

## Memorandum

To: **City of Tualatin**

Copy: **Vista Residential Partners**

From: **Jennifer Danziger**

Date: **January 30, 2023**

Subject: **Norwood Apartments – Conceptual Future Access on SW Boones Ferry Road**

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### Introduction

The proposed Norwood Apartments project includes the development of a 276-unit apartment complex on a site located south of SW Norwood Road and east of SW Boones Ferry Road in Tualatin, Oregon. The project site consists of tax map 2S135D lots 108 and 106. Lot 108 includes a 1.0-acre parcel located at 9300 SW Norwood Road and is currently occupied by one single-family home that currently takes access from SW Norwood Road. Lot 106 includes an 8.2-acre portion of the parcel located at 23370 SW Boones Ferry Road, which is part of the Horizon Christian School property, which has existing accesses on both SW Norwood Road and SW Boones Ferry Road.

Future access to the site will be provided via one new driveway along SW Norwood Road. An emergency access connection to the Horizon School circulation network will be provided. The site location is shown in Figure 1: Project Location (Source: City of Tualatin Interactive Zoning Map) with the project site outlined in yellow.

### Adjacent Properties

The proposed development abuts three parcels (tax map 2S135D lots 101, 102, and 109) with frontage along SW Boones Ferry Road. These parcels are outlined in red on Figure 1. Two of these parcels, Tax Lots 101 and 102, currently have direct access on SW Boones Ferry Road while Tax Lot 109 has direct access on SW Norwood Road.



Figure 1: Project Location (Source: City of Tualatin Interactive Zoning Map)

## Future Access Concept

SW Boones Ferry Road is an arterial in Washington County. Per CDC Section 501-8.5B, the access spacing on an arterial is 600 feet and direct access shall be from collectors or other arterial streets.

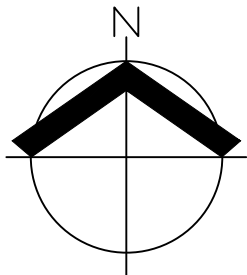
With the potential redevelopment of these properties at some time in the future, private access to SW Boones Ferry Road will not be permitted and alternative access will be required. Taking access through the proposed Norwood Apartments development is not appropriate as the internal network is designed to accommodate parking and circulation, not through traffic from other development. Connecting to the Horizon School Access Road would involve traversing the water quality facilities serving the school property. Therefore, Exhibit A illustrates a preliminary site access concept to demonstrate how future access could be provided for these three parcels.

The exhibit shows a local street access developed along the property line between Tax Lots 101 and 102 that would connect with SW Boones Ferry Road approximately 523 feet south of SW Norwood Road and 443 feet north of the Horizon School access. It is not possible to meet the 600-foot spacing requirement while the Horizon School has an access on SW Boones Ferry Road but this location is likely to be beyond any queuing that would occur with future signalization of the SW Boones Ferry Road & SW Norwood Road intersection, thus no conflict exists. This concept would also allow for a north-south connection that could serve Tax Lot 109 as well.

### *Attachments:*

*Exhibit A: Preliminary Site Access Concept*





SCALE: 1" = 150 FEET



ORIGINAL PAGE SIZE: 8.5" x 11"

DATE: 12/07/2022

**PRELIMINARY SITE ACCESS CONCEPT**

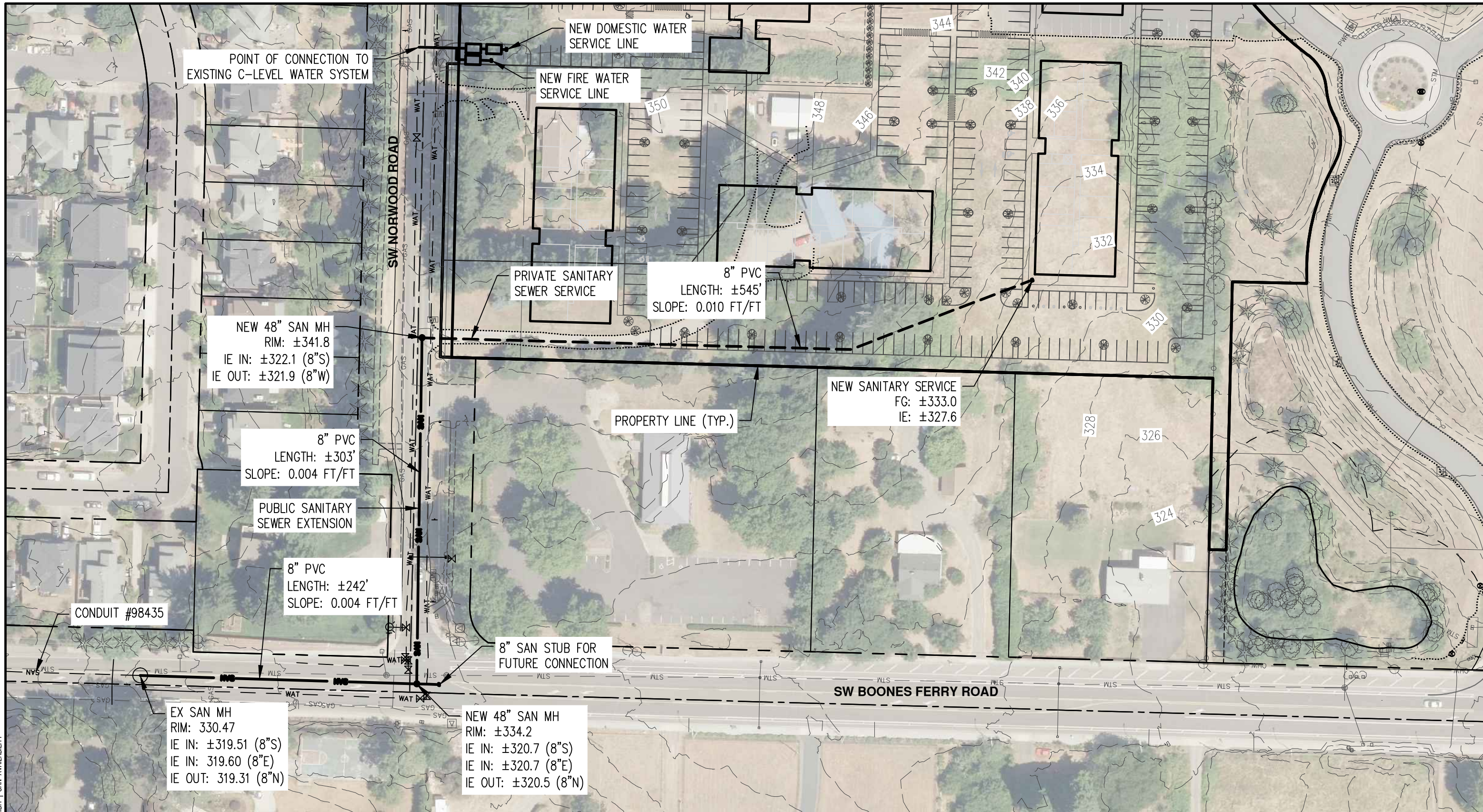
EXHIBIT  
**A**

AKS ENGINEERING & FORESTRY, LLC  
 12965 SW HERMAN RD, STE 100  
 TUALATIN, OR 97062  
 503.563.6151 WWW.AKS-ENG.COM

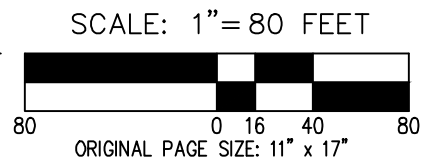
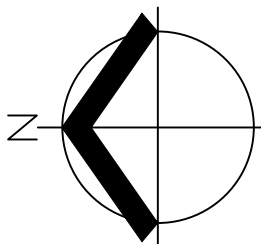


