6818

PRELIMINARY DRAINAGE REPORT
FOR

Charlene's House Apartments
Salem, Oregon

Prepared For:
Empire Builders
8527 Saghalie Dr. S
Salem, Oregon 97306

May 19, 2020

MULTI/TECH
ENGINEERING SERVICES, INC.

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Salem OR 97302

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Contents

INTRODUCTION

The Charlene's House Apartments is a proposed 18-unit apartment complex located at the intersection of Woodside Dr. SE and Mildred Lane SE. The parcel of land to be developed is a portion of Tax Lot 2400 of Marion County Assessor's Map 08 3W 14CB. A vicinity map and supporting maps are in Appendix A of this report. An aerial image is below.

Project Site

Green Stormwater Infrastructure (GSI) to the Maximum Extent Feasible (MEF) is being used for the new developed areas per City of Salem Administrative Rules, Chapter 109, Division 004, Stormwater System, Appendix 4E (Standards). All facilities will be constructed to meet the City of Salem standards.

EXISTING CONDITIONS

The 0.67-acre site is rectangular in the shape. Surface conditions consists of grassy meadow with trees. There are no identified wetlands or sensitive areas located on the property. Waln Creek traverses near the westerly property line. A topographical high point ridge is located on the northerly side of the site. Drainage from this high point flows southwesterly. The maximum relief is approximately 2-feet with a

high point elevation of 398-feet. The abutting properties are zoned single family residential, residential agriculture and Industrial commercial with public improvements that include storm water conveyance systems. Appendix A contains multiple maps of the site.

Soils

The Natural Resources Conservation Service (NRCS) Soil Resource Report for Marion County was used to determine a Hydrological Soil Group classification for runoff calculations. The report identifies the site soil to be McAlpin silty clay loam. The soil is in the hydrologic soil group C. The report is in Appendix B.

Infiltration

Infiltration testing will be performed at the site to determine percolation rates of the soils. It is anticipated that test results will indicate rates near 0.6 inches.

Water Quality Methodology

Because of limited land space and a small development footprint, green stormwater facilities will be a infiltration planter.

Water Quality Analysis

Water quality flow rates will be calculated with HydroCAD 10.00. The SCS TR-20 Unit Hydrograph method will be used to generate the hydrographs. A Type 1A storm and a 24-hour rainfall depth of 1.38 inches per hour will be used to determine the water quality flow rate.

Water Quality Design

The proposed filtration facility will provide water quality treatment by allowing for the removal of pollutants through sedimentation, adsorption onto surrounding vegetation, filtration and biological uptake. The facility will be designed per the City of Salem designed standards.

Stormwater Quantity Analysis

Stormwater quantity (Flow Control) is proposed to be handled by infiltration. Runoff from the developed site will be routed to the facility that ultimately controls runoff to pre-developed flow rates.

Per Subsection 4.2(p)(3)(A) of the standards, one-half of the post development peak runoff rate of the two-year storm must be equal to or less than one-half of the peak runoff rate of the pre-developed two-year, 24-hour storm. This also applies to the 10-year, 24-hour storm event.

The pre-developed flow rates were calculated using HydroCAD 10.00. Table 1 below lists the 24-hour rainfall depths used for the analysis of each storm event. Please note that the 2-year event was halved and then analyzed.

Table 1

Storm Event	24-hour Rainfall Depth (in)
2	2.2
10	3.2

For the pre-developed conditions, a time of concentration of 41.5 minutes was calculated for the Basin. The time of concentration data is in Appendix C. The calculations are incorporated in the HydroCAD output located in Appendix D. The entire area was classified as "City of Salem Pre-Development, HSG C" with a Curve Number (CN) of 72. A pre-developed basin map is in Appendix A.

The SCS TR-20 Unit Hydrograph method was used to generate the hydrographs. A Type 1A rainfall distribution was used with the above rainfall depths. Table 2 below identifies the allowable pre-developed release rate for each storm event.

Table 2

Storm Event	Basin Allowable Release Rate (cfs)
1/2 of 2-year	0.002
10-year	0.08

The post-developed flow rates were calculated using HydroCAD 10.00. A time of concentration of 5 minutes was assumed for the developed site. The calculations are incorporated in the HydroCAD output located in Appendix D. The site was classified as "Impervious, HSG C" with a CN of 98 and “> 75% Grass cover, HSG C” with a CN of 74. Area percentages were based on AutoCAD analysis. Table 3 below lists the CN values for the developed areas that will contribute storm water runoff to the system. A developed basin map is in Appendix A.

Table 3

Basin	Impervious Area (Ac) CN = 98	Landscape Area (Ac) CN = 74	TOTAL Area (Ac)	Composite CN
Site	0.44	0.23	0.67	90

Table 4 below identifies the calculated detention volume requirements for each storm event. The required detention was determined by using HydroCAD.

Table 4

Storm Event	Storage Volume (cf)
1/2 of 2-year	300
10-year	2,800

STORMWATER QUALITY ANALYSIS

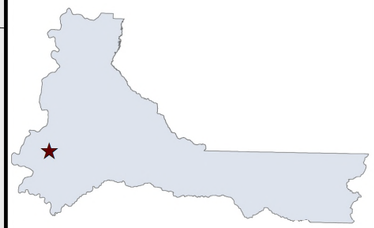
Water quality flow rates were calculated using HydroCAD 10.00. The SCS TR-20 Unit Hydrograph method was used to generate the hydrographs. A Type 1A rainfall distribution was used with a 1.38 rainfall depth. Appendix E contains the analysis.

CONCLUSION

Based on the presented information, the proposed design will meet the water quality and quantity standards. If there are any questions regarding this analysis or the design, please contact Matthew Hendrick at Multi/Tech Engineering by phone at (503) 363-9227 or via e-mail at mhendrick@mtengineering.net.

Appendix A

08 3W 14CB SALEM



MARION COUNTY, OREGON

NW1/4 SW1/4 SEC14 T8S R3W W.M.

SCALE 1" = 100'

LEGEND

LINE TYPES

- Taxlot Boundary
- Road Right-of-Way
- Railroad Right-of-Way
- Private Road ROW
- Subdivision/Plat Bndry
- Waterline - Taxlot Bndry
- Historical Boundary
- Easement
- Railroad Centerline
- Taxcode Line
- Map Boundary
- Waterline - Non Bndry

CORNER TYPES

- + 1/16TH Section Cor.
- ⊕ 1/4 Section Cor.
- ◎ DLC Corner
- 16 15 / 21 22 Section Corner

NUMBERS

Tax Code Number

000 00 00 0

Acreage *0.25 AC*

All acres listed are Net Acres, excluding any portions of the taxlot within public ROWs

NOTES

Tick Marks: A tick mark in the road indicates that the labeled dimension extends into the public ROW

