DRAINAGE SUMMARY

2202 COMMONWEALTH AVENUE

NEWTON, MASSACHUSETTS

June 2, 2023

Lakeview Engineering Associates
P.O. Box 787
Hudson, Massachusetts 01749

DRAINAGE SUMMARY
2202 COMMONWEALTH AVENUE
NEWTON, MASSACHUSETTS

The proposed project consists of the re-development of an existing, single family house lot at 2202 Commonwealth Avenue into a multi-family project, under the requirements of the City of Newton, including Stormwater Management & Erosion Control requirements. The proposed project includes the demolition of the existing structure & driveway and the construction of a new five unit condominium building, site grading, retaining walls, driveway and associated work. Overall, the proposed impervious area on the lot will be approximately 65.4% greater than existing conditions, due to the new building footprint, access driveway & parking area. The on-line soil survey for the area shows "Merrimack Urban Land Complex" soils which are a Class A sand / gravel as the predominant soils for the area. The on-site soil evaluation determined the soils to be similar to the Merrimack description, with sandy loam above & below the primary soil. Under State Stormwater Management guidelines would be considered a Class A soil. Typically these soils would have a "Rawls" rate of 0.0115 feet / minute. As such, the drainage controls have been designed with the standard "Rawls" infiltration rate component for the Merrimack soils, for both pre & post runoff calculations.

Existing ground cover on the site is a typical residential lawn area, in relatively average conditions around the house, with few trees. The drainage on the site from the rear area is to Commonwealth Avenue. The proposed grading and flow paths will be similar to the existing conditions, with more impervious surface due to the larger building footprint. Overall, the site will maintain the current flow patterns, with the building roof and the majority of the driveway, as well as a portion of the rear lawn being collected and discharged to the infiltration system. There are no wetland resource areas on or near the site. The proposed project will maintain the existing, residential use in the area. The proposed drainage controls are designed to capture & contain the roof area, the driveway & a portion of the rear lawn area. The roof runoff will be collected by the roof leader collection piping, which will discharge to the infiltration system. This system will store a large portion of the runoff from these areas and allow the stored water to slowly infiltrate during & after the storm event.

As noted, the design soil at the site is a coarse, sandy material. Under the proposed conditions, with the site being developed and loamed & seeded and the use of the infiltration system, the rate & volume of site runoff from the existing lot will be reduced for all design storm events. The reduction in rate & volume over the existing conditions, meets the City's requirement to handle the differential increase in runoff, as well as store a minimum of two inches of runoff from the total impervious area of the new project. In addition, the proposed controls will provide some additional, long term recharge of the groundwater at the site.

Tables No. 1 & 2 provides a summary of the existing and proposed conditions used in the runoff calculations.

Table No. 1 – Existing Conditions

Subcatchment	Ground Cover	Curve Number	Area (Sq. Ft.)	Tc (Min.)	Comments
A-1	Ex. Site	64	13,696	6.6	Incl. Roof, Drive, Walks & Walls & Lawn Area

Total Imp. Area= 4,127 Sq. Ft.

Table No. 2 – Proposed Conditions

Subcatchment	Ground Cover	Curve Number	Area (Sq. Ft.)	Tc (Min.)	Comments
B-1	Prop. Imp.	98	1,952	5.0	Drive & Walk
	Lawn	39	4,887		
B-2	Prop. Imp.	98	4,876	5.0	Roof, Walks, Drives & Walls
	Lawn	74	1,242	5.0	

Total Imp. Area= 6,828 Sq. Ft.

The runoff conditions at the site were evaluated for both pre and post-development conditions using the SCS TR-20 based Hydrocad computer program. Based on this evaluation (see attached) and as noted above, it is evident that the proposed work will be able to maintain a similar runoff flow pattern as exists today, with reduced rate & volume for up to the 100 year storm event, with the exception of a minor rate increase for the 100 year storm. The following summarizes the results of the computer evaluation under pre, post and controlled conditions:

EXISTING CONDITIONS

Storm Event
Runoff (Rate/Volume)

Drainage Area	2 Yr. Storm (cfs/af)	10 Yr. Storm (cfs/af)	25 Yr. Storm (cfs/af)	100 Yr. Storm (cfs/af)
Subcatchment A-1	0.16 / 0.014	0.57 / 0.040	0.88 / 0.061	1.57 / 0.107

POSTDEVELOPMENT RUNOFF CONDITIONS

Storm Event
Runoff (Rate/Volume)

Drainage Area	2 Yr. Storm (cfs/af)	10 Yr. Storm (cfs/af)	25 Yr. Storm (cfs/af)	100 Yr. Storm (cfs/af)
Subcatchment B-1	0.02 / 0.003	0.18 / 0.013	0.31 / 0.021	0.62 / 0.042
Subcatchment B-2	0.28 / 0.019	0.58 / 0.039	0.77 / 0.052	1.17 / 0.080
Non-Weighted Summary	0.30 / 0.022	0.76 / 0.042	1.08 / 0.073	1.79 / 0.122

CONTROLLED POSTDEVELOPMENT CONDITIONS*

Storm Event
Runoff (Rate/Volume)

Drainage Area	2 Yr. Storm (cfs/af)	10 Yr. Storm (cfs/af)	25 Yr. Storm (cfs/af)	100 Yr. Storm (cfs/af)
Subcatchment B-1	0.02 / 0.003	0.18 / 0.013	0.31 / 0.021	0.62 / 0.042
Pond # 1 (B-2)	0.00 / 0.000	0.00 / 0.000	0.00 / 0.000	1.51 / 0.013
Totals (Weighted)**	0.02 / 0.003	0.18 / 0.013	0.31 / 0.021	1.99 / 0.055

* As modified by the Infiltration Systems for Subcatchment B-2!
** Totals are Time Weighted per Summary Node

PRE & POST-DEVELOPMENT RUNOFF SUMMARY

Storm Event
Runoff (Rate/Volume)

Drainage Area	2 Yr. Storm (cfs/af)	10 Yr. Storm (cfs/af)	25 Yr. Storm (cfs/af)	100 Yr. Storm (cfs/af)
Predevelopment	0.16 / 0.014	0.57 / 0.040	0.88 / 0.061	1.57 / 0.107
Postdevelopment	0.02 / 0.003	0.18 / 0.013	0.31 / 0.021	1.99 / 0.055

As noted above, the subsurface stormwater infiltration system will contain a large portion of site runoff & infiltrate most of the site runoff during the storm event and after the storm ceases, maintaining discharge rates and volumes below existing conditions, with the exception of a minor rate increase for the 100 year storm. Currently, the site discharges to the street. The new site will maintain this flow pattern with a greatly reduced volume of runoff. The infiltration system will infiltrate runoff volume during and after the storm event due to the retained volume of runoff below the outlet, for additional groundwater recharge. This infiltrated volume more than approximates the infiltration volume of the existing site conditions that will be replaced with the new developed surfaces.

City Infiltration Requirement:

The City of Newton has adopted an additional requirement for projects with regard to retention & infiltration of runoff, based on the project type. The proposed project falls within the criteria of a "Minor Stormwater Permit" with a teardown and construction of a new dwelling & site work, as such, the City requires that the equivalent of two (2) inches of runoff from the total impervious area of the site be retained & infiltrated. The proposed on-site infiltration system will meet this requirement, as follows:

Total Proposed Impervious Area (See Table 2)- 6,828 Square Feet!

Retention Requirement: Two (2) inch rainfall event. As per the 2" rainfall event attached, the total runoff from the site is 0 cubic feet, which meets this requirement!

State Stormwater Standards:

The Massachusetts DEP has developed a set of standards that have been adopted by the City as part of their Stormwater Management and Erosion Control Rules & Regulations. These standards and the projects compliance are noted as follows:

Standard No. 1 - Untreated Stormwater

The project does not propose any new stormwater runoff discharge from the site that is not treated prior to discharge.

Standard No. 2 - Postdevelopment Peak Runoff Increase

The project does not proposed any increase in stormwater runoff rates or volumes, as noted above in the Pre & Post Development Runoff Summary, with the exception of a small increase of peak rate during the 100 year storm.

Standard No. 3 – Recharge to Groundwater

The proposed impervious area of 6,828 sq. ft. or 0.157 acres times 0.60 inches or 0.0079 acre feet required recharge for a Class A soil = 0.0079 acre feet (344 cu. ft.). The storage within the infiltration system is 655 cu. ft. which meets this requirement.

Standard No. 4 – Water Quality

The project requires a minimum of 0.5 inch of runoff times the impervious area of the site to be treated for solids removal and that an average of 80% removal be accomplished for the project. The majority of the proposed impervious area for the project is treated by the infiltration system which has a treatment level of 80%.

Standard No. 5 – Land Use with Potentially Higher Pollutant Loading

The project is a residential use lot and does not have any potential for higher pollutant load levels.

Standard No. 6 – Water Quality Treatment

The project is a residential use lot and does not discharge to any critical resource area.

Standard No. 7 – Redevelopment Projects

The project is a demolition & redevelopment of the residential use and meets the standard as well as the City requirements.

Standard No. 8 – Erosion Control

The project has erosion controls incorporated into the work.

Standard No. 9 – Operation & Maintenance Plan

The project is has a proposed O & M plan for all aspects of the design.

Standard No. 10 – Potential Illicit Discharges

The project is a residential use lot and does not have potential for illicit discharges.

Subcat Reach Pond Link

Drainage Diagram for 2202 Comm. Ave. Pre
Prepared by {enter your company name here} 5/30/2023

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Type III 24-hr Rainfall=3.29"
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A-1: Existing Lot to Street

Tc=6.6 min CN=64 Area=13,696 sf Runoff= 0.16 cfs 0.014 af

Runoff Area = 0.314 ac Volume = 0.014 af Average Depth = 0.53"

Subcatchment A-1: Existing Lot to Street

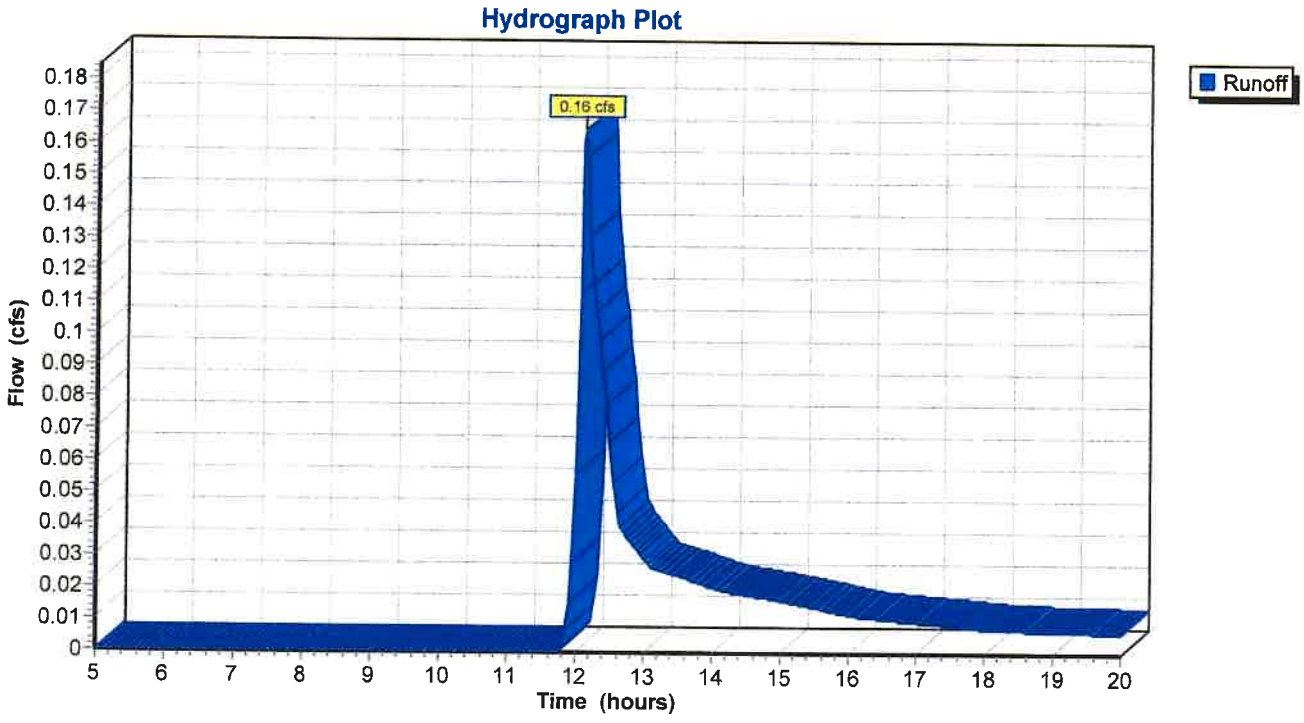
Runoff = 0.16 cfs @ 12.12 hrs, Volume= 0.014 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.29"

Area (sf)	CN	Description
4,127	98	Paved parking & roofs
9,569	49	50-75% Grass cover, Fair, HSG A
13,696	64	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	39	0.0330	0.2		**Sheet Flow, Overland Flow** Grass: Short n= 0.150 P2= 3.20"
1.9	20	0.0500	0.2		**Sheet Flow, Overland Flow** Grass: Short n= 0.150 P2= 3.20"
0.6	41	0.0240	1.1		**Shallow Concentrated Flow, Overland Flow** Short Grass Pasture Kv= 7.0 fps
0.3	28	0.0710	1.9		**Shallow Concentrated Flow, Overland Flow** Short Grass Pasture Kv= 7.0 fps
0.0	11	0.4500	4.7		**Shallow Concentrated Flow, Overland Flow** Short Grass Pasture Kv= 7.0 fps
6.6	139	Total			

Subcatchment A-1: Existing Lot to Street



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Type III 24-hr Rainfall=5.17"
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A-1: Existing Lot to Street

Tc=6.6 min CN=64 Area=13,696 sf Runoff= 0.57 cfs 0.040 af

Runoff Area = 0.314 ac Volume = 0.040 af Average Depth = 1.54"

Subcatchment A-1: Existing Lot to Street

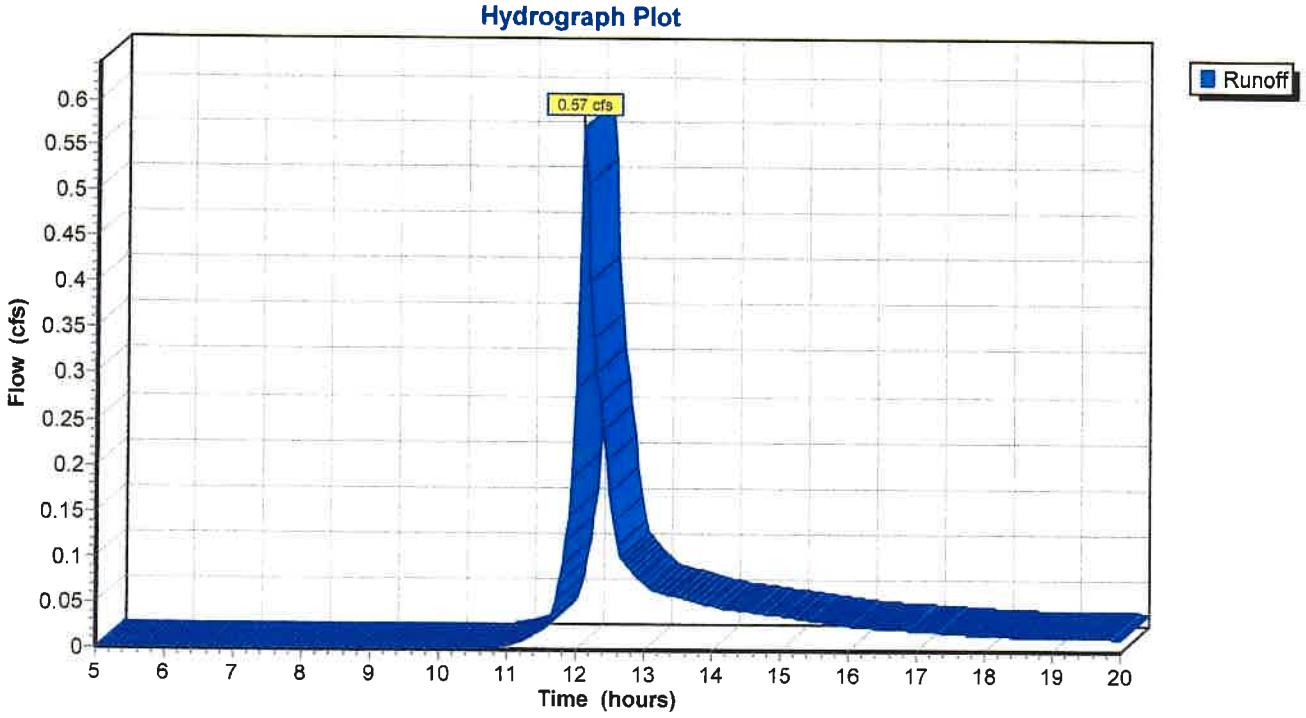
Runoff = 0.57 cfs @ 12.11 hrs, Volume= 0.040 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.17"

