Wyandotte Woods Sections 9 & 10

Stormwater Management Report

Prepared for:
The Homewood Corporation

Prepared by:

January 27, 2016

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LIST OF APPENDICES

1.0 Project Introduction

1.1 PROJECT BACKGROUND

The proposed Wyandotte Woods Sections 9 & 10 single family sites are located just north of Wyandotte Woods Section 8 and just west of the Emerald Fields Park in Dublin Ohio.

The proposed site will consist of 55 single family lots and corresponding street access. Section 9 will drain south toward Basin A that was constructed during development of Section 8. Section 10 will drain west toward Basin B that was constructed during Section 4 of the development. Basin A will be modified during this phase of construction to provide adequate water quality and quantity control for the proposed tributary area. Basin B is sized to adequately treat water quality and quantity for the post-developed conditions as evidenced in the attached approved stormwater management report from Section 4 and thus, will not require modifications.

This report details the stormwater quantity and quality treatment measures to be provided by the modified Basin A.

1.2 EXISTING CONDITIONS

The existing site is considered to be undeveloped light woodlands with existing land slopes of between 2% and 10%. The site currently drains to the south toward Section 8 and west toward Section 5. There are approximately 19.42 acres of the site tributary to the proposed detention system. All watershed areas are outlined in the record plans.

Basin A was constructed during Section 8 of development and is currently undersized to adequately control stormwater release from the site.

1.3 PROPOSED CONDITIONS

The proposed site will consist of 55 ¼ acre single family lots. Site slopes will vary between 0.5% and 8%. The stormwater management system has been designed to detain the 5-year post-developed onsite flow to the 1-year pre-developed rate per the City of Dublin Stormwater Management Design Manual the Wyandotte Woods Stormwater Master Plan. The total outflow from the system will not exceed the allowable release rates for any storm event. Basin A is located adjacent to a proposed multi-family development site and will require further modifications beyond what is outlined in this report to adequately control stormwater runoff from the future multi-family development.

2.0 Hydrologic Analysis

2.1 RUNOFF COEFFICIENTS

Pre-development runoff coefficients for the site were based on good light tree and dense grass cover. A CN value of 72 was used for the pre-developed onsite flow. A CN value of 81 was assigned to Section 8 to represent the 1/3 acre lots currently built on the site. A post-developed CN of 83 was assigned to Section 9 development to reflect the nature of ¼ acre lots planned for the development.

Soil types were considered to be in Hydrologic Soil Group C with slow infiltration rates.

2.2 TIME OF CONCENTRATION

Pre-development travel times were calculated using a combination of sheet and shallow concentrated flow. A maximum length of 100 feet of sheet flow was used before transitioning to shallow concentrated flow. A value of 2.20 inches was used for the 1-year 24-hour rainfall depth, as determined from the City of Dublin Stormwater Management Design Manual. (Dublin, 2013)

Existing contours were used to determine the existing land slopes leading to the outlet location, while the proposed storm sewer design was used to determine the post-developed times of concentration.

2.3 PREDEVELOPED RUNOFF RATES

Pre-developed runoff rates were calculated using the criteria outlined above and are presented in the table below.

TABLE 1 SUMMARY OF PRE-DEVELOPED RUNOFF RATES (CFS)

	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Section 8 Developed	6.83	9.83	14.42	18.36	24.06	28.87	33.99
Section 9A Pre-Developed	1.60	2.86	4.99	6.95	9.93	12.54	15.38
Section 9 B Pre-Developed	1.33	2.83	4.13	5.74	8.16	10.29	12.62
Total	**8.43**	**13.09**	**20.62**	**27.31**	**37.18**	**45.70**	**54.90**

3.0 Hydraulic Analysis

3.1 DETENTION CRITERIA

The City of Dublin Stormwater Management Design Manual designates a critical storm event based on the percentage increase in runoff volume between the one year pre-developed flow and one year post developed volume. Based on the existing conditions and expected land use of the overall site a 38% increase in runoff volume is expected, corresponding to a 5 year critical storm. According to the manual, all storm return periods up to and including the 5 year storm shall not release at a rate greater than the 1

year pre-developed flow from the site. Any storm events with a return period greater than 5 years shall not release at a rate greater than the pre-developed flow corresponding to that year.

TABLE 2 CRITICAL STORM CALCULATION

1 Year Pre Developed Volume	0.50	*Corresponds to a 5 year critical storm.
1 Year Post Developed Volume	0.79	
% Difference	37.7%	

*Note that analysis was completed to ensure compliance with the master stormwater plan for Wyandotte Woods.

3.2 MODELING PARAMETERS

Hydrologic and hydraulic modeling was performed using the HydroCAD® Version 10.0 software developed by HydroCAD Software Solutions LLC. This model uses the Soil Conservation Service (SCS) TR-20 methodology to determine peak flows and runoff volumes.

A Type II 24-hour storm type was selected to model the rainfall distribution across each rainfall event. This distribution is appropriate for most projects unless a localized design storm is required. The antecedent moisture condition was set to "normal" (an AMC value of 2) and the time span for the analysis was set to 48 hours.

3.3 MODIFIED STORMWATER BASIN

Detention and water quality treatment for the public right-of-way area will be provided in retention Basin A located in the open space along the southern extents of Section 8. A multi-stage outlet structure has been designed to restrict dewatering of the basin to a minimum of 24 hours during the water quality storm event (3/4" rainfall depth). During larger events, the structure will detain the release rates to the allowable rates, as determined from the pre-development conditions. An emergency overflow weir has been constructed in the basin embankment. This will activate in the event of the primary outlet becoming blocked, or in the event of a storm larger than the 100 year design storm. As noted in the previous sections the existing basin will be expanded by roughly 20 feet on the southwest edge and the outlet structure modified by cutting an additional 3.7" water quality orifice at an invert of 910.09, which will lower the normal water elevation. Both these changes are outlined in the Section 9 Street, Storm, and Waterline Improvements under the Basin Modification Detail sheet.

3.4 ANALYSIS RESULTS

The following tables are a summary of the anticipated release rates from the modified Basin A.

TABLE 3 SUMMARY OF SECTION 9 & 10 (5 Year Critical Storm)

	1 Year	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Area (acres)	16.8	16.8	16.8	16.8	16.8	16.8	16.8
Pre-Developed CN	76	76	76	76	76	76	76
Post-Developed CN	83	83	83	83	83	83	83
Pre-Developed Tc (min)	31.0	31.0	31.0	31.0	31.0	31.0	31.0
Post-Developed Tc (min)	10	10	10	10	10	10	10
Pre-Developed Flow (cfs)	8.43	13.09	20.62	27.31	37.18	45.70	54.90
Post-Developed Flow (cfs)	0.50	1.00	3.59	6.30	10.93	11.93	12.88
Allowable Release Rate (cfs)*	**5.71**	**9.90**	**10.84**	**11.50**	**12.41**	**13.21**	**14.02**

*Allowable release rates from Table 2 above are from the Stormwater Master Plan Release Point A Submitted to the City of Dublin on January 29, 2009.

Basin A will also act as a release point for future multi-family development planned south of existing Section 8. The basin is not adequately sized to handle additional multi-family flow and additional modifications will be necessary as development progresses.

4.0 WATER QUALITY SUMMARY

4.1 WATER QUALITY VOLUME

Basin A is currently designed to provide water quality for the existing Wyandotte Woods Section 8. In order to provide water quality volume for Section 9 and the future multi-family project the basin outlet water quality notch shall be cut to the invert of the outlet pipe. The 3.7" water quality orifice will provide adequate drawdown for the water quality event. An inverted PVC conduit shall be installed per the plans to prevent the orifice from clogging. According to the current Ohio EPA General Construction Stormwater Permit, the water quality requirements are based on the following equation:

$$WQv = 0.75 * C * P * (A/12)$$

Where:

WQv = water quality volume in acre-feet

C = runoff coefficient

P = precipitation depth

A = drainage area in acres

The water quality calculations are therefore as follows:

TABLE 4 WATER QUALITY SUMMARY TABLE

	Area (acres)	Runoff Coefficient
Medium Density Residential (4-8 Lots/acre):	16.80	0.4
Total Area:	**16.80**	**0.400**

P = Precipitation Depth =	**0.75**	inches
WQ_v =	**0.315**	ac-ft
Half WQ_v =	**0.158**	ac-ft

The WQv volume is satisfied at an elevation of 910.99 in the pond. The release rates below that elevation are restricted by a 3.7" water quality orifice located through the wall of the structure. Above the water quality orifice the existing water quality notch, side window, and horizontal grate permit larger flows to release. Less frequent storm events are then restricted by a 15" outlet orifice plate. The emergency overflow weir will only activate if the primary outlet is blocked or a storm larger than the 100 year storm occurs.

4.2 WATER QUALITY DRAWDOWN

The water quality rain event should be detained and allowed to release no sooner than 24 hours in a wet pond. The purpose of this additional detention time is to allow particulates to settle from the runoff and be deposited within the system, and therefore not be transported downstream. It must be demonstrated that the water quality volume does not discharge, or "drawn down", sooner than 24-hours after the start of the rainfall event. In addition, half of the volume must still be retained at 8-hours after the start of the event.

The water quality orifice has been sized to prevent the basin from de-watering sooner than the 24-hour minimum requirement. Water quality calculations and a hydrograph table of the drawdown time versus storage elevation are provided in Appendix D.

4.3 SEDIMENT STORAGE

Basin A is currently outfitted with a sediment riser structure that was built during construction of Section 8. The basin is currently sized to provide 1,472 CY of storage. According to the current Ohio EPA General Construction Stormwater Permit, the sediment storage requirements for construction activities are 67 cubic yards of storage per acre of disturbed earth. Based on a developed area of 9.3 acres the basin should provide a minimum storage volume of 623.1 CY. The basin is adequately sized to store sediment during construction of Section 9.

5.0 CONSTRUCTION INSPECTION AND BMP MAINTENANCE

5.1 CONSTRUCTION INSPECTION

Maintaining the newly installed detention system as construction progresses is important to protect the facility and ensure its functionality after construction is complete. A checklist to be used during this timeframe has been included in Appendix E and will be included the Stormwater Pollution Prevention Plan for the project.

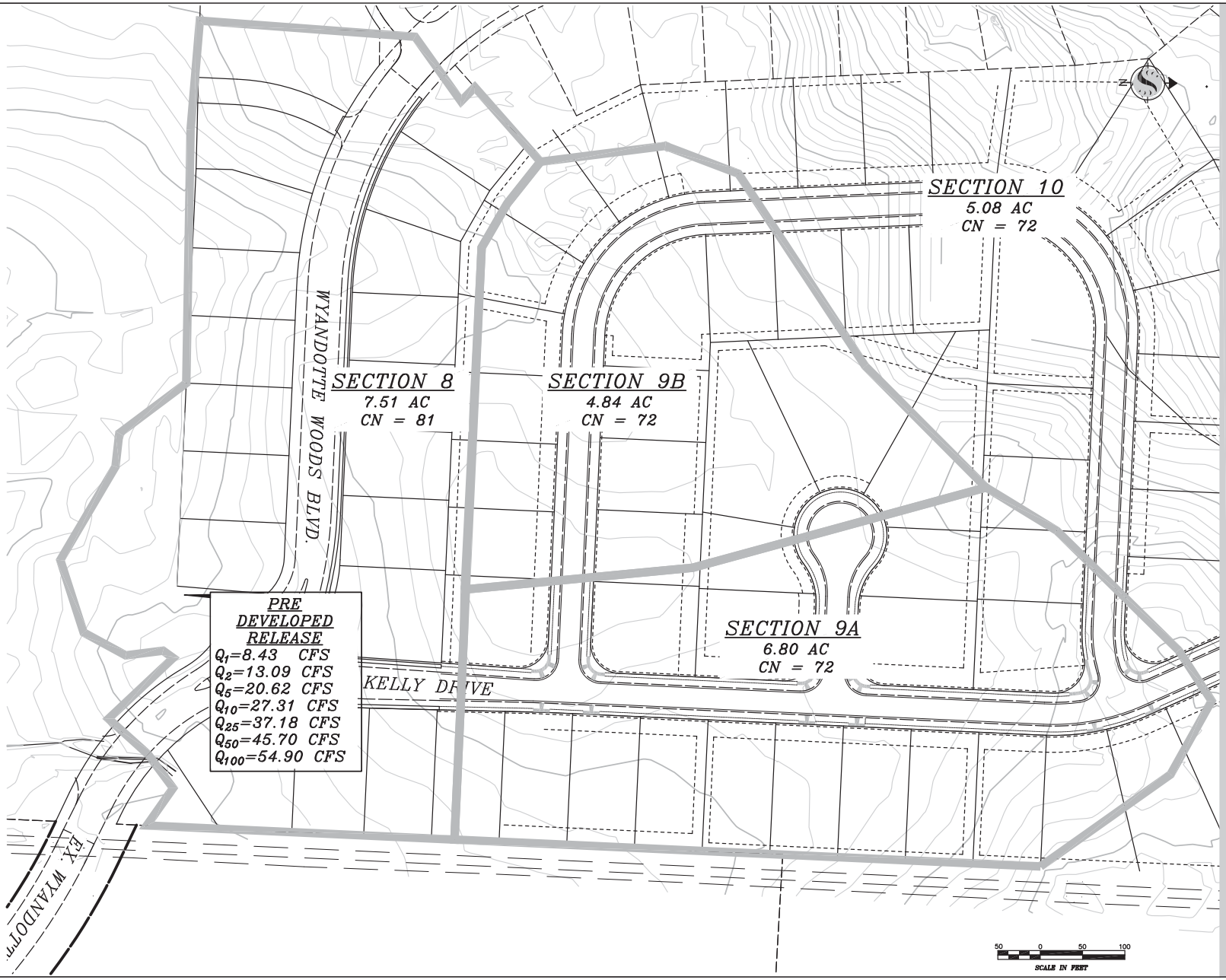
5.2 BMP OWNERSHIP AND MAINTENANCE

Ownership and maintenance of the proposed detention system will be the responsibility of the property owner. Continued maintenance of the system is critical to its operation. Routine inspection and maintenance is required to ensure the system is functioning as designed.

6.0 Conclusions

The proposed stormwater system is an effective device for addressing both water quality and detention issues. The basin will temporarily detain the runoff from the site and release at a restricted rate to help achieve the desired reduction in peak flows. The reduction in peak flows will benefit the offsite culvert and drainage ditch by reducing the peak elevation and flow passing through them. The basin also provides a temporary settling pool to remove sediment from the site runoff, minimizing the impact to the downstream receiving waters. As a result, this system helps contribute to an environmentally sound development.

Appendix A Pre-Developed Tributary Area Exhibit and Calculations



Stantec Consulting Services Inc.
1500 Lake Shore Drive, Suite 100
Columbus OH
43204-3800
Tel. 614.486.4383
Fax. 614.486.4387
www.stantec.com

Revision	By	Appd.	YY.MM.DD

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Permit-Seal

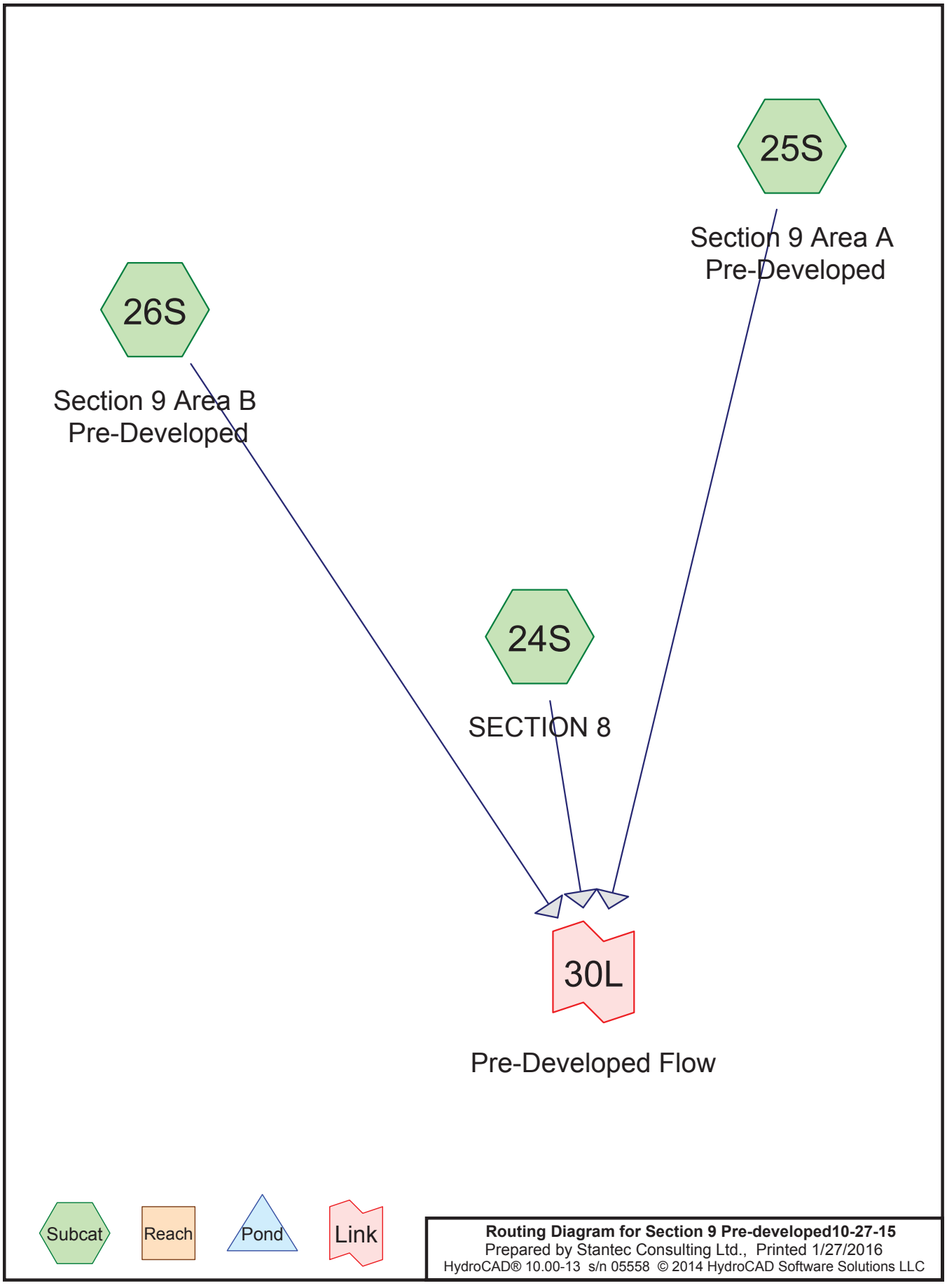
THE ENCLAVE AT WYANDOTTE WOODS
CITY OF DUBLIN, FRANKLIN COUNTY, OHIO

Project

PRE DEVELOPMENT
STORM TRIBUTARY AREA

Title

173408577	1" = 50'
Project No.	Scale
1 of 1	
Drawing No.	Sheet / Revision



Routing Diagram for Section 9 Pre-developed10-27-15
Prepared by Stantec Consulting Ltd., Printed 1/27/2016

Summary for Subcatchment 24S: SECTION 8

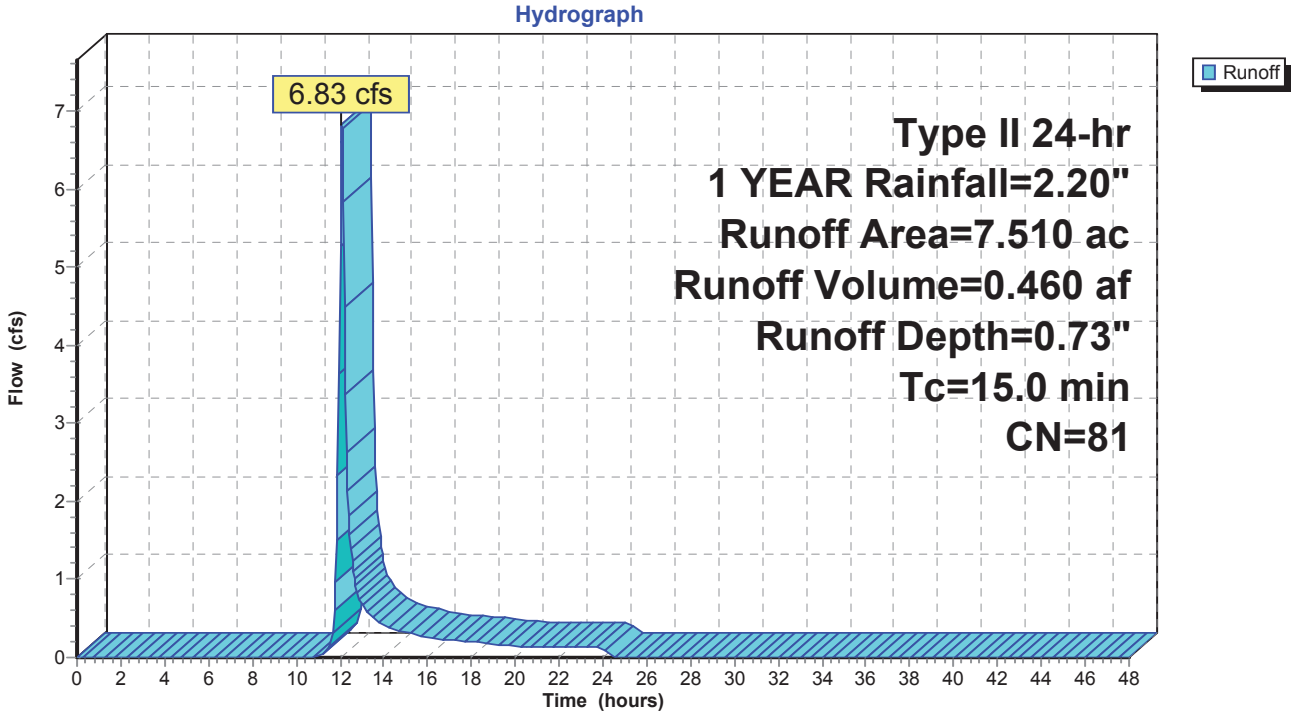
Runoff = 6.83 cfs @ 12.08 hrs, Volume= 0.460 af, Depth= 0.73"

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 1 YEAR Rainfall=2.20"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 25S: Section 9 Area A Pre-Developed

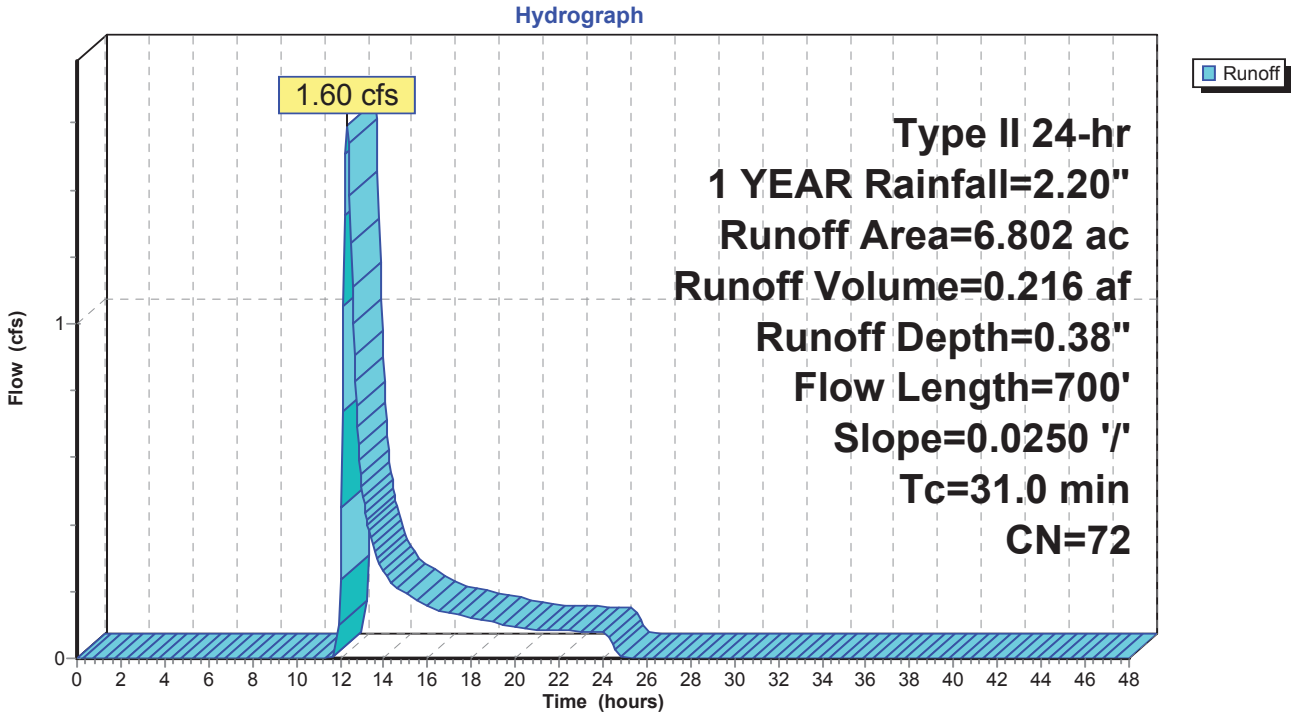
Runoff = 1.60 cfs @ 12.32 hrs, Volume= 0.216 af, Depth= 0.38"

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 1 YEAR Rainfall=2.20"

Area (ac)	CN	Description
6.802	72	Woods/grass comb., Good, HSG C
6.802		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0	100	0.0250	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
9.0	600	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
31.0	700	Total			

Subcatchment 25S: Section 9 Area A Pre-Developed



Summary for Subcatchment 26S: Section 9 Area B Pre-Developed

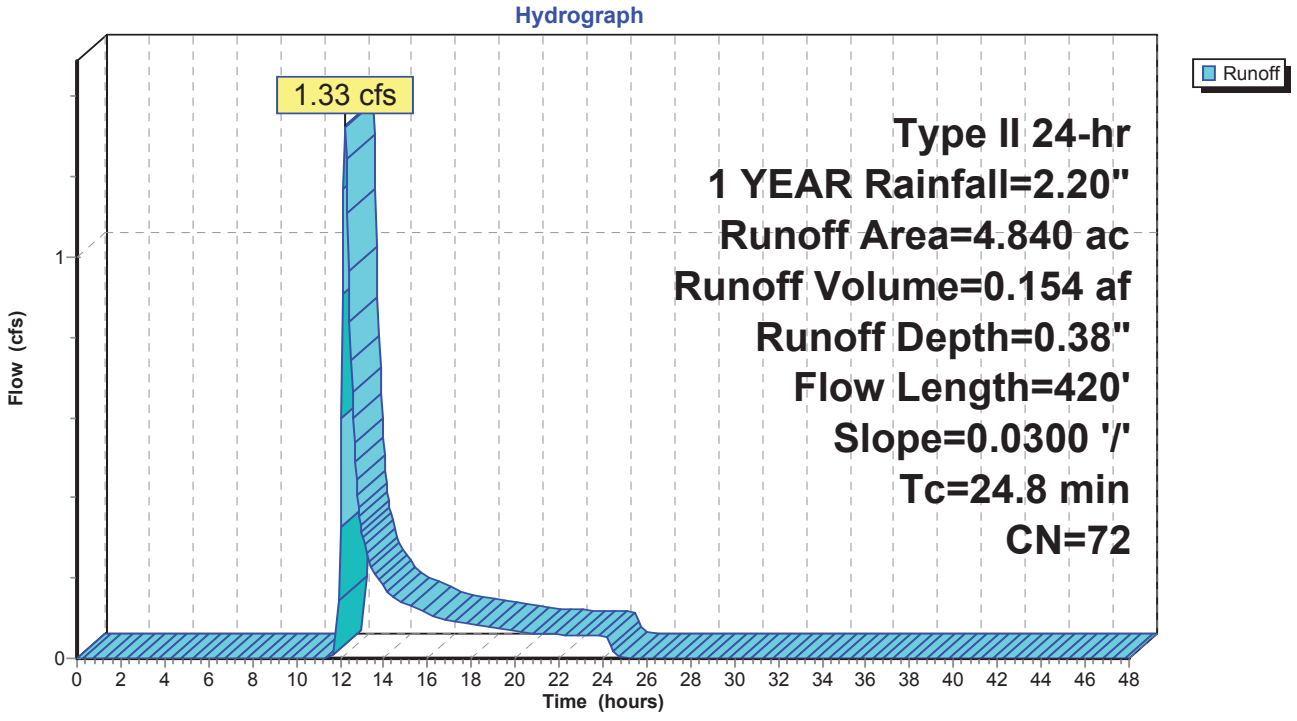
Runoff = 1.33 cfs @ 12.23 hrs, Volume= 0.154 af, Depth= 0.38"

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 1 YEAR Rainfall=2.20"

Area (ac)	CN	Description
4.840	72	Woods/grass comb., Good, HSG C
4.840		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.4	100	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
4.4	320	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
24.8	420	Total			

Subcatchment 26S: Section 9 Area B Pre-Developed

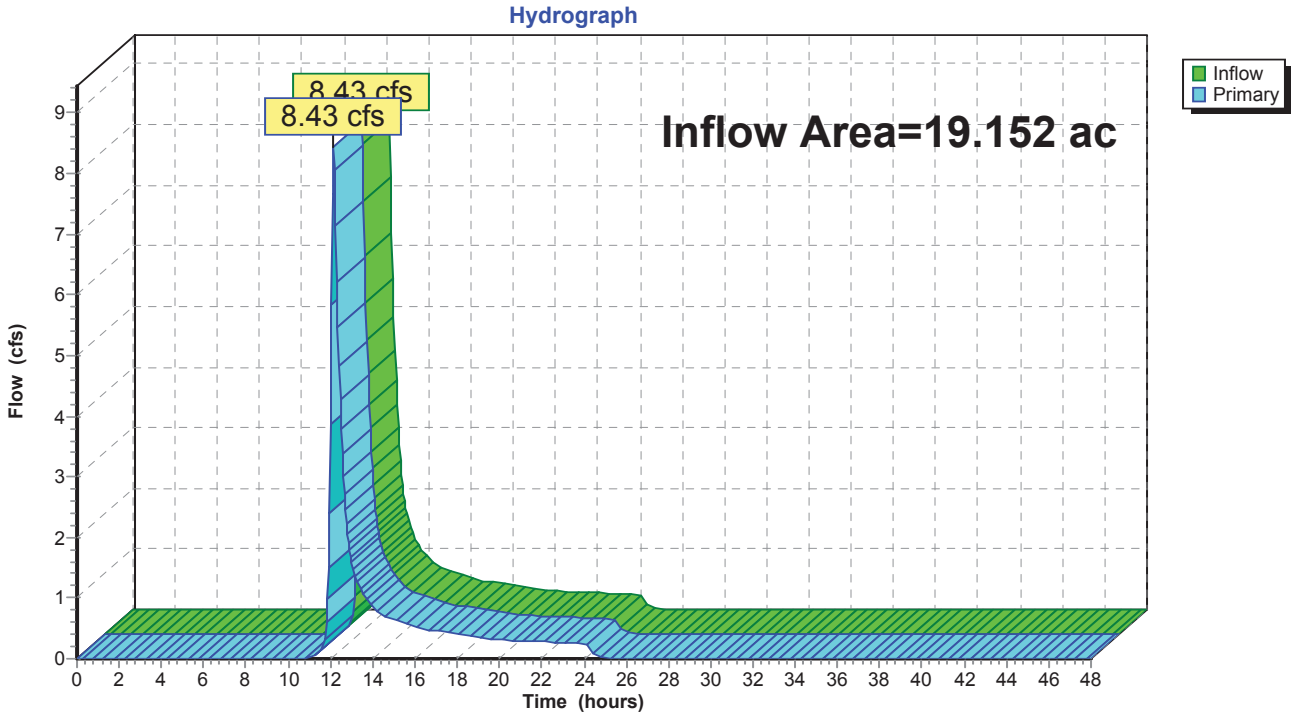


Summary for Link 30L: Pre-Developed Flow

Inflow Area = 19.152 ac, 11.76% Impervious, Inflow Depth = 0.52" for 1 YEAR event
Inflow = 8.43 cfs @ 12.11 hrs, Volume= 0.829 af
Primary = 8.43 cfs @ 12.16 hrs, Volume= 0.829 af, Atten= 0%, Lag= 3.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 30L: Pre-Developed Flow



