

Environmental Geology of Vigo, Clay, and Sullivan Counties, Indiana

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Purpose and Scope

The purpose of this report is to make available to regional, county, and city planning groups a study upon which they may base future decisions for land uses in their respective jurisdictions. This study will also aid those local, state and federal agencies which need recent data on various geologic aspects of the counties for ground water studies, landfill site proposals and flood insurance.

The scope of the report is limited to the geologic aspects of the region and does not attempt to assess the biological factors of the environment. The main sources of information for this report came from Montgomery *et al.* (3), Kelly *et al.* (2), Jones *et al.* (1), and from water well records on file at the Water Resources Division of the Indiana Department of Natural Resources.

Setting and Geology

Vigo, Clay, and Sullivan counties are located in southwestern Indiana along its border with Illinois. The topography is one of rolling hills and numerous river valleys. Most of the streams are small to medium sized and are part of the Wabash River drainage basin.

The Wabash River flows through two of the counties (Vigo and Sullivan) and, for a portion of its length, is the Indiana-Illinois boundary. The bottom lands and upland terraces along the Wabash are extensive and the flood cycles of the river have greatly influenced the landscape along its course. Generally the river valley is wide with gently sloping banks. In some areas the valley becomes narrow. These are the areas where the river has cut into the bedrock.

The whole area has been glaciated. The glacial cover consists mainly of Illionian age till with a small area in northwestern Vigo County covered with Wisconsin age ground and end morainal materials (5). The bedrock is Pennsylvanian shales, sandstones, limestones and some extensive coal seams. The dips are generally shallow and trend to the west or southwest (4). The area is along the eastern edge of the Illinois Basin and open pit coal mining is an important industry. In the past there were a number of underground coal mines but these have been abandoned.

The present drainage appears to roughly follow the pre-glacial drainage patterns. (Fig. 1) illustrates the bedrock topography. The Wabash River follows the bedrock valley of the pre-glacial river. Also, the general course of the Eel River in southern Clay County parallels a bedrock valley which drained to the southeast. The present Eel River travels southwest, also, to flow into the White River in Green County south of Clay County. Busseron Creek southeast of