Area (sf)	CN	Description
4,127	98	Paved parking & roofs
9,569	49	50-75% Grass cover, Fair, HSG A
13,696	64	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	39	0.0330	0.2		**Sheet Flow, Overland Flow** Grass: Short n= 0.150 P2= 3.20"
1.9	20	0.0500	0.2		**Sheet Flow, Overland Flow** Grass: Short n= 0.150 P2= 3.20"
0.6	41	0.0240	1.1		**Shallow Concentrated Flow, Overland Flow** Short Grass Pasture Kv= 7.0 fps
0.3	28	0.0710	1.9		**Shallow Concentrated Flow, Overland Flow** Short Grass Pasture Kv= 7.0 fps
0.0	11	0.4500	4.7		**Shallow Concentrated Flow, Overland Flow** Short Grass Pasture Kv= 7.0 fps
6.6	139	Total			

Subcatchment A-1: Existing Lot to Street



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Type III 24-hr Rainfall=6.35"
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A-1: Existing Lot to Street

Tc=6.6 min CN=64 Area=13,696 sf Runoff= 0.88 cfs 0.061 af

Runoff Area = 0.314 ac Volume = 0.061 af Average Depth = 2.31"

Subcatchment A-1: Existing Lot to Street

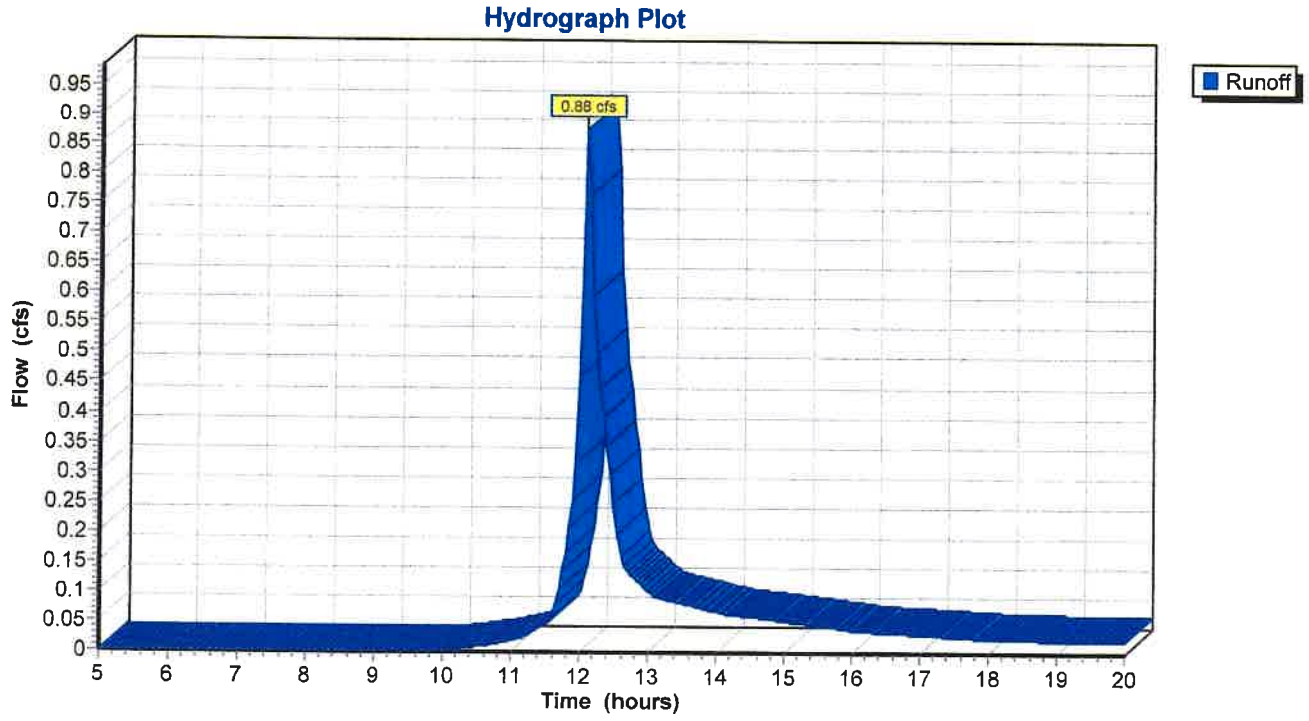
Runoff = 0.88 cfs @ 12.10 hrs, Volume= 0.061 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=6.35"

Area (sf)	CN	Description
4,127	98	Paved parking & roofs
9,569	49	50-75% Grass cover, Fair, HSG A
13,696	64	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	39	0.0330	0.2		**Sheet Flow, Overland Flow** Grass: Short n= 0.150 P2= 3.20"
1.9	20	0.0500	0.2		**Sheet Flow, Overland Flow** Grass: Short n= 0.150 P2= 3.20"
0.6	41	0.0240	1.1		**Shallow Concentrated Flow, Overland Flow** Short Grass Pasture Kv= 7.0 fps
0.3	28	0.0710	1.9		**Shallow Concentrated Flow, Overland Flow** Short Grass Pasture Kv= 7.0 fps
0.0	11	0.4500	4.7		**Shallow Concentrated Flow, Overland Flow** Short Grass Pasture Kv= 7.0 fps
6.6	139	Total			

Subcatchment A-1: Existing Lot to Street



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Type III 24-hr Rainfall=8.78"
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A-1: Existing Lot to Street

Tc=6.6 min CN=64 Area=13,696 sf Runoff= 1.57 cfs 0.107 af

Runoff Area = 0.314 ac Volume = 0.107 af Average Depth = 4.10"

Subcatchment A-1: Existing Lot to Street

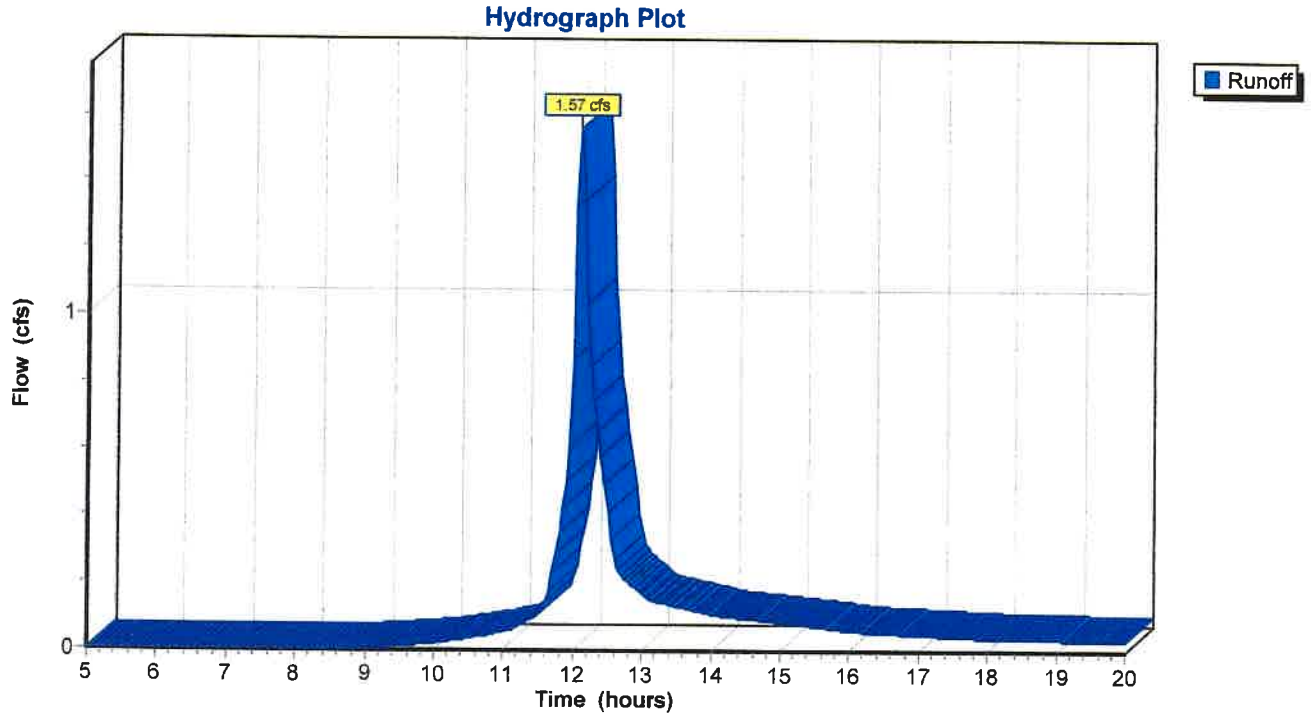
Runoff = 1.57 cfs @ 12.10 hrs, Volume= 0.107 af

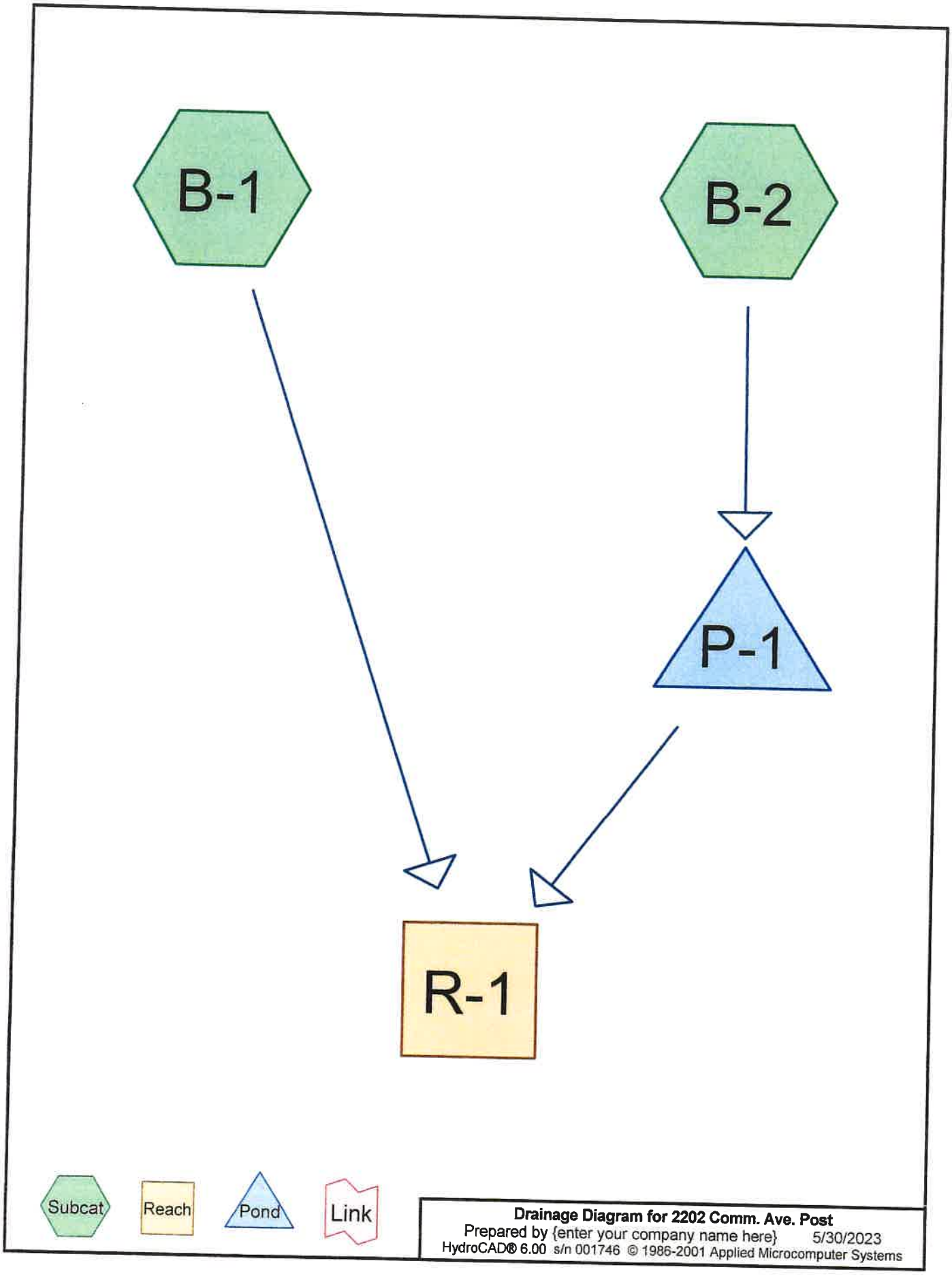
Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=8.78"

Area (sf)	CN	Description
4,127	98	Paved parking & roofs
9,569	49	50-75% Grass cover, Fair, HSG A
13,696	64	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	39	0.0330	0.2		**Sheet Flow, Overland Flow** Grass: Short n= 0.150 P2= 3.20"
1.9	20	0.0500	0.2		**Sheet Flow, Overland Flow** Grass: Short n= 0.150 P2= 3.20"
0.6	41	0.0240	1.1		**Shallow Concentrated Flow, Overland Flow** Short Grass Pasture Kv= 7.0 fps
0.3	28	0.0710	1.9		**Shallow Concentrated Flow, Overland Flow** Short Grass Pasture Kv= 7.0 fps
0.0	11	0.4500	4.7		**Shallow Concentrated Flow, Overland Flow** Short Grass Pasture Kv= 7.0 fps
6.6	139	Total			

Subcatchment A-1: Existing Lot to Street





Drainage Diagram for 2202 Comm. Ave. Post
Prepared by {enter your company name here} 5/30/2023

