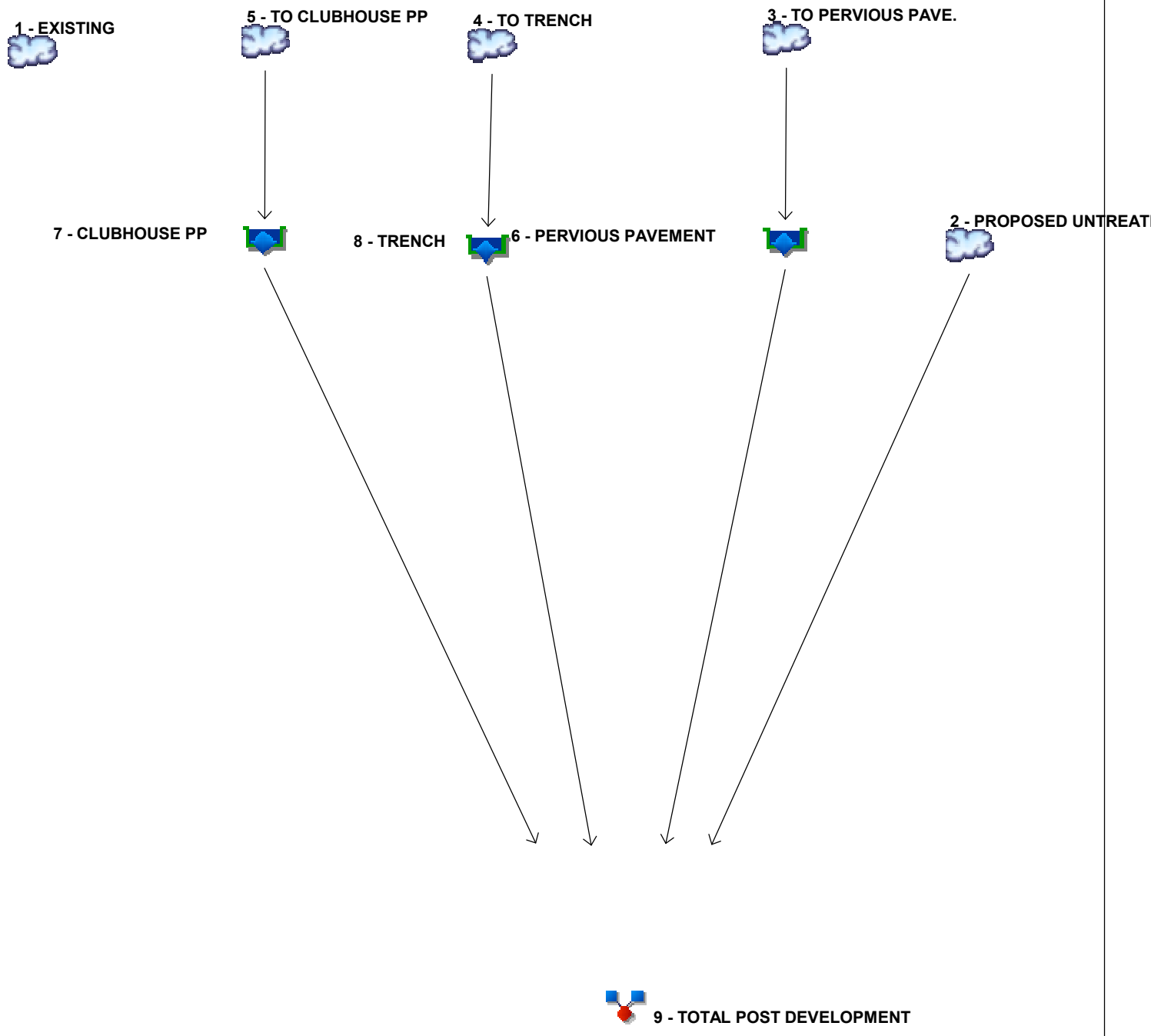
Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4



Legend

Hyd.	Origin	Description
1	SCS Runoff	EXISTING
2	SCS Runoff	PROPOSED UNTREATED
3	SCS Runoff	TO PERVIOUS PAVE.
4	SCS Runoff	TO TRENCH
5	SCS Runoff	TO CLUBHOUSE PP
6	Reservoir	PERVIOUS PAVEMENT
7	Reservoir	CLUBHOUSE PP
8	Reservoir	TRENCH
9	Combine	TOTAL POST DEVELOPMENT

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	-------	-------	-------	16.90	-------	-------	34.30	EXISTING
2	SCS Runoff	------	-------	-------	-------	-------	13.04	-------	-------	24.17	PROPOSED UNTREATED
3	SCS Runoff	------	-------	-------	-------	-------	6.475	-------	-------	10.98	TO PERVIOUS PAVE.
4	SCS Runoff	------	-------	-------	-------	-------	4.926	-------	-------	7.928	TO TRENCH
5	SCS Runoff	------	-------	-------	-------	-------	1.702	-------	-------	2.780	TO CLUBHOUSE PP
6	Reservoir	3	-------	-------	-------	-------	0.729	-------	-------	4.530	PERVIOUS PAVEMENT
7	Reservoir	5	-------	-------	-------	-------	0.755	-------	-------	0.862	CLUBHOUSE PP
8	Reservoir	4	-------	-------	-------	-------	2.272	-------	-------	6.988	TRENCH
9	Combine	2, 6, 7, 8	-------	-------	-------	-------	16.76	-------	-------	34.31	TOTAL POST DEVELOPMENT

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	16.90	1	722	45,457	------	------	------	EXISTING
2	SCS Runoff	13.04	1	722	35,296	------	------	------	PROPOSED UNTREATED
3	SCS Runoff	6.475	1	717	14,002	------	------	------	TO PERVIOUS PAVE.
4	SCS Runoff	4.926	1	717	11,711	------	------	------	TO TRENCH
5	SCS Runoff	1.702	1	717	3,873	------	------	------	TO CLUBHOUSE PP
6	Reservoir	0.729	1	737	13,987	3	933.31	6,237	PERVIOUS PAVEMENT
7	Reservoir	0.755	1	723	3,870	5	936.30	807	CLUBHOUSE PP
8	Reservoir	2.272	1	723	11,709	4	911.46	2,418	TRENCH
9	Combine	16.76	1	722	64,861	2, 6, 7, 8	------	------	TOTAL POST DEVELOPMENT

Hydrograph Report

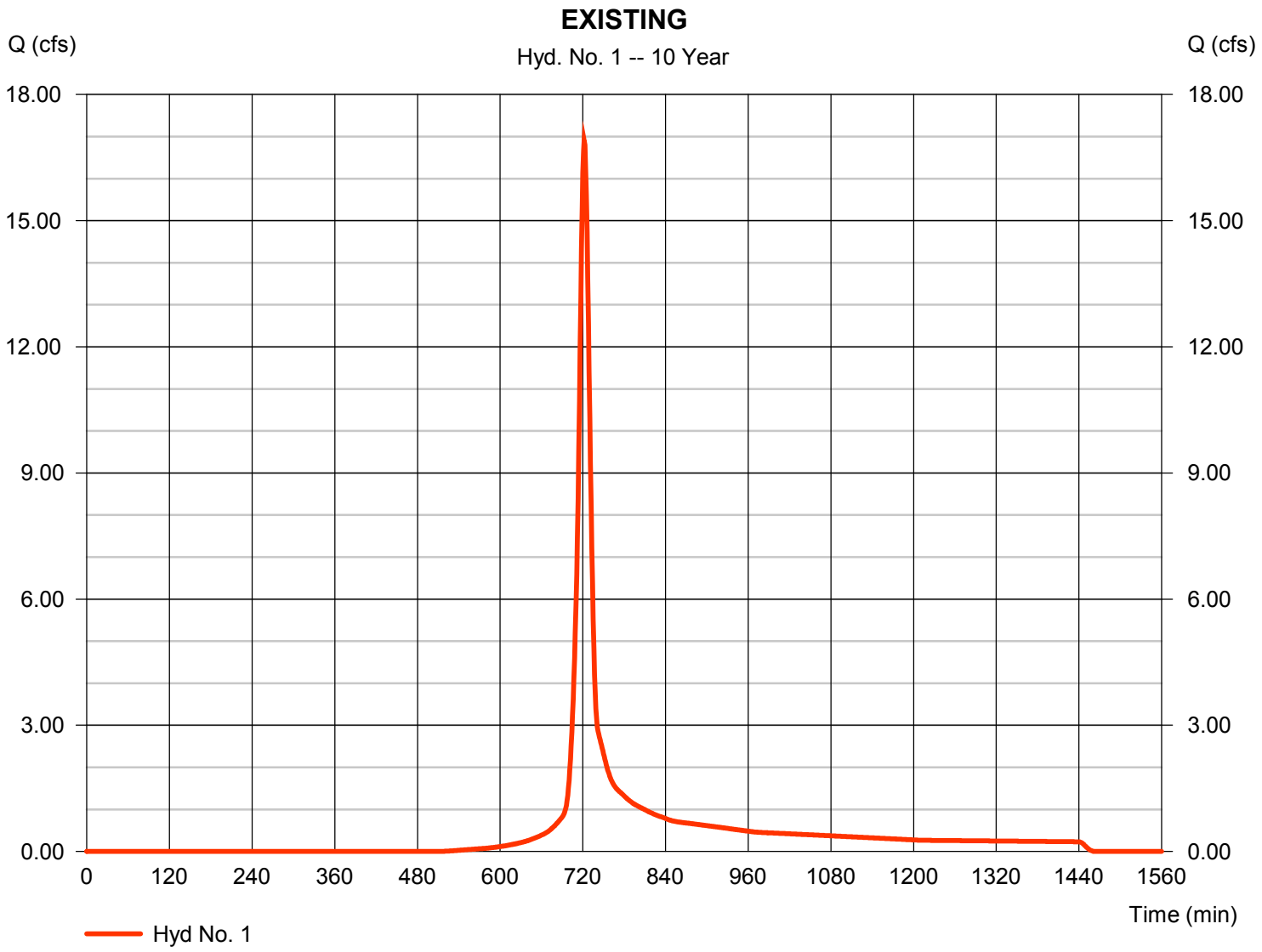
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 1

EXISTING

Hydrograph type	= SCS Runoff	Peak discharge	= 16.90 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 45,457 cuft
Drainage area	= 4.660 ac	Curve number	= 74*
Basin Slope	= 25.0 %	Hydraulic length	= 375 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 5.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (2.840 x 79) + (0.378 x 82) + (0.170 x 76) + (0.440 x 65) + (0.830 x 60)] / 4.660



