247a

State of Florida
Department of Natural Resources
Tom Gardner, Executive Director

Division of Resource Management
Jeremy Craft, Director

Florida Geological Survey
Walt Schmidt, State Geologist and Chief

Open File Report 30

Summary of the Geology of Glades County, Florida

by

Kenneth M. Campbell, P. G.

Florida Geological Survey
Tallahassee, Florida
1990

Summary of the Geology of Glades County, Florida

By

Kenneth M. Campbell, P. G.

GEOMORPHOLOGY

Glades County lies partially within both the central and southern physiographic zones of White, (1970). Several authors have discussed the geomorphology of the Florida peninsula; White's (1970) classification will be utilized in this report. The dominant geomorphic features within the county include the DeSoto Plain, Caloosahatchee Incline, Caloosahatchee River Valley and the Okeechobee Plain (White, 1970) (Figure 1).

DeSoto Plain

The DeSoto Plain is located primarily in Manatee, Hardee, DeSoto, Highlands, Charlotte and Glades Counties. The plain slopes very gently to the south and has elevations which range from 85 feet at the north to 60 feet at the south. The DeSoto Plain is found only in the northwestern corner of Glades County. White (1970) stated that the DeSoto Plain was a submarine plain probably formed under Pleistocene Wicomico seas (70-100 feet above present sea level). White (1970) cites a notable lack of relict shoreline features as evidence of the submarine origin of the plain.

Caloosahatchee Incline

The Caloosahatchee Incline forms the southern bounding scarp of the DeSoto Plain and the eastern bounding scarp between the

Okeechobee Plain and the Lake Wales Ridge. The crest of the incline is at 60 feet above mean sea level (MSL) while the toe is at 30-35 feet (White, 1970). White (1970) suggested that the Caloosahatchee Incline was the steeper slope at the distal end of a submarine shoal and was preserved during emergence due to a low energy environment.

Okeechobee Plain

The Okeechobee Plain is located primarily in Okeechobee, Highlands and Glades Counties and ranges in elevation from 30-40 feet at the south edge of the Osceola Plain to about 20 feet at the north shore of Lake Okeechobee (White, 1970). The Okeechobee Plain includes Lake Okeechobee.

Caloosahatchee Valley

The Caloosahatchee Valley is a relatively low lying feature through which the Caloosahatchee River flows. The valley is bounded to the east by Lake Okeechobee and grades into the Gulf Coastal Lowlands on the west. It is bounded to the north by the Caloosahatchee Incline and to the south by the Immokalee Rise (White, 1970).

LITHOSTRATIGRAPHY

The geologic formations which are encountered within 1000 feet of the land surface in Glades County include, in ascending order, the Avon Park Formation, Ocala Group, Suwannee Limestone, Hawthorn Group (which includes the Arcadia and Peace River Formations),

Tamiami, Caloosahatchee and Fort Thompson Formations and undifferentiated surficial sediments. See the cross sections and cross section location map (Figures 2-4) in conjunction with the text for this section.

Avon Park Formation

The Middle Eocene Avon Park Formation is the oldest lithologic unit commonly encountered in wells in Glades County. The formation underlies all of Glades County (Klein et al., 1964). Miller (1986) combined the Avon Park and Lake City Limestone (previous usage) into the Avon Park Formation in order to reflect the lithologic similarities of the two units and the presence of considerable quantities of dolostone.

The Avon Park Formation in Glades County consists primarily of tan to white, slightly porous, calcilutitic and fossiliferous limestone (packstone); well indurated granular limestone (grainstone) and finely crystalline dolostone. The top of the Avon Park Formation is encountered at approximately 840 feet below MSL in the northern portions of the county and dips to the south and southeast. In the southwest corner of the county, the Avon Park top is at 1050 feet below MSL while in the southeast corner of the county the top is at 1220 feet below MSL. The thickness of the Avon Park is variable, but in general thickens to the south and southeast and ranges from around 600 to over 1200 feet thick (Klein et al., 1964). The Avon Park Formation is unconformably overlain by the Ocala Group.

Ocala Group

The Upper Eocene Ocala Group consists of three formations. In ascending order they are the Inglis, Williston and Crystal River Formations (Puri, 1957). For the purposes of this report, however, the Ocala Group will be undifferentiated.

