GROUND WATER POLLUTION POTENTIAL OF FAYETTE COUNTY, OHIO

BY

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ABSTRACT

A ground water pollution potential map of Fayette County has been prepared using the DRASTIC mapping process. The DRASTIC system consists of two major elements: the designation of mappable units, termed hydrogeologic settings, and the superposition of a relative rating system for pollution potential.

Hydrogeologic settings incorporate hydrogeologic factors that control ground water movement and occurrence including depth to water, net recharge, aquifer media, soil media, topography, impact of the vadose zone media, and hydraulic conductivity of the aquifer. These factors, which form the acronym DRASTIC, are incorporated into a relative ranking scheme that uses a combination of weights and ratings to produce a numerical value called the ground water pollution potential index. Hydrogeologic settings are combined with the pollution potential indexes to create units that can be graphically displayed on a map.

Ground water pollution potential analysis in Fayette County resulted in a map with symbols and colors, which illustrate areas of varying ground water pollution potential indexes ranging from 96 to 172.

Fayette County lies entirely within the Glaciated Central hydrogeologic setting. Limestones and dolomites of the Silurian and Devonian Systems compose the aquifer in most of western and southern Fayette County. Yields in the uppermost carbonate aquifers range from 5 to 100 gallons per minute (gpm). Yields over 100 gpm are possible from larger diameter wells drilled deeper into the limestone.

Sand and gravel outwash and alluvial deposits adjacent to portions of Deer Creek and Paint Creek are capable of producing yields up to 100 gpm and 500 gpm respectively from large diameter wells. Sand and gravel lenses interbedded in the glacial till locally serve as aquifers in areas of eastern Fayette County adjacent to Deer Creek and Paint Creek. Yields for these sand and gravel lenses range from 5 to 25 gpm. Sand and gravel lenses are more common in areas of thicker drift. The sand and gravel lenses may lie directly on top of the limestone bedrock and serve as the aquifer or provide additional recharge to the underlying bedrock.

The ground water pollution potential mapping program optimizes the use of existing data to rank areas with respect to relative vulnerability to contamination. The ground water pollution potential map of Fayette County has been prepared to assist planners, managers, and local officials in evaluating the potential for contamination from various sources of pollution. This information can be used to help direct resources and land use activities to appropriate areas, or to assist in protection, monitoring, and clean-up efforts.

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INTRODUCTION

The need for protection and management of ground water resources in Ohio has been clearly recognized. Approximately 42 percent of Ohio citizens rely on ground water for drinking and household use from both municipal and private wells. Industry and agriculture also utilize significant quantities of ground water for processing and irrigation. In Ohio, approximately 750,000 rural households depend on private wells; 4,400 of these wells exist in Fayette County.

The characteristics of the many aquifer systems in the state make ground water highly vulnerable to contamination. Measures to protect ground water from contamination usually cost less and create less impact on ground water users than remediation of a polluted aquifer. Based on these concerns for protection of the resource, staff of the Division of Water conducted a review of various mapping strategies useful for identifying vulnerable aquifer areas. They placed particular emphasis on reviewing mapping systems that would assist in state and local protection and management programs. Based on these factors and the quantity and quality of available data on ground water resources, the DRASTIC mapping process (Aller et al., 1987) was selected for application in the program.

Considerable interest in the mapping program followed successful production of a demonstration county map and led to the inclusion of the program as a recommended initiative in the Ohio Ground Water Protection and Management Strategy (Ohio EPA, 1986). Based on this recommendation, the Ohio General Assembly funded the mapping program. A dedicated mapping unit has been established in the Division of Water, Water Resources Section to implement the ground water pollution potential mapping program on a countywide basis in Ohio.

The purpose of this report and map is to aid in the protection of our ground water resources. This protection can be enhanced by understanding and implementing the results of this study, which utilizes the DRASTIC system of evaluating an area's potential for ground water pollution. The mapping program identifies areas that are vulnerable to contamination and displays this information graphically on maps. The system was not designed or intended to replace site-specific investigations, but rather to be used as a planning and management tool. The map and report can be combined with other information to assist in prioritizing local resources and in making land use decisions.

APPLICATIONS OF POLLUTION POTENTIAL MAPS

The pollution potential mapping program offers a wide variety of applications in many counties. The ground water pollution potential map of Fayette County has been prepared to assist planners, managers, and state and local officials in evaluating the relative vulnerability of areas to ground water contamination from various sources of pollution. This information can be used to help direct resources and land use activities to appropriate areas, or to assist in protection, monitoring, and clean-up efforts.

An important application of the pollution potential maps for many areas will be assisting in county land use planning and resource expenditures related to solid waste disposal. A county may use the map to help identify areas that are suitable for disposal activities. Once these areas have been identified, a county can collect more site-specific information and combine this with other local factors to determine site suitability.

Pollution potential maps may be applied successfully where non-point source contamination is a concern. Non-point source contamination occurs where land use activities over large areas impact water quality. Maps providing information on relative vulnerability can be used to guide the selection and implementation of appropriate best management practices in different areas. Best management practices should be chosen based upon consideration of the chemical and physical processes that occur from the practice, and the effect these processes may have in areas of moderate to high vulnerability to contamination. For example, the use of agricultural best management practices that limit the infiltration of nitrates, or promote denitrification above the water table, would be beneficial to implement in areas of relatively high vulnerability to contamination.

A pollution potential map can assist in developing ground water protection strategies. By identifying areas more vulnerable to contamination, officials can direct resources to areas where special attention or protection efforts might be warranted. This information can be utilized effectively at the local level for integration into land use decisions and as an educational tool to promote public awareness of ground water resources. Pollution potential maps may be used to prioritize ground water monitoring and/or contamination clean-up efforts. Areas that are identified as being vulnerable to contamination may benefit from increased ground water monitoring for pollutants or from additional efforts to clean up an aquifer.

Individuals in the county who are familiar with specific land use and management problems will recognize other beneficial uses of the pollution potential maps. Planning commissions and zoning boards can use these maps to help make informed decisions about the development of areas within their jurisdiction. Developers proposing projects within ground water sensitive areas may be required to show how ground water will be protected.

Regardless of the application, emphasis must be placed on the fact that the system is not designed to replace a site-specific investigation. The strength of the system lies in its ability to make a "first-cut approximation" by identifying areas that are vulnerable to contamination. Any potential applications of the system should also recognize the assumptions inherent in the system.

SUMMARY OF THE DRASTIC MAPPING PROCESS

DRASTIC was developed by the National Ground Water Association for the United States Environmental Protection Agency. This system was chosen for implementation of a ground water pollution potential mapping program in Ohio. A detailed discussion of this system can be found in Aller et al. (1987).

The DRASTIC mapping system allows the pollution potential of any area to be evaluated systematically using existing information. Vulnerability to contamination is a combination of hydrogeologic factors, anthropogenic influences, and sources of contamination in any given area. The DRASTIC system focuses only on those hydrogeologic factors that influence ground water pollution potential. The system consists of two major elements: the designation of mappable units, termed hydrogeologic settings, and the superposition of a relative rating system to determine pollution potential.

The application of DRASTIC to an area requires the recognition of a set of assumptions made in the development of the system. DRASTIC evaluates the pollution potential of an area under the assumption that a contaminant with the mobility of water is introduced at the surface and flushed into the ground water by precipitation. Most important, DRASTIC cannot be applied to areas smaller than 100 acres in size and is not intended or designed to replace site-specific investigations.

Hydrogeologic Settings and Factors

To facilitate the designation of mappable units, the DRASTIC system used the framework of an existing classification system developed by Heath (1984), which divides the United States into 15 ground water regions based on the factors in a ground water system that affect occurrence and availability.

Within each major hydrogeologic region, smaller units representing specific hydrogeologic settings are identified. Hydrogeologic settings form the basis of the system and represent a composite description of the major geologic and hydrogeologic factors that control ground water movement into, through, and out of an area. A hydrogeologic setting represents a mappable unit with common hydrogeologic characteristics and, as a consequence, common vulnerability to contamination (Aller et al., 1987).

Figure 1 illustrates the format and description of a typical hydrogeologic setting found within Fayette County. Inherent within each hydrogeologic setting are the physical characteristics that affect the ground water pollution potential. These characteristics or factors identified during the development of the DRASTIC system include:

D – Depth to Water

R – Net Recharge

A – Aquifer Media

S – Soil Media

T – Topography

I – Impact of the Vadose Zone Media

C – Conductivity (Hydraulic) of the Aquifer

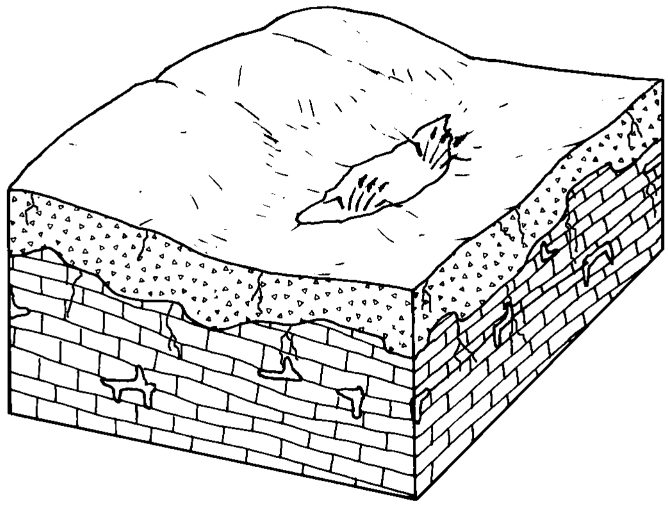
These factors incorporate concepts and mechanisms such as attenuation, retardation, and time or distance of travel of a contaminant with respect to the physical characteristics of the hydrogeologic setting. Broad consideration of these factors and mechanisms coupled with existing conditions in a setting provide a basis for determination of the area's relative vulnerability to contamination.

Depth to water is considered to be the depth from the ground surface to the water table in unconfined aquifer conditions or the depth to the top of the aquifer under confined aquifer conditions. The depth to water determines the distance a contaminant would have to travel before reaching the aquifer. The greater the distance the contaminant has to travel, the greater the opportunity for attenuation to occur or restriction of movement by relatively impermeable layers.

Net recharge is the total amount of water reaching the land surface that infiltrates the aquifer measured in inches per year. Recharge water is available to transport a contaminant from the surface into the aquifer and affects the quantity of water available for dilution and dispersion of a contaminant. Factors to be included in the determination of net recharge include contributions due to infiltration of precipitation, in addition to infiltration from rivers, streams and lakes, irrigation, and artificial recharge.

Aquifer media represents consolidated or unconsolidated rock material capable of yielding sufficient quantities of water for use. Aquifer media accounts for the various physical characteristics of the rock that provide mechanisms of attenuation, retardation, and flow pathways that affect a contaminant reaching and moving through an aquifer.

Soil media refers to the upper six feet of the unsaturated zone that is characterized by significant biological activity. The type of soil media influences the amount of recharge that can move through the soil column due to variations in soil permeability. Various soil types also have the ability to attenuate or retard a contaminant as it moves throughout the soil profile. Soil media is based on textural classifications of soils and considers relative thicknesses and attenuation characteristics of each profile within the soil.



7Ac-Glacial Till over Limestone

This hydrogeologic setting is widespread in Fayette County. The area is characterized by flat-lying topography and low relief associated with ground moraine. The vadose zone consists primarily of silty to clayey glacial till. The till may be fractured or jointed, particularly in areas where it is predominantly thin and weathered. Where the till is very thin, fractured limestone is considered to partially be the vadose zone media. The aquifer is composed of fractured Silurian limestones and dolomites. These carbonate rocks may contain significant solution features. Depth to water is typically shallow to moderate, ranging from 15 to 50 feet. Soils are typically are clay loams derived from till. Maximum ground water yields greater than 100 gpm are possible from the Silurian Lockport and Salina Groups in northeastern Fayette County. Yields decline to the west and south as the higher-yielding Silurian units thin in these directions. Yields average 5 to 25 gpm in the northwestern corner of the county and less than 5 gpm across the southern margin of the county. Recharge is moderate due to the clayey nature of the soils and vadose zone and the relatively shallow depth to water and permeable nature of the bedrock aquifer.

GWPP index values for the hydrogeologic setting of Glacial Till over Solution Limestone range from 96 to 156, with the total number of GWPP index calculations equaling 69.

Figure 1. Format and description of the hydrogeologic setting – 7Ac Glacial Till over Limestone.

Topography refers to the slope of the land expressed as percent slope. The slope of an area affects the likelihood that a contaminant will run off or be ponded and ultimately infiltrate into the subsurface. Topography also affects soil development and often can be used to help determine the direction and gradient of ground water flow under water table conditions.

The impact of the vadose zone media refers to the attenuation and retardation processes that can occur as a contaminant moves through the unsaturated zone above the aquifer. The vadose zone represents that area below the soil horizon and above the aquifer that is unsaturated or discontinuously saturated. Various attenuation, travel time, and distance mechanisms related to the types of geologic materials present can affect the movement of contaminants in the vadose zone. Where an aquifer is unconfined, the vadose zone media represents the materials below the soil horizon and above the water table. Under confined aquifer conditions, the vadose zone is simply referred to as a confining layer. The presence of the confining layer in the unsaturated zone has a significant impact on the pollution potential of the ground water in an area.

Hydraulic conductivity of an aquifer is a measure of the ability of the aquifer to transmit water, and is also related to ground water velocity and gradient. Hydraulic conductivity is dependent upon the amount and interconnectivity of void spaces and fractures within a consolidated or unconsolidated rock unit. Higher hydraulic conductivity typically corresponds to higher vulnerability to contamination. Hydraulic conductivity considers the capability for a contaminant that reaches an aquifer to be transported throughout that aquifer over time.

