ATTACHMENT E

PRELIMINARY DRAINAGE REPORT

NEW HORIZON SUBDIVISION, REPLAT 2

COUNCIL BLUFFS, IOWA

PREPARED FOR
92 INVESTMENTS, LLC

PREPARED BY
OLSSON ASSOCIATES

	I hereby certify that this engineering document was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.
	Kevin M. Sasse, PE Date License Number: 22653 My license renewal date is December 31, 2018. Pages or sheets covered by this seal: Entire Report

AUGUST 1, 2018

OLSSON PROJECT NO. 017-2499

2111 South 67th Street, Suite 200, Omaha, Nebraska 68106 • (402) 341-1116• FAX (402) 341-5859

TABLE OF CONTENTS

1. SITE CHARACTERISTICS:
   A. Pre-Development Conditions
   B. Post-Development Conditions
   C. Contributing Off-Site Drainage

2. PRE-DEVELOPMENT RUNOFF ANALYSIS:
   A. Watershed Area
   B. Time of Concentration
   C. Runoff Model
   D. Summary of Pre-Development Runoff

3. POST-DEVELOPMENT RUNOFF ANALYSIS:
   A. Watershed Area
   B. Time of Concentration
   C. Runoff Model
   D. Summary of Post-Development Runoff
   E. Summary of Pre/Post-Development Runoff with Detention
   F. Allowable Release Rate

4. APPENDICES
   A. Drainage Maps
   B. Existing HydroCAD Model

1. SITE CHARACTERISTICS:

A. Pre-Development Conditions.

Site location

This drainage report was generated for a proposed residential district, located in Section 28, Township 75 N, Range 43 W, Pottawattamie County, Iowa.

Site area

The New Horizon Subdivision, Replat 2 development is generally located on the south side of College Road, east of Valley View Drive, and west of Interstate 80. The site will be partially disturbed and re-graded to achieve the post-development drainage characteristics for the site. We are proposing to disturb approximately 20 acres.

Terrain and existing ground conditions

The project area was once agriculture zoning being used for the cultivation of row crops. The drainage on the site consists of three separate drainage basins as shown on **Exhibit 'A'** in **Appendix A**. Slope of grade is less than 3:1 across the entire existing site. Elevations range from approximately 1120' to approximately 1020' above sea level. Stormwater runoff overland flows offsite generally into an existing stormwater easement on the southwest corner of the development.

Discharge Location A defines runoff from basin EX-A along the north edge of the property. Discharge Location B is runoff from basin EX-B. Discharge Location C is runoff from basin EX-C on the south edge of the property. The entirety of the site is pervious and no impervious surfaces (roof/pavement/gravel) exist. The USDA Web Soil Survey classifies soils in this area as hydrologic soil group B. A Report of Geotechnical Exploration for this project has been submitted with the grading permit application and will be included in the final drainage report.

B. Post-Development Conditions.

The proposed project will consist of a row of townhomes in the southwest half of the property with a new street and cul-de-sac. The northeast half will have three residential, affordable housing buildings with associated parking, sidewalks, and greenspace. The Phase I building will be approximately 22,000 S.F. and the Phase II and III buildings will be approximately 19,000 S.F. Each phase will have its own parking lot to ensure the required parking ratios are met. The northeast site will have one access point onto College Road during Phase I, and a second access point will be added when Phase 2 is under construction. The on-site drainage will be routed through private storm sewer, into above-ground detention ponds, before being discharged into existing drainage swales and public storm sewer. The proposed discharge locations and limiting rates for each proposed drainage basin can be found on **Exhibit 'B'** in **Appendix A.**

C. Contributing Off-Site Drainage.

There are three off-site areas that are cumulatively less than 1 AC. These off-site areas make no sizable contribution to influence the drainage of the site. Private storm sewer will be sized to pass these stormwater an

2. Pre-Development Runoff Analysis.

A. Watershed Area:

The pre-development watershed consists of the drainage basins shown on the "Existing Drainage Basin Map," **Exhibit 'A'** in **Appendix A**. As discussed previously, runoff flows overland directly offsite, and is collected by inlets and existing drainage swales. Discharge Location A is runoff into public ROW from drainage basin EX-A. Discharge Location B is runoff into a stormwater and sanitary sewer easement from drainage basin EX-B. Discharge Location C is runoff from basin EX-C.

B. Time of Concentration:

The pre-development time of concentration for on-site drainage areas was calculated in HydroCAD using an combination of sheet and shallow concentrated flow.

C. Runoff Model:

The precipitation model used is derived from Iowa Statewide Urban Design and Specifications (SUDAS) Design Manual. Council Bluffs is located in Section 7 (Southwest) of the Climatic Sectional Codes for Iowa (Figure 2B-2.01 in SUDAS).

The NRCS Type II Distribution was used for the SCS method to determine existing runoff and proposed runoff for the site and surrounding areas. Runoff will be calculated, and detention basins will be sized using the HydroCAD program. The 24-hour design rainfall for Council Bluffs, per the 2015 Edition of SUDAS, is as follows:

Frequency	24-Hour Rainfall (in)
2-year	3.18
5-year	3.95
10-year	4.70
25-year	5.86
50-year	6.88
100-year	7.99

D. Summary of Pre-Development Runoff:

The pre-development watershed consists of three drainage basins (EX-A, EX-B, & EX-C), shown on the "Existing Drainage Basin Map," **Exhibit 'A'** in **Appendix A**. The existing basins are described as follows:

Pre-Development Basin EX-A

Existing Basin EX-A consists of areas within the property line that flow overland to the north. The water discharges into public Right of Way where it is picked up by public storm sewer on College Road.

Area = 0.598 acres
Area of Impervious Surface = 0%
Straight Row Crops, Runoff Curve Number, CN = 78

Pre-Development Basin EX-B
Existing Basin EX-B consists of the majority of the proposed redevelopment area. The site's zoning was once agriculture and was used for straight row crops. The drainage from EX-B overland flows to the southwest before entering an existing stormwater and sanitary sewer easement.

Area = 19.429 acres
Area of Impervious Surface = 0%
Straight Row Crops, Runoff Curve Number, CN = 78

Pre-Development Basin EX-C
Existing Basin EX-C consists of the remainder of the south part of the property. This basin was also used for straight row crops. The drainage overland flows to the southwest where it is picked up by storm sewer inlets.

Area = 1.793 acres
Area of Impervious Surface = 0%
Straight Row Crops, Runoff Curve Number, CN = 78

Pre-Development Runoff Rates

Basin Name	Area (Acres)	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
		(cfs)					
EX-A	**0.598**	**0.92**	**1.37**	**1.82**	**2.56**	**3.21**	**3.93**
EX-B	**19.429**	**22.70**	**35.66**	**49.27**	**71.50**	**91.79**	**114.31**
EX-C	**1.793**	**2.77**	**4.10**	**5.47**	**7.66**	**9.62**	**11.78**

3. Post-Development Runoff Analysis:

A. Watershed Area:
The proposed site design is a row of townhomes in the southwest half of the property, and three residential affordable housing facilities with associated parking lots in the northeast. The design will utilize overland flow, curb and gutter, and storm sewer to convey the runoff. The post-development watershed consists of three main drainage basins as shown on the "Proposed Drainage Basin Map," **Exhibit 'B'** in **Appendix A.** Discharge Location A collects runoff from drainage basins discharging onto College Road. Discharge Location B collects runoff from the majority of the site and discharges into the existing stormwater and sanitary sewer easement in the southwest. Discharge Location C collects stormwater from the south section of the property and discharges into storm sewer inlets.

B. Time of Concentration:
The post-development time of concentration for on-site drainage areas was assumed to be 15 minutes, which is the minimum time of concentration allowed by SUDAS. A more defined time of concentration will be calculated with the final drainage report.

C. Runoff Model:
Storm event, total rainfall, total storm duration, and runoff methods will be the same as used for the pre-development model. Reference Section 2-C in this report for the pre-development runoff model.

D. Summary of Post-Development Runoff:
The post-development watershed consists of three main drainage basins (PR-A, PR-B, & PR-C) as shown on the "Proposed Drainage Basin Map," **Exhibit 'B'** in **Appendix A**. The post-development basins are described as follows:

Post-Development Basin PR-A
Basin PR-A is the areas on the north edge of the site that discharge stormwater into public Right of Way where it is picked up by public storm sewer at Discharge Location A.

Area = 1.09 Acres
Area of Impervious Surface = 8%
Weighted Runoff Curve Number, CN = 80
Greenspace (0.96 Acres), CN = 78
Pavement (0.13 Acres), CN = 98

Post-Development Basin PR-B
Basin PR-B is the central areas of the site containing the majority of the redevelopment. Stormwater overland flows, is then picked up by private storm sewer, routed to the south west detention pond, and then is released at Discharge Location B.

Area = 20.11 Acres
Area of Impervious Surface = 32%
Weighted Runoff Curve Number, CN = 84
Greenspace (13.74 Acres), CN = 78
Pavement/Building Roofs (6.37 Acres), CN = 98

Post-Development Basin PR-C
Basin PR-C is on the south edge of the property and is mostly greenspace. This area is not captured by storm sewer and will be allowed to discharge directly at Discharge Location C.

