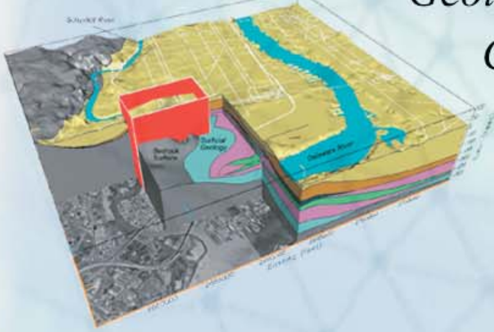
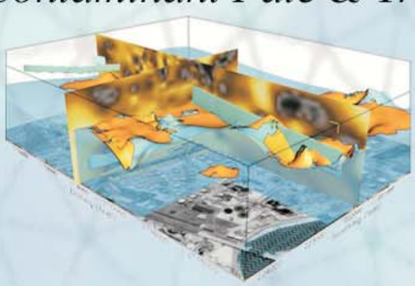
GeoHydros, LLC

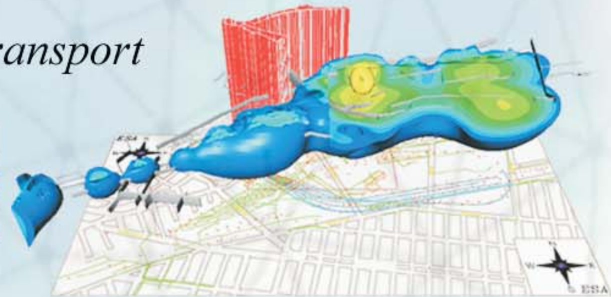
Specialized Geological Modeling

Geologic Site Assessment

Contaminant Fate & Transport



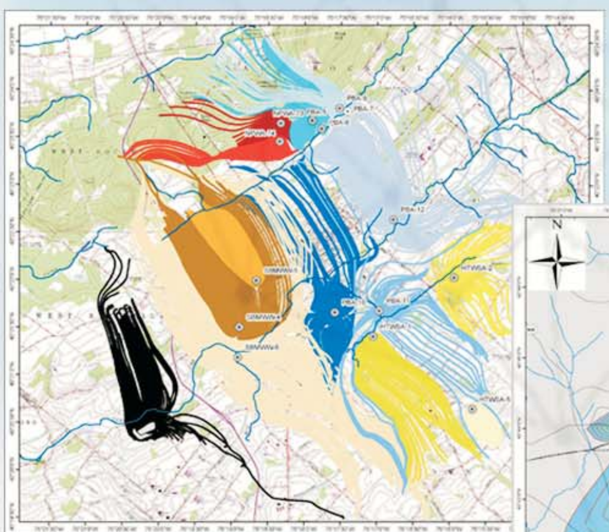


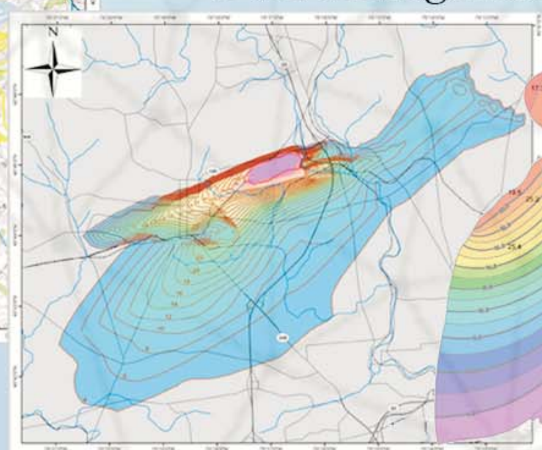


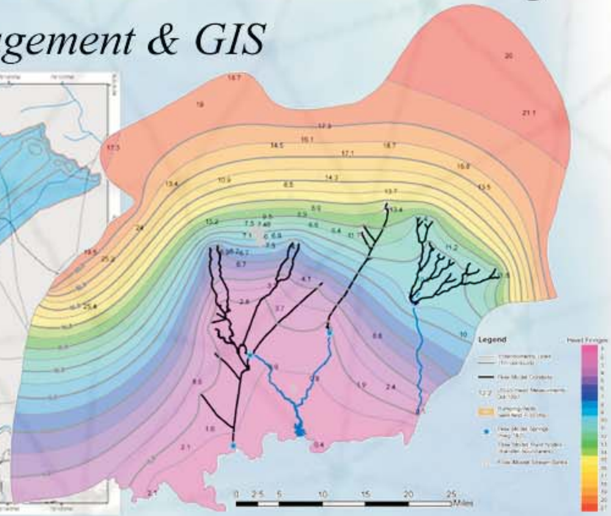
