

MEMORANDUM

DATE: February 23, 2022
BY: Craig Harris, PE *CH*
SUBJECT: Stormwater Memo
PROJECT: Turner Road Salem
PROJECT NO.: A21166.10

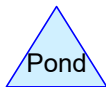
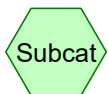
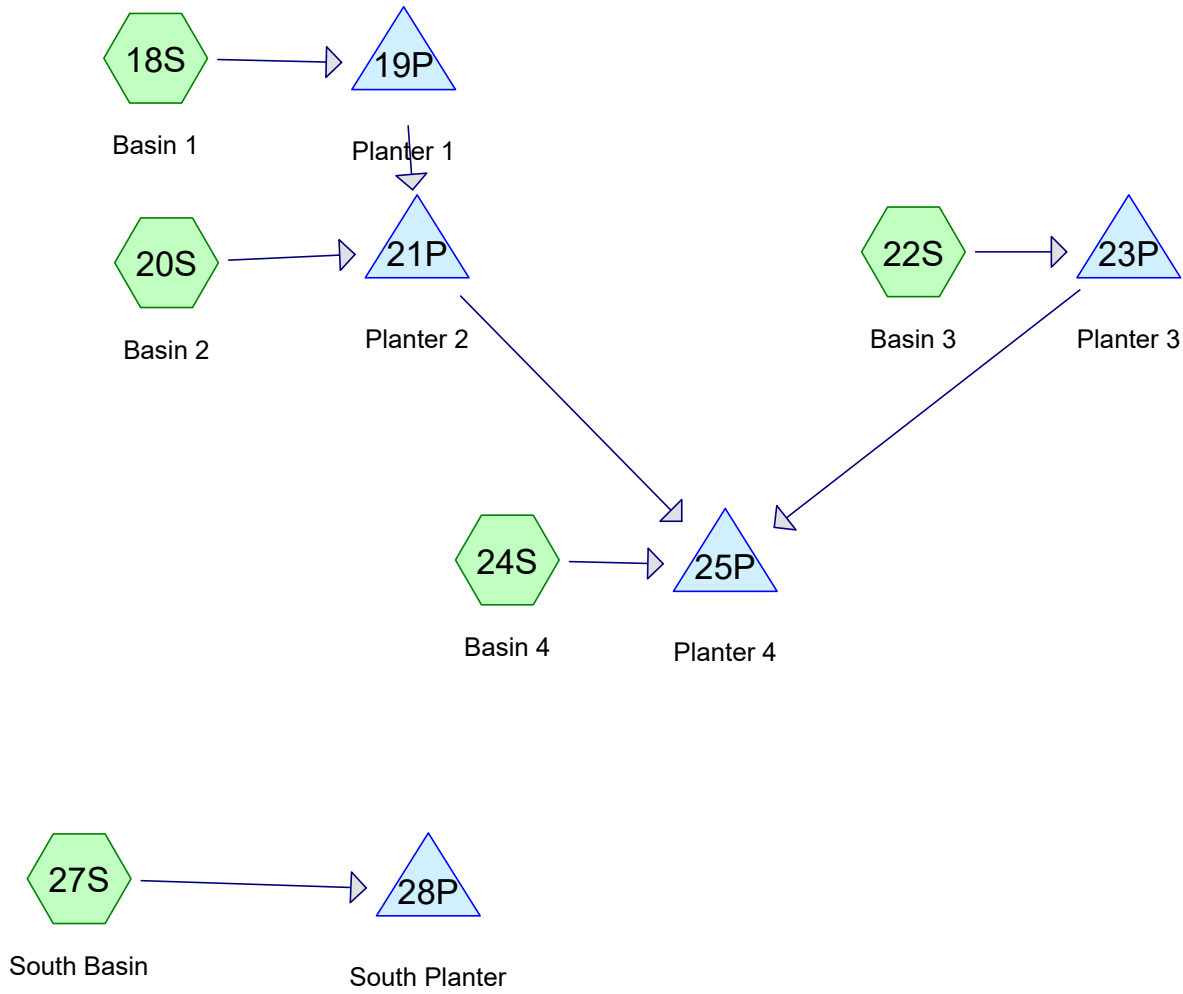


This memorandum is to outline the utility requirements and existing conditions for the proposed Turner Road project in Salem, OR. The total site area is 436,000SF, and the existing site is an undeveloped field. This project proposes to develop the site with one building and the associated parking, sidewalks, and utilities. As a result of these improvements, the proposed site will have 350,000SF of new impervious area.

The project will meet City of Salem standards for stormwater management. Storm runoff from the proposed impervious area will be directed via sheet flow to curb cuts, treatment and detention planters, underground detention pipes, and flow control manholes, before being discharged to public storm pipes. Roof runoff will be directed by conveyance piping into the treatment planters, and through the same system. The planters have been sized to allow all runoff from the 1.38-inch water quality storm to pass through the engineered soil, into perforated pipe. In larger events, water can overflow into lower planters and underground pipes. Detained runoff will be released at a controlled rate to reduce the peak flow from the 2-year storm to half the existing peak, and to match the existing peak flow during the 5-, 10-, and 25-, 50-, and 100-year storms (see attached HydroCAD Report).

The treated and flow-controlled stormwater from the site will be discharged into existing public storm pipes, which currently receive the runoff from the existing site. The existing pipes are adequately sized to convey the proposed flows.

TREATMENT CALCULATIONS



Turner Treatment

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Type IA 24-hr WQ Rainfall=1.38"

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Summary for Subcatchment 18S: Basin 1

Runoff = 0.31 cfs @ 7.87 hrs, Volume= 0.100 af, Depth= 1.16"

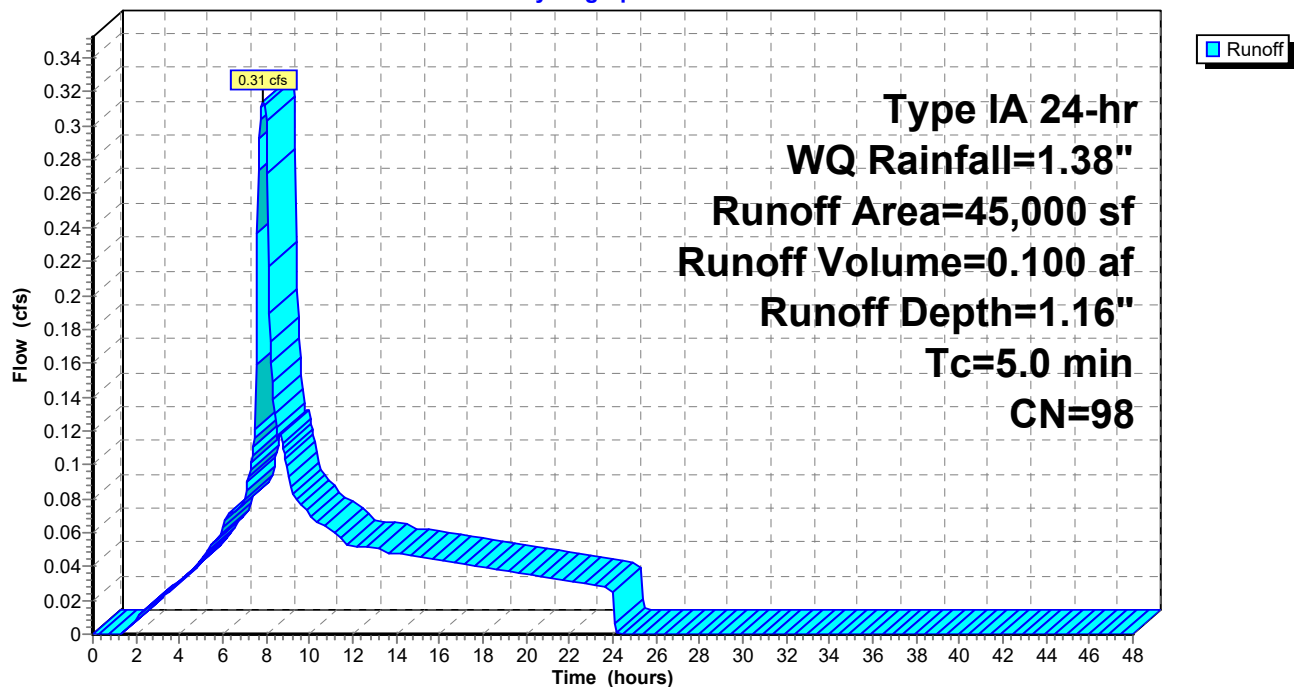
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	45,000	98	
	45,000		100.00% Impervious Area

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

Subcatchment 18S: Basin 1

Hydrograph



Turner Treatment

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Type IA 24-hr WQ Rainfall=1.38"

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Summary for Subcatchment 20S: Basin 2

Runoff = 0.42 cfs @ 7.87 hrs, Volume= 0.133 af, Depth= 1.16"

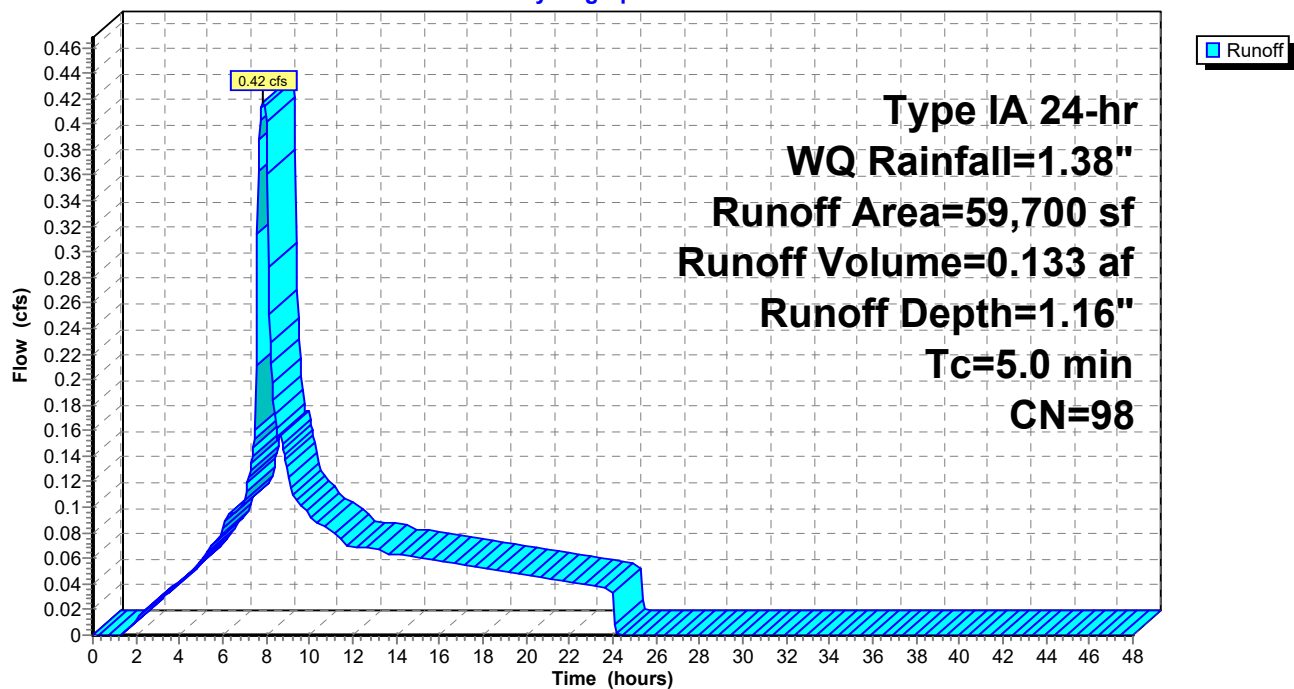
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	9,700	98	
*	50,000	98	
	59,700	98	Weighted Average
	59,700		100.00% Impervious Area

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

Subcatchment 20S: Basin 2

Hydrograph



Turner Treatment

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Type IA 24-hr WQ Rainfall=1.38"

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Summary for Subcatchment 22S: Basin 3

Runoff = 0.45 cfs @ 7.87 hrs, Volume= 0.142 af, Depth= 1.16"

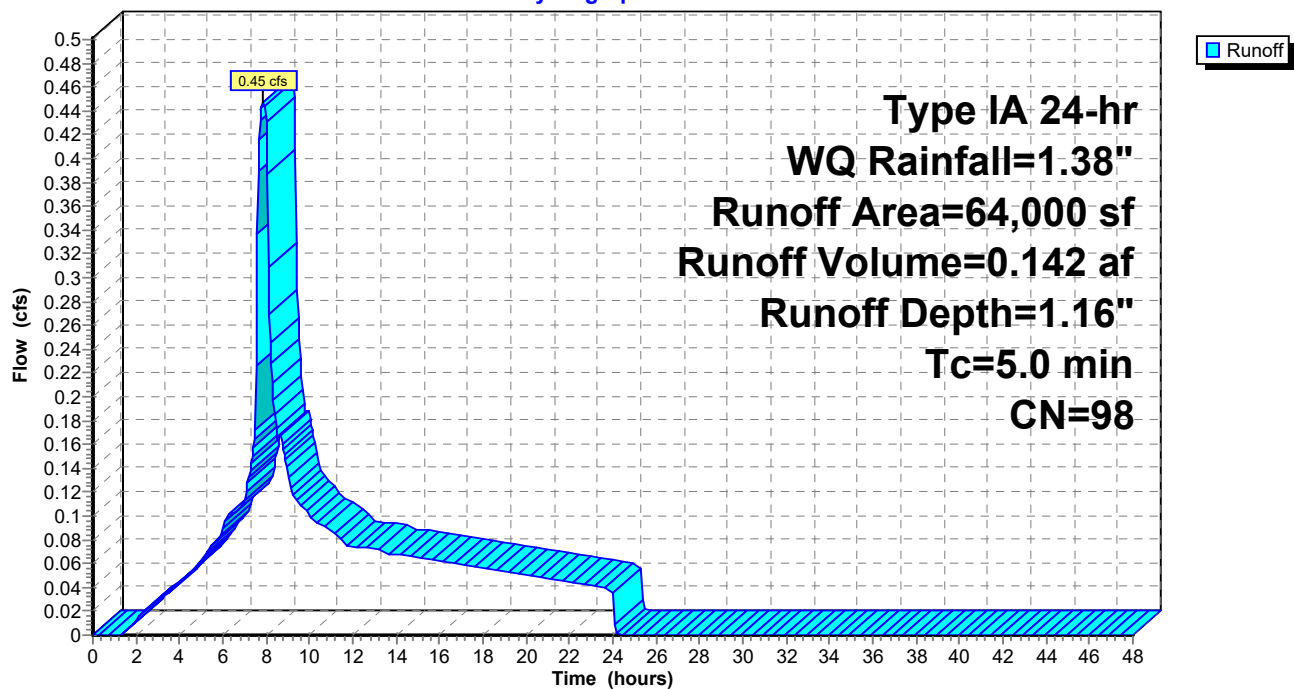
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	14,000	98	
*	50,000	98	
	64,000	98	Weighted Average
	64,000		100.00% Impervious Area

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

Subcatchment 22S: Basin 3

Hydrograph



Turner Treatment

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Type IA 24-hr WQ Rainfall=1.38"

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Summary for Subcatchment 24S: Basin 4

Runoff = 0.22 cfs @ 7.87 hrs, Volume= 0.071 af, Depth= 1.16"

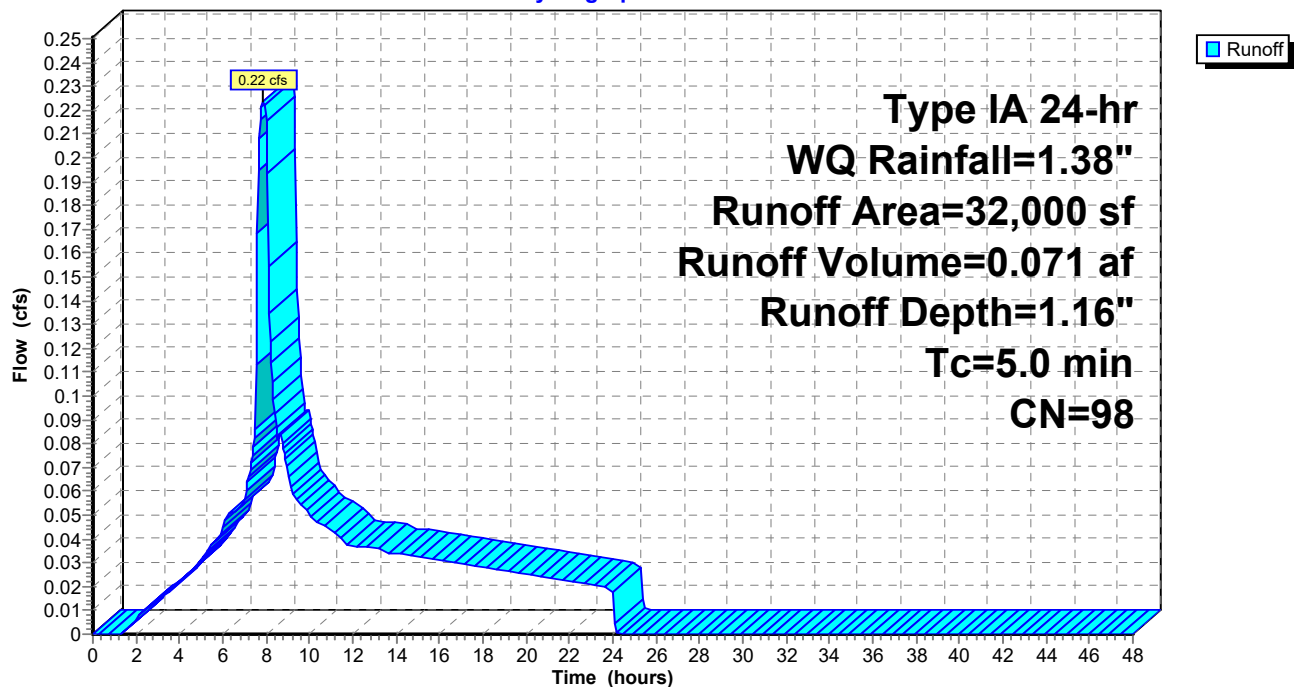
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	32,000	98	
	32,000		100.00% Impervious Area

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

Subcatchment 24S: Basin 4

Hydrograph



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Type IA 24-hr WQ Rainfall=1.38"

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Summary for Subcatchment 27S: South Basin

Runoff = 1.05 cfs @ 7.87 hrs, Volume= 0.333 af, Depth= 1.16"

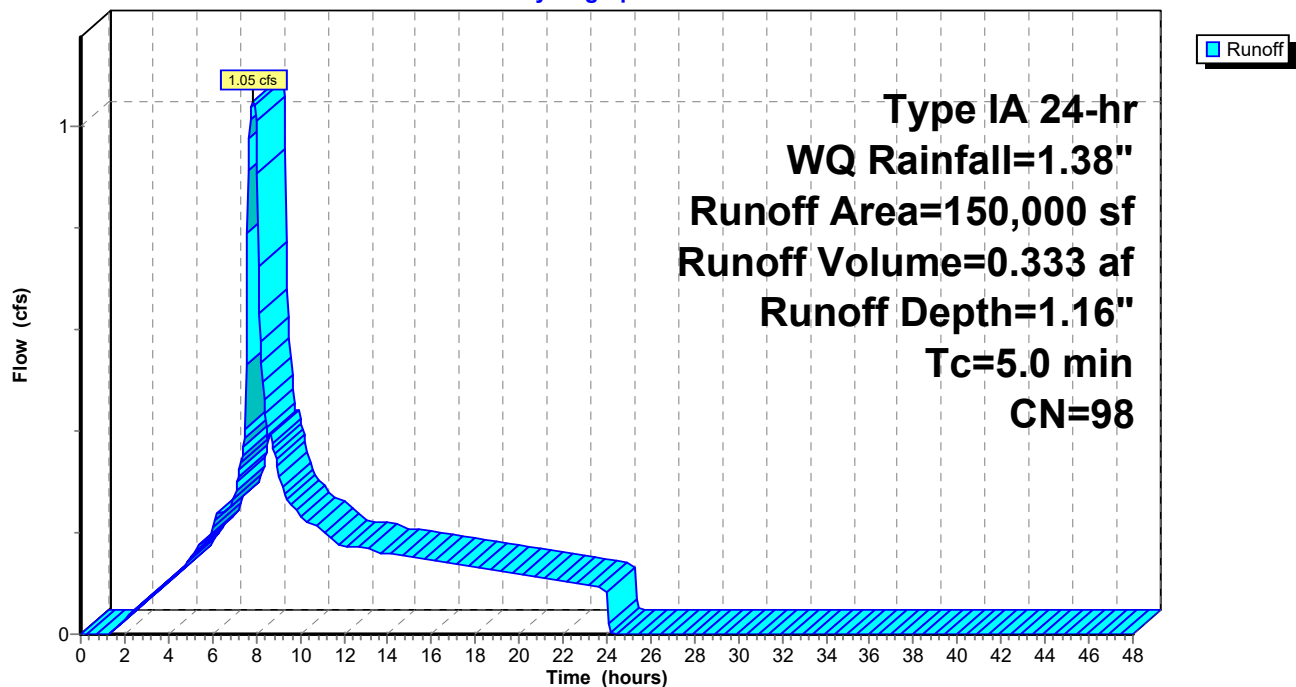
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	150,000	98	
	150,000		100.00% Impervious Area

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

Subcatchment 27S: South Basin

Hydrograph



Turner Treatment

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Type IA 24-hr WQ Rainfall=1.38"

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Summary for Pond 19P: Planter 1

Inflow Area = 1.033 ac, 100.00% Impervious, Inflow Depth = 1.16" for WQ event
Inflow = 0.31 cfs @ 7.87 hrs, Volume= 0.100 af
Outflow = 0.13 cfs @ 8.41 hrs, Volume= 0.100 af, Atten= 59%, Lag= 32.3 min
Discarded = 0.07 cfs @ 8.41 hrs, Volume= 0.095 af
Primary = 0.06 cfs @ 8.41 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 225.73' @ 8.41 hrs Surf.Area= 1,443 sf Storage= 683 cf

Plug-Flow detention time= 82.4 min calculated for 0.100 af (100% of inflow)
Center-of-Mass det. time= 82.3 min (777.7 - 695.4)

Volume	Invert	Avail.Storage	Storage Description
#1	225.20'	1,430 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
225.20	1,159	0	0
226.20	1,700	1,430	1,430