Weighting and Rating System

DRASTIC uses a numerical weighting and rating system that is combined with the DRASTIC factors to calculate a ground water pollution potential index or relative measure of vulnerability to contamination. The DRASTIC factors are weighted from 1 to 5 according to their relative importance to each other with regard to contamination potential (Table 1). Each factor is then divided into ranges or media types and assigned a rating from 1 to 10 based on their significance to pollution potential (Tables 2-8). The rating for each factor is selected based on available information and professional judgment. The selected rating for each factor is multiplied by the assigned weight for each factor. These numbers are summed to calculate the DRASTIC or pollution potential index.

Once a DRASTIC index has been calculated, it is possible to identify areas that are more likely to be susceptible to ground water contamination relative to other areas. The higher the DRASTIC index, the greater the vulnerability to contamination. The index generated provides only a relative evaluation tool and is not designed to produce absolute answers or to represent units of vulnerability. Pollution potential indexes of various settings should be compared to each other only with consideration of the factors that were evaluated in determining the vulnerability of the area.

Pesticide DRASTIC

A special version of DRASTIC was developed for use where the application of pesticides is a concern. The weights assigned to the DRASTIC factors were changed to reflect the processes that affect pesticide movement into the subsurface with particular emphasis on soils. Where other agricultural practices, such as the application of fertilizers, are a concern, general DRASTIC should be used to evaluate relative vulnerability to contamination. The process for calculating the Pesticide DRASTIC index is identical to the process used for calculating the general DRASTIC index. However, general DRASTIC and Pesticide DRASTIC numbers should not be compared because the conceptual basis in factor weighting and evaluation differs significantly. Table 1 lists the weights used for general and pesticide DRASTIC.

Table 1. Assigned weights for DRASTIC features

Feature	**General DRASTIC Weight**	**Pesticide DRASTIC Weight**
Depth to Water	5	5
Net Recharge	4	4
Aquifer Media	3	3
Soil Media	2	5
Topography	1	3
Impact of the Vadose Zone Media	5	4
Hydraulic Conductivity of the Aquifer	3	2

Table 2. Ranges and ratings for depth to water

Depth to Water (feet)	
Range	**Rating**
0-5	10
5-15	9
15-30	7
30-50	5
50-75	3
75-100	2
100+	1
Weight: 5	Pesticide Weight: 5

Table 3. Ranges and ratings for net recharge

Net Recharge (inches)	
Range	**Rating**
0-2	1
2-4	3
4-7	6
7-10	8
10+	9
Weight: 4	Pesticide Weight: 4

Table 4. Ranges and ratings for aquifer media

Aquifer Media		
Range	**Rating**	**Typical Rating**
Shale	1-3	2
Glacial Till	4-6	5
Sandstone	4-9	6
Limestone	4-9	6
Sand and Gravel	4-9	8
Interbedded Ss/Sh/Ls/Coal	2-10	9
Karst Limestone	9-10	10
Weight: 3	Pesticide Weight: 3	

Table 5. Ranges and ratings for soil media

Soil Media	
Range	**Rating**
Thin/Absent	10
Gravel	10
Sand	9
Peat	8
Shrink/Swell Clay	7
Sandy Loam	6
Loam	5
Silty Loam	4
Clay Loam	3
Muck	2
Clay	1
Weight: 2	Pesticide Weight: 5

Table 6. Ranges and ratings for topography

Topography (percent slope)	
Range	**Rating**
0-2	10
2-6	9
6-12	5
12-18	3
18+	1
Weight: 1	Pesticide Weight: 3

Table 7. Ranges and ratings for impact of the vadose zone media

Impact of the Vadose Zone Media		
Range	**Rating**	**Typical Rating**
Confining Layer	1	1
Silt/Clay	2-6	3
Shale	2-5	3
Limestone	2-7	6
Sandstone	4-8	6
Interbedded Ss/Sh/Ls/Coal	4-8	6
Sand and Gravel with Silt and Clay	4-8	6
Glacial Till	2-6	4
Sand and Gravel	6-9	8
Karst Limestone	8-10	10
Weight: 5	Pesticide Weight: 4	

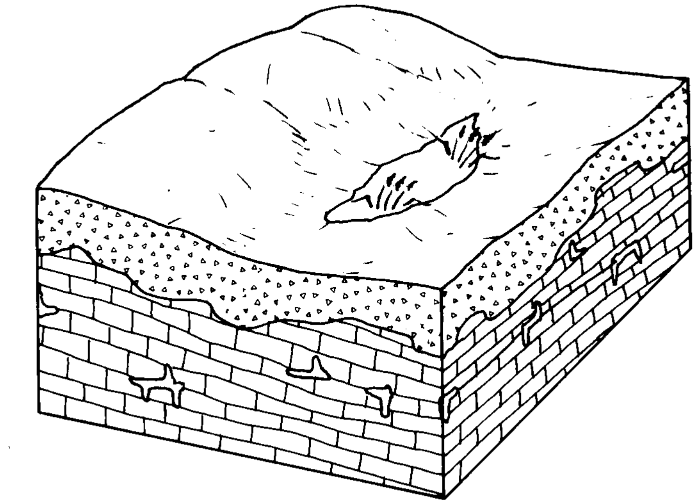
Table 8. Ranges and ratings for hydraulic conductivity

Hydraulic Conductivity (GPD/FT^2)	
Range	**Rating**
1-100	1
100-300	2
300-700	4
700-1000	6
1000-2000	8
2000+	10
Weight: 3	Pesticide Weight: 2

Integration of Hydrogeologic Settings and DRASTIC Factors

Figure 2 illustrates the hydrogeologic setting 7Ac1, Glacial Till over Limestone, identified in mapping Fayette County, and the pollution potential index calculated for the setting. Based on selected ratings for this setting, the pollution potential index is calculated to be 136. This numerical value has no intrinsic meaning, but can readily be compared to a value obtained for other settings in the county. DRASTIC indexes for typical hydrogeologic settings and values across the United States range from 45 to 223. The diversity of hydrogeologic conditions in Fayette County produces settings with a wide range of vulnerability to ground water contamination. Calculated pollution potential indexes for the eight settings identified in the county range from 96 to 172.

Hydrogeologic settings identified in an area are combined with the pollution potential indexes to create units that can be graphically displayed on maps. Pollution potential analysis in Fayette County resulted in a map with symbols and colors that illustrate areas of ground water vulnerability. The map describing the ground water pollution potential of Fayette County is included with this report.



SETTING 7Ac1		GENERAL		
FEATURE	**RANGE**	**WEIGHT**	**RATING**	**NUMBER**
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Limestone	3	6	18
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	sd +gvl w/sl + cl	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		DRASTIC	INDEX	136

Figure 2. Description of the hydrogeologic setting – 7Ac1 Glacial Till over Limestone.

INTERPRETATION AND USE OF GROUND WATER POLLUTION POTENTIAL MAPS

The application of the DRASTIC system to evaluate an area's vulnerability to contamination produces hydrogeologic settings with corresponding pollution potential indexes. The susceptibility to contamination is greater as the pollution potential index increases. This numeric value determined for one area can be compared to the pollution potential index calculated for another area.

The map accompanying this report displays both the hydrogeologic settings identified in the county and the associated pollution potential indexes calculated in those hydrogeologic settings. The symbols on the map represent the following information:

7Ac1 - defines the hydrogeologic region and setting
136 - defines the relative pollution potential

Here the first number (**7**) refers to the major hydrogeologic region and the upper case letter and lower case letter (**Ac**) refers to a specific hydrogeologic setting. The following number (**1**) references a certain set of DRASTIC parameters that are unique to this setting and are described in the corresponding setting chart. The second number (**136**) is the calculated pollution potential index for this unique setting. The charts for each setting provide a reference to show how the pollution potential index was derived.

The maps are color-coded using ranges depicted on the map legend. The color codes used are part of a national color-coding scheme developed to assist the user in gaining a general insight into the vulnerability of the ground water in the area. The color codes were chosen to represent the colors of the spectrum, with warm colors (red, orange, and yellow) representing areas of higher vulnerability (higher pollution potential indexes), and cool colors (greens, blues, and violet) representing areas of lower vulnerability to contamination. The maps also delineate large man-made and natural features such as lakes, landfills, quarries, and strip mines, but these areas are not rated and therefore are not color-coded.

GENERAL INFORMATION ABOUT FAYETTE COUNTY

Demographics

Fayette County occupies approximately 406 square miles (Meeker et al., 1973) in north central Ohio (Figure 3). Fayette County is bounded to the north by Madison County, to the northeast by Pickaway County, to the southeast by Ross County, to the south by Highland County, to the southwest by Clinton County, and to the northwest by Greene County.

The approximate population of Fayette County, based upon year 2000 census estimates, is 28,433 (Department of Development, Ohio County Profiles, 2004). Washington Court House is the largest community and the county seat. Growth is primarily along the I-71 corridor in the vicinity of Jeffersonville and Washington Court House. Agriculture accounts for roughly 93 percent of the land usage in Fayette County. Row crops are the primary agricultural land usage. Woodlands, industry, and residential are the other major land uses in the county. More specific information on land usage can be obtained from the Ohio Department of Natural Resources, Division of Real Estate and Land Management (REALM), Resource Analysis Program (formerly OCAP).

Climate

The *Hydrologic Atlas for Ohio* (Harstine, 1991) reports an average annual temperature of approximately 52 degrees Fahrenheit for Fayette County. The average temperatures increase slightly towards the south. Harstine (1991) shows that precipitation approximately averages 39 to 41 inches per year for the county, with precipitation increasing towards the west. The mean annual precipitation for Washington Court House is 39.12 inches per year based upon a thirty-year (1971-2000) period National Oceanographic and Atmospheric Administration (NOAA), 2002). The mean annual temperature at Washington Court House for the same thirty-year period is 52.5 degrees Fahrenheit (NOAA, 2002).

Physiography and Topography

Fayette County lies within the Central Till Plains Lowland Province (Frost, 1931; Fenneman, 1938, and Bier, 1956). Brockman (1998) and Schiefer (2002) assign all of Fayette County except the far southern fringe as belonging in the Darby Plain District of the Southern Ohio Loamy Till Plain Region. This southern fringe is characterized as being part of the general Southern Ohio Loamy Till Plain Region. Fayette County is characterized by flat ground moraine separated by wide belts of hummocky end moraines. In the southern part of the county, the rolling land surface reflects the transition to bedrock-controlled topography.

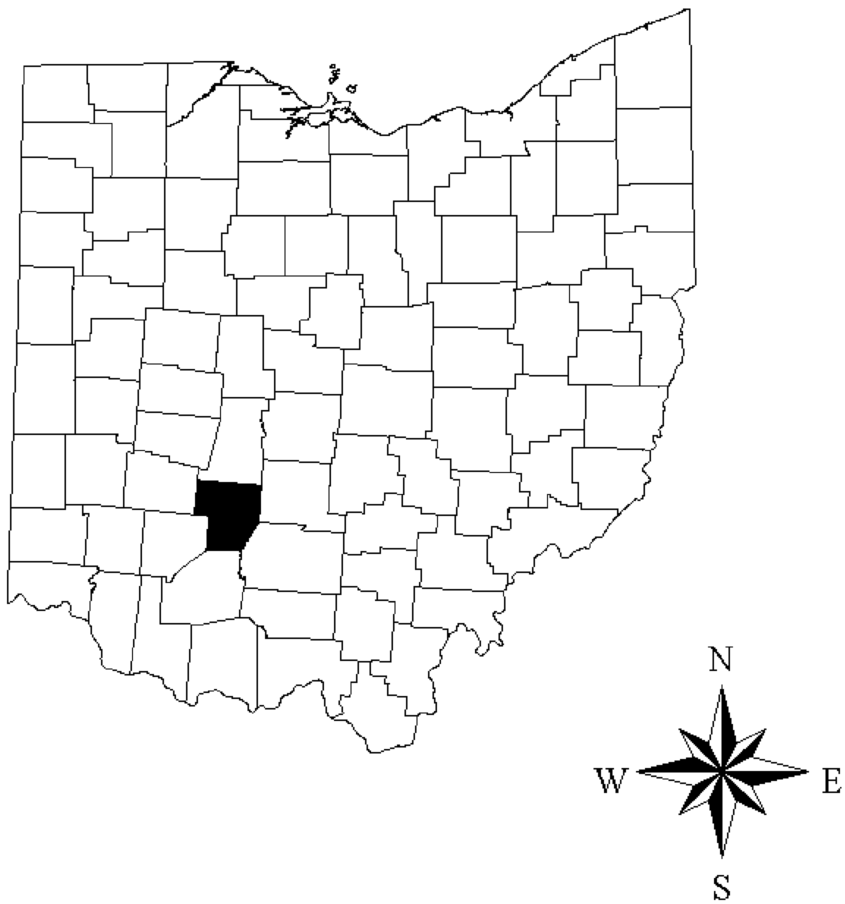


Figure 3. Location map of Fayette County, Ohio.

Modern Drainage

Fayette County lies south of the major drainage divide crossing north central Ohio; all of Fayette County drains toward the Ohio River via tributaries of the Scioto River. The major southeasterly flowing tributaries to the Scioto River (from northeast to southwest) include Deer Creek, North Fork Paint Creek, Compton Creek, East Fork Paint Creek, Paint Creek, Sugar Creek, Rattlesnake Creek, and Lee's Creek.

Pre- and Inter-Glacial Drainage Changes

The drainage patterns of Fayette County have changed significantly as a result of the multiple glaciations. The drainage changes are complex and not yet fully understood. More research and data are necessary in both Fayette County and adjacent counties. Particularly, well log data for deeper wells that penetrate the entire drift thickness would be helpful in making interpretations. This would allow a more accurate reconstruction of the system of buried valleys and former drainage channels for the county.