Summary for Subcatchment 24S: SECTION 8

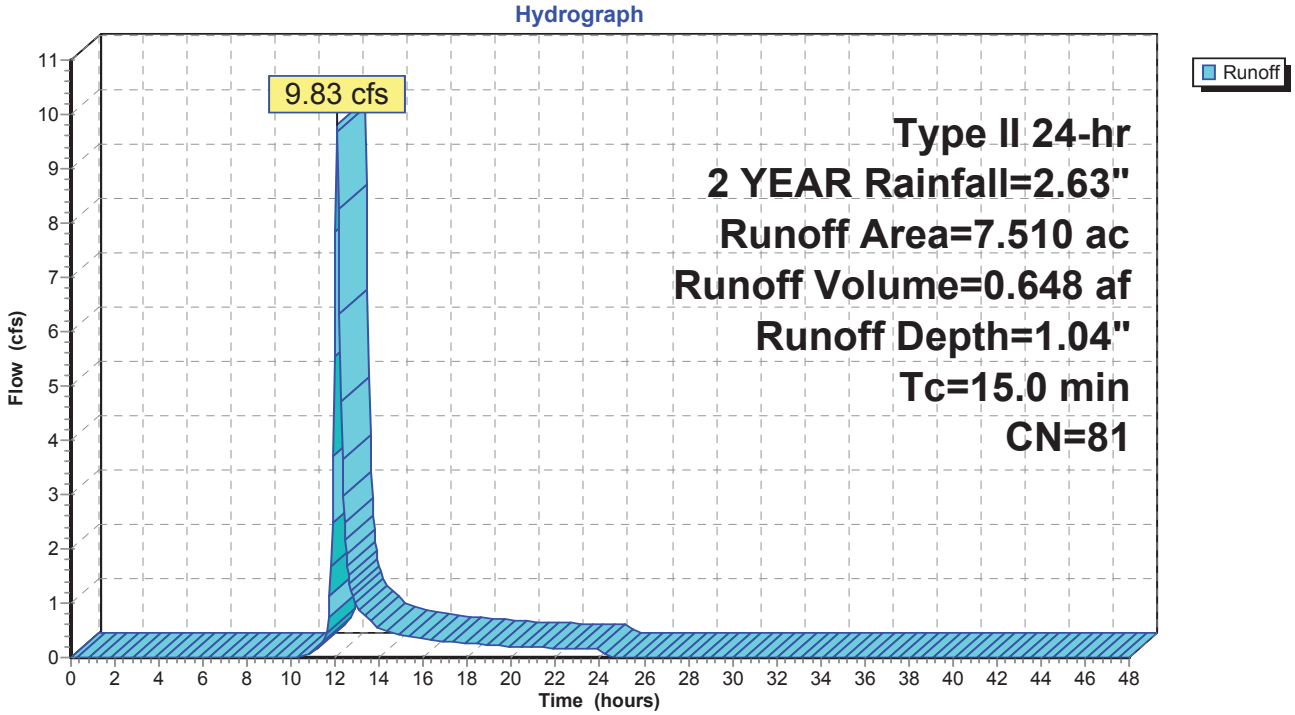
Runoff = 9.83 cfs @ 12.08 hrs, Volume= 0.648 af, Depth= 1.04"

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=2.63"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 25S: Section 9 Area A Pre-Developed

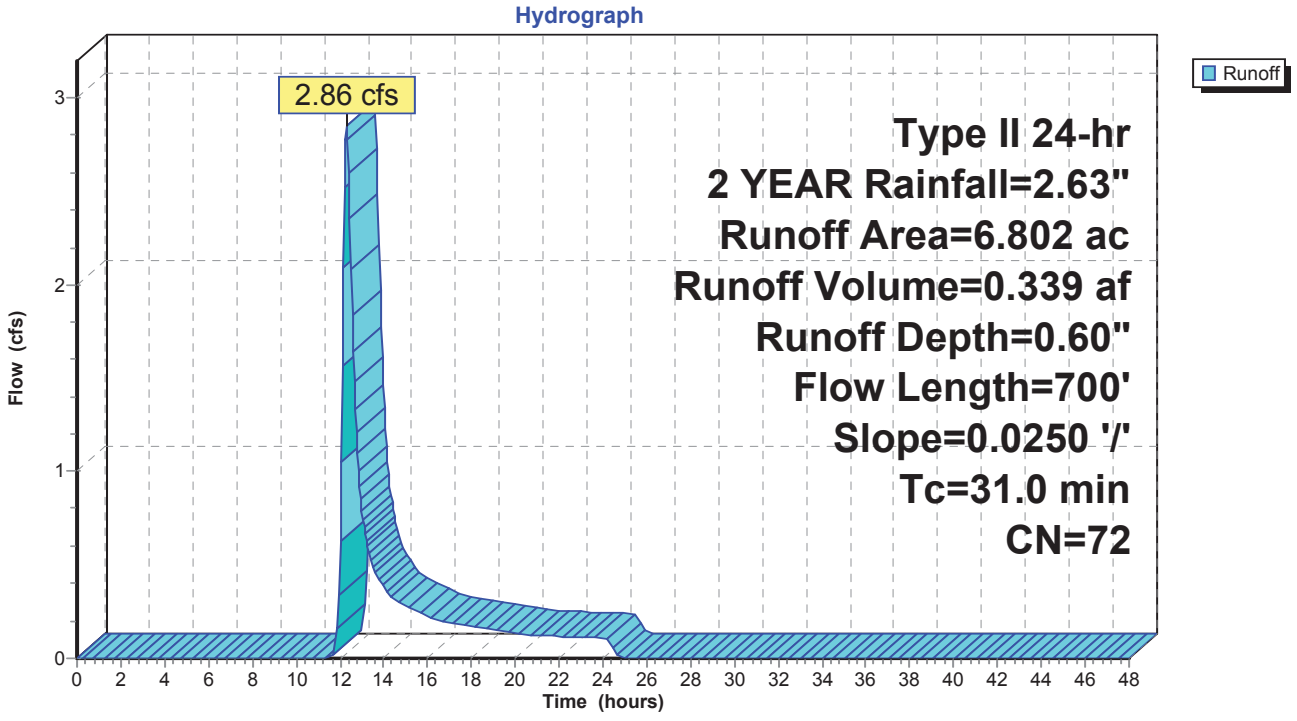
Runoff = 2.86 cfs @ 12.30 hrs, Volume= 0.339 af, Depth= 0.60"

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=2.63"

Area (ac)	CN	Description
6.802	72	Woods/grass comb., Good, HSG C
6.802		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0	100	0.0250	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
9.0	600	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
31.0	700	Total			

Subcatchment 25S: Section 9 Area A Pre-Developed



Summary for Subcatchment 26S: Section 9 Area B Pre-Developed

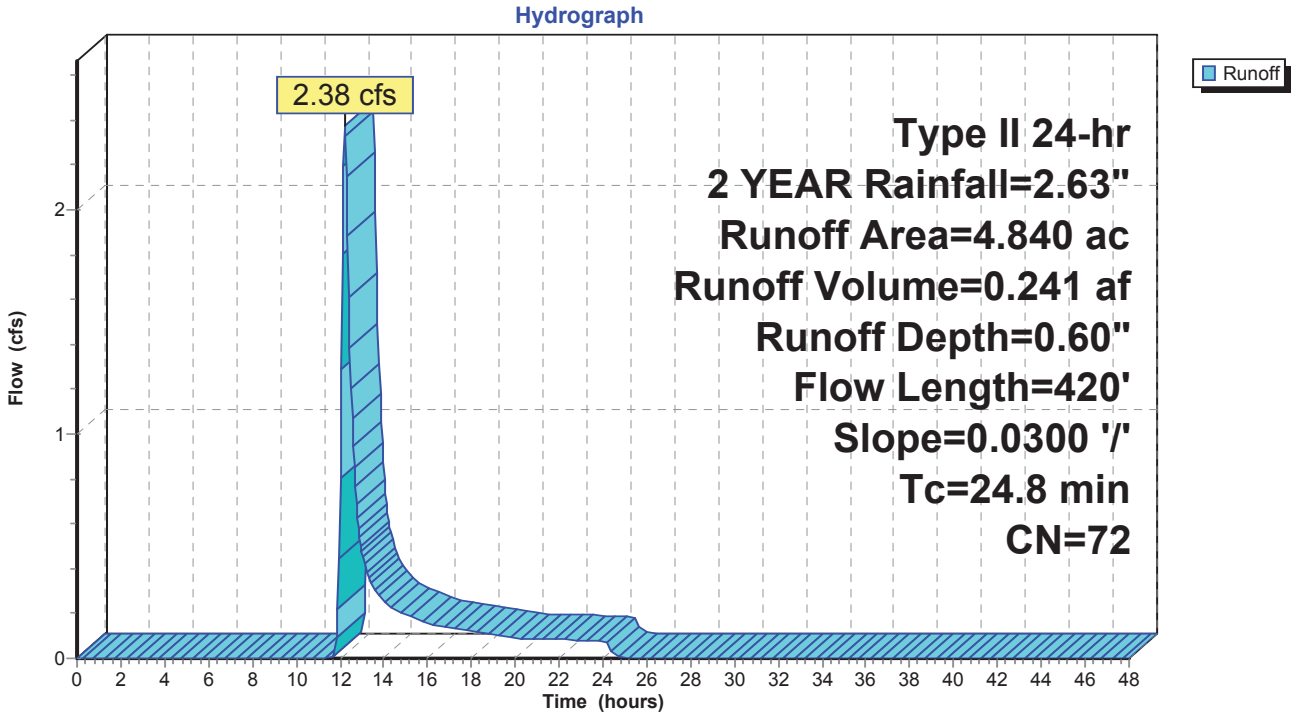
Runoff = 2.38 cfs @ 12.22 hrs, Volume= 0.241 af, Depth= 0.60"

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=2.63"

Area (ac)	CN	Description
4.840	72	Woods/grass comb., Good, HSG C
4.840		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.4	100	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
4.4	320	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
24.8	420	Total			

Subcatchment 26S: Section 9 Area B Pre-Developed

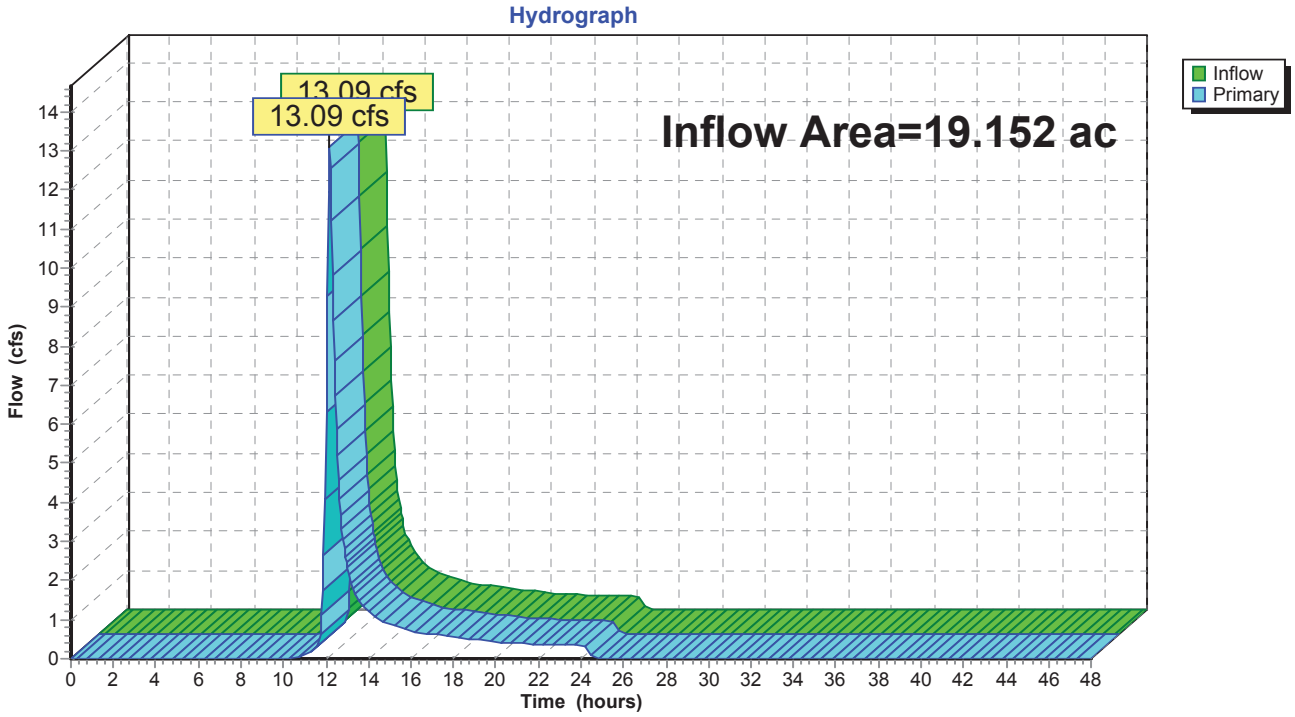


Summary for Link 30L: Pre-Developed Flow

Inflow Area = 19.152 ac, 11.76% Impervious, Inflow Depth = 0.77" for 2 YEAR event
Inflow = 13.09 cfs @ 12.11 hrs, Volume= 1.228 af
Primary = 13.09 cfs @ 12.16 hrs, Volume= 1.228 af, Atten= 0%, Lag= 3.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 30L: Pre-Developed Flow



Summary for Subcatchment 24S: SECTION 8

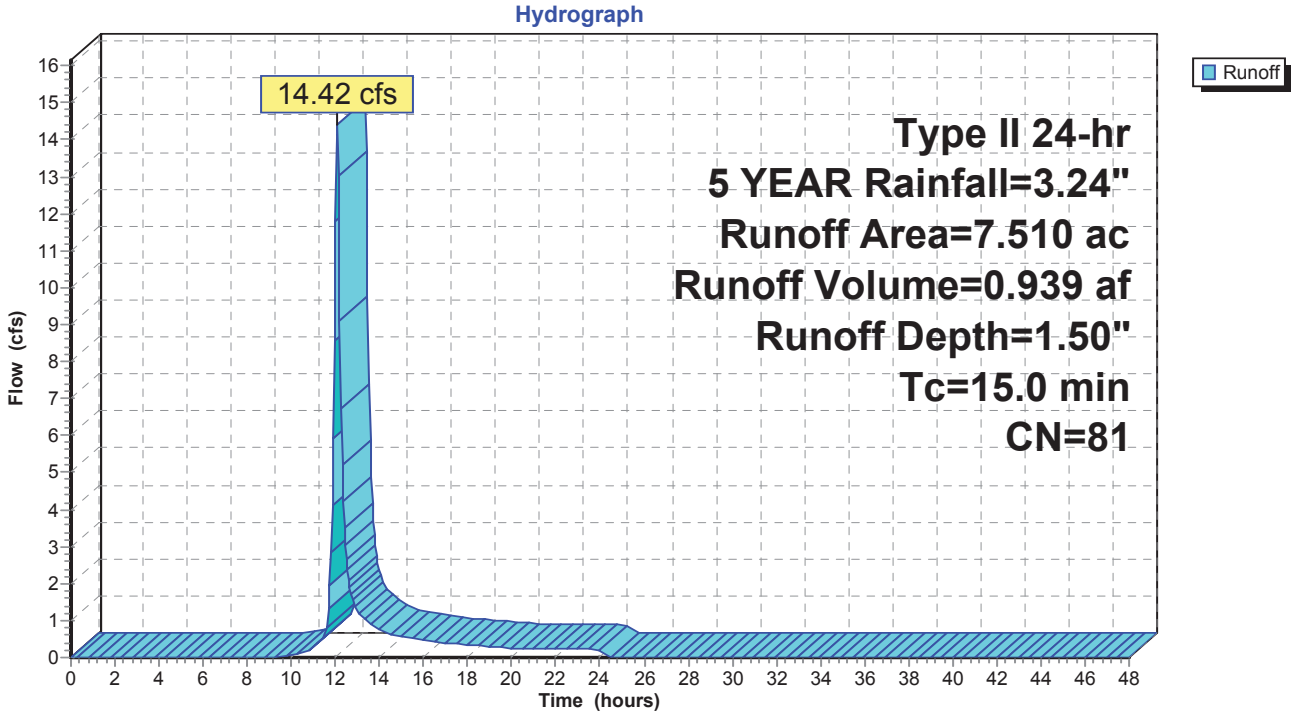
Runoff = 14.42 cfs @ 12.07 hrs, Volume= 0.939 af, Depth= 1.50"

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 5 YEAR Rainfall=3.24"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 25S: Section 9 Area A Pre-Developed

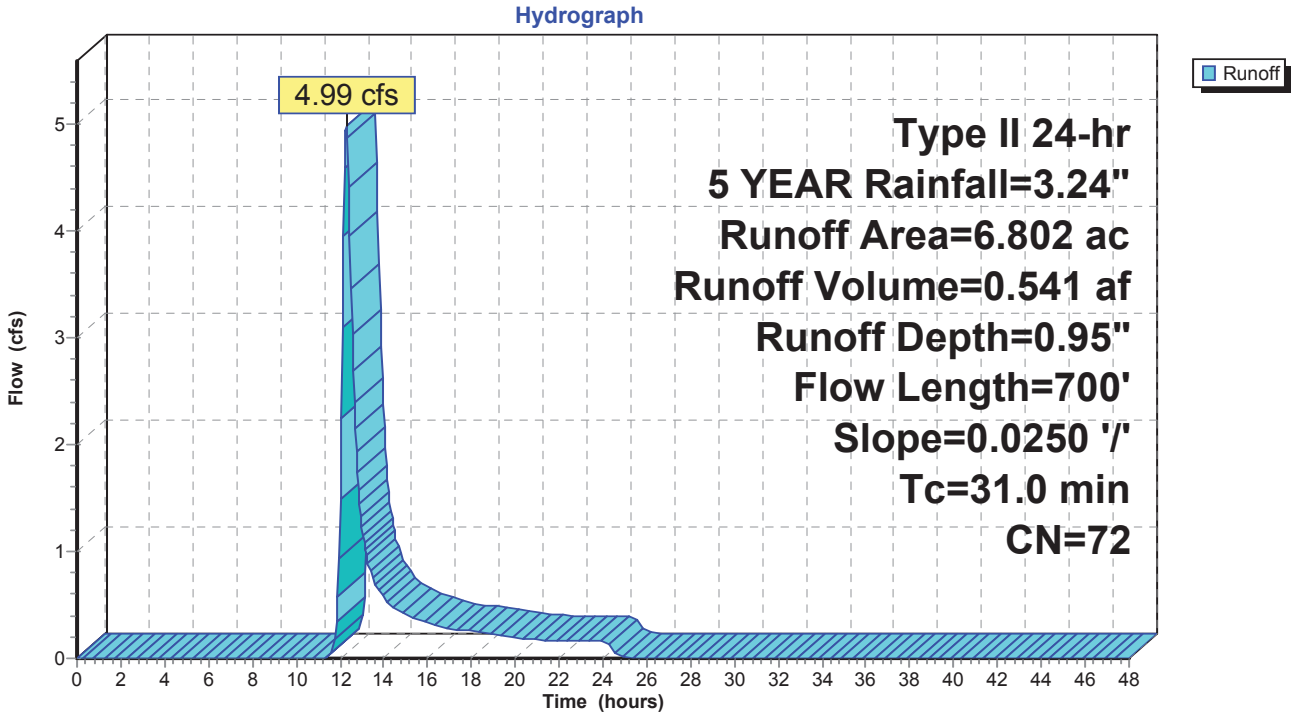
Runoff = 4.99 cfs @ 12.28 hrs, Volume= 0.541 af, Depth= 0.95"

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 5 YEAR Rainfall=3.24"

Area (ac)	CN	Description
6.802	72	Woods/grass comb., Good, HSG C
6.802		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0	100	0.0250	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
9.0	600	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
31.0	700	Total			

Subcatchment 25S: Section 9 Area A Pre-Developed



Summary for Subcatchment 26S: Section 9 Area B Pre-Developed

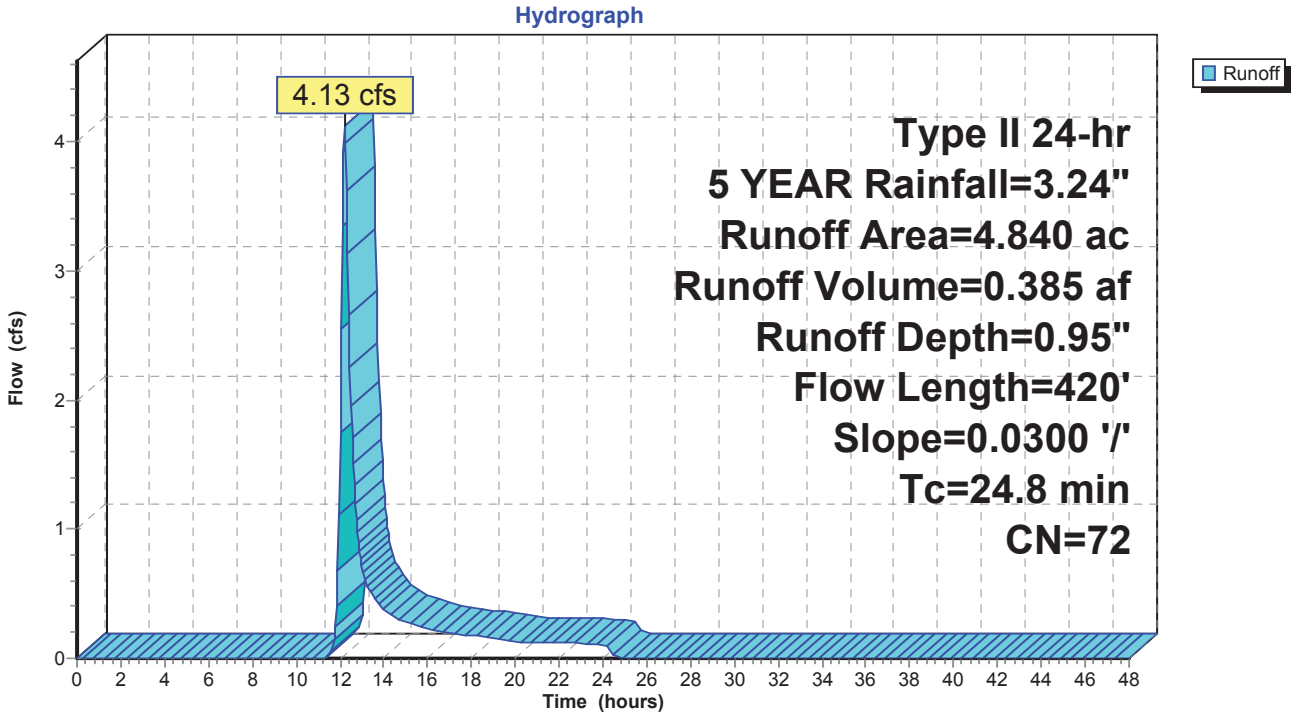
Runoff = 4.13 cfs @ 12.20 hrs, Volume= 0.385 af, Depth= 0.95"

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 5 YEAR Rainfall=3.24"

Area (ac)	CN	Description
4.840	72	Woods/grass comb., Good, HSG C
4.840		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.4	100	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
4.4	320	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
24.8	420	Total			

Subcatchment 26S: Section 9 Area B Pre-Developed

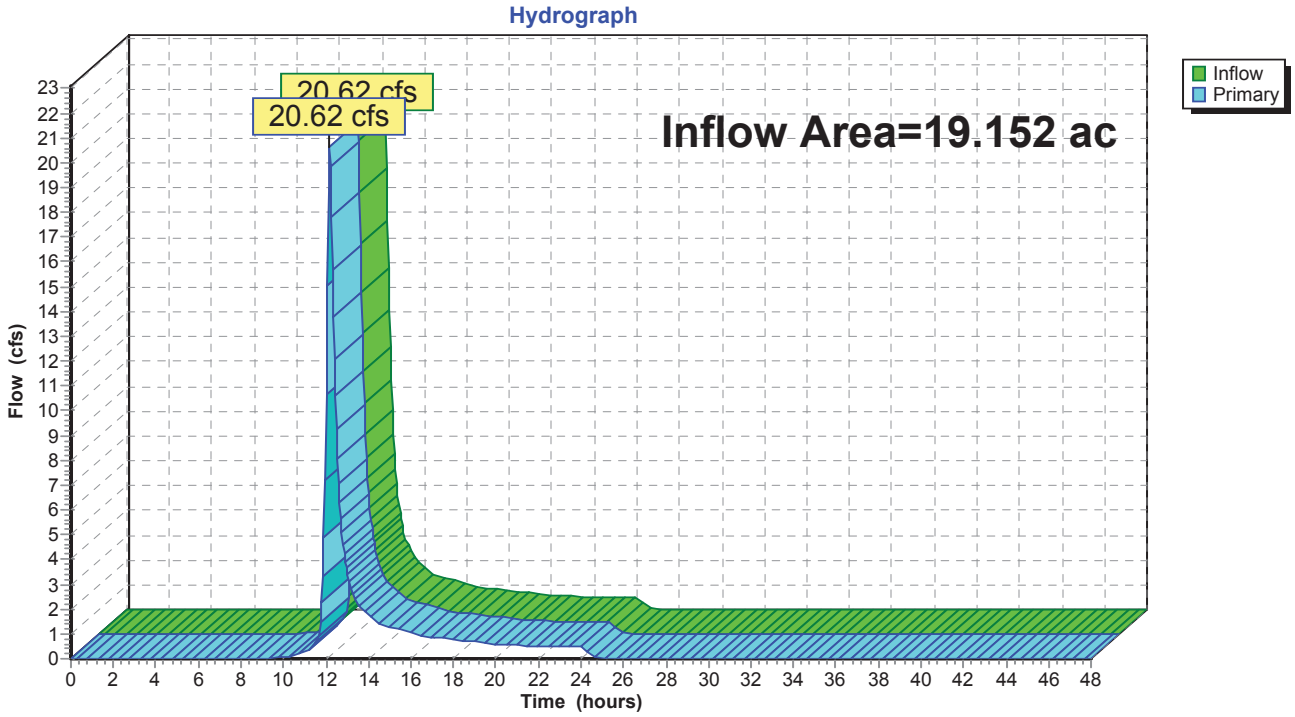


Summary for Link 30L: Pre-Developed Flow

Inflow Area = 19.152 ac, 11.76% Impervious, Inflow Depth = 1.17" for 5 YEAR event
Inflow = 20.62 cfs @ 12.11 hrs, Volume= 1.865 af
Primary = 20.62 cfs @ 12.16 hrs, Volume= 1.865 af, Atten= 0%, Lag= 3.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 30L: Pre-Developed Flow



Summary for Subcatchment 24S: SECTION 8

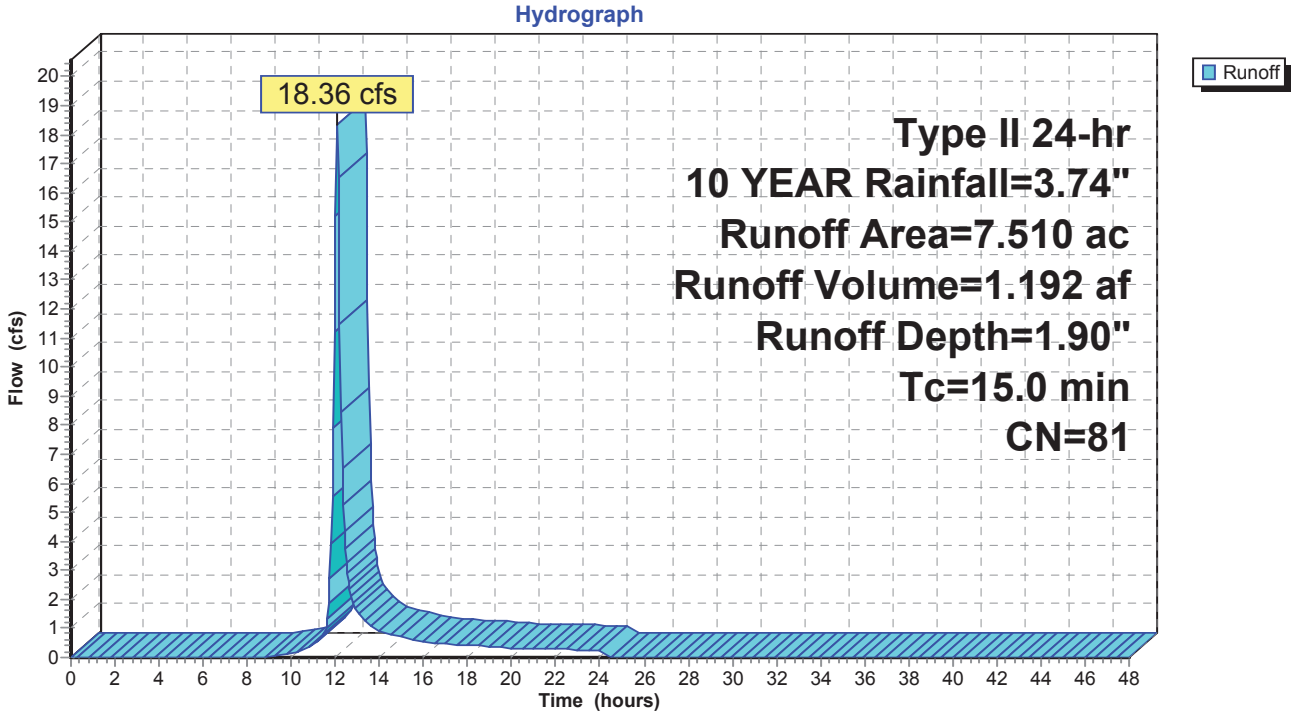
Runoff = 18.36 cfs @ 12.07 hrs, Volume= 1.192 af, Depth= 1.90"

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=3.74"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 25S: Section 9 Area A Pre-Developed

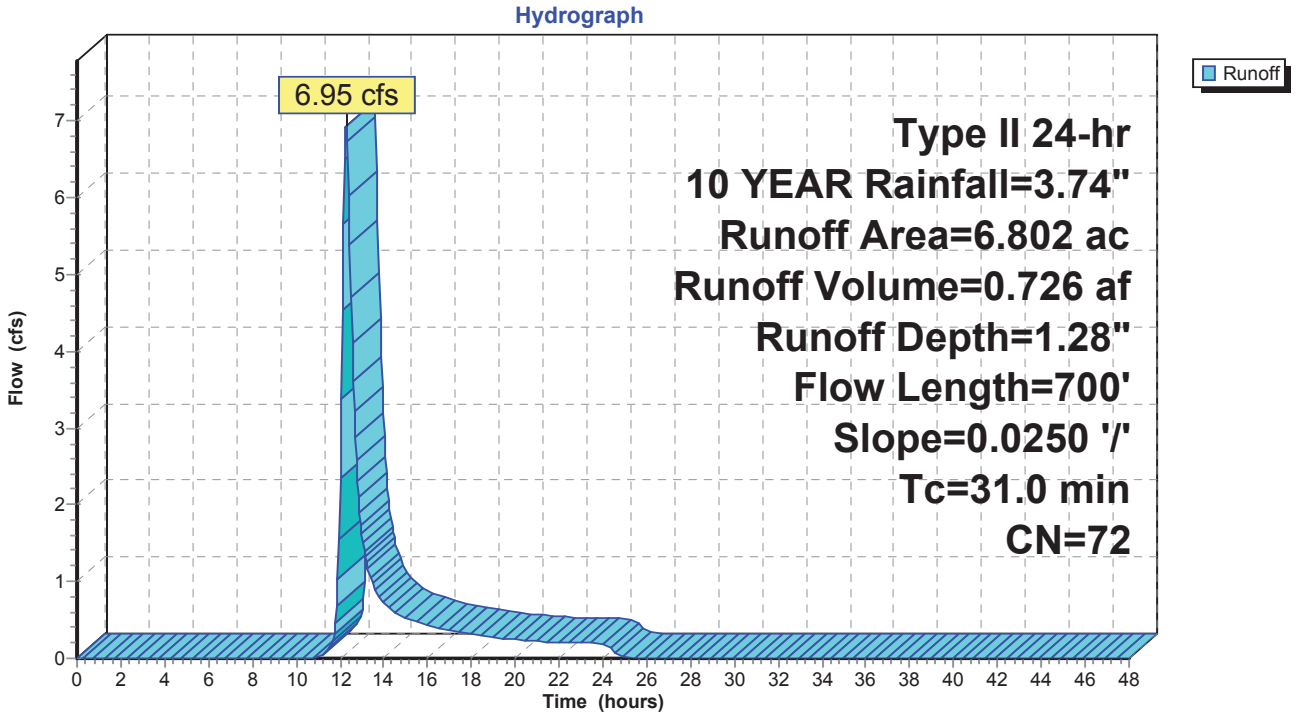
Runoff = 6.95 cfs @ 12.28 hrs, Volume= 0.726 af, Depth= 1.28"

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=3.74"

Area (ac)	CN	Description
6.802	72	Woods/grass comb., Good, HSG C
6.802		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0	100	0.0250	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
9.0	600	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
31.0	700	Total			

