December 18, 2014

Mr. Andrew Altevogt
Assistant Executive Officer
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive #200
Rancho Cordova, CA 95670

Subject: Submittal #2 (Water Balance) in Response to California Water Code 13267 Order to Submit Technical Reports, Recology Yuba Sutter, Yuba County

Dear Mr. Altevogt:

Please find enclosed a report from Golder Associates addressing Item f of the Section 13267 Order issued by Central Valley Regional Quality Control Board staff on December 9, 2014 for the Feather River Organics (FRO) composting facility in Marysville, California. Recology takes this matter very seriously. As you know, we have mobilized a large team of people to work on the matter and we have undertaken considerable efforts to fix the situation and vastly improve the site's compost water containment, collection and conveyance system.

The attached Golder report supplements our December 16th response to the referenced December 9, 2014 Order. The Golder report provides a revised water balance calculation for the 25-year, 24-hour storm event and an assessment of the capacity of the site's newly completed and modified compost stormwater collection system. Coupled with our December 16, 2014 submittal, the attached report completes Recology's response to the December 9th Order.

Recology has made a good faith effort to meet the applicable requirements for managing the compost water at the FRO site, and following the December 3rd storm event, Recology undertook substantial steps to improve the collection system. We also made sure we were in regular contact with Regional Board staff to keep them apprised of site activities and improvements since that storm.

Recology and its engineers have worked hard and in consultation with Regional Board staff, and have used the experience, knowledge and data gained from each storm event, to make the system work better. Since the storm event on December 3rd, Recology has submitted invoices and receipts documenting over $180,000 in expenditures in equipment, supplies and repairs (excluding engineering, consulting and internal costs as well as ongoing labor, supply and maintenance costs). The set of system improvements includes the following:

1. System capacity has been increased with 39 storage tanks now on site, with a total capacity of 819,000 gallons
2. Inflow piping and inlets have been improved
3. Additional plumbing also has been installed to facilitate the transfer of liquids among the tanks
4. Sand bags, wattles, hay bales, etc. are in use to better control runoff, sediment, erosion
5. Site personnel worked quickly and diligently to remove liquids from the Hog Farm after the overflow conditions that occurred on December 3rd
6. As protective measure a temporary geomembrane-lined basin was installed to capture and contain any overflows during subsequent rain events
7. Site staff worked through the night during the storm of December 11-12 and their work proved vital to containing the flows in a very powerful storm that exceeded the 25-year, 24-hour design event.

Recology remains committed to working with the Regional Board in a collaborative and cooperative manner to resolve this matter.

As per the Regional Board's direction on a paperless office, all documents are being uploaded to the Geotracker website. Please feel free to call me or Phil Graham at (530) 743-6321 with questions. Thank you for your time and consideration.

Sincerely,

Drew Lehman
Director, Environment and Planning

Attachment

cc: Mayumi Okamoto, State Water Resources Control Board
Wendy Wyels, Central Valley Regional Water Quality Control Board
Paul Donoho, Yuba County Local Enforcement Agency
Tim Daleiden, Phil Graham, Paul Yamamoto, Dave Vaughn, Recology
Ken Haskell, Golder Associates
Marc Bruner, Perkins Coie

December 18, 2014 Project No. 1301525

Mr. Phil Graham
Recology Yuba Sutter
3001 North Levee Road
Marysville, CA 95901

RE: SUPPLEMENTAL TECHNICAL REPORT FOR WATER CODE ORDER 13267 FOR THE FEATHER RIVER ORGANICS COMPOSTING OPERATION, RECOLOGY YUBA SUTTER FACILITY, MARYSVILLE, CALIFORNIA

Dear Mr. Graham:

Golder Associates (Golder) Inc. is submitting this report to supplement the submittals by Recology and Golder on December 16, 2014 responding to the Water Code 13267 Order issued by Central Valley Regional Water Quality Control Board staff for the Feather River Organics (FRO) Compost Facility in Marysville, California. Specifically, this report responds to Item f of the December 9 Order, which requires: "A revised water balance calculation and run-off model calibrated from the 3 December 2014 event. The water balance shall be prepared by, or under the supervision of, a California Registered Engineer, and signed/stamped by the registered engineer. The water balance shall include a run-off model based on the 25-year, 24-hour precipitation event of 3.14 inches. Recalculated run-off volumes shall be compared to on-site storage capability on 3 December 2014, and to on-site storage capacity as of 9 December 2014."

1.0 REVISED WATER BALANCE CALCULATIONS

Golder revised the water balance calculations by reviewing all of the precipitation and flow meter data collected by FRO personnel for the compost stormwater runoff collection system up to, during, and immediately following the December 3, 2014 event.

1.1 Model Calibration

As explained in Golder's December 16, 2014 report, a set of issues contributed to an overflow of the tank storage system that occurred at the FRO site on December 3, 2014. Golder reviewed the data from the flow meters but has concluded that several factors prevented the flow meters from the sumps and vaults to the tanks from providing an accurate estimate of compost stormwater run-off volumes for the December 3 rain event. First, overflow water was initially contained on the compost pad surface and conveyed back to the sumps and vaults, where the water was again pumped through the system. For example, the combined pumping volumes from the north vaults on December 3rd and 4th were approximately twice the total precipitation volume that fell on the portion of the compost pad that drained to the vaults which shows the recirculation of storm water through the system. In addition, as explained in our December 16 report, there was an overflow of compost water to the Hog Farm on the order of 17,000 to 25,000 gallons which was not captured by the flow meters on December 3rd. This water was subsequently pumped back to the tanks on December 5, 2014.

Due to the fact that the flow meters from the vaults and sumps to the storage tanks did not provide an accurate estimate of runoff during the December 3 rain event, Golder reviewed the precipitation data and flow meter data for the rainfall events prior to, during and immediately following the December 3, 2014 event. Additionally, a 3.45-inch, 24-hour storm event occurred at the site on December 11, 2014 has been analyzed and provides additional insight based on the reported performance of the upgraded stormwater collection system. Specific data used to calibrate the compost stormwater run-off model includes the following:

Golder Associates Inc.
1000 Enterprise Way, Suite 190
Roseville, CA 95678 USA
Tel: (916) 786-2424 Fax: (916) 786-2434 www.golder.com

- Prior to December 3, 2014, comparison of pumped compost water as a function of precipitation depth indicates that approximately 40 to 50 percent of the precipitation was pumped to the storage tanks on the north side of the compost operations and approximately 40 to 75 percent of precipitation was pumped to storage tanks for the south side of the compost operations. Tables A1 and A2 summarize the data used for this comparison. When significant pumping occurred the day following a precipitation event, or if there were multiple days of precipitation greater than 0.1 inch, the cumulative pumping rates were compared to the cumulative precipitation totals over these time periods. This appears to provide a more complete estimate of the total stormwater run-off.
- Although the pumping volumes to the storage tanks do not provide an accurate record of the run-off specifically for December 3, 2014, review of the total outflows through pumping to the POTW and J-stands provides a useful comparison. This outflow pumping occurred between December 3, 2014 and December 5, 2014, which totals 480,652 gallons. An additional 17,000 to 25,000 gallons of estimated water that overflowed to the Hog Farm is added to these recorded flow meter volumes to estimate the total run-off volume.
- The December 11, 2014 event (3.45-inches in 24 hours) resulted in a peak run-off flow to the north vaults that exceeded the pumping capacity of the electric pumps (800 gpm) and one diesel-driven, 6-inch pump with a pumping capacity estimated to be approximately 700 to 1,000 gpm. However, once the second back-up pump (also diesel-driven, 6-inch pump) was turned on, the pumping capacity exceeded the inflows. Therefore the peak run-off flow to the north vaults is estimated to be between 1,500 gpm and 2,800 gpm for this event.
- The December 11, 2014 event (3.45-inches in 24 hours) resulted in a peak run-off flow to the south area sumps that that was within the pumping capacity of the pumps that were in place (estimated to be between 500 and 700 gpm for each sump).

For an initial evaluation, the percent run-off for the precipitation events prior to December 3, 2014 were compared to run-off estimates provided by Figure 2-1 of the TR-55 manual (Urban Hydrology for Small Watersheds, Technical Release 55) to back-calculate an average Curve Number (CN) for the compost pad areas. In addition, the total precipitation for December 3, 2014 through December 5, 2014 (2.2 inches) was compared to the minimum run-off estimate of 498,000 to 506,000 gallons. As shown in Figures A1 and A2 (Attachment 1), the back-calculated values suggest that the average CN value is approximately 92 for the north side of the compost pad and approximately 95 for the south side of the compost pad.

The EPA Storm Water Management Model (SWMM) model was then was then used to check the total compost run-off volumes for the combined storm event that occurred on December 3, 2014 (1.83 inches) and December 4, 2014 (0.37 inches). Actual recorded hourly site precipitation was input into the model. Using a CN value of 92 for the north area and a CN value of 95 for the south area results in predicted run-off volume of 490,500 gallons, which compares closely to estimated volume of 498,000 gallons to 506,000 gallons based on the pumped outflows from December 3, 2014 through December 5, 2014 and the addition of water pumped from the Hog Farm on December 5, 2014.

The EPA SWMM model was also used to model the December 11, 2014 event (3.45-inches per 24, hours) using actual recorded hourly site precipitation data and a CN value of 92 for the north area and a CN value of 95 for the south area. This resulted in predicted peak run-off flow of approximately 1500 gpm for the north vaults, which is at the lower range of the maximum estimated pumping capacity of approximately 1,500 gpm at the time of the overflow to the geomembrane-lined basin in the Hog Farm was observed (i.e. prior to the operation of the second 6-inch diesel driven pump). Similarly, predicted peak run-off flow to the south sumps were well within the estimated pumping capacity of 500 to 700 gpm for each sump. These analyses also support the above assumed CN values are providing predicted peak run-off similar to that observed for a storm event that exceeded the design event of 3.16-inches in a 24-hour period.

A difference in the estimated CN values for the north and south sides can be explained by the different types and quantities of materials in each area. The north side of the pad primarily contains the active compost windrows, which likely retains and attenuates more precipitation than the unprocessed greenwaste piles that are primarily located on the south side of the compost facility. In addition, the south side of the compost operations has a larger proportion of the compost pad that is not covered with any material.

1.2 Revised Design Stormwater Balance

The computer program TR-55 was used to recalculate the estimated compost water stormwater run-off for a 3.16-inch, 24-hour storm event using an average CN value of 92 for the north side of the compost pad and an average CN value of 95 for the south side. This model's results (Attachment 3) indicate that the total run-off for the 3.16-inch, 24-hour mandated design storm event requires management through a combination of storage and pumping to the POTW of approximately 747,000 gallons.

1.3 Observed Performance of the Upgraded Stormwater Collection System

Golder's December 16, 2014 Technical Report identifies the numerous upgrades to the compost water collection system following the December 3, 2014 storm event. On December 11, 2014, precipitation totaling 3.45 inches in a 24-hour period occurred on December 11, 2014 (approximately 4:00 a.m. on December 11, 2014 to 4:00 a.m. December 12, 2014) based on FRO's precipitation gauge. This storm event provided a significant test to the upgraded system. In general, FRO was able to manage all of the stormwater within the primary containment system with the following exceptions:

- An overflow occurred from the north vault to an adjacent geomembrane lined basin occurred at approximately 10:00 a.m. on December 11, 2014 until the second 6-inch, diesel driven pump was turned on. The volume of the water overflow to the geomembrane-lined secondary containment basin was estimated by FRO to be approximately 15,000 gallons, all of which was pumped back to the storage tanks by 5 p.m. that same day.
- At approximately 3:00 a.m. on December 12, 2014, the capacity of the north tanks was exceeded resulting in overflow of the northern tanks. The overflow was contained on the compost pad and conveyed back to the storage tanks. At this point in the storm, the precipitation total was approximately 3.39 inches.
- At 3:25 a.m. on December 12, 2014, the capacity of the north vaults was exceeded. This resulted in overflow to the geomembrane-lined secondary containment basin that was estimated by FRO to be approximately 5,000 gallons. This water was also pumped back to the storage tanks shortly after overrunning the vault.

In summary, despite the storm event exceeding the 3.16-inch storm, the upgrades to collection system by FRO were able to contain the compost stormwater run-off in the storage tanks, on the compost pad, and, for short periods of time, within a geomembrane lined basin in the Hog Farm. These measures were able to prevent overflow to areas outside of the containment system and the geomembrane-lined secondary containment basin.

These observations indicate that the pumping and storage capacity of the FRO compost stormwater runoff containment system on December 11, 2014 and December 12, 2014 are capable of managing the compost run-off occurring during a 3.16-inch, 24-hour storm event.

1.4 Comparison to the Storage Capacity on December 3, 2014 and December 9, 2015

This section of the report compares the recalculated run-off volumes to the on-site storage capability on 3 December 2014, and to on-site storage capacity as of 9 December 2014 as required by the December 9, 2014 Water Code 13267 Order.

On December 3, 2015, the capacity of the storage tanks was approximately 252,000 gallons. In addition, approximately 160,000 gallons was pumped to the POTW for a total volume capacity of approximately 412,000 gallons. This volume is approximately 335,000 gallons less than the recalculated design capacity estimated in Section 1.2 for the 3.16-inch, 24-hour storm event.

On December 9, 2015, FRO had a total of 30 tanks on site with a total capacity of 630,000 gallons. Records show that 120,000 gallons was pumped to the POTW on December 11, 2014, which results in a minimum volume capacity of approximately 750,000 gallons. This volume is approximately the same as the recalculated design capacity in Section 1.2.

On December 10, 2015, FRO had a total of 32 tanks on site with a total capacity of 672,000 gallons. Based on the 120,000 gallons pumped to the POTW on December 11, 2014, the FRO had a minimum volume capacity of approximately 792,000 gallons. This results in a minimum volume capacity of approximately 750,000 gallons. This volume meets the recalculated design capacity in Section 1.2.

As of December 12, 2015, FRO had a total of 39 tanks on site with a total capacity of 819,000 gals. This storage volume alone exceeds the recalculated design capacity in Section 1.2 by 72,000 gallons. Additional pumping to the POTW and J-stands provides even more additional management capacity.

2.0 CLOSURE

The analyses presented in this report represent Golder's current assessment of the compost water collection system based on available precipitation data, flow meter data, and additional stormwater modeling. The scope of the analyses presented herein is consistent with the time constraints to review and analyze the available data. The back-analyzed CN values appear to correlate well to the available data as analyzed in this report, and therefore, the predicted run-off for the design storm event of 3.16-inches in a 24-hour period is believed to provide a reasonable design basis for the FRO compost operation. Golder's findings may be revised as appropriate based on further review of the available data.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

If you have any questions, please contact us.

Sincerely,

GOLDER ASSOCIATES INC.

Joel Kelsey
Project Engineer

Kenneth G. Haskell, P.E.
Principal/ Sr. Practice Leader

REGISTERED PROFESSIONAL ENGINEER
KENNETH G. HASKELL
No. C053290
Exp. 6/30/15
CIVIL
STATE OF CALIFORNIA

Attachment 1 – Pumping Volumes and Precipitation Data
Attachment 2 – Calibration Compost Water Run-off Analyses
Attachment 3 – Compost Water Run-off Analyses for a 3.16-inch, 24-hr Storm Event

ATTACHMENT 1
PUMPING VOLUMES AND PRECIPITATION DATA

Table A1 - Flow Meter Data For Pumping Water to the Storage Tanks

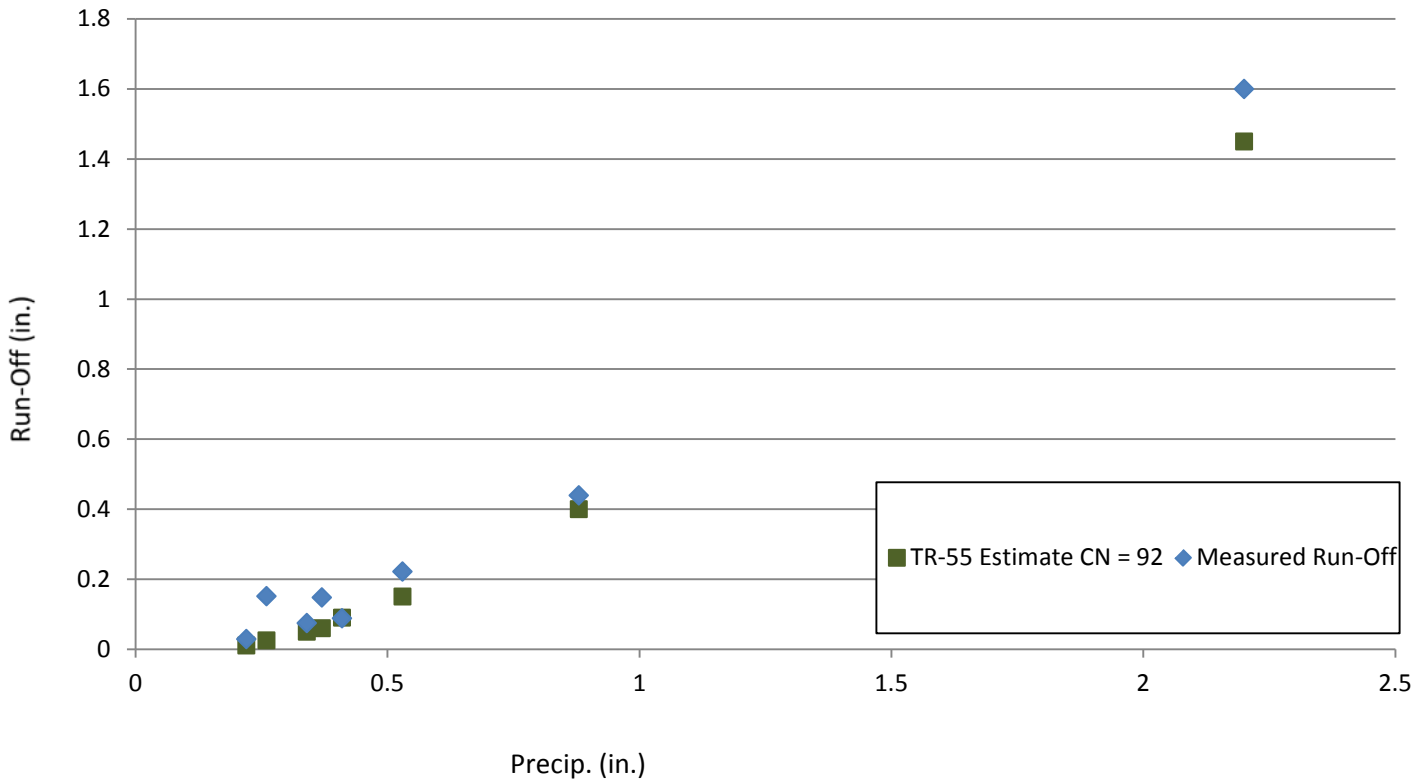
Date	Precip. In.	North Area Flow Meters			North Total	South Area Flow Meters		South Total
		F2	F3	F8		F5	F6	
10/25/14	0.34	435	9,324	42	9,801	2,312	1,585	3,897
10/26/14	0	-	6,926	-	6,926	1,312	785	2,097
10/27/14	0			-	-		880	880
10/28/14	0			-	-		793	793
10/31/14	0.53	-	5,703	-	5,703	922	1,425	2,347
11/1/14	0	12,796	29,093	2,349	44,238	8,986	7,994	16,980
11/13/14	0.37	5,122	25,535		30,657	6,823	6,659	13,482
11/14/14			2,635		2,635			-
11/19/14	0.27	-	7,069		7,069	2,356	1,668	4,024
11/20/14	0.12	-	11,098		11,098	3,851	2,847	6,698
11/21/14			1,708		1,708			-
11/22/14	0.26	2,738	31,358		34,096	-	-	-
11/29/14	0.46	13,044	38,055		51,099	15,713	13,686	29,399
11/30/14	0.37	6,895	30,745		37,640	11,954	9,853	21,807
12/1/14	0.05		3,486	6,634	10,120	3,486	4,709	8,195
12/2/14	0.22	-	6,465		6,465	1,643	1,609	3,252
12/3/14	1.83	43,186	78,816		122,002	51,647	48,492	100,139
12/4/14	0.37	57,842	110,602		168,444	37,098	21,412	58,510

