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WATER
STREETS
SURVEYS
PLATTING

La Crosse Engineering & Surveying Co., Inc.

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LA CROSSE, WISCONSIN 54601
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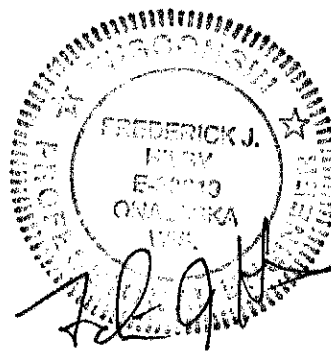
May 6, 2019

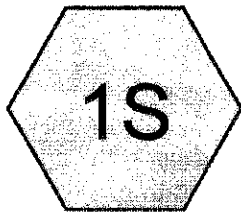
Becker & Steiger Properties, LLC
812 Copeland Ave., La Crosse, WI

Storm water Management

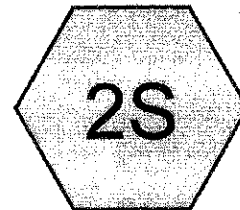
Becker & Steiger Properties, LLC is proposing a new storage building at the above location in La Crosse. A 1,664 sq. ft. building with parking adjacent to proposed building. The existing houses have been razed to make way for the proposed complex. The drainage for the proposed building and parking will be collected in the green areas, or landscaped areas. These areas will be built to infiltrate. During larger storms, the discharge will follow the previous route of runoff, which is over the sidewalk. The 10-year storm event is computed to remain on the project site. The computations are attached.

Storm event (yr)	Existing discharge (1S) to alley catch basin (cfs)	Proposed discharge (3P) to catch basin (cfs)
1	0.52	0.00
2	0.62	0.00
5	0.84	0.00
10	0.96	0.00
25	1.10	0.05

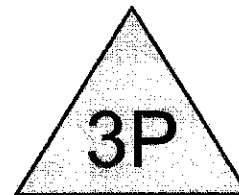




Existing



Proposed



Proposed



Routing Diagram for Cary

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Cary

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Project Notes

Rainfall events imported from "Aguilera.hcp"

Cary

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.055	69	50-75% Grass cover, Fair, HSG B (2S)
0.034	79	<50% Grass cover, Poor, HSG B (1S)
0.121	98	Paved parking, HSG B (1S, 2S)
0.104	98	Roofs, HSG B (1S, 2S)
0.010	98	Unconnected pavement, HSG B (1S)
0.325	91	TOTAL AREA

Cary

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.325	HSG B	1S, 2S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.325		TOTAL AREA

Cary

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.055	0.000	0.000	0.000	0.055	50-75% Grass cover, Fair	2S
0.000	0.034	0.000	0.000	0.000	0.034	<50% Grass cover, Poor	1S
0.000	0.121	0.000	0.000	0.000	0.121	Paved parking	1S, 2S
0.000	0.104	0.000	0.000	0.000	0.104	Roofs	1S, 2S
0.000	0.010	0.000	0.000	0.000	0.010	Unconnected pavement	1S
0.000	0.325	0.000	0.000	0.000	0.325	TOTAL AREA	

Cary

Type II 24-hr 2 yr Rainfall=2.90"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing

Runoff Area=7,085 sf 78.83% Impervious Runoff Depth>2.11"
Tc=5.0 min CN=94 Runoff=0.62 cfs 0.029 af

Subcatchment 2S: Proposed

Runoff Area=7,064 sf 66.02% Impervious Runoff Depth>1.60"
Tc=8.0 min CN=88 Runoff=0.45 cfs 0.022 af

Pond 3P: Proposed

Peak Elev=649.81' Storage=465 cf Inflow=0.45 cfs 0.022 af
Discarded=0.03 cfs 0.020 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.020 af

Total Runoff Area = 0.325 ac Runoff Volume = 0.050 af Average Runoff Depth = 1.86"
27.56% Pervious = 0.090 ac 72.44% Impervious = 0.235 ac

Cary

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Type II 24-hr 2 yr Rainfall=2.90"

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Summary for Subcatchment 1S: Existing