Subcatchment 25S: Section 9 Area A Pre-Developed



Summary for Subcatchment 26S: Section 9 Area B Pre-Developed

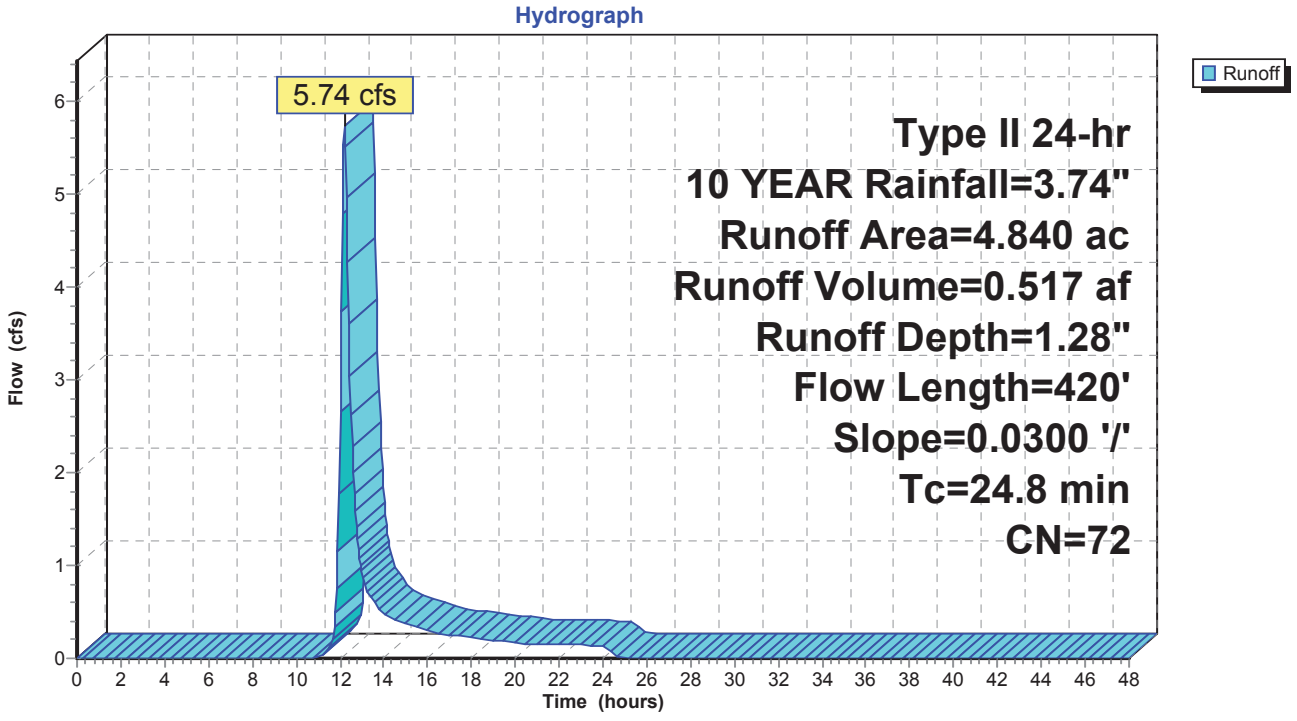
Runoff = 5.74 cfs @ 12.20 hrs, Volume= 0.517 af, Depth= 1.28"

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=3.74"

Area (ac)	CN	Description
4.840	72	Woods/grass comb., Good, HSG C
4.840		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.4	100	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
4.4	320	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
24.8	420	Total			

Subcatchment 26S: Section 9 Area B Pre-Developed

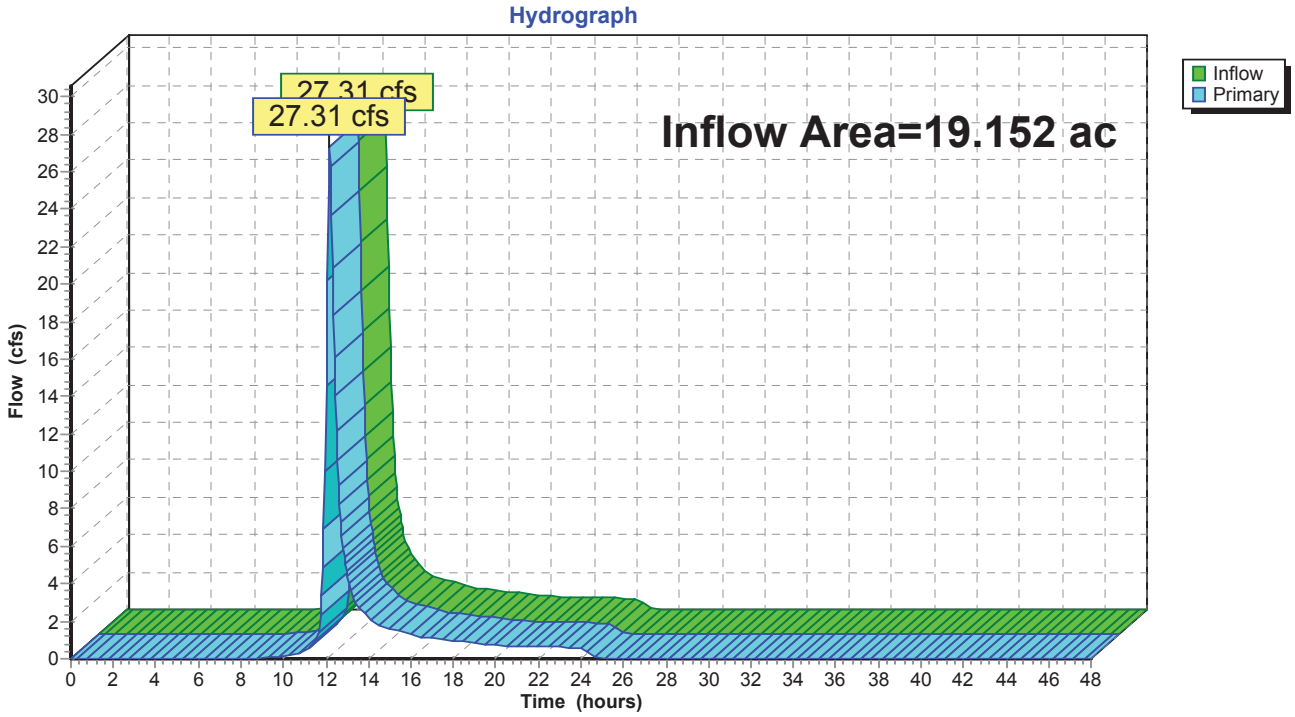


Summary for Link 30L: Pre-Developed Flow

Inflow Area = 19.152 ac, 11.76% Impervious, Inflow Depth = 1.53" for 10 YEAR event
Inflow = 27.31 cfs @ 12.11 hrs, Volume= 2.435 af
Primary = 27.31 cfs @ 12.16 hrs, Volume= 2.435 af, Atten= 0%, Lag= 3.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 30L: Pre-Developed Flow



Summary for Subcatchment 24S: SECTION 8

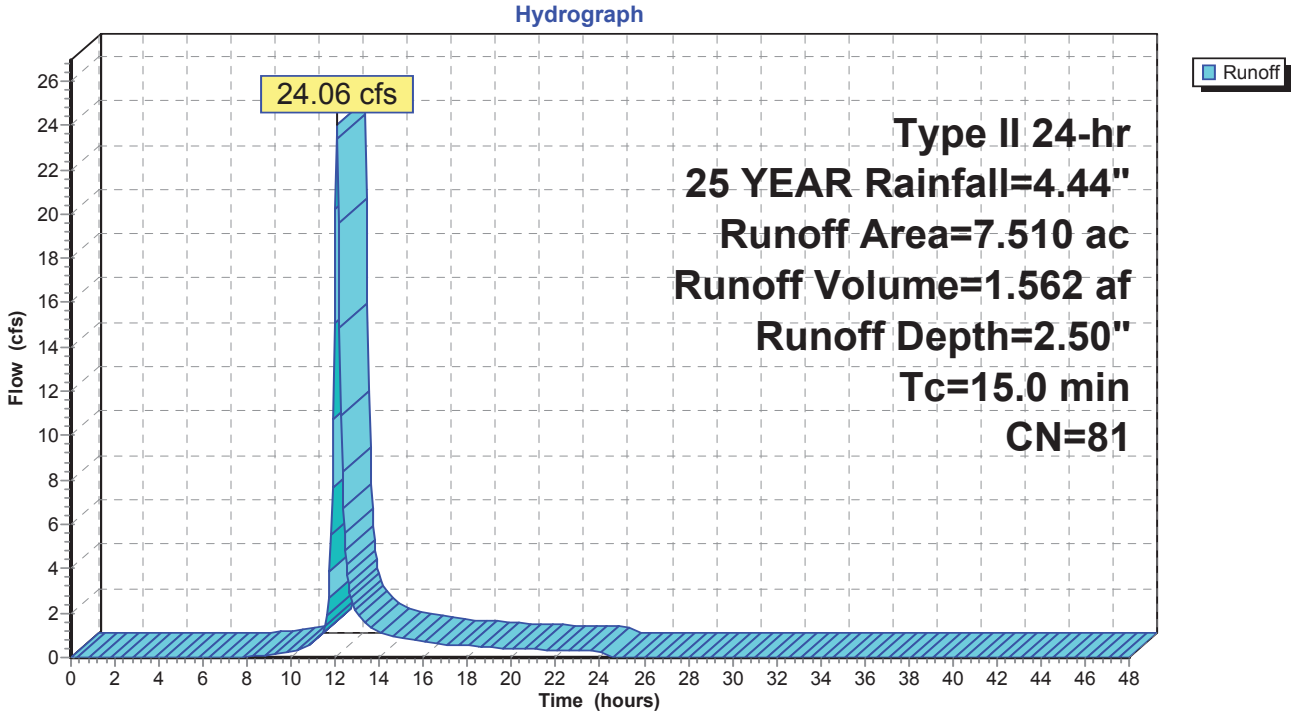
Runoff = 24.06 cfs @ 12.07 hrs, Volume= 1.562 af, Depth= 2.50"

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 25 YEAR Rainfall=4.44"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 25S: Section 9 Area A Pre-Developed

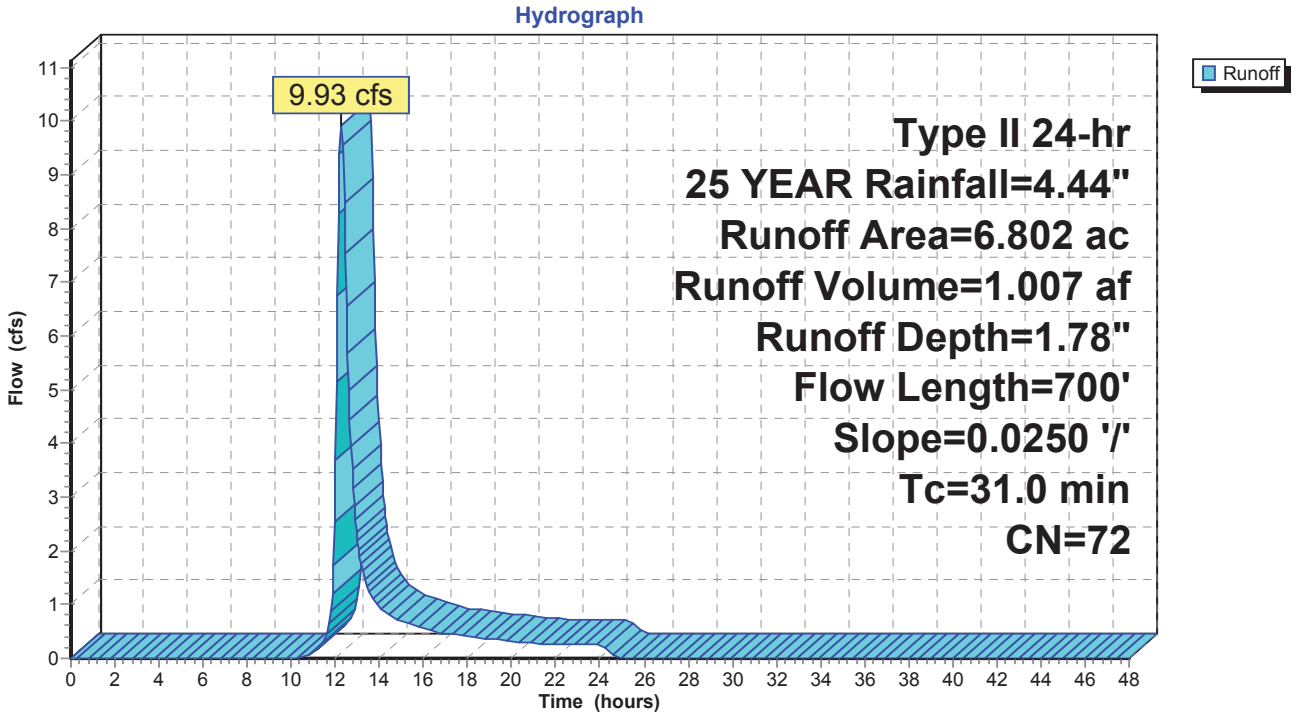
Runoff = 9.93 cfs @ 12.27 hrs, Volume= 1.007 af, Depth= 1.78"

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 25 YEAR Rainfall=4.44"

Area (ac)	CN	Description
6.802	72	Woods/grass comb., Good, HSG C
6.802		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0	100	0.0250	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
9.0	600	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
31.0	700	Total			

Subcatchment 25S: Section 9 Area A Pre-Developed



Summary for Subcatchment 26S: Section 9 Area B Pre-Developed

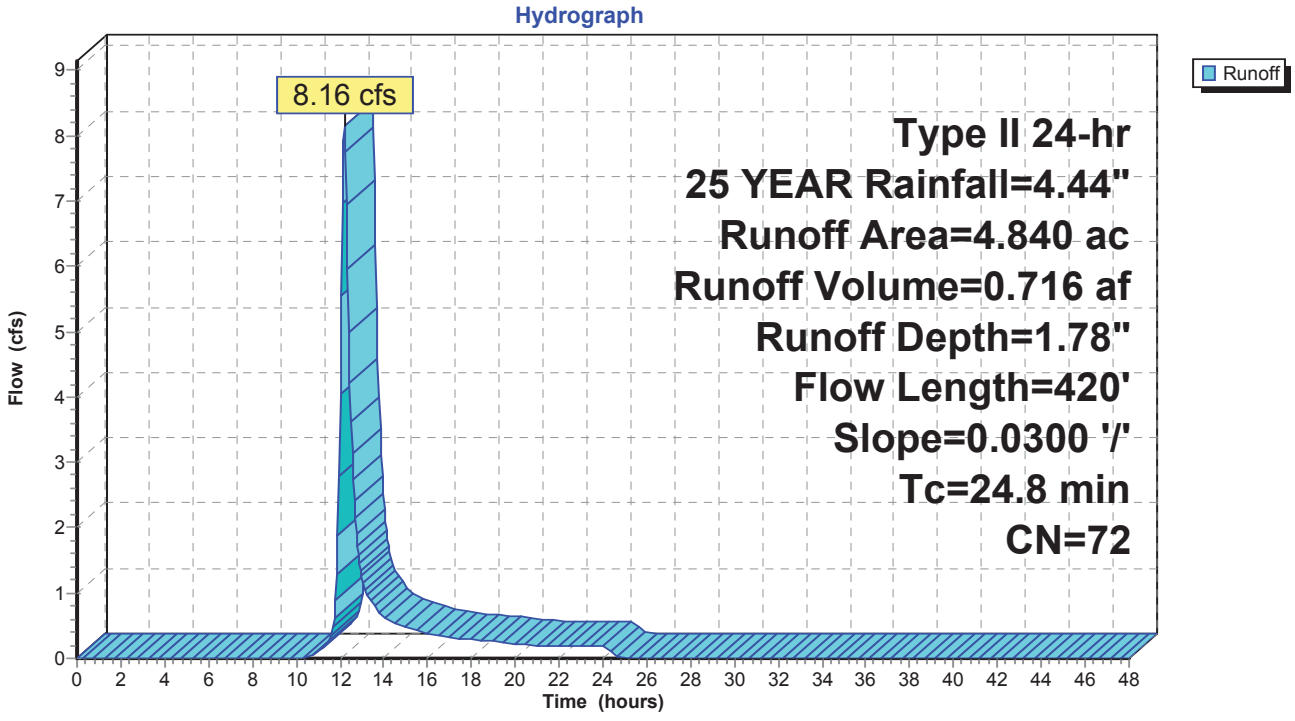
Runoff = 8.16 cfs @ 12.19 hrs, Volume= 0.716 af, Depth= 1.78"

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 25 YEAR Rainfall=4.44"

Area (ac)	CN	Description
4.840	72	Woods/grass comb., Good, HSG C
4.840		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.4	100	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
4.4	320	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
24.8	420	Total			

Subcatchment 26S: Section 9 Area B Pre-Developed

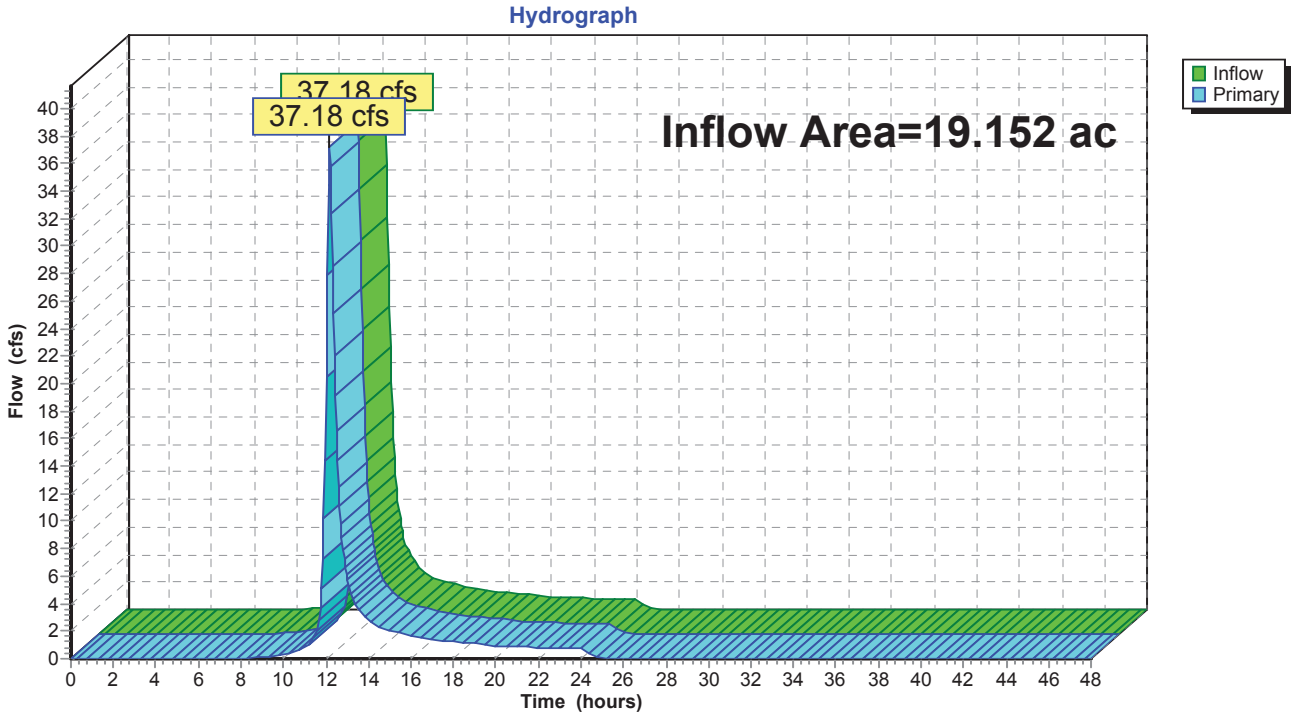


Summary for Link 30L: Pre-Developed Flow

Inflow Area = 19.152 ac, 11.76% Impervious, Inflow Depth = 2.06" for 25 YEAR event
Inflow = 37.18 cfs @ 12.11 hrs, Volume= 3.285 af
Primary = 37.18 cfs @ 12.16 hrs, Volume= 3.285 af, Atten= 0%, Lag= 3.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 30L: Pre-Developed Flow



Summary for Subcatchment 24S: SECTION 8

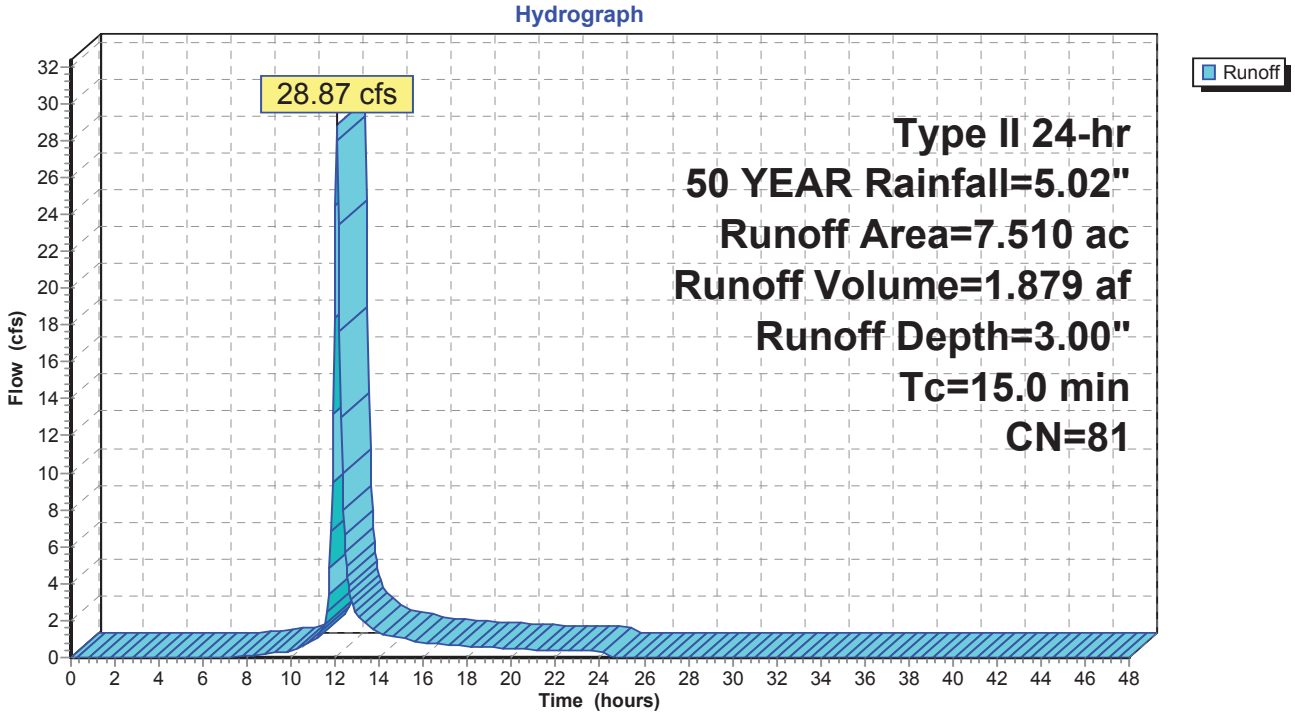
Runoff = 28.87 cfs @ 12.07 hrs, Volume= 1.879 af, Depth= 3.00"

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 50 YEAR Rainfall=5.02"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 25S: Section 9 Area A Pre-Developed

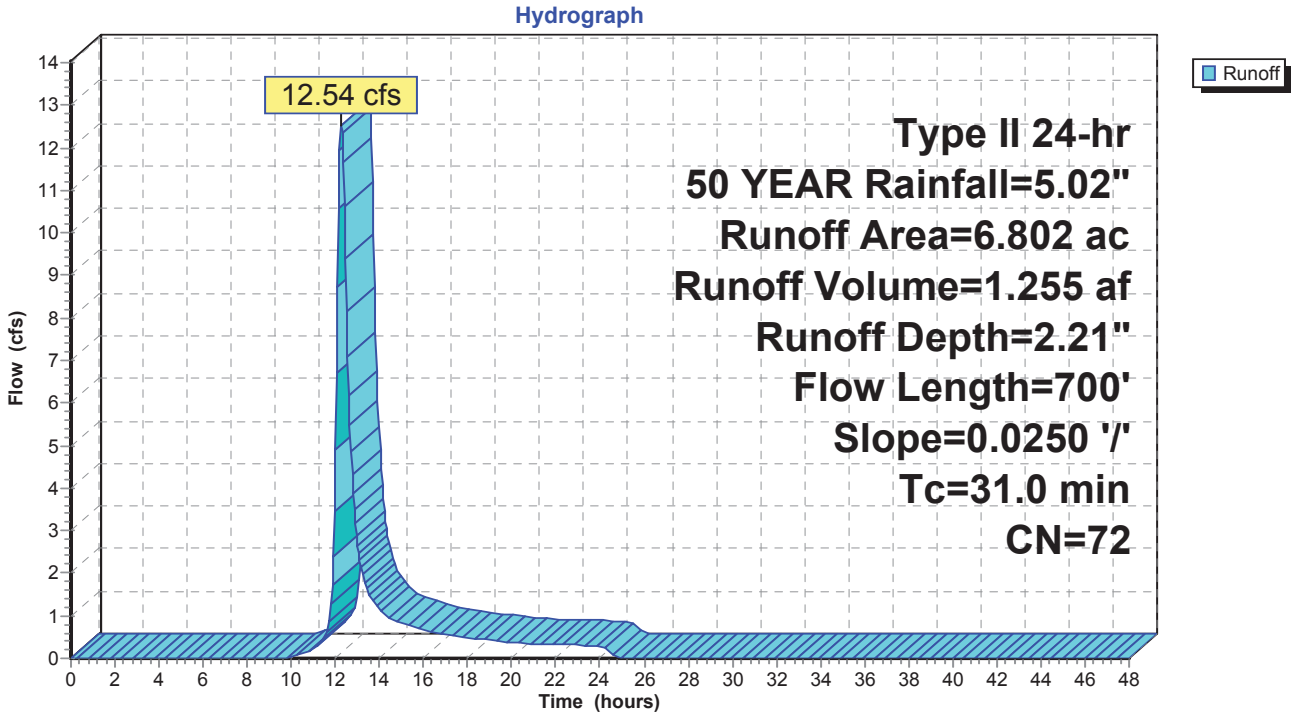
Runoff = 12.54 cfs @ 12.27 hrs, Volume= 1.255 af, Depth= 2.21"

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 50 YEAR Rainfall=5.02"

Area (ac)	CN	Description
6.802	72	Woods/grass comb., Good, HSG C
6.802		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0	100	0.0250	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
9.0	600	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
31.0	700	Total			

Subcatchment 25S: Section 9 Area A Pre-Developed



Summary for Subcatchment 26S: Section 9 Area B Pre-Developed

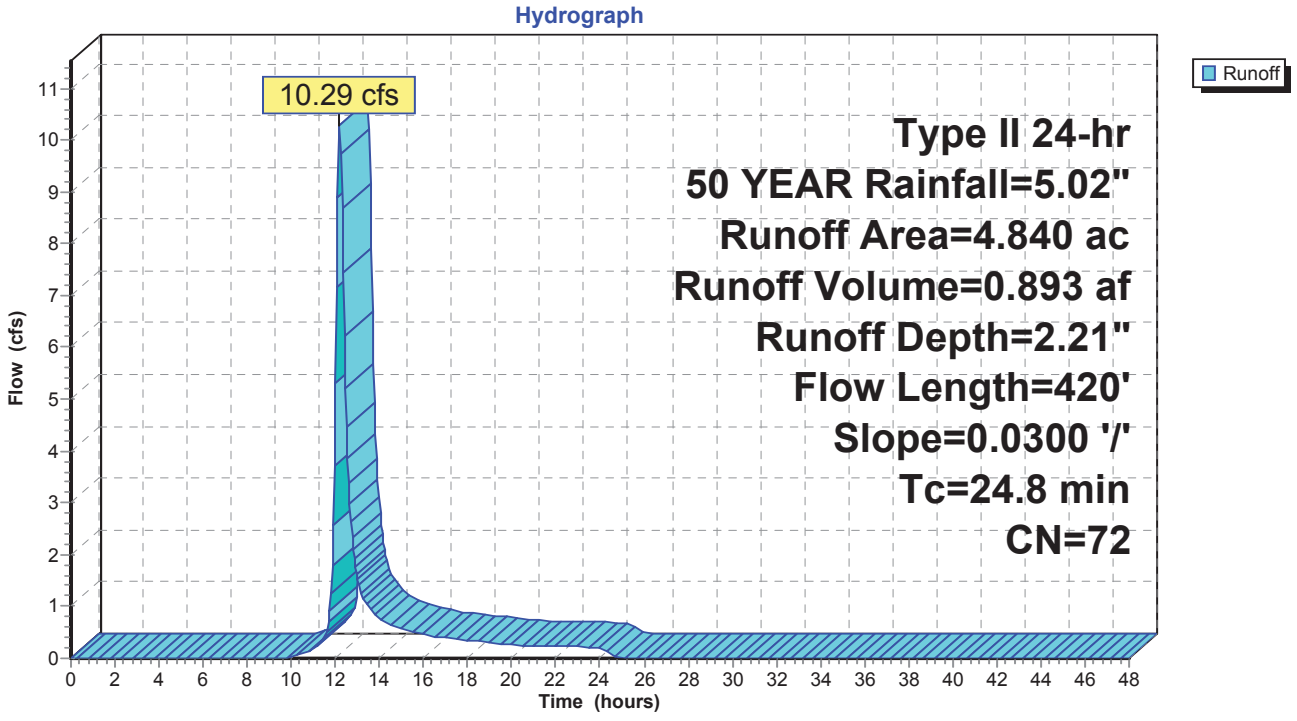
Runoff = 10.29 cfs @ 12.19 hrs, Volume= 0.893 af, Depth= 2.21"

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 50 YEAR Rainfall=5.02"

Area (ac)	CN	Description
4.840	72	Woods/grass comb., Good, HSG C
4.840		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.4	100	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
4.4	320	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
24.8	420	Total			

Subcatchment 26S: Section 9 Area B Pre-Developed

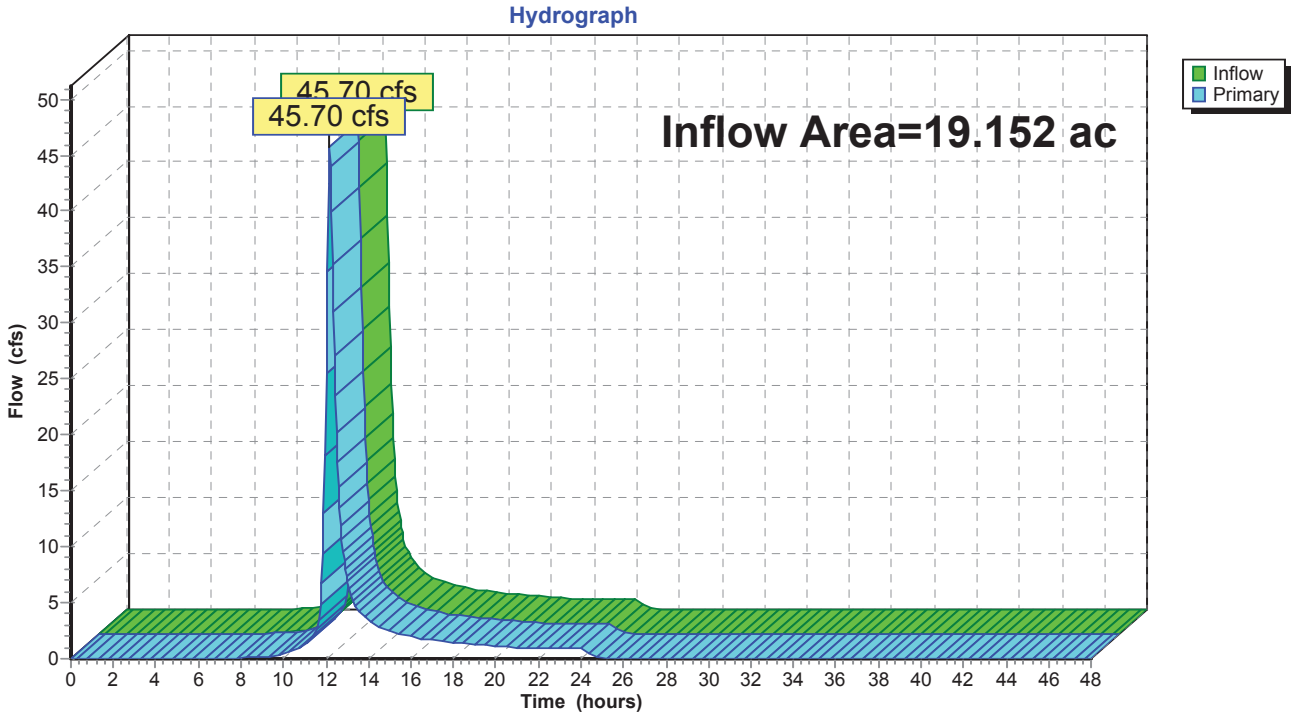


Summary for Link 30L: Pre-Developed Flow

Inflow Area = 19.152 ac, 11.76% Impervious, Inflow Depth = 2.52" for 50 YEAR event
Inflow = 45.70 cfs @ 12.11 hrs, Volume= 4.027 af
Primary = 45.70 cfs @ 12.16 hrs, Volume= 4.027 af, Atten= 0%, Lag= 3.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 30L: Pre-Developed Flow