Device	Routing	Invert	Outlet Devices
#1	Primary	225.70'	18.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Discarded	225.20'	2.000 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.07 cfs @ 8.41 hrs HW=225.73' (Free Discharge)
↑ **2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.06 cfs @ 8.41 hrs HW=225.73' (Free Discharge)
↑ **1=Orifice/Grate** (Weir Controls 0.06 cfs @ 0.52 fps)

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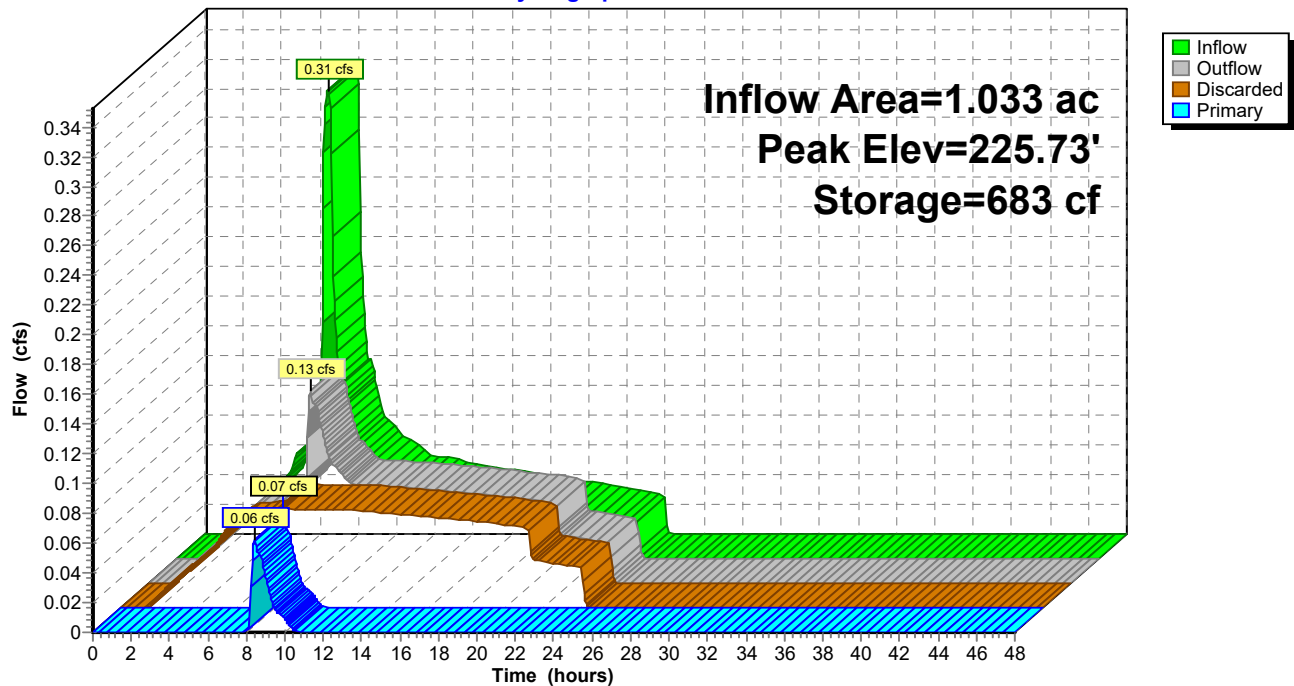
Type IA 24-hr WQ Rainfall=1.38"

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Pond 19P: Planter 1

Hydrograph



Turner Treatment

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Type IA 24-hr WQ Rainfall=1.38"

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Summary for Pond 21P: Planter 2

Inflow Area = 2.404 ac, 100.00% Impervious, Inflow Depth = 0.69" for WQ event
 Inflow = 0.42 cfs @ 7.87 hrs, Volume= 0.138 af
 Outflow = 0.11 cfs @ 9.74 hrs, Volume= 0.138 af, Atten= 73%, Lag= 112.3 min
 Discarded = 0.08 cfs @ 9.74 hrs, Volume= 0.135 af
 Primary = 0.03 cfs @ 9.74 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 225.61' @ 9.74 hrs Surf.Area= 1,767 sf Storage= 1,505 cf

Plug-Flow detention time= 193.3 min calculated for 0.138 af (100% of inflow)
 Center-of-Mass det. time= 193.3 min (882.8 - 689.5)

Volume	Invert	Avail.Storage	Storage Description
#1	224.60'	2,437 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
224.60	1,205	0	0
225.10	1,476	670	670
225.60	1,758	809	1,479
226.10	2,074	958	2,437

Device	Routing	Invert	Outlet Devices
#1	Primary	225.60'	18.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Discarded	224.60'	2.000 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.08 cfs @ 9.74 hrs HW=225.61' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.03 cfs @ 9.74 hrs HW=225.61' (Free Discharge)
 ↑ **1=Orifice/Grate** (Weir Controls 0.03 cfs @ 0.40 fps)

Turner Treatment

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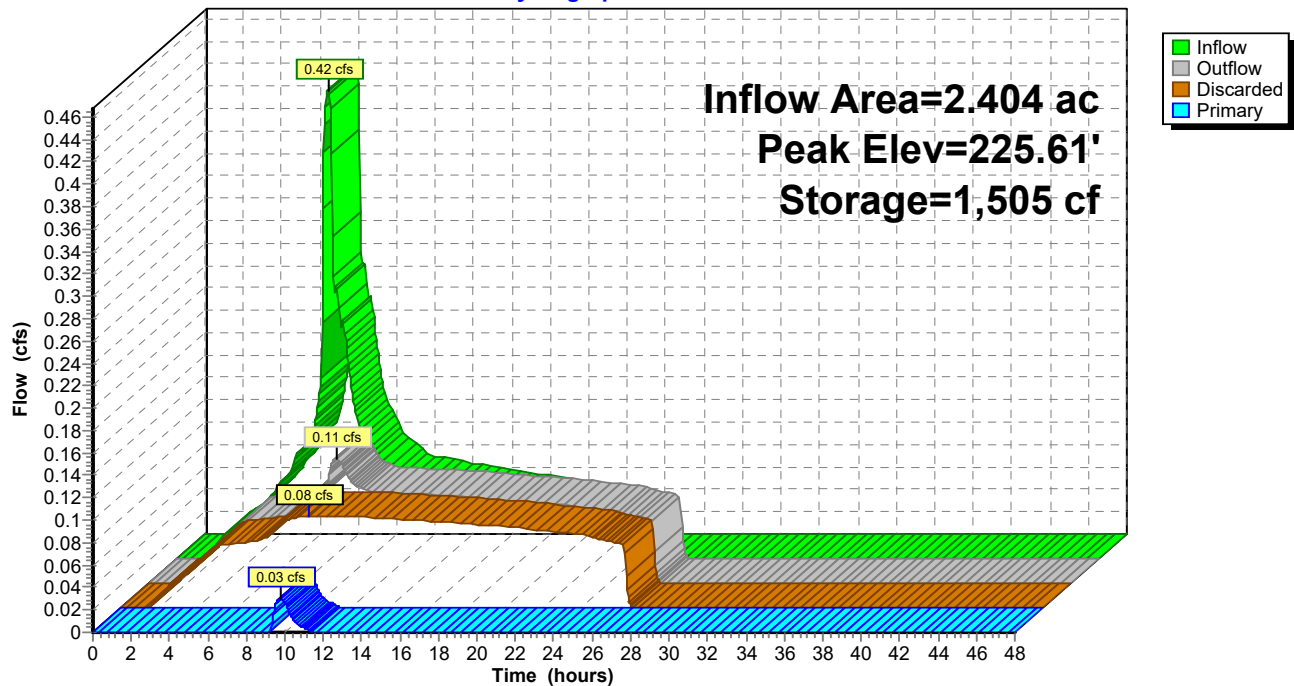
Type IA 24-hr WQ Rainfall=1.38"

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Pond 21P: Planter 2

Hydrograph



Turner Treatment

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Type IA 24-hr WQ Rainfall=1.38"

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Summary for Pond 23P: Planter 3

Inflow Area = 1.469 ac, 100.00% Impervious, Inflow Depth = 1.16" for WQ event
Inflow = 0.45 cfs @ 7.87 hrs, Volume= 0.142 af
Outflow = 0.45 cfs @ 7.91 hrs, Volume= 0.142 af, Atten= 0%, Lag= 2.4 min
Discarded = 0.04 cfs @ 7.91 hrs, Volume= 0.083 af
Primary = 0.40 cfs @ 7.91 hrs, Volume= 0.059 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 227.34' @ 7.91 hrs Surf.Area= 950 sf Storage= 493 cf

Plug-Flow detention time= 80.7 min calculated for 0.142 af (100% of inflow)

Center-of-Mass det. time= 80.8 min (776.2 - 695.4)

Volume	Invert	Avail.Storage	Storage Description
#1	226.75'	917 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
226.75	726	0	0
227.75	1,107	917	917

Device	Routing	Invert	Outlet Devices
#1	Primary	227.25'	18.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Discarded	226.75'	2.000 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.04 cfs @ 7.91 hrs HW=227.34' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.40 cfs @ 7.91 hrs HW=227.34' (Free Discharge)

↑ **1=Orifice/Grate** (Weir Controls 0.40 cfs @ 0.97 fps)

Turner Treatment

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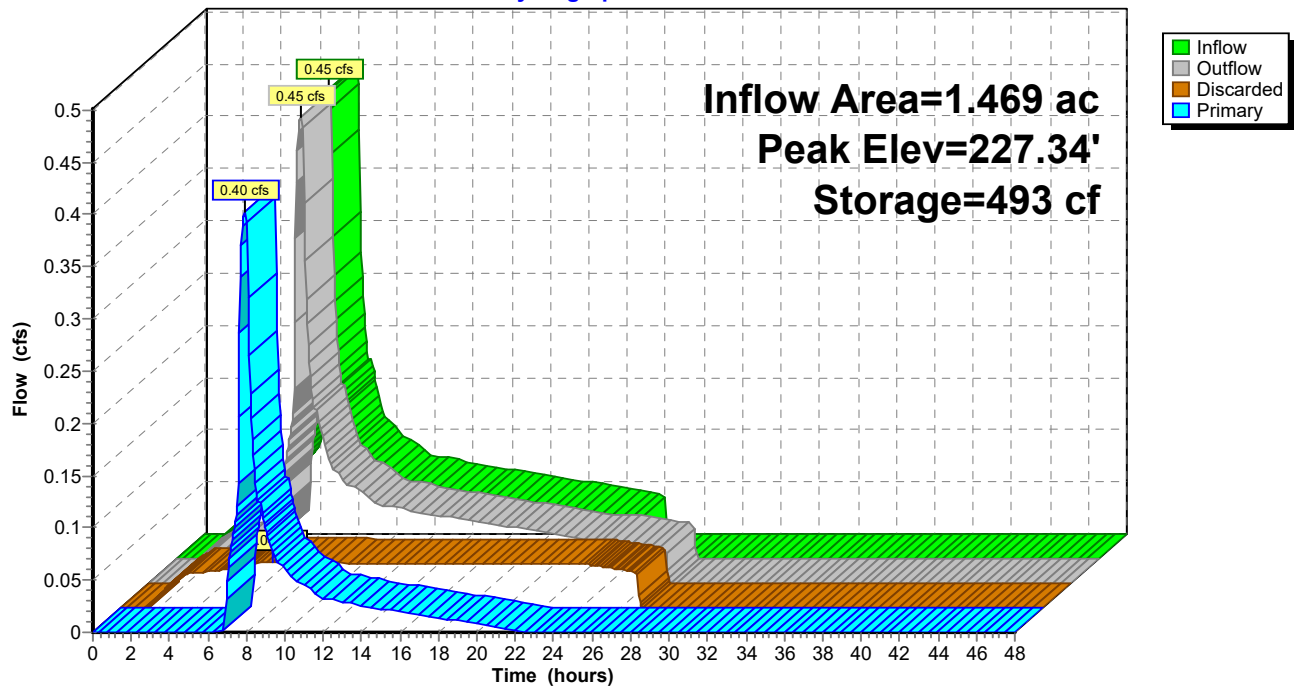
Type IA 24-hr WQ Rainfall=1.38"

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Pond 23P: Planter 3

Hydrograph



Turner Treatment

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Type IA 24-hr WQ Rainfall=1.38"

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Summary for Pond 25P: Planter 4

Inflow Area = 4.607 ac, 100.00% Impervious, Inflow Depth = 0.35" for WQ event
 Inflow = 0.63 cfs @ 7.90 hrs, Volume= 0.133 af
 Outflow = 0.34 cfs @ 8.22 hrs, Volume= 0.133 af, Atten= 46%, Lag= 19.2 min
 Discarded = 0.34 cfs @ 8.22 hrs, Volume= 0.133 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 224.08' @ 8.22 hrs Surf.Area= 7,316 sf Storage= 560 cf

Plug-Flow detention time= 10.9 min calculated for 0.132 af (100% of inflow)
 Center-of-Mass det. time= 10.9 min (670.2 - 659.2)

Volume	Invert	Avail.Storage	Storage Description
#1	224.00'	16,776 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
224.00	7,228	0	0
225.00	8,371	7,800	7,800
226.00	9,582	8,977	16,776

Device	Routing	Invert	Outlet Devices
#1	Primary	225.50'	18.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Discarded	224.00'	2.000 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.34 cfs @ 8.22 hrs HW=224.08' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=224.00' (Free Discharge)
 ↑ **1=Orifice/Grate** (Controls 0.00 cfs)

Turner Treatment

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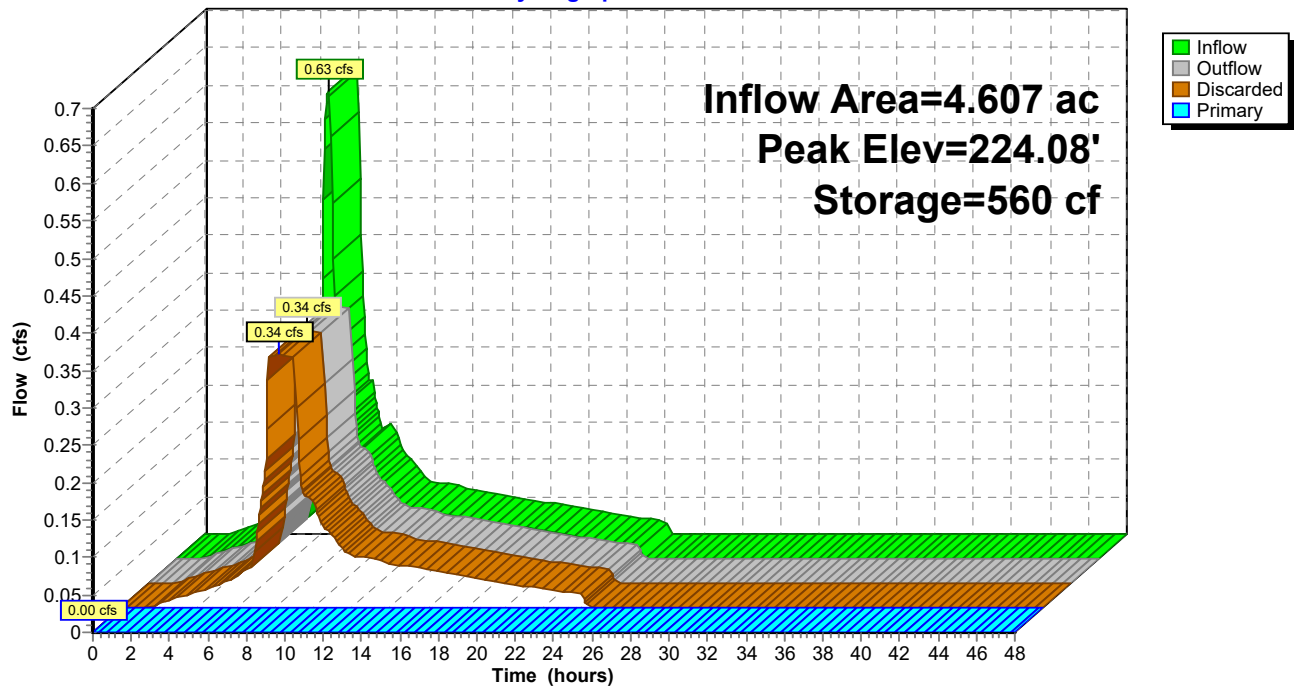
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Pond 25P: Planter 4

Hydrograph



Turner Treatment

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Type IA 24-hr WQ Rainfall=1.38"

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Summary for Pond 28P: South Planter

Inflow Area = 3.444 ac, 100.00% Impervious, Inflow Depth = 1.16" for WQ event
Inflow = 1.05 cfs @ 7.87 hrs, Volume= 0.333 af
Outflow = 0.28 cfs @ 9.22 hrs, Volume= 0.333 af, Atten= 73%, Lag= 80.8 min
Discarded = 0.28 cfs @ 9.22 hrs, Volume= 0.333 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 0.46' @ 9.22 hrs Surf.Area= 0.141 ac Storage= 0.054 af

Plug-Flow detention time= 61.2 min calculated for 0.333 af (100% of inflow)
Center-of-Mass det. time= 61.2 min (756.6 - 695.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.145 af	6.00'W x 700.00'L x 1.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	2.000 in/hr Exfiltration over Surface area
#2	Primary	0.50'	18.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.28 cfs @ 9.22 hrs HW=0.46' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

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

Turner Treatment

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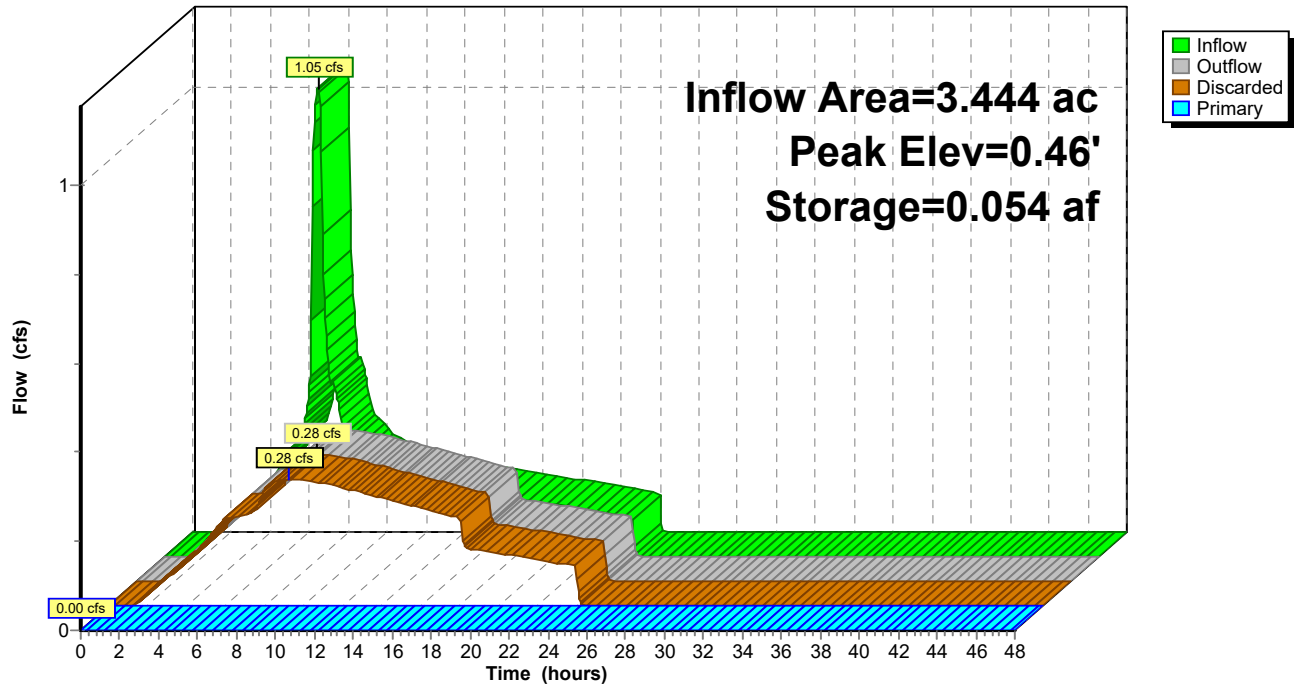
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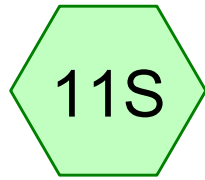
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Pond 28P: South Planter

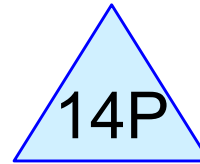
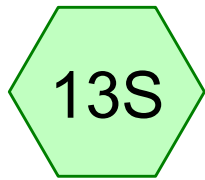
Hydrograph



DETENTION CALCULATIONS

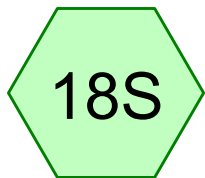


North Basin
Predeveloped

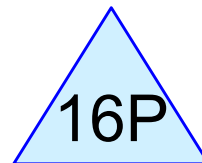


North Basin Developed

North Detention System

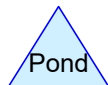
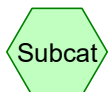


South Basin
Predeveloped



South Basin Developed

South Detention System



Routing Diagram for Turner Detention

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Turner Detention

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Type IA 24-hr 2-Yr Rainfall=2.20"

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Summary for Subcatchment 11S: North Basin Predeveloped

Runoff = 0.47 cfs @ 8.30 hrs, Volume= 0.263 af, Depth= 0.69"

