

# BREEZE CREEK TRAILS SUBDIVISION

## PRELIMINARY TECHNICAL INFORMATION REPORT

**Prepared for:**

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04/24/2024

This Preliminary Technical Information Report was prepared in accordance with the City of La Center Municipal Code (LCMC) Chapter 18.320 and the 1992 Stormwater Management Manual for the Puget Sound Basin.

ENG #: TBD

DATE: 3/7/20024

JOB #: 2334

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## **SECTION A - PROJECT OVERVIEW**

The Breeze Creek Trails Subdivision is located south of 4<sup>th</sup> Street and east of the La Center Bottoms Greenway in the City of La Center, Washington, and on parcel 986044822. The project will be extending 2<sup>nd</sup> Way from the existing subdivision to the east. A single-family home on 10 acres borders the site to the south, and La Center Elementary borders the project to the North. The property is approximately 4.87 acres and will be subdivided into 15 single family lots.

The existing site conditions consists of meadow with trees on the perimeter and scattered trees throughout the site. The site slopes gently from east to west. The north and western perimeter of the site drops steeply to Breeze Creek. Breeze Creek flows to the La Center Bottoms Greenway system. The Bottoms drain to the East Fork Lewis River. There are no existing stormwater facilities on site. Stormwater runoff currently flows to the Breeze Creek drainage basin, and ultimately the La Center Bottoms.

This project will extend the public road 2<sup>nd</sup> Way into the site and a dead-end cul-de-sac. The 15 proposed lots and proposed roadway will be collected and conveyed to a wetpond in the northern area of the site. The wetpond will treat and detain runoff before releasing water below predeveloped flow rates to the northwest corner of the site. The runoff will flow to Breeze Creek, continuing the existing drainage path for the site. Sanitary sewer and domestic water will also be installed on site.

## **SECTION B – APPROVAL CONDITIONS SUMMARY**

A final staff report with Conditions of Approval will be issued with Preliminary Land Use Approval. The Approval Conditions Summary will be provided with the Final TIR.

## **SECTION C - DOWNSTREAM ANALYSIS**

The site runoff currently sheet flows off the northern and western perimeters of the site. The adjacent terrain consists of heavily vegetated steep slopes with a creek at the bottom of the slope. The proposed discharge from the wetpond will be dispersed in the northwest corner of the site with a flow spreader to best simulate the existing drainage path from the site. Downstream from the dispersion location, Breeze Creek flows to the La Center Bottoms Greenway which contains several ponds and is an area with no structures or culverts that could be impacted by the project. Proper erosion control measures and construction techniques will be implemented to maintain slope stability and restore vegetation to existing conditions. The flow spreader will also prevent concentrated flow and prevent future erosion from the discharge location.

## **SECTION D - QUANTITY CONTROL ANALYSIS AND DESIGN**

A wetpond is proposed to provide flow control for the project. Runoff from all disturbed areas will be collected to the maximum extent feasible and conveyed to the wetpond. The wetpond shape was chosen to best fit the existing topography while providing adequate maintenance and inspection access.

The hydrologic analysis for this site follows methods and guidelines outlined in Chapter III of

the Puget Sound Manual and Chapter 14.10 of the La Center Stormwater Control Ordinance. The SBUH Hydrograph method was used to compute storm flows and volumes used in designing the storm system. Hydrocad software was used to complete the calculations.

The Predeveloped and Developed Basin maps are in Appendix A with breakdowns of impervious and pervious areas used in the modeling. The curve numbers used in the flow control calculations are located Appendix B along with the isopluvial maps, n and k values and soil group listings. The Basin Summary Sheet in Appendix C summarizes the flow control design assumptions and inputs used in the flow control analysis. Table 1 below details the wetpond design.

**Table 1. Wetpond ‘A’ Peak Flow Rates, Actual Release, Elevations**

<b>24 HOUR STORM</b>	<b>PEAK INFLOW (CFS)</b>	<b>ALLOWABLE DISCHARGE (CFS)</b>	<b>ACTUAL DISCHARGE (CFS)</b>	<b>STORAGE VOLUME REQUIRED (CF)</b>	<b>PEAK WATER SURFACE ELEVATION (0'=BOTTOM)</b>
<b>WQ</b>	0.94	0	0	13,839	2.88
<b>2-YEAR</b>	1.72	0.28	0.27	9,554	4.43
<b>10-YEAR</b>	2.61	1.04	0.68	11,978	4.75
<b>25-YEAR</b>	3.11	1.33	1.04	13,075	4.90
<b>100-YEAR</b>	4.01	1.87	1.87	15,285	5.16

Orifice sizing and placement is shown in Table 2 below. Orifice 1 was placed at the Water Quality elevation and sized to release less than ½ of the 2-year predeveloped flow. Orifice 2 was placed above the 2-year storm elevation and sized to release less than the predeveloped 10-year, 25-year and 100-year flows.

**Table 2. Wetpond ‘A’ Orifice Sizing**

<b>ORIFICE</b>	<b>ORIFICE HEIGHT (0'=BOTTOM)</b>	<b>ORIFICE DIAMETER (INCHES)</b>
1	3.00	3"
2	4.44	10.5"

Hydrocad reports of the stormwater modeling are located in Appendix C.

## **SECTION E - CONVEYANCE SYSTEM ANALYSIS AND DESIGN**

The preliminary stormwater collection and conveyance system consists of catch basins and 12" storm main. Reference sheet PRE3.0 – Preliminary Stormwater Plan. A detailed sizing analysis will be provided during final engineering. See Appendix B for flow rates, storm system capacities and other hydrologic parameters used in completing the analysis.

The hydrologic analysis for this site will follow methods and guidelines outlined in Chapter III

of the Puget Sound Manual and Chapter 14.10 of the La Center Stormwater Control Ordinance. The conveyance system will be designed to convey the 100-year storm.

## **SECTION F - WATER QUALITY DESIGN**

Water quality design for this project involves providing enough wet storage to detain the entire volume of the 24-hour water quality storm. Design methods and guidelines outlined in the Puget Sound Manual and the La Center Stormwater Control Ordinance were used in the water quality design. All surfaces were considered pollution generating in this design. The water quality volume is 13,839 cf. Appendix C contains the Hydrocad modeling report for the water quality analysis.

## **SECTION G - SOILS EVALUATION**

The soil type of the disturbed area on site is Gee (GeB). Gee soils are part of hydrologic soil group C. Group C soils generally have low to very low infiltration rates. Due to very low infiltration at the depth of the proposed facility, infiltration was deemed infeasible. The geotechnical report by True North Geotechnical is included in Appendix C with additional information on soil characteristics on site.

## **SECTION H - SPECIAL REPORTS AND STUDIES**

- Geotechnical/Soils Report – Appendix D
- Wetland Report – Appendix E

## **SECTION I – OTHER PERMITS**

An NPDES Permit will be issued prior to construction. No other permits are required.

## **SECTION J – GROUNDWATER MONITORING PROGRAM**

N/A to this design.

## **SECTION K - MAINTENANCE AND OPERATIONS**

Maintenance and operations manuals will be provided with final engineering.

## **SECTION L – TECHNICAL APPENDIX**

Appendix A: Maps  
Appendix B: Design Criteria  
Appendix C: Design Calculations  
Appendix D: Geotechnical Report  
Appendix E: Critical Areas Report

**Appendix A – Maps**

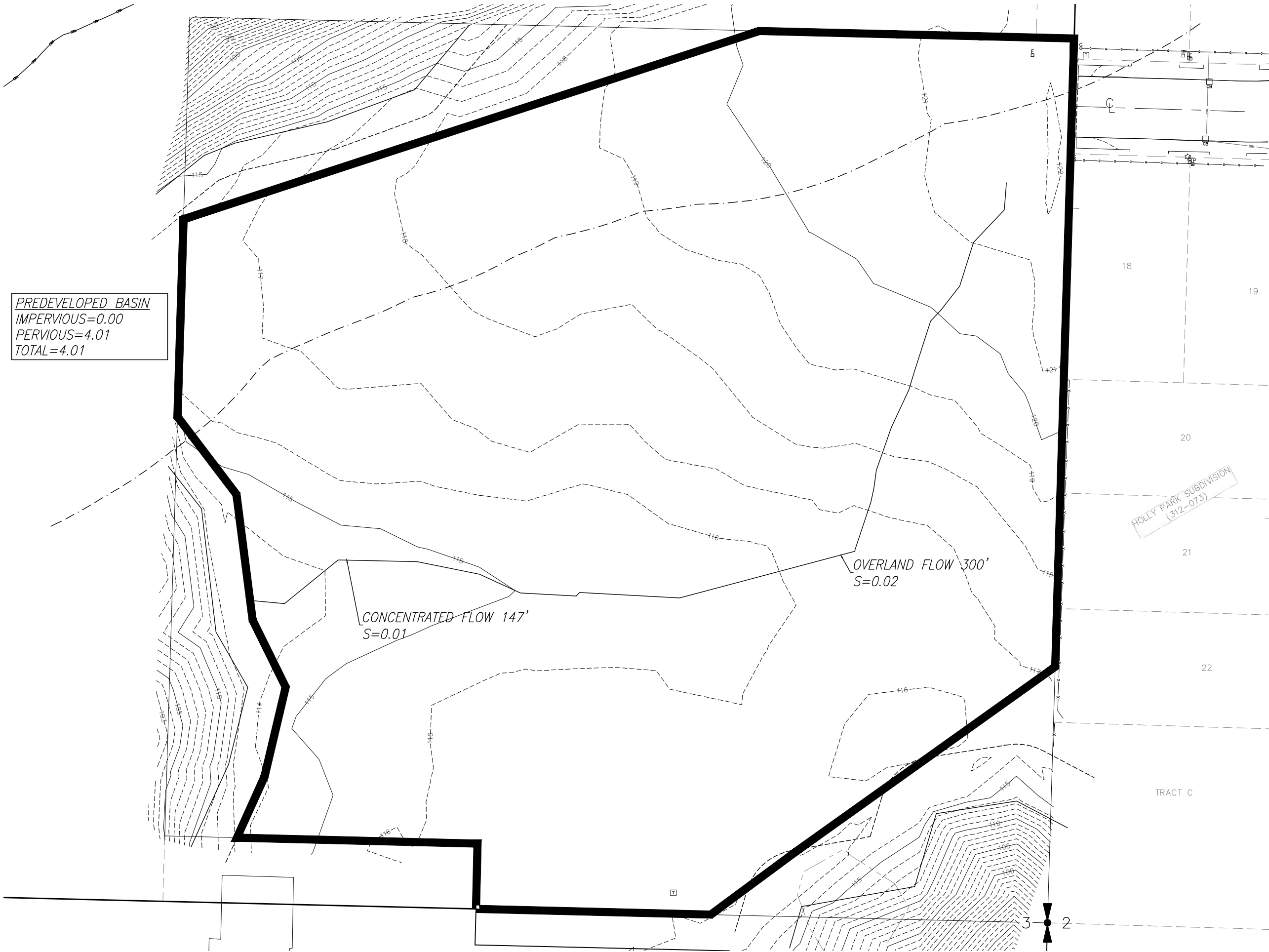
Vicinity Map

Contour Map

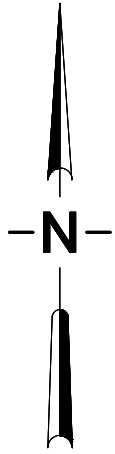
Soil Map

Predeveloped Basin Map

Developed Basin Map



PREDEVELOPED BASIN  
IMPERVIOUS=0.00  
PERVIOUS=4.01  
TOTAL=4.01

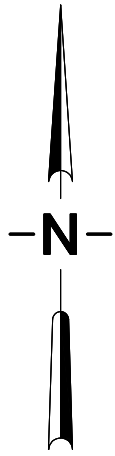


PREDEVELOPED BASIN MAP  
BREEZE CREEK TRAILS  
CITY OF LA CENTER, WA

SCALE: 1"=50'  
DATE: 2/26/2024  
PROJECT: 2334



DEVELOPED BASIN  
 IMPERVIOUS=2.37  
 PERVIOUS=1.64  
 TOTAL=4.01



DEVELOPED BASIN MAP  
 BREEZE CREEK TRAILS  
 CITY OF LA CENTER, WA

SCALE: 1"=50'  
 DATE: 2/26/2024  
 PROJECT: 2334



## **Appendix B – Design Criteria**

Soil Group

Curve Numbers

n and K Numbers

Isopluvial Maps

Map Symbol	Soil Name	HSG
HoB	HILLSBORO	B
<b>Soils Group (SG) 3 (continued)</b>		
HoC	HILLSBORO	B
HoD	HILLSBORO	B
HoE	HILLSBORO	B
HoG	HILLSBORO	B
HsB	HILLSBORO	B
McB	McBEE	C
MeA	McBEE	C
MIA	McBEE	C
OeD	OLEQUA	B
OeE	OLEQUA	B
OeF	OLEQUA	B
OIB	OLYMPIC	B
OID	OLYMPIC	B
OIE	OLYMPIC	B
OIF	OLYMPIC	B
OmE	OLYMPIC	B
OmF	OLYMPIC	B
OpC	OLYMPIC VARIANT	C
OpE	OLYMPIC VARIANT	C
OpG	OLYMPIC VARIANT	C
OrC	OLYMPIC VARIANT	C
PoB	POWELL	C
PoD	POWELL	C
PoE	POWELL	C
SmA	SAUVIE	B
SmB	SAUVIE	B
SnA	SAUVIE	D
SpB	SAUVIE	B

**Soils Group (SG) 4**

CvA	COVE	D
CwA	COVE	D
GeB	GEE	C

Table III-1.3 SCS Western Washington Runoff Curve Numbers  
(Published by SCS in 1982) Runoff curve numbers for selected agricultural,  
suburban and urban  
land use for Type 1A rainfall distribution, 24-hour storm duration.