In Glades County, the Ocala Group consists primarily of white, cream or tan, poorly indurated calcilutitic limestone (packstone or wackestone) or tan, granular dolostone. The limestone is often a foraminiferal coquina. The top of the Ocala Group is encountered at depths of 600-800 feet below MSL in Glades County and dips generally to the south. The thickness of the Ocala Group, in wells examined in this study, ranges from 265 feet in the northeast portion of the county, to over 320 feet in the central and southeastern portions of the county.

Suwannee Limestone

The Oligocene Suwannee Limestone underlies most, if not all, of Glades County. Klein et al. (1964) show the Suwannee Limestone in all but the northeastern corner of Glades County and extrapolate maximum thicknesses of over 400 feet in southern Glades County. Samples examined for the present study reveal lesser thicknesses, ranging from 25 to 140 feet, with the greatest thickness in the central and southwestern portions of the county. The top of the Suwannee dips gently to the south-southeast.

The Suwannee Limestone in Glades County consists primarily of white, cream or tan recrystallized limestone (packestone or wackestone) or tan granular or sucrosic dolostone. The limestone

is moderately to well indurated, variably calcilutitic, quartz sandy and slightly phosphatic. The Suwannee is commonly shelly or microcoquinoid, however, well-preserved fossils are rare and shells are often replaced with sparry calcite.

Hawthorn Group

Scott (1988) raised the Miocene Hawthorn Formation of previous usage to group status. In the south Florida area the Hawthorn Group consists of two formations, in ascending order the Arcadia and the Peace River Formations.

Arcadia Formation

The Arcadia Formation (Scott, 1988) is a predominantly carbonate unit which corresponds to the "Hawthorn carbonate unit" of past usage and includes the Tampa Formation of past usage as a member. The Tampa Member is not found in Glades County. The Arcadia Formation consists predominantly of white, light grey and yellowish grey, poorly to well indurated, calcilutitic and very finely crystalline limestone (wackestone to mudstone), dolomitic limestone and dolostone. The Arcadia contains variable amounts of clay, silt, quartz and phosphate sand with occasional phosphate gravel. Beds of clay, dolosilt and sand are common. The Arcadia is commonly somewhat fossiliferous (primarily oysters, pectens, bryozoans, with diatoms and foraminifera in some clayey intervals).

The top of the Arcadia is encountered at depths of approximately 100 feet below MSL in the northwest corner of the county and dips in a general southeasterly direction to about 370

feet below MSL in the eastern portion of the county. The thickness of the Arcadia ranges from about 200 feet to 460 feet. The unit is thinnest in northeast Glades County and thickens to the southwest.

Peace River Formation

The Peace River Formation (Scott, 1988) consists of the "upper Hawthorn siliciclastics" of prior usage as well as the siliciclastics previously placed in the Tamiami Formation (Parker, 1951, and Parker et al., 1955) and the Murdock Station and Bayshore Clay Members of the Tamiami Formation (Hunter, 1968). In Glades County, the Peace River Formation consists primarily of white, light gray and light olive, interbedded, poorly to moderately indurated sands, silts, clays and carbonates. The siliciclastic components are dominant. Carbonate material is primarily calcilutite or dolosilt. All lithologies typically contain variable amounts of quartz and phosphate sand.

The top of the Peace River Formation is encountered at approximately 40 feet above MSL in the northwest corner of the county. The formation dips generally to the east and southeast to depths of about 90 feet below MSL at the eastern edge of the county, although a depth of 111 feet below MSL is encountered in the south-central portion of the county. The thickness of the Peace River Formation typically ranges from about 140 to 280 feet, with the greatest thickness in the eastern portion of the county.

Tamiami Formation

The Tamiami Formation of Parker (1951) and Parker et al.,

(1955) has been restricted by later authors (Hunter, 1968; Scott, 1988). The Tamiami as used in this report reflects these changes and consists of the Ochopee and Buckingham Limestone Members and the Pinecrest Sand Member. Some difficulty arises in identifying the Tamiami where sandy sediments are devoid of shell material and recognizable limestone units are not present.

The Tamiami Formation is sporadically present within Glades County, primarily in the southern and western portions of the county. The top of the Tamiami, where encountered, ranges from 10 to 56 feet below MSL. The thickness of the formation ranges up to 70 feet.

