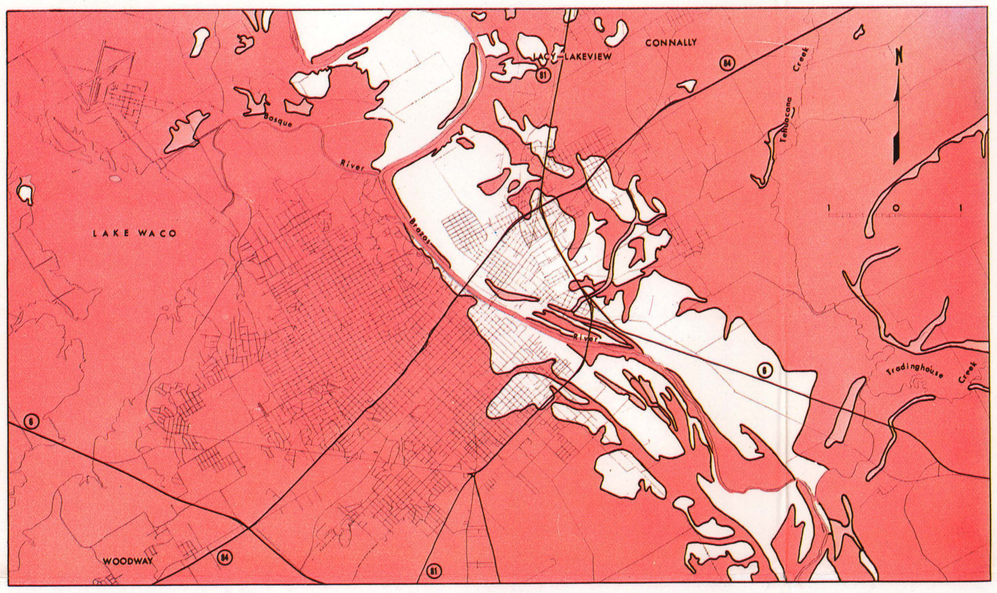


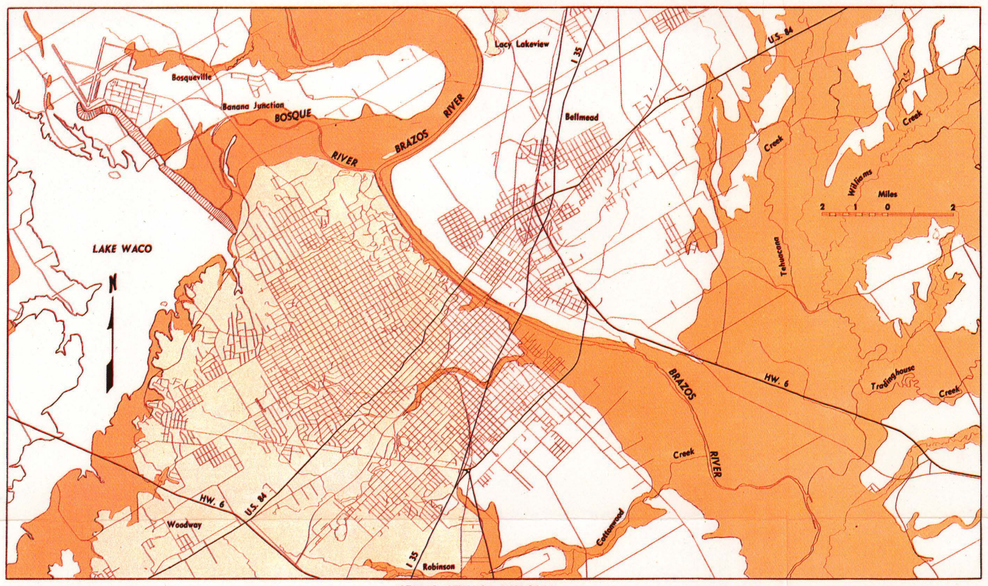
LIMITATIONS

Slight | Moderate | Severe

Limitations are shown in terms of *Slight*, *Moderate* and *Severe* based on normal density of residences. The soil properties used in evaluating suitability are: Permeability (A very slowly permeable soil is a severe limitation); Depth to Rock (Soils less than 10 inches thick have a severe limitation); Slope (Soils with a slope over 12 percent have a severe limitation); Flood Hazard (Soils with any degree of overflow have a severe limitation).

