DEER MEADOWS PRELIMINARY PLAT
STORM DRAINAGE CALCULATIONS

Prepared for:

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Project Location:

418 SW 12th St
College Place, WA
Parcel 350735420131

Prepared By:

Christine Batayola, PE

Christine Batayola
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Project #21-098

July 2022

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STORM DRAINAGE CALCULATIONS

Deer Meadows
418 SW 12th St, College Place, WA
NW 1/4, SE 1/4, S15, T7N, R35E, WM

Project: New 11-lot subdivision with associated roads

Objective: Determine volume of stormwater runoff for the storage and infiltration system.

Method: Washington State Department of Ecology Stormwater Management Manual for Eastern Washington, February 2019, Publication Number 18-10-044

Design Storms: 2-year 3-hour storm for construction stormwater
6-month 24-hour storm for volume-based treatment facility sizing.
6-month 3-hour storm for flow-based treatment facility sizing
25-year 24-hour storm for runoff storage volume and infiltration
25-year 3-hour storm for max runoff flow rate
100-year storms for Underground Injection Control (UIC) wells (drywells and infiltration trenches with perforated pipe)
100-year 72-hour regional storm for runoff storage volume and infiltration
100-year 3-hour storm for runoff storage volume and infiltration

Pollutant Loading

The new streets have an ADT of less than 7,500.

Pollutant Loading Classification = Low Table 5.22

Rainfall for Design Storms:

Precipitation depths are determined from precipitation charts for eastern Washington with adjustments for the 3-hour and 72-hour storms.

City =	College Place		
Region =	3		
Annual Rainfall =	14-16 in		
P__yr 3hr =	1.06 * C_{sds} * P2hr2yr		Eq. 4.2 to convert 2yr 2hr storm to 3hr storm for selected return period
C_{sds} =	1		Not used for 2yr storm.
P2yr 2hr =	0.45	in	Figure 4.6 for 2yr 2hr storm
P2yr 3hr =	0.477	in	Total Precipitation for 2yr 3hr storm
C_{sds} 6mo =	0.66		Table 4.7
P6mo 3hr =	0.31	in	Total Precipitation for 6mo 3hr storm
C_{sds} 25yr =	1.9		Table 4.7
P25yr 3hr =	0.91	in	Total Precipitation for 25yr 3hr storm
C_{sds} 100yr =	2.66		Table 4.7
P100yr 3hr =	1.27	in	Total Precipitation for 100yr 3hr storm
P2yr 24hr =	1.05	in	Figure 4.7
C_{wqs} =	0.69		Table 4.5, coefficient to compute 6mo 24hr from 2yr 24hr storm
P6mo 24hr =	0.72	in	
P25yr 24hr =	1.8	in	Figure 4.10 for 25yr 24hr storm
P100yr 24hr =	2.2	in	Figure 4.12 for 100yr 24hr storm
Regional Storm Factor (RSF) =	1.06		Table 4.6
P100yr 72hr =	P100yr 24hr * RSF		Conversion from 24hr to 72hr regional storm
P100yr 72hr =	2.332	in	

STORM DRAINAGE CALCULATIONS

Deer Meadows
418 SW 12th St, College Place, WA
NW 1/4, SE 1/4, S15, T7N, R35E, WM

Summary of Soils Information

Soils information is from the Custom Soil Resource Report, provided by the United States Department of Agriculture Natural Resources Conservation Service and a Geotechnical Report prepared by PBS Dated June 25, 2018.

NRCS Soil Survey

Soil Types =	Catherine Silt Loam					
Hydrologic Soil Group =	B					
Saturated Hydraulic Conductivity, Ksat =	.57 to 1.98	in/hr - per NRCS soils report				

Geotechnical Report

Soil Description =	Silt over poorly graded gravel					
	TP-1	TP-2		Average Rate		
Infiltration test =	2.00	1.5	in/hr	1.75	in/hr	
	Trench/Drywell	Swale		Factor of Safety		
Ksat vertical =	0.44	0.44	in/hr	4	Vertical	
Ksat horizontal =	0.88		in/hr	2	Horizontal	
Cation Exchange Capacity =	>5	meq/100g	(Assumed based on silty soil)			
Organic Content =	>1	%	(Assumed based on silty soil)			
Treatment capacity rating =	High	Table 5.21: Vadose Zone Treatment Capacity				

Well Logs

Material =	Clay	
Depth to Restrictive Layer =	33	restrictive layer material
Depth to Groundwater =	12	ft

UIC Separation

Minimum thickness =	5	ft
UIC Separation Requirement Met ?	Yes	

Runoff Depth for Design Storms:

SCS curve numbers (CN's) from Table 4.14 are used to determine runoff depths for design storms. These values are based on antecedent moisture condition (AMC) II, with rainfall limits given in Table 4.15 as between 0.5 and 1.1 inches of rain (Dormant Season) in the 5 days prior to the design storm. For 100-year 72-hour storms, the Modified SCS Type 1A design storm requires an adjustment to CN's for AMC's I and III. While Region 2 normally has dry conditions (AMC I) due to low precipitation events, the more conservative CN values for average conditions (AMC II) are used instead. For regions with AMC III, an adjustment is needed to increase CN's for the regional storm.

Antecedent Precipitation =	27%	Table 4.4	
Antecedent Precipitation =	0.62964	in	Compare value to the Total 5-Day Antecedent Rainfall for the Dormant Season, Table 4.15, to determine the AMC.
AMC =	II	If AMC I or II, use the CN values directly from Table 4.14 which are based on AMC II. If AMC III, then adjust the CN's for the 72hr regional storm per Table 4.16.	

Total Runoff Depth (D) = (P - 0.2 * S)^2 / (P + 0.8 * S)   Eq. 4.20 to estimate runoff using the SCS curve number method.
D = 0 if P<0.2*S
S = (1000 / CN) - 10

	Paved	Gravel	Landscaped	
CN =	98	85	61	Runoff Curve Number based on soil type and surface cover under average
S =	0.204	1.765	6.393	antecedent moisture conditions, Table 4.14.
D2yr 3hr =	0.297	0.008	0.000	Depth of runoff during 2yr 3hr storm
D6mo 3hr =	0.157	0.000	0.000	Depth of runoff during 6mo 3hr storm
D25yr 3hr =	0.700	0.132	0.000	Depth of runoff during 25yr 3hr storm
D100yr 3hr =	1.053	0.313	0.000	Depth of runoff during 100yr 3hr storm
D2yr 24hr =	0.839	0.197	0.000	Depth of runoff during 2yr 24hr storm
D6mo 24hr =	0.527	0.065	0.000	Depth of runoff during 6mo 24hr storm
D25yr 24hr =	1.576	0.652	0.039	Depth of runoff during 25yr 24hr storm
D100yr 72hr =	2.104	1.046	0.149	Depth of runoff during 100yr 24hr storm

STORM DRAINAGE CALCULATIONS

Deer Meadows
418 SW 12th St, College Place, WA
NW 1/4, SE 1/4, S15, T7N, R35E, WM

Drainage Areas:

Areas 1 - 3 include the right of way plus 25 ft into the properties assumed to be pervious except for a 25ftx40 driveway for each lot. Area 4 is a 3,600 sf residence on each site, refer to attached drainage area exhibit.

		Area 1	Area 2	Area 3	Areas 1-3	Area 4
Pervious/Landscaped (sf)		4,025	19,505	5,470	29,000	0
Gravel (sf)		0	0	0	0	0
Impervious/Paved (sf)		10,305	42,495	9,980	62,780	3,600
Total Area (sf)		14,330	62,000	15,450	91,780	3,600
Total Area (acres)		0.33	1.42	0.35	2.11	0.08
Percent Impervious		72%	69%	65%	68%	100%
Pervious	CN[1] =	61	61	61	61	85
	S =	6.393	6.393	6.393	6.393	1.765
Impervious	CN =	98	98	98	98	98
	S =	0.204	0.204	0.204	0.204	0.204

[1] - Pervious CN value is a weighted average between landscaping and gravel based on respective areas of each.

Runoff Volume & Peak Flow:

The peak flow rate is determined using the Santa Barbara Urban Hydrograph Method. The analyses for the 24-hour storms use the Type 1A design storm hyetograph (Table 4.31); the 3-hour analyses use the short duration storm hyetograph (Table 4.33). The 100-year 72-hour regional storm is modeled using the 24-hour Type 1A storm hyetograph with modifications for the regional storm factor and CN as applicable.

Volume of Runoff = (D imp * Imp Area)+(D grvl *Grvl Area) +(D lndscp * Lndscp Area)

	Area 1 Peak Flow (cfs)	Area 1 Volume (cf)	Area 2 Peak Flow (cfs)	Area 2 Volume (cf)	Area 3 Peak Flow (cfs)	Area 3 Volume (cf)	Areas 1-3 Peak Flow (cfs)	Areas 1-3 Volume (cf)
6mo 3hr =	0.09	135	0.38	556	0.09	131	0.57	822
6mo 24hr =	0.03	452	0.13	1,865	0.03	438	0.19	2,755
2yr 3hr =	0.18	255	0.72	1,052	0.17	247	1.07	1,555
2yr 24hr =	0.05	721	0.21	2,973	0.05	698	0.31	4,392
25yr 3hr =	0.40	601	1.66	2,480	0.39	582	2.46	3,664
25yr 24hr =	0.10	1,367	0.40	5,646	0.09	1,329	0.58	8,342
100yr 3hr =	0.60	904	2.46	3,729	0.58	876	3.63	5,509
100yr 72hr =	0.13	1,857	0.52	7,692	0.12	1,818	0.77	11,366

	Area 4 Peak Flow	Area 4 Volume
6mo 3hr =	0.03	47
6mo 24hr =	0.01	158
2yr 3hr =	0.06	89
2yr 24hr =	0.02	252
25yr 3hr =	0.14	210
25yr 24hr =	0.03	473
100yr 3hr =	0.21	316
100yr 72hr =	0.04	631

STORM DRAINAGE CALCULATIONS

Deer Meadows
418 SW 12th St, College Place, WA
NW 1/4, SE 1/4, S15, T7N, R35E, WM

Storage & Infiltration System

Runoff is directed to a swale in the southeast corner of the site. Storage volume required is calculated using the Santa Barbara Urban Hydrograph Method for the Type 1A design storm. The volume of the swale is calculated to the rim of the overflow manhole, and to the maximum water depth (1 ft below the top of the swale). When the pond fills to the level of the overflow manhole, runoff will be directed to an infiltration trench for below-ground infiltration. For the future buildings, the runoff will be directed to private infiltration trenches.

Trench/Swale	**Areas 1-3**	**Areas 1-3**	**Areas 1-3**	**Areas 1-3**	**Area 4**
Type =	swale	swale	trench	combined	trench
Bottom Length (ft) =			65		24
Bottom Width (ft) =			6		6
Bottom Area, A_{bot} (sf) =	897	897	390		144
Side Slope (H:V)=	2.5	2.5	0		0
Side Slope (H:V)=	2.5	2.5	0		0
Depth (ft) =	2.0	5.0	5.0		4.0
Top Length (ft) =			65		24
Top Width (ft) =			6		6
Top Area, A_{top} (sf) =	1,867	3,755	390		144
Middle Area, A_{mid} (sf) =	1,350	2,149	390		144
Pipe Diameter (in) =	0.0	0.0	12.0		8.0
Pipe Area (sf) =	0.0	0.0	0.8		0.3
Rock Porosity[2] =	1	1	0.35		0.35
Total Storage Volume[3] (cf) =	2,721	11,040	716	11,756	207
Below Ground Infil. Rate (cfs) =	0.0000	0.0000	0.0183	0.0183	0.0063
Above Ground Rate[4] (cfs) =	0.0140	0.0236	0.0000	0.0140	0.0000

[2] - Rock Porosity = 0.35 for trenches (rock-filled) and 1.0 for swales (not rock-filled)

[3] - Volume formula for swales and trenches: $V = h / 6 * (A_{bot} + 4 * A_{mid} + A_{top})$, where A_{mid} is the surface area of the trench/swale at mid-depth. Areas for irregular shapes measured using CAD software.

[4] - Above ground infiltration rate includes infiltration along the bottom and halfway up the sides of a swale.

Design Summary	**Areas 1-3**	**Area 4**
Length of swale/trench (ft) =	0	24
# of Drywells (ea) =	0	0
Total Storage Volume (cf) =	11,756	207
Infil. Rate - below ground (cfs) =	0.0183	0.0063
Infil. Rate - above ground (cfs) =	0.0140	0.0000
Infil. Rate - time to infiltrate (cfs) =	0.0323	0.0063
25yr3hr		
Required Storage (cf) =	3,393	162
Available/Required =	3.5	1.3
Sufficient Storage ?	Yes	Yes
Time to Infiltrate (hr) =	31.5	9.2
25yr24hr		
Required Storage (cf) =	6,145	99
Available/Required =	1.9	2.1
Sufficient Storage ?	Yes	Yes
Time to Infiltrate (hr) =	71.7	20.8
100yr3hr - UIC's only		
Required Storage (cf) =	5,211	
Available/Required =	2.3	
Sufficient Storage ?	Yes	
Time to Infiltrate (hr) =	47.3	
100yr72hr - UIC's only		
Required Storage (cf) =	9,114	
Available/Required =	1.3	
Sufficient Storage ?	Yes	
Time to Infiltrate (hr) =	97.7	

The proposed storage and infiltration facilities are sufficient to store and infiltrate the runoff from the design storms.