Water Resource Modeling

Karst Aquifer Characterization & Modeling

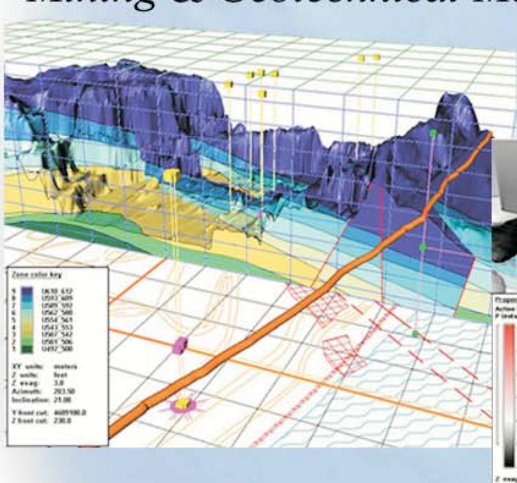
Data Management & GIS

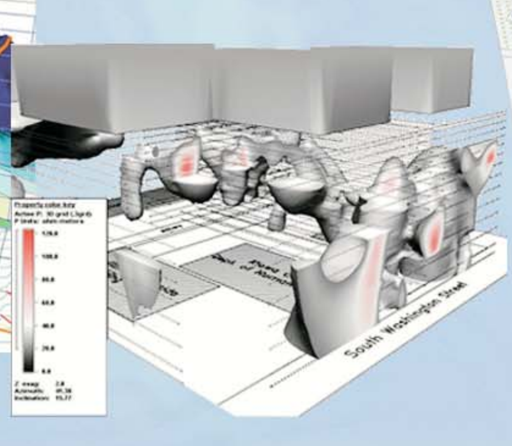






Mining & Geotechnical Modeling





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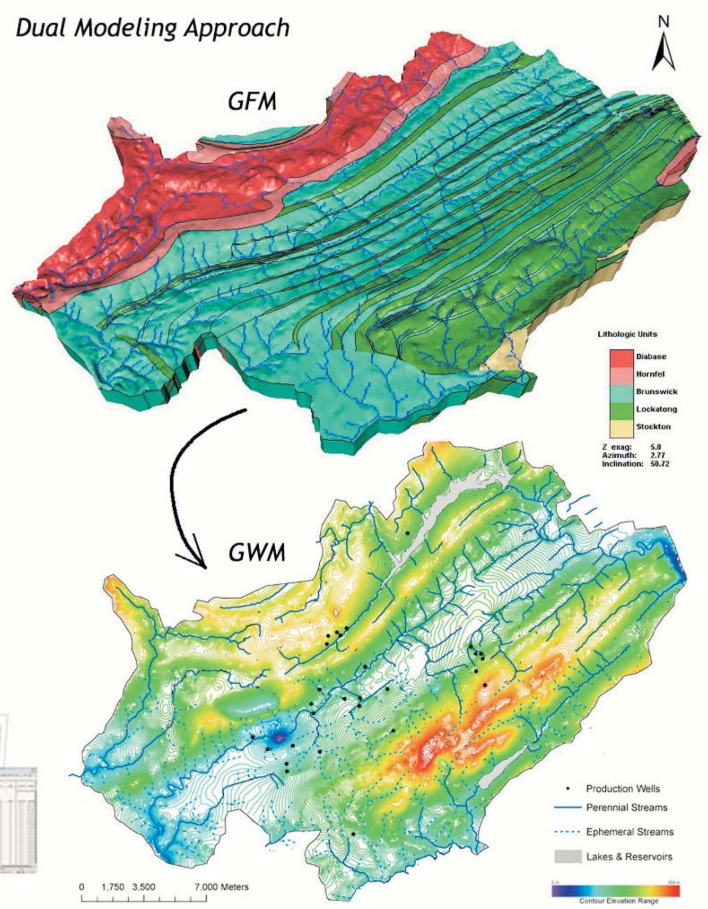
Dual Modeling Approach ...

