**WDNR Approximate Hydraulic Modeling Preferences**

The Contractor shall create the approximate hydraulic models in accordance with the WDNR’s zone A preferences listed below using HEC-RAS 6.2 or higher. Before beginning work, the Contractor will need to coordinate with the WDNR to ensure models will ‘tie-in’ with any nearby studies.

**Model Extent:** Newapproximatehydraulic models must have their bounding cross sections extend completely outside of the effective National Flood Hazard Layer zone A floodplain, except in cases where the upstream extent of the effective floodplain ends in a lake.

**Downstream Boundary Condition:** The downstream boundary condition should be set to normal depth, except in instances where there is a downstream study on the same stream that the model needs to tie-in to. In those instances, a known water surface elevation should be used. If the downstream water surface elevation is calculated to be higher than the receiving stream, then an additional XS should be added on the downstream end that gives a water surface elevation that is below the elevation on the receiving stream.

**Terrain Data:** 5-foot DEM provided by the WDNR.

**Cross Sections:** XS’s are drawn perpendicular to the flow direction, adding bends as needed. XS spacing varies with the size of the waterway. For large, flat waterways, XS’s may be a thousand feet apart or more. As the waterway size decreases and the slope increase, the spacing should be reduced to a couple hundred feet or less. When a stream gets steeper, a good rule of thumb is to place at least one cross section for every 2’ contour line crossing the channel.

In instances where critical depth occurs at a XS, interpolated XS’s should be added to try to put the water surface profile back into a subcritical flow regime.

**Manning’s n values:** Manually estimate an average n value over the whole cross section (weighted channel and overbanks) based on aerial photos.

**Structures:** Bridges and culverts will be modeled in HEC-RAS if there are DOT bridge plans or other plans / survey available. Available DOT plans can be found through the Wisconsin Department of Transportation’s Highway Structures Information System (HSI). For structures where no data is available, enter them as ‘Inline Structures’ and code a vertical notch in it by estimating the opening width using aerial photos. Four cross sections are required at each structure to compute energy losses due to the structure.

For dams, the Contractor should coordinate with the WDNR to obtain as-built data. If no as-built data is available, the same vertical notch approach that is used for bridges and culverts should be used.

**Contraction /Expansion coefficients:** Set contraction / expansion coefficients at all structures (sections 2 through 4) to 0.3 / 0.5, respectively.

**Ineffective Extents:** Add ineffective flow areas where needed.

**cHECk-RAS:** cHECk-RAS should be run for each model to identify any potential errors or warnings.