PRELIMINARY
STORMWATER REPORT

For:

ROLLING MEADOWS
Planned Unit Development

Oaklea Drive, near 6th & 10th
Junction City, Oregon

12/04/2018

PRESENTED BY:

CIVIL ENGINEERING ■ SURVEYING ■ PLANNING
112 N 5th ST – Suite 200 – P.O. BOX 909
KLAMATH FALLS, OR 97601
(541) 851-9405

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Preliminary Stormwater Report – Rolling Meadows PUD
Oaklea Dr, Junction City, OR

Project Overview:

The purpose of the preliminary stormwater report is to show that enough area has been set aside within the PUD master plan to provide adequate stormwater treatment and detention area within the development. During final design of the subdivision phases, a final stormwater report will be submitted to Junction City that provides more detail including pipe & orifice sizing and details.

The applicant is proposing to develop a new phased residential development called Rolling Meadows PUD. Phase 1 site access is proposed from Oaklea Drive at 6th Street. The development plan includes new private roof area, new asphalt & sidewalk area, and the remainder converted to residential landscaping. Landscaping will include 3" of bark mulch for planter areas and grass lawn covering over 50% of the landscape areas.

The subject property is currently designated as Residential with a mix by the Junction City Comprehensive Plan with the requirements of 1 acre high density residential (R3), 9 acres of medium density residential (R2), approximately 38 acres of low density residential (R1), with the remainder of the 85 acres being streets, wetland, and open space. The applicant is proposing a PUD master plan with approximately 333 lots ranging in size from 5000 sq.ft. to 8500 sq.ft. The concurrent subdivision application is for phase one includes approximately 75 low density residential lots.

Stormwater quality treatment & quantity detention for the new street, sidewalk, driveway, and roof areas will be routed to several onsite water quality treatment swales, prior to being detained by the onsite stormwater detention pond. The treatment and detention facilities will be located on the west side of the development, following the natural grade of the property.

Existing Conditions:

The site is currently undeveloped and is being used for farming practices. An older farm house and several barns and outbuildings have been recently demolished on the northeast corner of the site with overgrown blackberries surrounding the former structures. The site consists of Coburg silty clay loam (#31 – 32.7 acres), Malabon silty clay loam (#75 – 23.3 acres), Awbrig silty clay loam (#5 – 14.2 acres), Salem gravelly silt loam (#118 – 8.6 acres), and Conser silty clay loam (#33 – 6.2 acres), with hydrologic soil classifications ranging from B to D. The site is currently being farmed for grass seed, with a mix of weeds and blackberries covering the areas not being farmed. The site is "located" on Panel No. 41039C – 0605F of the Flood Insurance Rate Map (FIRM) for Lane County. The western 100-200 feet is located within Zone A of the flood map, however this area is within land that is delineated as a wetland and will remain as open space within the development. All residential development will be outside of the mapped flood plain and homes will have a minimum floor elevation that must be met.

Storm Water Design:

The proposed development will include the creation of new impervious surface, including:

- 17.1 acres new asphalt & sidewalk area
- 19.8 acres new roof area
- 29.9 new landscape area

The developed area will be modeled as impervious surface (CN 98) for the streets, parking lots, and roof areas, and as pervious surface (CN 79 C soil) for the new landscape areas because topsoil will be imported and landscaping will be planted including sod and bark mulch.

The developed site will detain storm water runoff to the 2yr, 10yr, and 100yr design storms as required by ODOT and the Junction City Stormwater Master Plan.

Type IA Storm Distribution Junction City, Oregon:

2-year Storm:	2.63 inches/24 hour
10-year Storm:	3.61inches/24 hour
25-year Storm:	4.24 inches/24 hour
100-year Storm:	5.24 inches/24 hour

Water Quality:

The site is designed using overland flow, catch basins, and underground storm piping. The developed project consists of residential homes which typically is not a high source of pollutants. Pollutants of concern would be mainly oil dripping from parked vehicles and from fertilizer used for landscaping.

Onsite water will be treated through three bio-filtration swales located at the pipe discharge locations for the stormwater facilities. The swales will be designed to treat the water quality storm for 9 minutes average residence time and 0.25' depth.

Water Quantity:

Per ODOT & Junction City requirements, runoff from the developed site must not exceed run-off from the pre-developed conditions for the 2-year, 10-year, and 100-yr storms.

2-year Developed Runoff $\leq$ 2-year pre-developed runoff
10-year Developed Runoff $\leq$ 10-year pre-developed runoff
100-year Developed Runoff $\leq$ 100-year pre-developed runoff

An analysis of the Pre-Developed and Post Developed areas was done, and the results are tabulated below:

Design Storm	Storage Volume (acre-ft)	Peak Pond Stage Elevation (ft.)	Pre-Developed Release Rate (CFS)	Allowable Release Rate (CFS)	Developed Release Rate Total (CFS)
2-year (2.63")	4.655	2.74	3.48	3.48	3.48
10-year (3.61")	6.373	3.75	8.55	8.55	6.71
100-year (5.24")	8.404	4.94	20.09	20.09	15.78

Table A1 – Detention Analysis

Therefore, the developed condition of the site meets the requirements for ODOT drainage facilities and the Junction City Stormwater Master Plan. See Appendix B-D for detailed Hydrocad calculations.

Conveyance System:

The conveyance system will be designed to provide free flow conditions during the 10-yr storm event at the final design stage. Storms greater than the 10-yr event will back water up into the storm piping system, where the pipes will be utilized for additional storage. The pond overflow is set lower than the lowest catch basin, therefore no water back up into the parking lots is anticipated for any storm.

Discharge Location:

Drainage will be discharged into the existing flat head creek ditch that is located along the western boundary of the project. Runoff then flows through this drainage with the eventual outflow into the Willamette River almost 1 mile to the northwest.

Offsite Analysis:

Because the developed run-off rate is detained to less than the pre-developed runoff rate, no adverse effects to the existing downstream system are anticipated. No downstream conveyance system problems were apparent or identified during a site inspection.

Additional Permits:

A Junction City Private Development Permit and Building Permits will be obtained prior to construction.

A DEQ 1200-C permit will be required because the development is greater than 1 acre and discharges runoff from the site.

Appendix A

Stormwater Catchment Plan

Rolling Meadows PUD

October, 2018

GRAPHIC SCALE

0 300 450 600 900

(IN FEET)

1 inch = 300 ft.

REGISTERED PROFESSIONAL ENGINEER
55,506PE
Marcus D. Cross
OREGON
JULY 09, 2001
MARCUS D. CROSS

RENEWS: 12-31-19

10-15-2018

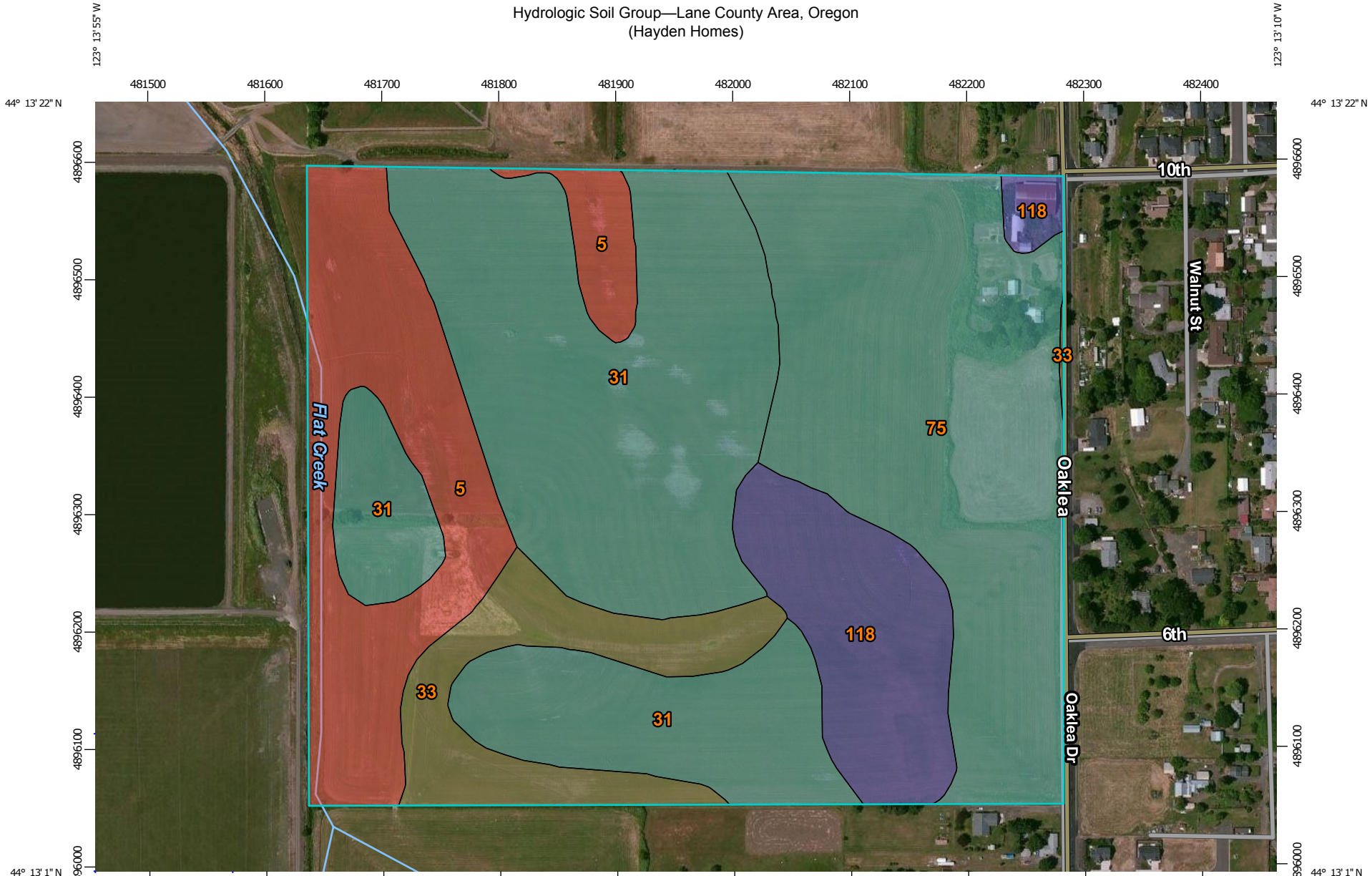
R-C RHINE-CROSS GROUP

RHINE-CROSS GROUP LLC

ENGINEERING - SURVEYING - PLANNING
112 N 5th ST - SUITE 200 - P.O. BOX 909
KLAMATH FALLS, OREGON 97601

Phone: (541) 851-9405 Fax: (541) 273-9200 admin@rc-grp.com

Hydrologic Soil Group—Lane County Area, Oregon
(Hayden Homes)



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 1:20,000.

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: Lane County Area, Oregon
Survey Area Data: Version 11, Sep 15, 2014

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

Date(s) aerial images were photographed: Jul 5, 2011—Sep 3, 2011

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 — Lane County Area, Oregon (OR637)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
5	Awbrig silty clay loam	D	14.4	16.6%
31	Coburg silty clay loam	C	32.9	38.0%
33	Conser silty clay loam	C/D	6.8	7.9%
75	Malabon silty clay loam	C	23.6	27.2%
118	Salem gravelly silt loam	B	8.9	10.2%
Totals for Area of Interest			**86.5**	**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

Table 2-2a Runoff curve numbers for urban areas [1/]

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2/]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5/]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

1 Average runoff condition, and $I_a = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands [1/]

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment [2/]	Hydrologic condition [3/]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+ CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1] Average runoff condition, and I_a=0.2S

[2] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

[3] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Table 2-2c Runoff curve numbers for other agricultural lands [1/]

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. [2/]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. [3/]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 [4/]	48	65	73
Woods—grass combination (orchard or tree farm). [5/]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. [6/]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 [4/]	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

1 Average runoff condition, and $I_a = 0.2S$.

2 ***Poor:*** <50%) ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: > 75% ground cover and lightly or only occasionally grazed.

3 ***Poor:*** <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.

4 Actual curve number is less than 30; use CN = 30 for runoff computations.

5 CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

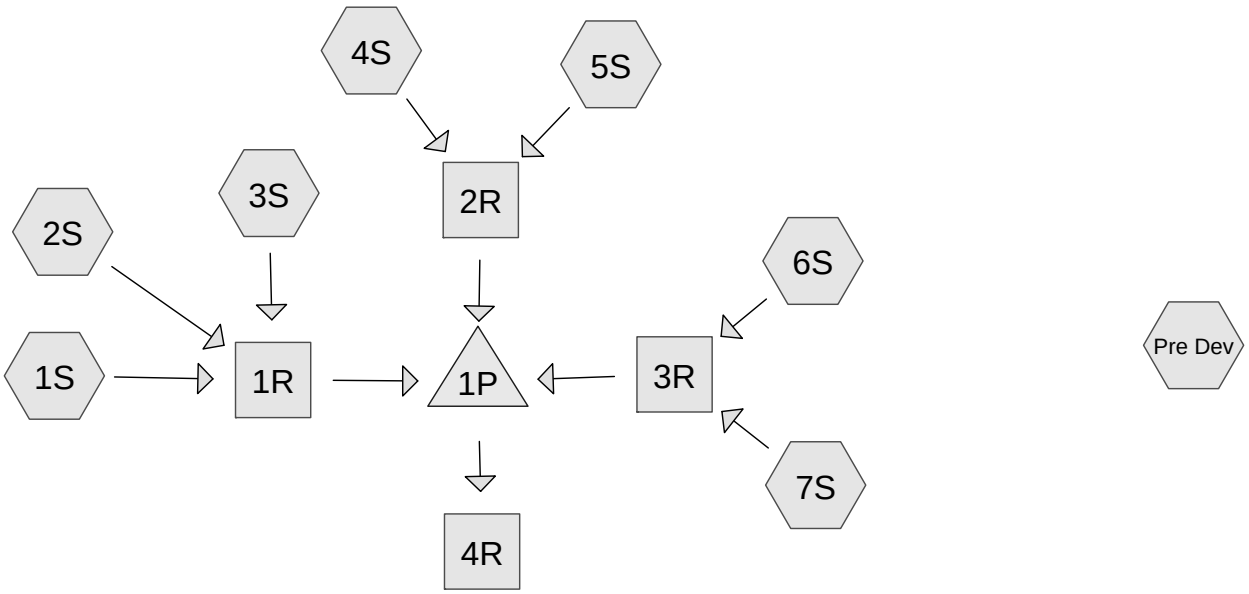
6 ***Poor:*** Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

Table 2-2d Runoff curve numbers for arid and semiarid rangelands [1/]

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition [2/]	A [3/]	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

1 Average runoff condition, and I_a, = 0.2S. For range in humid regions, use table 2-2c.
2 Poor: <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover.
Good: > 70% ground cover.
3 Curve numbers for group A have been developed only for desert shrub.

Appendix B



Subcat Reach Pond Link

Drainage Diagram for 1718 Rolling Meadows PRELIM
Prepared by Rhine Cross Group, LLC 12/6/2018

Subcatchment 1S: Phase 1 Developed

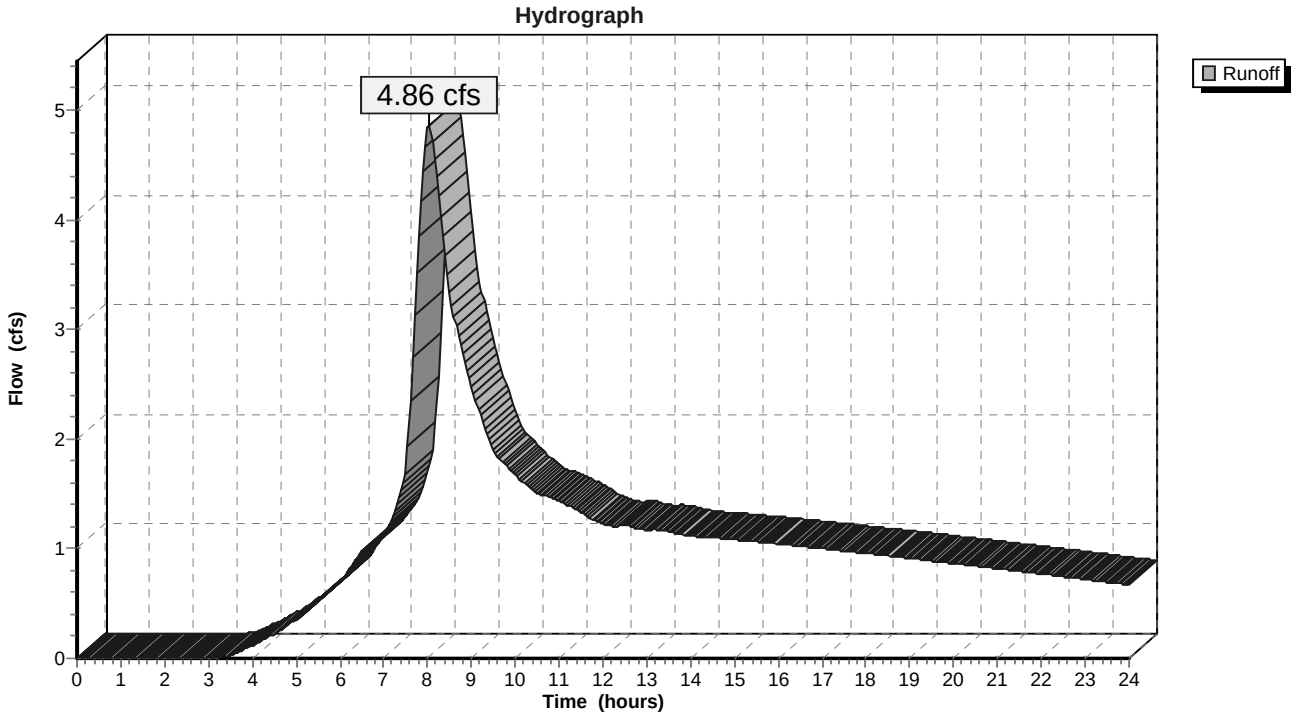
Runoff = 4.86 cfs @ 8.03 hrs, Volume= 1.975 af, Depth= 1.63"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=2.63"

Area (ac)	CN	Description
4.300	98	STREET & SIDEWALK
4.100	98	HOUSE ROOF/DRIVEWAYS
6.120	79	LANDSCAPE
14.520	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	130	0.0100	0.1		**Sheet Flow, LANDSCAPE** Grass: Short n= 0.150 P2= 2.50"
1.7	150	0.0050	1.4		**Shallow Concentrated Flow, GUTTER** Paved Kv= 20.3 fps
19.7	280	Total			

