

NEUTRON LOG SIGNATURE OF THE
PLIOCENE TAMiami FORMATION IN
BREVARD AND INDIAN RIVER COUNTIES,
EAST-CENTRAL PENINSULAR FLORIDA

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BY

Richard A. Johnson, P.G. #60

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ABSTRACT

In eastern (coastal) Brevard and Indian River Counties, east-central peninsular Florida, the Pliocene Tamiami Formation can be differentiated from the subjacent Miocene to Lower Pliocene Hawthorn Group and the superjacent Pleistocene Caloosahatchee Formation using neutron and electric-resistivity borehole geophysical logs. The carbonate-rich Tamiami Formation is recorded as a well-defined, higher intensity, single-, double-, triple-, or quadruple-peak on the logs, whereas the underlying and overlying more-siliciclastic units are recorded as much lower intensity (and resistivity). The Tamiami attains maximum known thickness in the study area in a well in Cocoa Beach (38 feet), east-central Brevard County, and thins (to generally 10- to 20-feet thick) to the west, north and south of this location. The thickest occurrence detected in Indian River County is an anomalous 27-feet thickness in a well in Wabasso (northeastern portion of the county).

ACKNOWLEDGMENTS

The author wishes to thank J. Arthur, P. Bond, K. Campbell, J. Lloyd, F. Rupert, and T. Scott of the Florida Geological Survey for reviews of this paper. I would also like to thank J. Frazee and D. Toth of the St. Johns River Water Management District, and former SJRWMD employee K. Rohrer for allowing access to the shallow-rock aquifer and other test wells drilled for their projects in Indian River and Brevard Counties.

*Independent Professional Geologist, P.O. Box 3560, Tallahassee, FL 32315.

INTRODUCTION

The purposes of this study are to identify the Pliocene, carbonate-rich, Tamiami Formation in the subsurface of Brevard and Indian River Counties, east-central peninsular Florida, and to trace the thickness trends of the Tamiami in this area using borehole neutron logs. The study area is shown in Figure 1.

The author believes that the stratigraphic interval which is the subject of this paper represents the Pliocene Tamiami Formation and is lithologically correlative with type Tamiami in southern peninsular Florida; other workers refer to this interval as "Tamiami equivalent" (T.M. Scott, Florida Geological Survey, personal communication, 1992).

TYPE AREA, LITHOLOGY AND STRATIGRAPHY

The type area of the Tamiami Formation occurs in the banks of the Tamiami Canal along U.S. Highway 41, the Tamiami Trail, between Ochopee and Monroe Station, southeastern Collier County, in southern peninsular Florida (Mansfield, 1939). In this area, the Tamiami consists of two carbonate-rich lithologies: the first, found in the banks of the Tamiami Canal, is a white to tan, very hard and massive, variably molluskan moldic, variably quartz-sandy (trace-20%), very finely recrystallized limestone which contains traces of very fine phosphate sand and scattered to common large unaltered oysters, pectens and echinoids. The second lithofacies, also found in the banks of the Tamiami Canal, consists of tan to gray to white, soft, moderately quartz-sandy (10-40%), unfossiliferous calcilutite, also with a trace of very fine phosphate grains. A third and less common lithofacies which occurs in northern Collier County (and to the north) consists of green-gray, poorly-consolidated, sparsely fossiliferous, somewhat phosphatic (trace-3%), very fine quartz sand.

In Brevard and Indian River Counties, the Tamiami Formation also consists of two carbonate-rich facies: gray to tan, moderately indurated, slightly phosphatic (1-2%), quartz-sandy (1-15%), partially recrystallized biogenic calcarenite with approximately 10-30 percent calcilutite cement. The second lithology is composed of white to gray, well-indurated, slightly phosphatic (1-2%), quartz-sandy (5-25%), variably molluskan moldic, very finely recrystallized micrite with scattered unaltered pelecypods. Both of these lithofacies occur throughout Brevard and Indian River Counties, and also throughout the total thickness of the Tamiami in these areas. Toward the west on the

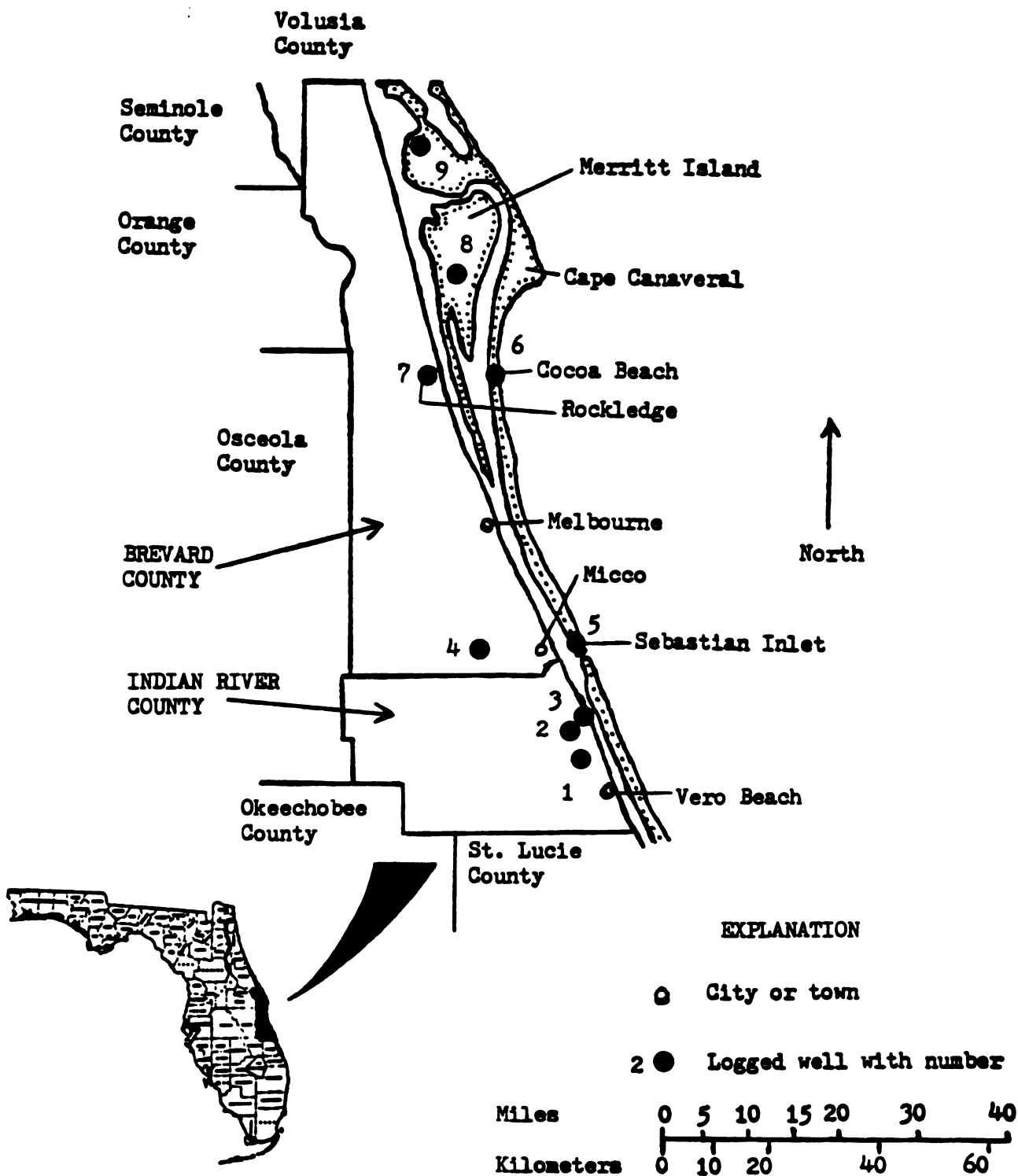


Figure 1. Location of study area and locations of the nine wells from which logs are analyzed in this paper.

mainland and to the south in St. Lucie County, the Tamiami becomes less recrystallized, consisting predominantly of an unconsolidated to moderately well-cemented mixture of abundant unaltered mollusks and fragments, some very fine to very coarse quartz sand, and scattered very fine to very coarse phosphate grains.