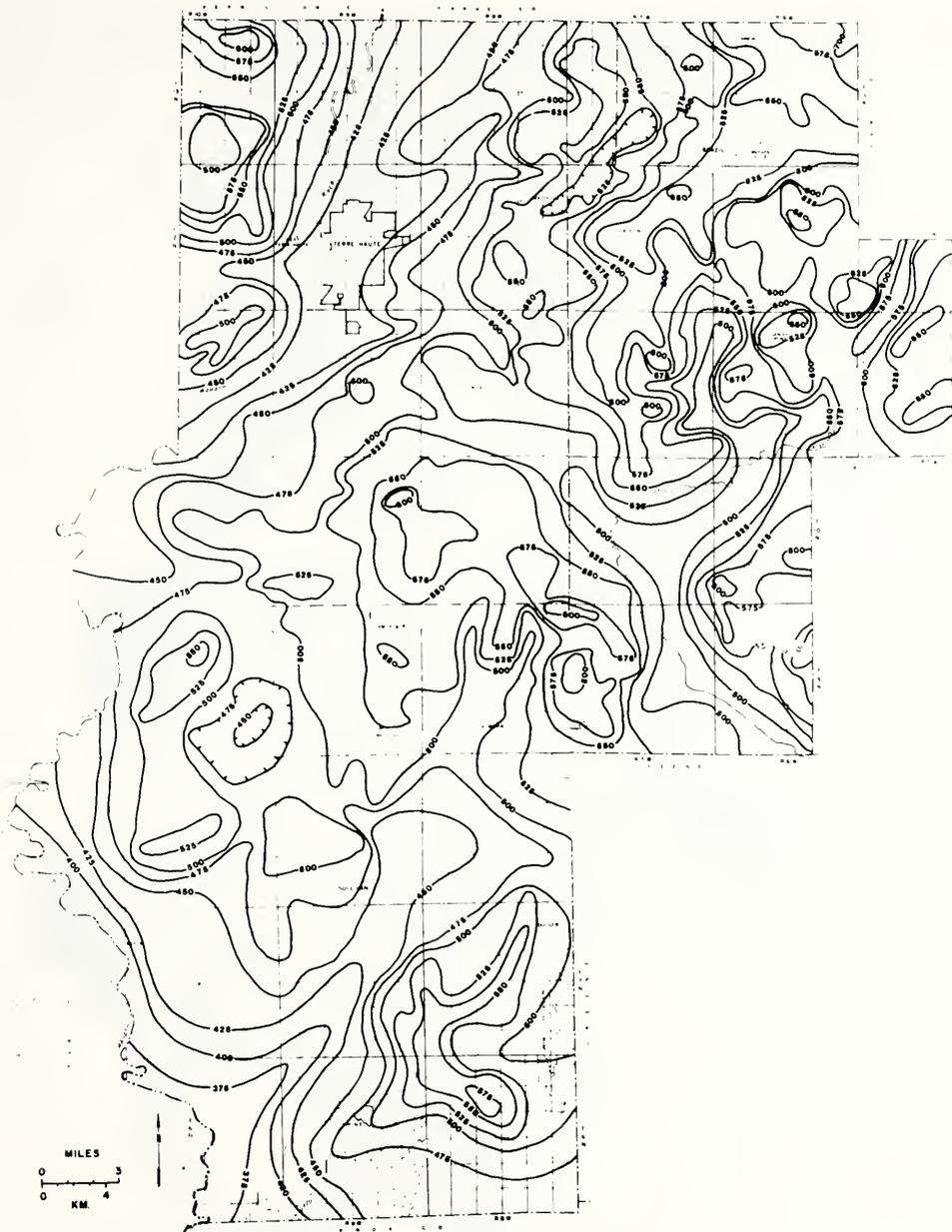


FIGURE 1. *Bedrock surface in Vigo, Clay and Sullivan Counties. The elevations are in feet above sea level.*

Sullivan follows a third bedrock valley to flow into the Wabash near the southwest corner of the map.

(Fig. 2) illustrates the drift thickness in the region. There are extensive areas which are covered with less than thirty feet of unconsolidated material over the bedrock. Site surveys and test drilling would be advised for these areas before developments requiring extensive excavating are started.

Water wells in these areas are more likely to be in the bedrock rather than the sand and gravel layers of the glacial till. The one exception to this will be those wells on the flood plain of the Wabash River. The most productive wells are located in the sand and gravel seams rather than the bedrock. None of the

