

Groundwater Inventory and Mapping Project

Summary and Status – September 2004

- In August 2003, the Michigan Legislature passed Public Acts (PA) 148 and 177. PA 148 requires that a groundwater inventory and map be generated for the State by August 2005. It also creates the Groundwater Conservation Advisory Council. PA 177 sets up a procedure to address groundwater withdrawal conflicts between groundwater users in the State.
- The project team consists of personnel from the Michigan Department of Environmental Quality (MDEQ), the United States Geological Survey (USGS), and Michigan State University (MSU).
- PA 148 stipulates that “The department shall include data on all of the following in the statewide groundwater inventory and map:
 - Location and water yielding capabilities of aquifers in the state.
 - Aquifer recharge rates in the state, if available to the department.
 - Static water levels of groundwater in the state.
 - Base flow of rivers and streams in the state.
 - Conflict areas in the state.
 - Surface waters, including designated trout lakes and streams, and groundwater-dependent natural resources that are identified on the natural features inventory.
 - The location and pumping capacity of all of the following:
 - (i) Industrial or processing facilities registered under section 32705 that withdraw groundwater.
 - (ii) Irrigation facilities registered under section 32705 that withdraw groundwater.
 - (iii) Public water supply systems that have the capacity to withdraw over 100,000 gallons of groundwater per day average in any consecutive 30-day period.
 - Aggregate agricultural water use and consumptive use, by township.”
 - “The department shall make the statewide groundwater inventory and map available to the general public.”
- General Approach to Determine Yield
 - Subdivide aquifer analysis to identify *bedrock* aquifers, but map overall water yield from the *glacial* deposits that are treated as a single aquifer with varying 3D properties.
 - Identify limitations and data needs.
 - Estimate and present uncertainty where appropriate.
- Specific Approach to Determine Yield
 - Location and water yielding capabilities of aquifers in the state.
 - MDEQ Wellogic water well record database
 - MDEQ public water supply aquifer-test database
 - Aquifer-test database compiled from Michigan Department of Natural Resources (MDNR) records by USGS RASA study
 - Published maps

- Aquifer transmissivity and storativity values reported in the literature
- Water yield estimation is a major new analysis
 - Traditionally, either average observed yield or an estimated maximum yield would be mapped.
 - The department desired a map that would complement PA 177.
 - Yield may be defined by the pumping rate that could produce a given drawdown at a given distance from a high-capacity well after a set time period.
 - The specific drawdown amount, distance, and time constraints will be determined by the department.
 - The water yield estimation map will be a screening tool: site-specific studies will still be required to evaluate a reported or potential conflict for a given high-capacity well.
- Aquifer recharge rates in the state, if available to the department.
 - USGS (1996) published estimate
 - Updated estimate for the Great Lakes Basin by USGS and Environment Canada
 - USGS Regional Aquifer System Analysis study for select bedrock aquifers
- Static water levels of groundwater in the state.
 - Hydrography (Michigan Department of Information Technology-Center for Geographic Information)
 - Soil maps (United States Department of Agriculture-Natural Resources Conservation Service)
 - Wetlands (United States Fish and Wildlife Service-National Wetlands Inventory)
 - Water levels reported in Wellogic database
 - USGS RASA study (bedrock aquifers)
 - MSU estimate of the “first water” elevation in the glacial deposits
- Base flow of rivers and streams in the state.
 - USGS (1996) published estimate
 - USGS (2003) published National Base Flow Index
 - The above estimates are being updated for the Great Lakes Basin by USGS and Environment Canada
 - MDNR-Fisheries Division estimate
- Conflict areas in the state.
 - Conflicts reported to and verified by the MDEQ through PA 177
- Surface waters, including designated trout lakes and streams, and groundwater-dependent natural resources that are identified on the natural features inventory.
 - Michigan Natural Features Inventory
 - MDNR

- The location and pumping capacity of industrial/processing facilities, nonfarm irrigation facilities, and public water supply systems that have the capacity to withdraw over 100,000 gallons per day of groundwater, on average, in any consecutive 30-day period.
 - MDEQ Water Use Reporting Program
- Aggregate agricultural water use and consumptive use, by township.
 - Michigan Department of Agriculture and MDEQ
- Make the statewide groundwater inventory and map available to the general public.
 - All the maps developed by the project (with metadata) will be available on-line at the project Web site.
 - The inventory of groundwater data will also be available on-line in a searchable database.
 - Hard-to-find reports will be scanned and made available (as .pdf files) on the project Web site.
 - Data about aquifer properties will be available on-line, with references back to the original source, at the project Web site.
- Information Needs
 - Statewide groundwater monitoring network, including wells that reflect natural variability in water levels.
 - Substantial addition of historical logs to Wellogig database.
 - Increase outreach and technology transfer to drilling contractors in order to improve the quality of the data in the Wellogig database.
 - Mapping of glacial deposits at a scale appropriate to capture the important 3D heterogeneities.
 - Actual (or estimated) use must be reported by well, not by facility, municipality, or township.
 - Research to improve the estimate of consumptive use.
 - Research to determine the relation of groundwater to aquatic ecosystems.
 - Maintain the inventory and mapping effort by continuously incorporating new data and studies as they become available.