

**ATTACHMENT E**  
**STORM AND SANITARY REPORTS**  
**DETENTION**

### Project Description

File Name ..... CMWA\_EXISTING.SPF

### Project Options

Flow Units ..... CFS  
 Elevation Type ..... Elevation  
 Hydrology Method ..... SCS TR-55  
 Time of Concentration (TOC) Method ..... SCS TR-55  
 Link Routing Method ..... Kinematic Wave  
 Enable Overflow Ponding at Nodes ..... YES  
 Skip Steady State Analysis Time Periods ... NO

### Analysis Options

Start Analysis On ..... Jun 21, 2019 00:00:00  
 End Analysis On ..... Jun 22, 2019 00:00:00  
 Start Reporting On ..... Jun 21, 2019 00:00:00  
 Antecedent Dry Days ..... 0 days  
 Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss  
 Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss  
 Reporting Time Step ..... 0 00:05:00 days hh:mm:ss  
 Routing Time Step ..... 30 seconds

### Number of Elements

Qty  
 Rain Gages ..... 3  
 Subbasins..... 1  
 Nodes..... 1  
     *Junctions* ..... 0  
     *Outfalls* ..... 1  
     *Flow Diversions* ..... 0  
     *Inlets* ..... 0  
     *Storage Nodes* ..... 0  
 Links..... 0  
     *Channels* ..... 0  
     *Pipes* ..... 0  
     *Pumps* ..... 0  
     *Orifices* ..... 0  
     *Weirs* ..... 0  
     *Outlets* ..... 0  
 Pollutants ..... 0  
 Land Uses ..... 0

### Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	100-24	Time Series	100-24	Cumulative	inches	Kentucky	Bourbon	100	6.56	SCS Type II 24-hr
2	10-24	Time Series	10-24	Cumulative	inches	Kentucky	Bourbon	10	4.27	SCS Type II 24-hr
3	25-24	Time Series	25-24	Cumulative	inches	Kentucky	Bourbon	25	5.11	SCS Type II 24-hr

### Subbasin Summary

SN Subbasin ID	Area (ac)	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1 CMWA_EXISTING	45.62	71.95	4.27	1.65	75.23	77.90	0 00:21:32

**Node Summary**

SN ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Out-01	Outfall	0.00				0.00	0.00					

## Subbasin Hydrology

### Subbasin : CMWA\_EXISTING

#### Input Data

Area (ac) ..... 45.62  
 Weighted Curve Number ..... 71.95  
 Rain Gage ID ..... 10-24

#### Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	6.00	C	98.00
Pasture, grassland, or range, Good	21.36	C	74.00
> 75% grass cover, Good	18.26	B	61.00
Composite Area & Weighted CN	45.62		71.95

#### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

Tc = Time of Concentration (hr)  
 n = Manning's roughness  
 Lf = Flow Length (ft)  
 P = 2 yr, 24 hr Rainfall (inches)  
 Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 \* (Sf<sup>0.5</sup>) (unpaved surface)  
 V = 20.3282 \* (Sf<sup>0.5</sup>) (paved surface)  
 V = 15.0 \* (Sf<sup>0.5</sup>) (grassed waterway surface)  
 V = 10.0 \* (Sf<sup>0.5</sup>) (nearly bare & untilled surface)  
 V = 9.0 \* (Sf<sup>0.5</sup>) (cultivated straight rows surface)  
 V = 7.0 \* (Sf<sup>0.5</sup>) (short grass pasture surface)  
 V = 5.0 \* (Sf<sup>0.5</sup>) (woodland surface)  
 V = 2.5 \* (Sf<sup>0.5</sup>) (forest w/heavy litter surface)  
 Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)  
 Lf = Flow Length (ft)  
 V = Velocity (ft/sec)  
 Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 \* (R<sup>2/3</sup>) \* (Sf<sup>0.5</sup>)) / n  
 R = Aq / Wp  
 Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)  
 Lf = Flow Length (ft)  
 R = Hydraulic Radius (ft)  
 Aq = Flow Area (ft<sup>2</sup>)  
 Wp = Wetted Perimeter (ft)  
 V = Velocity (ft/sec)  
 Sf = Slope (ft/ft)  
 n = Manning's roughness

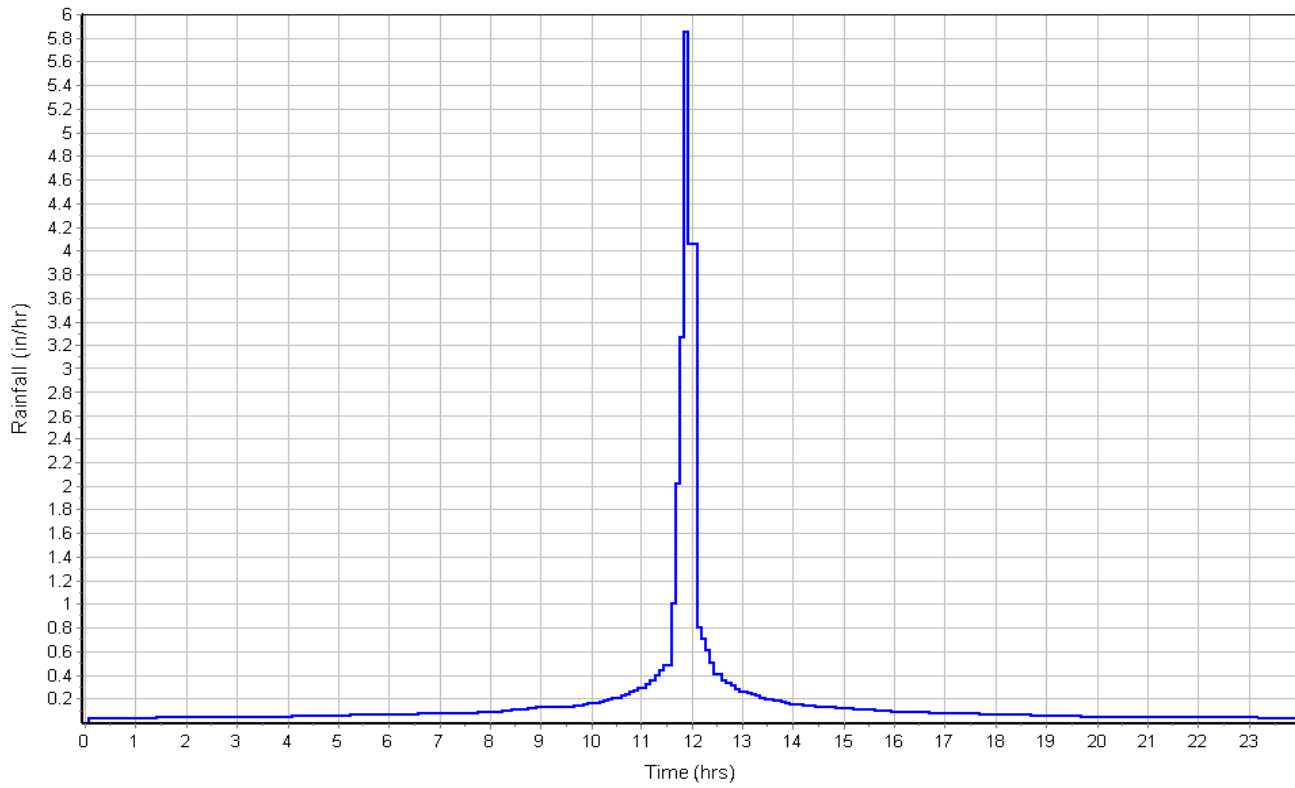
	Subarea	Subarea	Subarea
	A	B	C
<b>Sheet Flow Computations</b>			
Manning's Roughness :	.24	.24	0.00
Flow Length (ft) :	100	100	0.00
Slope (%) :	4	10	0.00
2 yr, 24 hr Rainfall (in) :	2.97	2.97	0.00
Velocity (ft/sec) :	0.15	0.21	0.00
Computed Flow Time (min) :	11.23	7.78	0.00
<b>Shallow Concentrated Flow Computations</b>			
	Subarea	Subarea	Subarea
	A	B	C
Flow Length (ft) :	75	0.00	0.00
Slope (%) :	10	0.00	0.00
Surface Type :			Unpaved
Velocity (ft/sec) :	4.74	0.00	0.00
Computed Flow Time (min) :	0.26	0.00	0.00
<b>Channel Flow Computations</b>			
	Subarea	Subarea	Subarea
	A	B	C
Manning's Roughness :	.03	0.00	0.00
Flow Length (ft) :	908	0.00	0.00
Channel Slope (%) :	3.85	0.00	0.00
Cross Section Area (ft <sup>2</sup> ) :	4.44	0.00	0.00
Wetted Perimeter (ft) :	7.87	0.00	0.00
Velocity (ft/sec) :	6.65	0.00	0.00
Computed Flow Time (min) :	2.27	0.00	0.00
Total TOC (min) .....	21.54		

**Subbasin Runoff Results**

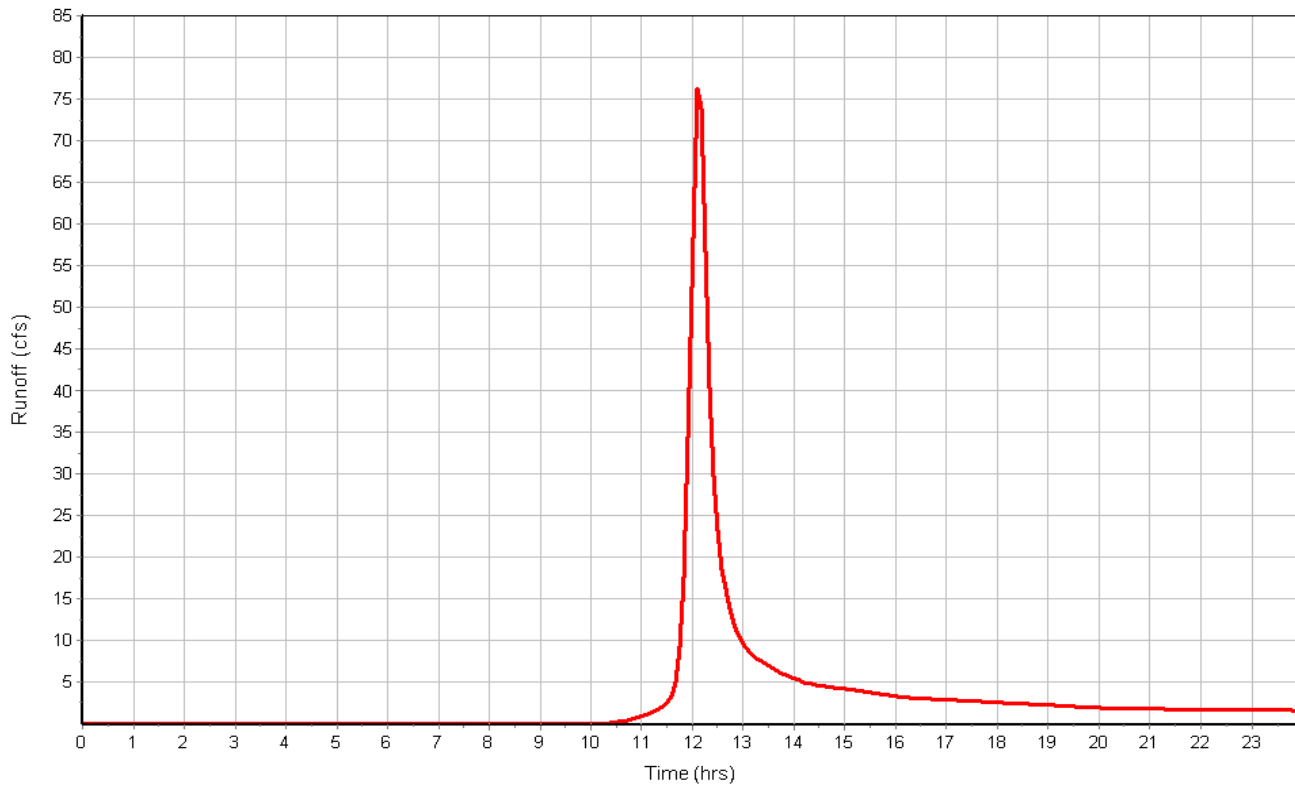
Total Rainfall (in) .....	4.27
Total Runoff (in) .....	1.65
Peak Runoff (cfs) .....	77.90
Weighted Curve Number .....	71.95
Time of Concentration (days hh:mm:ss) .....	0 00:21:32

