SOUTH FLORIDA RESEARCH CENTER

Report SFRC-85/02

Geologic Structure of the Surficial Aquifer System Underlying EVER and the BICY

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Geologic Structure of the Surficial Aquifer System Underlying Everglades National Park and the Big Cypress National Preserve

Report SFRC-85/02

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ABSTRACT

Well logs from 67 existing deep wells in southern Florida were used to determine the stratigraphy, depth, and extent of the Surficial Aquifer System underlying Everglades National Park and the Big Cypress National Preserve, Florida. Four geologic cross sections were prepared along well transects within the park and preserve to profile the aquifer system. The profiles reveal considerable heterogeneity in the lithologies but suggest two distinct zones: an upper zone of permeable limestones and clastics and a more heterogeneous lower zone of relatively impermeable fine-grained sands and sandy silts interbedded with permeable sands, limestones, and shelly marls.

The permeable upper zone and the more permeable beds of the lower zone were considered to be hydrologically connected; thus, the two zones were treated as comprising a Surficial Aquifer System. Presence of a regionally continuous "green clay bed" of the lower Tamiami Formation was verified, and it was considered the base of the aquifer system. Depth to this bed was determined for the 67 wells, and a contour map of depth to the base of the Surficial Aquifer System was constructed for Dade, Collier, and northern Monroe counties. Surficial Aquifer System depths in the study area range from 90 feet (27.4 m) to 300 feet (91.5 m) below mean sea level.

Key words: Everglades National Park, Big Cypress National Preserve, hydrology, hydrogeology, geology, well logs, aquifer.

INTRODUCTION

Properties of the Surficial Aquifer System underlying southern Florida's Everglades and Big Cypress basins (Fig. 1) create a unique relationship between the area's surface and ground water hydrology. Gleason (1984) describes the aquifer system as a series of interstratified highly permeable and relatively impermeable layers extending from the surface down to a regionally continuous basal zone. Fluctuating hydraulic gradients, and the permeabilities of the sands, limestones, sandstones, marls, and silts that compose the aquifer system control regional groundwater movement. Left undisturbed, this movement is generally slow freshwater seepage toward coastal areas, with some inland migration of seawater occurring during extended drought periods. Overall high permeability of the lithologies, together with low land elevations, lack of surface relief, and seasonally plentiful rainfall also allows the water table in the aquifer to rise above the land surface over large areas. These surface waters may then follow seaward gradients as "sheetflow" to tide, but also serve as a source of recharge for the Surficial Aquifer System. Thus, surface and groundwater are closely related, and disturbance of either must ultimately be viewed as having consequences for both.

The historic surface and groundwater hydrology of southern Florida, including the areas within what is now Everglades National Park and the Big Cypress National Preserve (Fig. 2), clearly have been perturbed by water management practices. For example, prior to drainage efforts spanning the last 100 years, Shark River Slough in Everglades National Park was the downstream end of the 9000 mi^2 (23,300 km^2) Kissimmee-Lake Okeechobee-Everglades basin (Fig. 1). This formerly integrated hydrologic system is now subdivided by hundreds of miles of canals and levees (Fig. 2) installed for purposes of drainage, flood control, and water supply. Leach et al., (1972) and various other authors have documented some effects of south Florida water management upon Everglades hydrology. Surface waters may now be retained by levees and released to downstream areas according to schedules. Groundwater may be intercepted by canals and diverted to other basins or to the ocean. Watersheds in the eastern part of the park have been similarly affected by water management external to park borders (Rose, Flora, and Rosendahl 1981), and most of the Big Cypress basin no longer retains its natural hydrologic character (Klein et al. 1970). Management of the park and preserve's water resources is, therefore, aimed at minimizing any deleterious effects of upstream or local water management practices and restoring historic surface and groundwater processes where practicable.

Physical-mathematical models capable of integrating regional surface and groundwater hydrology show promise as tools for evaluating park restoration proposals. Accuracy in such modelling is usually dependent upon the availability of extensive regionally distributed hydrologic and geologic data. However, insufficient data, theoretical constraints, or other limitations often require simplification of some model components. Such is often the case with subsurface flow, where two-dimensional representations of groundwater processes are widely employed despite the heterogeneous lithologies that may in fact be present (Dunne 1982). This report analyzes the available geologic data with the intent of defining the heterogeneous structure of the Surficial Aquifer System underlying the park and

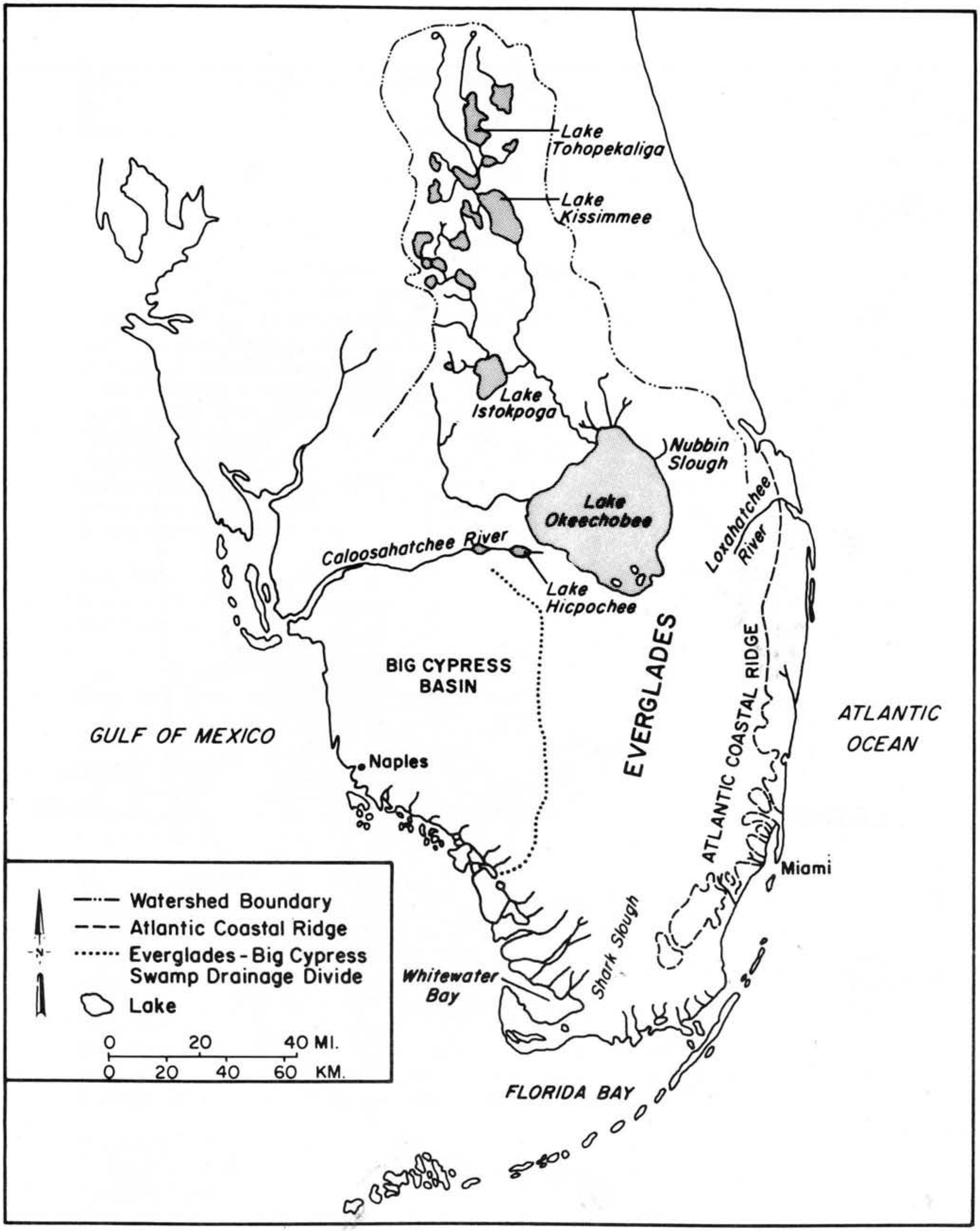

Figure 1. Generalized watersheds of pre-drainage south Florida.

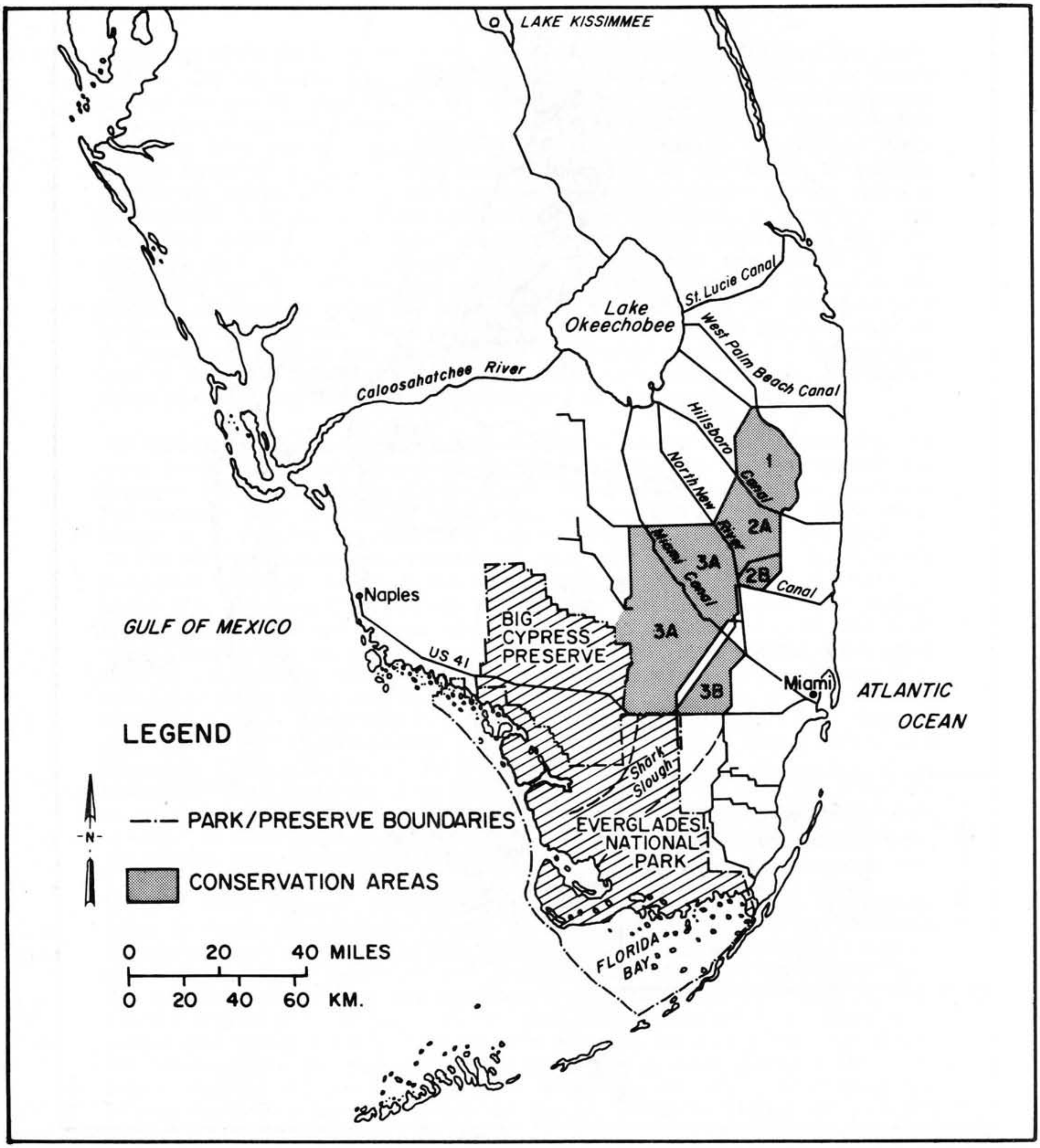

Figure 2. Some major features of south Florida's Water Management System.

preserve. However, emphasis is also placed on defining the extent of the aquifer from a simplified homogeneous perspective for application to most physically-based regional hydrologic modelling efforts.

