

Project HYDROSTRATIGRAPHIC MODEL OF THE OAK RIDGES MORAINE

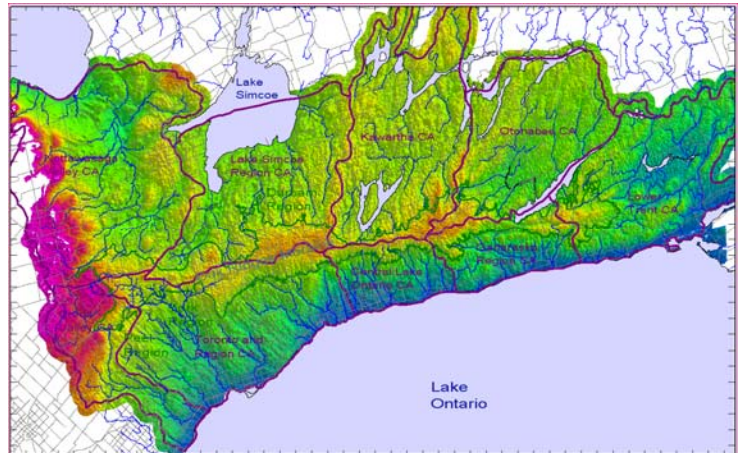
Client Conservation Authorities of the Moraine Coalition

Objectives

Extend and refine stratigraphic model of the Oak Ridges Moraine (ORM) developed by the Geological Survey of Canada (GSC) into a hydrostratigraphic model.

Outcomes

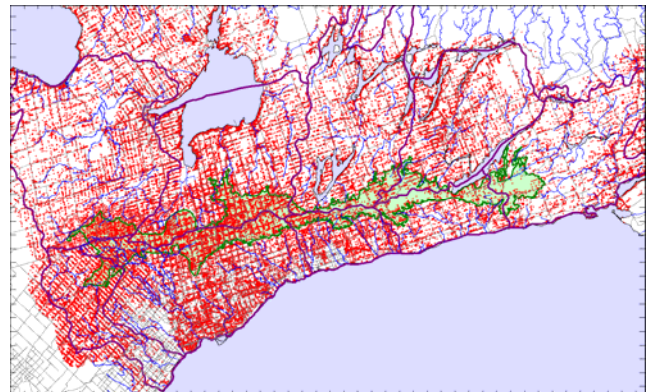
- Subdivision of the Lower Sediments (overburden deposits below the Newmarket till) into three units.
- A hydrostratigraphic model that serves as a basis for an eight-layer numerical groundwater model of the ORM.
- A better understanding of the impact of continuity of aquitard layers and the presence of “tunnel channels” on the hydrogeologic system.



Shaded relief map showing location of study area and Conservation Authorities bounding the Oak Ridges Moraine.

Key Aspects

- The team was able to integrate lithology, hydrogeologic indicators, and expert intuition into the aquifer geometry interpretation process.
- Efficient database design, dynamic querying, and visualization of wells in cross-section aided the interpretation process. Database contained over 140,000 wells and two million water levels.
- A VIEWLOG 3D GIS software was used to synthesize the data, pick hydrostratigraphic layers, and draw of three-dimensional (3-D) horizon lines.

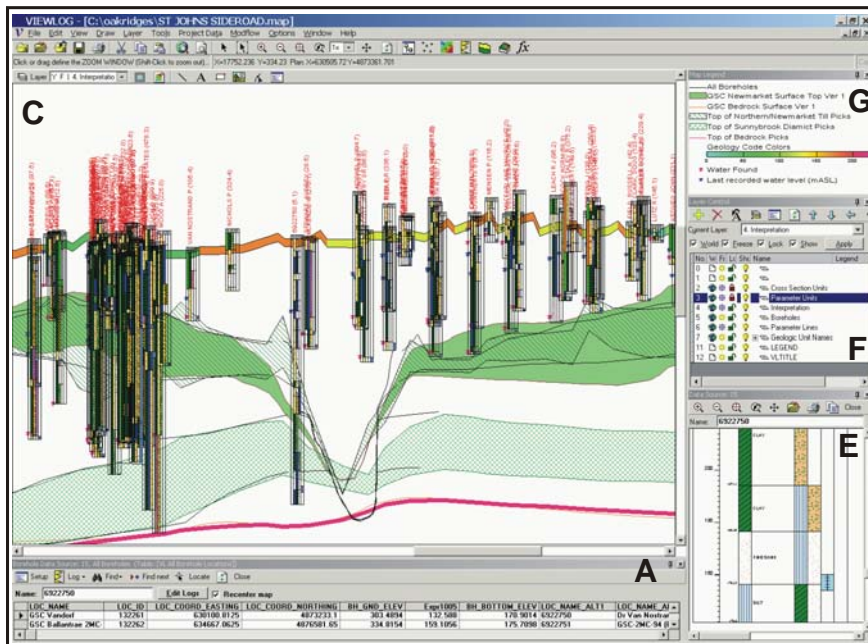


Symbols show location of the over 140,000 wells in the study area

Project Description

Building on the extensive analysis of the Oak Ridges Moraine by the GSC, our team of hydrogeologists extended and refined the existing stratigraphic model into a hydrostratigraphic framework used in an eight-layer numerical groundwater model. Focus was on the defining aquifer and aquitard geometry, determining the continuity of regional aquitards, and subdividing the Lower Sediments into two aquifer units.

Data contained in the MOE well log database were fully integrate with high quality geologic logs and geophysical data during the aquifer geometry interpretation process. Hydrogeologic indicators such as well screen placement, "water found", static water levels, and specific capacity measurements aided in the interpretation of lithologic data. Expert knowledge (including an understanding of stratigraphic processes) was incorporated by allowing team hydrogeologists to draw 3-D "horizon" lines that constrain the interpolation of layer surfaces between boreholes. Horizon lines were also used to define layer pinch-outs, tunnel channel erosion that resulted in holes in the confining aquitard, and "push-down" conditions



Section showing well logs, GSC surfaces (top of bedrock (thick red line) and Newmarket till (solid green fill)), refined position of Newmarket till from picks (hatched lines) and subdivision of

Efficient database design, dynamic querying, and visualization were critical to the interpretation process. A database containing over 3 GB of spatial information (maps) and 1000 hydrogeologic reports was created. VIEWLOG 3D GIS was used to synthesize all the data and provide for layer picking and horizon line drawing. The software graphical tools provided multi-parameter log plots, maps, sections, and interactive 3-D fence diagrams. The majority of the quantitative interpretation was performed on 2-D cross sections. The ability to dynamically push cross sections through the model domain, while picking and drawing 3-D horizon lines, allowed the interpretation team to make over 60,000 hydrostratigraphic layer picks within a short amount of time.

