

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, P.E.

Minnesota Registration No. 43423

Date: 8-18-23

Fretham 31st Addition Minnetonka, Minnesota

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Fretham 31st Addition Minnetonka, Minnesota

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-Yea	r Storm	100-Year Storm	
	Area	Rate	Volume	Rate	Volume	Rate	Volume
Drainage Area	acres	cfs	cf	cfs	cf	cfs	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-Yea	r Storm	100-Year Storm		
	Area	Rate	Volume	Rate	Volume	Rate	Volume	
Drainage Area	acres	cfs	cf	cfs	cf	cfs	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 ftDepth maximum allowed: 1.0 in/hr + 48 hours / 12 in/ft = 4.0 ft

Quality Control

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.

1-inch
Infiltration Proposed
Removal Removals
Ibs/yr Ibs/yr
TSS 908.2 1356

5

Table 3 – TSS and TP loads for infiltration and proposed

5.576

Best Management Practices

ΤP

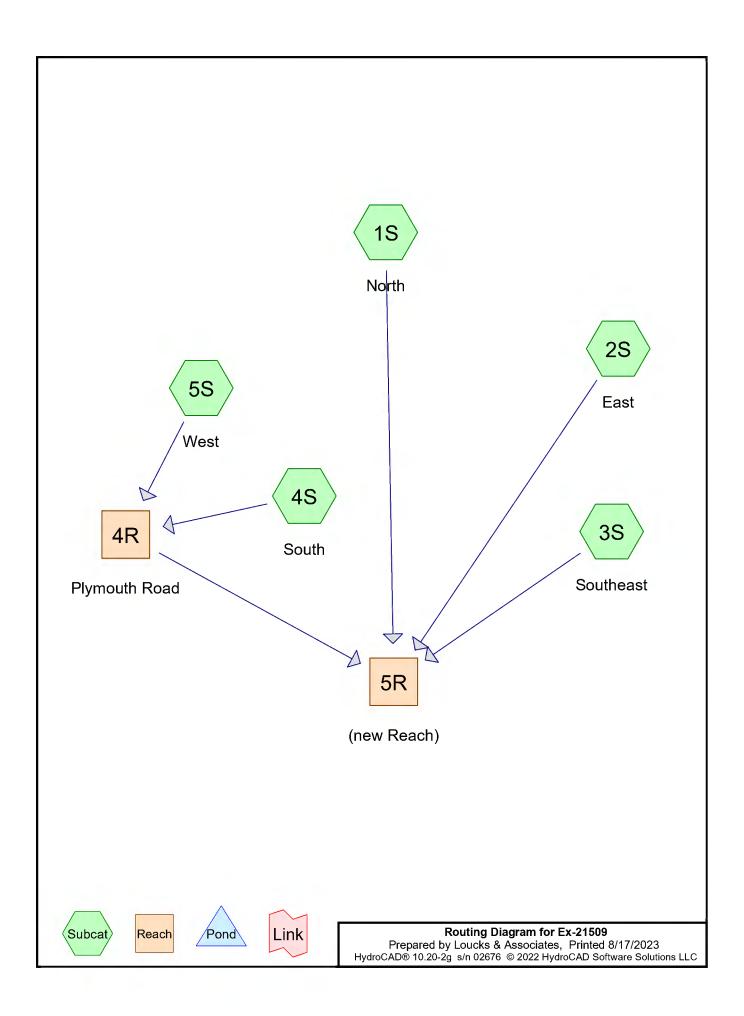
Best management practices (BMP's) will be implemented during construction per the project Stormwater Pollution Prevention Plan. During construction, erosion control measures will include dust control, silt fencing, inlet protection, and a temporary rock construction entrance. Permanent BMP's will include 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)



Page 2

Rainfall Events Listing (selected events)

Event#	Event	Storm Type	Curve	Mode	Duration	B/B	Depth	AMC
	Name				(hours)		(inches)	
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

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Area Listing (all nodes)

Area	CN	Description
(acres)		(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

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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)

_	Area	(ac) C	N Des	cription		
,	٠ 0.	358 9	98			
	8.	012 7	'3 Woo	ds, Fair, F	ISG C	
	8.	370 7	74 Weig	hted Aver	age	
	8.	012	95.7	2% Pervio	us Area	
	0.	358	4.28	% Impervi	ous Area	
	Тс	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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			

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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)

	Area	(ac) C	N Desc	cription		
* 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	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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	•	•	

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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)

	Area	(ac) C	N Des	cription		
*	0.	004	98			
				ds, Fair, F	ISG C	
0.562 73 Weighted Average						
	0.558 99.29% Pervious Area					
	0.004 0.71% Impervious Area				ous Area	
	· ·					
	Tc	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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		•	

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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

	Area	(ac) (CN Des	scription		
*	0.	021	98			
	0.	429	73 Wo	ods, Fair, F	ISG C	
	0.	450	74 We	ighted Avei	rage	
	0.	429	95.3	33% Pervio	us Area	
	0.	021	4.6	7% Impervi	ous Area	
	Тс	Length		•	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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			

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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

	Area	(ac) C	N Desc	cription		
*	0.	121 9	98			
	0.			ds, Fair, F	ISG C	
0.921 76 Weighted Average						
	0.	800	86.8	6% Pervio	us Area	
	0.121 13.14% Impervious Area					
	•					
	Tc	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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			

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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

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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

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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)

_	Area	(ac) C	N Desc	cription		
*	0.	.358 9	98			
	8.	.012 7	73 Woo	ds, Fair, F	ISG C	
_	8.	.370 7	74 Wei	ghted Aver	age	
	8.	012	•	2% Pervio	_	
	0.358 4.28% Impervious Area				ous Area	
	Тс	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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			

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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)

	Area	(ac) C	N Desc	cription		
* 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	% Impervi	ous Area	
	'					
	Tc	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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	•	•	

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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)

	Area	(ac) (CN De	scription		
*	0.	004	98			
	0.	558	73 Wc	ods, Fair, F	ISG C	
	0.	562	73 We	ighted Ave	rage	
	0.	558	99.	29% Pervic	us Area	
	0.004 0.71% Impervious Area				ous Area	
	Tc (min)	Length (feet)		•	Capacity (cfs)	Description
	20.5	100	0.0260	0.08		Sheet Flow,
	3.7	250	0.0500	1.12		Woods: Light underbrush n= 0.400 P2= 2.86" Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	24.2	350	Total			

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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

	Area	(ac)	CN De	scription		
*	0.	021	98			
	0.	429	73 W	ods, Fair, F	HSG C	
0.450 74 Weighted Average						
	0.	429	95	.33% Pervio	ous Area	
	0.021 4.67% Impervious Area				ious Area	
	_					
	Tc	Length		•	Capacity	Description
	(min)	(feet)	(ft/f1) (ft/sec)	(cfs)	
	20.8	100	0.025	80.0		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 2.86"
	0.5	35	0.065	0 1.27		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	21.3	135	Total			

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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

	Area	(ac) C	N Des	cription		
*	0.	121	98			
	0.	800	73 Woo	ds, Fair, F	ISG C	
0.921 76 Weighted Average				ghted Aver	age	
	0.800 86.86% Pervious Area				us Area	
	0.121 13.14% Impervious Area				∕ious Area	
					_	
	Tc	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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	·		

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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

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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

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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)

_	Area	(ac) C	N Desc	cription		
*	0.	.358 9	98			
	8.	.012 7	73 Woo	ds, Fair, F	ISG C	
_	8.	.370 7	74 Wei	ghted Aver	age	
	8.	012	•	2% Pervio	_	
	0.	358	4.28	% Impervi	ous Area	
	Тс	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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			

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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)

	Area	(ac) (N Des	cription		
*	0.	032	98			
	1.	429	73 Woo	ds, Fair, F	ISG C	
1.461 74 Weighted Average						
	1.	429	97.8	1% Pervio	us Area	
	0.032 2.19% Impervious Area				ous Area	
	Тс	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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			

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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)

	Area	(ac) C	N Des	cription		
*	0.	004	98			
	0.	558	73 Woo	ds, Fair, F	ISG C	
	0.562 73 Weighted Average				age	
	0.	558	99.2	9% Pervio	us Area	
	0.004 0.71% Impervious Area				ous Area	
	Тс	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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			