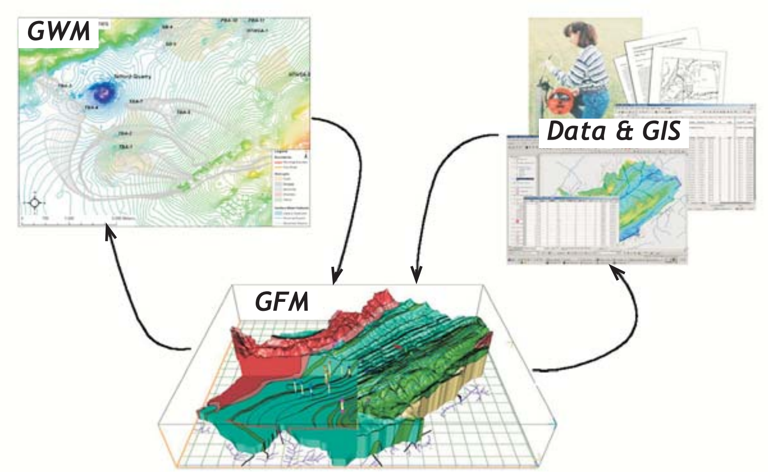
Our mission at GeoHydros is to help environmental and geoscience professionals interpret, disseminate, and manage complex geologic and hydrogeologic data through the development and implementation of linked, geologic, and process models using the most advanced modeling techniques and computer software. We take pride in contributing to a comprehensive and consistent approach to water resource management and environmental site characterization through integrated modeling and data synthesis.

Our modeling approach synthesizes all available hydrogeologic data into regional or site-specific conceptual models that we use as the framework for groundwater flow and/or fate and transport analyses. We describe this as a Dual Modeling Approach,™ wherein existing data and interpretations are incorporated into a comprehensive and accurate Geologic Framework Model (GFM), which feeds predictive analyses derived from a Groundwater Flow Model (GWM). This approach typically results in significant cost-savings over the course of an environmental characterization or remediation program because all modeling efforts are mutually supportive. This approach also provides for unparalleled evaluation of all site data from a holistic systems perspective, thereby fostering more effectively targeted data collection strategies.



Models are Decision Support Tools

Accurate predictions only come from accurate and holistic physical and mathematical conceptualizations



Typical Modeling Work Flow

All relevant data is synthesized into a central database. A GFM is constructed using all data and interpretations. The GFM framework is exported for process modeling and the results are imported back into the GFM for visualization and/or output to GIS.

We develop all data visualizations and GFMs with EarthVision® (EV), which is the most advanced solids modeling and geospatial visualization software available. Once constructed, our GFMs provide for data queries and visualization, and a framework for process modeling through deterministic and/or stochastic methods of geospatial correlation. Gridded geologic, hydraulic, contaminant and structural data are incorporated into visual and query-able interpretive models. Existing and predicted conditions can then be manipulated visually and mathematically to produce a wide variety of quantitative and qualitative output. Automated functions provide for cost-effective model updates and/or repetitive data analyses. The GWM is then constructed using the most appropriate process modeling software such as FEFLOW® or GMS.® Gridded data imported from the GFM is used to define the structural framework and initial conditions. Results of the predictive modeling such as heads, particle tracks, or contaminant concentrations, are exported back to the GFM such that those results can be easily evaluated in the context of the site conceptual model.

Who is GeoHydros?

- Todd R. Kincaid, Ph.D.

  Group Leader, Geologic Modeler

  Ph.D. - Hydrogeology - Univ. of Wyoming - 1999
  M.S. - Hydrogeology - Univ. of Florida - 1994
  B.S. - Geology - Univ. of Florida - 1991
  18 years professional experience
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- Kevin E. Day, M.S., P.G. (CA, FL)

  Geologic Modeler, Programmer, Database Dev.

  M.S. - Geology - Univ. of Wyoming - 2000
  B.S. - Geology - Colgate Univ. - 1993
  13 years professional experience
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- Brent A. Meyer, M.S.

