Bedrock Aquifer Systems of Whitley County, Indiana

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July 2007

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 Whitley County. 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. Thickness of unconsolidated deposits in Whitley County ranges from approximately 70 feet in the southern half of the county to as much as 360 feet to the north.

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 Whitley 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 Whitley County only the Antrim Shale subcrops in the Coldwater, Ellsworth and Antrim Shales Aquifer System. The subcrop area for the Antrim Shale is present along portions of the northern third and a small area of central Whitley County. Shale is commonly described as an aquitard and, therefore, the system is an extremely limited ground-water resource.

The Antrim Shale in Whitley County is up to 85 feet thick and generally increases in thickness to the north. This aquifer system consists mostly of brownish-black to greenish carbon-rich shale. Depth to bedrock is up to 360 feet.

Due to the availability of the overlying unconsolidated resources no known wells have been completed in the Coldwater, Ellsworth and Antrim Shales Aquifer System in Whitley County. However, a few domestic wells have been completed in equivalent deposits (New Albany Shale Aquifer System) in southern portions of Indiana. Typical yields are 5 gallons per minute (gpm) or less with some dry holes reported.

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 is extensive throughout nearly all of Whitley County. The system includes Silurian and Devonian age carbonate rock units (limestone and dolomite) with some interbedded shale units. Total thickness of the Silurian bedrock is up to 550 feet. Total thickness of Devonian bedrock is up to 125 feet. Depth to the bedrock surface ranges from about 70 to 385 feet but is commonly 165 to 230 feet. Total well depths range from 115 to 520 feet but are typically 210 to 290 feet with penetration into bedrock commonly 25 to 75 feet.

This system in Whitley County is capable of meeting the needs of domestic and some high-capacity users. Typical domestic yields range from 15 to 25 gpm. Static water levels range from 15 to 220 feet but are commonly 35 to 60 feet. There are 4 registered significant ground-water withdrawal facilities (9 wells) with yields that range from 80 to 1940 gpm.

Most of the Silurian and Devonian Carbonates Aquifer System in Whitley County is overlain by thick clay deposits. This aquifer system is generally considered at low risk to contamination. However, near the Eel River, bedrock is overlain by alluvial and outwash deposits with intermittent clay. These areas, therefore, are at moderate to high risk to contamination.

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