Subbasin : CMWA\_EXISTING

Rainfall Intensity Graph



Runoff Hydrograph



### Subbasin Summary

SN Subbasin ID	Area (ac)	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1 CMWA_EXISTING	45.62	71.95	5.11	2.28	103.97	109.22	0 00:21:32



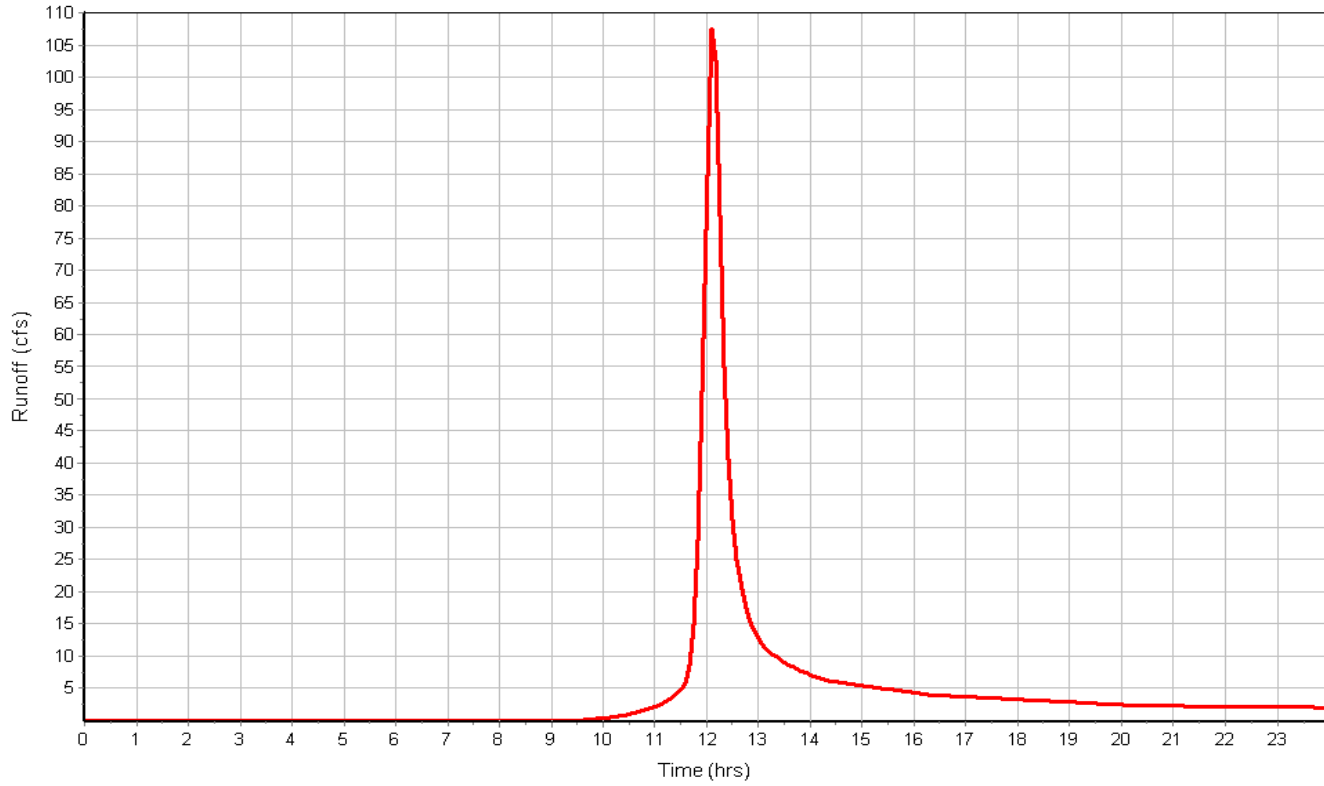
**Node Summary**

SN ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Out-01	Outfall	0.00				0.00	0.00					

### Subbasin Hydrology

Subbasin : CMWA\_EXISTING

Runoff Hydrograph



### Subbasin Summary

SN Subbasin ID	Area (ac)	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1 CMWA_EXISTING	45.62	71.95	6.56	3.45	157.48	167.04	0 00:21:32

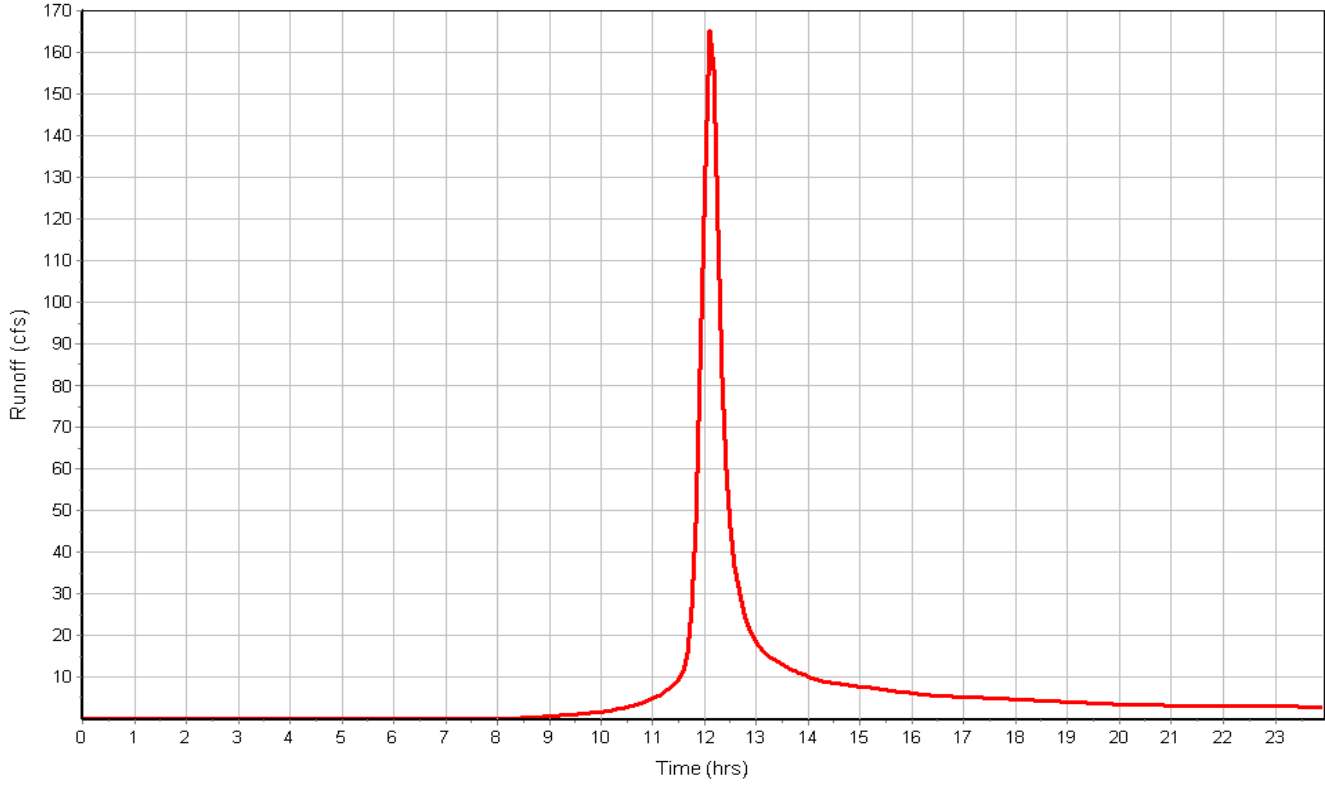
**Node Summary**

SN ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Out-01	Outfall	0.00				0.00	0.00					