Hydrograph Report

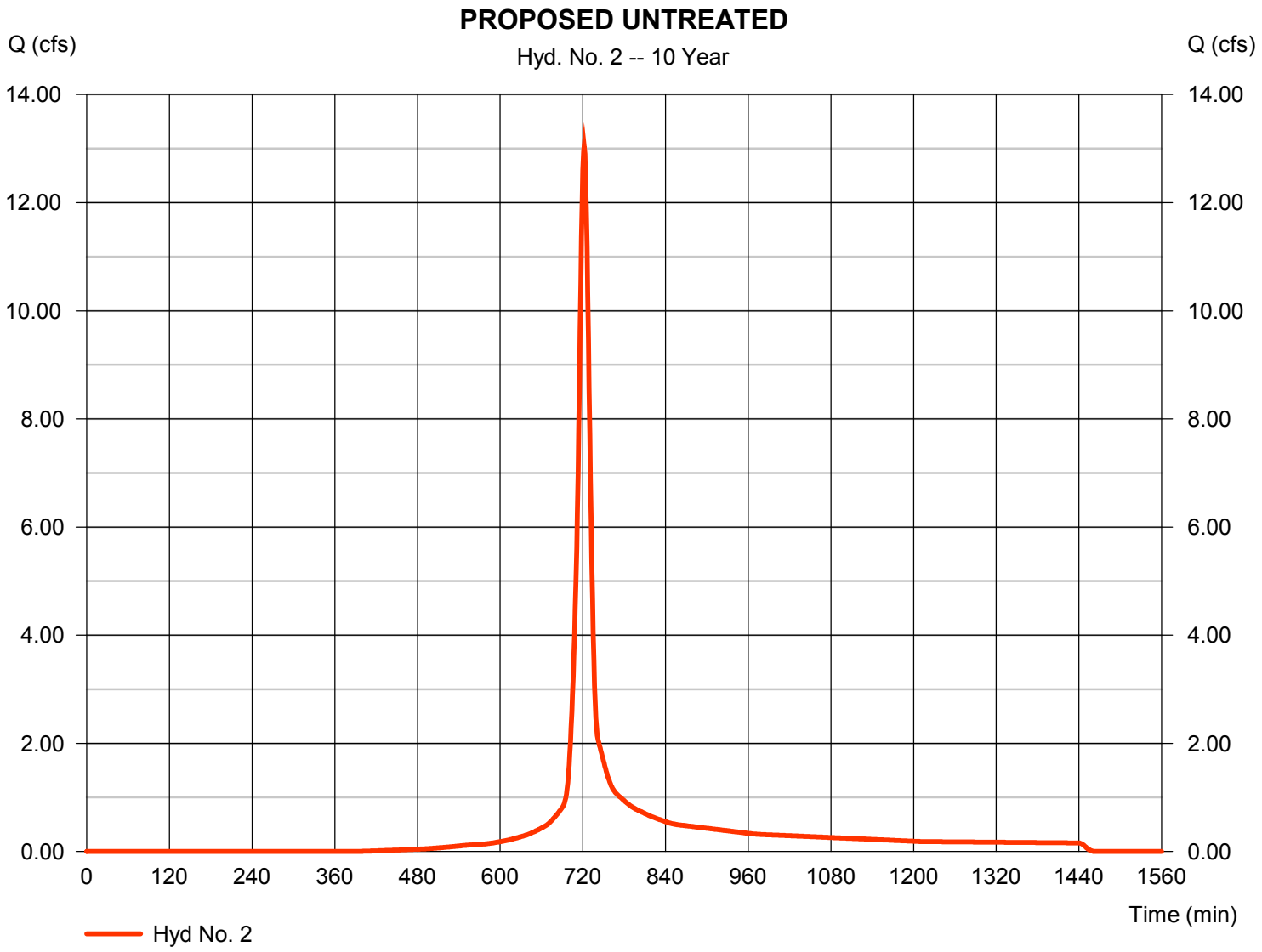
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 2

PROPOSED UNTREATED

Hydrograph type	= SCS Runoff	Peak discharge	= 13.04 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 35,296 cuft
Drainage area	= 2.910 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 5.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.290 x 98) + (0.400 x 80) + (0.060 x 82) + (1.860 x 79) + (0.300 x 74)] / 2.910



Hydrograph Report

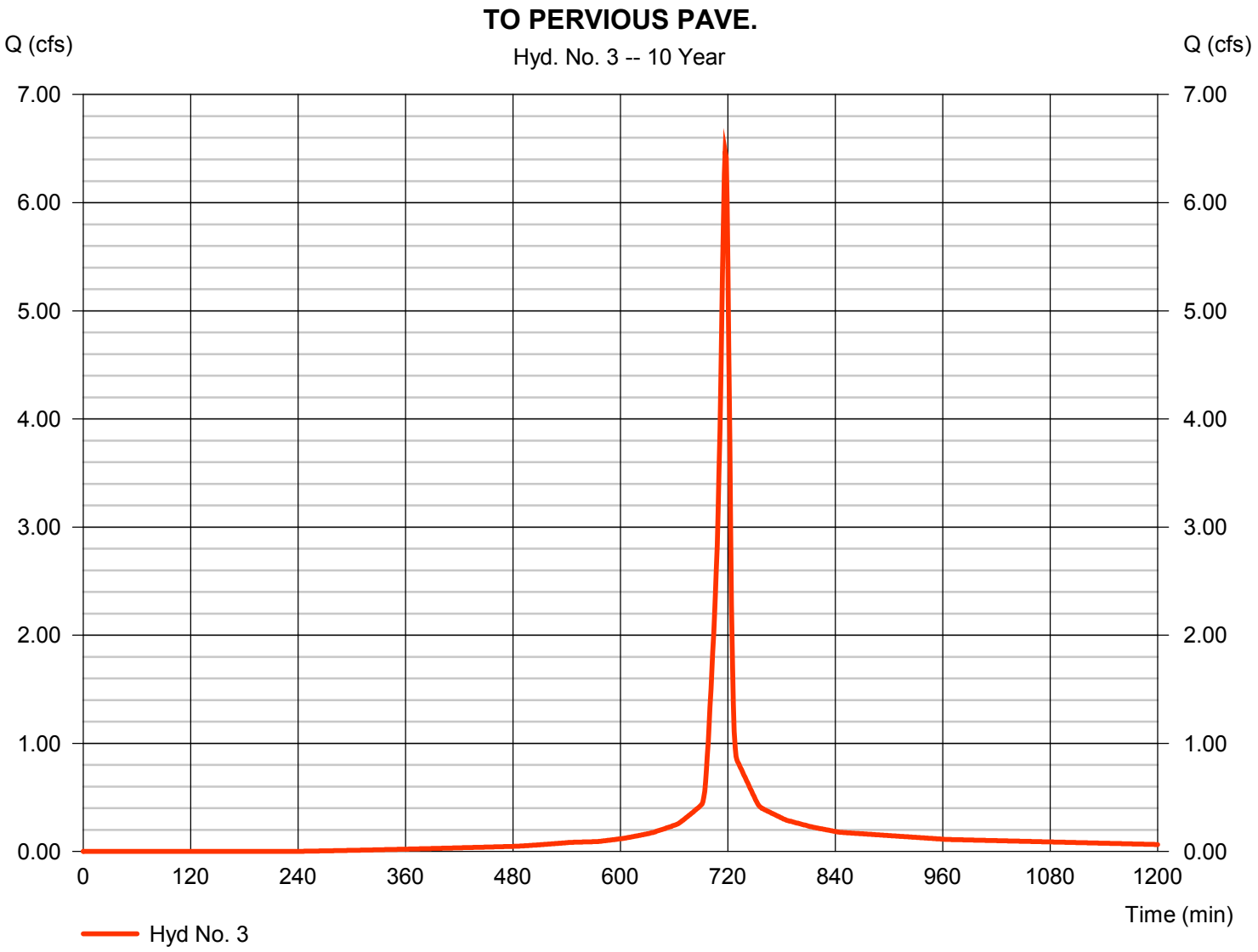
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 3

TO PERVIOUS PAVE.

Hydrograph type	= SCS Runoff	Peak discharge	= 6.475 cfs
Storm frequency	= 10 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 14,002 cuft
Drainage area	= 0.900 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.550 x 98) + (0.040 x 80) + (0.310 x 74)] / 0.900