GEOLOGY OF SOUTH FLORIDA

Late Cenozoic Geology

The Surficial Aquifer System consists of layered late Cenozoic era formations (Table 1) sloping from the central part of south Florida toward the coasts. The Naples to Miami cross-section shown in Figure 3 illustrates most of these formations. Stratigraphic unconformities in the formations resulted from distinct changes in sedimentary environments, followed by periods of erosion. During the early Pliocene when southern and eastern Florida were submerged, shelly marl beds, sandy limestones, and calcareous clays of the Caloosahatchee Marl and Tamiami Formations were being deposited. In the late Pliocene, a period of crustal instability caused the Floridan Plateau to emerge and differentially erode. Alternating freshwater and marine sediments in the late Pleistocene and Recent epochs were subsequently deposited, corresponding to sea level fluctuations during different glacial episodes (Parker et al. 1955; Parker and Cooke 1944).

The Tamiami Formation (Fig. 3) is the oldest member within the Surficial Aquifer System. It consists of two principle units; a lower unit of heterogeneous detrital sediments of variable permeability and an upper unit of generally highly permeable limestones and sandstones. The lower unit of the Tamiami Formation consists of shelly fine sands and greenish sandy, clayey silt beds. Throughout southern Florida these lower strata vary in thickness and extent, conforming with the surface of the underlying Hawthorn Formation (Schroeder et al. 1958). The lowest silt bed, a low permeability green clay, is identified by its argillaceous property rather than by mineral content (Peacock 1983). This bed and similar low permeability beds near the interface of the Tamiami and Hawthorn Formations form the major confining unit separating the Surficial Aquifer System from the underlying Floridan Aquifer (Gleason 1984).

The permeable upper unit of the Tamiami Formation extends as the surface bedrock over a large area of southwestern Florida (Fig. 4), including much of the Big Cypress basin. Dissolution and reprecipitation of dissolved minerals in the exposed limestone have formed a dense authigenic caprock throughout most of the preserve (Center for Wetlands 1979). The clastic members underlying the limestone in this area are generally argillaceous, shelly marls which, in part, have been indurated to a permeable limestone. Toward the east, the clastic and limestone beds increase in sand and silt content. Toward the west, the upper beds of the formation are interstratified with some green silty shell beds of the Caloosahatchee Marl which thicken toward the coast.

Pleistocene Age formations overlying the Tamiami Formation are primarily composed of marine and freshwater sediments. The Fort Thompson Formation (Fig. 3, Table 1) best reflects these alternating depositional environments. It consists of very permeable, fossiliferous, sandy marine limestones and calcareous sandstones interstratified with thin layers of dense freshwater limestone. In Dade County the

Table 1. Summary of late Cenozoic Formations of south Florida (modified from Schroeder et al. 1958).

Period	Epoch	Formation	Characteristics
Quartenary	Pleistocene	Pamlico Sand	Permeable quartz sand, white to black, very fine to coarse. Covers large areas underlain by Miami Oolite and the Anastasia Formation.
		Miami Limestone	Limestone, oolitic with a lower Bryozoan layer. Permeable.
		Anastasia Formation	Coquina, sand, calcareous sandstone, sandy limestone, and shell marl. Probably composed of deposits equivalent in age to marine members of Fort Thompson Formation. Permeable.
		Key Largo Limestone	Cavernous coralline reef rock. Very permeable.
		Fort Thompson Formation	Alternating marine and freshwater limestone and sandstone. Very permeable.
Tertiary	Pliocene	Caloosahatchee Marl	Sandy and marly clay, silt, and shell beds. Generally low permeability.
	Miocene	Tamiami Formation	White and greenish-gray clayey marl, silty shelly sand, and shell marl locally hardened to limestone. Upper unit is highly permeable, lower unit is of low permeability.
		Hawthorn Formation	Sandy, silty with "green clay" or marl. Generally impermeable, however, interstratified with sand and sandy pebble lenses.

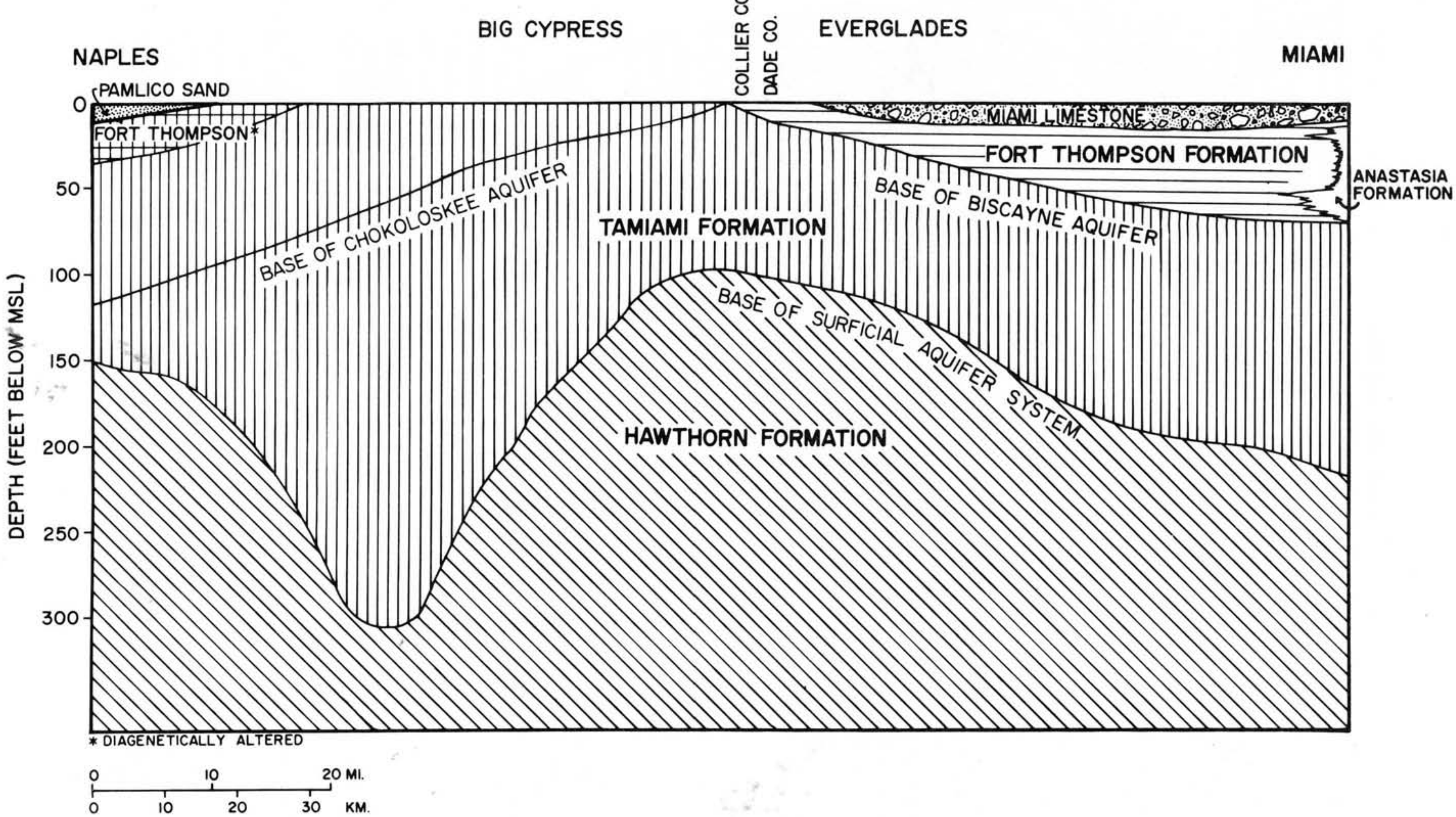

Figure 3. Geologic cross-section along a Naples-Miami transect.

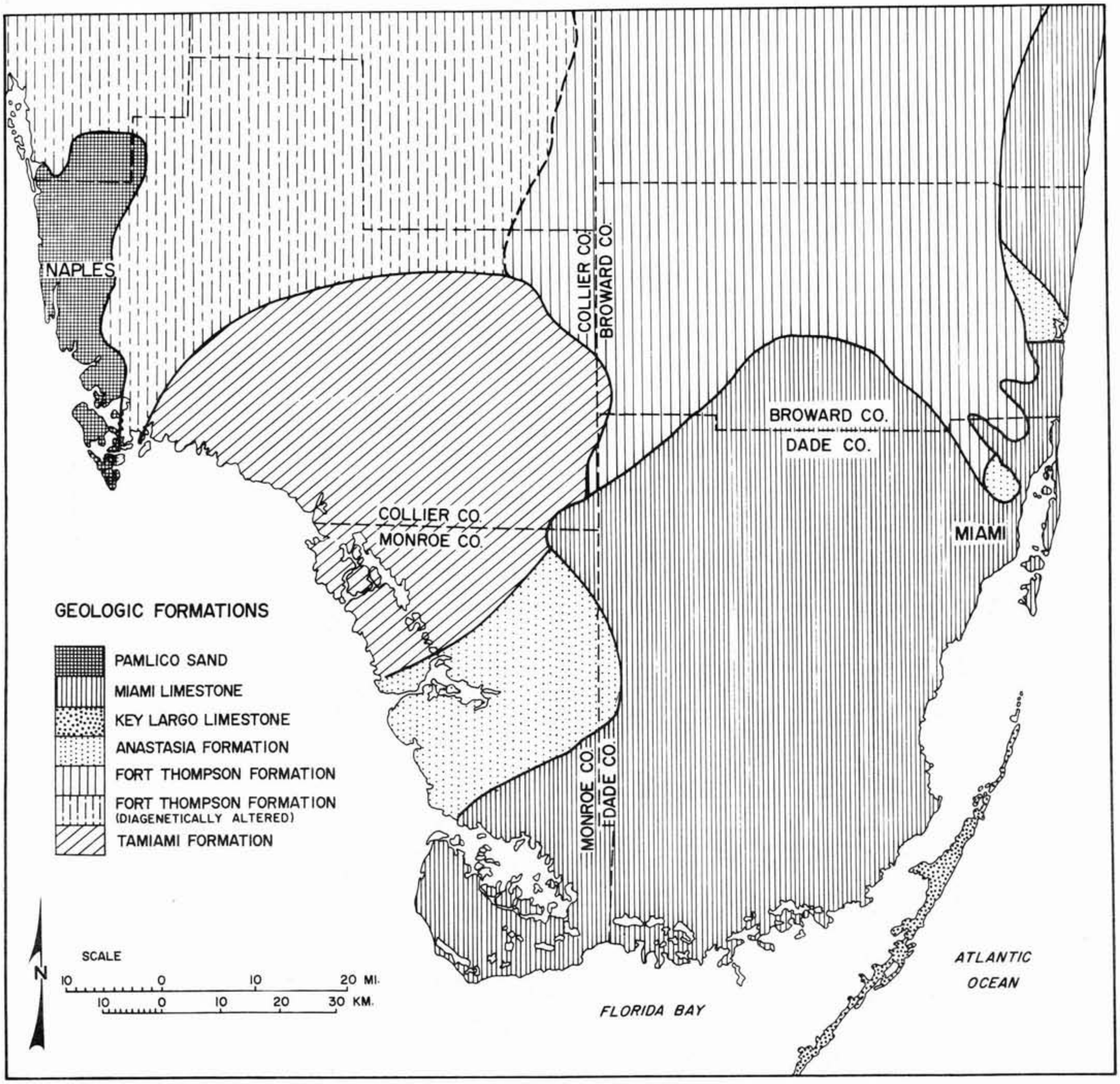

Figure 4. Surficial geology of south Florida (modified from Parker et al. (1955) and McCoy (1962)).

formation unconformably overlies the Tamiami Formation, forming a wedge which thickens toward the east coast (Fig. 3). The Fort Thompson Formation also overlies the Tamiami Formation toward Florida's west coast, forming the surface bedrock in portions of eastern and northern Collier County (Fig. 4). The Anastasia Formation (Fig. 4), a permeable limestone of marine origin, is approximately equivalent in age to the Fort Thompson Formation. It forms much of the surface bedrock in western Monroe County (Fig. 4) and thickens to the north. The Key Largo Limestone, a permeable coralline limestone, extends along the coastal area of southern Dade County and in the upper Florida Keys (Fig. 4). It yields large volumes of water due to its cavernous property but, like other permeable coastal formations including the Miami Limestone and Fort Thompson Formation, also permits salt water intrusion.

