Stormwater Management Plan

Fretham 31st Addition
Minnetonka, MN

Prepared by Loucks

July 21, 2023

Loucks Project No. 21509.00

Fretham 31st Addition

Minnetonka, MN

Stormwater Management Plan

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

Valentina Anderson

Valentina Anderson, P.E.
Minnesota Registration No. 43423
Date: 8-18-23

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Stormwater Management Plan

Introduction

This stormwater management plan was created for the Fretham 31st Addition project located along Plymouth Road in Minnetonka, Minnesota. The project site encompasses 11.75 acres which is surrounded to the west by Plymouth Road, between Bent Tree Road and Woodbridge Trail and Crescent Ridge Road to the east. The property is surrounded by residential.

The project generally consists of constructing a residential road with residential lots, stormwater pond, and associated utilities.

Included in this plan are calculations for the proposed discharge of stormwater at the Fretham 31st property.

Requirements and Methodology

City of Minnetonka and Minnehaha Creek Watershed District Requirements

1. Rate Control – Runoff rates for the proposed activity shall not exceed existing runoff rates for the 1, 10, and 100-year critical storm events.

2. Volume Control – 1-inch abstraction over the impervious surface. Where soils don't allow the full infiltration, alternative methods are used with infiltration used to the greatest extent possible

3. Water Quality – Total Phosphorus (TP) removal equivalent to that achieved from infiltration of 1-inch over impervious surface.

Methodology

The stormwater calculations were made utilizing the stormwater-modeling program HydroCAD 10.00. Calculations were performed for the Type II 24-hour Atlas 14 100-year rainfall event of 7.32 inches, 10-year rainfall event of 4.26 inches and 2-year rainfall event of 2.86 inches. For purposes of analyzing the site, a drainage area of about 11.5 acres is included in the hydrologic model to account for all runoff from the site.

Existing Conditions

The existing site is residential with four residences present on the parcels. The property is split into five drainage areas. Most of the site drains to the north (1S), there are two small areas to the south (3S, 4S), one to the east (2S) and one to the west (5S).
No treatment is present for the existing impervious surfaces.

The existing site model consists of 11.76 acres with 0.54 acres of impervious surface.

Proposed Conditions

The proposed site consists of a redeveloped residential development with public road and 16 lots with utilities. A proposed pond (1P) is provided for the largest treatment, volume control and rate control prior to discharging to existing storm sewer. Two small infiltration basins (21P and 30P) are located in corners for additional volume control and rate control. The proposed site being analyzed contains 2.52 acres of new impervious surface.

The proposed site is broken up into eight drainage areas. The five drainage areas (1S, 2S, 3S, 4S and 5S) going directly off site like existing and the three drainage areas going to the basins onsite for treatment before leaving the site. The runoff from the proposed street area is collected by storm sewer and discharged to the treatment pond 1P. This also collects parts of many of the lots that drain to the street.

The proposed site model consists of 11.77 acres with 3.06 acres of impervious surface, 2.52 acres of that being new.

Rate Control

The stormwater runoff rate from the proposed site shall be equal to or less than the runoff rate from the existing conditions for the 1-, 10- and 100-year storm events.

Two small infiltration basins and a NURP pond with filtration bench are used to treat the site development and provide rate control. Soils maps show soils to be C and D soils mostly. Borings have not been obtained yet. With the current information, it is assumed large amounts of infiltration cannot be achieved on-site. The site is treated to the extent possible without infiltration while still meeting TSS and TP removals.

Tables 1 and 2 compare the existing and proposed peak runoff rates for the discharge points analyzed.

Table 1 –Existing Peak Runoff Rates

		1-Year Storm		10-Year Storm		100-Year Storm	
Drainage Area	Area acres	Rate cfs	Volume cf	Rate cfs	Volume cf	Rate cfs	Volume cf
1S-North	8.37	4.26	0.388	14.24	1.181	34.97	2.879
2S-East	1.461	0.87	0.068	2.9	0.207	7.08	0.503
3S-Southeast	0.562	0.27	0.024	0.96	0.076	2.4	0.188
4S-South	0.45	0.26	0.021	0.86	0.064	2.1	0.155
5S-West	0.921	0.77	0.049	2.33	0.142	5.45	0.335
Plymouth Road	1.403	1.01	0.072	3.17	0.21	7.5	0.501
Total	11.5	5.94	0.538	19.84	1.633	48.55	3.972

Table 2 – Proposed Peak Runoff Rates

		1-Year Storm		10-Year Storm		100-Year Storm	
Drainage Area	Area acres	Rate cfs	Volume cf	Rate cfs	Volume cf	Rate cfs	Volume cf
1S-North	0.072	0.06	0.004	0.19	0.011	0.46	0.026
2S-East	0.932	0.78	0.05	2.44	0.145	5.79	0.344
3S-Southeast	0.12	0.07	0.006	0.23	0.017	0.58	0.042
4S-South	0.321	0.41	0.025	1.06	0.063	2.26	0.137
5S-West	0.599	0.52	0.036	1.53	0.101	3.51	0.232
1P-N Pond	8.787	0.36	0.543	7.76	1.486	22.33	3.464
21P-W Basin	0.5	0.1	0.016	0.64	0.065	1.44	0.17
30P-SW Basin	0.449	0.08	0.014	0.7	0.063	1.74	0.163
Plymouth Road	0.92	0.91	0.061	2.53	0.163	5.69	0.369
North	8.859	0.37	0.547	7.79	1.497	22.42	3.49
East	1.432	0.78	0.066	2.61	0.21	6.67	0.514
Southeast	0.569	0.09	0.019	0.82	0.081	2.12	0.205
Total	11.78	1.89	0.693	10.12	1.951	32.56	4.578

Elevations are evaluated for flooding of the site. All overflows are designed to keep the adjacent buildings from flooding. All flood elevations have at least 2 feet freeboard to the lowest opening elevation.

Volume Control

Based on the soils information we have at this time; most treatment will be by a pond with filtration bench. The bench will incorporate iron filings to meet total phosphorus removals. The two smaller infiltration basins will be used for treatment to the small areas they serve. The proposed site includes 3.06 acres of impervious surface. The disturbance within the site may be less than 40% but the increase in impervious surface is greater than 50%, therefore the volume control is required for the entire site. A 1.0-inch storm event over the impervious surface produces a volume of 11,108 cf. There is an additional 0.03 acres of impervious within the existing Plymouth Road ROW for street connection. The additional area brings the volume control needed to 11,217 cf.

Infiltration is used to the extent possible with the two basins (21P and 30P). The volumes below the outlet are 454 cf and 501 cf. The filtration volume is 21,893 cf, at 50% credit it is 10,946 cf. This is a total volume control of 11,901 cf.

The filtration bench provides the majority of the volume control with the pond providing the pretreatment. The calculations for the required volumes are shown below:

The proposed storage volume below the outlet for the filtration bench (1P) is **21,893 cubic-feet**. This volume is filtered through the biofiltration media mix in less than 48 hours.

Depth equivalent proposed: 21,893 cf / 5,900 sf(surface area of bench) = **3.71 ft**
Depth maximum allowed: 1.0 in/hr*48 hours/12in/ft = **4.0 ft**

<u>Quality Control</u>

The site is required to remove the total phosphorus equivalent to infiltration of the 1-inch over the impervious surface. MIDS is used to model the 1-inch infiltration and proposed TSS and TP for the site. The infiltration basins are used in the proposed condition to reduce the TSS and TP loads. The pond/filtration bench system is used to capture the remainder of removals. The pond acts as pretreatment for the filtration bench which is designed with biofiltration media. The pond dead volume is designed to meet a minimum of 1800 sf per acre of drainage to the pond, which is 8.787 acres * 1800 = 15,817 cf.

The table below shows the results for infiltration and proposed loads removed from the site.

Table 3 – TSS and TP loads for infiltration and proposed

	1-inch Infiltration Removal lbs/yr	Proposed Removals lbs/yr
TSS	908.2	1356
TP	5	5.576

Best Management Practices

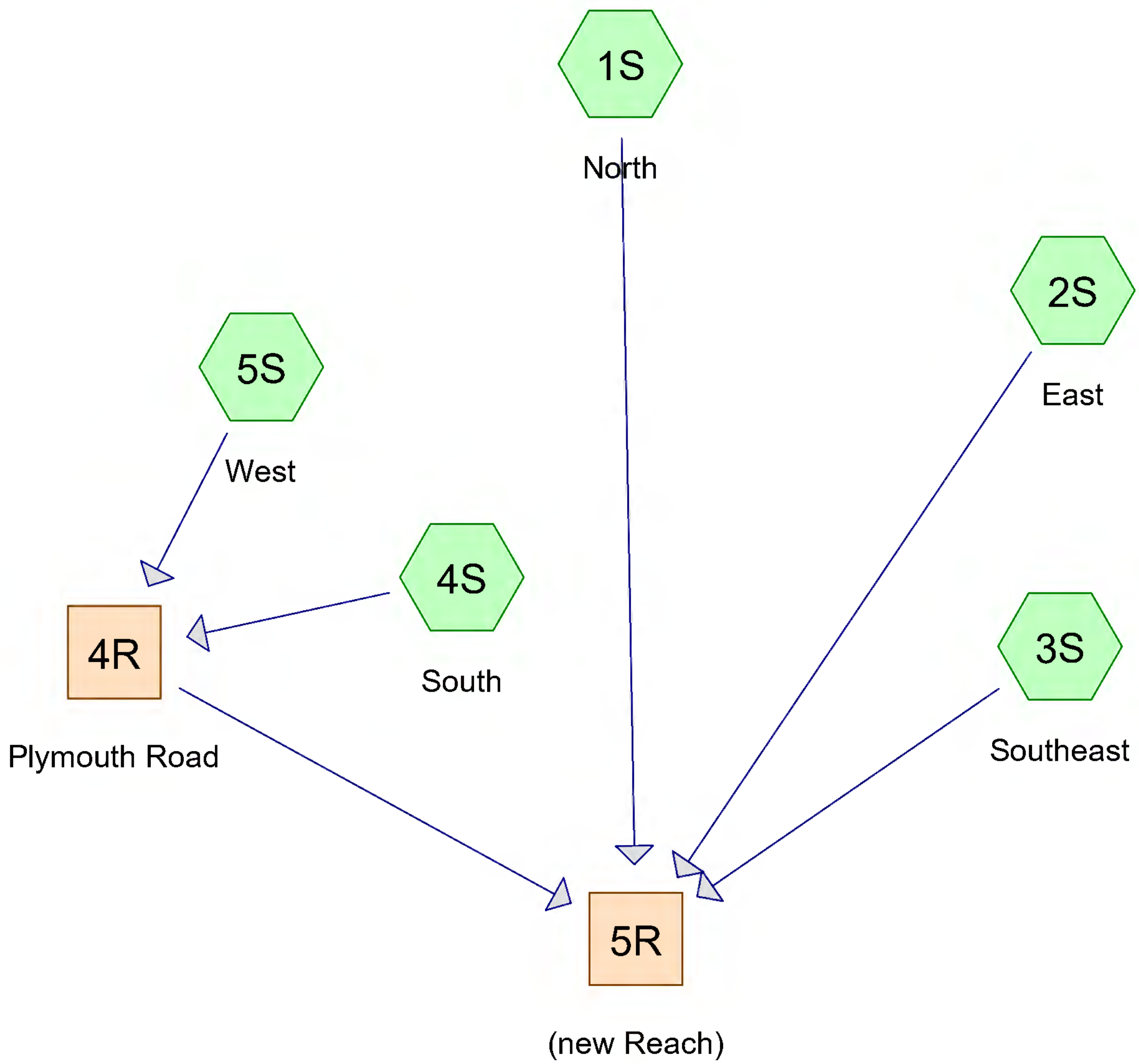
Best management practices (BMP's) will be implemented during construction per the project Stormwater Pollution Prevention Plan. During construction, erosion control measures will include dust control, silt fencing, inlet protection, and a temporary rock construction entrance. Permanent BMP's will include a stormwater pond, a large swale, sump storm sewer structures, surface pavements, and turf establishment (vegetation) of disturbed areas.

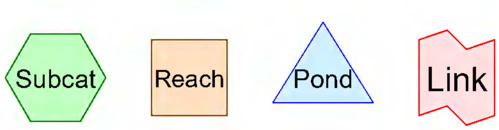
Conclusion

The proposed Stormwater Management Plan for the Dudycha property project provides an improved solution for the conveyance of stormwater on this site. The stormwater pond will capture runoff and provide additional water quality treatment on the site.

