

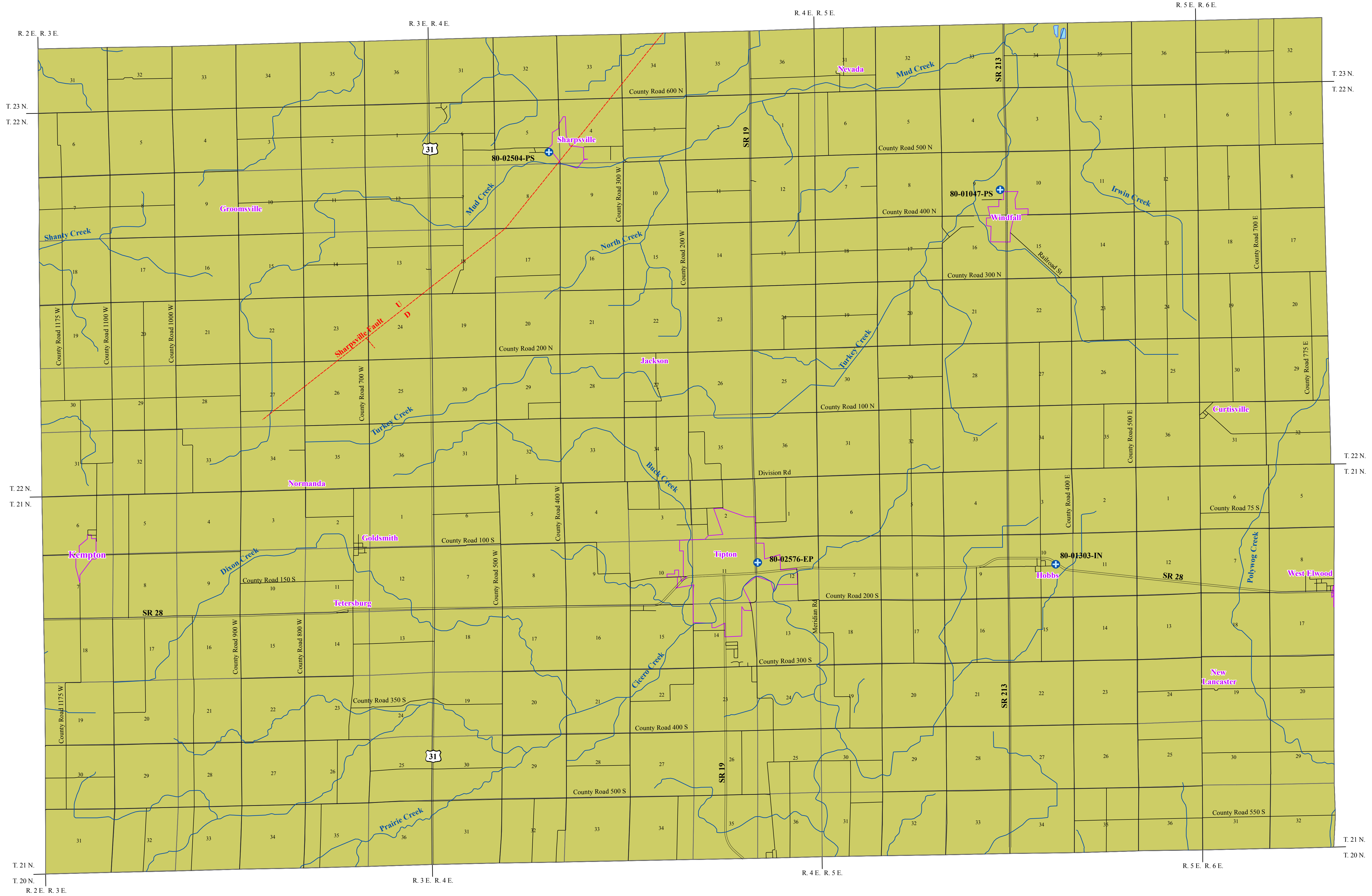
Water Resources and Use in Tipton County

Data Sources: U.S. Geological Survey and Indiana Department of Natural Resources

Withdrawal Location	River
WELL INTAKE	7Q2 Flow (MGD)
● Energy/Mining	— <10 MGD
● Industry	— 10 - 50 MGD
● Irrigation	— 50 - 100 MGD
● Misc.	— 100 - 500 MGD
● Public Supply	— > 500 MGD
● Rural Use	

■ Major Lakes	
— Interstate	
□ County	
⊗ City	

BEDROCK AQUIFER SYSTEMS OF TIPTON COUNTY, INDIANA



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.

Only one bedrock aquifer system is identified for Tipton County: the Silurian and Devonian Carbonates. Rock types exposed at the bedrock surface include moderately productive to prolific limestones and dolomites with varying amounts of interbedded shale. Bedrock wells represent about 25 percent of all wells completed in this county. Most of the bedrock system in Tipton County is 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 Silurian and Devonian Carbonates Aquifer System in Tipton County is overlain by unconsolidated deposits of varying thickness, ranging from about 25 feet to over 250 feet. In general, the thickness of unconsolidated deposits increases from the northeast to the southwest.

The yield of a bedrock aquifer depends on its hydraulic characteristics and the nature of the overlying deposits. Shale and clay 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 extremely variable.

The susceptibility of bedrock aquifer systems to surface contamination is largely dependent on the type and thickness of the overlying sediments. However, because bedrock aquifer systems may have complex fracturing systems, once a contaminant has been introduced into a bedrock aquifer system, it will be difficult to track and remediate.