Younger Pleistocene formations were deposited over the Fort Thompson and Anastasia Formations in southeastern Florida. The Miami Limestone unconformably overlies these formations and forms the surface bedrock throughout most of Dade County. It consists of an upper, prominent oolitic facies and a lower bryozoan facies. The formation has high vertical permeablity but its horizontal permeability is lower (Parker et al. 1955). The Pamlico Sand Formation of late Pleistocene unconformably and intermittently overlies the Miami Limestone in Dade County. It is a permeable, generally unconsolidated clean quartz sand deposited during interglacial periods.

In southwestern Florida, younger Pleistocene marine sediments overlying the Tamiami Limestone are wedge-shaped (Fig. 3) and thicken toward the northwest. The limestones and sandstones are generally mapped as the Anastasia Formation but may be facies from a diagenetically altered Fort Thompson Formation and an unnamed member of the Tamiami Formation (Gleason 1984). The Pamlico Sand Formation unconformably overlies these limestone and sandstone beds and is a prominent surface feature along the gulf coast (Fig. 4).

The Biscayne and Chokoloskee Aquifers

Aquifer studies in south Florida have largely concentrated on two permeable water yielding zones within the Surficial Aquifer System; the Biscayne Aquifer along the southeast coast and the Chokoloskee or "Shallow Aquifer" (Parker 1982) of the southwest coast (Fig. 5). Geologic investigations including those by Parker (1952), Parker et al. (1955), Parker and Cooke (1944), Schroeder et al. (1958), and Klein and Hull (1978) provide detailed qualitative information and quantitative data on the Biscayne Aquifer. Reports by McCoy (1962, 1972), Klein (1972), and the Center for Wetlands (1979) are sources of similar information on the Chokoloskee Aquifer.

The Biscayne Aquifer is defined by hydrogeologic properties rather than by formational boundaries. It is wedge-shaped (Fig. 3), extending along the east coast and thinning westward to the Dade-Collier County line (Fig. 5). The bottom of the permeable limestone member of the Tamiami Formation (upper unit) forms the base of the aquifer. In most of Dade County the Miami Limestone forms the upper portion of the aquifer, with the oolitic facies forming the surface bedrock in large areas of Everglades National Park. Rapid infiltration into this oolitic limestone facilitates aquifer recharge, thus making the park a significant recharge source.

Figure 5. Surface extent of the Biscayne and Chokoloskee Aquifers.

Aquifer transmissivity varies with local changes in lithologic properties. Published transmissivity values range from 3.2 to 14 million gallons per day per foot (gpd/ft), with an average of 5 million gpd/ft (Parker et al. 1955).

The Chokoloskee Aquifer or Shallow Aquifer extends along Florida's southwest coast and thins northward and eastward to the Collier-Dade County line. The limestone member of the Tamiami Formation is the basal unit of the aquifer as it is in the Biscayne Aquifer, but it extends to the surface in the Big Cypress Preserve. Although the bedrock near the surface is very porous, its cavities generally have been filled with marl and sand deposits to a depth of 10 to 15 feet, thereby, locally impeding infiltration (Parker, G. G., pers. comm., August 1983). Transmissivity values for the Chokoloskee Aquifer are lower than those for the Biscayne Aquifer. Values in the western Big Cypress Preserve range from less than 1.2 to 3.5 million gpd/ft (Missimer 1981) with an average of 2.0 mgd/ft calculated for the northern portion of the preserve (Klein 1972).

While both aquifers are composed of quite permeable formations, hydrogeologic differences in the surface bedrock and in the underlying geology result in the broad ranges of transmissivity and recharge rates. Local hydrologic studies, therefore, may require on-site transmissivity measurements.

STUDY METHODS

Data Compilation

Appendix A summarizes deep well information available within and directly adjacent to the study area (Dade, Broward, and northern Monroe Counties). Sources included wells drilled by county, state, and federal agencies, and deeper exploration wells drilled by private industries. Well logs were obtained from files at the U. S. Geological Survey in Tallahassee, from private industries, and from various literature sources. Wells for which geologic logs were available are numbered 1 through 215 in Appendix A, followed by listings of wells for which log descriptions were not available. Well log information in Appendix A includes location, log description parameters, and depth to the the confining zone of the Surficial Aquifer System (the "green clay" bed of the Tamiami Formation's lower unit). Literature references are identified where applicable, and a "comments" column lists other available information.

Data analysis focused on wells drilled in Dade, Collier, and northern Monroe Counties within the boundaries of the park and preserve, however, well logs from outside the study area were also used for reference, continuity, and correlations. Of the 215 available well logs reviewed, only 67 contained information pertinent to determining the stratigraphy, composition, depth, and extent of the Surficial Aquifer System. Figure 6 shows the locations of the 215 wells, with numbers (as assigned in Appendix A) representing locations of the wells ultimately used in determining aquifer depth and extent. A separate column in Appendix A also indicates whether or not the data were used in the report.

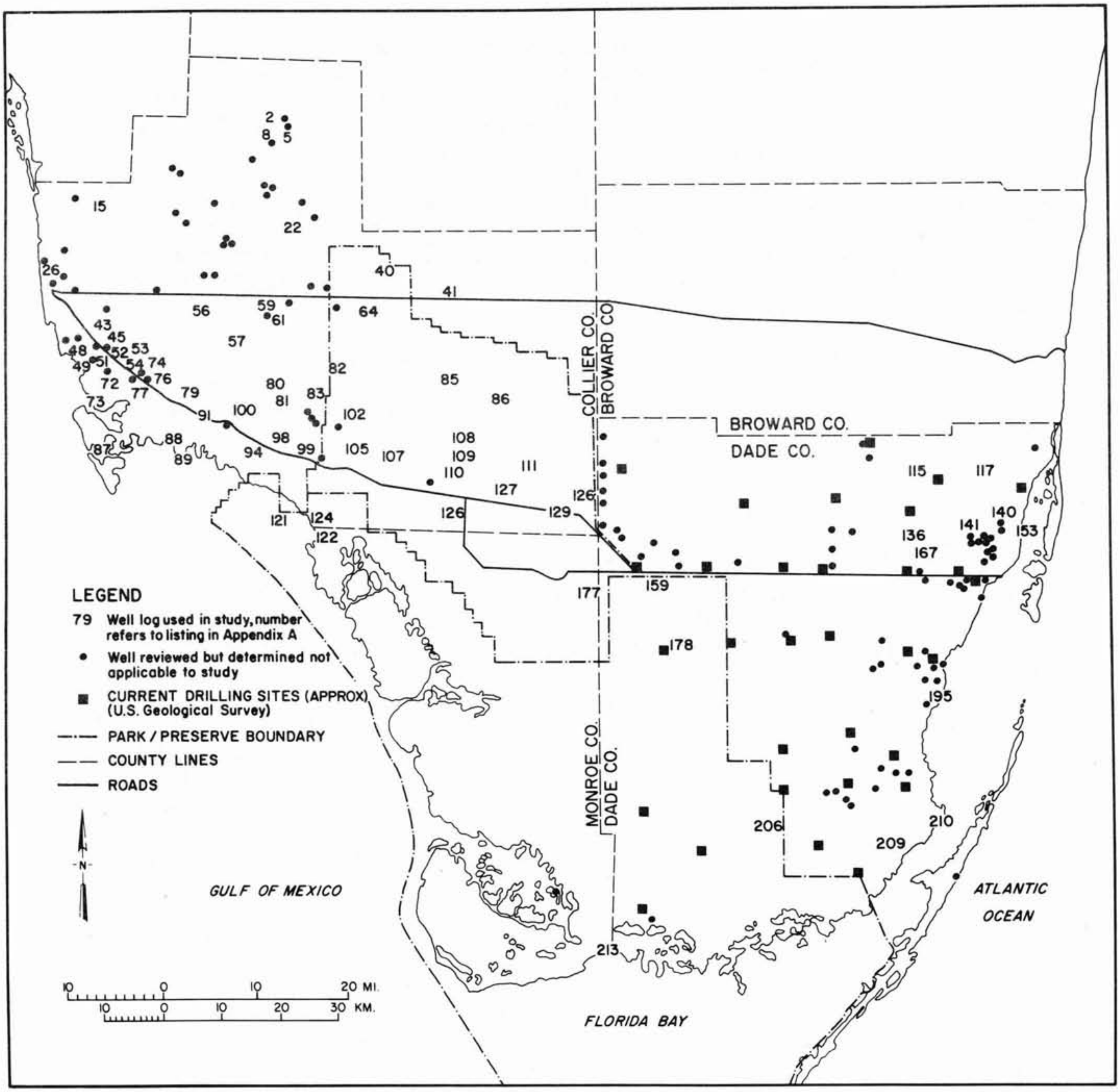

Figure 6. Locations of wells with descriptive logs available in Dade, Collier, and northern Monroe Counties, Florida.

Methods of Interpretation

Stratigraphic interpretations in the study were primarily based upon descriptive well logs. These geologic, lithologic, driller, and paleontological logs provided useful qualitative information, but varied in quality and content. Descriptions ranged from detailed records of texture, color, and mineral and fossil content at pre-determined intervals to driller logs which simply identify rock types.

Geophysical logs, including self-potential, electrical resistivity, and natural gamma data, were a valuable supplement to the descriptive logs. Electric resistivity and self-potential measurements simultaneously respond to variations in temperature, salinity, and porosity. A corresponding decrease in these signatures reflects a change in composition, most likely indicating a dense, less permeable zone. The example of an electric resistivity log corresponding to a stratigraphic description in Figure 7 shows a sustained lower resistivity associated with the green clay lens beginning at 120 feet (36.6 m). Natural gamma logs detect the presence of radioactive elements generally concentrated in clays, silty clays, or sands. A relative increase in gamma readings indicates a zone with increased phosphates and clay content, suggesting a clay lens or aquiclude.

Special considerations are necessary for interpretation of geophysical logs in coastal sedimentary environments of southern Florida. Signals may be affected by marine water trapped in sediments or by a fluctuating saltwater intrusion zone. Geophysical interpretations were, therefore, based on relative differences in recorded signals rather than actual signal magnitudes and were used only in supplementing descriptive logs.

Depth to the Surficial Aquifer System's confining zone was based on the hydrogeologic properties of the sediments at each well. Strata considered part of the Surficial Aquifer System were primarily composed of porous unconsolidated sediments and permeable limestones capable of storing and transmitting water. The underlying fine-grained sediments are also quite porous, however, their low permeability impedes water movement. The depth of the aquifer was, therefore, defined as the base of the last relatively permeable stratum overlying the regionally continuous "green clay" zone.

Definition of the "last relatively permeable stratum" is complicated by interstratification in lower portions of the aquifer system. Well W-7363 (Appendix B, D3 in Fig. 12), which is representative of the general geologic character of southeastern Dade County, illustrates this structure. Relatively impermeable beds of clay and fine-grained sands begin at 63 feet (19.2 m) but are interstratified with layers of coarse sand and shell. Well drilling and pump tests by the U. S. Geological Survey (Miami Subdistrict) at several sites within and adjacent to the park (Fig. 6) have shown that yield from the clay and fine sand beds was poor, but that large volumes of water could be pumped from the more permeable coarse sand and shell beds (pers. comm., Carmen Causaras, U. S. Geological Survey, Miami Subdistrict). Observations at these sites verified that the low permeability beds are not regionally continuous and, thus, do not confine the more permeable zones. Therefore, the regionally continuous "green clay" zone (beginning at 225 feet (68.6 m) at well W-7363) was considered the confining stratum both in the park and for comparable structure throughout the study area.

