Appendix D – Standard 3 Recharge Calculations

The Berkshire Design Group, Inc.

Landscape Architecture
Civil Engineering
Planning
Urban Design
Environmental Services

4 Allen Place
Northampton, Massachusetts 01060

JOB North Street Condominiums
SHEET NUMBER 1 OF 4
CALCULATED BY BCD DATE 4/13/09
CHECKED BY DATE
SCALE

Target Depth Factor = 0.25 in
for type C soils

Standard 3 - Recharge

System Sizing

Dry Well 1: Impervious Area to system = 660 sf

$$Rv = (660 sf) * \left(\frac{1 ft}{12''}\right) * (0.25 in) = 14 cf$$

Volume provided = 34 cf ✓ OKAY

Dry Well 2: Impervious Area to system = 1935 sf

$$Rv = (1935 sf) * \left(\frac{1 ft}{12''}\right) * (0.25 in) = 41 cf$$

Volume provided = 98 cf ✓ OKAY

Dry Well 3: Impervious Area to system = 6173 sf

$$Rv = (6173 sf) \left(\frac{1 ft}{12''}\right) (0.25 in) = 128 cf$$

Volume provided = 258 cf ✓ OKAY

Dry Well 4: Impervious Area to system = 1833 sf

$$Rv = (1833 sf) \left(\frac{1 ft}{12''}\right) (0.25 in) = 38 cf$$

Volume provided = 81 cf ✓ OKAY

Dry Well 5: Impervious Area to System = 815 sf

$$Rv = (815 sf) \left(\frac{1 ft}{12''}\right) (0.25 in) = 17 cf$$

Volume provided = 40 cf ✓ OKAY

Dry Well 6: Impervious Area to System = 960 sf

$$Rv = (960 sf) \left(\frac{1 ft}{12''}\right) (0.25 in) = 20 cf$$

Volume provided = 40 cf ✓ OKAY

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SCALE

Rain Garden 1:

Impervious Area to system = 11,109 sf

$R_v = (11,109 sf)(\frac{1ft}{12in})(0.25in) = 232 cf$

Volume provided = 706 cf* ✓OKAY

* See Rain Garden 1 Node on HydroCAD attachment
@ Storage elevation 97.40' for volume calculation

Rain Garden 2:

Impervious Area to System = 6,722 sf

$R_v = (6,722 sf)(\frac{1ft}{12in})(0.25in) = 140 cf$

Volume provided = 317 cf ✓OKAY

* See Rain Garden 2 Node on HydroCAD attachment
@ Storage elevation 97.60' for volume calculation

Drawdown in 72 Hours

$$Drawdown\ Time = \frac{R_v}{K * Bottom\ Area}$$

Dry Well 1:

$R_v = 34 cf$

* $k = 0.17 in/hr$

Bottom Area = 85 sf

$$\frac{34 cf}{(0.17 in/hr)(\frac{1}{2})(85 sf)} = 28.3 hrs < 72 hrs\ ✓OKAY$$

Dry Well 2

$R_v = 41 cf$

* $k = 0.17 in/hr$

Bottom Area = 246 sf

$$\frac{98 cf}{(0.17 in/hr)(\frac{1}{2})(246)} = 28.12 hrs < 72 hrs\ ✓OKAY$$

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SCALE

DryWell 3:

$Rv = 258cf$
*$K = 0.17 in/hr$
Bottom Area = 646 sf

$$\text{Drawdowntime} = \frac{258cf}{(0.17in/hr)(t_2)(646sf)} = 28.2 hrs$$

28.2 hrs < 72 hrs ✓ OKAY

DryWell 4

$Rv = 81cf$
*$k = 0.17 in/hr$
Bottom Area = 204 sf

$$\frac{81cf}{(0.17in/hr)(\frac{1}{2})(204sf)} = 28.02 hrs$$

28.02 < 72 hrs ✓ OKAY

DryWell 5

$Rv = 40cf$
*$k = 0.17 in/hr$
Bottom Area = 99 sf

$$\frac{40cf}{(0.17in/hr)(\frac{1}{2})(99sf)} = 28.6 hrs$$

28.6 hrs < 72 hrs ✓ OKAY

DryWell 6

$Rv = 40cf$
*$K = 0.17 in/hr$
Bottom Area =

$$\frac{40cf}{(0.17in/hr)(\frac{1}{2})(99sf)} = 28.6 hrs$$

28.6 hrs < 72 hrs ✓ OKAY

Rain Garden 1

$Rv = 580cf$
*$k = 0.17 in/hr$
Bottom Area = 632 sf

$$\frac{580cf}{(0.17in/hr)(\frac{1}{2})(632sf)} = 64 hrs < 72 hrs ✓ OKAY$$

* K values based on Rawls Rates in Table 2.3.3 in Vol 3, Chp 1

Rain Garden 2

$R_v = 317 cf$

* $k = 0.17 in/hr$

Bottom Area $= 534 sf$

$$\frac{317cf}{(0.17in/hr)(\frac{1}{12})(534sf)} = 41.9hrs < 72hrs \quad \checkmark OKAY$$

Capture Area

Total New impervious Area $= 45,324$

Impervious Area sent to infiltration system =

660 sf	Dry Well 1
1835 sf	Dry Well 2
6173 sf	Dry Well 3
1833 sf	Dry Well 4
815 sf	Dry Well 5
960 sf	Dry Well 6
11,109 sf	Rain Garden 1
6722 sf	Rain Garden 2
30,207 sf	Total

% Directed to infiltrat system $= \dfrac{30,207 sf}{45,440} = .664 = 66.4\%$

MADEP requires minimum of 65% $\checkmark$ OKAY

System size check ratio $\Rightarrow \dfrac{1.00}{0.66} = 1.52$ (multiplier factor)

Total required Recharge volume $= (45,440 sf)(\frac{1''}{12})(0.25)(1.52) = 1439 f$

Total provided $= 34cf + 98cf + 258cf + 81cf + 40cf + 90cf + 706cf + 317cf$
$= 1574 cf \quad \checkmark OKAY$