Silurian and Devonian Carbonates Aquifer System

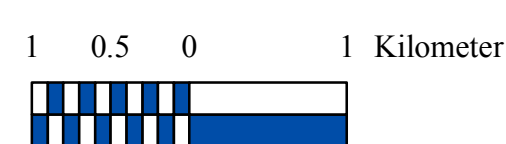
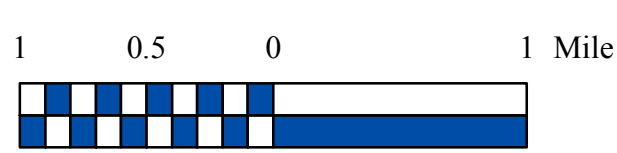
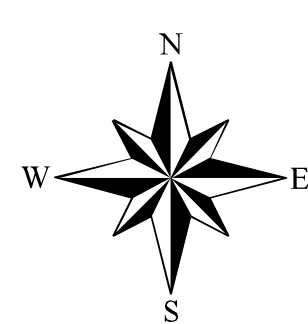
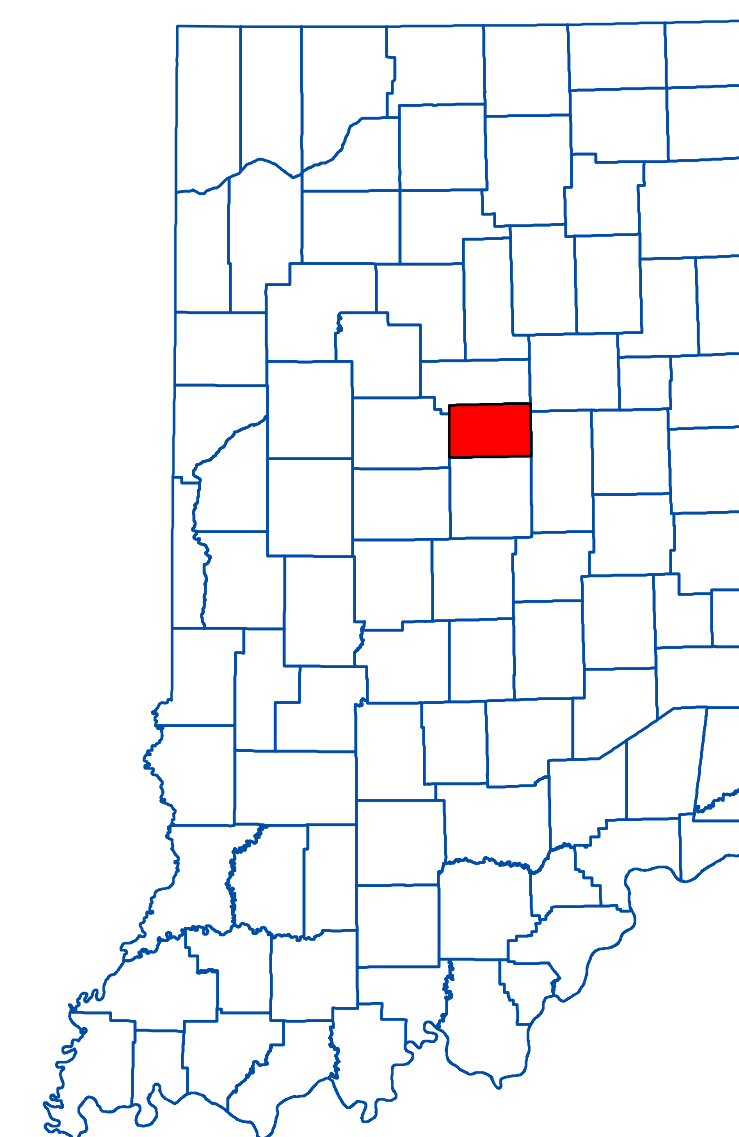
This aquifer system includes carbonate rock units (limestone and dolomite) with some interbedded shale units. In Tipton County, the system consists of the Pleasant Mills and Wabash formations of Silurian age, and the Mascatauck group of Devonian age. Generally, the thickness of the Silurian and Devonian Carbonates Aquifer System ranges from less than 275 feet in the western portion to over 360 feet in the eastern portion of Tipton County.

Wells in the Silurian and Devonian Carbonates Aquifer System in this county are commonly 65 to 150 feet deep. The amount of rock penetrated in this system typically ranges from 20 to 105 feet.

Wells completed in this system are capable of meeting the needs of domestic and some high-capacity users in this county. Domestic well yields commonly range from 10 to 45 gallons per minute (gpm). Static water levels typically range from 10 to 20 feet below the land surface with a few reports of flowing wells in the county. There are 4 registered significant groundwater withdrawal facilities (8 wells) using the Silurian and Devonian Carbonates Aquifer System in Tipton County. Reported high-capacity well yields range from 75 to 300 gpm.

This aquifer system has a low susceptibility to surface contamination due to thick clay deposits over most of the county. However, the Silurian and Devonian Carbonate Aquifer System is moderately to highly susceptible to contamination where overlying clays are thin or absent.

Location Map



EXPLANATION

- Registered Significant Groundwater Withdrawal Facility
- Stream
- County Road
- State Road & US Highway
- Sharpville Fault
- Municipal Boundary
- Lake

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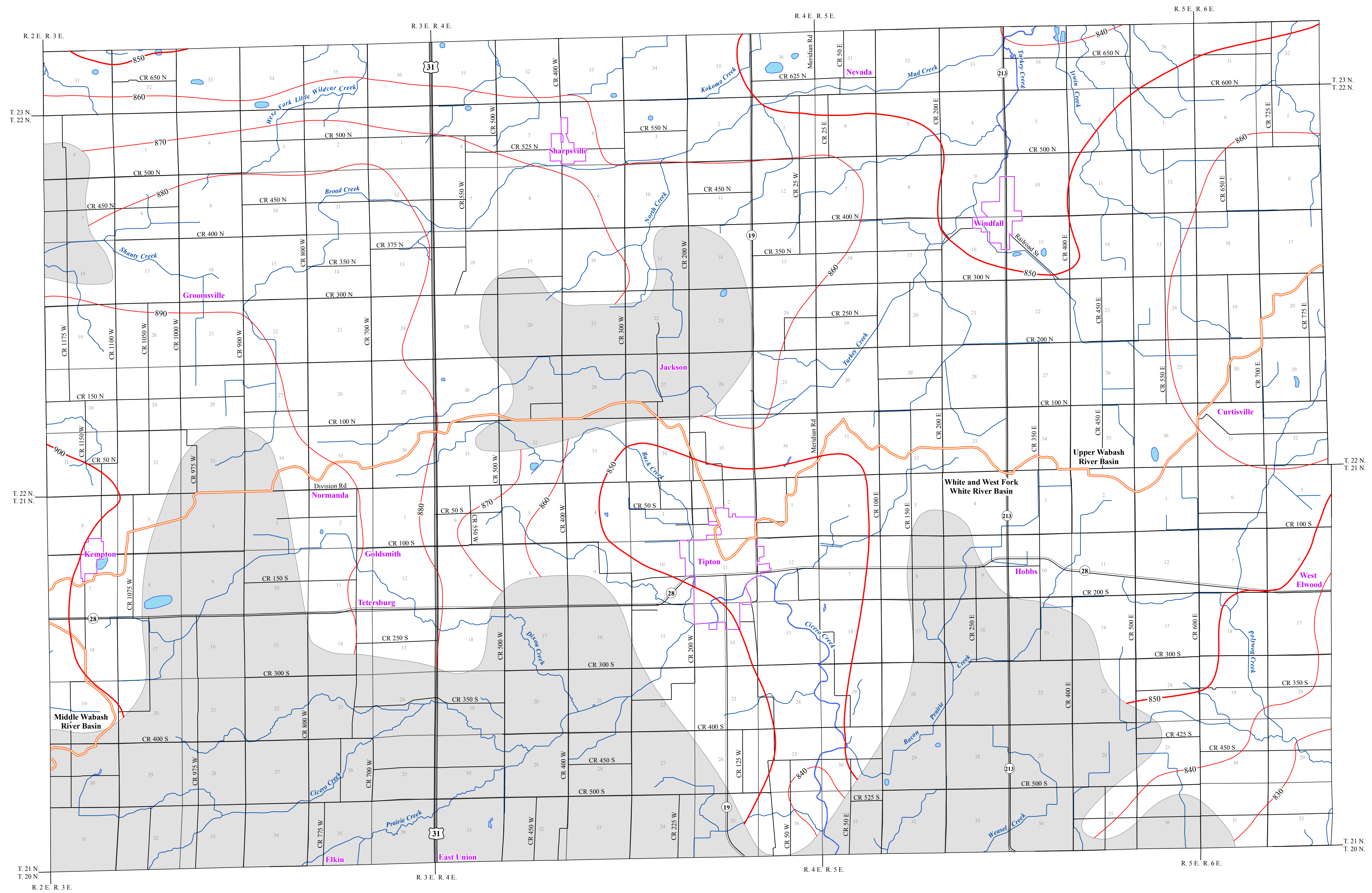
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Bedrock Aquifer Systems of Tipton County, Indiana