Appendix A

HydroCAD Report, Existing
(1, 10, 100)





Routing Diagram for Ex-21509
Prepared by Loucks & Associates, Printed 8/17/2023

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	MSE 24-hr	3	Default	24.00	1	2.48	2
2	10-Year	MSE 24-hr	3	Default	24.00	1	4.26	2
3	100-Year	MSE 24-hr	3	Default	24.00	1	7.32	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.536	98	(1S, 2S, 3S, 4S, 5S)
11.228	73	Woods, Fair, HSG C (1S, 2S, 3S, 4S, 5S)
11.764	**74**	**TOTAL AREA**

Summary for Subcatchment 1S: North

Runoff = 4.26 cfs @ 12.42 hrs, Volume= 0.388 af, Depth> 0.56"
Routed to Reach 5R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.48"

	Area (ac)	CN	Description
*	0.358	98	
	8.012	73	Woods, Fair, HSG C
	8.370	74	Weighted Average
	8.012		95.72% Pervious Area
	0.358		4.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0500	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
1.5	100	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.7	100	0.0083	0.46		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.3	500	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
26.2	800	Total			

Summary for Subcatchment 2S: East

Runoff = 0.87 cfs @ 12.33 hrs, Volume= 0.068 af, Depth> 0.56"
Routed to Reach 5R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.48"

	Area (ac)	CN	Description
*	0.032	98	
	1.429	73	Woods, Fair, HSG C
	1.461	74	Weighted Average
	1.429		97.81% Pervious Area
	0.032		2.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0380	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
2.1	100	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.7	200	Total			

Summary for Subcatchment 3S: Southeast

Runoff = 0.27 cfs @ 12.40 hrs, Volume= 0.024 af, Depth> 0.52"
Routed to Reach 5R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.48"

	Area (ac)	CN	Description
*	0.004	98	
	0.558	73	Woods, Fair, HSG C
	0.562	73	Weighted Average
	0.558		99.29% Pervious Area
	0.004		0.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0260	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
3.7	250	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.2	350	Total			

Summary for Subcatchment 4S: South

Runoff = 0.26 cfs @ 12.35 hrs, Volume= 0.021 af, Depth> 0.56"
Routed to Reach 4R : Plymouth Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.48"

	Area (ac)	CN	Description
*	0.021	98	
	0.429	73	Woods, Fair, HSG C
	0.450	74	Weighted Average
	0.429		95.33% Pervious Area
	0.021		4.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	100	0.0250	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.5	35	0.0650	1.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
21.3	135	Total			

Summary for Subcatchment 5S: West

Runoff = 0.77 cfs @ 12.25 hrs, Volume= 0.049 af, Depth> 0.64"
Routed to Reach 4R : Plymouth Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.48"

	Area (ac)	CN	Description
*	0.121	98	
	0.800	73	Woods, Fair, HSG C
	0.921	76	Weighted Average
	0.800		86.86% Pervious Area
	0.121		13.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	100	0.0660	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.3	30	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.4	130	Total			

Summary for Reach 4R: Plymouth Road

Inflow Area = 1.371 ac, 10.36% Impervious, Inflow Depth > 0.61" for 1-Year event
Inflow = 0.98 cfs @ 12.26 hrs, Volume= 0.070 af
Outflow = 0.98 cfs @ 12.26 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 5R : (new Reach)

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach 5R: (new Reach)

Inflow Area = 11.764 ac, 4.56% Impervious, Inflow Depth > 0.56" for 1-Year event
Inflow = 6.06 cfs @ 12.39 hrs, Volume= 0.550 af
Outflow = 6.06 cfs @ 12.39 hrs, Volume= 0.550 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: North

Runoff = 14.24 cfs @ 12.39 hrs, Volume= 1.181 af, Depth> 1.69"
Routed to Reach 5R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

	Area (ac)	CN	Description
*	0.358	98	
	8.012	73	Woods, Fair, HSG C
	8.370	74	Weighted Average
	8.012		95.72% Pervious Area
	0.358		4.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0500	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
1.5	100	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.7	100	0.0083	0.46		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.3	500	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
26.2	800	Total			

Summary for Subcatchment 2S: East

Runoff = 2.90 cfs @ 12.31 hrs, Volume= 0.207 af, Depth> 1.70"
Routed to Reach 5R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

	Area (ac)	CN	Description
*	0.032	98	
	1.429	73	Woods, Fair, HSG C
	1.461	74	Weighted Average
	1.429		97.81% Pervious Area
	0.032		2.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0380	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
2.1	100	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.7	200	Total			

Summary for Subcatchment 3S: Southeast

Runoff = 0.96 cfs @ 12.36 hrs, Volume= 0.076 af, Depth> 1.62"
Routed to Reach 5R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

	Area (ac)	CN	Description
*	0.004	98	
	0.558	73	Woods, Fair, HSG C
	0.562	73	Weighted Average
	0.558		99.29% Pervious Area
	0.004		0.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0260	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
3.7	250	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.2	350	Total			

Summary for Subcatchment 4S: South

Runoff = 0.86 cfs @ 12.32 hrs, Volume= 0.064 af, Depth> 1.70"
Routed to Reach 4R : Plymouth Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

	Area (ac)	CN	Description
*	0.021	98	
	0.429	73	Woods, Fair, HSG C
	0.450	74	Weighted Average
	0.429		95.33% Pervious Area
	0.021		4.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	100	0.0250	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.5	35	0.0650	1.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
21.3	135	Total			

Summary for Subcatchment 5S: West

Runoff = 2.33 cfs @ 12.23 hrs, Volume= 0.142 af, Depth> 1.85"
Routed to Reach 4R : Plymouth Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

	Area (ac)	CN	Description
*	0.121	98	
	0.800	73	Woods, Fair, HSG C
	0.921	76	Weighted Average
	0.800		86.86% Pervious Area
	0.121		13.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	100	0.0660	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.3	30	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.4	130	Total			

Summary for Reach 4R: Plymouth Road

Inflow Area = 1.371 ac, 10.36% Impervious, Inflow Depth > 1.80" for 10-Year event
Inflow = 3.09 cfs @ 12.25 hrs, Volume= 0.205 af
Outflow = 3.09 cfs @ 12.25 hrs, Volume= 0.205 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 5R : (new Reach)

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach 5R: (new Reach)

Inflow Area =	11.764 ac,	4.56% Impervious,	Inflow Depth > 1.70"	for 10-Year event	
Inflow =	20.28 cfs @	12.36 hrs, Volume=	1.669 af		
Outflow =	20.28 cfs @	12.36 hrs, Volume=	1.669 af,	Atten= 0%,	Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: North

Runoff = 34.97 cfs @ 12.37 hrs, Volume= 2.879 af, Depth> 4.13"
Routed to Reach 5R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

	Area (ac)	CN	Description
*	0.358	98	
	8.012	73	Woods, Fair, HSG C
	8.370	74	Weighted Average
	8.012		95.72% Pervious Area
	0.358		4.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0500	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
1.5	100	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.7	100	0.0083	0.46		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.3	500	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
26.2	800	Total			

Summary for Subcatchment 2S: East

Runoff = 7.08 cfs @ 12.30 hrs, Volume= 0.503 af, Depth> 4.14"
Routed to Reach 5R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

	Area (ac)	CN	Description
*	0.032	98	
	1.429	73	Woods, Fair, HSG C
	1.461	74	Weighted Average
	1.429		97.81% Pervious Area
	0.032		2.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0380	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
2.1	100	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.7	200	Total			

Summary for Subcatchment 3S: Southeast

Runoff = 2.40 cfs @ 12.35 hrs, Volume= 0.188 af, Depth> 4.02"
Routed to Reach 5R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

	Area (ac)	CN	Description
*	0.004	98	
	0.558	73	Woods, Fair, HSG C
	0.562	73	Weighted Average
	0.558		99.29% Pervious Area
	0.004		0.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0260	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
3.7	250	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.2	350	Total			

Summary for Subcatchment 4S: South

Runoff = 2.10 cfs @ 12.31 hrs, Volume= 0.155 af, Depth> 4.13"
Routed to Reach 4R : Plymouth Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

	Area (ac)	CN	Description
*	0.021	98	
	0.429	73	Woods, Fair, HSG C
	0.450	74	Weighted Average
	0.429		95.33% Pervious Area
	0.021		4.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	100	0.0250	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.5	35	0.0650	1.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
21.3	135	Total			

Summary for Subcatchment 5S: West

Runoff = 5.45 cfs @ 12.23 hrs, Volume= 0.335 af, Depth> 4.36"
Routed to Reach 4R : Plymouth Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

	Area (ac)	CN	Description
*	0.121	98	
	0.800	73	Woods, Fair, HSG C
	0.921	76	Weighted Average
	0.800		86.86% Pervious Area
	0.121		13.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	100	0.0660	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.3	30	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.4	130	Total			

Summary for Reach 4R: Plymouth Road

Inflow Area = 1.371 ac, 10.36% Impervious, Inflow Depth > 4.28" for 100-Year event
Inflow = 7.31 cfs @ 12.24 hrs, Volume= 0.490 af
Outflow = 7.31 cfs @ 12.24 hrs, Volume= 0.490 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 5R : (new Reach)

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach 5R: (new Reach)

Inflow Area =	11.764 ac,	4.56% Impervious, Inflow Depth > 4.14"	for 100-Year event	
Inflow =	49.62 cfs @	12.34 hrs, Volume=	4.061 af	
Outflow =	49.62 cfs @	12.34 hrs, Volume=	4.061 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

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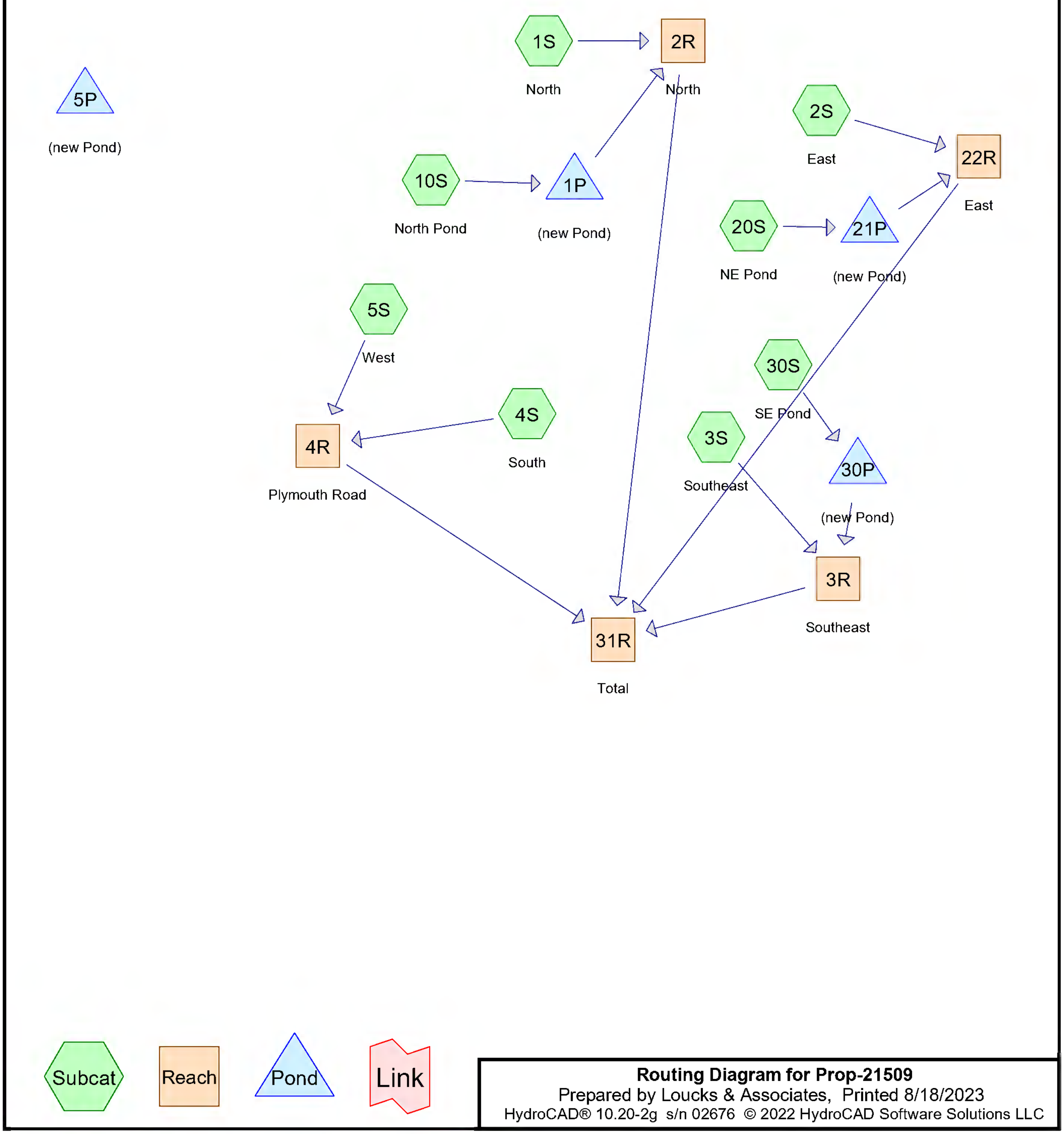
Appendix B

HydroCAD Report, Proposed
(1, 10, 100)



Routing Diagram for Prop-21509
Prepared by Loucks & Associates, Printed 8/18/2023
HydroCAD® 10.20-2g s/n 02676 © 2022 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	MSE 24-hr	3	Default	24.00	1	2.48	2
2	10-Year	MSE 24-hr	3	Default	24.00	1	4.26	2
3	100-Year	MSE 24-hr	3	Default	24.00	1	7.32	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.060	98	(2S, 4S, 5S, 10S, 20S, 30S)
3.117	74	>75% Grass cover, Good, HSG C (1S, 2S, 4S, 5S, 10S, 20S, 30S)
0.745	73	Woods, Fair, HSG C (3S, 4S, 5S, 30S)
4.858	72	Woods/grass comb., Good, HSG C (2S, 10S)
11.780	**79**	**TOTAL AREA**

Summary for Subcatchment 1S: North

Runoff = 0.06 cfs @ 12.21 hrs, Volume= 0.004 af, Depth= 0.60"
Routed to Reach 2R : North

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.48"

	Area (ac)	CN	Description
*	0.000	98	
	0.072	74	>75% Grass cover, Good, HSG C
	0.000	70	Woods, Good, HSG C
	0.072	74	Weighted Average
	0.072		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	50	0.0350	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.6	110	0.2000	3.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	160	Total			

Summary for Subcatchment 2S: East

Runoff = 0.78 cfs @ 12.22 hrs, Volume= 0.050 af, Depth= 0.64"
Routed to Reach 22R : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.48"

	Area (ac)	CN	Description
*	0.078	98	
	0.504	74	>75% Grass cover, Good, HSG C
	0.350	72	Woods/grass comb., Good, HSG C
	0.932	75	Weighted Average
	0.854		91.63% Pervious Area
	0.078		8.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.1000	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.4	40	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.3	140	Total			