Summary for Subcatchment 24S: SECTION 8

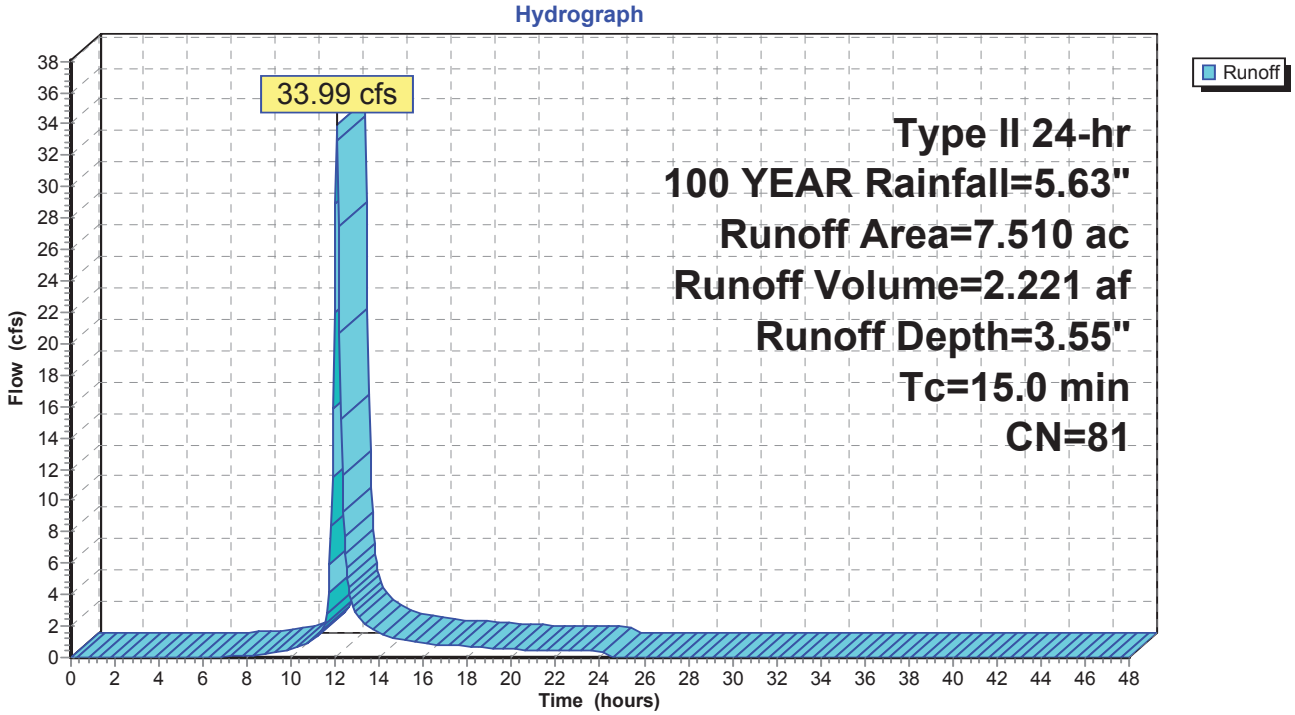
Runoff = 33.99 cfs @ 12.07 hrs, Volume= 2.221 af, Depth= 3.55"

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=5.63"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 25S: Section 9 Area A Pre-Developed

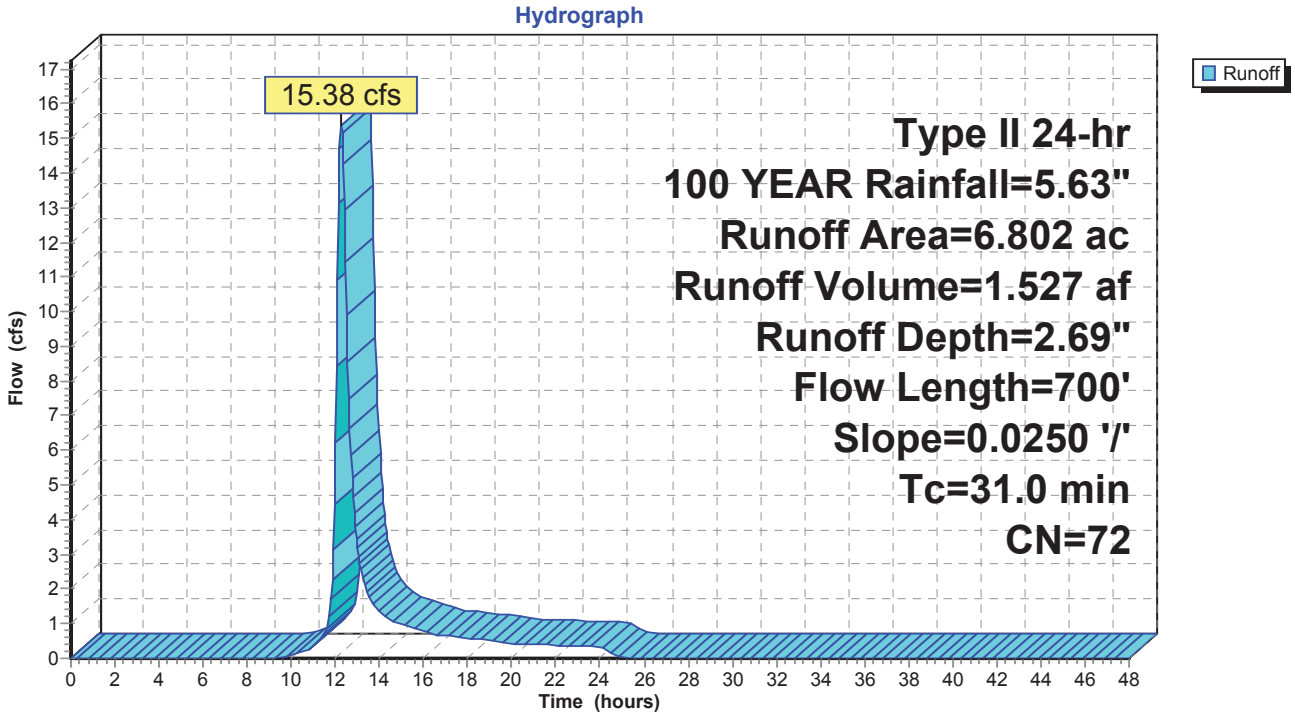
Runoff = 15.38 cfs @ 12.26 hrs, Volume= 1.527 af, Depth= 2.69"

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=5.63"

Area (ac)	CN	Description
6.802	72	Woods/grass comb., Good, HSG C
6.802		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0	100	0.0250	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
9.0	600	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
31.0	700	Total			

Subcatchment 25S: Section 9 Area A Pre-Developed



Summary for Subcatchment 26S: Section 9 Area B Pre-Developed

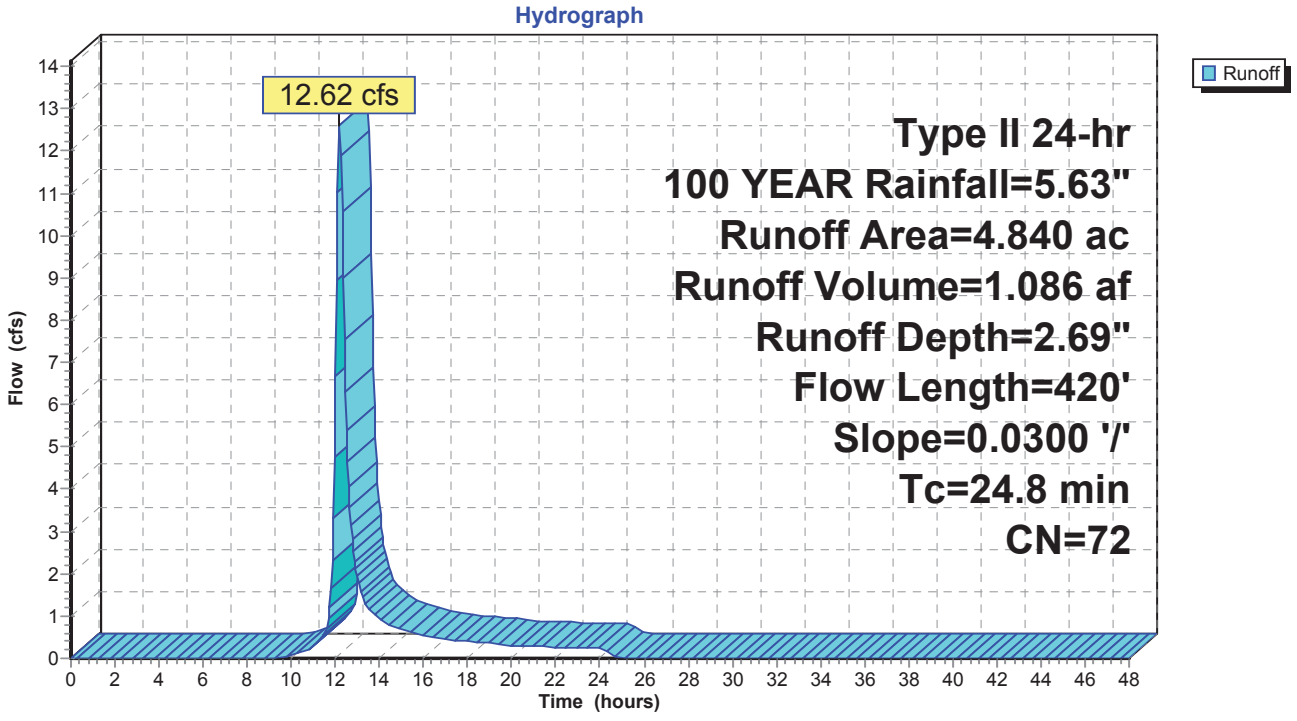
Runoff = 12.62 cfs @ 12.19 hrs, Volume= 1.086 af, Depth= 2.69"

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=5.63"

Area (ac)	CN	Description
4.840	72	Woods/grass comb., Good, HSG C
4.840		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.4	100	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.56"
4.4	320	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
24.8	420	Total			

Subcatchment 26S: Section 9 Area B Pre-Developed

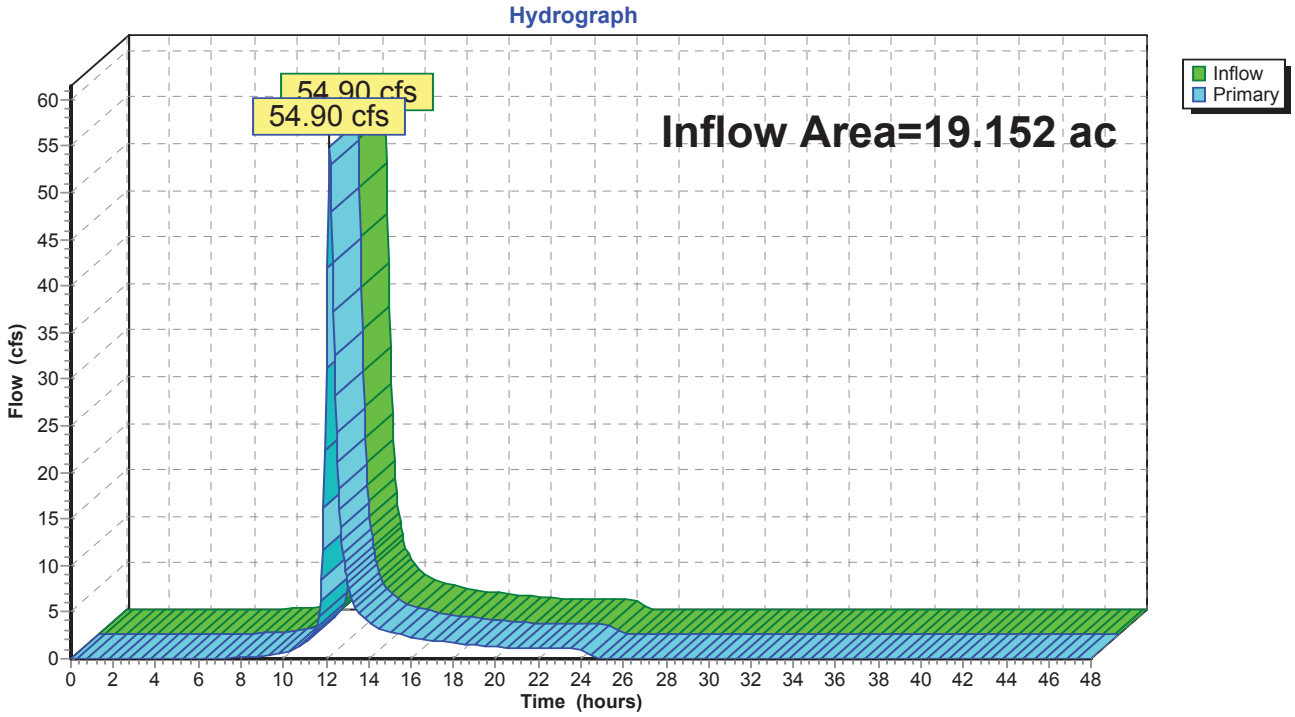


Summary for Link 30L: Pre-Developed Flow

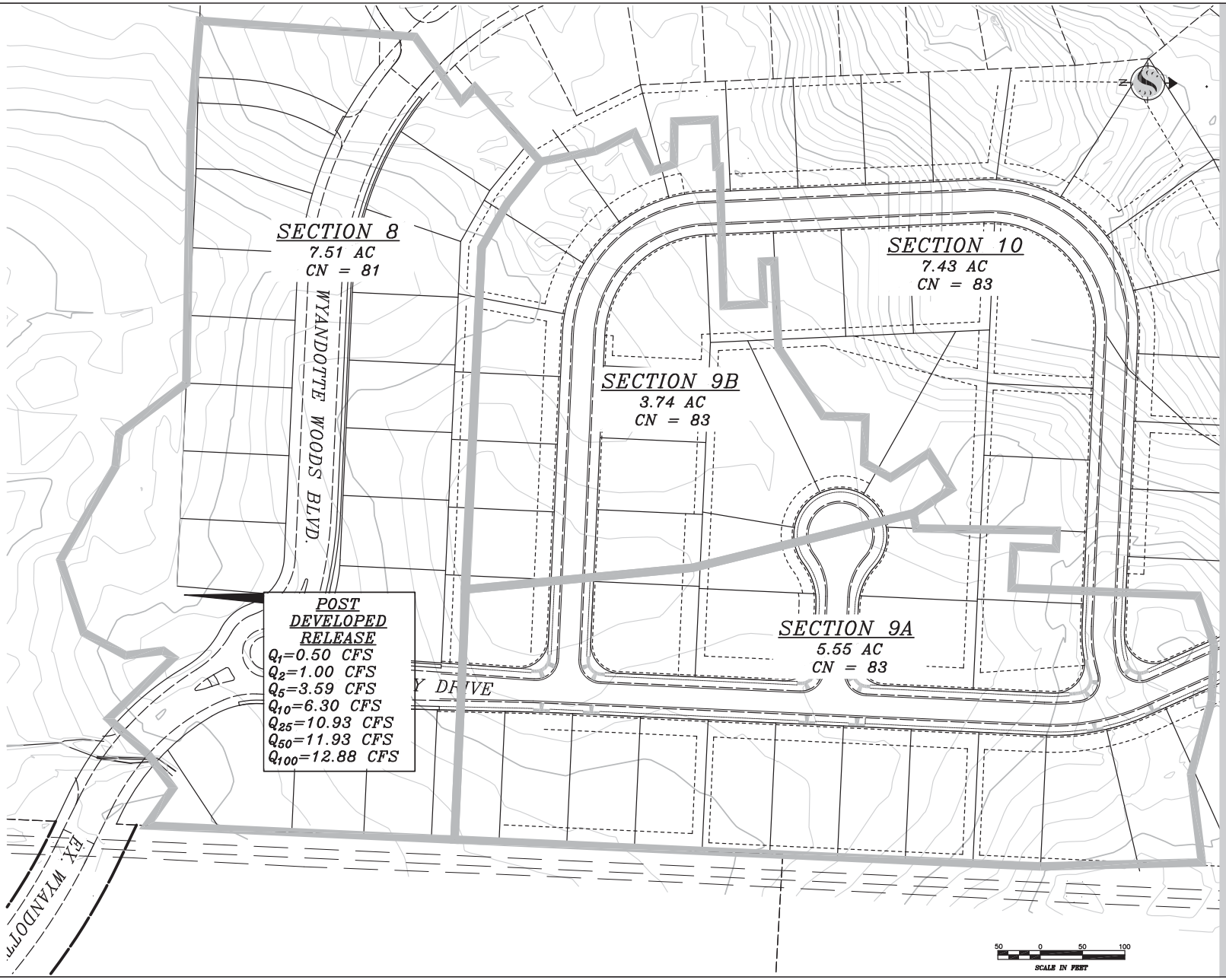
Inflow Area = 19.152 ac, 11.76% Impervious, Inflow Depth = 3.03" for 100 YEAR event
Inflow = 54.90 cfs @ 12.11 hrs, Volume= 4.834 af
Primary = 54.90 cfs @ 12.16 hrs, Volume= 4.834 af, Atten= 0%, Lag= 3.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 30L: Pre-Developed Flow



Appendix B Post-Developed Tributary Area Exhibit



Stantec Consulting Services Inc.
1500 Lake Shore Drive, Suite 100
Columbus OH
43204-3800
Tel. 614.486.4383
Fax. 614.486.4387
www.stantec.com

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

File Name:	Dsn.	Chkd.	Dsgn.	00.11.17 YY.MM.DD

Permit-Seal

THE ENCLAVE AT WYANDOTTE WOODS
CITY OF DUBLIN, FRANKLIN COUNTY, OHIO

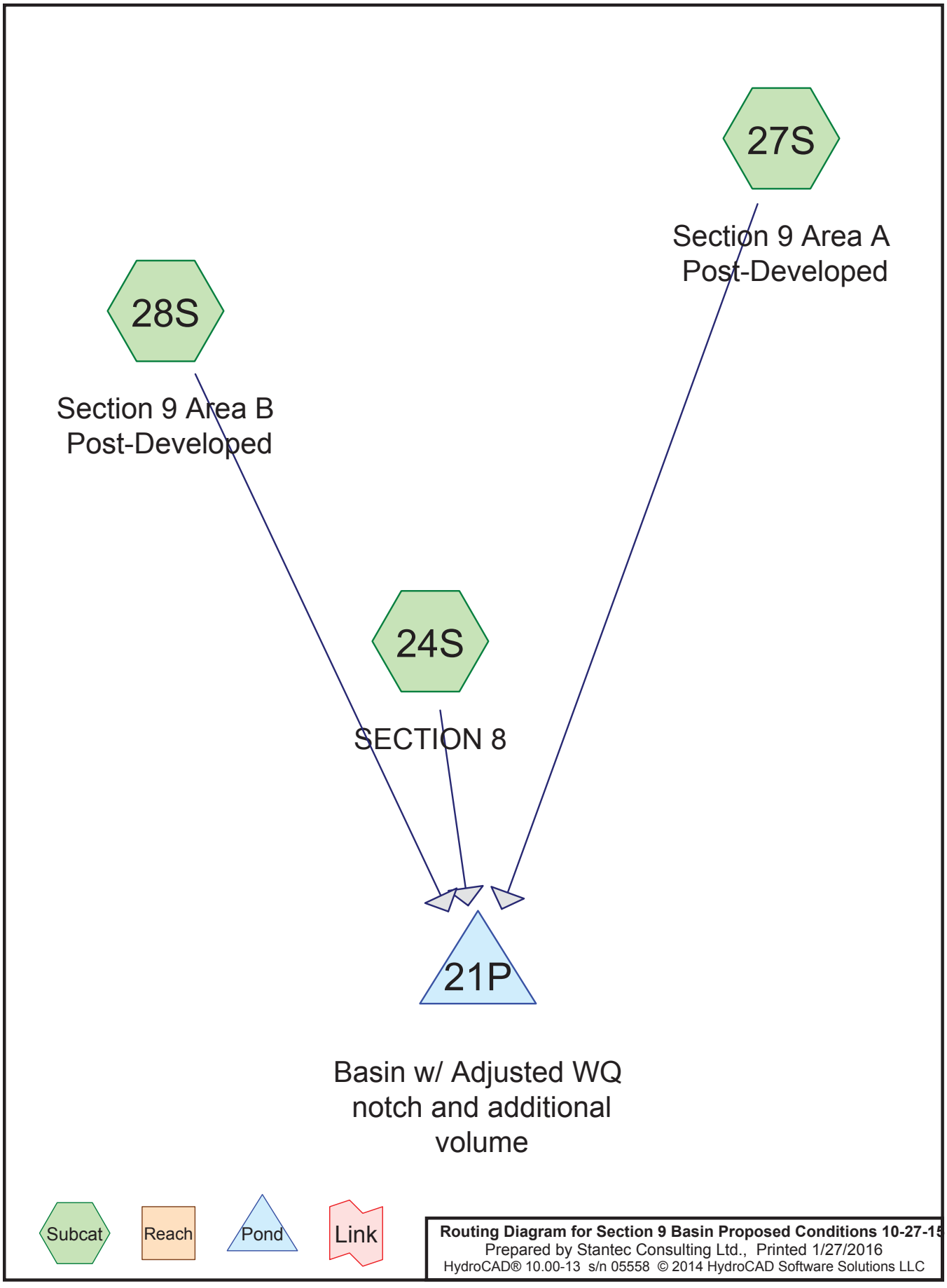
Project

POST DEVELOPMENT
STORM TRIBUTARY AREA

Title

173408577	1" = 50'
Project No.	Scale
Drawing No.	Sheet 1 of 1
	Revision

Appendix C Basin Routing Hydrographs



Routing Diagram for Section 9 Basin Proposed Conditions 10-27-15
Prepared by Stantec Consulting Ltd., Printed 1/27/2016

Summary for Subcatchment 24S: SECTION 8

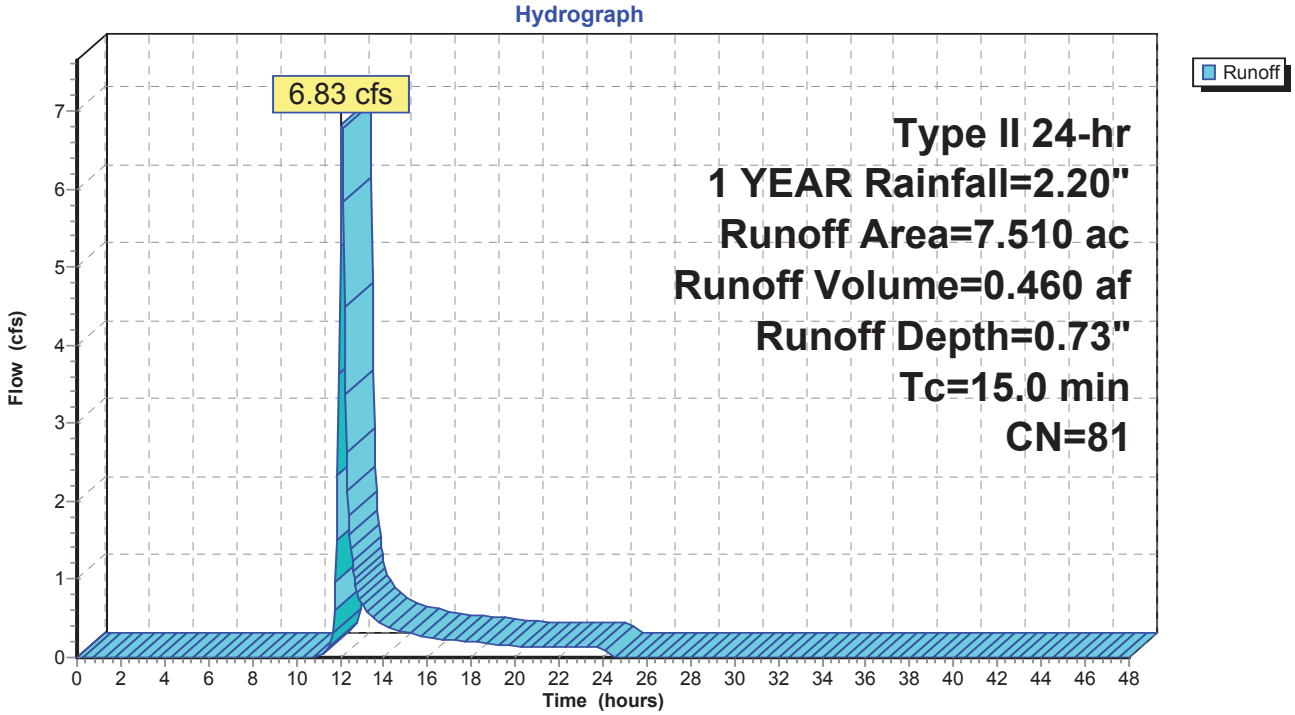
Runoff = 6.83 cfs @ 12.08 hrs, Volume= 0.460 af, Depth= 0.73"

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 1 YEAR Rainfall=2.20"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 27S: Section 9 Area A Post-Developed

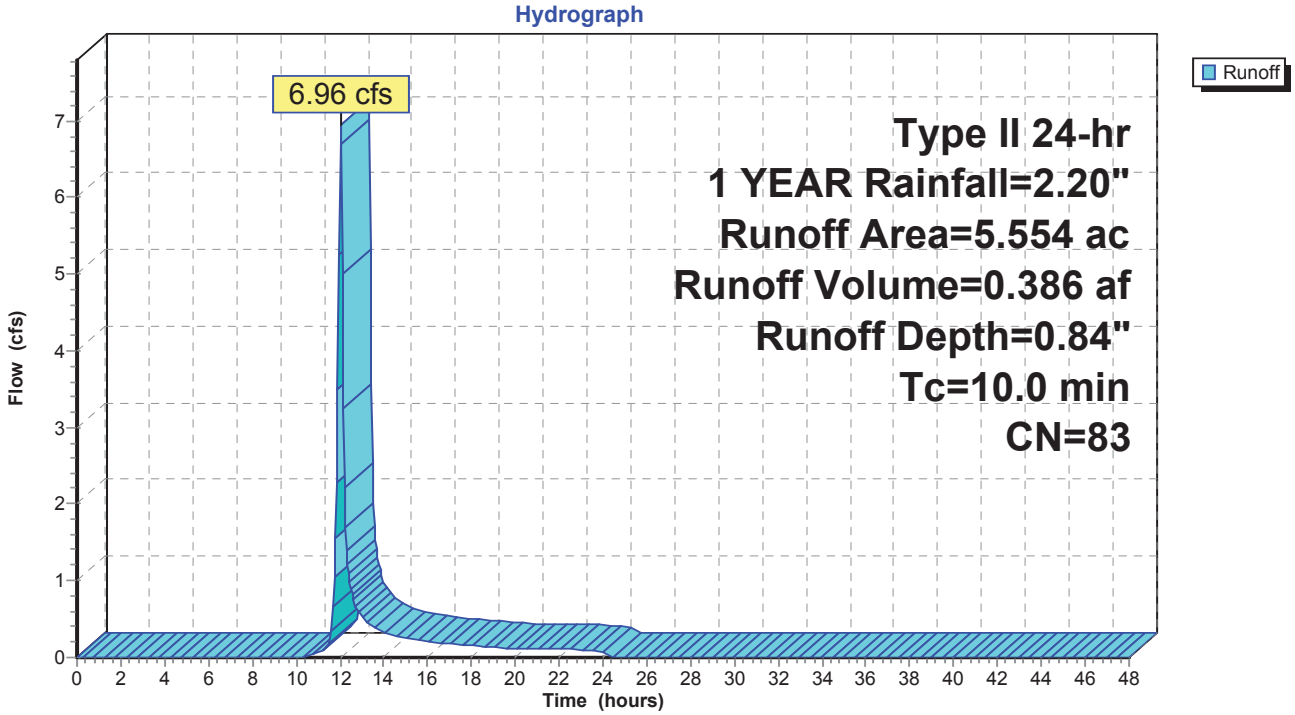
Runoff = 6.96 cfs @ 12.02 hrs, Volume= 0.386 af, Depth= 0.84"

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 1 YEAR Rainfall=2.20"

Area (ac)	CN	Description
5.554	83	1/4 acre lots, 38% imp, HSG C
3.443		62.00% Pervious Area
2.111		38.00% Impervious Area

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

Subcatchment 27S: Section 9 Area A Post-Developed



Summary for Subcatchment 28S: Section 9 Area B Post-Developed

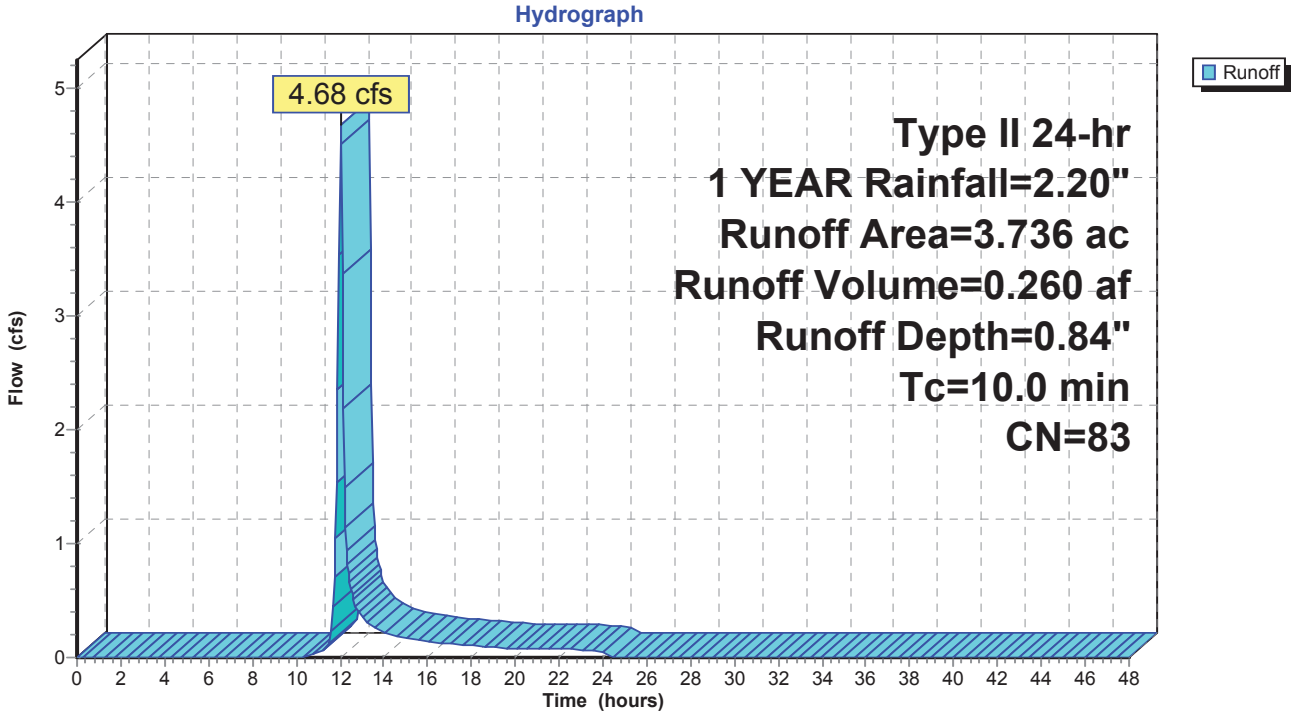
Runoff = 4.68 cfs @ 12.02 hrs, Volume= 0.260 af, Depth= 0.84"

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 1 YEAR Rainfall=2.20"

Area (ac)	CN	Description
3.736	83	1/4 acre lots, 38% imp, HSG C
2.316		62.00% Pervious Area
1.420		38.00% Impervious Area

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

Subcatchment 28S: Section 9 Area B Post-Developed



Summary for Pond 21P: Basin w/ Adjusted WQ notch and additional volume

Inflow Area = 16.800 ac, 34.42% Impervious, Inflow Depth = 0.79" for 1 YEAR event
Inflow = 17.88 cfs @ 12.04 hrs, Volume= 1.106 af
Outflow = 0.50 cfs @ 17.27 hrs, Volume= 1.026 af, Atten= 97%, Lag= 313.6 min
Primary = 0.50 cfs @ 17.27 hrs, Volume= 1.026 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 911.99' @ 17.27 hrs Surf.Area= 0.418 ac Storage= 0.697 af

Plug-Flow detention time= 738.6 min calculated for 1.025 af (93% of inflow)
Center-of-Mass det. time= 700.8 min (1,558.7 - 857.8)

Volume	Invert	Avail.Storage	Storage Description
#1	910.00'	2.892 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