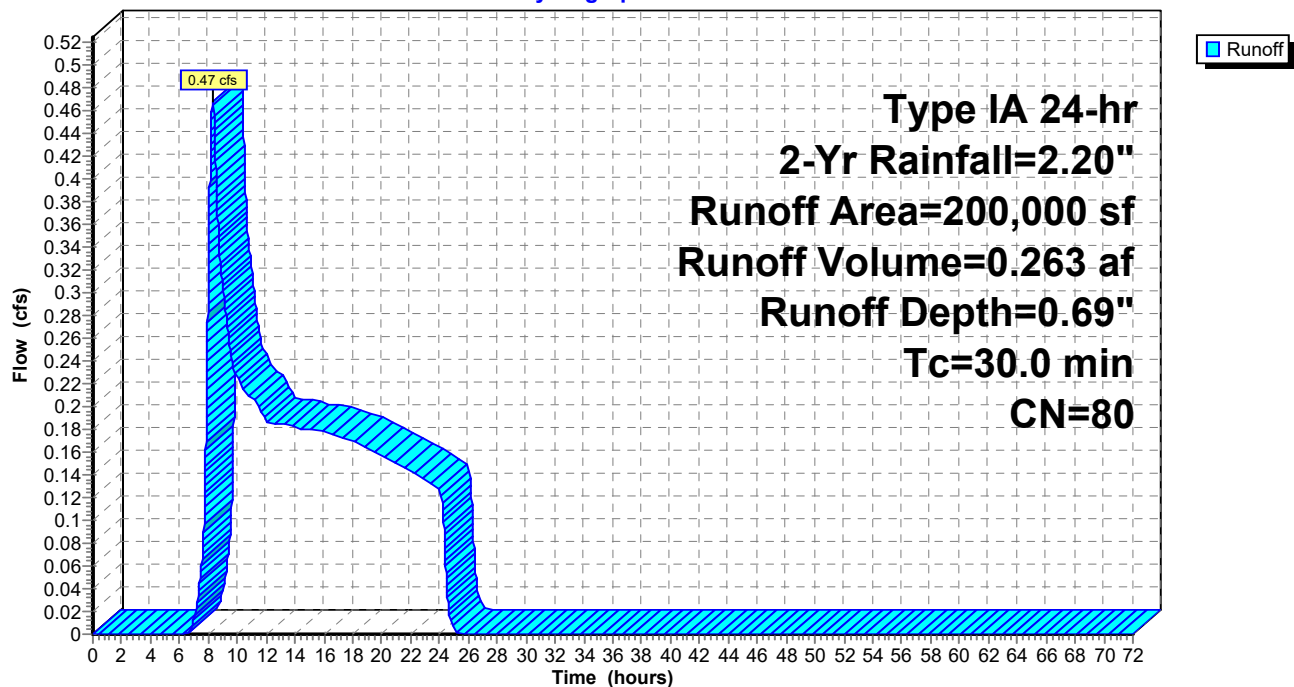
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=2.20"

	Area (sf)	CN	Description
*	200,000	80	
	200,000	80	100.00% Pervious Area

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

Subcatchment 11S: North Basin Predeveloped

Hydrograph



Turner Detention

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Type IA 24-hr 2-Yr Rainfall=2.20"

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Page 3

Summary for Subcatchment 13S: North Basin Developed

Runoff = 2.35 cfs @ 7.86 hrs, Volume= 0.755 af, Depth= 1.97"

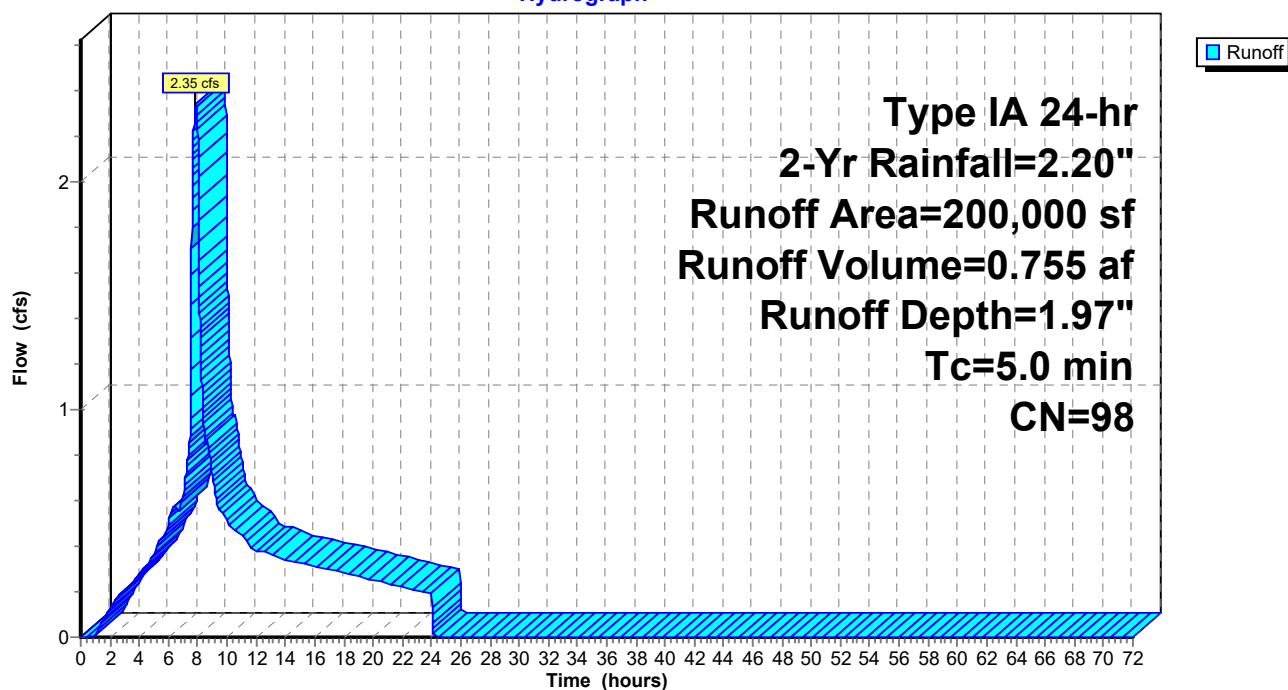
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=2.20"

	Area (sf)	CN	Description
*	200,000	98	
	200,000	98	100.00% Impervious Area

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

Subcatchment 13S: North Basin Developed

Hydrograph



Turner Detention

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Type IA 24-hr 2-Yr Rainfall=2.20"

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Summary for Subcatchment 15S: South Basin Developed

Runoff = 1.76 cfs @ 7.86 hrs, Volume= 0.566 af, Depth= 1.97"

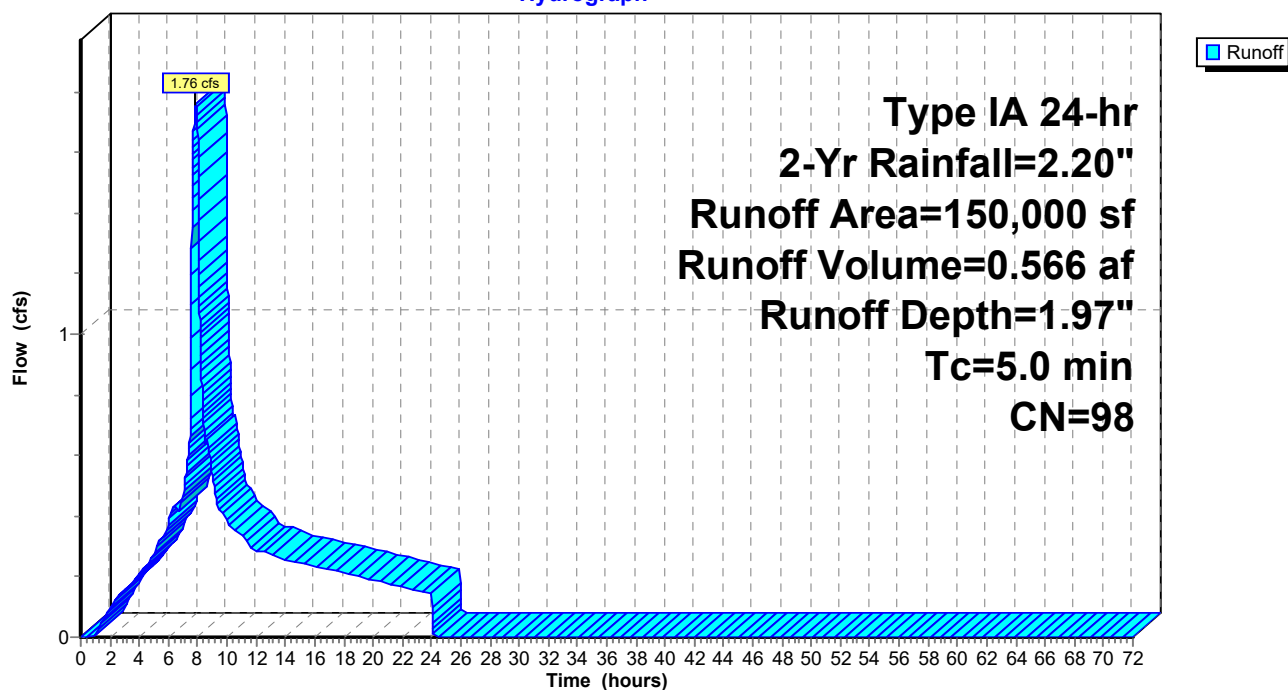
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=2.20"

	Area (sf)	CN	Description
*	150,000	98	
	150,000	98	100.00% Impervious Area

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

Subcatchment 15S: South Basin Developed

Hydrograph



Turner Detention

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Type IA 24-hr 2-Yr Rainfall=2.20"

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Summary for Subcatchment 18S: South Basin Predeveloped

Runoff = 0.35 cfs @ 8.30 hrs, Volume= 0.197 af, Depth= 0.69"

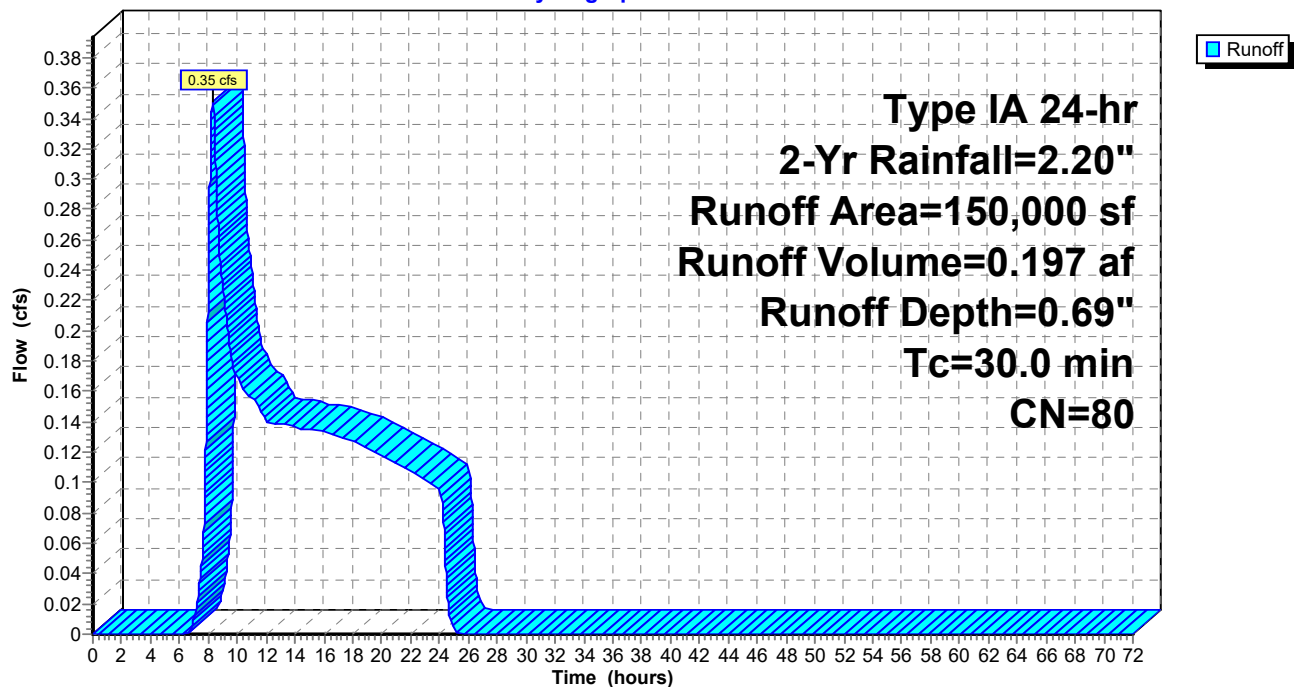
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=2.20"

	Area (sf)	CN	Description
*	150,000	80	
	150,000	80	100.00% Pervious Area

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

Subcatchment 18S: South Basin Predeveloped

Hydrograph



Turner Detention

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Type IA 24-hr 2-Yr Rainfall=2.20"

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Summary for Pond 14P: North Detention System

Inflow Area = 4.591 ac, 100.00% Impervious, Inflow Depth = 1.97" for 2-Yr event
 Inflow = 2.35 cfs @ 7.86 hrs, Volume= 0.755 af
 Outflow = 0.23 cfs @ 21.35 hrs, Volume= 0.755 af, Atten= 90%, Lag= 809.1 min
 Primary = 0.23 cfs @ 21.35 hrs, Volume= 0.755 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 225.21' @ 21.35 hrs Surf.Area= 12,290 sf Storage= 17,553 cf

Plug-Flow detention time= 878.4 min calculated for 0.755 af (100% of inflow)
 Center-of-Mass det. time= 878.5 min (1,554.8 - 676.3)

Volume	Invert	Avail.Storage	Storage Description
#1	222.45'	1,894 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	221.85'	2,919 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#3	221.25'	19,667 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#4	224.00'	1,207 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#5	221.20'	3,079 cf	42.0" Round Pipe Storage
			L= 320.0' S= 0.0030 '/'
		28,765 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
222.45	1,159	0.0	0	0
223.45	1,159	40.0	464	464
225.20	1,159	0.0	0	464
226.20	1,701	100.0	1,430	1,894

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
221.85	1,205	0.0	0	0
222.85	1,205	40.0	482	482
224.60	1,205	0.0	0	482
225.10	1,476	100.0	670	1,152
225.60	1,758	100.0	809	1,961
226.10	2,074	100.0	958	2,919

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
221.25	7,228	0.0	0	0
222.25	7,228	40.0	2,891	2,891
224.00	7,228	0.0	0	2,891
225.00	8,371	100.0	7,800	10,691
226.00	9,582	100.0	8,977	19,667

Turner Detention

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Type IA 24-hr 2-Yr Rainfall=2.20"

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Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
224.00	726	0.0	0	0
225.00	726	40.0	290	290
226.75	726	0.0	0	290
227.75	1,107	100.0	917	1,207

Device	Routing	Invert	Outlet Devices
#1	Primary	221.20'	2.1" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	225.25'	11.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

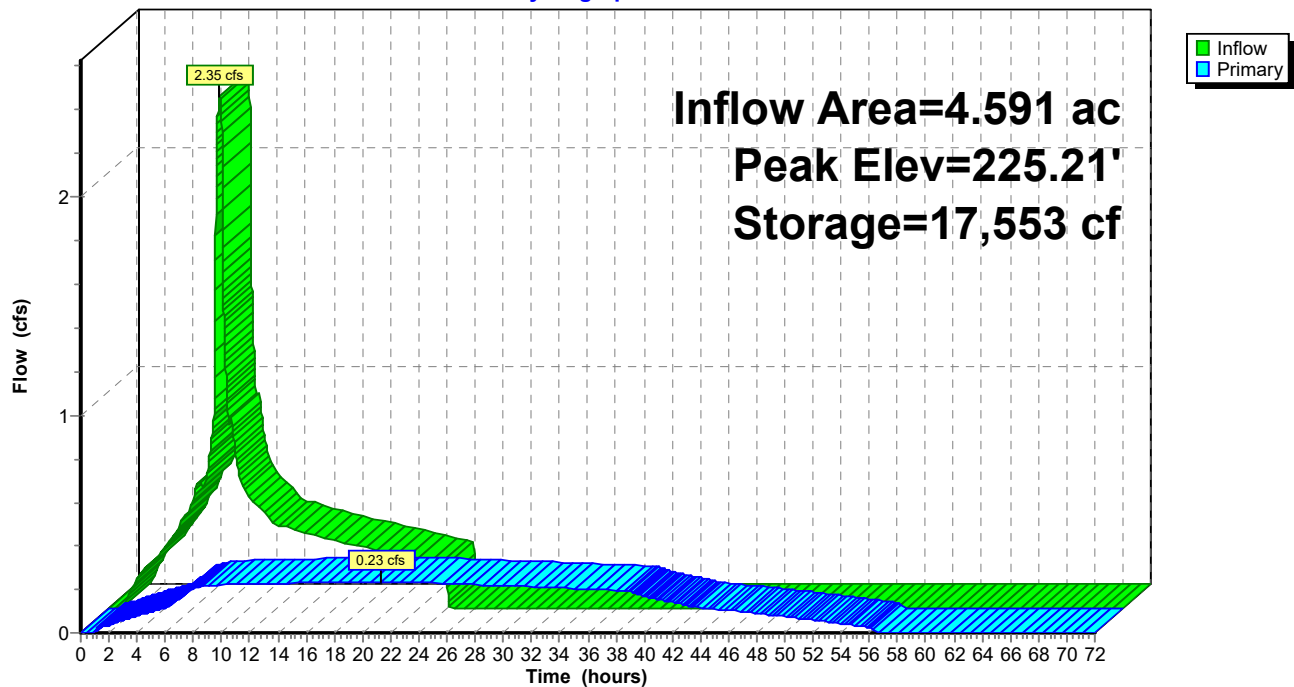
Primary OutFlow Max=0.23 cfs @ 21.35 hrs HW=225.21' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.23 cfs @ 9.64 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Pond 14P: North Detention System

Hydrograph



Turner Detention

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Type IA 24-hr 2-Yr Rainfall=2.20"

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Summary for Pond 16P: South Detention System

Inflow Area = 3.444 ac, 100.00% Impervious, Inflow Depth = 1.97" for 2-Yr event
 Inflow = 1.76 cfs @ 7.86 hrs, Volume= 0.566 af
 Outflow = 0.16 cfs @ 22.90 hrs, Volume= 0.566 af, Atten= 91%, Lag= 902.0 min
 Primary = 0.16 cfs @ 22.90 hrs, Volume= 0.566 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 229.48' @ 22.90 hrs Surf.Area= 0.240 ac Storage= 0.329 af

Plug-Flow detention time= 1,072.9 min calculated for 0.566 af (100% of inflow)
 Center-of-Mass det. time= 1,073.0 min (1,749.3 - 676.3)

Volume	Invert	Avail.Storage	Storage Description
#1	226.25'	0.037 af	6.00'W x 700.00'L x 1.00'H Prismatic 0.096 af Overall - 0.003 af Embedded = 0.093 af x 40.0% Voids
#2	229.00'	0.145 af	6.00'W x 700.00'L x 1.00'H Prismatic Z=3.0
#3	222.50'	0.231 af	48.0" Round Pipe Storage L= 800.0' S= 0.0030 '/'
#4	226.25'	0.003 af	6.0" Round Pipe Storage Inside #1 L= 700.0'
		0.417 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	222.50'	1.5" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	229.50'	8.0" W x 3.0" H Vert. Orifice/Grate C= 0.600
#3	Primary	229.75'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.16 cfs @ 22.90 hrs HW=229.48' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.16 cfs @ 12.72 fps)
 2=Orifice/Grate (Controls 0.00 cfs)
 3=Orifice/Grate (Controls 0.00 cfs)

Turner Detention

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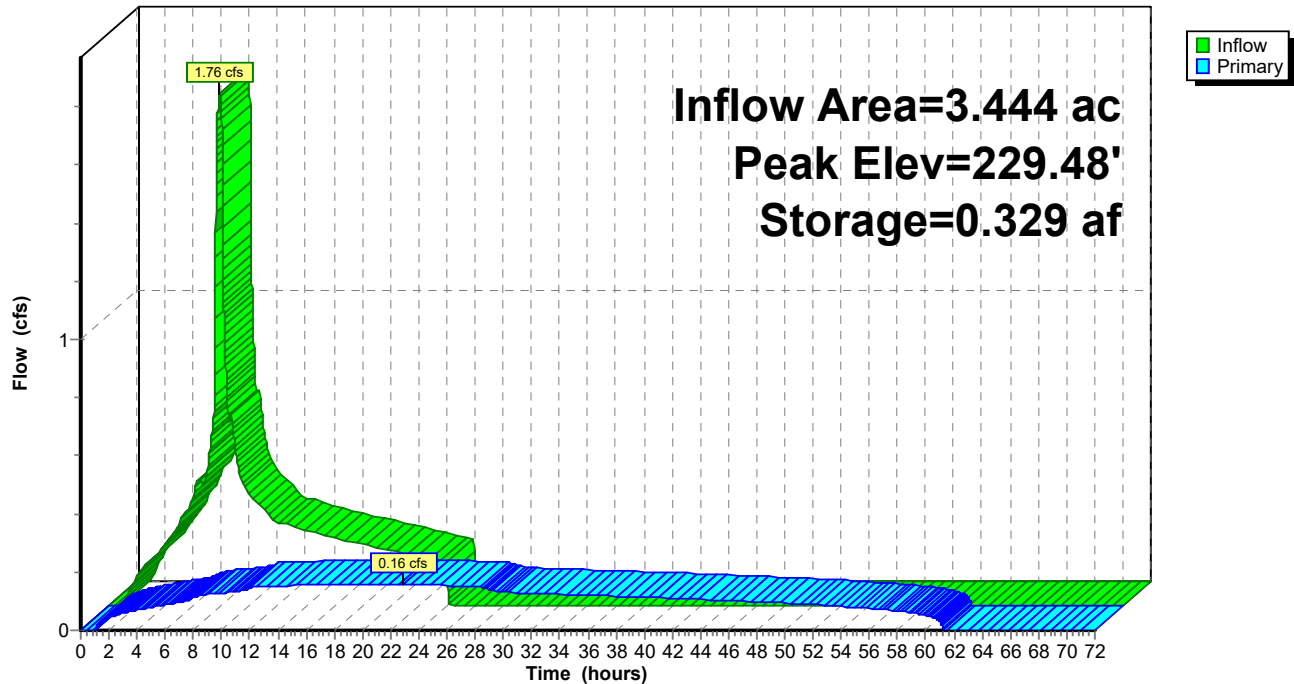
Type IA 24-hr 2-Yr Rainfall=2.20"

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Pond 16P: South Detention System

Hydrograph



Turner Detention

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Type IA 24-hr 5-Yr Rainfall=2.70"

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Summary for Subcatchment 11S: North Basin Predeveloped

Runoff = 0.81 cfs @ 8.27 hrs, Volume= 0.394 af, Depth= 1.03"

