2009 Spring Meeting

Northern Illinois University, Rockford, IL
April 1, 2009

Agenda and Abstracts

Agenda
Illinois Groundwater Association
2009 Spring Meeting
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8:30–9:00	Registration
9:00–9:15	Opening Remarks, **Melissa Lenczewski**, IGA Chair
9:15-9:45	**Jerry Dalsin**, *Illinois Dept. of Public Health*, Regulating Dewatering Wells During Site Development
9:45- 10:15	**Chris Greer**, *Northern Illinois University*, Preliminary Recharge Analyses into Shallow Glacial and Deep Bedrock Aquifers Related to the Troy Bedrock Valley System, DeKalb County, Illinois
10:15-10:45	**BREAK**
10:45-11:15	**Alan Stone**, *CES Group of Illinois, Inc.*, Comparison of TACO Equation R26 with Alternative Models
11:15-11:45	**Dan Ingerd**, *Illinois Dept. of Natural Resources*, Lake Michigan and Groundwater (Exact topic TBD)
11:45-1:00	**Lunch/Executive Committee Meeting**
1:00-1:30	**Bev Herzog,** *Illinois State Geological Survey*, Federal Legislative Updates Related to Groundwater and Water Resources
1:30-2:00	**George Roadcap**, *Illinois State Water Survey*, Topic TBD, Kane County Groundwater Modeling
2:00-2:30	**BREAK**
2:30-3:00	**Cassandra McKinney**, *McHenry County*, Water Supply Planning: 3-D Geological Mapping, Observation Wells with Real Time Data Collection, & Hydrologic Flow Modeling
3:00-3:30	**Steven Kroll**, *Patrick Engineering, Inc*., Basement Flooding in the DuPage River Valley, Lisle, Illinois
3:30-3:45	Open for Comments/Announcements
3:45-4:00	Closing Remarks: **Melissa Lenczewski**, IGA Chair

ABSTRACTS

(In order of presentation)

Regulating Dewatering Wells during Site Development

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Since in the past there were no specific requirements for dewatering wells in the Illinois Water Well Construction Code (IWWCC), (415 ILCS 30/; 77 Illinois Administrative Code 920), a guidance document was developed with emphasis on their construction and sealing. A dewatering well falls under the definition of a "water well" in the IWWCC and "well" in the Environmental Protection Act (415 ILCS 5/). Designed to lower the groundwater level to specified depth, dewatering systems can be either permanent, e.g., maintaining the groundwater below a certain level for a stretch of highway, or temporary, usually lasting no more than 12 months, e.g., building projects, installation of pipelines. The licensing requirements for constructing dewatering well systems fall under the Water Well and Pump Installation Contractor's License Act (225 ILCS 345/).

A well construction permit application, accompanied by a dewatering well plan and associated fee is required by the local health department. Construction and sealing requirements for permanent dewatering wells are contained in the IWWCC; those for temporary dewatering wells are specified in the guidance document. Details as to the reporting their construction and sealing have been simplified and are also contained in the document.

Preliminary Recharge Analyses into Shallow Glacial and Deep Bedrock Aquifers Related to the Troy Bedrock Valley System, DeKalb County, Illinois

Chris Greer
Northern Illinois University

A wide variety of methods have been employed to both measure and estimate recharge into near-surface aquifer systems, including "rule-of-thumb" precipitation percentages, stream discharge loss calculations, tensiometer and piezometer measurements, isotope analyses, and GIS and digital modeling. Subsequent recharge rates and pathways to deeper aquifer systems is more difficult to directly measure and requires more comprehensive efforts to digitally model entire systems, in conjunction with limited direct measurements to calibrate the model results. As DeKalb County is on the verge of expansion from the Chicago metropolitan area and serves as a primary recharge location for the regional aquifer system, a combined application of modeling-GIS-field-lab approaches to this ideal critical setting will assist researchers and agencies involved with these problems across the nation.

