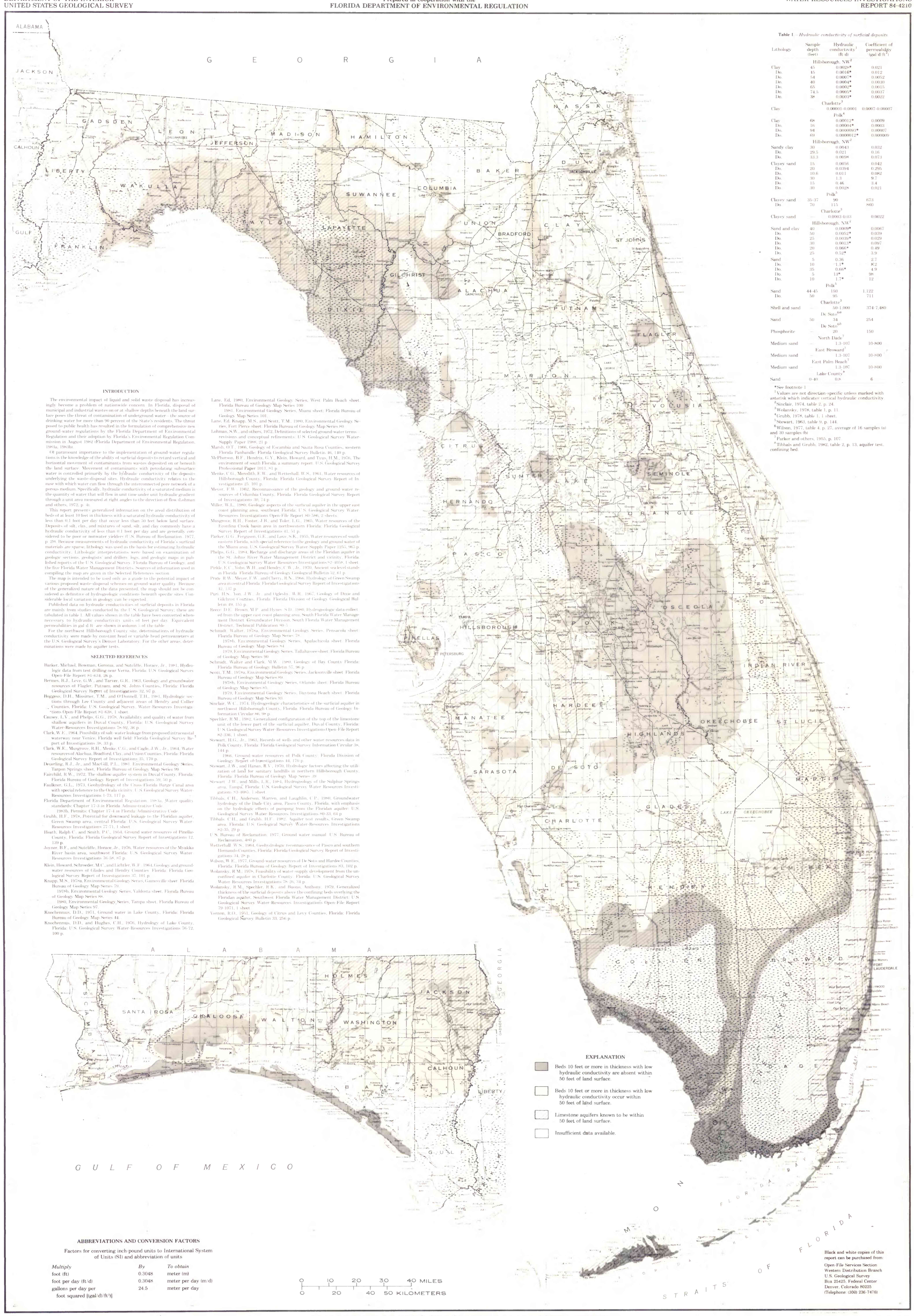
Prepared in cooperation with the
FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION






## INTRODUCTION

The environmental impact of liquid and solid waste disposal has increasingly become a problem of nationwide concern. In Florida, disposal of municipal and industrial wastes on or at shallow depths beneath the land surface poses the threat of contamination of underground water—the source of drinking water for more than 90 percent of the State's residents. The threat posed to public health has resulted in the formulation of comprehensive new ground-water regulations by the Florida Department of Environmental Regulation and their adoption by Florida's Environmental Regulation Commission in August 1982 (Florida Department of Environmental Regulation, 1983a, 1983b).

Of paramount importance to the implementation of ground-water regulations is the knowledge of the ability of surficial deposits to retard vertical and horizontal movement of contaminants from wastes deposited on or beneath the land surface. Movement of contaminants with percolating subsurface water is controlled primarily by the hydraulic conductivity of the deposits underlying the waste-disposal sites. Hydraulic conductivity relates to the ease with which water can flow through the interconnected pore network of a porous medium. Specifically, hydraulic conductivity of a saturated medium is the quantity of water that will flow in unit time under unit hydraulic gradient through a unit area measured at right angles to the direction of flow (Lohman and others, 1972, p. 4).

This report presents generalized information on the areal distribution of beds of at least 10 feet in thickness with a saturated hydraulic conductivity of less than 0.1 foot per day that occur less than 50 feet below land surface. Deposits of silt, clay, and mixtures of sand, silt, and clay commonly have a hydraulic conductivity of less than 0.1 foot per day and are generally considered to be poor or nonwater yielders (U.S. Bureau of Reclamation, 1977, p. 29). Because measurements of hydraulic conductivity of Florida's surficial materials are sparse, lithology was used as the basis for estimating hydraulic conductivity. Lithologic interpretations were based on examination of geologic sections, geologists' and drillers' logs, and geologic maps in published reports of the U.S. Geological Survey, Florida Bureau of Geology, and the five Florida Water Management Districts. Sources of information used in compiling the map are given in the Selected References section.