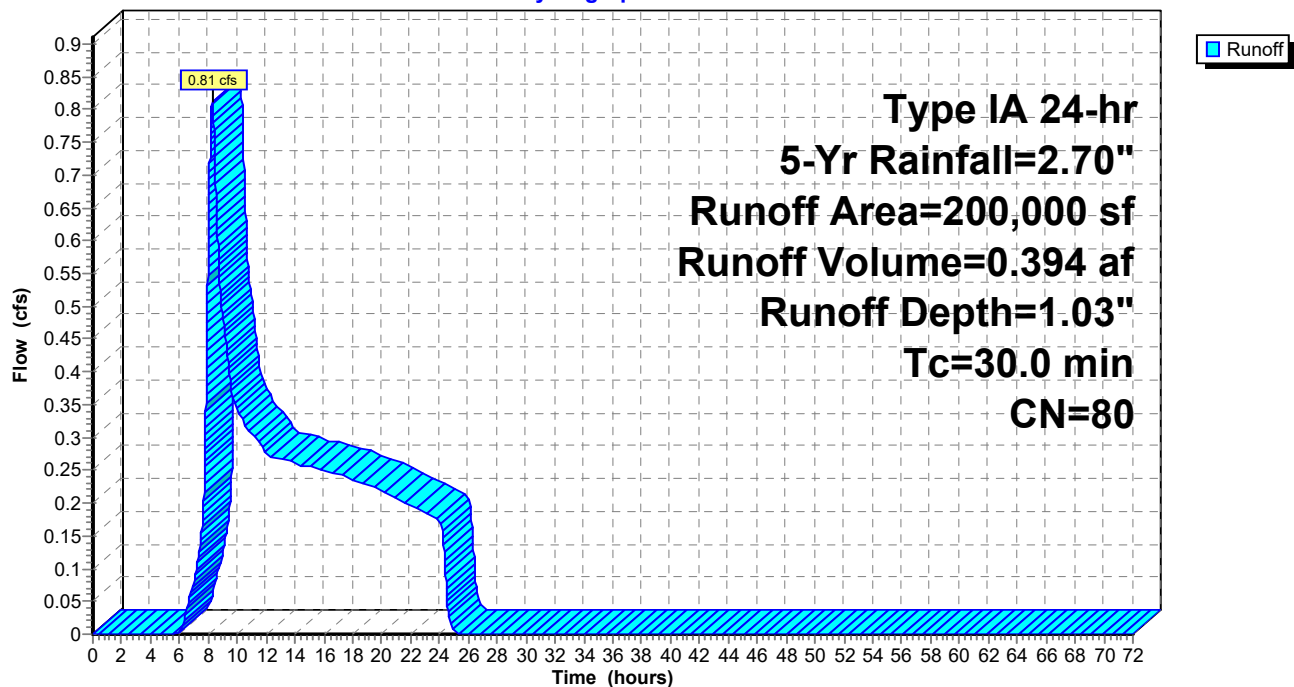
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 5-Yr Rainfall=2.70"

	Area (sf)	CN	Description
*	200,000	80	
	200,000	80	100.00% Pervious Area

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

Subcatchment 11S: North Basin Predeveloped

Hydrograph



Turner Detention

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Type IA 24-hr 5-Yr Rainfall=2.70"

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Summary for Subcatchment 13S: North Basin Developed

Runoff = 2.92 cfs @ 7.86 hrs, Volume= 0.945 af, Depth= 2.47"

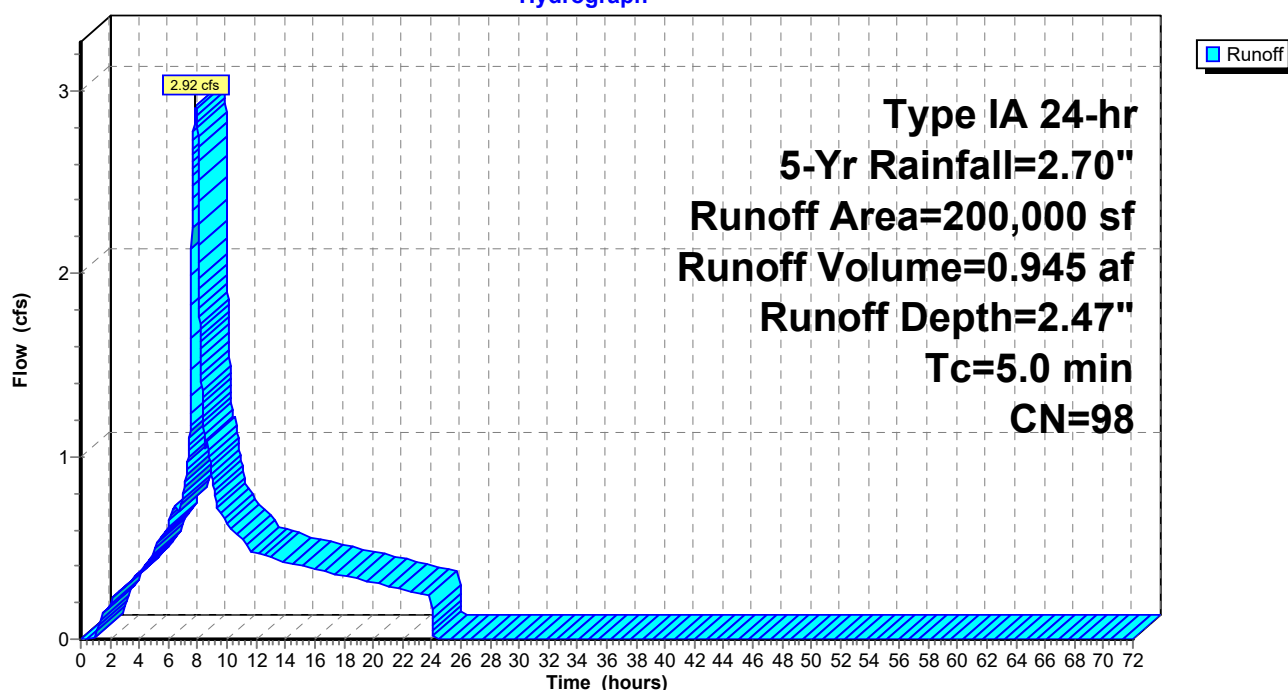
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 5-Yr Rainfall=2.70"

	Area (sf)	CN	Description
*	200,000	98	
	200,000	98	100.00% Impervious Area

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

Subcatchment 13S: North Basin Developed

Hydrograph



Turner Detention

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Type IA 24-hr 5-Yr Rainfall=2.70"

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Summary for Subcatchment 15S: South Basin Developed

Runoff = 2.19 cfs @ 7.86 hrs, Volume= 0.709 af, Depth= 2.47"

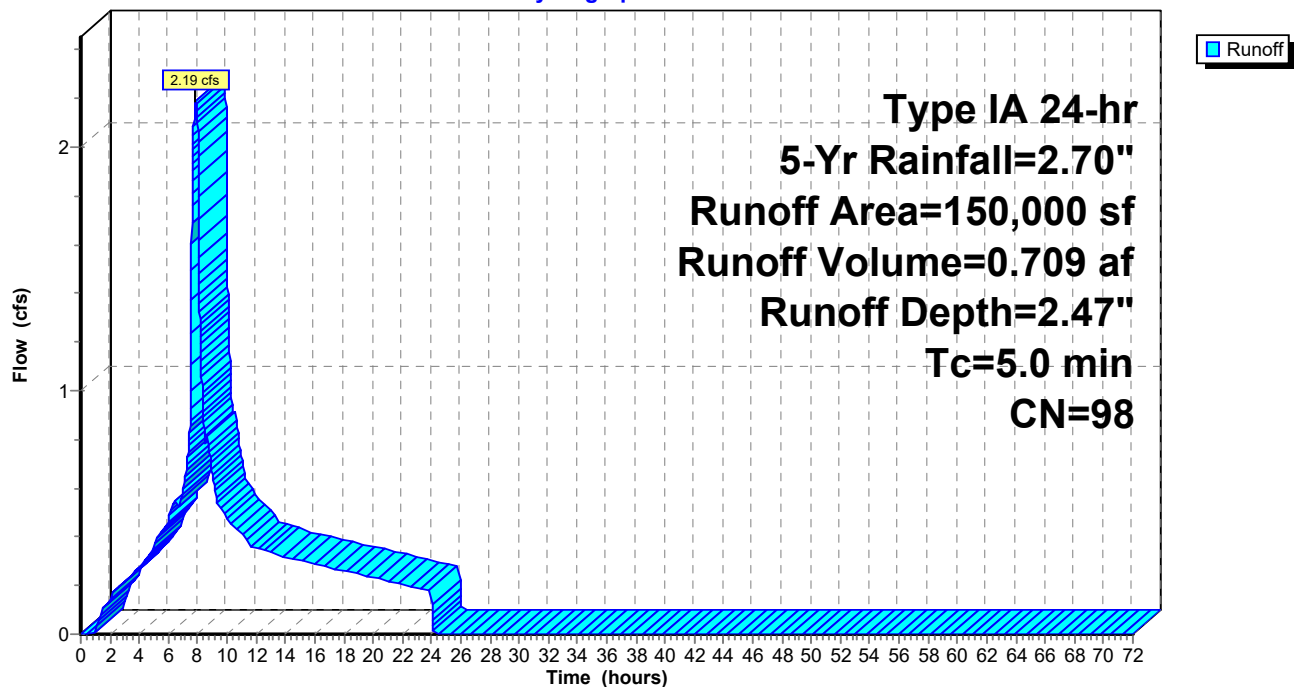
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 5-Yr Rainfall=2.70"

	Area (sf)	CN	Description
*	150,000	98	
	150,000	98	100.00% Impervious Area

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

Subcatchment 15S: South Basin Developed

Hydrograph



Turner Detention

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Type IA 24-hr 5-Yr Rainfall=2.70"

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Summary for Subcatchment 18S: South Basin Predeveloped

Runoff = 0.61 cfs @ 8.27 hrs, Volume= 0.296 af, Depth= 1.03"

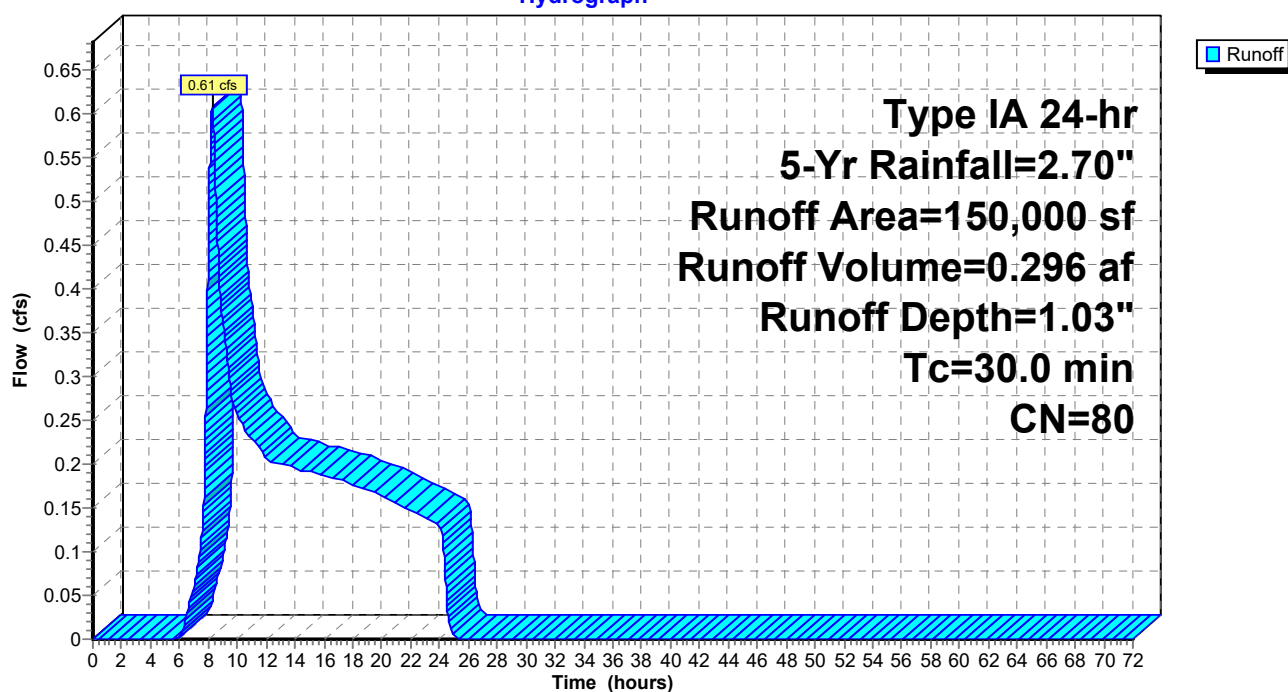
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 5-Yr Rainfall=2.70"

	Area (sf)	CN	Description
*	150,000	80	
	150,000	80	100.00% Pervious Area

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

Subcatchment 18S: South Basin Predeveloped

Hydrograph



Turner Detention

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Type IA 24-hr 5-Yr Rainfall=2.70"

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Summary for Pond 14P: North Detention System

Inflow Area = 4.591 ac, 100.00% Impervious, Inflow Depth = 2.47" for 5-Yr event
 Inflow = 2.92 cfs @ 7.86 hrs, Volume= 0.945 af
 Outflow = 0.46 cfs @ 12.59 hrs, Volume= 0.945 af, Atten= 84%, Lag= 283.9 min
 Primary = 0.46 cfs @ 12.59 hrs, Volume= 0.945 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 225.33' @ 12.59 hrs Surf.Area= 12,489 sf Storage= 19,021 cf

Plug-Flow detention time= 791.7 min calculated for 0.945 af (100% of inflow)
 Center-of-Mass det. time= 791.9 min (1,461.4 - 669.5)

Volume	Invert	Avail.Storage	Storage Description
#1	222.45'	1,894 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	221.85'	2,919 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#3	221.25'	19,667 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#4	224.00'	1,207 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#5	221.20'	3,079 cf	42.0" Round Pipe Storage
			L= 320.0' S= 0.0030 '/'
		28,765 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
222.45	1,159	0.0	0	0
223.45	1,159	40.0	464	464
225.20	1,159	0.0	0	464
226.20	1,701	100.0	1,430	1,894

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
221.85	1,205	0.0	0	0
222.85	1,205	40.0	482	482
224.60	1,205	0.0	0	482
225.10	1,476	100.0	670	1,152
225.60	1,758	100.0	809	1,961
226.10	2,074	100.0	958	2,919

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
221.25	7,228	0.0	0	0
222.25	7,228	40.0	2,891	2,891
224.00	7,228	0.0	0	2,891
225.00	8,371	100.0	7,800	10,691
226.00	9,582	100.0	8,977	19,667

Turner Detention

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Type IA 24-hr 5-Yr Rainfall=2.70"

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Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
224.00	726	0.0	0	0
225.00	726	40.0	290	290
226.75	726	0.0	0	290
227.75	1,107	100.0	917	1,207

Device	Routing	Invert	Outlet Devices
#1	Primary	221.20'	2.1" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	225.25'	11.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

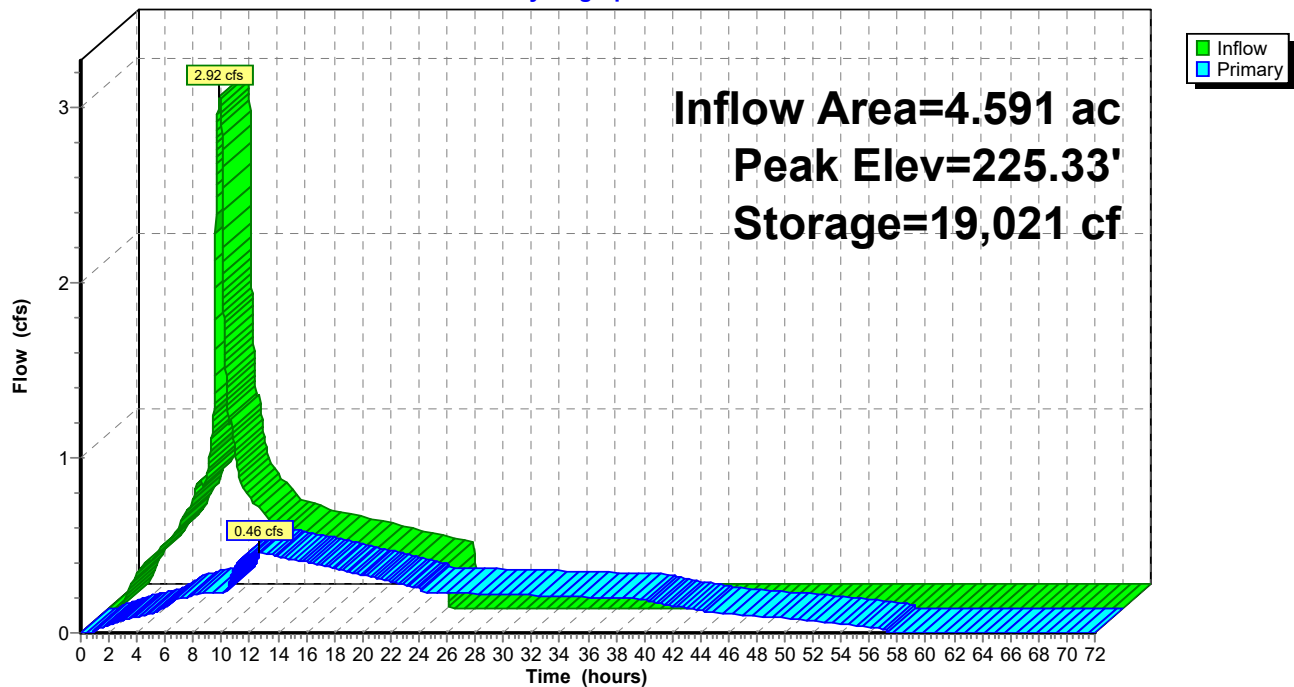
Primary OutFlow Max=0.46 cfs @ 12.59 hrs HW=225.33' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.24 cfs @ 9.79 fps)

2=Orifice/Grate (Weir Controls 0.22 cfs @ 0.94 fps)

Pond 14P: North Detention System

Hydrograph



Turner Detention

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Type IA 24-hr 5-Yr Rainfall=2.70"

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Summary for Pond 16P: South Detention System

Inflow Area = 3.444 ac, 100.00% Impervious, Inflow Depth = 2.47" for 5-Yr event
 Inflow = 2.19 cfs @ 7.86 hrs, Volume= 0.709 af
 Outflow = 0.31 cfs @ 14.65 hrs, Volume= 0.709 af, Atten= 86%, Lag= 407.7 min
 Primary = 0.31 cfs @ 14.65 hrs, Volume= 0.709 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 229.67' @ 14.65 hrs Surf.Area= 0.258 ac Storage= 0.357 af

Plug-Flow detention time= 961.7 min calculated for 0.709 af (100% of inflow)
 Center-of-Mass det. time= 961.7 min (1,631.2 - 669.5)

Volume	Invert	Avail.Storage	Storage Description
#1	226.25'	0.037 af	6.00'W x 700.00'L x 1.00'H Prismaoid 0.096 af Overall - 0.003 af Embedded = 0.093 af x 40.0% Voids
#2	229.00'	0.145 af	6.00'W x 700.00'L x 1.00'H Prismaoid Z=3.0
#3	222.50'	0.231 af	48.0" Round Pipe Storage L= 800.0' S= 0.0030 '/'
#4	226.25'	0.003 af	6.0" Round Pipe Storage Inside #1 L= 700.0'
		0.417 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	222.50'	1.5" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	229.50'	8.0" W x 3.0" H Vert. Orifice/Grate C= 0.600
#3	Primary	229.75'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.31 cfs @ 14.65 hrs HW=229.67' (Free Discharge)
 1=Orifice/Grate (Orifice Controls 0.16 cfs @ 12.89 fps)
 2=Orifice/Grate (Orifice Controls 0.15 cfs @ 1.31 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Turner Detention

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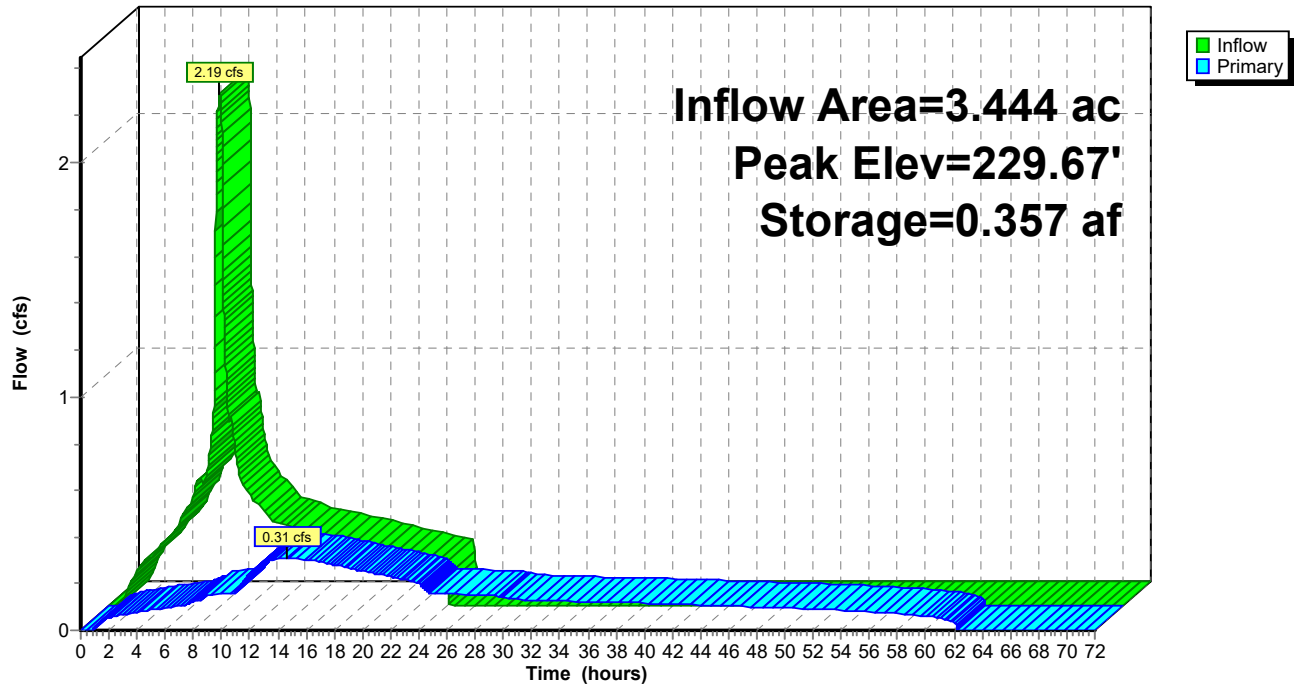
Type IA 24-hr 5-Yr Rainfall=2.70"

