Chapter ATCP 48

APPENDIX A

ESTIMATING WATER SURFACE ELEVATIONS

Water Surface Elevations; Base Flow

One may use any of the following methods to estimate the water surface elevation, at base flow, at any point along a district drain:

Base Flow Method 1

1. Identify the stream to which the district drain discharges. Select the data set from the corresponding drainage basin on pp. 25-401 of *Water Resources Data-Wisconsin Water Year 1997.*[1]
2. Calculate the base flow rate by dividing the "90 percent exceeds" value for the period of record by the drainage area of the relevant drainage basin. The resulting value will be expressed in cubic feet per second per square mile (cfsm).
3. Multiply the cfsm value by the area of land (expressed in square miles) which is drained by the district drain to the relevant point along the drain. The resulting value is the base flow rate for the district drain at that point.
4. Calculate base flow depth (at the relevant point along the drain) using the base flow rate, the drain cross-sectional dimensions (at the relevant point along the drain), and Manning's equation for open channel flow.
5. Add the base flow depth to the bottom elevation of the district drain at the relevant point. The resulting value is the base flow elevation at that point.

Base Flow Method 2

Conduct a field survey to measure the dominant discharge elevation in the district drain. The dominant discharge elevation is the lowest elevation at which vegetation is present. If vegetation has been disturbed, the dominant discharge elevation is the interface between unsaturated and saturated soils, as indicated by soil mottling.

Peak Water Surface Elevations; 10-Year 24-Hour Storm Event

One may use the following method to estimate the peak water surface elevation, at any point along a district drain, in the event of a 10-year 24-hour storm event:

1. Determine, from *Flood Frequency Characteristics of Wisconsin Streams*,[2] page 7, the flood-frequency area in which the district drain is located.
2. Calculate the peak flow rate from a 10-year 24-hour storm event using, from *Flood Frequency Characteristics of Wisconsin Streams*, page 9, the Q_{10} equation for the relevant flood-frequency area.
3. Calculate the peak flow depth (at the relevant point along the drain) using this peak flow rate, the drain cross-sectional dimensions (at the relevant point along the drain), and Manning's equation for open channel flow.
4. Add this peak flow depth to the bottom elevation of the district drain at the relevant point. The resulting value is the peak water surface elevation, at that point, in the event of a 10-year 24-hour storm event.

Peak Water Surface Elevations; 25-Year 24-Hour Storm Event

One may use the following method to estimate the peak water surface elevation, at any point along a district drain, in the event of a 25-year 24-hour storm event:

1. Determine, from *Flood Frequency Characteristics of Wisconsin Streams*,[3] page 7, the flood-frequency area in which the district drain is located.
2. Calculate the peak flow rate from a 25-year 24-hour storm event using, from *Flood Frequency Characteristics of Wisconsin Streams*, page 9, the Q_{25} equation for the relevant flood-frequency area.
3. Calculate the peak flow depth (at the relevant point along the drain) using this peak flow rate, the drain cross-sectional dimensions (at the relevant point along the drain), and Manning's equation for open channel flow.
4. Add this peak flow depth to the bottom elevation of the district drain at the relevant point. The resulting value is the peak water surface elevation, at that point, in the event of a 25-year 24-hour storm event.

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[1] *Water Resources Data-Wisconsin Water Year 1997*, by B.K. Holmstrum, D.L. Olson, and B.R. Ellefson; U.S. Geological Survey; Water-Data Report WI-97-1; 1998.

[2] *Flood Frequency Characteristics of Wisconsin Streams*, by William R. Krug, Duane H. Conger and Warren A Gebert; U.S. Geological Survey; Water Resources Investigations Report 91-4128; Madison, Wisconsin, 1992.

[3] *Flood Frequency Characteristics of Wisconsin Streams*, by William R. Krug, Duane H. Conger and Warren A Gebert; U.S. Geological Survey; Water Resources Investigations Report 91-4128; Madison, Wisconsin, 1992.