Stratigraphically, the Tamiami Formation overlies the Lower Miocene to Lower Pliocene Hawthorn Group (Scott, 1988). The upper portion of the Hawthorn consists of green to green-brown, silt-sized-dolomite-cemented microfossiliferous, phosphatic (up to 8%), very fine quartz sand and silt which varies to soft, very quartz-sandy silt-sized dolomite.

The Tamiami Formation is overlain by the Pleistocene Caloosahatchee Formation. The Caloosahatchee consists of mollusk-rich quartz sand; quartz-sandy, mollusk shell beds; and thin, discontinuous, partially recrystallized limestone beds (molluscan calcarenite to calcirudite), all of which are slightly (up to 2%) phosphatic.

METHODS AND EQUIPMENT

Forty-seven water wells in Brevard and Indian River Counties were geophysically logged by the author while employed at the St. Johns River Water Management District (SJRWMD). The Appendix gives a complete list of these wells with location and other information for each borehole. Neutron logs were obtained from all of these wells. The process of neutron logging involves moving an electronic probe which contains a relatively strong neutron source within an open or cased borehole. A variable amount of the neutrons are absorbed by the lithologies in the borehole walls, depending upon the total water (hydrogen) content of each lithology (which is related to total porosity) (Schlumberger, 1972). A neutron detector in the probe at a fixed spacing above the source measures the neutron intensity or number of neutrons remaining after absorption by the materials in the borehole walls. This value is then sent through a cable to surface electronics, processed, and plotted as a graph on chart paper, producing a neutron log, recorded in counts-per-second intensity (cps).

The uncompensated neutron probe used in the geophysical logging for this study was 1-11/16 inches in outside diameter and utilized a 3 curie americium-beryllium neutron source spaced 14 inches below a single helium-filled detector tube. Higher intensity generally indicates lower porosity and locally, lower permeability (Schlumberger, 1972); however, in the present

study, the logs are used qualitatively only, with emphasis on curve shape (peaks and valleys). The nature of this neutron logging system (i.e., uncompensated, with only one detector) precludes the quantitative use of these logs.

In most wells, a suite of logs, consisting of caliper, natural gamma-ray, and electric-resistivity, was obtained. Nine SJRWMD-drilled small-diameter "shallow-rock aquifer" test and observation wells were logged in Indian River County and three in Brevard County. These wells provided the nearly-ideal logging conditions (open hole and small diameter) required for the geophysical detection and analysis of the post-Hawthorn Group sediments in peninsular Florida. Sets of well-cuttings were available for all of these wells and, where possible, were correlated with the logs. In addition, partial cores were obtained from a few of the wells, and these were especially valuable in identification of the Tamiami Formation. Several very old and very short-cased small-diameter (3"-4" outside diameter, o.d.) wells also provided well-defined logs. Copies of all logs are available from the SJRWMD and several are on file at the Florida Geological Survey (FGS).

The Tamiami Formation section of an FGS core (W-13958) in east-central Indian River County was also examined for this paper. A portion of the core is described in detail and the electric-resistivity log of the Tamiami Formation is presented and discussed. Generally, resistivity logs of the Tamiami are similar to neutron logs, but most wells are cased through all or part of the unit and the electric log can not be obtained. The Tamiami Formation is identified in this core and the geophysical signature on the electric log is correlated with electric and neutron logs from nearby wells. Finally, the Tamiami is traced to the north into Brevard County through correlation with neutron logs from additional wells.

RESULTS

It was found that the Tamiami Formation is readily distinguishable on geophysical logs obtained from wells in Brevard and Indian River Counties. The Tamiami is best defined on neutron logs, recorded as a well-defined higher intensity single-, double-, triple-, or quadruple-peak with underlying and overlying conspicuously lower intensity valleys (representing uppermost Hawthorn Group and basal Caloosahatchee Formation, respectively).

The Tamiami Formation occurs in the subsurface along the Atlantic Coast of Brevard and Indian River Counties, attaining maximum known thickness in

the study area beneath the barrier island at Cocoa Beach (38 feet) and central Merritt Island (34 feet) in Brevard County. The unit thins to the west, north and south of Cocoa Beach, displaying an average thickness of 10-20 feet. The maximum thickness encountered in Indian River County was an anomalously thick 27 feet (in one well). Table 1 below lists the nine wells from which neutron and resistivity logs are analyzed in this paper, and gives additional information for each borehole. The wells are listed from south (Well 1, FGS corehole) to north (Well 9, northern Merritt Island).

TABLE 1
WELLS FROM WHICH LOGS ARE ANALYZED

<u>Well Number,</u> <u>Name and</u> <u>Location</u>	<u>Florida Geo-</u> <u>logical Survey</u> <u>Log Number</u>	<u>Latitude/Longitude</u>	<u>Elevation</u> (feet above Mean Sea Level)	<u>Depth to Top</u> <u>of Tamiami</u> (feet below land surface)	<u>Thickness</u> <u>of Tamiami</u> (feet)
Indian River County					
1 core W-13958	IR-46	27°41'50"N/80°26'09"W	23	121	8
2 Wabasso Sl	IR-68	27°44'14"N/80°26'50"W	20	117	8
3 Wabasso	IR-69	27°45'17"N/80°26'18"W	12	98	27
Brevard County					
4 Micco West	-	27°51'58"N/80°37'21"W	28	109	12
5 Sebastian Inlet	-	27°52'09"N/80°27'22"W	1	88	22
6 Cocoa Beach	-	28°18'45"N/80°36'34"W	12	74	38
7 Rockledge	-	28°19'04"N/80°43'35"W	30	92	25
8 Merritt Island	BR-221	28°27'55"N/80°41'06"W	4	75	34
9 N. Merritt Isl.	BR-229	28°39'44"N/80°46'33"W	0	98	11

Table 2 (page 8) presents a lithologic description of the Tamiami Formation and adjacent beds obtained from FGS core W-13958, Well 1, in east-central Indian River County.

The electric-resistivity (16" normal) log (Figure 2) obtained from this corehole (Well 1, Figure 1; Township 32 south, Range 39 east, Section 16) records the Tamiami Formation between approximately 121 feet and 129 feet below land surface (bls) as a well-defined higher intensity peak occurring between underlying and overlying conspicuously lower intensity valleys (representing uppermost Hawthorn Group and basal Caloosahatchee Formation, respectively). Thus, the Tamiami is only 8-feet thick at this location.

