17 Attachment 2

Borough of Gettysburg

APPENDIX A
EXAMPLE VOLUME CONTROL STANDARD CALCULATIONS

Example 1
Example Calculation of Runoff Capture Volume Requirement

Given:

BMP CN: CN for individual land covers based on Table 2.2a (TR-55, SCS, 1986).
Hydrologic Soil Group = B

Procedure:

Step 1: For the pre-development condition, determine percentage of each land cover occurring on the site and the CN associated with each land cover.

Land Cover	HSG	CN	% of Site	Land Coverage (ft^2)
Open space (good condition)	B	61	55	32.670
Woods (fair condition)	B	55	45	10,890

Step 2: Calculate the pre-development composite CN using a weighted average technique.

$$CN = \frac{61*32,670+55*10,890}{32,370+10,890}$$

$$CN = 59.5$$

Step 3: Calculate the required Runoff Capture Volume.

$$P = \text{Runoff Capture Volume} = \frac{200}{CN} - 2$$

$$P = \text{Runoff Capture Volume} = \frac{200}{59.5} - 2$$

$$P = \text{Runoff Capture Volume} = 1.36 \text{ inches}$$

For this hypothetical site, 1.36 inches of rainfall must be retained/infiltrated on the site.

Example 2
BMP CN Calculation

Given:

BMP CN: CN for individual land covers based on Table 2.2a (TR-55, SCS, 1986).
Hydrologic Soil Group = B

Procedure:

Step 1: Determine percentage of each land cover occurring on the site and the CN associated with each land cover.

Land Cover	HSG	CN	% of Site	Land Coverage (ft^2)
Impervious (directly connected)	B	98	5	2,178
Impervious (unconnected)	B	98	10	4,356
Pervious pavement	B	70	5	2,000
Open space (good condition)	B	61	55	24,136
Woods (fair condition)	B	55	25	10,890

Step 2: Calculate the composite custom CN.

$$CN_c = \frac{CN_1 A_1 + CN_2 A_2 \ldots + CN_j A_j}{A_1 + A_2 \ldots + A_j}$$

$$CN_c = \frac{98x2,178+98*4,356+71*2,000+61*24,136+55*10,890}{2,178+4,356+2,000+24,136+10,890_j}$$

$$CN_c = 65.4$$

Step 3: Calculate the BMP development CN based on the connectivity of site imperviousness.

$$CN_p = \frac{70*2,000+61*24,136+55*10,890}{2,000+24,136+10,890}$$

$$CN_p = 59.7$$

$$R = \frac{10}{15}$$

$$R = 0.67$$

$$CN_c = CN_p + \left(\frac{P_{imp}}{100}\right) X (98 - CN_p) X (1 - 0.5R)$$

$$CN_c = 59.7 + \left(\frac{15}{100}\right) X (98 - 59.7) X (1 - 0.5 X 0.67)$$

$$CN_c = 63.5$$

Example 3
Runoff Volume Calculation

Given: Runoff Control Volume Requirement (Example 1) = 1.38 inches.
Post development composite runoff curve number = 63.5 (Example 2)
Development area = 43,560 square feet (Example 3)

$$S = \frac{1000}{CN} - 10 \qquad Q_{(inches)} = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

$$S = \frac{1000}{63.5} - 10 \qquad Q_{(inches)} = \frac{(1.36 - 0.2 \times 5.7)^2}{(1.36 + 0.8 \times 5.7)}$$

$$S = 5.7 \qquad Q_{(inches)} = 0.01 \text{ inches}$$

$$Q_{(cubic\ feet)} = Q_{(inches)} \times \frac{1 \text{ foot}}{12 \text{ inches}} \times \text{Area}$$

$$Q_{(cubic\ feet)} = 0.01 \times \frac{1 \text{ foot}}{12 \text{ inches}} \times 43{,}560 \text{ square feet}$$

$$Q_{(cubic\ feet)} = 36 \text{ cubic feet}$$

P = Required Runoff Control Precipitation Volume
For this hypothetical case, P = 1.36 inches (Example 1)

CN = post-development runoff curve number
For this hypothetical case, CN = 63.5 (Example 2)

Area = Development site area (square feet)
For this hypothetical case, Area = 43, 560 (Example 2)

Q = "excess" runoff volume to be controlled by supplementary runoff volume control BMPs

Therefore: Approximately 36 cubic feet of runoff volume must be controlled using supplemental structural runoff volume control BMPs.