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Pond 16P: South Detention System

Hydrograph



Turner Detention

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Type IA 24-hr 10-Yr Rainfall=3.20"

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Summary for Subcatchment 11S: North Basin Predeveloped

Runoff = 1.20 cfs @ 8.24 hrs, Volume= 0.536 af, Depth= 1.40"

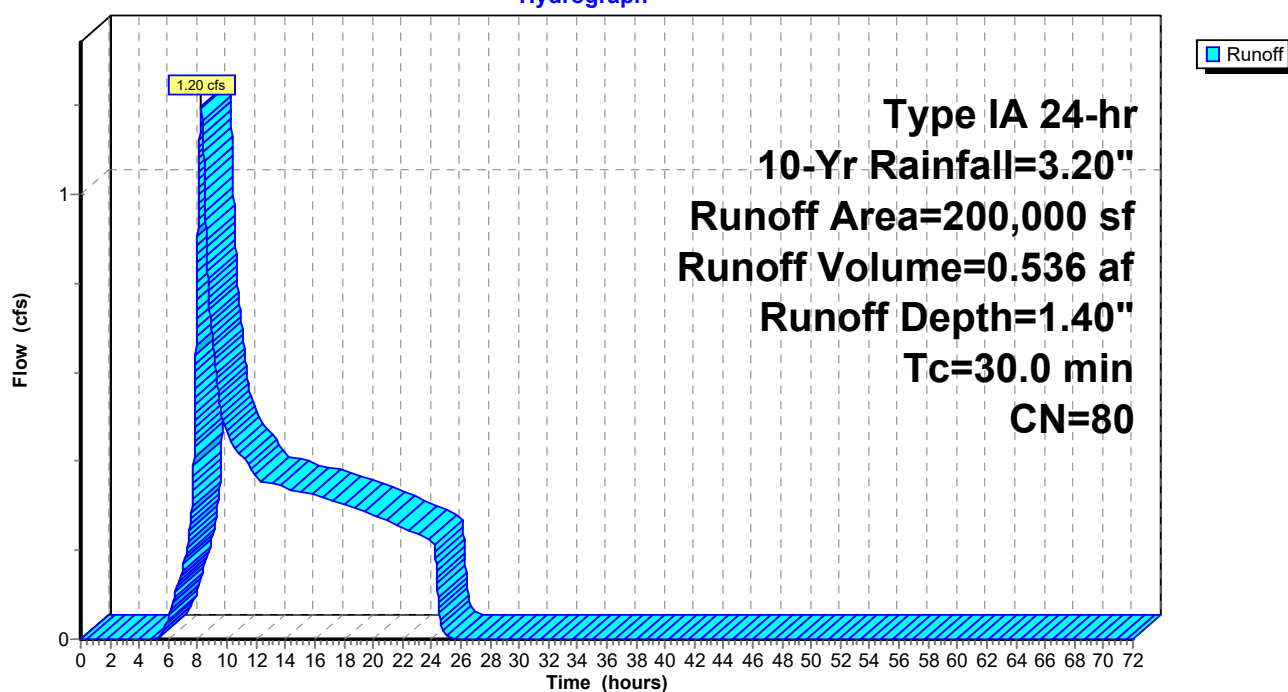
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=3.20"

	Area (sf)	CN	Description
*	200,000	80	
	200,000	80	100.00% Pervious Area

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

Subcatchment 11S: North Basin Predeveloped

Hydrograph



Turner Detention

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Type IA 24-hr 10-Yr Rainfall=3.20"

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Summary for Subcatchment 13S: North Basin Developed

Runoff = 3.49 cfs @ 7.86 hrs, Volume= 1.135 af, Depth= 2.97"

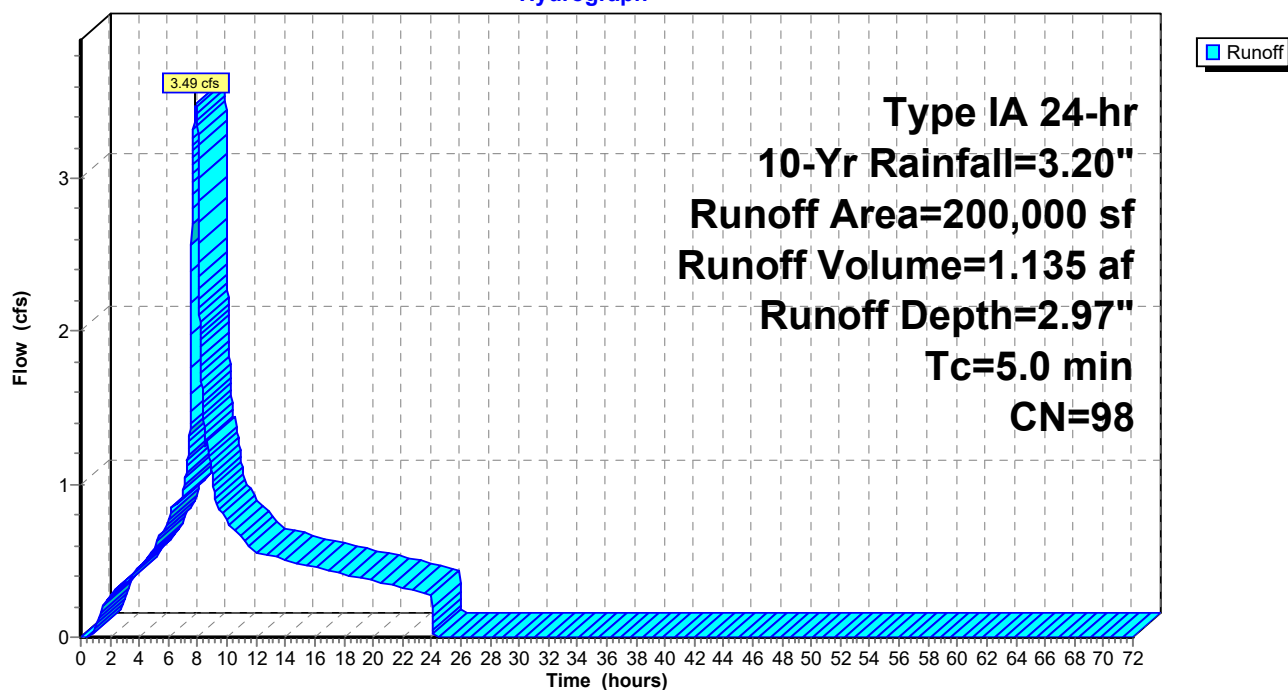
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=3.20"

	Area (sf)	CN	Description
*	200,000	98	
	200,000	98	100.00% Impervious Area

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

Subcatchment 13S: North Basin Developed

Hydrograph



Turner Detention

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Type IA 24-hr 10-Yr Rainfall=3.20"

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Summary for Subcatchment 15S: South Basin Developed

Runoff = 2.61 cfs @ 7.86 hrs, Volume= 0.852 af, Depth= 2.97"

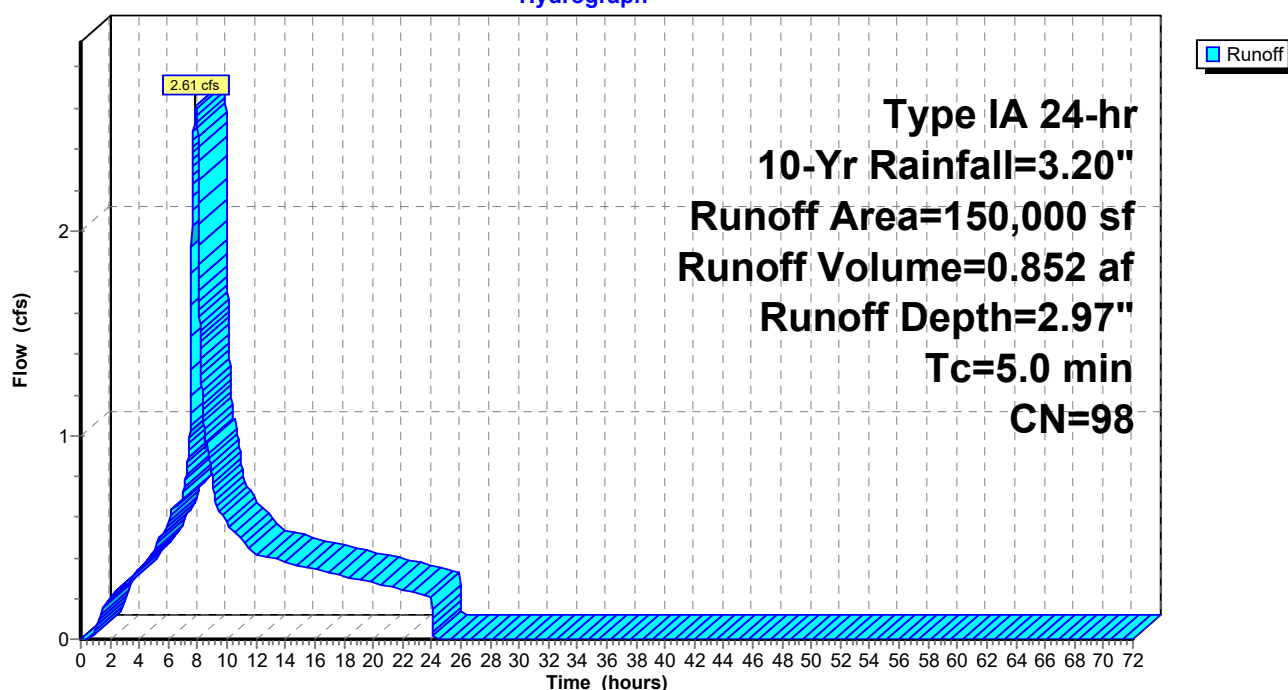
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=3.20"

	Area (sf)	CN	Description
*	150,000	98	
	150,000	98	100.00% Impervious Area

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

Subcatchment 15S: South Basin Developed

Hydrograph



Turner Detention

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Type IA 24-hr 10-Yr Rainfall=3.20"

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Summary for Subcatchment 18S: South Basin Predeveloped

Runoff = 0.90 cfs @ 8.24 hrs, Volume= 0.402 af, Depth= 1.40"

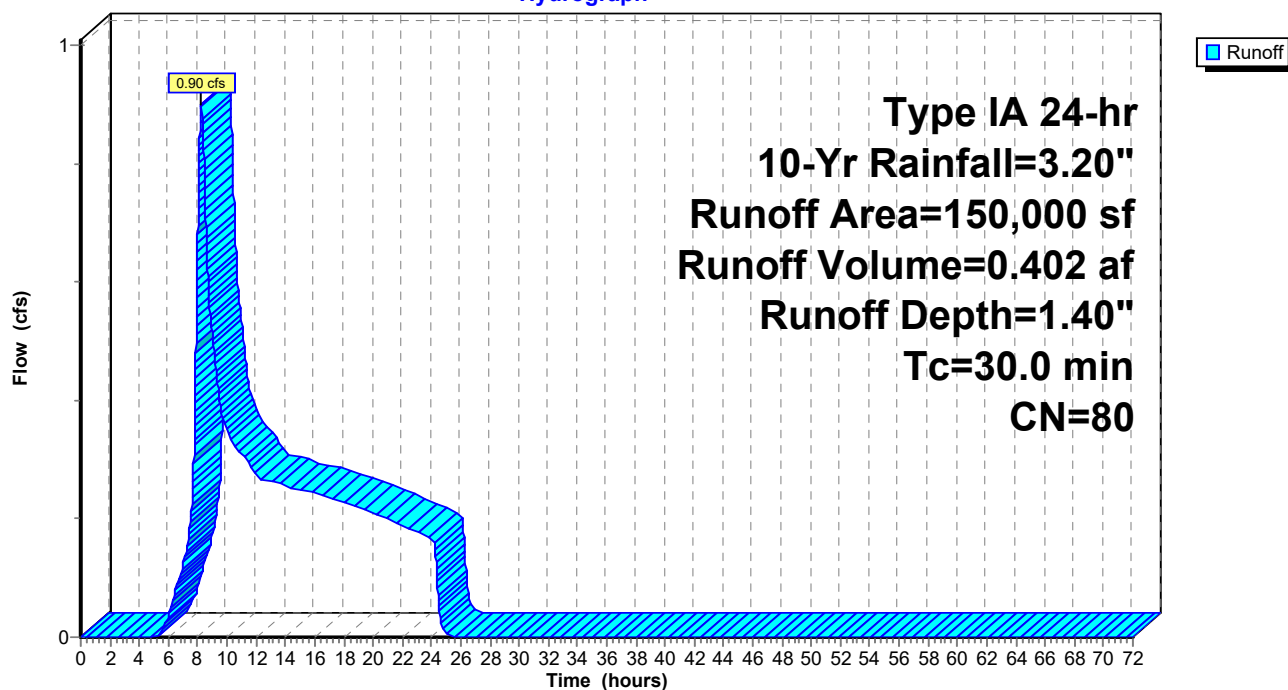
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=3.20"

	Area (sf)	CN	Description
*	150,000	80	
	150,000	80	100.00% Pervious Area

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

Subcatchment 18S: South Basin Predeveloped

Hydrograph



Turner Detention

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Type IA 24-hr 10-Yr Rainfall=3.20"

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Summary for Pond 14P: North Detention System

Inflow Area = 4.591 ac, 100.00% Impervious, Inflow Depth = 2.97" for 10-Yr event
 Inflow = 3.49 cfs @ 7.86 hrs, Volume= 1.135 af
 Outflow = 0.78 cfs @ 9.88 hrs, Volume= 1.135 af, Atten= 78%, Lag= 121.2 min
 Primary = 0.78 cfs @ 9.88 hrs, Volume= 1.135 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 225.40' @ 9.88 hrs Surf.Area= 12,600 sf Storage= 19,809 cf

Plug-Flow detention time= 684.7 min calculated for 1.135 af (100% of inflow)
 Center-of-Mass det. time= 684.8 min (1,349.4 - 664.6)

Volume	Invert	Avail.Storage	Storage Description
#1	222.45'	1,894 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	221.85'	2,919 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#3	221.25'	19,667 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#4	224.00'	1,207 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#5	221.20'	3,079 cf	42.0" Round Pipe Storage
			L= 320.0' S= 0.0030 '/'
		28,765 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
222.45	1,159	0.0	0	0
223.45	1,159	40.0	464	464
225.20	1,159	0.0	0	464
226.20	1,701	100.0	1,430	1,894

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
221.85	1,205	0.0	0	0
222.85	1,205	40.0	482	482
224.60	1,205	0.0	0	482
225.10	1,476	100.0	670	1,152
225.60	1,758	100.0	809	1,961
226.10	2,074	100.0	958	2,919

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
221.25	7,228	0.0	0	0
222.25	7,228	40.0	2,891	2,891
224.00	7,228	0.0	0	2,891
225.00	8,371	100.0	7,800	10,691
226.00	9,582	100.0	8,977	19,667

Turner Detention

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Type IA 24-hr 10-Yr Rainfall=3.20"

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Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
224.00	726	0.0	0	0
225.00	726	40.0	290	290
226.75	726	0.0	0	290
227.75	1,107	100.0	917	1,207

Device	Routing	Invert	Outlet Devices
#1	Primary	221.20'	2.1" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	225.25'	11.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

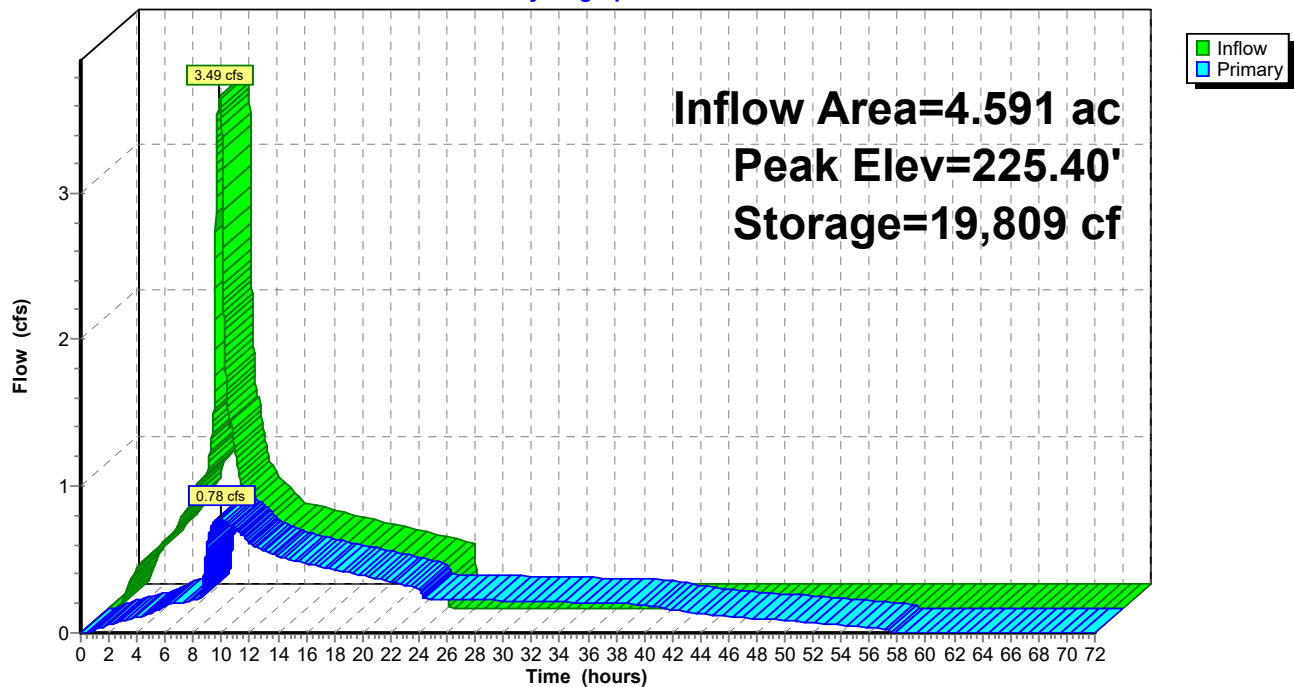
Primary OutFlow Max=0.78 cfs @ 9.88 hrs HW=225.40' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.24 cfs @ 9.87 fps)

2=Orifice/Grate (Weir Controls 0.54 cfs @ 1.26 fps)

Pond 14P: North Detention System

Hydrograph



Turner Detention

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Type IA 24-hr 10-Yr Rainfall=3.20"

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Summary for Pond 16P: South Detention System

Inflow Area = 3.444 ac, 100.00% Impervious, Inflow Depth = 2.97" for 10-Yr event
 Inflow = 2.61 cfs @ 7.86 hrs, Volume= 0.852 af
 Outflow = 0.49 cfs @ 10.97 hrs, Volume= 0.852 af, Atten= 81%, Lag= 187.1 min
 Primary = 0.49 cfs @ 10.97 hrs, Volume= 0.852 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 229.77' @ 10.97 hrs Surf.Area= 0.268 ac Storage= 0.375 af

Plug-Flow detention time= 837.8 min calculated for 0.851 af (100% of inflow)
 Center-of-Mass det. time= 838.0 min (1,502.6 - 664.6)

Volume	Invert	Avail.Storage	Storage Description
#1	226.25'	0.037 af	6.00'W x 700.00'L x 1.00'H Prismaoid 0.096 af Overall - 0.003 af Embedded = 0.093 af x 40.0% Voids
#2	229.00'	0.145 af	6.00'W x 700.00'L x 1.00'H Prismaoid Z=3.0
#3	222.50'	0.231 af	48.0" Round Pipe Storage L= 800.0' S= 0.0030 '/'
#4	226.25'	0.003 af	6.0" Round Pipe Storage Inside #1 L= 700.0'
		0.417 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	222.50'	1.5" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	229.50'	8.0" W x 3.0" H Vert. Orifice/Grate C= 0.600
#3	Primary	229.75'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.49 cfs @ 10.97 hrs HW=229.77' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.16 cfs @ 12.99 fps)
- 2=Orifice/Grate (Orifice Controls 0.30 cfs @ 1.78 fps)
- 3=Orifice/Grate (Weir Controls 0.04 cfs @ 0.49 fps)

Turner Detention

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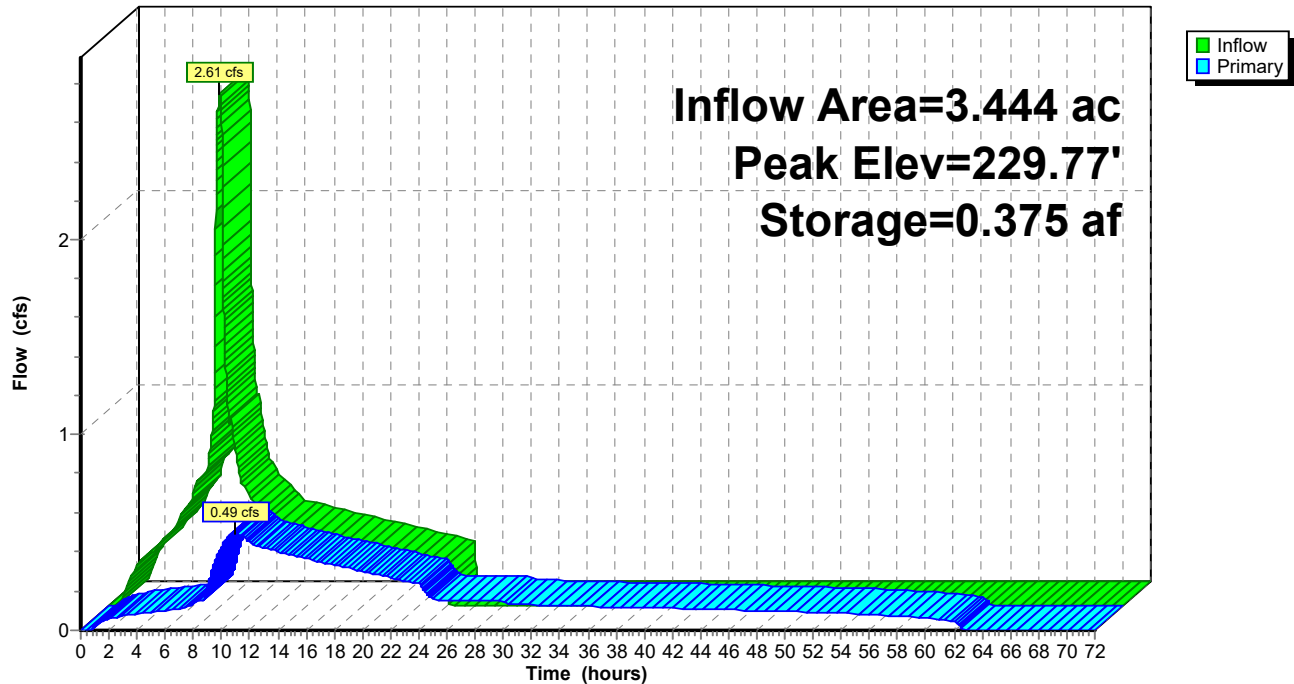
Type IA 24-hr 10-Yr Rainfall=3.20"