LAND USE DESCRIPTION		CURVE NUMBERS BY HYDROLOGIC SOIL GROUP			
		A	B	C	D
Cultivated land(1):	winter condition	86	91	94	95
Mountain open areas:	low growing brush & grasslands	74	82	89	92
Meadow or pasture:		65	78	85	89
Wood or forest land:	undisturbed	42	64	76	81
Wood or forest land:	young second growth or brush	55	72	81	86
Orchard:	with cover crop	81	88	92	94
Open spaces, lawns, parks, golf courses, cemeteries, landscaping.					
Good condition:	grass cover on $\geq 75\%$ of the area	68	80	86	90
Fair condition:	grass cover on 50-75% of the area	77	85	90	92
Gravel roads & parking lots:		76	85	89	91
Dirt roads & parking lots:		72	82	87	89
Impervious surfaces, pavement, roofs etc.		98	98	98	98
Open water bodies: lakes, wetlands, ponds etc.		100	100	100	100
Single family residential(2):					
Dwelling Unit/Gross Acre	%Impervious(3)				
1.0 DU/GA	15				
1.5 DU/GA	20				
2.0 DU/GA	25				
2.5 DU/GA	30				
3.0 DU/GA	34				
3.5 DU/GA	38				
4.0 DU/GA	42				
4.5 DU/GA	46				
5.0 DU/GA	48				
5.5 DU/GA	50				
6.0 DU/GA	52				
6.5 DU/GA	54				
7.0 DU/GA	56				
PUD's, condos, apartments, commercial businesses & industrial areas	%impervious must be computed				
		Separate curve number shall be selected for pervious & impervious portions of the site or basin			

- (1) For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Sec. 4, Hydrology, Chapter 9, August 1972.
- (2) Assumes roof and driveway runoff is directed into street/storm system.
- (3) The remaining pervious areas (lawn) are considered to be in good condition for these curve numbers.

Table III-1.4 "n" AND "k" Values Used in Time Calculations for Hydrographs

"n," Sheet Flow Equation Manning's Values (for the initial 300 ft. of travel)  $n_s$

Smooth surfaces (concrete, asphalt, gravel, or bare hand packed soil)	
0.011	
Fallow fields or loose soil surface (no residue)	0.05
Cultivated soil with residue cover ( $s \leq 0.20$ ft/ft)	0.06
Cultivated soil with residue cover ( $s > 0.20$ ft/ft)	0.17
Short prairie grass and lawns	0.15
Dense grasses	0.24
Bermuda grass	0.41
Range (natural)	0.13
Woods or forest with light underbrush	0.40
Woods or forest with dense underbrush	0.80

\*Manning values for sheet flow only, from Overton and Meadows 1976 (See TR-55, 1986)

"k" Values Used in Travel Time/Time of Concentration Calculations

Shallow Concentrated Flow (After the initial 300 ft. of sheet flow,  $R = 0.1$ )  $k_s$

1. Forest with heavy ground litter and meadows ( $n = 0.10$ )	3
2. Brushy ground with some trees ( $n = 0.060$ )	5
3. Fallow or minimum tillage cultivation ( $n = 0.040$ )	8
4. High grass ( $n = 0.035$ )	9
5. Short grass, pasture and lawns ( $n = 0.030$ )	11
6. Nearly bare ground ( $n = 0.25$ )	13
7. Paved and gravel areas ( $n = 0.012$ )	27

Channel Flow (intermittent) (At the beginning of visible channels  $R = 0.2$ )  $k_c$

1. Forested swale with heavy ground litter ( $n = 0.10$ )	5
2. Forested drainage course/ravine with defined channel bed ( $n = 0.050$ )	10
3. Rock-lined waterway ( $n = 0.035$ )	15
4. Grassed waterway ( $n = 0.030$ )	17
5. Earth-lined waterway ( $n = 0.025$ )	20
6. CMP pipe ( $n = 0.024$ )	21
7. Concrete pipe (0.012)	42
8. Other waterways and pipe $0.508/n$	

Channel Flow (Continuous stream,  $R = 0.4$ )  $k_c$

9. Meandering stream with some pools ( $n = 0.040$ )	20
10. Rock-lined stream ( $n = 0.035$ )	23
11. Grass-lined stream ( $n = 0.030$ )	27
12. Other streams, man-made channels and pipe $0.807/n^{**}$	

Exhibit C  
Isopluvial Maps for Design Storms in Clark County

2-Year, 24-Hour Isopluvials

Use no less than 2" for design storms

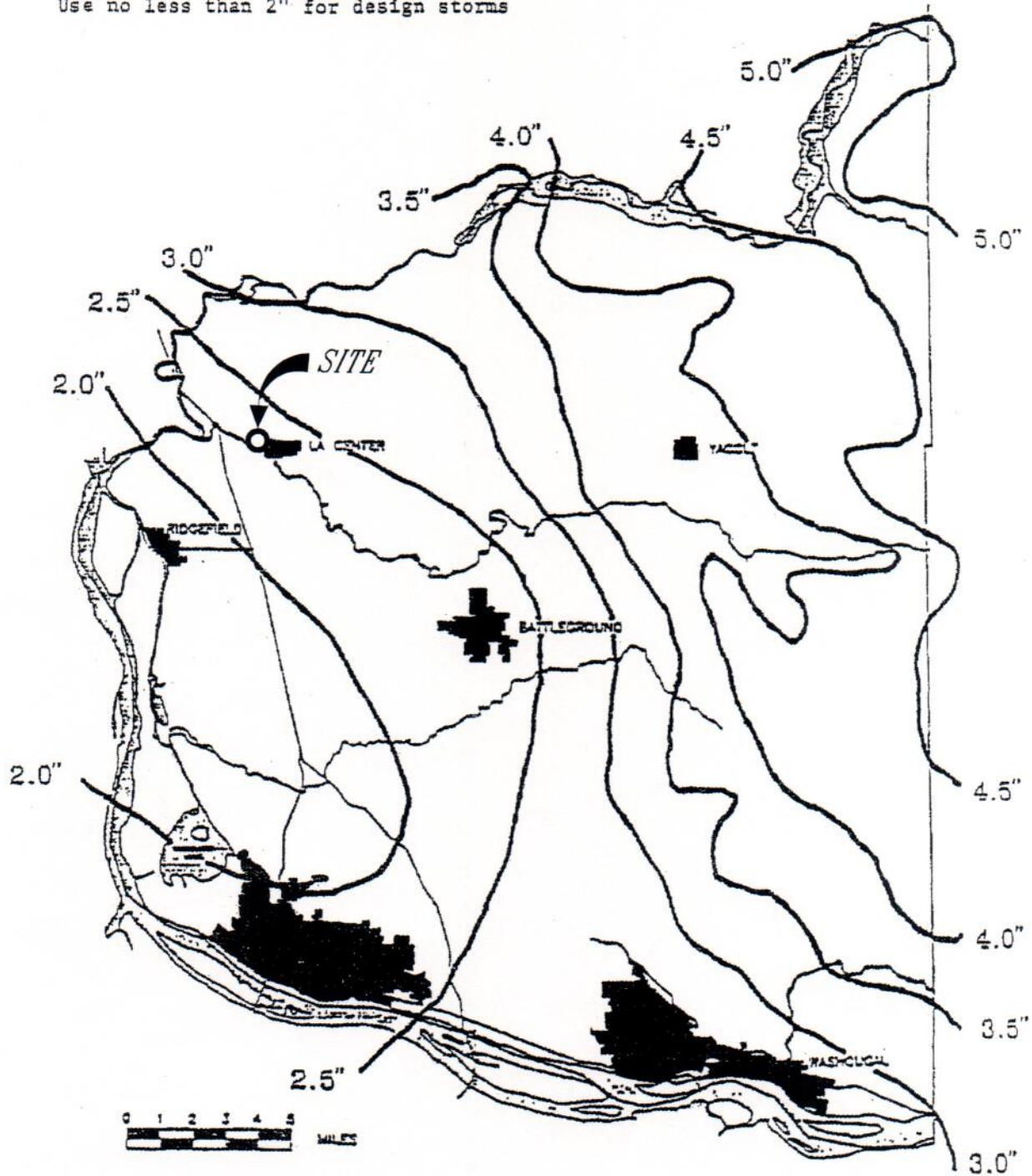
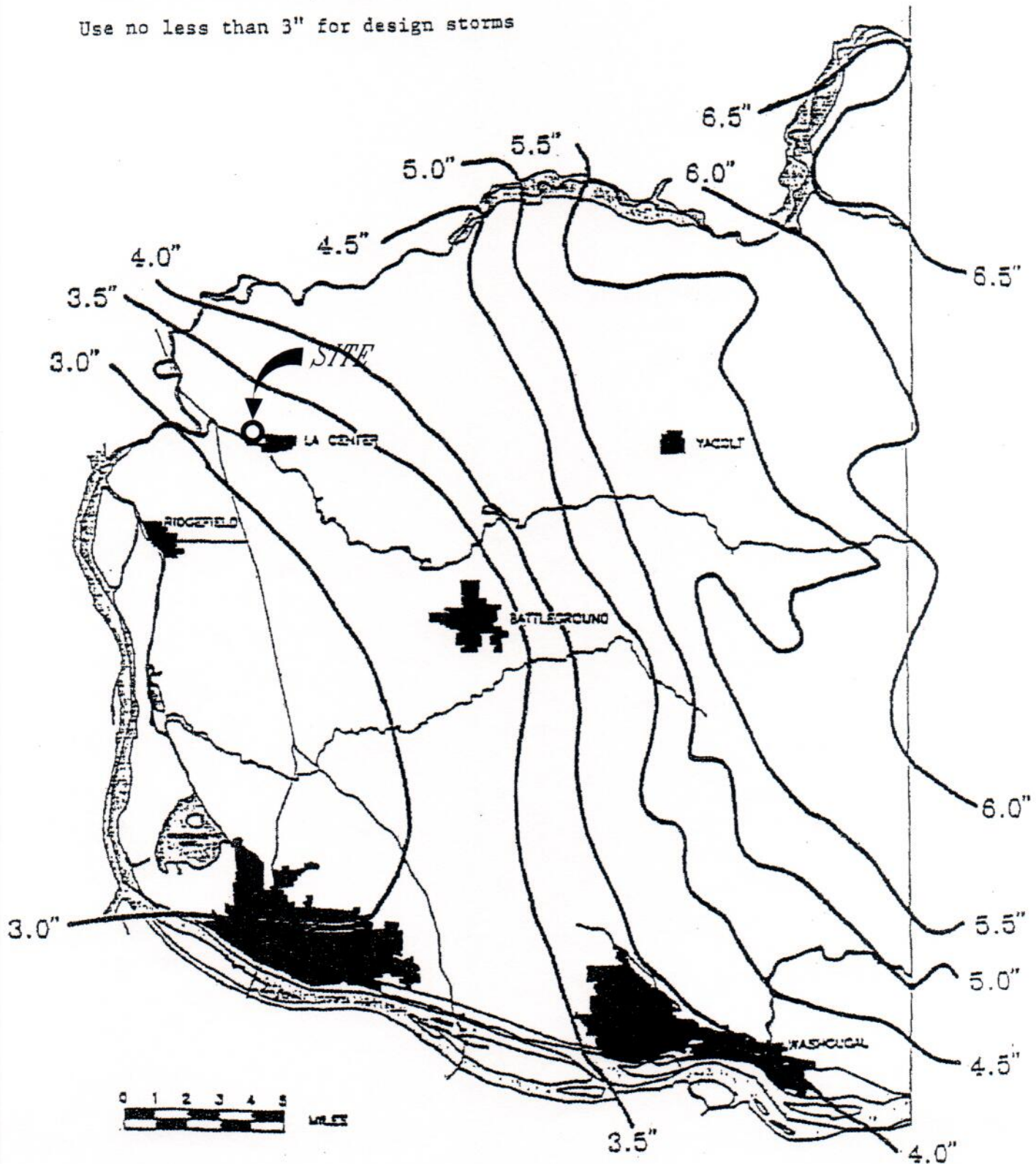




