EXHIBIT C. MEMORANDUM FROM STAFF

From: Oksana Polhuy, Planning Administrator
To: Lapel Board of Zoning Appeals
Date: 10/4/2023
RE: BZA-2023-01

There were a few planning-related topics mentioned during the hearing and staff would like to address them in this memo.

Submittal Documents

It was noted during the public comment that the sewer letter and the warranty deeds were missing from the applicant's packet posted online. The warranty deeds were linked in the title document. Staff extracted and attached them so that they are more obvious. The sewer letter was submitted by the applicant at the rezone application in June and staff attached that letter to the revised online packet.

Conditions in the Staff Report

Staff has edited and added some conditions to the Staff report. Since the findings of fact are based on the petitioner's commitment to store only vehicle carcasses, the staff proposes to add an explicit commitment that that's the only kind of vehicle item that may be stored in the outdoor yard. The reason behind some of the changes are noted throughout this memo.

Traffic Study

It was noted during the public comment that a traffic study would be needed. Lapel's UDO doesn't explicitly require it. Since this project is located on the State road, the state INDOT would have to review the permit application for any road improvements to this road. Typically, INDOT may require a traffic analysis or a study to determine what kinds of improvements are warranted based on the traffic level. This is done during the permitting stage.

Fire Hydrant

A written testimony had concerns about the location of existing fire hydrants that may be too far away.

Lapel's UDO permits the use of dry fire hydrants on site in the General Industrial zoning district (V 10.2.9.I), "*In locations where fire hydrants served by a public water system cannot be provided, dry hydrants shall be provided in all lakes and storm water retention and detention ponds subject to the specifications of the appropriate local fire department*." This item would be reviewed during the permitting stage.

Light Pollution

A concern about the light glare from the storage yard onto the surrounding uses was brought up during the public hearing. Lapel's UDO has the following regulations in place relevant to the storage yard (V 10.2.11):

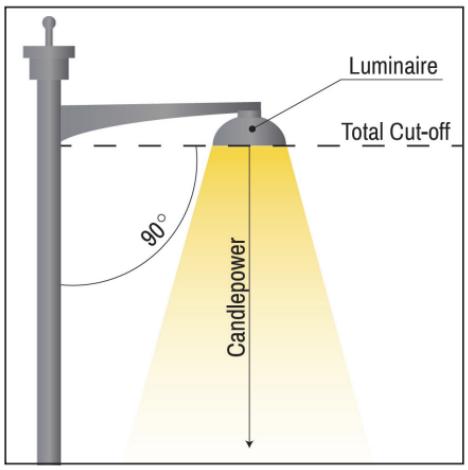


Figure V10.2.11.1

- Lighting on each lot shall be designed to reduce light pollution while providing the maximum light necessary for security and safe pedestrian movements.
- All freestanding lights and lights mounted on walls or facades must have cut-off luminaries with 90 degrees or less of an angle (downlighting). (See Figure V10.2.11.1)
- Measurements of light readings shall be taken along any property line of the subject property with a light meter facing the center of the property at a height of six (6) feet.

The light standards do not explicitly go over the lighting in the storage yards and the regulations do not require a lighting plan explicitly during the permitting stage to ensure that the lighting is designed to produce little to no glare at the property line. Due to that, staff proposes to add the following condition to approval that would be enforceable during the permitting stage to safeguard the surrounding property uses from the noise pollution: "*Where exterior lighting is provided, lighting levels for all areas shall be designed and located so that the illumination measured in foot-candles along the property lines shall be at or below 1.0 foot-candle. The applicant shall submit a lighting plan during the "Development Plan" / "Improvement Location Permit" stage showing a photometric layout indicating all photometric calculations including foot-candle levels on a regular grid across the site and extending beyond the lot; and the aiming direction of the light fixtures."*

Noise

Concerns were expressed about the noise produced by the operation. Lapel's Town Code has some noise provisions, but they may be a little too vague for this case. Staff proposes the following possible solutions:

1. Add a condition to limit operation hours. The range could be 7 am – 10 pm on week days and a different range on weekends.
2. Add a condition about limiting blasting operations only on the week days and maybe giving a range of hours when that may occur.

Other communities handle noise differently. Noise regulations are typically noted in the town codes and then zoning ordinances may add additional standards to specific uses. Here are some examples:

- Indianapolis zoning ordinance has noise-specific regulations for mining operations, *"The sound level created by any source shall not exceed 70 dB(C) and 60 dB(A), measured at the lot line except along a lot line contiguous to another property owned*

by the same property owner and approved for mining operations. Sound pressures shall be measured with a sound level meter meeting the standards of the American National Standards Institute's "American Standard Specification for General Purpose Sound Level Meters…. The following uses and activities shall be exempt from noise level regulation: noises of safety signals, warning devices, emergency pressure relief valves, and other emergency activity." There is a separate section on noise regulations of blasting activities that limits surface blasting to happen between 10 am and 3 pm on Mondays-Saturdays and subsurface blasting between 1 pm and 6 pm.

- Fishers zoning ordinance has a noise-specific regulation for car washes located within 200 feet of a residential use, *"All vacuuming and compression machines located outside of the enclosed building shall be of a design that does not exceed a noise level reading of 45 dB(A), as measured from the property line, between the hour of 6 AM to 7 AM and 55 dB(A) at all other lawful hours of operation. Operation of the establishment shall be prohibited prior to 6 AM and after 11 PM on all days of the week."*
- Noblesville's zoning ordinance has a certain maximum decibel level for industrial, commercial, and residential uses *in general* during the day and night measured at the property line, with some exceptions. For example, industrial uses shouldn't go over 65 dB during the day and 60 dB during the night. When the day and the night starts/ends is unclear.

While the examples above differ and aren't consistent, they show a general pattern of the items that could be included into a condition if the Board desires to add it:

- Limit on hours of operation.
- Limit on the noise created to be measured in dB(A) at a property line at different times.
- Exemptions of certain "momentary" activities that don't occur the whole day, but occur for a few minutes.

Generally known decibel levels:

- Subdivision at night: 40 dB.
- Human normal conversation: 60-70 dB.
- Washing machine: 70 dB.
- Gas-powered lawn mowers: 85 dB.

Prolonged exposure over time to constant noises over 70 dB may start damage to hearing per CDC.

If BZA would like to add a condition about the noises, staff recommends something along the lines of, "*The noise of normal operations of the use shall not go over 70 dB (A) during the day on weekdays (defined hours) and 55/60 dB at night (define hours), weekends (define days) and holidays. The crushing activities shall be limited to the following days and time of operation: [define] …. The noise produced by crushing may exceed the noise of the normal operation by 10-20 dB (A) for a single period no longer than [15-30] minutes a day. The noise level shall be measured at the property line with a sound level meter meeting the standards of the American*

National Standards Institute. The instrument shall be set to the A-weighted response scale and the meter to slow response."

Fence Material

Lapel's UDO states that the fence surrounding the vehicle junk yard should be made out of 100 % wood, stone, or masonry fence. The general fence regulations in the General Industrial district (V 10.2.22) and fence regulations within the landscaping and screening portion of regulations (V 10.2.7) do not allow chain link and barbed/razor wire fencing (or do not allow unless a permit is applied for a chain link fence and a certain PVC coating is applied).

