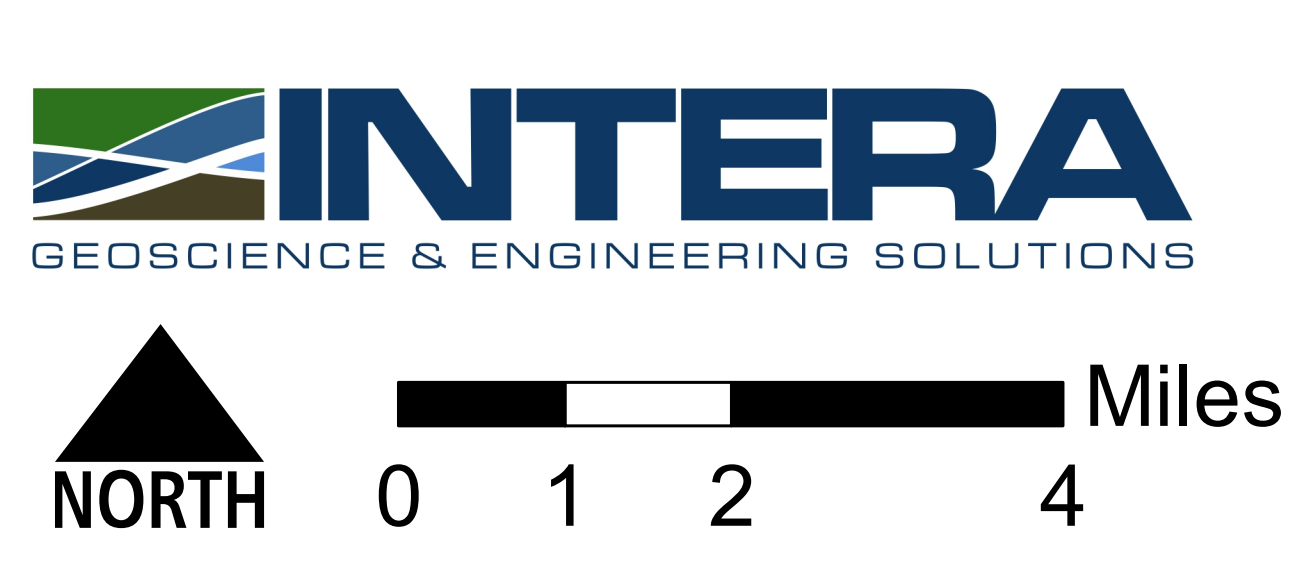
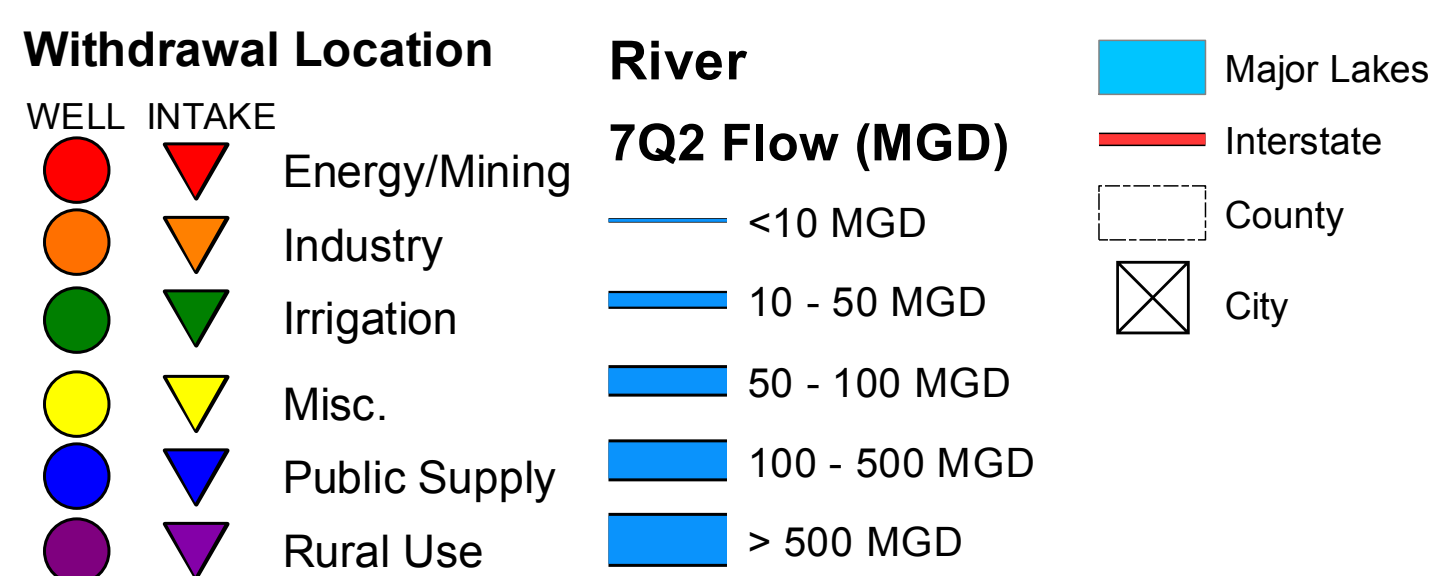
