Environmental Study of Howard County, Indiana: Geologic Aspects

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Abstract

The information necessary to compile a report of this type is available for many Indiana counties. A county soil survey by the Soil Conservation Service and over 600 logs of water wells drilled within Howard County were my data sources.

Maps summarizing the data show the following conditions: 1) the soil in most of the county is not suitable for large housing developments using septic systems; 2) there are numerous areas where wells can be pumped at over 100 gallons per minute; 3) bedrock is usually covered by 50 feet or more of glacial drift; 4) there are numerous areas that are potential sanitary landfill sites; 5) the southwestern portion of the county has a number of sites which are potentially good sources of gravel.

Purpose and Scope

The purpose of this report was to outline the geologic conditions which should be known about Howard County by persons who wish to develop the area.

The most important published reference sources for this study were Deal (2), Nevers and Walker (4), Wayne *et al.* (8), and Burger *et al.* (1). Water well logs from Ortman Drilling, Inc., Kokomo, were also available for this study.

Setting

Howard County is located in north-central Indiana. It comprises 293 square miles and has a population of 83,198 (1970 census). The local relief is one of upland plains and gently rolling hills. It is cut by stream valleys which are seldom more than 30 feet deep.

Bedrock is composed of nearly flat-lying limestones and shales. The bedrock relief (Fig. 4) is about 200 feet. Surface relief bears little relation to the underlying bedrock. The one exception is Wildcat Creek Valley which generally follows a pre-glacial stream valley.

Geologic History

The age of the bedrock ranges from Lower Silurian to Middle Devonian. There are no Lower Devonian rocks and the Middle Devonian Traverse Formation unconformably rests upon the Upper Silurian Salina Formation (1, 8).

A mantle of unconsolidated clay, sand, and gravel was deposited on top of the bedrock by the melting Wisconsin Age glaciers (7). In those areas where there has been little reworking of the sediments by running water there are high percentages of clay. The outwash areas have a lower percentage of clay and a high percentage of sand. In the river valleys the percentage of sand and gravel is very high and the clay fraction very low (2).

Methods of Study

In this study I used 601 water well logs. The information from these logs was transferred to those U.S.G.S. topographic maps which include Howard County. The maps in this paper show the results.

Surficial Deposits

Howard County lies in the Tipton Till Plain (7). This is an area of low relief which the post-glacial streams with their low gradients have not dissected to any great extent.

Deal (2) described the following soil series present in Howard County: Blount, Brookston, Carlisle, Crosby, Fincastle, Fox, Genesee, Hennepin, Kokomo, Linwood, Miami, Morley, Ockley, Patton, Pewamo, and Russell.

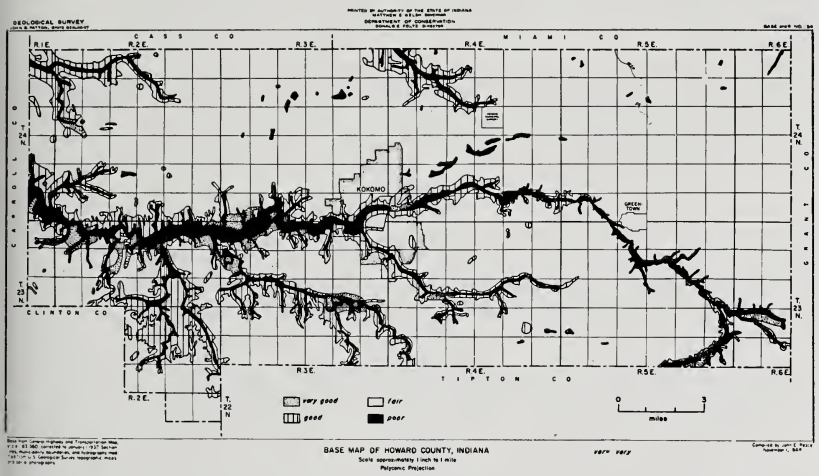

FIGURE 1. *Suitability of soils in Howard County for septic tank filter fields.*

Figure 1 shows the degree of suitability of soils for septic tank filter fields. Very good soils are the Fox and Ockley Series. Good soils are the Miami Series with slopes of less than ten degrees and Russell Series. Fair soils are the Blount, Brookston, Crosby, Fincastle, Kokomo, Morley, Patton (in areas not subjected to floods), and Pewamo Series. These are the bulk of soil types within the county. Poor soils are the Carlisle, Genessee, Hennepin, Linwood, Patton (in areas subject to floods), and Shoals Series.

