

Unconsolidated Aquifer Systems of Spencer County, Indiana

By

Glenn E. Grove

Division of Water, Resource Assessment Section

May 2006

Five unconsolidated aquifer systems have been mapped in Spencer County: the Unglaciaded Southern Hills and Lowlands; the Alluvial, Lacustrine, and Backwater Deposits; the Ohio River Outwash; the Ohio River Outwash Subsystem; and the Coal Mine Spoil. Boundaries of these aquifer systems are commonly gradational and individual aquifers may extend across aquifer system boundaries.

Although Spencer County lies within the unglaciaded region of Indiana, the effects of glacial meltwaters had a dramatic influence on the ground-water resources of the county. In places within the main valley of the Ohio River, sand and gravel were deposited of sufficient thickness and extent to make up an aquifer capable of supplying large municipal, industrial, and irrigation needs. Outside of the main alluvial valleys and the valley of the Ohio River, nearly the entire county has less than 60 feet of unconsolidated materials overlying the bedrock, and ground-water resources from unconsolidated deposits are minimal.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably from local reality. Variations within geologic environments can cause variation in susceptibility to surface contamination. In addition, man-made structures such as poorly constructed water wells, unplugged or improperly abandoned wells, and open excavations, can provide contaminant pathways that bypass the naturally protective clays. In general, the unconsolidated aquifer systems of the county are most vulnerable to contamination from surface sources where thick clay layers are lacking.

Unglaciaded Southern Hills and Lowlands Aquifer System

The Unglaciaded Southern Hills and Lowlands Aquifer System covers about 65 percent of Spencer County and is located primarily on the upland areas. This aquifer system contains relatively high amounts of clay and silt with some fragmented rock. However, thin deposits of sand and/or gravel are present in places. Included in this system are relatively thin deposits of alluvium, colluvium, and lacustrine materials within some of the stream valleys.

Total thickness of the Unglaciaded Southern Hills and Lowlands Aquifer System in Spencer County typically ranges from less than 1 foot to around 60 feet. This system has the most limited ground-water resources of the unconsolidated aquifer systems in the county. Most wells penetrating this system are completed in the underlying bedrock because sand and gravel deposits are thin or absent. Because of the generally low permeability of the near-surface materials, this system is not very susceptible to contamination from surface sources.

Alluvial, Lacustrine, and Backwater Deposits Aquifer System

In Spencer County, the Alluvial, Lacustrine, and Backwater Deposits Aquifer System is mapped adjacent to and in many of the valleys tributary to the Patoka and Ohio Rivers. The materials in this aquifer system come from two major sources. One source is alluvium deposited by the streams along with colluvium eroded from the valleys walls and upland areas. The second source is glaciolacustrine sediment, which accumulated in bodies of relatively stagnant lake water. These silts and clays were deposited when the Wabash River and the Ohio River valleys were choked with coarser material carried by glacial meltwater that effectively dammed tributary streams, creating lakes. Thick deposits of silt and clay mark the former locations of these glacial lakes. In places, thin Wisconsin age dune sands are present in this system, particularly around the town of Sand Ridge.

This system is mapped in Spencer County along portions of most tributaries to the Ohio River. Additionally, this system is mapped along portions of Hunley Creek, which is a tributary to the Patoka River. In places, particularly in downstream areas near the Ohio River, this system exceeds 85 feet in thickness. However, farther upstream, the system gradually thins to about 30 feet.

The Alluvial, Lacustrine, and Backwater Deposits Aquifer System is a limited resource in Spencer County and the Division has few records of wells actually producing from these deposits. However, in places, some wells drilled in this system (especially large diameter bucket-rig wells) may yield sufficient water for domestic use. This system is marked by thick deposits of soft silt and clay that have low susceptibility to surface contamination.