Subcatchment 1S: Phase 1 Developed



Subcatchment 2S: Phase 2 Developed

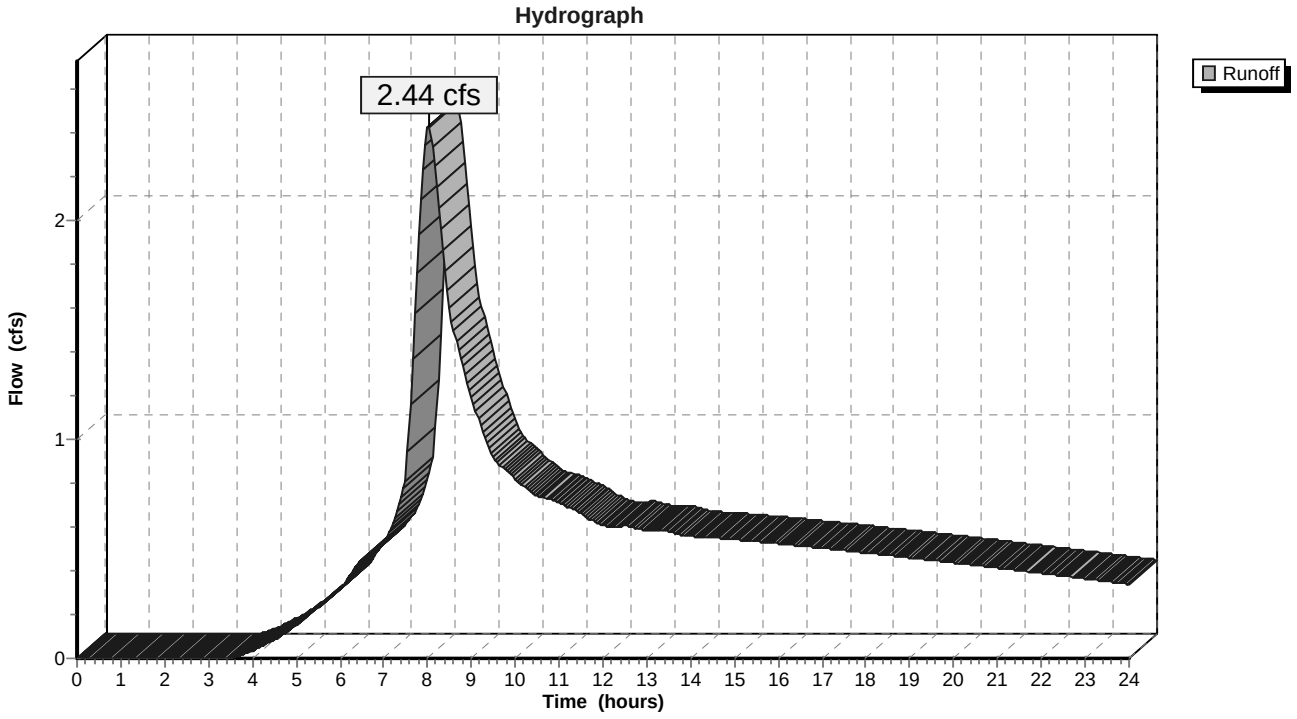
Runoff = 2.44 cfs @ 8.02 hrs, Volume= 0.974 af, Depth= 1.56"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=2.63"

Area (ac)	CN	Description
1.970	98	STREET & SIDEWALK
2.120	98	HOUSE ROOF/DRIVEWAY
3.420	79	LANDSCAPE
7.510	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, LANDSCAPE** Grass: Short n= 0.150 P2= 2.50"
2.9	250	0.0050	1.4		**Shallow Concentrated Flow, GUTTER** Paved Kv= 20.3 fps
17.5	350	Total			

Subcatchment 2S: Phase 2 Developed



Subcatchment 3S: Phase 3 Developed

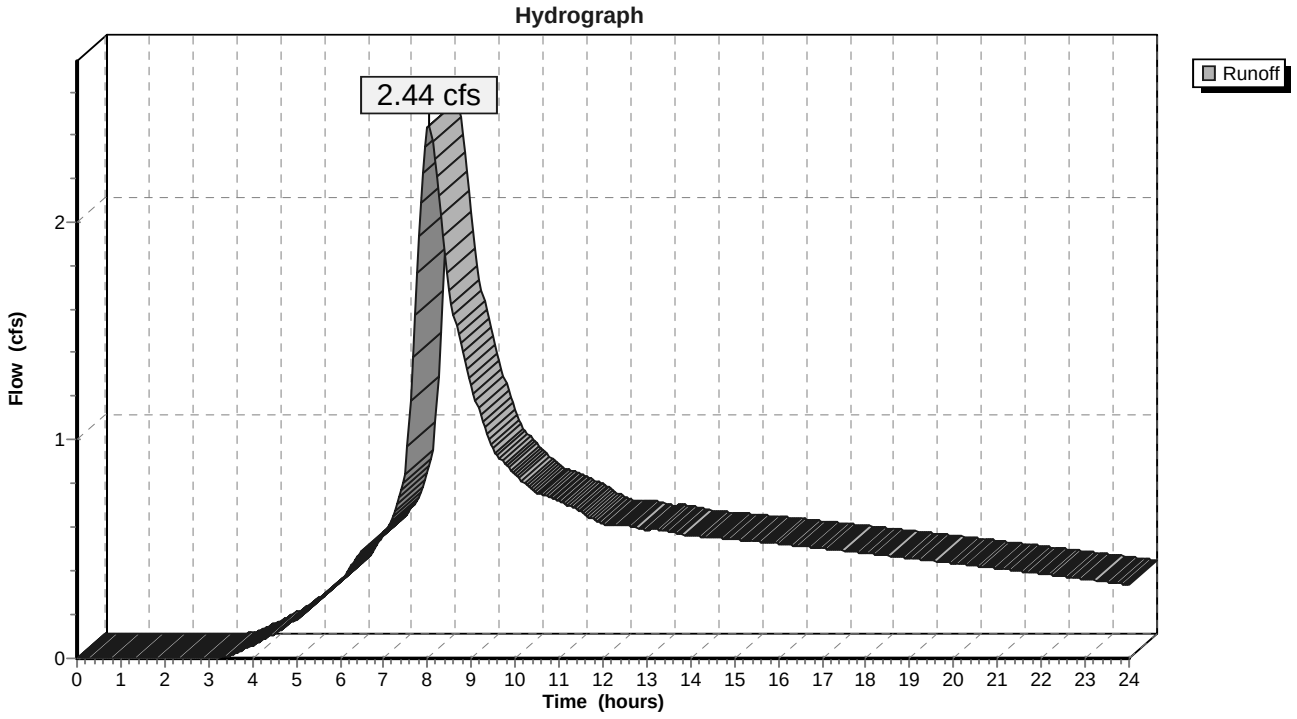
Runoff = 2.44 cfs @ 8.03 hrs, Volume= 0.994 af, Depth= 1.63"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=2.63"

Area (ac)	CN	Description
1.800	98	STREET & SIDEWALK
2.350	98	ROOF & DRIVEWAY
3.160	79	LANDSCAPE & PARK
7.310	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	120	0.0100	0.1		**Sheet Flow, LANDSCAPE** Grass: Short n= 0.150 P2= 2.50"
2.9	250	0.0050	1.4		**Shallow Concentrated Flow, GUTTER** Paved Kv= 20.3 fps
19.8	370	Total			

Subcatchment 3S: Phase 3 Developed



Subcatchment 4S: Phase 4 Developed

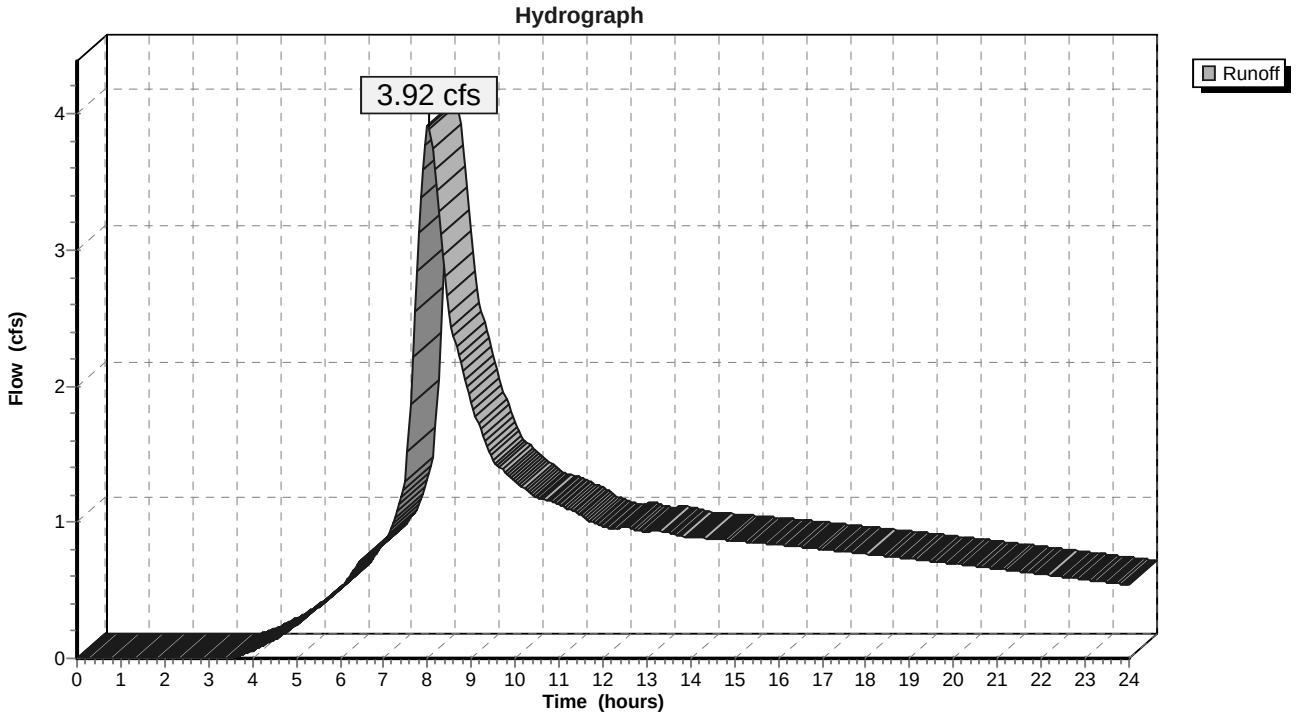
Runoff = 3.92 cfs @ 8.02 hrs, Volume= 1.550 af, Depth= 1.56"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=2.63"

Area (ac)	CN	Description
2.600	98	Streets & Sidewalk
3.390	98	Home & Driveway
5.960	79	Landscape
11.950	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, Landscape** Grass: Short n= 0.150 P2= 2.50"
2.3	200	0.0050	1.4		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
16.9	300	Total			

Subcatchment 4S: Phase 4 Developed



Subcatchment 5S: Phase 5 Developed

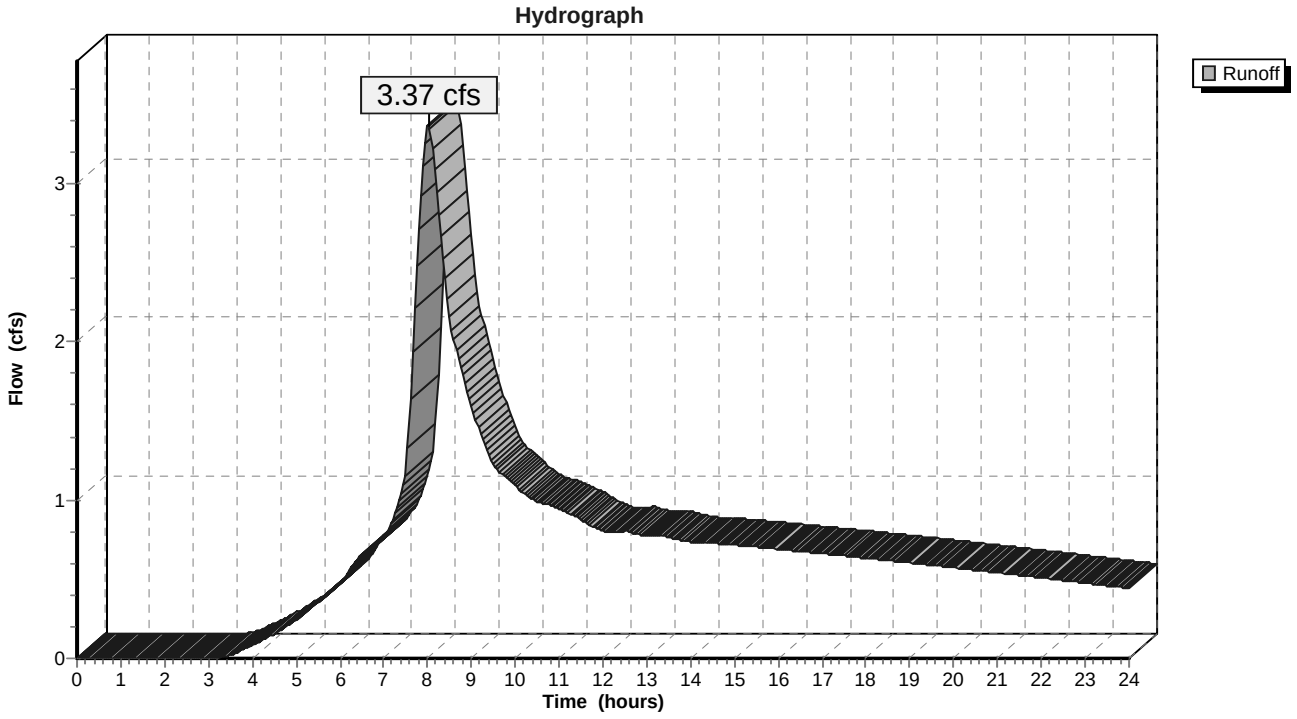
Runoff = 3.37 cfs @ 8.02 hrs, Volume= 1.312 af, Depth= 1.63"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=2.63"

Area (ac)	CN	Description
2.500	98	Streets & Sidewalk
2.870	98	Roofs & Driveways
4.260	79	Landscape
9.630	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, Landscape** Grass: Short n= 0.150 P2= 2.50"
2.3	200	0.0050	1.4		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
16.9	300	Total			

Subcatchment 5S: Phase 5 Developed



Subcatchment 6S: Phase 6 Developed

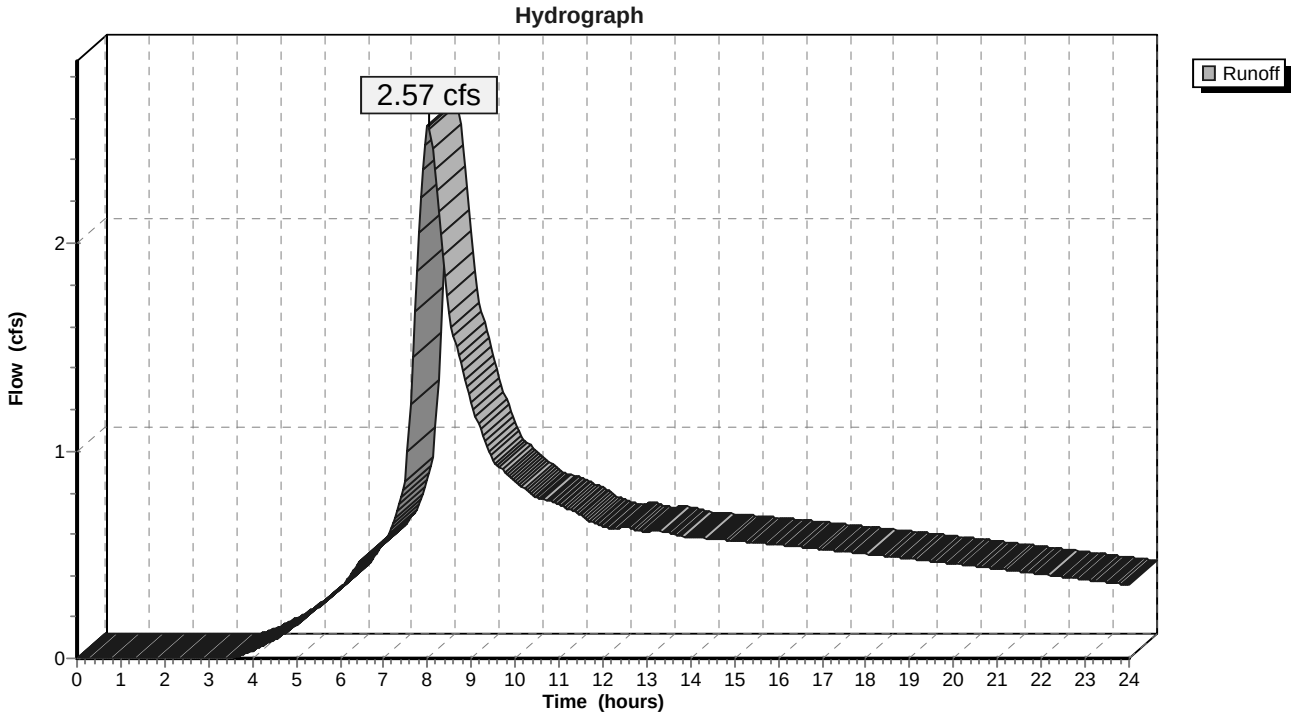
Runoff = 2.57 cfs @ 8.02 hrs, Volume= 1.017 af, Depth= 1.56"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=2.63"

Area (ac)	CN	Description
1.940	98	Streets & Sidewalk
2.360	98	House & Driveways
3.540	79	Landscape
7.840	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, Landscape** Grass: Short n= 0.150 P2= 2.50"
2.3	200	0.0050	1.4		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
16.9	300	Total			

Subcatchment 6S: Phase 6 Developed



Subcatchment 7S: Phase 7 Developed

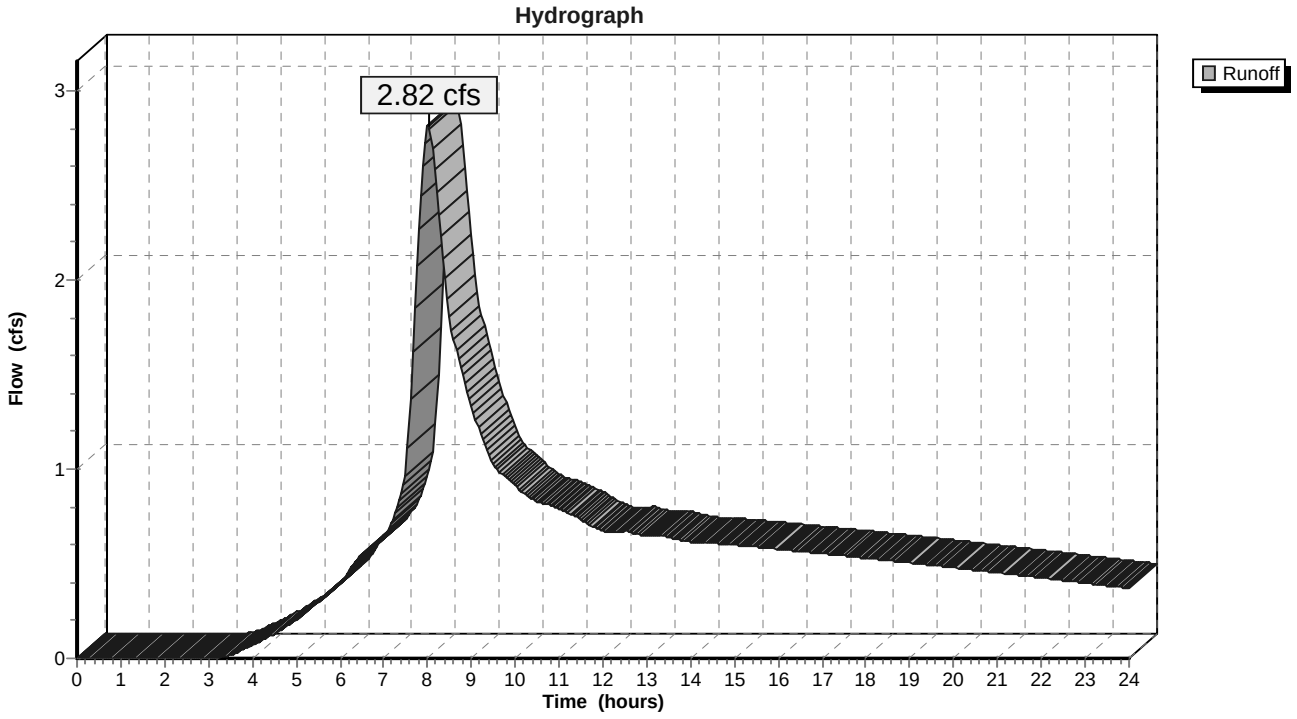
Runoff = 2.82 cfs @ 8.02 hrs, Volume= 1.098 af, Depth= 1.63"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=2.63"

Area (ac)	CN	Description
2.190	98	Street & Sidewalk
2.410	98	House & Driveway
3.460	79	Landscape
8.060	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, Landscape** Grass: Short n= 0.150 P2= 2.50"
2.3	200	0.0050	1.4		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
16.9	300	Total			