Finally, Lapel's UDO within "fences and walls" section states the following*, "In instances when special uses in the Ig District require Fence & Wall Standards that are different than those in this section (for reasons of public health, safety, and welfare), the Plan Commission or Town Council may modify the requirements of section V10.2.22 to accommodate the needs of the development*."

Due to a variety of types of fences permitted in the General Industrial district for other uses, staff interpreted that the main goal of stating different material types within the "junk yard" section was to stress that the fence should be *opaque* to visually screen the view onto the yard. There is no such requirement for any other storage yards or other industrial activities. It is possible that at the time of passing the ordinance, a metal opaque fence was not a common material and was omitted from the list of permitted materials.

Staff believes that the choice of material for the fence would be best if it matched the overall architecture of the building so that the overall look of the site is consistent. An industrial building with "concrete panel" outside look and a wooden fence may look at odds, though the wooden fence would be permitted.

It is within the Board's power to interpret this regulation differently from staff and ask the applicant if they can provide a material listed in the ordinance.

Water Quality

The biggest public concern about this proposal is how the proposed use could affect water quality in the area. Staff expressed a general opinion that a lot of environmental regulations come from the federal and state laws and are enforced by IDEM. When the applicant applies for the permits with IDEM, that would be the time when the petitioner would need to prove to the state that it can abide by those standards.

Additional conversations with IDEM resulted in the following findings:

- LKQ currently has stormwater runoff permits for all of its salvage yards in Indiana.
- LKQ has license to operate all salvage yards in Indiana.
- LKQ would need to apply for a "disturbance of more than 1 acre" permit, a state license to operate a salvage yard, and possibly a stormwater runoff permit depending on the type and scale of their activity.
- If any other environmentally sensitive areas like wetlands and floodplains are proposed to be disturbed, there would be an additional permit for that.

- IDEM doesn't test the groundwater before a use goes in. However, if a spill is reported, IDEM will send someone to investigate the spill.
- When IDEM looked at the water maps for the project site, it didn't find any special environmental sensitivities.

Is the project site located over a Wellhead Protection Area?

A Wellhead protection area is an area that a public water supplier may establish around the wells that provide the water to the public. The water supplier creates a plan for managing water quality and contingency plans if the spills happen. Indiana Code also has a few more regulations that apply to certain uses located inside of the wellhead protection area.

LKQ's site is NOT located in any wellhead protection area (see Figure 1 and 2):

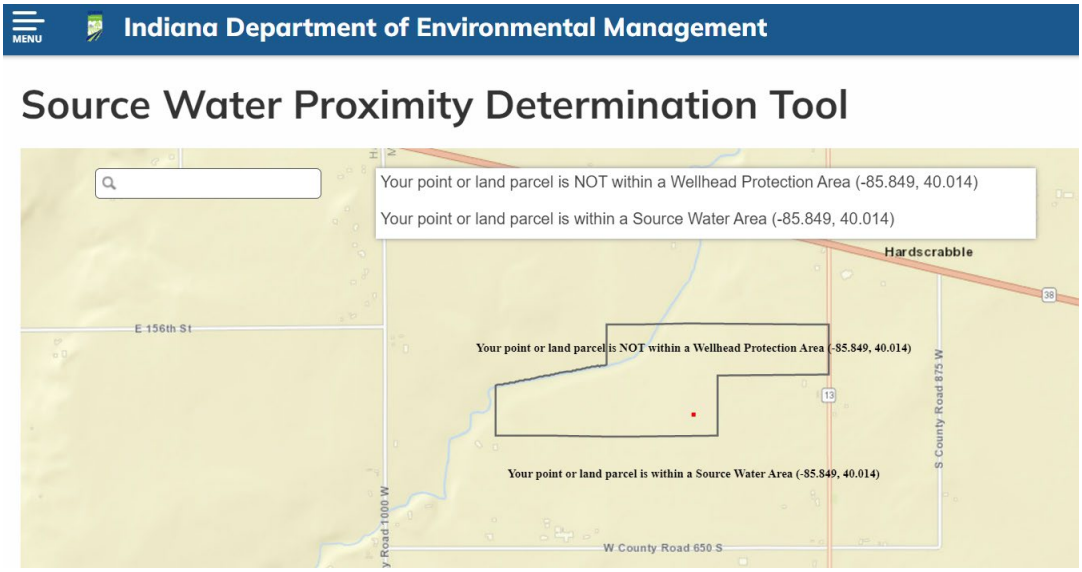


Figure 1

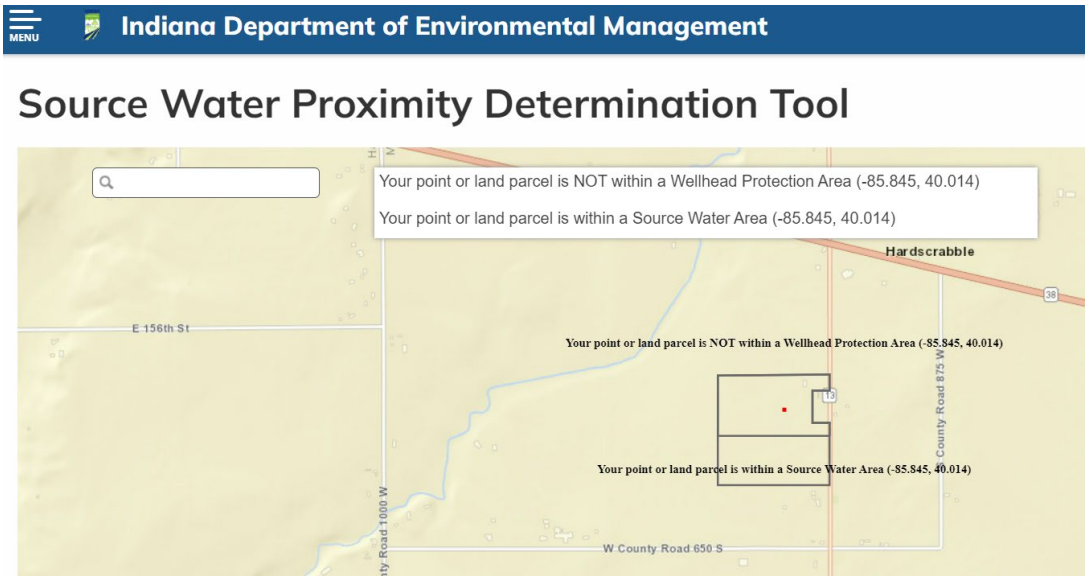


Figure 2

In addition to the information above, staff added a map from South Madison Citizens water. They have a Wellhead Protection Area around their well located 0.65 miles north of LKQ's site.

How far are the community wells from LKQ's site?

Per the information from the map of "unconsolidated aquifers" of Madison County, there is a Citizen's well located 0.65 miles north of the project site and Town of Lapel's well 0.54 miles north of the project site (Figure 3).

