GROUND WATER POLLUTION POTENTIAL OF FRANKLIN COUNTY, OHIO

BY

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GROUND WATER POLLUTION POTENTIAL REPORT NO. 40

OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER

WATER RESOURCES SECTION

SEPTEMBER, 1995

ABSTRACT

A ground water pollution potential map of Franklin 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 form the basis of the system and incorporate the major hydrogeologic factors that affect and 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.

Franklin County lies within the Glaciated Central hydrogeologic setting. Varying thicknesses of glacial till cover most of the county. Major stream valleys typically contain both alluvium and sand and gravel outwash deposits. The county is crossed by numerous buried valley systems. Yields from wells completed in the unconsolidated deposits range from less than 3 gallons per minute to over 3,000 gallons per minute. Bedrock varies considerably across Franklin County with Silurian and Devonian limestones and dolomites in the west, Devonian shales in the central portion of the county, and Mississippian shales and sandstones in the east. Yields up to 500 gallons per minute can be obtained from the carbonates, yields under 10 gallons per minute are typical for the shales, and yields from 10 to 25 gallons per minute are common for the interbedded Mississippian shales and sandstones. Ground water pollution potential analysis in Franklin County resulted in a map with symbols and colors which illustrate areas of varying ground water contamination vulnerability. Twelve hydrogeologic settings were identified in Franklin County with computed ground water pollution potential indexes ranging from 48 to 191.

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 Franklin 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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ACKNOWLEDGEMENTS

The preparation of the Franklin County Ground Water Pollution Potential report and map involved the contribution and work of a number of individuals in the Division of Water. Grateful acknowledgement is given to the following individuals for their technical review and map production, text authorship, report editing, and preparation:

Map preparation and review:	Michael P. Angle David J. Sugar
Map print production and review:	J. Gerrie McCall David Orr
Report production and review:	Michael P. Angle Michael Hallfrisch
Report editing:	Michael Hallfrisch Michael Angle J. Gerrie McCall
Desktop publishing and report design:	David Orr J. Gerrie McCall

The Division of Water sincerely appreciates the financial support of the Franklin County Development Department and the assistance of Kevin Wheeler and Tim Richardson of the Mid Ohio Regional Planning Commission for the printing of the Franklin County Ground Water Pollution Potential Map and Report.

This report is dedicated to James J. Schmidt, author of *The Ground Water Resources of Franklin County* (1958 and 1993) and for forty years the authority on ground water in central Ohio.

INTRODUCTION

The need for protection and management of ground water resources in Ohio has been clearly recognized. About 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; 20,000 of these wells exist in Franklin 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 clean-up 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 county-wide 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 Franklin 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.

Other beneficial uses of the pollution potential maps will be recognized by individuals in the county who are familiar with specific land use and management problems. 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

The system chosen for implementation of a ground water pollution potential mapping program in Ohio, DRASTIC, was developed by the National Water Well Association for the United States Environmental Protection Agency. 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 fifteen 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 Franklin County. Inherent within each hydrogeologic setting are the physical characteristics which 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

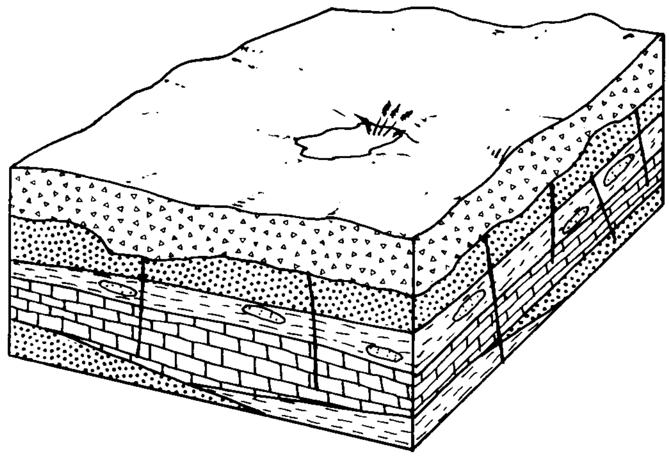
C – Conductivity (Hydraulic) of the Aquifer

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.



7Aa Glacial Till Over Bedded Sedimentary Rock

This hydrogeologic setting is limited to portions of Plain, Jefferson, and Truro Townships in eastern Franklin County. Topography is generally relatively flat to moderately sloping. The aquifer consists of the interbedded siltstones, shales, and fine-grained sandstones of the Cuyahoga Formation. Yields range from 5 to 25 gallons per minute (gpm). The aquifer is typically overlain by varying thicknesses of glacial till with an average thickness of 30 to 40 feet. Soils are commonly clay loams. Depth to water is shallow to moderate and rarely exceeds 50 feet. Precipitation infiltrating through the glacial till is the primary source of recharge. Recharge is moderate due to the moderate thickness of till and depth to water.

Figure 1. Format and description of the hydrogeologic setting - 7Aa Glacial Till Over Bedded Sedimentary Rock

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.

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 judgement. 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 to be used 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
Massive Shale	1-3	2
Metamorphic / Igneous	2-5	3
Weathered Metamorphic / Igneous	3-5	4
Glacial Till	4-6	5
Bedded Sandstone, Limestone and Shale Sequences	5-9	6
Massive Sandstone	4-9	6
Massive Limestone	4-9	6
Sand and Gravel	4-9	8
Basalt	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 or Absent	10
Gravel	10
Sand	9
Peat	8
Shrinking and / or Aggregated Clay	7
Sandy Loam	6
Loam	5
Silty Loam	4
Clay Loam	3
Muck	2
Nonshrinking and Nonaggregated 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
Bedded Limestone, Sandstone, Shale	4-8	6
Sand and Gravel with significant Silt and Clay	4-8	6
Metamorphic/Igneous	2-8	4
Sand and Gravel	6-9	8
Basalt	2-10	9
Karst Limestone	8-10	10
Weight: 5	Pesticide Weight: 4	

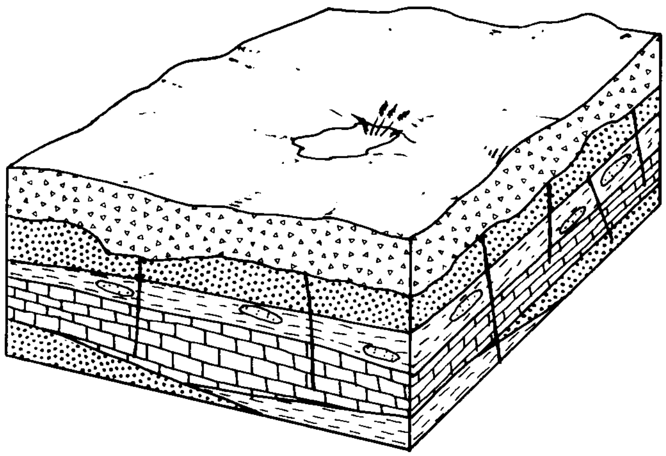
TABLE 8. RANGES AND RATINGS FOR HYDRAULIC CONDUCTIVITY

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 7Aa1, Glacial Till Over Bedded Sedimentary Rock, identified in mapping Franklin 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 123. This numerical value has no intrinsic meaning, but can be readily 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 Franklin County produces settings with a wide range of vulnerability to ground water contamination. Calculated pollution potential indexes for the twelve settings identified in the county range from 48 to 191.

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 Franklin 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 Franklin County is included with this report.



SETTING 7Aa1		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	NUMBER
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Interbedded Sandstone/Shale	3	4	12
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		DRASTIC	INDEX	123

Figure 2. Description of the hydrogeologic setting - 7Aa1 Glacial Till Over Bedded Sedimentary Rock

INTERPRETATION AND USE OF A GROUND WATER POLLUTION POTENTIAL MAP

The application of the DRASTIC system to evaluate an area's vulnerability to contamination produces hydrogeologic settings with corresponding pollution potential indexes. The higher the pollution potential index, the greater the susceptibility to contamination. 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:

7Aa1 - defines the hydrogeologic region and setting
123 - defines the relative pollution potential

Here the first number (7) refers to the major hydrogeologic region and the upper and lower case letters (Aa) refer 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 (123) 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 map includes information on the locations of selected observation wells. Available information on these observation wells is referenced in Appendix A, Description of the Logic in Factor Selection. Large man-made features such as landfills, quarries, or strip mines have also been marked on the map for reference.

GENERAL INFORMATION ABOUT FRANKLIN COUNTY

Demographics

Franklin County occupies approximately 538 square miles in central Ohio (Figure 3). Franklin County is bounded to the east by Licking County, to the southeast by Fairfield County, to the south by Pickaway County, to the west by Madison County, to the northwest by Union County, and to the north by Delaware County. Elevations range from 1130 feet in northeastern Plain Township to 665 feet where the Scioto River enters Pickaway County.

The approximate population of Franklin County, according to 1994 estimates, is 1,005,361 (Ohio Department of Development, personal communication), making Franklin County Ohio's second largest county in terms of population. Columbus is the county seat, largest city, and state capital. Approximately 50 percent of the land area is used for agriculture with the remainder devoted to urban, industrial, residential, recreational, and mining uses. Population growth and development are widespread throughout the county and are concentrated particularly around Hilliard, New Albany, Gahanna, and Pickerington, which lies partially within Fairfield County. The south central portion of the county remains the least developed. More specific information on land usage can be obtained from the ODNR, Division of Real Estate and Land Management (REALM), Resource Analysis Program (formerly OCAP).

Climate

The weather station at Port Columbus International Airport in eastern Franklin County reports a thirty-year (1961-1990) average mean annual temperature of 51.40° Fahrenheit (Owenby and Ezell, 1992). According to Harstine (1991), the average temperature is relatively constant across the county. The mean annual precipitation recorded at Port Columbus is 38.09 inches based on the same thirty-year (1961-1990) period (Owenby and Ezell, 1992). Harstine (1991) shows precipitation levels as being relatively constant across the county with a slight decrease to the northwest, roughly following the Scioto River Valley.

Figure 3. Location of Franklin County

Physiography and Topography

Franklin County lies within the Till Plains Section of the Interior Low Plains Province (Fenneman, 1938). Frost (1931) refers to Franklin County as being wihin the Central Till Plains. Franklin County lies roughly 40 miles to the west and northwest of the Glacial Boundary.

Franklin County is predominantly characterized by flat to gently rolling topography. Areas of higher relief are typically limited to stream dissection immediately adjacent to major modern river valleys. Stream dissection is most notable along the Scioto River near Dublin and along Darby Creek in Pleasant Township. Relief begins to increase and topography becomes slightly more rolling near the eastern margin of Franklin County. The increased relief in this area is due to a pair of escarpments which mark the extreme western margin of the Allegheny Plateau (Schmidt and Goldthwait, 1958). The first escarpment rises to an elevation of 1,000 feet and is formed by the Berea Sandstone capped by a thin layer of the Sunbury Shale. This escarpment can best be observed along Morse Road and East Dublin-Granville Road (State Route 161) between Cherry Bottom Road and Hamilton Road. The second rise or escarpment is formed by resistant thin sandstones of the Cuyahoga Formation and can best be observed along Blacklick Creek in Jefferson Township.

Modern Drainage

All of Franklin County eventually drains into the Scioto River watershed and ultimately into the Ohio River. Figure 4 depicts the major stream systems in Franklin County. The majority of the major streams have a pronounced north-south alignment which in part reflect the bedrock geology (Stauffer et al., 1911). Far western Franklin County is drained by Darby Creek which serves as the boundary between much of Franklin County and Madison County. Hellbranch Run is the major tributary and drains much of Pleasant and Prairie Townships. Darby Creek joins the Scioto River near Circleville in Pickaway County. Little Darby Creek, which flows eastward through Madison County, converges with Big Darby Creek in northwestern Pleasant Township.

The Scioto River drains much of western and central Franklin County. The Olentangy River is a major tributary and joins the Scioto River at Grandview Heights. Rocky Fork is the major tributary of Alum Creek. Alum Creek, Big Walnut Creek, and Blacklick Creek drain the majority of central and eastern Franklin County. Alum Creek and Blacklick Creek join Big Walnut Creek in northern Madison Township. Big Walnut Creek empties into the Scioto River just south of the boundary with Pickaway County. Little Walnut Creek drains the far southeastern corner of the county in the vicinity of Canal Winchester. Little Walnut Creek empties into the Scioto River between Ashville and Circleville in Pickaway County.

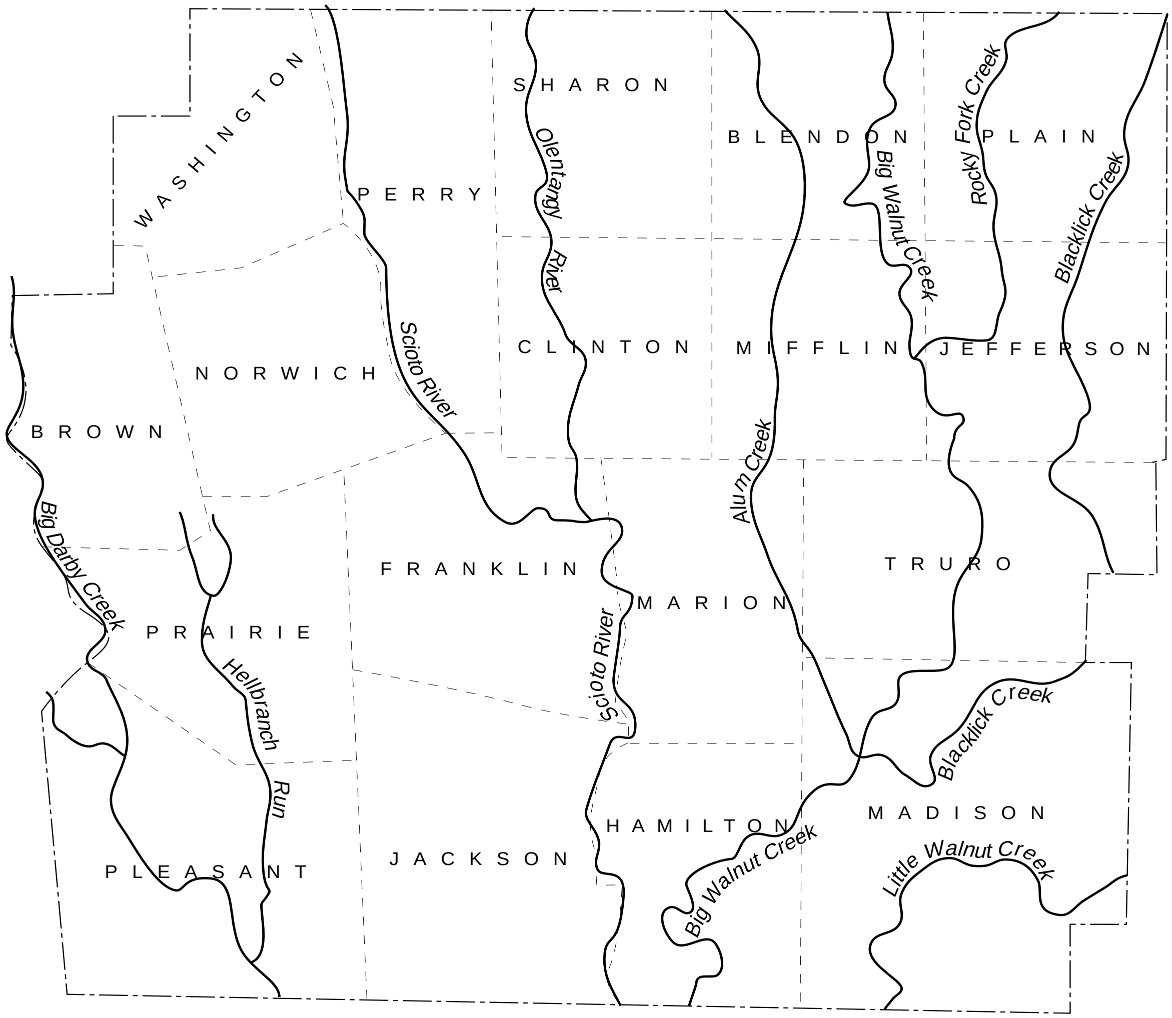


Figure 4. Modern Drainage in Franklin County (modified from Schmidt and Goldthwait, 1958).

The Scioto River drains much of western and central Franklin County. The Olentangy River is a major tributary and joins the Scioto River at Grandview Heights. Rocky Fork is the major tributary of Alum Creek. Alum Creek, Big Walnut Creek, and Blacklick Creek drain the majority of central and eastern Franklin County. Alum Creek and Blacklick Creek join Big Walnut Creek in northern Madison Township. Big Walnut Creek empties into the Scioto River just south of the boundary with Pickaway County. Little Walnut Creek drains the far southeastern corner of the county in the vicinity of Canal Winchester. Little Walnut Creek empties into the Scioto River between Ashville and Circleville in Pickaway County.