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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

_	Area	(ac) (CN Des	cription		
*	0.	021	98			
	0.429 73 Woods, Fair, HSG C			ods, Fair, F	ISG C	
	0.450 74 Weighted Average				age	
	0.	429	95.3	3% Pervio	us Area	
	0.021 4.67% Impervious Area				ous Area	
	Тс	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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			

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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

	Area	(ac) C	N Des	cription		
*	0.	121	98			
	0.	800	73 Woo	ds, Fair, F	ISG C	
	0.921 76 Weighted Average				age	
	0.800 86.86% Pervious Area				us Area	
	0.121 13.14% Impervious Area				∕ious Area	
	Тс	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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			

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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

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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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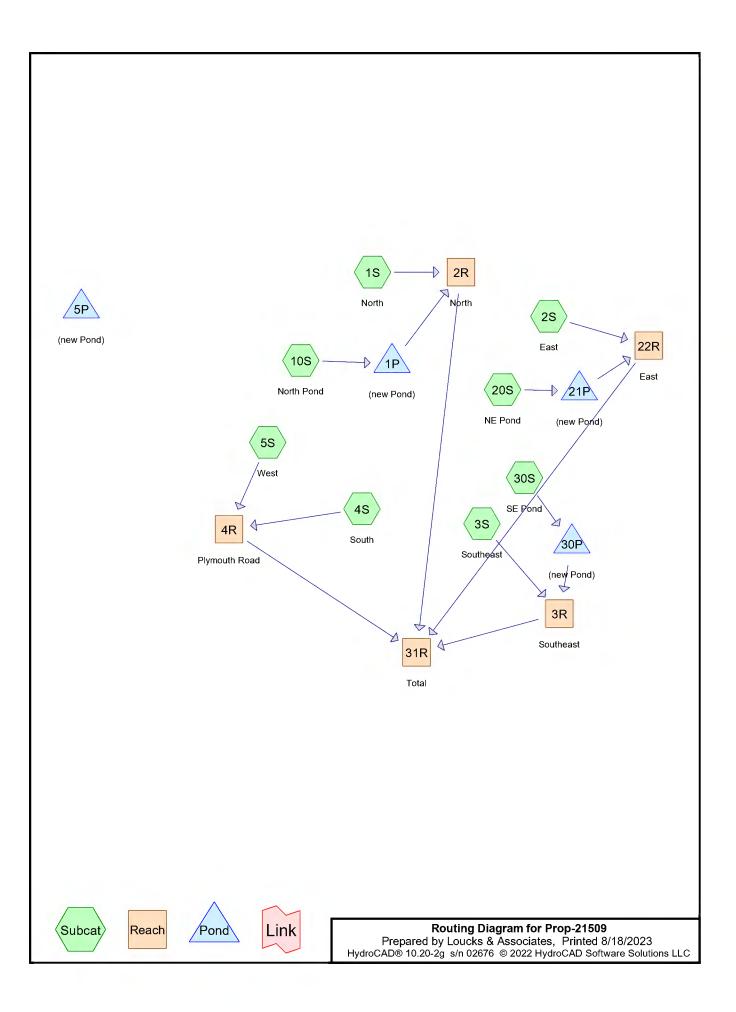
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Appendix B

HydroCAD Report, Proposed (1, 10, 100)



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Rainfall Events Listing (selected events)

	Event#	Event	Storm Type	Curve	Mode	Duration	B/B	Depth	AMC
_		Name				(hours)		(inches)	
	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

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Area Listing (all nodes)

Area	CN	Description
(acres)		(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

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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) C	N Des	cription		
7	0.	.000	98			
	0.	072	74 >75°	% Grass c	over, Good	, HSG C
0.000 70 Woods, Good, HSG C						
	0.	072	74 Wei	ghted Aver	age	
	0.	072	100.	00% Pervi	ous Area	
	Тс	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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			

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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 D	escription					
*	0.	078	98						
	0.	504	74 >7	75% Grass o	over, Good	I, 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% Imperv	ious Area				
	Tc (min)	Length (feet)		-	Capacity (cfs)	Description			
_	11.9	100				Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.86"			
	0.4	40	0.130	00 1.80		Shallow Concentrated Flow, Woodland Kv= 5.0 fps			
	12.3	140	Total						

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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	Desc	cription			
*	0.	000	98					
	0.	120	73	Woo	ds, Fair, F	ISG C		
	0.	120	73	Weig	ghted Aver	age		
	0.120 100.00% Pervious Area							
	Тс	Length	n S	lope	Velocity	Capacity	Description	
	(min)	(feet) ((ft/ft)	(ft/sec)	(cfs)		
	18.8	90	0.0	0260	0.08		Sheet Flow,	
							•	

Woods: Light underbrush n= 0.400 P2= 2.86"

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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	Desc	cription			
*	0.	105	98					
	0.	103	74	>75%	√ Grass co	over, Good	, HSG C	
_	0.	113	73	Woo	ds, Fair, H	ISG C		
	0.321 81 Weighted Average							
	0.	216		67.29	9% Pervio	us Area		
	0.	105		32.7	1% Imperv	∕ious Area		
	- -	1 41		3 1	\	0	Description	
	Tc	Length		Slope	Velocity	Capacity	Description	
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)		
	12.2	65	5 0.	.0420	0.09		Sheet Flow,	
							O D I 0.440 D0 0.00"	

Grass: Bermuda n= 0.410 P2= 2.86"

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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) C	N Des	cription					
*	0.	094	98						
	0.	100 7	74 >75°	% Grass c	over, Good	, HSG C			
	0.	405	73 Woo	ds, Fair, F	ISG C				
0.599 77 Weighted Average									
0.505 84.31% Pervious Area									
	0.	094	15.6	9% Imper	vious Area				
	Тс	Length	Slope	Velocity	Capacity	Description			
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)				
	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						

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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) C	N Des	cription				
*	2.	679 9	98					
	1.	600 7	'4 >75°	>75% Grass cover, Good, HSG C				
	4.508 72 Woods/grass comb., Go				,	<i>,</i>		
	8.787 80			ghted Aver				
		108	•	1% Pervio	-			
		679		30.49% Impervious Area				
	۷.	010	00.4	o 70 mport	11000 7 1100			
	Тс	Length	Slope	Velocity	Capacity	Description		
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	•		
	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					

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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_	Desc	ription				
*	0.	007	98						
	0.	493	74	>75%	√ Grass co	over, Good	, HSG C		
	0.	500	74	Weig	hted Aver	age			
	0.493 98.60% Pervious Area								
	0.	007		1.40	% Impervi	ous Area			
	т.	مائده مردا	CI	امسما	Valaaitu	Canasitu	Decembries		
	Tc	Length		lope	Velocity	Capacity	Description		
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
	20.1	90	0.0)220	0.07		Sheet Flow,		

Woods: Light underbrush n= 0.400 P2= 2.86"

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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	Desc	ription		
*	0.	097	98				
	0.	107	73	Woo	ds, Fair, H	ISG C	
	0.	245	74	>75%	√ Grass co	over, Good	, HSG C
	0.	449	79	Weig	hted Aver	age	
	0.	352		78.4	0% Pervio	us Area	
	0.	097		21.60	ואס Imper\	/ious Area	
	_					_	
	Тс	Length		Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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) T	otal			

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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

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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

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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

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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

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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

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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

0.36 cfs @ 15.32 hrs, Volume= 0.543 af, Atten= 95%, Lag= 179.6 min Outflow

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	ln۱	<u>/ert Avail.St</u>	orage Storage	Description						
#1	970.	.00' 116,3	306 cf Custom	Stage Data (Pr	ismatic)Listed below (Recalc)					
Elevation	on	Surf.Area	Inc.Store	Cum.Store						
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)						
970.0	00	640	0	0						
973.0	00	2,685	4,988	4,988						
975.0	00	4,400	7,085	12,073						
976.5		5,840	7,680	19,753						
977.5		11,825	8,833	28,585						
978.0		15,300	6,781	35,366						
979.0		17,300	16,300	51,666						
980.0		19,400	18,350	70,016						
981.0		21,590	20,495	90,511						
982.0)0	30,000	25,795	116,306						
Davidaa	Davidaa		Outlet Davies	_						
Device	Routing									
#1	Primary	975.90		d Culvert L= 49.						
					975.48' S= 0.0086 '/' Cc= 0.900					
"0		4 070 40	•	ow Area= 2.41 sf						
#2	Device				tangular Weir 2 End Contraction(s)					
#3	Device	1 979.50		Orifice/Grate C						
11.4	ъ.	4 070 00		ir flow at low hea						
#4	Device	1 976.00	6.0" Round	6.0" Round Culvert L= 100.0' Ke= 0.500						

n= 0.020. Flow Area= 0.20 sf

Excluded Surface area = 5,840 sf

Inlet / Outlet Invert= 976.00' / 976.00' S= 0.0000 '/' Cc= 0.900

976.50' 1.600 in/hr Exfiltration over Surface area above 976.50'