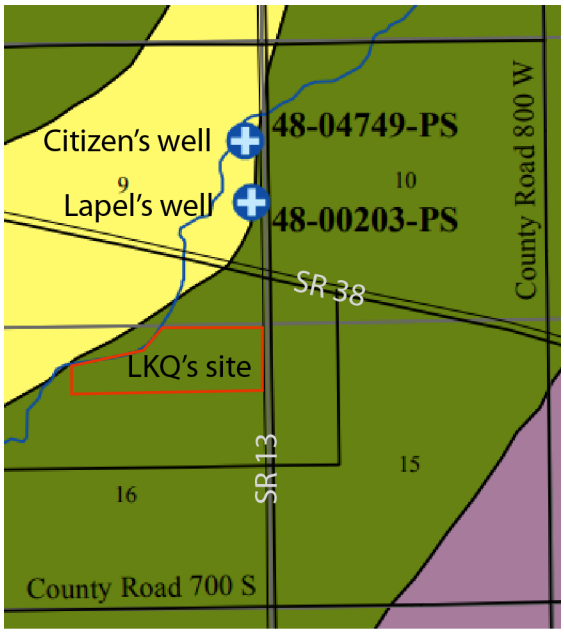


Figure 3

Aquifer Maps

Madison County Aquifer Maps show that there is some sort of bedrock or unconsolidated aquifer under every acre of land in the county. So, simply saying that a use should not be allowed because it's "over an aquifer" would be impractical.

We can analyze the information on those maps to see if there anything else specific to the aquifers and the flow of water around the project site.

The bedrock and unconsolidated aquifer maps provide explanation for each "material", its thickness, ability to produce water, and its susceptibility to contamination. This is what the map states about the bedrock and the unconsolidated material under the project site:

- Bedrock. Silurian and Devonian Carbonates Aquifer System.
    - This aquifer system is generally not very susceptible to surface contamination due to thick clay deposits over most of the county. However, there are localized areas, especially near the White River, where the bedrock surface is shallow. These areas, therefore, are at moderate to high risk to contamination.
- Unconsolidated Aquifer. Bluffton / New Castle / Tipton Till Aquifer Subsystem
    - This subsystem is generally not very susceptible to surface contamination because intertill sand and gravel units are overlain by thick till deposits. Wells producing from shallow aquifers are moderately to highly susceptible to contamination.

The potentiometric maps can shows us an approximate direction of surface and ground water movement. In the vicinity of the project site as well as north and south of it, the water would generally move from east to west.

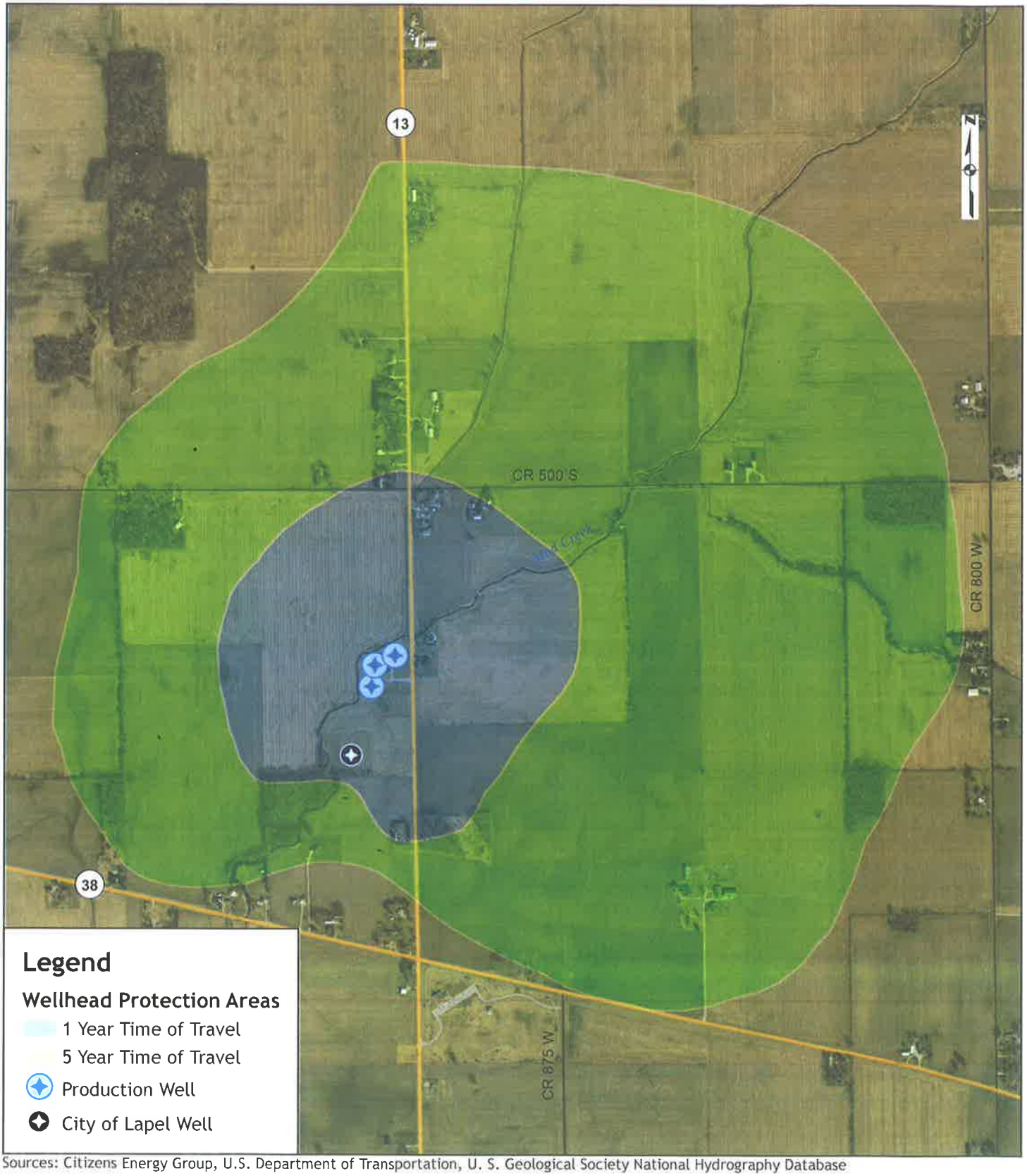
Since the most probably pollution source on LKQ's site, like on any parking lot or road, is the surface water runoff that then infiltrates into the ground is groundwater, it's prudent to look at where it's going to go. In general, the applicant already shows on the site plan the location of their retention/detention pond where stormwater will be collected before it's released into the nature. It's shown on the northwest side of the lot. Typically, sites need to be constructed in a way that the site would collect all stormwater produced by the activity and move and treat it in a way that doesn't negatively affect the surrounding properties. The reviews are done by the

Drainage Board (likely Madison County) and possibly by IDEM during the stormwater runoff permit review.

