

Drainage Study

Prepared for

Pachaug Capital, LLC

Black Ash Re-Subdivision

**Black Ash Road &
Old Colchester Road
Montville, Connecticut**

Date: March 6, 2024

Rev. May 28, 2024

Rev. July 10, 2024

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March 6, 2024 – Revised May 28, 2024 & July 10, 2024

Sara Lundy, Chair
Montville Planning & Zoning Commission
310 Norwich-New London Tpke
Uncasville, CT 06382

Re: Black Ash Estates Re- Subdivision
Black Ash Rd. and
Old Colchester Rd.
Montville, CT

Dear Sara:

I am writing to you in regards to your above referenced 13 lot subdivision. The subdivision layout has been designed to minimize potential onsite and offsite drainage impacts due to development.

The lot design encourages overland sheet flow in three major directions (see attached Overall Drainage Map for reference). The western portion of the site slopes to a large onsite wetland system that drains southerly via culverts under Black Ash Road. Similarly, the central portion of the site also drains to a large onsite wetland that also discharges southerly via culverts under Black Ash Road. The eastern portion of the site slopes southeasterly towards abutting properties that front on the north side of Black Ash Road.

Design elements included in the creation of this development include minimizing impervious areas, maximizing wooded areas, keeping wetlands and upland review areas undisturbed and in their existing vegetated state. Other low impact design elements include and encouraging runoff via overland sheet flow and maximizing infiltration within these areas. All proposed roof downspouts are to discharge into underground infiltration drywells. All storm runoff from driveway areas are to be treated in infiltration trenches or rain gardens. These Low Impact Development design features

will treat pollutants, maximize infiltration, retain runoff and discourage point discharges of storm water runoff.

Per town engineer recommendations, the following measures have been added to the design plans:

- Lot 9. All proposed activity is north of existing stonewall that runs east to west through the lot and is the highpoint of the site. All developed areas on this lot will drain to the north and west, away from abutting properties.
- Lot 10. Grading notes have been added along the western property line to ensure that drainage runoff from developed areas will slope to the south towards Lot 9 onsite wetlands.
- Lot 11. The rain garden for Lot 11 driveway has been increased in size to retain up to a 10 year (5.5" precipitation) 24 hour storm event. A proposed stonewall has been added along the southern property line to further retain and diffuse runoff from the developed portion of this lot.
- Lot 12. The rain garden treating driveways serving Lots 11 & 12 has been increased in size to retain up to a 10 year (5.5" precipitation) 24 hour storm event. A proposed stonewall has been added along the downslope side of the rain garden to provide additional runoff retention and diffuse any runoff from the developed portion of this lot. The existing stonewall along the southern property line will continue to diffuse and retain runoff sheet flow during larger storm events.
- Lot 13. The rain garden for Lot 11, 12 & 13 driveway has been increased in size to retain up to a 10 year (5.5" precipitation) 24 hour storm event.

In addition to the above, an in depth drainage analysis has been performed at key design points along the boundary line below Lots 11 & 12 per the recommendation of the town engineer.

Drainage Evaluation, Methodology and References

A pre. vs. post development analysis was proposed using NRCS TR-55 drainage design manual for 2, 10 & 25 year storm events utilizing the latest NOAA Atlas 14 precipitation data for this area.

By utilizing LID design measures, the analysis shows that peak flow rates and total runoff volume will be the same or reduced at all design points for

the 2, 10 and 25 year storm events after development when compared with existing drainage patterns. The resulting peak flows are as follows:

		<u>2yr</u>	<u>10 yr</u>	<u>25yr</u>
Exist.	Point A	0.3 cfs	1.0 cfs	1.5 cfs
Dev.	Point A	0.3 cfs	0.8 cfs	1.3 cfs
Exist.	Point B	0.6 cfs	1.9 cfs	2.8 cfs
Dev.	Point B	0.6 cfs	1.6 cfs	2.3 cfs
Exist.	Point C	0.5 cfs	1.4cfs	2.0 cfs
Dev.	Point C	0.1 cfs	0.4 cfs	0.6 cfs

The re-subdivision design plans include a site specific erosion and sedimentation control plan, design calculations for rain gardens and infiltration trenches, and a long term operation and maintenance plan for these design elements.

It is my professional opinion that the development of this project as designed will not result in any significant impacts to drainage runoff onsite or offsite.

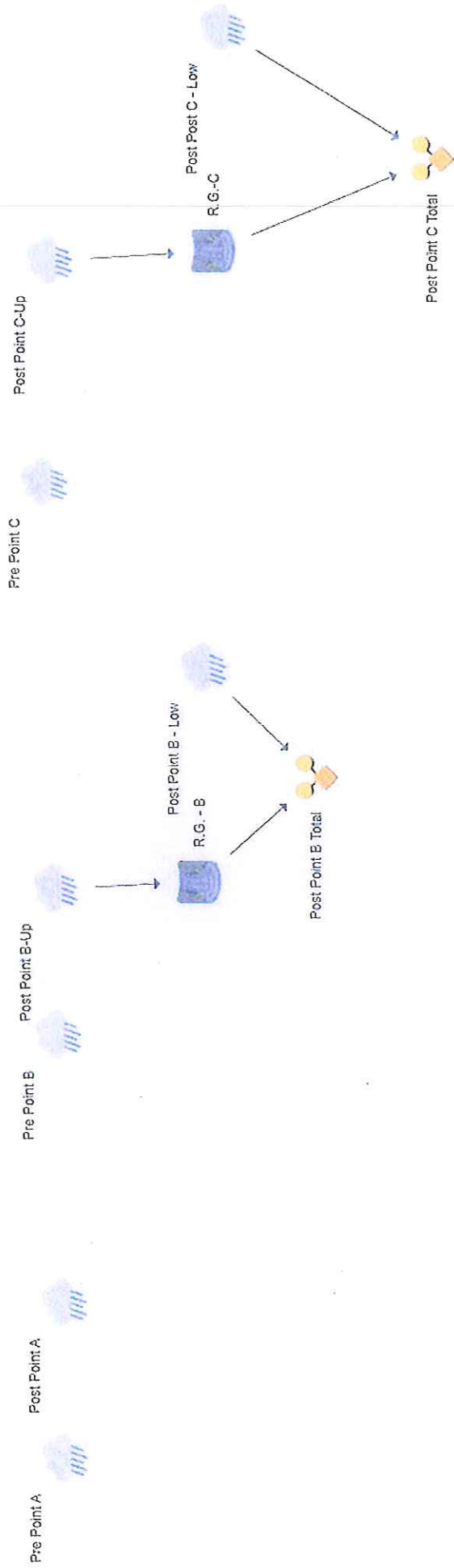
If you have any comments or questions, please do not hesitate to contact me.