Area = 0.64 Acres
Area of Impervious Surface = 6%
Weighted Runoff Curve Number, CN = 79
Greenspace (0.60 Acres), CN = 78
Building Roofs (0.04 Acres), CN = 98

E. Summary of Pre/Post-Development Runoff with Detention:

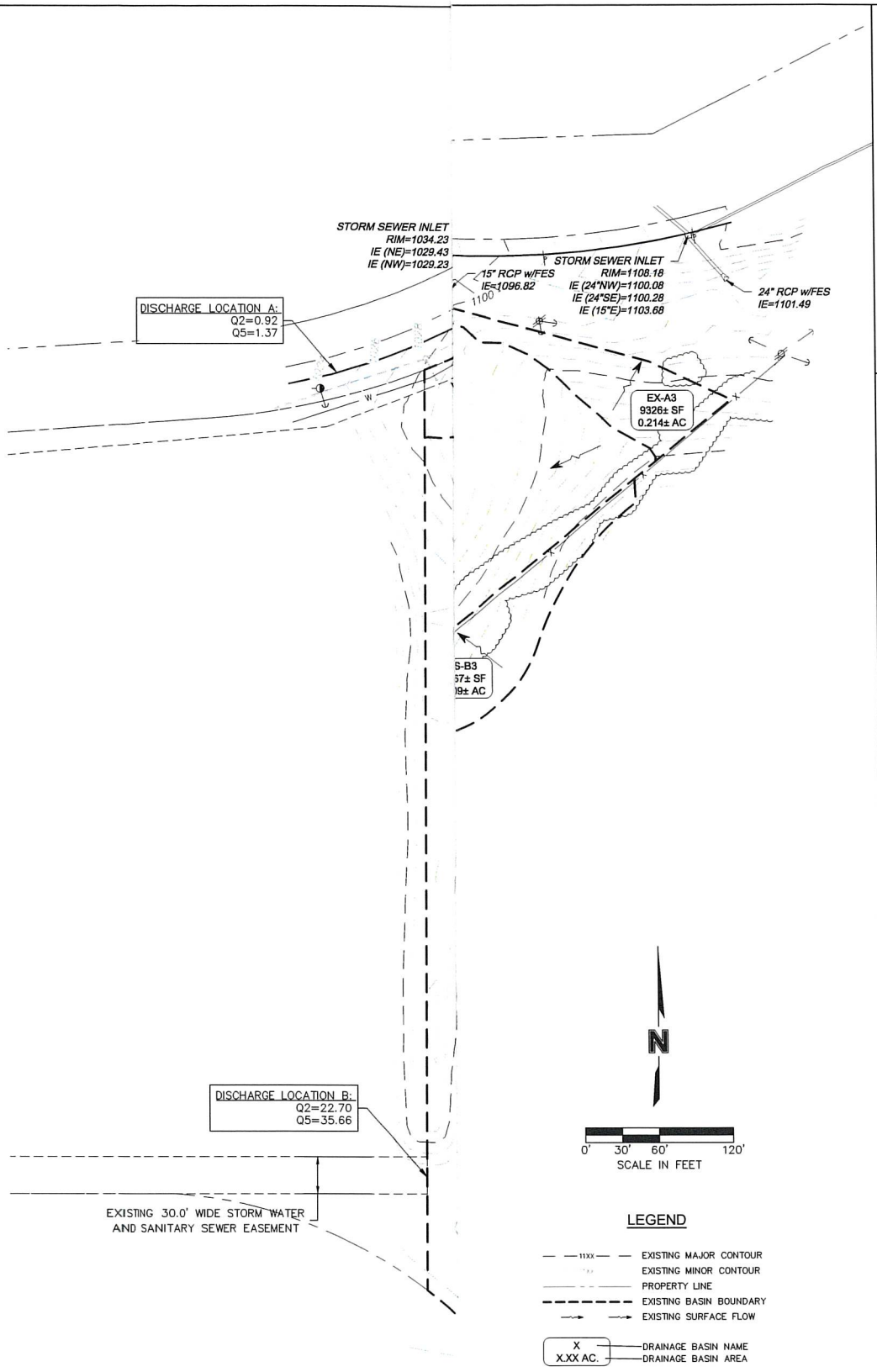
Basin Name	A		B		C	
	Pre	Post	Pre	Post	Pre	Post
Size (Acres)	0.598	1.09	19.429	20.11	1.793	0.64
Time of Concentration	15 min.	15 min.	15 min.	15 min.	15 min.	15 min.
Q_2	0.92	≤ 0.92	22.70	≤ 22.70	2.77	≤ 2.77
Q_5	1.37	≤ 1.37	35.66	≤ 35.66	4.10	≤ 4.10
Q_{10}		≤ 1.37		≤ 35.66		≤ 4.10
Q_{25}		≤ 1.37		≤ 35.66		≤ 4.10
Q_{50}		≤ 1.37		≤ 35.66		≤ 4.10
Q_{100}		≤ 1.37		≤ 35.66		≤ 4.10

F. Allowable Release Rate.

The allowable release rate from the site is based on two conditions according to SUDAS:

1. After development, the release rate of runoff for rainfall events having an expected return frequency of 2-years and 5-years should not exceed the existing, pre-developed peak runoff rate from those same storms.
2. For rainfall events having an expected return frequency of 10-years to 100-years inclusive, the rate of runoff from the developed site should not exceed the existing, pre-developed peak runoff from a 5-year frequency storm of the same duration. **The allowable discharge rate may be restricted due to downstream capacity.**

APPENDIX A –
DRAINAGE MAPS



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REVISIONS

REV. NO.	DATE	REVISIONS DESCRIPTION

EXISTING DRAINAGE BASIN MAP

NEW HORIZON SUBDIVISION, REPLAT 2

COUNCIL BLUFFS, IA

2018

drawn by:	JJE
checked by:	ALW
approved by:	ALW
QA/QC by:	LRW
project no.:	017-2499
drawing no.:	
date:	07.31.2018

EXHIBIT
A

DWG: F:\2017\2001-2500\017-2499\40-Design\Exhibits\Drainage Exhibits\18-07-31_New Horizon Replat 2_Existing Drainage Basin Map_72499.dwg USER: sfricke
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REV. NO.	DATE	REVISIONS DESCRIPTION
		REVISIONS

PROPOSED DRAINAGE BASIN MAP

NEW HORIZON SUBDIVISION, REPLAT 2

COUNCIL BLUFFS, IA

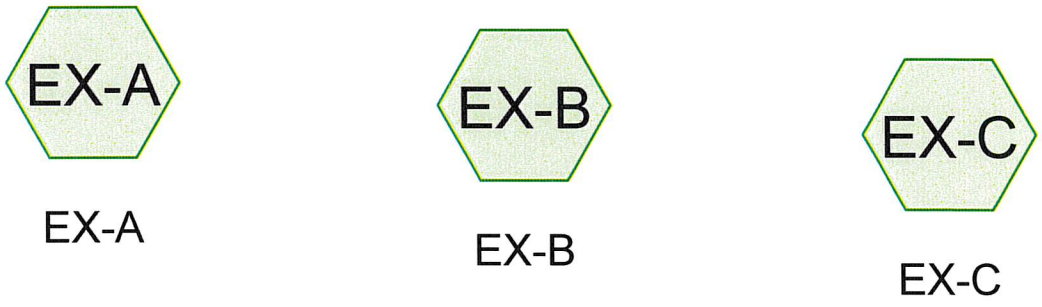
2018

drawn by:	JJE
checked by:	ALW
approved by:	ALW
QA/QC by:	LRW
project no.:	017-2499
drawing no.:	
date:	08.01.2018

EXHIBIT
B

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APPENDIX B –
HydroCAD Report



Subcat Reach Pond Link

Routing Diagram for 18-07-13_GNCV_Existing Drainage Report_72499
Prepared by Olsson Associates, Printed 8/3/2018
HydroCAD® 10.00-19 s/n 03881 © 2016 HydroCAD Software Solutions LLC

Summary for Subcatchment EX-A: EX-A

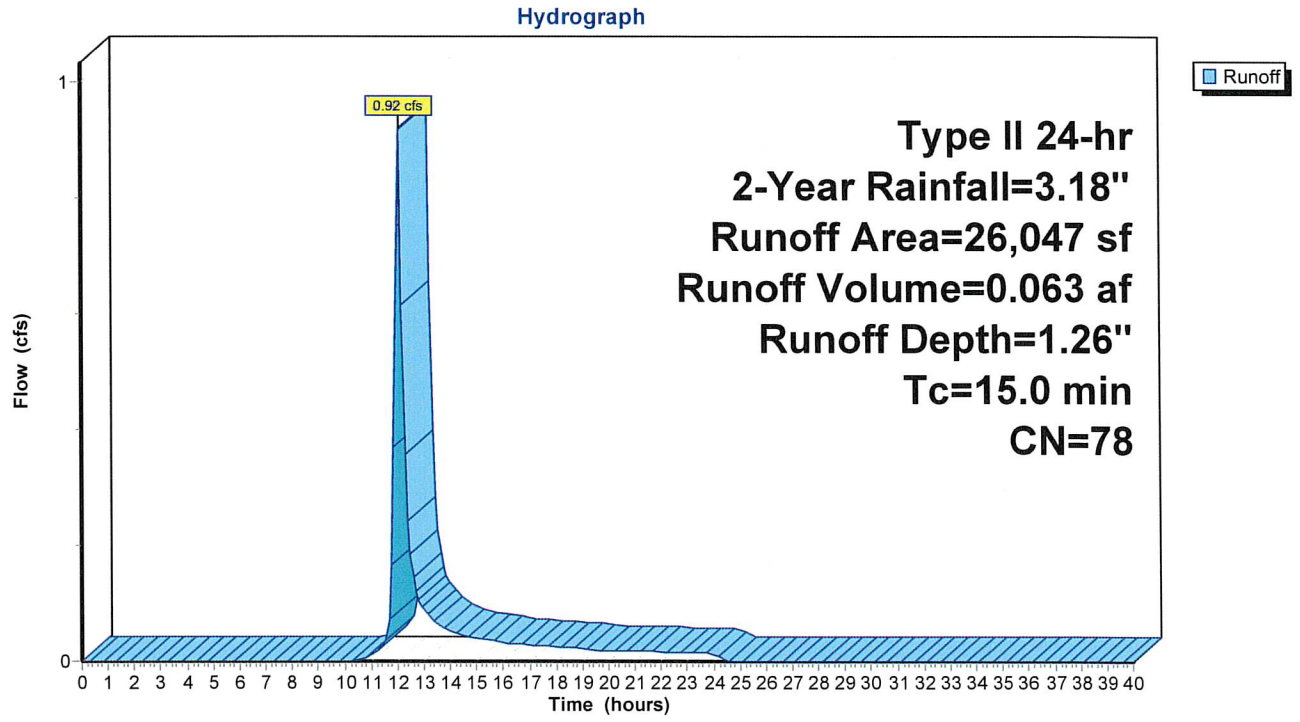
Runoff = 0.92 cfs @ 12.09 hrs, Volume= 0.063 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 2-Year Rainfall=3.18"