Subcatchment 7S: Phase 7 Developed



Subcatchment Pre Dev: PRE DEVELOPED

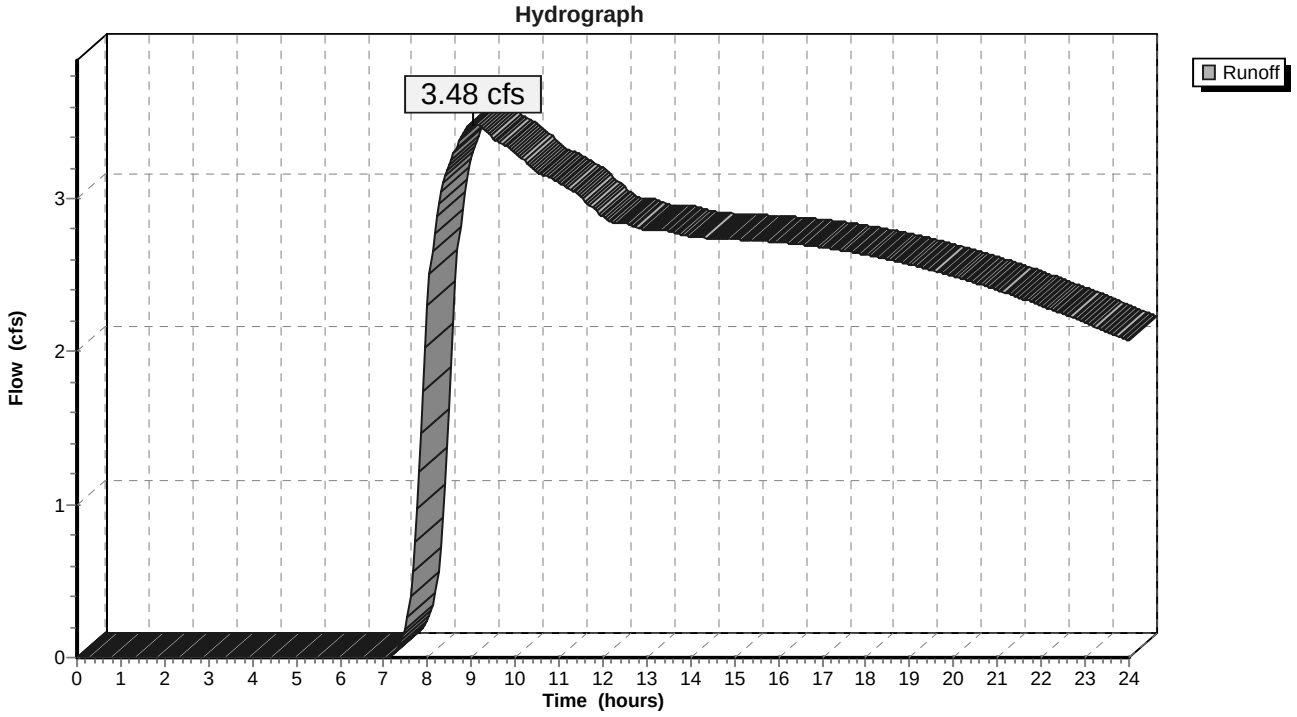
Runoff = 3.48 cfs @ 9.05 hrs, Volume= 3.637 af, Depth= 0.65"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=2.63"

Area (ac)	CN	Description
66.800	74	Herbaceous range, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.2	300	0.0100	0.1		**Sheet Flow, GRASSED** Grass: Short n= 0.150 P2= 2.50"
15.7	1,000	0.0050	1.1		**Shallow Concentrated Flow, NATURAL SWALE** Grassed Waterway Kv= 15.0 fps
6.7	1,000	0.0030	2.5	90.08	**Trap/Vee/Rect Channel Flow, DITCH** Bot.W=1.00' D=4.00' Z= 2.0 '/' n= 0.050
57.6	2,300	Total			

Subcatchment Pre Dev: PRE DEVELOPED



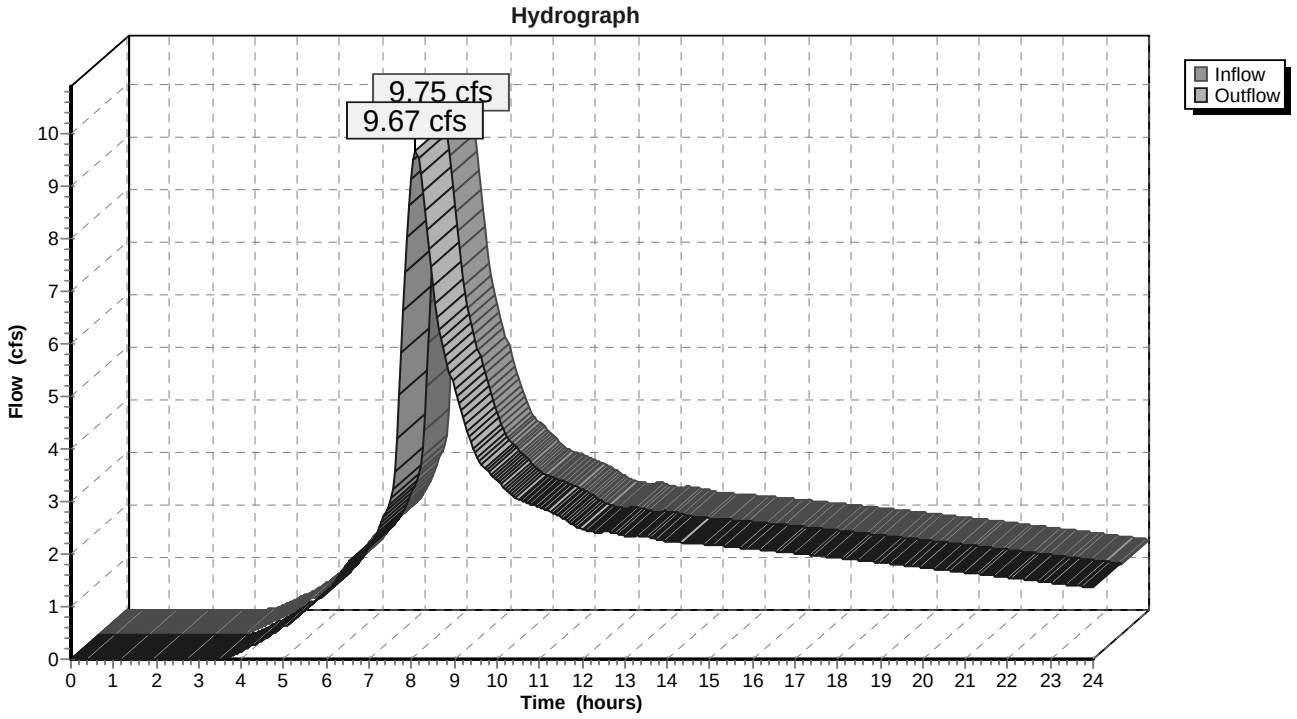
Reach 1R: PHASE 1-3 SWALE

Inflow Area = 29.340 ac, Inflow Depth = 1.61"
Inflow = 9.75 cfs @ 8.03 hrs, Volume= 3.944 af
Outflow = 9.67 cfs @ 8.10 hrs, Volume= 3.929 af, Atten= 1%, Lag= 4.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.6 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 4.5 min

Peak Depth= 1.00'
Capacity at bank full= 20.21 cfs
12.00' x 1.50' deep channel, n= 0.200 Length= 100.0' Slope= 0.0100 '/'
Side Slope Z-value= 3.0 '/'

Reach 1R: PHASE 1-3 SWALE



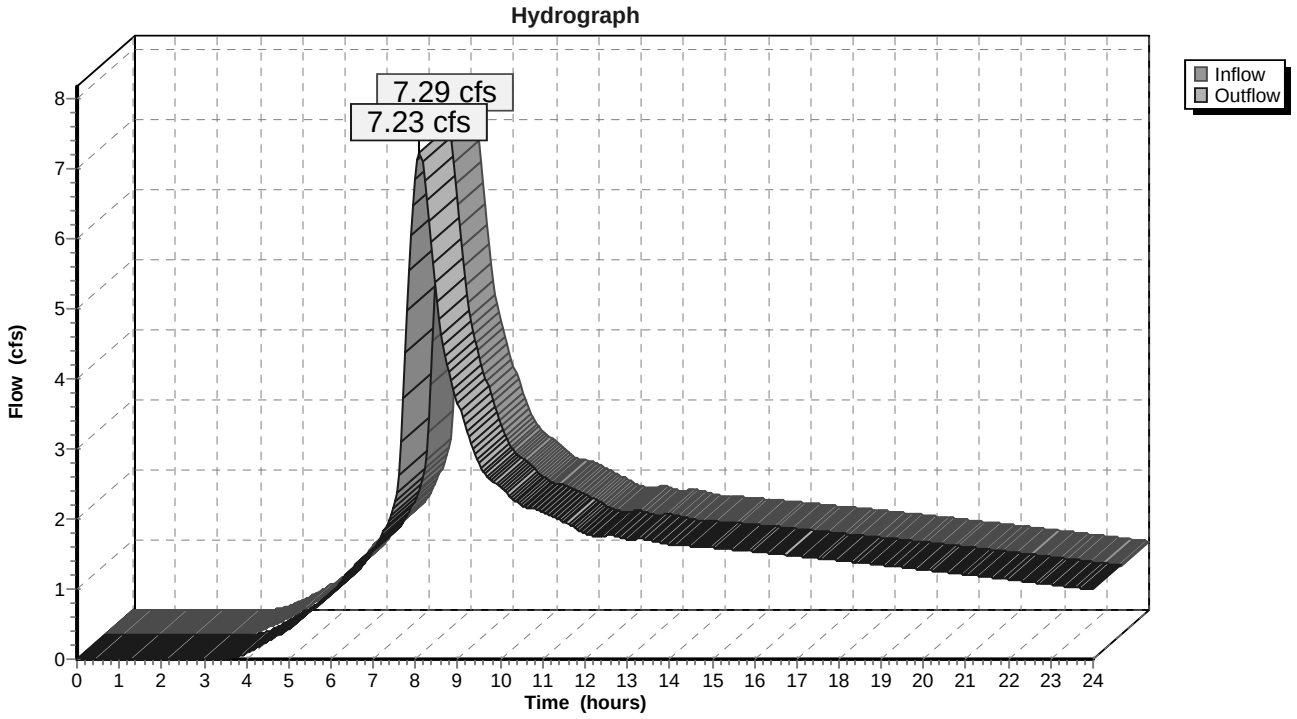
Reach 2R: pHASE 4 & 5 SWALE

Inflow Area = 21.580 ac, Inflow Depth = 1.59"
Inflow = 7.29 cfs @ 8.02 hrs, Volume= 2.862 af
Outflow = 7.23 cfs @ 8.10 hrs, Volume= 2.851 af, Atten= 1%, Lag= 4.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.6 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.3 fps, Avg. Travel Time= 4.5 min

Peak Depth= 1.13'
Capacity at bank full= 12.31 cfs
8.00' x 1.50' deep channel, n= 0.200 Length= 90.0' Slope= 0.0071 '/'
Side Slope Z-value= 3.0 '/'

Reach 2R: pHASE 4 & 5 SWALE



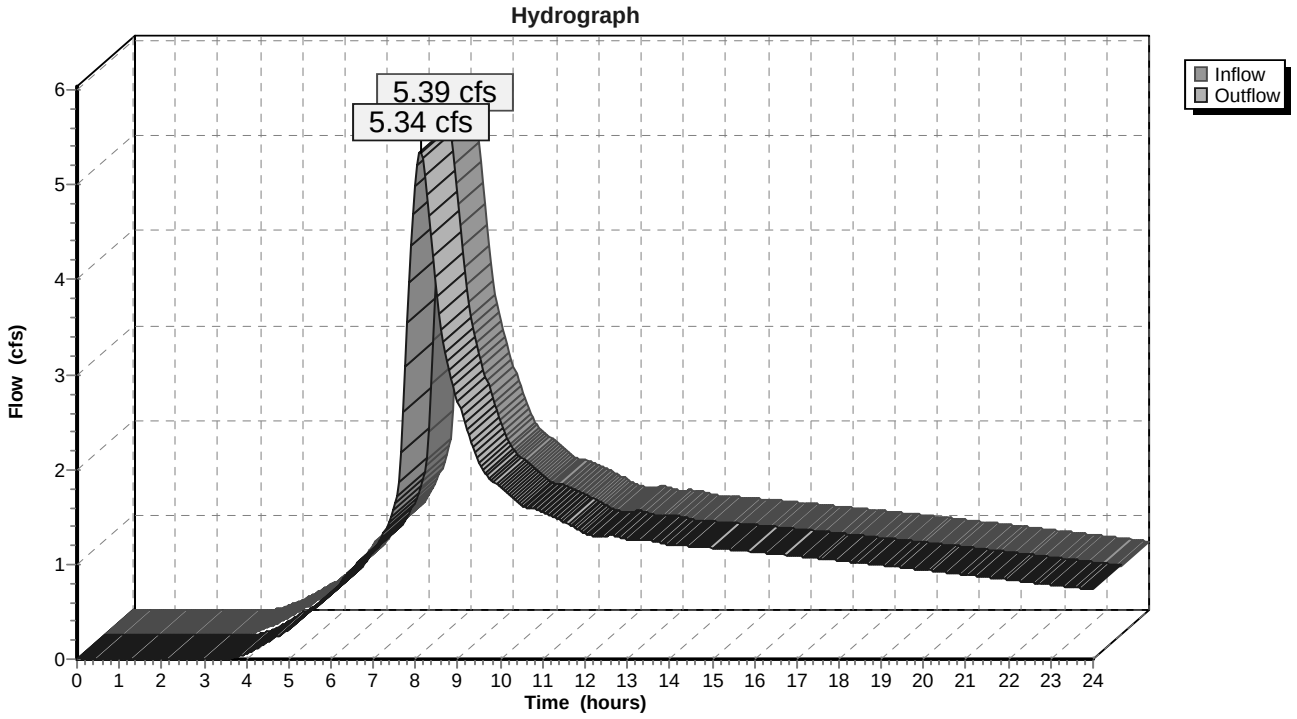
Reach 3R: PHASE 6 & 7 SWALE

Inflow Area = 15.900 ac, Inflow Depth = 1.60"
Inflow = 5.39 cfs @ 8.02 hrs, Volume= 2.115 af
Outflow = 5.34 cfs @ 8.11 hrs, Volume= 2.105 af, Atten= 1%, Lag= 5.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.5 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 0.3 fps, Avg. Travel Time= 5.7 min

Peak Depth= 0.83'
Capacity at bank full= 15.55 cfs
10.00' x 1.50' deep channel, n= 0.200 Length= 100.0' Slope= 0.0080 '/'
Side Slope Z-value= 3.0 '/'

Reach 3R: PHASE 6 & 7 SWALE



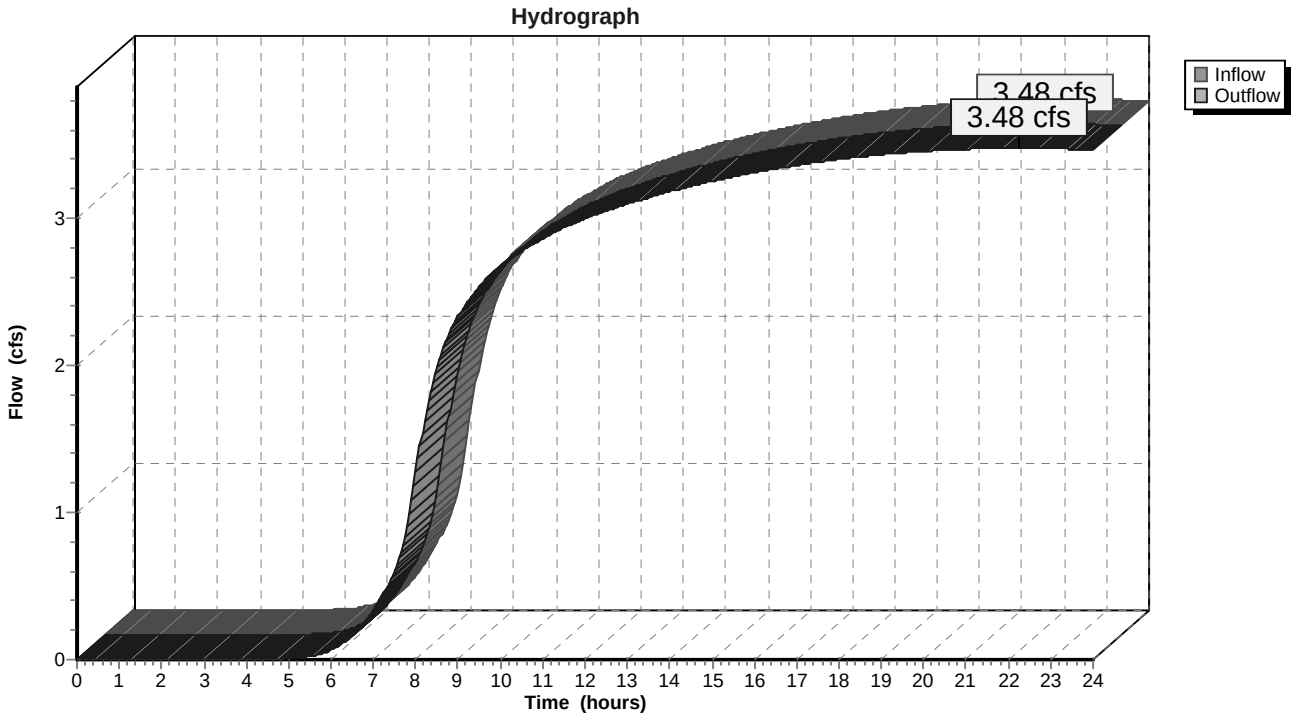
Reach 4R: PIPE

Inflow Area = 66.820 ac, Inflow Depth = 0.77"
Inflow = 3.48 cfs @ 22.20 hrs, Volume= 4.261 af
Outflow = 3.48 cfs @ 22.25 hrs, Volume= 4.244 af, Atten= 0%, Lag= 3.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.5 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 4.6 fps, Avg. Travel Time= 2.2 min

Peak Depth= 0.51'
Capacity at bank full= 24.51 cfs
24.0" Diameter Pipe n= 0.012 Length= 600.0' Slope= 0.0100 '/'

Reach 4R: PIPE



Pond 1P: MASTER POND

Inflow Area = 66.820 ac, Inflow Depth = 1.60"
Inflow = 22.23 cfs @ 8.10 hrs, Volume= 8.886 af
Outflow = 3.48 cfs @ 22.20 hrs, Volume= 4.261 af, Atten= 84%, Lag= 845.7 min
Primary = 3.48 cfs @ 22.20 hrs, Volume= 4.261 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

