

SITE INFORMATION AND CALCULATION SUMMARY

Heart's Place
120&122 Boeger Drive, Arlington Heights IL
CDF

12/12/17



Proposed Conditions

Total Property Area = 0.93 acres

EXISTING AREA	Total Area =	0.93 acres	0.00145 sq mi	VoAH	MWRD		
	Impervious Area =	0.08 acres	$C_{\text{impervious}} =$	0.95	0.90	$CN_{\text{impervious}} =$	98
	Gravel Area =	- acres	$C_{\text{gravel}} =$	0.70	0.70	$CN_{\text{gravel}} =$	98
	Pervious Area =	0.85 acres	$C_{\text{pervious}} =$	0.50	0.45	$CN_{\text{pervious}} =$	80
			$C =$	0.54	0.49	$CN =$	81.6
					$\% \text{ Imp} =$	8.71%	

PROPOSE D AREA	Disturbed Area =	0.93 acres	0.00145 sq mi	VoAH	MWRD		
	Impervious Area =	0.57 acres	$C_{\text{impervious}} =$	0.95	0.90	$CN_{\text{impervious}} =$	98
	Gravel Area =	- acres	$C_{\text{gravel}} =$	0.95	0.70	$CN_{\text{gravel}} =$	98
	Pervious Area =	0.36 acres	$C_{\text{pervious}} =$	0.50	0.45	$CN_{\text{pervious}} =$	80
			$C =$	0.78	0.73	$CN =$	91.0
					$\% \text{ Imp} =$	61.29%	
					$CN_{\text{adj}} =$	85.53	

	VoAH	MWRD
Allowable Release Rate =	0.18	0.30 cfs/acre
	0.17	0.28 cfs

	VoAH	MWRD
MAXIMUM RESTRICTOR DIAMETER =	2.16	2.16 in
ACTUAL RESTRICTOR DIAMETER =	2.165	in

ALLOWABLE RELEASE RATE =	0.17	0.279 cfs
ACTUAL RELEASE RATE =	0.167	cfs

VOLUME CONTROL IMPERVIOUS AREA =	N/A	24829 SF	
VOLUME CONTROL REQUIREMENT =	N/A	2069 CF	(1" Per SF of Imp Area)
VOLUME CONTROL PROVIDED =	8517	CF	(Stormtech)

DETENTION VOLUME REQUIRED =	0.255 N/A	Acre*ft	(Rational Method)
DETENTION VOLUME PROVIDED =	0.267	Acre*ft	(Stormtech)

Restrictor Invert=	703.25	
High Water Elevation=	705.13	
Basin Spill Elevation=	705.25	+/-

RESTRICTOR SIZING CALCULATIONS

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Village of Arlington Heights Restrictor

$$\begin{aligned}\text{High Water Elevation} &= 705.13 \\ C_D &= 0.61 \quad (\text{constant}) \\ G &= 32.20 \quad \text{ft/sec}^2 \\ \text{Inv. restrictor} &= 703.25 \\ Q_{\text{allowable}} &= 0.17 \quad \text{cfs}\end{aligned}$$

$$\begin{aligned}\Delta h &= \text{hwe} - \text{Inv.} - 1/2 \text{ Dia.} \\ &= 1.79 \quad \text{ft.}\end{aligned}$$

$$Q = C_D A (2gh)^{1/2}$$

$$\begin{aligned}A_{\text{restrictor}} &= (Q_{\text{allowable}}) / (C_D (2gh)^{1/2}) \\ A_{\text{restrictor}} &= 3.68 \quad \text{in}^2 \\ D_{\text{restrictor}} &= 2.165 \quad \text{in}\end{aligned}$$

=> Restrictor diameter = 2.165 inches

Release Rate Based on restrictor diameter

$$\begin{aligned}D_{\text{restrictor}} &= 2.165 \text{ in.} \\ A_{\text{restrictor}} &= 3.68 \text{ in}^2 \\ \Delta h &= 1.79\end{aligned}$$

$$Q = C_D A (2gh)^{1/2}$$

Q_{release} = 0.167 c.f.s.

VILLAGE DETENTION REQUIREMENTS 100-YEAR EVENT

Heart's Place

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1208122 Boeager Drive, Arlington Heights IL

Property Area: 0.93 acre
 Total Impervious Area 0.57 acre
 Allowable Release Rate Per Acre: 0.18 cfs/acre
 Allowable Release Rate: 0.17 cfs
 Actual Release Rate: 0.17 cfs
 Runoff Coefficient (C): 0.78
 100 Year Intnsity: 7.58 in Bul 70 100yr - 24hr

100-Year Event, Bulletin 70 Rainfall Data

RUNOFF FACTOR	STORM DURATION (HRS)	RAINFALL INTENSITY (IN/HR)	DRAINAGE AREA (ACRES)	INFLOW RATE (CFS)	RELEASE RATE (CFS)	STORAGE RATE (CFS)	STORAGE REQUIRED (ACRE-FT)
0.78	0.08	10.92	0.93	7.86	0.17	7.69	0.05
0.78	0.17	9.55	0.93	6.88	0.17	6.71	0.09
0.78	0.25	8.19	0.93	5.89	0.17	5.73	0.12
0.78	0.50	5.61	0.93	4.04	0.17	3.87	0.16
0.78	1.00	3.56	0.93	2.56	0.17	2.40	0.20
0.78	2.00	2.20	0.93	1.58	0.17	1.42	0.23
0.78	3.00	1.62	0.93	1.16	0.17	1.00	0.25
0.78	6.00	0.95	0.93	0.68	0.17	0.51	0.26
0.78	12.00	0.55	0.93	0.40	0.17	0.23	0.23
0.78	18.00	0.40	0.93	0.28	0.17	0.12	0.18
0.78	24.00	0.32	0.93	0.23	0.17	0.06	0.12