Area (sf)	CN	Description
10,114	78	Row crops, straight row, Good, HSG B
6,607	78	Row crops, straight row, Good, HSG B
9,326	78	Row crops, straight row, Good, HSG B
26,047	78	Weighted Average
26,047		100.00% Pervious Area

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

Subcatchment EX-A: EX-A



Summary for Subcatchment EX-B: EX-B

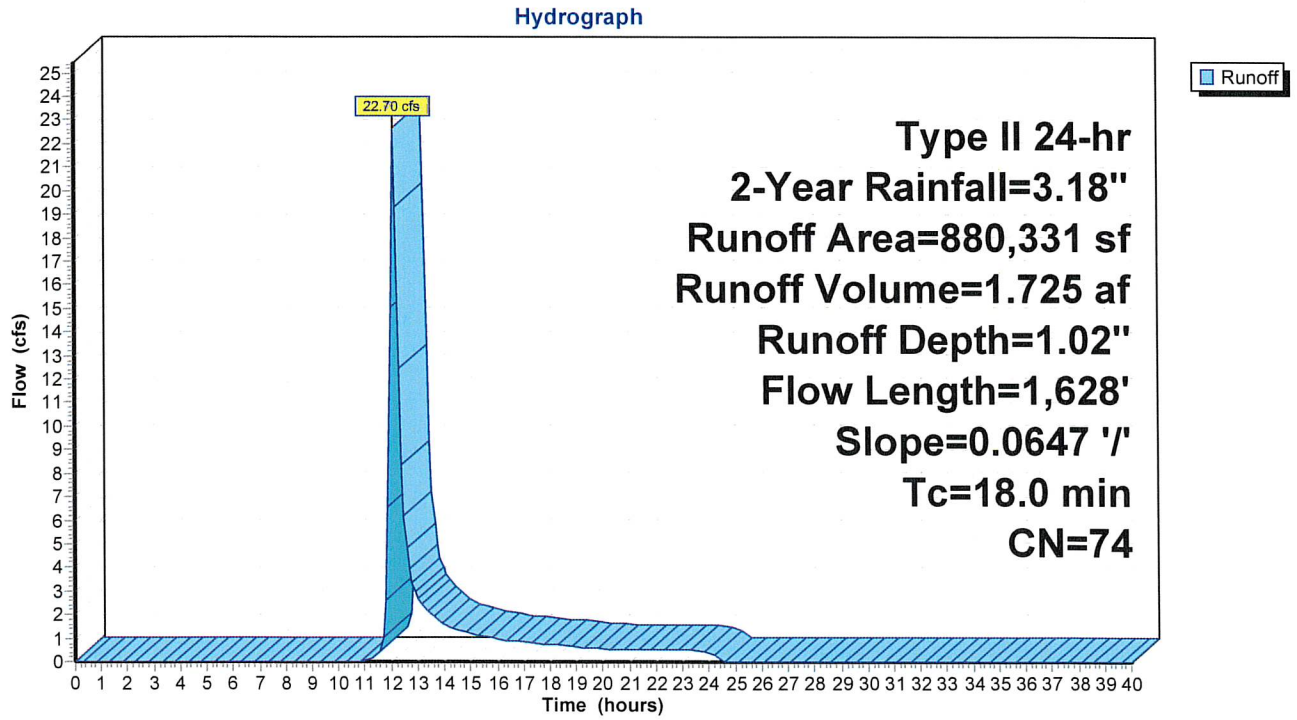
Runoff = 22.70 cfs @ 12.12 hrs, Volume= 1.725 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 2-Year Rainfall=3.18"

Area (sf)	CN	Description
846,326	75	Row crops, contoured, Good, HSG B
2,472	61	>75% Grass cover, Good, HSG B
18,066	61	>75% Grass cover, Good, HSG B
13,467	61	>75% Grass cover, Good, HSG B
880,331	74	Weighted Average
880,331		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0647	0.24		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 3.10"
11.1	1,528	0.0647	2.29		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
18.0	1,628	Total			

Subcatchment EX-B: EX-B



Summary for Subcatchment EX-C: EX-C

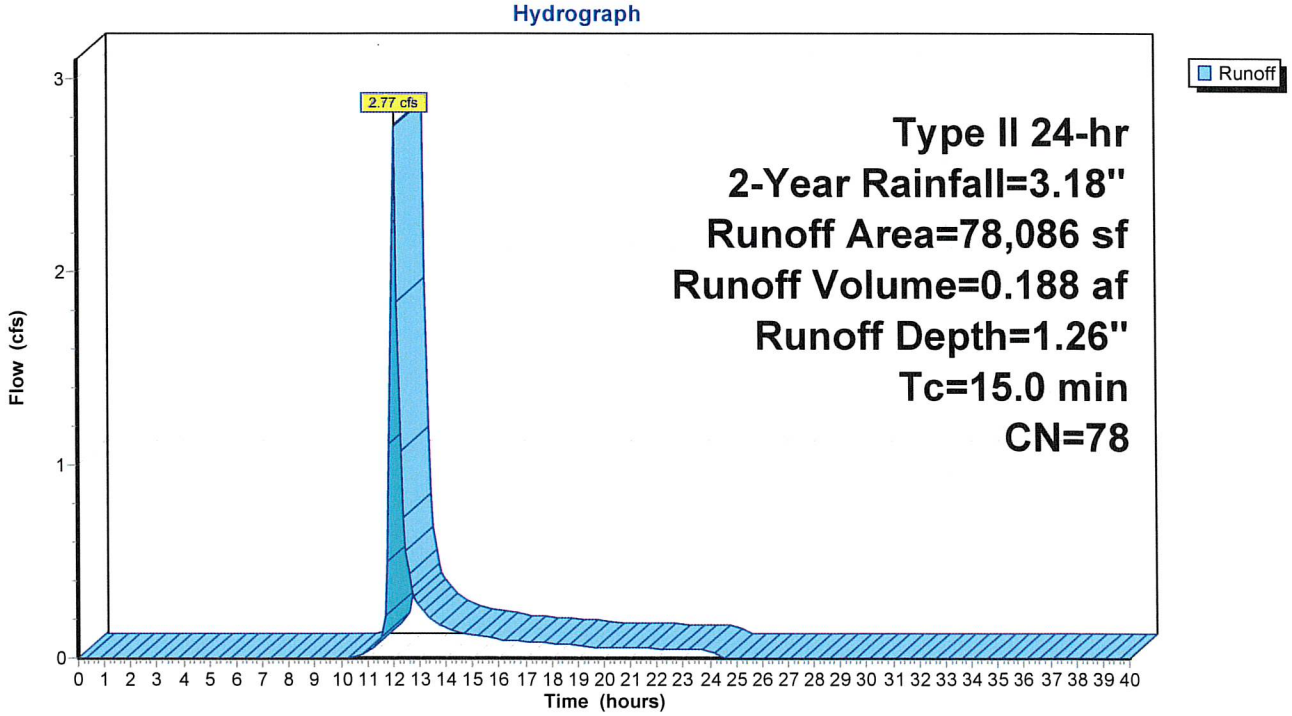
Runoff = 2.77 cfs @ 12.09 hrs, Volume= 0.188 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 2-Year Rainfall=3.18"

Area (sf)	CN	Description
78,086	78	Row crops, straight row, Good, HSG B
78,086		100.00% Pervious Area