Hydrograph Report

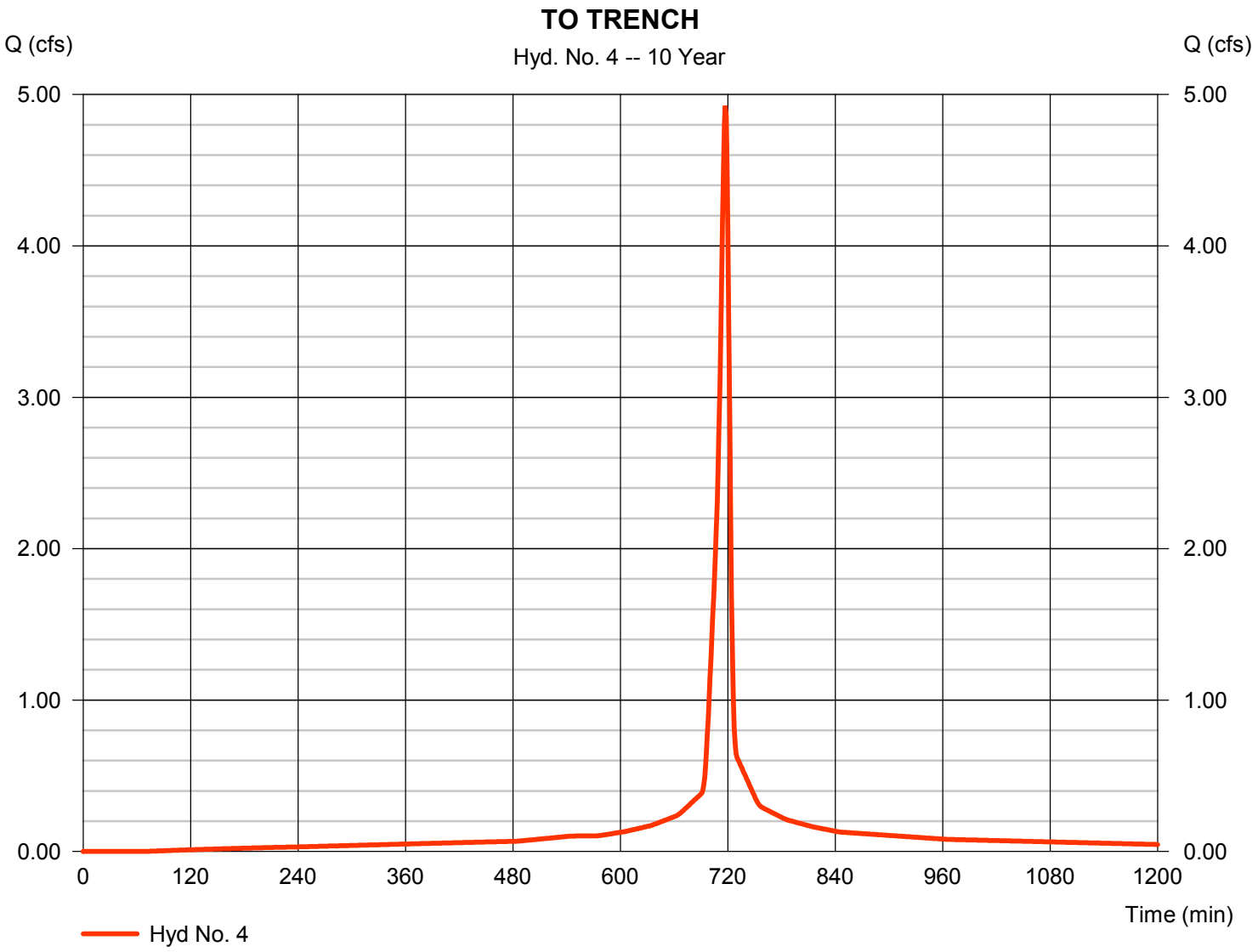
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 4

TO TRENCH

Hydrograph type	= SCS Runoff	Peak discharge	= 4.926 cfs
Storm frequency	= 10 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 11,711 cuft
Drainage area	= 0.620 ac	Curve number	= 97*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.600 x 98) + (0.020 x 80)] / 0.620



Hydrograph Report

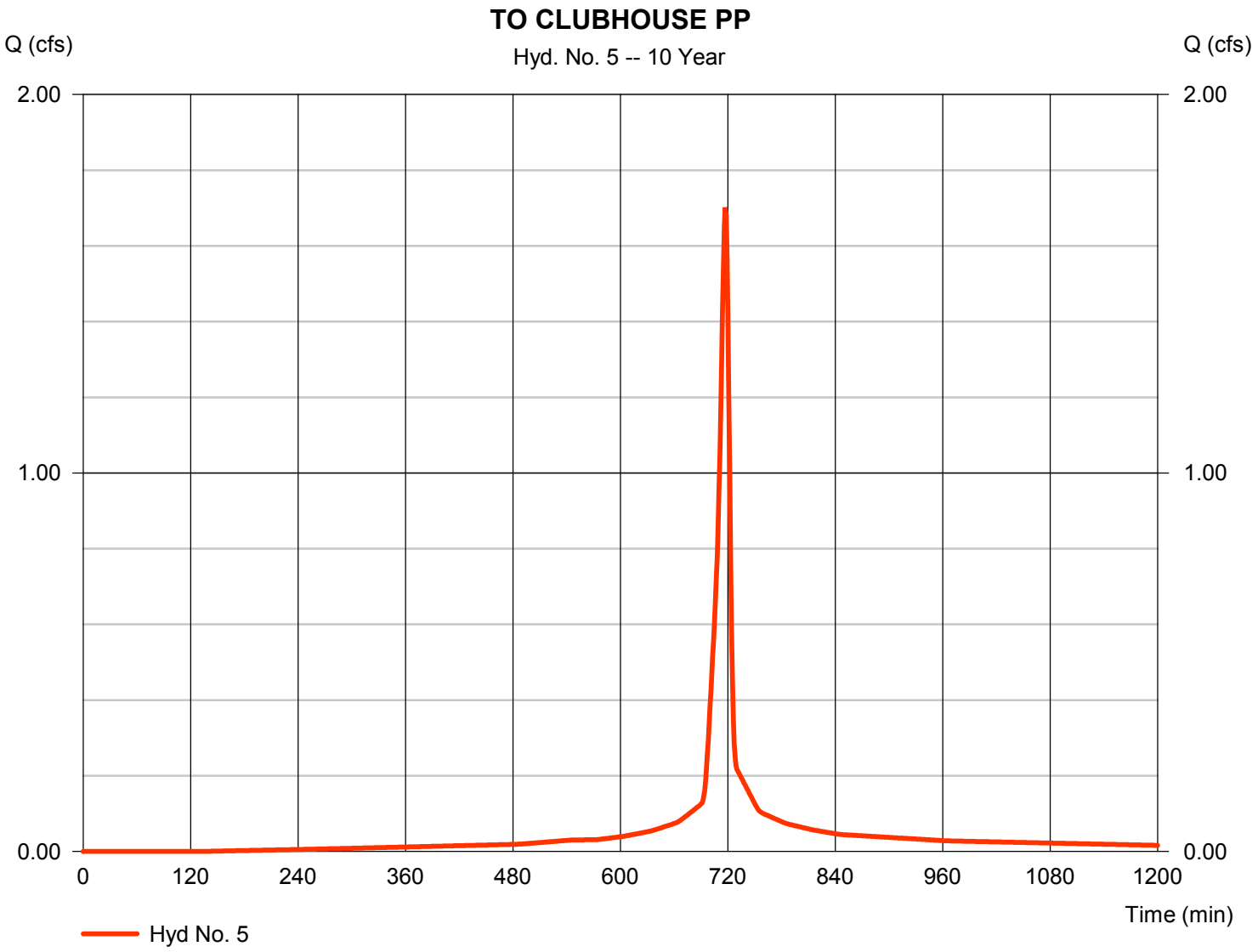
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 5

TO CLUBHOUSE PP

Hydrograph type	= SCS Runoff	Peak discharge	= 1.702 cfs
Storm frequency	= 10 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 3,873 cuft
Drainage area	= 0.220 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.170 x 98) + (0.050 x 80)] / 0.220



Hydrograph Report

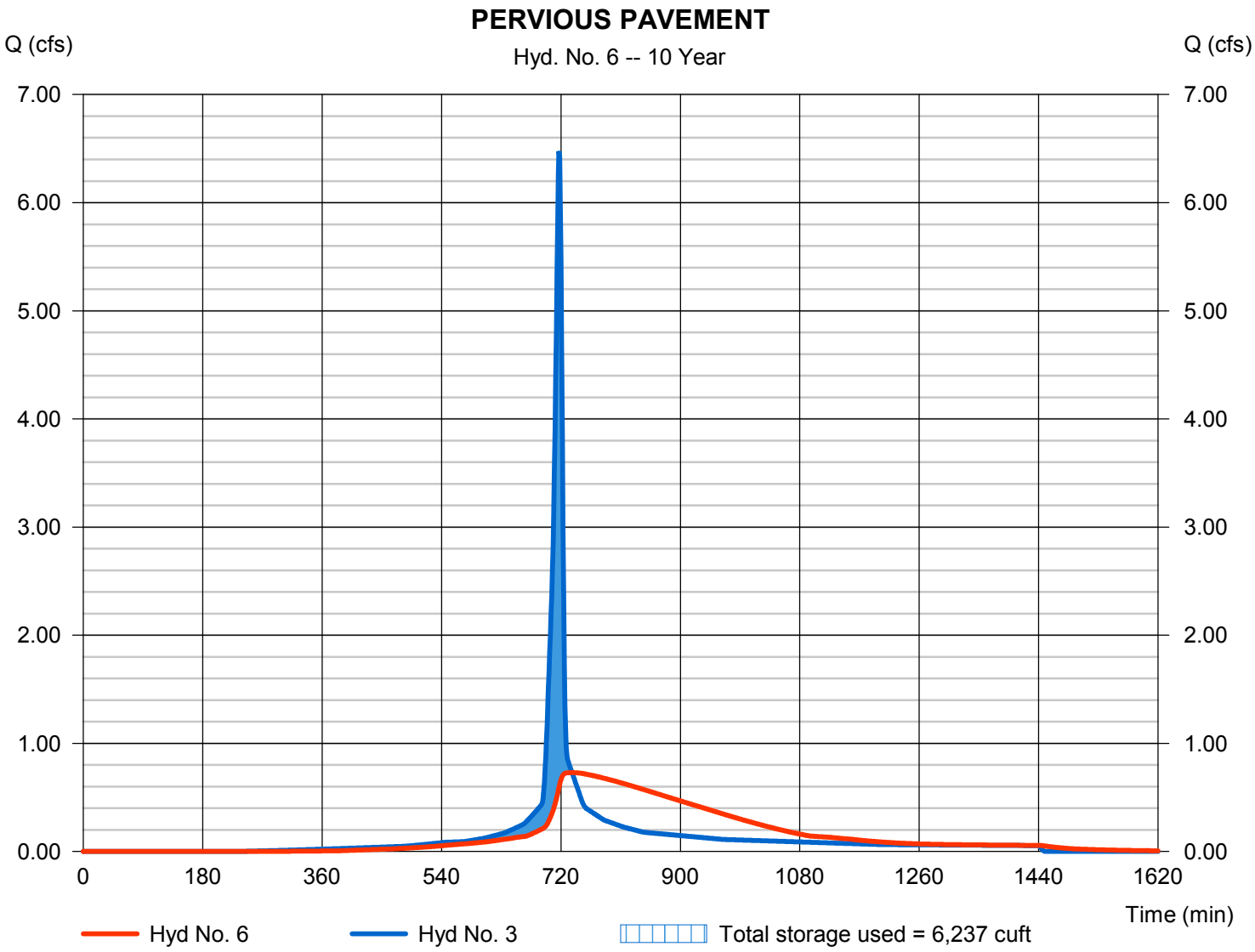
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 6

PERVIOUS PAVEMENT

Hydrograph type	= Reservoir	Peak discharge	= 0.729 cfs
Storm frequency	= 10 yrs	Time to peak	= 737 min
Time interval	= 1 min	Hyd. volume	= 13,987 cuft
Inflow hyd. No.	= 3 - TO PERVIOUS PAVE.	Max. Elevation	= 933.31 ft
Reservoir name	= PERVIOUS PAVEMENT	Max. Storage	= 6,237 cuft

Storage Indication method used.