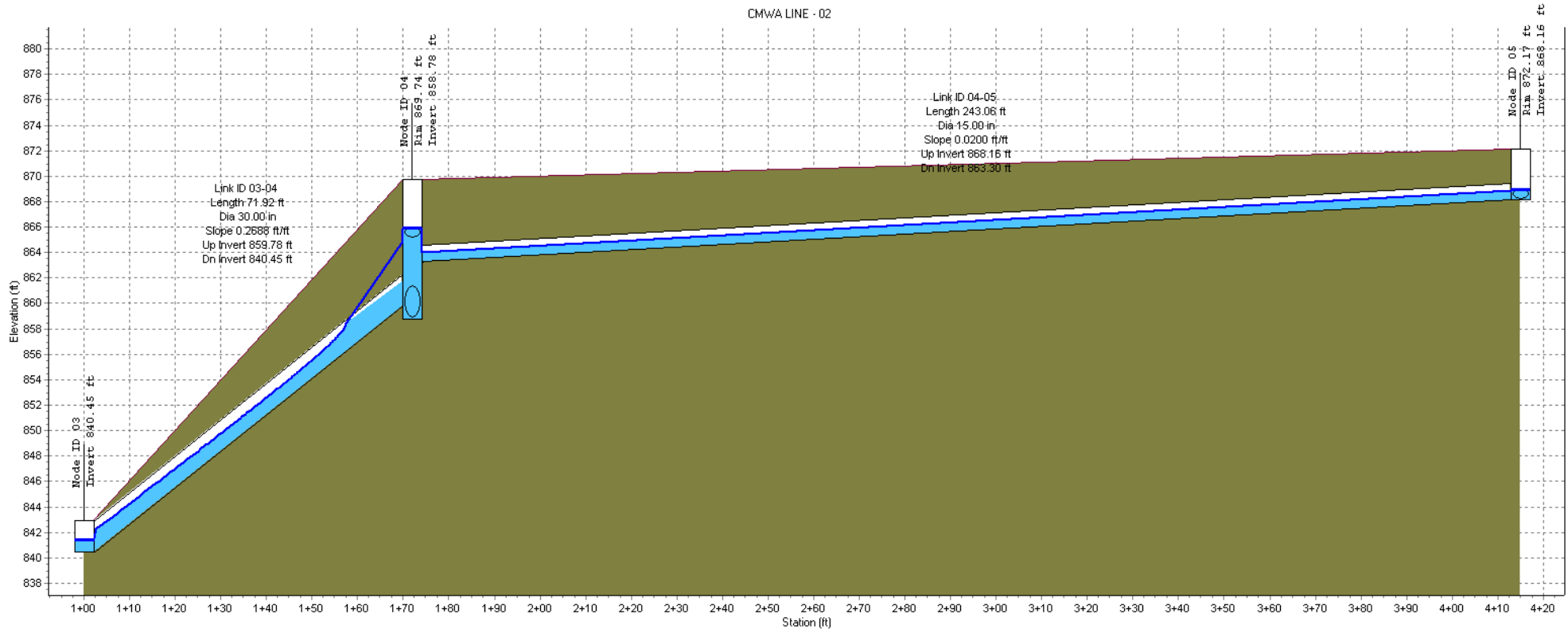
### Subbasin Hydrology

Subbasin : CMWA\_EXISTING

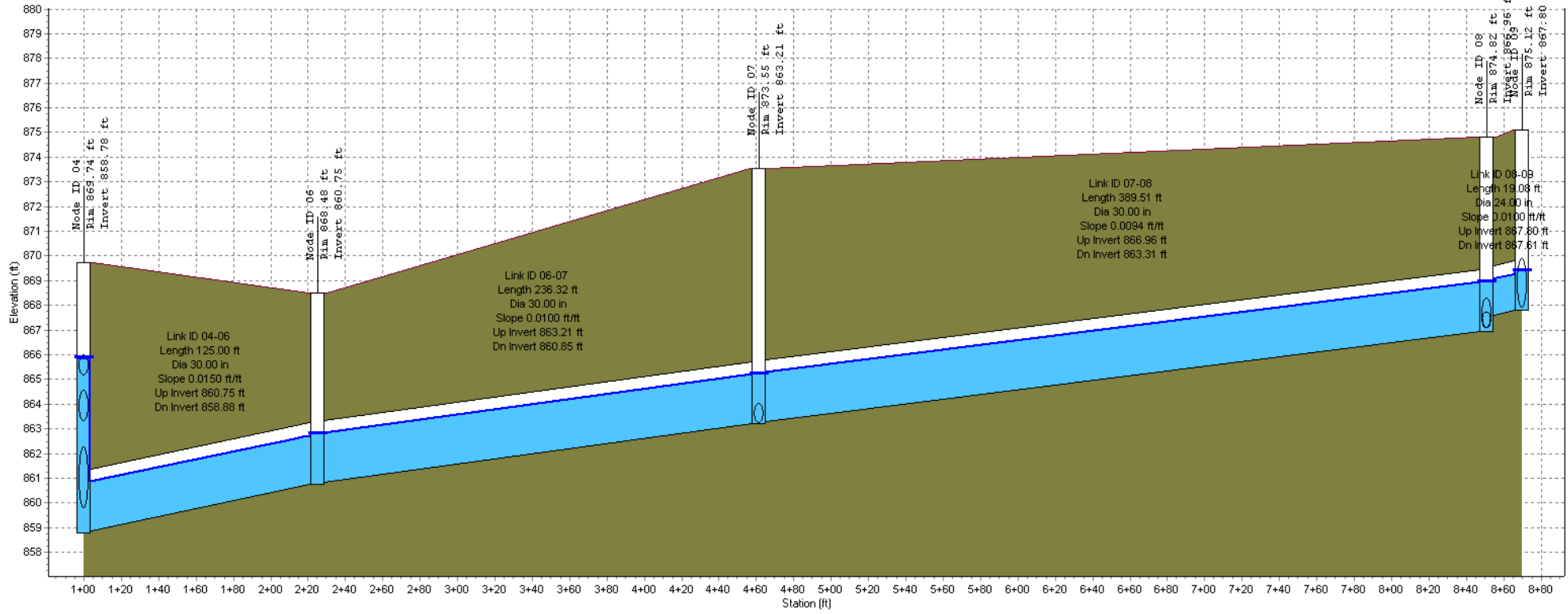
Runoff Hydrograph



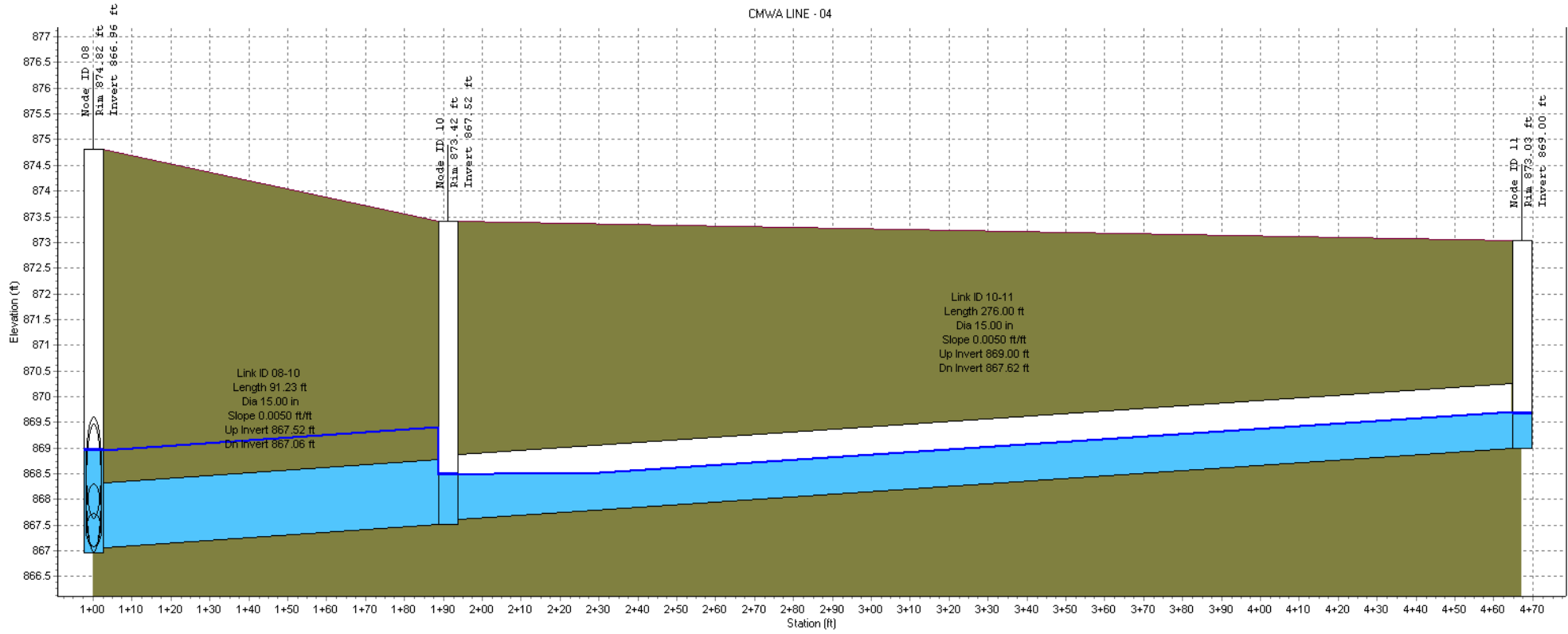
100 YEAR - 24 HOUR STORM  
CMWA LINE - 02



100 YEAR - 24 HOUR STORM  
 CMWA LINE - 03



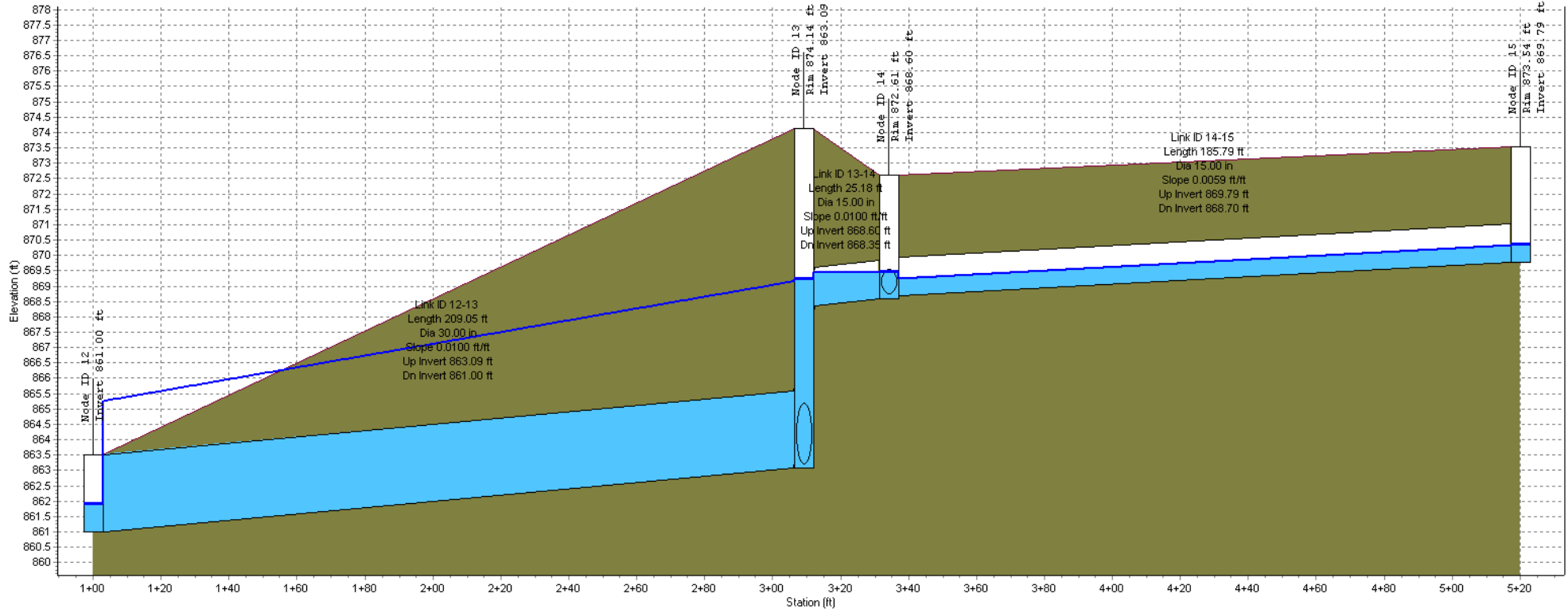
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CMWA LINE - 04



