

STORMWATER DRAINAGE TECHNICAL REPORT

For

Airtomic Industrial Building
Lot 2 Linville Business Park Plat
Franklin, IN

By

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Project Narrative

The project site is located on an approximately 5.0-acre parcel located on Lot 2 of the Linville Way Business Park in Franklin, Indiana. The proposed project will be the first phase of an overall industrial development that is planned for this property. Phase I includes the construction of an approximately 30,000 square foot industrial building. The proposed truck docks with face south and proposed employee parking is located on the south and east side of the building.

The project site is zoned IL, Industrial Light, by the City of Franklin. The proposed use is in compliance with the zoning. Figure 1 below is a location map and Figure 2 is a zoomed in aerial photograph showing the existing conditions of the site.



Figure 1: Location Map



Figure 2: Existing Conditions



Existing Conditions

The property is currently vacant farmland. There is no floodplain on the property. Existing soils on the property are a mixture of Brookstone Silty Clay Loam (Br) and Crosby Silt Loam (CrA). Each of these soils are classified under the hydrologic soil group B and C respectively. Refer to the Appendix for FEMA floodplain information, soil map, and soil information.

Proposed Conditions

The runoff rate for the development was determined using the HydroCAD computer software modeling hydrographs based on the NRCS TR-55 time of concentration and curve number calculation methodologies. Curve numbers for pre-development conditions were determined using the hydrologic soil group B. Curve numbers for post-development conditions were determined using the hydrologic soil group B. The 24-hour NRCS Type 2 Rainfall Distribution was utilized for runoff calculations. Rainfall data was pulled from NOAA to determine the rainfall depths. Please refer to the appendix for the NOAA rainfall information.

Storm Sewers

The current site flows into the proposed stormwater detention basin via underground storm or vegetative swales. The underground storm sewers convey roof drainage and detention outfall flows. These systems were designed to handle the peak runoff from a 24-hour, 10-year frequency storm. Reinforced concrete pipe (RCP) and High-Density Polyethylene (HDPE) are proposed on site and maintain 2.0-ft of cover.

Drainage Overflow Design

The stormwater detention basin will overflow into the existing ditch southeast of the site. This path will be updated once the southern property is developed.

Stormwater Quantity

The stormwater detention pond is designed to take a total 39.77-acres of off-site and on-site drainage sheds. Lot 2 has a total of 5.0 acres. The off-site drainage sheds were accounted for as if they released per City of Franklin stands post 10-yr to pre 2-yr and post 100-yr to pre 10-yr. Using a hydrologic soil group B and under the pasture properties, the CN for the pre-developed property is 61. Based on a hydrologic soil group B, pervious, and impervious areas, the weighted CN for the fully developed property is 83. The building, pavement, future pavement, and future building were considered impervious and have a CN of 98. The remaining pervious area had a CN value of 61. Refer to the hydrocad report in the appendix for a breakdown of these areas.

Each offsite area is analyzed separately. Lot 1 (13.12 Ac.) has a CN value of 61 in the existing condition. Block A1 (20 Ac.) has a CN value of 67 in the existing condition per the Crossroad Engineers drainage report. The area conveyed to Structure #13 in Linville Way (1.65 Ac.) has a CN value of 83 in the existing condition.



Given this information, the total watershed for the proposed pond is 39.77-acres. The pond is designed to release the post 10-yr event at the pre 2-yr rates and the post 100-yr event at the pre 10-yr rates. The allowable and proposed discharges are as follows:

Drainage Shed	Area (Acres)	CN	Pre 2-yr (cfs)	Pre 10-yr (cfs)
Lot 1	13.12	61	3.36	12.44
Block A1	20.0	67	10.48	27.03
Str #13	1.65	83	3.44	5.86
Lot 2	5.0	61	1.16	4.36
Total	39.77		18.44	49.69

	Allowable Discharge	Proposed Discharge	Water Surface Elevation	Storage (cu. Ft.)
10-year	18.44-cfs	16.64-cfs	752.21	59,017
100-year	49.69-cfs	41.06-cfs	753.94	118,579
Normal Pool			750.00	

One 24" storm pipe will control the release of the 10-yr and two 15" storm pipes will control 100-yr storm events. Refer to the construction details and hydrocad report for additional information.

Stormwater Quality

The wet detention pond provides the stormwater quality measures.

Conclusion

The design and analysis methods used in this study conform to the requirements of The City of Franklin Indiana Subdivision Control Ordinance and commonly accepted civil engineering practices. As proven, the allowable discharge rates have been satisfied. Therefore, no adverse effects are anticipated for adjacent or downstream land use.




Appendix A: FEMA floodplain map





National Flood Hazard Layer FIRMette















Legend




SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT


SPECIAL FLOOD HAZARD AREAS	 Without Base Flood Elevation (BFE) Zone A, V, A99 With BFE or Depth Zone AE, AO, AH, VE, AR Regulatory Floodway
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OTHER AREAS OF FLOOD HAZARD	 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X  Future Conditions 1% Annual Chance Flood Hazard Zone X  Area with Reduced Flood Risk due to Levee. See Notes. Zone X  Area with Flood Risk due to Levee Zone D
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OTHER AREAS	 Area of Minimal Flood Hazard Zone X  Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES	 Channel, Culvert, or Storm Sewer  Levee, Dike, or Floodwall

OTHER FEATURES	 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation  17.5 Coastal Transect  53 Base Flood Elevation Line (BFE)  Limit of Study  Jurisdiction Boundary  Coastal Transect Baseline  Profile Baseline  Hydrographic Feature
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MAP PANELS	 Digital Data Available  No Digital Data Available  Unmapped
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 The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **8/1/2018 at 2:37:55 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

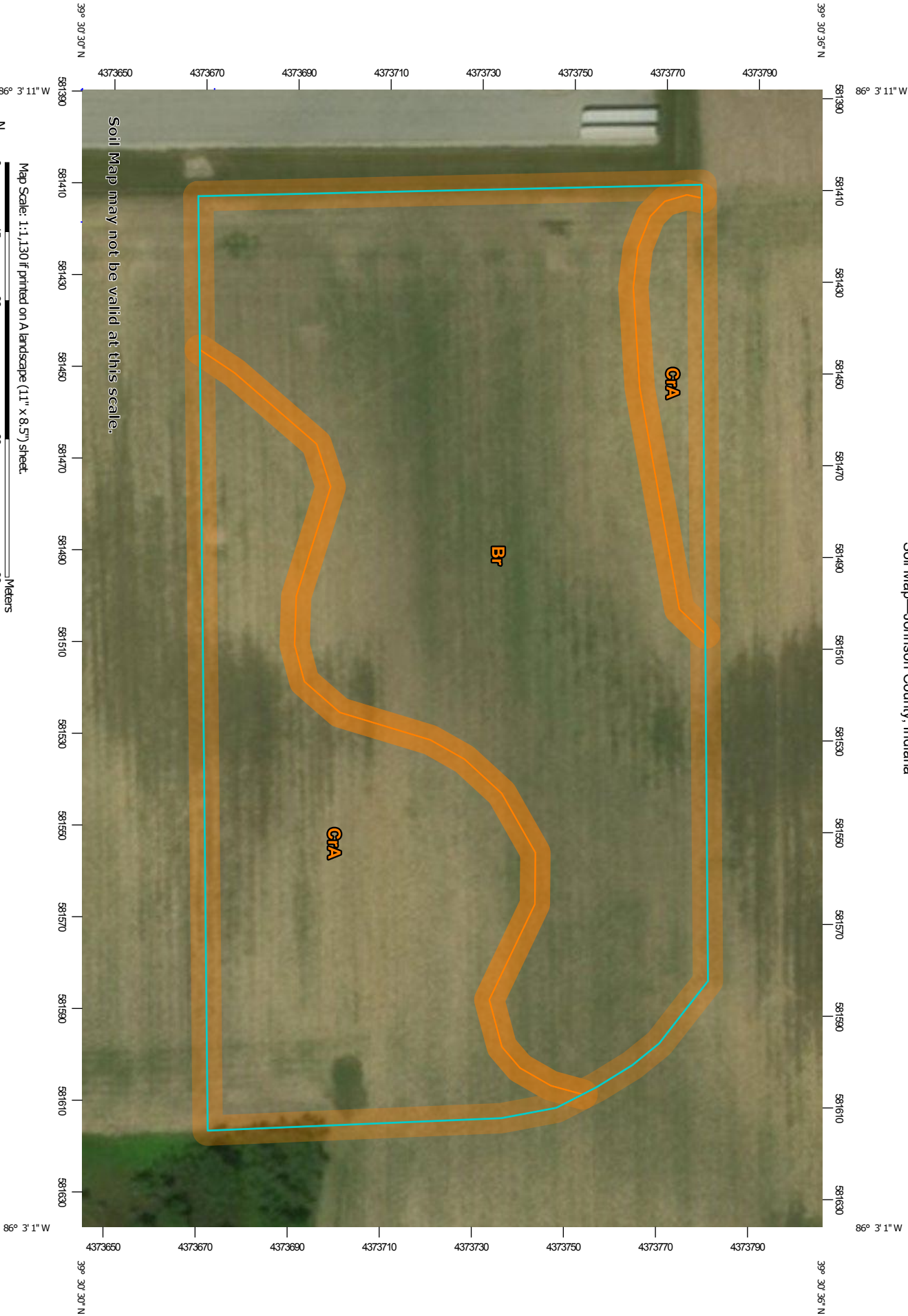
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmoderized areas cannot be used for regulatory purposes.