Pre- and Inter-Glacial Drainage and Topography

The pre-glacial and inter-glacial drainage of Franklin County is discussed in detail by Stauffer et al. (1911), Stout et al. (1943), and by Schmidt and Goldthwait (1958). The drainage changes occurring over time in Franklin County are numerous, complex, and are still not totally understood. It is important to note that entire drainage systems, including tributaries, have changed and these various systems have been superimposed (overlapped) over time.

Prior to glaciation, Franklin County was drained by the Teays Drainage System. The Teays River originated in the Appalachians and flowed northwest, entering Ohio near Portsmouth. Once in Ohio, the Teays flowed due north, roughly paralleling the present course of the Scioto River (Figure 5). In northern Pickaway County, the Teays veered to the northwest, flowing towards London and Urbana. The Teays then ran westward, eventually entering Indiana near Celina in Mercer County.

Stout et al. (1943) suggested that all of Franklin County was drained in pre-glacial time by the Groveport River, a major tributary of the Teays River. The Groveport River originated near Wooster in Wayne County and flowed southward toward Newark. From Newark, the Groveport River flowed south to the vicinity of Buckeye Lake and then due west, cutting across southern Franklin County and entering Madison County. Stout et al. (1943) speculated that the Groveport River flowed across Madison County and merged with the Teays River in Clark County. Schmidt and Goldthwait (1958) and Dove (1960) disagreed, suggesting that the Groveport River flowed westward through northeastern Fairfield County and then took a more southwesterly course. The Groveport River flowed through the southeastern corner of Franklin County and merged with the Teays River in north central Pickaway County. The Teays then followed a northwesterly course into Madison County.

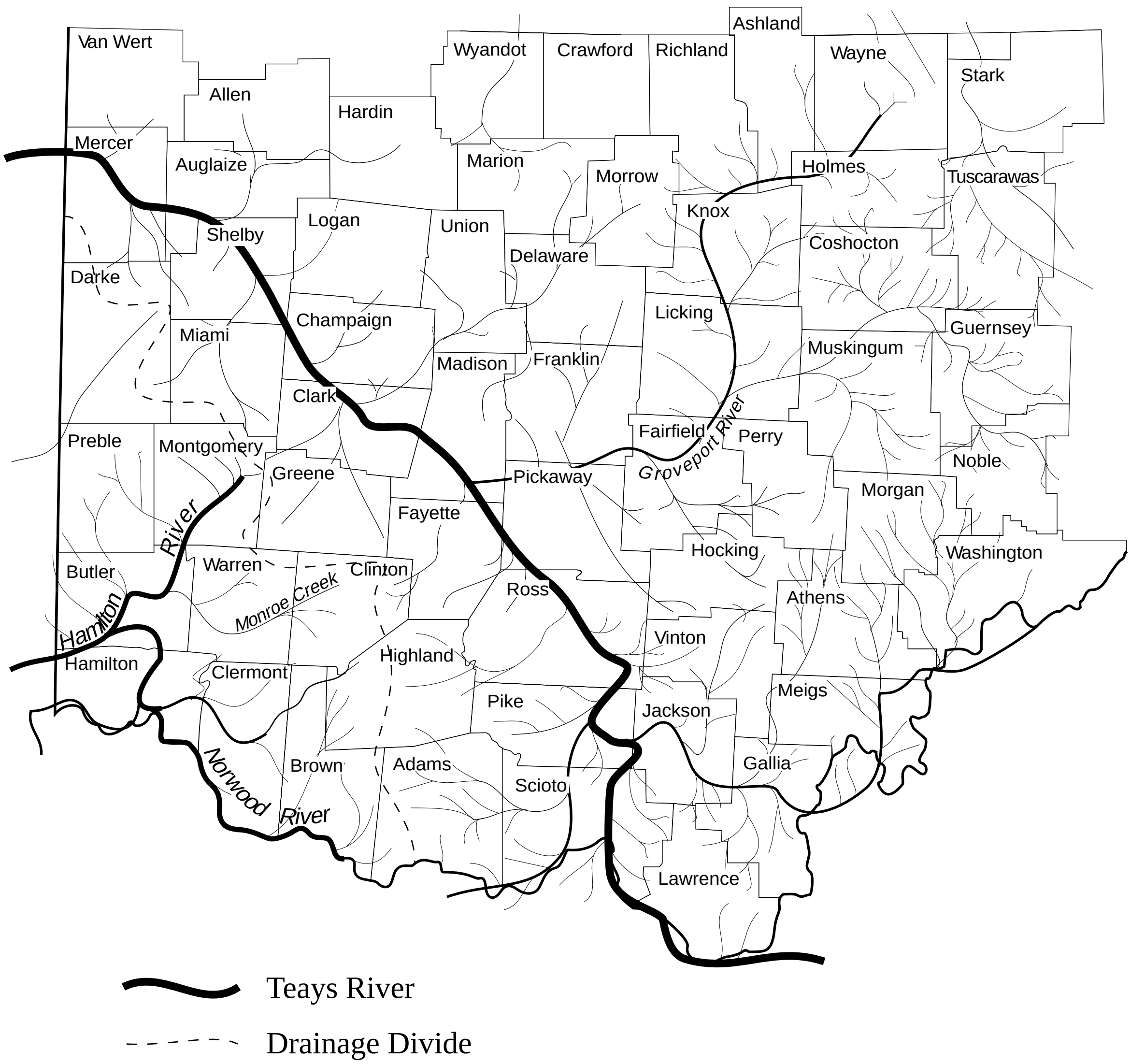


Figure 5. Teays Stage Drainage in Ohio (modified from Stout et al., 1943).

Schmidt and Goldthwait (1958) determined that four major tributaries of the Groveport River drained eastern, central, and northwestern Franklin County. These tributaries are depicted on Figure 6 as A, B, C, and D. A fifth tributary that drained the southwestern portion of the county is depicted as E in Figure 6. It has not yet been determined whether this tributary joined the Groveport River or the Teays River itself further south in Pickaway County.

As ice advanced through Ohio during the pre-Illinoian (Kansan) glaciation, the Teays Drainage System was eventually blocked. Flow backed up in the main trunk of the Teays Valley as well as in many of the tributaries, forming several large lakes. These lakes created spillways and cut new channels, and new drainage systems evolved (Stout et al., 1943; Schmidt and Goldthwait, 1958; and Dove, 1960). This downcutting by streams was believed to be relatively rapid and, in many places, the new channels were cut over 100 feet deeper than the previous Teays Valleys. This new drainage system is referred to as the Deep Stage due to this increased downcutting. In Franklin County, many of the Deep Stage channels closely followed the previous Teays Valleys.

The Illinoian glaciation further modified drainage systems in Franklin County (Schmidt and Golthwait, 1958). The advancing ice sheets further modified valleys by erosion, deposition, and blockage of streams. Meltwater derived from these ice sheets also alternately led to further erosion or deposition within valleys and drainage systems. Figure 7 delineates some of the drainage changes which occurred in Franklin County.

Thick sequences of coarse sand and gravel outwash were deposited by meltwater derived from the latest or Wisconsinan glaciation. These deposits in central and southeastern Franklin County constitute the highest-yielding aquifers in the county. In many portions of the county, modern stream drainages closely follow the course of these outwash-filled channels. This is true for much of the Olentangy River, Alum Creek, Big Walnut Creek, Little Walnut Creek, Blacklick Creek, and the southern portions of the Scioto River and Darby Creek in Franklin County. The modern rivers are all believed to be post-glacial (Stauffer et al., 1911 and Schmidt and Goldthwait, 1958) in nature. This is perhaps best evidenced by major stretches of the Scioto River and Darby Creek in northern Franklin County which have cut through glacial drift and are now flowing upon and actively eroding the bedrock surface (Stauffer et al., 1911 and Schmidt and Goldthwait, 1958). The northern reaches of the Scioto River, Darby Creek, and the Olentangy River (in Delaware County) appear to have younger valleys than in the southern reaches where these streams cut through outwash (Stauffer et al., 1911 and Schmidt and Goldthwait, 1958).

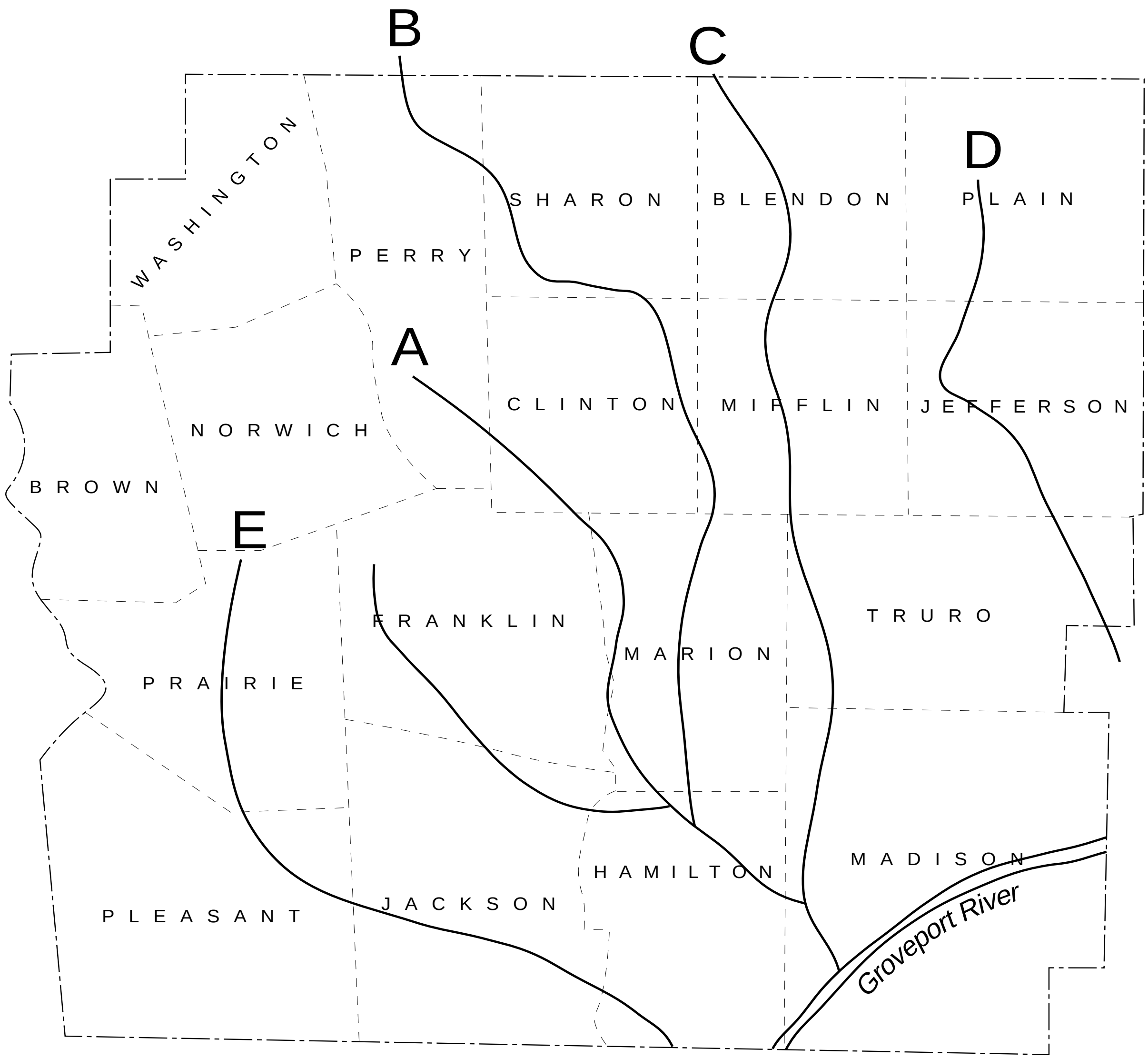


Figure 6. Pre-glacial Teays Stage / Groveport River Drainage in Franklin County (modified from Schmidt and Goldthwait, 1958).

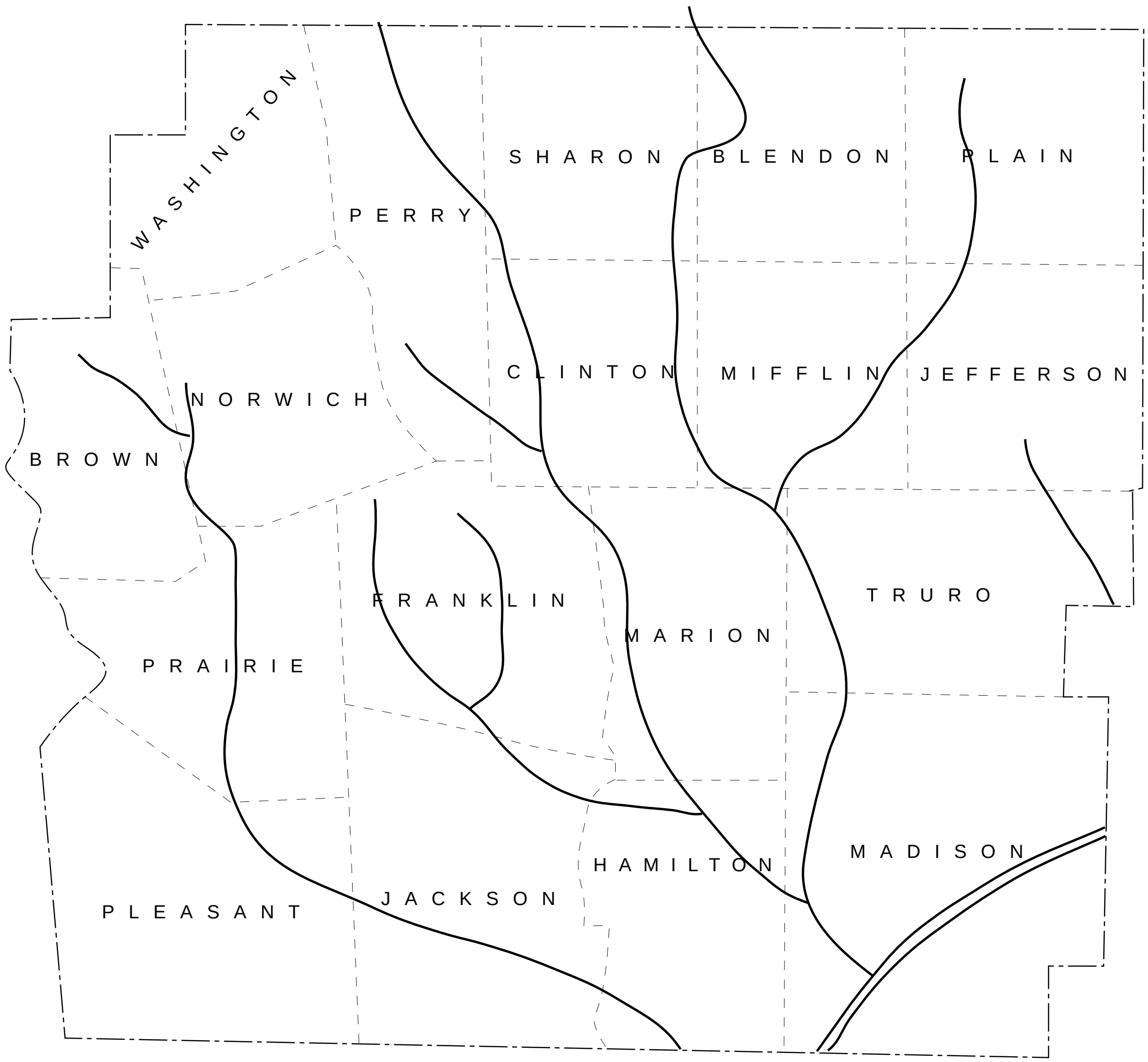


Figure 7. Deep Stage / Illinoian Drainage in Franklin County (modified from Schmidt and Goldthwait, 1958).

Glacial Geology

During the Pleistocene Epoch (2 million to 10,000 years before present (Y.B.P.)), several episodes of ice advance occurred in central Ohio. Table 9 summarizes the Pleistocene deposits encountered in Franklin County. Older ice advances are now conventionally referred to as pre-Illinoian (formerly Kansan). Deposits are determined to be pre-Illinoian if they predate the most recent (Brunhes) magnetic reversal (about 730,000 Y.B.P.). Evidence for these deposits has not been positively identified at the surface or in sub-surface cores in Franklin County; further research is needed to determine the age of older deposits in the bottoms of deeper buried valleys. Bennett and Williams (1988) and Weatherington-Rice et al. (1988) suggest that some of the clays and silts encountered in deep well borings in south central Franklin County are Minford Silts which are pre-Illinoian in age. The Minford Silts were deposited by lakes which were created by the blockage of the Teays River system during the initial ice advance into the region. The effects of the glacial advances on pre-existing drainage have been documented in the previous section. This discussion will focus on glacial deposits, processes, and landforms.