The following figures (3-10) display two sets of resistivity and neutron logs obtained from small-diameter wells (4" o.d.) in east-central Indian River County, and six additional neutron logs (no electric logs were obtained)

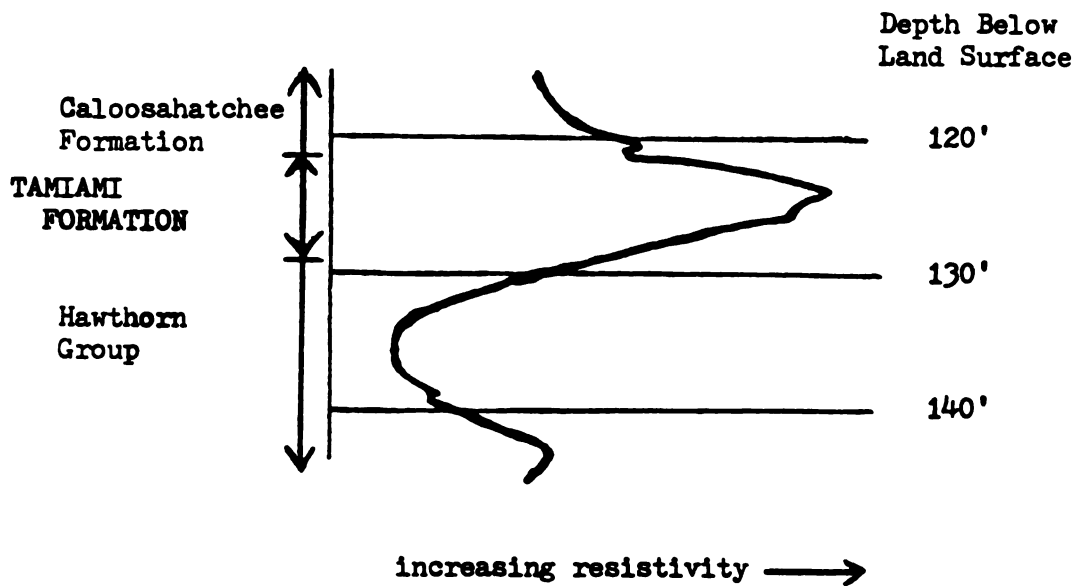


Figure 2. Electric-resistivity log from Well 1, FGS corehole W-13958, east-central Indian River County.

from equally small-diameter wells in Brevard County (Table 1, Figure 1). These logs are correlated with the resistivity log of the corehole (Well 1), and are used to trace the Tamiami Formation toward the north into northern Brevard County. They were selected from the 47 neutron-logged wells in the two counties and represent the logs on which the Tamiami is best defined.

TABLE 2
LITHOLOGIC DESCRIPTION OF FGS CORE W-13958 (by R. Johnson)

<u>Depth Range</u> <u>of Bed</u> (feet below land surface)	<u>Lithologic Description</u>
Top of Core Section Described	
-CALOOSAHATCHEE FORMATION-	
112-115	<u>Sand</u> , gray-green, quartz, very fine to medium, mode: very fine, angular to rounded, common to abundant very fine spheroidal to ellipsoidal very weathered biogenic fragments (or very weathered small foraminifera), some very fine black phosphate grains, very scattered whole large (pebble size) unaltered mollusks, very scattered fine unaltered foraminifera.
115-120.5	<u>Sand</u> , green-gray, quartz, very fine to fine, scattered medium, very scattered coarse, mode: very fine, common white shell fragments (very fine sand size to cobble size, mode: very fine), scattered unaltered foraminifera, very scattered very fine black phosphate grains, poorly-consolidated by low content of calcilutite cement.
-TAMIAMI FORMATION-	
120.5-128.5	<u>Limestone</u> , white to very light gray, partially recrystallized biogenic calcarenite, composed of abundant very fine sand size to pebble size partially recrystallized to recrystallized (to scattered unaltered) biogenic and mollusk fragments, scattered whole unaltered mollusks, some very fine to very coarse quartz sand (mode: medium), scattered very fine to very coarse black phosphate grains; some cobble size zones of hard, tan, very well-cemented, homogeneous, unfossiliferous, completely recrystallized micrite.
-HAWTHORN GROUP-	
128.5-137+	<u>Sand and silt</u> , green, quartz and phosphate, silt size to very fine sand size, mode: very fine, poorly-consolidated by very low carbonate cement content, very scattered small unaltered foraminifera.
Base of Core Section Described	

Figure 3 depicts the neutron log and the Tamiami Formation portion of the electric-resistivity (16" normal) log obtained from a SJRWMD-drilled shallow-rock test and observation well (2) located in east-central Indian River County (Township 31 south, Range 39 east, Section 32; Figure 1), approximately 3.5 miles north-northwest of Well 1. The Tamiami is recorded as an extremely well-defined, very thin, sharp peak on the neutron log between

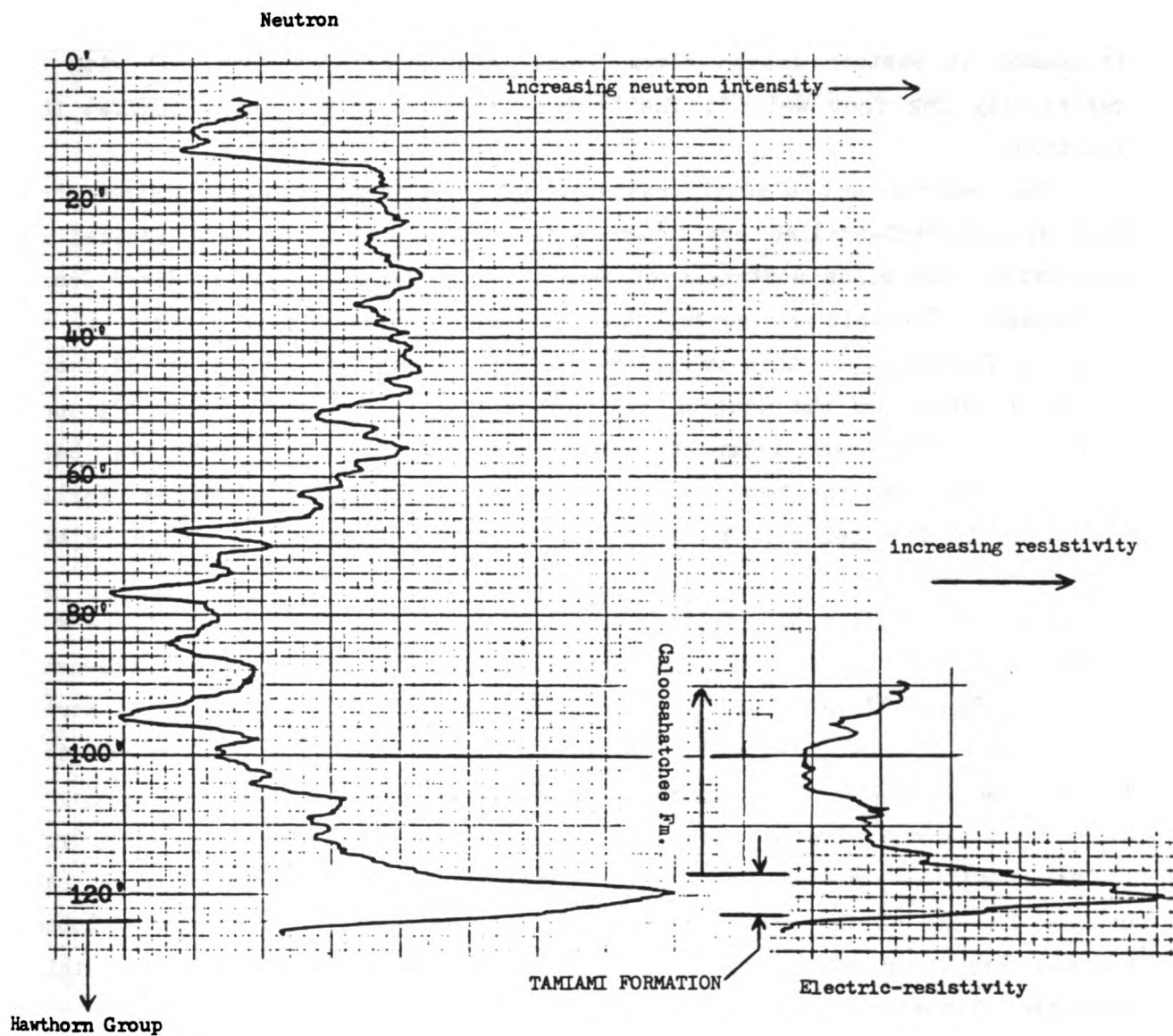


Figure 3. Neutron and electric-resistivity logs from Well 2, east-central Indian River County near Well 1.

approximately 117 feet and 125 feet bls, and also as a single peak on the resistivity log. This log trace pattern (a single thin peak) of the Tamiami is common in eastern Indian River County and correlates very well with the resistivity log from Well 1. The Tamiami remains only 8-feet thick at this location.