Ground Water

Water quality is generally satisfactory in the county (3). However, Table 1 shows the sulfates are high in some wells. Figure 2 shows the pressure surface of the ground water. In the county the water table is generally from a few feet to a few tens of feet below ground surface.

TABLE 1. *Raw water quality in Howard County.*[1]

	Greentown (1 well)	Kokomo (17 wells avg.)	Kokomo (reservoir)	West Middleton (2 wells avg.)
pH	7.7	7.5	8.2	7.7
Color	0-5	5	7	5
Turbidity	0.7-15	5	25	3-5
Hardness as $CaCO_3$	330-350	430	260	340-380
Calcium as Ca	77-85	120		85
Magnesium as Mg	30-38	30		35
Sodium as Na	10	60		15
Potassium as K	1-3	2		1
Iron as Fe	0.7-1.4	1.9	0.6	0.8-1.0
Manganese as Mn	0-0.05	0.2	0.05	0
Alkalinity as $CaCO_3$	320-335	320	195	330-360
Chlorides as Cl	4-7	13		6
Sulfates as SO_4	20-25	215		35-45
Nitrates as N	<1	0.4		0
Fluorides as F	0.6-0.8	0.5		0.5-0.6

[1] Data from Indiana State Board of Health (3). All columns are in parts per million (p.p.m.) except pH, color, and turbidity.

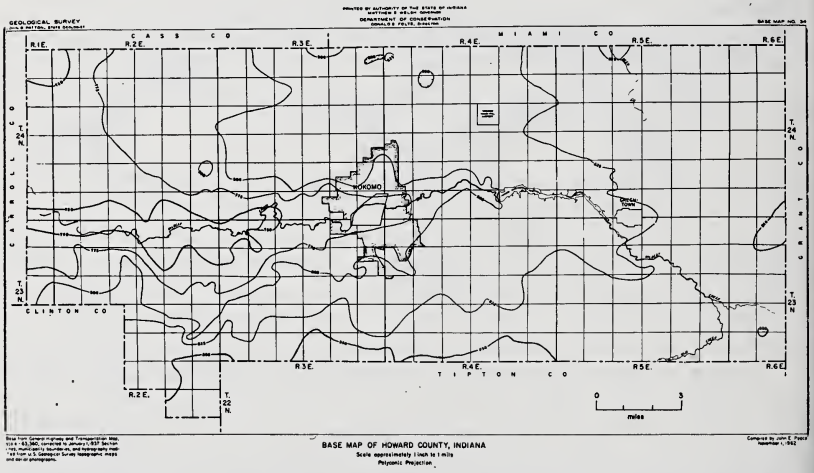

FIGURE 2. *Elevation in feet above sea level of the groundwater pressure surface in Howard County.*

Figure 3 illustrates those areas with wells of flow rates greater than 100 gal/min. The pattern suggests that there are fissure zones within the county which are sufficiently widespread to supply large amounts of water.

The five wells in this study which gave the highest yield in gallons per minute are the following: Midwest Plating and Chemical Co., 950 gal/min (10-inch casing), Kokomo Country Club, 820 gal/min (12-inch casing), Taylor Township School, 650 gal/min (10-inch casing),

Delco Radio Division, 500 gal/min (10-inch casing), and Pittsburgh Plate Glass Co., 425 gal/min (10-inch casing).

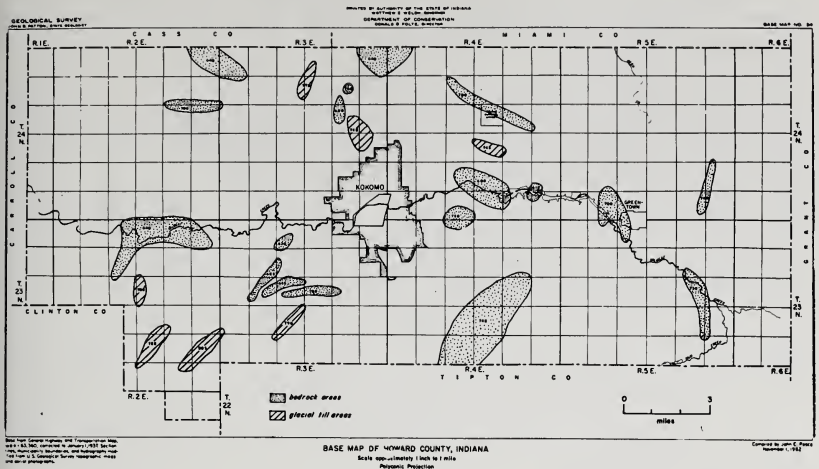

FIGURE 3. *Areas in Howard County where flow rates of 100+ gal/min are common. The number within each area is the elevation above sea level at which most of the wells bottom out.*

Geology

The bedrock in Howard County is composed of carbonate rocks. The rock formations are described in detail by Shaver *et al.* (5) and Shaver *et al.* (6).