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Pond 16P: South Detention System

Hydrograph



Turner Detention

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Type IA 24-hr 25-Yr Rainfall=3.60"

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Summary for Subcatchment 11S: North Basin Predeveloped

Runoff = 1.53 cfs @ 8.24 hrs, Volume= 0.657 af, Depth= 1.72"

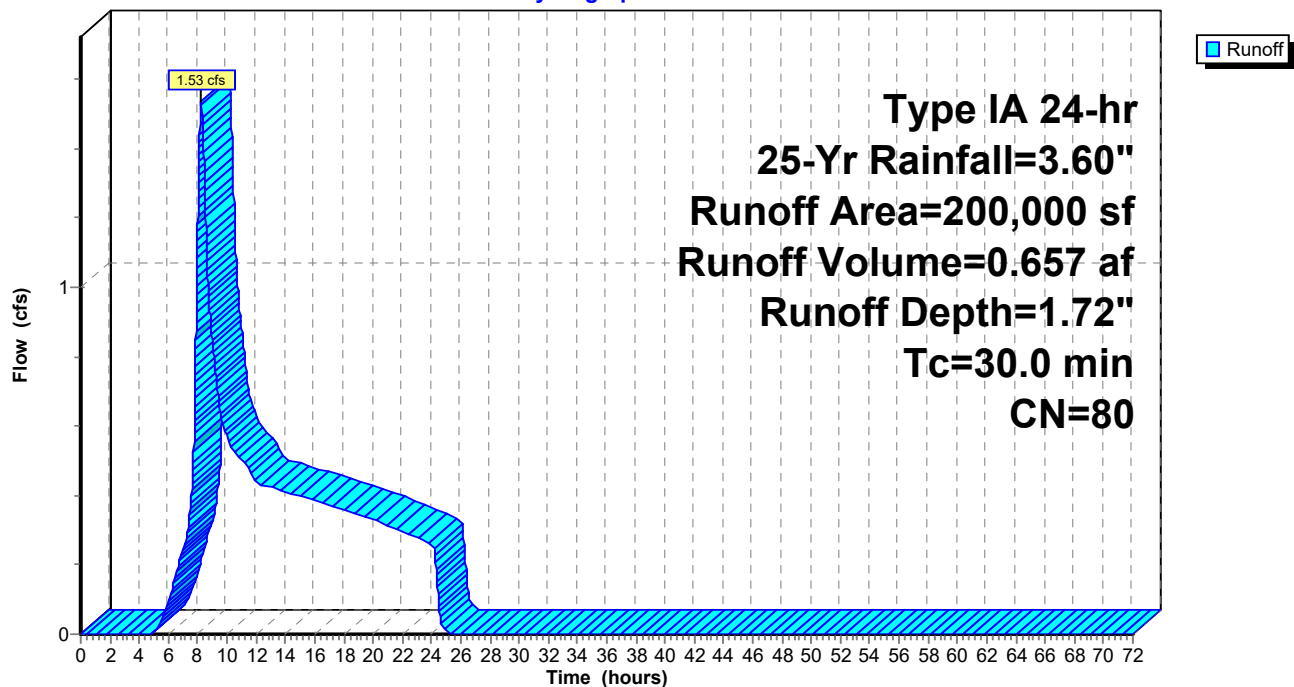
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=3.60"

	Area (sf)	CN	Description
*	200,000	80	
	200,000	80	100.00% Pervious Area

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

Subcatchment 11S: North Basin Predeveloped

Hydrograph



Turner Detention

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Type IA 24-hr 25-Yr Rainfall=3.60"

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Summary for Subcatchment 13S: North Basin Developed

Runoff = 3.94 cfs @ 7.86 hrs, Volume= 1.288 af, Depth= 3.37"

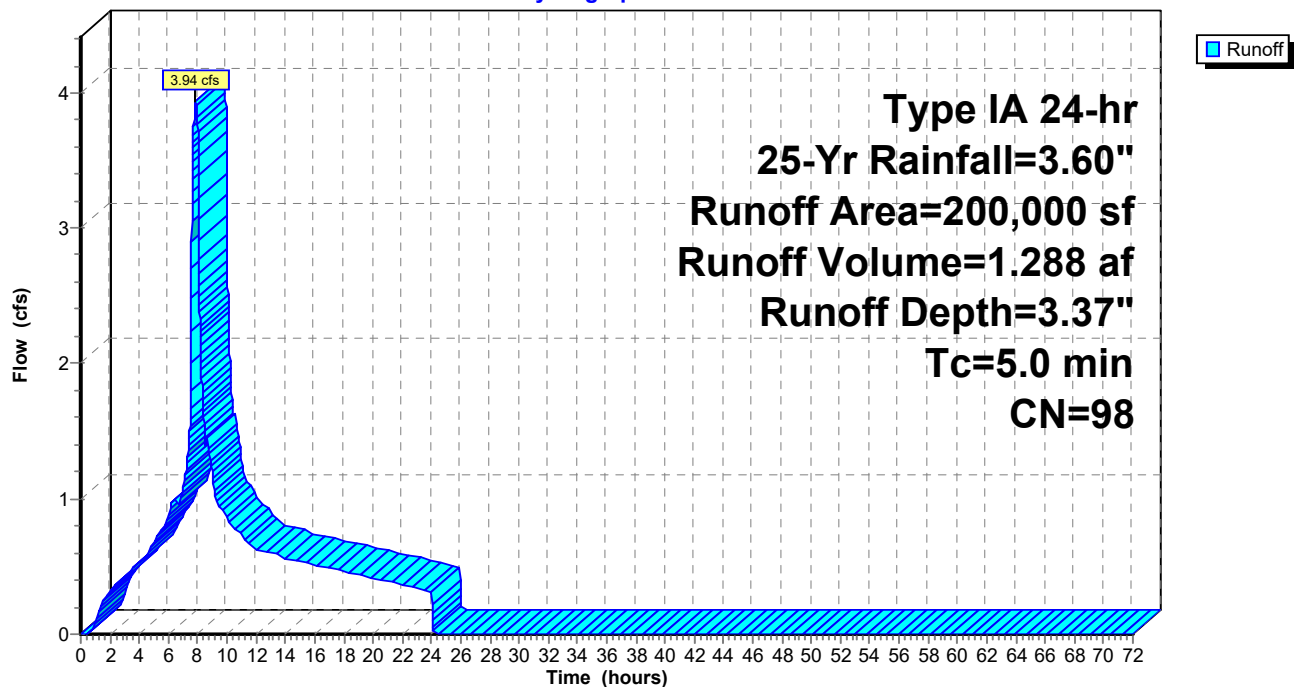
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=3.60"

	Area (sf)	CN	Description
*	200,000	98	
	200,000	98	100.00% Impervious Area

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

Subcatchment 13S: North Basin Developed

Hydrograph



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Type IA 24-hr 25-Yr Rainfall=3.60"

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Summary for Subcatchment 15S: South Basin Developed

Runoff = 2.95 cfs @ 7.86 hrs, Volume= 0.966 af, Depth= 3.37"

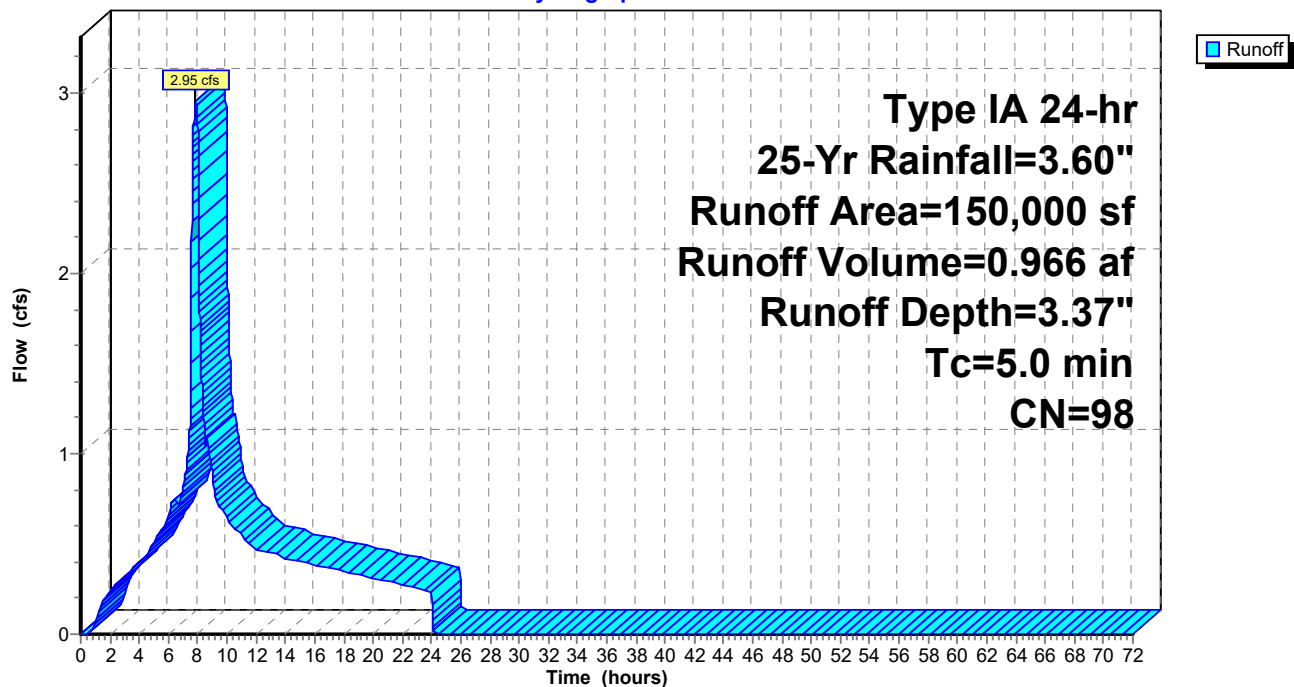
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=3.60"

	Area (sf)	CN	Description
*	150,000	98	
	150,000	98	100.00% Impervious Area

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

Subcatchment 15S: South Basin Developed

Hydrograph



Turner Detention

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Type IA 24-hr 25-Yr Rainfall=3.60"

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Summary for Subcatchment 18S: South Basin Predeveloped

Runoff = 1.15 cfs @ 8.24 hrs, Volume= 0.492 af, Depth= 1.72"

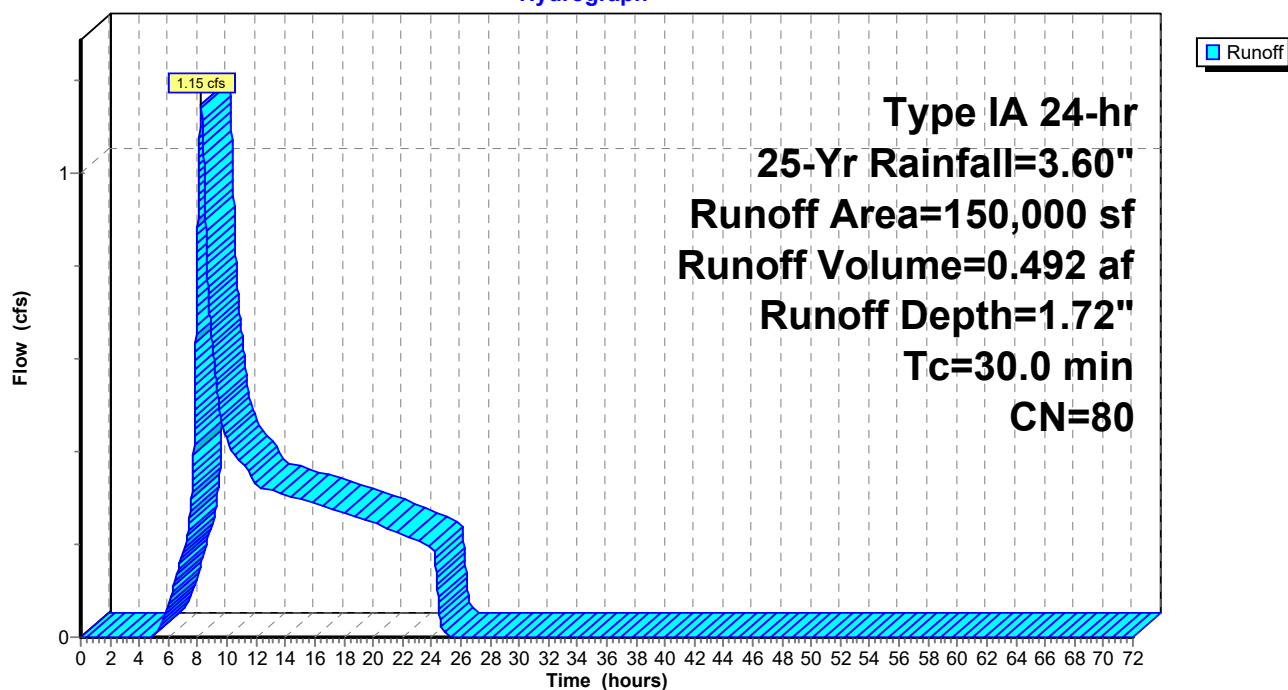
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=3.60"

	Area (sf)	CN	Description
*	150,000	80	
	150,000	80	100.00% Pervious Area

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

Subcatchment 18S: South Basin Predeveloped

Hydrograph



Turner Detention

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Type IA 24-hr 25-Yr Rainfall=3.60"

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Summary for Pond 14P: North Detention System

Inflow Area = 4.591 ac, 100.00% Impervious, Inflow Depth = 3.37" for 25-Yr event
 Inflow = 3.94 cfs @ 7.86 hrs, Volume= 1.288 af
 Outflow = 1.19 cfs @ 8.99 hrs, Volume= 1.288 af, Atten= 70%, Lag= 68.2 min
 Primary = 1.19 cfs @ 8.99 hrs, Volume= 1.288 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 225.47' @ 8.99 hrs Surf.Area= 12,716 sf Storage= 20,604 cf

Plug-Flow detention time= 617.5 min calculated for 1.288 af (100% of inflow)
 Center-of-Mass det. time= 617.7 min (1,279.2 - 661.5)

Volume	Invert	Avail.Storage	Storage Description
#1	222.45'	1,894 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	221.85'	2,919 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#3	221.25'	19,667 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#4	224.00'	1,207 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#5	221.20'	3,079 cf	42.0" Round Pipe Storage
			L= 320.0' S= 0.0030 '/'
		28,765 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
222.45	1,159	0.0	0	0
223.45	1,159	40.0	464	464
225.20	1,159	0.0	0	464
226.20	1,701	100.0	1,430	1,894

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
221.85	1,205	0.0	0	0
222.85	1,205	40.0	482	482
224.60	1,205	0.0	0	482
225.10	1,476	100.0	670	1,152
225.60	1,758	100.0	809	1,961
226.10	2,074	100.0	958	2,919

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
221.25	7,228	0.0	0	0
222.25	7,228	40.0	2,891	2,891
224.00	7,228	0.0	0	2,891
225.00	8,371	100.0	7,800	10,691
226.00	9,582	100.0	8,977	19,667

Turner Detention

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Type IA 24-hr 25-Yr Rainfall=3.60"

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Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
224.00	726	0.0	0	0
225.00	726	40.0	290	290
226.75	726	0.0	0	290
227.75	1,107	100.0	917	1,207

Device	Routing	Invert	Outlet Devices
#1	Primary	221.20'	2.1" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	225.25'	11.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

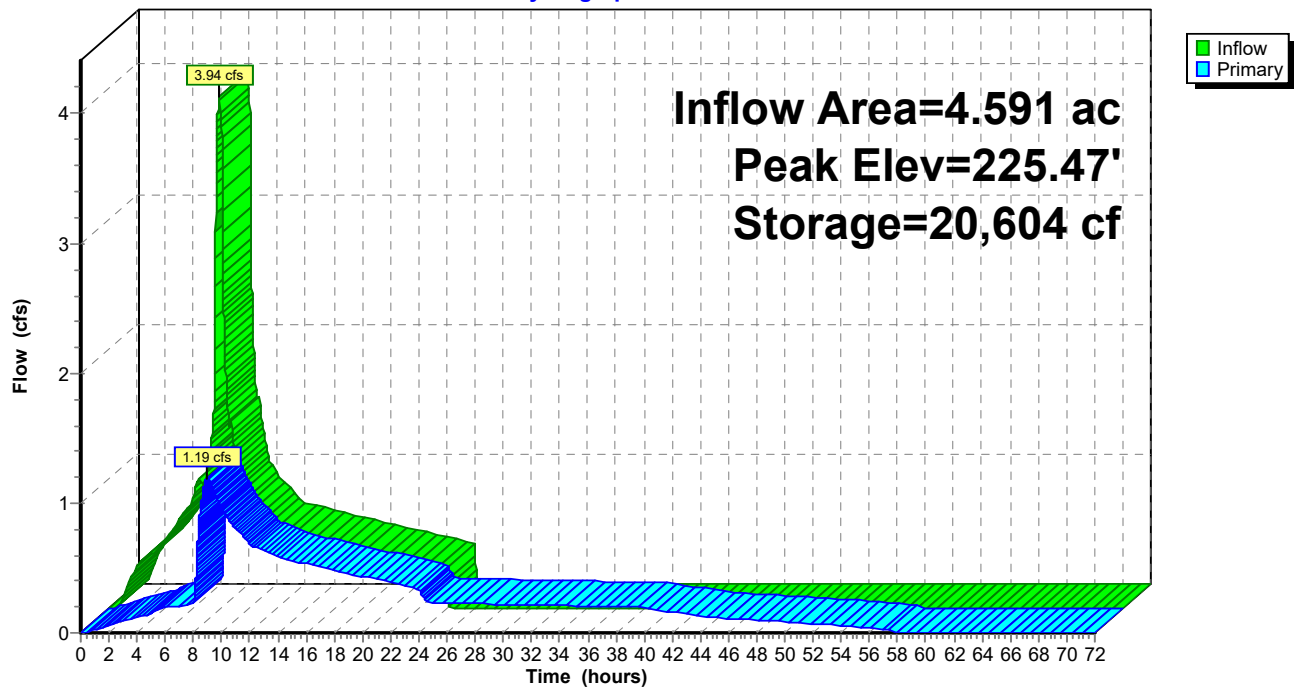
Primary OutFlow Max=1.18 cfs @ 8.99 hrs HW=225.47' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.24 cfs @ 9.94 fps)

2=Orifice/Grate (Weir Controls 0.94 cfs @ 1.52 fps)

Pond 14P: North Detention System

Hydrograph



Turner Detention

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Type IA 24-hr 25-Yr Rainfall=3.60"

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Summary for Pond 16P: South Detention System

Inflow Area = 3.444 ac, 100.00% Impervious, Inflow Depth = 3.37" for 25-Yr event
 Inflow = 2.95 cfs @ 7.86 hrs, Volume= 0.966 af
 Outflow = 0.76 cfs @ 9.27 hrs, Volume= 0.966 af, Atten= 74%, Lag= 84.9 min
 Primary = 0.76 cfs @ 9.27 hrs, Volume= 0.966 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 229.83' @ 9.27 hrs Surf.Area= 0.274 ac Storage= 0.385 af

Plug-Flow detention time= 756.6 min calculated for 0.966 af (100% of inflow)
 Center-of-Mass det. time= 756.8 min (1,418.3 - 661.5)

Volume	Invert	Avail.Storage	Storage Description
#1	226.25'	0.037 af	6.00'W x 700.00'L x 1.00'H Prismaoid 0.096 af Overall - 0.003 af Embedded = 0.093 af x 40.0% Voids
#2	229.00'	0.145 af	6.00'W x 700.00'L x 1.00'H Prismaoid Z=3.0
#3	222.50'	0.231 af	48.0" Round Pipe Storage L= 800.0' S= 0.0030 '/'
#4	226.25'	0.003 af	6.0" Round Pipe Storage Inside #1 L= 700.0'
		0.417 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	222.50'	1.5" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	229.50'	8.0" W x 3.0" H Vert. Orifice/Grate C= 0.600
#3	Primary	229.75'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.74 cfs @ 9.27 hrs HW=229.83' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.16 cfs @ 13.03 fps)
 2=Orifice/Grate (Orifice Controls 0.36 cfs @ 2.13 fps)
 3=Orifice/Grate (Weir Controls 0.22 cfs @ 0.91 fps)

Turner Detention

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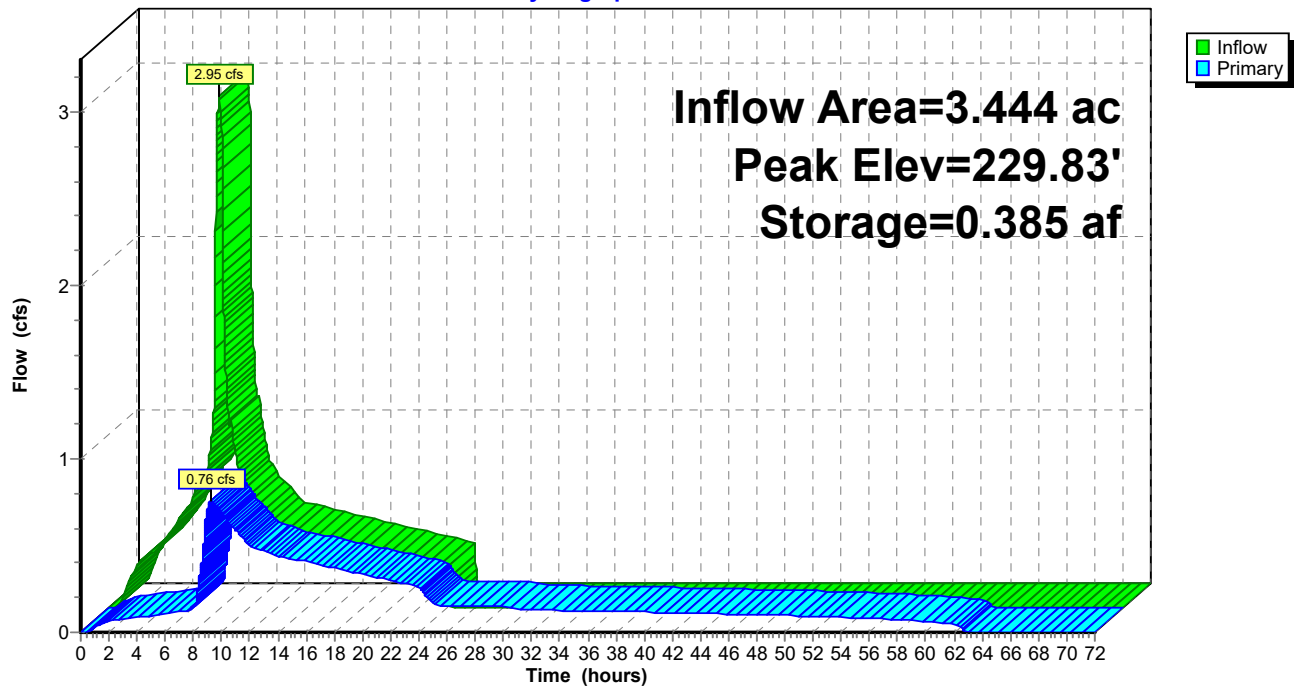
Type IA 24-hr 25-Yr Rainfall=3.60"