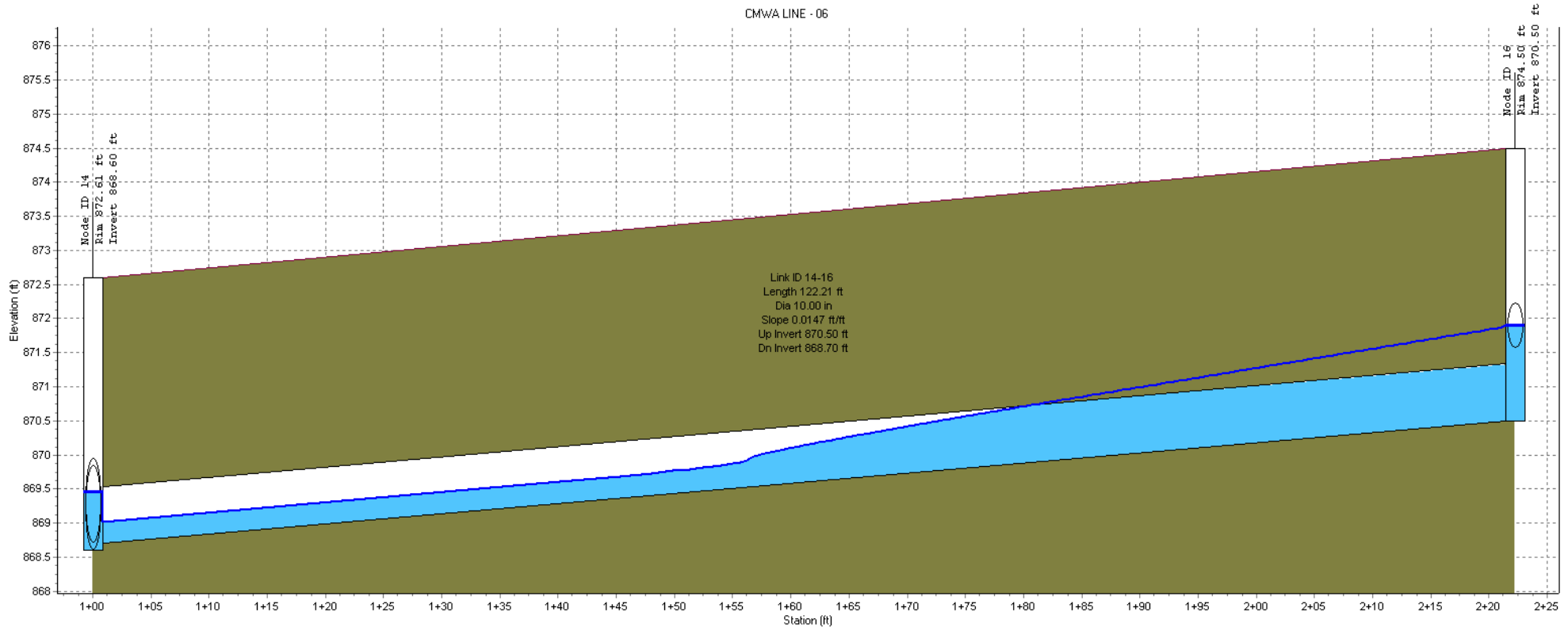


100 YEAR - 24 HOUR STORM

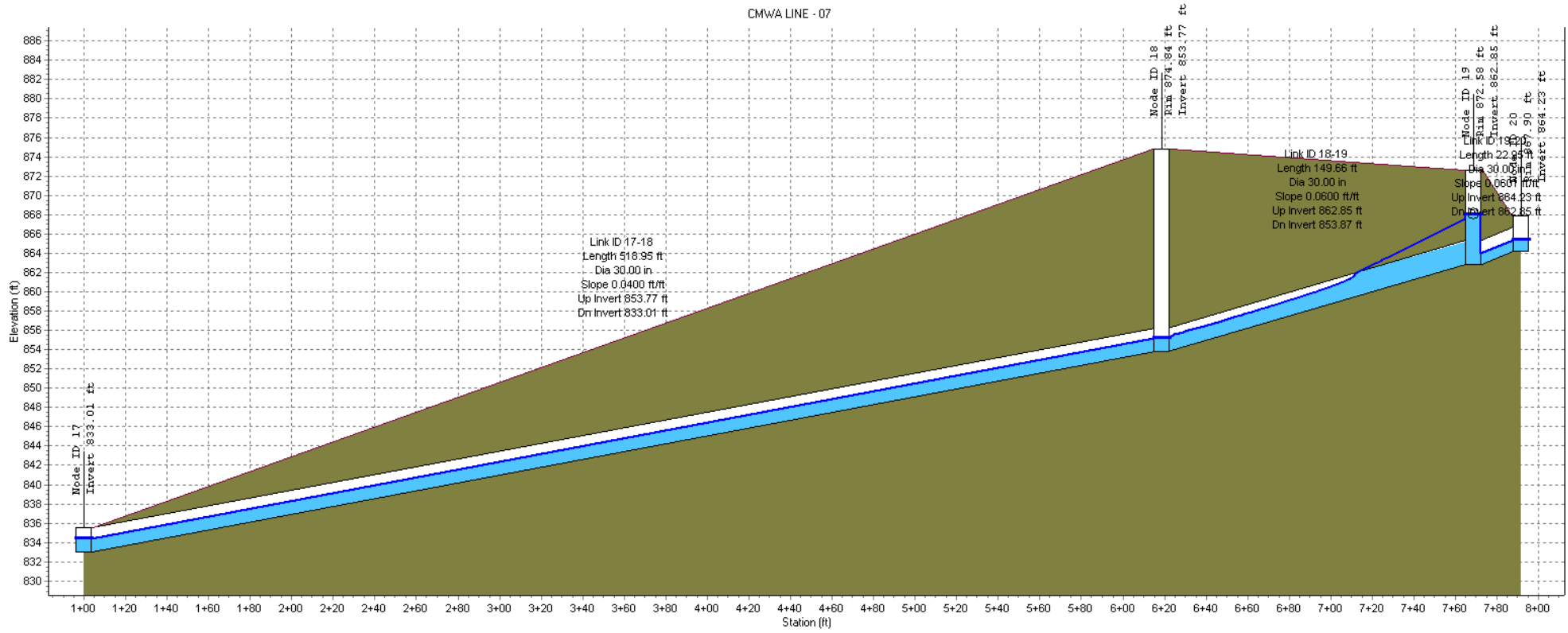
CMWA LINE - 94



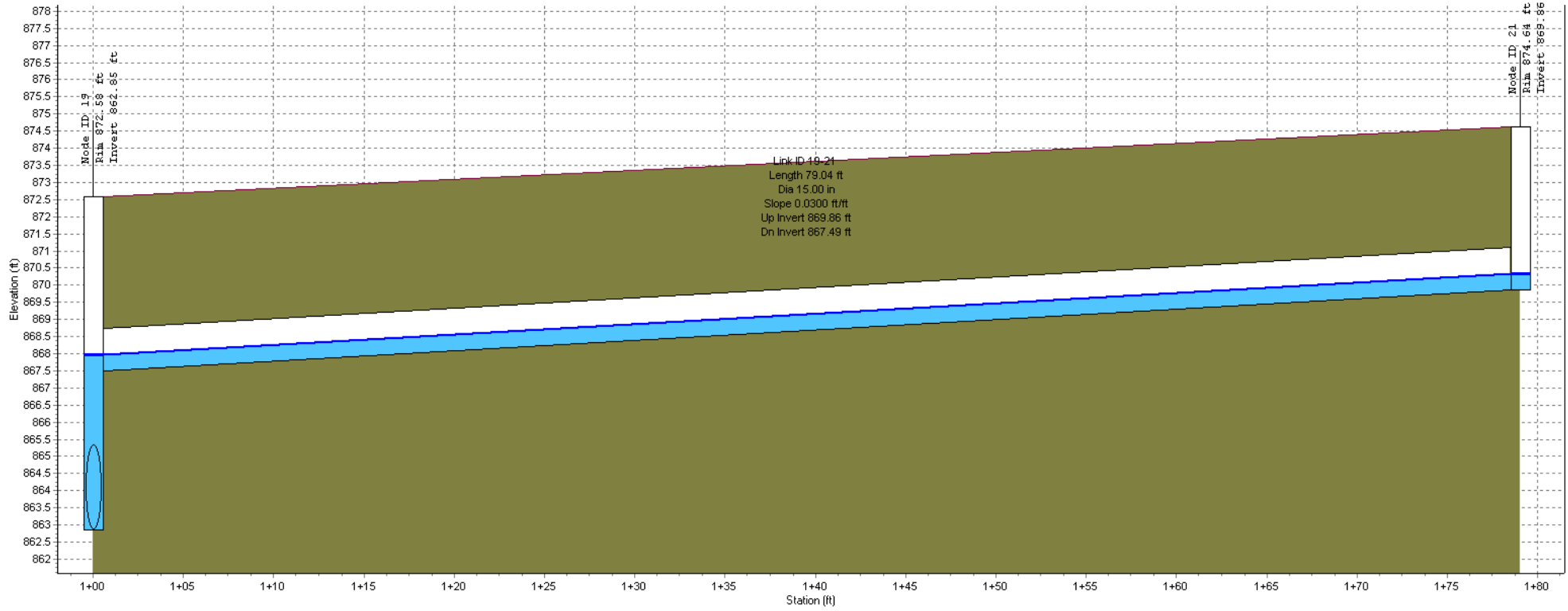
100 YEAR - 24 HOUR STORM  
CMWA LINE - 06

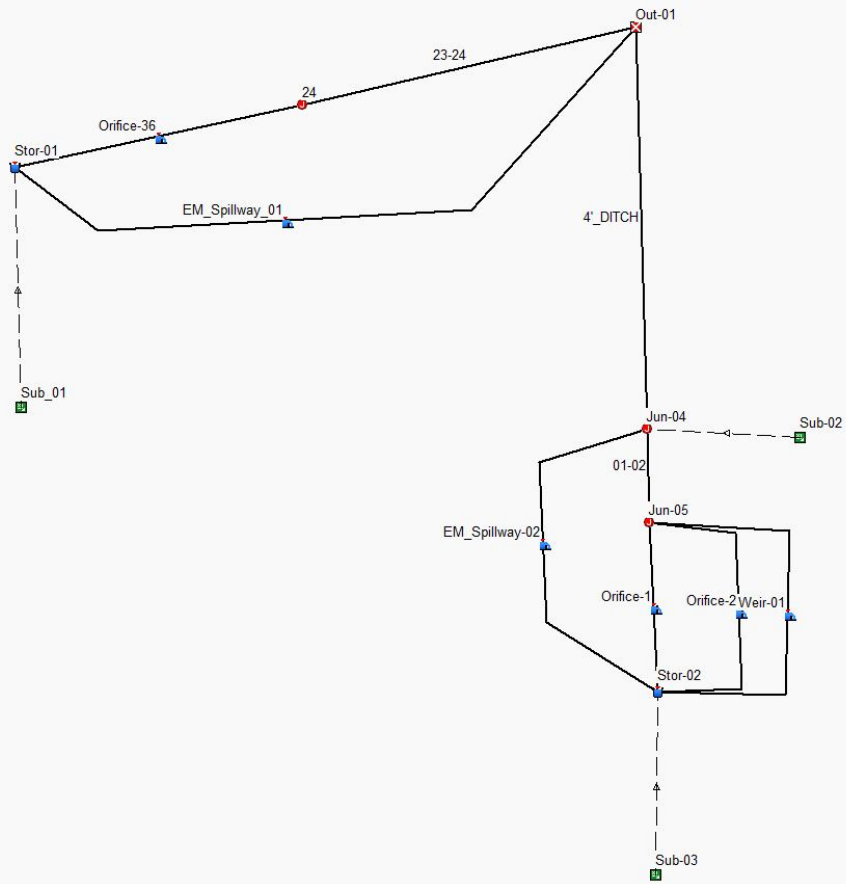


100 YEAR - 24 HOUR STORM  
 CMWA LINE - 07



100 YEAR - 24 HOUR STORM  
CMWA LINE - 08





### Project Description

POST-CONSTRUCTION

File Name ..... CMWA\_DETENTION\_POST.SPF

### Project Options

Flow Units ..... CFS  
 Elevation Type ..... Elevation  
 Hydrology Method ..... SCS TR-55  
 Time of Concentration (TOC) Method ..... SCS TR-55  
 Link Routing Method ..... Kinematic Wave  
 Enable Overflow Ponding at Nodes ..... YES  
 Skip Steady State Analysis Time Periods ... NO

### Analysis Options

Start Analysis On ..... Jun 21, 2019 00:00:00  
 End Analysis On ..... Jun 22, 2019 00:00:00  
 Start Reporting On ..... Jun 21, 2019 00:00:00  
 Antecedent Dry Days ..... 0 days  
 Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss  
 Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss  
 Reporting Time Step ..... 0 00:05:00 days hh:mm:ss  
 Routing Time Step ..... 30 seconds

### Number of Elements

Qty  
 Rain Gages ..... 3  
 Subbasins..... 3  
 Nodes..... 6  
     *Junctions* ..... 3  
     *Outfalls* ..... 1  
     *Flow Diversions* ..... 0  
     *Inlets* ..... 0  
     *Storage Nodes* ..... 2  
 Links..... 9  
     *Channels* ..... 1  
     *Pipes* ..... 2  
     *Pumps* ..... 0  
     *Orifices* ..... 3  
     *Weirs* ..... 3  
     *Outlets* ..... 0  
 Pollutants ..... 0  
 Land Uses ..... 0

### Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	100-24	Time Series	100-24	Cumulative	inches	Kentucky	Bourbon	100	6.56	SCS Type II 24-hr
2	10-24	Time Series	10-24	Cumulative	inches	Kentucky	Bourbon	10	4.27	SCS Type II 24-hr
3	25-24	Time Series	25-24	Cumulative	inches	Kentucky	Bourbon	25	5.11	SCS Type II 24-hr

### Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub_01	21.12	81.55	4.27	2.40	50.62	63.51	0 00:14:33
2	Sub-02	6.78	72.72	4.27	1.70	11.55	12.77	0 00:19:09
3	Sub-03	17.70	82.82	4.27	2.51	44.36	58.74	0 00:12:02

### Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	24	Junction	821.00	825.00	821.00	825.00	0.00	34.66	822.33	0.00	2.67	0 00:00	0.00	0.00
2	Jun-04	Junction	838.00	842.00	838.00	842.00	0.00	32.00	839.16	0.00	8.84	0 00:00	0.00	0.00
3	Jun-05	Junction	840.00	847.00	840.00	847.00	0.00	20.57	840.90	0.00	6.10	0 00:00	0.00	0.00
4	Out-01	Outfall	819.00				66.10		821.33					
5	Stor-01	Storage Node	821.00	828.00	821.00		0.00	61.04	824.30				0.00	0.00
6	Stor-02	Storage Node	840.00	850.00	840.00		0.00	58.51	846.11				0.00	0.00



### Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Reported	Surcharged Condition
				(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1 01-02	Pipe	Jun-05	Jun-04	70.63	839.90	838.00	2.6900	30.000	0.0120	20.57	74.77	0.28	13.00	0.89	0.36	0.00	Calculated
2 23-24	Pipe	24	Out-01	50.00	821.00	820.00	2.0000	30.000	0.0120	34.66	62.84	0.55	13.11	1.32	0.53	0.00	Calculated
3 4'_DITCH	Channel	Jun-04	Out-01	450.00	838.00	819.00	4.2200	24.000	0.0690	31.84	100.01	0.32	3.70	1.15	0.58	0.00	
4 Orifice-1	Orifice	Stor-02	Jun-05		840.00	840.00		18.000		20.16							
5 Orifice-2	Orifice	Stor-02	Jun-05		840.00	840.00		24.000		0.00							
6 Orifice-36	Orifice	Stor-01	24		821.00	821.00		30.000		34.66							
7 EM_Spillway_01	Weir	Stor-01	Out-01		821.00	819.00				0.00							
8 EM_Spillway-02	Weir	Stor-02	Jun-04		840.00	838.00				0.00							
9 Weir-01	Weir	Stor-02	Jun-05		840.00	840.00				0.41							

## Subbasin Hydrology

### Subbasin : Sub\_01

#### Input Data

Area (ac) ..... 21.12  
 Weighted Curve Number ..... 81.55  
 Rain Gage ID ..... 10-24

#### Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	7.06	C	98.00
Pasture, grassland, or range, Good	13.29	C	74.00
> 75% grass cover, Good	0.77	B	61.00
Composite Area & Weighted CN	21.12		81.55

#### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

Tc = Time of Concentration (hr)  
 n = Manning's roughness  
 Lf = Flow Length (ft)  
 P = 2 yr, 24 hr Rainfall (inches)  
 Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 \* (Sf<sup>0.5</sup>) (unpaved surface)  
 V = 20.3282 \* (Sf<sup>0.5</sup>) (paved surface)  
 V = 15.0 \* (Sf<sup>0.5</sup>) (grassed waterway surface)  
 V = 10.0 \* (Sf<sup>0.5</sup>) (nearly bare & untilled surface)  
 V = 9.0 \* (Sf<sup>0.5</sup>) (cultivated straight rows surface)  
 V = 7.0 \* (Sf<sup>0.5</sup>) (short grass pasture surface)  
 V = 5.0 \* (Sf<sup>0.5</sup>) (woodland surface)  
 V = 2.5 \* (Sf<sup>0.5</sup>) (forest w/heavy litter surface)  
 Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)  
 Lf = Flow Length (ft)  
 V = Velocity (ft/sec)  
 Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 \* (R<sup>2/3</sup>) \* (Sf<sup>0.5</sup>)) / n  
 R = Aq / Wp  
 Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)  
 Lf = Flow Length (ft)  
 R = Hydraulic Radius (ft)  
 Aq = Flow Area (ft<sup>2</sup>)  
 Wp = Wetted Perimeter (ft)  
 V = Velocity (ft/sec)  
 Sf = Slope (ft/ft)  
 n = Manning's roughness

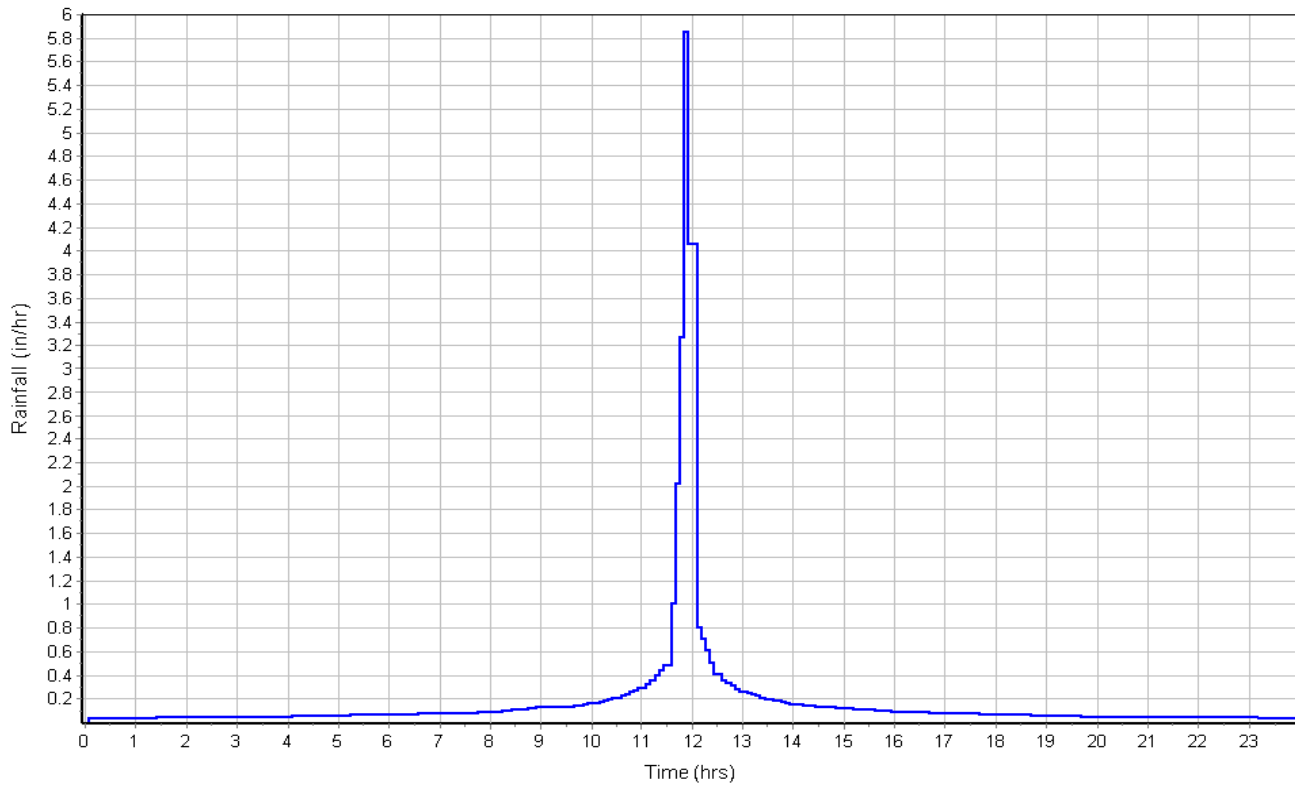
	Subarea	Subarea	Subarea
	A	B	C
<b>Sheet Flow Computations</b>			
Manning's Roughness :	.24	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	3	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.97	0.00	0.00
Velocity (ft/sec) :	0.13	0.00	0.00
Computed Flow Time (min) :	12.59	0.00	0.00
	Subarea	Subarea	Subarea
	A	B	C
<b>Shallow Concentrated Flow Computations</b>			
Flow Length (ft) :	315	0.00	0.00
Slope (%) :	10	0.00	0.00
Surface Type :			Unpaved
Velocity (ft/sec) :	4.74	0.00	0.00
Computed Flow Time (min) :	1.11	0.00	0.00
	Subarea	Subarea	Subarea
	A	B	C
<b>Channel Flow Computations</b>			
Manning's Roughness :	.03	0.00	0.00
Flow Length (ft) :	390	0.00	0.00
Channel Slope (%) :	3.33	0.00	0.00
Cross Section Area (ft <sup>2</sup> ) :	8.24	0.00	0.00
Wetted Perimeter (ft) :	10.58	0.00	0.00
Velocity (ft/sec) :	7.67	0.00	0.00
Computed Flow Time (min) :	0.85	0.00	0.00
Total TOC (min) .....	14.55		

**Subbasin Runoff Results**

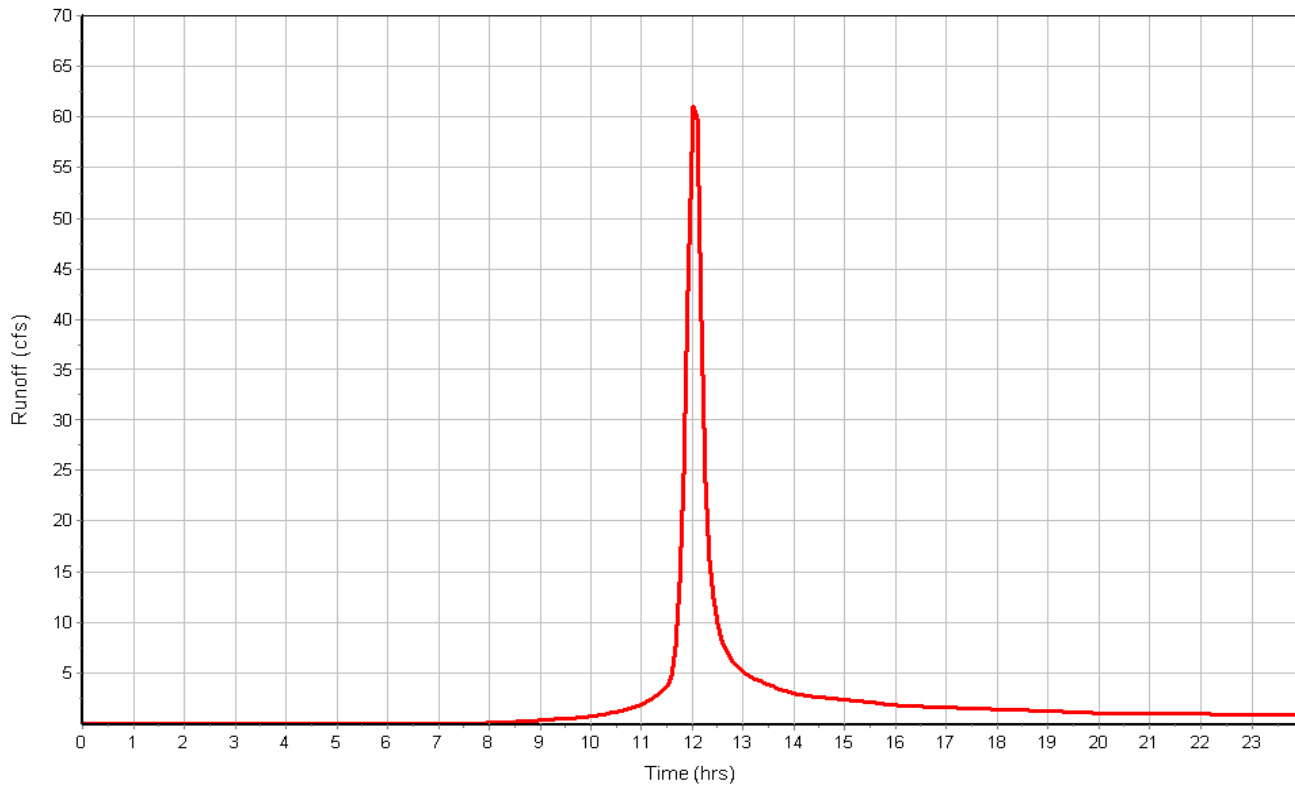
Total Rainfall (in) .....	4.27
Total Runoff (in) .....	2.40
Peak Runoff (cfs) .....	63.51
Weighted Curve Number .....	81.55
Time of Concentration (days hh:mm:ss) .....	0 00:14:33

Subbasin : Sub\_01

Rainfall Intensity Graph



Runoff Hydrograph



**Subbasin : Sub-02**

**Input Data**

Area (ac) ..... 6.78  
 Weighted Curve Number ..... 72.72  
 Rain Gage ID ..... 10-24

**Composite Curve Number**

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
> 75% grass cover, Good	6.11	C	74.00
> 75% grass cover, Good	0.67	B	61.00
Composite Area & Weighted CN	6.78		72.72

**Time of Concentration**

Sheet Flow Computations	Subarea	Subarea	Subarea
	A	B	C
Manning's Roughness :	.24	.24	0.00
Flow Length (ft) :	60	140	0.00
Slope (%) :	3	10	0.00
2 yr, 24 hr Rainfall (in) :	2.97	2.97	0.00
Velocity (ft/sec) :	0.12	0.23	0.00
Computed Flow Time (min) :	8.37	10.18	0.00

