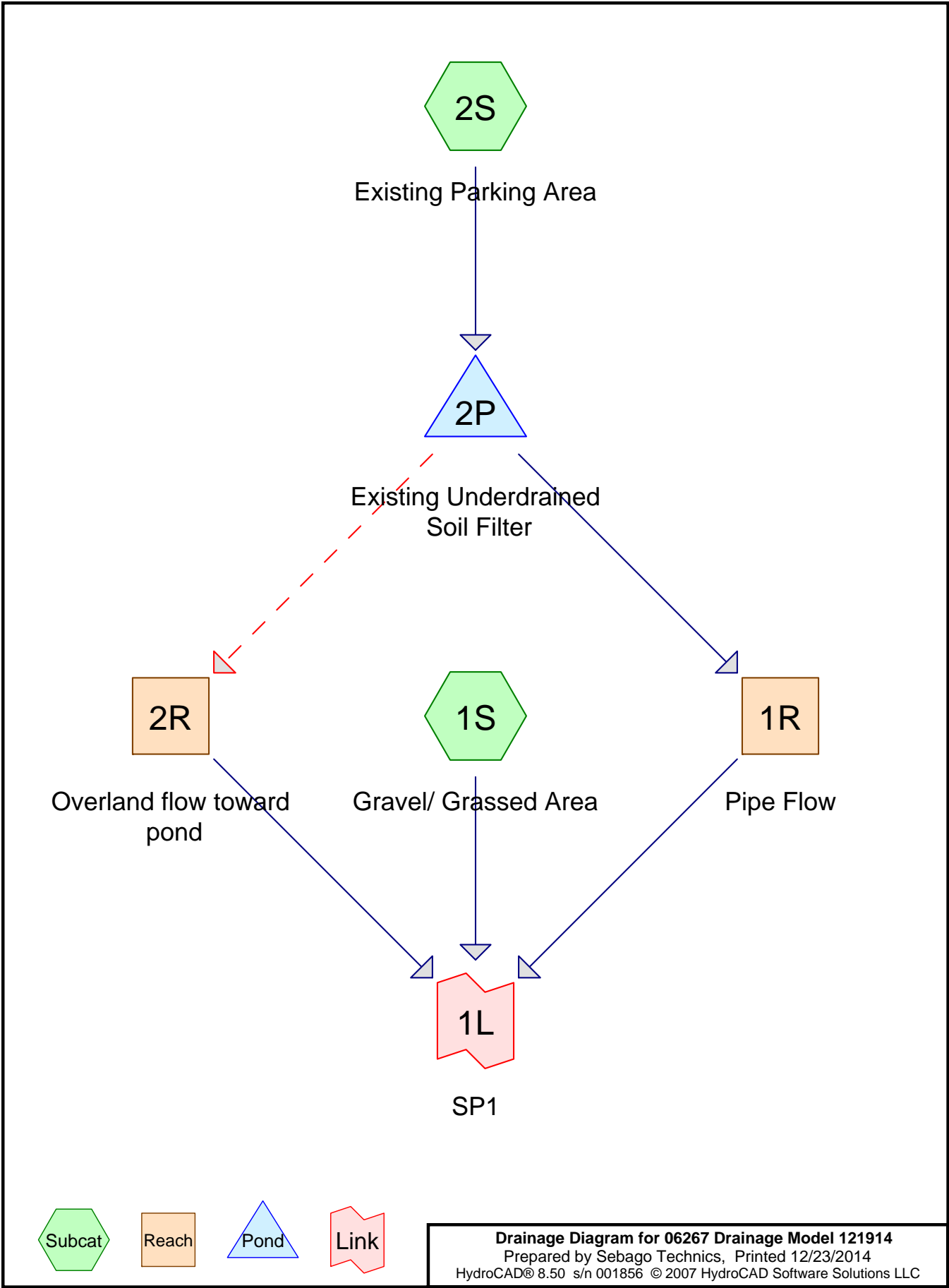


Attachment A

Pre-Development Stormwater Modeling



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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.115	74	>75% Grass cover, Good, HSG C (1S,2S)
0.110	94	Gravel, HSG C (1S)
0.143	98	Parking Lot (1S,2S)
0.368		TOTAL AREA