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)

#5

Device 4

4=Culvert (Passes 0.36 cfs of 0.46 cfs potential flow)

5=Exfiltration (Exfiltration Controls 0.36 cfs)

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

Elevation	Surface	Storage
(feet)	(sq-ft)	(cubic-feet)
970.00	640 776	0
970.20 970.40	776 913	142 311
970.60	1,049	507
970.80	1,185	730
971.00 971.20	1,322 1,458	981 1,259
971.40	1,594	1,564
971.60	1,731	1,897
971.80 972.00	1,867 2,003	2,256 2,643
972.20	2,140	3,058
972.40 972.60	2,276	3,499
972.80 972.80	2,412 2,549	3,968 4,464
973.00	2,685	4,988
973.20 973.40	2,857	5,542
973.60	3,028 3,200	6,130 6,753
973.80	3,371	7,410
974.00 974.20	3,543 3,714	8,101 8,827
974.40	3,885	9,587
974.60	4,057	10,381
974.80 975.00	4,228 4,400	11,210 12,073
975.20	4,592	12,973
975.40	4,784	13,909
975.60 975.80	4,976 5,168	14,885 15,900
976.00	5,360	16,953
976.20	5,552	18,044
976.40 976.60	5,744 6,439	19,173 20,366
976.80	7,635	21,774
977.00	8,833	23,421
977.20 977.40	10,030 11,226	25,307 27,432
977.60	12,520	29,802
977.80	13,910	32,445
978.00 978.20	15,300 15,700	35,366 38,466
978.40	16,100	41,646
978.60 978.80	16,500 16,900	44,906 48,246
979.00	17,300	51,666
979.20	17,720	55,168
979.40 979.60	18,140 18,560	58,754 62,424
979.80	18,980	66,178
980.00	19,400	70,016
980.20	19,838	73,940
		•

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
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

Volume

Invert

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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)

Avail.Storage Storage Description

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

#1	977.00' 6	61.546 cf Custom	Stone Deta (Dri	emetical introd holow (Popula)
#1	311.00	1,540 OF Custon	i Stage Data (Pri	smatic)Listed below (Recalc)
Elevation	Surf.Area	Inc.Store	Cum.Store	
(feet)	(sq-ft)	(cubic-feet)	(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)

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

Elevation	Surface	Storage	Elevation	Surface	Storage
(feet)	(sq-ft)	(cubic-feet)	(feet)	(sq-ft)	(cubic-feet)
977.00	475	0	982.20	7,672	15,712
977.10	558 640	52	982.30	8,108	16,501
977.20 977.30	640 722	112 180	982.40 982.50	8,544	17,334 18,210
977.30 977.40	805	256	982.60	8,980 9,163	,
977.50 977.50	888	250 341	982.70	9,163 9,346	19,117 20,043
977.60	970	434	982.80	9,540 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
979.60 979.70	2,812 2,907	4,177 4,463	984.80 984.90	13,413 13,614	43,866 45,217
979.70	3,001	4,403 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			
981.40 981.50	4,698	10,887			
981.60	4,810 5,208	11,363 11,863			
981.70	5,606	12,404			
981.80	6,004	12,404			
981.90	6,402	13,605			
982.00	6,800	14,265			
982.10	7,236	14,967			
	•				

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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	Inve	rt Avail.Sto	rage Stora	ge Description	
#1	999.00)' 3,5	96 cf Custo	om Stage Data (P	rismatic)Listed below (Recalc)
Elevatio	on S	Surf.Area	Inc.Store	Cum.Store	
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)	
999.0	00	550	0	0	
1,000.0	00	1,215	883	883	
1,001.0	00	1,975	1,595	2,478	
1,001.5	50	2,500	1,119	3,596	
Device	Routing	Invert	Outlet Devi	ces	
#1	Primary	999.60'	8.0" Roun	d Culvert L= 23.0	0' Ke= 0.500
				et Invert= 999.60' / Flow Area= 0.35 st	999.47' S= 0.0057 '/' Cc= 0.900 f
#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)

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

Elevation	Surface	Storage
(feet)	(sq-ft)	(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
1,001.45	2,500	3,473 3,596

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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)

Inve	ert Avail.Sto	orage Storage	e Description		
1,015.0	00' 1,9	940 cf Custon	n Stage Data (Pi	r <mark>ismatic)L</mark> isted below (F	Recalc)
on et)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)		
00	875	0	0		
00	1,380	1,128	1,128		
50	1,870	813	1,940		
Routing	Invert	Outlet Device	es		
Primary	1,015.50'	10.0" Round	d Culvert L= 15	.0' Ke= 0.500	
Discarde	d 1,015.00'	n= 0.013, Flo	ow Area= 0.55 sf	:	'/' Cc= 0.900
	1,015.0 on ot) 00 00 50 Routing Primary	1,015.00' 1,9 on Surf.Area et) (sq-ft) 00 875 00 1,380 50 1,870 Routing Invert Primary 1,015.50'	1,015.00' 1,940 cf Custon on Surf.Area Inc.Store ot) (sq-ft) (cubic-feet) 00 875 0 00 1,380 1,128 00 1,870 813 Routing Invert Outlet Device Primary 1,015.50' 10.0" Round Inlet / Outlet n= 0.013, Fig.	1,015.00' 1,940 cf Custom Stage Data (Property of Surf.Area Inc.Store Cum.Store (st) (sq-ft) (cubic-feet) (cubic-feet) (cubic-feet) (00 875 0 0 00 1,380 1,128 1,128 50 1,870 813 1,940	1,015.00' 1,940 cf Custom Stage Data (Prismatic)Listed below (Form Surf.Area Inc.Store Cum.Store (sq-ft) (cubic-feet) (cubic-feet) 00 875 0 0 1,380 1,128 1,128 50 1,870 813 1,940 Routing Invert Outlet Devices 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 n= 0.013, Flow Area= 0.55 sf

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)

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

					,
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,015.00	875	0	1,016.04	1,419	1,183
1,015.02	885	18	1,016.04		
	895			1,439	1,212
1,015.04		35	1,016.08	1,458	1,241
1,015.06	905	53	1,016.10	1,478	1,270
1,015.08	915	72	1,016.12	1,498	1,300
1,015.10	926	90	1,016.14	1,517	1,330
1,015.12	936	109	1,016.16	1,537	1,361
1,015.14	946	127	1,016.18	1,556	1,392
1,015.16	956	146	1,016.20	1,576	1,423
1,015.18	966	166	1,016.22	1,596	1,455
1,015.20	976	185	1,016.24	1,615	1,487
1,015.22	986	205	1,016.26	1,635	1,519
1,015.24	996	225	1,016.28	1,654	1,552
1,015.26	1,006	245	1,016.30	1,674	1,586
1,015.28	1,016	265	1,016.32	1,694	1,619
1,015.30	1,026	285	1,016.34	1,713	1,653
1,015.32	1,037	306	1,016.36	1,733	1,688
1,015.34	1,047	327	1,016.38	1,752	1,723
1,015.36	1,057	348	1,016.40	1,772	1,758
1,015.38	1,067	369	1,016.42	1,792	1,794
1,015.40	1,077	390	1,016.44	1,811	1,830
1,015.42	1,087	412	1,016.46	1,831	1,866
1,015.44	1,097	434	1,016.48	1,850	1,903
1,015.46	1,107	456	1,016.50	1,870	1,940
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			
1,015.74	1,259	811			
1,015.78	1,269	836			
1,015.76	1,279	862			
1,015.82	1,289	887			
1,015.82	1,289	913			
1,015.86	1,309 1,310	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			

