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March 13, 2025

Final Stormwater Management & Drainage Report

Client

Intrinsic Development
3622 Endeavor Ave, Ste. 101
Columbia, MO 65201

Project

Alura Apartments at Discovery Park
SW Corner of NE Douglas St and Lee's Summit Rd
Lee's Summit, MO

P.N. 24KC10030

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Project Description and General Information

The proposed project is a 22 acre apartment development located southwest of the intersection of NE Douglas Street and Lee's Summit Road in Lee's Summit, Missouri. Alura Apartments is the second phase of the Village at Discovery Park project located on the northwest corner of NW Colbern Road and NE Douglas Street.

The purpose of this report is to analyze the stormwater impacts of the proposed residential development and show that the post-development conditions meet the regulations established by the City of Lee's Summit. This phase of the development is located on the northwest corner of Douglas Street and Colbern Road in Lee's Summit, Missouri. The full site is bounded by undeveloped ground to the north, Douglas Street to the east, Phase 1 of Discovery Park with mixed use to the south, and an existing detention basin to the west. This phase is the northern most portion encompassing approximately 22 acres of the overall site. The existing site is undeveloped, consisting mostly of grass and farmland.

The existing soil characteristics as published in the Soil Survey for Jackson County, Missouri are summarized in the table below. Additional information on the existing soil is provided in the Web Soil Survey located in the Appendix.

Table 1: Soil Classifications

Map Unit Symbol	Map Unit Name	Slopes	Hydrologic Soil Group
10120	Sharpsburg Silty Loam	2 to 5%	C
30080	Greenton Silty Clay Loam	5 to 9%	C/D
40107	Snead-Rock Outcrop Complex	5 to 14%	D
40108	Snead-Rock Outcrop Complex	14 to 30%	D

According to FEMA flood maps (FIRM Panel 29095C0409G), the site is located in zone X, an area of minimal flood hazard. No amendments or revisions to the map are being proposed.

Methodology

The Alura site was analyzed in both the pre-development and post-development conditions. The analysis was conducted utilizing HydroCAD which uses an SCS Type-II 24 hr. rainfall distribution data in computing unit hydrographs for varying conditions. Precipitation depths used in the analysis have been interpolated from the "Technical Paper No. 40 Rainfall Frequency Atlas of the United States" (TP-40).



Table 2: Rainfall Precipitation

Annual Exceedance Probability (AEP)	Rainfall Depth (inches)
90% (Water Quality Event)	1.37
50% (2 year)	3.50
10% (10 year)	5.34
1% (100 year)	7.71

The post-development rates were determined utilizing the APWA 5600 Comprehensive Protection Strategy in accordance with the City of Lee's Summit regulations. Under this strategy, peak runoff control is provided for the 1%, 10%, and 50% chance storms and volumetric and/or extended detention control (≥ 40 hr.) of the 90% mean annual event storm. The maximum allowable release rates for the design storm events are established for the 2-year (0.50 cfs/acre), 10-year (2.0 cfs/acre), 100-year (3.0 cfs/acre).

Existing Conditions Analysis

The site generally drains to the north and west. The west watershed drains to the existing storm sewer network constructed with the first phase of Discovery Park, and ultimately into the regional detention basin. The north watershed drains into the stream located north of the site that ultimately drains to Unity Lake Number Two located northwest of the project site. Refer to the Pre-Development Plan in the Appendix. A summary of the existing conditions design parameters is in the table below.

Table 3: Existing Conditions Parameters

Subarea	Total Area (ac)	NRCS Weighted CN	Time of Concentration (min)
North	11.62	80	7.7
West	10.87	81	10.2

The portion draining to the west has been included in the previous drainage study titled "Discovery Park Macro Stormwater Report" prepared by Olsson dated October 24, 2023 and the drainage study titled "Stormwater Management and Drainage Report" prepared by OWN, Inc. dated July 9, 2024. The previous studies determined the allowable release rates and calculated the required detention for The Village at Discovery Park, Alura (Previously called Aria) Apartments, and a portion of Discovery Crossing. A portion of Alura Apartments will drain into the existing basin constructed as part of the Village at Discovery Park. The existing peak runoff rates were calculated for the design storms and summarized below.



Table 4: Existing Peak Flow Summary

Watershed	Peak Flow 2-yr Event (cfs)	Peak Flow 10-yr Event (cfs)	Peak Flow 100-yr Event (cfs)
North	31.49	60.58	99.32
West	27.92	53.19	86.71

Proposed Conditions Analysis

The proposed development for this phase consists of 12 apartment buildings and associated surface parking. The proposed site has 2 watersheds; north and west. Refer to the Post-Development Plan in the Appendix. The allowable release rates were determined using the Comprehensive Control Strategy as defined in APWA 5608.4. A summary of the allowable release rates is provided in the table below:

Table 5: Allowable Release Rates

Design Storm	Allowable Release Rate (cfs/acre)	North (11.29 ac.) (cfs)	West (11.21 ac.) (cfs)
50% (2 year)	0.5	5.65	N/A
10% (10 year)	2.0	22.58	N/A
1% (100 year)	3.0	33.87	N/A

*Note: The west watershed is not included in the allowable release rate calculations as detention has been previously provided.

A summary of the proposed design parameters is in the table below.

Table 6: Proposed Conditions Parameters

Subarea	Total Area (ac)	NRCS Weighted CN	Time of Concentration (min)
North	11.29	87	6
West	11.21	87	6

To mitigate the impact of the proposed increase in impervious area associated with the development and to satisfy the requirement for detention, an above ground detention basin is proposed to capture stormwater and release at rates at or below the allowable release rates as established above. The proposed basin will receive stormwater from enclosed pipe systems that collect water from the streets and parking lots.

Outlet control structures with multiple stage release controls are proposed to provide controlled release over the design storms. Specific detail of each outlet control structure is provided in the associated watershed review below.



West Watershed

The proposed improvements in the west watershed are consistent with the previously approved drainage studies. Below is a comparison summary of the previously assumed parameters for the sizing of the regional detention basin and the proposed improvements.

Table 7: Existing Basin Design Comparison Summary

	Previous Studies	Proposed
Total Area (ac.)	11.29	11.21
NRCS CN	92	87

The proposed condition onsite area shows a reduction in the area originally proposed and reduced CN value and therefore no additional detention is required.

North Watershed

The north watershed is approximately 11.29 acres located generally on the eastern side of the project site. The calculated CN for this area is 87, which is consistent with dense residential development.

An above ground extended dry detention basin is proposed to provide the volume needed to meet the allowable release rate for this development. The basin will have a 5'x5' outlet control structure to control the release rates for the 2-yr, 10-yr, and 100-yr design storms and to provide a controlled release of the water quality storm. A 2.25-inch diameter orifice is proposed to drain the water quality storm over the required 40 hour period. The associated water quality volume and sizing calculations are provided in the Appendix. A 48-inch by 8-inch rectangular opening and 60-inch by 60-inch open top will provide the controlled release of the 2-yr, 10-yr, and 100-yr design storms. The peak release rates are summarized in the table below:

Table 8: North Watershed Release Rate Summary

Storm Event	Allowable Release Rate (cfs)	Proposed Peak Release Rates (cfs)
2 year	5.65	3.56
10 year	22.58	20.02
100 year	33.87	31.82

The peak flows were also compared to the existing flows and summarized in the table below. The proposed west and south watershed peak flows were combined to compare to the existing west watershed.



Table 9: Peak Flow Comparison

Watershed	Existing Peak Flow 2-yr Event (cfs)	Proposed Peak Flow 2-yr Event (cfs)	Existing Peak Flow 10-yr Event (cfs)	Proposed Peak Flow 10-yr Event (cfs)	Existing Peak Flow 100-yr Event (cfs)	Proposed Peak Flow 100-yr Event (cfs)
North	31.49	3.56	60.58	20.02	99.32	31.82
West	27.92	41.38	53.19	71.64	86.71	110.44

The west watershed shows an increase in the peak flow rates as a result of the development. This increase has already been mitigated with the detention basin previously provided in the first phase of the project.

Summary and Recommendations

The existing site is undeveloped, consisting mostly of grass and farmland. The proposed development for this phase consists of 12 apartment buildings and associated surface parking. To mitigate the increase in runoff release rates due to the increase in impervious area, an enclosed pipe network in conjunction with above ground detention basins with an outlet control structure was designed. As stated previously, approximately 11 acres of the west watershed was included in the design of the first phase of Discovery Park and the proposed changes in this phase still meet the assumed parameters set for its design. Peak runoff control is provided for the 1%, 10%, and 50% chance storms and volumetric and/or extended detention control (≥ 40 hr.) of the 90% mean annual event storm. Post-development site conditions and detention basins were modeled and analyzed using HydroCAD. Detailed calculations are presented in the Appendix to support the presented release rate summaries, detention volumes, and maximum water surface elevations.

Appendix



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Pre-Development Plan



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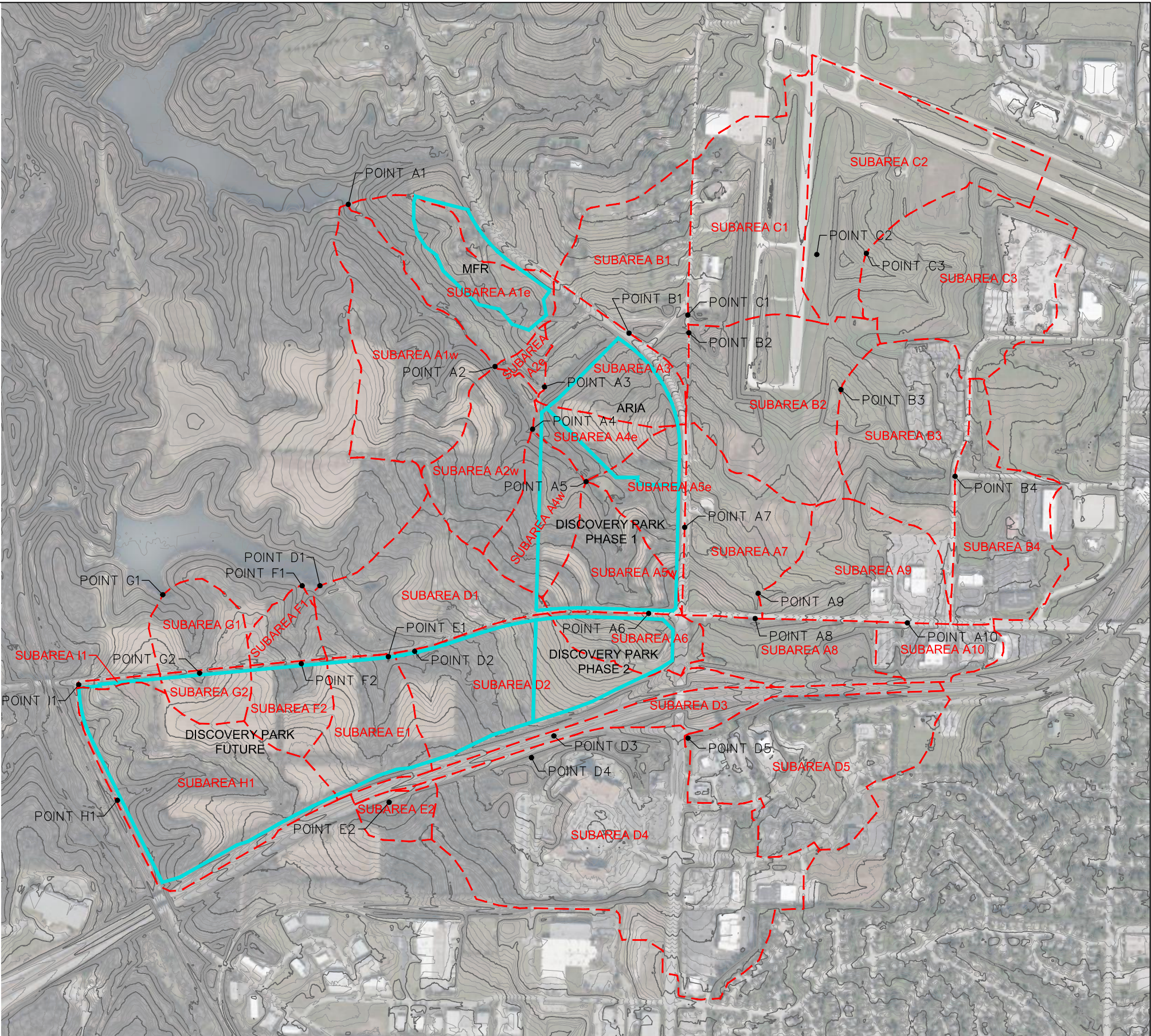
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Location ID:	Total Area (sf):	Aria Onsite Area (sf):	Discovery Park Phase 1 Onsite Area (sf):	Discovery Park Phase 2 Onsite Area (sf):	Discovery Park Future Onsite Area (sf):	Weighted NRCS CN:
Subarea A1(e):	27.97				12.36	77
Subarea A1(w):	43.14					76
Subarea A2(e):	3.08					80
Subarea A2(w):	23.41					73
Subarea A3:	24.42	11.62				80
Subarea A4(e):	9.85	5.99	3.35			81
Subarea A4(w):	17.41		9.19			73
Subarea A5(e):	15.16	4.88	8.00			80
Subarea A5(w):	19.77		18.66			76
Subarea A6:	13.45			9.21		83
Subarea A7:	30.60					76
Subarea A8:	21.56					81
Subarea A9:	31.84					84
Subarea A10:	12.23					94
Subtotal:	293.88	22.50	39.20	9.21	12.36	
Subarea B1:	31.94					79
Subarea B2:	48.54					78
Subarea B3:	40.69					83
Subarea B4-DET:	25.05					94
Subarea B4-BYP:	7.42					94
Subtotal:	153.64					
Subarea C1:	45.21					90
Subarea C2:	57.13					81
Subarea C3:	52.36					83
Subtotal:	154.70					
Subarea D1:	36.91		0.22			77
Subarea D2:	47.00			10.62	24.74	79
Subarea D3:	16.84					88
Subarea D4:	112.38					88
Subarea D5:	53.24					89
Subtotal:	266.37		0.22	10.62	24.74	
Subarea E1:	22.59				20.68	80
Subarea E2:	6.56					73
Subtotal:	29.15				20.68	
Subarea F1:	7.85					77
Subarea F2:	12.76				12.06	81
Subtotal:	20.60				12.06	
Subarea G1:	14.04					81
Subarea G2:	7.93				7.11	85
Subtotal:	21.96				7.11	
Subarea H1:	56.17				51.06	78
Subtotal:	56.17				51.06	
Subarea I1:	1.40				0.61	86
Subtotal:	1.40				0.61	

Sub-W'Shed A Subtotal:	293.88	22.50	39.20	9.21	12.36
Sub-W'Shed B Subtotal:	153.64				
Sub-W'Shed C Subtotal:	154.70				
Sub-W'Shed D Subtotal:	266.37		0.22	10.62	24.74
Sub-W'Shed E Subtotal:	29.15				20.68
Sub-W'Shed F Subtotal:	20.60				12.06
Sub-W'Shed G Subtotal:	21.96				7.11
Sub-W'Shed H Subtotal:	56.17				51.06
Sub-W'Shed I Subtotal:	1.40				0.61
Modeled Total:	997.89	22.50	39.42	19.83	128.62