Exhibit C  
Isopluvial Maps for Design Storms in Clark County

10-Year, 24-Hour Isopluvials

Use no less than 3" for design storms



**Exhibit C**  
**Isopluvial Maps for Design Storms in Clark County**

25-Year, 24-Hour Isopluvials

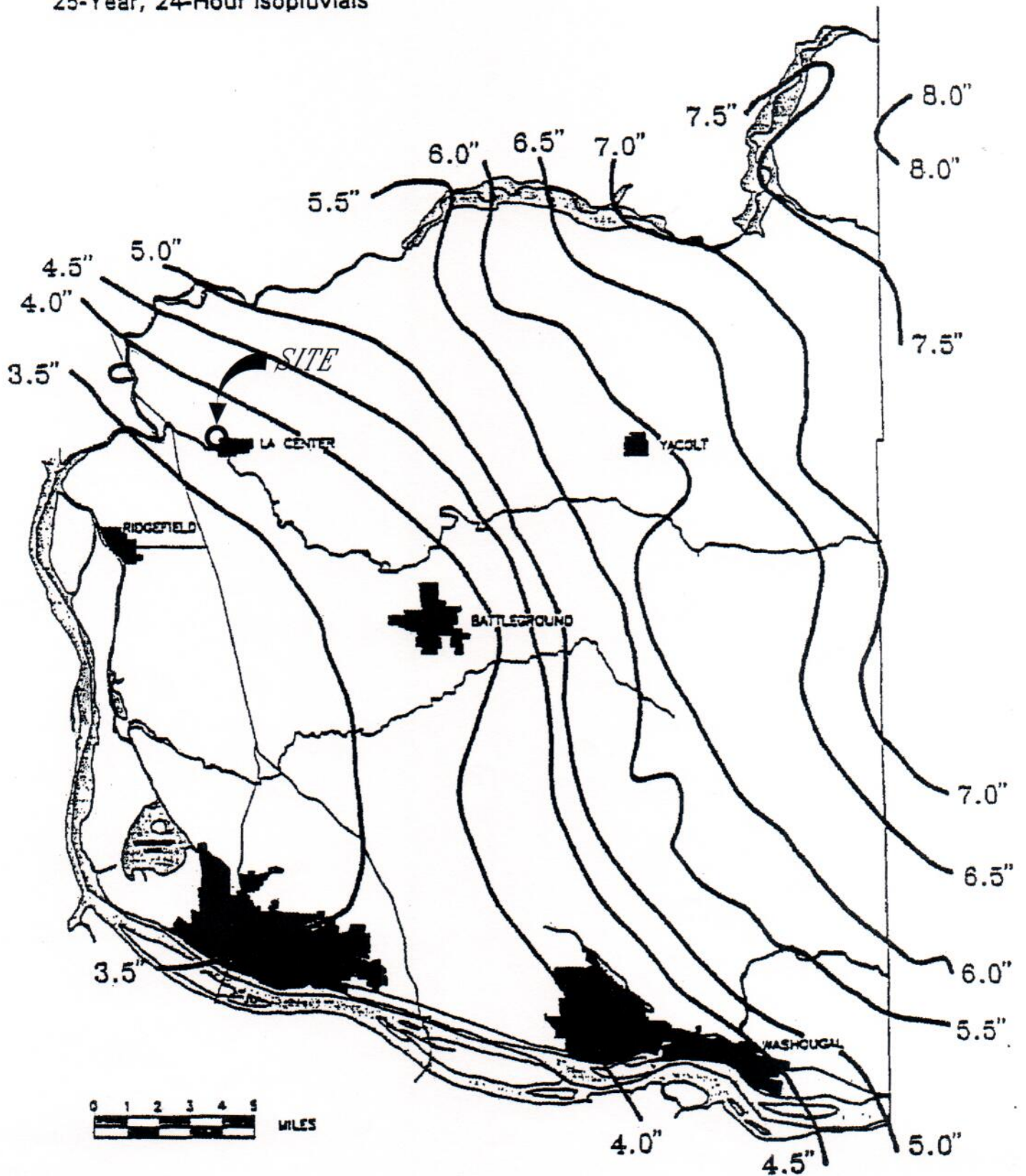
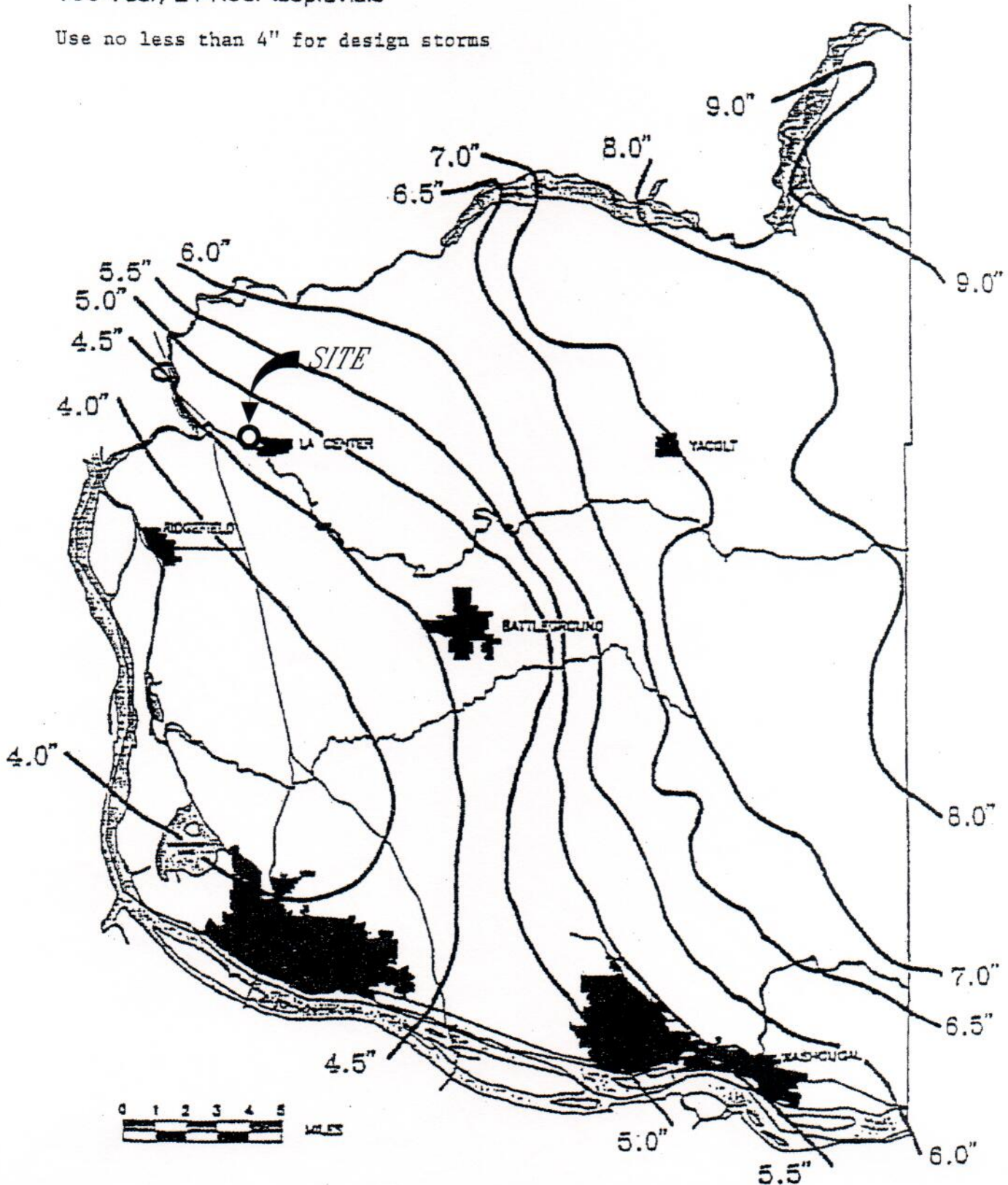




Exhibit C  
Isopluvial Maps for Design Storms in Clark County

100-Year, 24-Hour Isopluvials

Use no less than 4" for design storms





## **Appendix C - Design Calculations**

Basin Summary Sheet

HydroCAD Water Quality Report

HydroCAD Flow Control Report

## BASIN SUMMARY SHEET

BREEZE CREEK

JOB #: **2334**

[illegible]

Designed By: JAI  
Checked By: \_\_\_\_\_

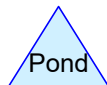
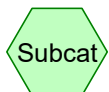
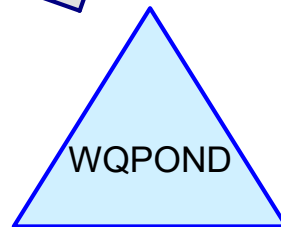
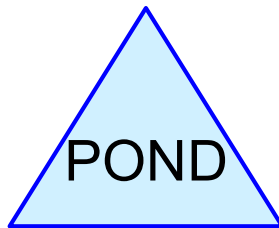
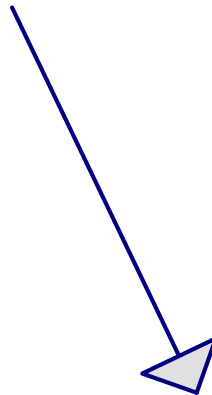
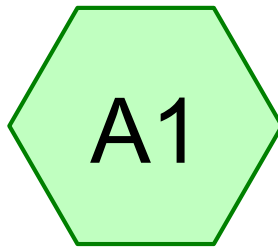
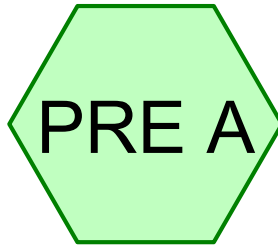
W.Q. Precip.:	<u>1.68 in.</u>
2 Yr. Precip.:	<u>2.40 in.</u>
10 Yr. Precip.:	<u>3.30 in.</u>
100 Yr. Precip.:	<u>4.70 in.</u>

70 % of 2-Yr.

Hydrologic Soils Group:

NOTES:

\*A minimum Tc of 6 minutes is used to calculate Peak Flows using the Hydrocad Program.



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### Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	WQ	Type IA 24-hr		Default	24.00	1	1.60	2

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### Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.370	98	(A1)
1.640	86	(A1)
4.010	85	(PRE A)
<b>8.020</b>	<b>89</b>	<b>TOTAL AREA</b>

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### Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
8.020	Other	A1, PRE A
<b>8.020</b>		<b>TOTAL AREA</b>

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### Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	8.020	8.020		A1, PRE A
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>8.020</b>	<b>8.020</b>	<b>TOTAL AREA</b>	

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Type IA 24-hr WQ Rainfall=1.60"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points

Runoff by SBUH method, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment A1: POST DEVELOPED A** Runoff Area=4.010 ac 59.10% Impervious Runoff Depth>0.95"  
Tc=6.0 min CN=93 Runoff=0.94 cfs 0.318 af

**Subcatchment PRE A: PRE-DEVELOPED A** Runoff Area=4.010 ac 0.00% Impervious Runoff Depth>0.50"  
Tc=44.9 min CN=85 Runoff=0.20 cfs 0.167 af

**Pond POND: POND** Peak Elev=0.00' Storage=0 cf  
Primary=0.00 cfs 0.000 af

**Pond WQPOND: WQ** Peak Elev=2.88' Storage=13,839 cf Inflow=0.94 cfs 0.318 af  
Outflow=0.00 cfs 0.000 af

**Total Runoff Area = 8.020 ac Runoff Volume = 0.485 af Average Runoff Depth = 0.73"**  
**70.45% Pervious = 5.650 ac 29.55% Impervious = 2.370 ac**



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Type IA 24-hr WQ Rainfall=1.60"

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### Summary for Subcatchment A1: POST DEVELOPED A

Runoff = 0.94 cfs @ 7.98 hrs, Volume= 0.318 af, Depth> 0.95"

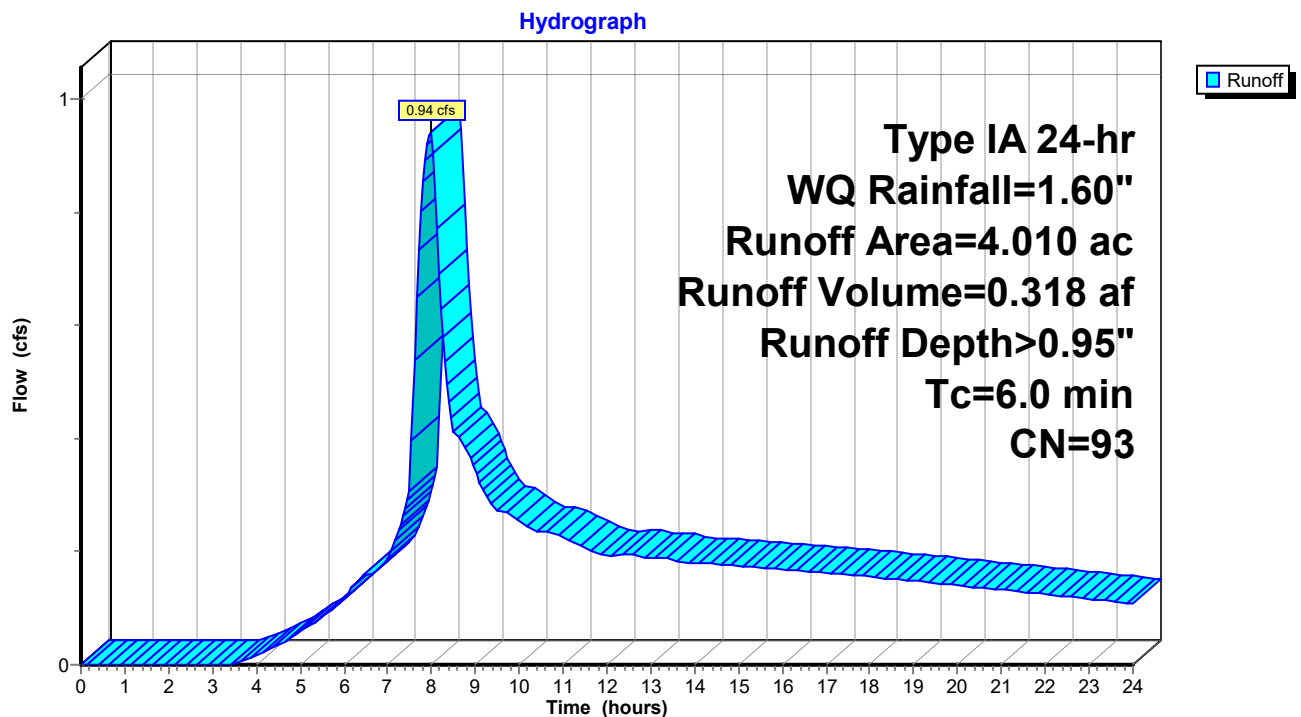
Runoff by SBUH method, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Type IA 24-hr WQ Rainfall=1.60"