200.00
175.00

CANCELLED NUMBERS

400
401
403
404
405
407
408
2300
2600
2700
2900
8000
8900

DISCLAIMER: THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSES ONLY

Marion County OREGON — Assessors Office Cartography Dept

FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT www.co.marion.or.us

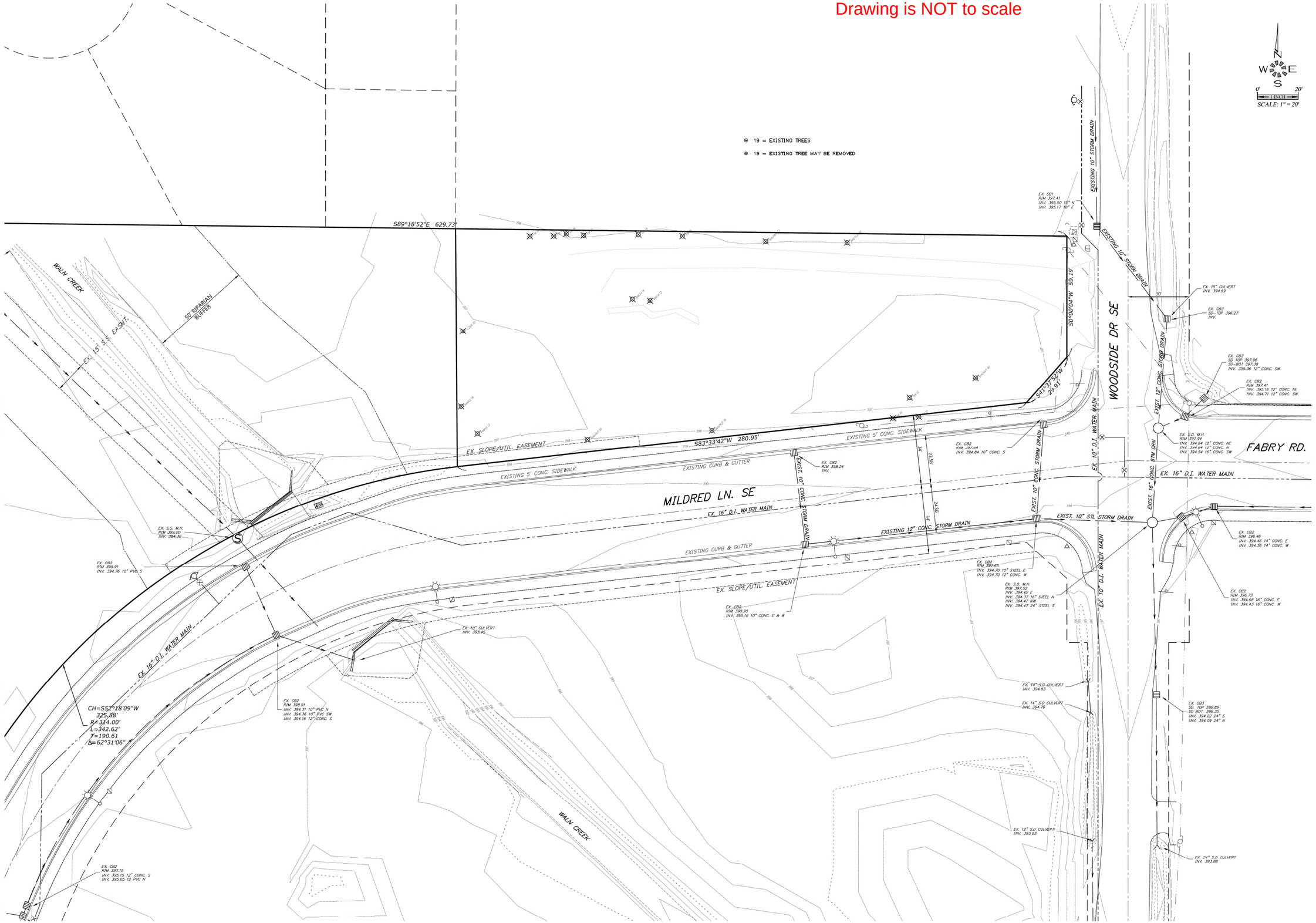
PLOT DATE: 1/24/2018

SALEM

08 3W 14CB

08 3W 14CB

Drawing is NOT to scale



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EXISITNG CONDITIONS PLAN

CHARLENE'S HOUSE APARTMENTS

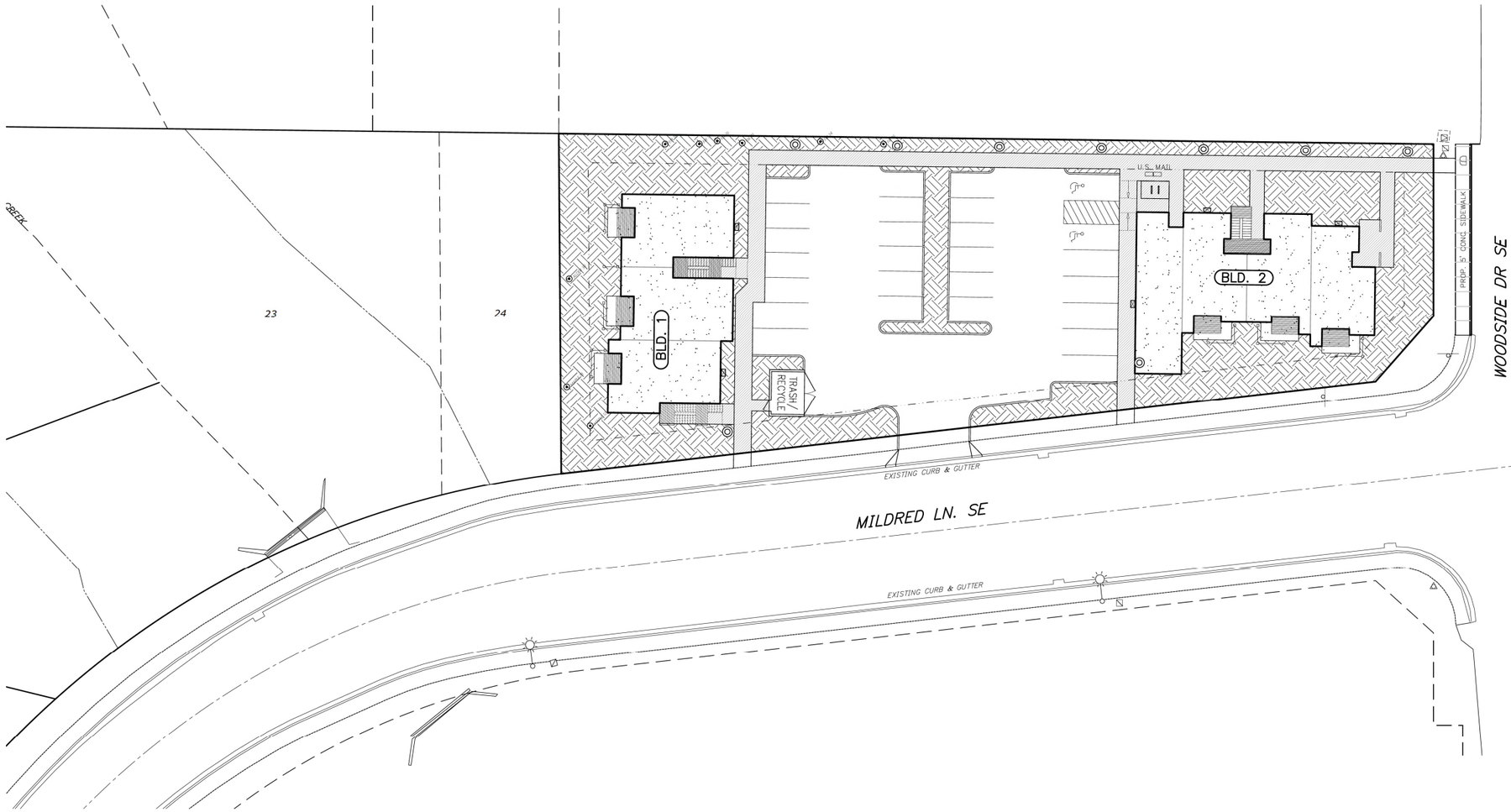
6818p SDR2-XCOND

Design: M.D.G.
Drawn: C.D.S.
Checked: J.J.G.
Date: SEPT 19
Scale: AS SHOWN

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 14, 1978
MARK D. GRENZ
EXPIRES: 06-30-2021