by
 Robert A. Scott
 Division of Water, Resource Assessment Section

March 2008

POTENTIOMETRIC SURFACE MAP OF THE BEDROCK AQUIFERS OF TIPTON COUNTY, INDIANA



Tipton County, Indiana is located in the central portion of the state bounded by Clinton, Howard, Grant, Madison, and Hamilton counties to the west, north, northeast, east, and south, respectively. The northern half of the county is situated within the Upper Wabash River Basin, and a small portion in the southwest is within the Middle Wabash River Basin. The remainder of the southern half of the county is situated within the White and West Fork White River Basin.

The Bedrock Potentiometric Surface Map (PSM) of Tipton County is mapped by contouring the elevations of 597 static water levels reported on well records received primarily over a 50-year period. These wells are completed in bedrock aquifers at various depths and typically under confined conditions (bounded by impermeable layers above and below the water bearing formation). However, some wells are completed in unconfined settings with water bearing formations not bounded by impermeable layers. The potentiometric surface is a measure of the pressure on water in a water bearing formation, or aquifer. The groundwater level in an unconfined aquifer system is at atmospheric pressure and will not rise in a well above the top of the aquifer formation. The potentiometric surface in most wells completed in bedrock within Tipton County rises above the top of the bedrock aquifer due to the confining nature of the system.

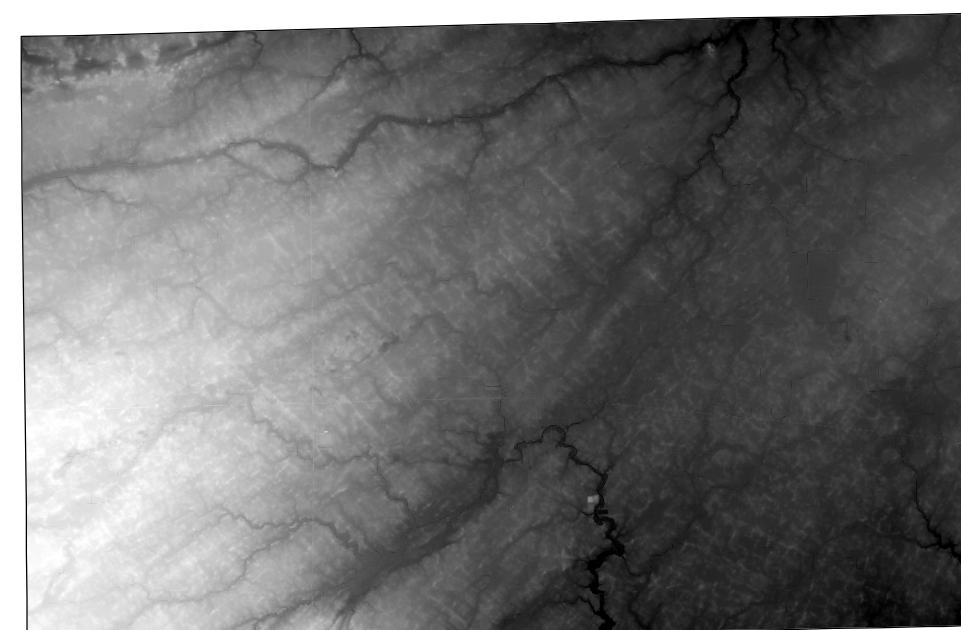
Static water level measurements in individual wells used to construct county PSM's are indicative of the water level at the time of well completion. The groundwater level within an aquifer constantly fluctuates in response to rainfall, evapotranspiration, groundwater movement, and pumpage. Therefore, current site-specific conditions may differ due to local or seasonal variations in measured static water levels. Because fluctuations in groundwater are typically small, static water levels can be used to construct a generalized PSM. Groundwater flow is naturally from areas of recharge toward areas of discharge. The contours were determined based on the amount of data and the degree of change in water levels between wells. Bedrock potentiometric surface elevation contours have not been extended across portions of southern and central Tipton County. Some of this area is lacking in data and/or covered by more prolific unconsolidated deposits that limit the necessity to complete wells in bedrock.

Data collected to generate the PSM were standardized and validated for accuracy. Universal Transverse Mercator (UTM) coordinates for the water wells were either physically obtained in the field, determined through address geocoding, or determined based on water well records. The location of the majority of the water well records used to make the PSM were field verified. Elevation data were derived from a digital elevation model based on LiDAR. Quality control/quality assurance procedures were utilized to refine or remove data where errors were readily apparent.

