

May 15, 2019

Revised June 17, 2019

**South Hadley Dog Park
Stormwater Standard 3 – Recharge Calculations**

Existing Impervious Area

Table 1 shows the existing impervious surface area within each drainage area. These totals include a portion of Mulligan drive and access to the water tank.

Table 1. Existing Impervious Area

Drainage Area ID (See Figure 5)	Impervious Area (sf)
E1	16,286
E2	0
E3	0
E4	2,890
E5	0

Proposed Impervious Area & Required Recharge Volume

Table 2 shows the increase in impervious area in each drainage area, and the associated Required Recharge Volume.

The increase in impervious area is calculated by taking the final impervious area in the proposed condition and subtracting the existing impervious area (where applicable).

Required Recharge Volume is calculated by applying the following equation:

$$\text{Required Recharge Volume, } Rv = F \times I$$

Where, F = Target Depth Factor, 0.6" for HSG A soils
 I = Impervious Area

Table 2. Proposed Increase in Impervious Area and Recharge Volume

Drainage Area ID (See Figure 6)	Increase in Impervious Area (sq. ft.)	Required Recharge Volume (cu. ft.)
P1	948	48
P2	8,280	414
P3	3,320	166
P4	826	41
P5	625	31
Total	13,999	700

Storage Volume Provided

This analysis utilizes the “Static Method” for determining required storage volume for infiltration features. Therefore, the minimum required storage volume is equal to the Required Recharge Volume, tabulated above.

Because of the linear nature of the dog park, a portion of the pathways is not captured in the proposed rain gardens. Impervious surfaces within areas P1, P4 and P5 are not captured and represent 17% of the proposed impervious area. Up to 35% is acceptable under Standard 3.

Table 3 summarizes the storage volume provided for the infiltration features in each drainage area. For earth infiltration basins, storage volume was calculated by average end area applied to contours, as shown on the Grading & Drainage Plan.

Table 3. Proposed Increase in Impervious Area

Drainage Area ID (See Figure 6)	Required Recharge Volume (cu. ft.)	Storage Volume Provided (cu. ft.)
P1	48	0
P2, P3	580	498 (rain garden 1) 284 (rain garden 2) 796 (underground storage) Total: 1,578 cu. ft.
P4	41	0
P5	31	0
Total	700	1,578

The provided infiltration storage volume of 1,743 cu. ft. exceeds the Required Recharge Volume. See below for capture area adjustment calculations.

Capture Area Adjustment

The Massachusetts Stormwater Handbook requires an increase in storage capacity of infiltration features if only a portion of the site's impervious area is tributary to the stormwater practice. At the South Hadley Dog Park site a portion of the walkways is not captured by the stormwater facility.

1. Required recharge volume (static): 700 cu. ft.
2. Impervious area draining to recharge facilities: 11,600 sq. ft.
3. Total impervious/impervious draining to facilities: 13,999/11,600 = 1.21
4. 1.21 x 700 = 847 cu. ft.

Provided recharge of 1,578 cu. ft. > 847 cu. ft.

The provided recharge exceeds the required recharge with the capture area adjustment.

Drawdown Time

The Massachusetts Stormwater Handbook requires that infiltration features empty in a time of less than 72 hours. All proposed infiltration features are in areas where soil evaluations have determined that in-situ soils are classified as loamy sand. The Rawls infiltration rate for loamy sand is 2.41 inches per hour; however, a conservative infiltration rate of 1.5"/hr is used to match the model.

$$Time = \frac{Rv}{1.5 \frac{in}{hr} * bottom\ area}$$

Rain garden 1: 414 cf / (1.5 in/hr * 1/12 ft/in * 294 ft²) = 11.3 hours

Rain garden 2: 166 cf / (1.5 in/hr * 1/12 ft/in * 237 ft²) = 5.6 hours

Both rain gardens drain in less than 72 hours.