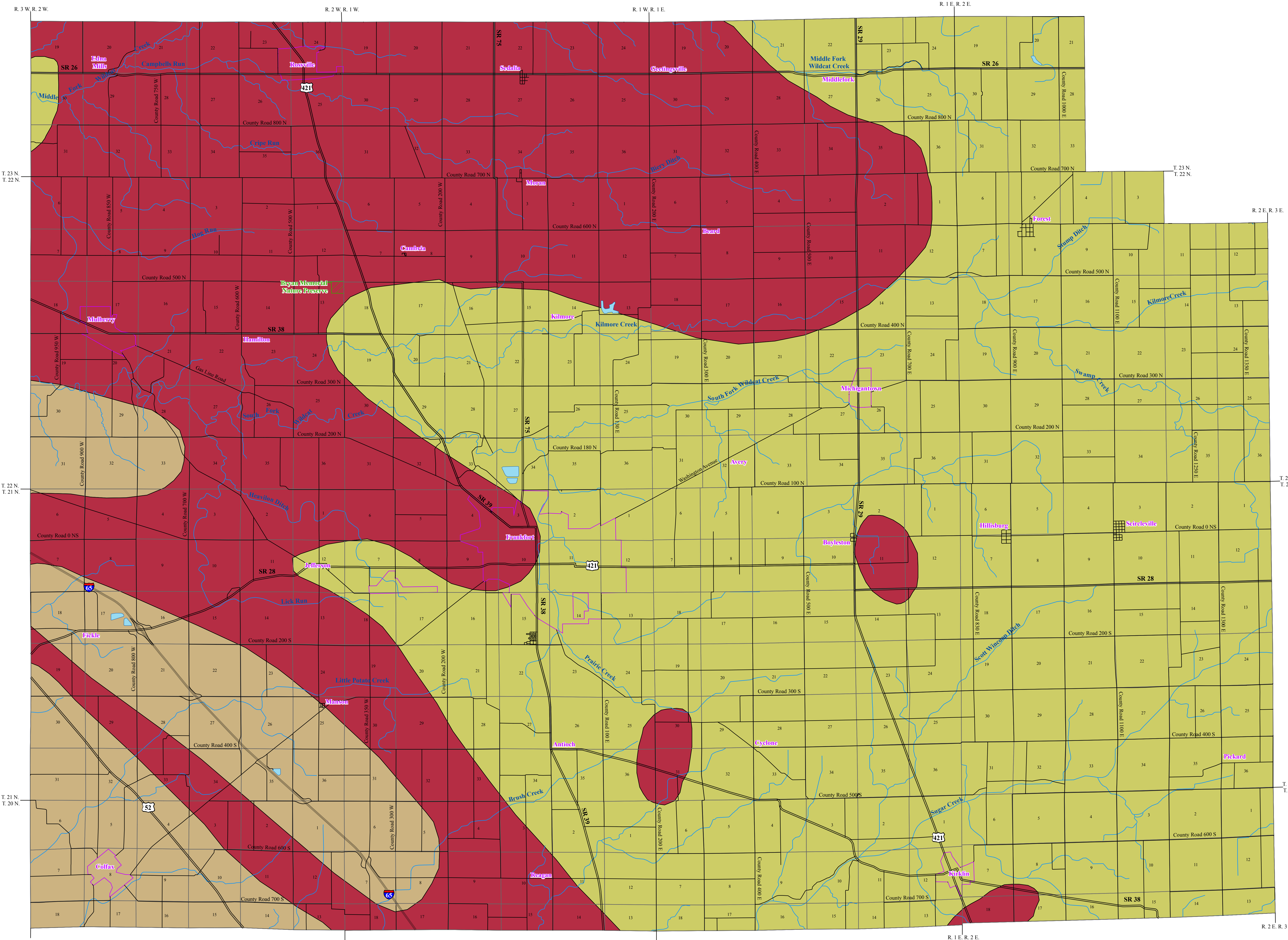


