Bedrock Aquifer Systems of Blackford 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. In places, along the Salamonie River near Montpelier, bedrock lies within 10 feet of the surface. However, the bedrock surface is buried beneath more than 400 feet of unconsolidated materials in the deepest parts of the bedrock valley which cuts across northern Blackford County. 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.

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 Blackford County. They are, from younger to older: the Silurian and Devonian Carbonates and the Maquoketa Group of Ordovician age.

Silurian and Devonian Carbonates Aquifer System

The Silurian and Devonian Carbonates Aquifer System outcrops/subcrops throughout much of Blackford County. This aquifer system consists exclusively of Silurian age carbonates in Blackford County because Devonian age rocks are not present. Total thickness of this aquifer system ranges from 0 to about 250 feet.

Wells completed in 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

wells utilizing this system in Blackford County have reported depths ranging from 30 to 397 feet, but are typically 105 to 200 feet deep. The amount of rock penetrated in this system commonly ranges from 35 to 90 feet. Typical yields for domestic wells range from 10 to 25 gallons per minute (gpm) and static water levels are generally 25 to 55 feet below land surface. There are 5 registered significant ground-water withdrawal facilities (8 wells) with reported yields from 30 to 645 gpm.

In most of Blackford 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 Blackford County, the Maquoketa Group subcrops in the buried pre-glacial valleys where the overlying Silurian and Devonian bedrock has been removed by erosion. The Maquoketa Group consists mostly of shales with interbedded limestone units. This system is approximately 650 to 750 feet thick in the county. However, no known wells utilize this aquifer system in Blackford County because the Maquoketa Group lies about 200 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.

Registered Significant Ground-Water Withdrawal Facilities

There are 5 registered significant ground-water withdrawal facilities (total of 8 wells) using bedrock aquifers in the county. All of these wells tap the Silurian and Devonian Carbonates Aquifer System. Reported capacities for individual wells range from 30 to 645 gpm. Refer to the table for some details on the individual wells and to the map for the facility locations.

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