Potentiometric surface contours are developed based on the static water levels from the bedrock aquifer systems and displayed here with 10-foot contours and 50-foot index contours. Bedrock potentiometric surface contours in Tipton County range from a high of 900 feet mean sea level (msl) in the southwest edge of the county, to a low of 830 feet msl in the southeast corner of the county. Groundwater flow direction within the bedrock aquifer system of Tipton County is generally towards the north and northeast in the northern portion of the county. Groundwater flow transitions to an east southeast flow south of the major drainage divide.

The county PSM can be used to define the regional groundwater flow path and to identify significant areas of groundwater recharge and discharge. County PSM's represent overall regional characteristics and are not intended to be a substitute for site-specific studies.

Digital Elevation Model of Tipton County, Indiana

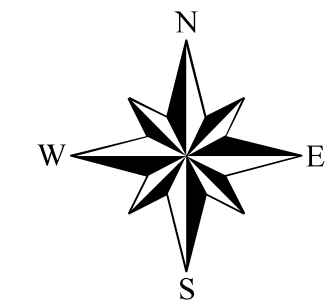
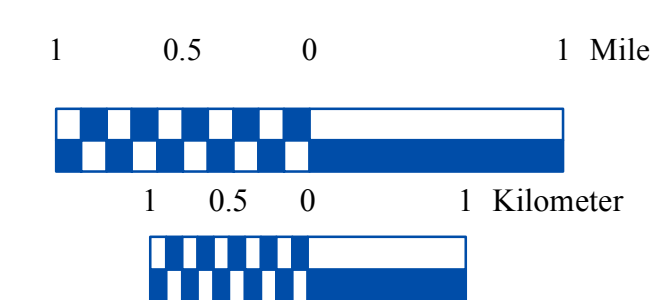
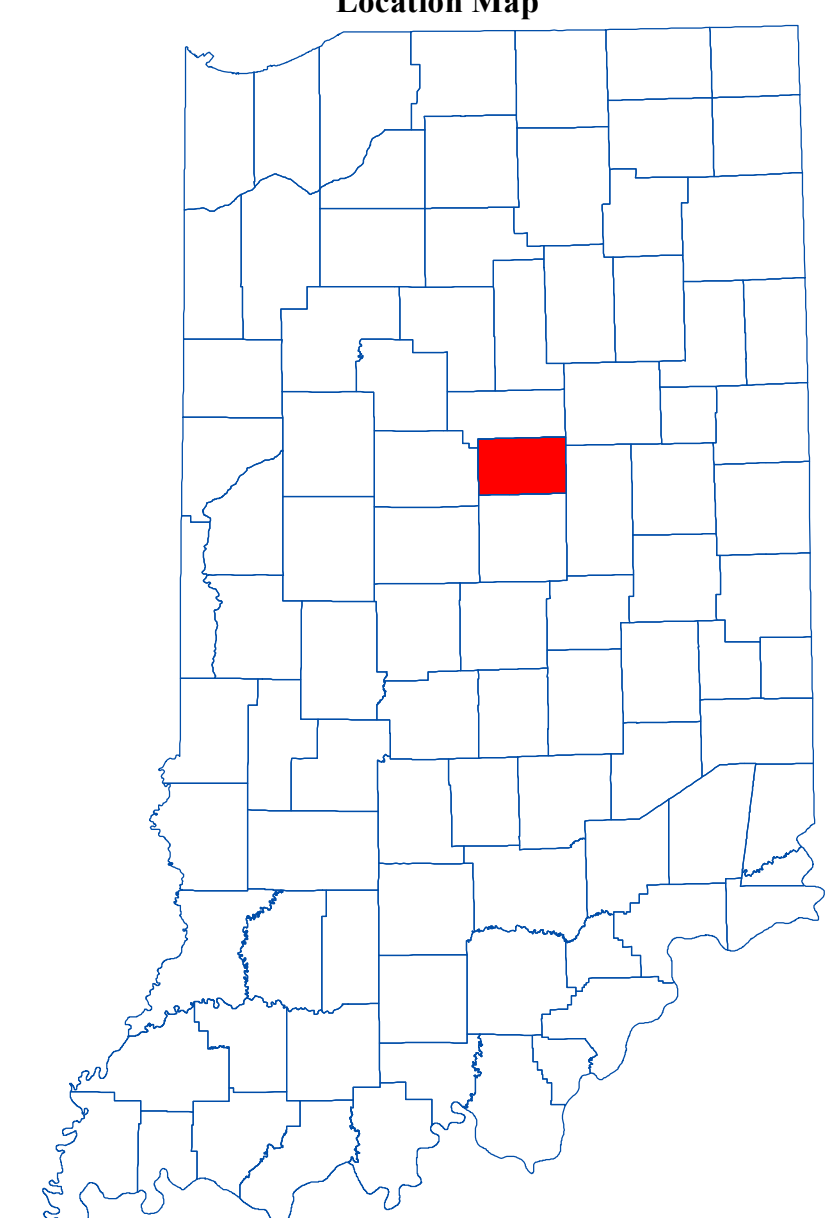


Elevation (feet)
939
813

EXPLANATION

- Line of equal elevation, in feet above mean sea level
- Potentiometric Contour interval 10 feet
- Stream
- County Road
- State Road
- US Highway
- Basin Boundary
- No Aquifer Material or Limited Data
- Municipal Boundary
- Lake