DRWN: JLG  
 CHKD: AMC  
 AKS JOB:  
 8723

DWG: 8723\_20221205 SANITARY CAPACITY EXHIBIT | SAN AVAILABILITY



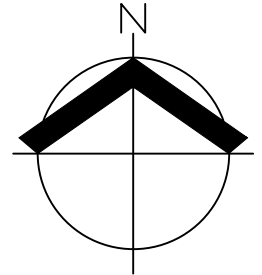
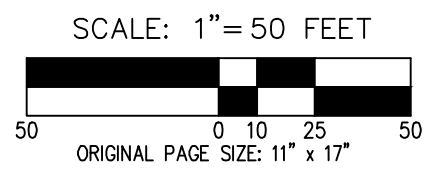
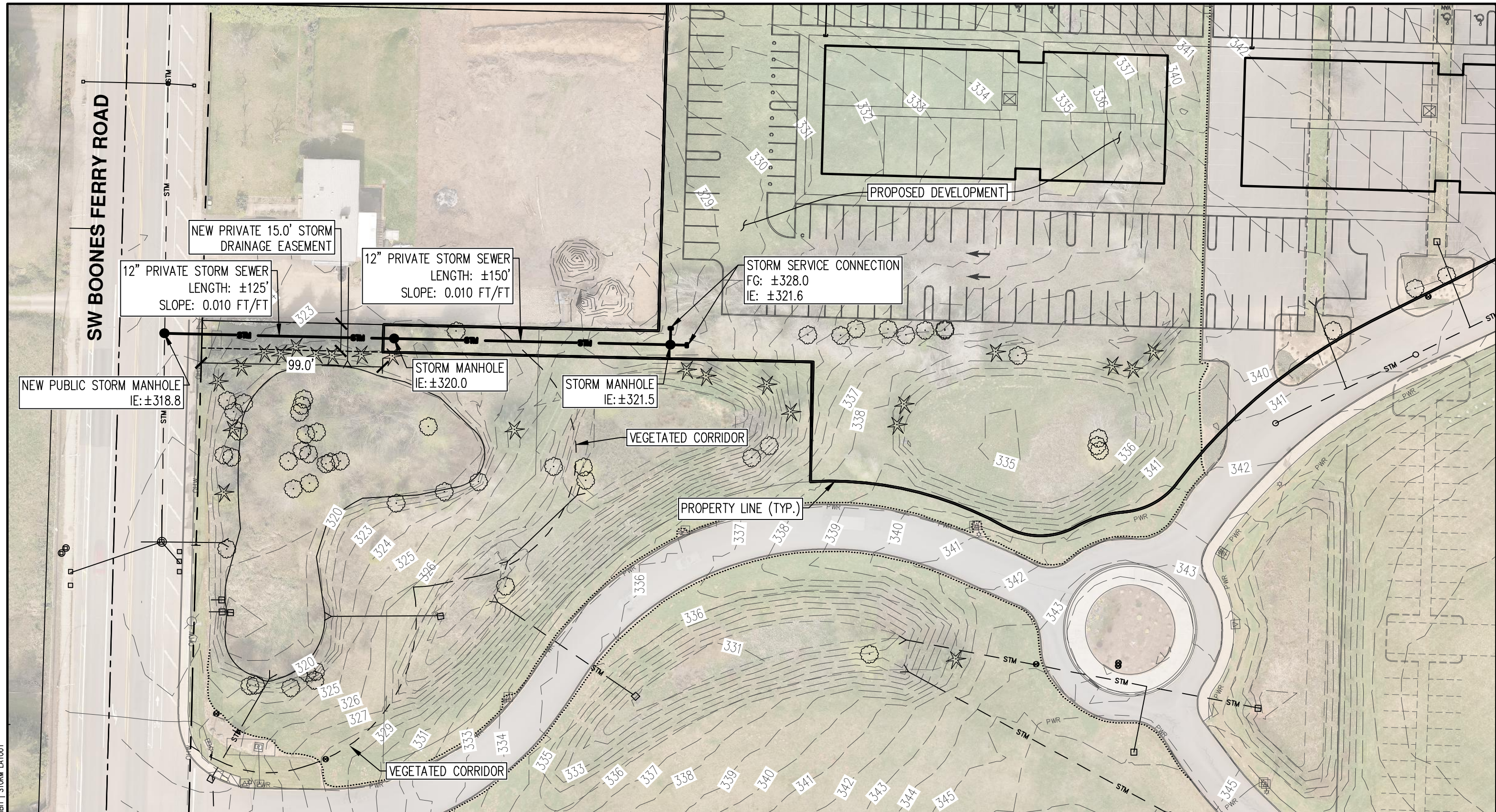
DATE: 12/16/2022



<b>PRELIMINARY SANITARY SEWER LAYOUT</b>		FIGURE
<b>NORWOOD MULTI-FAMILY</b>		<b>2</b>
AKS ENGINEERING & FORESTRY, LLC 12965 SW HERMAN RD #100 TUALATIN, OR 97062 503.563.6151    WWW.AKS-ENG.COM		DRWN: JAM CHKD: AMC AKS JOB: 8723



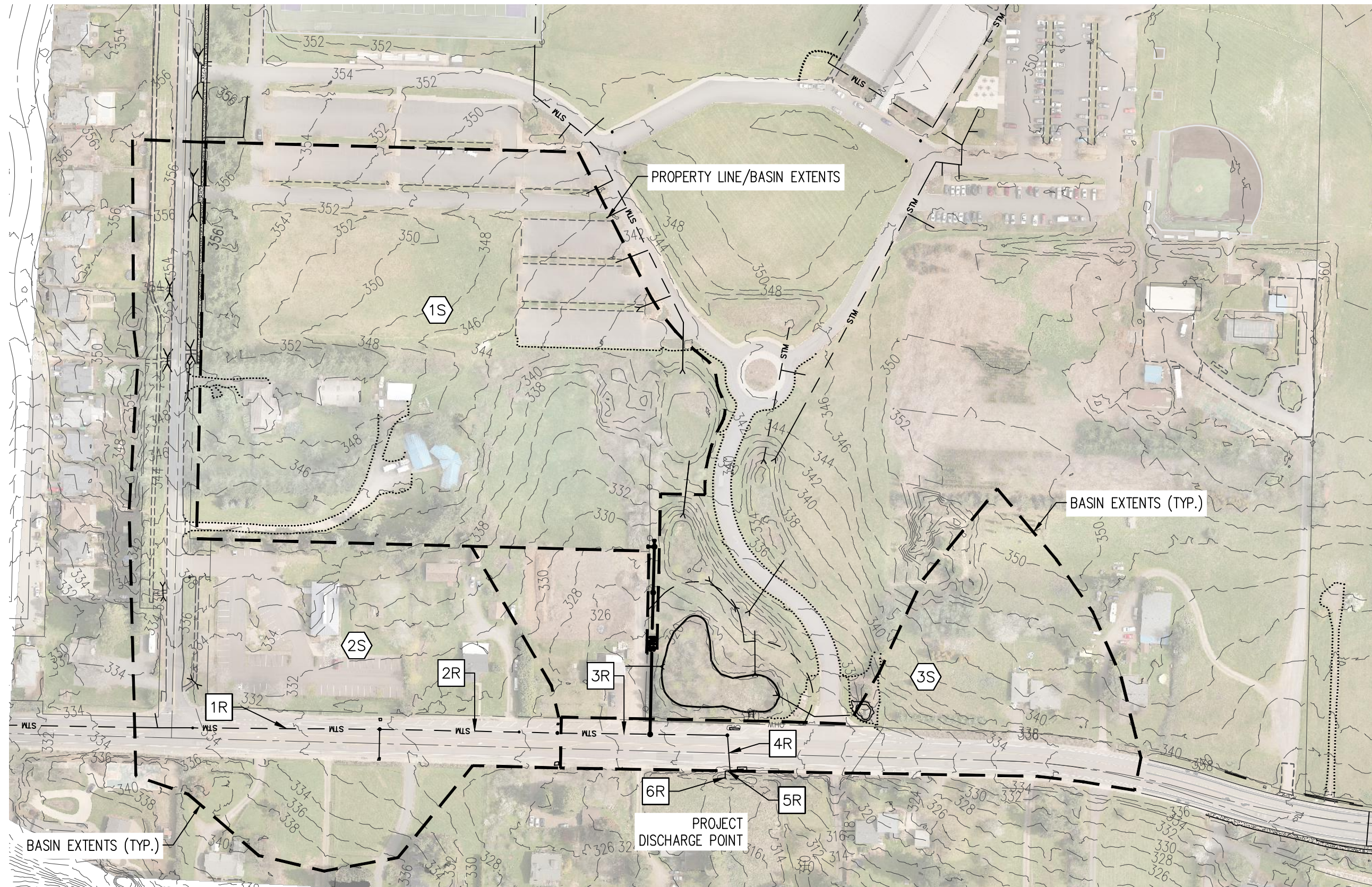
DWG: 8723 20220908 STORM AVAILABILITY EXHIBIT | STORM LAYOUT



