

Bedrock Aquifer Systems of Shelby County, Indiana

by
Gregory P. Schrader
Division of Water, Resource Assessment Section
October 2005

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. In Shelby County, rock types exposed at the bedrock surface are moderately productive limestones and dolomites with varying amounts of interbedded shales to poorly productive shale.

Bedrock aquifer systems in the county are overlain by unconsolidated deposits of varying thickness. 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.

Two bedrock aquifer systems are identified for Shelby County. They are, from west to east and younger to older: New Albany Shale of Devonian and Mississippian age and the Silurian and Devonian Carbonates. Bedrock aquifers are not highly productive in this county. However, bedrock wells represent about 30% of all wells completed in the county.

The quality of water in bedrock aquifer systems in this county is generally acceptable for domestic use. The susceptibility of bedrock aquifer systems to surface contamination is largely dependent on the type and thickness of the overlying sediments. Just as recharge for bedrock aquifers cannot exceed that of overlying unconsolidated deposits, susceptibility to surface contamination will not exceed that of overlying deposits. 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.

Devonian and Mississippian -- New Albany Shale Aquifer System

The New Albany Shale consists mostly of brownish-black carbon-rich shale, greenish-gray shale, along with minor amounts of dolomite and dolomitic quartz sandstone. In Shelby County,

the New Albany Shale has a maximum thickness of about 20 feet, an areal extent of less than 3 square miles, and is only present in the extreme southwestern part of the county.

This aquifer system is considered a poor ground-water resource and is generally described as an aquitard. No wells penetrating the New Albany Shale in the county have been reported. The few known wells in this area utilize the prolific unconsolidated sand and gravel aquifers overlying the New Albany Shale. 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 Shelby 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 in buried pre-glacial valleys where Muscatatuck Group rocks have been removed by erosion. Because individual units of the Silurian and Devonian systems are composed 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. Total thickness of the Silurian and Devonian Carbonates Aquifer System in Shelby County ranges from about 100 to 200 feet.

Wells utilizing the Silurian and Devonian Carbonates Aquifer System in Shelby County have reported depths ranging from 20 to 300 feet, but are commonly 55 to 175 feet deep. The amount of rock penetrated in this system typically ranges from 15 to 50 feet. Water wells completed in this system are generally capable of meeting the needs of domestic users and some high-capacity users in this county. Typical yields for domestic wells range from 5 to 15 gallons per minute (gpm). Static water levels typically range from 10 to 30 feet below 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 unconsolidated deposits composed primarily of sand and gravel outwash materials and in places where clay aquitards are absent.

Registered Significant Ground-Water Withdrawal Facilities

There is one registered significant ground-water withdrawal facility (total of 1 well) using bedrock aquifers in the county. This industrial well taps the Silurian and Devonian Carbonates Aquifer System and has a reported capacity of 100 gpm. Refer to Table 1 for some details on the well and to the map for the facility location.

Map Use and Disclaimer Statement

We request that the following agency be acknowledged in products derived from this map:
Indiana Department of Natural Resources, Division of Water.

This map was compiled by staff of the Indiana Department of Natural Resources, Division of Water using data believed to be reasonably accurate. However, a degree of error is inherent in all maps. This product is distributed “as is” without warranties of any kind, either expressed or implied. This map is intended for use only at the published scale.