Hydrograph Report

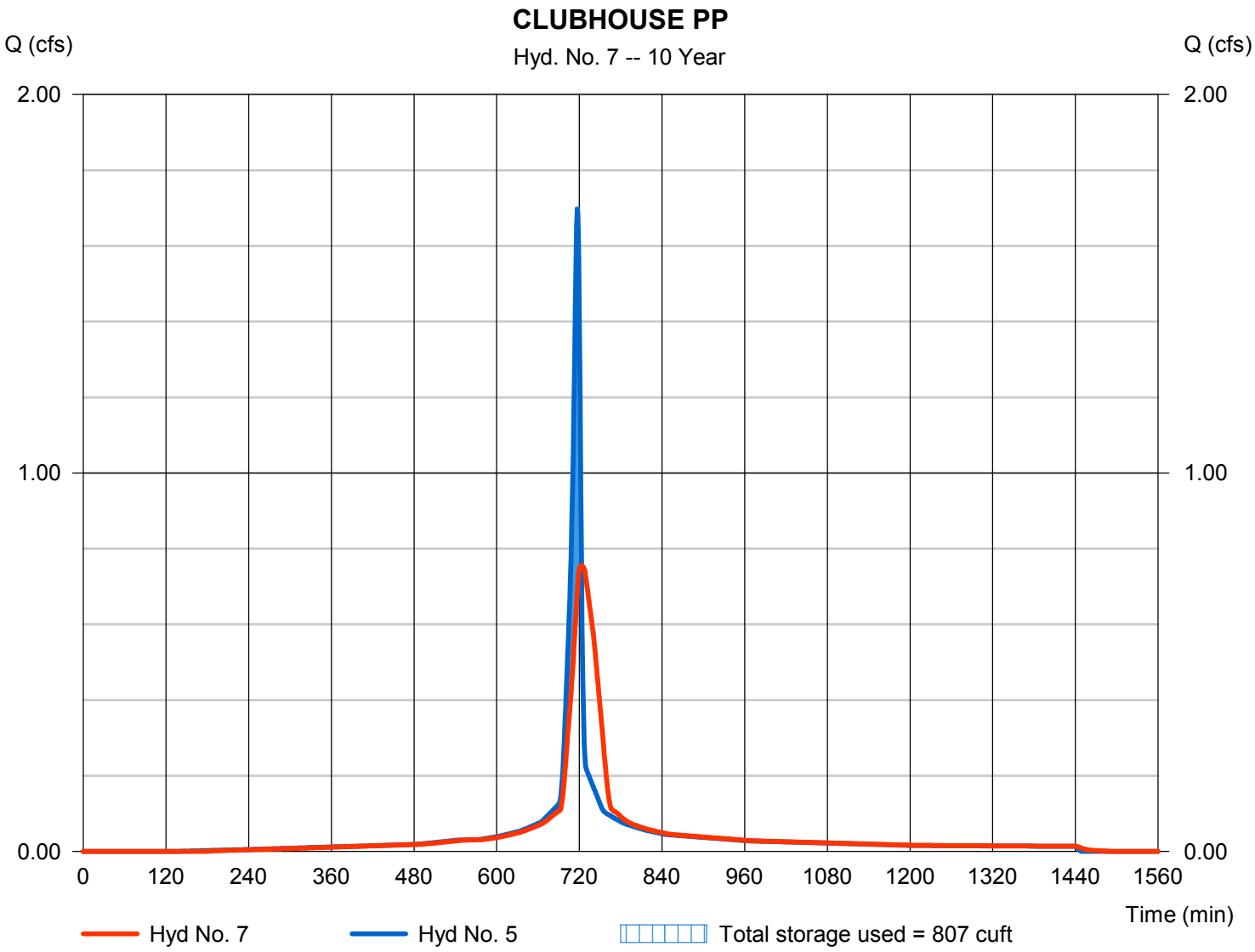
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 7

CLUBHOUSE PP

Hydrograph type	= Reservoir	Peak discharge	= 0.755 cfs
Storm frequency	= 10 yrs	Time to peak	= 723 min
Time interval	= 1 min	Hyd. volume	= 3,870 cuft
Inflow hyd. No.	= 5 - TO CLUBHOUSE PP	Max. Elevation	= 936.30 ft
Reservoir name	= CLUBHOUSE PP	Max. Storage	= 807 cuft

Storage Indication method used.



Hydrograph Report

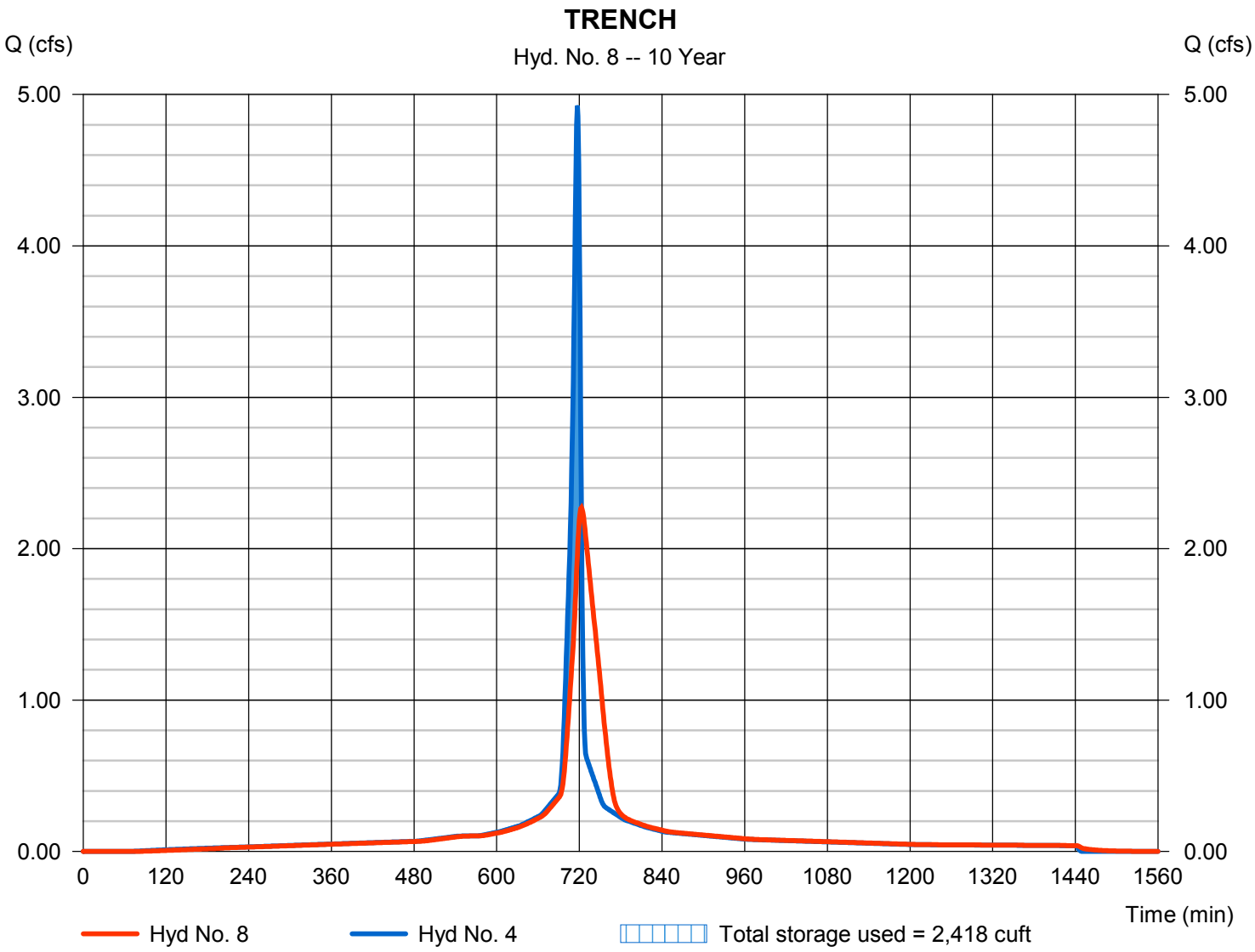
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 8

TRENCH

Hydrograph type	= Reservoir	Peak discharge	= 2.272 cfs
Storm frequency	= 10 yrs	Time to peak	= 723 min
Time interval	= 1 min	Hyd. volume	= 11,709 cuft
Inflow hyd. No.	= 4 - TO TRENCH	Max. Elevation	= 911.46 ft
Reservoir name	= TRENCH 2	Max. Storage	= 2,418 cuft

Storage Indication method used.