Figure 4 is a map of the bedrock topography. It clearly shows a number of buried sinkholes and pre-glacial river valleys. A comparison

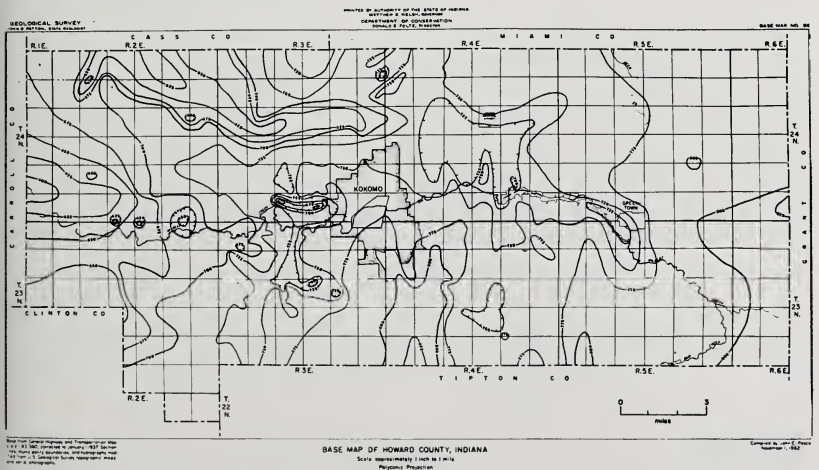

FIGURE 4. *Bedrock surface in Howard County. The elevations are in feet above sea level.*

of Figure 4 with Figure 3 shows that many high-yield wells are located in bedrock along the sides of pre-glacial river valleys.

Figure 5 shows the drift thickness. The thick drift cover is a detriment to limestone quarrying except along the Wildcat Creek Valley just west of Kokomo.

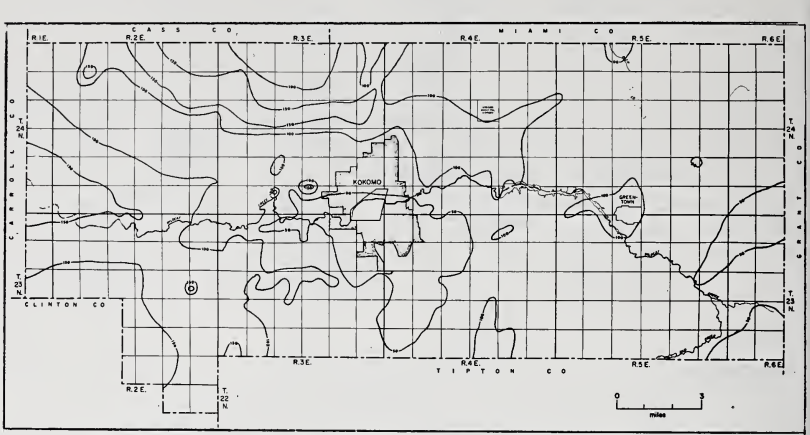

FIGURE 5. *Thickness, in feet, of glacial drift covering Howard County.*

Figure 6 shows areas which are potentially good sites for sanitary landfills. The most desirable locations are those with a cover of fifty feet or more of clay. Less desirable locations are those with a cover of at least 30 feet of clay. Extensive site studies would be necessary before any of these areas could be approved for such use.

Figure 7 shows areas of gravel deposits which are at least 3 feet thick. The quality of the gravel has not been evaluated in this study.