	Area (ac)	CN	Description
*	2.370	98	
*	1.640	86	
	4.010	93	Weighted Average
	1.640		40.90% Pervious Area
	2.370		59.10% Impervious Area

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

### Subcatchment A1: POST DEVELOPED A



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Type IA 24-hr WQ Rainfall=1.60"

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### Summary for Subcatchment PRE A: PRE-DEVELOPED A

Runoff = 0.20 cfs @ 8.35 hrs, Volume= 0.167 af, Depth> 0.50"

Runoff by SBUH method, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

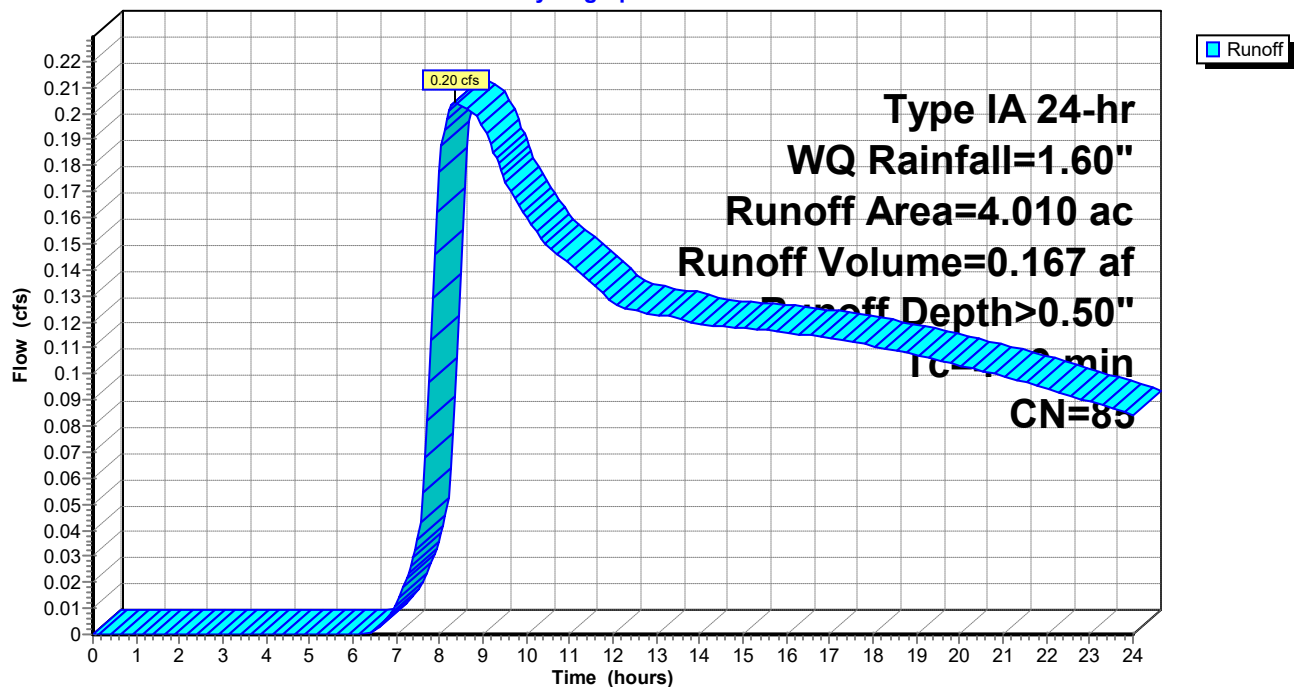
Type IA 24-hr WQ Rainfall=1.60"

Area (ac)	CN	Description
* 4.010	85	
4.010		100.00% Pervious Area

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

### Subcatchment PRE A: PRE-DEVELOPED A

Hydrograph



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Type IA 24-hr WQ Rainfall=1.60"

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### Summary for Pond POND: POND

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	22,767 cf	<b>Custom Stage Data (Prismatic)</b> Listed below 28,819 cf Overall x 79.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.00	7,152	0	0
4.00	8,757	7,955	7,955
5.00	10,418	9,588	17,542
6.00	12,136	11,277	28,819

Device	Routing	Invert	Outlet Devices
#1	Primary	3.00'	<b>3.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#2	Primary	4.44'	<b>10.5" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

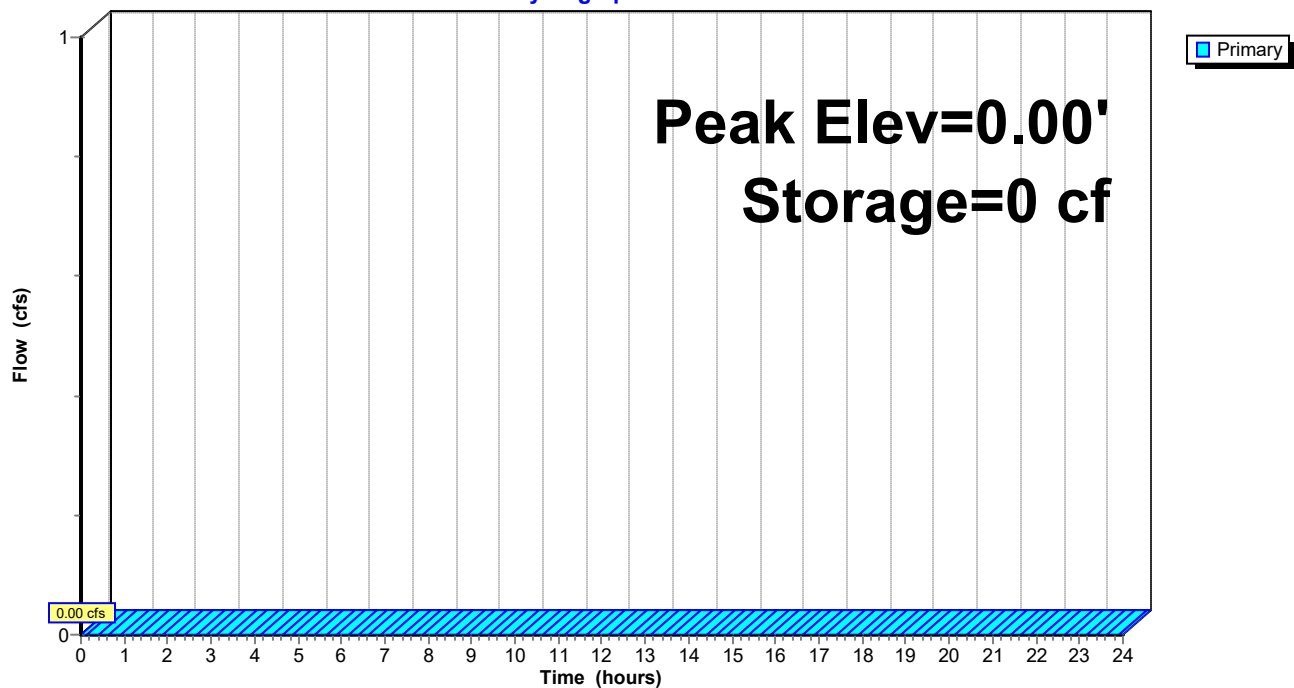
**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)

1=Orifice/Grate ( Controls 0.00 cfs)

2=Orifice/Grate ( Controls 0.00 cfs)

### Pond POND: POND

Hydrograph



## 2334 BREEZE CREEK TRAILS

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Type IA 24-hr WQ Rainfall=1.60"

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### Summary for Pond WQPOND: WQ

Inflow Area = 4.010 ac, 59.10% Impervious, Inflow Depth > 0.95" for WQ event  
Inflow = 0.94 cfs @ 7.98 hrs, Volume= 0.318 af  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Peak Elev= 2.88' @ 24.00 hrs Surf.Area= 6,959 sf Storage= 13,839 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

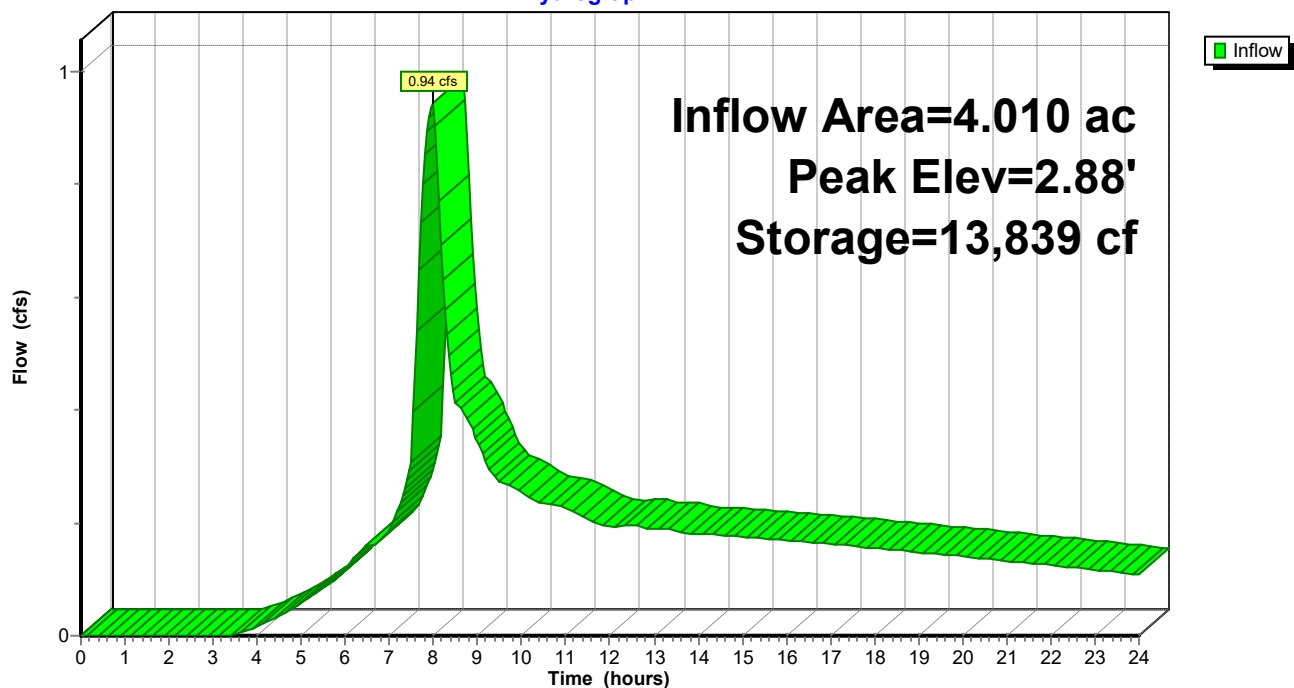
Center-of-Mass det. time= (not calculated: no outflow)

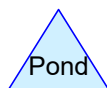
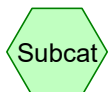
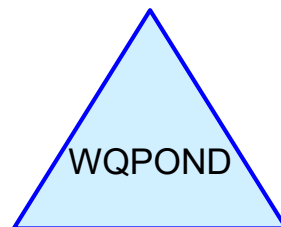
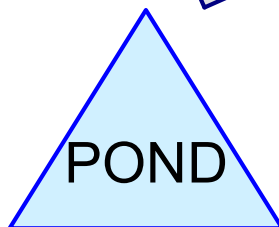
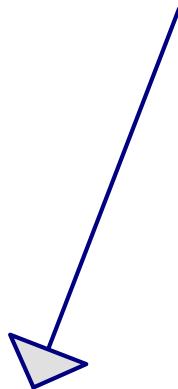
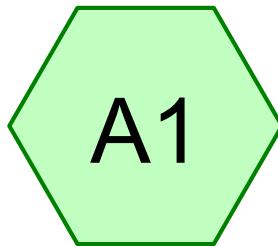
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	43,451 cf	<b>Custom Stage Data (Prismatic)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	2,678	0	0
1.00	4,113	3,396	3,396
2.00	5,604	4,859	8,254
3.00	7,152	6,378	14,632
4.00	8,757	7,955	22,587
5.00	10,418	9,588	32,174
6.00	12,136	11,277	43,451