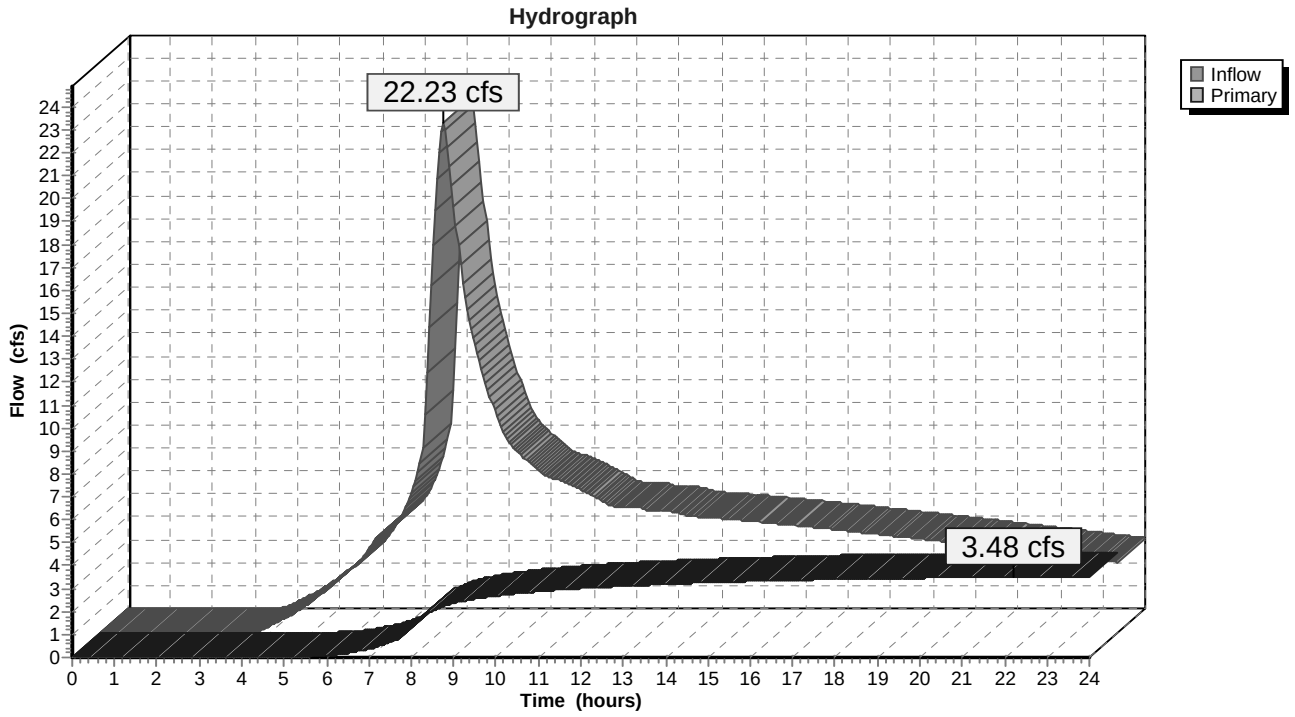
Peak Elev= 2.74' Surf.Area= 1.656 ac Storage= 4.655 af
Plug-Flow detention time= 468.5 min calculated for 4.261 af (48% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
0.00	1.200	0.000	0.000
6.00	2.200	10.200	10.200

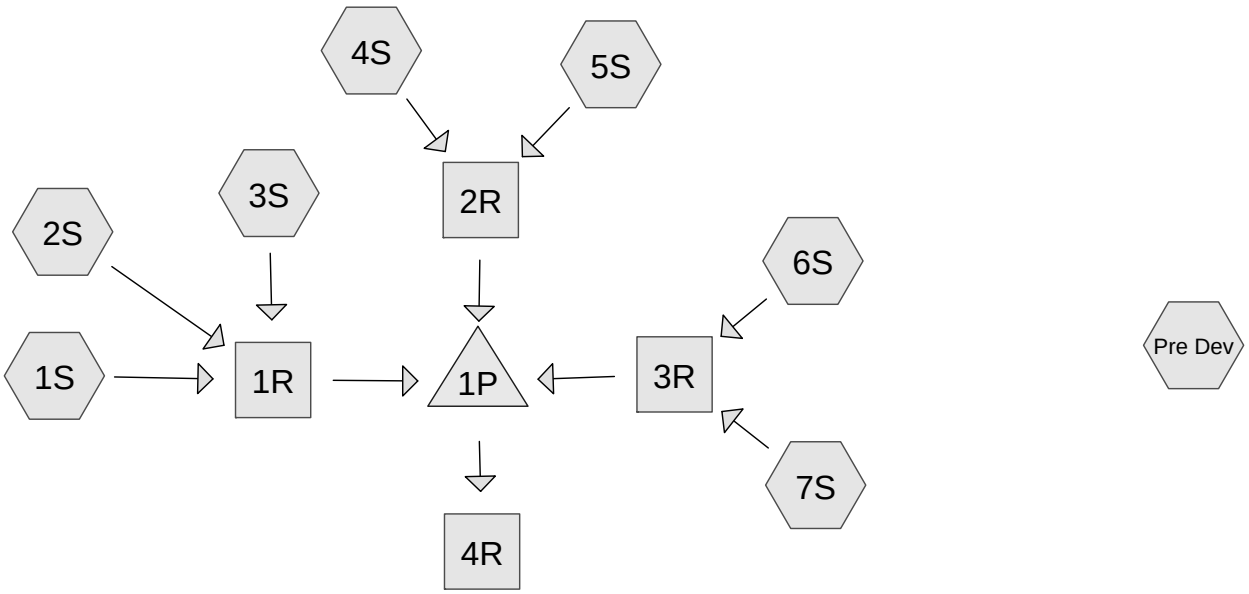
Primary OutFlow Max=3.48 cfs @ 22.20 hrs HW=2.74' (Free Discharge)
- **1=Orifice/Grate** (Controls 3.48 cfs)
- **2=Orifice/Grate** (Controls 0.00 cfs)
- **3=Orifice/Grate** (Controls 0.00 cfs)

#	Routing	Invert	Outlet Devices
1	Primary	0.00'	**9.3" Vert. Orifice/Grate** C= 0.600
2	Primary	2.80'	**12.0" Vert. Orifice/Grate** C= 0.600
3	Primary	4.50'	**24.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond 1P: MASTER POND



Appendix C



Subcat Reach Pond Link

Drainage Diagram for 1718 Rolling Meadows PRELIM
Prepared by Rhine Cross Group, LLC 12/6/2018

Subcatchment 1S: Phase 1 Developed

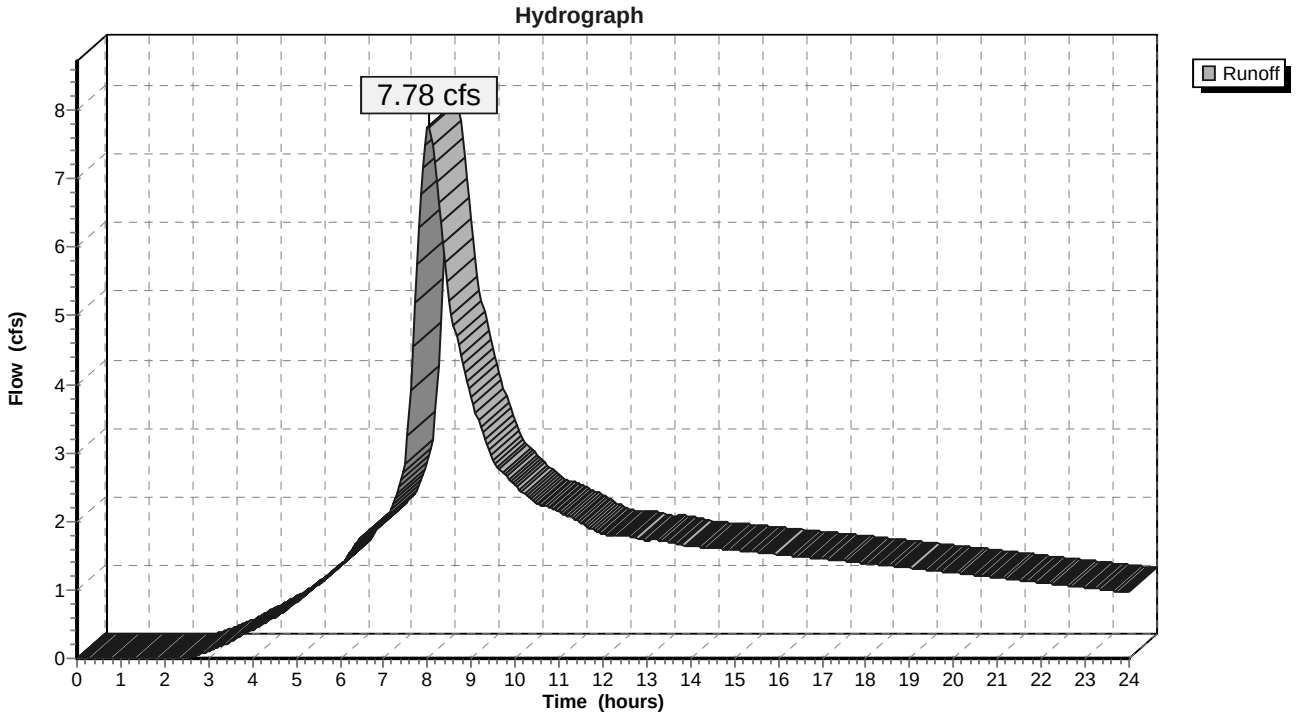
Runoff = 7.78 cfs @ 8.02 hrs, Volume= 3.061 af, Depth= 2.53"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=3.61"

Area (ac)	CN	Description
4.300	98	STREET & SIDEWALK
4.100	98	HOUSE ROOF/DRIVEWAYS
6.120	79	LANDSCAPE
14.520	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	130	0.0100	0.1		**Sheet Flow, LANDSCAPE** Grass: Short n= 0.150 P2= 2.50"
1.7	150	0.0050	1.4		**Shallow Concentrated Flow, GUTTER** Paved Kv= 20.3 fps
19.7	280	Total			

Subcatchment 1S: Phase 1 Developed



Subcatchment 2S: Phase 2 Developed

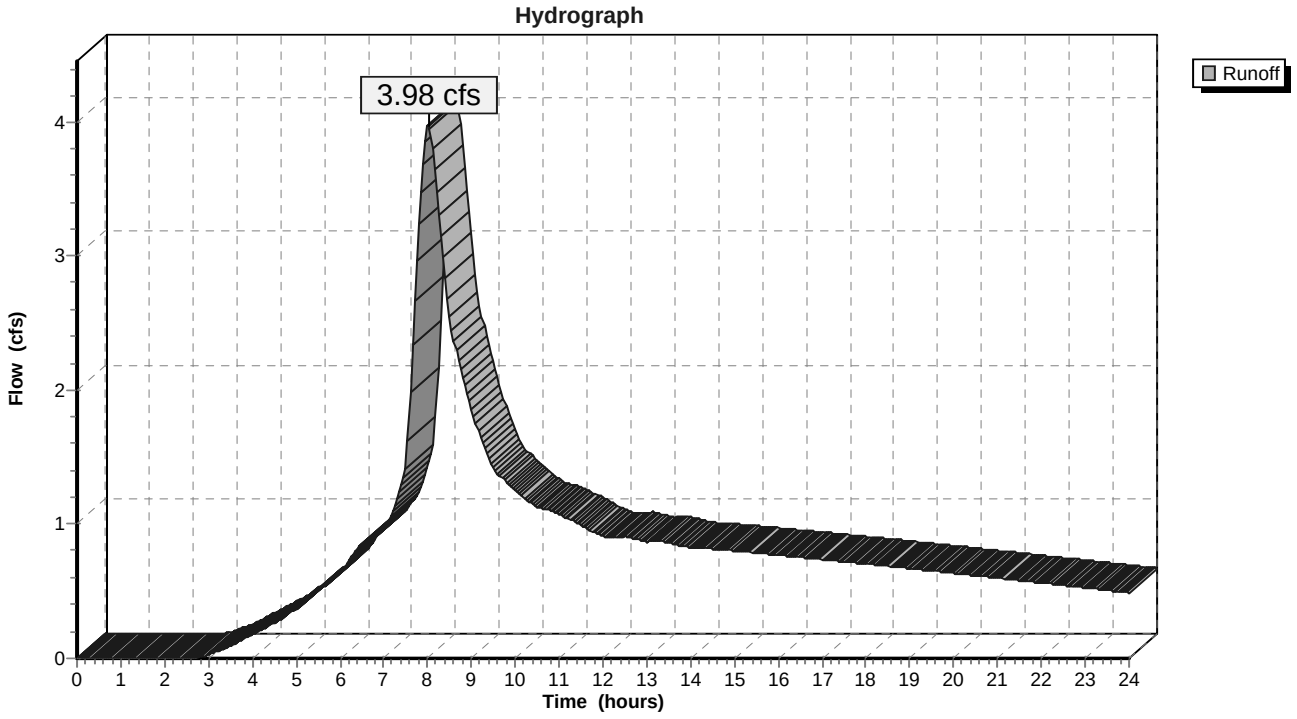
Runoff = 3.98 cfs @ 8.02 hrs, Volume= 1.527 af, Depth= 2.44"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=3.61"

Area (ac)	CN	Description
1.970	98	STREET & SIDEWALK
2.120	98	HOUSE ROOF/DRIVEWAY
3.420	79	LANDSCAPE
7.510	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, LANDSCAPE** Grass: Short n= 0.150 P2= 2.50"
2.9	250	0.0050	1.4		**Shallow Concentrated Flow, GUTTER** Paved Kv= 20.3 fps
17.5	350	Total			

Subcatchment 2S: Phase 2 Developed



Subcatchment 3S: Phase 3 Developed

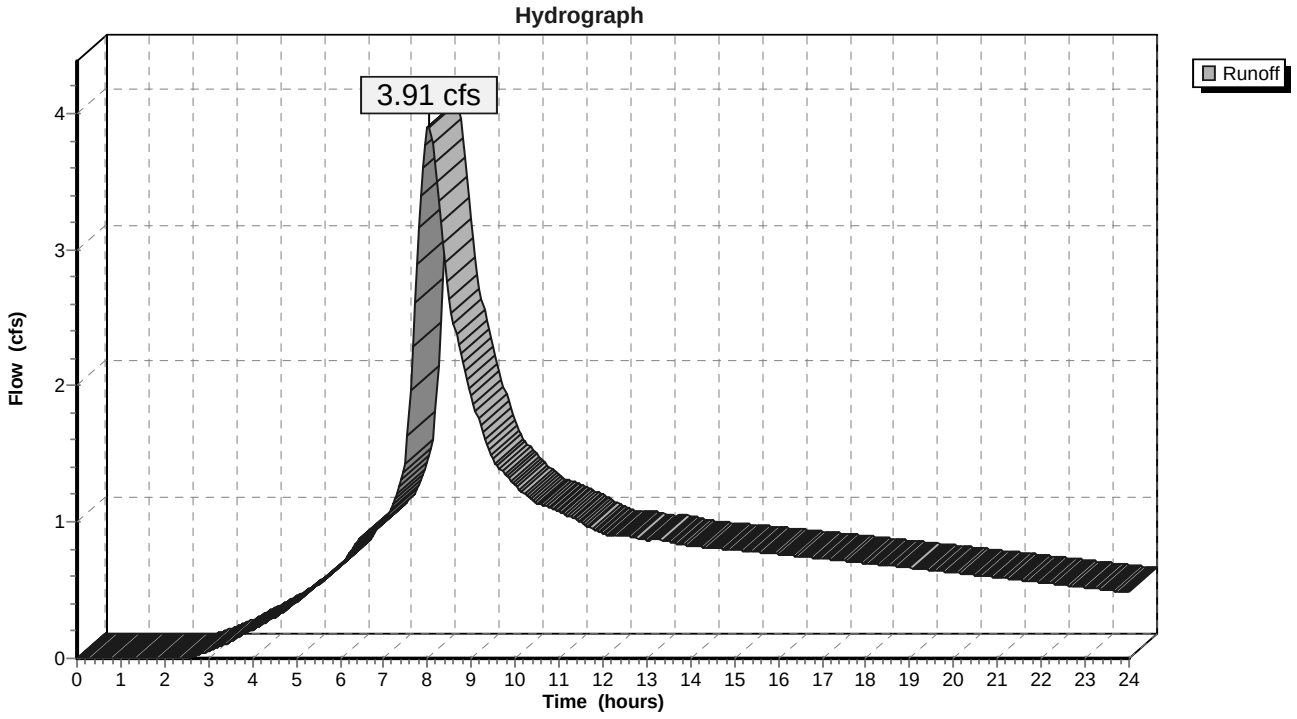
Runoff = 3.91 cfs @ 8.02 hrs, Volume= 1.541 af, Depth= 2.53"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=3.61"

Area (ac)	CN	Description
1.800	98	STREET & SIDEWALK
2.350	98	ROOF & DRIVEWAY
3.160	79	LANDSCAPE & PARK
7.310	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	120	0.0100	0.1		**Sheet Flow, LANDSCAPE** Grass: Short n= 0.150 P2= 2.50"
2.9	250	0.0050	1.4		**Shallow Concentrated Flow, GUTTER** Paved Kv= 20.3 fps
19.8	370	Total			

Subcatchment 3S: Phase 3 Developed



Subcatchment 4S: Phase 4 Developed

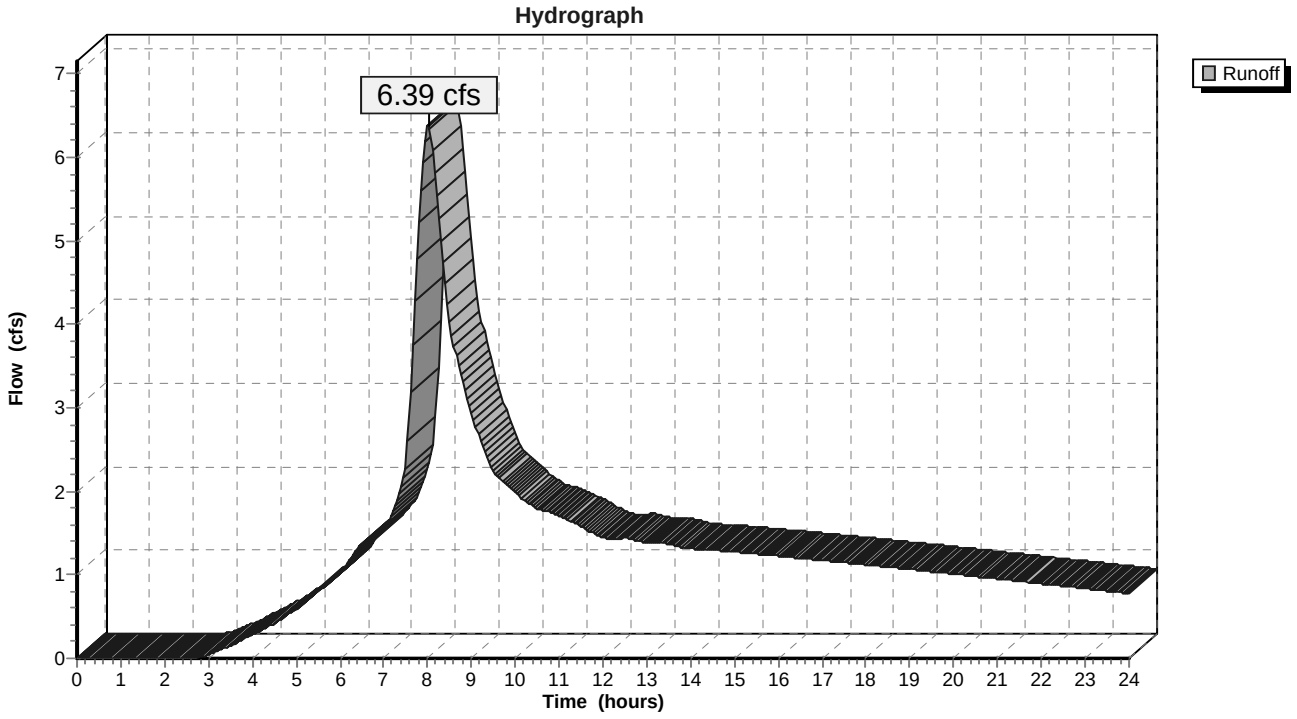
Runoff = 6.39 cfs @ 8.02 hrs, Volume= 2.431 af, Depth= 2.44"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=3.61"

Area (ac)	CN	Description
2.600	98	Streets & Sidewalk
3.390	98	Home & Driveway
5.960	79	Landscape
11.950	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, Landscape** Grass: Short n= 0.150 P2= 2.50"
2.3	200	0.0050	1.4		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
16.9	300	Total			