STORM DRAINAGE CALCULATIONS

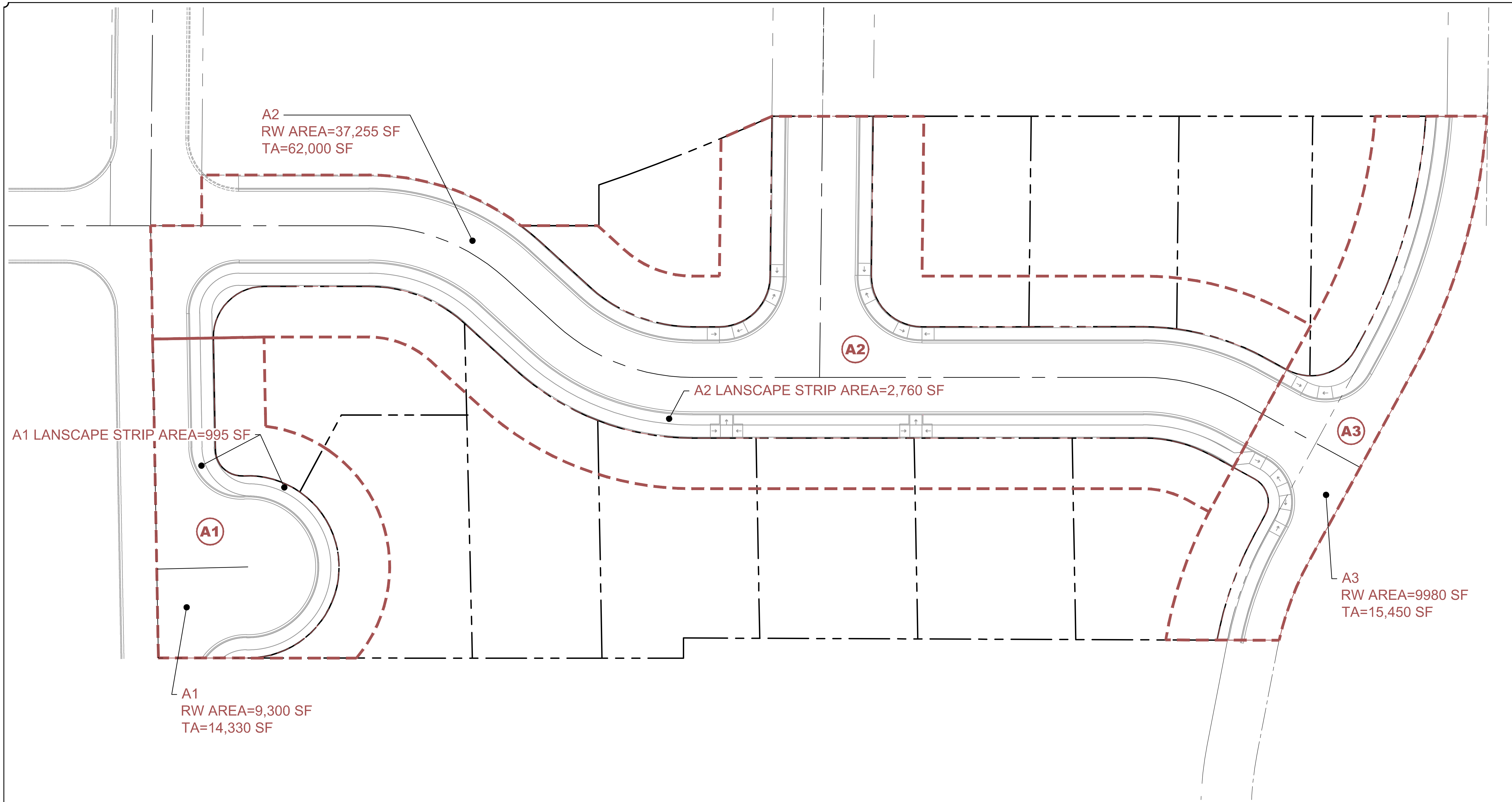
Deer Meadows
418 SW 12th St, College Place, WA
NW 1/4, SE 1/4, S15, T7N, R35E, WM

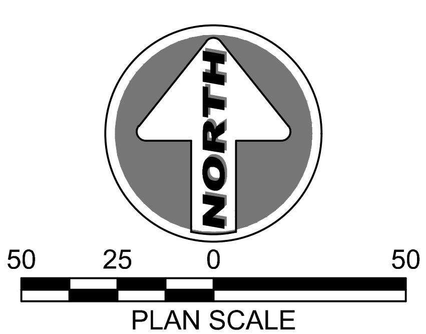
Site Suitability Criteria - Infiltration Trenches

Criteria	Compliance
SSC-1: Setback Criteria	swales and trenches are not within noted setback requirements for wells, septic tanks, drainfields, springs, etc. Slopes are not a concern.
SSC-2: Ground Water Protection Areas	Site will not cause a violation of the ground water standards.
SSC-3: High Vehicle Traffic Areas	Not a high use site.
SSC-4: Soil Infiltration Rate/Draw down Time	Infiltration tests showed 1.5 to 2 in/hr, design uses the upper layer of soil for infiltration and treatment, lower layer is only used beyond the treatment design storm. System draws down in less than 72-hours.
SSC-5: Depth to Bedrock, Grounwater Table, or Impermeable Layer	Depth to restrictive layer or groundwater is more than 5 ft below the bottom of the swales or infiltration trenches.
SSC-6: Soil Physical and Chemical Suitability for Treatment	Soils meet requirements for cation exchange capacity ≥ 5meq/100g and organic content ≥ 1% and are thicker than 18".
SSC-7: Seepage Analysis and Control	Seepage will not cause adverse effects.
SSC-8: Cold Climate and Impact of Roadway Deicing Chemicals	Road deicing chemicals will not affect potable water wells.
SSC-9: Previously Contaminated Soils or Unsuitable Soils	The site isn't contaminated or located upgradient of contaminated sites.

Core Element Assessment

Core Elements	Applicability	Compliance
#1: Stormwater Site Plan	New development: applies to entire project	Stormwater Site plan provided with construction documents.
#2: Construction Pollution Prevention	Applies to entire project	Appropriate BMP's will be used.
#3: Source Control	Applies to entire project	Sources of contamination will be controlled in accordance with State and local codes.
#4: Preservation of Natural Drainage	New development: applies to entire project	Site will be graded to keep stormwater on-site, no changes to natural drainage of surrounding areas.
#5: Runoff Treatment	Applies to Work Area (> 5000 sf).	The swale will provide treatment. The rim for the overflow manhole that drains to the infiltration trench will be above the volume needed for the water quality design storm.
#6: Flow Control	N/A, runoff contained on site	
#7: Operation and Maintenance	Applies to Cores #5 and #6	Catch basins, manholes, swale, and infiltration trenches will be regularly inspected and cleaned.
#8: Local Requirements	Applies to entire project	Site will be designed to meet local requirements.





	A1	A2	A3	A1-3
IMPERVIOUS AREA:	10,305 SF	42,495 SF	9,980 SF	62,780 SF
GRAVEL AREA:	0 SF	0 SF	0 SF	0 SF
PERVIOUS AREA:	4,025 SF	19,505 SF	5,470 SF	29,000 SF
TOTAL AREA:	14,330 SF	62,000 SF	15,450 SF	91,780 SF

HARMS ENGINEERING, INC.
1632 W Sylvester Street, Pasco WA 99301 | 509.547.2679 | HarmsEngineering.com
Designed By: C BATAYOLA
Drawn By: M CLARK
File Name: 21-098 Preliminary Davis Ave Subdivision 01G_
Plotted: July 6, 2022, 4:04:18 PM
File Path: P:\2021\21-098.1 J&J Kelly Davis Ave Subdivision\Dwgs

Rev	Description	By	Date

Drawing Name
DEER MEADOWS
STORM DRAIN AREAS
418 SW 12TH ST, COLLEGE PLACE, WA

Client/Project Information
J&J KELLY CONSTRUCTION
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1006 CHRISTOPHER LANE, PASCO, WA 99301

Date B
07-06-2022
Project Number
21-098.1
Sheet Number
EX1B

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

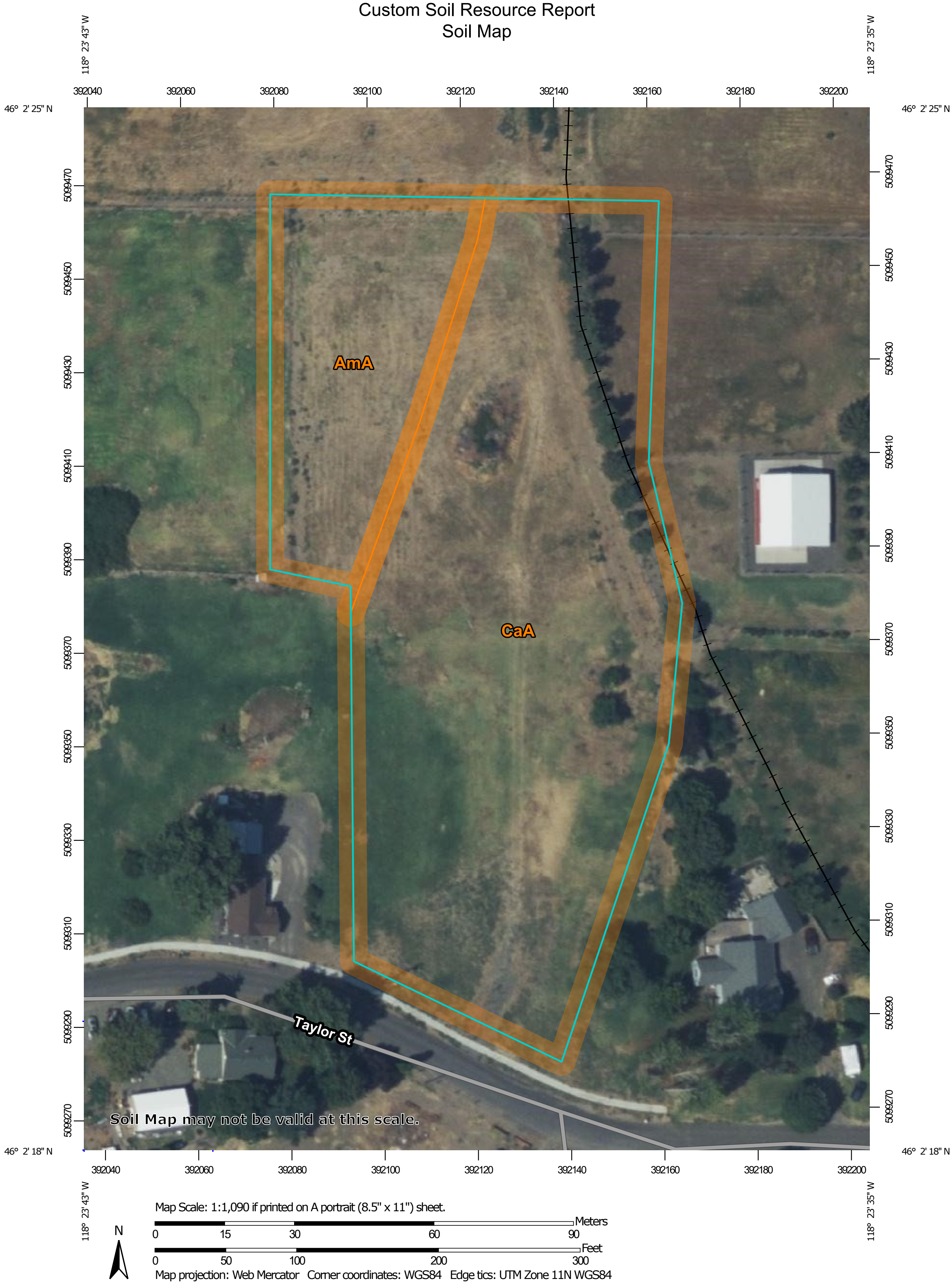
Custom Soil Resource Report for

Walla Walla County Area, Washington

Deer Meadows

June 14, 2022

Soil Map


118° 23' 43" W
118° 23' 35" W
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46° 2' 18" N
392040
392060
392080
392100
392120
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392160
392180
392200
5099470
5099450
5099430
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5099390
5099370
5099350
5099330
5099310
5099290
5099270
AmA
CaA
Taylor St
Soil Map may not be valid at this scale.
N
Map Scale: 1:1,090 if printed on A portrait (8.5" x 11") sheet.
Meters
0 15 30 60 90
Feet
0 50 100 200 300
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

Walla Walla County Area, Washington

AmA—Ahtanum silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2d5h
Elevation: 700 to 3,000 feet
Mean annual precipitation: 6 to 12 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 140 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Ahtanum and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ahtanum

Setting

Landform: Depressions
Parent material: Loess and pumice alluvium

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 34 inches: silt loam
H3 - 34 to 40 inches: cemented silt loam
H4 - 40 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Moderately saline to strongly saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: C/D
Ecological site: R007XY401WA - ALKALI BOTTOM 6-10 PZ
Hydric soil rating: Yes

CaA—Catherine silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2d61
Elevation: 600 to 4,000 feet
Mean annual precipitation: 11 to 23 inches
Mean annual air temperature: 45 to 54 degrees F
Frost-free period: 100 to 195 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Catherine and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Catherine

Setting

Landform: Valley floors
Parent material: Loess alluvium

Typical profile

H1 - 0 to 13 inches: silt loam
H2 - 13 to 48 inches: silt loam
H3 - 48 to 60 inches: stratified loamy sand to very gravelly silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 36 to 72 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: High (about 11.3 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B
Ecological site: R008XY601WA - WET MEADOW 10-16 PZ
Hydric soil rating: No

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT Appli. #6883

WELL LOG No. Permit #6509

Date April 15, 19 64

Record by Driller

Source Driller's Record

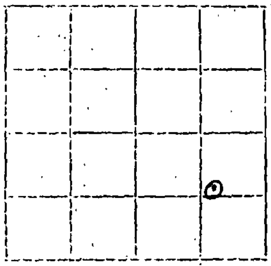


Diagram of Section

Location: State of WASHINGTON

County Walla Walla

Area 1446' E & 1426' N of S¼

Map corner

NE ¼ SE ¼ sec. 35 T. 7 N., R. 35 E. E./W.

Drilling Co. Ross Davis Drilling

Address 1006 S. College Place, Washington

Method of Drilling Cable Date March 9, 19 64

Owner Evern Budd

Address P.O.Box 116, College Place, Washington

Land surface, datum .... ft. above/below

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)		
	Irrigation well - 6" x 44'		
	Hardpan	0	8
	Gravel	8	12
	Sand, fine, brown	12	33
	Clay, light brown	33	35
	Sand, fine brown	35	40
	Sand and gravel	40	44
	Casing: 6" from 0 to 44'		
	SWL: 12'		
	Bailed 33 gpm with 2' DD after	1 hour	
	Pump: 1 HP centrifugal, jet in	well	

Turn up

Sheet .... of .... sheets

Table 4.5: Values of Coefficient C_{wqs} for Computing 6-Month, 24-Hour Precipitation

Climate Region Number	Climate Region Name	C_{wqs}
1	East Slope Cascades	0.70
2	Central Basin	0.66
3	Okanogan, Spokane, Palouse	0.69
4	Northeastern & Blue Mountains	0.70

Note: Values of C_{wqs} are based on the generalized extreme value (GEV) distribution whose distribution parameters can be expressed as a function of mean annual precipitation for eastern Washington.

Table 4.6: Factors for Converting From 24-Hour to Regional Storm Precipitation Depth

Climate Region Number	Climate Region Name	Multiplication Factor for Converting From 24-Hour to Regional Storm Precipitation Depth
1	East Slope Cascades	1.16
2	Central Basin	1.00
3	Okanogan, Spokane, Palouse	1.06
4	Northeastern & Blue Mountains	1.07

4.3.8 Precipitation Magnitude and Frequency for Short-Duration Storms

Design of flow-rate-based treatment BMPs using the single-event hydrograph method requires a determination of the 6-month, 3-hour precipitation depth for use with the 3-hour short-duration design storm hyetograph. (The updated design storm is indexed to sum to unity at 3 hours, so the 3-hour precipitation depth is needed to scale the hyetograph.) Design of other BMPs or conveyance elements based on the short-duration storm may also require the conversion of the 2-year, 2-hour precipitation to a 3-hour precipitation depth for a different recurrence interval.

The isopluvial map that is used as the starting point for determining the design precipitation depth for a 3-hour short-duration storm is a 2-year, 2-hour precipitation isopluvial map (Figure 4.6: 2-Year, 2-Hour Isopluvial Map).

The following equation is used to determine 3-hour precipitation for a selected return period:

Equation 4.2: Short-Duration Storm

$$P_{sds} = 1.06 * C_{sds} * P_{2yr2hr}$$

where:

P_{sds} = 3-hour precipitation (inches) for a selected return period for the short-duration storm

1.06 = multiplier used for all climate regions to convert
x-year, 2-hour precipitation to x-year, 3-hour precipitation

C_{sds} = coefficient (from Table 4.3.6) for converting 2-year,
2-hour precipitation to x-year, 2-hour precipitation depth

P_{2yr2hr} = 2-year, 2-hour precipitation (inches) from Figure 4.6: 2-Year, 2-Hour Isopluvial Map

Table 4.7: Values of the Coefficient Csds for Using 2-Year, 2-Hour Precipitation to Compute 2-Hour Precipitation for Selected Periods of Return lists values of the coefficient C_{sds} for selected return periods for various magnitudes of mean annual precipitation. An isopluvial map of average annual precipitation is shown in Figure 4.1: Average Annual Precipitation and Climate Regions and can be used to determine the mean annual precipitation for the site.