The neutron and electric-resistivity (16" normal) logs obtained from Well 3, a SJRWMD-drilled shallow-rock test and observation well located approximately 1.5 miles northeast of Well 2 in northeastern Indian River County in Wabasso (Township 31 south, Range 39 east, Section 28; Figure 1), are shown in Figure 4. In this well, the Tamiami is anomalously thick (27 feet), and is recorded on the neutron log between 98 feet and 125 feet bls as a double-peak. The lower intensity Hawthorn Group underlies the Tamiami below 125 feet bls, and the basal lower intensity of the Caloosahatchee overlies the Tamiami. The resistivity log records the Tamiami as a single, albeit very thick, peak.

Figure 5 depicts the neutron log obtained from Well 4, a shallow-rock SJRWMD test and observation well located in southern Brevard County (Township 30 south, Range 37 east, Section 22; Figure 1) approximately 20 miles northwest of Well 3. In this well, the Tamiami Formation extends from 109 feet to 121 feet bls and is again recorded as a single peak. The development of a second peak can also be seen on this trace. The top of the Hawthorn Group is very well-defined as an abrupt stepdown in intensity marking the base of the Tamiami at 121 feet bls. The lower portion of the overlying Caloosahatchee Formation consists of partially recrystallized, mollusk-rich thinly-bedded limestone, recorded on the log as a series of low peaks between 60 feet and 106 feet bls. The Tamiami attains a thickness of 12 feet in this well.

Figure 6 shows the neutron log obtained from Well 5, an uncased SJRWMD test well (Toth, 1985) approximately one mile north of Sebastian Inlet in extreme southeastern Brevard County (Township 30 south, Range, 39 east, Section 17; Figure 1) located 11 miles east of Well 4. This log again records the Tamiami Formation as a single, albeit relatively thick, higher intensity peak between 88 feet and 110 feet bls. The lower intensity valley directly below the Tamiami peak represents the top of the more-siliciclastic Hawthorn Group. The overlying thick broad valley of lower intensity between 42 feet and 88 feet bls represents the siliciclastic Caloosahatchee Formation which,

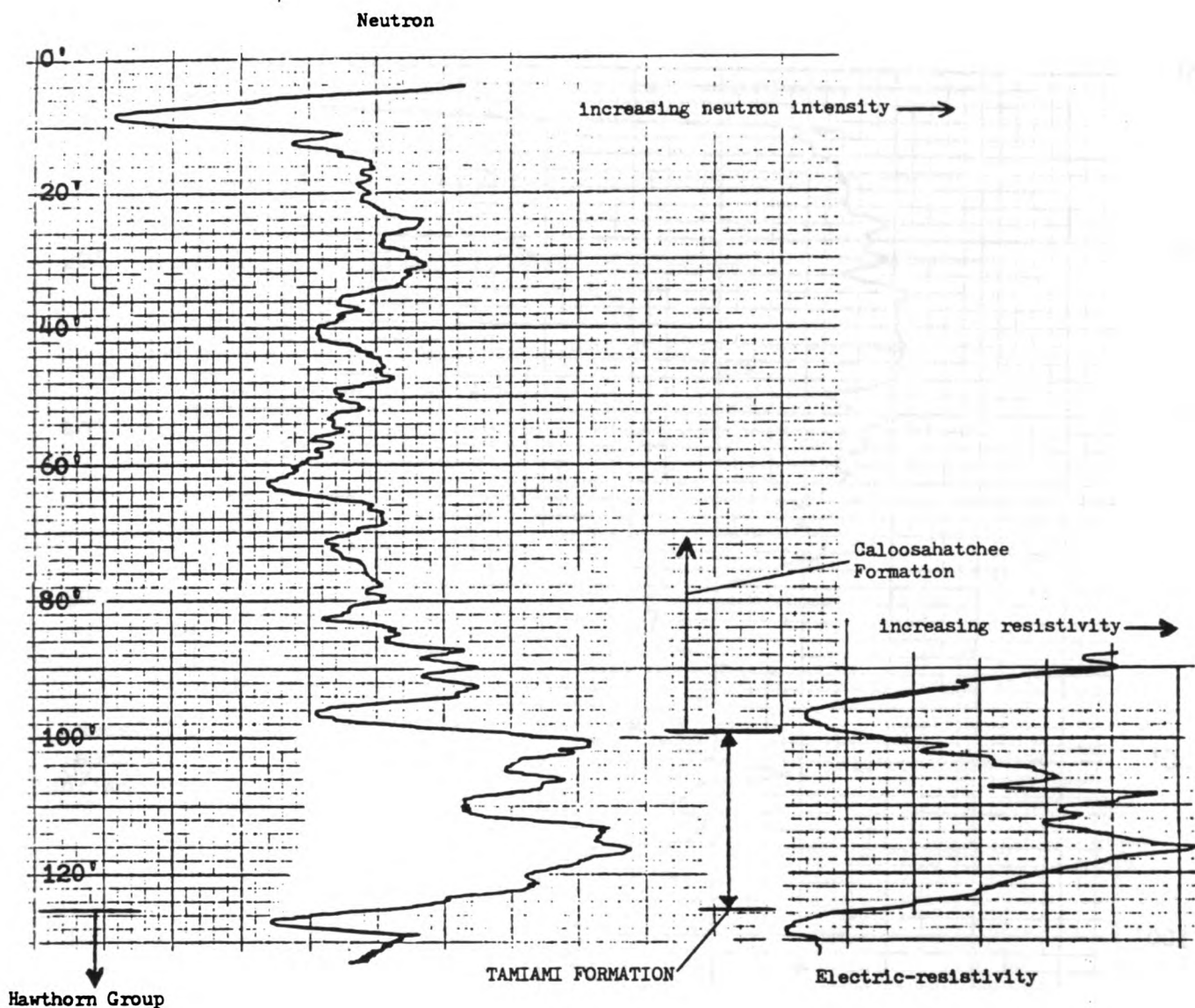


Figure 4. Neutron and electric-resistivity logs from Well 3 in Wabasso, northeastern Indian River County.

