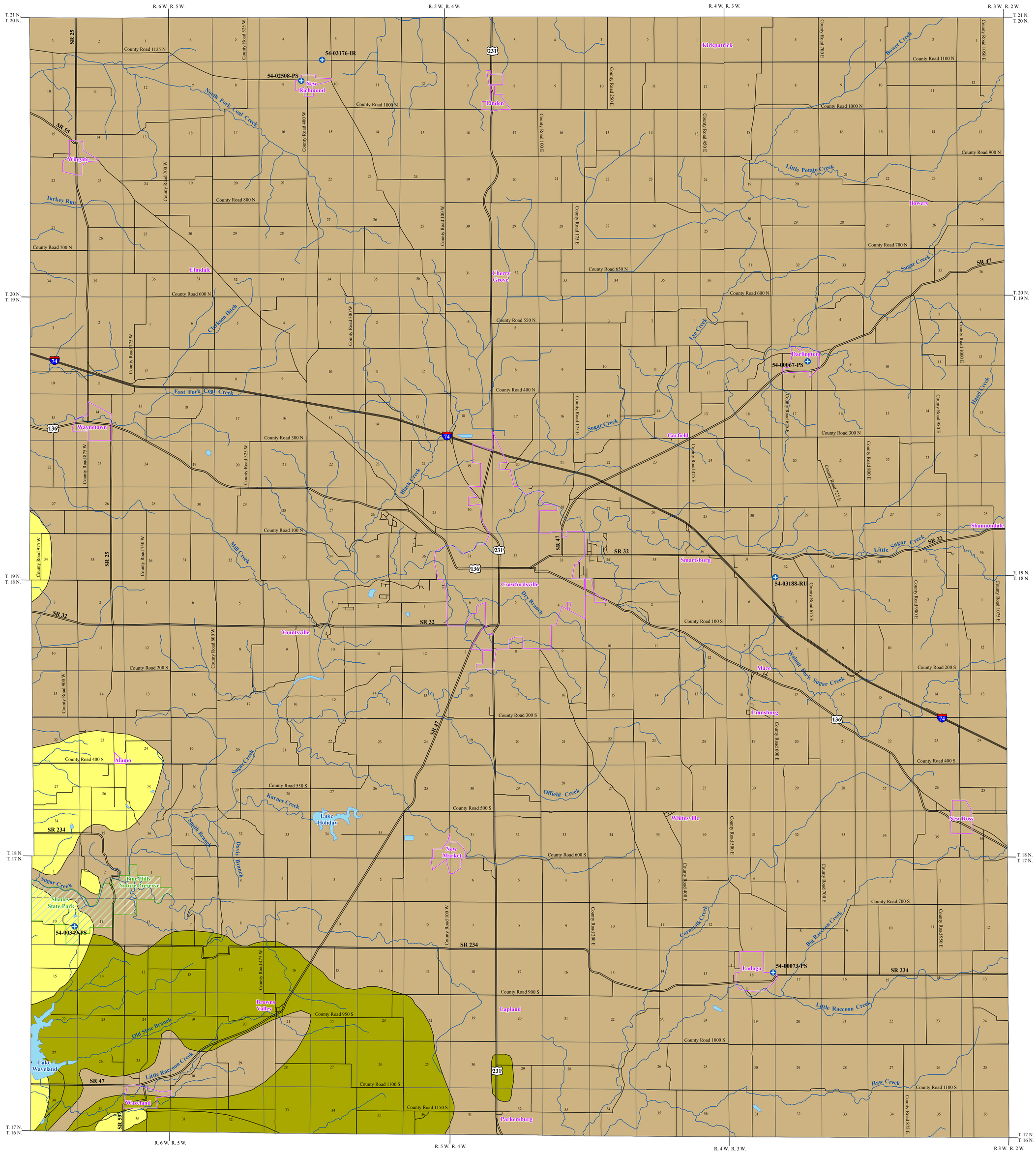
BEDROCK AQUIFER SYSTEMS OF MONTGOMERY COUNTY, INDIANA



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 of varying thickness ranging from outcropping to over 400 feet thick northwest of Kirkpatrick where a deep narrow buried bedrock valley exits the county. Bedrock is at or near the surface in many places along Sugar Creek and its tributaries, and also Big Raccoon Creek. Bedrock is typically less than 100 feet deep in much of 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 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.

Three bedrock aquifer systems are identified for Montgomery County. They are, from youngest to oldest: the Raccoon Creek Group of Pennsylvanian age, the Blue River and Sanders Group of Mississippian age, and the Borden Group of Mississippian age. Bedrock wells represent a little more than half of all wells completed in the county.