BOUNDARY LEGEND

- SITE BOUNDARY
- TRIBUTARY DRAINAGE BOUNDARY



EXISTING CONDITIONS

PROJECT NO: A21-04643

DRAWN BY: DFG

DATE: 01/18/2023

olsson

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EXHIBIT

EX-300

Post-Development Plan



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Soil Report



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United States
Department of
Agriculture

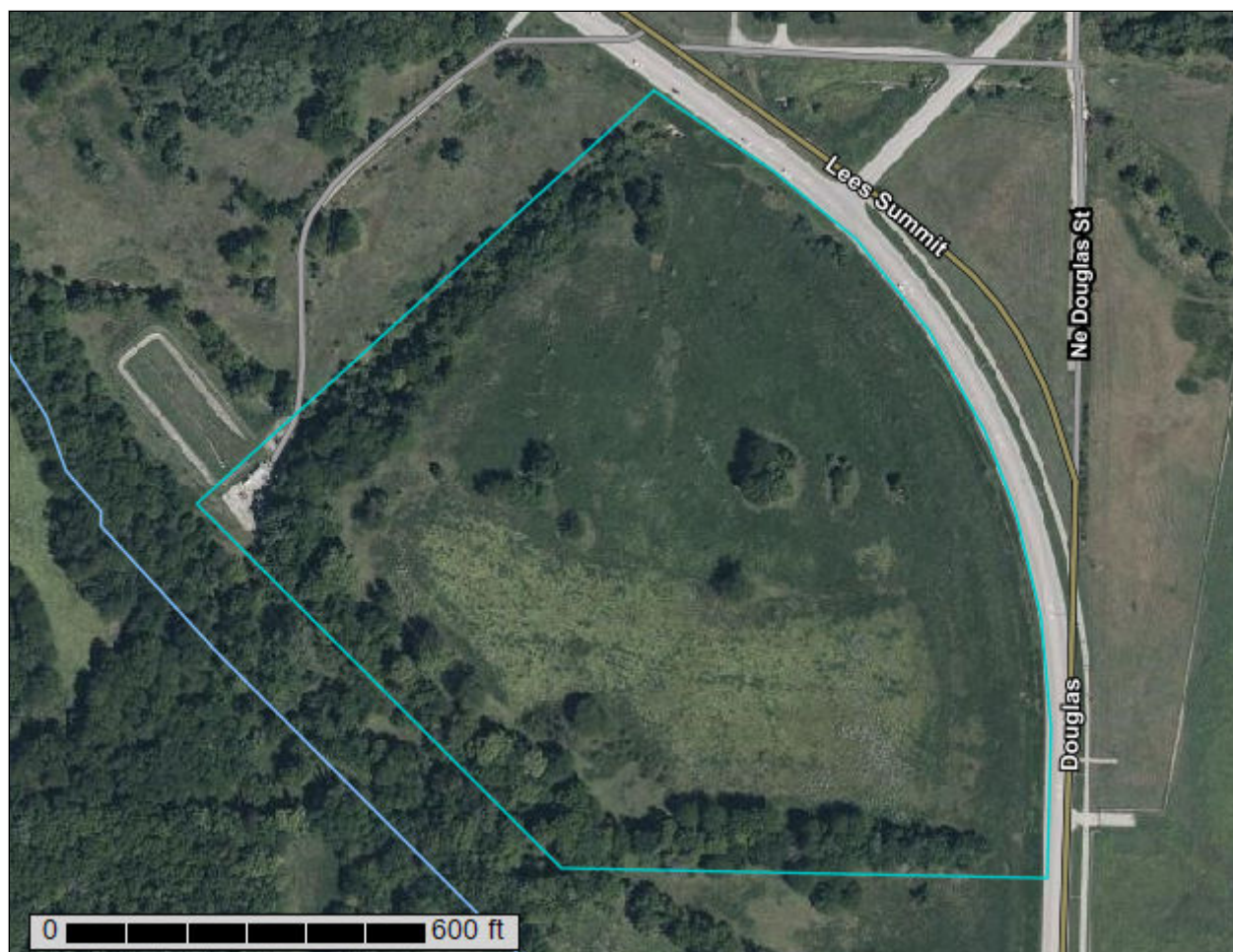
NRCS

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 **Jackson County, Missouri**

Alura Apartments



August 16, 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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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

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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



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MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Jackson County, Missouri
Survey Area Data: Version 25, Aug 22, 2023

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

Date(s) aerial images were photographed: Aug 30, 2022—Sep 8, 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
10120	Sharpsburg silt loam, 2 to 5 percent slopes	2.0	7.3%
30080	Greenton silty clay loam, 5 to 9 percent slopes	18.5	66.7%
40107	Snead-Rock outcrop complex, warm, 5 to 14 percent slopes	3.1	11.0%
40108	Snead-Rock outcrop complex, warm, 14 to 30 percent slopes	4.2	15.1%
Totals for Area of Interest		27.7	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.

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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.

Jackson County, Missouri

10120—Sharpsburg silt loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2yy7v
Elevation: 1,000 to 1,300 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: All areas are prime farmland

Map Unit Composition

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

Description of Sharpsburg

Setting

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

Typical profile

Ap - 0 to 6 inches: silt loam
A - 6 to 16 inches: silty clay loam
Bt1 - 16 to 22 inches: silty clay loam
Bt2 - 22 to 46 inches: silty clay loam
BC - 46 to 58 inches: silty clay loam
C - 58 to 79 inches: silty clay loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Medium
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 45 to 50 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: R109XY002MO - Loess Upland Prairie
Hydric soil rating: No

Minor Components

Sibley

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R109XY002MO - Loess Upland Prairie
Hydric soil rating: No

Higginsville, eroded

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R109XY002MO - Loess Upland Prairie
Hydric soil rating: No

30080—Greenton silty clay loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2xjd9
Elevation: 640 to 1,120 feet
Mean annual precipitation: 35 to 41 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 177 to 209 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Greenton

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess over residuum weathered from limestone and shale

Typical profile

Ap - 0 to 12 inches: silty clay loam
Bt - 12 to 28 inches: silty clay

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2Bt - 28 to 30 inches: silty clay

2C - 30 to 79 inches: silty clay

Properties and qualities

Slope: 5 to 9 percent

Depth to restrictive feature: More than 80 inches

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 12 to 30 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C/D

Ecological site: R109XY002MO - Loess Upland Prairie

Hydric soil rating: No

Minor Components

Sampsel

Percent of map unit: 10 percent

Landform: Hillslopes

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Convex

Ecological site: R109XY002MO - Loess Upland Prairie

Hydric soil rating: Yes

40107—Snead-Rock outcrop complex, warm, 5 to 14 percent slopes

Map Unit Setting

National map unit symbol: 2zccr

Elevation: 660 to 1,130 feet

Mean annual precipitation: 39 to 43 inches

Mean annual air temperature: 54 to 57 degrees F

Frost-free period: 185 to 220 days

Farmland classification: Not prime farmland

Map Unit Composition

Snead, warm, and similar soils: 70 percent

Rock outcrop: 20 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Snead, Warm

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 limestone and shale

Typical profile

A - 0 to 10 inches: silty clay loam
Bw - 10 to 20 inches: silty clay
BC - 20 to 24 inches: silty clay
C - 24 to 35 inches: silty clay
Cr - 35 to 45 inches: bedrock

Properties and qualities

Slope: 5 to 14 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Moderately well drained
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 30 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R109XY010MO - Interbedded Sedimentary Upland Savanna
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 5 to 14 percent
Depth to restrictive feature: 0 inches to lithic bedrock
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): 8s
Hydric soil rating: No

Minor Components

Oska

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R106XY015KS - Loamy Upland (PE 30-37)
Hydric soil rating: No

Sampsel

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Concave
Ecological site: R109XY010MO - Interbedded Sedimentary Upland Savanna
Hydric soil rating: Yes

Kennebec, occasionally flooded

Percent of map unit: 3 percent
Landform: Drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R109XY028MO - Loamy Upland Drainageway Savanna
Hydric soil rating: No

40108—Snead-Rock outcrop complex, warm, 14 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2zccp
Elevation: 670 to 1,130 feet
Mean annual precipitation: 39 to 43 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 185 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Snead, warm, and similar soils: 65 percent
Rock outcrop: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Snead, Warm

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 limestone and shale

Typical profile

A - 0 to 10 inches: silty clay loam
Bw - 10 to 20 inches: silty clay
BC - 20 to 24 inches: silty clay
C - 24 to 35 inches: silty clay
Cr - 35 to 45 inches: bedrock

Properties and qualities

Slope: 14 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Moderately well drained
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 30 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R109XY010MO - Interbedded Sedimentary Upland Savanna
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 14 to 30 percent
Depth to restrictive feature: 0 inches to lithic bedrock
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): 8s
Hydric soil rating: No

Minor Components

Norris

Percent of map unit: 5 percent

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Landform: Hillslopes

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Concave, convex

Across-slope shape: Convex

Ecological site: F109XY025MO - Interbedded Sedimentary Exposed Backslope
Woodland

Hydric soil rating: No

Sampsel

Percent of map unit: 5 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Concave

Ecological site: R109XY010MO - Interbedded Sedimentary Upland Savanna

Hydric soil rating: Yes

Oska

Percent of map unit: 3 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Linear

Ecological site: R106XY015KS - Loamy Upland (PE 30-37)

Hydric soil rating: No

Kennebec, occasionally flooded

Percent of map unit: 2 percent

Landform: Drainageways

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Talf

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R109XY028MO - Loamy Upland Drainageway Savanna

Hydric soil rating: No

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 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

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.

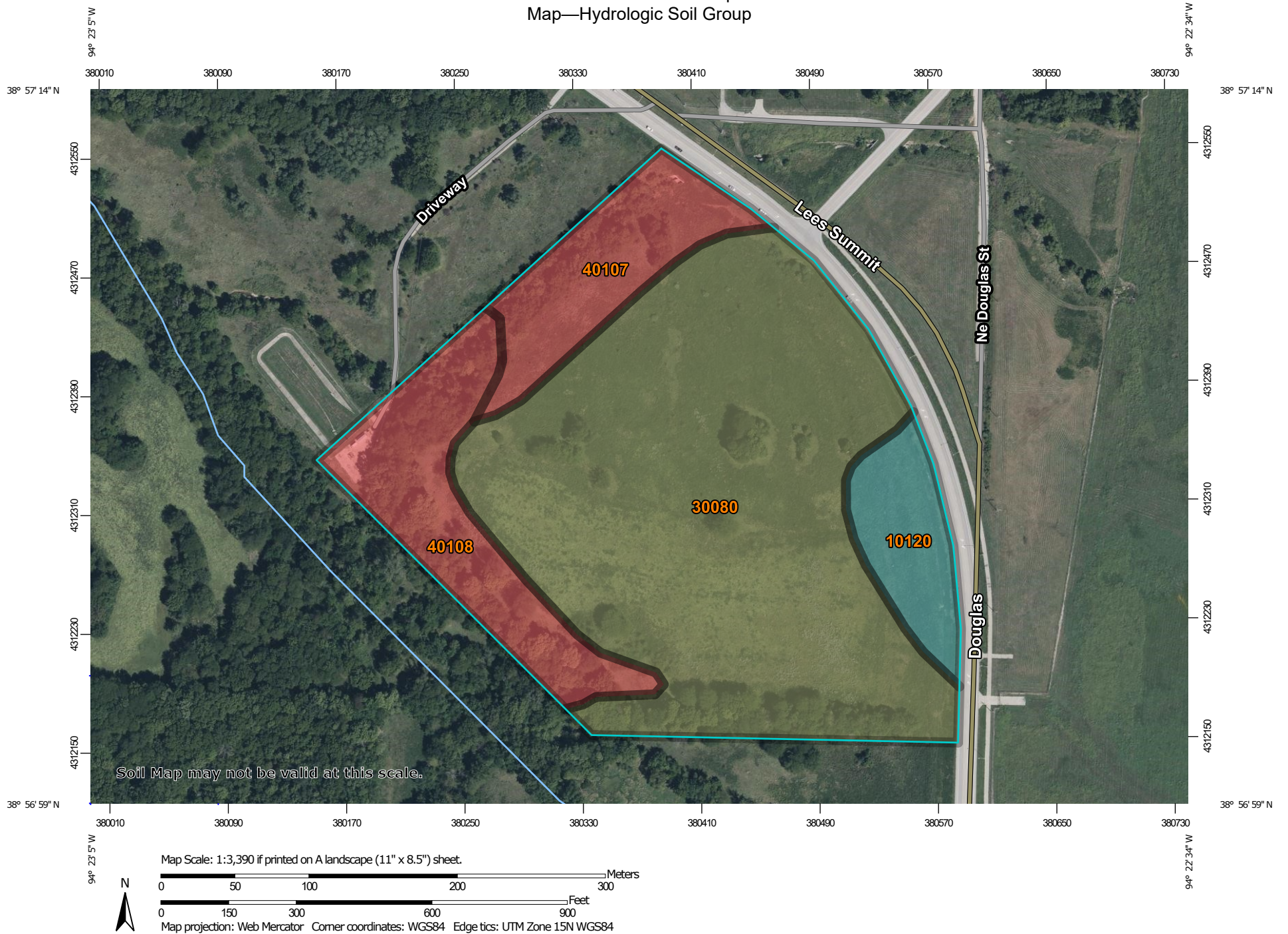
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Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water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



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:
 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: Jackson County, Missouri
 Survey Area Data: Version 25, Aug 22, 2023

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

Date(s) aerial images were photographed: Aug 30, 2022—Sep 8, 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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10120	Sharpsburg silt loam, 2 to 5 percent slopes	C	2.0	7.3%
30080	Greenton silty clay loam, 5 to 9 percent slopes	C/D	18.5	66.7%
40107	Snead-Rock outcrop complex, warm, 5 to 14 percent slopes	D	3.1	11.0%
40108	Snead-Rock outcrop complex, warm, 14 to 30 percent slopes	D	4.2	15.1%
Totals for Area of Interest			27.7	100.0%

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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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

FEMA Floodplain Map

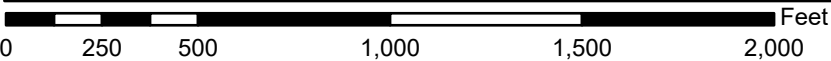


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National Flood Hazard Layer FIRMMette



94°23'7"W 38°57'21"N



1:6,000

94°22'30"W 38°56'53"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
MAP PANELS		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

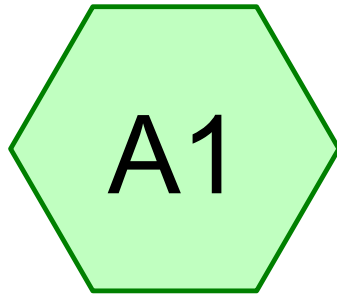
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/16/2024 at 11:53 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

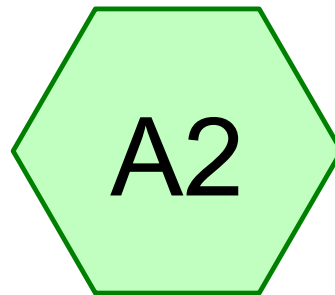
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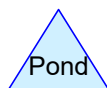
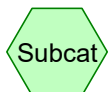
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North Existing



West Existing



Routing Diagram for Discovery Park Alura Existing

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Discovery Park Alura Existing

Prepared by OWN Inc

Printed 1/27/2025

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type II 24-hr		Default	24.00	1	3.50	2
2	10-Year	Type II 24-hr		Default	24.00	1	5.34	2
3	100-Year	Type II 24-hr		Default	24.00	1	7.71	2