The Tamiami consists primarily of yellowish gray, shelly, quartz sandy, slightly phosphatic limestone with calcilutite or recrystallized calcite matrix. Molds of aragonitic fossils are common. Quartz sand, shell content and induration are variable.

Caloosahatchee and Fort Thompson Formations

The Caloosahatchee and Fort Thompson Formations of previous usage are undifferentiated in this report due to the lack of lithologic characteristics on which to differentiate the units. These units were originally defined based on the fossils they contain.

The Caloosahatchee typically consists of unconsolidated sand, sandy "marl" and limestone containing abundant marine molluscs (Klein et al., 1964). The Fort Thompson consists of alternating marine and freshwater limestones and "marl" (Klein et al., 1964). These sediments are found in the northeast corner of the county, in

a band along the west edge of Lake Okeechobee and along the Caloosahatchee River Valley in the southern portion of the county. The top of the Caloosahatchee/Fort Thompson undifferentiated unit is encountered from approximately 25 feet above MSL to about 45 feet below MSL. The maximum thickness of the unit is around 60 feet.

Undifferentiated surficial sand and clay

The undifferentiated surficial sediments consist of terrace sands, organic soils and "marl" of Pleistocene and Holocene age. Undifferentiated surficial sediments blanket most if not all of the county. The thickness of these sediments ranges up to slightly more than 100 feet. Surficial sediments are thickest in the central portion of the county, in the vicinity of the Caloosahatchee Incline.

HYDROLOGY

Two regional aquifer systems are important in Glades County: the surficial and intermediate aquifer systems (SEGS, 1986). The Floridan aquifer system, although utilized in the past, contains nonpotable water (chloride and/or sulfate concentrations above 250 milligrams per liter (mg/L) in the Glades County area (Causey and Leve, 1976) and thus will not be discussed in this report.

Surficial aquifer system

The surficial aquifer system consists of undifferentiated surficial sands as well as shell beds, limestone and "marl" of the

Caloosahatchee/Fort Thompson and Tamiami Formations which contain water under unconfined, or water table conditions. The base of the surficial aquifer system consists of relatively impermeable beds of regional extent in the Peace River Formation. The thickness of the surficial aquifer system ranges from about 20-100 feet.

Intermediate aquifer system

The intermediate aquifer system consists primarily of permeable beds in the Peace River Formation or Arcadia Formation where it is not in hydraulic communication with the Floridan aquifer system. Permeable beds are typically interbedded with impermeable beds and water is under confined conditions. The intermediate aquifer system ranges from around 90 to over 225 feet thick in Glades County.

Water Quality

Water quality in the surficial and intermediate aquifer systems is highly variable, but is generally better than the underlying Floridan aquifer system. Water sample analysis reported by Klein et al. (1964) indicate that in general the water is hard (13-755 mg/L) with around one half of the wells with total dissolved solids above 500 mg/L. Sulfate, iron, chloride and color are all highly variable and often exceed standards. Phelps (1978) reports that some water in Glades County exceeds .5 mg/L ammonia concentration.

MINERAL RESOURCES

Quartz sand and limestone are currently produced in Glades County (Spencer, 1989). Quartz sand is mined in the vicinity of Ortona from beds tentatively assigned to the Peace River Formation. These sands are characteristically coarse and are mined for use as concrete and asphalt sand, fine aggregate and filter bed materials. Limestone is mined from an area adjacent to the northwest shore of Lake Okeechobee and from an area west of Moorhaven (Figure 2). This limestone is utilized for road base material.

BIBLIOGRAPHY

Causey, L. V., and Leve, G. W., 1976, Thickness at the potable-water zone in the Floridan aquifer: Florida Bureau of Geology Map Series 74.

Hunter, M. E., 1968, Molluscan guide fossils in Late Miocene sediments of southern Florida: Transactions, Gulf Coast Association of Geological Societies, Vol. xviii, p. 439-450.

Klein, H., Schroeder, M. C., and Lichtler, W. F., 1964, Geology and ground-water resources of Glades and Hendry Counties, Florida: Florida Geological Survey Report of Investigations 37, 101 p.

Miller, J. A., 1986, Hydrogeologic framework of the Floridan aquifer system in Florida and in parts of Georgia, Alabama and South Carolina: U. S. Geological Survey Professional Paper 1403-B, 91 p.

Parker, G. G., 1951, Geologic and hydrologic factors in the perennial yield of the Biscayne Aquifer: Journal of the American Water Works Association, v. 43, pt. 2, p. 817-834.