Illinoian deposits have been identified at the base of some of the larger stream exposures as well as within some of the deeper sand and gravel pits and other deep excavations. These deposits range from dense glacial till to sands, gravels, and silts referred to as the Lockbourne Outwash (Bennett and Williams, 1988 and Weatherington-Rice et al., 1988). A well known exposure of Illinoian till can be found at the base of Rocky Fork Creek near Havens Corner Road in Gahanna. This particular exposure has been studied by geologists for many years (Stauffer et al., 1911 and Fernandez et al., 1988). Szabo et al. (1993) have made some tentative correlations between Illinoian tills in Licking County and Franklin County.

The majority of the glacial deposits fall into four main types: (glacial) till, lacustrine (lake), outwash, and ice-contact sand and gravel (kames and eskers). Buried valleys may feature sequences containing all of these types of deposits. Drift is an older term that collectively refers to the entire sequence of glacial deposits. Modern stream valleys contain alluvium or floodplain deposits which also contribute to the valley fill.

Till is an unsorted, non-stratified (non-bedded) mixture of sand, silt, clay, and gravel deposited directly by the ice sheet. There are two main types or facies of 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, pebbles tend to be angular, broken, and have a preferred direction or orientation. 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 bands melts and the meltwater carries some of the fines (clay and silt "mud" sized particles). Ablation till tends to be less dense, less compacted, slightly coarser in texture, and lacks preferred pebble orientations.

At the land surface, till accounts for two primary landforms: ground moraine and end moraine. Ground moraine is typically flat to gently rolling and is also referred to as till plains. End moraines are more ridge-like, having steeper topography and tending to be more rolling or hummocky. The relief of the end moraines is typically enhanced by streams cutting along their margins. Moraines ideally represent a thickening of till and function as a drainage divide.

Prominent end moraines are lacking in the majority of Franklin County. The southern fringe of the Powell Moraine extends into the far northwestern corner of the county (Stauffer et al., 1911 and Schmidt and Goldthwait, 1958). The main axis or ridge of the moraine can best be observed near the town of Powell and by the Columbus Zoo (Goldthwait et al., 1961 and Paris, 1985). An element of the London Moraine passes through the far southwestern corner of the county (Schmidt and Goldthwait, 1958 and Goldthwait et al., 1961). The moraine can best be observed just west of Darby Creek near Harrisburg and just east of Big Darby Creek near Orient (Goldthwait and Rosengreen, 1969). The New Albany Moraine runs roughly northeast-southwest through eastern Plain Township and Jefferson Township (Stauffer et al., 1911 and Schmidt and Goldthwait, 1958). The New Albany Moraine can best be observed along State Route 605 just north of the town of New Albany or along Reynoldsburg-New Albany Road just south of town (Weatherington, 1978). The New Albany Moraine may be related to the Canal Winchester Moraine, the Lithopolis Moraine, and the Marcy Moraine (Goldthwait et al., 1961 and Wolfe et al., 1962).

The Powell Moraine marks the southern edge of a more clay-rich, late Wisconsinan till (McLoda and Parkinson, 1980; Paris, 1985; Goldthwait, 1989; and Angle, 1991). This till has been referred to as the Olentangy Till (Goldthwait, 1989), the Powell Till (Fullerton, 1986), and the Hayesville Till (Paris, 1985 and Angle, 1991). The clayey till marks the last advance of the ice sheet in the vicinity of Franklin County (see Table 9). This till is limited to the area of the Powell Moraine in far northwestern Franklin County. The surficial till covering the majority of Franklin County is the Darby Till (Goldthwait and Rosengreen, 1969; Dreimanis and Goldthwait, 1973; and Weatherington, 1978). It is a relatively thin, loamy, non-compact till which is typically oxidized to yellowish-brown (Weatherington, 1978; Goldthwait, 1989; and Angle, 1991). The Darby Till represents the last advance of the late Wisconsinan ice sheet which extended across Franklin County (see Table 9). In much of southern and western Franklin County, the Darby Till appears to be ablational in nature. The till becomes sandier and is found covering kames and other features associated with the melting of the ice sheet (McLoda and Parkinson, 1980). The Caesar Till and the Boston Till are two other late Wisconsinan tills which may be encountered below the ground surface in Franklin County (Goldthwait and Rosengreen, 1969; Weatherington, 1978; and Bennett and Williams, 1988). These tills tend to be dense, compact, stony, and are typically unoxidized (gray in color).

Table 9. Generalized Glacial Statigraphy of Franklin County (after Bennet and Williams, 1988; Weatherington-Rice et al., 1988; Goldthwait, 1989; Angle, 1991; and Szabo et al.,1993).

AGE (years ago)	EPOCH	STAGE		SUBSTAGE	UNIT OR INTERVAL
25, 000	PLEISTOCENE	WISCONSINAN	LATE	Wood-fordian	Worthington Outwash (5) Olentangy Till (2) Hayesville Till (3) Darby Till (2) Caesar Till (2) Navarre Till (3) Boston Till (2)
40,000			MIDDLE	Farmdalian (1)	Paleosol, Loess ? Lockbourne Outwash (5, 6)
70,000			EARLY	Altonian (1)	Millbrook Till (3, 4) Lockbourne Outwash (5, 6)
120,000		SANGAMONIAN			Paleosol, Loess ?, Unknown
730,000		ILLINOIAN			Lockbourne Outwash (5, 6) Millbrook Till (3, 4) Gahanna Till (3)
2,000,000		PRE-ILLINOIAN			Minford Silt (7)

(1) Usage of these terms is being reveiwed.
(2) After Goldthwait, 1989 and Angle, 1991.
(3) After Szabo et al., 1993.
(4) Age duration of the Millbrook Till is currently unknown.
(5) Weatherington-Rice et al., 1988.
(6) Age duration of the Lockbourne Outwash is under study.
(7) Bennett and Williams, 1988.

An excellent exposure of these tills can be viewed along a streamcut adjacent to Graesle Road, just west of Big Darby Creek in Pleasant Township (Fernandez et al., 1988). Weatherington (1978) suggests that the Boston till has a more northeasterly source and can be identified due to different pebble lithology and till fabric. Till fabric refers to the preferred orientation of clasts (pebbles) as well as the finer matrix of the till. Underlying the Wisconsinan tills are Illinoian deposits which are discussed above.

Lacustrine deposits were created as a result of lakes formed by damming of streams by ice sheets or large deposits resulting from ice sheets. The buried valleys may contain appreciable thicknesses of lacustrine deposits. Lacustrine deposits tend to be composed of fairly uniform, dense silt and clay with minor fine sand. These deposits may display very thin bedding referred to as laminations. These sediments infer deposition into quiet, low-energy environments with little or no current. Lacustrine deposits encountered in deeper buried valleys have been inferred to be pre-Illinoian Minford Silts by Bennet and Williams (1988) and Weatherington-Rice et al. (1988).

Outwash deposits are created by active deposition of sediments by meltwater streams. These deposits are generally bedded (stratified) and are sorted. Outwash deposits in Franklin County occur in two different settings or terrains. Throughout the majority of the county, outwash is predominantly limited to stream valleys associated with meltwater from the melting ablating ice sheets. Such outwash deposits were referred to in the early literature as valley trains. The majority of these valleys are now occupied by modern streams. Sorting and degree of coarseness of the deposits depended upon the nature and proximity of the melting ice sheet. Outwash is typically deposited by braided stream streams. Such streams have multiple channels which migrate across the width of the valley floor, leaving behind a complex record of erosion and deposition. As modern streams downcut, the older, now higher elevation remnants of the valley floors are referred to as terraces. The majority of the terraces are believed to be Wisconsinan in age (Schmidt and Goldthwait, 1958).

Outwash deposits appear to be persistent across much of Hamilton Township and Madison Township in southeastern Franklin County (Schmidt and Goldthwait, 1958 and Schmidt, 1993). These deposits are more difficult to study and interpret as they are covered by a fairly thick cover of glacial till. Data from the numerous well logs available for the area show relatively thick, uniform sands and gravels occurring at roughly the same elevations across this area. Exposures in the many sand and gravel pits in south-central and southeastern Franklin County demonstrate how extensive these deposits are and also how variable the materials can be. It is unclear as to whether these sand and gravel deposits indicate an outwash plain located along the margin of the melting ice sheet. Alternatively, the outwash deposits may indicate a network of overlapping braided stream channels.

Bennett and Williams (1988) and Weatherington-Rice et al. (1988) discuss the age, origin, and nature of the outwash deposits of Franklin County in detail. The surficial to near surficial outwash found in much of south-central and southeastern Franklin County is associated with the melting of the last Wisconsinan ice sheet and has been referred to as the Worthington Outwash (Stauffer et al., 1911; Schmidt and

Goldthwait, 1958; and Goldthwait and Rosengreen, 1969). The thick sequences of outwash underlying the Worthington Outwash in south-central and southeastern Franklin County have been referred to as The Lockbourne Outwash (Stauffer et al., 1911; Schmidt and Goldthwait, 1958; and Dove, 1960). Bennett and Williams (1988) and Weatherington-Rice et al. (1988) have identified two separate units within the Lockbourne Outwash. These "upper" and "lower" units appear to be separated by a dense, silty to clayey lacustrine deposit.

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 within the ice. As the surrounding ice melts, a mound of sediment remains behind. Typically, these deposits may collapse or flow, depending upon their moisture content as the surrounding ice melts. These deposits may display high angle, distorted or tilted beds, faults, and folds. These deposits are associated with melting of the ice sheet. They may appear as isolated features in uplands or occur in groups along the margin of valleys. Groups of kames coalescing along the margin of a valley are referred to as kame terraces. They tend to have common elevations and may resemble outwash terraces if they have been eroded. Kame terraces represent deposition of materials between the melting ice sheet in the center of the valley and the valley walls. Examples of kame moraine exist along the margins of Darby Creek near Darbydale.

Excellent examples of kames in upland areas can be found in Hamilton Township and Madison Township. Spangler Hill, which is just east of U.S. Route 23 and north of Scioto Downs is a prominent kame which has been excavated for years for sand and gravel (Stauffer et al., 1911). Another excellent example of a kame is the ridge underlying Saltzgaber Road just west of Groveport.

Peat and muck are organic-rich deposits associated with low-lying depressional areas, kettles, bogs, and swamps. Muck is a fine, dense silt with a high content of organics and a dark black color. Peat is typically brownish and contains pieces of decaying plant material. The two deposits commonly occur together. In Franklin County, these features are usually found in upland areas east of Big Darby Creek in Prairie Township and Pleasant Township. This area of poorly drained soils and unique original vegetation has been referred to as the "Darby Prairie" and extends into Madison County and southern Union County (Mac Albin, Naturalist, Darby-Battelle Metropolitan Park, personal communication).

Alluvium is associated with the floodplains of most of the major drainageways in Franklin County (McLoda and Parkinson, 1980). Alluvium varies from clayey-silt to sandy-silt. Alluvium tends to coarsen within the actual channel areas of streams where finer sediments are washed away and the coarser "bed-load" sediments are re-worked. Finer silts and clays are associated with overbank deposits which occur during flood events.

Bedrock Geology

Bedrock exposed at the surface in Franklin County varies considerably and ranges from the Silurian System in far southwestern Franklin County to the Mississippian System in the eastern portion of the county. Table 10 summarizes the bedrock stratigraphy found in Franklin County. A cross-section which depicts the general interrelation and position of the bedrock units appears on the map accompanying this report. Bedrock units as well as contacts between units display a pronounced north-south orientation or strike. Fracture patterns in the bedrock also tend to follow this pronounced north-south trend. This is further evidenced by the strong north-south orientation of major streams within the county. This is particularly true for portions of the major streams which overlie bedrock and are considered to be bedrock-controlled.

Limestones and dolomites associated with the undifferentiated Salina Formation of the Silurian System are found underlying Devonian limestones and dolomites in the western third of Franklin County (Stauffer et al., 1911 and Schmidt and Goldthwait, 1958). Exposures of the Salina are limited to outcrops near stream base in Big Darby Creek in Pleasant Township. These rocks are fine-grained, thin to massive bedded, impure, argillaceous ("dirty"), and contain thin beds of shale or gypsum. These sediments were deposited in shallow marine areas such as tidal flats and bays. A warm to tropical climate increased the evaporation rate. Algal mats and small reefs are commonly associated with these rocks.

The Columbus Limestone forms the basal unit of the Devonian System in Franklin County. The Columbus Limestone changes from a fairly massive, pure, dense limestone to a more porous, impure limestone (Stauffer et al., 1911 and Goldthwait and Schmidt, 1958). The Columbus Limestone tends to be more dolomitic and less fossiliferous lower in the section. Higher in the section, the Columbus Limestone is more calcareous, cherty, fossiliferous, porous, and vuggy. This section of the Columbus Limestone also has prominent solution features. These solution features include minor karst development at the surface in northern Washington Township. An interesting feature in the Columbus Limestone is the presence of thin seams of yellowish to reddish clay encountered in wells drilled in Washington Township, Norwich Township, and Brown Township. These same areas of the Columbus Limestone seem to contain the most vuggy zones or cavities. The Columbus Limestone may be observed along the Scioto River and its tributaries in the northern part of the county as well as in the many limestone quarries. These rocks were also deposited in warm, shallow seas. They were probably deposited in somewhat more open, higher-circulation and wave energy areas than the Salina. This environment favored the greater assemblage of fossils.

Overlying the Columbus Limestone is the Devonian Delaware Limestone (Stauffer et al., 1911 and Schmidt and Goldthwait, 1958). The Delaware Limestone tends to be thin-bedded, dense, blue-gray limestone. It is usually fairly shaley and impure, containing pyrite and black chert. The unit is relatively thin, averaging less than 30 feet thick, and is impure in much of western Franklin County. The Delaware Limestone tends to be thicker and resembles a more typical limestone farther north in Delaware County. Exposures of the Delaware Limestone can be observed along the Scioto River and its tributaries as well as in limestone quarries. These rocks were deposited in warm shallow seas that had some influx of sediments from terrestrial sources. The depositional setting was probably less open and had lower circulation of waters than the Columbus Limestone.

The Olentangy Shale overlies the Delaware Limestone (Stauffer et al., 1911; Schmidt and Goldthwait, 1958; and Krissek and Coats, 1995). Average thickness is 30 feet or less. The Olentangy Shale is a soft, bluish-gray shale that quickly weathers to a blue clay where exposed. The unit contains small nodular limestone concretions, chert, black shale stringers, and pyrite, and is almost void of fossils. The Olentangy Shale is best observed in exposures along tributaries of the Scioto River and the Olentangy River. This unit was deposited in shallow marine waters which were receiving increasing amounts of terrigenous (land-derived) sediments. Water circulation and energy levels decreased significantly from the underlying limestones. The Delaware Limestone and the Olentangy Shale represent a transition between the underlying Columbus Limestone and Silurian carbonates and the overlying Ohio Shale.

The Ohio Shale overlies the Olentangy Shale (Stauffer et al., 1911; Schmidt and Goldthwait, 1958; and Krissek and Coats, 1995). The three major members of the Ohio Shale (the Huron Shale, the Chagrin Shale, and the Cleveland Shale) have not been differentiated in central Ohio as they have been in northeastern Ohio. The Ohio Shale is a very thick sequence of dark black, highly fissile, dirty shale. It contains abundant pyrite and excellent examples of concretions. The shale has a very high organic content and can have both a petroleum and a sulfur odor. The Ohio Shale also tends to have a very well developed fracture system. The Ohio Shale may reach maximum thicknesses of up to 450 feet in the east central part of the county (Schmidt and Goldthwait, 1958). It can be observed in many locations along the Olentangy River, Alum Creek, Hoover Reservoir, and Interstate 270. The depositional environment for the Ohio Shale was believed to be a marine basin that was surrounded by land. The land served as barriers, prohibiting the circulation of fresh waters into the basin. Anoxic (oxygen-poor) conditions resulted. Organic matter failed to decompose, bacteria thrived, and a carbon- and sulfur-rich environment resulted (Krissek and Coats, 1995).

Table 10. Generalized Bedrock Stratigraphy of Franklin County (after Stauffer et al., 1911; Schmidt and Goldthwait, 1958; and Krissek and Coats, 1995).

AGE	**SYSTEM**	**SIGNIFICANT FORMATIONS**	**DESCRIPTIONS**
355 TO 325 MILLION YEARS AGO	MISSISSIPPIAN	Cuyahoga	Interbedded, thin, grayish siltstones, sandy shales, and fine sandstones. Moderate aquifer
		Sunbury Shale	Thin, fissile, black, organic-rich, pyritic shale. Poor aquifer.
		Berea Sandstone	Thin to massive, fine-grained grayish sandstone. Basal portion more shaley, dirty. Moderate aquifer.
		Bedford Shale	Soft, uniform, fine-grained, grayish to reddish-pink uniform shale. Very poor aquifer.
405 TO 355 MILLION YEARS AGO	DEVONIAN	Ohio Shale	Thin, fissile, black, organic-rich, pyritic shale. Contains concretions. Poor aquifer.
		Olentangy Shale	Soft, clayey, bluish-gray shale. Erodes easily. Poor aquifer.
		Delaware Limestone	Thin, dense. blue-gray, shaley, impure limestone. Moderate to poor aquifer.
		Columbus Limestone	Massive, light gray limestone. Upper portion more calcareous, vuggy, cherty, fossiliferous. Lower portion dense, more dolomitic. Excellent aquifer.
425 TO 405 MILLION YEARS AGO	SILURIAN	Undifferentiated Salina Formation	Fine-grained, whitish to light brown dolomite and limestone. Impure, shaley, gypsum beds. Excellent to good aquifer.