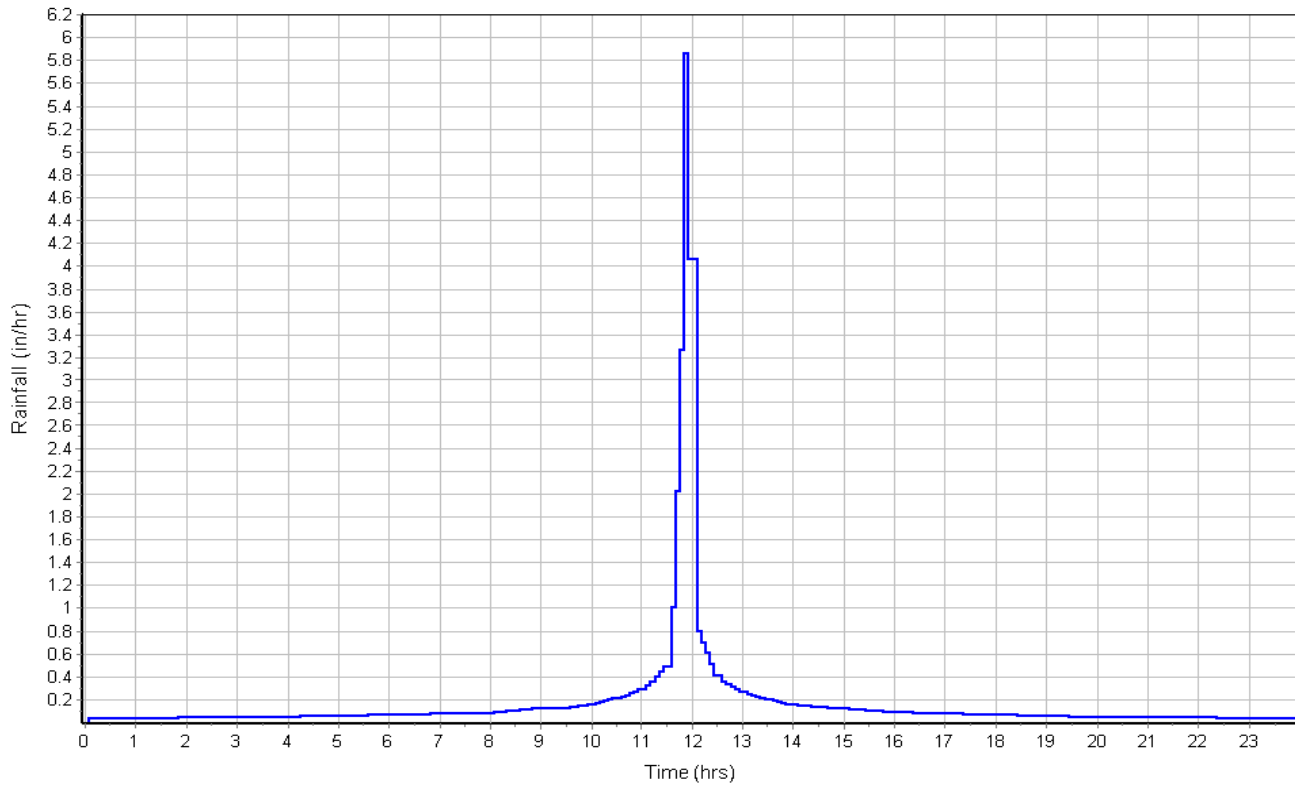
Shallow Concentrated Flow Computations	Subarea	Subarea	Subarea
	A	B	C
Flow Length (ft) :	170	0.00	0.00
Slope (%) :	10	0.00	0.00
Surface Type :		Unpaved	Unpaved
Velocity (ft/sec) :	4.74	0.00	0.00
Computed Flow Time (min) :	0.60	0.00	0.00
Total TOC (min) .....	19.15		

**Subbasin Runoff Results**

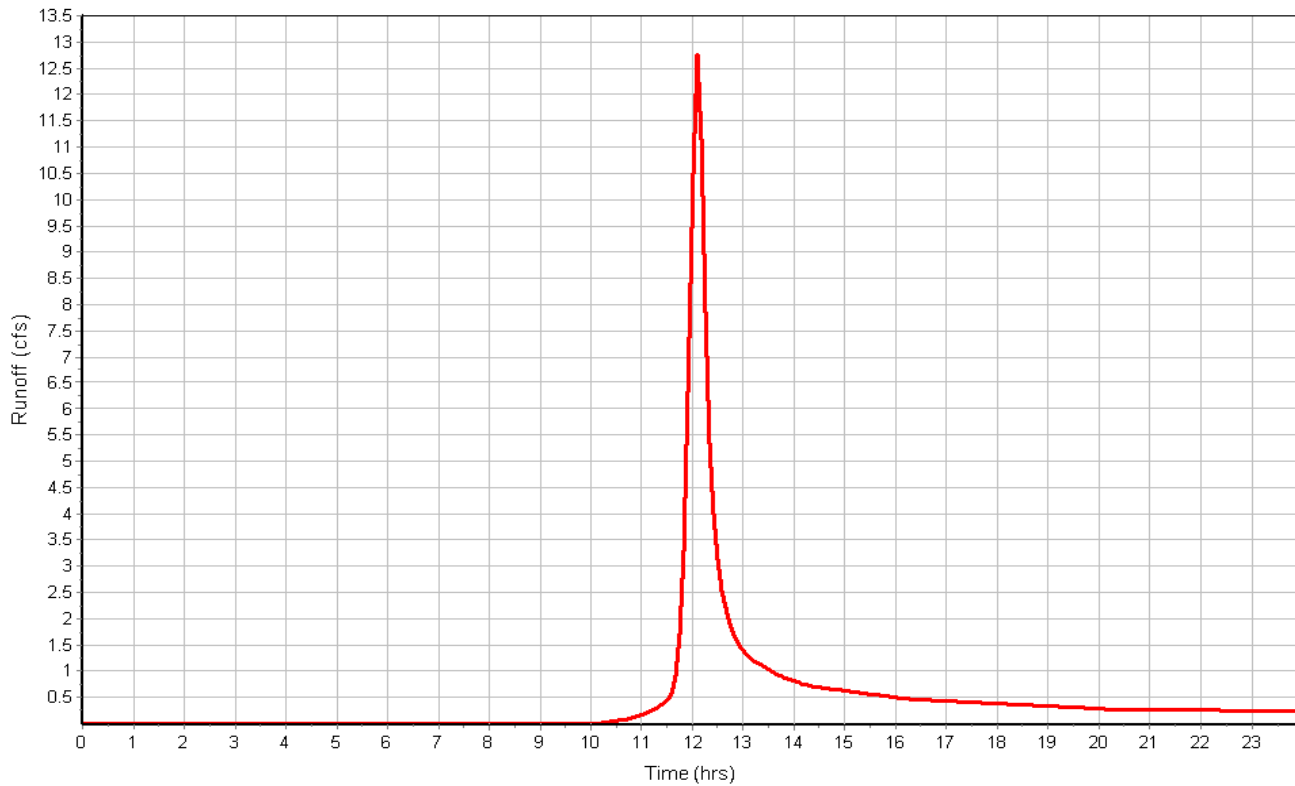
Total Rainfall (in) ..... 4.27  
 Total Runoff (in) ..... 1.70  
 Peak Runoff (cfs) ..... 12.77  
 Weighted Curve Number ..... 72.72  
 Time of Concentration (days hh:mm:ss) ..... 0 00:19:09

Subbasin : Sub-02

Rainfall Intensity Graph



Runoff Hydrograph



**Subbasin : Sub-03**

**Input Data**

Area (ac) ..... 17.70  
 Weighted Curve Number ..... 82.82  
 Rain Gage ID ..... 10-24

**Composite Curve Number**

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved parking & roofs	9.11	C	98.00
> 75% grass cover, Good	4.81	B	61.00
> 75% grass cover, Good	3.78	C	74.00
Composite Area & Weighted CN	17.70		82.82

**Time of Concentration**

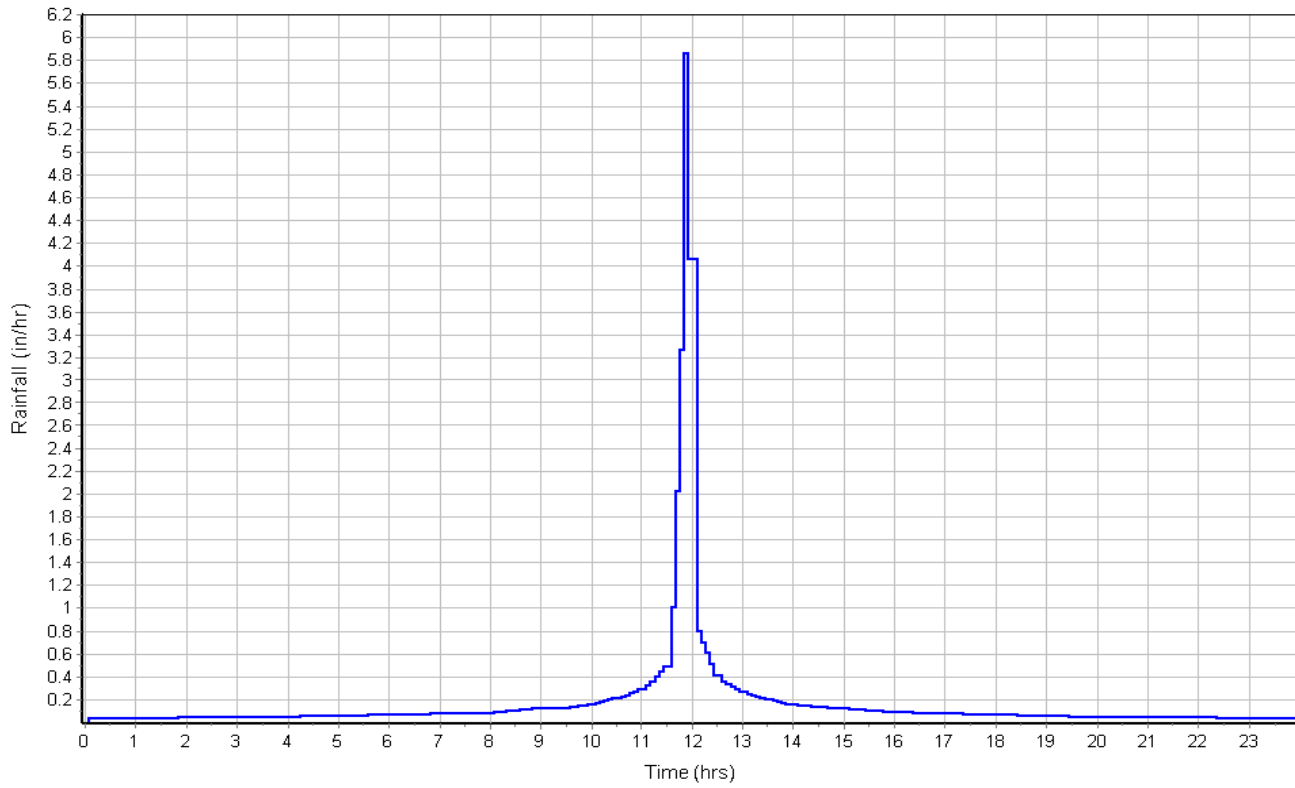
	Subarea		
	A	B	C
<b>Sheet Flow Computations</b>			
Manning's Roughness :	.24	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	4	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.97	0.00	0.00
Velocity (ft/sec) :	0.15	0.00	0.00
Computed Flow Time (min) :	11.23	0.00	0.00
<b>Shallow Concentrated Flow Computations</b>			
Flow Length (ft) :	50	0.00	0.00
Slope (%) :	25	0.00	0.00
Surface Type :		Unpaved	Unpaved
Velocity (ft/sec) :	7.50	0.00	0.00
Computed Flow Time (min) :	0.11	0.00	0.00
<b>Channel Flow Computations</b>			
Manning's Roughness :	.03	.069	0.00
Flow Length (ft) :	45	95	0.00
Channel Slope (%) :	1	9	0.00
Cross Section Area (ft <sup>2</sup> ) :	2.5	2.5	0.00
Wetted Perimeter (ft) :	5.8	6	0.00
Velocity (ft/sec) :	2.83	3.61	0.00
Computed Flow Time (min) :	0.26	0.44	0.00
Total TOC (min) .....	12.04		