Prior to glaciation, the drainage in Ohio is referred to as the Teays Stage. The Teays River drained the southern and western two thirds of the state and was the master stream for what is now the upper Ohio River Valley. The Teays River entered Ohio nearby Portsmouth and flowed northward, roughly following a course similar to the modern Scioto River. The Teays River then turned sharply westward in northern Pickaway County. Stout et al. (1943) showed the northwesterly flowing, main trunk of the Teays River valley crossing the northeast corner of Fayette County (Figure 4). Norris and Spicer (1958) and Cummins (1959) depicted the main trunk of the Teays River turning westward farther north than Fayette County, near Harrisburg. Modern bedrock topography data compiled by the ODNR, Division of Geological Survey, agrees with Cummins (1959) work. From eastern Madison County, the Teays River flowed roughly northwest towards present Great Lake St. Mary's and then continued due west into Indiana. During the Teays Drainage stage, unnamed northeasterly flowing tributaries drained Fayette County. (Stout et al, 1943).

As ice advanced through Ohio during the pre-Illinoian (Kansan) glaciations, northerly and western drainage ways were blocked. Flow backed-up these numerous tributaries, forming several large lakes. These lakes over-topped, creating spillways and cutting new channels. New drainage systems began to evolve (Stout et al., 1943). This down cutting by these new streams was believed to be relatively rapid and, in many places, the new channels were cut over 100 feet deeper than the previous Teays River System valleys. The new drainage system is referred to as the Deep Stage due to this increased down cutting. In south central Ohio, the new spillways and channels flowed southward, reversing their former flow direction. The main trunk stream was referred to as the Newark River (Stout et al, 1943) which roughly followed a course similar to the modern Scioto River just to the west of the former Teays channel (Figure 5). Fayette County was drained by a number of

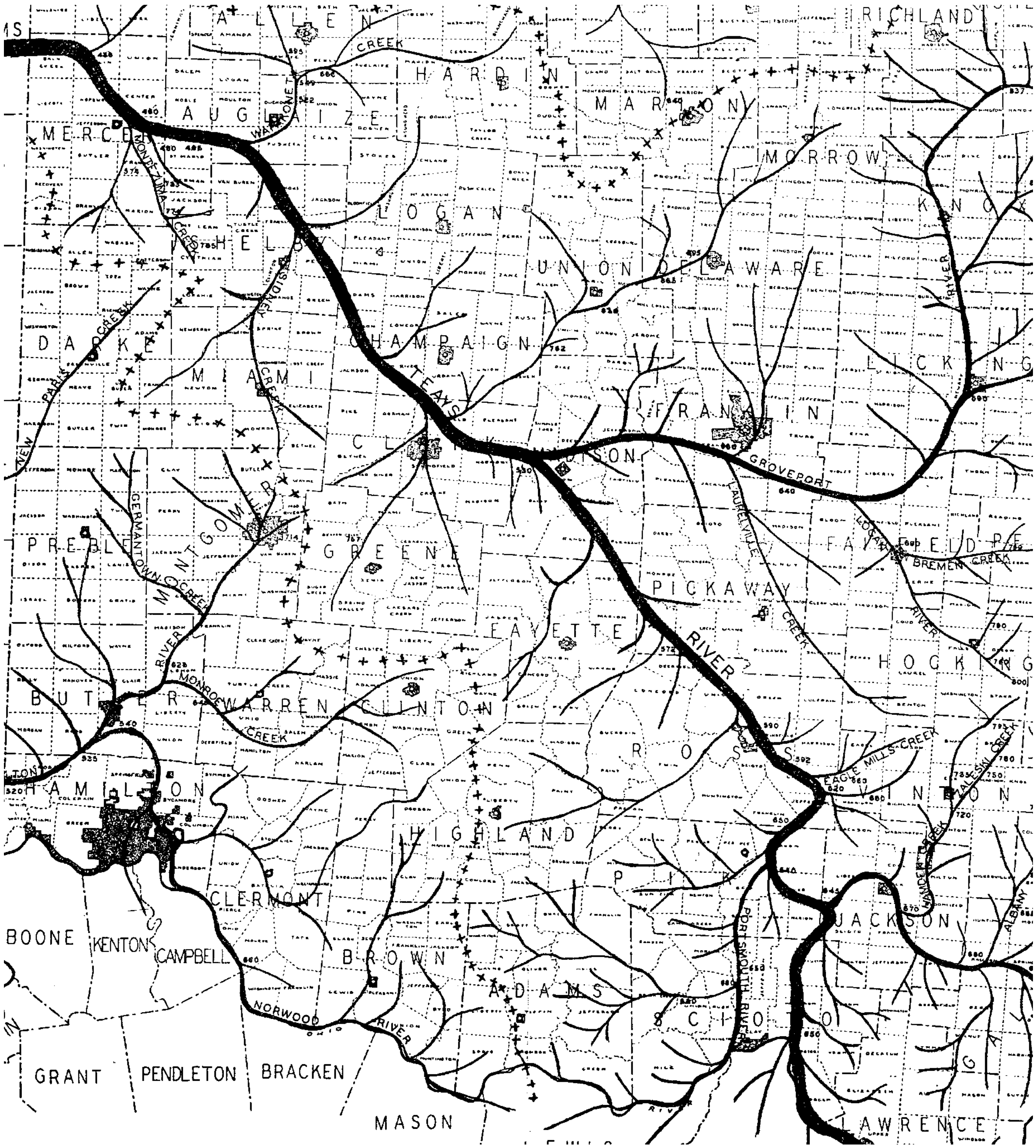


Figure 4. Teays Stage drainage in Fayette County (after Stout et al., 1943).

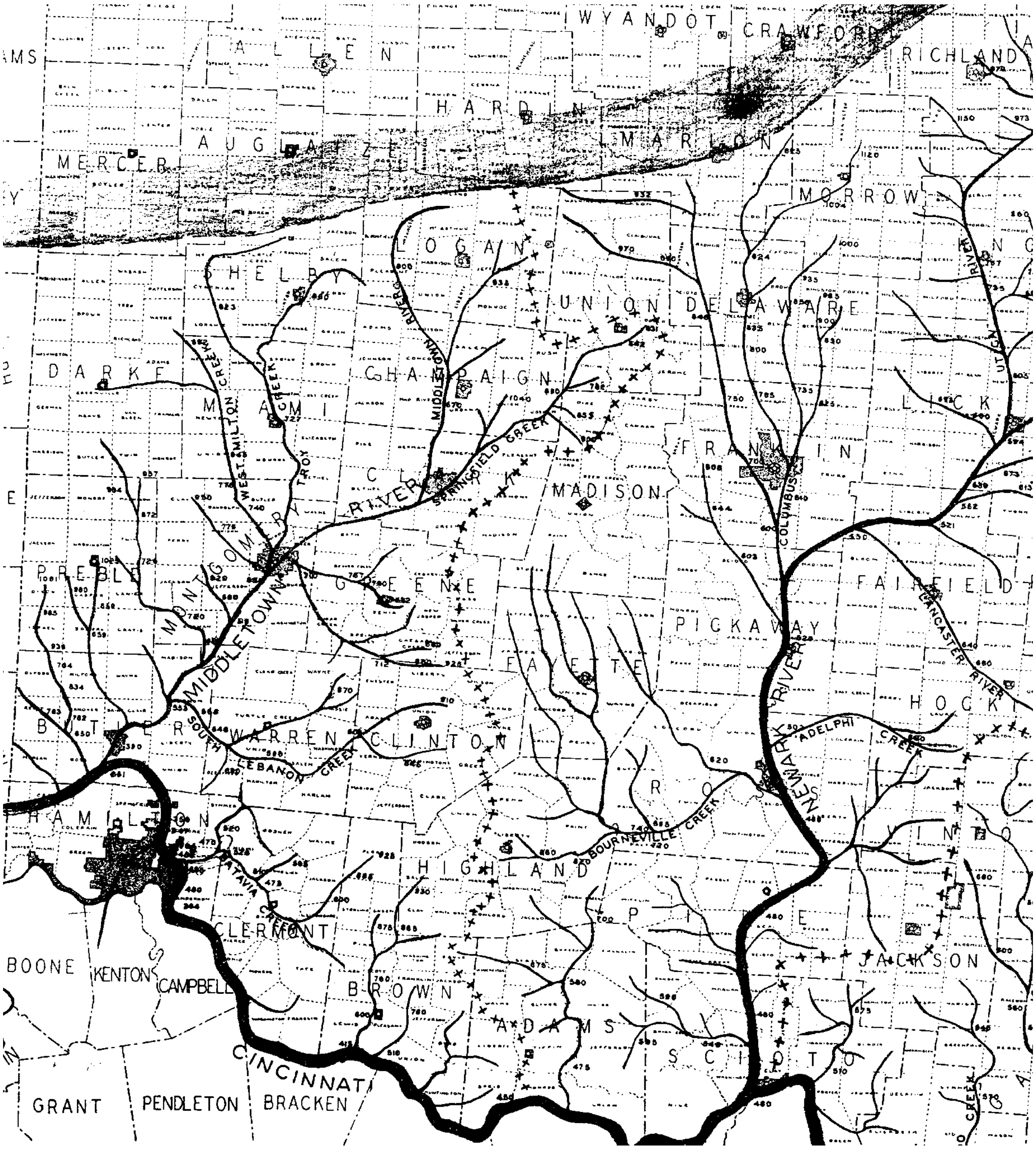


Figure 5. Deep Stage drainage in Fayette County (after Stout et al., 1943).

southerly flowing tributaries that fed Bourneville Creek, which closely follows a course similar to modern Paint Creek in Ross County.

The Illinoian ice advance had a continued effect on drainage patterns. Former drainage channels were blocked and filled, and the ancestral Scioto River drainage became better established. The modern drainage patterns of Fayette County largely reflect the terrain resulting from the final Wisconsinan glacial advances, particularly end moraines.

Glacial Geology

During the Pleistocene Epoch (2 million to 10,000 years before present (Y.B.P.)) several episodes of ice advance occurred in northwestern Ohio. Older ice advances that predate the most recent (Brunhes) magnetic reversal (about 730,000 Y.B.P.) are now commonly referred to as pre-Illinoian (formerly Kansan). Goldthwait et al. (1961), Pavey et al. (1999), and Brockman et al. (2004) report that the last advance, the Late Wisconsinan Ice Sheet, deposited the surficial till in Fayette County. Evidence for the earlier glaciations is lacking or obscured.

Detailed glacial reports specifically for Fayette County are lacking. Much of the information was taken from reports for surrounding counties, including Clinton County (Teller, 1967), Highland County (Rosengreen, 1974), and Ross County (Quinn and Goldthwait, 1985). Descriptions of the glacial geology from regional field trips (Goldthwait, 1965 and Goldthwait et al, 1981) were also utilized. The majority of the glacial deposits in Fayette County fall into four main types: (glacial) till, lacustrine deposits, outwash (valley train) deposits, and ice-contact sand and gravel (kames, eskers) deposits. Drift is an older term that collectively refers to the entire sequence of glacial deposits. Overall, drift is thinner in areas of ground moraine and thicker in end moraines. Drift is thickest in the buried valleys found in northern and central Fayette County. There are areas in southern Fayette County where the drift is very thin and the bedrock is very close to the ground surface (ODNR, Division of Geological Survey, Open File Bedrock Topography and ODNR, Division of Water, Glacial State Aquifer Map, 2000).

Till is an unsorted, non-stratified (non-bedded) mixture of sand, gravel, silt, and clay deposited directly by the ice sheet. There are two main types or facies of glacial till: lodgement till and ablation till. Lodgement till is "plastered-down" or "bulldozed" at the base of an actively moving ice sheet. Lodgement till tends to be relatively dense and compacted and pebbles typically are angular or broken and have a preferred direction or orientation. "Hardpan" and "boulder-clay" are two common terms used for lodgement till. Ablation or "melt-out" till occurs as the ice sheet melts or stagnates away. Debris bands are laid down or stacked as the ice between the bands melts. Ablation till tends to be less dense, less compacted, and slightly coarser as meltwater commonly washes away some of the fine silt and clay.

Till has relatively low inherent permeability. Permeability in till is in part dependent upon the primary porosity of the till, which reflects how fine-textured the particular till is. Vertical permeability in till is controlled largely by factors influencing the secondary porosity such as fractures (joints), worm burrows, root channels, sand seams, etc. (Brockman and Szabo, 2000 and Haefner, 2000). Fractures may also interconnect the sand and gravel lenses.

At the land surface, till accounts for two primary landforms: ground moraine and end moraine. Ground moraine (till plain) is relatively flat to gently rolling. End moraines are ridge-like, with terrain that is steeper and more rolling or hummocky. End moraines commonly serve as a local drainage divide due to their ridge-like nature. The Reesville Moraine is found in the extreme southwest corner of Fayette County. The Glendon Moraine roughly flanks the east side of Rattlesnake Creek. The Esboro Moraine occupies a broad area between Sugar Creek and Paint Creek in central Fayette County. The Bloomingburg Moraine is a wide moraine that lies to the west of North Fork Paint Creek in northeastern Fayette County.

Outwash deposits are created by active deposition of sediments by meltwater streams. These deposits are generally bedded or stratified and are sorted. Outwash deposits in Fayette County are mostly associated with Deer Creek in the northeastern corner of the county. Outwash deposits associated with stream valleys were referred to in earlier literature as valley trains. Sorting and degree of coarseness depend upon the nature and proximity of the melting ice sheet. Braided streams usually deposited the outwash. Such streams have multiple channels, which migrate across the width of the valley floor, leaving behind a complex record of deposition and erosion. Deposition of outwash may precede an advancing ice sheet or be associated with a melting ice sheet. As modern streams downcut, the older, now higher elevation remnants of the original valley floor are called terraces. Terraces in Fayette County tend to be relatively low elevation and are at elevations just above the current floodplain.