Subcatchment 4S: Phase 4 Developed



Subcatchment 5S: Phase 5 Developed

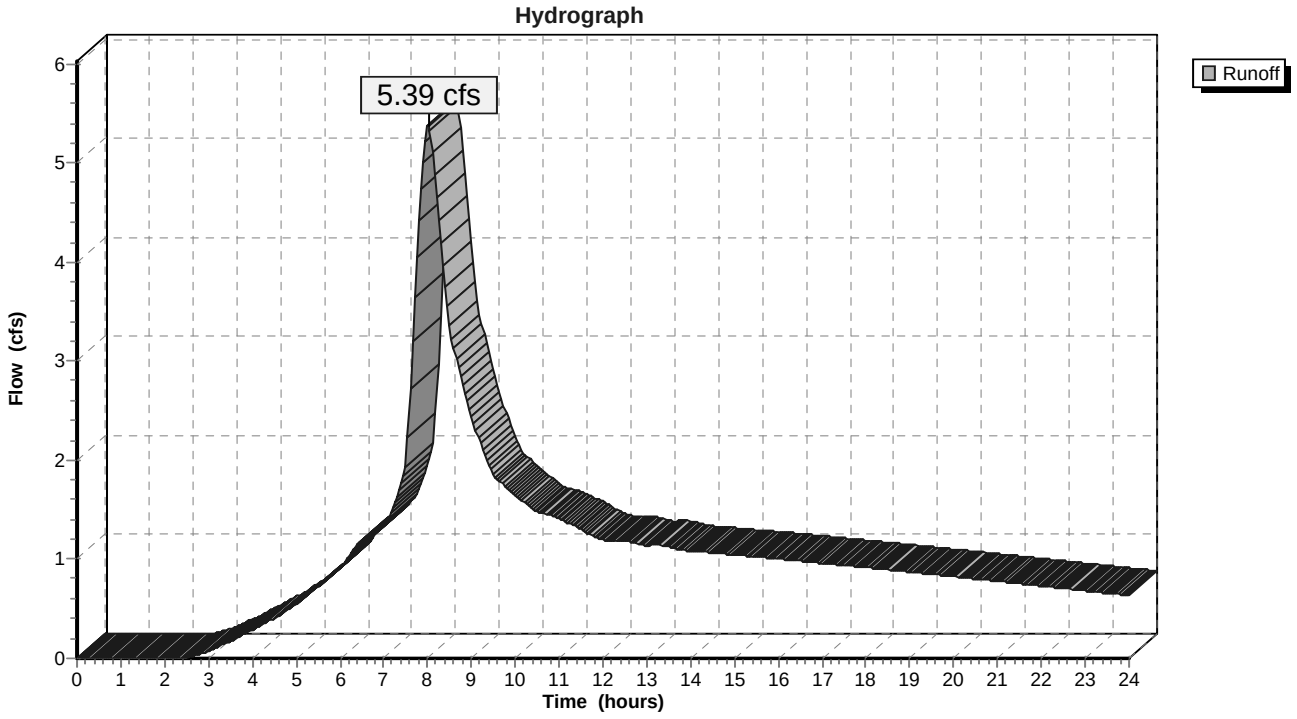
Runoff = 5.39 cfs @ 8.01 hrs, Volume= 2.033 af, Depth= 2.53"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=3.61"

Area (ac)	CN	Description
2.500	98	Streets & Sidewalk
2.870	98	Roofs & Driveways
4.260	79	Landscape
9.630	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, Landscape** Grass: Short n= 0.150 P2= 2.50"
2.3	200	0.0050	1.4		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
16.9	300	Total			

Subcatchment 5S: Phase 5 Developed



Subcatchment 6S: Phase 6 Developed

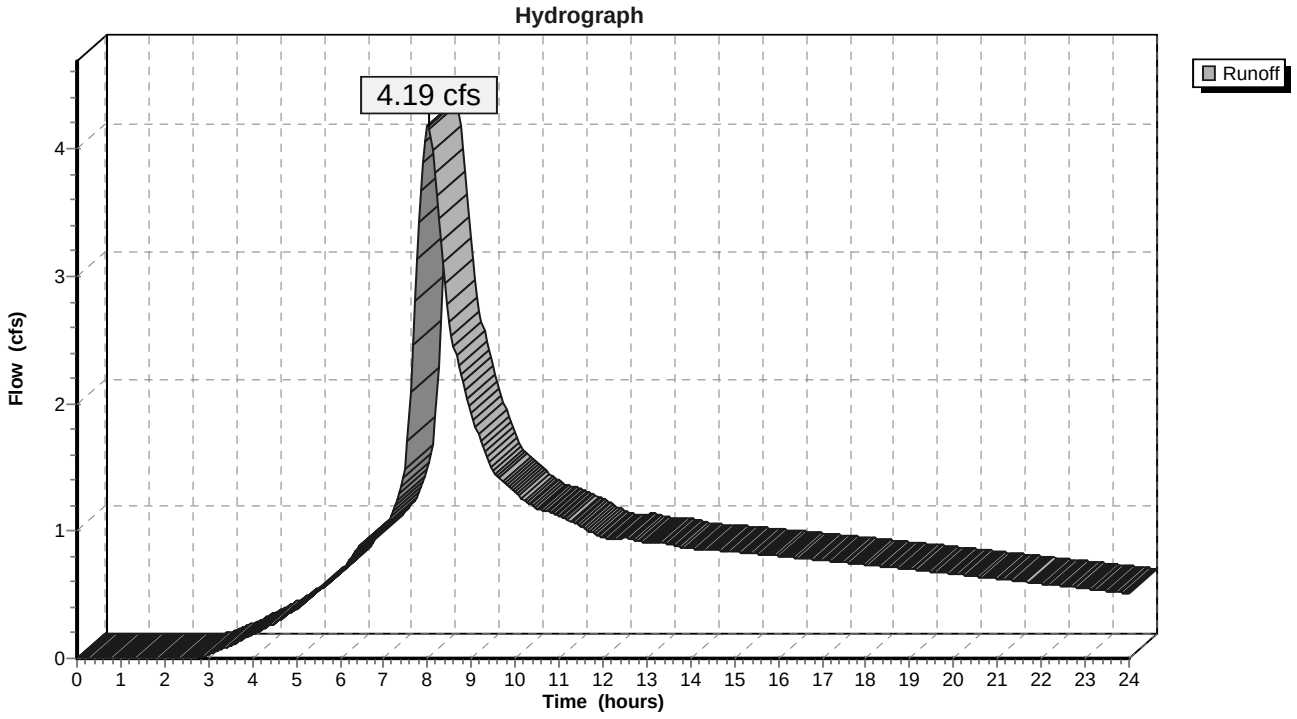
Runoff = 4.19 cfs @ 8.02 hrs, Volume= 1.595 af, Depth= 2.44"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=3.61"

Area (ac)	CN	Description
1.940	98	Streets & Sidewalk
2.360	98	House & Driveways
3.540	79	Landscape
7.840	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, Landscape** Grass: Short n= 0.150 P2= 2.50"
2.3	200	0.0050	1.4		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
16.9	300	Total			

Subcatchment 6S: Phase 6 Developed



Subcatchment 7S: Phase 7 Developed

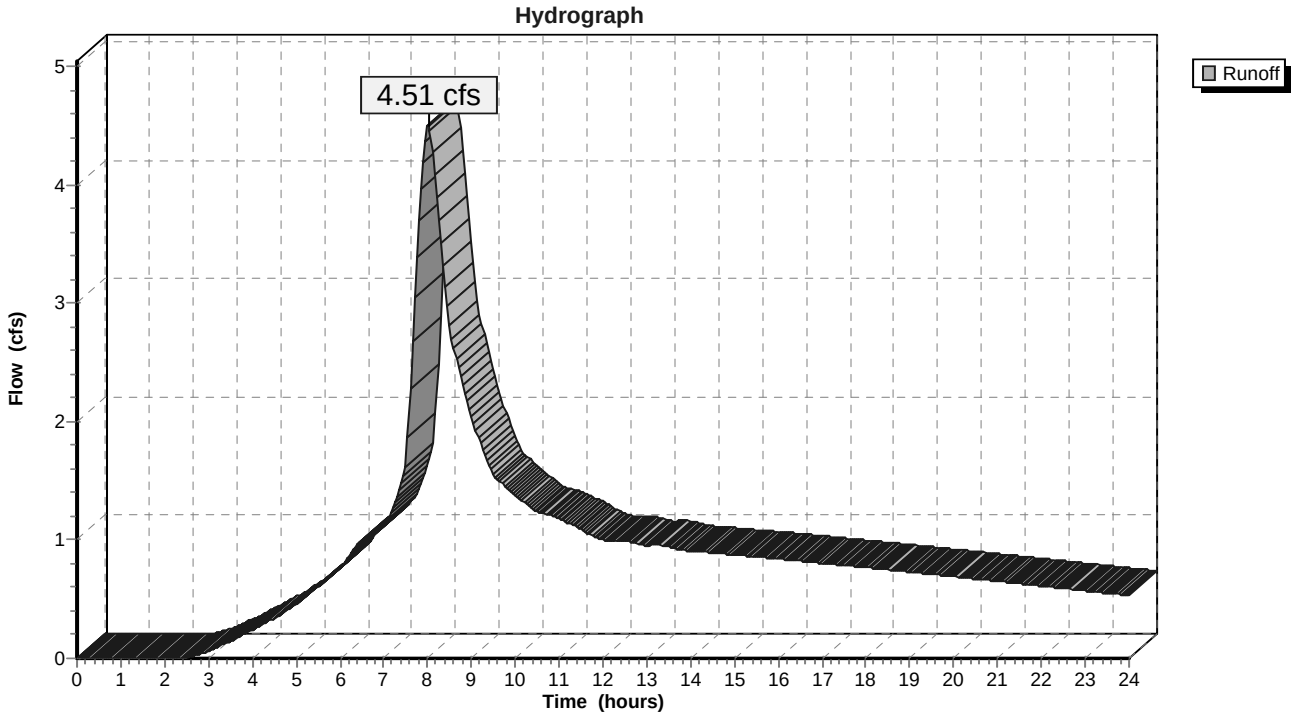
Runoff = 4.51 cfs @ 8.01 hrs, Volume= 1.701 af, Depth= 2.53"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=3.61"

Area (ac)	CN	Description
2.190	98	Street & Sidewalk
2.410	98	House & Driveway
3.460	79	Landscape
8.060	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, Landscape** Grass: Short n= 0.150 P2= 2.50"
2.3	200	0.0050	1.4		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
16.9	300	Total			

Subcatchment 7S: Phase 7 Developed



Subcatchment Pre Dev: PRE DEVELOPED

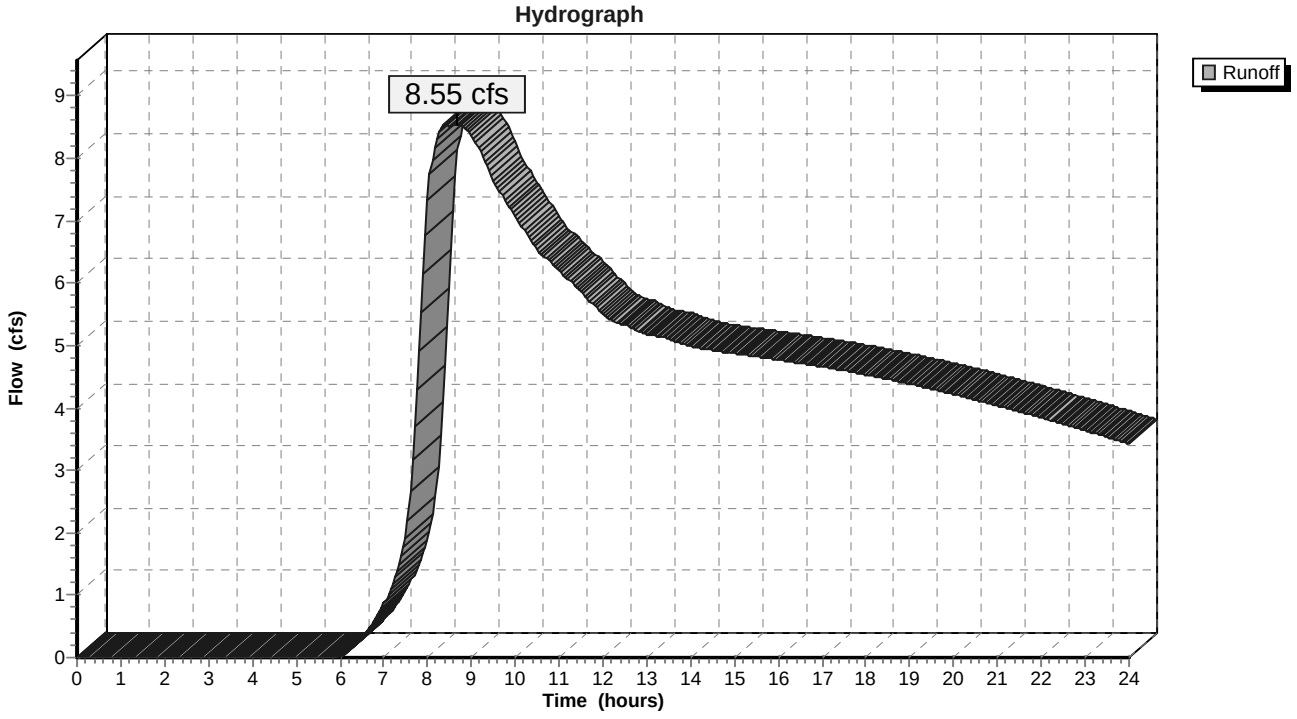
Runoff = 8.55 cfs @ 8.67 hrs, Volume= 7.057 af, Depth= 1.27"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=3.61"

Area (ac)	CN	Description
66.800	74	Herbaceous range, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.2	300	0.0100	0.1		**Sheet Flow, GRASSED** Grass: Short n= 0.150 P2= 2.50"
15.7	1,000	0.0050	1.1		**Shallow Concentrated Flow, NATURAL SWALE** Grassed Waterway Kv= 15.0 fps
6.7	1,000	0.0030	2.5	90.08	**Trap/Vee/Rect Channel Flow, DITCH** Bot.W=1.00' D=4.00' Z= 2.0 '/' n= 0.050
57.6	2,300	Total			

Subcatchment Pre Dev: PRE DEVELOPED



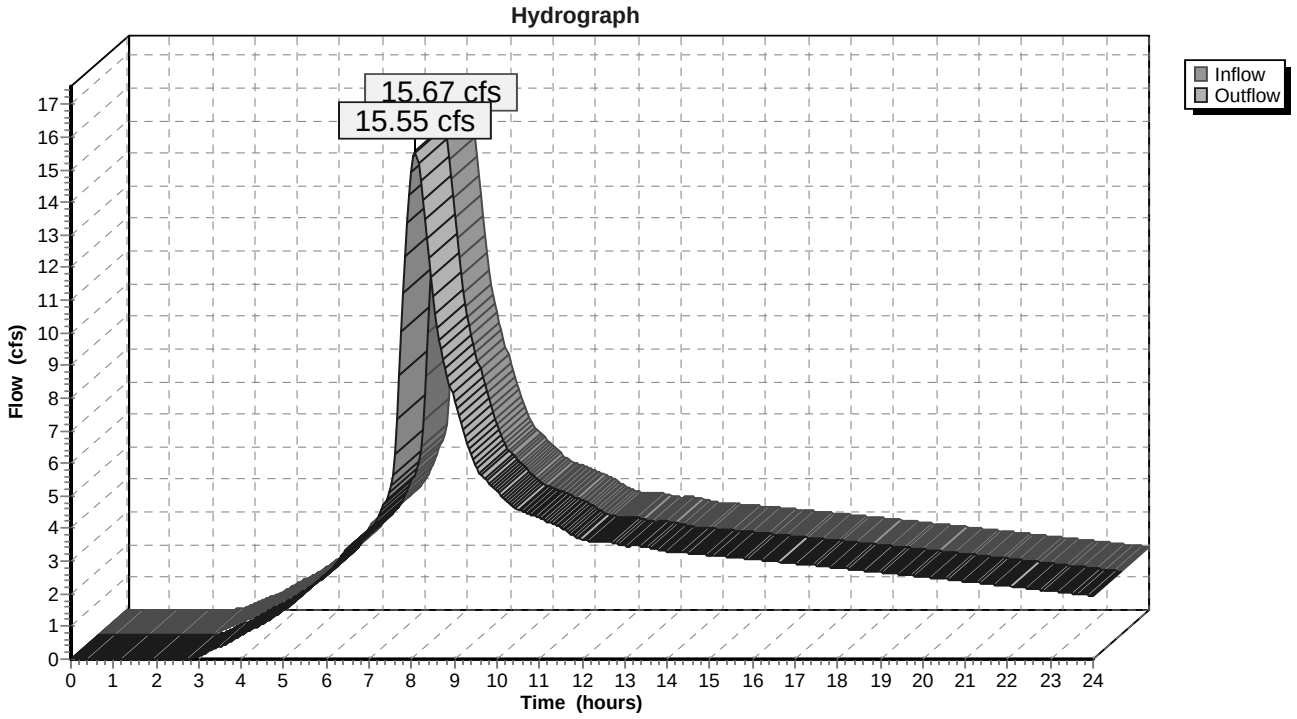
Reach 1R: PHASE 1-3 SWALE

Inflow Area = 29.340 ac, Inflow Depth = 2.51"
Inflow = 15.67 cfs @ 8.02 hrs, Volume= 6.129 af
Outflow = 15.55 cfs @ 8.09 hrs, Volume= 6.111 af, Atten= 1%, Lag= 3.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.8 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 3.9 min

Peak Depth= 1.30'
Capacity at bank full= 20.21 cfs
12.00' x 1.50' deep channel, n= 0.200 Length= 100.0' Slope= 0.0100 '/'
Side Slope Z-value= 3.0 '/'

Reach 1R: PHASE 1-3 SWALE



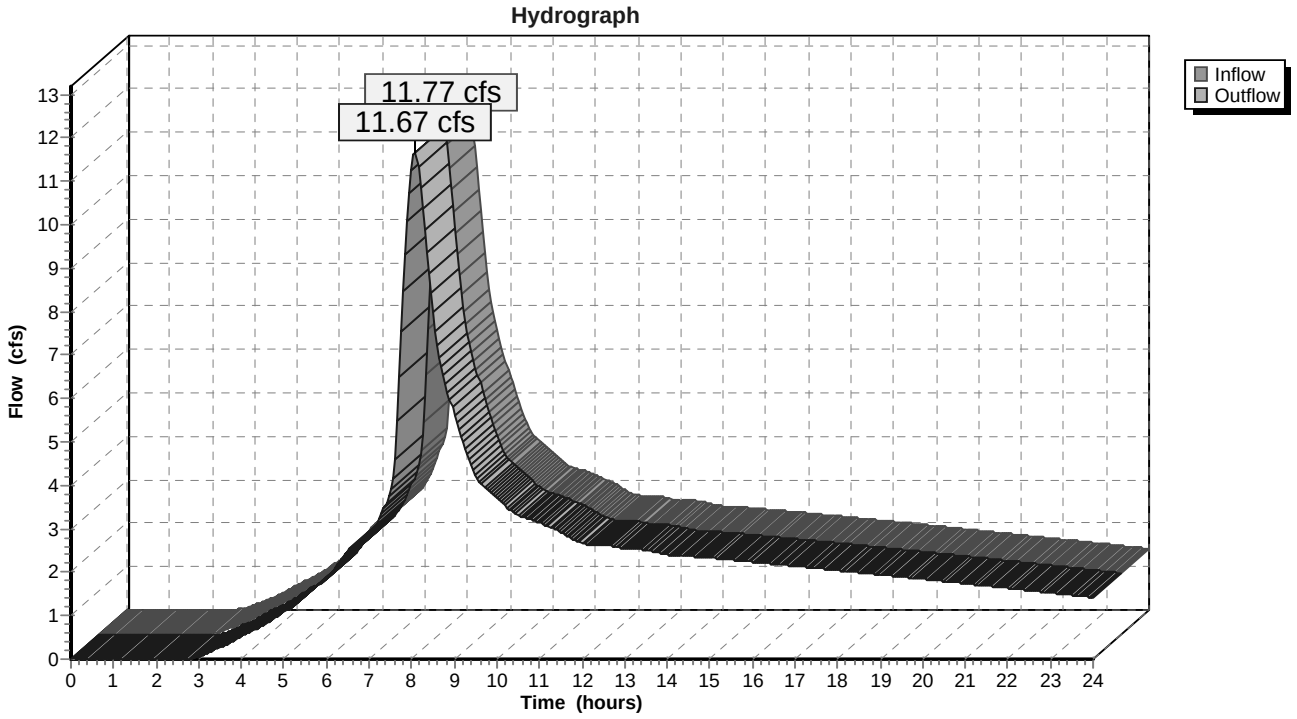
Reach 2R: pHASE 4 & 5 SWALE

Inflow Area = 21.580 ac, Inflow Depth = 2.48"
Inflow = 11.77 cfs @ 8.01 hrs, Volume= 4.463 af
Outflow = 11.67 cfs @ 8.08 hrs, Volume= 4.450 af, Atten= 1%, Lag= 4.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.6 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 4.0 min