Exposures showing the sequence of units from the Columbus Limestone to the Ohio Shale include Slate Run in Upper Arlington, and Highbanks Metropolitan Park and Camp Lazarus Boy Scout Camp in Delaware County.

Overlying the Ohio Shale is the Bedford Shale which classically has been considered as a mark of the base of the Mississippian System. The Bedford Shale is a soft, relatively uniform, fine-grained shale. It is probably more correctly referred to as a siltstone or a claystone as it lacks the fissility (platey-nature) found in shales. Color varies from light bluish gray to a reddish brown. The best exposures are found in the vicinity of Gahanna and in Galena in Delaware County. Excellent exposures of the Bedford Shale were temporarily made available during the construction of the State Route 161 by-pass west of New Albany. Deposition of the Bedford Shale marked the beginning of deposition by more oxygenated waters. Circulation of marine waters appears to have improved (Krissek and Coats, 1995) and sediments consist of fine-grained material deposited at the distal (far) margin of a deltaic system. These sediments were far-removed from the mouth of the stream and were probably carried into the deeper water environment by storm events or floods. The Bedford Shale includes spectacular structures such as ripple marks, laminations, and worm burrow tubes.

The Berea Sandstone overlies the Bedford Shale (Stauffer et al., 1911; Schmidt and Goldthwait, 1958; Coats, 1988; and Krissek and Coats, 1995). The contact between the Bedford Shale and the Berea Sandstone is highly variable throughout Ohio. In some areas the contact is marked by a gradual transition between the units. Elsewhere, the Berea Sandstone is much coarser and fills channels eroded into the Bedford Shale. The Berea Sandstone is a relatively pure, thin- to massive-bedded, fine-grained sandstone which may contain some minor shale layers and "dirty zones" near the base. Like the Bedford Shale, the Berea Sandstone contains some excellent sedimentary structures including ripples, deformation features, and burrows. The Berea Sandstone is perhaps best exposed along Rocky Fork Creek in Gahanna and in the vicinity of Lithopolis. The Berea Sandstone has a variable thickness, ranging from less than 20 feet to 60 feet. Schmidt and Goldthwait (1958) report that the Berea Sandstone and the Bedford Shale appear to have an inverse relationship. In the northern part of the county, the Berea Sandstone thickens and the Bedford Shale thins; to the south the Berea Sandstone thins and becomes more shaley and the Bedford Shale thickens. The unit is believed to have been deposited along a major deltaic front. Storm and wave activity as well as variations in the sediment load carried by the river systems were the major contributing factors accounting for the variability in the Berea Sandstone. The unit tends to be very resistant to erosion and, in large part, creates the escarpment or overall rise observed in eastern Franklin County.

The contact between the Berea Sandstone and the overlying Sunbury Shale is very sharp and well defined (Stauffer et al., 1911; Schmidt and Goldthwait, 1959; and Coats and Krissek, 1995). The Sunbury Shale is a black, fissile, organic-rich shale that closely resembles the Ohio Shale. This unit ranges from less than 20 feet to almost 50 feet thick. The best exposures of the Sunbury Shale are along Rocky Fork Creek in Gahanna and along Big Walnut Creek in Delaware County. The depositional environment of the Sunbury Shale marks a rapid increase in the depth of water, a decline in deltaic sediments, and a return to the anoxic conditions similar to the Ohio Shale (Krissek and Coats, 1995).

The Cuyahoga Formation is the uppermost bedrock unit found in Franklin County (Stauffer et al., 1911 and Schmidt and Goldthwait, 1958). The contact between the Cuyahoga Formation and the underlying Sunbury Shale is not particularly distinct. The basal five feet of the Cuyahoga Formation is a bluish-gray shale that appears to be transitional with the Sunbury Shale. The Cuyahoga Formation consists of interbedded, thin-layered gray sandy shales, siltstones, and thin to massive-bedded, fine-grained sandstones. Thickness of the Cuyahoga Formation varies widely, total thicknesses in Franklin County exceed 100 feet in localized areas. The Cuyahoga Formation can best be observed along Blacklick Creek near the village of Blacklick and in Pine Quarry Park just east of Reynoldsburg. The sandier portions of the Cuyahoga Formation are relatively resistant to erosion and help form a secondary escarpment or rise along the eastern bank of Blacklick Creek. The depositional environment of the Cuyahoga Formation is primarily a deltaic front/shoreline, marking a return to the shallower water conditions in which the Berea Sandstone was deposited. Sandstone intervals probably represent deposition of bars or splays near the mouth of the river system, whereas shales and siltstones denote deposition along the far margin of the delta.

Hydrogeology

Ground water in Franklin County is derived from both glacial (unconsolidated) and bedrock (consolidated) aquifers. Glacial deposits are utilized as the aquifers within the buried valleys. The thick sequences of outwash in the south-central and southeastern portions of the county are the most productive aquifers. Sand and gravel lenses interbedded within the glacial till are also utilized in upland areas of the county. Bedrock is utilized where the glacial deposits are too thin or too fine-grained. The highly productive Silurian and Devonian dolomites and limestones are selectively utilized by many drillers due to their high productivity and the relative ease of developing a well in these formations.

Yields from glacial aquifers in Franklin County are highly variable, particularly within the buried valleys. Aquifers range from thin, isolated lenses of sand and gravel interbedded in thick sequences of fine-grained glacial till or lacustrine deposits to thick sequences of coarse, well-sorted sand and gravel outwash in close proximity to modern streams. The massive outwash deposits located in south-central and southeastern Franklin County have potential yields exceeding 1000 gallons per minute (g.p.m.) (Schmidt and Goldthwait, 1958 and Schmidt, 1993). Properly designed, large diameter wells in these areas may have maximum capabilities exceeding 2,000 g.p.m. (Bennett and Williams, 1988). Outwash deposits extending northward up the Scioto River, Alum Creek, Rocky Fork Creek, the Olentangy River, and Blacklick Creek just north of Reynoldsburg also have the capability of providing 500 g.p.m. to 1,000 g.p.m. (Schmidt and Goldthwait, 1958 and Schmidt, 1993). Test drilling may be necessary to find the highest producing intervals in these areas. Outwash deposits along Big Darby Creek may be capable of yields up to 500 g.p.m. in areas where there are adequate thicknesses of sand and gravel (Schmidt and Goldthwait, 1958).

Maximum yields from wells developed within the remaining buried valley deposits within the county vary considerably. Important factors include the nature, thickness, and lateral extent of the sand and gravel deposits, the presence of overlying modern streams, and the presence and thickness of fine-grained units separating the aquifer from the land surface or modern streams. In the more favorable areas, properly designed wells may have maximum yields of 100 g.p.m. to 500 g.p.m. (Schmidt and Goldthwait, 1958 and Schmidt, 1993). In moderately favorable areas, maximum yields of 25 g.p.m. to 100 g.p.m. are common (Schmidt and Goldthwait, 1958 and Schmidt, 1993). In less favorable areas, yields are suitable for only domestic purposes, averaging 10 g.p.m. and rarely exceeding 25 g.p.m. (Schmidt and Goldthwait, 1958 and Schmidt, 1993). In areas dominated by fine-grained till and containing very thin, isolated sand and gravel lenses, yields of only 3 g.p.m. to 10 g.p.m. may be expected (Schmidt and Goldthwait, 1958 and Schmidt, 1993). Test drilling in these areas is recommended to insure that adequate supplies for domestic purposes are available.

Yields developed from glacial aquifers outside of buried valleys are also variable. These areas generally contain less than 100 feet of drift and may contain much less drift in many areas. In favorable areas containing predominantly outwash and having modern streams, maximum yields range from 100 g.p.m. to 250 g.p.m. (Schmidt and Goldthwait, 1958 and Schmidt, 1993). Yields in moderately favorable areas range from 25 g.p.m. to 100 g.p.m. (Schmidt and Goldthwait, 1958 and Schmidt, 1993). In upland areas, particularly in the vicinity of the end moraines, yields average from 10 g.p.m. to 20 g.p.m. and seldom exceed 25 g.p.m. (Schmidt and Goldthwait, 1958 and Schmidt, 1993). In less favorable areas with thin glacial drift or in areas dominated by fine-grained till, yields may average from 3 g.p.m. to 5 g.p.m. and seldom exceed 10 g.p.m. (Schmidt and Goldthwait, 1958 and Schmidt, 1993). Wells are typically developed in these less favorable glacial deposits essentially because they overlay low-yielding shale bedrock.

The Silurian and Devonian limestones and dolomites found in the western third of the county constitute the highest-yielding bedrock aquifers within Franklin County. Yields developed from the limestones and dolomites are in part dependent upon the number and size of fractures encountered as well as in the amount of solution features. Maximum yields from 100 g.p.m. to 500 g.p.m. may be obtained from properly developed, large diameter wells completed in these carbonate units (Schmidt and Goldthwait, 1958 and Schmidt, 1993). Domestic wells drilled into these formations typically yield from 15 g.p.m. to 40 g.p.m. (Schmidt and Goldthwait, 1958 and Schmidt, 1993). The Delaware Limestone is not nearly as good an aquifer as the underlying Columbus Limestone and undifferentiated Salina Formation (Schmidt and Goldthwait, 1958). Drillers typically drill through this thin unit into the more productive underlying formations.

The Olentangy Shale is essentially a non-aquifer (Schmidt and Goldthwait, 1958) due to its very clayey nature. Wells completed in this unit and in the lower portions of the Ohio Shale can be expected to yield less than 3 g.p.m. (Schmidt and Goldthwait, 1958). Drillers generally drill through this unit and complete the well in the underlying carbonates or complete the well in the overlying Ohio Shale or glacial deposits. The Ohio Shale is also a poor aquifer with yields averaging less than 3 g.p.m. and yields seldom exceeding 10 g.p.m. (Schmidt and Goldthwait, 1958 and Schmidt, 1993). Yields in the Ohio Shale are in part dependent upon how many fractures are encountered. The uppermost 10 feet of the unit tend to be highly weathered or "broken" and tend to be the most productive part of the unit. Water is generally obtained from near the drift-weathered bedrock contact and the well is then extended downwards for additional wellbore storage. The shale units tend to have high static water levels. However, high drawdowns can be anticipated with pumping, and reports of "dry-holes" are not uncommon in these areas.

The Bedford Shale is an extremely poor aquifer with yields averaging below 3 g.p.m. if water is available at all (Schmidt and Goldthwait, 1958). Drillers typically try to develop wells in formations overlying this unit or stop drilling when they first encounter this unit. Variable yields can be obtained from the Berea Sandstone. In eastern Blendon Township and western Jefferson Township, the basal Berea Sandstone is more shaley and dirty and is capable of producing yields ranging from 3 g.p.m. to 10 g.p.m. (Schmidt, 1993). Yields ranging from 10 g.p.m. to 25 g.p.m. can be obtained from the middle and upper portions of the Berea Sandstone where an adequate thickness of this unit exists (Schmidt and Goldthwait, 1958 and Schmidt, 1993). Yields from the Cuyahoga Formation typically vary from 10 g.p.m. to 25 g.p.m. (Schmidt and Goldthwait, 1958 and Schmidt, 1993). The yields vary according to the number of fractures and bedding planes encountered while drilling and upon the relative proportion of shale, siltstone, and sandstone.

Areas of Special Interest

Unmapped Areas

Two large unmapped areas are apparent when reviewing the map accompanying the report. These areas were similarly delineated by Schmidt (1993) for the Ground Water Resources Map of Franklin County. The larger area parallels the Scioto River and Interstate 71 in south-central Franklin County. The other area follows the Scioto River as it bends to the west just before the confluence with the Olentangy River. These two areas have not been mapped as they have been pervasively altered by human activities. These areas contain numerous active and inactive sand and gravel pits, limestone quarries, and sanitary and demolition debris landfills. Such activities obviously have a major impact on many factors, including soils, recharge, topography, and impact of vadose zone materials. These areas have also undergone extensive dewatering for mining operations. Any further human activities in these areas would require extensive site-specific study to determine their suitability.

South Columbus Well Field

The South Well Field for the City of Columbus has been the subject of extensive research for many years. The South Well Field supplies approximately 15 to 20 percent of the daily supply of water for Columbus and surrounding communities and has a maximum capacity of over 40 million gallons per day (g.p.d.). The following discussion is presented as this is an important resource to protect and the vast amount of research and references available for this site are relevant and provide insight to the understanding the hyrogeology of many surrounding areas as well.

The South Well Field is comprised of four large diameter, Ranney-designed, radial collector wells. Three of these wells are located along a north-south line on the eastern floodplain of the Scioto River. The fourth well is located near the Sewage Treatment Plant along Big Walnut Creek. The locations of the four wells are delineated on the map accompanying the report. The wells have been designated CW-101, CW-103, CW-104, and CW-115.

The majority of the recent research conducted on the South Well Field has been conducted by the U.S. Geological Survey and by The Ohio State University. Studies conducted on the South Well Field include the reports of Ranney Water Systems (1968), Ranney Water Systems (1972), Stilson and Associates (1976), Stowe (1979), Weiss and Razem (1980), de Roche and Razem (1981), Garner (1983), Razem (1983), de Roche and Razem (1984), Gallagher (1985), de Roche (1985), Eberts (1987), Moreno (1988), Bennett and Williams (1988), Sedam et al. (1989), Eberts and Bair (1990), Raab (1991), and Childress et al. (1991).

The reports supply valuable information on recharge, sedimentology of the deposits, hydraulic properties including conductivity and transmissivity, water quality, and yield of the aquifers. A few of the major findings of the research are summarized below.

1.) The underlying aquifer is prolific and vulnerable.

2.) The deposits fine slightly downstream towards Pickaway County.

3.) The carbonate bedrock aquifers are a very important source of recharge to the sand and gravel aquifers along the margins of the buried valley.

4.) The Scioto River is only a moderate source of recharge to the underlying aquifers.

5.) Pumping to dewater the quarry to the north of the well field area has been beneficial in that it keeps the water table suppressed below the base of the many landfills in the vicinity. Re-saturation of the landfills would have a deleterious impact on the overall water chemistry of the area.

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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, Division of Water, Water Resources Section (WRS). Approximately 20,000 water well records are on file for Franklin County; roughly half of these have been field located. Data from over 5,000 representative wells were selected and plotted on U.S.G.S. 7 1/2 minute topographic maps during the course of the project. Static water levels and information on depth to the saturated zones were taken from the well log records. The Ground Water Resources map of Franklin County (Schmidt and Goldthwait, 1958 and Schmidt, 1993) provided generalized depth to water information throughout Franklin County. Topographic and geomorphic trends were utilized in areas where other data sources were lacking.

The following reports also provided information on the depth to water for many specific areas within Franklin County. These reports include Division of Water (1965), Stowe (1979), Razem (1983), Garner (1983), Eberts (1987), Bennett and Williams (1988), Eagon & Associates (1988), Moreno (1988), Sedam et al. (1990), Eberts and Bair (1990), Bair and Norris (1990), Frederick et al. (1990), Raab (1991), Piskura and Hallfrisch (1991), Spahr and Raab (1991), Raab et al. (1991), Haiker and Raab (1991), Childress et al. (1991), and Raab et al. (1992).

Depths to water of 5 to 15 feet (DRASTIC value = (9)) and 15 to 30 feet (7) were typical of areas in both smaller tributary stream valleys and areas paralleling the floodplains in larger valleys. Depths of 5 to 15 feet (9) were also common for areas with shale aquifers, particularly if the bedrock was near the ground surface. Depths of 0 to 5 feet (10) were used in a few limited areas where streams and floodplains were found to be directly overlying shale bedrock. Depths of 5 to 15 feet (9) and 15 to 30 feet (7) were also common along outwash terraces flanking modern stream valleys. Depths of 15 to 30 feet (7) were common in areas of ground moraine which were not overlying buried valleys.

Depths of 30 to 50 feet (5) were common in many portions of Franklin County. Depths of 30 to 50 feet (5) included most areas having moderate thicknesses (roughly 40 to 80 feet) of glacial till. This included buried valley areas which were lacking modern streams and where the till overlies the various bedrock aquifers. Depths of 30 to 50 feet (5) were also common for the more prominent kames and in end moraines.