Table A2 - Run-Off Estimate as a Percentage of Water Pumped to the Storage Tanks

		North Area Flow Meters (gals)				South Area Flow Meters (gals)			North Area		South Area	
Date	Precip. In.	F2	F3	F8	North Total	F5	F6	South Total	Rain Volume (gals)	% Pumped Run-Off (gals)	Rain Volume (gals)	% Pumped Run-Off (gals)
10/25/14	0.34	435	9,324	42	9,801	2,312	1,585	3,897	76,624		29,542	
10/26/14	0	-	6,926	-	6,926	1,312	785	2,097	-	21.8%		20.3%
10/31/14	0.53	-	5,703	-	5,703	922	1,425	2,347	119,443		46,050	
11/1/14	0	12,796	29,093	2,349	44,238	8,986	7,994	16,980	-	41.8%		42.0%
11/13/14	0.37	5,122	25,535		30,657	6,823	6,659	13,482	83,385		32,148	
11/14/14	0		2,635		2,635			-	-	39.9%		41.9%
11/19/14	0.27	-	7,069		7,069	2,356	1,668	4,024	60,849		23,460	
11/20/14	0.12	-	11,098		11,098	3,851	2,847	6,698	27,044		10,427	
11/21/14	0.02		1,708		1,708			-	4,507	21.5%	1,738	30.1%
11/22/14	0.26	2,738	31,358		34,096	-	-	-	58,595	58.2%	22,591	-
11/29/14	0.46	13,044	38,055		51,099	15,713	13,686	29,399	103,668		39,968	
11/30/14	0.37	6,895	30,745		37,640	11,954	9,853	21,807	83,385		32,148	
12/1/14	0.05		3,486	6,634	10,120	3,486	4,709	8,195	11,268	49.8%	4,344	77.7%
12/2/14	0.22	-	6,465		6,465	1,643	1,609	3,252	49,580	13.0%	19,115	17.0%
12/3/14	1.83	43,186	78,816		122,002	51,647	48,492	100,139	412,418		159,004	
12/4/14	0.37	57,842	110,602		168,444	37,098	21,412	58,510	83,385	202.0%	32,148	99.8%

North Area = 8.3 acres
South Area = 3.2 acres

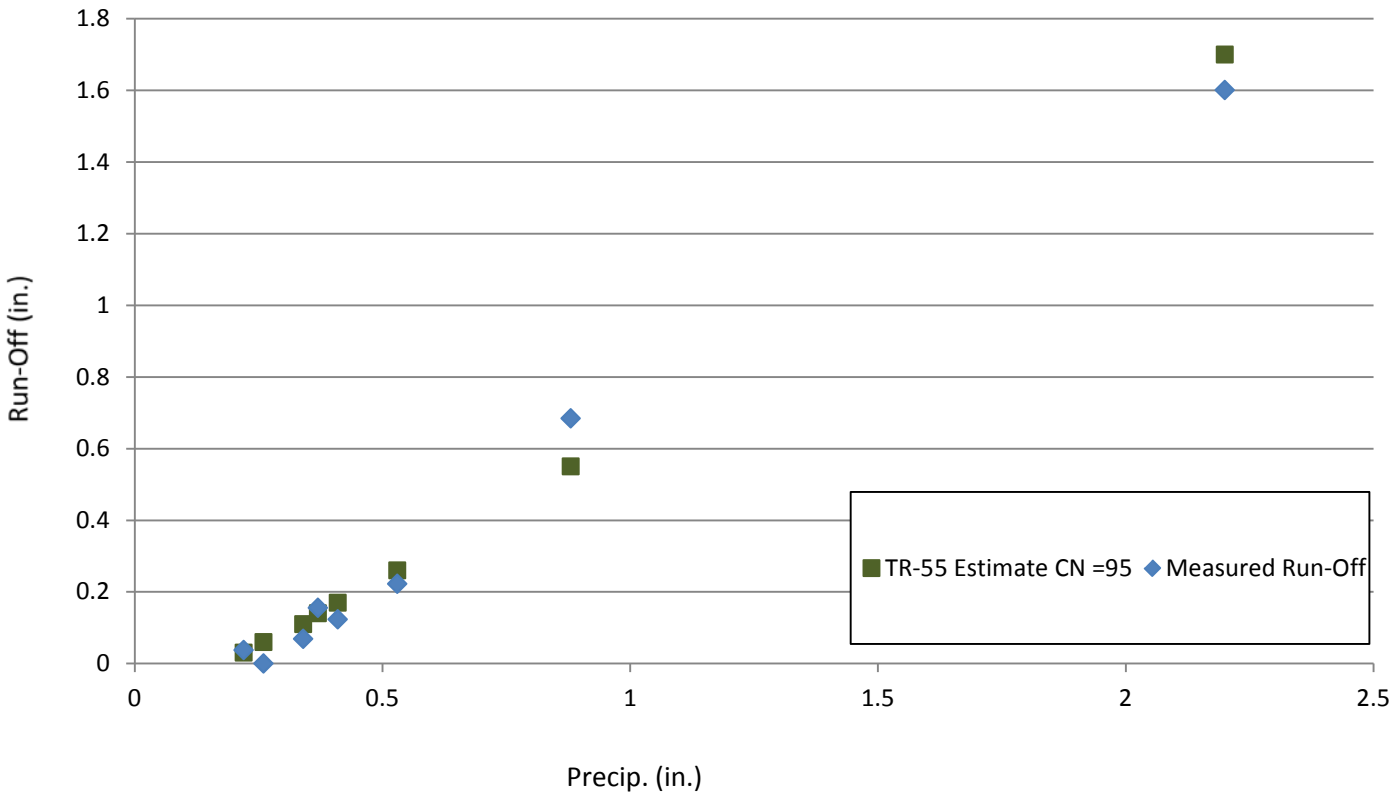
Figure A1 - Comparison of North Area Run-Off Estimated by TR-55 to Measured Run-Off



Notes:

1. TR-55 estimate based on Figure 2-1, " Urban Hydrology for Small Water Sheds, Technical Release 55 (TR-55)
2. Precipitation total and run-off totals are based on measured precipitation of 1.83-inches on 12/3, 0.37 inches on 12/4, and total pumping volumes to POTW and J-Stands from 12/3 through 12/5

Figure A2 - Comparison of South Area Run-Off Estimated by TR-55 to Measured Run-Off



Notes:

1. TR-55 estimate based on Figure 2-1, " Urban Hydrology for Small Water Sheds, Technical Release 55 (TR-55)
2. Precipitation total and run-off totals are based on measured precipitation of 1.83-inches on 12/3, 0.37 inches on 12/4, and total pumping volumes to POTW and J-Stands from 12/3 through 12/5

ATTACHMENT 2
CALIBRATION COMPOST WATER RUN-OFF ANALYSES

Project Description

File Name	Dec 3-4 1.83 EPA 92-95.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	EPA SWMM
EPA SWMM Infiltration Method	SCS Curve Number
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	Dec 03, 2014	00:00:00
End Analysis On	Dec 04, 2014	23:59:00
Start Reporting On	Dec 03, 2014	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	2	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	5
Nodes	10
Junctions	5
Outfalls	4
Flow Diversions	0
Inlets	0
Storage Nodes	1
Links	7
Channels	0
Pipes	5
Pumps	1
Orifices	0
Weirs	1
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		Time Series	Dec 1 - Dec 4	Cumulative	inches				0.00	

Subbasin Summary

SN	Subbasin ID	Area	Impervious Area	Weighted Curve Number	Average Slope	Pervious Area Manning's Roughness	Total Rainfall	Total Infiltration	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
		(ft^2)	(%)		(%)		(in)	(in)	(in)	(ft^3)	(cfs)	(days hh:mm:ss)
1	Sub-01	125246.19	0.00	92.00	3.0000	0.0100	2.20	0.6360	1.52	15812.33	1.22	0 00:27:59
2	Sub-02	98348.29	0.00	92.00	3.0000	0.0100	2.20	0.6350	1.52	12424.67	0.96	0 00:24:21
3	Sub-03	138739.73	0.00	92.00	3.0000	0.0100	2.20	0.6370	1.52	17515.89	1.35	0 00:29:13
4	Sub-04	73369.50	0.00	95.00	3.0000	0.0100	2.20	0.4300	1.72	10528.52	0.77	0 00:15:17
5	Sub-06	64608.93	0.00	95.00	3.0000	0.0100	2.20	0.4300	1.72	9271.38	0.68	0 00:14:09

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 Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio
					(ft)	(ft)	(ft)	(%)	(in)		(ft/sec)	(ft)	
1	4in_V1	Pipe	Jun-V1-2	Out-Retain	207.32	0.00	0.00	0.0000	3.939	0.0150	23.56	0.15	0.46
2	Link-04	Pipe	Jun-01	Jun-02	446.12	92.00	91.00	0.2200	18.000	0.0150	2.06	0.60	0.40
3	Link-05	Pipe	Jun-02	Jun-03	395.25	91.00	89.00	0.5100	18.000	0.0150	1.73	1.06	0.71
4	Link-09	Pipe	Jun-03	Jct_HF	540.02	89.00	88.35	0.1200	18.000	0.0150	2.74	1.02	0.68
5	Link-27	Pipe	Jct_HF	Vault-1	40.00	88.35	85.75	6.4900	18.000	0.0240	6.39	0.52	0.35
6	Weir-02	Weir	Vault-1	Out-HF		79.00	0.00						
7	Pump-07	Pump	Vault-1	Jun-V1-2		79.00	79.00						

Subbasin Hydrology

Subbasin : Sub-01

Input Data

Area (ft²)	125246.19
Impervious Area (%)	0.00
Weighted Curve Number	92.00
Conductivity (in/hr)	0.1500
Drying Time (days)	7.00
Average Slope (%)	3.0000
Equivalent Width (ft)	311.60
Impervious Area	
Manning's Roughness	0.0150
Pervious Area	
Manning's Roughness	0.0100
Curb & Gutter Length (ft)	0.00
Rain Gage ID	Rain Gage-03

Composite Curve Number

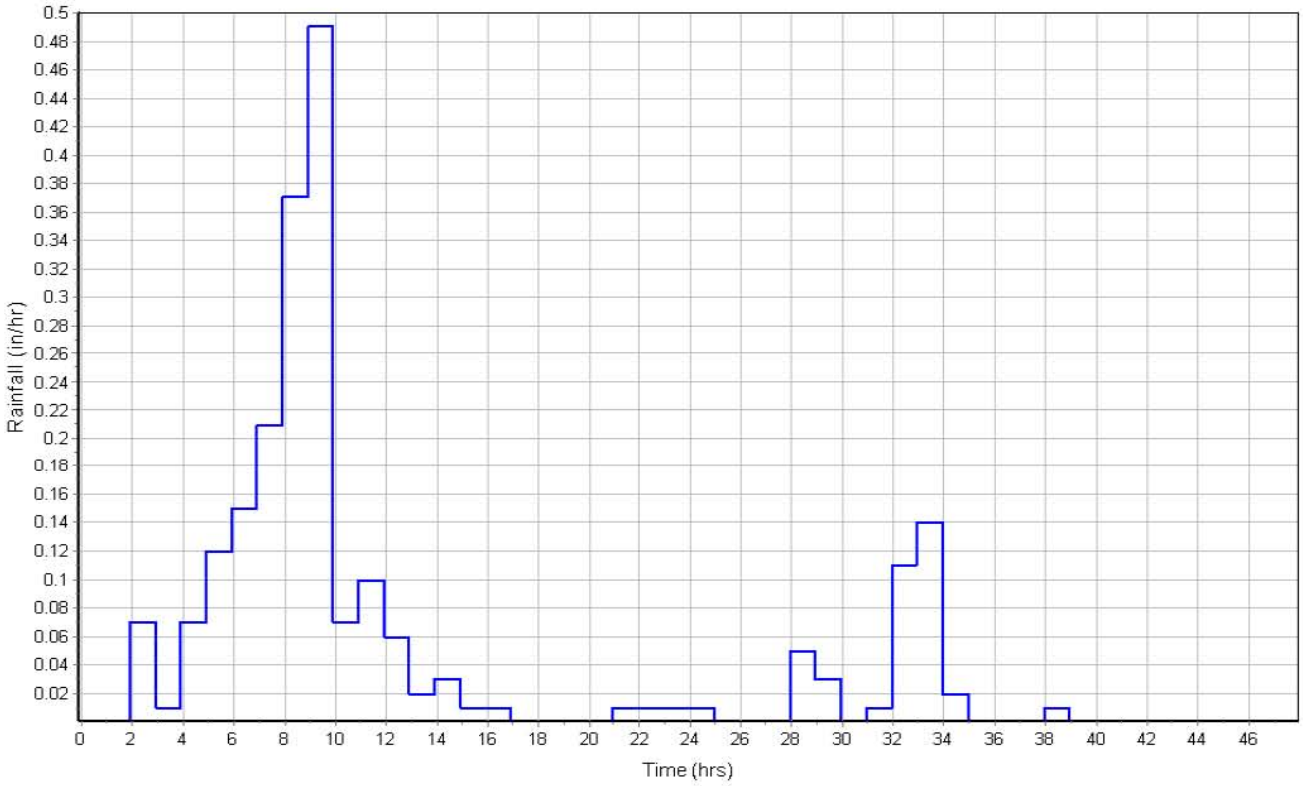
Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
-	125246.19	-	92.00
Composite Area & Weighted CN	125246.19		92.00

Subbasin Runoff Results

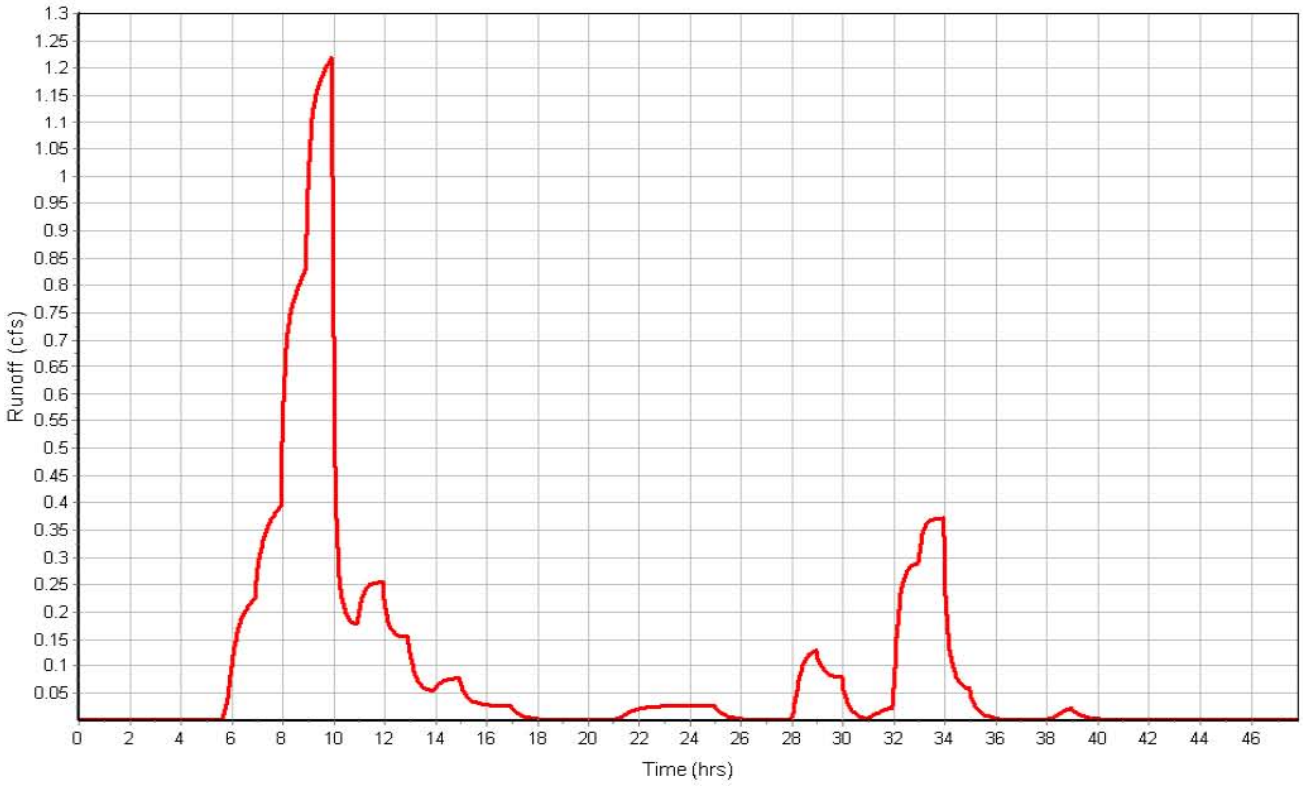
Total Rainfall (in)	2.20
Total Runon (in)	0.00
Total Evaporation (in)	0.0000
Total Infiltration (in)	0.6360
Total Runoff (in)	1.52
Peak Runoff (cfs)	1.22
Weighted Curve Number	92.00
Time of Concentration (days hh:mm:ss)	0 00:27:59

Subbasin : Sub-01

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-02

Input Data

Area (ft²)	98348.29
Impervious Area (%)	0.00
Weighted Curve Number	92.00
Conductivity (in/hr)	0.1500
Drying Time (days)	7.00
Average Slope (%)	3.0000
Equivalent Width (ft)	308.48
Impervious Area	
Manning's Roughness	0.0150
Pervious Area	
Manning's Roughness	0.0100
Curb & Gutter Length (ft)	0.00
Rain Gage ID	Rain Gage-03

Composite Curve Number

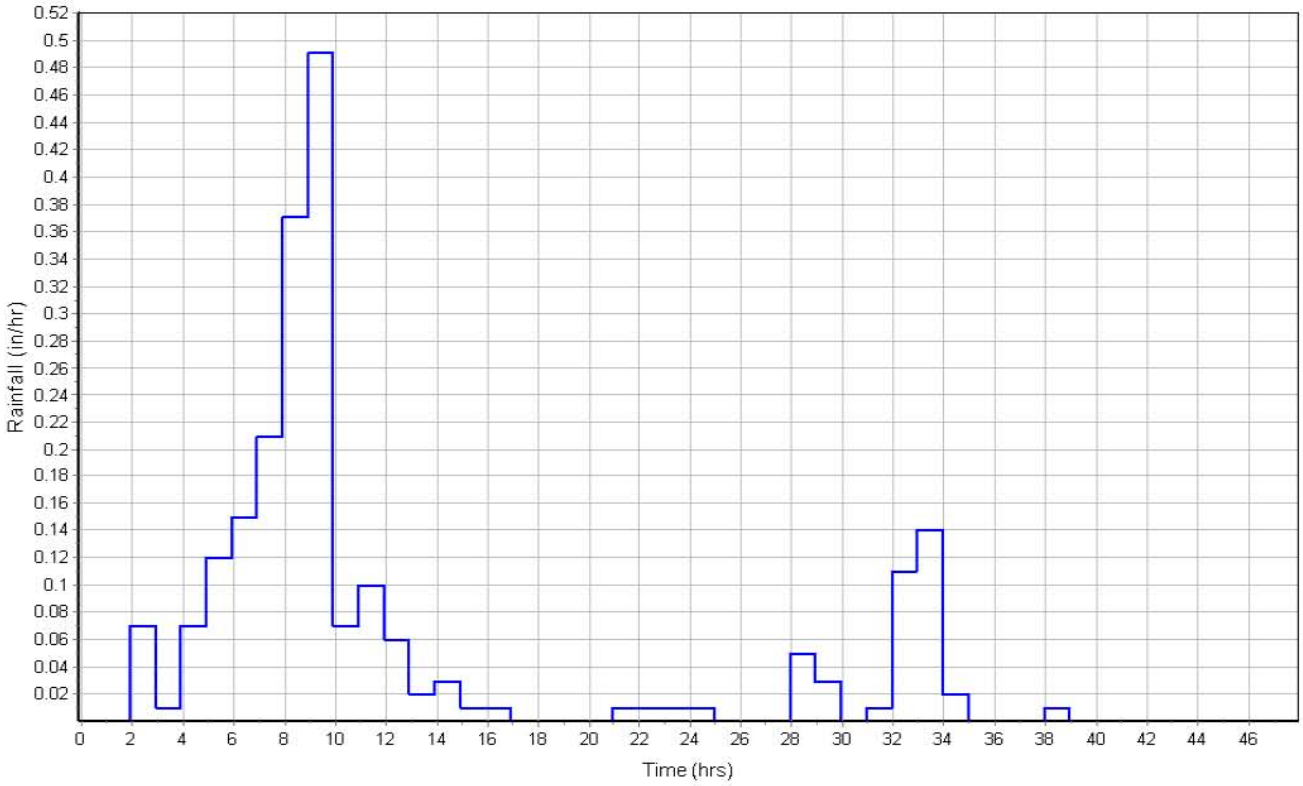
Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
-	98348.29	-	92.00
Composite Area & Weighted CN	98348.29		92.00