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Pond 16P: South Detention System

Hydrograph



Turner Detention

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Type IA 24-hr 50-Yr Rainfall=4.10"

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Summary for Subcatchment 11S: North Basin Predeveloped

Runoff = 1.97 cfs @ 8.23 hrs, Volume= 0.813 af, Depth= 2.12"

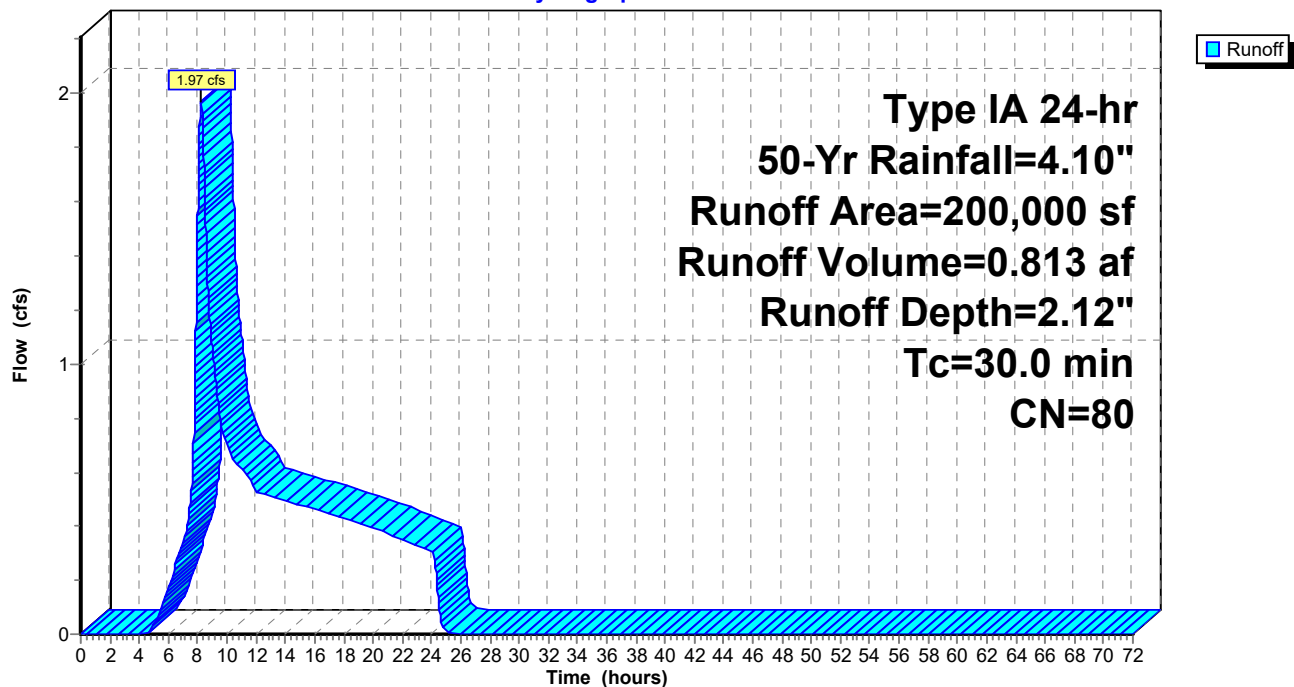
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=4.10"

	Area (sf)	CN	Description
*	200,000	80	
	200,000	80	100.00% Pervious Area

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

Subcatchment 11S: North Basin Predeveloped

Hydrograph



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Type IA 24-hr 50-Yr Rainfall=4.10"

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Summary for Subcatchment 13S: North Basin Developed

Runoff = 4.50 cfs @ 7.85 hrs, Volume= 1.479 af, Depth= 3.86"

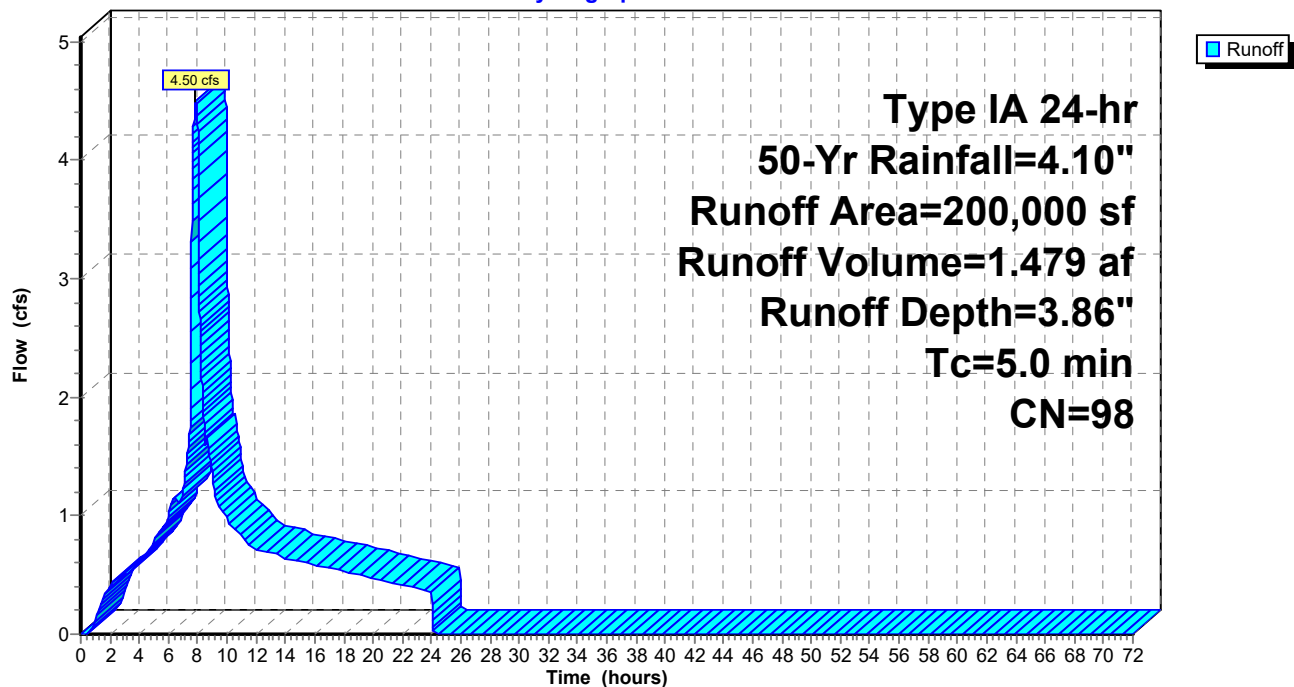
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=4.10"

	Area (sf)	CN	Description
*	200,000	98	
	200,000	98	100.00% Impervious Area

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

Subcatchment 13S: North Basin Developed

Hydrograph



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Type IA 24-hr 50-Yr Rainfall=4.10"

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Summary for Subcatchment 15S: South Basin Developed

Runoff = 3.38 cfs @ 7.85 hrs, Volume= 1.109 af, Depth= 3.86"

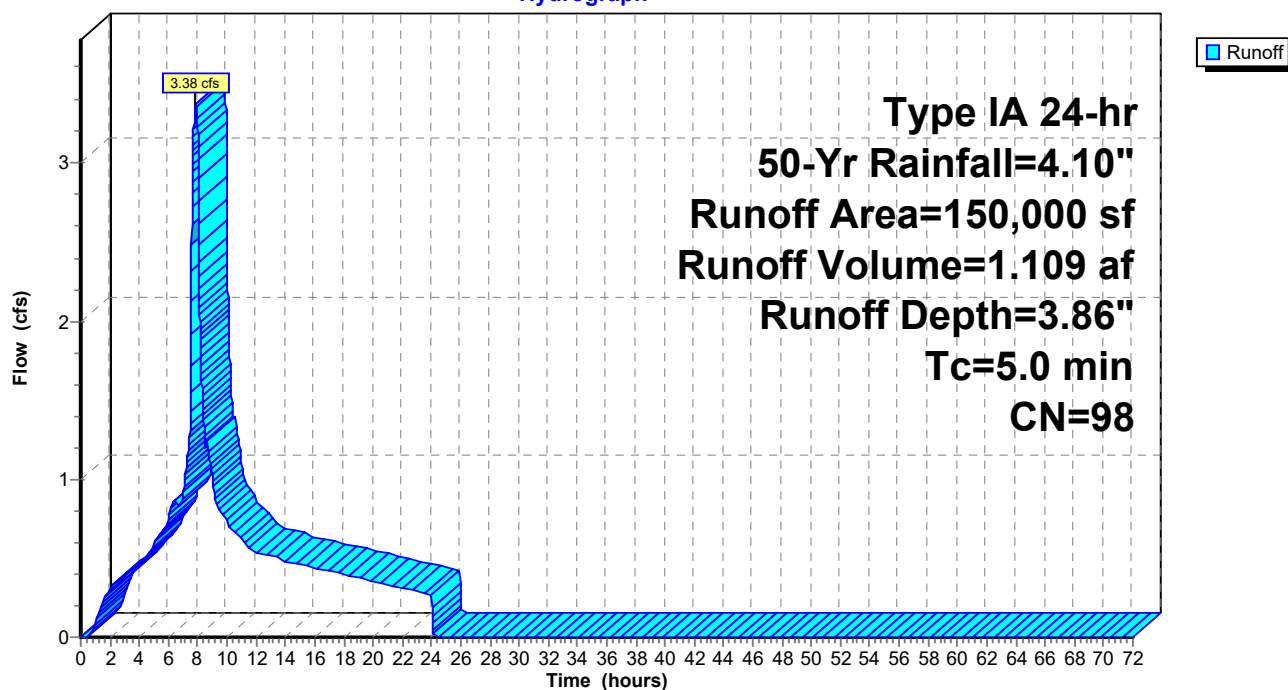
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=4.10"

	Area (sf)	CN	Description
*	150,000	98	
	150,000	98	100.00% Impervious Area

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

Subcatchment 15S: South Basin Developed

Hydrograph



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Type IA 24-hr 50-Yr Rainfall=4.10"

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Summary for Subcatchment 18S: South Basin Predeveloped

Runoff = 1.48 cfs @ 8.23 hrs, Volume= 0.610 af, Depth= 2.12"

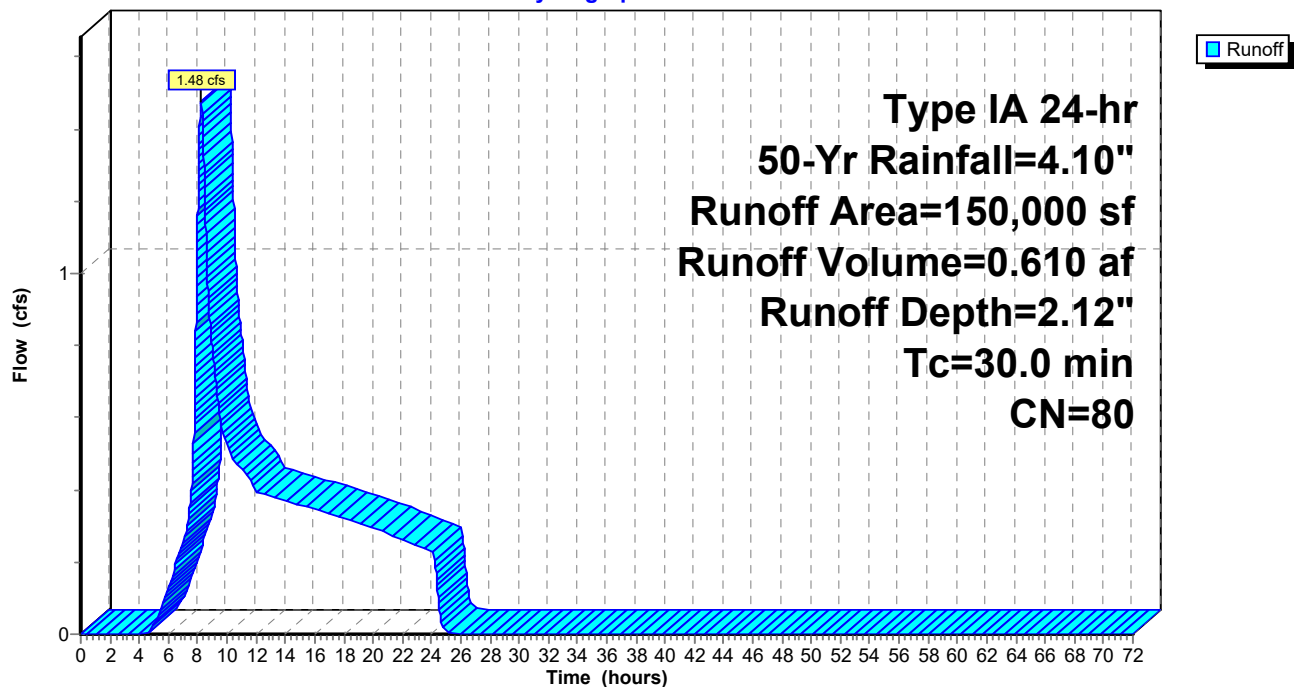
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=4.10"

	Area (sf)	CN	Description
*	150,000	80	
	150,000	80	100.00% Pervious Area

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

Subcatchment 18S: South Basin Predeveloped

Hydrograph



Turner Detention

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Type IA 24-hr 50-Yr Rainfall=4.10"

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Summary for Pond 14P: North Detention System

Inflow Area = 4.591 ac, 100.00% Impervious, Inflow Depth = 3.86" for 50-Yr event
 Inflow = 4.50 cfs @ 7.85 hrs, Volume= 1.479 af
 Outflow = 1.85 cfs @ 8.38 hrs, Volume= 1.479 af, Atten= 59%, Lag= 31.8 min
 Primary = 1.85 cfs @ 8.38 hrs, Volume= 1.479 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 225.56' @ 8.38 hrs Surf.Area= 12,886 sf Storage= 21,713 cf

Plug-Flow detention time= 551.2 min calculated for 1.479 af (100% of inflow)
 Center-of-Mass det. time= 551.4 min (1,209.7 - 658.3)

Volume	Invert	Avail.Storage	Storage Description
#1	222.45'	1,894 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	221.85'	2,919 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#3	221.25'	19,667 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#4	224.00'	1,207 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#5	221.20'	3,079 cf	42.0" Round Pipe Storage
			L= 320.0' S= 0.0030 '/'
		28,765 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
222.45	1,159	0.0	0	0
223.45	1,159	40.0	464	464
225.20	1,159	0.0	0	464
226.20	1,701	100.0	1,430	1,894

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
221.85	1,205	0.0	0	0
222.85	1,205	40.0	482	482
224.60	1,205	0.0	0	482
225.10	1,476	100.0	670	1,152
225.60	1,758	100.0	809	1,961
226.10	2,074	100.0	958	2,919

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
221.25	7,228	0.0	0	0
222.25	7,228	40.0	2,891	2,891
224.00	7,228	0.0	0	2,891
225.00	8,371	100.0	7,800	10,691
226.00	9,582	100.0	8,977	19,667

Turner Detention

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Type IA 24-hr 50-Yr Rainfall=4.10"

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Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
224.00	726	0.0	0	0
225.00	726	40.0	290	290
226.75	726	0.0	0	290
227.75	1,107	100.0	917	1,207

Device	Routing	Invert	Outlet Devices
#1	Primary	221.20'	2.1" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	225.25'	11.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

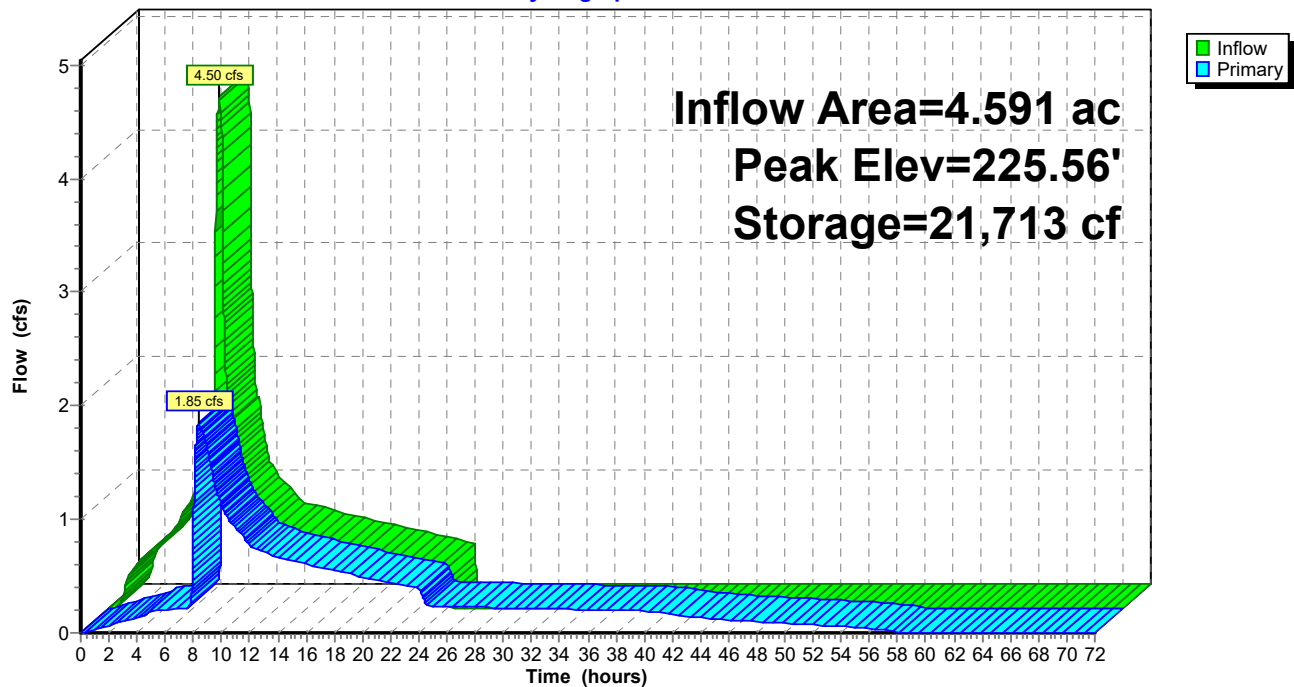
Primary OutFlow Max=1.85 cfs @ 8.38 hrs HW=225.56' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.24 cfs @ 10.05 fps)

2=Orifice/Grate (Weir Controls 1.61 cfs @ 1.81 fps)

Pond 14P: North Detention System

Hydrograph



Turner Detention

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Type IA 24-hr 50-Yr Rainfall=4.10"

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Summary for Pond 16P: South Detention System

Inflow Area = 3.444 ac, 100.00% Impervious, Inflow Depth = 3.86" for 50-Yr event
 Inflow = 3.38 cfs @ 7.85 hrs, Volume= 1.109 af
 Outflow = 1.22 cfs @ 8.70 hrs, Volume= 1.109 af, Atten= 64%, Lag= 50.6 min
 Primary = 1.22 cfs @ 8.70 hrs, Volume= 1.109 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 229.90' @ 8.70 hrs Surf.Area= 0.281 ac Storage= 0.398 af

Plug-Flow detention time= 674.9 min calculated for 1.109 af (100% of inflow)
 Center-of-Mass det. time= 675.1 min (1,333.4 - 658.3)

Volume	Invert	Avail.Storage	Storage Description
#1	226.25'	0.037 af	6.00'W x 700.00'L x 1.00'H Prismaoid 0.096 af Overall - 0.003 af Embedded = 0.093 af x 40.0% Voids
#2	229.00'	0.145 af	6.00'W x 700.00'L x 1.00'H Prismaoid Z=3.0
#3	222.50'	0.231 af	48.0" Round Pipe Storage L= 800.0' S= 0.0030 '/'
#4	226.25'	0.003 af	6.0" Round Pipe Storage Inside #1 L= 700.0'
		0.417 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	222.50'	1.5" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	229.50'	8.0" W x 3.0" H Vert. Orifice/Grate C= 0.600
#3	Primary	229.75'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.21 cfs @ 8.70 hrs HW=229.90' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.16 cfs @ 13.10 fps)
 2=Orifice/Grate (Orifice Controls 0.42 cfs @ 2.52 fps)
 3=Orifice/Grate (Weir Controls 0.63 cfs @ 1.29 fps)