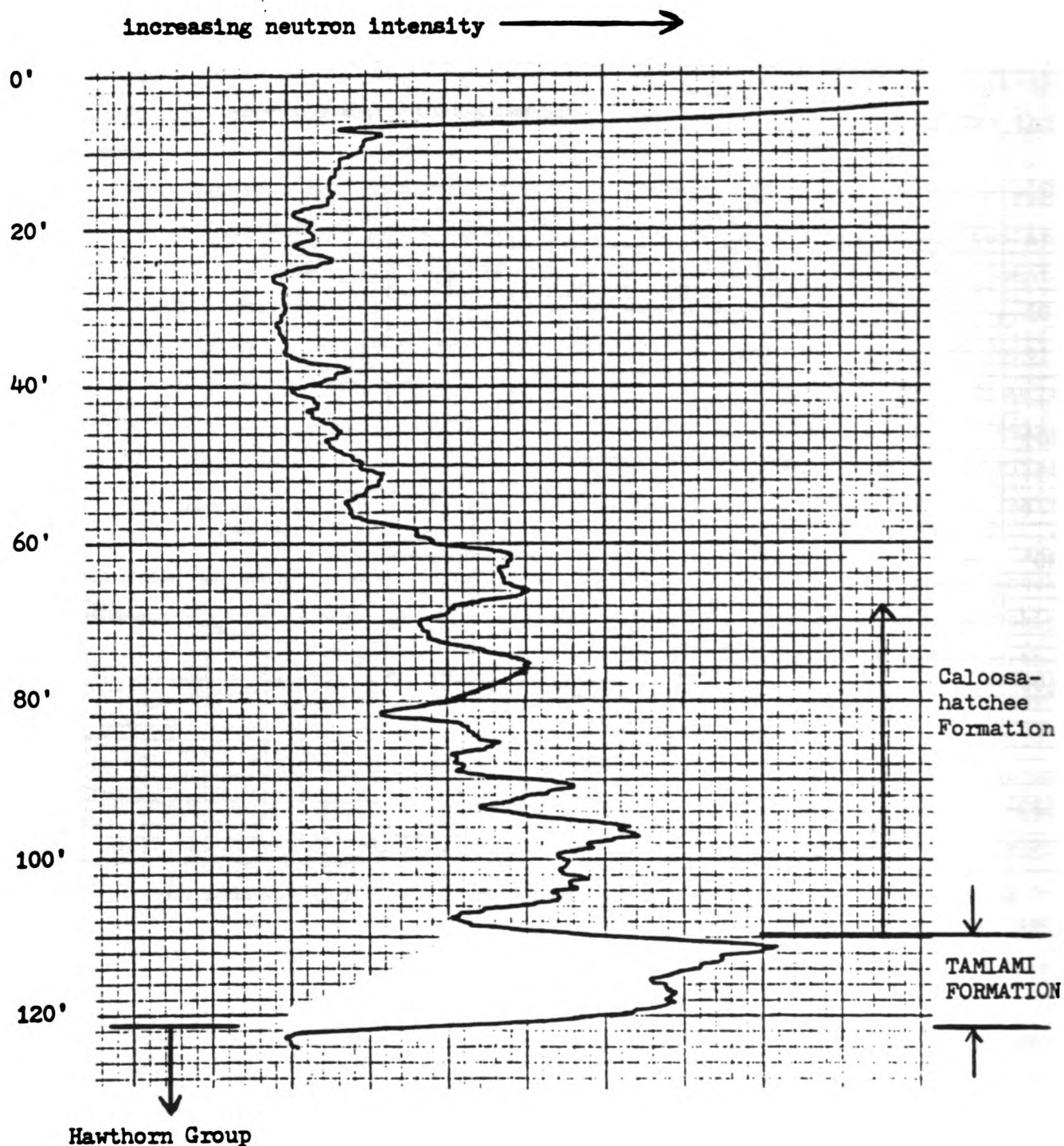


Figure 5. Neutron log from Well 4, southern Brevard County, northwest of Well 3.

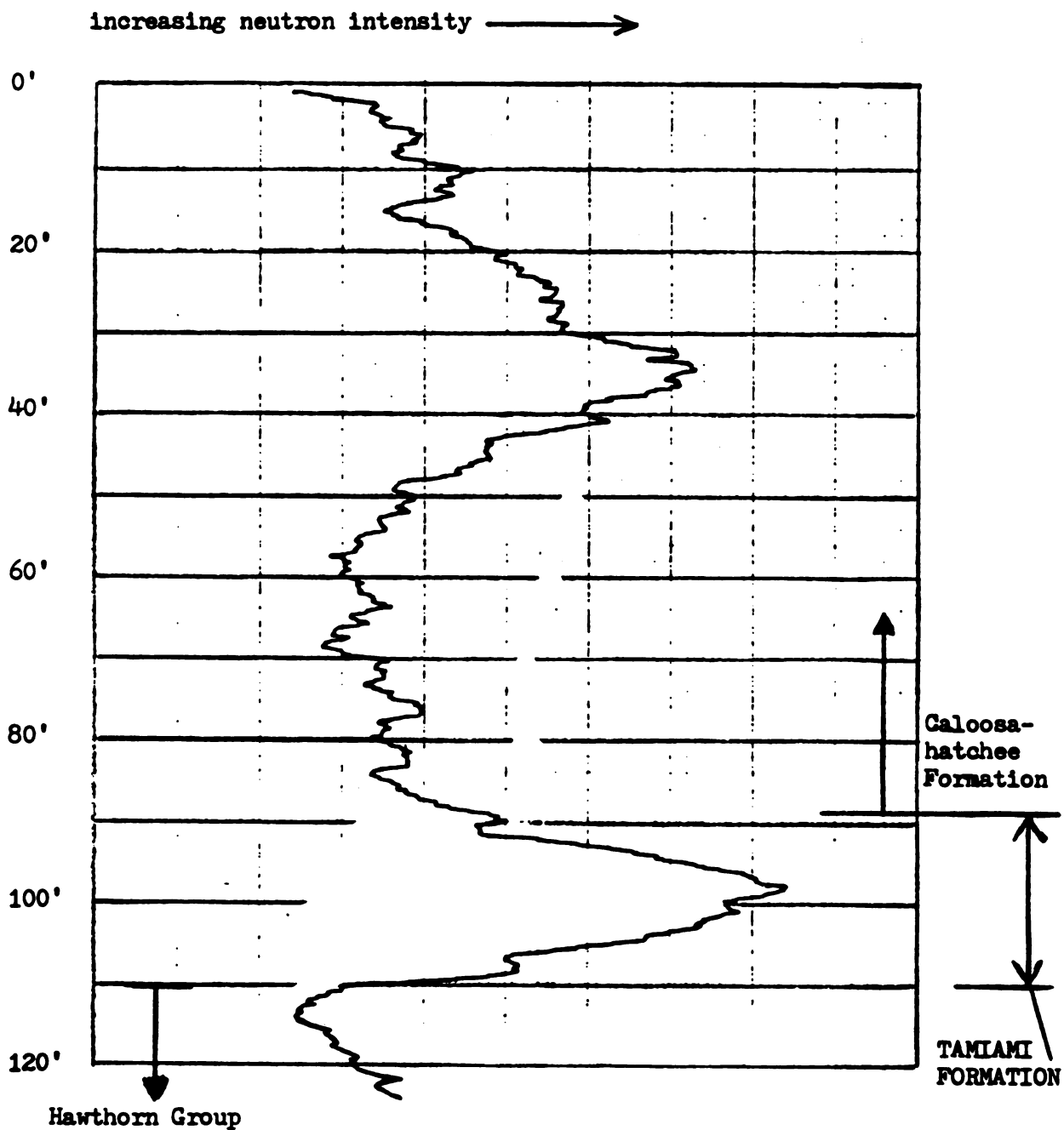


Figure 6. Neutron log from Well 5 at Sebastian Inlet, southern Brevard County.

on the barrier island in much of Brevard County, contains no partially recrystallized limestone beds. At this location and to the north, the top of the Tamiami Formation is significantly shallower below land surface than to the south in Indian River County and to the west in south-central (mainland) Brevard County. In this well, the Tamiami is 22-feet thick, whereas 11 miles to the west in Well 4, the thickness is only 12 feet, illustrating that the formation generally thins toward the west from the immediate vicinity of the Atlantic coast.

Well 6 is located in Cocoa Beach, extreme east-central Brevard County (Township 25 south, Range 37 east, Section 15; Figure 1), approximately 35 miles north-northwest of Well 5. The neutron log (Figure 7) depicts a quadruple-peak or zone of higher intensity between 74 feet and 112 feet bls corresponding to the Tamiami Formation. The uppermost Hawthorn Group below 112 feet bls is recorded on the log as lower intensity. Above the Tamiami, the Caloosahatchee Formation is also recorded as lower intensity. The Tamiami is 38-feet thick in this well, representing the thickest occurrence found in the study area.

Well 7 is located in Rockledge, east-central Brevard County (Township 25 south, Range 36 east, Section 15; Figure 1), approximately 15 miles directly west of Well 6 in Cocoa Beach. This borehole represents a shallow-rock aquifer test and observation well drilled by the SJRWMD. The neutron log (Figure 8) shows a well-defined higher intensity double-peak (Tamiami Formation) extending from 92 to 117 feet bls, situated between underlying (Hawthorn Group) and overlying (Caloosahatchee Formation) lower intensity zones. The total thickness of the Tamiami at this location is 25 feet, again illustrating that the formation generally thins toward the west inland from the immediate vicinity of the Atlantic coast (Cocoa Beach: 38 feet, Rockledge: 25 feet).