_____, Ferguson, G. E., and Love, S. K., 1955, Water resources of southeastern Florida: U. S. Geological Survey Water Supply Paper 1255, 965 p.

Phelps, G. G., 1978, Chemical quality of water used for municipal supply in Florida, 1975: Florida Bureau of Geology Map Series 82.

Puri, H. S., 1957, Stratigraphy and zonation of the Ocala Group: Florida Geological Survey Bulletin 38, 248 p.

Scott, T. M., 1988, The lithostratigraphy of the Hawthorn (Miocene) of Florida: Florida Geological Survey Bulletin 59, 148 p.

Southeastern Geological Society Ad Hoc Committee on Florida Hydrostratigraphic Unit Definition, 1986, Hydrogeological units of Florida: Florida Geological Survey Special Publication 28, 8 p.

Spencer, S. M., 1989, The industrial minerals industry directory of Florida: Florida Geological Survey Information Circular 105, Part 1, 35 p.

White, W. A., 1970, Geomorphology of the Florida Peninsula: Florida Bureau of Geology Bulletin 51, 164 p.

Figure Captions

Figure 1: Geomorphic Map of Glades County, After White, 1970

Figure 2: Cross section location map

Figure 3: Cross section A-A'

Figure 4: Cross section B-B'

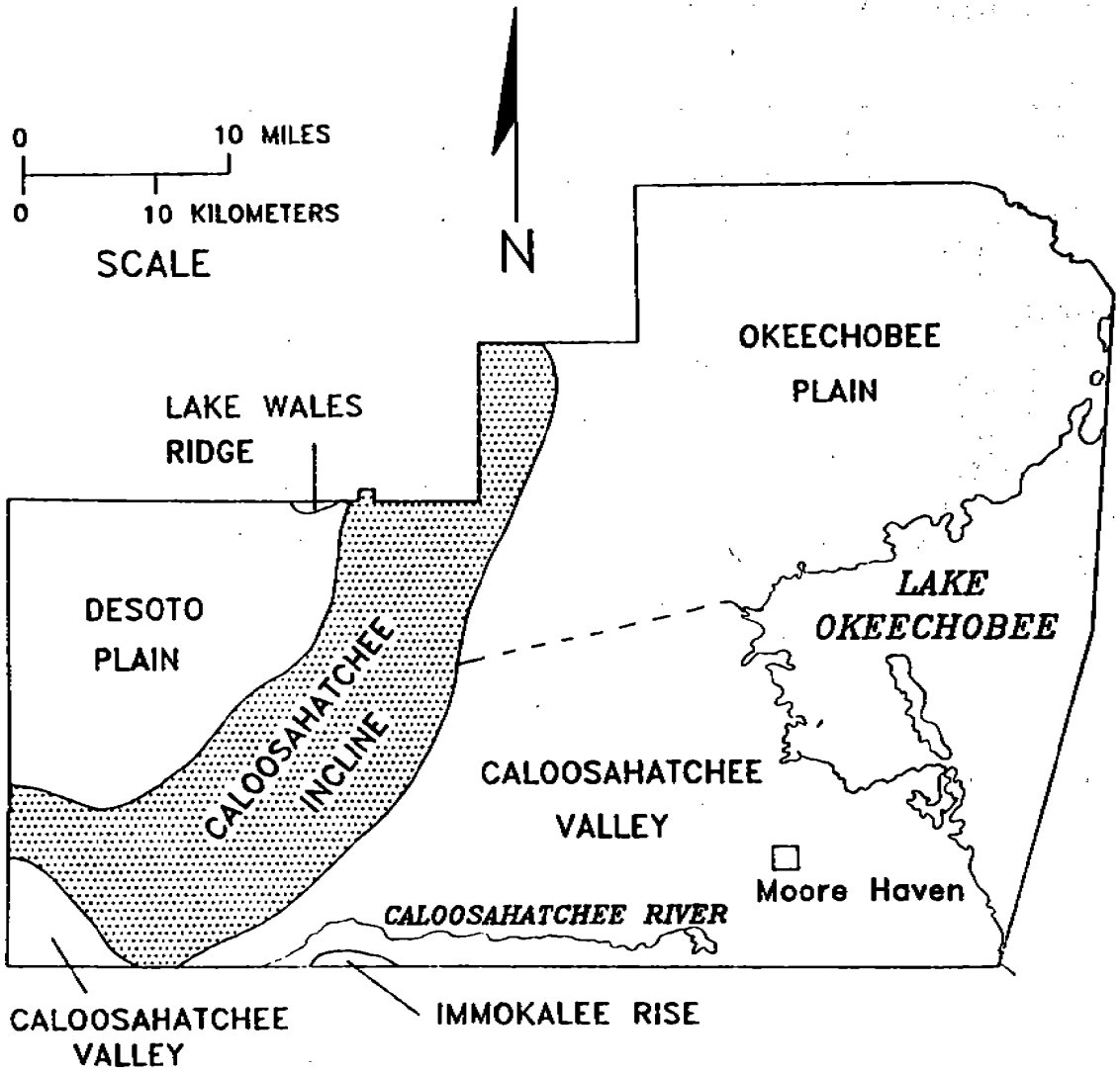

Figure 1: Geomorphic Map of Glades County, after White, 1970.

