

# **Bedrock Aquifer Systems of Vigo 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.

Bedrock aquifer systems in the county are overlain by unconsolidated deposits ranging from less than one foot up to 150 feet thick. The unconsolidated sand and gravel outwash aquifers near the Wabash River have far greater groundwater potential than any of the bedrock aquifers. However, bedrock aquifers are widely used in Vigo County where unconsolidated sediments are relatively thin and unproductive. There are no registered significant groundwater withdrawal facilities utilizing bedrock aquifers in this county. Most of the bedrock aquifers 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.

Three bedrock aquifer systems are identified for Vigo County. They are, from west to east and younger to older: the McLeansboro Group of Pennsylvanian age, the Carbondale Group of Pennsylvanian age and the Raccoon Creek Group of Pennsylvanian age.

## **Pennsylvanian -- McLeansboro Group Aquifer System**

The McLeansboro Group subcrop area is located in the western and southwestern portions of the county. This aquifer system consists in ascending order of the Shelburn, Patoka, Bond, and Mattoon Formations. However, in Vigo County the Mattoon Formation is absent. Total thickness of the group ranges up to 200 feet.

The Patoka Formation consists primarily of shale and sandstone with clay, limestone, and coal. The underlying Shelburn Formation consists of shale, siltstone, sandstone, coal, and limestone. Two important members of the Shelburn Formation include the West Franklin Limestone at the top of the formation and the Busseron Sandstone at the base. These are the primary aquifer units within the McLeansboro Group Aquifer System.

The depth to the bedrock surface ranges from less than one foot to over 125 feet in places, near St. Mary-of-the-Woods. Total well depths typically range from 50 to 170 feet. The amount of rock penetrated generally ranges from 10 to 110 feet. Most domestic wells produce less than 5 gallons per minute (gpm) with a few dry (pumped) holes reported. Static water levels range from 10 to 40 feet below the surface.

Most of the McLeansboro Group Aquifer System contains fine-grained materials that limit the movement of groundwater. However, in some areas alluvial materials directly overlie the bedrock surface. Therefore, the aquifer system is considered at moderate risk to contamination.

### **Pennsylvanian -- Carbondale Group Aquifer System**

The Carbondale Group Aquifer System subcrops throughout much of Vigo County. The group consists in ascending order of the Linton, Petersburg, and Dugger Formations. Bedrock deposits include mostly shale and sandstone with some limestone and commercially important coal. Thickness of the Carbondale Group in Vigo County ranges up to 350 feet.

Depth to the bedrock surface is typically from 25 to 75 feet and well depths generally range from 70 to 200 feet. The amount of rock penetrated ranges from 10 to 160 feet. The Carbondale Group is considered a minor groundwater source with domestic wells typically pumping less than 10 gpm. Static water levels in the wells are commonly between 20 and 65 feet below the surface.

Most wells produce from the thicker sandstone and coal units in the upper formations of the Carbondale Group. Localized yields are greater in areas where outwash and alluvial sands and gravels directly overlie bedrock. A few dry (pumped) holes have been reported. Water quality from the deeper bedrock units is highly mineralized.

In areas where overlying clay materials are present, the Carbondale Group Aquifer System is at low risk to contamination. However, in some areas outwash and alluvial materials directly overlie the bedrock surface. These areas are at moderate to high risk from surface contamination.

### **Pennsylvanian -- Raccoon Creek Group Aquifer System**

The Raccoon Creek Group Aquifer System subcrops in portions of northeastern Vigo County. This bedrock aquifer system consists of mostly sandstone and shale with minor amounts of mudstone, coal, and limestone. The basal formation of the Raccoon Creek Group, the Mansfield Formation, rests unconformably on Mississippian rocks. The Pennsylvanian-Mississippian erosional contact surface is quite irregular in elevation, resulting in variable thickness of

Mansfield rocks. The lowermost part of the Mansfield commonly contains a large percentage of sandstone.

The depth to the bedrock surface is typically less than 100 feet. Wells in the Raccoon Creek Group Aquifer System generally range from 70 to 250 feet deep. The amount of rock penetrated by wells varies from 10 to 150 feet. Domestic well production typically ranges from 2 to 15 gpm with a few dry (pumped) holes reported. Static water levels commonly range from 10 to 55 feet below the surface. This system is not very susceptible to contamination from the land surface because of thick, low-permeability strata above water-bearing zones. However, the system is moderately susceptible to contamination from the land surface where the unconsolidated deposits are thin.

### **Underground Mine Areas**

In about 20 percent of the county various coal seams, primarily within the Carbondale Group, have been removed by underground mining methods. In underground mines, approximately 50 percent of the coal seam was typically removed, leaving the potential for storage of substantial amounts of water in the larger mines. Although the Division has no records of wells drilled into these mines, yields of a few hundred gpm may be possible. A limitation on use of the water could be its more mineralized nature.

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