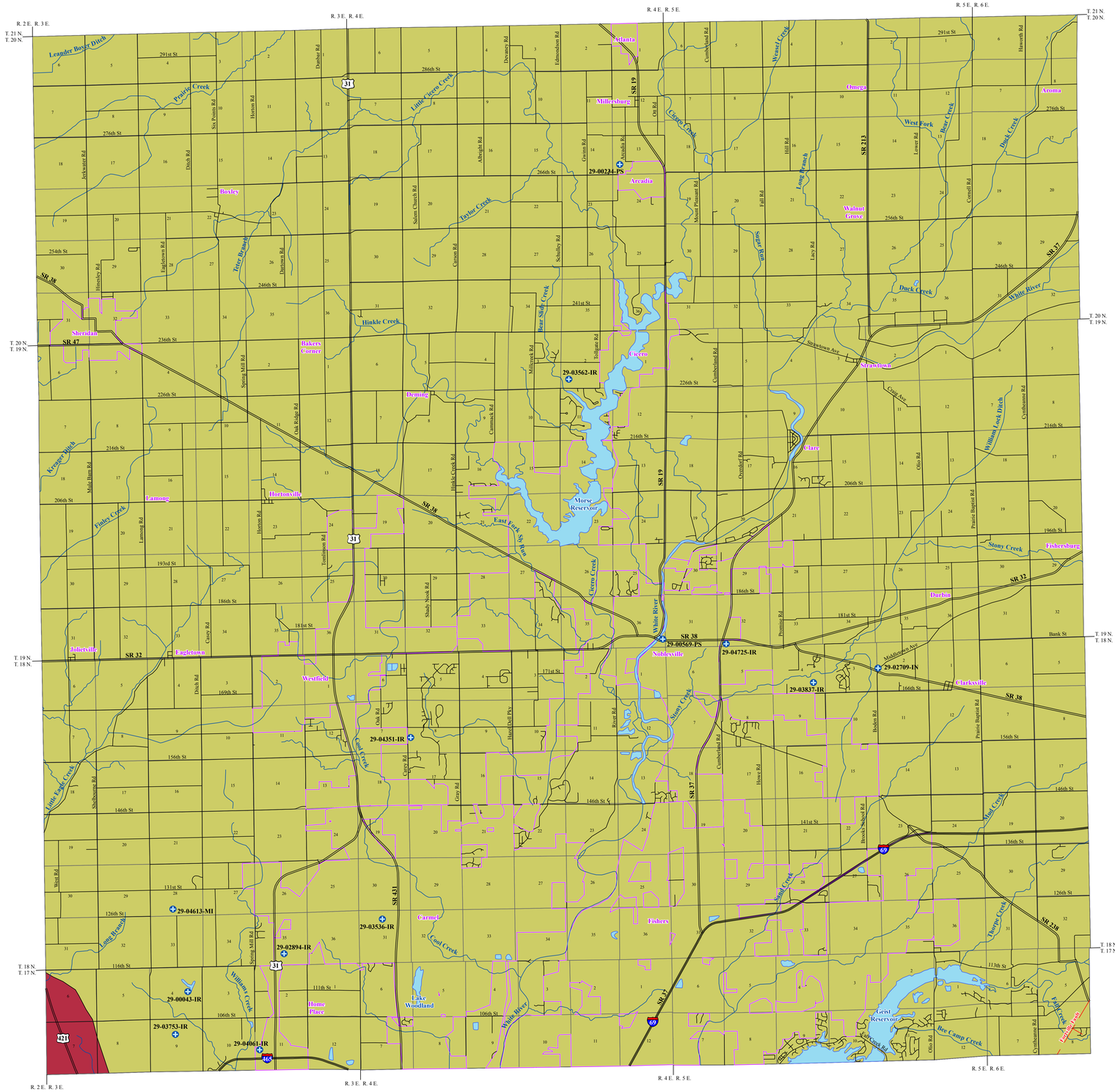
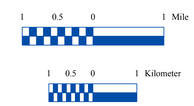
BEDROCK AQUIFER SYSTEMS OF HAMILTON COUNTY, INDIANA





The occurrence of bedrock aquifers depends on the original composition of the geologic material 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 Hamilton County are overlain by unconsolidated deposits of varying thickness ranging from about 5 feet to over 300 feet. Bedrock, in places, is at or near the surface along many streams in the county.

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 bedrock aquifers are highly variable.

Most bedrock aquifers in the county are under confined conditions, mainly a result of low vertical hydraulic conductivity clay-rich materials, such as glacial till, overlying the bedrock. Therefore, the potentiometric surface (water level) in most wells completed in bedrock rises above the top of the water-bearing zone.

Two bedrock aquifer systems are identified for Hamilton County. They are, from younger to older; the New Albany Shale of Devonian and Mississippian age, and the Silurian and Devonian Carbonates. Bedrock aquifers are fairly productive in this county. Bedrock wells represent approximately 25 percent of all wells completed in Hamilton County.

The susceptibility of bedrock aquifer systems to surface contamination is largely dependent on the type and thickness of the overlying sediments. 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.

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 subcrops in a relatively small area in the southwestern corner of Hamilton County. There are no reported wells completed in the New Albany Shale in Hamilton 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 gallons per minute (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 Hamilton County, Silurian and Devonian Carbonates Aquifer System subcrops throughout nearly all of Hamilton County. The total thickness of this system in the county ranges up to 450 feet.

In Hamilton County, wells penetrating the Silurian and Devonian Carbonates Aquifer System have reported depths ranging from 25 to 300 feet, but are commonly 80 to 240 feet deep. The amount of rock penetrated in this system typically ranges from 20 to 145 feet.

Wells utilizing the Silurian and Devonian Carbonates Aquifer System are generally capable of meeting the needs of domestic users and some high-capacity users in this county. Domestic well yields commonly range from 10 to 30 gpm. Static water levels typically range from 10 to 45 feet below the land surface. A few flowing wells have been reported for this bedrock aquifer system in the county. There are 12 registered significant groundwater withdrawal facilities (20 wells) utilizing the Silurian and Devonian Carbonates Aquifer System in Hamilton County. High-capacity well depths range from approximately 65 to 550 feet below the land surface. Reported high-capacity well yields range from about 100 gpm to nearly 700 gpm.

This aquifer system is generally not very susceptible to surface contamination due to thick clay deposits over most of the county. However, solution features (caves) are described in a few well records suggesting minor karst development and there are localized areas, especially near the White River, where the bedrock surface is shallow. These areas, therefore, are at moderate to high risk to contamination.

EXPLANATION

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

Location Map

Map generated by Scott H. Dean
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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.

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