**Subbasin Runoff Results**

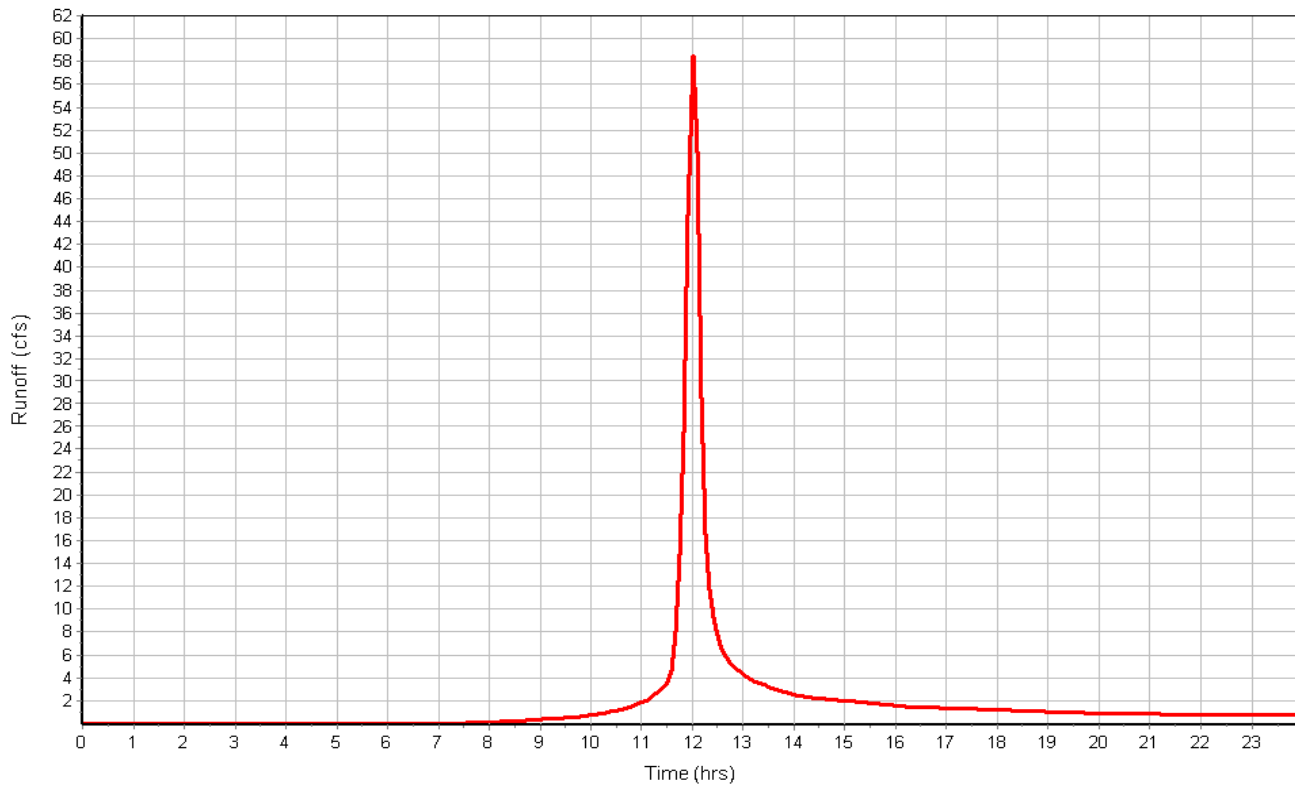
Total Rainfall (in) ..... 4.27  
 Total Runoff (in) ..... 2.51  
 Peak Runoff (cfs) ..... 58.74  
 Weighted Curve Number ..... 82.82  
 Time of Concentration (days hh:mm:ss) ..... 0 00:12:02

Subbasin : Sub-03

Rainfall Intensity Graph



Runoff Hydrograph





### Junction Input

SN Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft <sup>2</sup> )	Minimum Pipe Cover (in)
1 24	821.00	825.00	4.00	821.00	0.00	825.00	0.00	0.00	0.00
2 Jun-04	838.00	842.00	4.00	838.00	0.00	842.00	0.00	0.00	0.00
3 Jun-05	840.00	847.00	7.00	840.00	0.00	847.00	0.00	0.00	0.00

### Junction Results

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 24	34.66	0.00	822.33	1.33	0.00	2.67	821.21	0.21	0 12:17	0 00:00	0.00	0.00
2 Jun-04	32.00	12.76	839.16	1.16	0.00	8.84	838.20	0.20	0 12:10	0 00:00	0.00	0.00
3 Jun-05	20.57	0.00	840.90	0.90	0.00	6.10	840.19	0.19	0 12:18	0 00:00	0.00	0.00

### Channel Input

SN Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1 4'_DITCH	450.00	838.00	0.00	819.00	0.00	19.00	4.2200	Trapezoidal	2.000	16.000	0.0690	0.5000	0.5000	0.0000	0.00	No

### Channel Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1 4'_DITCH	31.84	0 12:12	100.01	0.32	3.70	2.03	1.15	0.58	0.00		

### Pipe Input

SN Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Pipe Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1 01-02	70.63	839.90	-0.10	838.00	0.00	1.90	2.6900	CIRCULAR	30.000	30.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
2 23-24	50.00	821.00	0.00	820.00	1.00	1.00	2.0000	CIRCULAR	30.000	30.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1

### Pipe Results

SN Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1 01-02	20.57	0 12:18	74.77	0.28	13.00	0.09	0.89	0.36	0.00		Calculated
2 23-24	34.66	0 12:17	62.84	0.55	13.11	0.06	1.32	0.53	0.00		Calculated

## Storage Nodes

### Storage Node : Stor-01

#### Input Data

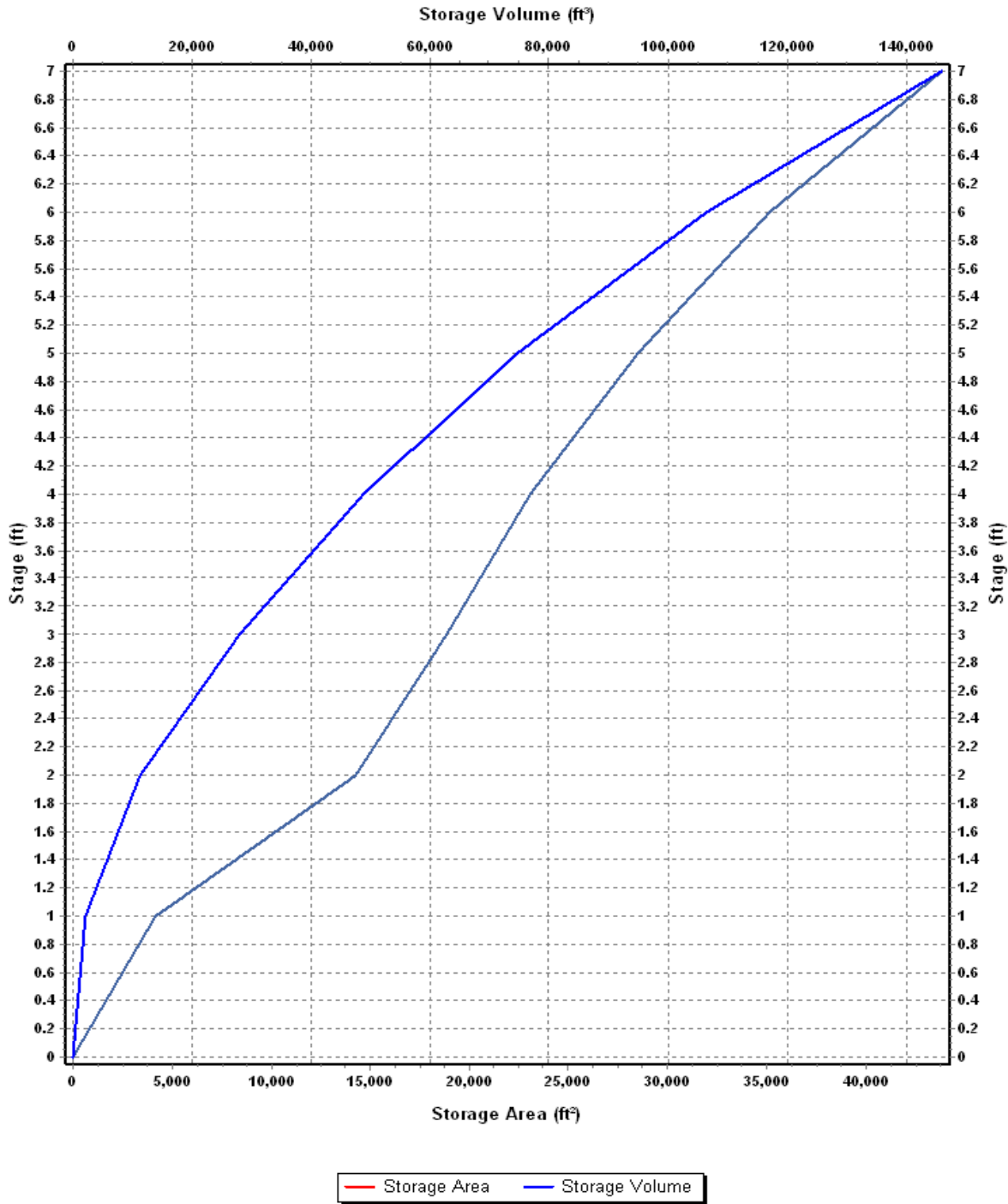
Invert Elevation (ft) ..... 821.00  
 Max (Rim) Elevation (ft) ..... 828.00  
 Max (Rim) Offset (ft) ..... 7.00  
 Initial Water Elevation (ft) ..... 821.00  
 Initial Water Depth (ft) ..... 0.00  
 Ponded Area (ft<sup>2</sup>) ..... 0.00  
 Evaporation Loss ..... 0.00

#### Storage Area Volume Curves

Storage Curve : BASIN\_01

Stage (ft)	Storage Area (ft <sup>2</sup> )	Storage Volume (ft <sup>3</sup> )
0	10	0.000
1	4200	2105.00
2	14260	11335.00
3	18860	27895.00
4	23080	48865.00
5	28500	74655.00
6	35120	106465.00
7	43830	145940.00

### Storage Area Volume Curves





**Storage Node : Stor-01 (continued)**

**Outflow Weirs**

SN Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1 EM_Spillway_01	Trapezoidal	No	826.00	5.00	10.00	2.00	3.33

**Outflow Orifices**

SN Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1 Orifice-36	Side	CIRCULAR	No	30.00			821.00	0.61

**Output Summary Results**

Peak Inflow (cfs)	61.04
Peak Lateral Inflow (cfs)	61.04
Peak Outflow (cfs)	34.66
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	824.30
Max HGL Depth Attained (ft)	3.3
Average HGL Elevation Attained (ft)	821.33
Average HGL Depth Attained (ft)	0.33
Time of Max HGL Occurrence (days hh:mm)	0 12:17
Total Exfiltration Volume (1000-ft <sup>3</sup> )	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

**Storage Node : Stor-02**

**Input Data**

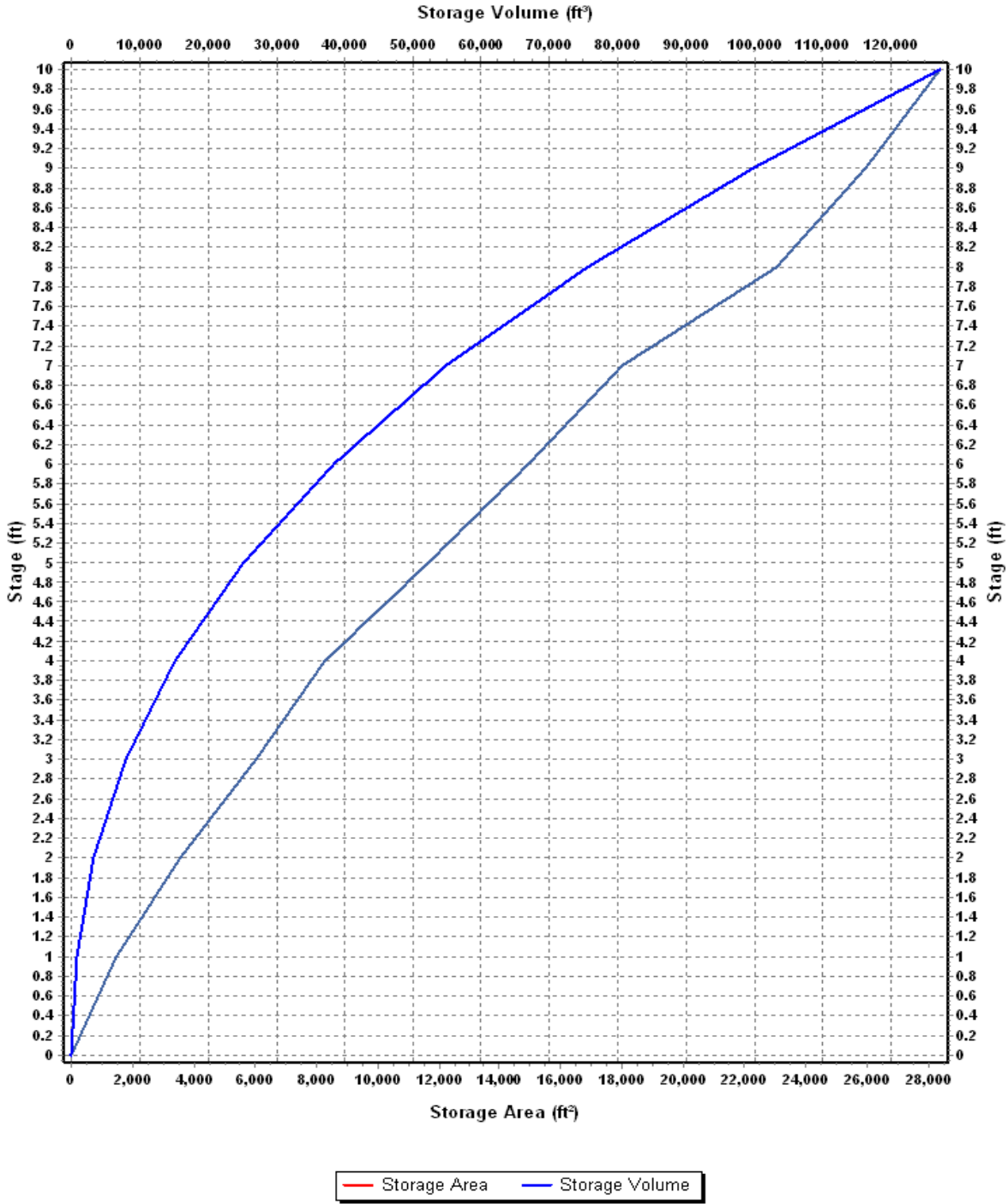
Invert Elevation (ft) ..... 840.00  
 Max (Rim) Elevation (ft) ..... 850.00  
 Max (Rim) Offset (ft) ..... 10.00  
 Initial Water Elevation (ft) ..... 840.00  
 Initial Water Depth (ft) ..... 0.00  
 Poned Area (ft<sup>2</sup>) ..... 0.00  
 Evaporation Loss ..... 0.00

