

# **Bedrock Aquifer Systems of St. Joseph 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.

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 of the bedrock aquifers in the county 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 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.

## **Devonian and Mississippian -- Coldwater, Ellsworth, and Antrim Shales Aquifer System**

One bedrock aquifer system is identified for St. Joseph County: the Devonian and Mississippian age Coldwater, Ellsworth, and Antrim Shales. The Coldwater, Ellsworth, and Antrim Shales Aquifer System is about 300 feet thick and subcrops throughout St. Joseph County. These shales are commonly considered an aquitard; therefore, the system is an extremely limited groundwater resource.

St. Joseph County has a complex glacial history and was subjected to multiple glacial advances from the north and northeast resulting in thick glacial deposits that overlies the bedrock surface and completely covers the county. This aquifer system consists in ascending order of the Coldwater, Ellsworth, and Antrim Shales. However, in St. Joseph County only the Ellsworth and Antrim Shales are present. The Ellsworth Shales consist primarily of gray-green shale with limestone or dolomite lenses in the upper part and alternating beds of gray-green shale and black-brown shale in the lower part. The underlying Antrim Shales consist of brown to black non-calcareous shale in the upper part and black to brown non-calcareous shale with calcareous shale, limestone, and sandstone present in the lower part of the unit. This system is overlain by

unconsolidated deposits ranging in thickness from 150 feet in the northeast and western portion of the county to over 300 feet in the northwestern portion of the county.

A few wells have been completed in this aquifer system and are capable of meeting the needs of some domestic users in St. Joseph County. Domestic well yields are commonly less than 5 gallons per minute with a few dry holes (pumped) reported. Well depths range from 45 to 140 feet deep and static water levels typically range from 5 to 50 feet below the land surface. The amount of rock penetrated in this system ranges from 30 to 60 feet. There are no registered significant groundwater withdrawal facilities using the Coldwater, Ellsworth, and Antrim Shales Aquifer System in St. Joseph County.

Since the permeability of shale materials is considered low and the overlying unconsolidated deposits are thick, susceptibility to contamination introduced at or near the surface is low.

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