JOB # 6818

SDR2



W E S

0' 20'
1 INCH
SCALE: 1" = 20'

Drawing is NOT to scale

SITE AREAS
BOUNDARY — 29,145 S.F. (0.67 AC)

PERVIOUS AREA:
OPEN SPACE
COMMON OPEN SPACE — 8,360 S.F. (29.25%)
INTERIOR PARKING LOT LANDSCAPING — 1,732 S.F. (5%)

IMPERVIOUS AREA
PARKING AREA — 9,024 S.F. (32.75%)
SIDEWALK — 3,401 S.F. (11.5%)
BUILDINGS — 6,163 S.F. (21.5%)

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OPEN SPACE PLAN

CHARLENE'S HOUSE APARTMENTS

6818p SDR4-OS

Design: M.D.G.
Drawn: C.D.S.
Checked: J.J.G.
Date: SEPT 19
Scale: AS SHOWN

JOB # 6818

SDR4

J:\68xx\1818--Charlene Hhouse(Toney)\dwg -2D\6818p-dwg, SDR4-OS, 9/19/2020 9:54:18 AM, CS-Inesner

Appendix B

United States Department of Agriculture

NRCS

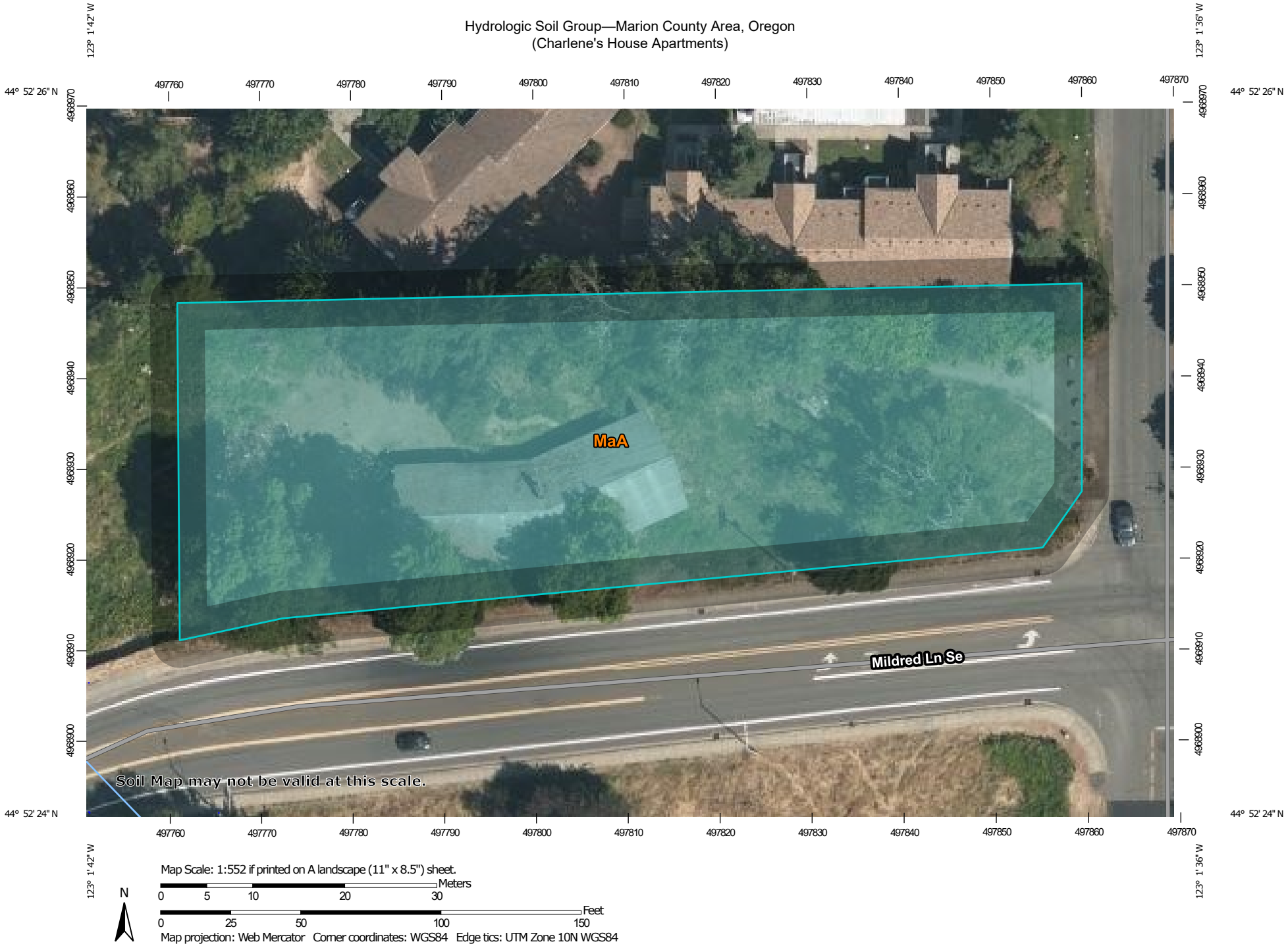
Natural Resources Conservation Service

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 Marion County Area, Oregon

Charlene's House Apartments

February 28, 2020



Map Scale: 1:552 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Marion County Area, Oregon
Survey Area Data: Version 16, Sep 10, 2019

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

Date(s) aerial images were photographed: Aug 1, 2018—Aug 31, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
MaA	McAlpin silty clay loam, 0 to 3 percent slopes	C	0.8	100.0%
Totals for Area of Interest			**0.8**	**100.0%**

Description

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

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

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

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

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

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

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

Appendix C

Drawing is NOT to scale

Point A
Elev. 398.25

Point B
Elev. 396.50

L = 170'

⊛ 19 = EXISTING TREES

⊛ 19 = EXISTING TREE MAY BE REMOVED

S89°18'52"E 629.73'

WALN CREEK

50' RIPARIAN BUFFER

EX. 15' S.S. EASMT.

EX. SLOPE/UTIL. EASEMENT

S83°33'42"W 280.95'

EXISTING 5' CONC. SIDEWALK

EXISTING CURB & GUTTER

MILDRED LN. SE

EX. 16" D.I. WATER MAIN

EXIST. 10" CONC. STORM DRAIN

EX. CB2
RIM 398.24
INV.