A. MAP SHOWING SUITABILITY OF SOILS FOR SEPTIC FIELDS, WACO AREA, TEXAS

Reprinted from Elder (1965, fig. 7)



SEPTIC SEWAGE DISPOSAL

Adequate | Moderately Adequate | Inadequate

Inadequate septic sewage disposal is typical in impermeable earth materials, where septic systems are continuously inoperative or become inoperative during each wet period.

Inadequate septic sewage disposal exists in alluvial clays and silts in the Lower Taylor Marl and bentonitic and shaly portions of the Wolfe City Sand; in the South Bosque Shale; in the Lake Waco Formation; in the Pepper Shale; in the Del Rio Clay; and in shale members of the Georgetown Formation.

Moderately adequate septic sewage disposal is encountered in those areas where septic systems are usually operative, except in periods of prolonged saturation. Moderate disposal is typical in moderately permeable earth materials.

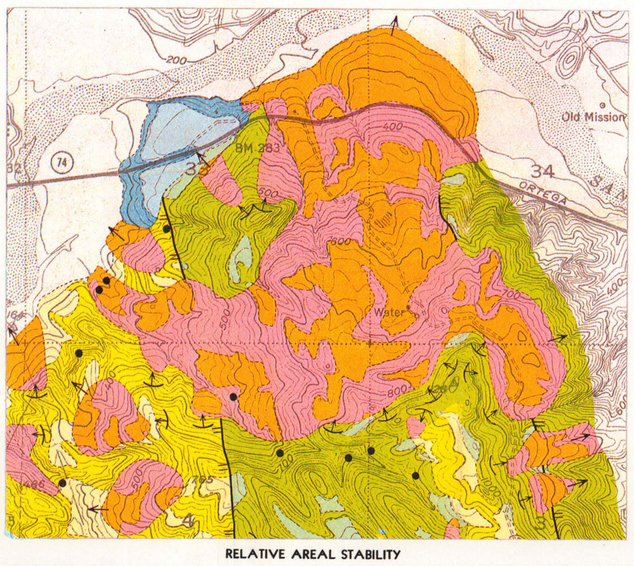
Moderately adequate septic sewage disposal exists in some areas of the Wolfe City Sand; in the Austin Chalk; and in the Georgetown Limestone.

Adequate septic sewage disposal is characteristic in highly permeable earth materials, where septic systems are usually operative even in periods of high saturation.

Adequate septic sewage disposal exists mainly in Bosque and Brazos terrace deposits. Where terrace deposits are thin, and rest on impermeable materials, septic sewage disposal may be inadequate.

B. MAP SHOWING SUITABILITY OF FORMATIONS FOR SEPTIC SEWAGE DISPOSAL, WACO AREA, TEXAS

Reprinted from Font and Williamson (1970, fig. 5)



RELATIVE AREAL STABILITY

Decreasing stability

1	2	3	4	5	6	7	8

Numerous factors that control the stability of natural slopes have been integrated to show the relative stability within the mapped area.

C. PART OF A SLOPE-STABILITY MAP OF SAN CLEMENTE AREA, CALIFORNIA

Reprinted from Blanc and Cleveland (1968, pl. 1)

This map shows pattern that results if map units are defined by two sets of criteria that are generally not spatially covariant. Four classes of decreasing strength (1–2), (3–4), (5–6), and (7–8) are subdivided into units indicating areas below critical slope angle (1, 3, 5, 7) or above critical slope angle (2, 4, 6, 8).

