

Bedrock Aquifer Systems of DeKalb 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.

Two bedrock aquifer systems are identified for DeKalb County: the Devonian and Mississippian age Coldwater, Ellsworth, and Antrim Shales; and the Silurian and Devonian Carbonates. Unproductive shales subcrop over nearly the entire county and thicken from south to north. A relatively small area of carbonate bedrock subcrops in southwestern DeKalb County and underlies the shale in the remainder of the county.

DeKalb County has a complex glacial history and was subjected to multiple glacial advances from the north, northeast, and east resulting in glacial sediment deposits completely covering the county. The thickness of unconsolidated sediments ranges from over 400 feet in northern DeKalb County to approximately 150 feet in the southeastern corner of the county. Major sand and gravel aquifers occur in these thick unconsolidated deposits overlying the bedrock. There are no known water wells utilizing bedrock aquifers in DeKalb 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 the bedrock aquifers are highly variable. 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 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 -- Coldwater, Ellsworth, and Antrim Shales Aquifer System

The Coldwater, Ellsworth, and Antrim Shales Aquifer System subcrops throughout nearly the entirety of DeKalb County; it is absent only in a relatively small area along the southwestern Allen County border. Oil and gas records show that the shales attain a thickness of over 200 feet near the center of the county and thicken to about 300 feet to the north. These shales are commonly considered an aquitard; therefore, the system is an extremely limited ground-water resource.

This system is overlain by unconsolidated deposits ranging in thickness from 150 feet to over 400 feet. Because of the availability of the overlying unconsolidated resources, no water wells have been completed in the Coldwater, Ellsworth, and Antrim Shales Aquifer System in DeKalb County.

Since 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 along a small area of the southwestern county border. This aquifer system consists of the middle Devonian age Muscatatuck Group. 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.

No wells have been completed in the Silurian and Devonian Carbonates Aquifer System in DeKalb County because of the availability of the overlying sand and gravel aquifers. Wells completed in the Silurian and Devonian Carbonates Aquifer System in adjoining Allen County to the south are generally capable of meeting the needs of most domestic and some high-capacity users. Reported yields for domestic wells are commonly 10 to 100 gallons per minute (gpm) and static water levels are 23 to 55 feet below the land surface. High-capacity well yields range from 80 to 1500 gpm.

In DeKalb County, the Silurian and Devonian Carbonates Aquifer System has a low susceptibility to surface contamination because thick clay deposits overlie the system.

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