Environmental Sequence Stratigraphy in Numerical Groundwater Models

J.P. Brandenburg, PhD, **R.M. Suribhatla**, PhD, PE, and M. Einarson, PG, CHG (Haley & Aldrich)

Recent advances in borehole logging and visualization software combined with more rigorous evaluation of depositional environments have made sophisticated subsurface geologic interpretation and models accessible to the environmental consulting industry. However, in practice, conceptual site models are still very often based on generalized and often arbitrarily subdivided stratigraphy. Relationships between stratigraphy and non-stratigraphic features such as bedrock unconformities and anthropogenic construction fill are often conceptually challenging in this layer-based framework. Interpretation and model improvement are important in characterizing the geological controls of complex processes such as biological and abiotic degradation pathways. What is less defined is the added value for including detailed stratigraphy in numerical groundwater models.

Stratigraphic interpretations and related groundwater models for contaminated groundwater sites are reviewed in the context of informing remedial design and scope. The value of information is assessed by comparing the potential influence of using a more detailed stratigraphic model compared to a simpler layered geologic model. We evaluate performance of different numerical discretization schemes for representing complex stratigraphy and discuss efficient workflows for converting to scale-appropriate numerical models.

Application of detailed stratigraphic analysis offers many benefits to contaminated site management. Of these, more accurate site conceptualization is arguably the most valuable. The ability to develop and communicate a geologically consistent interpretation at the correct resolution adds context for heterogeneous data and uncertainty inherent in standard environmental projects. An understanding of the maximum level of detail that is appropriate, and their representation in numerical models is critical to maximizing this value.