DATE: 12/16/2022

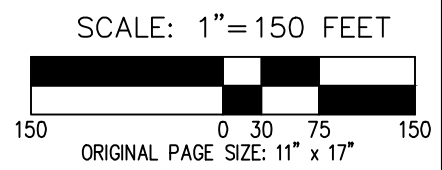
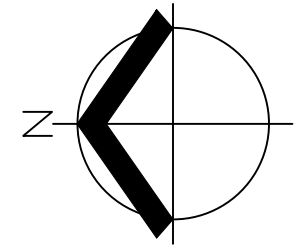
<b>PRELIMINARY STORMWATER LAYOUT</b>		FIGURE
<b>NORWOOD MULTI-FAMILY</b>		<b>3</b>
AKS ENGINEERING & FORESTRY, LLC 12965 SW HERMAN RD #100 TUALATIN, OR 97062 503.563.6151 WWW.AKS-ENG.COM		DRWN: JAM CHKD: AMC AKS JOB: 8723





DWG: 8723\_20220518 PRELIMINARY DRAINAGE EXHIBIT | EX-A

DATE: 12/16/2022



<b>PRELIMINARY BASIN MAP</b>		FIGURE
<b>NORWOOD MULTI-FAMILY</b>		<b>4</b>
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**NORWOOD MULTI-FAMILY DEVELOPMENT  
SANITARY PIPE CAPACITY CALCULATIONS**



Client: Vista Residential Partners  
Project: Norwood Multi-Family  
AKS Job No.: 8723  
Date: 12/16/2022  
Done By: AMC

Post-Developed Private System Flow Calculations		
Peak Daily Flow (GPM)	I/I (GPM)	PWWF (GPM)
38.33	25.53	109.86

CONDUIT ID	PIPE INFO			SCENARIO										
	SIZE (IN)	SLOPE (FT/FT)	PIPE CAPACITY	EXISTING		2025			2035			FULL BUILDOUT		
				MODEL	REMAINING CAPACITY	MODEL	MODEL + PWWF	REMAINING CAPACITY	MODEL	MODEL + PWWF	REMAINING CAPACITY	MODEL	MODEL + PWWF	REMAINING CAPACITY
98435	8	0.0435	1130.87	6.52	1124.35	6.73	116.59	1014.28	6.73	116.59	1014.28	6.73	116.59	1014.28
98691	8	0.0474	1181.41	9.38	1172.03	9.74	119.60	1061.81	9.74	119.60	1061.81	9.74	119.60	1061.81
98690	8	0.0121	595.91	13.80	582.11	14.24	124.10	471.81	14.24	124.10	471.81	14.24	124.10	471.81
98685	8	0.0077	474.31	19.09	455.22	19.70	129.56	344.75	19.70	129.56	344.75	19.70	129.56	344.75
98689	8	0.0029	291.02	16.06	274.96	16.60	126.46	164.56	16.60	126.46	164.56	16.60	126.46	164.56
98688	8	0.0046	368.24	8.44	359.80	8.92	118.78	249.46	8.92	118.78	249.46	8.92	118.78	249.46
98686	8	0.0038	334.93	2.76	332.17	3.04	112.90	222.03	3.04	112.90	222.03	3.04	112.90	222.03
98687	8	0.0052	389.34	0.53	388.81	0.64	110.50	278.84	0.64	110.50	278.84	0.64	110.50	278.84
98314	8	0.0066	439.46	40.13	399.33	42.97	152.83	286.63	42.97	152.83	286.63	42.97	152.83	286.63
98957	8	0.0041	347.77	40.62	307.15	43.37	153.23	194.54	43.37	153.23	194.54	43.37	153.23	194.54
99426	8	0.0440	360.63	40.12	320.51	43.04	152.90	207.73	43.04	152.90	207.73	43.04	152.90	207.73
99427	8	0.0072	459.06	33.89	425.17	37.13	146.99	312.07	37.13	146.99	312.07	37.13	146.99	312.07
99041	8	0.0042	352.57	35.39	317.18	39.02	148.88	203.69	39.02	148.88	203.69	39.02	148.88	203.69
99040	8	0.0039	336.61	16.82	319.79	19.17	129.03	207.58	19.17	129.03	207.58	19.17	129.03	207.58
99408	8	0.0483	1192.08	11.65	1180.43	13.48	123.34	1068.74	13.48	123.34	1068.74	13.48	123.34	1068.74
98951	8	0.0047	370.07	5.36	364.71	6.74	116.60	253.47	6.74	116.60	253.47	6.74	116.60	253.47
98594	8	0.0070	452.22	18.01	434.21	19.92	129.78	322.44	19.92	129.78	322.44	19.92	129.78	322.44
98593	8	0.0060	420.11	15.44	404.67	16.64	126.50	293.61	16.64	126.50	293.61	16.64	126.50	293.61
98596	8	0.0058	411.38	14.82	396.56	15.83	125.69	285.69	15.83	125.69	285.69	15.83	125.69	285.69
98592	8	0.0585	1312.35	22.84	1289.51	24.13	133.99	1178.36	24.13	133.99	1178.36	24.13	133.99	1178.36
98290	8	0.0273	896.20	22.61	873.59	23.84	133.70	762.50	23.84	133.70	762.50	23.84	133.70	762.50
1706	10	0.0096	964.40	26.36	938.04	27.57	137.43	826.97	27.57	137.43	826.97	27.57	137.43	826.97
1705	12	0.0034	935.23	34.45	900.78	34.45	144.31	790.92	34.45	144.31	790.92	34.45	144.31	790.92