Subbasin Runoff Results

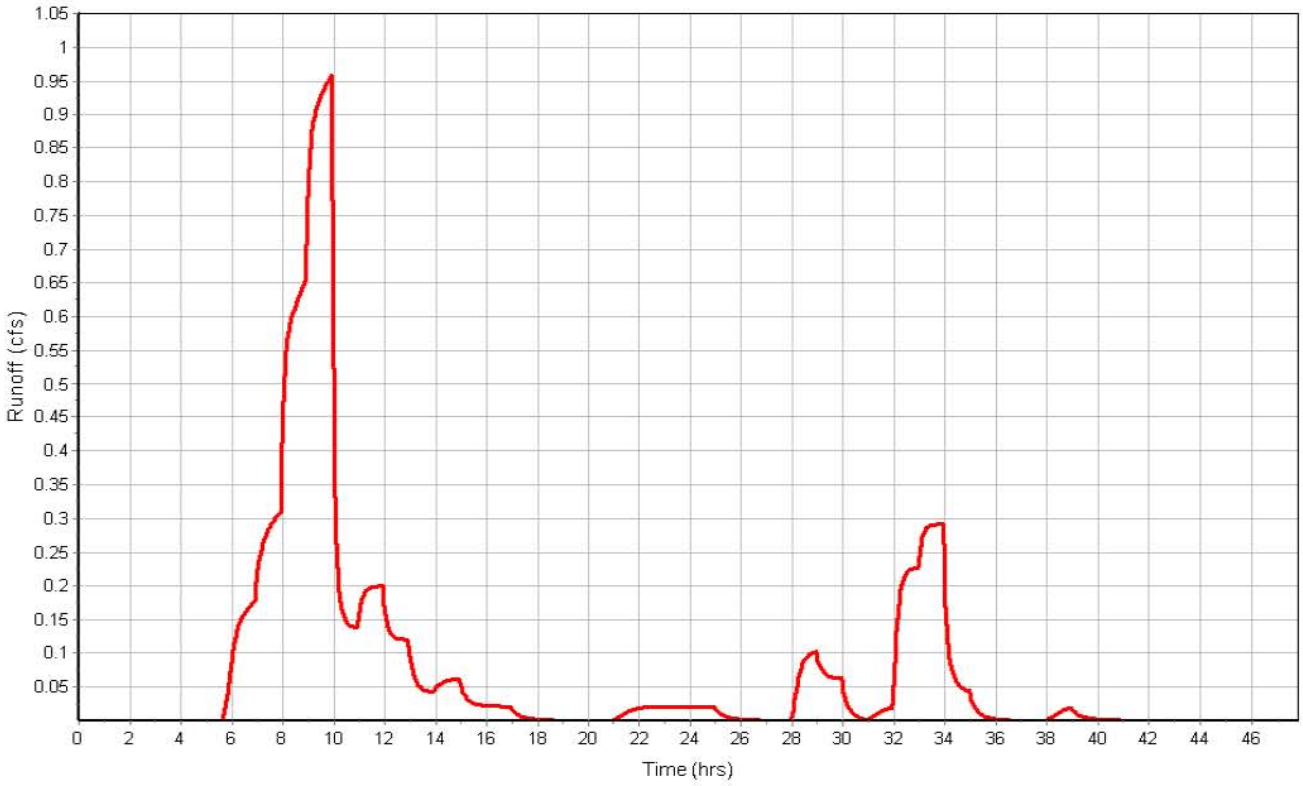
Total Rainfall (in)	2.20
Total Runon (in)	0.00
Total Evaporation (in)	0.0000
Total Infiltration (in)	0.6350
Total Runoff (in)	1.52
Peak Runoff (cfs)	0.96
Weighted Curve Number	92.00
Time of Concentration (days hh:mm:ss)	0 00:24:21

Subbasin : Sub-02

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-03

Input Data

Area (ft²)	138739.73
Impervious Area (%)	0.00
Weighted Curve Number	92.00
Conductivity (in/hr)	0.1500
Drying Time (days)	7.00
Average Slope (%)	3.0000
Equivalent Width (ft)	321.23
Impervious Area	
Manning's Roughness	0.0150
Pervious Area	
Manning's Roughness	0.0100
Curb & Gutter Length (ft)	0.00
Rain Gage ID	Rain Gage-03

Composite Curve Number

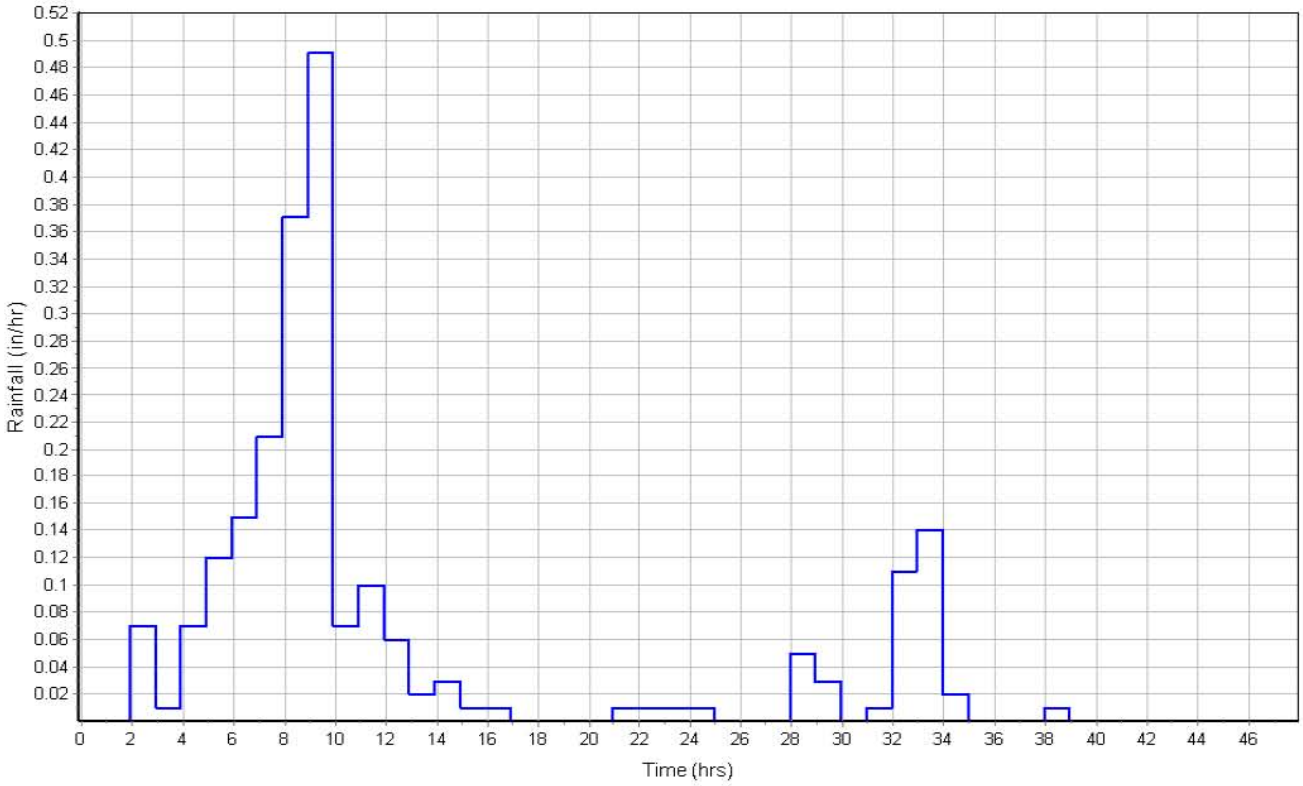
Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
-	138739.73	-	92.00
Composite Area & Weighted CN	138739.73		92.00

Subbasin Runoff Results

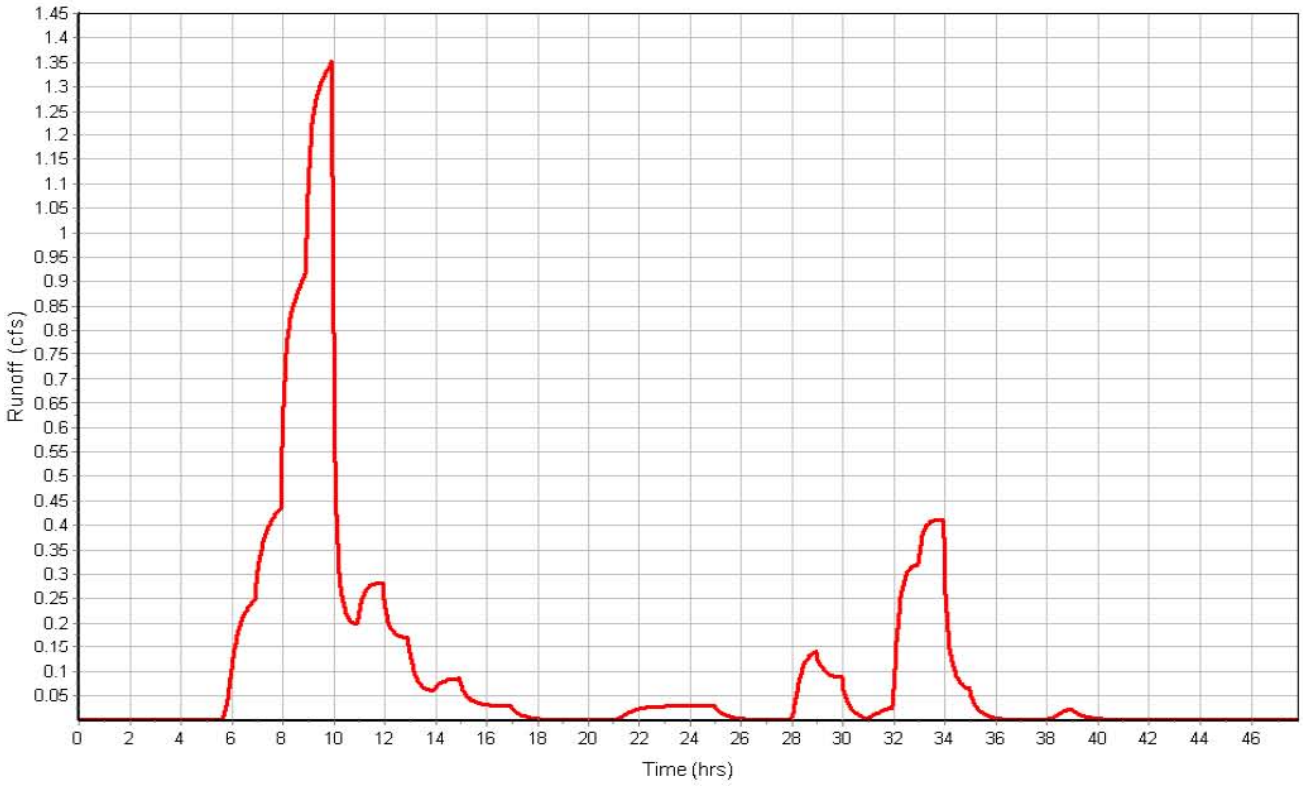
Total Rainfall (in)	2.20
Total Runon (in)	0.00
Total Evaporation (in)	0.0000
Total Infiltration (in)	0.6370
Total Runoff (in)	1.52
Peak Runoff (cfs)	1.35
Weighted Curve Number	92.00
Time of Concentration (days hh:mm:ss)	0 00:29:13

Subbasin : Sub-03

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-04

Input Data

Area (ft²)	73369.50
Impervious Area (%)	0.00
Weighted Curve Number	95.00
Conductivity (in/hr)	0.1500
Drying Time (days)	7.00
Average Slope (%)	3.0000
Equivalent Width (ft)	500.00
Impervious Area	
Manning's Roughness	0.0150
Pervious Area	
Manning's Roughness	0.0100
Curb & Gutter Length (ft)	0.00
Rain Gage ID	Rain Gage-03

Composite Curve Number

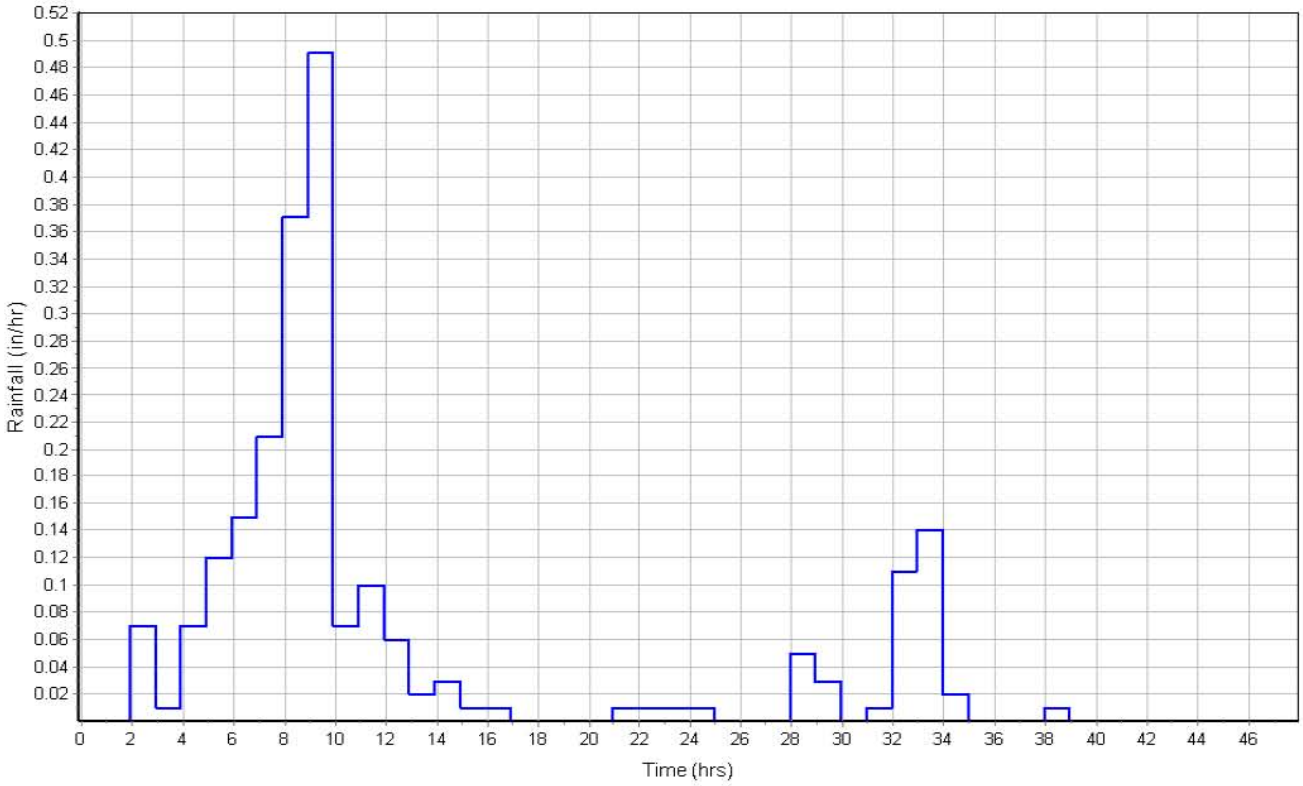
Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
-	73369.50	-	95.00
Composite Area & Weighted CN	73369.50		95.00

Subbasin Runoff Results

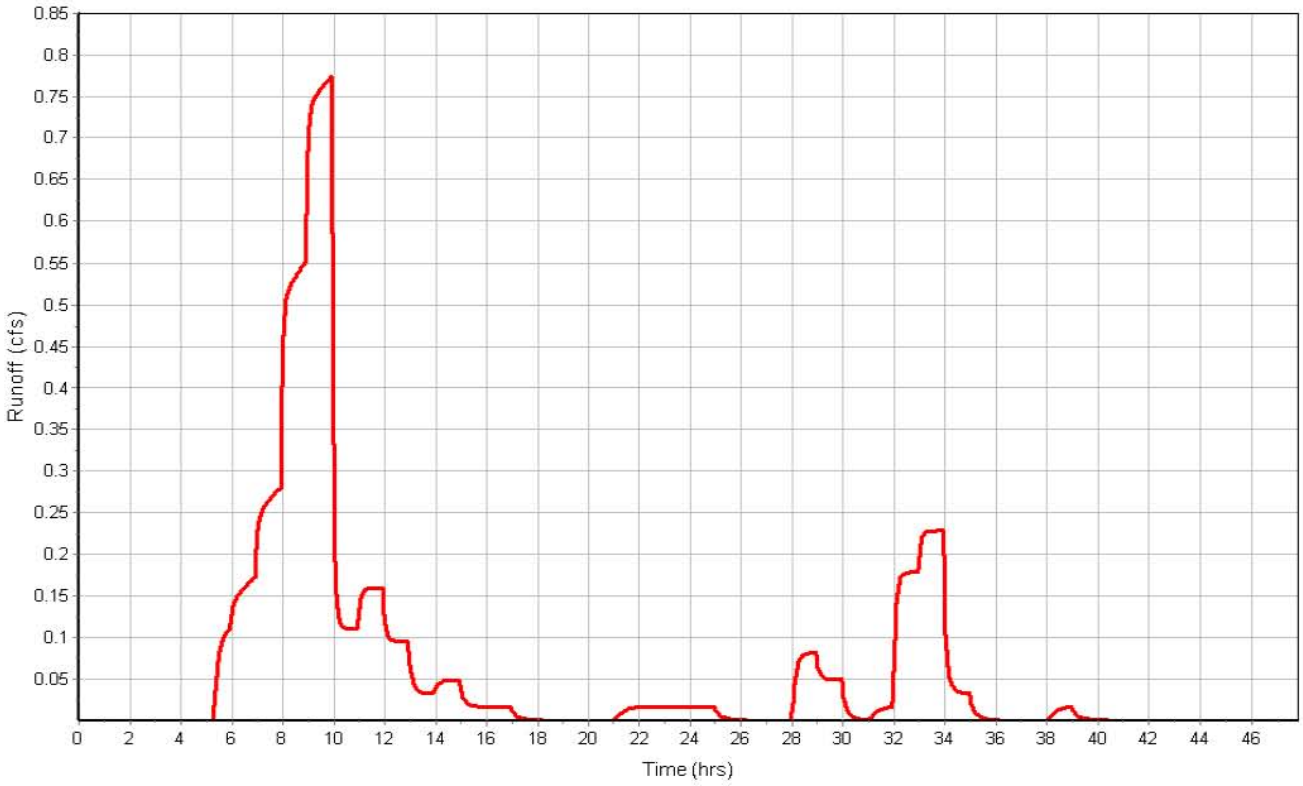
Total Rainfall (in)	2.20
Total Runon (in)	0.00
Total Evaporation (in)	0.0000
Total Infiltration (in)	0.4300
Total Runoff (in)	1.72
Peak Runoff (cfs)	0.77
Weighted Curve Number	95.00
Time of Concentration (days hh:mm:ss)	0 00:15:17

