



September 16, 2024

Andover Planning Board
Town Office
36 Bartlett Street
Andover, MA 01810

Attn: Ms. Jacki Byerley, Town Planner

RE: Runoff to Bancroft from Project
Eden Estates – Definitive Subdivision @ 9 Bancroft Road, Andover, MA

The following explains the two attached exhibits regarding the runoff from Eden Estates to Bancroft Road:

Subcatchment SC-5 collects the runoff mainly from the proposed road and surrounding area. The runoff flows through the closed drainage system and is discharged into the proposed basin; Runoff from Subcatchment SC-6 sheet flows from the area between the building on lot 1 and the existing building at 9 Bancroft Road to the proposed basin. As indicated, Subcatchments SC-5 & SC-6 discharges into the Infiltration Basin; Subcatchment SC-7 is mainly the area between the proposed roadway and the existing building on 9 Bancroft Road and flows out onto Bancroft Road.

Exhibit “A” shows the peak flow from the infiltration basin directly into the closed drainage system in Bancroft Road during a 10-year design storm is 0.2 cfs.

Exhibit “B” shows the peak rate of runoff and runoff volume under pre-development and post-development conditions for the 10-year design storm at the analysis point (Point #1). As indicated, there is a 77 percent decrease in the peak flow rate and a 36 percent decrease in the runoff volume.

Based on the analysis and because of the flow and volume decreases and the minimal amount of flow, there should be no adverse impacts to the existing closed drainage system in Bancroft Road under the required design storm.

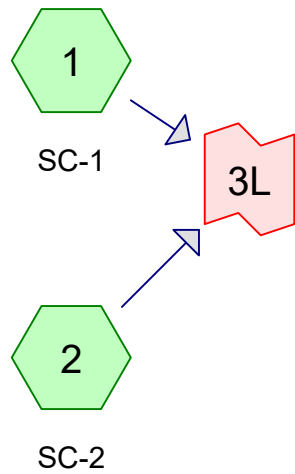
Should you have any questions or require additional information regarding the above discussion, please do not hesitate to contact me at your convenience.

Sincerely,

Daniel Koravos, P.E.
DK Engineering LLC

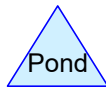
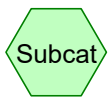
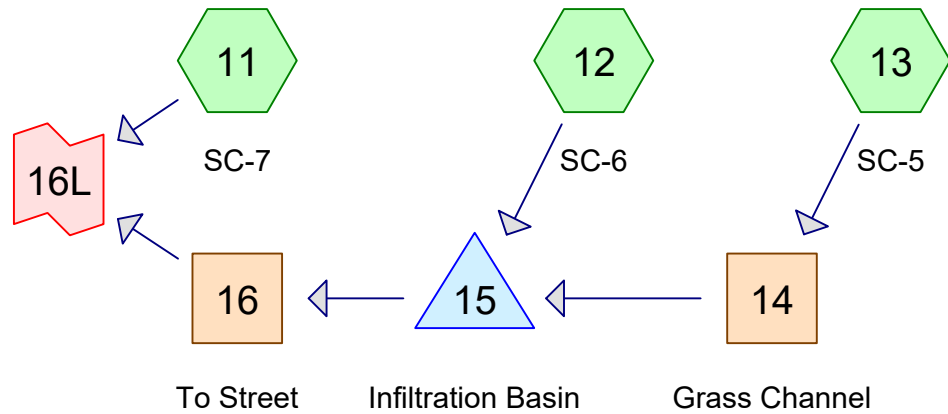
Att: Eden Estates – Exhibit “A” and “B”

Pre-Development



POINT #1

Post-Development



Routing Diagram for 42215 Rev 2024-08-28
Prepared by DK Engineering LLC, Printed 9/17/2024
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EXHIBIT "A"

Eden Estates - Andover, MA

42215 Rev 2024-08-28

Type III 24-hr 010 YR Rainfall=5.06"

Prepared by DK Engineering LLC

Printed 8/29/2024

HydroCAD® 10.00-26 s/n 04123 © 2020 HydroCAD Software Solutions LLC

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: SC-1 Runoff Area=29,285 sf 19.98% Impervious Runoff Depth=2.50"
Flow Length=265' Tc=14.3 min UI Adjusted CN=75 Runoff=1.5 cfs 0.140 af

Subcatchment2: SC-2 Runoff Area=52,209 sf 11.45% Impervious Runoff Depth=2.50"
Flow Length=387' Tc=11.3 min UI Adjusted CN=75 Runoff=2.9 cfs 0.250 af

Link 3L: Inflow=4.4 cfs 0.389 af
Primary=4.4 cfs 0.389 af

Subcatchment4: SC-3 Runoff Area=117,357 sf 0.81% Impervious Runoff Depth=2.33"
Flow Length=483' Tc=23.0 min CN=73 Runoff=4.6 cfs 0.523 af

