

## ONE-HOUR PEAK RUNOFF

The criteria for design for animal solid settling facilities refers to the peak runoff from a 10-year, 1-hour storm. The 10-year, 1-hour storm for the state of Iowa is 2.4". Following is a method for determining the peak runoff for a 1-hour storm.

Equation 16A-9, page 16A-2, National Engineering Handbook, Part 630, Hydrology, gives the equation for determining peak rate of flow:

$$q_p = \frac{484 (A)(Q)}{\frac{\Delta D}{2} + 0.6 (T_c)}$$

When:  $q_p$  = peak rate of flow, cfs

$$A = \text{drainage area, sq. mi.} = \frac{a}{640}$$

$a$  = drainage area, acres

$Q$  = runoff, inches

$\Delta D$  = storm duration, hours

$$T_c = \frac{\text{Length, feet}}{(3600) (\text{Velocity, ft/sec})} = \text{Time of concentration, hours}$$

Length = Most distant point in the watershed to the settling basin, feet

Velocity = 2 ft/sec for unpaved lot, 4 ft/sec for paved lots

Then for a 1-hour storm:

$$q_p = \frac{484 (A)(Q)}{\frac{1}{2} + 0.6 \left[ \frac{\text{Length}}{3600 (\text{Velocity})} \right]} \quad \text{or} \quad q_p = \frac{484 (a)(Q)}{640 \left[ \frac{1}{2} + 0.6 \left[ \frac{\text{Length}}{3600 (\text{Velocity})} \right] \right]} \quad \text{or} \quad q_p = FaQ$$

Determine value of F from the following table:

Length	Value of F	
	v = 2 fps	v = 4 fps
0	1.51	1.51
100	1.49	1.50
500	1.40	1.45
1000	1.30	1.40
1500	1.21	1.34
2000	1.13	1.30
2500	1.07	1.25
3000	1.01	1.21
4000	0.91	1.13
5000	0.83	1.07

Example:

Find the peak rate of runoff for a 10-year, 1-hour storm from a 4-acre paved feedlot in Humboldt County. All outside runoff is diverted from the lot. It is 1000 feet from the most distant point in the lot to the settling facility.

10-year, 1-hour rainfall = 2.4 inches (for the state of Iowa)

RCN = 98 for paved lots

Q = 1.78 inches

F = 1.40

$Q_p = (1.40)(4)(1.78) = 9.97$ , Use 10 cfs

This procedure was developed by Herman W. Kopitzke, Jr., Hydraulic Engineer