STORMWATER DRAINAGE REPORT

Prepared for:

CAPODAGLI PROPERTY COMPANY, LLC / MERIDIA, LLC

Meridia Village Commons Proposed Mixed Use Building
4th Street & Valley Street
Block 2303, Lots 7-11
Township of South Orange Village
Essex County, New Jersey

Prepared by:

DYNAMIC ENGINEERING

245 Main Street, Suite 110
Chester, NJ 07930
(908) 879-9229

Joseph C. Sparone, PE, PP
NJ Professional Engineer License #47204

June 2017
DEC #1084-16-015

TABLE OF CONTENTS

I. Introduction 3

II. Existing Site Conditions 3

III. Proposed Site Conditions 4

IV. Design Methodology 5

V. Underground Stormwater Management Basin Design 6

VI. Runoff Rates 6

VII. Water Quality Storm 7

VIII. Groundwater Recharge 7

IX. "Green Street" Infrastructure 7

X. Conclusion 7

APPENDIX

- NRCS Web Soil Survey
- Time of Concentration Calculations
- Runoff Curve Number (CN) Calculations
- Inlet Area Calculations and Stormwater Collection System Calculations (Pipe Sizing)
- Existing & Proposed Hydrographs for 2yr, 10yr & 100yr Design Storms (Hydrographs created using Hydrology Studio 2016 Computer Software)
- Drainage Area Maps

I. INTRODUCTION

The intention of this study is to analyze the stormwater drainage conditions that will occur as a result of the proposed mixed-use redevelopment that will include the construction of a 5-story mixed-use building containing ground level commercial uses, subsurface parking areas, and residential dwelling units. The subject site is located at the intersection of 4th Street & Valley Street, Township of South Orange Village, Essex County, New Jersey. The site is identified as Block 2303; Lots 7-11 on the Township of South Orange Village Tax Maps. The majority of the subject site is developed with four (4) single-family detached residential dwellings and one (1) automotive service center. The scope of this report focuses on the overall drainage conditions within the Drainage Study Area as depicted on the accompanying Drainage Area Maps.

The primary design constraints for this project are based on requirements established in the 4th & Valley Redevelopment Plan, Township of South Orange Village Land Development Ordinance, and the State of New Jersey Stormwater Regulations outlined in NJAC 7:8. In general the stormwater management design will serve to maintain the existing drainage patterns. Post-development site runoff rates will be reduced when compared to pre-development runoff conditions and the improvements will not have a negative impact on downstream facilities.

The limit of disturbance for the project exceeds one (1) acre; therefore the project meets the definition of a "major development" under NJAC 7:8. As such, the project has been designed to meet applicable standards set forth by the Township of South Orange Village and NJAC 7:8.

II. EXISTING SITE CONDITIONS

The subject site consists of 50,449 SF (1.16 acres). The majority of the area to be developed has been previously developed or disturbed consisting of an existing automotive service center, single-family dwellings, and associated impervious surfaces.

Based upon the Essex County Soil Survey, the soil types native to the site include:

SOIL TYPE	SOIL TYPE NAME	HYDRAULIC SOIL GROUP
URDUNB	Urban Land, Dunellen Substratum, 0 to 8 percent slopes	D

The site has been evaluated using the TR-55 'Urban Hydrology for Small Watersheds' standards with the following drainage sub-watershed areas as depicted on the Existing Conditions Drainage Area Map included with the Appendix of this report:

EX-DA-1: The stormwater generated by this study area sheet flows offsite towards the Valley Street Right-of-Way. Ultimately the stormwater runoff generated by this drainage area is tributary to the existing 30" storm sewer channel located within the Valley Street right-of-way. A minimum time of concentration of 10 minutes has been utilized for this drainage area.

EX-DA-2: The stormwater generated by this study area sheet flows offsite towards 4th Street Right-of Way. Ultimately, the stormwater runoff generated by this drainage area is tributary to the existing inlet at the northwestern end of 4th Street, which conveys water to the East Branch of the Rahway River. A minimum time of concentration of 10 minutes has been utilized for this drainage area.

III. PROPOSED SITE CONDITIONS

The proposed site improvements include the construction of a multi-story mixed-use building and associated site improvements. The proposed improvements will result in an increase in impervious coverage of 5,672 SF (0.13 acres). An underground stormwater management basin has been designed to detain stormwater runoff generated by the building and parking garage roof areas, to meet stormwater runoff reduction requirements set forth under NJAC 7:8 as per the NJDEP and Township of South Orange Village Development.

The proposed site conditions have been evaluated using the following drainage sub-watershed areas as depicted on the Proposed Conditions Drainage Area Map included within the Appendix of this report:

DA-1 Detained: This area contains the proposed building and the proposed public plaza and patio areas above the parking deck. The stormwater runoff generated by this area will be conveyed to the proposed stormwater management basin via roof leaders. Stormwater will be detained within the underground basin and released at a controlled rate to an existing inlet at the northwestern end of 4th Street, which is tributary to the East Branch of the Rahway River. A minimum time of concentration of 10 minutes has been utilized for this drainage area.

DA-2 Undetained: This area consists of the area behind the proposed building on the southwestern portion of the subject property. The stormwater runoff generated by this area shall continue to sheet flow northwest offsite, towards the adjacent property. Ultimately the stormwater runoff is collected by an inlet located at the northwestern end of 4th Street and conveyed to the east branch of the Rahway River. A minimum time of concentration of 10 minutes has been utilized for this drainage area.

DA-3 Undetained: This area consists of the streetscape area along Valley Street. The stormwater runoff generated by this area shall sheet flow south toward the Valley Street right-of-way and southwest to an existing inlet. Ultimately the stormwater runoff generated by this drainage area is tributary to the existing 30" storm sewer channel within the Valley Street right-of-way, similar to existing conditions. A minimum time of concentration of 10 minutes has been utilized for this drainage area.

IV. DESIGN METHODOLOGY

The intention of the design of the proposed stormwater management facilities is to provide measures as required to address applicable aspects of the Township of South Orange Village Land Development Ordinance, 4th & Valley Redevelopment Plan, and N.J.A.C. 7:8. In order to prepare the stormwater management design for the subject project, extensive initial investigation of the property and a topographic survey was performed. On-site review of the tract was performed by Dynamic Engineering Consultants, PC to verify existing site conditions and land cover characteristics.

Based on our review of the existing site conditions, review of the Survey, and establishment of the Drainage Area Maps for the existing and proposed site conditions, the calculations as defined within this report were established. A grading plan was also developed for the proposed site improvements with consideration to the existing drainage patterns. The plan was designed so runoff from the proposed development could be directed to the proposed stormwater management facility and reduce existing flow rates.

Stormwater runoff rates for the site were modeled utilizing Hydrology Studio 2016 computer software using the Urban Hydrology for Small Watershed TR55 method for the applicable design storms. The 2-, 10-, and 100-year design storms are based upon the New Jersey 24-Hour Rainfall

Frequency Data for Essex County as published by the USDA NRCS utilizing a Type III rainfall distribution. Curve number calculations have been included within the Appendix and are based upon HSG D as identified by the Essex County Soil Survey. A minimum time of concentration of ten (10) minutes was calculated per TR-55 and impervious and pervious areas were modeled separately per the NJDEP Stormwater Management Best Management Practices (BMP) Manual.

V. UNDERGROUND STORMWATER MANAGEMENT BASIN DESIGN

The stormwater management system has been designed to meet the applicable standards set forth by NJAC 7:8 and the Township of South Orange Village. Specifically, the underground stormwater management basin has been designed to accommodate the 100-year design storm while providing the requisite stormwater quantity reductions without negatively impacting downstream facilities.

As indicated above, the existing sub-watershed drainage areas are currently tributary to the storm sewer systems located within Valley Street and 4th Street. The majority of existing stormwater runoff from the site discharges to the system located within 4th Street. Therefore, the underground stormwater management system will discharge to this system in an effort to maintain existing drainage patterns to the maximum extent possible.

Associated calculations are included in the Appendix of this report and details have been provided on the accompanying engineering drawings.

VI. RUNOFF RATES

The following is a comparison of pre- and post- development stormwater runoff rates:

Existing vs. Allowable Runoff Rates					
	Total Existing (CFS)	**Required Reduction**	**Allowable Runoff (CFS)**	**Proposed Runoff (CFS)**	**Overall Reduction (CFS)**
2 Year	2.55	50%	1.28	0.95	-1.60
10 Year	4.03	25%	3.02	1.43	-2.60
100 Year	6.91	20%	5.53	5.46	-1.45

As noted above, the stormwater management system has been designed to not exceed the allowable runoff rates for the 2-, 10-, and 100 year design storms thus meeting the stormwater management design standards of the Township and NJAC 7:8.

VII. WATER QUALITY STORM

The proposed development will not increase impervious coverage on-site by more than ¼ acre, therefore, compliance with the stormwater quality standards under NJAC 7:8 is not required. However, it is important to note that the majority of the stormwater runoff generated by the site is from the building roof area which is void of vehicular traffic and can be considered 'clean' therefore the project complies with NJAC 7:8 stormwater quality requirements.

VIII. GROUNDWATER RECHARGE

The proposed project is located on a previously developed parcel located within the Metropolitan Planning Area (PA-1) therefore, this project is exempt from the Groundwater Recharge requirements set forth by the Township of South Orange Village and NJAC 7:8.

IX. "GREEN STREET" INFRASTRUCTURE

The proposed project incorporates "green infrastructure" to allow for on-site infiltration of stormwater runoff as required by the 4th & Valley Redevelopment Plan. Green infrastructure refers to a set of stormwater management practices that use or mimic the natural water cycle to capture, filter, or absorb stormwater. Green infrastructure will be incorporated within the Valley Street streetscape and within the public plaza to aide with stormwater management. Please refer to the accompanying plans associated with this proposed redevelopment for additional information.

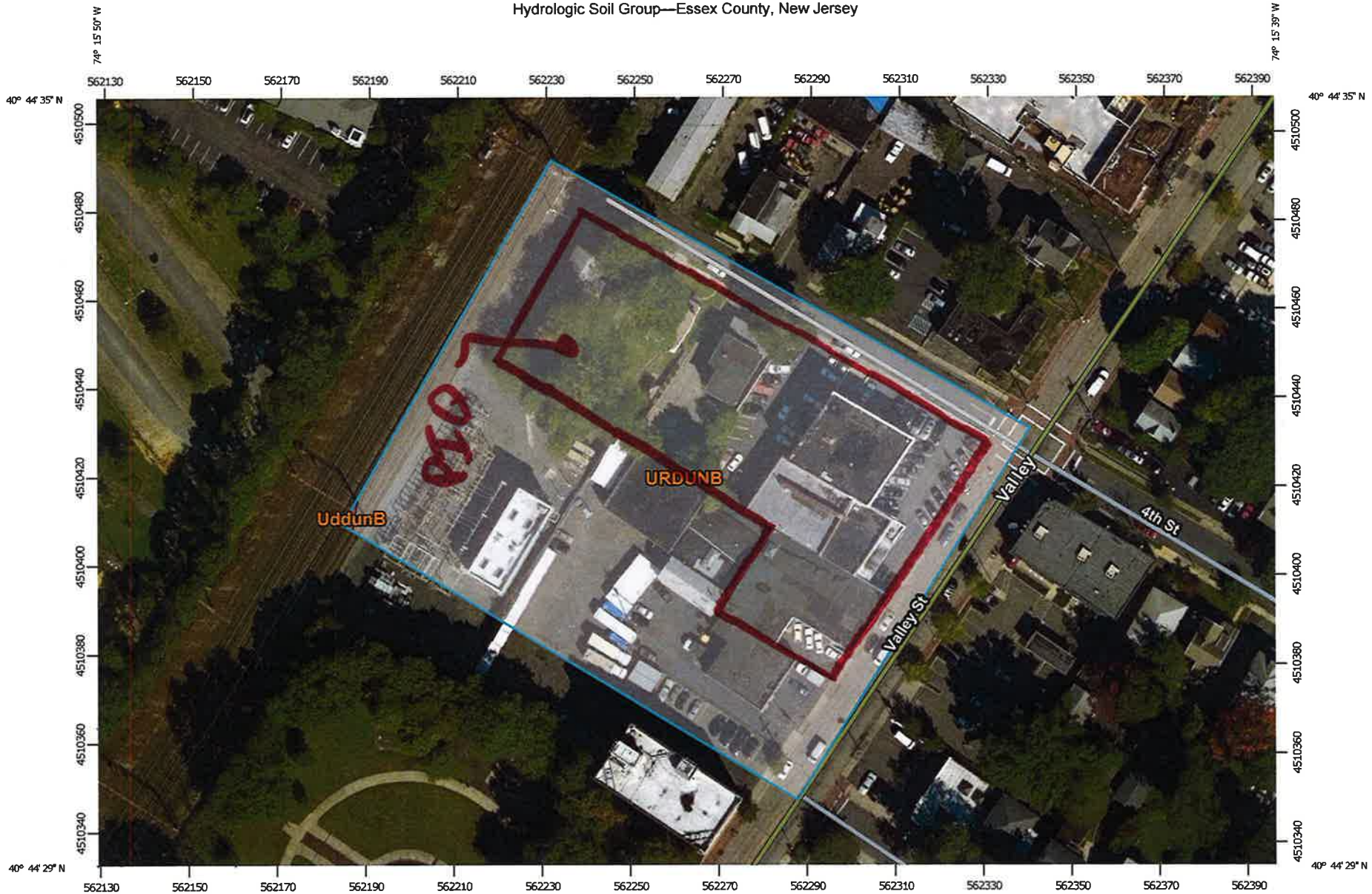
X. CONCLUSION

The proposed project has been designed in a manner so that it will not adversely impact the existing drainage patterns, adjacent roadways or adjacent parcels. Further, stormwater runoff rates for the 2, 10 and 100 year design storms will comply with the runoff rate reduction requirements set forth in NJAC 7:8. With that stated, it is evident that the proposed development will not have a negative impact on the existing stormwater management systems within the vicinity of the subject parcel.

APPENDIX

NRCS WEB SOIL SURVEY

Hydrologic Soil Group—Essex County, New Jersey



Map Scale: 1:1,220 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Essex County, New Jersey
Survey Area Data: Version 11, Sep 18, 2015

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

Date(s) aerial images were photographed: Aug 25, 2014—Sep 27, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Essex County, New Jersey (NJ013)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
UddunB	Udorthents, Dunellen substratum, 0 to 8 percent slopes	D	0.0	0.1%
URDUNB	Urban land, Dunellen substratum, 0 to 8 percent slopes		2.9	99.9%
Totals for Area of Interest			**2.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

TIME OF CONCENTRATION CALCULATIONS

DYNAMIC ENGINEERING

1904 Main Street, Lake Como, NJ 07719
(732) 974-0198

Date: 6/14/2017
Project: Meridia South Orange
Project No: 1084-16-015

Calculated By: JPB
Checked By: RJC

Worksheet 3: Time of Concentration (T_c) Calculations

Land Condition: Existing
Drainage Area: EX-DA-1

- ***Sheet Flow:***

	AB			
1. Surface Description	Smooth Surfaces			
2. Manning's Roughness Coefficient, n	0.011			
3. Flow Length, L { *total* $L \le 100$ *ft* }	100.0 ft			
4. Two-Year 24-hour Rainfall, p_2 for .. Essex County	3.44 in			
5. Land Slope, s *(ft/ft)*	0.020 ft/ft			
6. Travel Time, $T_t = \frac{0.007\,(n\,L)^{0.8}}{p_2^{0.5}\,s^{0.4}}$	0.019 hr	+ 0.000 hr	+ 0.000 hr	= 0.019 hr

- ***Shallow Concentrated Flow:***

	BC	CD	DE	
7. Surface Description	Paved	Paved	Paved	
8. Flow Length, L	82.0 ft	110.0 ft	380.0 ft	
9. Watercourse Slope, s	0.020 ft/ft	0.020 ft/ft	0.006 ft/ft	
10. Average velocity, V { *see Figure 3.1)*	2.87 ft/s	2.87 ft/s	1.57 ft/s	
11. Travel Time, $T_t = \frac{L}{3600\,V}$	0.008 hr	+ 0.011 hr	+ 0.067 hr	= 0.086 hr

- ***Channel Flow:***

12. Pipe Diameter, D				
13. Cross-Sectional Flow Area, A				
14. Wetted Perimeter, p_w				
15. Hydraulic Radius, $r = A / p_w$				
16. Channel Slope, s				
17. Pipe Material				
18. Manning's Roughness Coefficient, n				
19. Velocity, $V = \frac{1.49\,r^{2/3}\,s^{1/2}}{n}$				
20. Flow Length, L				
21. Travel Time, $T_t = \frac{L}{3600\,V}$	0.000 hr	+ 0.000 hr	+ 0.000 hr	= 0.000 hr
22. Watershed or subarea Time of Concentration, T_c { *add* T_t *in steps 6, 11 and 21* }				0.105 hr
				6.3 min

DYNAMIC ENGINEERING

1904 Main Street, Lake Como, NJ 07719
(732) 974-0198

Date: 6/14/2017
Project: Meridia South Orange
Project No: 1084-16-015

Calculated By: JPB
Checked By: RJC

Worksheet 3: Time of Concentration (T_c) Calculations

Land Condition: Existing
Drainage Area: EX-DA-2

- ***Sheet Flow:***

	AB			
1. Surface Description	Smooth Surfaces			
2. Manning's Roughness Coefficient, n	0.011			
3. Flow Length, L { *total* $L \le 100$ *ft* }	100.0 ft			
4. Two-Year 24-hour Rainfall, p_2 for Essex County	3.44 in			
5. Land Slope, s *(ft/ft)*	0.048 ft/ft			
6. Travel Time, $T_t = \frac{0.007\,(n\,L)^{0.8}}{p_2^{0.5}\,s^{0.4}}$	0.014 hr	+ 0.000 hr	+ 0.000 hr	= 0.014 hr

- ***Shallow Concentrated Flow:***

	BC			
7. Surface Description	Paved			
8. Flow Length, L	235.0 ft			
9. Watercourse Slope, s	0.048 ft/ft			
10. Average velocity, V { *see Figure 3.1)*	4.45 ft/s			
11. Travel Time, $T_t = \frac{L}{3600\,V}$	0.015 hr	+ 0.000 hr	+ 0.000 hr	= 0.015 hr

- ***Channel Flow:***

	CD			
12. Pipe Diameter, D	15 in			
13. Cross-Sectional Flow Area, A	1.227 sf			
14. Wetted Perimeter, p_w	3.9 ft			
15. Hydraulic Radius, $r = A / p_w$	0.3 ft			
16. Channel Slope, s	0.063 ft/ft			
17. Pipe Material	RCP			
18. Manning's Roughness Coefficient, n	0.013			
19. Velocity, $V = \frac{1.49\,r^{2/3}\,s^{1/2}}{n}$	13.25 ft/s			
20. Flow Length, L	30.0			
21. Travel Time, $T_t = \frac{L}{3600\,V}$	0.001 hr	+ 0.000 hr	+ 0.000 hr	= 0.001 hr

22. Watershed or subarea Time of Concentration, T_c { *add* T_t *in steps 6, 11 and 21* } . . . . . 0.029 hr

1.7 min

DYNAMIC ENGINEERING

1904 Main Street, Lake Como, NJ 07719
(732) 974-0198

Date: 6/14/2017
Project: Meridia South Orange
Project No: 1084-16-015

Calculated By: JPB
Checked By: RJC

Worksheet 3: Time of Concentration (T_c) Calculations

Land Condition: Proposed
Drainage Area: DA-2 Undetained

- ***Sheet Flow:***

	AB		
1. Surface Description	Smooth Surfaces		
2. Manning's Roughness Coefficient, n	0.011		
3. Flow Length, L { *total* $L \le 100$ *ft* }	50.0 ft		
4. Two-Year 24-hour Rainfall, p_2 for Essex County	3.44 in		
5. Land Slope, s *(ft/ft)*	0.017 ft/ft		
6. Travel Time, $T_t = \frac{0.007\,(n\,L)^{0.8}}{p_2^{0.5}\,s^{0.4}}$	0.012 hr +	0.000 hr +	0.000 hr = 0.012 hr

- ***Shallow Concentrated Flow:***

	BC		
7. Surface Description	Unpaved		
8. Flow Length, L	266.0 ft		
9. Watercourse Slope, s	0.052 ft/ft		
10. Average velocity, V { *see Figure 3.1)*	3.68 ft/s		
11. Travel Time, $T_t = \frac{L}{3600\,V}$	0.020 hr +	0.000 hr +	0.000 hr = 0.020 hr

- ***Channel Flow:***

12. Pipe Diameter, D			
13. Cross-Sectional Flow Area, A			
14. Wetted Perimeter, p_w			
15. Hydraulic Radius, $r = A / p_w$			
16. Channel Slope, s			
17. Pipe Material			
18. Manning's Roughness Coefficient, n			
19. Velocity, $V = \frac{1.49\,r^{2/3}\,s^{1/2}}{n}$			
20. Flow Length, L			
21. Travel Time, $T_t = \frac{L}{3600\,V}$	0.000 hr +	0.000 hr +	0.000 hr = 0.000 hr
22. Watershed or subarea Time of Concentration, T_c { *add* T_t *in steps 6, 11 and 21* }			0.032 hr
			1.9 min

RUNOFF CURVE NUMBER (CN) CALCULATIONS

DYNAMIC ENGINEERING

EXISTING & PROPOSED DRAINAGE AREA SUMMARY AND AVERAGE CURVE NUMBER(CN) CALCULATIONS

Project: Capodagli Property Company, LLC / Meridia, LLC
Job #: 1084-16-015
Location: South Orange

Computed By: JPB
Checked By: RJC
Date: 6/16/2017

Drainage Area	Impervious Area (acre)	Impervious Area (sf)	Curve Number (CN) Used	HSG D - Open Space Area (acre)	HSG D - Open Space Area (sf)	Curve Number (CN) Used	HSG D - Gravel Area (acre)	HSG D - Gravel Area (sf)	Curve Number (CN) Used	Avg. Perv. Curve Number	Total Perv. Area (acres)	Total Area (acres)	TC (Min.)
EX-DA-1	0.39	17,187	98	0.00	-	80	0.00	-	91	N/A	0.00	0.39	10
EX-DA-2	0.52	22,545	98	0.25	10,717	80	0.00	-	91	80	0.25	0.76	10
	0.91			**0.25**			**0.00**				**0.25**	**1.16**	
DA-1 Detained	0.90	39,124	98	0.03	1,415	80	0.00	-	91	80	0.03	0.93	10
DA-2 Undetained	0.01	240	98	0.00	-	80	0.06	2,730	91	91	0.06	0.07	10
DA-3 Undetained	0.14	6,040	98	0.02	900	80	0.00	-	91	80	0.02	0.16	10
	1.04			**0.05**			**0.06**				**0.12**	**1.16**	

Per County Soil Survey -	URDUNB	HSG	D	Soil	Urban Land Dunellen

Description	Runoff Curve Number (CN) (HSG D)
Impervious Surface	98
Open Space (lawn) (good)	80
Gravel	91