Kames and eskers are ice contact features. They are composed of masses of generally poorly sorted sand and gravel with minor till, deposited in depressions, holes, tunnels, or other cavities in the ice. As the surrounding ice melts, a mound of sediment remains behind. Typically, these deposits may collapse or flow as the surrounding ice melts. These deposits may display high angle, distorted or tilted beds, faults, and folds. Kames are comprised of isolated or small groups of rounded mounds of dirty sand and gravel with minor till. Eskers are comprised of elongate, narrow, sinuous ridges of sand and gravel. Kame terraces are a linear belt of kames that have a similar appearance and a fairly uniform elevation. Kame terraces commonly flank valleys or streams. The best examples of ice contact deposits are small, isolated kames found in the southwestern part of the county near Buena Vista (Pavey et al., 1999).

Lacustrine deposits are composed of silty to clayey material found in intermorainal lake areas. These lakes are referred to as intermorainal lakes as they occupy low areas of ground moraine between end moraines. Lacustrine deposits tend to be laminated (or varved) and contain various proportions of silts and clays. Thin layers of fine sand interbedded with the clayey to silty lacustrine deposits may reflect storm or flood events. Permeability is preferentially horizontal due to the laminations and water-laid nature of these sediments. The inherent vertical permeability is low; however, secondary porosity features such as fractures, joints, root channels, etc. help increase the vertical permeability.

The lakes were created during the recession of the ice sheets. Meltwater was trapped between the receding ice sheet and end moraines. In some areas, meltwater may have been trapped between two end moraines, forming a lake. Run-off also helped to fill these ponds. The only lakebed mapped is found along the border of Clinton County in western Concord Township and Jasper Township.

Bedrock Geology

Bedrock underlying the surface of Fayette County belongs to the Silurian System. Carbonate (limestone and dolomite) bedrock underlies the entire county. Table 9 summarizes the bedrock stratigraphy found in Fayette County. The ODNR, Division of Geological Survey has Open-File Reconnaissance Bedrock Geological Maps completed at a 1:24,000 scale on USGS topographic map bases available for the entire county. The ODNR, Division of Water has Open File Bedrock State Aquifer maps available for the county also.

The youngest units encountered in Fayette County are the Salina Undifferentiated Group, which consist of dolomites, fine-grained limestones, and some minor evaporite deposits such as gypsum. These rocks were deposited in warm, shallow tidal areas. Units of the Salina Undifferentiated Group are found in northern and eastern Fayette County.

Underlying the Salina Undifferentiated Group are dolomites and minor shale of the Silurian Tymochtee and Greenfield Formations, which were also deposited in warm, shallow seas. These formations are thickest and produce the highest yields in the northeast corner of the county. The formations thin and yields decline sharply to the southwest.

The Lockport Group rocks were associated with tidal reefs deposited in warm, high-energy shallow seas. The rocks are light-colored massive dolomites. Yields typically remain constant across the county as well. The Lockport has been mapped in northeastern and north central Fayette County.

The Cedarville Dolomite, Springfield Dolomite, and Euphemia Dolomite have been grouped and mapped together. The units are roughly time-equivalent to the Lockport Group. These units are variable, thin, darker-colored, massive dolomites. They are mapped in northwestern Fayette County.

The Massie Shale, Laurel Dolomite, Osgood Shale, and Brassfield Limestone have been grouped and mapped together. These units vary from bluish shales to gray, massive dense dolomites. These units are found in northwestern and southern Fayette County.

Table 9. Bedrock stratigraphy of Fayette County

System	Group/Formation (Symbol)	Lithologic Description
Silurian	Undifferentiated Salina Dolomite	Gray to brown, thin-bedded, argillaceous dolomite. Thin evaporite zones common. This unit thins to the north and west. Yields rarely exceed 25 gpm due to the overall thinness of the units.
	Tymochtee and Greenfield Dolomites (Stg)	Thin- to massive-bedded, olive-gray to yellowish-brown dolomite. The Tymochtee contains shale partings. The Greenfield has a laminated dolomite lithology. Thickness decreases to the southwest. Yields can be >100 gpm in the northeast corner of the county and decline to the south and west. Yields generally decline as thickness declines.
	Lockport Dolomite (Sl)	White to medium gray, medium- to massive-bedded dolomite. Commonly contains cavernous solution zones. Thickness >100 feet. Yields can exceed 100 gpm, especially in cavernous or solution zones in the northeastern corner of the county.
	Cedarville Dolomite, Springfield Dolomite, Euphemia Dolomite undivided (Scse)	The Cedarville is a white to gray, massive-bedded dolomite. The Springfield Dolomite is gray to tan, with massive bedding that weathers to a layered brick-like bedding. The Euphemia is a gray to bluish gray dolomite with massive bedding. This aquifer occurs in the western portion of the county, and has a thickness of less than 100 feet. Yields through most of the county are 5 to 25 gallons per minute.
	Massie Shale, Laurel Dolomite, Osgood Shale, Dayton Limestone, Brassfield Limestone undivided (Sm-b)	The shales are gray to blue gray with minor limestone and dolomite, thin- to thick-bedded. The Laurel is a gray to tan argillaceous dolomite that is thin- to medium-bedded. The Dayton is a gray to bluish gray medium- to thick-bedded dolomitic limestone. The Brassfield is a white to pink argillaceous limestone that is thin- to medium-bedded. This aquifer occurs in western and southern Fayette County. Yields are usually less than 5 gallons per minute

Ground Water Resources

Ground water in Fayette County is obtained from both unconsolidated (glacial-alluvial) and consolidated (bedrock) aquifers. The relatively thick, clean outwash deposits along Deer Creek are the highest–producing aquifers in Fayette County. Yields up to 100 to 500 gpm (ODNR, Division of Water, Glacial State Aquifer Map, 2000 and Schmidt, 1990) can be obtained from properly constructed, large diameter wells completed in these units. Yields of 25 to 100 gpm can be obtained from sandy outwash and alluvial deposits flanking the East Fork Paint Creek and Paint Creek in central Fayette County (ODNR, Division of Water, Glacial State Aquifer Map, 2000 and Schmidt, 1990). Yields of 25 to 100 gpm are also obtained from an area including and extending eastward from the North Fork of Paint Creek in northeastern Fayette County.

Thin lenses of sand and gravel interbedded with till comprise the glacial aquifers in northern and eastern Fayette County. Yields from sand and gravel lenses interbedded with the fine-grained till average 5 to 25 gpm (ODNR, Div. of Water, Glacial State Aquifer Map, 2000 and Schmidt, 1990). These thin sand and gravel aquifers are commonly associated with areas of ground moraine, end moraine and glacial complexes. Glacial complexes are areas of thick glacial drift that are predominantly comprised of thick, dense till (ODNR, Division of Water, Glacial State Aquifer Map, 2000). Complexes typically lack surface expression, unlike end moraines and some buried valleys. Modern perennial streams usually do not overlie complexes and they commonly lack major outwash and ice contact deposits. Sand and gravel lenses can directly overlie the carbonate bedrock. These lenses may serve as an aquifer or, more commonly, serve as an extra source of recharge to the underlying fractured bedrock. The sand and gravel may also directly overlie the bedrock and yield 5 to 25 gpm. Drillers may penetrate the bedrock directly below the sand and gravel. In such cases the bedrock acts as a “screen” to help filter fines out of the gravel.

The carbonate aquifer is an important regional aquifer for most of western and south central Ohio and underlies all of Fayette County (Norris and Fidler, 1973 and Schmidt, 1990). Completed water wells typically penetrate multiple bedrock units. Yields exceeding 100 gpm (ODNR, Div. of Water, Open File, Bedrock State Aquifer Map, 2000, Norris and Fidler, 1973, and Schmidt, 1990) are available from deep, larger diameter wells drilled into the Silurian Salina Undifferentiated Group, the Tymochtee and Greenfield Dolomites, and the Lockport Dolomite in northeastern Fayette County. Yields from these formations decrease markedly to the south and west as these aquifers thin considerably in these directions. (ODNR, Div. of Water, Open File, Bedrock State Aquifer Map, 2000, Norris and Fidler, 1973, and Schmidt, 1990). The Silurian Cedarville Dolomite, Springfield Dolomite, and Euphemia Dolomite are found in northwestern Fayette County and yield 5 to 25 gpm (ODNR, Div. of Water, Open File, Bedrock State Aquifer Map, 2000, Norris and Fidler, 1973, and Schmidt, 1990). The Massie Shale, Laurel Dolomite, Osgood Shale, and Brassfield Limestone are found in the southern portion of Fayette County. The yields drop significantly for these units, averaging less than 10 gpm (ODNR, Div. of Water, Open File, Bedrock State Aquifer Map, 2000, Norris and Fidler, 1973, and Schmidt, 1990). The amount of fracturing, solution, and vuggy (porous) zones has great local importance.

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APPENDIX A
DESCRIPTION OF THE LOGIC IN FACTOR SELECTION

Depth to Water

This factor was primarily evaluated using information from water well log records on file at the Ohio Department of Natural Resources (ODNR), Division of Water, Water Resources Section (WRS). Approximately 4,400 water well log records are on file for Fayette County. Data from roughly 1,000 located water well log records were analyzed and plotted on U.S.G.S. 7-1/2 minute topographic maps during the course of the project. Static water levels and information as to the depths at which water was encountered were taken from these records. The *Ground Water Resources of Fayette County* (Schmidt, 1990) provided generalized depth to water information throughout the county. Depth to water trends mapped in adjoining Madison County (Hallfrisch and Voytek, 1987 and Angle, 2004), Greene County (Jones, 1995), Clinton County (Schmidt, 1995), Pickaway County (Sugar, 1990), and Ross County (Frederick, 1991) were used as a guideline. Topographic and geomorphic trends were utilized in areas where other sources of data were lacking.

Depths to water of 0 to 5 (10) were used for some limited floodplain areas adjacent to the headwaters of some minor streams adjacent to the Greene County border. Depths of 5 to 15 feet (9) were selected for most of the alluvial settings and some areas of lower elevation ground moraine. Depths to water of 15 to 30 feet (7) were used for most areas of ground moraine throughout the county. Depths to water of 30 to 50 feet (5) were utilized for the majority of end moraines and complexes

Net Recharge

Recharge is the precipitation that reaches the aquifer after evapotranspiration and run-off. This factor was evaluated using many criteria, including depth to water, topography, soil type, surface drainage, vadose zone material, aquifer type, and annual precipitation. General estimates of recharge provided by Pettyjohn and Henning (1979) and Dumouchelle and Schiefer (2002) proved to be helpful. Recharge information from Madison County (Hallfrisch and Voytek, 1987 and Angle, 2004), Greene County (Jones, 1995), Clinton County (Schmidt, 1995), Pickaway County (Sugar, 1990), and Ross County (Frederick, 1991) was used as a guideline.

Values of 7 to 10 inches per year (8) were used for areas of high recharge. Such areas were limited to low-lying outwash terraces flanking Deer Creek in northeastern Fayette County. Values of 4 to 7 inches per year (6) were used for areas with moderate recharge. These areas include the vast majority of Fayette County. Values of 2 to 4 inches per year (3) were utilized for limited, higher elevation areas adjacent to Clinton County.

Aquifer Media

Information on evaluating aquifer media was obtained primarily from the *Ground Water Resources of Fayette County* (Schmidt, 1990). Open File Bedrock Reconnaissance Maps and Open File Bedrock Topography Maps, based upon U.S.G.S. 7-1/2 minute topographic maps from the ODNR, Division of Geological Survey proved helpful. Aquifer ratings from neighboring Madison County (Hallfrisch and Voytek, 1987 and Angle, 2004), Greene County (Jones, 1995), Clinton County (Schmidt, 1995), Pickaway County (Sugar, 1990), and Ross County (Frederick, 1991) were used as a guideline. The ODNR, Division of Water, Glacial State Aquifer Map (2000) and Bedrock State Aquifer Map (2000) were an important source of aquifer data. The *Glacial Map of Ohio* (Goldthwait et al., 1961), *Surficial Geology of the Springfield 30 x 60 Minute Quadrangle* (Brockman et al, 2004) and the *Quaternary Geology of Ohio* (Pavey et al., 1999) provided useful information on the nature of the glacial aquifers and the delineation of the hydrogeologic settings. Additional information on limestone aquifers was obtained from Norris and Fidler's (1973) report on carbonates in southwestern Ohio. Development and the need for increased ground water supply spurred a number of site-specific aquifer tests and reports in the vicinity of I-71 by the Jeffersonville exit. These reports include those of Eagon (1973), ODNR, Division of Water (1990), Spahr (1990), G.M. Baker (1991), and Reynolds, Inc., (1993). Well log records on file at the ODNR, Division of Water, were the primary source of aquifer information.

All of the bedrock and most of the interbedded lenses of sand and gravel are semi-confined or leaky; however, for the purposes of DRASTIC, they have been evaluated as being unconfined (Aller et al., 1987). Limestone was evaluated as the aquifer for the majority of Fayette County, particularly the western and southern portions. An aquifer rating of (8) was applied to the high-yielding Silurian Lockport Dolomite and Undifferentiated Salina Dolomite in the far northeastern part of the county. An aquifer rating of (7) was applied to the Silurian Lockport Dolomite, Tymochtee and Greenfield Dolomites and Undifferentiated Salina Dolomite elsewhere in the northeastern and north central part of Fayette County. An aquifer rating of (6) was selected for all of northwestern and south central Fayette County. Aquifer ratings of (4) and (5) are used for the lower-yielding limestones and dolomites across southern Fayette County.

Sand and gravel was given a rating of (8) for the high-yielding outwash deposits adjacent to Deer Creek. Other sand and gravel deposits adjacent to Paint Creek and its tributaries were given an aquifer media rating of (7). An aquifer rating of (4) or (6) was assigned to sand and gravel lenses interbedded in till. Sand and gravel was selected as the aquifer for the 7Af-Sand and Gravel Interbedded in Glacial Till, 7D-Buried Valley, and 7Ed-Alluvium over Glacial Till settings. Sand and gravel was chosen for the aquifer for portions of the 7C- Moraine and 7J-Glacial Complex settings. Yields and drawdown data reported on water well log records were also used to help evaluate the sand and gravel deposits.