If the Board wants to know of the general direction of surface water flow, staff recommends looking at the topographic maps of Madison County (MCCOG's website). It shows that the ground elevations of the sites to the west of LKQ's site are higher than LKQ (862-864), SR 13 is generally 862, and then the elevations reduce from 860 to 842 across LKQ's site until it reaches the creek. Then the elevations increase back up west of the creek. The elevations of the sites north and south of LKQ follow LKQ's overall pattern of elevation reduction east to west. So, the overall groundwater flow pattern is east to west. Also, creek's elevations are higher north of LKQ's site than south. So, the overall flow of the water in the creek is north to south.

Figure 1

Citizens South Madison Wellfield Wellhead Protection Areas



Sources: Citizens Energy Group, U.S. Department of Transportation, U. S. Geological Society National Hydrography Database

Updated 1/12/2017

1 "=1,247 '

0 420 840 1,680 2,520 3,360 Feet

BEDROCK AQUIFER SYSTEMS OF MADISON 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.

Bedrock aquifer systems in Madison County are overlain by unconsolidated deposits of varying thickness ranging from bedrock exposure in Fall Creek at Pendleton to over 350 feet in a buried bedrock valley located south of Chesterfield. Bedrock, in places, is at or near the surface along several streams in 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 bedrock aquifers are highly variable.

Most bedrock aquifers in the county are under confined conditions, mainly a result of low vertical hydraulic conductivity clay-rich materials, such as glacial till, overlying the bedrock. Therefore, the potentiometric surface (water level) in most wells completed in bedrock rises above the top of the water-bearing zone.

Two bedrock aquifer systems are identified for Madison County. They are, from west to east and younger to older: the Silurian and Devonian Carbonates, and the Maquoketa Group of Ordovician age. Approximately 49 percent of all wells in this county are completed in bedrock.

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.

Silurian and Devonian Carbonates Aquifer System

The Silurian and Devonian Carbonates Aquifer System subcrops throughout nearly all of Madison County. Wells penetrating the Silurian and Devonian Carbonates Aquifer System have reported depths ranging from 25 to 480 feet, but are commonly 90 to 220 feet deep. The amount of rock penetrated in this system typically ranges from 30 to 132 feet.

Wells utilizing the Silurian and Devonian Carbonates Aquifer System are generally capable of meeting the needs of domestic and some high-capacity users in this county. Domestic well yields commonly range from 8 to 26 gallons per minute (gpm). Static water levels typically range from 15 to 36 feet below the land surface. A few flowing wells have been reported for this bedrock aquifer system in the county. There are 12 registered significant groundwater withdrawal facilities (34 wells) utilizing the Silurian and Devonian Carbonates Aquifer System in Madison County. High-capacity well depths range from approximately 100 to 400 feet below the land surface. Reported high-capacity well yields range from 90 gpm to nearly 500 gpm.

This aquifer system is generally not very susceptible to surface contamination due to thick clay deposits over most of the county. However, there are localized areas, especially near the White River, where the bedrock surface is shallow. These areas, therefore, are at moderate to high risk to contamination.

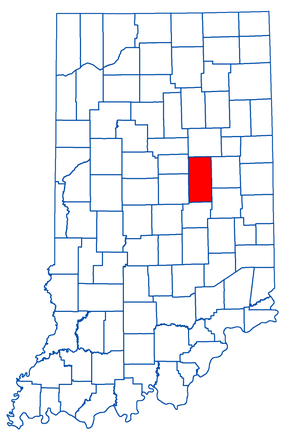
Ordovician -- Maquoketa Group Aquifer System

The extent of the Maquoketa Group Aqui fer System subcrop area is limited to a buried pre-glacial bedrock valley located in central Madison County. The Maquoketa Group consists mostly of shale with interbedded limestone units.

Few wells have been reported in this system in Madison County mostly due to the availability of overlying unconsolidated sand and gravel aquifer resources. However, wells completed in the Maquoketa Group Aquifer System are generally capable of meeting the needs of domestic users in this county. Reported depths of the few wells utilizing this system range from 170 to 270 feet with the amount of rock penetration typically 5 to 85 feet. Reported well yields range from 6 to 28 gpm with static water levels ranging from 22 to 42 feet. There are no registered significant groundwater withdrawal facilities utilizing the Maquoketa Group Aquifer System in Madison County.

The Maquoketa Group Aquifer System is generally not very susceptible to contamination from the land surface because thick layers of clay-rich material overlie the bedrock.

Location Map

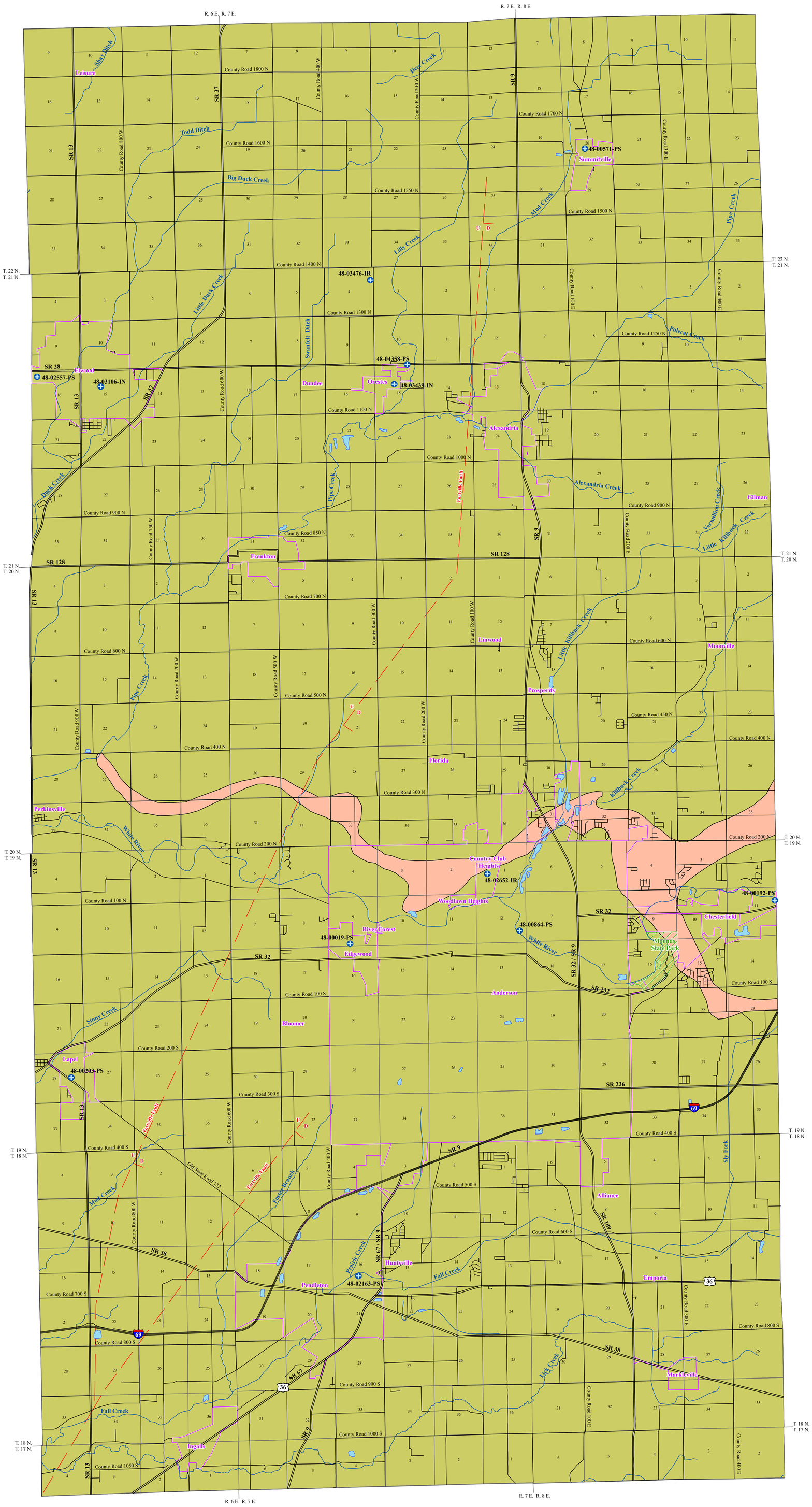


1 0.5 0 1 Mile

1 0.5 0 1 Kilometer

EXPLANATION

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



Map generated by Scott H. Dean
IDNR, Division of Water, Resource Assessment Section

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Bedrock Aquifer Systems of Madison County, Indiana

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

August 2010

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

Madison County, Indiana is located in the north-central section of the state and lies primarily within the White and West Fork White River Basin; however, the northern portion lies within the Upper Wabash River Basin and the southeast section lies within the East Fork White River Basin.

The Potentiometric Surface Map (PSM) of the bedrock aquifers of Madison County was mapped by contouring the elevations of 2438 static water-levels reported on well records received primarily over a 50 year period. These wells are completed in aquifers at various depths, and typically, under confined conditions (bounded by impermeable layers above and below the water bearing formation). However, some wells were completed under unconfined (not bounded by impermeable layers) settings.

The potentiometric surface is a measure of the pressure on water in a water bearing formation. Water in an unconfined aquifer is at atmospheric pressure and will not rise in a well above the top of the aquifer, in contrast to groundwater in a confined aquifer which is under hydrostatic pressure and will rise in a well above the top of the water bearing formation.

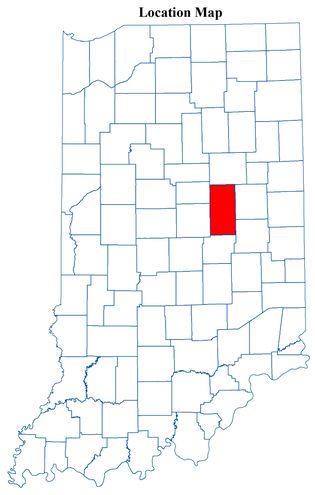
Static water-level measurements in individual wells used to construct county PSM's are indicative of the water-level at the time of well completion. The groundwater level within an aquifer constantly fluctuates in response to rainfall, evapotranspiration, groundwater movement and pumpage. Therefore, measured static water-levels in an area may differ due to local or seasonal variations. Because fluctuations in groundwater are typically small, static water-levels can be used to construct a generalized PSM. As a general rule, but certainly not always, groundwater flow approximates the overlying topography and intersects the land surface at major streams.

Universal Transverse Mercator (UTM) coordinates for the water wells were either physically obtained in the field, determined through address geocoding, or reported 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 obtained from a digital elevation model. Quality control/quality assurance procedures were utilized to refine or remove data where errors were readily apparent.

Potentiometric surface elevations range from a high of 970 feet mean sea level (msl) in the southeastern corner of the county, to a low of 790 feet msl in the west-central section. Groundwater flow direction throughout the majority of the county is generally to the west-southwest towards Pipe Creek and the White River, with a subcomponent flowing to the southwest toward Fall Creek. However, in the northeastern portion of the county, approximately north of the boundary between the White and West Fork White River, and Upper Wabash River Basins, groundwater flow is to the north. Bedrock potentiometric surface elevation contours have not been extended through portions of the county. These areas are lacking in data and/or covered by more prolific unconsolidated deposits that limit the necessity to complete wells in bedrock.

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.

