

Bedrock Aquifer Systems of Grant 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.

Bedrock aquifer systems in the county are overlain by unconsolidated deposits of varying thickness. Bedrock depth ranges from 50 feet or less below the surface on the western portion of the county to more than 450 feet below the surface in the buried bedrock valley that cuts across the northeastern portion of Grant County. However, throughout much of Grant County bedrock is commonly 100 to 200 feet below the surface. 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 Grant County. They are, from younger to older: the Silurian and Devonian Carbonates, and the Maquoketa Group of Ordovician age. Bedrock wells represent about 50 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.

Silurian and Devonian Carbonates Aquifer System

The Silurian and Devonian Carbonates Aquifer System subcrops throughout much of Grant County. This aquifer system consists exclusively of Silurian age carbonates in Grant County. 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 completed in the Silurian and Devonian Carbonates Aquifer System are generally capable of meeting the needs of domestic and some high-capacity users in Grant County. Domestic wells utilizing this system have reported depths ranging from 30 to 497 feet, but are typically 90 to 220 feet deep. The amount of rock penetrated in this system commonly ranges from 30 to 150 feet. Typical yields for domestic wells range from 12 to 40 gallons per minute (gpm) and static water levels are generally 20 to 55 feet below land surface. There are 14 registered significant ground-water withdrawal facilities (29 wells) with reported yields from 15 to 550 gpm.

In most of Grant County the Silurian and Devonian Carbonates Aquifer System has a low susceptibility to surface contamination because it is overlain by thick clay deposits. However, solution features (caves) are described on a few well records suggesting minor karst development. Therefore, areas where overlying clays are thin or absent are at moderate to high risk to contamination.

Ordovician -- Maquoketa Group Aquifer System

In Grant County, the Maquoketa Group subcrops only in the buried pre-glacial valley where the overlying Silurian and Devonian bedrock has been removed by erosion. The Maquoketa Group consists mostly of shale with interbedded limestone units. In general, this system ranges from 650 to 750 feet thick in the county. However, no known wells utilize this aquifer system in Grant County because the Maquoketa Group lies about 250 to 450 feet below the ground surface and adequate water supplies are typically found in the overlying unconsolidated deposits or in the Silurian and Devonian Carbonates, where present. This aquifer system has a low susceptibility to surface contamination because thick clay deposits cover the subcrop area.

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