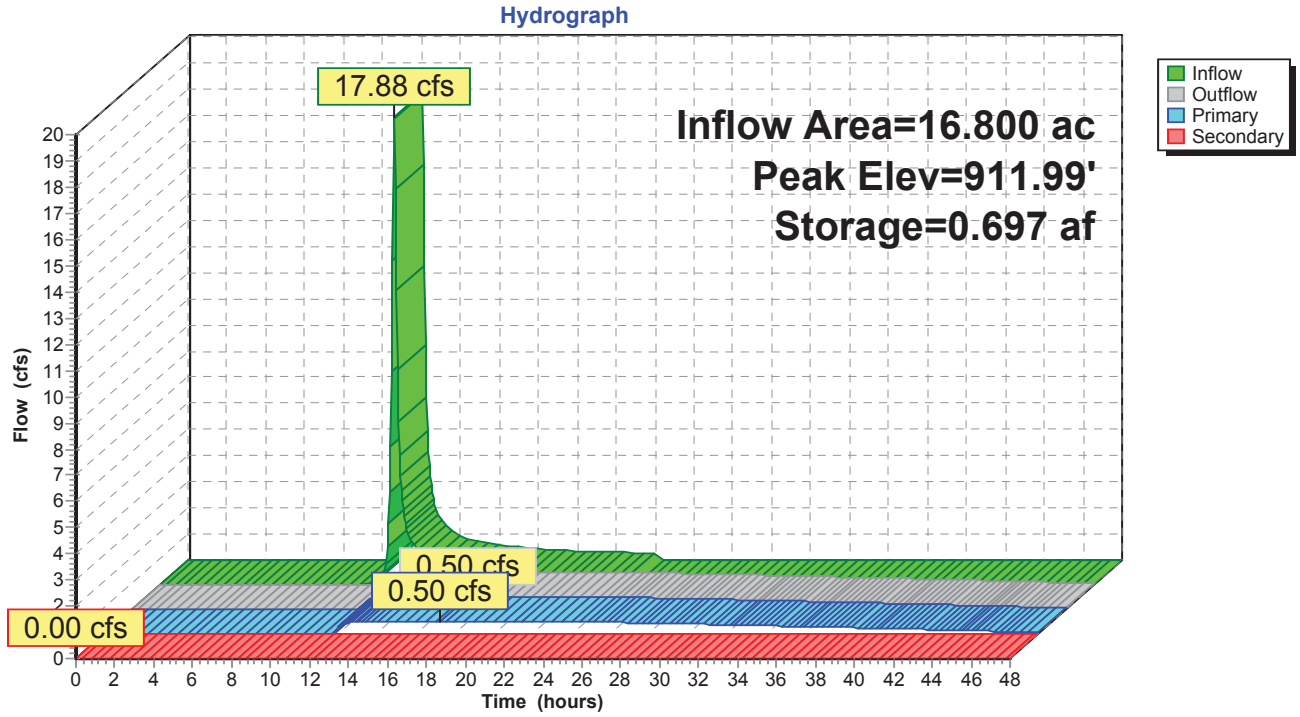
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
910.00	0.293	0.000	0.000
911.00	0.347	0.320	0.320
912.00	0.419	0.383	0.703
913.00	0.481	0.450	1.153
914.00	0.545	0.513	1.666
915.00	0.611	0.578	2.244
916.00	0.685	0.648	2.892

Device	Routing	Invert	Outlet Devices
#1	Primary	909.93'	**24.0" Round Culvert** L= 55.7' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 909.93' / 909.85' S= 0.0014 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	910.09'	**15.0" Vert. Orifice/Grate** C= 0.600
#3	Device 2	910.09'	**3.8" Vert. Orifice/Grate** C= 0.600
#4	Device 2	912.00'	**4.3" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	912.50'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#6	Device 2	913.34'	**24.0" x 24.0" Horiz. Orifice/Grate X 0.40** C= 0.600 Limited to weir flow at low heads
#7	Secondary	916.00'	**35.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.50 cfs @ 17.27 hrs HW=911.99' (Free Discharge)
└**1=Culvert** (Passes 0.50 cfs of 11.26 cfs potential flow)
└**2=Orifice/Grate** (Passes 0.50 cfs of 6.66 cfs potential flow)
└**3=Orifice/Grate** (Orifice Controls 0.50 cfs @ 6.35 fps)
└**4=Orifice/Grate** (Controls 0.00 cfs)
└**5=Orifice/Grate** (Controls 0.00 cfs)
└**6=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=910.00' (Free Discharge)
└**7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 21P: Basin w/ Adjusted WQ notch and additional volume



Summary for Subcatchment 24S: SECTION 8

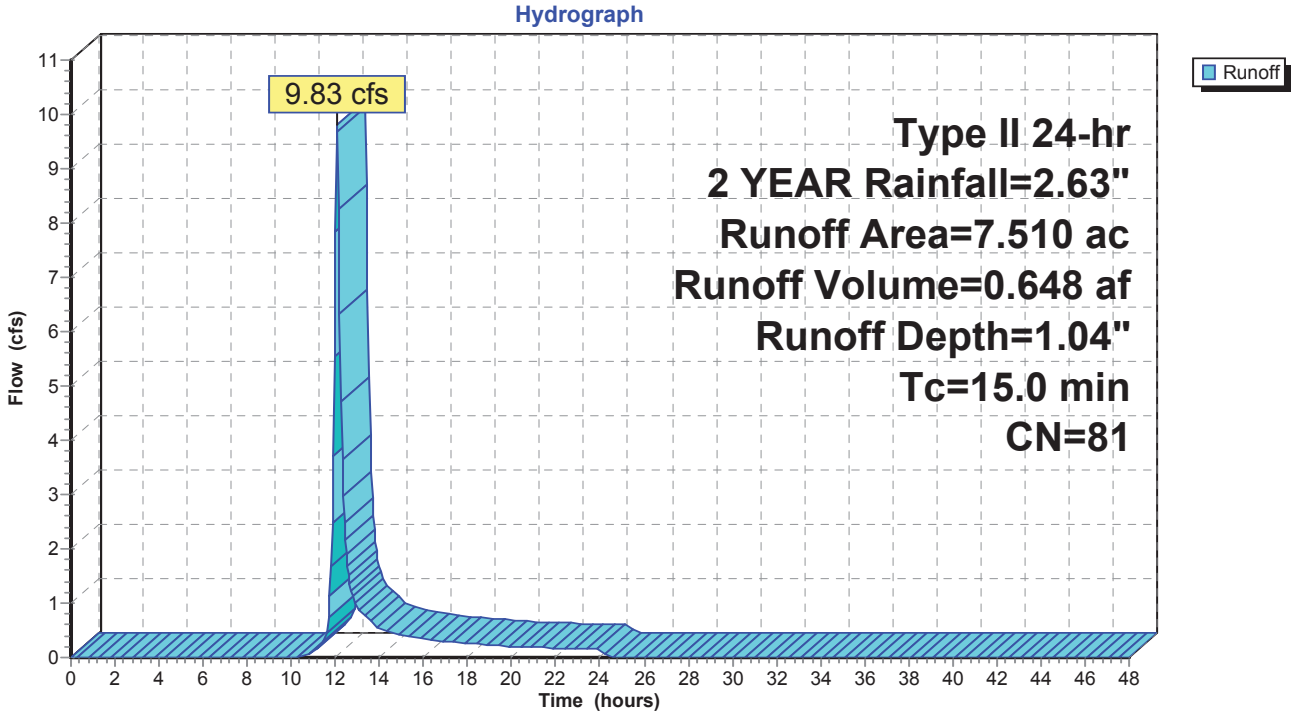
Runoff = 9.83 cfs @ 12.08 hrs, Volume= 0.648 af, Depth= 1.04"

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=2.63"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 27S: Section 9 Area A Post-Developed

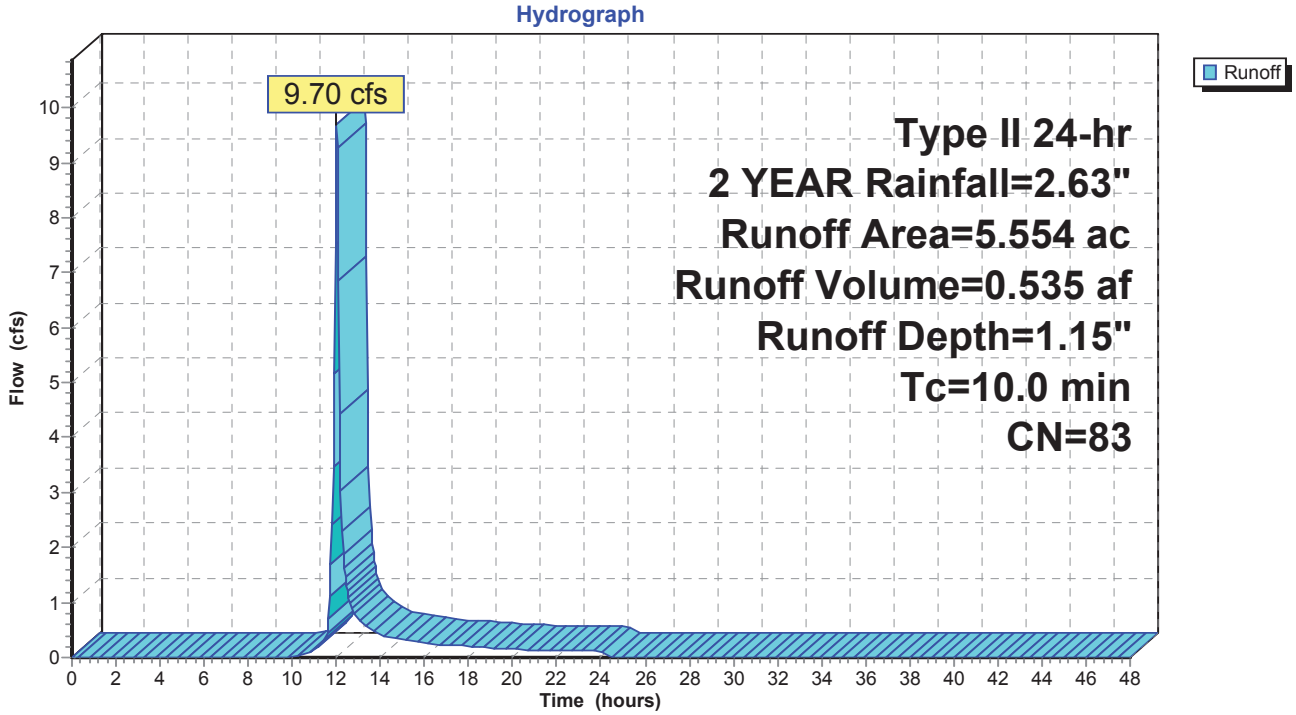
Runoff = 9.70 cfs @ 12.02 hrs, Volume= 0.535 af, Depth= 1.15"

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=2.63"

Area (ac)	CN	Description
5.554	83	1/4 acre lots, 38% imp, HSG C
3.443		62.00% Pervious Area
2.111		38.00% Impervious Area

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

Subcatchment 27S: Section 9 Area A Post-Developed



Summary for Subcatchment 28S: Section 9 Area B Post-Developed

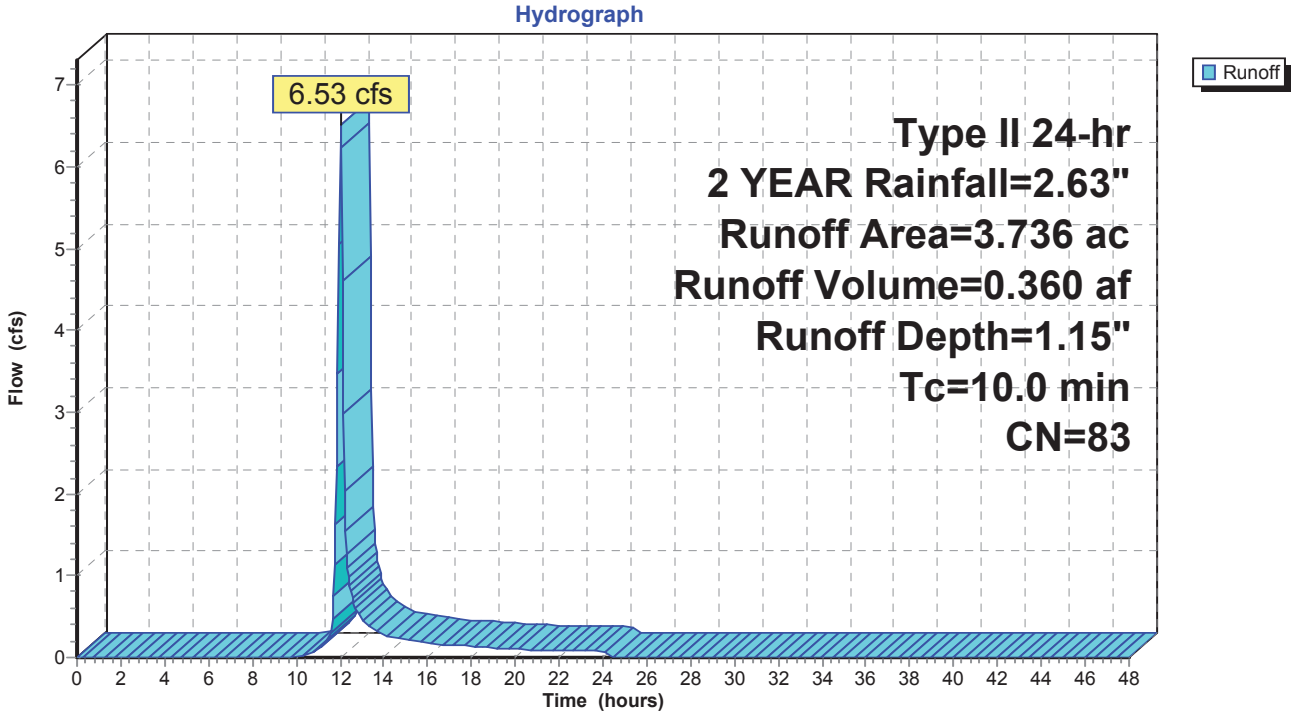
Runoff = 6.53 cfs @ 12.02 hrs, Volume= 0.360 af, Depth= 1.15"

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=2.63"

Area (ac)	CN	Description
3.736	83	1/4 acre lots, 38% imp, HSG C
2.316		62.00% Pervious Area
1.420		38.00% Impervious Area

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

Subcatchment 28S: Section 9 Area B Post-Developed



Summary for Pond 21P: Basin w/ Adjusted WQ notch and additional volume

Inflow Area = 16.800 ac, 34.42% Impervious, Inflow Depth = 1.10" for 2 YEAR event
Inflow = 25.25 cfs @ 12.04 hrs, Volume= 1.543 af
Outflow = 1.00 cfs @ 14.89 hrs, Volume= 1.440 af, Atten= 96%, Lag= 171.2 min
Primary = 1.00 cfs @ 14.89 hrs, Volume= 1.440 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 912.51' @ 14.89 hrs Surf.Area= 0.451 ac Storage= 0.926 af

Plug-Flow detention time= 678.2 min calculated for 1.438 af (93% of inflow)
Center-of-Mass det. time= 643.0 min (1,491.0 - 848.0)

Volume	Invert	Avail.Storage	Storage Description
#1	910.00'	2.892 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

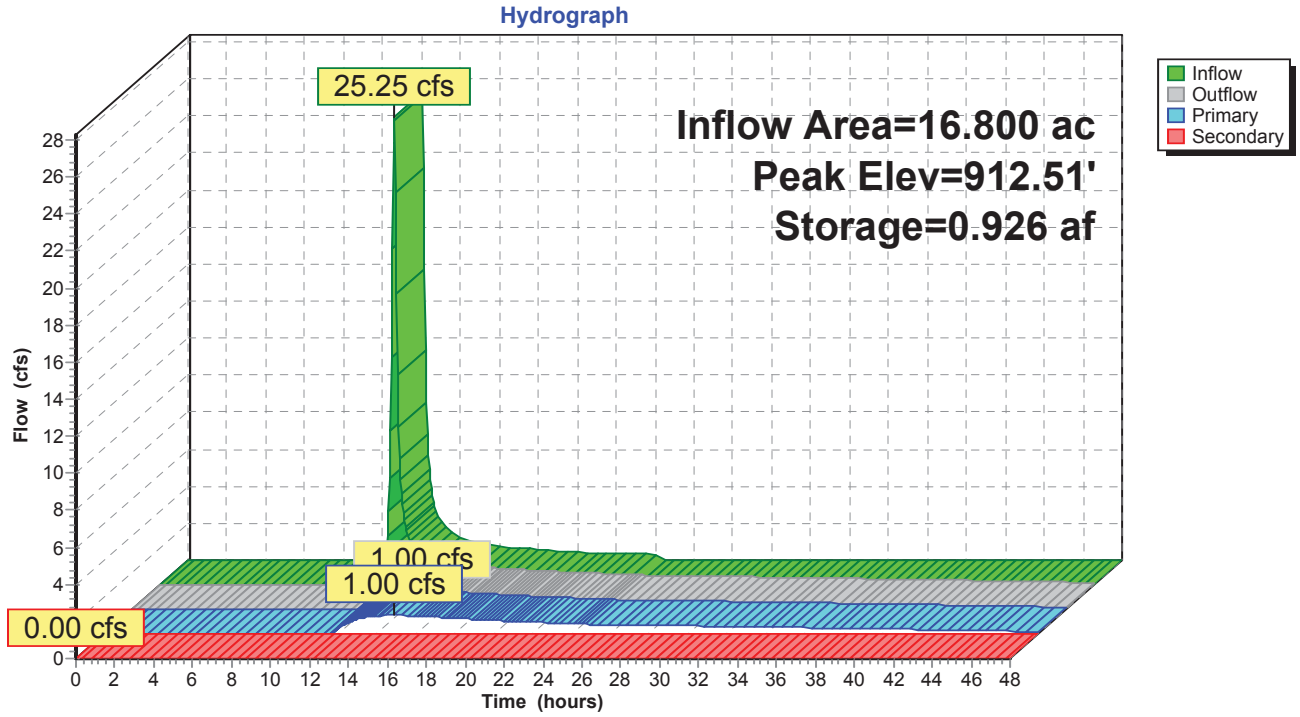
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
910.00	0.293	0.000	0.000
911.00	0.347	0.320	0.320
912.00	0.419	0.383	0.703
913.00	0.481	0.450	1.153
914.00	0.545	0.513	1.666
915.00	0.611	0.578	2.244
916.00	0.685	0.648	2.892

Device	Routing	Invert	Outlet Devices
#1	Primary	909.93'	**24.0" Round Culvert** L= 55.7' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 909.93' / 909.85' S= 0.0014 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	910.09'	**15.0" Vert. Orifice/Grate** C= 0.600
#3	Device 2	910.09'	**3.8" Vert. Orifice/Grate** C= 0.600
#4	Device 2	912.00'	**4.3" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	912.50'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#6	Device 2	913.34'	**24.0" x 24.0" Horiz. Orifice/Grate X 0.40** C= 0.600 Limited to weir flow at low heads
#7	Secondary	916.00'	**35.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=1.00 cfs @ 14.89 hrs HW=912.51' (Free Discharge)
- **1=Culvert** (Passes 1.00 cfs of 14.69 cfs potential flow)
  - **2=Orifice/Grate** (Passes 1.00 cfs of 7.92 cfs potential flow)
    - **3=Orifice/Grate** (Orifice Controls 0.57 cfs @ 7.25 fps)
    - **4=Orifice/Grate** (Orifice Controls 0.42 cfs @ 2.35 fps)
    - **5=Orifice/Grate** (Orifice Controls 0.01 cfs @ 0.37 fps)
    - **6=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=910.00' (Free Discharge)
- **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 21P: Basin w/ Adjusted WQ notch and additional volume



Summary for Subcatchment 24S: SECTION 8

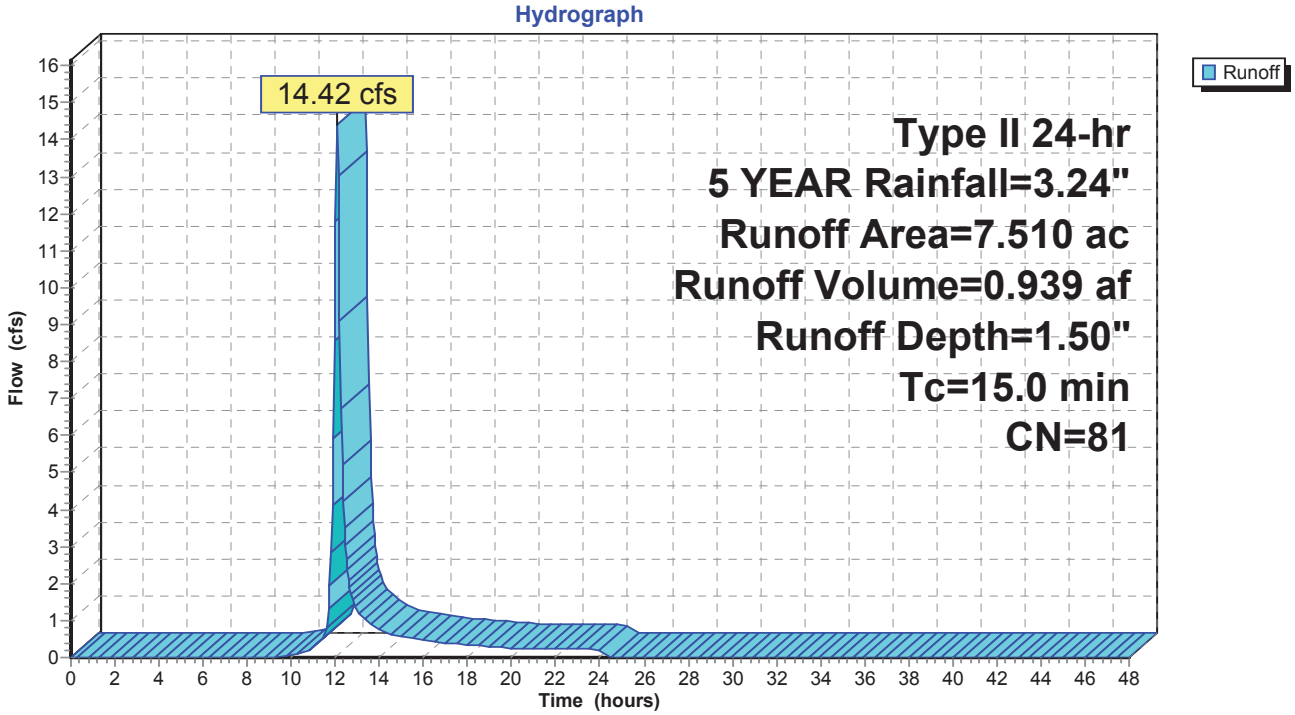
Runoff = 14.42 cfs @ 12.07 hrs, Volume= 0.939 af, Depth= 1.50"

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 5 YEAR Rainfall=3.24"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 27S: Section 9 Area A Post-Developed

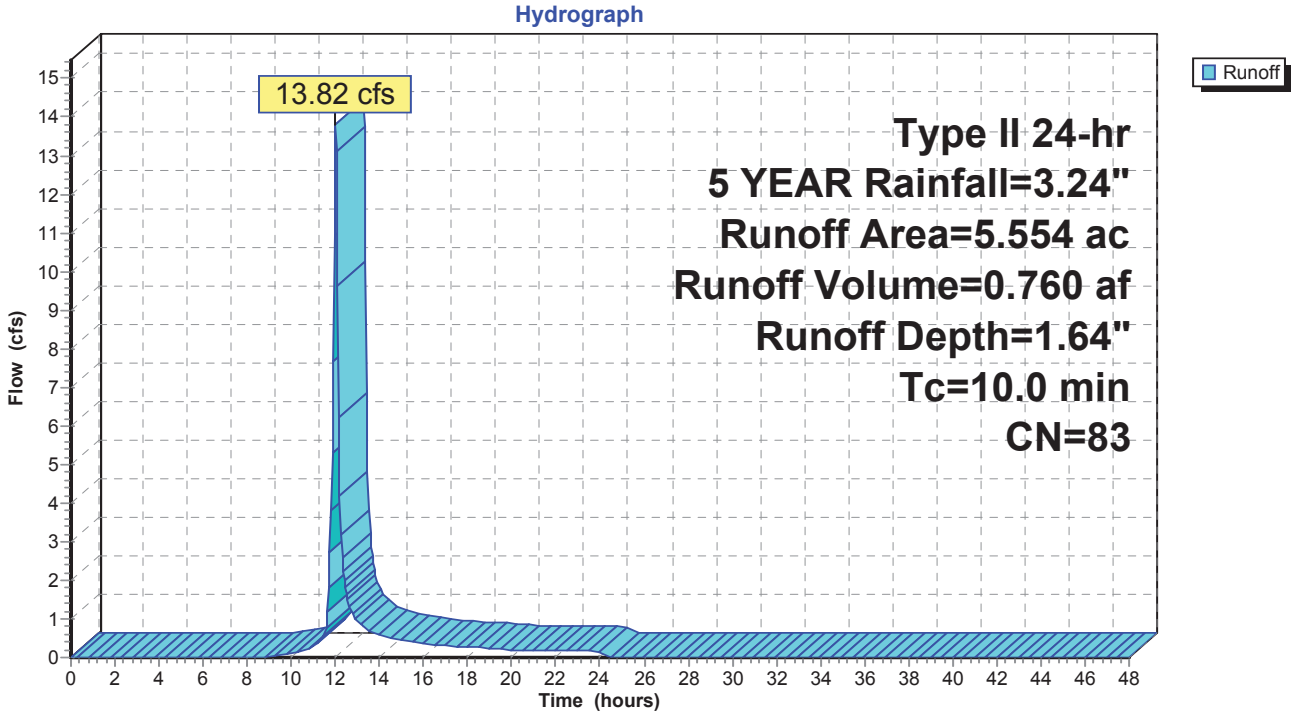
Runoff = 13.82 cfs @ 12.02 hrs, Volume= 0.760 af, Depth= 1.64"

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 5 YEAR Rainfall=3.24"

Area (ac)	CN	Description
5.554	83	1/4 acre lots, 38% imp, HSG C
3.443		62.00% Pervious Area
2.111		38.00% Impervious Area

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

Subcatchment 27S: Section 9 Area A Post-Developed



Summary for Subcatchment 28S: Section 9 Area B Post-Developed

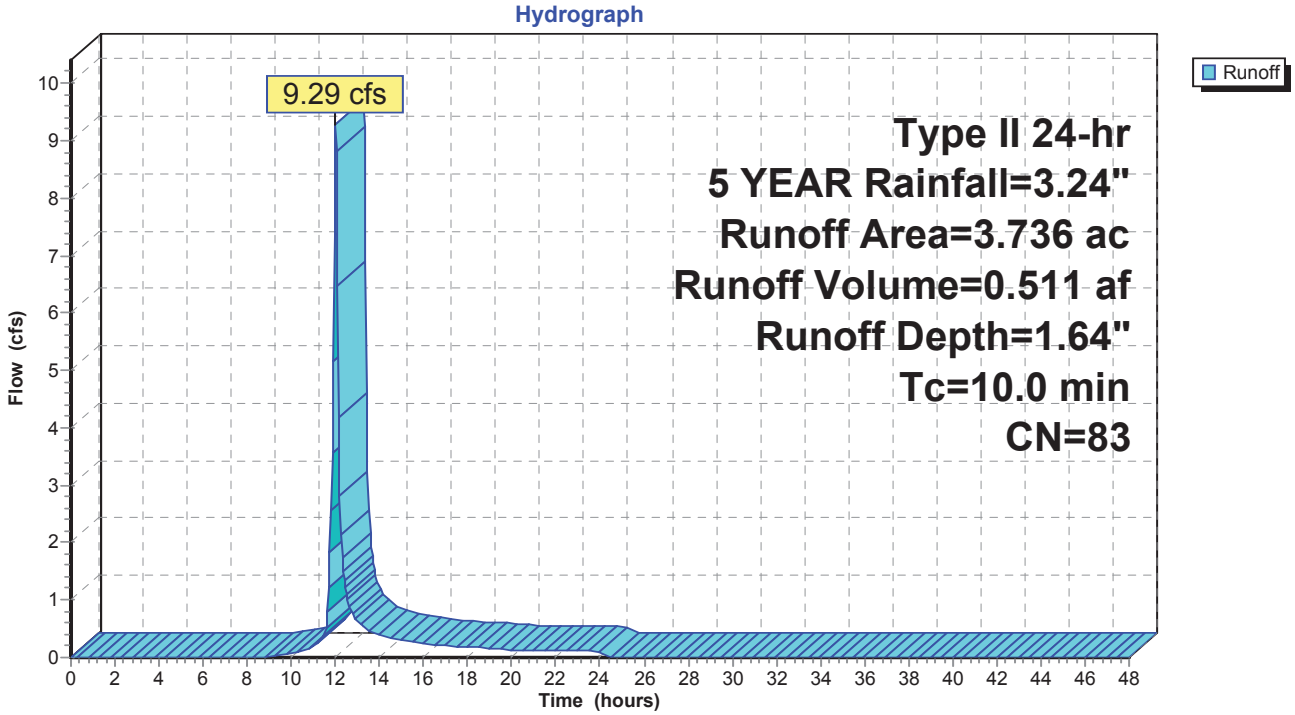
Runoff = 9.29 cfs @ 12.02 hrs, Volume= 0.511 af, Depth= 1.64"

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 5 YEAR Rainfall=3.24"

Area (ac)	CN	Description
3.736	83	1/4 acre lots, 38% imp, HSG C
2.316		62.00% Pervious Area
1.420		38.00% Impervious Area

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

Subcatchment 28S: Section 9 Area B Post-Developed



Summary for Pond 21P: Basin w/ Adjusted WQ notch and additional volume

Inflow Area = 16.800 ac, 34.42% Impervious, Inflow Depth = 1.58" for 5 YEAR event
Inflow = 36.38 cfs @ 12.03 hrs, Volume= 2.210 af
Outflow = 3.59 cfs @ 12.75 hrs, Volume= 2.096 af, Atten= 90%, Lag= 42.7 min
Primary = 3.59 cfs @ 12.75 hrs, Volume= 2.096 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 912.99' @ 12.75 hrs Surf.Area= 0.480 ac Storage= 1.149 af

Plug-Flow detention time= 515.8 min calculated for 2.093 af (95% of inflow)
Center-of-Mass det. time= 487.9 min (1,325.5 - 837.6)

Volume	Invert	Avail.Storage	Storage Description
#1	910.00'	2.892 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

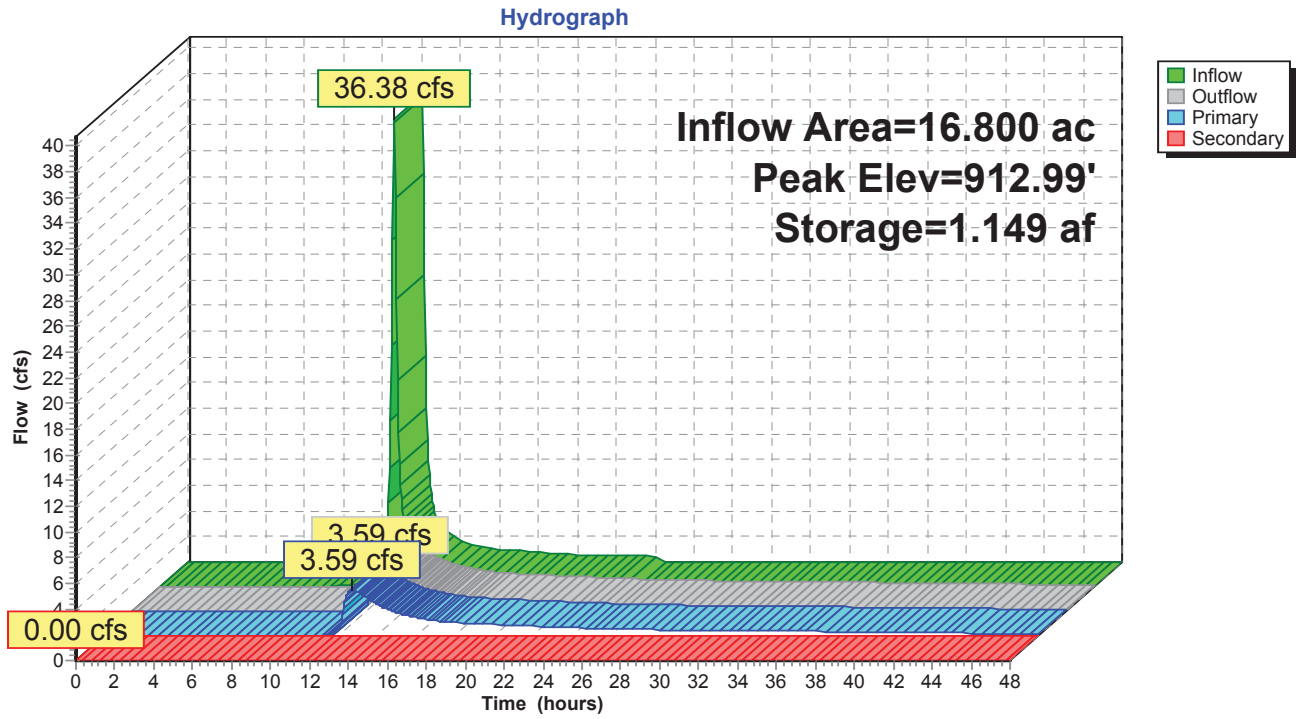
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
910.00	0.293	0.000	0.000
911.00	0.347	0.320	0.320
912.00	0.419	0.383	0.703
913.00	0.481	0.450	1.153
914.00	0.545	0.513	1.666
915.00	0.611	0.578	2.244
916.00	0.685	0.648	2.892

Device	Routing	Invert	Outlet Devices
#1	Primary	909.93'	**24.0" Round Culvert** L= 55.7' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 909.93' / 909.85' S= 0.0014 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	910.09'	**15.0" Vert. Orifice/Grate** C= 0.600
#3	Device 2	910.09'	**3.8" Vert. Orifice/Grate** C= 0.600
#4	Device 2	912.00'	**4.3" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	912.50'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#6	Device 2	913.34'	**24.0" x 24.0" Horiz. Orifice/Grate X 0.40** C= 0.600 Limited to weir flow at low heads
#7	Secondary	916.00'	**35.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=3.59 cfs @ 12.75 hrs HW=912.99' (Free Discharge)
- **1=Culvert** (Passes 3.59 cfs of 18.19 cfs potential flow)
  - **2=Orifice/Grate** (Passes 3.59 cfs of 8.92 cfs potential flow)
    - **3=Orifice/Grate** (Orifice Controls 0.63 cfs @ 7.98 fps)
    - **4=Orifice/Grate** (Orifice Controls 0.74 cfs @ 4.13 fps)
    - **5=Orifice/Grate** (Orifice Controls 2.22 cfs @ 2.25 fps)
    - **6=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=910.00' (Free Discharge)
- **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 21P: Basin w/ Adjusted WQ notch and additional volume