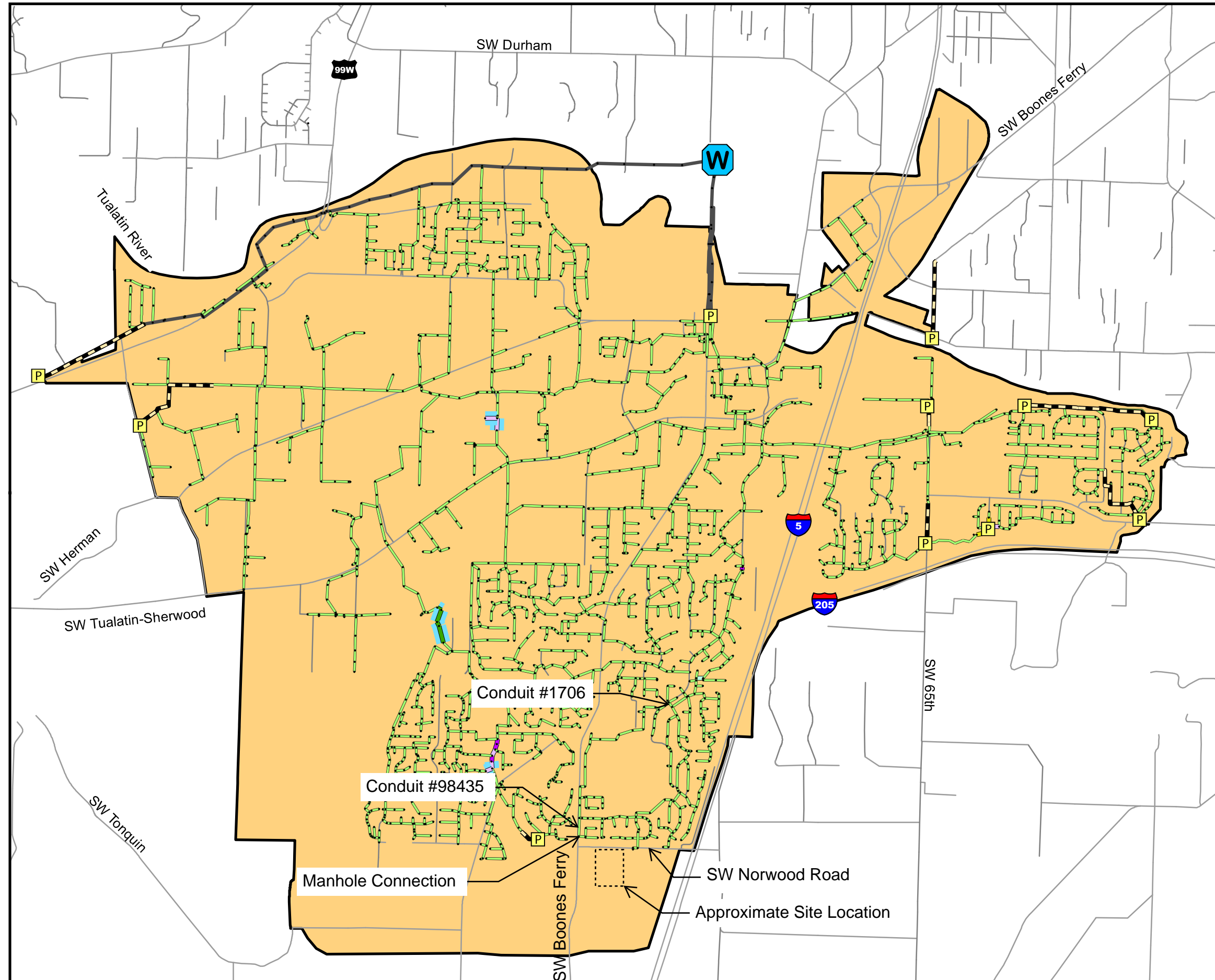
**MODEL = RESULTANT FLOW FROM CITY INFOSWMM MODEL**

**MODEL + AWWF = MODEL + POST-DEVELOPED PWWF**

**REMAINING CAPACITY = PIPE CAPACITY - (MODEL + PWWF)**

Figure 1

# Conduit Map

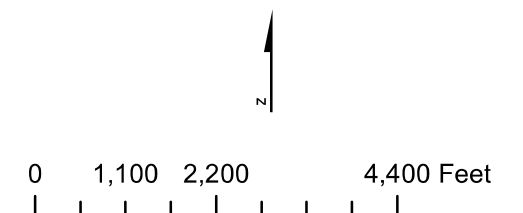


## LEGEND

- Durham AWWTF
- Pump Station
- UGB
- CWS Interceptor  
(Not Evaluated in this Plan)
- Force Main

Category	Priority	Description
LS	1	Flooding, steep HGL
LH	2	Flooding
HS	3	0-3' freeboard, steep HGL
HH	4	0-3' freeboard
IS	5	3-10' freeboard, steep HGL
IH	6	3-10' freeboard
DS	7	10'+ freeboard, steep HGL
DH	8	10'+ freeboard
OK	9	No surcharging
Backwater	N/A	Capacity limited downstream

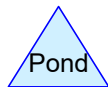
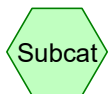
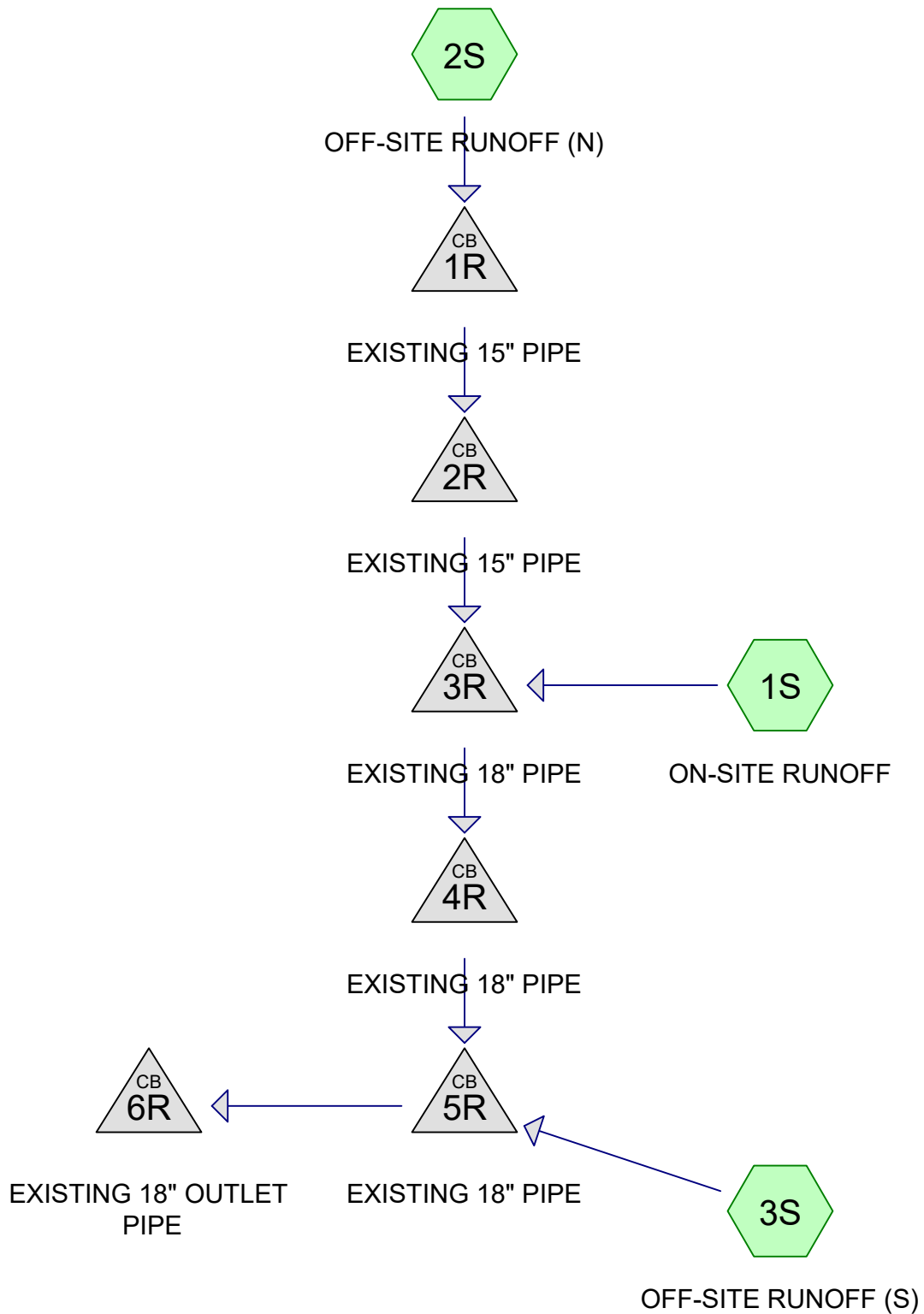
Note: This study recommends upgrades for deficiencies of priorities 1, 2, or 3. Backwater condition is not prioritized but can be another indication of where upgrades are needed.