Sincerely,



Wesley J. Wentworth

P.E. , Soil Scientist



Hydrograph by Return Period

Project Name:

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07-11-2024

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Outflow (cfs)							
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
1	NRCS Runoff	Pre Point A		0.276			0.963	1.492		
2	NRCS Runoff	Post Point A		0.270			0.830	1.255		
3	NRCS Runoff	Pre Point B		0.595			1.860	2.802		
4	NRCS Runoff	Post Point B-Up		0.631			1.596	2.277		
5	NRCS Runoff	Pre Point C		0.459			1.361	2.024		
6	NRCS Runoff	Post Point C-Up		0.709			1.736	2.465		
7	NRCS Runoff	Post Point B - Low		0.306			0.899	1.341		
8	Pond Route	R.G. - B		0.000			0.153	0.865		
9	Junction	Post Point B Total		0.306			0.899	1.744		
10	NRCS Runoff	Post Post C - Low		0.111			0.392	0.607		
11	Pond Route	R.G.-C		0.000			0.101	0.426		
12	Junction	Post Point C Total		0.111			0.392	0.621		

Hydrograph 2-yr Summary

Project Name:

Hydrology Studio v 3.0.0.32

07-11-2024

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	NRCS Runoff	Pre Point A	0.276	12.27	1,629	----		
2	NRCS Runoff	Post Point A	0.270	12.33	1,568	----		
3	NRCS Runoff	Pre Point B	0.595	12.27	3,223	----		
4	NRCS Runoff	Post Point B-Up	0.631	12.17	2,782	----		
5	NRCS Runoff	Pre Point C	0.459	12.23	2,388	----		
6	NRCS Runoff	Post Point C-Up	0.709	12.13	2,737	----		
7	NRCS Runoff	Post Point B - Low	0.306	12.30	1,717	----		
8	Pond Route	R.G. - B	0.000	49.57	0.000	4	452.56	1,849
9	Junction	Post Point B Total	0.306	12.30	1,717	7, 8		
10	NRCS Runoff	Post Post C - Low	0.111	12.23	625	----		
11	Pond Route	R.G.-C	0.000	39.60	0.000	6	442.50	1,748
12	Junction	Post Point C Total	0.111	12.23	625	10, 11		

Hydrograph Report

Hydrology Studio v 3.0.0.32

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Project Name:

07-10-2024

Pre Point A

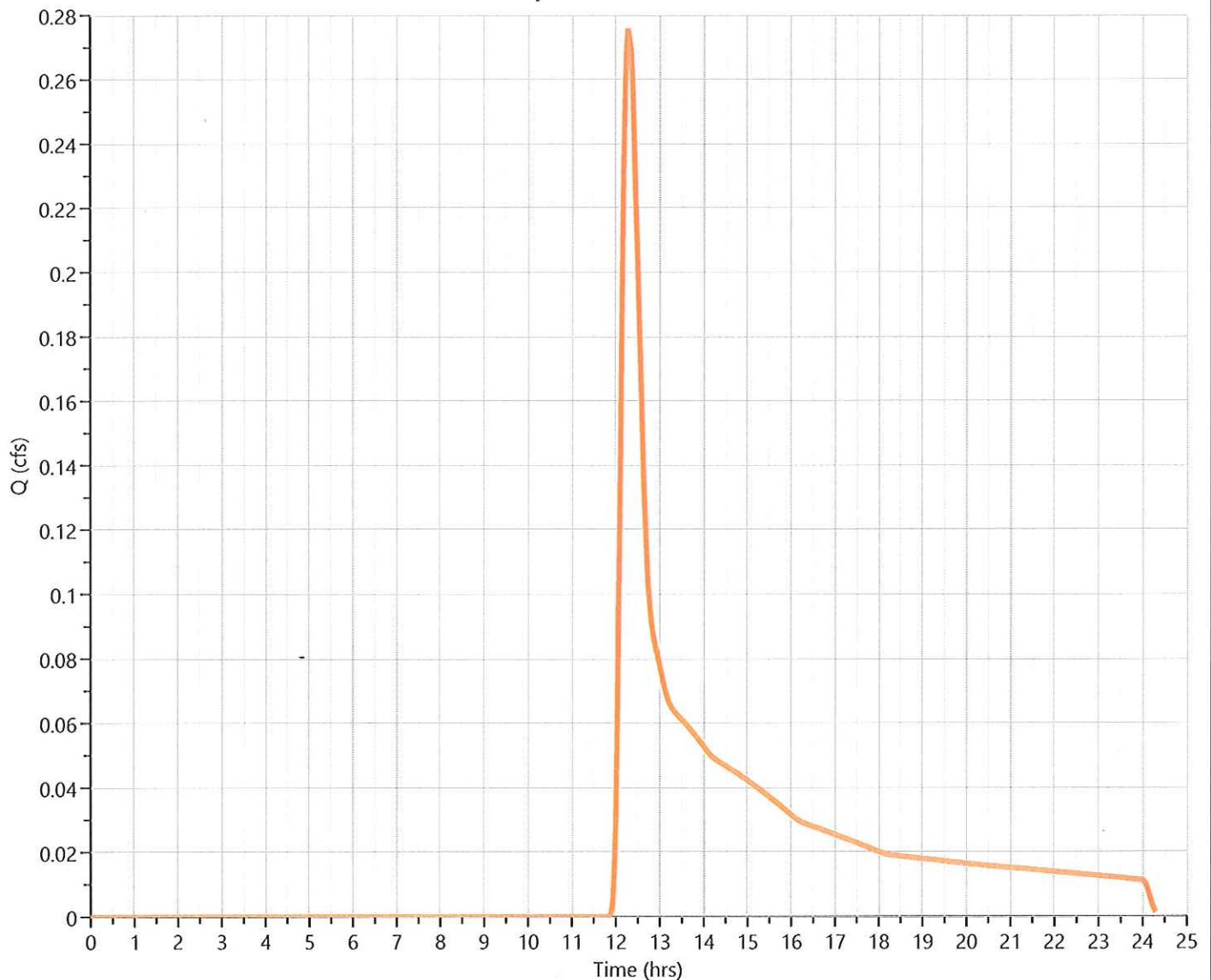
Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.276 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.27 hrs
Time Interval	= 2 min	Runoff Volume	= 1,629 cuft
Drainage Area	= 0.91 ac	Curve Number	= 60*
Tc Method	= TR55 (See Worksheet)	Time of Conc. (Tc)	= 14.84 min
Total Rainfall	= 3.44 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

* Composite CN Worksheet

AREA (ac)	CN	DESCRIPTION
0.91	60	Soil B/Wooded
0.91	60	Weighted CN Method Employed

Qp = 0.28 cfs



Hydrograph Report

Hydrology Studio v 3.0.0.32

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Project Name:

07-10-2024

Post Point A

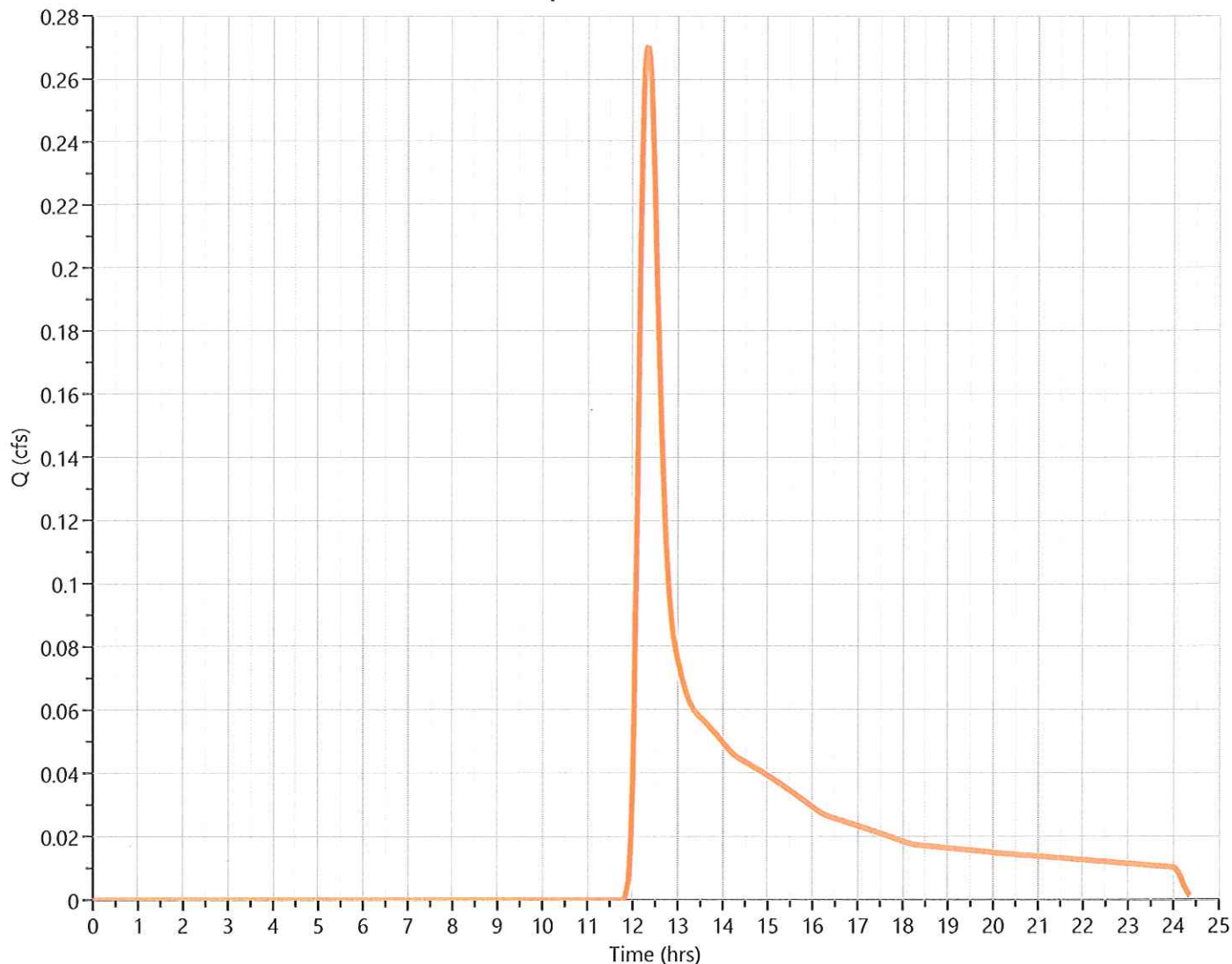
Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.270 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Runoff Volume	= 1,568 cuft
Drainage Area	= 0.735 ac	Curve Number	= 62*
Tc Method	= TR55 (See Worksheet)	Time of Conc. (Tc)	= 18.77 min
Total Rainfall	= 3.44 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

* Composite CN Worksheet

AREA (ac)	CN	DESCRIPTION
0.025	98	Roof
0.38	61	Soil B / Grass
0.33	60	Soil B / Wooded
0.735	62	Weighted CN Method Employed

Qp = 0.27 cfs



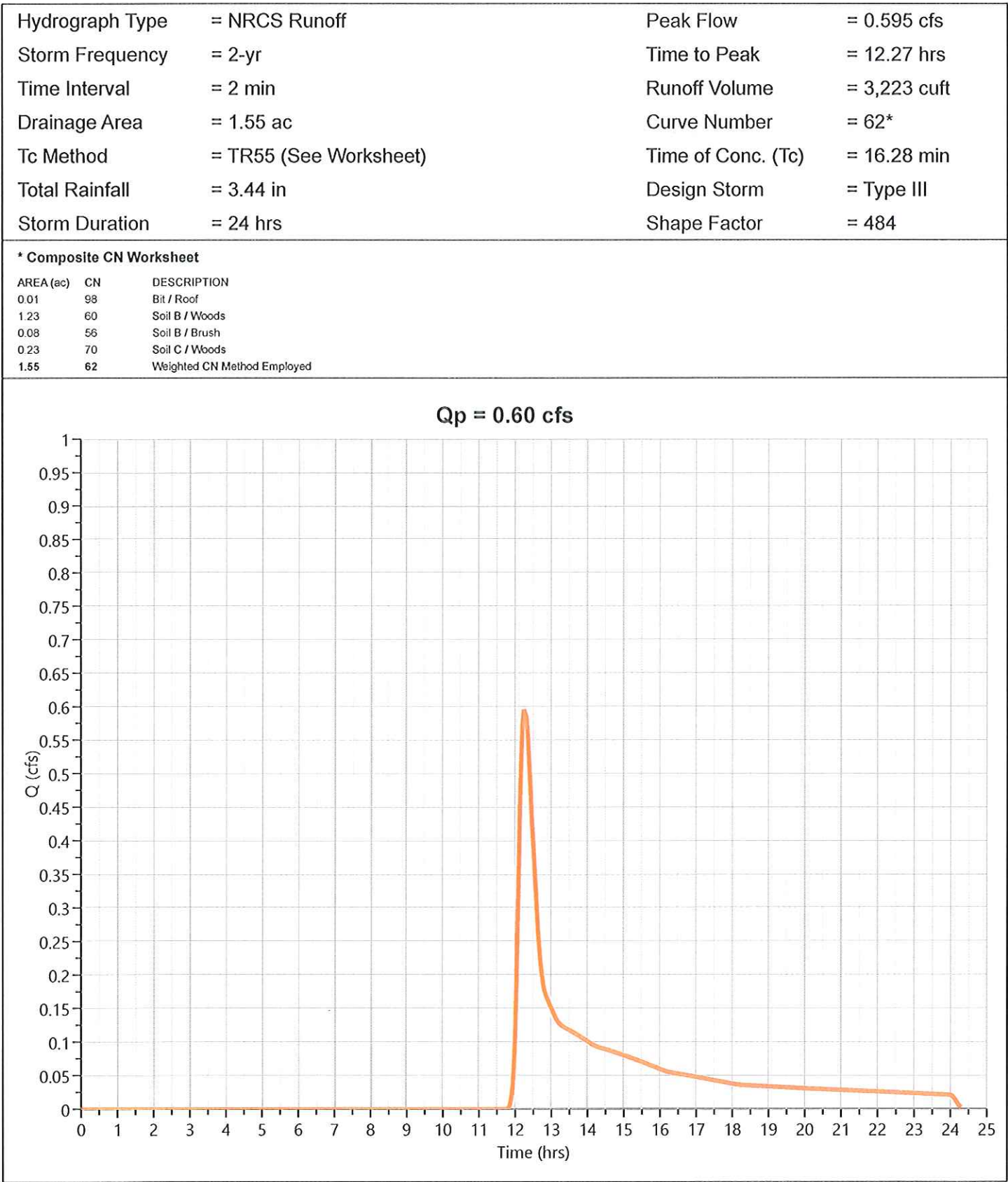
Hydrograph Report

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07-10-2024

Pre Point B

Hyd. No. 3



Hydrograph Report

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Project Name:

07-10-2024

Post Point B-Up

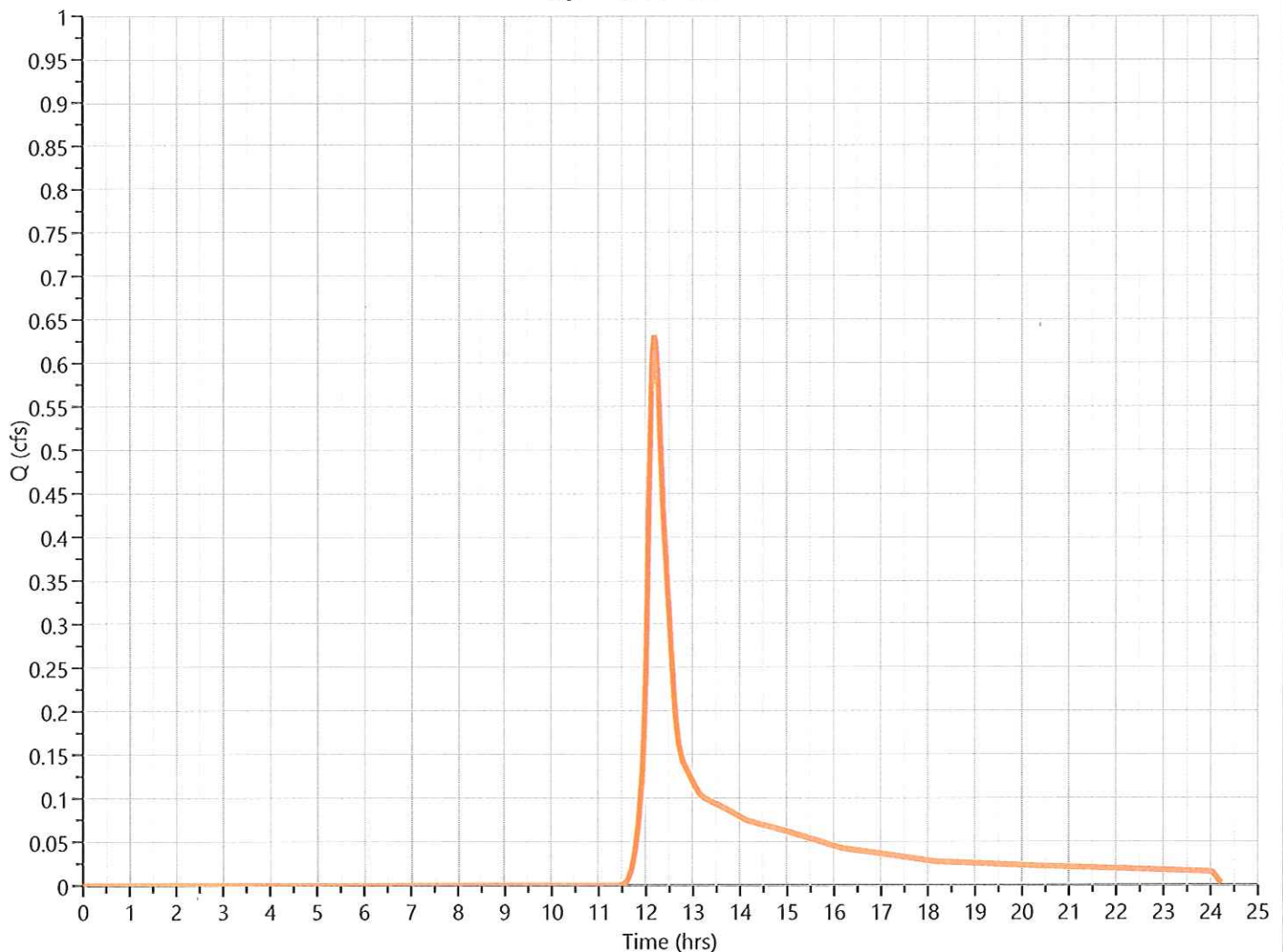
Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.631 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 2 min	Runoff Volume	= 2,782 cuft
Drainage Area	= 0.91 ac	Curve Number	= 67*
Tc Method	= TR55 (See Worksheet)	Time of Conc. (Tc)	= 12.7 min
Total Rainfall	= 3.44 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

* Composite CN Worksheet

AREA (ac)	CN	DESCRIPTION
0.12	98	Bit / Roof
0.32	61	Soil B / Lawn
0.12	56	Soil B / Brush
0.11	60	Soil B / Woods
0.24	70	Soil C / Brush
0.91	67	Weighted CN Method Employed

Qp = 0.63 cfs



Stage-Storage-Discharge Summary

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

Pond Report

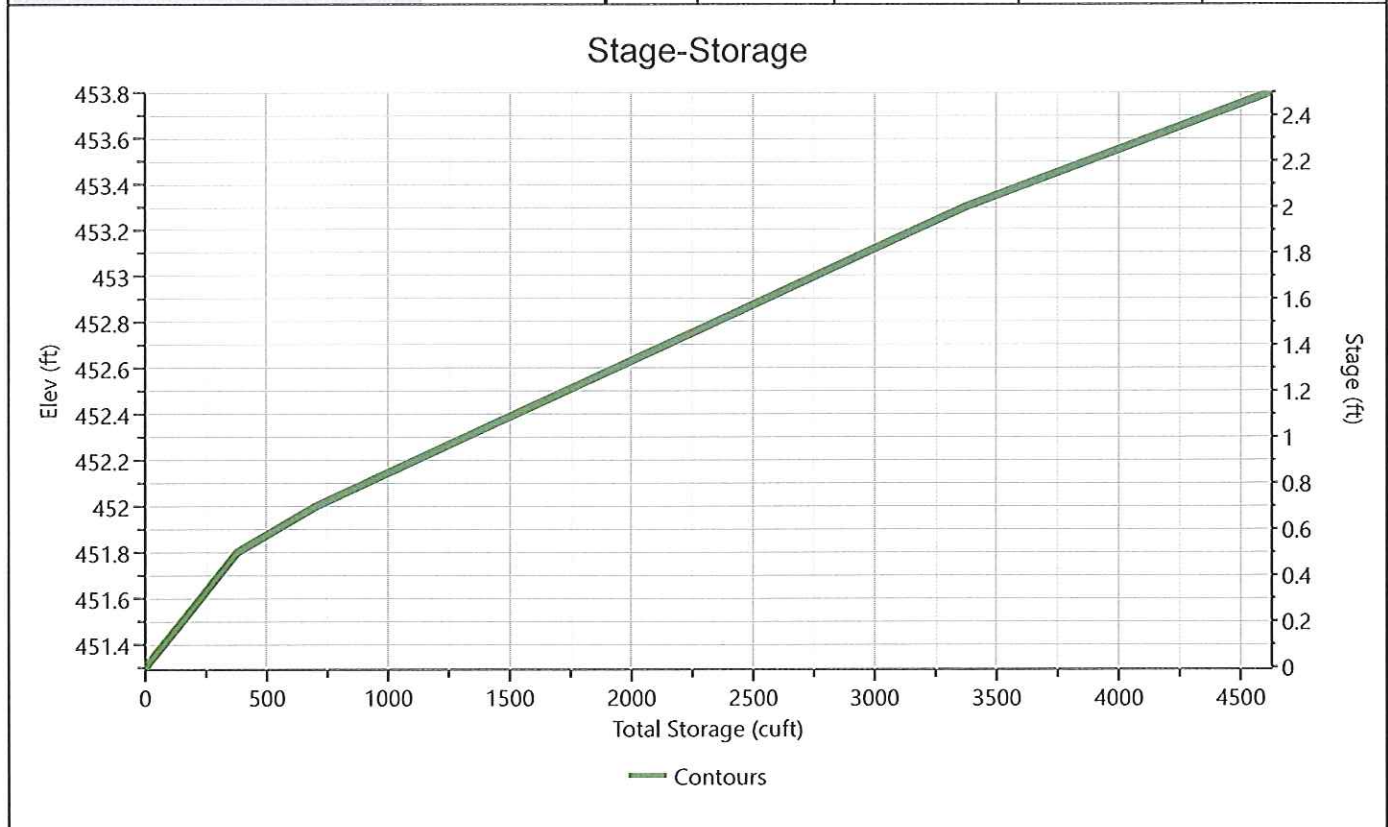
Project Name:

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07-10-2024

R.G. - B

Stage-Storage

[illegible]

Pond Report

Project Name:

Hydrology Studio v 3.0.0.32

07-10-2024

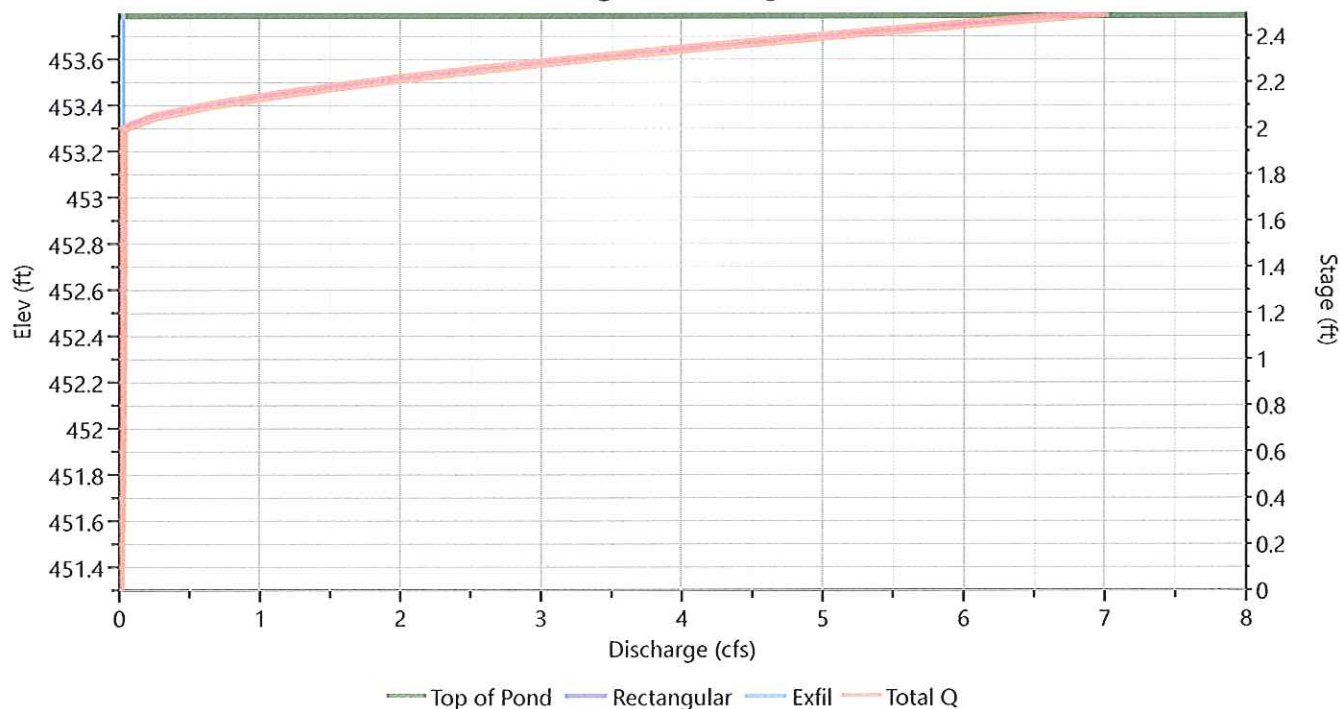
R.G. - B

Stage-Discharge

Culvert / Orifices		Orifice			Perforated Riser	
		Culvert	1	2	3	
Rise, in						Hole Diameter, in
Span, in						No. holes
No. Barrels						Invert Elevation, ft
Invert Elevation, ft						Height, ft
Orifice Coefficient, Co						Orifice Coefficient, Co
Length, ft						
Barrel Slope, %						
N-Value, n						
Weirs		Riser	Weir			Ancillary
			1 (i)	2	3	
Shape / Type			Rectangular			Exfiltration, in/hr 0.50**
Crest Elevation, ft			453.3			Tailwater Elevation, ft
Crest Length, ft			6			
Angle, deg						
Weir Coefficient, Cw			3.3			

m = Flows through Culvert, i = Independent **Exfiltration extracted from outflow hydrograph. Rate applied to contours.

Stage-Discharge



Hydrograph Report

Hydrology Studio v 3.0.0.32

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Project Name:

07-10-2024

Post Point B - Low

Hyd. No. 7

Hydrograph Type = NRCS Runoff

Storm Frequency = 2-yr

Time Interval = 2 min

Drainage Area = 0.75 ac

Tc Method = TR55 (See Worksheet)

Total Rainfall = 3.44 in

Storm Duration = 24 hrs

Peak Flow = 0.306 cfs

Time to Peak = 12.30 hrs

Runoff Volume = 1,717 cuft

Curve Number = 63*

Time of Conc. (Tc) = 18.52 min

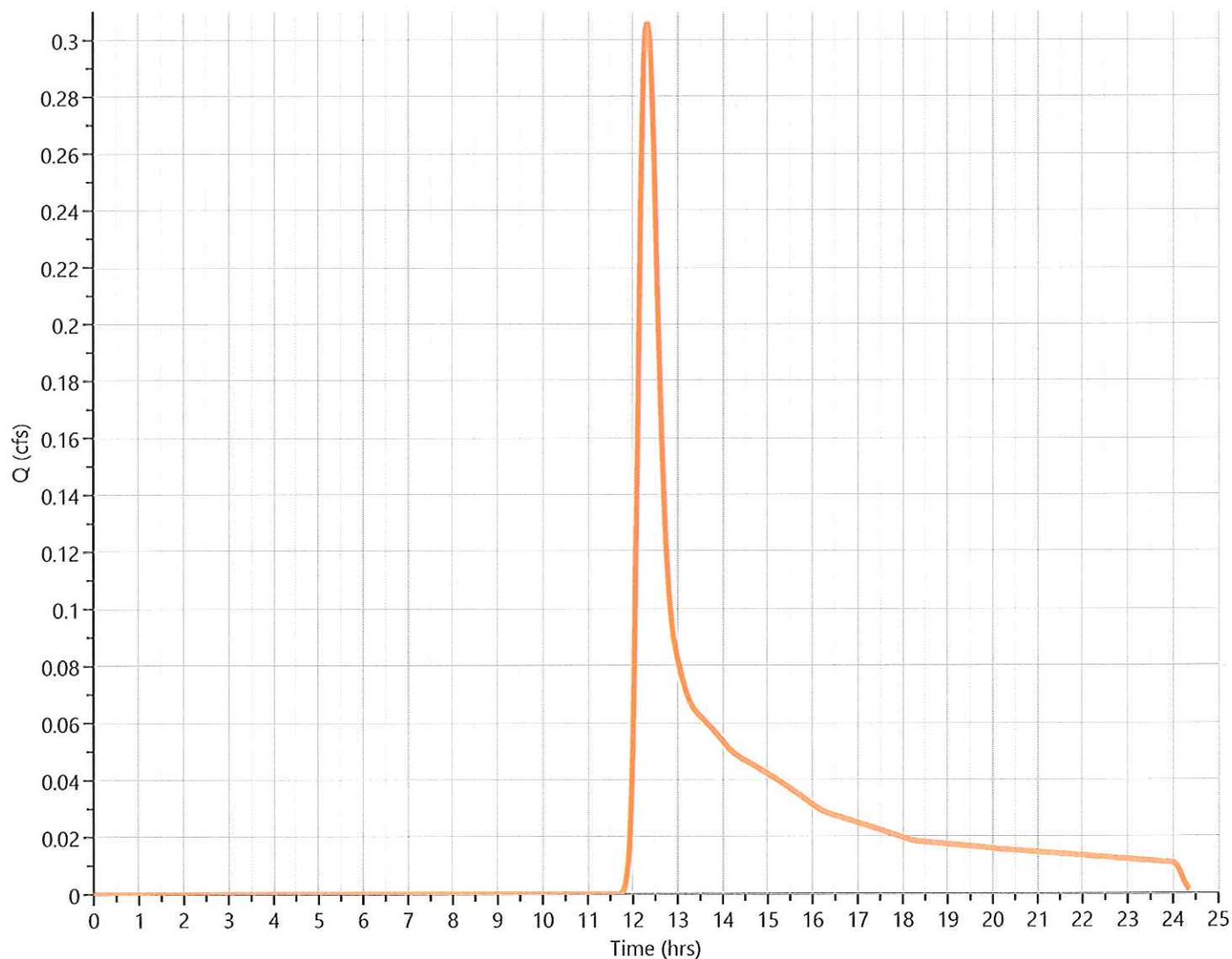
Design Storm = Type III

Shape Factor = 484

* Composite CN Worksheet

AREA (ac)	CN	DESCRIPTION
0.05	98	Roof
0.32	61	Soil B / Lawn
0.38	60	Soil B / Wood
0.75	63	Weighted CN Method Employed

