

QUATERNARY STRATIGRAPHY OF  
SOUTHERN MILWAUKEE COUNTY, WISCONSIN  
PRELIMINARY RESULTS

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INTRODUCTION

With the exception of Alden's studies of the Quaternary geology of southeastern Wisconsin (1906, 1918), no detailed investigation and interpretation of the glacial stratigraphy of southern Milwaukee County, Wisconsin, has been done. Previous stratigraphic studies in the Milwaukee and Menomonee River valleys, north of the area covered in this report, are limited to the engineering studies of Williams (1954) and Rose (1978) and the stratigraphic study by Need (this volume). Along the Lake Michigan shoreline the general stratigraphic relationships and engineering properties of the bluff materials are generally known from the work of Mickelson and others (1977) and Klauk (1978).

In order to obtain better information on the Quaternary deposits south of the Menomonee River valley and west of the Lake Michigan bluffs, a study of southern Milwaukee County has begun. The area under consideration is bounded on the north by Morgan Avenue, on the south by the Milwaukee-Racine County line, on the east by Lake Michigan, and on the west by the Milwaukee-Waukesha County line. To date, approximately 130 water-well records have been examined. As there is inconsistency among records, we plan to begin a drilling program this summer to obtain better records in areas where the subsurface geology is not well known. In addition, we plan to take geotechnical borings so that we may analyze sediment properties which in turn will assist us in stratigraphic correlation.

GEOLOGICAL SETTING

The surficial deposits in Milwaukee County consist of till and outwash deposits interbedded with fine-grained, stratified lake sediment and have been reported by numerous workers beginning with Chamberlin in 1877. The deposits are Wisconsinan in age and were deposited during the Woodfordian and Greatlakean Substages (Frye and Willman, 1960; Evenson and others, 1976). During this time successive glacial advances and retreats coupled with the development of proglacial lakes left a series of unlithified deposits in southern Milwaukee County. The Wisconsinan glacier flowed from the north and northeast down the Lake Michigan basin into Illinois and simultaneously spread westward and southwestward out of the basin into Wisconsin. As a result, the Pleistocene materials in the county consist of till, outwash, and lacustrine sediment.

STRATIGRAPHY

The most detailed work on stratigraphy has been done along the Lake Michigan bluffs (fig. 1; Stop 5 of Mickelson and others, 1983). The materials found in the lake bluffs are primarily unnamed units of the Oak Creek Formation (Mickelson and others, in press) and consist primarily of till, outwash, and lacustrine sediment. Inland the unlithified deposits are predominantly composed of till and glaciofluvial sediment. In the northern part of the county lacustrine sediment is overlain by the lowest till unit (Till III, fig. 1) of the Ozaukee Mem-

STRATIGRAPHIC CROSS-SECTIONS  
 OF THE LAKE MICHIGAN BLUFF SHORELINE  
 IN MILWAUKEE COUNTY, WISCONSIN

LOCATED IN SECTION 34, T.8N., R.22E.  
 OF NORTHERN MILWAUKEE COUNTY

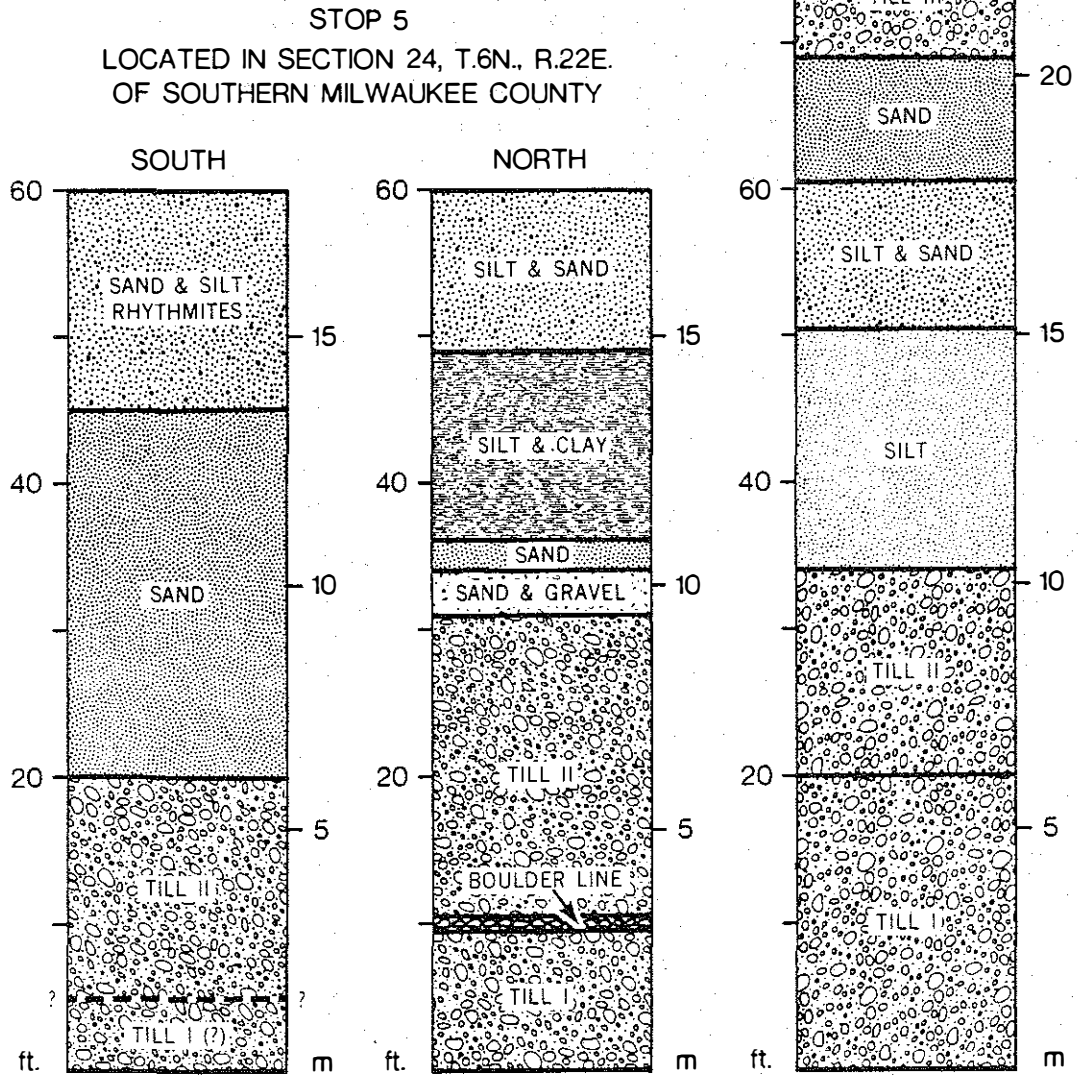


FIGURE 1.--Stratigraphic cross-sections of the Lake Michigan Bluff Shoreline in Milwaukee County, Wisconsin.

ber of the Kewaunee Formation (Mickelson and others, in press), and are also tentatively identified in the northwest quadrant of southern Milwaukee County.

The oldest till (Till I, fig. 1) exposed in the bluffs is the uppermost till member of the New Berlin Formation (Mickelson and others, in press). It is also tentatively identified as the lowest till unit in portions of southern Milwaukee County. The till was probably deposited during a glacial advance prior to 14,000 B.P. and probably correlates with the Haeger Till Member of the Wedron Formation of northeastern Illinois (Willman and Frye, 1970). Till I consists of material ranging in size from clay to boulders (2 m in diameter). The till at the bluffs and throughout the southern part of the county is primarily sandy silt with a large number of cobbles and boulders. Near the Lake Michigan shore the sand fraction ranges from 17 to 46 percent by weight, but as one moves west across

the county there are areas where it is significantly sandier, containing up to approximately 70 percent sand by weight. The color of the till ranges from light brownish-gray (10YR 6/2) to light gray (10YR 6/1) to brown (7.5YR 5/4).

Till I is overlain by a boulder-lag deposit that separates it from Till II at the Lake Michigan bluffs. This separation is not detectable in water-well records in the County. The till, probably deposited at approximately 13 000 B.P., is much clayier, and is the lowest till unit of the Oak Creek Formation. The till is primarily clayey silt near the Lake Michigan shore, but varies inland from clayey silt to silty clay with the clay-silt fraction ranging from 65 to 98 percent by weight. Till II was probably deposited during several closely spaced fluctuations of the ice front based on the fact that it is interbedded with glaciofluvial sand and gravel at many localities and in

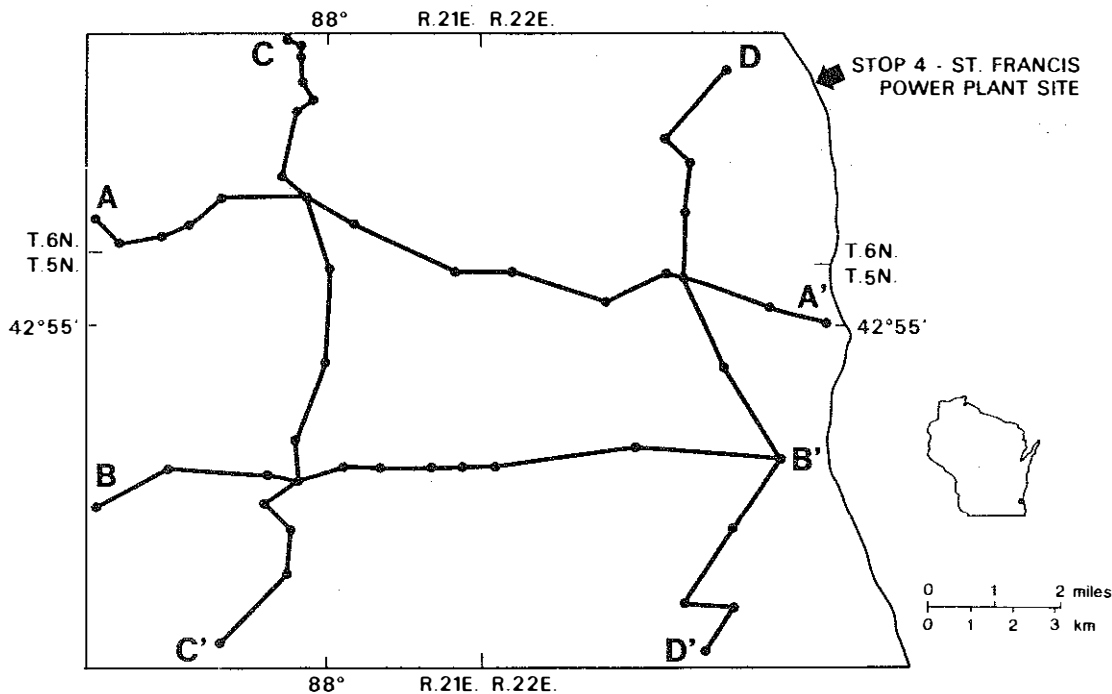


FIGURE 2.--Location map of cross-sections of the unconsolidated Pleistocene materials, southern Milwaukee County, Wisconsin.

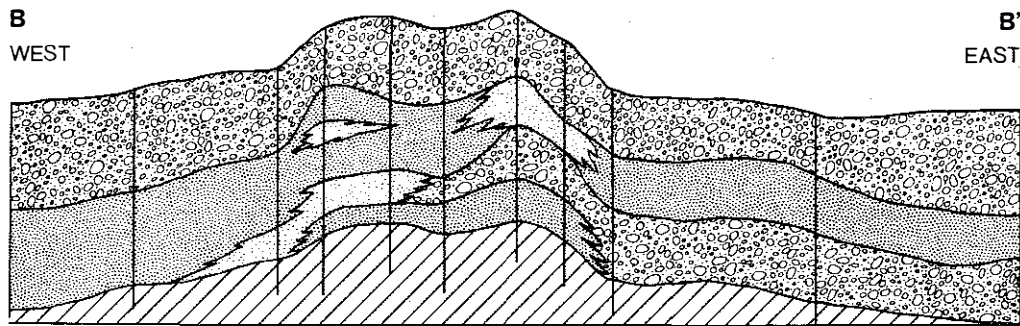
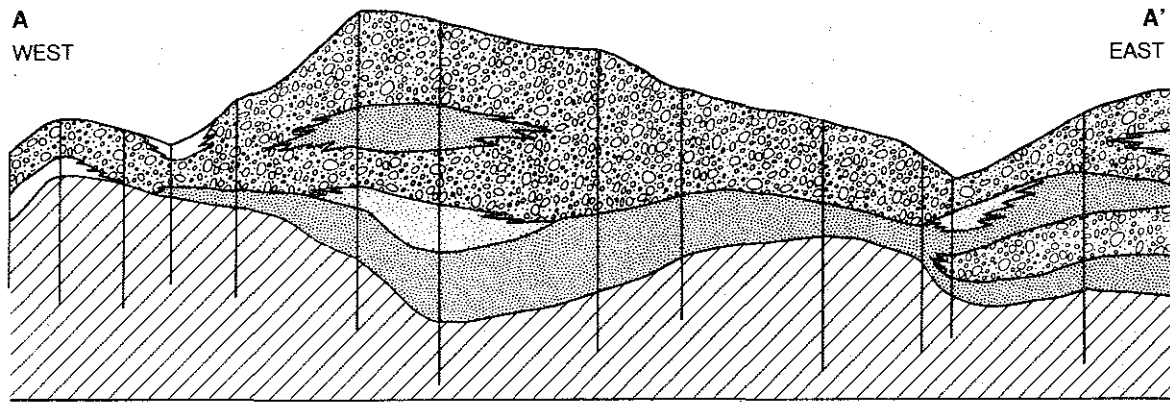
some localities with lacustrine sediment. The till is correlatable with the Wadsworth Till Member of the Wedron Formation in Illinois (Willman and Frye, 1970). Schneider (in Mickelson and others, in press) believes that it is very probably "... equivalent in age to the upper parts of the Horicon Formation of the Green Bay Lobe." The color of Till II ranges from dark brown (7.5YR 4/2, 4/4) to gray (10YR 5/1) or light gray (10YR 7/1). The abundant clay in this till was probably caused by incorporation of ice-marginal lake sediments into the glacial debris as glaciers moved west southwestward out of the Lake Michigan Basin.

Along the Lake Michigan bluffs Till II is often interbedded with sand and gravel and the till may be divided into an upper and lower unit. From our preliminary work, most of the till in southern Milwaukee County appears to belong to this unit. On the cross sections (figs. 3 and 4), the interfingering relationships among the upper and lower unit of the till and the outwash and lacustrine sediment are readily identifiable. In general, the till is separated by lacustrine and occasional glaciofluvial sediment along the Lake Michigan bluffs, but further to the west till and glaciofluvial sediment dominates.

Finally, there is some evidence in the northwestern part of southern Milwaukee County of a younger till, Till III (fig. 1), the Ozaukee Member of the Kewaunee Formation (Mickelson and others, in press). The Ozaukee Member is found in northern Milwaukee County and appears to extend into the northern (especially northwestern) sections of southern Milwaukee County. It ranges from reddish-brown (5YR 5/3) to light reddish-brown (5YR 6/3).

#### SUMMARY

The stratigraphy in the Lake Michigan bluffs in southern Milwaukee County is well known and has been documented by Klauk (1978) and Mickelson and others (1977). Our preliminary attempts to extend that stratigraphy inland resulted in the construction of cross sections A-A', B-B', C-C', and D-D' (figs. 3 and 4). In those sections Till II appears to be the principal till unit in the southern part of the county as determined from water-well records, initial geotechnical boring data, and from surficial exposures. Tills I and III are of much lesser significance in the area. Till I, found in the lake bluffs, is the oldest till in the area and probably forms part of the lowest till unit found in portions of the cross sections. Till III is found only in portions of the northern part of the area.



UWM CARTOGRAPHIC SERVICES

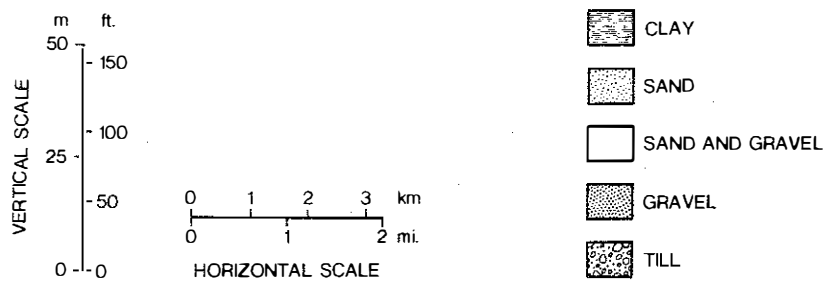


FIGURE 3.--East-west cross-sections A-A' and B-B' of the Pleistocene materials in southern Milwaukee County, Wisconsin. See figure 2 for section locations.

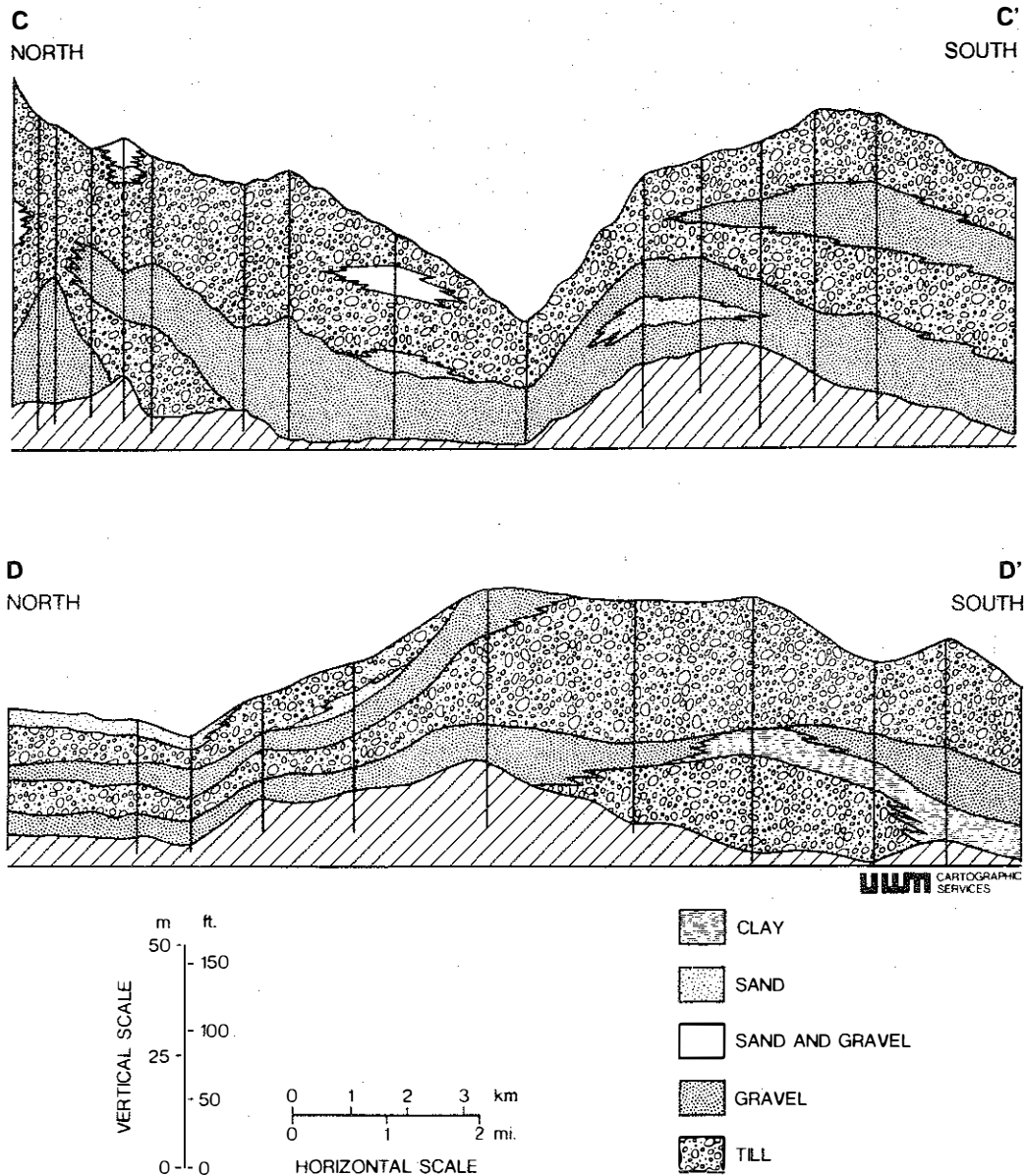


FIGURE 4.--North-south cross-sections C-C' and D-D' of the Pleistocene materials in southern Milwaukee County, Wisconsin. See figure 2 for section locations.

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