### FIGURE 3-3 Existing System Deficiencies

City of Tualatin Sewer Master Plan





# 8723 STORM CAPACITY HYDROCAD

Prepared by {enter your company name here}

HydroCAD® 10.00-22 s/n 05095 © 2018 HydroCAD Software Solutions LLC

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Page 2

## Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
6.650	98	Impervious (1S, 2S, 3S)
6.950	71	Pervious (1S)
5.600	64	Pervious (2S, 3S)
<b>19.200</b>	<b>78</b>	<b>TOTAL AREA</b>

**Summary for Subcatchment 1S: ON-SITE RUNOFF**

Runoff = 2.74 cfs @ 8.01 hrs, Volume= 1.455 af, Depth= 1.90"

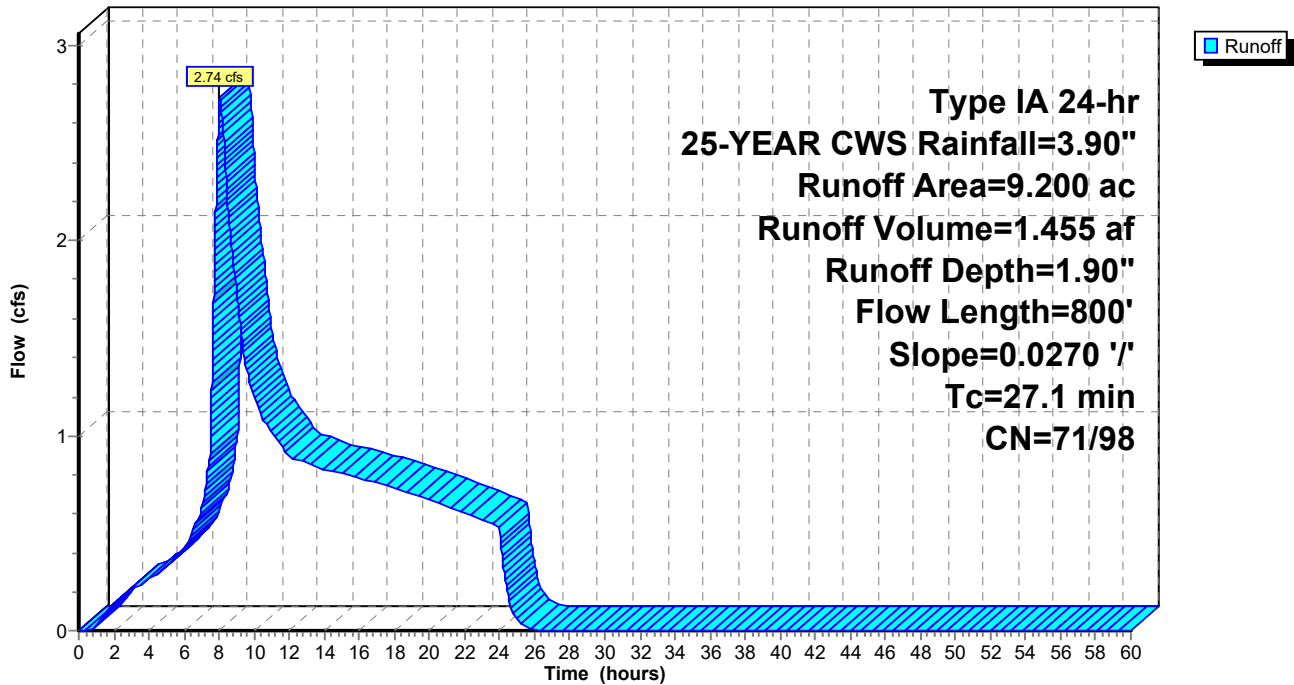
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 25-YEAR CWS Rainfall=3.90"

Area (ac)	CN	Description
* 2.250	98	Impervious
* 6.950	71	Pervious
9.200	78	Weighted Average
6.950	71	75.54% Pervious Area
2.250	98	24.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.7	300	0.0270	0.21		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.50"
3.4	500	0.0270	2.46		<b>Shallow Concentrated Flow,</b> Grassed Waterway Kv= 15.0 fps
27.1	800	Total			

**Subcatchment 1S: ON-SITE RUNOFF**

Hydrograph



**Summary for Subcatchment 2S: OFF-SITE RUNOFF (N)**

Runoff = 2.52 cfs @ 8.01 hrs, Volume= 1.168 af, Depth= 2.12"

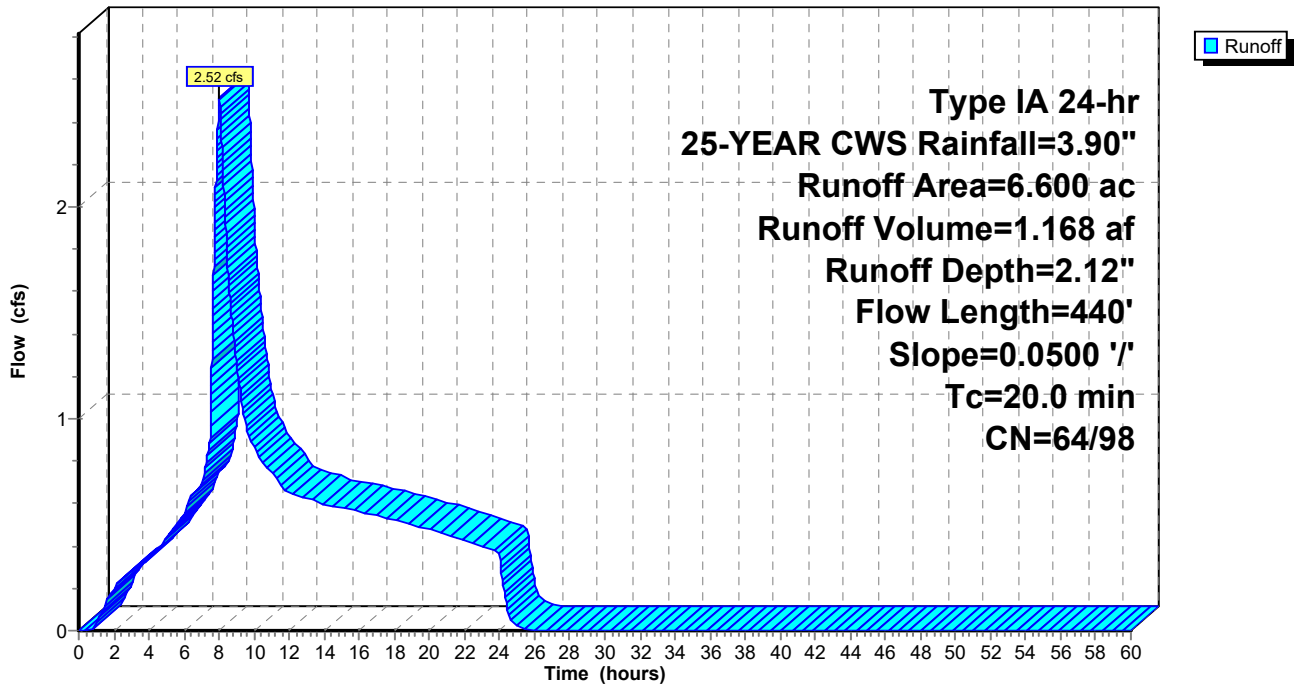
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 25-YEAR CWS Rainfall=3.90"

Area (ac)	CN	Description
* 2.900	98	Impervious
* 3.700	64	Pervious
6.600	79	Weighted Average
3.700	64	56.06% Pervious Area
2.900	98	43.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	300	0.0500	0.27		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.50"
1.5	140	0.0500	1.57		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
20.0	440	Total			

**Subcatchment 2S: OFF-SITE RUNOFF (N)**

Hydrograph



**Summary for Subcatchment 3S: OFF-SITE RUNOFF (S)**

Runoff = 1.30 cfs @ 8.00 hrs, Volume= 0.603 af, Depth= 2.13"