Subbasin : Sub-04

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-06

Input Data

Area (ft²)	64608.93
Impervious Area (%)	0.00
Weighted Curve Number	95.00
Conductivity (in/hr)	0.1500
Drying Time (days)	7.00
Average Slope (%)	3.0000
Equivalent Width (ft)	500.00
Impervious Area	
Manning's Roughness	0.0150
Pervious Area	
Manning's Roughness	0.0100
Curb & Gutter Length (ft)	0.00
Rain Gage ID	Rain Gage-03

Composite Curve Number

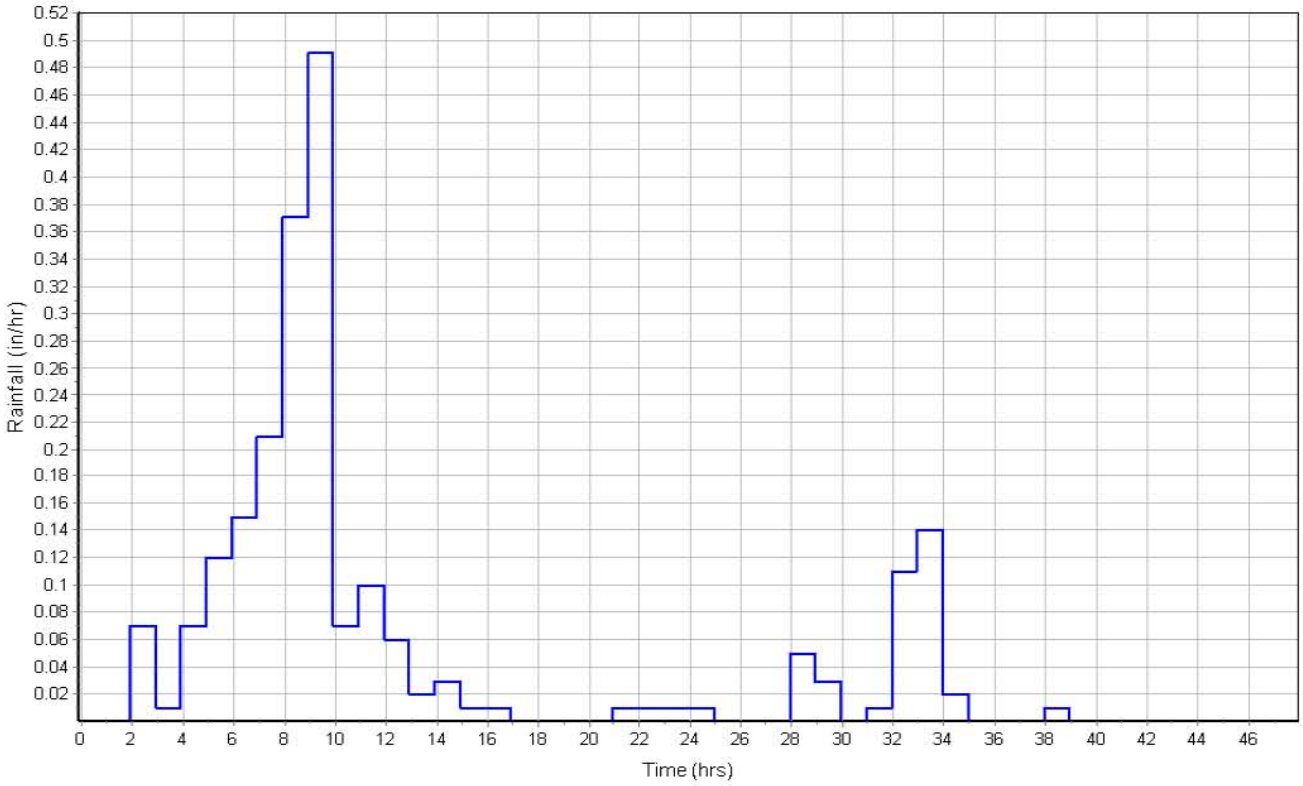
Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
-	64608.93	-	95.00
Composite Area & Weighted CN	64608.93		95.00

Subbasin Runoff Results

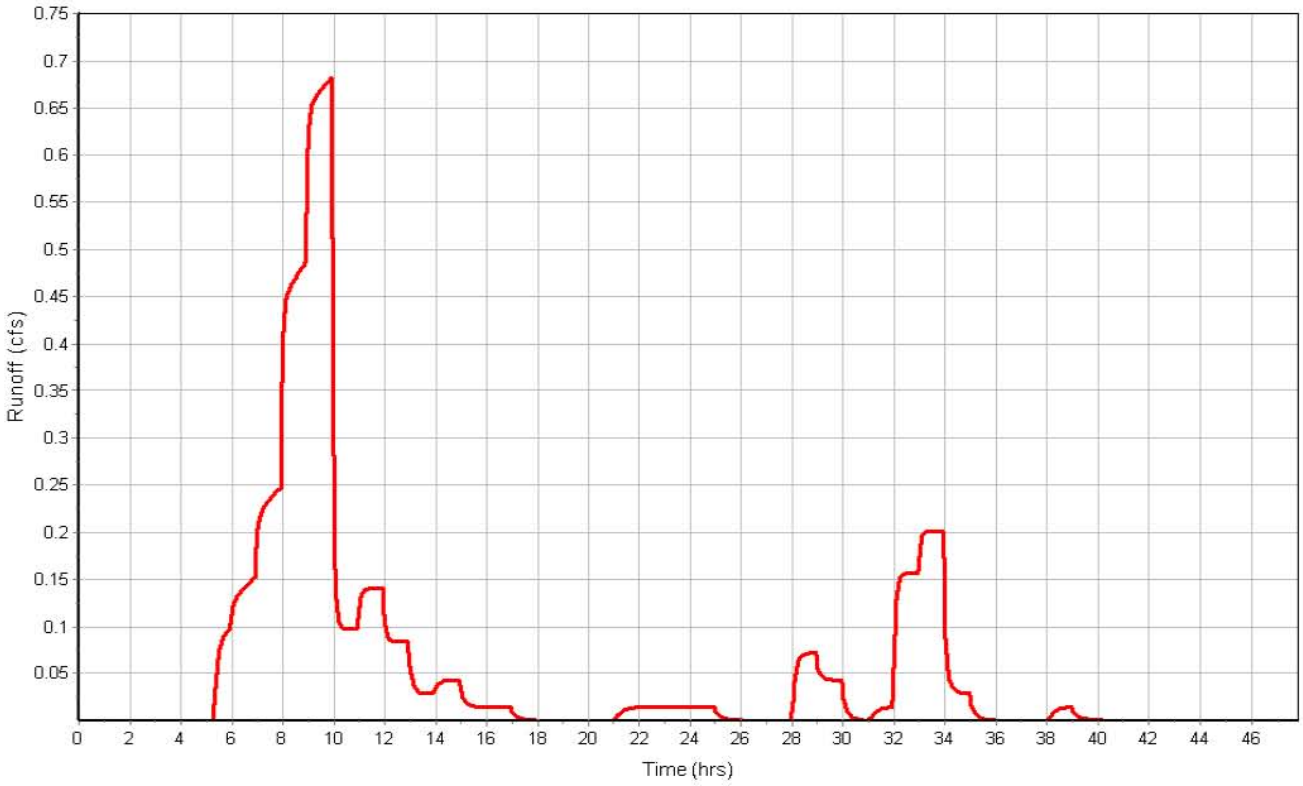
Total Rainfall (in)	2.20
Total Runon (in)	0.00
Total Evaporation (in)	0.0000
Total Infiltration (in)	0.4300
Total Runoff (in)	1.72
Peak Runoff (cfs)	0.68
Weighted Curve Number	95.00
Time of Concentration (days hh:mm:ss)	0 00:14:09

Subbasin : Sub-06

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 (ft²)	Minimum Pipe Cover (in)
1	Jct_HF	88.35	91.35	3.00	88.35	0.00	500.00	408.66	0.00	0.00
2	Jun-01	92.00	94.00	2.00	92.00	0.00	500.00	406.00	0.00	0.00
3	Jun-02	91.00	93.00	2.00	91.00	0.00	500.00	407.00	0.00	0.00
4	Jun-03	89.00	91.00	2.00	89.00	0.00	500.00	409.00	0.00	0.00
5	Jun-V1-2	79.00	86.00	7.00	79.00	0.00	86.00	0.00	0.00	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 Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness
1	4in_V1	207.32	0.00	-79.00	0.00	0.00	0.00	0.0000	Circular Force Main	3.960	3.960	0.0150
2	Link-04	446.12	92.00	0.00	91.00	0.00	1.00	0.2200	CIRCULAR	18.000	18.000	0.0150
3	Link-05	395.25	91.00	0.00	89.00	0.00	2.00	0.5100	CIRCULAR	18.000	18.000	0.0150
4	Link-09	540.02	89.00	0.00	88.35	0.00	0.66	0.1200	CIRCULAR	18.000	18.000	0.0150
5	Link-27	40.00	88.35	0.00	85.75	6.75	2.60	6.4900	CIRCULAR	18.000	18.000	0.0240

Storage Nodes

Storage Node : Vault-1

Input Data

Invert Elevation (ft)	79.00
Max (Rim) Elevation (ft)	86.00
Max (Rim) Offset (ft)	7.00
Initial Water Elevation (ft)	79.00
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	3.51
Peak Lateral Inflow (cfs)	0.00
Peak Outflow (cfs)	3.51
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	85.04
Max HGL Depth Attained (ft)	6.04
Average HGL Elevation Attained (ft)	79.40
Average HGL Depth Attained (ft)	0.4
Time of Max HGL Occurrence (days hh:mm)	0 10:00
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Project Description

File Name ..... Dec 11-12 3.45 EPA 92-95.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... EPA SWMM
EPA SWMM Infiltration Method ..... SCS Curve Number
Link Routing Method ..... Hydrodynamic
Enable Overflow Ponding at Nodes ..... YES
Skip Steady State Analysis Time Periods ... NO

Analysis Options

Start Analysis On	Dec 11, 2014	00:00:00
End Analysis On	Dec 12, 2014	05:59:00
Start Reporting On	Dec 11, 2014	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	2	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	5
Nodes.....	10
Junctions	5
Outfalls	4
Flow Diversions	0
Inlets	0
Storage Nodes	1
Links.....	7
Channels	0
Pipes	5
Pumps	1
Orifices	0
Weirs	1
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		Time Series	Dec 11-12	Cumulative	inches					User Defined

Subbasin Summary

SN	Subbasin ID	Area	Impervious Area	Weighted Curve Number	Average Slope	Pervious Area Manning's Roughness	Total Rainfall	Total Infiltration	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
		(ft^2)	(%)		(%)		(in)	(in)	(in)	(ft^3)	(cfs)	(days hh:mm:ss)
1	Sub-01	125246.19	0.00	92.00	3.0000	0.0100	3.56	0.6990	2.80	29234.55	1.15	0 00:14:33
2	Sub-02	98348.29	0.00	92.00	3.0000	0.0100	3.56	0.6990	2.80	22964.33	0.90	0 00:12:39
3	Sub-03	138739.73	0.00	92.00	3.0000	0.0100	3.56	0.6990	2.80	32372.61	1.27	0 00:15:11
4	Sub-04	73369.50	0.00	95.00	3.0000	0.0100	3.56	0.4590	3.05	18629.74	0.74	0 00:07:57
5	Sub-06	64608.93	0.00	95.00	3.0000	0.0100	3.56	0.4590	3.05	16405.29	0.65	0 00:07:21

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 Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio
					(ft)	(ft)	(ft)	(%)	(in)		(ft/sec)	(ft)	
1	4in_V1	Pipe	Jun-V1-2	Out-Retain	207.32	0.00	0.00	0.0000	3.939	0.0150	23.56	0.15	0.46
2	Link-04	Pipe	Jun-01	Jun-02	446.12	92.00	91.00	0.2200	18.000	0.0150	2.02	0.58	0.39
3	Link-05	Pipe	Jun-02	Jun-03	395.25	91.00	89.00	0.5100	18.000	0.0150	1.69	1.02	0.68
4	Link-09	Pipe	Jun-03	Jct_HF	540.02	89.00	88.35	0.1200	18.000	0.0150	2.69	0.99	0.66
5	Link-27	Pipe	Jct_HF	Vault-1	40.00	88.35	85.75	6.4900	18.000	0.0240	6.30	0.51	0.34
6	Weir-02	Weir	Vault-1	Out-HF		79.00	0.00						
7	Pump-07	Pump	Vault-1	Jun-V1-2		79.00	79.00						

Subbasin Hydrology

Subbasin : Sub-01

Input Data

Area (ft²)	125246.19
Impervious Area (%)	0.00
Weighted Curve Number	92.00
Conductivity (in/hr)	0.1500
Drying Time (days)	7.00
Average Slope (%)	3.0000
Equivalent Width (ft)	311.60
Impervious Area	
Manning's Roughness	0.0150
Pervious Area	
Manning's Roughness	0.0100
Curb & Gutter Length (ft)	0.00
Rain Gage ID	Rain Gage-03

Composite Curve Number

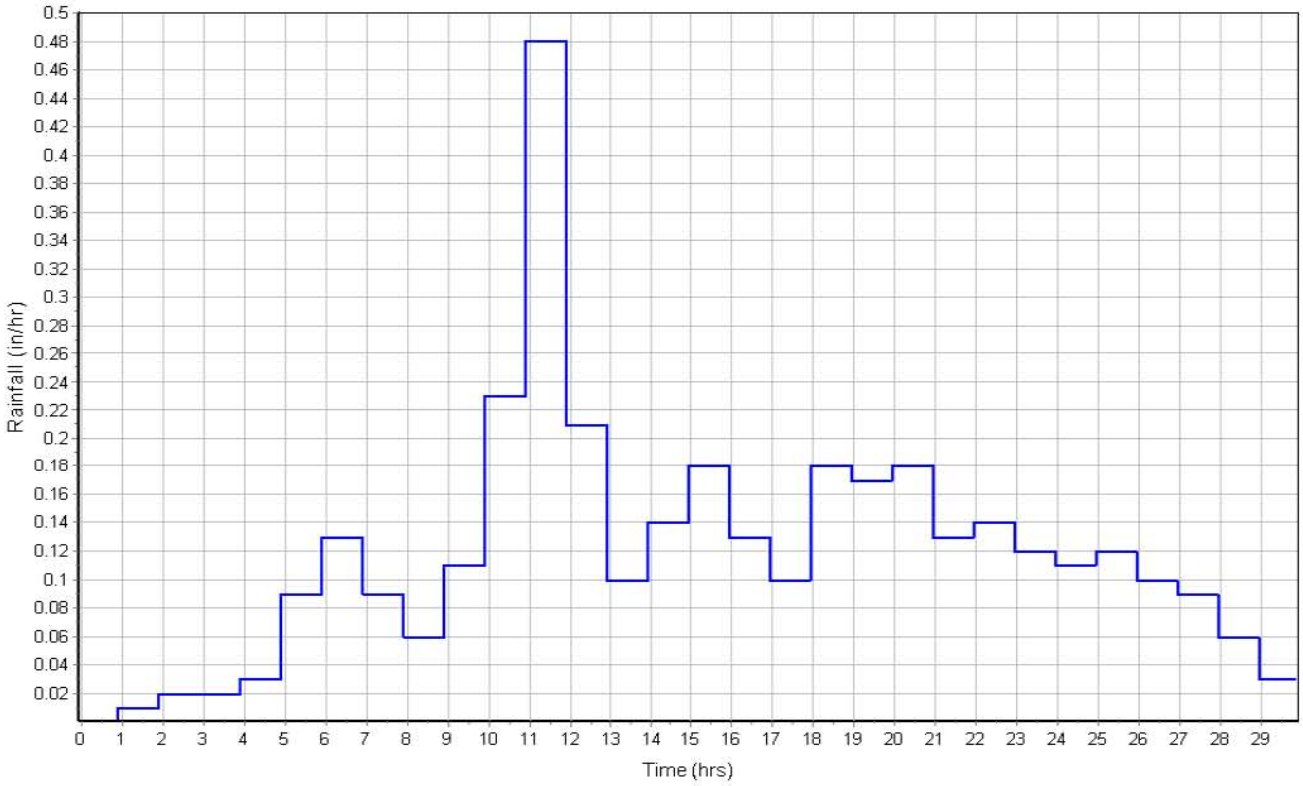
Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
-	125246.19	-	92.00
Composite Area & Weighted CN	125246.19		92.00

Subbasin Runoff Results

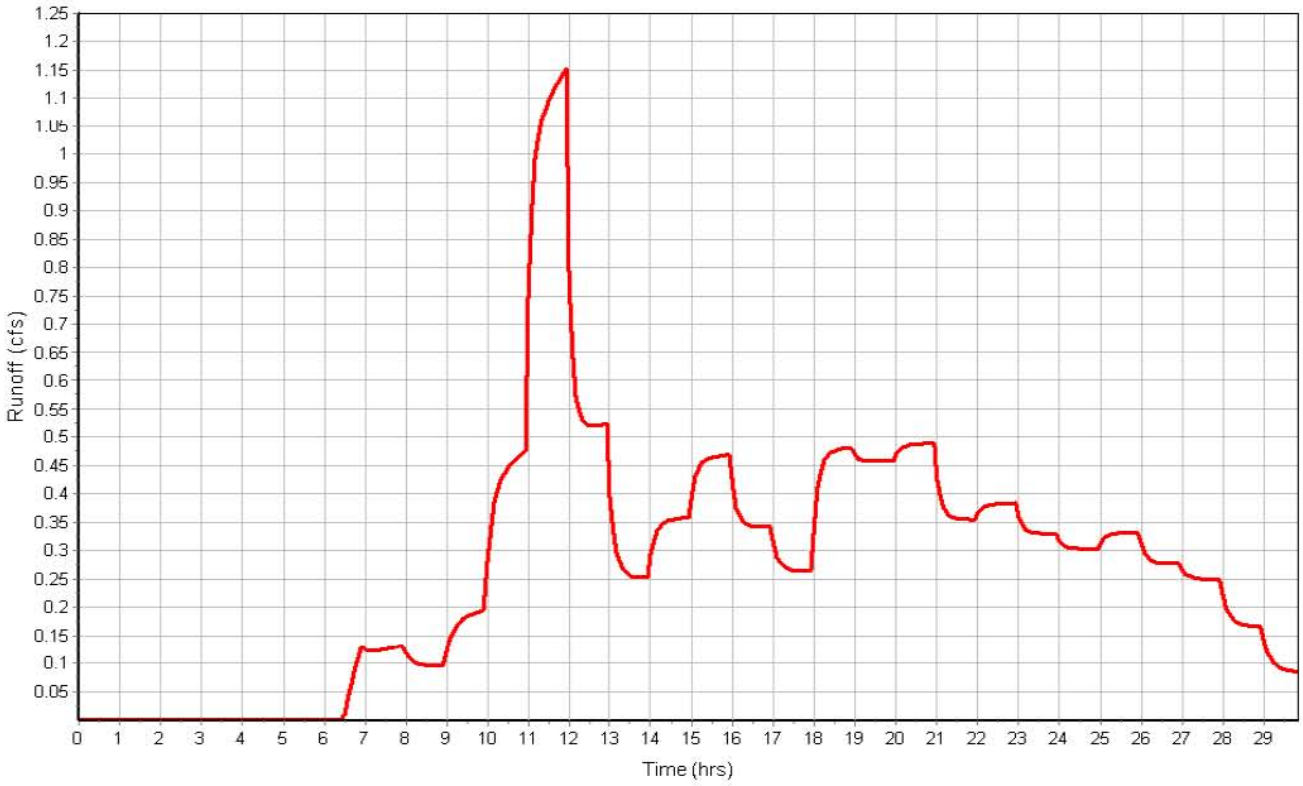
Total Rainfall (in)	3.56
Total Runon (in)	0.00
Total Evaporation (in)	0.0000
Total Infiltration (in)	0.6990
Total Runoff (in)	2.80
Peak Runoff (cfs)	1.15
Weighted Curve Number	92.00
Time of Concentration (days hh:mm:ss)	0 00:14:33