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Type III 24-hr 25yr Rainfall=5.50"

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Summary for Subcatchment 1S: Gravel/ Grassed Area

Runoff = 0.69 cfs @ 12.07 hrs, Volume= 0.050 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=5.50"

Area (ac)	CN	Description
* 0.003	98	Parking Lot
* 0.110	94	Gravel, HSG C
0.021	74	>75% Grass cover, Good, HSG C
0.134	91	Weighted Average
0.131		Pervious Area
0.003		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, TC Time < 5 Mins

Summary for Subcatchment 2S: Existing Parking Area

Runoff = 1.14 cfs @ 12.07 hrs, Volume= 0.081 af, Depth= 4.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=5.50"

Area (ac)	CN	Description
* 0.140	98	Parking Lot
0.094	74	>75% Grass cover, Good, HSG C
0.234	88	Weighted Average
0.094		Pervious Area
0.140		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, TC Time < 5 Mins

Summary for Reach 1R: Pipe Flow

Inflow Area = 0.234 ac, 59.83% Impervious, Inflow Depth=527.99" for 25yr event
 Inflow = 10.04 cfs @ 12.09 hrs, Volume= 29.796 af, Incl. 10.00 cfs Base Flow
 Outflow = 10.21 cfs @ 0.02 hrs, Volume= 29.784 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Max. Velocity= 11.80 fps, Min. Travel Time= 0.3 min
 Avg. Velocity = 11.59 fps, Avg. Travel Time= 0.3 min

Peak Storage= 168 cf @ 0.01 hrs, Average Depth at Peak Storage= 0.65'
 Bank-Full Depth= 2.08', Capacity at Bank-Full= 50.79 cfs

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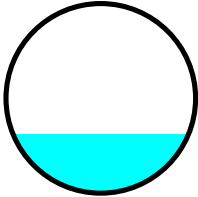
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Type III 24-hr 25yr Rainfall=5.50"

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25.0" Diameter Pipe, n= 0.013 Concrete pipe, straight & clean
Length= 185.0' Slope= 0.0405 '/'
Inlet Invert= 27.50', Outlet Invert= 20.00'



Summary for Reach 2R: Overland flow toward pond

Inflow = 1.09 cfs @ 12.09 hrs, Volume= 0.045 af
Outflow = 1.08 cfs @ 12.11 hrs, Volume= 0.045 af, Atten= 1%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.51 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.14 fps, Avg. Travel Time= 2.3 min

Peak Storage= 66 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 351.19 cfs

5.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 155.0' Slope= 0.0774 '/'
Inlet Invert= 32.00', Outlet Invert= 20.00'



Summary for Pond 2P: Existing Underdrained Soil Filter

Inflow Area = 0.234 ac, 59.83% Impervious, Inflow Depth = 4.15" for 25yr event
Inflow = 1.14 cfs @ 12.07 hrs, Volume= 0.081 af
Outflow = 1.12 cfs @ 12.09 hrs, Volume= 0.081 af, Atten= 2%, Lag= 0.9 min
Primary = 0.04 cfs @ 12.09 hrs, Volume= 0.035 af
Secondary = 1.09 cfs @ 12.09 hrs, Volume= 0.045 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 32.66' @ 12.09 hrs Surf.Area= 647 sf Storage= 455 cf
Flood Elev= 33.00' Surf.Area= 908 sf Storage= 632 cf

Plug-Flow detention time= 94.4 min calculated for 0.081 af (100% of inflow)
Center-of-Mass det. time= 94.6 min (888.1 - 793.6)

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Type III 24-hr 25yr Rainfall=5.50"

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Volume	Invert	Avail.Storage	Storage Description		
#1	29.10'	632 cf	Custom Stage Data (Prismatic) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
29.10	50	30.0	0	0	
30.59	50	30.0	22	22	
31.60	50	100.0	51	73	
32.00	136	100.0	37	110	
33.00	908	100.0	522	632	