Soils

Soils were mapped using the data obtained from the *Soil Survey of Fayette County* (Meeker et al, 1973). Each soil type was evaluated and given a rating for soil media. Evaluations were based upon the texture, permeability, and shrink-swell potential for each soil material. Special emphasis is placed upon determining the most restrictive layer. The soils of Fayette County showed a high degree of variability. This is a reflection of the parent material. Table 10 is a list of the soils, parent materials, setting, and corresponding DRASTIC values for Fayette County.

Shrink-swell (non-aggregated) clays (7) were selected for some thick, highly clayey soils. These soils included areas of clayey alluvial ("oxbow") deposits and areas where limestone is very close to the surface. Soils were considered to be sandy loam (6) for terraces and floodplains associated with most major trunk streams in central and northern Fayette County. This includes Deer Creek, North Fork of Paint Creek, East Fork Paint Creek, and both Paint Creek and Sugar Creek north of their confluence. Silt loam (4) was designated for alluvial and floodplain deposits along Rattlesnake Creek and Paint Creek in southern Fayette County. Silt loam (4) was also selected for thin alluvial soils found in the headwaters of tributaries. Clay loam (3) soils were evaluated for the majority of the county including till overlying ground moraine, end moraine, and areas mapped as glacial complex.

Topography

Topography, or percent slope, was evaluated using U.S.G.S. 7-1/2 minute quadrangle maps and the *Soil Survey of Fayette County* (Meeker et al., 1973). Slopes of 0 to 2 percent (10) were selected for the majority of the settings in Fayette County due to the overall flat lying to gently rolling topography and low relief. Slopes of 2 to 6 percent (9) were assigned to some end moraines exhibiting hummocky terrain. Slopes of 6 to 12 percent (5) were selected for a limited number of upland areas in southern Fayette County. These areas have undergone a higher level of stream dissection.

Impact of the Vadose Zone Media

Information on evaluating vadose zone media was obtained primarily from the Ground Water Resources of Fayette County (Schmidt, 1990) and water well log records on file at the ODNR, Division of Water. Open File Bedrock Reconnaissance Maps and Open File Bedrock Topography Maps, based upon U.S.G.S. 7-1/2 minute topographic maps from the ODNR, Division of Geological Survey proved helpful. Vadose zone media ratings from neighboring Madison County (Hallfrisch and Voytek, 1987 and Angle, 2004), Greene County (Jones, 1995), Clinton County (Schmidt, 1995), Pickaway County (Sugar, 1990), and Ross County (Frederick, 1991) were used as a guideline. The ODNR, Division of Water, Glacial

Table 10. Fayette County soils

Soil Name	Parent Material/ Setting	DRASTIC Rating	Soil Media
Algiers	Alluvium	4	Silt loam
Brookston	Loamy till	3	Clay loam
Cana	Loess/till/weathered shale	3	Clay loam
Casco	Outwash	6	Sandy loam
Celina	Loamy Till	3	Clay loam
Corwin	Loess/till	3	Clay loam
Crosby	Loamy till	3	Clay loam
Fox	Outwash, kames	6	Sandy loam
Genesee	Alluvium	4	Silt loam
Henshaw	Alluvium, lacustrine terrace	4	Silt loam
Homer	Outwash	6	Sandy loam
Kane	Outwash terrace	6	Sandy loam
Kendalville	Thin outwash over ablation till	3	Clay loam
Medway	Alluvium	4	Silt loam
Miamian	Loamy till	3	Clay loam
Milsdale	Till over limestone	7	Shrink-swell clay
Milton	Till over limestone	7	Shrink-swell clay
Odell	Lacustrine over ablation till	4	Silt Loam
Patton	Silty lacustrine, ponds	4	Silt loam
Paulding	Clayey lacustrine	7	Shrink-swell clay
Pewamo	Clayey till, drainage ways	3	Clay loam
Randolph	Till over limestone	7	Shrink-swell clay
Ritchey	Limestone residuum	10	Thin or absent
Rodman	Outwash	6	Sandy loam
Romeo	Limestone residuum, cliffs	10	Thin or absent
Ross	Alluvium	4	Silt Loam
Sleeth	Outwash, coarse alluvium	5	Loam
Thackery	Alluvium over outwash terrace	5	Loam
Warners	Peat, muck, prairie bog	8	Peat
Warsaw	Outwash	6	Sandy loam
Wea	Loess/prairie over outwash	6	Sandy loam
Westland	Outwash over ablation till	4	Silt loam

State Aquifer Map (2000) and Bedrock State Aquifer Map (2000) were important sources of vadose zone media data. The *Soil Survey of Fayette County* (Meeker et al, 1973) provided valuable information on parent materials. The *Glacial Map of Ohio* (Goldthwait et al., 1961), the *Surficial Geology of the Springfield 30 x 60 Minute Quadrangle* (Brockman et al, 2004), and the *Quaternary Geology of Ohio* (Pavey et al., 1999) were useful in delineating vadose zone media.

The vadose zone media is a critical component of the overall DRASTIC rating in Fayette County. The rating varies with the restrictive properties of the various glacial materials. The higher the proportion of silt and clay and the greater the compaction (density) of the sediments, the lower the permeability and the lower the vadose zone media are rated.

Limestone/fractured till with a vadose zone media rating of (6) was selected for parts of southern Fayette County where the till covering the underlying limestone was very thin. Glacial till was given a vadose zone media ratings of (5) for most areas of ground moraine and end moraine. In these areas the thickness of till was thin to moderate and the depth to water was shallow. The majority of the till in the sequence was weathered and fractured. A vadose zone media rating of (4) was assigned to areas with a greater thickness of till and with moderate depths to water. This rating was commonly used in the 7J-Glacial Complex hydrogeologic setting and for areas of thicker end moraines in the 7C-Moraine hydrogeologic setting. A vadose zone media rating of (3) was selected for limited portions along the border of Clinton County where the till was unusually dense and fine-grained.

A vadose zone media rating of (7) or (6) was chosen for sand and gravel with significant silt and clay for alluvial and outwash terraces flanking portions of Deer Creek. Sand and gravel with significant silt and clay was used for all areas having sandy loam soils. A vadose zone media rating of (6) was selected for sand and gravel with significant silt and clay for Paint Creek and East Fork Paint Creek from Washington Court House northwards. A vadose zone media rating of (5) was assigned for sand and gravel with significant silt and clay along East Fork Paint Creek, Compton Creek, Sugar Creek, and Rattlesnake Creek. Sand and gravel with significant silt and clay with a vadose zone rating of (4) or (5) was chosen to match areas bordering Greene County and Pickaway County. In these earlier mapped counties, till was not yet utilized as a vadose zone media.

Silt and clay with a vadose zone media rating of (4) or (5) was selected for most alluvial settings in the southern third of the county. Silt and clay (3) was selected for areas covered with the lacustrine deposits associated with the 7Fc-Intermorainal Lake Deposits hydrogeologic setting. It was also used for adjacent areas of fine-grained alluvium along Rattlesnake Creek at the Clinton County border.

Hydraulic Conductivity

Information on evaluating the hydraulic conductivity was obtained from the maps and report of the Norris and Fidler (1973), and the *Ground Water Resources of Fayette County* (Schmidt, 1990). Open File Bedrock Reconnaissance Maps and Open File Bedrock

Topography Maps, based upon U.S.G.S. 7-1/2 minute topographic maps from the ODNR, Division of Geological Survey, proved helpful. Hydraulic conductivity ratings from neighboring Madison County (Hallfrisch and Voytek, 1987 and Angle, 2004), Greene County (Jones, 1995), Clinton County (Schmidt, 1995), Pickaway County (Sugar, 1990), and Ross County (Frederick, 1991) were used as a guideline. The ODNR, Division of Water, Glacial State Aquifer Map (2000) and Bedrock State Aquifer Map (2000) were important sources of hydraulic conductivity data. Additional site-specific hydraulic conductivity data includes reports by Eagon (1973), ODNR, Division of Water (1990), Spahr (1990), G.M. Baker (1991), and Reynolds, Inc., (1993). Water well log records on file at the ODNR, Division of Water, were also used to help determine hydraulic conductivity. Textbook tables (Freeze and Cherry, 1979, Fetter, 1980, and Driscoll, 1986) were useful in obtaining estimated values for hydraulic conductivity in a variety of aquifers.

Values for hydraulic conductivity correspond to aquifer ratings; i.e., the more highly rated aquifers have higher values for hydraulic conductivity. Sand and gravel aquifers with an aquifer rating of (8) and those with a rating of (7) in the vicinity of Washington Court House were assigned a hydraulic conductivity rating of 700-1000 (6) gallons per day per square foot (gpd/ft^2). All other sand and gravel deposits with an aquifer media rating of (6) or (7) were assigned a hydraulic conductivity rating of 300-700 (4) gpd/ft^2. Sand and gravel with an aquifer rating of (6) were given a hydraulic conductivity rating of 100-300 (2) gpd/ft^2. Decreasing hydraulic conductivity values indicate decreasing permeability, porosity, a lack of sorting, being poorly bedded, and the sand and gravel being “dirtier” (containing more fine-grained particles).

Limestone with aquifer ratings of (8) and (7) were given a hydraulic conductivity rating of 300-700 (4) gpd/ft^2. Limestone in northwestern and central Fayette County with an aquifer rating of (6) was given a hydraulic conductivity rating of 700-1000 (6) gpd/ft^2. Limestone aquifers in the south central Fayette County were given a hydraulic conductivity rating of 300-700 gpd/ft^2 (4). A hydraulic conductivity rating of 300-700 gpd/ft^2 (4) was selected for limestone aquifers with an aquifer rating of (5) in southwestern Fayette County. A hydraulic conductivity rating of 100-300 gpd/ft^2 (2) was assigned to limestone aquifers with a rating of (5) in extreme southeastern Fayette County. Limestone aquifers with a rating of (4) were assigned a hydraulic conductivity rating of 100-300 gpd/ft^2 (2) along the border of Clinton County. Decreasing hydraulic conductivity values in carbonate aquifers indicate reductions in permeability and solution features, being less “vuggy” (porous), and being less fractured or jointed.

APPENDIX B

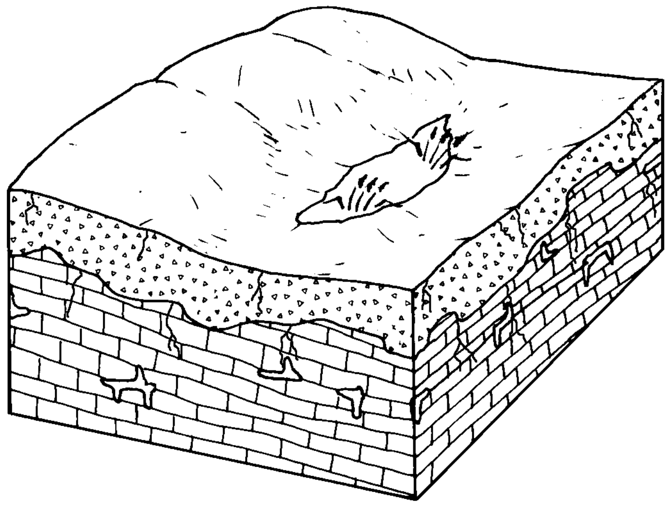
DESCRIPTION OF HYDROGEOLOGIC SETTINGS AND CHARTS

Ground water pollution potential mapping in Fayette County resulted in the identification of eight hydrogeologic settings within the Glaciated Central Region. The list of these settings, the range of pollution potential index calculations, and the number of index calculations for each setting are provided in Table 11. Computed pollution potential indexes for Fayette County range from 96 to 172.

Table 11. Hydrogeologic settings mapped in Fayette County, Ohio

Hydrogeologic Settings	Range of GWPP Indexes	Number of Index Calculations
7Ac-Glacial till over limestone	96-156	69
7Af-Sand and gravel interbedded in glacial till	97-153	17
7C-Moraine	110-152	54
7D-Buried valley	111-172	6
7Ec-Alluvium over sedimentary rock	105-160	25
7Ed-Alluvium over glacial till	143-160	6
7Fc-Intermorainal lake deposits	132	1
7J-Glacial complex	117-152	17

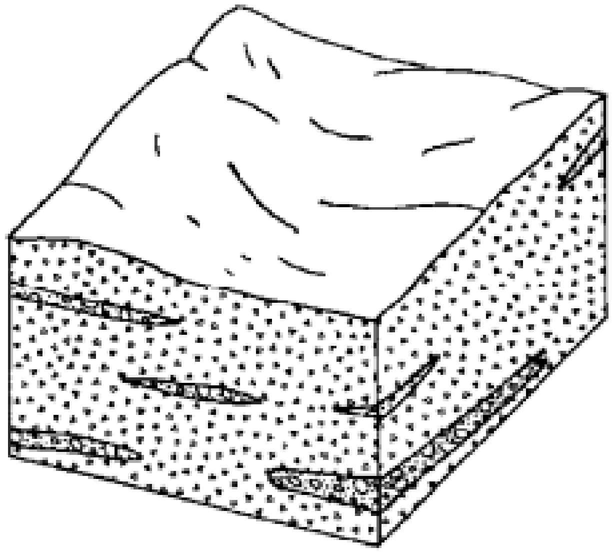
The following information provides a description of each hydrogeologic setting identified in the county, a block diagram illustrating the characteristics of the setting, and a listing of the charts for each unique combination of pollution potential indexes calculated for each setting. The charts provide information on how the ground water pollution potential index was derived and are a quick and easy reference for the accompanying ground water pollution potential map. A complete discussion of the rating and evaluation of each factor in the hydrogeologic settings is provided in Appendix A, Description of the Logic in Factor Selection.



