

# **Bedrock Aquifer Systems of Union County, Indiana**

By

Randal D. Maier

Division of Water, Resource Assessment Section

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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.

In Union County thickness of unconsolidated deposits overlying bedrock ranges from less than 4 feet in the south-central part of the county and along portions of the east edge of the East Fork Whitewater River Valley, to as much as 214 feet in the central part of the county where a buried bedrock valley is present.

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 Union County. They are the Silurian and Devonian Carbonates and the Ordovician Maquoketa Group. Approximately 33 percent of all located wells in Union County are completed in bedrock.

## **Silurian and Devonian Carbonates Aquifer System**

The Silurian and Devonian Carbonates Aquifer System subcrops along small portions of northwestern and northeastern Union County. In this county only the older Silurian age carbonates are present.

Due to the availability of overlying unconsolidated deposits and the limited extent of the bedrock aquifer system, very few wells are reported in this system in Union County. Depth to the bedrock surface ranges from 60 to 123 feet with reported total well depths of 85 to 161 feet. Well yields of 1 and 10 gallons per minute (gpm) along with one dry hole have been reported. Static water levels are reported at 14 and 40 feet below surface.

Most of the Silurian and Devonian Carbonates Aquifer System in Union County is overlain by thick clay deposits. These areas are considered at low risk to contamination.

### **Ordovician -- Maquoketa Group Aquifer System**

The outcrop/subcrop area of the Maquoketa Group includes nearly all of Union County. The Maquoketa Group consists of the Kope, the Dillsboro, and the Whitewater Formations. However, in Union County, only the Dillsboro and Whitewater Formations are present. This bedrock aquifer system includes mostly shale with some interbedded limestone units.

In Union County depth to the bedrock surface ranges from 4 to 214 feet but is typically 20 to 75 feet. Total well depths are commonly 25 to 100 feet. The amount of penetration into the Maquoketa Group ranges from 1 to 212 feet. The Maquoketa Group is considered a limited groundwater resource. Well yields vary widely from 1 to 60 gpm with static water levels of 1 to 93 feet below surface. However, wells showing greater yields are commonly associated with significant to complete drawdowns and dry holes are reported.

Most of the Maquoketa Group Aquifer System in Union County is overlain by thick clay deposits. These areas are considered at low risk to contamination. However, in some places clay deposits are thin and/or sands and gravels directly overlie the bedrock surface. These areas are considered at high risk to contamination.

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