Depths of 50 to 75 feet (3) and 75 to 100 feet (2) were most common in areas where thick glacial till (roughly 100 feet or more) overlies the aquifer. This included many portions of buried valleys which predominantly contain till and lack extensive outwash deposits. Depths of 50 to 75 (3) feet and 75 to 100 feet (2) were also encountered in areas where thick till overlies bedrock aquifers. These areas included areas east of Big Darby Creek which contained thick sequences of till over limestone, similar areas just west of the Scioto River, and areas bordering Licking County where thick till overlies the Cuyahoga Formation. Areas where moderate thicknesses of shale overlie the carbonate bedrock also seemed to have depths of water averaging 50 to 75 feet (3).

Depths of over 100 feet (1) were only utilized for one buried valley northeast of Reynoldsburg. This buried valley is a tributary of an extremely deep buried valley system in western Licking County that was a major trunk of the Groveport River during Teays time (Dove, 1960). In this area, limited thin sand and gravel lenses are overlain by over 250 feet of dense glacial till. The aquifers in this area have a very deep static water level and these aquifers are also considered to be truly confined (Angle, in progress Ground Water Pollution Potential Report of Licking County).

Net Recharge

This factor was evaluated using many criteria, including depth to water, topography, soil type, surface drainage, vadose zone material, and annual precipitation. General estimates of recharge provided by Pettyjohn and Henning (1979) proved to be helpful. Recharge is the precipitation that is not lost to evapotranspiration and runoff and that reaches or recharges the aquifer system.

Many reports helped to provide recharge data for localized areas or for particular settings. It is interesting to note that Stauffer et al. (1911) observed stream water disappearing into fractures in the Columbus Limestone underlying Hayden Run near Dublin. These studies include Division of Water (1965), Stowe (1979), Garner (1983), de Roche (1985), Gallagher (1985), Bennett and Williams (1988), Eagon (1988), Moreno (1988), Sedam et al. (1989), Eberts and Bair (1990), Bair and Norris (1990), Childress et al. (1991), Frederick et al. (1990), Raab et al. (1991), Spahr and Raab (1991), Haiker and Raab (1991), and Raab et al. (1992). Recharge rates provided by Sheets and Yost (1994) for the Mad River in Clark County were also found to be applicable for similar terrains in Franklin County.

Values of 7 to 10 inches per year (8) of recharge were assigned to areas with highly permeable soils (e.g. sandy loams) and vadose materials (e.g. outwash), shallow depths to water, and relatively flat topography. These areas typically occur along terraces or floodplains flanking modern streams. Areas with these high recharge rates commonly fall into the Outwash (7Ba), Outwash Over Limestone (7Bc), and Alluvium Over Outwash (7Ee) hydrogeologic settings or in portions of the Buried Valley (7D) hydrogeologic setting which contain abundant outwash adjacent to modern streams.

Recharge values of 4 to 7 inches per year (6) were utilized in the majority of Franklin County. This included most areas with thin to moderate thicknesses of glacial till overlying both sand and gravel and various bedrock aquifers. These areas typically have a depth of water less than 50 feet and slopes under 12 percent. Recharge values of 4 to 7 inches per year were utilized for areas containing dirtier sand and gravel outwash or kame deposits and having low permeability clay loam soils.

Values of 2 to 4 inches per year (3) were selected for areas overlain by thick till and/or shale, areas having a depth of water over 50 feet, and areas with depths to water of 30 to 50 feet with slopes greater than 12 percent and clay loam soils. These ratings were typically limited to areas having thick till over limestone in western Franklin County and deeper buried valleys containing predominantly till in western and eastern Franklin County.

Values of 0 to 2 inches per year (1) were limited to areas just east of Big Darby Creek and areas along the Licking County border north of Reynoldsburg. These areas have depths of water exceeding 75 feet, thicknesses of till exceeding well over 100 feet, and clay loam soils. This recharge value was utilized for the truly confined conditions encountered in the deep buried valley extending into Licking County.

Aquifer Media

Water well records on file at the WRS were a primary source of information on aquifer media. Information on aquifer media was obtained from the reports of Stauffer et al. (1911), Schmidt and Goldthwait (1958), Kaser (1963), Division of Water (1965), Klaer (1971), Fidler (1973), Stilson & Associates (1976), Weatherington (1978), Stowe (1979), Garner (1983), Eagon (1988), Bennett and Williams (1988), Weatherington-Rice et al. (1988), Sedam et al. (1989), Frederick et al. (1990), Childress et al. (1991), Spahr and Raab (1991), and Schmidt (1993). Regional and county-wide information on bedrock topography proved to be useful in delineating buried valleys and identifying areas of shallow bedrock. This information included the reports of Stout et al. (1943), Schmidt and Goldthwait (1958), and Cummins (1959). Open file reconnaissance bedrock topography maps from the ODNR, Division of Geological Survey proved invaluable in delineating buried valleys and mapping aquifer media. This mapping was done on a scale of 1:24,000 and included the maps of Brockman (1995a,b,c,d,), Shrake (1993a,b), Shrake and Sugar (1993), Slucher (1995a,b,c,d), Sugar and Shrake (1993), Sugar and Swinford (1992), Sugar et al. (1992), Swinford (1992a), Vormelker (1991), Vormelker and Shrake (1993), and Vormelker et al. (1992). Open file bedrock geologic maps from the ODNR, Division of Geological Survey were used to differentiate bedrock units in the western half of the county. This mapping was done on a scale of 1:24,000 and included the maps of Shrake (1993b,c,1994), Shrake et al. (1994), Slucher et al. (1992), Swinford (1992b,c,d), Swinford and Shrake (1994), and Swinford and Slucher (1992), and the 1:100,000 scale (30 x 60 minute) map of Swinford and Slucher (1995). Field observations at outcrops, quarries, excavations, and sand and gravel pits helped to verify ratings in complex areas. Where more than one aquifer was present, the uppermost aquifer was rated.

The aquifer rating for bedrock varied considerably across the county. In the far western portion of the county bordering Madison County and Union County and adjacent to Darby Creek, the limestone and dolomite aquifers were considered to be solution limestone and given a rating of (8). Well logs in these areas commonly indicate solution cavities, fractures, and vuggy zones. The remainder of the limestones and dolomites were considered to be massive limestone and given a rating of (7). An aquifer rating of (3) was applied to areas where the Olentangy Shale and / or the Ohio Shale was utilized as the aquifer. The Bedford Shale was given a rating of (2) due to its extremely tight, fine-grained nature. A rating of (4) was selected for the Berea Sandstone. The interbedded shales, siltstones, and fine-grained sandstones of the Cuyahoga Formation were also given a rating of (4).

Ratings for the aquifers in the glacial deposits also varied significantly across Franklin County. The thick, continuous, clean outwash deposits were given a rating of (8). This rating was applied to extensive areas in south-central and southeastern Franklin County and for many of the modern stream valleys overlying outwash deposits elsewhere in the county. In adjacent areas where the sand and gravel deposits were somewhat less continuous or were interbedded with fine-grained sands and silt, a rating of (7) was utilized. Ratings for kames typically varied from (7) to (8). The ratings of (8) and (7) were most commonly applied in the Outwash (7Ba), Outwash Over Limestone (7Bc), Alluvium Over Outwash (7Ee), and many areas of the Buried Valley (7D) hydrogeologic settings. Aquifer ratings of (5) or (6) were applied to thin, discontinuous sand and gravel lenses interbedded with thick sequences of till, lacustrine, or fine-grained alluvial settings. This included portions of buried valleys predominantly filled with till and upland areas of ground moraine or end moraine.

Soil Media

This factor was primarily evaluated using data obtained from the Soil Survey of Franklin County (McLoda, and Parkinson, 1980), as well as from observations from Larry Tornes (personal communication, Ohio Department of Natural Resources, Division of Soil and Water Conservation). Table 11 lists the soil types encountered in Franklin County and gives information on the soils' parent material or setting and the corresponding DRASTIC rating. The nature of the underlying glacial deposits or bedrock type were two of the main factors influencing soil types in Franklin County. Soil ratings were based upon the most restrictive layer or horizon within the soil profile.

Clay loam (3) was the most common soil rating utilized throughout Franklin County. Clay loam was encountered in most areas where glacial till was the surficial material including ground moraine and end moraine. Clay loam was also encountered on kames and outwash terraces that were blanketed by glacial till. Silt loam (4) was common in modern alluvial terraces and floodplains. Silt loam was also found capping some of the coarser outwash terraces. Loam (5) and sandy loam (6) soils were associated with kames, outwash terraces and floodplains containing coarser alluvium. Shrink-swell (aggregated) clays (7) were limited to a few small areas in western Franklin County where fine-grained lacustrine slackwater ("ponded") deposits were found at the surface. Peat (8) soils were found in a few isolated kettles occupying low areas overlying outwash deposits.

Topography

Topography was evaluated by determining the percentage of slope obtained from the U.S.G.S. 7-1/2 minute (1:24,000 scale) quadrangle maps and from the Soil Survey of Franklin County (McLoda and Parkinson, 1980). Slopes of 0 to 2 percent (10) were selected for floodplains, flat-lying outwash terraces, and large areas of ground moraine. Slopes of 2 to 6 percent (9) were common in both areas of ground moraine and end moraine, as well as in some terraces. Slopes of 6 to 12 percent (5) were utilized in areas adjacent to major streams where lateral (headward) erosion by minor tributaries has occurred. Kames, bedrock-controlled ridges, and portions of some end moraines also had slopes of 6 to 12 percent (5). Slopes of 12 to 18 percent (3) were found in limited areas of steep stream dissection occurring along the valley walls of modern streams. These steep areas were most commonly found along the margins of the Scioto River, Big Darby Creek, and Rocky Fork Creek.

Impact of the Vadose Zone Media

Water well records on file at the WRS were a primary source of information on vadose zone media. Information on vadose zone media was obtained from the Table 11. Soils of Franklin County (after McLoda and Parkinson, 1980).

Soil Name	Parent Material or Setting	DRASTIC Rating	Soil Media
Alexandria	till	3	clay loam
Algiers	alluvium	4	silt loam
Bennington	till	3	clay loam
Blount	till	3	clay loam
Cardington	till	3	clay loam
Carlisle	kettles, bogs	8	peat
Celina	till	3	clay loam
Condit	till, depressions	3	clay loam
Crane	slackwater terrace	3	clay loam
Crosby	till	3	clay loam
Eel	alluvium	4	silt loam
Eldean	outwash terrace, kames	5	loam
Genesee	alluvium	4	silt loam
Glynwood	till	3	clay loam
Hennepin	till	3	clay loam
Miamian	till	3	clay loam
Kendalville	ablation till	3	clay loam
Kokomo	till, depressions	3	clay loam
Lewisburg	till	3	clay loam
Medway	coarse alluvium	5	loam
Milton	till over limestone	5	loam
Mitiwanga	till over sandstone	5	loam
Montgomery	slackwater	7	shrink/swell clay
Ockley	fine outwash, kames	4	silt loam
Pewano	till, depressions	3	clay loam
Ritchey	till over limestone	6	sandy loam
Ross	alluvium	4	silt loam
Shoals	alluvium	4	silt loam
Sleeth	loess, dirty outwash	4	silt loam
Sloan	alluvium	4	silt loam
Thackery	loess over outwash	4	silt loam
Warsaw	outwash	5	loam
Wea	outwash	5	loam
Westland	outwash	5	loam

Division of Water (1965), Klaer (1971), Norris and Fidler (1973), Stilson & Associates (1976), Weatherington (1978), Stowe (1979), Garner (1983), Eagon (1988), Bennett and Williams (1988), Weatherington-Rice et al. (1988), Sedam et al. (1989), Frederick et al. (1990), Childress et al. (1991), Spahr and Raab (1991), and Schmidt (1993). Regional and county-wide information on bedrock topography proved to be useful in delineating buried valleys and identifying areas of shallow bedrock. This information included the reports of Stout et al. (1943), Schmidt and Goldthwait (1958), and Cummins (1959). Open file reconnaissance bedrock topography maps from the ODNR, Division of Geological Survey proved invaluable in delineating buried valleys and mapping aquifer media. This mapping was done on a scale of 1:24,000 and included the maps of Brockman (1995a,b,c,d,), Shrake (1993a,b), Shrake and Sugar (1993), Slucher (1995a,b,c,d), Sugar and Shrake (1993), Sugar and Swinford (1992), Sugar et al. (1992), Swinford (1992a), Vormelker (1991), Vormelker and Shrake (1993), and Vormelker et al. (1992). Open file bedrock geologic maps from the ODNR, Division of Geological Survey were used to differentiate bedrock units in the western half of the county. This mapping was done on a scale of 1:24,000 and included the maps of Shrake (1993b,c; 1994), Shrake et al. (1994), Slucher et al. (1992), Swinford (1992b,c,d), Swinford and Shrake (1994), Swinford and Slucher (1992), and the 1:100,000 scale (30 x 60 minute) map of Swinford and Slucher (1995). Field observations at outcrops, quarries, excavations, and sand and gravel pits helped to verify ratings in complex areas.

Till was chosen as the vadose zone material for much of Franklin County, including most areas of ground moraine, end moraine, and areas of buried valleys lacking outwash or alluvial fill near the surface. Typically a rating of (4) was selected for the till. Where the thickness of till and the depth to water both exceeded 50 feet, a rating of (3) was utilized for the till. In areas where the thickness of till exceeded 100 feet and the depth to water exceeded 75 feet, a rating of (2) was selected for the till. As the depth to water increases, the till typically becomes unweathered, fracturing decreases significantly and, with increasing thickness, the compaction and density of the till tends to increase. Szabo et al. (1993) also noted that the older Illinoian-age tills typically found in the deeper buried valleys are usually somewhat finer-grained. These factors account for the lower ratings of the till. These lower ratings are commonly associated with buried valleys predominantly filled with till. A vadose zone rating of (1) was selected for the deep buried valley entering Licking County northeast of Reynoldsburg. This rating denotes the confining nature of the extremely thick till overlying the aquifer in this setting.

In areas containing outwash, including many areas of buried valleys, sand and gravel with significant silt and clay was selected as the vadose zone material and ratings of (5), (6), (7) or (8) were used. The varied ratings were based upon the relative proportion of sand and gravel and the degree of coarseness and sorting of the sand and gravel units. Sand and gravel with significant silt and clay was also selected for outwash terraces and kames and was typically given ratings of (6), (7) or (8). Ratings of (4) or (5) were utilized for silt and clay which was selected as the vadose zone media for alluvium and floodplains.

Bedrock was utilized as the vadose zone media for a limited number of areas in the county. In these areas, the overlying till is relatively thin and the depth to water is moderate to deep. In far western Franklin County, a rating of (6) was used where massive limestone was selected as the vadose zone media. The Ohio Shale was given a rating of (3) where it was chosen to be the vadose material for nearby Hoover Reservoir. A vadose zone media rating of (4) was applied to the Berea Sandstone for limited areas in Jefferson Township.

Hydraulic Conductivity

Data for hydraulic conductivity was obtained from the reports of Ranney Water Systems (1948), Schmidt and Goldthwait (1958), Kaser (1963), Division of Water (1965), Klaer (1971), Norris and Fidler (1973), Stilson & Associates (1976), Stowe (1979), Bennett and Williams (1988), Eagon (1988), and Sedam et al. (1989). In many of these reports, transmissivity data were provided. Values for hydraulic conductivity were calculated by taking the transmissivity and dividing by an estimated (or given) value for the saturated thickness. In some reports, actual data for hydraulic conductivity or permeability were given. Water well log records from the WRS were carefully reviewed. Textbook tables (Freeze and Cherry, 1979; Fetter, 1980; and Driscoll, 1986) were useful in obtaining estimated hydraulic conductivity values for a variety of sediments.

Values for hydraulic conductivity roughly followed the aquifer ratings; i.e., the more highly rated aquifers have higher hydraulic conductivities. For sand and gravel aquifers, the hydraulic conductivity is a function of coarseness, stratification, sorting, and cleanliness (absence of fines). For both sand and gravel aquifers with aquifer media ratings of (5) and (6), ranges for hydraulic conductivity varied from 100-300 gallons per day (gpd)/ft^2 (2) to 300-700 gpd/ft^2 (4). In sand and gravel aquifers with an aquifer media rating of (7), hydraulic conductivity values ranging from 300-700 gpd/ft^2 (4) to 700-1,000 gpd/ft^2 (6) were utilized. The highest rated (8) sand and gravel aquifers were given ranges of hydraulic conductivity from 700-1,000 gpd/ft^2 (6), to 1,000-2,000 gpd/ft^2 (8), to greater than 2,000 gpd/ft^2 (10).

Ranges of hydraulic conductivity values also varied between the different bedrock aquifers. The primary porosity of the bedrock was less a factor than bedding planes, fractures, joints, and the effects of weathering. Solution features are an important factor in the limestone and dolomite wells. Values of hydraulic conductivity ranged from 1-100 gpd/ft^2 (1) for the Bedford Shale, the Olentangy Shale, and the Ohio Shale. For the lower, shaley, dirty portion of the Berea Sandstone, a range of hydraulic conductivity values from 1-100 gpd/ft^2 (1) was selected. Hydraulic conductivity values for the majority of the Berea Sandstone ranged from 100-300 gpd/ft^2 (2). Values for hydraulic conductivity for the Cuyahoga Formation ranged from 1-100 gpd/ft^2 (1) to 100-300 gpd/ft^2 (2).

