Intrinsic Susceptibility Analysis

The susceptibility of an aquifer to contamination is a function of the susceptibility of its recharge area to the infiltration of contaminants. Groundwater susceptibility can thus be defined as: the tendency or likelihood for contaminants to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer. Susceptibility is not an absolute property, but a relative indication of where contamination may enter the subsurface. It is also necessary to consider long-term effects on groundwater quality, perhaps over decades, in carrying out a susceptibility analysis.

Intrinsic susceptibility for the uppermost significant aquifer (the water table aquifer) was assessed using information contained within the MOE Water Well Information System and the location of identified karst features in Grey and Bruce Counties. The approach followed the method outlined in the MOE Technical Terms of Reference. This method considers the thickness of the different geologic strata as well as their permeability through the use of a K-factor. Polygons representing the identified karst areas (caves, sinkholes, sinking streams, sinking lakes, and karst pavement) within the Counties were overlain, incorporated into the GIS and given a high susceptibility value. Within the uppermost aquifer system, areas of low, medium, and high susceptibility were identified using the MOE susceptibility classes (low (ISI > 80), medium (30 £ ISI £ 80) and high (ISI < 30)).

The Bruce Peninsula is an area of medium to high susceptibility as a result of the thin and discontinuous nature of the Quaternary cover material providing little protection to the underlying bedrock. This is shown in the Canadian Parks Service field investigation of karst features of the Upper Bruce Peninsula. The remainder of the medium and high susceptibility areas trend from the base of the Bruce Peninsula to southern Grey County and roughly correspond to the occurrence of the Guelph and Amabel Formations underlying it. The higher susceptibility rating for these units is related to the fact that the are generally more permeable than other bedrock units in the area. Areas of low susceptibility occur mainly in the southwest portion of Bruce County, and correspond to the clay and silt-rich Quaternary deposits of the Huron Slope. This fine grained surface material restricts the downward movement of infiltrating surface water, making the underlying groundwater much less susceptible to associated contamination. In areas of high susceptibility near municipal pumping wells, it is recommended that municipal planning measures be developed to restrict development, or to require local scale hydrogeologic investigations that assess the vulnerability of the aquifer to contamination.