**Section 378.APPENDIX C Discharge and Travel Time Estimation**

The Illinois State Water Survey, in a publication entitled, "Hydraulic Geometry of Illinois Streams," (by J.B. Stall and Y.S. Fok, WRC Research Report 15, 1968) provides a method of predicting discharge and average stream velocity in stream basins as a function of drainage area. The equations are listed below. Where an equation is not listed for the basin of interest, the statewide composite equations may be used. Drainage areas can be obtained from the U.S. Geological Survey report entitled "River Mileages and Drainage Areas for Illinois Streams - Volumes 1 and 2," (by R. W. Healy, Water Resources Investigation 79-110 and 79-111, 1979).

Hydraulic Geometry Equations for Illinois River Basins

Description of Units

Q = discharge in cubic feet per second (cfs)

V = average velocity in feet per second (fps)

Ad = drainage area in square miles

F = frequency in percent of days, as a decimal

1n denotes that all logarithms are natural logarithms to the base

e = 2.718

Statewide Composite Equations

|  |  |
| --- | --- |
| 1n Q = 1.176 - 5.22 F + 0.984 1n Ad (cfs)  1n V = 0.103 - 1.81 F + 0.158 1n Ad (fps) |  |
| Rock River | Des Plaines River |
| 1n Q = 0.24 - 3.50 F + 1.03 1n Ad  1n V = 0.20 - 1.50 F + 0.13 1n Ad | 1n Q = 1.78 - 4.98 F + 0.90 1n Ad  1n V = 0.26 - 1.31 F + 0.08 1n Ad |
| Galena River | Kankakee River |
| 1n Q = 0.13 - 2.27 F + 0.96 1n Ad  1n V =-0.06 - 0.81 F + 0.06 1n Ad | 1n Q = 1.41 - 5.12 F + 0.96 1n Ad  1n V =-0.38 - 1.19 F + 0.17 1n Ad |
| Fox River | Vermilion River (Illinois River Basin) |
| 1n Q =-0.24 - 3.33 F + 1.13 1n Ad  1n V = 0.11 - 1.39 F + 0.16 1n Ad | 1n Q = 0.97 - 6.28 F + 1.01 1n Ad  1n V =-0.20 - 2.19 F + 0.17 1n Ad |
| Mackinaw River | Kaskaskia River |
| 1n Q = 1.39 - 7.52 F + 1.00 1n Ad  1n V = 0.38 - 2.26 F + 0.09 1n Ad  Henderson Creek | 1n Q = 0.95 - 5.88 F + 1.02 1n Ad  1n V =-0.26 - 1.28 F + 0.14 1n Ad  Vermilion River (Wabash River Basin) |
| 1n Q = 1.44 - 5.00 F + 0.89 1n Ad  1n V = 0.58 - 1.76 F + 0.01 1n Ad | 1n Q = 1.11 - 4.96 F + 0.98 1n Ad  1n V =-0.81 - 2.20 F + 0.29 1n Ad |
| Spoon River | Embarras River |
| 1n Q = 0.86 - 4.82 F + 1.00 1n Ad  1n V = 0.52 - 1.63 F + 0.08 1n Ad | 1n Q = 0.04 - 5.61 F + 1.17 1n Ad  1n V =-0.92 - 1.62 F + 0.26 1n Ad |
| LaMoine River | Little Wabash River |
| 1n Q = 1.03 - 5.60 F + 0.92 1n Ad  1n V =-0.13 - 1.16 F + 0.11 1n Ad | 1n Q = 1.91 - 7.90 F + 0.96 1n Ad  1n V =-1.38 - 1.18 F + 0.30 1n Ad |
| Sny River | Big Muddy River |
| 1n Q =-2.27 - 5.87 F + 1.63 1n Ad  1n V =-1.29 - 1.06 F + 0.39 1n Ad | 1n Q = 1.26 - 8.50 F + 1.09 1n Ad  1n V =-0.75 - 1.47 F + 0.18 1n Ad |
| Sangamon River | Big Bay Creek |
| 1n Q = 0.65 - 4.93 F + 1.03 1n Ad  1n V =-1.01 - 0.95 F + 0.26 1n Ad | 1n Q = 1.48 - 7.90 F + 1.05 1n Ad  1n V =-0.53 - 0.41 F + 0.14 1n Ad |