Summary for Subcatchment 3S: Southeast

Runoff = 0.07 cfs @ 12.32 hrs, Volume= 0.006 af, Depth= 0.56"
Routed to Reach 3R : Southeast

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.48"

	Area (ac)	CN	Description
*	0.000	98	
	0.120	73	Woods, Fair, HSG C
	0.120	73	Weighted Average
	0.120		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	90	0.0260	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"

Summary for Subcatchment 4S: South

Runoff = 0.41 cfs @ 12.21 hrs, Volume= 0.025 af, Depth= 0.93"
Routed to Reach 4R : Plymouth Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.48"

	Area (ac)	CN	Description
*	0.105	98	
	0.103	74	>75% Grass cover, Good, HSG C
	0.113	73	Woods, Fair, HSG C
	0.321	81	Weighted Average
	0.216		67.29% Pervious Area
	0.105		32.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	65	0.0420	0.09		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 2.86"

Summary for Subcatchment 5S: West

Runoff = 0.52 cfs @ 12.26 hrs, Volume= 0.036 af, Depth= 0.73"
Routed to Reach 4R : Plymouth Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.48"

	Area (ac)	CN	Description
*	0.094	98	
	0.100	74	>75% Grass cover, Good, HSG C
	0.405	73	Woods, Fair, HSG C
	0.599	77	Weighted Average
	0.505		84.31% Pervious Area
	0.094		15.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	20	0.0400	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
11.9	80	0.0650	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.3	30	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.4	130	Total			

Summary for Subcatchment 10S: North Pond

Runoff = 8.08 cfs @ 12.33 hrs, Volume= 0.641 af, Depth= 0.88"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.48"

	Area (ac)	CN	Description
*	2.679	98	
	1.600	74	>75% Grass cover, Good, HSG C
	4.508	72	Woods/grass comb., Good, HSG C
	8.787	80	Weighted Average
	6.108		69.51% Pervious Area
	2.679		30.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.2	100	0.0350	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
2.4	300	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	45	0.0050	4.20	7.43	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
20.9	465	Total			

Summary for Subcatchment 20S: NE Pond

Runoff = 0.29 cfs @ 12.33 hrs, Volume= 0.025 af, Depth= 0.60"
Routed to Pond 21P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.48"

	Area (ac)	CN	Description
*	0.007	98	
	0.493	74	>75% Grass cover, Good, HSG C
	0.500	74	Weighted Average
	0.493		98.60% Pervious Area
	0.007		1.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	90	0.0220	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"

Summary for Subcatchment 30S: SE Pond

Runoff = 0.35 cfs @ 12.39 hrs, Volume= 0.031 af, Depth= 0.82"
Routed to Pond 30P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-Year Rainfall=2.48"

	Area (ac)	CN	Description
*	0.097	98	
	0.107	73	Woods, Fair, HSG C
	0.245	74	>75% Grass cover, Good, HSG C
	0.449	79	Weighted Average
	0.352		78.40% Pervious Area
	0.097		21.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.7	100	0.0180	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
1.3	120	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.0	220	Total			

Summary for Reach 2R: North

Inflow Area = 8.859 ac, 30.24% Impervious, Inflow Depth > 0.74" for 1-Year event
Inflow = 0.37 cfs @ 15.04 hrs, Volume= 0.547 af
Outflow = 0.37 cfs @ 15.04 hrs, Volume= 0.547 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 31R : Total

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: Southeast

Inflow Area = 0.569 ac, 17.05% Impervious, Inflow Depth = 0.41" for 1-Year event
Inflow = 0.09 cfs @ 13.07 hrs, Volume= 0.019 af
Outflow = 0.09 cfs @ 13.07 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 31R : Total

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 4R: Plymouth Road

Inflow Area = 0.920 ac, 21.63% Impervious, Inflow Depth = 0.80" for 1-Year event
Inflow = 0.91 cfs @ 12.24 hrs, Volume= 0.061 af
Outflow = 0.91 cfs @ 12.24 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 31R : Total

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 22R: East

Inflow Area = 1.432 ac, 5.94% Impervious, Inflow Depth = 0.55" for 1-Year event
Inflow = 0.78 cfs @ 12.22 hrs, Volume= 0.066 af
Outflow = 0.78 cfs @ 12.22 hrs, Volume= 0.066 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 31R : Total

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 31R: Total

Inflow Area = 11.780 ac, 25.98% Impervious, Inflow Depth > 0.71" for 1-Year event
Inflow = 1.89 cfs @ 12.24 hrs, Volume= 0.693 af
Outflow = 1.89 cfs @ 12.24 hrs, Volume= 0.693 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: (new Pond)

Inflow Area = 8.787 ac, 30.49% Impervious, Inflow Depth = 0.88" for 1-Year event
Inflow = 8.08 cfs @ 12.33 hrs, Volume= 0.641 af
Outflow = 0.36 cfs @ 15.32 hrs, Volume= 0.543 af, Atten= 95%, Lag= 179.6 min
Primary = 0.36 cfs @ 15.32 hrs, Volume= 0.543 af
Routed to Reach 2R : North

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 976.50' Surf.Area= 5,840 sf Storage= 19,753 cf
Peak Elev= 978.19' @ 15.32 hrs Surf.Area= 15,684 sf Storage= 38,343 cf (18,591 cf above start)

Plug-Flow detention time= 1,222.0 min calculated for 0.089 af (14% of inflow)
Center-of-Mass det. time= 496.6 min (1,334.9 - 838.3)

Volume	Invert	Avail.Storage	Storage Description
#1	970.00'	116,306 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
970.00	640	0	0
973.00	2,685	4,988	4,988
975.00	4,400	7,085	12,073
976.50	5,840	7,680	19,753
977.50	11,825	8,833	28,585
978.00	15,300	6,781	35,366
979.00	17,300	16,300	51,666
980.00	19,400	18,350	70,016
981.00	21,590	20,495	90,511
982.00	30,000	25,795	116,306

Device	Routing	Invert	Outlet Devices
#1	Primary	975.90'	**21.0" Round Culvert** L= 49.0' Ke= 0.500 Inlet / Outlet Invert= 975.90' / 975.48' S= 0.0086 '/' Cc= 0.900 n= 0.013, Flow Area= 2.41 sf
#2	Device 1	978.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	979.50'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	976.00'	**6.0" Round Culvert** L= 100.0' Ke= 0.500 Inlet / Outlet Invert= 976.00' / 976.00' S= 0.0000 '/' Cc= 0.900 n= 0.020, Flow Area= 0.20 sf
#5	Device 4	976.50'	**1.600 in/hr Exfiltration over Surface area above 976.50'** Excluded Surface area = 5,840 sf

Primary OutFlow Max=0.36 cfs @ 15.32 hrs HW=978.19' (Free Discharge)
└─**1=Culvert** (Passes 0.36 cfs of 13.06 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Culvert** (Passes 0.36 cfs of 0.46 cfs potential flow)
    └─**5=Exfiltration** (Exfiltration Controls 0.36 cfs)

Stage-Area-Storage for Pond 1P: (new Pond)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
970.00	640	0
970.20	776	142
970.40	913	311
970.60	1,049	507
970.80	1,185	730
971.00	1,322	981
971.20	1,458	1,259
971.40	1,594	1,564
971.60	1,731	1,897
971.80	1,867	2,256
972.00	2,003	2,643
972.20	2,140	3,058
972.40	2,276	3,499
972.60	2,412	3,968
972.80	2,549	4,464
973.00	2,685	4,988
973.20	2,857	5,542
973.40	3,028	6,130
973.60	3,200	6,753
973.80	3,371	7,410
974.00	3,543	8,101
974.20	3,714	8,827
974.40	3,885	9,587
974.60	4,057	10,381
974.80	4,228	11,210
975.00	4,400	12,073
975.20	4,592	12,972
975.40	4,784	13,909
975.60	4,976	14,885
975.80	5,168	15,900
976.00	5,360	16,953
976.20	5,552	18,044
976.40	5,744	19,173
976.60	6,439	20,366
976.80	7,635	21,774
977.00	8,833	23,421
977.20	10,030	25,307
977.40	11,226	27,432
977.60	12,520	29,802
977.80	13,910	32,445
978.00	15,300	35,366
978.20	15,700	38,466
978.40	16,100	41,646
978.60	16,500	44,906
978.80	16,900	48,246
979.00	17,300	51,666
979.20	17,720	55,168
979.40	18,140	58,754
979.60	18,560	62,424
979.80	18,980	66,178
980.00	19,400	70,016
980.20	19,838	73,940
980.40	20,276	77,951
980.60	20,714	82,050
980.80	21,152	86,237
981.00	21,590	90,511
981.20	23,272	94,997
981.40	24,954	99,820
981.60	26,636	104,979
981.80	28,318	110,474
982.00	**30,000**	**116,306**

Summary for Pond 5P: (new Pond)

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min
Primary	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 982.50' Surf.Area= 8,980 sf Storage= 18,210 cf
Peak Elev= 982.50' @ 0.00 hrs Surf.Area= 8,980 sf Storage= 18,210 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	977.00'	61,546 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
977.00	475	0	0
978.00	1,300	888	888
980.00	3,190	4,490	5,378
981.00	4,250	3,720	9,098
981.50	4,810	2,265	11,363
982.00	6,800	2,903	14,265
982.50	8,980	3,945	18,210
983.00	9,895	4,719	22,929
984.00	11,805	10,850	33,779
985.00	13,815	12,810	46,589
986.00	16,100	14,958	61,546

Device	Routing	Invert	Outlet Devices
#1	Primary	982.00'	**24.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 982.00' / 981.85' S= 0.0075 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	982.50'	**16.0" W x 8.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	983.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	984.75'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=982.50' (Free Discharge)
└─**1=Culvert** (Passes 0.00 cfs of 1.15 cfs potential flow)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  ├─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Stage-Area-Storage for Pond 5P: (new Pond)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
977.00	475	0	982.20	7,672	15,712
977.10	558	52	982.30	8,108	16,501
977.20	640	112	982.40	8,544	17,334
977.30	722	180	982.50	8,980	18,210
977.40	805	256	982.60	9,163	19,117
977.50	888	341	982.70	9,346	20,043
977.60	970	434	982.80	9,529	20,986
977.70	1,053	535	982.90	9,712	21,948
977.80	1,135	644	983.00	9,895	22,929
977.90	1,217	762	983.10	10,086	23,928
978.00	1,300	888	983.20	10,277	24,946
978.10	1,395	1,022	983.30	10,468	25,983
978.20	1,489	1,166	983.40	10,659	27,040
978.30	1,583	1,320	983.50	10,850	28,115
978.40	1,678	1,483	983.60	11,041	29,210
978.50	1,773	1,656	983.70	11,232	30,323
978.60	1,867	1,838	983.80	11,423	31,456
978.70	1,962	2,029	983.90	11,614	32,608
978.80	2,056	2,230	984.00	11,805	33,779
978.90	2,150	2,440	984.10	12,006	34,969
979.00	2,245	2,660	984.20	12,207	36,180
979.10	2,340	2,889	984.30	12,408	37,411
979.20	2,434	3,128	984.40	12,609	38,662
979.30	2,528	3,376	984.50	12,810	39,933
979.40	2,623	3,634	984.60	13,011	41,224
979.50	2,718	3,901	984.70	13,212	42,535
979.60	2,812	4,177	984.80	13,413	43,866
979.70	2,907	4,463	984.90	13,614	45,217
979.80	3,001	4,758	985.00	13,815	46,589
979.90	3,095	5,063	985.10	14,044	47,982
980.00	3,190	5,378	985.20	14,272	49,397
980.10	3,296	5,702	985.30	14,500	50,836
980.20	3,402	6,037	985.40	14,729	52,298
980.30	3,508	6,382	985.50	14,958	53,782
980.40	3,614	6,738	985.60	15,186	55,289
980.50	3,720	7,105	985.70	15,415	56,819
980.60	3,826	7,482	985.80	15,643	58,372
980.70	3,932	7,870	985.90	15,871	59,948
980.80	4,038	8,269	986.00	**16,100**	**61,546**
980.90	4,144	8,678			
981.00	4,250	9,098			
981.10	4,362	9,528			
981.20	4,474	9,970			
981.30	4,586	10,423			
981.40	4,698	10,887			
981.50	4,810	11,363			
981.60	5,208	11,863			
981.70	5,606	12,404			
981.80	6,004	12,985			
981.90	6,402	13,605			
982.00	6,800	14,265			
982.10	7,236	14,967			

Summary for Pond 21P: (new Pond)

Inflow Area =	0.500 ac,	1.40% Impervious,	Inflow Depth = 0.60"	for 1-Year event	
Inflow =	0.29 cfs @	12.33 hrs,	Volume=	0.025 af	
Outflow =	0.11 cfs @	12.77 hrs,	Volume=	0.029 af,	Atten= 64%, Lag= 26.3 min
Discarded =	0.01 cfs @	12.77 hrs,	Volume=	0.013 af	
Primary =	0.10 cfs @	12.77 hrs,	Volume=	0.016 af	

Routed to Reach 22R : East

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 999.60' Surf.Area= 949 sf Storage= 450 cf
Peak Elev= 999.81' @ 12.77 hrs Surf.Area= 1,086 sf Storage= 659 cf (209 cf above start)

Plug-Flow detention time= 400.3 min calculated for 0.018 af (74% of inflow)
Center-of-Mass det. time= 110.9 min (965.9 - 855.0)

Volume	Invert	Avail.Storage	Storage Description
#1	999.00'	3,596 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
999.00	550	0	0
1,000.00	1,215	883	883
1,001.00	1,975	1,595	2,478
1,001.50	2,500	1,119	3,596

Device	Routing	Invert	Outlet Devices
#1	Primary	999.60'	**8.0" Round Culvert** L= 23.0' Ke= 0.500 Inlet / Outlet Invert= 999.60' / 999.47' S= 0.0057 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Discarded	999.00'	**0.200 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.77 hrs HW=999.81' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.10 cfs @ 12.77 hrs HW=999.81' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.10 cfs @ 1.65 fps)