Table 4.7: Values of the Coefficient C_{sds} for Using 2-Year, 2-Hour Precipitation to Compute 2-Hour Precipitation for Selected Periods of Return

Climate Region Number	Mean Annual Precipitation (inches)	6-Month	1-Year	10-Year	25-Year	50-Year	100-Year
2	6-8	0.61	0.79	1.63	2.17	2.68	3.29
	8–10	0.62	0.80	1.60	2.09	2.55	3.09
	10–12	0.64	0.81	1.56	2.02	2.44	2.92
2, 3	12–16	0.66	0.82	1.51	1.90	2.26	2.66
3	16–22	0.67	0.83	1.47	1.82	2.13	2.48
1, 4	22–28	0.69	0.84	1.43	1.74	2.01	2.31
	28–40	0.70	0.85	1.40	1.68	1.92	2.19
	40–60	0.72	0.86	1.36	1.61	1.82	2.05
	60–120	0.74	0.87	1.33	1.55	1.74	1.93

Notes

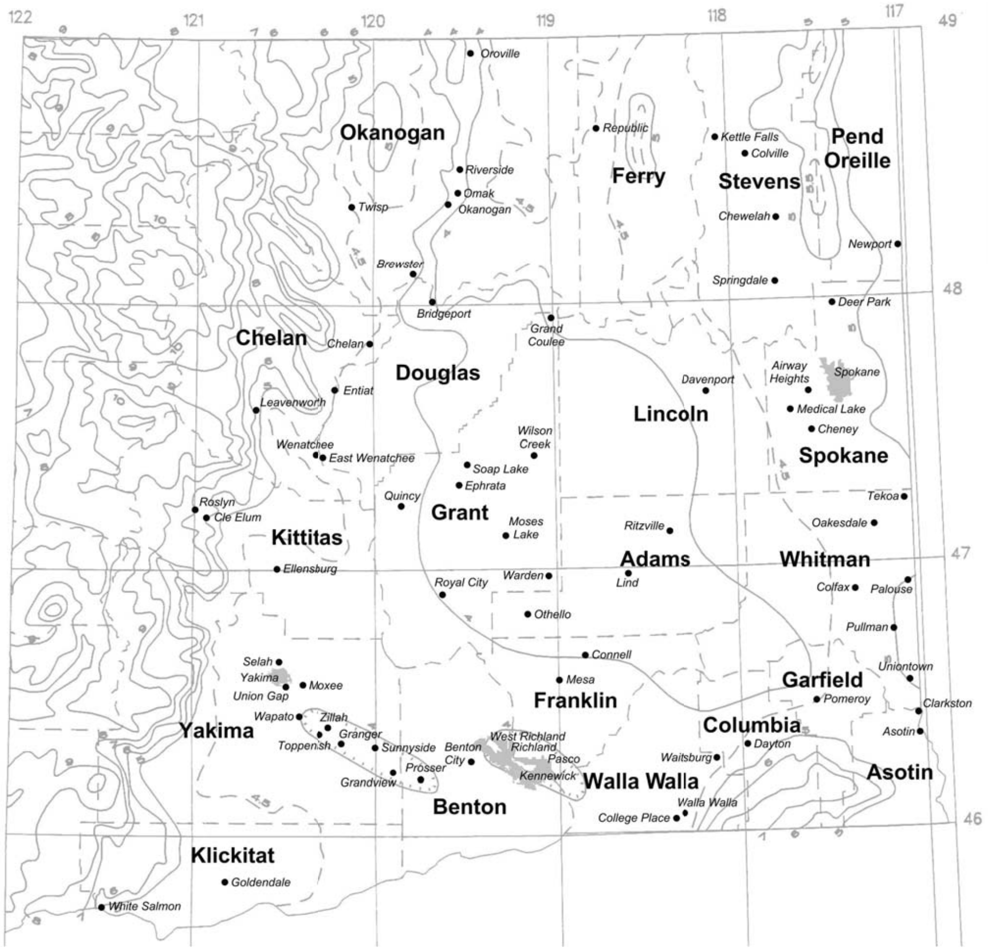
- The value for 2-hour precipitation is converted to 3-hour precipitation using a multiplier of 1.06 for all recurrence intervals.
- Values of C_{sds} are based on the generalized extreme value (GEV) distribution whose distribution parameters can be expressed as a function of mean annual precipitation for eastern Washington.

High ground water or shallow bedrock can cause a significant increase in runoff. If either of these conditions exists, it needs to be addressed by the designer. For a more complete discussion of computing weighted CN values, see *Urban Hydrology for Small Watersheds* (USDA, 1986).

Table 4.14: Runoff Curve Numbers (CNs) for Selected Agricultural, Suburban, and Urban Areas

Cover type and hydrologic condition	CNs for hydrologic soil group			
	A	B	C	D
Open space (lawns, parks, golf courses, cemeteries, landscaping, etc.)[a]				
Poor condition (grass cover <50% of the area)	68	79	86	89
Fair condition (grass cover on 50% to 75% of the area)	49	69	79	84
Good condition (grass cover on >75% of the area)	39	61	74	80
Impervious areas				
Open water bodies: lakes, wetlands, ponds etc.	100	100	100	100
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	98	98	98	98
Permeable pavers and permeable interlocking concrete (assumed as 85% impervious and 15% lawn)				
Fair lawn condition (weighted average CNs)	95	96	97	97
Gravel (including right-of-way)	76	85	89	91
Dirt (including right-of-way)	72	82	87	89
Pasture, grassland, or range-continuous forage for grazing				
Poor condition (ground cover <50% or heavily grazed with no mulch)	68	79	86	89
Fair condition (ground cover 50% to 75% and not heavily grazed)	49	69	79	84
Good condition (ground cover >75% and lightly or only occasionally grazed)	39	61	74	80
Cultivated agricultural lands				
Row Crops (good) e.g., corn, sugar beets, soy beans	64	75	82	85
Small Grain (good) e.g., wheat, barley, flax	60	72	80	84
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)				

Figure 4.6: 2-Year, 2-Hour Isopluvial Map



SOURCE: *Dam Safety Guidelines, Technical Note 3, Design Storm Construction, Washington State Department' of Ecology, Water Resources Program, report 92-55G April 1993.*

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2-Year, 2-Hour Isopluvial Map

Revised April 2002

College Place is very near the 0.45 in isopluvial.

Figure 4.7: 2-Year, 24-Hour Isopluvial Map

Source: Miller et. al., 1973

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2-Year, 24-Hour Isopluvial Map

Revised March 2005

College Place is between the 1.0 and 1.2 isopluvials, interpolate to 1.05

Figure 4.10: 25-Year, 24-Hour Isopluvial Map

Source: Miller et. al., 1973

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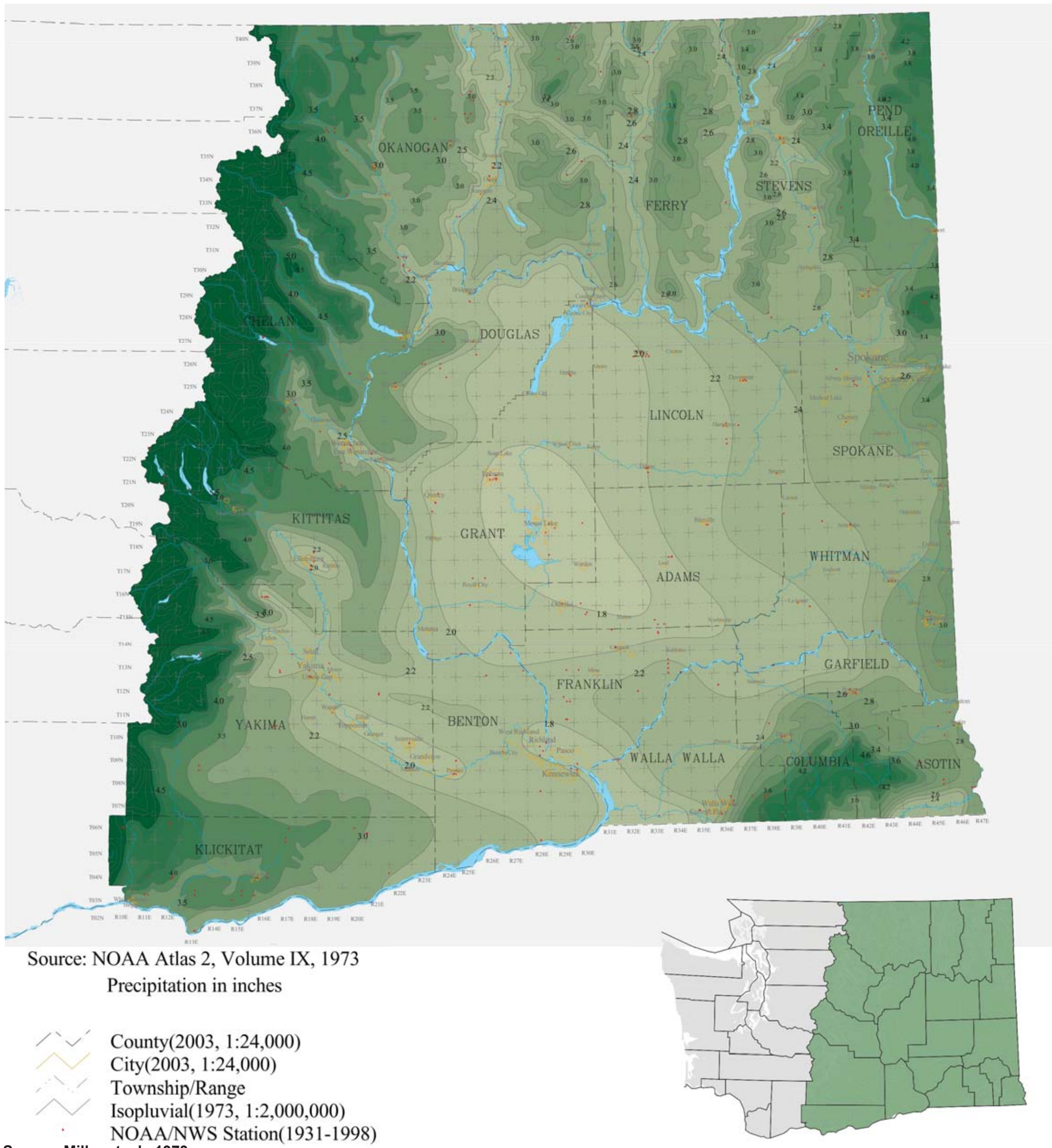
25-Year, 24-Hour Isopluvial Map

Revised March 2005

College Place is between the 1.6 and 1.8" isopluvials, use 1.8"

Figure 4.12: 100-Year, 24-Hour Isopluvial Map



Source: Miller et. al., 1973

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100-Year, 24-Hour Isopluvial Map

Revised March 2005

College Place is between the 1.8 and 2.2" isopluvials, use 2.2".

Areas 1-3

Storm: 25Yr 24Hr

SCS Type 1A Storm Hyetograph Values

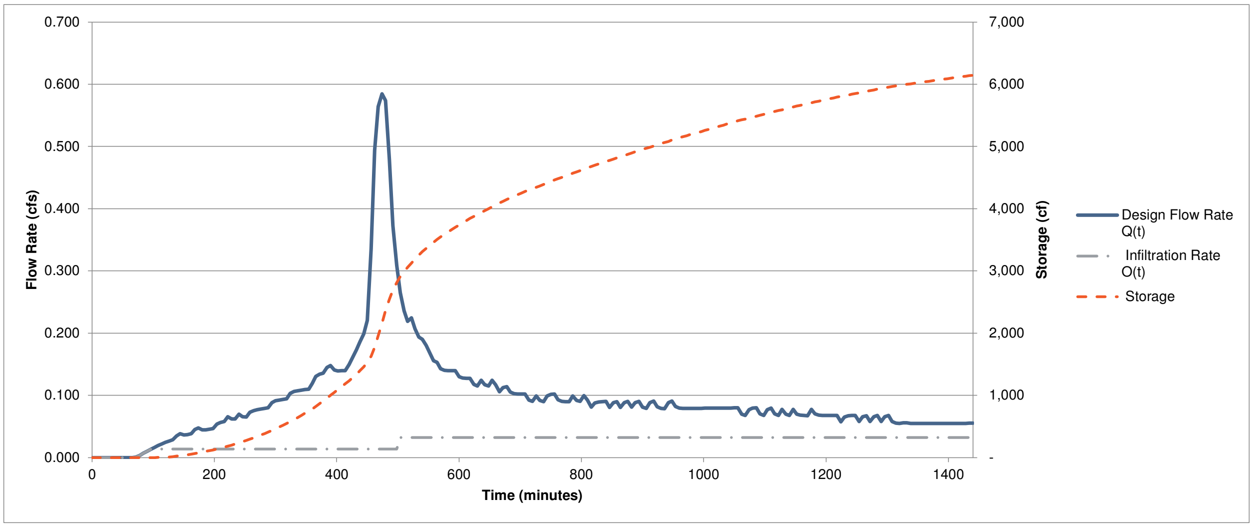
Santa Barbara Urban Hydrograph Method

Drainage Basin Area, A =	2.11	acres	Abstract Runoff Value, S =	(1000/CN) - 10			
Total Rainfall, P25yr24hr =	1.8	inches	Runoff Curve Number, CN =	per Table 4.5.2			
Time Increment, dt =	6	minutes	Routing Constant, w =	dt/(2*Tc + dt)			
Time of Concentration, Tc =	5	minutes	w =	0.375			
Below Ground Infil. Rate =	0.0183	cfs	Swale Volume to rim =	2,721 cf			
Above Ground Infil. Rate =	0.0140	cfs					

Summary

Peak Design Flow =	0.584	cfs
Required Storage =	6,145	cf
Peak Hour Runoff =	1,517	cf

Pervious Area:	A_{perv}=	0.67	acres	CN_{perv} =	61	S_{perv} =	6.39	$0.2*S_{perv}$ =	1.28
Impervious Area:	A_{imp}=	1.44	acres	CN_{imp} =	98	S_{imp} =	0.20	$0.2*S_{imp}$ =	0.04



Column Description and Formula

1 Time Step or Increment, t
2 Elapsed Time (minutes)
3 Rainfall Distribution, Type 1A Storm from Table 4.2.2
4 Incremental Rainfall, P(t) = Column 3 * P
5 Accumulated Rainfall, P = Accumulated Sum of Column 4
6 Accumulated Runoff Depth Pervious Area — If P ≤ $0.2*S_{perv,}$ then = 0; otherwise,
If P > $0.2*S_{perv,}$ then = $(P - 0.2*S_{perv})$^2/$(P + 0.8*S_{perv})$
7 Incremental Runoff Depth, $D_{perv}(t)$ = Column 6 of present step - Column 6 of prevous step
8 Accumulated Runoff Depth Impervious Area — If P ≤ $0.2S_{imp,}$ then = 0; otherwise,
If P > $0.2S_{imp,}$ then = $(P - 0.2*S_{imp})$^2/$(P + 0.8*S_{imp})$
9 Incremental Runoff Depth, $D_{imp}(t)$ = Column 7 of present step - Column 7 of prevous step
10 Total Runoff Depth, D(t) = (A_{perv}/A)*$D_{perv}(t)$ + (A_{imp}/A)· $D_{imp}(t)$
11 Instantaneaous Hydrograph Flow Rate, I(t) = 60.5*D(t) * A/dt
12 Design Flow Rate, Q(t+1) = Q(t) + w*[I(t) + I(t+1) - 2*Q(t)]
13 Accumulated Runoff = Q(t)*dt*60 sec/min + Column 13 of previous step
14 Infiltration Rate = (Ksat/(12* 3600)) * AI
15 Change in Storage = dt * { [(I(t)+I(t-1))/2] - [(O(t)+O(t-1))/2]}
16 Storage = Storage from previous step plus change in storage