For the carbonate rocks having an aquifer media rating of (7), hydraulic conductivities ranging from 300-700 gpd/ft^2 (4) were used. Limestones and dolomites in areas of very pronounced stream dissection as well as areas immediately adjacent to deep buried valleys were believed to be more highly fractured. These units were evaluated as having hydraulic conductivities ranging from 700-1,000 gpd/ft^2 (6). For limestones and dolomites having an aquifer rating of (8), a range of hydraulic conductivity from 300-700 gpd/ft^2 (4) was selected.

APPENDIX B

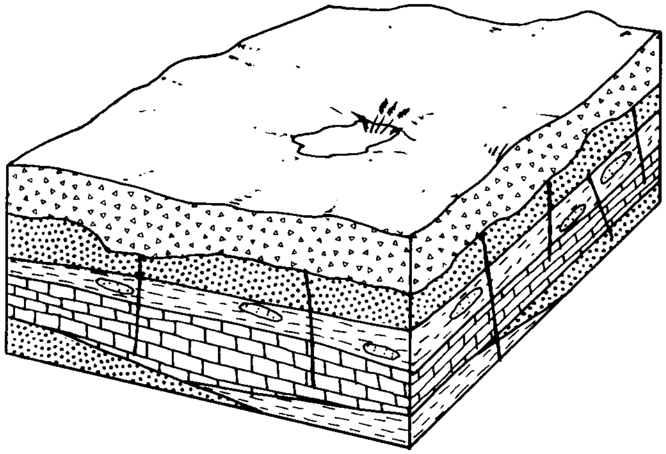
DESCRIPTION OF HYDROGEOLOGIC SETTINGS AND CHARTS

Ground water pollution potential mapping in Franklin County resulted in the identification of twelve 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 12. Computed pollution potential indexes for Franklin County range from 48 to 191.

Table 12. Hydrogeologic Settings Mapped in Franklin County.

Hydrogeologic Settings	Range of GWPP Indexes	Number of Index Calculations
7Aa - Glacial Till Over Bedded Sedimentary Rock	95-123	8
7Ac - Glacial Till Over Limestone	81-143	42
7Ad - Glacial Till Over Sandstone	109-123	11
7Ae - Glaical Till Over Shale	92-123	17
7Af - Sand and Gravel Interbedded in Glacial Till	87-153	28
7Ba - Outwash	147-158	4
7Bc - Outwash Over Limestone	156-172	5
7D - Buried Valley	48-191	143
7Ec - Alluvium Over Sedimentary Rock	119-161	18
7Ed - Alluvium Over Glacial Till	128-155	8
7Ee - Alluvium Over Outwash	147-185	14
7Gb - Thin Till Over Limestone	144	1

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.



7Aa Glacial Till Over Bedded Sedimentary Rock

This hydrogeologic setting is limited to portions of Plain, Jefferson, and Truro Townships in eastern Franklin County. Topography is generally relatively flat to moderately sloping. The aquifer consists of the interbedded siltstones, shales, and fine-grained sandstones of the Cuyahoga Formation. Yields range from 5 to 25 gallons per minute (gpm). The aquifer is typically overlain by varying thicknesses of glacial till with an average thickness of 30 to 40 feet. Soils are commonly clay loams. Depth to water is shallow to moderate and rarely exceeds 50 feet. Precipitation infiltrating through the glacial till is the primary source of recharge. Recharge is moderate due to the moderate thickness of till and depth to water.

GWPP index values for the hydrogeologic setting of Glacial Till Over Bedded Sedimentary Rock range from 95 to 123 with the total number of GWPP index calculations equaling 8.

Setting: 7Aa1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Interbedded sandstone/shale	3	4	12
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	123

Setting: 7Aa2		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Interbedded sandstone/shale	3	4	12
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	120

Setting: 7Aa3		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Interbedded sandstone/shale	3	4	12
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	112

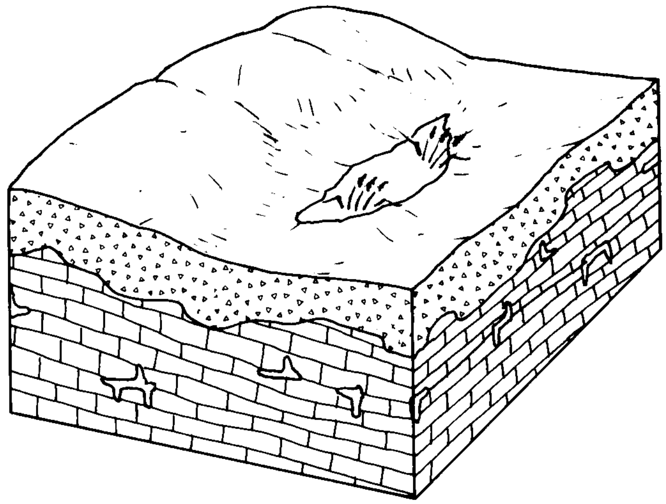
Setting: 7Aa4		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Interbedded sandstone/shale	3	4	12
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	113

Setting: 7Aa5		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Interbedded sandstone/shale	3	4	12
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	122

Setting: 7Aa6		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Interbedded sandstone/shale	3	4	12
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	95

Setting: 7Aa7		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Interbedded sandstone/shale	3	4	12
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	103

Setting: 7Aa8		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Interbedded sandstone/shale	3	4	12
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	102



7Ac Glacial Till Over Limestone

This hydrogeologic setting was used in the western and west-central portion of Franklin County. The area is characterized by broad, flat-lying uplands. Areas adjacent to Big Darby Creek and the Scioto River have moderately steep relief associated with stream dissection of many small tributaries. The aquifer consists of underlying Silurian and Devonian limestones and dolomites. Ground water occurs in fractures, solution features, and vuggy zones within these units. Minor karst features are found in Washington Township. Yields typically range from 15 to 30 gpm and large diameter wells are capable of producing up to 500 gallons per minute. The glacial till consists primarily of clay, sand, silt, and gravel. Sand and gravel lenses within the till are numerous but are too thin and discontinuous to constitute an aquifer. The thickness of the till ranges from less than 10 feet to approximately 100 feet in areas peripheral to buried valley systems. Average till thickness commonly is in excess of 50 feet. Depth to water is variable and depends in part upon the thickness of the till and the proximity of surficial drainage systems. Soils are typically clay loams. Precipitation infiltrating through the till serves as the source of recharge to the bedrock. Recharge is moderate to low and depends upon the thickness of the till, depth to water, proximity of streams, and slope.

The GWPP index values for the hydrogeologic setting of Glacial Till Over Limestone range from 81 to 143 with the total number of GWPP calculations equaling 42.

Setting: 7Ac1		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Solution limestone	3	8	24
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	131

Setting: 7Ac2		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Solution limestone	3	8	24
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	120

Setting: 7Ac3		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	700-10000	3	6	18
		GWPP	INDEX	123

Setting: 7Ac4		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	134

Setting: 7Ac5		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	117

Setting: 7Ac6		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	128

Setting: 7Ac7		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Solution limestone	3	8	24
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	121

Setting: 7Ac8		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	118

Setting: 7Ac9		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Solution limestone	3	8	24
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	130

Setting: 7Ac10		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Solution limestone	3	8	24
Soil Media	Loam	2	5	10
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and Gravel w/Silt and Clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	139

Setting: 7Ac11		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Solution limestone	3	8	24
Soil Media	Clay Loam	2	3	6
Topography	6-12%	1	5	5
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	126

Setting: 7Ac12		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Solution limestone	3	8	24
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	94

Setting: 7Ac13		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	Solution limestone	3	8	24
Soil Media	Clay Loam	2	3	6
Topography	12-18%	1	3	3
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	102

Setting: 7Ac14		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	0-2	4	1	4
Aquifer Media	Solution limestone	3	8	24
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	2	10
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	81

Setting: 7Ac15		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	91

Setting: 7Ac16		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	90

Setting: 7Ac17		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Solution limestone	3	8	24
Soil Media	Clay Loam	2	3	6
Topography	6-12%	1	5	5
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	116

Setting: 7Ac18		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Solution limestone	3	8	24
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	93

Setting: 7Ac19		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	Solution limestone	3	8	24
Soil Media	Clay Loam	2	3	6
Topography	6-12%	1	5	5
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	104

Setting: 7Ac20		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	Massive limestone	3	7	21
Soil Media	Loam	2	5	10
Topography	6-12%	1	5	5
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	111

Setting: 7Ac21		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	6-12%	1	5	5
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	86

Setting: 7Ac22		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	2-4	4	3	12
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	85

Setting: 7Ac23		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	96

Setting: 7Ac24		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	2-4	4	3	12
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	91

Setting: 7Ac25		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Loam	2	5	10
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	121

Setting: 7Ac26		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	6	12
Topography	6-12%	1	5	5
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	125

Setting: 7Ac27		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	127

Setting: 7Ac28		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Sandy Loam	2	6	12
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	129

Setting: 7Ac29		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	100+	5	1	5
Net Recharge	2-4	4	3	12
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	80

Setting: 7Ac30		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	100+	5	1	5
Net Recharge	2-4	4	3	12
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	81

Setting: 7Ac31		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Loam	2	5	10
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	137

Setting: 7Ac32		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Massive limestone	3	7	21
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	95

Setting: 7Ac33		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	85

Setting: 7Ac34		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Loam	2	5	10
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	700-1000	3	4	12
		GWPP	INDEX	121

Setting: 7Ac35		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Massive limestone	3	7	21
Soil Media	Loam	2	5	10
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	100

Setting: 7Ac36		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	123

Setting: 7Ac37		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Massive limestone	3	7	21
Soil Media	Loam	2	5	10
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	105

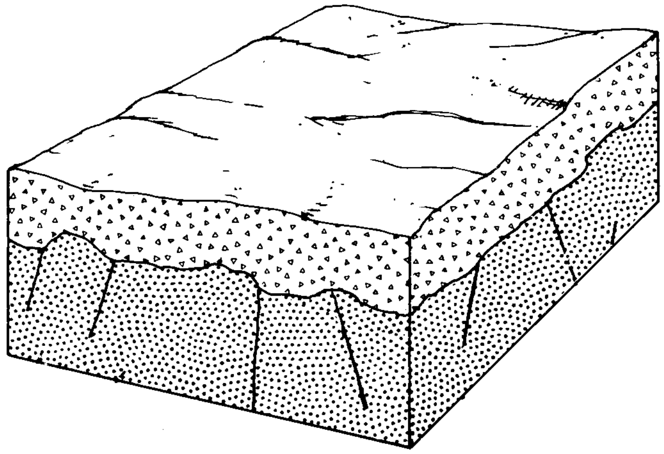
Setting: 7Ac38		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	143

Setting: 7Ac39		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	122

Setting: 7Ac40		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Silt Loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and loam	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	131

Setting: 7Ac41		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and loam	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	122

Setting: 7Ac42		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay Loam	2	5	10
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and loam	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	126



7Ad Glacial Till Over Sandstone

This hydrogeologic setting is limited to a narrow north-south band running through Blendon, Plain, and Jefferson Townships. The area is characterized by broad, flat-lying ridgetops flanked by moderately steep slopes. The underlying aquifer consists of the fine-grained Berea Sandstone. Yields range from 5 to 25 gpm for the upper portion of the formation to 3 to 10 gpm for the lower portion which becomes dirtier and more shaley. The Berea Sandstone is overlain by a relatively thin cover of glacial till. The till has an average thickness of 20 feet. Thicknesses under 10 feet are not uncommon. Depth to water is typically shallow with depths averaging between 10 and 20 feet. Soils are typically clay loams with loams in areas where bedrock is closer to the surface. Recharge is moderate due to the moderately shallow depth to water and the relatively low permeability of the soils and till.

The GWPP index values for the hydrogeologic setting of Glacial Till Over Sandstone range from 109 to 123 with the total number of GWPP index calculations equaling 11.

Setting: 7Ad1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Fine sandstone	3	4	12
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Fine sandstone	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	109

Setting: 7Ad2		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Fine sandstone	3	4	12
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	123

Setting: 7Ad3		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Fine sandstone	3	4	12
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	113

Setting: 7Ad4		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Fine sandstone	3	4	12
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	122

Setting: 7Ad5		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Fine sandstone	3	4	12
Soil Media	Clay loam	2	3	6
Topography	6-12%	1	5	5
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	118

Setting: 7Ad6		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Fine sandstone	3	4	12
Soil Media	Loam	2	5	10
Topography	2-6%	1	9	9
Impact of Vadose Zone	Fine sandstone	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	113

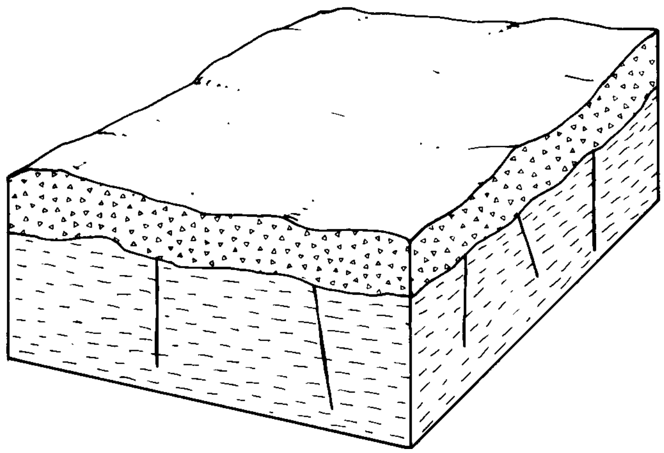
Setting: 7Ad7		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Fine sandstone	3	4	12
Soil Media	Loam	2	5	10
Topography	2-6%	1	9	9
Impact of Vadose Zone	Fine sandstone	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	123

Setting: 7Ad8		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Fine sandstone	3	4	12
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	119

Setting: 7Ad9		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Fine sandstone	3	4	12
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	120

Setting: 7Ad10		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Fine sandstone	3	4	12
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	112

Setting: 7Ad11		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Fine sandstone	3	4	12
Soil Media	Clay loam	2	3	6
Topography	6-12%	1	5	5
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	115



7Ae Glacial Till Over Shale

This hydrogeologic setting was utilized for much of the central, east-central, and far southeastern portions of Franklin County. This setting is typified by broad, flat-lying uplands with steeper slopes adjacent to Alum Creek, Big Walnut Creek, and the Olentangy River. The thickness of the till varies, but is typically less than 40 feet in uplands and under 10 feet along steeper slopes. The depth to water is typically quite shallow, averaging less than 20 feet. Yields are typically under 3 gpm. Slightly higher yields in the Ohio Shale may be possible where fractures are persistent. The upper, weathered portion of the shale is the most productive zone; additional depth is usually drilled to increase storage. Precipitation infiltrating through the till is the source of recharge to the shale. Soils are typically clay loams. Recharge is moderate due to the shallow depth to water and the relatively low permeability of the clay loam soils, till, and the shale itself.

The GWPP index values for the hydrogeologic setting of Glacial Till Over Shale range from 92 to 123 with the total number of GWPP calculations equaling 17.

