NOTES ON ANALYSIS BY EXCEL ENGINEERING

– by Lee Trotta, Globetrotta Productions 10-25-15

First, the consulting company used the Theis Equation to analyze the pump test results. The Theis Equation is only applicable when the aquifer is homogeneous and isotropic and water is released from storage within each point of the aquifer. The Kohler site is a fractured bedrock aquifer and satisfies neither of these requirements. As a result, the concentric circles depicted in the drawdown contour maps of the Excel report are certainly misleading.

The fractured dolomite aquifer can only be studied using methods specific to fracture flow. Flow is likely restricted to vertical fractures and bedding plane joints based on studies done in Door County (Sherrill, 1977). An example of an analysis using proper methods for fracture flow is given in Bradbury et al (1998). Using borehole flow logs and/or multiple-well constant-discharge tests (as shown in Dunning and Yeskis, 2007) is another appropriate approach to fracture flow.

Another assumption made in the Excel Engineering analysis was that the Silurian dolomite aquifer was confined. It is true that it is covered by up to 90 ft of clay and the pumping well was artesian, but in some wells the clay thickness is only 20 ft. Some test wells indicated caverns in the dolomite and such collapsed areas could further reduce the overlying clay layer thus making the dolomite unconfined within the general area. The fact that the pump test displacement (pages 32 and 33 of Excel report) tails off towards the bottom indicates probable contribution from the layer overlying the clay. The implication is that over prolonged periods of pumping, wetlands and other surface-water bodies may be affected.

Page 5 of the Excel report says that no complaints were received after the pump test. My question is "were local residents informed of the pump test schedule"?

References:

Bradbury, Rayne, Muldoon, and Roffers, 1998, Application of a Discrete Fracture Flow Model for Wellhead Protection at Sturgeon Bay, Wisconsin: Wis. Geol. & Nat. Hist. Survey Open File Report 1998-04, 62 p.

Dunning, C.P., and Yeskis, D.J., 2007, Lithostratigraphic and Hydrogeologic Characteristics of the Ordovician Sinnipee Group in the Vicinity of Waupun, Fond du Lac County, Wisconsin, 1995-96: USGS Scientific Investigations Report 2007-5114, 60 p.

Sherrill, Marvin G., 1978, Geology and ground water in Door County, Wisconsin, with emphasis on contamination potential in the Silurian dolomite: USGS Water Supply Paper 2047, 38 p.