Areas 1-3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
					Pervious Area		Impervious Area								
Time Increment t	Elapsed Time	Rainfall Distr.	Incremental Rainfall P(t)	Accumulated Rainfall P	Accumulated Runoff	Incremental Runoff D_{perv} (t)	Accumulated Runoff	Incremental Runoff $D_{imp}(t)$	Total Runoff D(t)	Instant Flow Rate I(t)	Design Flow Rate Q(t)	Accumulated Runoff	Infiltration Rate O(t)	Change in Storage	Storage
	(minutes)	(fraction)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(cfs)	(cfs)	(cf)	(cfs)	(cf)	(cf)
0	0		-	-	-	-	-	-	-	-	-	-	-	-	-
1	6	0.0020	0.004	0.004	-	-	-	-	-	-	-	-	-	-	-
2	12	0.0020	0.004	0.007	-	-	-	-	-	-	-	-	-	-	-
3	18	0.0020	0.004	0.011	-	-	-	-	-	-	-	-	-	-	-
4	24	0.0020	0.004	0.014	-	-	-	-	-	-	-	-	-	-	-
5	30	0.0020	0.004	0.018	-	-	-	-	-	-	-	-	-	-	-
6	36	0.0020	0.004	0.022	-	-	-	-	-	-	-	-	-	-	-
7	42	0.0020	0.004	0.025	-	-	-	-	-	-	-	-	-	-	-
8	48	0.0020	0.004	0.029	-	-	-	-	-	-	-	-	-	-	-
9	54	0.0020	0.004	0.032	-	-	-	-	-	-	-	-	-	-	-
10	60	0.0020	0.004	0.036	-	-	-	-	-	-	-	-	-	-	-
11	66	0.0030	0.005	0.041	-	-	0.000	0.000	0.000	0.00	0.000	0.0	0.000	-	-
12	72	0.0030	0.005	0.047	-	-	0.000	0.000	0.000	0.00	0.001	0.3	0.001	-	-
13	78	0.0030	0.005	0.052	-	-	0.001	0.000	0.000	0.01	0.004	1.6	0.004	-	-
14	84	0.0030	0.005	0.058	-	-	0.001	0.001	0.000	0.01	0.007	4.1	0.007	-	-
15	90	0.0030	0.005	0.063	-	-	0.002	0.001	0.001	0.01	0.010	7.8	0.010	-	-

Areas 1-3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
					Pervious Area		Impervious Area								
Time Increment t	Elapsed Time	Rainfall Distr.	Incremental Rainfall P(t)	Accumulated Rainfall P	Accumulated Runoff	Incremental Runoff D_{perv} (t)	Accumulated Runoff	Incremental Runoff $D_{imp}(t)$	Total Runoff D(t)	Instant Flow Rate I(t)	Design Flow Rate Q(t)	Accumulated Runoff	Infiltration Rate O(t)	Change in Storage	Storage
	(minutes)	(fraction)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(cfs)	(cfs)	(cf)	(cfs)	(cf)	(cf)
16	96	0.0030	0.005	0.068	-	-	0.003	0.001	0.001	0.02	0.014	12.7	0.014	-	-
17	102	0.0030	0.005	0.074	-	-	0.005	0.001	0.001	0.02	0.017	18.6	0.014	0.46	0
18	108	0.0030	0.005	0.079	-	-	0.006	0.001	0.001	0.02	0.019	25.6	0.014	1.42	2
19	114	0.0030	0.005	0.085	-	-	0.008	0.002	0.001	0.02	0.022	33.5	0.014	2.40	4
20	120	0.0030	0.005	0.090	-	-	0.010	0.002	0.001	0.03	0.024	42.3	0.014	3.31	8
21	126	0.0030	0.005	0.095	-	-	0.012	0.002	0.001	0.03	0.027	51.9	0.014	4.17	12
22	132	0.0030	0.005	0.101	-	-	0.014	0.002	0.001	0.03	0.029	62.3	0.014	4.97	17
23	138	0.0040	0.007	0.108	-	-	0.017	0.003	0.002	0.04	0.035	75.0	0.014	6.48	23
24	144	0.0030	0.005	0.113	-	-	0.019	0.002	0.002	0.03	0.038	88.7	0.014	8.18	31
25	150	0.0030	0.005	0.119	-	-	0.022	0.003	0.002	0.04	0.036	101.8	0.014	8.41	40
26	156	0.0030	0.005	0.124	-	-	0.024	0.003	0.002	0.04	0.037	115.2	0.014	8.20	48
27	162	0.0030	0.005	0.130	-	-	0.027	0.003	0.002	0.04	0.038	129.1	0.014	8.57	57
28	168	0.0040	0.007	0.137	-	-	0.031	0.004	0.003	0.06	0.045	145.3	0.014	10.01	67
29	174	0.0030	0.005	0.142	-	-	0.034	0.003	0.002	0.04	0.048	162.6	0.014	11.72	78
30	180	0.0030	0.005	0.148	-	-	0.037	0.003	0.002	0.04	0.045	178.6	0.014	11.62	90
31	186	0.0030	0.005	0.153	-	-	0.040	0.003	0.002	0.05	0.045	194.7	0.014	11.02	101
32	192	0.0030	0.005	0.158	-	-	0.043	0.003	0.002	0.05	0.045	211.1	0.014	11.18	112
33	198	0.0030	0.005	0.164	-	-	0.046	0.003	0.002	0.05	0.047	227.8	0.014	11.53	124
34	204	0.0040	0.007	0.171	-	-	0.051	0.004	0.003	0.06	0.054	247.2	0.014	13.00	137
35	210	0.0030	0.005	0.176	-	-	0.054	0.003	0.002	0.05	0.056	267.4	0.014	14.77	151
36	216	0.0040	0.007	0.184	-	-	0.059	0.005	0.003	0.07	0.058	288.3	0.014	15.56	167
37	222	0.0040	0.007	0.191	-	-	0.064	0.005	0.003	0.07	0.066	312.0	0.014	17.26	184
38	228	0.0030	0.005	0.196	-	-	0.067	0.004	0.002	0.05	0.062	334.4	0.014	18.00	202
39	234	0.0040	0.007	0.203	-	-	0.072	0.005	0.003	0.07	0.062	356.8	0.014	17.35	220
40	240	0.0040	0.007	0.211	-	-	0.077	0.005	0.003	0.07	0.070	381.9	0.014	18.70	238
41	246	0.0030	0.005	0.216	-	-	0.081	0.004	0.003	0.06	0.066	405.5	0.014	19.30	258
42	252	0.0040	0.007	0.223	-	-	0.086	0.005	0.004	0.07	0.065	429.0	0.014	18.50	276
43	258	0.0040	0.007	0.230	-	-	0.091	0.005	0.004	0.08	0.073	455.2	0.014	19.83	296
44	264	0.0040	0.007	0.238	-	-	0.097	0.005	0.004	0.08	0.076	482.4	0.014	21.69	318
45	270	0.0040	0.007	0.245	-	-	0.102	0.005	0.004	0.08	0.077	510.2	0.014	22.44	340
46	276	0.0040	0.007	0.252	-	-	0.107	0.005	0.004	0.08	0.078	538.3	0.014	22.88	363
47	282	0.0040	0.007	0.259	-	-	0.113	0.005	0.004	0.08	0.079	566.7	0.014	23.25	386
48	288	0.0040	0.007	0.266	-	-	0.118	0.006	0.004	0.08	0.080	595.5	0.014	23.57	410
49	294	0.0050	0.009	0.275	-	-	0.125	0.007	0.005	0.10	0.088	627.3	0.014	25.26	435
50	300	0.0040	0.007	0.283	-	-	0.131	0.006	0.004	0.08	0.091	660.2	0.014	27.29	462
51	306	0.0050	0.009	0.292	-	-	0.138	0.007	0.005	0.10	0.093	693.5	0.014	28.05	490
52	312	0.0040	0.007	0.299	-	-	0.144	0.006	0.004	0.08	0.094	727.2	0.014	28.49	519
53	318	0.0050	0.009	0.308	-	-	0.151	0.007	0.005	0.11	0.095	761.3	0.014	28.82	548
54	324	0.0050	0.009	0.317	-	-	0.159	0.007	0.005	0.11	0.103	798.5	0.014	30.57	578
55	330	0.0050	0.009	0.326	-	-	0.166	0.007	0.005	0.11	0.106	836.7	0.014	32.67	611
56	336	0.0050	0.009	0.335	-	-	0.174	0.007	0.005	0.11	0.108	875.4	0.014	33.43	644
57	342	0.0050	0.009	0.344	-	-	0.181	0.008	0.005	0.11	0.109	914.5	0.014	33.85	678
58	348	0.0050	0.009	0.353	-	-	0.189	0.008	0.005	0.11	0.109	953.8	0.014	34.17	712
59	354	0.0050	0.009	0.362	-	-	0.196	0.008	0.005	0.11	0.110	993.4	0.014	34.45	747
60	360	0.0060	0.011	0.373	-	-	0.205	0.009	0.006	0.13	0.119	1,036.3	0.014	36.23	783
61	366	0.0060	0.011	0.383	-	-	0.215	0.009	0.006	0.13	0.130	1,083.3	0.014	39.89	823
62	372	0.0060	0.011	0.394	-	-	0.224	0.009	0.006	0.14	0.134	1,131.5	0.014	42.54	865
63	378	0.0060	0.011	0.405	-	-	0.233	0.009	0.006	0.14	0.135	1,180.3	0.014	43.44	909
64	384	0.0070	0.013	0.418	-	-	0.244	0.011	0.008	0.16	0.145	1,232.4	0.014	45.43	954
65	390	0.0060	0.011	0.428	-	-	0.254	0.009	0.006	0.14	0.148	1,285.7	0.014	47.69	1,002
66	396	0.0060	0.011	0.439	-	-	0.263	0.010	0.007	0.14	0.141	1,336.4	0.014	46.92	1,049
67	402	0.0060	0.011	0.450	-	-	0.273	0.010	0.007	0.14	0.139	1,386.5	0.014	45.37	1,094
68	408	0.0060	0.011	0.461	-	-	0.283	0.010	0.007	0.14	0.140	1,436.8	0.014	45.16	1,140
69	414	0.0060	0.011	0.472	-	-	0.292	0.010	0.007	0.14	0.140	1,487.2	0.014	45.27	1,185
70	420	0.0070	0.013	0.484	-	-	0.304	0.011	0.008	0.16	0.149	1,540.9	0.014	47.05	1,232
71	426	0.0070	0.013	0.497	-	-	0.315	0.011	0.008	0.17	0.161	1,598.9	0.014	50.83	1,283
72	432	0.0080	0.014	0.511	-	-	0.328	0.013	0.009	0.19	0.173	1,661.3	0.014	55.15	1,338
73	438	0.0080	0.014	0.526	-	-	0.341	0.013	0.009	0.19	0.186	1,728.2	0.014	59.63	1,397
74	444	0.0090	0.016	0.542	-	-	0.356	0.015	0.010	0.22	0.199	1,799.8	0.014	64.18	1,462
75	450	0.0100	0.018	0.560	-	-	0.373	0.017	0.011	0.24	0.220	1,879.1	0.014	70.40	1,532
76	456	0.0210	0.038	0.598	-	-	0.407	0.035	0.024	0.51	0.336	1,999.9	0.014	95.05	1,627
77	462	0.0240	0.043	0.641	-	-	0.448	0.040	0.028	0.59	0.494	2,177.7	0.014	144.23	1,771
78	468	0.0240	0.043	0.684	-	-	0.488	0.041	0.028	0.59	0.564	2,380.7	0.014	185.32	1,957
79	474	0.0240	0.043	0.727	-	-	0.529	0.041	0.028	0.59	0.584	2,591.0	0.014	201.65	2,158
80	480	0.0220	0.040	0.767	-	-	0.567	0.038	0.026	0.55	0.573	2,797.5	0.014	203.39	2,362
81	486	0.0140	0.025	0.792	-	-	0.591	0.024	0.016	0.35	0.479	2,970.0	0.014	184.45	2,546
82	492	0.0130	0.023	0.815	-	-	0.613	0.022	0.015	0.32	0.373	3,104.1	0.014	148.28	2,694
83	498	0.0100	0.018	0.833	-	-	0.630	0.017	0.012	0.25	0.309	3,215.3	0.014	117.62	2,812
84	504	0.0100	0.018	0.851	-	-	0.648	0.017	0.012	0.25	0.265	3,310.8	0.032	94.99	2,907
85	510	0.0080	0.014	0.866	-	-	0.661	0.014	0.009	0.20	0.236	3,395.6	0.032	78.52	2,986
86	516	0.0090	0.016	0.882	-	-	0.677	0.016	0.011	0.23	0.219	3,474.5	0.032	70.23	3,056
87	522	0.0090	0.016	0.898	-	-	0.693	0.016	0.011	0.23	0.225	3,555.4	0.032	68.24	3,124
88	528	0.0070	0.013	0.911	-	-	0.705	0.012	0.008	0.18	0.207	3,630.0	0.032	66.10	3,190
89	534	0.0080	0.014	0.925	-	-	0.719	0.014	0.009	0.20	0.194	3,699.7	0.032	60.53	3,251
90	540	0.0070	0.013	0.938	-	-	0.731	0.012	0.008	0.18	0.190	3,768.3	0.032	57.49	3,308
91	546	0.0070	0.013	0.950	-	-	0.743	0.012	0.008	0.18	0.180	3,833.1	0.032	55.07	3,363
92	552	0.0060	0.011	0.961	-	-	0.753	0.010	0.007	0.15	0.168	3,893.7	0.032	51.09	3,414
93	558	0.0060	0.011	0.972	-	-	0.764	0.010	0.007	0.15	0.156	3,949.9	0.032	46.72	3,461

Areas 1-3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
					Pervious Area		Impervious Area								
Time Increment t	Elapsed Time	Rainfall Distr.	Incremental Rainfall P(t)	Accumulated Rainfall P	Accumulated Runoff	Incremental Runoff D_{perv} (t)	Accumulated Runoff	Incremental Runoff D_{imp}(t)	Total Runoff D(t)	Instant Flow Rate I(t)	Design Flow Rate Q(t)	Accumulated Runoff	Infiltration Rate O(t)	Change in Storage	Storage
	(minutes)	(fraction)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(cfs)	(cfs)	(cf)	(cfs)	(cf)	(cf)
94	564	0.0060	0.011	0.983	-	-	0.774	0.010	0.007	0.15	0.153	4,004.9	0.032	43.94	3,505
95	570	0.0050	0.009	0.992	-	-	0.783	0.009	0.006	0.13	0.143	4,056.3	0.032	41.57	3,547
96	576	0.0060	0.011	1.003	-	-	0.793	0.010	0.007	0.15	0.140	4,106.7	0.032	39.29	3,586
97	582	0.0050	0.009	1.012	-	-	0.802	0.009	0.006	0.13	0.140	4,157.0	0.032	38.74	3,625
98	588	0.0060	0.011	1.022	-	-	0.813	0.010	0.007	0.15	0.140	4,207.3	0.032	38.62	3,663
99	594	0.0050	0.009	1.031	-	-	0.821	0.009	0.006	0.13	0.140	4,257.5	0.032	38.61	3,702
100	600	0.0050	0.009	1.040	-	-	0.830	0.009	0.006	0.13	0.130	4,304.4	0.032	36.91	3,739
101	606	0.0050	0.009	1.049	-	-	0.839	0.009	0.006	0.13	0.128	4,350.4	0.032	34.79	3,773
102	612	0.0050	0.009	1.058	-	-	0.848	0.009	0.006	0.13	0.127	4,396.2	0.032	34.28	3,808
103	618	0.0050	0.009	1.067	-	-	0.856	0.009	0.006	0.13	0.127	4,442.0	0.032	34.16	3,842
104	624	0.0040	0.007	1.075	-	-	0.863	0.007	0.005	0.10	0.118	4,484.3	0.032	32.43	3,874
105	630	0.0050	0.009	1.084	-	-	0.872	0.009	0.006	0.13	0.115	4,525.8	0.032	30.29	3,905
106	636	0.0050	0.009	1.093	-	-	0.881	0.009	0.006	0.13	0.124	4,570.6	0.032	31.49	3,936
107	642	0.0040	0.007	1.100	-	-	0.888	0.007	0.005	0.10	0.117	4,612.7	0.032	31.80	3,968
108	648	0.0050	0.009	1.109	-	-	0.897	0.009	0.006	0.13	0.115	4,654.2	0.032	30.17	3,998
109	654	0.0050	0.009	1.118	-	-	0.905	0.009	0.006	0.13	0.124	4,699.0	0.032	31.49	4,030
110	660	0.0040	0.007	1.125	-	-	0.912	0.007	0.005	0.10	0.117	4,741.1	0.032	31.83	4,061
111	666	0.0040	0.007	1.132	-	-	0.919	0.007	0.005	0.10	0.106	4,779.2	0.032	28.49	4,090
112	672	0.0050	0.009	1.141	-	-	0.928	0.009	0.006	0.13	0.113	4,819.7	0.032	27.66	4,118
113	678	0.0040	0.007	1.148	-	-	0.935	0.007	0.005	0.10	0.114	4,860.9	0.032	29.19	4,147
114	684	0.0040	0.007	1.156	-	-	0.942	0.007	0.005	0.10	0.105	4,898.7	0.032	27.85	4,175
115	690	0.0040	0.007	1.163	-	-	0.949	0.007	0.005	0.10	0.103	4,935.7	0.032	25.81	4,200
116	696	0.0040	0.007	1.170	-	-	0.956	0.007	0.005	0.10	0.102	4,972.6	0.032	25.30	4,226
117	702	0.0040	0.007	1.177	-	-	0.963	0.007	0.005	0.10	0.102	5,009.4	0.032	25.18	4,251
118	708	0.0040	0.007	1.184	-	-	0.970	0.007	0.005	0.10	0.102	5,046.2	0.032	25.16	4,276
119	714	0.0030	0.005	1.190	-	-	0.976	0.005	0.004	0.08	0.093	5,079.5	0.032	23.44	4,299
120	720	0.0040	0.007	1.197	-	-	0.983	0.007	0.005	0.10	0.090	5,112.0	0.032	21.29	4,321
121	726	0.0040	0.007	1.204	-	-	0.990	0.007	0.005	0.10	0.099	5,147.8	0.032	22.48	4,343
122	732	0.0030	0.005	1.210	-	-	0.995	0.005	0.004	0.08	0.092	5,180.9	0.032	22.78	4,366
123	738	0.0040	0.007	1.217	-	-	1.002	0.007	0.005	0.10	0.090	5,213.3	0.032	21.14	4,387
124	744	0.0040	0.007	1.224	-	-	1.009	0.007	0.005	0.10	0.099	5,249.1	0.032	22.46	4,410
125	750	0.0040	0.007	1.231	-	-	1.016	0.007	0.005	0.10	0.102	5,285.6	0.032	24.52	4,434
126	756	0.0040	0.007	1.238	-	-	1.023	0.007	0.005	0.10	0.102	5,322.4	0.032	25.05	4,459
127	762	0.0030	0.005	1.244	-	-	1.029	0.005	0.004	0.08	0.093	5,355.8	0.032	23.45	4,483
128	768	0.0040	0.007	1.251	-	-	1.036	0.007	0.005	0.10	0.090	5,388.4	0.032	21.33	4,504
129	774	0.0030	0.005	1.256	-	-	1.041	0.005	0.004	0.08	0.090	5,420.7	0.032	20.81	4,525
130	780	0.0040	0.007	1.264	-	-	1.048	0.007	0.005	0.10	0.090	5,453.0	0.032	20.68	4,545
131	786	0.0040	0.007	1.271	-	-	1.055	0.007	0.005	0.10	0.099	5,488.8	0.032	22.38	4,568
132	792	0.0030	0.005	1.276	-	-	1.060	0.005	0.004	0.08	0.092	5,521.9	0.032	22.81	4,591
133	798	0.0040	0.007	1.283	0.000	0.000	1.067	0.007	0.005	0.10	0.090	5,554.4	0.032	21.20	4,612
134	804	0.0040	0.007	1.291	0.000	0.000	1.074	0.007	0.005	0.10	0.100	5,590.3	0.032	22.54	4,634
135	810	0.0030	0.005	1.296	0.000	0.000	1.080	0.005	0.004	0.08	0.092	5,623.5	0.032	22.90	4,657
136	816	0.0030	0.005	1.301	0.000	0.000	1.085	0.005	0.004	0.08	0.081	5,652.6	0.032	19.54	4,677
137	822	0.0040	0.007	1.309	0.000	0.000	1.092	0.007	0.005	0.10	0.088	5,684.2	0.032	18.73	4,696
138	828	0.0030	0.005	1.314	0.000	0.000	1.097	0.005	0.004	0.08	0.090	5,716.5	0.032	20.29	4,716
139	834	0.0040	0.007	1.321	0.000	0.000	1.104	0.007	0.005	0.10	0.090	5,748.9	0.032	20.71	4,737
140	840	0.0030	0.005	1.327	0.000	0.000	1.110	0.005	0.004	0.08	0.090	5,781.4	0.032	20.84	4,757
141	846	0.0030	0.005	1.332	0.000	0.000	1.115	0.005	0.004	0.08	0.081	5,810.5	0.032	19.15	4,777
142	852	0.0040	0.007	1.339	0.001	0.000	1.122	0.007	0.005	0.10	0.088	5,842.2	0.032	18.75	4,795
143	858	0.0030	0.005	1.345	0.001	0.000	1.127	0.005	0.004	0.08	0.090	5,874.6	0.032	20.42	4,816
144	864	0.0030	0.005	1.350	0.001	0.000	1.133	0.005	0.004	0.08	0.081	5,903.7	0.032	19.11	4,835
145	870	0.0040	0.007	1.357	0.001	0.000	1.140	0.007	0.005	0.10	0.088	5,935.5	0.032	18.81	4,854
146	876	0.0030	0.005	1.363	0.001	0.000	1.145	0.005	0.004	0.08	0.090	5,968.0	0.032	20.51	4,874
147	882	0.0030	0.005	1.368	0.001	0.000	1.150	0.005	0.004	0.08	0.081	5,997.2	0.032	19.20	4,893
148	888	0.0040	0.007	1.375	0.001	0.000	1.157	0.007	0.005	0.10	0.089	6,029.1	0.032	18.90	4,912
149	894	0.0030	0.005	1.381	0.002	0.000	1.163	0.005	0.004	0.08	0.091	6,061.7	0.032	20.60	4,933
150	900	0.0030	0.005	1.386	0.002	0.000	1.168	0.005	0.004	0.08	0.081	6,090.9	0.032	19.29	4,952
151	906	0.0030	0.005	1.391	0.002	0.000	1.173	0.005	0.004	0.08	0.079	6,119.4	0.032	17.23	4,969
152	912	0.0040	0.007	1.399	0.002	0.000	1.180	0.007	0.005	0.10	0.088	6,151.2	0.032	18.49	4,988
153	918	0.0030	0.005	1.404	0.002	0.000	1.186	0.005	0.004	0.08	0.091	6,183.9	0.032	20.60	5,008
154	924	0.0030	0.005	1.409	0.003	0.000	1.191	0.005	0.004	0.08	0.082	6,213.2	0.032	19.38	5,028
155	930	0.0030	0.005	1.415	0.003	0.000	1.196	0.005	0.004	0.08	0.079	6,241.8	0.032	17.33	5,045
156	936	0.0030	0.005	1.420	0.003	0.000	1.202	0.005	0.004	0.08	0.079	6,270.2	0.032	16.83	5,062
157	942	0.0040	0.007	1.427	0.003	0.000	1.209	0.007	0.005	0.11	0.089	6,302.1	0.032	18.50	5,081
158	948	0.0030	0.005	1.433	0.004	0.000	1.214	0.005	0.004	0.08	0.091	6,334.9	0.032	20.71	5,101
159	954	0.0030	0.005	1.438	0.004	0.000	1.219	0.005	0.004	0.08	0.082	6,364.4	0.032	19.51	5,121
160	960	0.0030	0.005	1.444	0.004	0.000	1.225	0.005	0.004	0.08	0.080	6,393.1	0.032	17.46	5,138
161	966	0.0030	0.005	1.449	0.004	0.000	1.230	0.005	0.004	0.08	0.079	6,421.6	0.032	16.96	5,155
162	972	0.0030	0.005	1.454	0.005	0.000	1.235	0.005	0.004	0.08	0.079	6,450.0	0.032	16.85	5,172
163	978	0.0030	0.005	1.460	0.005	0.000	1.241	0.005	0.004	0.08	0.079	6,478.5	0.032	16.84	5,189
164	984	0.0030	0.005	1.465	0.005	0.000	1.246	0.005	0.004	0.08	0.079	6,507.0	0.032	16.86	5,206
165	990	0.0030	0.005	1.471	0.006	0.000	1.251	0.005	0.004	0.08	0.079	6,535.6	0.032	16.88	5,223
166	996	0.0030	0.005	1.476	0.006	0.000	1.257	0.005	0.004	0.08	0.079	6,564.1	0.032	16.90	5,240
167	1002	0.0030	0.005	1.481	0.006	0.000	1.262	0.005	0.004	0.08	0.079	6,592.7	0.032	16.93	5,256
168	1008	0.0030	0.005	1.487	0.007	0.000	1.267	0.005	0.004	0.08	0.079	6,621.3	0.032	16.95	5,273
169	1014	0.0030	0.005	1.492	0.007	0.000	1.272	0.005	0.004	0.08	0.080	6,649.9	0.032	16.97	5,290
170	1020	0.0030	0.005	1.498	0.007	0.000	1.278	0.005	0.004	0.08	0.080	6,678.5	0.032	16.99	5,307
171	1026	0.0030	0.005	1.503	0.008	0.000	1.283	0.005	0.004	0.08	0.080	6,707.2	0.032	17.02	5,324

Areas 1-3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
					Pervious Area		Impervious Area								
Time Increment t	Elapsed Time	Rainfall Distr.	Incremental Rainfall P(t)	Accumulated Rainfall P	Accumulated Runoff	Incremental Runoff D_{perv} (t)	Accumulated Runoff	Incremental Runoff D_{imp}(t)	Total Runoff D(t)	Instant Flow Rate I(t)	Design Flow Rate Q(t)	Accumulated Runoff	Infiltration Rate O(t)	Change in Storage	Storage
	(minutes)	(fraction)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(cfs)	(cfs)	(cf)	(cfs)	(cf)	(cf)
172	1032	0.0030	0.005	1.508	0.008	0.000	1.288	0.005	0.004	0.08	0.080	6,735.9	0.032	17.04	5,341
173	1038	0.0030	0.005	1.514	0.008	0.000	1.294	0.005	0.004	0.08	0.080	6,764.6	0.032	17.06	5,358
174	1044	0.0030	0.005	1.519	0.009	0.000	1.299	0.005	0.004	0.08	0.080	6,793.4	0.032	17.09	5,376
175	1050	0.0030	0.005	1.525	0.009	0.000	1.304	0.005	0.004	0.08	0.080	6,822.1	0.032	17.11	5,393
176	1056	0.0030	0.005	1.530	0.010	0.000	1.310	0.005	0.004	0.08	0.080	6,850.9	0.032	17.13	5,410
177	1062	0.0020	0.004	1.534	0.010	0.000	1.313	0.004	0.003	0.05	0.070	6,876.1	0.032	15.35	5,425
178	1068	0.0030	0.005	1.539	0.010	0.000	1.319	0.005	0.004	0.08	0.068	6,900.4	0.032	13.12	5,438
179	1074	0.0030	0.005	1.544	0.011	0.000	1.324	0.005	0.004	0.08	0.077	6,928.1	0.032	14.38	5,453
180	1080	0.0030	0.005	1.550	0.011	0.000	1.329	0.005	0.004	0.08	0.079	6,956.7	0.032	16.51	5,469
181	1086	0.0030	0.005	1.555	0.011	0.000	1.335	0.005	0.004	0.08	0.080	6,985.5	0.032	17.06	5,486
182	1092	0.0020	0.004	1.559	0.012	0.000	1.338	0.004	0.003	0.05	0.070	7,010.8	0.032	15.40	5,502
183	1098	0.0030	0.005	1.564	0.012	0.000	1.343	0.005	0.004	0.08	0.068	7,035.2	0.032	13.20	5,515
184	1104	0.0030	0.005	1.570	0.013	0.000	1.349	0.005	0.004	0.08	0.077	7,063.0	0.032	14.47	5,529
185	1110	0.0030	0.005	1.575	0.013	0.000	1.354	0.005	0.004	0.08	0.080	7,091.7	0.032	16.61	5,546
186	1116	0.0020	0.004	1.579	0.013	0.000	1.358	0.004	0.003	0.05	0.070	7,117.0	0.032	15.35	5,561
187	1122	0.0030	0.005	1.584	0.014	0.000	1.363	0.005	0.004	0.08	0.068	7,141.4	0.032	13.23	5,574
188	1128	0.0030	0.005	1.589	0.014	0.000	1.368	0.005	0.004	0.08	0.077	7,169.3	0.032	14.53	5,589
189	1134	0.0020	0.004	1.593	0.015	0.000	1.372	0.004	0.003	0.05	0.070	7,194.4	0.032	14.87	5,604
190	1140	0.0030	0.005	1.598	0.015	0.000	1.377	0.005	0.004	0.08	0.068	7,218.9	0.032	13.15	5,617
191	1146	0.0030	0.005	1.604	0.016	0.001	1.382	0.005	0.004	0.08	0.078	7,246.8	0.032	14.55	5,632
192	1152	0.0020	0.004	1.607	0.016	0.000	1.386	0.004	0.003	0.05	0.070	7,272.0	0.032	14.91	5,646
193	1158	0.0030	0.005	1.613	0.017	0.001	1.391	0.005	0.004	0.08	0.068	7,296.5	0.032	13.20	5,660
194	1164	0.0020	0.004	1.616	0.017	0.000	1.395	0.004	0.003	0.05	0.068	7,320.8	0.032	12.78	5,672
195	1170	0.0030	0.005	1.622	0.017	0.001	1.400	0.005	0.004	0.08	0.068	7,345.1	0.032	12.68	5,685
196	1176	0.0030	0.005	1.627	0.018	0.001	1.406	0.005	0.004	0.08	0.078	7,373.1	0.032	14.50	5,700
197	1182	0.0020	0.004	1.631	0.018	0.000	1.409	0.004	0.003	0.05	0.070	7,398.3	0.032	14.96	5,715
198	1188	0.0030	0.005	1.636	0.019	0.001	1.414	0.005	0.004	0.08	0.068	7,422.9	0.032	13.27	5,728
199	1194	0.0020	0.004	1.640	0.019	0.000	1.418	0.004	0.003	0.05	0.068	7,447.3	0.032	12.85	5,741
200	1200	0.0030	0.005	1.645	0.020	0.001	1.423	0.005	0.004	0.08	0.068	7,471.7	0.032	12.76	5,753
201	1206	0.0020	0.004	1.649	0.020	0.000	1.427	0.004	0.003	0.05	0.068	7,496.1	0.032	12.75	5,766
202	1212	0.0030	0.005	1.654	0.021	0.001	1.432	0.005	0.004	0.08	0.068	7,520.5	0.032	12.76	5,779
203	1218	0.0020	0.004	1.658	0.021	0.000	1.436	0.004	0.003	0.05	0.068	7,544.9	0.032	12.77	5,792
204	1224	0.0020	0.004	1.661	0.022	0.000	1.439	0.004	0.003	0.05	0.058	7,565.6	0.032	10.95	5,803
205	1230	0.0030	0.005	1.667	0.022	0.001	1.445	0.005	0.004	0.08	0.065	7,589.1	0.032	10.50	5,813
206	1236	0.0020	0.004	1.670	0.023	0.000	1.448	0.004	0.003	0.05	0.067	7,613.4	0.032	12.24	5,825
207	1242	0.0030	0.005	1.676	0.023	0.001	1.454	0.005	0.004	0.08	0.068	7,637.8	0.032	12.68	5,838
208	1248	0.0020	0.004	1.679	0.024	0.000	1.457	0.004	0.003	0.05	0.068	7,662.2	0.032	12.80	5,851
209	1254	0.0020	0.004	1.683	0.024	0.000	1.461	0.004	0.003	0.05	0.058	7,683.1	0.032	11.00	5,862
210	1260	0.0030	0.005	1.688	0.025	0.001	1.466	0.005	0.004	0.08	0.066	7,706.7	0.032	10.56	5,872
211	1266	0.0020	0.004	1.692	0.025	0.000	1.470	0.004	0.003	0.05	0.067	7,730.9	0.032	12.30	5,885
212	1272	0.0020	0.004	1.696	0.026	0.000	1.473	0.004	0.003	0.05	0.058	7,751.7	0.032	10.91	5,896
213	1278	0.0030	0.005	1.701	0.026	0.001	1.478	0.005	0.004	0.08	0.066	7,775.4	0.032	10.57	5,906
214	1284	0.0020	0.004	1.705	0.027	0.000	1.482	0.004	0.003	0.05	0.068	7,799.7	0.032	12.33	5,919
215	1290	0.0020	0.004	1.708	0.027	0.000	1.486	0.004	0.003	0.05	0.058	7,820.5	0.032	10.94	5,930
216	1296	0.0030	0.005	1.714	0.028	0.001	1.491	0.005	0.004	0.08	0.066	7,844.2	0.032	10.60	5,940
217	1302	0.0020	0.004	1.717	0.028	0.000	1.494	0.004	0.003	0.05	0.068	7,868.5	0.032	12.37	5,952
218	1308	0.0020	0.004	1.721	0.029	0.000	1.498	0.004	0.003	0.05	0.058	7,889.4	0.032	10.98	5,963
219	1314	0.0020	0.004	1.724	0.029	0.000	1.502	0.004	0.003	0.05	0.056	7,909.4	0.032	8.79	5,972
220	1320	0.0020	0.004	1.728	0.030	0.000	1.505	0.004	0.003	0.05	0.055	7,929.2	0.032	8.25	5,981
221	1326	0.0021	0.004	1.732	0.030	0.000	1.509	0.004	0.003	0.06	0.056	7,949.3	0.032	8.31	5,989
222	1332	0.0020	0.004	1.735	0.030	0.000	1.512	0.004	0.003	0.05	0.056	7,969.5	0.032	8.51	5,997
223	1338	0.0020	0.004	1.739	0.031	0.000	1.516	0.004	0.003	0.05	0.055	7,989.3	0.032	8.38	6,006
224	1344	0.0020	0.004	1.743	0.031	0.000	1.520	0.004	0.003	0.05	0.055	8,009.1	0.032	8.17	6,014
225	1350	0.0020	0.004	1.746	0.032	0.000	1.523	0.004	0.003	0.05	0.055	8,028.8	0.032	8.13	6,022
226	1356	0.0020	0.004	1.750	0.032	0.000	1.527	0.004	0.003	0.05	0.055	8,048.6	0.032	8.12	6,030
227	1362	0.0020	0.004	1.753	0.033	0.000	1.530	0.004	0.003	0.05	0.055	8,068.4	0.032	8.13	6,038
228	1368	0.0020	0.004	1.757	0.033	0.000	1.534	0.004	0.003	0.05	0.055	8,088.1	0.032	8.14	6,046
229	1374	0.0020	0.004	1.761	0.034	0.000	1.537	0.004	0.003	0.05	0.055	8,107.9	0.032	8.15	6,055
230	1380	0.0020	0.004	1.764	0.034	0.000	1.541	0.004	0.003	0.06	0.055	8,127.7	0.032	8.15	6,063
231	1386	0.0020	0.004	1.768	0.035	0.000	1.544	0.004	0.003	0.06	0.055	8,147.5	0.032	8.16	6,071
232	1392	0.0020	0.004	1.771	0.035	0.000	1.548	0.004	0.003	0.06	0.055	8,167.3	0.032	8.17	6,079
233	1398	0.0020	0.004	1.775	0.036	0.000	1.552	0.004	0.003	0.06	0.055	8,187.2	0.032	8.18	6,087
234	1404	0.0020	0.004	1.779	0.036	0.001	1.555	0.004	0.003	0.06	0.055	8,207.0	0.032	8.19	6,095
235	1410	0.0020	0.004	1.782	0.037	0.001	1.559	0.004	0.003	0.06	0.055	8,226.8	0.032	8.20	6,104
236	1416	0.0020	0.004	1.786	0.037	0.001	1.562	0.004	0.003	0.06	0.055	8,246.7	0.032	8.21	6,112
237	1422	0.0020	0.004	1.789	0.038	0.001	1.566	0.004	0.003	0.06	0.055	8,266.5	0.032	8.21	6,120
238	1428	0.0020	0.004	1.793	0.038	0.001	1.569	0.004	0.003	0.06	0.055	8,286.4	0.032	8.22	6,128
239	1434	0.0020	0.004	1.797	0.039	0.001	1.573	0.004	0.003	0.06	0.055	8,306.3	0.032	8.23	6,136
240	1440	0.0020	0.004	1.800	0.039	0.001	1.576	0.004	0.003	0.06	0.055	8,326.2	0.032	8.24	6,145

Area 4

Storm: 25Yr 24Hr

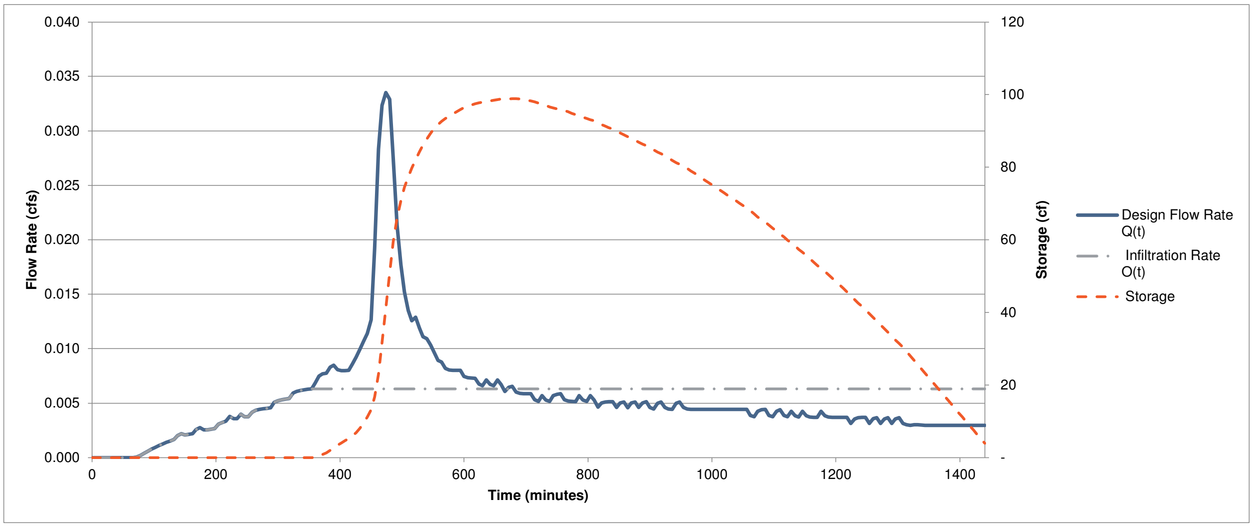
SCS Type 1A Storm Hyetograph Values
Santa Barbara Urban Hydrograph Method

Drainage Basin Area, A =	0.08	acres	Abstract Runoff Value, S =	(1000/CN) - 10
Total Rainfall, P25yr24hr =	1.8	inches	Runoff Curve Number, CN =	per Table 4.5.2
Time Increment, dt =	6	minutes	Routing Constant, w =	dt/(2*Tc + dt)
Time of Concentration, Tc =	5	minutes	w =	0.375
Total Infiltration Rate =	0.0063	cfs		

Summary

Peak Design Flow =	0.034	cfs
Required Storage =	99	cf
Peak Hour Runoff =	87	cf

Pervious Area:	A_{perv}=	0.00	acres	CN_{perv} =	85	S_{perv} =	1.76	$0.2*S_{perv}$ =	0.35
Impervious Area:	A_{imp}=	0.08	acres	CN_{imp} =	98	S_{imp} =	0.20	$0.2*S_{imp}$ =	0.04



Column	Description and Formula
1	Time Step or Increment, t
2	Elapsed Time (minutes)
3	Rainfall Distribution, Type 1A Storm from Table 4.2.2
4	Incremental Rainfall, P(t) = Column 3 * P
5	Accumulated Rainfall, P = Accumulated Sum of Column 4
6	Accumulated Runoff Depth Pervious Area — If P ≤ $0.2*S_{perv,}$ then = 0; otherwise, If P > $0.2*S_{perv,}$ then = (P - $0.2*S_{perv}$)^2/(P + $0.8*S_{perv}$)
7	Incremental Runoff Depth, $D_{perv}(t)$ = Column 6 of present step - Column 6 of prevous step
8	Accumulated Runoff Depth Impervious Area — If P ≤ $0.2S_{imp,}$ then = 0; otherwise, If P > $0.2S_{imp,}$ then = (P - $0.2*S_{imp}$)^2/(P + $0.8*S_{imp}$)
9	Incremental Runoff Depth, $D_{imp}(t)$ = Column 7 of present step - Column 7 of prevous step
10	Total Runoff Depth, D(t) = (A_{perv}/A)*$D_{perv}(t)$ + (A_{imp}/A)$\cdot$ $D_{imp}(t)$
11	Instantaneaous Hydrograph Flow Rate, I(t) = 60.5*D(t) * A/dt
12	Design Flow Rate, Q(t+1) = Q(t) + w*[I(t) + I(t+1) - 2*Q(t)]
13	Accumulated Runoff = Q(t)*dt*60 sec/min + Column 13 of previous step
14	Infiltration Rate = (Ksat/(12* 3600)) * AI
15	Change in Storage = dt * { [(I(t)+I(t-1))/2] - [(O(t)+O(t-1))/2]}
16	Storage = Storage from previous step plus change in storage

Area 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
					Pervious Area		Impervious Area								
Time Increment t	Elapsed Time	Rainfall Distr.	Incremental Rainfall P(t)	Accumulated Rainfall P	Accumulated Runoff	Incremental Runoff D_{perv} (t)	Accumulated Runoff	Incremental Runoff $D_{imp}(t)$	Total Runoff D(t)	Instant Flow Rate I(t)	Design Flow Rate Q(t)	Accumulated Runoff	Infiltration Rate O(t)	Change in Storage	Storage
	(minutes)	(fraction)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(cfs)	(cfs)	(cf)	(cfs)	(cf)	(cf)
0	0		-	-	-	-	-	-	-	-	-	-	-	-	-
1	6	0.0020	0.004	0.004	-	-	-	-	-	-	-	-	-	-	-
2	12	0.0020	0.004	0.007	-	-	-	-	-	-	-	-	-	-	-
3	18	0.0020	0.004	0.011	-	-	-	-	-	-	-	-	-	-	-
4	24	0.0020	0.004	0.014	-	-	-	-	-	-	-	-	-	-	-
5	30	0.0020	0.004	0.018	-	-	-	-	-	-	-	-	-	-	-
6	36	0.0020	0.004	0.022	-	-	-	-	-	-	-	-	-	-	-
7	42	0.0020	0.004	0.025	-	-	-	-	-	-	-	-	-	-	-
8	48	0.0020	0.004	0.029	-	-	-	-	-	-	-	-	-	-	-
9	54	0.0020	0.004	0.032	-	-	-	-	-	-	-	-	-	-	-
10	60	0.0020	0.004	0.036	-	-	-	-	-	-	-	-	-	-	-
11	66	0.0030	0.005	0.041	-	-	0.000	0.000	0.000	0.00	0.000	0.0	0.000	-	-
12	72	0.0030	0.005	0.047	-	-	0.000	0.000	0.000	0.00	0.000	0.0	0.000	-	-
13	78	0.0030	0.005	0.052	-	-	0.001	0.000	0.000	0.00	0.000	0.1	0.000	-	-
14	84	0.0030	0.005	0.058	-	-	0.001	0.001	0.001	0.00	0.000	0.2	0.000	-	-
15	90	0.0030	0.005	0.063	-	-	0.002	0.001	0.001	0.00	0.001	0.4	0.001	-	-

Area 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
					Pervious Area		Impervious Area								
Time Increment t	Elapsed Time	Rainfall Distr.	Incremental Rainfall P(t)	Accumulated Rainfall P	Accumulated Runoff	Incremental Runoff D_{perv} (t)	Accumulated Runoff	Incremental Runoff D_{imp}(t)	Total Runoff D(t)	Instant Flow Rate I(t)	Design Flow Rate Q(t)	Accumulated Runoff	Infiltration Rate O(t)	Change in Storage	Storage
	(minutes)	(fraction)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(cfs)	(cfs)	(cf)	(cfs)	(cf)	(cf)
16	96	0.0030	0.005	0.068	-	-	0.003	0.001	0.001	0.00	0.001	0.7	0.001	-	-
17	102	0.0030	0.005	0.074	-	-	0.005	0.001	0.001	0.00	0.001	1.1	0.001	-	-
18	108	0.0030	0.005	0.079	-	-	0.006	0.001	0.001	0.00	0.001	1.5	0.001	-	-
19	114	0.0030	0.005	0.085	-	-	0.008	0.002	0.002	0.00	0.001	1.9	0.001	-	-
20	120	0.0030	0.005	0.090	-	-	0.010	0.002	0.002	0.00	0.001	2.4	0.001	-	-
21	126	0.0030	0.005	0.095	-	-	0.012	0.002	0.002	0.00	0.002	3.0	0.002	-	-
22	132	0.0030	0.005	0.101	-	-	0.014	0.002	0.002	0.00	0.002	3.6	0.002	-	-
23	138	0.0040	0.007	0.108	-	-	0.017	0.003	0.003	0.00	0.002	4.3	0.002	-	-
24	144	0.0030	0.005	0.113	-	-	0.019	0.002	0.002	0.00	0.002	5.1	0.002	-	-
25	150	0.0030	0.005	0.119	-	-	0.022	0.003	0.003	0.00	0.002	5.8	0.002	-	-
26	156	0.0030	0.005	0.124	-	-	0.024	0.003	0.003	0.00	0.002	6.6	0.002	-	-
27	162	0.0030	0.005	0.130	-	-	0.027	0.003	0.003	0.00	0.002	7.4	0.002	-	-
28	168	0.0040	0.007	0.137	-	-	0.031	0.004	0.004	0.00	0.003	8.3	0.003	-	-
29	174	0.0030	0.005	0.142	-	-	0.034	0.003	0.003	0.00	0.003	9.3	0.003	-	-
30	180	0.0030	0.005	0.148	-	-	0.037	0.003	0.003	0.00	0.003	10.2	0.003	-	-
31	186	0.0030	0.005	0.153	-	-	0.040	0.003	0.003	0.00	0.003	11.2	0.003	-	-
32	192	0.0030	0.005	0.158	-	-	0.043	0.003	0.003	0.00	0.003	12.1	0.003	-	-
33	198	0.0030	0.005	0.164	-	-	0.046	0.003	0.003	0.00	0.003	13.1	0.003	-	-
34	204	0.0040	0.007	0.171	-	-	0.051	0.004	0.004	0.00	0.003	14.2	0.003	-	-
35	210	0.0030	0.005	0.176	-	-	0.054	0.003	0.003	0.00	0.003	15.3	0.003	-	-
36	216	0.0040	0.007	0.184	-	-	0.059	0.005	0.005	0.00	0.003	16.5	0.003	-	-
37	222	0.0040	0.007	0.191	-	-	0.064	0.005	0.005	0.00	0.004	17.9	0.004	-	-
38	228	0.0030	0.005	0.196	-	-	0.067	0.004	0.004	0.00	0.004	19.2	0.004	-	-
39	234	0.0040	0.007	0.203	-	-	0.072	0.005	0.005	0.00	0.004	20.5	0.004	-	-
40	240	0.0040	0.007	0.211	-	-	0.077	0.005	0.005	0.00	0.004	21.9	0.004	-	-
41	246	0.0030	0.005	0.216	-	-	0.081	0.004	0.004	0.00	0.004	23.3	0.004	-	-
42	252	0.0040	0.007	0.223	-	-	0.086	0.005	0.005	0.00	0.004	24.6	0.004	-	-
43	258	0.0040	0.007	0.230	-	-	0.091	0.005	0.005	0.00	0.004	26.1	0.004	-	-
44	264	0.0040	0.007	0.238	-	-	0.097	0.005	0.005	0.00	0.004	27.7	0.004	-	-
45	270	0.0040	0.007	0.245	-	-	0.102	0.005	0.005	0.00	0.004	29.3	0.004	-	-
46	276	0.0040	0.007	0.252	-	-	0.107	0.005	0.005	0.00	0.004	30.9	0.004	-	-
47	282	0.0040	0.007	0.259	-	-	0.113	0.005	0.005	0.00	0.005	32.5	0.005	-	-
48	288	0.0040	0.007	0.266	-	-	0.118	0.006	0.006	0.00	0.005	34.1	0.005	-	-
49	294	0.0050	0.009	0.275	-	-	0.125	0.007	0.007	0.01	0.005	36.0	0.005	-	-
50	300	0.0040	0.007	0.283	-	-	0.131	0.006	0.006	0.00	0.005	37.9	0.005	-	-
51	306	0.0050	0.009	0.292	-	-	0.138	0.007	0.007	0.01	0.005	39.8	0.005	-	-
52	312	0.0040	0.007	0.299	-	-	0.144	0.006	0.006	0.00	0.005	41.7	0.005	-	-
53	318	0.0050	0.009	0.308	-	-	0.151	0.007	0.007	0.01	0.005	43.7	0.005	-	-
54	324	0.0050	0.009	0.317	-	-	0.159	0.007	0.007	0.01	0.006	45.8	0.006	-	-
55	330	0.0050	0.009	0.326	-	-	0.166	0.007	0.007	0.01	0.006	48.0	0.006	-	-
56	336	0.0050	0.009	0.335	-	-	0.174	0.007	0.007	0.01	0.006	50.2	0.006	-	-
57	342	0.0050	0.009	0.344	-	-	0.181	0.008	0.008	0.01	0.006	52.4	0.006	-	-
58	348	0.0050	0.009	0.353	-	-	0.189	0.008	0.008	0.01	0.006	54.7	0.006	-	-
59	354	0.0050	0.009	0.362	0.000	0.000	0.196	0.008	0.008	0.01	0.006	57.0	0.006	-	-
60	360	0.0060	0.011	0.373	0.000	0.000	0.205	0.009	0.009	0.01	0.007	59.4	0.006	0.09	0
61	366	0.0060	0.011	0.383	0.001	0.000	0.215	0.009	0.009	0.01	0.007	62.1	0.006	0.30	0
62	372	0.0060	0.011	0.394	0.001	0.000	0.224	0.009	0.009	0.01	0.008	64.9	0.006	0.45	1
63	378	0.0060	0.011	0.405	0.001	0.001	0.233	0.009	0.009	0.01	0.008	67.7	0.006	0.50	1
64	384	0.0070	0.013	0.418	0.002	0.001	0.244	0.011	0.011	0.01	0.008	70.7	0.006	0.62	2
65	390	0.0060	0.011	0.428	0.003	0.001	0.254	0.009	0.009	0.01	0.008	73.7	0.006	0.75	3
66	396	0.0060	0.011	0.439	0.004	0.001	0.263	0.010	0.010	0.01	0.008	76.6	0.006	0.70	3
67	402	0.0060	0.011	0.450	0.005	0.001	0.273	0.010	0.010	0.01	0.008	79.5	0.006	0.62	4
68	408	0.0060	0.011	0.461	0.006	0.001	0.283	0.010	0.010	0.01	0.008	82.4	0.006	0.60	5
69	414	0.0060	0.011	0.472	0.007	0.001	0.292	0.010	0.010	0.01	0.008	85.3	0.006	0.61	5
70	420	0.0070	0.013	0.484	0.009	0.002	0.304	0.011	0.011	0.01	0.009	88.4	0.006	0.71	6
71	426	0.0070	0.013	0.497	0.011	0.002	0.315	0.011	0.011	0.01	0.009	91.7	0.006	0.93	7
72	432	0.0080	0.014	0.511	0.013	0.002	0.328	0.013	0.013	0.01	0.010	95.3	0.006	1.18	8
73	438	0.0080	0.014	0.526	0.015	0.002	0.341	0.013	0.013	0.01	0.011	99.1	0.006	1.43	10
74	444	0.0090	0.016	0.542	0.018	0.003	0.356	0.015	0.015	0.01	0.011	103.2	0.006	1.69	11
75	450	0.0100	0.018	0.560	0.022	0.003	0.373	0.017	0.017	0.01	0.013	107.8	0.006	2.05	13
76	456	0.0210	0.038	0.598	0.030	0.008	0.407	0.035	0.035	0.03	0.019	114.7	0.006	3.46	17
77	462	0.0240	0.043	0.641	0.040	0.011	0.448	0.040	0.040	0.03	0.028	124.9	0.006	6.28	23
78	468	0.0240	0.043	0.684	0.052	0.012	0.488	0.041	0.041	0.03	0.032	136.5	0.006	8.64	32
79	474	0.0240	0.043	0.727	0.065	0.013	0.529	0.041	0.041	0.03	0.034	148.6	0.006	9.58	41
80	480	0.0220	0.040	0.767	0.079	0.013	0.567	0.038	0.038	0.03	0.033	160.4	0.006	9.68	51
81	486	0.0140	0.025	0.792	0.087	0.009	0.591	0.024	0.024	0.02	0.027	170.3	0.006	8.59	59
82	492	0.0130	0.023	0.815	0.096	0.009	0.613	0.022	0.022	0.02	0.021	178.0	0.006	6.52	66
83	498	0.0100	0.018	0.833	0.103	0.007	0.630	0.017	0.017	0.01	0.018	184.4	0.006	4.76	71
84	504	0.0100	0.018	0.851	0.110	0.007	0.648	0.017	0.017	0.01	0.015	189.9	0.006	3.65	74
85	510	0.0080	0.014	0.866	0.115	0.006	0.661	0.014	0.014	0.01	0.014	194.7	0.006	2.89	77
86	516	0.0090	0.016	0.882	0.122	0.007	0.677	0.016	0.016	0.01	0.013	199.2	0.006	2.42	80
87	522	0.0090	0.016	0.898	0.129	0.007	0.693	0.016	0.016	0.01	0.013	203.9	0.006	2.31	82
88	528	0.0070	0.013	0.911	0.134	0.005	0.705	0.012	0.012	0.01	0.012	208.2	0.006	2.18	84
89	534	0.0080	0.014	0.925	0.140	0.006	0.719	0.014	0.014	0.01	0.011	212.2	0.006	1.86	86
90	540	0.0070	0.013	0.938	0.146	0.005	0.731	0.012	0.012	0.01	0.011	216.1	0.006	1.69	88
91	546	0.0070	0.013	0.950	0.151	0.006	0.743	0.012	0.012	0.01	0.010	219.8	0.006	1.55	89
92	552	0.0060	0.011	0.961	0.156	0.005	0.753	0.010	0.010	0.01	0.010	223.3	0.006	1.32	91
93	558	0.0060	0.011	0.972	0.161	0.005	0.764	0.010	0.010	0.01	0.009	226.5	0.006	1.07	92

Area 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
					Pervious Area		Impervious Area								
Time Increment t	Elapsed Time	Rainfall Distr.	Incremental Rainfall P(t)	Accumulated Rainfall P	Accumulated Runoff	Incremental Runoff D_{perv} (t)	Accumulated Runoff	Incremental Runoff D_{imp}(t)	Total Runoff D(t)	Instant Flow Rate I(t)	Design Flow Rate Q(t)	Accumulated Runoff	Infiltration Rate O(t)	Change in Storage	Storage
	(minutes)	(fraction)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(cfs)	(cfs)	(cf)	(cfs)	(cf)	(cf)
94	564	0.0060	0.011	0.983	0.166	0.005	0.774	0.010	0.010	0.01	0.009	229.7	0.006	0.91	93
95	570	0.0050	0.009	0.992	0.170	0.004	0.783	0.009	0.009	0.01	0.008	232.6	0.006	0.78	93
96	576	0.0060	0.011	1.003	0.175	0.005	0.793	0.010	0.010	0.01	0.008	235.5	0.006	0.65	94
97	582	0.0050	0.009	1.012	0.179	0.004	0.802	0.009	0.009	0.01	0.008	238.4	0.006	0.61	95
98	588	0.0060	0.011	1.022	0.184	0.005	0.813	0.010	0.010	0.01	0.008	241.3	0.006	0.61	95
99	594	0.0050	0.009	1.031	0.188	0.004	0.821	0.009	0.009	0.01	0.008	244.1	0.006	0.61	96
100	600	0.0050	0.009	1.040	0.193	0.004	0.830	0.009	0.009	0.01	0.007	246.8	0.006	0.51	96
101	606	0.0050	0.009	1.049	0.197	0.004	0.839	0.009	0.009	0.01	0.007	249.5	0.006	0.39	97
102	612	0.0050	0.009	1.058	0.201	0.004	0.848	0.009	0.009	0.01	0.007	252.1	0.006	0.36	97
103	618	0.0050	0.009	1.067	0.206	0.004	0.856	0.009	0.009	0.01	0.007	254.7	0.006	0.35	97
104	624	0.0040	0.007	1.075	0.209	0.004	0.863	0.007	0.007	0.01	0.007	257.1	0.006	0.25	98
105	630	0.0050	0.009	1.084	0.214	0.004	0.872	0.009	0.009	0.01	0.007	259.5	0.006	0.13	98
106	636	0.0050	0.009	1.093	0.218	0.005	0.881	0.009	0.009	0.01	0.007	262.1	0.006	0.20	98
107	642	0.0040	0.007	1.100	0.222	0.004	0.888	0.007	0.007	0.01	0.007	264.5	0.006	0.22	98
108	648	0.0050	0.009	1.109	0.227	0.005	0.897	0.009	0.009	0.01	0.007	266.9	0.006	0.12	98
109	654	0.0050	0.009	1.118	0.231	0.005	0.905	0.009	0.009	0.01	0.007	269.5	0.006	0.20	99
110	660	0.0040	0.007	1.125	0.235	0.004	0.912	0.007	0.007	0.01	0.007	271.9	0.006	0.22	99
111	666	0.0040	0.007	1.132	0.239	0.004	0.919	0.007	0.007	0.01	0.006	274.1	0.006	0.03	99
112	672	0.0050	0.009	1.141	0.243	0.005	0.928	0.009	0.009	0.01	0.006	276.4	0.006	(0.02)	99
113	678	0.0040	0.007	1.148	0.247	0.004	0.935	0.007	0.007	0.01	0.007	278.7	0.006	0.07	99
114	684	0.0040	0.007	1.156	0.251	0.004	0.942	0.007	0.007	0.01	0.006	280.9	0.006	(0.01)	99
115	690	0.0040	0.007	1.163	0.255	0.004	0.949	0.007	0.007	0.01	0.006	283.0	0.006	(0.13)	99
116	696	0.0040	0.007	1.170	0.259	0.004	0.956	0.007	0.007	0.01	0.006	285.1	0.006	(0.16)	99
117	702	0.0040	0.007	1.177	0.262	0.004	0.963	0.007	0.007	0.01	0.006	287.3	0.006	(0.16)	98
118	708	0.0040	0.007	1.184	0.266	0.004	0.970	0.007	0.007	0.01	0.006	289.4	0.006	(0.16)	98
119	714	0.0030	0.005	1.190	0.269	0.003	0.976	0.005	0.005	0.00	0.005	291.3	0.006	(0.26)	98
120	720	0.0040	0.007	1.197	0.273	0.004	0.983	0.007	0.007	0.01	0.005	293.1	0.006	(0.39)	98
121	726	0.0040	0.007	1.204	0.277	0.004	0.990	0.007	0.007	0.01	0.006	295.2	0.006	(0.32)	97
122	732	0.0030	0.005	1.210	0.280	0.003	0.995	0.005	0.005	0.00	0.005	297.1	0.006	(0.30)	97
123	738	0.0040	0.007	1.217	0.284	0.004	1.002	0.007	0.007	0.01	0.005	298.9	0.006	(0.40)	97
124	744	0.0040	0.007	1.224	0.288	0.004	1.009	0.007	0.007	0.01	0.006	301.0	0.006	(0.32)	96
125	750	0.0040	0.007	1.231	0.292	0.004	1.016	0.007	0.007	0.01	0.006	303.1	0.006	(0.20)	96
126	756	0.0040	0.007	1.238	0.296	0.004	1.023	0.007	0.007	0.01	0.006	305.2	0.006	(0.17)	96
127	762	0.0030	0.005	1.244	0.299	0.003	1.029	0.005	0.005	0.00	0.005	307.1	0.006	(0.26)	96
128	768	0.0040	0.007	1.251	0.303	0.004	1.036	0.007	0.007	0.01	0.005	309.0	0.006	(0.38)	95
129	774	0.0030	0.005	1.256	0.306	0.003	1.041	0.005	0.005	0.00	0.005	310.8	0.006	(0.41)	95
130	780	0.0040	0.007	1.264	0.310	0.004	1.048	0.007	0.007	0.01	0.005	312.7	0.006	(0.42)	94
131	786	0.0040	0.007	1.271	0.314	0.004	1.055	0.007	0.007	0.01	0.006	314.7	0.006	(0.32)	94
132	792	0.0030	0.005	1.276	0.317	0.003	1.060	0.005	0.005	0.00	0.005	316.6	0.006	(0.30)	94
133	798	0.0040	0.007	1.283	0.321	0.004	1.067	0.007	0.007	0.01	0.005	318.5	0.006	(0.39)	93
134	804	0.0040	0.007	1.291	0.325	0.004	1.074	0.007	0.007	0.01	0.006	320.6	0.006	(0.32)	93
135	810	0.0030	0.005	1.296	0.328	0.003	1.080	0.005	0.005	0.00	0.005	322.5	0.006	(0.30)	93
136	816	0.0030	0.005	1.301	0.332	0.003	1.085	0.005	0.005	0.00	0.005	324.1	0.006	(0.49)	92
137	822	0.0040	0.007	1.309	0.336	0.004	1.092	0.007	0.007	0.01	0.005	325.9	0.006	(0.54)	92
138	828	0.0030	0.005	1.314	0.339	0.003	1.097	0.005	0.005	0.00	0.005	327.8	0.006	(0.45)	91
139	834	0.0040	0.007	1.321	0.343	0.004	1.104	0.007	0.007	0.01	0.005	329.6	0.006	(0.43)	91
140	840	0.0030	0.005	1.327	0.346	0.003	1.110	0.005	0.005	0.00	0.005	331.5	0.006	(0.42)	90
141	846	0.0030	0.005	1.332	0.349	0.003	1.115	0.005	0.005	0.00	0.005	333.1	0.006	(0.52)	90
142	852	0.0040	0.007	1.339	0.354	0.004	1.122	0.007	0.007	0.01	0.005	334.9	0.006	(0.54)	89
143	858	0.0030	0.005	1.345	0.357	0.003	1.127	0.005	0.005	0.00	0.005	336.8	0.006	(0.45)	89
144	864	0.0030	0.005	1.350	0.360	0.003	1.133	0.005	0.005	0.00	0.005	338.4	0.006	(0.53)	88
145	870	0.0040	0.007	1.357	0.364	0.004	1.140	0.007	0.007	0.01	0.005	340.2	0.006	(0.55)	88
146	876	0.0030	0.005	1.363	0.367	0.003	1.145	0.005	0.005	0.00	0.005	342.1	0.006	(0.45)	87
147	882	0.0030	0.005	1.368	0.371	0.003	1.150	0.005	0.005	0.00	0.005	343.7	0.006	(0.53)	87
148	888	0.0040	0.007	1.375	0.375	0.004	1.157	0.007	0.007	0.01	0.005	345.5	0.006	(0.55)	86
149	894	0.0030	0.005	1.381	0.378	0.003	1.163	0.005	0.005	0.00	0.005	347.4	0.006	(0.45)	86
150	900	0.0030	0.005	1.386	0.381	0.003	1.168	0.005	0.005	0.00	0.005	349.0	0.006	(0.53)	85
151	906	0.0030	0.005	1.391	0.385	0.003	1.173	0.005	0.005	0.00	0.004	350.7	0.006	(0.64)	85
152	912	0.0040	0.007	1.399	0.389	0.004	1.180	0.007	0.007	0.01	0.005	352.5	0.006	(0.57)	84
153	918	0.0030	0.005	1.404	0.392	0.003	1.186	0.005	0.005	0.00	0.005	354.3	0.006	(0.46)	84
154	924	0.0030	0.005	1.409	0.396	0.003	1.191	0.005	0.005	0.00	0.005	355.9	0.006	(0.53)	83
155	930	0.0030	0.005	1.415	0.399	0.003	1.196	0.005	0.005	0.00	0.004	357.6	0.006	(0.64)	83
156	936	0.0030	0.005	1.420	0.402	0.003	1.202	0.005	0.005	0.00	0.004	359.2	0.006	(0.67)	82
157	942	0.0040	0.007	1.427	0.407	0.004	1.209	0.007	0.007	0.01	0.005	360.9	0.006	(0.58)	81
158	948	0.0030	0.005	1.433	0.410	0.003	1.214	0.005	0.005	0.00	0.005	362.8	0.006	(0.46)	81
159	954	0.0030	0.005	1.438	0.413	0.003	1.219	0.005	0.005	0.00	0.005	364.4	0.006	(0.53)	80
160	960	0.0030	0.005	1.444	0.417	0.003	1.225	0.005	0.005	0.00	0.004	366.1	0.006	(0.64)	80
161	966	0.0030	0.005	1.449	0.420	0.003	1.230	0.005	0.005	0.00	0.004	367.7	0.006	(0.67)	79
162	972	0.0030	0.005	1.454	0.423	0.003	1.235	0.005	0.005	0.00	0.004	369.2	0.006	(0.68)	78
163	978	0.0030	0.005	1.460	0.427	0.003	1.241	0.005	0.005	0.00	0.004	370.8	0.006	(0.68)	78
164	984	0.0030	0.005	1.465	0.430	0.003	1.246	0.005	0.005	0.00	0.004	372.4	0.006	(0.68)	77
165	990	0.0030	0.005	1.471	0.433	0.003	1.251	0.005	0.005	0.00	0.004	374.0	0.006	(0.68)	76
166	996	0.0030	0.005	1.476	0.437	0.003	1.257	0.005	0.005	0.00	0.004	375.6	0.006	(0.68)	76
167	1002	0.0030	0.005	1.481	0.440	0.003	1.262	0.005	0.005	0.00	0.004	377.2	0.006	(0.68)	75
168	1008	0.0030	0.005	1.487	0.444	0.003	1.267	0.005	0.005	0.00	0.004	378.8	0.006	(0.68)	74
169	1014	0.0030	0.005	1.492	0.447	0.003	1.272	0.005	0.005	0.00	0.004	380.4	0.006	(0.68)	74
170	1020	0.0030	0.005	1.498	0.450	0.003	1.278	0.005	0.005	0.00	0.004	382.0	0.006	(0.68)	73
171	1026	0.0030	0.005	1.503	0.454	0.003	1.283	0.005	0.005	0.00	0.004	383.6	0.006	(0.68)	72