Setting: 7Ae1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Shale	3	3	9
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	106

Setting: 7Ae2		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Shale	3	3	9
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	117

Setting: 7Ae3		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Shale	3	3	9
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	116

Setting: 7Ae4		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Shale	3	3	9
Soil Media	Clay loam	2	3	6
Topography	12-18%	1	3	3
Impact of Vadose Zone	Shale	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	95

Setting: 7Ae5		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Shale	3	3	9
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	107

Setting: 7Ae6		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Shale	3	3	9
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	96

Setting: 7Ae7		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Clay shale	3	2	6
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	113

Setting: 7Ae8		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Clay shale	3	2	6
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	103

Setting: 7Ae9		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Clay shale	3	2	6
Soil Media	Clay loam	2	3	6
Topography	12-18%	1	3	3
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	97

Setting: 7Ae10		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Shale	3	3	9
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	119

Setting: 7Ae11		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Clay shale	3	2	6
Soil Media	Clay loam	2	3	6
Topography	12-18%	1	3	3
Impact of Vadose Zone	Shale	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	92

Setting: 7Ae12		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Clay shale	3	2	6
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	123

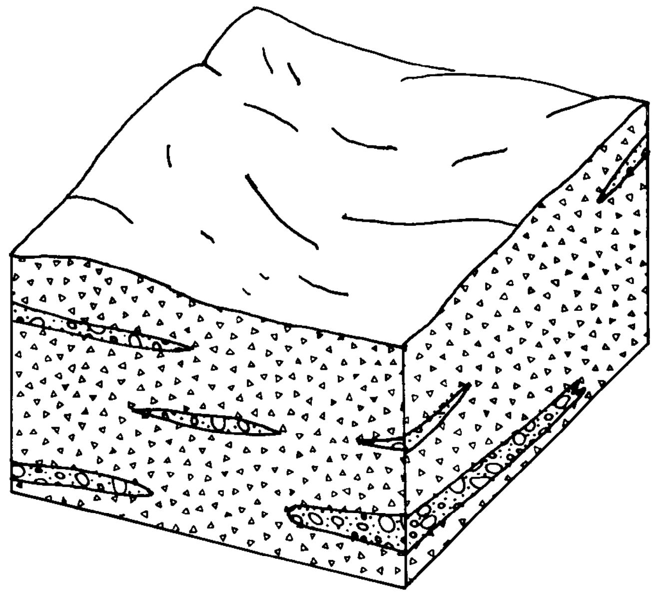
Setting: 7Ae13		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Clay shale	3	2	6
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	104

Setting: 7Ae14		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Shale	3	3	9
Soil Media	Clay loam	2	3	6
Topography	6-12%	1	5	5
Impact of Vadose Zone	Shale	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	107

Setting: 7Ae15		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Clay shale	3	2	6
Soil Media	Clay loam	2	3	6
Topography	6-12%	1	5	5
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	99

Setting: 7Ae16		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Clay shale	3	2	6
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	114

Setting: 7Ae17		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Shale	3	3	9
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	114



7Af Sand and Gravel Interbedded in Glacial Till

This hydrogeologic setting was distributed throughout Franklin County. Areas in this setting are generally peripheral to major buried valley systems and also include end moraine areas. The total thickness of the drift is less than that found within the 7D Buried Valley hydrogeologic setting. Topography is commonly flat-lying with steeper slopes along end moraines. The till is composed of a dense, unsorted mixture of clay, silt, sand, and gravel. The aquifer consists of relatively thin and discontinuous lens-shaped bodies. In some areas, the sand and gravel may exist in thicker sheets that cover a larger area. The sand and gravel units may be found at a common horizon within the till. Thickness of the till varies, but generally ranges between 60 and 100 feet. Depth to water is typically moderate, ranging from 20 to 40 feet. Recharge is from precipitation percolating through the till and is dependent upon the presence of fractures and small sand seams within the till. Yields typically average from 10 to 20 gpm. Soils are typically clay loams. Recharge is moderate due to the flat slopes, moderate depth to water, and relatively low permeability of the soil and glacial till.

The GWPP index values for the hydrogeologic setting of Sand and Gravel Interbedded in Glacial Till range from 87 to 153 and the total number of GWPP index calculations equaling 28.

Setting: 7Af1		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	122

Setting: 7Af2		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	112

Setting: 7Af3		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	121

Setting: 7Af4		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	6-12%	1	5	5
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	117

Setting: 7Af5		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	111

Setting: 7Af6		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	87

Setting: 7Af7		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	12-18%	1	3	3
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	118

Setting: 7Af8		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	116

Setting: 7Af9		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	115

Setting: 7Af10		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	127

Setting: 7Af11		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	132

Setting: 7Af12		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	106

Setting: 7Af13		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	126

Setting: 7Af14		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	135

Setting: 7Af15		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	125

Setting: 7Af16		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	125

Setting: 7Af17		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	135

Setting: 7Af18		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	153

Setting: 7Af19		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	118

Setting: 7Af20		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	130

Setting: 7Af21		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	127

Setting: 7Af22		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	132

Setting: 7Af23		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	114

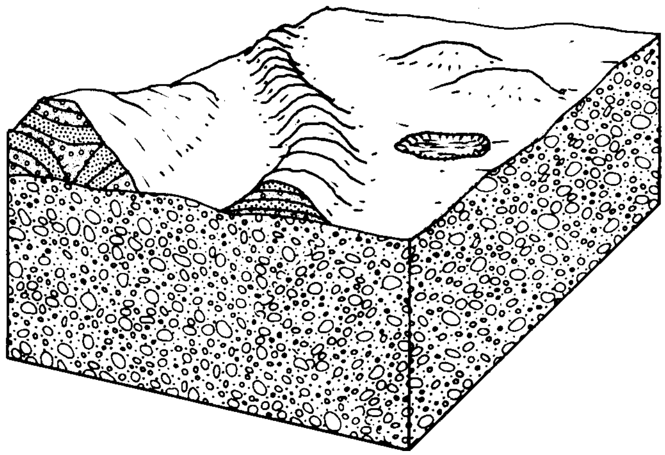
Setting: 7Af24		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	141

Setting: 7Af25		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	128

Setting: 7Af26		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	114

Setting: 7Af27		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	122

Setting: 7Af28		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	137



7Ba Outwash

This hydrogeologic setting is limited to Spangler Hill, a complex of kames just south of Scioto Downs in western Hamilton Township. Topography varies from gently rolling to moderately steep. The aquifer consists of sand and gravel outwash directly underlying the kames. The outwash consists of coarse, moderately well-sorted, stratified sand and gravel. The total thickness of drift is less in this area than that of the surrounding buried valleys. Yields exceeding 500 gpm may be possible from properly constructed, large-diameter wells. The depth to water is moderately shallow, ranging from 20 to 40 feet. Soils are typically silt loams or loams. The vadose zone media consists of dirty, poorly-sorted sand and gravel with minor glacial till. Recharge is moderately high due to the permeable nature of the soils and vadose, and the relatively shallow depth to water.

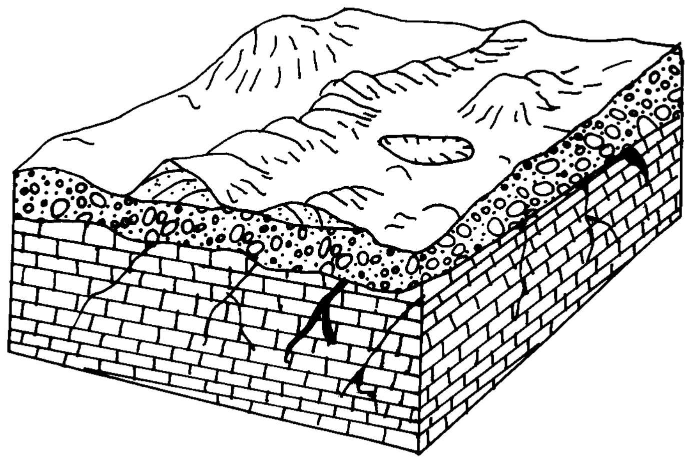
The GWPP index values for the hydrogeologic setting of Outwash range from 147 to 158 with the total number of GWPP index calculations equaling 4.

Setting: 7Ba1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Silt loam	2	4	8
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	147

Setting: 7Ba2		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	151

Setting: 7Ba3		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	6-12%	1	5	5
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	149

Setting: 7Ba4		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	158



7Bc Outwash Over Limestone

This hydrogeologic setting is limited to portions of the Scioto River Valley where low outwash terraces overlie the limestone bedrock. Topography varies from relatively flat to gently rolling. The outwash is too thin to comprise the aquifer, therefore ground water is obtained from the underlying limestone bedrock. The outwash is in direct hydraulic connection with the underlying bedrock. Precipitation moving through the outwash recharges the bedrock. Yields of 100 to 500 gpm may be obtained from the underlying limestone. The number of fractures and solution features encountered within the limestone help to determine the yield. Depth to water is generally less than 20 feet as these low terraces are adjacent to the Scioto River. Soils are loams or silt loams. Recharge is moderately high due to the permeable soils and vadose, the shallow depth to water, and the flat topography.

The GWPP index values for the hydrogeologic setting Outwash Over Limestone range from 156 to 172 with the total number of calculations equaling 5.

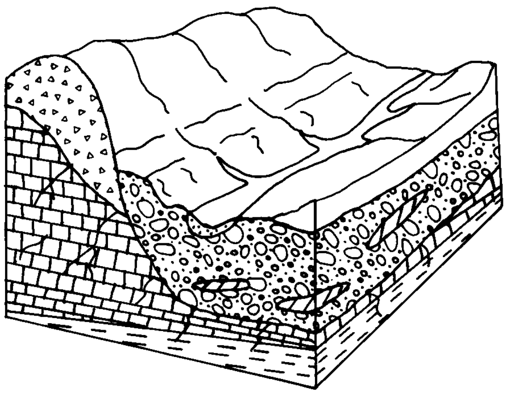
Setting: 7Bc1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Solution limestone	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	172

Setting: 7Bc2		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Solution limestone	3	8	24
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	164

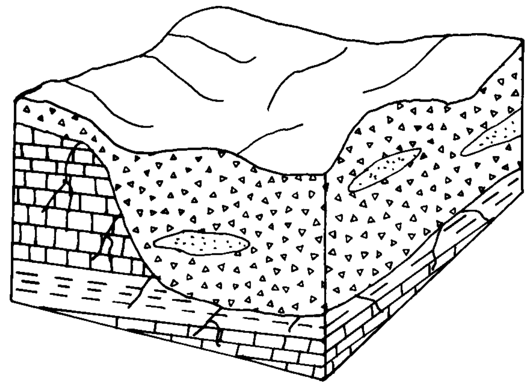
Setting: 7Bc3		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Massive limestone	3	7	21
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	169

Setting: 7Bc4		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Massive limestone	3	7	21
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	156

Setting: 7Bc5		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Massive limestone	3	7	21
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	166



(a)



(b)

<u>7D Buried Valley</u>

This hydrogeologic setting varied considerably across Franklin County. The buried valleys were created by pre-glacial or interglacial rivers which downcut into the bedrock. The differing glacial deposits filling these valleys can be best illustrated by describing the two common forms mapped within Franklin County.

One common form of buried valley deposit (Block Diagram a) is exemplified by the southern portion of the Scioto River and Big Walnut Creek Valleys. These valleys are occupied by a modern river and floodplain, and contain numerous outwash terraces and small kames. The upper portions of these valleys contain 50 to 100 feet of outwash. Depth to water is less than 30 feet. Yields over 1,000 gpm are possible from large-diameter wells. Soils are typically loams. The streams are in direct hydraulic connection with the aquifer and recharge is high. GWPP index values for these settings are usually over 160.

The other common form of buried valley is typified by the large valleys extending into Licking County and deep valleys east of Big Darby Creek. The surface topography is flat ground moraine and it is hard to distinguish these areas from ground moraines with shallow depth to rock. They usually lack streams or contain intermittent streams. The aquifer consists of thinner, less discontinuous lenses of sand and gravel interbedded in thick sequences of till or fine lacustrine sediments. Yields are commonly less than 25 gpm. Soils are typically clay loams. Recharge is moderate to low. GWPP index values for these settings are typically less than 100.

The GWPP index values for the hydrogeologic setting Buried Valleys range from 48 to 191 with the total number of GWPP index calculations equaling 143.

Setting: 7D1		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	125

Setting: 7D2		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	114

Setting: 7D3		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	137

Setting: 7D4		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	115

Setting: 7D5		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	135

Setting: 7D6		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	127

Setting: 7D7		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	79

Setting: 7D8		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	112

Setting: 7D9		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	130

Setting: 7D10		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	106

Setting: 7D11		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	85

Setting: 7D12		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	88

Setting: 7D13		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	129

Setting: 7D14		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	132

Setting: 7D15		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Shrink/swell clay	2	7	14
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	118

Setting: 7D16		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	87

Setting: 7D17		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Shrink/swell clay	2	7	14
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	100-300	3	4	12
		GWPP	INDEX	96

Setting: 7D18		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	6-12%	1	5	5
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	92

Setting: 7D19		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	81

Setting: 7D20		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	12-18%	1	3	3
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	96

Setting: 7D21		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	6-12%	1	5	5
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	98

Setting: 7D22		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	6-12%	1	5	5
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	83

Setting: 7D23		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	169

Setting: 7D24		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	8	40
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	183

Setting: 7D25		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	8	40
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	175

Setting: 7D26		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	83

Setting: 7D27		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	91

Setting: 7D28		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	92

Setting: 7D29		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	82

Setting: 7D30		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	96

Setting: 7D31		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	178

Setting: 7D32		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	180

Setting: 7D33		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	124

Setting: 7D34		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	121

Setting: 7D35		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	83

Setting: 7D36		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	74

Setting: 7D37		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	79

Setting: 7D38		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	123

Setting: 7D39		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	139

Setting: 7D40		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	138

Setting: 7D41		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	84

Setting: 7D42		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	115

Setting: 7D43		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	154

Setting: 7D44		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	155

Setting: 7D45		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	152

Setting: 7D46		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	78

Setting: 7D47		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	111

Setting: 7D48		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	99

Setting: 7D49		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	126

Setting: 7D50		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	144

Setting: 7D51		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	141

Setting: 7D52		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	172

Setting: 7D53		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	120

Setting: 7D54		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	117

Setting: 7D55		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	153

Setting: 7D56		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	157

Setting: 7D57		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	100

Setting: 7D58		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	129

Setting: 7D59		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	113

Setting: 7D60		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	103

Setting: 7D61		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	109

Setting: 7D62		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	119

Setting: 7D63		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	76

Setting: 7D64		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	0-2	4	1	4
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	2	10
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	58

Setting: 7D65		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	116

Setting: 7D66		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	146

Setting: 7D67		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	118

Setting: 7D68		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	149

Setting: 7D69		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	122

Setting: 7D70		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	132

Setting: 7D71		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	155

Setting: 7D72		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	140

Setting: 7D73		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	139

Setting: 7D74		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	149

Setting: 7D75		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	148

Setting: 7D76		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	159

Setting: 7D77		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	152

Setting: 7D78		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	131

Setting: 7D79		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	125

Setting: 7D80		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	124

Setting: 7D81		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	127

Setting: 7D82		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	128

Setting: 7D83		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	133

Setting: 7D84		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	145

Setting: 7D85		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	142

Setting: 7D86		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	8	40
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	189

Setting: 7D87		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	159

Setting: 7D88		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	161

Setting: 7D89		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	8	40
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	185

Setting: 7D90		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	8	40
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	191

Setting: 7D91		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	160

Setting: 7D92		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	8	40
Hydraulic Conductivity	1000-2000	3	10	30
		GWPP	INDEX	178

Setting: 7D93		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	8	40
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	179

Setting: 7D94		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	8	40
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	169

Setting: 7D95		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	174

Setting: 7D96		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	164

Setting: 7D97		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	149

Setting: 7D98		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	144

Setting: 7D99		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	169

Setting: 7D100		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	179

Setting: 7D101		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	184

Setting: 7D102		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	148

Setting: 7D103		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	133

Setting: 7D104		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	147

Setting: 7D105		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	153

Setting: 7D106		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	142

Setting: 7D107		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	163

Setting: 7D108		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	175

Setting: 7D109		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	173

Setting: 7D110		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	148

Setting: 7D111		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	162

Setting: 7D112		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	156

Setting: 7D113		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	176

Setting: 7D114		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	178

Setting: 7D115		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	169

Setting: 7D116		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	158

Setting: 7D117		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-10%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	144

Setting: 7D118		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	157

Setting: 7D119		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	100+	5	1	5
Net Recharge	0-2	4	1	4
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Confining layer (till)	5	1	5
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	48

Setting: 7D120		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	136

Setting: 7D121		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	158

Setting: 7D122		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	147

Setting: 7D123		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	159

Setting: 7D124		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	139

Setting: 7D125		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	164

Setting: 7D126		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	125

Setting: 7D127		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	167

Setting: 7D128		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	154

Setting: 7D129		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	171

Setting: 7D130		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	164

Setting: 7D131		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	156

Setting: 7D132		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	132

Setting: 7D133		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	2000+	3	10	30
		GWPP	INDEX	186

Setting: 7D134		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	168

Setting: 7D135		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	155

Setting: 7D136		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	129

Setting: 7D137		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Sandy loam	2	6	12
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	160

Setting: 7D138		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	119

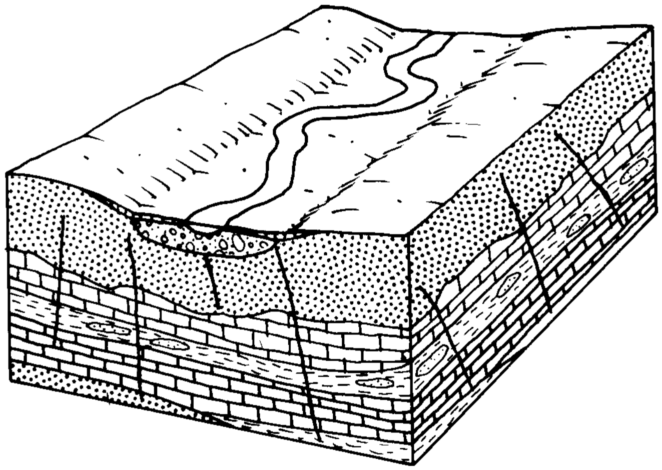
Setting: 7D139		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	97

Setting: 7D140		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	141

Setting: 7D141		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Till	5	3	15
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	106

Setting: 7D142		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	137

Setting: 7D143		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	150



7Ec Alluvium Over Sedimentary Rock

This hydrogeologic setting was found throughout Franklin County. Underlying bedrock included limestone, shale, sandstone, and interbedded sandstone, shale, and siltstone. This setting is characterized by low relief floodplains and terraces containing thin to moderate thicknesses of modern alluvium. The alluvium is comprised of non-compact sand, silt, clay, and minor gravel. Depth to water is shallow and the stream is in hydraulic connection with the alluvium. Underlying, fractured bedrock serves as the aquifer. Yields vary considerably, depending upon the bedrock type. Soils are typically silt loams. Recharge is high due to the shallow depth to water, flat topography, and the moderately permeable nature of the alluvium.

