

Bedrock Aquifer Systems of Pulaski County, Indiana

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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.

Unconsolidated deposits of varying thickness overlie bedrock aquifer systems in Pulaski County. Thickness of unconsolidated deposits ranges from less than 5 feet to 235 feet. Most of the bedrock aquifers, therefore, 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 formation.

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.

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.

Two bedrock aquifer systems are identified for Pulaski County. They are the Devonian and Mississippian Coldwater, Ellsworth and Antrim Shales; and the Silurian and Devonian Carbonates.

Devonian and Mississippian -- Coldwater, Ellsworth and Antrim Shales Aquifer System

In Pulaski County only the Antrim Shale subcrops in the Coldwater, Ellsworth and Antrim Shales Aquifer System. The Antrim Shale in Indiana is typically described as brownish-black shale and is commonly considered an aquitard. Therefore, the system is an extremely limited ground-water resource. However, in some places the lower portion of the Antrim Shale may contain some limestone.

The subcrop area for the Antrim Shale includes the northwestern corner of Pulaski County along with a small area near the north-central county boundary. Depth to bedrock generally ranges from 45 to 112 feet. In general, reported thickness of the Antrim Shale in the subcrop area ranges from 1 to 50 feet.

In Pulaski County only one well (dry hole) is reported in the Coldwater, Ellsworth and Antrim Shales Aquifer System. Many 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 permeability of shale materials is considered low and the overlying unconsolidated deposits are thick, susceptibility to contamination introduced at or near the surface is low.

Silurian and Devonian Carbonates Aquifer System

The Silurian and Devonian Carbonates Aquifer System subcrops over most of Pulaski County. The system includes Silurian age carbonate rock units of the Wabash Formation and Devonian age carbonate units of the Muscatatuck Group. Total thickness of the Silurian bedrock is up to 500 feet. Total thickness of the Devonian bedrock generally ranges from 50 to 75 feet. Depth to the bedrock surface ranges from about 5 to 235 feet.

The Silurian and Devonian Carbonates Aquifer System is capable of meeting the needs of domestic and some high-capacity users. Total well depths range from 40 to 500 feet with typical penetration into bedrock ranging from 15 to 110 feet. Domestic yields generally range from 5 to 65 gallons per minute (gpm) with static water levels ranging from 4 to 20 feet. There are 29 registered significant ground-water withdrawal facilities (45 wells) utilizing the Silurian and Devonian Carbonates Aquifer System with reported yields of individual wells ranging from 90 to 1400 gpm.

Most of the Silurian and Devonian Carbonates Aquifer System in Pulaski County is overlain by thick clay deposits. These areas are generally considered at low risk to contamination. However, areas to the southwest where outwash materials directly overlie shallow bedrock are at high risk to contamination.

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