

Bedrock Aquifer Systems of Clay County, Indiana

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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.

Bedrock aquifer systems in Clay County are overlain by unconsolidated deposits of varying thickness ranging from less than 2 feet thick in the northern portion of the county to 215 feet thick in the southeastern portion of the county. Bedrock, in places, is near the surface along several streams in the county.

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.

Most bedrock aquifers in the county 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.

Four bedrock aquifer systems are identified for Clay County. They are the Pennsylvanian Carbondale Group; the Pennsylvanian Raccoon Creek Group; the Mississippian Buffalo Wallow, Stephensport, and West Baden Groups; and the Mississippian Blue River and Sanders Groups.

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.

Pennsylvanian -- Carbondale Group Aquifer System

The Carbondale Group Aquifer System is present along portions of the western part of Clay County. Bedrock deposits include mostly shale and sandstone with some limestone and commercially important coal. Wells penetrating the Carbondale Group have reported depths

ranging from 25 to 340 feet, but are commonly 75 to 230 feet deep. The amount of rock penetrated in this system typically ranges from 20 to 145 feet.

Wells utilizing the Carbondale Group Aquifer System are generally capable of meeting the needs of domestic users in this county. Domestic well yields commonly range from 2 to 10 gallons per minute (gpm) with significant drawdowns reported. Static water levels typically range from 18 to 64 feet below the land surface. There are no high-capacity groundwater withdrawal facilities utilizing the Carbondale Group Aquifer System in Clay County.

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

Pennsylvanian -- Raccoon Creek Group Aquifer System

The Raccoon Creek Group Aquifer System subcrops throughout most of Clay County. The group consists in ascending order of the Mansfield, Brazil and Staunton formations. The basal sandstone formation of the group, the Mansfield Formation, rests unconformably on Mississippian rocks. Bedrock consists mostly of shale, mudstone, and siltstone with minor amounts of coal, sandstone and limestone. The Raccoon Creek Group in Clay County ranges from near exposure at the ground surface to being overlain by up to 215 feet of unconsolidated deposits; however unconsolidated deposits generally range from 20 to 60 feet thick.

Wells completed in the Raccoon Creek Group Aquifer System are generally capable of meeting the needs of domestic users in this county. Wells in this system are completed at depths ranging from 95 to 230 feet. The amount of penetration into bedrock generally ranges from 25 to 160 feet. Yields for domestic wells range from 2 to 12 gpm with some dry holes reported. Static water levels range from flowing to 70 feet below the land surface. There is one registered significant groundwater withdrawal facility (3 wells) utilizing the Raccoon Creek Group Aquifer System in Clay County. The reported high-capacity well depths are completed from 300 to 385 feet below the land surface and the well yields range from 70 to 100 gpm.

In the majority of Clay County, the Raccoon Creek Group Aquifer System has a low susceptibility to surface contamination where thick clay deposits overlie the system. However, in some areas outwash, alluvial, and lacustrine sands directly overlie the bedrock surface. These areas are at moderate to high risk from surface contamination.

Mississippian -- Buffalo Wallow, Stephensport, and West Baden Groups Aquifer System

This Upper Mississippian bedrock aquifer system is present in a relatively small portion of eastern Clay County. This aquifer system consists of three groups, from oldest to youngest: West Baden, Stephensport, and Buffalo Wallow. However, no Stephensport or Buffalo Wallow strata are present in the county. The West Baden Group is composed primarily of shale, limestone, and sandstone.

The Division has no records of wells that are completed in this system in Clay County. However, in nearby Owen County well depths range from 115 to 250 feet with 7 to 50 feet of typical bedrock penetration. Also, in Owen County domestic well yields are generally 4 to 15 gpm with reported static water levels ranging from 45 to 160 feet below land surface.

As noted in Owen County, some areas of the Buffalo Wallow, Stephensport and West Baden Groups Aquifer System bedrock are shallow and some karst has developed in the limestone beds. These conditions warrant considering the aquifer system as a whole to be somewhat susceptible to contaminants introduced at and near land surface.

Mississippian -- Blue River and Sanders Groups Aquifer System

The Blue River and Sanders Groups Aquifer System subcrops in two small portions of eastern Clay County. The Sanders Group includes primarily limestone with some dolomitic limestone content. The overlying Blue River Group includes mostly limestones containing significant amounts of gypsum, anhydrite, shale, chert, and calcareous sandstone.

Wells completed in the Blue River and Sanders Groups Aquifer System are generally capable of meeting the needs of most domestic users in this county. Well depths in Clay County range from 80 to 160 feet. Depth to bedrock ranges from 14 to 38 feet below land surface. The reported domestic well capacities range up to 20 gpm. The static water levels range from 32 to 47 feet below surface. There are no registered significant groundwater withdrawal facilities using the Blue River and Sanders Groups Aquifer System in Clay County.

In areas where overlying clay materials are present, the Blue River and Sanders Group Aquifer System is at low risk to contamination. However, in some areas karst has developed in the limestone beds and outwash, alluvial, and lacustrine sands directly overlie the bedrock surface. These areas are at moderate to high risk from surface contamination.

Underground Mine Areas

In Clay County various coal seams within the Carbondale Group have been removed by underground mining methods. In underground mines, approximately 50 percent of the coal seam has been 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 gallons per minute are possible. A limitation on use of the water could be its more mineralized nature.

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