SILURIAN	Middle Silurian	Bisher(?) Limestone	D	0–10	Shale, greenish-gray, clayey, thin- and evenly bedded, blocky to conchoidal fracture, very plastic when moist. Locally upper part contains thin (½ to 2 inches thick) interbeds of silty limestone with rare fossil (crinoid) fragments; in places banded and mottled with light-reddish-brown streaks. Has low porosity and permeability but absorbs some water. This is an expansive shale that falls within the critical category of FHA classification (Lambe, 1960) and develops a swell index of 4100 psf.
	Lower and Middle Silurian	Upper part of Crab Orchard Formation	A	80–150	Limestone and shale: Limestone, greenish-gray, weathers bright reddish brown and yellowish brown, coarsely to finely crystalline, dolomitic in part, locally oölitic with hematite in upper part. Even beds up to 10 inches thick; thicker beds break into large slabs up to 4 feet long. Crossbedded bioclastic limestone and large 1- to 2-foot ripple marked beds in upper part. Chemical weathering moderate producing a reddish-brown soil. Lower part of unit predominantly limestone, upper part limestone interbedded with green clay shale. Bedding planes frequently marked with X-like impressions 4 to 6 inches long. Crinoids and brachiopods common particularly in oölitic beds. Angular "cog wheel" crinoid beads up to 1 inch in diameter and brachipods are typical of upper part. Cavities of fossils sometimes filled with petroleum or petroleum residues. Basal beds form conspicuous bench along lower valley slopes. Shale, greenish-gray, clayey, thin-bedded, blocky to conchoidal fracture; glauconite pellets locally abundant; low porosity and permeability but absorbs water becoming very plastic when wet.
		Line deleted / Lower part of Crab Orchard Formation and Brassfield Formation	*Line added* A / D	50–55	
ORDOVICIAN	Upper Ordovician	Sedimentary rocks	C	30–35	Shale, greenish-gray, thin- and evenly bedded, calcareous, hackly fracture, moderately indurated, sparsely fossiliferous. Forms lower valley slopes in northwestern and southwestern parts of quadrangle. This and underlying unit included in Richmond Group by Perry (1925).
			D	35+	Limestone, light- to medium-gray, thin and irregularly bedded, argillaceous, fossiliferous; weathers to-slabs 1 to 3 inches thick and up to 18 inches in length. Brachiopods and bryozoans common. Unit forms ledges and riffles along stream beds.

70+

Geologic map units — *Units of map showing excavation and foundation conditions*

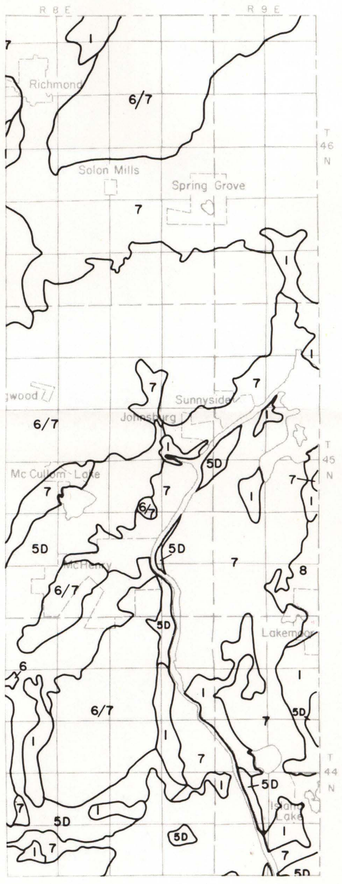
A — Poor foundation material, easily excavated (Shale)

Bedford Shale, upper part of Crab Orchard Formation, and upper part of the lower part of the Crab Orchard Formation and the Brassfield Formation

Expansive clay shale; landslides and slumps are common where valley slopes are steep or excavated cuts are oversteepened; structural failures of Fox Springs Road east of Wallingford are caused by flowage of water-saturated shale. There the shale, which is several feet thick, overlies resistant limestone of the Brassfield Formation; permeability low to very low

D. PARTS OF THE LITHOLOGIC COLUMN DESCRIPTION AND EXPLANATION OF MAP SHOWING FOUNDATION AND EXCAVATION CONDITIONS IN THE BURTONVILLE QUADRANGLE, KENTUCKY

Reprinted from Dobrovolny and Morris (1965)