[49] Hint: $T_c < 2dt$ may require smaller dt

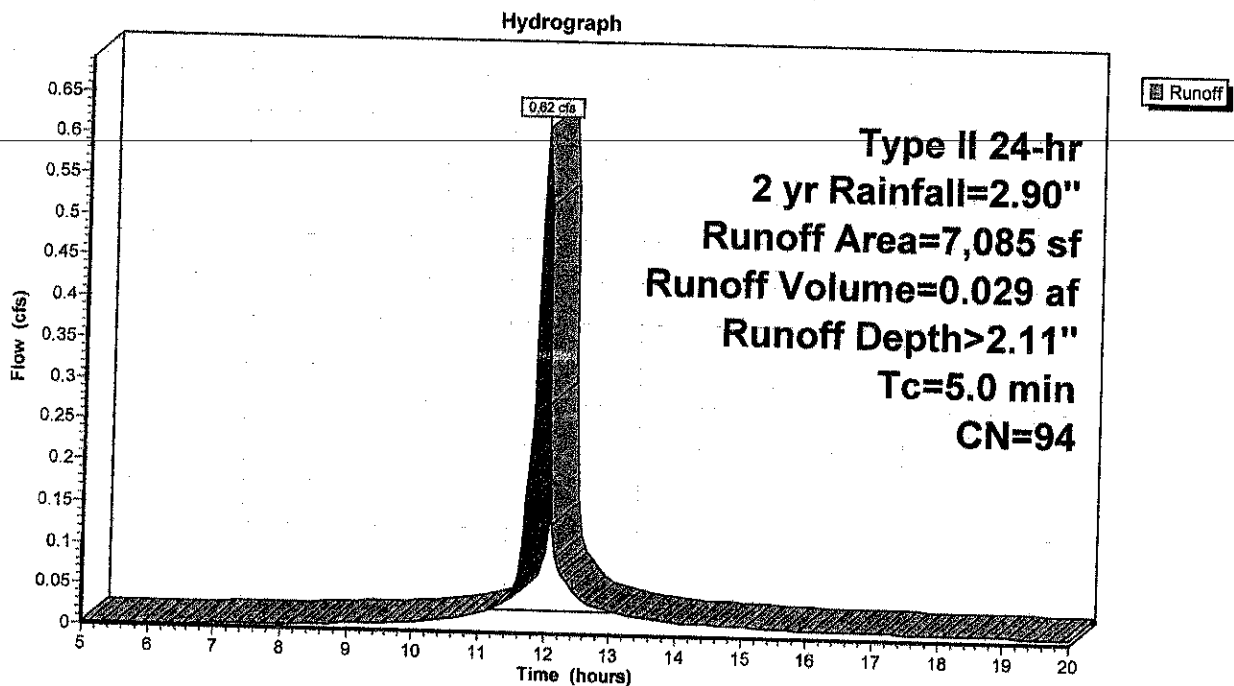
Runoff = 0.62 cfs @ 11.95 hrs, Volume= 0.029 af, Depth> 2.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, $dt=0.05$ hrs
Type II 24-hr 2 yr Rainfall=2.90"

Area (sf)	CN	Description
2,025	98	Roofs, HSG B
450	98	Unconnected pavement, HSG B
830	98	Roofs, HSG B
2,280	98	Paved parking, HSG B
1,500	79	<50% Grass cover, Poor, HSG B
7,085	94	Weighted Average
1,500		21.17% Pervious Area
5,585		78.83% Impervious Area
450		8.06% Unconnected

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

Subcatchment 1S: Existing



Cary

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Type II 24-hr 2 yr Rainfall=2.90"

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Summary for Subcatchment 2S: Proposed