Peak Depth= 1.46'
Capacity at bank full= 12.31 cfs
8.00' x 1.50' deep channel, n= 0.200 Length= 90.0' Slope= 0.0071 '/'
Side Slope Z-value= 3.0 '/'

Reach 2R: pHASE 4 & 5 SWALE



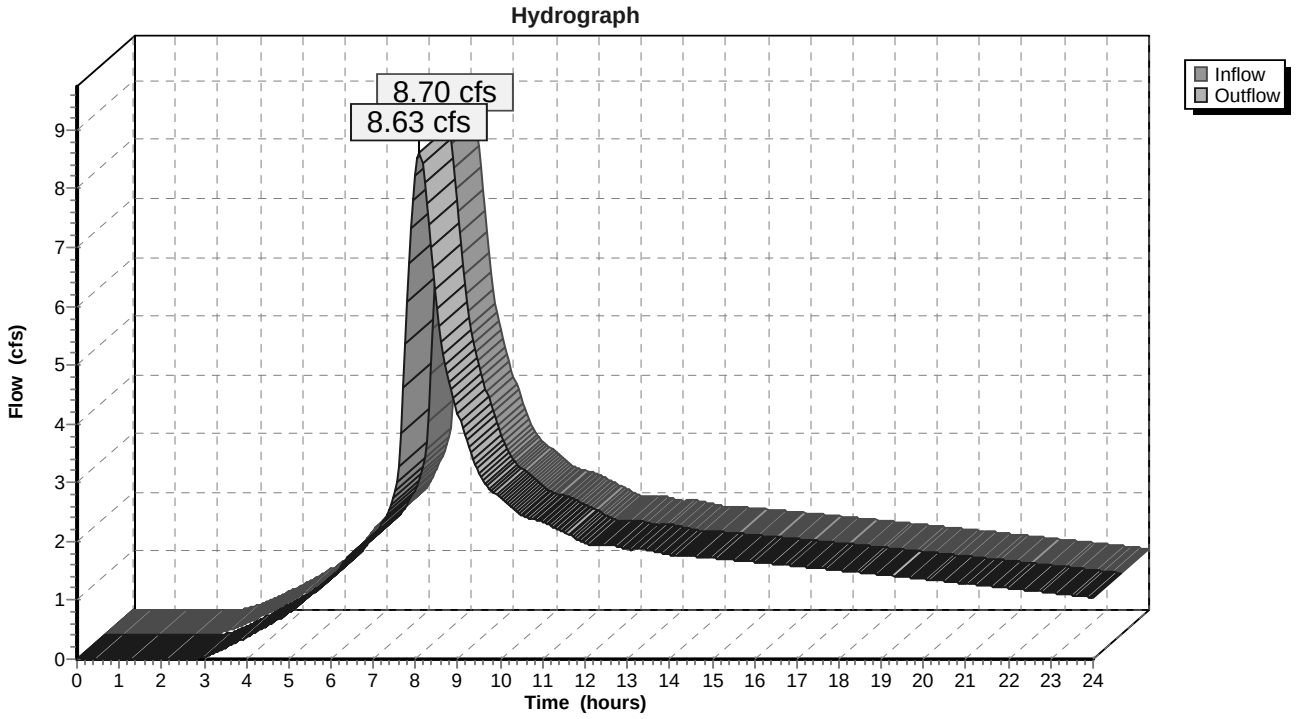
Reach 3R: PHASE 6 & 7 SWALE

Inflow Area = 15.900 ac, Inflow Depth = 2.49"
Inflow = 8.70 cfs @ 8.01 hrs, Volume= 3.296 af
Outflow = 8.63 cfs @ 8.09 hrs, Volume= 3.284 af, Atten= 1%, Lag= 4.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.6 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 0.3 fps, Avg. Travel Time= 4.9 min

Peak Depth= 1.09'
Capacity at bank full= 15.55 cfs
10.00' x 1.50' deep channel, n= 0.200 Length= 100.0' Slope= 0.0080 '/'
Side Slope Z-value= 3.0 '/'

Reach 3R: PHASE 6 & 7 SWALE



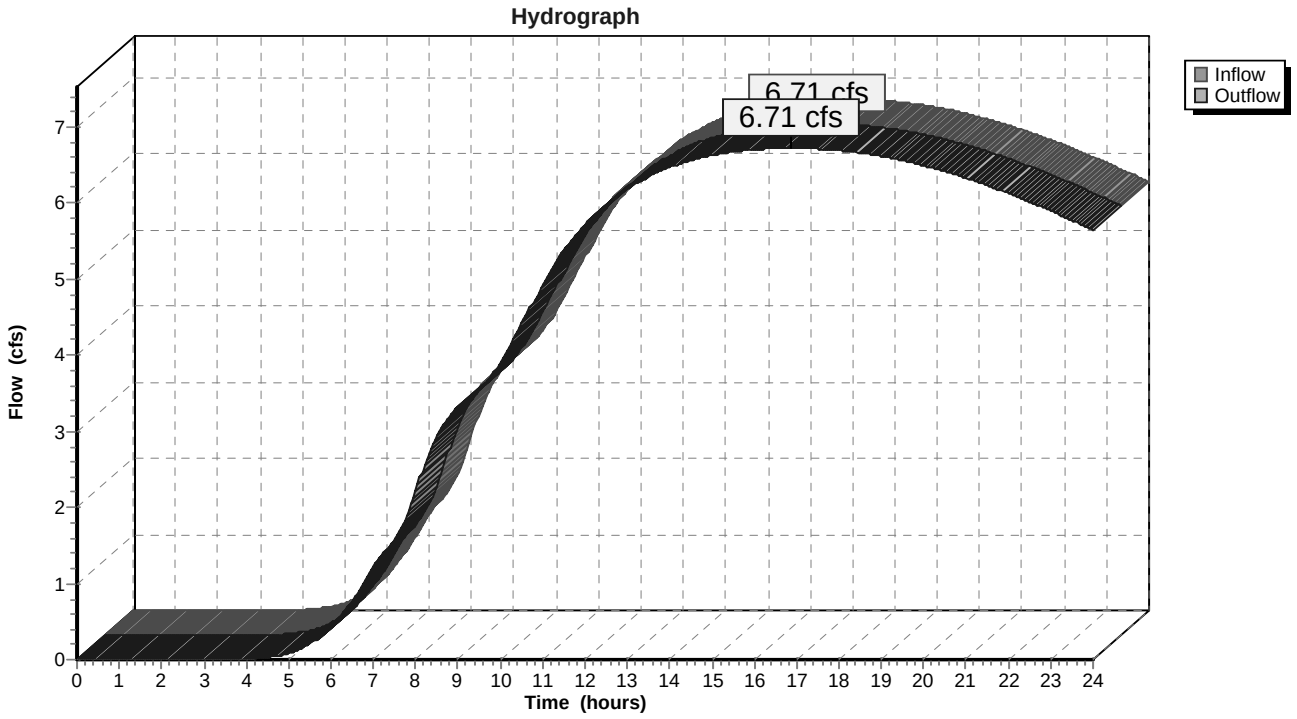
Reach 4R: PIPE

Inflow Area = 66.820 ac, Inflow Depth = 1.42"
Inflow = 6.71 cfs @ 16.81 hrs, Volume= 7.919 af
Outflow = 6.71 cfs @ 16.86 hrs, Volume= 7.895 af, Atten= 0%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.7 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 5.4 fps, Avg. Travel Time= 1.8 min

Peak Depth= 0.72'
Capacity at bank full= 24.51 cfs
24.0" Diameter Pipe n= 0.012 Length= 600.0' Slope= 0.0100 '/'

Reach 4R: PIPE



Pond 1P: MASTER POND

Inflow Area = 66.820 ac, Inflow Depth = 2.49"
Inflow = 35.84 cfs @ 8.09 hrs, Volume= 13.845 af
Outflow = 6.71 cfs @ 16.81 hrs, Volume= 7.919 af, Atten= 81%, Lag= 523.5 min
Primary = 6.71 cfs @ 16.81 hrs, Volume= 7.919 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

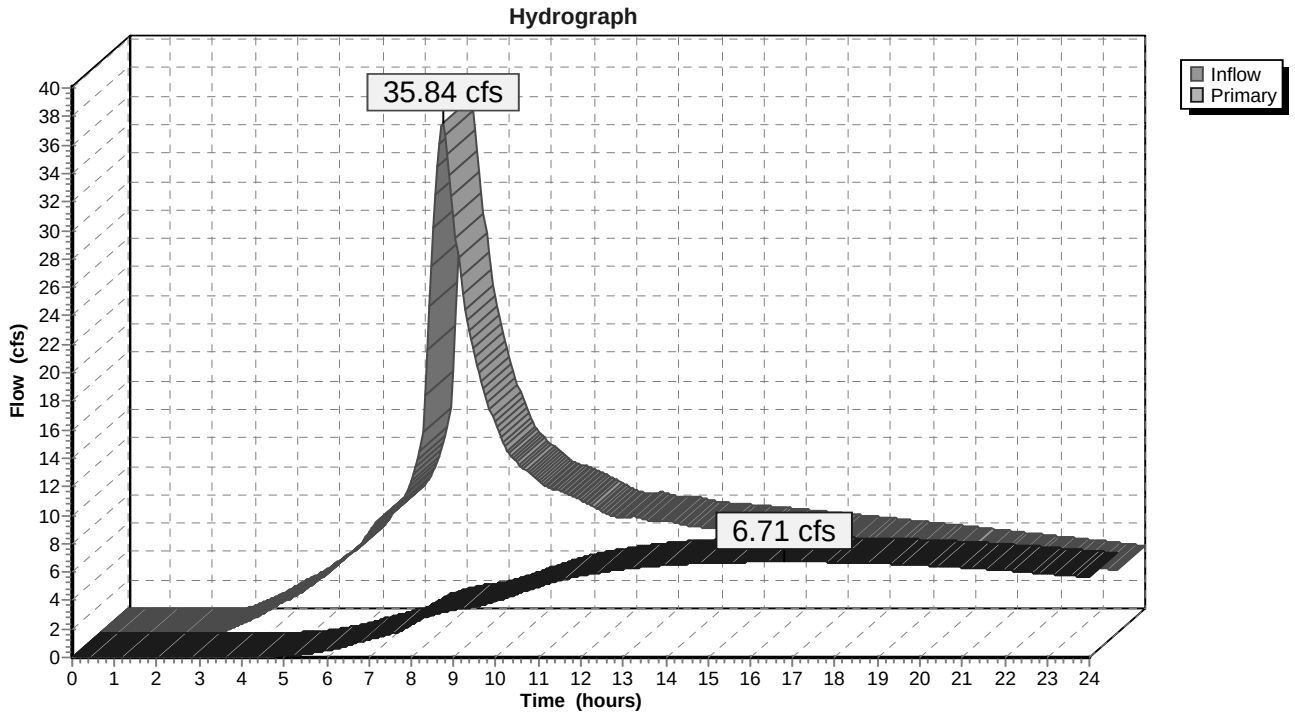
Peak Elev= 3.75' Surf.Area= 1.825 ac Storage= 6.373 af
Plug-Flow detention time= 456.6 min calculated for 7.919 af (57% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
0.00	1.200	0.000	0.000
6.00	2.200	10.200	10.200

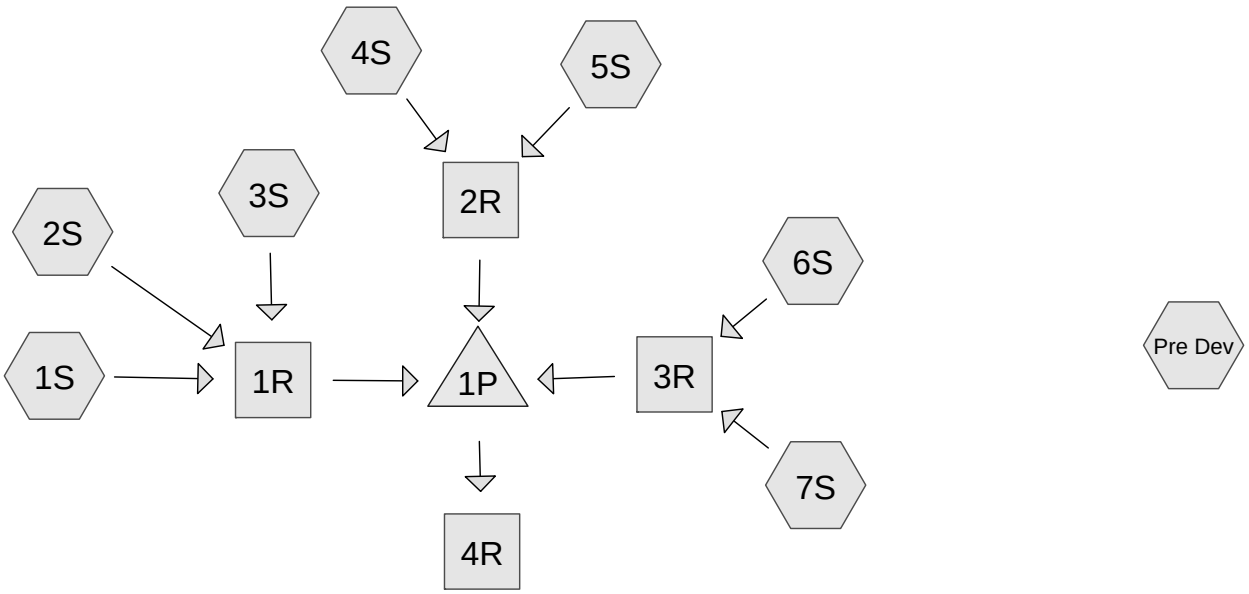
Primary OutFlow Max=6.72 cfs @ 16.81 hrs HW=3.75' (Free Discharge)
- **1=Orifice/Grate** (Controls 4.16 cfs)
- **2=Orifice/Grate** (Controls 2.55 cfs)
- **3=Orifice/Grate** (Controls 0.00 cfs)

#	Routing	Invert	Outlet Devices
1	Primary	0.00'	**9.3" Vert. Orifice/Grate** C= 0.600
2	Primary	2.80'	**12.0" Vert. Orifice/Grate** C= 0.600
3	Primary	4.50'	**24.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond 1P: MASTER POND



Appendix D



Subcat Reach Pond Link

Drainage Diagram for 1718 Rolling Meadows PRELIM
Prepared by Rhine Cross Group, LLC 12/6/2018

Subcatchment 1S: Phase 1 Developed

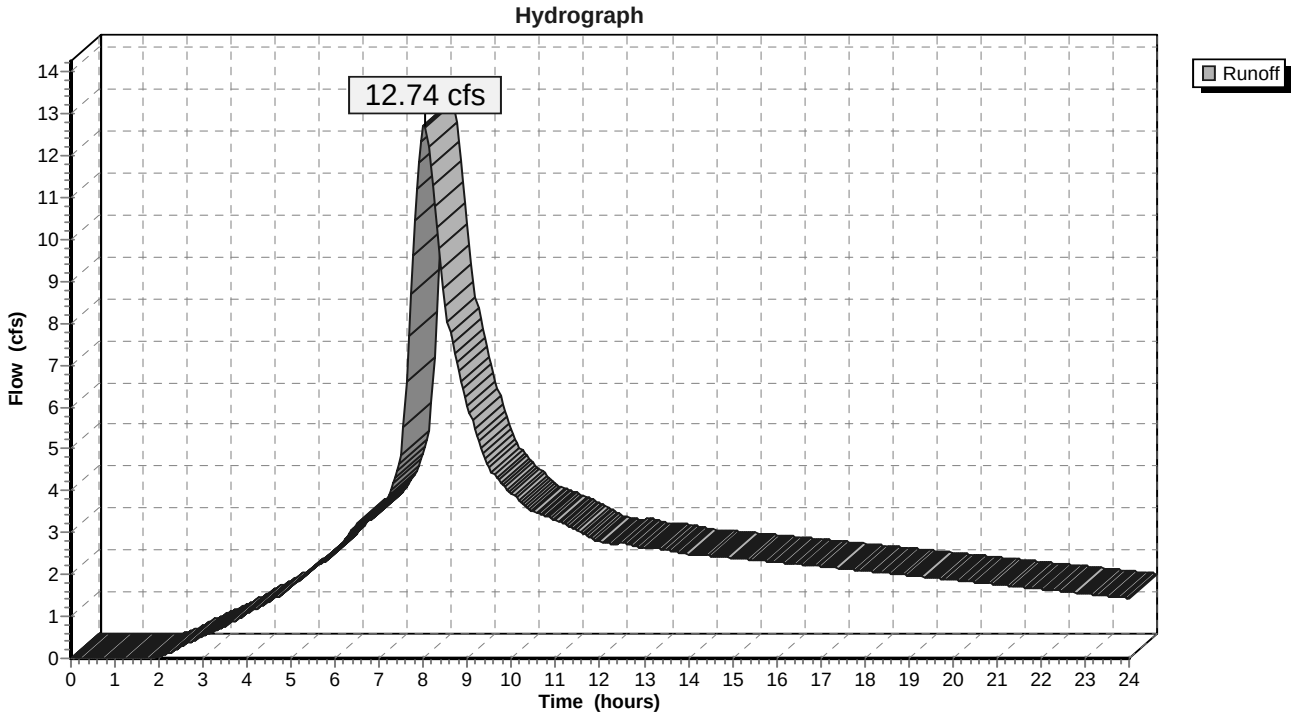
Runoff = 12.74 cfs @ 8.02 hrs, Volume= 4.932 af, Depth= 4.08"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=5.24"

Area (ac)	CN	Description
4.300	98	STREET & SIDEWALK
4.100	98	HOUSE ROOF/DRIVEWAYS
6.120	79	LANDSCAPE
14.520	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	130	0.0100	0.1		**Sheet Flow, LANDSCAPE** Grass: Short n= 0.150 P2= 2.50"
1.7	150	0.0050	1.4		**Shallow Concentrated Flow, GUTTER** Paved Kv= 20.3 fps
19.7	280	Total			