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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) C	N Des	cription				
,	0.	.000	98					
	0.	072	74 >75°	% Grass c	over, Good	, HSG C		
_	0.	.000	70 Woo	ds, Good,	HSG C			
	0.072 74 Weighted Average							
	0.	072	100.	00% Pervi	ous Area			
	Тс	Length	Slope	Velocity	Capacity	Description		
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
	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					

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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) (ON De	escription				
*	0.	078	98					
	0.504 74 >75% Grass cover, Good, HSG C							
_	0.350 72 Woods/grass comb., Good, HSG C							
	0.	932	75 W	eighted Ave	rage			
	0.	854	91	.63% Pervio	ous Area			
	0.	078	8.3	37% Imperv	ious Area			
	-	1 41-	01		0 :6 -	Describether		
	Tc	Length			Capacity	Description		
_	(min)	(feet)	(ft/f	:) (ft/sec)	(cfs)			
	11.9	100	0.100	0 0.14		Sheet Flow,		
						Woods: Light underbrush n= 0.400 P2= 2.86"		
	0.4	40	0.130	0 1.80		Shallow Concentrated Flow,		
_						Woodland Kv= 5.0 fps		
	12.3	140	Total					

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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	Desc	cription		
*	0.	.000	98				
	0.	.120	73	Woo	ds, Fair, F	ISG C	
	0.	120	73	Weig	ghted Aver	age	
	0.	120		100.	00% Pervi	ous Area	
	_		_				
	Тс	Lengtl	n S	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	18.8	90	0.0	0260	0.08		Sheet Flow,
							NA

Woods: Light underbrush n= 0.400 P2= 2.86"

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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	Desc	cription		
*	0.	105	98				
	0.	103	74	>75%	% Grass co	over, Good	, HSG C
	0.	113	73	Woo	ds, Fair, H	ISG C	
	0.	321	81	Weig	hted Aver	age	
	0.	216		67.2	9% Pervio	us Area	
	0.	105		32.7	1% Imperv	ious Area	
	Тс	Length	า ร์	Slope	Velocity	Capacity	Description
	(min)	(feet		(ft/ft)	(ft/sec)	(cfs)	'
	12.2	65	5 0.	.0420	0.09		Sheet Flow,
							Crace: Berraude n= 0.440 D2= 2.96"

Grass: Bermuda n= 0.410 P2= 2.86"

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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) C	N Des	Description					
*	0.	.094 9	98						
0.100 74 >75% Grass cover, Good, HSG C						, HSG C			
0.405 73 Woods, Fair, HSG C									
0.599 77 Weighted Average									
	0.	505	84.3	1% Pervio					
	0.	094	15.6	9% Imper	vious Area				
	Тс	Length	Slope	Velocity	Capacity	Description			
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)				
	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						

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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)		N Desc	cription		
*	2.	679	98			
	1.600		74 >759	>75% Grass cover, Good.		, HSG C
	4.508				omb., Goo	•
_	8.787			ghted Aver	•	,
		108		9.51% Pervious Area		
		679	30.49% Imper			
		010	00.1	o /o import	7104071104	
	Тс	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)		(cfs)		
_	18.2	100	0.0350	0.09		Sheet Flow,
	10.2	100				Woods: Light underbrush n= 0.400 P2= 2.86"
	2.4	300		2 12		Shallow Concentrated Flow,
	2.7		0.1000	2.12		Woodland Kv= 5.0 fps
	0.1	20	0.0200	2.87		Shallow Concentrated Flow,
	0.1	20	0.0200	2.07		Paved Kv= 20.3 fps
	0.2	45	0.0050	4.20	7.43	Pipe Channel,
	0.2	70	0.0000	4.20	7.43	18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'
						n= 0.013
	20.9	465	Total			0.0.0

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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_	Desc	ription			
*	0.	007	98					
	0.	493	74	>75%	√ Grass co	over, Good	, HSG C	
	0.	500	74	Weig	hted Aver	age		
0.493 98.60% Pervious Area								
	0.007 1.40% Impervious Area					ous Area		
	т.	ما در می داد	C	lana	Valaaitu	Canasitu	Decembries	
	Tc	Length		lope	Velocity	Capacity	Description	
	(min)	(feet)	((ft/ft)	(ft/sec)	(cfs)		
	20.1	90	0.0)220	0.07		Sheet Flow,	

Woods: Light underbrush n= 0.400 P2= 2.86"

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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	Woo	ds, Fair, H	ISG C				
	0.	245	74	>75%	∕₀ Grass co	over, Good	, HSG C			
0.449 79 Weighted Average										
	0.	352		78.4	0% Pervio	us Area				
	0.097 21.60% Impervious Area					∕ious Area				
	_		_							
	Тс	Length		lope	Velocity	Capacity	Description			
_	(min)	(feet)	((ft/ft)	(ft/sec)	(cfs)				
	23.7	100	0.0)180	0.07		Sheet Flow,			
							Woods: Light underbrush n= 0.400 P2= 2.86"			
	1.3	120	0.0)500	1.57		Shallow Concentrated Flow,			
							Short Grass Pasture Kv= 7.0 fps			
	25.0	220	То	tal		•				

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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

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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

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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

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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

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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

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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

7.76 cfs @ 12.70 hrs, Volume= 1.486 af, Atten= 64%, Lag= 23.3 min Outflow

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	Inve	rt Avail.Sto	rage Storage	Description	
#1	970.00	0' 116,30	06 cf Custom	Stage Data (Pr	ismatic) Listed below (Recalc)
	_	S 6 A		0 01	
Elevation		Surf.Area	Inc.Store	Cum.Store	
(fee		(sq-ft)	(cubic-feet)	(cubic-feet)	
970.0		640	0	0	
973.0	00	2,685	4,988	4,988	
975.0	00	4,400	7,085	12,073	
976.5	50	5,840	7,680	19,753	
977.5	50	11,825	8,833	28,585	
978.0	00	15,300	6,781	35,366	
979.0	00	17,300	16,300	51,666	
980.0	00	19,400	18,350	70,016	
981.0	00	21,590	20,495	90,511	
982.0	00	30,000	25,795	116,306	
ъ .	D "		0 11 1 15 1		
Device	Routing	Invert	Outlet Device	-	
#1	Primary	975.90'		l Culvert L= 49.	
					975.48' S= 0.0086 '/' Cc= 0.900
			,	w Area= 2.41 sf	
#2	Device 1	978.40'			tangular Weir 2 End Contraction(s)
#3	Device 1	979.50'	30.0" Horiz. (Orifice/Grate C	= 0.600
				r flow at low hea	
#4	Device 1	976.00'	6.0" Round (Culvert L= 100.	0' Ke= 0.500
			Inlet / Outlet I	nvert= 976.00' / !	976.00' S= 0.0000 '/' Cc= 0.900
			n= 0.020, Flo	w Area= 0.20 sf	
#5	Device 4	976.50'	1.600 in/hr Ex	xfiltration 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)

Storage (cubic-feet)

77,951

82,050

86,237

90,511

94,997

99,820

104,979

110,474

116,306

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

Surface

(sq-ft)

20,276

20,714

21,152

21,590

23,272

24,954

26,636

28,318

30,000

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)
970.00	640	0	980.40
970.20	776	142	980.60
970.40	913	311	980.80
970.60	1,049	507	981.00
970.80	1,185	730	981.20
971.00	1,322	981	981.40
971.20	1,458	1,259	981.60
971.40 971.60	1,594 1,731	1,564 1,897	981.80 982.00
971.80	1,867	2,256	902.00
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	
973.00 973.20	2,685 2,857	4,988 5,542	
973.40	2,857 3,028	5,542 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	
974.80 975.00	4,228 4,400	11,210 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	
976.40 976.60	5,744 6,439	19,173 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	
978.00 978.20	15,300 15,700	35,366 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	
979.60 979.80	18,560 18,980	62,424 66,178	
980.00	19,400	70,016	
980.20	19,838	73,940	
	·	•	

Volume

Invert

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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)

Avail.Storage Storage Description

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

#1	977.00'	61,546 cf Custo	m Stage Data (Pr	rismatic)Listed below (Recalc)
Elevation	Surf.Area	Inc.Store	Cum.Store	
(feet)	(sq-ft)	(cubic-feet)	(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)