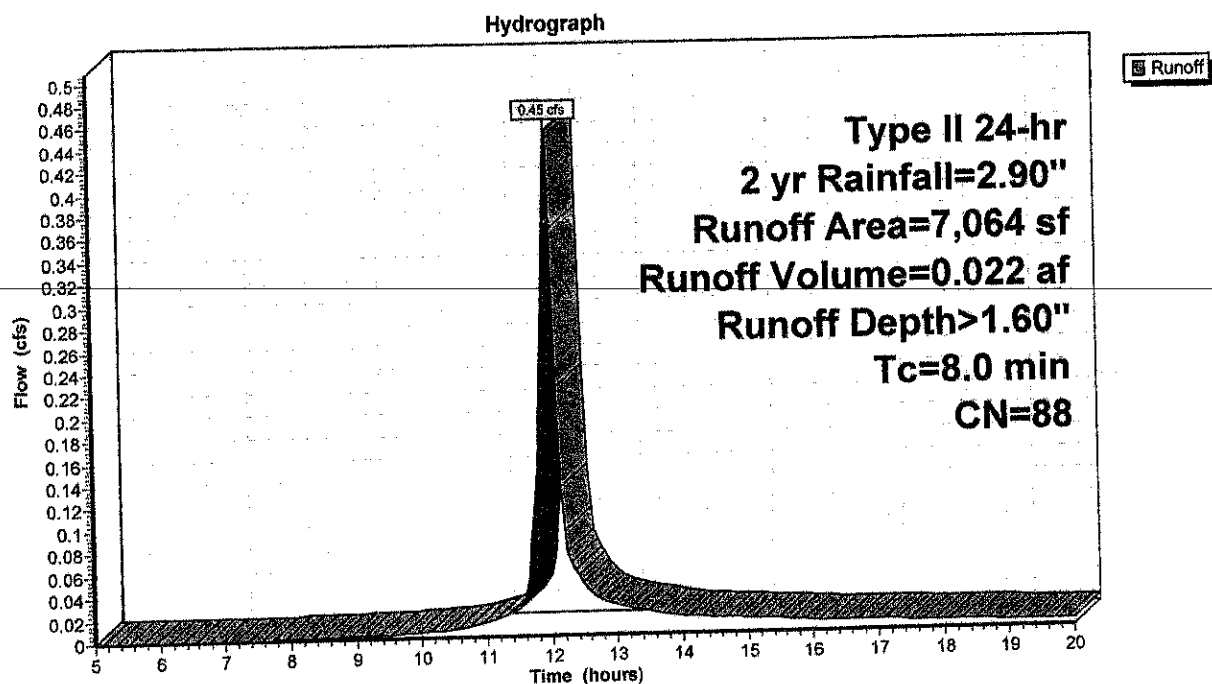
Runoff = 0.45 cfs @ 11.99 hrs, Volume= 0.022 af, Depth> 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 yr Rainfall=2.90"

Area (sf)	CN	Description
1,664	98	Roofs, HSG B
3,000	98	Paved parking, HSG B
2,400	69	50-75% Grass cover, Fair, HSG B
7,064	88	Weighted Average
2,400		33.98% Pervious Area
4,664		66.02% Impervious Area

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

Subcatchment 2S: Proposed



Cary

Type II 24-hr 2 yr Rainfall=2.90"

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Summary for Pond 3P: Proposed

Inflow Area = 0.162 ac, 66.02% Impervious, Inflow Depth > 1.60" for 2 yr event
 Inflow = 0.45 cfs @ 11.99 hrs, Volume= 0.022 af
 Outflow = 0.03 cfs @ 12.65 hrs, Volume= 0.020 af, Atten= 92%, Lag= 39.2 min
 Discarded = 0.03 cfs @ 12.65 hrs, Volume= 0.020 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 649.81' @ 12.65 hrs Surf.Area= 913 sf Storage= 465 cf

Plug-Flow detention time= 151.7 min calculated for 0.020 af (91% of inflow)
 Center-of-Mass det. time= 122.7 min (901.2 - 778.5)

Volume	Invert	Avail.Storage	Storage Description
#1	649.00'	1,268 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
649.00	230	0	0
650.00	1,070	650	650
650.50	1,400	618	1,268

Device	Routing	Invert	Outlet Devices
#1	Discarded	649.00'	1.600 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 630.00'
#2	Primary	650.30'	6.0' long x 5.0' breadth Broad-Crested Rectangular Weir 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.03 cfs @ 12.65 hrs HW=649.81' (Free Discharge)
 ↑1=Exfiltration (Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=649.00' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Cary