Water Resources and Use in Clinton County

Data Sources: U.S. Geological Survey and Indiana Department of Natural Resources



BEDROCK AQUIFER SYSTEMS OF CLINTON COUNTY, INDIANA



The occurrence of bedrock aquifers depends on the original composition of the rocks and subsequent changes which influence the hydraulic properties. Post-depositional processes, which promote jointing, fracturing, and solution activity of exposed bedrock, generally increase the hydraulic conductivity (permeability) of the upper portion of bedrock aquifer systems. Because permeability in many places is greatest near the bedrock surface, bedrock units within the upper 100 feet are commonly the most productive aquifers.

Bedrock aquifer systems in the county are overlain by unconsolidated deposits of varying thickness, ranging from about 100 feet in the southwestern corner to over 400 feet in the southeastern portion of the county. Most of the bedrock aquifers in the county are under confined conditions. In other words, the potentiometric surface (water level) in most wells completed in bedrock rises above the top of the water-bearing zone.

The yield of a bedrock aquifer depends on its hydraulic characteristics and the nature of the overlying deposits. Shale and glacial till act as aquitards, restricting recharge to underlying bedrock aquifers. However, fracturing and/or jointing may occur in aquitards, which can increase recharge to the underlying aquifers. Hydraulic properties of the bedrock aquifers are highly variable.

Three bedrock aquifer systems are identified for Clinton County. They are, from west to east and younger to older: the Borden Group of Mississippian age, the New Albany Shale of Devonian and Mississippian age, and the Silurian and Devonian Carbonates. Due to unconsolidated deposits bedrock wells represent about four percent of all wells completed in the county.

The susceptibility of bedrock aquifer systems to surface contamination is largely dependent on the type and thickness of the overlying sediments. However, because the bedrock aquifer systems have complex fracturing systems, once a contaminant has been introduced into a bedrock aquifer system, it will be difficult to track and remediate.

Mississippian - Borden Group Aquifer System

The Mississippian age Borden Group subgroups in the southwestern portion of Clinton County. This bedrock aquifer system is composed mostly of siltstone and shale but fine-grained sandstones are common. Carbonates are rare but do occur as discontinuous interbedded limestone lenses, mostly in the upper portion of the group.

The Borden Group in Clinton County is overlain by unconsolidated deposits with a maximum thickness ranging from 100 to 350 feet. There are no reported wells completed in the Borden Group for Clinton County.

Because the Borden Group is generally not very productive, it is typically used only where overlying deposits do not contain aquifer material. The Borden Group is often described as an aquitard and yields of wells completed in it are typically quite limited. Most domestic wells from adjacent counties that were completed in the Borden Group Aquifer System have reported testing rates of less than 5 gallons per minute (gpm).

The Borden Group is composed of primarily fine-grained materials that limit the movement of ground water to fractures, joints, and along the bedrock surface. This, along with the overlying, typically fine-grained clay materials, puts most of the Borden Group Aquifer System in Clinton County at low risk to contamination from the surface or near surface sources.