Summary for Subcatchment 24S: SECTION 8

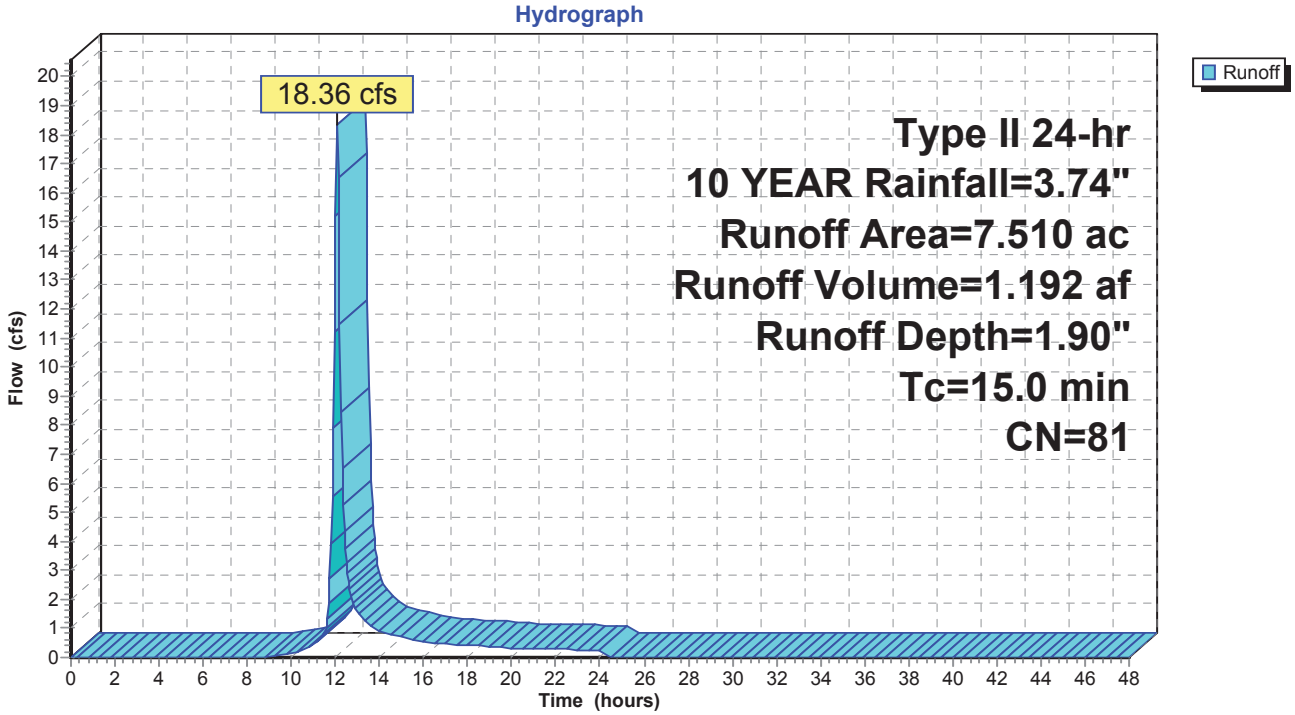
Runoff = 18.36 cfs @ 12.07 hrs, Volume= 1.192 af, Depth= 1.90"

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=3.74"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 27S: Section 9 Area A Post-Developed

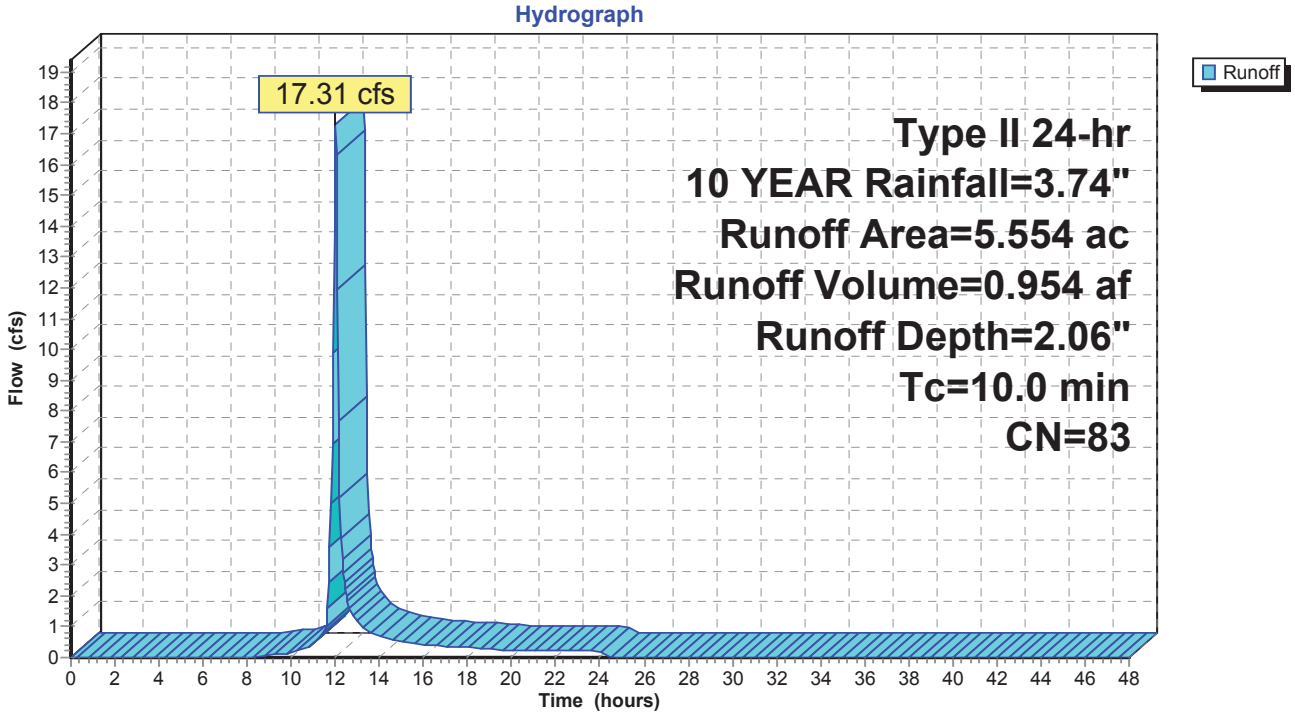
Runoff = 17.31 cfs @ 12.02 hrs, Volume= 0.954 af, Depth= 2.06"

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=3.74"

Area (ac)	CN	Description
5.554	83	1/4 acre lots, 38% imp, HSG C
3.443		62.00% Pervious Area
2.111		38.00% Impervious Area

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

Subcatchment 27S: Section 9 Area A Post-Developed



Summary for Subcatchment 28S: Section 9 Area B Post-Developed

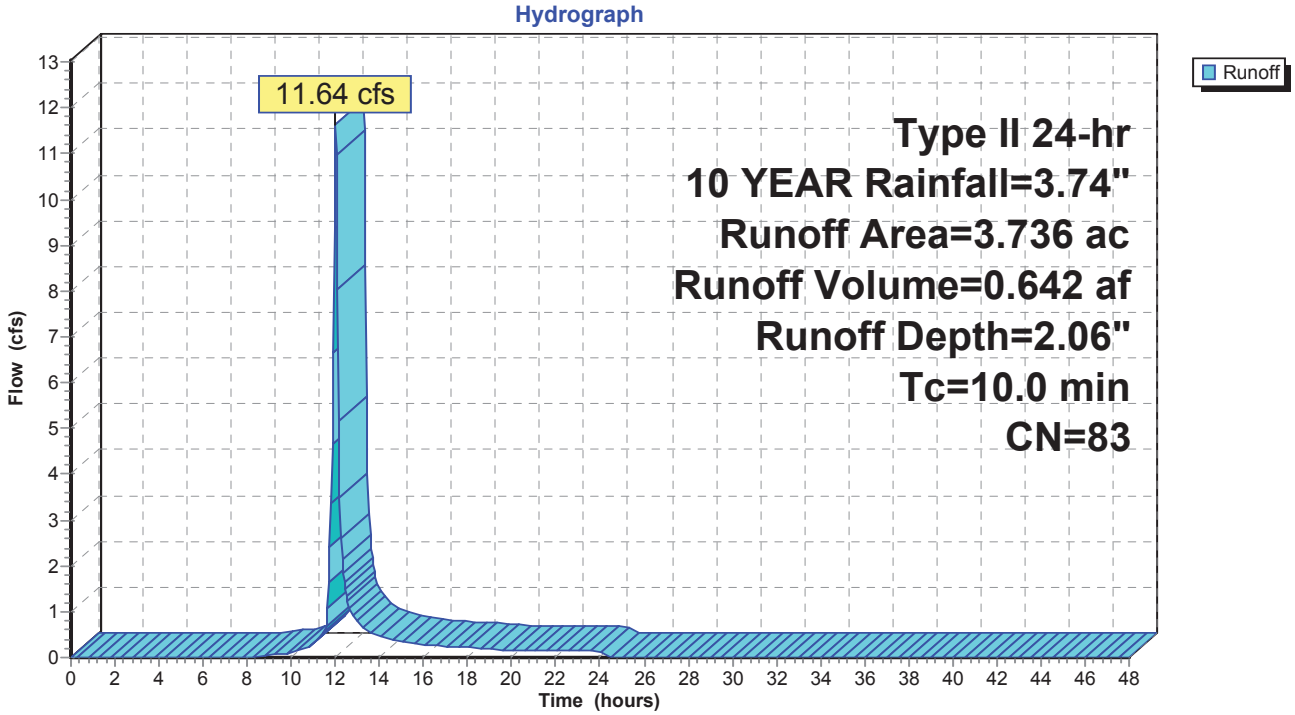
Runoff = 11.64 cfs @ 12.02 hrs, Volume= 0.642 af, Depth= 2.06"

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=3.74"

Area (ac)	CN	Description
3.736	83	1/4 acre lots, 38% imp, HSG C
2.316		62.00% Pervious Area
1.420		38.00% Impervious Area

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

Subcatchment 28S: Section 9 Area B Post-Developed



Summary for Pond 21P: Basin w/ Adjusted WQ notch and additional volume

Inflow Area = 16.800 ac, 34.42% Impervious, Inflow Depth = 1.99" for 10 YEAR event
Inflow = 45.87 cfs @ 12.03 hrs, Volume= 2.789 af
Outflow = 6.30 cfs @ 12.55 hrs, Volume= 2.667 af, Atten= 86%, Lag= 30.9 min
Primary = 6.30 cfs @ 12.55 hrs, Volume= 2.667 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 913.48' @ 12.55 hrs Surf.Area= 0.512 ac Storage= 1.392 af

Plug-Flow detention time= 429.7 min calculated for 2.664 af (96% of inflow)
Center-of-Mass det. time= 405.9 min (1,236.9 - 831.0)

Volume	Invert	Avail.Storage	Storage Description
#1	910.00'	2.892 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

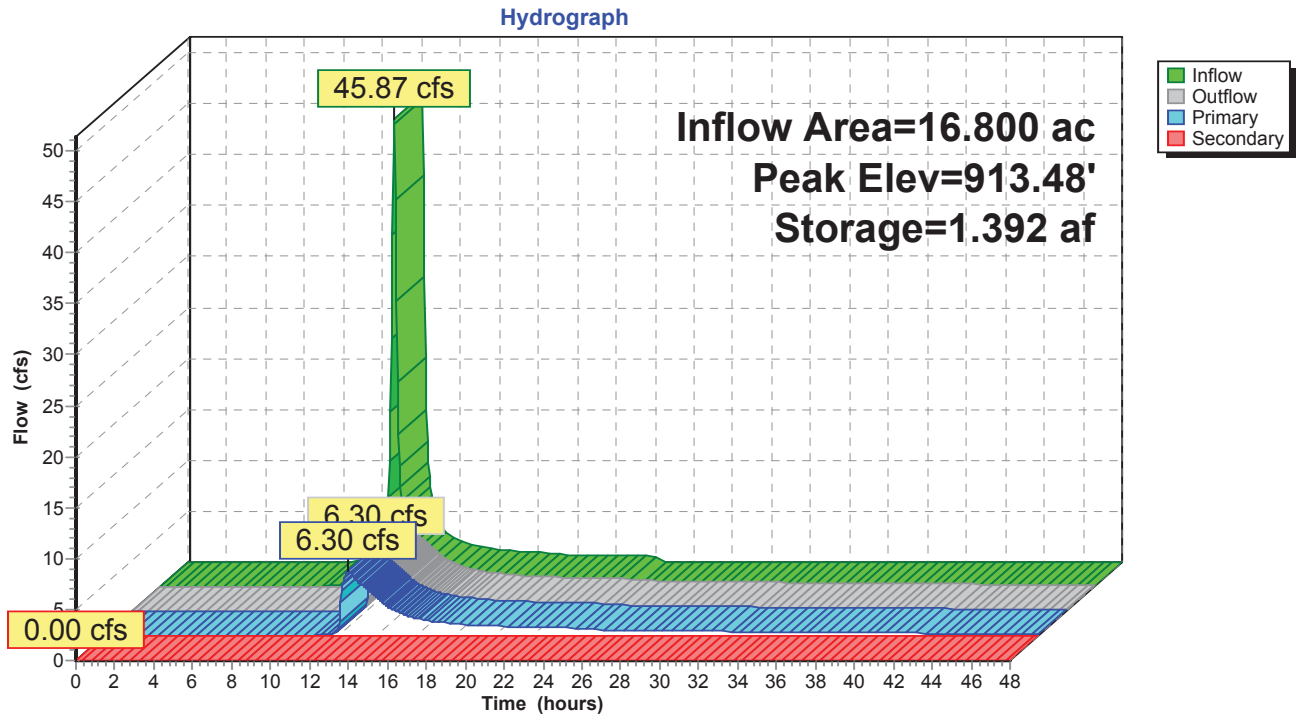
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
910.00	0.293	0.000	0.000
911.00	0.347	0.320	0.320
912.00	0.419	0.383	0.703
913.00	0.481	0.450	1.153
914.00	0.545	0.513	1.666
915.00	0.611	0.578	2.244
916.00	0.685	0.648	2.892

Device	Routing	Invert	Outlet Devices
#1	Primary	909.93'	**24.0" Round Culvert** L= 55.7' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 909.93' / 909.85' S= 0.0014 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	910.09'	**15.0" Vert. Orifice/Grate** C= 0.600
#3	Device 2	910.09'	**3.8" Vert. Orifice/Grate** C= 0.600
#4	Device 2	912.00'	**4.3" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	912.50'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#6	Device 2	913.34'	**24.0" x 24.0" Horiz. Orifice/Grate X 0.40** C= 0.600 Limited to weir flow at low heads
#7	Secondary	916.00'	**35.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=6.29 cfs @ 12.55 hrs HW=913.48' (Free Discharge)
- **1=Culvert** (Passes 6.29 cfs of 21.74 cfs potential flow)
  - **2=Orifice/Grate** (Passes 6.29 cfs of 9.83 cfs potential flow)
    - **3=Orifice/Grate** (Orifice Controls 0.68 cfs @ 8.66 fps)
    - **4=Orifice/Grate** (Orifice Controls 0.96 cfs @ 5.33 fps)
    - **5=Orifice/Grate** (Orifice Controls 4.10 cfs @ 4.10 fps)
    - **6=Orifice/Grate** (Weir Controls 0.56 cfs @ 0.49 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=910.00' (Free Discharge)
- **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 21P: Basin w/ Adjusted WQ notch and additional volume



Summary for Subcatchment 24S: SECTION 8

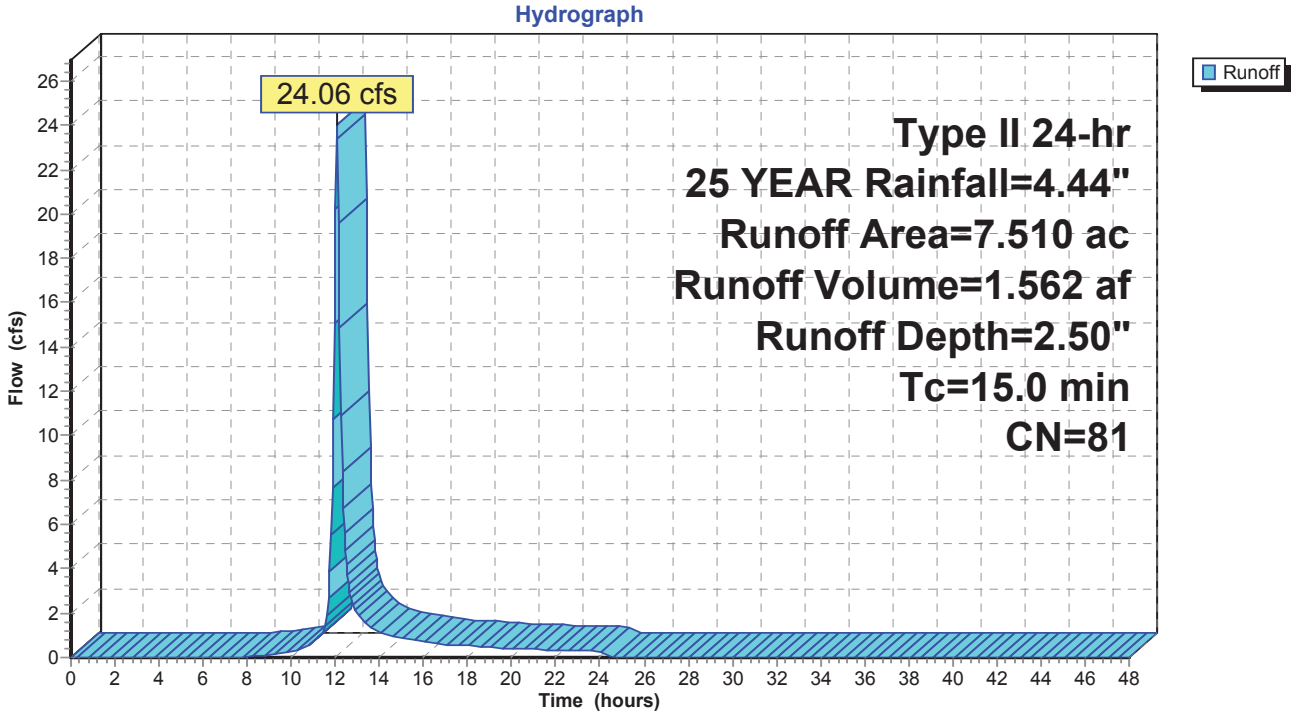
Runoff = 24.06 cfs @ 12.07 hrs, Volume= 1.562 af, Depth= 2.50"

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 25 YEAR Rainfall=4.44"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 27S: Section 9 Area A Post-Developed

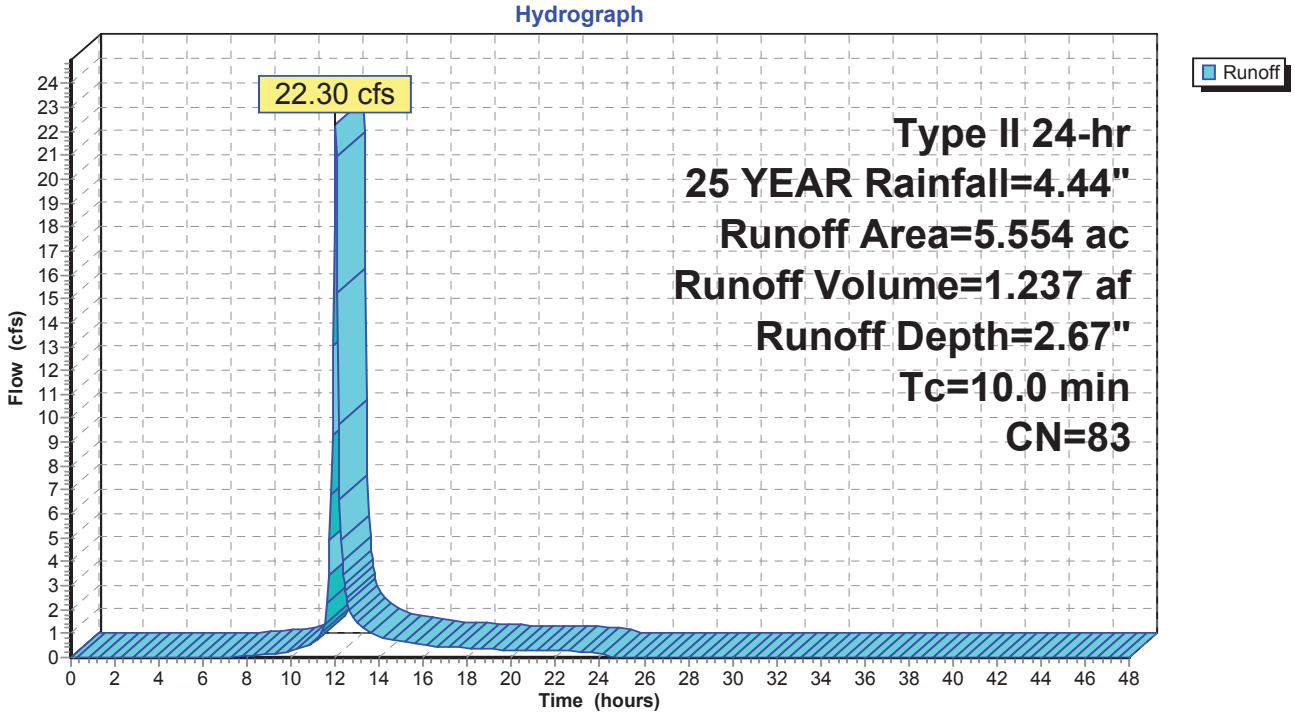
Runoff = 22.30 cfs @ 12.01 hrs, Volume= 1.237 af, Depth= 2.67"

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 25 YEAR Rainfall=4.44"

Area (ac)	CN	Description
5.554	83	1/4 acre lots, 38% imp, HSG C
3.443		62.00% Pervious Area
2.111		38.00% Impervious Area

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

Subcatchment 27S: Section 9 Area A Post-Developed



Summary for Subcatchment 28S: Section 9 Area B Post-Developed

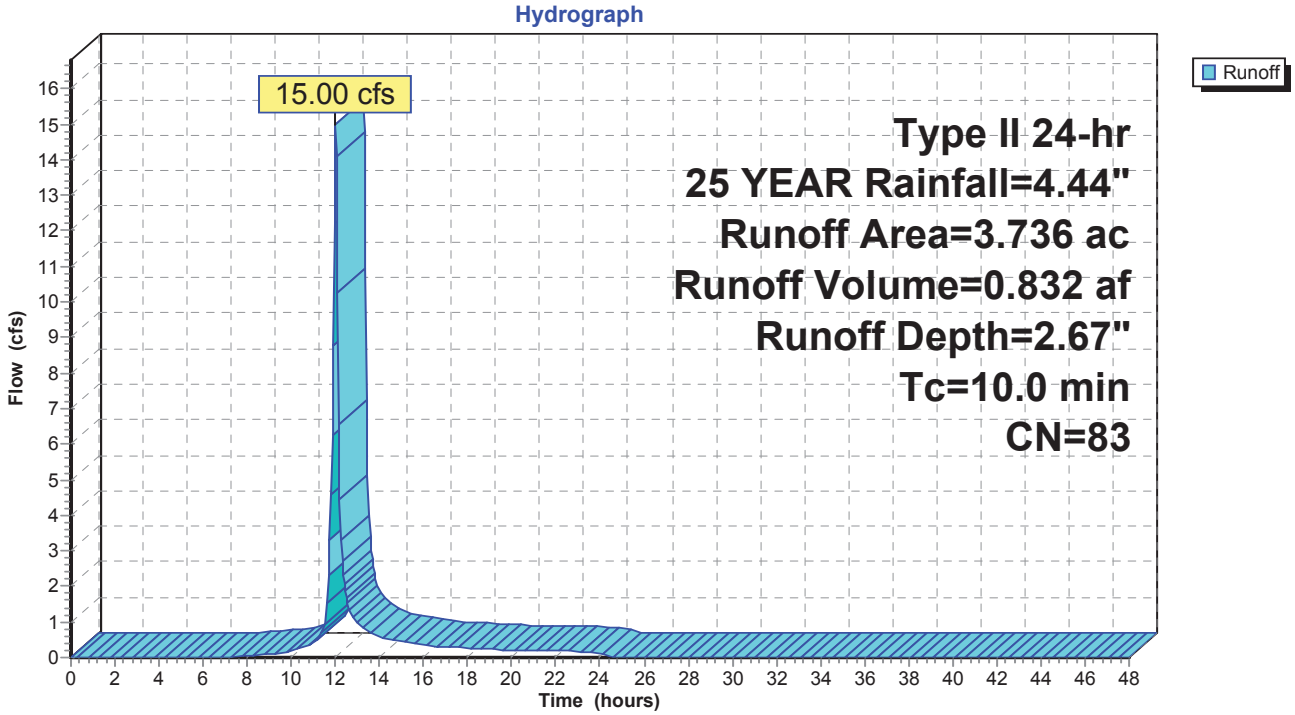
Runoff = 15.00 cfs @ 12.01 hrs, Volume= 0.832 af, Depth= 2.67"

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 25 YEAR Rainfall=4.44"

Area (ac)	CN	Description
3.736	83	1/4 acre lots, 38% imp, HSG C
2.316		62.00% Pervious Area
1.420		38.00% Impervious Area

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

Subcatchment 28S: Section 9 Area B Post-Developed



Summary for Pond 21P: Basin w/ Adjusted WQ notch and additional volume

Inflow Area = 16.800 ac, 34.42% Impervious, Inflow Depth = 2.59" for 25 YEAR event
Inflow = 59.51 cfs @ 12.03 hrs, Volume= 3.631 af
Outflow = 10.93 cfs @ 12.42 hrs, Volume= 3.501 af, Atten= 82%, Lag= 23.3 min
Primary = 10.93 cfs @ 12.42 hrs, Volume= 3.501 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 914.14' @ 12.42 hrs Surf.Area= 0.554 ac Storage= 1.742 af

Plug-Flow detention time= 350.7 min calculated for 3.501 af (96% of inflow)
Center-of-Mass det. time= 329.8 min (1,153.3 - 823.5)

Volume	Invert	Avail.Storage	Storage Description
#1	910.00'	2.892 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

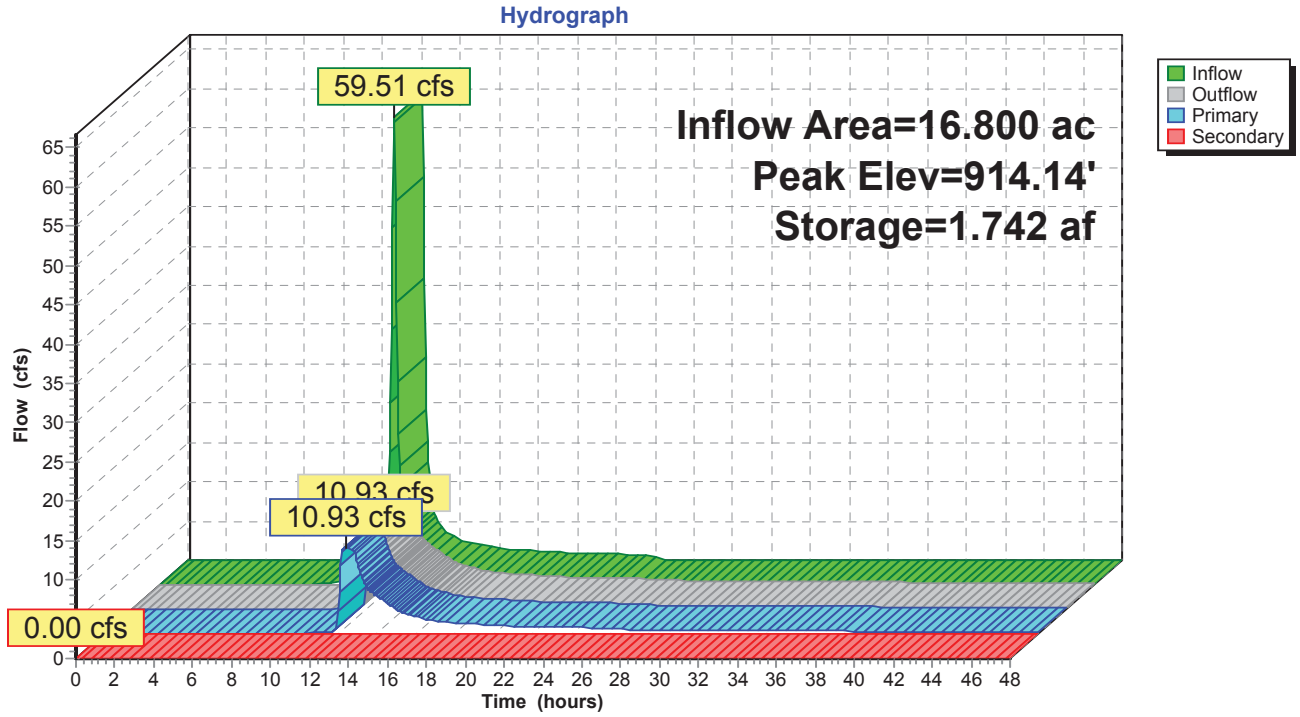
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
910.00	0.293	0.000	0.000
911.00	0.347	0.320	0.320
912.00	0.419	0.383	0.703
913.00	0.481	0.450	1.153
914.00	0.545	0.513	1.666
915.00	0.611	0.578	2.244
916.00	0.685	0.648	2.892

Device	Routing	Invert	Outlet Devices
#1	Primary	909.93'	**24.0" Round Culvert** L= 55.7' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 909.93' / 909.85' S= 0.0014 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	910.09'	**15.0" Vert. Orifice/Grate** C= 0.600
#3	Device 2	910.09'	**3.8" Vert. Orifice/Grate** C= 0.600
#4	Device 2	912.00'	**4.3" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	912.50'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#6	Device 2	913.34'	**24.0" x 24.0" Horiz. Orifice/Grate X 0.40** C= 0.600 Limited to weir flow at low heads
#7	Secondary	916.00'	**35.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=10.93 cfs @ 12.42 hrs HW=914.14' (Free Discharge)
- **1=Culvert** (Passes 10.93 cfs of 25.74 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 10.93 cfs @ 8.91 fps)
    - **3=Orifice/Grate** (Passes < 0.75 cfs potential flow)
    - **4=Orifice/Grate** (Passes < 1.18 cfs potential flow)
    - **5=Orifice/Grate** (Passes < 5.66 cfs potential flow)
    - **6=Orifice/Grate** (Passes < 6.88 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=910.00' (Free Discharge)
- **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 21P: Basin w/ Adjusted WQ notch and additional volume



Summary for Subcatchment 24S: SECTION 8

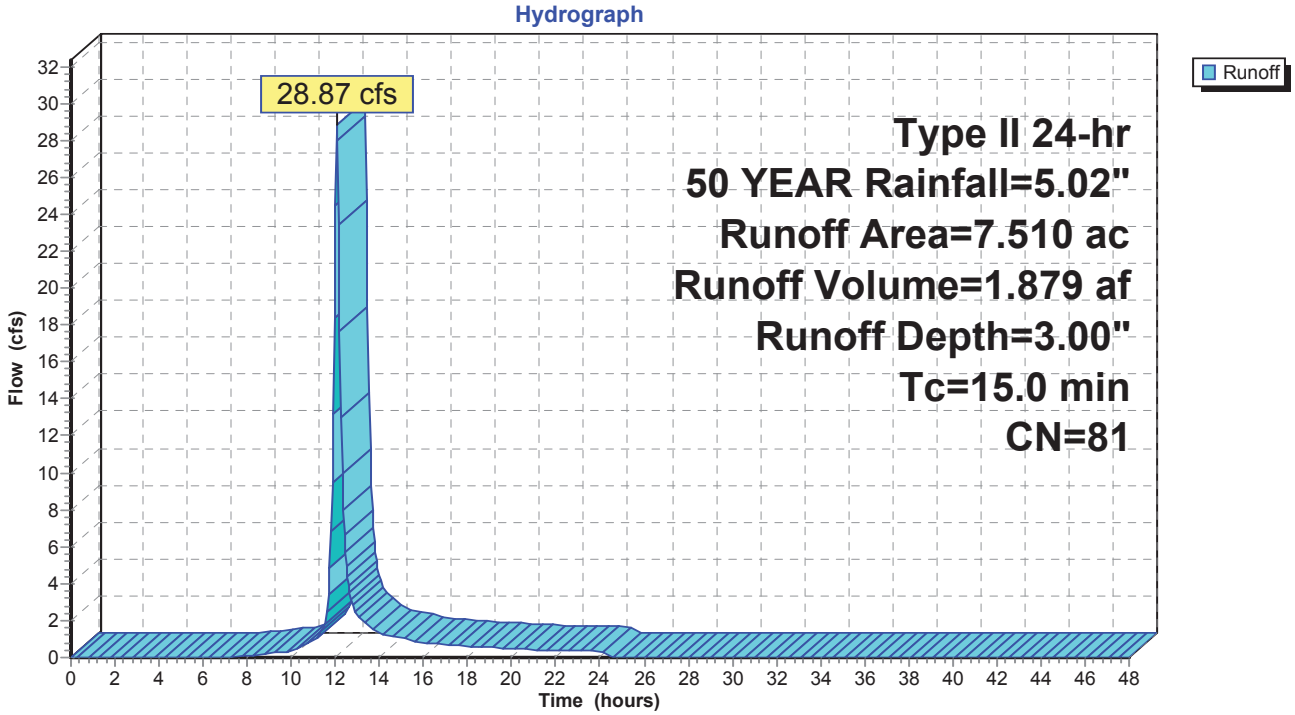
Runoff = 28.87 cfs @ 12.07 hrs, Volume= 1.879 af, Depth= 3.00"