Appendix B: NRCS Soil Map and Soil Information

Soil Map—Johnson County, Indiana



MAP LEGEND

	Area of Interest (AOI)		Spoil Area
	Area of Interest (AOI)		Stony Spot
Soils			Very Stony Spot
	Soil Map Unit Polygons		Wet Spot
	Soil Map Unit Lines		Other
	Soil Map Unit Points		Special Line Features
Special Point Features		Water Features	
	Blowout		Streams and Canals
	Borrow Pit	Transportation	
	Clay Spot		Rails
	Closed Depression		Interstate Highways
	Gravel Pit		US Routes
	Gravelly Spot		Major Roads
	Landfill		Local Roads
	Lava Flow	Background	
	Marsh or swamp		Aerial Photography
	Mine or Quarry		
	Miscellaneous Water		
	Perennial Water		
	Rock Outcrop		
	Saline Spot		
	Sandy Spot		
	Severely Eroded Spot		
	Sinkhole		
	Slide or Slip		
	Sodic Spot		

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Johnson County, Indiana
Survey Area Data: Version 25, Oct 2, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 24, 2014—Mar 20, 2017

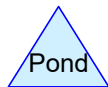
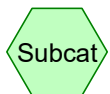
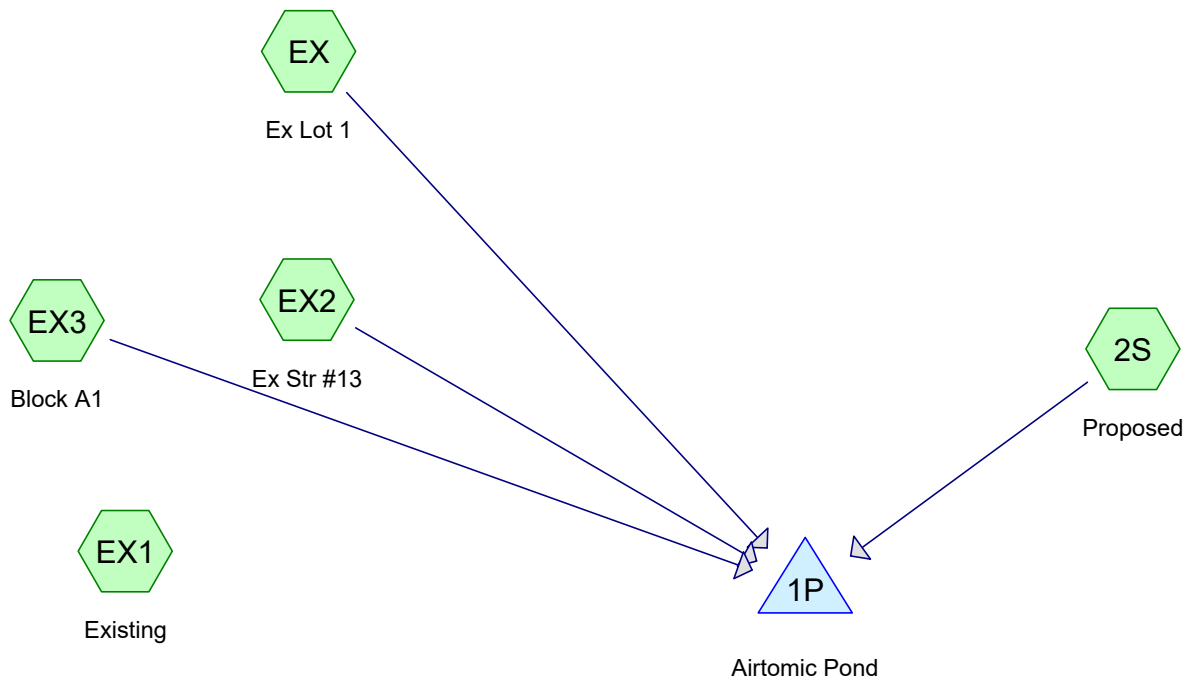
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Br	Brookston silty clay loam, 0 to 2 percent slopes	3.3	60.7%
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	2.1	39.3%
Totals for Area of Interest		5.4	100.0%



Appendix E: Detention Calculations (HydroCAD Report)



Routing Diagram for Airtomic

Prepared by The Veridus Group, Printed 8/9/2018
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Airtomic

Prepared by The Veridus Group

Printed 8/9/2018

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.030	61	>75% Grass cover, Good, HSG B (2S)
0.530	98	Future (2S)
18.122	61	Pasture/grassland/range, Good, HSG B (EX, EX1)
20.000	67	Pasture/grassland/range, Good, HSG B (EX3)
2.440	98	Paved parking, HSG A (2S)
1.650	83	Paved parking, HSG A (EX2)
44.772	67	TOTAL AREA

Airtomic

Prepared by The Veridus Group

Printed 8/9/2018

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
4.090	HSG A	2S, EX2
40.152	HSG B	2S, EX, EX1, EX3
0.000	HSG C	
0.000	HSG D	
0.530	Other	2S
44.772		TOTAL AREA

Summary for Subcatchment 2S: Proposed

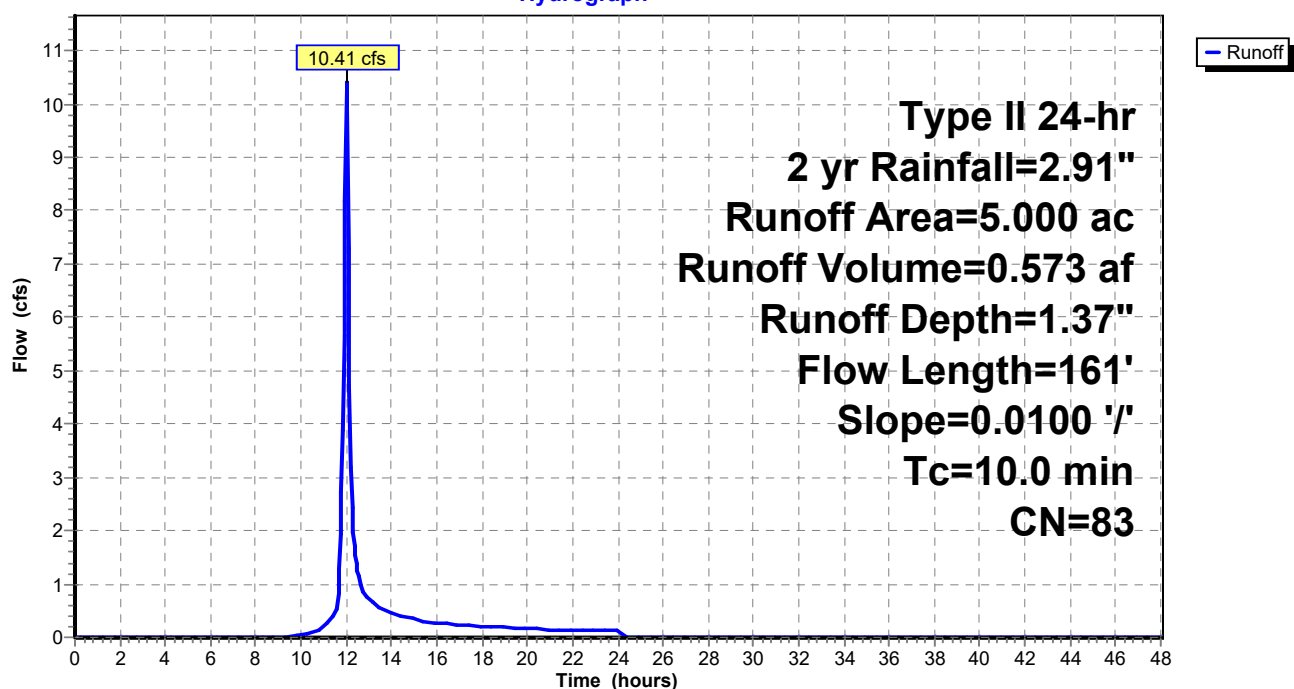
Runoff = 10.41 cfs @ 12.02 hrs, Volume= 0.573 af, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 2 yr Rainfall=2.91"

Area (ac)	CN	Description
2.440	98	Paved parking, HSG A
* 0.530	98	Future
2.030	61	>75% Grass cover, Good, HSG B
5.000	83	Weighted Average
2.030		40.60% Pervious Area
2.970		59.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	161	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
7.7					Direct Entry, From storm calcs
9.4	161				Total, Increased to minimum Tc = 10.0 min

