

Unconsolidated Aquifer Systems of Boone County, Indiana

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The unconsolidated aquifer systems of Boone County are a result of a complicated sequence of glacial events and comprise sediments deposited by or resulting from glaciers, glacial meltwaters, and post-glacial precipitation events. Six unconsolidated aquifer systems have been mapped in Boone County: the Till Veneer; the Tipton Till; the Tipton Till Subsystem; the Tipton Complex; the Wabash River and Tributaries Outwash Subsystem; and the White River and Tributaries Outwash. Because of the complicated glacial geology, boundaries of the aquifer systems in this county are commonly gradational and individual aquifers may extend across aquifer system boundaries.

The thickness of unconsolidated deposits in Boone County is quite variable, due to the deposition of glacial material over an uneven bedrock surface. In a few places along Sugar Creek and Big Raccoon Creek in western Boone County, bedrock is at or near the surface. North and northeast of Lebanon, the thickness of unconsolidated deposits increases to over 350 feet. Elsewhere, the depth to bedrock is generally less than 100 feet, roughly west of a diagonal from the southeast corner to the northwest corner of Boone County.

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.

Till Veneer Aquifer System

In Boone County, the Till Veneer Aquifer System consists of areas where the unconsolidated material is predominantly thin till overlying bedrock. Along some of the major streams, this system also includes thin alluvium and surficial sand and gravel outwash deposits overlying shallow bedrock. The Till Veneer Aquifer System in Boone County is primarily mapped in places along Sugar Creek and Big Raccoon Creek, and some tributaries in the western third of county. This system has the most limited ground-water resources of the unconsolidated aquifer systems in the county. Total thickness of the Till Veneer Aquifer System generally ranges from about 25 to 50 feet.

There is little potential for ground-water production in this system in Boone County. Potential aquifers within this system include thin isolated sand and/or gravel layers. Therefore, very few of the reported wells penetrating this aquifer system in the county are completed in unconsolidated materials. The system is commonly bypassed in favor of the underlying bedrock.

In this county the depth of the few wells that are completed in the Till Veneer Aquifer System, range from 36 to 47 feet deep with static water levels between 3 and 20 feet below the surface. Most of the wells have reported capacities of less than 10 gallons per minute (gpm).

This system is generally not very susceptible to contamination from surface sources because of the low permeability of the near-surface materials. However, there are areas where protective clay layers are thin or absent. These areas are very susceptible to contamination.

Tipton Till Aquifer System

The Tipton Till Aquifer System primarily consists of glacial till with intratill sand and gravel layers. In Boone County, this aquifer system ranges in thickness from about 50 feet to around 300 feet. However, the sand and gravel aquifers in this system tend to be thin and discontinuous.

Wells completed in this system are capable of meeting the needs of most domestic and some high-capacity users in Boone County; however, where one well might produce a good or adequate water supply a nearby well may not produce any water. Saturated aquifer materials include sand and/or gravel deposits that are commonly 7 to 15 feet thick and are generally overlain by 40 to 75 feet of till. Wells producing from this aquifer system are typically 75 to 175 feet deep. Domestic well capacities are commonly 10 to 30 gpm. Static water levels generally range from 20 to 45 feet below the surface. There are 13 registered significant ground-water withdrawal facilities (23 wells) using the Tipton Till Aquifer System. Primary usage for these facilities are public water supply and irrigation. The reported pumping rates range up to 350 gpm.

The Tipton Till Aquifer System typically has a low susceptibility to surface contamination because intratill sand and gravel units are commonly overlain by thick glacial till. Shallow wells completed in this system are moderately susceptible to contamination.

Tipton Till Aquifer Subsystem

Areas where unconsolidated materials are generally greater than 50 feet in thickness, yet have limited aquifer potential, are mapped as the Tipton Till Aquifer Subsystem in Boone County. The unconsolidated deposits vary between 50 feet to over 300 feet thick for the subsystem in this county. However, the depth to bedrock is generally less than 150 feet. Potential aquifer materials include thin, discontinuous intratill sand and gravel deposits. Where present, these deposits are typically capped by till that is commonly 45 to 85 feet thick.

About 30 percent of wells started in this subsystem in Boone County are completed in the underlying bedrock aquifer system. However, the Tipton Till Aquifer Subsystem is capable of meeting the needs of some domestic users in the county. The wells producing from this subsystem are completed at depths ranging from 50 to 120 feet. Intratill sand and gravel aquifer materials are typically less than 5 feet thick. Domestic well yields are commonly 5 to 15 gpm and static water levels are generally 5 to 40 feet below the surface.