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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	9,540 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			
981.20 981.30	4,474 4,586	9,970 10,423			
981.40	4,698	10,423			
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			
	,	,			

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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 0.64 cfs @ 12.50 hrs, Volume= Primary 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	Inve	ert Avail.St	orage Storag	ge Description				
#1	999.0	00' 3,5	596 cf Custo	om Stage Data (P	rismatic)Listed below (Recalc)			
- 14:		O	l Ot	O Ot				
Elevatio	on	Surf.Area	Inc.Store	Cum.Store				
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)				
999.0	00	550	0	0				
1,000.0	00	1,215	883	883				
1,001.0	00	1,975	1,595	2,478				
1,001.5	50	2,500	1,119	3,596				
Device	Routing	Invert	Outlet Devi	ces				
#1	Primary	999.60	8.0" Roun	d Culvert L= 23.0	0' Ke= 0.500			
	-		Inlet / Outle	et Invert= 999.60' /	999.47' S= 0.0057 '/' Cc= 0.900			
				n= 0.013, Flow Area= 0.35 sf				
40	D:	-1 000 001	•					
#2	Discarde	d 999.00'	บ.2บบ 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)

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

Elevation	Surface	Storage
(feet)	(sq-ft)	(cubic-feet)
999.00 999.05	550 583	0 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
999.40 999.45	816 849	273 315
999.50	883	358
999.55	916	403
999.60	949	450
999.65	982	498
999.70 999.75	1,016 1,049	548 600
999.80	1,043	653
999.85	1,115	708
999.90	1,148	764
999.95	1,182	823
1,000.00 1,000.05	1,215 1,253	883 944
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 1,000.35	1,443 1,481	1,281 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 1,000.60	1,633	1,666
1,000.65	1,671 1,709	1,748 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 1,899	2,190
1,000.90 1,000.95	1,937	2,284 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 1,001.20	2,132 2,185	2,786 2,894
1,001.25	2,103	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 1,001.50	2,448 2,500	3,473 3,596
1,001.00	_,000	5,550

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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)

<u>Volume</u>	Inve	ert Avail.Sto	orage Storage	Description		_	
#1	1,015.0	00' 1,9	40 cf Custom	Stage Data (Pr	rismatic)Listed below (Recalc)		
Elevatio		Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)			
1,015.0	00	875	0	0			
1,016.0	00	1,380	1,128	1,128			
1,016.5	50	1,870	813	1,940			
Device	Routing	Invert	Outlet Devices	s		_	
#1	#1 Primary		10.0" Round	0.0" Round Culvert L= 15.0' Ke= 0.500			
Inlet / Outlet Invert= 1 n= 0.013, Flow Area= #2 Discarded 1,015.00' 0.200 in/hr Exfiltratio		w Area= 0.55 sf					

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)

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

		· ·	J	•	,
Elevation	Surface	Storage	Elevation	Surface	Storage
(feet)	(sq-ft)	(cubic-feet)	(feet)	(sq-ft)	(cubic-feet)
1,015.00	875	0	1,016.04	1,419	1,183
1,015.02	885	18	1,016.06	1,439	1,212
1,015.04	895	35	1,016.08	1,458	1,241
1,015.06	905	53	1,016.10	1,478	1,270
1,015.08	915	72	1,016.12	1,498	1,300
1,015.10	926	90	1,016.14	1,517	1,330
1,015.12	936	109	1,016.16	1,537	1,361
1,015.14	946	127	1,016.18	1,556	1,392
1,015.16	956	146	1,016.20	1,576	1,423
1,015.18	966	166	1,016.22	1,596	1,455
1,015.10	976	185	1,016.24	1,615	1,487
1,015.22	986	205	1,016.24	1,635	1,519
	996	205 225			
1,015.24			1,016.28	1,654 1,674	1,552
1,015.26	1,006	245	1,016.30	1,674	1,586
1,015.28	1,016	265	1,016.32	1,694	1,619
1,015.30	1,026	285	1,016.34	1,713	1,653
1,015.32	1,037	306	1,016.36	1,733	1,688
1,015.34	1,047	327	1,016.38	1,752	1,723
1,015.36	1,057	348	1,016.40	1,772	1,758
1,015.38	1,067	369	1,016.42	1,792	1,794
1,015.40	1,077	390	1,016.44	1,811	1,830
1,015.42	1,087	412	1,016.46	1,831	1,866
1,015.44	1,097	434	1,016.48	1,850	1,903
1,015.46	1,107	456	1,016.50	1,870	1,940
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			
4 0 4 = = 4	1,249	786			
1,015.74 1,015.76	1,259	811			
	1,269				
1,015.78		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			

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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 [Desc	ription				
*	0.	.000	98						
	0.	072	74 >	>75%	√ Grass co	over, Good	, HSG C		
_	0.	.000	70 \	Noo	ds, Good,	HSG C			
	0.072 74 Weighted Average								
	0.	072	1	100.0	00% Pervi	ous Area			
	Тс	Length		•	Velocity	Capacity	Description		
_	(min)	(feet)) (ft	:/ft)	(ft/sec)	(cfs)			
	10.4	50	0.03	350	0.08		Sheet Flow,		
							Woods: Light underbrush n= 0.400 P2= 2.86"		
	0.6	110	0.20	000	3.13		Shallow Concentrated Flow,		
							Short Grass Pasture Kv= 7.0 fps		
_	11.0	160) Tota	al			<u> </u>		

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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	Desc	ription						
*	0.	078	98								
	0.	504	74	>75%	% Grass co	over, Good	, HSG C				
	0.	350	72	Woo	ds/grass d	omb., Goo	d, HSG C				
	0.	932	75	Weig	hted Aver	age					
	0.	854		91.6	3% Pervio	us Area					
	0.	078		8.37	% Impervi	ous Area					
	Тс	Length	. SI	lope	Velocity	Capacity	Description				
	(min)	(feet)		ft/ft)	(ft/sec)	(cfs)	'				
	11.9	100	0.1	000	0.14		Sheet Flow,				
							Woods: Light underbrush n= 0.400 P2= 2.86"				
	0.4	40	0.1	300	1.80		Shallow Concentrated Flow,				
_							Woodland Kv= 5.0 fps				
	12.3	140	Tot	tal							

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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	Desc	cription				
*	0.	000	98						
	0.	120	73	Woo	ds, Fair, H	ISG C			
	0.120 73 Weighted Average								
	0.	120		100.	00% Pervi	ous Area			
	Тс	Length	า ร	Slope	Velocity	Capacity	Description		
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
	18.8	90	0.	.0260	0.08		Sheet Flow,		

Woods: Light underbrush n= 0.400 P2= 2.86"

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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)	<u>CN D</u>	escription			
*	0.	105	98				
	0.	103	74 >	75% Grass o	over, Good	I, HSG C	
_	0.	113	73 W	/oods, Fair, l	HSG C		
_	0.	321	81 W	eighted Ave	rage		
	0.216 67.29% Pervious Area						
	0.	105	32	2.71% Imper	vious Area		
	То	Longth	. Clar	o Volocity	Conocity	Description	
	Tc	Length		-		Description	
_	(min)	(feet)	(ft/	ft) (ft/sec)	(cfs)		
	12.2	65	0.042	20 0.09		Sheet Flow,	
						One Democrate 0 440 DO- 0 00"	

Grass: Bermuda n= 0.410 P2= 2.86"

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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) C	N Des	cription				
*	0.	094	98					
	0.	100 7	74 >75°	% Grass c	over, Good	, HSG C		
0.405 73 Woods, Fair, HSG C								
	0.	599	77 Weig	ghted Aver	age			
	0.	505	84.3	1% Pervio	us Area			
	0.	094	15.6	9% Imper	vious Area			
	Тс	Length	Slope	Velocity	Capacity	Description		
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
	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					