### Pond WQPOND: WQ

Hydrograph





## 2334 BREEZE CREEK TRAILS

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### Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-YR	Type IA 24-hr		Default	24.00	1	2.40	2
2	10-YR	Type IA 24-hr		Default	24.00	1	3.30	2
3	25-YR	Type IA 24-hr		Default	24.00	1	3.80	2
4	100-YR	Type IA 24-hr		Default	24.00	1	4.70	2

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### Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.370	98	(A1)
1.640	86	(A1)
4.010	85	(PRE A)
<b>8.020</b>	<b>89</b>	<b>TOTAL AREA</b>

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### Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
8.020	Other	A1, PRE A
<b>8.020</b>		<b>TOTAL AREA</b>



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### Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	8.020	8.020		A1, PRE A
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>8.020</b>	<b>8.020</b>	<b>TOTAL AREA</b>	

## 2334 BREEZE CREEK TRAILS

Type IA 24-hr 2-YR Rainfall=2.40"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points

Runoff by SBUH method, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment A1: POST DEVELOPED A** Runoff Area=4.010 ac 59.10% Impervious Runoff Depth>1.68"  
Tc=6.0 min CN=93 Runoff=1.72 cfs 0.562 af

**Subcatchment PRE A: PRE-DEVELOPED A** Runoff Area=4.010 ac 0.00% Impervious Runoff Depth>1.07"  
Tc=44.9 min CN=85 Runoff=0.56 cfs 0.358 af

**Pond POND: POND** Peak Elev=4.43' Storage=9,554 cf Inflow=1.72 cfs 0.562 af  
Outflow=0.27 cfs 0.369 af

**Pond WQPOND: WQ** Peak Elev=0.00' Storage=0 cf

**Total Runoff Area = 8.020 ac Runoff Volume = 0.920 af Average Runoff Depth = 1.38"**  
**70.45% Pervious = 5.650 ac 29.55% Impervious = 2.370 ac**

## 2334 BREEZE CREEK TRAILS

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Type IA 24-hr 2-YR Rainfall=2.40"

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### Summary for Subcatchment A1: POST DEVELOPED A

Runoff = 1.72 cfs @ 7.96 hrs, Volume= 0.562 af, Depth> 1.68"

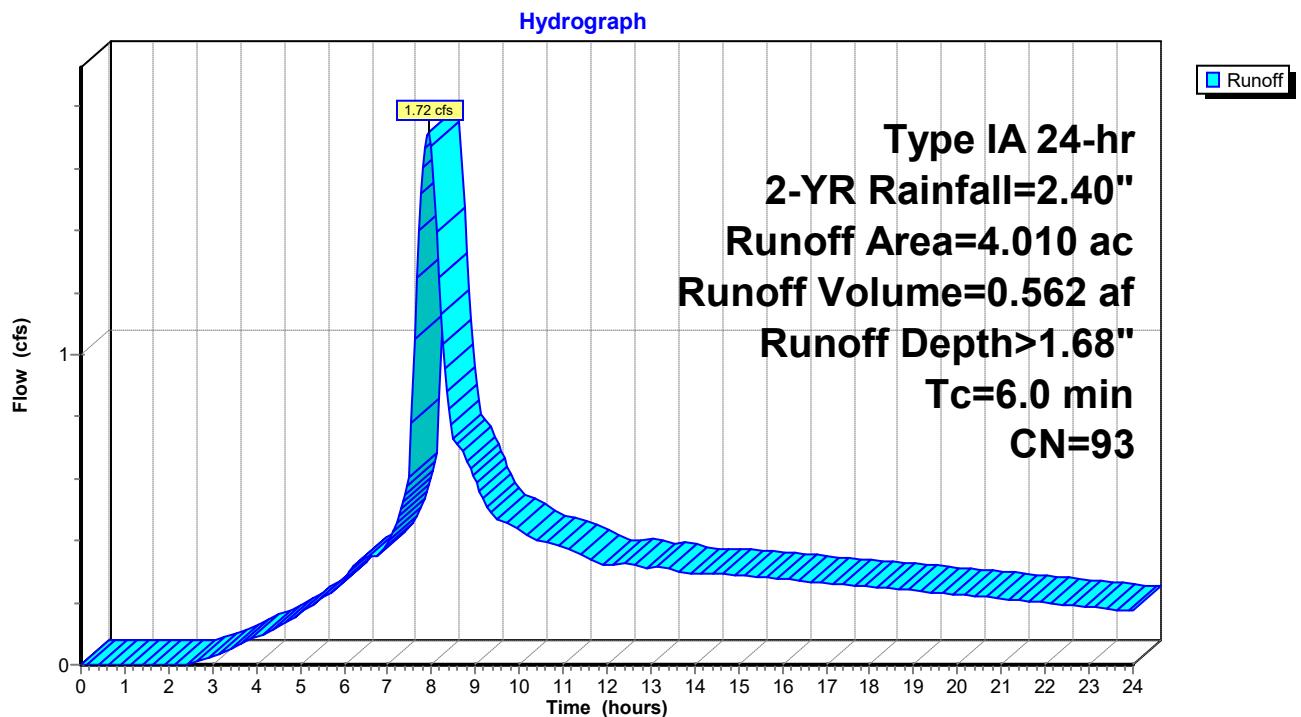
Runoff by SBUH method, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Type IA 24-hr 2-YR Rainfall=2.40"

	Area (ac)	CN	Description
*	2.370	98	
*	1.640	86	
	4.010	93	Weighted Average
	1.640		40.90% Pervious Area
	2.370		59.10% Impervious Area

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

### Subcatchment A1: POST DEVELOPED A



## 2334 BREEZE CREEK TRAILS

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Type IA 24-hr 2-YR Rainfall=2.40"

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### Summary for Subcatchment PRE A: PRE-DEVELOPED A

Runoff = 0.56 cfs @ 8.22 hrs, Volume= 0.358 af, Depth> 1.07"

Runoff by SBUH method, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

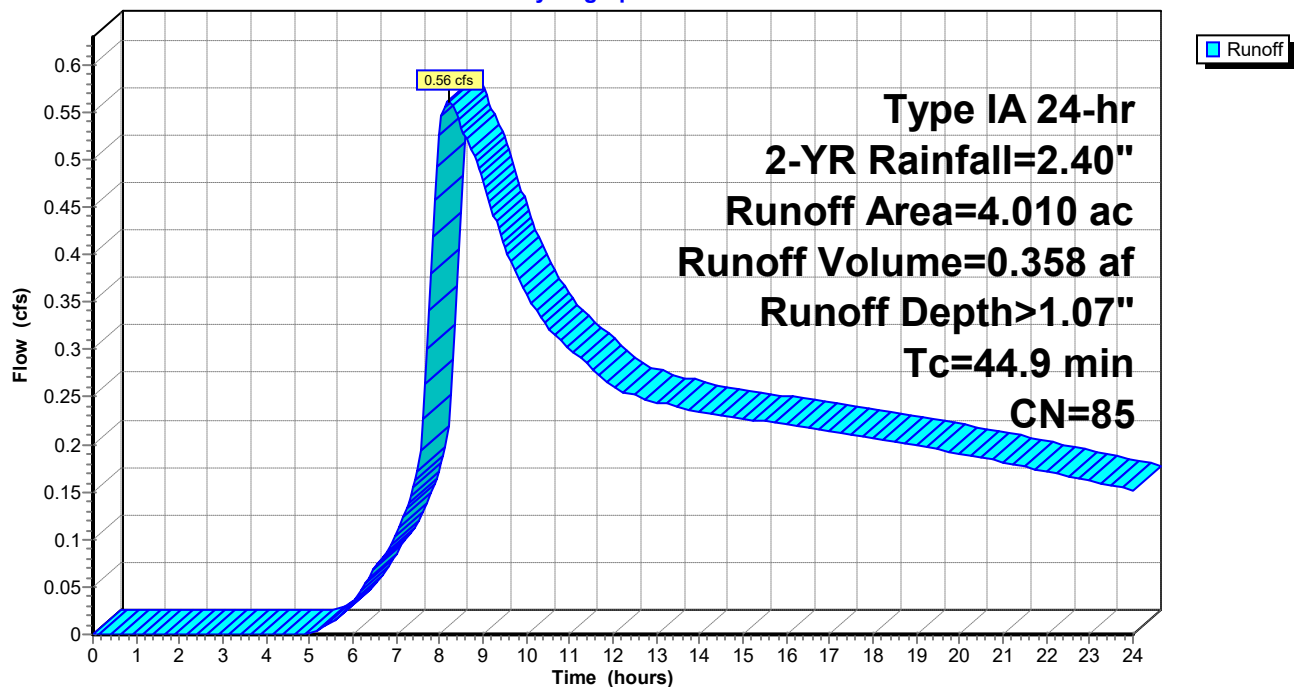
Type IA 24-hr 2-YR Rainfall=2.40"

Area (ac)	CN	Description
* 4.010	85	
4.010		100.00% Pervious Area

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

### Subcatchment PRE A: PRE-DEVELOPED A

Hydrograph



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Type IA 24-hr 2-YR Rainfall=2.40"

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**Summary for Pond POND: POND**

Inflow Area = 4.010 ac, 59.10% Impervious, Inflow Depth > 1.68" for 2-YR event  
 Inflow = 1.72 cfs @ 7.96 hrs, Volume= 0.562 af  
 Outflow = 0.27 cfs @ 16.42 hrs, Volume= 0.369 af, Atten= 84%, Lag= 508.0 min  
 Primary = 0.27 cfs @ 16.42 hrs, Volume= 0.369 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 4.43' @ 16.42 hrs Surf.Area= 9,474 sf Storage= 9,554 cf

Plug-Flow detention time= 389.1 min calculated for 0.369 af (66% of inflow)  
 Center-of-Mass det. time= 191.2 min ( 931.4 - 740.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	22,767 cf	<b>Custom Stage Data (Prismatic)</b> Listed below 28,819 cf Overall x 79.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.00	7,152	0	0
4.00	8,757	7,955	7,955
5.00	10,418	9,588	17,542
6.00	12,136	11,277	28,819

Device	Routing	Invert	Outlet Devices
#1	Primary	3.00'	<b>3.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#2	Primary	4.44'	<b>10.5" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=0.27 cfs @ 16.42 hrs HW=4.43' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.27 cfs @ 5.50 fps)

2=Orifice/Grate ( Controls 0.00 cfs)

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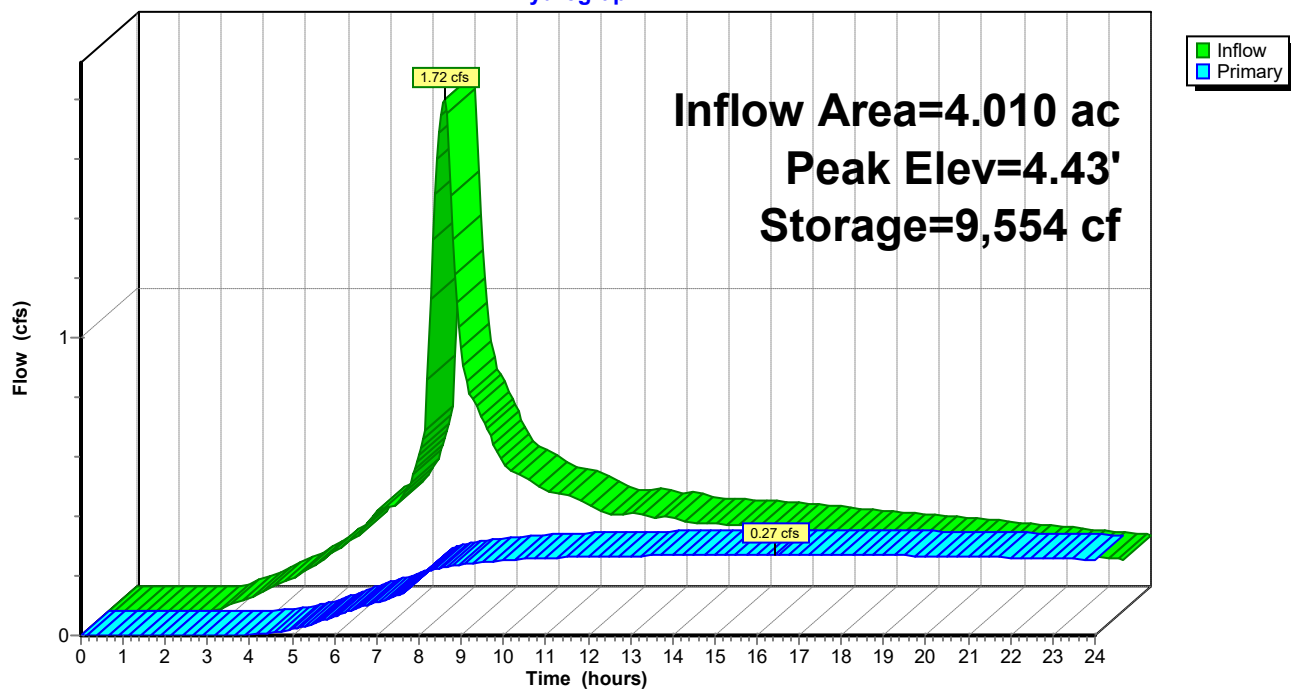
Type IA 24-hr 2-YR Rainfall=2.40"