Subcatchment 2S: Proposed**Hydrograph**

Summary for Subcatchment EX: Ex Lot 1

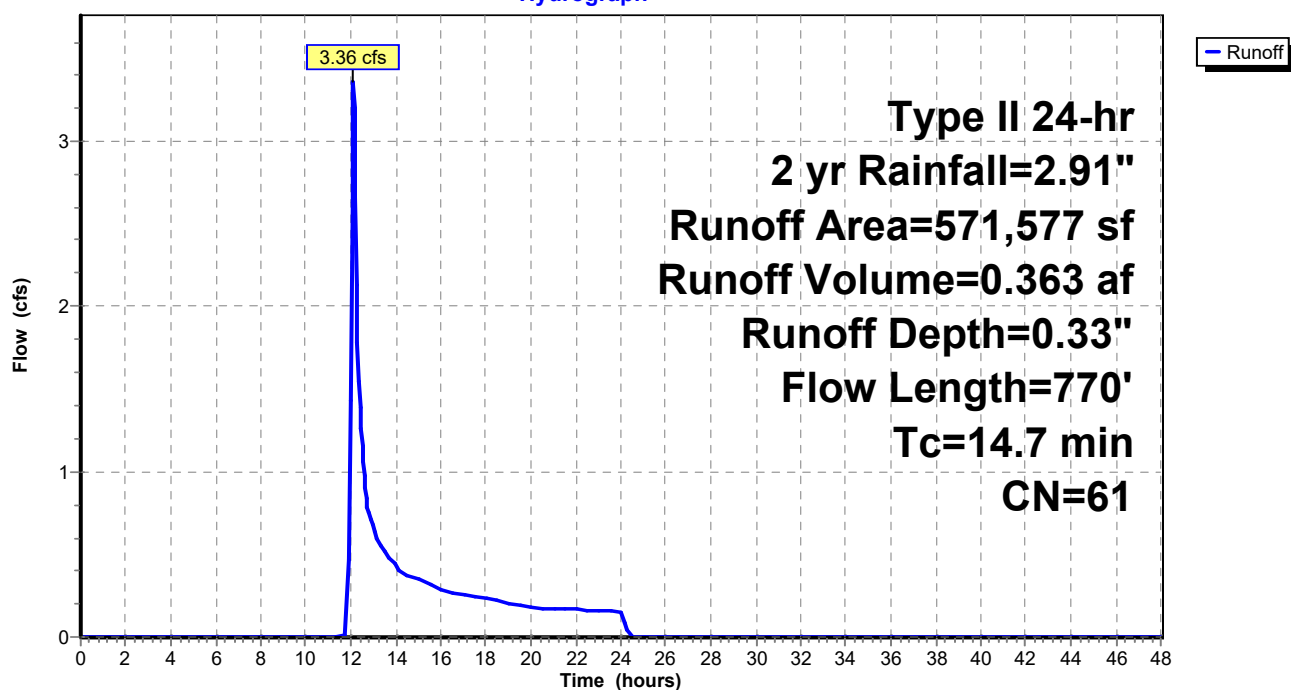
Runoff = 3.36 cfs @ 12.12 hrs, Volume= 0.363 af, Depth= 0.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 2 yr Rainfall=2.91"

Area (sf)	CN	Description
571,577	61	Pasture/grassland/range, Good, HSG B
571,577		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	20	0.0500	0.19		Sheet Flow, Range n= 0.130 P2= 2.91"
12.9	750	0.0036	0.97		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
14.7	770	Total			

Subcatchment EX: Ex Lot 1**Hydrograph**

Summary for Subcatchment EX1: Existing

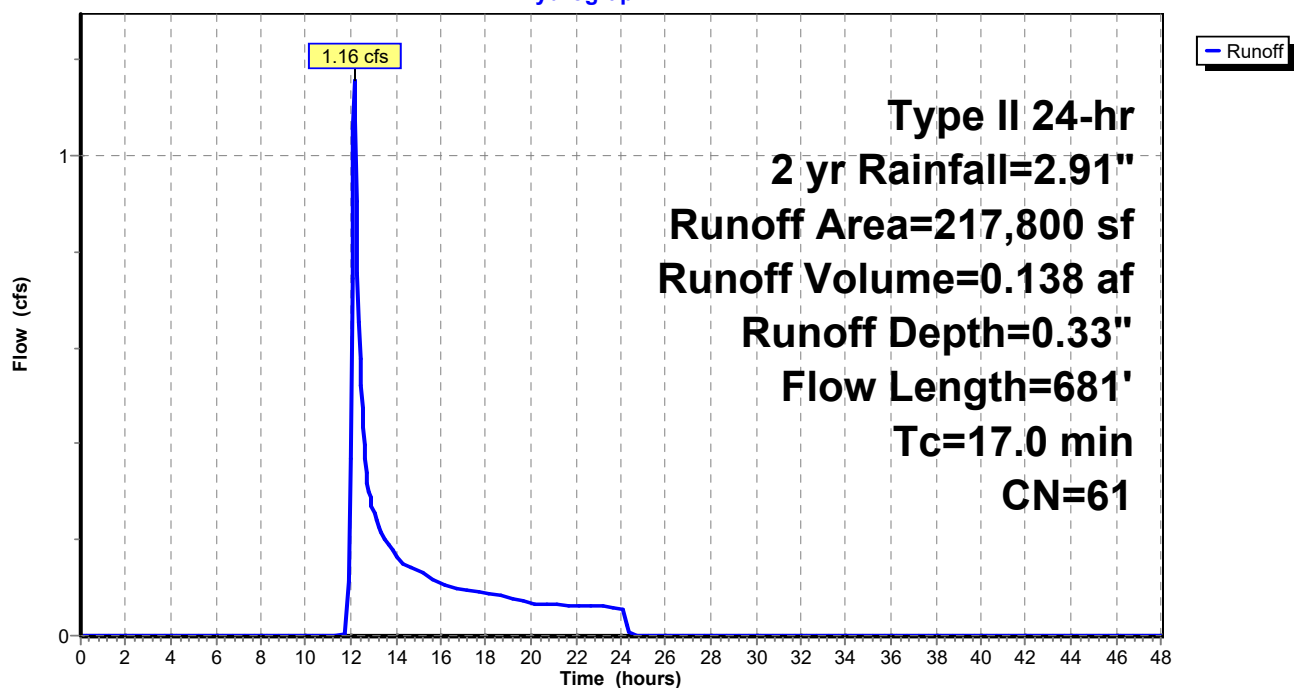
Runoff = 1.16 cfs @ 12.15 hrs, Volume= 0.138 af, Depth= 0.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 2 yr Rainfall=2.91"

Area (sf)	CN	Description
217,800	61	Pasture/grassland/range, Good, HSG B
217,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0140	0.16		Sheet Flow,
					Range n= 0.130 P2= 2.91"
4.7	500	0.0120	1.76		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
1.7	81	0.0028	0.79		Shallow Concentrated Flow,
					Grassed Waterway Kv= 15.0 fps
17.0	681	Total			

Subcatchment EX1: Existing**Hydrograph**

Summary for Subcatchment EX2: Ex Str #13

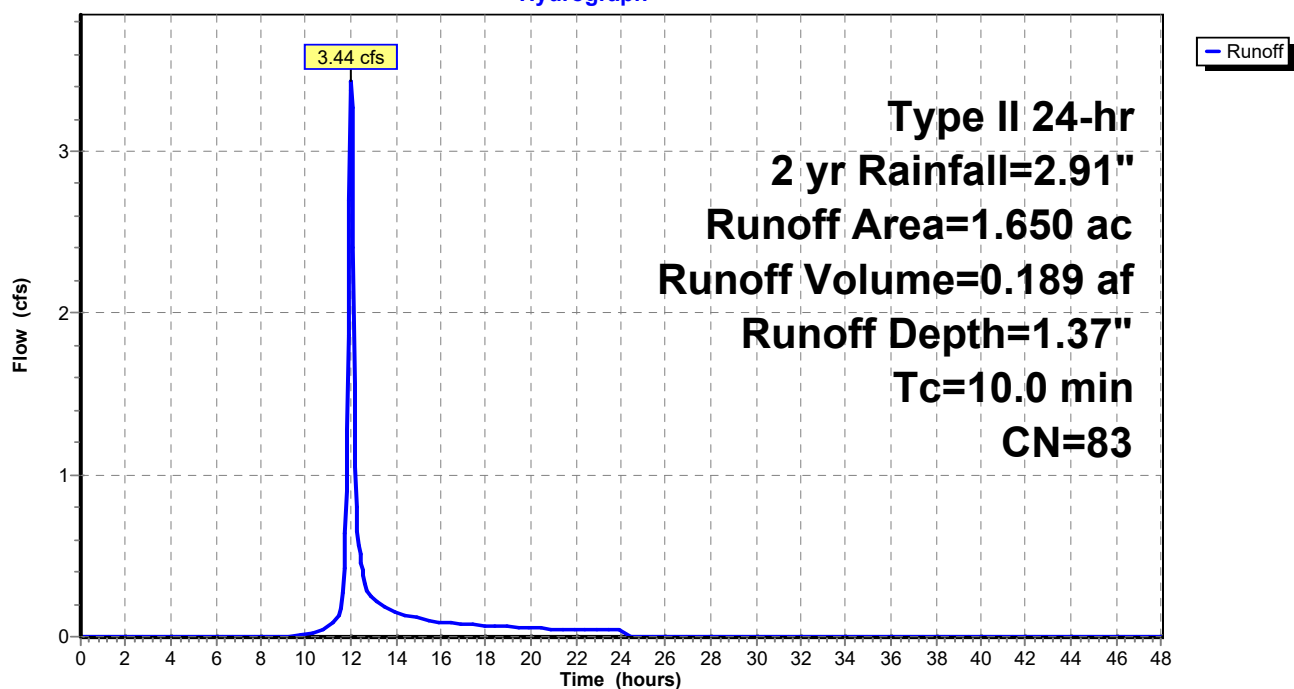
Runoff = 3.44 cfs @ 12.02 hrs, Volume= 0.189 af, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 2 yr Rainfall=2.91"

Area (ac)	CN	Description
* 1.650	83	Paved parking, HSG A
1.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7					Direct Entry,
8.7	0				Total, Increased to minimum Tc = 10.0 min