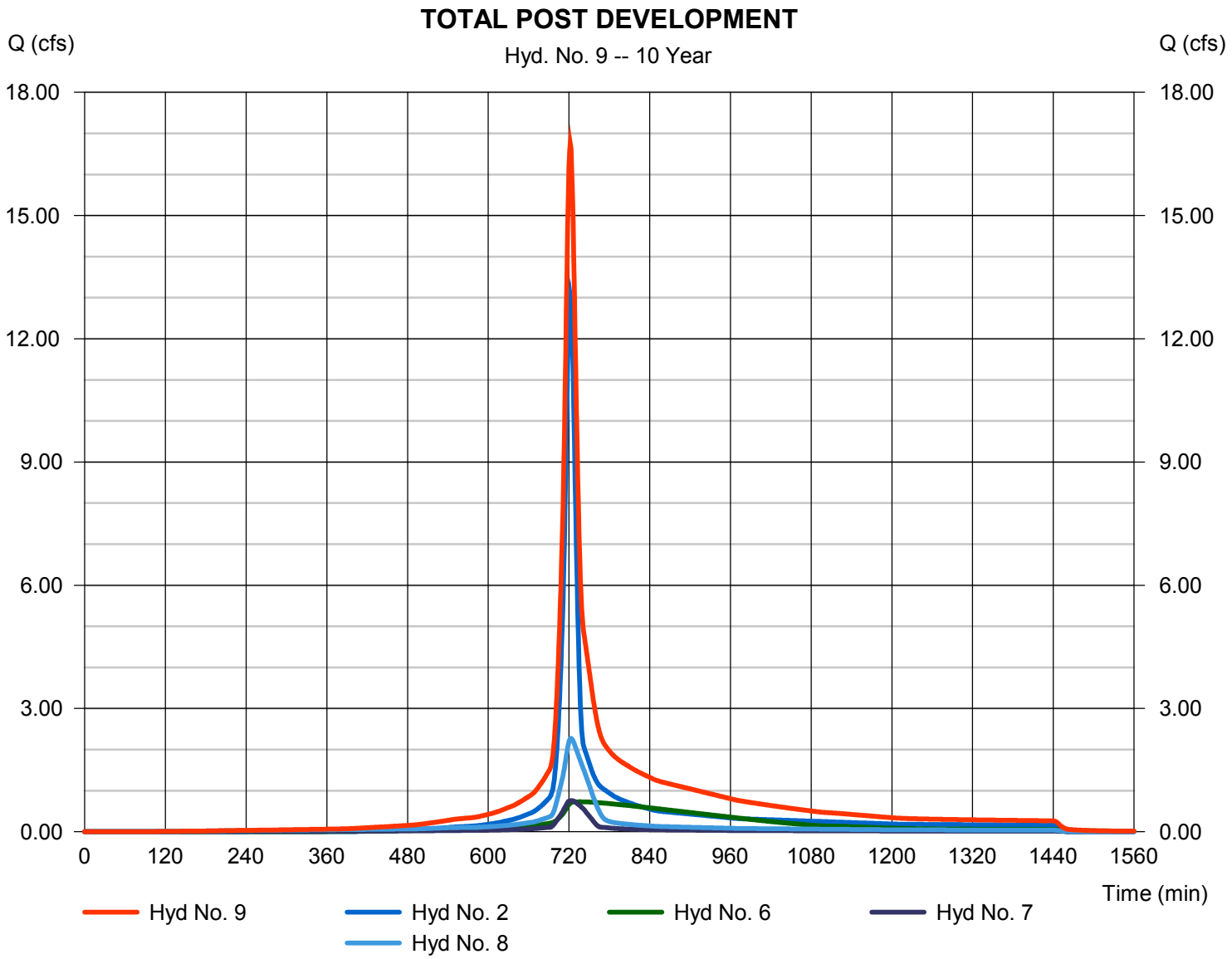
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 9

TOTAL POST DEVELOPMENT

Hydrograph type	= Combine	Peak discharge	= 16.76 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 64,861 cuft
Inflow hyds.	= 2, 6, 7, 8	Contrib. drain. area	= 2.910 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	34.30	1	722	93,068	------	------	------	EXISTING
2	SCS Runoff	24.17	1	722	67,060	------	------	------	PROPOSED UNTREATED
3	SCS Runoff	10.98	1	717	24,647	------	------	------	TO PERVIOUS PAVE.
4	SCS Runoff	7.928	1	717	19,216	------	------	------	TO TRENCH
5	SCS Runoff	2.780	1	717	6,521	------	------	------	TO CLUBHOUSE PP
6	Reservoir	4.530	1	723	24,632	3	935.42	10,218	PERVIOUS PAVEMENT
7	Reservoir	0.862	1	724	6,518	5	936.35	1,619	CLUBHOUSE PP
8	Reservoir	6.988	1	719	19,215	4	913.16	3,588	TRENCH
9	Combine	34.31	1	722	117,424	2, 6, 7, 8	------	------	TOTAL POST DEVELOPMENT

Hydrograph Report

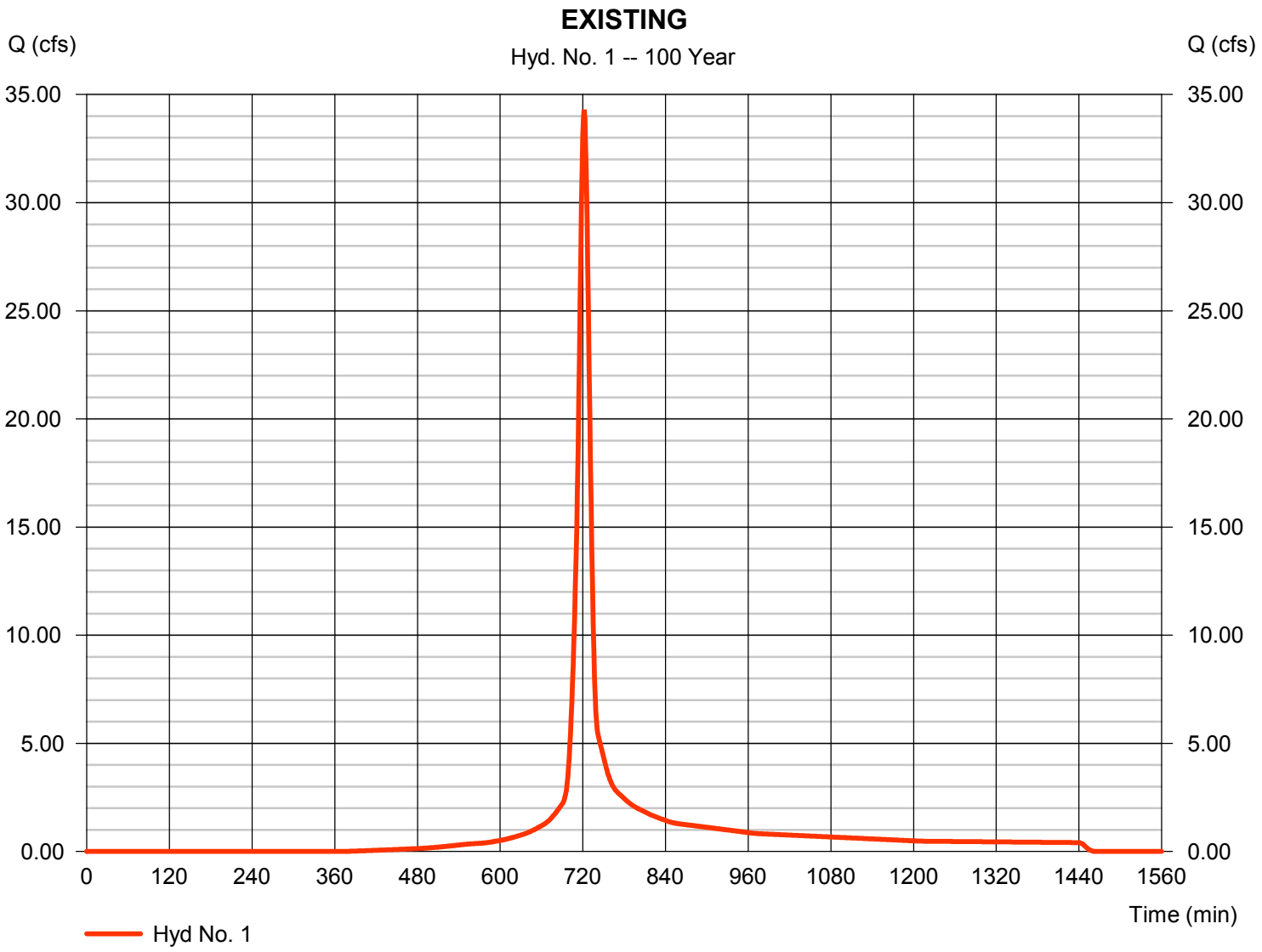
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 1

EXISTING

Hydrograph type	= SCS Runoff	Peak discharge	= 34.30 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 93,068 cuft
Drainage area	= 4.660 ac	Curve number	= 74*
Basin Slope	= 25.0 %	Hydraulic length	= 375 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 8.64 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (2.840 x 79) + (0.378 x 82) + (0.170 x 76) + (0.440 x 65) + (0.830 x 60)] / 4.660



Hydrograph Report

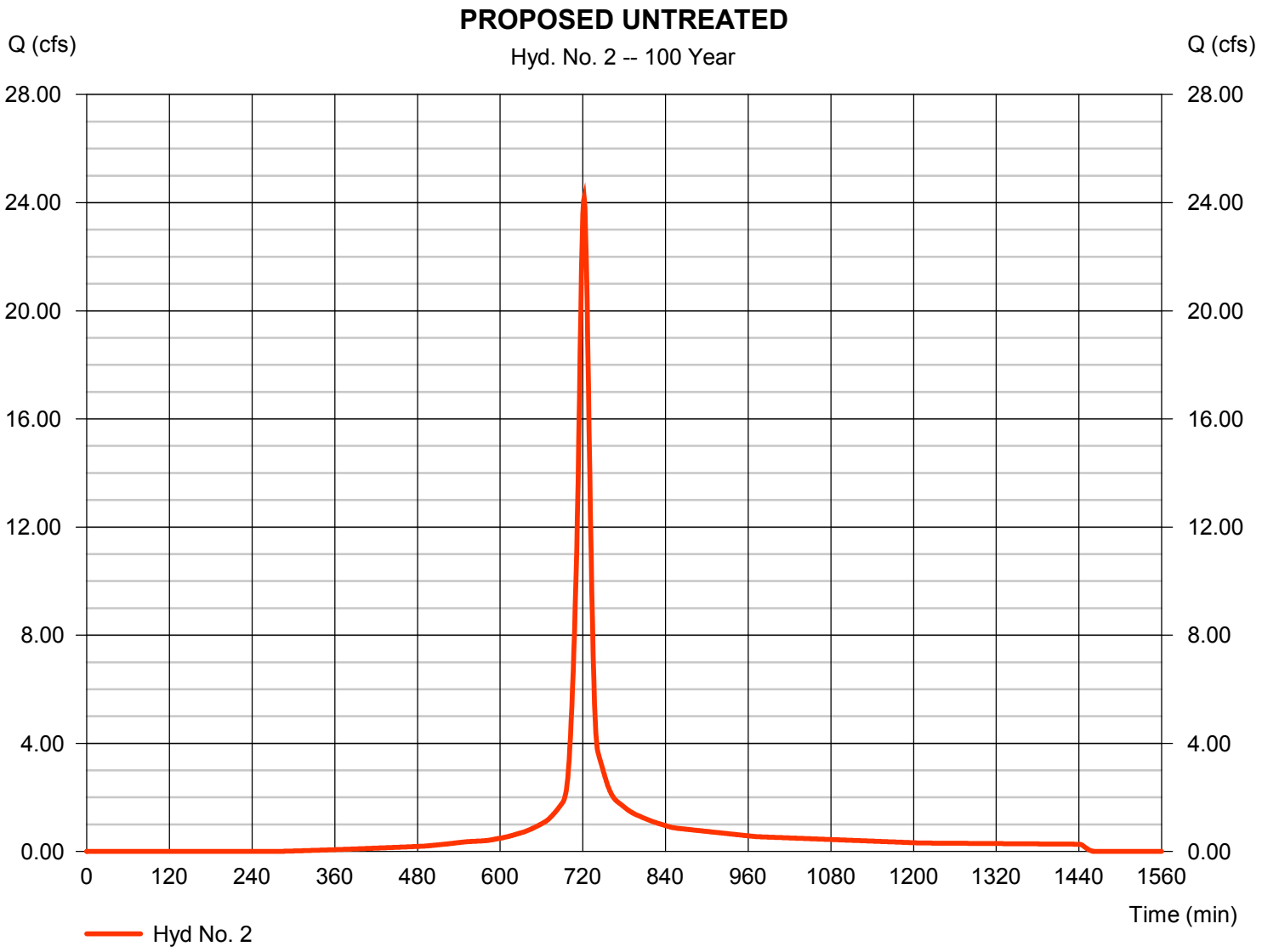
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 2