Subcatchment 1S: Phase 1 Developed



Subcatchment 2S: Phase 2 Developed

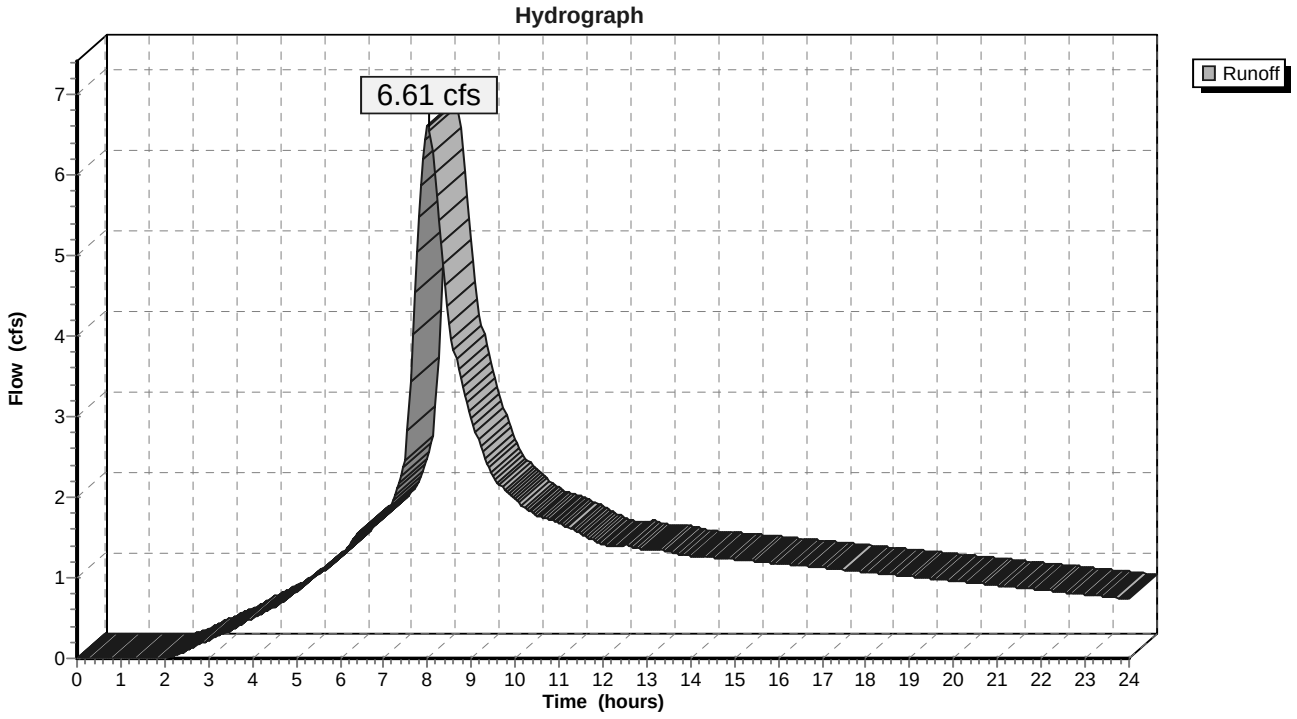
Runoff = 6.61 cfs @ 8.01 hrs, Volume= 2.487 af, Depth= 3.97"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=5.24"

Area (ac)	CN	Description
1.970	98	STREET & SIDEWALK
2.120	98	HOUSE ROOF/DRIVEWAY
3.420	79	LANDSCAPE
7.510	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, LANDSCAPE** Grass: Short n= 0.150 P2= 2.50"
2.9	250	0.0050	1.4		**Shallow Concentrated Flow, GUTTER** Paved Kv= 20.3 fps
17.5	350	Total			

Subcatchment 2S: Phase 2 Developed



Subcatchment 3S: Phase 3 Developed

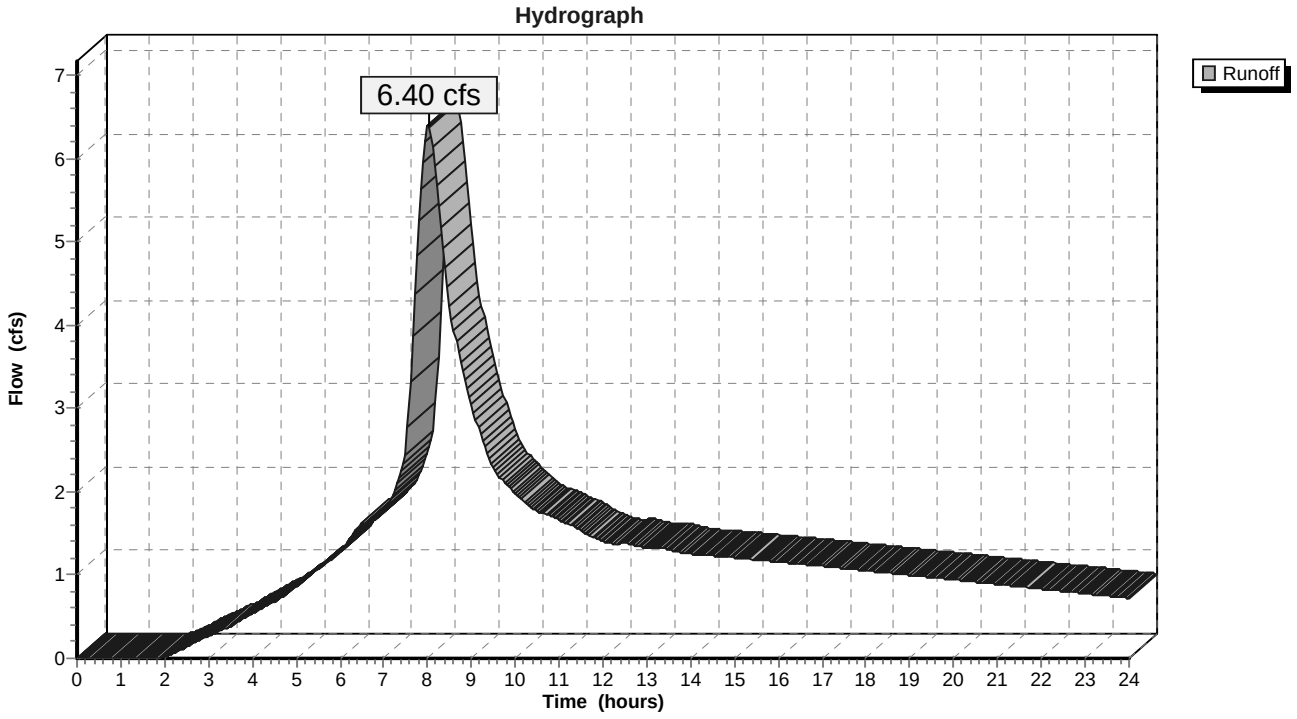
Runoff = 6.40 cfs @ 8.02 hrs, Volume= 2.483 af, Depth= 4.08"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=5.24"

Area (ac)	CN	Description
1.800	98	STREET & SIDEWALK
2.350	98	ROOF & DRIVEWAY
3.160	79	LANDSCAPE & PARK
7.310	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	120	0.0100	0.1		**Sheet Flow, LANDSCAPE** Grass: Short n= 0.150 P2= 2.50"
2.9	250	0.0050	1.4		**Shallow Concentrated Flow, GUTTER** Paved Kv= 20.3 fps
19.8	370	Total			

Subcatchment 3S: Phase 3 Developed



Subcatchment 4S: Phase 4 Developed

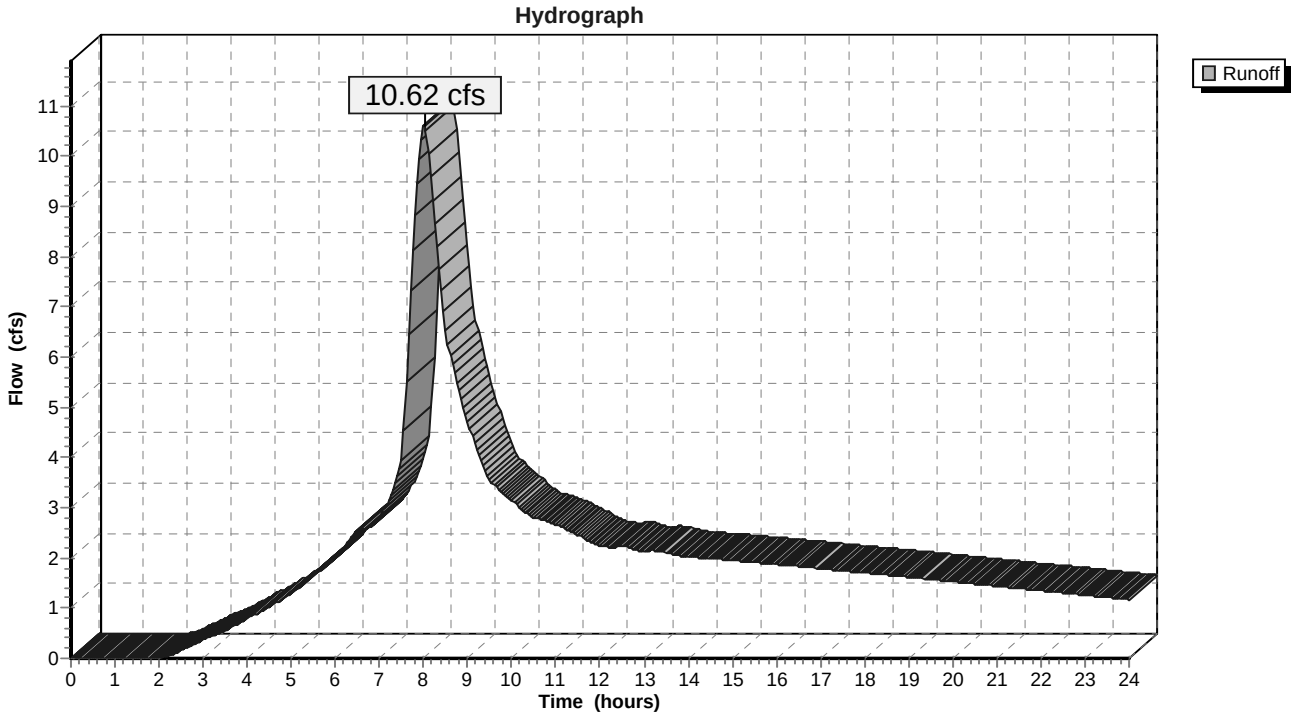
Runoff = 10.62 cfs @ 8.01 hrs, Volume= 3.958 af, Depth= 3.97"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=5.24"

Area (ac)	CN	Description
2.600	98	Streets & Sidewalk
3.390	98	Home & Driveway
5.960	79	Landscape
11.950	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, Landscape** Grass: Short n= 0.150 P2= 2.50"
2.3	200	0.0050	1.4		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
16.9	300	Total			

Subcatchment 4S: Phase 4 Developed



Subcatchment 5S: Phase 5 Developed

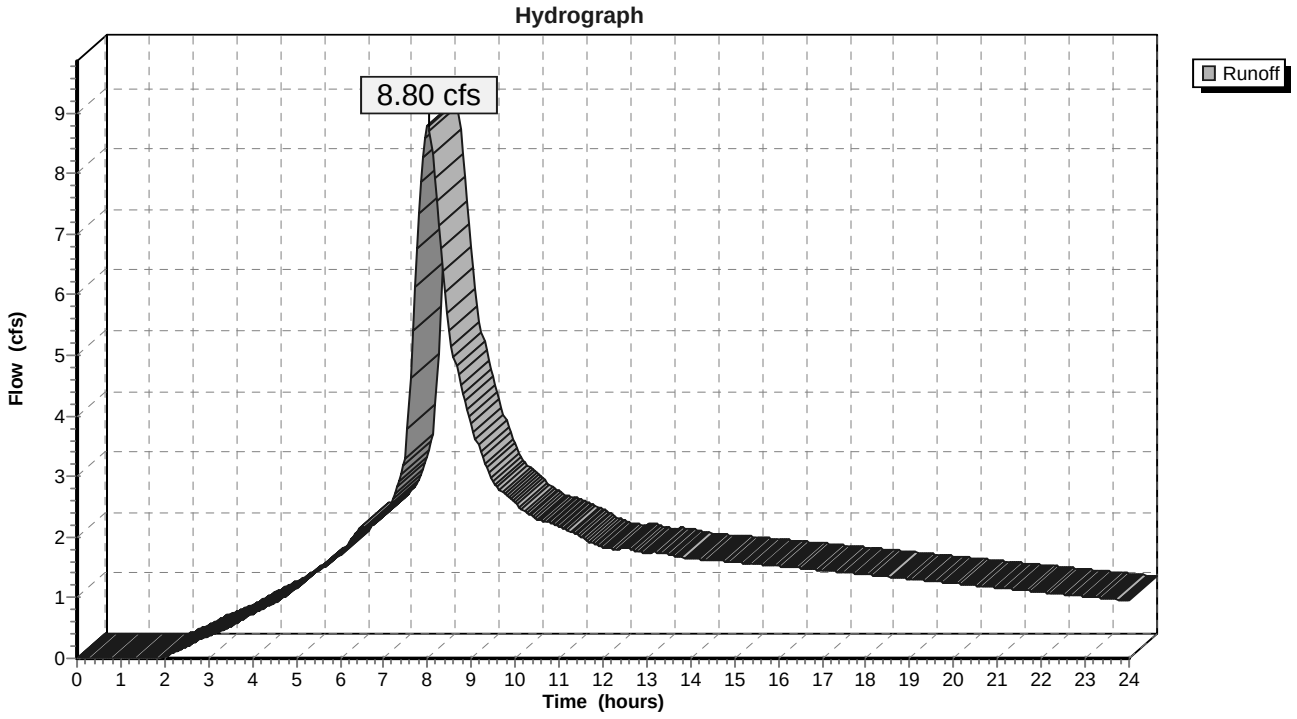
Runoff = 8.80 cfs @ 8.01 hrs, Volume= 3.275 af, Depth= 4.08"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=5.24"

Area (ac)	CN	Description
2.500	98	Streets & Sidewalk
2.870	98	Roofs & Driveways
4.260	79	Landscape
9.630	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, Landscape** Grass: Short n= 0.150 P2= 2.50"
2.3	200	0.0050	1.4		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
16.9	300	Total			

Subcatchment 5S: Phase 5 Developed



Subcatchment 6S: Phase 6 Developed

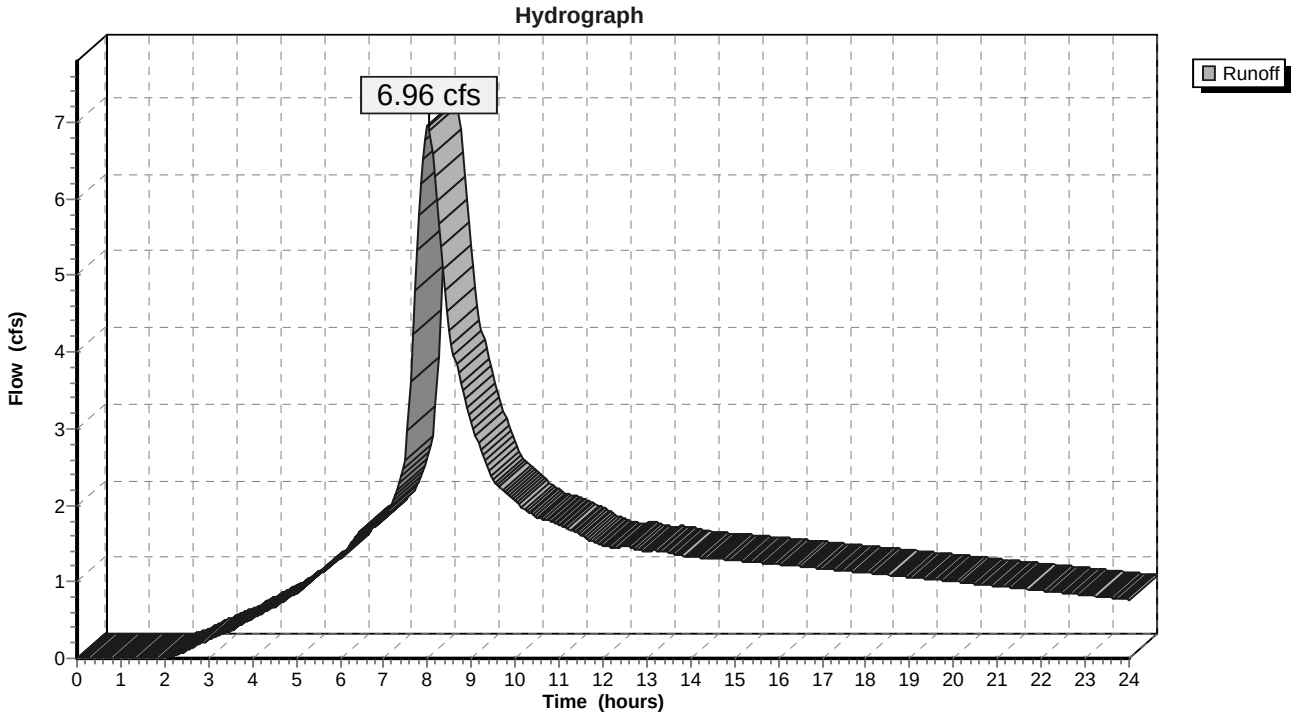
Runoff = 6.96 cfs @ 8.01 hrs, Volume= 2.597 af, Depth= 3.97"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=5.24"

Area (ac)	CN	Description
1.940	98	Streets & Sidewalk
2.360	98	House & Driveways
3.540	79	Landscape
7.840	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, Landscape** Grass: Short n= 0.150 P2= 2.50"
2.3	200	0.0050	1.4		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
16.9	300	Total			

Subcatchment 6S: Phase 6 Developed



Subcatchment 7S: Phase 7 Developed

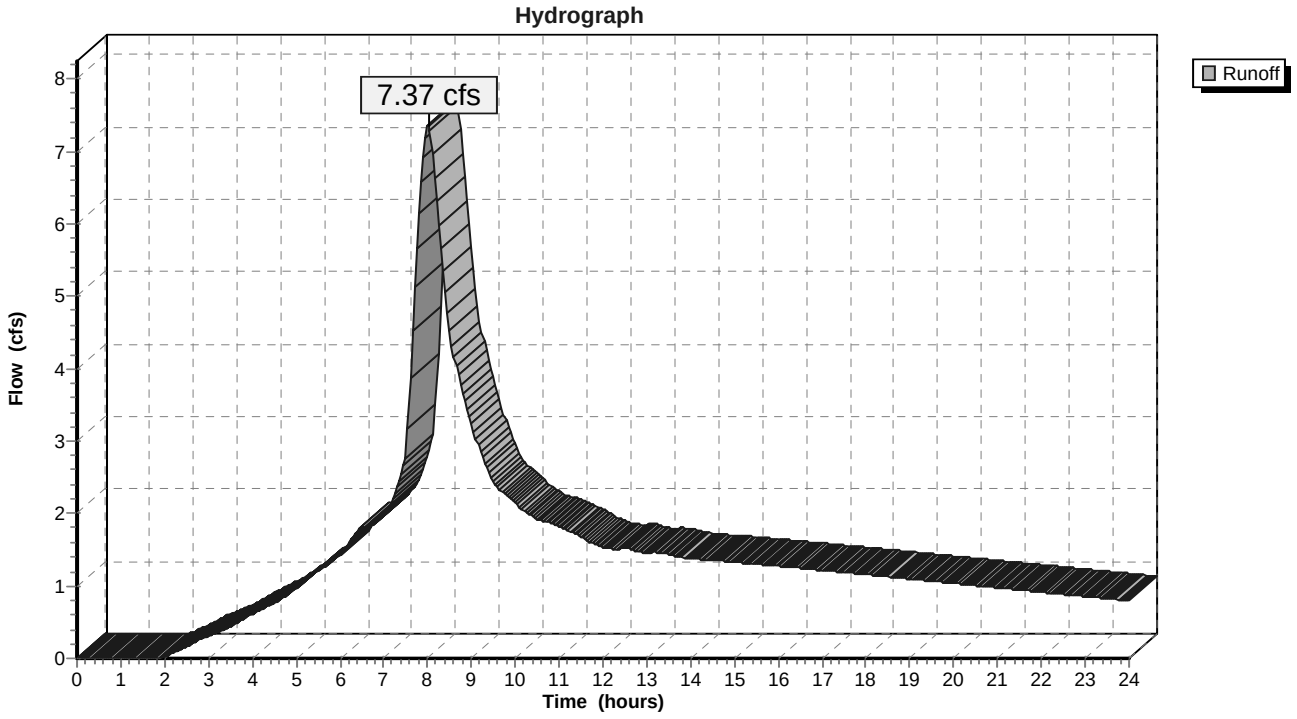
Runoff = 7.37 cfs @ 8.01 hrs, Volume= 2.741 af, Depth= 4.08"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=5.24"