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 50 YEAR Rainfall=5.02"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 27S: Section 9 Area A Post-Developed

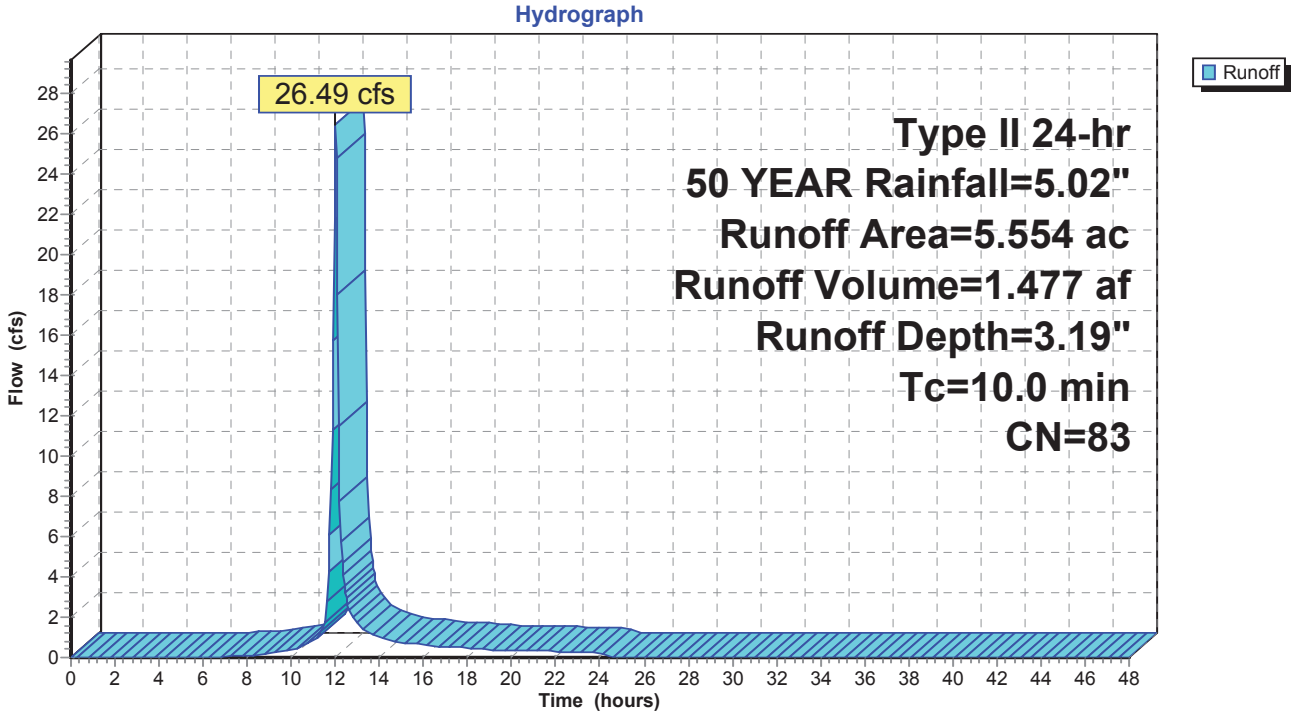
Runoff = 26.49 cfs @ 12.01 hrs, Volume= 1.477 af, Depth= 3.19"

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 50 YEAR Rainfall=5.02"

Area (ac)	CN	Description
5.554	83	1/4 acre lots, 38% imp, HSG C
3.443		62.00% Pervious Area
2.111		38.00% Impervious Area

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

Subcatchment 27S: Section 9 Area A Post-Developed



Summary for Subcatchment 28S: Section 9 Area B Post-Developed

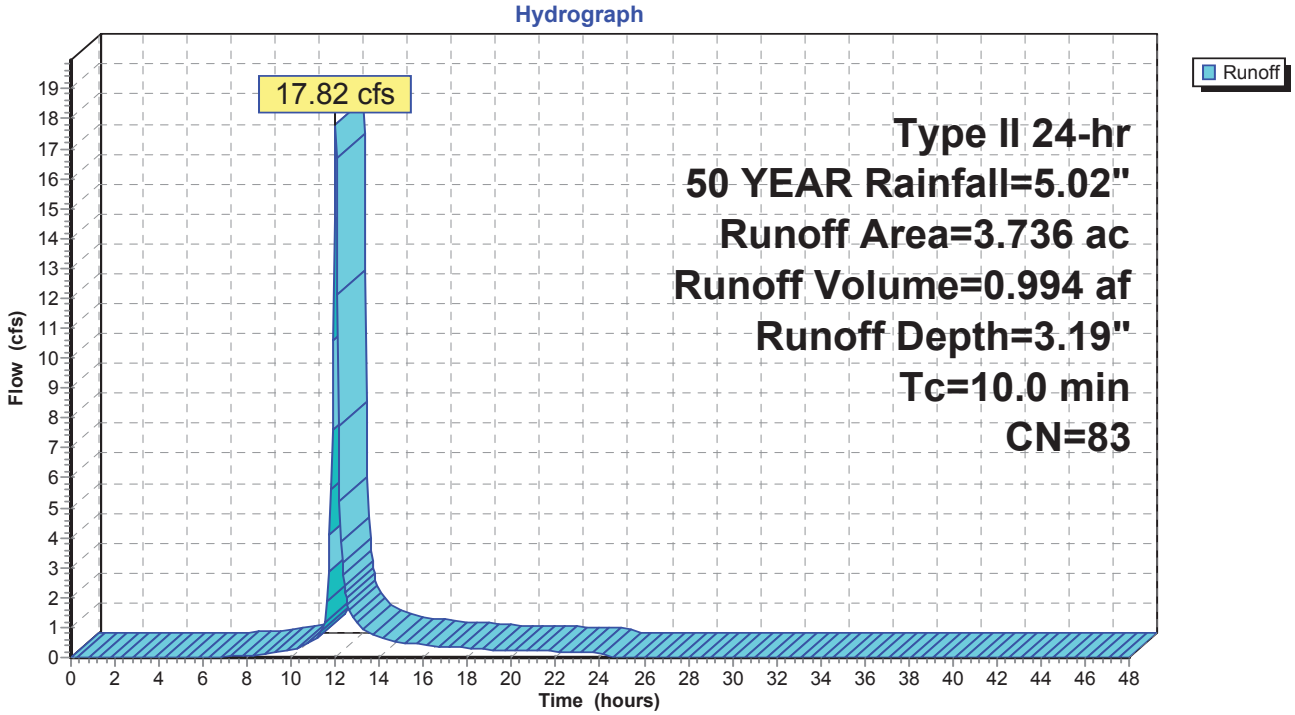
Runoff = 17.82 cfs @ 12.01 hrs, Volume= 0.994 af, Depth= 3.19"

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 50 YEAR Rainfall=5.02"

Area (ac)	CN	Description
3.736	83	1/4 acre lots, 38% imp, HSG C
2.316		62.00% Pervious Area
1.420		38.00% Impervious Area

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

Subcatchment 28S: Section 9 Area B Post-Developed



Summary for Pond 21P: Basin w/ Adjusted WQ notch and additional volume

Inflow Area = 16.800 ac, 34.42% Impervious, Inflow Depth = 3.11" for 50 YEAR event
Inflow = 70.99 cfs @ 12.03 hrs, Volume= 4.351 af
Outflow = 11.93 cfs @ 12.45 hrs, Volume= 4.216 af, Atten= 83%, Lag= 25.0 min
Primary = 11.93 cfs @ 12.45 hrs, Volume= 4.216 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 914.79' @ 12.45 hrs Surf.Area= 0.597 ac Storage= 2.116 af

Plug-Flow detention time= 310.0 min calculated for 4.216 af (97% of inflow)
Center-of-Mass det. time= 291.7 min (1,110.0 - 818.3)

Volume	Invert	Avail.Storage	Storage Description
#1	910.00'	2.892 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

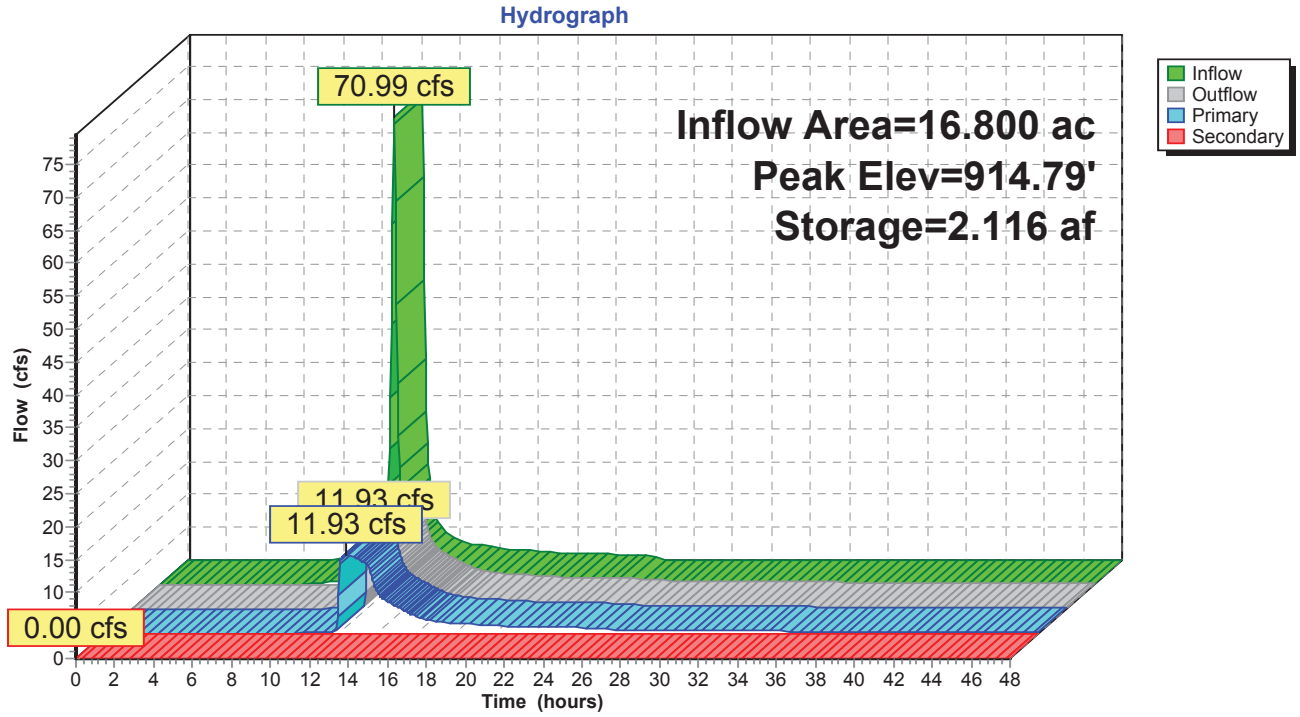
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
910.00	0.293	0.000	0.000
911.00	0.347	0.320	0.320
912.00	0.419	0.383	0.703
913.00	0.481	0.450	1.153
914.00	0.545	0.513	1.666
915.00	0.611	0.578	2.244
916.00	0.685	0.648	2.892

Device	Routing	Invert	Outlet Devices
#1	Primary	909.93'	**24.0" Round Culvert** L= 55.7' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 909.93' / 909.85' S= 0.0014 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	910.09'	**15.0" Vert. Orifice/Grate** C= 0.600
#3	Device 2	910.09'	**3.8" Vert. Orifice/Grate** C= 0.600
#4	Device 2	912.00'	**4.3" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	912.50'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#6	Device 2	913.34'	**24.0" x 24.0" Horiz. Orifice/Grate X 0.40** C= 0.600 Limited to weir flow at low heads
#7	Secondary	916.00'	**35.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=11.93 cfs @ 12.45 hrs HW=914.79' (Free Discharge)
- **1=Culvert** (Passes 11.93 cfs of 29.17 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 11.93 cfs @ 9.72 fps)
    - **3=Orifice/Grate** (Passes < 0.81 cfs potential flow)
    - **4=Orifice/Grate** (Passes < 1.37 cfs potential flow)
    - **5=Orifice/Grate** (Passes < 6.87 cfs potential flow)
    - **6=Orifice/Grate** (Passes < 9.27 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=910.00' (Free Discharge)
- **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 21P: Basin w/ Adjusted WQ notch and additional volume



Summary for Subcatchment 24S: SECTION 8

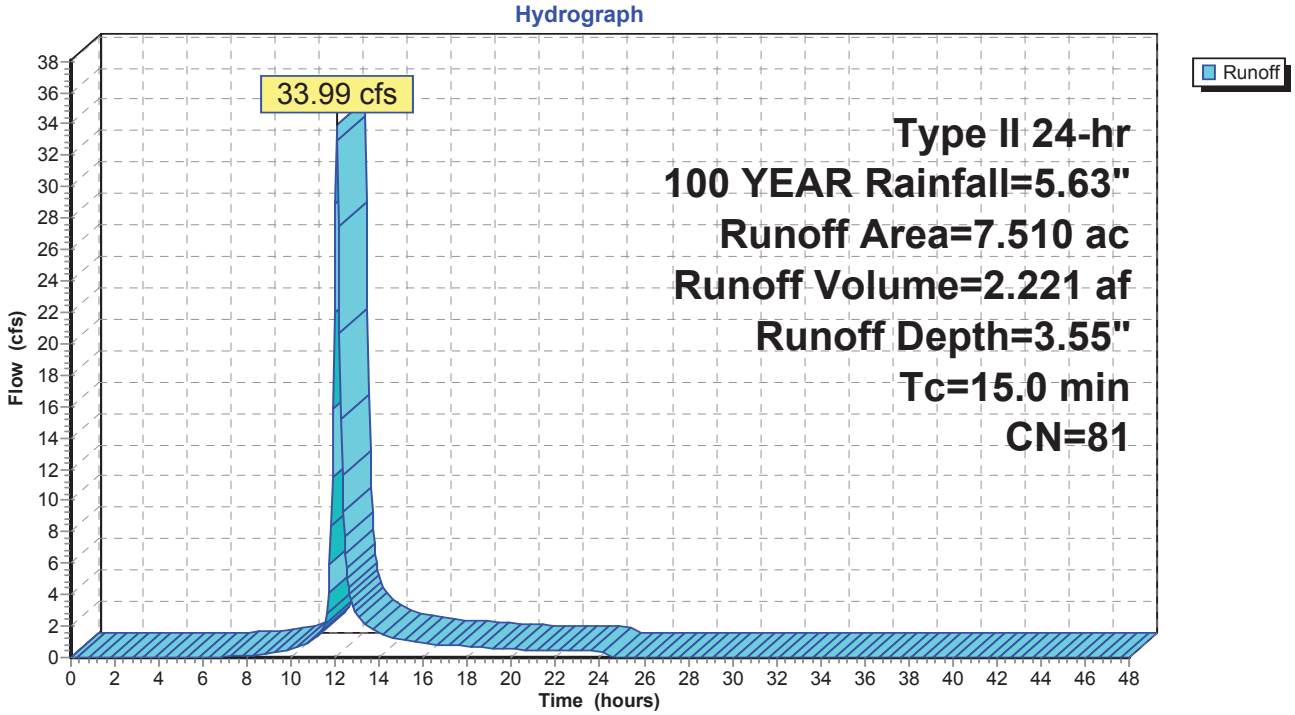
Runoff = 33.99 cfs @ 12.07 hrs, Volume= 2.221 af, Depth= 3.55"

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=5.63"

Area (ac)	CN	Description
7.510	81	1/3 acre lots, 30% imp, HSG C
5.257		70.00% Pervious Area
2.253		30.00% Impervious Area

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

Subcatchment 24S: SECTION 8



Summary for Subcatchment 27S: Section 9 Area A Post-Developed

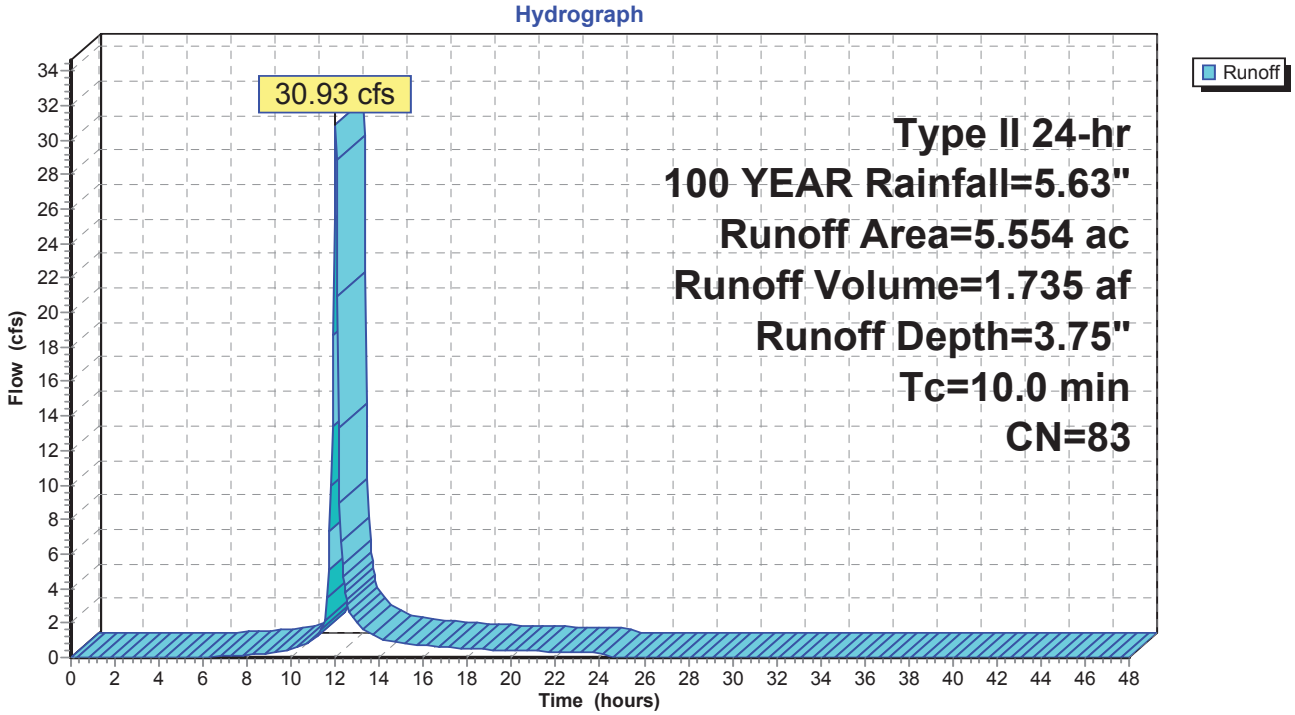
Runoff = 30.93 cfs @ 12.01 hrs, Volume= 1.735 af, Depth= 3.75"

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=5.63"

Area (ac)	CN	Description
5.554	83	1/4 acre lots, 38% imp, HSG C
3.443		62.00% Pervious Area
2.111		38.00% Impervious Area

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

Subcatchment 27S: Section 9 Area A Post-Developed



Summary for Subcatchment 28S: Section 9 Area B Post-Developed

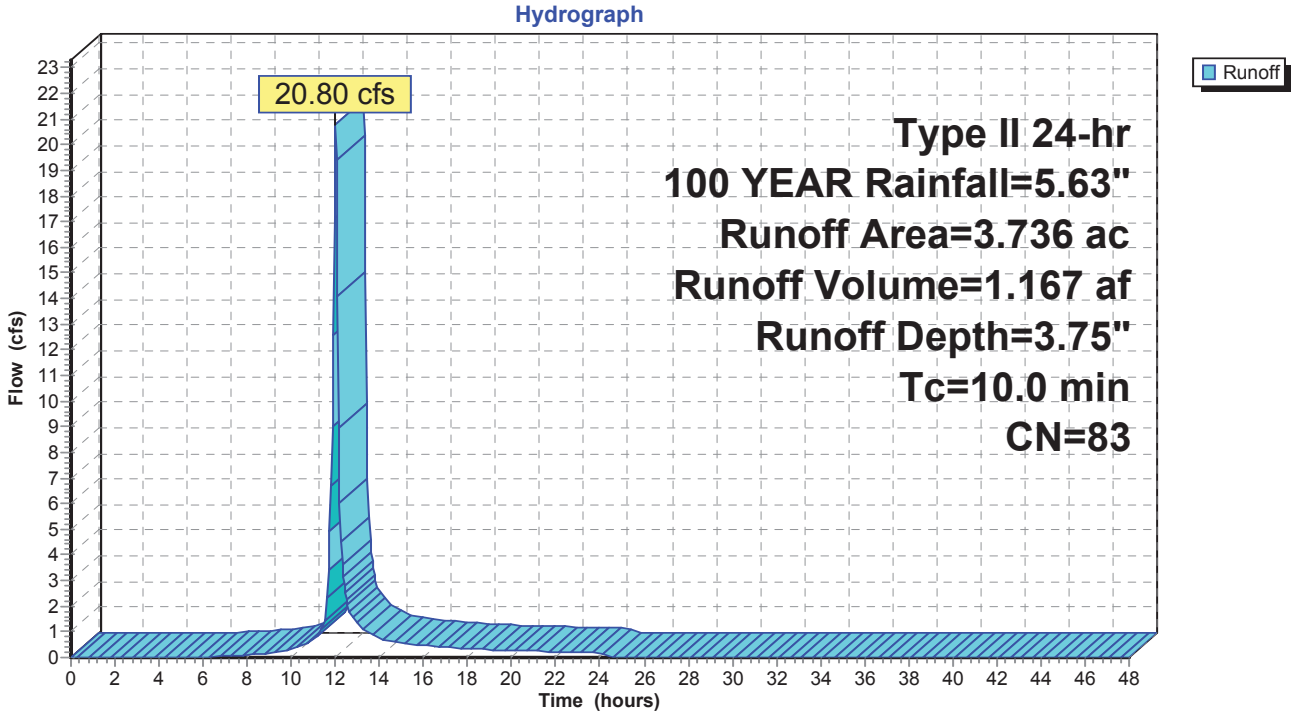
Runoff = 20.80 cfs @ 12.01 hrs, Volume= 1.167 af, Depth= 3.75"

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=5.63"

Area (ac)	CN	Description
3.736	83	1/4 acre lots, 38% imp, HSG C
2.316		62.00% Pervious Area
1.420		38.00% Impervious Area

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

Subcatchment 28S: Section 9 Area B Post-Developed



Summary for Pond 21P: Basin w/ Adjusted WQ notch and additional volume

Inflow Area = 16.800 ac, 34.42% Impervious, Inflow Depth = 3.66" for 100 YEAR event
Inflow = 83.16 cfs @ 12.03 hrs, Volume= 5.123 af
Outflow = 12.88 cfs @ 12.47 hrs, Volume= 4.985 af, Atten= 85%, Lag= 26.6 min
Primary = 12.88 cfs @ 12.47 hrs, Volume= 4.985 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 915.47' @ 12.47 hrs Surf.Area= 0.646 ac Storage= 2.538 af

Plug-Flow detention time= 281.7 min calculated for 4.985 af (97% of inflow)
Center-of-Mass det. time= 265.5 min (1,079.2 - 813.7)

Volume	Invert	Avail.Storage	Storage Description
#1	910.00'	2.892 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

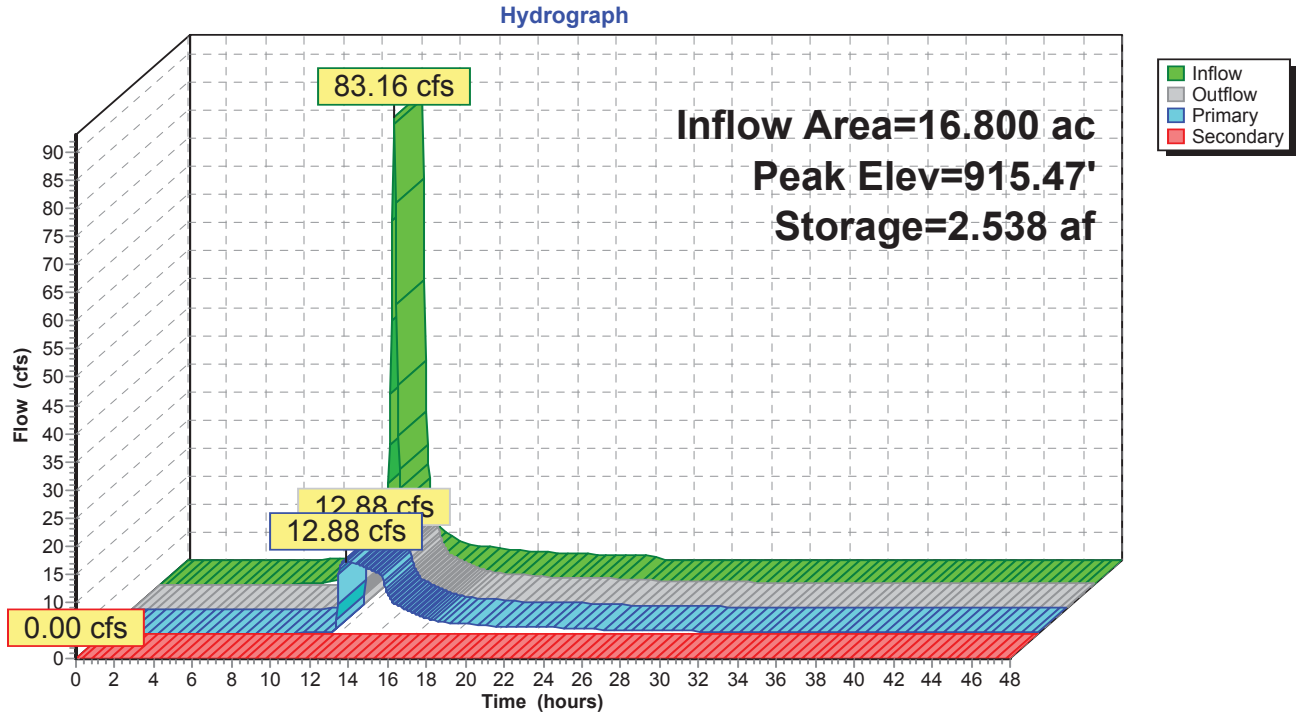
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
910.00	0.293	0.000	0.000
911.00	0.347	0.320	0.320
912.00	0.419	0.383	0.703
913.00	0.481	0.450	1.153
914.00	0.545	0.513	1.666
915.00	0.611	0.578	2.244
916.00	0.685	0.648	2.892

Device	Routing	Invert	Outlet Devices
#1	Primary	909.93'	**24.0" Round Culvert** L= 55.7' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 909.93' / 909.85' S= 0.0014 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	910.09'	**15.0" Vert. Orifice/Grate** C= 0.600
#3	Device 2	910.09'	**3.8" Vert. Orifice/Grate** C= 0.600
#4	Device 2	912.00'	**4.3" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	912.50'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#6	Device 2	913.34'	**24.0" x 24.0" Horiz. Orifice/Grate X 0.40** C= 0.600 Limited to weir flow at low heads
#7	Secondary	916.00'	**35.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=12.88 cfs @ 12.47 hrs HW=915.47' (Free Discharge)
- **1=Culvert** (Passes 12.88 cfs of 32.22 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 12.88 cfs @ 10.50 fps)
    - **3=Orifice/Grate** (Passes < 0.87 cfs potential flow)
    - **4=Orifice/Grate** (Passes < 1.55 cfs potential flow)
    - **5=Orifice/Grate** (Passes < 7.93 cfs potential flow)
    - **6=Orifice/Grate** (Passes < 11.23 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=910.00' (Free Discharge)
- **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 21P: Basin w/ Adjusted WQ notch and additional volume



Appendix D Water Quality Calculations and Drawdown Time

Project: **Wyandotte Woods Section 9 & 10** Calc by: **JDC**

Pond: **A**

Stantec JN: **2550** Checked:

Date: **10/27/15**

WATER QUALITY VOLUME

Wet Pond $WQ_v = (C*P*A)/12*0.75$

Dry Basin $WQ_v = (C*P*A)/12$

	Area (acres)	Runoff Coefficient
Medium Density Residential (4-8 Lots/acre):	16.80	0.4
Total Area:	**16.80**	**0.400**

P = Precipitation Depth = **0.75** inches

WQ_v = **0.315** ac-ft

Half WQ_v = **0.158** ac-ft

Pond Elevations and Areas from Normal Water Elevation to Spillover

Elevation	Area (ac)	Volume (ac-ft)
		(Cummulative)
910.0	0.293	0.000
911.0	0.347	0.320
912.0	0.419	0.703
913.0	0.481	1.153
914.0	0.545	1.666
915.0	0.611	2.244
916.0	0.685	2.892

Total Volume From Normal Water Elevation to Spillover: **1.666** ac-ft

Contour Elevation where WQ_v has been satisfied: **910.99**

See HydroCAD report for draw down time analysis.