Device	Routing	Invert	Outlet Devices									
#1	Primary	28.35'	8.0" x 20.0' long 8" SD CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 26.60' S= 0.0875 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior									
#2	Device 1	32.81'	0.17' x 0.17' Horiz. CB Grate X 36.00 Limited to weir flow C= 0.600									
#3	Device 1	29.10'	6.0" x 70.0' long 6" UD CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 28.41' S= 0.0099 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior									
#4	Device 3	29.10'	2.410 in/hr Filtration to UD over Surface area									
#5	Secondary	32.50'	7.0' long x 4.0' breadth Overflow Spillway Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32									

Primary OutFlow Max=0.04 cfs @ 12.09 hrs HW=32.66' (Free Discharge)

- ↑ 1=8" SD (Passes 0.04 cfs of 2.65 cfs potential flow)
- ↑ 2=CB Grate (Controls 0.00 cfs)
- ↑ 3=6" UD (Passes 0.04 cfs of 1.12 cfs potential flow)
- ↑ 4=Filtration to UD (Exfiltration Controls 0.04 cfs)

Secondary OutFlow Max=1.08 cfs @ 12.09 hrs HW=32.66' (Free Discharge)

- ↑ 5=Overflow Spillway (Weir Controls 1.08 cfs @ 0.96 fps)

Summary for Link 1L: SP1

Inflow Area = 0.368 ac, 38.86% Impervious, Inflow Depth >974.34" for 25yr event
 Inflow = 11.74 cfs @ 12.10 hrs, Volume= 29.880 af
 Primary = 11.74 cfs @ 12.10 hrs, Volume= 29.880 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

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Type III 24-hr 2yr Rainfall=3.00"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Gravel/ Grassed Area Runoff Area=0.134 ac 2.24% Impervious Runoff Depth=2.07"
Tc=5.0 min CN=91 Runoff=0.33 cfs 0.023 af

Subcatchment 2S: Existing Parking Area Runoff Area=0.234 ac 59.83% Impervious Runoff Depth=1.82"
Tc=5.0 min CN=88 Runoff=0.52 cfs 0.035 af

Reach 1R: Pipe Flow Avg. Depth=0.65' Max Vel=11.80 fps Inflow=10.03 cfs 29.785 af
D=25.0" n=0.013 L=185.0' S=0.0405 '/ Capacity=50.79 cfs Outflow=10.21 cfs 29.774 af

Reach 2R: Overland flow toward pond Avg. Depth=0.05' Max Vel=1.75 fps Inflow=0.43 cfs 0.011 af
n=0.030 L=155.0' S=0.0774 '/ Capacity=351.19 cfs Outflow=0.41 cfs 0.011 af

Pond 2P: Existing Underdrained Soil Filter Peak Elev=32.59' Storage=416 cf Inflow=0.52 cfs 0.035 af
Primary=0.03 cfs 0.025 af Secondary=0.43 cfs 0.011 af Outflow=0.46 cfs 0.035 af

Link 1L: SP1 Inflow=10.66 cfs 29.808 af
Primary=10.66 cfs 29.808 af

Total Runoff Area = 0.368 ac Runoff Volume = 0.059 af Average Runoff Depth = 1.91"
61.14% Pervious = 0.225 ac 38.86% Impervious = 0.143 ac

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Type III 24-hr 10yr Rainfall=4.70"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Gravel/ Grassed Area Runoff Area=0.134 ac 2.24% Impervious Runoff Depth=3.69"
Tc=5.0 min CN=91 Runoff=0.58 cfs 0.041 af

Subcatchment 2S: Existing Parking Area Runoff Area=0.234 ac 59.83% Impervious Runoff Depth=3.38"
Tc=5.0 min CN=88 Runoff=0.94 cfs 0.066 af

Reach 1R: Pipe Flow Avg. Depth=0.65' Max Vel=11.80 fps Inflow=10.04 cfs 29.793 af
D=25.0" n=0.013 L=185.0' S=0.0405 '/ Capacity=50.79 cfs Outflow=10.21 cfs 29.781 af

Reach 2R: Overland flow toward pond Avg. Depth=0.07' Max Vel=2.34 fps Inflow=0.89 cfs 0.034 af
n=0.030 L=155.0' S=0.0774 '/ Capacity=351.19 cfs Outflow=0.88 cfs 0.034 af