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## Pond POND: POND

### Hydrograph



**2334 BREEZE CREEK TRAILS**

Type IA 24-hr 2-YR Rainfall=2.40"

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**Summary for Pond WQPOND: WQ**

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	43,451 cf	<b>Custom Stage Data (Prismatic)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	2,678	0	0
1.00	4,113	3,396	3,396
2.00	5,604	4,859	8,254
3.00	7,152	6,378	14,632
4.00	8,757	7,955	22,587
5.00	10,418	9,588	32,174
6.00	12,136	11,277	43,451

## 2334 BREEZE CREEK TRAILS

Type IA 24-hr 10-YR Rainfall=3.30"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points

Runoff by SBUH method, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment A1: POST DEVELOPED A** Runoff Area=4.010 ac 59.10% Impervious Runoff Depth>2.54"  
Tc=6.0 min CN=93 Runoff=2.61 cfs 0.847 af

**Subcatchment PRE A: PRE-DEVELOPED A** Runoff Area=4.010 ac 0.00% Impervious Runoff Depth>1.80"  
Tc=44.9 min CN=85 Runoff=1.04 cfs 0.602 af

**Pond POND: POND** Peak Elev=4.75' Storage=11,978 cf Inflow=2.61 cfs 0.847 af  
Outflow=0.67 cfs 0.617 af

**Pond WQPOND: WQ** Peak Elev=0.00' Storage=0 cf

**Total Runoff Area = 8.020 ac Runoff Volume = 1.449 af Average Runoff Depth = 2.17"**  
**70.45% Pervious = 5.650 ac 29.55% Impervious = 2.370 ac**



## 2334 BREEZE CREEK TRAILS

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Type IA 24-hr 10-YR Rainfall=3.30"

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### Summary for Subcatchment A1: POST DEVELOPED A

Runoff = 2.61 cfs @ 7.94 hrs, Volume= 0.847 af, Depth> 2.54"

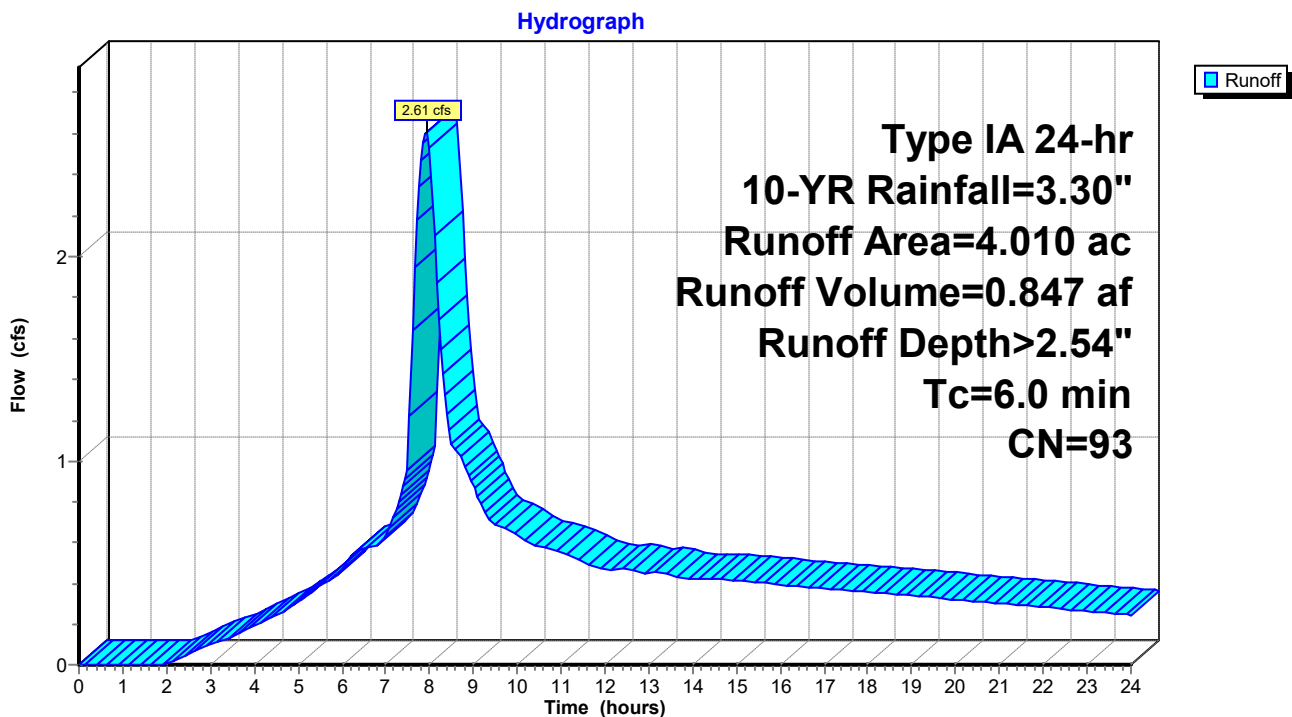
Runoff by SBUH method, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Type IA 24-hr 10-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	2.370	98	
*	1.640	86	
	4.010	93	Weighted Average
	1.640		40.90% Pervious Area
	2.370		59.10% Impervious Area

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

### Subcatchment A1: POST DEVELOPED A



## 2334 BREEZE CREEK TRAILS

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Type IA 24-hr 10-YR Rainfall=3.30"

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### Summary for Subcatchment PRE A: PRE-DEVELOPED A

Runoff = 1.04 cfs @ 8.16 hrs, Volume= 0.602 af, Depth> 1.80"

Runoff by SBUH method, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

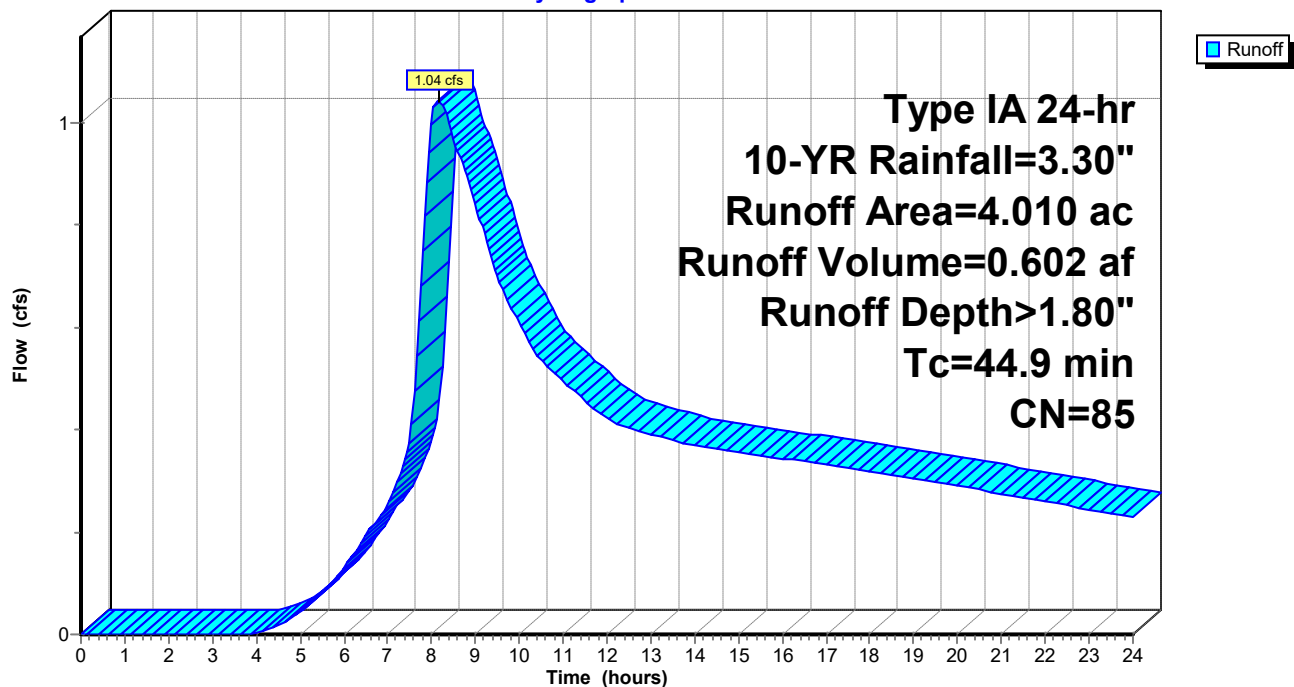
Type IA 24-hr 10-YR Rainfall=3.30"

Area (ac)	CN	Description
* 4.010	85	
4.010		100.00% Pervious Area

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

### Subcatchment PRE A: PRE-DEVELOPED A

Hydrograph



**2334 BREEZE CREEK TRAILS**

Type IA 24-hr 10-YR Rainfall=3.30"

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**Summary for Pond POND: POND**

Inflow Area = 4.010 ac, 59.10% Impervious, Inflow Depth > 2.54" for 10-YR event  
 Inflow = 2.61 cfs @ 7.94 hrs, Volume= 0.847 af  
 Outflow = 0.67 cfs @ 9.75 hrs, Volume= 0.617 af, Atten= 74%, Lag= 108.7 min  
 Primary = 0.67 cfs @ 9.75 hrs, Volume= 0.617 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 4.75' @ 9.75 hrs Surf.Area= 10,006 sf Storage= 11,978 cf

Plug-Flow detention time= 314.1 min calculated for 0.616 af (73% of inflow)  
 Center-of-Mass det. time= 149.2 min ( 868.7 - 719.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	22,767 cf	<b>Custom Stage Data (Prismatic)</b> Listed below 28,819 cf Overall x 79.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.00	7,152	0	0
4.00	8,757	7,955	7,955
5.00	10,418	9,588	17,542
6.00	12,136	11,277	28,819

Device	Routing	Invert	Outlet Devices
#1	Primary	3.00'	<b>3.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#2	Primary	4.44'	<b>10.5" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=0.67 cfs @ 9.75 hrs HW=4.75' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.30 cfs @ 6.14 fps)  
 — **2=Orifice/Grate** (Orifice Controls 0.37 cfs @ 1.90 fps)

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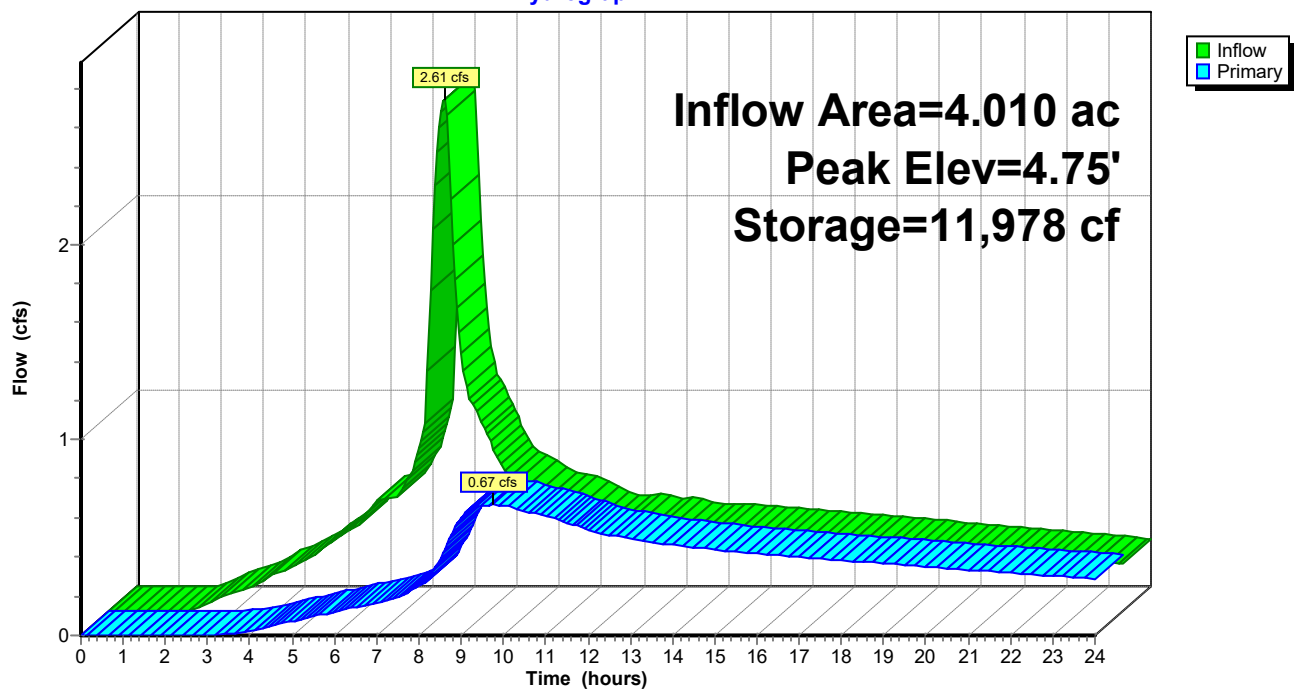
Type IA 24-hr 10-YR Rainfall=3.30"

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## Pond POND: POND

### Hydrograph



**2334 BREEZE CREEK TRAILS**

Type IA 24-hr 10-YR Rainfall=3.30"

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**Summary for Pond WQPOND: WQ**