INLET AREA CALCULATIONS AND STORMWATER COLLECTION SYSTEM CALCULATIONS (PIPE SIZING)

DYNAMIC ENGINEERING

Stormwater Collection System Calculations

Capodagli Property Company
Project: / Meridia, LLC
Job #: 1084-16-015
Location: South Orange
Design Storm: 100

Computed By: JPB
Checked By: RJC
Date: 6/16/2017
Revised:

NOTES:
1) Design method used is Rational Method
2) Refer to Weighted Runoff Coefficient table for calculation of incremental areas and C values

PIPE SECTION		SUBCATCHMENT AREA	INCREMENTAL		CUMULATIVE	TIME OF CONCENTRATION			I	PEAK RUNOFF		PIPING INPUT			PIPING DATA			
FROM	TO	Area (Acres)	"C"	A x C Ac	A x C (acres)	Tc to Inlet (min)	Tc in Pipe (min.)	Final Tc (min)	(In/Hr)	Q to Inlet (CFS)	Q cum. for Pipe (CFS)	Dia. (In)	Length (Ft)	Man. "n"	Slope (ft/ft)	Pipe Capacity (cfs)	Full Pipe Velocity (fps)	Actual Pipe Velocity (fps)
Basin Out	MH 101	0.55	0.99	0.54	0.54	10.00	0.10	10.00	8.00	4.32	4.32	15	25.0	0.013	0.0060	5.00	4.08	4.64
MH 101	EX-B Inlet	0.00	0.99	0.00	0.54	10.00	0.16	10.10	8.00	0.00	4.32	15	39.0	0.013	0.0060	5.00	4.08	4.64

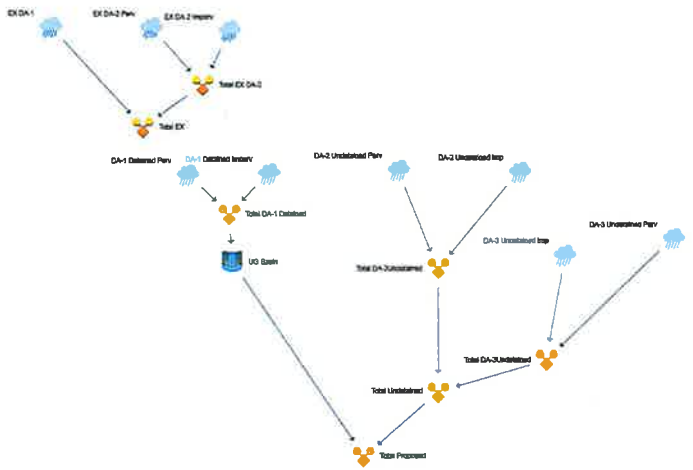
EXISTING & PROPOSED HYDROGRAPHS FOR 2YR, 10YR & 100 YR DESIGN STORMS (HYDROGRAPHS CREATED USING HYDROLOGY STUDIO 2016 COMPUTER SOFTWARE)

Basin Model

Hydrology Studio v 2.0.0.46

Project Name:

06-16-2017



Hydrograph by Return Period

Hydrology Studio v 2.0.0.46

Project Name:

06-16-2017

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Outflow (cfs)							
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
1	SCS Runoff	EX DA-1		0.945			1.444			2.403
3	SCS Runoff	EX DA-2 Perv		0.339			0.659			1.305
4	SCS Runoff	EX DA-2 Imperv		1.260			1.925			3.204
5	Junction	Total EX DA-2		1.599			2.584			4.509
7	Junction	Total EX		2.545			4.028			6.911
9	SCS Runoff	DA-1 Detained Perv		0.041			0.079			0.157
10	SCS Runoff	DA-1 Detained Imperv		2.181			3.331			5.545
11	Junction	Total DA-1 Detained		2.222			3.410			5.702
12	Pond Route	UG Basin		0.563			0.780			4.318
14	SCS Runoff	DA-2 Undetained Perv		0.125			0.205			0.357
15	SCS Runoff	DA-2 Undetained Imp		0.024			0.037			0.062
16	Junction	Total DA-2Undetained		0.149			0.242			0.418
18	SCS Runoff	DA-3 Undetained Perv		0.027			0.053			0.104
19	SCS Runoff	DA-3 Undetained Imp		0.339			0.518			0.863
20	Junction	Total DA-3Undetained		0.366			0.571			0.967
22	Junction	Total Undetained		0.515			0.812			1.385
24	Junction	Total Proposed		0.946			1.430			5.460

Hydrograph 2-yr Summary

Project Name:

06-16-2017

Hydrology Studio v 2.0.0.46

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	SCS Runoff	EX DA-1	0.945	12.17	4,256	---		
3	SCS Runoff	EX DA-2 Perv	0.339	12.17	1,352	---		
4	SCS Runoff	EX DA-2 Imperv	1.260	12.17	5,675	---		
5	Junction	Total EX DA-2	1.599	12.17	7,026	3, 4		
7	Junction	Total EX	2.545	12.17	11,282	1, 5		
9	SCS Runoff	DA-1 Detained Perv	0.041	12.17	162	---		
10	SCS Runoff	DA-1 Detained Imperv	2.181	12.17	9,821	---		
11	Junction	Total DA-1 Detained	2.222	12.17	9,984	9, 10		
12	Pond Route	UG Basin	0.563	12.58	9,971	11	198.39	3,760
14	SCS Runoff	DA-2 Undetained Perv	0.125	12.17	507	---		
15	SCS Runoff	DA-2 Undetained Imp	0.024	12.17	109	---		
16	Junction	Total DA-2Undetained	0.149	12.17	616	14, 15		
18	SCS Runoff	DA-3 Undetained Perv	0.027	12.17	108	---		
19	SCS Runoff	DA-3 Undetained Imp	0.339	12.17	1,528	---		
20	Junction	Total DA-3Undetained	0.366	12.17	1,636	18, 19		
22	Junction	Total Undetained	0.515	12.17	2,252	16, 20		
24	Junction	Total Proposed	0.946	12.17	12,224	12, 22		

Hydrograph Report

Project Name:

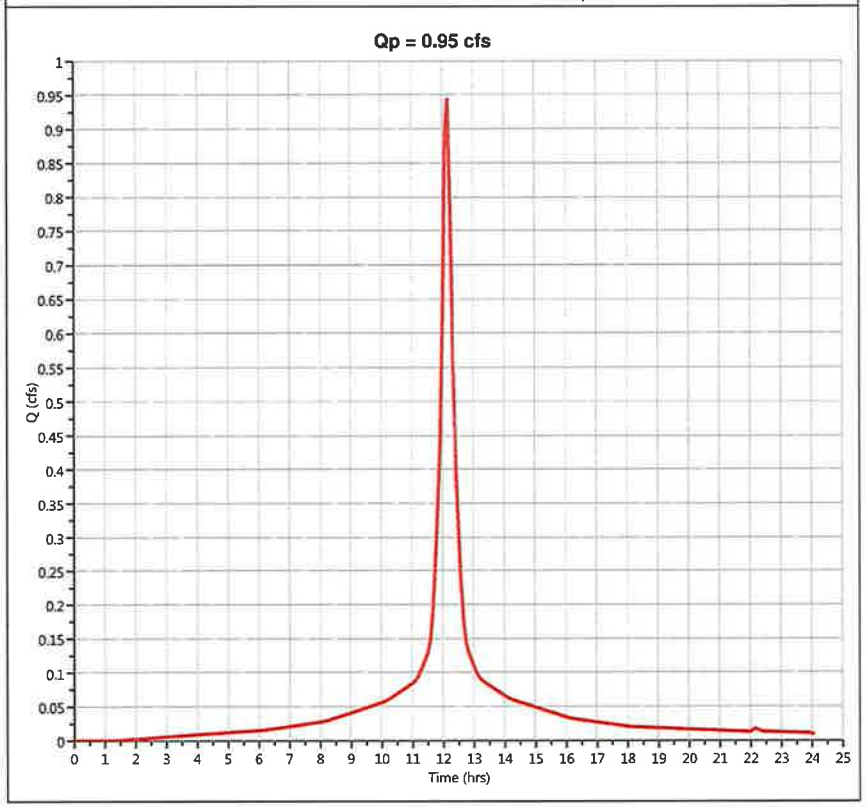
Hydrology Studio v 2.0.0.46

06-16-2017

EX DA-1

Hyd. No. 1

Hydrograph Type	= SCS Runoff	Peak Flow	= 0.945 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 4,256 cuft
Drainage Area	= 0.39 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.4400 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

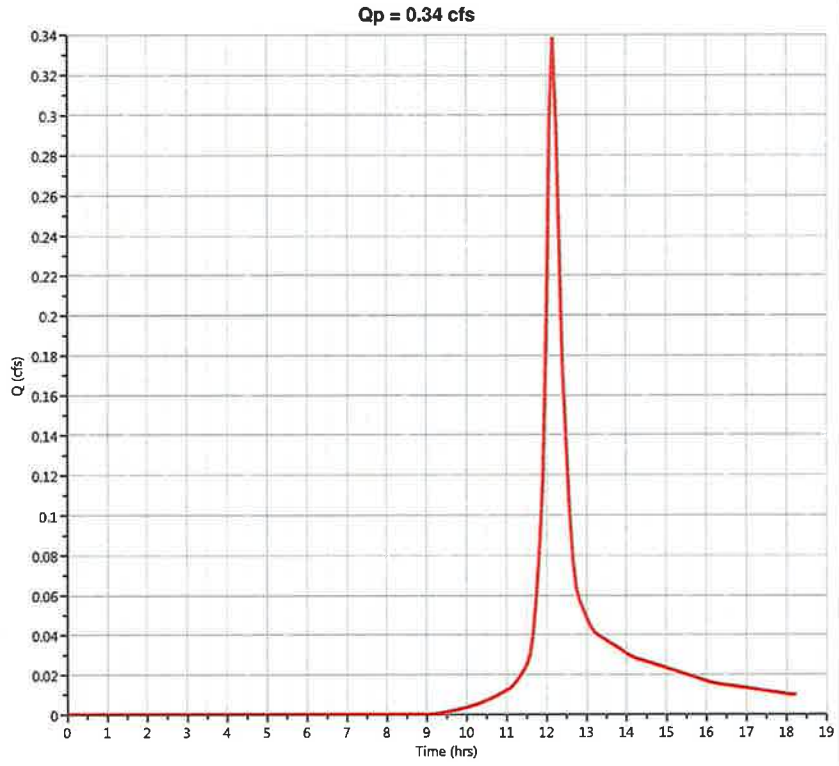
Hydrology Studio v 2.0.0.46

06-16-2017

EX DA-2 Perv

Hyd. No. 3

Hydrograph Type	= SCS Runoff	Peak Flow	= 0.339 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 1,352 cuft
Drainage Area	= 0.25 ac	Curve Number	= 80
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.4400 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

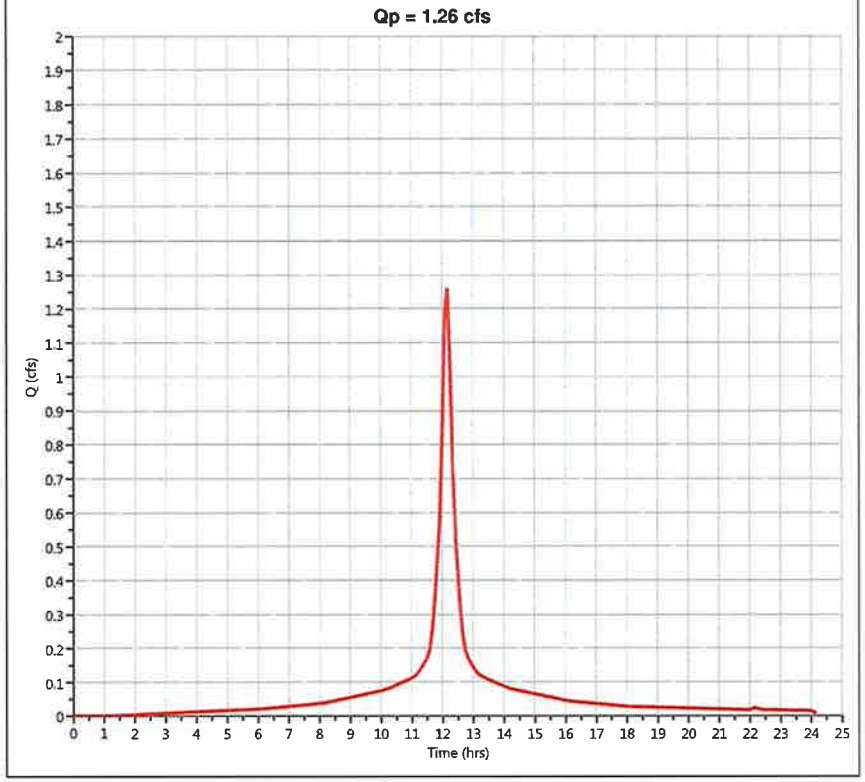
Hydrology Studio v 2.0.0.46

06-16-2017

EX DA-2 Imperv

Hyd. No. 4

Hydrograph Type	= SCS Runoff	Peak Flow	= 1.260 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 5,675 cuft
Drainage Area	= 0.52 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.4400 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

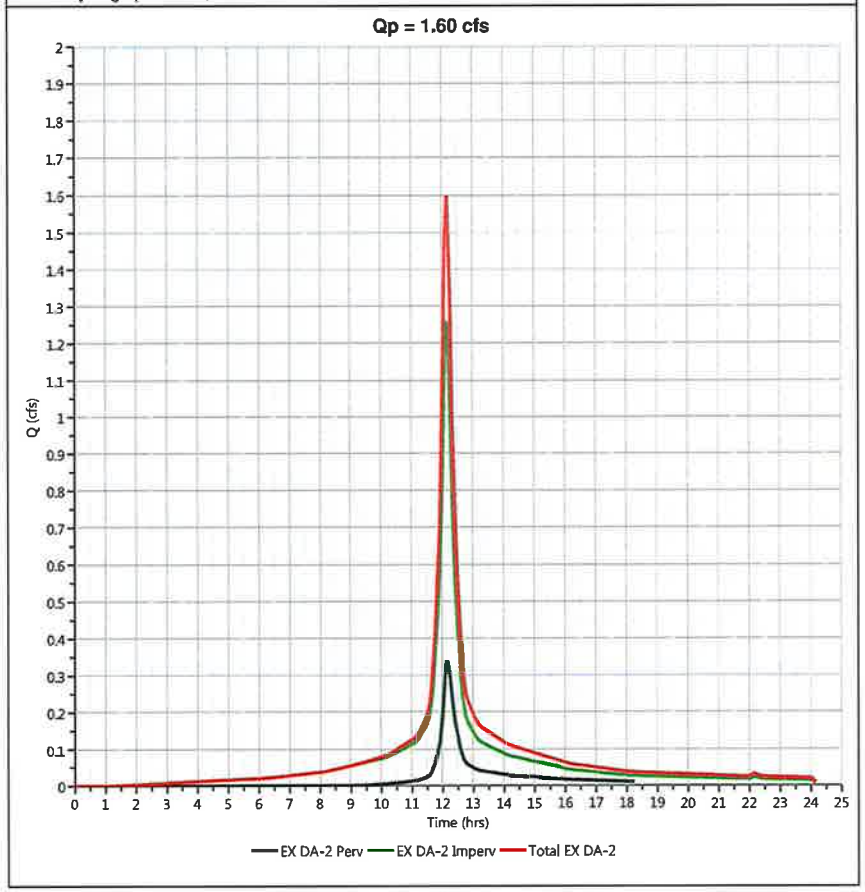
Hydrology Studio v 2.0.0.46

06-16-2017

Total EX DA-2

Hyd. No. 5

Hydrograph Type	= Junction	Peak Flow	= 1.599 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 7,026 cuft
Inflow Hydrographs	= 3, 4	Total Contrib. Area	= 0.77 ac



Hydrograph Report

Project Name:

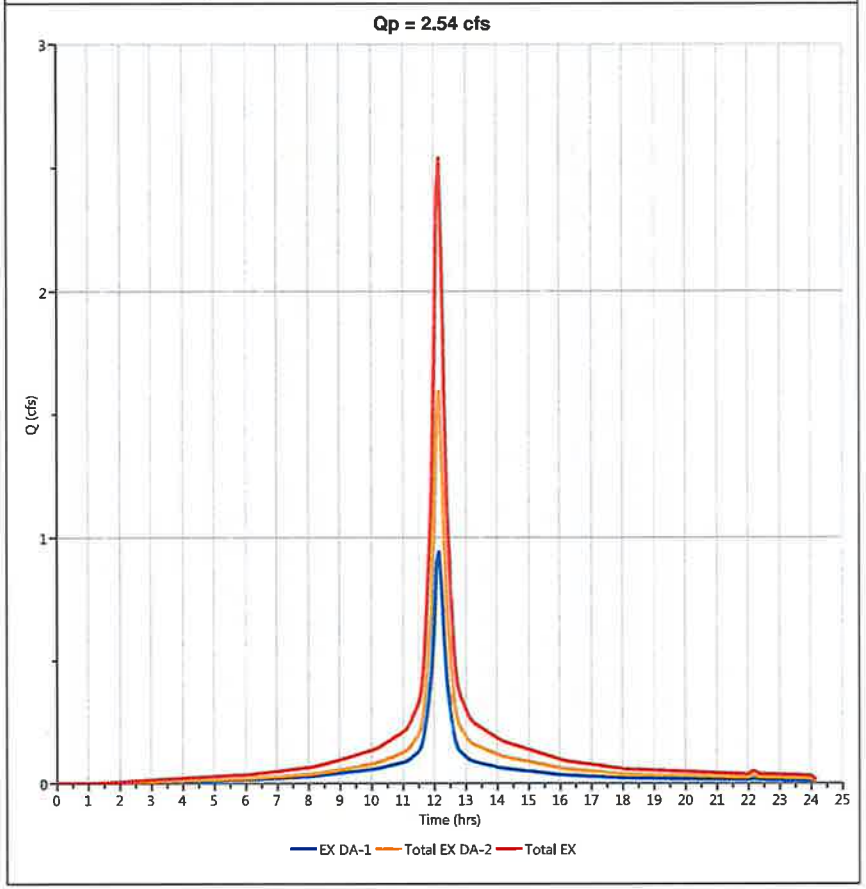
Hydrology Studio v 2.0.0.46

06-16-2017

Total EX

Hyd. No. 7

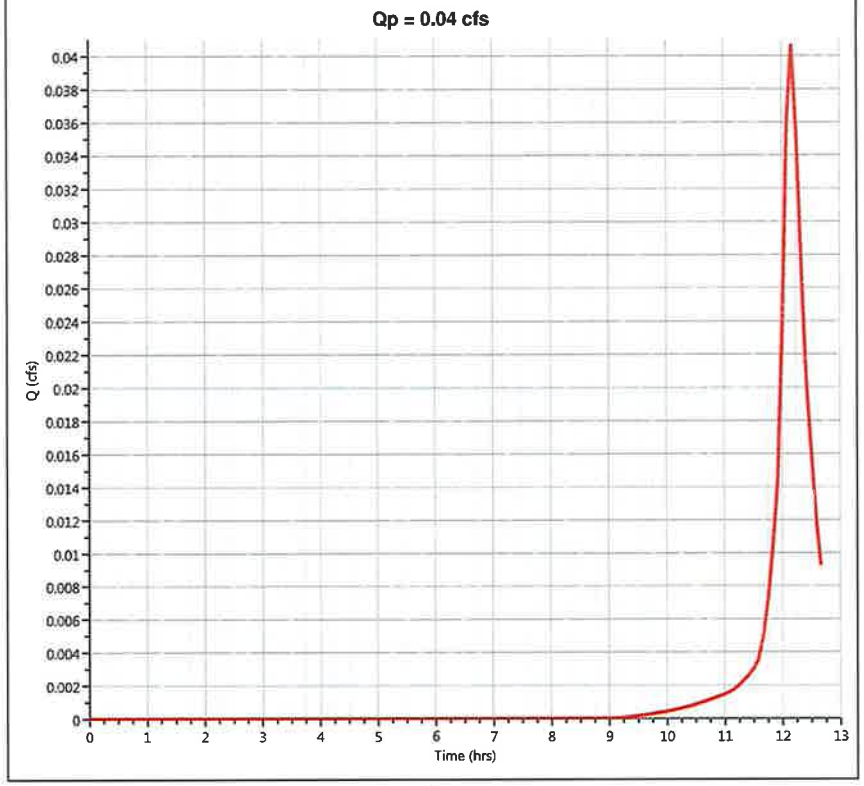
Hydrograph Type	= Junction	Peak Flow	= 2.545 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 11,282 cuft
Inflow Hydrographs	= 1, 5	Total Contrib. Area	= 1.16 ac



DA-1 Detained Perv

Hyd. No. 9

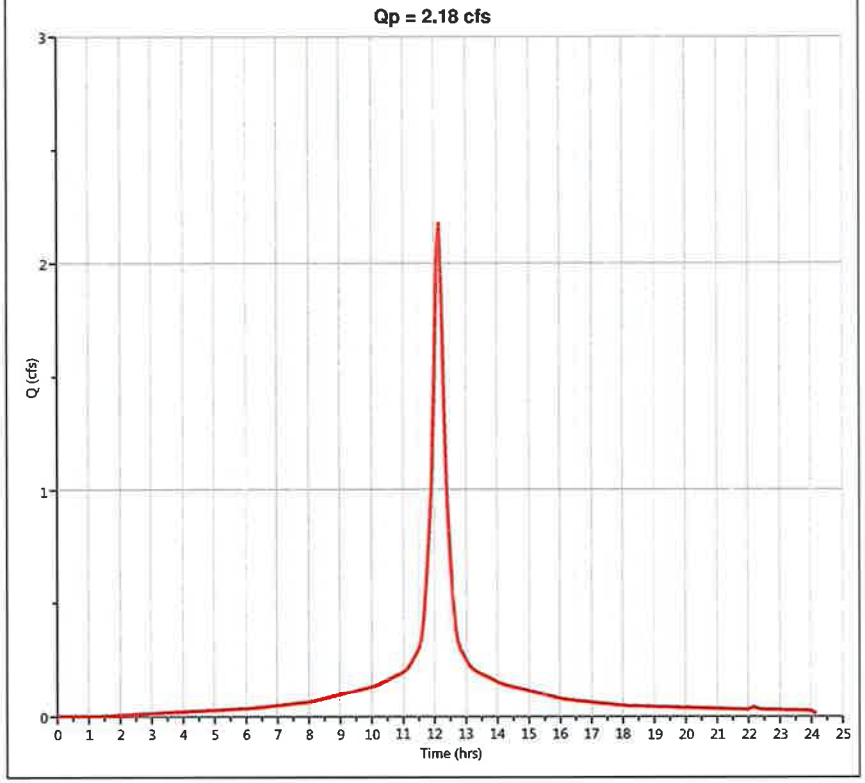
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.041 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 162 cuft
Drainage Area	= 0.03 ac	Curve Number	= 80
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.4400 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