Well 8 is located on central Merritt Island one mile southeast of the south gate of the Kennedy Space Center, east-central Brevard County (Township 23 south, Range 36 east, Section 24; Figure 1), approximately 11 miles north-northeast of Well 7. The neutron log (Figure 9) records the Tamiami Formation as a well-defined triple-peak between 75 feet and 109 feet bls. Again, the top of the underlying Hawthorn Group is recorded as markedly lower intensity (below 109 feet bls), as is the entire Caloosahatchee Formation which overlies the Tamiami above 75 feet bls. The total thickness of the Tamiami Formation at this location is 34 feet, the second-thickest occurrence

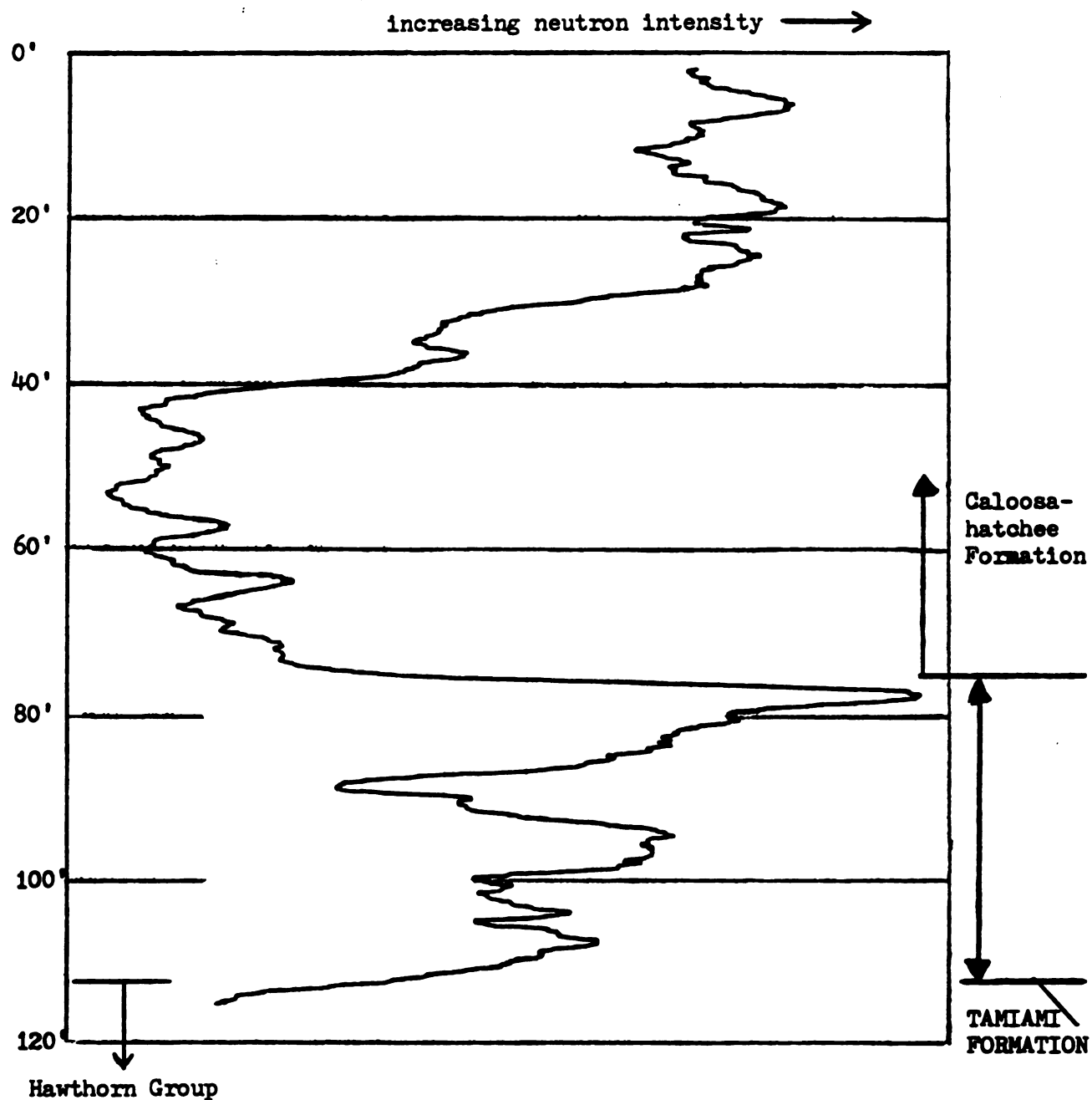


Figure 7. Neutron log from Well 6 in Cocoa Beach, east-central Brevard County.

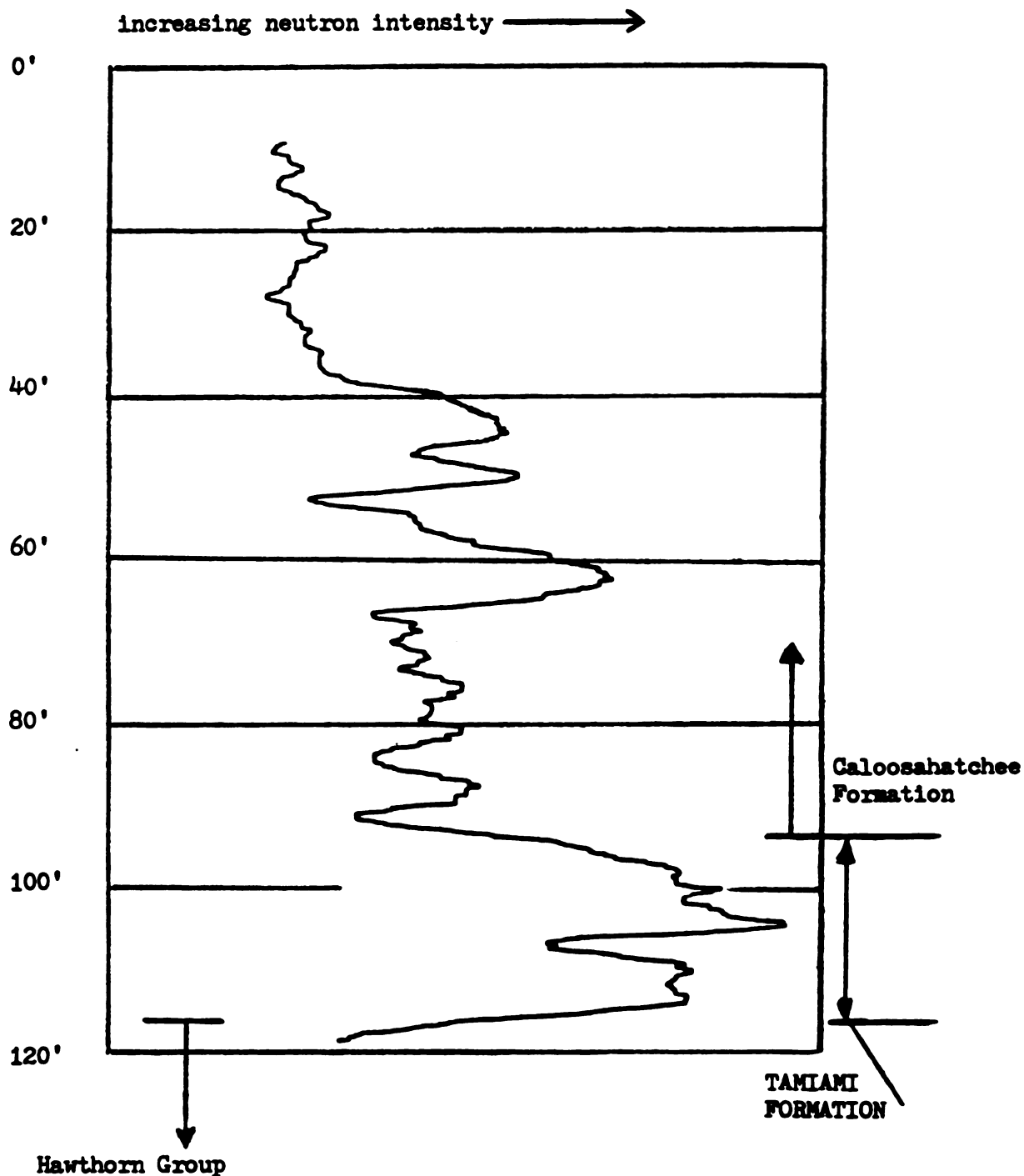


Figure 8. Neutron log from Well 7 in Rocklodge, east-central Brevard County.