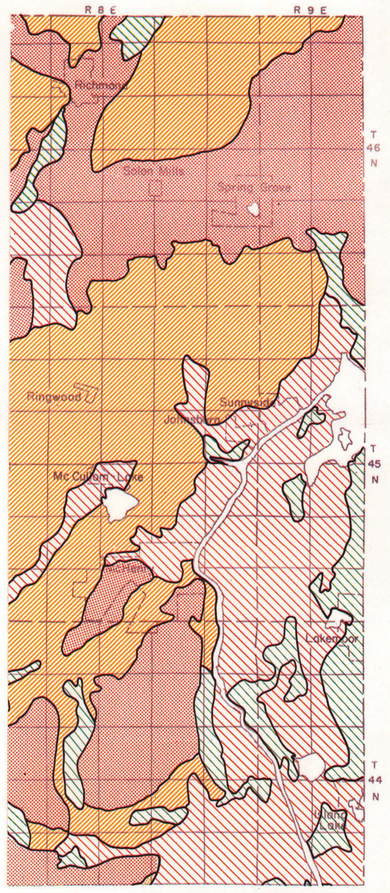


1A. EXPLANATION

SYSTEM	Series	Stage	Substage	Unit	
QUATERNARY	Recent	Recent		1	Peat
				2	Silts and alluvium
	Pleistocene	Wisconsinan	Woodfordian	4	Kamic sand and gravel
				5A	Outwash, coarse-grained gravel and sand
				5B	Outwash, fine-grained gravel and sand
				5C	Outwash, sand and pea gravel
				5D	Sand, variable
			West Chicago	6	Till, yellow, sandy, gravelly, > 5 feet thick
				6/7	Unit 6, < 5 feet thick, over sand and gravel
				6/9	Unit 6, < 5 feet thick, over Marseilles till (9)
				6/16	Unit 6, < 5 feet thick, over Marengo till (16)
				7	Sand and coarse-grained gravel
			Marseilles	8	Lacustrine clay (Lake Wauconda)
				9	Till, gray, clayey, pebbly
				9-10	Unit 9 intermixed with Huntley till
			Huntley	10-9	Till, olive gray, clayey, silty, pebbly, intermixed with Marseilles till (9)
			Gilberts	11	Kamic sand and gravel
				12	Outwash, sand and gravel
				13-16	Till, yellowish pink, silty, sandy, intermixed with Marengo till (16)
			Marengo	14	Kamic sand and gravel
				15	Outwash, sand and gravel
				16	Till, pink, silty, sandy
				16-G	Unit 16, intermixed with Gilberts drift
		Altonian	Winnebago	19	Kamic sand and gravel
				21	Till, yellowish pink, sandy
				30	Bedrock

E. PART OF MAP SHOWING SURFICIAL DEPOSITS, AND ITS EXPLANATION, MC HENRY COUNTY, ILLINOIS

Reprinted from map by D. L. Gross (Hackett and McComas, 1969, pl. 1 A)



2C. GEOLOGIC CONDITIONS RELATING TO WASTE DISPOSAL

G-2 — Area of thick clay-till overlying dense bedrock. Only very small ground-water supplies available at depths of less than 500 feet. Potential for pollution of water supplies is low.

G-3 — Area of ground-water discharge in small basins containing peat. Pollutants generally are confined in the area and unable to reach usable ground-water sources. Locally, use of these areas may be limited by periodic flooding. Pollution potential is low.

Y-1 — Deposits of pebbly clay and silt of varying thickness and local deposits of sand, which might overlie potential ground-water sources. Potential for pollution is low to moderate.

Y-2 — Thick deposits of dry permeable materials more than 30 feet above ground-water zone. Possibly a good area for sanitary landfills and a poor area for lagoons. Pollution potential is moderately low for landfills and moderate to high for lagoons.

Y-3 — Areas of mixed drift with extreme range in character of materials. Materials range from clay to gravel. Individual site evaluation is essential, as pollution potential ranges from low to high.

R-1 — Areas where depth to ground-water saturation is shallow and where permeable materials are present; widespread movement of pollution at land surface into shallow water sources and surface water bodies creates a moderately high potential for pollution.