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	43,451 cf	<b>Custom Stage Data (Prismatic)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	2,678	0	0
1.00	4,113	3,396	3,396
2.00	5,604	4,859	8,254
3.00	7,152	6,378	14,632
4.00	8,757	7,955	22,587
5.00	10,418	9,588	32,174
6.00	12,136	11,277	43,451

## 2334 BREEZE CREEK TRAILS

Type IA 24-hr 25-YR Rainfall=3.80"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points

Runoff by SBUH method, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment A1: POST DEVELOPED A** Runoff Area=4.010 ac 59.10% Impervious Runoff Depth>3.02"  
Tc=6.0 min CN=93 Runoff=3.11 cfs 1.009 af

**Subcatchment PRE A: PRE-DEVELOPED A** Runoff Area=4.010 ac 0.00% Impervious Runoff Depth>2.23"  
Tc=44.9 min CN=85 Runoff=1.33 cfs 0.745 af

**Pond POND: POND** Peak Elev=4.90' Storage=13,075 cf Inflow=3.11 cfs 1.009 af  
Outflow=1.04 cfs 0.770 af

**Pond WQPOND: WQ** Peak Elev=0.00' Storage=0 cf

**Total Runoff Area = 8.020 ac Runoff Volume = 1.754 af Average Runoff Depth = 2.62"**  
**70.45% Pervious = 5.650 ac 29.55% Impervious = 2.370 ac**

## 2334 BREEZE CREEK TRAILS

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Type IA 24-hr 25-YR Rainfall=3.80"

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### Summary for Subcatchment A1: POST DEVELOPED A

Runoff = 3.11 cfs @ 7.94 hrs, Volume= 1.009 af, Depth> 3.02"

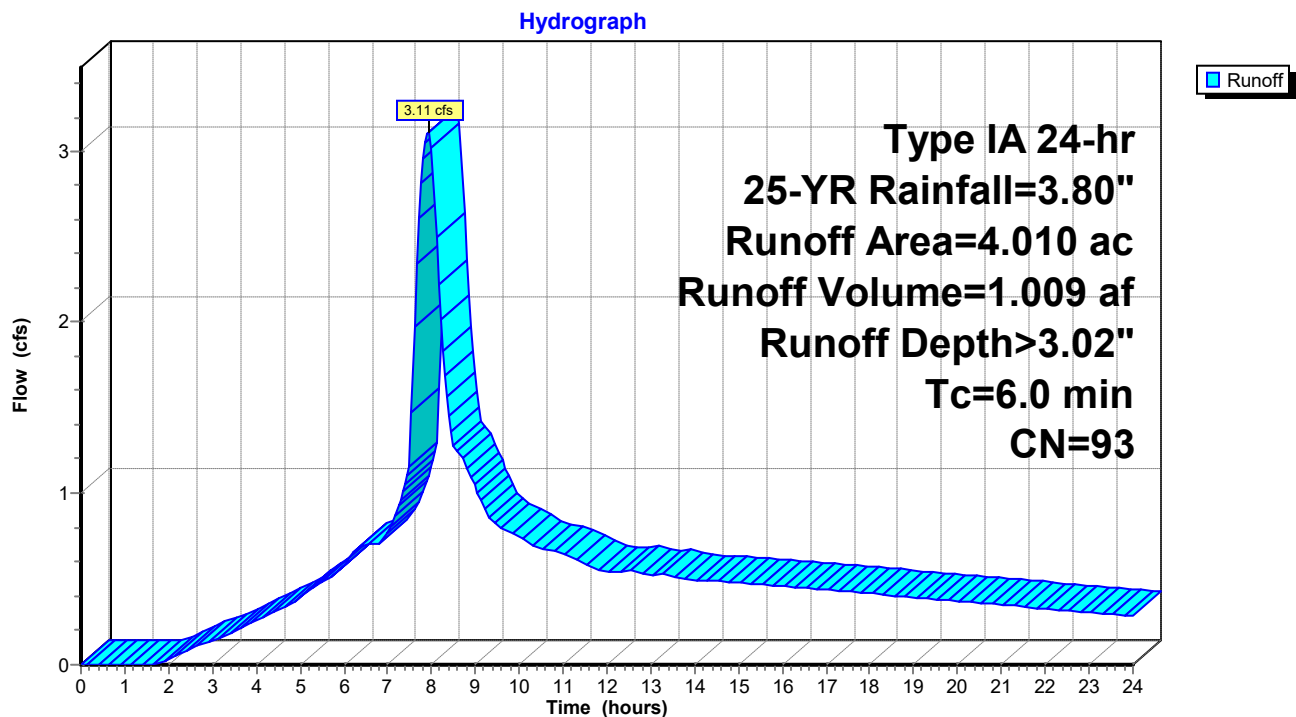
Runoff by SBUH method, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Type IA 24-hr 25-YR Rainfall=3.80"

	Area (ac)	CN	Description
*	2.370	98	
*	1.640	86	
	4.010	93	Weighted Average
	1.640		40.90% Pervious Area
	2.370		59.10% Impervious Area

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

### Subcatchment A1: POST DEVELOPED A



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Type IA 24-hr 25-YR Rainfall=3.80"

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### Summary for Subcatchment PRE A: PRE-DEVELOPED A

Runoff = 1.33 cfs @ 8.15 hrs, Volume= 0.745 af, Depth> 2.23"

Runoff by SBUH method, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

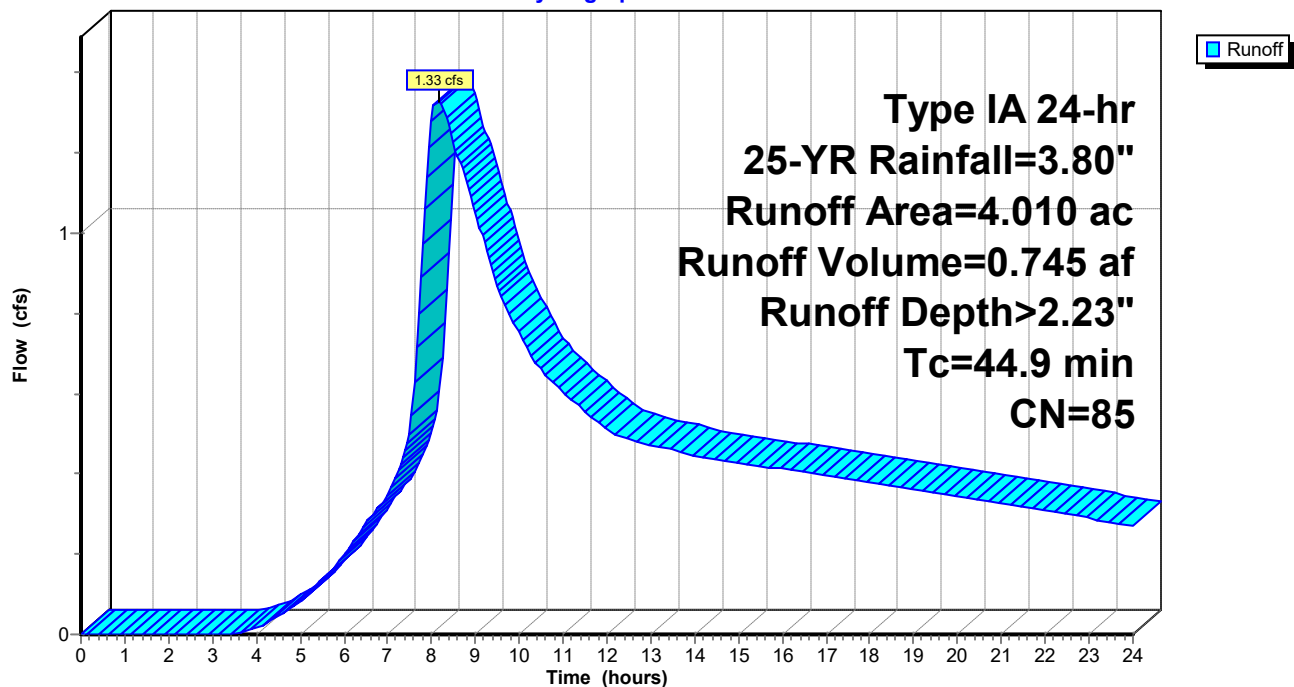
Type IA 24-hr 25-YR Rainfall=3.80"

Area (ac)	CN	Description
* 4.010	85	
4.010		100.00% Pervious Area

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

### Subcatchment PRE A: PRE-DEVELOPED A

Hydrograph





**2334 BREEZE CREEK TRAILS**

Type IA 24-hr 25-YR Rainfall=3.80"

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**Summary for Pond POND: POND**

Inflow Area = 4.010 ac, 59.10% Impervious, Inflow Depth > 3.02" for 25-YR event  
 Inflow = 3.11 cfs @ 7.94 hrs, Volume= 1.009 af  
 Outflow = 1.04 cfs @ 8.98 hrs, Volume= 0.770 af, Atten= 66%, Lag= 62.7 min  
 Primary = 1.04 cfs @ 8.98 hrs, Volume= 0.770 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 4.90' @ 8.98 hrs Surf.Area= 10,246 sf Storage= 13,075 cf

Plug-Flow detention time= 276.7 min calculated for 0.769 af (76% of inflow)  
 Center-of-Mass det. time= 129.4 min ( 840.9 - 711.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	22,767 cf	<b>Custom Stage Data (Prismatic)</b> Listed below 28,819 cf Overall x 79.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.00	7,152	0	0
4.00	8,757	7,955	7,955
5.00	10,418	9,588	17,542
6.00	12,136	11,277	28,819

Device	Routing	Invert	Outlet Devices
#1	Primary	3.00'	<b>3.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#2	Primary	4.44'	<b>10.5" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=1.04 cfs @ 8.98 hrs HW=4.90' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.31 cfs @ 6.41 fps)  
 — **2=Orifice/Grate** (Orifice Controls 0.73 cfs @ 2.30 fps)

# 2334 BREEZE CREEK TRAILS

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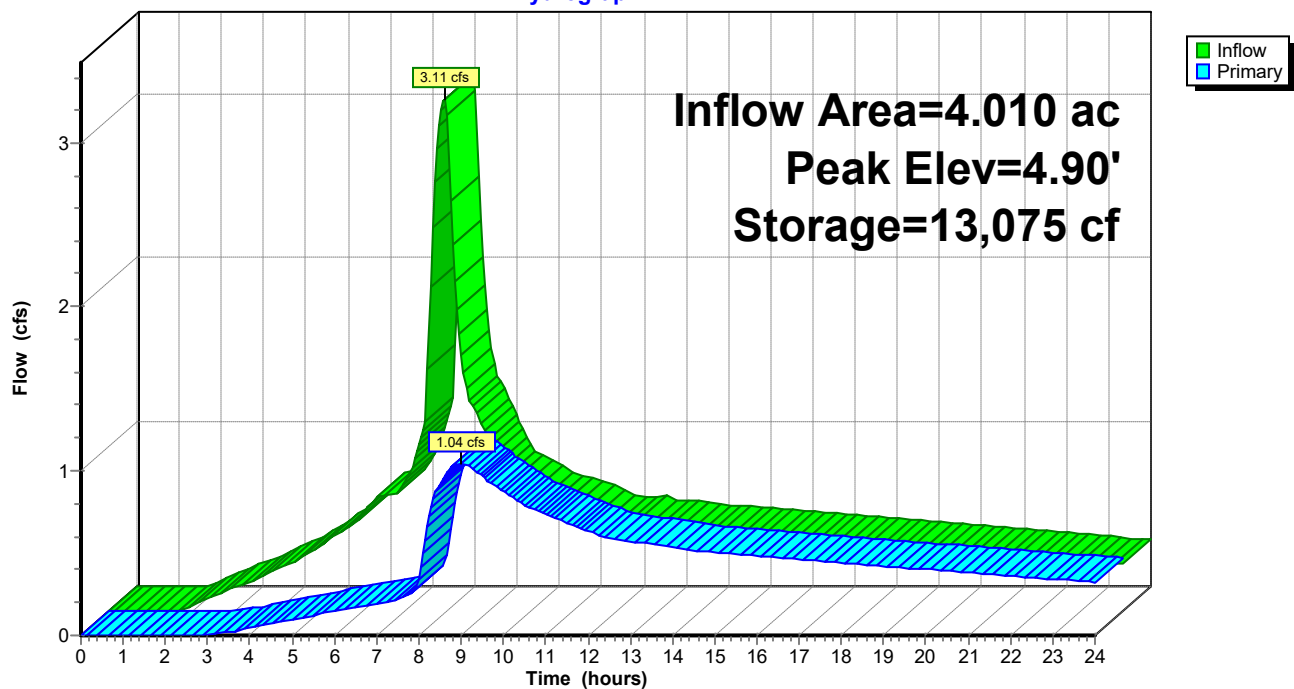
Type IA 24-hr 25-YR Rainfall=3.80"

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## Pond POND: POND

### Hydrograph



**2334 BREEZE CREEK TRAILS**

Type IA 24-hr 25-YR Rainfall=3.80"

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**Summary for Pond WQPOND: WQ**

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	43,451 cf	<b>Custom Stage Data (Prismatic)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	2,678	0	0
1.00	4,113	3,396	3,396
2.00	5,604	4,859	8,254
3.00	7,152	6,378	14,632
4.00	8,757	7,955	22,587
5.00	10,418	9,588	32,174
6.00	12,136	11,277	43,451