Subcatchment B-1: Tributary to Street

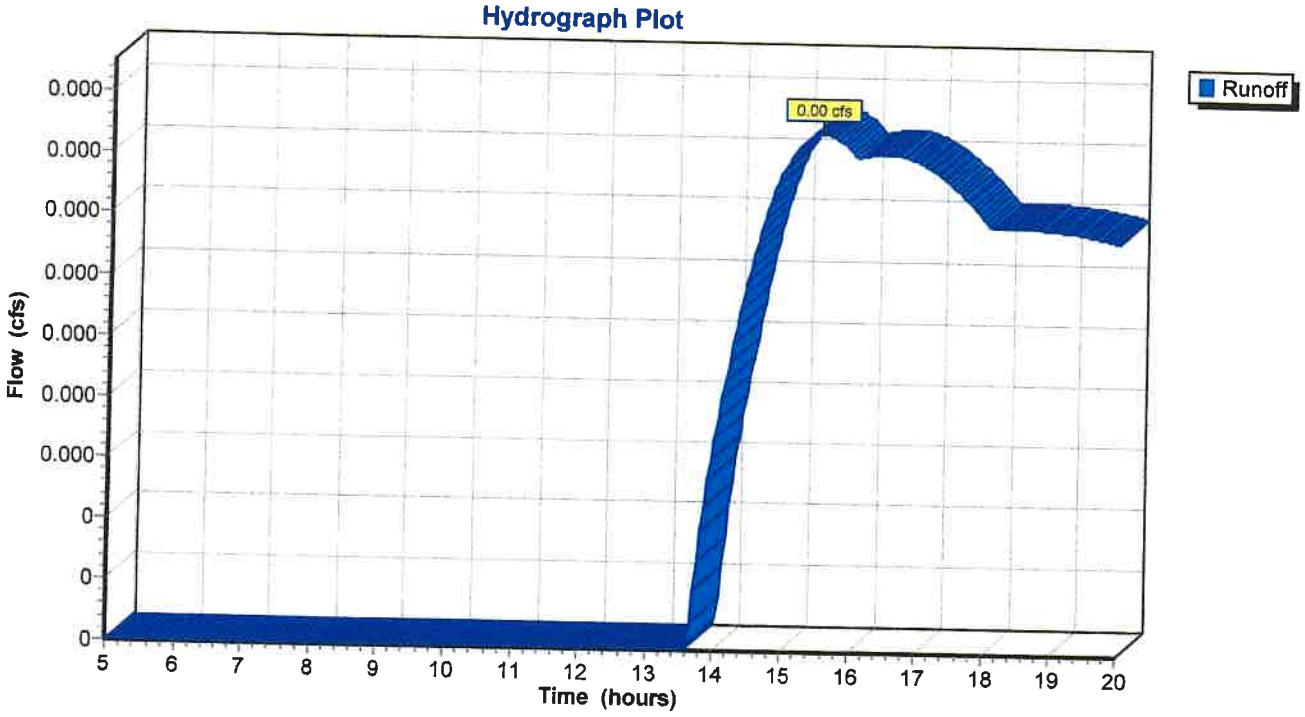
Runoff = 0.00 cfs @ 15.56 hrs, Volume= 0.000 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=2.00"

Area (sf)	CN	Description
1,952	98	Paved parking & roofs
4,887	39	>75% Grass cover, Good, HSG A
6,839	56	Weighted Average

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

Subcatchment B-1: Tributary to Street



Subcatchment B-2: Tributary to Infiltration

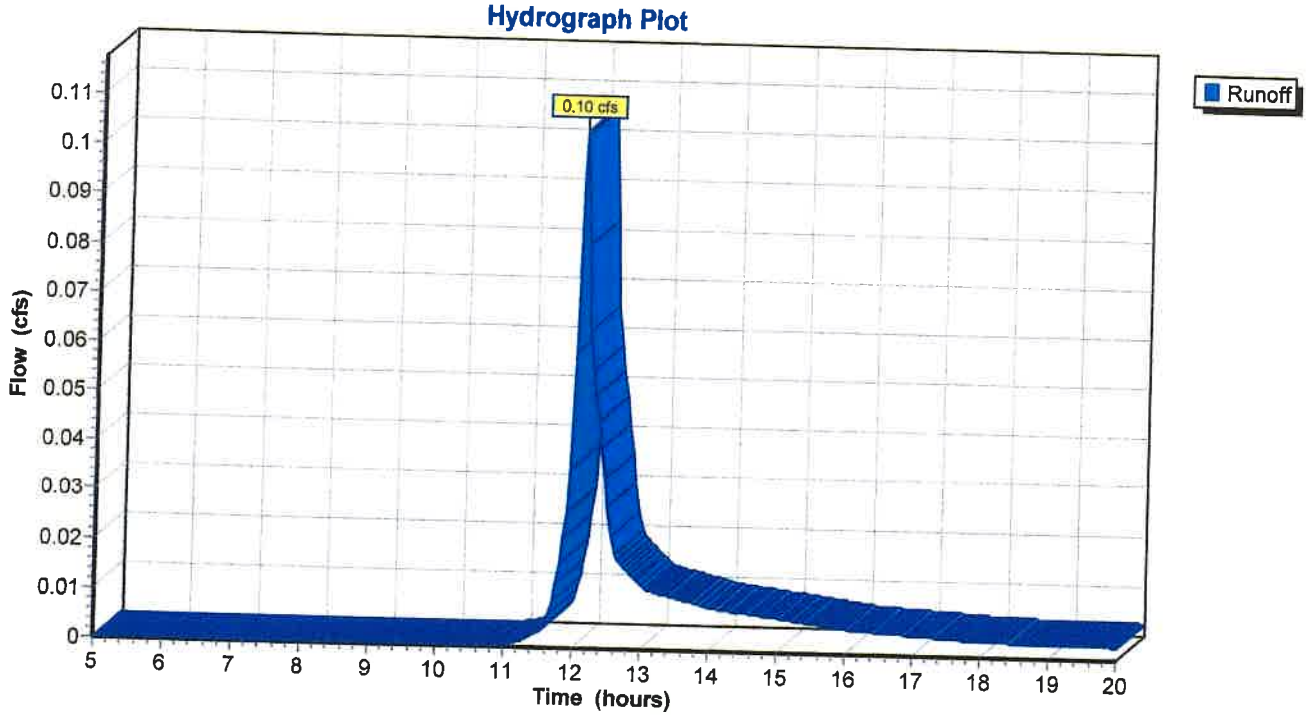
Runoff = 0.10 cfs @ 12.09 hrs, Volume= 0.007 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=2.00"

Area (sf)	CN	Description
4,876	98	Paved parking & roofs
1,981	39	>75% Grass cover, Good, HSG A
6,857	81	Weighted Average

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

Subcatchment B-2: Tributary to Infiltration

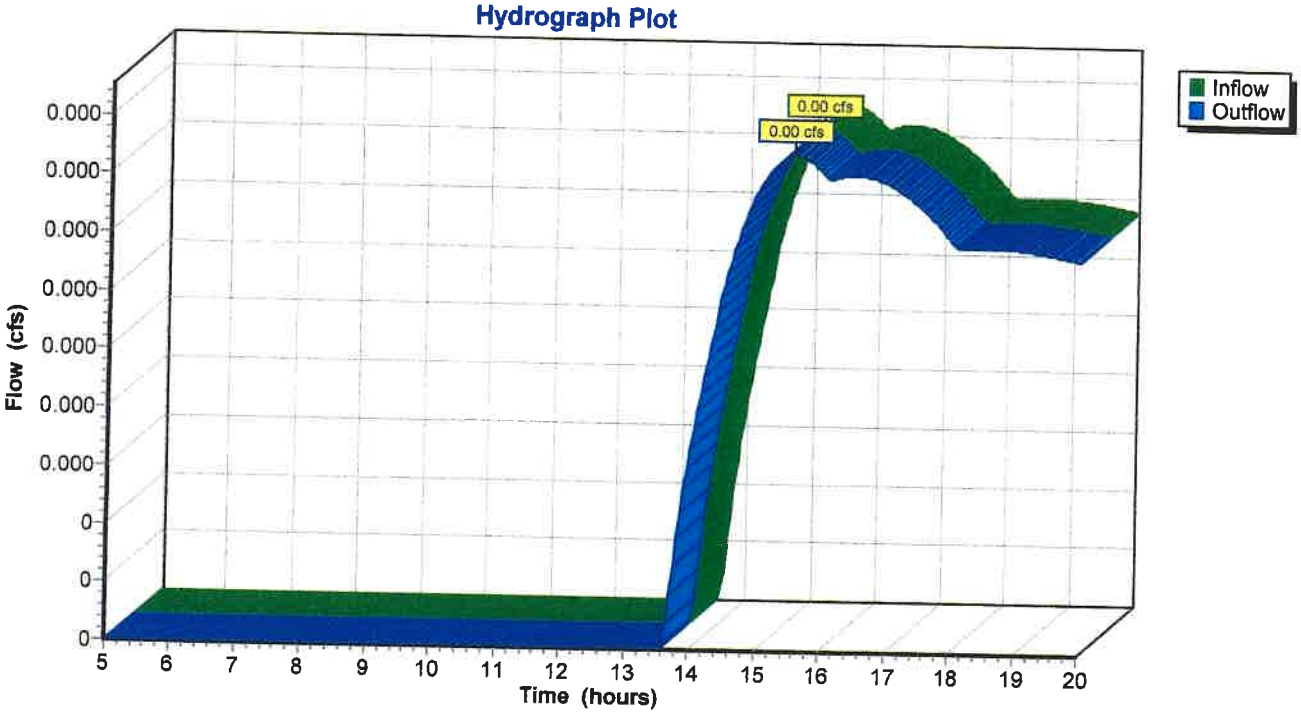


Reach R-1: Summary Node

Inflow = 0.00 cfs @ 15.56 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 15.56 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach R-1: Summary Node



Pond P-1: Infiltration System

Inflow	=	0.10 cfs @	12.09 hrs,	Volume=	0.007 af
Outflow	=	0.10 cfs @	12.11 hrs,	Volume=	0.007 af, Atten= 1%, Lag= 1.0 min
Discarded	=	0.10 cfs @	12.11 hrs,	Volume=	0.007 af
Primary	=	0.00 cfs @	5.00 hrs,	Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 74.32' Storage= 6 cf
Plug-Flow detention time= 1.0 min calculated for 0.007 af (100% of inflow)

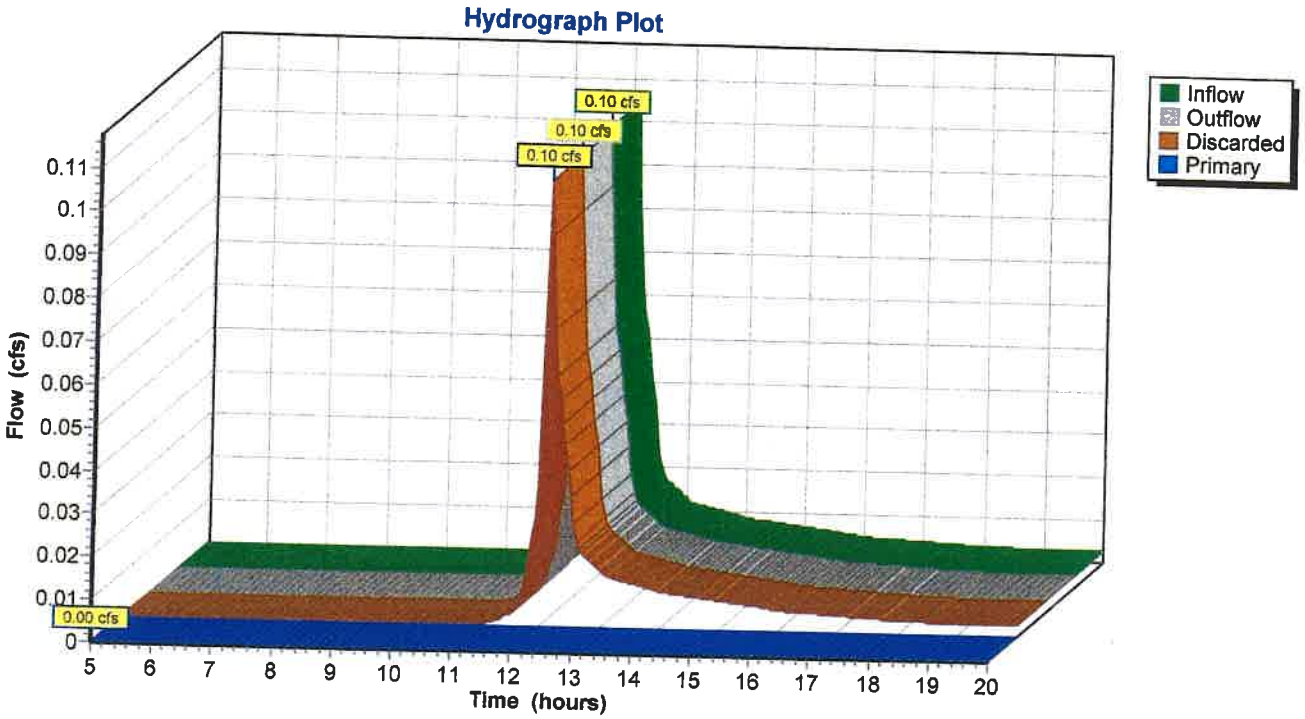
Elevation (feet)	Cum.Store (cubic-feet)
74.30	0
74.80	126
75.97	540
76.47	591
77.60	655

Discarded OutFlow (Free Discharge)
└2=Exfiltration

Primary OutFlow (Free Discharge)
└1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	77.50'	**12.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
2	Discarded	74.30'	**0.14 cfs Exfiltration when above invert**

Pond P-1: Infiltration System



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Type III 24-hr Rainfall=3.29"
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment B-1: Tributary to Street

Tc=5.0 min CN=56 Area=6,839 sf Runoff= 0.02 cfs 0.003 af

Subcatchment B-2: Tributary to Infiltration

Tc=5.0 min CN=81 Area=6,857 sf Runoff= 0.28 cfs 0.019 af

Reach R-1: Summary Node

Inflow= 0.02 cfs 0.003 af
Outflow= 0.02 cfs 0.003 af

Pond P-1: Infiltration System

Peak Storage= 79 cf Inflow= 0.28 cfs 0.019 af
Discarded= 0.14 cfs 0.019 af Primary= 0.00 cfs 0.000 af Outflow= 0.14 cfs 0.019 af

Runoff Area = 0.314 ac Volume = 0.022 af Average Depth = 0.85"

Subcatchment B-1: Tributary to Street

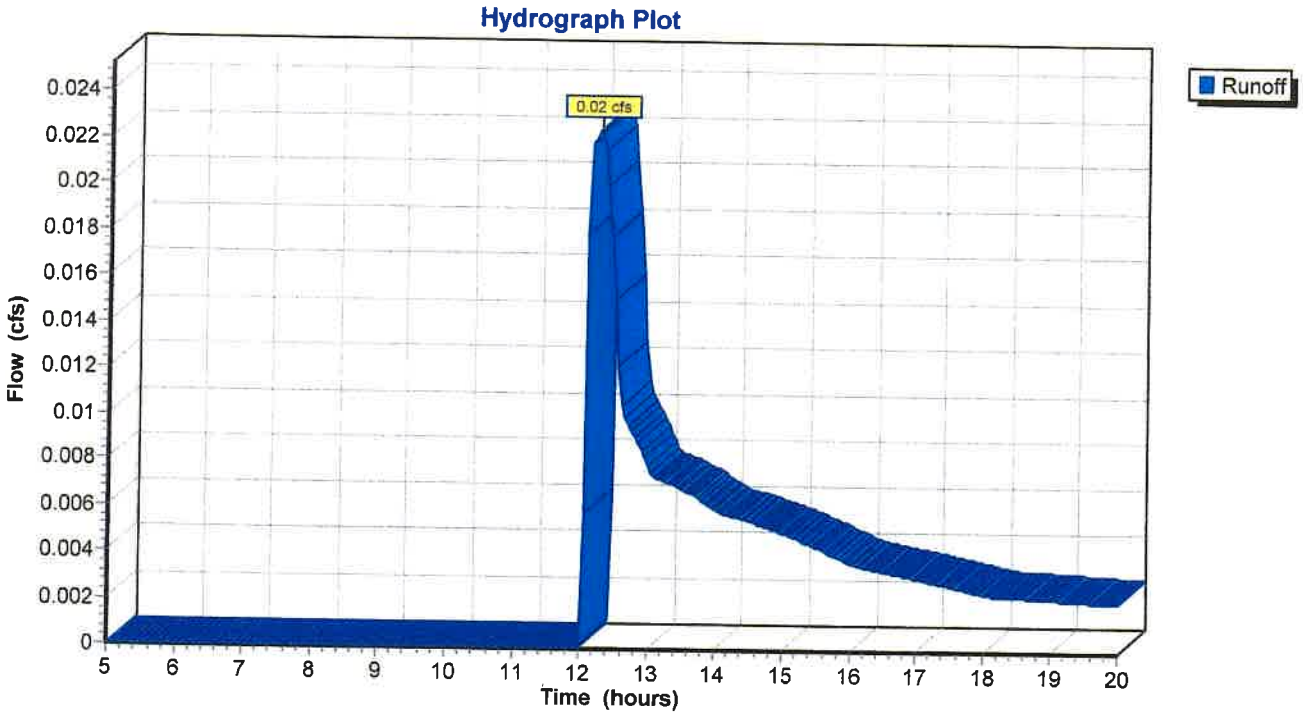
Runoff = 0.02 cfs @ 12.27 hrs, Volume= 0.003 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.29"