PROPOSED UNTREATED

Hydrograph type	= SCS Runoff	Peak discharge	= 24.17 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 67,060 cuft
Drainage area	= 2.910 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 8.64 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.290 x 98) + (0.400 x 80) + (0.060 x 82) + (1.860 x 79) + (0.300 x 74)] / 2.910



Hydrograph Report

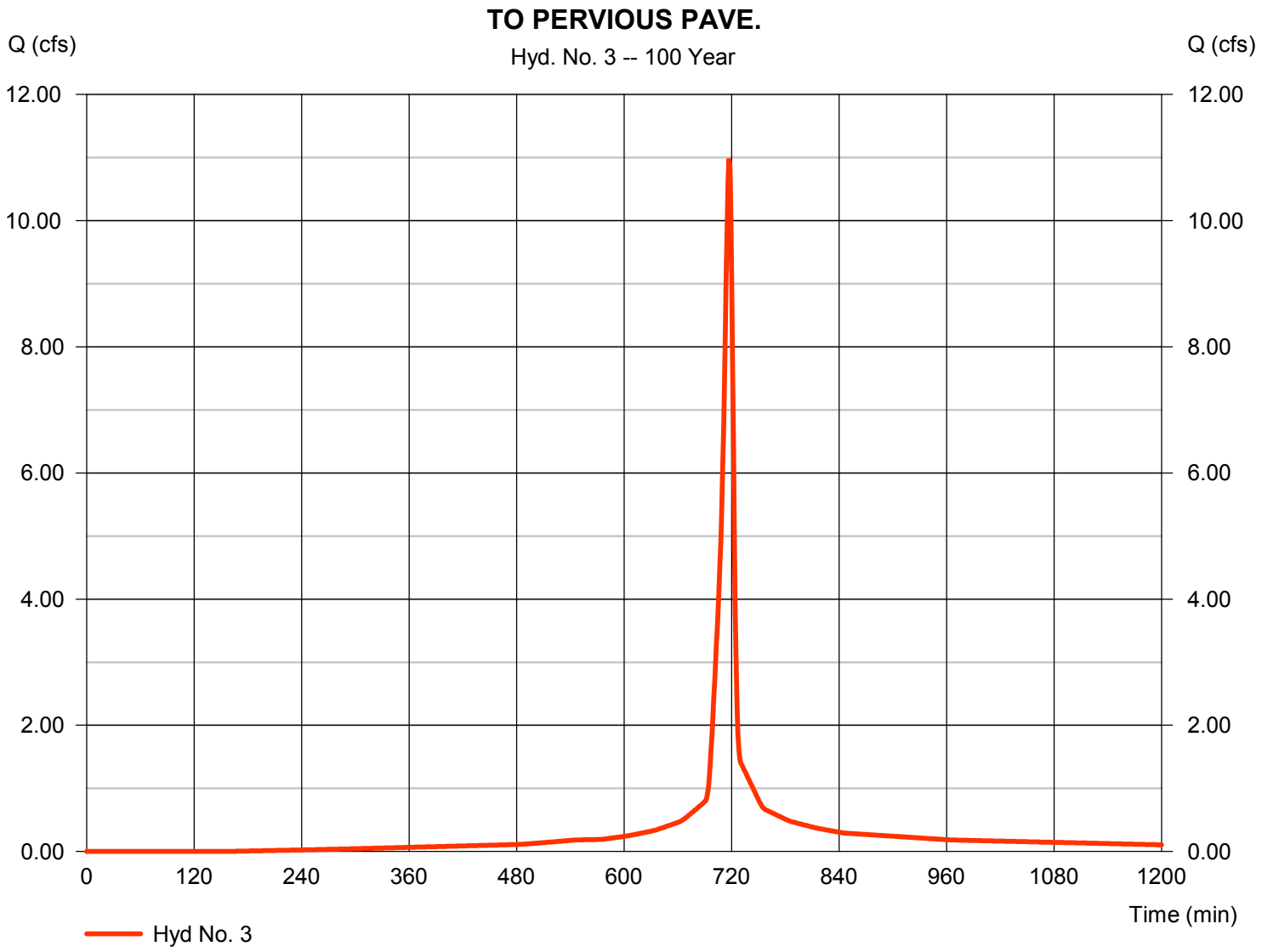
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 3

TO PERVIOUS PAVE.

Hydrograph type	= SCS Runoff	Peak discharge	= 10.98 cfs
Storm frequency	= 100 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 24,647 cuft
Drainage area	= 0.900 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 8.64 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.550 x 98) + (0.040 x 80) + (0.310 x 74)] / 0.900



Hydrograph Report

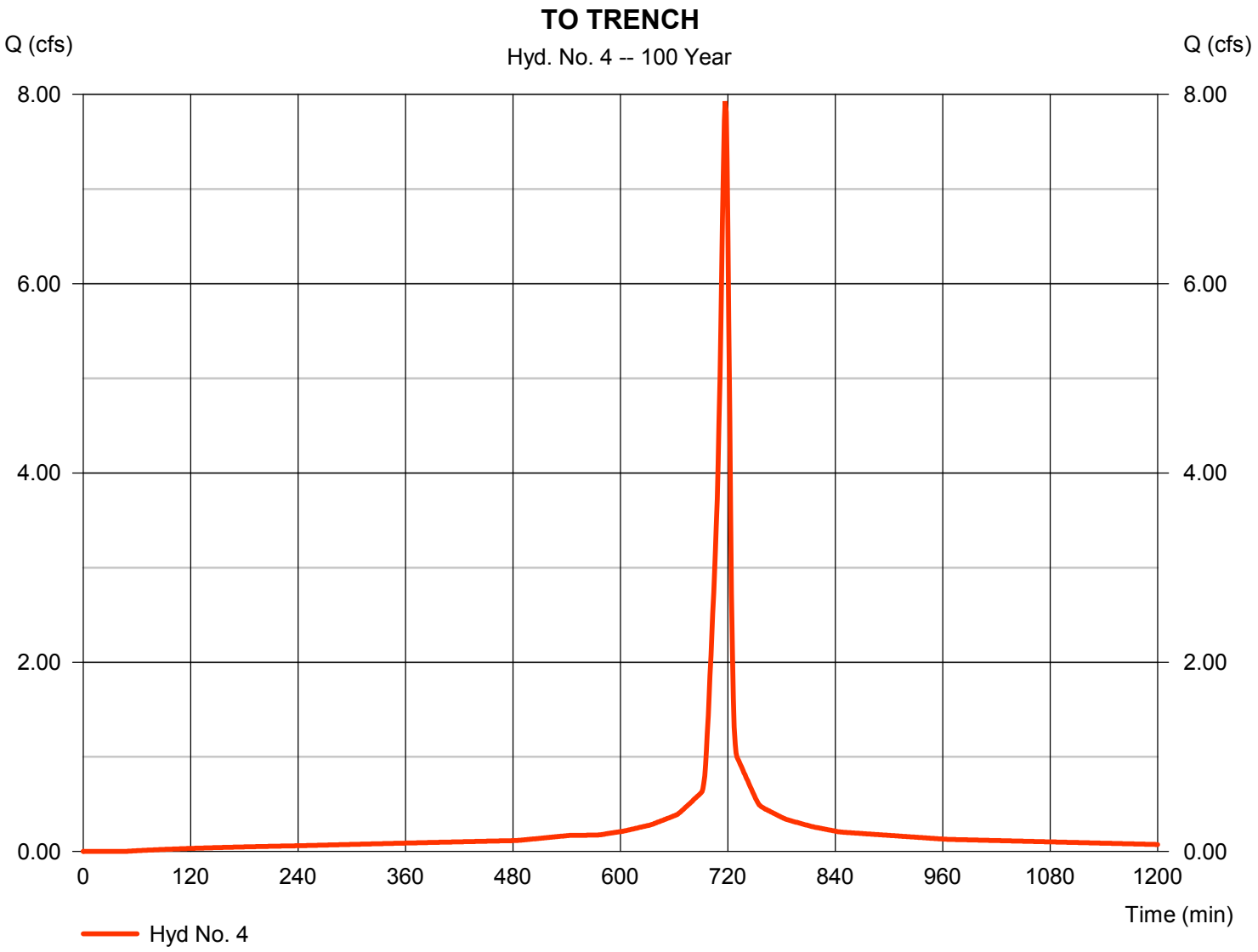
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 4

TO TRENCH

Hydrograph type	= SCS Runoff	Peak discharge	= 7.928 cfs
Storm frequency	= 100 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 19,216 cuft
Drainage area	= 0.620 ac	Curve number	= 97*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 8.64 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.600 x 98) + (0.020 x 80)] / 0.620