7Ac-Glacial Till over Limestone

This hydrogeologic setting is widespread in Fayette County. The area is characterized by flat-lying topography and low relief associated with ground moraine. The vadose zone consists primarily of silty to clayey glacial till. The till may be fractured or jointed, particularly in areas where it is predominantly thin and weathered. Where the till is very thin, fractured limestone is considered to partially be the vadose zone media. The aquifer is composed of fractured Silurian limestones and dolomites. These carbonate rocks may contain significant solution features. Depth to water is typically shallow to moderate, ranging from 15 to 50 feet. Soils are typically clay loams derived from till. Maximum ground water yields greater than 100 gpm are possible from the Silurian Lockport and Salina Groups in northeastern Fayette County. Yields decline to the west and south as the higher-yielding Silurian units thin in these directions. Yields average 5 to 25 gpm in the northwestern corner of the county and less than 5 gpm across the southern margin of the county. Recharge is moderate due to the clayey nature of the soils and vadose zone and the relatively shallow depth to water and permeable nature of the bedrock aquifer.

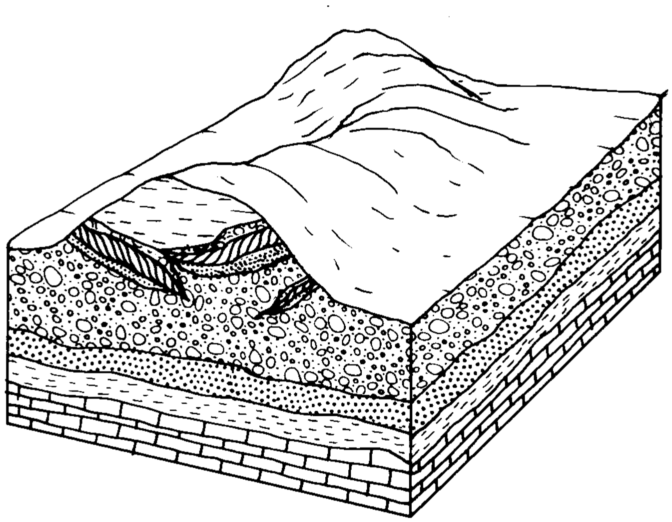
GWPP index values for the hydrogeologic setting of Glacial Till over Limestone range from 96 to 156, with the total number of GWPP index calculations equaling 69.



7Af-Sand and Gravel Interbedded in Glacial Till

This hydrogeologic setting is common, particularly in eastern Fayette County. The area is characterized by flat lying topography and low relief. The setting is commonly associated with areas of ground moraine. The vadose zone is composed of silty to clayey glacial till. The till may be fractured or jointed, particularly in areas where it is predominantly thin and weathered. In areas bordering Clinton County and Pickaway County the till may be referred to as sand and gravel with significant silt and clay. This was done to match these counties with older maps and reports that did not recognize till as a vadose zone media. Depth to water is usually shallow to moderate, averaging less than 50 feet. Soils are generally clay loams. The aquifer consists of thin lenses of sand and gravel interbedded in the glacial till. Ground water yields range from 5 to 25 gpm. Yields increase up to the 25 to 100 gpm range for an area east of North Fork Paint Creek. Recharge is moderate due to the relatively low permeability of the clayey soils and vadose zone material and the relative shallow depth to the sand and gravel aquifers.

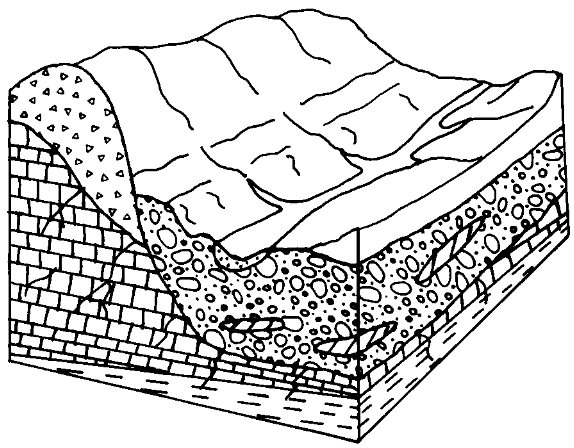
GWPP index values for the hydrogeologic setting of Sand and Gravel Interbedded in Glacial Till range from 97 to 153, with the total number of GWPP index calculations equaling 17.



7C-Moraine

This hydrogeologic setting consists of elongated, broad belts of end moraines that cross Fayette County. This setting is characterized by hummocky to rolling topography. Relief tends to become steeper near the margins of the moraine, especially if enhanced by the down cutting of an adjacent stream. Relief along these features is greater in southern Fayette County. Wells are completed in sand and gravel lenses within the moraine. Wells are completed in the underlying limestone and dolomite bedrock in areas where there is not an adequate thickness of sand and gravel in which to develop a well. Yields from these sand and gravel wells average 5 to 25 gpm. The aquifer typically consists of limestone bedrock that underlies the till. Maximum ground water yields greater than 100 gpm are possible from the Silurian Lockport and Salina Groups in northeastern Fayette County. Yields decline to the west and south as the higher-yielding Silurian units thin in these directions. Yields average 5 to 25 gpm in the northwestern corner of the county and less than 5 gpm across the southern margin of the county. The vadose zone is composed of loamy to clayey glacial till. The till may be fractured or jointed, particularly in areas where it is predominantly thin and weathered. Depth to water is shallow to moderate and depends primarily upon how deep the underlying aquifer is. Soils are commonly clay loams. Recharge is moderate due to the relatively low permeability of the clayey soils and vadose zone material and the relative shallow depth to the aquifers. The end moraines are a primary area of local recharge

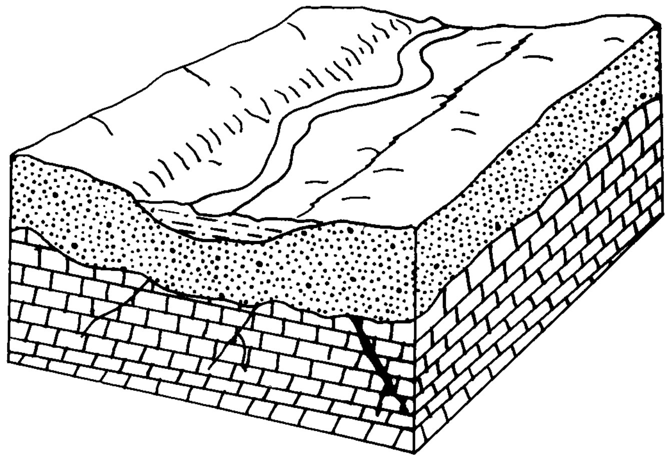
GWPP index values for the hydrogeologic setting of Moraine range from 110 to 152, with the total number of GWPP index calculations equaling 54.



7D-Buried Valley

This hydrogeologic setting is limited to the northeastern corner of Fayette County. The surface topography is flat and has low relief. The buried valley underlies modern Deer Creek. The aquifer consists of relatively coarse, thick, clean sand and gravel outwash. Yields from the sand and gravel outwash are greater than 100 gpm for large diameter wells. Soils are variable due to the varying nature of parent materials in the floodplains and terraces. Depths to water are typically shallow to moderate. Recharge is typically high due to the relatively permeable soils, vadose, and aquifer materials, shallow depth to water, and the influence of modern overlying streams that might be hydraulically connected to the sand and gravel aquifers. However, there is one rated index, 7D1, in the extreme northwest corner of the county, that more closely resembles the description of the 7J-Glacial Complex hydrogeologic setting than the Buried Valley setting described here.

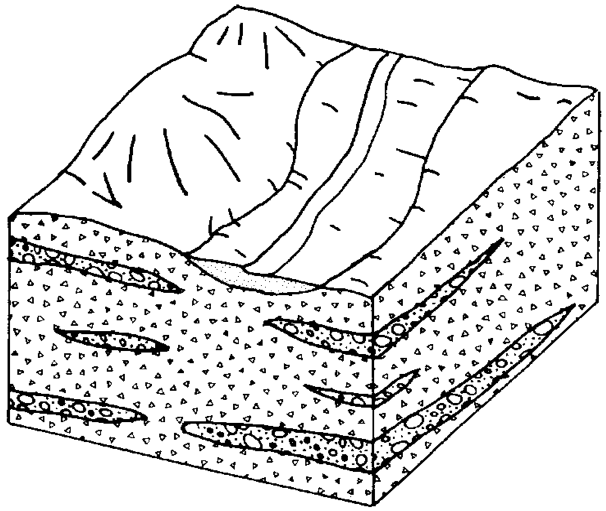
GWPP index values for the hydrogeologic setting of Buried Valley range from 111 to 172, with the total number of GWPP index calculations equaling 6.



7Ec-Alluvium over Sedimentary Rock

This hydrogeologic setting is common throughout Fayette County, especially areas of thinner glacial drift.. This hydrogeologic setting is comprised of flat-lying floodplains and stream terraces containing thin to moderate thicknesses of modern alluvium. This setting is similar to the 7Ed-Alluvium over Glacial Till except that the underlying aquifers consist of limestone bedrock. The aquifers consist of Silurian limestones. The vadose zone consists of the sandy to silty to clayey alluvial deposits. Where the alluvium is thin, the vadose zone may include underlying till or limestone. Soils are variable due to the varying texture of the alluvial materials and are usually silt loams or sandy loams. Depth to water is commonly very shallow, averaging less than 20 feet. The alluvium may be in direct hydraulic connection with the underlying bedrock or there may be thin till or lacustrine deposits in between. Maximum ground water yields greater than 100 gpm are possible from the Silurian Lockport and Salina Groups in northeastern Fayette County. Yields decline to the west and south as the higher-yielding Silurian units thin in these directions. Yields average 5 to 25 gpm in the northwestern corner of the county and less than 5 gpm across the southern margin of the county. Recharge is typically moderately high due to the flat-lying topography, shallow depth to water, the moderate permeability of the soils and vadose zone media, and the relatively high permeability of the underlying bedrock.

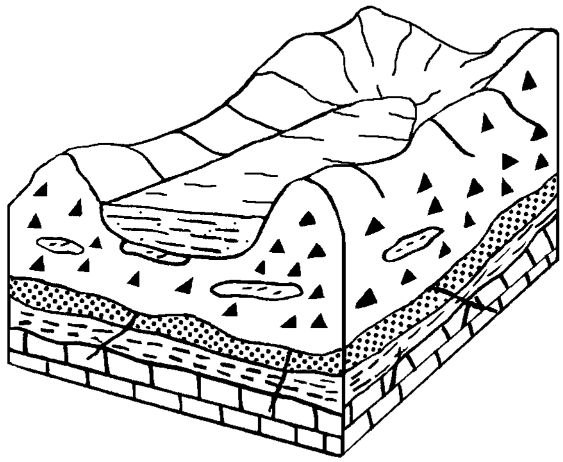
The GWPP index values for the hydrogeologic setting Alluvium over Sedimentary Rocks range from 105 to 160, with the total number of GWPP index calculations equaling 25.



<u>7Ed-Alluvium Over Glacial Till</u>

This hydrogeologic setting is comprised of flat-lying floodplains and stream terraces containing thin to moderate thicknesses of modern alluvium. This setting is most common in areas of thicker drift in northeastern and north central Fayette County. This setting is similar to the 7Af–Sand and Gravel interbedded in Glacial Till setting except for the presence of the modern stream and related deposits. The setting is also similar to the 7Ec-Alluvium over Sedimentary Rock except that the underlying aquifer consists of shallow sand and gravel lenses instead of bedrock. The stream may or may not be in direct hydraulic connection with the underlying sand and gravel lenses that constitute the aquifer. The surficial, silty to sandy alluvium is typically more permeable than the underlying till. The alluvium is too thin to be considered the aquifer. The vadose zone consists of the sandy to silty to clayey alluvial deposits. Soils are usually sandy loams. Yields commonly range from 5 to 25 gpm from the sand and gravel lenses. Depth to water is typically shallow with depths averaging less than 20 feet. Recharge is moderately high due to the shallow depth to water, flat-lying topography, and the moderate permeability of the glacial till and alluvium.

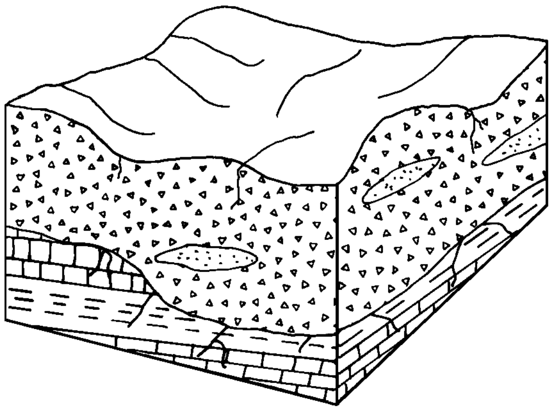
The GWPP index values for the hydrogeologic setting Alluvium Over Glacial Till range from 143 to 160, with the total number of GWPP index calculations equaling 6.



7Fc-Intermorainal Lake Deposits

This hydrogeologic setting is characterized by the flat-lying topography between end moraines and contains varying thicknesses of fine-grained lacustrine sediments. Surficial drainage is typically very poor; ponding is very common after rains. These sediments were deposited in shallow lakes formed between end moraines and the retreating ice sheets before the modern drainage system evolved. This setting occupies a low-lying area adjacent to Rattlesnake Creek in Jasper Township and Concord Township in western Fayette County. The vadose zone media consists of silty to clayey lacustrine sediments that overlie glacial till. The aquifer consists of the underlying limestone bedrock. Yields from the limestone average 10 to 25 gpm. Depth to water is commonly very shallow. Soils are silt loams derived from silty lacustrine sediments. Recharge in this setting is moderately low due to the relatively low permeability soils and vadose zone material and the relatively shallow depth to water.

The GWPP index value for the hydrogeologic setting of Intermorainal Lake Deposits is 132, with the total number of GWPP index calculations equaling 1.