Location Map



1 0.5 0 1 Mile

1 0.5 0 1 Kilometer

N
W E
S

EXPLANATION

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

INDIANA DEPARTMENT OF NATURAL RESOURCES

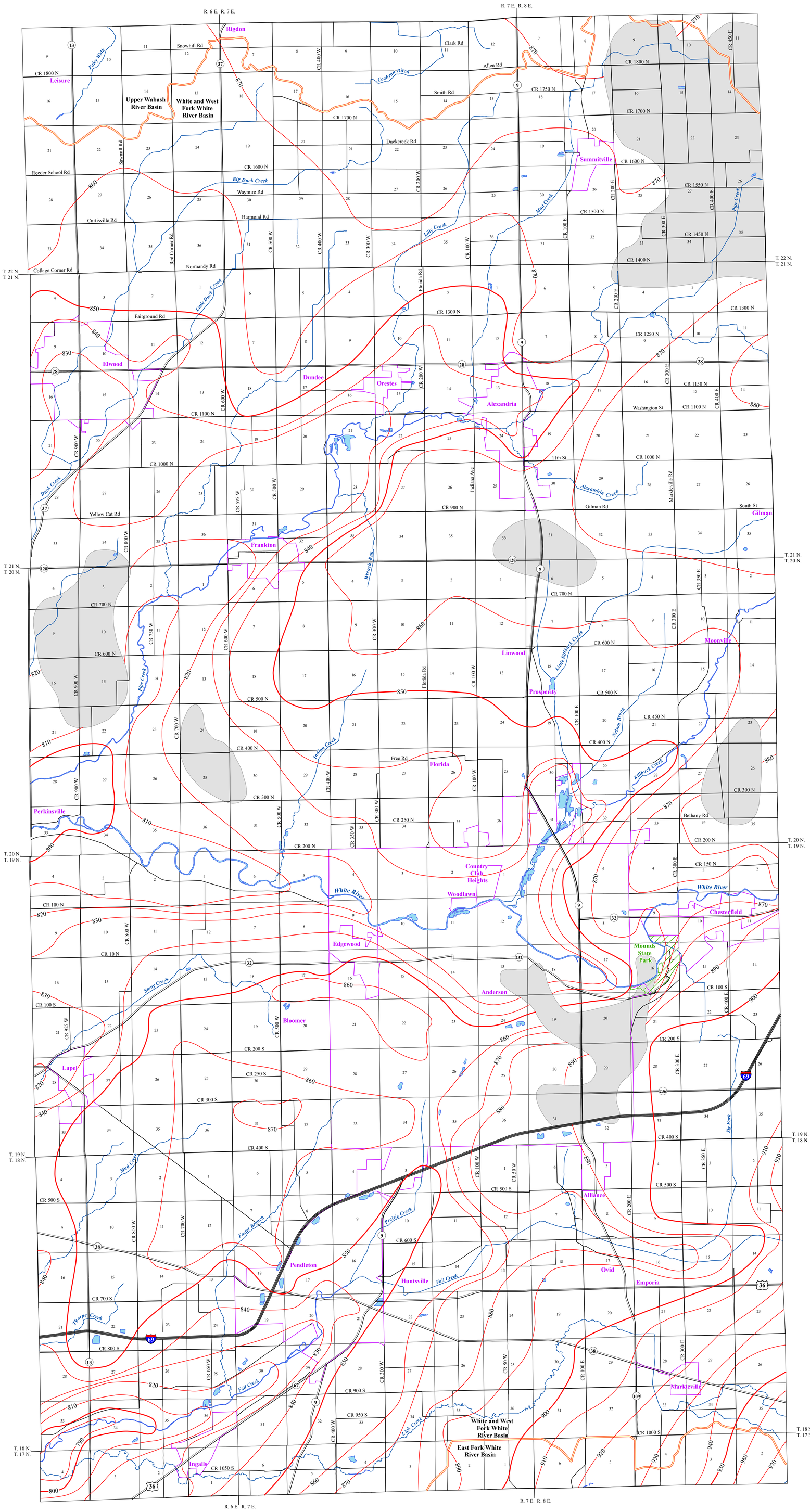
INDIANA DEPARTMENT OF NATURAL RESOURCES DIVISION OF WATER

Digital Elevation Model of Madison County, Indiana

Elevation (feet)

1027

658



Map generated by Joel D. Sanderson
IDNR, Division of Water, Resource Assessment Section

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

by
Robert K. Schmidt
Division of Water, Resource Assessment Section

February 2014

UNCONSOLIDATED AQUIFER SYSTEMS OF MADISON COUNTY, INDIANA

The unconsolidated aquifer systems of Madison County are composed of sediments deposited by, or resulting from, a complex sequence of glaciers, glacial meltwaters, and post-glacial precipitation events. Six unconsolidated aquifer systems have been mapped in Madison County: the Till Veneer; the Bluffton / New Castle / Tipton Till; the Bluffton / New Castle / Tipton Till Subsystem; the Bluffton / New Castle / Tipton Complex; the White River and Tributaries Outwash; and the White River and Tributaries Outwash Subsystem. 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. Approximately 51 percent of all wells in this county are completed in unconsolidated deposits.

The thickness of unconsolidated deposits in Madison County is quite variable, due to the deposition of glacial material over an uneven bedrock surface. Unconsolidated deposits in the county range from no cover at the falls of Fall Creek at Pendleton to over 350 feet thick in a buried bedrock valley located south of Chesterfield.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably due to a wide range of variation within geologic environments. 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 Madison County, the Till Veneer Aquifer System occurs in areas where the unconsolidated material is predominantly thin till overlying bedrock. This system is chiefly the product of the deposition of glacial till over an uneven, eroded bedrock surface, and is generally less than 50 feet thick. Portions of northern and southwestern Madison County are mapped as Till Veneer.

The Till Veneer Aquifer System has the most limited groundwater resources of the unconsolidated aquifer systems. Approximately 99 percent of the wells in this system are completed in the underlying bedrock; however, some wells do utilize this aquifer system. Potential aquifers within this system include thin isolated sand and/or gravel layers, and surficial sand and gravel outwash or alluvium. Wells are completed at depths ranging from 24 to 45 feet with sand and gravel aquifer materials commonly 4 to 10 feet thick. Most of the wells in this system have reported capacities of 5 gallons per minute (gpm) or less with some wells being reported as “dry”. Static water levels range between 16 and 32 feet below the surface. There are no registered significant groundwater withdrawal facilities utilizing this system.

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

Bluffton / New Castle / Tipton Till Aquifer System

The Bluffton / New Castle / Tipton Till Aquifer System is mapped throughout portions of Madison County. This aquifer system is up to about 170 feet in thickness, and consists primarily of glacial till with intertill sand and gravel layers. However, the sand and gravel aquifers in this system tend to be relatively thin and discontinuous.

This aquifer system is capable of meeting the needs of most domestic and some high-capacity users in Madison County. The wells utilizing this aquifer system are completed at depths ranging from 50 to 105 feet with sand and gravel aquifer materials commonly 4 to 24 feet thick. Domestic well yields are typically 10 to 40 gpm and static water levels range from flowing to 32 feet below the land surface. There are 5 registered significant groundwater withdrawal facilities (11 wells) using the Bluffton / New Castle / Tipton Till Aquifer System. The reported yields for the high-capacity wells range from 250 to 1,000 gpm.

The Bluffton / New Castle / 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.

Bluffton / New Castle / Tipton Till Aquifer Subsystem

The Bluffton / New Castle / Tipton Till Aquifer Subsystem is mapped in several areas throughout Madison County. The subsystem is mapped similar to the Bluffton / New Castle / Tipton Till Aquifer System; however, potential aquifer materials are generally thinner and potential yields are less in the subsystem.

About 81 percent of wells started in this subsystem in Madison County are completed in the underlying bedrock aquifer system. However, the Bluffton / New Castle / Tipton Till Aquifer Subsystem is capable of meeting the needs of some domestic users in the county. Potential aquifer materials include relatively thin, discontinuous intertill sand and gravel deposits. These intertill sand and gravel aquifer materials are commonly less than 10 feet thick. The wells producing from this subsystem are typically completed at depths ranging from about 45 to 85 feet. Domestic well yields are generally 5 to 10 gpm and static water levels range from 10 to 30 feet below the surface. There are no registered significant groundwater withdrawal facilities using the Bluffton / New Castle / Tipton Till Aquifer Subsystem.

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

Bluffton / New Castle / Tipton Complex Aquifer System

The Bluffton / New Castle / Tipton Complex Aquifer System is mapped throughout the central and southern areas of Madison County. Multiple glacial advances resulted in sequences of intertill sand and gravel layers, typically overlain by thick clay, resulting in aquifers that are highly variable in depth, thickness, and lateral extent. The total combined thickness of the unconsolidated deposits is up to 240 feet.

The deeper more prolific aquifers of this system are capable of meeting the needs of domestic and some high-capacity users in Madison County. Saturated aquifer materials in the Bluffton / New Castle / Tipton Complex Aquifer System range from about 5 to 25 feet thick, and wells in this system are generally completed at depths from about 70 feet to 125 feet. Domestic well yields range up to 50 gpm and static water levels are about 15 to 40 feet below the surface. There are 14 registered significant groundwater withdrawal facilities (34 wells) using this system. The reported yields for the high-capacity wells range from 75 to 2,847 gpm.

The New Castle Complex Aquifer System overlies a buried bedrock valley located in the east-central portion of the county. The total unconsolidated thickness is up to 350 feet in this area. Only a few reported wells utilize the deeper aquifer within the buried bedrock valley. The aquifer utilized by these wells is up to 22 feet thick, and the reported yields range from 10 to 30 gpm. There is 1 registered significant groundwater withdrawal facility (1 well) using this system. The reported yield for the high-capacity well is 400 gpm.

