

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

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The occurrence of bedrock aquifers depends on the original composition of the geologic material 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.

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 bedrock aquifers are highly variable.

Most bedrock aquifers are under confined conditions, mainly a result of low vertical hydraulic conductivity clay-rich materials, such as glacial till, overlying the bedrock. Therefore, 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.

Two bedrock aquifer systems are identified for Franklin County. They are, from west to east and younger to older: the Silurian and Devonian Carbonates; and the Maquoketa Group of Ordovician age. Bedrock aquifer systems in Franklin County are overlain by unconsolidated deposits ranging in thickness from about 3 to 110 feet throughout the county.

The unconsolidated sand and gravel outwash aquifers near the Whitewater River have far greater groundwater potential than any of the bedrock aquifers in the county. However, bedrock aquifers are widely used in Franklin County where unconsolidated sediments are relatively thin and unproductive. Approximately 44 percent of all wells in this county are completed in bedrock. There are no registered significant groundwater withdrawal facilities utilizing bedrock aquifers in this county.

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

In Franklin County the Silurian and Devonian Carbonates Aquifer System is located in much of the west and northwest portions of the county, and consists only of the older Silurian age carbonates.

Wells completed in the Silurian and Devonian Carbonates Aquifer System are generally capable of meeting the needs of most domestic users. The depth to bedrock is commonly 45 to 75 feet. Domestic wells utilizing this system in Franklin County have reported depths ranging from 27 to 150 feet, but are commonly 60 to 110 feet deep. The amount of rock penetrated in this system ranges from 6 to 70 feet. Typical yields for domestic wells range from 4 to 12 gallons per minute (gpm), and static water levels are generally 10 to 25 feet below land surface. However, a few dry holes have also been reported.

This aquifer system has a low susceptibility to surface contamination due to thick clay deposits over most of the county. However, the Silurian and Devonian Carbonates Aquifer System is moderately susceptible where overlying clay-rich till and residuum are thin or absent.

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

The Maquoketa Group includes nearly all of Franklin County. The Maquoketa Group consists in ascending order of the Kope, Dillsboro, and Whitewater Formations. This bedrock aquifer system includes mostly shale with some interbedded limestone units and is considered a limited groundwater resource.

In Franklin County, depth to the bedrock surface ranges from 3 to 117 feet with reported total well depths between 25 to 195 feet; however, wells are typically constructed at depths between 35 and 90 feet. The amount of rock penetrated by these wells is commonly 10 to 60 feet with a maximum penetration of 170 feet. Well yields vary from about 1 to 12 gpm with static water levels ranging from flowing to 72 feet below surface.

Most of the Maquoketa Group Aquifer System in Franklin County is overlain by thick clay deposits. These areas are considered at low risk to contamination. However, in some places clay and residuum 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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