The susceptibility of bedrock aquifer systems to surface contamination is largely dependent on the type and thickness of the overlying sediments. However, 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 -- Raccoon Creek Group Aquifer System

The Raccoon Creek Group Aquifer System outcrops/subcrops primarily in portions of southwestern Montgomery 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. The few wells in this system are completed at depths ranging from 45 to 147 feet. The amount of rock penetrated by wells varies from 26 to 111 feet. Reported static water levels range from 9 to 51 feet below the surface. There is one registered significant groundwater withdrawal facility (2 wells) that penetrates this system. These wells primarily utilize the Mansfield Formation. The facility is used for public water supply and the wells have reported capacities of 58 and 83 gallons per minute (gpm). 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.

Mississippian -- Blue River and Sanders Groups Aquifer System

The area of the Blue River and Sanders Groups Aquifer System in Montgomery County is located in the southwestern corner of the county. The rocks of this system primarily consist of limestone and dolomite, but they contain significant amounts of gypsum, anhydrite, shale, chert, and calcareous sandstone in places.

The depth to the bedrock surface is typically between 20 and 120 feet. Wells in this system are completed at depths from ranging from 55 to 175 feet with reported static water levels ranging from 6 to 60 feet below the surface. The amount of rock penetrated by wells varies from 10 to as much as 115 feet. This aquifer system in Montgomery County is considered moderately susceptible to contamination from the land surface because of the shallow rock. Where the unconsolidated deposits are thicker the susceptibility to contamination is lower.

Mississippian -- Borden Group Aquifer System

The Mississippian age Borden Group outcrops/subcrops throughout most of the county. This bedrock aquifer system is composed mostly of siltstone and shale, but fine-grained sandstones are common. Carbonates are rare, but do occur as discontinuous interbedded limestone lenses, mostly in the upper portion of the group. Depth to bedrock in the Borden Group in Montgomery County ranges from outcropping along Sugar Creek, to over 400 feet deep northwest of Kirkpatrick.

Because this system is generally not very productive, it is typically used only where overlying deposits do not contain aquifer material. The Borden Group is often described as an aquitard, and well yields are typically quite limited. A few of the domestic wells penetrate through the shale and siltstone in favor of the underlying Silurian and Devonian Carbonates that are generally more productive. Reported depths commonly range from 60 to 120 feet deep. The amount of rock penetrated in this system generally ranges from 15 to 55 feet. The typical domestic well in the outcrop/subcrop area produces less than 15 gpm. Many dry holes have been reported in this system. Static water levels commonly range from 10 to 40 feet below the land surface. There are five registered significant groundwater withdrawal facilities (8 wells) that penetrate this system with reported capacities between 60 and 225 gpm. However, it is likely these wells have encountered a fractured area and are receiving water from the unconsolidated deposits on top of the bedrock, or are utilizing underlying Silurian and Devonian Carbonates. The facilities are used for public water supply, irrigation and rural uses.

The Borden Group is composed of primarily fine-grained materials that limit the movement of groundwater to fractures, joints, and along the bedrock surface. Where bedrock is shallow, risk to contamination from the surface or near surface sources is high. Where the overlying sediment consists of thick fine-grained clay materials, the Borden Group Aquifer System in Montgomery County is at low risk to contamination from the surface or near surface sources.

EXPLANATION

- Registered Significant Ground-Water Withdrawal Facility
- Stream
- County Road
- State Road & US Highway
- Interstate
- Municipal Boundary
- State Managed Property
- Lake & River

N
W E
S

1 0.5 0 1 Mile

1 0.5 0 1 Kilometer

INDIANA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER

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Location Map

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This map was created from several existing shapefiles. Township and Range Lines of Indiana (line shapefile, 20020621), Land Survey Lines of Indiana (polygon shapefile, 20020621) and County Boundaries of Indiana (polygon shapefile, 20020621), were all from the Indiana Geological Survey and based on a 1:24,000 scale, except the Bedrock Geology of Indiana (polygon shapefile, 20020318), which was at a 1:500,000 scale. Draft road shapefiles, System1 and System2 (line shapefiles, 2003), were from the Indiana Department of Transportation and based on a 1:24,000 scale. Populated Areas in Indiana 2000 (polygon shapefile, 20021000) was from the U.S. Census Bureau and based on a 1:100,000 scale. Streams27 (line shapefile, 20000420 was from the Center for Advanced Applications in GIS at Purdue University. Managed Areas 96 (polygon shapefile, various dates) was from IDNR.

Map generated by Scott H. Dean
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