7J-Glacial Complex

This setting is found in areas of thicker drift in northern Fayette County. The surface topography is flat and has low relief. Modern streams typically do not overly these deposits. The setting is characterized by a thick sequence of glacial till. The aquifer consists of thinner, less continuous lenses of sand and gravel interbedded with thicker sequences of fine-grained glacial till or the underlying limestone bedrock. Due to the high-yielding nature of the Silurian limestones, most wells are completed in the limestone. Maximum ground water yields greater than 100 gpm are possible from the Silurian Lockport and Salina Groups in northeastern Fayette County. Yields decline to the west and south as the higher-yielding Silurian units thin in these directions. Yields average 5 to 25 gpm in the northwestern corner of the county. Soils are usually clay loams derived from the underlying glacial till. Depths to water are typically shallow to moderate. Recharge is typically moderate to low due to the fine-grained nature of the soils and vadose zone media and the moderate depth to the limestone aquifers.

GWPP index values for the hydrogeologic setting of Glacial Complex range from 117 to 152, with the total number of GWPP index calculations equaling 17.

Table 12. Hydrogeologic Settings, DRASTIC Factors, and Ratings

Setting	Depth To Water (feet)	Recharge (In/Yr)	Aquifer Media	Soil Media	Topography (% slope)	Vadose Zone Media	Hydraulic Conductivity	Rating	Pesticide Rating_
7Ac1	15-30	4-7	limestone	Clay Loam	0-2	sd + gvl w/sl + cl	700-1000	136	154
7Ac2	5-15	4-7	limestone	Clay Loam	0-2	sd + gvl w/sl + cl	700-1000	146	164
7Ac3	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	146	164
7Ac4	15-30	4-7	limestone	Clay Loam	0-2	till	700-1000	136	154
7Ac5	15-30	4-7	limestone	Clay Loam	0-2	till	700-1000	131	150
7Ac6	15-30	4-7	limestone	Clay Loam	0-2	till	700-1000	139	157
7Ac7	15-30	4-7	limestone	Clay Loam	2-6	till	700-1000	138	154
7Ac8	15-30	4-7	limestone	Clay Loam	0-2	till	700-1000	134	153
7Ac9	15-30	4-7	limestone	Clay Loam	2-6	till	700-1000	135	151
7Ac10	30-50	4-7	limestone	Clay Loam	0-2	till	700-1000	132	150
7Ac11	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	149	167
7Ac12	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	144	163
7Ac13	15-30	4-7	limestone	Clay Loam	0-2	till	700-1000	142	160
7Ac14	15-30	4-7	limestone	Clay Loam	2-6	till	700-1000	141	157
7Ac15	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	152	170
7Ac16	30-50	4-7	limestone	Clay Loam	2-6	till	700-1000	131	147
7Ac17	5-15	4-7	limestone	Clay Loam	2-6	till	700-1000	148	164
7Ac18	15-30	4-7	limestone	Clay Loam	6-12	till	700-1000	134	142
7Ac19	30-50	4-7	limestone	Clay Loam	0-2	till	700-1000	129	147
7Ac20	30-50	4-7	limestone	Clay Loam	2-6	till	700-1000	128	144
7Ac21	15-30	4-7	limestone	Clay Loam	6-12	till	100-300	111	124
7Ac22	30-50	4-7	limestone	Clay Loam	0-2	till	100-300	106	129
7Ac23	30-50	4-7	limestone	Clay Loam	0-2	till	300-700	120	140
7Ac24	30-50	4-7	limestone	Clay Loam	2-6	till	300-700	119	137
7Ac25	15-30	4-7	limestone	Clay Loam	6-12	till	700-1000	126	135
7Ac26	15-30	4-7	limestone	Clay Loam	6-12	till	700-1000	131	139
7Ac27	5-15	4-7	limestone	Clay Loam	2-6	till	700-1000	145	161
7Ac28	30-50	4-7	limestone	Clay Loam	0-2	till	700-1000	126	144
7Ac29	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	141	160
7Ac30	15-30	4-7	limestone	Clay Loam	0-2	till	300-700	130	150
7Ac31	15-30	4-7	limestone	Clay Loam	2-6	till	300-700	129	147
7Ac32	5-15	4-7	limestone	Clay Loam	0-2	till	300-700	140	160
7Ac33	5-15	4-7	limestone	Clay Loam	0-2	silt and clay	300-700	130	152
7Ac34	15-30	4-7	limestone	Clay Loam	0-2	silt and clay	300-700	120	142
7Ac35	0-5	4-7	limestone	Clay Loam	0-2	sd + gvl w/sl + cl	700-1000	156	173
7Ac36	5-15	4-7	limestone	Clay Loam	2-6	limestone/frac till	300-700	144	161

Setting	Depth To Water (feet)	Recharge (In/Yr)	Aquifer Media	Soil Media	Topography (% slope)	Vadose Zone Media	Hydraulic Conductivity	Rating	Pesticide Rating_
7Ac37	5-15	4-7	limestone	Clay Loam	0-2	limestone/frac till	300-700	145	164
7Ac38	15-30	4-7	limestone	Clay Loam	0-2	limestone/frac till	300-700	135	154
7Ac39	5-15	2-4	limestone	Clay Loam	0-2	silt and clay	100-300	106	130
7Ac40	15-30	2-4	limestone	Clay Loam	0-2	silt and clay	100-300	96	120
7Ac41	5-15	4-7	limestone	Clay Loam	0-2	till	300-700	137	157
7Ac42	5-15	4-7	limestone	Clay Loam	2-6	limestone/frac till	300-700	136	154
7Ac43	5-15	4-7	limestone	Clay Loam	2-6	till	300-700	136	154
7Ac44	5-15	4-7	limestone	Clay Loam	0-2	limestone/frac till	300-700	137	157
7Ac45	5-15	4-7	Limestone	Clay Loam	2-6	Till	300-700	139	157
7Ac46	15-30	4-7	limestone	Clay Loam	6-12	till	300-700	125	135
7Ac47	15-30	4-7	limestone	Clay Loam	2-6	limestone/frac till	300-700	134	151
7Ac48	15-30	4-7	limestone	Clay Loam	2-6	limestone/frac till	700-1000	140	155
7Ac49	15-30	4-7	limestone	Clay Loam	6-12	till	300-700	122	132
7Ac50	15-30	4-7	limestone	Clay Loam	2-6	till	300-700	126	144
7Ac51	15-30	4-7	limestone	Clay Loam	0-2	till	300-700	127	147
7Ac52	15-30	4-7	limestone	Clay Loam	2-6	limestone/frac till	300-700	126	144
7Ac53	15-30	4-7	limestone	Clay Loam	0-2	limestone/frac till	300-700	127	147
7Ac54	15-30	4-7	limestone	Clay Loam	6-12	limestone/frac till	300-700	122	132
7Ac55	30-50	4-7	limestone	Clay Loam	2-6	till	300-700	116	134
7Ac56	15-30	4-7	limestone	Clay Loam	6-12	limestone/frac till	300-700	130	139
7Ac57	30-50	4-7	limestone	Clay Loam	2-6	limestone/frac till	300-700	116	134
7Ac58	30-50	4-7	limestone	Clay Loam	2-6	till	100-300	110	130
7Ac59	30-50	4-7	limestone	Clay Loam	0-2	limestone/frac till	100-300	111	133
7Ac60	30-50	4-7	limestone	Shrink/Swell Clay	2-6	limestone/frac till	100-300	118	150
7Ac61	15-30	4-7	limestone	Shrink/Swell Clay	2-6	limestone/frac till	100-300	128	160
7Ac62	15-30	4-7	limestone	Clay Loam	2-6	till	100-300	120	140
7Ac63	15-30	4-7	limestone	Clay Loam	2-6	limestone/frac till	100-300	120	140
7Ac64	15-30	4-7	limestone	Clay Loam	0-2	limestone/frac till	100-300	121	143
7Ac65	5-15	4-7	limestone	Clay Loam	0-2	till	100-300	131	153
7Ac66	15-30	4-7	limestone	Clay Loam	0-2	till	100-300	121	143
7Ac67	15-30	4-7	limestone	Clay Loam	2-6	till	100-300	115	136
7Ac68	30-50	4-7	limestone	Clay Loam	2-6	till	100-300	105	126
7Ac69	30-50	4-7	limestone	Clay Loam	6-12	till	100-300	101	114

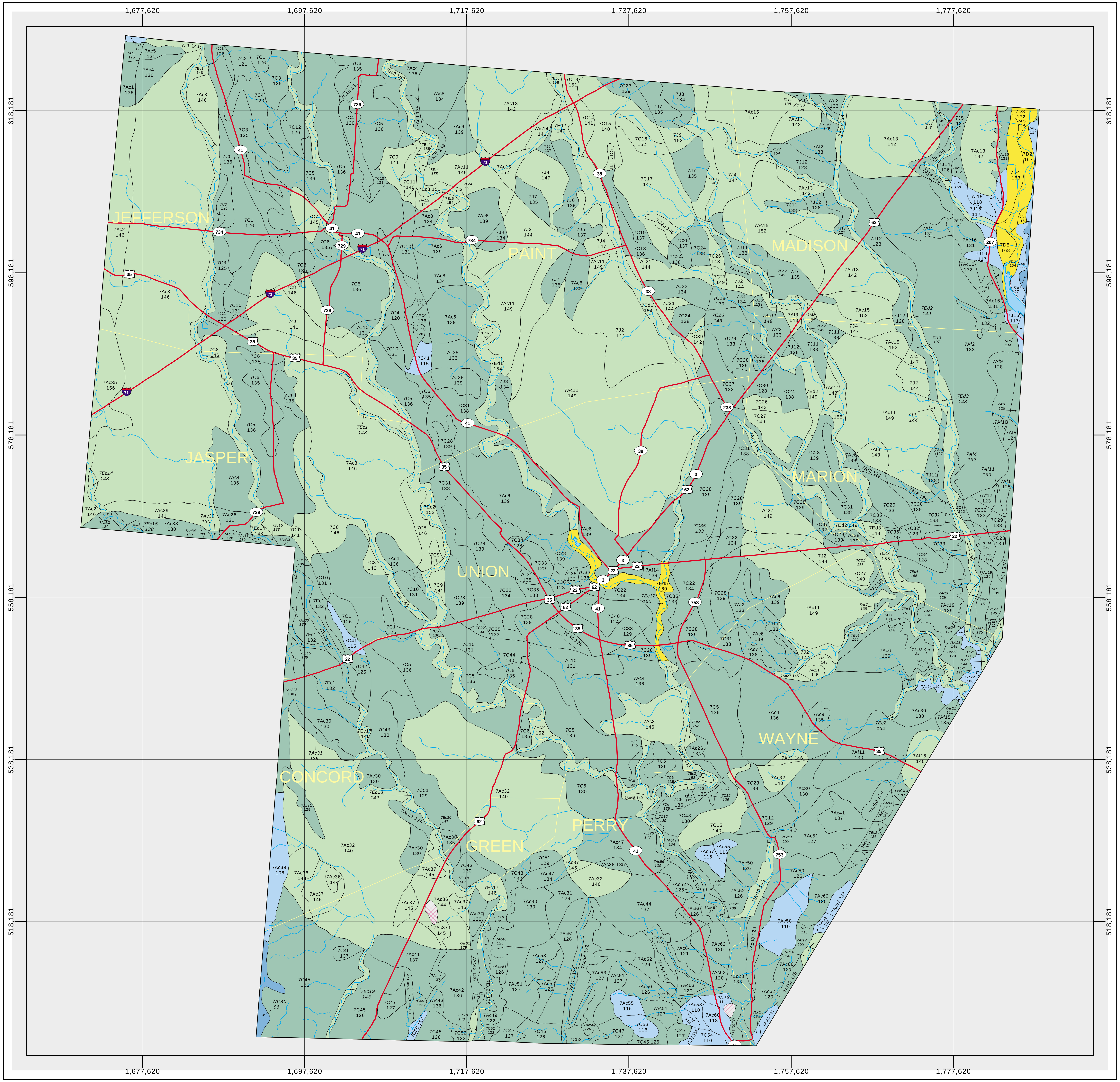
Setting	Depth To Water (feet)	Recharge (In/Yr)	Aquifer Media	Soil Media	Topography (% slope)	Vadose Zone Media	Hydraulic Conductivity	Rating	Pesticide Rating_
7Af1	15-30	4-7	sand and gravel	Clay Loam	0-2	sd + gvl w/sl + cl	300-700	125	146
7Af2	15-30	4-7	sand and gravel	Clay Loam	0-2	till	300-700	133	153
7Af3	5-15	4-7	sand and gravel	Clay Loam	0-2	till	300-700	143	163
7Af4	15-30	4-7	sand and gravel	Clay Loam	2-6	till	300-700	132	150
7Af5	15-30	4-7	sand and gravel	Clay Loam	2-6	sd + gvl w/sl + cl	300-700	124	143
7Af6	30-50	4-7	sand and gravel	Clay Loam	2-6	sd + gvl w/sl + cl	300-700	114	133
7Af7	30-50	2-4	sand and gravel	Clay Loam	2-6	silt and clay	300-700	97	117
7Af8	30-50	4-7	sand and gravel	Clay Loam	6-12	till	300-700	115	125
7Af9	15-30	4-7	sand and gravel	Clay Loam	0-2	till	300-700	128	149
7Af10	15-30	4-7	sand and gravel	Clay Loam	2-6	till	300-700	127	146
7Af11	15-30	4-7	sand and gravel	Clay Loam	0-2	till	300-700	130	150
7Af12	30-50	4-7	sand and gravel	Clay Loam	0-2	till	300-700	123	143
7Af13	15-30	4-7	sand and gravel	Clay Loam	0-2	till	300-700	125	146
7Af14	15-30	4-7	sand and gravel	Clay Loam	0-2	till	700-1000	139	157
7Af15	15-30	4-7	sand and gravel	Clay Loam	0-2	sd + gvl w/sl + cl	300-700	135	154
7Af16	5-15	4-7	sand and gravel	Clay Loam	0-2	till	300-700	140	160
7Af17	0-5	7-10	sand and gravel	Clay Loam	0-2	till	300-700	153	173
7C1	30-50	4-7	limestone	Clay Loam	0-2	till	700-1000	126	144
7C2	30-50	4-7	limestone	Clay Loam	0-2	till	700-1000	121	140
7C3	30-50	4-7	limestone	Clay Loam	2-6	till	700-1000	125	141
7C4	30-50	4-7	limestone	Clay Loam	2-6	till	700-1000	120	137
7C5	15-30	4-7	limestone	Clay Loam	0-2	till	700-1000	136	154
7C6	15-30	4-7	limestone	Clay Loam	2-6	till	700-1000	135	151
7C7	5-15	4-7	limestone	Clay Loam	2-6	till	700-1000	145	161
7C8	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	146	164
7C9	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	141	160
7C10	15-30	4-7	limestone	Clay Loam	0-2	till	700-1000	131	150
7C11	5-15	4-7	limestone	Clay Loam	2-6	till	700-1000	140	157
7C12	15-30	4-7	sand and gravel	Clay Loam	2-6	till	300-700	129	147
7C13	5-15	4-7	limestone	Clay Loam	2-6	till	700-1000	151	167
7C14	15-30	4-7	limestone	Clay Loam	2-6	till	700-1000	141	157