EXISTING 12" CONC. STORM DRAIN

EX. CB2
RIM 394.64
INV. 394.84 10" CONC. S

EXIST. 10" STL. STORM DRAIN

EX. 10" D.I. WATER MAIN

EXISTING 10" STORM DRAIN

EX. CB1
RIM 397.41
INV. 395.50 10" N
INV. 395.17 10" E

S0°00'04"W 59.19'

S41°37'52"W 29.91'

WOODSIDE DR SE

EXIST. 12" CONC. STORM DRAIN

EX. 15" CULVERT
INV. 394.69

EX. CB3
SD-TOP 396.27
INV.

EX. CB3
SD TOP 397.96
SD-BOT 397.38
INV. 395.36 12" CONC. SW

EX. CB2
RIM 397.41
INV. 395.16 12" CONC. NE
INV. 394.71 12" CONC. SW

EX. S.D. M.H.
RIM 397.94
INV. 394.64 12" CONC. NE
INV. 394.64 12" CONC. N
INV. 394.54 16" CONC. SW

FABRY RD.

EX. 16" D.I. WATER MAIN

EXIST. 16" CONC. STM DRN

EX. CB2
RIM 396.46
INV. 394.46 14" CONC. E
INV. 394.36 14" CONC. W

EX. CB2
RIM 396.73
INV. 394.68 16" CONC. E
INV. 394.43 16" CONC. W

EX. CB2
RIM 397.65
INV. 394.70 10" STEEL E
INV. 394.70 12" CONC. W

EX. S.D. M.H.
RIM 397.52
INV. 394.42 E
INV. 394.37 16" STEEL N
INV. 394.47 NW
INV. 394.47 24" STEEL S

EX. 10" D.I. WATER MAIN

EX. 14" S.D. CULVERT
INV. 394.83

EX. 14" S.D. CULVERT
INV. 394.76

EX. CB3
SD TOP 396.89
SD BOT. 396.30
INV. 394.22 24" S
INV. 394.09 24" N

EX. 12" S.D. CULVERT
INV. 393.03

EX. 24" S.D. CULVERT
INV. 393.88

EX. 10" CULVERT
INV. 393.43

EX. 16" D.I. WATER MAIN

CH=S52°18'09"W
325.88'
R=314.00'
L=342.62'
T=190.61
Δ=62°31'06"

EX. CB2
RIM 398.91
INV. 394.31 10" PVC N
INV. 394.36 10" PVC SW
INV. 394.16 12" CONC. S

EX. CB2
RIM 398.91
INV. 394.76 10" PVC S

EX. S.S. M.H.
RIM 399.00
INV. 394.90

EX. CB2
RIM 397.15
INV. 395.15 12" CONC. S
INV. 395.05 12" PVC N

EX. CB2
RIM 398.20
INV. 395.10 10" CONC. E & W

WALN CREEK

Time of concentration

SCALE: 1" = 20'

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EXISITNG CONDITIONS PLAN

CHARLENE'S HOUSE
APARTMENTS

NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.

DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

6818p SDR2-XCOND

Design: M.D.G.
Drawn: C.D.S.
Checked: J.J.G.
Date: SEPT 19
Scale: AS SHOWN

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 14, 1978
MARK D. GRENZ
EXPIRES: 06-30-2021

JOB # 6818

SDR2

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Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project	By	Date
Charlene's House Apartments	M. Hendrick	3/2020
Location	**Checked**	**Date**
Salem, Oregon		

Check one: ☑ Present ☐ Developed

Check one: ☑ T_c ☑ T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

	Segment ID	A-B	
1.	Surface description (Table 4D-4)	Mixed	
2.	Manning's roughness coefficient, n (Table 4D-4)	0.30	
3.	Flow length, L (total L † 300 ft) ft	170	
4.	Two-year 24-hour rainfall, P_2 in	2.2	
5.	Land slope, s ft/ft	0.01	
6.	$T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t hr	0.692	+ = 0.692

Shallow concentrated flow

	Segment ID		
7.	Surface description (paved or unpaved)		
8.	Flow length, L ft		
9.	Watercourse slope, s ft/ft		
10.	Average velocity, V (figure 3-1) ft/s		
11.	$T_t = \frac{L}{3600\ V}$ Compute T_t hr		+ =

Channel flow

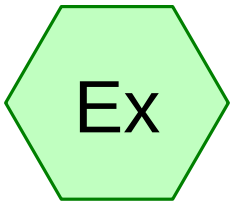
	Segment ID		
12.	Cross sectional flow area, a ft^2		
13.	Wetted perimeter, p_w ft		
14.	Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft		
15	Channel slope, s ft/ft		
16.	Manning's roughness coefficient, n		
17.	$V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V ft/s		
18.	~~Flow~~ length, L ft		
19.	$T_t = \frac{L}{3600\ V}$ Compute T_t hr		+ =
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) Hr		0.692

0.692 Hrs = 41.5 Minutes

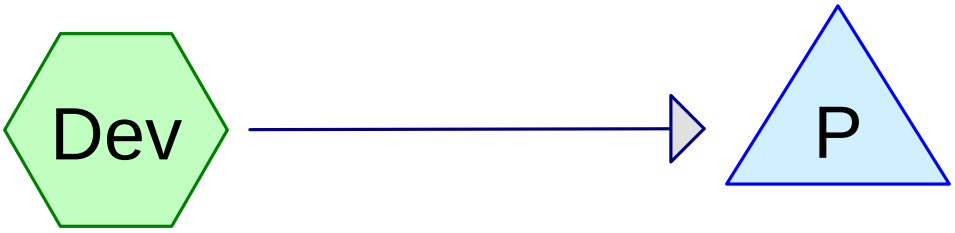
Manning's Roughness Coefficients for Overland Sheet Flow	
Surface Types:	**n**
Impervious Areas	0.014
Gravel Pavement	0.02
Developed: Landscape Areas (Except Lawns)	0.08
Undeveloped: Meadow, Pasture, or Farm	0.15
Developed: Lawns	0.24
Pre-developed: Mixed	0.30
Pre-developed: Woodland and Forest	0.40
Development Types:	**n**
Commercial Development	0.015
Industrial Development, Heavy	0.04
Industrial Development, Light	0.05
Dense Residential (over 6 units/acre)	0.08
Normal Residential (3 to 6 units/acre)	0.20
Light Residential (1 to 3 units/acre)	0.30
Parks	0.40