Area (sf)	CN	Description
1,952	98	Paved parking & roofs
4,887	39	>75% Grass cover, Good, HSG A
6,839	56	Weighted Average

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

Subcatchment B-1: Tributary to Street



Subcatchment B-2: Tributary to Infiltration

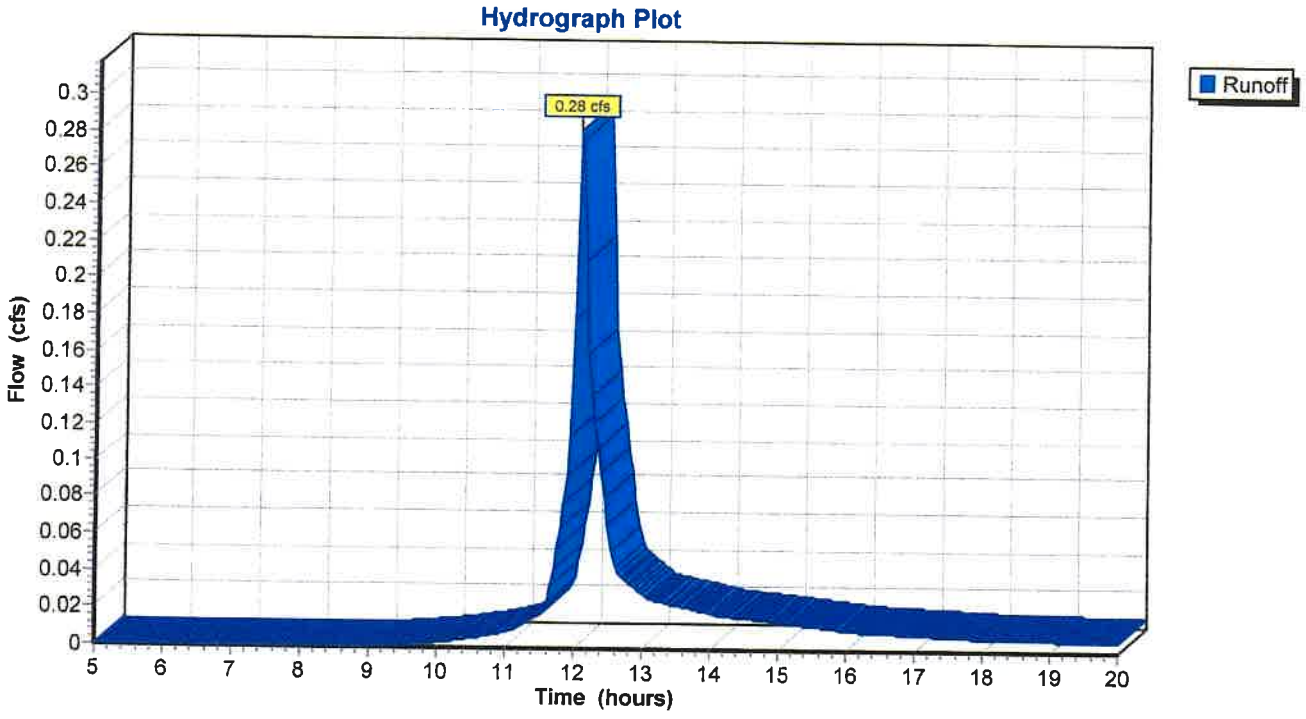
Runoff = 0.28 cfs @ 12.08 hrs, Volume= 0.019 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.29"

Area (sf)	CN	Description
4,876	98	Paved parking & roofs
1,981	39	>75% Grass cover, Good, HSG A
6,857	81	Weighted Average

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

Subcatchment B-2: Tributary to Infiltration

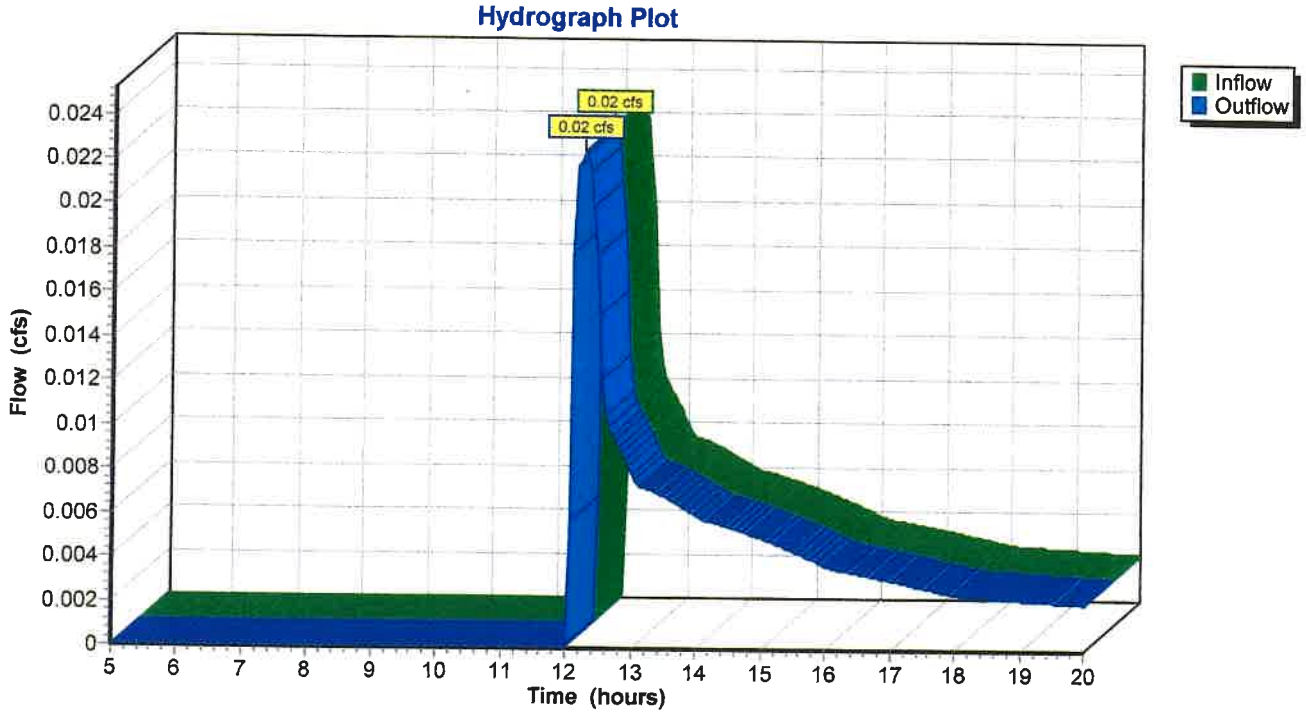


Reach R-1: Summary Node

Inflow = 0.02 cfs @ 12.27 hrs, Volume= 0.003 af
Outflow = 0.02 cfs @ 12.27 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach R-1: Summary Node



Pond P-1: Infiltration System

Inflow	=	0.28 cfs @	12.08 hrs, Volume=	0.019 af	
Outflow	=	0.14 cfs @	12.00 hrs, Volume=	0.019 af,	Atten= 51%, Lag= 0.0 min
Discarded	=	0.14 cfs @	12.00 hrs, Volume=	0.019 af	
Primary	=	0.00 cfs @	5.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 74.61' Storage= 79 cf
Plug-Flow detention time= 3.1 min calculated for 0.019 af (100% of inflow)

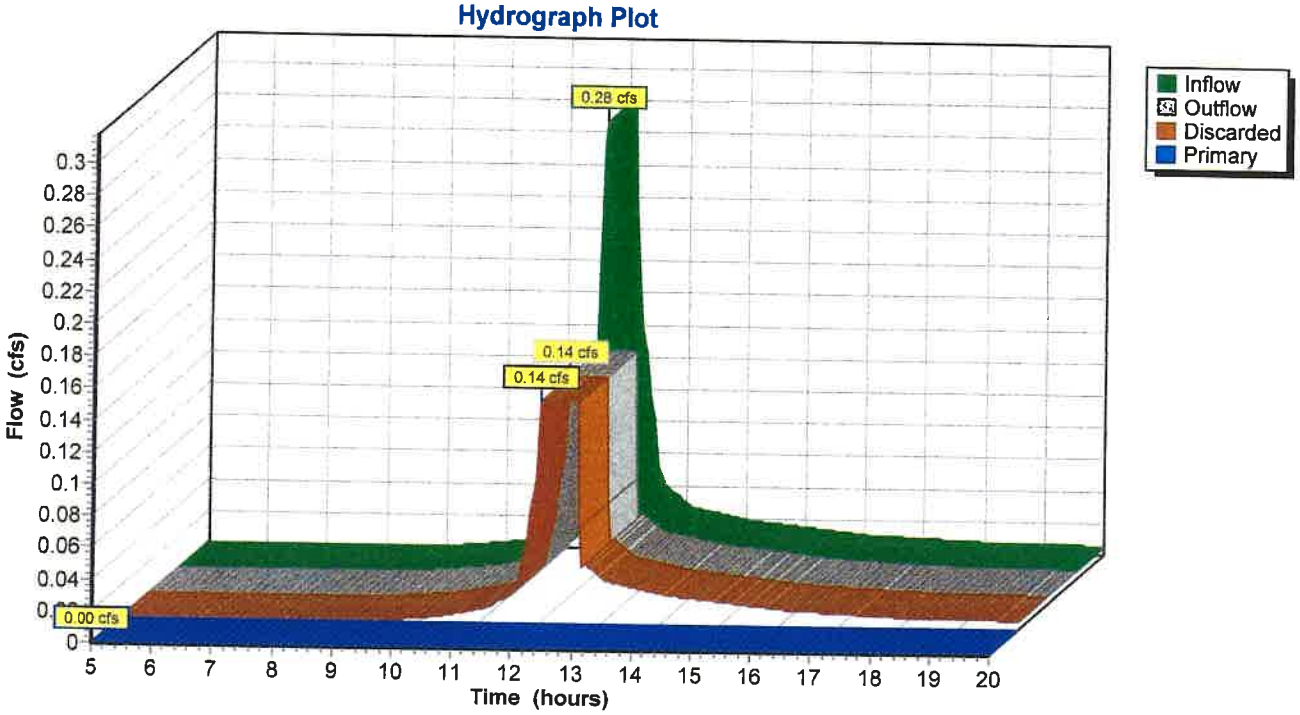
Elevation (feet)	Cum.Store (cubic-feet)
74.30	0
74.80	126
75.97	540
76.47	591
77.60	655

Discarded OutFlow (Free Discharge)
└─2=Exfiltration

Primary OutFlow (Free Discharge)
└─1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	77.50'	**12.0' long x 1.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
2	Discarded	74.30'	**0.14 cfs Exfiltration when above invert**

Pond P-1: Infiltration System



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Type III 24-hr Rainfall=5.17"
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment B-1: Tributary to Street

Tc=5.0 min CN=56 Area=6,839 sf Runoff= 0.18 cfs 0.013 af

Subcatchment B-2: Tributary to Infiltration

Tc=5.0 min CN=81 Area=6,857 sf Runoff= 0.58 cfs 0.039 af

Reach R-1: Summary Node

Inflow= 0.18 cfs 0.013 af
Outflow= 0.18 cfs 0.013 af

Pond P-1: Infiltration System

Peak Storage= 389 cf Inflow= 0.58 cfs 0.039 af
Discarded= 0.14 cfs 0.039 af Primary= 0.00 cfs 0.000 af Outflow= 0.14 cfs 0.039 af

Runoff Area = 0.314 ac Volume = 0.052 af Average Depth = 1.98"

Subcatchment B-1: Tributary to Street

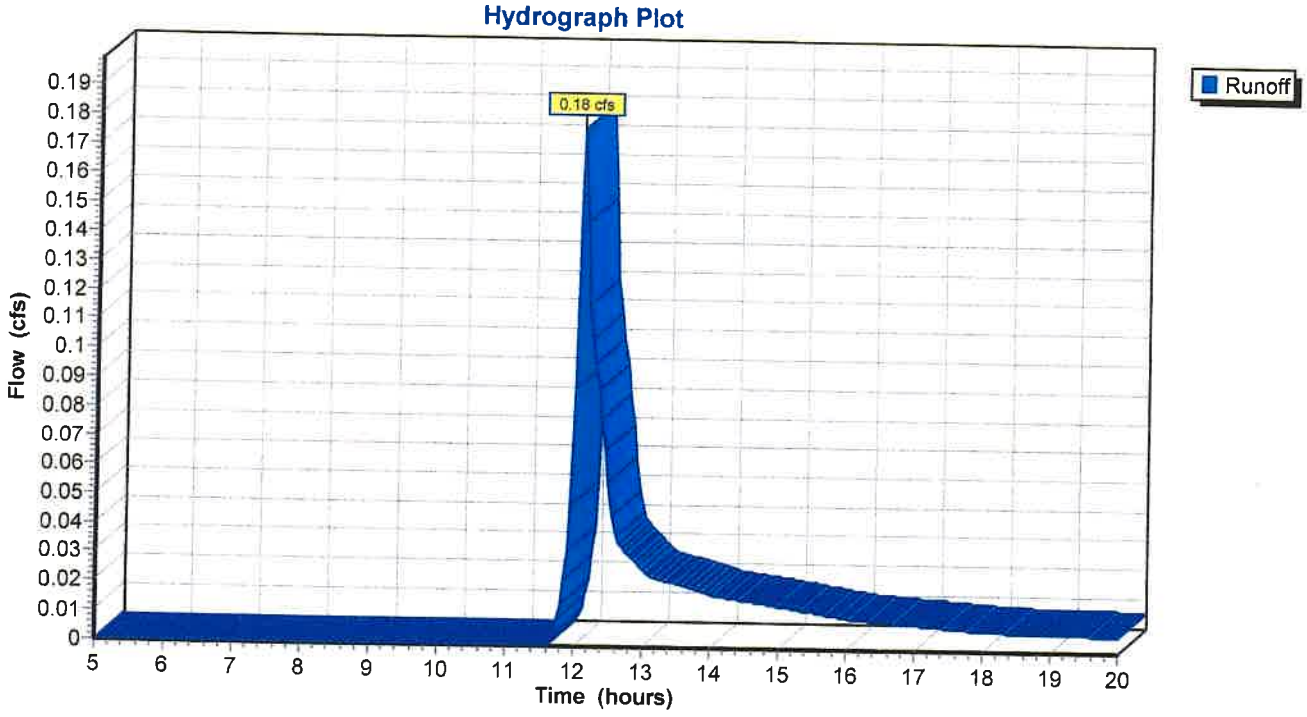
Runoff = 0.18 cfs @ 12.10 hrs, Volume= 0.013 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.17"

Area (sf)	CN	Description
1,952	98	Paved parking & roofs
4,887	39	>75% Grass cover, Good, HSG A
6,839	56	Weighted Average