  Hydrogeologic Modeler, GIS Technician

  M.S. - Hydrogeology - Univ. of Nevada - 2004
  B.A. - Geology - Univ. of Montana - 1997
  10 years professional experience
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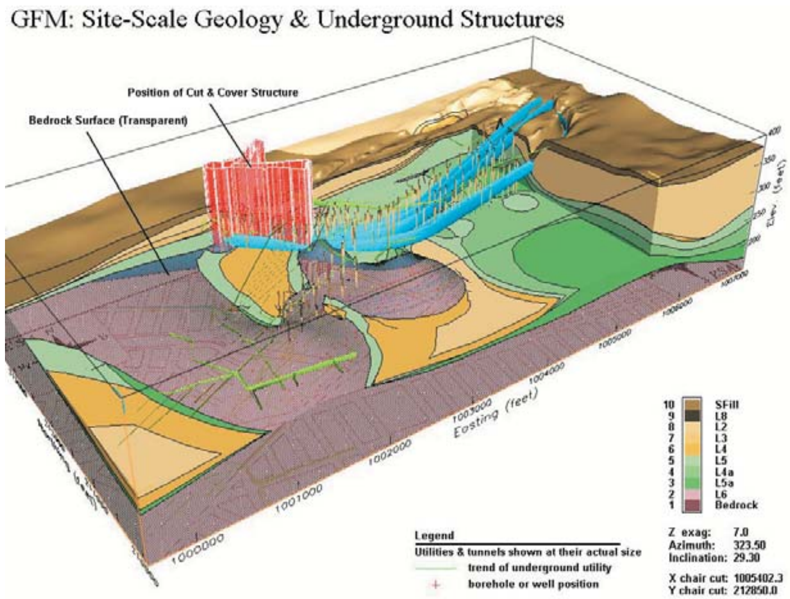
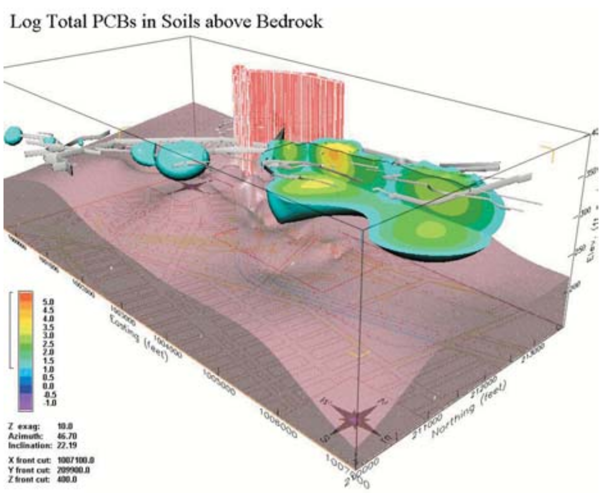
Geological Framework Modeling ...

Modeling should be considered a living tool designed to enhance the understanding of a technical problem for all interested parties. We design and construct our models to provide a centralized framework into which all available geologic, hydrologic, and engineering data is synthesized and from which spatial relationships between any combination of data as well as the results of all subsequent predictive modeling efforts can be evaluated quantitatively and visually through a 3D GIS.

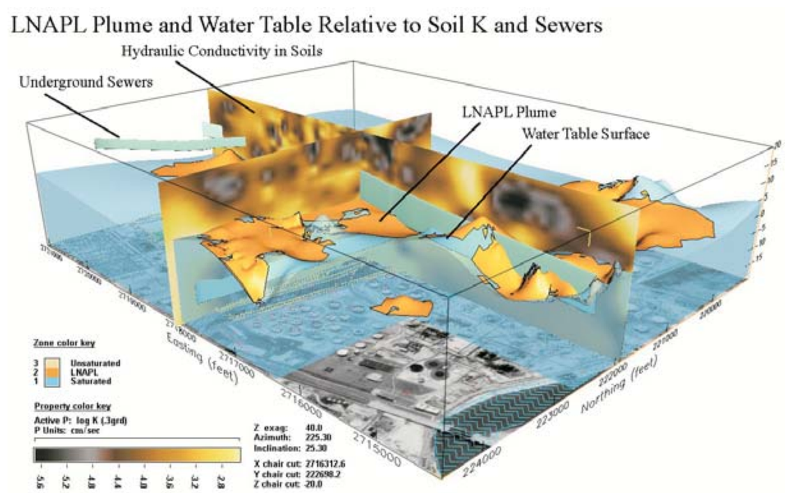
We have successfully developed cost-effective GFMs for large and small scale contaminant assessment and remediation, water resources, and geotechnical projects. Our models have helped project managers to better understand site complexities, optimize data collection strategies and remediation systems, and design subsurface structures. Our visualizations have been used to effectively convey project goals and technical concepts to project management, regulators, and the general public.