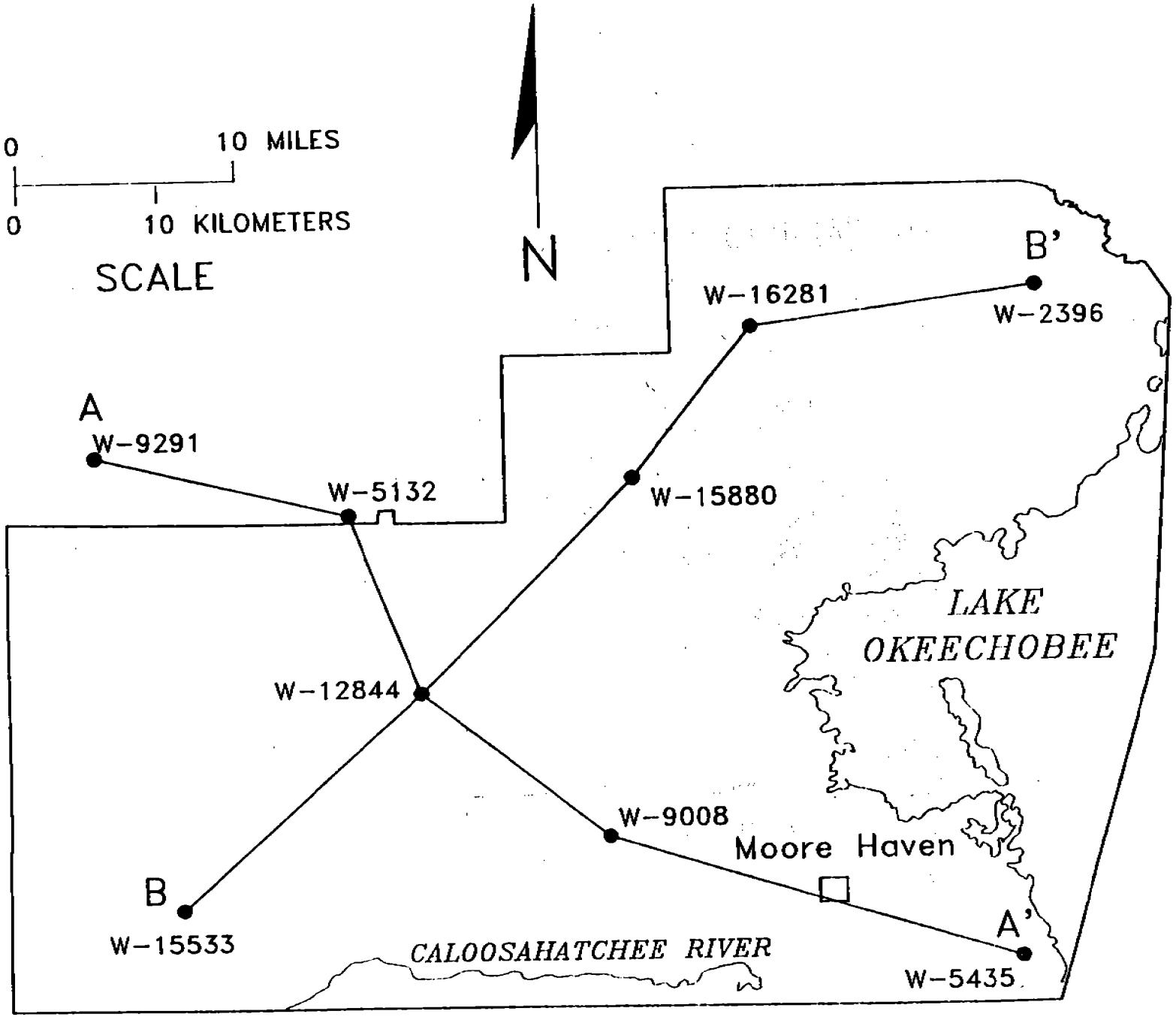

Figure 2: Cross-Section Location Map