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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) C	N Desc	cription		
*	2.	679	98			
	1.	600 7	74 >75°	% Grass co	over, Good	, HSG C
	4.				omb., Goo	•
_	8	787 8		ghted Aver	•	,
		108		1% Pervio	•	
		679			/ious Area	
		010	00.1	o /o import	7104071104	
	Тс	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
_	18.2	100	0.0350	0.09	(/	Sheet Flow,
	10.2	100	0.0000	0.00		Woods: Light underbrush n= 0.400 P2= 2.86"
	2.4	300	0.1800	2.12		Shallow Concentrated Flow,
	۷.٦	000	0.1000	2.12		Woodland Kv= 5.0 fps
	0.1	20	0.0200	2.87		Shallow Concentrated Flow,
	0.1	20	0.0200	2.07		Paved Kv= 20.3 fps
	0.2	45	0.0050	4.20	7.43	Pipe Channel,
	0.2	70	0.0000	7.20	7.40	18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'
						n= 0.013
	20.9	465	Total			0.0.0

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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_	Desc	ription			
*	0.	007	98					
	0.	493	74	>75%	√ Grass co	over, Good	, HSG C	
	0.	500	74	Weig	hted Aver	age		
	0.493 98.60% Pervious Area							
	0.	007		1.40	% Impervi	ous Area		
	т.	مائده مردا	CI	امسما	Valaaitu	Canasitu	Decembries	
	Tc	Length		lope	Velocity	Capacity	Description	
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)		
	20.1	90	0.0)220	0.07		Sheet Flow,	

Woods: Light underbrush n= 0.400 P2= 2.86"

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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) (ON De	scription		
*	0.	097	98			
	0.	107	73 W	ods, Fair, F	HSG C	
	0.	245	74 >7	5% Grass c	over, Good	, HSG C
	0.	449	79 W	eighted Ave	rage	
	0.	352	78	.40% Pervio	ous Area	
	0.	097	21	.60% Imper	vious Area	
	Тс	Length			Capacity	Description
_	(min)	(feet)	(ft/f) (ft/sec)	(cfs)	
	23.7	100	0.018	0.07		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 2.86"
	1.3	120	0.050	1.57		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	25.0	220	Total			

MSE 24-hr 3 100-Year Rainfall=7.32" Printed 8/18/2023

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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

Prepared by Loucks & Associates

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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

Prop-21509

Prepared by Loucks & Associates

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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

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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

MSE 24-hr 3 100-Year Rainfall=7.32"

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Prop-21509

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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

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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

22.33 cfs @ 12.59 hrs, Volume= Outflow 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	Inve	ert Avail.St	orage Stor	age Description	
#1	970.0	00' 116,3	06 cf Cus	tom Stage Data (P	rismatic)Listed below (Recalc)
		0. (4		0 01	
Elevation	on	Surf.Area	Inc.Stor		
(fee	et)	(sq-ft)	(cubic-feet	t) (cubic-feet)	
970.0	00	640		0 0	
973.0	00	2,685	4,98	8 4,988	
975.0	00	4,400	7,08	5 12,073	
976.5	50	5,840	7,68	0 19,753	
977.5	50	11,825	8,83	3 28,585	
978.0	00	15,300	6,78	1 35,366	
979.0	00	17,300	16,30	0 51,666	
980.0	00	19,400	18,35	0 70,016	
981.0	00	21,590	20,49	5 90,511	
982.0	00	30,000	25,79	5 116,306	
Device	Routing	Invert	Outlet De	vices	
#1	Primary	975.90'	21.0" Ro	ound Culvert L= 49	.0' Ke= 0.500
	•		Inlet / Ou	tlet Invert= 975.90' /	975.48' S= 0.0086 '/' Cc= 0.900
			n= 0.013,	Flow Area= 2.41 st	F
#2	Device 1	978.40'	4.0' long	Sharp-Crested Red	ctangular Weir 2 End Contraction(s)
#3	Device 1	979.50'	30.0" Ho	riz. Orifice/Grate	C= 0.600
Limited to weir flow at low heads					ads

#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 976.50 #5 Device 4 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)

Storage

77,951

82,050

86,237

90,511

94,997

99,820

104,979

110,474

116,306

(cubic-feet)

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

Surface

(sq-ft)

20,276

20,714

21,152

21,590

23,272

24,954

26,636

28,318

30,000

Elevation

(feet) 980.40

980.60

980.80

981.00

981.20

981.40

981.60

981.80

982.00

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
970.80 971.00	1,185 1,322	730 981
971.20	1,458	1,259
971.40	1,594	1,564
971.60	1,731	1,897
971.80	1,867	2,256
972.00 972.20	2,003 2,140	2,643 3,058
972.40	2,140	3,499
972.60	2,412	3,968
972.80	2,549	4,464
973.00	2,685 2,857	4,988
973.20 973.40	2,857 3,028	5,542 6,130
973.60	3,200	6,753
973.80	3,371	7,410
974.00	3,543	8,101
974.20 974.40	3,714 3,885	8,827 9,587
974.60	4,057	10,381
974.80	4,228	11,210
975.00	4,400	12,073
975.20 975.40	4,592 4,784	12,972 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
976.40 976.60	5,744 6,439	19,173 20,366
976.80	7,635	21,774
977.00	8,833	23,421
977.20	10,030	25,307
977.40 977.60	11,226 12,520	27,432 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
978.60 978.80	16,500 16,900	44,906 48,246
979.00	17,300	51,666
979.20	17,720	55,168
979.40	18,140	58,754
979.60 979.80	18,560 18,980	62,424 66,178
980.00	19,400	70,016
980.20	19,838	73,940
		I

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Summary for Pond 5P: (new Pond)

Inflow 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

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

0.00 hrs, Volume= Primary 0.00 cfs @ 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 Ava	ail.Storage	Storage	Description	
#1	977.00'	61,546 cf	Custon	ո Stage Data (Pr	ismatic)Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)		Store -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	1	0,850	33,779	
985.00	13,815	1	2,810	46,589	
986.00	16,100	1	4,958	61,546	

Device	Routing	Invert	Outlet Devices
#1	Primary	982.00'	
			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)

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

Elevation	Surface	Storage	Elevation	Surface	Storage
(feet)	(sq-ft)	(cubic-feet)	(feet)	(sq-ft)	(cubic-feet)
977.00	475	0	982.20	7,672	15,712
977.10	558 640	52	982.30	8,108	16,501
977.20 977.30	640 722	112 180	982.40 982.50	8,544	17,334 18,210
977.30 977.40	805	256	982.60	8,980 9,163	,
977.50 977.50	888	250 341	982.70	9,163 9,346	19,117 20,043
977.60 977.60	970	434	982.80	9,540 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
979.60 979.70	2,812 2,907	4,177 4,463	984.80 984.90	13,413 13,614	43,866 45,217
979.70	3,001	4,403 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			
981.40 981.50	4,698	10,887			
981.60	4,810 5,208	11,363 11,863			
981.70	5,606	12,404			
981.80	6,004	12,404			
981.90	6,402	13,605			
982.00	6,800	14,265			
982.10	7,236	14,967			
	•	·			

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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	Inve	rt Avail.Sto	rage Storag	ge Description	
#1	999.00)' 3,59	96 cf Custo	om Stage Data (P	rismatic)Listed below (Recalc)
Elevatio	nn S	Surf.Area	Inc.Store	Cum.Store	
(fee		(sq-ft)	(cubic-feet)	(cubic-feet)	
999.0	00	550	0	0	
1,000.0	00	1,215	883	883	
1,001.0	00	1,975	1,595	2,478	
1,001.5	50	2,500	1,119	3,596	
Device	Routing	Invert	Outlet Devi	ces	
#1	Primary	999.60'	8.0" Roun	d Culvert L= 23.0)' Ke= 0.500
			Inlet / Outle	t Invert= 999.60' /	999.47' S= 0.0057 '/' Cc= 0.900
			n= 0.013, F	Flow Area= 0.35 st	f
#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)

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

Elevation	Surface	Storage
(feet)	(sq-ft)	(cubic-feet)
999.00	550 500	0
999.05 999.10	583 617	28 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
999.50 999.55	883 916	358 403
999.60	949	450 450
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 1,000.00	1,182 1,215	823 883
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 1,519	1,354 1,429
1,000.40 1,000.45	1,519	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 1,000.85	1,823 1,861	2,098 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 1,001.25	2,185 2,238	2,894 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

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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)