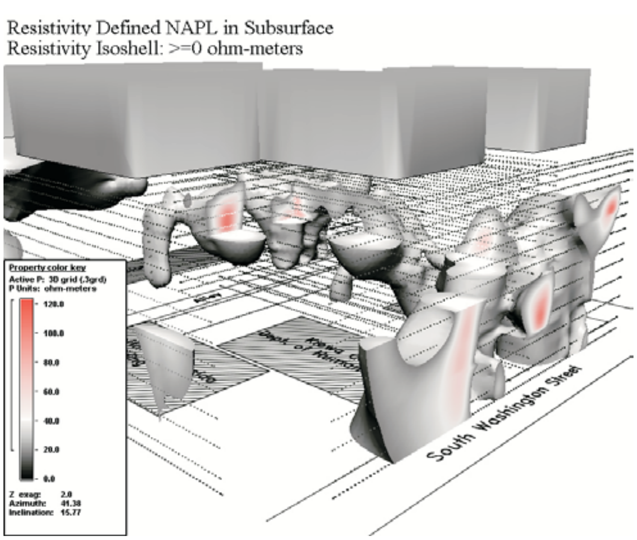
Structural Analysis of Bedrock and Glacial Sediments for Underground Construction Projects



Volumetric & Spatial Analysis of Contaminant Plumes



Volumetric, Spatial & Morphologic Analysis of LNAPL, Soil Hydraulic Conductivity, & Underground Structures



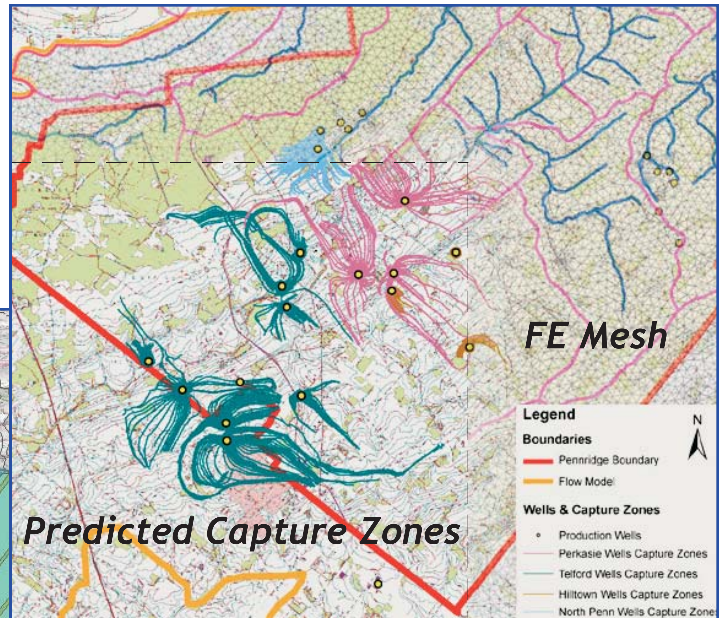
3D Delineation & Volumetric Analysis of Resistivity Defined Soil Zones and NAPL Distribution

Fit the model to the data...
Not the data to the model.

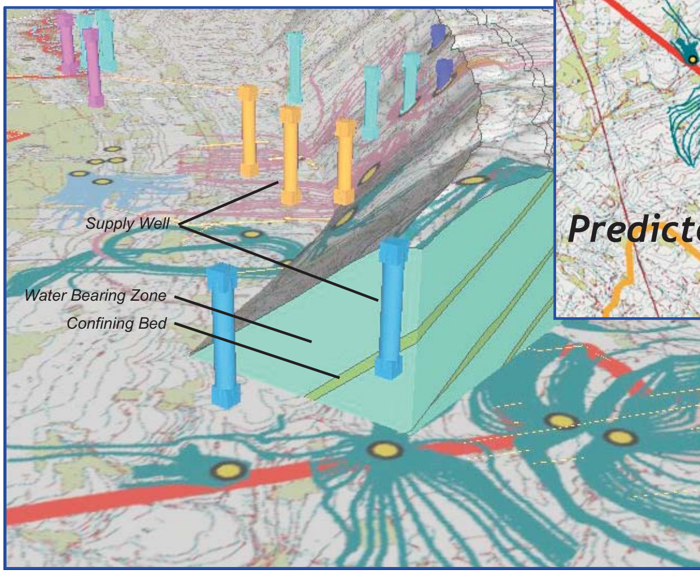
Predictive Modeling ...