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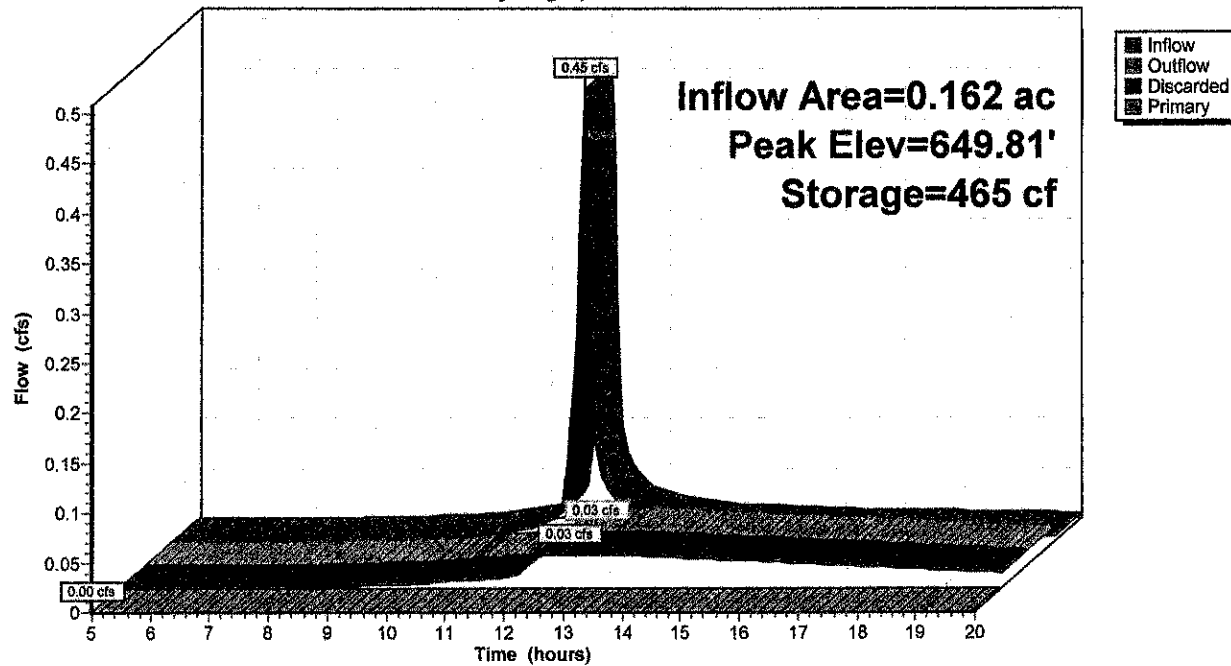
Type II 24-hr 2 yr Rainfall=2.90"

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Pond 3P: Proposed

Hydrograph



Cary

Type II 24-hr 5 yr Rainfall=3.80"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

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

Subcatchment 1S: Existing

Runoff Area=7,085 sf 78.83% Impervious Runoff Depth>2.93"
Tc=5.0 min CN=94 Runoff=0.84 cfs 0.040 af

Subcatchment 2S: Proposed

Runoff Area=7,064 sf 66.02% Impervious Runoff Depth>2.37"
Tc=8.0 min CN=88 Runoff=0.66 cfs 0.032 af

Pond 3P: Proposed

Peak Elev=650.07' Storage=729 cf Inflow=0.66 cfs 0.032 af
Discarded=0.04 cfs 0.027 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.027 af

Total Runoff Area = 0.325 ac Runoff Volume = 0.072 af Average Runoff Depth = 2.65"
27.56% Pervious = 0.090 ac 72.44% Impervious = 0.235 ac

Cary

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Type II 24-hr 5 yr Rainfall=3.80"

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Summary for Subcatchment 1S: Existing

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.84 cfs @ 11.95 hrs, Volume= 0.040 af, Depth> 2.93"

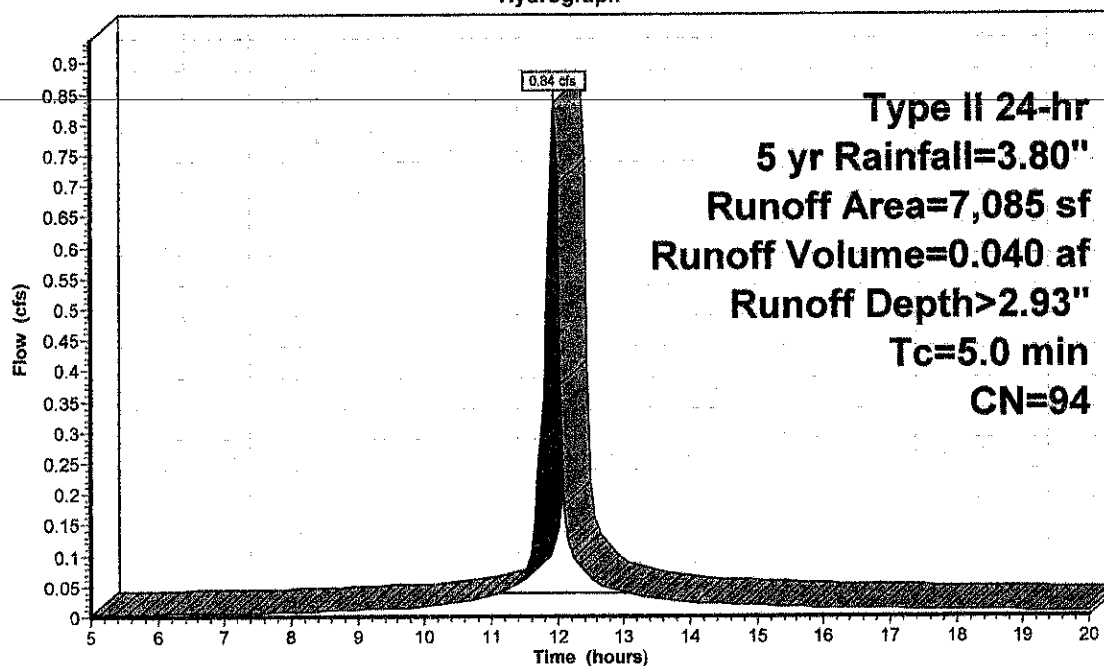
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, $dt=0.05$ hrs
Type II 24-hr 5 yr Rainfall=3.80"