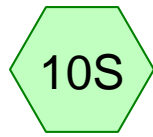
Pond 2P: Existing Underdrained Soil Filter Peak Elev=32.64' Storage=445 cf Inflow=0.94 cfs 0.066 af
Primary=0.04 cfs 0.032 af Secondary=0.89 cfs 0.034 af Outflow=0.92 cfs 0.066 af

Link 1L: SP1 Inflow=11.43 cfs 29.856 af
Primary=11.43 cfs 29.856 af

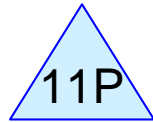
Total Runoff Area = 0.368 ac Runoff Volume = 0.107 af Average Runoff Depth = 3.50"
61.14% Pervious = 0.225 ac 38.86% Impervious = 0.143 ac

Attachment B

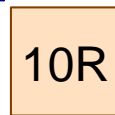
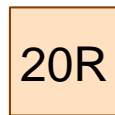
Post-Development Stormwater Modeling



Existing & Proposed
Parking Areas



Underdrained Soil Filter

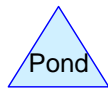
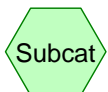


Overland flow toward
pond

Pipe Flow



SP1



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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.093	74	>75% Grass cover, Good, HSG C (10S)
0.268	98	Parking Lot (10S)
0.361		TOTAL AREA

Summary for Subcatchment 10S: Existing & Proposed Parking Areas

Runoff = 1.89 cfs @ 12.07 hrs, Volume= 0.138 af, Depth= 4.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25yr Rainfall=5.50"

Area (ac)	CN	Description
* 0.268	98	Parking Lot
0.093	74	>75% Grass cover, Good, HSG C
0.361	92	Weighted Average
0.093		Pervious Area
0.268		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, TC Time < 5 Mins

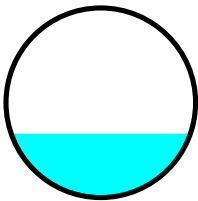
Summary for Reach 10R: Pipe Flow

Inflow Area = 0.361 ac, 74.24% Impervious, Inflow Depth =993.84" for 25yr event
 Inflow = 11.60 cfs @ 12.12 hrs, Volume= 29.898 af, Incl. 10.00 cfs Base Flow
 Outflow = 11.60 cfs @ 12.12 hrs, Volume= 29.889 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Max. Velocity= 12.34 fps, Min. Travel Time= 0.2 min
 Avg. Velocity = 11.62 fps, Avg. Travel Time= 0.2 min

Peak Storage= 136 cf @ 0.01 hrs, Average Depth at Peak Storage= 0.70'
 Bank-Full Depth= 2.08', Capacity at Bank-Full= 50.91 cfs

25.0" Diameter Pipe, n= 0.013 Concrete pipe, straight & clean
 Length= 135.0' Slope= 0.0407 1/100
 Inlet Invert= 25.50', Outlet Invert= 20.00'



Summary for Reach 20R: Overland flow toward 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

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
 Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

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Type III 24-hr 25yr Rainfall=5.50"

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Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 426.69 cfs

5.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 105.0' Slope= 0.1143 '/'
Inlet Invert= 32.00', Outlet Invert= 20.00'



Summary for Pond 11P: Underdrained Soil Filter

Inflow Area = 0.361 ac, 74.24% Impervious, Inflow Depth = 4.58" for 25yr event
Inflow = 1.89 cfs @ 12.07 hrs, Volume= 0.138 af
Outflow = 1.60 cfs @ 12.12 hrs, Volume= 0.138 af, Atten= 15%, Lag= 2.8 min
Primary = 1.60 cfs @ 12.12 hrs, Volume= 0.138 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 30.75' @ 12.12 hrs Surf.Area= 1,360 sf Storage= 1,803 cf

Plug-Flow detention time= 191.0 min calculated for 0.138 af (100% of inflow)
Center-of-Mass det. time= 190.9 min (969.8 - 778.8)

Volume	Invert	Avail.Storage	Storage Description	
#1	27.00'	3,958 cf	Custom Stage Data (Prismatic) Listed below	
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
27.00	688	30.0	0	0
29.49	688	30.0	514	514
29.50	688	100.0	7	521
30.00	945	100.0	408	929
30.66	1,306	100.0	743	1,672
31.00	1,502	100.0	477	2,149
32.00	2,115	100.0	1,809	3,958