DA-1 Detained Imperv

Hyd. No. 10

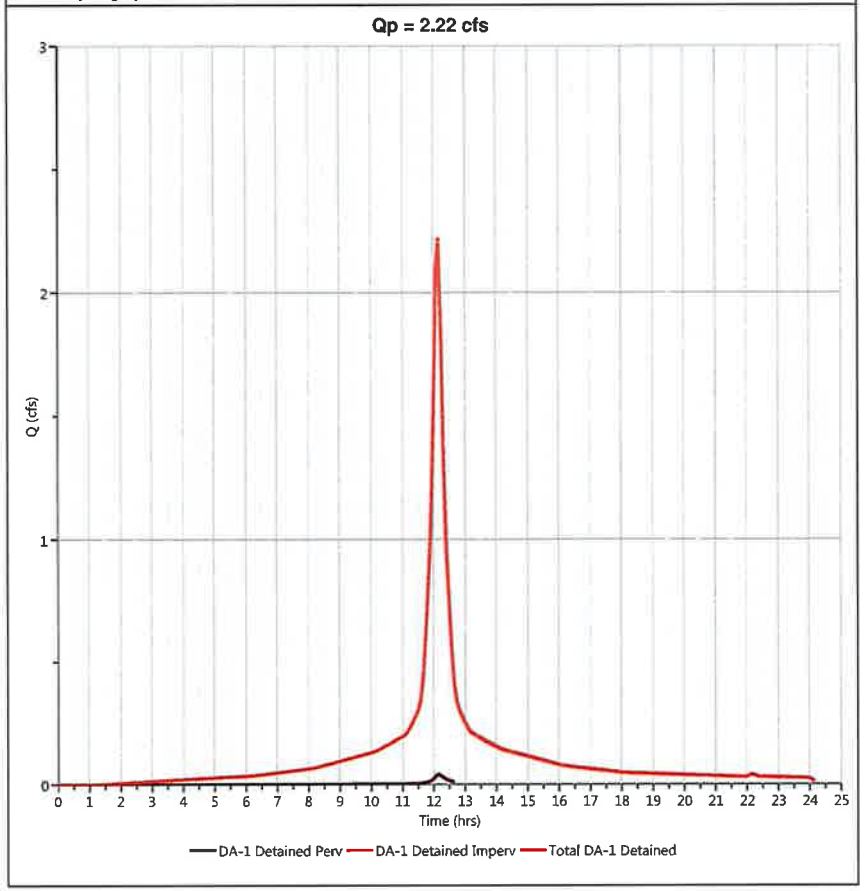
Hydrograph Type	= SCS Runoff	Peak Flow	= 2.181 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 9,821 cuft
Drainage Area	= 0.9 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.4400 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Total DA-1 Detained

Hyd. No. 11

Hydrograph Type	= Junction	Peak Flow	= 2.222 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 9,984 cuft
Inflow Hydrographs	= 9, 10	Total Contrib. Area	= 0.93 ac

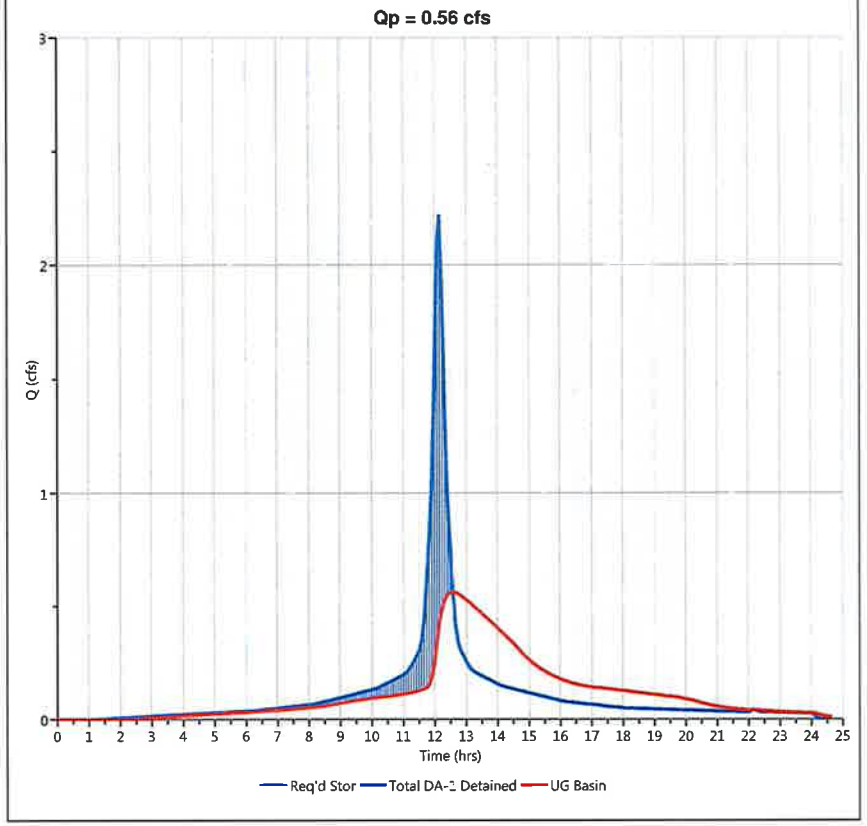


UG Basin

Hyd. No. 12

Hydrograph Type	= Pond Route	Peak Flow	= 0.563 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.58 hrs
Time Interval	= 5 min	Hydrograph Volume	= 9,971 cuft
Inflow Hydrograph	= 11 - Total DA-1 Detained	Max. Elevation	= 198.39 ft
Pond Name	= UG Basin	Max. Storage	= 3,760 cuft

Pond Routing by Storage Indication Method *Center of mass detention time = 1.53 hrs*



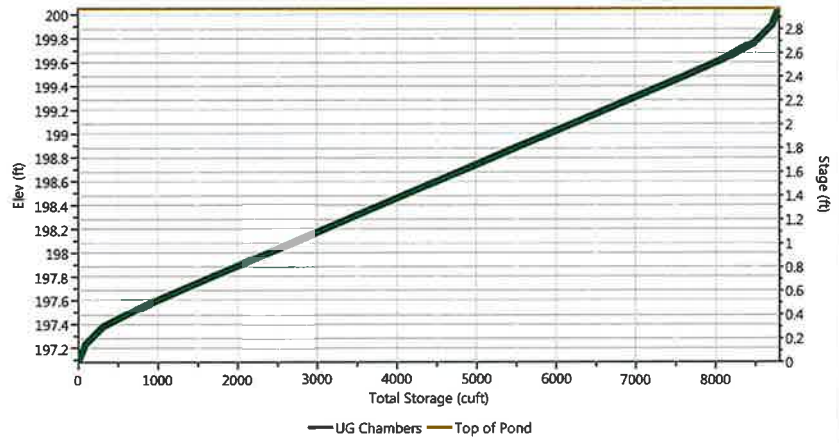
UG Basin

Stage-Storage

Underground Chambers	
Description	Input
Invert Elev Down, ft	197.08
Chamber Rise, ft	2.50
Chamber Shape	Box
Chamber Span, ft	22.00
Barrel Length, ft	160.00
No. Barrels	1
Barrel Slope, %	0.30
Headers, y/n	No
Stone Encasement, y/n	No
Encasement Bottom Elevation, ft	0.00
Encasement Width per Chamber, ft	0.00
Encasement Depth, ft	0.00
Encasement Voids, %	40.00

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	197.08	n/a	0.000	0.000
0.15	197.23	n/a	87.4	87.4
0.30	197.38	n/a	224	311
0.45	197.53	n/a	437	748
0.60	197.68	n/a	505	1,253
0.75	197.83	n/a	525	1,778
0.89	197.97	n/a	525	2,303
1.04	198.12	n/a	525	2,827
1.19	198.27	n/a	525	3,352
1.34	198.42	n/a	525	3,876
1.49	198.57	n/a	525	4,401
1.64	198.72	n/a	525	4,925
1.79	198.87	n/a	525	5,450
1.94	199.02	n/a	525	5,975
2.09	199.17	n/a	525	6,499
2.24	199.32	n/a	525	7,024
2.38	199.46	n/a	525	7,548
2.53	199.61	n/a	505	8,054
2.68	199.76	n/a	437	8,491
2.83	199.91	n/a	224	8,714
2.98	200.06	n/a	87.4	8,802



UG Basin

Stage-Discharge

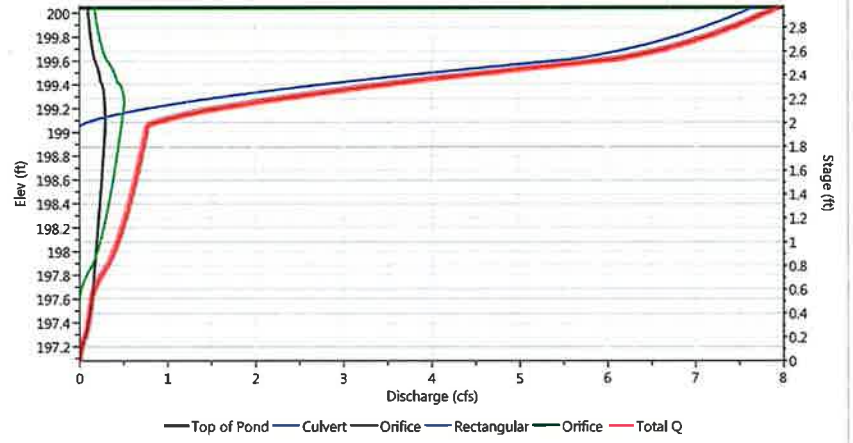
Culvert / Orifices	Culvert	Orifices 1*	Orifices 2*	Orifices 3
Rise, in	15	3	4	
Span, in	15	3	4	
No. Barrels	1	1	1	
Invert Elevation, ft	197.08	197.08	197.6	
Orifice Coefficient, Co	.6	.6	.6	
Length, ft	64			
Barrel Slope, %	.6			
N-Value, n	0.013			

Weirs	Riser*	Weirs 1*	Weirs 2	Weirs 3
Shape / Type		Rectangular		
Crest Elevation, ft		199.05		
Crest Length, ft		4		
Angle, deg				
Weir Coefficient, Cw		3.3		

Perforated Riser	
Perf. Rise, in	
Perf. Span, in	
No. Perforations	
Invert Elevation, ft	
Height, ft	
Orifice Coefficient, Co	

Ancillary	
Exfiltration, in/hr	
Tailwater Elevation, ft	

*Routes through Culvert.



Pond Report

Project Name:

Hydrology Studio v 2.0.0.46

06-16-2017

UG Basin

Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	197.08	0.000	0.00	0.00	0.00			0.00						0.00
0.15	197.23	87.4	0.037 ic	0.037	0.00			0.00						0.037
0.30	197.38	311	0.099 ic	0.095	0.00			0.00						0.095
0.45	197.53	748	0.127 ic	0.127	0.00			0.00						0.127
0.60	197.68	1,253	0.172 ic	0.152	0.014			0.00						0.166
0.75	197.83	1,778	0.275 ic	0.169	0.102			0.00						0.270
0.89	197.97	2,303	0.390 ic	0.185	0.191			0.00						0.376
1.04	198.12	2,827	0.458 ic	0.203	0.251			0.00						0.454
1.19	198.27	3,352	0.533 ic	0.219	0.299			0.00						0.518
1.34	198.42	3,876	0.587 ic	0.235	0.340			0.00						0.575
1.49	198.57	4,401	0.644 ic	0.250	0.377			0.00						0.627
1.64	198.72	4,925	0.675 ic	0.265	0.410			0.00						0.675
1.79	198.87	5,450	0.735 ic	0.279	0.441			0.00						0.720
1.94	199.02	5,975	0.766 ic	0.293	0.470			0.00						0.762
2.09	199.17	6,499	1.329 ic	0.293	0.497			0.521						1.312
2.24	199.32	7,024	2.606 oc	0.281	0.500			1.801						2.582
2.38	199.46	7,548	4.168 oc	0.235	0.417			3.516						4.168
2.53	199.61	8,054	6.049 oc	0.174	0.310			5.564 s						6.048
2.68	199.76	8,491	6.951 oc	0.137	0.243			6.571 s						6.950
2.83	199.91	8,714	7.522 oc	0.113	0.201			7.207 s						7.521
2.98	200.06	8,802	7.968 oc	0.097	0.172			7.699 s						7.967

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

Hydrograph Report

Project Name:

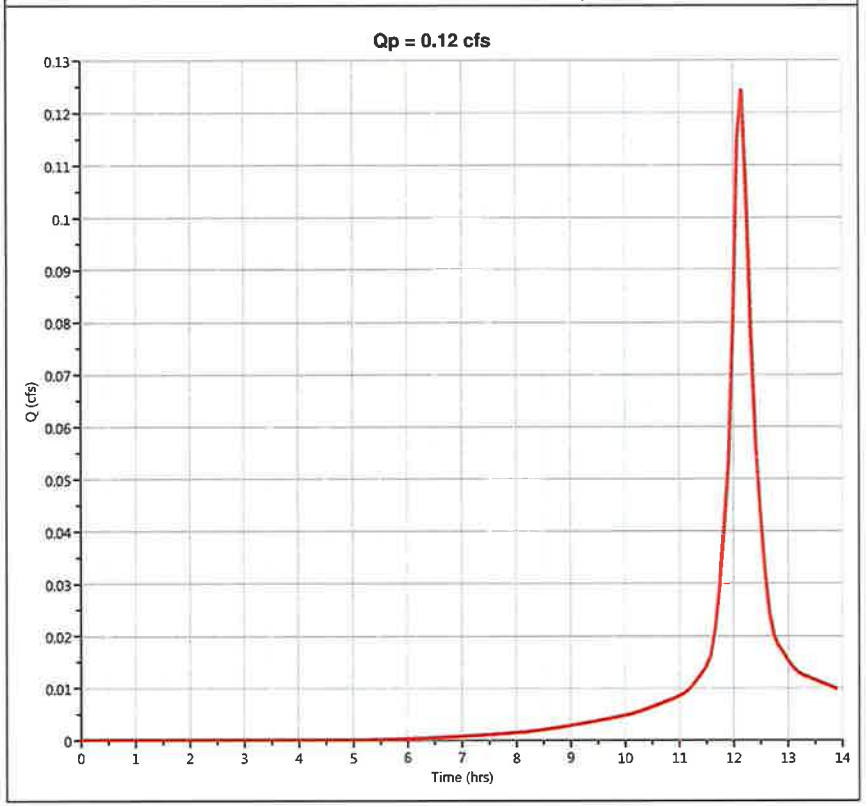
Hydrology Studio v 2.0.0.46

06-16-2017

DA-2 Undetained Perv

Hyd. No. 14

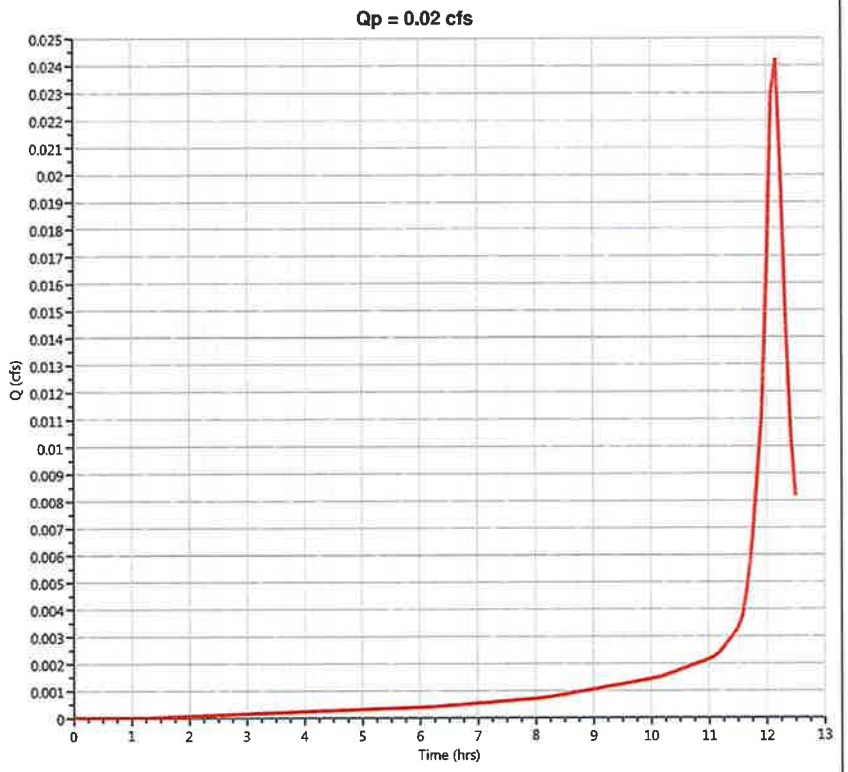
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.125 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 507 cuft
Drainage Area	= 0.06 ac	Curve Number	= 91
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.4400 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



DA-2 Undetained Imp

Hyd. No. 15

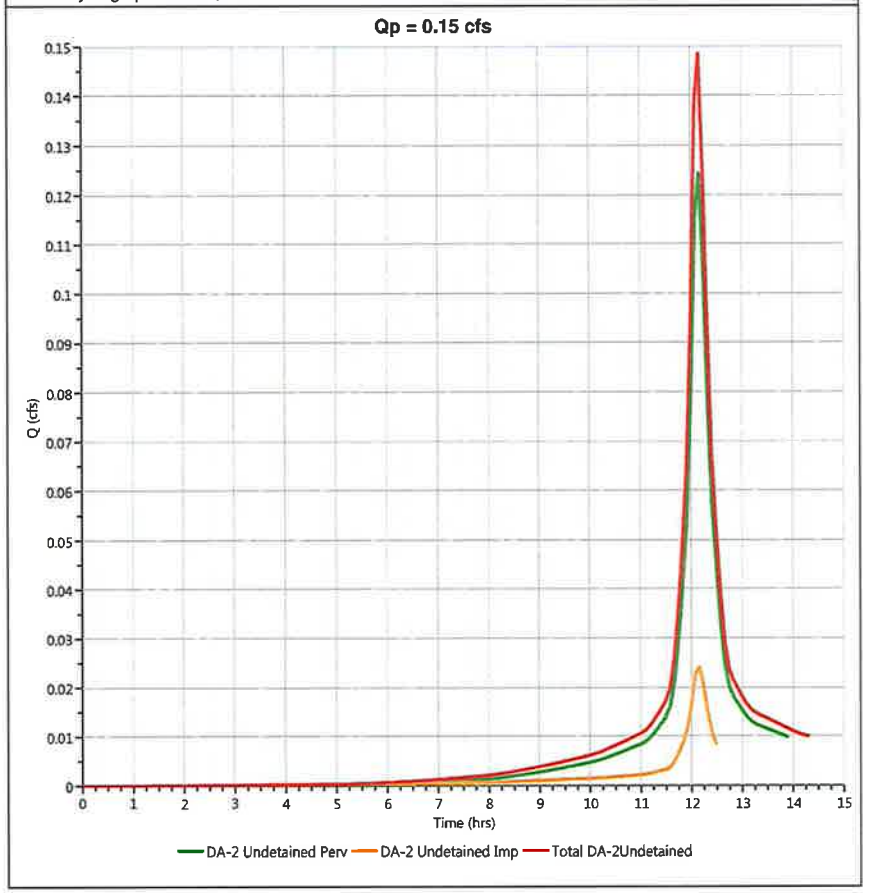
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.024 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 109 cuft
Drainage Area	= 0.01 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.4400 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Total DA-2Undetained

Hyd. No. 16

Hydrograph Type	= Junction	Peak Flow	= 0.149 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 616 cuft
Inflow Hydrographs	= 14, 15	Total Contrib. Area	= 0.07 ac



Hydrograph Report

Project Name:

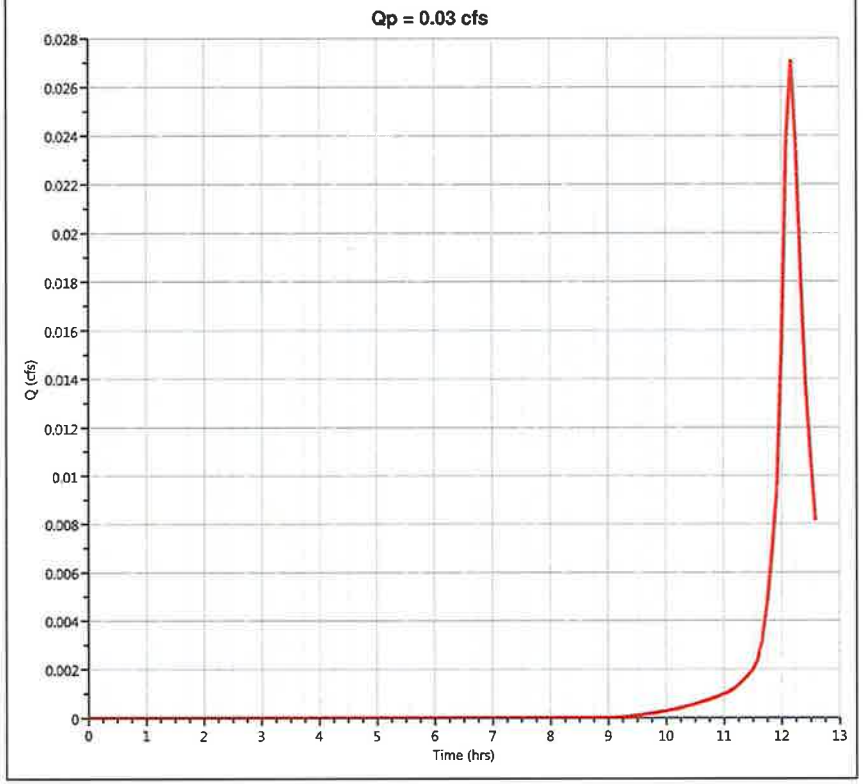
Hydrology Studio v 2.0.0.46

06-16-2017

DA-3 Undetained Perv

Hyd. No. 18

Hydrograph Type	= SCS Runoff	Peak Flow	= 0.027 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 108 cuft
Drainage Area	= 0.02 ac	Curve Number	= 80
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.4400 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

