213 Attachment 1

Borough of Stockertown

Appendix A
Storm Drainage Runoff Calculation

The following guidelines shall be used for subdivisions and land developments within watersheds that do not have an approved Act 167 Stormwater Management Plan. In subdivision and land developments that are within an approved Act 167 area, the requirements of that plan shall be followed.

A. Rational Formula. The rational formula used in calculating runoff is Q = CiA. In this equation, Q is the peak runoff in cubic feet per second, C is a runoff coefficient which depends on the nature of the land cover, i is the intensity of rainfall in inches per hour for a duration equal to the time of concentration for the drainage area involved, and A is the watershed area in acres. The time of concentration is the time required for runoff from the upper reaches of the watershed to reach the point for which runoff rates are being calculated.

1. **Values of Coefficient "C."** Runoff coefficients used in the Rational Formula shall be consistent with the Rational Formula.

2. **Values of Rainfall Intensity "i."** Rainfall intensities to be used in the Regional Formula shall be consistent with the Intensity-Duration-Frequency (I-D-F) Curves as shown in the Rational Formula. Time of concentration values to be used with the I-D-F curves shall be based upon a segmental velocity/travel time calculation along the most remote path. The flow path should be broken down into flow type (overland, shallow concentrated, open channel) based upon site evaluation and velocities and travel times calculated with methods acceptable to the Borough Engineer. The time of concentration would be the sums of the segmental travel times.

B. Manning's Equation.

1. Manning's equation to determine the velocity of flow in open channels and closed drains not under pressure is listed below. The second equation is used to determine the capacity after the velocity has been determined.

$$V = \frac{1.486}{n} \times r^{2/3} \times S^{1/2}$$

q = Va
V = Velocity in feet per second
n = Coefficient of roughness
a = Cross-sectional area of flow in square feet
p = Wetted perimeter, the length of the line of contact between the water and the bottom and sides of the channel or pipe around the cross-section in feet

r = Hydraulic radius = a/p
S = Slope of the channel or pipe in feet per foot
q = Capacity of the channel or pipe in cubic feet per second

2. The coefficient of roughness used shall be in accordance with the United States Department of Transportation Hydraulic Design Series #3.

C. Maximum Stream Velocities in Open Channels. Maximum permissible velocities in channels shall be based upon the DEP Erosion and Sediment Pollution Control Program Manual, as amended.