<u>Volume</u>	Inve	ert Avail.St	orage Storage	Description		
#1	1,015.0	00' 1,9	940 cf Custom	Stage Data (Pri	ismatic) Listed below (Red	alc)
Elevatio		Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)		
1,015.0	00	875	0	0		
1,016.0	00	1,380	1,128	1,128		
1,016.5	50	1,870	813	1,940		
Device	Routing	Invert	Outlet Devices	3		
#1	Primary	1,015.50	10.0" Round	Culvert L= 15.0	0' Ke= 0.500	
#2	Discarde	ed 1,015.00	n= 0.013, Flo	nvert= 1,015.50'. w Area= 0.55 sf c filtration over \$	/ 1,015.05' S= 0.0300 '/' Surface area	Cc= 0.900

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)

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

					,
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,015.00	875	0	1,016.04	1,419	1,183
1,015.02	885	18	1,016.04		
	895			1,439	1,212
1,015.04		35	1,016.08	1,458	1,241
1,015.06	905	53	1,016.10	1,478	1,270
1,015.08	915	72	1,016.12	1,498	1,300
1,015.10	926	90	1,016.14	1,517	1,330
1,015.12	936	109	1,016.16	1,537	1,361
1,015.14	946	127	1,016.18	1,556	1,392
1,015.16	956	146	1,016.20	1,576	1,423
1,015.18	966	166	1,016.22	1,596	1,455
1,015.20	976	185	1,016.24	1,615	1,487
1,015.22	986	205	1,016.26	1,635	1,519
1,015.24	996	225	1,016.28	1,654	1,552
1,015.26	1,006	245	1,016.30	1,674	1,586
1,015.28	1,016	265	1,016.32	1,694	1,619
1,015.30	1,026	285	1,016.34	1,713	1,653
1,015.32	1,037	306	1,016.36	1,733	1,688
1,015.34	1,047	327	1,016.38	1,752	1,723
1,015.36	1,057	348	1,016.40	1,772	1,758
1,015.38	1,067	369	1,016.42	1,792	1,794
1,015.40	1,077	390	1,016.44	1,811	1,830
1,015.42	1,087	412	1,016.46	1,831	1,866
1,015.44	1,097	434	1,016.48	1,850	1,903
1,015.46	1,107	456	1,016.50	1,870	1,940
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			
1,015.74	1,259	811			
1,015.78	1,269	836			
1,015.76	1,279	862			
1,015.82	1,289	887			
1,015.82	1,289	913			
1,015.86	1,309 1,310	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			

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- 35 Reach 4R: Plymouth Road
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- 37 Reach 31R: Total
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- 46 Subcat 1S: North
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48 Subcat 3S: Southeast

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49 Subcat 4S: South

50 Subcat 5S: West

51 Subcat 10S: North Pond

52 Subcat 20S: NE Pond

53 Subcat 30S: SE Pond

54 Reach 2R: North

55 Reach 3R: Southeast

56 Reach 4R: Plymouth Road

57 Reach 22R: East

58 Reach 31R: Total

59 Pond 1P: (new Pond)

61 Pond 5P: (new Pond)

63 Pond 21P: (new Pond)

65 Pond 30P: (new Pond)

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
		I	mpervious A	rea (acres)	3.06
			Total A	rea (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
		I	mpervious A	rea (acres)	3.06
			Total A	rea (acres)	3.06

Summary Information

Performance Goal Requirement

12219	ft3
12219	ft ³
100	%
6.628	acre-ft
6.1264	acre-ft
92	%
2.9746	lbs
2.75	lbs
2.434	lbs
2.25	lbs
5	lbs
92	%
	12219 100 6.628 6.1264 92 2.9746 2.75 2.434 2.25 5

BMP Summary

Performance Goal Summary

Post development annual TSS load:

Annual TSS removed by BMPs:

Percent annual TSS removed:

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

982.5

908.2

92

lbs

lbs

%

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 (abo	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 (abo	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 (abo	2.4338	0	2.2496	0.1842	92

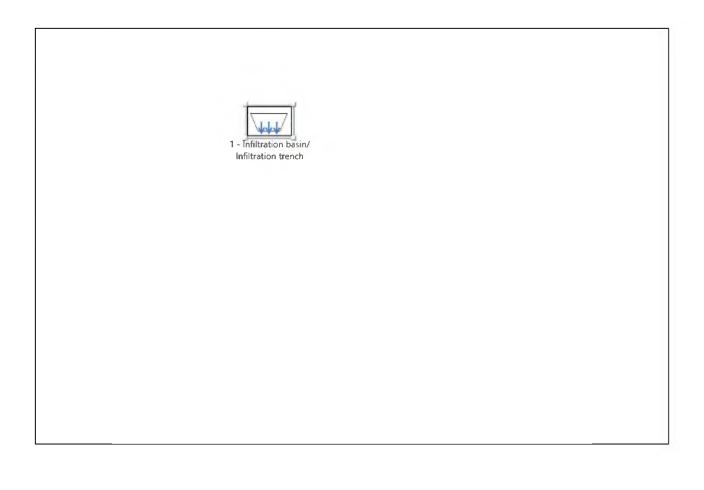
Total Phosphorus Summary

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 (abo	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 (abo	982.53	0	908.18	74.35	92

BMP Schematic



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
		I	Impervious Area (acres)		3.06
			Total A	rea (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
		I	mpervious A	rea (acres)	2.783
			Total A	rea (acres)	9.736

Summary Information

Performance Goal Requirement

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

Annual Volume and Pollutant Load Reductions

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

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 (abo	395	28	28	0	100
2 - Infiltration basin/Infiltration trench (abo	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 (abo	0.2625	0	0.1933	0.0692	74
2 - Infiltration basin/Infiltration trench (abo	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 (abo	0.1178	0	0.0868	0.031	74
2 - Infiltration basin/Infiltration trench (abo	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 (abo	0.0964	0	0.071	0.0254	74
2 - Infiltration basin/Infiltration trench (abo	0.142	0	0.1129	0.0291	80
1 - Constructed stormwater pond	3.2558	0	0.2605	2.9953	8

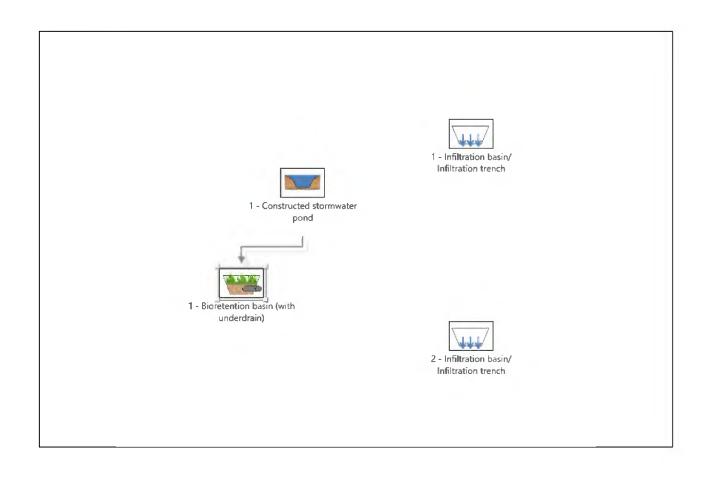
Total Phosphorus Summary

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 (abo	0.2142	0	0.1578	0.0564	74
2 - Infiltration basin/Infiltration trench (abo	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 (abo	38.91	0	28.66	10.25	74
2 - Infiltration basin/Infiltration trench (abo	57.32	0	45.56	11.76	79
1 - Constructed stormwater pond	1314.37	0	1104.07	210.3	84