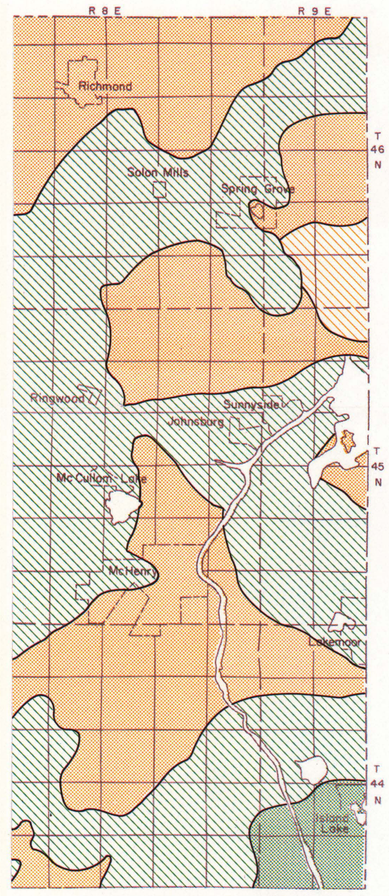
R-2 — Area of thick sand and gravel aquifers, at or very close to the surface. Ground-water levels are high so that waste would be disposed in the saturated zone. Locally, this area is subject to periodic flooding. Potential for pollution on site is high, but pollutants might be rapidly diluted.

R-3 — Area of thin drift over highly fractured bedrock, or area of bedrock outcrops. Potential for pollution of bedrock aquifers is high.

R — Indicates Stop. Major problems, impractical to overcome.
Y — Indicates Caution. Major problems, controllable.
G — Indicates Go. Minor problems.

F. PART OF MAP SHOWING GEOLOGIC CONDITIONS RELATING TO WASTE DISPOSAL, AND ITS EXPLANATION, MC HENRY COUNTY, ILLINOIS

Reprinted from map by M. R. McComas (Hackett and McComas, 1969, pl. 2C)



2A. GROUND-WATER CONDITIONS

G-1 — Continuous surficial aquifers of well sorted sand and gravel more than 50 feet thick. Permeable sandstone aquifers between depths of 500 and 2000 feet.

G-2 — Continuous surficial aquifers of well sorted sand and gravel 15 to 50 feet thick. Dolomite aquifers more than 100 feet thick within a depth of 300 feet. Permeable sandstone aquifers between depths of 500 and 2000 feet.

G-3 — Surficial sand and gravel aquifers, variable in texture, thickness, and continuity, generally more than 15 feet thick; buried sand and gravel aquifers more than 50 feet thick below a depth of 50 feet, or more than 25 feet thick above a depth of 50 feet; dolomite aquifers 50 to 100 feet thick. Preceding aquifers all within a depth of 300 feet. Permeable sandstone aquifers between depths of 500 and 2000 feet.

Y-1 — Permeable sandstone aquifers between depths of 500 and 2000 feet. Within a depth of 300 feet are buried sand and gravel aquifers 25 to 50 feet thick below a depth of 50 feet, and dolomite aquifers, with thin shale zones, more than 50 feet thick.

Y-2 — Permeable sandstone aquifers between depths of 500 and 2000 feet. Within a depth of 300 feet are sand and gravel aquifers less than 25 feet thick and dolomite aquifers less than 50 feet thick.

Y-3 — Permeable sandstone aquifers between depths of 500 and 2000 feet. Sand and gravel or dolomite aquifers limited in occurrence within a depth of 300 feet.

R — Indicates Stop. Resource absent or impractical to develop (none present on this map).
Y — Indicates Caution. Some resource limitations.
G — Indicates Go. Resource of high quality, accessible.

G. PART OF MAP OF GROUND-WATER CONDITIONS, AND ITS EXPLANATION, MC HENRY COUNTY, ILLINOIS

Reprinted from map by J. E. Hackett and J. I. Larsen (Hackett and McComas, 1969, pl. 2A)

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA.—1974, REPRINTED, 1980, 1984—G84827

THE LOGIC OF GEOLOGICAL MAPPING