Area (ac)	CN	Description
2.190	98	Street & Sidewalk
2.410	98	House & Driveway
3.460	79	Landscape
8.060	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0100	0.1		**Sheet Flow, Landscape** Grass: Short n= 0.150 P2= 2.50"
2.3	200	0.0050	1.4		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
16.9	300	Total			

Subcatchment 7S: Phase 7 Developed



Subcatchment Pre Dev: PRE DEVELOPED

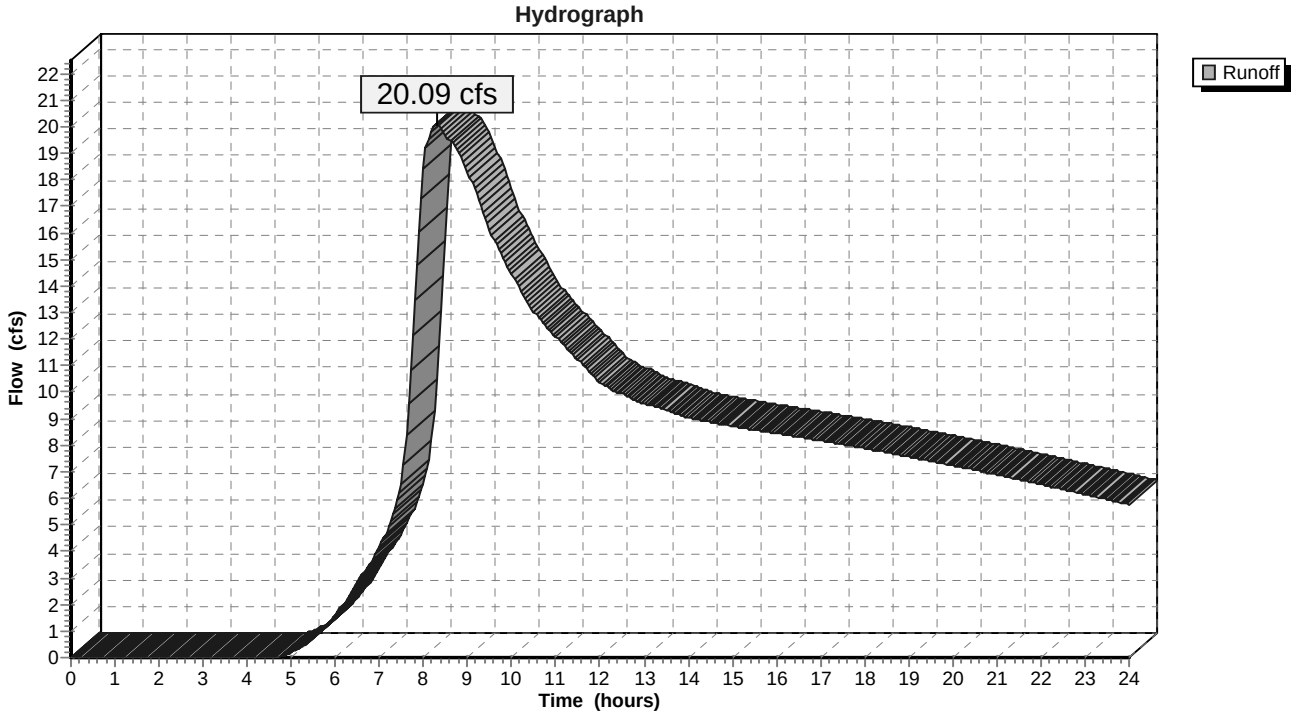
Runoff = 20.09 cfs @ 8.29 hrs, Volume= 13.779 af, Depth= 2.48"

Runoff by SBUH method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr Rainfall=5.24"

Area (ac)	CN	Description
66.800	74	Herbaceous range, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.2	300	0.0100	0.1		**Sheet Flow, GRASSED** Grass: Short n= 0.150 P2= 2.50"
15.7	1,000	0.0050	1.1		**Shallow Concentrated Flow, NATURAL SWALE** Grassed Waterway Kv= 15.0 fps
6.7	1,000	0.0030	2.5	90.08	**Trap/Vee/Rect Channel Flow, DITCH** Bot.W=1.00' D=4.00' Z= 2.0 '/' n= 0.050
57.6	2,300	Total			

Subcatchment Pre Dev: PRE DEVELOPED



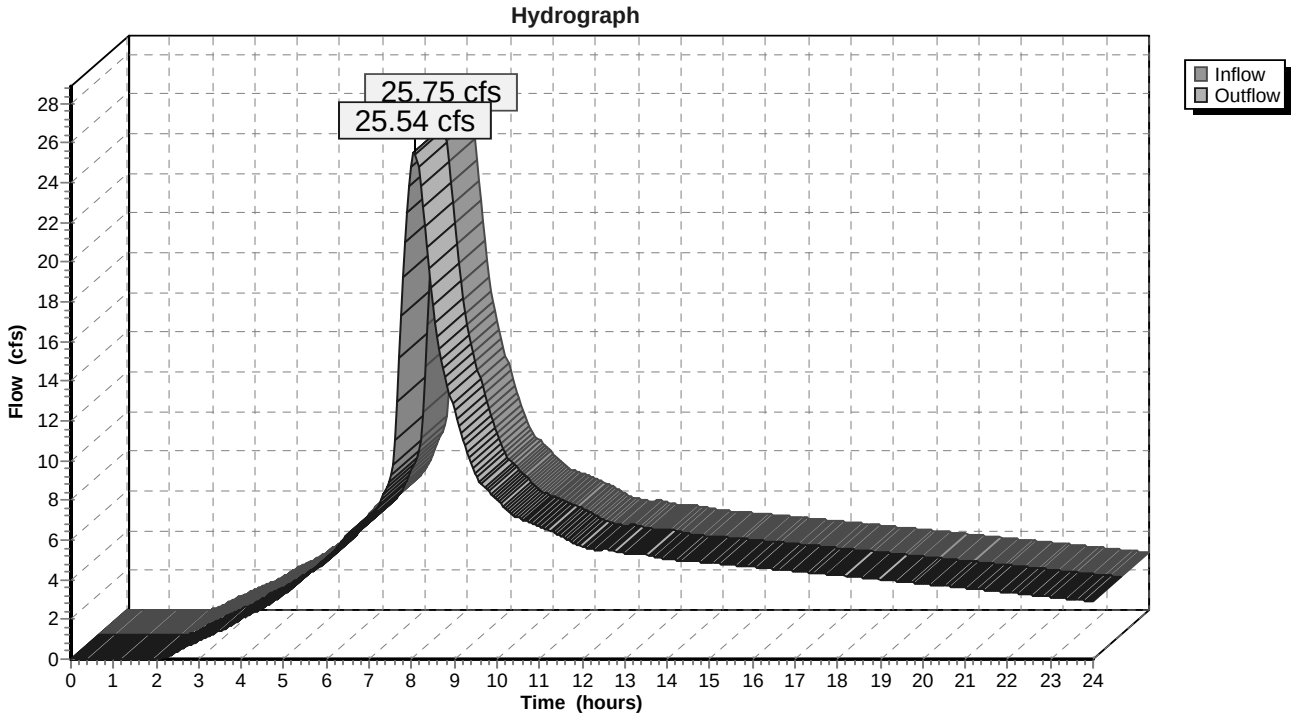
Reach 1R: PHASE 1-3 SWALE

Inflow Area = 29.340 ac, Inflow Depth = 4.05"
Inflow = 25.75 cfs @ 8.02 hrs, Volume= 9.902 af
Outflow = 25.54 cfs @ 8.07 hrs, Volume= 9.879 af, Atten= 1%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.9 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.5 fps, Avg. Travel Time= 3.3 min

Peak Depth= 1.72'
Capacity at bank full= 20.21 cfs
12.00' x 1.50' deep channel, n= 0.200 Length= 100.0' Slope= 0.0100 '/'
Side Slope Z-value= 3.0 '/'

Reach 1R: PHASE 1-3 SWALE



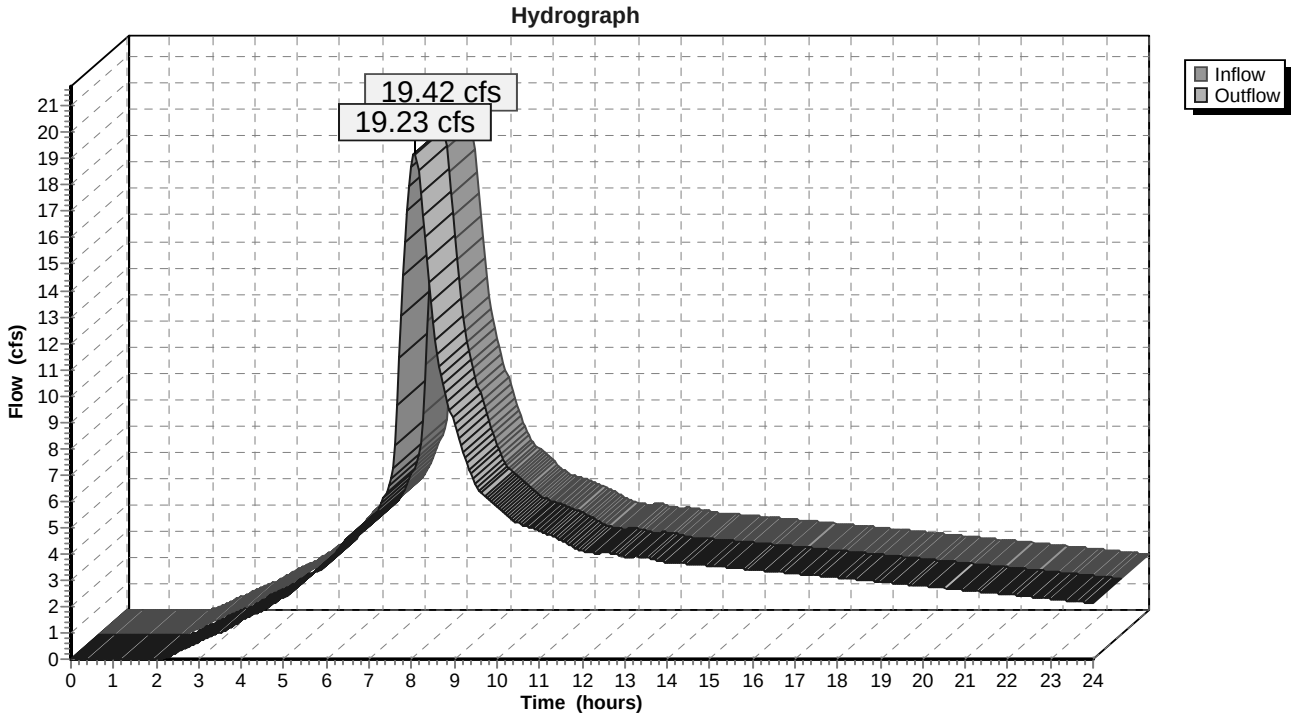
Reach 2R: pHASE 4 & 5 SWALE

Inflow Area = 21.580 ac, Inflow Depth = 4.02"
Inflow = 19.42 cfs @ 8.01 hrs, Volume= 7.233 af
Outflow = 19.23 cfs @ 8.07 hrs, Volume= 7.216 af, Atten= 1%, Lag= 3.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.7 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 3.4 min

Peak Depth= 1.95'
Capacity at bank full= 12.31 cfs
8.00' x 1.50' deep channel, n= 0.200 Length= 90.0' Slope= 0.0071 '/'
Side Slope Z-value= 3.0 '/'

Reach 2R: pHASE 4 & 5 SWALE



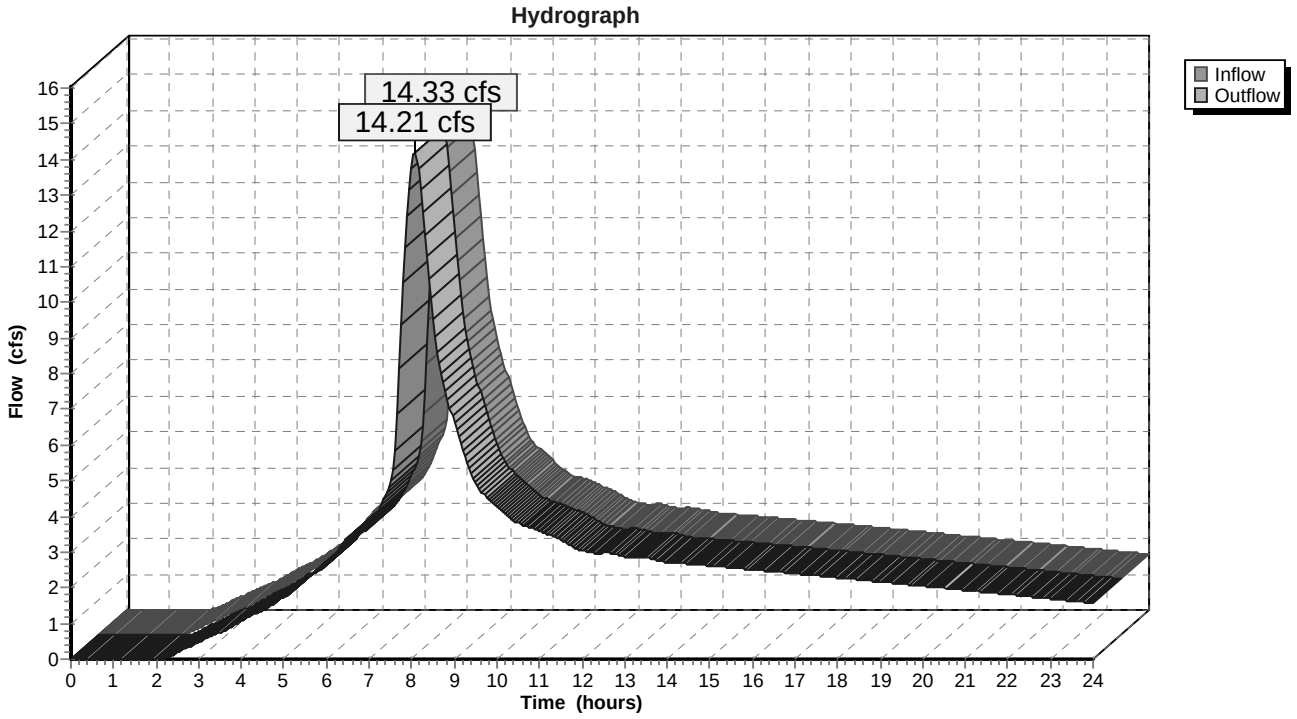
Reach 3R: PHASE 6 & 7 SWALE

Inflow Area = 15.900 ac, Inflow Depth = 4.03"
Inflow = 14.33 cfs @ 8.01 hrs, Volume= 5.338 af
Outflow = 14.21 cfs @ 8.08 hrs, Volume= 5.322 af, Atten= 1%, Lag= 4.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.7 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 4.2 min

Peak Depth= 1.43'
Capacity at bank full= 15.55 cfs
10.00' x 1.50' deep channel, n= 0.200 Length= 100.0' Slope= 0.0080 '/'
Side Slope Z-value= 3.0 '/'

Reach 3R: PHASE 6 & 7 SWALE



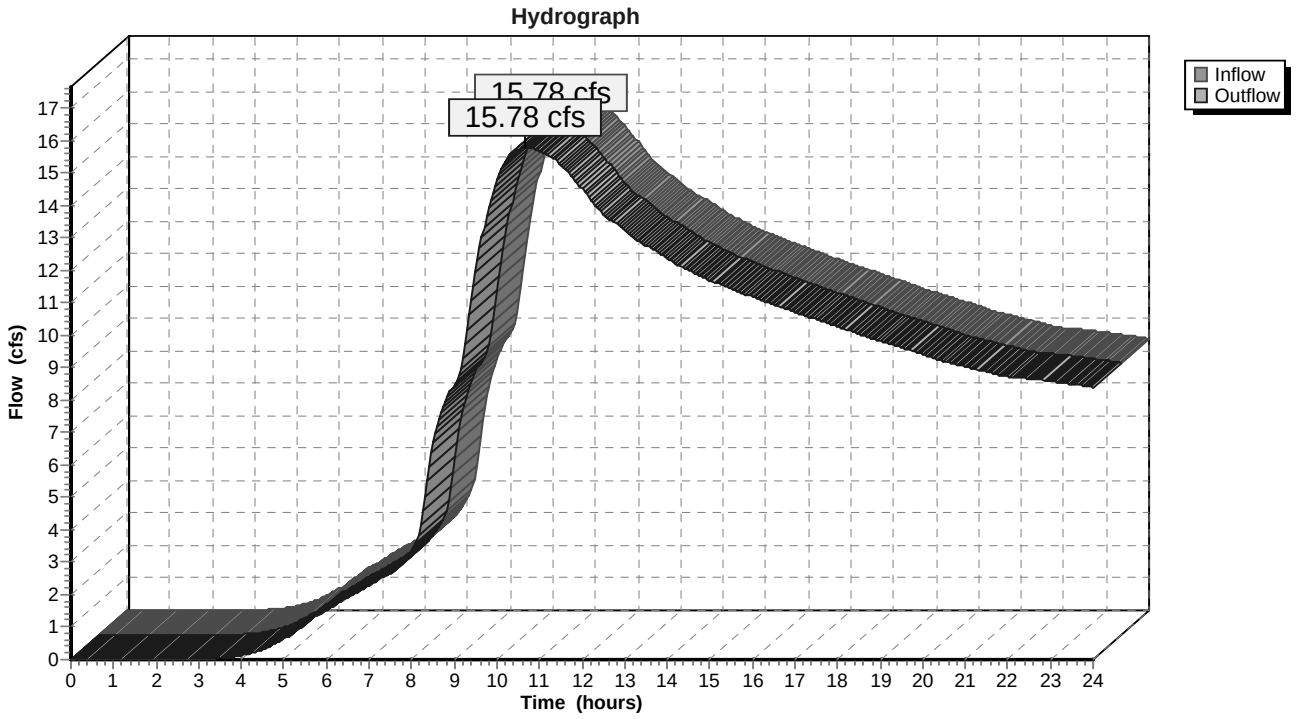
Reach 4R: PIPE

Inflow Area = 66.820 ac, Inflow Depth = 2.70"
Inflow = 15.78 cfs @ 10.63 hrs, Volume= 15.028 af
Outflow = 15.78 cfs @ 10.67 hrs, Volume= 14.998 af, Atten= 0%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.3 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 6.4 fps, Avg. Travel Time= 1.6 min

Peak Depth= 1.17'
Capacity at bank full= 24.51 cfs
24.0" Diameter Pipe n= 0.012 Length= 600.0' Slope= 0.0100 '/'

Reach 4R: PIPE



Pond 1P: MASTER POND

Inflow Area = 66.820 ac, Inflow Depth = 4.03"
Inflow = 58.96 cfs @ 8.07 hrs, Volume= 22.416 af
Outflow = 15.78 cfs @ 10.63 hrs, Volume= 15.028 af, Atten= 73%, Lag= 153.6 min
Primary = 15.78 cfs @ 10.63 hrs, Volume= 15.028 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 4.94' Surf.Area= 2.024 ac Storage= 8.404 af
Plug-Flow detention time= 371.8 min calculated for 15.028 af (67% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
0.00	1.200	0.000	0.000
6.00	2.200	10.200	10.200

Primary OutFlow Max=15.77 cfs @ 10.63 hrs HW=4.94' (Free Discharge)
- **1=Orifice/Grate** (Controls 4.85 cfs)
- **2=Orifice/Grate** (Controls 4.85 cfs)
- **3=Orifice/Grate** (Controls 6.07 cfs)

#	Routing	Invert	Outlet Devices
1	Primary	0.00'	**9.3" Vert. Orifice/Grate** C= 0.600
2	Primary	2.80'	**12.0" Vert. Orifice/Grate** C= 0.600
3	Primary	4.50'	**24.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond 1P: MASTER POND