Setting	Depth To Water (feet)	Recharge (In/Yr)	Aquifer Media	Soil Media	Topography (% slope)	Vadose Zone Media	Hydraulic Conductivity	Rating	Pesticide Rating_
7C15	5-15	4-7	sand and gravel	Clay Loam	0-2	till	300-700	140	160
7C16	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	152	170
7C17	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	147	166
7C18	15-30	4-7	limestone	Clay Loam	2-6	till	700-1000	136	153
7C19	15-30	4-7	limestone	Clay Loam	0-2	till	700-1000	137	156
7C20	5-15	4-7	limestone	Clay Loam	2-6	till	700-1000	146	163
7C21	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	144	163
7C22	15-30	4-7	limestone	Clay Loam	0-2	till	700-1000	134	153
7C23	5-15	4-7	sand and gravel	Clay Loam	2-6	till	300-700	139	157
7C24	5-15	4-7	sand and gravel	Clay Loam	0-2	till	300-700	138	159
7C25	5-15	4-7	sand and gravel	Clay Loam	2-6	till	300-700	137	156
7C26	5-15	4-7	sand and gravel	Clay Loam	0-2	till	300-700	143	163
7C27	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	149	167
7C28	15-30	4-7	limestone	Clay Loam	0-2	till	700-1000	139	157
7C29	15-30	4-7	sand and gravel	Clay Loam	0-2	till	300-700	133	153
7C30	15-30	4-7	sand and gravel	Clay Loam	0-2	till	300-700	128	149
7C31	15-30	4-7	limestone	Clay Loam	2-6	till	700-1000	138	154
7C32	30-50	4-7	sand and gravel	Clay Loam	0-2	till	300-700	123	143
7C33	30-50	4-7	limestone	Clay Loam	0-2	till	700-1000	129	147
7C34	30-50	4-7	limestone	Clay Loam	2-6	till	700-1000	128	144
7C35	15-30	4-7	limestone	Clay Loam	2-6	till	700-1000	133	150
7C36	30-50	4-7	limestone	Clay Loam	2-6	till	700-1000	123	140
7C37	15-30	4-7	sand and gravel	Clay Loam	2-6	till	300-700	132	150
7C38	30-50	4-7	sand and gravel	Clay Loam	2-6	till	300-700	122	140
7C39	5-15	4-7	sand and gravel	Clay Loam	2-6	till	300-700	142	160
7C40	30-50	4-7	limestone	Clay Loam	0-2	till	700-1000	124	143
7C41	30-50	4-7	limestone	Clay Loam	0-2	till	300-700	115	136
7C42	15-30	4-7	limestone	Clay Loam	0-2	till	300-700	125	146
7C43	15-30	4-7	limestone	Clay Loam	0-2	till	300-700	130	150
7C44	15-30	4-7	limestone	Clay Loam	2-6	till	700-1000	130	147
7C45	15-30	4-7	limestone	Clay Loam	2-6	till	300-700	126	144
7C46	5-15	4-7	limestone	Clay Loam	0-2	till	300-700	137	157
7C47	15-30	4-7	limestone	Clay Loam	0-2	till	300-700	127	147
7C48	15-30	4-7	limestone	Clay Loam	0-2	till	300-700	122	143
7C49	15-30	4-7	limestone	Clay Loam	2-6	till	300-700	121	140

Setting	Depth To Water (feet)	Recharge (In/Yr)	Aquifer Media	Soil Media	Topography (% slope)	Vadose Zone Media	Hydraulic Conductivity	Rating	Pesticide Rating_
7C50	15-30	4-7	limestone	Clay Loam	6-12	till	300-700	117	128
7C51	15-30	4-7	limestone	Clay Loam	2-6	till	300-700	129	147
7C52	15-30	4-7	limestone	Clay Loam	6-12	till	300-700	122	132
7C53	30-50	4-7	limestone	Clay Loam	2-6	till	300-700	116	134
7C54	30-50	4-7	limestone	Clay Loam	2-6	till	100-300	110	130
7D1	5-15	2-4	sand and gravel	Clay Loam	0-2	till	100-300	111	134
7D2	5-15	7-10	sand and gravel	Silty Loam	0-2	sd + gvl w/sl + cl	700-1000	167	187
7D3	5-15	7-10	sand and gravel	Silty Loam	0-2	sd + gvl w/sl + cl	700-1000	172	191
7D4	15-30	7-10	sand and gravel	Sandy Loam	0-2	sd + gvl w/sl + cl	700-1000	163	188
7D5	5-15	7-10	sand and gravel	Sandy Loam	0-2	sd + gvl w/sl + cl	700-1000	168	194
7D6	5-15	7-10	sand and gravel	Silty Loam	0-2	sd + gvl w/sl + cl	700-1000	164	184
7Ec1	5-15	4-7	limestone	Silty Loam	0-2	silt and clay	700-1000	148	169
7Ec2	5-15	4-7	limestone	Sandy Loam	0-2	sd + gvl w/sl + cl	700-1000	152	179
7Ec3	5-15	4-7	limestone	Silty Loam	0-2	silt and clay	700-1000	151	172
7Ec4	5-15	4-7	limestone	Sandy Loam	0-2	sd + gvl w/sl + cl	700-1000	155	182
7Ec5	5-15	4-7	limestone	Sandy Loam	2-6	sd + gvl w/sl + cl	700-1000	154	179
7Ec6	5-15	4-7	limestone	Sandy Loam	0-2	sd + gvl w/sl + cl	700-1000	158	185
7Ec7	5-15	4-7	limestone	Silty Loam	0-2	sd + gvl w/sl + cl	700-1000	154	175
7Ec8	15-30	4-7	limestone	Sandy Loam	0-2	sd + gvl w/sl + cl	700-1000	148	175
7Ec9	5-15	4-7	limestone	Silty Loam	0-2	sd + gvl w/sl + cl	700-1000	151	172
7Ec10	5-15	4-7	limestone	Shrink/Swell Clay	0-2	sd + gvl w/sl + cl	100-300	144	177
7Ec11	5-15	4-7	limestone	Shrink/Swell Clay	0-2	silt and clay	300-700	148	180
7Ec12	5-15	4-7	limestone	Sandy Loam	0-2	sd + gvl w/sl + cl	700-1000	160	186
7Ec13	5-15	4-7	limestone	Sandy Loam	0-2	sd + gvl w/sl + cl	700-1000	157	183
7Ec14	5-15	4-7	limestone	Silty Loam	0-2	silt and clay	700-1000	143	165
7Ec15	5-15	4-7	limestone	Shrink/Swell Clay	0-2	till	300-700	138	172
7Ec16	5-15	4-7	limestone	Silty Loam	0-2	silt and clay	300-700	137	161
7Ec17	5-15	4-7	limestone	Sandy Loam	0-2	sd + gvl w/sl + cl	300-700	146	175
7Ec18	5-15	4-7	limestone	Silty Loam	0-2	silt and clay	300-700	142	165

Setting	Depth To Water (feet)	Recharge (In/Yr)	Aquifer Media	Soil Media	Topography (% slope)	Vadose Zone Media	Hydraulic Conductivity	Rating	Pesticide Rating_
7Ec19	5-15	4-7	limestone	Sandy Loam	0-2	sd + gvl w/sl + cl	300-700	143	172
7Ec20	5-15	4-7	limestone	Silty Loam	0-2	limestone/frac till	300-700	147	169
7Ec21	5-15	4-7	limestone	Silty Loam	0-2	silt and clay	300-700	139	162
7Ec22	5-15	4-7	limestone	Shrink/Swell Clay	0-2	silt and clay	300-700	140	173
7Ec23	5-15	4-7	limestone	Silty Loam	0-2	silt and clay	100-300	133	158
7Ec24	5-15	4-7	limestone	Clay Loam	0-2	sd + gvl w/sl + cl	100-300	136	157
7Ec25	30-50	4-7	limestone	Clay Loam	2-6	till	100-300	105	126
7Ed1	5-15	4-7	sand and gravel	Sandy Loam	0-2	sd + gvl w/sl + cl	300-700	154	182
7Ed2	5-15	4-7	sand and gravel	Sandy Loam	0-2	sd + gvl w/sl + cl	300-700	149	178
7Ed3	5-15	4-7	sand and gravel	Sandy Loam	2-6	sd + gvl w/sl + cl	300-700	148	175
7Ed4	5-15	4-7	sand and gravel	Shrink/Swell Clay	0-2	sd + gvl w/sl + cl	300-700	143	176
7Ed5	5-15	4-7	sand and gravel	Sandy Loam	0-2	sd + gvl w/sl + cl	700-1000	160	186
7Ed6	5-15	4-7	sand and gravel	Sandy Loam	2-6	sd + gvl w/sl + cl	300-700	153	179
7Fc1	5-15	4-7	limestone	Silty Loam	0-2	silt and clay	300-700	132	157
7J1	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	141	160
7J2	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	144	163
7J3	15-30	4-7	limestone	Clay Loam	0-2	till	700-1000	134	153
7J4	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	147	166
7J5	15-30	4-7	limestone	Clay Loam	0-2	till	700-1000	137	156
7J6	15-30	4-7	limestone	Clay Loam	2-6	till	700-1000	136	153
7J7	5-15	4-7	sand and gravel	Clay Loam	0-2	till	300-700	135	156
7J8	5-15	4-7	sand and gravel	Clay Loam	2-6	till	300-700	134	153
7J9	5-15	4-7	limestone	Clay Loam	0-2	till	700-1000	152	170
7J10	5-15	4-7	limestone	Clay Loam	2-6	till	700-1000	146	163
7J11	5-15	4-7	sand and gravel	Clay Loam	0-2	till	300-700	138	159
7J12	15-30	4-7	sand and gravel	Clay Loam	0-2	till	300-700	128	149
7J13	15-30	4-7	sand and gravel	Clay Loam	2-6	till	300-700	127	146
7J14	30-50	4-7	limestone	Clay Loam	2-6	till	700-1000	126	143
7J15	30-50	4-7	sand and gravel	Clay Loam	0-2	till	300-700	118	139

Setting	Depth To Water (feet)	Recharge (In/Yr)	Aquifer Media	Soil Media	Topography (% slope)	Vadose Zone Media	Hydraulic Conductivity	Rating	Pesticide Rating_
7J16	30-50	4-7	sand and gravel	Clay Loam	2-6	till	300-700	117	136
7J17	15-30	4-7	limestone	Clay Loam	2-6	till	700-1000	133	150



Ground Water Pollution Potential of Fayette County

by
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Ground Water Pollution Potential maps are designed to evaluate the susceptibility of ground water to contamination from surface sources. These maps are based on the DRASTIC system developed for the USEPA (Aller et al., 1987). The DRASTIC system consists of two major elements: the designation of mappable units, termed hydrogeologic settings, and a relative rating system for determining the ground water pollution potential within a hydrogeologic setting. The application of DRASTIC to an area requires the recognition of a set of assumptions made in the development of the system. The evaluation of pollution potential of an area assumes that a contaminant with the mobility of water is introduced at the surface and is flushed into the ground water by precipitation. DRASTIC is not designed to replace specific on-site investigations.

In DRASTIC mapping, hydrogeologic settings form the basis of the system and incorporate the major hydrogeologic factors that affect and control ground water movement and occurrence. The relative rating system uses a combination of weights and ratings to produce a numerical value called the ground water pollution potential index. Higher index values indicate higher susceptibility to ground water contamination. Polygons (outlined in black on the map at left) are regions where the hydrogeologic setting and the pollution potential index are combined to create a mappable unit with specific hydrogeologic characteristics, which determine the region's relative vulnerability to contamination. Additional information on the DRASTIC system, hydrogeologic settings, ratings, and weighting factors is included in the report.

Description of Map Symbols

Hydrogeologic Region → 7D24 ← Hydrogeologic Setting
170 ← Relative Pollution Potential

Legend

Colors are used to depict the ranges in the pollution potential indexes shown below. Warm colors (red, orange, yellow) represent areas of higher vulnerability (higher pollution potential indexes), while cool colors (green, blue, violet) represent areas of lower vulnerability to contamination (lower pollution potential indexes).

- Roads
- Streams
- Lakes
- Townships

Index Ranges

- Not Rated
- Less Than 79
- 80 - 99
- 100 - 119
- 120 - 139
- 140 - 159
- 160 - 179
- 180 - 199
- Greater Than 200

N

Black grid represents the State Plane South Coordinate System (NAD27, feet).

0 1 2 3 4 5
Miles

0 1 2 4 6 8
Kilometers

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