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

Subcatchment EX-C: EX-C



Summary for Subcatchment EX-A: EX-A

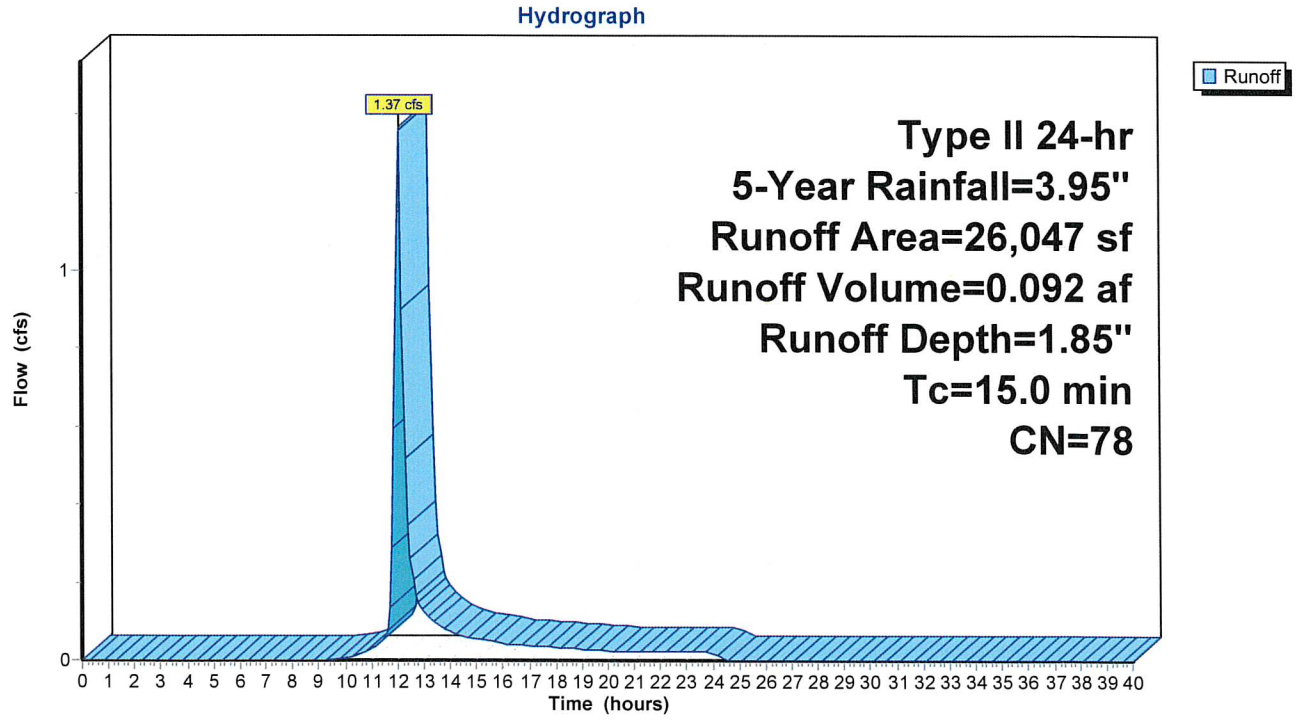
Runoff = 1.37 cfs @ 12.08 hrs, Volume= 0.092 af, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 5-Year Rainfall=3.95"

Area (sf)	CN	Description
10,114	78	Row crops, straight row, Good, HSG B
6,607	78	Row crops, straight row, Good, HSG B
9,326	78	Row crops, straight row, Good, HSG B
26,047	78	Weighted Average
26,047		100.00% Pervious Area

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

Subcatchment EX-A: EX-A



Summary for Subcatchment EX-B: EX-B

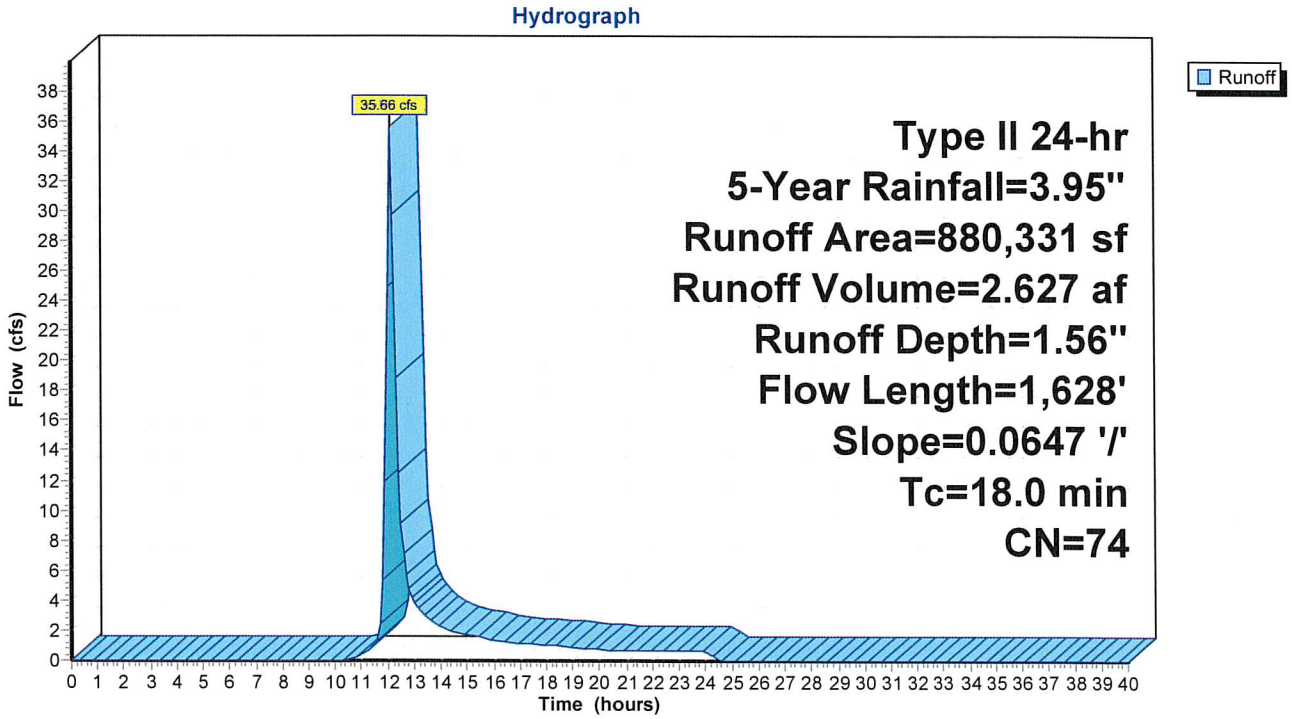
Runoff = 35.66 cfs @ 12.12 hrs, Volume= 2.627 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 5-Year Rainfall=3.95"

Area (sf)	CN	Description
846,326	75	Row crops, contoured, Good, HSG B
2,472	61	>75% Grass cover, Good, HSG B
18,066	61	>75% Grass cover, Good, HSG B
13,467	61	>75% Grass cover, Good, HSG B
880,331	74	Weighted Average
880,331		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0647	0.24		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 3.10"
11.1	1,528	0.0647	2.29		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
18.0	1,628	Total			

Subcatchment EX-B: EX-B



Summary for Subcatchment EX-C: EX-C

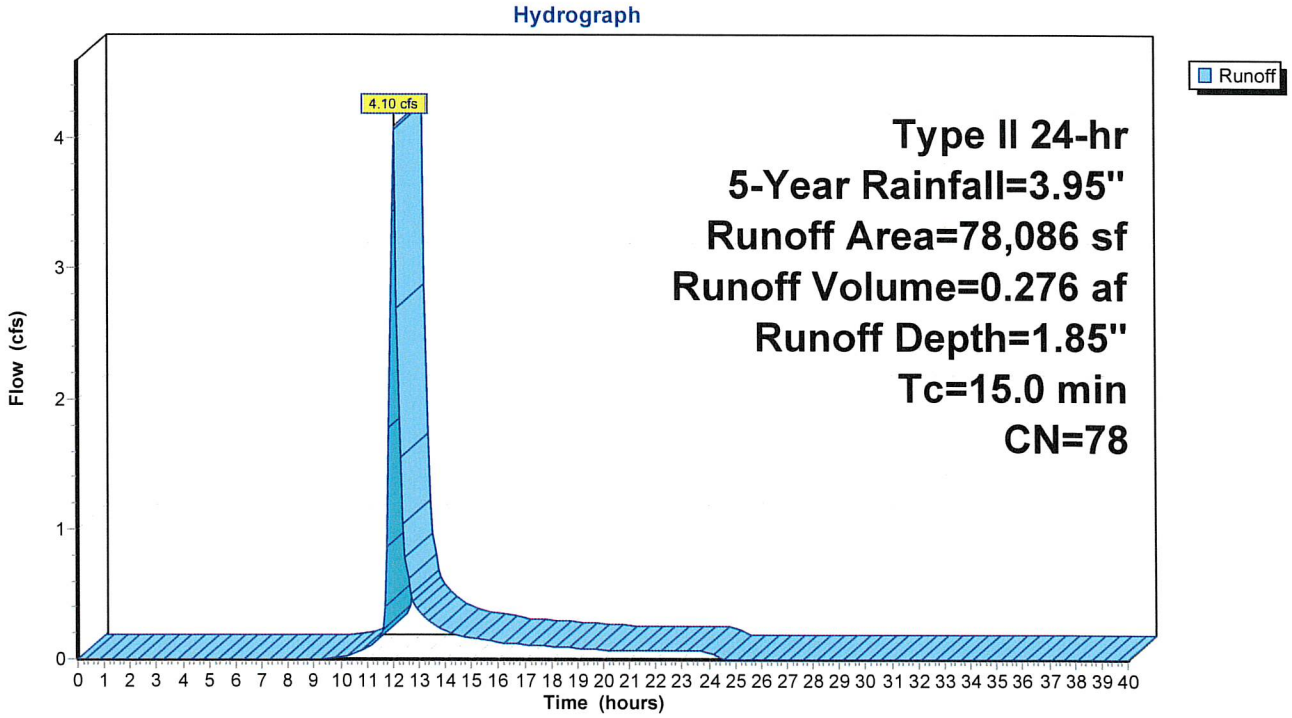
Runoff = 4.10 cfs @ 12.08 hrs, Volume= 0.276 af, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 5-Year Rainfall=3.95"

Area (sf)	CN	Description
78,086	78	Row crops, straight row, Good, HSG B
78,086		100.00% Pervious Area