The goals of this study are to determine the rate of recharge through the surficial deposits to the shallow groundwater system and ultimately the deeper regional aquifer systems in the suburban and rural settings of the county. This will be done through the combination of several specific objectives: 1) description and modeling of the site-specific hydrogeology of DeKalb County, especially the Troy Bedrock Valley setting; 2) a comparison of methods to determine local groundwater recharge (including water budget calculations, calculations from vertical gradients, isotopic groundwater dating and model calibrations); 3) development of recharge estimates (including averages and extreme-condition ranges) to both the shallow glacial aquifers and the underlying regional aquifer; and 4) predictive modeling of the potential future impact of urbanization on local and regional groundwater resources. Recent research has produced recharge estimates between 0.2 and 13 inches per year to the local glacial aquifer system within DeKalb County. These estimates will be compared to and used in conjunction with isotopic groundwater dates as input to a groundwater flow model for the glacial and bedrock aquifer systems down to the regional Ancell-St. Peter Sandstone Formation. In addition, the model's discharge into the regional bedrock aquifer system will be compared to the Illinois State Water Survey's model of the regional groundwater system.

Comparison of TACO Equation R26 With Alternative Models

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Tiered Approach to Corrective Action Objectives (TACO) Tier 2 equations are currently used to model impacted soil and groundwater at Leaking Underground Storage Tank (LUST) sited in Illinois. Equations R15 and R26, from 35 IAC 742 Appendix C Table C, are steady state equations used to calculate theoretical downgradient extents of groundwater impact from reported soil and groundwater contaminant concentrations. These equations are relatively easy to use with a spreadsheet, but have some limitations. They assume source area concentrations remain constant and do not decrease over time, which may overestimate the maximum downgradient extent. This may require institutional controls at properties that may never become impacted. These equations also do not determine time required for the plume to reach its calculated maximum extent (steady state conditions).

Alternative equations such as those presented in ASTM E 1739-95 and the USAFCEE guidance document (1995) also calculate theoretical downgradient extents of groundwater contamination, and should be considered. They are less restrictive, and less prone to overestimate the downgradient extent of groundwater impact.

Groundwater analytical and site-specific hydrogeologic data from a site in Sheboygan, WI were entered into a spreadsheet model. Theoretical downgradient extents were calculated using equation R26 and alternative equations. Results from the alternative equations were compared with R26. Equation R26 provided the largest theoretical downgradient extent. The Domenico solution with source area degradation reported the smallest theoretical downgradient extent.

Can Water from Lake Michigan Take the Pressure Off Groundwater Withdrawals in Northeastern Illinois?

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Northeastern Illinois abuts the greatest surface freshwater resource in the world. Although our use is limited pursuant to a United States Supreme Court Decree, it currently serves as the water supply source for approximately 77% of the population of the eleven county N.E. Illinois region.

This presentation will provide an overview of the Lake Michigan water allocation program, review how Lake Michigan water allocations impact groundwater use, summarize a few key findings of the Northeastern Illinois Regional Water Supply Planning Group, and discuss some of the issues causing uncertainty in meeting the future water supply needs of the N.E. Illinois region.

Update on Federal Issues Related to Groundwater

Bev Herzog
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University of Illinois

The National Ground Water Association (NGWA) held its Legislative Conference in late March. More than 120 NGWA members from 36 states attended, including seven from Illinois. The first day included briefings on federal groundwater issues from congressional staff, Department of Energy staff, and NGWA's Washington representatives (Dutko Worldwide). Congressional staff sees improvement for environmental issues and small business in the new administration. The Department of Energy focused on geothermal power as it is covered in the stimulus package. The US EPA notes, through Dutko, increases in brownfields and LUST funding and notes that Superfund may be resurrected.

The afternoon was devoted to issues that members would discuss with their congressmen the next day. Four issues were presented for this year's discussion: the SECURE Water Act and its pilot groundwater monitoring network, the USGS study on private water wells and a proposed tax credit for well owners who have their water quality tested, inclusion of geothermal energy in the proposed Renewable Energy Portfolio Standards, and the Diesel Emissions Reduction Act. Each delegation is to select at least two issues to discuss with their congressmen. They can do more if they are comfortable doing so and have the time in their meetings. Illinois selected the first two issues and added the third when time allowed.

Four members of the Government Affairs Committee stayed a third day for additional visits. Two members visited with two Senate Committees to discuss geothermal energy. Another scientist and I met with OMB and the Office of Technology Policy (OSTP). Our visits were to introduce NGWA to a new office (OMB) and a new staff person (OSTP) to establish relationships and discuss our mutual interests in groundwater.