Subcatchment EX2: Ex Str #13**Hydrograph**

Summary for Subcatchment EX3: Block A1

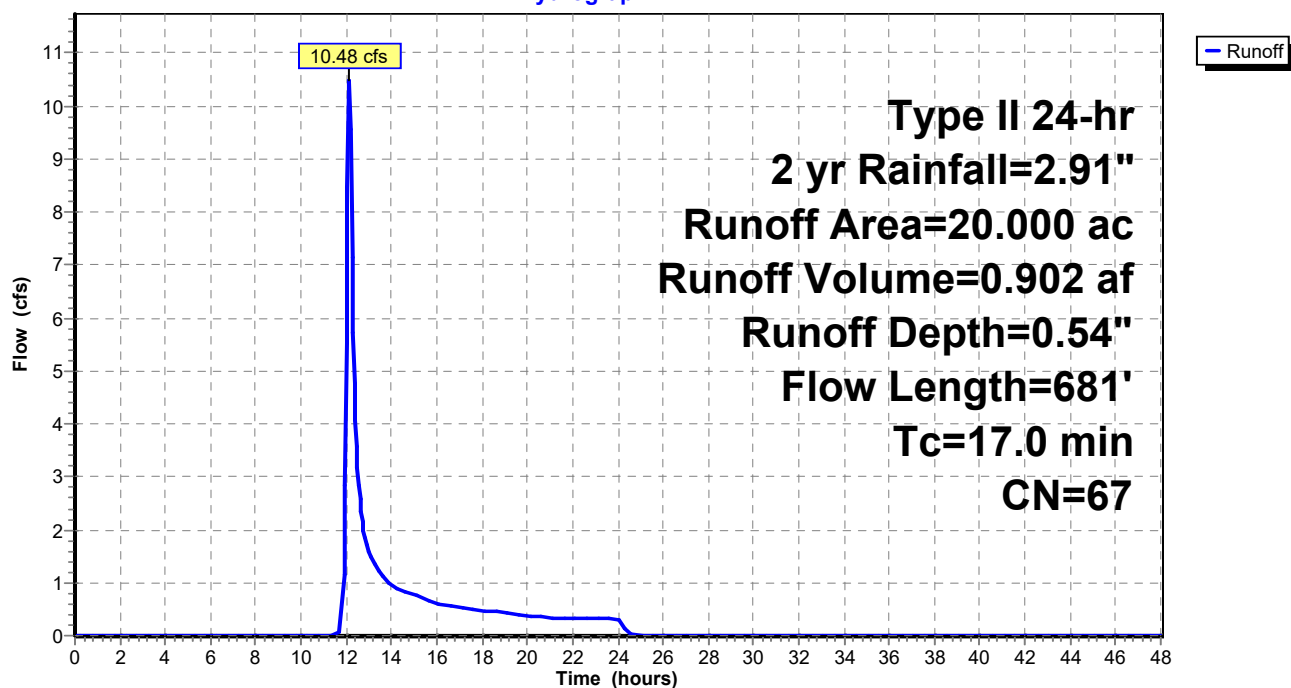
Runoff = 10.48 cfs @ 12.12 hrs, Volume= 0.902 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 2 yr Rainfall=2.91"

Area (ac)	CN	Description
* 20.000	67	Pasture/grassland/range, Good, HSG B
20.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0140	0.16		Sheet Flow, Range n= 0.130 P2= 2.91"
4.7	500	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.7	81	0.0028	0.79		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
17.0	681	Total			

Subcatchment EX3: Block A1**Hydrograph**

Airtomic

Prepared by The Veridus Group

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Summary for Pond 1P: Airtomic Pond

Inflow Area = 39.772 ac, 7.47% Impervious, Inflow Depth = 0.61" for 2 yr event
 Inflow = 24.48 cfs @ 12.06 hrs, Volume= 2.026 af
 Outflow = 6.27 cfs @ 12.48 hrs, Volume= 2.007 af, Atten= 74%, Lag= 25.0 min
 Primary = 6.27 cfs @ 12.48 hrs, Volume= 2.007 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 751.10' @ 12.48 hrs Surf.Area= 26,669 sf Storage= 26,850 cf

Plug-Flow detention time= 125.3 min calculated for 2.005 af (99% of inflow)
 Center-of-Mass det. time= 121.6 min (1,006.3 - 884.7)

Volume	Invert	Avail.Storage	Storage Description
#1	750.00'	120,902 cf	Airtomic Pond (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
750.00	22,365	0	0
754.00	38,086	120,902	120,902

Device	Routing	Invert	Outlet Devices
#1	Primary	749.90'	36.0" Vert. Orifice/Grate C= 0.600
#2	Device 1	750.00'	24.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	752.30'	15.0" Horiz. Orifice/Grate X 2 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=6.27 cfs @ 12.48 hrs HW=751.09' (Free Discharge)

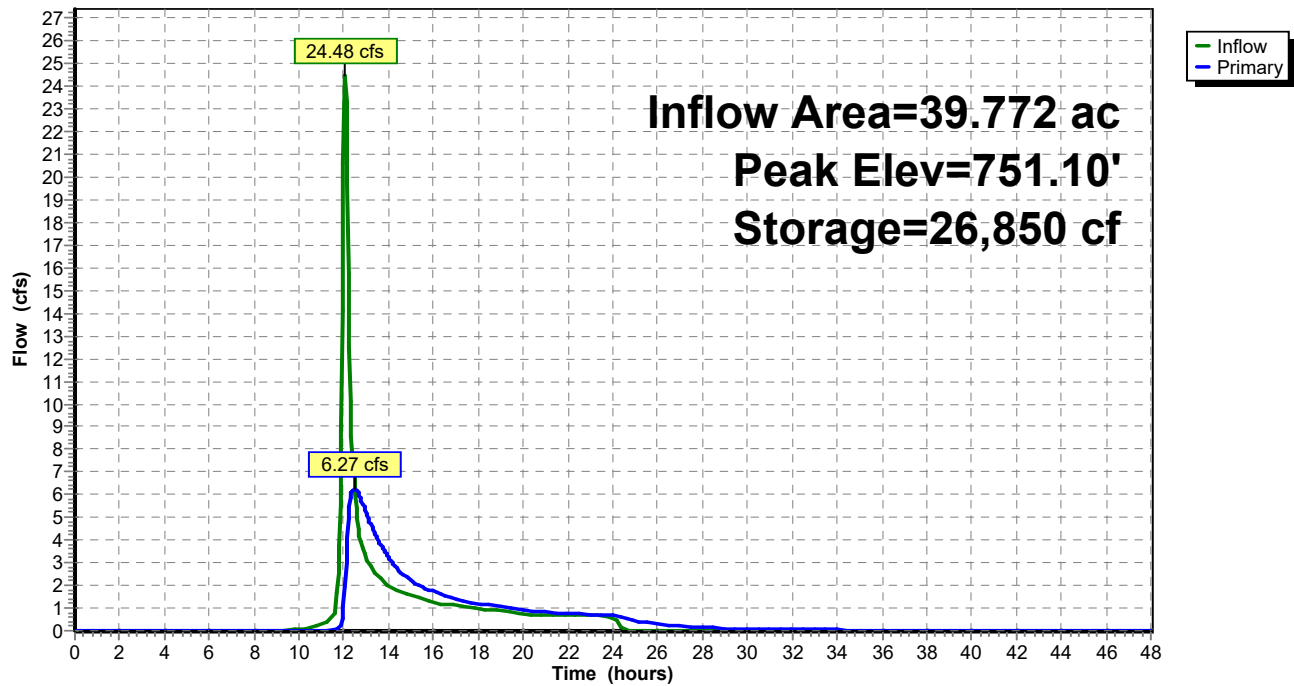
↑ **1=Orifice/Grate** (Passes 6.27 cfs of 9.77 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 6.27 cfs @ 3.56 fps)

↑ **3=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: Airtomic Pond

Hydrograph



Summary for Subcatchment 2S: Proposed

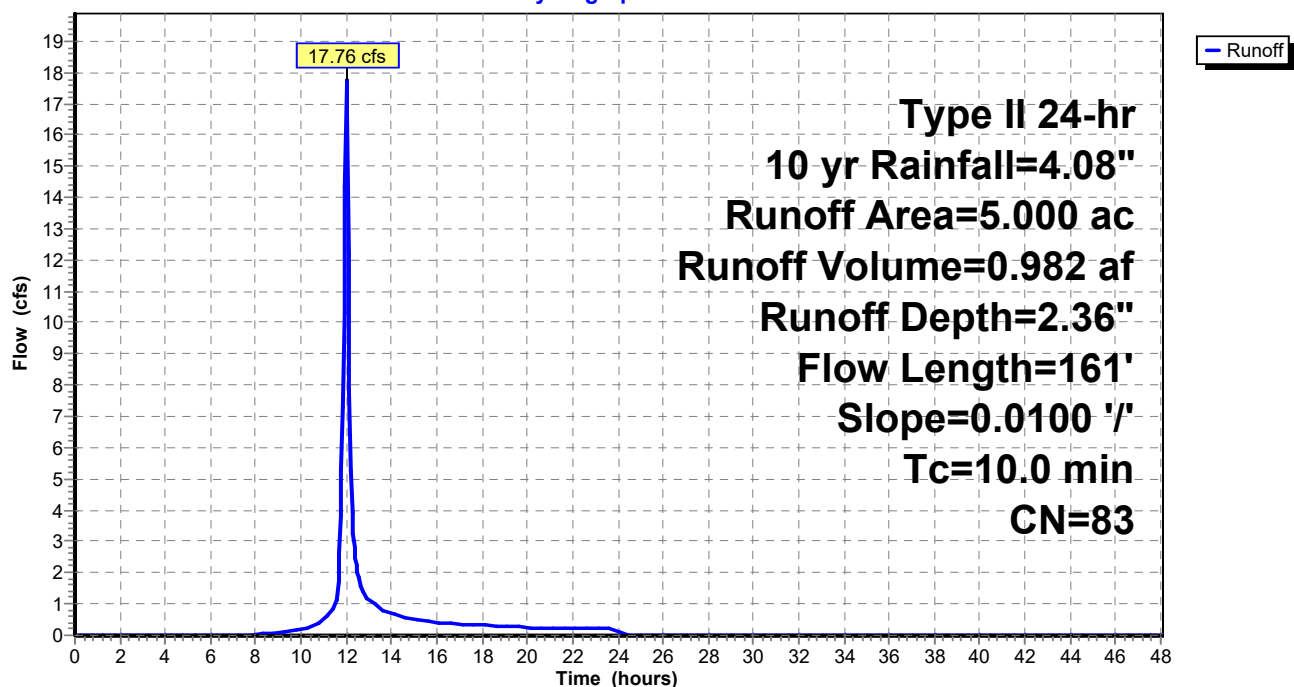
Runoff = 17.76 cfs @ 12.01 hrs, Volume= 0.982 af, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 10 yr Rainfall=4.08"