Stage-Area-Storage for Pond 21P: (new Pond)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
999.00	550	0
999.05	583	28
999.10	617	58
999.15	650	90
999.20	683	123
999.25	716	158
999.30	749	195
999.35	783	233
999.40	816	273
999.45	849	315
999.50	883	358
999.55	916	403
999.60	949	450
999.65	982	498
999.70	1,016	548
999.75	1,049	600
999.80	1,082	653
999.85	1,115	708
999.90	1,148	764
999.95	1,182	823
1,000.00	1,215	883
1,000.05	1,253	944
1,000.10	1,291	1,008
1,000.15	1,329	1,073
1,000.20	1,367	1,141
1,000.25	1,405	1,210
1,000.30	1,443	1,281
1,000.35	1,481	1,354
1,000.40	1,519	1,429
1,000.45	1,557	1,506
1,000.50	1,595	1,585
1,000.55	1,633	1,666
1,000.60	1,671	1,748
1,000.65	1,709	1,833
1,000.70	1,747	1,919
1,000.75	1,785	2,008
1,000.80	1,823	2,098
1,000.85	1,861	2,190
1,000.90	1,899	2,284
1,000.95	1,937	2,380
1,001.00	1,975	2,478
1,001.05	2,027	2,578
1,001.10	2,080	2,680
1,001.15	2,132	2,786
1,001.20	2,185	2,894
1,001.25	2,238	3,004
1,001.30	2,290	3,117
1,001.35	2,343	3,233
1,001.40	2,395	3,351
1,001.45	2,448	3,473
1,001.50	**2,500**	**3,596**

Summary for Pond 30P: (new Pond)

Inflow Area = 0.449 ac, 21.60% Impervious, Inflow Depth = 0.82" for 1-Year event
Inflow = 0.35 cfs @ 12.39 hrs, Volume= 0.031 af
Outflow = 0.08 cfs @ 13.11 hrs, Volume= 0.024 af, Atten= 76%, Lag= 43.2 min
Discarded = 0.01 cfs @ 13.11 hrs, Volume= 0.010 af
Primary = 0.08 cfs @ 13.11 hrs, Volume= 0.014 af
Routed to Reach 3R : Southeast

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 1,015.64' @ 13.11 hrs Surf.Area= 1,198 sf Storage= 664 cf

Plug-Flow detention time= 351.5 min calculated for 0.024 af (78% of inflow)
Center-of-Mass det. time= 277.6 min (1,122.5 - 844.9)

Volume	Invert	Avail.Storage	Storage Description
#1	1,015.00'	1,940 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,015.00	875	0	0
1,016.00	1,380	1,128	1,128
1,016.50	1,870	813	1,940

Device	Routing	Invert	Outlet Devices
#1	Primary	1,015.50'	**10.0" Round Culvert** L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 1,015.50' / 1,015.05' S= 0.0300 '/' Cc= 0.900 n= 0.013, Flow Area= 0.55 sf
#2	Discarded	1,015.00'	**0.200 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 13.11 hrs HW=1,015.64' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.08 cfs @ 13.11 hrs HW=1,015.64' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.08 cfs @ 1.28 fps)

Stage-Area-Storage for Pond 30P: (new Pond)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,015.00	875	0
1,015.02	885	18
1,015.04	895	35
1,015.06	905	53
1,015.08	915	72
1,015.10	926	90
1,015.12	936	109
1,015.14	946	127
1,015.16	956	146
1,015.18	966	166
1,015.20	976	185
1,015.22	986	205
1,015.24	996	225
1,015.26	1,006	245
1,015.28	1,016	265
1,015.30	1,026	285
1,015.32	1,037	306
1,015.34	1,047	327
1,015.36	1,057	348
1,015.38	1,067	369
1,015.40	1,077	390
1,015.42	1,087	412
1,015.44	1,097	434
1,015.46	1,107	456
1,015.48	1,117	478
1,015.50	1,128	501
1,015.52	1,138	523
1,015.54	1,148	546
1,015.56	1,158	569
1,015.58	1,168	592
1,015.60	1,178	616
1,015.62	1,188	640
1,015.64	1,198	663
1,015.66	1,208	687
1,015.68	1,218	712
1,015.70	1,229	736
1,015.72	1,239	761
1,015.74	1,249	786
1,015.76	1,259	811
1,015.78	1,269	836
1,015.80	1,279	862
1,015.82	1,289	887
1,015.84	1,299	913
1,015.86	1,309	939
1,015.88	1,319	966
1,015.90	1,329	992
1,015.92	1,340	1,019
1,015.94	1,350	1,046
1,015.96	1,360	1,073
1,015.98	1,370	1,100
1,016.00	1,380	1,128
1,016.02	1,400	1,155
1,016.04	1,419	1,183
1,016.06	1,439	1,212
1,016.08	1,458	1,241
1,016.10	1,478	1,270
1,016.12	1,498	1,300
1,016.14	1,517	1,330
1,016.16	1,537	1,361
1,016.18	1,556	1,392
1,016.20	1,576	1,423
1,016.22	1,596	1,455
1,016.24	1,615	1,487
1,016.26	1,635	1,519
1,016.28	1,654	1,552
1,016.30	1,674	1,586
1,016.32	1,694	1,619
1,016.34	1,713	1,653
1,016.36	1,733	1,688
1,016.38	1,752	1,723
1,016.40	1,772	1,758
1,016.42	1,792	1,794
1,016.44	1,811	1,830
1,016.46	1,831	1,866
1,016.48	1,850	1,903
1,016.50	**1,870**	**1,940**

Summary for Subcatchment 1S: North

Runoff = 0.19 cfs @ 12.20 hrs, Volume= 0.011 af, Depth= 1.79"
Routed to Reach 2R : North

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

	Area (ac)	CN	Description
*	0.000	98	
	0.072	74	>75% Grass cover, Good, HSG C
	0.000	70	Woods, Good, HSG C
	0.072	74	Weighted Average
	0.072		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	50	0.0350	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.6	110	0.2000	3.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	160	Total			

Summary for Subcatchment 2S: East

Runoff = 2.44 cfs @ 12.21 hrs, Volume= 0.145 af, Depth= 1.86"
Routed to Reach 22R : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

	Area (ac)	CN	Description
*	0.078	98	
	0.504	74	>75% Grass cover, Good, HSG C
	0.350	72	Woods/grass comb., Good, HSG C
	0.932	75	Weighted Average
	0.854		91.63% Pervious Area
	0.078		8.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.1000	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.4	40	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.3	140	Total			

Summary for Subcatchment 3S: Southeast

Runoff = 0.23 cfs @ 12.30 hrs, Volume= 0.017 af, Depth= 1.72"
Routed to Reach 3R : Southeast

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

	Area (ac)	CN	Description
*	0.000	98	
	0.120	73	Woods, Fair, HSG C
	0.120	73	Weighted Average
	0.120		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	90	0.0260	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"

Summary for Subcatchment 4S: South

Runoff = 1.06 cfs @ 12.20 hrs, Volume= 0.063 af, Depth= 2.34"
Routed to Reach 4R : Plymouth Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

	Area (ac)	CN	Description
*	0.105	98	
	0.103	74	>75% Grass cover, Good, HSG C
	0.113	73	Woods, Fair, HSG C
	0.321	81	Weighted Average
	0.216		67.29% Pervious Area
	0.105		32.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	65	0.0420	0.09		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 2.86"

Summary for Subcatchment 5S: West

Runoff = 1.53 cfs @ 12.25 hrs, Volume= 0.101 af, Depth= 2.02"
Routed to Reach 4R : Plymouth Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

	Area (ac)	CN	Description
*	0.094	98	
	0.100	74	>75% Grass cover, Good, HSG C
	0.405	73	Woods, Fair, HSG C
	0.599	77	Weighted Average
	0.505		84.31% Pervious Area
	0.094		15.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	20	0.0400	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
11.9	80	0.0650	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.3	30	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.4	130	Total			

Summary for Subcatchment 10S: North Pond

Runoff = 21.62 cfs @ 12.31 hrs, Volume= 1.654 af, Depth= 2.26"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

	Area (ac)	CN	Description
*	2.679	98	
	1.600	74	>75% Grass cover, Good, HSG C
	4.508	72	Woods/grass comb., Good, HSG C
	8.787	80	Weighted Average
	6.108		69.51% Pervious Area
	2.679		30.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.2	100	0.0350	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
2.4	300	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	45	0.0050	4.20	7.43	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
20.9	465	Total			

Summary for Subcatchment 20S: NE Pond

Runoff = 0.99 cfs @ 12.31 hrs, Volume= 0.075 af, Depth= 1.79"
Routed to Pond 21P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

	Area (ac)	CN	Description
*	0.007	98	
	0.493	74	>75% Grass cover, Good, HSG C
	0.500	74	Weighted Average
	0.493		98.60% Pervious Area
	0.007		1.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	90	0.0220	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"

Summary for Subcatchment 30S: SE Pond

Runoff = 0.97 cfs @ 12.37 hrs, Volume= 0.081 af, Depth= 2.18"
Routed to Pond 30P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

	Area (ac)	CN	Description
*	0.097	98	
	0.107	73	Woods, Fair, HSG C
	0.245	74	>75% Grass cover, Good, HSG C
	0.449	79	Weighted Average
	0.352		78.40% Pervious Area
	0.097		21.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.7	100	0.0180	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
1.3	120	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.0	220	Total			

Summary for Reach 2R: North

Inflow Area = 8.859 ac, 30.24% Impervious, Inflow Depth > 2.03" for 10-Year event
Inflow = 7.79 cfs @ 12.70 hrs, Volume= 1.497 af
Outflow = 7.79 cfs @ 12.70 hrs, Volume= 1.497 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 31R : Total

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: Southeast

Inflow Area = 0.569 ac, 17.05% Impervious, Inflow Depth = 1.70" for 10-Year event
Inflow = 0.82 cfs @ 12.53 hrs, Volume= 0.081 af
Outflow = 0.82 cfs @ 12.53 hrs, Volume= 0.081 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 31R : Total

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 4R: Plymouth Road

Inflow Area = 0.920 ac, 21.63% Impervious, Inflow Depth = 2.13" for 10-Year event
Inflow = 2.53 cfs @ 12.23 hrs, Volume= 0.163 af
Outflow = 2.53 cfs @ 12.23 hrs, Volume= 0.163 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 31R : Total

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 22R: East

Inflow Area = 1.432 ac, 5.94% Impervious, Inflow Depth = 1.76" for 10-Year event
Inflow = 2.61 cfs @ 12.22 hrs, Volume= 0.210 af
Outflow = 2.61 cfs @ 12.22 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 31R : Total

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 31R: Total

Inflow Area = 11.780 ac, 25.98% Impervious, Inflow Depth > 1.99" for 10-Year event
Inflow = 10.12 cfs @ 12.64 hrs, Volume= 1.951 af
Outflow = 10.12 cfs @ 12.64 hrs, Volume= 1.951 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: (new Pond)

Inflow Area = 8.787 ac, 30.49% Impervious, Inflow Depth = 2.26" for 10-Year event
Inflow = 21.62 cfs @ 12.31 hrs, Volume= 1.654 af
Outflow = 7.76 cfs @ 12.70 hrs, Volume= 1.486 af, Atten= 64%, Lag= 23.3 min
Primary = 7.76 cfs @ 12.70 hrs, Volume= 1.486 af
Routed to Reach 2R : North

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 976.50' Surf.Area= 5,840 sf Storage= 19,753 cf
Peak Elev= 979.09' @ 12.70 hrs Surf.Area= 17,499 sf Storage= 53,319 cf (33,566 cf above start)

Plug-Flow detention time= 464.6 min calculated for 1.031 af (62% of inflow)
Center-of-Mass det. time= 251.7 min (1,070.0 - 818.3)

Volume	Invert	Avail.Storage	Storage Description
#1	970.00'	116,306 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
970.00	640	0	0
973.00	2,685	4,988	4,988
975.00	4,400	7,085	12,073
976.50	5,840	7,680	19,753
977.50	11,825	8,833	28,585
978.00	15,300	6,781	35,366
979.00	17,300	16,300	51,666
980.00	19,400	18,350	70,016
981.00	21,590	20,495	90,511
982.00	30,000	25,795	116,306

Device	Routing	Invert	Outlet Devices
#1	Primary	975.90'	**21.0" Round Culvert** L= 49.0' Ke= 0.500 Inlet / Outlet Invert= 975.90' / 975.48' S= 0.0086 '/' Cc= 0.900 n= 0.013, Flow Area= 2.41 sf
#2	Device 1	978.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	979.50'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	976.00'	**6.0" Round Culvert** L= 100.0' Ke= 0.500 Inlet / Outlet Invert= 976.00' / 976.00' S= 0.0000 '/' Cc= 0.900 n= 0.020, Flow Area= 0.20 sf
#5	Device 4	976.50'	**1.600 in/hr Exfiltration over Surface area above 976.50'** Excluded Surface area = 5,840 sf

Primary OutFlow Max=7.74 cfs @ 12.70 hrs HW=979.09' (Free Discharge)
└─**1=Culvert** (Passes 7.74 cfs of 17.64 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Weir Controls 7.31 cfs @ 2.73 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Culvert** (Passes 0.43 cfs of 0.56 cfs potential flow)
    └─**5=Exfiltration** (Exfiltration Controls 0.43 cfs)