Ohio River Outwash Aquifer System

The Ohio River Outwash Aquifer System occupies portions of the main valley of the Ohio River and the former channel of the Ohio River north and northwest of Rockport. Great quantities of outwash from the melting glaciers were transported within this valley during the Wisconsin and pre-Wisconsin glacial times. This aquifer system contains large volumes of sand and gravel that partially fill the main river valley and the former channel. As the glaciers melted, the sediment contained within them was delivered to the Ohio River in quantities too large for the stream to transport. As a result, the increased sediment load was stored in the valley as vertical and lateral accretionary deposits. As long as the retreating glaciers continued to provide sediment in quantities too large for the stream to transport farther downstream, the valley continued to be filled. This valley-filling process formed the most prolific aquifer system in the county.

Total thickness of the Ohio River Outwash Aquifer System ranges from about 60 feet near the edge of the valley to over 120 feet near the Ohio River. The saturated sand and gravel (aquifer) thickness of the Ohio River Outwash Aquifer System is typically between 30 and 60 feet. Commonly, 15 to 25 feet of silty to sandy clay overlie the aquifer materials; however, in places this confining layer is absent.

This system has the potential to consistently meet the needs of domestic and high-capacity water users. Domestic well yields generally range from 20 to 50 gallons per minute (gpm) and static water levels are commonly 5 to 30 feet below the land surface. There are 11 registered significant ground-water withdrawal facilities (30 wells) in this system in Spencer County. Reported capacities range from 100 to 1600 gpm.

The Ohio River Outwash Aquifer System in Spencer County is highly susceptible to contamination in areas where the overlying clay layers are thin or absent. Areas within the system that are overlain by thick layers of clay or silt are moderately susceptible to surface contamination.

Ohio River Outwash Aquifer Subsystem

In Spencer County, the Ohio River Outwash Aquifer Subsystem is generally mapped as a transitional zone contiguous to the Ohio River Outwash Aquifer System. In general, the thickness of saturated outwash materials is considerably less than the main outwash system and sands and gravels are generally overlain by a greater thickness of silt, clay, or lacustrine deposits.

Thickness of unconsolidated materials overlying bedrock within this system range from about 50 to 120 feet, with up to 30 feet of continuous sand and gravel. There are very few reported wells utilizing this system in Spencer County. However, the data from nearby counties where the Ohio River Aquifer Subsystem is mapped suggest that the subsystem in Spencer County has the potential to meet the needs of domestic and some high-capacity users. Areas within this aquifer system that have overlying clay or silt deposits are moderately susceptible to surface contamination; whereas, areas that lack overlying clay or silt deposits are highly susceptible to contamination.

Coal Mine Spoil Aquifer System

The Coal Mine Spoil Aquifer System covers less than 5 percent of Spencer County. This aquifer system was formed during the process of mining coal by surface-mining methods. The overburden was typically broken up by blasting and moved aside to uncover the desired coal seam. In Spencer County, there are no reported wells actually producing from the Coal Mine Spoil Aquifer System. Information from surface coal mine areas in other counties indicates that the quality of ground water in this system is probably much poorer than that in the overburden before mining took place. Very generally, it is expected that aquifers in old spoil that was not graded and capped with compacted soil are highly susceptible to surface contamination, whereas new spoil areas benefiting from modern reclamation methods are likely to be only moderately susceptible.

Registered Significant Ground-water Withdrawal Facilities

Currently there are 11 registered significant ground-water withdrawal facilities using unconsolidated aquifers in Spencer County. All of these facilities (total of 30 wells) utilize the Ohio River Outwash Aquifer System. These facilities are used for public water supply, irrigation, and energy production. Refer to Table for some details on the wells and to the map for facility locations.

Map Use and Disclaimer Statement

We request that the following agency be acknowledged in products derived from this map:
Indiana Department of Natural Resources, Division of Water.

This map was compiled by staff of the Indiana Department of Natural Resources, Division of Water using data believed to be reasonably accurate. However, a degree of error is inherent in all maps. This product is distributed “as is” without warranties of any kind, either expressed or implied. This map is intended for use only at the published scale.