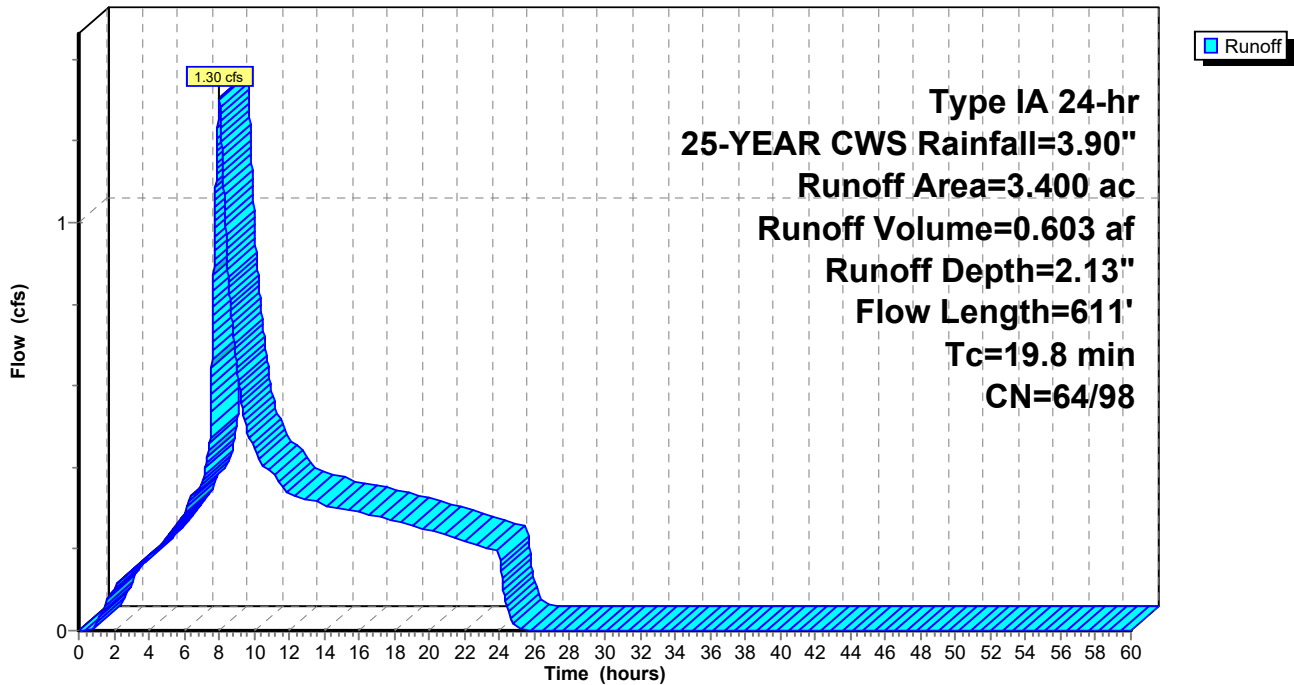
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 25-YEAR CWS Rainfall=3.90"

Area (ac)	CN	Description
* 1.500	98	Impervious
* 1.900	64	Pervious
3.400	79	Weighted Average
1.900	64	55.88% Pervious Area
1.500	98	44.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	300	0.0500	0.27		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.50"
1.3	311	0.0400	4.06		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
19.8	611	Total			

**Subcatchment 3S: OFF-SITE RUNOFF (S)**

Hydrograph



**Summary for Pond 1R: EXISTING 15" PIPE**

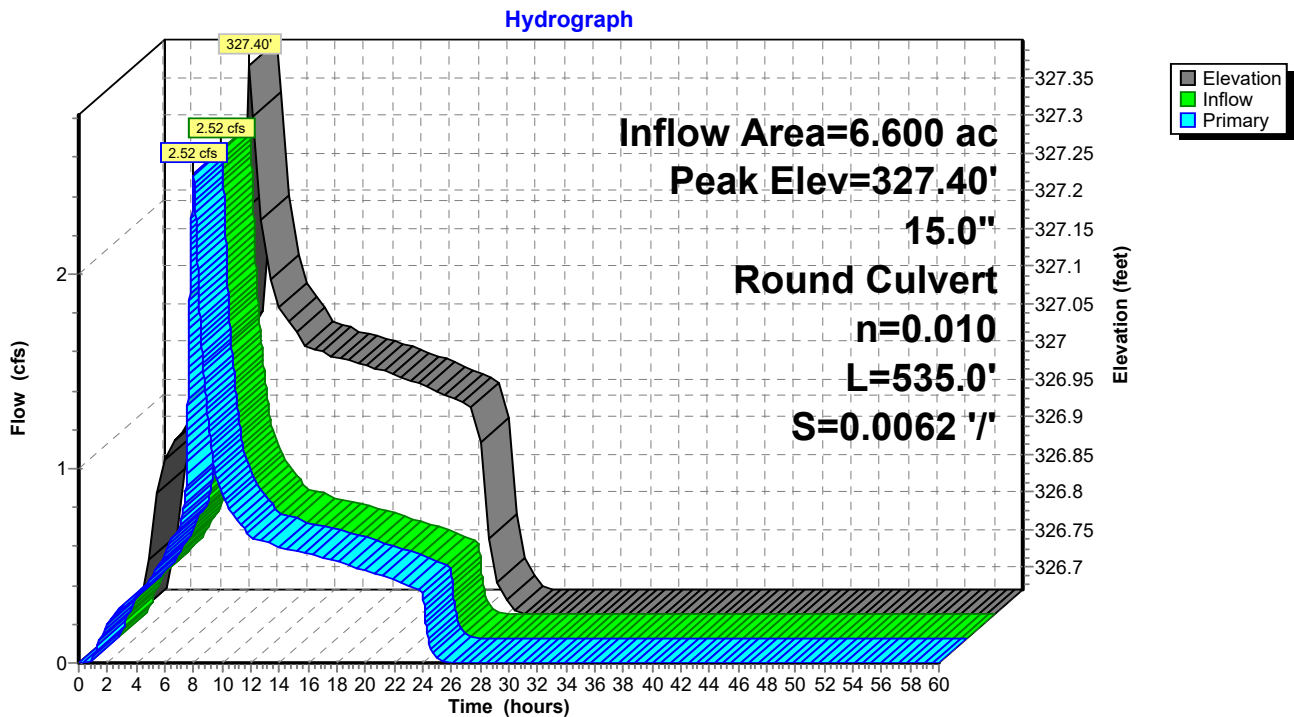
Inflow Area = 6.600 ac, 43.94% Impervious, Inflow Depth = 2.12" for 25-YEAR CWS event  
 Inflow = 2.52 cfs @ 8.01 hrs, Volume= 1.168 af  
 Outflow = 2.52 cfs @ 8.01 hrs, Volume= 1.168 af, Atten= 0%, Lag= 0.0 min  
 Primary = 2.52 cfs @ 8.01 hrs, Volume= 1.168 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
 Peak Elev= 327.40' @ 8.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	326.67'	<b>15.0" Round Culvert</b> L= 535.0' Ke= 0.200 Inlet / Outlet Invert= 326.67' / 323.33' S= 0.0062 '/' Cc= 0.900 n= 0.010, Flow Area= 1.23 sf

**Primary OutFlow** Max=2.52 cfs @ 8.01 hrs HW=327.40' (Free Discharge)  
 ↑1=Culvert (Barrel Controls 2.52 cfs @ 4.88 fps)