Qp = 0.31 cfs



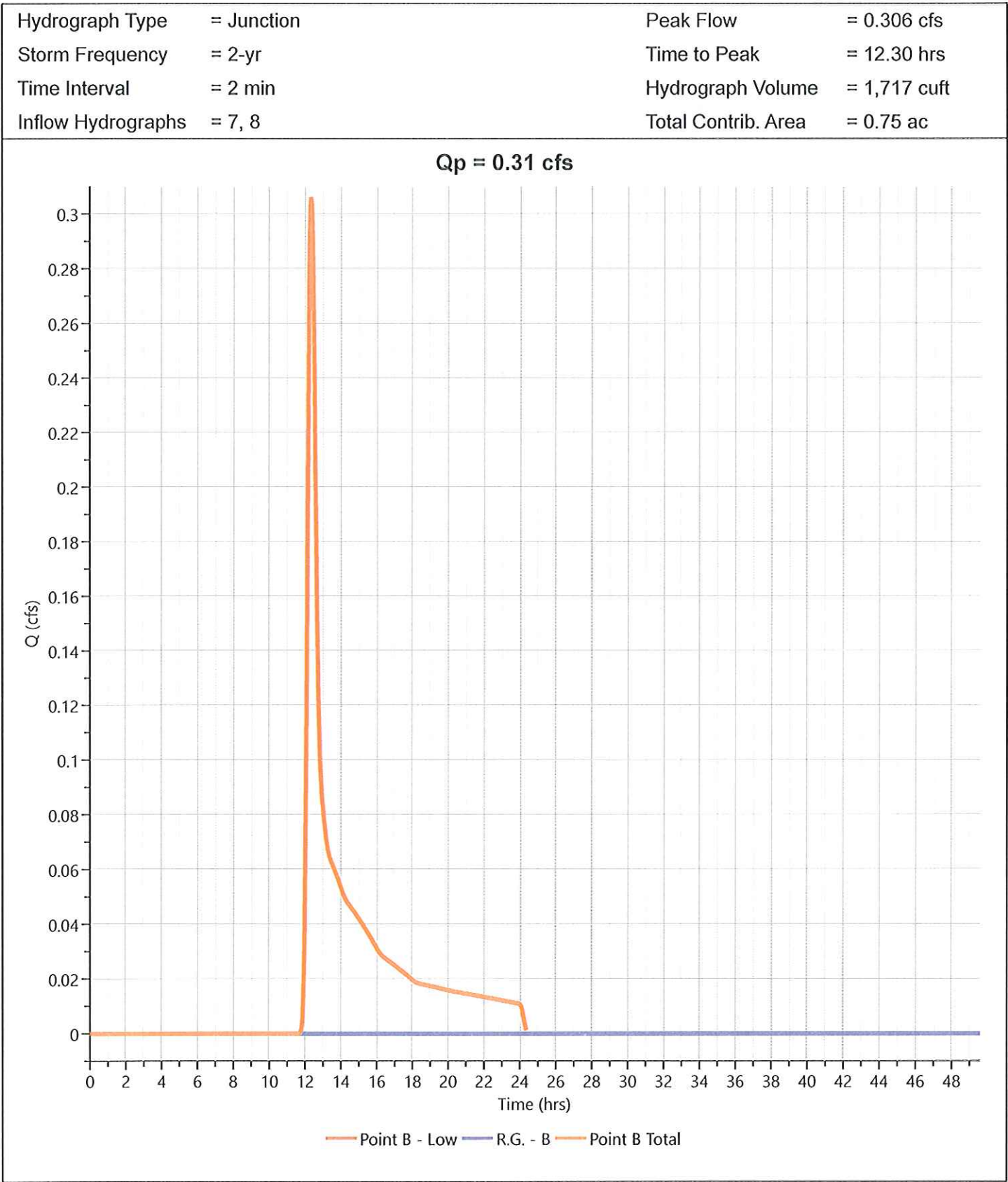
Hydrograph Report

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07-10-2024

Post Point B Total

Hyd. No. 9



Hydrograph Report

Hydrology Studio v 3.0.0.32

07-10-2024

Pre Point C

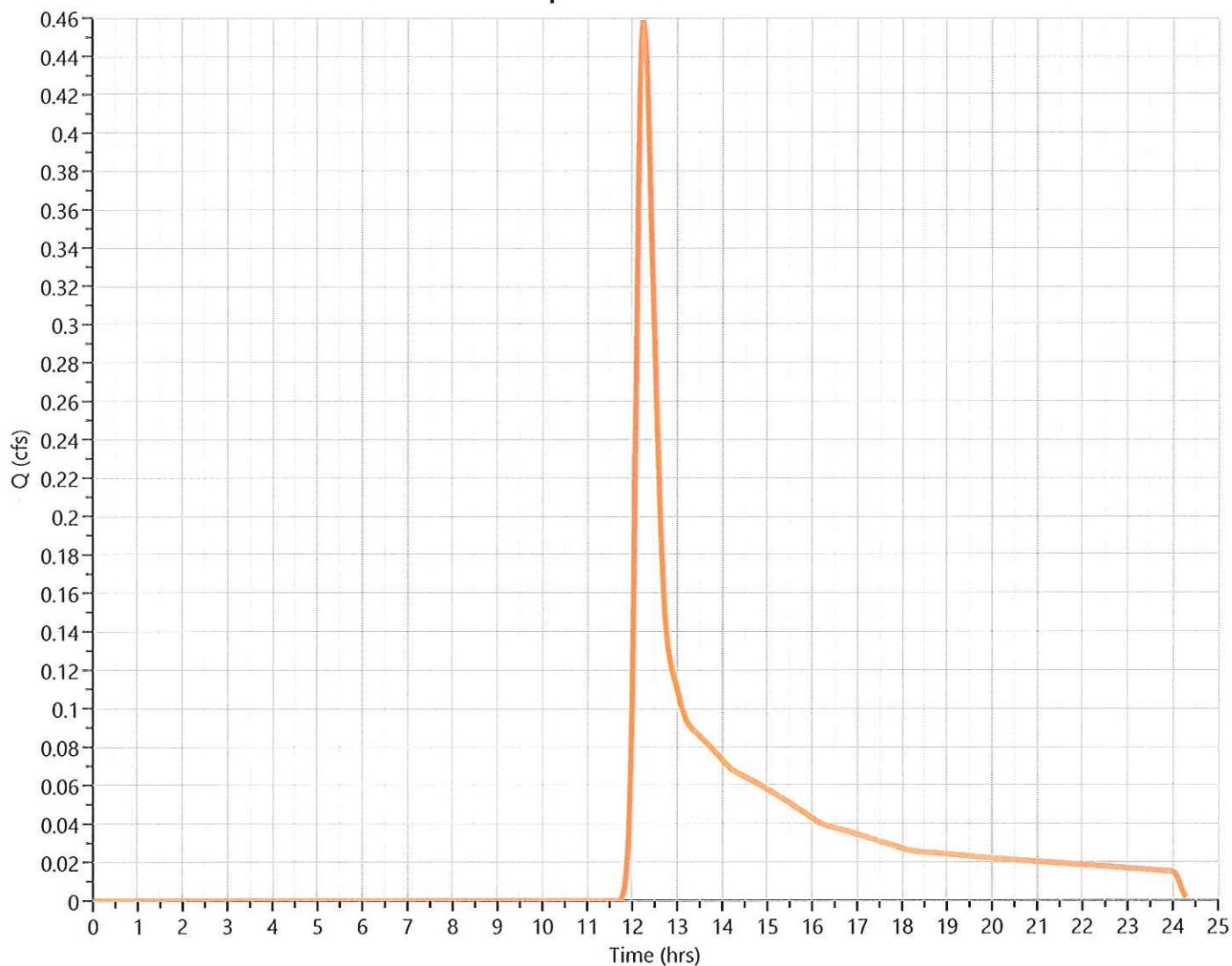
Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.459 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.23 hrs
Time Interval	= 2 min	Runoff Volume	= 2,388 cuft
Drainage Area	= 1.07 ac	Curve Number	= 63*
Tc Method	= TR55 (See Worksheet)	Time of Conc. (Tc)	= 14.57 min
Total Rainfall	= 3.44 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