Area (sf)	CN	Description
2,025	98	Roofs, HSG B
450	98	Unconnected pavement, HSG B
830	98	Roofs, HSG B
2,280	98	Paved parking, HSG B
1,500	79	<50% Grass cover, Poor, HSG B
7,085	94	Weighted Average
1,500		21.17% Pervious Area
5,585		78.83% Impervious Area
450		8.06% Unconnected

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

Subcatchment 1S: Existing

Hydrograph



Cary

Type II 24-hr 5 yr Rainfall=3.80"

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Summary for Subcatchment 2S: Proposed

Runoff = 0.66 cfs @ 11.99 hrs, Volume= 0.032 af, Depth> 2.37"

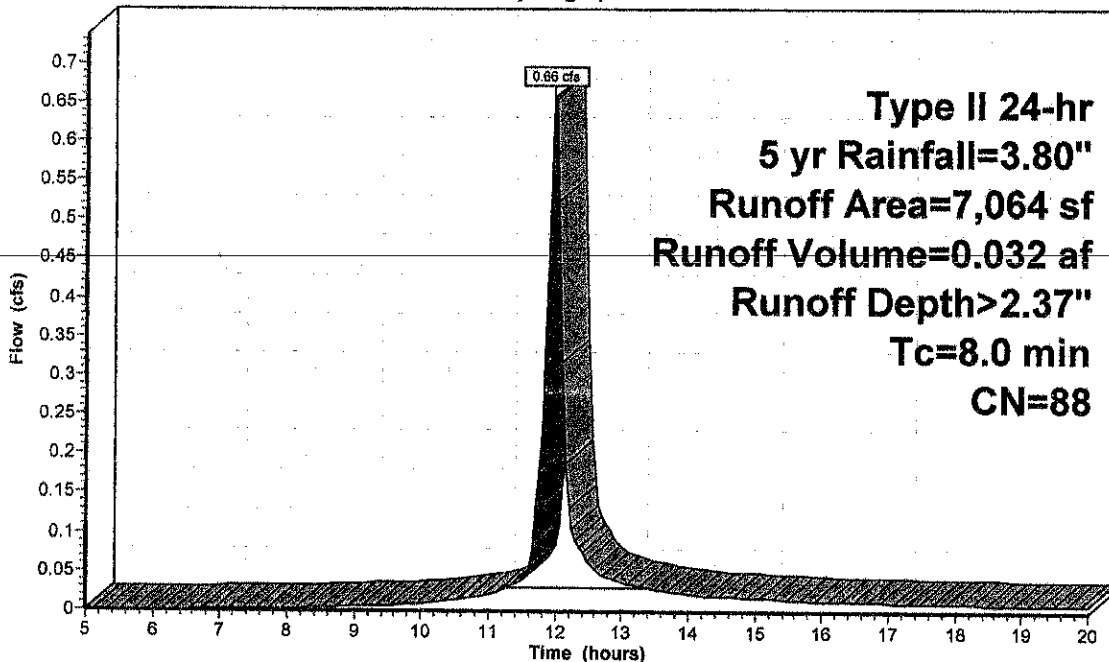
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 5 yr Rainfall=3.80"

Area (sf)	CN	Description
1,664	98	Roofs, HSG B
3,000	98	Paved parking, HSG B
2,400	69	50-75% Grass cover, Fair, HSG B
7,064	88	Weighted Average
2,400		33.98% Pervious Area
4,664		66.02% Impervious Area

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

Subcatchment 2S: Proposed

Hydrograph



Cary

Type II 24-hr 5 yr Rainfall=3.80"

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Summary for Pond 3P: Proposed