Devonian and Mississippian - New Albany Shale Aquifer System

The New Albany Shale consists mostly of brownish-black carbon-rich shale, greenish-gray shale, and minor amounts of dolomite and dolomitic quartz sandstone. The New Albany Shale subgroups mostly in the western portion of Clinton County. A few isolated remnants remain in the central and southern part of the county. There are no reported wells completed in the New Albany Shale in Clinton County. Domestic wells either produce from the overlying unconsolidated deposits or penetrate through the shale in favor of the underlying Silurian and Devonian Carbonates.

Because the New Albany Shale is generally not very productive, it is typically used only where overlying deposits do not contain aquifer material. The New Albany Shale is often described as an aquitard, and yields of wells completed in it are typically quite limited. Most domestic wells from adjacent counties that were completed in the New Albany Shale Aquifer System have reported testing rates of less than 5 gpm.

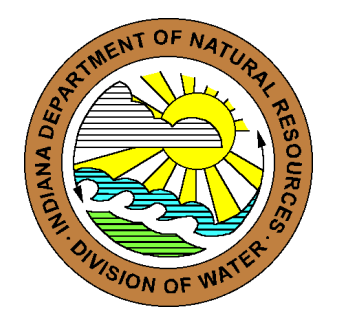
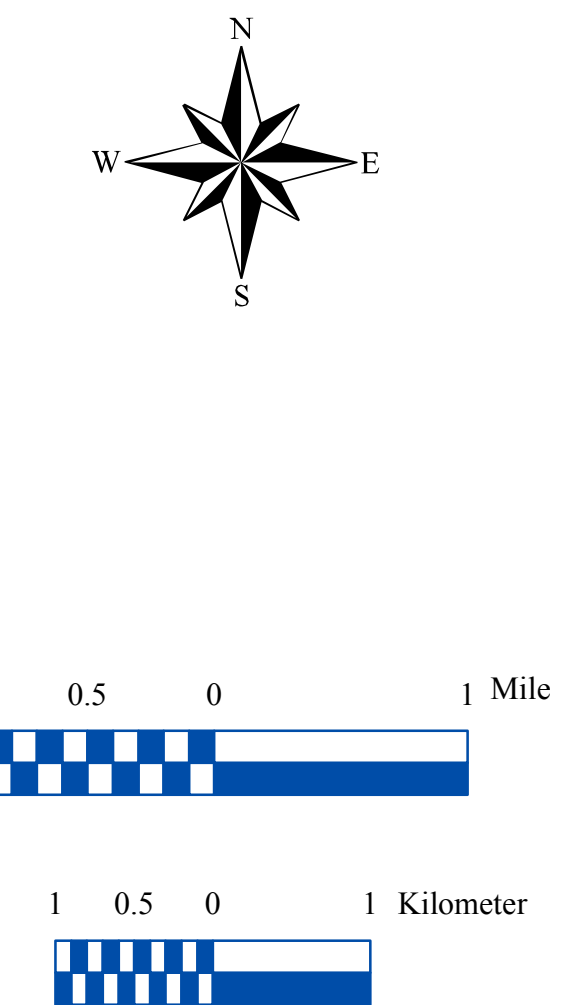
The permeability of shale materials is considered low. The New Albany Shale Aquifer System, therefore, has a low susceptibility to contamination introduced at or near the surface.