Stage-Area-Storage for Pond 1P: (new Pond)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
970.00	640	0
970.20	776	142
970.40	913	311
970.60	1,049	507
970.80	1,185	730
971.00	1,322	981
971.20	1,458	1,259
971.40	1,594	1,564
971.60	1,731	1,897
971.80	1,867	2,256
972.00	2,003	2,643
972.20	2,140	3,058
972.40	2,276	3,499
972.60	2,412	3,968
972.80	2,549	4,464
973.00	2,685	4,988
973.20	2,857	5,542
973.40	3,028	6,130
973.60	3,200	6,753
973.80	3,371	7,410
974.00	3,543	8,101
974.20	3,714	8,827
974.40	3,885	9,587
974.60	4,057	10,381
974.80	4,228	11,210
975.00	4,400	12,073
975.20	4,592	12,972
975.40	4,784	13,909
975.60	4,976	14,885
975.80	5,168	15,900
976.00	5,360	16,953
976.20	5,552	18,044
976.40	5,744	19,173
976.60	6,439	20,366
976.80	7,635	21,774
977.00	8,833	23,421
977.20	10,030	25,307
977.40	11,226	27,432
977.60	12,520	29,802
977.80	13,910	32,445
978.00	15,300	35,366
978.20	15,700	38,466
978.40	16,100	41,646
978.60	16,500	44,906
978.80	16,900	48,246
979.00	17,300	51,666
979.20	17,720	55,168
979.40	18,140	58,754
979.60	18,560	62,424
979.80	18,980	66,178
980.00	19,400	70,016
980.20	19,838	73,940
980.40	20,276	77,951
980.60	20,714	82,050
980.80	21,152	86,237
981.00	21,590	90,511
981.20	23,272	94,997
981.40	24,954	99,820
981.60	26,636	104,979
981.80	28,318	110,474
982.00	**30,000**	**116,306**

Summary for Pond 5P: (new Pond)

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min
Primary	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 982.50' Surf.Area= 8,980 sf Storage= 18,210 cf
Peak Elev= 982.50' @ 0.00 hrs Surf.Area= 8,980 sf Storage= 18,210 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	977.00'	61,546 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
977.00	475	0	0
978.00	1,300	888	888
980.00	3,190	4,490	5,378
981.00	4,250	3,720	9,098
981.50	4,810	2,265	11,363
982.00	6,800	2,903	14,265
982.50	8,980	3,945	18,210
983.00	9,895	4,719	22,929
984.00	11,805	10,850	33,779
985.00	13,815	12,810	46,589
986.00	16,100	14,958	61,546

Device	Routing	Invert	Outlet Devices
#1	Primary	982.00'	**24.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 982.00' / 981.85' S= 0.0075 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	982.50'	**16.0" W x 8.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	983.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	984.75'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=982.50' (Free Discharge)
└─**1=Culvert** (Passes 0.00 cfs of 1.15 cfs potential flow)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  ├─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Stage-Area-Storage for Pond 5P: (new Pond)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
977.00	475	0
977.10	558	52
977.20	640	112
977.30	722	180
977.40	805	256
977.50	888	341
977.60	970	434
977.70	1,053	535
977.80	1,135	644
977.90	1,217	762
978.00	1,300	888
978.10	1,395	1,022
978.20	1,489	1,166
978.30	1,583	1,320
978.40	1,678	1,483
978.50	1,773	1,656
978.60	1,867	1,838
978.70	1,962	2,029
978.80	2,056	2,230
978.90	2,150	2,440
979.00	2,245	2,660
979.10	2,340	2,889
979.20	2,434	3,128
979.30	2,528	3,376
979.40	2,623	3,634
979.50	2,718	3,901
979.60	2,812	4,177
979.70	2,907	4,463
979.80	3,001	4,758
979.90	3,095	5,063
980.00	3,190	5,378
980.10	3,296	5,702
980.20	3,402	6,037
980.30	3,508	6,382
980.40	3,614	6,738
980.50	3,720	7,105
980.60	3,826	7,482
980.70	3,932	7,870
980.80	4,038	8,269
980.90	4,144	8,678
981.00	4,250	9,098
981.10	4,362	9,528
981.20	4,474	9,970
981.30	4,586	10,423
981.40	4,698	10,887
981.50	4,810	11,363
981.60	5,208	11,863
981.70	5,606	12,404
981.80	6,004	12,985
981.90	6,402	13,605
982.00	6,800	14,265
982.10	7,236	14,967
982.20	7,672	15,712
982.30	8,108	16,501
982.40	8,544	17,334
982.50	8,980	18,210
982.60	9,163	19,117
982.70	9,346	20,043
982.80	9,529	20,986
982.90	9,712	21,948
983.00	9,895	22,929
983.10	10,086	23,928
983.20	10,277	24,946
983.30	10,468	25,983
983.40	10,659	27,040
983.50	10,850	28,115
983.60	11,041	29,210
983.70	11,232	30,323
983.80	11,423	31,456
983.90	11,614	32,608
984.00	11,805	33,779
984.10	12,006	34,969
984.20	12,207	36,180
984.30	12,408	37,411
984.40	12,609	38,662
984.50	12,810	39,933
984.60	13,011	41,224
984.70	13,212	42,535
984.80	13,413	43,866
984.90	13,614	45,217
985.00	13,815	46,589
985.10	14,044	47,982
985.20	14,272	49,397
985.30	14,500	50,836
985.40	14,729	52,298
985.50	14,958	53,782
985.60	15,186	55,289
985.70	15,415	56,819
985.80	15,643	58,372
985.90	15,871	59,948
986.00	**16,100**	**61,546**

Summary for Pond 21P: (new Pond)

Inflow Area = 0.500 ac, 1.40% Impervious, Inflow Depth = 1.79" for 10-Year event
Inflow = 0.99 cfs @ 12.31 hrs, Volume= 0.075 af
Outflow = 0.65 cfs @ 12.50 hrs, Volume= 0.078 af, Atten= 34%, Lag= 11.3 min
Discarded = 0.01 cfs @ 12.50 hrs, Volume= 0.013 af
Primary = 0.64 cfs @ 12.50 hrs, Volume= 0.065 af
Routed to Reach 22R : East

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 999.60' Surf.Area= 949 sf Storage= 450 cf
Peak Elev= 1,000.18' @ 12.50 hrs Surf.Area= 1,354 sf Storage= 1,118 cf (668 cf above start)

Plug-Flow detention time= 141.7 min calculated for 0.068 af (91% of inflow)
Center-of-Mass det. time= 55.4 min (884.8 - 829.4)

Volume	Invert	Avail.Storage	Storage Description
#1	999.00'	3,596 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
999.00	550	0	0
1,000.00	1,215	883	883
1,001.00	1,975	1,595	2,478
1,001.50	2,500	1,119	3,596

Device	Routing	Invert	Outlet Devices
#1	Primary	999.60'	**8.0" Round Culvert** L= 23.0' Ke= 0.500 Inlet / Outlet Invert= 999.60' / 999.47' S= 0.0057 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Discarded	999.00'	**0.200 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.50 hrs HW=1,000.18' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.64 cfs @ 12.50 hrs HW=1,000.18' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.64 cfs @ 2.65 fps)

Stage-Area-Storage for Pond 21P: (new Pond)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
999.00	550	0
999.05	583	28
999.10	617	58
999.15	650	90
999.20	683	123
999.25	716	158
999.30	749	195
999.35	783	233
999.40	816	273
999.45	849	315
999.50	883	358
999.55	916	403
999.60	949	450
999.65	982	498
999.70	1,016	548
999.75	1,049	600
999.80	1,082	653
999.85	1,115	708
999.90	1,148	764
999.95	1,182	823
1,000.00	1,215	883
1,000.05	1,253	944
1,000.10	1,291	1,008
1,000.15	1,329	1,073
1,000.20	1,367	1,141
1,000.25	1,405	1,210
1,000.30	1,443	1,281
1,000.35	1,481	1,354
1,000.40	1,519	1,429
1,000.45	1,557	1,506
1,000.50	1,595	1,585
1,000.55	1,633	1,666
1,000.60	1,671	1,748
1,000.65	1,709	1,833
1,000.70	1,747	1,919
1,000.75	1,785	2,008
1,000.80	1,823	2,098
1,000.85	1,861	2,190
1,000.90	1,899	2,284
1,000.95	1,937	2,380
1,001.00	1,975	2,478
1,001.05	2,027	2,578
1,001.10	2,080	2,680
1,001.15	2,132	2,786
1,001.20	2,185	2,894
1,001.25	2,238	3,004
1,001.30	2,290	3,117
1,001.35	2,343	3,233
1,001.40	2,395	3,351
1,001.45	2,448	3,473
1,001.50	**2,500**	**3,596**

Summary for Pond 30P: (new Pond)

Inflow Area = 0.449 ac, 21.60% Impervious, Inflow Depth = 2.18" for 10-Year event
Inflow = 0.97 cfs @ 12.37 hrs, Volume= 0.081 af
Outflow = 0.70 cfs @ 12.56 hrs, Volume= 0.074 af, Atten= 27%, Lag= 11.3 min
Discarded = 0.01 cfs @ 12.56 hrs, Volume= 0.011 af
Primary = 0.70 cfs @ 12.56 hrs, Volume= 0.063 af
Routed to Reach 3R : Southeast

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 1,015.95' @ 12.56 hrs Surf.Area= 1,357 sf Storage= 1,065 cf

Plug-Flow detention time= 141.5 min calculated for 0.074 af (91% of inflow)
Center-of-Mass det. time= 102.1 min (926.2 - 824.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,015.00'	1,940 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,015.00	875	0	0
1,016.00	1,380	1,128	1,128
1,016.50	1,870	813	1,940

Device	Routing	Invert	Outlet Devices
#1	Primary	1,015.50'	**10.0" Round Culvert** L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 1,015.50' / 1,015.05' S= 0.0300 '/' Cc= 0.900 n= 0.013, Flow Area= 0.55 sf
#2	Discarded	1,015.00'	**0.200 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.56 hrs HW=1,015.95' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.70 cfs @ 12.56 hrs HW=1,015.95' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.70 cfs @ 2.29 fps)

Stage-Area-Storage for Pond 30P: (new Pond)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,015.00	875	0
1,015.02	885	18
1,015.04	895	35
1,015.06	905	53
1,015.08	915	72
1,015.10	926	90
1,015.12	936	109
1,015.14	946	127
1,015.16	956	146
1,015.18	966	166
1,015.20	976	185
1,015.22	986	205
1,015.24	996	225
1,015.26	1,006	245
1,015.28	1,016	265
1,015.30	1,026	285
1,015.32	1,037	306
1,015.34	1,047	327
1,015.36	1,057	348
1,015.38	1,067	369
1,015.40	1,077	390
1,015.42	1,087	412
1,015.44	1,097	434
1,015.46	1,107	456
1,015.48	1,117	478
1,015.50	1,128	501
1,015.52	1,138	523
1,015.54	1,148	546
1,015.56	1,158	569
1,015.58	1,168	592
1,015.60	1,178	616
1,015.62	1,188	640
1,015.64	1,198	663
1,015.66	1,208	687
1,015.68	1,218	712
1,015.70	1,229	736
1,015.72	1,239	761
1,015.74	1,249	786
1,015.76	1,259	811
1,015.78	1,269	836
1,015.80	1,279	862
1,015.82	1,289	887
1,015.84	1,299	913
1,015.86	1,309	939
1,015.88	1,319	966
1,015.90	1,329	992
1,015.92	1,340	1,019
1,015.94	1,350	1,046
1,015.96	1,360	1,073
1,015.98	1,370	1,100
1,016.00	1,380	1,128
1,016.02	1,400	1,155
1,016.04	1,419	1,183
1,016.06	1,439	1,212
1,016.08	1,458	1,241
1,016.10	1,478	1,270
1,016.12	1,498	1,300
1,016.14	1,517	1,330
1,016.16	1,537	1,361
1,016.18	1,556	1,392
1,016.20	1,576	1,423
1,016.22	1,596	1,455
1,016.24	1,615	1,487
1,016.26	1,635	1,519
1,016.28	1,654	1,552
1,016.30	1,674	1,586
1,016.32	1,694	1,619
1,016.34	1,713	1,653
1,016.36	1,733	1,688
1,016.38	1,752	1,723
1,016.40	1,772	1,758
1,016.42	1,792	1,794
1,016.44	1,811	1,830
1,016.46	1,831	1,866
1,016.48	1,850	1,903
1,016.50	**1,870**	**1,940**

Summary for Subcatchment 1S: North

Runoff = 0.46 cfs @ 12.19 hrs, Volume= 0.026 af, Depth= 4.32"
Routed to Reach 2R : North

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

	Area (ac)	CN	Description
*	0.000	98	
	0.072	74	>75% Grass cover, Good, HSG C
	0.000	70	Woods, Good, HSG C
	0.072	74	Weighted Average
	0.072		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	50	0.0350	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.6	110	0.2000	3.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	160	Total			

Summary for Subcatchment 2S: East

Runoff = 5.79 cfs @ 12.20 hrs, Volume= 0.344 af, Depth= 4.43"
Routed to Reach 22R : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

	Area (ac)	CN	Description
*	0.078	98	
	0.504	74	>75% Grass cover, Good, HSG C
	0.350	72	Woods/grass comb., Good, HSG C
	0.932	75	Weighted Average
	0.854		91.63% Pervious Area
	0.078		8.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.1000	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.4	40	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.3	140	Total			

Summary for Subcatchment 3S: Southeast

Runoff = 0.58 cfs @ 12.28 hrs, Volume= 0.042 af, Depth= 4.21"
Routed to Reach 3R : Southeast

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

	Area (ac)	CN	Description
*	0.000	98	
	0.120	73	Woods, Fair, HSG C
	0.120	73	Weighted Average
	0.120		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	90	0.0260	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"

Summary for Subcatchment 4S: South

Runoff = 2.26 cfs @ 12.20 hrs, Volume= 0.137 af, Depth= 5.10"
Routed to Reach 4R : Plymouth Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

	Area (ac)	CN	Description
*	0.105	98	
	0.103	74	>75% Grass cover, Good, HSG C
	0.113	73	Woods, Fair, HSG C
	0.321	81	Weighted Average
	0.216		67.29% Pervious Area
	0.105		32.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	65	0.0420	0.09		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 2.86"