Location Map



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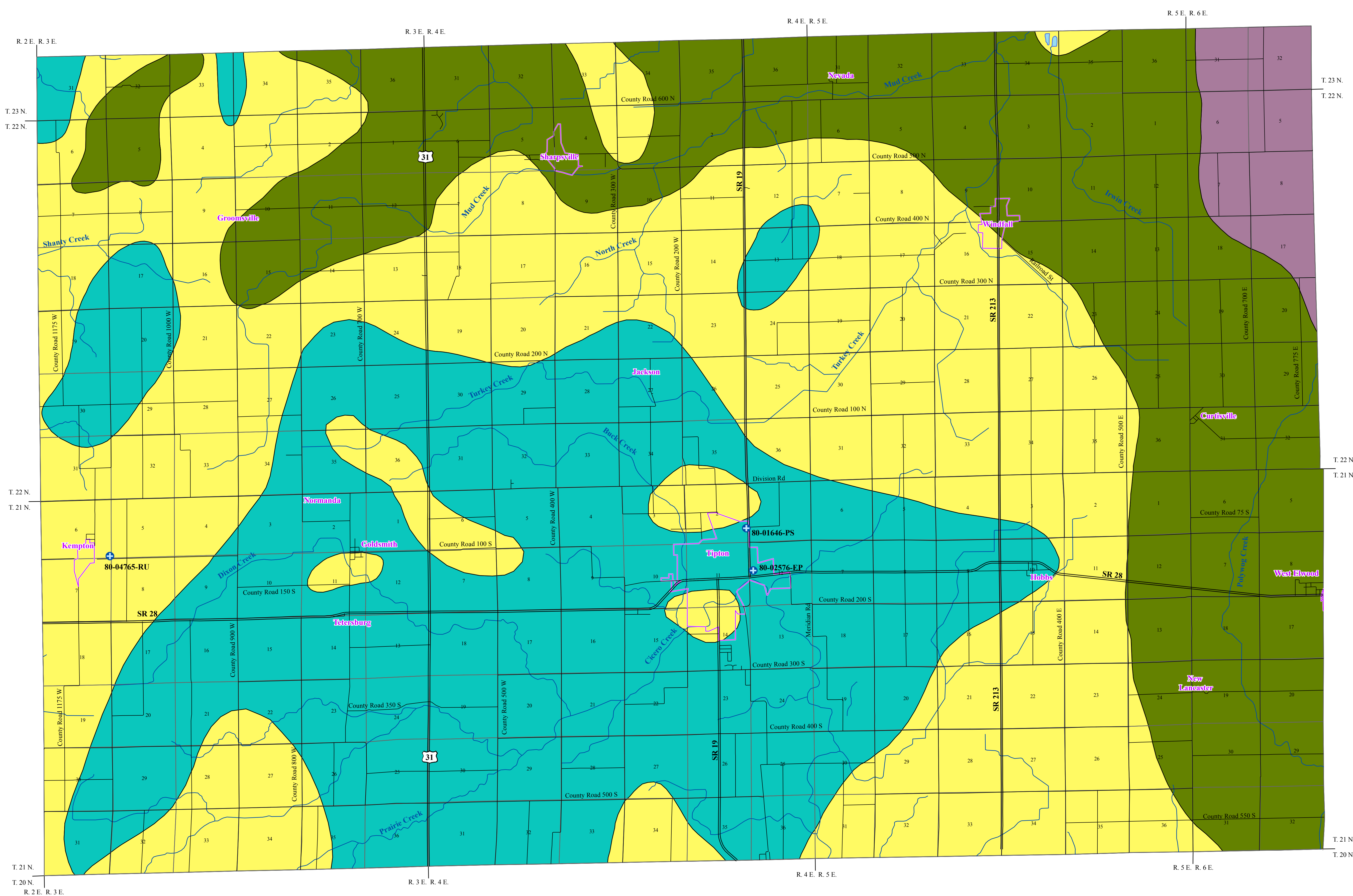
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Potentiometric Surface Map of the Bedrock Aquifers of Tipton County, Indiana

by
Ginger C. Kornek
Division of Water, Resource Assessment Section

December 2013

UNCONSOLIDATED AQUIFER SYSTEMS OF TIPTON COUNTY, INDIANA



Four unconsolidated aquifer systems have been mapped in Tipton County: the Till Veneer, the Tipton Till, the Tipton Till Subsystem, and the Tipton Complex. Boundaries of all aquifer systems described are commonly gradational, and individual aquifers may extend across aquifer system boundaries. The thickness of unconsolidated deposits in Tipton County is quite variable because glacial material has been deposited over an uneven bedrock surface. Unconsolidated materials range from less than 50 feet thick in the northeastern portion of the county to more than 250 feet in the southwest portion of Tipton County.

Regional estimates of potential contamination to aquifer systems from the surface can differ considerably by location. Variations within geologic environments can result in a wide range of susceptibility to these systems. 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 Tipton County, the Till Veneer Aquifer System includes areas where the unconsolidated material is predominantly thin till overlying an eroded bedrock surface. This system is mapped in the northeastern corner of Tipton County and is the most limited groundwater resource 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 groundwater production in the Till Veneer Aquifer System in Tipton County. Few wells have been completed in this system because most wells have been completed in the underlying bedrock. Potential aquifer deposits would include thin, isolated sands and/or gravels with yields less than 5 gallons per minute (gpm). There are no registered significant groundwater withdrawal facilities using this system. The Till Veneer Aquifer System is not very susceptible to contamination from surface sources because the near-surface materials generally have low permeability.

Tipton Till Aquifer System

In Tipton County, this aquifer system ranges in thickness from about 50 feet in the eastern and northeastern portion of the county to over 250 feet in the southwestern portion of the county. Wells completed in the Tipton Till Aquifer System are capable of meeting the needs of most domestic and some high-capacity users in Tipton County. However, approximately 30 percent of wells started in this system utilize the underlying bedrock aquifer. Saturated aquifer materials include sand and/or gravel deposits that are commonly 5 to 15 feet thick and are generally overlain by 65 to 125 feet of till. Wells producing from the Tipton Till Aquifer System are typically 70 to 140 feet deep. Domestic well capacities are commonly 15 to 50 gpm. Static water levels generally range from 10 to 22 feet below the surface, however, two flowing wells have been reported in Tipton County. There is 1 registered significant groundwater withdrawal facility (1 well) with a reported yield of 150 gpm.

The Tipton Till Aquifer System typically has a low susceptibility to surface contamination because intertill 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 the county. Total thickness of unconsolidated materials in this subsystem ranges from about 50 to 200 feet thick in Tipton County. Potential aquifer materials include intertill sand and gravel deposits. Where present these aquifer materials are typically capped by till that is commonly 40 to 75 feet thick.

More than 80 percent of wells started in the Tipton Till Aquifer Subsystem in this county are completed in the underlying bedrock aquifer system. However, this subsystem is capable of meeting the needs of some domestic users in the county. The few wells producing from the Tipton Till Aquifer Subsystem are generally completed at depths of 45 to 100 feet. Intertill sand and gravel aquifer materials are typically 2 to 10 feet thick. Reported well yields generally range from 10 to 25 gpm and static water levels are commonly 8 to 18 feet below the surface. There are no registered significant groundwater withdrawal facilities using this system.

This subsystem is generally not very susceptible to surface contamination because intertill sand and gravel units are overlain by thick till deposits. However, in some areas where aquifers are shallow and overlying clay deposits are thin, the system is at moderate risk.