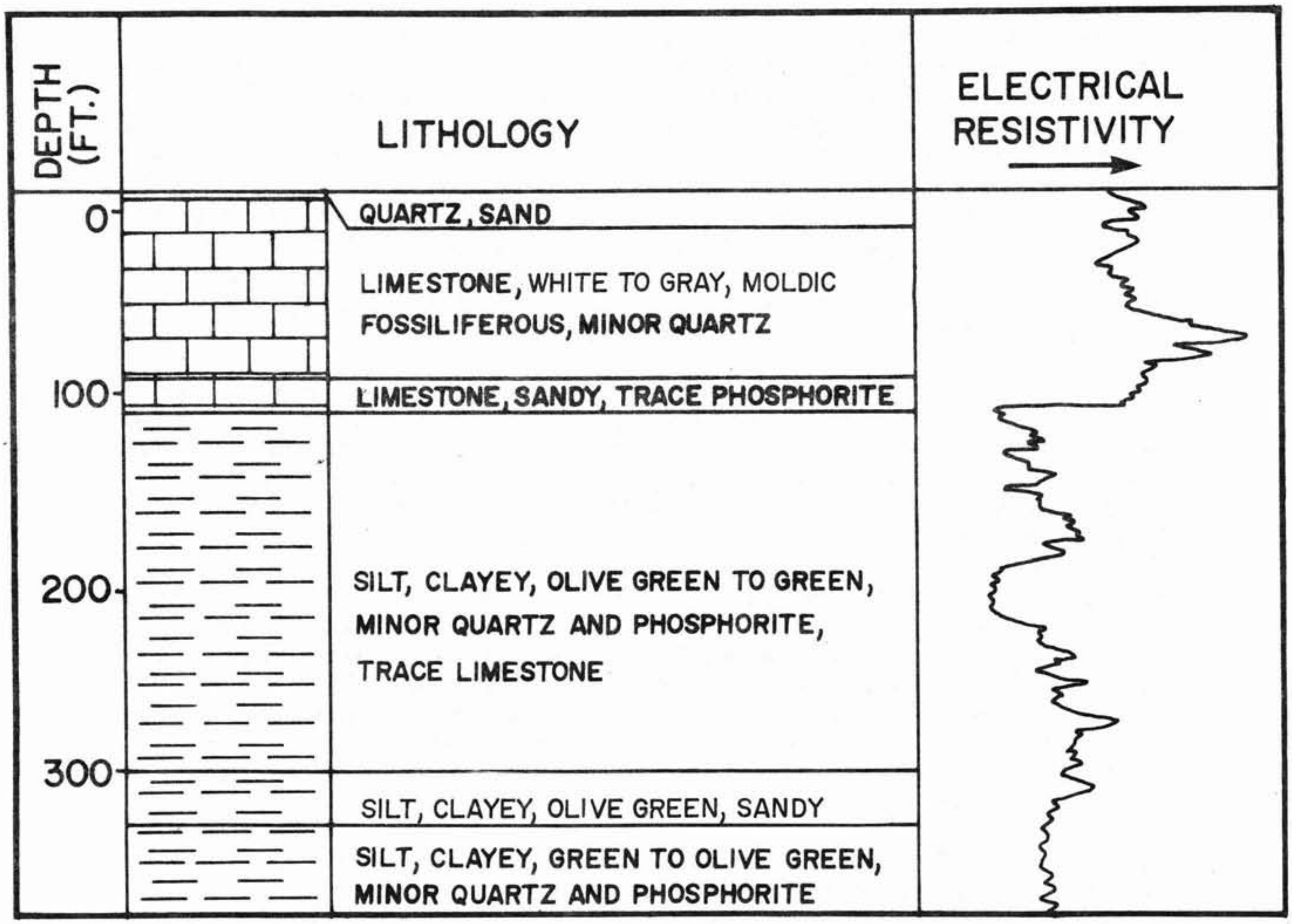

Figure 7. Example of a descriptive well log with corresponding electric resistivity log.

When correlating aquifer depths between well sites it was important to consider the nonconformity and heterogeneous character of the underlying geology. Because the permeability of a lithologic unit is significant only relative to its thickness, extent, and the nature of the surrounding beds, stratigraphic interpretations were based upon trends in lithologic properties rather than simply by formational boundaries.

RESULTS AND DISCUSSION

Geologic Cross Sections

Four geologic cross sections were prepared to profile the Surficial Aquifer System underlying Everglades National Park and the Big Cypress National Preserve (Fig. 8). Two transects, A-A', and C-C', traverse the preserve from north to south and a third transect, B-B', runs west-east, paralleling U. S. 41. In Dade County a northwest to southeast transect, D-D', passes through the north central part of the park and extends to the southeast coastline.

The lithology along transect A-A' (Fig. 9) is primarily a limestone unit interstratified and underlain by sandy and shelly beds (A1-A5). The low permeability green clay zone occurs at approximately 300 feet (91.5 m) below mean sea level along the transect except at well A6. Here the confining bed rises sharply, indicating a rapid thinning of the Surficial Aquifer System to the north.

Transect B-B' (Fig. 10) shows that the Surficial Aquifer System structure is dominated by permeable limestones and shelly sands. The aquifer thickens from the gulf coast toward south central Collier County where it reaches a maximum thickness of 300 feet (91.5 m). A rapid thinning occurs from this point to the east. Strata near the gulf coast are relatively homogeneous, consisting primarily of limestone underlain by sands (B3) or sandy limestone (B1). Calcareous marl is more prevalent in the west (B2) than toward the eastern Big Cypress area. At site B4, the limestone and shelly sand is interstratified with silt and sandstone lenses. As the aquifer thins toward the east from this point, a marked increase in shelly sands occurs (B5) with strata becoming primarily limestone and sandy limestone further east.

The north-south transect C-C' (Fig. 11) passes through the central and eastern portion of the preserve. The profiles give areal perspective to the eastward thinning of the aquifer indicated by transect B-B'. The Surficial Aquifer System thickness averages only 160 feet (48.8 m) along the transect compared to 300 feet (91.5 m) along transect A-A'. The lithology is primarily a surface limestone underlain by sands (C3, C4) or interstratified with sandstone (C1, C2, C5) and shelly limestone beds (C2, C5).

Profile D-D' (Fig. 12) through Everglades National Park shows a gradual thickening of the aquifer system toward the east coast. The maximum depth to the top of the confining zone reaches 260 feet (79.3 m) at D4. The stratigraphy at the northern part of the park (D1) conforms with the lithologic properties in the southern Big Cypress Preserve. The heterogeneous sand and silt zones are interstratified with sandstone and shelly limestone beds. To the east, the limestone thickens (D3, D4) and is underlain by sand and sandy silt zones with lenses of coarse sand and shell beds.

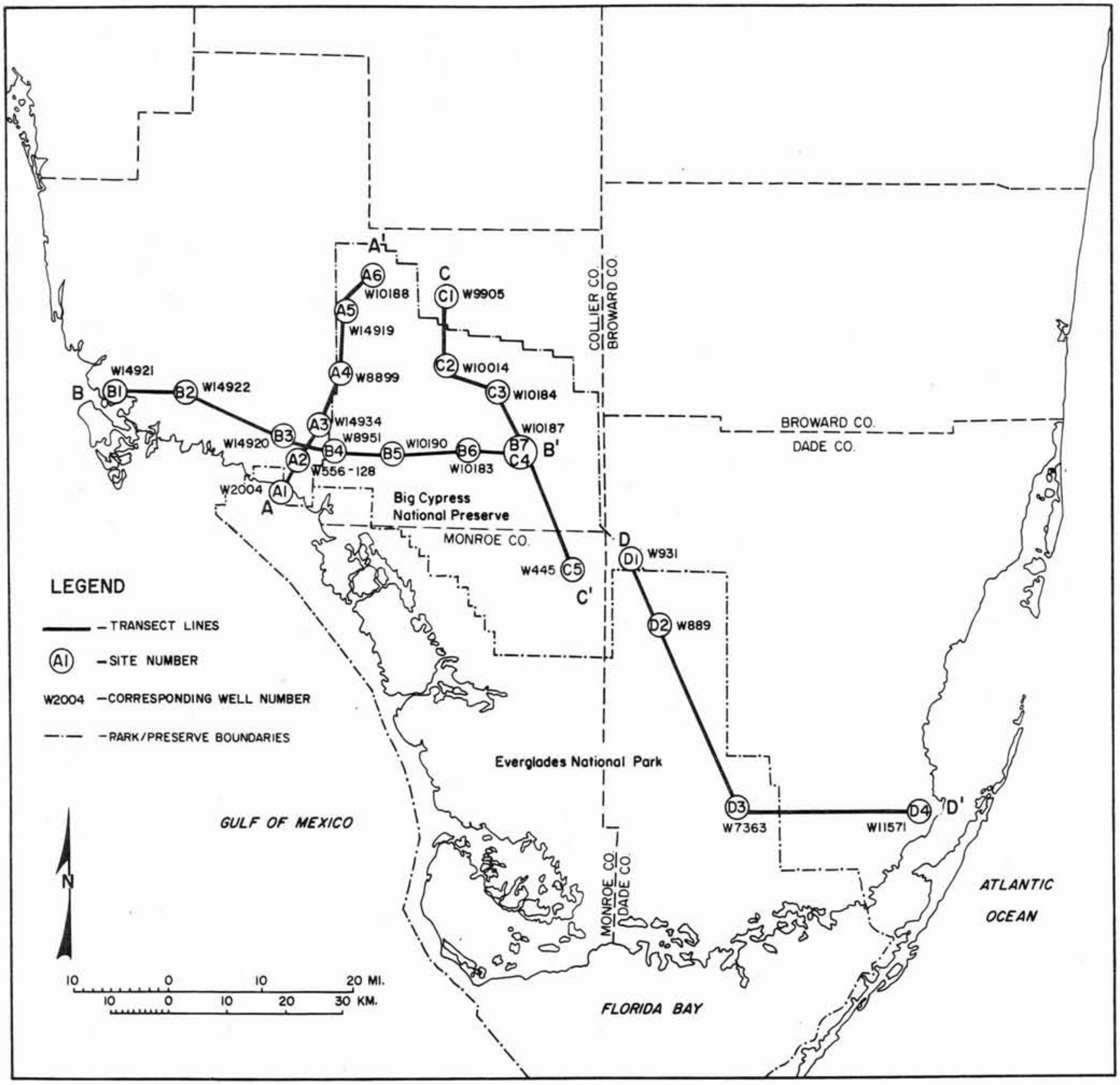

Figure 8. Transects of geologic cross-sections through Everglades National Park and the Big Cypress National Preserve.

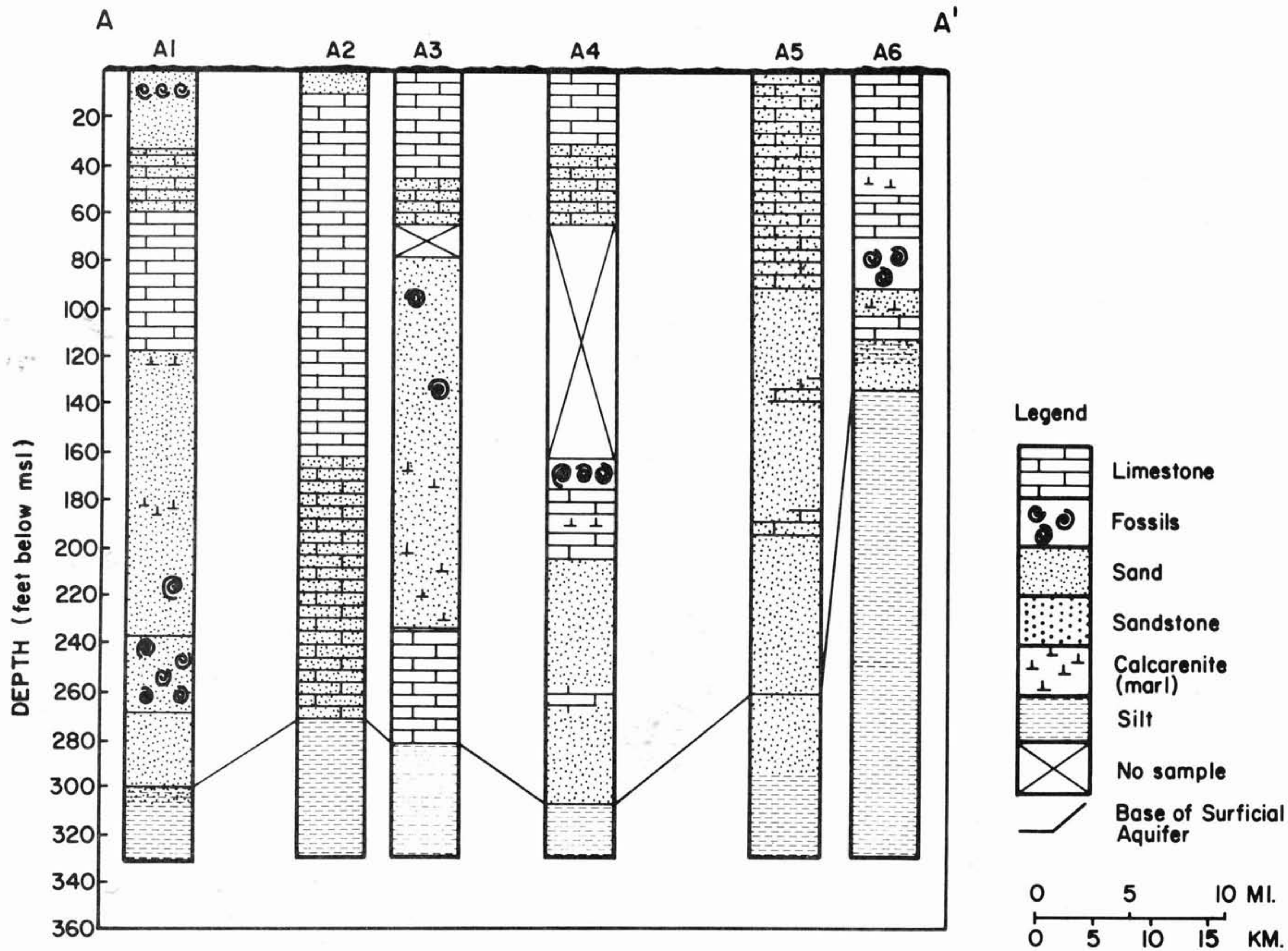

Figure 9. North-south geologic section (A-A') along western Big Cypress National Preserve.

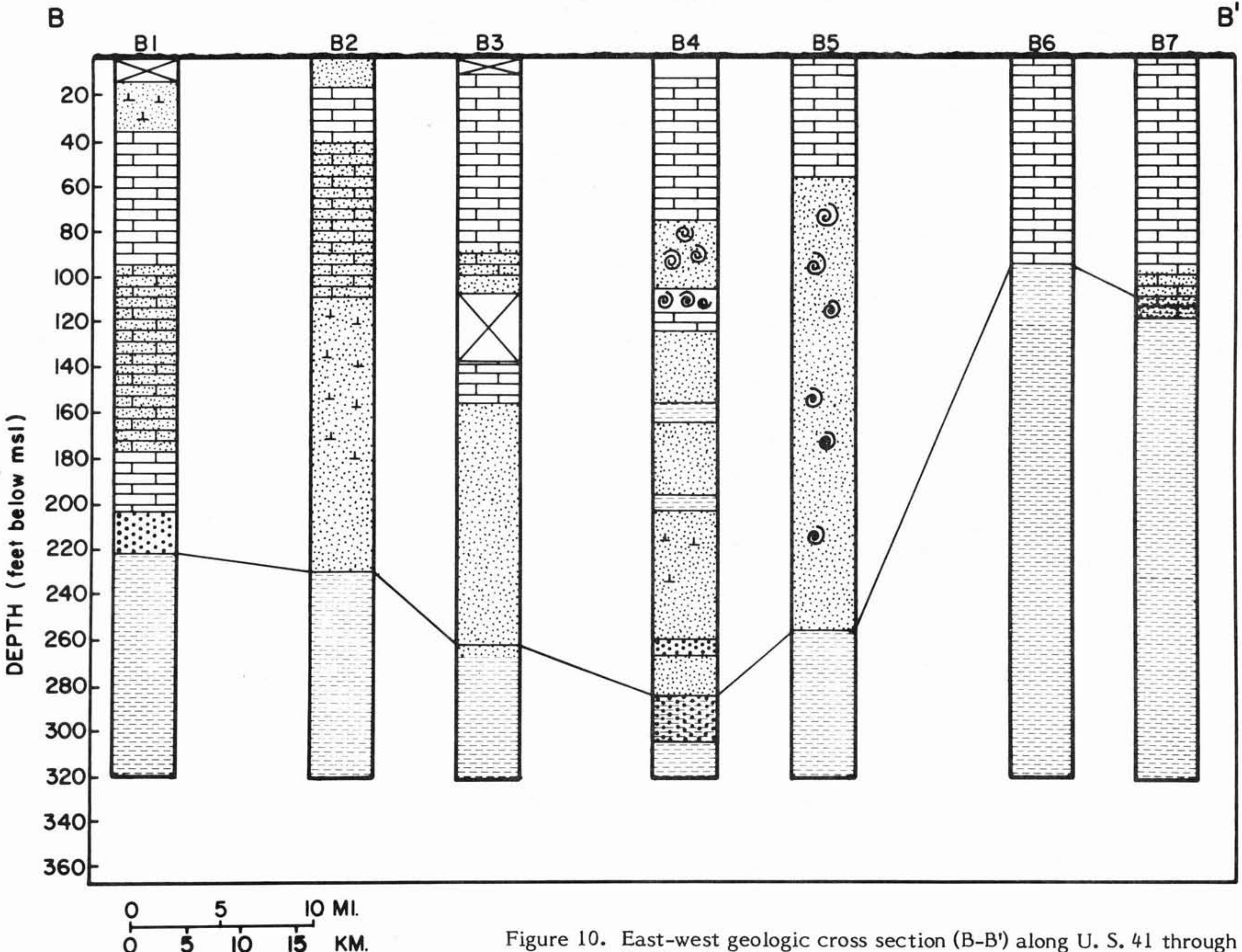

Figure 10. East-west geologic cross section (B-B') along U. S. 41 through Collier County.

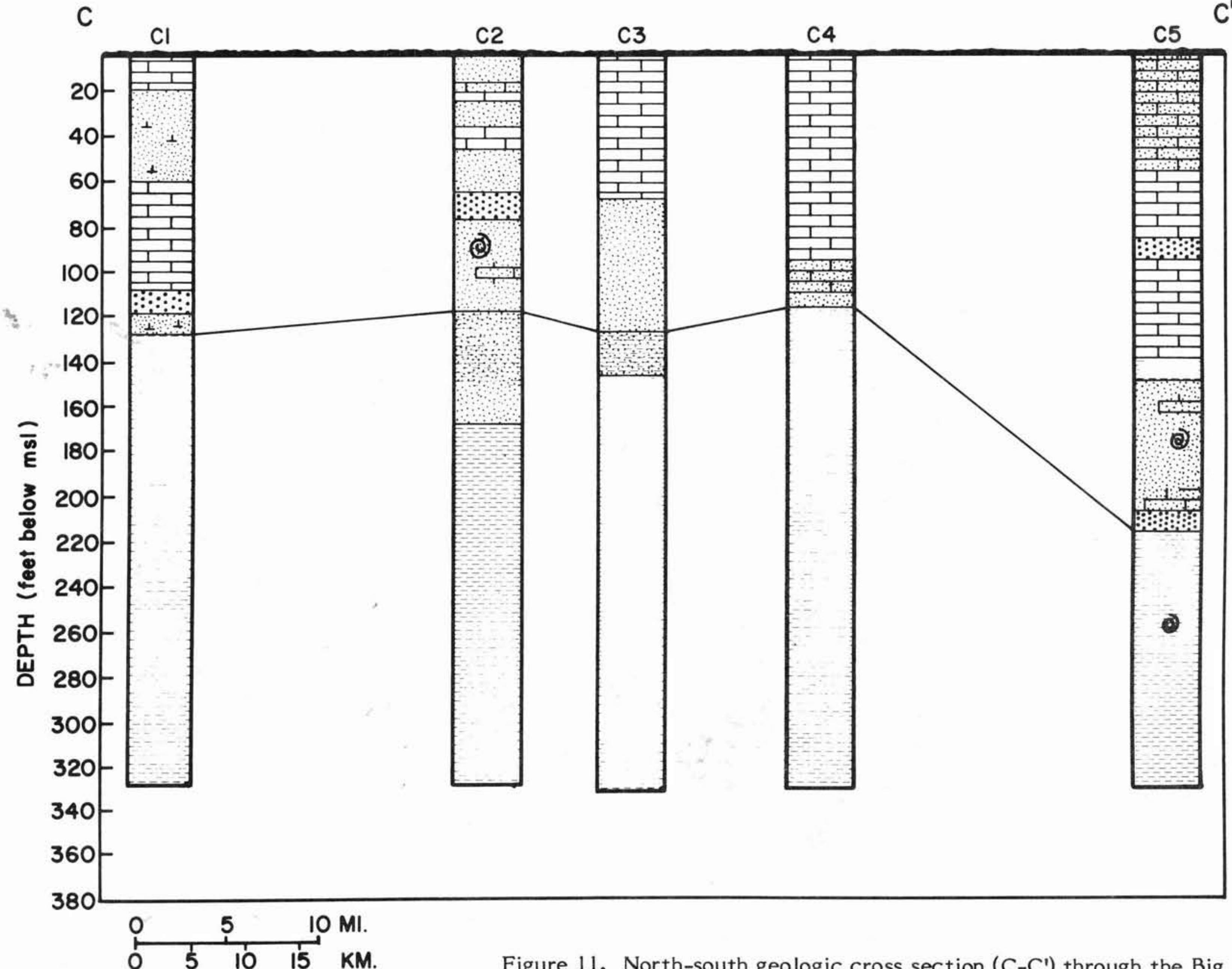

Figure 11. North-south geologic cross section (C-C') through the Big Cypress National Preserve.

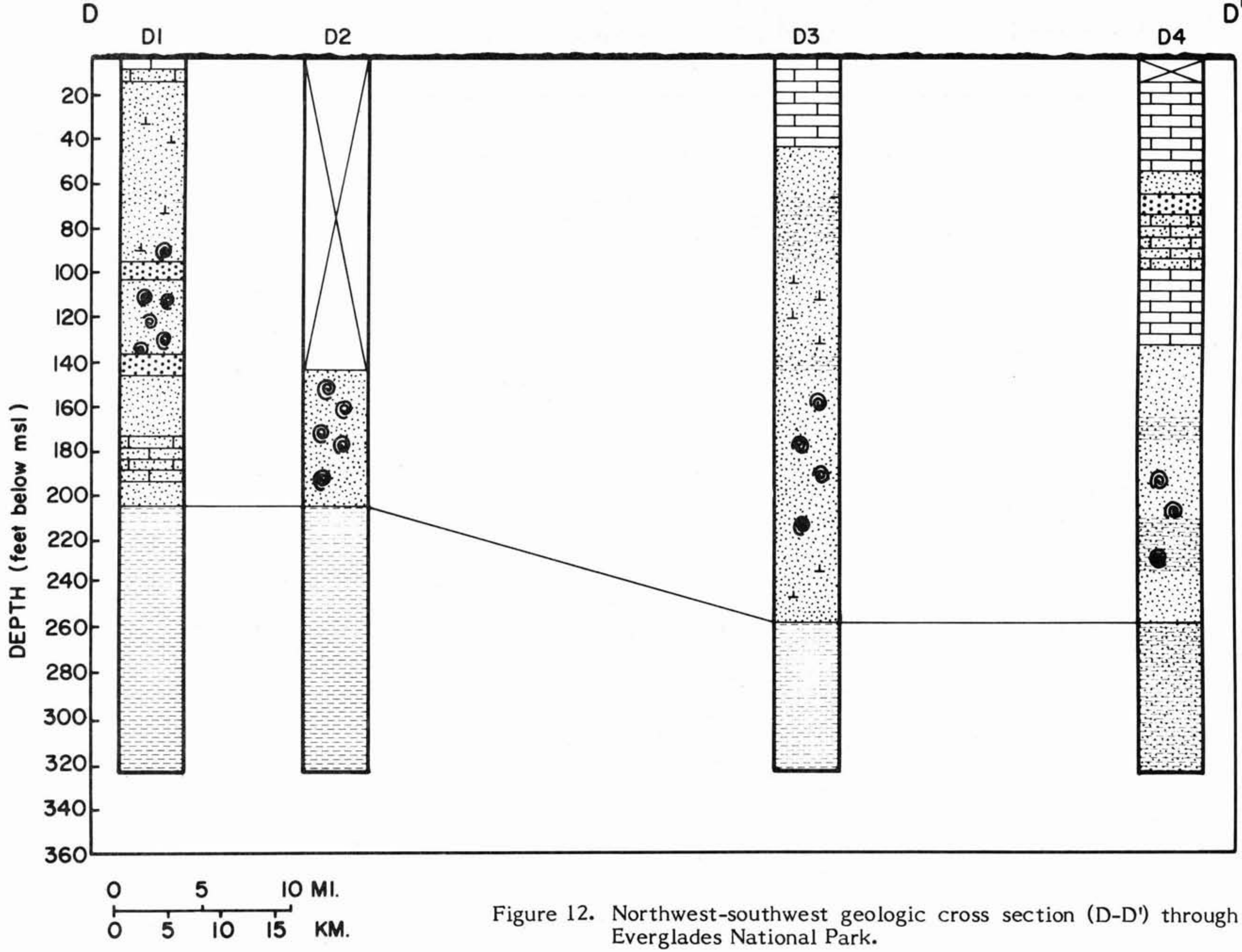

Figure 12. Northwest-southwest geologic cross section (D-D') through Everglades National Park.

The four geologic cross sections verify the existence of two distinct aquifer zones beneath the park and preserve. The upper zone consists of permeable limestones and clastics and includes the Biscayne and Chokoloskee Aquifers. The lower zone is a more heterogeneous sandy and sandy-silt section interbedded with permeable sands, limestones, and shelly marls. As discussed previously, the two zones are hydrologically connected, and together comprise a regional Surficial Aquifer System.

One important application of the profile information is in developing physically based hydrologic simulation models for use in park water delivery management. It is doubtful, however, that an expensive, finely detailed 3-dimensional aquifer representation of the vast Everglades and Big Cypress basins would yield significantly greater accuracy in regional water level prediction than would a simplified model. The following section, therefore, presents the data as a contour map of a simplified, homogeneous Surficial Aquifer System extending down to the system's confining zone.

Contour Map of the Base of the Surficial Aquifer System

Depths to the top of the confining material in each well used in the study were plotted on a base map and contours were constructed at 20 foot intervals (Fig. 13). The contours in the eastern portion of the study area reveal a wedge-shaped aquifer system with the thickest portion near the Atlantic Coast. There it reaches a depth of 260 feet (79.3 m) below msl and gradually thins both to the north and west to a minimum of 90 feet (27.4 m) below msl in eastern Collier County.

West of the node in eastern Collier County the aquifer system again gradually thickens, reaching a maximum depth of 300 feet (91.5 m) below msl in a depression near the western border of the Big Cypress National Preserve. Contours based upon the intersection of transects A-A' and B-B' show this depression to be north-south trending. The depression may have served as a funnel through which clastic sediments were deposited in a marine environment (Peacock 1983). West of the depression the aquifer system thins, conforming with the Shallow Aquifer depths determined by Jakob (1983) for the area south of Naples.

Extrapolated areas on the contour map indicate large areas of Dade, Collier, and northern Monroe Counties where subsurface geology data are vague or nonexistent. Field studies presently being conducted by the South Florida Water Management District and the U. S. Geological Survey (Miami Subdistrict) should make significant contributions to filling these gaps in lithologic information and determining corresponding transmissivity data.

SUMMARY AND CONCLUSIONS

Protection of Everglades National Park and the Big Cypress National Preserve in an atmosphere of increasingly competitive regional water needs requires sophisticated knowledge of the area's hydrology. Physically-based mathematical models integrating surface and subsurface hydrology should prove useful in simulating hydrologic processes and evaluating restoration proposals, however, considerable data aquisition and processing are necessary for their development and calibration.

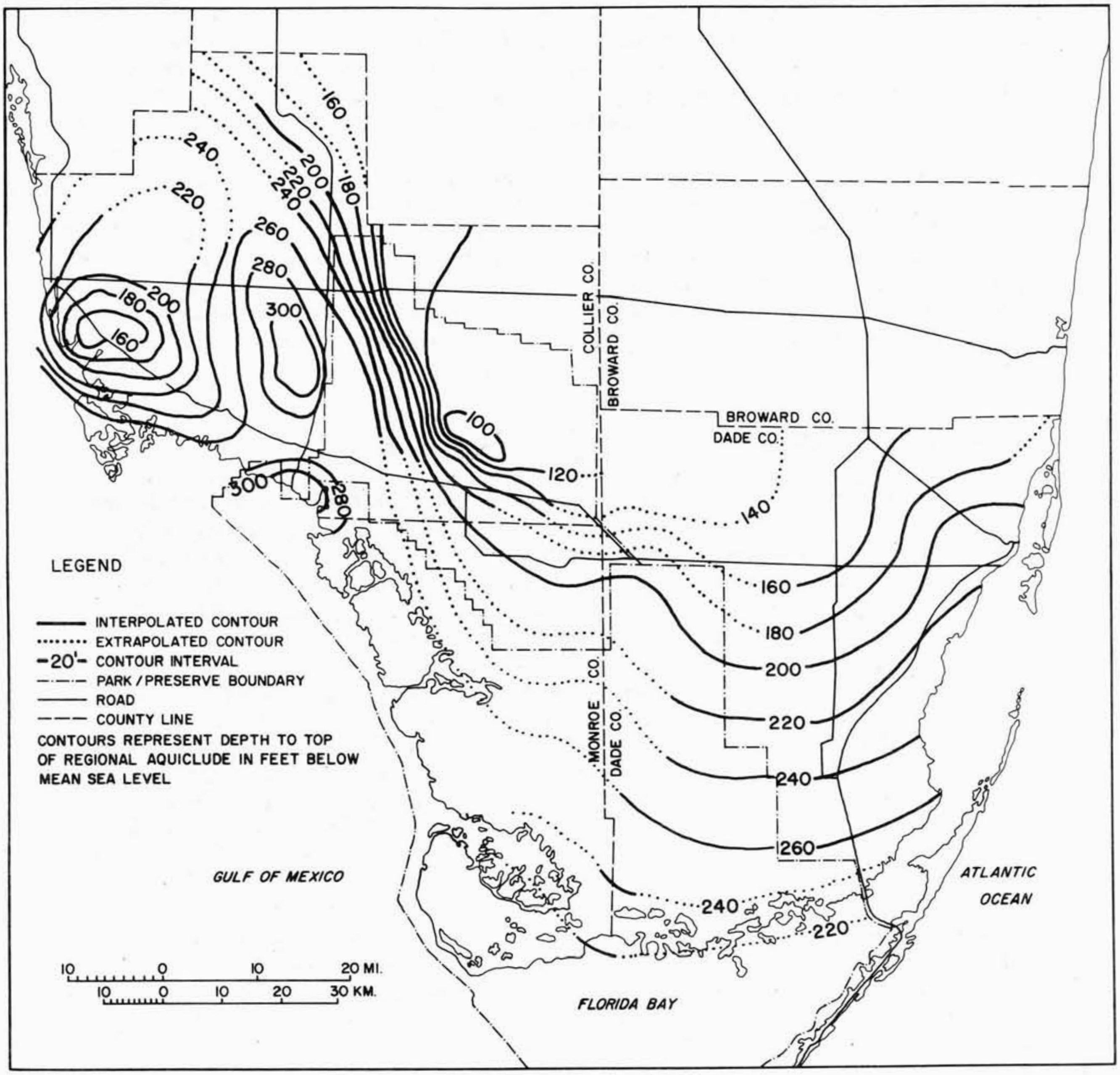

Figure 13. Contour map of the base of the Surficial Aquifer System in Dade, Collier, and northern Monroe Counties, Florida.

This report summarizes the Surficial Aquifer System structure underlying the park and preserve and presents this structure in a form appropriate for use in most regional scale hydrologic modelling.

Conclusions of the report are summarized as follows:

(1) Sufficient well log information is available to profile the stratigraphy of four transects in the Big Cypress National Preserve and Everglades National Park. Data analyses from areas where logs were available show considerable heterogeneity in the aquifer lithologies and their corresponding hydrologic properties. The upper, more permeable unit consists of clastics and limestones comprising the Biscayne and Chokoloskee Aquifers. The lower unit is largely a shelly, sandy, marly aquitard interstratified with permeable clastic and limestone zones. More permeable beds within the lower zone store and transmit water and may be considered a functional part of the Surficial Aquifer System.

(2) The green clay zone of the lower Tamiami Formation appears to be continuous throughout the study area and may be considered the base and confining bed of the Surficial Aquifer System within the park and preserve.

(3) Though the stratigraphic profiles exhibit considerable heterogeneity, the aquifer structure may be simplified into a homogeneous, two-dimensional representation suitable for most regional, physical-mathematical modelling purposes. This simplification is presented as contours of the base of the aquifer system, with depths to the base ranging from 90 to 300 feet (27.4 to 91.5 m) below msl.

(4) Extrapolated areas on the contour map indicate areas where data are insufficient for analysis. Further investigations into aquifer structure and hydrogeology are necessary both to upgrade the contour map and to assure proper assignment of transmissivity values associated with the simplified aquifer model.

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Appendix A. Index of wells investigated.

EXPLANATION OF CODES.

Identification number.

Numbers identify wells with logs reviewed for the report. Listings without numbers at the end of the appendix are wells for which lithologic descriptions were not available.

Well number prefix codes.

Wells drilled in various locations throughout the study area and filed with the U. S. Geological Survey (USGS) in Tallahassee are catalogued by the USGS "W" series numbers. Wells designated "C" or "G" were drilled in either Collier or Dade County, respectively, but are not on file with the USGS and, thus, were not redesignated with a "W" series number. Information for wells with the prefix "E" is available from Exxon Corporation. Log descriptions located in the literature are cited in the reference column.

County.

D - Dade County
C - Collier County
M - Monroe County

Type of geologic log.

1. None
2. Descriptive (lithologic, geologic)
3. Driller
4. Paleontological

Geophysical and hydrologic information.

Types of available geophysical or hydrologic data:

1. None
2. Electric resistivity logs
3. Self potential logs
4. Natural Gamma logs
5. Hydrologic data

References

Well listed is on file at the U. S. Geological Survey in Tallahassee unless otherwise noted.

Information used.

Y - Yes, the well log was used to determine the structure of the Surficial Aquifer System

N - Well log data was reviewed but determined to be inappropriate for this analysis

Comments.

Lists any additional information pertinent to the well, other identification numbers found in literature, or references to this publication.

Appendix A. Index of wells investigated.

Identification Number	Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
1	W 3879	C	46/29/20	184	3	180	5		Y	
2	W 13721	C	46/29/31	195	3	190	5		Y	
3	W 4724	C	46/29/33	250	3		5		N	
4	C 626126	C	46/29/33	123	2		1	McCoy, 1962	N	
5	C 625123	C	46/29/34	303	2	212	1	McCoy, 1962	Y	
6	C 621135	C	47/27/26	123	2		1	McCoy, 1962	N	
7	C 621136	C	47/27/27	130	2		1	McCoy, 1962	N	
8	W 3858	C	47/29/03	292	3	204	5		Y	
9	W 4235	C	47/29/10	164	3		5		N	
10	C 626123	C	47/29/16	150	2		1	McCoy, 1962	N	
11	C 622125	C	47/29/28	120	2		1	McCoy, 1962	N	
12	W 118	C	48/25/23	141	2		1	McCoy, 1962	N	C617-146
13	W 12885	C	48/26/14	90	3		5		N	
14	W 10279	C	48/26/19	64	3		5		N	
15	W 3343	C	48/26/22	300	2	240	1	McCoy, 1962	Y	C616-141
16	W 10876	C	48/27/25	300	3		1		N	
17	C 616131	C	48/28/21	130	2		1	McCoy, 1962	N	
18	W 11957	C	48/29/05	101	3		1		N	
19	W 11959	C	48/29/05	100	3		1		N	
20	W 11972	C	48/29/05	125	3		1		N	

Appendix A continued.

Identification Number	Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
21	W 1787	C	48/29/13	11500	3		1		N	
22	W 10252	C	48/29/34	2055	2	250	1		Y	
23	W 820	C	48/30/29	11626	2		1		N	
24	C 614146	C	49/25/01	115	2		1	McCoy, 1962	N	
25	C 613148	C	49/25/09	142	2		1	McCoy, 1962	N	
26	W 13686	C	49/25/09	640	2	240	5		Y	
27	W 8842	C	49/25/10	85	3		1		N	
28	W 8843	C	49/25/10	85	3		1		N	
29	C 130	C	49/25/21	71	2		1	McCoy, 1972	N	
30	W 10284	C	49/26/30	63	3		5		N	
31	W 11960	C	49/28/03	100	3		1		N	
32	W 11965	C	49/28/03	100	3		1		N	
33	W 11973	C	49/28/03	125	3		1		N	
34	W 11958	C	49/28/20	92	3		1		N	
35	W 11961	C	49/28/20	90	3		1		N	
36	W 11974	C	49/28/20	114	3		1		N	
37	W 11979	C	49/28/32	100	3		1		N	
38	W 4236	C	49/30/30	170	3		5		N	
39	C 609120	C	49/30/32	122	2		1	McCoy, 1962	N	
40	W 10188	C	49/31/21	1120	2	130	1	Peacock, 1983	Y	A6 in this report

Appendix A continued.

Identification Number	Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
41	W 9905	C	49/32/33	1265	2	120	1	Peacock, 1983	Y	C1 in this report
42	C 174	C	50/26/03	140	2		1	McCoy, 1972	N	
43	W 14534	C	50/26/03	540	2	173	4	Peacock, 1983	Y	C-2020, A3 in this report
44	C 607145	C	50/26/18	141	2		1	McCoy, 1962	N	C-185
45	C 2003D	C	50/26/23	170	2	179	2,3,4	Jakob, 1983	Y	
46	C 606143	C	50/26/28	142	2		1	McCoy, 1962	N	
47	C 2011D	C	50/26/28	140	2		2,3,4	Jacob, 1983	N	
48	C 2002D	C	50/26/30	167	2	167	2,3,4	Jakob, 1983	Y	
49	E 81	C	50/26/30	280	3	170	2,3	Exxon Corp.	Y	
50	C 2007D	C	50/26/31	69	2		2,3,4	Jakob, 1983	N	
51	W 2009D	C	50/26/33	190	2	175	2,3,4	Jakob, 1983	Y	
52	C 2008D	C	50/26/34	180	2	160	2,3,4	Jakob, 1983	Y	
53	C 2012D	C	50/26/36	220	2	150	2,3,4	Jakob, 1983	Y	
54	C 2017D	C	50/26/36	340	2	150	2,3,4	Jakob, 1983	Y	
55	C 11	C	50/28/05	67	2		1	McCoy, 1972	N	
56	W 14601	C	50/28/06	1000	2	218	4	Peacock, 1983	Y	C-2022D
57	W 10223	C	50/28/22	1359	3	254	2	Peacock, 1983	Y	
58	C 8	C	50/29/03	85	2		1	McCoy, 1972	N	
59	W 14600	C	50/29/05	720	2	280	1		Y	C-2023D
60	W 10809	C	50/29/08	156	3		5		N	

Appendix A continued.

Identification Number	Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
61	W 14918	C	50/29/08	887	2	287	4	Peacock, 1983	Y	
62	C 7	C	50/30/03	50	2		1	McCoy, 1972	N	
63	W 14919	C	50/30/04	1205	3		4	Peacock, 1983	N	
64	C 609115	C	50/30/18	700	2	260	1	McCoy, 1962	Y	A5 in this report
65	C 10	C	50/35/02	82	2		1	McCoy, 1972	N	
66	C 9	C	50/38/06	75	2		1	McCoy, 1972	N	
67	C S 14	D	51/35/ --	51	2		1	Parker, 1955	N	
68	C 2004	C	51/26/10	199	2		2,3,4	Jakob, 1983	N	
69	C 20130	C	51/26/12	220	2		2,3,4	Jakob, 1983	N	
70	E 80	C	51/26/14	270	3		2,3	Exxon Corp.	N	
71	C 2006	C	51/26/24	70	2		2,3,4	Jakob, 1983	N	
72	W 2420	C	51/26/27	1320	2	175	1	Peacock, 1983	Y	
73	W 14921	C	51/26/33	798	2	220	4	Peacock, 1983	Y	B1 in this report
74	C 2014D	C	51/27/08	198	2	183	2,3,4	Jakob, 1983	Y	
75	C 1025D	C	51/27/17	180	2		2,3,4	Jakob, 1983	N	
76	C 2010D	C	51/27/18	220	2	195	2,3,4	Jakob, 1983	Y	
77	C 2005D	C	51/27/30	198	2	200	2,3,4	Jakob, 1983	Y	
78	E 79	C	51/27/30	270	3		2,3		N	
79	W 14922	C	51/27/36	494	2	224	1	Peacock, 1983	Y	B2 in this report
80	W 10201	C	51/29/21	1373	3	243	2	Peacock, 1983	Y	

Appendix A continued

Identification Number	Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
81	W 10202	C	51/29/21	1380	3	352	2	Peacock, 1983	Y	
82	W 8899	C	51/30/16	1040	2	300	1	Peacock, 1983	Y	A4 in this report
83	W 9413	C	51/30/19	1491	2	300	1	Peacock, 1983	Y	
84	C 559120	C	51/30/30	126	2		1	McCoy, 1962	N	
85	W 10014	C	51/32/17	1198	2	110	1	Peacock, 1983	Y	C2 in this report
86	W 10184	C	51/33/29	1171	2	116	2	Peacock, 1983	Y	C3 in this report
87	W 4937	C	52/26/28	404	2	270	5	McCoy, 1962	Y	C-554143
88	W 2233	C	52/27/19	345	2	270	1		Y	C-47
89	W 2616	C	52/27/19	298	2	270	1		Y	C-42
90	E 249	C	52/28/02	1334	3	260	2,3	Exxon Corp.	Y	
91	E 96	C	52/28/06	310	3	230	2,3	Exxon Corp.	Y	
92	E 97	C	52/28/08	320	3		2,3	Exxon Corp.	N	
93	E 98	C	52/28/10	340	3		2,3	Exxon Corp.	N	
94	W 14920	C	52/28/13	1234	3	260	4	Peacock, 1983	Y	B3 in this report
95	C 286	C	52/29/13	140	2		1	Missimer, 1983	N	
96	C 291	C	52/29/13	52	2		1	Missimer, 1983	N	
97	C 294	C	52/29/13	54	2		1	Missimer, 1983	N	
98	E 100	C	52/29/21	350	3	280	2,3	Exxon Corp.	Y	
99	C 556128	C	52/29/25	392	2	262	1	McCoy, 1962	Y	A2 in this report
100	W 8005	C	52/29/25	468	3		5		N	

Appendix A continued.

Identification Number		Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
101	E	99	C	52/29/27	340	3		2,3	Exxon Corp.	N	
102	W	14934	C	52/30/03	785	3	270	4	Peacock, 1983	Y	A3 in this report
103	W	10180	C	52/30/09	1290	3		2,3	Peacock, 1983	N	Exxon 238
104	W	10446	C	52/30/27	20	3		5		N	
105	W	8951	C	52/30/29	1260	2	290	1	Peacock, 1983	Y	B4 in this report
106	W	7803	C	52/30/33	466	3		1		N	
107	W	10190	C	52/31/29	1312	3	247	2	Peacock, 1983	Y	Exxon 248, B5 in this report
108	E	242	C	52/32/21	1182	3	100	2,3	Exxon Corp.	Y	
109	W	10183	C	52/32/24	1166	3	90	2,3	Peacock, 1983	Y	Exxon 241, B6 in this report
110	E	240	C	52/32/35	1219	3	100	2,3	Exxon Corp.	Y	
111	W	10187	C	52/33/23	1140	2	110	2	Peacock, 1983	Y	B7, C4 in this report
112	W	2067	D	52/39/03	29	2		5		N	
113	W	2066	D	52/39/10	46	2		5		N	
114	W	44	D	52/40/24	102	2		1		N	
115	W	168	D	52/40/30	218	2	164	1	Parker, 1944, 1955	Y	G-187
116	W	12248	D	52/41/08	58	3		1		N	
117	G	185	D	52/41/09	301	2	186	1	Parker, 1955	Y	
118	W	12163	D	52/42/07	110	2		1		N	
119	W	12172	D	52/42/07	122	2		1		N	
120	G	429	D	52/42/30	99	2		1	Parker, 1955	N	

Appendix A continued.

Identification Number	Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
121	W 7310	C	53/29/30	407	3	295	5		Y	
122	W 2005	C	53/30/30	484	2	290	5		Y	C-39
123	W 1998	C	53/30/31	60	2		1		N	
124	W 2004	C	53/30/31	498	2	300	1	Peacock, 1983	Y	C-41, A1 in this report
125	E 239	C	53/32/07	1249	3		2,3	Exxon Corp.	N	
126	E 243	C	53/32/21	1230	3	200	2,3	Exxon Corp.	Y	
127	E 244	C	53/33/04	1165	3	110	2	Exxon Corp.	Y	
128	E 247	C	53/33/14	1100	3	120	2,3	Exxon Corp.	Y	
129	E 246	C	53/34/16	1123	3	130	2,3	Exxon Corp.	Y	
130	W 935	D	53/35/31	10284	4		1		N	
131	W 466	D	53/35/31	1280	4		1		N	
132	W 2096	D	53/38/24	27	2		5		N	
133	W 2064	D	53/38/36	28	2		5		N	
134	W 2065	D	53/38/36	28	2		5		N	
135	G 225	D	53/39/20	100	2		1	Parker, 1955	N	
136	G 218	D	53/40/18	202	2	180	1	Parker, 1955	Y	
137	G 224	D	53/40/15	104	2		1	Parker, 1955	N	
138	W 47	D	53/40/24	73	2		1		N	
139	W 46	D	53/40/24	60	2		1		N	
140	G 186	D	53/41/15	288	2	184	1	Parker, 1944	Y	

Appendix A continued.

Identification Number	Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
141	W 472	D	53/41/19	295	2	206	1	Parker, 1944	Y	G182
142	W 43	D	53/41/19	94	2		1		N	
143	W 45	D	53/41/19	60	2		1		N	
144	G 421	D	53/41/12	97	2		1	Parker, 1955	N	
145	G 548	D	53/41/19	97	2		1	Parker, 1955	N	
146	G 197	D	53/41/20	91	2		1	Parker, 1955	N	
147	G 195	D	53/41/20	95	2		1	Parker, 1955	N	
148	G 199	D	53/41/20	98	2		1	Parker, 1955	N	
149	G 193	D	53/41/29	84	2		1	Parker, 1955	N	
150	G 196	D	53/41/29	92	2		1	Parker, 1955	N	
151	G 525	D	53/41/33	113	2		1	Parker, 1955	N	
152	G 419	D	53/42/16	95	2		1	Parker, 1955	N	
153	W 469	D	53/42/18	339	2	202	1	Parker, 1944	Y	G183
154	W 5010	D	54/34/11	11675	3		1		N	
155	D 29-43	D	54/34/18	22	2		1	Schroeder, 1954	N	Wells along Dade/ Collier county line
156	W 7336	D	54/35/15	11615	2		1		N	
157	W 147	D	54/35/19	4560	3		1		N	
158	W 960	D	54/35/24	950	4		1		N	
159	W 931	D	54/35/27	600	2	202	1	Parker, 1944	Y	G223, D1 in this report
160	W 3174	D	54/36/18	11352	3		1		N	

Appendix A continued.