BMP Schematic

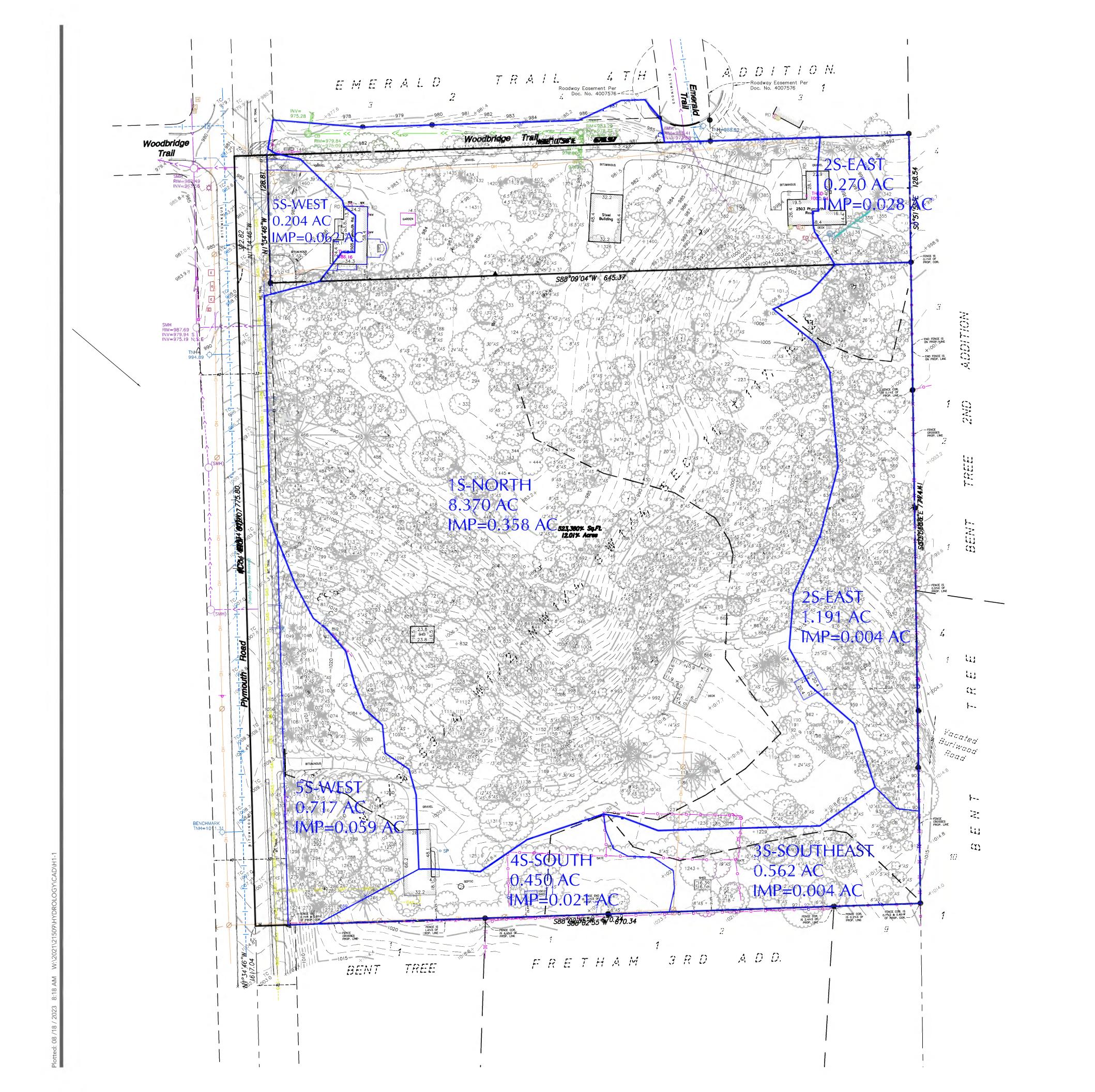


Appendix D

Pipe Sizing Spreadsheet

Figures

Existing Drainage Exhibit Proposed Drainage Exhibit



DUDYCHA PROPERTY

2511 & 2615 Plymouth Roa Minnetonka, MN 5530

LAKE WEST

4525 Highway 7, Suite 265

LOUCKS

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7200 Hemlock Lane, Suite 300 Maple Grove, MN 55369 763.424.5505 www.loucksinc.com

CADD QUALIFICATION

CADD files prepared by the Consultant for this project are instruments of the Consultant professional services for use solely with respect to this project. These CADD files shall not be used on other projects, for additions to this project, or for completion of this project by others without written approval by the Consultant. With the Consultant's approval, others may be permitted to obtain copies of the CADD drawing files for information and reference only. All intentional or unintentional revisions, additions, or deletions to these CADD files shall be made at the full risk of that party making such revisions, additions or deletions and that party shall hold harmless and indemnify the Consultant from any & all responsibilities, claims, and liabilities.

SUBMITTAL/REVISIONS

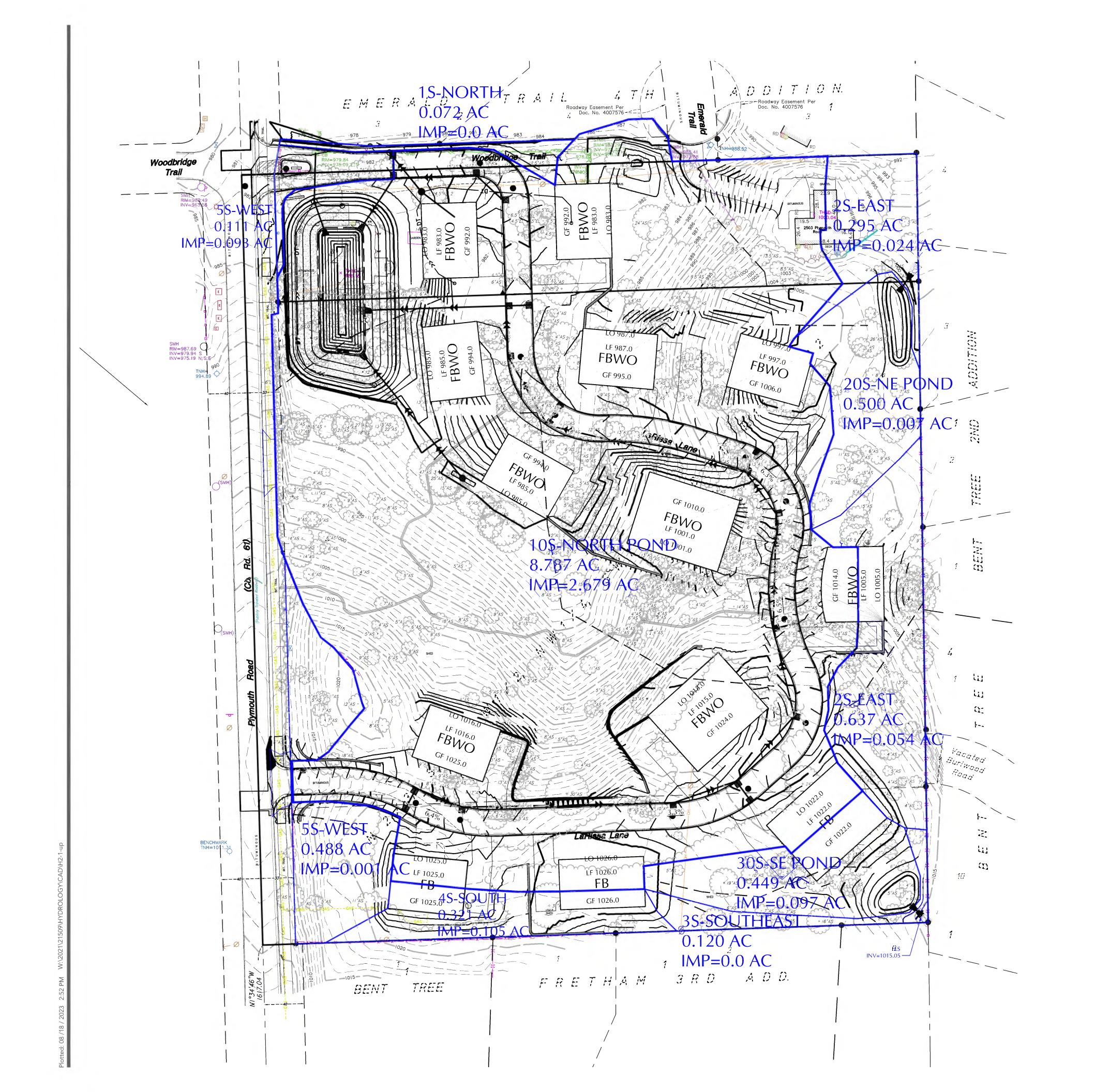
PROFESSIONAL SIGNATURE

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. 4650

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





DUDYCHA PROPERTY

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OUALITY CONTROL

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

SHEET INDEX

PROPOSED DRAINAGE PLAN