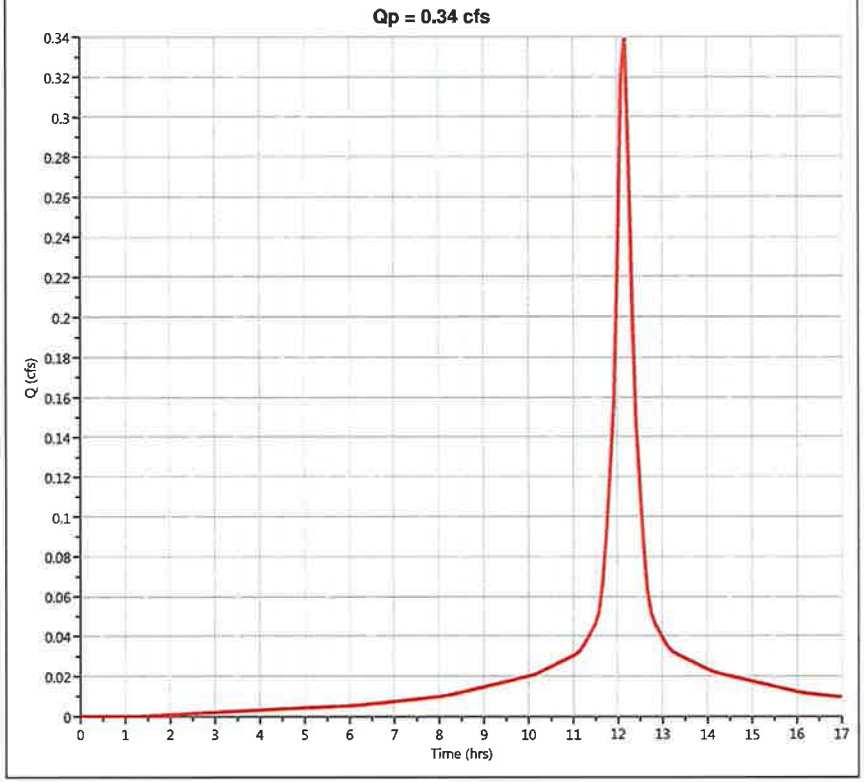
Hydrology Studio v 2.0.0.46

06-16-2017

DA-3 Undetained Imp

Hyd. No. 19

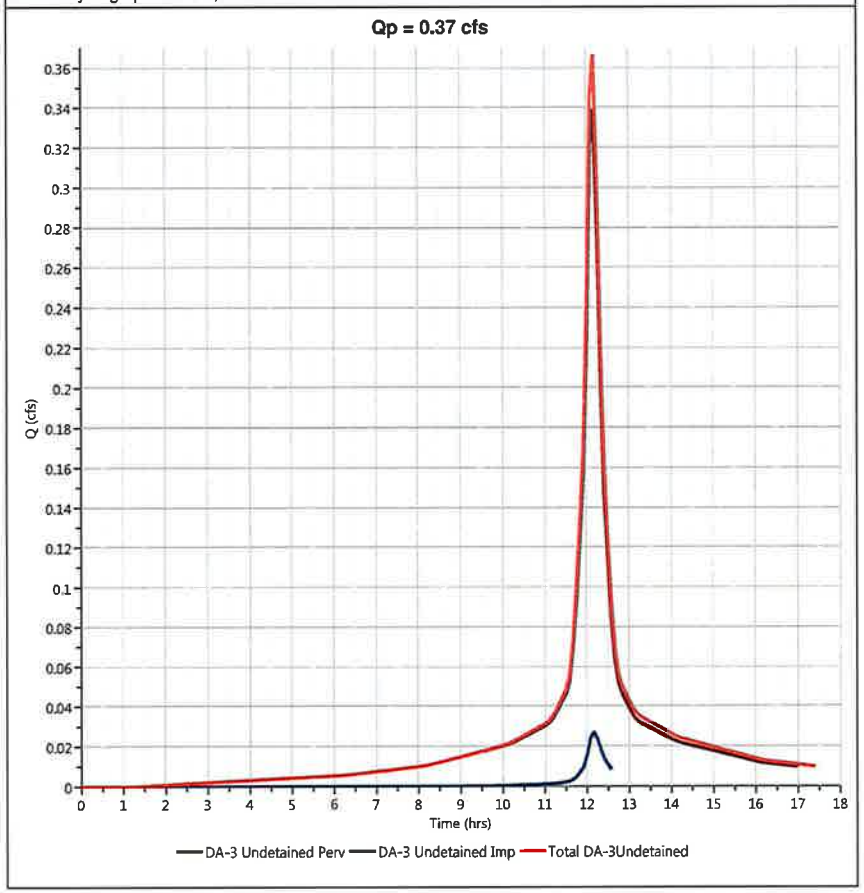
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.339 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 1,528 cuft
Drainage Area	= 0.14 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.4400 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Total DA-3Undetained

Hyd. No. 20

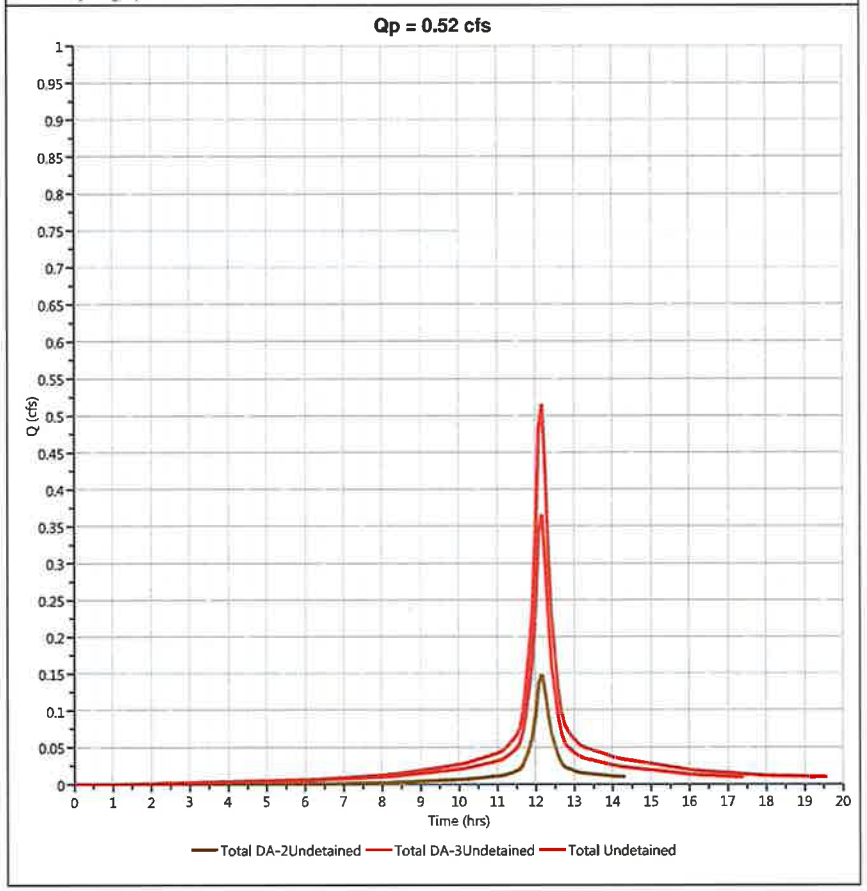
Hydrograph Type	= Junction	Peak Flow	= 0.366 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 1,636 cuft
Inflow Hydrographs	= 18, 19	Total Contrib. Area	= 0.16 ac



Total Undetained

Hyd. No. 22

Hydrograph Type	= Junction	Peak Flow	= 0.515 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 2,252 cuft
Inflow Hydrographs	= 16, 20	Total Contrib. Area	= 0.23 ac



Hydrograph Report

Project Name:

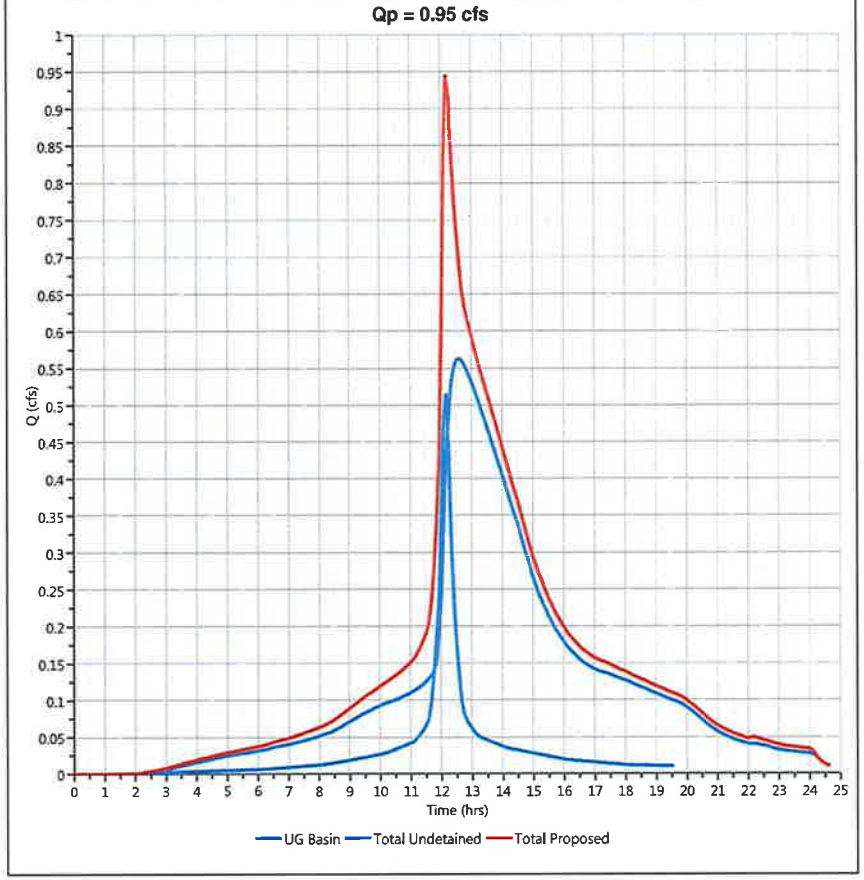
Hydrology Studio v 2.0.0.46

06-16-2017

Total Proposed

Hyd. No. 24

Hydrograph Type	= Junction	Peak Flow	= 0.946 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 12,224 cuft
Inflow Hydrographs	= 12, 22	Total Contrib. Area	= 0.23 ac



Hydrograph 10-yr Summary

Project Name:

06-16-2017

Hydrology Studio v 2.0.0.46

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	SCS Runoff	EX DA-1	1.444	12.17	6,613	—		
3	SCS Runoff	EX DA-2 Perv	0.659	12.17	2,625	—		
4	SCS Runoff	EX DA-2 Imperv	1.925	12.17	8,818	—		
5	Junction	Total EX DA-2	2.584	12.17	11,443	3, 4		
7	Junction	Total EX	4.028	12.17	18,056	1, 5		
9	SCS Runoff	DA-1 Detained Perv	0.079	12.17	315	—		
10	SCS Runoff	DA-1 Detained Imperv	3.331	12.17	15,261	—		
11	Junction	Total DA-1 Detained	3.410	12.17	15,576	9, 10		
12	Pond Route	UG Basin	0.780	12.58	15,564	11	199.06	6,103
14	SCS Runoff	DA-2 Undetained Perv	0.205	12.17	857	—		
15	SCS Runoff	DA-2 Undetained Imp	0.037	12.17	170	—		
16	Junction	Total DA-2Undetained	0.242	12.17	1,026	14, 15		
18	SCS Runoff	DA-3 Undetained Perv	0.053	12.17	210	—		
19	SCS Runoff	DA-3 Undetained Imp	0.518	12.17	2,374	—		
20	Junction	Total DA-3Undetained	0.571	12.17	2,584	18, 19		
22	Junction	Total Undetained	0.812	12.17	3,610	16, 20		
24	Junction	Total Proposed	1.430	12.17	19,175	12, 22		

Hydrograph Report

Project Name:

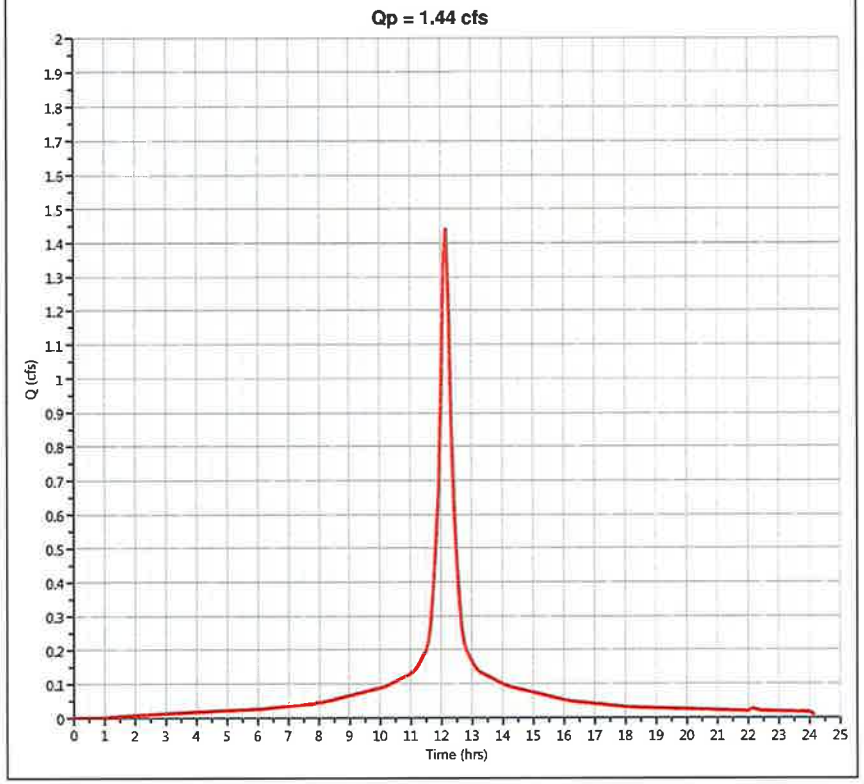
Hydrology Studio v 2.0.0.46

06-16-2017

EX DA-1

Hyd. No. 1

Hydrograph Type	= SCS Runoff	Peak Flow	= 1.444 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 6,613 cuft
Drainage Area	= 0.39 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 5.2200 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

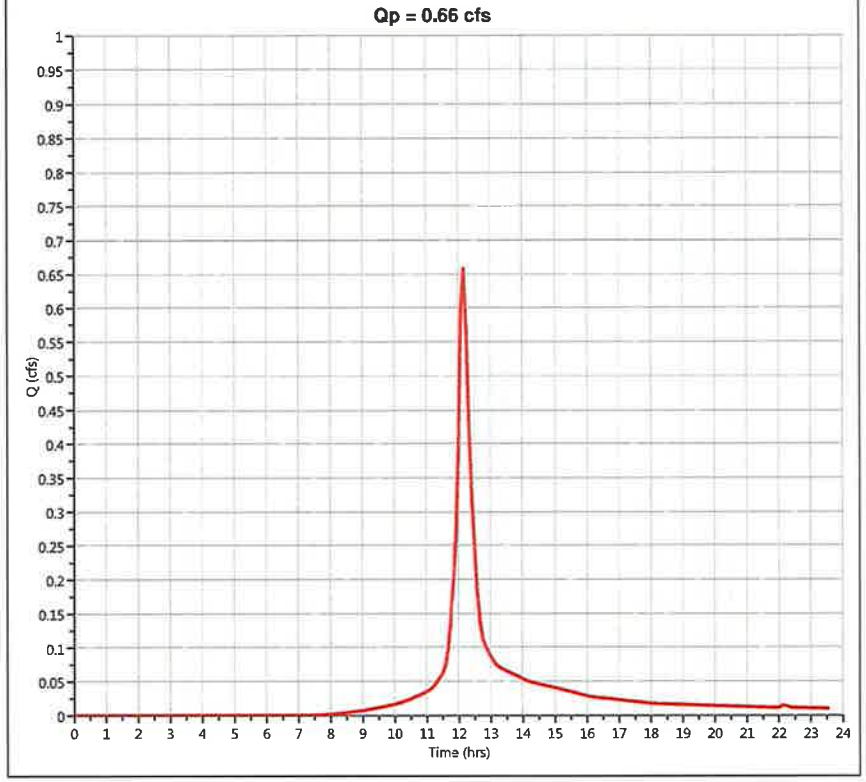
Hydrology Studio v 2.0.0.46

06-16-2017

EX DA-2 Perv

Hyd. No. 3

Hydrograph Type	= SCS Runoff	Peak Flow	= 0.659 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 2,625 cuft
Drainage Area	= 0.25 ac	Curve Number	= 80
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 5.2200 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

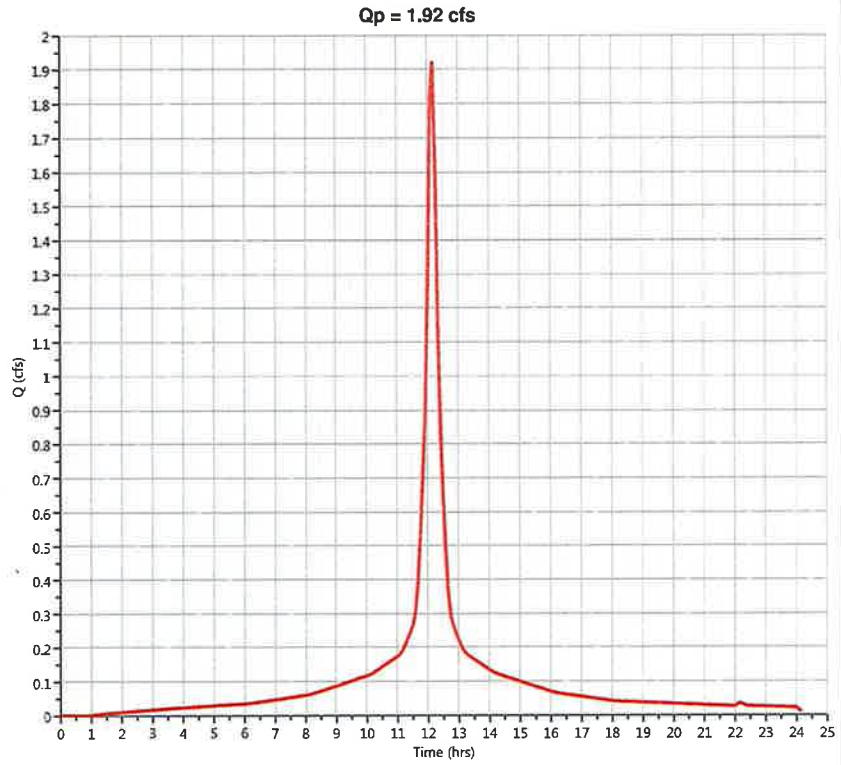
Hydrology Studio v 2.0.0.46

06-16-2017

EX DA-2 Imperv

Hyd. No. 4

Hydrograph Type	= SCS Runoff	Peak Flow	= 1.925 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 8,818 cuft
Drainage Area	= 0.52 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 5.2200 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

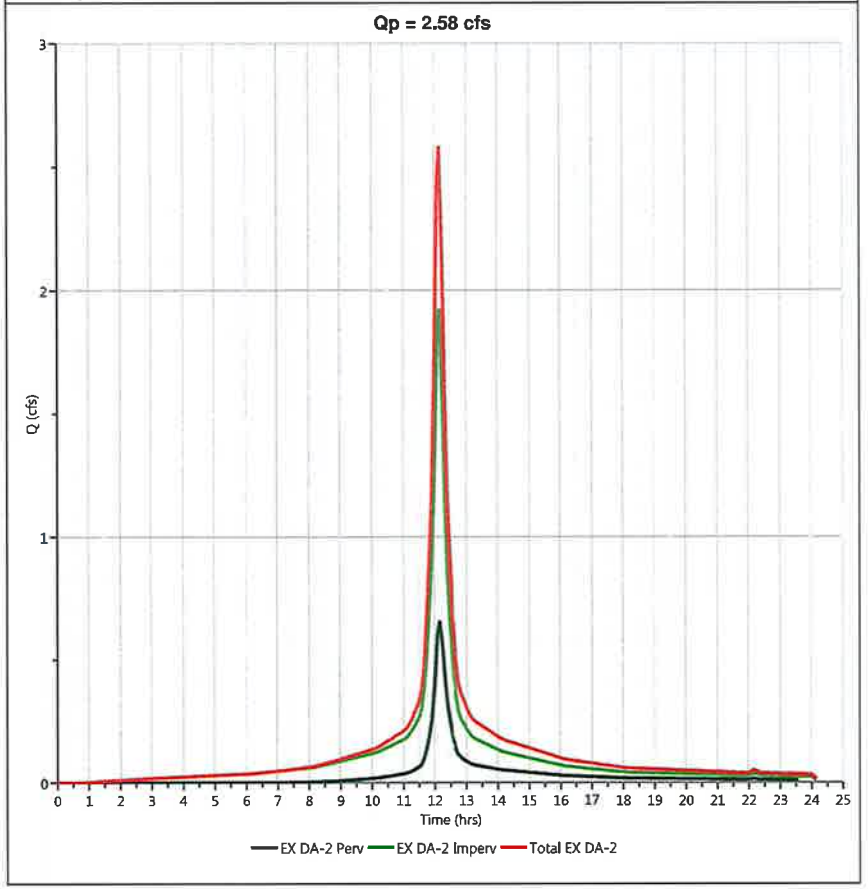
Hydrology Studio v 2.0.0.46

06-16-2017

Total EX DA-2

Hyd. No. 5

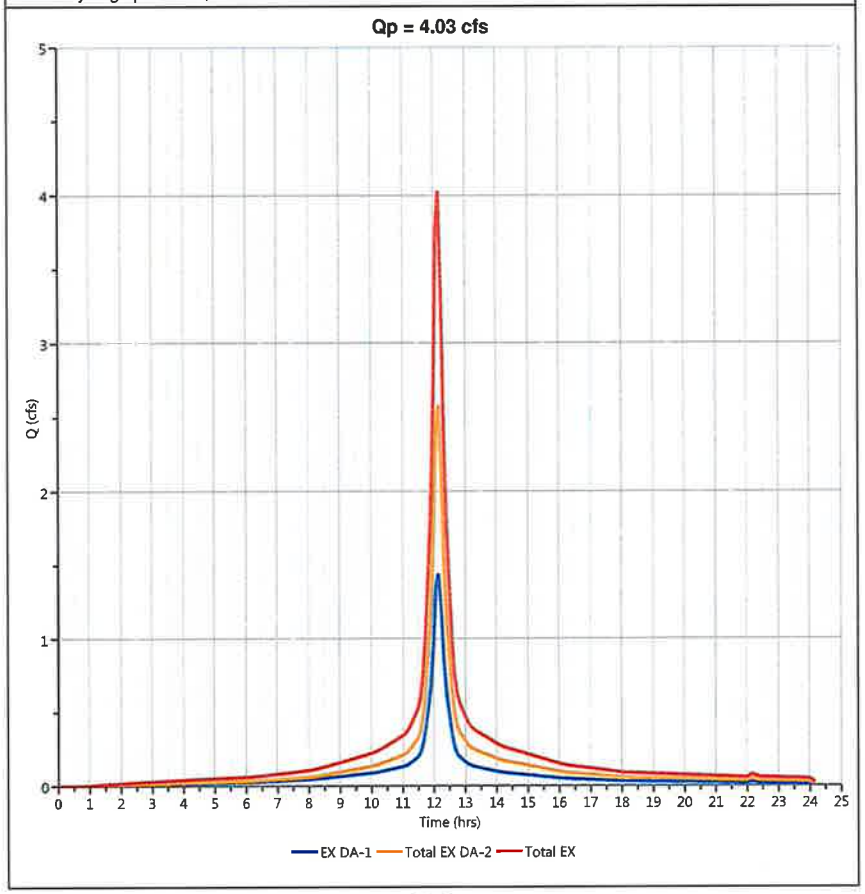
Hydrograph Type	= Junction	Peak Flow	= 2.584 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 11,443 cuft
Inflow Hydrographs	= 3, 4	Total Contrib. Area	= 0.77 ac