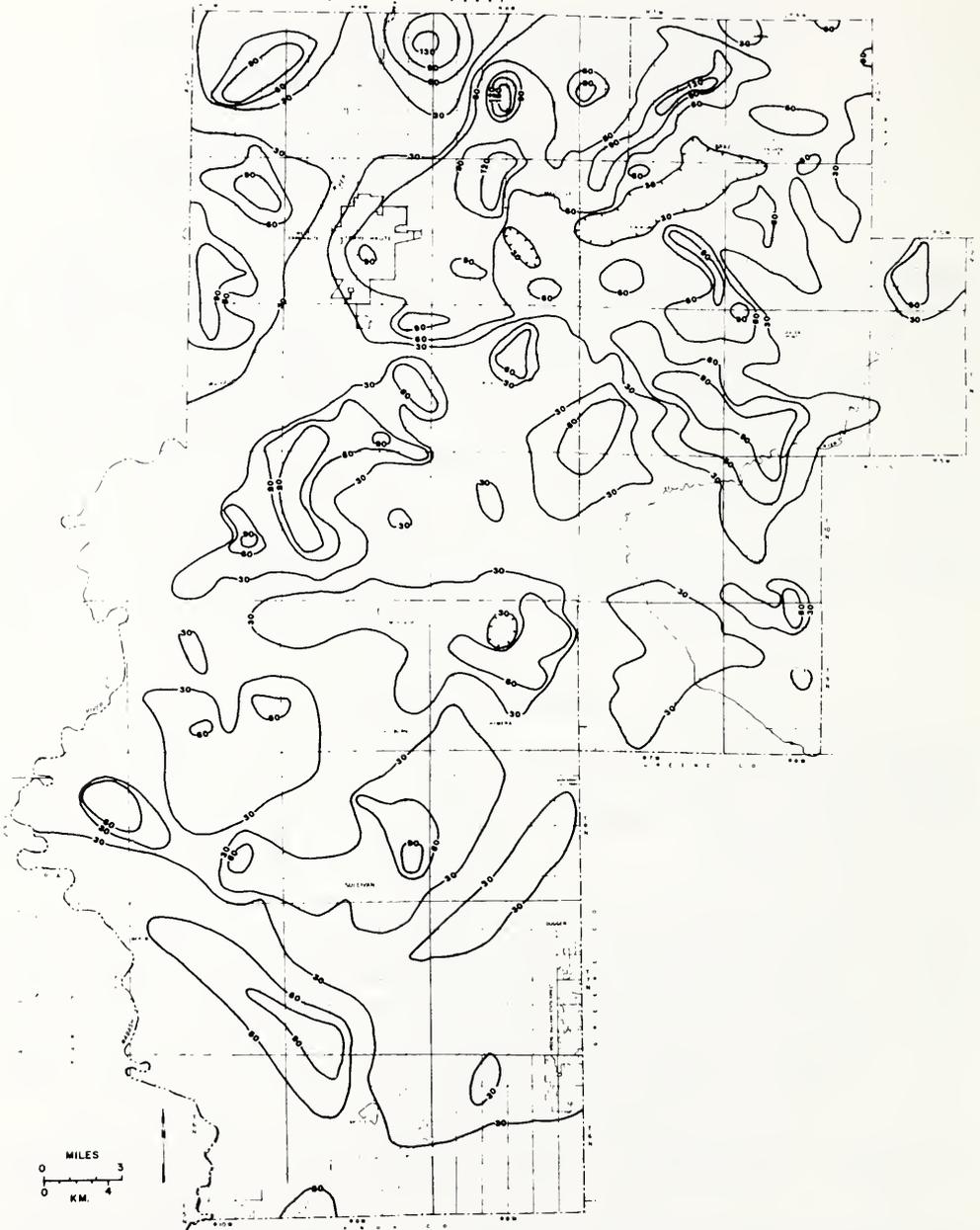


FIGURE 2. *Thickness, in feet, of glacial drift covering Vigo, Clay and Sullivan Counties.*

wells in the area are large water producers. The flows range from less than two gallons per minute to as much as fifteen gallons per minute for a four inch diameter (or equivalent) well. A flow rate of less than ten gallons per minute to as much as fifteen gallons per minute for a four inch diameter (or equivalent) well seems to be typical of the area.

There are some dry wells scattered through the area with no apparent pattern. It is recommended that test wells be drilled before buildings are erected. It is a possibility that there may be no obtainable ground water at a given site. Industrial sites should be developed in those areas which have thick deposits of glacial cover. The reasons are that bedrock will present no problems in excavating for the building footings and the increased likelihood that sand and

gravel seams will be encountered when drilling water wells. An alternate solution for industrial water supply is to use the surface water from the Wabash River.



FIGURE 3. Flood-prone areas, shown in black, of Vigo, Clay and Sullivan Counties.

(Fig. 3) outlines the flood-prone areas of the region. It should be noted that industrial plants can be located, in some areas, quite close to the Wabash River with little danger of being flooded. Therefore it is possible for river water to be piped to those plants rather than having to depend upon ground water for their operations. The flood-prone areas were mapped by using the soil surveys. Some soils develop only on flood plains and so are excellent indicators for the extent of probable flooding of a river. The soils used to outline the flood-prone areas are, Armiesburg, Atkins, Cuba, Eel, Genesee, Holly, Petrolia, Ross, Sharkey, Shoals, Sloan, Stendal, Wakeland, Waverly, Wilbur, and Zipp.