Discovery Park Alura Existing

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Discovery Park Alura Apartments
Type II 24-hr 2-Year Rainfall=3.50"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: North Existing

Runoff Area=11.620 ac 0.00% Impervious Runoff Depth=1.64"
Tc=7.7 min CN=80 Runoff=31.49 cfs 1.585 af

Subcatchment A2: West Existing

Runoff Area=10.870 ac 0.00% Impervious Runoff Depth=1.71"
Tc=10.2 min CN=81 Runoff=27.92 cfs 1.548 af

Total Runoff Area = 22.490 ac Runoff Volume = 3.132 af Average Runoff Depth = 1.67"
100.00% Pervious = 22.490 ac 0.00% Impervious = 0.000 ac

Discovery Park Alura Existing

Prepared by OWN Inc

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Discovery Park Alura Apartments
Type II 24-hr 2-Year Rainfall=3.50"

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Summary for Subcatchment A1: North Existing

Runoff = 31.49 cfs @ 11.99 hrs, Volume= 1.585 af, Depth= 1.64"

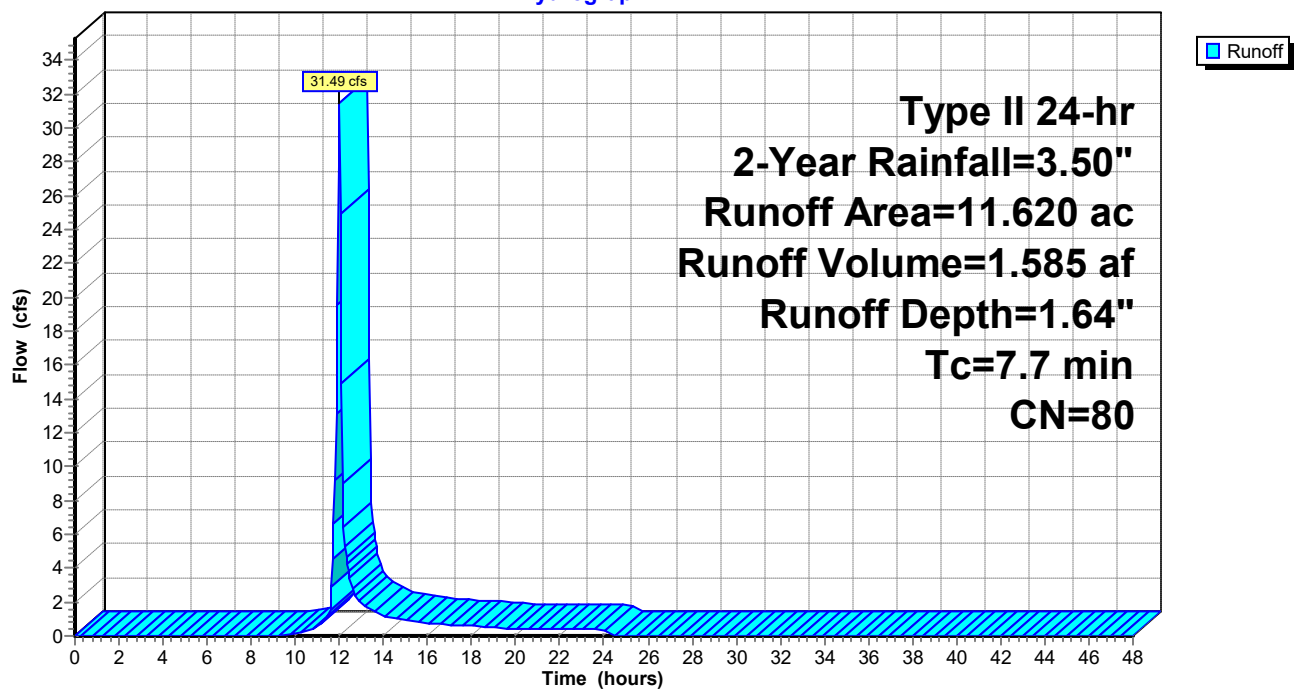
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

Area (ac)	CN	Description
* 11.620	80	
11.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7					Direct Entry,

Subcatchment A1: North Existing

Hydrograph



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Discovery Park Alura Apartments
Type II 24-hr 2-Year Rainfall=3.50"

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Summary for Subcatchment A2: West Existing

Runoff = 27.92 cfs @ 12.02 hrs, Volume= 1.548 af, Depth= 1.71"

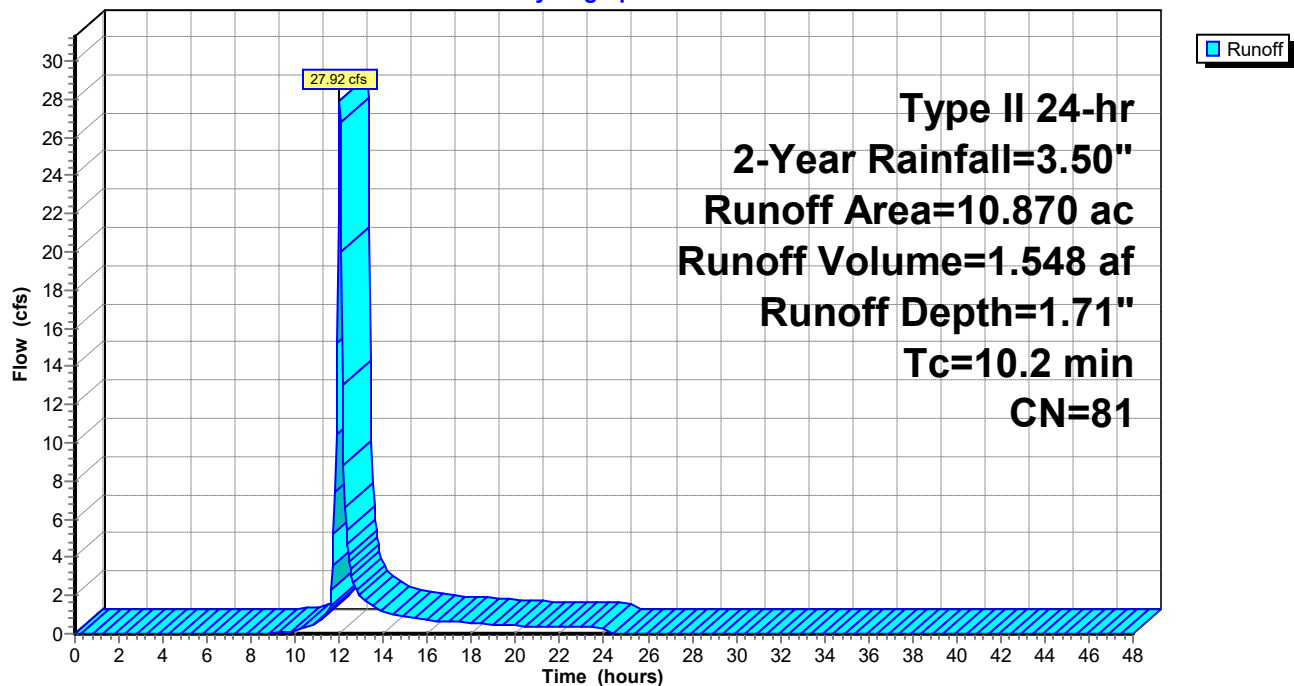
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	4.880	80	
*	5.990	81	
	10.870	81	Weighted Average
	10.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2					Direct Entry,

Subcatchment A2: West Existing

Hydrograph



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Type II 24-hr 10-Year Rainfall=5.34"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: North Existing

Runoff Area=11.620 ac 0.00% Impervious Runoff Depth=3.19"
Tc=7.7 min CN=80 Runoff=60.58 cfs 3.090 af

Subcatchment A2: West Existing

Runoff Area=10.870 ac 0.00% Impervious Runoff Depth=3.29"
Tc=10.2 min CN=81 Runoff=53.19 cfs 2.978 af

Total Runoff Area = 22.490 ac Runoff Volume = 6.068 af Average Runoff Depth = 3.24"
100.00% Pervious = 22.490 ac 0.00% Impervious = 0.000 ac

Discovery Park Alura Existing

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Type II 24-hr 10-Year Rainfall=5.34"

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Summary for Subcatchment A1: North Existing

Runoff = 60.58 cfs @ 11.99 hrs, Volume= 3.090 af, Depth= 3.19"

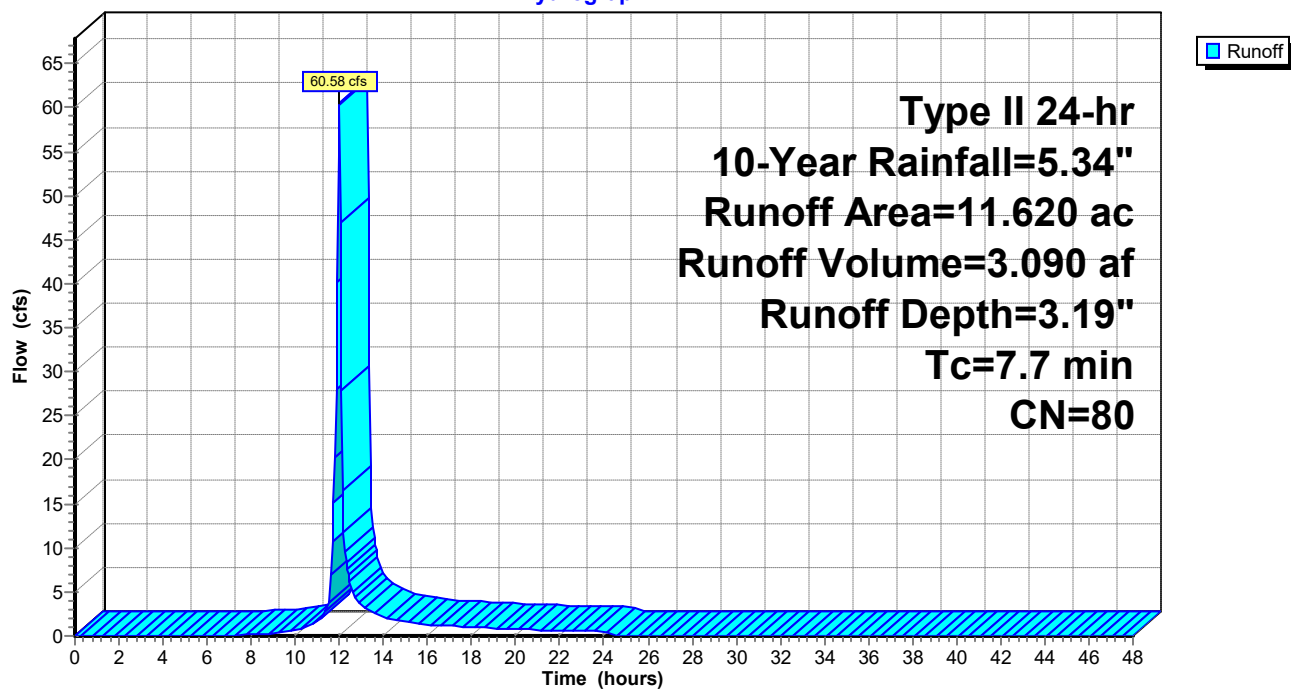
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.34"

Area (ac)	CN	Description
* 11.620	80	
11.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7					Direct Entry,

Subcatchment A1: North Existing

Hydrograph



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Type II 24-hr 10-Year Rainfall=5.34"

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Summary for Subcatchment A2: West Existing

Runoff = 53.19 cfs @ 12.02 hrs, Volume= 2.978 af, Depth= 3.29"

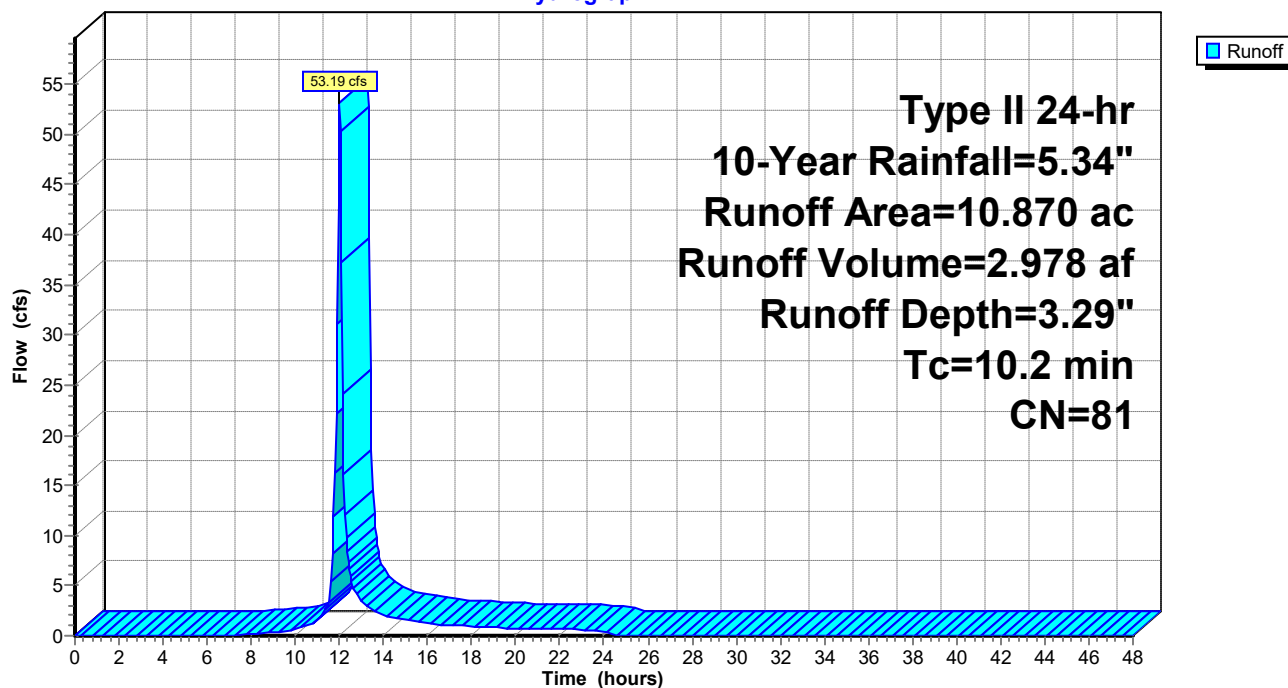
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.34"

Area (ac)	CN	Description
* 4.880	80	
* 5.990	81	
10.870	81	Weighted Average
10.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2					Direct Entry,

Subcatchment A2: West Existing

Hydrograph



Discovery Park Alura Existing

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Discovery Park Alura Apartments
Type II 24-hr 100-Year Rainfall=7.71"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: North Existing

Runoff Area=11.620 ac 0.00% Impervious Runoff Depth=5.35"
Tc=7.7 min CN=80 Runoff=99.32 cfs 5.184 af

Subcatchment A2: West Existing

Runoff Area=10.870 ac 0.00% Impervious Runoff Depth=5.47"
Tc=10.2 min CN=81 Runoff=86.71 cfs 4.954 af

Total Runoff Area = 22.490 ac Runoff Volume = 10.138 af Average Runoff Depth = 5.41"
100.00% Pervious = 22.490 ac 0.00% Impervious = 0.000 ac

Discovery Park Alura Existing

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Discovery Park Alura Apartments
Type II 24-hr 100-Year Rainfall=7.71"