The Bluffton / New Castle / 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 relatively thin, 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 in the central portion of Madison County along the White River. The system includes thick glacial outwash sands and gravels that are generally capped by a layer of clay and silt deposits.

The White River and Tributaries Outwash Aquifer System is capable of meeting the needs of both domestic and high-capacity users in Madison County. The wells utilizing this aquifer system are completed at depths ranging from 35 to 105 feet with sand and gravel aquifer materials commonly 4 to 22 feet thick. Domestic well yields are typically 10 to 50 gpm with static water levels ranging from 12 to 36 feet below the surface. In the White River and Tributaries Outwash Aquifer System there are 2 registered significant groundwater withdrawal facilities (3 wells). Reported production for these high-capacity wells range from 512 to 1,319 gpm.

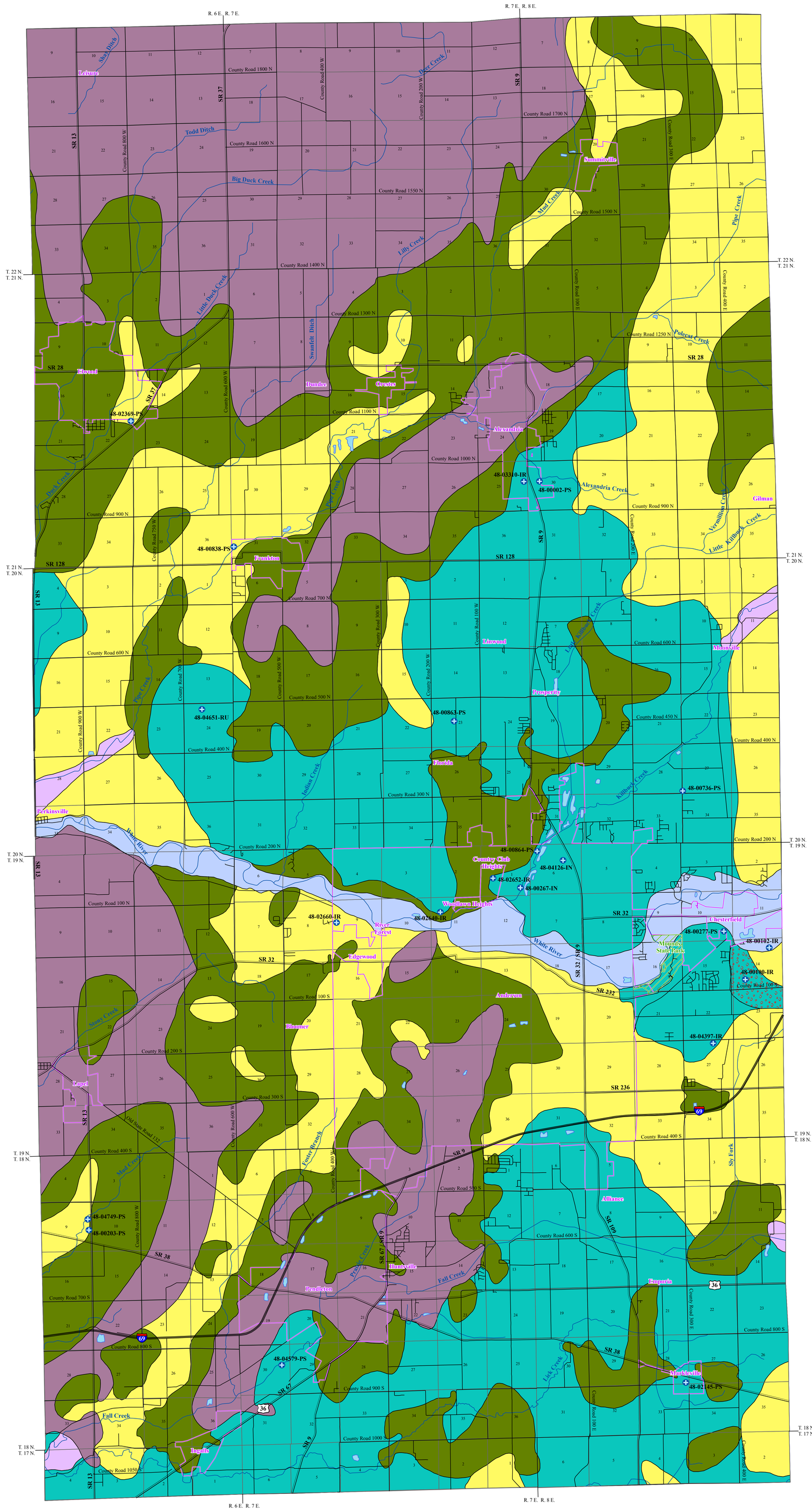
The White River and Tributaries Outwash Aquifer System is highly susceptible to surface contamination where sand and gravel deposits are near the surface and have little or no clay deposits. However, areas having relatively thick clays overlying the sand and gravel deposits are moderately susceptible to contamination.

White River and Tributaries Outwash Aquifer Subsystem

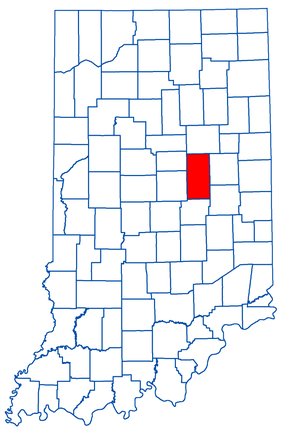
The White River and Tributaries Outwash Aquifer Subsystem is mapped in several areas of Madison County along portions of Fall Creek, Pipe Creek, and Killbuck Creek. This subsystem is mapped similar to the White River and Tributaries Outwash Aquifer System; however, aquifer materials in the White River and Tributaries Outwash Aquifer Subsystem are generally thinner, overlying silt and/or clay materials are thicker, and potential yields are less in the subsystem.

The White River and Tributaries Outwash Aquifer Subsystem has the potential to meet the needs of domestic and some high-capacity users. The wells in this subsystem are completed at depths commonly ranging from 50 to 90 feet. Saturated aquifer materials include sand and gravel deposits that are typically 15 to 50 feet thick. Domestic well yields are generally 10 gpm with static water levels ranging from 8 to 28 feet below the surface. There are no registered significant groundwater withdrawal facilities in the White River and Tributaries Outwash Aquifer Subsystem.

Areas within the White River and Tributaries Outwash Aquifer Subsystem that have overlying clay deposits are moderately susceptible to surface contamination; however, areas lacking overlying clay deposits are highly susceptible to contamination.



Location Map



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

Map generated by Scott H. Dean
IDNR, Division of Water, Resource Assessment Section

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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 1:24,000 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. Unconsolidated Aquifer Systems coverage (Scott, 2010) was based on a 1:24,000 scale.

Unconsolidated Aquifer Systems of Madison County, Indiana

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

August 2010

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

Madison County, Indiana is located in the north-central section of the state and lies primarily within the White and West Fork White River Basin; however, the northern portion lies within the Upper Wabash River Basin and the southeast section lies within the East Fork White River Basin.