The map is intended to be used only as a guide to the potential impact of various proposed waste-disposal schemes on ground-water quality. Because of the generalized nature of the data presented, the map should not be considered as definitive of hydrogeologic conditions beneath specific sites. Considerable local variation in geology can be expected.

Published data on hydraulic conductivities of surficial deposits in Florida are mainly from studies conducted by the U.S. Geological Survey; these are tabulated in table 1. All values shown in the table have been converted where necessary to hydraulic conductivity units of feet per day. Equivalent permeabilities in gal/d/ft² are shown in column 3 of the table.

For the northwest Hillsborough County site, determinations of hydraulic conductivity were made by constant head or variable head permeameters at the U.S. Geological Survey's Denver Laboratory. For the other areas, determinations were made by aquifer tests.

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**Table 1.**—*Hydraulic conductivity of surficial deposits*

| Lithology | Sample depth (feet) | Hydraulic conductivity[1] (ft/d) | Coefficient of permeability (gal/d/ft²) |
|---|---|---|---|
| | | Hillsborough, NW[2] | |
| Clay | 45 | 0.0028* | 0.021 |
| Do. | 45 | 0.0016* | 0.012 |
| Do. | 54 | 0.0007* | 0.0052 |
| Do. | 40 | 0.0004* | 0.0030 |
| Do. | 65 | 0.0002* | 0.0015 |
| Do. | 74.5 | 0.0005* | 0.0037 |
| Do. | 38 | 0.0003* | 0.0022 |
| | | Charlotte[3] | |
| Clay | — | 0.00001-0.0001 | 0.0007-0.00007 |
| | | Polk[4] | |
| Clay | 68 | 0.00012* | 0.0009 |
| Do. | 16 | 0.00004* | 0.0003 |
| Do. | 94 | 0.00000093* | 0.00007 |
| Do. | 69 | 0.00000012* | 0.000009 |
| | | Hillsborough, NW[2] | |
| Sandy clay | 30 | 0.0043 | 0.032 |
| Do. | 29.5 | 0.021 | 0.16 |
| Do. | 33.3 | 0.0098 | 0.073 |
| Clayey sand | 15 | 0.0056 | 0.042 |
| Do. | 20 | 0.0394 | 0.295 |
| Do. | 10.6 | 0.011 | 0.082 |
| Do. | 30 | 1.3 | 9.7 |
| Do. | 15 | 0.46 | 3.4 |
| Do. | 30 | 0.0028 | 0.021 |
| | | Polk[5] | |
| Clayey sand | 35-37 | 90 | 673 |
| Do. | 70 | 115 | 860 |
| | | Charlotte[3] | |
| Clayey sand | — | 0.0003-0.03 | 0.0022 |
| | | Hillsborough, NW[2] | |
| Sand and clay | 40 | 0.0009* | 0.0067 |
| Do. | 50 | 0.0052* | 0.039 |
| Do. | 25 | 0.0039* | 0.029 |
| Do. | 30 | 0.0013* | 0.097 |
| Do. | 20 | 0.066* | 0.49 |
| Do. | 25 | 0.52* | 3.9 |
| Sand | 5 | 0.36 | 2.7 |
| Do. | 10 | 1.1* | 8.2 |
| Do. | 35 | 0.66* | 4.9 |
| Do. | 5 | 13* | 98 |
| Do. | 10 | 1.7* | 12 |
| | | Polk[5] | |
| Sand | 44-45 | 150 | 1,122 |
| Do. | 50 | 95 | 711 |
| | | Charlotte[3] | |
| Shell and sand | — | 50-1,000 | 374-7,480 |
| | | De Soto[6a] | |
| Sand | 50 | 34 | 254 |
| | | De Soto[6b] | |
| Phosphorite | — | 20 | 150 |
| | | North Dade[7] | |
| Medium sand | — | 1.3-107 | 10-800 |
| | | East Broward[7] | |
| Medium sand | — | 1.3-107 | 10-800 |
| | | East Palm Beach[7] | |
| Medium sand | — | 1.3-107 | 10-800 |
| | | Lake County[8] | |
| Sand | 0-40 | 0.8 | 6 |

*See footnote 1.

[1] Values are not direction-specific unless marked with asterisk which indicates vertical hydraulic conductivity.

[2] Sinclair, 1974, table 2, p. 24.

[3] Wolansky, 1978, table 1, p. 11.

[4] Grubb, 1978, table 1, 1 sheet.

[5] Stewart, 1963, table 9, p. 144.

[6] Wilson, 1977, table 4, p. 27, average of 16 samples (a) and 30 samples (b).

[7] Parker and others, 1955, p. 107.

[8] Tibbals and Grubb, 1982, table 2, p. 13, aquifer test, confining bed.

### EXPLANATION

- Beds 10 feet or more in thickness with low hydraulic conductivity are absent within 50 feet of land surface.
- Beds 10 feet or more in thickness with low hydraulic conductivity occur within 50 feet of land surface.
- Limestone aquifers known to be within 50 feet of land surface.
- Insufficient data available.

### ABBREVIATIONS AND CONVERSION FACTORS

Factors for converting inch-pound units to International System of Units (SI) and abbreviation of units

| *Multiply* | *By* | *To obtain* |
|---|---|---|
| foot (ft) | 0.3048 | meter (m) |
| foot per day (ft/d) | 0.3048 | meter per day (m/d) |
| gallons per day per foot squared [(gal/d)/ft²)] | 24.5 | meter per day |

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# OCCURRENCE OF BEDS OF LOW HYDRAULIC CONDUCTIVITY IN SURFICIAL DEPOSITS OF FLORIDA

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