**Pond 1R: EXISTING 15" PIPE**



**Summary for Pond 2R: EXISTING 15" PIPE**

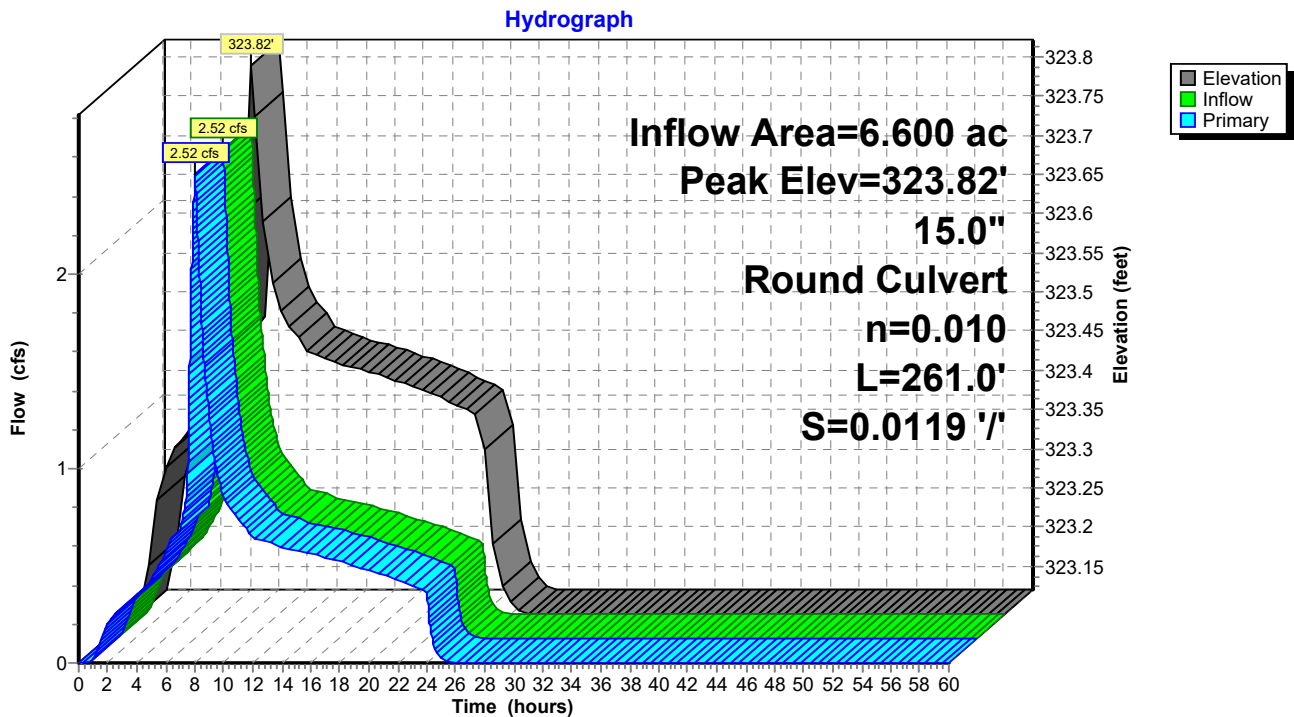
Inflow Area = 6.600 ac, 43.94% Impervious, Inflow Depth = 2.12" for 25-YEAR CWS event  
 Inflow = 2.52 cfs @ 8.01 hrs, Volume= 1.168 af  
 Outflow = 2.52 cfs @ 8.01 hrs, Volume= 1.168 af, Atten= 0%, Lag= 0.0 min  
 Primary = 2.52 cfs @ 8.01 hrs, Volume= 1.168 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
 Peak Elev= 323.82' @ 8.01 hrs

Device #	Routing	Invert	Outlet Devices
1	Primary	323.12'	<b>15.0" Round Culvert</b> L= 261.0' Ke= 0.200 Inlet / Outlet Invert= 323.12' / 320.02' S= 0.0119 '/' Cc= 0.900 n= 0.010, Flow Area= 1.23 sf

**Primary OutFlow** Max=2.52 cfs @ 8.01 hrs HW=323.82' (Free Discharge)  
 ↑1=Culvert (Inlet Controls 2.52 cfs @ 3.56 fps)

**Pond 2R: EXISTING 15" PIPE**



**Summary for Pond 3R: EXISTING 18" PIPE**

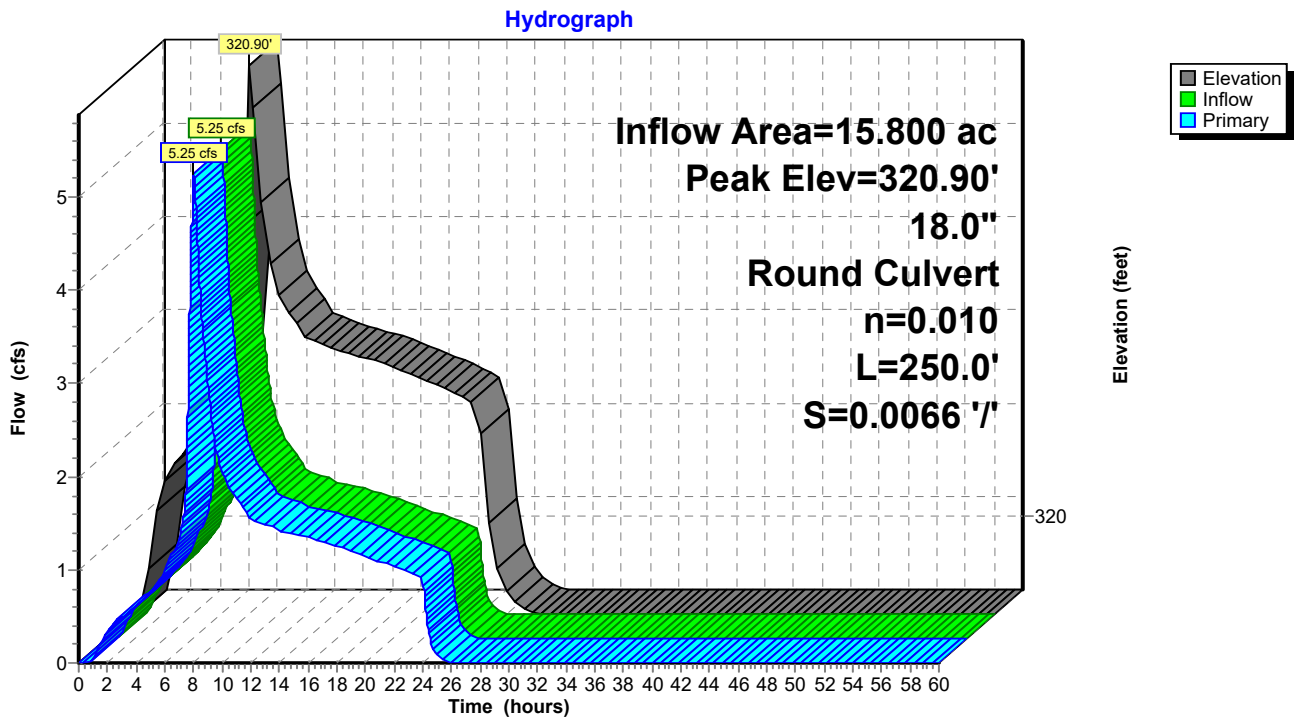
Inflow Area = 15.800 ac, 32.59% Impervious, Inflow Depth = 1.99" for 25-YEAR CWS event  
 Inflow = 5.25 cfs @ 8.01 hrs, Volume= 2.624 af  
 Outflow = 5.25 cfs @ 8.01 hrs, Volume= 2.624 af, Atten= 0%, Lag= 0.0 min  
 Primary = 5.25 cfs @ 8.01 hrs, Volume= 2.624 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
 Peak Elev= 320.90' @ 8.01 hrs

Device #	Routing	Invert	Outlet Devices
#1	Primary	319.86'	<b>18.0" Round Culvert</b> L= 250.0' Ke= 0.200 Inlet / Outlet Invert= 319.86' / 318.20' S= 0.0066 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf

**Primary OutFlow** Max=5.25 cfs @ 8.01 hrs HW=320.90' (Free Discharge)  
 ↑1=Culvert (Barrel Controls 5.25 cfs @ 5.68 fps)