Identification Number		Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
161	W	3491	D	54/36/19	11625	2		1		N	
162	W	160	D	54/37/07	68	2		1	Parker, 1944	N	G222
163	W	2062	D	54/38/01	33	2		5		N	
164	W	2063	D	54/38/01	28	2		5		N	
165	W	467	D	54/38/12	191	2	155	1	Parker, 1944	Y	G188
166	G	551	D	54/31/36	98	2		1	Parker, 1955	N	
167	W	520	D	54/40/03	807	2	214	1	Parker, 1944	Y	G101
168	G	198	D	54/40/14	102	2		1	Parker, 1955	N	
169	W	10245	D	54/40/32	845	2		1			
170	G	422	D	54/41/2	98	2		1	Parker, 1955	N	
171	W	698	D	54/41/15	230	2		1	Parker, 1944	N	G189
172	G	350	D	54/41/16	93	2		1	Parker, 1955	N	
173	G	196	D	54/41/17	225	2		1	Parker, 1955	N	
174	G	428	D	54/41/18	96	2		1	Parker, 1955	N	
175	G	431	D	54/41/20	100	2		1	Parker, 1955	N	
176	G	426	D	54/41/20	98	2		1	Parker, 1955	N	
177	W	445	M	55/34/06	10006	4	200	1		Y	C5 in this report
178	W	889	D	55/36/30	11789	4	200	1		Y	D2 in this report
179	W	2038	D	55/37/25	11520	3		1		N	
180	G	447	D	55/39/11	104	2		1	Parker, 1955	N	

Appendix A continued.

Identification Number		Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
181	G	226	D	55/39/26	100	2		1	Parker, 1955	N	
182	G	552	D	55/39/27	87	2		1	Parker, 1955	N	
183	W	215	D	55/40/12	5200	4		1		N	
184	G	553	D	55/40/16	127	2		1	Parker, 1955	N	
185	W	482	D	55/40/18	96	1		1		N	G-448
186	G	449	D	55/40/22	105	2		1	Parker, 1955	N	
187	G	72	D	55/40/25	98	2		1	Parker, 1955	N	
188	G	469	D	55/40/26	137	2		1	Parker, 1955	N	
189	G	450	D	55/40/27	104	2		1	Parker, 1955	N	
190	G	471	D	55/40/34	119	2		1	Parker, 1955	N	
191	G	451	D	55/40/35	107	2		1	Parker, 1955	N	
192	G	423	D	55/41/06	52	2		1	Parker, 1955	N	
193	G	425	D	55/41/07	97	2		1	Parker, 1955	N	
194	G	424	D	55/41/07	95	2		1	Parker, 1955	N	
195	W	13768	D	56/40/02	3200	2	230	1		Y	
196	G	474	D	56/40/10	107	2		1	Parker, 1955	N	
197	G	207	D	57/38/25	108	2		1	Parker, 1955	N	
198	G	214	D	57/38/26	61	2		1	Parker, 1955	N	
199	G	217	D	57/39/15	120	2		1	Parker, 1955	N	
200	G	216	D	57/39/14	110	2		1	Parker, 1955	N	

Appendix A continued.

Identification Number	Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
201	G 491	D	57/39/24	38	2		1	Parker, 1955	N	
202	G 213	D	57/39/27	78	2		1	Parker, 1955	N	
203	G 212	D	57/39/31	79	2		1	Parker, 1955	N	
204	G 211	D	57/39/31	88	2		1	Parker, 1955	N	
205	G 527	D	57/40/20	51	2		1	Parker, 1955	N	
206	W 7363	D	58/37/14	1333	2	255	5		Y	NP 100, D3 in this report
207	G 210	D	58/38/24	62	2		1	Parker, 1955	N	
208	G 209	D	58/39/21	66	2		1	Parker, 1955	N	
209	W 12294	D	58/39/26	1700	2	250	1	Dames-Moore, 1972	Y	
210	W 11571	D	58/40/28	2000	2	250	1	Dames-Moore, 1972	Y	D4 in this report
211	S 30	D	59/35/	64	2		1	Parker, 1955	N	
212	W 3011	M	59/40/24	11968	3		1		N	
213	W 2402	M	60/27/34	485	2	226	1		Y	G-610
214	W 1115	D	60/35/27	6024	3		1		N	
215	W 3510	M	62/32/18	12631	4		1		N	
	W 3008	C	46/28/04	2858	1		1		N	
	W 3007	C	46/29/06	4107	1		1		N	
	W 3009	C	47/28/09	4048	1		1		N	
	W 11763	C	47/29/12	11936	1		1		N	
	W 3006	C	47/29/18	4141	1		1		N	

Appendix A continued.

Identification Number	Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
W	3005	C	47/30/31	4198	1		1		N	
W	11762	C	49/30/02	11812	1		1		N	
W	3004	C	49/31/30	2937	1		1		N	
W	12994	C	49/31/34	11880	1		1		N	
W	13706	C	49/32/31	11810	1		1		N	
W	14069	C	49/32/34	11795	1		1		N	
W	11500	C	49/33/31	11760	1		1		N	
W	14225	C	50/25/12		1		1		N	
W	14226	C	50/25/12		1		1		N	
W	14227	C	50/25/12		1		1		N	
W	8074	C	50/26/06		1		1		N	
W	9409	C	50/26/11		1		1		N	
W	8864	C	50/26/333		1		1		N	
W	2678	C	50/26/34		1		1		N	
W	2686	C	50/26/34		1		1		N	
W	5359	C	50/30/01		1		1		N	
W	11886	C	50/30/24	11997	1		1		N	
W	12690	C	50/30/35	12011	1		1		N	
W	13624	C	50/31/04	11920	1		1		N	
W	12045	C	50/31/05		1		1		N	

Appendix A continued.

Identification Number	Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
	W 13975	C	50/31/36	11900	1		1		N	
	W 14962	C	50/33/21		1		1		N	
	W 14478	C	51/26/18	220	1		1		N	
	W 12046	C	51/26/24		1		1		N	
	W 13561	C	51/34/33	11658	1		1		N	
	W 15012	C	51/34/34		1		1		N	
	W 14294	C	51/34/35	12991	1		1		N	
	W 12838	C	52/27/10	16877	1		1		N	
	W 8996	C	52/29/13	1290	1		1		N	
	W 12957	C	52/31/05	13255	1		1		N	
	W 14961	C	52/34/02		1		1		N	
	W 18925	C	52/34/17	11705	3		1		N	
	W 790	D	52/35/06		1		1		N	
	W 2171	D	52/41/12	124	2		1		N	
	W 1265	D	52/42/07	117	1		1		N	
	W 12837	C	53/29/10	570	1		1		N	
	C 114	C	53/29/10	469	1		1		N	
	C 115	C	53/29/10	478	1		1		N	
	C 116	C	53/29/10	472	1		1		N	
	W 11765	C	53/32/14	15820	1		1		N	

Appendix A continued.

Identification Number	Well Number	County	Township/ Range/ Section Number	Maximum Well Depth (feet below msl)	Type of Geologic Log	Depth to Confining Zone (feet below msl)	Geophysical/Hydrologic Information	Reference*	Information Used?	Comments
	W 794	D	53/41/30		3		1		N	
	W 815	D	53/41/34		1		1		N	
	W 506	D	53/42/22		3		1		N	
	W 11768	M	54/33/14		1		1		N	
	W 112692	M	54/34/11	12865	1		1		N	
	W 3054	D	54/35/16		3		1		N	
	W 8387	D	54/35/17		2		1		N	
	W 8131	D	54/36/18	11500	3		1		N	
	W 11474	D	55/40/07		3		1		N	
	W 3376	D	55/40/23		1		1		N	
	W 6209	D	55/40/23		3		1		N	
	W 5451	D	56/40/06		3		1		N	
	W 5452	D	56/40/06		3		1		N	
	W 14391	D	56/40/21	3110	1		1		N	
	W 14392	D	56/40/21	3110	1		1		N	
	W 14475	D	56/40/21	3120	1		1		N	
	W 13768	D	56/40/22	3200	2		1		N	
	W 3483	D	56/39/01		3		1		N	
	W 637	D	57/39/14		1		1		N	
	W 3516	D	57/39/18		3		1		N	**AFB 3516-3518
	W 3549	D	59/39/36		3		1		N	**AFB W3549-3552

* If no reference listed, well is on file at the U. S. Geological Survey, Tallahassee, Florida.
** Homestead Air Force Base, Homestead, Florida.

Appendix B. Example of lithologic well log description.

W-7363

OWNER	:	U.S.G.S 252255N080361101
LOCATION	:	Field #NP100, Everglades National Park Ranger Station
COUNTY	:	Dade
ELEVATION	:	5' topo
DRILLER	:	J. P. Carroll Co. for Fla. Test. Lab.
STARTED	:	6-24-64
COMPLETED	:	7-2-65
DEPTH	:	1,333'
CASING	:	620' of 8" Pipe
HEAD	:	
DRAWDOWN	:	
YIELD	:	1,570 GPM
QUALITY	:	Brackish
USE	:	Test
REMARKS	:	204 Samples Rec. 9-23-65 5' - 1,333'

PLEISTOCENE SERIES
Miami Oolite

5-20	Calcarenite, pale to yellow-orange, oolitic, calcitic and calcilutite, very hard, dense.
20-30	Calcilutite, pale yellow-orange, dense, fossiliferous
30-40	Calcilutite, light gray, dense, and oolite as above.

Pine Crest Formation

40-50	Sandstone, white, quartz; and calcilutite, hard, dense.
50-63	Sand and shells, and sandstone, white, quartz, specks of phosphorite. Barnacles (Pleistocene sp.)

MIOCENE SERIES
Tamiami Formation

63-70	Clay, pale yellow-orange to gray, very sandy, shells fragments and phosphorite.
71-81	Clay, pale yellow-orange to gray, very sandy fossiliferous, pebbles of phosphorite and shell fragments.
81-95	Clay as above, and sand, white, quartz, fine with phosphorite and shells. Nonionella sp. - Elphidium sp.
95-110	Sand, pale yellow-orange to gray, quartz, very fine grained, shell fragments and phosphorite.
110-115	Sand, pale yellow-orange, medium grained and shell hash.

115-125.7	Calcilutite, gray, very sandy, with shells.
125.7-135	Sand, gray, quartz, fine grained and shell hash.
135-140	Clay, gray, very sandy, shells. *Nonion advenum*.
140-147	Same as above. *Elphidium sagrum*.
147-155	Same as above and frequent shell fragments.
155-160	Same as above with phosphorite, shark teeth, claws.
160-165	Calcilutite, yellow-orange to gray, dense and shell fragments.
165-170	Calcilutite, yellow to gray, very sandy. Shell fragments. *Hemicythere conradi*.
170-182	Sand, pale yellow to gray, fine grained, fossiliferous and clay, gray with shells.
180-185	Calcilutite, gray, very sandy, phosphorite and shell fragments.
185-190	Same as above.
190-195	Same with increasing amount of shells, fragments of *Ostrea* sp.
200-205	Same with fragments *Pecten* sp.
203-208	Same with incrusting Bryozoa.

Hawthorn Formation

214-224	Sand, light orange yellow, quartz, medium to coarse and clay, gray, phosphorite and shell fragments.
224-226	Same as above, fragments of calcilutite.
226-249	Sand, gray, quartz fine to medium; argillaceous, with phosphorite. *Operculinoides* sp. (Miocene)
255-260	Clay, dark green, very sandy, quartz sand and phosphorite.
260-262	Clay, olive green, very sandy, micaceous, pebbles of phosphorite quartz and fragments of *Ostrea normalis*.
262-267	Clay as above; phosphorite and shells.
267-273	Same.
273-276	Same.
276-278	Same.