Summary for Subcatchment 5S: West

Runoff = 3.51 cfs @ 12.24 hrs, Volume= 0.232 af, Depth= 4.65"
Routed to Reach 4R : Plymouth Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

	Area (ac)	CN	Description
*	0.094	98	
	0.100	74	>75% Grass cover, Good, HSG C
	0.405	73	Woods, Fair, HSG C
	0.599	77	Weighted Average
	0.505		84.31% Pervious Area
	0.094		15.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	20	0.0400	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
11.9	80	0.0650	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.3	30	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.4	130	Total			

Summary for Subcatchment 10S: North Pond

Runoff = 47.24 cfs @ 12.31 hrs, Volume= 3.654 af, Depth= 4.99"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

	Area (ac)	CN	Description
*	2.679	98	
	1.600	74	>75% Grass cover, Good, HSG C
	4.508	72	Woods/grass comb., Good, HSG C
	8.787	80	Weighted Average
	6.108		69.51% Pervious Area
	2.679		30.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.2	100	0.0350	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
2.4	300	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	45	0.0050	4.20	7.43	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
20.9	465	Total			

Summary for Subcatchment 20S: NE Pond

Runoff = 2.41 cfs @ 12.30 hrs, Volume= 0.180 af, Depth= 4.32"
Routed to Pond 21P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

	Area (ac)	CN	Description
*	0.007	98	
	0.493	74	>75% Grass cover, Good, HSG C
	0.500	74	Weighted Average
	0.493		98.60% Pervious Area
	0.007		1.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	90	0.0220	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"

Summary for Subcatchment 30S: SE Pond

Runoff = 2.16 cfs @ 12.36 hrs, Volume= 0.183 af, Depth= 4.88"
Routed to Pond 30P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

	Area (ac)	CN	Description
*	0.097	98	
	0.107	73	Woods, Fair, HSG C
	0.245	74	>75% Grass cover, Good, HSG C
	0.449	79	Weighted Average
	0.352		78.40% Pervious Area
	0.097		21.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.7	100	0.0180	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
1.3	120	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.0	220	Total			

Summary for Reach 2R: North

Inflow Area = 8.859 ac, 30.24% Impervious, Inflow Depth > 4.73" for 100-Year event
Inflow = 22.42 cfs @ 12.58 hrs, Volume= 3.490 af
Outflow = 22.42 cfs @ 12.58 hrs, Volume= 3.490 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 31R : Total

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: Southeast

Inflow Area = 0.569 ac, 17.05% Impervious, Inflow Depth = 4.33" for 100-Year event
Inflow = 2.12 cfs @ 12.42 hrs, Volume= 0.205 af
Outflow = 2.12 cfs @ 12.42 hrs, Volume= 0.205 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 31R : Total

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 4R: Plymouth Road

Inflow Area = 0.920 ac, 21.63% Impervious, Inflow Depth = 4.81" for 100-Year event
Inflow = 5.69 cfs @ 12.22 hrs, Volume= 0.369 af
Outflow = 5.69 cfs @ 12.22 hrs, Volume= 0.369 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 31R : Total

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 22R: East

Inflow Area = 1.432 ac, 5.94% Impervious, Inflow Depth = 4.31" for 100-Year event
Inflow = 6.67 cfs @ 12.21 hrs, Volume= 0.514 af
Outflow = 6.67 cfs @ 12.21 hrs, Volume= 0.514 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 31R : Total

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 31R: Total

Inflow Area = 11.780 ac, 25.98% Impervious, Inflow Depth > 4.66" for 100-Year event
Inflow = 32.56 cfs @ 12.32 hrs, Volume= 4.578 af
Outflow = 32.56 cfs @ 12.32 hrs, Volume= 4.578 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: (new Pond)

Inflow Area = 8.787 ac, 30.49% Impervious, Inflow Depth = 4.99" for 100-Year event
Inflow = 47.24 cfs @ 12.31 hrs, Volume= 3.654 af
Outflow = 22.33 cfs @ 12.59 hrs, Volume= 3.464 af, Atten= 53%, Lag= 17.2 min
Primary = 22.33 cfs @ 12.59 hrs, Volume= 3.464 af
Routed to Reach 2R : North

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 976.50' Surf.Area= 5,840 sf Storage= 19,753 cf
Peak Elev= 980.49' @ 12.59 hrs Surf.Area= 20,481 sf Storage= 79,864 cf (60,111 cf above start)

Plug-Flow detention time= 214.1 min calculated for 3.006 af (82% of inflow)
Center-of-Mass det. time= 127.8 min (930.2 - 802.4)

Volume	Invert	Avail.Storage	Storage Description
#1	970.00'	116,306 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
970.00	640	0	0
973.00	2,685	4,988	4,988
975.00	4,400	7,085	12,073
976.50	5,840	7,680	19,753
977.50	11,825	8,833	28,585
978.00	15,300	6,781	35,366
979.00	17,300	16,300	51,666
980.00	19,400	18,350	70,016
981.00	21,590	20,495	90,511
982.00	30,000	25,795	116,306

Device	Routing	Invert	Outlet Devices
#1	Primary	975.90'	**21.0" Round Culvert** L= 49.0' Ke= 0.500 Inlet / Outlet Invert= 975.90' / 975.48' S= 0.0086 '/' Cc= 0.900 n= 0.013, Flow Area= 2.41 sf
#2	Device 1	978.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	979.50'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	976.00'	**6.0" Round Culvert** L= 100.0' Ke= 0.500 Inlet / Outlet Invert= 976.00' / 976.00' S= 0.0000 '/' Cc= 0.900 n= 0.020, Flow Area= 0.20 sf
#5	Device 4	976.50'	**1.600 in/hr Exfiltration over Surface area above 976.50'** Excluded Surface area = 5,840 sf

Primary OutFlow Max=22.33 cfs @ 12.59 hrs HW=980.49' (Free Discharge)
└─**1=Culvert** (Inlet Controls 22.33 cfs @ 9.28 fps)
  ├─**2=Sharp-Crested Rectangular Weir** (Passes < 35.43 cfs potential flow)
  ├─**3=Orifice/Grate** (Passes < 23.54 cfs potential flow)
  └─**4=Culvert** (Passes < 0.70 cfs potential flow)
    └─**5=Exfiltration** (Passes < 0.54 cfs potential flow)

Stage-Area-Storage for Pond 1P: (new Pond)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
970.00	640	0
970.20	776	142
970.40	913	311
970.60	1,049	507
970.80	1,185	730
971.00	1,322	981
971.20	1,458	1,259
971.40	1,594	1,564
971.60	1,731	1,897
971.80	1,867	2,256
972.00	2,003	2,643
972.20	2,140	3,058
972.40	2,276	3,499
972.60	2,412	3,968
972.80	2,549	4,464
973.00	2,685	4,988
973.20	2,857	5,542
973.40	3,028	6,130
973.60	3,200	6,753
973.80	3,371	7,410
974.00	3,543	8,101
974.20	3,714	8,827
974.40	3,885	9,587
974.60	4,057	10,381
974.80	4,228	11,210
975.00	4,400	12,073
975.20	4,592	12,972
975.40	4,784	13,909
975.60	4,976	14,885
975.80	5,168	15,900
976.00	5,360	16,953
976.20	5,552	18,044
976.40	5,744	19,173
976.60	6,439	20,366
976.80	7,635	21,774
977.00	8,833	23,421
977.20	10,030	25,307
977.40	11,226	27,432
977.60	12,520	29,802
977.80	13,910	32,445
978.00	15,300	35,366
978.20	15,700	38,466
978.40	16,100	41,646
978.60	16,500	44,906
978.80	16,900	48,246
979.00	17,300	51,666
979.20	17,720	55,168
979.40	18,140	58,754
979.60	18,560	62,424
979.80	18,980	66,178
980.00	19,400	70,016
980.20	19,838	73,940
980.40	20,276	77,951
980.60	20,714	82,050
980.80	21,152	86,237
981.00	21,590	90,511
981.20	23,272	94,997
981.40	24,954	99,820
981.60	26,636	104,979
981.80	28,318	110,474
982.00	**30,000**	**116,306**

Summary for Pond 5P: (new Pond)

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min
Primary	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 982.50' Surf.Area= 8,980 sf Storage= 18,210 cf
Peak Elev= 982.50' @ 0.00 hrs Surf.Area= 8,980 sf Storage= 18,210 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	977.00'	61,546 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
977.00	475	0	0
978.00	1,300	888	888
980.00	3,190	4,490	5,378
981.00	4,250	3,720	9,098
981.50	4,810	2,265	11,363
982.00	6,800	2,903	14,265
982.50	8,980	3,945	18,210
983.00	9,895	4,719	22,929
984.00	11,805	10,850	33,779
985.00	13,815	12,810	46,589
986.00	16,100	14,958	61,546

Device	Routing	Invert	Outlet Devices
#1	Primary	982.00'	**24.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 982.00' / 981.85' S= 0.0075 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	982.50'	**16.0" W x 8.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	983.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	984.75'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=982.50' (Free Discharge)
└─**1=Culvert** (Passes 0.00 cfs of 1.15 cfs potential flow)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  ├─**3=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Stage-Area-Storage for Pond 5P: (new Pond)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
977.00	475	0	982.20	7,672	15,712
977.10	558	52	982.30	8,108	16,501
977.20	640	112	982.40	8,544	17,334
977.30	722	180	982.50	8,980	18,210
977.40	805	256	982.60	9,163	19,117
977.50	888	341	982.70	9,346	20,043
977.60	970	434	982.80	9,529	20,986
977.70	1,053	535	982.90	9,712	21,948
977.80	1,135	644	983.00	9,895	22,929
977.90	1,217	762	983.10	10,086	23,928
978.00	1,300	888	983.20	10,277	24,946
978.10	1,395	1,022	983.30	10,468	25,983
978.20	1,489	1,166	983.40	10,659	27,040
978.30	1,583	1,320	983.50	10,850	28,115
978.40	1,678	1,483	983.60	11,041	29,210
978.50	1,773	1,656	983.70	11,232	30,323
978.60	1,867	1,838	983.80	11,423	31,456
978.70	1,962	2,029	983.90	11,614	32,608
978.80	2,056	2,230	984.00	11,805	33,779
978.90	2,150	2,440	984.10	12,006	34,969
979.00	2,245	2,660	984.20	12,207	36,180
979.10	2,340	2,889	984.30	12,408	37,411
979.20	2,434	3,128	984.40	12,609	38,662
979.30	2,528	3,376	984.50	12,810	39,933
979.40	2,623	3,634	984.60	13,011	41,224
979.50	2,718	3,901	984.70	13,212	42,535
979.60	2,812	4,177	984.80	13,413	43,866
979.70	2,907	4,463	984.90	13,614	45,217
979.80	3,001	4,758	985.00	13,815	46,589
979.90	3,095	5,063	985.10	14,044	47,982
980.00	3,190	5,378	985.20	14,272	49,397
980.10	3,296	5,702	985.30	14,500	50,836
980.20	3,402	6,037	985.40	14,729	52,298
980.30	3,508	6,382	985.50	14,958	53,782
980.40	3,614	6,738	985.60	15,186	55,289
980.50	3,720	7,105	985.70	15,415	56,819
980.60	3,826	7,482	985.80	15,643	58,372
980.70	3,932	7,870	985.90	15,871	59,948
980.80	4,038	8,269	986.00	**16,100**	**61,546**
980.90	4,144	8,678			
981.00	4,250	9,098			
981.10	4,362	9,528			
981.20	4,474	9,970			
981.30	4,586	10,423			
981.40	4,698	10,887			
981.50	4,810	11,363			
981.60	5,208	11,863			
981.70	5,606	12,404			
981.80	6,004	12,985			
981.90	6,402	13,605			
982.00	6,800	14,265			
982.10	7,236	14,967			

Summary for Pond 21P: (new Pond)

Inflow Area = 0.500 ac, 1.40% Impervious, Inflow Depth = 4.32" for 100-Year event
Inflow = 2.41 cfs @ 12.30 hrs, Volume= 0.180 af
Outflow = 1.45 cfs @ 12.51 hrs, Volume= 0.183 af, Atten= 40%, Lag= 12.5 min
Discarded = 0.01 cfs @ 12.51 hrs, Volume= 0.013 af
Primary = 1.44 cfs @ 12.51 hrs, Volume= 0.170 af
Routed to Reach 22R : East

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 999.60' Surf.Area= 949 sf Storage= 450 cf
Peak Elev= 1,000.86' @ 12.51 hrs Surf.Area= 1,868 sf Storage= 2,207 cf (1,757 cf above start)

Plug-Flow detention time= 73.4 min calculated for 0.173 af (96% of inflow)
Center-of-Mass det. time= 36.8 min (848.1 - 811.3)

Volume	Invert	Avail.Storage	Storage Description
#1	999.00'	3,596 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
999.00	550	0	0
1,000.00	1,215	883	883
1,001.00	1,975	1,595	2,478
1,001.50	2,500	1,119	3,596

Device	Routing	Invert	Outlet Devices
#1	Primary	999.60'	**8.0" Round Culvert** L= 23.0' Ke= 0.500 Inlet / Outlet Invert= 999.60' / 999.47' S= 0.0057 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Discarded	999.00'	**0.200 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.51 hrs HW=1,000.86' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.44 cfs @ 12.51 hrs HW=1,000.86' (Free Discharge)
└─**1=Culvert** (Barrel Controls 1.44 cfs @ 4.12 fps)