The GWPP index values for the hydrogeologic setting Alluvium Over Sedimentary Rock range from 119 to 161 with the total number of GWPP index calculations equaling 18.

Setting: 7Ec1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	138

Setting: 7Ec2		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Solution limestone	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	143

Setting: 7Ec3		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	146

Setting: 7Ec4		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay loam	2	3	6
Topography	2-6%	1	9	9
Impact of Vadose Zone	Till	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	137

Setting: 7Ec5		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	133

Setting: 7Ec6		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Solution limestone	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	133

Setting: 7Ec7		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Solution limestone	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	148

Setting: 7Ec8		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Shale	3	3	9
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	119

Setting: 7Ec9		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Massive limestone	3	7	21
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	159

Setting: 7Ec10		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Interbedded sandstone/shale	3	4	12
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	125

Setting: 7Ec11		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	Interbedded sandstone/shale	3	4	12
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	143

Setting: 7Ec12		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	Shale	3	3	9
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	142

Setting: 7Ec13		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Interbedded sandstone/shale	3	4	12
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	130

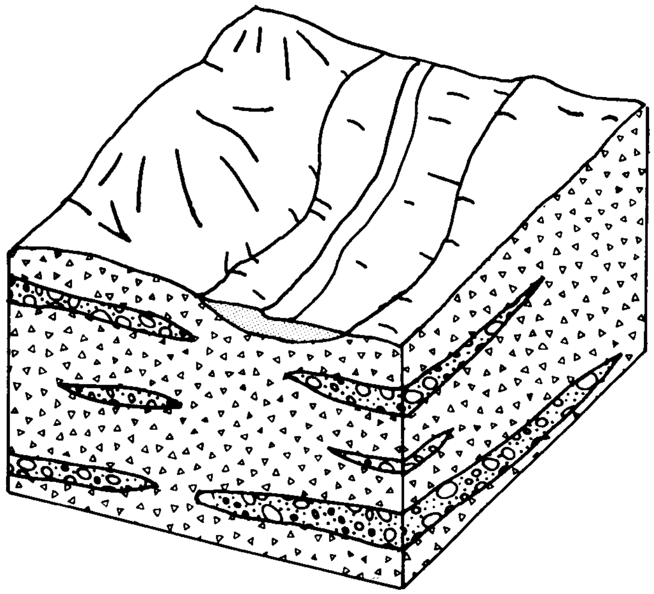
Setting: 7Ec14		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Clay shale	3	2	6
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	121

Setting: 7Ec15		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Massive limestone	3	7	21
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	161

Setting: 7Ec16		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	140

Setting: 7Ec17		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Clay loam	2	3	6
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	128

Setting: 7Ec18		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Massive limestone	3	7	21
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	158



7Ed Alluvium Over Glacial Till

This hydrogeologic setting is composed of flat-lying floodplains and stream terraces comprised of thin to moderate thicknesses of modern alluvium. 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 stream may or may not be in hydraulic connection with the underlying sand and gravel lenses which constitute the aquifer. The surficial, silty alluvium is typically more permeable than the surrounding till. The Alluvium is too thin to be the aquifer. Soils are typically silt loams. Yields typically range from 10 to 25 gpm. Depth to water is shallow with depths usually less than 20 feet. Water percolating through the alluvium may serve as an avenue of recharge to the underlying sand and gravel deposits. Recharge is moderate due to the shallow depth of water, flat topography, and the relatively low permeability of the glacial till.

GWPP index values for the hydrogeologic setting Alluvium Over Glacial Till range from 128 to 155 with the total number of GWPP index calculations equaling 8.

Setting: 7Ed1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	134

Setting: 7Ed2		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	146

Setting: 7Ed3		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	128

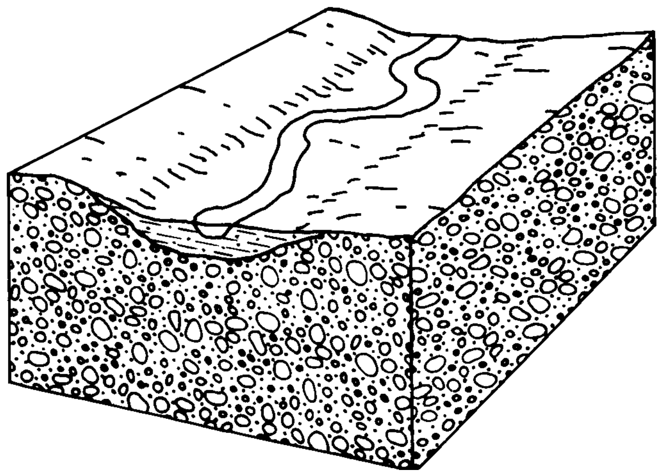
Setting: 7Ed4		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Silt/clay	5	4	20
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	137

Setting: 7Ed5		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	155

Setting: 7Ed6		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	150

Setting: 7Ed7		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	142

Setting: 7Ed8		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	132



7Ee Alluvium Over Outwash

This hydrogeologic setting is limited to areas of the Scioto River and other major streams that do not have an adequate thickness of drift to be considered buried valleys. The setting is characterized by low relief floodplains and low terraces with thin to moderate thicknesses of modern alluvium overlying outwash. The alluvium is comprised of clay, silt, and fine sand. Soils are typically silt loams or loams. The depth to water is shallow, averaging less than 20 feet. Streams are in hydraulic connection with the alluvium and are typically in connection with the underlying sand and gravel outwash. Yields exceeding 500 gpm may be possible from properly developed, large-diameter wells. The underlying outwash is described in setting 7Ba Outwash. Recharge is high due to the permeable soils and vadose, the flat topography, and the shallow depth to water.

The GWPP index values for the hydrogeologic setting of Alluvium Over Outwash range from 147 to 185. with the total number of GWPP index calculations equaling 14.

Setting: 7Ee1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	164

Setting: 7Ee2		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	149

Setting: 7Ee3		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	154

Setting: 7Ee4		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	5	15
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	5	25
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	147

Setting: 7Ee5		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	7	35
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	178

Setting: 7Ee6		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	8	40
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	185

Setting: 7Ee7		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	8	40
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	183

Setting: 7Ee8		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	6	18
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	155

Setting: 7Ee9		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	173

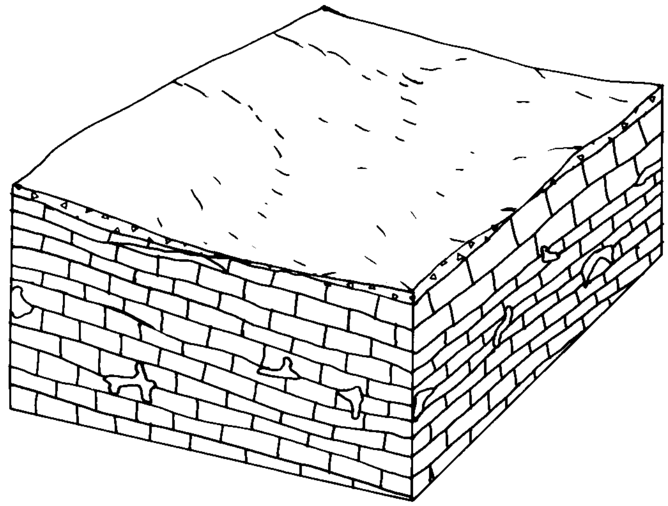
Setting: 7Ee10		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Clay loam	2	3	6
Topography	0-10%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	161

Setting: 7Ee11		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	156

Setting: 7Ee12		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	7	21
Soil Media	Silt loam	2	4	8
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	700-1000	3	6	18
		GWPP	INDEX	154

Setting: 7Ee13		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	165

Setting: 7Ee14		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	Sand and gravel	3	8	24
Soil Media	Loam	2	5	10
Topography	0-2%	1	10	10
Impact of Vadose Zone	Sand and gravel w/silt and clay	5	6	30
Hydraulic Conductivity	1000-2000	3	8	24
		GWPP	INDEX	175



<u>7Gb Thin Till Over Limestone</u>

This hydrogeologic setting was used for an area of extremely shallow limestone bedrock to the northwest of Dublin. The setting is characterized by low relief. The overlying glacial till is very thin (averaging less than 5 feet), patchy, and weathered. Soils are sandy loam and reflect the residual bedrock. Depth to water is moderately shallow. Yields may range up to 500 gpm for a large-diameter, properly constructed well. Recharge to the underlying bedrock is moderately rapid as the bedrock is exposed at or near the surface.

The GWPP index value for the one hydrogeologic setting of Thin Till Over Limestone was 144.

7Gb1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	Massive limestone	3	7	21
Soil Media	Sandy loam	2	6	12
Topography	0-2%	1	10	10
Impact of Vadose Zone	Massive limestone	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	144

Ground Water Pollution Potential of FRANKLIN COUNTY

by
Michael P. Angle

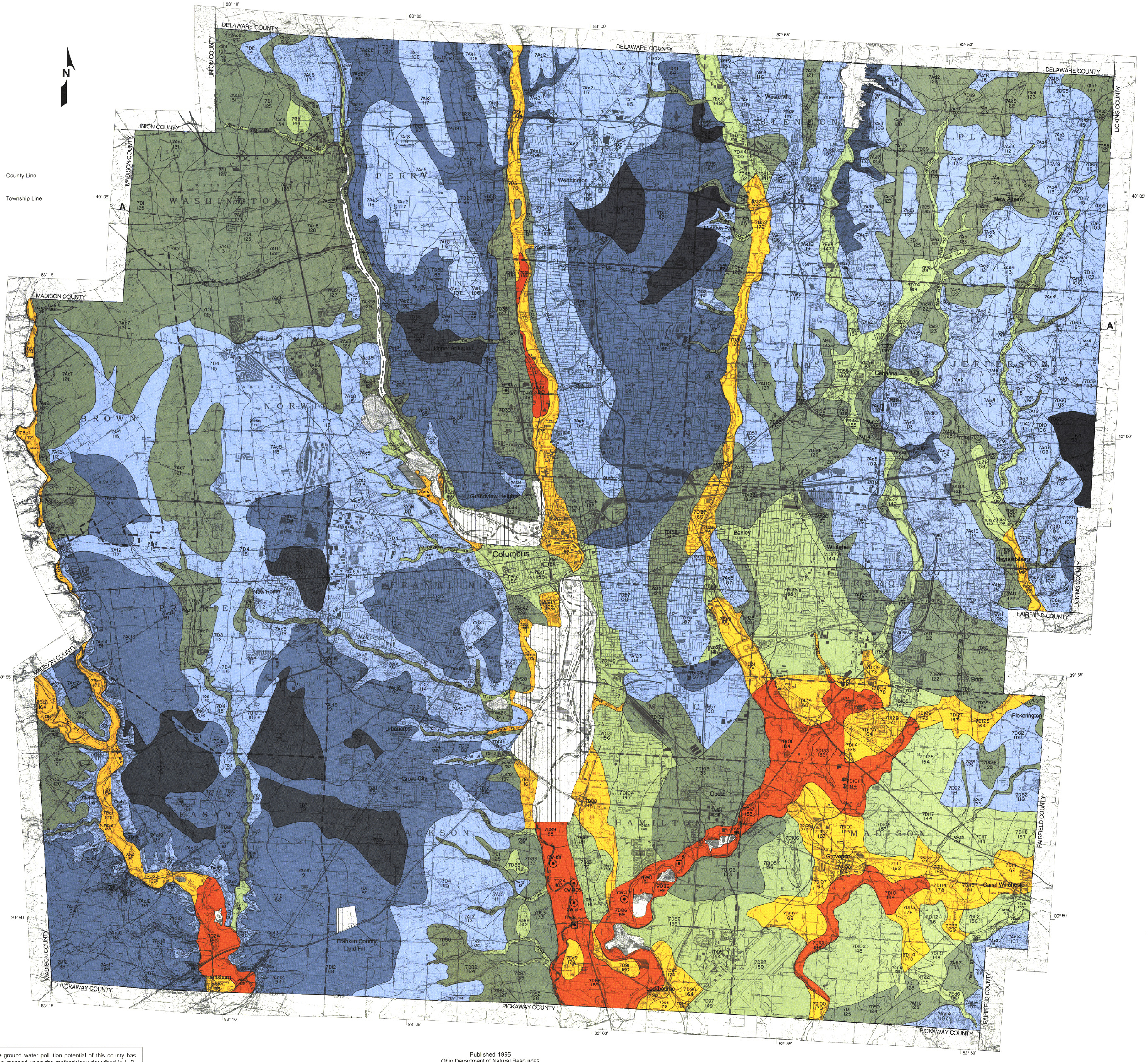
Miles

Kilometers

CONTOUR INTERVAL 10 FEET

County Line

Township Line



Description of Map Symbols

Hydrogeologic Region — **7Ad6** — Hydrogeologic Setting

98 — Relative Pollution Potential

- Observation Well Site *
- Municipal-Industrial Well
- Gravel Pit / Quarry
- Disturbed Land

*Observation well sites indicate the location of wells used to collect ground water level information. These wells are part of the state observation well network. Hydrographs of the water levels recorded in these and other State observation wells can be obtained through ODNR-Division of Water.

Pollution Potential Index Range

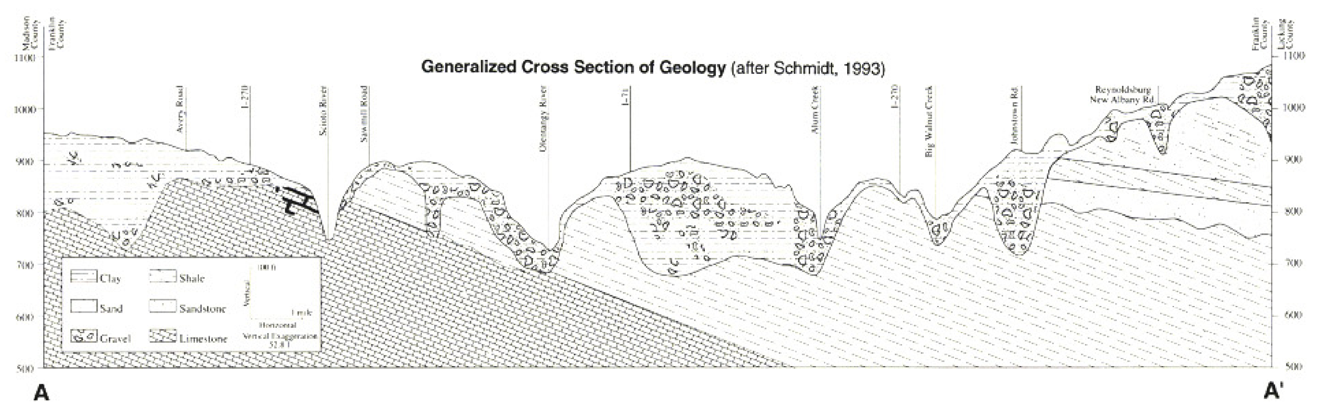
Higher	180 - 199
	160 - 179
	140 - 159
to	120 - 139
	100 - 119
	80 - 99
Lower	< 79

Hydrogeologic Settings

7Aa –	Glacial Till Over Bedded Sedimentary Rock
7Ac –	Glacial Till Over Limestone
7Ad –	Glacial Till Over Sandstone
7Ae –	Glacial Till Over Shale
7Af –	Sand and Gravel Interbedded in Glacial Till
7Ba –	Outwash
7Bc –	Outwash Over Limestone
7D –	Buried Valley
7Ec –	Alluvium Over Sedimentary Rock
7Ed –	Alluvium Over Glacial Till
7Ee –	Alluvium Over Outwash
7Gb –	Thin Till Over Limestone

A more detailed description of the hydrogeologic settings and the evaluation of the pollution potential may be found in the publication "Ground Water Pollution Potential of Franklin County," GWPP Report No. 40, Ohio Department of Natural Resources, Division of Water.

Generalized Cross Section of Geology (after Schmidt, 1993)



The ground water pollution potential of this county has been mapped using the methodology described in U.S. EPA Publication EPA/600-2-87/035, "DRASTIC: A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings" (Aller et al., 1987).

Published 1995
Ohio Department of Natural Resources
Division of Water
Water Resources Section
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Columbus, Ohio 43224

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Total Copies Printed 500
Unit Cost: $ 4.45
Publication Date: 9/95

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