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

Subcatchment B-1: Tributary to Street



Subcatchment B-2: Tributary to Infiltration

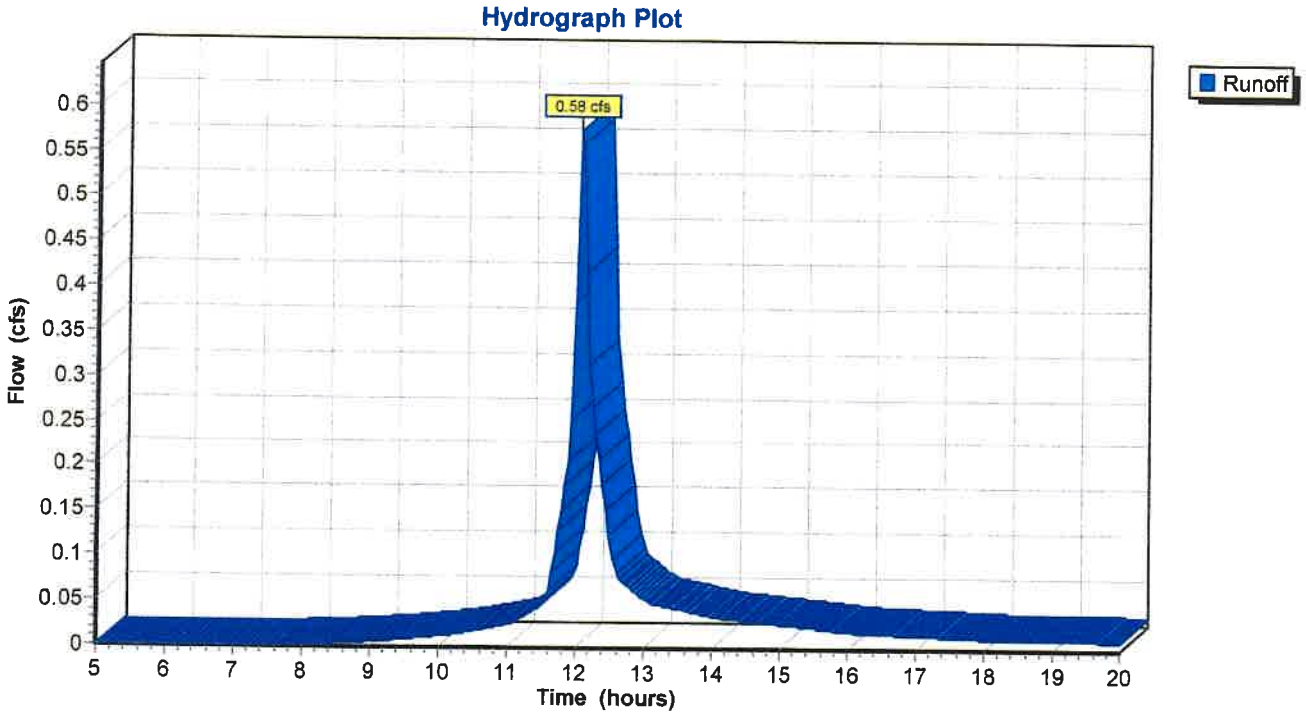
Runoff = 0.58 cfs @ 12.08 hrs, Volume= 0.039 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.17"

Area (sf)	CN	Description
4,876	98	Paved parking & roofs
1,981	39	>75% Grass cover, Good, HSG A
6,857	81	Weighted Average

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

Subcatchment B-2: Tributary to Infiltration

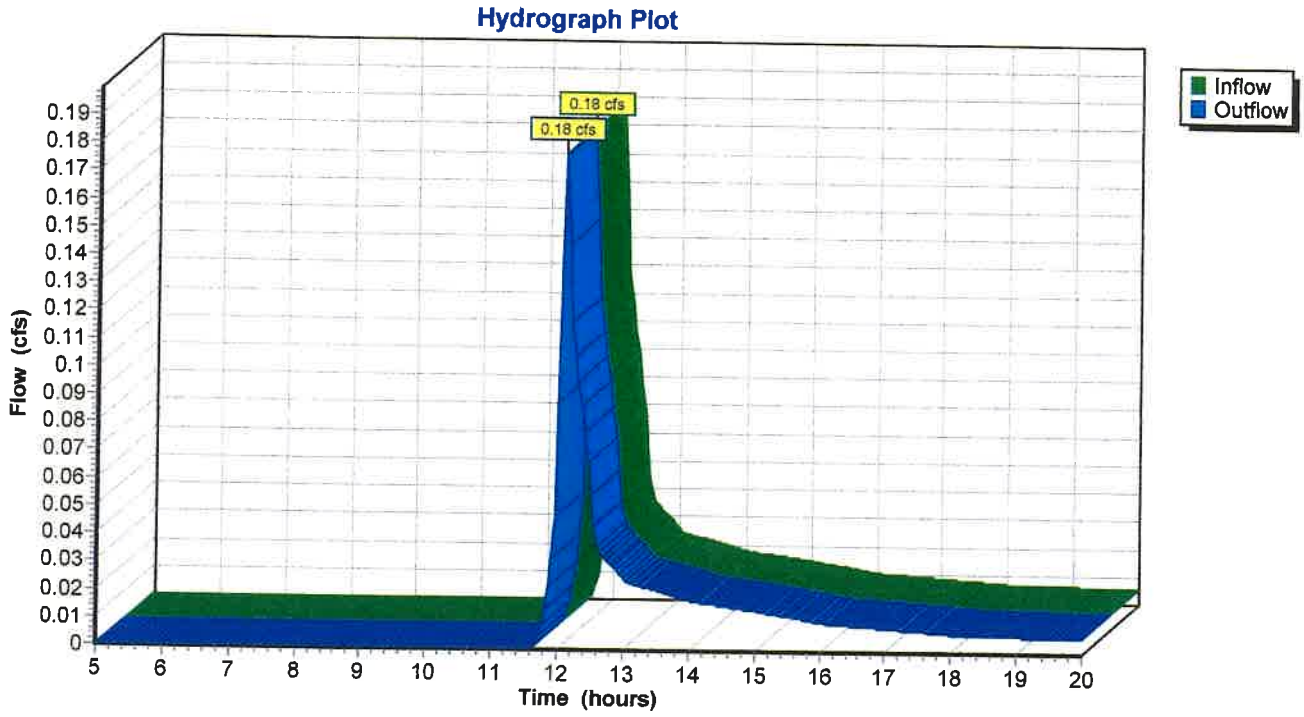


Reach R-1: Summary Node

Inflow = 0.18 cfs @ 12.10 hrs, Volume= 0.013 af
Outflow = 0.18 cfs @ 12.10 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach R-1: Summary Node



Pond P-1: Infiltration System

Inflow	=	0.58 cfs @	12.08 hrs,	Volume=	0.039 af
Outflow	=	0.14 cfs @	11.80 hrs,	Volume=	0.039 af, Atten= 76%, Lag= 0.0 min
Discarded	=	0.14 cfs @	11.80 hrs,	Volume=	0.039 af
Primary	=	0.00 cfs @	5.00 hrs,	Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 75.54' Storage= 389 cf
Plug-Flow detention time= 15.9 min calculated for 0.038 af (100% of inflow)

Elevation (feet)	Cum.Store (cubic-feet)
74.30	0
74.80	126
75.97	540
76.47	591
77.60	655

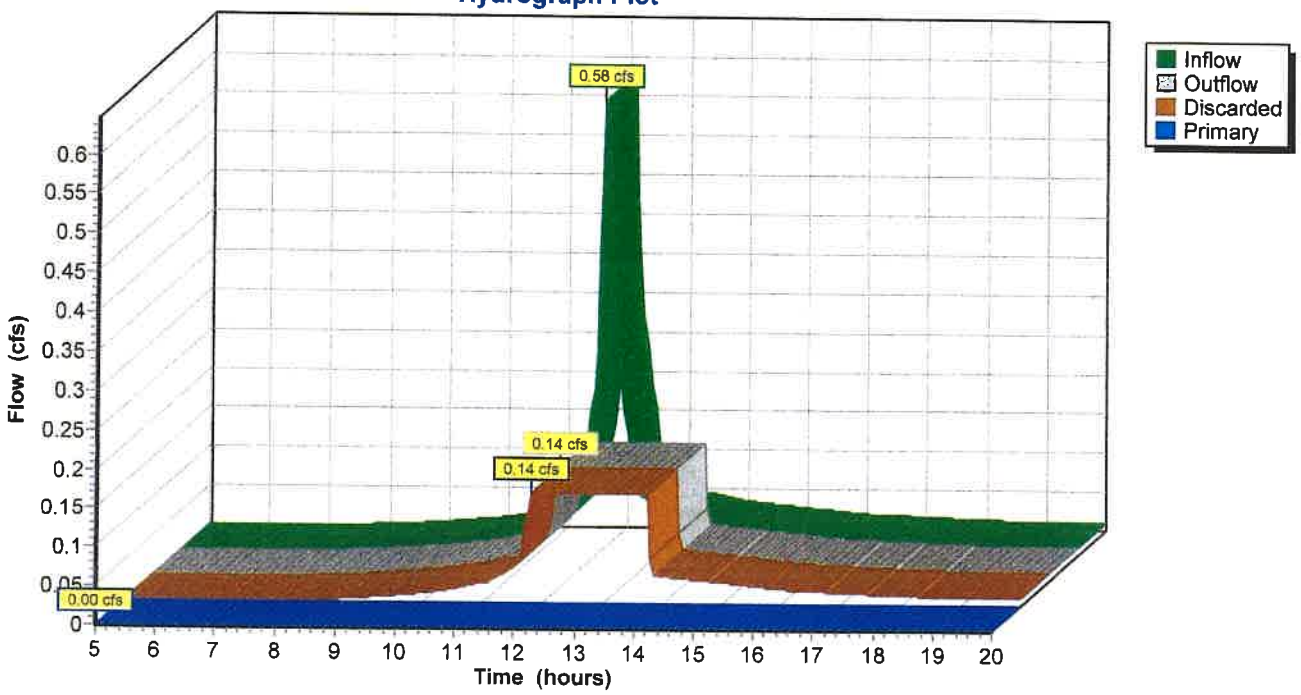
Discarded OutFlow (Free Discharge)
└2=Exfiltration

Primary OutFlow (Free Discharge)
└1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	77.50'	**12.0' long x 1.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
2	Discarded	74.30'	**0.14 cfs Exfiltration when above invert**

Pond P-1: Infiltration System

Hydrograph Plot



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Type III 24-hr Rainfall=6.35"
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment B-1: Tributary to Street

Tc=5.0 min CN=56 Area=6,839 sf Runoff= 0.31 cfs 0.021 af

Subcatchment B-2: Tributary to Infiltration

Tc=5.0 min CN=81 Area=6,857 sf Runoff= 0.77 cfs 0.052 af

Reach R-1: Summary Node

Inflow= 0.31 cfs 0.021 af
Outflow= 0.31 cfs 0.021 af

Pond P-1: Infiltration System

Peak Storage= 644 cf Inflow= 0.77 cfs 0.052 af
Discarded= 0.14 cfs 0.052 af Primary= 0.00 cfs 0.000 af Outflow= 0.14 cfs 0.052 af

Runoff Area = 0.314 ac Volume = 0.073 af Average Depth = 2.80"

Subcatchment B-1: Tributary to Street

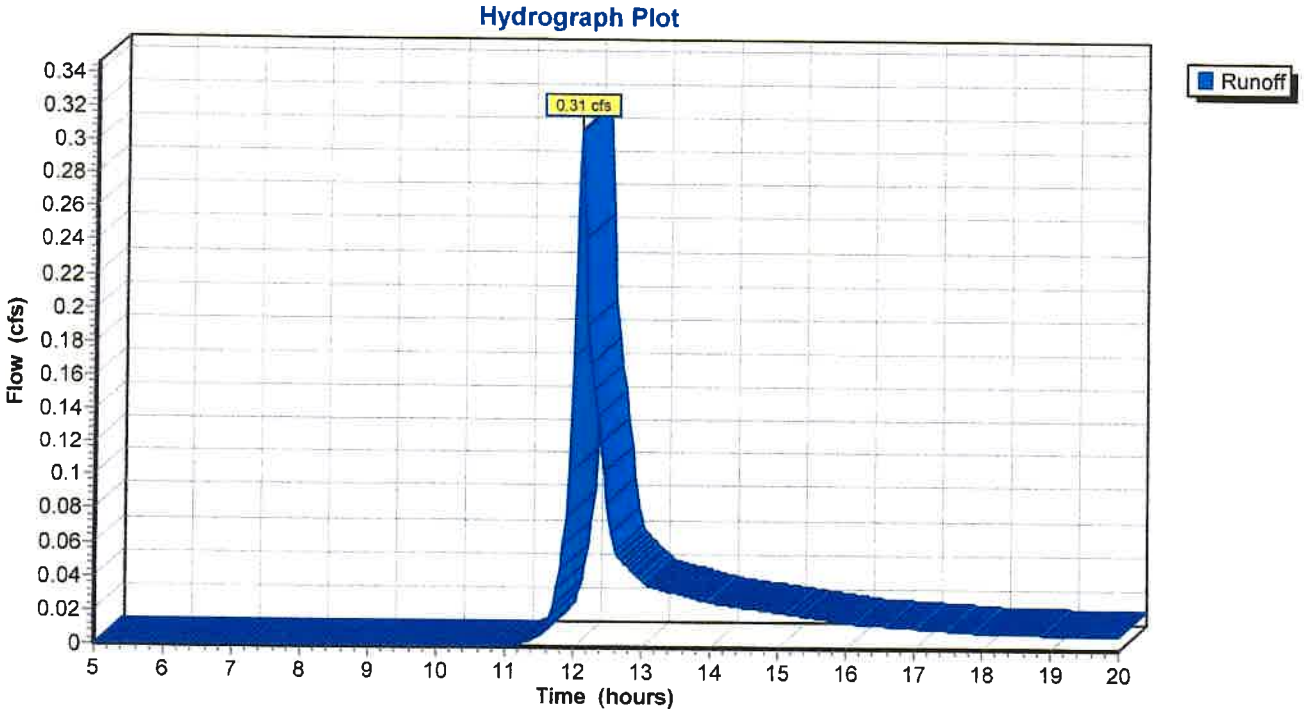
Runoff = 0.31 cfs @ 12.09 hrs, Volume= 0.021 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=6.35"

Area (sf)	CN	Description
1,952	98	Paved parking & roofs
4,887	39	>75% Grass cover, Good, HSG A
6,839	56	Weighted Average