Stage-Area-Storage for Pond 21P: (new Pond)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
999.00	550	0
999.05	583	28
999.10	617	58
999.15	650	90
999.20	683	123
999.25	716	158
999.30	749	195
999.35	783	233
999.40	816	273
999.45	849	315
999.50	883	358
999.55	916	403
999.60	949	450
999.65	982	498
999.70	1,016	548
999.75	1,049	600
999.80	1,082	653
999.85	1,115	708
999.90	1,148	764
999.95	1,182	823
1,000.00	1,215	883
1,000.05	1,253	944
1,000.10	1,291	1,008
1,000.15	1,329	1,073
1,000.20	1,367	1,141
1,000.25	1,405	1,210
1,000.30	1,443	1,281
1,000.35	1,481	1,354
1,000.40	1,519	1,429
1,000.45	1,557	1,506
1,000.50	1,595	1,585
1,000.55	1,633	1,666
1,000.60	1,671	1,748
1,000.65	1,709	1,833
1,000.70	1,747	1,919
1,000.75	1,785	2,008
1,000.80	1,823	2,098
1,000.85	1,861	2,190
1,000.90	1,899	2,284
1,000.95	1,937	2,380
1,001.00	1,975	2,478
1,001.05	2,027	2,578
1,001.10	2,080	2,680
1,001.15	2,132	2,786
1,001.20	2,185	2,894
1,001.25	2,238	3,004
1,001.30	2,290	3,117
1,001.35	2,343	3,233
1,001.40	2,395	3,351
1,001.45	2,448	3,473
1,001.50	**2,500**	**3,596**

Summary for Pond 30P: (new Pond)

Inflow Area = 0.449 ac, 21.60% Impervious, Inflow Depth = 4.88" for 100-Year event
Inflow = 2.16 cfs @ 12.36 hrs, Volume= 0.183 af
Outflow = 1.75 cfs @ 12.50 hrs, Volume= 0.175 af, Atten= 19%, Lag= 8.6 min
Discarded = 0.01 cfs @ 12.50 hrs, Volume= 0.012 af
Primary = 1.74 cfs @ 12.50 hrs, Volume= 0.163 af
Routed to Reach 3R : Southeast

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 1,016.35' @ 12.50 hrs Surf.Area= 1,728 sf Storage= 1,679 cf

Plug-Flow detention time= 73.5 min calculated for 0.175 af (96% of inflow)
Center-of-Mass det. time= 53.6 min (861.5 - 807.9)

Volume	Invert	Avail.Storage	Storage Description
#1	1,015.00'	1,940 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,015.00	875	0	0
1,016.00	1,380	1,128	1,128
1,016.50	1,870	813	1,940

Device	Routing	Invert	Outlet Devices
#1	Primary	1,015.50'	**10.0" Round Culvert** L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 1,015.50' / 1,015.05' S= 0.0300 '/' Cc= 0.900 n= 0.013, Flow Area= 0.55 sf
#2	Discarded	1,015.00'	**0.200 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.50 hrs HW=1,016.35' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.74 cfs @ 12.50 hrs HW=1,016.35' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.74 cfs @ 3.19 fps)

Stage-Area-Storage for Pond 30P: (new Pond)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,015.00	875	0
1,015.02	885	18
1,015.04	895	35
1,015.06	905	53
1,015.08	915	72
1,015.10	926	90
1,015.12	936	109
1,015.14	946	127
1,015.16	956	146
1,015.18	966	166
1,015.20	976	185
1,015.22	986	205
1,015.24	996	225
1,015.26	1,006	245
1,015.28	1,016	265
1,015.30	1,026	285
1,015.32	1,037	306
1,015.34	1,047	327
1,015.36	1,057	348
1,015.38	1,067	369
1,015.40	1,077	390
1,015.42	1,087	412
1,015.44	1,097	434
1,015.46	1,107	456
1,015.48	1,117	478
1,015.50	1,128	501
1,015.52	1,138	523
1,015.54	1,148	546
1,015.56	1,158	569
1,015.58	1,168	592
1,015.60	1,178	616
1,015.62	1,188	640
1,015.64	1,198	663
1,015.66	1,208	687
1,015.68	1,218	712
1,015.70	1,229	736
1,015.72	1,239	761
1,015.74	1,249	786
1,015.76	1,259	811
1,015.78	1,269	836
1,015.80	1,279	862
1,015.82	1,289	887
1,015.84	1,299	913
1,015.86	1,309	939
1,015.88	1,319	966
1,015.90	1,329	992
1,015.92	1,340	1,019
1,015.94	1,350	1,046
1,015.96	1,360	1,073
1,015.98	1,370	1,100
1,016.00	1,380	1,128
1,016.02	1,400	1,155
1,016.04	1,419	1,183
1,016.06	1,439	1,212
1,016.08	1,458	1,241
1,016.10	1,478	1,270
1,016.12	1,498	1,300
1,016.14	1,517	1,330
1,016.16	1,537	1,361
1,016.18	1,556	1,392
1,016.20	1,576	1,423
1,016.22	1,596	1,455
1,016.24	1,615	1,487
1,016.26	1,635	1,519
1,016.28	1,654	1,552
1,016.30	1,674	1,586
1,016.32	1,694	1,619
1,016.34	1,713	1,653
1,016.36	1,733	1,688
1,016.38	1,752	1,723
1,016.40	1,772	1,758
1,016.42	1,792	1,794
1,016.44	1,811	1,830
1,016.46	1,831	1,866
1,016.48	1,850	1,903
1,016.50	**1,870**	**1,940**

TABLE OF CONTENTS

Appendix C

MIDS Results

Project Information

Calculator Version:	Version 4: July 2020
Project Name:	
User Name / Company Name:	
Date:	
Project Description:	
Construction Permit?:	No

Site Information

Retention Requirement (inches):	1.1
Site's Zip Code:	55305
Annual Rainfall (inches):	30.4
Phosphorus EMC (mg/l):	0.3
TSS EMC (mg/l):	54.5

Total Site Area

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed					0
			Impervious Area (acres)		3.06
			Total Area (acres)		3.06

Site Areas Routed to BMPs

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed					0
			Impervious Area (acres)		3.06
			Total Area (acres)		3.06

Summary Information

Performance Goal Requirement

Performance goal volume retention requirement:	12219	ft3
Volume removed by BMPs towards performance goal:	12219	ft^3
Percent volume removed towards performance goal	**100**	**%**

Annual Volume and Pollutant Load Reductions

Post development annual runoff volume	6.628	acre-ft
Annual runoff volume removed by BMPs:	6.1264	acre-ft
Percent annual runoff volume removed:	**92**	**%**
Post development annual particulate P load:	2.9746	lbs
Annual particulate P removed by BMPs:	2.75	lbs
Post development annual dissolved P load:	2.434	lbs
Annual dissolved P removed by BMPs:	2.25	lbs
Total P removed by BMPs	5	lbs
Percent annual total phosphorus removed:	**92**	**%**
Post development annual TSS load:	982.5	lbs
Annual TSS removed by BMPs:	908.2	lbs
Percent annual TSS removed:	**92**	**%**

BMP Summary

Performance Goal Summary

BMP Name	BMP Volume Capacity (ft3)	Volume Recieved (ft3)	Volume Retained (ft3)	Volume Outflow (ft3)	Percent Retained (%)
1 - Infiltration basin/Infiltration trench (abc	12220	12219	12219	0	100

Annual Volume Summary

BMP Name	Volume From Direct Watershed (acre-ft)	Volume From Upstream BMPs (acre-ft)	Volume Retained (acre-ft)	Volume outflow (acre-ft)	Percent Retained (%)
1 - Infiltration basin/Infiltration trench (abc	6.628	0	6.1265	0.5015	92

Particulate Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Infiltration basin/Infiltration trench (abc	2.9746	0	2.7495	0.2251	92

Dissolved Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Infiltration basin/Infiltration trench (abc	2.4338	0	2.2496	0.1842	92

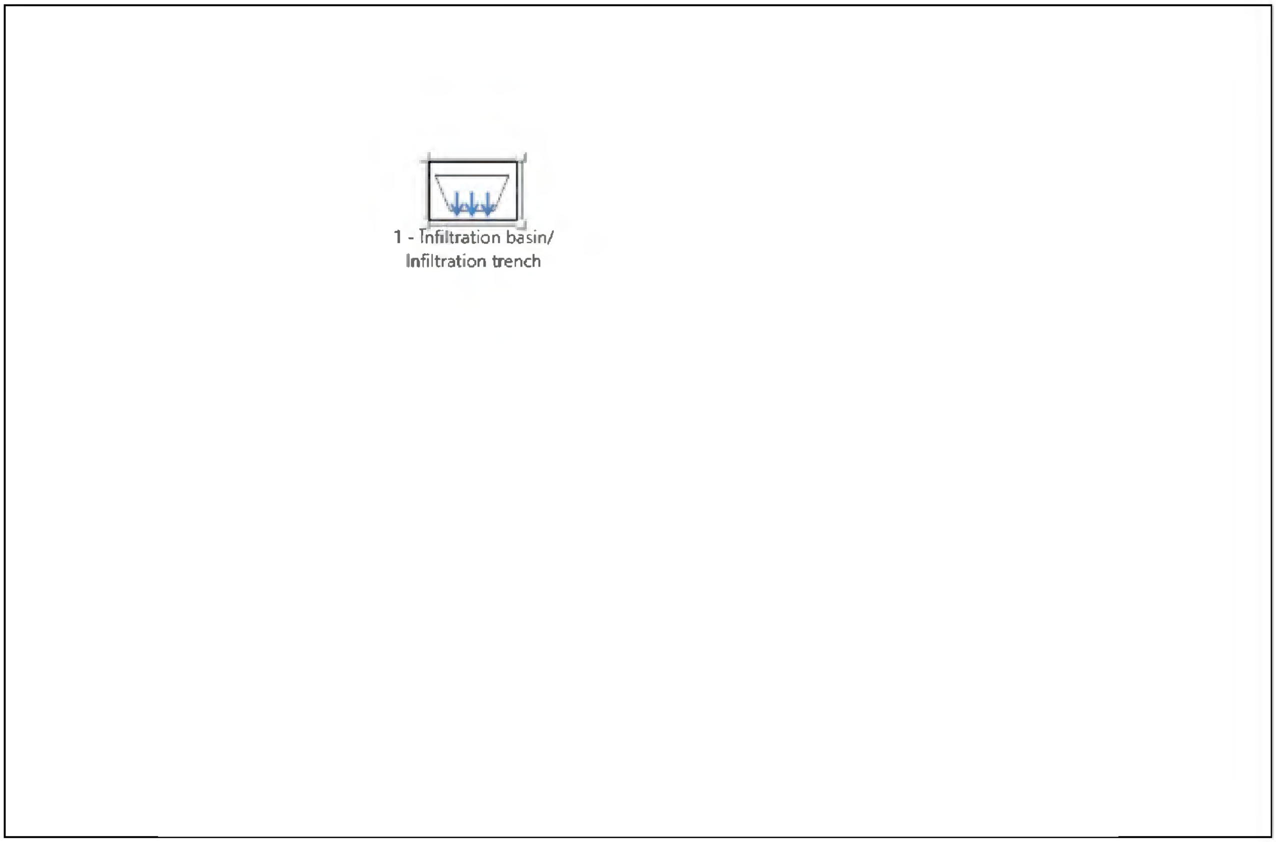
Total Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Infiltration basin/Infiltration trench (abc	5.4084	0	4.9991	0.4093	92

TSS Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Infiltration basin/Infiltration trench (abc	982.53	0	908.18	74.35	92

BMP Schematic


1 - Infiltration basin/
Infiltration trench

Project Information

Calculator Version:	Version 4: July 2020
Project Name:	
User Name / Company Name:	
Date:	
Project Description:	
Construction Permit?:	No

Site Information

Retention Requirement (inches):	1.1
Site's Zip Code:	55305
Annual Rainfall (inches):	30.4
Phosphorus EMC (mg/l):	0.3
TSS EMC (mg/l):	54.5

Total Site Area

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed			6.953		6.953
			Impervious Area (acres)		3.06
			Total Area (acres)		10.013

Site Areas Routed to BMPs

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed			6.953		6.953
			Impervious Area (acres)		2.783
			Total Area (acres)		9.736

Summary Information

Performance Goal Requirement

Performance goal volume retention requirement:	12219	ft3
Volume removed by BMPs towards performance goal:	5122	ft^3
Percent volume removed towards performance goal	**42**	**%**

Annual Volume and Pollutant Load Reductions

Post development annual runoff volume	10.1156	acre-ft
Annual runoff volume removed by BMPs:	2.5062	acre-ft
Percent annual runoff volume removed:	**25**	**%**
Post development annual particulate P load:	4.5399	lbs
Annual particulate P removed by BMPs:	4.106	lbs
Post development annual dissolved P load:	3.714	lbs
Annual dissolved P removed by BMPs:	1.47	lbs
Total P removed by BMPs	5.576	lbs
Percent annual total phosphorus removed:	**68**	**%**
Post development annual TSS load:	1499.5	lbs
Annual TSS removed by BMPs:	1356	lbs
Percent annual TSS removed:	**90**	**%**

BMP Summary

Performance Goal Summary

BMP Name	BMP Volume Capacity (ft3)	Volume Recieved (ft3)	Volume Retained (ft3)	Volume Outflow (ft3)	Percent Retained (%)
1 - Bioretention basin (with underdrain)	4706	10697	4706	5991	44
1 - Infiltration basin/Infiltration trench (abc	395	28	28	0	100
2 - Infiltration basin/Infiltration trench (abc	532	387	387	0	100
1 - Constructed stormwater pond	0	10697	0	10697	0

Annual Volume Summary

BMP Name	Volume From Direct Watershed (acre-ft)	Volume From Upstream BMPs (acre-ft)	Volume Retained (acre-ft)	Volume outflow (acre-ft)	Percent Retained (%)
1 - Bioretention basin (with underdrain)	0	8.8665	2.0055	6.861	23
1 - Infiltration basin/Infiltration trench (abc	0.2625	0	0.1933	0.0692	74
2 - Infiltration basin/Infiltration trench (abc	0.3867	0	0.3074	0.0793	79
1 - Constructed stormwater pond	8.8665	0	0	8.8665	0