Hydrograph Report

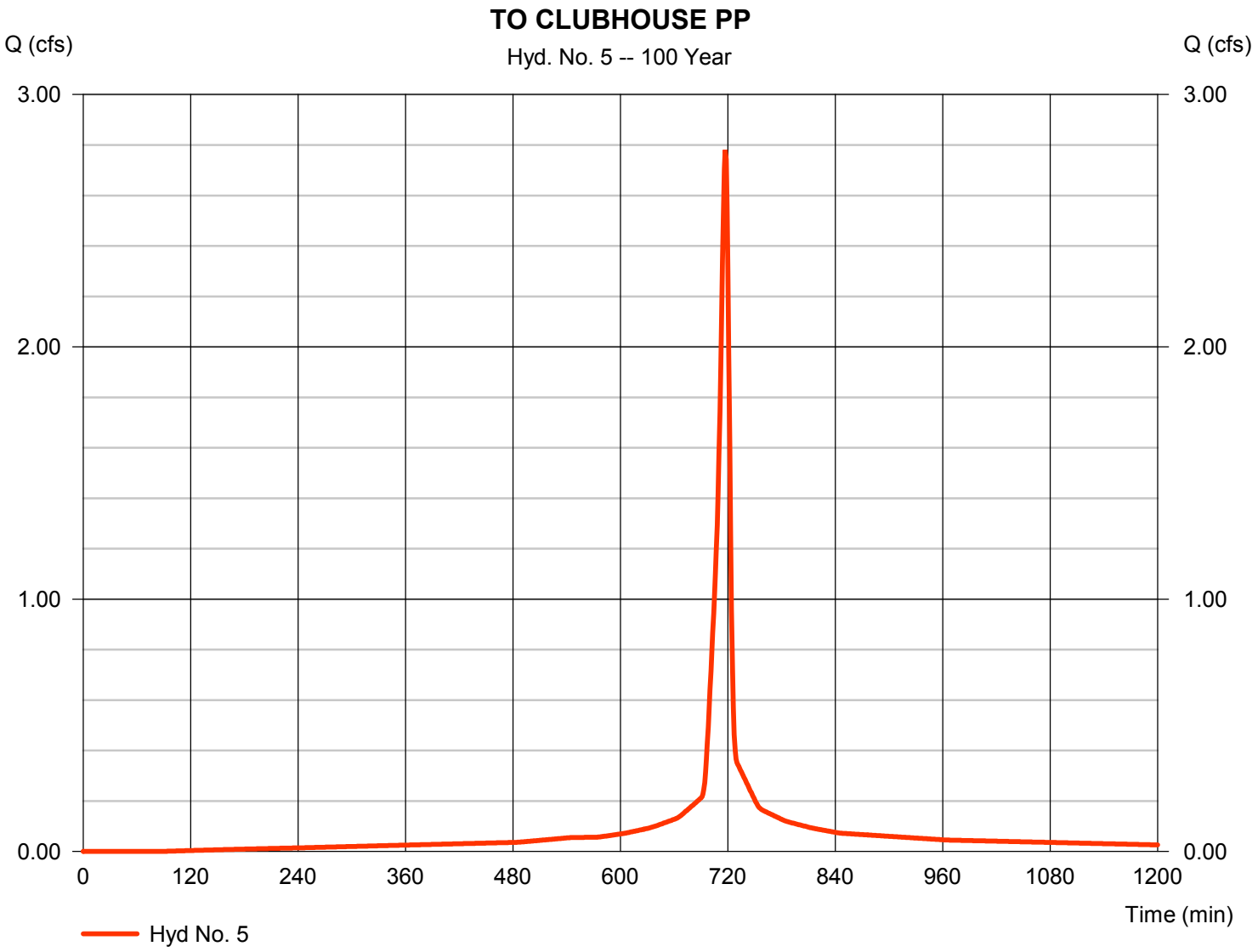
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 5

TO CLUBHOUSE PP

Hydrograph type	= SCS Runoff	Peak discharge	= 2.780 cfs
Storm frequency	= 100 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 6,521 cuft
Drainage area	= 0.220 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 8.64 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.170 x 98) + (0.050 x 80)] / 0.220



Hydrograph Report

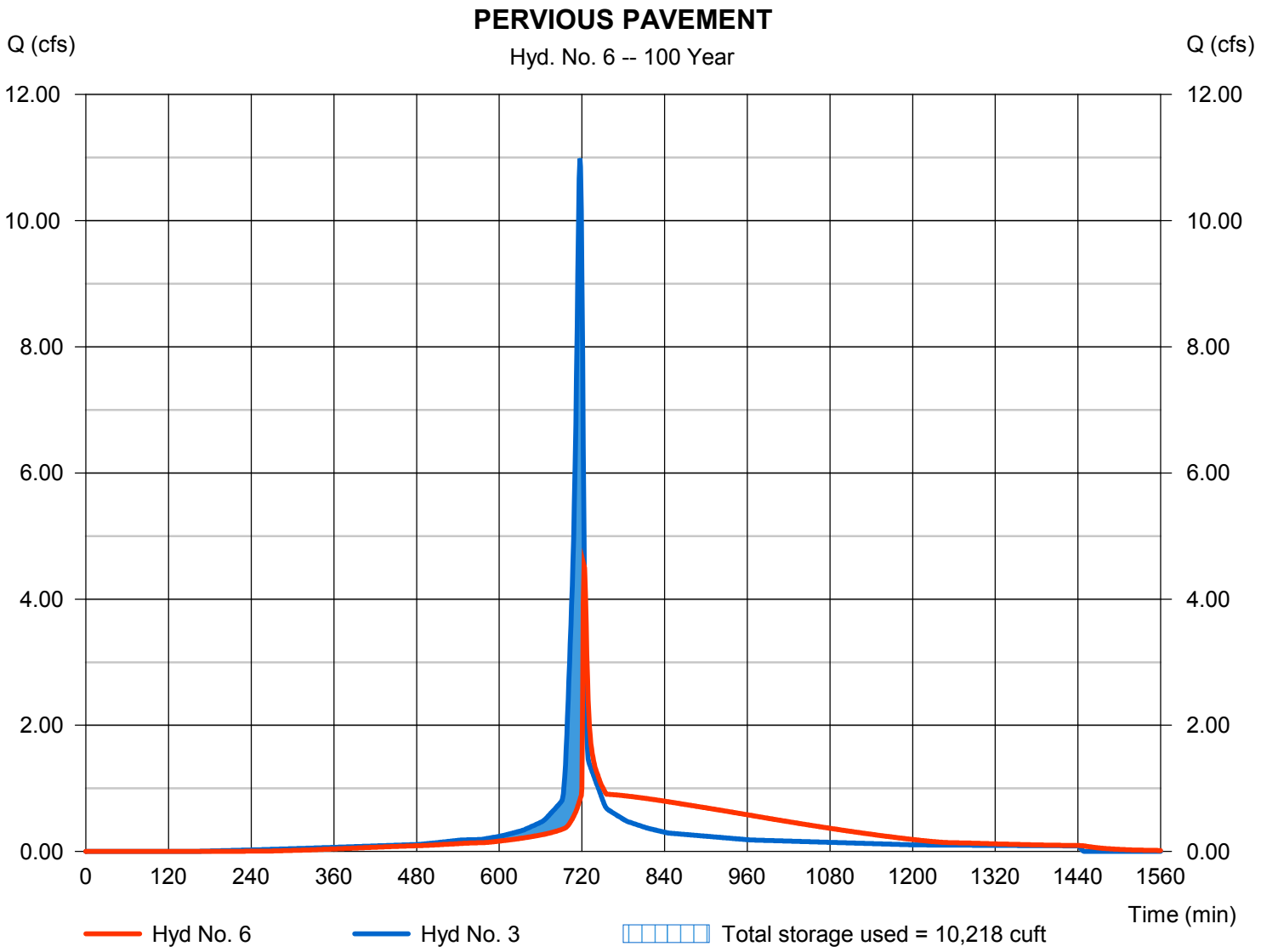
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 6

PERVIOUS PAVEMENT

Hydrograph type	= Reservoir	Peak discharge	= 4.530 cfs
Storm frequency	= 100 yrs	Time to peak	= 723 min
Time interval	= 1 min	Hyd. volume	= 24,632 cuft
Inflow hyd. No.	= 3 - TO PERVIOUS PAVE.	Max. Elevation	= 935.42 ft
Reservoir name	= PERVIOUS PAVEMENT	Max. Storage	= 10,218 cuft

Storage Indication method used.



Hydrograph Report

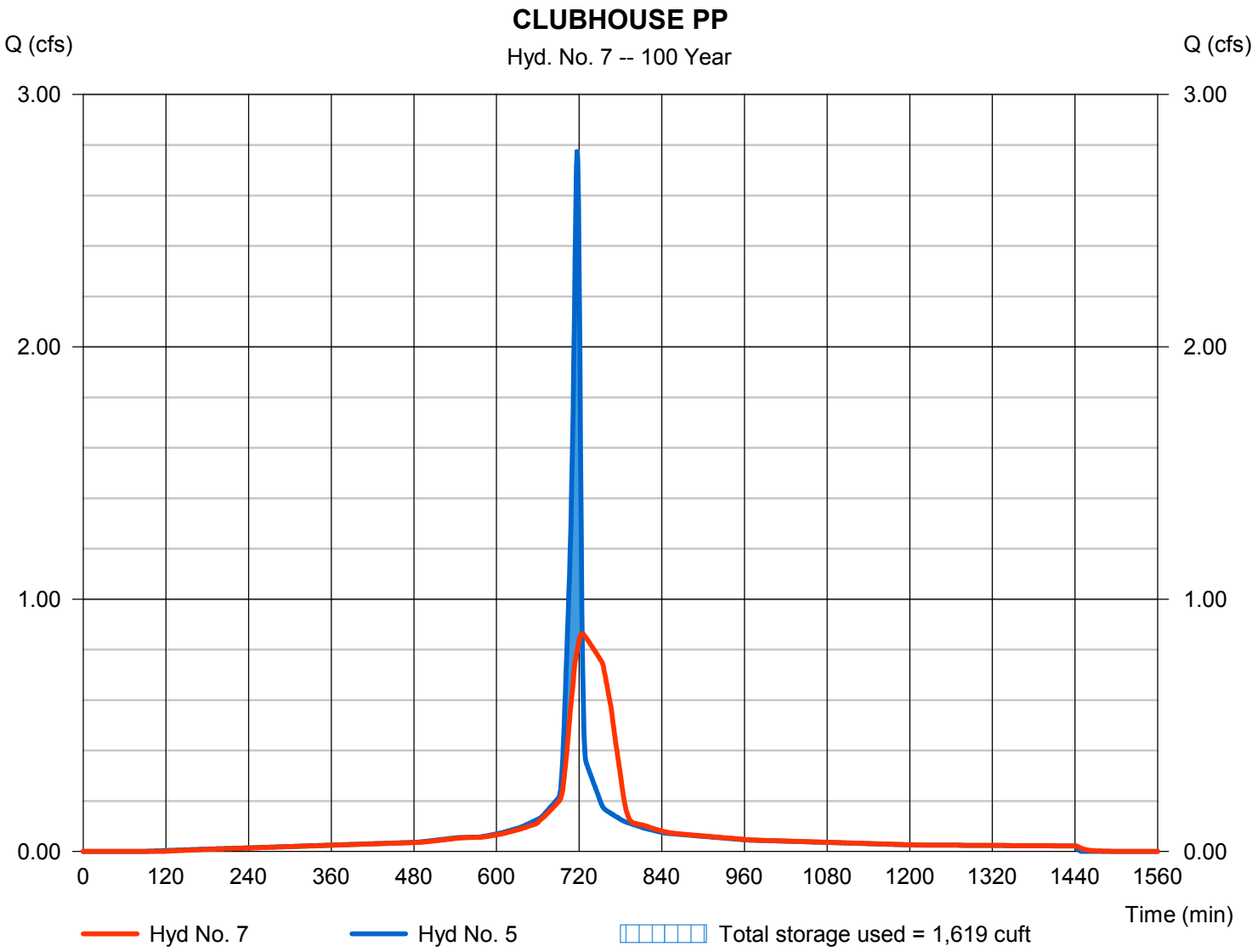
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 7

CLUBHOUSE PP

Hydrograph type	= Reservoir	Peak discharge	= 0.862 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 6,518 cuft
Inflow hyd. No.	= 5 - TO CLUBHOUSE PP	Max. Elevation	= 936.35 ft
Reservoir name	= CLUBHOUSE PP	Max. Storage	= 1,619 cuft

Storage Indication method used.