Required Storage: 0.255 acre-ft

Project: Heart's Place - Arlington Heights



Chamber Model -	SC-310
Units -	Imperial
Number of chambers -	372
Voids in the stone (porosity) -	36 %
Underdrain Invert Elevation -	703.80 ft
Base of STONE Elevation -	702.80 ft
Amount of Stone Above Chambers -	6 in
Amount of Stone Below Chambers -	6 in
Area of system -	9676 sf

Min. Area 8825 sf min. area

100 Year Restrictor

Dia= 2.165	in
C _d = 0.61	
Inv= 703.25	
g = 32.20	ft/sec ²
A _{rest} = 3.68	in ²

Height of System <i>(inches)</i>	Elevation <i>(feet)</i>	Incremental Single Chamber <i>(cubic feet)</i>	Incremental Total Chamber <i>(cubic feet)</i>	Incremental Stone <i>(cubic feet)</i>	Incremental Ch & St <i>(cubic feet)</i>	Cumulative Storage <i>(cubic feet)</i>	Detention Volume <i>(acre-ft)</i>	Storage Ratio <i>(%)</i>	Vol. Control Storage <i>(cubic feet)</i>	Q (Total) <i>(cfs)</i>
28	705.13	0.00	0.00	290.28	290.28	11641.93	0.267	50%	8517.22	0.168
27	705.05	0.00	0.00	290.28	290.28	11351.65	0.261	50%	8372.08	0.164
26	704.97	0.00	0.00	290.28	290.28	11061.37	0.254	50%	8226.94	0.160
25	704.88	0.00	0.00	290.28	290.28	10771.09	0.247	50%	8081.80	0.155
24	704.80	0.00	0.00	290.28	290.28	10480.81	0.241	50%	7936.66	0.151
23	704.72	0.00	0.00	290.28	290.28	10190.53	0.234	50%	7791.52	0.147
22	704.63	0.06	21.87	282.41	304.28	9900.25	0.227	50%	7646.38	0.142
21	704.55	0.15	57.55	269.56	327.11	9595.97	0.220	50%	7494.24	0.138
20	704.47	0.27	98.90	254.68	353.58	9268.86	0.213	50%	7330.69	0.133
19	704.38	0.54	202.66	217.32	419.98	8915.28	0.205	50%	7153.90	0.128
18	704.30	0.70	261.90	195.99	457.90	8495.29	0.195	50%	6943.91	0.123
17	704.22	0.82	306.73	179.86	486.58	8037.40	0.185	50%	6714.96	0.117
16	704.13	0.92	343.94	166.46	510.40	7550.81	0.173	50%	6471.67	0.111
15	704.05	1.01	377.58	154.35	531.93	7040.41	0.162	50%	6216.47	0.105
14	703.97	1.09	407.17	143.70	550.87	6508.48	0.149	50%	5950.50	0.099
13	703.88	1.15	429.39	135.70	565.09	5957.61	0.137	50%	5675.07	0.092
12	703.80	1.21	451.96	127.58	579.53	5392.52	0.124	100%	5392.52	0.085
11	703.72	1.27	474.26	119.55	593.80	4812.99	0.110	100%	4812.99	0.077
10	703.63	1.32	492.74	112.89	605.63	4219.18	0.097	100%	4219.18	0.068
9	703.55	1.36	507.77	107.48	615.26	3613.55	0.083	100%	3613.55	0.057
8	703.47	1.40	522.66	102.12	624.78	2998.30	0.069	100%	2998.30	0.045
7	703.38	1.43	533.68	98.16	631.83	2373.51	0.054	100%	2373.51	0.026
6	703.30	0.00	0.00	290.28	290.28	1741.68	0.040	100%	1741.68	0.000
5	703.22	0.00	0.00	290.28	290.28	1451.40	0.033	100%	1451.40	0.000
4	703.13	0.00	0.00	290.28	290.28	1161.12	0.027	100%	1161.12	0.000
3	703.05	0.00	0.00	290.28	290.28	870.84	0.020	100%	870.84	0.000
2	702.97	0.00	0.00	290.28	290.28	580.56	0.013	100%	580.56	0.000
1	702.88	0.00	0.00	290.28	290.28	290.28	0.007	100%	290.28	0.000

Storm Sewer Minimum Pipe Slopes

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S = Minimum Pipe Slope, ft/ft

Ks = Constant, 2.88

n = Manning's Roughness Coefficient, 0.13

V = Average Pipe Velocity, 2 ft/s

D = Pipe Diameter, ft

$$S = K_s (nV/D^{0.67})^2$$

Pipe Dia. (in)	Pipe Dia. (ft)	Minimum Slope (ft/ft)
8	0.67	0.335
10	0.83	0.249
12	1.00	0.195
15	1.25	0.144
18	1.50	0.113
21	1.75	0.092
24	2.00	0.077