Table 4D-4. Manning's Roughness Coefficients for Overland Sheet Flow

Appendix D

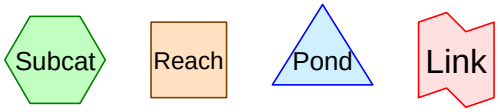


Existing Conditions



Developed Conditions

Planter Media



Routing Diagram for Hydrology

Prepared by Multitech Engineering Services, Inc., Printed 5/19/2020

Summary for Subcatchment Ex: Existing Conditions

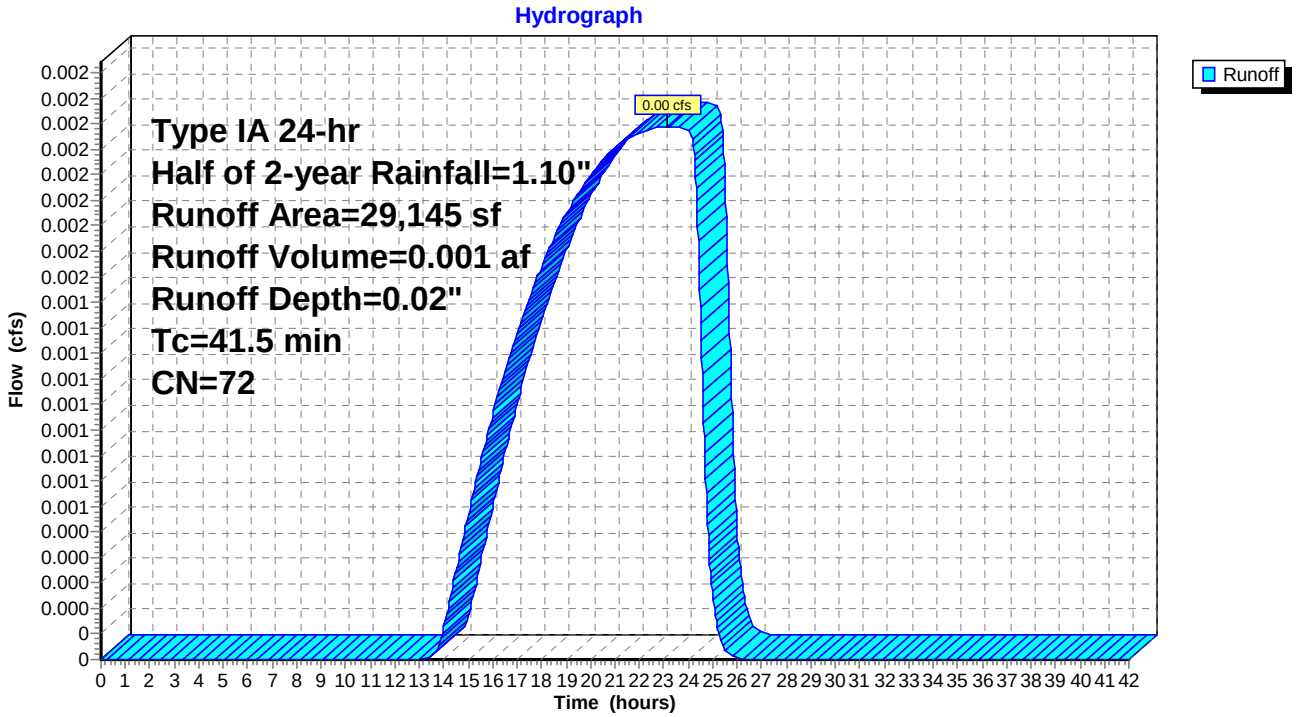
Runoff = 0.00 cfs @ 23.10 hrs, Volume= 0.001 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.02 hrs
Type IA 24-hr Half of 2-year Rainfall=1.10"

	Area (sf)	CN	Description
*	29,145	72	City of Salem Predeveloped, HSG C
	29,145		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
41.5					**Direct Entry, TR-55 Worksheet**

Subcatchment Ex: Existing Conditions



Summary for Subcatchment Dev: Developed Conditions

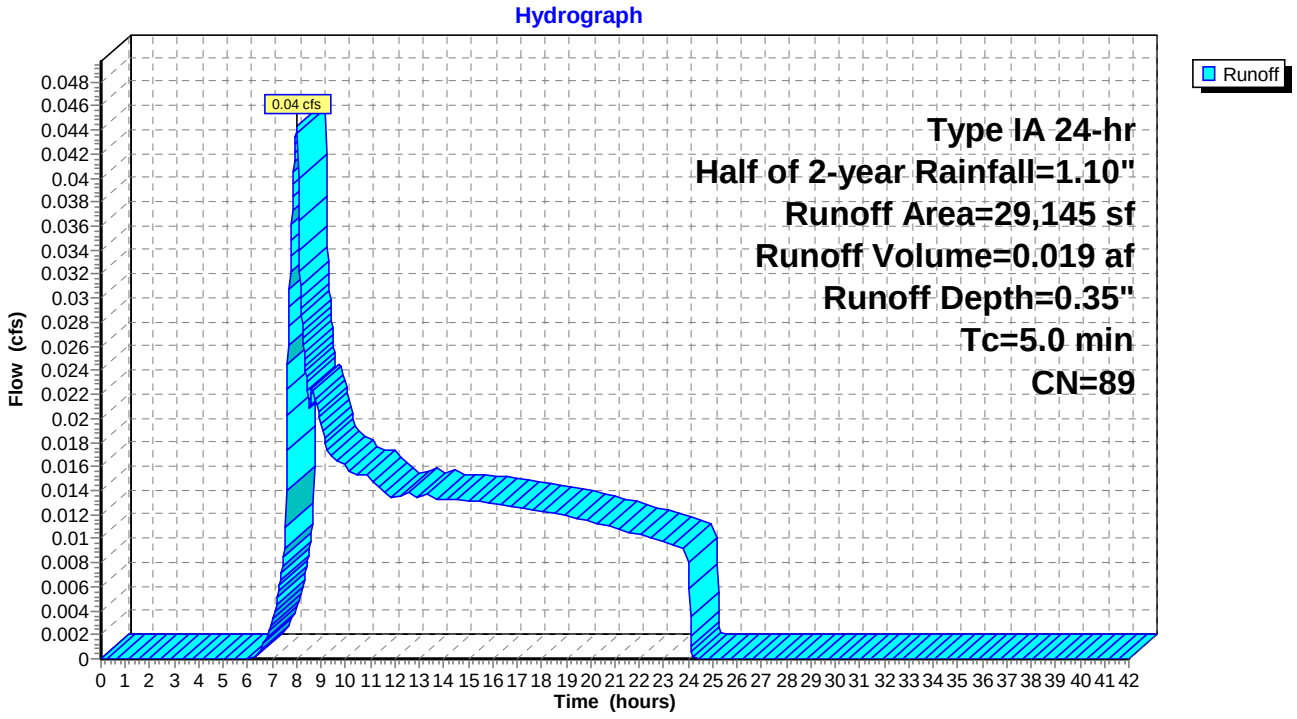
Runoff = 0.04 cfs @ 8.01 hrs, Volume= 0.019 af, Depth= 0.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.02 hrs
Type IA 24-hr Half of 2-year Rainfall=1.10"

Area (sf)	CN	Description
18,588	98	Paved parking, HSG C
10,557	74	>75% Grass cover, Good, HSG C
29,145	89	Weighted Average
10,557		36.22% Pervious Area
18,588		63.78% Impervious Area

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

Subcatchment Dev: Developed Conditions



Summary for Pond P: Planter Media

Inflow Area = 0.669 ac, 63.78% Impervious, Inflow Depth = 0.35" for Half of 2-year event
Inflow = 0.04 cfs @ 8.01 hrs, Volume= 0.019 af
Outflow = 0.01 cfs @ 7.56 hrs, Volume= 0.019 af, Atten= 81%, Lag= 0.0 min
Discarded = 0.01 cfs @ 7.56 hrs, Volume= 0.019 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.02 hrs
Peak Elev= 396.53' @ 24.03 hrs Surf.Area= 615 sf Storage= 325 cf

Plug-Flow detention time= 387.4 min calculated for 0.019 af (100% of inflow)
Center-of-Mass det. time= 387.4 min (1,253.2 - 865.8)

Volume	Invert	Avail.Storage	Storage Description
#1	393.74'	2,625 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