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

Subcatchment EX-C: EX-C



Summary for Subcatchment EX-A: EX-A

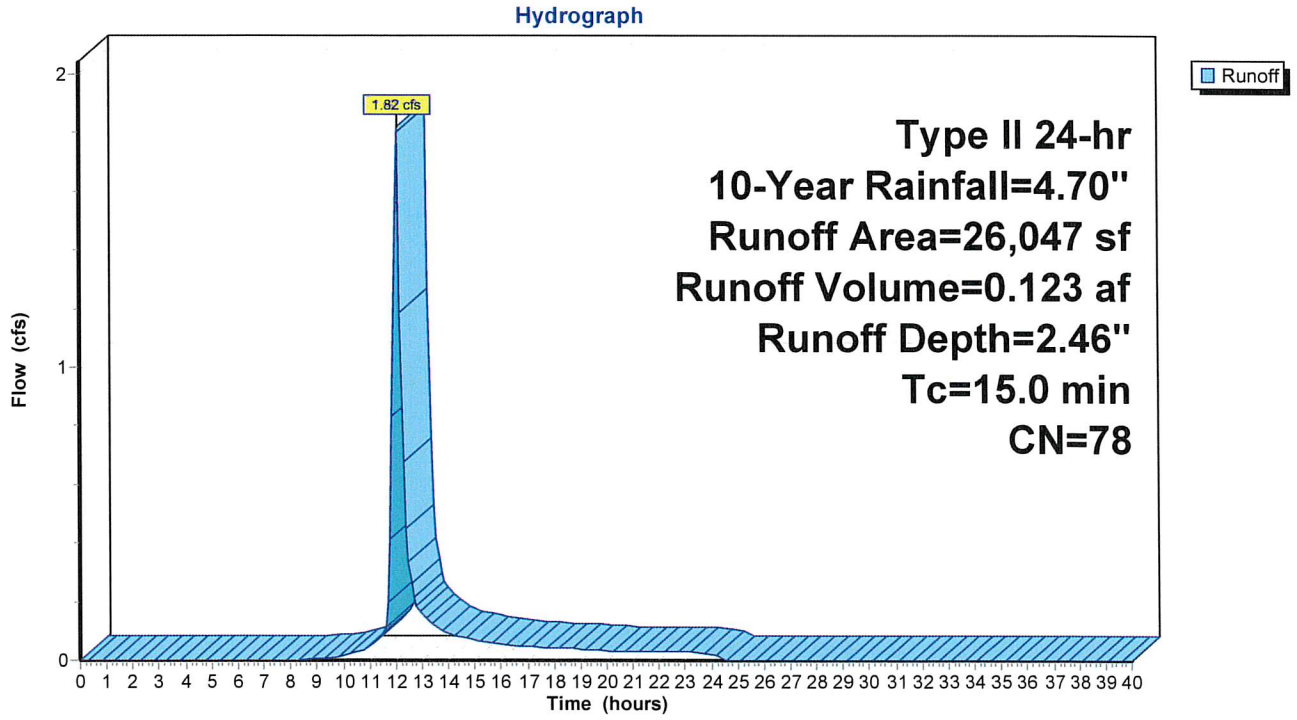
Runoff = 1.82 cfs @ 12.08 hrs, Volume= 0.123 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
10,114	78	Row crops, straight row, Good, HSG B
6,607	78	Row crops, straight row, Good, HSG B
9,326	78	Row crops, straight row, Good, HSG B
26,047	78	Weighted Average
26,047		100.00% Pervious Area

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

Subcatchment EX-A: EX-A



Summary for Subcatchment EX-B: EX-B

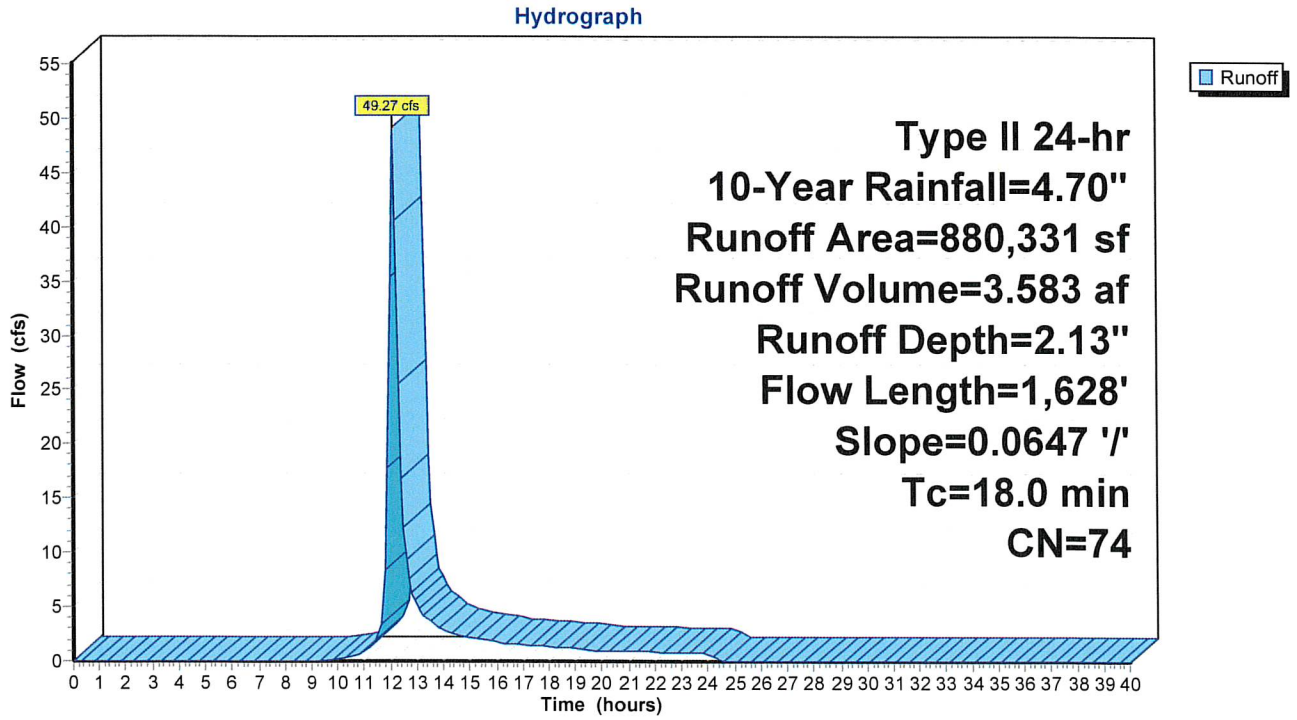
Runoff = 49.27 cfs @ 12.11 hrs, Volume= 3.583 af, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
846,326	75	Row crops, contoured, Good, HSG B
2,472	61	>75% Grass cover, Good, HSG B
18,066	61	>75% Grass cover, Good, HSG B
13,467	61	>75% Grass cover, Good, HSG B
880,331	74	Weighted Average
880,331		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0647	0.24		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 3.10"
11.1	1,528	0.0647	2.29		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
18.0	1,628	Total			

Subcatchment EX-B: EX-B



Summary for Subcatchment EX-C: EX-C

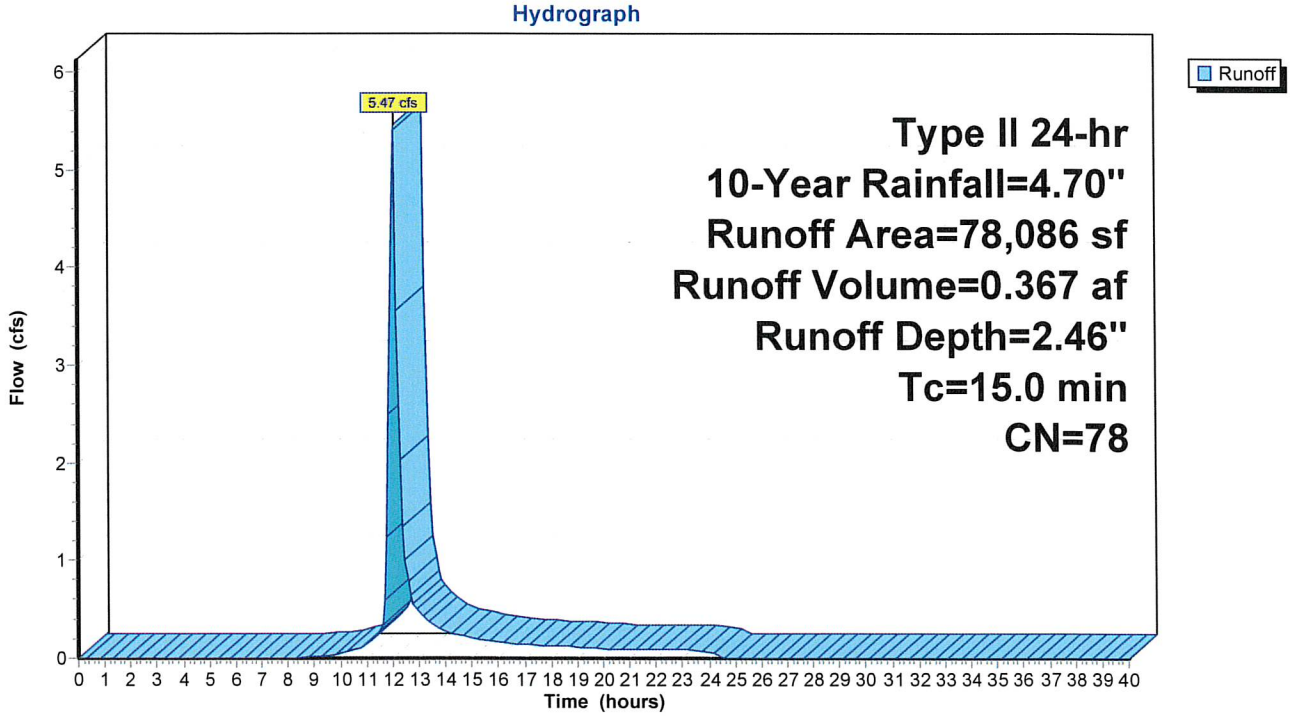
Runoff = 5.47 cfs @ 12.08 hrs, Volume= 0.367 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
78,086	78	Row crops, straight row, Good, HSG B
78,086		100.00% Pervious Area