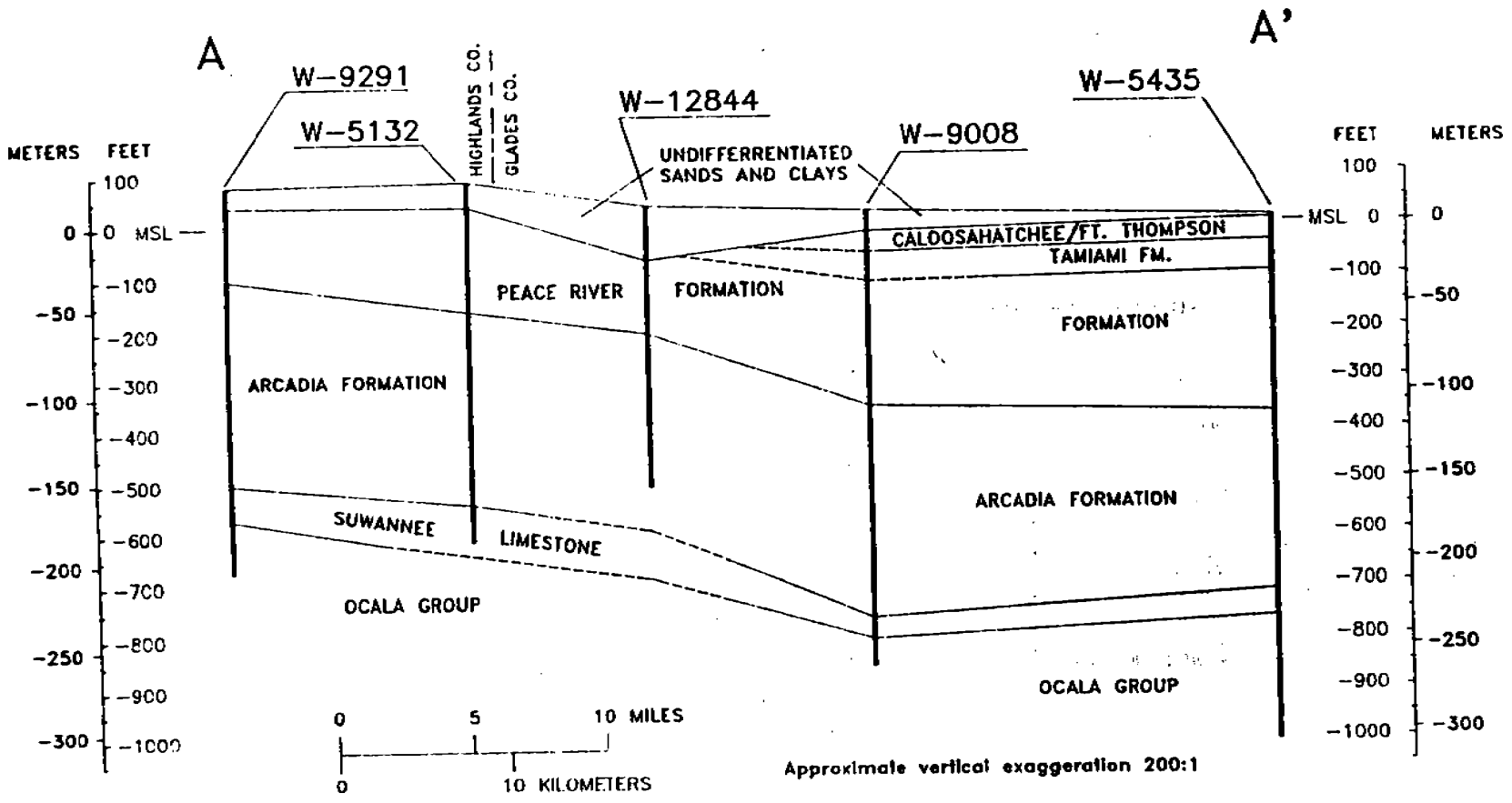

Figure 3 : Cross Section A – A'