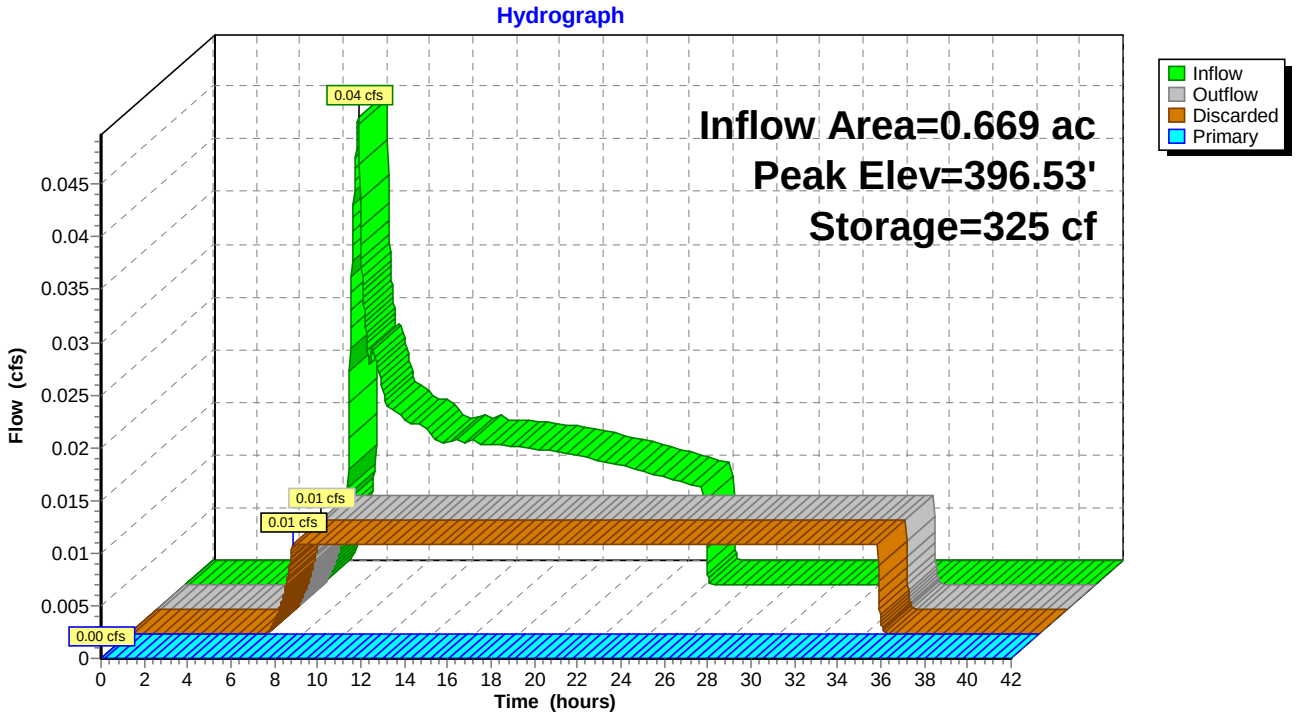
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
393.74	615	0.0	0	0
393.75	615	40.0	2	2
394.74	615	40.0	244	246
394.75	615	5.0	0	246
396.49	615	5.0	54	300
396.50	615	100.0	6	306
398.00	615	100.0	923	1,228
398.01	615	100.0	6	1,235
398.51	4,945	100.0	1,390	2,625

Device	Routing	Invert	Outlet Devices
#1	Discarded	393.74'	**0.600 in/hr Exfiltration over Surface area**
#2	Primary	398.45'	**2.5" x 31.5" Horiz. Grate X 7.00** C= 0.600 in 27.0" x 32.0" Grate (64% open area)

Discarded OutFlow Max=0.01 cfs @ 7.56 hrs HW=393.75' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=393.74' (Free Discharge)
↑—**2=Grate** (Controls 0.00 cfs)

Pond P: Planter Media



Summary for Subcatchment Ex: Existing Conditions

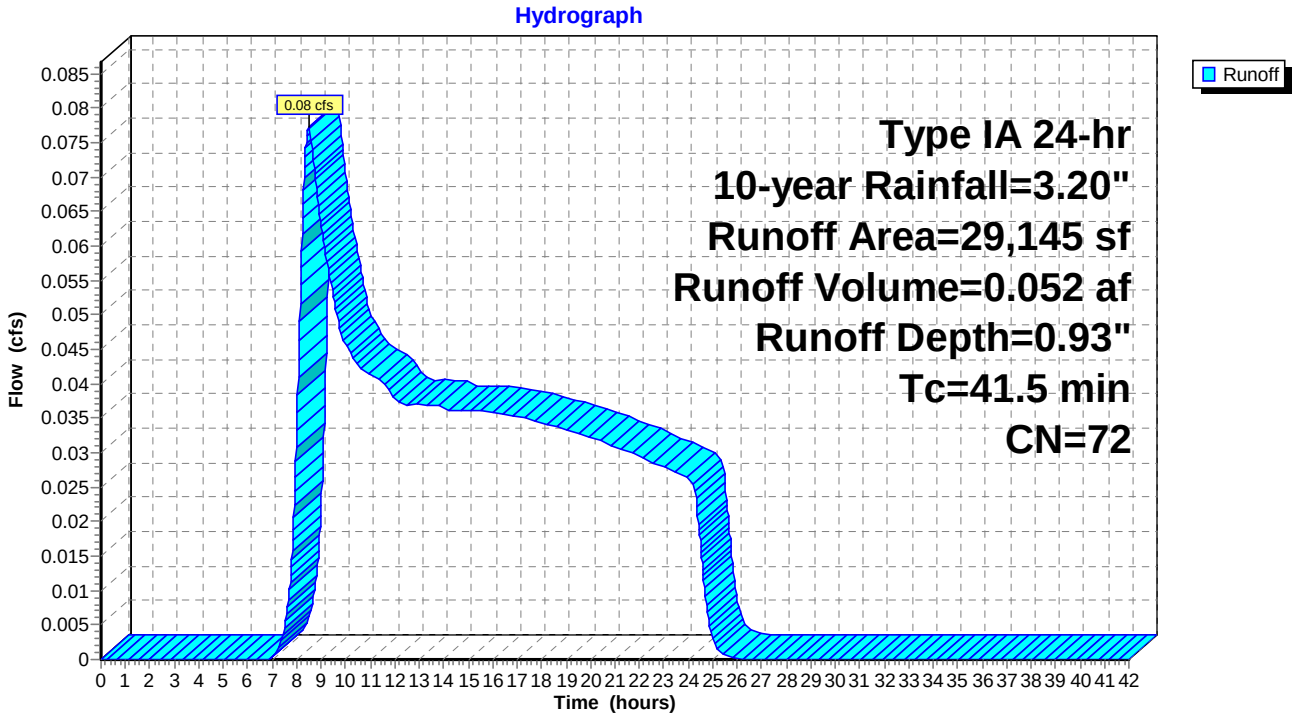
Runoff = 0.08 cfs @ 8.49 hrs, Volume= 0.052 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.02 hrs
Type IA 24-hr 10-year Rainfall=3.20"

	Area (sf)	CN	Description
*	29,145	72	City of Salem Predeveloped, HSG C
	29,145		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
41.5					**Direct Entry, TR-55 Worksheet**