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

Subcatchment EX-C: EX-C



Summary for Subcatchment EX-A: EX-A

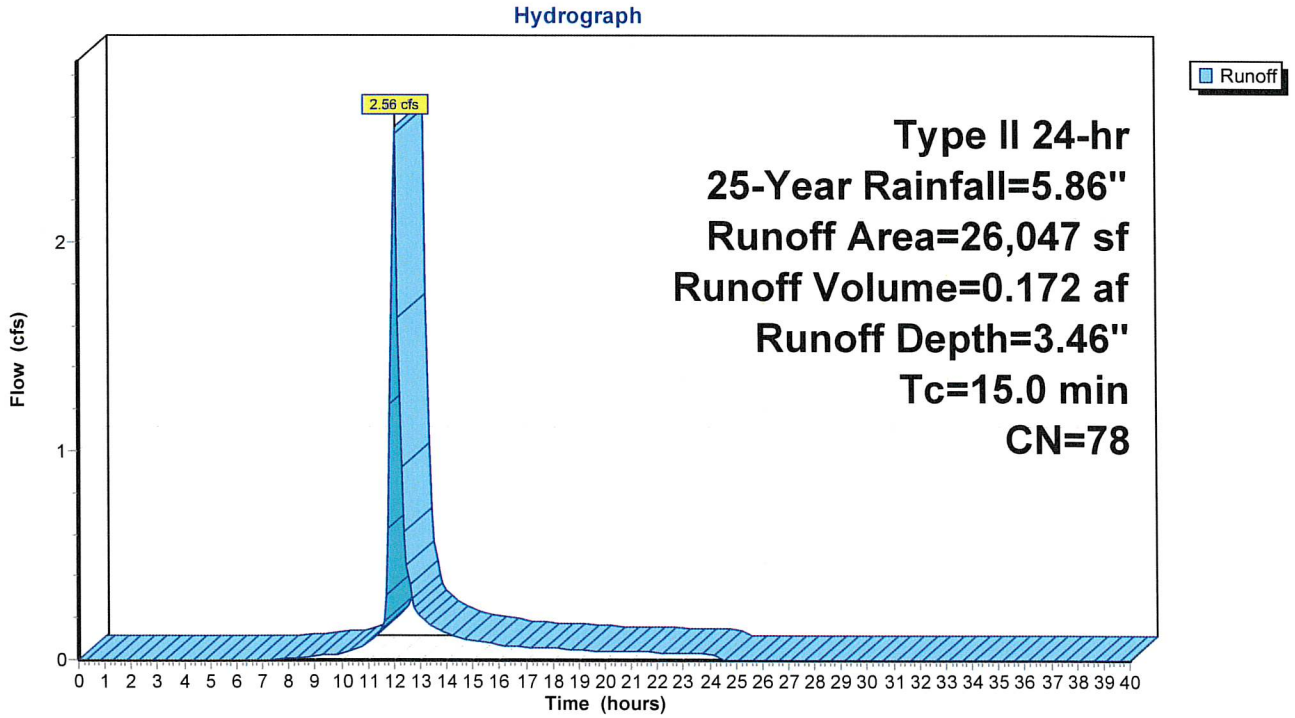
Runoff = 2.56 cfs @ 12.08 hrs, Volume= 0.172 af, Depth= 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 25-Year Rainfall=5.86"

Area (sf)	CN	Description
10,114	78	Row crops, straight row, Good, HSG B
6,607	78	Row crops, straight row, Good, HSG B
9,326	78	Row crops, straight row, Good, HSG B
26,047	78	Weighted Average
26,047		100.00% Pervious Area

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

Subcatchment EX-A: EX-A



Summary for Subcatchment EX-B: EX-B

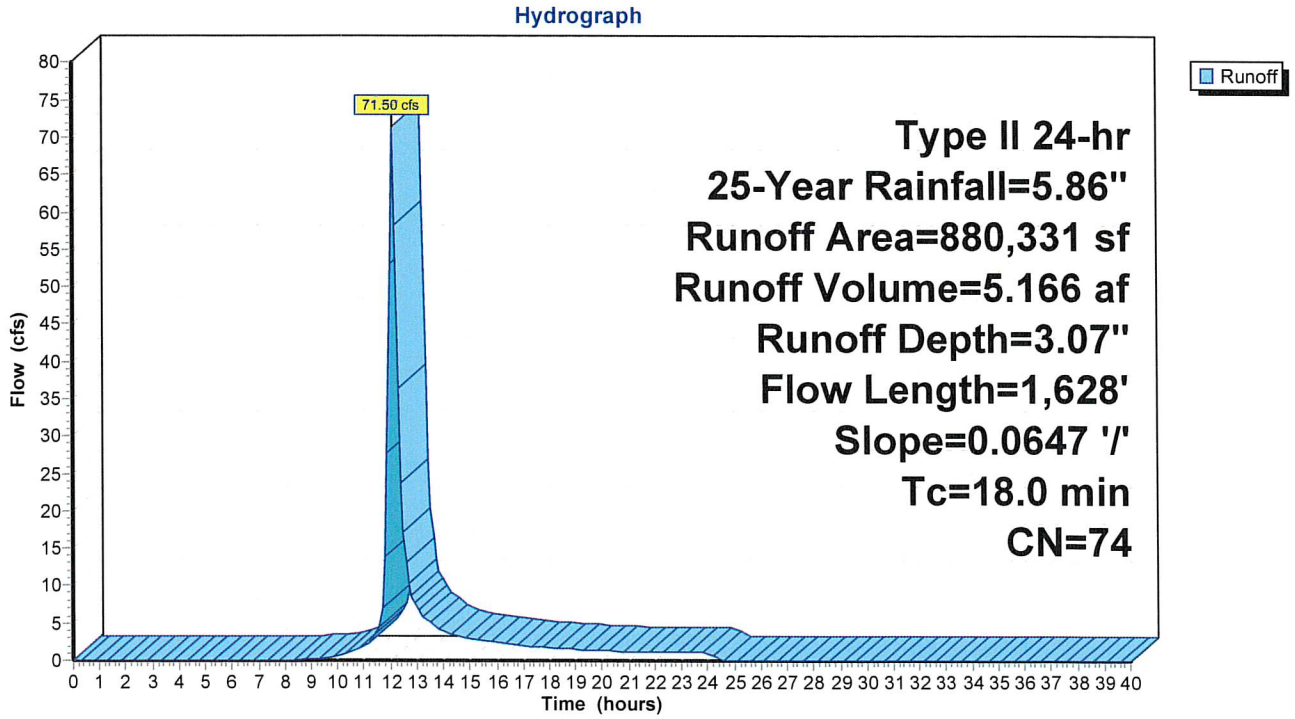
Runoff = 71.50 cfs @ 12.11 hrs, Volume= 5.166 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 25-Year Rainfall=5.86"

Area (sf)	CN	Description
846,326	75	Row crops, contoured, Good, HSG B
2,472	61	>75% Grass cover, Good, HSG B
18,066	61	>75% Grass cover, Good, HSG B
13,467	61	>75% Grass cover, Good, HSG B
880,331	74	Weighted Average
880,331		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0647	0.24		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 3.10"
11.1	1,528	0.0647	2.29		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
18.0	1,628	Total			

Subcatchment EX-B: EX-B



Summary for Subcatchment EX-C: EX-C

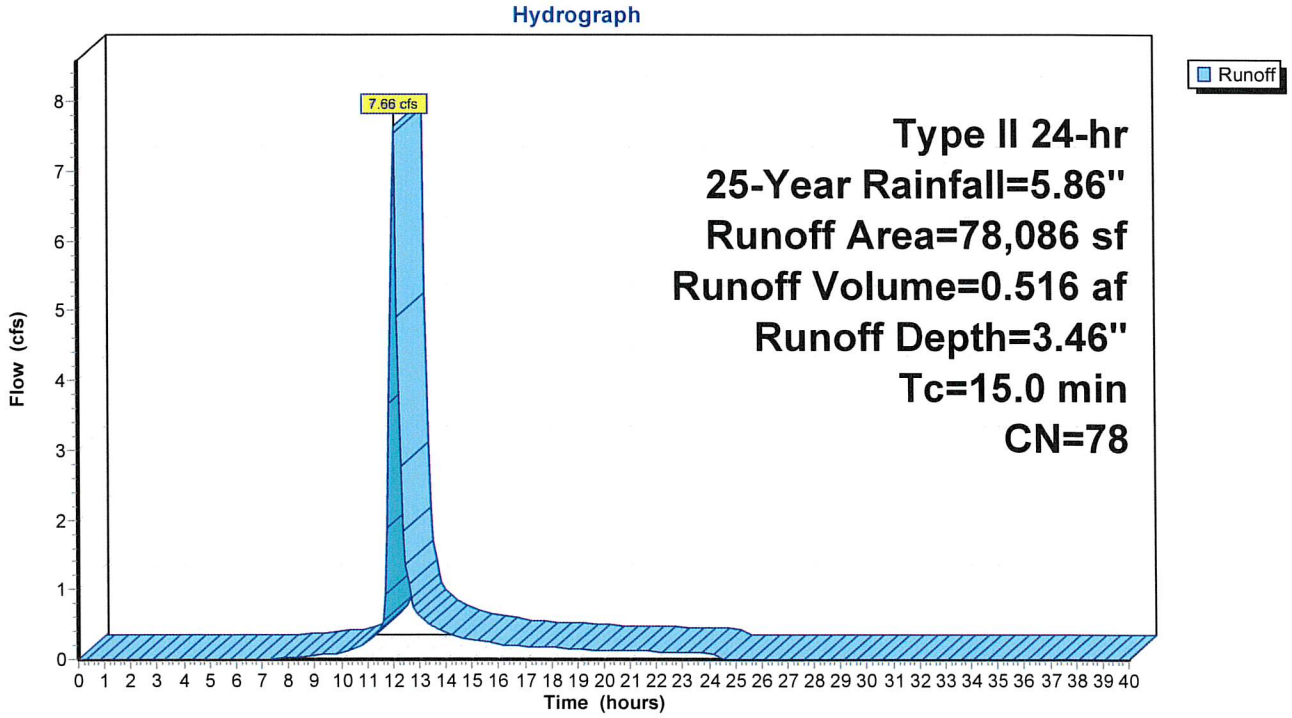
Runoff = 7.66 cfs @ 12.08 hrs, Volume= 0.516 af, Depth= 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 25-Year Rainfall=5.86"