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Summary for Subcatchment A1: North Existing

Runoff = 99.32 cfs @ 11.99 hrs, Volume= 5.184 af, Depth= 5.35"

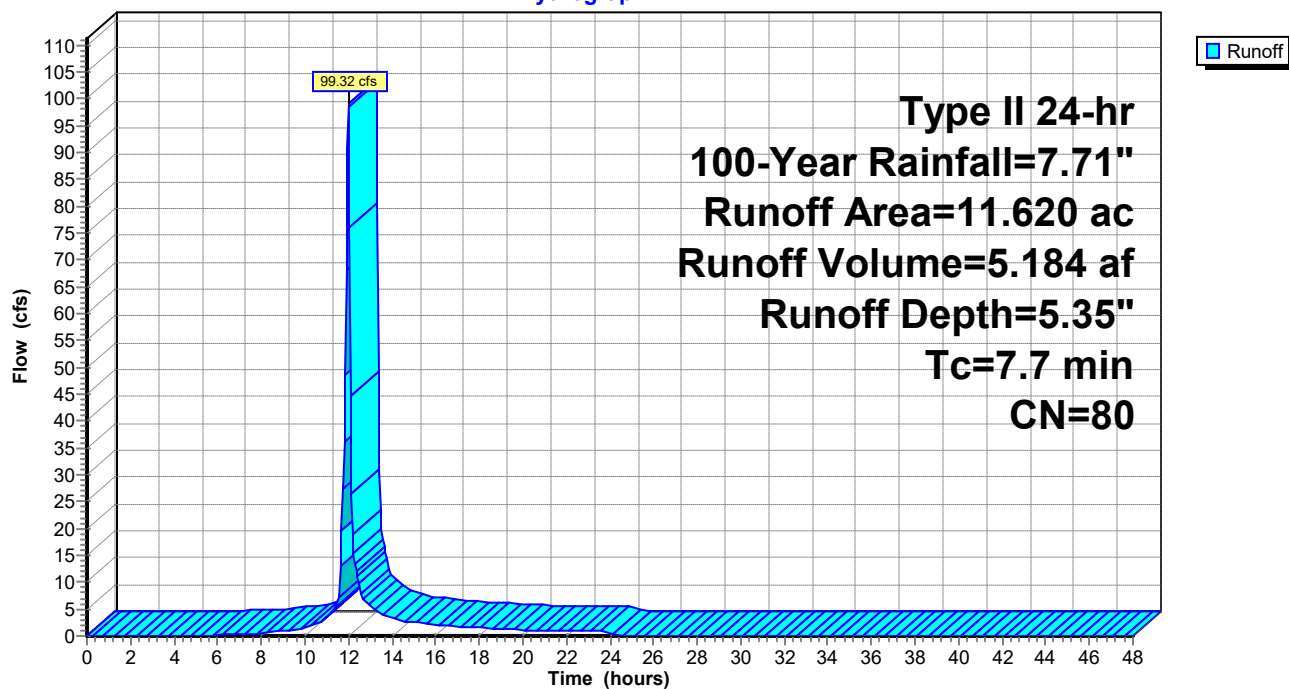
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.71"

Area (ac)	CN	Description
* 11.620	80	
11.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7					Direct Entry,

Subcatchment A1: North Existing

Hydrograph



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Type II 24-hr 100-Year Rainfall=7.71"

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Summary for Subcatchment A2: West Existing

Runoff = 86.71 cfs @ 12.01 hrs, Volume= 4.954 af, Depth= 5.47"

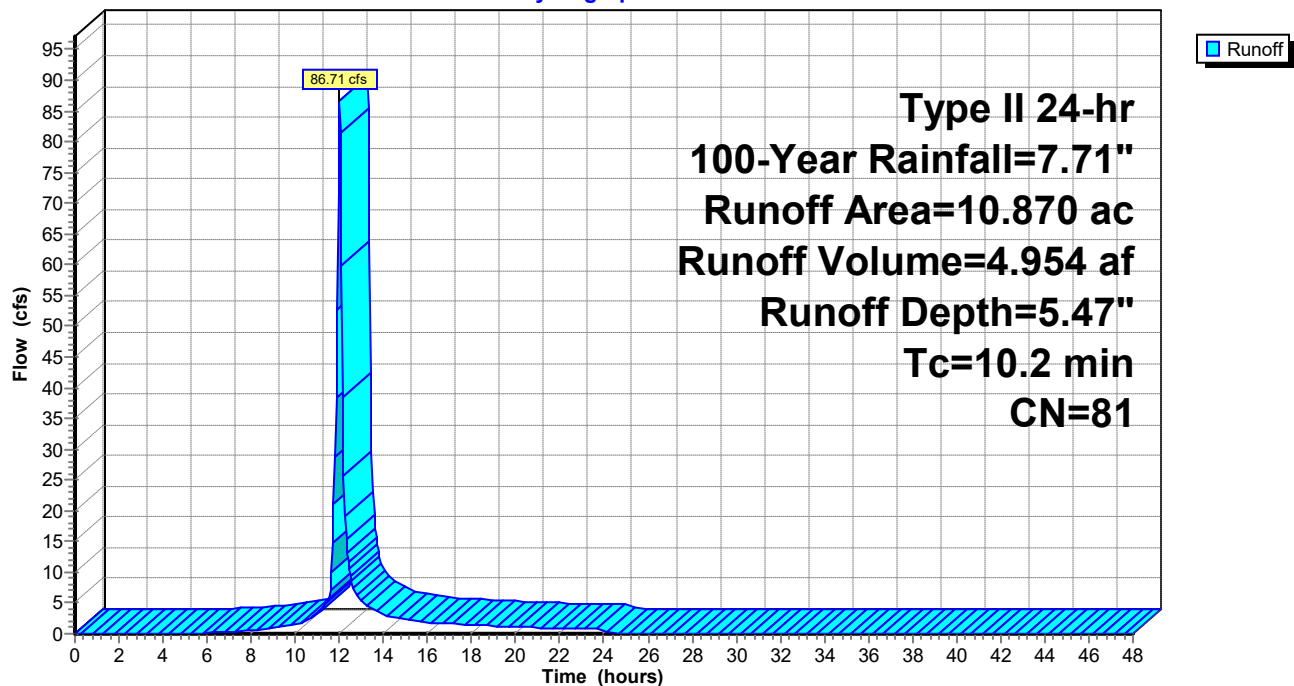
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.71"

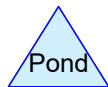
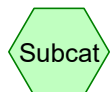
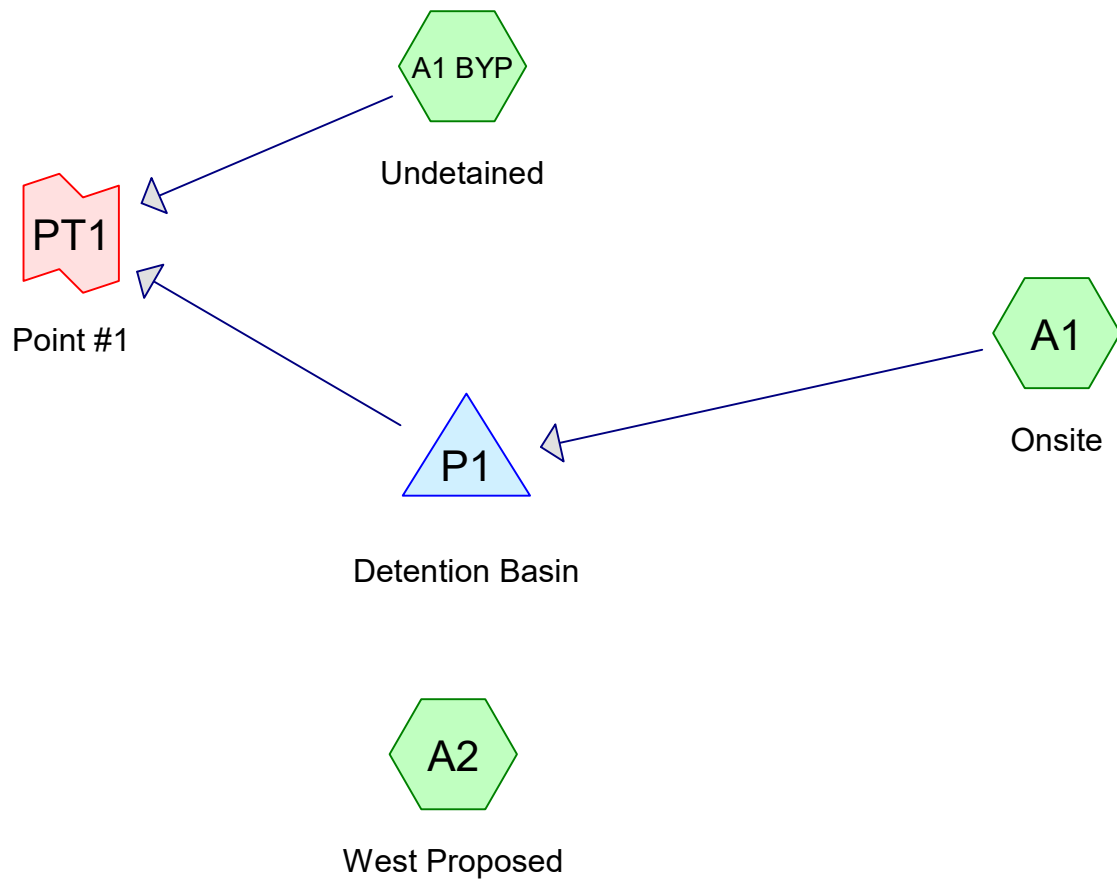
	Area (ac)	CN	Description
*	4.880	80	
*	5.990	81	
	10.870	81	Weighted Average
	10.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2					Direct Entry,

Subcatchment A2: West Existing

Hydrograph





Routing Diagram for Discovery Park Alura Proposed

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Discovery Park Alura Proposed

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type II 24-hr		Default	24.00	1	3.50	2
2	10-Year	Type II 24-hr		Default	24.00	1	5.34	2
3	100-Year	Type II 24-hr		Default	24.00	1	7.71	2

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Discovery Park Alura Apartments
Type II 24-hr 2-Year Rainfall=3.50"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: Onsite	Runoff Area=10.300 ac 0.00% Impervious Runoff Depth=2.18" Tc=6.0 min CN=87 Runoff=38.02 cfs 1.873 af
Subcatchment A1 BYP: Undetained	Runoff Area=0.990 ac 0.00% Impervious Runoff Depth=1.64" Tc=6.0 min CN=80 Runoff=2.79 cfs 0.135 af
Subcatchment A2: West Proposed	Runoff Area=11.210 ac 0.00% Impervious Runoff Depth=2.18" Tc=6.0 min CN=87 Runoff=41.38 cfs 2.039 af
Pond P1: Detention Basin	Peak Elev=926.22' Storage=44,815 cf Inflow=38.02 cfs 1.873 af Outflow=3.29 cfs 1.528 af
Link PT1: Point #1	above 5,000.00 cfs Inflow=3.56 cfs 1.663 af Primary=0.00 cfs 0.000 af Secondary=3.56 cfs 1.663 af
Total Runoff Area = 22.500 ac Runoff Volume = 4.047 af Average Runoff Depth = 2.16" 100.00% Pervious = 22.500 ac 0.00% Impervious = 0.000 ac	

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Type II 24-hr 2-Year Rainfall=3.50"

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Summary for Subcatchment A1: Onsite

Runoff = 38.02 cfs @ 11.97 hrs, Volume= 1.873 af, Depth= 2.18"
Routed to Pond P1 : Detention Basin

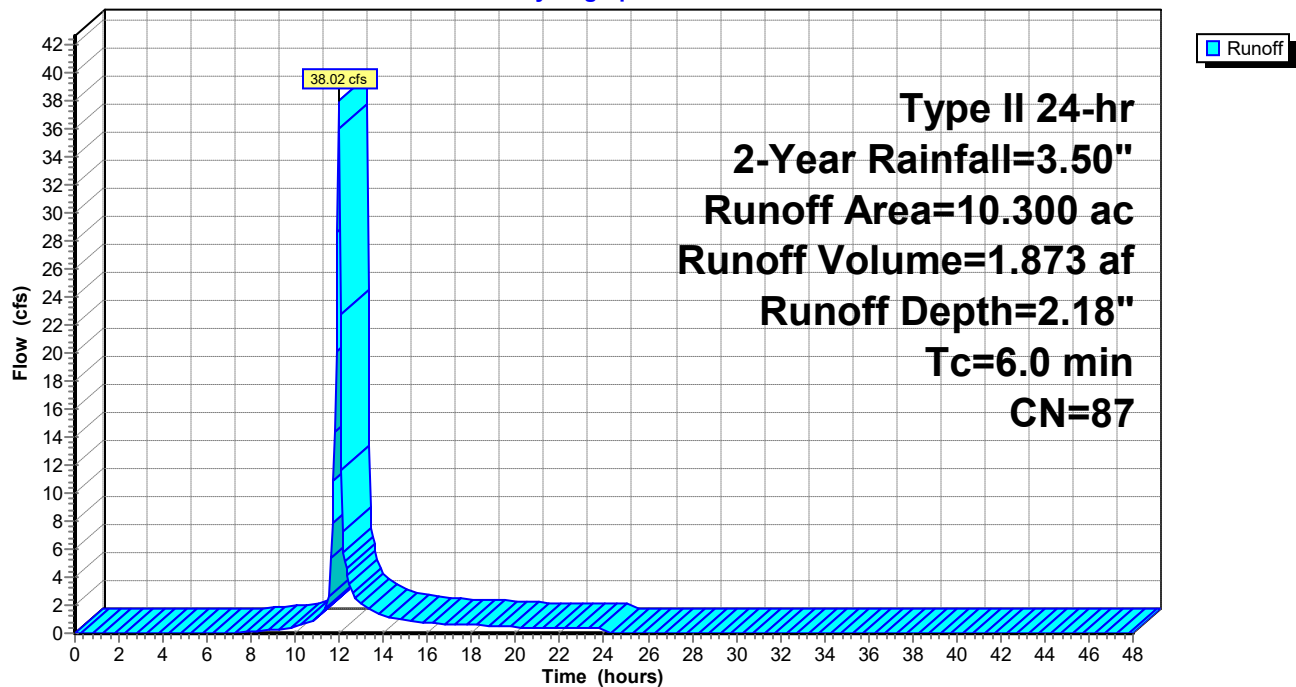
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

Area (ac)	CN	Description
* 10.300	87	
10.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment A1: Onsite

Hydrograph



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Type II 24-hr 2-Year Rainfall=3.50"

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Summary for Subcatchment A1 BYP: Undetained

Runoff = 2.79 cfs @ 11.97 hrs, Volume= 0.135 af, Depth= 1.64"
Routed to Link PT1 : Point #1