Silurian and Devonian Carbonates Aquifer System

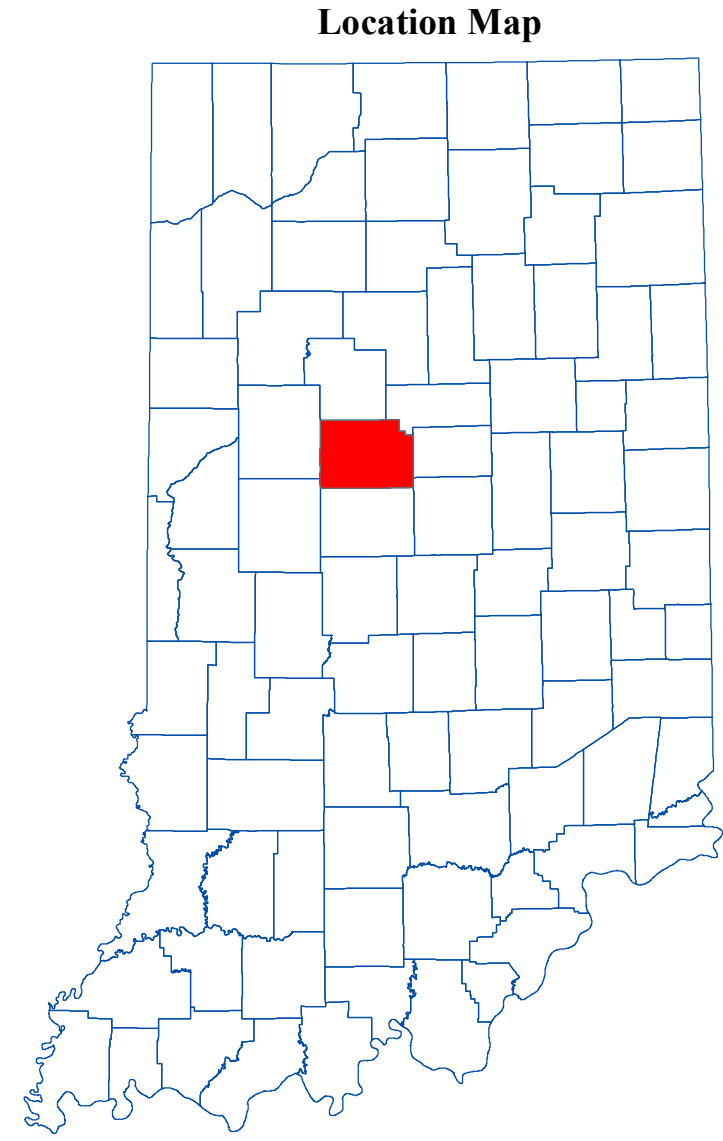
In Clinton County this aquifer system consists primarily of middle Devonian age carbonates of the Muscatatuck Group and underlying Silurian carbonates. It is composed of only Silurian carbonates where Muscatatuck Group rocks have been removed by erosion. Because individual units of the Silurian and Devonian systems consist of similar carbonate rock types and cannot easily be distinguished on the basis of water well records, they are considered as a single water-bearing system.

Wells utilizing the Silurian and Devonian Carbonates Aquifer System in Clinton County have reported depths ranging from 125 to 477 feet, but are commonly 185 to 320 feet deep. The amount of rock penetrated in this system typically ranges from 5 to 85 feet. Water wells completed in this system are generally capable of meeting the needs of domestic users. Typical yields for domestic wells range from 12 to 60 gpm. Static water levels commonly range from 20 to 40 feet below the land surface.

This aquifer system has a low susceptibility to surface contamination due to thick clay deposits over most of the county. However, the Silurian and Devonian Carbonate Aquifer System is moderately to highly susceptible where overlain by sand and gravel and in places where clay aquitards are absent.



- EXPLANATION**
- Stream
 - County Road
 - State Road & US Highway
 - Interstate
 - Municipal Boundary
 - State Managed Property
 - Lake & River



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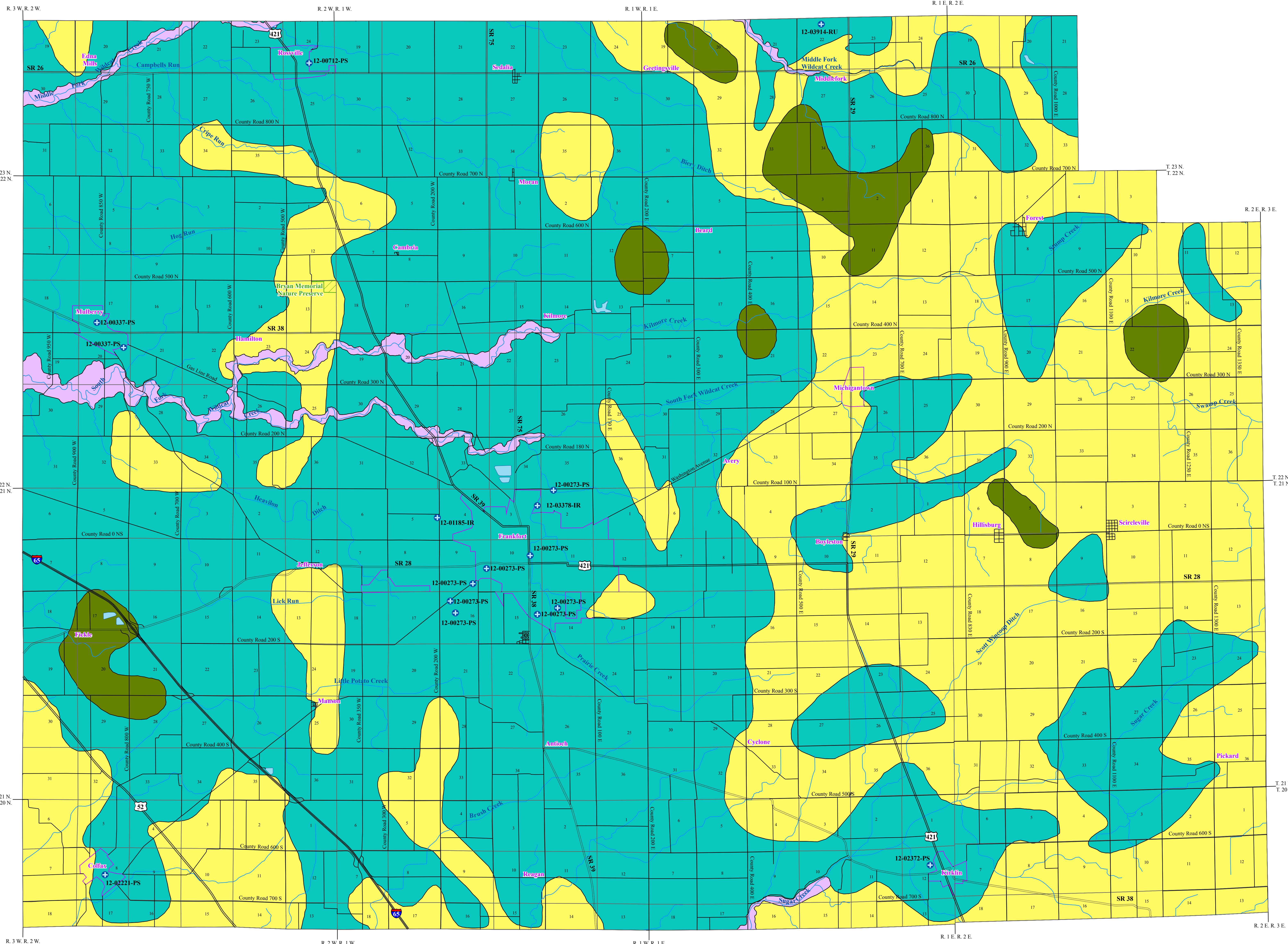
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Bedrock Aquifer Systems of Clinton County, Indiana

by
 Robert A. Scott
 Division of Water, Resource Assessment Section

October 2008

UNCONSOLIDATED AQUIFER SYSTEMS OF CLINTON COUNTY, INDIANA



Four unconsolidated aquifer systems have been mapped in Clinton County: the Tipton Till, the Tipton Complex, the Tipton Complex, and the Wabash River and Tributaries Outwash Subsystem. Boundaries of all aquifer systems described are commonly gradational and individual aquifers may extend across aquifer system boundaries.

The thickness of unconsolidated deposits in Clinton County is quite variable because glacial material has been deposited over an uneven bedrock surface. The thickness of unconsolidated deposits ranges from about 100 feet in the southwestern corner to over 400 feet in the southeastern portion of the county.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably from local reality. Variations within geologic environments can cause variation in susceptibility to surface contamination. In addition, man-made structures such as poorly constructed water wells, unplugged or improperly abandoned wells, and open excavations, can provide contaminant pathways that bypass the naturally protective clays.

Tipton Till Aquifer System

In Clinton County, the unconsolidated thickness of this aquifer system ranges from about 100 feet in the southwestern corner of the county to over 400 feet in the southeastern portion of the county. Wells completed in the Tipton Till Aquifer System are capable of meeting the needs of most domestic users in Clinton County. However, approximately 7 percent of wells started in this system utilize the underlying bedrock aquifer. Saturated aquifer materials include sand and/or gravel deposits that are commonly 5 to 10 feet thick and are generally overlain by 55 to 175 feet of till. Wells producing from the Tipton Till Aquifer System are typically 60 to 180 feet deep. Domestic well capacities are commonly 15 to 50 gallons per minute (gpm). Static water levels generally range from 15 to 30 feet below the surface. There are no registered significant ground-water withdrawal facilities in this system in Clinton County.

Tipton Till Aquifer Subsystem

The subsystem is mapped similar to that of the Tipton Till Aquifer System. However, potential aquifer materials are typically thinner and potential yield is generally less in the subsystem than in the Tipton Till Aquifer System. The unconsolidated material in this subsystem ranges from about 200 to 400 feet thick. Potential aquifer materials include thin intertill sand and gravel deposits. Where present, aquifer materials are typically capped by till that is commonly 50 to 105 feet thick.

Approximately 43 percent of wells started in the Tipton Till Aquifer Subsystem are completed in the underlying bedrock aquifer system in Clinton County. However, this subsystem is capable of meeting the needs of some domestic users in the county. The few wells producing from the Tipton Till Aquifer Subsystem are generally completed at depths of 55 to 110 feet. Intertill sand and gravel aquifer materials are typically 2 to 5 feet thick. Reported well yields generally range from 5 to 10 gpm and static water levels are commonly 10 to 20 feet below the surface. There are no registered significant ground-water withdrawal facilities in this system in Clinton County.

This subsystem is generally not very susceptible to surface contamination because intertill sand and gravel units are overlain by thick tills. However, in some areas where aquifers are shallow and overlying clay deposits are thin, the system is at moderate risk.

Tipton Complex Aquifer System

The Tipton Complex Aquifer System is characterized by unconsolidated deposits that are quite variable in materials and thickness. Aquifers within the system range from thin to thick and include single or multiple intertill sands and gravels. The aquifers are highly variable in depth and lateral extent and are typically confined by thick clay layers. The total unconsolidated thickness of the Tipton Complex Aquifer System generally ranges from about 200 feet to over 400 feet in Clinton County.

This system is capable of meeting the needs of domestic and most high-capacity users in the county. Aquifer layers utilized in the Tipton Complex Aquifer System are generally 5 to 10 feet thick sand and/or gravels. These sands and gravels are overlain by a till cap which is commonly 65 to 190 feet thick with thin intertill sand and gravel layers. Wells in this system are typically completed at depths ranging from 68 to 195 feet. Domestic well yields are commonly 15 to 65 gpm and static water levels are generally 15 to 35 feet below the surface. There are 8 registered significant ground-water withdrawal facilities (29 wells) in this system in Clinton County. High-capacity well yields up to 1200 gpm are reported.

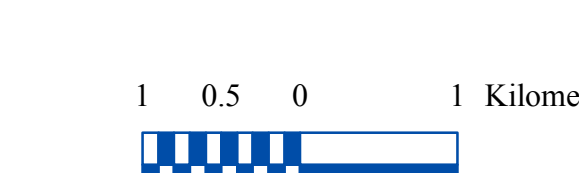
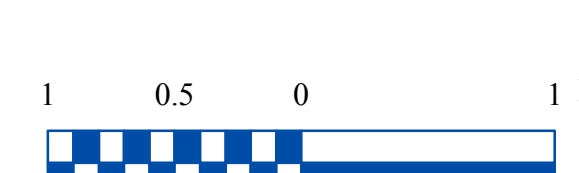
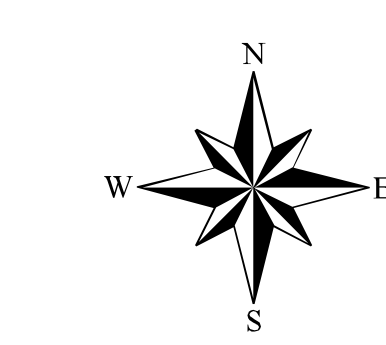
The Tipton Complex Aquifer System is generally not susceptible to contamination because it is typically overlain by thick clay deposits. However, in places surficial clay thickness is thin or not present. These areas are at moderate to high risk to surface contamination.

Wabash River and Tributaries Outwash Aquifer Subsystem

The Wabash River and Tributaries Outwash Aquifer Subsystem is mapped along portions of Middle Fork Wildcat Creek, South Fork Wildcat Creek, Kilmore Creek, and Sugar Creek in Clinton County. The system is made up of thick, glacially derived outwash deposits (sand and gravel).

This subsystem is capable of meeting the needs of domestic and some high-capacity users in the county. The few wells producing from the Wabash River and Tributaries Outwash Aquifer Subsystem are generally completed at depths ranging from 60 to 165 feet below surface with up to 18 feet of continuous sand and gravel. In places, aquifer materials are capped by silt or sandy clay ranging from 4 to 95 feet thick. Domestic wells typically yield 15 to 25 gpm with static water levels commonly 5 to 35 feet below surface. There are no registered significant ground-water withdrawal facilities in this system in Clinton County.

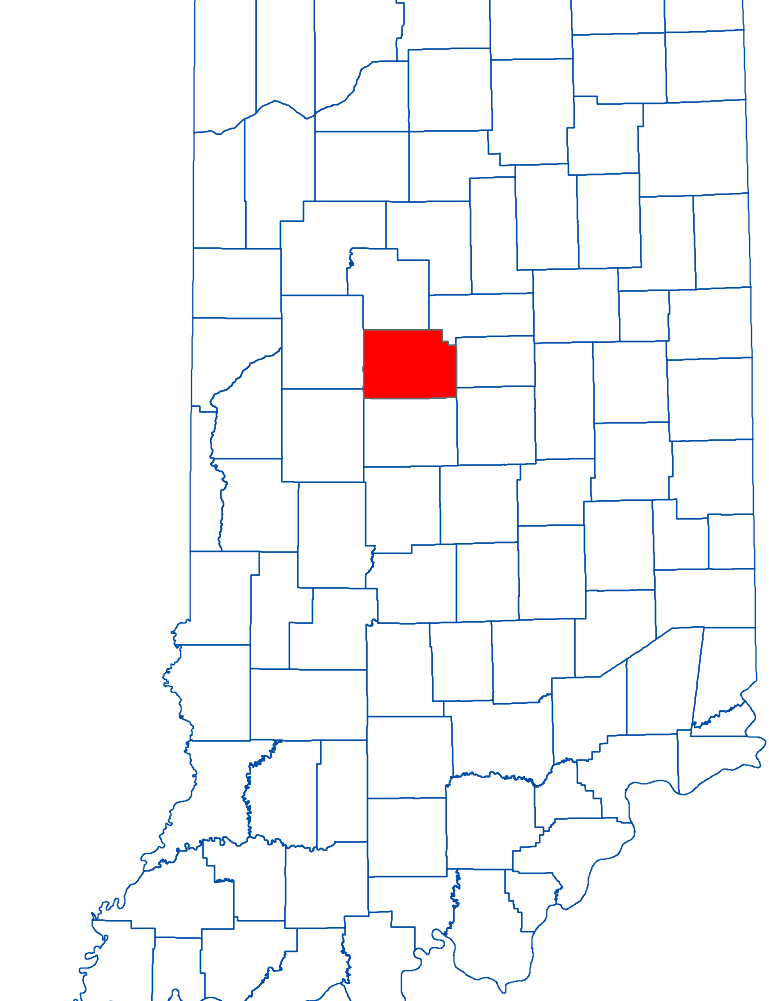
Where overlying clay or silt deposits are present the system is moderately susceptible to surface contamination. However, the few areas that lack overlying clay or silt deposits are highly susceptible to contamination.



EXPLANATION

- Registered Significant Ground-Water Withdrawal Facility
- Stream
- County Road
- State Road & US Highway
- Interstate
- Municipal Boundary
- State Managed Property
- Lake & River

Location Map



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Unconsolidated Aquifer Systems of Clinton County, Indiana

by
Robert A. Scott
Division of Water, Resource Assessment Section

October 2008

Map generated by Scott H. Dean
DNR, Division of Water, Resource Assessment Section

Clinton County