Area 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
					Pervious Area		Impervious Area								
Time Increment t	Elapsed Time	Rainfall Distr.	Incremental Rainfall P(t)	Accumulated Rainfall P	Accumulated Runoff	Incremental Runoff D_{perv} (t)	Accumulated Runoff	Incremental Runoff D_{imp}(t)	Total Runoff D(t)	Instant Flow Rate I(t)	Design Flow Rate Q(t)	Accumulated Runoff	Infiltration Rate O(t)	Change in Storage	Storage
	(minutes)	(fraction)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(cfs)	(cfs)	(cf)	(cfs)	(cf)	(cf)
172	1032	0.0030	0.005	1.508	0.457	0.003	1.288	0.005	0.005	0.00	0.004	385.2	0.006	(0.68)	71
173	1038	0.0030	0.005	1.514	0.461	0.003	1.294	0.005	0.005	0.00	0.004	386.8	0.006	(0.68)	71
174	1044	0.0030	0.005	1.519	0.464	0.003	1.299	0.005	0.005	0.00	0.004	388.4	0.006	(0.68)	70
175	1050	0.0030	0.005	1.525	0.468	0.003	1.304	0.005	0.005	0.00	0.004	390.0	0.006	(0.68)	69
176	1056	0.0030	0.005	1.530	0.471	0.003	1.310	0.005	0.005	0.00	0.004	391.6	0.006	(0.68)	69
177	1062	0.0020	0.004	1.534	0.473	0.002	1.313	0.004	0.004	0.00	0.004	393.0	0.006	(0.78)	68
178	1068	0.0030	0.005	1.539	0.477	0.003	1.319	0.005	0.005	0.00	0.004	394.3	0.006	(0.90)	67
179	1074	0.0030	0.005	1.544	0.480	0.003	1.324	0.005	0.005	0.00	0.004	395.9	0.006	(0.83)	66
180	1080	0.0030	0.005	1.550	0.484	0.003	1.329	0.005	0.005	0.00	0.004	397.4	0.006	(0.72)	66
181	1086	0.0030	0.005	1.555	0.487	0.003	1.335	0.005	0.005	0.00	0.004	399.0	0.006	(0.69)	65
182	1092	0.0020	0.004	1.559	0.490	0.002	1.338	0.004	0.004	0.00	0.004	400.4	0.006	(0.78)	64
183	1098	0.0030	0.005	1.564	0.493	0.003	1.343	0.005	0.005	0.00	0.004	401.8	0.006	(0.90)	63
184	1104	0.0030	0.005	1.570	0.497	0.004	1.349	0.005	0.005	0.00	0.004	403.3	0.006	(0.83)	62
185	1110	0.0030	0.005	1.575	0.500	0.004	1.354	0.005	0.005	0.00	0.004	404.9	0.006	(0.72)	62
186	1116	0.0020	0.004	1.579	0.502	0.002	1.358	0.004	0.004	0.00	0.004	406.3	0.006	(0.79)	61
187	1122	0.0030	0.005	1.584	0.506	0.004	1.363	0.005	0.005	0.00	0.004	407.6	0.006	(0.90)	60
188	1128	0.0030	0.005	1.589	0.509	0.004	1.368	0.005	0.005	0.00	0.004	409.2	0.006	(0.83)	59
189	1134	0.0020	0.004	1.593	0.512	0.002	1.372	0.004	0.004	0.00	0.004	410.6	0.006	(0.82)	58
190	1140	0.0030	0.005	1.598	0.515	0.004	1.377	0.005	0.005	0.00	0.004	411.9	0.006	(0.91)	57
191	1146	0.0030	0.005	1.604	0.519	0.004	1.382	0.005	0.005	0.00	0.004	413.4	0.006	(0.84)	57
192	1152	0.0020	0.004	1.607	0.521	0.002	1.386	0.004	0.004	0.00	0.004	414.8	0.006	(0.82)	56
193	1158	0.0030	0.005	1.613	0.525	0.004	1.391	0.005	0.005	0.00	0.004	416.2	0.006	(0.91)	55
194	1164	0.0020	0.004	1.616	0.527	0.002	1.395	0.004	0.004	0.00	0.004	417.5	0.006	(0.93)	54
195	1170	0.0030	0.005	1.622	0.531	0.004	1.400	0.005	0.005	0.00	0.004	418.8	0.006	(0.94)	53
196	1176	0.0030	0.005	1.627	0.534	0.004	1.406	0.005	0.005	0.00	0.004	420.4	0.006	(0.84)	52
197	1182	0.0020	0.004	1.631	0.537	0.002	1.409	0.004	0.004	0.00	0.004	421.7	0.006	(0.82)	51
198	1188	0.0030	0.005	1.636	0.540	0.004	1.414	0.005	0.005	0.00	0.004	423.1	0.006	(0.91)	50
199	1194	0.0020	0.004	1.640	0.543	0.002	1.418	0.004	0.004	0.00	0.004	424.4	0.006	(0.93)	49
200	1200	0.0030	0.005	1.645	0.546	0.004	1.423	0.005	0.005	0.00	0.004	425.8	0.006	(0.94)	48
201	1206	0.0020	0.004	1.649	0.549	0.002	1.427	0.004	0.004	0.00	0.004	427.1	0.006	(0.94)	48
202	1212	0.0030	0.005	1.654	0.552	0.004	1.432	0.005	0.005	0.00	0.004	428.4	0.006	(0.94)	47
203	1218	0.0020	0.004	1.658	0.555	0.002	1.436	0.004	0.004	0.00	0.004	429.8	0.006	(0.94)	46
204	1224	0.0020	0.004	1.661	0.557	0.002	1.439	0.004	0.004	0.00	0.003	430.9	0.006	(1.04)	45
205	1230	0.0030	0.005	1.667	0.561	0.004	1.445	0.005	0.005	0.00	0.004	432.2	0.006	(1.07)	44
206	1236	0.0020	0.004	1.670	0.563	0.002	1.448	0.004	0.004	0.00	0.004	433.5	0.006	(0.97)	43
207	1242	0.0030	0.005	1.676	0.567	0.004	1.454	0.005	0.005	0.00	0.004	434.8	0.006	(0.95)	42
208	1248	0.0020	0.004	1.679	0.569	0.002	1.457	0.004	0.004	0.00	0.004	436.2	0.006	(0.94)	41
209	1254	0.0020	0.004	1.683	0.572	0.002	1.461	0.004	0.004	0.00	0.003	437.3	0.006	(1.04)	40
210	1260	0.0030	0.005	1.688	0.575	0.004	1.466	0.005	0.005	0.00	0.004	438.6	0.006	(1.07)	39
211	1266	0.0020	0.004	1.692	0.578	0.002	1.470	0.004	0.004	0.00	0.004	439.9	0.006	(0.97)	38
212	1272	0.0020	0.004	1.696	0.580	0.002	1.473	0.004	0.004	0.00	0.003	441.0	0.006	(1.05)	37
213	1278	0.0030	0.005	1.701	0.584	0.004	1.478	0.005	0.005	0.00	0.004	442.3	0.006	(1.07)	35
214	1284	0.0020	0.004	1.705	0.586	0.002	1.482	0.004	0.004	0.00	0.004	443.6	0.006	(0.97)	35
215	1290	0.0020	0.004	1.708	0.589	0.002	1.486	0.004	0.004	0.00	0.003	444.8	0.006	(1.05)	33
216	1296	0.0030	0.005	1.714	0.592	0.004	1.491	0.005	0.005	0.00	0.004	446.0	0.006	(1.07)	32
217	1302	0.0020	0.004	1.717	0.595	0.002	1.494	0.004	0.004	0.00	0.004	447.4	0.006	(0.97)	31
218	1308	0.0020	0.004	1.721	0.597	0.002	1.498	0.004	0.004	0.00	0.003	448.5	0.006	(1.05)	30
219	1314	0.0020	0.004	1.724	0.600	0.002	1.502	0.004	0.004	0.00	0.003	449.6	0.006	(1.17)	29
220	1320	0.0020	0.004	1.728	0.602	0.002	1.505	0.004	0.004	0.00	0.003	450.6	0.006	(1.20)	28
221	1326	0.0021	0.004	1.732	0.605	0.003	1.509	0.004	0.004	0.00	0.003	451.7	0.006	(1.20)	27
222	1332	0.0020	0.004	1.735	0.607	0.002	1.512	0.004	0.004	0.00	0.003	452.8	0.006	(1.18)	26
223	1338	0.0020	0.004	1.739	0.610	0.002	1.516	0.004	0.004	0.00	0.003	453.9	0.006	(1.19)	24
224	1344	0.0020	0.004	1.743	0.612	0.002	1.520	0.004	0.004	0.00	0.003	455.0	0.006	(1.20)	23
225	1350	0.0020	0.004	1.746	0.615	0.002	1.523	0.004	0.004	0.00	0.003	456.0	0.006	(1.21)	22
226	1356	0.0020	0.004	1.750	0.617	0.002	1.527	0.004	0.004	0.00	0.003	457.1	0.006	(1.21)	21
227	1362	0.0020	0.004	1.753	0.620	0.002	1.530	0.004	0.004	0.00	0.003	458.2	0.006	(1.21)	20
228	1368	0.0020	0.004	1.757	0.622	0.002	1.534	0.004	0.004	0.00	0.003	459.2	0.006	(1.21)	18
229	1374	0.0020	0.004	1.761	0.625	0.002	1.537	0.004	0.004	0.00	0.003	460.3	0.006	(1.21)	17
230	1380	0.0020	0.004	1.764	0.627	0.002	1.541	0.004	0.004	0.00	0.003	461.4	0.006	(1.21)	16
231	1386	0.0020	0.004	1.768	0.630	0.002	1.544	0.004	0.004	0.00	0.003	462.4	0.006	(1.21)	15
232	1392	0.0020	0.004	1.771	0.632	0.002	1.548	0.004	0.004	0.00	0.003	463.5	0.006	(1.21)	14
233	1398	0.0020	0.004	1.775	0.635	0.002	1.552	0.004	0.004	0.00	0.003	464.6	0.006	(1.21)	12
234	1404	0.0020	0.004	1.779	0.637	0.002	1.555	0.004	0.004	0.00	0.003	465.6	0.006	(1.21)	11
235	1410	0.0020	0.004	1.782	0.640	0.002	1.559	0.004	0.004	0.00	0.003	466.7	0.006	(1.21)	10
236	1416	0.0020	0.004	1.786	0.642	0.003	1.562	0.004	0.004	0.00	0.003	467.8	0.006	(1.21)	9
237	1422	0.0020	0.004	1.789	0.645	0.003	1.566	0.004	0.004	0.00	0.003	468.9	0.006	(1.21)	8
238	1428	0.0020	0.004	1.793	0.647	0.003	1.569	0.004	0.004	0.00	0.003	469.9	0.006	(1.21)	6
239	1434	0.0020	0.004	1.797	0.650	0.003	1.573	0.004	0.004	0.00	0.003	471.0	0.006	(1.21)	5
240	1440	0.0020	0.004	1.800	0.652	0.003	1.576	0.004	0.004	0.00	0.003	472.1	0.006	(1.21)	4