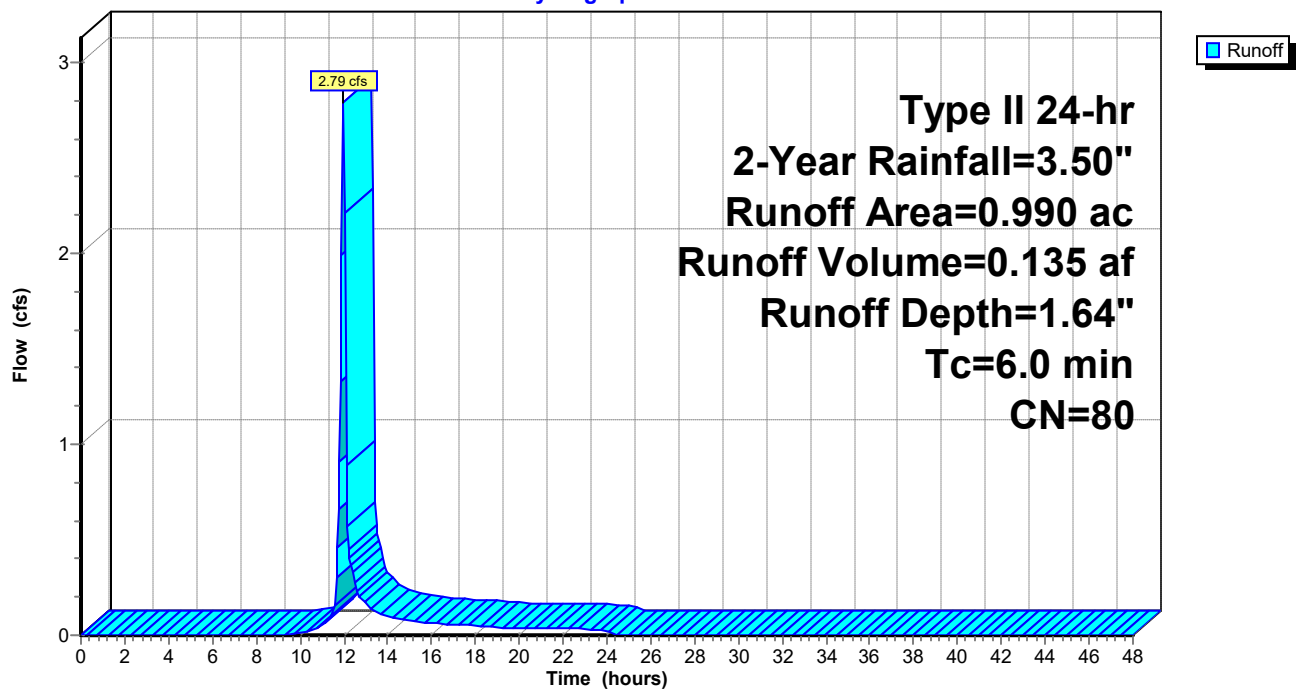
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

Area (ac)	CN	Description
0.990	80	>75% Grass cover, Good, HSG D
0.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment A1 BYP: Undetained

Hydrograph



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Type II 24-hr 2-Year Rainfall=3.50"

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Summary for Subcatchment A2: West Proposed

Runoff = 41.38 cfs @ 11.97 hrs, Volume= 2.039 af, Depth= 2.18"

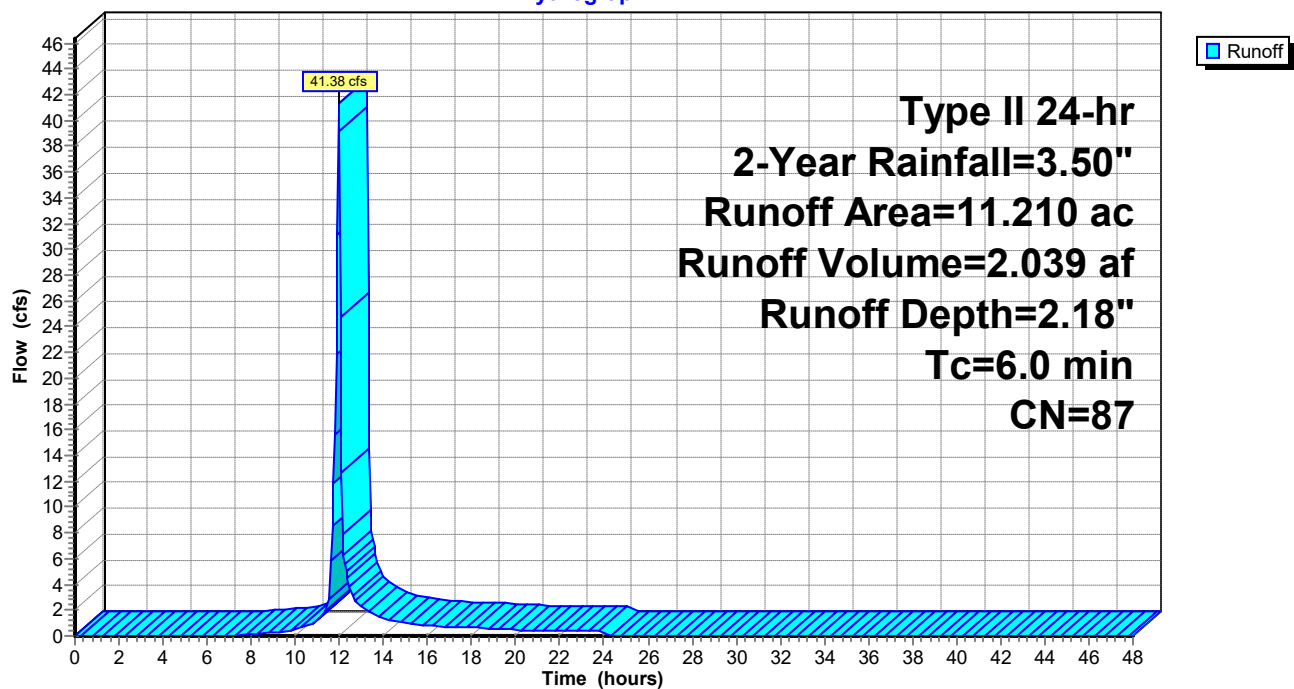
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

Area (ac)	CN	Description
* 11.210	87	
11.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment A2: West Proposed

Hydrograph



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Type II 24-hr 2-Year Rainfall=3.50"

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Summary for Pond P1: Detention Basin

Inflow Area = 10.300 ac, 0.00% Impervious, Inflow Depth = 2.18" for 2-Year event
Inflow = 38.02 cfs @ 11.97 hrs, Volume= 1.873 af
Outflow = 3.29 cfs @ 12.50 hrs, Volume= 1.528 af, Atten= 91%, Lag= 32.1 min
Primary = 3.29 cfs @ 12.50 hrs, Volume= 1.528 af
Routed to Link PT1 : Point #1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 926.22' @ 12.50 hrs Surf.Area= 12,335 sf Storage= 44,815 cf

Plug-Flow detention time= 661.1 min calculated for 1.526 af (81% of inflow)
Center-of-Mass det. time= 584.1 min (1,396.2 - 812.1)

Volume	Invert	Avail.Storage	Storage Description	
#1	919.00'	176,845 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
919.00	1,307	0	0	1,307
920.00	2,240	1,753	1,753	2,252
921.00	3,138	2,676	4,429	3,168
922.00	5,147	4,101	8,530	5,190
923.00	6,695	5,904	14,434	6,762
924.00	8,340	7,502	21,937	8,435
925.00	10,081	9,197	31,134	10,209
926.00	11,918	10,987	42,120	12,083
927.00	13,851	12,872	54,993	14,057
928.00	15,880	14,854	69,847	16,132
929.00	18,005	16,931	86,778	18,306
930.00	20,218	19,101	105,879	20,573
931.00	22,485	21,341	127,220	22,898
932.00	24,806	23,636	150,856	25,282
933.00	27,189	25,988	176,845	27,733

Device	Routing	Invert	Outlet Devices
#1	Primary	919.00'	24.0" Round Culvert L= 200.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 919.00' / 910.00' S= 0.0450 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	919.00'	2.2" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	925.85'	48.0" W x 8.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	930.10'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

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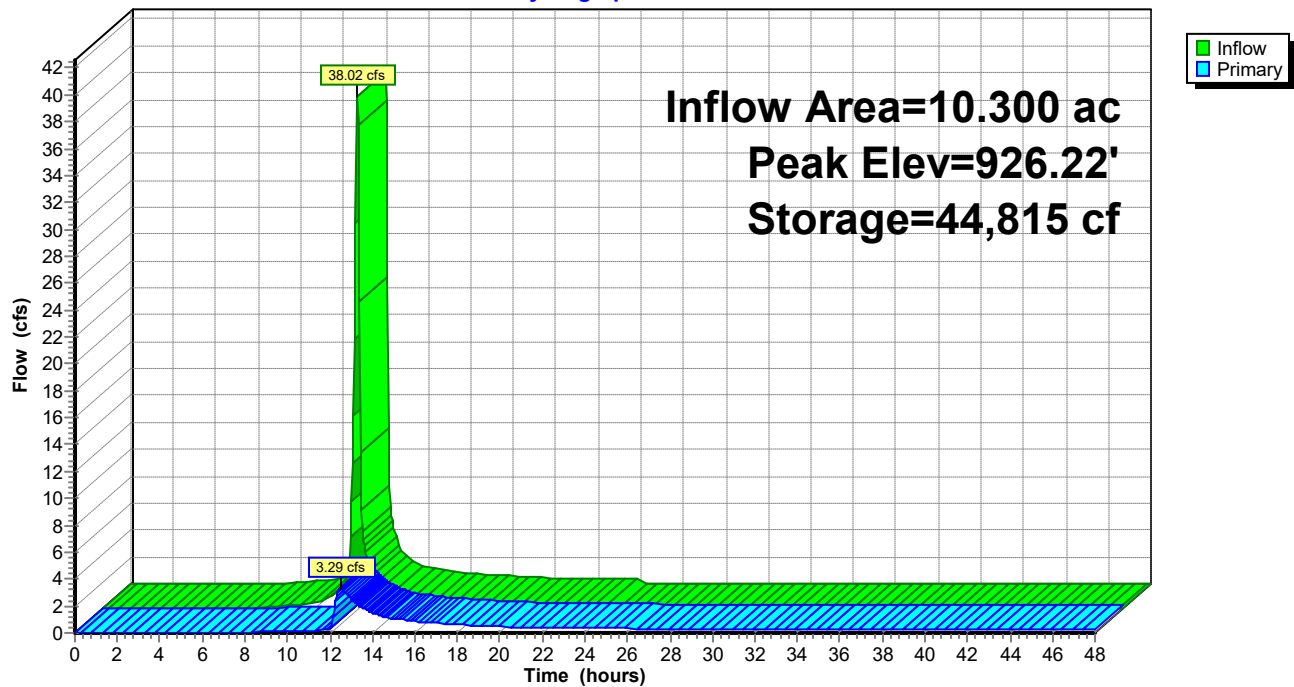
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Primary OutFlow Max=3.25 cfs @ 12.50 hrs HW=926.22' (Free Discharge)

- 1=Culvert (Passes 3.25 cfs of 37.73 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.34 cfs @ 12.86 fps)
- 3=Orifice/Grate (Orifice Controls 2.91 cfs @ 1.96 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond P1: Detention Basin

Hydrograph



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Stage-Area-Storage for Pond P1: Detention Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
919.00	1,307	0	929.20	18,437	90,422
919.20	1,474	278	929.40	18,875	94,153
919.40	1,650	590	929.60	19,317	97,973
919.60	1,837	939	929.80	19,765	101,881
919.80	2,033	1,326	930.00	20,218	105,879
920.00	2,240	1,753	930.20	20,662	109,967
920.20	2,408	2,217	930.40	21,110	114,144
920.40	2,581	2,716	930.60	21,564	118,411
920.60	2,761	3,250	930.80	22,022	122,770
920.80	2,946	3,821	931.00	22,485	127,220
921.00	3,138	4,429	931.20	22,940	131,763
921.20	3,500	5,093	931.40	23,400	136,397
921.40	3,882	5,831	931.60	23,864	141,123
921.60	4,284	6,647	931.80	24,333	145,943
921.80	4,706	7,545	932.00	24,806	150,856
922.00	5,147	8,530	932.20	25,274	155,864
922.20	5,440	9,589	932.40	25,746	160,966
922.40	5,742	10,707	932.60	26,223	166,163
922.60	6,051	11,886	932.80	26,704	171,456
922.80	6,369	13,128	933.00	27,189	176,845
923.00	6,695	14,434			
923.20	7,010	15,805			
923.40	7,331	17,239			
923.60	7,660	18,738			
923.80	7,997	20,303			
924.00	8,340	21,937			
924.20	8,675	23,638			
924.40	9,017	25,407			
924.60	9,365	27,245			
924.80	9,720	29,154			
925.00	10,081	31,134			
925.20	10,436	33,185			
925.40	10,797	35,309			
925.60	11,165	37,505			
925.80	11,538	39,775			
926.00	11,918	42,120			
926.20	12,293	44,541			
926.40	12,674	47,038			
926.60	13,060	49,611			
926.80	13,453	52,262			
927.00	13,851	54,993			
927.20	14,246	57,802			
927.40	14,646	60,691			
927.60	15,052	63,661			
927.80	15,463	66,712			
928.00	15,880	69,847			
928.20	16,294	73,064			
928.40	16,714	76,365			
928.60	17,139	79,750			
928.80	17,569	83,221			
929.00	18,005	86,778			

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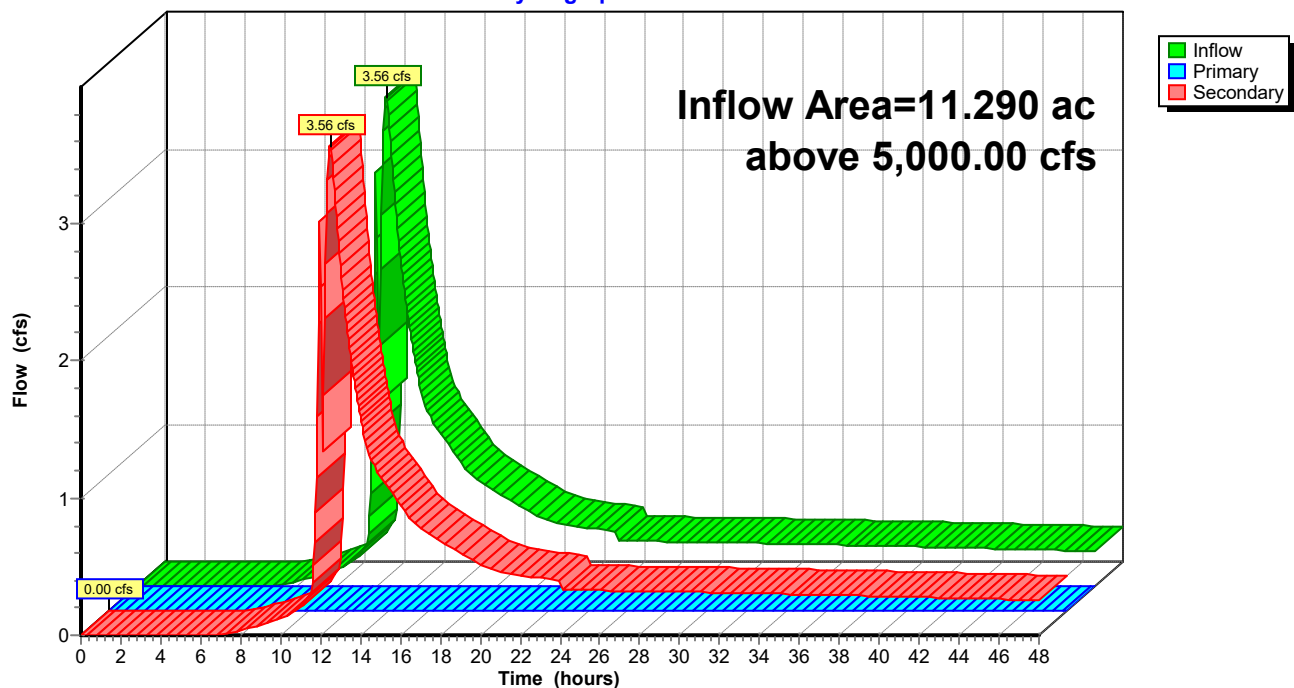
Summary for Link PT1: Point #1