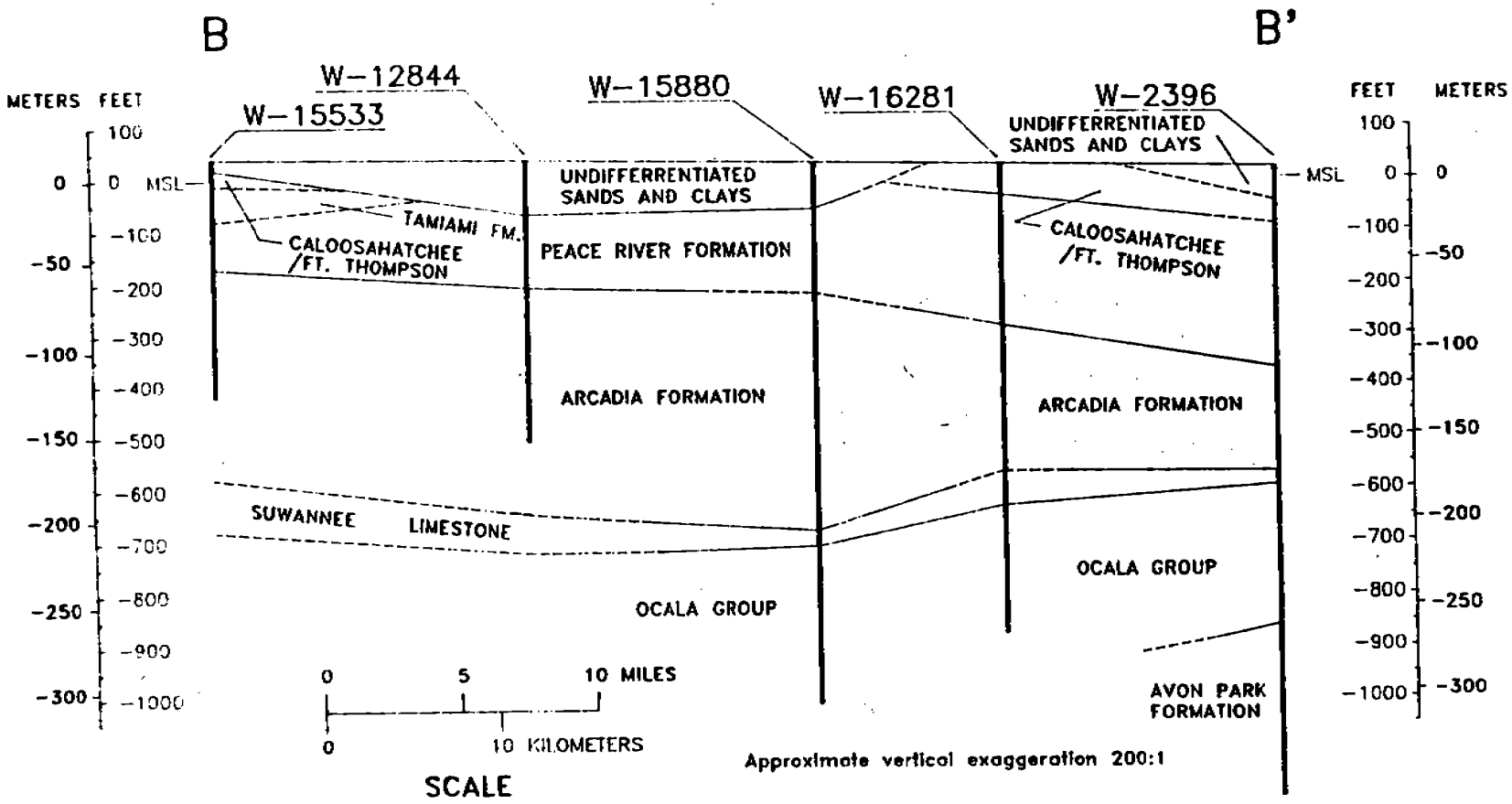

Figure 4 : Cross Section B – B'