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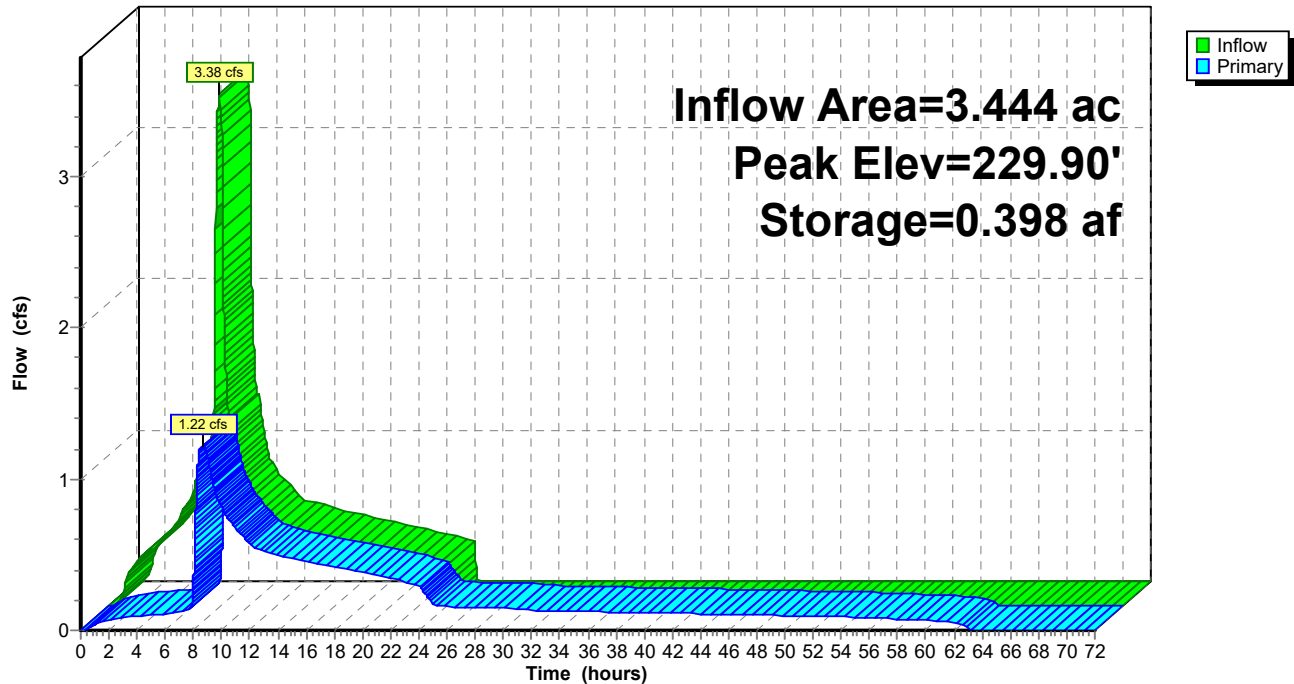
Type IA 24-hr 50-Yr Rainfall=4.10"

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Pond 16P: South Detention System

Hydrograph



Turner Detention

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Type IA 24-hr 100-Yr Rainfall=4.40"

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Summary for Subcatchment 11S: North Basin Predeveloped

Runoff = 2.24 cfs @ 8.23 hrs, Volume= 0.909 af, Depth= 2.38"

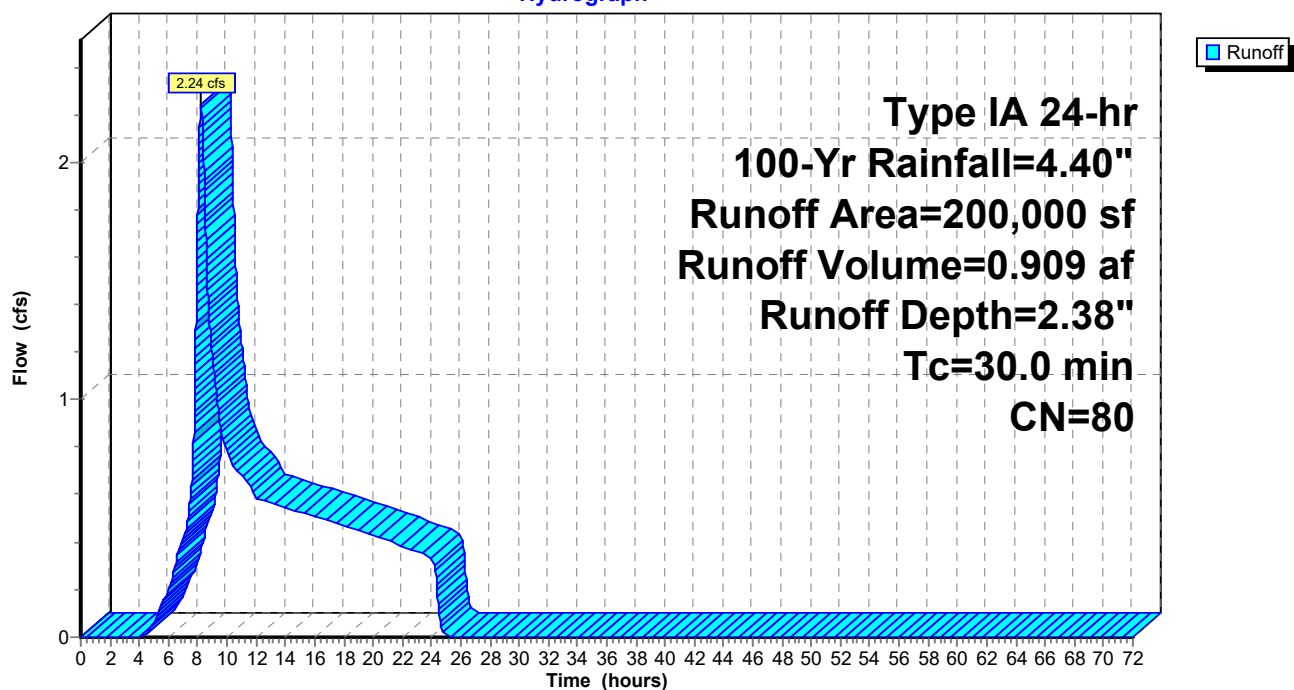
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=4.40"

	Area (sf)	CN	Description
*	200,000	80	
	200,000	80	100.00% Pervious Area

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

Subcatchment 11S: North Basin Predeveloped

Hydrograph



Turner Detention

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Type IA 24-hr 100-Yr Rainfall=4.40"

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Summary for Subcatchment 13S: North Basin Developed

Runoff = 4.84 cfs @ 7.85 hrs, Volume= 1.593 af, Depth= 4.16"

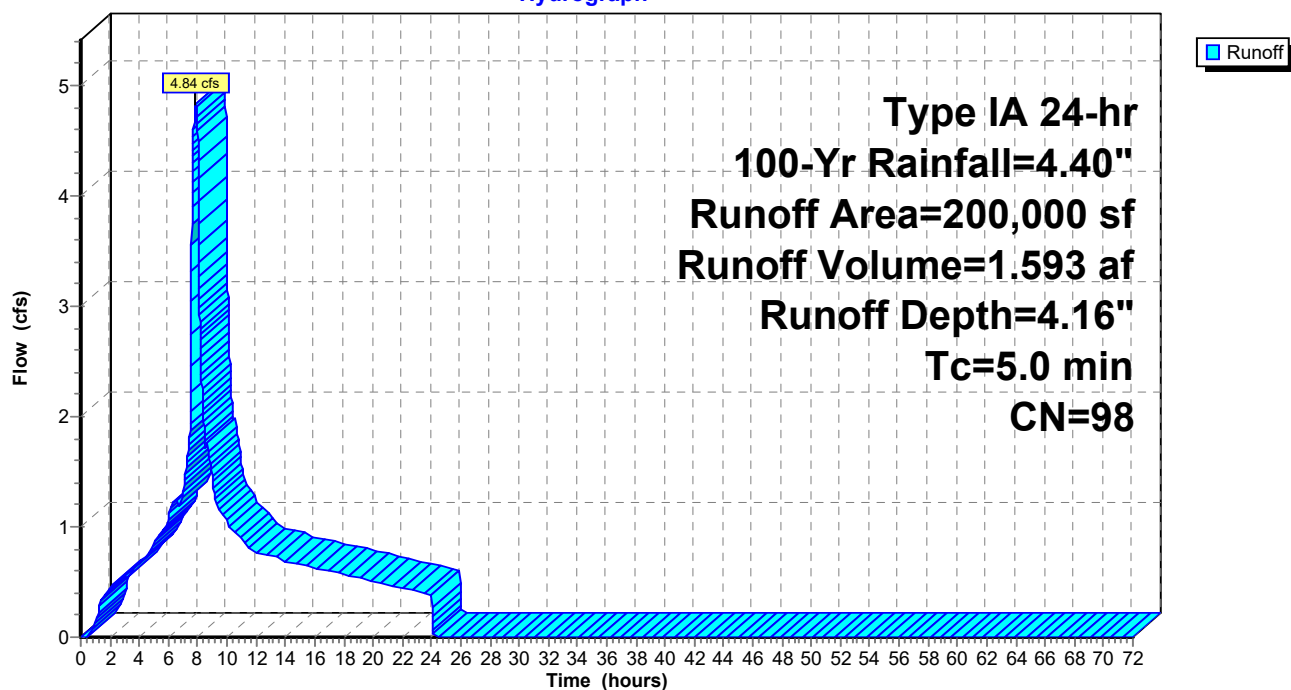
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=4.40"

	Area (sf)	CN	Description
*	200,000	98	
	200,000	98	100.00% Impervious Area

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

Subcatchment 13S: North Basin Developed

Hydrograph



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Type IA 24-hr 100-Yr Rainfall=4.40"

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Summary for Subcatchment 15S: South Basin Developed

Runoff = 3.63 cfs @ 7.85 hrs, Volume= 1.195 af, Depth= 4.16"

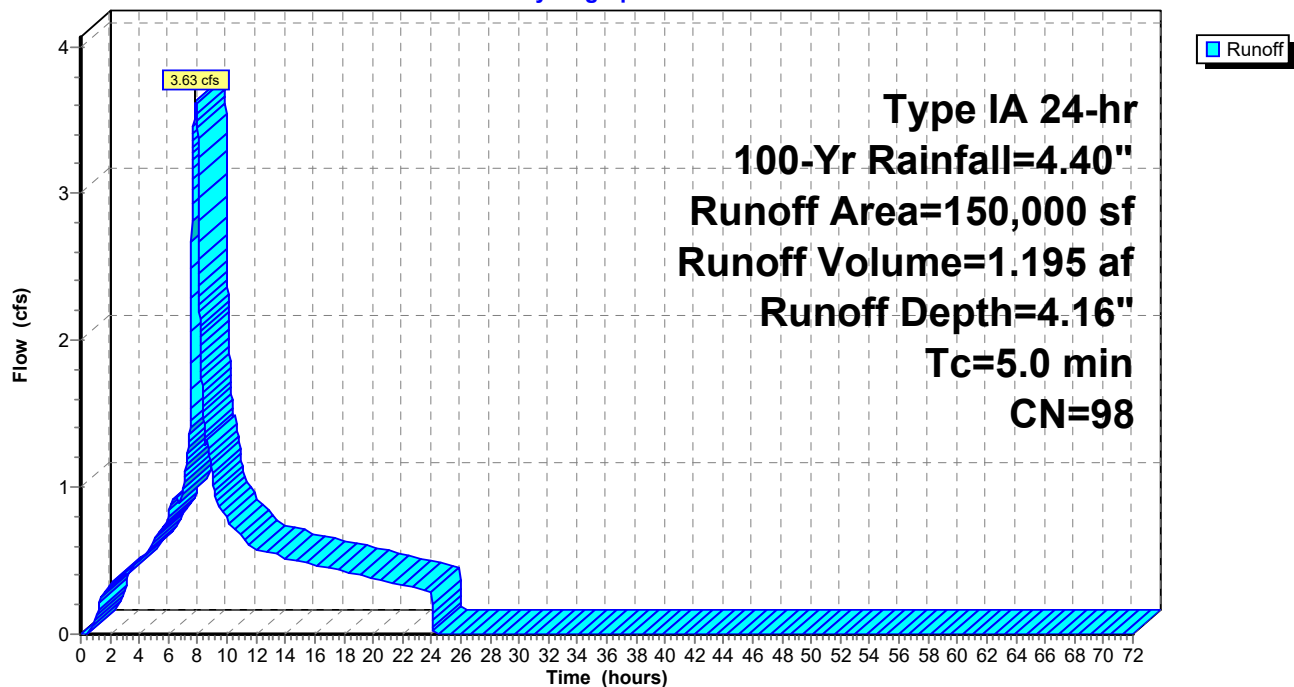
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=4.40"

	Area (sf)	CN	Description
*	150,000	98	
	150,000	98	100.00% Impervious Area

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

Subcatchment 15S: South Basin Developed

Hydrograph



Turner Detention

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Type IA 24-hr 100-Yr Rainfall=4.40"

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Summary for Subcatchment 18S: South Basin Predeveloped

Runoff = 1.68 cfs @ 8.23 hrs, Volume= 0.682 af, Depth= 2.38"

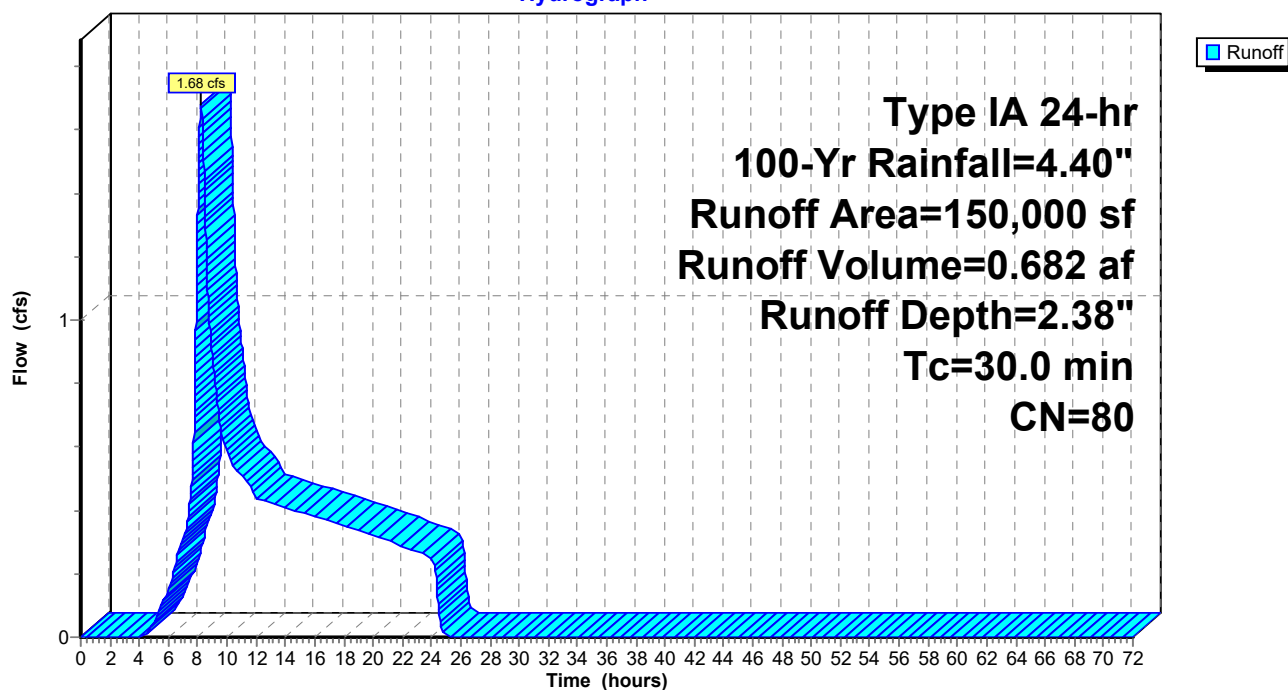
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=4.40"

	Area (sf)	CN	Description
*	150,000	80	
	150,000	80	100.00% Pervious Area

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

Subcatchment 18S: South Basin Predeveloped

Hydrograph



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Type IA 24-hr 100-Yr Rainfall=4.40"

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Summary for Pond 14P: North Detention System

Inflow Area = 4.591 ac, 100.00% Impervious, Inflow Depth = 4.16" for 100-Yr event
 Inflow = 4.84 cfs @ 7.85 hrs, Volume= 1.593 af
 Outflow = 2.22 cfs @ 8.31 hrs, Volume= 1.593 af, Atten= 54%, Lag= 27.1 min
 Primary = 2.22 cfs @ 8.31 hrs, Volume= 1.593 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 225.64' @ 8.31 hrs Surf.Area= 13,047 sf Storage= 22,678 cf

Plug-Flow detention time= 518.7 min calculated for 1.593 af (100% of inflow)
 Center-of-Mass det. time= 518.9 min (1,175.6 - 656.7)

Volume	Invert	Avail.Storage	Storage Description
#1	222.45'	1,894 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	221.85'	2,919 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#3	221.25'	19,667 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#4	224.00'	1,207 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#5	221.20'	3,079 cf	42.0" Round Pipe Storage
			L= 320.0' S= 0.0030 '/'
		28,765 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
222.45	1,159	0.0	0	0
223.45	1,159	40.0	464	464
225.20	1,159	0.0	0	464
226.20	1,701	100.0	1,430	1,894

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
221.85	1,205	0.0	0	0
222.85	1,205	40.0	482	482
224.60	1,205	0.0	0	482
225.10	1,476	100.0	670	1,152
225.60	1,758	100.0	809	1,961
226.10	2,074	100.0	958	2,919

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
221.25	7,228	0.0	0	0
222.25	7,228	40.0	2,891	2,891
224.00	7,228	0.0	0	2,891
225.00	8,371	100.0	7,800	10,691
226.00	9,582	100.0	8,977	19,667

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Type IA 24-hr 100-Yr Rainfall=4.40"

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Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
224.00	726	0.0	0	0
225.00	726	40.0	290	290
226.75	726	0.0	0	290
227.75	1,107	100.0	917	1,207

Device	Routing	Invert	Outlet Devices
#1	Primary	221.20'	2.1" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	225.25'	11.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

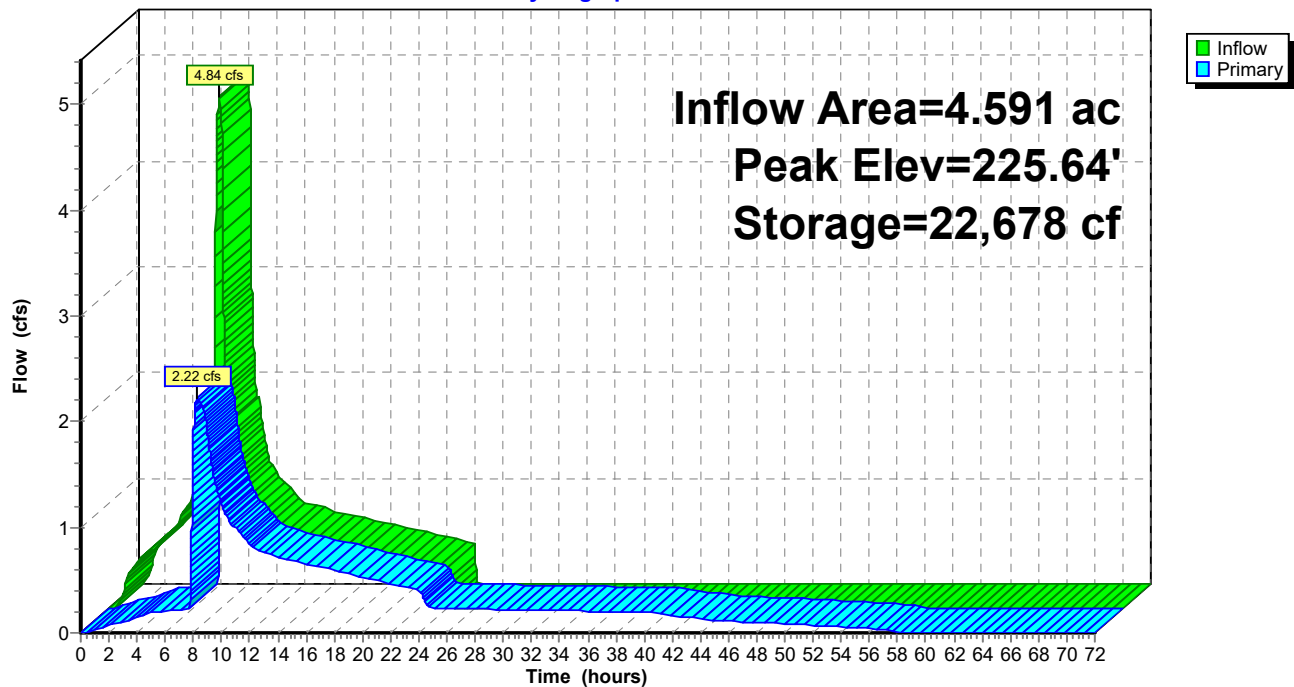
Primary OutFlow Max=2.22 cfs @ 8.31 hrs HW=225.64' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.24 cfs @ 10.14 fps)

2=Orifice/Grate (Orifice Controls 1.98 cfs @ 2.99 fps)

Pond 14P: North Detention System

Hydrograph



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Type IA 24-hr 100-Yr Rainfall=4.40"

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Summary for Pond 16P: South Detention System

Inflow Area = 3.444 ac, 100.00% Impervious, Inflow Depth = 4.16" for 100-Yr event
 Inflow = 3.63 cfs @ 7.85 hrs, Volume= 1.195 af
 Outflow = 1.67 cfs @ 8.30 hrs, Volume= 1.195 af, Atten= 54%, Lag= 26.8 min
 Primary = 1.67 cfs @ 8.30 hrs, Volume= 1.195 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 229.97' @ 8.30 hrs Surf.Area= 0.288 ac Storage= 0.410 af

Plug-Flow detention time= 634.2 min calculated for 1.195 af (100% of inflow)
 Center-of-Mass det. time= 634.5 min (1,291.2 - 656.7)

Volume	Invert	Avail.Storage	Storage Description
#1	226.25'	0.037 af	6.00'W x 700.00'L x 1.00'H Prismaoid 0.096 af Overall - 0.003 af Embedded = 0.093 af x 40.0% Voids
#2	229.00'	0.145 af	6.00'W x 700.00'L x 1.00'H Prismaoid Z=3.0
#3	222.50'	0.231 af	48.0" Round Pipe Storage L= 800.0' S= 0.0030 '/'
#4	226.25'	0.003 af	6.0" Round Pipe Storage Inside #1 L= 700.0'
		0.417 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	222.50'	1.5" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	229.50'	8.0" W x 3.0" H Vert. Orifice/Grate C= 0.600
#3	Primary	229.75'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.66 cfs @ 8.30 hrs HW=229.97' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.16 cfs @ 13.16 fps)
- 2=Orifice/Grate (Orifice Controls 0.47 cfs @ 2.80 fps)
- 3=Orifice/Grate (Weir Controls 1.03 cfs @ 1.52 fps)

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Type IA 24-hr 100-Yr Rainfall=4.40"

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Pond 16P: South Detention System

Hydrograph