Tipton Complex Aquifer System

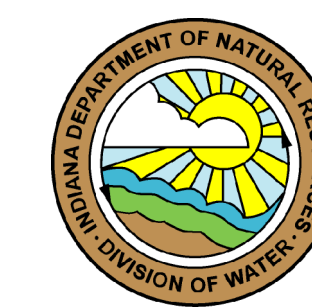
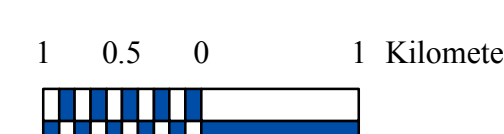
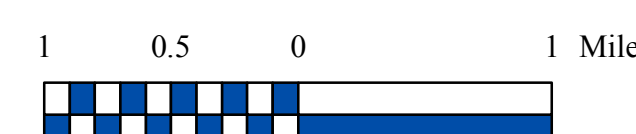
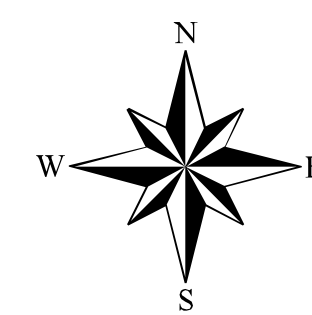
The Tipton Complex Aquifer System is characterized by unconsolidated deposits that are quite variable in materials and thickness. Aquifers within the system range from thin to thick and include single or multiple intertill sands and gravels. The aquifers are highly variable in depth and lateral extent and are typically confined by thick clay layers. Total thickness of the Tipton Complex Aquifer System generally ranges from about 100 to over 250 feet in Tipton County.

This system is capable of meeting the needs of domestic and some high-capacity users in Tipton County. However, approximately 14 percent of wells started in this system utilize the underlying bedrock aquifer. The most utilized aquifer layers in the Tipton Complex Aquifer System are generally 5 to 20 feet thick sands and/or gravels overlain by a till cap which is commonly 70 to 135 feet thick. Wells in this system are typically completed at depths ranging from 85 to 155 feet. Domestic well yields are commonly 15 to 50 gpm and static water levels are generally 8 to 20 feet below the surface. There are 2 registered significant groundwater withdrawal facilities (total of 9 wells) with reported yields of up to 745 gpm.

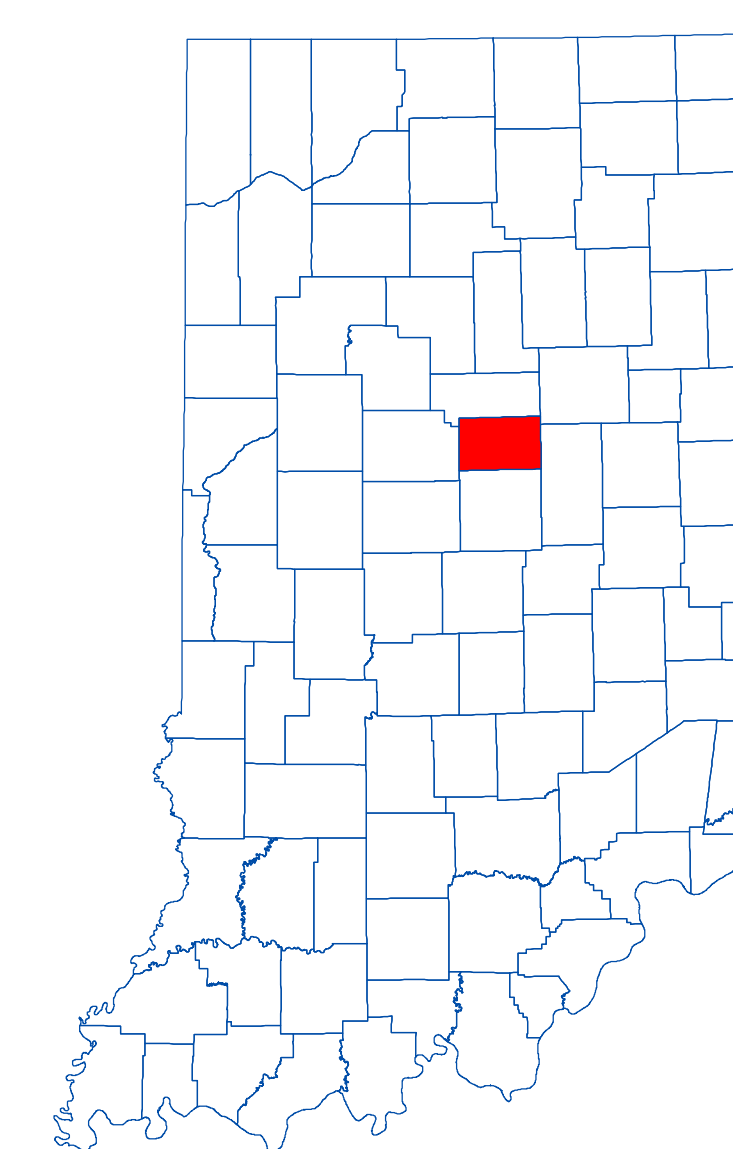
The Tipton Complex Aquifer System is not very susceptible to contamination where overlain by thick clay deposits. However, in some areas where surficial clay deposits are thin, the shallow aquifer, if present, is at moderate to high risk.

EXPLANATION

- Registered Significant Groundwater Withdrawal Facility
- Stream
- County Road
- State Road and US Highway
- Municipal Boundary
- Lake