Inflow Area = 0.162 ac, 66.02% Impervious, Inflow Depth > 2.37" for 5 yr event
 Inflow = 0.66 cfs @ 11.99 hrs, Volume= 0.032 af
 Outflow = 0.04 cfs @ 12.80 hrs, Volume= 0.027 af, Atten= 93%, Lag= 48.2 min
 Discarded = 0.04 cfs @ 12.80 hrs, Volume= 0.027 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 650.07' @ 12.80 hrs Surf.Area= 1,118 sf Storage= 729 cf

Plug-Flow detention time= 178.8 min calculated for 0.027 af (84% of inflow)
 Center-of-Mass det. time= 131.0 min (900.6 - 769.6)

Volume	Invert	Avail.Storage	Storage Description
#1	649.00'	1,268 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
649.00	230	0	0
650.00	1,070	650	650
650.50	1,400	618	1,268

Device	Routing	Invert	Outlet Devices
#1	Discarded	649.00'	1.600 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 630.00'
#2	Primary	650.30'	6.0' long x 5.0' breadth Broad-Crested Rectangular Weir 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.04 cfs @ 12.80 hrs HW=650.07' (Free Discharge)
 ↑1=Exfiltration (Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=649.00' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Cary

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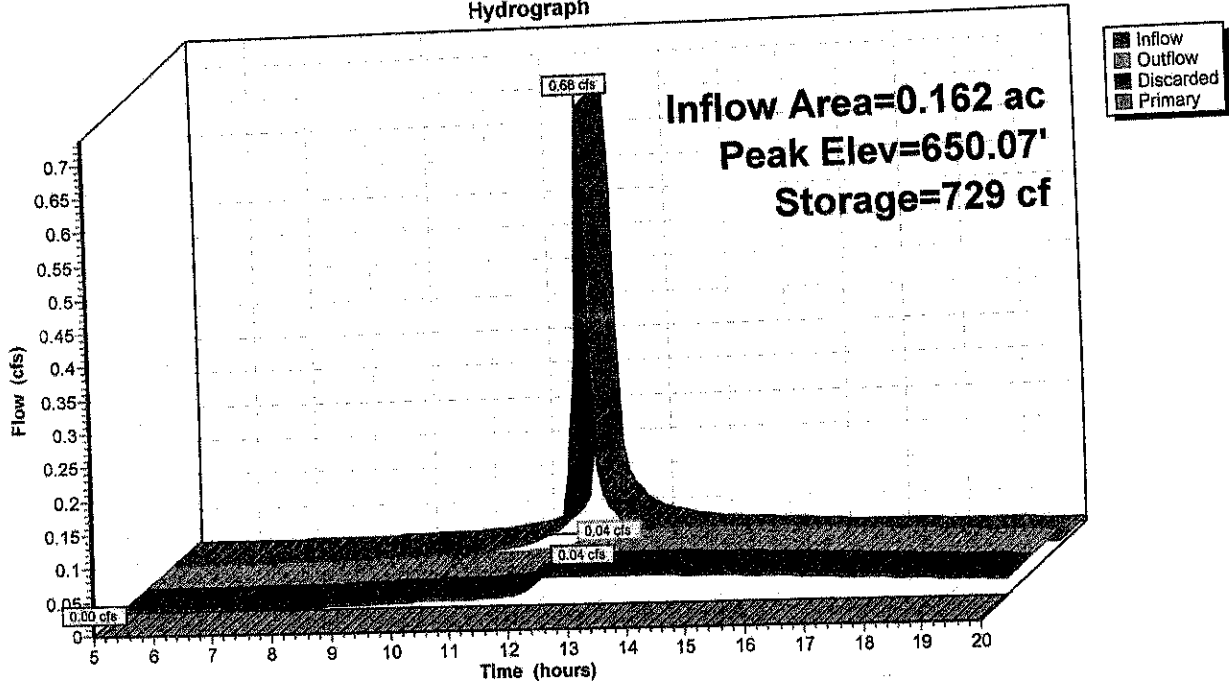
Type II 24-hr 5 yr Rainfall=3.80"

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Pond 3P: Proposed

Hydrograph



Cary

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Type II 24-hr 10 yr Rainfall=4.30"
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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing

Runoff Area=7,085 sf 78.83% Impervious Runoff Depth>3.39"
Tc=5.0 min CN=94 Runoff=0.96 cfs 0.046 af