Summary for Pond 28P: WQv

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.31 cfs @	0.00 hrs, Volume=	0.279 af, Atten= 0%, Lag= 0.0 min
Primary	=	0.31 cfs @	0.00 hrs, Volume=	0.279 af
Secondary	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Starting Elev= 910.99' Surf.Area= 0.347 ac Storage= 0.316 af
Peak Elev= 910.99' @ 0.00 hrs Surf.Area= 0.347 ac Storage= 0.316 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	910.00'	2.892 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

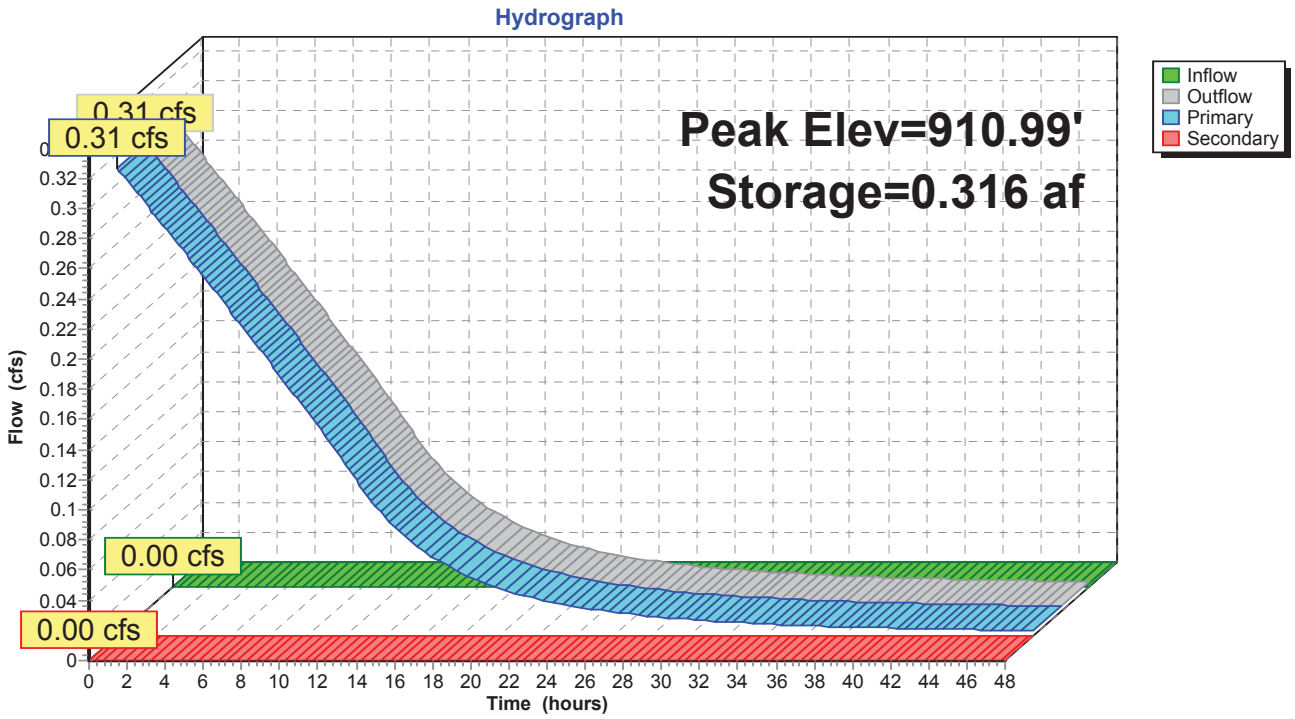
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
910.00	0.293	0.000	0.000
911.00	0.347	0.320	0.320
912.00	0.419	0.383	0.703
913.00	0.481	0.450	1.153
914.00	0.545	0.513	1.666
915.00	0.611	0.578	2.244
916.00	0.685	0.648	2.892

Device	Routing	Invert	Outlet Devices
#1	Primary	909.93'	**24.0" Round Culvert** L= 55.7' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 909.93' / 909.85' S= 0.0014 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	910.09'	**15.0" Vert. Orifice/Grate** C= 0.600
#3	Device 2	910.09'	**3.7" Vert. Orifice/Grate** C= 0.600
#4	Device 2	912.00'	**4.3" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	912.50'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#6	Device 2	913.30'	**24.0" x 24.0" Horiz. Orifice/Grate X 0.40** C= 0.600 Limited to weir flow at low heads
#7	Secondary	916.00'	**35.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.31 cfs @ 0.00 hrs HW=910.99' (Free Discharge)
- **1=Culvert** (Passes 0.31 cfs of 3.57 cfs potential flow)
  - **2=Orifice/Grate** (Passes 0.31 cfs of 3.06 cfs potential flow)
    - **3=Orifice/Grate** (Orifice Controls 0.31 cfs @ 4.16 fps)
    - **4=Orifice/Grate** (Controls 0.00 cfs)
    - **5=Orifice/Grate** (Controls 0.00 cfs)
    - **6=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=910.99' (Free Discharge)
- **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 28P: WQv


Hydrograph
Peak Elev=910.99'
Storage=0.316 af
0.31 cfs
0.31 cfs
0.00 cfs
0.00 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0 0.32 0.3 0.28 0.26 0.24 0.22 0.2 0.18 0.16 0.14 0.12 0.1 0.08 0.06 0.04 0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Hydrograph for Pond 28P: WQv

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	**0.00**	**0.316**	**910.99**	**0.31**	**0.31**	**0.00**
1.00	0.00	0.291	910.92	0.29	0.29	0.00
2.00	0.00	0.268	910.85	0.28	0.28	0.00
3.00	0.00	0.245	910.78	0.26	0.26	0.00
4.00	0.00	0.224	910.72	0.25	0.25	0.00
5.00	0.00	0.204	910.66	0.23	0.23	0.00
6.00	0.00	0.186	910.60	0.21	0.21	0.00
7.00	0.00	0.169	910.55	0.20	0.20	0.00
8.00	0.00	0.153	910.50	0.18	0.18	0.00
9.00	0.00	0.139	910.45	0.16	0.16	0.00
10.00	0.00	0.126	910.41	0.15	0.15	0.00
11.00	0.00	0.114	910.38	0.13	0.13	0.00
12.00	0.00	0.104	910.34	0.11	0.11	0.00
13.00	0.00	0.095	910.32	0.10	0.10	0.00
14.00	0.00	0.088	910.29	0.08	0.08	0.00
15.00	0.00	0.082	910.27	0.07	0.07	0.00
16.00	0.00	0.077	910.26	0.06	0.06	0.00
17.00	0.00	0.072	910.24	0.05	0.05	0.00
18.00	0.00	0.069	910.23	0.04	0.04	0.00
19.00	0.00	0.065	910.22	0.04	0.04	0.00
20.00	0.00	0.063	910.21	0.03	0.03	0.00
21.00	0.00	0.060	910.20	0.03	0.03	0.00
22.00	0.00	0.058	910.19	0.02	0.02	0.00
23.00	0.00	0.056	910.19	0.02	0.02	0.00
24.00	0.00	0.054	910.18	0.02	0.02	0.00
25.00	0.00	0.053	910.18	0.02	0.02	0.00
26.00	0.00	0.051	910.17	0.02	0.02	0.00
27.00	0.00	0.050	910.17	0.01	0.01	0.00
28.00	0.00	0.049	910.17	0.01	0.01	0.00
29.00	0.00	0.048	910.16	0.01	0.01	0.00
30.00	0.00	0.047	910.16	0.01	0.01	0.00
31.00	0.00	0.046	910.16	0.01	0.01	0.00
32.00	0.00	0.045	910.15	0.01	0.01	0.00
33.00	0.00	0.045	910.15	0.01	0.01	0.00
34.00	0.00	0.044	910.15	0.01	0.01	0.00
35.00	0.00	0.043	910.15	0.01	0.01	0.00
36.00	0.00	0.043	910.14	0.01	0.01	0.00
37.00	0.00	0.042	910.14	0.01	0.01	0.00
38.00	0.00	0.042	910.14	0.01	0.01	0.00
39.00	0.00	0.041	910.14	0.01	0.01	0.00
40.00	0.00	0.041	910.14	0.01	0.01	0.00
41.00	0.00	0.040	910.14	0.01	0.01	0.00
42.00	0.00	0.040	910.13	0.00	0.00	0.00
43.00	0.00	0.039	910.13	0.00	0.00	0.00
44.00	0.00	0.039	910.13	0.00	0.00	0.00
45.00	0.00	0.039	910.13	0.00	0.00	0.00
46.00	0.00	0.038	910.13	0.00	0.00	0.00
47.00	0.00	0.038	910.13	0.00	0.00	0.00
48.00	0.00	0.038	910.13	0.00	0.00	0.00

Appendix E Construction Site Inspection Checklist and BMP Maintenance Schedule

WYANDOTTE WOODS SECTION 9 & 10

IMPROVEMENTS

BMP MAINTENANCE PLAN

WATER QUALITY STRUCTURE NOTICE:

EXISTING STRUCTURE 30 PROVIDES WATER QUALITY AND QUANTITY CONTROL FOR THIS PROJECT AREA. STRUCTURE 30 IS A STORM WATER QUALITY BMP AND IS AN INTERGRAL PART OF THE STORM SEWER SYSTEM DEPICTED IN THESE DRAWINGS. RESPONSIBILITY AND ASSURANCE OF PERIODIC MAINTENANCE AND THE CONTINUOUS FUNCTIONALITY OF THIS STORM WATER QUALITY DEVICE IS PERPETUAL, BEGINNING WITH THE OWNER AT THE TIME OF INSTALLATION AND CONTINUING TO ALL FUTURE OWNERS OF SAID STORM SEWER SYSTEM.

INSPECTION AND MAINTENANCE NOTES:

INSPECTION AND MAINTENANCE ACTIVITIES FOR BMP'S

ACTIVITY	SCHEDULE
EMBANKMENT AND EMERGENCY SPILLWAY:	
• INSPECT VEGETATION AND GROUND COVER. RE-SOD OR RE-PLANT, AS NECESSARY.	ANNUALLY (SEMI-ANNUALLY THE FIRST YEAR)
• INSPECT AND CORRECT EROSION PROBLEMS OR ANIMAL BURROWS. RE-SOD OR RE-PLANT PER ABOVE, AS NECESSARY.	ANNUALLY
• INSPECT FOR VISUAL SETTLEMENT OR HORIZONTAL MISALIGNMENT OF TOP OF EMBANKMENT.	ANNUALLY
• ENSURE EMERGENCY SPILLWAY IS CLEAR OF DEBRIS.	SEMI-ANNUALLY
• MOW GRASS TO MAINTAIN A HEIGHT OF FOUR TO FIVE INCHES.	MONTHLY
PERMANENT POOL:	
• REMOVE FLOATING OR FLOATABLE DEBRIS OR OTHER POLLUTION.	MONTHLY
• CHECK FOR UNDESIRABLE VEGETATIVE GROWTH. APPLY AN AQUATIC SAFE (GLYPHOSATE BASED, SURFACTANT FREE) HERBICIDE DIRECTLY TO INVASIVE WEED SPECIES, AVOIDING ADJACENT VEGETATION.	SEMI-ANNUALLY
• CHECK FOR ANY SHORELINE PROBLEMS AND CORRECT AS NECESSARY.	ANNUALLY
PRINCIPAL SPILLWAY AND PIPE OUTFALLS:	
• ENSURE WATER QUALITY NOTCH IS UNOBSTRUCTED.	AFTER MAJOR STORM
• ENSURE STRUCTURE CASTING IS CLEAR OF DEBRIS. REMOVE AS NECESSARY.	AFTER MAJOR STORM
• REMOVE EXCESSIVE SEDIMENT ACCUMULATION FROM INSIDE OUTLET STRUCTURE.	MONTHLY
• ENSURE OUTFALL PIPE IS FLOWING.	AFTER MAJOR STORM
• THE SYSTEM MAY ALSO REQUIRE CLEANING IN THE EVENT OF A SPILL OF TOXIC OR FOREIGN SUBSTANCES. DISPOSAL SHALL BE IN ACCORDANCE WITH CURRENT CITY OF COLUMBUS AND OHIO EPA GUIDELINES. DISPOSE OF SEDIMENT AWAY FROM THE BMP. RE-SOD OR RE-PLANT AS NECESSARY.	AS REQUIRED
PIPE OUTFALLS:	
• CHECK FOR RIPRAP FAILURES.	ANNUALLY
• INSPECT STORM DRAIN PIPES, ENDWALLS AND HEADWALLS FOR STRUCTURAL DEFECTS.	ANNUALLY
• INSPECT AND CORRECT SLOPE EROSION PROBLEMS.	ANNUALLY

Ohio EPA Construction Site Inspection Checklist

By making use of some simple Best Management Practices (BMPs) a developer can do his or her share to protect Ohio's water resources from the harmful effects of sediment. The topography of the site and the extent of the construction activities will determine which of these practices are applicable to any given site, but the BMPs listed here are applicable to most construction sites. For details on the installation and maintenance of these BMPs, please refer to ***Rainwater and Land Development***, *Ohio's Standards for Storm Water Management, Land Development and Urban Stream Protection* (Ohio Department of Natural Resources, 1996), available from your county Soil and Water Conservation District (SWCD).

Temporary Stabilization

This is the most effective BMP. All disturbed areas that will lie dormant for over 21 days must be stabilized within 7 days of the date the area becomes inactive. The goal of temporary stabilization is to provide cover, quickly. Areas within 50 feet of a stream must be stabilized within 2 days of inactivity. This is accomplished by seeding with fast-growing grasses then covering with straw mulch. Apply only mulch between November 1 and March 31. To minimize your costs of temporary stabilization, leave natural cover in place for as long as possible. Only disturb areas you intend to work within the next 21 days.

Construction Entrances

Construction entrances are installed to minimize off-site tracking of sediments. A stone access drive should be installed at every point where vehicles enter or exit the site. Every individual lot should also have its own drive once construction on the lot begins.

Sediment Ponds

This is the sediment control of choice for areas, which exceed the design capacity of silt fence (see page 119 of the ***Rainwater*** manual) or to control concentrated flows or runoff. There are two types of sediment ponds: sediment basins and sediment traps. A sediment trap is appropriate where the contributing drainage area is 10 acres or less. The outlet is an earthen embankment with a simple stone spillway. A sediment basin is appropriate for drainage areas larger than 10 acres. The outlet is an engineered riser pipe. Often a permanent storm water management pond, such as a retention or detention basin, can be modified to act as a sediment basin during construction. All sediment ponds, regardless of whether they are a trap or a basin and regardless of whether they will become a permanent storm water pond, must provide a minimum storage of 67 cubic yards per acre of total contributing drainage area. Sediment ponds must be installed within 7 days of first grubbing the area they control.

Silt Fence

This is typically used at the perimeter of a disturbed area. It's only for small drainage areas on relatively flat slopes or around small soil storage piles. Not suitable where runoff is concentrated in a ditch, pipe or through streams. For large drainage areas where flow is concentrated, collect runoff in diversion berms or channels and pass it through a sediment pond prior to discharging it from the site. Combination barriers constructed of silt fence supported by straw bales or silt fence embedded within rock check dams may be effective within small channels. As with all sediment controls, silt fence must be capable of ponding runoff so that sediment can settle out of suspension. Silt fence must be installed within 7 days of first grubbing the area it controls.

Inlet Protection

These must be installed on all yard drains and curb drains when these inlets do not drain to a sediment trap or basin. Even if there is a sediment trap or basin, inlet protection is still recommended, as it will increase the overall sediment removal efficiency. Best used on roads with little or no traffic. If working properly, inlet protection will cause water to pond. If used on curb inlets, streets will flood temporarily during heavy storms. Check with your municipality before installing curb inlet protection. They may prefer an alternate means of sediment control such as silt fence or ponds.

Permanent Stabilization

All areas at final grade must be permanently stabilized within 7 days of reaching final grade. This is usually accomplished by using seed and mulch, but special measures are sometimes required. This is particularly true in drainage ditches or on steep slopes. These measures include the addition of topsoil, erosion control matting, rock rip-rap or retaining walls. Permanent seeding should be done March 1 to May 31 and August 1 to September 30. Dormant seeding can be done from November 20 to March 15. At all other times of the year, the area should be temporarily stabilized until a permanent seeding can be applied.

Non-Sediment Pollution Control

Although sediment is the pollutant of greatest concern on most construction sites, there are other sources of pollution. Most of these BMPs are easy to implement with a little bit of planning and go a long way toward keeping your site clean and organized. Please be sure to inform all contractors how these BMPs affect their operations on the site, particularly those that will be working near a stream.

Inspection Sheet

INSPECTIONS MUST BE CONDUCTED ONCE EVERY 7 DAYS AND WITHIN 24 HOURS OF A 0.5" OR GREATER RAINFALL. ALL SEDIMENT CONTROLS MUST BE INSTALLED PRIOR TO GRADING AND WITHIN 7 DAYS OF FIRST GRUBBING

TEMPORARY STABILIZATION

Key things to look for ...

	Yes	No
1. Are there any areas of the site that are disturbed, but will likely lie dormant for over 21 days?	☐	☐
2. Have all dormant, disturbed areas been temporarily stabilized in their entireties?	☐	☐
3. Have disturbed areas outside the silt fence been seeded or mulched?	☐	☐
4. Have soil stockpiles that will sit for over 21 days been stabilized?	☐	☐
5. Has seed and mulch been applied at the proper rate? In general, seed is applied at 3 to 5 lbs per 1000 sq ft and straw mulch is applied at 2-3 bales per 1000 sq ft.	☐	☐
6. Has seed or mulch blown away? If so, repair.	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

_____

_____

CONSTRUCTION ENTRANCES

Key things to look for ...

	Yes	No
1. Has the drive been constructed by placing geotextile fabric under the stone?	☐	☐
2. Is the stone 2-inch diameter?	☐	☐
3. Has the stone been placed to a depth of 6 inches, with a width of 10 feet and a length of at least 50 feet (30 feet for entrances onto individual sublots)?	☐	☐
4. If the drive is placed on a slope, has a diversion berm been constructed across the drive to divert runoff away from the street or water resource?	☐	☐
5. If drive is placed across a ditch, was a culvert pipe used to allow runoff to flow across the drive?	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

_____

_____

SEDIMENT PONDS

Key things to look for ...

		Yes	No
1.	Are concentrated flows of runoff directed to a sediment pond?	☐	☐
2.	Is sheet-flow runoff from drainage areas that exceed the design capacity of silt fence (generally 0.25 acre or larger) directed to a sediment pond?	☐	☐
3.	Is runoff being collected and directed to the sediment pond via the storm sewer system or via a network of diversion berms and channels?	☐	☐
4.	Is the sediment pond appropriately sized (67 cubic yards per acre of total drainage area)?	☐	☐
5.	Have the embankments of the sediment pond and the areas that lie downstream of the pond been stabilized?	☐	☐
6.	For sediment basins that dewater 100% between storms, is the riser pipe wrapped with chicken wire and double wrapped with geotextile fabric? Does the riser have 1-inch diameter holes spaced 4 inches apart, both horizontally and vertically? For sediment basins, which dewater 60% between storms, is the diameter of the dewatering hole per plan (see page 105 of ***Rainwater*** manual)?	☐	☐
7.	For sediment traps, is there geotextile under the stone spillway and is the spillway saddle-shaped? For sediment traps, which dewater 100% between storms, is the dewatering pipe end-capped, no larger than 6 inches in diameter, perforated and double-wrapped in geotextile?	☐	☐
8.	Is the length-to-width ratio between inlet(s) and outlet at least 2:1? **NOTE**: If not, a baffle should be added to lengthen the distance.	☐	☐
9.	Is the depth from the bottom of the basin to the top of the primary spillway no more than 3 to 5 feet?	☐	☐
10.	For a modified storm water pond being used as a sediment pond, is the connection between the riser pipe and the permanent outlet water-tight? Was the basin installed prior to grading the site?	☐	☐
11.	Is it time to clean-out the sediment pond to restore its original capacity? Generally, sediment should be removed once the pond is half-full. Stabilize the dredged sediments with seed and mulch.	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

SILT FENCE

Key things to look for ...

	Yes	No
1. Is the fence at least 4" to 6" into the ground?	☐	☐
2. Is the trench backfilled to prevent runoff from cutting underneath the fence?	☐	☐
3. Is the fence pulled tight so it won't sag when water builds up behind it?	☐	☐
4. Are the ends brought upslope of the rest of the fence so as to prevent runoff from going around the ends?	☐	☐
5. Is the fence placed on a level contour? If not, the fence will only act as a diversion.	☐	☐
6. Have all the gaps and tears in the fence been eliminated.	☐	☐
7. Is the fence controlling an appropriate drainage area? Refer to page 119 of ***Rainwater*** manual. **RULE OF THUMB**: Design capacity for 100 linear feet of silt fence is 0.5 acres for slopes < 2%, 0.25 acres for slopes 2% to 20%, & 0.125 acres for slopes 20% or more. Generally, no more than 0.25 acres should lie behind 100 feet of fence at 2% to 10% slope, i.e., the distance between the fence and the top of the slope behind it should be no more than 125 feet. The allowable distance increases on flatter slopes and decreases for steeper slopes.	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

INLET PROTECTION

Key things to look for ...

	Yes	No
1. Does water pond around the inlet when it rains?	☐	☐
2. Has the fabric been replaced when it develops tears or sags?	☐	☐
3. For curb inlet protection, does the fabric cover the entire grate, including the curb window? For yard inlet protection, does the structure encircle the entire grate?	☐	☐
4. Is the fabric properly entrenched or anchored so that water passes through it and not under it?	☐	☐
5. For yard inlet protection, is the fabric properly supported to withstand the weight of water and prevent sagging? The fabric should be supported by a wood frame with cross braces, or straw bales.	☐	☐
6. Is sediment that has accumulated around the inlet removed on a regular basis?	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

PERMANENT STABILIZATION

Key things to look for ...

	Yes	No
1. Are any areas at final grade?	☐	☐
2. Has the soil been properly prepared to accept permanent seeding?	☐	☐
3. Has seed and mulch been applied at the appropriate rate (see page 169 of the ***Rainwater*** manual)?	☐	☐
4. If rainfall has been inadequate, are seeded areas being watered?	☐	☐
5. For drainage ditches where flow velocity exceeds 3.5 ft/s from a 10-year, 24-hour storm has matting been applied to the ditch bottom? If the flow velocity exceeds 5.0 ft/s, has the ditch bottom been stabilized with rock rip-rap? **NOTE**: Rock check dams may be needed to slow the flow of runoff.	☐	☐
6. Has rock rip-rap been placed under all storm water outfall pipes to prevent scouring in the receiving stream or erosion of the receiving channel?	☐	☐
7. For sites with steep slopes or fill areas, is runoff from the top of the site conveyed to the bottom of the slope or fill area in a controlled manner so as not to cause erosion?	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

_____

_____

NON-SEDIMENT POLLUTION CONTROL

Key things to look for ...

	Yes	No
1. Has an area been designated for washing out concrete trucks? Washings must be contained on site within a bermed area until they harden. The washings should never be directed toward a watercourse, ditch or storm drain.	☐	☐
2. Is waste and packaging disposed of in a dumpster? Do not burn them on site.	☐	☐
3. Are fuel tanks and drums of toxic and hazardous materials stored within a diked area or trailer and away from any watercourse, ditch or storm drain?	☐	☐
4. Are streets swept as often as necessary to keep them clean and free from sediment? NOTE: Sediment should be swept back onto the lot - not down the storm sewers.	☐	☐
5. Are stockpiles of soil or other materials stored away from any watercourse, ditch or storm drain?	☐	☐
6. Have stream crossings been constructed entirely of non-erodible material?	☐	☐
7. If an area of the site is being dewatered, is it being pumped from a sump pit or is the discharge directed to a sediment pond? **NOTE**: if you must lower ground water, the water may be discharged to the receiving stream as long as the water remains clean. Be sure not to co-mingle the clean ground water with sediment-laden water or to discharge it off-site by passing it over disturbed ground.	☐	☐

Appendix F Storm Sewer and Major Flood Routing Calculations

MAJOR FLOOD ROUTING

SPILL OVER

TO DETERMINE THE WIDTH AND DEPTH OF THE OVERFLOW OF THE MAJOR FLOOD

TRIANGULAR NOTCH WIER FORMULA FROM "HYDRAULICS FIELD MANUAL" BY ROBERT O. PARMLEY, PAGE 116.

OVERFLOW FORMULA

Q=C(4/15)(L)(H)(2*g*H)^(1/2)

Q=Flow (cfs)
C=Runoff Coefficient
g=Gravity (32.2 ft/sec^2)
H=Depth of Overflow (ft)
L=Width of Overflow (ft)

DIMENSIONS OF V-NOTCH WEIR

L=Kl*H+Kr*H

Kl=Left Side Slope of Weir (ex. 4:1 is 4)
Kr=Right Side Slope of Weir

Piped Storm= 10 yr
Overflow Storm= 100 yr

Section A-A

A (ac.)	t(c)	C(<10yr)	C(>10yr)	C(weir)
6.31	15.00	0.56	0.96	3

I(100)= 6.56 in/hr
I(10)= 4.16 in/hr

Q(100-10)= 14.54 cfs

Q(mfr)= 14.54 cfs = Q of Major Flood Routing that needs to be routed

Lot #:	224		223
Pad Elev:	922.00		921.20
Spillover Elev:		919.50	
Side Slopes:	4.00 >	<	5.88
Dist. to Top:	10		10

water surface elevation: 920.20 min pad elev. w/freeboard: 921.200
allowable depth= 0.7
(1.00 freeboard)

AVAILABLE CAPACITY

H= 0.70 ft
L= 6.9 ft
Q(spill)= 26.01 cfs

Q(mfr)= 26.01 cfs **= Total cfs available**

MAJOR FLOOD ROUTING

SPILL OVER

TO DETERMINE THE WIDTH AND DEPTH OF THE OVERFLOW OF THE MAJOR FLOOD

TRIANGULAR NOTCH WIER FORMULA FROM "HYDRAULICS FIELD MANUAL" BY ROBERT O. PARMLEY, PAGE 116.

OVERFLOW FORMULA

Q=C(4/15)(L)(H)(2*g*H)^(1/2)

Q=Flow (cfs)
C=Runoff Coefficient
g=Gravity (32.2 ft/sec^2)
H=Depth of Overflow (ft)
L=Width of Overflow (ft)

DIMENSIONS OF V-NOTCH WEIR

L=Kl*H+Kr*H

Kl=Left Side Slope of Weir (ex. 4:1 is 4)
Kr=Right Side Slope of Weir

Piped Storm= 10 yr
Overflow Storm= 100 yr

Section B-B

A (ac.)	t(c)	C(<10yr)	C(>10yr)	C(weir)
2.38	15.00	0.56	0.96	3

I(100)= 6.56 in/hr
I(10)= 4.16 in/hr

Q(100-10)= 5.48 cfs

Q(mfr)= 5.48 cfs = Q of Major Flood Routing that needs to be routed

Lot #:	245		246
Pad Elev:	923.00		925.90
Spillover Elev:		921.00	
Side Slopes:	5.00 >	<	2.04
Dist. to Top:	10		10

water surface elevation: 922.00 min pad elev. w/freeboard: 923.000
allowable depth= 1.0
(1.00 freeboard)

AVAILABLE CAPACITY

H= 1.00 ft
L= 7.0 ft
Q(spill)= 45.20 cfs

Q(mfr)= 45.20 cfs **= Total cfs available**

MAJOR FLOOD ROUTING

SPILL OVER

TO DETERMINE THE WIDTH AND DEPTH OF THE OVERFLOW OF THE MAJOR FLOOD

TRIANGULAR NOTCH WIER FORMULA FROM "HYDRAULICS FIELD MANUAL" BY ROBERT O. PARMLEY, PAGE 116.

OVERFLOW FORMULA

Q=C(4/15)(L)(H)(2*g*H)^(1/2)

Q=Flow (cfs)
C=Runoff Coefficient
g=Gravity (32.2 ft/sec^2)
H=Depth of Overflow (ft)
L=Width of Overflow (ft)

DIMENSIONS OF V-NOTCH WEIR

L=Kl*H+Kr*H

Kl=Left Side Slope of Weir (ex. 4:1 is 4)
Kr=Right Side Slope of Weir

Piped Storm= 10 yr
Overflow Storm= 100 yr

Section C-C

A (ac.)	t(c)	C(<10yr)	C(>10yr)	C(weir)
1.81	15.00	0.56	0.96	3

I(100)= 6.56 in/hr
I(10)= 4.16 in/hr

Q(100-10)= 4.17 cfs

Q(mfr)= 4.17 cfs = Q of Major Flood Routing that needs to be routed

Lot #:	232		231
Pad Elev:	930.00		930.00
Spillover Elev:		928.70	
Side Slopes:	7.69 >	<	7.69
Dist. to Top:	10		10

water surface elevation: 929.00 min pad elev. w/freeboard: 930.000
allowable depth= 0.3
(1.00 freeboard)

AVAILABLE CAPACITY

H= 0.30 ft
L= 4.6 ft
Q(spill)= 4.87 cfs

Q(mfr)= 4.87 cfs **= Total cfs available**

Appendix G Section 4 Stormwater Management Report

STORM WATER MANAGEMENT SUMMARY
FOR
WYANDOTTE WOODS SECTION 4
USING CITY OF DUBLIN DESIGN CRITERIA
RDZ JN: 2550.4

EXISTING CONDITIONS

The remaining undeveloped area of Wyandotte Woods consists of approximately 80 acres of land situated south of Summit View Road and north of Hard Road. The site is covered by tall weeds and some wooded areas. 29.3 acres drain east to west into a wooded ravine through Section 2 of this development to ultimately flow under S.R. 257 and into the Scioto River. Section 4 contains 6.79 acres and is included in this area. The watershed for this section corresponds to areas LE-560 and 570 of the City of Dublin Stormwater Master Plan.

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PROPOSED CONDITIONS

Section 4 will be developed into a 16 lot single family subdivision with an average density of 2.50 du/ac. A pond to be constructed at the west side of the site will provide retention for Section 4 and future sections of similar density. The pre and post developed areas are shown on the exhibit of Drainage Areas.

CRITICAL STORM

The critical storm for the watershed has been calculated as the 10 year storm (see pg. 5). The pond routing calculations verify that sufficient capacity exists in the basin to detain the critical storm.

RELEASE RATES

The allowable release rates for each of the existing subareas have been provided by the City of Dublin (see City of Dublin Table C-2 pg. 6-8). Actual release rates have been calculated based on the critical storm, the onsite and offsite areas, and the allowable release rate per acre. As shown on page 9 the allowable release rate for the critical storm is 1.2 cfs.

The Stormwater Management Summary Table shows the actual and allowable release rates and the pre and post developed flows for the 1, 2, 5, 10, 25, 50 and 100-year storm events.

BASIN GEOMETRY

The basin geometry is restricted by the existing terrain in that the embankment forming the pond is limited to ten feet in height placing the pond low in the ravine. This is to avoid ODNR classification as a dam. A 6:1 slope is needed in order to tie back into existing ground. Use of a 10:1 slope would further impact trees. The normal water surface elevation is 899.0 and a 5' wide safety bench is provided at elevation 897.0. A 45 foot emergency weir has also been provided (See pg.32).

The basin will provide 0.313 ac-ft of storage using a catch basin with a 2.7" orifice plate for water quality and 3.9" orifice plate for extended detentionThe water quality orifice will allow for 0.26 cfs to be released during the first 12hrs of the critical storm event. The extended detention orifice will allow an additional 0.92 cfs after the first 12 hrs. This combined outlet will allow a total of 1.18 cfs to pass at a depth of 5.49 ft. above the NWSE during the 10-year storm event.

RESULTS

The following Stormwater Management Summary Tables show the effect of development on the existing watershed. The release rate is reduced to 1.18 cfs during the 10-year critical storm. See pgs. 10-16 for pre developed flows.

STORMWATER MANAGEMENT SUMMARY TABLE
(LE 560 & 570)

	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Pre Developed Q	10.57	18.28	29.03	38.08	52.66	66.08	80.62
Postdeveloped Q	25.19	38.10	54.97	68.68	90.12	109.36	129.84
Allowable Release per Dublin	1.20	1.20	1.20	1.20	10.9	23.6	39.3
Total Release	0.57	0.82	1.04	1.18	3.97	14.54	39.4
Pond Elevation	901.45	902.37	903.53	904.41	905.08	905.23	905.46

See pgs. 18-31.

EXTENDED DETENTION AND SEDIMENT STORAGE VOLUME

The permanent pool and extended detention volumes are each sized using the following equation: V=AraP

A = 26.64ac
r = 0.858 i^3 - 0.78 i^2 + 0.774i + 0.04
a = 1.109
P = 0.04
i = 7.79 ac (impervious area) / 26.64 ac (total area) = 0.292
r = 0.22

V_b= 26.64*0.22*1.109*0.04*43560 = 0.26 ac-ft

Sediment storage volume = 20% * 0.26 = 0.052 ac-ft

Actual Permanent Pool Volume = 1.29 ac-ft > 0.26 ac-ft required (See pg. 17)
Actual Extended Detention + Sediment Storage = 4.24 ac-ft (See pg. 24)
> 0.26 + 0.052 = 0.31 ac-ft required

Maximum outlet flow to release extended detention in no less than 12 hours:

$$\frac{0.26\text{ac-ft} * 43560}{12\text{hr} * 60 * 60} = 0.26\text{cfs}$$

:

At 12 hours during the 10 year critical storm using a 2.7" diameter orifice:

Required Release Rate = 0.26 cfs
Actual Release Rate = 0.25 cfs
Required Storage = 0.31 ac-ft
Storage Provided = 0.91 ac-ft

(See page 25)

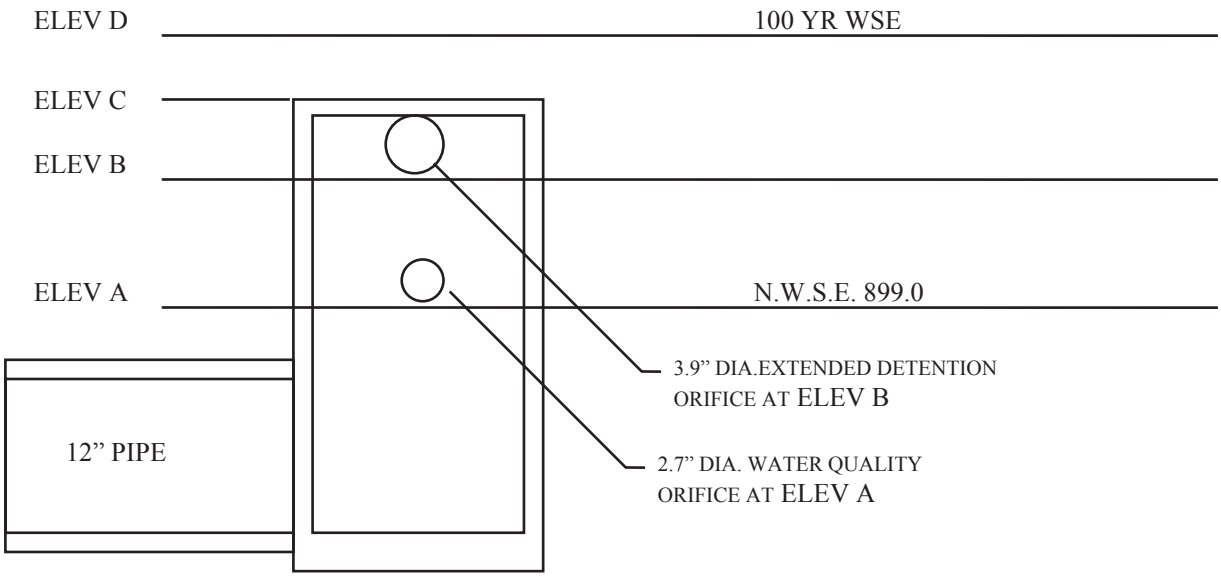
SUMMARY

The accompanying calculations show the developed run-off from the site will be adequately detained within the proposed retention basin. In addition, the sediment storage volumes and water quality requirements of the City of Dublin will be met.

Use of the MORPC analysis for release rate was considered to see if the impact on trees could be reduced. This would allow the 1 year pre developed flow of 10.6 cfs to be discharged during the 10 year critical storm corresponding to an 18" diameter outlet pipe. The ponding elevation would be reduced by 1.5' in the 10 year event but would remain unchanged in the 100 year due to a greater amount of water passing through the pipe rather than over the weir as in the current design. (see pgs. 33-34) Therefore, use of the MORPC analysis would not reduce impact on trees and would result in a critical storm discharge rate in the ravine approximately 10 times higher than that obtained by using the Dublin release rate.

OUTLET STRUCTURE ELEVATIONS

	ELEV A	ELEV B	ELEV C	ELEV D
Pond	899.00	900.81	901.64	905.46



POND OUTLET STRUCTURE

STORMWATER MANAGEMENT REPORT
FOR

WYANDOTTE WOODS SECTION 4

August, 2003

Prepared by

R.D. Zande & Associates

1500 Lakeshore Drive
Columbus, Ohio 43204