Location Map



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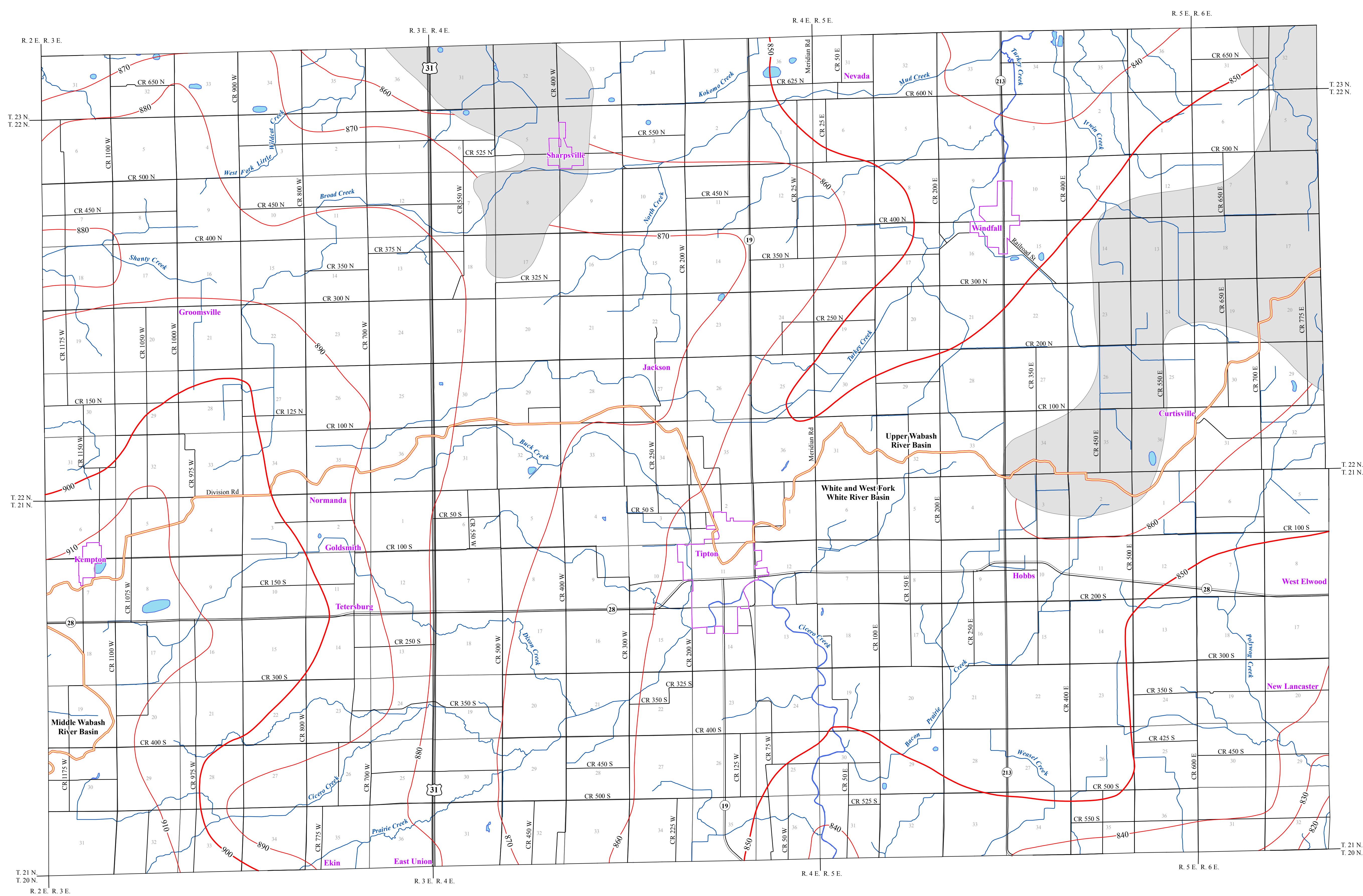
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Unconsolidated Aquifer Systems of Tipton County, Indiana

by
Robert A. Scott
Division of Water, Resource Assessment Section

October 2009

POTENTIOMETRIC SURFACE MAP OF THE UNCONSOLIDATED AQUIFERS OF TIPTON COUNTY, INDIANA



Tipton County, Indiana is located in the central portion of the state bounded by Clinton, Howard, Grant, Madison, and Hamilton counties to the west, north, northeast, east, and south, respectively. The northern half of the county is situated within the Upper Wabash River Basin, and a small portion in the southwest is within the Middle Wabash River Basin. The remainder of the southern half of the county is situated within the White and West Fork White River Basin.

The Potentiometric Surface Map (PSM) of the unconsolidated aquifers of Tipton County is mapped by contouring the elevations of 1166 static water levels reported on well records received primarily over a 50-year period. These wells are completed in unconsolidated aquifers at various depths and typically under confined conditions (bounded by impermeable layers above and below the water bearing formation). However, some wells are completed in unconfined settings with water bearing formations not bounded by impermeable layers. The potentiometric surface is a measure of the pressure on water in a water bearing formation, or aquifer. Water in an unconfined aquifer is at atmospheric pressure and will not rise in a well above the top of the water bearing formation. In contrast, water in a confined aquifer, which is under hydrostatic pressure, will rise in a well above the top of the water bearing formation.

Static water level measurements in individual wells used to construct county potentiometric surface contours are indicative of the water level at the time of well completion. The groundwater level within an aquifer constantly fluctuates in response to rainfall, evapotranspiration, groundwater movement, and pumpage. Therefore, current site-specific conditions may differ due to local or seasonal variations in measured static water levels. Because fluctuations in groundwater are typically small, static water levels can be used to construct a generalized PSM. Groundwater flow is naturally from areas of recharge toward areas of discharge. As a general rule, but certainly not always, groundwater flow approximates the overlying topography and intersects the land surface at major streams. The contours were determined based on the amount of data and the degree of change in water levels between wells.

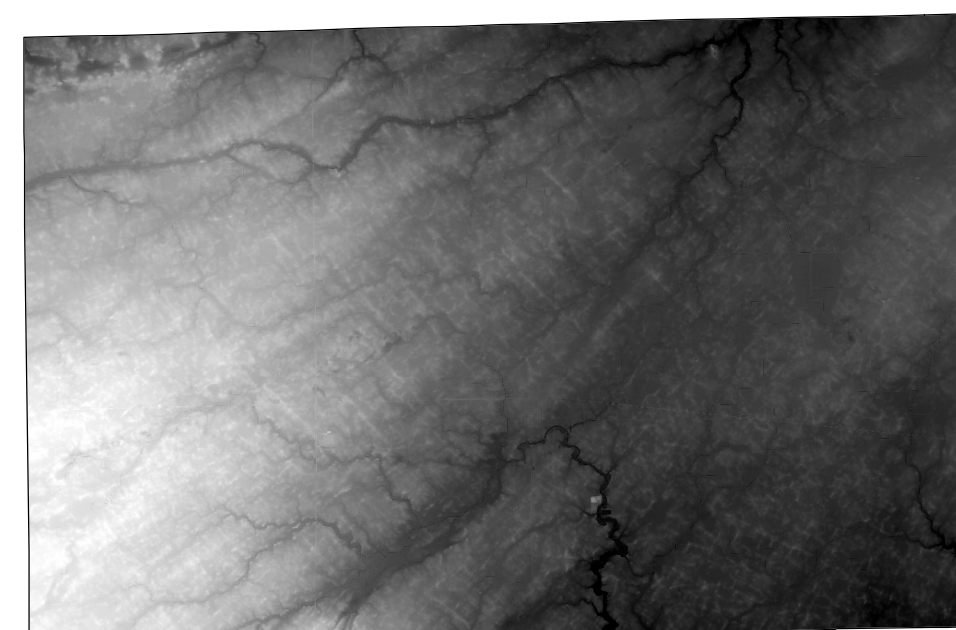
The potentiometric surface contours are mapped primarily for the upper 100 feet of the unconsolidated materials and utilize data for wells 100 feet or less in depth. When shallow data is sparse or unavailable in an area, deeper wells are used to complement the mapping. Unconsolidated potentiometric surface elevation contours have not been extended within a portion of north-central and northeast Tipton County. This area is either lacking in data and/or covered by thin or unproductive unconsolidated deposits.