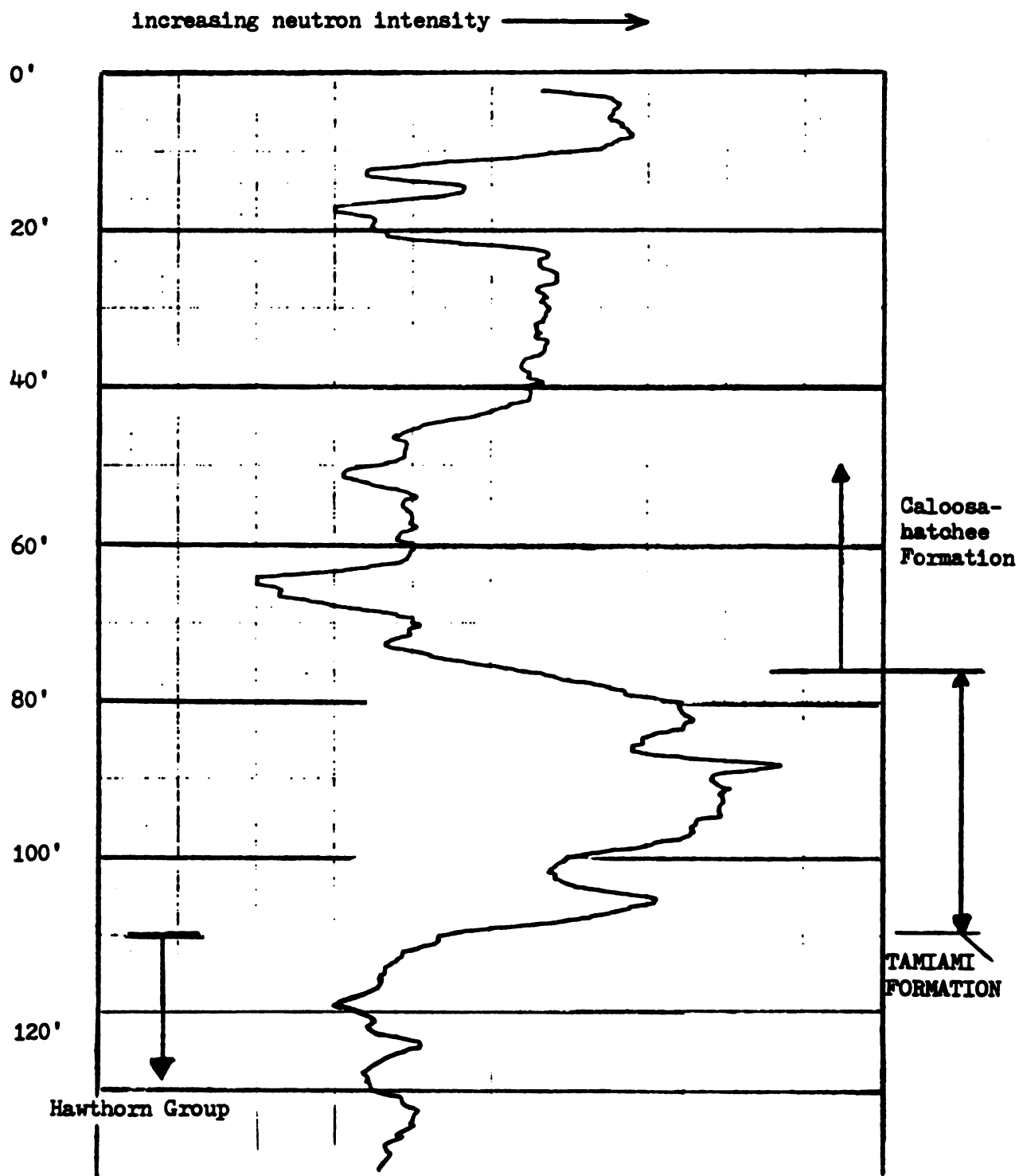


Figure 9. Neutron log from Well 8 on Merritt Island, east-central Brevard County.

of Tamiami identified in the study area.

The thinning of the Tamiami Formation toward the north in northeastern Brevard County is indicated on the neutron log obtained from Well 9 and illustrated on Figure 10. This well is located on northern Merritt Island in the Merritt Island National Wildlife Refuge (Township 21 south, Range 35 east, Section 13; Figure 1), approximately 15 miles north-northwest of Well 8. As in southern Brevard County and most of Indian River County, the Tamiami Formation is here recorded as a single peak (between 98 feet and 109 feet bls). Log suites obtained from additional wells in northern Merritt Island indicate that the Hawthorn Group varies considerably in thickness (<5-30 feet). On the present neutron log, the very thin valley of lower intensity immediately below the Tamiami probably records this highly variable Hawthorn Group. Above the Tamiami, the Caloosahatchee Formation is recorded as a series of low peaks indicative of thinly-interbedded, partially recrystallized limestone, and siliciclastics (above 98 feet bls). The Tamiami Formation is only 11-feet thick in this well.

SUMMARY

In eastern or coastal Brevard and Indian River Counties, the Pliocene Tamiami Formation is best defined and most easily identified on neutron logs. Electric-resistivity logs, when available, also may be used to identify the Tamiami. The carbonate-rich formation is recorded as a prominent single-, double-, triple-, or quadruple-peak underlain (upper Hawthorn Group) and overlain (basal Caloosahatchee Formation) by markedly lower intensity zones indicative of siliciclastics. In the study area, the Tamiami is thickest beneath Cocoa Beach and central Merritt Island (38 feet and 34 feet, respectively). The Tamiami thins to the south into southern Brevard and eastern Indian River Counties as well as to the north into northern Brevard County. The Tamiami also generally thins inland toward the west from the immediate vicinity of the Atlantic coast. The thickest occurrence of Tamiami found in Indian River County is an anomalous 27 feet in Wabasso in the northeastern portion of the county. In the remainder of eastern Indian River County, and in northern and southern Brevard County the Tamiami averages 10-20 feet or less in thickness, but remains well-defined on neutron and electric-resistivity logs.

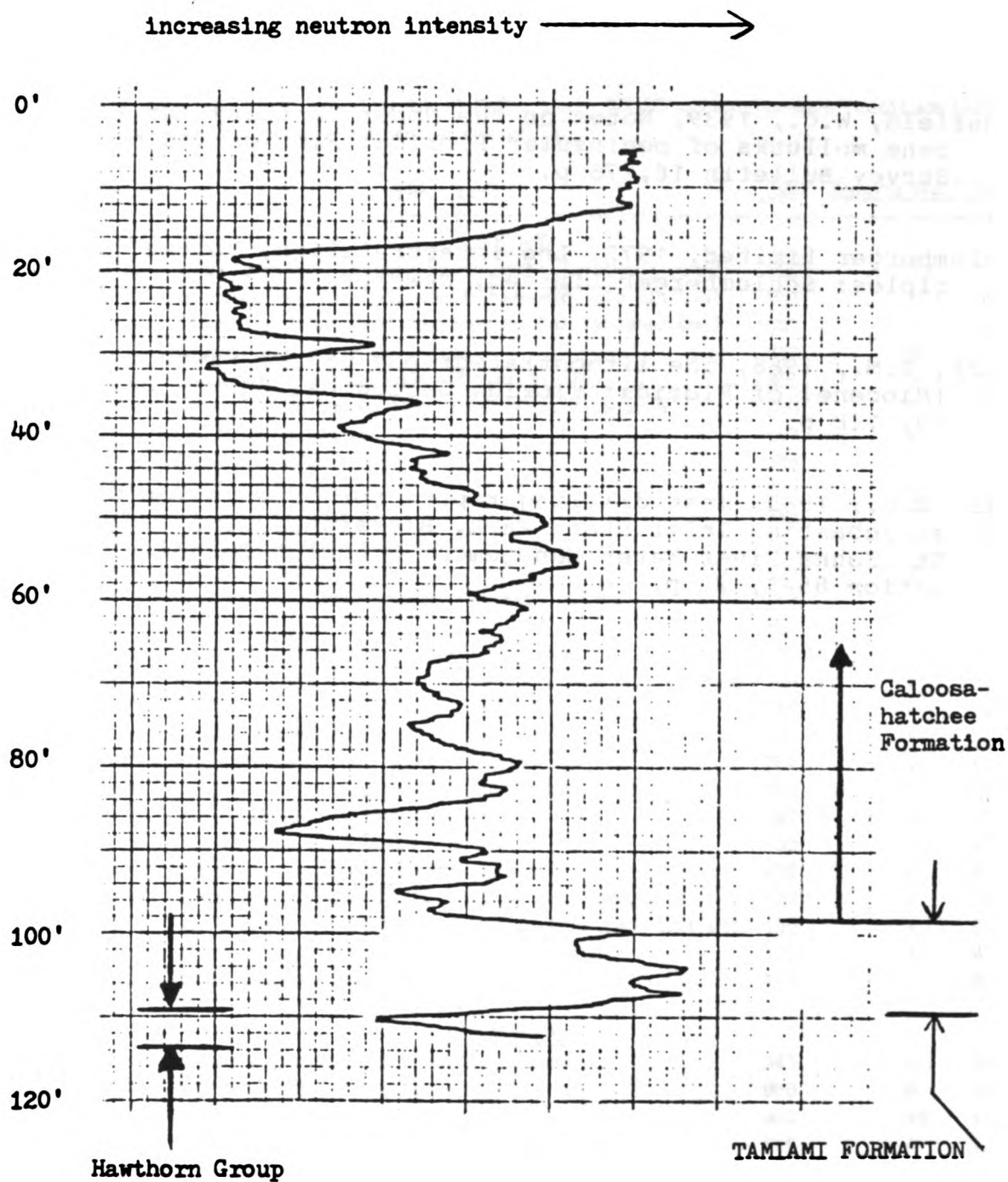


Figure 10. Neutron log from Well 9 on northern Merritt Island, northeastern Brevard County.

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APPENDIX

LIST OF ALL WELLS NEUTRON-LOGGED IN THE STUDY AREA

Note: Since these wells were logged by the SJRWMD, their SJRWMD access numbers (Latitude/Longitude) are used to identify and locate the wells.

<u>Latitude/Longitude</u>	<u>Well Name</u>	<u>TDL*</u>	<u>Casing/Size"</u>	<u>Depth'</u>
<u>BREVARD</u>				
282533N/804223W	Injection test-Brevard Waste Water Treatment Plant	2698	12	130
280138N/803516W	Bethesda Baptist Retirement Home-very old oil test	993	10/8	398
275210N/802722W	Sebastian Inlet Proj (parameters for finished well)	651	4	560
275550N/803137W	Couch Pumps North well-Grant	628	8	159
275759N/803033W	Floridana Beach-Oceanway-Public Supply	556	6	331
280007N/804337W	General Development Corp (GDC)-Port Malabar-5	349	6	87
275926N/804146W	GDC Port Malabar-6	347	4	127
275459N/804011W	GDC Port Malabar-1	336	6	107
275530N/804050W	GDC Port Malabar-4	335	6	124
275548N/804135W	GDC Port Malabar-2	316	4	93
282033N/804634W	Weber Ranch-Rockledge West	300	4	91
275546N/804145W	GDC Port Malabar-3	299	6	123
281653N/804028W	Crooked Mile Road-southern Merritt Island	248	4	126
280234N/803502W	Castaway Point-Palm Bay	245	6	189
282205N/804156W	Westwood Drive-central Merritt Island	242	4	120
283414N/803912W	Kennedy Space Center-in bldg-northern Merritt Island	225	4	131
282755N/804106W	Foosaner 1-central Merritt Island	212	4	36
283944N/804633W	Merritt Island National Wildlife Refuge	204	4	116
282756N/804108W	Foosaner 2-central Merritt Island-SW	202	3	84
282757N/804117W	Foosaner 3-central Merritt Island-NW	183	4	86
282304N/804213W	Merritt Crossing Shopping Center	182	3	93
275340N/803951W	Blackhawk Quarry-south county	139	3	127
282807N/804220W	Crisafolli-central Merritt Island	135	4	89
280634N/803858W	Melbourne Airport-SJRWMD shallow rock test well	133	4	75
275158N/803721W	Fellsmere Joint Venture-SJRWMD shallow rock test well	130	4	80
281904N/804335W	Rockledge-SJRWMD shallow rock test well	122	4	47
281845N/803634W	Cocoa Beach-Third Street South	117	4	66
<u>INDIAN RIVER</u>				
273427N/801956W	Seminole Shores-south barrier island	943	6	348
273615N/802835W	Jackson Brothers Groves	860	8	355
274837N/802935W	Sebastian Country Club	840	10	198
273821N/802739W	CR 505A and SR 60-Holt-west of Vero Beach	746	4	138
274123N/802943W	Takaho Groves-northwest of Vero Beach	676	6	230
274455N/802637W	Johns Island-Wabasso	558	12	327
274522N/803043W	Vero Beach Farms-west of Wabasso	465	4	167
273548N/802039W	The Moorings 2-south barrier island	456	10	418
273537N/802009W	The Moorings 1-south barrier island	436	4	404
273348N/801930W	Round Island Park SJRWMD shallow rock test well	192	4	99
274002N/802619W	South Gifford SJRWMD shallow rock test well	150	4	84
274240N/802532W	Winter Beach SJRWMD shallow rock test well	144	4	95
273607N/802328W	South Canal SJRWMD shallow rock test well	143	4	10
NA	Vero Beach public supply #28-Vero Beach High School	141	NA	NA
274603N/803457W	Fellsmere SJRWMD shallow rock test well	140	4	105

APPENDIX continued

<u>Latitude/Longitude</u>	<u>Well Name</u>	<u>TDL*</u>	<u>Casing Size"</u>	<u>Depth'</u>
274948N/802916W	Roseland SJRWMD shallow rock test well	135	4	105
274517N/802618W	Wabasso School SJRWMD shallow rock test well	132	4	85
274414N/802650W	SW Wabasso SJRWMD shallow rock test well	128	4	88
NA	Vero Beach public supply well #23	126	12	NA
273732N/802410W	Vero Beach Elem School SJRWMD shallow rock test well	123	4	108

NOTES

- *= Total depth logged by neutron probe in feet below land surface
- "= Casing outside diameter in inches
- '= Bottom of casing (depth) in feet below land surface
- NA= data not available