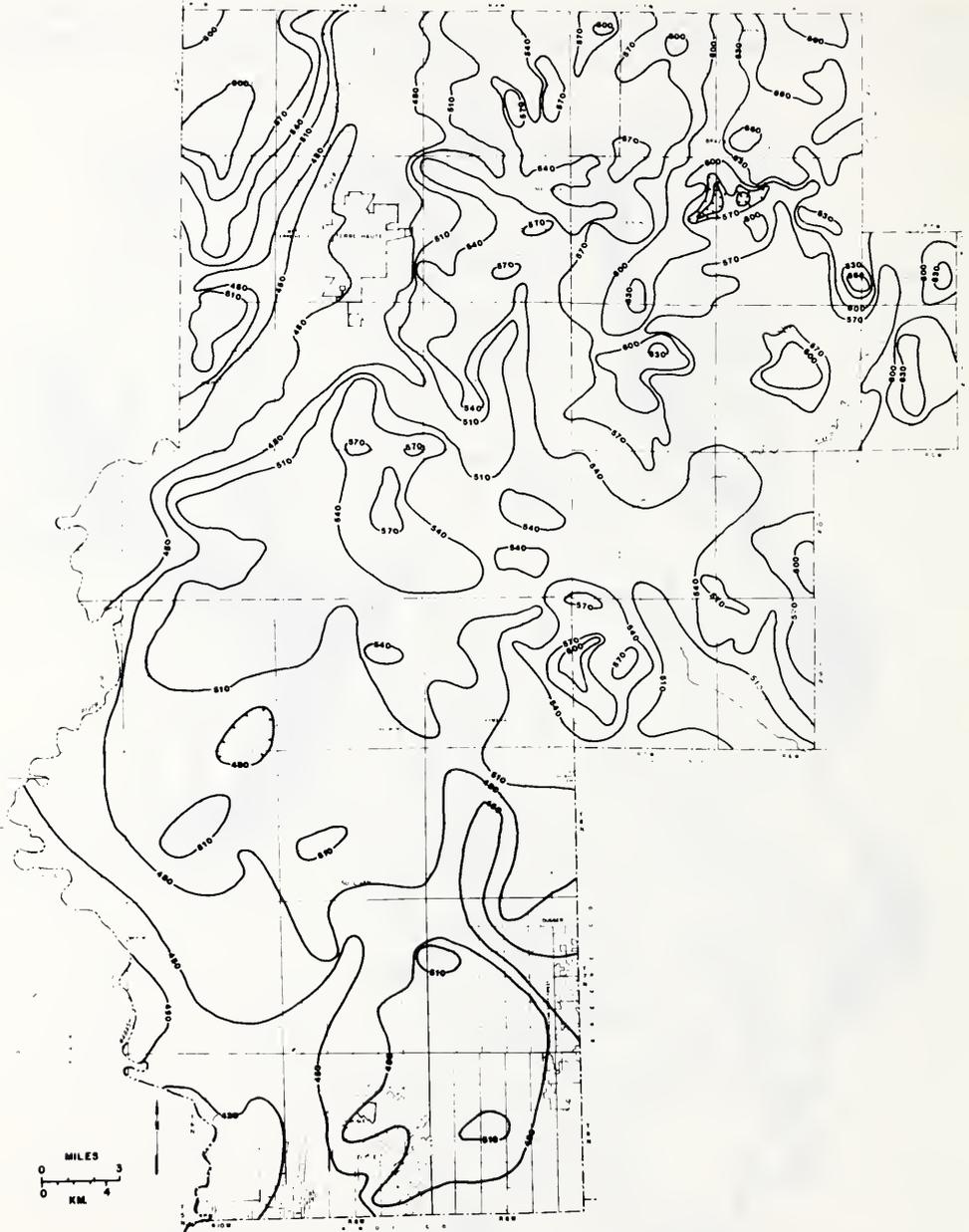


FIGURE 4. Elevation, in feet above sea level, of the ground water pressure surface in Vigo, Clay and Sullivan Counties.