Subcatchment 2S: Proposed

Runoff Area=7,064 sf 66.02% Impervious Runoff Depth>2.81"
Tc=8.0 min CN=88 Runoff=0.77 cfs 0.038 af

Pond 3P: Proposed

Peak Elev=650.21' Storage=886 cf Inflow=0.77 cfs 0.038 af
Discarded=0.05 cfs 0.030 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.030 af

Total Runoff Area = 0.325 ac Runoff Volume = 0.084 af Average Runoff Depth = 3.10"
27.56% Pervious = 0.090 ac 72.44% Impervious = 0.235 ac

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Type II 24-hr 10 yr Rainfall=4.30"

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Summary for Subcatchment 1S: Existing

[49] Hint: $T_c < 2dt$ may require smaller dt

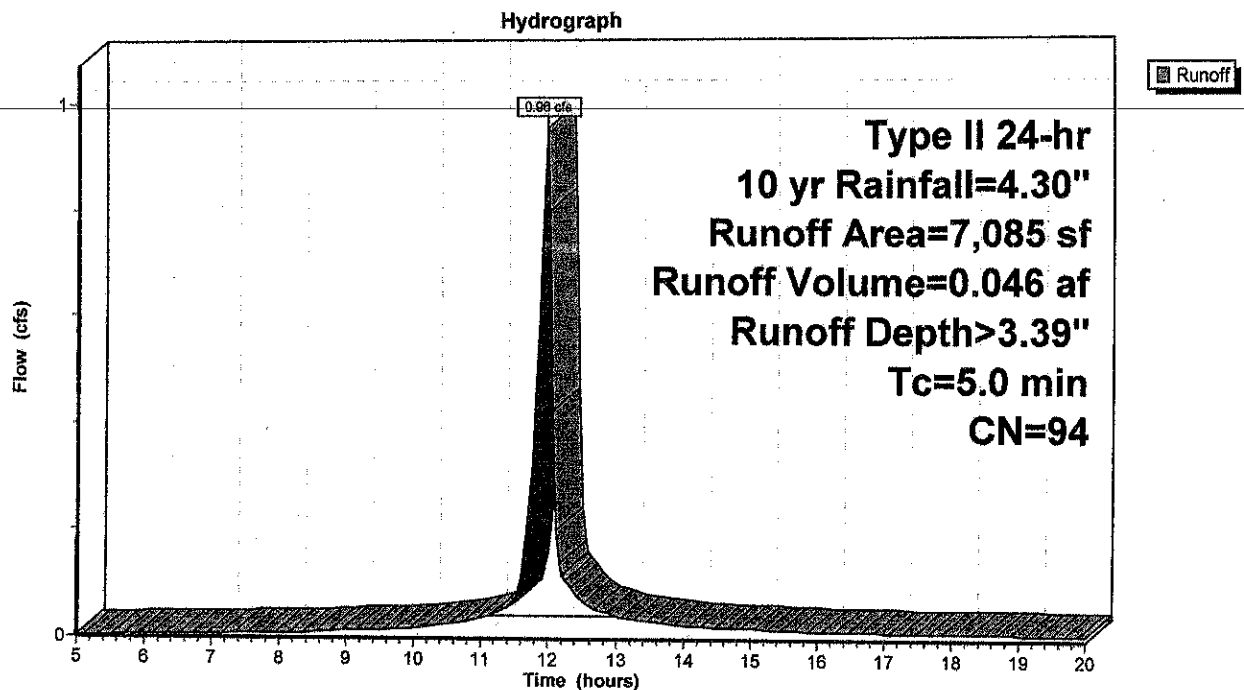
Runoff = 0.96 cfs @ 11.95 hrs, Volume= 0.046 af, Depth> 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, $dt=0.05$ hrs
Type II 24-hr 10 yr Rainfall=4.30"

Area (sf)	CN	Description
2,025	98	Roofs, HSG B
450	98	Unconnected pavement, HSG B
830	98	Roofs, HSG B
2,280	98	Paved parking, HSG B
1,500	79	<50% Grass cover, Poor, HSG B
7,085	94	Weighted Average
1,500		21.17% Pervious Area
5,585		78.83% Impervious Area
450		8.06% Unconnected

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

Subcatchment 1S: Existing



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Type II 24-hr 10 yr Rainfall=4.30"

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Summary for Subcatchment 2S: Proposed