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

Subcatchment B-1: Tributary to Street



Subcatchment B-2: Tributary to Infiltration

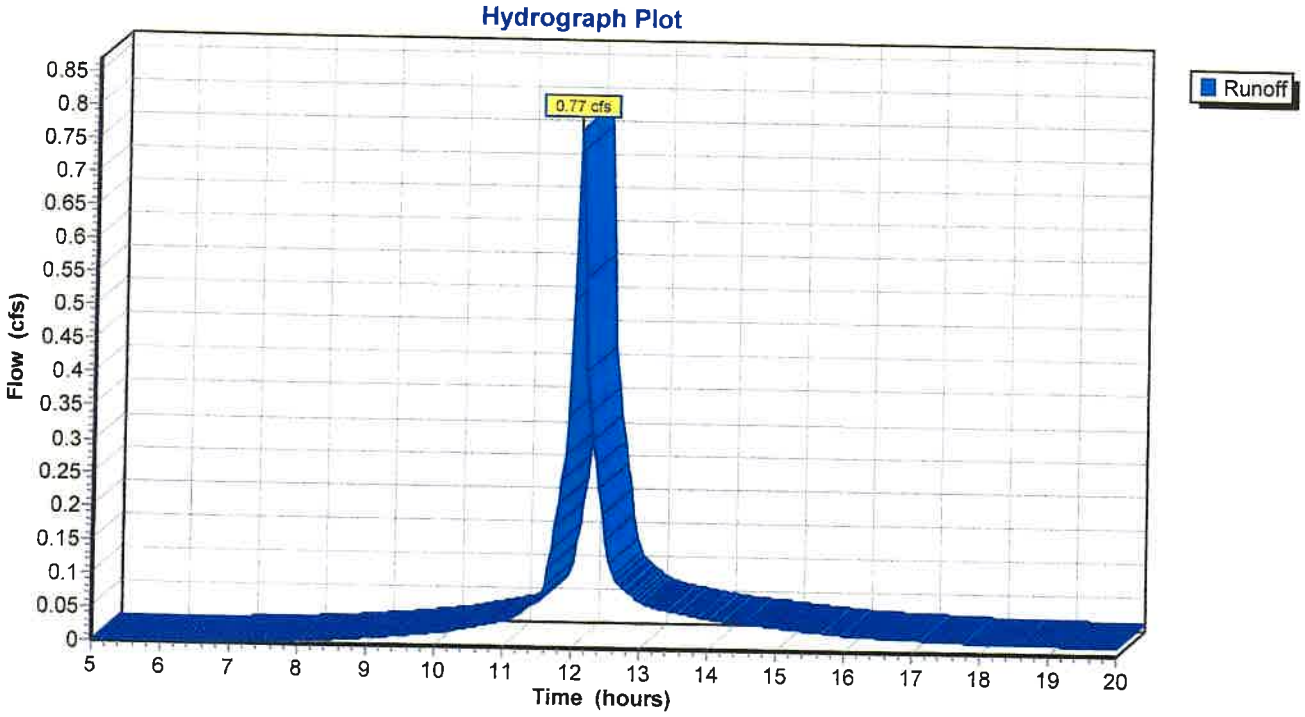
Runoff = 0.77 cfs @ 12.07 hrs, Volume= 0.052 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=6.35"

Area (sf)	CN	Description
4,876	98	Paved parking & roofs
1,981	39	>75% Grass cover, Good, HSG A
6,857	81	Weighted Average

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

Subcatchment B-2: Tributary to Infiltration

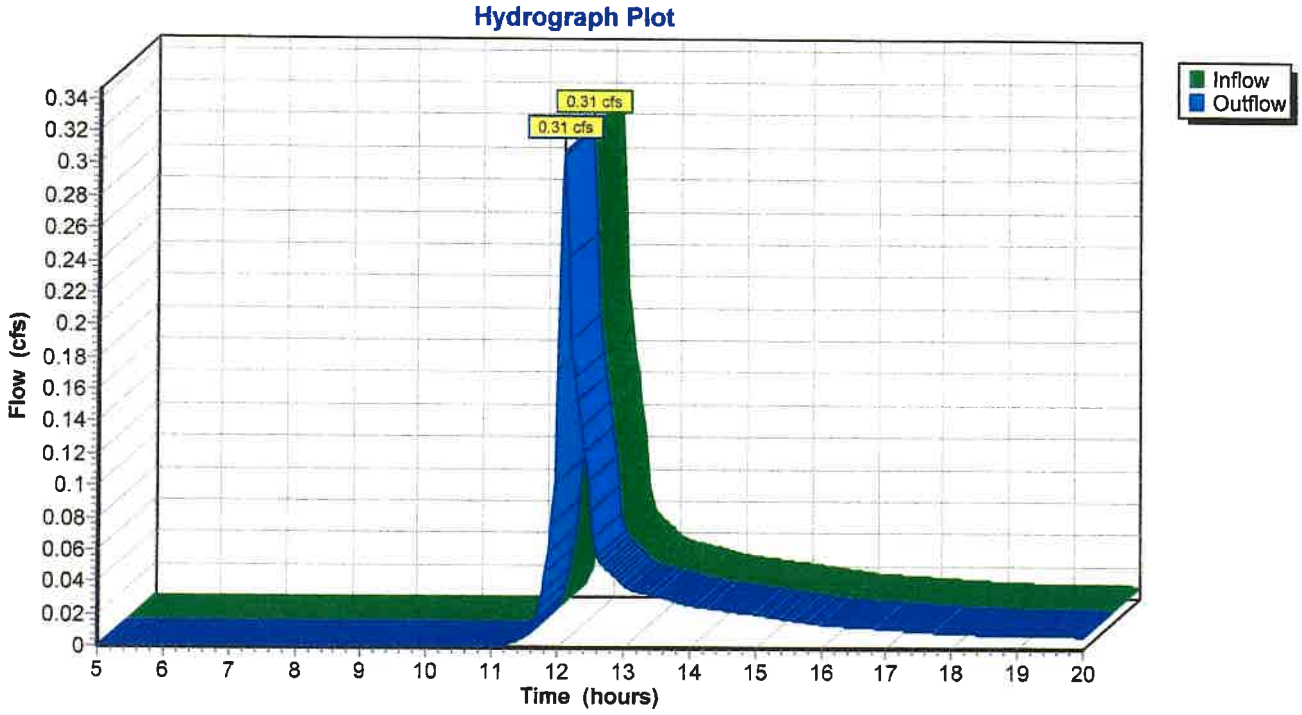


Reach R-1: Summary Node

Inflow = 0.31 cfs @ 12.09 hrs, Volume= 0.021 af
Outflow = 0.31 cfs @ 12.09 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach R-1: Summary Node



Pond P-1: Infiltration System

Inflow	=	0.77 cfs @	12.07 hrs, Volume=	0.052 af	
Outflow	=	0.14 cfs @	11.75 hrs, Volume=	0.052 af,	Atten= 82%, Lag= 0.0 min
Discarded	=	0.14 cfs @	11.75 hrs, Volume=	0.052 af	
Primary	=	0.00 cfs @	5.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 77.41' Storage= 644 cf
Plug-Flow detention time= 29.2 min calculated for 0.052 af (100% of inflow)

Elevation (feet)	Cum.Store (cubic-feet)
74.30	0
74.80	126
75.97	540
76.47	591
77.60	655

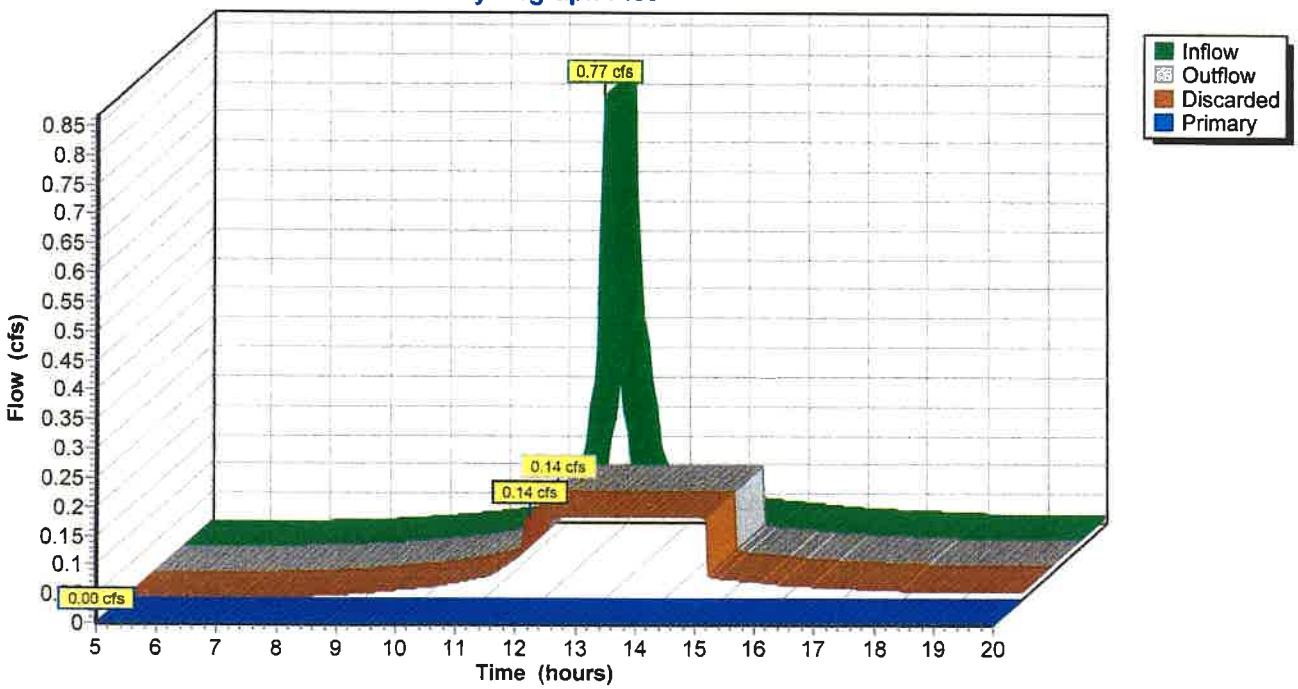
Discarded OutFlow (Free Discharge)
└2=Exfiltration

Primary OutFlow (Free Discharge)
└1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	77.50'	**12.0' long x 1.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
2	Discarded	74.30'	**0.14 cfs Exfiltration when above invert**

Pond P-1: Infiltration System

Hydrograph Plot



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Type III 24-hr Rainfall=8.78"
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment B-1: Tributary to Street

Tc=5.0 min CN=56 Area=6,839 sf Runoff= 0.62 cfs 0.042 af

Subcatchment B-2: Tributary to Infiltration

Tc=5.0 min CN=81 Area=6,857 sf Runoff= 1.17 cfs 0.080 af

Reach R-1: Summary Node

Inflow= 1.99 cfs 0.055 af
Outflow= 1.99 cfs 0.055 af

Pond P-1: Infiltration System

Peak Storage= 657 cf Inflow= 1.17 cfs 0.080 af
Discarded= 0.14 cfs 0.067 af Primary= 1.51 cfs 0.013 af Outflow= 1.65 cfs 0.080 af

Runoff Area = 0.314 ac Volume = 0.122 af Average Depth = 4.65"

Subcatchment B-1: Tributary to Street

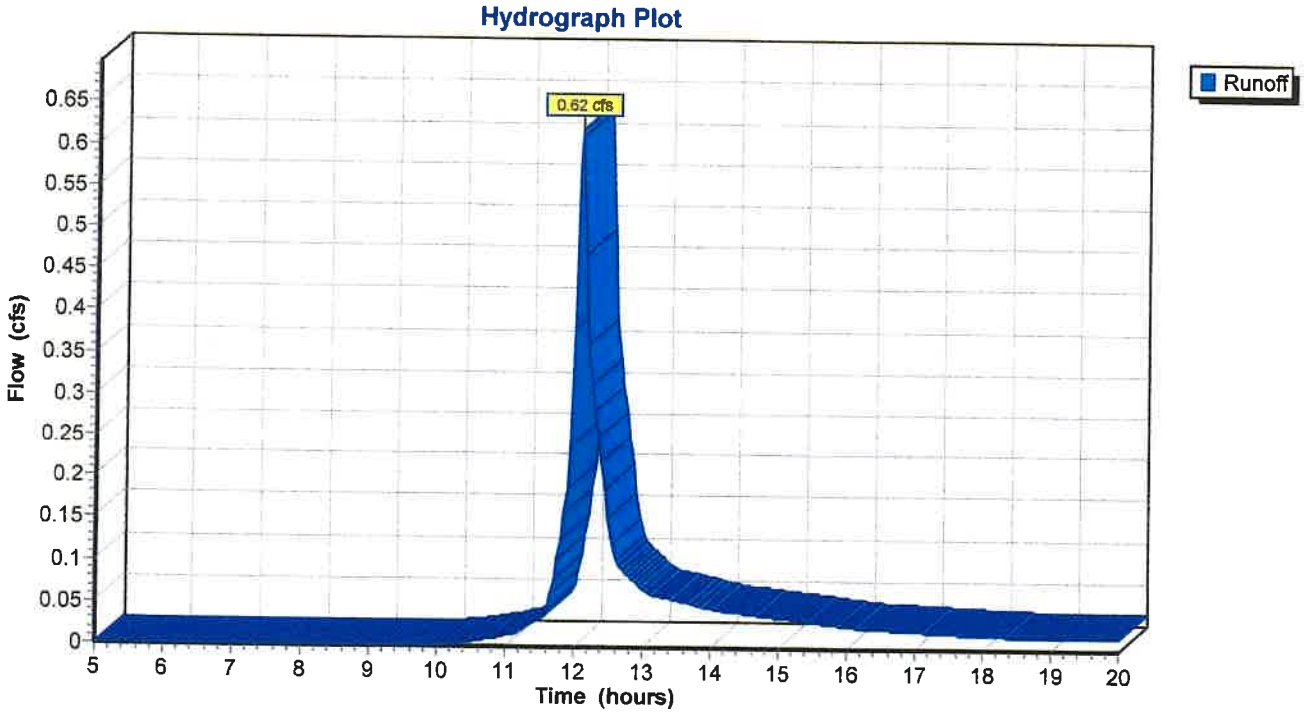
Runoff = 0.62 cfs @ 12.08 hrs, Volume= 0.042 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=8.78"

Area (sf)	CN	Description
1,952	98	Paved parking & roofs
4,887	39	>75% Grass cover, Good, HSG A
6,839	56	Weighted Average

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

Subcatchment B-1: Tributary to Street



Subcatchment B-2: Tributary to Infiltration

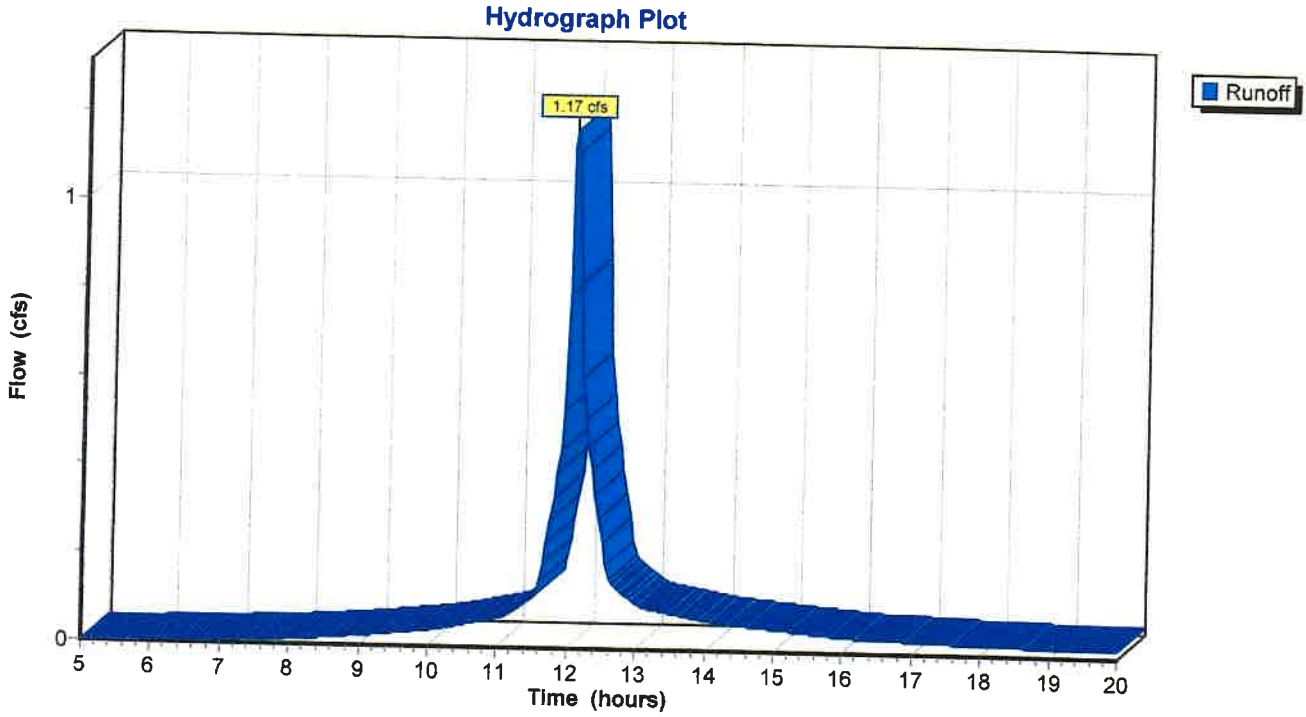
Runoff = 1.17 cfs @ 12.07 hrs, Volume= 0.080 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=8.78"