Inflow Area = 11.290 ac, 0.00% Impervious, Inflow Depth > 1.77" for 2-Year event
Inflow = 3.56 cfs @ 12.48 hrs, Volume= 1.663 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Secondary = 3.56 cfs @ 12.48 hrs, Volume= 1.663 af

Primary outflow = Inflow above 5,000.00 cfs, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link PT1: Point #1

Hydrograph



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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: Onsite Runoff Area=10.300 ac 0.00% Impervious Runoff Depth=3.89"
Tc=6.0 min CN=87 Runoff=65.83 cfs 3.338 af

Subcatchment A1 BYP: Undetained Runoff Area=0.990 ac 0.00% Impervious Runoff Depth=3.19"
Tc=6.0 min CN=80 Runoff=5.37 cfs 0.263 af

Subcatchment A2: West Proposed Runoff Area=11.210 ac 0.00% Impervious Runoff Depth=3.89"
Tc=6.0 min CN=87 Runoff=71.64 cfs 3.633 af

Pond P1: Detention Basin Peak Elev=927.97' Storage=69,329 cf Inflow=65.83 cfs 3.338 af
Outflow=17.50 cfs 2.986 af

Link PT1: Point #1 above 5,000.00 cfs Inflow=20.02 cfs 3.250 af
Primary=0.00 cfs 0.000 af Secondary=20.02 cfs 3.250 af

Total Runoff Area = 22.500 ac Runoff Volume = 7.234 af Average Runoff Depth = 3.86"
100.00% Pervious = 22.500 ac 0.00% Impervious = 0.000 ac

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Type II 24-hr 10-Year Rainfall=5.34"

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Summary for Subcatchment A1: Onsite

Runoff = 65.83 cfs @ 11.97 hrs, Volume= 3.338 af, Depth= 3.89"
Routed to Pond P1 : Detention Basin

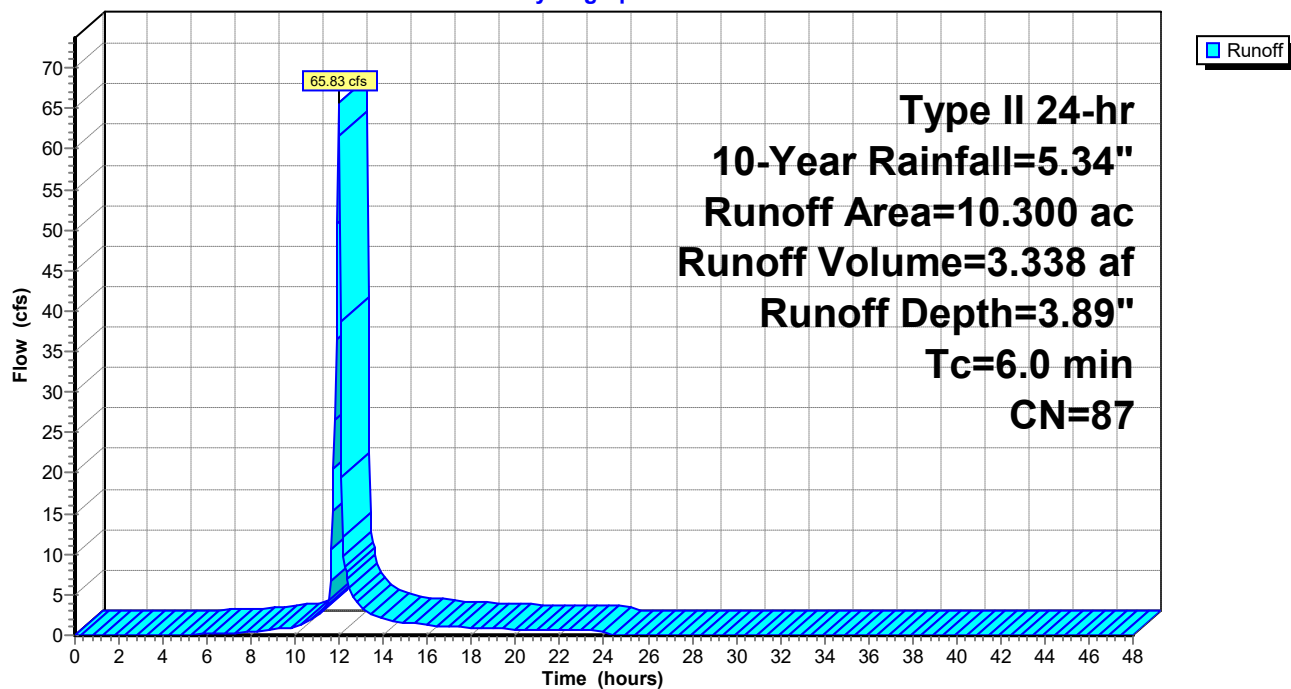
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.34"

Area (ac)	CN	Description
* 10.300	87	
10.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment A1: Onsite

Hydrograph



Discovery Park Alura Proposed

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Discovery Park Alura Apartments
Type II 24-hr 10-Year Rainfall=5.34"

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Summary for Subcatchment A1 BYP: Undetained

Runoff = 5.37 cfs @ 11.97 hrs, Volume= 0.263 af, Depth= 3.19"
Routed to Link PT1 : Point #1

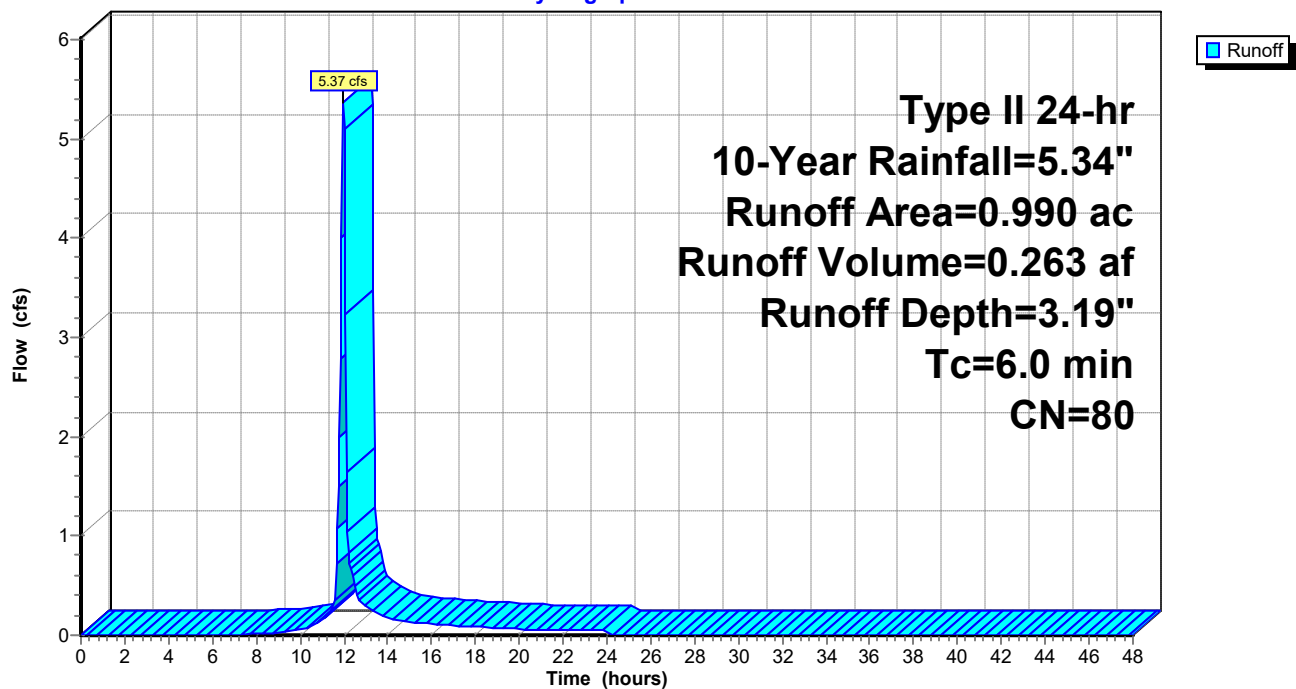
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.34"

Area (ac)	CN	Description
0.990	80	>75% Grass cover, Good, HSG D
0.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment A1 BYP: Undetained

Hydrograph



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Summary for Subcatchment A2: West Proposed

Runoff = 71.64 cfs @ 11.97 hrs, Volume= 3.633 af, Depth= 3.89"

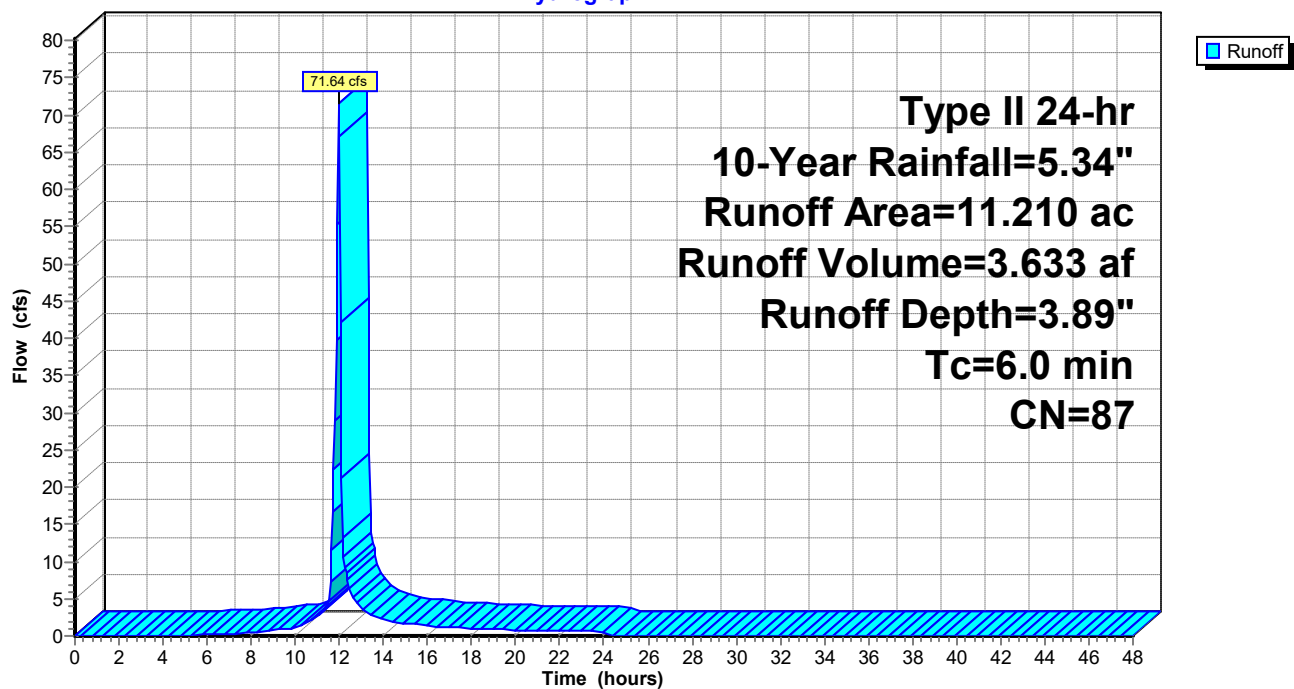
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.34"

Area (ac)	CN	Description
* 11.210	87	
11.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment A2: West Proposed

Hydrograph



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Type II 24-hr 10-Year Rainfall=5.34"

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Summary for Pond P1: Detention Basin

Inflow Area = 10.300 ac, 0.00% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 65.83 cfs @ 11.97 hrs, Volume= 3.338 af
Outflow = 17.50 cfs @ 12.12 hrs, Volume= 2.986 af, Atten= 73%, Lag= 9.2 min
Primary = 17.50 cfs @ 12.12 hrs, Volume= 2.986 af
Routed to Link PT1 : Point #1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 927.97' @ 12.12 hrs Surf.Area= 15,812 sf Storage= 69,329 cf

Plug-Flow detention time= 370.3 min calculated for 2.983 af (89% of inflow)
Center-of-Mass det. time= 318.7 min (1,114.4 - 795.7)

Volume	Invert	Avail.Storage	Storage Description	
#1	919.00'	176,845 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
919.00	1,307	0	0	1,307
920.00	2,240	1,753	1,753	2,252
921.00	3,138	2,676	4,429	3,168
922.00	5,147	4,101	8,530	5,190
923.00	6,695	5,904	14,434	6,762
924.00	8,340	7,502	21,937	8,435
925.00	10,081	9,197	31,134	10,209
926.00	11,918	10,987	42,120	12,083
927.00	13,851	12,872	54,993	14,057
928.00	15,880	14,854	69,847	16,132
929.00	18,005	16,931	86,778	18,306
930.00	20,218	19,101	105,879	20,573
931.00	22,485	21,341	127,220	22,898
932.00	24,806	23,636	150,856	25,282
933.00	27,189	25,988	176,845	27,733

Device	Routing	Invert	Outlet Devices
#1	Primary	919.00'	24.0" Round Culvert L= 200.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 919.00' / 910.00' S= 0.0450 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	919.00'	2.2" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	925.85'	48.0" W x 8.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	930.10'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

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Type II 24-hr 10-Year Rainfall=5.34"

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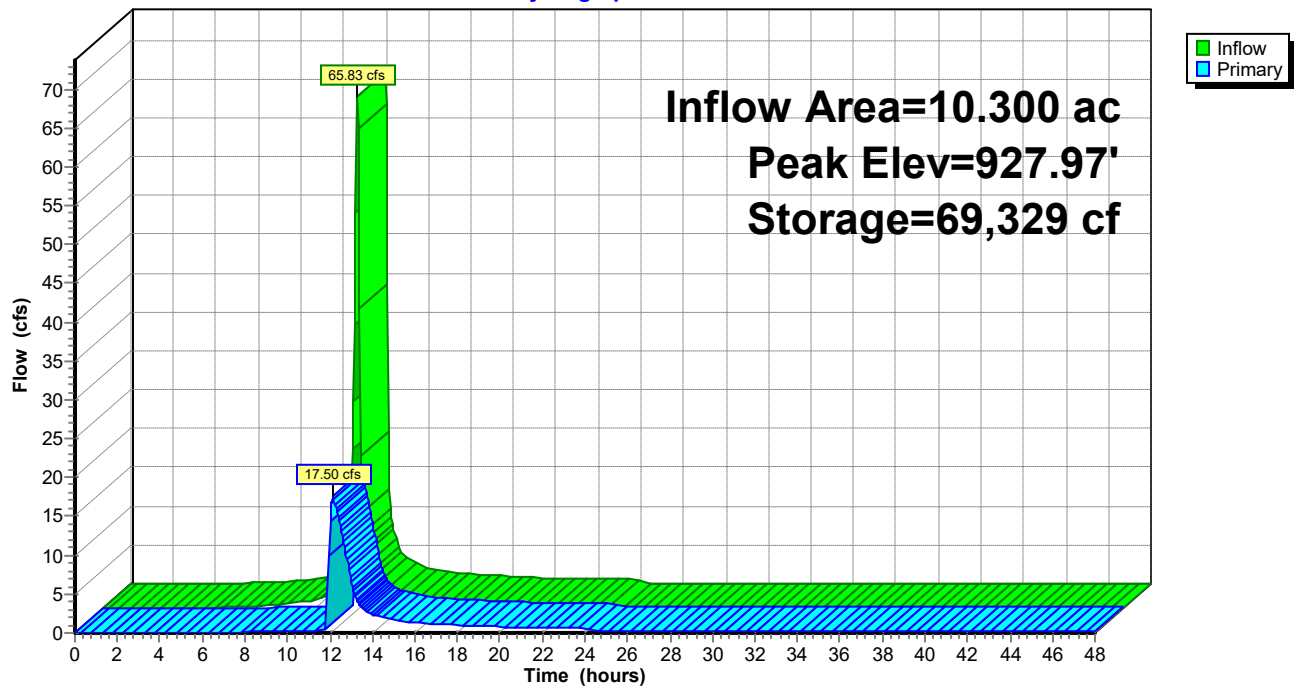
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Primary OutFlow Max=17.41 cfs @ 12.12 hrs HW=927.95' (Free Discharge)

