

Developing the database for 3-D modeling: acquiring, assembling, verifying, assessing, interpreting, and integrating source data

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Lake County, Illinois contains some of the most rapidly growing communities in the state, many of which rely heavily upon groundwater resources. Accurate maps of the aquifers within the thick Quaternary sediments (up to 400 feet thick) are needed by agencies and local governments for infrastructure planning, resource development, land use planning, and environmental protection. The sources of data necessary to produce these maps vary in their point of origin, availability, content, and many other factors.

Modeling subsurface stratigraphy requires a considerable effort to develop the database. High quality geological data from boreholes with inaccurate spatial reference is as useless as poor-quality data from accurately located boreholes. Also, the variation in complexity of the subsurface stratigraphy influences data requirements. The spatial density and quality of data available for use in modeling are variable and additional drilling is often required in specific locations to supplement existing data.

During the past year our team has invested more than 4.5 work years acquiring, verifying, and interpreting the drilling records and/or logging the sediments from about 7,000 borings primarily in the Antioch Quadrangle as part of a Pilot Study for the Central Great Lake Geologic Mapping Coalition. These records include water wells and foundation borings for bridges, highways, and utility and telecommunication towers. We will be examining the drilling and other records from more than 200 projects conducted by a private engineering consulting firm. These projects were located in very urbanized and restricted access areas, so they will be a valuable source of quality geotechnical data. More than 200 sets of sediment samples, collected during the drilling of various water wells over the years and stored in the State Geological Survey's sample library, have been examined and described. We are also drilling in areas where data are lacking and in areas where our borehole descriptions can be used to interpret the driller's logs from surrounding wells that have been spatially verified. A program of gamma logging of new water wells in the area is providing valuable information on subsurface stratigraphy and will be integrated into our shallow seismic geophysical research.

We have verified more than 3,000 boreholes using plat books, tax parcel and address matching, and field verification techniques. Now these spatially-located records must be interpreted and sorted by quality of information and location and their descriptive driller's records translated into more standardized data formats. This process will further reduce the number of viable records because some of the verified data will not have information useful for modeling. One product of this evaluation process will be a method that provides a more consistent assessment and characterization of geological records in the area. We hope this methodology for organizing data can be transferred to other areas.

All these different types of records must be integrated in a single database before any modeling can begin. But, once initiated, the modeling should provide interesting and useful insights. Our mapping team will then begin to test this model using additional drilling and geophysical fieldwork. Our clients are expecting more than a standard 3-D visualization. It will be our challenge to integrate these records and the expertise of mappers, stratigraphers, groundwater geologists, sedimentologists, geophysicists, and GIS/database specialists to produce

products that not only detail the geology but permit an in-depth analysis which will include an assessment of our confidence in the data and the rationale supporting our interpretations.