Area (sf)	CN	Description
4,876	98	Paved parking & roofs
1,981	39	>75% Grass cover, Good, HSG A
6,857	81	Weighted Average

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

Subcatchment B-2: Tributary to Infiltration

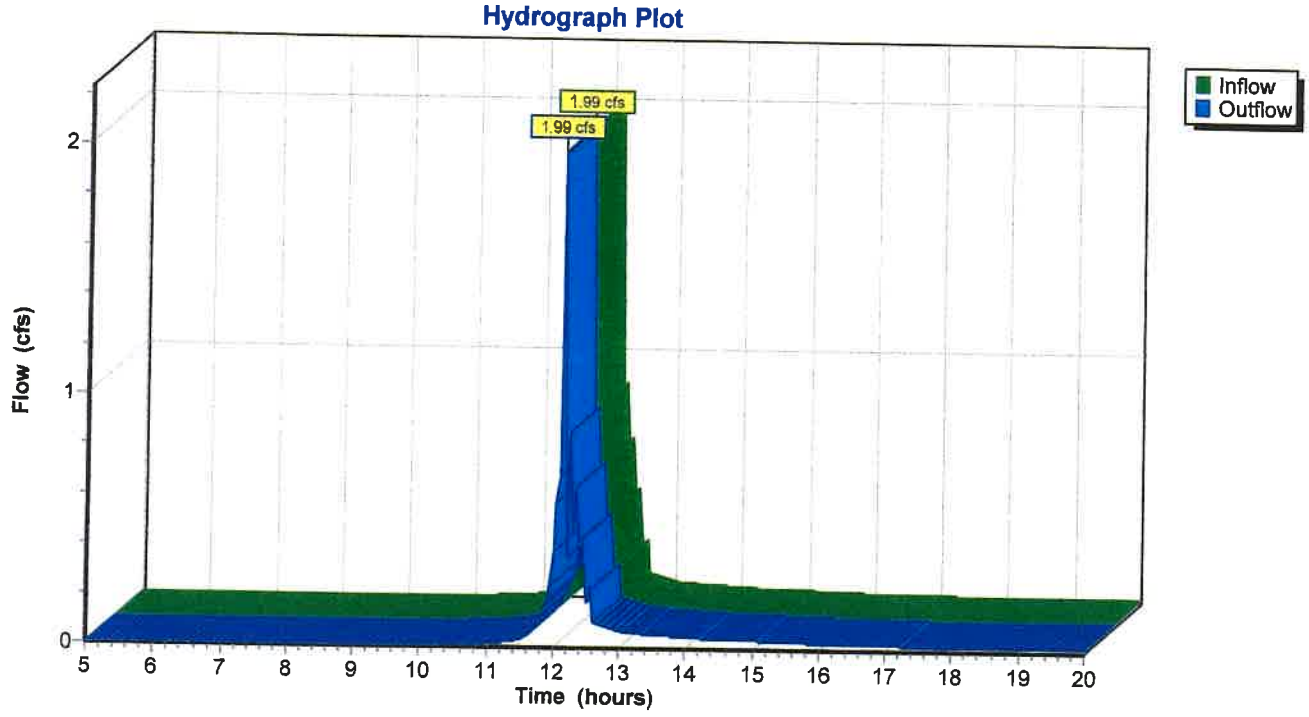


Reach R-1: Summary Node

Inflow = 1.99 cfs @ 12.15 hrs, Volume= 0.055 af
Outflow = 1.99 cfs @ 12.15 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach R-1: Summary Node



Pond P-1: Infiltration System

Inflow	=	1.17 cfs @	12.07 hrs, Volume=	0.080 af
Outflow	=	1.65 cfs @	12.15 hrs, Volume=	0.080 af, Atten= 0%, Lag= 4.6 min
Discarded	=	0.14 cfs @	11.65 hrs, Volume=	0.067 af
Primary	=	1.51 cfs @	12.15 hrs, Volume=	0.013 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 77.64' Storage= 657 cf
Plug-Flow detention time= 26.1 min calculated for 0.080 af (100% of inflow)

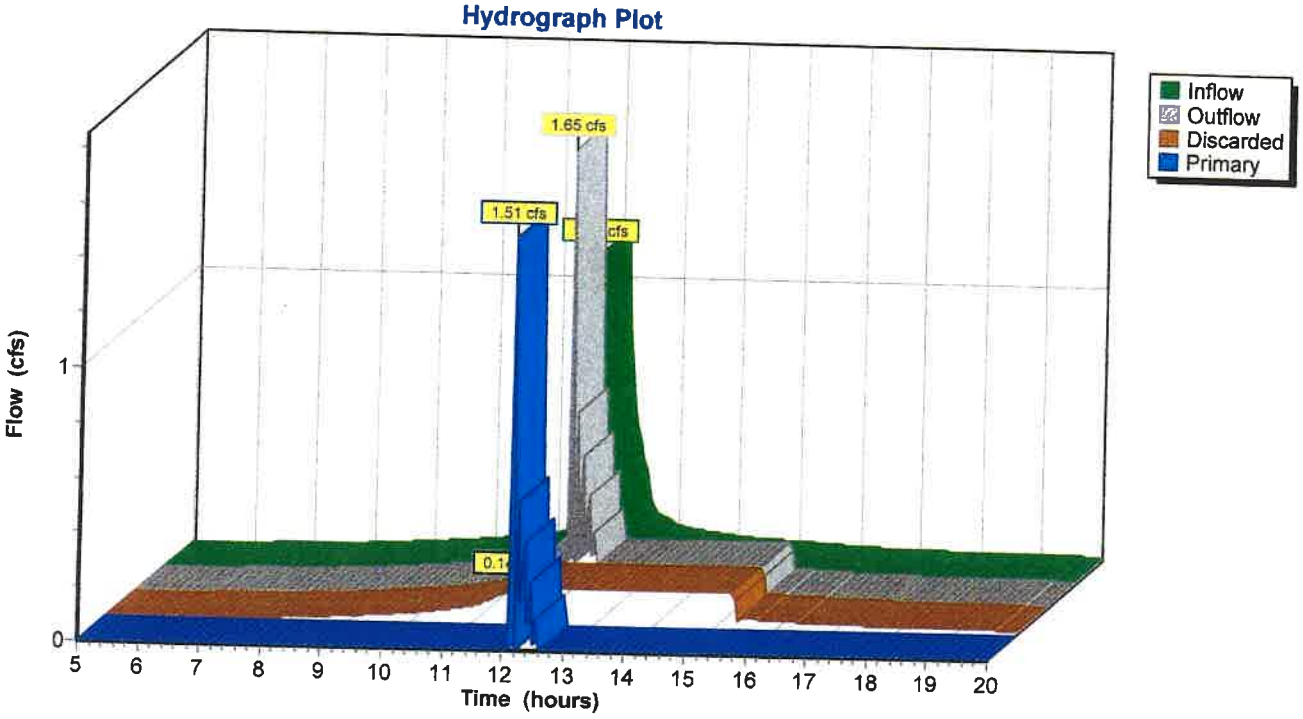
Elevation (feet)	Cum.Store (cubic-feet)
74.30	0
74.80	126
75.97	540
76.47	591
77.60	655

Discarded OutFlow (Free Discharge)
└2=Exfiltration

Primary OutFlow (Free Discharge)
└1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	77.50'	**12.0' long x 1.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
2	Discarded	74.30'	**0.14 cfs Exfiltration when above invert**

Pond P-1: Infiltration System



OPERATION & MAINTENANCE PLAN

STORMWATER MANAGEMENT FACILITIES

2202 COMMONWEALTH AVENUE

NEWTON, MASSACHUSETTS

June 2, 2023

Lakeview Engineering Associates
P.O. Box 787
Hudson, Massachusetts 01749

OPERATION & MAINTENANCE PLAN
STORMWATER MANAGEMENT FACILITIES
2202 COMMONWEALTH AVENUE
NEWTON, MASSACHUSETTS

The proposed project includes stormwater runoff controls associated with the re-development of the existing house lot to a multi-family use, including a new building layout, access driveway & site grading, that will require continued maintenance by the property owner. The major components associated with maintenance needs is are the trench drain, sediment trap manhole, the leaching galley system & the yard drain, as well as the roof gutters & downspouts. These will need to be cleaned periodically as noted below. Cleaning of these structures shall be done by the property owner or by a specialty contractor with hydraulic cleaning ability. The following outlines the major maintenance issues associated with the project:

Trench Drain Cleaning:

The trench drain should be inspected after completion of construction to assure that all debris was removed and no construction material will be cause the system to clog or restrict the outlet.

Maintenance of this system is subject to continuous monitoring after storm events to determine frequency of maintenance needs. The trench drain should be cleaned manually, after all major storms or as a minimum, once per month to remove accumulated solids and debris. This is required to prevent clogging and overflow of solids to the driveway. Assuming the trench drains are maintained and cleaning is routinely performed, the driveway runoff and associated solids should be routed to the sediment trap for removal, prior to infiltration.

Sediment Trap Manhole:

The sediment trap manhole should be inspected after completion of construction to assure that all debris was removed and no construction material will be cause the system to clog.

Maintenance of this system is subject to on-site evaluation and catchbasin type maintenance. Initially, this system should be inspected on a monthly / storm event schedule to note any solids carry over. After the first year of operation, the system should receive quarterly inspections. It is recommended that the sediment trap manhole should be cleaned at least twice yearly (Spring & Fall).

Galley Infiltration System:

The galley infiltration system should be inspected after completion of construction to assure that all debris was removed and no construction material will be cause the system to clog.

The proposed system are intended to be used for collection & storage of roof and driveway runoff, for infiltration after a storm event. As part of this process, some soil and debris could collect in these galleys. This should be removed periodically, every four to five years, to maximize infiltration and storage capabilities. The debris / soil must be removed by means of hydraulic vacuuming by a specialty contractor.

Yard Drain:

The yard drain manhole should be inspected after completion of construction to assure that all debris was removed and no construction material will be cause the system to clog.

Maintenance of this system is subject to on-site evaluation and catchbasin type maintenance. Initially, this system should be inspected on a monthly / storm event schedule to note any solids carry over. After the first year of operation, the system should receive quarterly inspections. It is recommended that the yard drain manhole should be cleaned at least twice yearly (Spring & Fall).

Gutters & Downspouts Cleaning:

The roof gutters & downspouts should be inspected after completion of construction to assure that all debris was removed and no construction material will be cause the system to clog or restrict the outlet.

Maintenance of the gutter system should be performed at least twice a year (Spring & Fall) to assure the gutters & downspouts are functional.

Galley Infiltration System:

The galley infiltration system should be inspected after completion of construction to assure that all debris was removed and no construction material will be cause the system to clog.

The proposed systems are intended to be used for collection & storage of roof and driveway runoff, for infiltration after a storm event. As part of this process, some soil and debris could collect in these galleys. This should be removed periodically, every four to five years, to maximize infiltration and storage capabilities. The debris / soil must be removed by means of hydraulic vacuuming by a specialty contractor.

Maintenance Responsibilities

The maintenance of the various drainage system components is the responsibility of the Property Owner (Condominium Association). Some of the work (gutters) can be accomplished by the Owner or a landscape contractor. The infiltration system be contracted to a company that specializes in the cleaning of storm drainage facilities. Inspections should be performed by independent individual such as the design engineer or other experienced individual in the field.

STORMWATER MANAGEMENT REPORT
2202 COMMONWEALTH AVENUE
NEWTON, MASSACHUSETTS

INSPECTION REPORT:

Inspection Firm: _____

Inspectors Name: _____ Date: _____

Components Inspected: _____

_____

Signed: _____

SYSTEM MAINTENANCE:

Maintenance Firm : _____ Date : _____

Gutters & Downspouts Inspected: Yes ____ No ____ Comments: _____

_____

_____

Gutters & Downspouts Cleaned: Yes ____ No ____ Comments: _____

_____

_____

Trench Drain Inspected: Yes ____ No ____ Comments: _____

_____

_____

Trench Drain Cleaned: Yes ____ No ____ Comments: _____

_____

_____

Sediment Trap Manhole Inspected: Yes ____ No ____ Comments: _____

_____

_____

Sediment Trap Manhole Cleaned: Yes ____ No ____ Comments: _____

_____

_____

Leaching Galleys Inspected: Yes ____ No ____ Comments: _____

Leaching Galleys Cleaned: Yes ____ No ____ Comments: _____

Yard Drain Inspected: Yes ____ No ____ Comments: _____

Yard Drain Cleaned: Yes ____ No ____ Comments: _____

Estimate of Material Removed: _____

Other Comments: _____

Signed: _____

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Type III 24-hr Rainfall=2.00"
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment B-1: Tributary to Street

Tc=5.0 min CN=56 Area=6,839 sf Runoff= 0.00 cfs 0.000 af

Subcatchment B-2: Tributary to Infiltration

Tc=5.0 min CN=81 Area=6,857 sf Runoff= 0.10 cfs 0.007 af

Reach R-1: Summary Node

Inflow= 0.00 cfs 0.000 af
Outflow= 0.00 cfs 0.000 af

Pond P-1: Infiltration System

Peak Storage= 6 cf Inflow= 0.10 cfs 0.007 af
Discarded= 0.10 cfs 0.007 af Primary= 0.00 cfs 0.000 af Outflow= 0.10 cfs 0.007 af

Runoff Area = 0.314 ac Volume = 0.007 af Average Depth = 0.28"

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

2202 Commonwealth Avenue, LLC
Owner Name

2202 Commonwealth Avenue
Street Address

41013 / 0006
Map/Lot #

Newton
City

MA
State

02466
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Published Soil Survey Available? ☒ Yes ☐ No
If yes: 1995 (Year Published) 1:25,000 (Publication Scale) 626B(NRCS) (Soil Map Unit)

Merrimac Urban Land Complex
Soil Name

Rapid Infiltration Rate
Soil Limitations

3. Surficial Geological Report Available? ☐ Yes ☒ No
If yes: (Year Published) (Publication Scale) (Map Unit)

Glacial Outwash
Geologic Material

Kame Terrace
Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? ☒ Yes ☐ No
Within the 100-year flood boundary? ☐ Yes ☒ No

Within the 500-year flood boundary? ☐ Yes ☒ No
Within a velocity zone? ☐ Yes ☒ No

5. Wetland Area: National Wetland Inventory Map
N/A (Map Unit) (Name)

Wetlands Conservancy Program Map
N/.A (Map Unit) (Name)

6. Current Water Resource Conditions (USGS): Dec. 2022 (Month/Year)
Range: ☐ Above Normal ☒ Normal ☐ Below Normal

7. Other references reviewed: N/A

Commonwealth of Massachusetts
City/Town of Newton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserved disposal area)*

Deep Observation Hole Number: DH-1 | 12/22/22 (Date) | AM (Time) | Fair (Weather)

1. Location

Ground Elevation at Surface of Hole: 80.8+/- | Location (identify on plan): See Site Plan

2. Land Use: Residential (e.g., woodland, agricultural field, vacant lot, etc.) | N/A (Surface Stones) | 1% (Slope (%))
Lawn (Vegetation) | Kame Terrace (Landform) | See Site PLan (Position on Landscape (attach sheet))

3. Distances from:

Open Water Body	> 100 feet	Drainage Way	> 100 feet	Possible Wet Area	>100 feet
Property Line	21' feet	Drinking Water Well	> 100 feet	Other	feet