- 1=Culvert (Passes 17.41 cfs of 42.65 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.38 cfs @ 14.33 fps)
- 3=Orifice/Grate (Orifice Controls 17.04 cfs @ 6.39 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond P1: Detention Basin

Hydrograph



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Type II 24-hr 10-Year Rainfall=5.34"

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Stage-Area-Storage for Pond P1: Detention Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
919.00	1,307	0	929.20	18,437	90,422
919.20	1,474	278	929.40	18,875	94,153
919.40	1,650	590	929.60	19,317	97,973
919.60	1,837	939	929.80	19,765	101,881
919.80	2,033	1,326	930.00	20,218	105,879
920.00	2,240	1,753	930.20	20,662	109,967
920.20	2,408	2,217	930.40	21,110	114,144
920.40	2,581	2,716	930.60	21,564	118,411
920.60	2,761	3,250	930.80	22,022	122,770
920.80	2,946	3,821	931.00	22,485	127,220
921.00	3,138	4,429	931.20	22,940	131,763
921.20	3,500	5,093	931.40	23,400	136,397
921.40	3,882	5,831	931.60	23,864	141,123
921.60	4,284	6,647	931.80	24,333	145,943
921.80	4,706	7,545	932.00	24,806	150,856
922.00	5,147	8,530	932.20	25,274	155,864
922.20	5,440	9,589	932.40	25,746	160,966
922.40	5,742	10,707	932.60	26,223	166,163
922.60	6,051	11,886	932.80	26,704	171,456
922.80	6,369	13,128	933.00	27,189	176,845
923.00	6,695	14,434			
923.20	7,010	15,805			
923.40	7,331	17,239			
923.60	7,660	18,738			
923.80	7,997	20,303			
924.00	8,340	21,937			
924.20	8,675	23,638			
924.40	9,017	25,407			
924.60	9,365	27,245			
924.80	9,720	29,154			
925.00	10,081	31,134			
925.20	10,436	33,185			
925.40	10,797	35,309			
925.60	11,165	37,505			
925.80	11,538	39,775			
926.00	11,918	42,120			
926.20	12,293	44,541			
926.40	12,674	47,038			
926.60	13,060	49,611			
926.80	13,453	52,262			
927.00	13,851	54,993			
927.20	14,246	57,802			
927.40	14,646	60,691			
927.60	15,052	63,661			
927.80	15,463	66,712			
928.00	15,880	69,847			
928.20	16,294	73,064			
928.40	16,714	76,365			
928.60	17,139	79,750			
928.80	17,569	83,221			
929.00	18,005	86,778			

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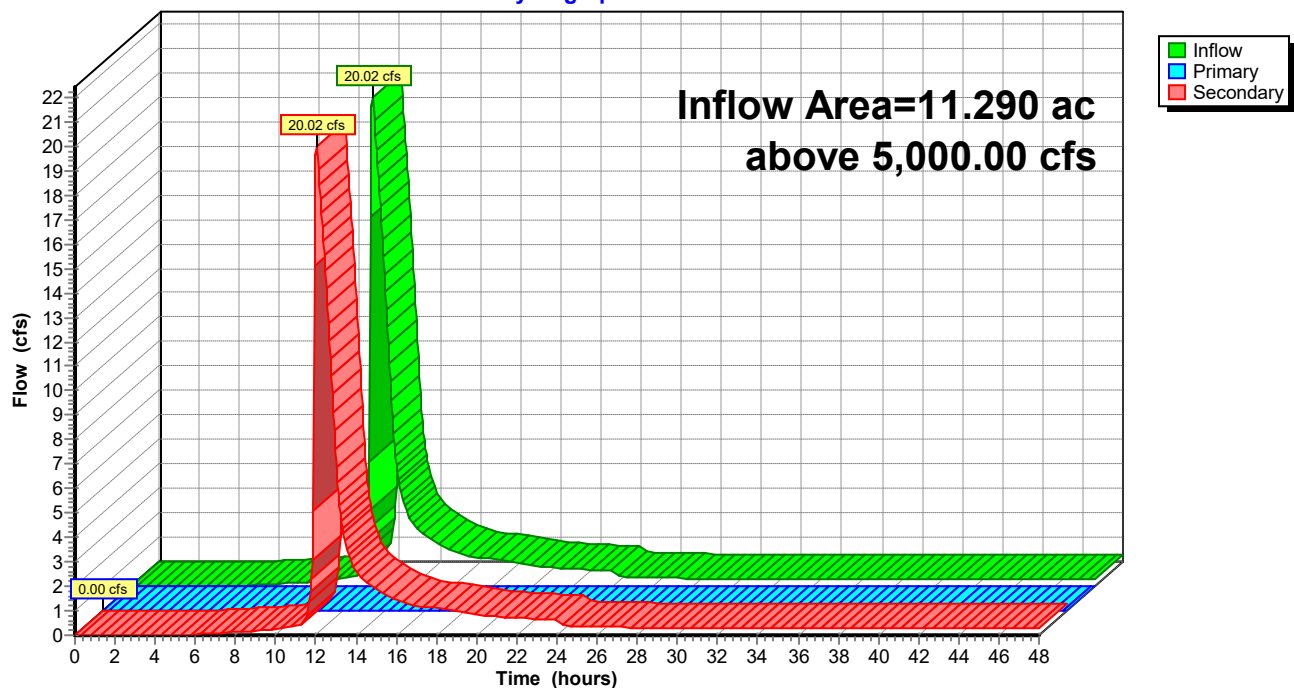
Summary for Link PT1: Point #1

Inflow Area = 11.290 ac, 0.00% Impervious, Inflow Depth > 3.45" for 10-Year event
Inflow = 20.02 cfs @ 12.04 hrs, Volume= 3.250 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Secondary = 20.02 cfs @ 12.04 hrs, Volume= 3.250 af

Primary outflow = Inflow above 5,000.00 cfs, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link PT1: Point #1

Hydrograph



Discovery Park Alura Proposed

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Type II 24-hr 100-Year Rainfall=7.71"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: Onsite Runoff Area=10.300 ac 0.00% Impervious Runoff Depth=6.17"
Tc=6.0 min CN=87 Runoff=101.48 cfs 5.294 af

Subcatchment A1 BYP: Undetained Runoff Area=0.990 ac 0.00% Impervious Runoff Depth=5.35"
Tc=6.0 min CN=80 Runoff=8.81 cfs 0.442 af

Subcatchment A2: West Proposed Runoff Area=11.210 ac 0.00% Impervious Runoff Depth=6.17"
Tc=6.0 min CN=87 Runoff=110.44 cfs 5.762 af

Pond P1: Detention Basin Peak Elev=930.09' Storage=107,737 cf Inflow=101.48 cfs 5.294 af
Outflow=25.80 cfs 4.937 af

Link PT1: Point #1 above 5,000.00 cfs Inflow=31.82 cfs 5.379 af
Primary=0.00 cfs 0.000 af Secondary=31.82 cfs 5.379 af

Total Runoff Area = 22.500 ac Runoff Volume = 11.497 af Average Runoff Depth = 6.13"
100.00% Pervious = 22.500 ac 0.00% Impervious = 0.000 ac

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Discovery Park Alura Apartments
Type II 24-hr 100-Year Rainfall=7.71"

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Summary for Subcatchment A1: Onsite

Runoff = 101.48 cfs @ 11.96 hrs, Volume= 5.294 af, Depth= 6.17"
Routed to Pond P1 : Detention Basin

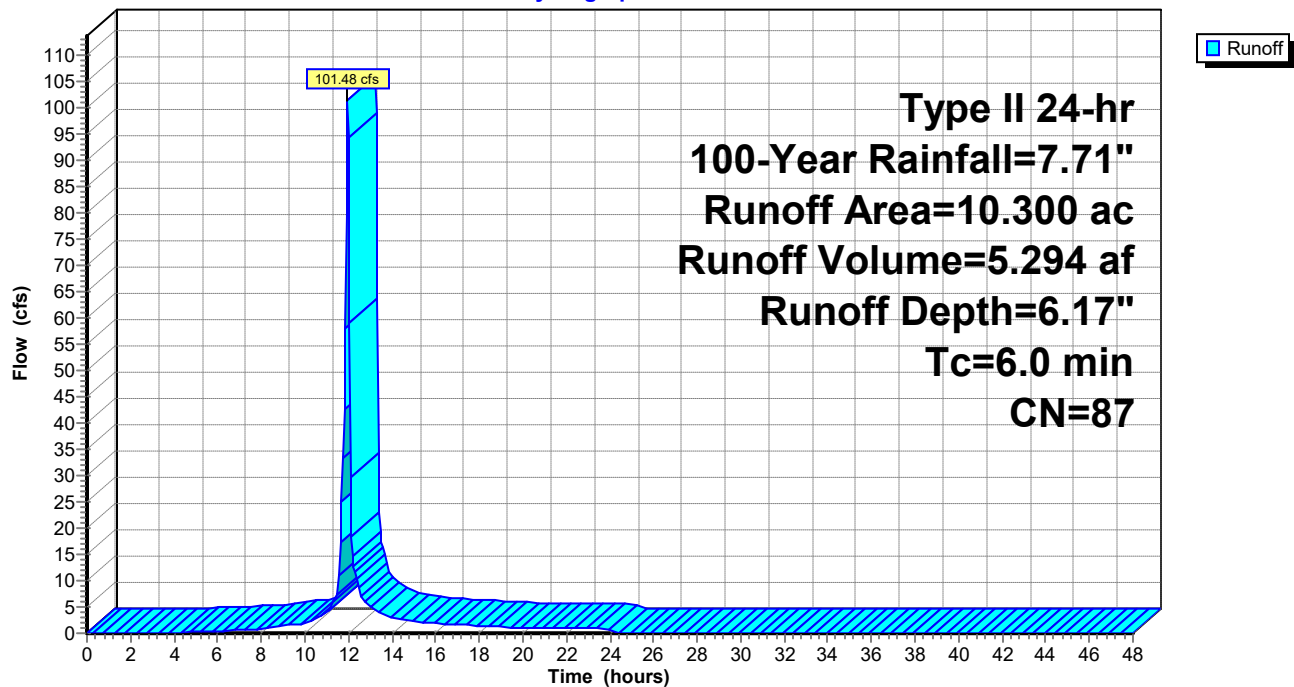
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.71"

Area (ac)	CN	Description
* 10.300	87	
10.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment A1: Onsite

Hydrograph



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Type II 24-hr 100-Year Rainfall=7.71"

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Summary for Subcatchment A1 BYP: Undetained

Runoff = 8.81 cfs @ 11.97 hrs, Volume= 0.442 af, Depth= 5.35"
Routed to Link PT1 : Point #1

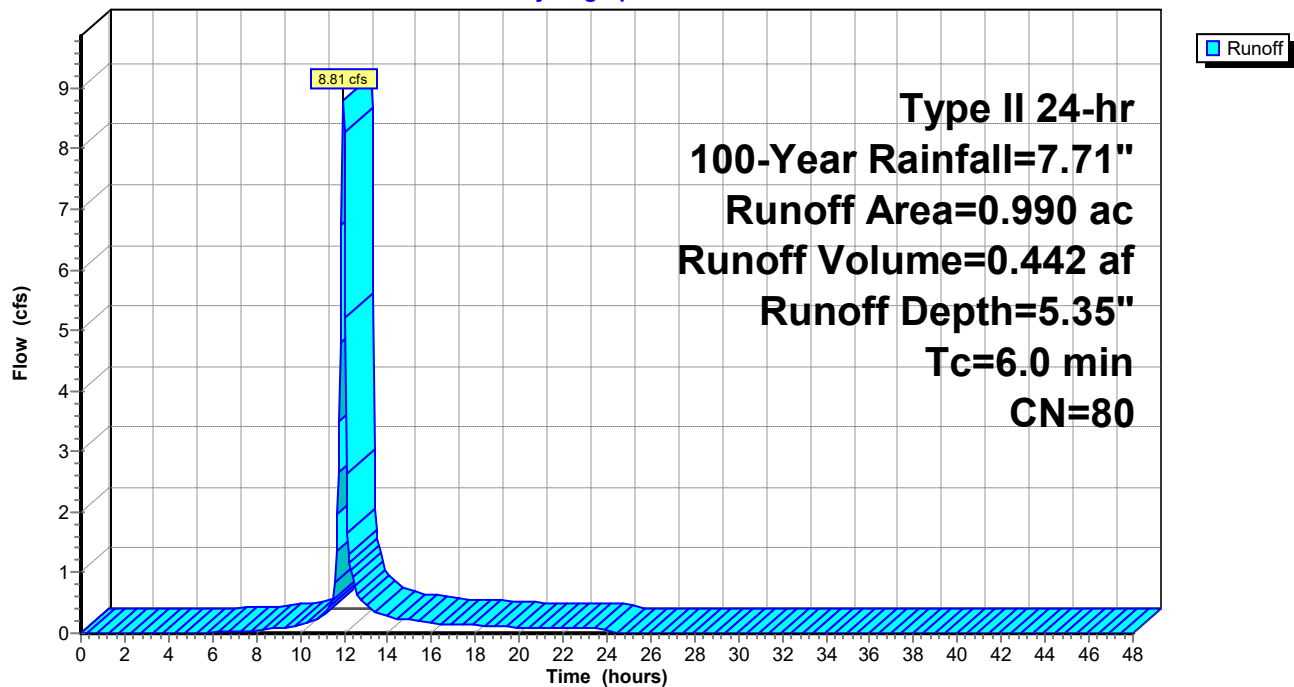
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.71"

Area (ac)	CN	Description
0.990	80	>75% Grass cover, Good, HSG D
0.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment A1 BYP: Undetained

Hydrograph



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Summary for Subcatchment A2: West Proposed

Runoff = 110.44 cfs @ 11.96 hrs, Volume= 5.762 af, Depth= 6.17"