This subsystem is generally not very susceptible to surface contamination because intratill sand and gravel units are overlain by thick till deposits. Wells producing from shallow aquifers are moderately to highly susceptible to contamination.

Tipton Complex Aquifer System

The Tipton Complex Aquifer System is characterized by unconsolidated deposits that are quite variable in materials and thickness and primarily located in the northern third of Boone County. Aquifers within the system range from thin to thick, and include single or multiple discontinuous intratill sand and gravel layers. The aquifers are highly variable in depth and lateral extent and are typically confined by thick clay layers. The total thickness of unconsolidated deposits ranges from about 50 feet to over 350 feet.

This system is capable of meeting the needs of domestic and most high-capacity users in Boone County. Saturated aquifer materials in the Tipton Complex Aquifer System are generally 10 to 35 feet thick and are overlain by a till cap which is commonly 40 to 90 feet thick. Wells in this system are typically completed at depths ranging from 70 to 160 feet. Domestic well yields are commonly 10 to 50 gpm and static water levels are generally 10 to 40 feet below the surface. There are two registered significant ground-water withdrawal facilities (5 wells) using this system. These facilities are used for public water supply. Reported capacities for the wells range from 200 to 700 gpm.

The Tipton Complex Aquifer System is not very susceptible to contamination where overlain by thick clay deposits. However, in some areas where surficial clay deposits are thin or lacking, the shallow aquifer, if present, is at moderate to high risk.

White River and Tributaries Outwash Aquifer System

The White River and Tributaries Outwash Aquifer System is mapped along sections of Eagle Creek and Little Eagle Creek in Boone County. In places, sand and gravel from the melting glaciers (outwash) were deposited in the stream valleys. The total thickness of unconsolidated deposits in this system ranges from about 50 feet to over 150 feet.

This aquifer system is capable of meeting the needs of domestic and high-capacity users in Boone County. Wells in the White River and Tributaries Outwash Aquifer System are completed at depths from 55 to 160 feet. Sand and gravel aquifers are commonly 20 to 50 feet thick and are generally capped by silt, sandy clay, or clay ranging from 5 to 20 feet thick. However, in many places, the protective cap is missing and unsaturated sand and gravel deposits lie above the productive aquifer. Domestic well yields in this system are 10 to 60 gpm and static water levels range from flowing to 50 feet below the surface. In Boone County, there are two registered significant ground-water withdrawal facilities (4 wells) in this system. Uses for these facilities are public water supply and irrigation. Reported capacities for these wells range up to

220 gpm in Boone County; however, the Indianapolis Water Company has wells with reported capacities of around 600 gpm just south of the county line.

This system is moderately susceptible to surface contamination where overlying clay or silt deposits are present. However, areas that lack overlying clay or silt deposits are highly susceptible to contamination.

Wabash River and Tributaries Outwash Aquifer Subsystem

In Boone County, the Wabash River and Tributaries Outwash Aquifer Subsystem is mapped along portions of Sugar Creek. Total thickness of unconsolidated deposits overlying bedrock ranges from about 50 feet to over 300 feet.

The Wabash River and Tributaries Outwash Aquifer Subsystem has the potential to meet the needs of domestic and some high-capacity users. The wells in this system are completed at depths from 36 to 285 feet. Saturated aquifer materials include sand and gravel deposits that are commonly 10 to 25 feet thick. Domestic well yields typically range from 10 to 45 gpm with static water levels ranging from flowing to 50 feet below the surface. There are two registered significant ground-water withdrawal facilities (4 wells) using this system. These facilities are used for public water supply and industry. Reported capacities for the wells range up to 700 gpm.

The aquifer materials in the Wabash River and Tributaries Outwash Aquifer Subsystem are generally overlain by 5 to 25 feet of silt or clay. However, in many places, this layer is missing and unsaturated sand and gravel deposits lie above the productive aquifer. 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.

Registered Significant Ground-Water Withdrawal Facilities

There are 16 registered significant ground-water withdrawal facilities using unconsolidated aquifers in the county (total of 36 wells). Most of these facilities utilize the Tipton Till Aquifer System (13 facilities, 23 wells), and the Tipton Complex Aquifer System (2 facilities, 5 wells). Two facilities use the White River and Tributaries Outwash Aquifer System (4 wells), and two facilities use the Wabash River and Tributaries Outwash Aquifer Subsystem (4 wells). Reported capacities for individual high capacity wells range from 90 to 700 gpm. The uses for the Boone County facilities are public water supply, irrigation, industry, and miscellaneous. Refer to the table for some details on the wells and to the map for the facilities location.

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