## 2334 BREEZE CREEK TRAILS

Type IA 24-hr 100-YR Rainfall=4.70"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points

Runoff by SBUH method, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment A1: POST DEVELOPED A** Runoff Area=4.010 ac 59.10% Impervious Runoff Depth>3.89"  
Tc=6.0 min CN=93 Runoff=4.01 cfs 1.302 af

**Subcatchment PRE A: PRE-DEVELOPED A** Runoff Area=4.010 ac 0.00% Impervious Runoff Depth>3.03"  
Tc=44.9 min CN=85 Runoff=1.87 cfs 1.012 af

**Pond POND: POND** Peak Elev=5.16' Storage=15,285 cf Inflow=4.01 cfs 1.302 af  
Outflow=1.87 cfs 1.053 af

**Pond WQPOND: WQ** Peak Elev=0.00' Storage=0 cf

**Total Runoff Area = 8.020 ac Runoff Volume = 2.313 af Average Runoff Depth = 3.46"**  
**70.45% Pervious = 5.650 ac 29.55% Impervious = 2.370 ac**

## 2334 BREEZE CREEK TRAILS

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Type IA 24-hr 100-YR Rainfall=4.70"

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### Summary for Subcatchment A1: POST DEVELOPED A

Runoff = 4.01 cfs @ 7.93 hrs, Volume= 1.302 af, Depth> 3.89"

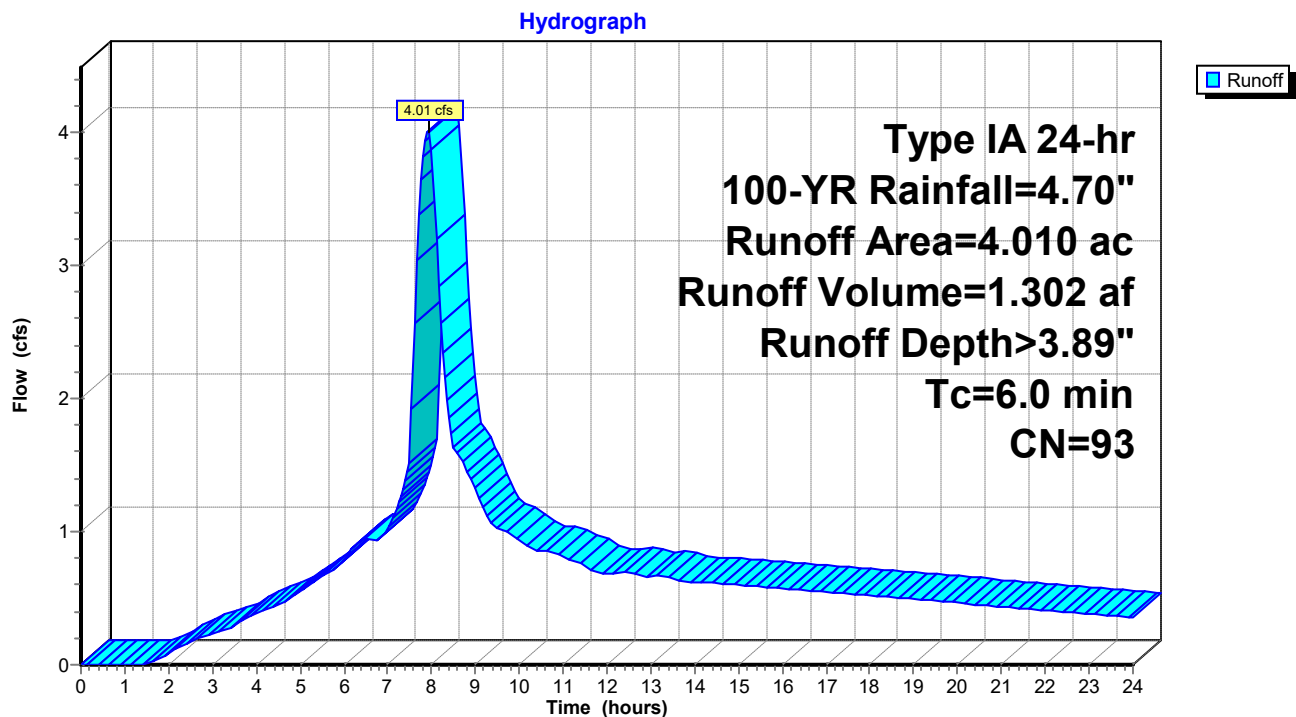
Runoff by SBUH method, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Type IA 24-hr 100-YR Rainfall=4.70"

	Area (ac)	CN	Description
*	2.370	98	
*	1.640	86	
	4.010	93	Weighted Average
	1.640		40.90% Pervious Area
	2.370		59.10% Impervious Area

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

### Subcatchment A1: POST DEVELOPED A



## 2334 BREEZE CREEK TRAILS

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Type IA 24-hr 100-YR Rainfall=4.70"

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### Summary for Subcatchment PRE A: PRE-DEVELOPED A

Runoff = 1.87 cfs @ 8.13 hrs, Volume= 1.012 af, Depth> 3.03"

Runoff by SBUH method, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

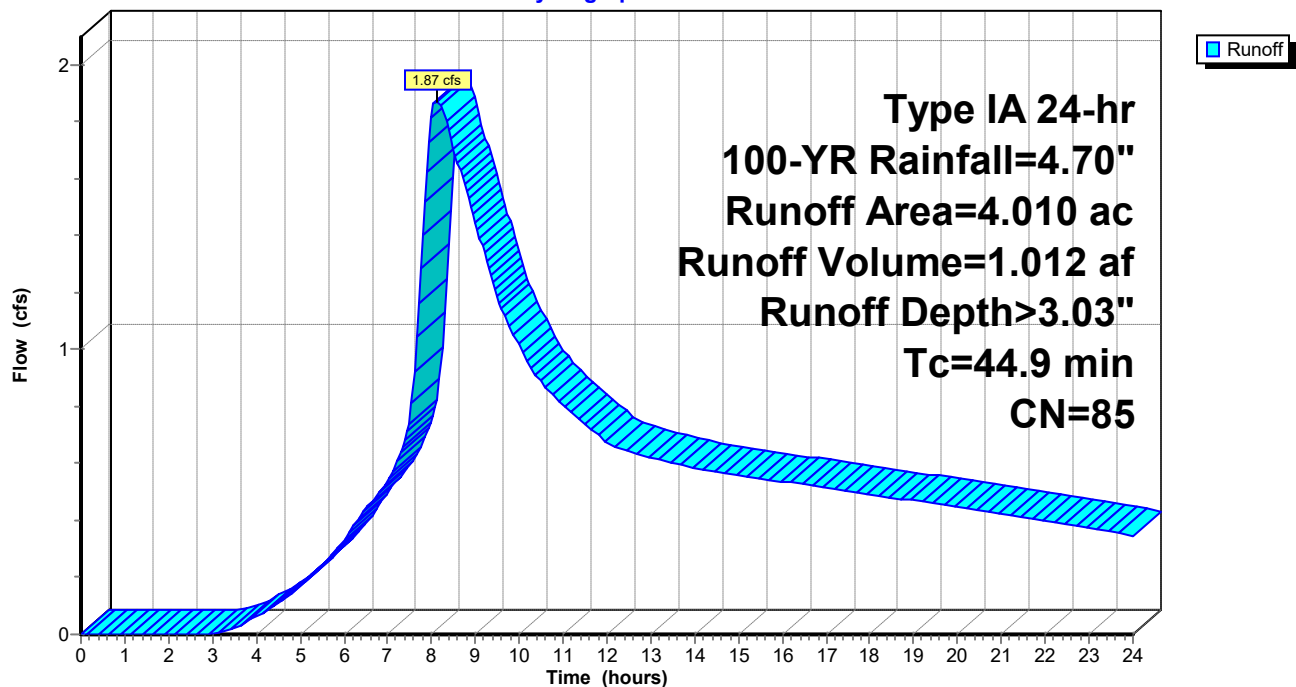
Type IA 24-hr 100-YR Rainfall=4.70"

Area (ac)	CN	Description
* 4.010	85	
4.010		100.00% Pervious Area

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

### Subcatchment PRE A: PRE-DEVELOPED A

Hydrograph



**2334 BREEZE CREEK TRAILS**

Type IA 24-hr 100-YR Rainfall=4.70"

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**Summary for Pond POND: POND**

Inflow Area = 4.010 ac, 59.10% Impervious, Inflow Depth > 3.89" for 100-YR event  
 Inflow = 4.01 cfs @ 7.93 hrs, Volume= 1.302 af  
 Outflow = 1.87 cfs @ 8.40 hrs, Volume= 1.053 af, Atten= 53%, Lag= 28.0 min  
 Primary = 1.87 cfs @ 8.40 hrs, Volume= 1.053 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 5.16' @ 8.40 hrs Surf.Area= 10,693 sf Storage= 15,285 cf

Plug-Flow detention time= 232.0 min calculated for 1.053 af (81% of inflow)  
 Center-of-Mass det. time= 108.0 min ( 808.4 - 700.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	22,767 cf	<b>Custom Stage Data (Prismatic)</b> Listed below 28,819 cf Overall x 79.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.00	7,152	0	0
4.00	8,757	7,955	7,955
5.00	10,418	9,588	17,542
6.00	12,136	11,277	28,819

Device	Routing	Invert	Outlet Devices
#1	Primary	3.00'	<b>3.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#2	Primary	4.44'	<b>10.5" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=1.87 cfs @ 8.40 hrs HW=5.16' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.34 cfs @ 6.87 fps)  
 — **2=Orifice/Grate** (Orifice Controls 1.53 cfs @ 2.89 fps)

# 2334 BREEZE CREEK TRAILS

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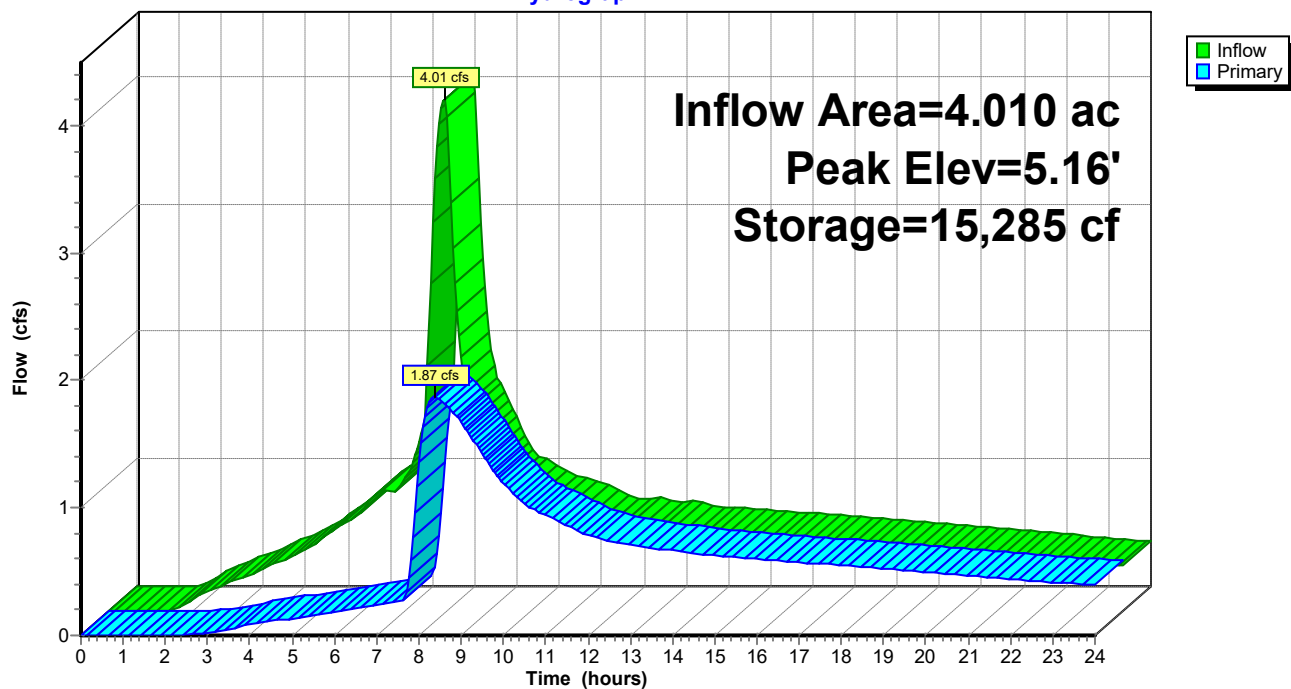
Type IA 24-hr 100-YR Rainfall=4.70"

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## Pond POND: POND

### Hydrograph





**2334 BREEZE CREEK TRAILS**

Type IA 24-hr 100-YR Rainfall=4.70"

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**Summary for Pond WQPOND: WQ**

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	43,451 cf	<b>Custom Stage Data (Prismatic)</b> Listed below

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4.00	8,757	7,955	22,587
5.00	10,418	9,588	32,174
6.00	12,136	11,277	43,451

**Appendix D - Soils Report**

See Preliminary Application

## **Appendix E – Wetland Report**

See Preliminary Application