Total EX

Hyd. No. 7

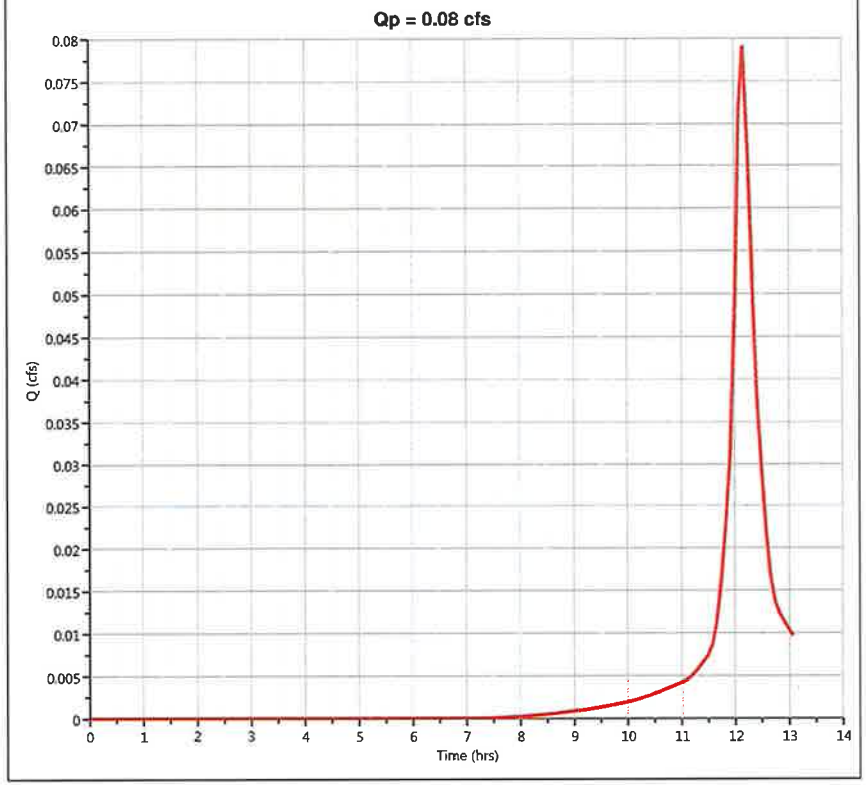
Hydrograph Type	= Junction	Peak Flow	= 4.028 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 18,056 cuft
Inflow Hydrographs	= 1, 5	Total Contrib. Area	= 1.16 ac



DA-1 Detained Perv

Hyd. No. 9

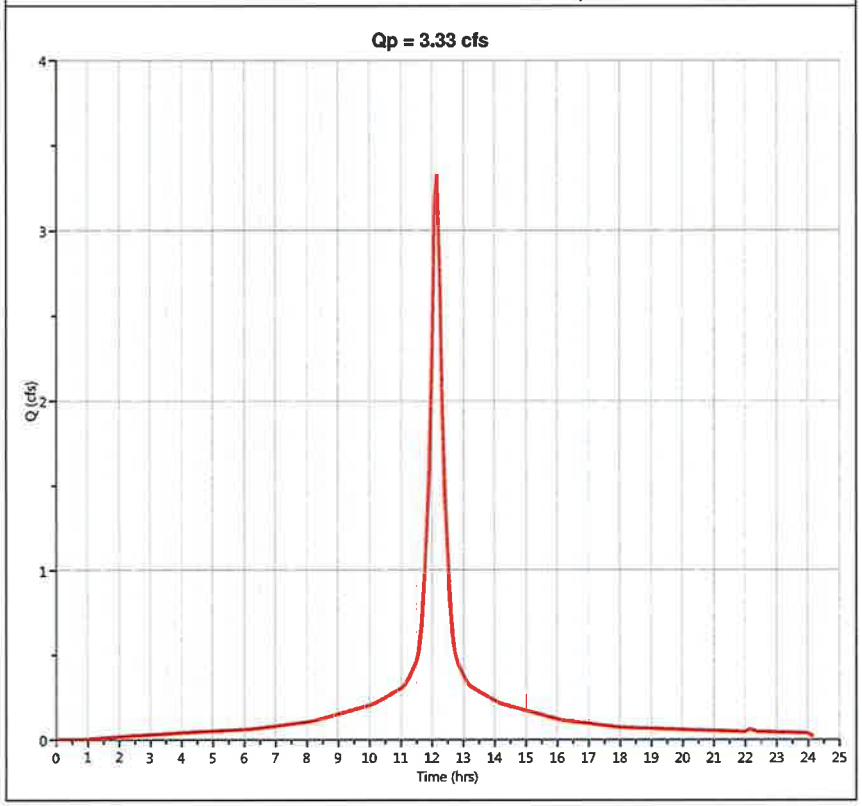
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.079 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 315 cuft
Drainage Area	= 0.03 ac	Curve Number	= 80
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 5.2200 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



DA-1 Detained Imperv

Hyd. No. 10

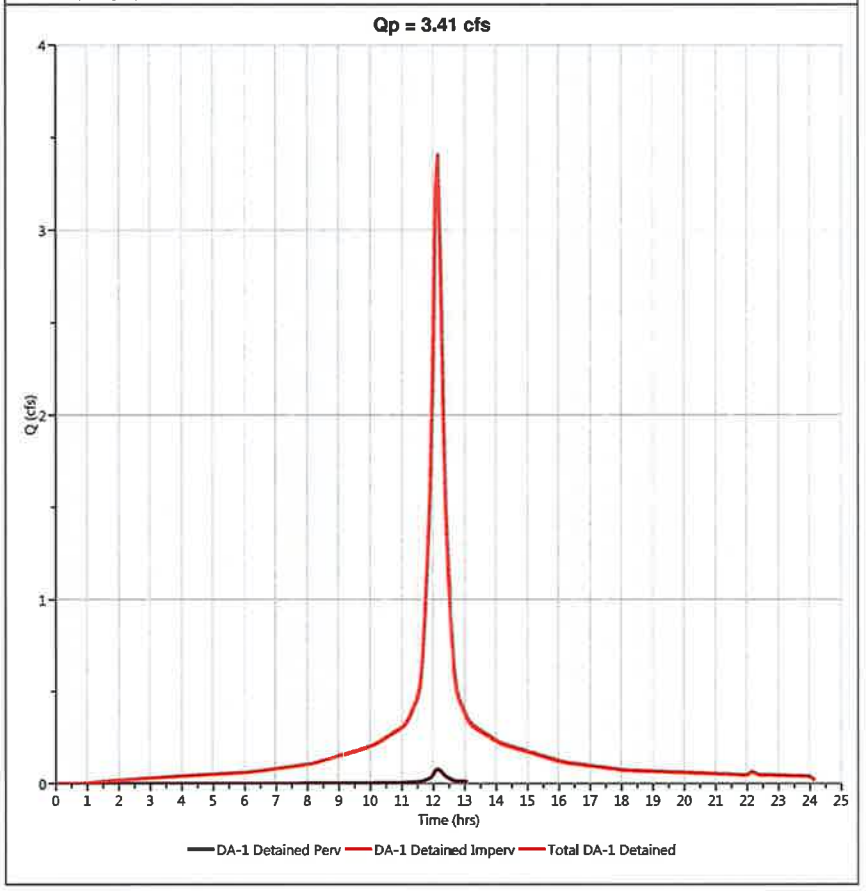
Hydrograph Type	= SCS Runoff	Peak Flow	= 3.331 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 15,261 cuft
Drainage Area	= 0.9 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 5.2200 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Total DA-1 Detained

Hyd. No. 11

Hydrograph Type	= Junction	Peak Flow	= 3.410 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 15,576 cuft
Inflow Hydrographs	= 9, 10	Total Contrib. Area	= 0.93 ac

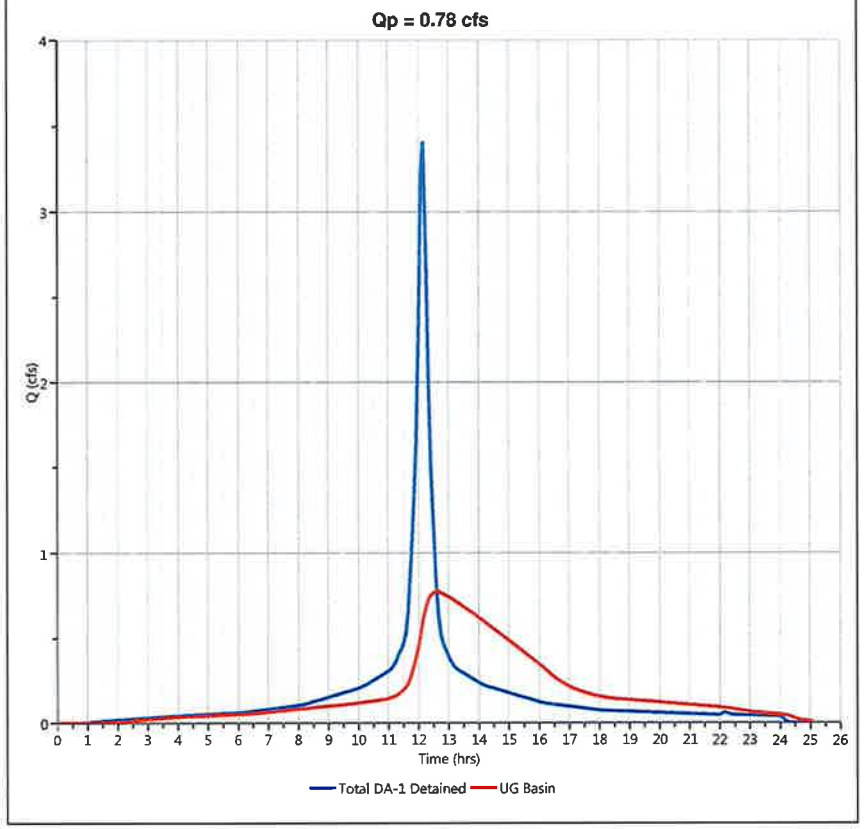


UG Basin

Hyd. No. 12

Hydrograph Type	= Pond Route	Peak Flow	= 0.780 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.58 hrs
Time Interval	= 5 min	Hydrograph Volume	= 15,564 cuft
Inflow Hydrograph	= 11 - Total DA-1 Detained	Max. Elevation	= 199.06 ft
Pond Name	= UG Basin	Max. Storage	= 6,103 cuft

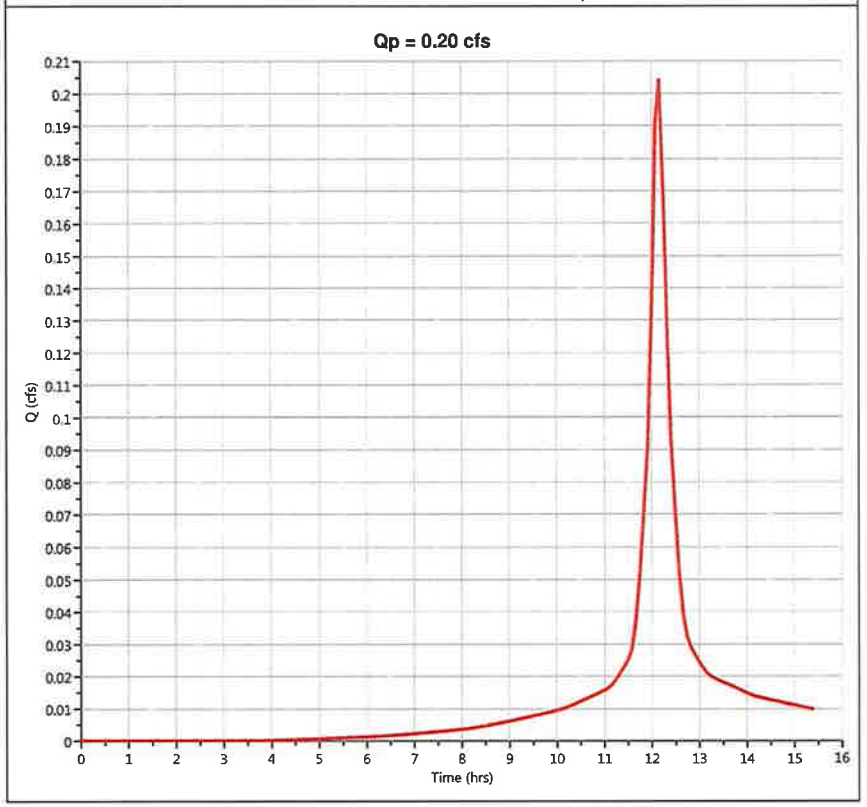
Pond Routing by Storage Indication Method *Center of mass detention time = 1.73 hrs*



DA-2 Undetained Perv

Hyd. No. 14

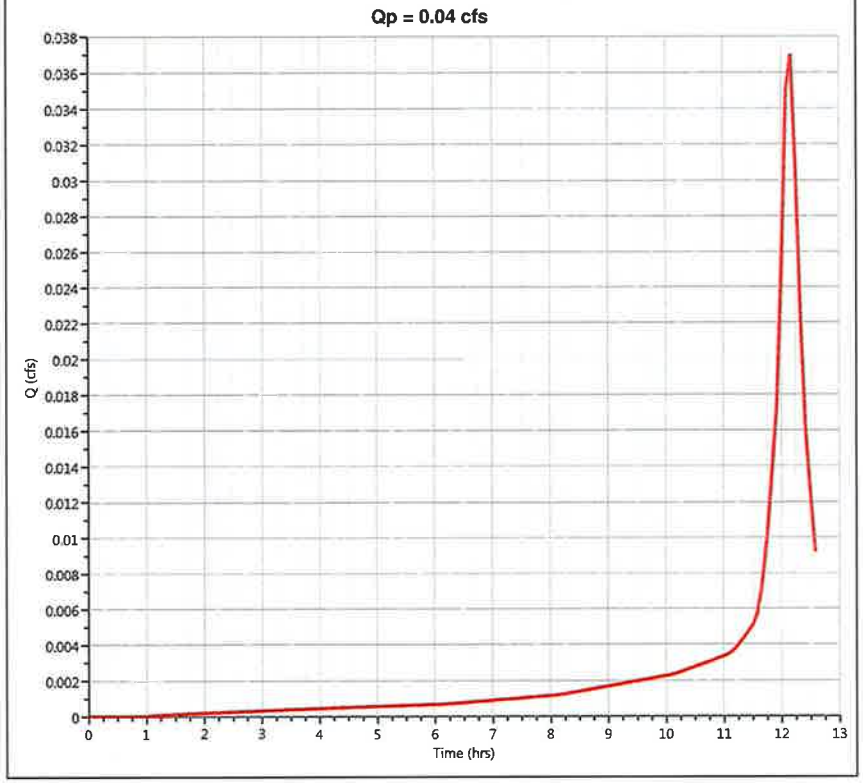
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.205 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 857 cuft
Drainage Area	= 0.06 ac	Curve Number	= 91
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 5.2200 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



DA-2 Undetained Imp

Hyd. No. 15

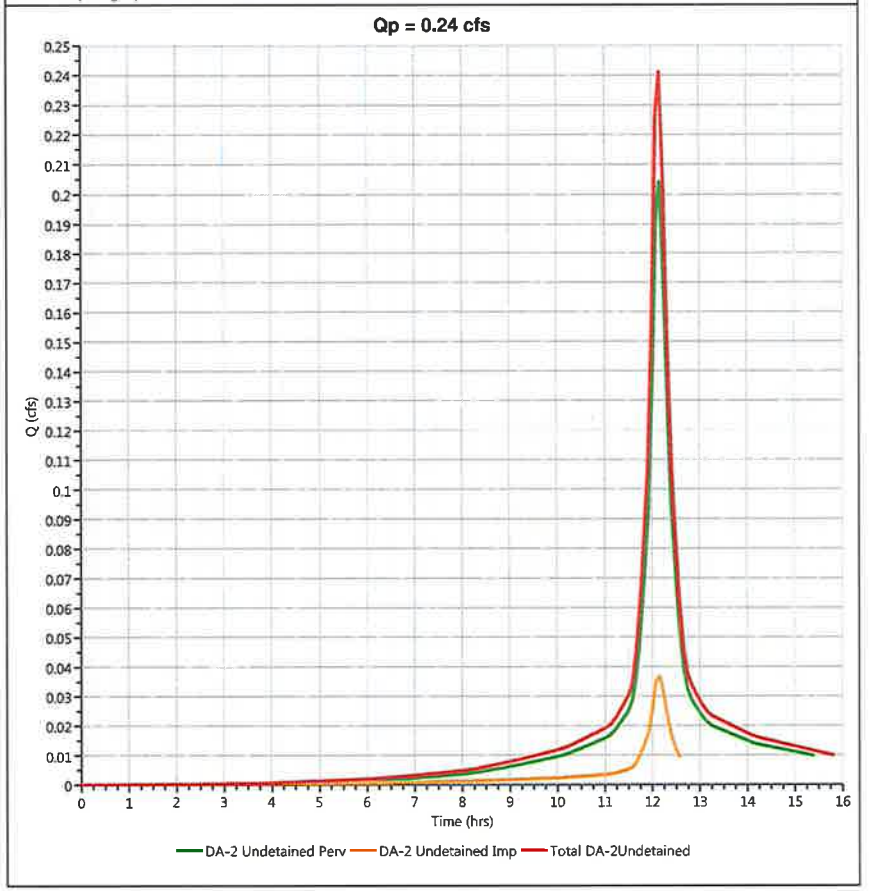
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.037 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 170 cuft
Drainage Area	= 0.01 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 5.2200 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Total DA-2Undetained

Hyd. No. 16

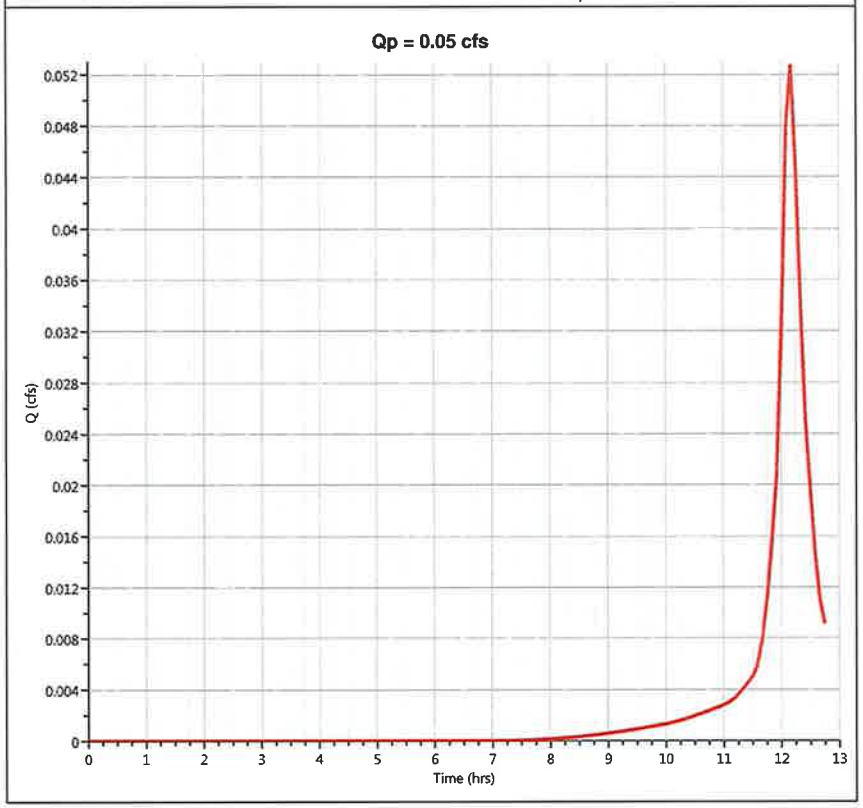
Hydrograph Type	= Junction	Peak Flow	= 0.242 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 1,026 cuft
Inflow Hydrographs	= 14, 15	Total Contrib. Area	= 0.07 ac



DA-3 Undetained Perv

Hyd. No. 18

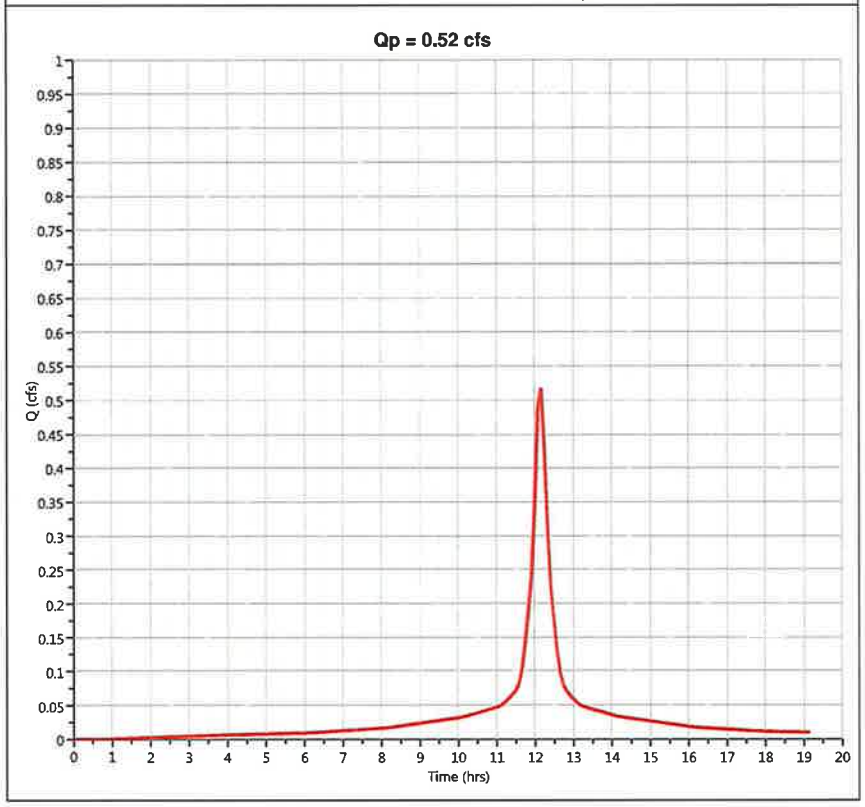
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.053 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 210 cuft
Drainage Area	= 0.02 ac	Curve Number	= 80
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 5.2200 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