4. Parent Material: Glacial Outwash | Unsuitable Materials Present: ☐ Yes ☒ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No | If yes: 102" (Depth Weeping from Pit) | 112" (Depth Standing Water in Hole)

Estimated Depth to High Groundwater: 102" (inches) | 71.3+/- (elevation)

Commonwealth of Massachusetts
City/Town of Newton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: DH-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
18"	A	7.5 YE 2/2				Sandy Loam			Massive	Dry	Fine
40"	B	7.5 YR 5/8				Sandy Loam			Massive	Dry	Fine
102"	C1	2.5 Y 6/3	102"	10 YR 5/6	>5%	Sand	25%	20%	Single Grain	Dry	Coarse, Compact
114"	C2	2.5 Y 5/1				Sandy Loam	5%	20%	Massive	Damp	Medium, Compact

Additional Notes:

Commonwealth of Massachusetts
City/Town of Newton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: DH-2 | 12/22/22 (Date) | AM (Time) | Fair (Weather)

1. Location

Ground Elevation at Surface of Hole: 82.0+/- | Location (identify on plan): See Site plan

2. Land Use: Residential (e.g., woodland, agricultural field, vacant lot, etc.) | N/A (Surface Stones) | 1% (Slope (%))

Pavement (Vegetation) | Kame Terrace (Landform) | See Site Plan (Position on Landscape (attach sheet))

3. Distances from:

Open Water Body	<100 feet	Drainage Way	<100 feet	Possible Wet Area	< 100 feet
Property Line	10' feet	Drinking Water Well	<100 feet	Other	feet

4. Parent Material: Glacial Outwash | Unsuitable Materials Present: ☒ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☒ Impervious Layer(s) ☐ Weathered/Fractured Rock ☒ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No | If yes: N/A (Depth Weeping from Pit) | N/A (Depth Standing Water in Hole)

Estimated Depth to High Groundwater: 114" (inches) | 72.5+/- (elevation)

Commonwealth of Massachusetts
City/Town of Newton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: DH-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
2"	Pavement	N/A				Driveway					
12"	A	7.5 YR 2/2				Sandy Loam			Massive	Dry	Fine
24"	B	7.5 YR 5/8				Sandy Loam			Massive	Dry	Fine
48"	C1	2.5 Y 5/2				Sandy Loam	5%	10%	Massive	Dry	Medium. Compact
114"	C2	2.5 Y 5/3				Sand	25%	20%	Single Grain	Dry	Coarse. Compact

Additional Notes:

Commonwealth of Massachusetts
City/Town of Newton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

☐ Depth observed standing water in observation hole	A. _____ inches	B. _____ inches
☒ Depth weeping from side of observation hole	A. _____ inches	B. _____ inches
☒ Depth to soil redoximorphic features (mottles)	A. 102" inches	B. N/A inches
☐ Groundwater adjustment (USGS methodology)	A. _____ inches	B. _____ inches

2. _____ Index Well Number _____ Reading Date _____ Index Well Level

_____ Adjustment Factor _____ Adjusted Groundwater Level

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☒ Yes ☐ No

   b. If yes, at what depth was it observed? Upper boundary: 40" inches Lower boundary: 114" inches

Commonwealth of Massachusetts
City/Town of Newton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

12/27/22
Date

Stephen E. Poole SE1955
Typed or Printed Name of Soil Evaluator / License #

July 1995
Date of Soil Evaluator Exam

None
Name of Board of Health Witness

N/A
Board of Health

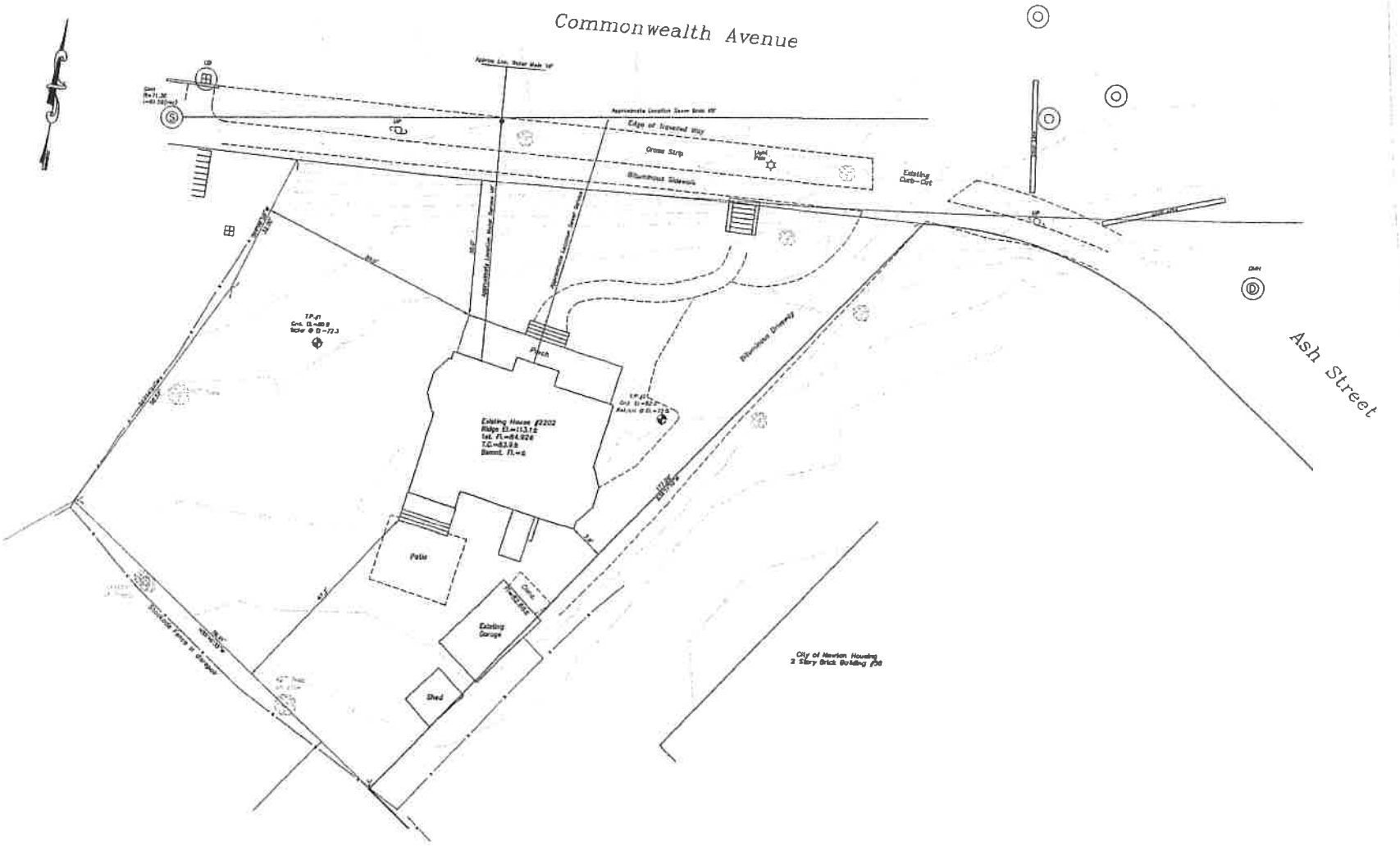
Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Commonwealth of Massachusetts
City/Town of Newton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Field Diagrams

Use this sheet for field diagrams:



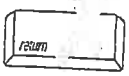
Commonwealth of Massachusetts
City/Town of

Percolation Test

Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A. Site Information

2202 Commonwealth Avenue, LLC
Owner Name

2202 Commonwealth Avenue
Street Address or Lot #

Newton | MA | 02466-1804
City/Town | State | Zip Code

Contact Person (if different from Owner) | Telephone Number

B. Test Results

	12/22/22 (Date) 09:35 AM (Time)	12/22/22 (Date) 10:05 AM (Time)
Observation Hole #	#1 (P-1)	#2 (P-2)
Depth of Perc	56" (76.1)	65" (76.6)
Start Pre-Soak	09:35 AM	10:05 AM
End Pre-Soak	09:48 AM	10:19 AM
Time at 12"		
Time at 9"		
Time at 6"		
Time (9"-6")	<15 Min.	<15 Min.
Rate (Min./Inch)	2 MPI	2 MPI
	Test Passed: ☒ Test Failed: ☐	Test Passed: ☒ Test Failed: ☐

Stephen E. Poole, SE 1955
Test Performed By:

Witnessed By:

Comments:

Very Stony Gravel, Somewhat Compact

Soil Map—Middlesex County, Massachusetts
(2202 Commonwealth Avenue)

Map Scale: 1:1,070 if printed on A landscape (11" x 8.5") sheet.

N

0 15 30 60 90 Meters

0 50 100 200 300 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

USDA **Natural Resources Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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: Middlesex County, Massachusetts
Survey Area Data: Version 22, Sep 9, 2022

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	3.1	58.0%
656	Udorthents-Urban land complex	2.2	42.0%
Totals for Area of Interest		**5.3**	**100.0%**

Middlesex County, Massachusetts

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9
Elevation: 0 to 820 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Crest, side slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)

Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Outwash terraces, dunes, outwash plains, deltas
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, crest, side slope, rise
Down-slope shape: Convex

Across-slope shape: Convex, linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 22, Sep 9, 2022

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.301 (0.241-0.377)	0.372 (0.298-0.467)	0.488 (0.389-0.615)	0.585 (0.463-0.742)	0.718 (0.549-0.964)	0.817 (0.611-1.13)	0.924 (0.670-1.33)	1.05 (0.711-1.55)	1.24 (0.803-1.90)	1.39 (0.881-2.19)
10-min	0.427 (0.342-0.535)	0.528 (0.422-0.662)	0.693 (0.552-0.873)	0.830 (0.658-1.05)	1.02 (0.778-1.37)	1.16 (0.866-1.60)	1.31 (0.949-1.89)	1.49 (1.01-2.19)	1.75 (1.14-2.69)	1.97 (1.25-3.10)
15-min	0.502 (0.402-0.629)	0.621 (0.497-0.779)	0.815 (0.650-1.03)	0.976 (0.773-1.24)	1.20 (0.915-1.61)	1.36 (1.02-1.88)	1.54 (1.12-2.22)	1.75 (1.19-2.58)	2.06 (1.34-3.16)	2.32 (1.47-3.65)
30-min	0.686 (0.549-0.859)	0.849 (0.679-1.07)	1.12 (0.889-1.41)	1.34 (1.06-1.70)	1.64 (1.25-2.20)	1.87 (1.40-2.58)	2.11 (1.53-3.05)	2.40 (1.63-3.54)	2.84 (1.84-4.36)	3.21 (2.03-5.04)
60-min	0.869 (0.697-1.09)	1.08 (0.862-1.35)	1.42 (1.13-1.78)	1.70 (1.34-2.15)	2.08 (1.60-2.80)	2.37 (1.78-3.27)	2.68 (1.95-3.88)	3.05 (2.07-4.50)	3.62 (2.35-5.56)	4.10 (2.59-6.44)
2-hr	1.12 (0.905-1.40)	1.40 (1.13-1.74)	1.85 (1.48-2.31)	2.22 (1.77-2.80)	2.74 (2.11-3.66)	3.11 (2.35-4.28)	3.53 (2.59-5.10)	4.04 (2.75-5.91)	4.84 (3.15-7.37)	5.54 (3.52-8.61)
3-hr	1.31 (1.06-1.62)	1.63 (1.32-2.02)	2.15 (1.73-2.68)	2.59 (2.07-3.24)	3.18 (2.46-4.24)	3.62 (2.74-4.96)	4.10 (3.02-5.91)	4.71 (3.21-6.85)	5.66 (3.69-8.56)	6.48 (4.12-10.0)
6-hr	1.70 (1.39-2.10)	2.11 (1.71-2.60)	2.77 (2.24-3.43)	3.31 (2.66-4.13)	4.07 (3.16-5.37)	4.62 (3.52-6.28)	5.23 (3.87-7.46)	5.99 (4.10-8.63)	7.16 (4.69-10.7)	8.19 (5.22-12.5)
12-hr	2.19 (1.79-2.68)	2.69 (2.20-3.30)	3.50 (2.86-4.31)	4.18 (3.38-5.18)	5.11 (3.99-6.69)	5.80 (4.43-7.79)	6.55 (4.85-9.22)	7.46 (5.12-10.6)	8.85 (5.82-13.1)	10.1 (6.44-15.2)
24-hr	2.66 (2.19-3.23)	3.29 (2.71-4.00)	4.32 (3.54-5.28)	5.17 (4.21-6.36)	6.35 (4.99-8.25)	7.21 (5.54-9.63)	8.16 (6.08-11.4)	9.33 (6.43-13.2)	11.1 (7.34-16.4)	12.7 (8.16-19.1)
2-day	3.05 (2.53-3.68)	3.84 (3.18-4.65)	5.14 (4.24-6.25)	6.22 (5.10-7.60)	7.71 (6.10-9.99)	8.79 (6.81-11.7)	10.00 (7.53-14.0)	11.5 (7.99-16.2)	14.0 (9.27-20.4)	16.2 (10.4-24.1)
3-day	3.36 (2.79-4.04)	4.22 (3.51-5.08)	5.63 (4.66-6.80)	6.79 (5.59-8.27)	8.40 (6.68-10.8)	9.57 (7.45-12.7)	10.9 (8.24-15.2)	12.6 (8.72-17.6)	15.3 (10.1-22.2)	17.8 (11.4-26.2)
4-day	3.64 (3.04-4.37)	4.53 (3.78-5.45)	5.99 (4.97-7.22)	7.20 (5.93-8.73)	8.86 (7.06-11.4)	10.1 (7.86-13.3)	11.4 (8.67-15.9)	13.2 (9.16-18.3)	16.0 (10.6-23.1)	18.6 (12.0-27.3)
7-day	4.41 (3.70-5.27)	5.34 (4.47-6.38)	6.86 (5.72-8.22)	8.12 (6.72-9.79)	9.85 (7.88-12.6)	11.1 (8.69-14.6)	12.5 (9.51-17.2)	14.3 (9.99-19.8)	17.3 (11.5-24.7)	19.9 (12.9-29.0)
10-day	5.13 (4.31-6.10)	6.08 (5.11-7.24)	7.63 (6.39-9.12)	8.92 (7.41-10.7)	10.7 (8.57-13.5)	12.0 (9.39-15.6)	13.4 (10.2-18.3)	15.3 (10.7-20.9)	18.1 (12.1-25.8)	20.6 (13.4-29.9)
20-day	7.19 (6.09-8.49)	8.21 (6.95-9.71)	9.89 (8.33-11.7)	11.3 (9.43-13.5)	13.2 (10.6-16.4)	14.6 (11.4-18.6)	16.1 (12.1-21.4)	17.9 (12.6-24.2)	20.4 (13.7-28.7)	22.5 (14.6-32.3)
30-day	8.88 (7.55-10.4)	9.96 (8.46-11.7)	11.7 (9.92-13.9)	13.2 (11.1-15.7)	15.2 (12.2-18.8)	16.8 (13.1-21.1)	18.3 (13.7-23.9)	20.0 (14.1-26.9)	22.2 (15.0-31.0)	24.0 (15.6-34.2)
45-day	11.0 (9.38-12.9)	12.1 (10.3-14.2)	14.0 (11.9-16.5)	15.5 (13.1-18.4)	17.7 (14.2-21.6)	19.3 (15.1-24.1)	21.0 (15.6-26.9)	22.5 (16.0-30.1)	24.5 (16.6-34.0)	26.0 (16.9-36.8)
60-day	12.8 (10.9-14.9)	13.9 (11.9-16.3)	15.9 (13.5-18.6)	17.5 (14.8-20.6)	19.7 (15.9-24.0)	21.4 (16.8-26.6)	23.1 (17.2-29.5)	24.6 (17.5-32.7)	26.5 (17.9-36.5)	27.7 (18.1-39.1)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical