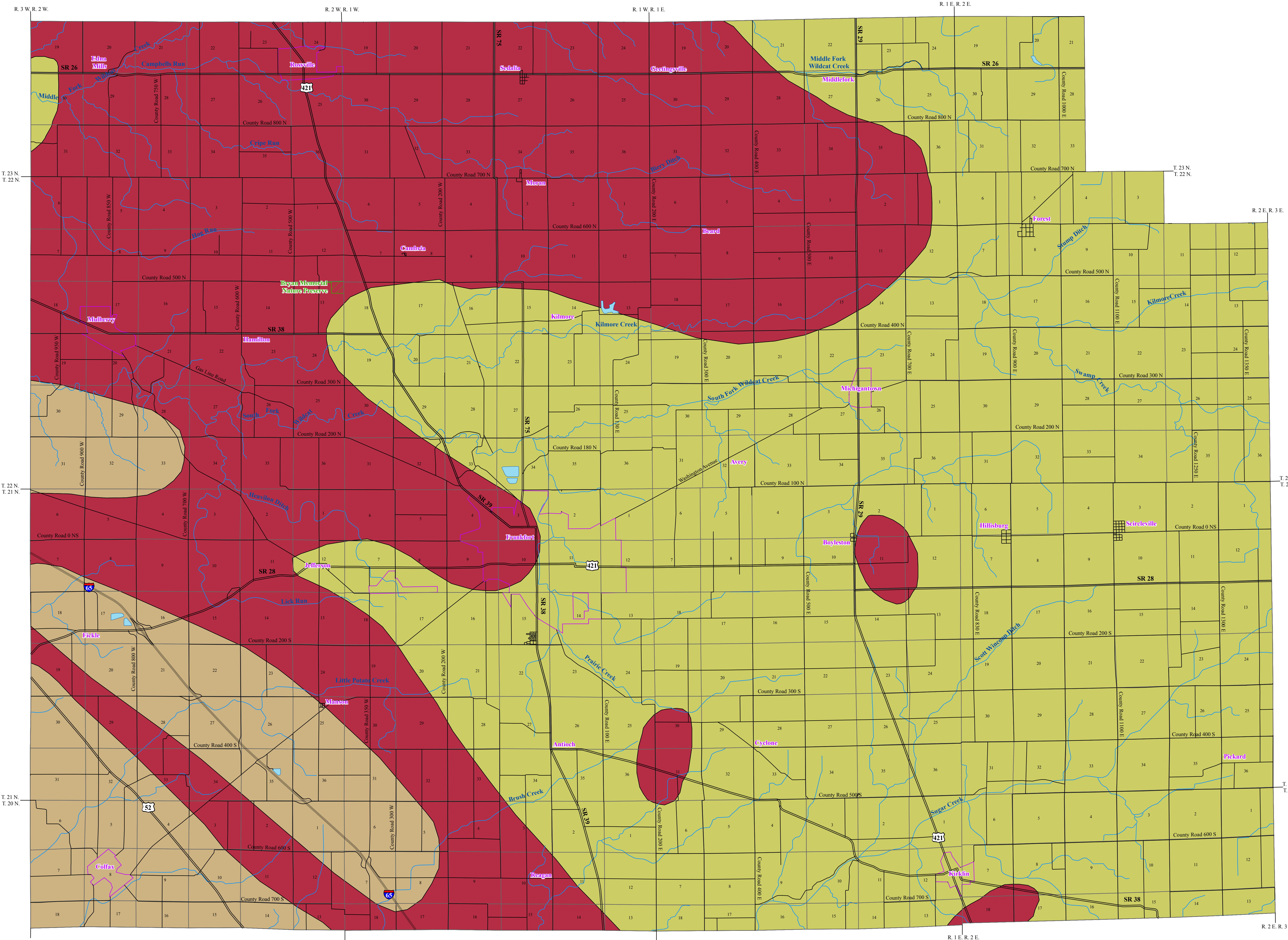


BEDROCK AQUIFER SYSTEMS OF CLINTON COUNTY, INDIANA



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.

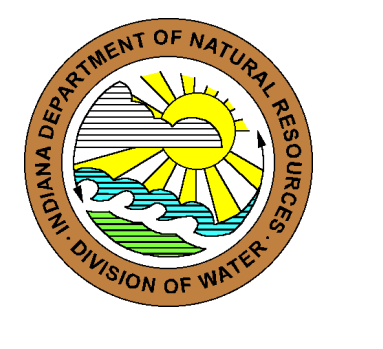
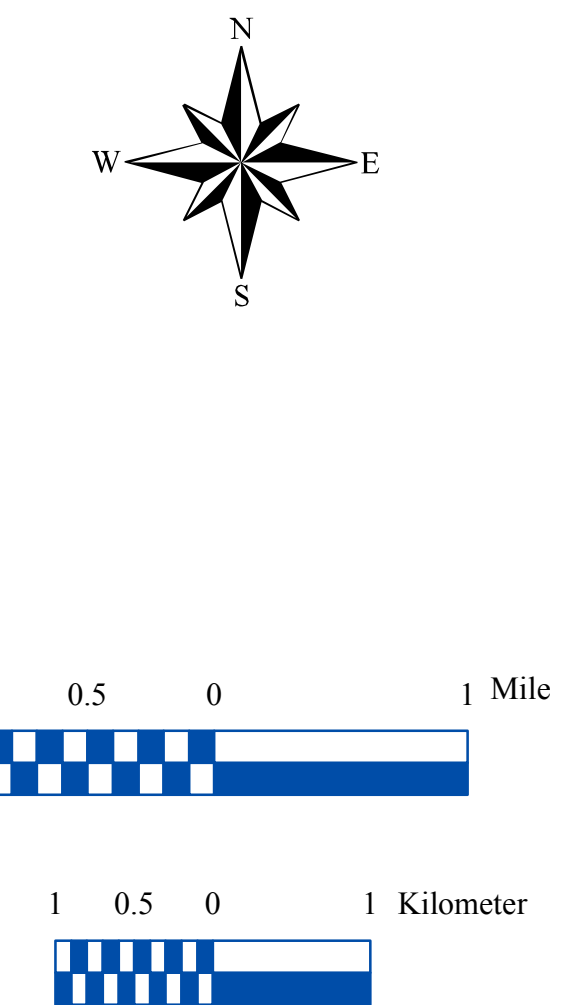
The permeability of shale materials is considered low. The New Albany Shale Aquifer System, therefore, has a low susceptibility to contamination introduced at or near the surface.

Silurian and Devonian Carbonates Aquifer System

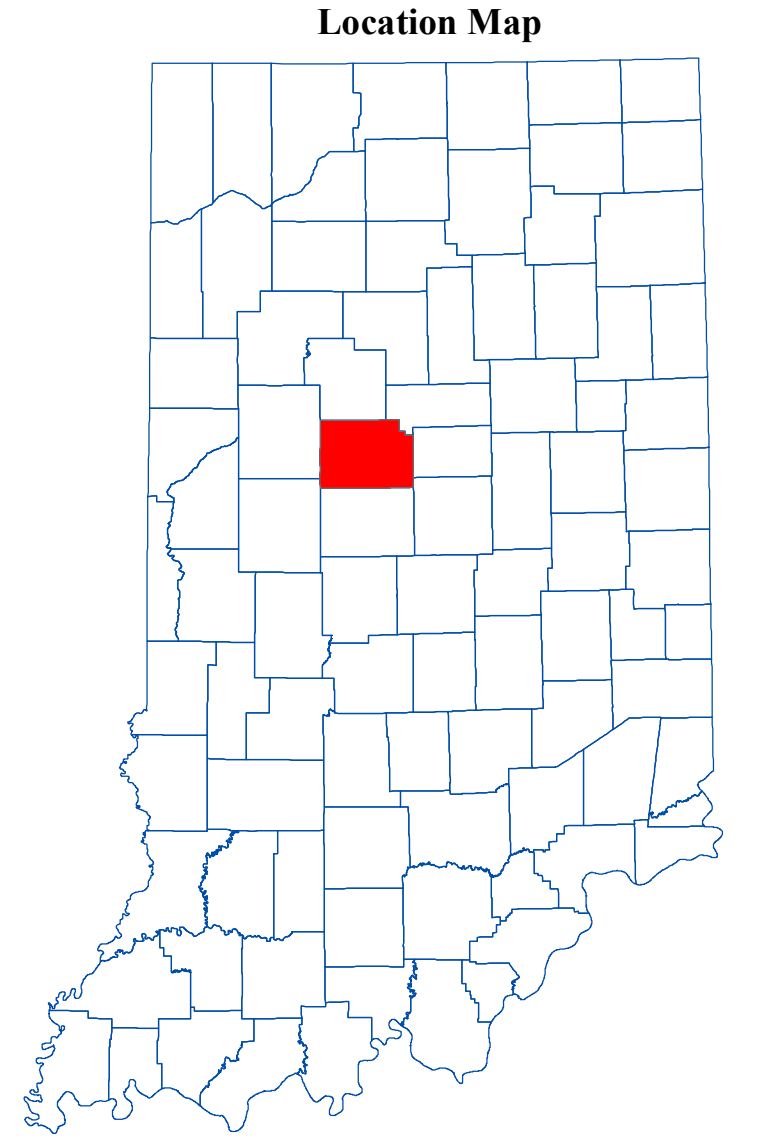
In Clinton County this aquifer system consists primarily of middle Devonian age carbonates of the Muscatatuck Group and underlying Silurian carbonates. It is composed of only Silurian carbonates where Muscatatuck Group rocks have been removed by erosion. Because individual units of the Silurian and Devonian 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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This map was created from several existing shapefiles: Township and Range Lines of Indiana (line shapefile, 20020621); Land Survey Lines of Indiana (polygon shapefile, 20020621) and County Boundaries of Indiana (polygon shapefile, 20020621), were all from the Indiana Geological Survey and based on a 1:24,000 scale, except the Bedrock Geology of Indiana (polygon shapefile, 20020318), which was at a 1:500,000 scale; Draft road shapefiles, System1 and System2 (line shapefiles, 2003), were from the Indiana Department of Transportation and based on a 1:24,000 scale; Populated Areas in Indiana 2000 (polygon shapefile, 20021000) was from the U.S. Census Bureau and based on a 1:100,000 scale; Streams27 (line shapefile, 20000420) was from the Center for Advanced Applications in GIS at Purdue University; Managed Areas 96 (polygon shapefile, various dates) was from IDNR.

Bedrock Aquifer Systems of Clinton County, Indiana

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