DA-3 Undetained Imp

Hyd. No. 19

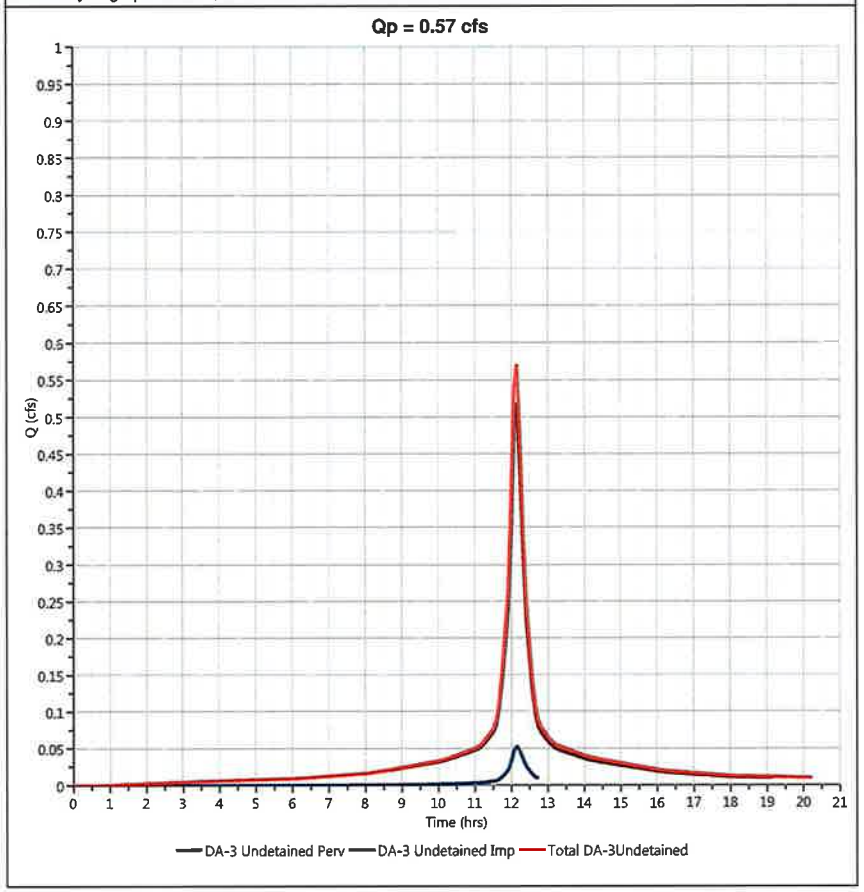
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.518 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 2,374 cuft
Drainage Area	= 0.14 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 5.2200 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Total DA-3Undetained

Hyd. No. 20

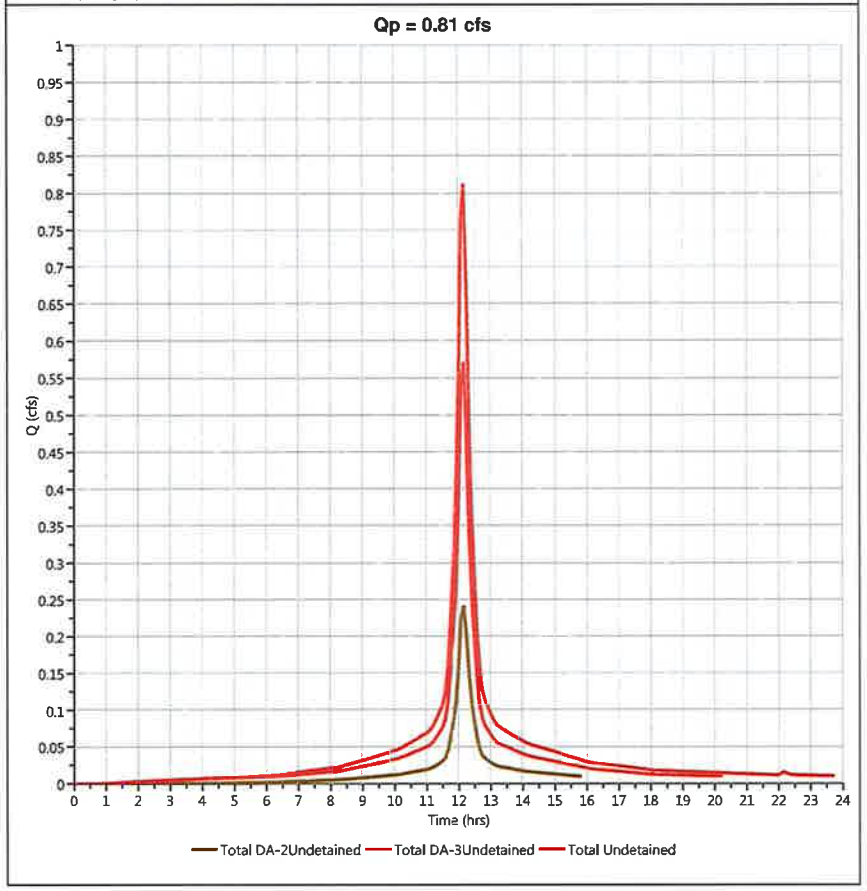
Hydrograph Type	= Junction	Peak Flow	= 0.571 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 2,584 cuft
Inflow Hydrographs	= 18, 19	Total Contrib. Area	= 0.16 ac



Total Undetained

Hyd. No. 22

Hydrograph Type	= Junction	Peak Flow	= 0.812 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 3,610 cuft
Inflow Hydrographs	= 16, 20	Total Contrib. Area	= 0.23 ac



Hydrograph Report

Project Name:

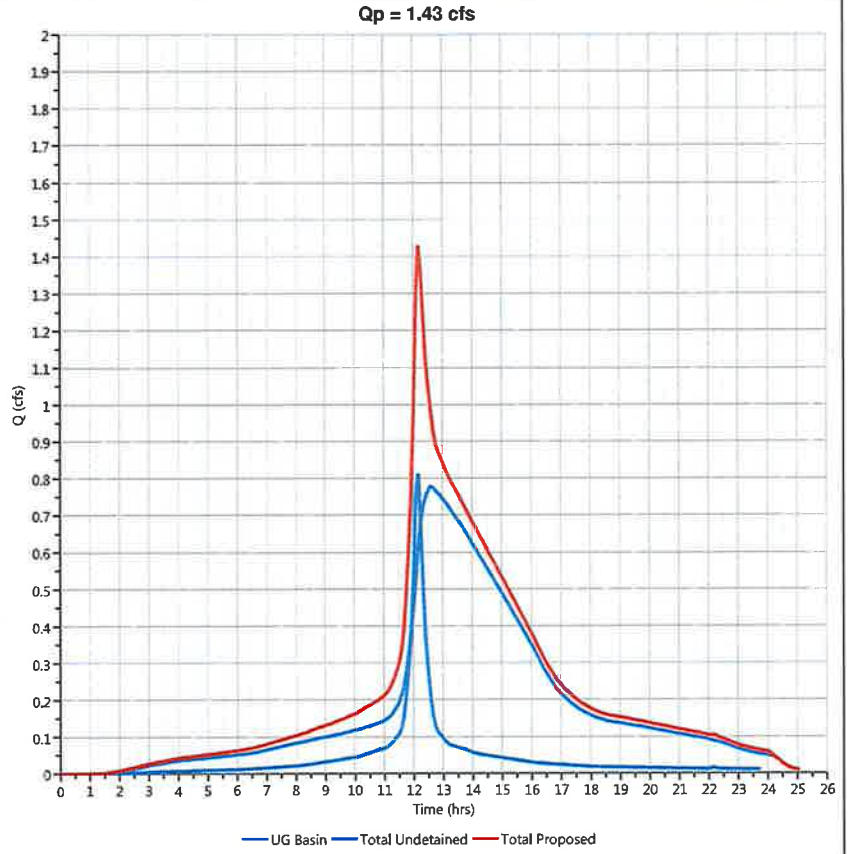
Hydrology Studio v 2.0.0.46

06-16-2017

Total Proposed

Hyd. No. 24

Hydrograph Type	= Junction	Peak Flow	= 1.430 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 19,175 cuft
Inflow Hydrographs	= 12, 22	Total Contrib. Area	= 0.23 ac



Hydrograph 100-yr Summary

Project Name:

06-16-2017

Hydrology Studio v 2.0.0.46

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	SCS Runoff	EX DA-1	2.403	12.17	11,175	---		
3	SCS Runoff	EX DA-2 Perv	1.305	12.17	5,314	---		
4	SCS Runoff	EX DA-2 Imperv	3.204	12.17	14,900	---		
5	Junction	Total EX DA-2	4.509	12.17	20,214	3, 4		
7	Junction	Total EX	6.911	12.17	31,389	1, 5		
9	SCS Runoff	DA-1 Detained Perv	0.157	12.17	638	---		
10	SCS Runoff	DA-1 Detained Imperv	5.545	12.17	25,788	---		
11	Junction	Total DA-1 Detained	5.702	12.17	26,426	9, 10		
12	Pond Route	UG Basin	4.318	12.25	26,414	11	199.49	7,590
14	SCS Runoff	DA-2 Undetained Perv	0.357	12.17	1,547	---		
15	SCS Runoff	DA-2 Undetained Imp	0.062	12.17	287	---		
16	Junction	Total DA-2Undetained	0.418	12.17	1,834	14, 15		
18	SCS Runoff	DA-3 Undetained Perv	0.104	12.17	425	---		
19	SCS Runoff	DA-3 Undetained Imp	0.863	12.17	4,012	---		
20	Junction	Total DA-3Undetained	0.967	12.17	4,437	18, 19		
22	Junction	Total Undetained	1.385	12.17	5,270	16, 20		
24	Junction	Total Proposed	5.460	12.25	32,684	12, 22		

Hydrograph Report

Project Name:

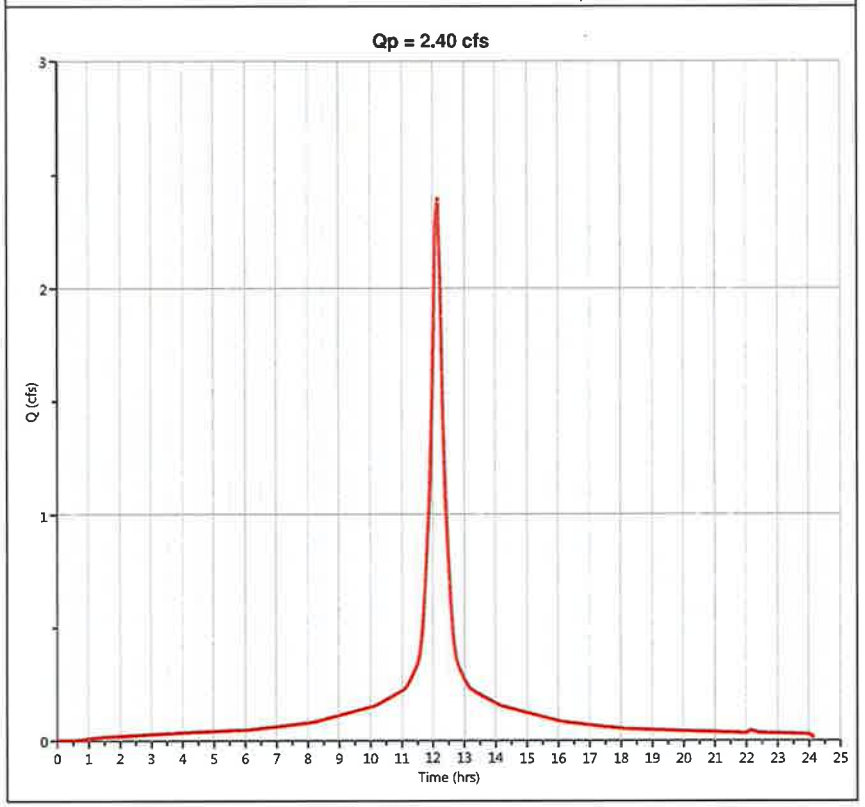
Hydrology Studio v 2.0.0.46

06-16-2017

EX DA-1

Hyd. No. 1

Hydrograph Type	= SCS Runoff	Peak Flow	= 2.403 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 11,175 cuft
Drainage Area	= 0.39 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 8.6600 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

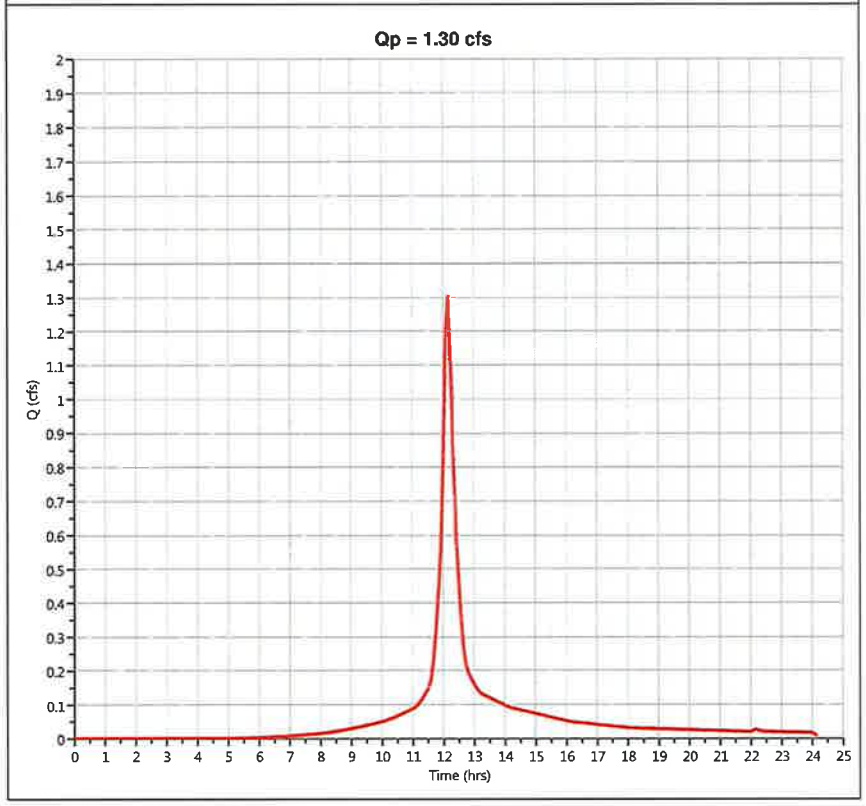
Hydrology Studio v 2.0.0.46

06-16-2017

EX DA-2 Perv

Hyd. No. 3

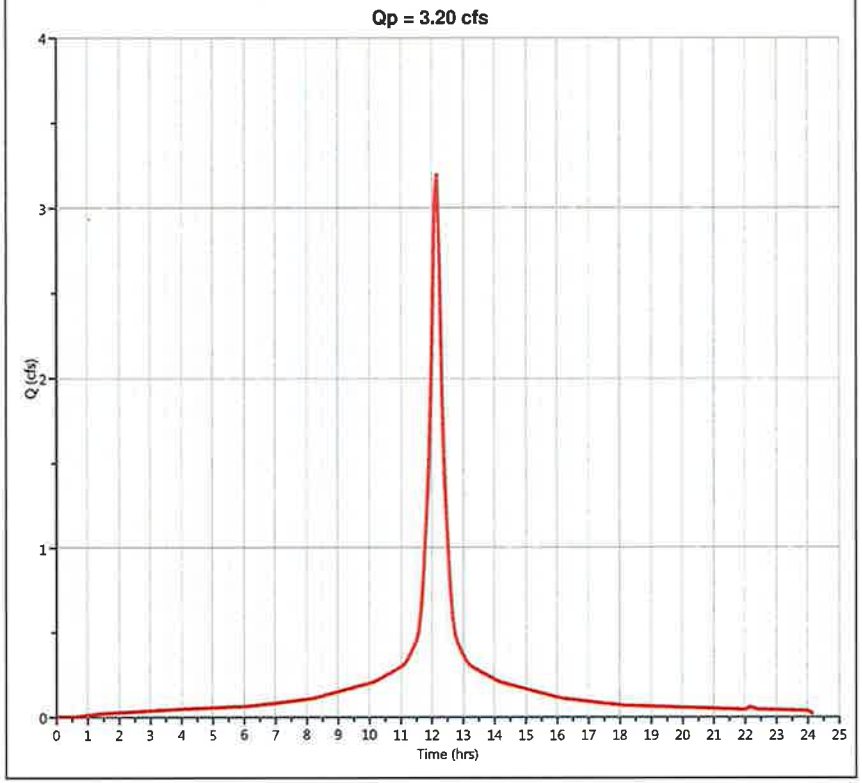
Hydrograph Type	= SCS Runoff	Peak Flow	= 1.305 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 5,314 cuft
Drainage Area	= 0.25 ac	Curve Number	= 80
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 8.6600 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



EX DA-2 Imperv

Hyd. No. 4

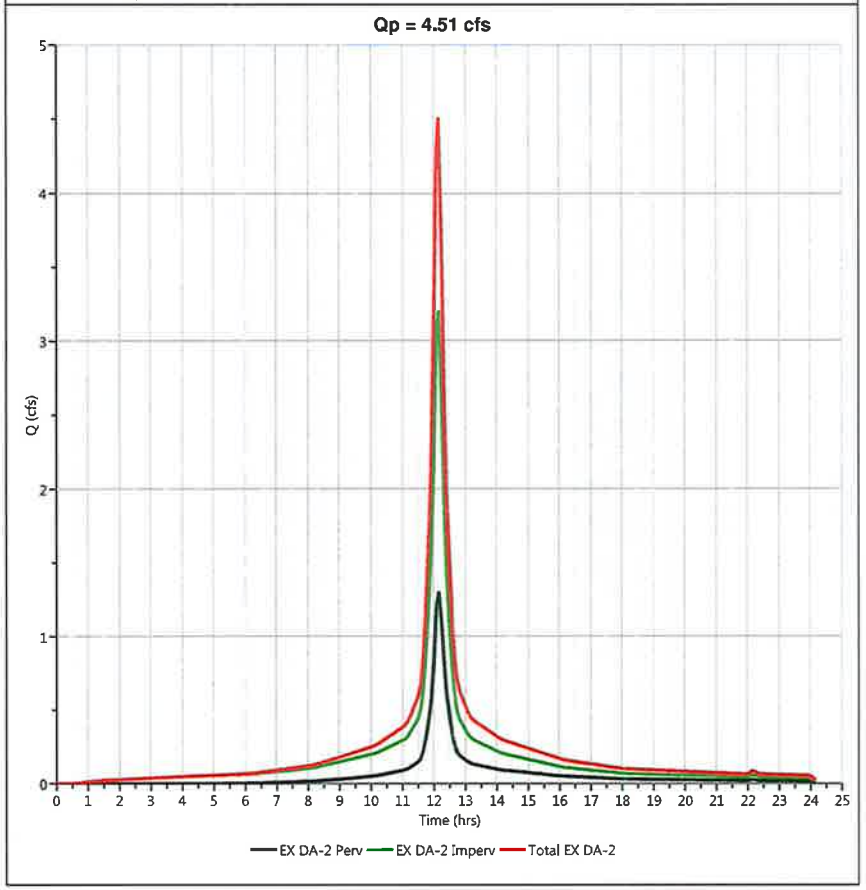
Hydrograph Type	= SCS Runoff	Peak Flow	= 3.204 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 14,900 cuft
Drainage Area	= 0.52 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 8.6600 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Total EX DA-2

Hyd. No. 5

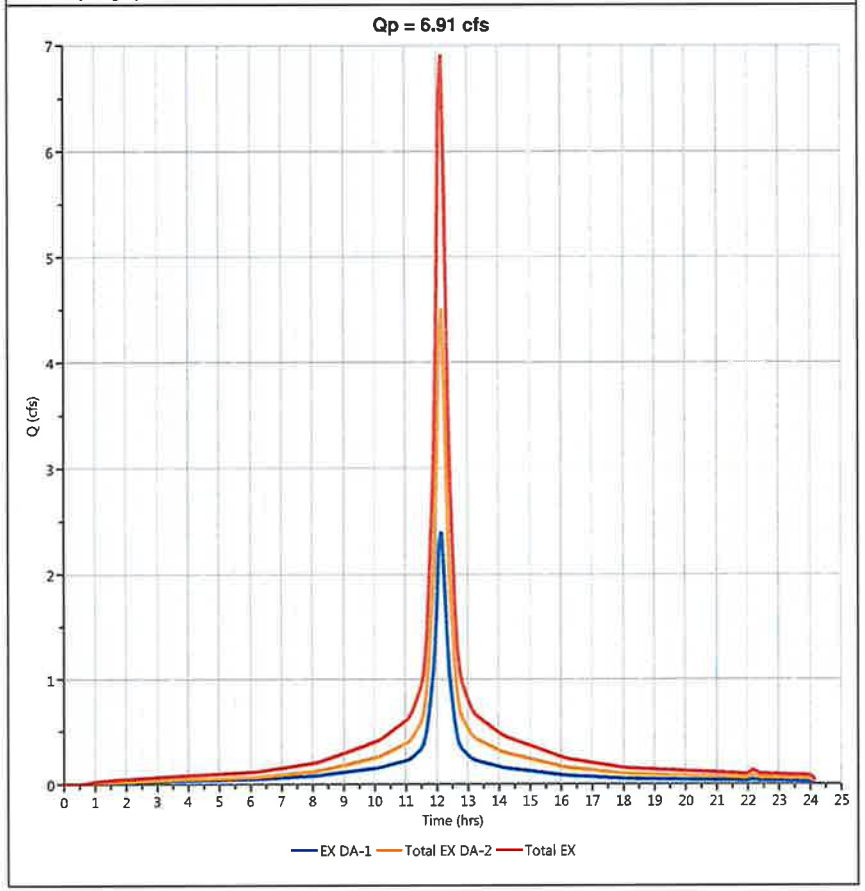
Hydrograph Type	= Junction	Peak Flow	= 4.509 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 20,214 cuft
Inflow Hydrographs	= 3, 4	Total Contrib. Area	= 0.77 ac



Total EX

Hyd. No. 7

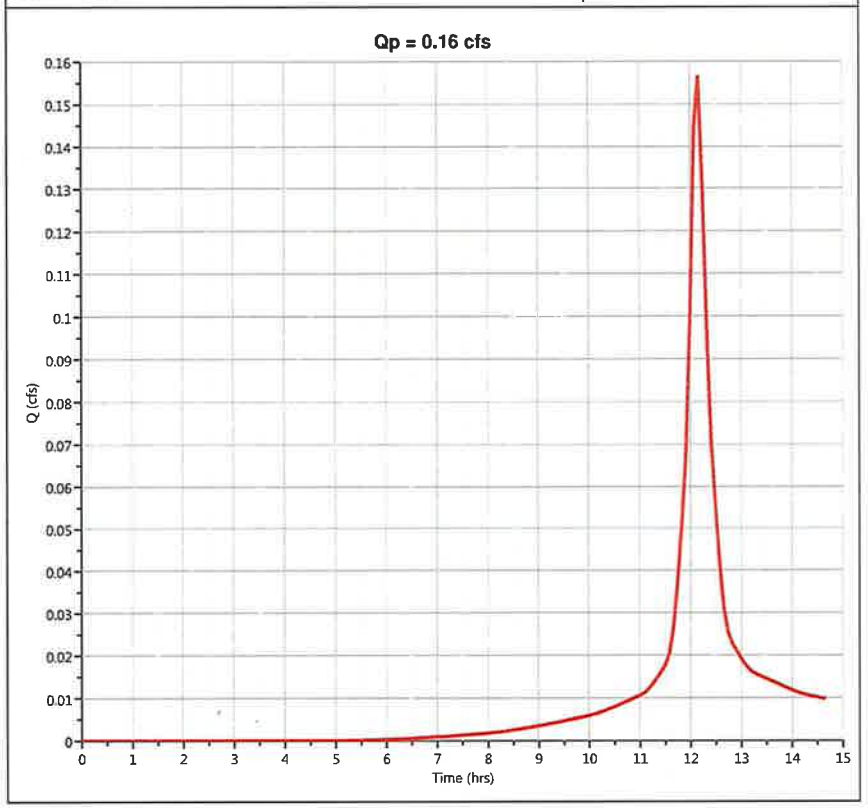
Hydrograph Type	= Junction	Peak Flow	= 6.911 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 31,389 cuft
Inflow Hydrographs	= 1, 5	Total Contrib. Area	= 1.16 ac