Subbasin : Sub-01

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-02

Input Data

Area (ft²)	98348.29
Impervious Area (%)	0.00
Weighted Curve Number	92.00
Conductivity (in/hr)	0.1500
Drying Time (days)	7.00
Average Slope (%)	3.0000
Equivalent Width (ft)	308.48
Impervious Area	
Manning's Roughness	0.0150
Pervious Area	
Manning's Roughness	0.0100
Curb & Gutter Length (ft)	0.00
Rain Gage ID	Rain Gage-03

Composite Curve Number

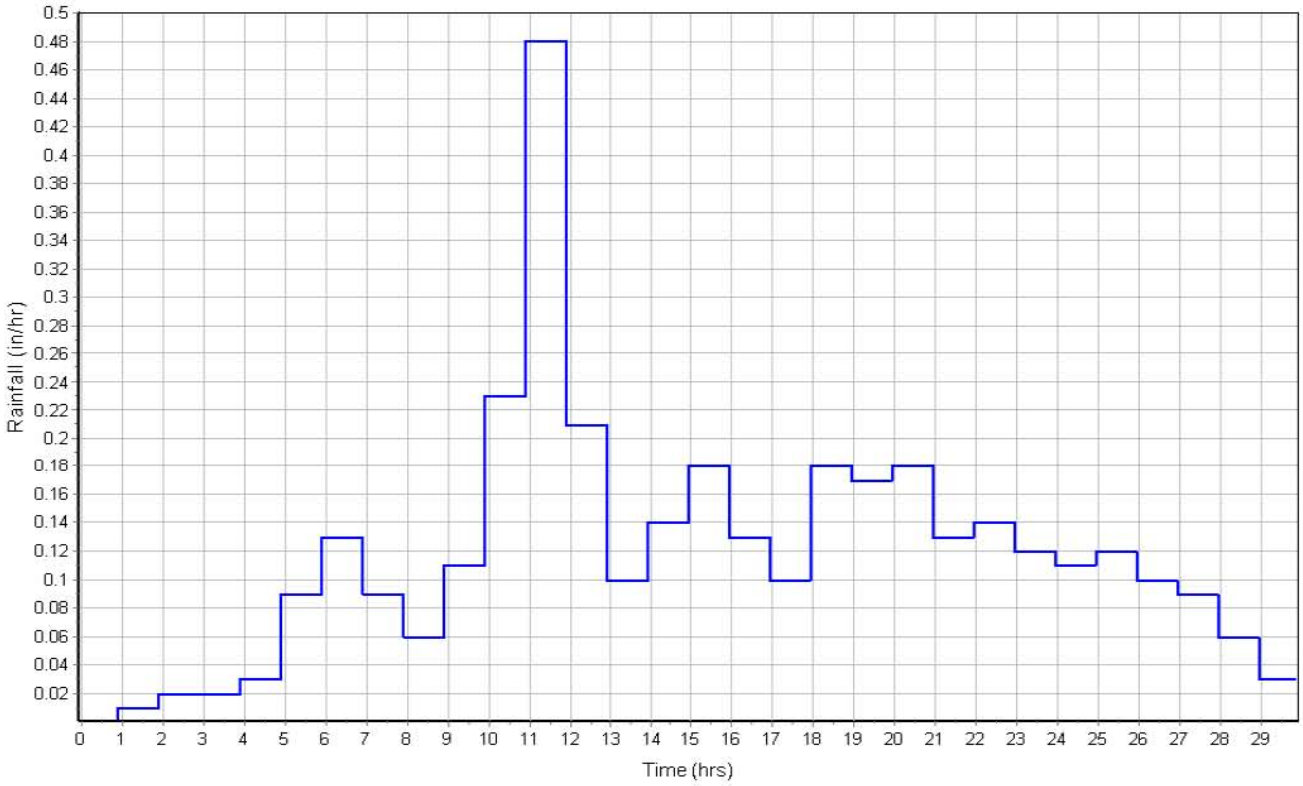
Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
-	98348.29	-	92.00
Composite Area & Weighted CN	98348.29		92.00

Subbasin Runoff Results

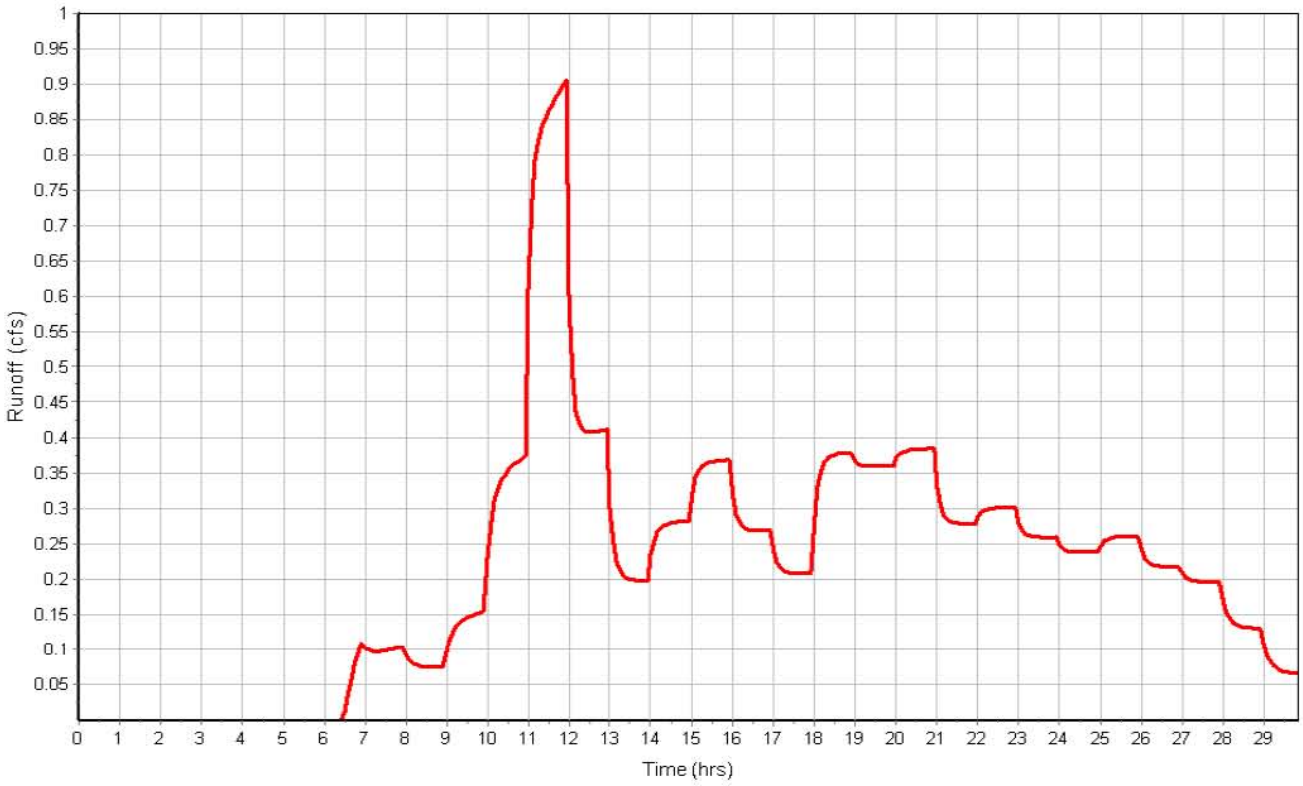
Total Rainfall (in)	3.56
Total Runon (in)	0.00
Total Evaporation (in)	0.0000
Total Infiltration (in)	0.6990
Total Runoff (in)	2.80
Peak Runoff (cfs)	0.90
Weighted Curve Number	92.00
Time of Concentration (days hh:mm:ss)	0 00:12:39

Subbasin : Sub-02

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-03

Input Data

Area (ft²)	138739.73
Impervious Area (%)	0.00
Weighted Curve Number	92.00
Conductivity (in/hr)	0.1500
Drying Time (days)	7.00
Average Slope (%)	3.0000
Equivalent Width (ft)	321.23
Impervious Area	
Manning's Roughness	0.0150
Pervious Area	
Manning's Roughness	0.0100
Curb & Gutter Length (ft)	0.00
Rain Gage ID	Rain Gage-03

Composite Curve Number

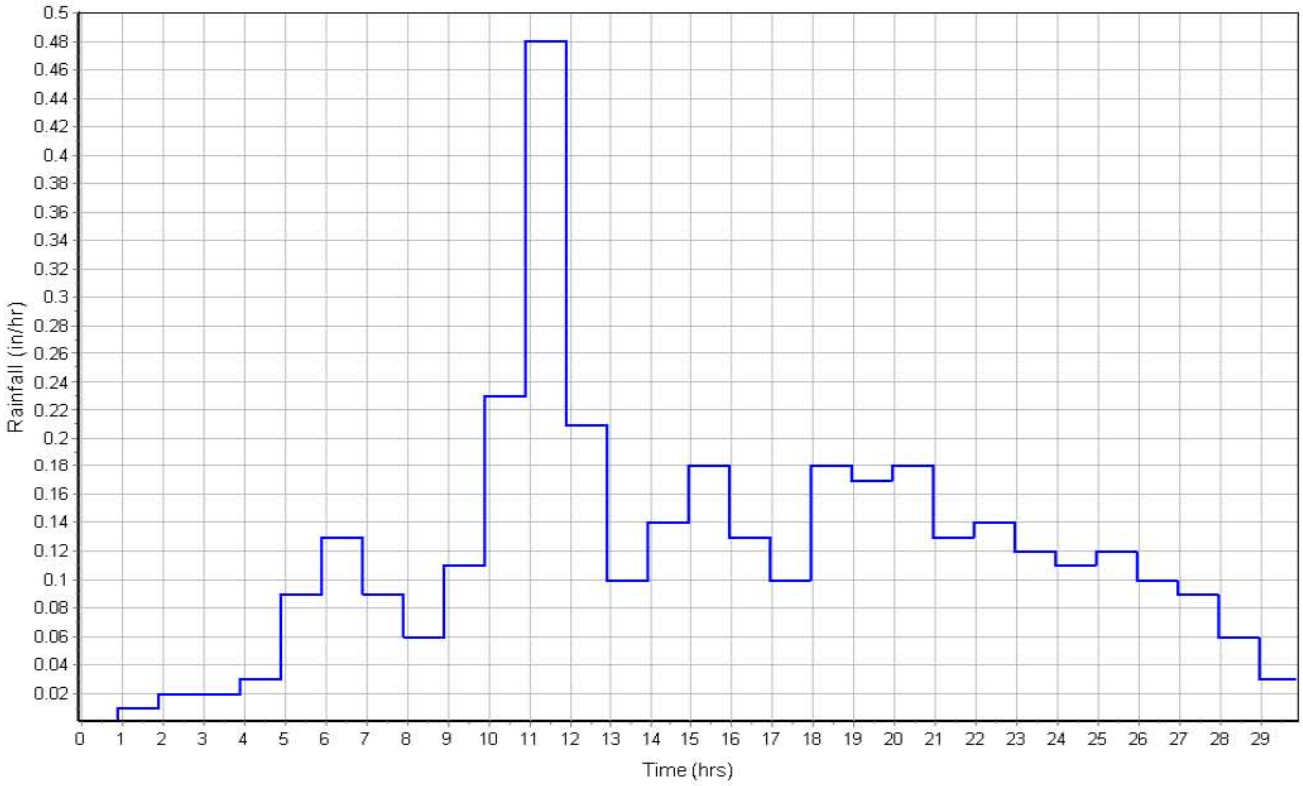
Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
-	138739.73	-	92.00
Composite Area & Weighted CN	138739.73		92.00

Subbasin Runoff Results

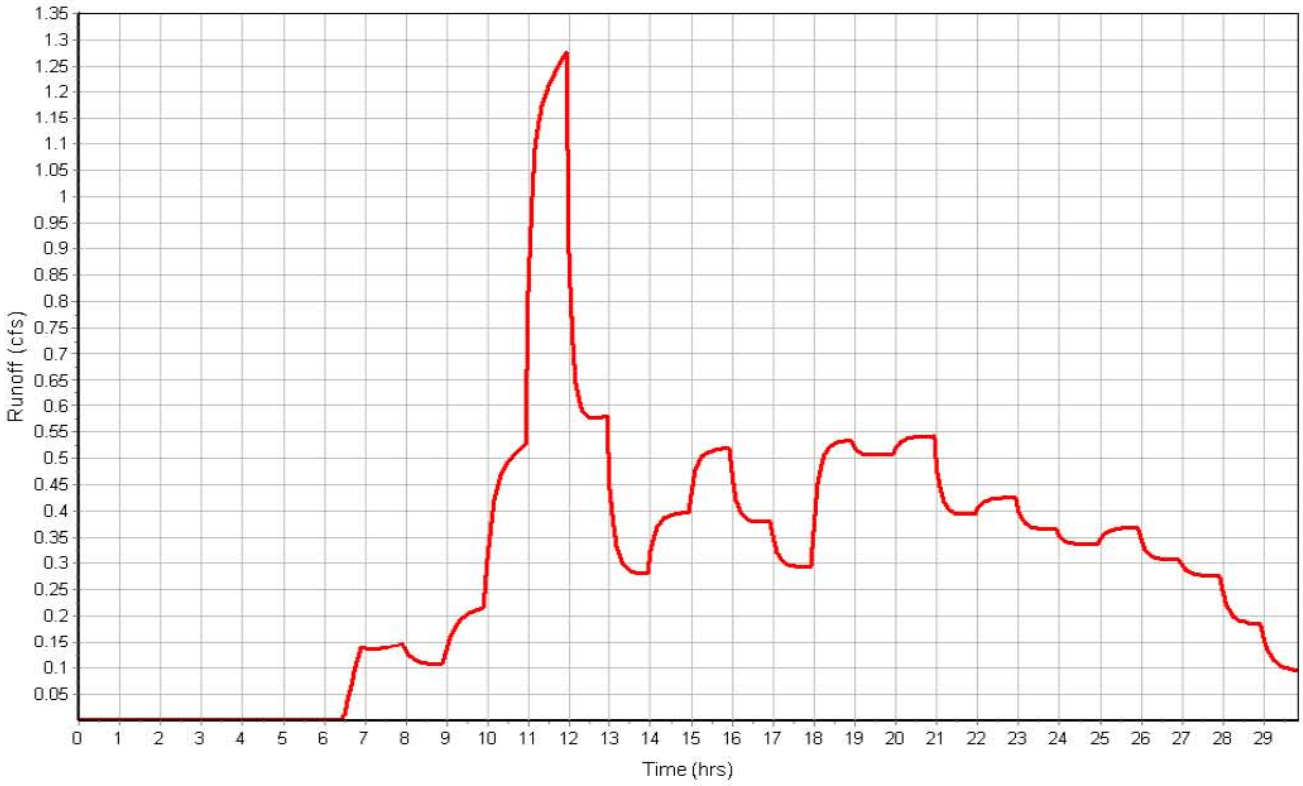
Total Rainfall (in)	3.56
Total Runon (in)	0.00
Total Evaporation (in)	0.0000
Total Infiltration (in)	0.6990
Total Runoff (in)	2.80
Peak Runoff (cfs)	1.27
Weighted Curve Number	92.00
Time of Concentration (days hh:mm:ss)	0 00:15:11

Subbasin : Sub-03

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-04

Input Data

Area (ft²)	73369.50
Impervious Area (%)	0.00
Weighted Curve Number	95.00
Conductivity (in/hr)	0.1500
Drying Time (days)	7.00
Average Slope (%)	3.0000
Equivalent Width (ft)	500.00
Impervious Area	
Manning's Roughness	0.0150
Pervious Area	
Manning's Roughness	0.0100
Curb & Gutter Length (ft)	0.00
Rain Gage ID	Rain Gage-03

Composite Curve Number

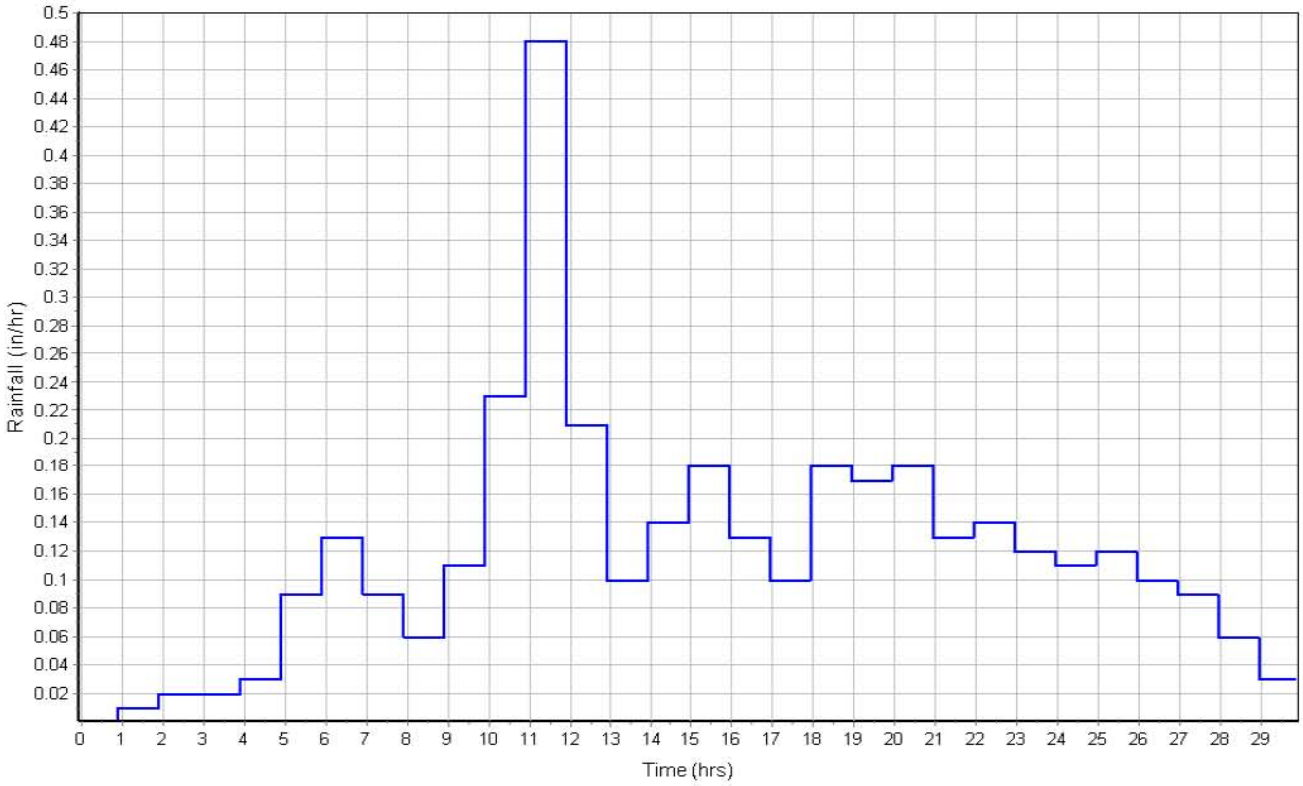
Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
-	73369.50	-	95.00
Composite Area & Weighted CN	73369.50		95.00