Data collected to generate the PSM were standardized and validated for accuracy. Universal Transverse Mercator (UTM) coordinates for the water wells were either physically obtained in the field, determined through address geocoding, or determined based on water well records. The location of the majority of the water well records used to make the PSM were field verified. Elevation data were derived from a digital elevation model based on LIDAR. Quality control/quality assurance procedures were utilized to refine or remove data where errors were readily apparent.

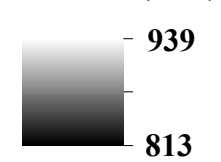
Potentiometric surface contours are developed based on the static water levels from the unconsolidated aquifer systems and displayed here with 10-foot contours and 50-foot index contours. Potentiometric surface contours in Tipton County range from a high of 910 feet mean sea level (msl) in the southwest, to a low of 820 feet msl in the southeast. Groundwater flow direction is generally to the northeast, north of the major basin boundary. Groundwater flow transitions to the east and southeast, south of the major drainage basin divide.

The county PSM can be used to define the regional groundwater flow path and to identify significant areas of groundwater recharge and discharge. County PSM's represent overall regional characteristics and are not intended to be a substitute for site-specific studies.

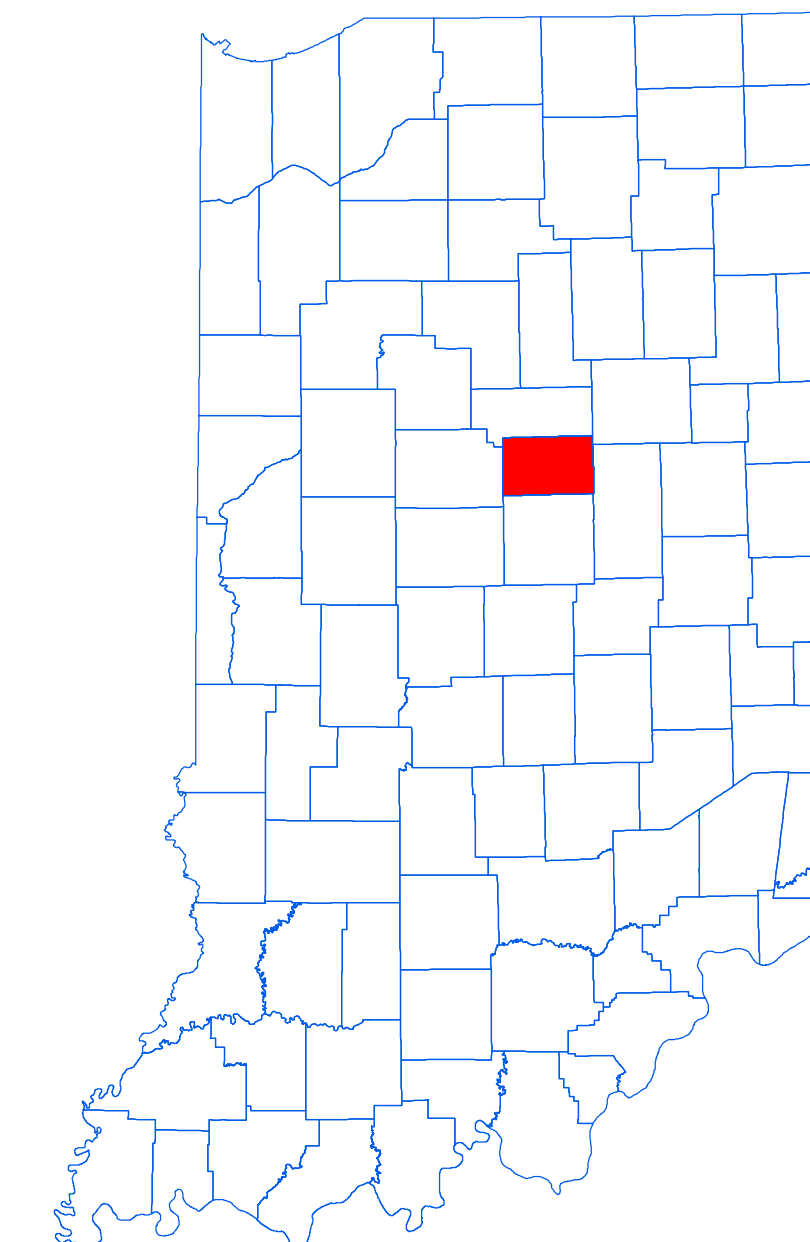
Digital Elevation Model of Tipton County, Indiana



Elevation (feet)

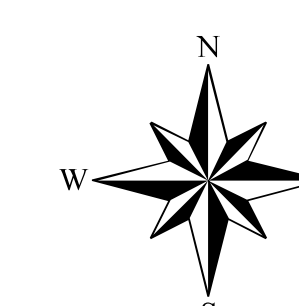
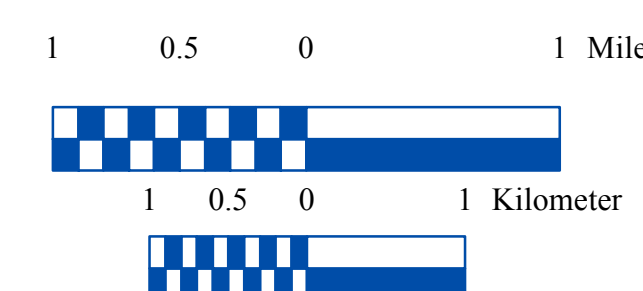


Location Map



EXPLANATION

- 800 Potentiometric Contour interval 10 feet
- Stream
- County Road
- State Road
- US Highway
- Basin Boundary
- No Aquifer Material or Limited Data
- Municipal Boundary
- Lake



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Potentiometric Surface Map of the Unconsolidated Aquifers of Tipton County, Indiana

by
 Ginger C. Korinek
 Division of Water, Resource Assessment Section

December 2013

Tipton County