Particulate Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Bioretention basin (with underdrain)	0	0.6367	0.5382	0.0985	85
1 - Infiltration basin/Infiltration trench (abc	0.1178	0	0.0868	0.031	74
2 - Infiltration basin/Infiltration trench (abc	0.1735	0	0.1379	0.0356	79
1 - Constructed stormwater pond	3.9793	0	3.3426	0.6367	84

Dissolved Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Bioretention basin (with underdrain)	0	2.9953	1.0252	1.9701	34
1 - Infiltration basin/Infiltration trench (abc	0.0964	0	0.071	0.0254	74
2 - Infiltration basin/Infiltration trench (abc	0.142	0	0.1129	0.0291	80
1 - Constructed stormwater pond	3.2558	0	0.2605	2.9953	8

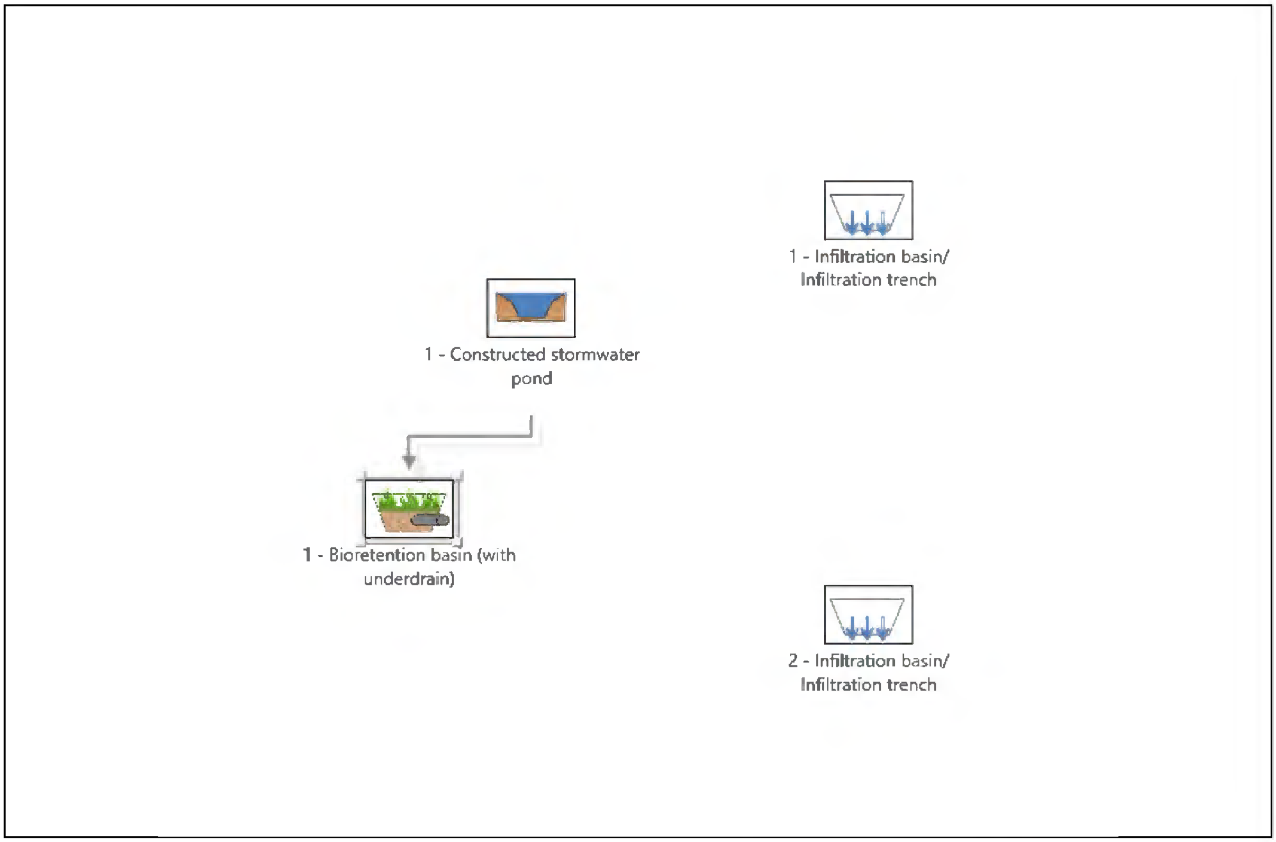
Total Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Bioretention basin (with underdrain)	0	3.632	1.5634	2.0686	60
1 - Infiltration basin/Infiltration trench (abc	0.2142	0	0.1578	0.0564	74
2 - Infiltration basin/Infiltration trench (abc	0.3155	0	0.2508	0.0647	80
1 - Constructed stormwater pond	7.2351	0	3.6031	3.632	46

TSS Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Bioretention basin (with underdrain)	0	210.3	177.75	32.55	85
1 - Infiltration basin/Infiltration trench (abc	38.91	0	28.66	10.25	74
2 - Infiltration basin/Infiltration trench (abc	57.32	0	45.56	11.76	79
1 - Constructed stormwater pond	1314.37	0	1104.07	210.3	84

BMP Schematic

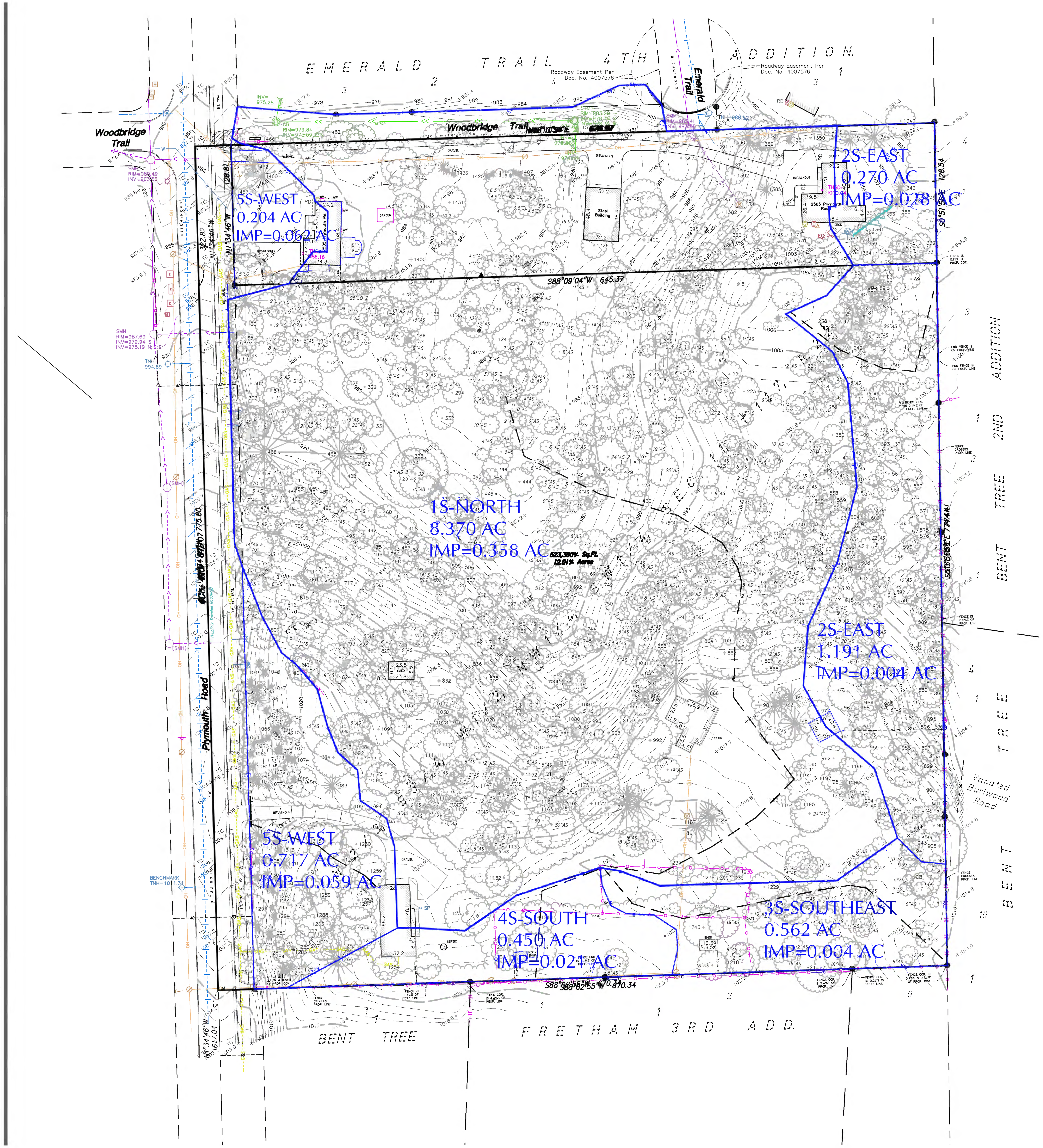

1 - Infiltration basin/ Infiltration trench
1 - Constructed stormwater pond
1 - Bioretention basin (with underdrain)
2 - Infiltration basin/ Infiltration trench

Appendix D

Pipe Sizing Spreadsheet

Figures

Existing Drainage Exhibit
Proposed Drainage Exhibit



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DUDYCHA PROPERTY

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SUBMITTAL/REVISIONS

PROFESSIONAL SIGNATURE

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Landscape Architect under the laws of the State of Minnesota.

Chad E. Feigum - LA

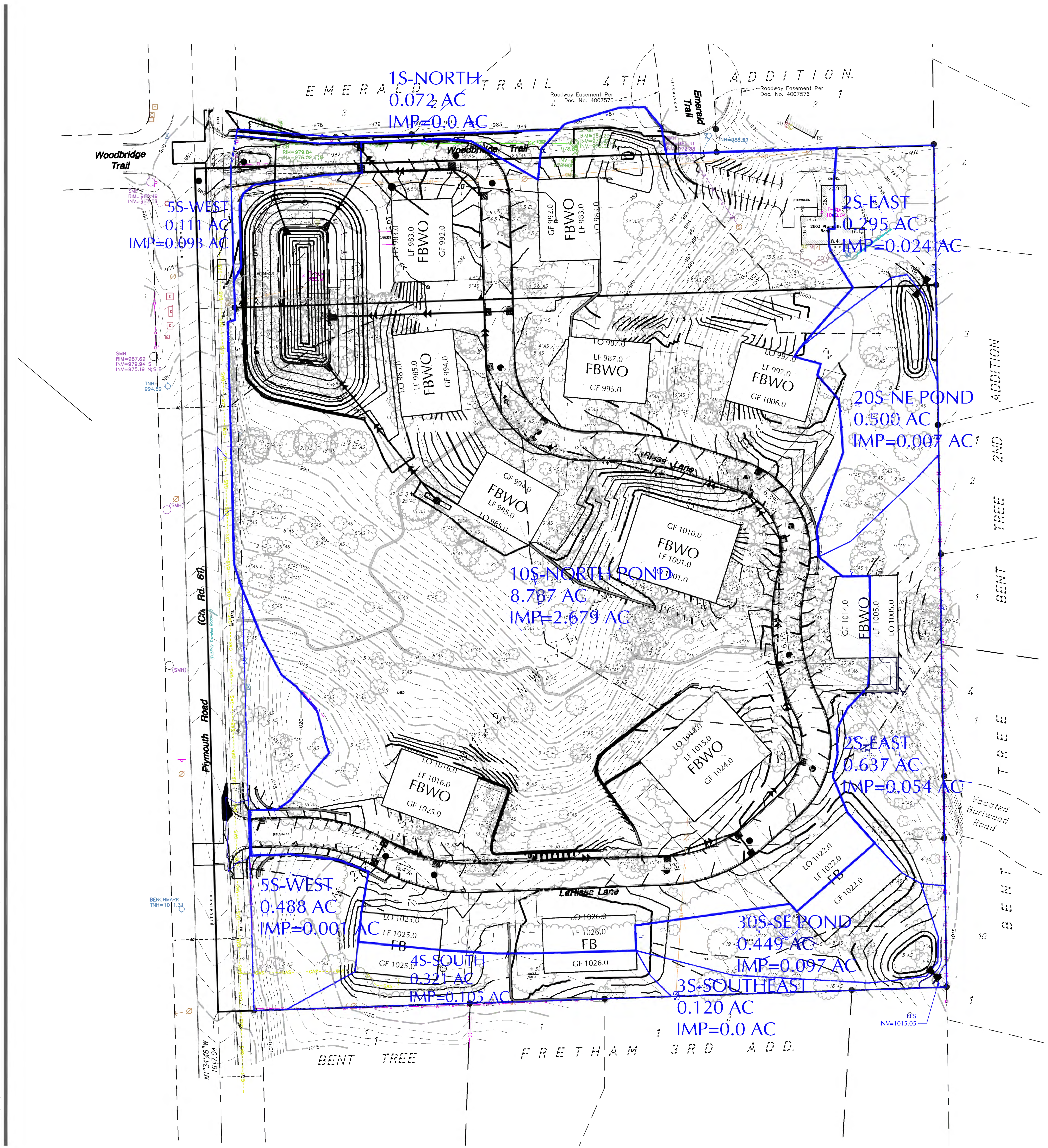
License No. 46508
Date

QUALITY CONTROL

Loucks Project No.	21509.0
Project Lead	CEF
Drawn By	CEF
Checked By	TJG/CEF
Review Date	

EXISTING DRAINAGE PLAN

H1-1



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SUBMITTAL/REVISIONS

PROFESSIONAL SIGNATURE

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Landscape Architect under the laws of the State of Minnesota.

Chad E. Feigum - LA

License No. 46508

Date

QUALITY CONTROL

Loucks Project No.	21509.0
Project Lead	CEF
Drawn By	CEF
Checked By	TJG/CEF
Review Date	

SHEET INDEX

PROPOSED DRAINAGE PLAN

H2-1