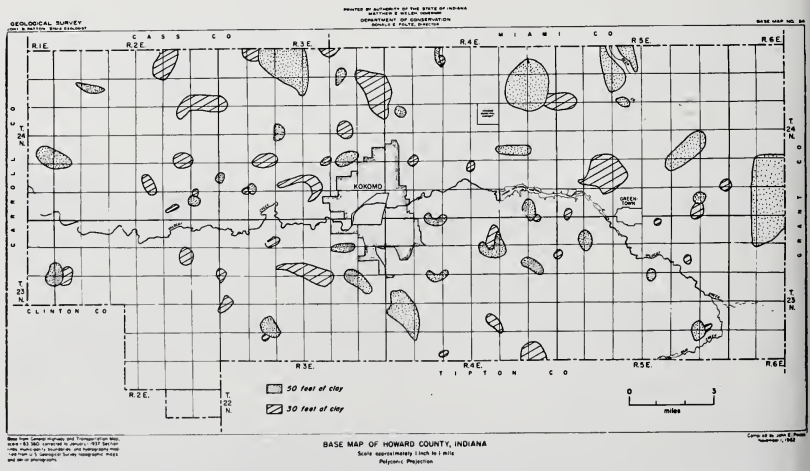

FIGURE 6. *Areas in Howard County which are potential sites for sanitary landfills.*

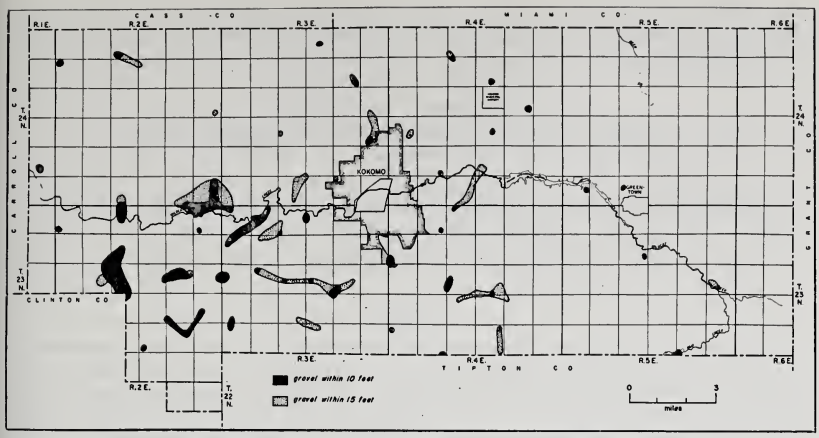

FIGURE 7. *Sites of potential gravel deposits in Howard County.*

Acknowledgments

I wish to thank Mr. Richard Ortman and Mr. Ned Ortman for allowing me free access to the well logs in their company files.

Literature Cited

1. BURGER, A. M., J. L. FORSYTH, R. S. NICOLL, and W. J. WAYNE. 1971. Geologic map of the 1° x 2° quadrangle, Indiana and Ohio, showing bedrock and unconsolidated deposits. Indiana Geol. Surv. Reg. Geol. Map 5, Muncie Sheet.

2. DEAL, J. M. 1971. Soil survey of Howard County, Indiana. U. S. Dep. Agr., Soil Conserv. Serv., Washington, D.C. 65 p.

3. Indiana State Board of Health. 1960. Data on Indiana public water supplies. Sanitary Eng. Bull. 10. 92 p.

4. NEVERS, G. M., and R. D. WALKER. 1962. Annotated bibliography of Indiana geology through 1955. Indiana Geol. Surv. Bull. 24. 486 p.

5. SHAVER, R. H., H. H. GRAY, A. P. PINSAK, J. A. SUNDERMAN, W. D. THORNBURY, and W. J. WAYNE. 1961. Stratigraphy of the Silurian rocks of northern Indiana. Indiana Geol. Surv. Field Conf. Guidebook 10. 62 p.

6. ————, A. M. BURGER, G. R. GATES, H. H. GRAY, H. C. HUTCHISON, S. J. KELLER, J. B. PATTON, C. B. REXROAD, N. M. SMITH, W. J. WAYNE, and C. E. WEIR. 1970. Compendium of rock-unit stratigraphy in Indiana. Indiana Geol. Surv. Bull. 43. 229 p.

7. WAYNE, W. J. 1956. Thickness of drift and bedrock physiography of Indiana north of the Wisconsin glacial boundary. Indiana Geol. Surv. Rep. Prog. 7. 70 p.

8. ————, G. H. JOHNSON, and S. J. KELLER. 1966. Geologic map of the 1° x 2° Danville quadrangle, Indiana and Illinois, showing bedrock and unconsolidated deposits. Indiana Geol. Surv. Reg. Geol. Map 2, Danville Sheet.