DA-1 Detained Perv

Hyd. No. 9

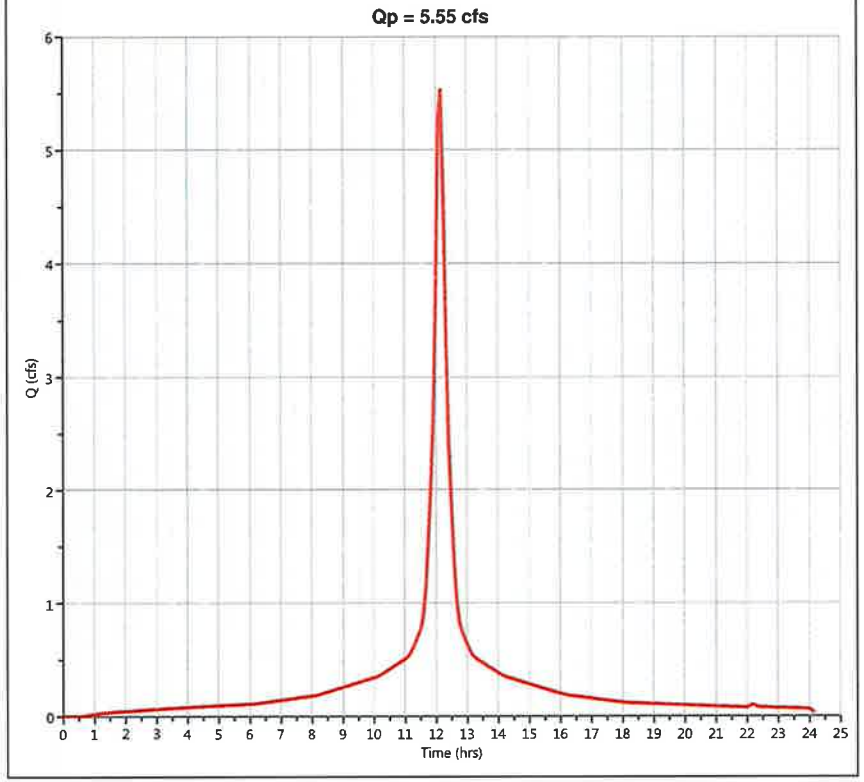
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.157 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 638 cuft
Drainage Area	= 0.03 ac	Curve Number	= 80
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 8.6600 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



DA-1 Detained Imperv

Hyd. No. 10

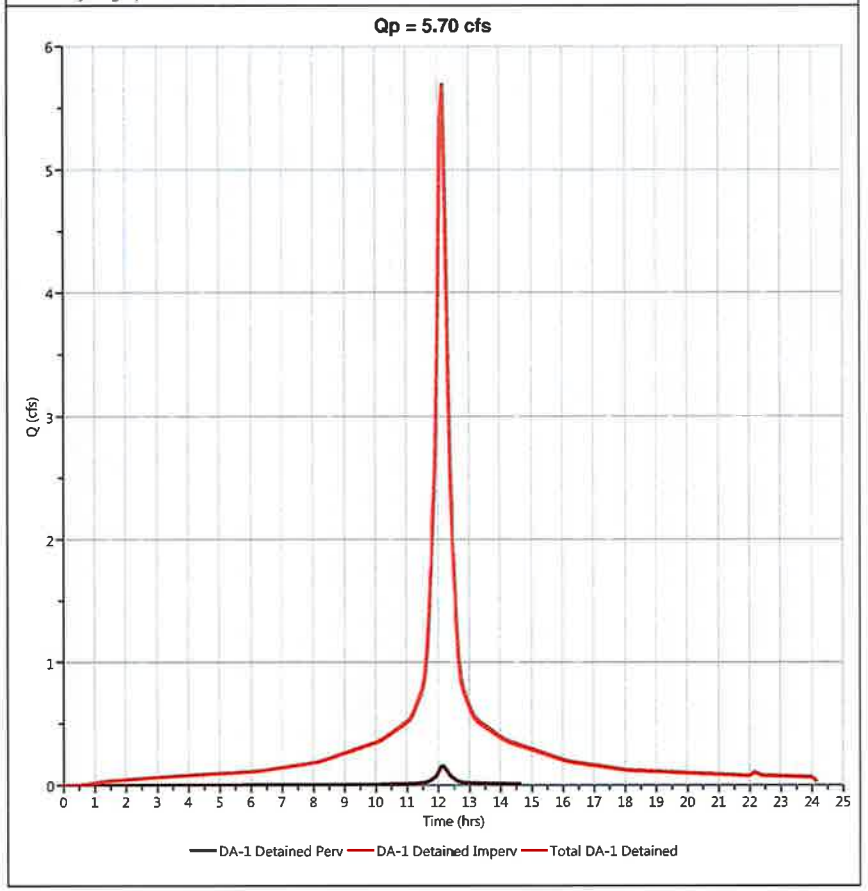
Hydrograph Type	= SCS Runoff	Peak Flow	= 5.545 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 25,788 cuft
Drainage Area	= 0.9 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 8.6600 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Total DA-1 Detained

Hyd. No. 11

Hydrograph Type	= Junction	Peak Flow	= 5.702 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 26,426 cuft
Inflow Hydrographs	= 9, 10	Total Contrib. Area	= 0.93 ac

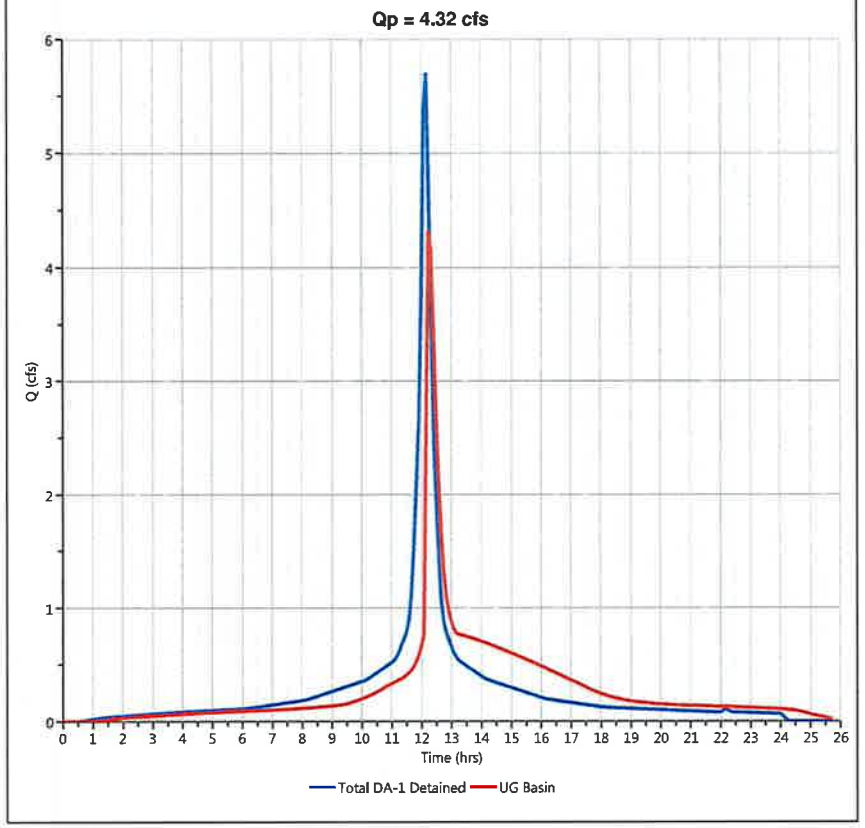


UG Basin

Hyd. No. 12

Hydrograph Type	= Pond Route	Peak Flow	= 4.318 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.25 hrs
Time Interval	= 5 min	Hydrograph Volume	= 26,414 cuft
Inflow Hydrograph	= 11 - Total DA-1 Detained	Max. Elevation	= 199.49 ft
Pond Name	= UG Basin	Max. Storage	= 7,590 cuft

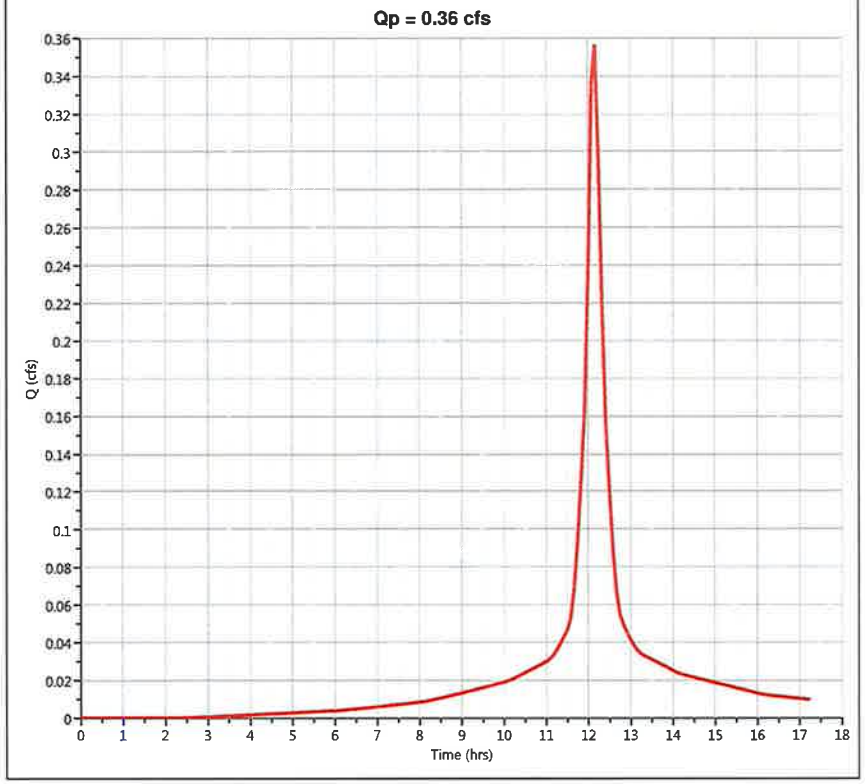
Pond Routing by Storage Indication Method *Center of mass detention time = 1.47 hrs*



DA-2 Undetained Perv

Hyd. No. 14

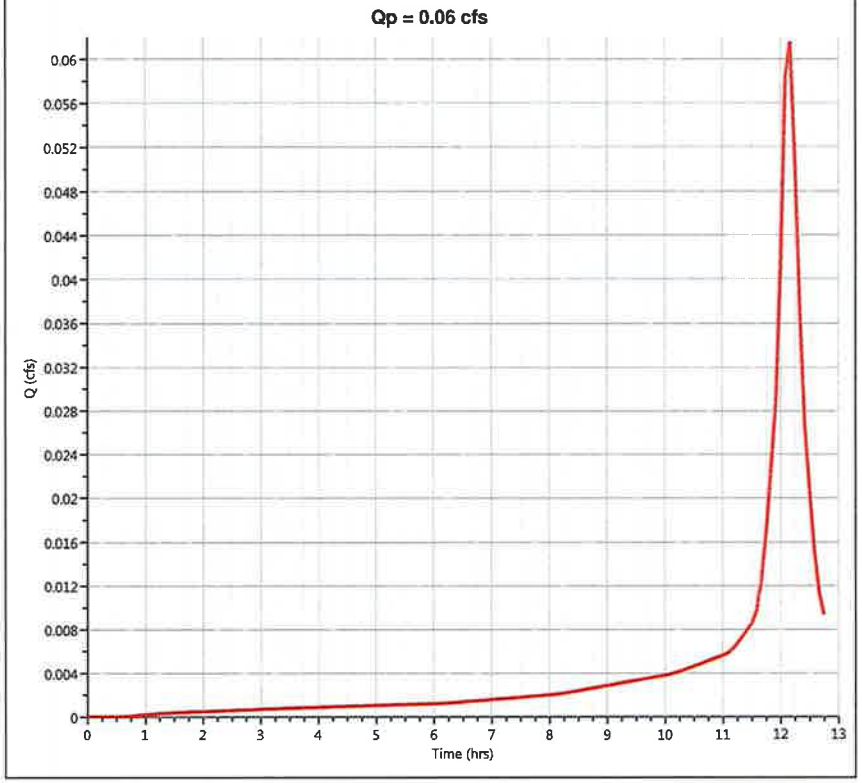
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.357 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 1,547 cuft
Drainage Area	= 0.06 ac	Curve Number	= 91
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 8.6600 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



DA-2 Undetained Imp

Hyd. No. 15

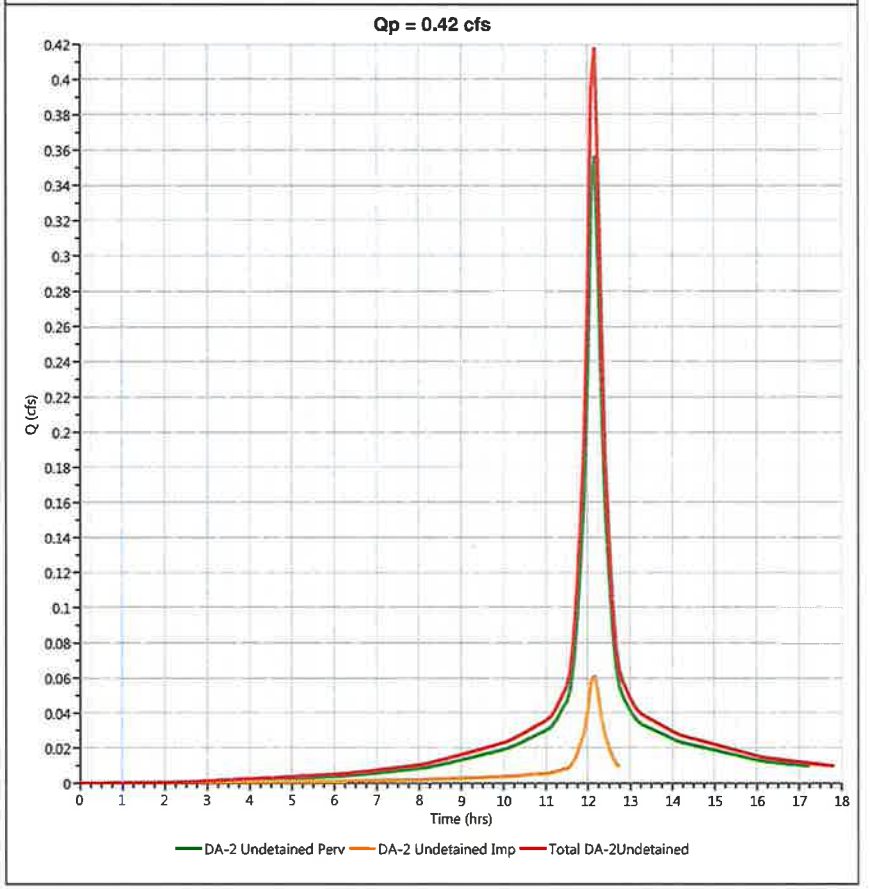
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.062 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 287 cuft
Drainage Area	= 0.01 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 8.6600 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Total DA-2Undetained

Hyd. No. 16

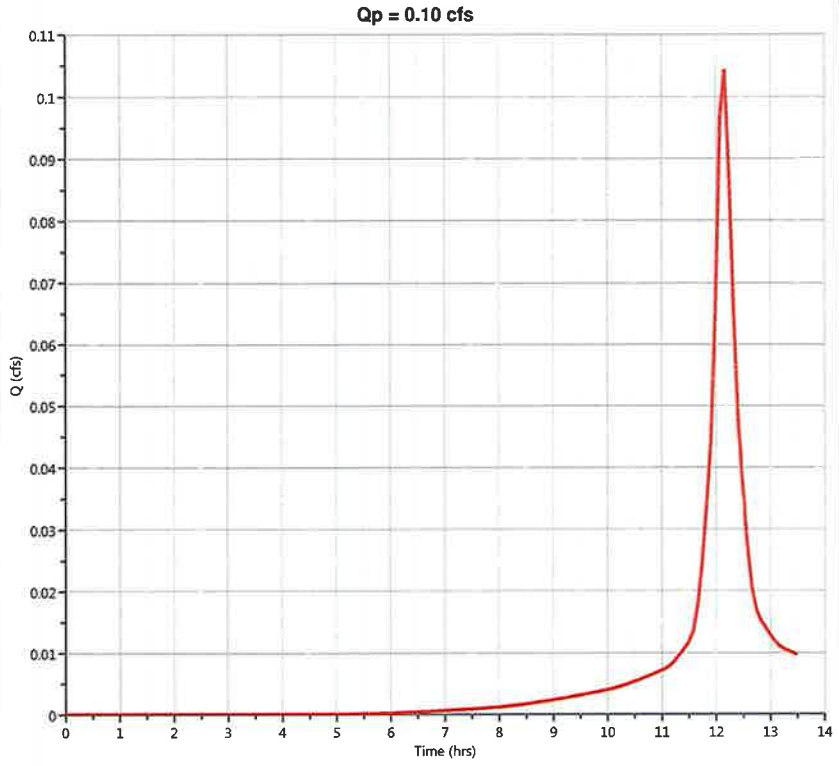
Hydrograph Type	= Junction	Peak Flow	= 0.418 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 1,834 cuft
Inflow Hydrographs	= 14, 15	Total Contrib. Area	= 0.07 ac



DA-3 Undetained Perv

Hyd. No. 18

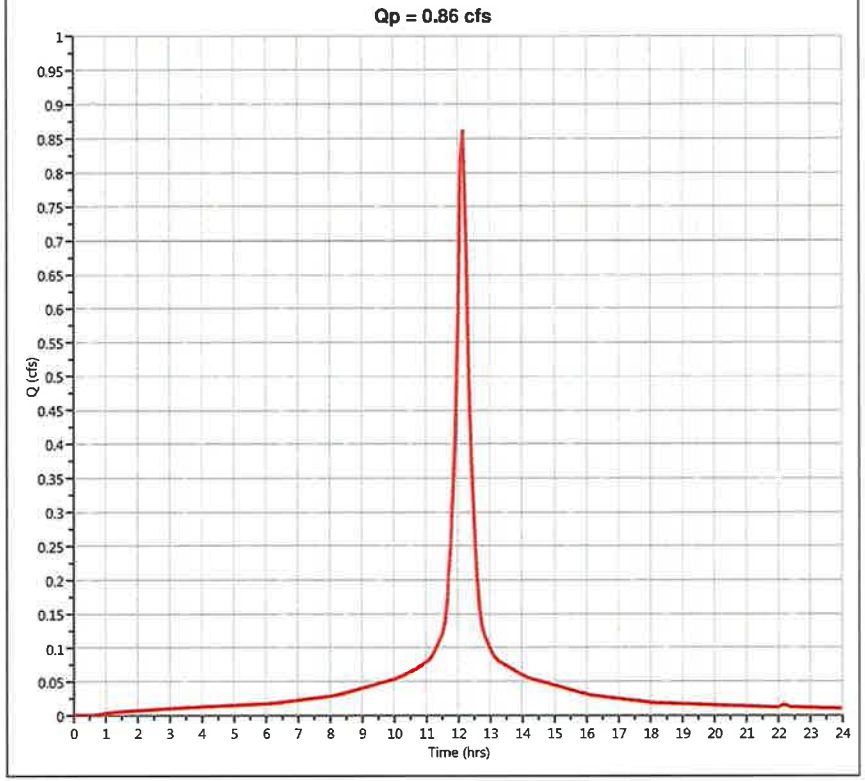
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.104 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 425 cuft
Drainage Area	= 0.02 ac	Curve Number	= 80
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 8.6600 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



DA-3 Undetained Imp

Hyd. No. 19

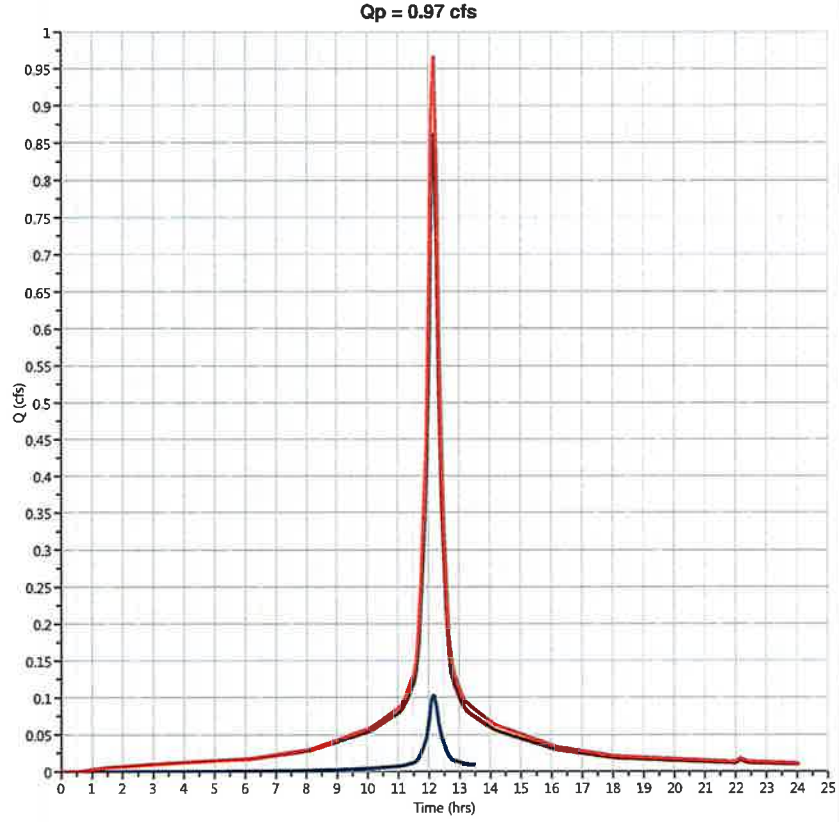
Hydrograph Type	= SCS Runoff	Peak Flow	= 0.863 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 4,012 cuft
Drainage Area	= 0.14 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 8.6600 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Total DA-3Undetained