Subbasin Runoff Results

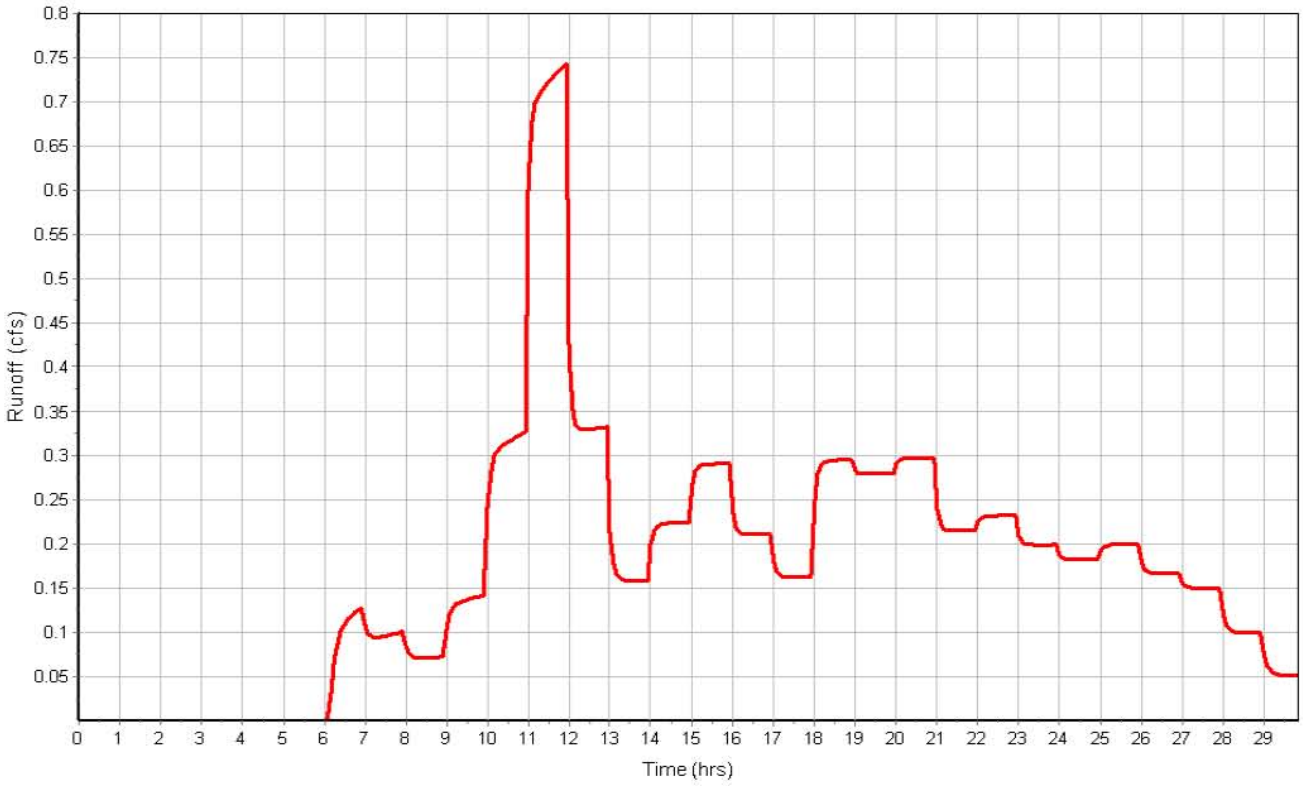
Total Rainfall (in)	3.56
Total Runon (in)	0.00
Total Evaporation (in)	0.0000
Total Infiltration (in)	0.4590
Total Runoff (in)	3.05
Peak Runoff (cfs)	0.74
Weighted Curve Number	95.00
Time of Concentration (days hh:mm:ss)	0 00:07:57

Subbasin : Sub-04

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-06

Input Data

Area (ft²)	64608.93
Impervious Area (%)	0.00
Weighted Curve Number	95.00
Conductivity (in/hr)	0.1500
Drying Time (days)	7.00
Average Slope (%)	3.0000
Equivalent Width (ft)	500.00
Impervious Area	
Manning's Roughness	0.0150
Pervious Area	
Manning's Roughness	0.0100
Curb & Gutter Length (ft)	0.00
Rain Gage ID	Rain Gage-03

Composite Curve Number

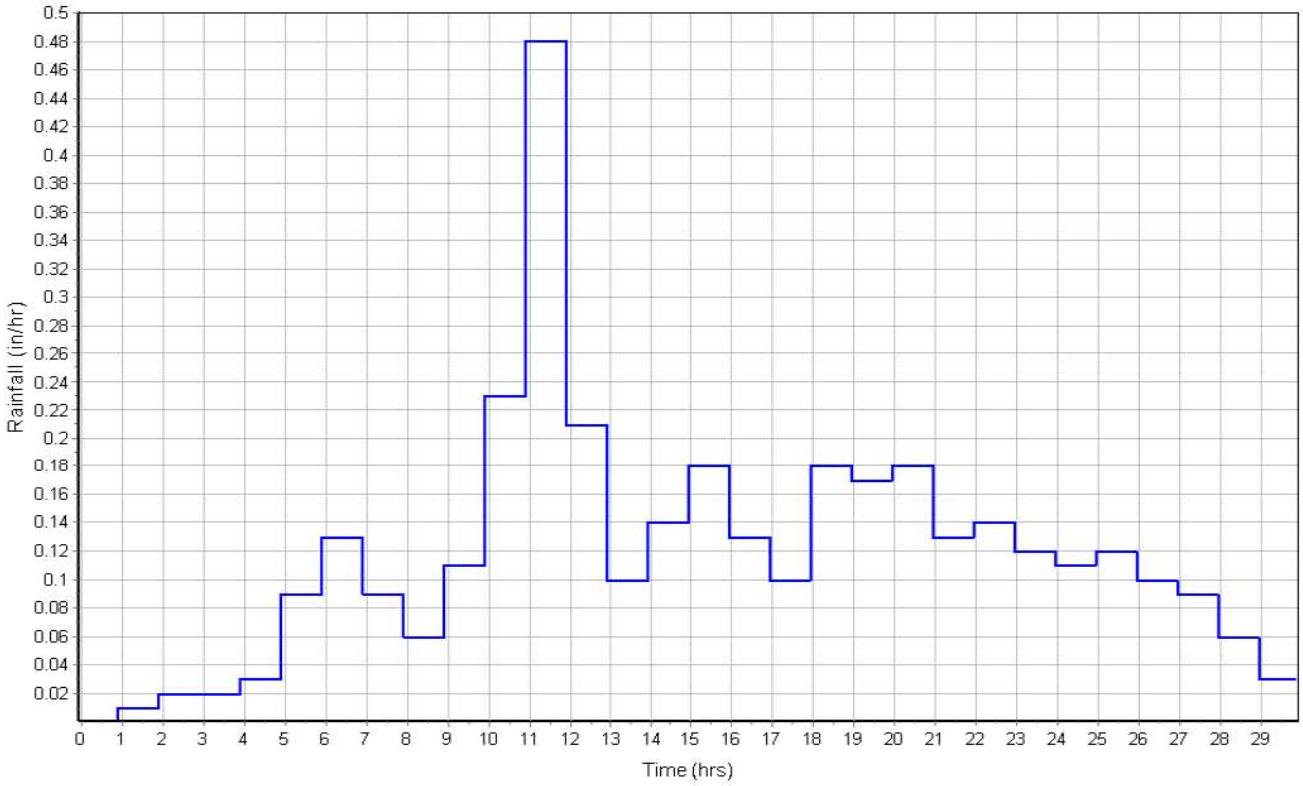
Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
-	64608.93	-	95.00
Composite Area & Weighted CN	64608.93		95.00

Subbasin Runoff Results

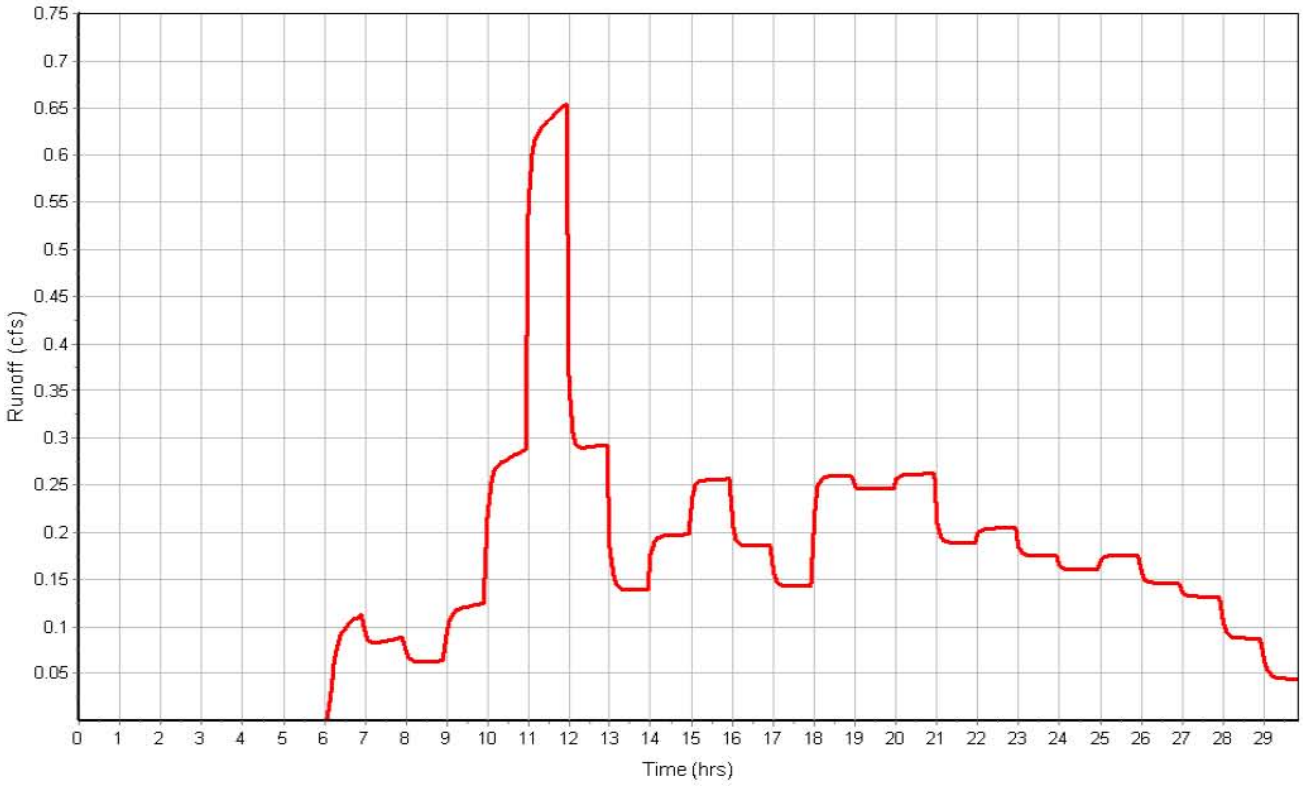
Total Rainfall (in)	3.56
Total Runon (in)	0.00
Total Evaporation (in)	0.0000
Total Infiltration (in)	0.4590
Total Runoff (in)	3.05
Peak Runoff (cfs)	0.65
Weighted Curve Number	95.00
Time of Concentration (days hh:mm:ss)	0 00:07:21

Subbasin : Sub-06

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 (ft²)	Minimum Pipe Cover (in)
1	Jct_HF	88.35	91.35	3.00	88.35	0.00	500.00	408.66	0.00	0.00
2	Jun-01	92.00	94.00	2.00	92.00	0.00	500.00	406.00	0.00	0.00
3	Jun-02	91.00	93.00	2.00	91.00	0.00	500.00	407.00	0.00	0.00
4	Jun-03	89.00	91.00	2.00	89.00	0.00	500.00	409.00	0.00	0.00
5	Jun-V1-2	79.00	86.00	7.00	79.00	0.00	86.00	0.00	0.00	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 Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness
1	4in_V1	207.32	0.00	-79.00	0.00	0.00	0.00	0.0000	Circular Force Main	3.960	3.960	0.0150
2	Link-04	446.12	92.00	0.00	91.00	0.00	1.00	0.2200	CIRCULAR	18.000	18.000	0.0150
3	Link-05	395.25	91.00	0.00	89.00	0.00	2.00	0.5100	CIRCULAR	18.000	18.000	0.0150
4	Link-09	540.02	89.00	0.00	88.35	0.00	0.66	0.1200	CIRCULAR	18.000	18.000	0.0150
5	Link-27	40.00	88.35	0.00	85.75	6.75	2.60	6.4900	CIRCULAR	18.000	18.000	0.0240

Storage Nodes

Storage Node : Vault-1

Input Data

Invert Elevation (ft)	79.00
Max (Rim) Elevation (ft)	86.00
Max (Rim) Offset (ft)	7.00
Initial Water Elevation (ft)	79.00
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	3.31
Peak Lateral Inflow (cfs)	0.00
Peak Outflow (cfs)	3.31
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	85.04
Max HGL Depth Attained (ft)	6.04
Average HGL Elevation Attained (ft)	82.29
Average HGL Depth Attained (ft)	3.29
Time of Max HGL Occurrence (days hh:mm)	0 12:00
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

NOT TO SCALE

FIGURE 1
FRO SUB-BASIN AREA GRAPHIC

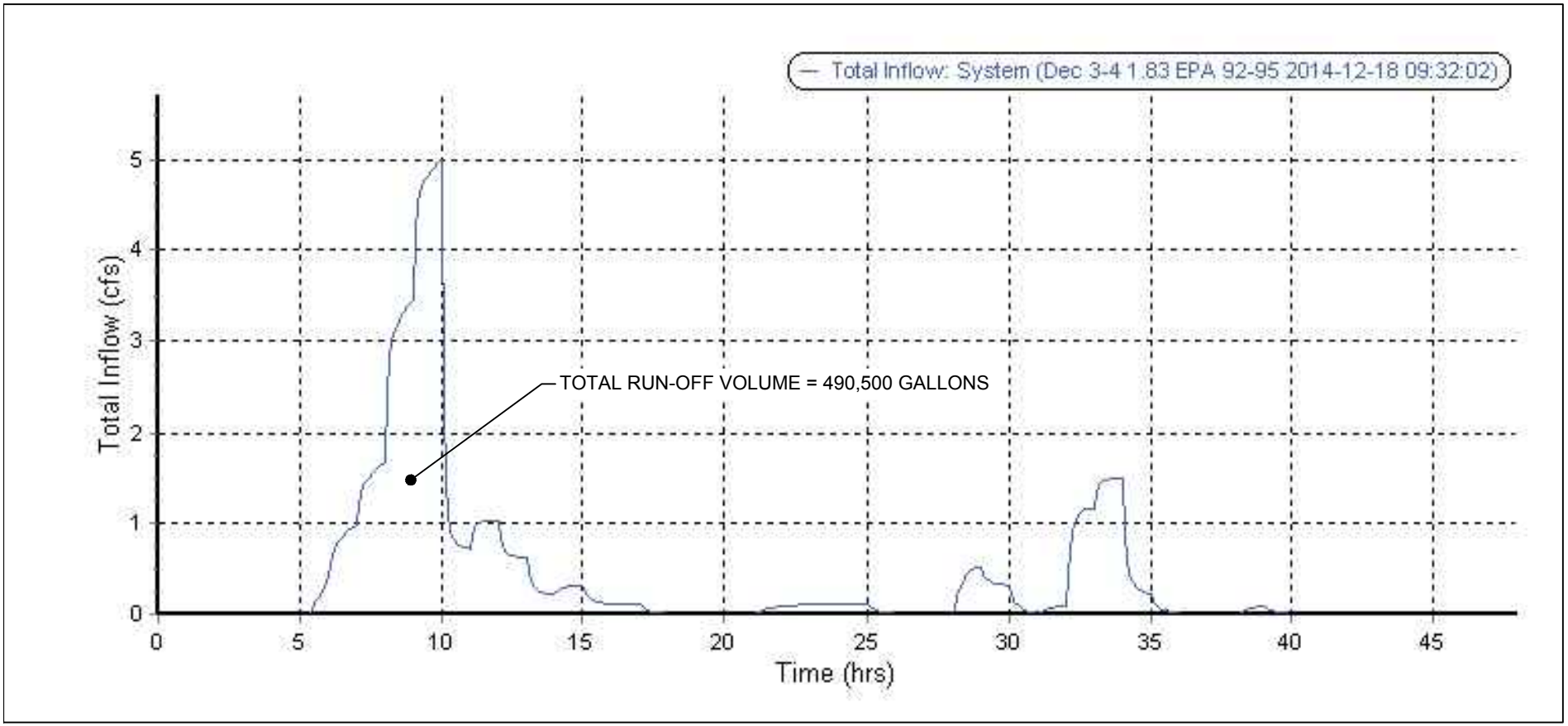


FIGURE 2
DECEMBER 3-4 TOTAL PRECIPITATION RUN-OFF

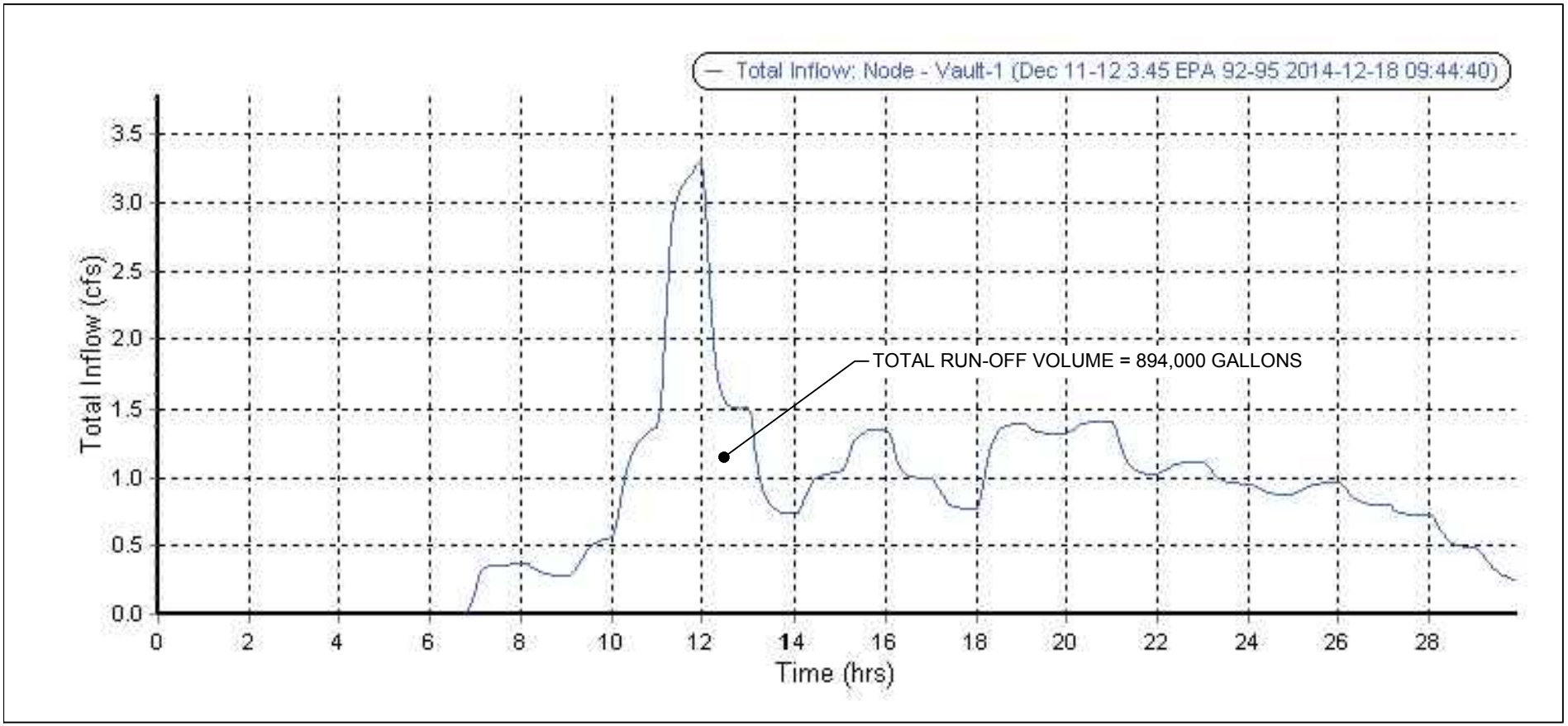


FIGURE 3
DECEMBER 11-12 TOTAL PRECIPITATION RUN-OFF

ATTACHMENT 3
COMPOST WATER RUN-OFF ANALYSES FOR A 3.16-INCH, 24-HOUR STORM EVENT

Project Description

File Name	Dec 2014 RYS Model.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	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	Dec 17, 2014	00:00:00
End Analysis On	Dec 18, 2014	23:59:00
Start Reporting On	Dec 17, 2014	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	2	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	5
Nodes	8
Junctions	4
Outfalls	3
Flow Diversions	0
Inlets	0
Storage Nodes	1
Links	5
Channels	0
Pipes	4
Pumps	0
Orifices	0
Weirs	1
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		Time Series	TS-08	Cumulative	inches	California	Yuba (Marysville)	25	3.16	SCS Type I 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ft^2)	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ft^3)	Time of Concentration (days hh:mm:ss)
1	Sub-01	125246.19	92.00	3.16	2.31	24141.21	0 00:08:09
2	Sub-02	98348.29	92.00	3.16	2.31	18956.63	0 00:08:27
3	Sub-03	138739.73	92.00	3.16	2.31	26742.08	0 00:08:45
4	Sub-04	73369.50	95.00	3.16	2.61	15933.41	0 00:09:03
5	Sub-06	64608.93	95.00	3.16	2.61	14030.91	0 00:08:45

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 Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio
					(ft)	(ft)	(ft)	(%)	(in)		(ft/sec)	(ft)	
1	Link-04	Pipe	Jun-01	Jun-02	446.12	92.00	91.00	0.2200	18.000	0.0150	2.90	1.50	1.00
2	Link-05	Pipe	Jun-02	Jun-03	395.25	91.00	89.00	0.5100	18.000	0.0150	4.95	1.50	1.00
3	Link-09	Pipe	Jun-03	Jct_HF	540.02	89.00	88.35	0.1200	18.000	0.0150	7.62	1.50	1.00
4	Link-27	Pipe	Jct_HF	Vault-1	40.00	88.35	85.75	6.4900	18.000	0.0240	8.24	1.32	0.88
5	Weir-02	Weir	Vault-1	Out-HF		79.00	0.00						

Subbasin Hydrology

Subbasin : Sub-01

Input Data

Area (ft²) 125246.19
Weighted Curve Number 92.00
Rain Gage ID ..... Rain Gage-03

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
COMPACT_CLAYEY-LOAM_SOIL(ACCESS_ROAD)	125246.19	-	92.00
Composite Area & Weighted CN	125246.19		92.00

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^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^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (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^(2/3)) * (Sf^0.5)) / 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 (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

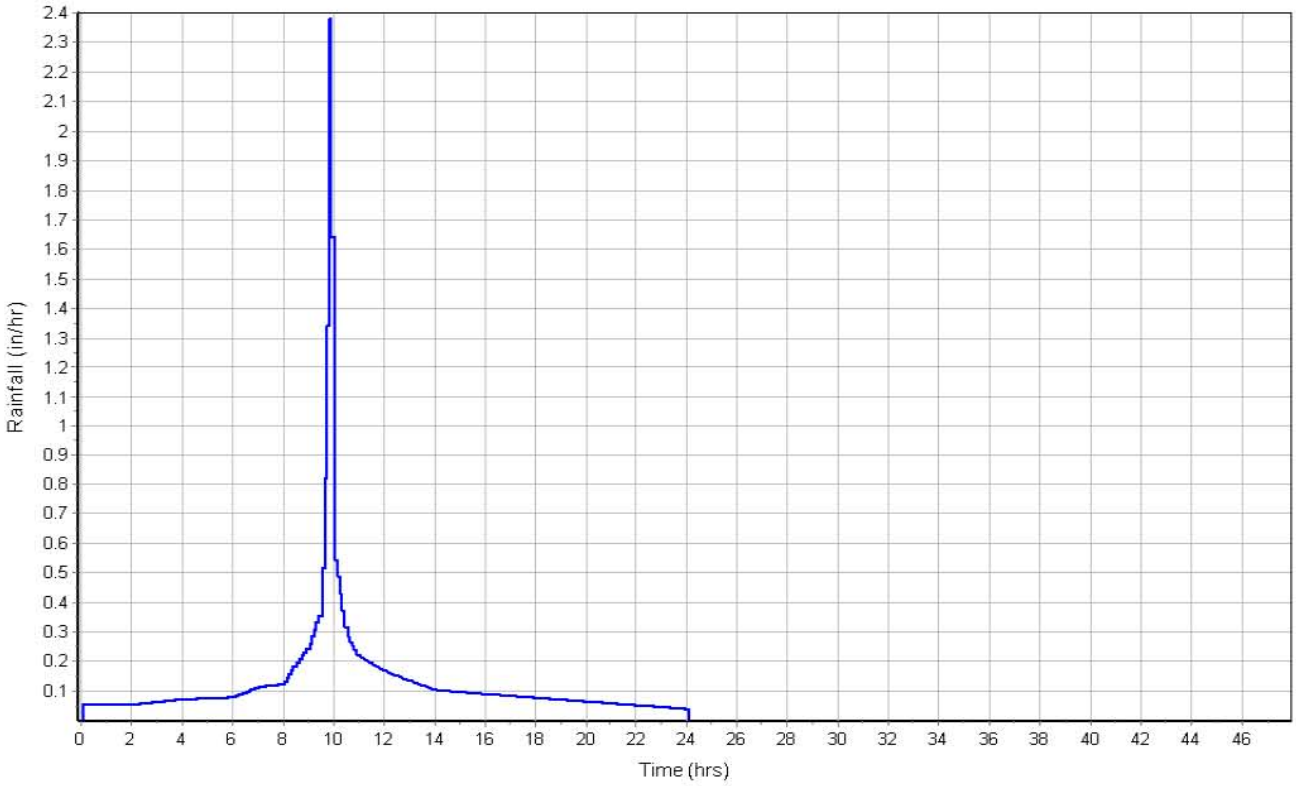
Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	.1	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	3	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.2	0.00	0.00
Velocity (ft/sec) :	0.23	0.00	0.00
Computed Flow Time (min) :	7.26	0.00	0.00

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	150	0.00	0.00
Slope (%) :	3	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.79	0.00	0.00
Computed Flow Time (min) :	0.90	0.00	0.00

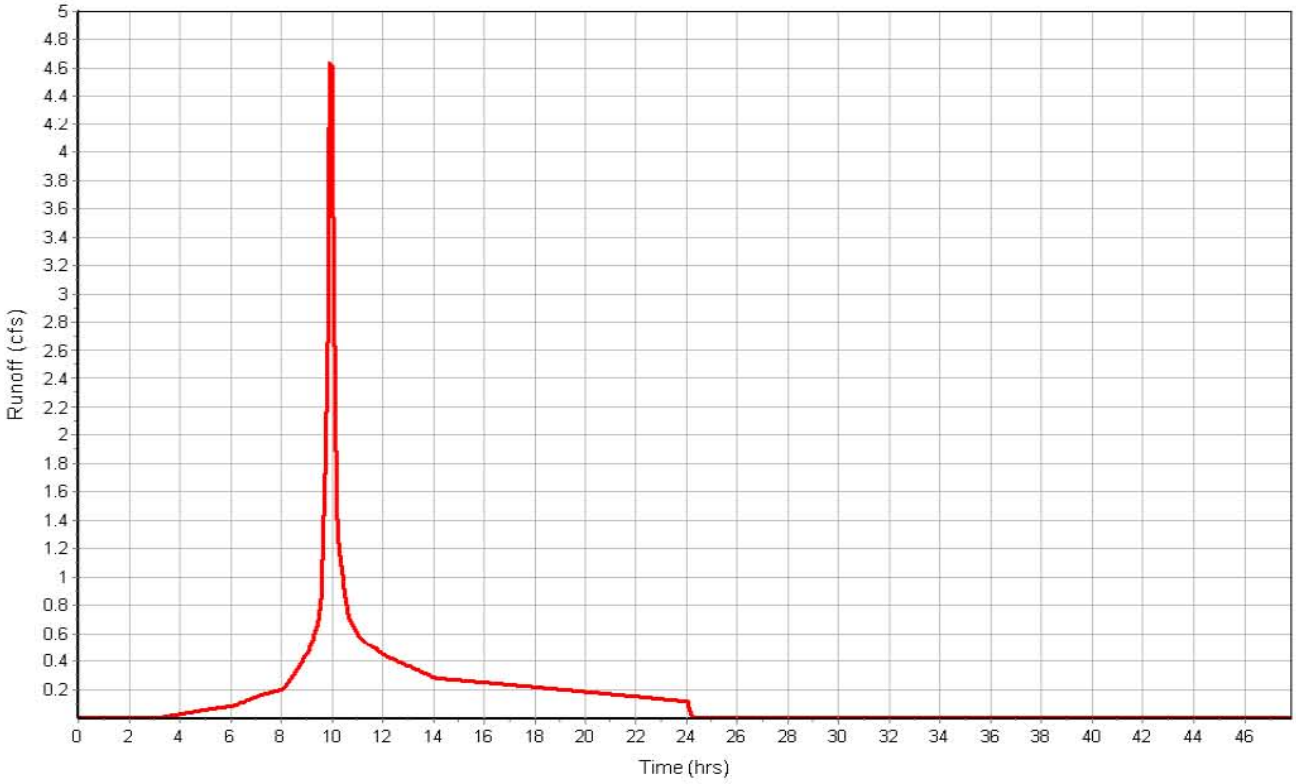
Total TOC (min) 8.16

Subbasin : Sub-01

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-02

Input Data

Area (ft²)	98348.29
Weighted Curve Number	92.00
Rain Gage ID	Rain Gage-03

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
COMPACT_CLAYEY-LOAM_SOIL(ACCESS_ROAD)	98348.29	-	92.00
Composite Area & Weighted CN	98348.29		92.00

Time of Concentration

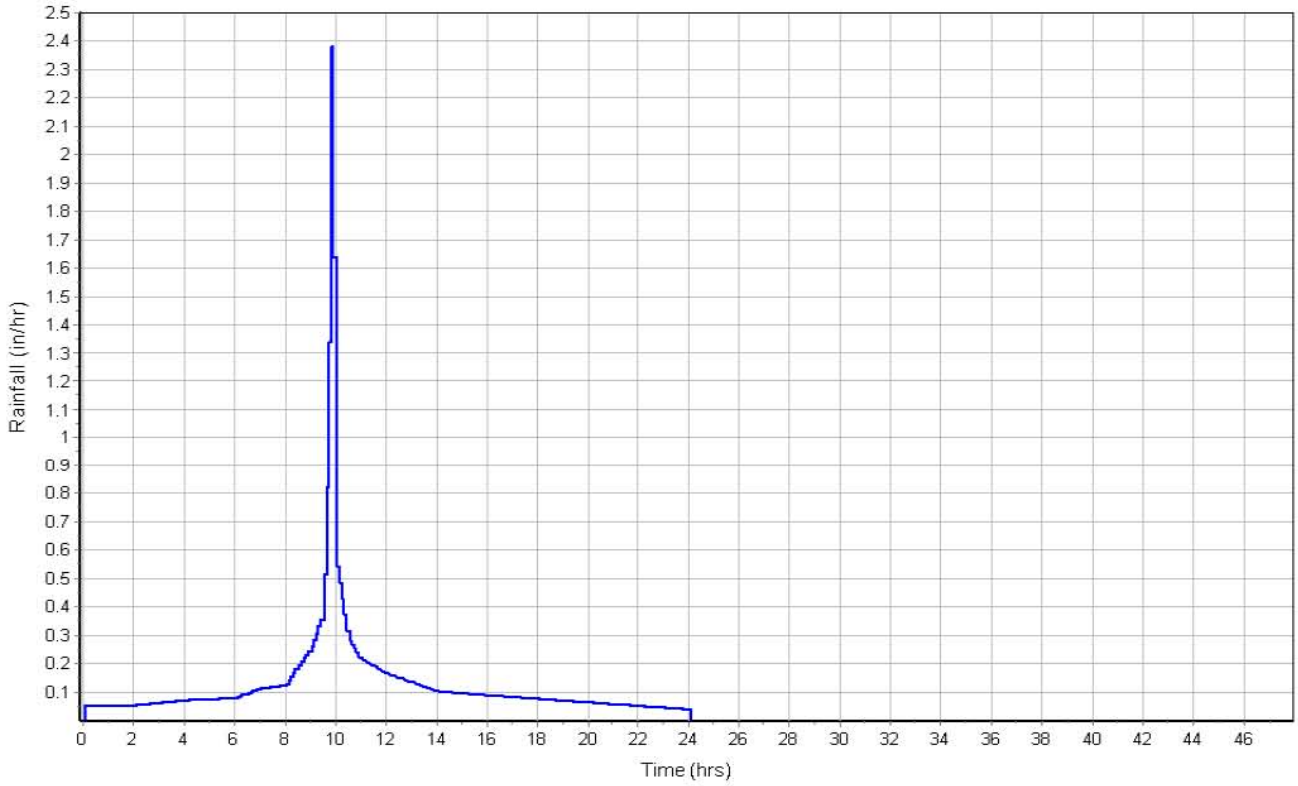
Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	.1	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	3	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.2	0.00	0.00
Velocity (ft/sec) :	0.23	0.00	0.00
Computed Flow Time (min) :	7.26	0.00	0.00

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	200	0.00	0.00
Slope (%) :	3	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.79	0.00	0.00
Computed Flow Time (min) :	1.19	0.00	0.00

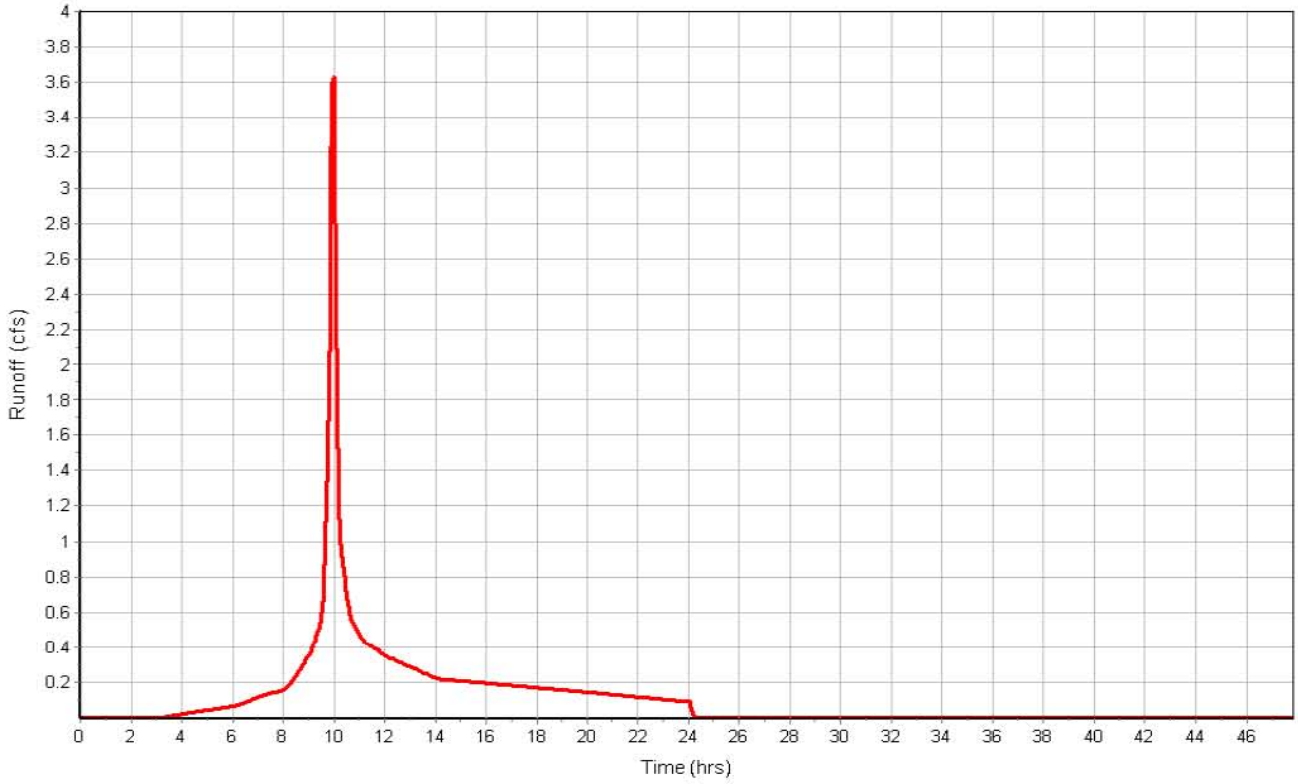
Total TOC (min) 8.46

Subbasin : Sub-02

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-03

Input Data

Area (ft²) 138739.73
Weighted Curve Number 92.00
Rain Gage ID ..... Rain Gage-03

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
COMPACT_CLAYEY-LOAM_SOIL(ACCESS_ROAD)	138739.73	-	92.00
Composite Area & Weighted CN	138739.73		92.00

Time of Concentration

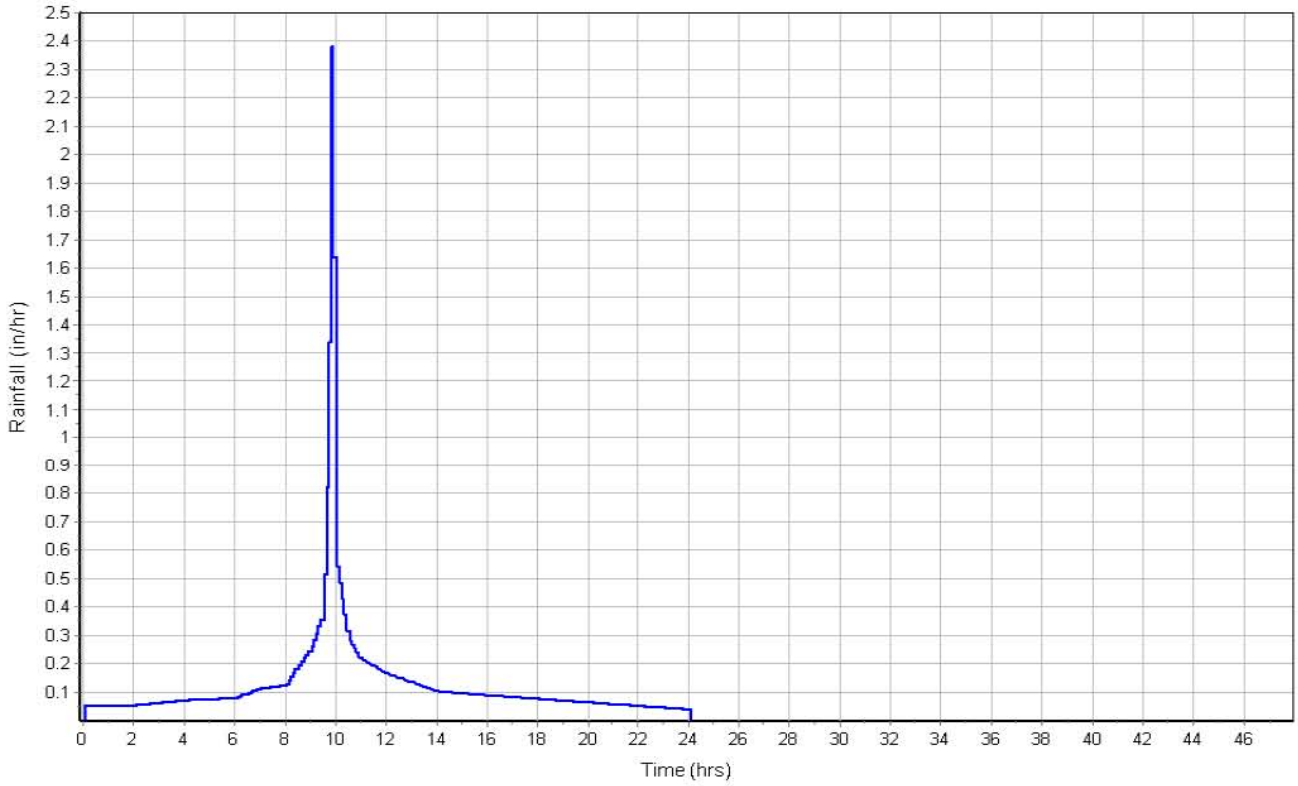
Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	.1	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	3	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.2	0.00	0.00
Velocity (ft/sec) :	0.23	0.00	0.00
Computed Flow Time (min) :	7.26	0.00	0.00