**Pond 3R: EXISTING 18" PIPE**





**Summary for Pond 4R: EXISTING 18" PIPE**

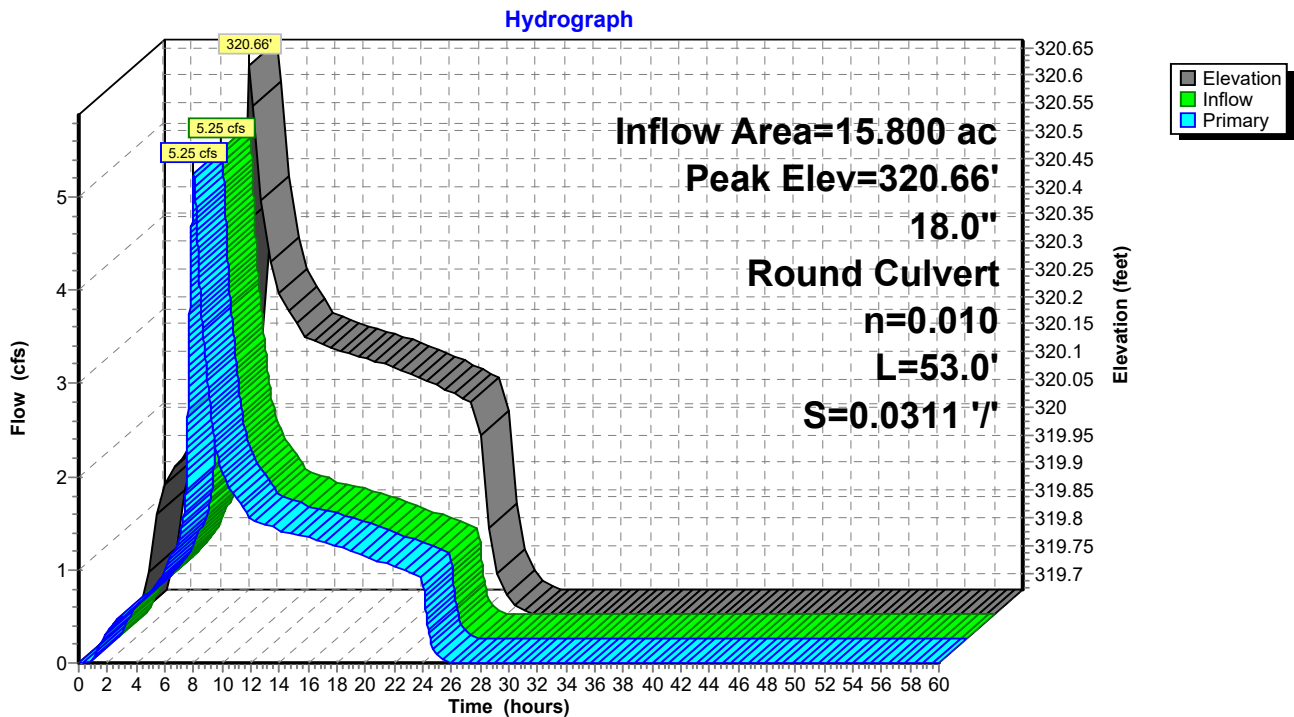
Inflow Area = 15.800 ac, 32.59% Impervious, Inflow Depth = 1.99" for 25-YEAR CWS event  
 Inflow = 5.25 cfs @ 8.01 hrs, Volume= 2.624 af  
 Outflow = 5.25 cfs @ 8.01 hrs, Volume= 2.624 af, Atten= 0%, Lag= 0.0 min  
 Primary = 5.25 cfs @ 8.01 hrs, Volume= 2.624 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
 Peak Elev= 320.66' @ 8.01 hrs

Device #	Routing	Invert	Outlet Devices
1	Primary	319.67'	<b>18.0" Round Culvert</b> L= 53.0' Ke= 0.200 Inlet / Outlet Invert= 319.67' / 318.02' S= 0.0311 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf

**Primary OutFlow** Max=5.25 cfs @ 8.01 hrs HW=320.66' (Free Discharge)  
 ↑1=Culvert (Inlet Controls 5.25 cfs @ 4.24 fps)

**Pond 4R: EXISTING 18" PIPE**



**Summary for Pond 5R: EXISTING 18" PIPE**

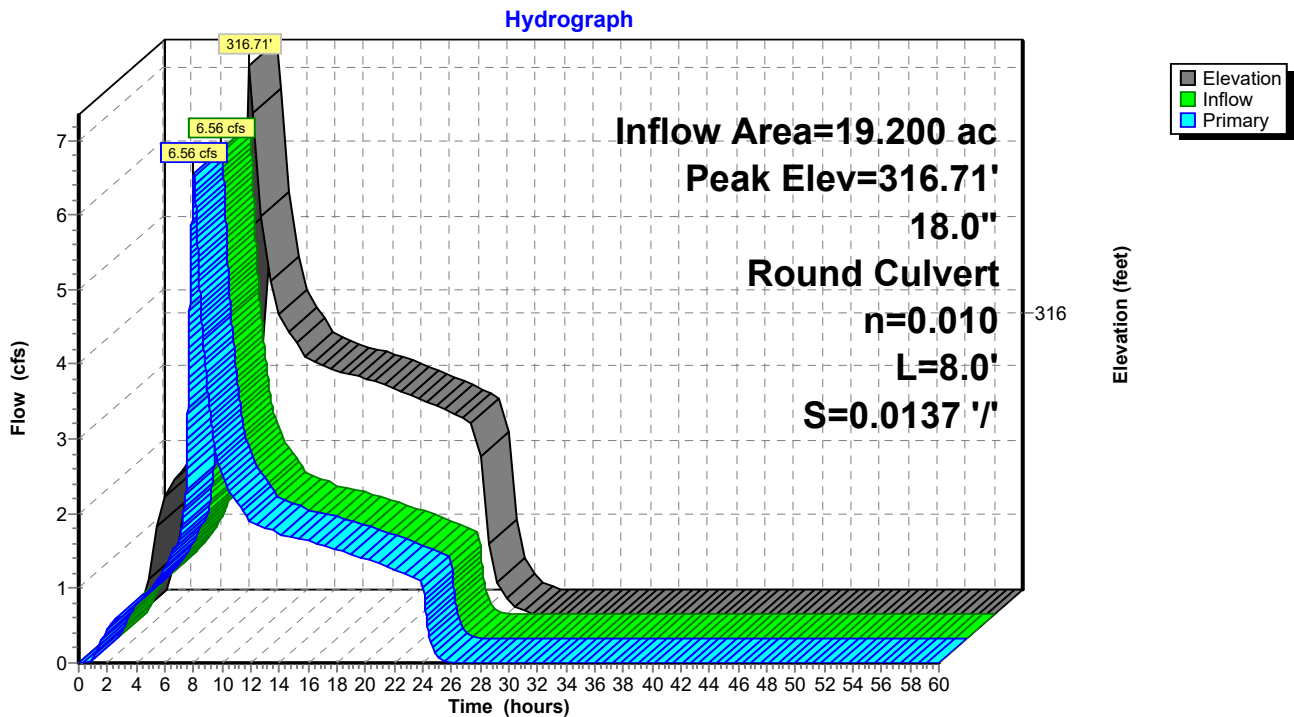
Inflow Area = 19.200 ac, 34.64% Impervious, Inflow Depth = 2.02" for 25-YEAR CWS event  
 Inflow = 6.56 cfs @ 8.01 hrs, Volume= 3.227 af  
 Outflow = 6.56 cfs @ 8.01 hrs, Volume= 3.227 af, Atten= 0%, Lag= 0.0 min  
 Primary = 6.56 cfs @ 8.01 hrs, Volume= 3.227 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
 Peak Elev= 316.71' @ 8.01 hrs

Device #	Routing	Invert	Outlet Devices
1	Primary	315.28'	<b>18.0" Round Culvert</b> L= 8.0' Ke= 0.200 Inlet / Outlet Invert= 315.28' / 315.17' S= 0.0137 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf

**Primary OutFlow** Max=6.55 cfs @ 8.01 hrs HW=316.70' (Free Discharge)  
 ↑1=Culvert (Barrel Controls 6.55 cfs @ 4.87 fps)

**Pond 5R: EXISTING 18" PIPE**



**Summary for Pond 6R: EXISTING 18" OUTLET PIPE**

Inflow Area = 19.200 ac, 34.64% Impervious, Inflow Depth = 2.02" for 25-YEAR CWS event  
 Inflow = 6.56 cfs @ 8.01 hrs, Volume= 3.227 af  
 Outflow = 6.56 cfs @ 8.01 hrs, Volume= 3.227 af, Atten= 0%, Lag= 0.0 min  
 Primary = 6.56 cfs @ 8.01 hrs, Volume= 3.227 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
 Peak Elev= 314.52' @ 8.01 hrs

Device #1	Routing	Invert	Outlet Devices
	Primary	313.08'	<b>18.0" Round Culvert</b> L= 8.0' Ke= 0.200 Inlet / Outlet Invert= 313.08' / 312.98' S= 0.0125 '/' Cc= 0.900 n= 0.010 Concrete pipe, straight & clean, Flow Area= 1.77 sf

**Primary OutFlow** Max=6.55 cfs @ 8.01 hrs HW=314.52' (Free Discharge)  
 ↑1=Culvert (Barrel Controls 6.55 cfs @ 4.83 fps)

**Pond 6R: EXISTING 18" OUTLET PIPE**