Area (ac)	CN	Description
2.440	98	Paved parking, HSG A
* 0.530	98	Future
2.030	61	>75% Grass cover, Good, HSG B
5.000	83	Weighted Average
2.030		40.60% Pervious Area
2.970		59.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	161	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
7.7					Direct Entry, From storm calcs
9.4	161				Total, Increased to minimum Tc = 10.0 min

Subcatchment 2S: Proposed**Hydrograph**

Summary for Subcatchment EX: Ex Lot 1

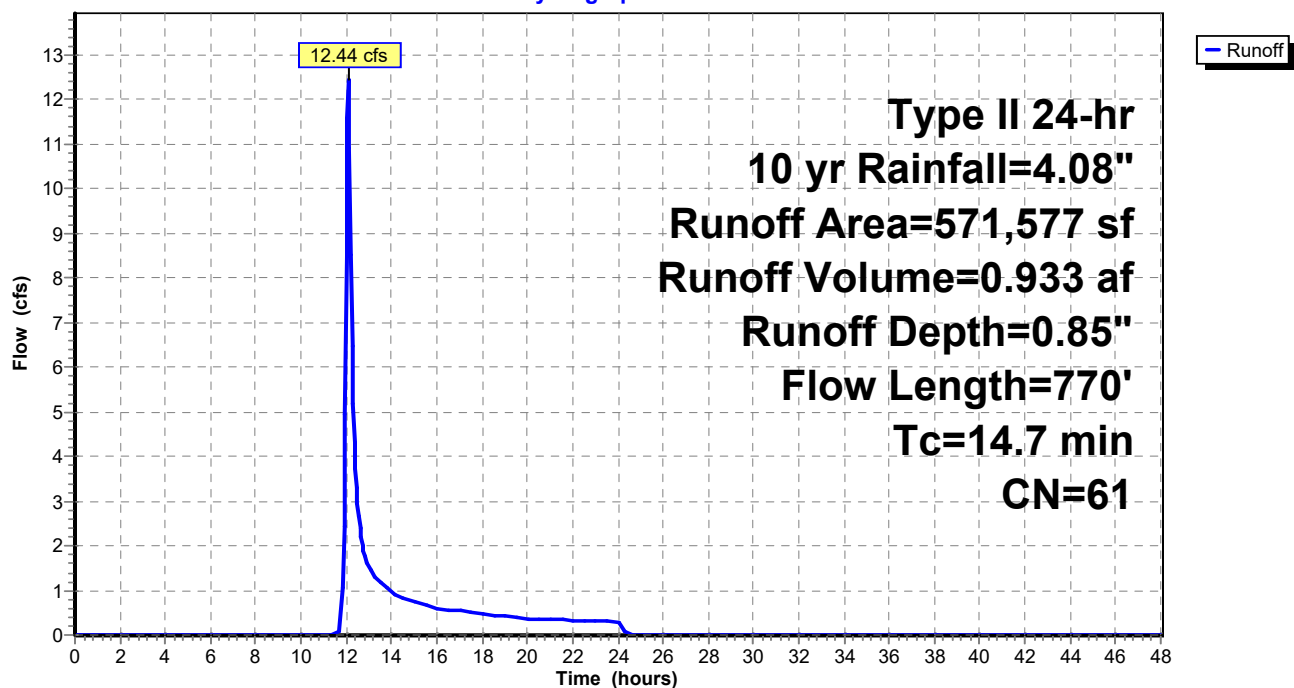
Runoff = 12.44 cfs @ 12.09 hrs, Volume= 0.933 af, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 10 yr Rainfall=4.08"

Area (sf)	CN	Description
571,577	61	Pasture/grassland/range, Good, HSG B
571,577		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	20	0.0500	0.19		Sheet Flow, Range n= 0.130 P2= 2.91"
12.9	750	0.0036	0.97		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
14.7	770	Total			

Subcatchment EX: Ex Lot 1**Hydrograph**

Summary for Subcatchment EX1: Existing

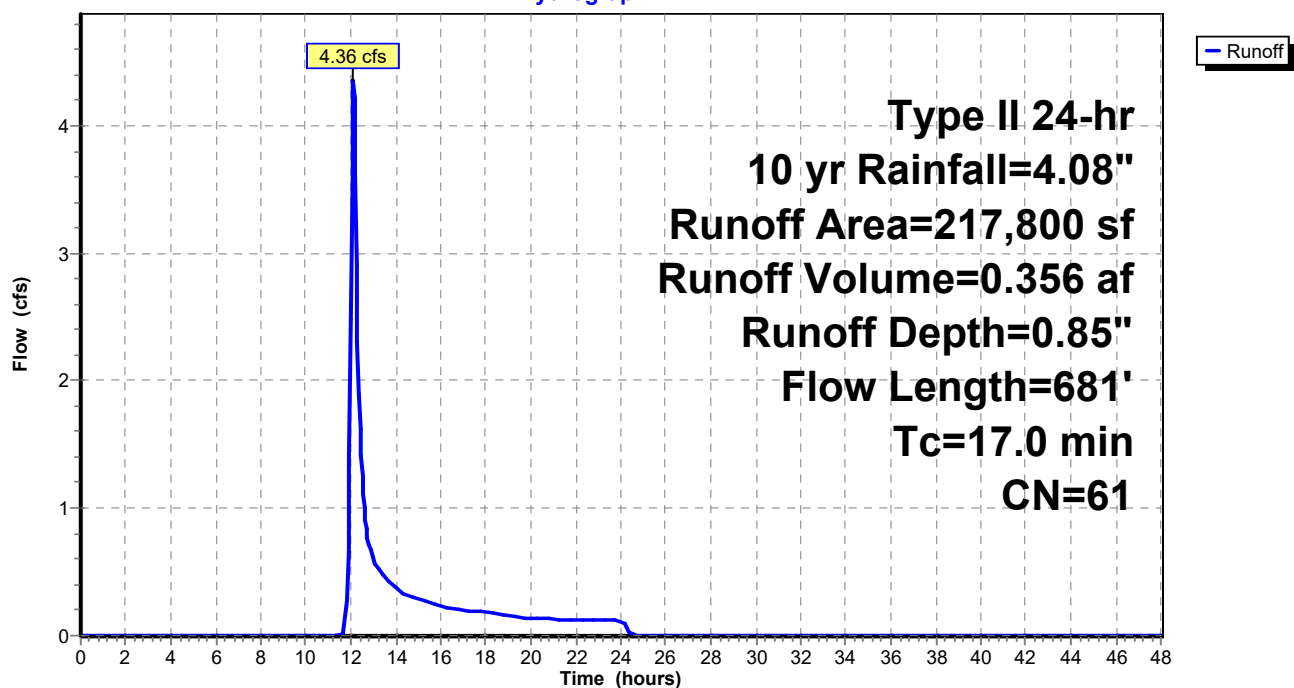
Runoff = 4.36 cfs @ 12.12 hrs, Volume= 0.356 af, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 10 yr Rainfall=4.08"

Area (sf)	CN	Description
217,800	61	Pasture/grassland/range, Good, HSG B
217,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0140	0.16		Sheet Flow, Range n= 0.130 P2= 2.91"
4.7	500	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.7	81	0.0028	0.79		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
17.0	681	Total			