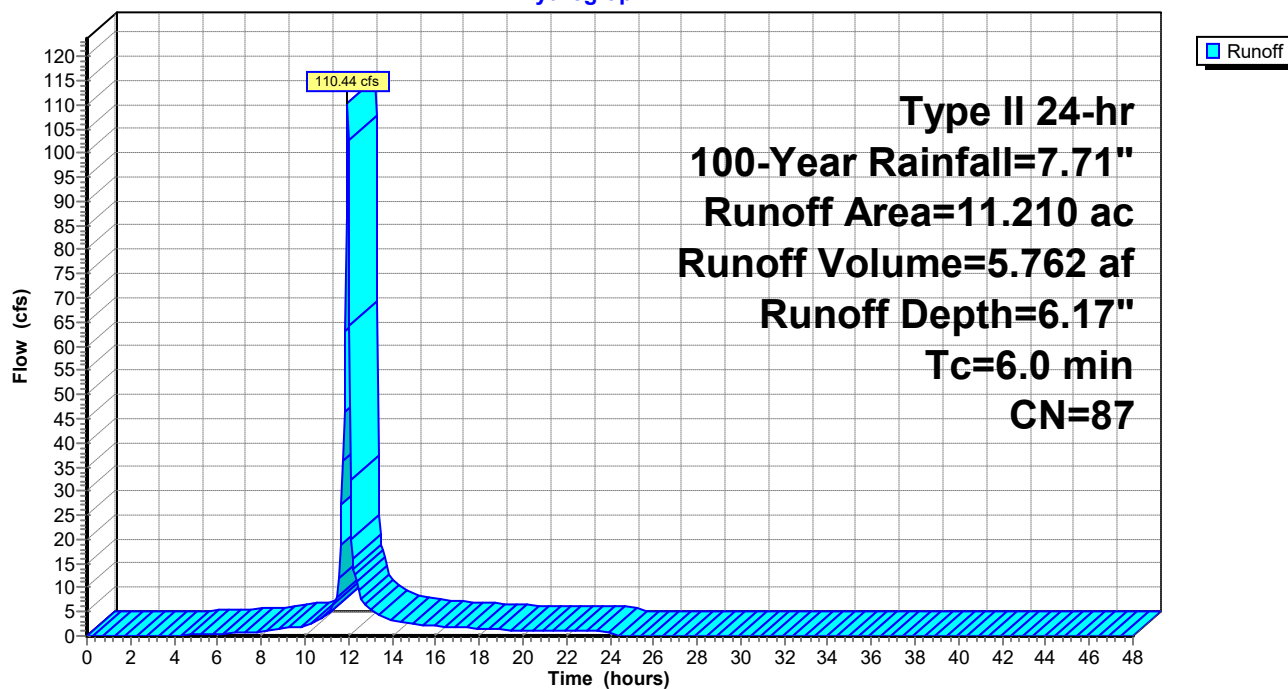
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.71"

Area (ac)	CN	Description
* 11.210	87	
11.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment A2: West Proposed

Hydrograph



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Summary for Pond P1: Detention Basin

Inflow Area = 10.300 ac, 0.00% Impervious, Inflow Depth = 6.17" for 100-Year event
Inflow = 101.48 cfs @ 11.96 hrs, Volume= 5.294 af
Outflow = 25.80 cfs @ 12.12 hrs, Volume= 4.937 af, Atten= 75%, Lag= 9.4 min
Primary = 25.80 cfs @ 12.12 hrs, Volume= 4.937 af
Routed to Link PT1 : Point #1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 930.09' @ 12.12 hrs Surf.Area= 20,420 sf Storage= 107,737 cf

Plug-Flow detention time= 252.9 min calculated for 4.932 af (93% of inflow)
Center-of-Mass det. time= 216.8 min (999.7 - 782.9)

Volume	Invert	Avail.Storage	Storage Description	
#1	919.00'	176,845 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
919.00	1,307	0	0	1,307
920.00	2,240	1,753	1,753	2,252
921.00	3,138	2,676	4,429	3,168
922.00	5,147	4,101	8,530	5,190
923.00	6,695	5,904	14,434	6,762
924.00	8,340	7,502	21,937	8,435
925.00	10,081	9,197	31,134	10,209
926.00	11,918	10,987	42,120	12,083
927.00	13,851	12,872	54,993	14,057
928.00	15,880	14,854	69,847	16,132
929.00	18,005	16,931	86,778	18,306
930.00	20,218	19,101	105,879	20,573
931.00	22,485	21,341	127,220	22,898
932.00	24,806	23,636	150,856	25,282
933.00	27,189	25,988	176,845	27,733

Device	Routing	Invert	Outlet Devices
#1	Primary	919.00'	24.0" Round Culvert L= 200.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 919.00' / 910.00' S= 0.0450 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	919.00'	2.2" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	925.85'	48.0" W x 8.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	930.10'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

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Type II 24-hr 100-Year Rainfall=7.71"

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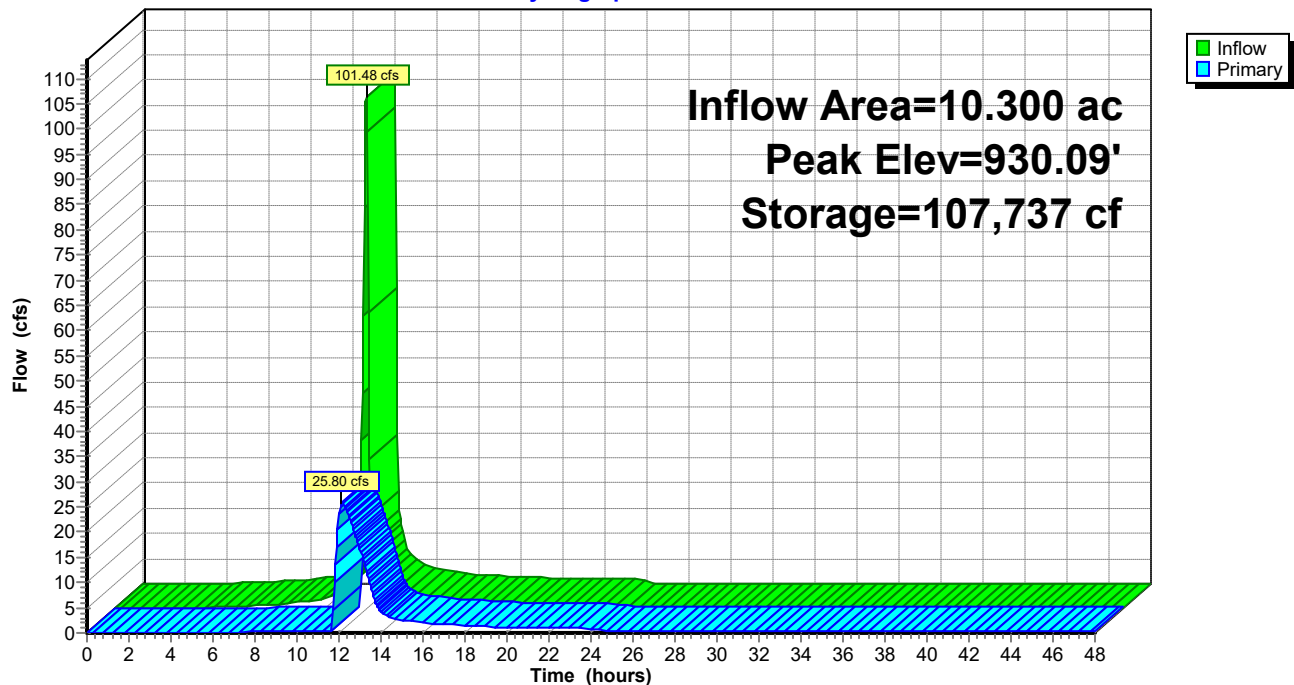
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Primary OutFlow Max=25.72 cfs @ 12.12 hrs HW=930.07' (Free Discharge)

- 1=Culvert (Passes 25.72 cfs of 48.00 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.42 cfs @ 15.95 fps)
- 3=Orifice/Grate (Orifice Controls 25.30 cfs @ 9.49 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond P1: Detention Basin

Hydrograph



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Stage-Area-Storage for Pond P1: Detention Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
919.00	1,307	0	929.20	18,437	90,422
919.20	1,474	278	929.40	18,875	94,153
919.40	1,650	590	929.60	19,317	97,973
919.60	1,837	939	929.80	19,765	101,881
919.80	2,033	1,326	930.00	20,218	105,879
920.00	2,240	1,753	930.20	20,662	109,967
920.20	2,408	2,217	930.40	21,110	114,144
920.40	2,581	2,716	930.60	21,564	118,411
920.60	2,761	3,250	930.80	22,022	122,770
920.80	2,946	3,821	931.00	22,485	127,220
921.00	3,138	4,429	931.20	22,940	131,763
921.20	3,500	5,093	931.40	23,400	136,397
921.40	3,882	5,831	931.60	23,864	141,123
921.60	4,284	6,647	931.80	24,333	145,943
921.80	4,706	7,545	932.00	24,806	150,856
922.00	5,147	8,530	932.20	25,274	155,864
922.20	5,440	9,589	932.40	25,746	160,966
922.40	5,742	10,707	932.60	26,223	166,163
922.60	6,051	11,886	932.80	26,704	171,456
922.80	6,369	13,128	933.00	27,189	176,845
923.00	6,695	14,434			
923.20	7,010	15,805			
923.40	7,331	17,239			
923.60	7,660	18,738			
923.80	7,997	20,303			
924.00	8,340	21,937			
924.20	8,675	23,638			
924.40	9,017	25,407			
924.60	9,365	27,245			
924.80	9,720	29,154			
925.00	10,081	31,134			
925.20	10,436	33,185			
925.40	10,797	35,309			
925.60	11,165	37,505			
925.80	11,538	39,775			
926.00	11,918	42,120			
926.20	12,293	44,541			
926.40	12,674	47,038			
926.60	13,060	49,611			
926.80	13,453	52,262			
927.00	13,851	54,993			
927.20	14,246	57,802			
927.40	14,646	60,691			
927.60	15,052	63,661			
927.80	15,463	66,712			
928.00	15,880	69,847			
928.20	16,294	73,064			
928.40	16,714	76,365			
928.60	17,139	79,750			
928.80	17,569	83,221			
929.00	18,005	86,778			

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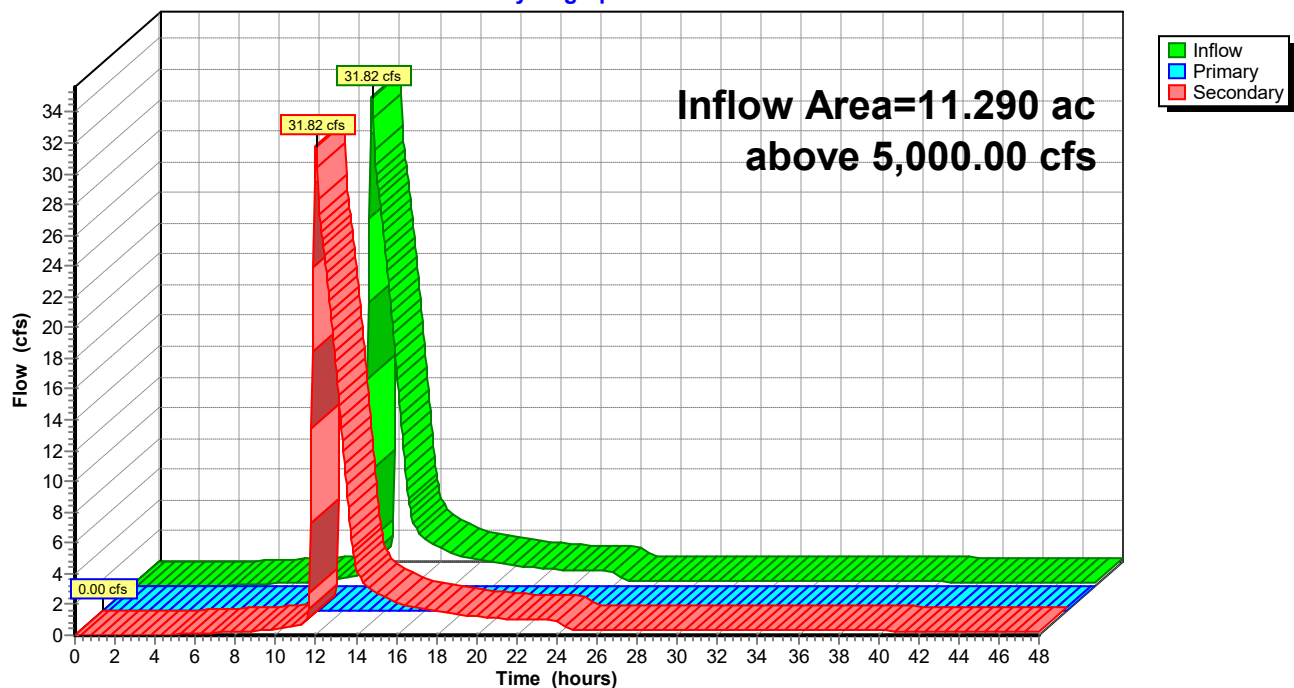
Summary for Link PT1: Point #1

Inflow Area = 11.290 ac, 0.00% Impervious, Inflow Depth > 5.72" for 100-Year event
Inflow = 31.82 cfs @ 12.01 hrs, Volume= 5.379 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Secondary = 31.82 cfs @ 12.01 hrs, Volume= 5.379 af

Primary outflow = Inflow above 5,000.00 cfs, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link PT1: Point #1

Hydrograph



Water Quality Computations



Engineering beyond.™

WORKSHEET: EXTENDED DRY DETENTION BASIN (EDD) DESIGN

Project: Alura Apartments
Location: Lee's Summit, MO

By: JWB 1/27/2025
Checked:

Basin ID: P1

Required Volume Calculation

$$WQ_v = P * R_v * A / 12 \text{ (ac-ft)}$$

P = Water Quality Storm rainfall depth = 1.37 in.

A = Local Treatment Drainage Area (acres)

R_v = Volumetric Runoff Coefficient = 0.05 + 0.009 * I

I = Percent Site Imperviousness (%)

Drainage Area:	11.29 acres
% Impervious:	75.0 %

WQ_v (required): 0.93 ac-ft
40,706 cu ft

Water Quality Outlet Type

Step 1) Set water quality outlet type

Type 1 = single orifice

Type 2 = perforated riser or plate

Type 3 = v-notch weir

Outlet Type 1

Water Quality Outlet, Single Orifice

Step 1) Depth of water quality volume at outlet, Z_{WQ} (ft)

Z_{WQ}: 5.8 ft

Step 2) Average head of water quality volume over invert of orifice, H_{WQ} (ft)

$$H_{WQ} = 0.5 * Z_{WQ}$$

H_{WQ}: 2.92 ft

Step 3) Average water quality outflow rate, Q_{WQ} (cfs)

Q_{WQ}: 0.28 cfs

$$Q_{WQ} = (WQ_v * 43,560) / (40 * 3,600)$$

Step 4) Set value of orifice discharge coefficient, C_O

C_O: 0.66

C_O = 0.66 when thickness of riser/weir plate is ≤ orifice diameter

C_O = 0.80 when thickness of riser/weir plate is > orifice diameter

Step 5) Water quality outlet orifice diameter (minimum of 4 inches), D_O (in)

D_O: 2.39 in

$$D_O = 12 * 2 * (Q_{WQ} / (C_O * \pi * (2 * g * H)^{0.5}))^{0.5}$$

WQ_v (proposed): 0.92 ac-ft

40-Hour WQ_v Outlet

Outlet Elevation:	919.00
Outlet Type:	Orifice
Outlet Size:	2.25" Diameter
Outlet Protection:	Submerged Well-screen