The Aquifer Protection Approach

Water flow is not limited by political boundaries, therefore a watershed-scale approach to wellhead and aquifer protection is essential to the development of effective management strategies. By incorporating the geologic complexities defined by the GFM into a GWM with an appropriately structured mesh or grid, our models produce more detailed and defensible predictions of capture and aquifer vulnerability zones. Exporting the results back into the GFM then provides for more effective evaluation, interpretation, and presentation of the model results.

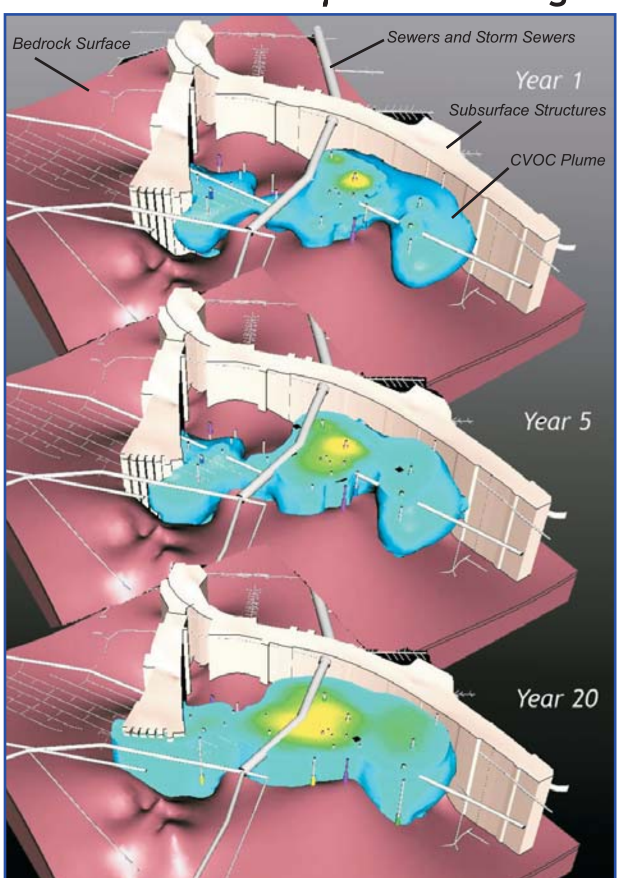


3D Evaluation & Visualization



Above: Capture zones for 14 municipal wells that supply six separate municipalities within the Perkiomen and Lake Nockamixon watersheds, Pennsylvania. The complex capture zone geometries arise from the structural orientation of the water-bearing rocks and confining beds (light blue and green at left), and would not be adequately defined by standard wellhead protection methods.

3D Fate & Transport Modeling



Contaminant Fate & Transport Modeling

Accurate prediction of contaminant fate and transport is predicated on an accurate conceptualization of the geological environment impacted by the contaminants, the magnitude and direction of groundwater flow, and site-specific conditions driving the physics governing transport and decay. We address each of these issues through our *Dual Modeling Approach*. Geological constraints are defined in the GFM, which is used as the basis for modeling the steady-state or transient groundwater flow field. Transient contaminant transport modeling is then performed in either 2D or 3D using the most appropriate modeling code for the problem, (e.g. FEFLOW, MT3D, RT3D, or TOUGHREACT). The image at left shows the results of a 3D fate and transport model of dissolved CVOC in groundwater moving toward a nearly impermeable subsurface structure. Results have been exported from FEFLOW to a site-scale GFM for visualization purposes. Volumetric and center-of-mass movement analyses are then performed as part of every one of our modeling projects using our own proprietary programs that link the transport and structural model components.

Example Clients & Projects

- *NYC MTA (PB/STV Joint Venture): New York, NY - Geological modeling and 3D contaminant fate and transport modeling.*
- *US Department of Defense (TetraTech EC): Philadelphia, PA - Geological and geotechnical modeling, groundwater flow & fate and transport modeling, LNAPL volume estimation.*
- *Florida Geological Survey: Tallahassee, FL - Karst watershed characterization and water resource modeling. See www.geohydros.com/FGS.*
- *The Coca-Cola Company: High Springs, FL - Karst water resource modeling.*
- *Bucks County, PA: Aquifer protection modeling.*
- *Buzzi Unicem USA: NY & PA - Geological and groundwater flow modeling for mining resource and impact assessments.*