Hyd. No. 20

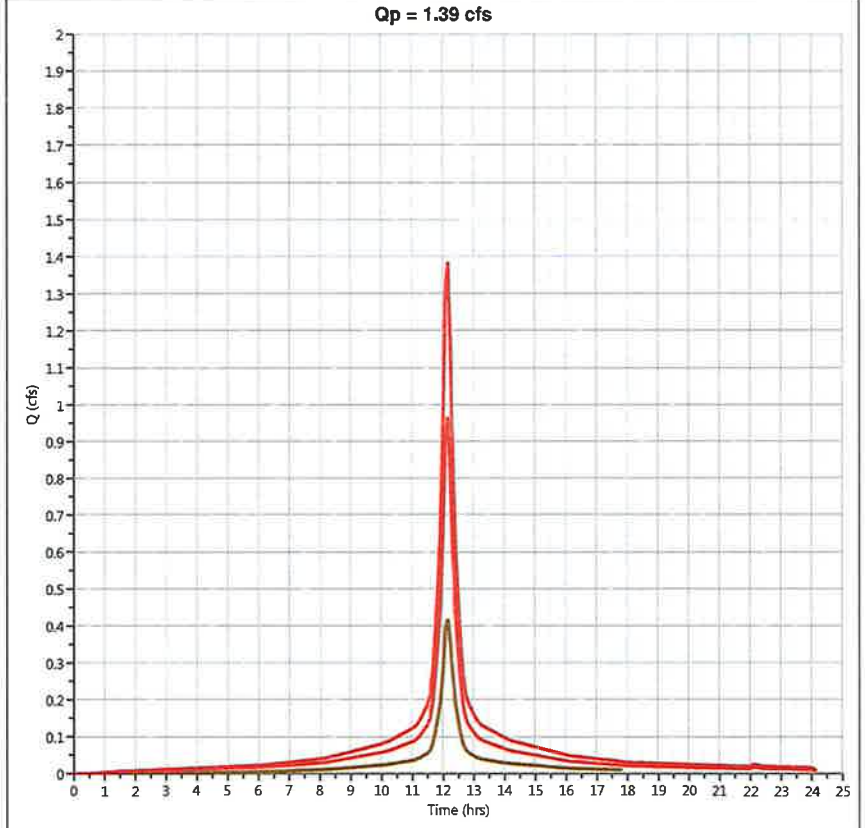
Hydrograph Type	= Junction	Peak Flow	= 0.967 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 4,437 cuft
Inflow Hydrographs	= 18, 19	Total Contrib. Area	= 0.16 ac



Total Undetained

Hyd. No. 22

Hydrograph Type	= Junction	Peak Flow	= 1.385 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 6,270 cuft
Inflow Hydrographs	= 16, 20	Total Contrib. Area	= 0.23 ac



Hydrograph Report

Project Name:

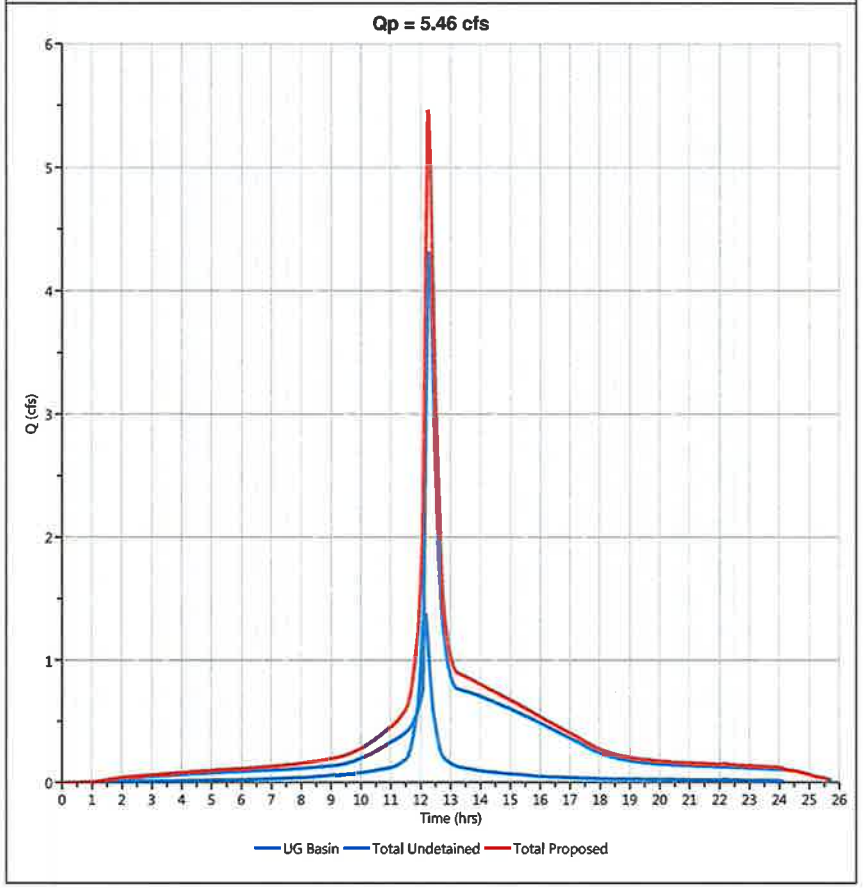
Hydrology Studio v 2.0.0.46

06-16-2017

Total Proposed

Hyd. No. 24

Hydrograph Type	= Junction	Peak Flow	= 5.460 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.25 hrs
Time Interval	= 5 min	Hydrograph Volume	= 32,684 cuft
Inflow Hydrographs	= 12, 22	Total Contrib. Area	= 0.23 ac



IDF Report

IDF filename: SampleIDF.idf

Hydrology Studio v 2.0.0.46

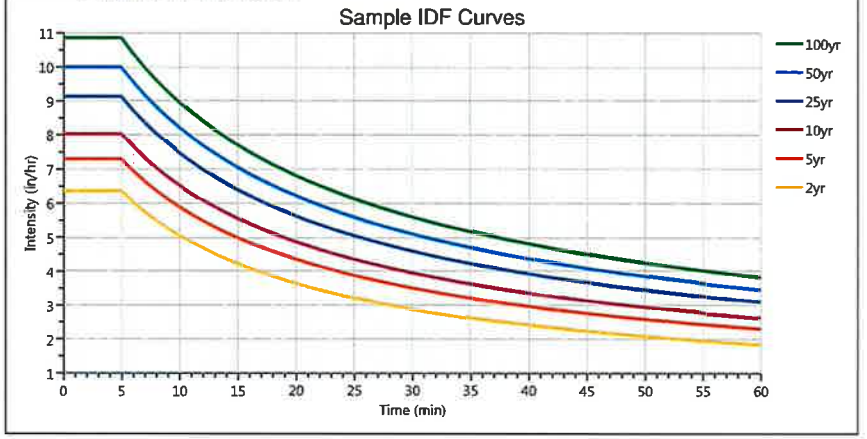
06-16-2017

Equation Coefficients	Intensity = B / (Tc + D)^E (In/hr)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
B	0.0000	58.1215	0.0000	57.1446	58.8780	63.5498	67.7965	72.2003
D	0.0000	10.3000	0.0000	10.3000	10.3000	10.4000	10.5000	10.6000
E	0.0000	0.8106	0.0000	0.7542	0.7303	0.7097	0.6986	0.6898

Minimum Tc = 5 minutes

Tc (min)	Intensity Values (In/hr)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Cf	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
5	0	6.37	0	7.30	8.03	9.13	9.99	10.85
10	0	5.06	0	5.90	6.53	7.48	8.22	8.96
15	0	4.24	0	5.00	5.56	6.40	7.06	7.71
20	0	3.66	0	4.36	4.88	5.63	6.23	6.82
25	0	3.23	0	3.89	4.36	5.06	5.60	6.14
30	0	2.90	0	3.52	3.96	4.60	5.11	5.61
35	0	2.64	0	3.22	3.64	4.24	4.71	5.18
40	0	2.43	0	2.98	3.37	3.94	4.38	4.82
45	0	2.25	0	2.77	3.14	3.68	4.10	4.52
50	0	2.10	0	2.60	2.95	3.46	3.86	4.26
55	0	1.96	0	2.44	2.78	3.27	3.65	4.03
60	0	1.85	0	2.31	2.64	3.10	3.47	3.83

Cf = Correction Factor applied to Rational Method runoff coefficient



Precipitation Report

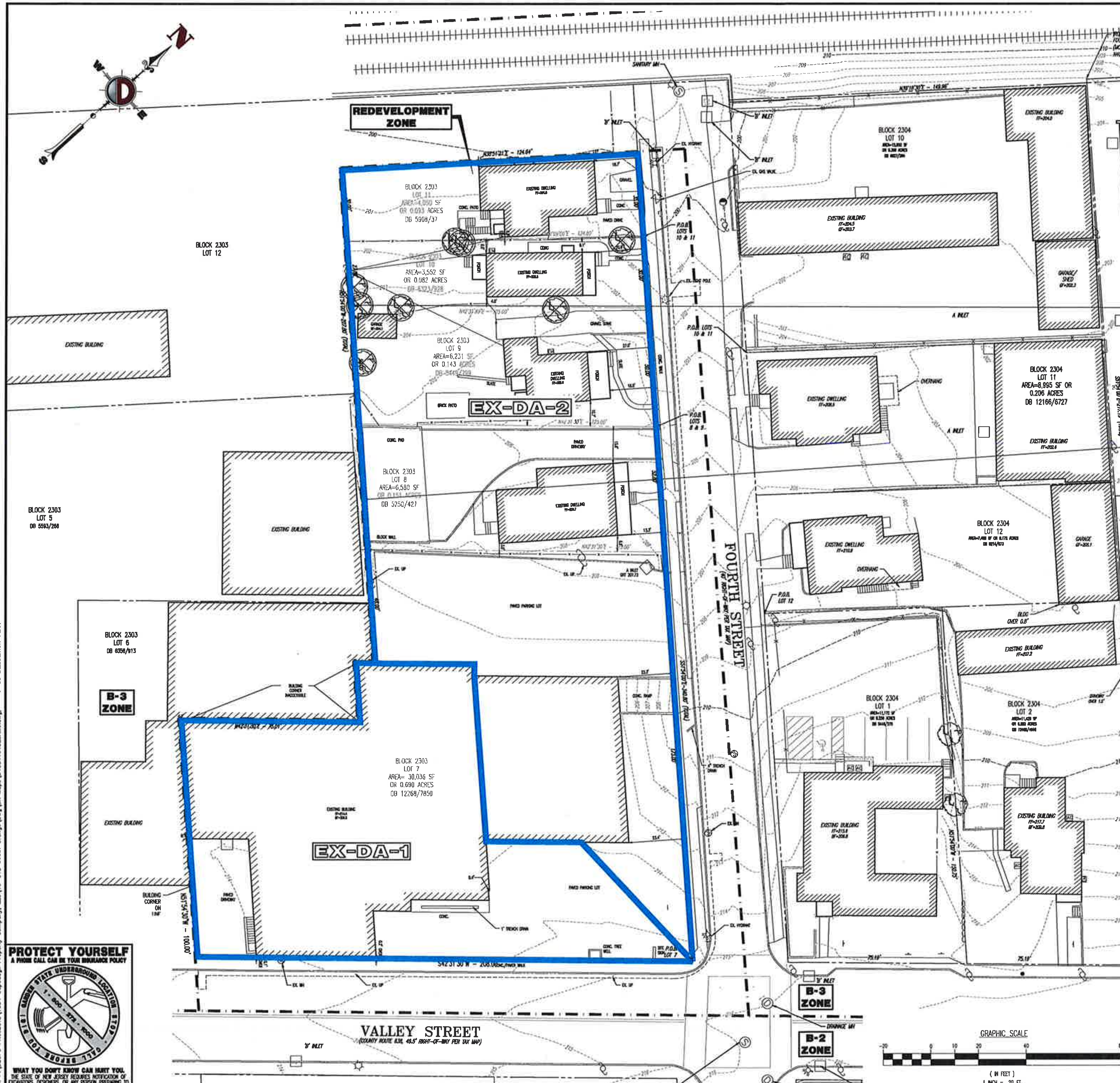
Precipitation filename: Essex County NRCS.pcp

Hydrology Studio v 2.0.0.46

06-16-2017

	Active	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Active			✓			✓			✓
NRCS/SCS Storms	**> SCS Dimensionless Storms**								
SCS 6hr		0	0	0	0	0	0	0	0
Type I, 24-hr		0	0	0	0	0	0	0	0
Type IA, 24-hr		0	0	0	0	0	0	0	0
Type II, 24-hr		0	0	0	0	0	0	0	0
Type II FL, 24-hr		0	0	0	0	0	0	0	0
Type III, 24-hr	✓	2.85	3.44	0	4.40	5.22	6.44	7.49	8.66
Synthetic Storms	**> IDF-Based Synthetic Storms**								
1-hr		0	1.85	0	2.31	2.64	3.10	3.47	3.83
2-hr		0	2.24	0	2.90	3.36	4.01	4.51	5.01
3-hr		0	2.48	0	3.27	3.82	4.60	5.20	5.79
6-hr		0	2.89	0	3.96	4.70	5.73	6.53	7.32
12-hr		0	3.33	0	4.75	5.73	7.08	8.13	9.17
24-hr		0	3.82	0	5.66	6.94	8.70	10.07	11.42
Huff Distribution	**> 1st Quartile (0 to 6 hrs)**								
1-hr		0.76	0.98	0	1.33	1.61	2.01	2.34	2.69
2-hr		0.89	1.14	0	1.50	1.80	2.24	2.60	2.99
3-hr		0.96	1.24	0	1.59	1.90	2.33	2.68	3.07
6-hr		1.20	1.50	0	1.86	2.18	2.64	3.01	3.41
Huff Distribution	**> 2nd Quartile (>6 to 12 hrs)**								
8-hr		0	0	0	0	0	0	0	0
12-hr		0	0	0	0	0	0	0	0
Huff Distribution	**> 3rd Quartile (>12 to 24 hrs)**								
18-hr		0	0	0	0	0	0	0	0
24-hr		0	0	0	0	0	0	0	0
Custom Storms	**> Custom Storm Distributions**								
NJ Water Quality		1.25	0	0	0	0	0	0	0
My Custom Storm 2		0	0	0	0	0	0	0	0
My Custom Storm 3		0	0	0	0	0	0	0	0
My Custom Storm 4		0	0	0	0	0	0	0	0
My Custom Storm 5		0	0	0	0	0	0	0	0
My Custom Storm 6		0	0	0	0	0	0	0	0
My Custom Storm 7		0	0	0	0	0	0	0	0
My Custom Storm 8		0	0	0	0	0	0	0	0
My Custom Storm 9		0	0	0	0	0	0	0	0
My Custom Storm 10		0	0	0	0	0	0	0	0

DRAINAGE AREA MAPS



REDEVELOPMENT ZONE
BLOCK 2303 LOT 11 AREA=4,050 SF OR 0.093 ACRES DB 5908/37
BLOCK 2303 LOT 10 AREA=3,552 SF OR 0.082 ACRES
BLOCK 2303 LOT 9 AREA=6,231 SF OR 0.143 ACRES
EX-DA-2
BLOCK 2303 LOT 8 AREA=6,580 SF DB 5250/421
BLOCK 2303 LOT 7 AREA= 30,036 SF OR 0.690 ACRES DB 12268/7850
EX-DA-1
BLOCK 2303 LOT 12
BLOCK 2303 LOT 5
BLOCK 2303 LOT 6
B-3 ZONE
B-2 ZONE
FOURTH STREET
VALLEY STREET
BLOCK 2304 LOT 10
BLOCK 2304 LOT 11 AREA=8,995 SF OR 0.206 ACRES DB 12166/6727
BLOCK 2304 LOT 12
BLOCK 2304 LOT 1
BLOCK 2304 LOT 2
EXISTING BUILDING
EXISTING DWELLING
PAVED PARKING LOT
GRAPHIC SCALE
(IN FEET)
1 INCH = 20 FT.
PROTECT YOURSELF
WHAT YOU DON'T KNOW CAN HURT YOU.

THIS PLAN SET IS FOR PERMITTING PURPOSES ONLY AND MAY NOT BE USED FOR CONSTRUCTION

DYNAMIC ENGINEERING

LAND DEVELOPMENT CONSULTING • PERMITTING • GEOTECHNICAL • ENVIRONMENTAL • SURVEY • PLANNING & ZONING

TITLE:

EXISTING DRAINAGE AREA MAP

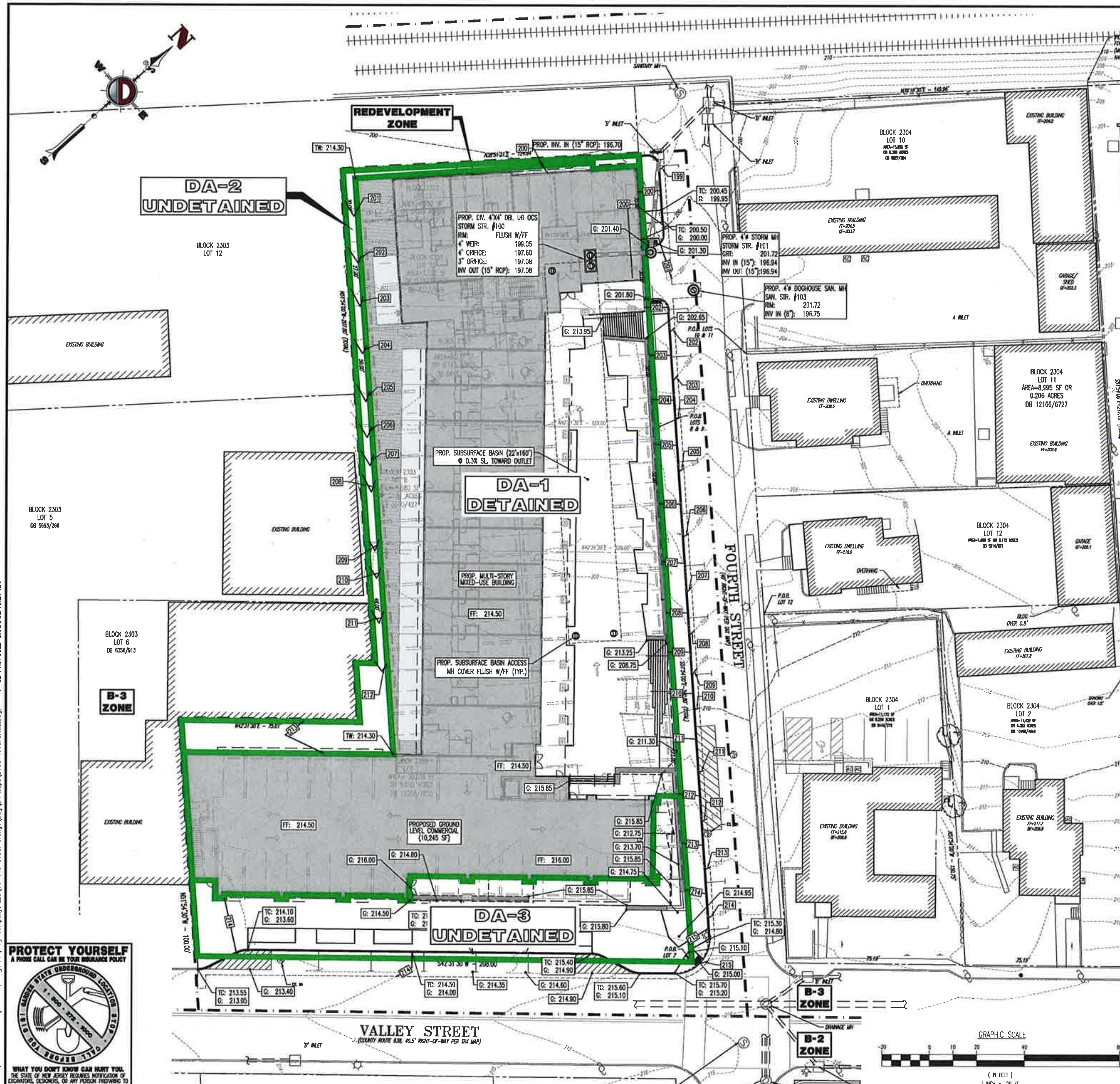
PROJECT: CAPODAGLI PROPERTY COMPANY, LLC / MERIDIA, LLC
MERIDIA VILLAGE COMMONS – PROPOSED MIXED-USE BUILDING
BLOCK 2303, LOTS 7–11
4TH STREET & VALLEY STREET (C.R. 638)
TOWNSHIP OF SOUTH ORANGE VILLAGE, ESSEX COUNTY, NJ

JOB No: 1084-16-015	DATE: 06/14/2017
DRAWN BY: GH	SCALE: (H) 1"=20' (V)
DESIGNED BY: RJC	SHEET No: 1 OF 2
CHECKED BY: JCS	
DEC Client Code: 1084	Rev. 0

JOSEPH C. SPARONE
PROFESSIONAL ENGINEER
NEW JERSEY LICENSE No. 47704
PENNSYLVANIA LICENSE No. 78935
DELAWARE LICENSE No. 17322
COLORADO LICENSE No. 39846
VIRGINIA LICENSE No. 51627

BRETT W. SKAPINETZ
PROFESSIONAL ENGINEER
NEW JERSEY LICENSE No. 41985
PENNSYLVANIA LICENSE No. 77727
NEW YORK LICENSE No. 087962
CONNECTICUT LICENSE No. 0027591

CONSTRUCTION CHECK — DATE
CONSTRUCTION CHECK — DATE



THIS PLAN SET IS FOR PERMITTING PURPOSES ONLY AND MAY NOT BE USED FOR CONSTRUCTION

DYNAMIC ENGINEERING
LAND DEVELOPMENT CONSULTING • PERMITTING • GEOTECHNICAL • ENVIRONMENTAL • SURVEY • PLANNING & ZONING
245 Main Street · Suite 110
Chester, NJ 07930
T 908 879 9229
F 908 879 0222
www.dynamicec.com

TITLE:

PROPOSED DRAINAGE AREA MAP

PROJECT: CAPODAGLI PROPERTY COMPANY, LLC / MERIDIA, LLC
MERIDIA VILLAGE COMMONS – PROPOSED MIXED-USE BUILDING
BLOCK 2303, LOTS 7-11
4TH STREET & VALLEY STREET (C.R. 638)
TOWNSHIP OF SOUTH ORANGE VILLAGE, ESSEX COUNTY, NJ

JOB No:	1084-16-015
DATE:	06/14/2017
DRAWN BY:	GH
DESIGNED BY:	RJC
CHECKED BY:	JCS
SCALE:	(H) 1"=20' (V)
SHEET No:	2 OF 2
DEC Client Code:	1084
Rev. #	0

JOSEPH C. SPARONE
PROFESSIONAL ENGINEER
NEW JERSEY LICENSE No. 47204
PENNSYLVANIA LICENSE No. 78935
DELAWARE LICENSE No. 17322
COLORADO LICENSE No. 39848
VIRGINIA LICENSE No. 51627

BRETT W. SKAPINETZ
PROFESSIONAL ENGINEER
NEW JERSEY LICENSE No. 41985
PENNSYLVANIA LICENSE No. 77727
NEW YORK LICENSE No. 087982
CONNECTICUT LICENSE No. 0027591

CONSTRUCTION CHECK — DATE
CONSTRUCTION CHECK — DATE

Rev.	Date	Comments	By