1,672 - 521 = 1,151 CF

Device	Routing	Invert	Outlet Devices
#1	Primary	26.20'	8.0" x 6.0' long 8" SD CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 25.50' S= 0.1167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	30.66'	0.17' x 0.17' Horiz. CB Grate X 36.00 Limited to weir flow C= 0.600
#3	Device 1	27.00'	6.0" x 82.0' long 6" UD CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 26.26' S= 0.0090 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#4	Device 3	27.00'	2.410 in/hr Filtration to UD over Surface area

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Type III 24-hr 25yr Rainfall=5.50"

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#5	Secondary	<u>30.90'</u>	5.0' long x 4.0' breadth Overflow Spillway
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66
			2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=1.60 cfs @ 12.12 hrs HW=30.75' (Free Discharge)

- ↑ 1=8" SD (Passes 1.60 cfs of 2.73 cfs potential flow)
- ↑ 2=CB Grate (Orifice Controls 1.53 cfs @ 1.47 fps)
- ↑ 3=6" UD (Passes 0.08 cfs of 1.09 cfs potential flow)
- ↑ 4=Filtration to UD (Exfiltration Controls 0.08 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=27.00' (Free Discharge)

- ↑ 5=Overflow Spillway (Controls 0.00 cfs)

Summary for Link 10L: SP1

Inflow Area = 0.361 ac, 74.24% Impervious, Inflow Depth >93.53" for 25yr event
 Inflow = 11.60 cfs @ 12.12 hrs, Volume= 29.889 af
 Primary = 11.60 cfs @ 12.12 hrs, Volume= 29.889 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

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Type III 24-hr 2yr Rainfall=3.00"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10S: Existing & Proposed Runoff Area=0.361 ac 74.24% Impervious Runoff Depth=2.16"
Tc=5.0 min CN=92 Runoff=0.93 cfs 0.065 af

Reach 10R: Pipe Flow Avg. Depth=0.70' Max Vel=12.34 fps Inflow=10.06 cfs 29.825 af
D=25.0" n=0.013 L=135.0' S=0.0407 '/' Capacity=50.91 cfs Outflow=10.11 cfs 29.816 af

Reach 20R: Overland flow toward pond Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=105.0' S=0.1143 '/' Capacity=426.69 cfs Outflow=0.00 cfs 0.000 af

Pond 11P: Underdrained Soil Filter Peak Elev=30.34' Storage=1,313 cf Inflow=0.93 cfs 0.065 af
Primary=0.06 cfs 0.065 af Secondary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.065 af

Link 10L: SP1 Inflow=10.11 cfs 29.816 af
Primary=10.11 cfs 29.816 af

Total Runoff Area = 0.361 ac Runoff Volume = 0.065 af Average Runoff Depth = 2.16"
25.76% Pervious = 0.093 ac 74.24% Impervious = 0.268 ac

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Type III 24-hr 10yr Rainfall=4.70"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10S: Existing & Proposed Runoff Area=0.361 ac 74.24% Impervious Runoff Depth=3.80"
Tc=5.0 min CN=92 Runoff=1.59 cfs 0.114 af

Reach 10R: Pipe Flow Avg. Depth=0.70' Max Vel=12.34 fps Inflow=10.86 cfs 29.875 af
D=25.0" n=0.013 L=135.0' S=0.0407 '/' Capacity=50.91 cfs Outflow=10.85 cfs 29.865 af

Reach 20R: Overland flow toward pond Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=105.0' S=0.1143 '/' Capacity=426.69 cfs Outflow=0.00 cfs 0.000 af

Pond 11P: Underdrained Soil Filter Peak Elev=30.71' Storage=1,740 cf Inflow=1.59 cfs 0.114 af
Primary=0.86 cfs 0.114 af Secondary=0.00 cfs 0.000 af Outflow=0.86 cfs 0.114 af

Link 10L: SP1 Inflow=10.85 cfs 29.865 af
Primary=10.85 cfs 29.865 af

Total Runoff Area = 0.361 ac Runoff Volume = 0.114 af Average Runoff Depth = 3.80"
25.76% Pervious = 0.093 ac 74.24% Impervious = 0.268 ac