Area (sf)	CN	Description
78,086	78	Row crops, straight row, Good, HSG B
78,086		100.00% Pervious Area

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

Subcatchment EX-C: EX-C



Summary for Subcatchment EX-A: EX-A

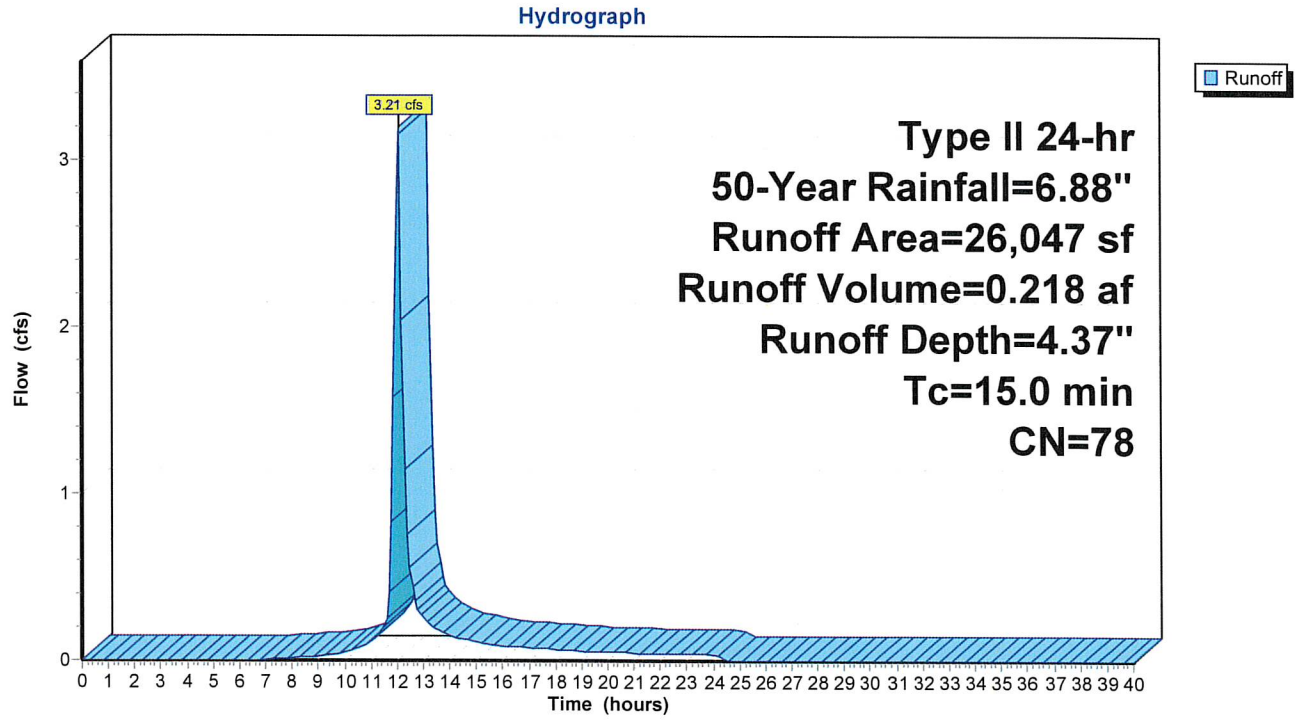
Runoff = 3.21 cfs @ 12.07 hrs, Volume= 0.218 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 50-Year Rainfall=6.88"

Area (sf)	CN	Description
10,114	78	Row crops, straight row, Good, HSG B
6,607	78	Row crops, straight row, Good, HSG B
9,326	78	Row crops, straight row, Good, HSG B
26,047	78	Weighted Average
26,047		100.00% Pervious Area

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

Subcatchment EX-A: EX-A



Summary for Subcatchment EX-B: EX-B

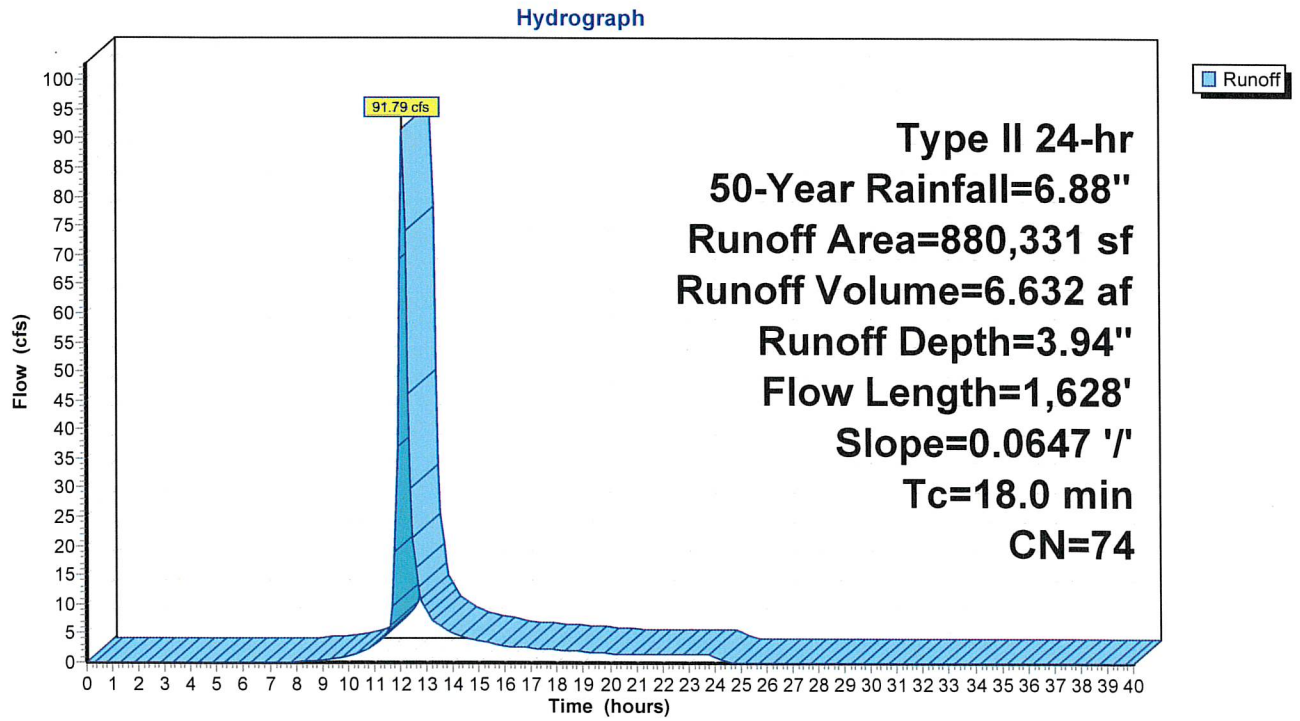
Runoff = 91.79 cfs @ 12.11 hrs, Volume= 6.632 af, Depth= 3.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 50-Year Rainfall=6.88"

Area (sf)	CN	Description
846,326	75	Row crops, contoured, Good, HSG B
2,472	61	>75% Grass cover, Good, HSG B
18,066	61	>75% Grass cover, Good, HSG B
13,467	61	>75% Grass cover, Good, HSG B
880,331	74	Weighted Average
880,331		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0647	0.24		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 3.10"
11.1	1,528	0.0647	2.29		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
18.0	1,628	Total			