Subcatchment11: SC-7 Runoff Area=15,747 sf 28.32% Impervious Runoff Depth=2.67"
Flow Length=89' Tc=10.4 min UI Adjusted CN=77 Runoff=1.0 cfs 0.081 af

Subcatchment12: SC-6 Runoff Area=54,910 sf 9.61% Impervious Runoff Depth=3.04"
Flow Length=328' Tc=14.0 min UI Adjusted CN=81 Runoff=3.5 cfs 0.319 af

Subcatchment13: SC-5 Runoff Area=31,857 sf 40.91% Impervious Runoff Depth=3.83"
Flow Length=629' Tc=8.2 min CN=89 Runoff=2.9 cfs 0.233 af

Reach 14: Grass Channel Avg. Flow Depth=0.57' Max Vel=2.74 fps Inflow=2.9 cfs 0.233 af
n=0.033 L=336.0' S=0.0145 '/' Capacity=21.1 cfs Outflow=2.7 cfs 0.233 af

Pond 15: Infiltration Basin Peak Elev=288.48' Storage=12,652 cf Inflow=6.2 cfs 0.553 af
Discarded=0.2 cfs 0.383 af Primary=0.2 cfs 0.169 af Outflow=0.4 cfs 0.553 af
During a 10-yr Storm, there is 0.2 cfs entering the stormdrain system from the basin discharge.

Reach 16: To Street Avg. Flow Depth=0.11' Max Vel=4.80 fps Inflow=0.2 cfs 0.169 af
12.0" Round Pipe n=0.010 L=80.0' S=0.0375 '/' Capacity=9.0 cfs Outflow=0.2 cfs 0.169 af

Link 16L: Inflow=1.0 cfs 0.250 af
Primary=1.0 cfs 0.250 af

Subcatchment20: Lot 1 Bldg Runoff Area=3,072 sf 100.00% Impervious Runoff Depth=4.82"
Flow Length=25' Slope=0.3000 '/' Tc=6.0 min CN=98 Runoff=0.3 cfs 0.028 af

Subcatchment21: Lot 2 Bldg Runoff Area=3,072 sf 100.00% Impervious Runoff Depth=4.82"
Flow Length=25' Slope=0.3000 '/' Tc=6.0 min CN=98 Runoff=0.3 cfs 0.028 af

Subcatchment22: Lot 3 Bldg Runoff Area=3,072 sf 100.00% Impervious Runoff Depth=4.82"
Flow Length=25' Slope=0.3000 '/' Tc=6.0 min CN=98 Runoff=0.3 cfs 0.028 af

Pond 23: Drywell Peak Elev=3.18' Storage=1,294 cf Inflow=1.0 cfs 0.085 af
Discarded=0.0 cfs 0.060 af Primary=0.8 cfs 0.025 af Outflow=0.8 cfs 0.085 af

Subcatchment24: SC-8 Runoff Area=87,121 sf 3.03% Impervious Runoff Depth=2.76"
Flow Length=483' Tc=23.0 min CN=78 Runoff=4.1 cfs 0.460 af

EXHIBIT "B"

Eden Estates

Andover, Massachusetts

Pre-Development vs. Post-Development Drainage Summary Tables

Point #1 Flow to Bancroft Road

Design Storm	Peak Flow Rate			Runoff Volume		
	Pre-Dev. (cfs)	Post-Dev. (cfs)	Δ (cfs)	Pre-Dev. (ac.-ft.)	Post-Dev. (ac.-ft.)	Δ (ac.-ft.)
2	1.8	0.4	(1.4)	0.171	0.061	(0.110)
10	4.4	1.0 77%	(3.4)	0.389	0.250	(0.139)
25	6.1	2.1	(4.0)	0.541	0.425	(0.116)
100	8.9	6.4	(2.5)	0.789	0.720	(0.069)

36%

The percent decrease from pre-dev. conditions are indicated in RED.

Point #2

Design Storm	Peak Flow Rate			Runoff Volume		
	Pre-Dev. (cfs)	Post-Dev. (cfs)	Δ (cfs)	Pre-Dev. (ac.-ft.)	Post-Dev. (ac.-ft.)	Δ (ac.-ft.)
2	1.8	1.8	0.0	0.221	0.212	(0.009)
10	4.6	4.5	(0.1)	0.523	0.486	(0.037)
25	6.5	6.1	(0.4)	0.735	0.671	(0.064)
100	9.7	8.6	(1.1)	1.084	0.971	(0.113)

These Storm Drainage calculations were prepared in accordance with the applicable Town of Andover Regulations and the Massachusetts DEP Stormwater Handbook. Drainage structures and pipes were designed according to generally accepted engineering principles and in accordance with the stated regulations.