Subcatchment Ex: Existing Conditions



Summary for Subcatchment Dev: Developed Conditions

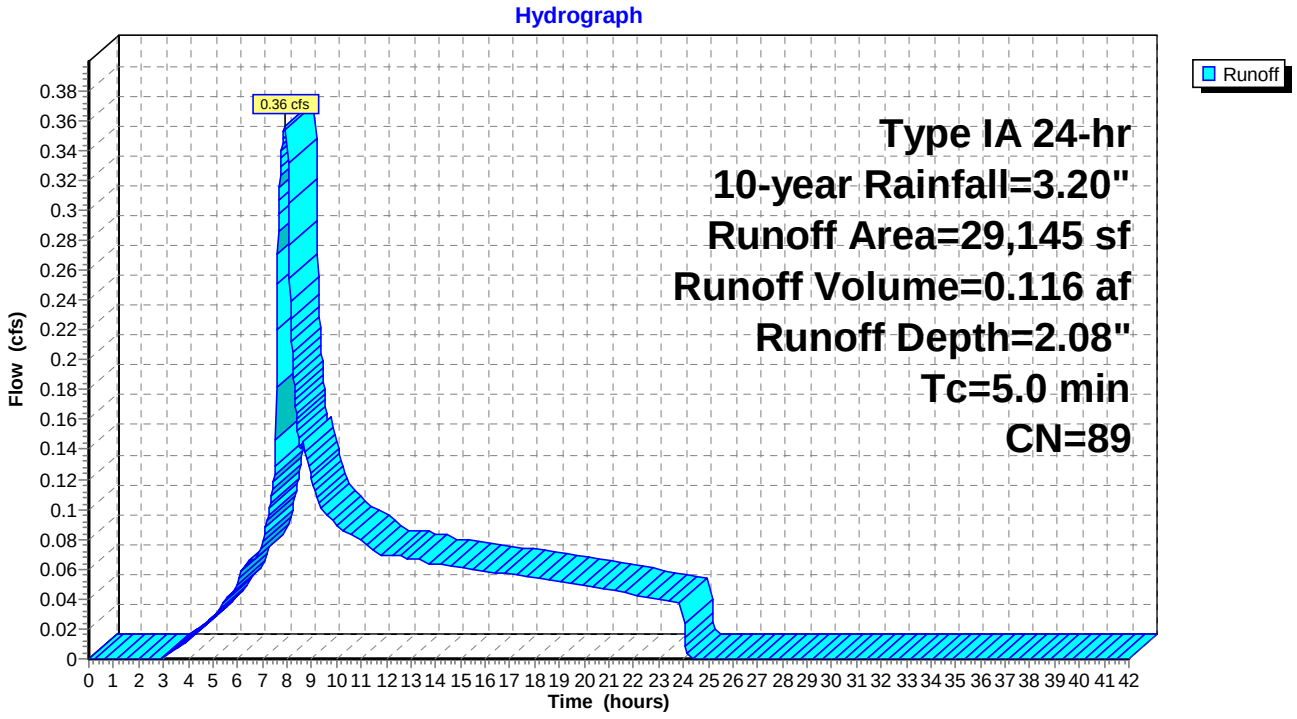
Runoff = 0.36 cfs @ 7.92 hrs, Volume= 0.116 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.02 hrs
Type IA 24-hr 10-year Rainfall=3.20"

Area (sf)	CN	Description
18,588	98	Paved parking, HSG C
10,557	74	>75% Grass cover, Good, HSG C
29,145	89	Weighted Average
10,557		36.22% Pervious Area
18,588		63.78% Impervious Area

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

Subcatchment Dev: Developed Conditions



Summary for Pond P: Planter Media

Inflow Area = 0.669 ac, 63.78% Impervious, Inflow Depth = 2.08" for 10-year event
Inflow = 0.36 cfs @ 7.92 hrs, Volume= 0.116 af
Outflow = 0.06 cfs @ 17.13 hrs, Volume= 0.095 af, Atten= 84%, Lag= 552.9 min
Discarded = 0.06 cfs @ 17.13 hrs, Volume= 0.095 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.02 hrs
Peak Elev= 398.41' @ 17.13 hrs Surf.Area= 4,041 sf Storage= 2,155 cf

Plug-Flow detention time= 530.7 min calculated for 0.095 af (82% of inflow)
Center-of-Mass det. time= 419.7 min (1,174.2 - 754.5)

Volume	Invert	Avail.Storage	Storage Description
#1	393.74'	2,625 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

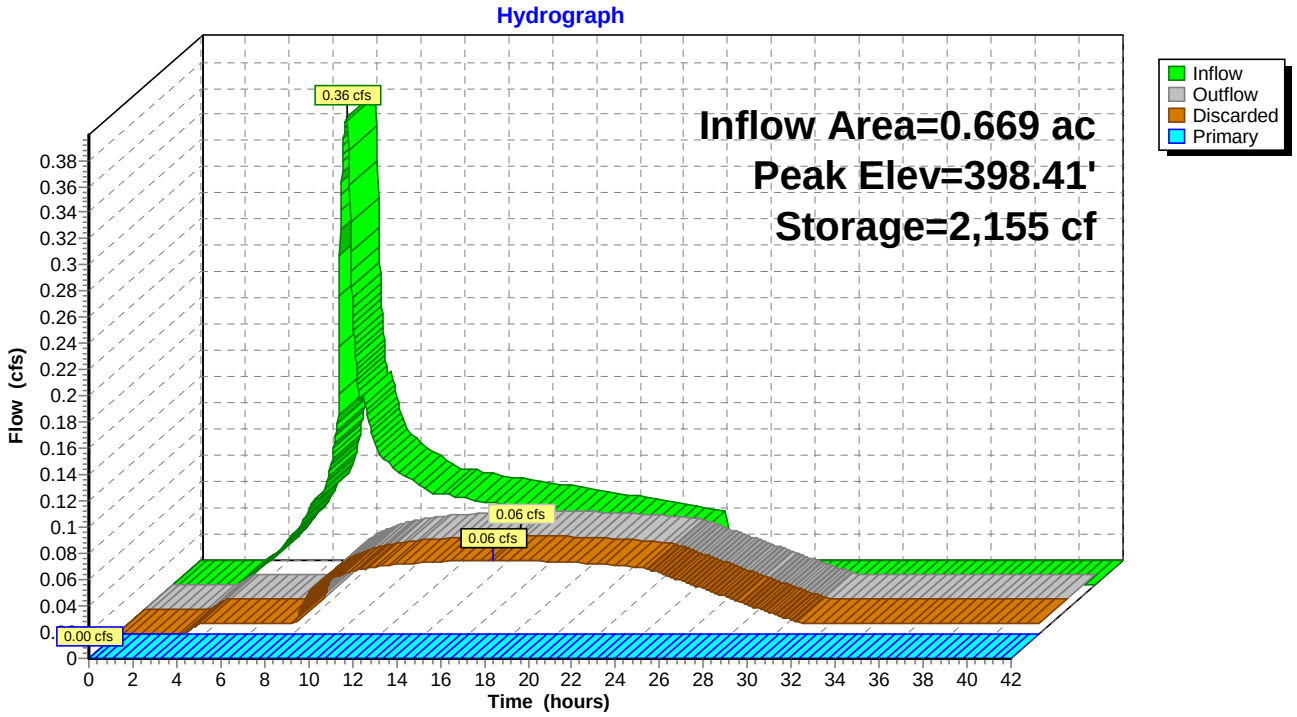
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
393.74	615	0.0	0	0
393.75	615	40.0	2	2
394.74	615	40.0	244	246
394.75	615	5.0	0	246
396.49	615	5.0	54	300
396.50	615	100.0	6	306
398.00	615	100.0	923	1,228
398.01	615	100.0	6	1,235
398.51	4,945	100.0	1,390	2,625

Device	Routing	Invert	Outlet Devices
#1	Discarded	393.74'	**0.600 in/hr Exfiltration over Surface area**
#2	Primary	398.45'	**2.5" x 31.5" Horiz. Grate X 7.00** C= 0.600 in 27.0" x 32.0" Grate (64% open area)

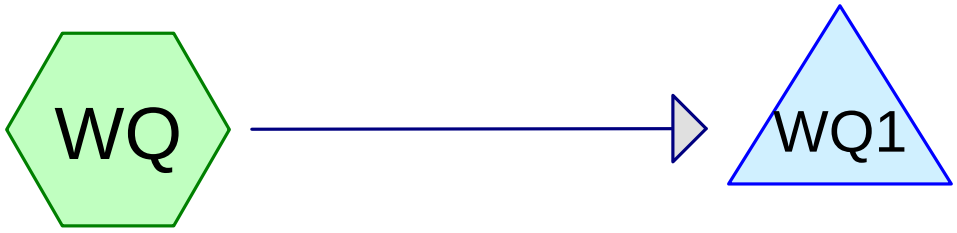
Discarded OutFlow Max=0.06 cfs @ 17.13 hrs HW=398.41' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=393.74' (Free Discharge)
↑—**2=Grate** (Controls 0.00 cfs)

Pond P: Planter Media



Appendix E



Developed Conditions

Planter Media

Subcat Reach Pond Link

Routing Diagram for Hydrology

Prepared by Multitech Engineering Services, Inc., Printed 5/19/2020

Summary for Subcatchment WQ: Developed Conditions

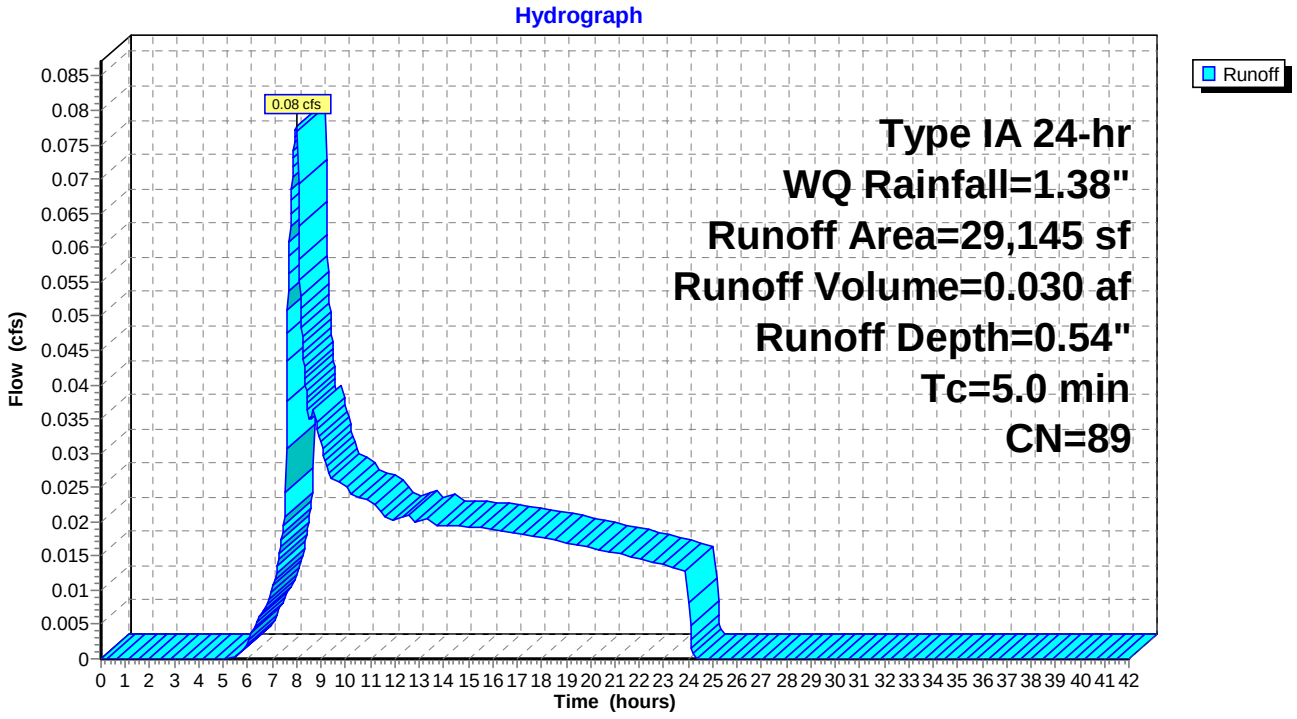
Runoff = 0.08 cfs @ 7.99 hrs, Volume= 0.030 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.02 hrs
Type IA 24-hr WQ Rainfall=1.38"

Area (sf)	CN	Description
18,588	98	Paved parking, HSG C
10,557	74	>75% Grass cover, Good, HSG C
29,145	89	Weighted Average
10,557		36.22% Pervious Area
18,588		63.78% Impervious Area

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

Subcatchment WQ: Developed Conditions



Summary for Pond WQ1: Planter Media

Inflow Area = 0.669 ac, 63.78% Impervious, Inflow Depth = 0.54" for WQ event
Inflow = 0.08 cfs @ 7.99 hrs, Volume= 0.030 af
Outflow = 0.01 cfs @ 6.94 hrs, Volume= 0.025 af, Atten= 89%, Lag= 0.0 min
Discarded = 0.01 cfs @ 6.94 hrs, Volume= 0.025 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.02 hrs
Peak Elev= 397.25' @ 24.06 hrs Surf.Area= 615 sf Storage= 769 cf

Plug-Flow detention time= 708.2 min calculated for 0.025 af (83% of inflow)
Center-of-Mass det. time= 613.4 min (1,449.5 - 836.0)

Volume	Invert	Avail.Storage	Storage Description
#1	393.74'	2,625 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
393.74	615	0.0	0	0
393.75	615	40.0	2	2
394.74	615	40.0	244	246
394.75	615	5.0	0	246
396.49	615	5.0	54	300
396.50	615	100.0	6	306
398.00	615	100.0	923	1,228
398.01	615	100.0	6	1,235
398.51	4,945	100.0	1,390	2,625

Device	Routing	Invert	Outlet Devices
#1	Discarded	393.74'	**0.600 in/hr Exfiltration over Surface area**
#2	Primary	398.45'	**2.5" x 31.5" Horiz. Grate X 7.00** C= 0.600 in 27.0" x 32.0" Grate (64% open area)

Discarded OutFlow Max=0.01 cfs @ 6.94 hrs HW=393.75' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=393.74' (Free Discharge)
↑—**2=Grate** (Controls 0.00 cfs)

Pond WQ1: Planter Media