

# **Bedrock Aquifer Systems of Hendricks 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 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 within Hendricks County. They are, from youngest to oldest: the Borden Group of Mississippian age, and the New Albany Shale of Devonian and Mississippian age. Bedrock aquifer systems in Hendricks County are overlain by unconsolidated deposits ranging in thickness from outcropping primarily in the south and southwestern portions of the county to over 275 feet in the buried valleys. Approximately 36 percent of all wells in this county are completed in bedrock.

## **Mississippian -- Borden Group Aquifer System**

The Borden Group outcrops/subcrops in nearly the entire county. This bedrock aquifer system is composed mostly of sandstone, siltstone, mudstone and shale. Although carbonates are somewhat rare, discontinuous interbedded limestone lenses are present. The Borden Group in Hendricks County is overlain by unconsolidated deposits up to 275 feet in thickness; however, there are areas where the bedrock is exposed at the surface.

The Borden Group is composed primarily of fine-grained materials that limit the movement of groundwater to fractures, joints, and along the bedrock surface. This aquifer system is often described as an aquitard, and yields of wells completed in it are typically quite limited. Because the Borden Group is generally not very productive, most wells produce either from the overlying unconsolidated deposits or penetrate through the sandstone, siltstone, mudstone and shale in favor of the underlying carbonates.

Wells in this system are completed at depths ranging from approximately 30 to 500 feet. Domestic well yields range from 2 to 100 gallons per minute (gpm) with some dry holes reported. Static water levels range from flowing to about 225 feet below surface. There are two registered significant groundwater withdrawal facilities (7 wells) using the Borden Group Aquifer System. These facilities are used for public water supply and irrigation.

Where bedrock is shallow, risk to contamination from the surface or near surface sources is high. Where the overlying sediment consists of thick fine-grained clay materials, the Borden Group Aquifer System in Hendricks County is at low risk to contamination from the surface or near surface sources.

### **Devonian and Mississippian -- New Albany Shale Aquifer System**

The New Albany Shale subcrops in a relatively small portion of northeastern Hendricks County and consists mostly of brownish-black carbon-rich shale, greenish-gray shale, and minor amounts of dolomite and dolomitic quartz sandstone. The New Albany Shale is often described as an aquitard, and yields of wells completed in it are typically quite limited. Therefore, most wells either produce from the overlying unconsolidated deposits or penetrate through the shale in favor of the underlying Silurian and Devonian Carbonates.

Few wells are located in the New Albany Shale; however, the depths of the wells reported in this system range from 197 to 466 feet deep. The amount of rock penetrated in this system ranges from 20 to 275 feet. Domestic water well yields are typically less than 5 gpm with many dry holes having been reported in this system. There are no registered significant groundwater withdrawal facilities completed in this system for Hendricks County.

The permeability of shale materials is considered low. The New Albany Shale Aquifer System, therefore, has a low susceptibility to contamination introduced at or near the surface.

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