Hydrograph Report

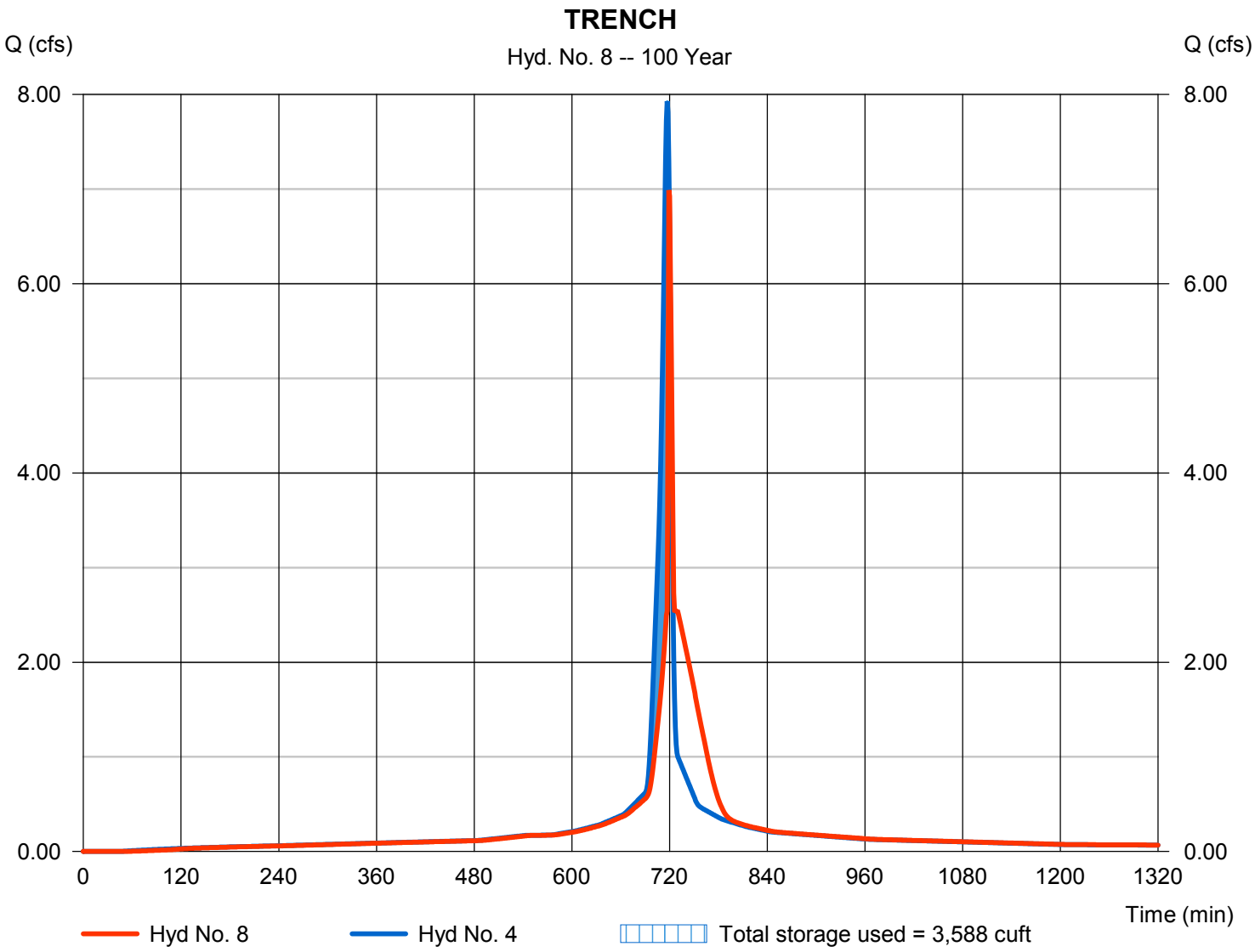
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 8

TRENCH

Hydrograph type	= Reservoir	Peak discharge	= 6.988 cfs
Storm frequency	= 100 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 19,215 cuft
Inflow hyd. No.	= 4 - TO TRENCH	Max. Elevation	= 913.16 ft
Reservoir name	= TRENCH 2	Max. Storage	= 3,588 cuft

Storage Indication method used.



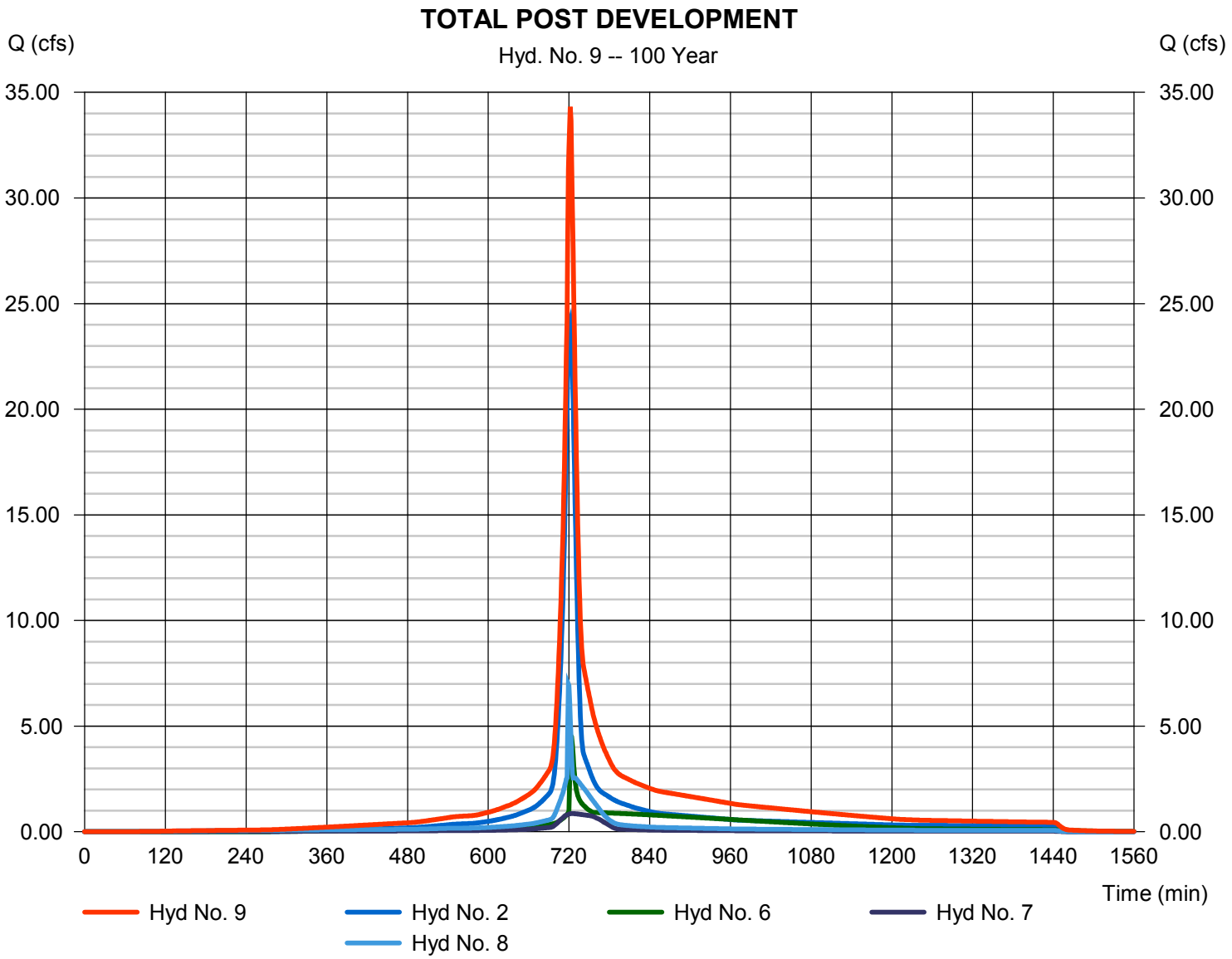
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Friday, 01 / 30 / 2015

Hyd. No. 9

TOTAL POST DEVELOPMENT

Hydrograph type	= Combine	Peak discharge	= 34.31 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 117,424 cuft
Inflow hyds.	= 2, 6, 7, 8	Contrib. drain. area	= 2.910 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	69.8703	13.1000	0.8658	--------
3	0.0000	0.0000	0.0000	--------
5	79.2597	14.6000	0.8369	--------
10	88.2351	15.5000	0.8279	--------
25	102.6072	16.5000	0.8217	--------
50	114.8193	17.2000	0.8199	--------
100	127.1596	17.8000	0.8186	--------

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

Precip. file name: G:\KCS\Teams\LDVP\Reference - Other\IDF Information\Parkville MO.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	3.03	3.59	0.00	4.56	5.40	6.62	7.61	8.64
SCS 6-Hr	2.18	2.64	0.00	3.42	4.09	5.04	5.81	6.61
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00