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	250	0.00	0.00
Slope (%) :	3	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.79	0.00	0.00
Computed Flow Time (min) :	1.49	0.00	0.00

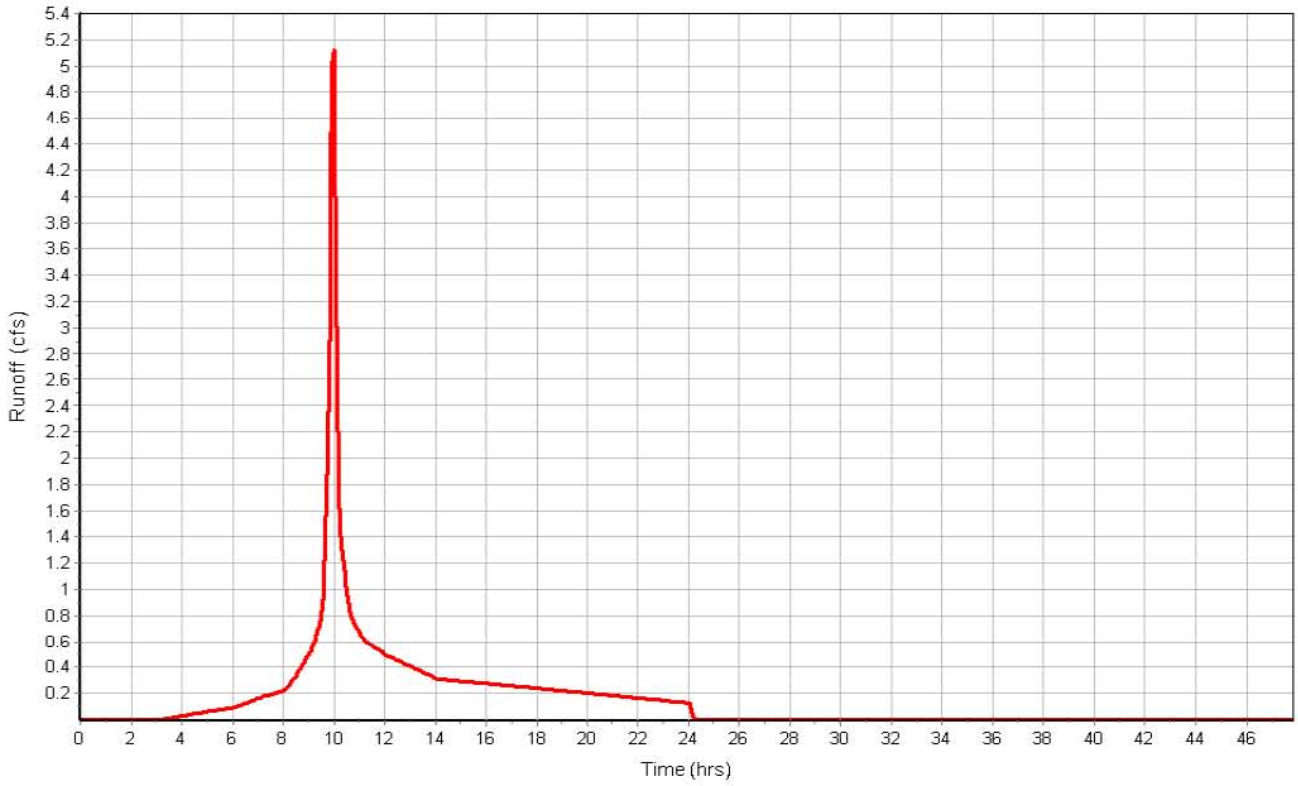
Total TOC (min) 8.76

Subbasin : Sub-03

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-04

Input Data

Area (ft²) 73369.50
Weighted Curve Number 95.00
Rain Gage ID ..... Rain Gage-03

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Dirt roads	73369.50	C	95.00
Composite Area & Weighted CN	73369.50		95.00

Time of Concentration

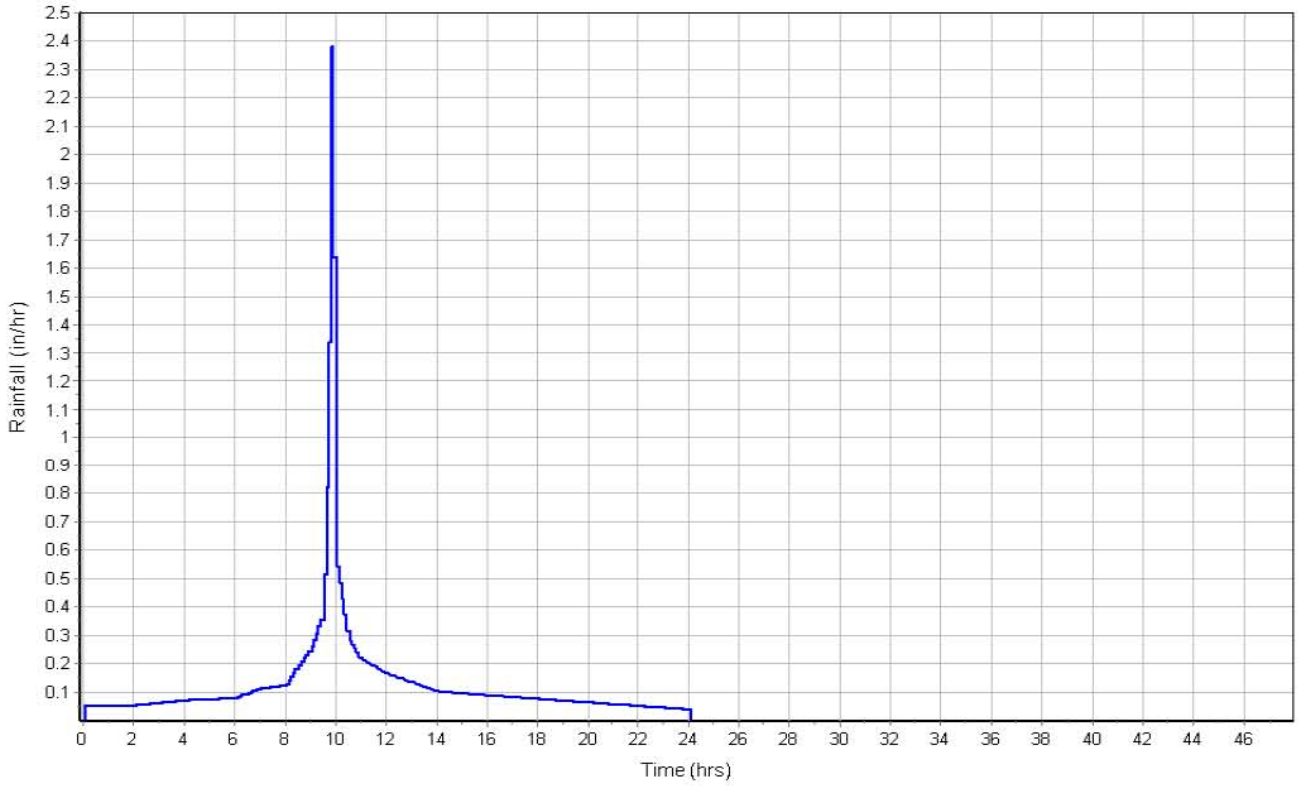
Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	.1	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	3	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.2	0.00	0.00
Velocity (ft/sec) :	0.23	0.00	0.00
Computed Flow Time (min) :	7.26	0.00	0.00

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	300	0.00	0.00
Slope (%) :	3	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.79	0.00	0.00
Computed Flow Time (min) :	1.79	0.00	0.00

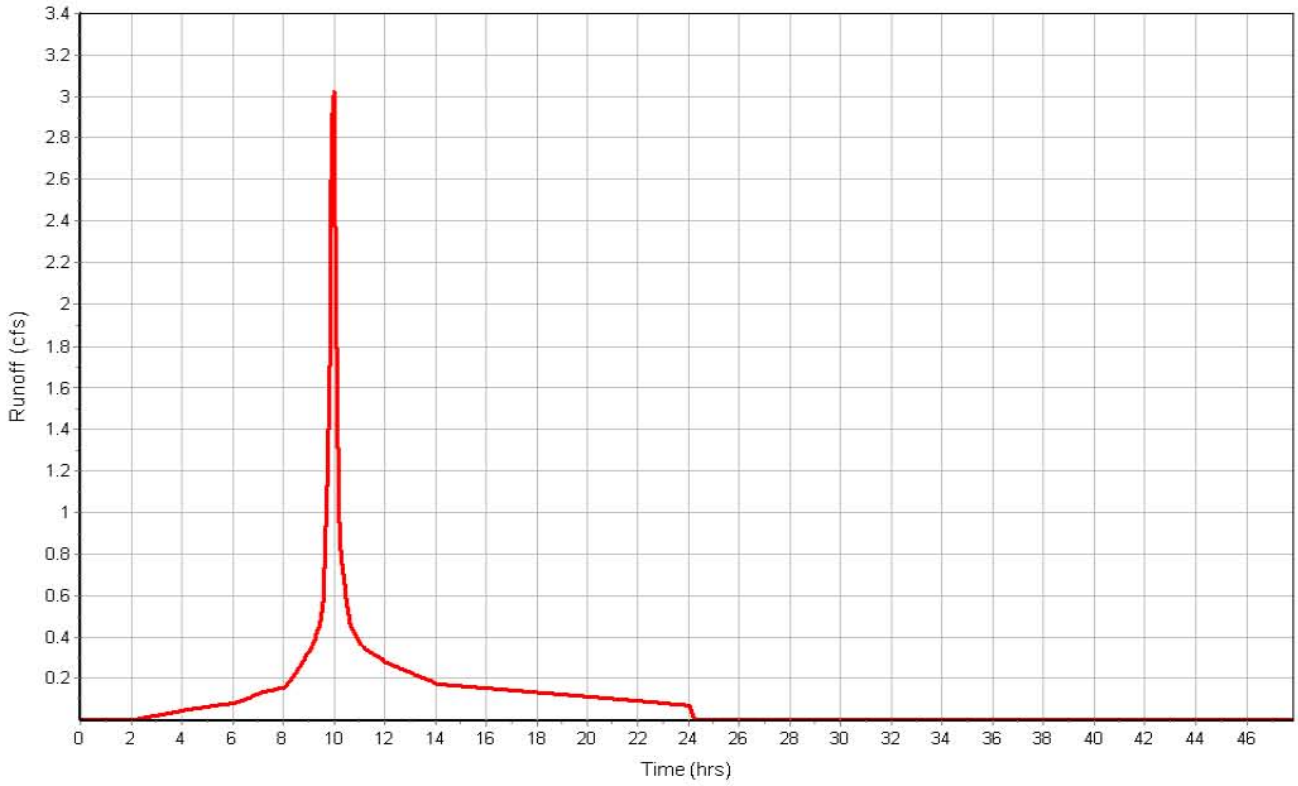
Total TOC (min) 9.06

Subbasin : Sub-04

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-06

Input Data

Area (ft²) 64608.93
Weighted Curve Number 95.00
Rain Gage ID ..... Rain Gage-03

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Dirt roads	64608.93	C	95.00
Composite Area & Weighted CN	64608.93		95.00

Time of Concentration

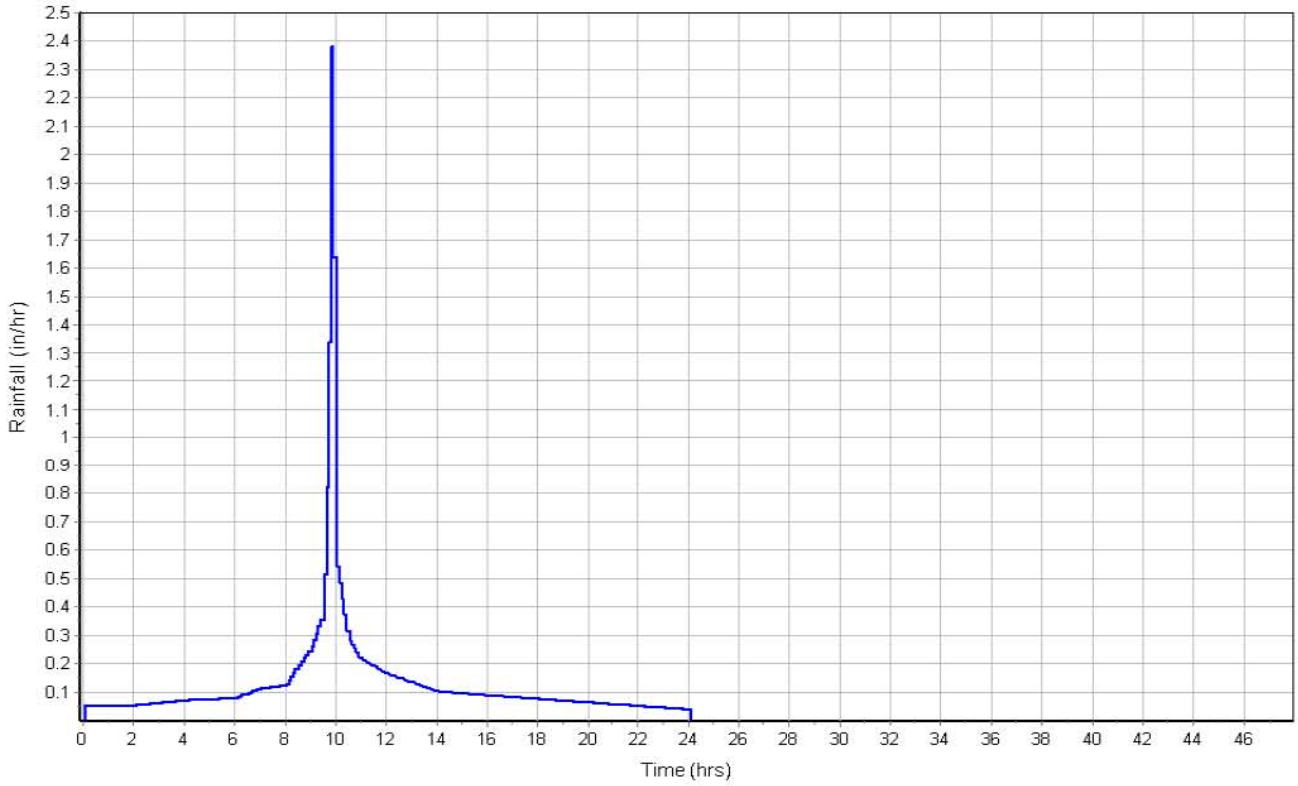
Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	.1	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	3	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.2	0.00	0.00
Velocity (ft/sec) :	0.23	0.00	0.00
Computed Flow Time (min) :	7.26	0.00	0.00

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	250	0.00	0.00
Slope (%) :	3	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.79	0.00	0.00
Computed Flow Time (min) :	1.49	0.00	0.00

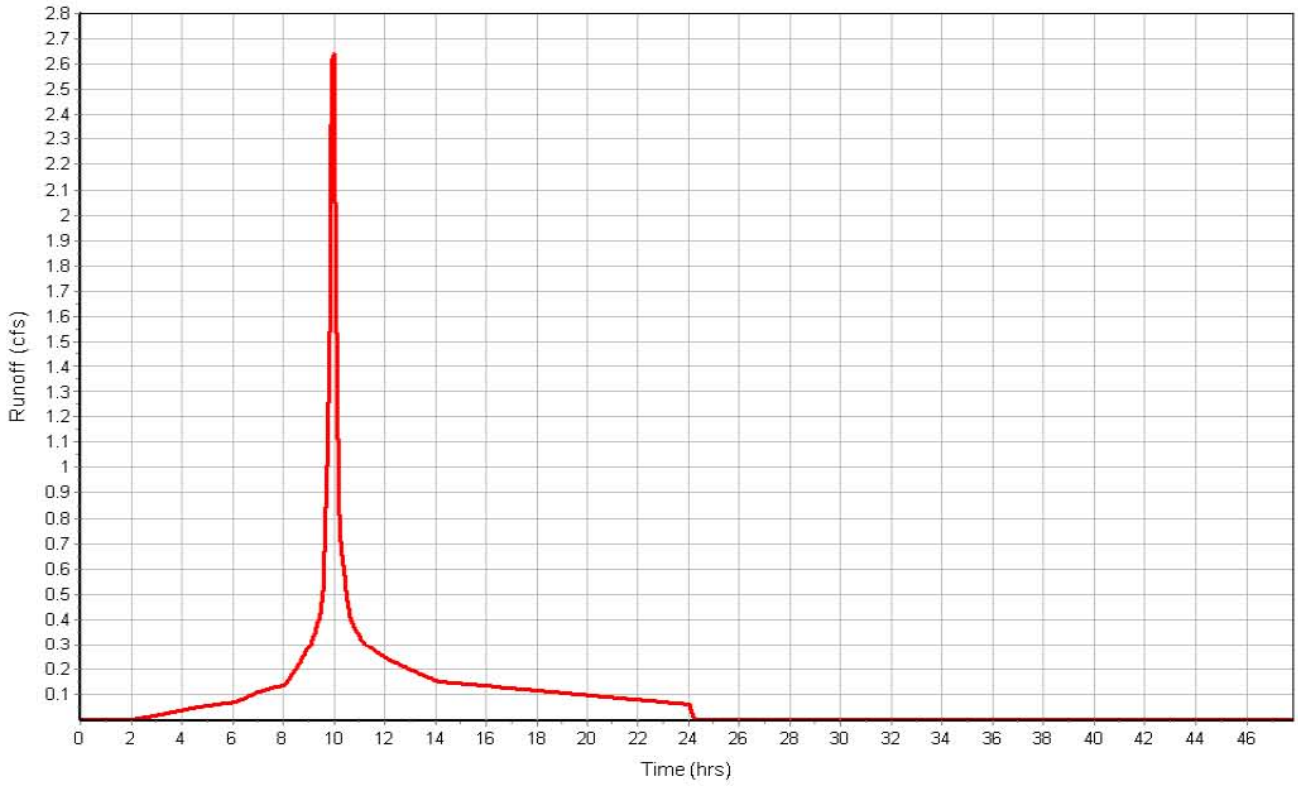
Total TOC (min) 8.76

Subbasin : Sub-06

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^2)	Minimum Pipe Cover (in)
1	Jct_HF	88.35	91.35	3.00	88.35	0.00	500.00	408.66	0.00	0.00
2	Jun-01	92.00	94.00	2.00	92.00	0.00	500.00	406.00	0.00	0.00
3	Jun-02	91.00	93.00	2.00	91.00	0.00	500.00	407.00	0.00	0.00
4	Jun-03	89.00	91.00	2.00	89.00	0.00	500.00	409.00	0.00	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 Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness
1	Link-04	446.12	92.00	0.00	91.00	0.00	1.00	0.2200	CIRCULAR	18.000	18.000	0.0150
2	Link-05	395.25	91.00	0.00	89.00	0.00	2.00	0.5100	CIRCULAR	18.000	18.000	0.0150
3	Link-09	540.02	89.00	0.00	88.35	0.00	0.66	0.1200	CIRCULAR	18.000	18.000	0.0150
4	Link-27	40.00	88.35	0.00	85.75	6.75	2.60	6.4900	CIRCULAR	18.000	18.000	0.0240

Storage Nodes

Storage Node : Vault-1

Input Data

Invert Elevation (ft)	79.00
Max (Rim) Elevation (ft)	86.00
Max (Rim) Offset (ft)	7.00
Initial Water Elevation (ft)	79.00
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00