* Composite CN Worksheet

AREA (ac)	CN	DESCRIPTION
0.82	60	Soil B / Woods
0.06	70	Soil C / Brush
0.19	73	Soil C / Woods
1.07	63	Weighted CN Method Employed

$Q_p = 0.46$ cfs



Hydrograph Report

Hydrology Studio v 3.0.0.32

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Project Name:

07-10-2024

Post Point C-Up

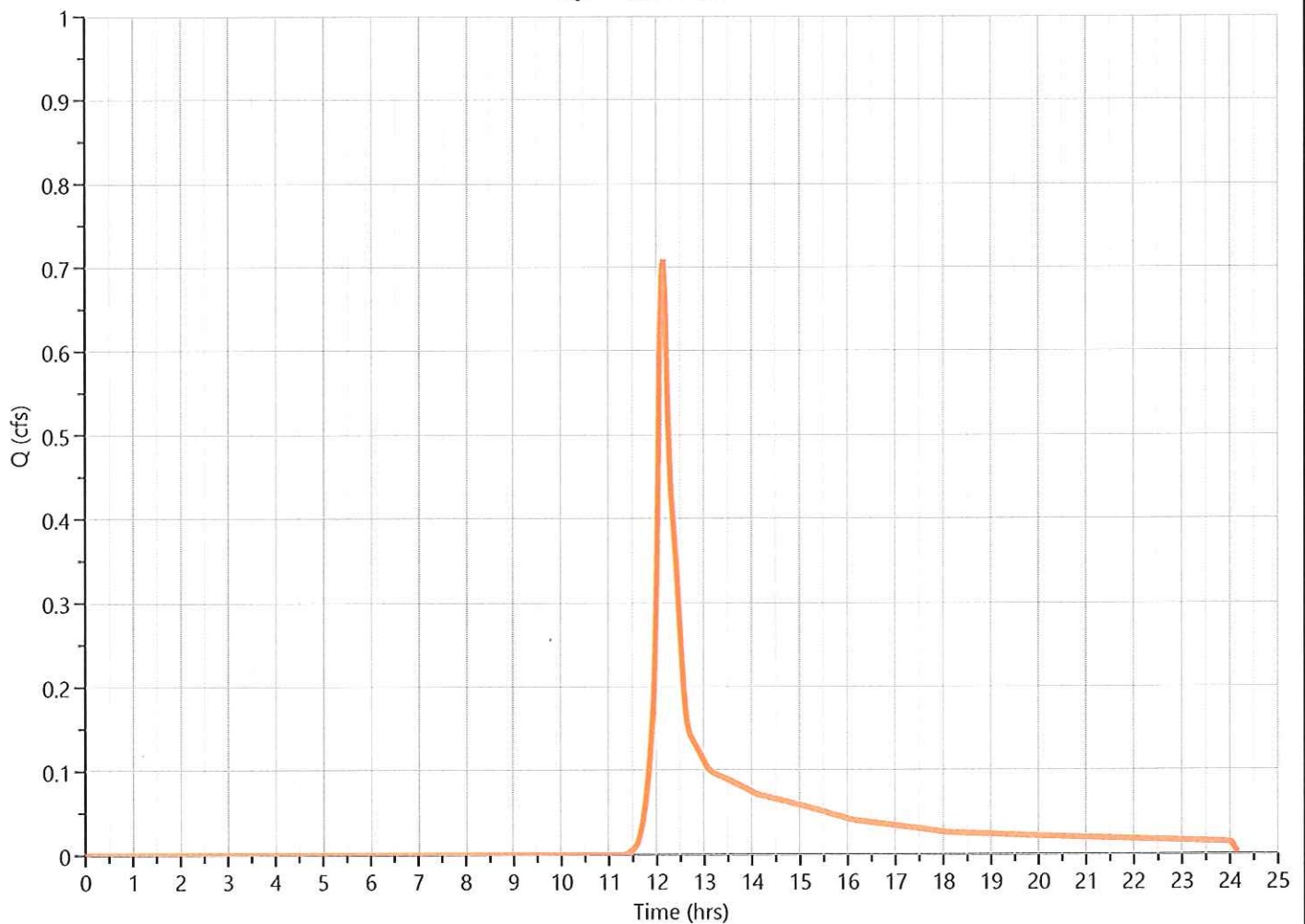
Hyd. No. 6

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.709 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.13 hrs
Time Interval	= 2 min	Runoff Volume	= 2,737 cuft
Drainage Area	= 0.87 ac	Curve Number	= 68*
Tc Method	= TR55 (See Worksheet)	Time of Conc. (Tc)	= 8.98 min
Total Rainfall	= 3.44 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

* Composite CN Worksheet

AREA (ac)	CN	DESCRIPTION
0.11	98	Bit
0.44	61	Soil B / Lawn
0.12	60	Soil B / Woods
0.12	74	Soil C / Lawn
0.06	70	Soil C / Brush
0.02	73	Soil C / Woods
0.87	68	Weighted CN Method Employed

$Q_p = 0.71$ cfs



Pond Report

Hydrology Studio v 3.0.0.32

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Project Name:

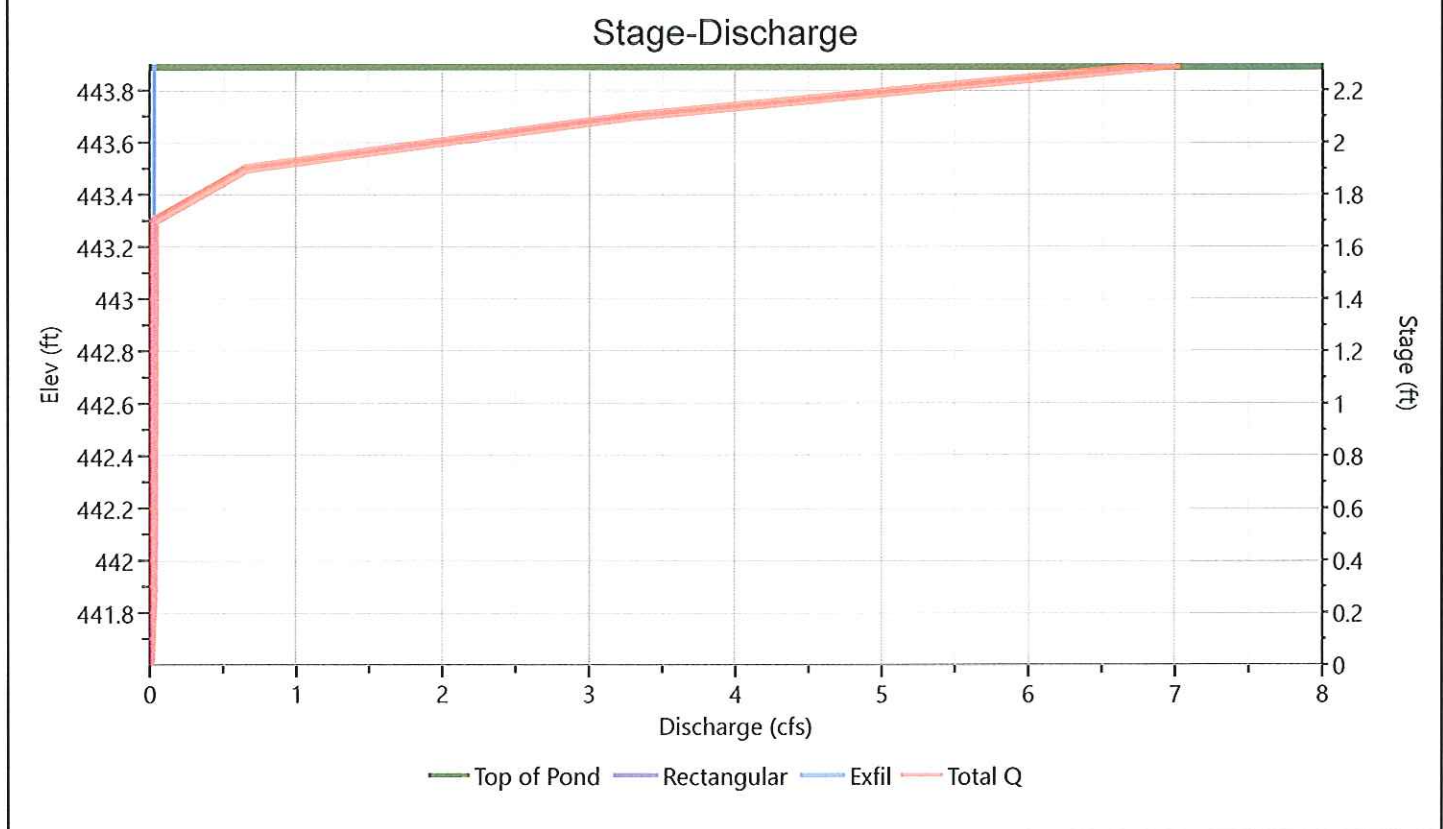
07-11-2024

R.G.-C

Stage-Discharge

Culvert / Orifices	Culvert	Orifice			Perforated Riser
		1	2	3	
Rise, in					Hole Diameter, in
Span, in					No. holes
No. Barrels					Invert Elevation, ft
Invert Elevation, ft					Height, ft
Orifice Coefficient, Co					Orifice Coefficient, Co
Length, ft					
Barrel Slope, %					
N-Value, n					
Weirs	Riser	Weir			Ancillary
		1 (i)	2	3	
Shape / Type		Rectangular			Exfiltration, in/hr 0.50**
Crest Elevation, ft		443.4			Tailwater Elevation, ft
Crest Length, ft		6			
Angle, deg					
Weir Coefficient, Cw		3.3			

m = Flows through Culvert, i = Independent **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Hydrograph Report

Hydrology Studio v 3.0.0.32

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Project Name:

07-10-2024

Post Post C - Low

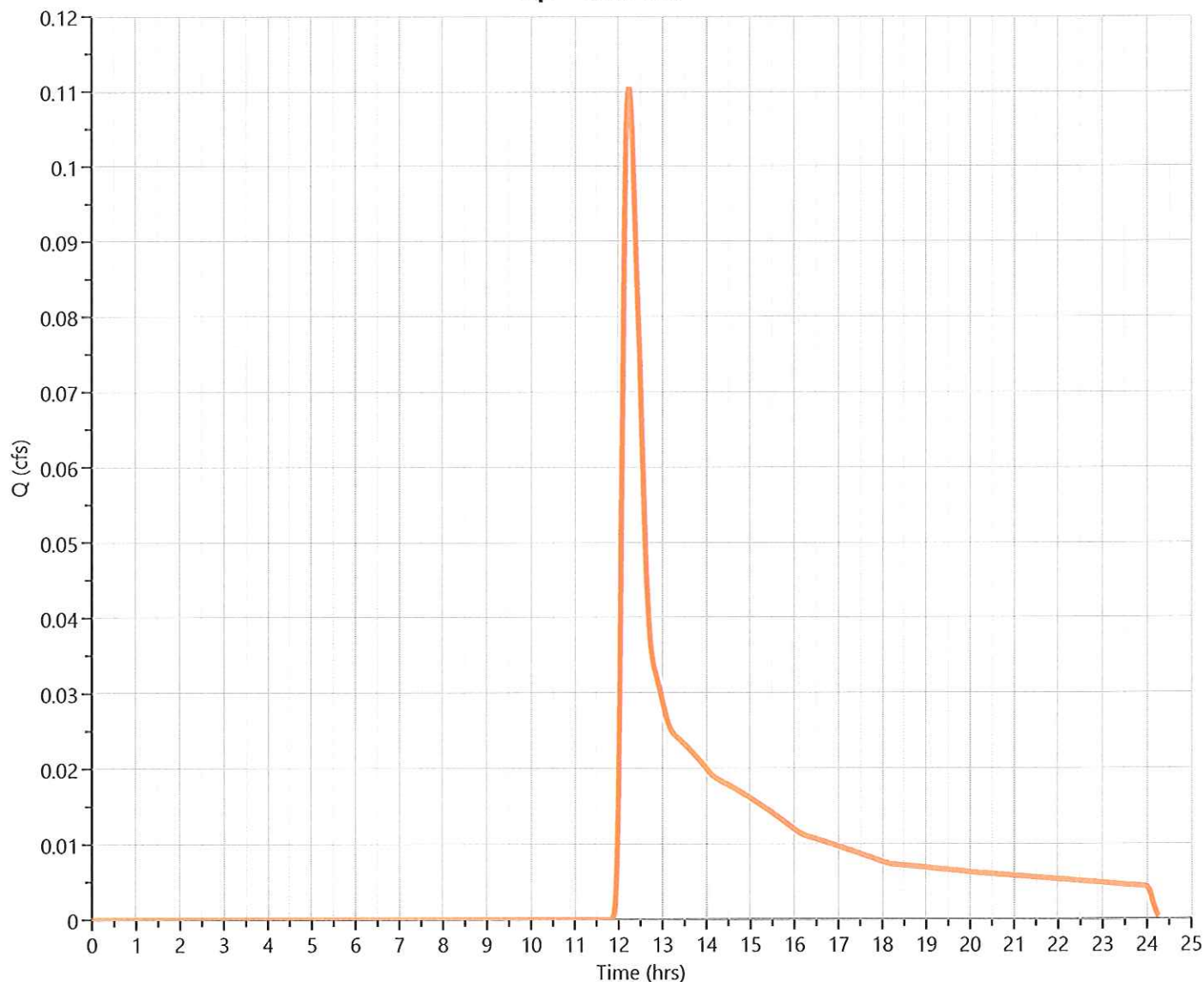
Hyd. No. 10

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.111 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.23 hrs
Time Interval	= 2 min	Runoff Volume	= 625 cuft
Drainage Area	= 0.33 ac	Curve Number	= 60*
Tc Method	= TR55 (See Worksheet)	Time of Conc. (Tc)	= 11.26 min
Total Rainfall	= 3.44 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

* Composite CN Worksheet

AREA (ac)	CN	DESCRIPTION
0.33	60	Soil B / Woods
0.33	60	Weighted CN Method Employed

Qp = 0.11 cfs



Post Point C Total

Hyd. No. 12