Subcatchment EX1: Existing**Hydrograph**

Summary for Subcatchment EX2: Ex Str #13

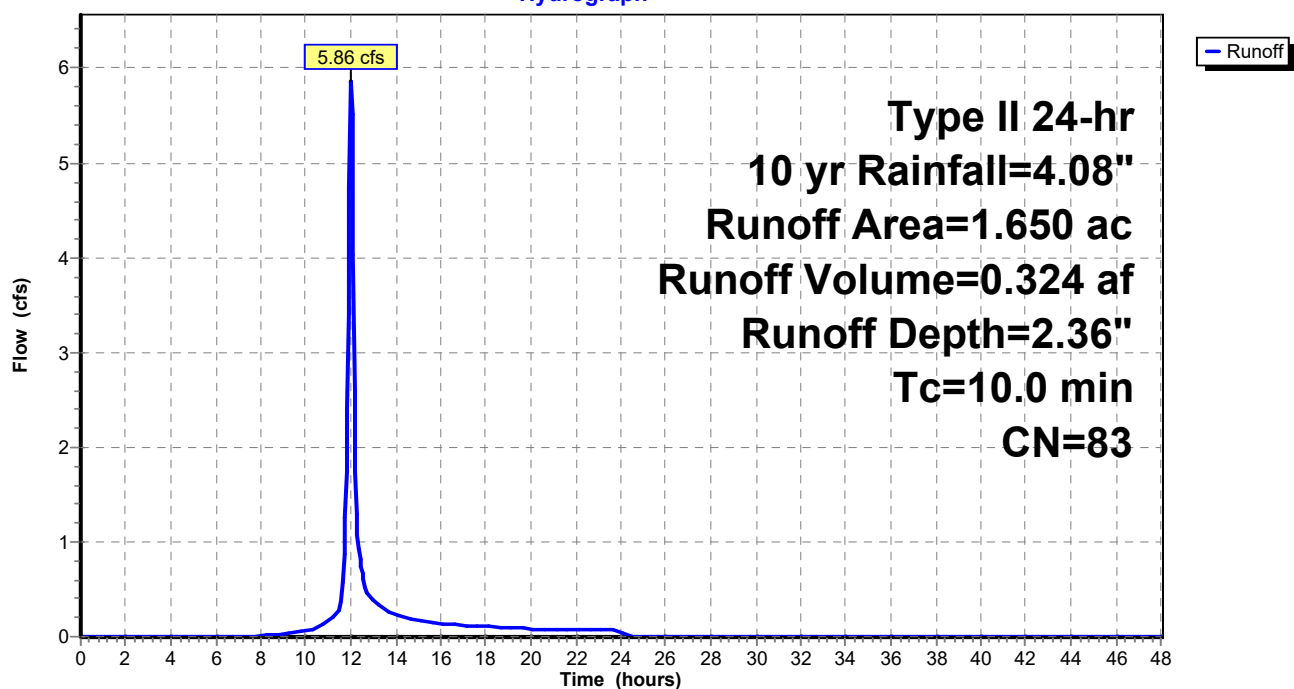
Runoff = 5.86 cfs @ 12.01 hrs, Volume= 0.324 af, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 10 yr Rainfall=4.08"

Area (ac)	CN	Description
* 1.650	83	Paved parking, HSG A
1.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7					Direct Entry,
8.7	0				Total, Increased to minimum Tc = 10.0 min

Subcatchment EX2: Ex Str #13**Hydrograph**

Summary for Subcatchment EX3: Block A1

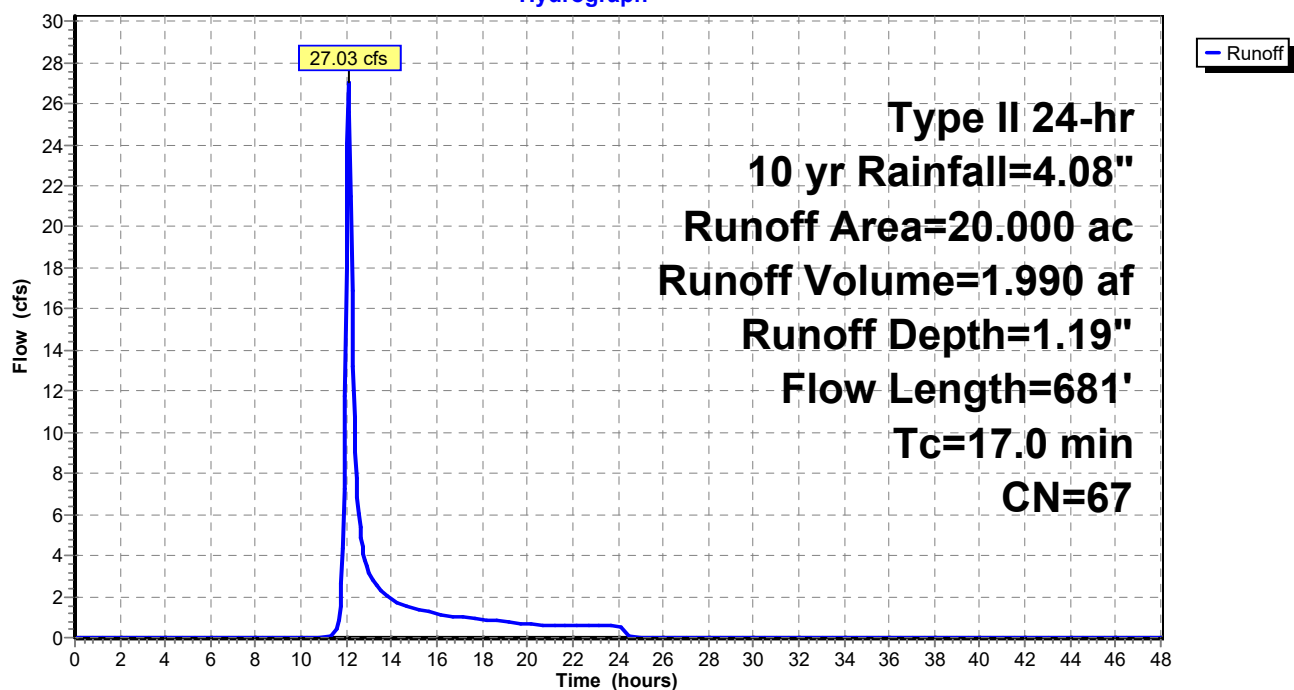
Runoff = 27.03 cfs @ 12.11 hrs, Volume= 1.990 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 10 yr Rainfall=4.08"

Area (ac)	CN	Description
* 20.000	67	Pasture/grassland/range, Good, HSG B
20.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0140	0.16		Sheet Flow, Range n= 0.130 P2= 2.91"
4.7	500	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.7	81	0.0028	0.79		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
17.0	681	Total			

Subcatchment EX3: Block A1**Hydrograph**

Airtomic

Prepared by The Veridus Group

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Airtomic

Type II 24-hr 10 yr Rainfall=4.08"

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Summary for Pond 1P: Airtomic Pond

Inflow Area = 39.772 ac, 7.47% Impervious, Inflow Depth = 1.28" for 10 yr event
 Inflow = 58.28 cfs @ 12.06 hrs, Volume= 4.229 af
 Outflow = 16.64 cfs @ 12.39 hrs, Volume= 4.210 af, Atten= 71%, Lag= 19.7 min
 Primary = 16.64 cfs @ 12.39 hrs, Volume= 4.210 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 752.21' @ 12.39 hrs Surf.Area= 31,050 sf Storage= 59,017 cf

Plug-Flow detention time= 90.3 min calculated for 4.206 af (99% of inflow)
 Center-of-Mass det. time= 88.9 min (952.0 - 863.1)

Volume	Invert	Avail.Storage	Storage Description
#1	750.00'	120,902 cf	Airtomic Pond (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
750.00	22,365	0	0
754.00	38,086	120,902	120,902

Device	Routing	Invert	Outlet Devices
#1	Primary	749.90'	36.0" Vert. Orifice/Grate C= 0.600
#2	Device 1	750.00'	24.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	752.30'	15.0" Horiz. Orifice/Grate X 2 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=16.63 cfs @ 12.39 hrs HW=752.21' (Free Discharge)

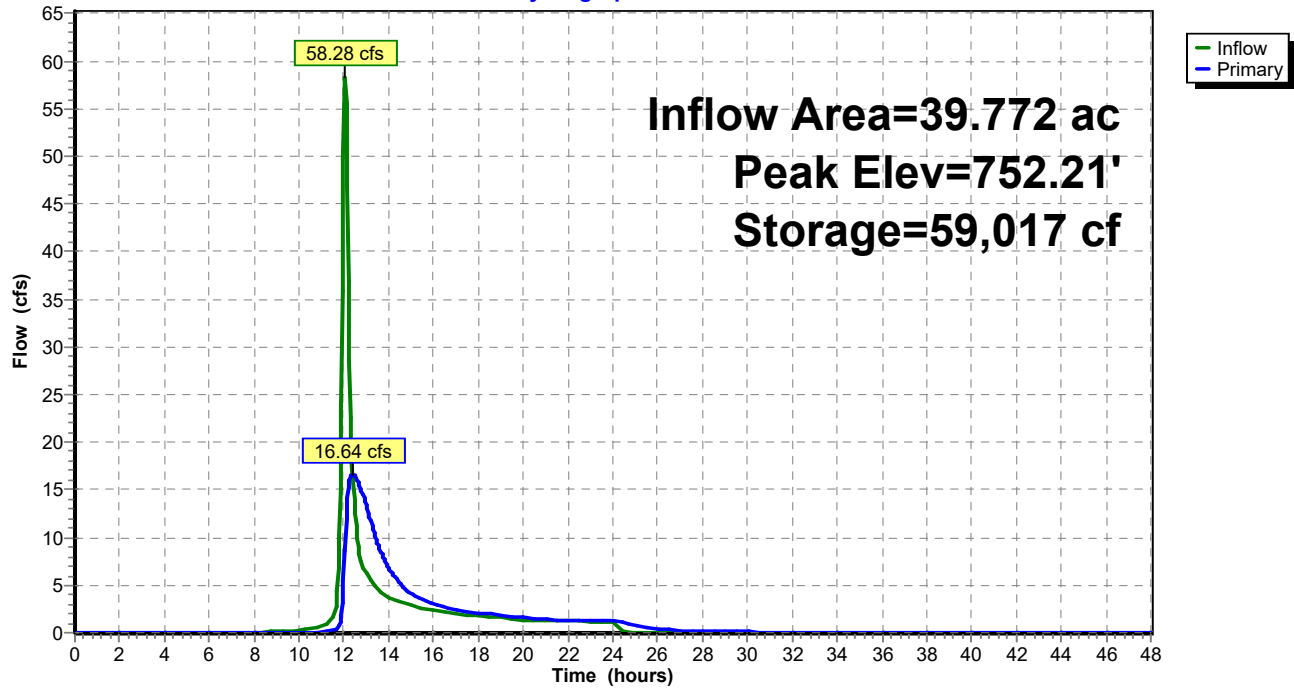
1=Orifice/Grate (Passes 16.63 cfs of 30.20 cfs potential flow)