The Potentiometric Surface Map (PSM) of the unconsolidated aquifers of Madison County was mapped by contouring the elevations of 2881 static water-levels reported on well records received primarily over a 50 year period. These wells are completed in aquifers at various depths, and typically, under confined conditions (bounded by impermeable layers above and below the water bearing formation). However, some wells were completed under unconfined (not bounded by impermeable layers) settings. The mapped potentiometric surface contours are primarily for the upper 100 feet of the unconsolidated materials and utilize data for wells 100 feet or less in depth. If the shallow data was sparse or unavailable in an area, deeper wells were used to complement the mapping.

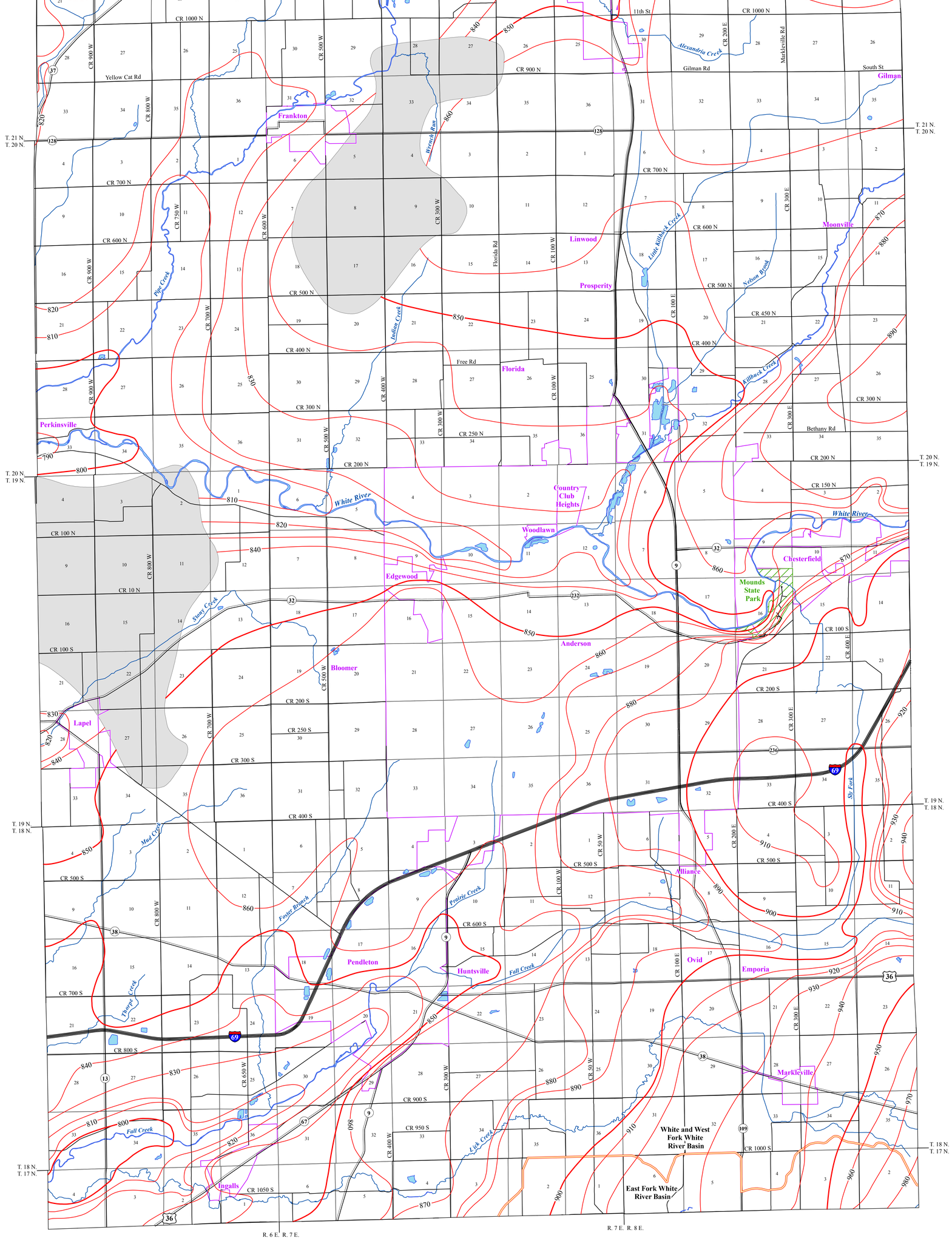
The potentiometric surface is a measure of the pressure on water in a water bearing formation. Water in an unconfined aquifer is at atmospheric pressure and will not rise in a well above the top of the aquifer, in contrast to groundwater in a confined aquifer which is under hydrostatic pressure and will rise in a well above the top of the water bearing formation.

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, measured static water-levels in an area may differ due to local or seasonal variations. Because fluctuations in groundwater are typically small, static water-levels can be used to construct a generalized PSM. As a general rule, but certainly not always, groundwater flow approximates the overlying topography and intersects the land surface at major streams.

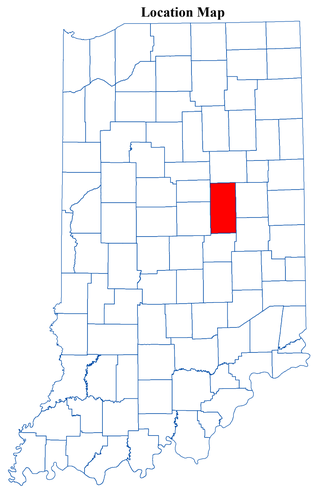
Universal Transverse Mercator (UTM) coordinates for the water wells were either physically obtained in the field, determined through address geocoding, or reported on water well records. The location of the majority of the water well records used to make the PSM were field verified. Elevation data were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

Potentiometric surface elevations range from a high of 980 feet mean sea level (msl) in the southeastern corner of the county, to a low of 790 feet msl in the west-central section. Groundwater flow direction throughout the majority of the county is generally to the west-southwest towards Pipe Creek and the White River, with a subcomponent flowing to the southwest toward Fall Creek. However, in the northeastern portion of the county, approximately north of the boundary between the White and West Fork White River, and Upper Wabash River Basins, groundwater flow is to the north. In portions of the county, where data is lacking and/or covered by thin or unproductive deposits, potentiometric surface elevation contours have not been extended through these areas.

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.



Location Map



1 0.5 0 1 Mile

1 0.5 0 1 Kilometer

N W E S

EXPLANATION

- 810 — Line of equal elevation, in feet above mean sea level Potentiometric Contour interval 10 feet
- Stream
- County Road
- 32 — State Road
- 36 — US Highway
- 69 — Interstate
- Basin Boundary
- Municipal Boundary
- State Managed Property
- Lake & River
- No Aquifer Material or Limited Data

INDIANA DEPARTMENT OF NATURAL RESOURCES

INDIANA DEPARTMENT OF NATURAL RESOURCES DIVISION OF WATER

Digital Elevation Model of Madison County, Indiana

Elevation (feet)

1027

658

Map generated by Joel D. Sanderson
IDNR, Division of Water, Resource Assessment Section

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

by
Robert K. Schmidt
Division of Water, Resource Assessment Section

February 2014