Subcatchment EX-B: EX-B



Summary for Subcatchment EX-C: EX-C

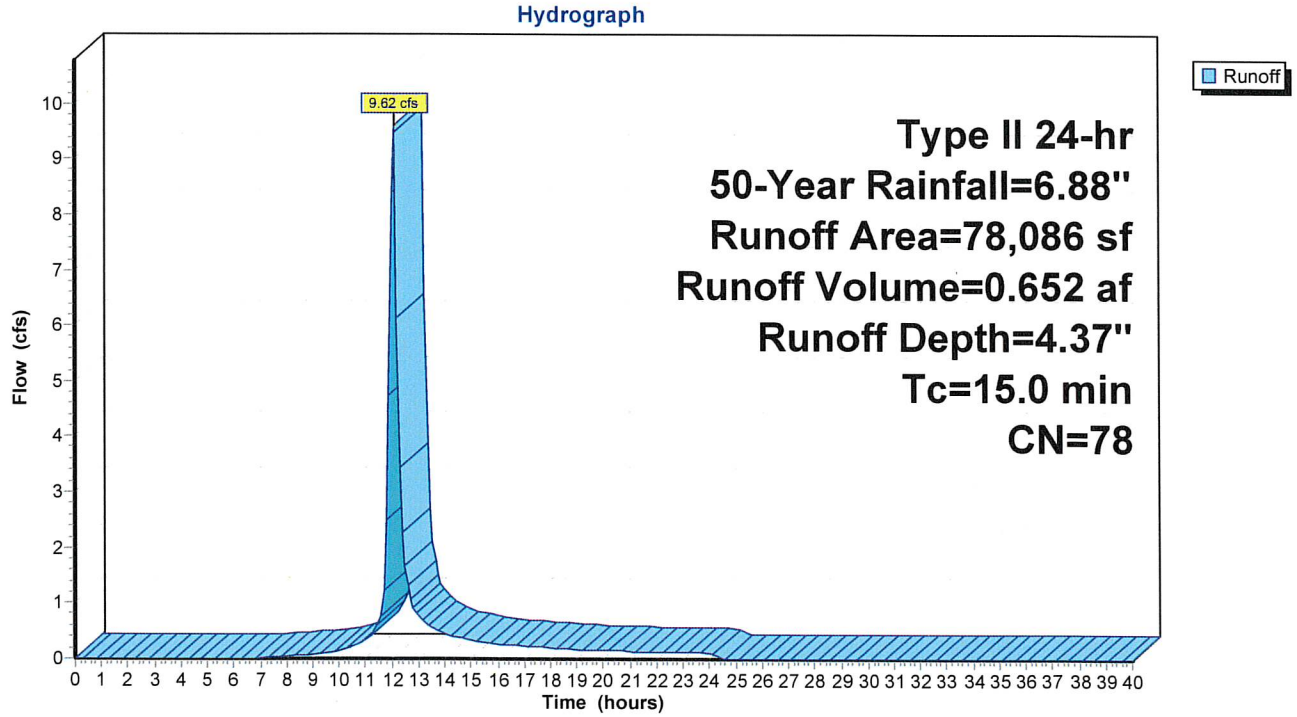
Runoff = 9.62 cfs @ 12.07 hrs, Volume= 0.652 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 50-Year Rainfall=6.88"

Area (sf)	CN	Description
78,086	78	Row crops, straight row, Good, HSG B
78,086		100.00% Pervious Area

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

Subcatchment EX-C: EX-C



Summary for Subcatchment EX-A: EX-A

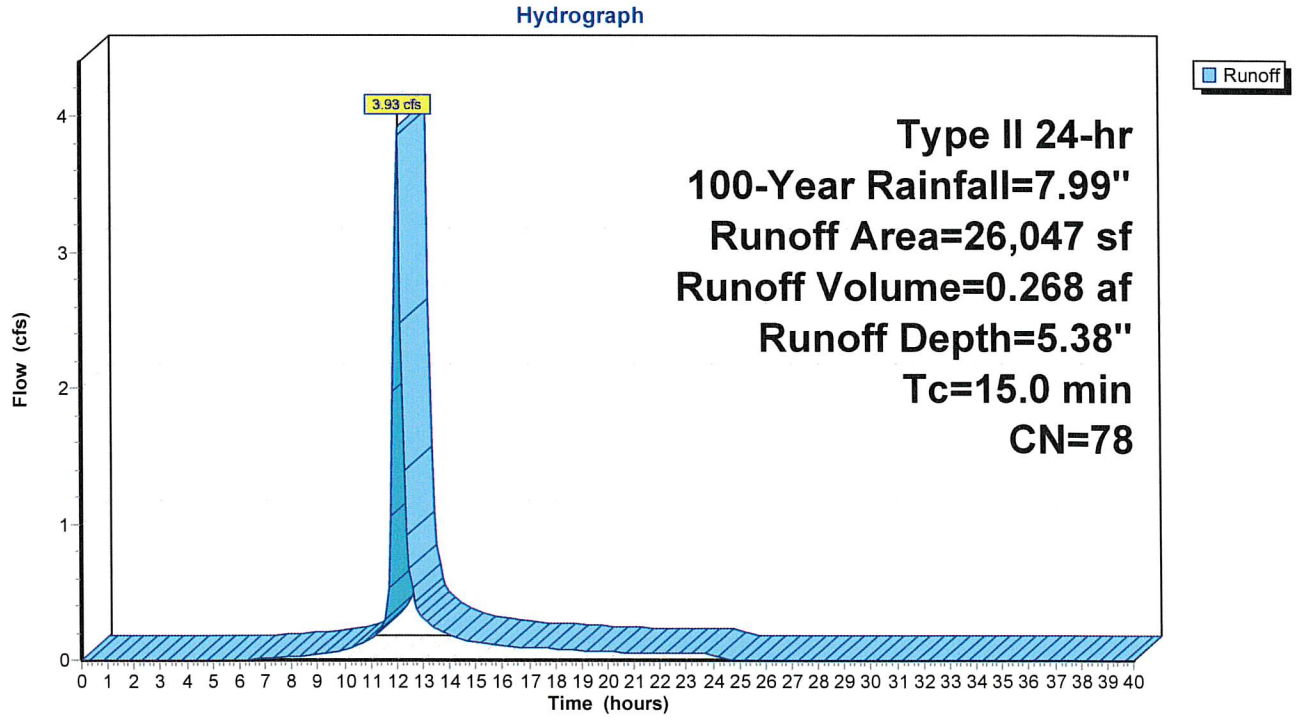
Runoff = 3.93 cfs @ 12.07 hrs, Volume= 0.268 af, Depth= 5.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 100-Year Rainfall=7.99"

Area (sf)	CN	Description
10,114	78	Row crops, straight row, Good, HSG B
6,607	78	Row crops, straight row, Good, HSG B
9,326	78	Row crops, straight row, Good, HSG B
26,047	78	Weighted Average
26,047		100.00% Pervious Area

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

Subcatchment EX-A: EX-A



Summary for Subcatchment EX-B: EX-B

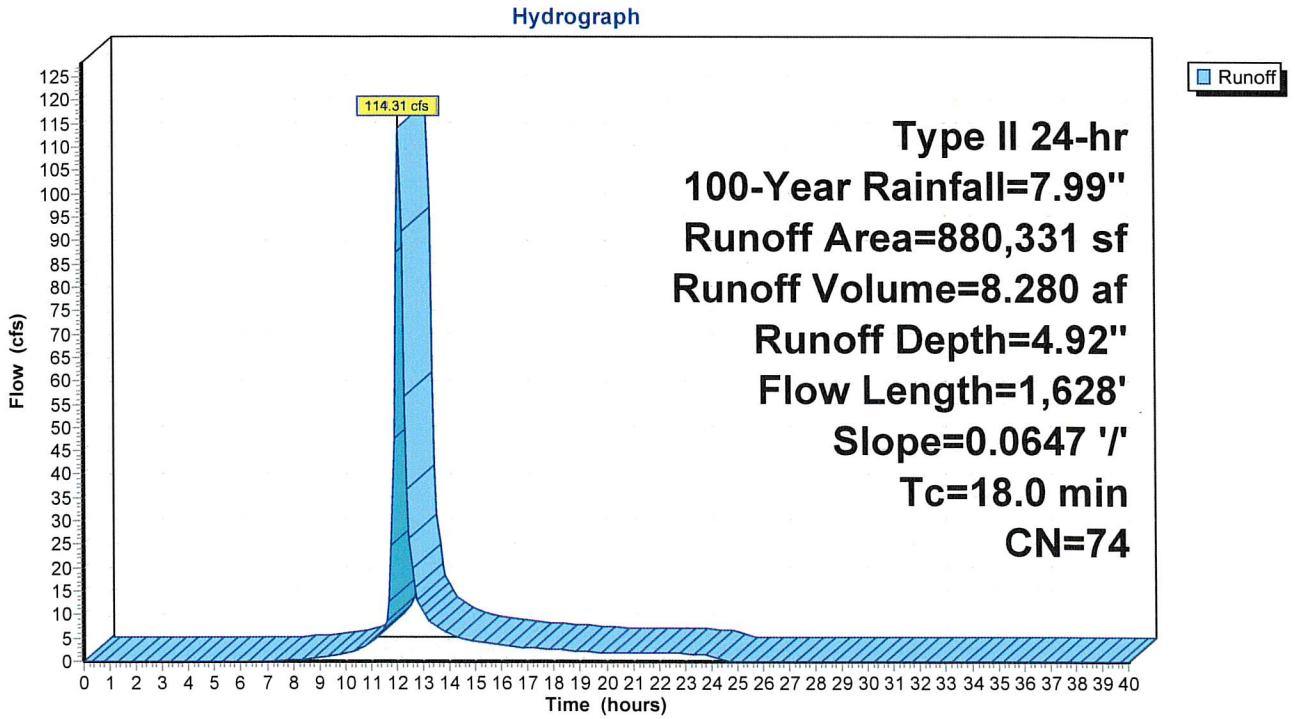
Runoff = 114.31 cfs @ 12.10 hrs, Volume= 8.280 af, Depth= 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 100-Year Rainfall=7.99"

Area (sf)	CN	Description
846,326	75	Row crops, contoured, Good, HSG B
2,472	61	>75% Grass cover, Good, HSG B
18,066	61	>75% Grass cover, Good, HSG B
13,467	61	>75% Grass cover, Good, HSG B
880,331	74	Weighted Average
880,331		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0647	0.24		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 3.10"
11.1	1,528	0.0647	2.29		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
18.0	1,628	Total			

Subcatchment EX-B: EX-B



Summary for Subcatchment EX-C: EX-C

Runoff = 11.78 cfs @ 12.07 hrs, Volume= 0.804 af, Depth= 5.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.10 hrs
Type II 24-hr 100-Year Rainfall=7.99"

Area (sf)	CN	Description
78,086	78	Row crops, straight row, Good, HSG B
78,086		100.00% Pervious Area

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

Subcatchment EX-C: EX-C