Modeling the Effects of Future Pumping on Shallow Groundwater in Kane County

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To quantify the amount of groundwater flow in the shallow aquifers in Kane County we constructed a detailed computer model. This model puts together the local geologic model with the hydrologic information from the measured water levels in wells, measured and modeled stream flows, water withdrawal data, and calculated regional groundwater flows from the regional (deep) groundwater flow model. The model reproduces the measured water levels and stream flows with representative permeability values and surficial recharge rates for glacial sand and clay deposits. The flow model is a tool that can be used for a variety of water supply planning needs. Scenarios of future water use from existing or potential wells can be run in the model to show the potential impact on water levels in the aquifers and on streamflow. Simulating a growth in water withdrawal of 1.7% a year until the year 2050, model shows water-level declines of more than 30 feet in some of the wellfields and the potential for some production wells to go dry.

Water Supply Planning:
3-D Geological Mapping, Observation Wells with Real Time Date Collection,
& Hydrologic Flow Modeling

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Recent studies suggest that areas in Northeastern Illinois will experience water supply shortages as early as 2030. This is particularly alarming to McHenry County as the entire County is solely dependent on groundwater for all of its potable water supply needs. In 2007, the McHenry County Groundwater Resource Management Plan was completed and revealed that a number of the County's developing townships will be approaching or exceeding their maximum sustainable aquifer yields by 2030. In an effort to plan for the future and guard against supply shortages, McHenry County hired a Water Resource Manager and has engaged in a comprehensive effort to study its only potable water supply - Groundwater.

Two scientific research projects are currently being conducted simultaneously with the Illinois State Geological Survey (ISGS) and the United States Army Corps of Engineers (USACE) to study: the geologic makeup of McHenry County, aquifer extent and thickness, real-time aquifer levels, and impacts on potable water supply availability. A third study with the Illinois State Water Survey (ISWS) is scheduled to begin in 2009 and will take data from the first two studies to refine current water supply projections and create a hydrologic flow model for the County. The results from all studies will subsequently be used to produce maps depicting major shallow sand and gravel aquifer units, aquifer sensitivity, prime aquifer recharge areas, and geologic cross sections. Results from the observation wells' real time data loggers will be collected indefinitely and used to continuously refine a hydrologic flow model to more accurately project water supply changes, availability, and areas of concern.

Basement Flooding in the DuPage River Valley, Lisle, Illinois

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The basement of a senior living center in Lisle, Illinois has recently begun to experience severe seepage and flooding during and after significant precipitation events. The basement has always experienced some degree of seepage since its construction in the late 1990's and a 4-inch diameter drain tile was installed around the perimeter of the basement. In September of 2008, the area experienced a greater than 8-inch rainfall coupled with a power outage. The pumps that discharged the drain tile were unable to cope with the amount of water flowing into the drain and water started pooling in the basement from the sump pits and from cracks in the basement floor slab. The facility was forced to shut down the backup generator, which was located in the basement, when the water levels continued to rise. The water level in the basement eventually reached a peak exceeding 5 feet in depth.

A hydrogeological investigation was performed in an attempt to characterize the groundwater flow system and to determine the type of groundwater control that would most effectively alleviate the basement flooding. The investigation revealed that the site sits on a 30-foot thick sand and gravel aquifer lying directly on the Silurian dolomite aquifer that runs under the entire region. Piezometers that were installed at the site revealed that the unconfined water table rises dramatically after rainfall events to a elevation greatly exceeding the elevation of the basement slab.

Several groundwater control methods were analyzed. A slurry wall was considered as a method to divert groundwater flow away from the basement area, however, this method would have proven difficult to implement properly and could have caused upgradient flooding. The second option considered was enlarging the 4-inch drain tile to 18 inches and upgrading the sump pumps to passively collect the excess groundwater. The installation of this new drain tile would be difficult and costly due to the presence of the other buildings at the site. The third option considered was the installation of permanent dewatering wells that would actively extract the excess groundwater during and after storm events. The benefits of this option include the ease of installation, rapid deployment, and the ability to add wells if the initial system does not perform to standards. The major issues with this system are the continual operation and maintenance costs and where to put the pumped groundwater. Final design of the well dewatering system will begin shortly.