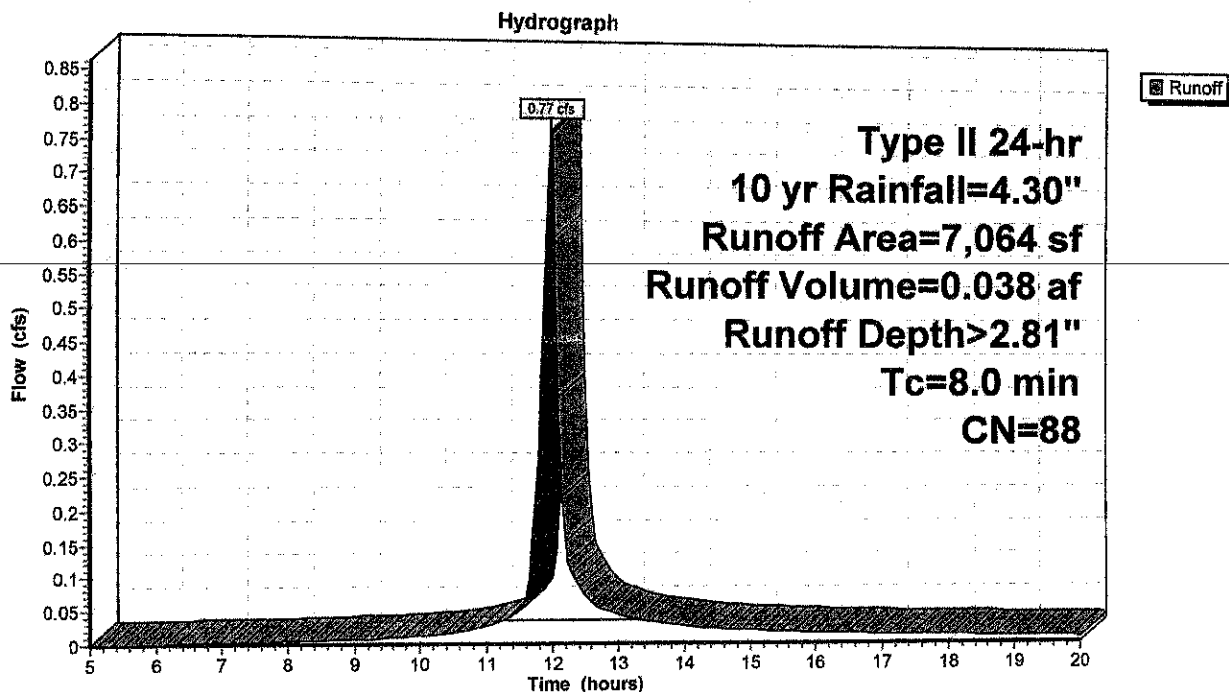
Runoff = 0.77 cfs @ 11.99 hrs, Volume= 0.038 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 yr Rainfall=4.30"

Area (sf)	CN	Description
1,664	98	Roofs, HSG B
3,000	98	Paved parking, HSG B
2,400	69	50-75% Grass cover, Fair, HSG B
7,064	88	Weighted Average
2,400		33.98% Pervious Area
4,664		66.02% Impervious Area

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

Subcatchment 2S: Proposed



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Type II 24-hr 10 yr Rainfall=4.30"

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Summary for Pond 3P: Proposed

Inflow Area = 0.162 ac, 66.02% Impervious, Inflow Depth > 2.81" for 10 yr event
Inflow = 0.77 cfs @ 11.99 hrs, Volume= 0.038 af
Outflow = 0.05 cfs @ 12.89 hrs, Volume= 0.030 af, Atten= 94%, Lag= 53.9 min
Discarded = 0.05 cfs @ 12.89 hrs, Volume= 0.030 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 650.21' @ 12.89 hrs Surf.Area= 1,207 sf Storage= 886 cf

Plug-Flow detention time= 187.7 min calculated for 0.030 af (80% of inflow)
Center-of-Mass det. time= 134.2 min (899.9 - 765.7)

Volume	Invert	Avail.Storage	Storage Description
#1	649.00'	1,268 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
649.00	230	0	0
650.00	1,070	650	650
650.50	1,400	618	1,268

Device	Routing	Invert	Outlet Devices
#1	Discarded	649.00'	1.600 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 630.00'
#2	Primary	650.30'	6.0' long x 5.0' breadth Broad-Crested Rectangular Weir 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.05 cfs @ 12.89 hrs HW=650.21' (Free Discharge)
↑1=Exfiltration (Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=649.00' (Free Discharge)
↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Cary

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Type II 24-hr 10 yr Rainfall=4.30"

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Pond 3P: Proposed

Hydrograph