**Storage Area Volume Curves**

Storage Curve : BASIN\_02

Stage (ft)	Storage Area (ft <sup>2</sup> )	Storage Volume (ft <sup>3</sup> )
0	0	0.000
1	1447	723.50
2	3570	3232.00
3	6027	8030.50
4	8287	15187.50
5	11631	25146.50
6	14938	38431.00
7	18009	54904.50
8	23054	75436.00
9	25946	99936.00
10	28378	127098.00

### Storage Area Volume Curves



**Storage Node : Stor-02 (continued)**

**Outflow Weirs**

SN Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1 EM_Spillway-02	Trapezoidal	No	848.00	8.00	11.00	2.00	3.33
2 Weir-01	Rectangular	No	846.00	6.00	3.50	1.00	3.33

**Outflow Orifices**

SN Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1 Orifice-1	Side	CIRCULAR	No	18.00			840.00	0.61
2 Orifice-2	Bottom	Rectangular	No		24.00	24.00	847.00	0.63

**Output Summary Results**

Peak Inflow (cfs) .....	58.51
Peak Lateral Inflow (cfs) .....	58.51
Peak Outflow (cfs) .....	20.57
Peak Exfiltration Flow Rate (cfm) .....	0.00
Max HGL Elevation Attained (ft) .....	846.11
Max HGL Depth Attained (ft) .....	6.11
Average HGL Elevation Attained (ft) .....	840.56
Average HGL Depth Attained (ft) .....	0.56
Time of Max HGL Occurrence (days hh:mm) .....	0 12:18
Total Exfiltration Volume (1000-ft³) .....	0.000
Total Flooded Volume (ac-in) .....	0
Total Time Flooded (min) .....	0
Total Retention Time (sec) .....	0.00

### Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub_01	21.12	81.55	5.11	3.14	66.21	82.66	0 00:14:33
2	Sub-02	6.78	72.72	5.11	2.34	15.89	17.75	0 00:19:09
3	Sub-03	17.70	82.82	5.11	3.26	57.63	75.83	0 00:12:02

### Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	24	Junction	821.00	825.00	821.00	825.00	0.00	40.36	822.46	0.00	2.54	0 00:00	0.00	0.00
2	Jun-04	Junction	838.00	842.00	838.00	842.00	0.00	47.07	839.40	0.00	8.60	0 00:00	0.00	0.00
3	Jun-05	Junction	840.00	847.00	840.00	847.00	0.00	32.04	841.14	0.00	5.86	0 00:00	0.00	0.00
4	Out-01	Outfall	819.00					87.17	821.46					
5	Stor-01	Storage Node	821.00	828.00	821.00		0.00	79.94	825.04				0.00	0.00
6	Stor-02	Storage Node	840.00	850.00	840.00		0.00	75.61	846.93				0.00	0.00

### Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Reported	Surcharged Condition
				(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1 01-02	Pipe	Jun-05	Jun-04	70.63	839.90	838.00	2.6900	30.000	0.0120	32.05	74.77	0.43	14.65	1.14	0.46	0.00	Calculated
2 23-24	Pipe	24	Out-01	50.00	821.00	820.00	2.0000	30.000	0.0120	40.37	62.84	0.64	13.58	1.45	0.58	0.00	Calculated
3 4'_DITCH	Channel	Jun-04	Out-01	450.00	838.00	819.00	4.2200	24.000	0.0690	47.01	100.01	0.47	4.12	1.40	0.70	0.00	
4 Orifice-1	Orifice	Stor-02	Jun-05		840.00	840.00		18.000		21.64							
5 Orifice-2	Orifice	Stor-02	Jun-05		840.00	840.00		24.000		0.00							
6 Orifice-36	Orifice	Stor-01	24		821.00	821.00		30.000		40.36							
7 EM_Spillway_01	Weir	Stor-01	Out-01		821.00	819.00				0.00							
8 EM_Spillway-02	Weir	Stor-02	Jun-04		840.00	838.00				0.00							
9 Weir-01	Weir	Stor-02	Jun-05		840.00	840.00				10.40							

### Junction Results

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 24	40.36	0.00	822.46	1.46	0.00	2.54	821.25	0.25	0 12:18	0 00:00	0.00	0.00
2 Jun-04	47.07	17.75	839.40	1.40	0.00	8.60	838.23	0.23	0 12:14	0 00:00	0.00	0.00
3 Jun-05	32.04	0.00	841.14	1.14	0.00	5.86	840.22	0.22	0 12:17	0 00:00	0.00	0.00



### Channel Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1 4'_DITCH	47.01	0 12:15	100.01	0.47	4.12	1.82	1.40	0.70	0.00		

### Pipe Results

SN Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1 01-02	32.05	0 12:16	74.77	0.43	14.65	0.08	1.14	0.46	0.00		Calculated
2 23-24	40.37	0 12:18	62.84	0.64	13.58	0.06	1.45	0.58	0.00		Calculated

## Storage Nodes

### Storage Node : Stor-01

#### Output Summary Results

Peak Inflow (cfs) .....	79.94
Peak Lateral Inflow (cfs) .....	79.94
Peak Outflow (cfs) .....	40.36
Peak Exfiltration Flow Rate (cfm) .....	0.00
Max HGL Elevation Attained (ft) .....	825.04
Max HGL Depth Attained (ft) .....	4.04
Average HGL Elevation Attained (ft) .....	821.41
Average HGL Depth Attained (ft) .....	0.41
Time of Max HGL Occurrence (days hh:mm) .....	0 12:18
Total Exfiltration Volume (1000-ft <sup>3</sup> ) .....	0.000
Total Flooded Volume (ac-in) .....	0
Total Time Flooded (min) .....	0
Total Retention Time (sec) .....	0.00

**Storage Node : Stor-02**

**Output Summary Results**

Peak Inflow (cfs) .....	75.61
Peak Lateral Inflow (cfs) .....	75.61
Peak Outflow (cfs) .....	32.04
Peak Exfiltration Flow Rate (cfm) .....	0.00
Max HGL Elevation Attained (ft) .....	846.93
Max HGL Depth Attained (ft) .....	6.93
Average HGL Elevation Attained (ft) .....	840.68
Average HGL Depth Attained (ft) .....	0.68
Time of Max HGL Occurrence (days hh:mm) .....	0 12:17
Total Exfiltration Volume (1000-ft³) .....	0.000
Total Flooded Volume (ac-in) .....	0
Total Time Flooded (min) .....	0
Total Retention Time (sec) .....	0.00

### Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub_01	21.12	81.55	6.56	4.46	94.13	116.24	0 00:14:33
2	Sub-02	6.78	72.72	6.56	3.53	23.93	26.86	0 00:19:09
3	Sub-03	17.70	82.82	6.56	4.59	81.31	105.58	0 00:12:02

### Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	24	Junction	821.00	825.00	821.00	825.00	0.00	47.99	822.64	0.00	2.36	0 00:00	0.00	0.00
2	Jun-04	Junction	838.00	842.00	838.00	842.00	0.00	84.56	839.85	0.00	8.15	0 00:00	0.00	0.00
3	Jun-05	Junction	840.00	847.00	840.00	847.00	0.00	60.00	841.70	0.00	5.30	0 00:00	0.00	0.00
4	Out-01	Outfall	819.00				132.50		821.64					
5	Stor-01	Storage Node	821.00	828.00	821.00		0.00	113.13	826.19				0.00	0.00
6	Stor-02	Storage Node	840.00	850.00	840.00		0.00	105.52	847.81				0.00	0.00

### Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Reported	Surcharged Condition
				(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1 01-02	Pipe	Jun-05	Jun-04	70.63	839.90	838.00	2.6900	30.000	0.0120	59.99	74.77	0.80	16.93	1.69	0.68	0.00	Calculated
2 23-24	Pipe	24	Out-01	50.00	821.00	820.00	2.0000	30.000	0.0120	47.99	62.84	0.76	14.10	1.64	0.65	0.00	Calculated
3 4'_DITCH	Channel	Jun-04	Out-01	450.00	838.00	819.00	4.2200	24.000	0.0690	84.24	100.01	0.84	4.80	1.84	0.92	0.00	
4 Orifice-1	Orifice	Stor-02	Jun-05		840.00	840.00		18.000		23.13							
5 Orifice-2	Orifice	Stor-02	Jun-05		840.00	840.00		24.000		18.04							
6 Orifice-36	Orifice	Stor-01	24		821.00	821.00		30.000		47.99							
7 EM_Spillway_01	Weir	Stor-01	Out-01		821.00	819.00				2.80							
8 EM_Spillway-02	Weir	Stor-02	Jun-04		840.00	838.00				0.00							
9 Weir-01	Weir	Stor-02	Jun-05		840.00	840.00				18.83							

### Junction Results

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 24	47.99	0.00	822.64	1.64	0.00	2.36	821.30	0.30	0 12:19	0 00:00	0.00	0.00
2 Jun-04	84.56	26.84	839.85	1.85	0.00	8.15	838.29	0.29	0 12:12	0 00:00	0.00	0.00
3 Jun-05	60.00	0.00	841.70	1.70	0.00	5.30	840.26	0.26	0 12:14	0 00:00	0.00	0.00



### Channel Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1 4'_DITCH	84.24	0 12:13	100.01	0.84	4.80	1.56	1.84	0.92	0.00		

### Pipe Results

SN Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1 01-02	59.99	0 12:14	74.77	0.80	16.93	0.07	1.69	0.68	0.00		Calculated
2 23-24	47.99	0 12:19	62.84	0.76	14.10	0.06	1.64	0.65	0.00		Calculated

## Storage Nodes

### Storage Node : Stor-01

#### Output Summary Results

Peak Inflow (cfs) .....	113.13
Peak Lateral Inflow (cfs) .....	113.13
Peak Outflow (cfs) .....	50.79
Peak Exfiltration Flow Rate (cfm) .....	0.00
Max HGL Elevation Attained (ft) .....	826.19
Max HGL Depth Attained (ft) .....	5.19
Average HGL Elevation Attained (ft) .....	821.55
Average HGL Depth Attained (ft) .....	0.55
Time of Max HGL Occurrence (days hh:mm) .....	0 12:19
Total Exfiltration Volume (1000-ft <sup>3</sup> ) .....	0.000
Total Flooded Volume (ac-in) .....	0
Total Time Flooded (min) .....	0
Total Retention Time (sec) .....	0.00

**Storage Node : Stor-02**

**Output Summary Results**

Peak Inflow (cfs) .....	105.52
Peak Lateral Inflow (cfs) .....	105.52
Peak Outflow (cfs) .....	60.00
Peak Exfiltration Flow Rate (cfm) .....	0.00
Max HGL Elevation Attained (ft) .....	847.81
Max HGL Depth Attained (ft) .....	7.81
Average HGL Elevation Attained (ft) .....	840.85
Average HGL Depth Attained (ft) .....	0.85
Time of Max HGL Occurrence (days hh:mm) .....	0 12:14
Total Exfiltration Volume (1000-ft³) .....	0.000
Total Flooded Volume (ac-in) .....	0
Total Time Flooded (min) .....	0
Total Retention Time (sec) .....	0.00