(Fig. 4) shows the ground water pressure surface elevation above sealevel in the area. The ground water flow generally follows the bedrock valley system developed by the pre-glacial drainage. In most wells, the water table is in a range of fifteen feet to over eighty feet below the ground surface. There are some dry holes in the region. However, it is likely that the water table has been penetrated by these wells but the flow rate into the well is so low that they were classified as dry by the driller on his log.

The ground water flow is toward the three main rivers of the area—Wabash River, Eel River and Busseron Creek. The only exception to this is an area immediately south of Brazil. There are strip mines in this area and it appears that

the pressure surface has been lowered by mine dewatering operations. There are numerous strip mines in the region but the pressure surface only reflects this one artificial lowering. It appears that the coal mining in the area has had little effect on the water table in the three counties. This does not mean that some wells close to the excavated areas might not be affected. Only, on a larger county-wide scale, there is little evidence of permanent changes in the pressure surface due to mining activities.



FIGURE 5. *Suitability of soils in Vigo, Clay and Sullivan Counties for septic tank filter fields. The white areas have acceptable soils and the black areas have unacceptable soils.*

(Fig. 5) shows areas which would be suitable for large subdivisions that use septic systems as the means of waste treatment. There are many sites which would be acceptable and also many others which are not acceptable. This map was based upon the soil types found in the region. Acceptable soils are those

which have fair to good drainage (but not too rapid) and are thick enough so there is no danger of contaminated water reaching the bedrock to mix with the ground water. This map should be used to judge whether or not large subdivisions might better have a central waste treatment plant rather than depending upon septic systems. It is not meant to judge the adequacy of an individual septic system. Septic systems in high-clay soils can work if the finger system is long enough. But lots in many subdivisions are one-half acre or less and this may not be adequate where fifty or more families have homes on less than forty acres of land.

The following soil types are acceptable for septic systems in high density population areas: Alford <12% slopes, Ayrshire, Camden, Crane, Elston, Fincastle, Fox, Iona, Iva, Markland <12% slopes, Muren, Parke <12% slopes, Princeton <12% slopes, Proctor, Reesville, Russell <12% slopes, Tippecanoe, Warsaw, Whitaker, and Xenia.

The following soil types are judged to be inadequate for the proper functioning of septic systems in subdivisions. Excessively fast drainage is encountered in Ade and Bloomfield soils. Very poor drainage is found in Ava, Bartle, Carlisle, Cincinnati, Cory, Henshaw, Kings, Lyles, McGary, Millsdale, Patton, Ragsdale, Renssalaer, Vigo, Vincennes, Washtenaw, and Westland soils. Thin soils with bedrock close to the surface are Randolph and Shadeland. Soils developed on steep slopes are Alford >12% slopes, Gibson >12% slopes, Hennepin, Hickory, Markland >12% slopes, Negley, Parke, >12% slopes, Princeton >12% slopes, Rodman, and Russell >12% slopes. Soils which develop on flood plains should be avoided since they are subjected to periodic flooding. These soils have already been listed in the discussion of (Fig. 3) flood-prone areas.

(Fig. 6) illustrates areas which are suitable for sanitary landfills. For a landfill site, a number of stringent criteria must be met. The foremost is that there should be no likelihood that any leachate will leak from the landfill to contaminate surface waters or any useable supply of ground water. Such a condition of total confinement of leachate can only be achieved in a large body of clay or silt. The potential site must also not be in a flood plain with any surface water running through it. Lastly, the site should be reasonably close to the cities which will use the site. Long distance transport of waste becomes too expensive for municipalities.

The sites in (Fig. 6) are divided into two categories. The best sites contain fifty feet of clay measured from the surface downward. The acceptable sites contains thirty feet of clay measured from the surface downward. It is assumed that the trench method of landfill will be used. The trenches should be no deeper than twenty feet which will provide an unbroken bottom seal of at least ten feet to contain any leachate.

These are recommended localities based upon the clay content of the area. It will be necessary to do a site study at a particular location before a final decision is made to use the area for a sanitary landfill.