2=Orifice/Grate (Orifice Controls 16.63 cfs @ 5.29 fps)

3=Orifice/Grate (Controls 0.00 cfs)

Pond 1P: Airtomic Pond

Hydrograph



Summary for Subcatchment 2S: Proposed

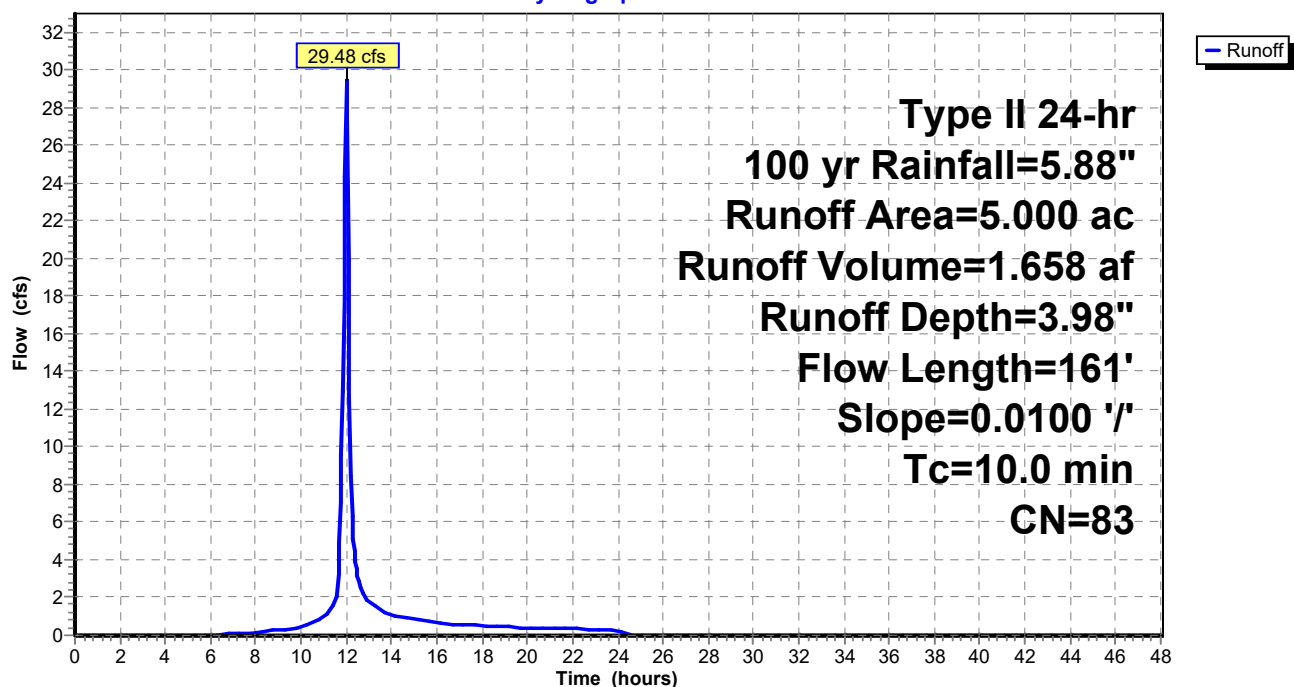
Runoff = 29.48 cfs @ 12.01 hrs, Volume= 1.658 af, Depth= 3.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 100 yr Rainfall=5.88"

Area (ac)	CN	Description
2.440	98	Paved parking, HSG A
* 0.530	98	Future
2.030	61	>75% Grass cover, Good, HSG B
5.000	83	Weighted Average
2.030		40.60% Pervious Area
2.970		59.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	161	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
7.7					Direct Entry, From storm calcs
9.4	161				Total, Increased to minimum Tc = 10.0 min

Subcatchment 2S: Proposed**Hydrograph**

Summary for Subcatchment EX: Ex Lot 1

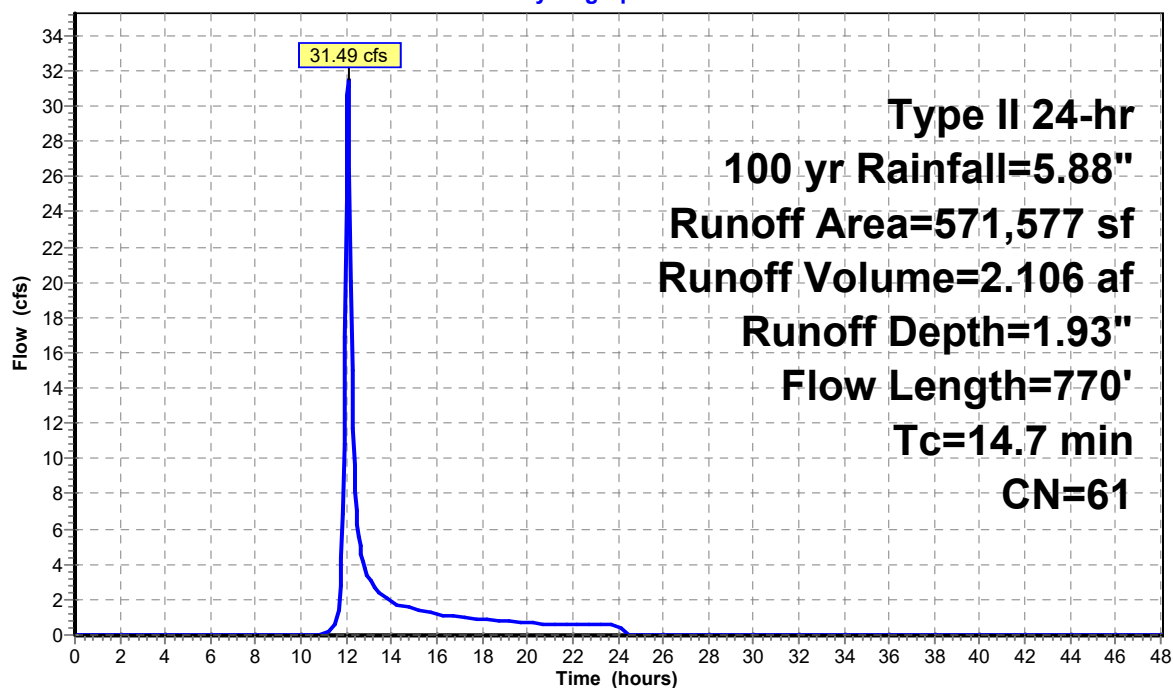
Runoff = 31.49 cfs @ 12.08 hrs, Volume= 2.106 af, Depth= 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 100 yr Rainfall=5.88"

Area (sf)	CN	Description
571,577	61	Pasture/grassland/range, Good, HSG B
571,577		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	20	0.0500	0.19		Sheet Flow, Range n= 0.130 P2= 2.91"
12.9	750	0.0036	0.97		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
14.7	770	Total			

Subcatchment EX: Ex Lot 1**Hydrograph**

Summary for Subcatchment EX1: Existing

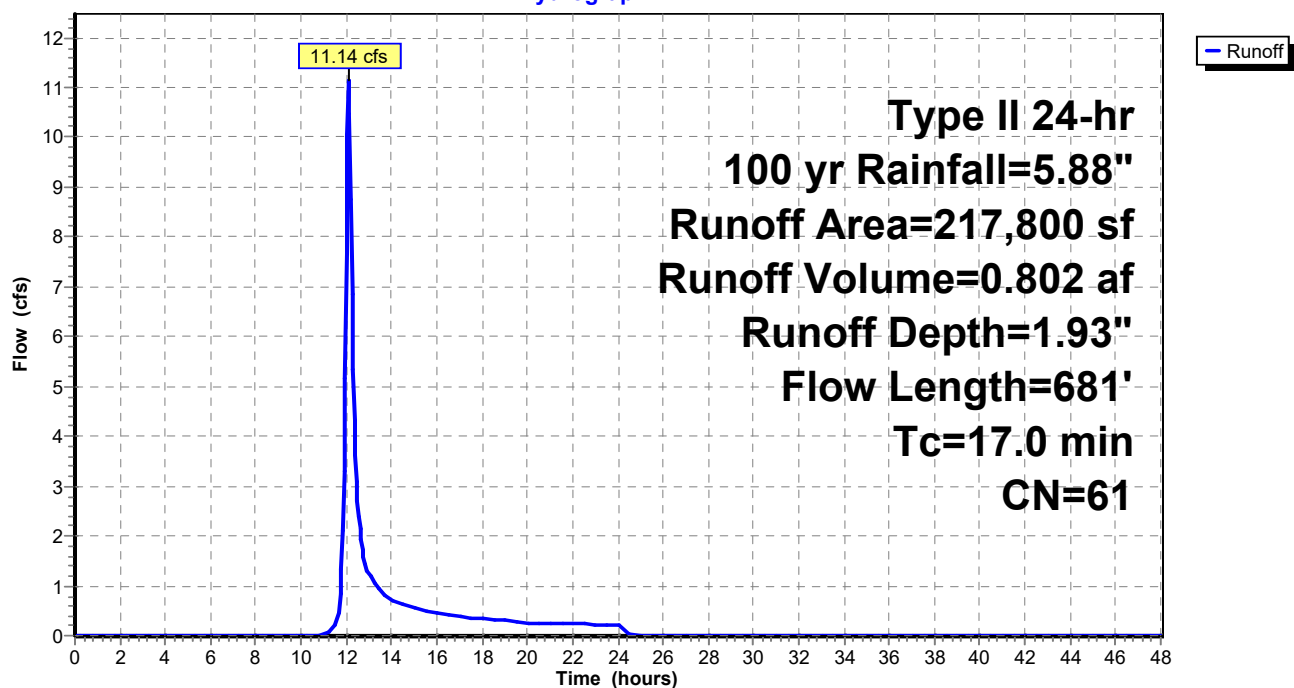
Runoff = 11.14 cfs @ 12.11 hrs, Volume= 0.802 af, Depth= 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 100 yr Rainfall=5.88"