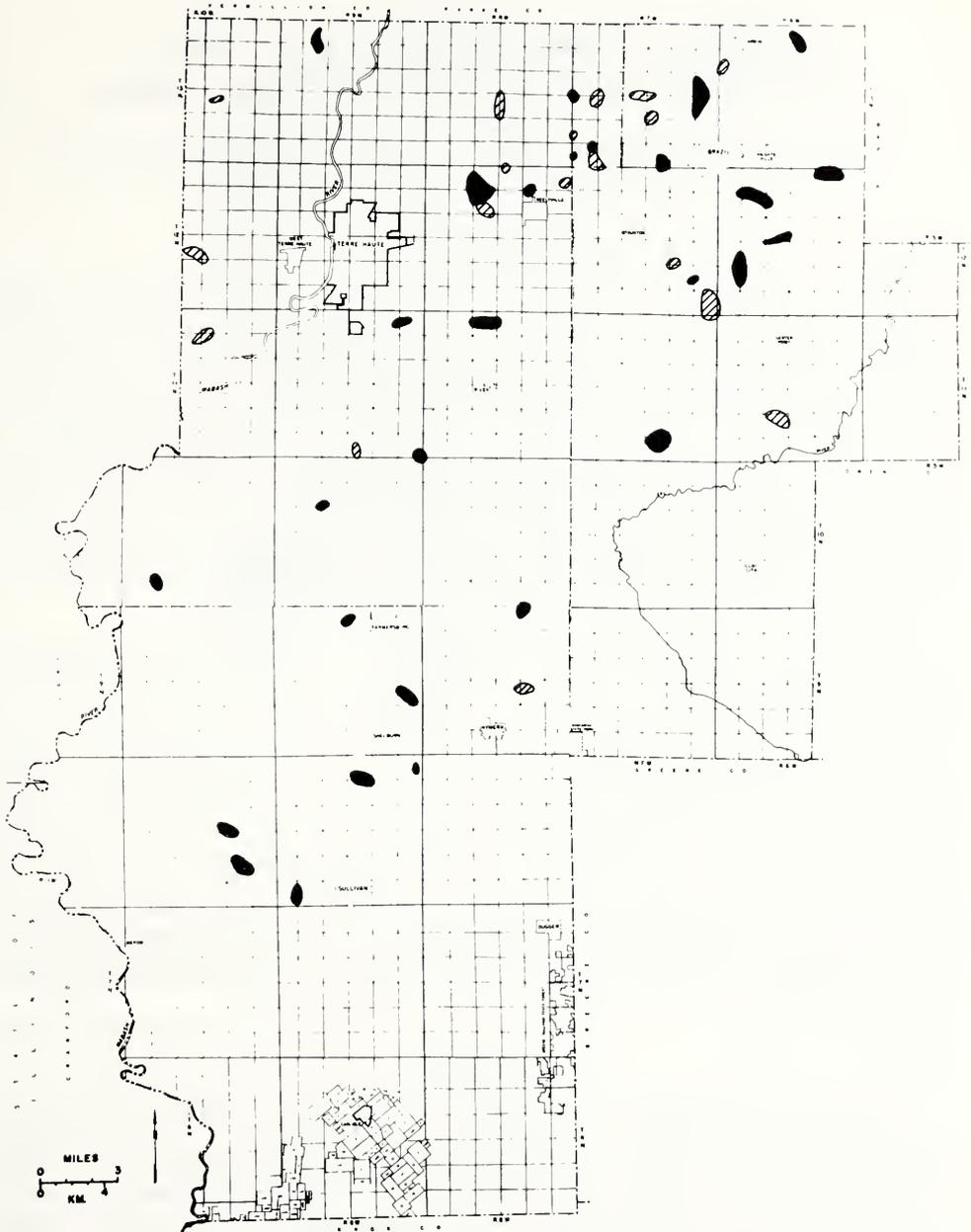


FIGURE 6. Areas in Vigo, Clay and Sullivan Counties which are potential sites for sanitary landfills. The black areas contain thirty feet of clay and the stripped areas contains fifty feet of clay.

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