Area (sf)	CN	Description
217,800	61	Pasture/grassland/range, Good, HSG B
217,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0140	0.16		Sheet Flow, Range n= 0.130 P2= 2.91"
4.7	500	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.7	81	0.0028	0.79		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
17.0	681	Total			

Subcatchment EX1: Existing**Hydrograph**

Summary for Subcatchment EX2: Ex Str #13

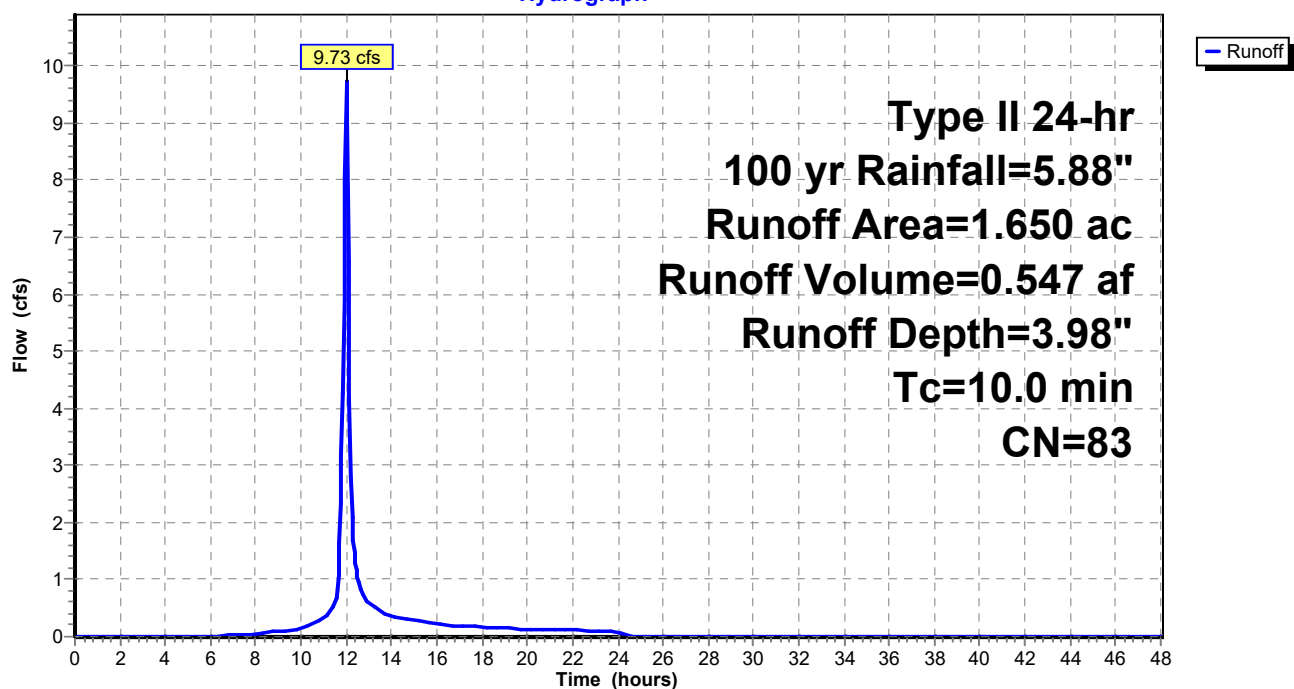
Runoff = 9.73 cfs @ 12.01 hrs, Volume= 0.547 af, Depth= 3.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 100 yr Rainfall=5.88"

Area (ac)	CN	Description
* 1.650	83	Paved parking, HSG A
1.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7					Direct Entry,
8.7	0				Total, Increased to minimum Tc = 10.0 min

Subcatchment EX2: Ex Str #13**Hydrograph**

Summary for Subcatchment EX3: Block A1

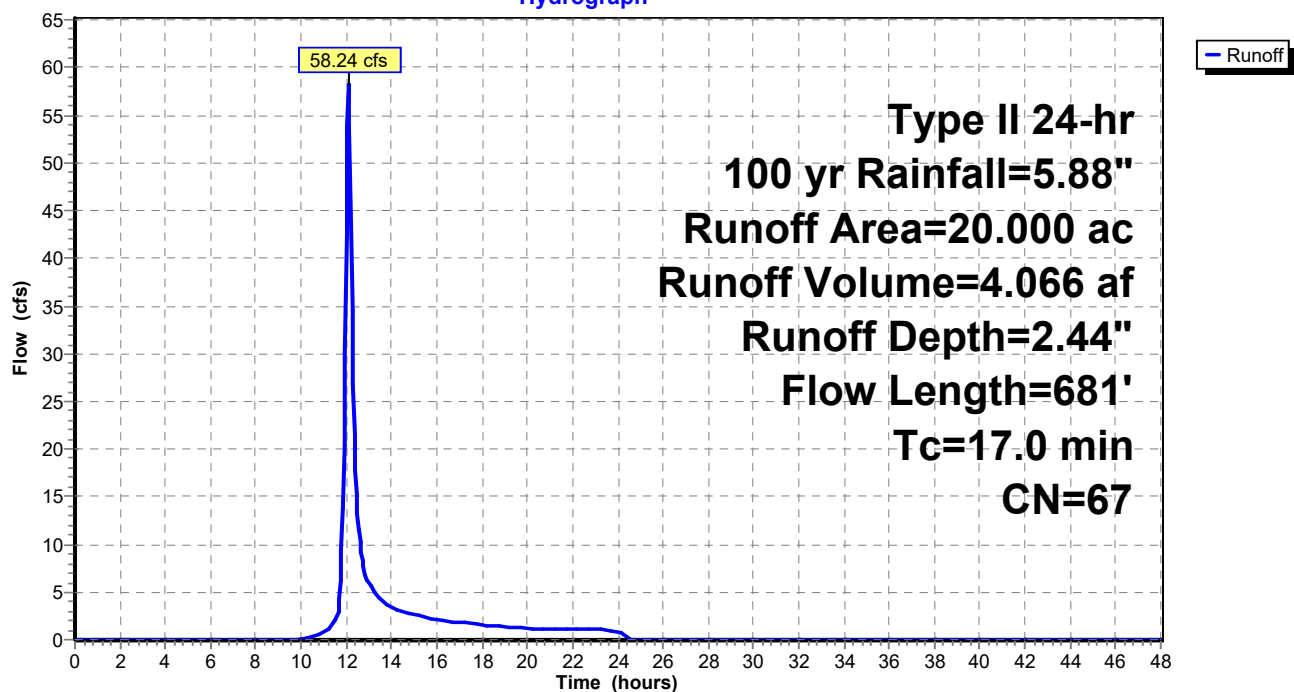
Runoff = 58.24 cfs @ 12.10 hrs, Volume= 4.066 af, Depth= 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Type II 24-hr 100 yr Rainfall=5.88"

Area (ac)	CN	Description
* 20.000	67	Pasture/grassland/range, Good, HSG B
20.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0140	0.16		Sheet Flow, Range n= 0.130 P2= 2.91"
4.7	500	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.7	81	0.0028	0.79		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
17.0	681	Total			

Subcatchment EX3: Block A1**Hydrograph**

Airtomic

Prepared by The Veridus Group

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Airtomic

Type II 24-hr 100 yr Rainfall=5.88"

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Summary for Pond 1P: Airtomic Pond

Inflow Area = 39.772 ac, 7.47% Impervious, Inflow Depth = 2.53" for 100 yr event
 Inflow = 121.60 cfs @ 12.06 hrs, Volume= 8.378 af
 Outflow = 41.06 cfs @ 12.33 hrs, Volume= 8.358 af, Atten= 66%, Lag= 15.9 min
 Primary = 41.06 cfs @ 12.33 hrs, Volume= 8.358 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 753.94' @ 12.33 hrs Surf.Area= 37,846 sf Storage= 118,579 cf

Plug-Flow detention time= 71.1 min calculated for 8.358 af (100% of inflow)
 Center-of-Mass det. time= 69.7 min (914.2 - 844.5)

Volume	Invert	Avail.Storage	Storage Description
#1	750.00'	120,902 cf	Airtomic Pond (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
750.00	22,365	0	0
754.00	38,086	120,902	120,902

Device	Routing	Invert	Outlet Devices
#1	Primary	749.90'	36.0" Vert. Orifice/Grate C= 0.600
#2	Device 1	750.00'	24.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	752.30'	15.0" Horiz. Orifice/Grate X 2 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=41.02 cfs @ 12.33 hrs HW=753.93' (Free Discharge)

↑ **1=Orifice/Grate** (Passes 41.02 cfs of 54.19 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 25.91 cfs @ 8.25 fps)

↑ **3=Orifice/Grate** (Orifice Controls 15.11 cfs @ 6.16 fps)

Pond 1P: Airtomic Pond

Hydrograph

